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FEDERAL COMMUNICATIONS COMMISSION

Part 3—Radio Broadcast Services

(January 1956 Edition)

TITLE 47—TELECOMMUNICATION

Chapter I—Federal Communications Commission

PART 3—RADIO BROADCAST SERVICES

The Commission, by order dated November 3, 1955, effective January 2, 1956, revised Part 3 of its Rules and Regulations to read as set forth below.

FEDERAL COMMUNICATIONS COMMISSION,

MARY JANE MORRIS,
Secretary.

Subpart A—Standard Broadcast Stations

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SUBPART A—STANDARD BROADCAST STATIONS

DEFINITIONS

§ 3.1 *Standard broadcast station.* The term "standard broadcast station" means a broadcasting station licensed for the transmission of radiotelephone emissions primarily intended to be received by the general public and operated on a channel in the band 535–1605 kilocycles.

§ 3.2 *Standard broadcast band.* The term "standard broadcast band" means the band of frequencies extending from 535 to 1605 kilocycles.

§ 3.3 *Standard broadcast channel.* The term "standard broadcast channel" means the band of frequencies occupied by the carrier and two side bands of a broadcast signal with the carrier frequency at the center. Channels shall be designated by their assigned carrier frequencies. The 107 carrier frequencies assigned to standard broadcast stations shall begin at 540 kilocycles and be in successive steps of 10 kilocycles.

§ 3.4 *Dominant station.* The term "dominant station" means a Class I station, as hereinafter defined, operating on a clear channel.

§ 3.5 *Secondary station.* The term "secondary station" means any station except a Class I station operating on a clear channel.

§ 3.6 *Daytime.* The term "daytime" means that period of time between local sunrise and local sunset.

§ 3.7 *Nighttime.* The term "nighttime" means that period of time between local sunset and 12 midnight local standard time.

§ 3.8 *Sunrise and sunset.* The terms "sunrise and sunset" mean, for each particular location and during any particular month, the time of sunrise and sunset as specified in the instrument of authorization.

§ 3.9 *Broadcast day.* The term "broadcast day" means that period of time between local sunrise and 12 midnight local standard time.

§ 3.10 *Experimental period.* The term "experimental period" means that time between 12 midnight and local sunrise. This period may be used for experimental purposes in testing and maintaining apparatus by the licensee of any standard broadcast station on its assigned frequency and with its authorized power, provided no interference is caused to other stations maintaining a regular operating schedule within such period. No station licensed for "daytime" or "specified hours" of operation may broadcast any regular or scheduled program during this period.

§ 3.11 *Service areas.* (a) The term "primary service area" of a broadcast station means the area in which the groundwave is not subject to objectionable interference or objectionable fading.

(b) The term "secondary service area" of a broadcast station means the area served by the skywave and not subject to objectionable interference. The signal is subject to intermittent variations in intensity.

(c) The term "intermittent service area" of a broadcast station means the area receiving service from the groundwave but beyond the primary service

area and subject to some interference and fading.

§ 3.12 *Portable transmitter.* The term "portable transmitter" means a transmitter so constructed that it may be moved about conveniently from place to place, and is in fact so moved about from time to time, but not ordinarily used while in motion. In the standard broadcast band, such a transmitter is used in making field intensity measurements for locating a transmitter site for a standard broadcast station. A portable broadcast station will not be licensed in the standard broadcast band for regular transmission of programs intended to be received by the public.

§ 3.13 *Auxiliary transmitter.* The term "auxiliary transmitter" means a transmitter maintained only for transmitting the regular programs of a station in case of failure of the main transmitter.

§ 3.14 *Technical definitions*—(a) *Combined audio harmonics.* The term "combined audio harmonics" means the arithmetical sum of the amplitudes of all the separate harmonic components. Root sum square harmonic readings may be accepted under conditions prescribed by the Commission.

(b) *Effective field.* The term "effective field" or "effective field intensity" is the root-mean-square (RMS) value of the inverse distance fields at a distance of 1 mile from the antenna in all directions in the horizontal plane.

(c) *Operating power.* "Operating power" is the power that is actually supplied to the radio station antenna.

(d) *Maximum rated carrier power.* "Maximum rated carrier power" is the maximum power at which the transmitter can be operated satisfactorily and is determined by the design of the transmitter and the type and number of vacuum tubes used in the last radio stage.

(e) *Plate input power.* "Plate input power" means the product of the direct plate voltage applied to the tubes in the last radio stage and the total direct current flowing to the plates of these tubes, measured without modulation.

(f) *Antenna power.* "Antenna input power" or "antenna power" means the product of the square of the antenna current and the antenna resistance at the point where the current is measured.

(g) *Antenna current.* "Antenna current" means the radio-frequency current in the antenna with no modulation.

(h) *Antenna resistance.* "Antenna resistance" means the total resistance of the transmitting antenna system at the operating frequency and at the point at which the antenna current is measured.

(i) *Modulator stage.* "Modulator stage" means the last amplifier stage of the modulating wave which modulates a radio-frequency stage.

(j) *Modulated stage* "Modulated stage" means the radio-frequency stage to which the modulator is coupled and in which the continuous wave (carrier wave) is modulated in accordance with the system of modulation and the characteristics of the modulating wave.

(k) *Last radio stage.* "Last radio stage" means the oscillator or radio-frequency-power amplifier stage which supplies power to the antenna.

(l) *Percentage modulation (amplitude).* "Percentage modulation" with respect to an amplitude modulated wave means the ratio of half the difference between the maximum and minimum amplitudes of the amplitude modulated wave to the average amplitude expressed in percentage.

(m) *Maximum percentage of modulation.* "Maximum percentage of modulation" means the greatest percentage of modulation that may be obtained by a transmitter without producing in its output harmonics of the modulating frequency in excess of those permitted by these regulations.

(n) *High level modulation.* "High level modulation" is modulation produced in the plate circuit of the last radio stage of the system.

(o) *Low level modulation.* "Low level modulation" is modulation produced in an earlier stage than the final.

(p) *Plate modulation.* "Plate modulation" is modulation produced by introduction of the modulating wave into the plate circuit of any tube in which the carrier frequency wave is present.

(q) *Grid modulation.* "Grid modulation" is modulation produced by introduction of the modulating wave into any of the grid circuits of any tube in which the carrier frequency wave is present.

(r) *Blanketing.* Blanketing is that form of interference which is caused by the presence of a broadcast signal of 1 v/m or greater intensity in the area adjacent to the antenna of the transmitting station. The 1 v/m contour is referred to as the blanket contour and the area within this contour is referred to as the blanket area.

ALLOCATION OF FACILITIES

§ 3.21 *Three classes of standard broadcast channels*—(a) *Clear channel.* A clear channel is one on which the dominant station or stations render service over wide areas and which are cleared of objectionable interference within their primary service areas and over all or a substantial portion of their secondary service areas.

(b) *Regional channel.* A regional channel is one on which several stations may operate with powers not in excess of 5 kilowatts. The primary service area of a station operating on any such channel may be limited as a consequence of interference to a given field intensity contour.

(c) *Local channel.* A local channel is one on which several stations may operate with powers not in excess of 250 watts. The primary service area of a station operating on any such channel may be limited as a consequence of interference to a given field intensity contour.

§ 3.22 *Classes and power of standard broadcast stations*—(a) *Class I station.* A Class I station is a dominant station operating on a clear channel and designed to render primary and secondary service over an extended area and at relatively long distances. Its primary service area is free from objectionable interference from other stations on the same and adjacent channels, and its secondary service area free from interference except from stations on the adjacent channel, and from stations on the same channel in accordance with the channel designation in § 3.25 or § 3.182. The operating power shall be not less than 10 kilowatts nor more than 50 kilowatts. (Also see § 3.25 (a) for further power limitation.)

(b) *Class II station.* A Class II station is a secondary station which operates on a clear channel (see § 3.25) and is designed to render service over a primary service area which is limited by and subject to such interference as may be received from Class I stations. A station of this class shall operate with power not less than 0.25 kilowatt nor more than 50 kilowatts. Whenever necessary a Class II station shall use a directional antenna or other means to avoid interference with Class I stations and with other Class II stations, in accordance with § 3.182.

(c) *Class III station.* A Class III station is a station which operates on a regional channel and is designed to render service primarily to a metropolitan district and the rural area contiguous thereto. Class III stations are subdivided into two classes. (The term "metropolitan district" as used in this paragraph is not limited in accordance with the definition given by the Bureau of the Census but includes any principal center of population in any area.)

(1) *Class III–A station.* A Class III–A station is a Class III station which operates with power not less than 1 kilowatt nor more than 5 kilowatts and the service area of which is subject to interference in accordance with § 3.182.

(2) *Class III–B station.* A Class III–B station is a Class III station which operates with a power not less than 0.5 kilowatt, and not more than 1 kilowatt night and 5 kilowatts daytime, and the service area of which is subject to interference in accordance with § 3.182.

(d) *Class IV station.* A Class IV station is a station operating on a local channel and designed to render service primarily to a city or town and the suburban and rural areas contiguous thereto. The power of a station of this class shall not be less than 0.1 kilowatt nor more than 0.25 kilowatt, and its service area is subject to interference in accordance with § 3.182.

§ 3.23 *Time of operation of the several classes of stations.* The several classes of standard broadcast stations may be licensed to operate in accordance with the following:

(a) Unlimited time permits operation without a maximum limit as to time.

(b) Limited time is applicable to Class II (secondary stations) operating on a clear channel only. It permits operation of the secondary station during daytime, and until local sunset if located west of the dominant station on the channel, or if located east thereof, until sunset at the dominant station, and in addition during night hours, if any, not used by the dominant station or stations on the channel.

(c) Daytime permits operation during the hours between average monthly local

sunrise and average monthly local sunset. Daytime stations operating on local channels may, upon notification to the Commission and the Engineer in Charge of the radio district in which they are located, operate at hours beyond those specified in their license.

(d) Sharing time permits operation during hours which are so restricted by the station license as to require a division of time with one or more other stations using the same channel.

(e) Specified hours means that the exact operating hours are specified in the license. (The minimum hours that any station shall operate are specified in § 3.71.) Specified hours stations operating on local channels except those sharing time with other stations may, upon notification to the Commission and the Engineer in Charge of the radio district in which they are located, operate at hours beyond those specified in their license.

§ 3.24 *Broadcast facilities; showing required.* (a) Applications for new stations or for modifications of existing authorizations shall be filed on FCC Form 301; for licenses, on FCC Form 302; for renewal of licenses, on FCC Form 303.

(b) An authorization for a new standard broadcast station or increase in facilities of an existing station will be issued only after a satisfactory showing has been made in regard to the following, among others:

(1) That the proposed assignment will tend to effect a fair, efficient, and equitable distribution of radio service among the several states and communities.

(2) That objectionable interference will not be caused to existing stations or that if interference will be caused the need for the proposed service outweighs the need for the service which will be lost by reason of such interference. That the proposed station will not suffer interference to such an extent that its service would be reduced to an unsatisfactory degree. (For determining objectionable interference, see §§ 3.182 and 3.188.)

(3) That the applicant is financially qualified to construct and operate the proposed station.

(4) That the applicant is legally qualified. That the applicant (or the person or persons in control of an applicant corporation or other organization) is of good character and possesses other qualifications sufficient to provide a satisfactory public service.

(5) That the technical equipment proposed, the location of the transmitter, and other technical phases of operation comply with the regulations governing the same, and the requirements of good engineering practice. (See technical regulations of this subpart and § 3.188.)

(6) That the facilities sought are subject to assignment as requested under existing international agreements and the rules and regulations of the Commission.

(7) That the population within the 1 v/m contour does not exceed 1.0 percent of the population within the 25 mv/m contour: *Provided, however,* That where the number of persons within the 1 v/m contour is 300 or less the provisions of this subparagraph are not applicable.

(8) That the public interest, convenience, and necessity will be served through the operation under the proposed assignment.

§ 3.25 *Clear channels; Class I and II stations* The frequencies in the following tabulations are designated as clear channels and assigned for use by the Classes of stations given:

(a) To each of the channels below there will be assigned one Class I station and there may be assigned one or more Class II stations within the continental limits of the United States operating limited time or daytime only: 640, 650, 660, 670, 700, 720, 750, 760, 770, 780, 820, 830, 840, 870, 880, 890, 1020, 1040, 1100, 1120, 1160, 1180, 1200, and 1210 kilocycles. There also may be assigned to these frequencies Class II stations operating unlimited time in Alaska, Hawaii, Virgin Islands and Puerto Rico which will not deliver over 5 microvolts per meter groundwave day or night or 25 microvolts per meter 10 percent time skywave at night at any point within the continental limits of the United States. The power of the Class I stations on these channels shall not be less than 50 kilowatts.

(b) To each of the channels below there may be assigned Class I and Class II stations: 680, 710, 810, 850, 940, 1000, 1030, 1060, 1070, 1080, 1090, 1110, 1130, 1140, 1170, 1190, 1500, 1510, 1520, 1530, 1540, 1550, and 1560 kilocycles.

NOTE: Class I and II stations on 1540 kc shall deliver not over 5 microvolts per meter groundwave or 25 microvolts per meter 10 percent time skywave at any point of land in the Bahama Islands, and such stations operating nighttime (i. e., sunset to sunrise at the location of the Class II station) shall be located not less than 650 miles from the nearest point of land in the Bahama Islands.

(c) For Class II stations which will not deliver over 5 microvolts per meter groundwave or 25 microvolts per meter 10 percent time skywave at any point on the Canadian border and provided that such stations operating nighttime (i. e., sunset to sunrise at the location of the Class II station) are located not less than 650 miles from the nearest Canadian border, 640, 690, 740, 860, 990, 1010, and 1580 kilocycles.

NOTE 1: See § 2.104 (a) of this chapter with respect to use of 540 kc.

NOTE 2: A station on 1010 kilocycles shall also protect a Class I-B station at Havana, Cuba.

(d) In continenal United States, for Class II stations which operate daytime only with power not in excess of 1 kilowatt and which will not deliver over 5 microvolts per meter groundwave at any point on the Mexican border, and in Alaska, Hawaii, Puerto Rico, and the Virgin Islands, for Class II stations which will not deliver over 5 microvolts per meter groundwave or 25 microvolts per meter 10 percent time skywave at any point on the said border: 730, 800, 900, 1050, 1220 and 1570 kilocycles.

NOTE 1: See North American Regional Broadcasting Agreement, Havana, 1937 (Appendix I, Table IV) for use of 1050 kc by a station in New York.

NOTE 2: See agreement with Mexico for further use of 1220 kc

§ 3.26 *Regional channels: Classes III-A and III-B stations.* The following frequencies are designated as regional channels and are assigned for use by Class III-A and III-B stations: 550, 560, 570, 580, 590, 600, 610, 620, 630, 790, 910, 920, 930, 950, 960, 970, 980, 1150, 1250, 1260, 1270, 1280, 1290, 1300, 1310, 1320, 1330, 1350, 1360, 1370, 1380, 1390, 1410, 1420, 1430, 1440, 1460, 1470, 1480, 1590, and 1600 kilocycles.

NOTE. See North American Regional Broadcasting Agreement for special provisions concerning the assigning of Class II stations in other countries of North America to 560, 570, 590, 630, and 1270 kcs. Such stations shall be protected from interference in accordance with appendix II, table I, of said agreement.

§ 3.27 *Local channels. Class IV stations.* The following frequencies are designated as local channels and are assigned for use by Class IV stations: 1230, 1240, 1340, 1400, 1450, and 1490 kilocycles.

§ 3.28 *Assignment of stations to channels* (a) The individual assignments of stations to channels which may cause interference to other United States stations only, shall be made in accordance with the provisions of this part for the respective classes of stations involved. (For determining objectionable interference, see §§ 3.182 and 3.186.)

(b) In all cases where an individual station assignment may cause interference with or may involve a channel assigned for priority of use by a station in another North American country, the classifications, allocation requirements and engineering standards set forth in the North American Regional Broadcasting Agreement shall be observed.

NOTE: Pending action with respect to ratification and entry into force of the North American Regional Broadcasting Agreement, Washington, 1950 (referred to herein as NARBA), no assignment for a standard broadcast station will be made which would be inconsistent with the terms of that agreement.

On an interim basis while protection by countries not signatory to the NARBA continues for assignments in the United States, no assignment for a standard broadcast station will be made which would cause objectionable interference to a duly notified station in a North American country which is not signatory to the NARBA (i. e., Mexico and Haiti). For purposes of this paragraph, interference will in general be determined, in accordance with the engineering standards in use at the time of the expiration of the Interim Agreement (Modus Vivendi), Treaties and Other International Acts Series 1553. In particular, the existence or absence of interference resulting from skywave signal transmission will be determined by the use of Figures 1 and 6 (a) of § 3.190 and the "50 per cent exclusion" method of calculating RSS interference described in § 3.182. Figure 1 of § 3.190 will be utilized in connection with curve #1 of Figure 6 (a) of § 3.190 in the determination of 50 percent skywave signals. Figure 1 of § 3.190, converted for radiation of 100 mv/m at angles above the horizontal by the use of curve #1 of Figure 6 (a) of § 3.190 and the vertical radiation pattern for a 0.311 λ antenna in Figure 5 of § 3.190, will be used with the highest value of antenna radiation occurring at any pertinent angle between the limits described by curves #4 and #5 of Figure 6 (a)

of § 3.190 in the determination of 10% skywave signals. The Mexican and Haitian stations considered to be duly notified will be those notified and accepted in accordance with past agreements, and those subsequently notified in substantial accordance with the procedures and understandings that have pertained thus far.

Engineering standards now in force domestically differ in some respects from those specified for international purposes and must be observed in appropriate cases. For example, the engineering standards specified for international purposes will be used to determine (1) the extent to which interference might be caused by a proposed station in the United States to a station in another North American country and (2) whether the United States should register an objection to any new or changed assignment notified by another North American country. The domestic standards in effect in the United States will be used to determine the extent to which interference exists or would exist from a foreign station where the value of such interference (1) enters into a calculation of the service to be rendered by a proposed operation in the United States or (2) enters into the calculation of the permissible interfering signal from one station in the United States towards another United States station.

In general, an application for a standard broadcast station assignment the grant of which would be consistent with provisions of the NARBA and would not cause objectionable interference to a duly notified station in a North American country not signatory to the NARBA, will be considered and acted upon by the Commission in accordance with the established procedure for action upon such applications even though the NARBA may not yet have entered into force. However, in particular cases such applications may also present considerations of an international nature which require that a different procedure be followed. In such cases the procedure to be followed will be determined by the Commission in the light of the special considerations involved.

Special provisions of a procedural nature respecting the consideration of applications for standard broadcast station assignments pending action with respect to ratification and entry into force of NARBA, 1950, and respecting the consideration of applications the grant of which would cause objectionable interference to duly notified stations in countries not signatory to the NARBA, are set out in a note to Part 1 of this chapter, Subparts D and G.

(c) Upon showing that a need exists, a Class II, III, or IV station may be assigned to a channel available for such class, even though interference will be received within its normally protected contour; *Provided:* (1) No objectionable interference will be caused by the proposed station to existing stations or that if interference will be caused, the need for the proposed service outweighs the need for the service which will be lost by reason of such interference; and (2) primary service will be provided to the community in which the proposed station is to be located; and (3) the interference received does not affect more than 10 percent of the population in the proposed station's normally protected primary service area. However, in the event that the nighttime interference received by the proposed station would exceed this amount, then an assignment may be made if the proposed station would provide either a standard broadcast nighttime facility to a community not having such a facility or if 25 percent or more of the nighttime primary service area of the proposed station is without primary nighttime service.

§ 3.29 *Class IV stations on regional channels.* No license will be granted for the operation of a Class IV station on a regional channel: *Provided, however,* That Class IV stations presently authorized to operate on regional channels will not be required to change frequency, or power but will not be protected against interference from Class III stations.

§ 3.30 *Station location and program origination.* (a) Except as provided in paragraph (b) of this section, each standard broadcast station will be licensed to serve primarily a particular city, town, or other political subdivision which will be specified in the station license and the station will be considered to be located in such place. Unless licensed as a synchronous amplifier transmitter, each station shall maintain a studio, which will be known as the main studio, in the place where the station is located provided that the main studio may be located at the transmitter site whether or not the transmitter site is in the place where the station is located. A majority (computed on the basis of duration and not number) of a station's programs or in the case of a station affiliated with a network ⅔ of such station's non-network programs, whichever is smaller, shall originate from the main studio or from other studios or remote points situated in the place where the station is located.

(b) Stations will be licensed to serve more than one city, town, or other political subdivision only where a satisfactory showing is made that each such place meets all the requirements of the rules and regulations of this subpart with respect to the location of main studios, that the station can and will originate a substantial number of local live programs from each such place; and that the requirements as to origination of programs contained in paragraph (a) of this section would place an unreasonable burden on the station if it were licensed to serve only one city, town, or other political sub-division. A station licensed to serve more than one place shall be considered to be located in and shall maintain main studios in each such place. With respect to such station the requirements as to origination of programs contained in paragraph (a) of this section shall be satisfied by the origination of programs from any or all of the main studios or from other studios and remote points situated in any or all of the places in which the main studios are located.

(c) The transmitter of each standard broadcast station shall be so located that primary service is delivered to the borough or city in which the main studio is located in accordance with the rules and regulations of this subpart.

§ 3.31 *Authority to move main studio.* The licensee of a station shall not move its main studio outside the borders of the borough or city, state, district, territory, or possession in which it is located, unless such move is to the location of the station's transmitter, without first securing a modification of construction permit or license. The licensee shall promptly notify the Commission of any other change in location of the main studio.

§ 3.32 *Special experimental authorizations.* (a) Special experimental authorization may be issued to the licensee of a standard broadcast station in addition to the regular license upon informal application therefor and upon a satisfactory showing in regard to the following, among others:

(1) That the applicant has a program of research and experimentation which indicates reasonable promise of contribution to the development and practical application of broadcasting, and will be in addition to and advancement of the work that can be accomplished under its regular license.

(2) That the experimental operation and experimentation will be under the direct supervision of a qualified engineer with an adequate staff of engineers qualified to carry on the program of research and experimentation.

(3) That the public interest, convenience, and necessity will be served by granting the authorization requested.

(b) In case a special experimental authorization permits additional hours of operation, no licensee shall transmit any commercial or sponsored program or make any commercial announcement during such time of operation. In case of other additional facilities, no additional charge shall be made by reason of transmission with such facilities.

(c) A special experimental authorization will not be extended after the actual experimentation is concluded.

(d) The program of research and experimentation as outlined in the application for a special experimental authorization shall be adhered to in the main unless the licensee is authorized to do otherwise by the Commission.

(e) The Commission may require from time to time a broadcast station holding such experimental authorization to conduct experiments that are deemed desirable and reasonable.

(f) A supplemental report shall be filed with and made a part of each application for an extension of a special experimental authorization and shall include statements of the following:

(1) Comprehensive summary of all research and experimentation conducted.

(2) Conclusions and outline of proposed program for further research and development.

(3) Comprehensive summary and conclusions as to the social and economic effects of its use.

§ 3.33 *Antenna systems; showing required.* (a) An application for authority to install a broadcast antenna shall specify a definite site and include full details of the antenna design and expected performance. (Site-to-be-determined applications which were on file prior to October 28, 1953, may be granted conditioned upon the filing within 60 days of such grant of an application for modification of permit specifying a site conforming to Commission's rules and standards.)

(b) All data necessary to show compliance with the terms and conditions

of the construction permit must be filed with the license application. If the station is using a directional antenna, a proof of performance must also be filed.

§ 3.34 *Normal license period.* (a) All standard broadcast station licenses will be issued for a normal license period of three years. Licenses will be issued to expire at the hour of 3:00 a. m., e. s. t., in accordance with the following schedule and at three-year intervals thereafter.

(1) For stations located in Delaware and Pennsylvania, August 1, 1957.
(2) For stations located in Maryland, District of Columbia, Virginia, West Virginia, October 1, 1957.
(3) For stations located in North Carolina, South Carolina, December 1, 1957.
(4) For stations located in Florida, Puerto Rico and Virgin Islands, February 1, 1958.
(5) For stations located in Alabama and Georgia, April 1, 1958.
(6) For stations located in Arkansas, Louisiana and Mississippi, June 1, 1958.
(7) For stations located in Tennessee, Kentucky and Indiana, August 1, 1958.
(8) For stations located in Ohio and Michigan, October 1, 1958.
(9) For stations located in Illinois and Wisconsin, December 1, 1958.
(10) For stations located in Iowa and Missouri, February 1, 1956.
(11) For stations located in Minnesota, North Dakota, South Dakota, Montana and Colorado, April 1, 1956.
(12) For stations located in Kansas, Oklahoma, Nebraska, June 1, 1956.
(13) For stations located in Texas, August 1, 1956.
(14) For stations located in Wyoming, Nevada, Arizona, Utah, New Mexico and Idaho, October 1, 1956
(15) For stations located in California, December 1, 1956.
(16) For stations located in Washington, Oregon, Alaska, Guam and Hawaii, February 1, 1957.
(17) For stations located in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont, April 1, 1957.
(18) For stations located in New Jersey and New York, June 1, 1957.

(b) When an application is granted by the Commission necessitating the issuance of a modified license less than 60 days prior to the expiration date of the license sought to be modified, and an application for renewal of said license is granted subsequent or prior thereto (but within 30 days of expiration of the present license) the modified license as well as the renewal license shall be issued to conform to the combined action of the Commission.

§ 3.35 *Multiple ownership.* No license for a standard broadcast station shall be granted to any party (including all parties under common control.) if:

(a) Such party directly or indirectly owns, operates or controls another standard broadcast station, a substantial portion of whose primary service area would receive primary service from the station in question, except upon a showing that public interest, convenience and necessity will be served through such multiple ownership situation; or

(b) Such party, or any stockholder, officer or director of such party, directly or indirectly owns, operates controls, or has any interest in, or is an officer or director of any other standard broadcast station if the grant of such license would result in a concentration of control of standard broadcasting in a manner inconsistent with public interest, convenience, or necessity. In determining whether there is such a concentration of control, consideration will be given to the facts of each case with particular reference to such factors as the size, extent and location of areas served, the number of people served, classes of stations involved and the extent of other competitive service to the areas in question. The Commission, however, will in any event consider that there would be such a concentration of control contrary to the public interest, convenience or necessity for any party or any of its stockholders, officers or directors to have a direct or indirect interest in, or be stockholders, officers, or directors of, more than seven standard broadcast stations.

NOTE: 1. The word "control" as used herein is not limited to majority stock ownership, but includes actual working control in whatever manner exercised.

2. In applying the foregoing provisions to the stockholders of a corporation which has more than 50 voting stockholders, only those stockholders need be considered who are officers or directors or who directly or indirectly own 1 percent or more of the outstanding voting stock.

§ 3.36 *Special field test authorization.* (a) Upon a showing that a need exists, a special test authorization to operate a portable or regularly authorized transmitter may be issued to persons desiring to make field intensity surveys to determine values of soil conductivity, or other factors influencing radio wave propagation, in particular areas or paths for the period necessary to conduct the survey. Such authorizations may be granted upon the following conditions:

(1) No objectionable interference will result to the operation of other authorized radio services; in this connection, the power requested shall not exceed that necessary for the purposes of the test.

(2) The carrier will be unmodulated except for half-hourly voice identification.

(3) The plate power ($E_p \times I_p$) of the final stage of the transmitter shall not exceed authorized test power and the antenna current shall be maintained at a constant value for each phase of the test.

(4) The test equipment shall not be permanently installed, unless such installation has been separately authorized. Mobile units shall not be deemed permanent installations.

(5) The equipment must be operated by or under the personal direction of either a licensed radiotelephone first-class or second-class operator

(6) A report, under oath, containing the measurements, their analysis and other results of the survey shall be filed with the Commission within sixty (60) days from the termination of the test authorization. The measurements taken shall be sufficiently complete, in accordance with § 3.186, so as to permit a determination of the inverse distance field at 1 mile in pertinent directions.

(7) The plate voltage (E_p) and plate current (I_p) of the final stage of the transmitter shall be logged at half-hour intervals and at any time that such power is changed. Certified copies of such log notations shall be submitted to the Commission with the required report.

(8) Operation shall conform to the requirements of Subpart G of this part.

(b) The test equipment, installation and operation thereof need not comply with the requirements of Commission rules and standards except as specified in this section: *Provided however*, That the equipment, installation and operation shall be consistent with good engineering principles and practices.

(c) No authorization shall be issued unless the applicant for such authorization is determined to be legally qualified. Requests for authorizations to operate a transmitter under this section shall be made in writing, signed by the applicant under oath or affirmation (with no special form provided, however), and shall set forth the following information:

(1) Purpose, duration and need for the survey.

(2) Frequency, plate power and time of operation.

(3) A brief description of the test antenna system and its estimated effective field and its proposed location.

(4) In the case of a directional test antenna, an estimate of the maximum fields expected to be radiated in the direction of pertinent broadcast stations.

(5) In the case of a person who is not a licensee or permittee of this Commission the information required by section II of FCC Form 301.

(d) The authorization may be modified or terminated by notification from the Commission if in its judgment such action will promote the public interest, convenience or necessity.

§ 3.37 *Minimum separation between stations.* A license will not be granted for a station on a frequency of ±30 kc from that of another station if the area enclosed by the 25 mv/m groundwave contours of the two stations overlap, nor will a license be granted for the operation of a station on a frequency ±20 kc or ±10 kc from the frequency of another station if the area enclosed by the 25 mv/m groundwave contour of either one overlaps the area enclosed by the 2 mv/m groundwave contour of the other.

EQUIPMENT

§ 3.39 *Indicating instruments—specifications.*

(a) Instruments indicating the plate current or plate voltage of the last radio stage (linear scale instruments), shall meet the following specifications:

(1) Length of scale shall be not less than 2⅞ inches.

(2) Accuracy shall be at least 2 percent of the full scale reading.

(3) The maximum rating of the meter shall be such that it does not read off scale during modulation.

(4) Scale shall have at least 40 divisions.

(5) Full scale reading shall not be greater than five times the minimum normal indication.

(b) Instruments indicating the antenna current shall meet the following specifications:

(1) Instruments having logarithmic or square law scales.

(i) Shall meet same requirements as paragraph (a) (1), (2) and (3) of this section for linear scale instruments.

(ii) Full scale reading shall not be greater than three times the minimum normal indication.

(iii) No scale division above one-third full scale reading (in amperes) shall be greater than one-thirtieth of the full scale reading. (Example: An ammeter meeting requirement (i) having full scale reading of 6 amperes is acceptable for reading currents from 2 to 6 amperes, provided no scale division between 2 and 6 amperes is greater than one-thirtieth of 6 amperes, 0.2 ampere.)

(2) Radio frequency instruments having expanded scales.

(i) Shall meet same requirements as paragraph (a) (1), (2) and (3) of this section for linear scale instruments.

(ii) Full scale reading shall not be greater than five times the minimum normal indication

(iii) No scale division above one-fifth full scale reading (in amperes) shall be greater than one-fiftieth of the full scale reading. (Example: An ammeter meeting the requirement (i) is acceptable for indicating currents from 1 to 5 amperes, provided no division between 1 and 5 amperes is greater than one-fiftieth of 5 amperes, 0.1 ampere.)

(iv) Manufacturers of instruments of the expanded scale type must submit data to the Commission showing that these instruments have acceptable expanded scales, and the type number of these instruments must include suitable designation.

(c) A thermocouple type ammeter meeting the requirements of paragraph (b) of this section shall be permanently installed in the antenna circuit (This thermocouple ammeter may be so connected that it is short circuited or open circuited when not actually being read. If open circuited, a make-before-break switch must be employed.)

(d) Remote reading antenna ammeters may be employed and the indications logged as the antenna current in accordance with the following:

(1) Remote reading antenna ammeters may be provided by:

(i) Inserting second thermocouple directly in the antenna circuit with remote leads to the indicating instrument.

(ii) Inductive coupling to thermocouple or other device for providing direct current to indicating instrument.

(iii) Capacity coupling to thermocouple or other device for providing direct current to indicating instrument.

(iv) Current transformer connected to second thermocouple or other device for providing direct current to indicating instrument.

(v) Using transmission line current meter at transmitter as remote reading ammeter. See subparagraph (7) of this paragraph.

(vi) Using indications of phase monitor for determining the ratio of antenna currents in the case of directional antennas, provided the indicating instruments in the unit are connected directly in the current sampling circuits with no other shunt circuits of any nature.

(2) The remote ammeter shall be connected at the same point in the antenna circuit as the thermocouple ammeter and shall be so connected and calibrated as to read in amperes within 2 percent of this meter over the entire range above one-third or one-fifth full scale. See paragraphs (b) (1) (i), (iii) and (b) (2) (i), (iii) of this section.

(3) The regular antenna ammeter shall be above the coupling to the remote meter in the antenna circuit so it does not read the current to ground through the remote meter.

(4) All remote meters shall meet the same requirements as the regular antenna ammeter with respect to scale accuracy, etc.

(5) Calibration shall be checked against the regular meter at least once a week.

(6) All remote meters shall be provided with shielding or filters as necessary to prevent any feed-back from the antenna to the transmitter.

(7) In the case of shunt excited antennas, the transmission line current meter at the transmitter may be considered as the remote antenna ammeter provided the transmission line is terminated directly into the excitation circuit feed line, which shall employ series tuning only (no shunt circuits of any type shall be employed), and insofar as practicable, the type and scale of the transmission line meter should be the same as those of the excitation circuit feed line meter (meter in slant wire feed line or equivalent).

(8) Remote reading antenna ammeters employing vacuum tube rectifiers are acceptable provided:

(i) The indicating instruments shall meet all the above requirements for linear scale instruments.

(ii) Data are submitted under oath showing the unit has an over-all accuracy of at least 2 percent of the full scale reading.

(iii) The installation, calibration, and checking are in accordance with the requirements of this paragraph.

(9) In the event there is any question as to the method of providing or the accuracy of the remote meter, the burden of proof of satisfactory performance shall be upon the licensee and the manufacturer of the equipment.

(e) Statons determining power by the indirect method may log the transmission line current in lieu of the antenna current provided the instrument meets the above requirements for antenna ammeters, and further provided that the ratio between the transmission line current and the antenna current is entered each time in the log. In case the station is authorized for the same operating power for both day and nighttime operation, this ratio shall be checked at least once daily. Stations which are authorized to operate with nighttime power different from the daytime power shall check the ratio for each power at least once daily.

(f) No instrument, the seal of which has been broken, or the accuracy of which is questionable, shall be employed. Any instrument which was not originally sealed by the manufacturer that has been opened shall not be used until it has been recalibrated and sealed in accordance with the following: Repairs and recalibration of instruments shall be made by the manufacturer, by an authorized instrument repair service of the manufacturer or by some other properly qualified and equipped instrument repair service. In either case the instrument must be resealed with the symbol or trade-mark of the repair service and a certificate of calibration supplied therewith.

(g) Since it is usually impractical to measure the actual antenna current of a shunt excited antenna system, the current measured at the input of the excitation circuit feed line is accepted as the antenna current.

(h) Recording instruments may be employed in addition to the indicating instruments to record the antenna current and the direct plate current and direct plate voltage of the last radio stage provided that they do not affect the operation of the circuits or accuracy of the indicating instruments. If the records are to be used in any proceedings before the Commission as representation of operation with respect to plate or antenna current and plate voltage only, the accuracy must be the equivalent of the indicating instruments and the calibration shall be checked at such intervals as to insure the retention of the accuracy.

(i) The function of each instrument shall be clearly and permanently shown on the instrument itself or on the panel immediately adjacent thereto.

§ 3.40 *Transmitter; design, construction, and safety of life requirements.*

(a) *Design.* The general design of standard broadcast transmitting equipment [main studio microphone (including telephone lines, if used, as to performance only) to antenna output] shall be in accordance with the following specifications. (In cases where telephone lines are not available to give the performance as required in these specifications a relay transmitter may be authorized to supersede the lines.) For the points not specifically covered below, the principles set out shall be followed: The equipment shall be so designed that:

(1) The maximum rated carrier power (determined by § 3.42) is in accordance with the requirements of § 3.41.

(2) The equipment is capable of satisfactory operation at the authorized operating power or the proposed operating power with modulation of at least 85 to 95 percent with no more distortion than given in (3) below.

(3) The total audio frequency distortion from microphone terminals, including microphone amplifier, to antenna output does not exceed 5 percent harmonics (voltage measurements of arithmetical sum or r. s. s.) when modulated from 0 to 84 percent, and not over 7.5 percent harmonics (voltage measurements of arithmetical sum or r. s. s.) when modulating 85 percent to 95 percent (distortion shall be measured with modulating frequencies of 50, 100, 400, 1000, 5000 and 7500 cycles up to tenth harmonic or 16000 cycles, or any intermediate frequency that readings on these frequencies indicate is desirable).

(4) The audio frequency transmitting characteristics of the equipment from the microphone terminals (including microphone amplifier unless microphone frequency correction is included in which event proper allowance shall be made accordingly) to the antenna output does not depart more than 2 decibels from that at 1000 cycles between 100 and 5000 cycles

(5) The carrier shift (current) at any percentage of modulation does not exceed 5 percent.

(6) The carrier hum and extraneous noise (exclusive of microphone and studio noises) level (unweighted r. s. s.) is at least 50 decibels below 100 percent modulation for the frequency band of 150 to 5000 cycles and at least 40 decibels down outside this range.

(7) The transmitter shall be equipped with suitable indicating instruments in accordance with the requirements of § 3.58 and any other instruments necessary for the proper adjustment and operation of the equipment.

(8) Adequate provision is made for varying the transmitter power output between sufficient limits to compensate for excessive variations in line voltage, or other factors which may affect the power output

(9) The transmitter is equipped with automatic frequency control equipment capable of maintaining the operating frequency within the limit specified by § 3.59.

(i) The maximum temperature variation at the crystal from the normal operating temperature shall not be greater than,

Plus or minus 0.1° C. when an *X* or *Y* cut crystal is employed, or

Plus or minus 1.0° C. when low temperature coefficient crystal is employed.

(ii) Unless otherwise authorized, a thermometer shall be installed in such manner that the temperature at the crystal can be accurately measured within 0.05° C. for *X* or *Y* cut crystal or 0.5° for low temperature coefficient crystal.

(iii) It is preferable that the tank circuit of the oscillator tube be installed in the temperature controlled chamber.

NOTE: Explanations of excessive frequency deviations will not be accepted when temperature variations are in excess of the values specified.

(10) Means are provided for connection and continuous operation of approved modulation monitor and approved frequency monitor.

(i) The radio frequency energy for operation of the approved frequency monitor shall be obtained from a radio-frequency stage prior to the modulated stage unless the monitor is of such design as to permit satisfactory operation when otherwise connected and the monitor circuits shall be such that the carrier is not heterodyned thereby.

(11) Adequate margin is provided in all component parts to avoid overheating at the maximum rated power output.

(b) *Construction* In general, the transmitter shall be constructed either on racks and panels or in totally enclosed frames protected as required by article 810 of the National Electrical Code and as set forth in this paragraph and paragraph (c) of this section.

NOTE 1. The final stages of high power transmitters may be assembled in open frames provided the equipment is enclosed by a protective fence.

NOTE 2. The pertinent sections of article 810 of the National Electrical Code read as follows:

"8191. *General*—Transmitters shall comply with the following

"*a. Enclosing*—The transmitter shall be enclosed in a metal frame or grille, or separated from the operating space by a barrier or other equivalent means, all metallic parts of which are effectually connected to ground.

"*b. Grounding of controls*—All external metallic handles and controls accessible to the operating personnel shall be effectually grounded. No circuit in excess of 150 volts shall have any parts exposed to direct contact. A complete dead-front type of switchboard is preferred.

"*c. Interlocks on doors*.—All access doors shall be provided with interlocks which will disconnect all voltages in excess of 350 volts when any access door is opened."

(1) Means shall be provided for making all tuning adjustments, requiring voltages in excess of 350 volts to be applied to the circuit, from the front of the panels with all access doors closed.

(2) Proper bleeder resistors or other automatic means shall be installed across all the condenser banks to remove any charge which may remain after the high voltage circuit is opened (in certain instances the plate circuit of the tubes may provide such protection; however, individual approval of such shall be obtained by the manufacturer in case of standard equipment, and the licensee in case of composite equipment).

(3) All plate supply and other high voltage equipment, including transformers, filters, rectifiers and motor generators, shall be protected so as to prevent injury to operating personnel.

(i) Commutator guards shall be provided on all high voltage rotating machinery (coupling guards on motor generators, although desirable, are not required).

(ii) Power equipment and control panels of the transmitter shall meet the above requirements (exposed 220 volt AC switching equipment on the front of the power control panels is not recommended; however, is not prohibited).

(iii) Power equipment located at a broadcast station but not directly associated with the transmitter (not purchased as part of same), such as power distribution panels, control equipment on indoor or outdoor stations and the substations associated therewith, are not under the jurisdiction of the Commission; therefore, § 3.46 does not apply.

(iv) It is not necessary to protect the equipment in the antenna tuning house and the base of the antenna with screens and interlocks, provided the doors to the tuning house and antenna base are fenced and locked at all times, with the keys in the possession of the operator on duty at the transmitter. Ungrounded fencing or wires should be effectively grounded, either directly or through proper static leaks. Lighting protection for the antenna system is not specifically required but should be installed.

(v) The antenna, antenna lead-in, counterpoise (if used), etc., shall be installed so as not to present a hazard. The antenna may be located close by or at a distance from the transmitter building. A properly designed and terminated transmission line should be used between the transmitter and the antenna when located at a distance.

(4) Metering equipment. (In addition to the following requirements, instruments shall meet the requirements of §§ 3.39 and 3.58.)

(i) All instruments having more than 1,000 volts potential to ground on the movement shall be protected by a cage or cover in addition to the regular case. (Some instruments are designed by the manufacturer to operate safely with voltages in excess of 1,000 volts on the movement. If it can be shown by the manufacturer's rating that the instrument will operate safely at the applied potential, additional protection is not necessary.)

(ii) In case the plate voltmeter is located on the low potential side of the multiplier resistor with one terminal of the instrument at or less than 1,000 volts above ground, no protective case is required. However, it is good practice to protect voltmeters subject to more than 5,000 volts with suitable over-voltage protective devices across the instrument terminals in case the winding opens.

(iii) The antenna ammeters (both regular and remote and any other radio frequency instrument which it is necessary for the operator to read) shall be so installed as to be easily and accurately read without the operator having to risk contact with circuits carrying high potential radio frequency energy.

(c) *Wiring and shielding.* (1) The transmitter panels or units shall be wired in accordance with standard switchboard practice, either with insulated leads properly cabled and supported or with rigid bus bar properly insulated and protected.

(2) Wiring between units of the transmitter, with the exception of circuits carrying radio frequency energy, shall be installed in conduits or approved fiber or metal raceways to protect it from mechanical injury.

(3) Circuits carrying low level radio frequency energy between units shall be either concentric tube, two wire balanced lines, or properly shielded to prevent the pickup of modulated radio frequency energy from the output circuits.

(4) Each stage (including the oscillator) preceding the modulated stage shall be properly shielded and filtered to prevent unintentional feedback from any circuit following the modulated stage (an exception to this requirement may be made in the case of high level modulated transmitters of approved manufacture which have been properly engineered to prevent reaction).

(5) The crystal chamber, together with the conductor or conductors to the oscillator circuit shall be totally shielded.

(6) The monitors and the radio frequency lines to the transmitter shall be thoroughly shielded.

(d) *Installation.* (1) The installation shall be made in suitable quarters.

(2) Since an operator must be on duty at the transmitter control point during operation, suitable facilities for his wel-

fare and comfort shall be provided at the control point.

(e) *Spare tubes.* A spare tube of every type employed in the transmitter and frequency and modulation monitors shall be kept on hand. When more than one tube of any type are employed, the following table determines the number of spares of that type required:

Number of each type employed:	Spares required
1 or 2	1
3 to 5	2
6 to 8	3
9 or more	4

(f) *Studio equipment.* (1) The studio equipment shall be subject to all the above requirements where applicable except as follows:

(i) If it is properly covered by an underwriter's certificate, it will be considered as satisfying the safety requirements.

(ii) Section 8191 of article 810 of the National Electrical Code shall apply for voltages only when in excess of 500 volts.

(2) No specific requirements are made relative to the design and acoustical treatment. However, the studios and particularly the main studio should be in accordance with the standard practice for the class of station concerned, keeping the noise level as low as reasonably possible.

§ 3.41 *Maximum rated carrier power; tolerances.* The maximum rated carrier power of a transmitter shall be an even power step as recognized by the Commission's plan of allocation (100 watts, 250 watts, 500 watts, 1 kw., 5 kw., 10 kw., 25 kw., 50 kw.) and shall not be less than the authorized power nor shall it be greater than the value specified in the following table:

Class of station	Maximum power authorized to station	Maximum rated carrier power permitted to be installed
		Watts
Class IV	100 or 250 watts	250
Class III	500 or 1,000 watts	1,000
	5,000 watts	5,000
Class II	250, 500, or 1,000 watts	1,000
	5,000 or 10,000 watts	10,000
	25,000 or 50,000 watts	50,000
Class I	10,000 watts	10,000
	25,000 or 50,000 watts	50,000

§ 3.42 *Maximum rated carrier power; how determined.* The maximum rated carrier power of a standard broadcast transmitter shall be determined as the sum of the applicable power ratings of the vacuum tubes employed in the last radio stage.

§ 3.43 *Changes in equipment; authority for.* No licensee or permittee shall change, in the last radio stage, the number of vacuum tubes, nor change to vacuum tubes of different power rating or class of operation, nor shall it change the system of modulation, without authority of the Commission.

§ 3.44 *Other changes in equipment.* Other changes except as provided for in this subpart which do not affect the maximum power rating or operating power of the transmitter or the operation or precision of the frequency control equipment may be made at any time without authority of the Commission, but in the next succeeding application for renewal of license such changes which affect the information already on file shall be shown in full.

§ 3.45 *Radiating system.* (a) All applicants for new, additional, or different broadcast facilities and all licensees requesting authority to change the transmitter site of an existing station shall specify a radiating system the efficiency of which complies with the requirements of good engineering practice for the class and power of the station. (See §§ 3.186 and 3.189.)

(b) No broadcast station licensee or permittee shall change the physical height of the transmitting antenna, or supporting structures, or make any changes in the radiating system which will measurably alter the radiation patterns, except upon application to and authority from the Commission.

(c) Should any changes occur which would alter the resistance of the antenna system, the licensee shall immediately make a new determination of the antenna resistance (see § 3.54) and shall submit application for authority to determine power by the direct method on the basis of the new measurements.

(d) The antenna and/or supporting structure shall be painted and illuminated in accordance with the specifications supplied by the Commission pursuant to section 303 (q) of the Communications Act of 1934 as amended. (See Part 17 of this chapter; Rules Concerning the Construction Marking, and Lighting of Antenna Structures.)

(e) The simultaneous use of a common antenna or antenna structure by more than one standard broadcast station, or by one or more standard broadcast stations and one or more stations of any other class or service may be authorized provided:

(1) Complete verified engineering data are submitted showing that satisfactory operation of each station will be obtained without adversely affecting the operation of the other station.

(2) The minimum antenna height or field intensity for each standard broadcast station concerned complies with paragraph (a) of this section.

(3) Complete responsibility for maintaining the installation and for painting and illuminating the structure in accordance with the pertinent provisions of Part 17 of this chapter is assumed by one of the licensees.

§ 3.46 *Transmitter.* (a) The transmitter proper and associated transmitting equipment of each broadcast station shall be designed, constructed, and operated in accordance with good engineering practice in all phases not otherwise specifically included in the regulations in this subpart.

(b) The transmitter shall be wired and shielded in accordance with good engineering practice and shall be provided with safety features in accordance with the specifications of article 810 of the current National Electrical Code as approved by the American Standards Association.

(c) The station equipment shall be so operated, tuned, and adjusted that emissions are not radiated outside the authorized band which cause or are capable of causing interference to the communications of other stations. Spurious emissions, including radio frequency harmonics, and audio frequency harmonics, shall be maintained at as low a level as practicable at all times in accordance with good engineering practice. In the event interference is caused to other stations by modulating frequencies in excess of 7500 cycles or spurious emissions, including radio frequency harmonics and audio frequency harmonics outside the band plus or minus 7500 cycles of the authorized carrier frequency, the licensee or permittee shall install equipment or make adjustments which limit the emissions to within this band or to such an extent above 7500 cycles as to reduce the interference to where it is no longer objectionable.

(d) The audio distortion, audio frequency response, carrier hum, noise level, and other essential phases of the operation which control the external effects shall at all times conform to the requirements of good engineering practice.

§ 3.47 *Equipment performance measurements.* (a) The licensee of each standard broadcast station shall make the following equipment performance measurements at yearly intervals. One such set shall be made during the four-month period preceding the date of filing application for renewal of station license:

(1) Data and curves showing over-all audio frequency response from 30 to 7500 CPS for approximately 25, 50, 85, and 100 (if obtainable) percent modulation. Family of curves should be plotted (one for each percentage above) with DB above and below a reference frequency of 1000 CPS as ordinate and audio frequency as abscissa.

(2) Data and curves showing audio frequency harmonic content for 25, 50, 85, and 100 percent modulation for fundamental frequencies of 50, 100, 400, 1000, 5000, and 7500 CPS (either arithmetical or root sum square values up to the tenth harmonic or 16000 CPS). Plot family of curves (one for each percentage above) with percent distortion as ordinate and audio frequency as abscissa.

(3) Data showing percentage carrier shift for 25, 50, 85, and 100 percent modulation with 400 CPS tone.

(4) Carrier hum and extraneous noise generated within the equipment and measured as the level below 100 percent modulation throughout the audio spectrum or by bands.

(5) Measurements or evidence showing that spurious radiations including radio frequency harmonics are suppressed or are not present to a degree capable of causing objectionable interference to other radio services. Field intensity measurements are preferred but observations made with a communications type receiver may be accepted. However, in particular cases involving interference or controversy, the Commis-

sion may require actual measurements. Measurements shall be made with the equipment adjusted for normal program operation and shall include all circuits between main studio amplifier input and antenna output including equalizer or correction circuits normally employed, but without compression if such amplifier is employed.

(b) The data required by paragraph (a) of this section together with a description of instruments and procedure, signed by the engineer making the measurements, shall be kept on file at the transmitter and retained for a period of two years and on request shall be made available during that time to any duly authorized representative of the Federal Communications Commission.

§ 3.48 *Acceptability of broadcast transmitters for licensing.* (a) In order to facilitate the filing of, and action on applications for station authorizations, transmitters will be accepted for licensing by the Commission under one of the following conditions:

(1) A transmitter may be Type-Accepted upon the request of any manufacturer of transmitters built in quantity by following the type acceptance procedure set forth in Part 2 of this chapter, provided that the data and information submitted indicates that the transmitter meets the requirements of § 3.40. If accepted, such transmitter will be included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment". Applicants specifying transmitters included on such a list need not submit detailed descriptions and diagrams where the correct type number is specified, provided that the equipment proposed is identical with that accepted. Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(2) An application specifying a transmitter not included on the Radio Equipment List, Part B may be accepted upon the request of a prospective licensee submitting with the application for construction permit a complete description of the transmitter, including the circuit diagram, listing of all tubes used, function of each, multiplication in each stage, plate current and voltage applied to each tube, a description of the oscillator circuit together with any devices installed for the purpose of frequency stabilization and the means of varying output power to compensate for power supply voltage variations. However, if this data has been filed with the Commission by a manufacturer in connection with a request for type acceptance, it need not be submitted with the application for construction permit but may be referred to as "on file". Measurement data for type acceptance made in accordance with subparagraph (1) of this paragraph shall be submitted with the license application.

(3) A transmitter shown on an instrument of authorization by manufacturer and type number, or as a composite, and which was in use prior to June 30, 1955 may continue to be used by the licensee, his successors or assignees, provided such transmitter continues to comply with the rules and regulations.

(b) Additional rules with respect to withdrawal of type-acceptance, modification of type-accepted equipment and limitations on the findings upon which type acceptance is based are set forth in Part 2 of this chapter.

§ 3.49 *Requirements for approval of frequency monitors*—(a) *General requirements and approval.* (1) There are several ways or means by which it can be determined whether the frequency of the emitted carrier wave is within the required limits of the assigned frequency. However, one of the commonest ways is by means of a local piezo oscillator of known frequency producing a beat with the emitted wave used in conjunction with an instrument to indicate the resultant beat frequency. The visual indicator is the only method now in common use by which it is considered that the frequency of the beat may be determined with the required degree of accuracy. Approval of a frequency monitor will be given based upon data taken by the Laboratory Division of the F. C. C. Any manufacturer desiring to submit a monitor for approval shall supply the Commission with full details. If the specifications appear to meet the requirements, the Commission will authorize the Laboratory Division to issue shipping instructions. The shipping charges to and from the Laboratory Division at Laurel, Md., shall be paid by the manufacturer.

(2) In approving a frequency monitor, based upon the tests by the Laboratory, the Commission merely recognizes that the type of monitor has the inherent capability of functioning in compliance with § 3.60, if properly constructed, maintained, and operated. The Commission accepts no responsibility beyond this and further realizes that these monitors may have a limited range over which the visual indicator will determine deviations. Accordingly, it is necessary that adjunct equipment be used to determine major deviations

NOTE: In addition to the visual indicator, the range of which is necessarily limited in order to obtain the required accuracy, an aural indicator should also be employed to indicate frequency deviations beyond the range of the visual indicator, particularly where the visual indicator is so designed that the indication becomes zero when the deviations become considerably greater than the range of the instrument. When it is desired to make any change, either mechanical or electrical, the details shall be submitted to the Commission for its consideration.

(3) No change whatsoever will be permitted in the monitors sold under approval number issued by the Commission except when the licensee or the manufacturer is specifically authorized to make such changes.

(4) When it is desired to make any change, either mechanical or electrical, the details shall be submitted to the Commission for its consideration.

(5) Approval is given subject to withdrawal if the unit proves defective in service and cannot be relied upon under usual conditions of maintenance and operation encountered in the average standard broadcast station. Withdrawal of approval means that no further units may be installed by standard broadcast stations for the purpose of complying with § 3.60, but will not affect units already sold, unless it is found that there has been an unauthorized change in design or construction, or the material or workmanship is defective.

(b) *General specifications.* The general specifications that frequency monitors shall meet before they will be approved by the Commission are as follows:

(1) The unit shall have an accuracy of at least five parts per million under ordinary conditions (temperature, humidity, power supply, and other conditions which may affect its accuracy) encountered in standard broadcast stations throughout the United States.

(2) The range of the indicating device shall be at least from 20 cycles below to 20 cycles above the assigned frequency.

(3) The scale of the indicating device shall be so calibrated as to be accurately read within at least 1 cycle.

(4) The unit shall be equipped with an automatic temperature control chamber (preferably enclosing the tank circuits of the oscillator) such that the maximum temperature variation at the crystal from the normal operating temperature shall not be greater than,

Plus or minus 0.05° C. when *X* or *Y* cut crystal is employed, or

Plus or minus 0.5° C. when low temperature coefficient crystal is employed.

(5) Unless otherwise specifically authorized, the instrument shall be equipped with a thermometer such that the temperature can be accurately measured within 0.025° C. for *X* or *Y* cut crystal or 0.25° C. for low temperature coefficient crystal.

(6) The monitor circuit shall be such that it may be continuously operated and the emitted carrier of the station is not heterodyned thereby.

(7) Means shall be provided for adjustment of the temperature or other means for correction of the indications of the monitor to agree with the external standard.

(c) *Tests to be made by the Laboratory Division of the F. C. C.* The tests to be made at the Laboratory will include the determination of the following:

(1) *Accuracy.* (i) Oscillator frequency, as received.

(ii) Constancy of oscillator frequency, as measured several times in 1 month.

(iii) Accuracy of readings of frequency-difference instrument.

(iv) Functioning of frequency adjustment device.

(v) Effects on frequency of changing tubes and of voltage variations.

(2) *Temperature control stability.* Effect on frequency of variation of room temperature through a range not to exceed 10° to 35° C.

(3) *Sensitivity.* Response of indicating instrument to small changes of frequency.

(4) *General construction.* (i) Inspection to determine ability to stand shipment and service

(ii) Special tests to determine quality of construction, such as effect of tilting or tipping on frequency.

(5) *Miscellaneous performance.* Various, depending on character of apparatus (e. g., changes after stopping and starting, effect of varying coupling with transmitter, etc.).

(d) The equipment will be operated in a test in the same way and the same conditions under which it will be used in service as specified by the manufacturer. The manufacturer shall supply to the Laboratory Division all instructions or services which will be supplied to the purchaser of the equipment. The equipment, as submitted, shall be adjusted for operation in connection with broadcast stations operating on 1600 kilocycles.

§ 3.50 *Requirements for approval of modulation monitors.* (a) Approval will be given based on the test data taken at the Laboratory Division of the F. C. C. Any manufacturer desiring to submit a monitor for approval shall supply the Commission with full details and if the specifications appear to meet the requirements, the Commission will authorize the Laboratory Division to issue shipping instructions. The shipping charges to and from Laurel, Md., shall be paid by the manufacturer.

(b) The specifications that the modulation monitor shall meet before it will be approved by the Commission are as follows:

(1) A DC meter for setting the average rectified carrier at a specific value and to indicate changes in carrier intensity during modulation.

(2) A peak indicating light or similar device that can be set at any predetermined value from 50 to 120 percent modulation to indicate on positive peaks, and/or from 50 to 100 percent negative modulation.

(3) A semi-peak indicator with a meter having the characteristics given below shall be used with a circuit such that peaks of modulation of duration between 40 and 90 milliseconds are indicated to 90 percent of full value and the discharge rate adjusted so that the pointer returns from full reading to 10 percent of zero within 500 to 800 milliseconds. A switch shall be provided so that this meter will read either positive or negative modulation and, if desired, in the center position it may read both in a full-wave circuit. The characteristics of the indicating meter are as follows:

(i) The time for one complete oscillation of the pointer shall be 290 to 350 milliseconds. The damping factor shall be between 16 and 200. The useful scale length shall be at least 2.3 inches. The meter shall be calibrated for modulation from 0 to 110 percent and in decibels below 100 percent with 100 percent being 0 DB.

(ii) The accuracy of the reading on percentage of modulation shall be ±2 percent for 100 percent modulation, and ±4 percent of full scale reading at any other percentage of modulation.

(4) The frequency characteristics curve shall not depart from a straight line more than ± ½ DB from 30 to 10000 cycles. The amplitude distortion or generation of audio harmonics shall be kept to a minimum.

(5) The modulation meter shall be equipped with appropriate terminals so that an external peak counter can be readily connected.

(6) Modulation will be tested at 115 volts ±6 percent and 60 cycles, and the above accuracies shall be applicable under these conditions.

(7) All specifications not already covered above, and the general design, construction, and operation of these units must be in accordance with good engineering practice.

TECHNICAL OPERATION

§ 3.51 *Operating power; how determined.* (a) Except as provided in paragraph (b) of this section, the operating power shall be determined by the direct method (the square of the antenna current times the antenna resistance at the point where the current is measured and at the operating frequency).

(b) Operating power shall be determined on a temporary basis by the indirect method: (1) In case of an emergency where the licensed antenna system has been damaged by causes beyond the control of the licensee (see § 3.45), or (2) Pending completion of authorized changes in the antenna system, or (3) If any change is made in the antenna system or any other change is made which may affect the antenna system. (See § 3.45.)

§ 3.52 *Operating power; indirect measurement.* (a) The operating power determined by indirect measurement from the plate input power of the last radio stage is the product of the plate voltage (Ep), the total plate current of the last radio stage (Ip), and the proper factor (F) given in paragraph (b) of this section: That is

$$\text{Operating power} = Ep \times Ip \times F$$

(b) Factor to be used.

Factor (F)	Method of modulation	Maximum rated carrier power	Class of amplifier
0.70	Plate	0.1–1.0 kw	
.80	Plate	5 kw and over	
.35	Low Level	0.1 kw and over	B
.65	Low Level	0.1 kw and over	BC [1]
.35	Grid	0.1 kw and over	

[1] All linear amplifier operation where efficiency approaches that of Class C operation.

(c) In computing operating power by the indirect method, the factor in paragraph (b) of this section shall apply in all cases, and no distinction will be recognized due to the operating power being less than the maximum rated carrier power.

§ 3.53 [Reserved.]

§ 3.54 *Operating power; direct measurement.* (a) Applications to determine the operating power by the direct method shall be made on FCC Form 302.

(b) The resistance variation method, substitution method and bridge method are acceptable methods of measuring the total antenna resistance.

(c) A determination of the resistance of an omni-directional antenna shall be made by taking a series of measurements at 5, 10, 15, and 20 kc on each side of the operating frequency. The values measured should be plotted with frequency as abscissa and resistance in ohms as ordinate and a smooth curve drawn. The point on the ordinate where this curve intersects the operating frequency gives the value of the antenna resistance.

(d) Antenna resistance for a directional antenna system shall be measured at the point of common radio frequency input to the directional antenna system. The following conditions shall obtain:

(1) The antenna shall be finally adjusted for the required pattern.

(2) The reactance at the operating frequency and at the point of measurement shall be adjusted to zero or as near thereto as practical.

(3) Suitable radio-frequency bridge or other method shall be employed to determine the resistance and reactance at the point of common radio frequency input.

(4) Resistance and reactance measurements at approximately 5, 10, 15, and 20 kc. on each side of the operating frequency shall be made. The values measured shall be plotted and the resistance at the operating frequency determined in the same manner as set forth in paragraph (c) of this section.

(5) A permanently installed antenna ammeter shall be placed in each element of the system as well as at the point of measurement of resistance.

(e) The license for a station of power of 5 kw or under which employs a directional antenna will specify the antenna resistance as 92.5 percent of that determined at the point of common input. The resistance specified for stations of a power over 5 kw will be 95 percent of that determined at the point of common input.

§ 3.55 *Modulation.* The percentage of modulation shall be maintained as high as possible consistent with good quality of transmission and in no case less than 85 percent on peaks nor more than 100 percent on negative peaks of frequent recurrence during any selection which is transmitted at the highest level of the program under consideration.

§ 3.56 *Modulation monitors.* (a) Each station shall have in operation, either at the transmitter or at the place the transmitter is controlled, a modulation monitor of a type approved by the Commission.

NOTE. Approved modulation monitors are included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment". Copies of this list are available for inspection at the Commission's office in Washington, D. C. and at each of its field offices.

(b) In the event that the modulation monitor becomes defective the station may be operated without the monitor pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided,* That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the monitor was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the monitor is found to be defective and immediately after the repaired or

replacement monitor has been installed and is functioning properly.

(3) The degree of modulation of the station shall be monitored with a cathode ray oscilloscope or other acceptable means.

(c) If conditions beyond the control of the licensee prevent the restoration of the monitor to service within the above allowed period, informal request may be filed with the Engineer in Charge of the radio district in which the station is operating for such additional time as may be required to complete repairs of the defective instrument.

§ 3.57 *Operating power; maintenance of.* (a) The operating power of each station shall be maintained as near as practicable to the licensed power and shall not exceed the limits of 5 percent above and 10 percent below the licensed power, except that in an emergency when due to causes beyond control of the licensee it becomes impossible to operate with full licensed power, the station may be operated with reduced power for a period not to exceed 10 days, provided the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified immediately after the emergency develops and also upon the resumption of licensed power.

(b) In addition to maintaining the operating power within the above limitations, stations employing directional antenna systems shall maintain the ratio of the antenna currents in the elements of the system within 5 percent of that specified by the terms of the license or other instrument of authorization.

§ 3.58 *Indicating instruments.* (a) Each standard broadcast station shall be equipped with indicating instruments which conform with the specifications set forth in § 3.39 for measuring the DC plate circuit current and voltage of the last radio frequency amplifier stage; the radio frequency base current of each antenna element; and, for stations employing directional antenna systems, the radio frequency current at the point of common input to the directional antenna.

(b) In the event that any one of these indicating instruments becomes defective when no substitute which conforms with the required specifications is available, the station may be operated without the defective instrument pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided,* That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the meter was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the instrument is found to be defective and immediately after the repaired or replacement instrument has been installed and is functioning properly.

(3) If the defective instrument is the antenna current meter of a nondirectional station which does not employ a remote antenna ammeter, or if the defective instrument is the common point meter of a station which employs a directional antenna, and does not employ a remote common point meter, the operating power shall be determined by the indirect method in accordance with § 3.52 during the entire time the station is operated without the antenna current meter or common point meter. However, if a remote antenna ammeter or a remote common point meter is employed and the antenna current meter or common point meter becomes defective, the remote meter may be used in determining operating power by the direct method pending the return to service of the regular meter, provided other meters maintained at same value previously employed.

(c) If conditions beyond the control of the licensee prevent the restoration of the meter to service within the above allowed period, informal request in accordance with § 1.332 (d) of this chapter may be filed with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

(d) Remote antenna ammeters and remote common point meters are not required therefore authority to operate without them is not necessary. However if a remote antenna ammeter or common point meter is employed and becomes defective, the antenna base currents may be read and logged once daily for each mode of operation, pending the return to service of the regular remote meter.

§ 3.59 *Frequency tolerance.* The operating frequency of each station shall be maintained within 20 cycles of the assigned frequency.

§ 3.60 *Frequency monitor.* (a) The licensee of each station shall have in operation, either at the transmitter or at the place where the transmitter is controlled, a frequency monitor of a type approved by the Commission which shall be independent of the frequency control of the transmitter.

NOTE: Approved frequency monitors are included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment." Copies of this list are available for inspection at the Commission's office in Washington, D. C. and at each of its field offices.

(b) In the event that the frequency monitor becomes defective the station may be operated without the monitor pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided,* That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the monitor was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the monitor is found to be defective and immediately after the repaired or replacement monitor has been installed and is functioning properly.

(3) The frequency of the station shall be measured by an external source at least once each seven days and the results entered in the station log.

(c) If conditions beyond the control of the licensee prevent the restoration of the monitor to service within the above allowed period, informal request in accordance with § 1.332 (d) of this chapter may be filed with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

§ 3.61 *New equipment; restrictions.* The Commission will authorize the installation of new transmitting equipment in a broadcast station or changes in the frequency control of an existing transmitter only if such equipment is so designed that there is reasonable assurance that the transmitter is capable of maintaining automatically the assigned frequency within the limits specified in § 3.59.

§ 3.62 *Automatic frequency control equipment; authorization required.* New automatic frequency control equipment and changes in existing automatic frequency control equipment that may affect the precision of frequency control or the operation of the transmitter shall be installed only upon authorization from the Commission.

§ 3.63 *Auxiliary transmitter.* Upon showing that a need exists for the use of an auxiliary transmitter in addition to the regular transmitter of a broadcast station, a license therefor may be issued: *Provided,* That:

(a) An auxiliary transmitter may be installed either at the same location as the main transmitter or at another location.

(b) A licensed operator shall be in control whenever an auxiliary transmitter is placed in operation.

(c) The auxiliary transmitter shall be maintained so that it may be put into immediate operation at any time for the following purposes:

(1) The transmission of the regular programs upon the failure of the main transmitter.

(2) The transmission of regular programs during maintenance or modification work on the main transmitter necessitating discontinuance of its operation for a period not to exceed five days. Where such operation is required for periods in excess of five days an informal application shall be made.

(3) Upon request by a duly authorized representative of the Commission.

(d) The auxiliary transmitter shall be tested at least once each week to determine that it is in proper operating condition and that it is adjusted to the proper frequency, except that in the case of operation in accordance with paragraph (c) of this section during any week, the test in that week may be omitted provided the operation under paragraph (c) of this section is satisfactory. Tests shall be conducted only between midnight and 9 a. m., local standard time. A record shall be kept of the time and result of each test. Such records shall be retained for a period of two years.

(e) The auxiliary transmitter shall be equipped with satisfactory control equip-

ment which will enable the maintenance of the frequency emitted by the station within the limits prescribed by the regulations in this part.

(f) An auxiliary transmitter which is licensed at a geographical location different from that of the main transmitter shall be equipped with a frequency control which will automatically hold the frequency within the limits prescribed by the regulations in this part without any manual adjustment during operation or when it is being put into operation.

(g) The operating power of an auxiliary transmitter may be less than the authorized power, but in no event shall it be greater than such power.

(h) All regulations as to safety requirements and spurious emissions applying to broadcast transmitting equipment shall apply also to an auxiliary transmitter.

§ 3.64 *Alternate main transmitters.* The licensee of a standard broadcast station may be licensed for alternate main transmitters provided that a technical need for such alternate transmitters is shown, such as licensees maintaining 24-hour schedule and needing alternate operations for maintenance, or where developmental work requires alternate operation, and that the following conditions are met:

(a) Both transmitters are located at the same place.

(b) The transmitters have the same power rating except at stations operating with different daytime and nighttime power when it shall be permissible to employ transmitters of power ratings appropriate to either the licensed daytime or nighttime power.

(c) The external effects from both transmitters are substantially the same as to frequency stability, reliability of operation, radio harmonics and other spurious emissions, audio frequency range and audio harmonic generation in the transmitter.

§ 3.65 *Antenna structure, marking and lighting.* Where an antenna structure(s) is required to be painted or lighted see § 17.37, *Inspection of tower lights and associated control equipment;* § 17.39, *Cleaning and repainting;* § 17.40, *Time when lights shall be exhibited;* § 17.41, *Spare lamps;* and § 17.42, *Lighting equipment;* of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.66 *Remote control operation.* (a) A station which is authorized for nondirectional operation with power of 10 kilowatts or less may, upon prior authorization from the Commission, be operated by remote control at the point(s) which shall be specified in the station license. An application for authorization to operate by remote control may be made as a part of an application for construction permit or license, or modification thereof by specifying the proposed remote control point(s). Operation by remote control shall be subject to the following conditions:

(1) The equipment at the operating and transmitting positions shall be so installed and protected that it is not accessible to or capable of operation by persons other than those duly authorized by the licensee.

(2) The control circuits from the operating position to the transmitter shall provide positive on and off control and shall be such that open circuits, short circuits, grounds or other line faults will not actuate the transmitter and any fault causing loss of such control will automatically place the transmitter in an inoperative condition.

(3) Control and monitoring equipment shall be installed so as to allow the licensed operator either at the remote control point or at the transmitter, to perform all of the functions in a manner required by the Commission's rules.

OPERATION

§ 3.71 *Minimum operating schedule.* Except Sundays, the licensee of each standard broadcast station shall maintain a minimum operating schedule of two-thirds of the total hours that it is authorized to operate between 6 a. m. and 6 p. m., local standard time, and two-thirds of the total hours it is authorized to operate between 6 p. m. and midnight, local standard time, except that in an emergency when, due to causes beyond the control of the licensee, it becomes impossible to continue operating, the station may cease operation for a period of not to exceed 10 days, provided that the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified in writing immediately after the emergency develops.

§ 3.72 *Operation during experimental period.* The licensee of each standard broadcast station shall operate or refrain from operating its station during the experimental period as directed by the Commission in order to facilitate frequency measurement or for the determination of interference.

§ 3.73 *Specified hours.* If the license of a station specifies the hours of operation, the schedule so specified shall be adhered to except as provided in §§ 3.71 and 3.72.

§ 3.74 *Sharing time.* If the licenses of stations authorized to share time do not specify hours of operation, the licensees shall endeavor to reach an agreement for a definite schedule of periods of time to be used by each. Such agreement shall be in writing and each licensee shall file the same in triplicate original with each application to the Commission for renewal of license. If and when such written agreements are properly filed in conformity with this section the file mark of the Commission will be affixed thereto, one copy will be retained by the Commission, one copy forwarded to the Engineer in Charge of the radio district in which the station is located, and one copy returned to the licensee to be posted with the station license and considered as a part thereof. If the license specifies a proportionate time division, the agreement shall maintain this proportion. If no proportionate time division is specified in the license, the licensees shall agree upon a division of time. Such division of time shall not include simultaneous operation of the stations unless specifically authorized by the terms of the license.

§ 3.75 *Sharing time, equivalence of day and night hours.* For the purpose of determining the proportionate division of time of the broadcast day for sharing time stations 1 night hour shall be considered the equivalent of 2 day hours.

§ 3.76 *Sharing time; experimental period.* If the license of a station authorized to share time does not specify the hours of operation, the station may be operated for the transmission of regular programs during the experimental period provided an agreement thereto is reached with the other stations with which the broadcast day is shared and further provided such operation is not in conflict with § 3.72. Time-sharing agreements for operation during the experimental period need not be submitted to the Commission.

§ 3.77 *Sharing time; departure from regular schedule.* A departure from the regular operating schedule set forth in a time-sharing agreement will be permitted only in cases where an agreement to that effect is reduced to writing, is signed by the licensees of the stations affected thereby and filed in triplicate by each licensee with the Commission prior to the time of the proposed change. If time is of the essence, the actual departure in operating schedule may precede the actual filing of written agreement, provided appropriate notice is sent to the Commission and the Engineer in Charge of the radio district in which the station is located.

§ 3.78 *Sharing time stations; notification to Commission.* If the licensees of stations authorized to share time are unable to agree on a division of time, the Commission shall be so notified by statement to that effect filed with the applications for renewals of licenses. Upon receipt of such statement the Commission will designate the applications for a hearing and, pending such hearing, the operating schedule previously adhered to shall remain in full force and effect.

§ 3.79 *License to specify sunrise and sunset hours* If the licensee of a broadcast station is required to commence or cease operation, or to change the mode of operation of the station at the times of sunrise and sunset at any particular location, the controlling times for each month of the year are set forth in the station's instrument of authorization. Uniform sunrise and sunset times are specified for all of the days of each month, based upon the actual times of sunrise and sunset for the fifteenth day of that month adjusted to the nearest quarter hour. In accordance with a standardized procedure described therein, actual sunrise and sunset times are derived by interpolation in the tables of the 1946 American Nautical Almanac, issued by the Nautical Almanac Office of the United States Naval Observatory

§ 3.80 *Secondary station; filing of operating schedule.* The licensee of a secondary station authorized to operate

limited time and which may resume operation at the time the dominant station (or stations) on the same channel ceases operation shall, with each application for renewal of license, file in triplicate a copy of its regular operating schedule, bearing a signed notation by the licensee of the dominant station of its objection or lack of objection thereto. Upon approval of such operating schedule, the Commission will affix its file mark and return one copy to the licensee authorized to operate limited time, which shall be posted with the station license and considered as a part thereof. Departure from said operating schedule will be permitted only in accordance with the procedure set forth in § 3.77.

§ 3.81 *Secondary station; failure to reach agreement.* If the licensee of a secondary station authorized to operate limited time and a dominant station on a channel are unable to agree upon a definite time for resumption of operation by the station authorized limited time, the Commission shall be so notified by the licensee of the station authorized limited time After receipt of such statement the Commission will designate for hearing the applications of both stations for renewal of license, and pending the hearing the schedule previously adhered to shall remain in full force and effect.

§ 3.82 *Departure from schedule; material violation.* In all cases where a station licensee is required to prepare and file an operating schedule, any deviation or departure from such schedule, except as herein authorized, shall be considered as a violation of a material term of the license.

§ 3.83 *Local standard time.* All references herein to standard time or local standard time refer to local standard time as determined and fixed by the Interstate Commerce Commission

§ 3.84 *Daylight saving time.* If local time is changed from standard time to daylight saving time at the location of all stations sharing time on the same channel, the hours of operation of all such stations on that channel shall be understood to refer to daylight saving time, and not standard time, as long as daylight saving time is observed at such locations. This provision shall govern when the time is changed by provision of law or general observance of daylight saving time by the various communities, and when the time of operation of such stations is specified in the license or is mutually agreed upon by the licensees: *Provided, however,* That when the license specifies average time of sunrise and sunset, local standard time shall be observed. In no event shall a station licensed for daytime only operate on regular schedule prior to local sunrise, or shall a station licensed for greater daytime power than nighttime power or for a different radiation pattern for daytime operation than for nighttime operation operate with the daytime power or radiation pattern prior to local sunrise.

§ 3.85 *Changes in time; agreement between licensees.* Where the local time is not changed from standard time to daylight saving time at the location of all stations sharing time on the same channel, the hours of operation of such stations shall be understood to have reference to standard time, and not daylight saving time, unless said licensees mutually agree upon a new schedule which shall be effective only while daylight saving time is observed at the location of some of these stations.

§ 3.86 *Local standard time; license provisions.* The time of operation of any broadcast station which does not share time with other stations on the same channel shall be understood to have reference to local standard time unless modification of such license with respect to hours of operation is authorized by the Commission.

§ 3.87 *Program transmissions prior to local sunrise.* (a) The provisions of §§ 3.6, 3.8, 3.9, 3.10, 3.23, 3.79, and 3.84 shall not prevent the transmission of programs between 4 o'clock a. m., local standard time, and local sunrise, of standard broadcast stations with their authorized daytime facilities: *Provided,* That the provisions of this section shall not extend to:

(1) Stations regularly sharing time during daytime hours either under licenses pursuant to which time-sharing agreements have been entered into or licenses specifying hours of operation, unless time-sharing agreements have been reached covering such operation prior to local sunrise Sections 3.74, 3.77, and 3.78 shall be applicable to such agreements.

(2) Any Class II station causing interference, as determined by the standard broadcast Technical Standards of this subpart, by use of its daytime facilities within the 0.5 mv/m 50 percent skywave contour of any Class I station either of the United States or of any country party to the North American Regional Broadcasting Agreement, except (i) where the Class I station is located east of the Class II station in which case operation may begin at local sunrise at the Class I station; (ii) where an agreement has been reached with the Class I station to begin operation prior to local sunrise.

(3) Operation by use of its daytime facilities of any Class II station on any Class I-A channel not assigned to the United States under the North American Regional Broadcasting Agreement.

(b) Any station operating during such hours receiving notice from the Commission that undue interference is caused shall refrain from such operation during such hours pending further notice from the Commission.

(c) Nothing contained in outstanding instruments of authorization for such stations shall prohibit such operation except as herein provided.

(d) The period 4 a. m. to 6 a. m., local standard time, shall not be included in determining compliance with § 3.71.

§ 3.88 *Blanketing interference.* The licensee of each broadcast station is required to satisfy all reasonable complaints of blanketing interference within the 1 v/m contour.

§ 3.89 *Use of frequency and modulation monitors at auxiliary transmitters.* (a) The following shall govern the installation of approved frequency and modulation monitors at auxiliary transmitters:

(1) In case the auxiliary transmitter location is at a site different from that of the main transmitter, an approved frequency monitor shall be installed at the auxiliary transmitter, except when the frequency of the auxiliary transmitter can be monitored by means of the frequency monitor at the main transmitter.

(2) The provision that the frequency monitor may be located at the site of the main transmitter shall not relieve the obligation that the frequency deviation of the auxiliary transmitter shall be maintained within 20 cycles.

(3) Installation of an approved modulation monitor at the location of the auxiliary transmitter, when different from that of the main transmitter, is optional with the licensee. However, when it is necessary to operate the auxiliary transmitter beyond 2 calendar days, a modulation monitor shall be installed and operated at the auxiliary transmitter. The monitor (if taken from the main transmitter) shall be reinstalled at the main transmitter immediately upon resumption of operation of the main transmitter.

(4) In all cases where the auxiliary transmitter and the main transmitter have the same location, the same frequency and modulation monitor may be used for monitoring both transmitters, provided they are so arranged as to be switched readily from one transmitter to the other

§ 3.90 [Reserved.]

§ 3.91 *Discontinuance of operation.* The licensee of each station shall notify the Commission in Washington, D. C., and the Engineer in Charge of the radio district where such station is located of permanent discontinuance of operation at least two days before operation is discontinued. The licensee, shall, in addition, immediately forward the station license and other instruments of authorization to the Washington, D. C., office of the Commission for cancellation.

§ 3.92 *Station and operator licenses; posting of.* (a) The station license and any other instrument of station authorization shall be posted in a conspicuous place and in such manner that all terms are visible, at the place the licensee considers to be the principal control point of the transmitter At all other control points listed on the station authorization, a photocopy of the station license and other instruments of station authorization shall be posted.

(b) The original operator license, or FCC Form 759, of each station operator shall be posted at the place where he is on duty as an operator.

§ 3.93 *Operator requirements.* (a) One or more radio operators holding a valid radiotelephone first-class operator license, except as provided below, shall be in actual charge of the transmitting apparatus and shall be on duty either at the transmitter location or remote control point.

(b) A station which is authorized for non-directional operation with power of 10 kilowatts or less may be operated by

persons holding commercial radio operator license of any class, except an aircraft radiotelephone operator authorization or a temporary limited radiotelegraph second-class operator license, when the equipment is so designed that the stability of the frequency is maintained by the transmitter itself within the limits of tolerance specified, and none of the operations, except those specified in subparagraphs (1) through (4) of this paragraph, necessary to be performed during the course of normal operation may cause off-frequency operation or result in any unauthorized radiation. (A person holding any class of radio operator license or permit who is authorized thereunder to perform limited operation of a standard broadcast station may, when a Conelrad Radio Alert is called, make adjustments necessary to effect operation on a Conelrad authorization: *Provided*, That the station's full-time radiotelephone firstclass operator shall have previously instructed such person in the adjustments to the transmitter which are necessary to accomplish Conelrad operation.) Adjustments of transmitting equipment by such operators, except when under the immediate supervision of a radiotelephone first-class operator, shall be limited to the following:

(1) Those necessary to commence or terminate transmitter emissions as a routine matter.

(2) Those external adjustments that may be required as a result of variations of primary power supply.

(3) Those external adjustments which may be necessary to insure modulation within the limits required.

(4) Those adjustments necessary to effect any change in operating power which may be required by the station's instrument of authorization.

Should the transmitting apparatus be observed to be operating in a manner inconsistent with the station's instrument of authorization and none of the above adjustments are effective in bringing it into proper operation, a person holding other than a radiotelephone first-class operator license and not acting under the immediate supervision of radiotelephone first-class operator, shall be required to terminate the station's emissions.

(c) The licensee of a station which is operated by one or more operators holding other than a radiotelephone first-class operator license shall have one or more operators holding a radiotelephone first-class operator license in regular full-time employment at the station whose primary duties shall be to effect and insure the proper functioning of the transmitting equipment. In the event that the licensee also operates an FM broadcast station in the same community, a regular full-time radiotelephone first-class operator or operators employed in connection with the standard broadcast station may concurrently be employed to satisfy the requirements of § 3 265 (c) or § 3.565 (c): *Provided*, That the duties of such operator or operators concerning the FM broadcast transmitting equipment shall in nowise interfere with the proper performance of his duties with respect to the standard broadcast transmitter.

(d) The licensed operator on duty and in charge of a standard broadcast transmitter may, at the discretion of the licensee, be employed for other duties or for the operation of another radio station or stations in accordance with the class of operator's license which he holds and the rules and regulations governing such other stations: *Provided, however*, That such duties shall in nowise interfere with the proper operation of the standard broadcast transmitter.

§ 3.94 *Period of construction.* Each construction permit for a radio station in the standard broadcast service will specify a maximum of 60 days from the date of granting thereof as the time within which construction of the station shall begin, and a maximum of six months thereafter as the time within which construction shall be completed and with the station ready for operation, unless otherwise determined by the Commission upon proper showing in any particular case.

§ 3 95 *Equipment tests.* (a) During the process of construction of a standard broadcast station the permittee, after notifying the Commission and Engineer in Charge of the radio district in which the station is located, may without further authority of the Commission, conduct equipment tests during the experimental period for the purpose of such adjustments and measurements as may be necessary to assure compliance with the terms of the construction permit, the technical provisions of the application therefor, the rules and regulations, and the applicable engineering standards. In addition, the Commission may authorize equipment tests other than during the experimental period if such operation is shown to be desirable to the proper completion of construction and adjustment of the transmitting equipment and antenna system An informal application for such authority, giving full details regarding the need for such tests, shall be filed with the Commission at least two (2) days (not including Sundays and Saturdays and legal holidays when the offices of the Commission are not open) prior to the date on which it is desired to begin such operation.

(b) The Commission may notify the permittee to conduct no tests or may cancel, suspend, or change the date for the beginning of equipment tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Equipment tests may be continued so long as the construction permit shall remain valid and shall be conducted only during the experimental period (12 midnight to local sunrise) unless otherwise specifically authorized.

(d) Inspection of a station will ordinarily be required during the equipment test period and before the commencement of program tests. After construction and after adjustments and measurements have been completed to show compliance with the terms of the construction permit, the technical provisions of the application therefor, the rules and regulations and the applicable engineering standards, the permittee should notify the Engineer in Charge of the radio district in which the station is located that it is ready for inspection.

(e) The authorization for tests embodied in this section shall not be construed as constituting a license to operate but as a necessary part of construction.

§ 3.96 *Program tests.* (a) Upon completion of construction of a standard broadcast station in accordance with the terms of the construction permit, the technical provisions of the application therefor, and the rules and regulations and applicable engineering standards and when an application for station license has been filed showing the station to be in satisfactory operating condition, the permittee may request authority to conduct program tests: *Provided*, That such request shall be filed with the Commission at least ten (10) days prior to the date on which it is desired to begin such operation and that the Engineer in Charge of the radio district in which the station is located is notified. All data necessary to show compliance with the terms and conditions of the construction permit must be filed with the license application. If the station is using a directional antenna, a proof of performance must also be filed as required by § 3.33 (b).

(b) Program tests shall not commence until specific Commission authority is received. The Commission reserves the right to change the date of the beginning of such tests or to suspend or revoke the authority for program tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Unless sooner suspended or revoked program test authority continues valid during Commission consideration of the application for license and during this period further extension of the construction permit is not required. Program test authority shall be automatically terminated by final determination upon the application for station license.

(d) All operation on program test authority shall be in strict compliance with the rules governing standard broadcast stations and in strict accordance with representations made in the application for license pursuant to which the tests were authorized.

(e) The granting of program test authority shall not be construed as approval by the Commission of the application for station license.

§ 3.97 *Station inspection.* The licensee of any radio station shall make the station available for inspection by representatives of the Commission at any reasonable hour

OTHER OPERATING REQUIREMENTS

§ 3.111 *Logs.* The licensee or permittee of each standard broadcast station shall maintain program and operating logs and shall require entries to be made as follows:

(a) In the program log:

(1) An entry of the time each station identification announcement (call letters and location) is made.

(2) An entry briefly describing each program broadcast, such as "music,"

"drama," "speech," etc., together with the name or title thereof, and the sponsor's name, with the time of the beginning and ending of the complete program. If a mechanical record is used, the entry shall show the exact nature thereof, such as "record," "transcription," etc., and the time it is announced as a mechanical record. If a speech is made by a political candidate, the name and political affiliations of such speaker shall be entered.

(3) An entry showing that each sponsored program broadcast has been announced as sponsored, paid for, or furnished by the sponsor.

(4) An entry showing, for each program of network origin, the name of the network originating the program.

(b) In the operating log:

(1) An entry of the time the station begins to supply power to the antenna, and the time it stops.

(2) An entry of the time the program begins and ends.

(3) An entry of each interruption to the carrier wave, its cause, and duration.

(4) An entry of the following each 30 minutes:

(i) Operating constants of last radio stage (total plate current and plate voltage).

(ii) Antenna current.

(iii) Frequency monitor reading.

(5) Log of experimental operation during experimental period. (If regular operation is maintained during this period, the above logs shall be kept.)

(i) A log must be kept of all operation during the experimental period. If the entries required above are not applicable thereto, then the entries shall be made so as to fully describe the operation.

(c) Where an antenna structure(s) is required to be illuminated see § 17.38, *Recording of tower light inspections in the station record*, of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.112 *Logs; retention of.* Logs of standard broadcast stations shall be retained by the licensee or permittee for a period of two years: *Provided, however*, That logs involving communications incident to a disaster or which include communications incident to or involved in an investigation by the Commission and concerning which the licensee or permittee has been notified, shall be retained by the licensee or permittee until he is specifically authorized in writing by the Commission to destroy them: *Provided, further*, That logs incident to or involved in any claim or complaint of which the licensee or permittee has notice shall be retained by the licensee or permittee until such claim or complaint has been fully satisfied or until the same has been barred by statute limiting the time for the filing of suits upon such claims.

NOTE: Application forms for licenses and other authorizations require that certain operating and program data be supplied. It is suggested that these application forms be kept in mind in connection with maintenance of station program and operating records.

§ 3.113 *Logs; by whom kept.* Each log shall be kept by the person or persons competent to do so, having actual knowledge of the facts required, who shall sign the log when starting duty and again when going off duty. The logs shall be made available upon request by an authorized representative of the Commission

§ 3.114 *Log form* The log shall be kept in an orderly manner, in suitable form, and in such detail that the data required for the particular class of station concerned are readily available. Key letters or abbreviations may be used if proper meaning or explanation is contained elsewhere in the log.

§ 3.115 *Correction of logs* No log or portion thereof shall be erased, obliterated, or willfully destroyed within the period of retention provided by the rules. Any necessary correction may be made only by the person originating the entry who shall strike out the erroneous portion, initial the correction made, and indicate the date of correction.

§ 3.116 *Rough logs.* Rough logs may be transcribed into condensed form, but in such case the original log or memoranda and all portions thereof shall be preserved and made a part of the complete log.

§ 3.117 *Station identification.* (a) A licensee of a standard broadcast station shall make station identification announcement (call letters and location) at the beginning and ending of each time of operation and during operation (1) on the hour and (2) either on the half hour or at the quarter hour following the hour and at the quarter hour preceding the next hour: *Provided,*

(b) Such identification announcement need not be made on the hour when to make such announcement would interrupt a single consecutive speech, play, religious service, symphony concert, or operatic production of longer duration than 30 minutes. In such cases the identification announcement shall be made at the beginning of the program, at the first interruption of the entertainment continuity, and at the conclusion of the program.

(c) Such identification announcement need not be made on the half hour or quarter hours when to make such announcement would interrupt a single consecutive speech, play, religious service, symphony concert, or operatic production. In such cases an identification announcement shall be made at the first interruption of the entertainment continuity and at the conclusion of the program: *Provided*, That an announcement within 5 minutes of the times specified in paragraph (a) (2) of this section will satisfy the requirements of identification announcements.

(d) In the case of variety show programs, baseball game broadcasts, or similar programs of longer duration than 30 minutes, the identification announcement shall be made within 5 minutes of the hour and of the times specified in paragraph (a) (2) of this section.

(e) In the case of all other programs the identification announcement shall be made within 2 minutes of the hour and of the times specified in paragraph (a) (2) of this section.

(f) In making the identification announcement the call letters shall be given only on the channel of the station identified thereby, except as otherwise provided in § 3.287 of the Commission's rules governing FM broadcast stations.

§ 3.118 *Mechanical records.* (a) Each program broadcast which consists in whole or in part of one or more mechanical reproductions shall be announced in the manner and to the extent set out in this section.

(1) Each such program of longer duration than 30 minutes, consisting in whole or in part of one or more mechanical reproductions, shall be identified by appropriate announcement at the beginning of the program, at each 30-minute interval and at the conclusion of the program: *Provided, however*, That the identifying announcement at each 30-minute interval is not required in case of a mechanical reproduction consisting of a continuous uninterrupted speech, play, religious service, symphony concert, or operatic production of longer than 30 minutes.

(2) Each such program of a longer duration than 5 minutes and not in excess of 30 minutes, consisting in whole or in part of one or more mechanical reproductions, shall be identified by an appropriate announcement at the beginning and end of the program.

(3) Each such program of 5 minutes or less, consisting in whole or in part of mechanical reproductions, shall be identified by appropriate announcement immediately preceding the use thereof: *Provided, however*, That each such program of one minute or less need not be announced as such.

(4) In case a mechanical reproduction is used for background music, sound effects, station identification, program identification (theme music of short duration) or identification of the sponsorship of the program proper, no announcement of the mechanical reproduction is required.

(5) The exact form of identifying announcement is not prescribed, but the language shall be clear and in terms commonly used and understood. A licensee shall not attempt affirmatively to create the impression that any program being broadcast by mechanical reproduction consists of live talent.

(6) During the annual periods in which daylight saving time will be effective the requirements of this section are waived with respect to network programs, transcribed and rebroadcast one hour later because of the time differential resulting from the adoption of daylight saving time in some areas, this waiver being applicable whether the off-the-line recording is made by the network itself at one of its key stations or by an individual station, but only when the off-the-line recording is for broadcast one hour later by those stations which operate on standard time. Furthermore, each station which broadcasts network programs one hour later in accordance with this waiver shall make an appropriate announcement at least once each day between the hours of 10 a. m.

and 10 p. m., stating that some or all of the network programs which are broadcast by that station are delayed broadcasts by means of transcription, and indicating whether the transcriptions have been made by the network or the individual station. A network organization or individual station taking advantage of this waiver should so advise the Commission.

§ 3.119 *Sponsored programs, announcement of.* (a) In the case of each program for the broadcasting of which money, services, or other valuable consideration is either directly or indirectly paid or promised to, or charged or received by, any radio broadcast station, the station broadcasting such program shall make, or cause to be made, an appropriate announcement that the program is sponsored, paid for, or furnished, either in whole or in part.

(b) In the case of any political program or any program involving the discussion of public controversial issues for which any records, transcriptions, talent, scripts, or other material or services of any kind are furnished, either directly or indirectly, to a station as an inducement to the broadcasting of such program, an announcement shall be made both at the beginning and conclusion of such program on which such material or services are used that such records, transcriptions, talent, scripts, or other material or services have been furnished to such station in connection with the broadcasting of such program: *Provided, however*, That only one such announcement need be made in the case of any such program of 5 minutes' duration or less, which announcement may be made either at the beginning or the conclusion of the program.

(c) The announcement required by this section shall fully and fairly disclose the true identity of the person or persons by whom or in whose behalf such payment is made or promised, or from whom or in whose behalf such services or other valuable consideration is received, or by whom the material or services referred to in paragraph (b) of this section are furnished. Where an agent or other person contracts or otherwise makes arrangements with a station on behalf of another, and such fact is known to the station, the announcement shall disclose the identity of the person or persons in whose behalf such agent is acting instead of the name of such agent.

(d) In the case of any program, other than a program advertising commercial products or services, which is sponsored, paid for or furnished, either in whole or in part, or for which material or services referred to in paragraph (b) of this section are furnished, by a corporation, committee, association or other unincorporated group, the announcement required by this section shall disclose the name of such corporation, committee, association or other unincorporated group. In each such case the station shall require that a list of the chief executive officers or members of the executive committee or of the board of directors of the corporation, committee, association or other unincorporated group shall be made available for public inspection at one of the radio stations carrying the program.

(e) In the case of programs advertising commercial products or services, an announcement stating the sponsor's corporate or trade name or the name of the sponsor's product, shall be deemed sufficient for the purposes of this section and only one such announcement need be made at any time during the course of the program.

§ 3.120 *Broadcasts by candidates for public office*—(a) *Definitions.* A "legally qualified candidate" means any person who has publicly announced that he is a candidate for nomination by a convention of a political party or for nomination or election in a primary, special, or general election, municipal, county, State or national, and who meets the qualifications prescribed by the applicable laws to hold the office for which he is a candidate, so that he may be voted for by the electorate directly or by means of delegates or electors, and who.

(1) Has qualified for a place on the ballot or

(2) Is eligible under the applicable law to be voted for by sticker, by writing in his name on the ballot, or other method, and (i) has been duly nominated by a political party which is commonly known and regarded as such, or (ii) makes a substantial showing that he is a bona fide candidate for nomination or office, as the case may be.

(b) *General requirements.* No station licensee is required to permit the use of its facilities by any legally qualified candidate for public office, but if any licensee shall permit any such candidate to use its facilities, it shall afford equal opportunities to all other such candidates for that office to use such facilities: *Provided*, That such licensee shall have no power of censorship over the material broadcast by any such candidate.

(c) *Rates and practices.* (1) The rates, if any, charged all such candidates for the same office shall be uniform and shall not be rebated by any means direct or indirect. A candidate shall, in each case, be charged no more than the rate the station would charge if the candidate were a commercial advertiser whose advertising was directed to promoting its business within the same area as that encompassed by the particular office for which such person is a candidate. All discount privileges otherwise offered by a station to commercial advertisers shall be available upon equal terms to all candidates for public office.

(2) In making time available to candidates for public office no licensee shall make any discrimination between candidates in charges, practices, regulations, facilities, or services for or in connection with the service rendered pursuant to this part, or make or give any preference to any candidate for public office or subject any such candidate to any prejudice or disadvantage; nor shall any licensee make any contract or other agreement which shall have the effect of permitting any legally qualified candidate for any public office to broadcast to the exclusion of other legally qualified candidates for the same public office.

(d) *Records; inspection.* Every licensee shall keep and permit public inspection of a complete record of all requests for broadcast time made by or on behalf of candidates for public office, together with an appropriate notation showing the disposition made by the licensee of such requests, and the charges made, if any, if request is granted. Such records shall be retained for a period of two years.

§ 3.121 *Rebroadcast.* (a) The term "rebroadcast" means reception by radio of the program of a radio station, and the simultaneous or subsequent retransmission of such program by a broadcast station.

NOTE 1: As used in § 3.121, program includes any complete program or part thereof, or any signals if other than A-3 emission.

NOTE 2. In case a program is transmitted from its point of origin to a broadcast station entirely by telephone facilities in which a section of such transmission is by radio, the broadcasting of this program is not considered a rebroadcast.

(b) The licensee of a standard broadcast station may, without further authority of the Commission, rebroadcast the program of a United States standard or FM broadcast station, provided the Commission is notified of the call letters of each station rebroadcast and the licensee certifies that express authority has been received from the licensee of the station originating the program.

NOTE. The notice and certification of consent shall be given within 3 days of any single rebroadcast, but in case of the regular practice of rebroadcasting certain programs of a standard broadcast station several times during a license period, notice and certification of consent shall be given for the ensuing license period with the application for renewal of license, or at the beginning of such rebroadcast practice if begun during a license period.

(c) (1) The licensee of the standard broadcast station located within a state or the District of Columbia, may, without further authority of the Commission rebroadcast on a noncommercial basis a noncommercial program of a United States international broadcast station.

(2) The licensee of a standard broadcast station located in any territory or insular possession of the United States may, without further authority of the Commission, rebroadcast any program of a United States international broadcast station.

(3) In the case of any rebroadcast under the provisions of this paragraph, the Commission shall be notified of the call letters of each station whose programs are rebroadcast and the licensee shall certify that express authority has been received from the licensee of the station originating the program.

(d) No licensee of a standard broadcast station shall rebroadcast the program of any other class of United States radio station without written authority having first been obtained from the Commission upon application accompanied by written consent or certification of consent of the licensee of the station originating the program.

NOTE 1: The broadcasting of a program relayed by a remote pick-up broadcast station

(§ 4.401 of this chapter) is not considered a rebroadcast.

NOTE 2: Informal application may be employed.

NOTE 3: By Order No. 82, dated and effective June 24, 1941, until further order of the Commission, § 3.121 (d) is suspended only insofar as it requires prior written authority of the Commission for the rebroadcasting of programs originated for that express purpose by United States Government radio stations.

(e) In case of a program rebroadcast by several standard broadcast stations, such as a chain rebroadcast, the person legally responsible for distributing the program or the network facilities may obtain the necessary authorization for the entire rebroadcast both from the Commission and from the person or licensee of the station originating the program.

(f) Attention is directed to section 325 (b) of the Communications Act of 1934, which reads as follows:

No person shall be permitted to locate, use, or maintain a radio broadcast studio or other place or apparatus from which or whereby sound waves are converted into electrical energy, or mechanical or physical reproduction of sound waves produced, and caused to be transmitted or delivered to a radio station in a foreign country for the purpose of being broadcast from any radio station there, having a power output of sufficient intensity, and/or being so located geographically that its emissions may be received consistently in the United States, without first obtaining a permit from the Commission upon proper application therefor. (See § 1.327 of this chapter.)

§ 3.122 *Lotteries.* (a) An application for construction permit, license, renewal of license, or any other authorization for the operation of a broadcast station, will not be granted where the applicant proposes to follow or continue to follow a policy or practice of broadcasting or permitting "the broadcasting of, any advertisement of or information concerning any lottery, gift enterprise, or similar scheme, offering prizes dependent in whole or in part upon lot or chance, or any list of the prizes drawn or awarded by means of any such lottery, gift enterprise, or scheme, whether said list contains any part or all of such prizes." (See 18 U. S. C. 1304.)

(b) The determination whether a particular program comes within the provisions of paragraph (a) of this section depends on the facts of each case. However, the Commission will in any event consider that a program comes within the provisions of paragraph (a) of this section if in connection with such program a prize consisting of money or thing of value is awarded to any person whose selection is dependent in whole or in part upon lot or chance, if as a condition of winning or competing for such prize, such winner or winners are required to furnish any money or thing of value or are required to have in their possession any product sold, manufactured, furnished or distributed by a sponsor of a program broadcast on the station in question.

LICENSING POLICIES

§ 3.131 *Exclusive affiliation of station.* No license shall be granted to a standard broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization under which the station is prevented or hindered from, or penalized for, broadcasting the programs of any other network organization. (The term "network organization" as used herein includes national and regional network organizations. See ch VII, J, of Report on Chain Broadcasting.)

§ 3.132 *Territorial exclusivity.* No license shall be granted to a standard broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which prevents or hinders another station serving substantially the same area from broadcasting the network's programs not taken by the former station, or which prevents or hinders another station serving a substantially different area from broadcasting any program of the network organization. This section shall not be construed to prohibit any contract, arrangement, or understanding between a station and a network organization pursuant to which the station is granted the first call in its primary service area upon the programs of the network organization.

§ 3.133 *Term of affiliation.* No license shall be granted to a standard broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which provides, by original term, provisions for renewal, or otherwise for the affiliation of the station with the network organization for a period longer than 2 years: *Provided,* That a contract, arrangement, or understanding for a period up to 2 years, may be entered into within six months prior to the commencement of such period.

§ 3.134 *Option time.* No license shall be granted to a standard broadcast station which options for network programs any time subject to call on less than 56 days' notice, or more time than a total of 3 hours within each of four segments of the broadcast day, as herein described. The broadcast day is divided into four segments, as follows: 8 a. m. to 1 p. m.; 1 p. m. to 6 p. m.; 6 p. m. to 11 p. m.; 11 p. m. to 8 a. m. (These segments are to be determined for each station in terms of local time at the location of the station but may remain constant throughout the year regardless of shifts from standard to daylight saving time or vice versa.) Such option may not be exclusive as against other network organizations and may not prevent or hinder the station from optioning or selling any or all of the time covered by the option, or other time, to other network organizations.

NOTE 1: As used in this section, an option is any contract, arrangement, or understanding, express or implied, between a station and a network organization which prevents or hinders the station from scheduling programs before the network agrees to utilize the time during which such programs are scheduled, or which requires the station to clear time already scheduled when the network organization seeks to utilize the time.

NOTE 2: All time options permitted under this section must be for specified clock hours, expressed in terms of any time system set forth in the contract agreed upon by the station and network organization. Shifts from daylight saving to standard time or vice versa may or may not shift the specified hours correspondingly as agreed by the station and network organization.

§ 3.135 *Right to reject programs.* No license shall be granted to a standard broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which (a) with respect to programs offered pursuant to an affiliation contract, prevents or hinders the station from rejecting or refusing network programs which the station reasonably believes to be unsatisfactory or unsuitable; or which (b) with respect to network programs so offered or already contracted for, prevents the station from rejecting or refusing any program which, in its opinion, is contrary to the public interest, or from substituting a program of outstanding local or national importance.

§ 3.136 *Network ownership of stations.* No license shall be granted to a network organization, or to any person directly or indirectly controlled by or under common control with a network organization, for more than one standard broadcast station where one of the stations covers substantially the service area of the other station, or for any standard broadcast station in any locality where the existing standard broadcast stations are so few or of such unequal desirability (in terms of coverage, power, frequency, or other related matters) that competition would be substantially restrained by such licensing. (The word "control" as used herein is not limited to full control but includes such a measure of control as would substantially affect the availability of the station to other networks.)

NOTE: Effective date of this section with respect to any station may be extended from time to time in order to permit the orderly disposition of properties, and it shall be suspended indefinitely with respect to regional network organizations.

§ 3.137 *Dual network operation.* No license shall be issued to a standard broadcast station affiliated with a network organization which maintains more than one network: *Provided,* That this section shall not be applicable if such networks are not operated simultaneously, or if there is no substantial overlap in the territory served by the group of stations comprising each such network.

§ 3.138 *Control by networks of station rates.* No license shall be granted to a standard broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization under which the station is prevented or hindered from, or penalized for, fixing or altering its rates for the sale of broadcast time for other than the network's programs.

§ 3.139 *Special rules relating to contracts providing for reservation of time upon sale of a station.* (a) No license, renewal of license, assignment of license, or transfer of control of a corporate licensee shall be granted or authorized to a standard broadcast station which has

a contract, arrangement or understanding, express or implied, pursuant to which, as consideration or partial consideration for the assignment of license or transfer of control, the assignor of a station license or the transferor of stock, where transfer of a corporate licensee is involved, or the nominee of such assignor or transferor retains any right of reversion of the license or any right to the reassignment of the license in the future, or reserves the right to use the facilities of the station for any period whatsoever.

(b) In the case of assignment of license or transfer of control of a corporate licensee approved by the Commission before the effective date of this section, February 15, 1949, involving a contract, arrangement or understanding of the type covered by paragraph (a) of this section and the existence and terms of which were fully disclosed to the Commission at the time of execution, the Commission will give consideration to the issuance of a license despite the existence of such contract, arrangement or understanding, if the parties thereto modify such contract within 6 months from the effective date of this section. Such modifications will be considered on the facts of each case but no such modification will be approved unless the modified contract contains at least the following provisions:

(1) A maximum limitation of the time subject to reservation so that no more than 12 hours per week shall be subject to reservation, of which no more than 4 hours shall be on any given day.

(2) A clause providing that the licensee reserves the right to reject or refuse programs which he reasonably believes to be unsatisfactory or unsuitable or for which, in his opinion, a program of outstanding local or national importance should be substituted, but provision may be made for the substitution of other radio time for programs so rejected or for the payment at the station card rate for the time made unavailable.

(3) A prohibition against the resale or reassignment of any of the broadcast time reserved by such modified contract.

(4) An express negation of any right with respect to reversion or reassignment of license.

(5) An express provision setting forth a definite expiration date of the contract, arrangement or understanding. Such expiration date shall not extend beyond February 15, 1964 and shall in no event extend beyond the expiration date originally provided for in any such contract, agreement or understanding, in the event that such expiration date is a date prior to February 15, 1964.

(6) An express provision giving to the licensee the right to terminate the contract, arrangement or understanding for substantial cause, including, but not limited to, the assignment of license or the transfer of control of a corporate licensee, consistent disagreement over programs between the parties, or the acquisition of a network affiliation by the licensee, upon the payment of a lump sum or periodic payments, and providing that the amount initially fixed shall thereafter decrease as the amount of time reserved is decreased by performance of the contract. Any such payment should not be so unduly large as to constitute in practice an effective deterrent to the licensee exercising the right of termination. In determining whether the amount is unduly large, the Commission will consider the amount by which consideration in return for the transfer of the station was decreased by reason of the reservation of time or the present value of the radio time still reserved and unused as of the date of the exercise of the right of termination.

DATA AND MEASUREMENTS

§ 3.150 *Data required with applications for directional antenna systems* (a) The following engineering data shall be submitted with the application for authority to install a directional antenna:

(1) Complete description of the proposed system showing:

(i) Number of elements,

(ii) Type of each element (i. e., guyed or self-supporting, uniform cross section or tapered (specifying base width), grounded or insulated, etc.),

(iii) Complete engineering details of top loading or sectionalizing, if any,

(iv) Height of vertical lead of each element in feet (height above base insulator or base, if grounded),

(v) Overall height in feet of each element above ground,

(vi) Details including sketches of ground system for each element (length and number of radials, dimensions of ground screen, if used, and depth buried) and outlines of property,

(vii) Ratio of fields from elements (identifying elements).

(2) Calculated horizontal (ground) plane field intensity patterns for each mode of operation plotted to the largest scale possible on standard letter-size polar coordinate paper (main engraving approximately 7" x 10") using only scale divisions and subdivisions having values of 1, 2, 2.5, or 5 times 10^{n} and showing.

(i) Inverse field intensity at 1 mile and effective field intensity (RMS).

(ii) Direction true north shall be shown at zero azimuth

(iii) Direction and distance to each existing station with which interference may be involved. (All directions shall be determined by accurate calculation or from Lambert Conformal Conic Projection Map such as United States Coast and Geodetic Survey Map, No. 3060a, or map of equal accuracy, and all distances shall be determined by accurate calculation or from United States Albers Equal Area Projection Map scale 1/2,500,000 or map of equal accuracy. These may be obtained from the United States Coast and Geodetic Survey and the United States Department of Interior, Geological Survey.)

(iv) Orientation of array with respect to true north and time phasing of fields from elements (specifying degrees leading [+] or lagging [−]) and space phasing of elements (identifying elements). (Space phasing should be given in feet as well as in degrees.)

(v) The location of all the minima in the pattern

(3) Calculated field intensity vs. azimuth patterns for every 5 degrees of elevation through 60 degrees in those instances where radiation at angles above the horizontal plane is a pertinent factor in station allocation. These patterns may be plotted in polar or rectangular coordinates but shall be submitted one to a page. Minor lobe and null detail occurring between the 5 degree intervals need not be submitted.

(4) Data used in computing the patterns in subparagraphs (2) and (3) of this paragraph including:

(i) Formula used for calculating the horizontal patterns, sample calculations. (Derivation of formula if other than standard is used.)

(ii) All assumptions made and basis therefor, including electrical height, current distribution and efficiency of each element, and ground conductivity.

(iii) Complete tabulation of final calculated data used in plotting patterns, including data for determination of RMS value of pattern.

(5) Values of field intensity less than 10 percent of the effective field intensity of the patterns in subparagraphs (2) and (3) of this paragraph shown on an enlarged scale.

(6) In the event actual inverse distance field intensities expected to be determined in practice (that is, the values determined from actual measurements, particularly in sharp nulls) are different from the calculated values in subparagraphs (2) and (3) of this paragraph, the maximum expected operating values (MEOV) as well as the calculated values shall be shown on both the full patterns and the enlarged sections.

(7) Any additional information required by the application form.

§ 3.151 *Field intensity measurements to establish performance of directional antennas.* (a) In addition to the information required by the license application form, the following showing must be submitted to indicate that the pattern obtained for each mode of directional operation is essentially the same as that predicted by the application and required by terms of the authorization and that any specific requirements set out are fully met:

(1) Horizontal field intensity pattern(s) showing the inverse field intensity at 1 mile and effective field intensity (RMS) as determined from field intensity measurements taken and analyzed in accordance with § 3.186 in at least the following directions:

(i) Those specified in the instrument of authorization.

(ii) In major lobes. Generally at least three radials are necessary to establish a major lobe; however, additional radials may be required.

(iii) Along sufficient number of other radials to establish the effective field. In the case of a relatively simple directional antenna pattern, approximately five radials in addition to those in subdivisions (i) and (ii) of this subparagraph are sufficient. However, when more complicated patterns are involved, that is, patterns having several or sharp lobes or nulls, measurements shall be taken along as many radials as may be

necessary, to definitely establish the pattern(s).

(2) Pattern(s) plotted with direction true north as zero azimuth and showing the orientation of array with respect to true north, time and space phasing of elements, and both calculated and measured parameters. (Specify degrees leading (+) or lagging (−) and space phasing in feet as well as in degrees.)

(3) Pattern(s) plotted to the largest scale possible on standard letter-size polar coordinate paper (main engraving approximately 7'' x 10'') using divisions and subdivisions having values of 1, 2, 2.5, or 5 times 10^{n} (no other values shall be used) All values of field intensity less than 10 percent of the RMS field intensity of the pattern shown on an enlarged scale.

(4) Complete tabulation of all data used in plotting the above pattern(s).

(5) The 25 and 5 mv/m field intensity contours and the nighttime interference-free contour, when the pattern is for nighttime operation, as well as any other contours specified by the instrument of authorization, plotted on a map which has the largest practical scale. These contours need not be shown for distances greater than 20 miles from the antenna except that the field intensity contours on the far side of the business and residential areas of the city in which the main studio is located shall be shown. When the station is limited by interference within the 5 mv/m contour the latter contour need not be shown. In the event the 5 mv/m contour includes and extends beyond the city and beyond 20 miles, the highest signal intensity contour that entirely includes the city may be plotted in lieu of the 5 mv/m contour; in the event that the 5 mv/m contour does not include the city, the contour of highest signal intensity encompassing the city shall be plotted in addition to the 5 mv/m contour.

(6) The actual field intensity measured at each monitoring point established in the various directions for which a limiting field was specified in the instrument of authorization together with accurate and detailed description of each monitoring point together with ordinary snapshots, clear and sharp, taken with the field intensity meter in its measuring position and with the camera so located that its field of view takes in as many pertinent landmarks as possible. In addition, the directions for proceeding to each monitoring point together with a rough sketch or map upon which has been indicated the most accessible approaches to the monitoring points should be submitted.

§ 3.152 *Field intensity measurements in support of applications or evidence at hearings.* In the determination of interference, groundwave field intensity measurements will take precedence over theoretical values, provided such measurements are properly taken and presented. When measurements of groundwave signal intensity are presented, they shall be sufficiently complete in accordance with § 3.186 to determine the field intensity at 1 mile in the pertinent directions for that station

NOTE: The antenna resistance measurements required by § 3.186 need not be taken or submitted.

STANDARD BROADCAST TECHNICAL STANDARDS

§ 3.181 *Introduction.* (a) There are presented herein the Technical Standards giving interpretations and further considerations concerning the rules and regulations of the Federal Communications Commission governing standard broadcast stations. While rules and regulations form the basis of good engineering practice, these standards may go beyond the rules and regulations and set up engineering principles for consideration of various allocation problems. These standards have been approved by the Commission and thus are considered as reflecting the opinion of the Commission in all matters involved.

(b) The Technical Standards set forth herein are those deemed necessary for the construction and operation of standard broadcast stations to meet the requirements of technical regulations and for operation in public interest along technical lines not specifically enunciated in the regulations. These standards are based on the best engineering data available from evidence supplied in formal and informal hearings and extensive surveys conducted in the field by the Commission's personnel. Numerous informal conferences have been held with radio engineers, manufacturers of radio equipment and others for the guidance of the Commission in the formulation of these standards.

(c) These standards are complete in themselves and supersede any previous announcements or policies which may have been enunciated by the Commission on engineering matters concerning standard broadcast stations.

(d) While these standards provide for flexibility and set forth the conditions under which they are applicable, it is not expected that material deviation therefrom as to fundamental principles will be recognized unless full information is submitted as to the reasonableness of such departure and the need therefor.

(e) These standards will necessarily change as progress is made in the art, and accordingly it will be necessary to make revisions from time to time. The Commission will accumulate and analyze engineering data available as to the progress of the art so that its standards may be kept current with the developments.

§ 3.182 *Engineering standards of allocation.* (a) Sections 3.21 to 3.34, inclusive, govern allocation of facilities in the standard broadcast band of 535 to 1605 kc. Section 3.21 establishes three classes of channels in this band, namely, clear channels for the use of high-powered stations, regional channels for the use of medium-powered stations, and local channels for the use of low-powered stations. The classes and power of standard broadcast stations which will be assigned to the various channels are set forth in § 3.22. The classification of the standard broadcast stations are as follows.

(1) Class I stations are dominant stations operating on clear channels with powers of not less than 10 or more than 50 kw. These stations are designed to render primary and secondary service over an extended area and at relatively long distances, hence have their primary service areas free from objectionable interference from other stations on the same and adjacent channels and secondary service areas free from objectionable interference from stations on the same channels. (The secondary service area of a Class I station is not protected from adjacent channel interference. However, if it is desired to make a determination of the area in which adjacent channel groundwave interference (10 kc removed) to skywave service exists, it may be considered as the area where the ratio of the desired 50% skywave of the Class I station to the undesired groundwave of a station 10 kc removed is 1 to 4.) From an engineering point of view, Class I stations may be divided into two groups and, hereafter, for the purpose of convenience, the two groups of Class I stations will be termed Class I–A or I–B in accordance with the assignment to channels allocated by § 3.25 (a) or (b).

(i) The Class I stations in group I–A are those assigned to the channels allocated by § 3.25 (a), on which duplicate nighttime operation is not permitted, that is, no other station is permitted to operate on a channel with a Class I station of this group within the limits of the United States (the Class II stations assigned the channels operate limited time or daytime only), and during daytime the Class I station is protected to the 100 uv/m ground wave contour. Protection is given this class of station to the 500 uv/m ground wave contour from adjacent channel stations for both day and nighttime operations. The power of each such Class I station shall not be less than 50 kw.

(ii) The Class I stations in group I-B are those assigned to the channels allocated by § 3.25 (b), on which duplicate operation is permitted, that is, other Class I or Class II stations operating unlimited time may be assigned to such channels. During nighttime hours of operation a Class I station of this group is protected to the 500 uv/m 50 percent sky wave contour and during daytime hours of operation to the 100 uv/m ground wave contour from stations on the same channel. Protection is given to the 500 uv/m groundwave contour from stations on adjacent channels for both day and nighttime operation. The operating powers of Class I stations on these frequencies shall be not less than 10 kw nor more than 50 kw.

(2) Class II stations are secondary stations which operate on clear channels with powers not less than 0.25 kw. or more than 50 kw. These stations are required to use a directional antenna or other means to avoid causing interference within the normally protected service areas of Class I stations or other Class II stations. These stations normally render primary service only, the area of which depends on the geographical location, power, and frequency. This may be relatively large but is limited by and subject to such interference as may be received from Class I stations. However, it is recommended that Class

II stations be so located that the interference received from other stations will not limit the service area to greater than the 2500 uv/m ground wave contour nighttime and 500 uv/m groundwave contour daytime, which are the values for the mutual protection of this class of stations with other stations of the same class.

(3) Class III stations operate on regional channels and normally render primary service to the larger cities and the rural area contiguous thereto, and are subdivided into two classes:

(i) Class III-A stations which operate with powers not less than 1 kw or more than 5 kw are normally protected to the 2500 uv/m groundwave contour nighttime and the 500 uv/m groundwave contour daytime.

(ii) Class III-B stations which operate with powers not less than 0.5 kw, or more than 1 kw nighttime and 5 kw daytime are normally protected to the 4000 uv/m groundwave contour nighttime and 500 uv/m groundwave contour daytime

(4) Class IV stations operate on local channels normally rendering primary service only to a city or town and the surburban and rural areas contiguous thereto with powers not less than 0.1 kw or more than 0.25 kw. The stations are normally protected to 500 uv/m groundwave contour daytime. On local channels the separation required for the daytime protection shall also determine the nighttime separation. The actual nighttime limitation will be calculated.

NOTE: The following approximate method may be used. It is based on the assumption of 0.25 wavelength antenna height and 88 mv/m at one mile effective field for 250 watts power, using the 10% skywave field intensity curve of Figure 2 of § 3.190. Zones defined by circles of various radii specified below are drawn about the desired station and the interfering 10% skywave signal from each station in a given zone is considered to be the value tabulated below. The effective interfering 10% skywave signal is taken to be the RSS value of all signals originating within these zones. (Stations beyond 500 miles are not considered.)

Zone	Inner radius	Outer radius	10 percent skywave signal (mv/m)
A	....	60	0.10
B	60	80	.12
C	80	100	.14
D	100	250	.16
E	250	350	.14
F	350	450	.12
G	450	500	.10

Where the power of the interfering station is not 250 watts, the 10% skywave signal should be adjusted by the square root of the ratio of the power to 250 watts.

(b) The class of any station is determined by the channel assignment, the power, and the field intensity contour to which it renders service free of interference from other stations as determined by these standards. No station will be permitted to change to a class normally protected to a contour of less intensity than the contour to which the station actually renders interference-free service. Any Station of a class normally protected to a contour of less intensity than that to which the station actually renders interference-free service, will be automatically reclassified according to the class normally protected, the minimum consistent with its power and channel assignment. Likewise, any station to which the interference is reduced so that service is rendered to a contour normally protected for a higher class will be automatically changed to that class if consistent with its power and channel assignment.

(c) When it is shown that primary service is rendered by any station, beyond the normally protected contour, and when primary service to approximately 90 percent of the population (population served with adequate signal) of the area between the normally protected contour and the contour to which such station actually serves, is not supplied by any other station or stations carrying the same general program service, the contour to which protection may be afforded in such cases will be determined from the individual merits of the case under consideration.

(d) When a station is already limited by interference from other stations to a contour of higher value than that normally protected for its class, this contour shall be the established standard for such station with respect to interference from all other stations.

(e) The several classes of broadcast stations have in general three service areas; namely, primary, secondary, and intermittent service areas. (See § 3.11 for the definitions of primary, secondary, and intermittent service areas.) Class I stations render service to all three service areas. Class II stations render service to a primary area but the secondary and intermittent service areas may be materially limited or destroyed due to interference from other stations depending on the station assignments involved. Class III and IV stations usually have only primary service areas as interference from other stations generally prevents any secondary service and may limit the intermittent service area. However, complete intermittent service may be obtained in many cases depending on the station assignments involved.

(f) The signals necessary to render primary service to different types of service areas are as follows:

Area:	*Field intensity groundwave*[1]
City business or factory areas	10 to 50 mv/m
City residential areas	2 to 10 mv/m
Rural—all areas during winter or northern areas during summer	0.1 to 0.5 mv/m
Rural—southern areas during summer	0.25 to 1.0 mv/m

[1] See § 3.184 for curves showing distance to various ground wave field intensity contours for different frequency and ground conductivities and § 3.183

All these values are based on an absence of objectionable fading, either in changing intensity or selective fading, the usual noise level in the areas, and an absence of limiting interference from other broadcast stations. The values apply both day and night but generally fading or interference from other stations limits the primary service at night in all rural areas to higher values of field intensity than the values given. The Commission will not authorize a directive antenna for a Class IV station assigned a local channel.

NOTE: Standards have not been established for interference from atmospherics or man-made electric noise as no uniform method of measuring noise or static has been established. In any individual case objectionable interference from any source, except other broadcast signals, may be determined by comparing the actual noise interference reproduced during reception of a desired broadcast signal to the degree of interference that would be caused by another broadcast signal within 20 cycles of the desired signal and having a carrier ratio of 20 to 1 with both signals modulated 100 percent on peaks of usual programs. Standards of noise measurements and interference ratio for noise are now being studied.

(g) In determining the population of the primary service area, it may be considered that the following signals are satisfactory to overcome man-made noise in towns of the population given.

Population:	*Field intensity groundwave*
Up to 2,500	0.5 mv/m
2,500 to 10,000	2.0 mv/m
10,000 and up	Values given in paragraph (f) of this section

These values are subject to wide variations in individual areas and especial attention must be given to interference from other stations. The values are not considered satisfactory in any case for service to the city in which the main studio of the station is located. The values in paragraph (f) of this section shall apply except as individual consideration may determine.

(h) All classes of broadcast stations have primary service areas subject to limitation by fading and noise, and interference from other stations to the contours set out for each class of station.

(i) Secondary service is delivered in the areas where the sky wave for 50 percent or more of the time has a field intensity of 500 uv/m or greater. (The secondary service area of a Class 1-A station should be considered as having this limit only for determination of service in comparison with other stations.) It is not considered that satisfactory secondary service can be rendered to cities unless the sky wave approaches in value the ground wave required for primary service. The secondary service is necessarily subject to some interference and extensive fading, whereas the primary service area of a station is subject to no objectionable interference or fading. Class I stations only are assigned on the basis of rendering secondary service.

NOTE: Standards have not been established for objectionable fading as such standards would necessarily depend on the receiver characteristics which have been changed considerably in this regard during the last several years. Selective fading causing audio distortion and the signal fading below the noise level are the objectionable characteristics of fading on modern design receivers. The AVC circuits in the better designed modern receivers in general maintain the audio output sufficiently constant to be satisfactory during most fading.

(j) The intermittent service is rendered by the groundwave and begins at the outer boundary of the primary service area and extends to the value of signal

where it may be considered as having no further service value. This may be down to only a few microvolts in certain areas and up to several millivolts in other areas of high noise level, interference from other stations, or objectionable fading at night. The intermittent service area may vary widely from day to night and generally varies from time to time as the name implies. Only Class I stations are assigned for protection from interference from other stations into the intermittent service area.

(k) Section 3.23 provides that the several classes of broadcast stations may be licensed to operate unlimited time, limited time, daytime, sharing time, and specified hours, with full explanation given in the section.

(l) Section 3.24 sets out the general requirements for obtaining an increase in facilities of a licensed station and for a new station. Section 3.24 (b) concerns the matter of interference that may be caused by a new assignment or increase in facilities of an existing assignment.

(m) [Reserved.]

(n) [Reserved.]

(o) Objectionable interference from another broadcast station is the degree of interference produced when, at a specified field intensity contour with respect to the desired station, the field intensity of an undesired station (or the root-sum-square value of field intensities of two or more stations on the same frequency) exceeds for ten (10) percent or more of the time the values set forth in these standards. (The secondary service area of a Class I–A station should be considered as having this limit only for determination of service in comparison with other stations.)

(1) With respect to the root-sum-square values of interfering field intensities referred to herein, except in the case of Class IV stations on local channels, calculation is accomplished by considering the signals in order of decreasing magnitude, adding the squares of the values and extracting the square root of the sum, excluding those signals which are less than 50% of the RSS value of the higher signals already included.

(2) The RSS value will not be considered to be increased when a new interfering signal is added which is less than 50% of the RSS value of the interference from existing stations, and which at the same time is not greater than the smallest signal included in the RSS value of interference from existing stations.

(3) It is recognized that application of the above "50% exclusion" method of calculating the RSS interference may result in some cases in anomalies wherein the addition of a new interfering signal or the increase in value of an existing interfering signal will cause the exclusion of a previously included signal and may cause a decrease in the calculated RSS value of interference. In order to provide the Commission with more realistic information regarding gains and losses in service (as a basis for determination of the relative merits of a proposed operation) the following alternate method for calculating the proposed RSS values of interference will be employed wherever applicable.

(4) In the cases where it is proposed to add a new interfering signal which is not less than 50% of the RSS value of interference from existing stations or which is greater than the smallest signal already included to obtain this RSS value, the RSS limitation after addition of the new signal shall be calculated without excluding any signal previously included. Similarly, in cases where it is proposed to increase the value of one of the existing interfering signals which has been included in the RSS value, the RSS limitation after the increase shall be calculated without excluding the interference from any source previously included.

(5) If the new or increased signal proposed in such cases is ultimately authorized, the RSS values of interference to other stations affected will thereafter be calculated by the "50% exclusion" method without regard to this alternate method of calculation.

(6) Examples of RSS interference calculations:

(i) Existing interferences:

Station No. 1—1.0 mv/m.
Station No. 2—0.60 mv/m.
Station No. 3—0.59 mv/m.
Station No. 4—0.58 mv/m.
The RSS value from Nos 1, 2 and 3 is 1.31 mv/m; therefore interference from No. 4 is excluded for it is less than 50% of 1.31 mv/m.

(ii) Station A receives interference from:

Station No. 1—1.0 mv/m.
Station No. 2 -0.60 mv/m.
Station No. 3—0.59 mv/m

It is proposed to add a new limitation—0.58 mv/m. This is more than 50% of 1.31 mv/m, the RSS value of Nos. 1, 2 and 3. The RSS value of Station No. 1 and of the proposed station would be 1.21 mv/m which is more than twice as large as the limitation from Station No. 2 or No. 3. However, under the above provision the new signal and the three existing interferences are nevertheless calculated for purposes of comparative studies, resulting in an RSS value of 1.47 mv/m. However, if the proposed station is ultimately authorized, only No. 1 and the new signal are included in all subsequent calculations for the reason that Nos. 2 and 3 are less than 50% of 1.21 mv/m, the RSS value of the new signal and No. 1.

(iii) Station A receives interference from:

Station No. 1—1.0 mv/m.
Station No. 2—0.60 mv/m.
Station No. 3—0.59 mv/m.

No. 1 proposes to increase the limitation it imposes on Station A to 1.21 mv/m. Although the limitations from stations Nos. 2 and 3 are less than 50% of the 1.21 mv/m limitation, under the above provision they are nevertheless included for comparative studies, and the RSS limitation is calculated to be 1.47 mv/m. However, if the increase proposed by Station No. 1 is authorized, the RSS value then calculated is 1.21 mv/m because Stations Nos. 2 and 3 are excluded in view of the fact that the limitations they impose are less than 50% of 1.21 mv/m.

(p) Objectionable interference from a station on the same channel shall be considered to exist to a station when, at the field intensity contour specified in paragraph (v) of this section with respect to the class to which the station belongs, the field intensity of an interfering station (or the root-sum-square value of the field intensities of two or more interfering stations) operating on the same channel, exceeds for ten (10) percent or more of the time the value of the permissible interfering signal set forth opposite such class in paragraph (v) of this section.

(q) Objectionable interference from a station on an adjacent channel shall be considered to exist to a station when, at the normally protected contour of a desired station, the field intensity of the ground wave of an undesired station operating on an adjacent channel (or the root-sum-square value of the field intensities of two or more such undesired stations operating on the same adjacent channel) exceeds a value specified in paragraph (w) of this section.

(r) For the purpose of estimating the coverage and the interfering effects of stations in the absence of field intensity measurements, use shall be made of Figure 8 of § 3.190 which describes the estimated effective field for one kilowatt power input of simple vertical omnidirectional antennas of various heights with ground systems of at least 120 one-quarter wavelength radials. Certain approximations, based on the curve or other appropriate theory, may be made when other than such antennas and ground systems are employed, but in any event the effective field to be employed shall not be less than given in the following:

Class of station:	*Effective field*
I	225 mv/m
II and III	175 mv/m
IV	150 mv/m

In case a directional antenna is employed, the interfering signal of a broadcasting station will vary in different directions, being greater than the above values in certain directions and less in others, depending upon the design and adjustment of the directional antenna system. To determine the interference in any direction the measured or calculated radiated field (unabsorbed field intensity at 1 mile from the array) must be used in conjunction with the appropriate propagation curves. (See § 3.185 for further discussion and solution of a typical directional antenna case.)

(s) The existence or absence of objectionable groundwave interference from stations on the same or adjacent channels shall be determined by actual measurements made according to the method hereinafter described, or, in the absence of such measurements, by reference to the propagation curves of § 3.184. The existence or absence of objectionable interference due to skywave propagation shall be determined by reference to the appropriate propagation curves in Figure 1 or Figure 2 of § 3.190.

(t) In computing the fifty (50) percent skywave field intensity values and the ten (10) percent skywave field intensity values of a station on a clear channel, use shall be made of the appropriate graph set forth in Figure 1 of § 3.190 entitled "Average Skywave Field Inten-

sity" (corresponding to the second hour after sunset at the recording station). These graphs are drawn for a radiated field of 100 mv/m at 1 mile in the horizontal plane from a 0.311 wavelength antenna. In computing the ten (10) percent skywave field intensity of a regional channel station, use shall be made of the appropriate curve in Figure 2 of § 3.190 entitled "10 percent Skywave Signal Range." This graph is drawn for a radiated field of 100 mv/m at 1 mile at the vertical angle pertinent to transmission by one reflection. This curve supersedes the ten (10) percent skywave curve of Figure 1 of § 3.190, only for regional and local channels at the present time Adoption of revised skywave curves for use on clear channels will await the outcome of the Clear Channel Hearing (Docket No. 6741).

(u) The distance to any specified groundwave field intensity contour for any frequency may be determined from the appropriate curves in § 3.184 entitled "Ground Wave Field Intensity vs. Distance."

(v) Protected service contours and permissible interference signals for broadcast stations are as follows:

Class of station	Class of channel used	Permissible power	Signal intensity contour of area protected from objectionable interference [1]		Permissible interfering signal on same channel [2]	
			Day [3]	Night	Day [3]	Night
I-A	Clear	50 kw	SC 100 uv/m.. AC 500 uv/m..	Not duplicated	5 uv/m..	Not duplicated.
I-B	Clear	10 kw. to 50 kw	SC 100 uv/m.. AC 500 uv/m..	500 uv/m. (50% skywave).	5 uv/m..	25 uv/m
II	Clear	0.25 kw. to 50 kw	500 uv/m	2500uv/m [4] (groundwave)	25uv/m..	125 uv/m.
III-A	Regional	1 kw. to 5 kw	500 uv/m	2500 uv/m (groundwave)	25uv/m..	125 uv/m.
III-B	Regional	0.5 to 1 kw. night and 5 kw. day.	500 uv/m	4000 uv/m (groundwave)	25 uv/m.	200 uv/m.
IV	Local	0.1 kw. to 0.25 kw.	500 uv/m	Not prescribed [5]	25 uv/m.	Not prescribed [5]

[1] When it is shown that primary service is rendered by any of the above classes of stations, beyond the normally protected contour, and when primary service to approximately 90 percent of the population (population served with adequate signal) of the area between the normally protected contour and the contour to which such station actually serves, is not supplied by any other station or stations, the contour to which protection may be afforded in such cases will be determined from the individual merits of the case under consideration. When a station is already limited by interference from other stations to a contour of higher value than that normally protected for its class, this contour shall be the established standard for such station with respect to interference from all other stations.

[2] For adjacent channels see paragraph (w) of this section.

[3] Ground wave.

[4] Skywave field intensity for 10 percent or more of the time.

[5] These values are with respect to interference from all stations except Class I-B, which stations may cause interference to a field intensity contour of higher value. However, it is recommended that Class II stations be so located that the interference received from Class I-B stations will not exceed these values. If the Class II stations are limited by Class I-B stations to higher values, then such values shall be the established standard with respect to protection from all other stations.

[6] See paragraph (a) (4) of this section.

SC = Same channel.
AC = Adjacent channel

(w) The following ratios are to be used for determining the minimum ratio of the field intensity of a desired to an undesired signal for interference free service. In the case of a desired groundwave signal interfered with by two or more skywave signals on the same frequency, the RSS value of the latter is used.

Frequency separation of desired to undesired signals—	Desired groundwave to—		Desired 50 percent skywave to undesired 10 percent skywave
	Undesired groundwave	Undesired 10 percent skywave	
0 kc	20:1	20:1	20:1
10 kc	1:1	1:5	(1)
20 kc	1:30		

[1] The secondary service area of a Class I station is not protected from adjacent channel interference. However, if it is desired to make a determination of the area in which adjacent channel groundwave interference (10 kc. removed) to skywave service exists, it may be considered as the area where the ratio of the desired 50 percent skywave of the Class I station to the undesired groundwave of a station 10 kc. removed is 1 to 4.

From the above, it is apparent that in many cases stations operating on channels 10 and 20 kilocycles apart may be operated with antenna systems side by side or otherwise in proximity without any indications of interference if the interference is defined only in terms of permissible ratios listed in this paragraph. As a practical matter, serious interference problems may arise when two or more stations with the same general service area are operated on channels 10, 20 and 30 kilocycles apart.

(x) Two stations, one with a frequency twice that of the other, should not be assigned in the same groundwave service area unless special precautions are taken to avoid interference from the second harmonic of the lower frequency. In selecting a frequency, consideration should be given to the fact that occasionally the frequency assignment of two stations in the same area may bear such a relation to the intermediate frequency of some broadcast receivers as to cause so-called "image" interference. However, since this can usually be rectified by readjustment of the intermediate frequency of such receivers, the Commission in general will not take this kind of interference into consideration in allocation problems.

(y) Two stations operating with synchronized carriers and carrying the identical program will have their groundwave service subject to some distortion in areas where the signals from the two stations are of comparable intensity. For the purpose of estimating coverage of such stations areas in which the signal ratio is between 1 to 2 and 2 to 1 will not be considered as having satisfactory service.

NOTE: Two stations are considered to be operated synchronously when the carriers are maintained within one-fifth of a cycle per second of each other and they transmit identical programs

§ 3.183 *Groundwave signals.* (a) Interference that may be caused by a proposed assignment or an existing assignment during day time should be determined, when possible, by measurements on the frequency involved or on another frequency over the same terrain and by means of the curves in § 3.184 entitled "Ground Wave Field Intensity versus Distance."

(b) In determining interference based upon field intensity measurements, it is necessary to do the following: First, establish the outer boundary of the protected service area of the desired station in the direction of the station that may cause interference to it. Second, at this boundary, measure the interfering signal from the undesired station. The ratio of the desired to the undesired signal given in § 3.182 (w) should be applied to the measured signals and if the required ratio is observed, no objectionable interference is foreseen. When measurements of both the desired and undesired stations are made in one area to determine the point where objectionable interference from groundwave signals occur or to establish other pertinent contours, several measurements of each station shall be made within a few miles of this point or contour. The effective field of the antennas in the pertinent directions of the stations must be established and all measurements must be made in accordance with § 3.186.

(c) In all cases where measurements taken in accordance with the requirements are not available, the groundwave intensity must be determined by means of the pertinent map of ground conductivity and the groundwave curves of field intensity versus distance. The conductivity of a given terrain may be determined by measurements of any broadcast signal traversing the terrain involved. Figures M3 and R3 of § 3.190 show the conductivity throughout the United States by general areas of reasonably uniform conductivity When it is clear that only one conductivity value is involved, Figure R3 of § 3.190, which is a replica of Figure M3 and contained in these standards, may be used; in all other situations Figure M3 must be employed. It is recognized that in areas of limited size or over a particular path, the conductivity may vary widely from the values given, therefore, these maps are to be used only when accurate and acceptable measurements have not been made. Figure 4 of § 3.190 is a map of ground conductivity in Canada prepared by the Canadian Department of Transport. It is to be noted that at some locations there are differences in conductivity on either side of the border, which cannot be explained by geophysical cleavages. Pending adjustment of the maps for such inconsistencies, all variations at the border will be treated as real.

NOTE: Figure M3 which is incorporated in these Standards by reference, was derived by indicating ground conductivity values in the United States on the United States Albers equal area projection map (based on standard parallels 29½° and 45½°; North American datum; scale 1/2,500,000). Figure M3, consisting of two sections, an eastern and a western half, may be obtained from the Superintendent of Documents, Washington, D C.

(d) Example of determining interference by the graphs in § 3.184:

It is desired to find whether objectionable interference exists between a 5 kw Class III station on 990 kc and a 1 kw Class III station on 1000 kc, the stations being separated by 130 miles; both stations use nondirectional antennas having such height as to produce an effective field for 1 kw of 175 mv/m. (See § 3.185 in case of use of directional antennas.) The conductivity at each station and of the intervening terrain is determined as 6 mmhos/m. The protection to Class III stations during daytime is to the 500 uv/m contour. The distance to the 500 uv/m groundwave contour of the 1 kw station is determined by the use of the appropriate curve in § 3.184, Graph 12. Since the curve is plotted for 100 mv/m at a mile, to find the distance to the 500 uv/m contour of the 1 kw station, it is necessary to determine the distance to the 285 uv/m contour ($\frac{100 \times 500}{175} = 285$). From the appropriate curve, the estimated radius of the service area for the desired station is found to be 39.5 miles. Subtracting this distance from the distance between the two stations leaves 90.5 miles for the interfering signal to travel. From the above curve it is found that the signal from the 5 kw station at this distance would be 158 uv/m. Since a one to one ratio applies for stations separated by 10 kc, the undesired signal at that point can have a value up to 500 uv/m without objectionable interference. If the undesired signal had been found to be greater than 500 uv/m, then objectionable interference would exist. For other channel separations, the appropriate ratio of desired to undesired signal should be used.

(e) Where a signal traverses a path over which different conductivities exist, the distance to a particular groundwave field intensity contour shall be determined by the use of the equivalent distance method. Reasonably accurate results may be expected in determining field intensities at a distance from the antenna by application of the equivalent distance method when the unattenuated field of the antenna, the various ground conductivities and the location of discontinuities are known. This method considers a wave to be propagated across a given conductivity according to the curve for a homogeneous earth of that conductivity. When the wave crosses from a region of one conductivity into a region of a second conductivity, the equivalent distance of the receiving point from the transmitter changes abruptly but the field intensity does not. From a point just inside the second region the transmitter appears to be at that distance where, on the curve for a homogeneous earth of the second conductivity, the field intensity equals the value that occurred just across the boundary in the first region. Thus the equivalent distance from the receiving point to the transmitter may be either greater or less than the actual distance. An imaginary transmitter is considered to exist at that equivalent distance. This technique is not intended to be used as a means of evaluating unattenuated field or ground conductivity by the analysis of measured data. The method to be employed for such determinations is set out in § 3.185.

(f) An example of the use of the equivalent distance method follows:

It is desired to determine the distance to the 0.5 mv/m and 0.025 mv/m contours of a station on a frequency of 1000 kc with an inverse distance field of 100 mv/m at one mile being radiated over a path having a conductivity of 10 mmhos/m for a distance of 15 miles, 5 mmhos/m for the next 20 miles and 15 mmhos/m thereafter. By the use of the appropriate curves in § 3.184—Graph 12, it is seen that at a distance of 15 miles on the curve for 10 mmhos/m the field is 3.46 mv/m. The equivalent distance to this field intensity for a conductivity of 5 mmhos/m is 11 miles. Continuing on the propagation curve for the second conductivity, the 0.5 mv/m contour is encountered at a distance of 27.9 miles from the imaginary transmitter. Since the imaginary transmitter was 4 miles nearer (15 − 11 miles) to the 0.5 mv/m contour, the distance from the contour to the actual transmitter is 31.9 miles (27.9+4 miles). The distance to the 0.025 mv/m contour is determined by continuing on the propagation curve for the second conductivity to a distance of 31 miles (11+20 miles), at which point the field is read to be 0.39 mv/m. At this point the conductivity changes to 15 mmhos/m and from the curve relating to that conductivity, the equivalent distance is determined to be 58 miles—27 miles more distant than would obtain had a conductivity of 5 mmhos/m prevailed. Using the curve representing the conductivity of 15 mmhos/m the 0.025 mv/m contour is determined to be at an equivalent distance of 172 miles. Since the imaginary transmitter was considered to be 4 miles closer at the first boundary and 27 miles farther at the second boundary, the net effect is to consider the imaginary transmitter 23 miles (27 − 4 miles) more distant than the actual transmitter, thus the actual distance to the 0.025 mv/m contour is determined to be 149 miles (172 − 23 miles).

§ 3.184 *Groundwave field intensity charts.* (a) Graphs 1–19A show the computed values of groundwave field intensity as a function of the distance from the transmitting antenna. The groundwave field intensity is here considered to be that part of the vertical component of the electric field received on the ground which has not been reflected from the ionosphere nor the troposphere. These 20 charts were computed for 20 different frequencies, a dielectric constant of the ground equal to 15 for land and 80 for sea water (referred to air as unity) and for the ground conductivities (expressed in mmhos/m) given on the curves. The curves show the variation of the groundwave field intensity with distance to be expected for transmission from a short vertical antenna at the surface of a uniformly conducting spherical earth with the ground constants shown on the curves; the curves are for an antenna power and efficiency such that the inverse distance field is 100 mv/m at 1 mile. The curves are valid at distances large compared to the dimensions of the antenna for other than short vertical antennas.

(b) The inverse distance field (100 mv/m divided by the distance in miles) corresponds to the groundwave field intensity to be expected from an antenna with the same radiation efficiency when it is located over a perfectly conducting earth. To determine the value of the groundwave field intensity corresponding to a value of inverse distance field other than 100 mv/m at 1 mile, simply multiply the field intensity as given on these charts by the desired value of inverse distance field at 1 mile divided by 100; for example, to determine the groundwave field intensity for a station with an inverse distance field of 1700 mv/m at 1 mile, simply multiply the values given on the charts by 17. The value of the inverse distance field to be used for a particular antenna depends upon the power input to the antenna, the nature of the ground in the neighborhood of the antenna, and the geometry of the antenna. For methods of calculating the interrelations between these variables and the inverse distance field, see "The Propagation of Radio Waves Over the Surface of the Earth and in the Upper Atmosphere," Part II, by Mr. K. A. Norton, Proc. I. R. E., Vol. 25, September 1937, pp. 1203–1236.

(c) At sufficiently short distances (say less than 35 miles), such that the curvature of the earth does not introduce an additional attenuation of the waves, the graphs were computed by means of the plane earth formulas given in the papers, "The Propagation of Radio Waves Over the Surface of the Earth and in the Upper Atmosphere," Part I, by Mr. K. A. Norton, Proc. I. R. E., Vol. 24, October 1936, pp. 1367–1387. At larger distances the additional attenuation of the waves which is introduced by the effect of the curvature of the earth was introduced by the methods outlined in the papers, "The Diffraction of Electromagnetic Waves from an Electrical Point Source round a Finitely Conducting Sphere, with Applications to Radiotelegraphy and the Theory of the Rainbow," by Balth van der Pol and H. Bremmer, Part I, Phil. Mag., Vol. 24, p. 141, July 1937, Part II, Phil. Mag., Vol. 24, p. 825, Suppl., November 1937, "Ergebnisse einer Theorie uber die Fortpflanzung elektromagnetischer Wellen uber eine Kugel endlicher Leitfahigkeit," by Balth van der Pol and H. Bremmer, Hochfrequenztechnik und Elektroakustik, Band 51, Heft 6, June 1938, "Further Note on the Propagation of Radio Waves over a Finitely Conducting Spherical Earth," by Balth van der Pol and H. Bremmer, Phil. Mag., Vol. 27, p. 261, March 1939. In order to allow for the refraction of the radio waves in the lower atmosphere due to the variation of the dielectric constant of the air with height above the earth, a radius of the earth equal to 4/3 the actual radius was used in the computations for the effect of the earth's curvature in the manner suggested by C. R. Burrows, "Radio Propagation over Spherical Earth," Proc. I. R. E., May 1935; i. e., the distance corresponding to a given value of attenuation due to the curvature of the earth in the absence of air refraction was multiplied by the factor $(4/3)^{\frac{1}{2}} = 1.21$. The amount of this refraction varies from day to day and from season to season, depending on the air mass conditions in the lower atmosphere. If k denotes the ratio between the equivalent radius of the earth and the true radius, the following table gives the values of k for several typical air masses encountered in the United States.

Air mass type	k	
	Summer	Winter
Tropical Gulf—T	1.53	1.43
Polar Continental—P	1.31	1.25
Superior—S	1.25	1.25
Average	1.33	

It is clear from this table that the use of the average value of $k=4/3$ is justified in obtaining a single correction for the systematic effects of atmospheric refraction.

(d) Provided the value of the dielectric constant is near 15, the curves of Graphs 1–19A may be compared with experimental data to determine the appropriate values of the ground conductivity and of the inverse distance field intensity at 1 mile. This is accomplished simply by plotting the measured fields on transparent log-log graph paper similar to that used for Graphs 1–19A and superimposing this chart over the graph corresponding to the frequency involved. The log-log graph sheet is then shifted vertically until the best fit is obtained with one of the curves on the graph; the intersection of the inverse distance line on the chart determines the inverse distance field intensity at 1 mile. For other values of dielectric constant, the following procedure may be used for a determination of the dielectric constant of the ground, conductivity of the ground and the inverse distance field intensity at 1 mile. Graph 20 gives the relative values of groundwave field intensity over a plane earth as a function of the numerical distance p and phase angle b. On graph paper with coordinates similar to those of Graph 20, plot the measured values of field intensity as ordinates versus the corresponding distances from the antenna expressed in miles as abscissae. The data should be plotted only for distances greater than one wavelength (or, when this is greater, five times the vertical height of the antenna in the case of a single element, i. e., nondirectional antenna or 10 times the spacing between the elements of a directional antenna) and for distances less than $50/f_{mc}^{\frac{1}{3}}$ miles (i. e., 50 miles at 1 mc). Then, using a light box, place the sheet with the data plotted on it over the sheet with the curves of Graph 20 and shift the data sheet vertically and horizontally (making sure that the vertical lines on both sheets are parallel) until the best fit with the data is obtained with one of the curves on Graph 20. When the two sheets are properly lined up, the value of the field intensity corresponding to the intersection of the inverse distance line of Graph 20 with the 1 mile abscissa on the data sheet is the inverse distance field intensity at 1 mile, and the values of the numerical distance at 1 mile, p_1, and of b are also determined. Knowing the values of b and p_1 (the numerical distance at 1 mile), we may substitute in the following approximate formulas to determine the appropriate values of the ground conductivity and dielectric constant.

$$x \cong \frac{\pi}{p_1} \cdot (R/\lambda)_1 \cos b \qquad (1)$$

$(R/\lambda)_1$ = Number of wavelengths in 1 mile.

$$\sigma_{\text{e. m. u.}} = \frac{x f_{mc}}{17.9731} \cdot 10^{-14} \qquad (2)$$

$\sigma_{\text{e. m. u.}}$ = Conductivity of the ground expressed in electromagnetic units

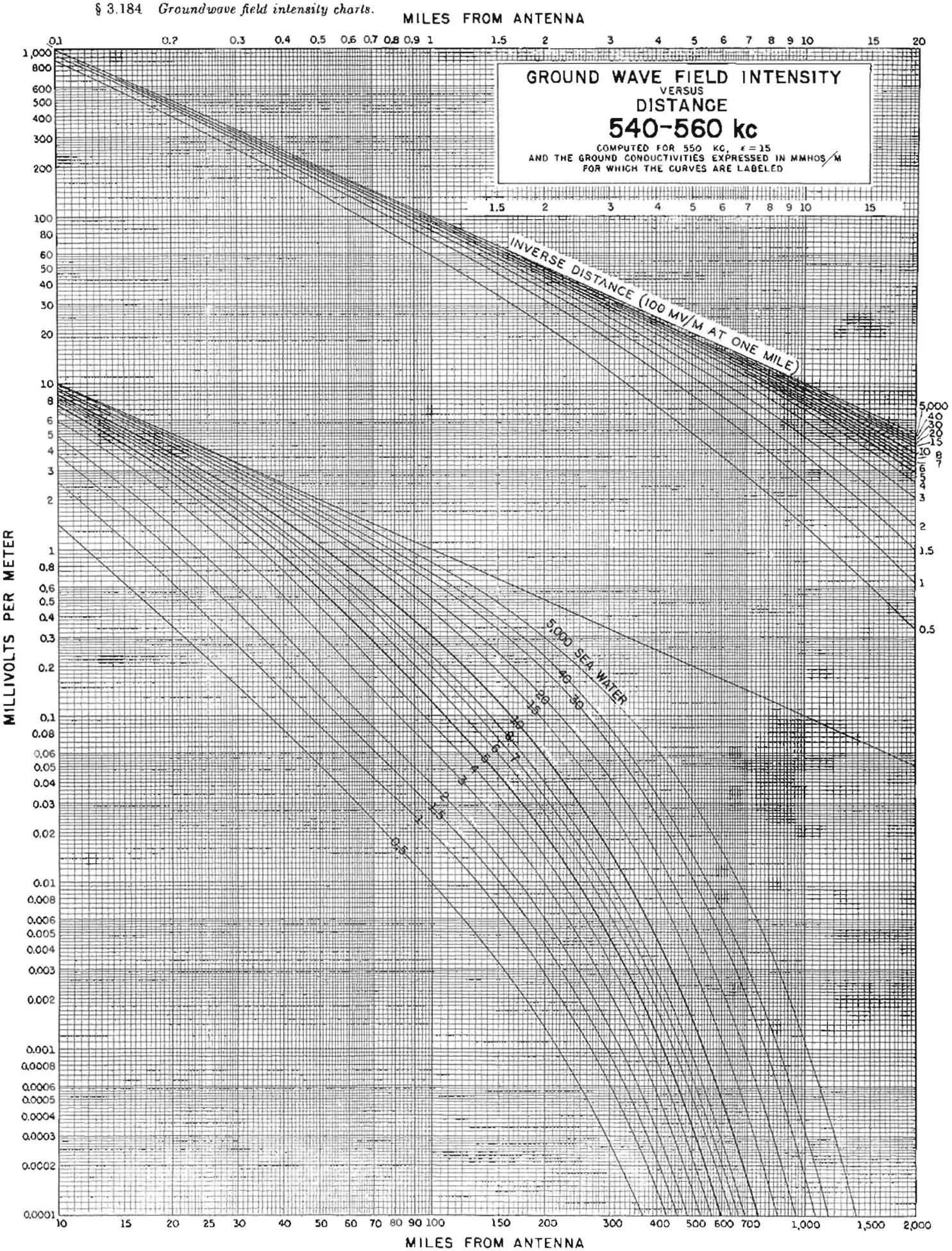
f_{mc} = Frequency expressed in megacycles

$$\epsilon \cong x \tan b - 1 \qquad (3)$$

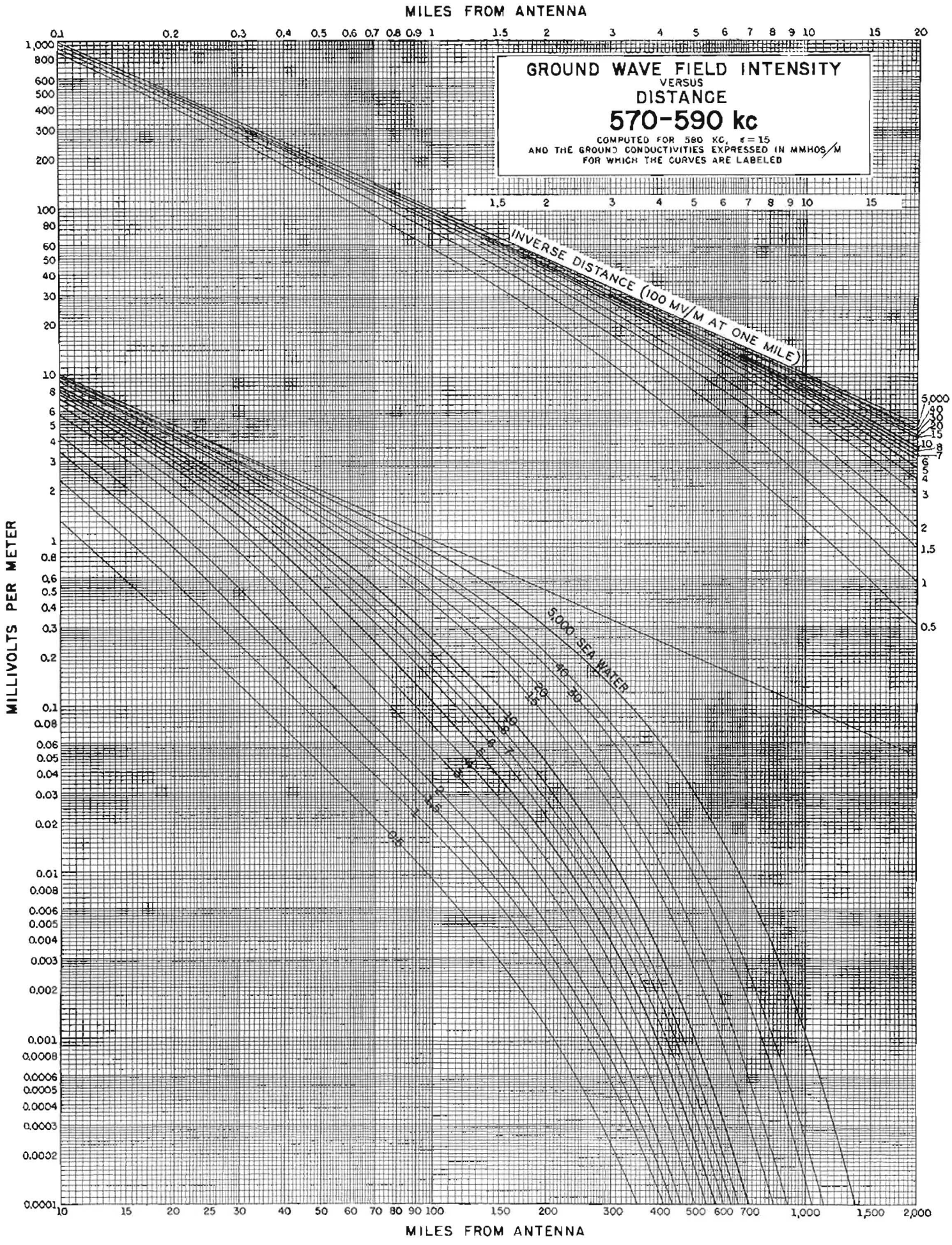
ϵ = Dielectric constant of the ground referred to air as unity

First solve for x by substituting the known values of p_1, $(R/\lambda)_1$, and cos b in equation (1). Equation (2) may then be solved for σ and equation (3) for ϵ. At distances greater than $50/f_{mc}^{\frac{1}{3}}$ miles the curves of Graph 20 do not give the correct relative values of field intensity since the curvature of the earth weakens the field more rapidly than these plane earth curves would indicate. Thus, no attempt should be made to fit experimental data to these curves at the larger distances.

(e) At sufficiently short distances (say less than 35 miles at broadcast frequencies), such that the curvature of the earth does not introduce an additional attenuation of the waves, the curves of Graph 20 may be used for determining the ground wave field intensity for transmitting and receiving antennas at the surface of the earth for any radiated power, frequency, or set of ground constants in the following manner: First, lay off the straight inverse distance line corresponding to the power radiated on transparent log-log graph paper similar to that of Graph 20, labelling the ordinates of the chart in terms of field intensity, and the abscissae in terms of distance. Next, by means of the formulas given on Graph 20, calculate the value of the numerical distance, p, at 1 mile, and the value of b. Then superimpose the log-log chart over Graph 20, shifting it vertically until the inverse distance lines on both charts coincide and shifting it horizontally until the numerical distance at 1 mile on Graph 20 coincides with 1 mile on the log-log graph paper. The curve of Graph 20 corresponding to the calculated value of b is then traced on the log-log graph paper giving the field intensity versus distance in miles.

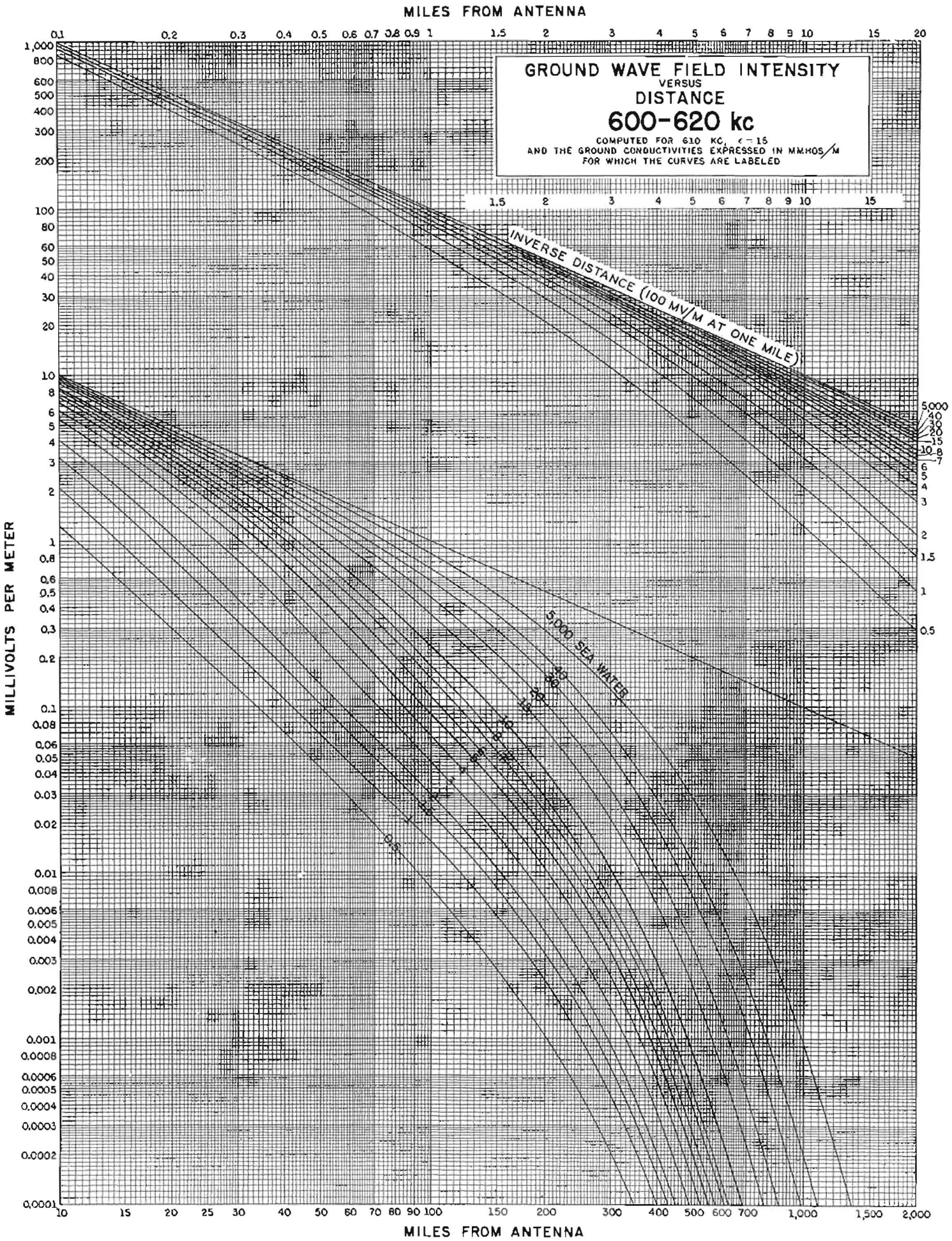

MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
540-560 kc
COMPUTED FOR 550 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
40
30
20
15
10
8
7
6
5
4
3
2
1.5
1
0.5
MILLIVOLTS PER METER
MILES FROM ANTENNA

GRAPH 1

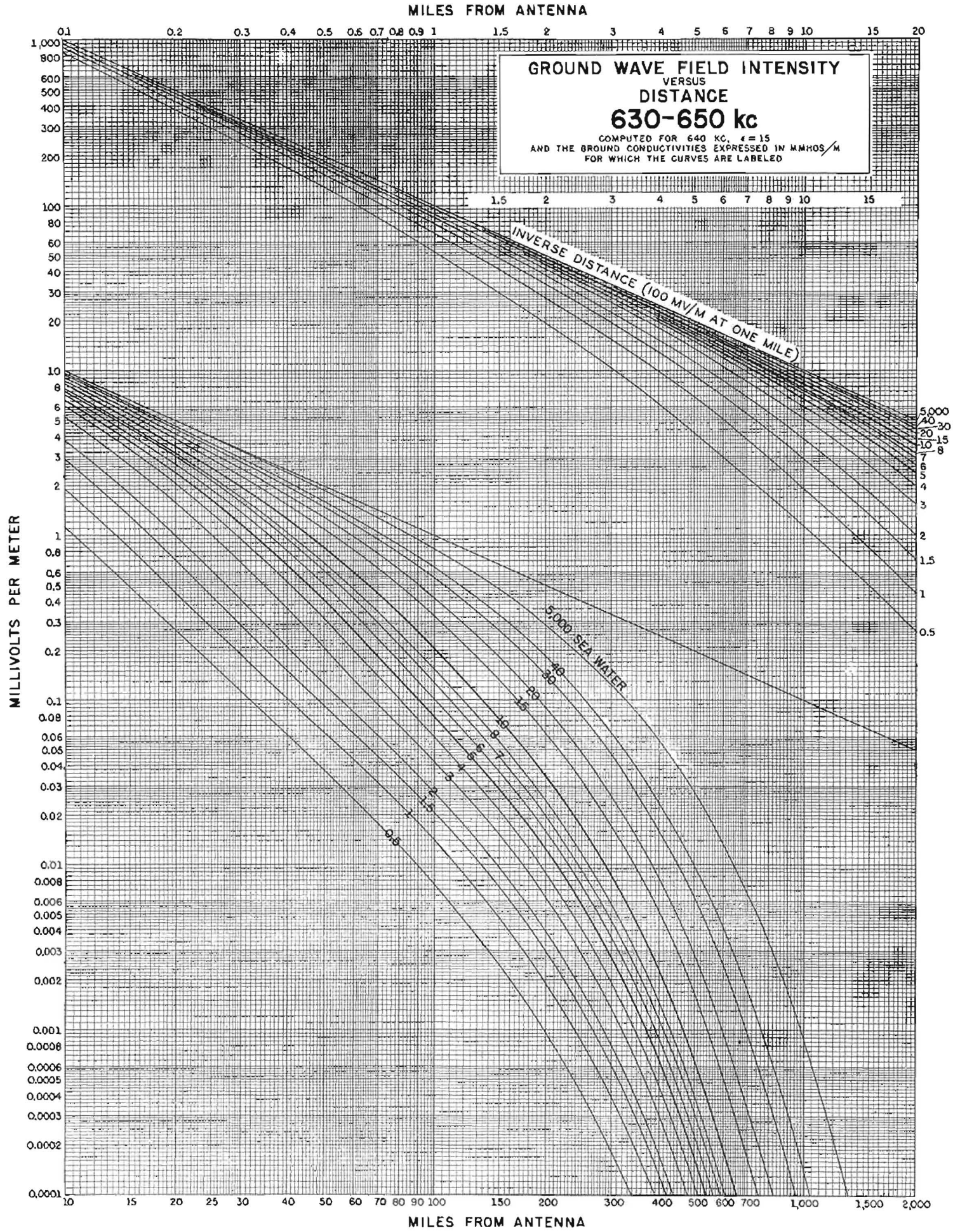


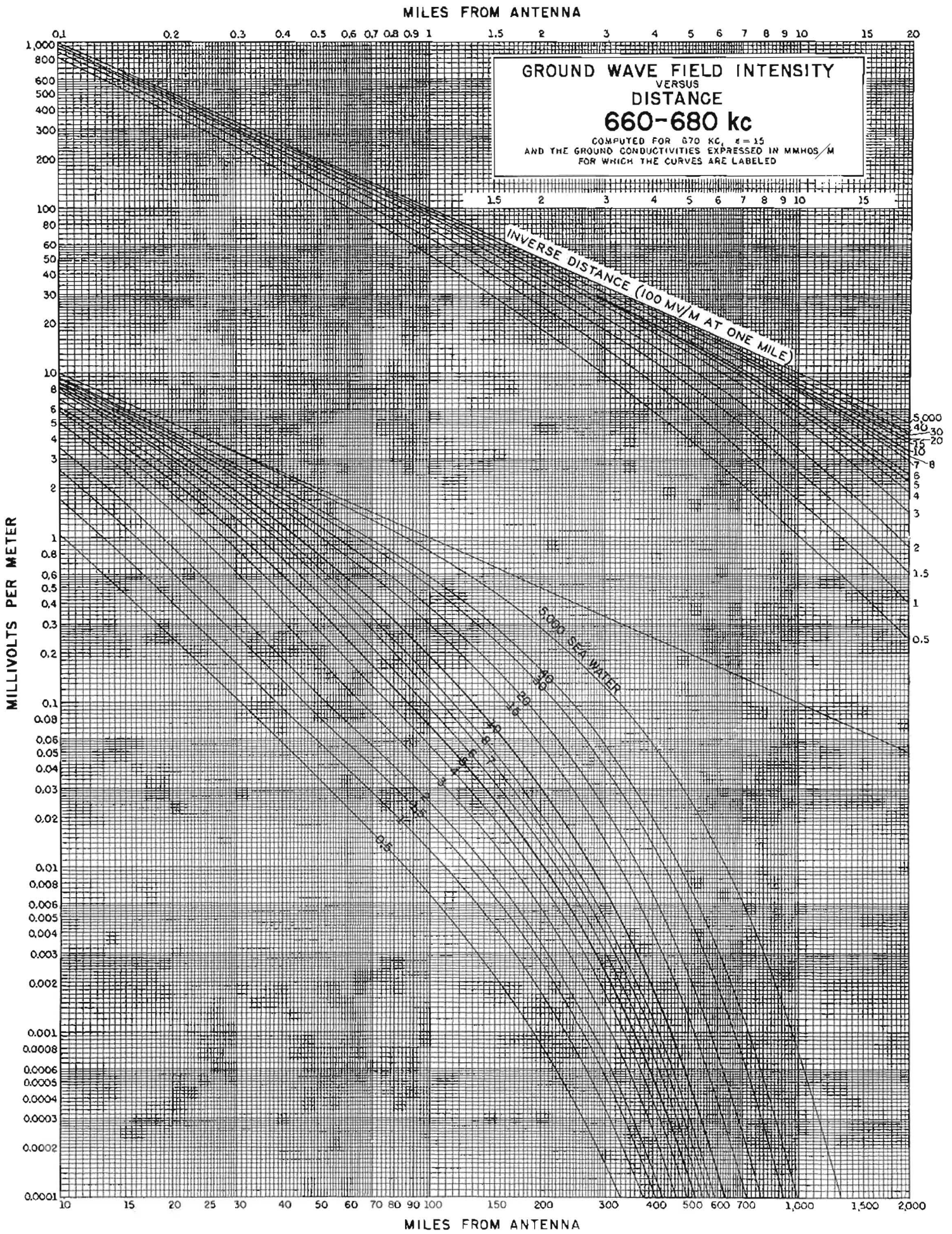
GRAPH 2

369781 O—56 (Face p. 28) No. 2


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
600-620 kc
COMPUTED FOR 610 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

GRAPH 3

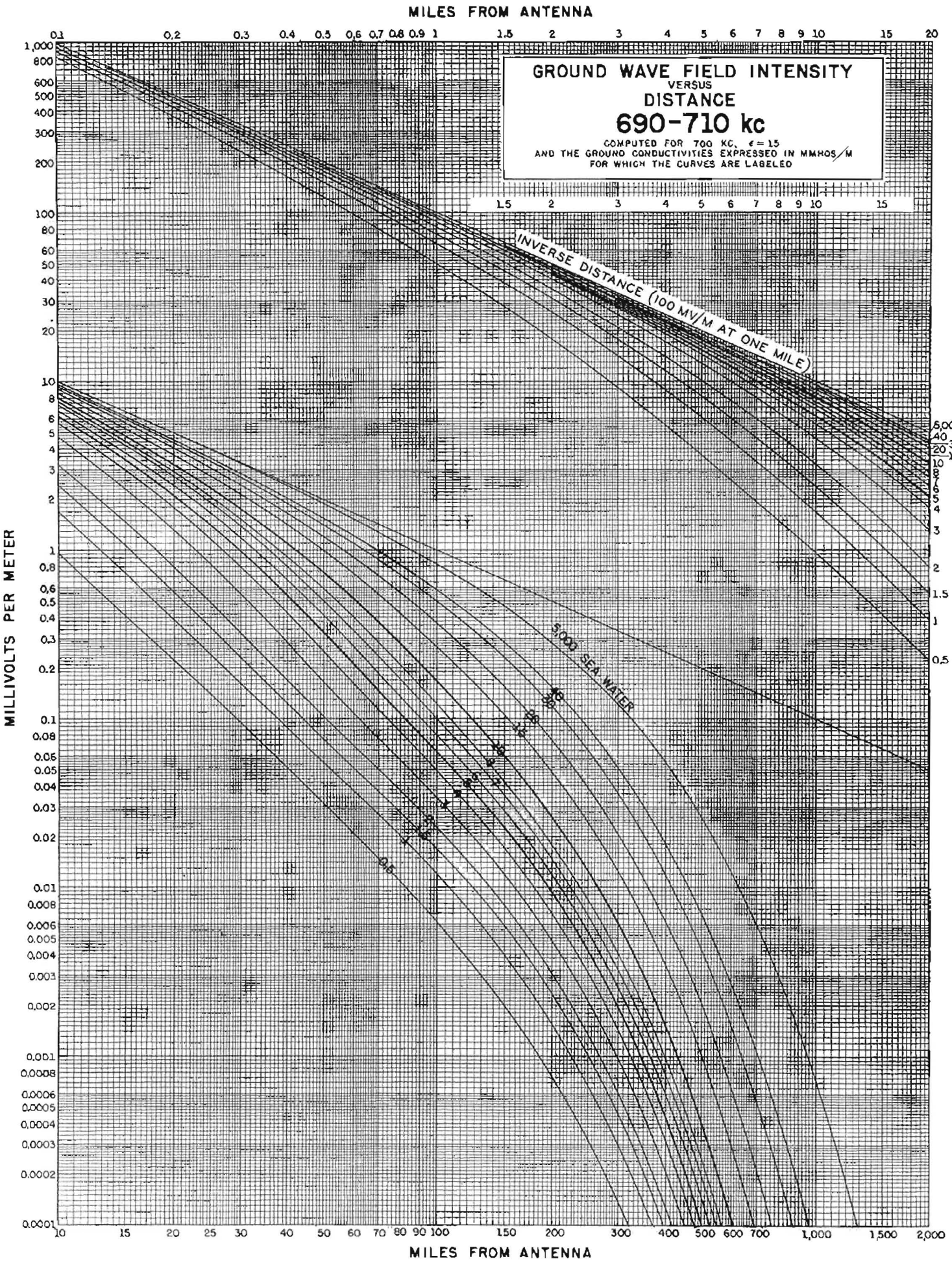

MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
630-650 kc
COMPUTED FOR 640 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
40
30
20
15
10
8
7
6
5
4
3
2
1.5
1
0.5
MILLIVOLTS PER METER
MILES FROM ANTENNA



369781 O- 56 (Face p. 28) No. 5

GRAPH 5

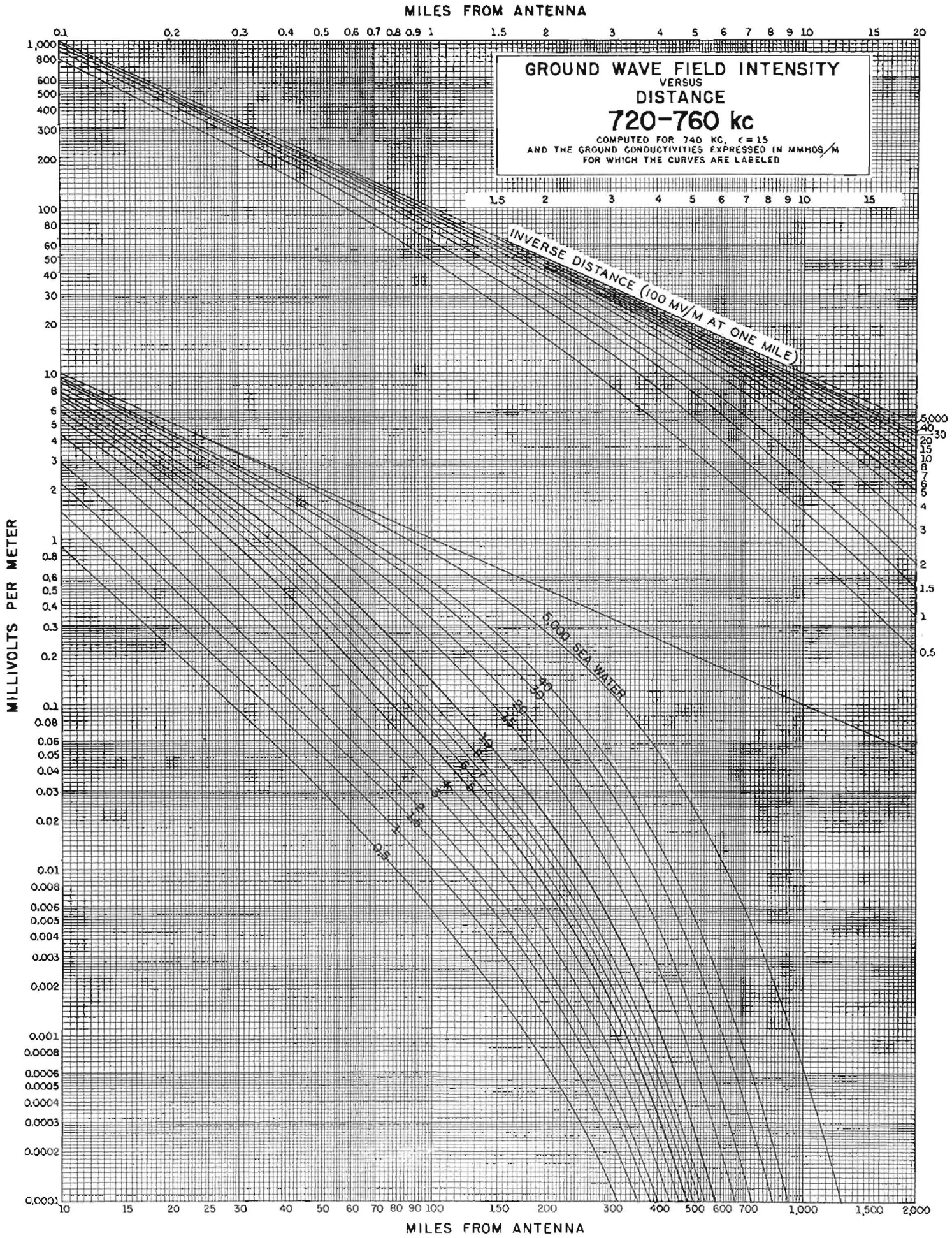
FCC-1954



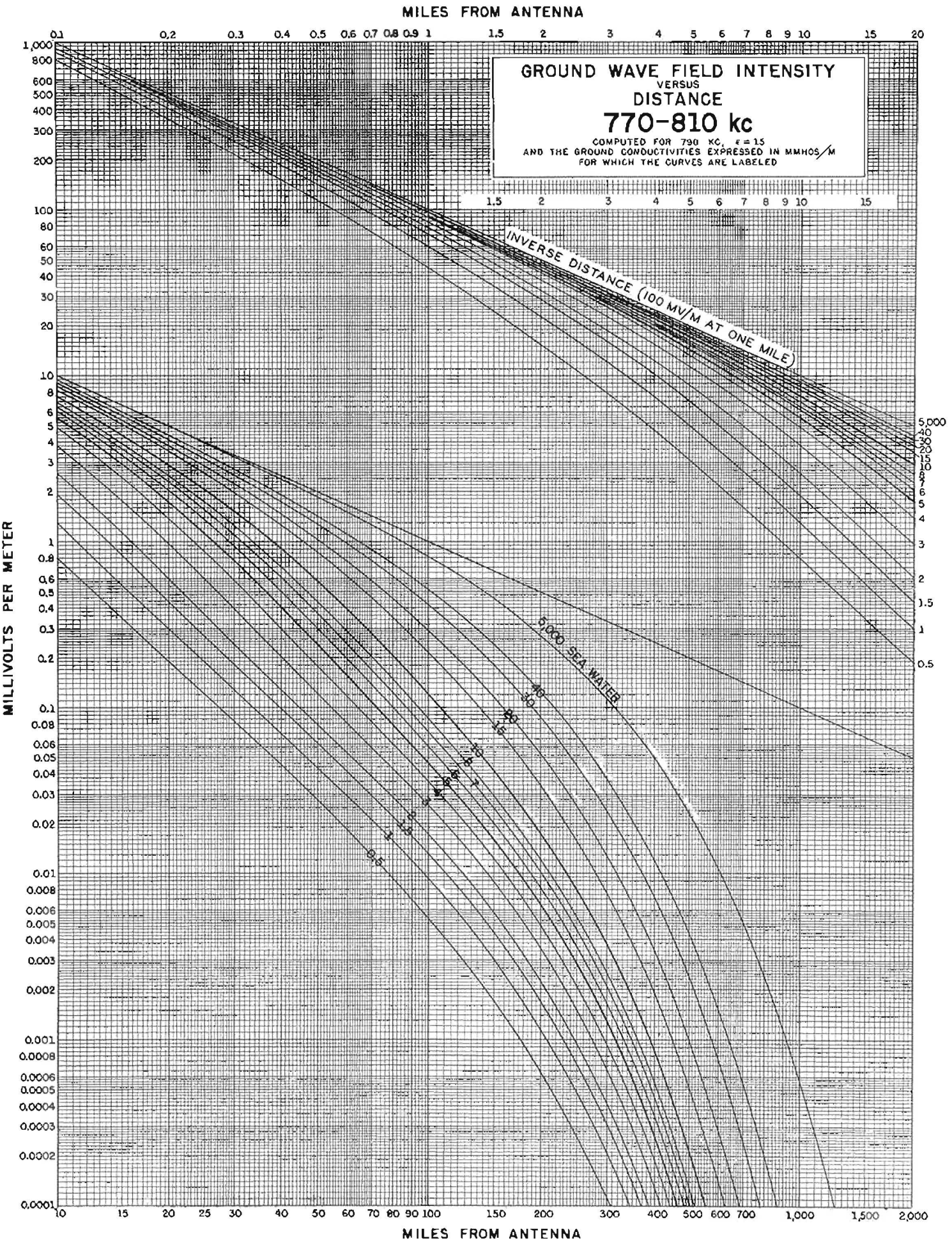
GRAPH 6

869781 O—56 (Face p. 28) No. 6

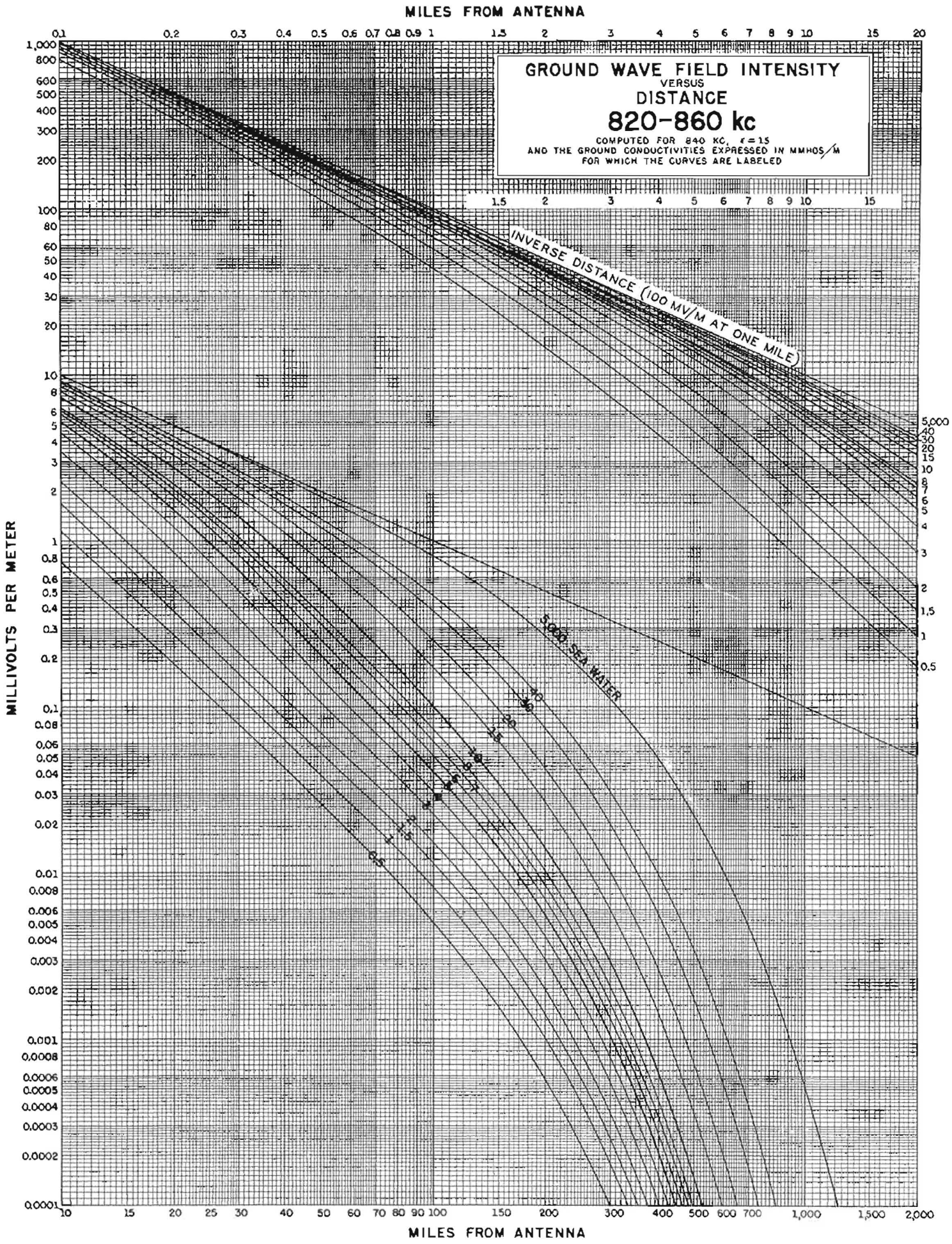
FCC-1954


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
720-760 kc
COMPUTED FOR 740 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

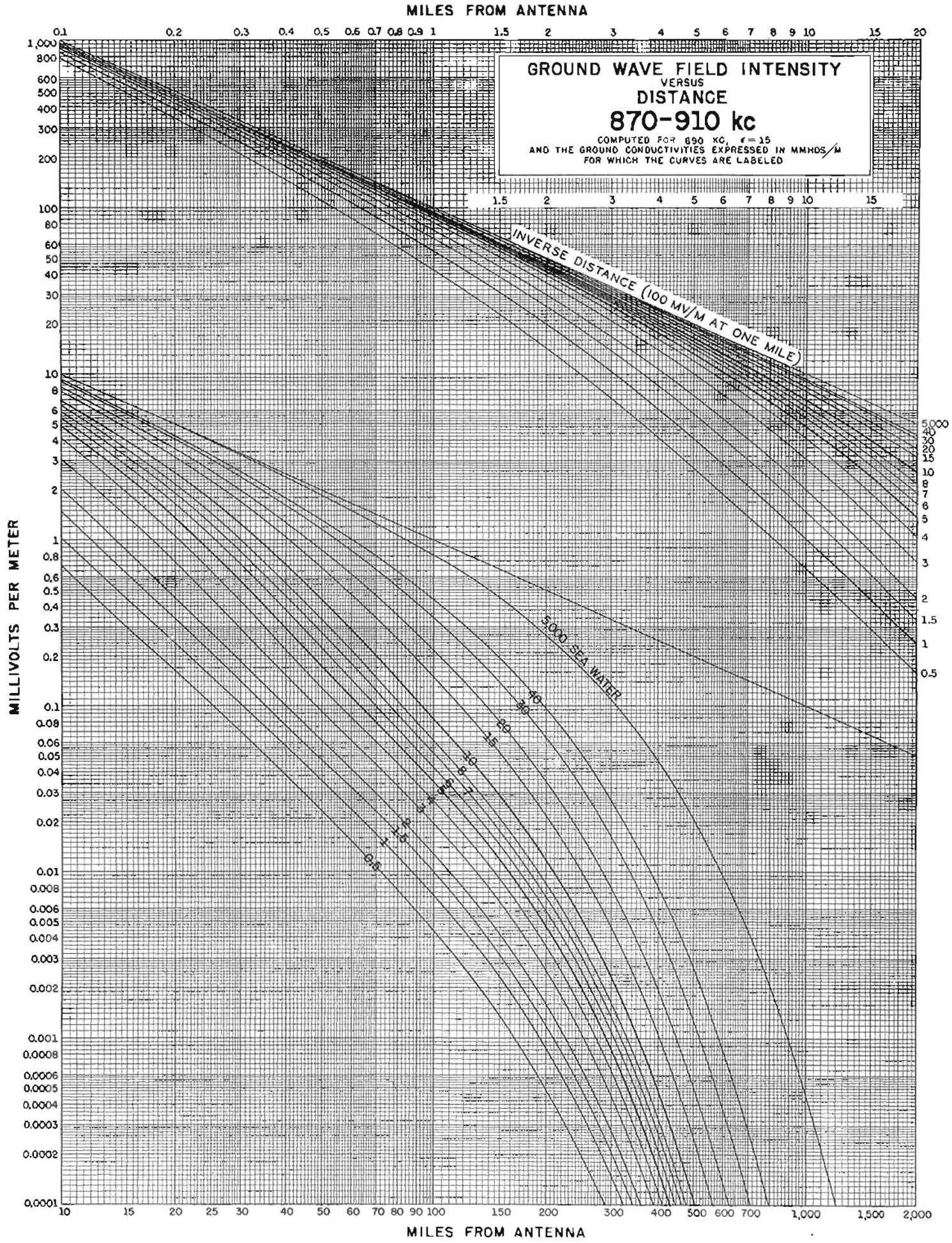
GRAPH 7


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
770-810 kc
COMPUTED FOR 790 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

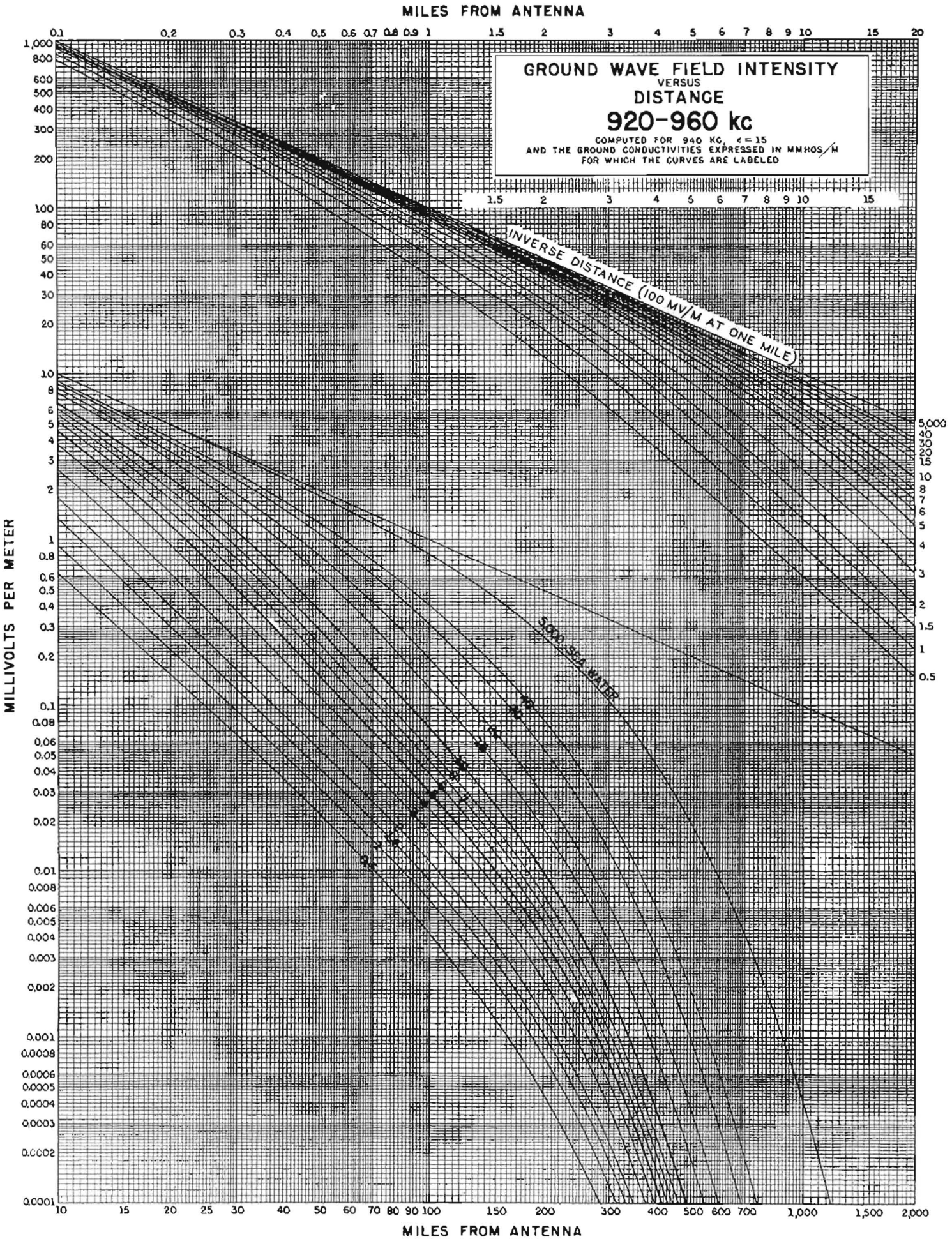
GRAPH 8


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
820–860 kc
COMPUTED FOR 840 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
40
30
20
15
10
8
7
6
5
4
3
2
1.5
1
0.5
0.25
MILLIVOLTS PER METER
MILES FROM ANTENNA

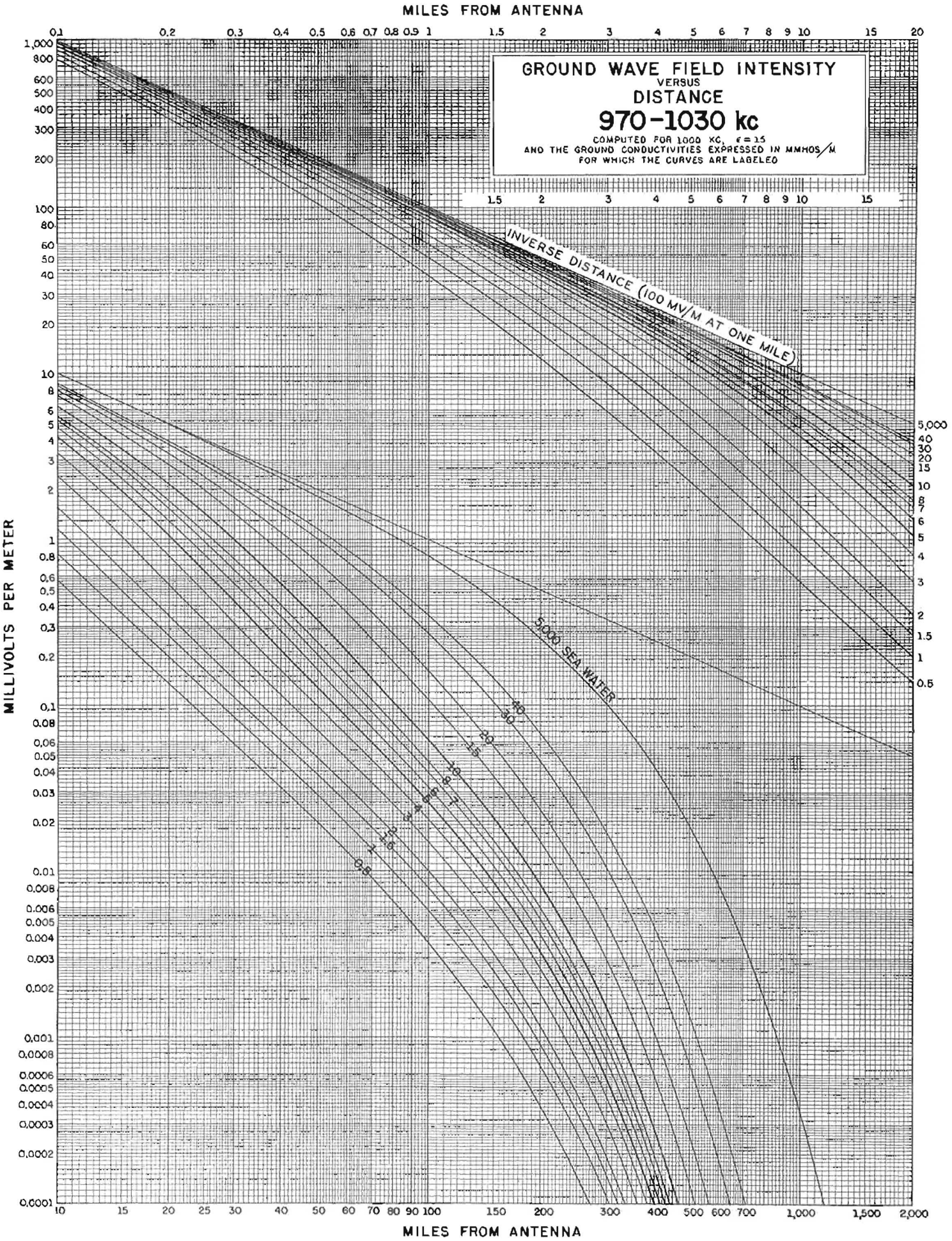
GRAPH 9


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
870-910 kc
COMPUTED FOR 890 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
40
30
20
15
10
8
7
6
5
4
3
2
1.5
1
0.5
MILLIVOLTS PER METER
MILES FROM ANTENNA

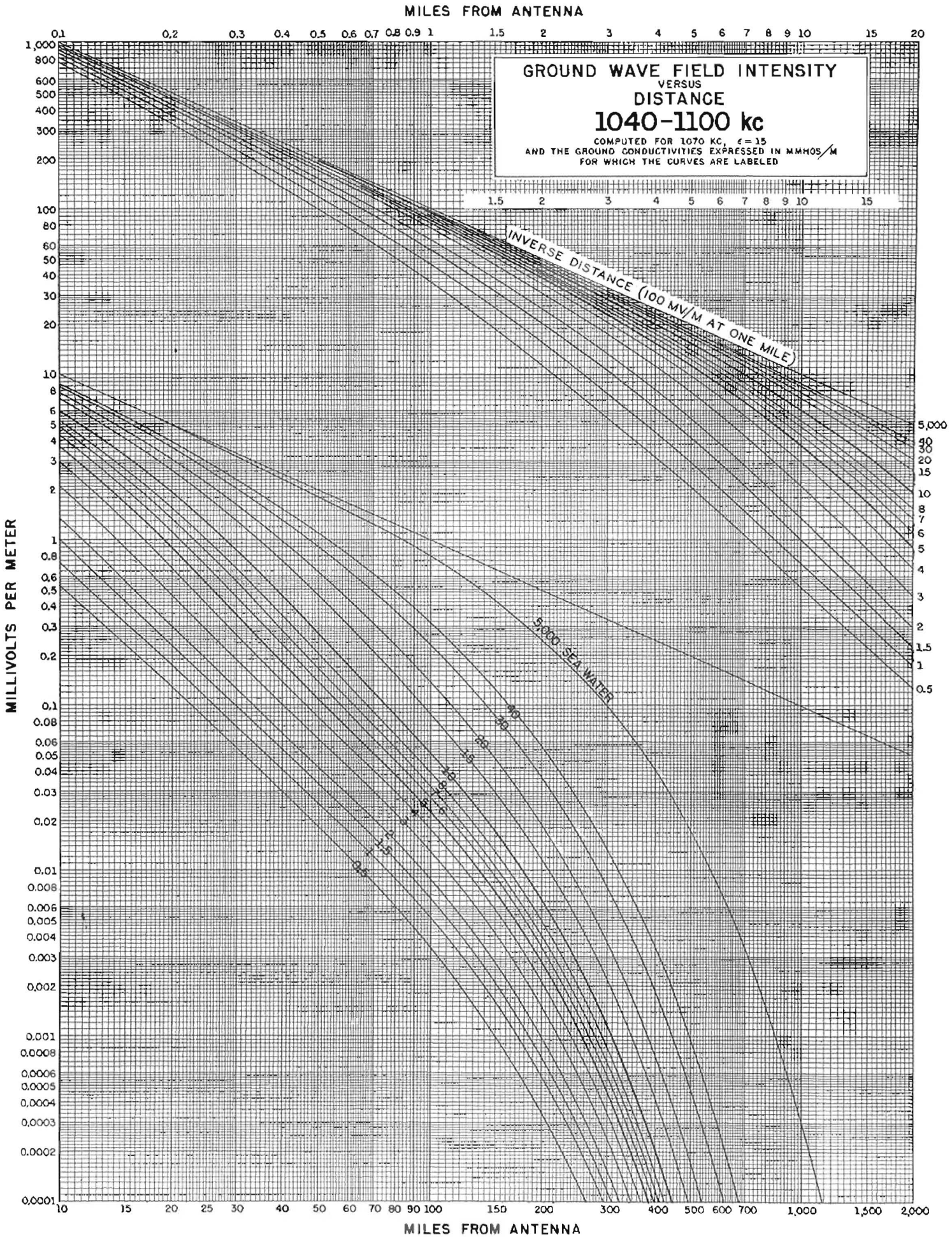
GRAPH 10


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
920-960 kc
COMPUTED FOR 940 KC, ϵ = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

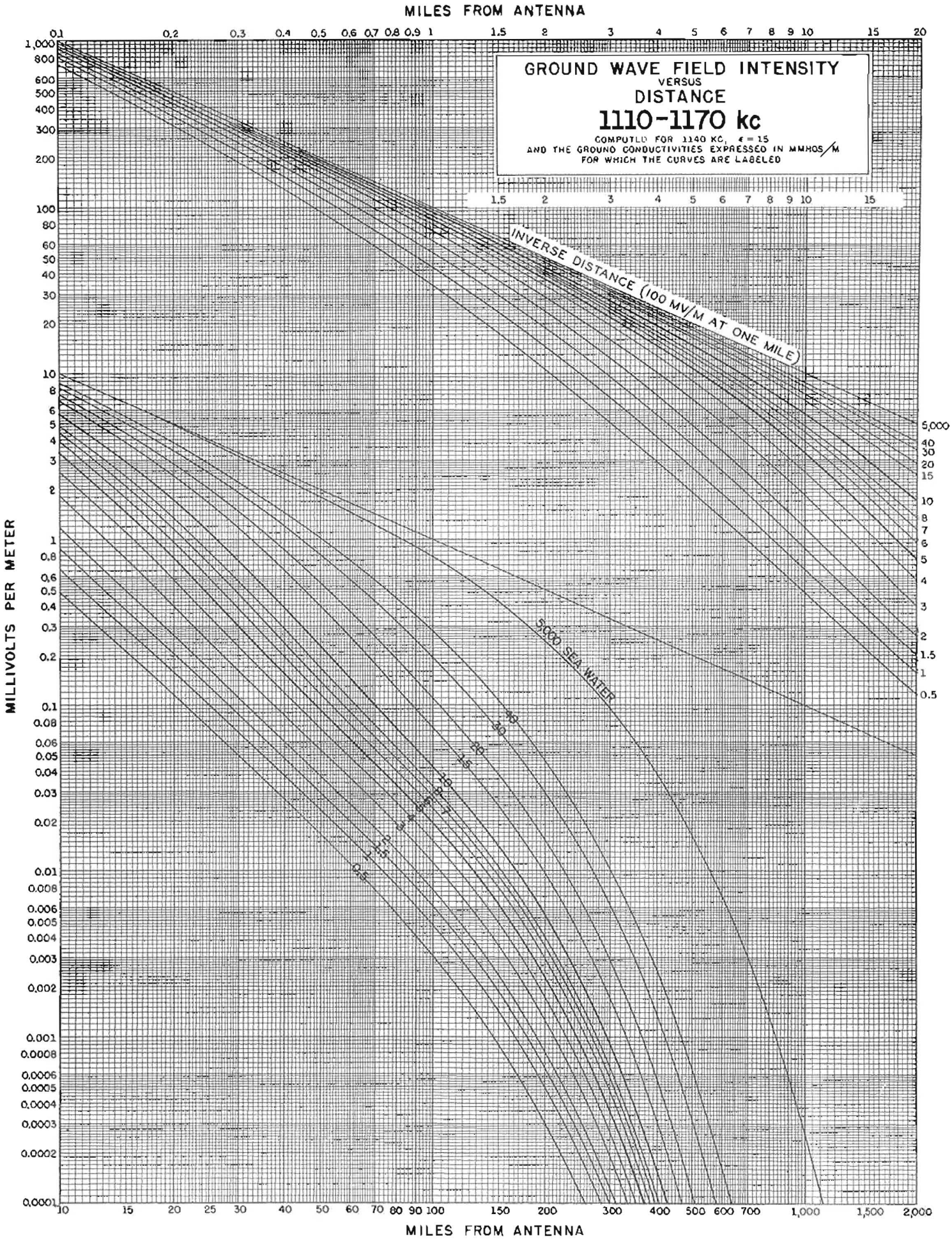
GRAPH 11


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
970-1030 kc
COMPUTED FOR 1000 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5000 SEA WATER
40
30
20
15
10
7
5
4
3
2
1.6
1
0.5
MILLIVOLTS PER METER
MILES FROM ANTENNA

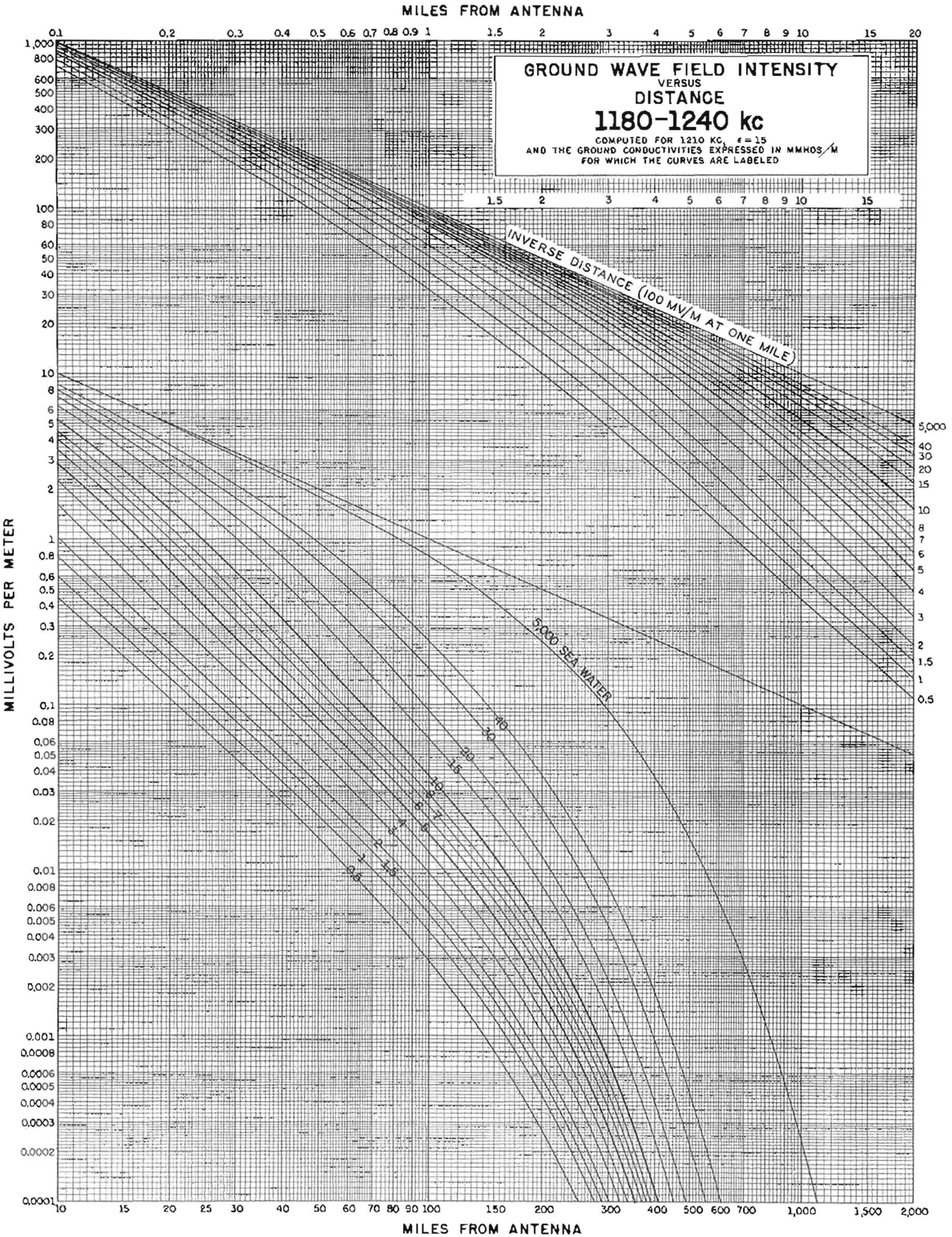
GRAPH 12


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1040-1100 kc
COMPUTED FOR 1070 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
40
30
20
15
10
5
3
2
1.5
1
0.5
MILLIVOLTS PER METER
MILES FROM ANTENNA

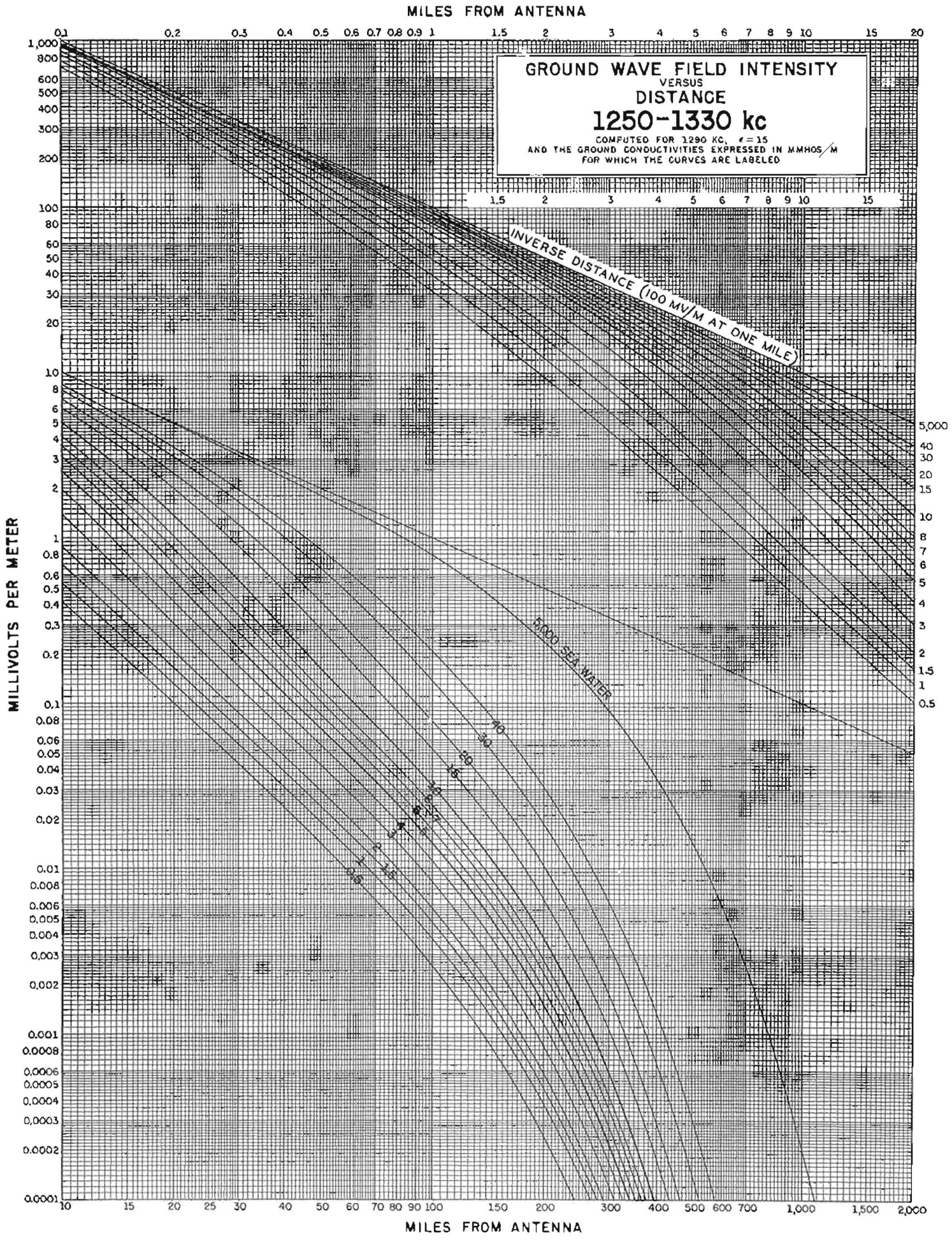
GRAPH 13


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1110-1170 kc
COMPUTED FOR 1140 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

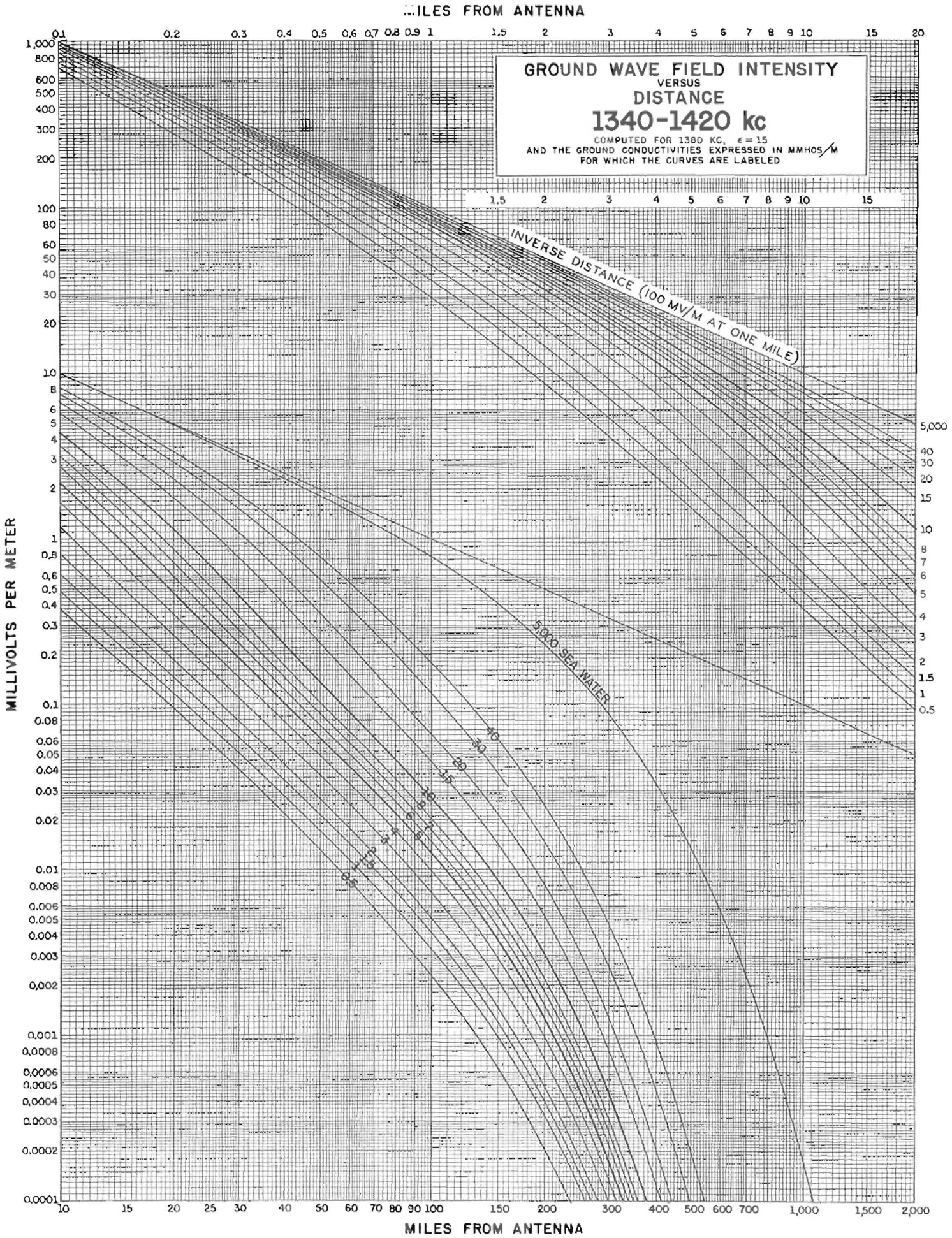
GRAPH 14


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1180–1240 kc
COMPUTED FOR 1210 KC, ϵ = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
40
30
20
15
10
6
4
2
1
0.5
0.25
MILLIVOLTS PER METER
MILES FROM ANTENNA

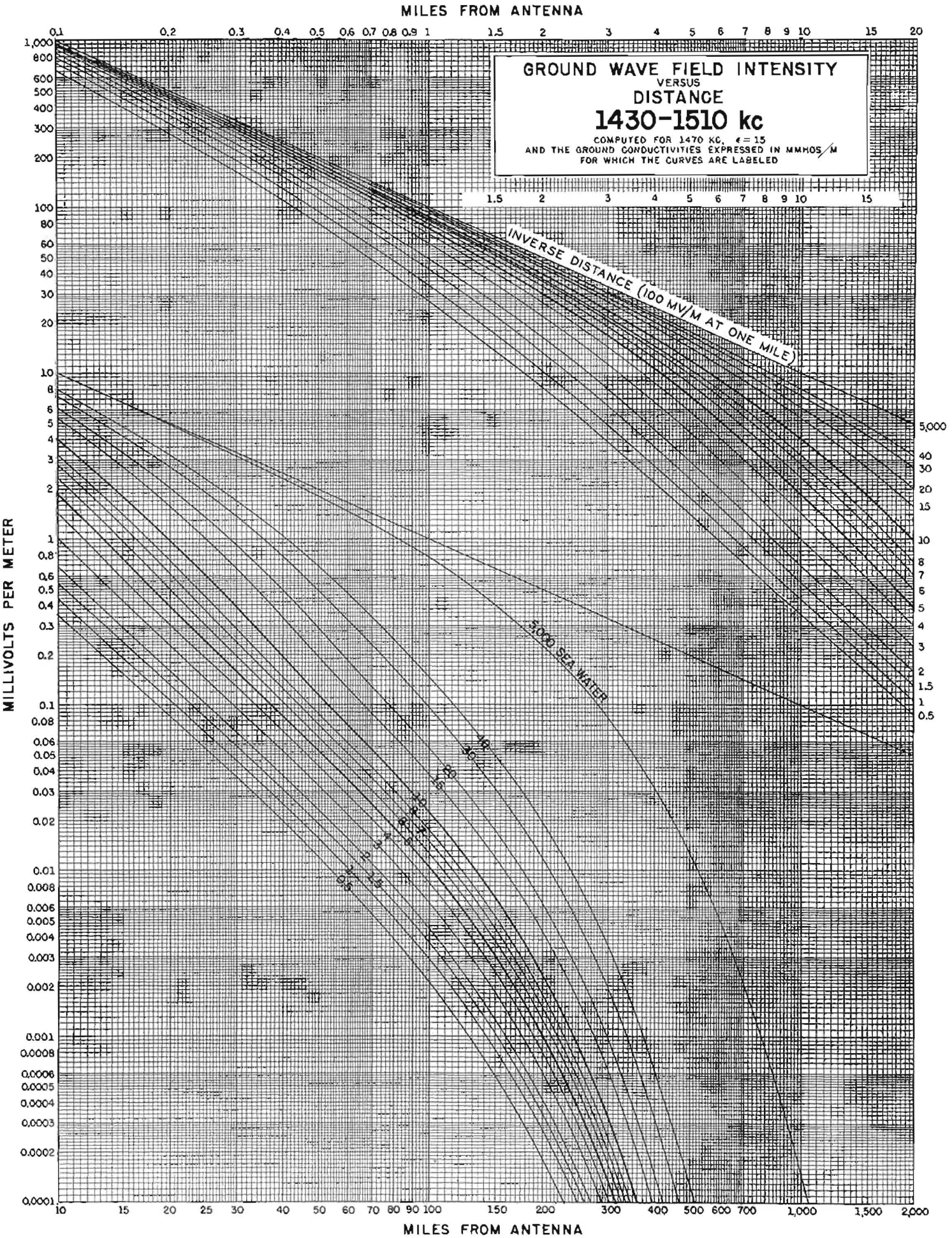
GRAPH 15


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1250-1330 kc
COMPUTED FOR 1290 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

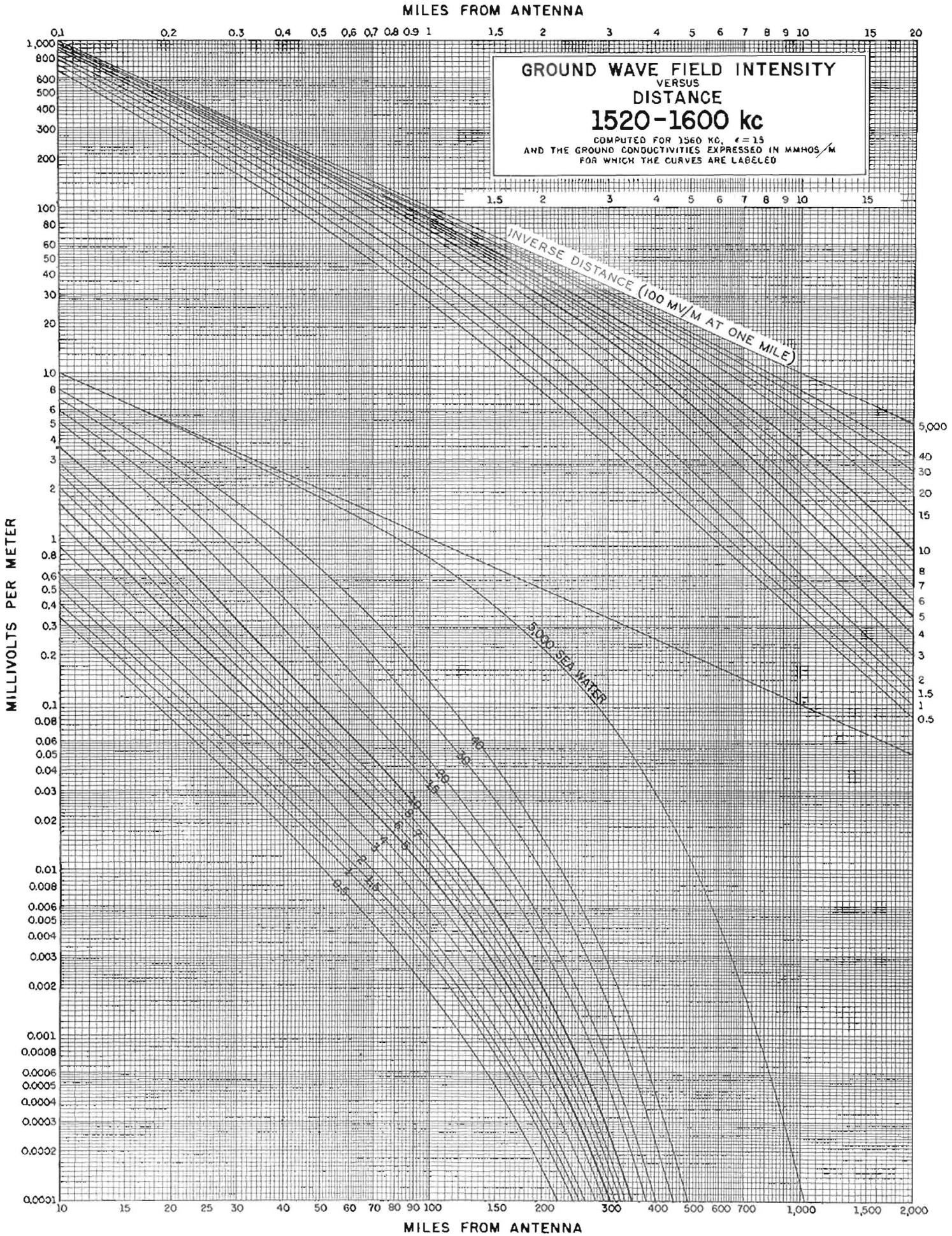
GRAPH 16


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1340-1420 kc
COMPUTED FOR 1380 KC, ϵ = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 SEA WATER
40
30
20
15
10
8
6
5
4
3
2
1.5
1
0.5
MILLIVOLTS PER METER
MILES FROM ANTENNA

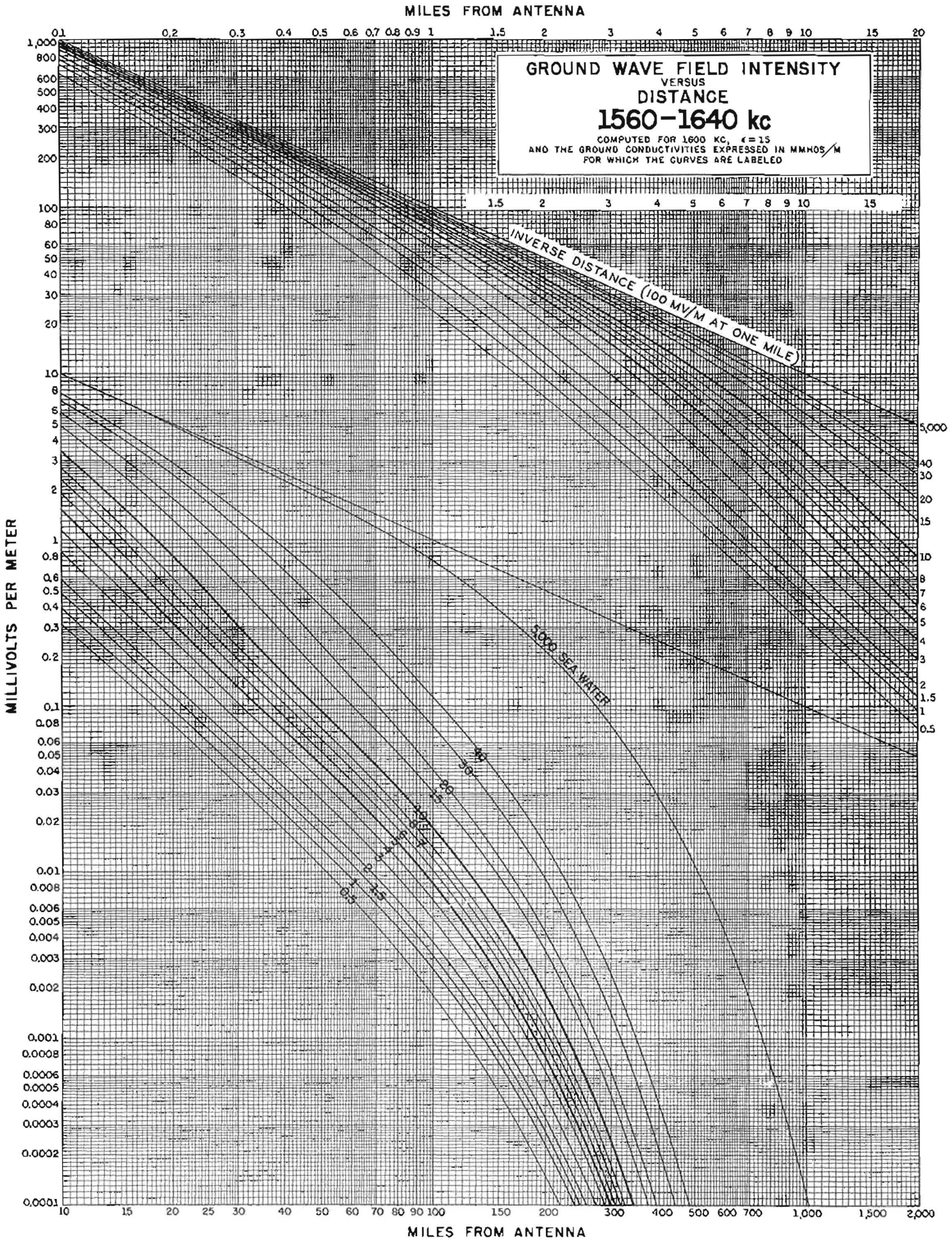
GRAPH 17


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1430-1510 kc
COMPUTED FOR 1470 KC, ϵ = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

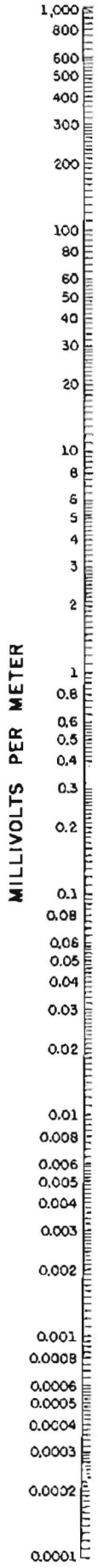
GRAPH 18


MILES FROM ANTENNA
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.5 2 3 4 5 6 7 8 9 10 15 20
1,000 800 600 500 400 300 200 100 80 60 50 40 30 20 10 8 6 5 4 3 2 1 0.8 0.6 0.5 0.4 0.3 0.2 0.1 0.08 0.06 0.05 0.04 0.03 0.02 0.01 0.008 0.006 0.005 0.004 0.003 0.002 0.001 0.0008 0.0006 0.0005 0.0004 0.0003 0.0002 0.0001
MILLIVOLTS PER METER
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1520-1600 kc
COMPUTED FOR 1560 KC, ϵ = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
1.5 2 3 4 5 6 7 8 9 10 15
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5,000 40 30 20 15 10 8 7 6 5 4 3 2 1.5 1 0.5
5,000 SEA WATER
40
30
20
15
10
5
3
2
1
0.5
10 15 20 25 30 40 50 60 70 80 90 100 150 200 300 400 500 600 700 1,000 1,500 2,000
MILES FROM ANTENNA

GRAPH 19


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
VERSUS
DISTANCE
1560–1640 kc
COMPUTED FOR 1600 KC, ε = 15
AND THE GROUND CONDUCTIVITIES EXPRESSED IN MMHOS/M
FOR WHICH THE CURVES ARE LABELED
INVERSE DISTANCE (100 MV/M AT ONE MILE)
5000 SEA WATER
MILLIVOLTS PER METER
MILES FROM ANTENNA

GRAPH 19-A



(SLIDER FOR USE WITH GRAPHS 1–19A AND 20)

GROUND WAVE FIELD INTENSITY VERSUS NUMERICAL DISTANCE OVER A PLANE EARTH

$$p = \frac{\pi}{x}\frac{R}{\lambda}\frac{\cos^2 b''}{\cos b'} \cong \frac{\pi}{x}\frac{R}{\lambda}\cos b$$
$$b = 2b'' - b' \cong \tan^{-1}\frac{\epsilon+1}{x}$$
} Vertical Polarization.

$$p = \pi\frac{R}{\lambda}\frac{x}{\cos b'}$$
$$b = 180° - b'$$
} Horizontal Polarization.

$$x = \frac{1.79731\cdot 10^{15}\,\sigma \text{ e.m.u.}}{f m c}$$

$\frac{R}{\lambda}$ = distance expressed in wavelengths.

σ = ground conductivity expressed in mmhos/m.

f = frequency expressed in megacycles.

ϵ = dielectric constant of the ground referred to air as unity.

$$\tan b'' = \frac{\epsilon}{x}$$
$$\tan b' = \frac{\epsilon - 1}{x}$$

INVERSE DISTANCE ($1/p$)

$b = 0°$, 15°, 30°, 45°, 60°, 75°, 90°, 180°

RELATIVE FIELD INTENSITY $\frac{f(p)}{p}$

100, 50, 20, 10, 5, 2, 1, 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0.005, 0.002, 0.001, 0.0005, 0.0002, 0.0001, 0.00005, 0.00002, 0.00001

0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200

p

NUMERICAL DISTANCE

GRAPH 20

§ 3.185 *Computation of interfering signal from a directional antenna.* (a) In case of an antenna directional in the horizontal plane, the groundwave interference can be readily computed from the calculated horizontal pattern by determining the vectors toward the service area of the station to be protected and apply these values to the groundwave curves set out in § 3.183.

(b) For signals from stations operating on clear channels, in case of determining skywave interference from an antenna with a vertical pattern different from that on which Figure 1 of § 3.190 is predicated (the basis of the night mileage separation tables), it is necessary to compare the appropriate vectors in the vertical plane.

(c) The skywave curves entitled "Average Skywave Field Intensity" (corresponding to the second hour after sunset at the recording station) as shown in Figure 1 of § 3.190 are based on antenna systems having height of 0.311 wave length (112°) and producing a vertical pattern as shown in Figure 5 of § 3.190. A nondirectional antenna system, as well as a directional antenna system having vertical patterns other than essentially the same as shown, must be converted to the pattern of a 0.311 wave length antenna having the same field intensity at the critical angle as does the pattern of the antenna involved.

(d) Example of the use of skywave curves:

Figure 6 of § 3.190 is a graph entitled "Variation With Distance of Two Important Parameters in the Theory of Sky Wave Propagation." The curve for θ showing the angle above the horizon at which radiation occurs plotted against distance, must be used for this purpose. For instance, assuming the station with which interference may be expected is located at a distance of 450 miles from a proposed station, the critical angle of radiation as determined from this curve is approximately 15°. Therefore, if the vertical pattern of the proposed station in the direction of the other station is such that at 15° above the horizon the radiation is 1.3 times that from an antenna having a vertical pattern as shown in Figure 5 of § 3.190 and producing the same field intensity at 1 mile in the horizontal plane, the interfering signal would be 1.3 times that determined from Figure 1 of § 3.190 for an antenna having the same field intensity in the horizontal plane. That is, if the field intensity in the horizontal plane of the proposed station is 124 mv/m the interfering field intensity exceeded 10 percent of the time at the other station would be

$$140 \times 1.30 \times \frac{124}{100} \text{ or } 225 \text{ uv/m}$$

and would cause interference to the 4.5 mv/m ground wave contour of the existing station.

(e) For signals from stations on regional and local channels, in computing the 10% skywave (interference) field intensity values of Class III and Class IV stations, Fig. 2 of § 3.190 is to be used in place of Figure 1 of § 3.190. (Certain simplifying assumptions may be made in the case of Class IV stations on local channels: See note to § 3.182 (a) (4).) Since Figure 2 of § 3.190 is predicated upon a radiated field of 100 mv/m at one mile in the pertinent direction, no comparison with the vertical pattern of a 0.311 wavelength antenna is to be made. Instead the appropriate radiated field in the vertical plane corresponding to the distance to the receiving station, divided by 100, is multiplied into the value of 10% skywave field intensity determined from Figure 2 of § 3.190. There are two new factors to be considered, however, namely the variation of received field with latitude of the path and the variation of pertinent vertical angle due to variations of ionosphere height and ionosphere scattering.

(f) Figure 2 of § 3.190, "10% Skywave Signal Range Chart," shows the 10% skywave signal as a function of the latitude of the transmission path and the distance from a transmitting antenna with a radiated field of 100 mv/m at the pertinent angle for the distance. The latitude of the transmission path is defined as the geographic latitude of the midpoint between the transmitter and the receiver. Latitude 35° should be used in case the midpoint of the path lies below 35° North and latitude 50° should be used in case the midpoint of the path lies above 50° North.

(g) Figure 6–A of § 3.190, entitled "Angles of Departure vs. Transmission Range," is to be used in determining the angles in the vertical pattern of the antenna of an interfering station to be considered as pertinent to transmission by one reflection. Corresponding to any

given distance, the curves 4 and 5 indicate the upper and lower angles within which the radiated field is to be considered. The maximum value of field intensity occurring between these angles will be used to determine the multiplying factor for the 10% skywave field intensity determined from Figure 2 of § 3.190. (Curves 2 and 3 are considered to represent the variation due to the variation of the effective height of the E-layer while Curves 4 and 5 extend the range of pertinent angles to include a factor which allows for scattering. The dotted lines are included for information only.)

(h) In the case of non-directional vertical antennas, the vertical distribution of relative fields for several heights, assuming sinusoidal distribution of current along the antenna, is shown in Figure 5 of § 3.190. In the case of directional antennas the vertical pattern in the great circle direction toward the point of reception in question must first be calculated. Then for the distance to the points, the upper and lower pertinent angles are determined from Figure 6-A of § 3.190. The ratio of the largest value of radiated field occurring between these angles, to 100 mv/m (for which Figure 2 of § 3.190 is drawn) is then used as the multiplying factor for the value of the field read from the curves of Figure 2 of § 3.190. Note that while the accuracy of the curves is not as well established by measurements for distances less than 250 miles as for distances in excess of 250 miles, the curves represent the most accurate data available today. Pending accumulation of additional data to establish firm standards for skywave calculations in this range, the curves may be used. In cases where the radiation in the vertical plane, in the pertinent azimuth, contains a large lobe at a higher angle than the pertinent angle for one reflection the method of calculating interference will not be restricted to that described above, but each such case will be considered on the basis of the best knowledge available.

(i) Example, suppose it is desired to determine the amount of interference to a Class III station at Portland, Oregon, caused by another Class III station at Los Angeles, California, which is radiating a signal of 560 mv/m unattenuated at one mile in the great circle direction of Portland, using a 0.5 wavelength antenna. The distance is 825 miles. From Figure 6-A of § 3.190 the upper and lower pertinent angles are 7° and 3.5° and, from Figure 5 of § 3.190 the maximum radiation within these angles is 99% of the horizontal radiation or 554 mv/m at 1 mile. The latitude of the path is 39.8° N and from Figure 2 of § 3.190, the 10% skywave field at 825 miles is 0.050 mv/m for 100 mv/m radiated. Multiplying by $\frac{554}{100}$ to adjust the value to the actual radiation gives 0.277 mv/m. At 20 to 1 ratio the limitation to the Portland station is to the 5.6 mv/m contour.

(j) When the distance is large, more than one reflection may be involved and due consideration must be given each appropriate vector in the vertical pattern, as well as the constants of the earth where reflection takes place between the transmitting station and the service area to which interference may be caused.

§ 3.186 *Field intensity measurements in allocation; establishment of effective field at one mile.* (a) Section 3.45 provides that certain minimum field intensities are acceptable in lieu of the required minimum physical vertical heights of the antennas proper. Also in other allocation problems, it is necessary to determine the effective field at 1 mile. The following requirements shall govern the taking and submission of data on the field intensity produced.

(1) Beginning as near to the antenna as possible without including the induction field and to provide for the fact that a broadcast antenna not being a point source of radiation (not less than one wave length or 5 times the vertical height in the case of a single element, i. e., nondirectional antenna or 10 times the spacing between the elements of a directional antenna), measurements shall be made on eight or more radials, at intervals of approximately one-tenth mile up to 2 miles from the antenna, at intervals of approximately one-half mile from 2 miles to 6 miles from the antenna, at intervals of approximately 2 miles from 6 miles to 15 or 20 miles from the antenna, and a few additional measurements if needed at greater distances from the antenna. Where the antenna is rurally located and unobstructed measurements can be made, there shall be as many as 18 or 20 measurements on each radial. However, where the antenna is located in a city where unobstructed measurements are difficult to make, measurements shall be made on each radial at as many unobstructed locations as possible, even though the intervals are considerably less than stated above, particularly within 2 miles of the antenna. In cases where it is not possible to obtain accurate measurements at the closer distances (even out to 5 or 6 miles due to the character of the intervening terrain), the measurements at greater distances should be made at closer intervals. (It is suggested that "wave tilt" measurements may be made to determine and compare locations for taking field intensity measurements, particularly to determine that there are no abrupt changes in ground conductivity or that reflected waves are not causing abnormal intensities.)

(2) The data required by subparagraph (1) of this paragraph should be plotted for each radial in accordance with either of the two methods set forth below:

(i) Using log-log coordinate paper, plot field intensities as ordinate and distance as abscissa.

(ii) Using semi-log coordinate paper, plot field intensity times distance as ordinate on the log scale and distance as abscissa on the linear scale.

(3) However, regardless of which of the methods in subparagraph (2) of this paragraph is employed, the proper curve to be drawn through the points plotted shall be determined by comparison with the curves in § 3.184 as follows: Place the sheet on which the actual points have been plotted over the appropriate Graph in § 3.184, hold to the light if necessary and adjust until the curve most closely matching the points is found. This curve should then be drawn on the sheet on which the points were plotted, together with the inverse distance curve corresponding to that curve. The field at 1 mile for the radial concerned shall be the ordinate on the inverse distance curve at 1 mile.

(4) When all radials have been analyzed in accordance with subparagraph (3) of this paragraph, a curve shall be plotted on polar coordinate paper from the fields obtained, which gives the inverse distance field pattern at 1 mile. The radius of a circle, the area of which is equal to the area bounded by this pattern, is the effective field. (See § 3.14.)

(5) While making the field intensity survey, the output power of the station shall be maintained at the licensed power as determined by the direct method. To do this it is necessary to determine accurately the total antenna resistance (the resistance variation method, the substitution method or bridge method is acceptable) and to measure the antenna current by means of an ammeter of acceptable accuracy. (See §§ 3.39 and 3.54.)

(b) Complete data taken in conjunction with the field intensity measurements shall be submitted to the Commission in affidavit form including the following:

(1) Tabulation by number of each point of measurement to agree with the map required in (2) below and the field intensity meter reading, the attenuation constant, the field intensity (E), the distance from the antenna (D) and the product of the field intensity and distance (ED) (if data for each radial are plotted on semi-logarithmic paper, see above) for each point of measurement.

(2) Map showing each point of measurement numbered to agree with tabulation required above.

(3) Description of method used to take field intensity measurements.

(4) The family of theoretical curves used in determining the curve for each radial properly identified by conductivity and dielectric constants.

(5) The curves drawn for each radial and the field intensity pattern.

(6) Antenna resistance measurement:

(i) Antenna resistance at operating frequency.

(ii) Description of method employed.

(iii) Tabulation of complete data.

(iv) Curve showing antenna resistance versus frequency.

(7) Antenna current or currents maintained during field intensity measurements.

(8) Description, accuracy, date, and by whom each instrument was last calibrated.

(9) Name, address, and qualifications of the engineer making the measurements.

(10) Any other pertinent information.

§ 3.187 [Reserved.]

§ 3.188 *Location of transmitters.* (a) The four primary objectives to be obtain in the selection of a site for a transmitter of a broadcast station are as follows:

(1) To serve adequately the center of population in which the studio is located and to give maximum coverage to adjacent areas.

(2) To cause and experience minimum interference to and from other stations.

(3) To present a minimum hazard to air navigation consistent with objectives (1) and (2).

(4) To fulfill certain other requirements given below.

(b) The site selected should meet the following conditions:

(1) A minimum field intensity of 25 to 50 mv/m will be obtained over the business or factory areas of the city.

(2) A minimum field intensity of 5 to 10 mv/m will be obtained over the most distant residential section.

(3) The absorption of the signal is the minimum for any obtainable sites in the area. As a guide in this respect the absorption of the signals from other stations in that area should be followed, as well as the results of tests on other sites.

(4) The population within the blanket contour does not exceed that specified by § 3.24 (g).

(c) In selecting a site in the center of a city it is usually necessary to place the radiating system on the top of a building. This building should be large enough to permit the installation of a satisfactory ground and/or counterpoise system. Great care must be taken to avoid selecting a building surrounded by taller buildings or where any nearby building higher than the antenna is located in the direction which it is desired to serve. Such a building will tend to cast "radio shadows" which may materially reduce the coverage of the station in that direction. Irrespective of the height of surrounding buildings, the building on which the antenna is located should not have height of approximately one-quarter wavelength. A study of antenna systems located on buildings tends to indicate that where the building is approximately a quarter wavelength in height, the efficiency of radiation may be materially reduced.

(d) Particular attention must be given to avoiding cross-modulation. In this connection, attention is invited to the fact that it has been found very unsatisfactory to locate broadcast stations so that high signal intensities occur in areas with overhead electric power or telephone distribution systems and sections where the wiring and plumbing are old or improperly installed. These areas are usually found in the older or poorer sections of a city. These conditions give rise to cross-modulation interference due to the nonlinear conductivity characteristics of contacts between wiring, plumbing, or other conductors. This type of interference is independent of the selectivity characteristics of the receiver and normally can be eliminated only by correction of the condition causing the interference. Cross-modulation tends to increase with frequency and in some areas it has been found impossible to eliminate all sources of cross-modulation, resulting in an unsatisfactory condition for both licensee and listeners. The Commission will not authorize, (1) new stations (2) increased facilities to existing stations, or (3) auxiliary transmitters, for use with other than the authorized antenna system of the main transmitter, located in such areas or utilizing roof-top antennas, when the operating power would be in excess of 500 watts.

(e) If it is determined that a site should be selected removed from the city, there are several general conditions to be followed in determining the exact site. Three maps should be given consideration if available:

(1) Map of the density of population and number of people by sections in the area. (See Bureau of Census series P–D and H–E available from Superintendent of Documents, Washington 25, D. C.)

(2) Geographical contour map with contour intervals of 20 to 50 feet.

(3) Map showing the type, nature and depth of the soil in the area with special reference to the condition of the moisture throughout the year.

From these maps a site should be selected with a minimum number of intervening hills between it and the center of the city. In general, because of ground conditions, it is better to select a site in a low area rather than on top of a hill, and the only condition under which a site on top of a hill should be selected is that it is only possible by this means to avoid a substantial number of hills, between the site and the center of a city with the resulting radio shadows. If a site is to be selected to serve a city which is on a general sloping area, it is generally better to select a site below the city than above the city.

(f) If a compromise must be made between probable radio shadows from intervening hills and locating the transmitter on top of a hill, it is generally better to compromise in favor of the low area, where an efficient radiating system may be installed which will more than compensate for losses due to shadows being caused by the hills, if not too numerous or too high. Several transmitters have been located on top of hills, but so far as data has been supplied not a single installation has given superior efficiency of propagation and coverage.

(g) The ideal location of a broadcast transmitter is in a low area of marshy or "crawfishy" soil or area which is damp the maximum percentage of time and from which a clear view over the entire center of population may be had and the tall buildings in the business section of the city would cast a shadow across the minimum residential area.

(h) The type and condition of the soil or earth immediately around a site is very important. Important, to an equal extent, is the soil or earth between the site and the principal area to be served. Sandy soil is considered the worst type, with glacial deposits and mineral-ore areas next. Alluvial, marshy areas and salt-water bogs have been found to have the least absorption of the signal. One is fortunate to have available such an area and, if not available, the next best condition must be selected.

(i) Figures M3 and R3 of § 3.190 indicate effective conductivity values in the United States and are to be used for determining the extent of broadcast station coverage when adequate field intensity measurements over the path in question are not available. Since the values specified are only for general areas and since conductivity values over particular paths may vary widely from those shown, caution must be exercised in using the maps for selection of a satisfactory transmitter site. Where the submission of field intensity measurements is deemed necessary or advisable, the Commission, in its discretion, may require an applicant for new or changed broadcast facilities to submit such data in support of its application.

(j) In general, broadcast transmitters operating with approximately the same power can be grouped in the same approximate area and thereby reduce the interference between them. If the city is of irregular shape, it is often possible to take advantage of this in selecting a suitable location that will give a maximum coverage. The maps giving the density of population will be a key to this. The map giving the elevation by contours will be a key to the obstructing hills between the site and city. The map of the soil conditions will assist in determining the efficiency of the radiating system that may be erected and the absorption of the signal encountered in the surrounding area.

(k) Another factor to be considered is the relation of the site to airports and airways. Procedures and standards with respect to the Commission's consideration of proposed antenna structures which will serve as a guide to persons intending to apply for radio station licenses are contained in Part 17 of this chapter (Rules Concerning the Construction, Marking and Lighting of Antenna Structures).

(l) In finally selecting the site, consideration must be given to the required space for erecting an efficient radiating system, including the ground or counterpoise. It is the general practice to use direct grounds consisting of a radial buried wire system. If the area is such that it is not possible to get such ground system in soil that remains moist throughout the year, it probably will be found better to erect a counterpoise. (Such a site should be selected only as a last resort.) It, like the antenna itself, must of course be designed properly for the operating frequency and other local conditions.

(m) While an experienced engineer can sometimes select a satisfactory site for a 100-watt station by inspection, it is necessary for a higher power station to make a field-intensity survey to determine that the site selected will be entirely satisfactory. There are several facts that cannot be determined by inspection that make a survey very desirable for all locations removed from the city. Often two or more sites may be selected that appear to be of equal promise. It is only by means of field-intensity surveys taken with a transmitter at the different sites or from measurements on the signal of nearby stations traversing the terrain involved that the most desirable site can be determined. There

are many factors regarding site efficiency that cannot be determined by any other method. When making the final selection of a site, the need for a field-intensity survey to establish the exact conditions cannot be stressed too strongly. The selection of a proper site for a broadcast station is an important engineering problem and can only be done properly by experienced radio engineers

§ 3.189 *Minimum antenna heights or field intensity requirements.* (a) Section 3.45 requires that all applicants for new, additional, or different broadcast facilities and all licensees requesting authority to move the transmitter of an existing station, shall specify a radiating system, the efficiency of which complies with the requirements of good engineering practice for the class and power of the station

(b) The specifications deemed necessary to meet the requirements of good engineering practice at the present state of the art are set out in detail below.

(1) The licensee of a standard broadcast station requesting a change in power, time of operation, frequency, or transmitter location must also request authority to install a new antenna system or to make changes in the existing antenna system which will meet the minimum height requirements, or submit evidence that the present antenna system meets the minimum requirements with respect to field intensity, before favorable consideration will be given thereto. (See § 3.186.) In the event it is proposed to make substantial changes in an existing antenna system, the changes shall be such as to meet the minimum height requirements or will be permitted subject to the submission of field intensity measurements showing that it meets the minimum requirements with respect to effective field intensity.

(2) These minimum actual physical vertical heights of antennas permitted to be installed are shown by curves A, B, and C of Figure 7 of § 3.190 as follows:

(i) Class IV stations, 150 feet or a minimum effective field intensity of 150 mv/m for 1 kilowatt (100 watts 47.5 mv/m, and 250 watts 75 mv/m). (This height applies to a Class IV station on a local channel only. In the case of a Class IV station assigned to a regional channel Curve A shall apply.)

(ii) Class II and III stations, or a minimum effective field intensity of 175 mv/m for 1 kilowatt.

(iii) Class I stations, or a minimum effective field intensity of 225 mv/m for 1 kilowatt.

(3) The heights given on the graph for the antenna apply regardless of whether the antenna is located on the ground or on a building. Except for the reduction of shadows, locating the antenna on a building does not necessarily increase the efficiency and where the height of the building is in the order of a quarter wave the efficiency may be materially reduced.

(4) To obtain the maximum efficiency of which any antenna is capable a good ground system must be employed (a counterpoise may be substituted under certain conditions).

(5) At the present development of the art, it is considered that where a vertical radiator is employed with its base on the ground, the ground system should consist of buried radial wires at least one-fourth wave length long. There should be as many of these radials evenly spaced as practicable and in no event less than 90. (120 radials of 0.35 to 0.4 of a wave length in length and spaced 3° is considered an excellent ground system and in case of high base voltage, a base screen of suitable dimensions should be employed.)

(6) It should be borne in mind that the above specifications are the minimum and where possible better antenna and ground systems should be installed.

(7) In case it is contended that the required antenna efficiency can be obtained with an antenna of height or ground system less than the minimum specified, a complete field intensity survey must be supplied to the Commission showing that the field intensity at a mile without absorption fulfills the minimum requirements. (See § 3.188.) This field survey must be made by a qualified engineer using equipment of acceptable accuracy.

(8) The main element or elements of a directional antenna system shall meet the above minimum requirements with respect to height or effective field intensity. No directional antenna system will be approved which is so designed that the effective field of the array is less than the minimum prescribed for the class of station concerned, or in case of a Class I station less than 90 percent of the ground wave field which would be obtained from a perfect antenna of the height specified by Figure 7 of § 3.190 for operation on frequencies below 1000 kilocycles, and in the case of a Class II or III station less than 90 percent of the ground wave field which would be obtained from a perfect antenna of the height specified by Figure 7 of § 3.190 for operation on frequencies below 750 kilocycles.

(9) Before any changes are made in the antenna system, it is necessary to submit full details to the Commission for approval. These data may be submitted by letter.

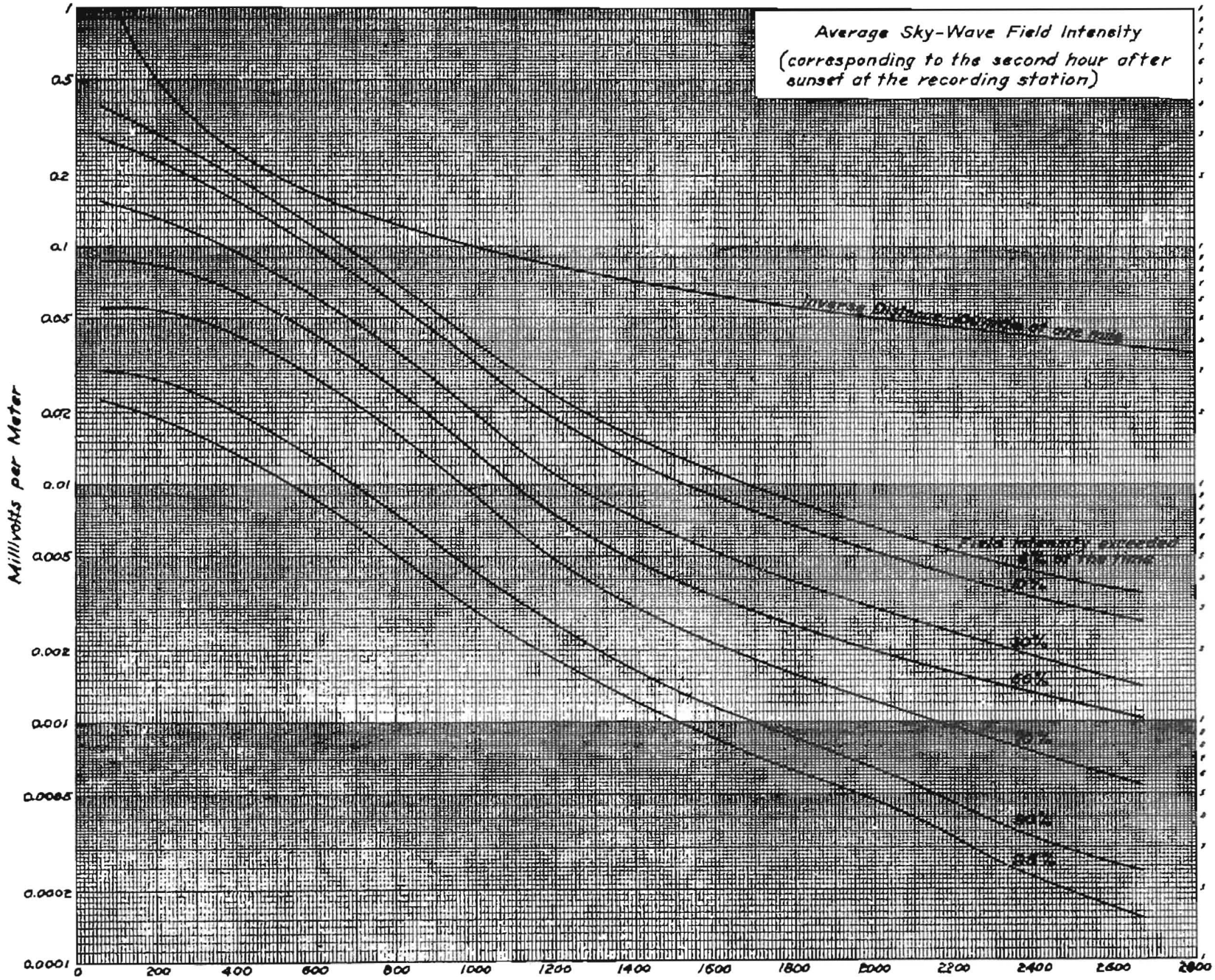


Figure 1

These curves are not considered to be sufficiently accurate for practical use for distances less than approximately 250 miles.

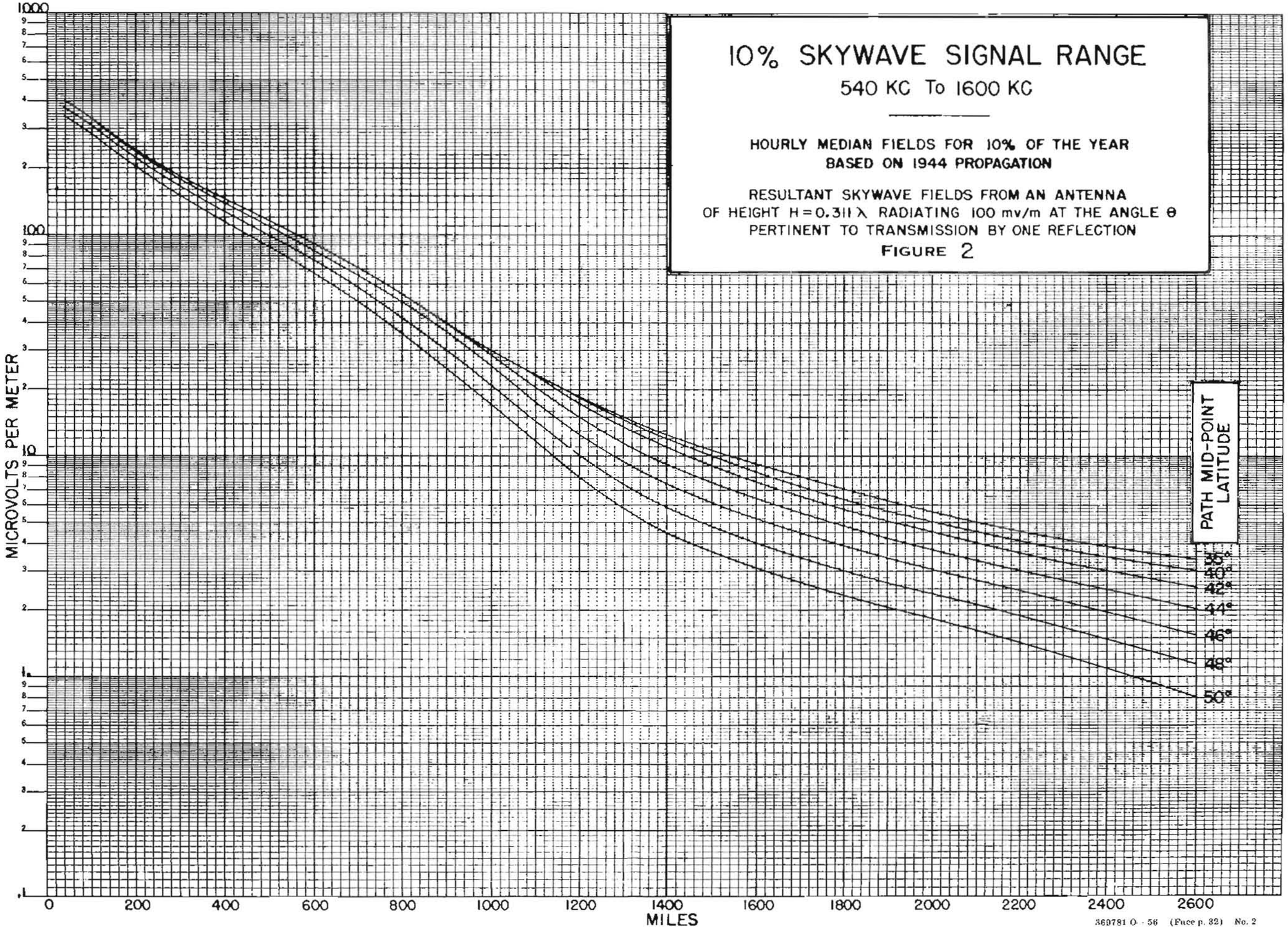
10% SKYWAVE SIGNAL RANGE

540 KC To 1600 KC

HOURLY MEDIAN FIELDS FOR 10% OF THE YEAR
BASED ON 1944 PROPAGATION

RESULTANT SKYWAVE FIELDS FROM AN ANTENNA
OF HEIGHT $H = 0.311\lambda$ RADIATING 100 mv/m AT THE ANGLE θ
PERTINENT TO TRANSMISSION BY ONE REFLECTION

FIGURE 2



369781 O - 56 (Face p. 32) No. 2

NUMBERS ON MAP REPRESENT ESTIMATED EFFECTIVE GROUND CONDUCTIVITY IN MILLIMHOS PER METER

CONDUCTIVITY OF SEAWATER IS NOT SHOWN ON MAP BUT IS ASSUMED TO BE 5000 MILLIMHOS PER METER

0 50 100 150 200
SCALE IN MILES

ESTIMATED EFFECTIVE GROUND CONDUCTIVITY IN THE UNITED STATES

FIGURE R3

February 1954

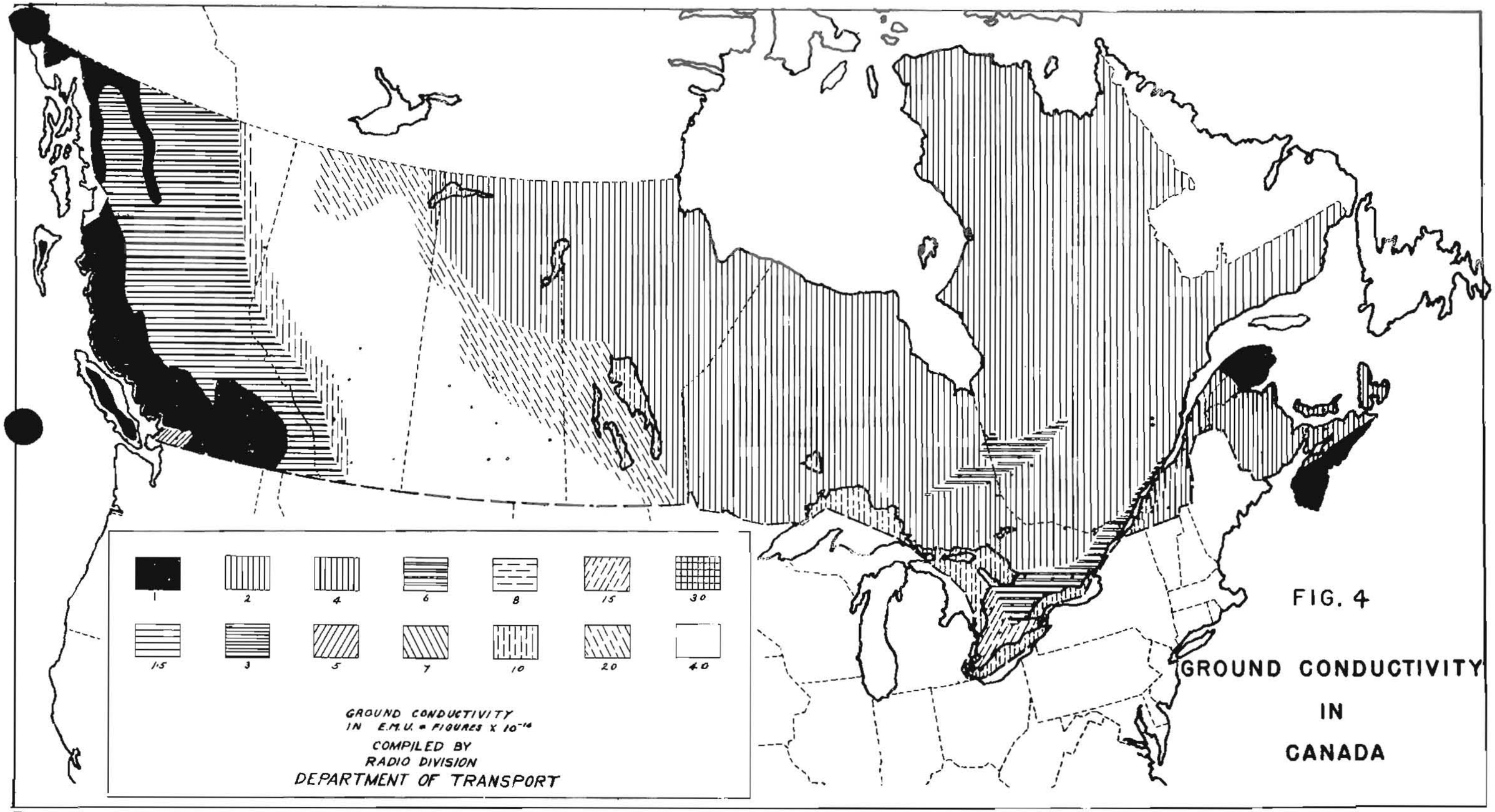
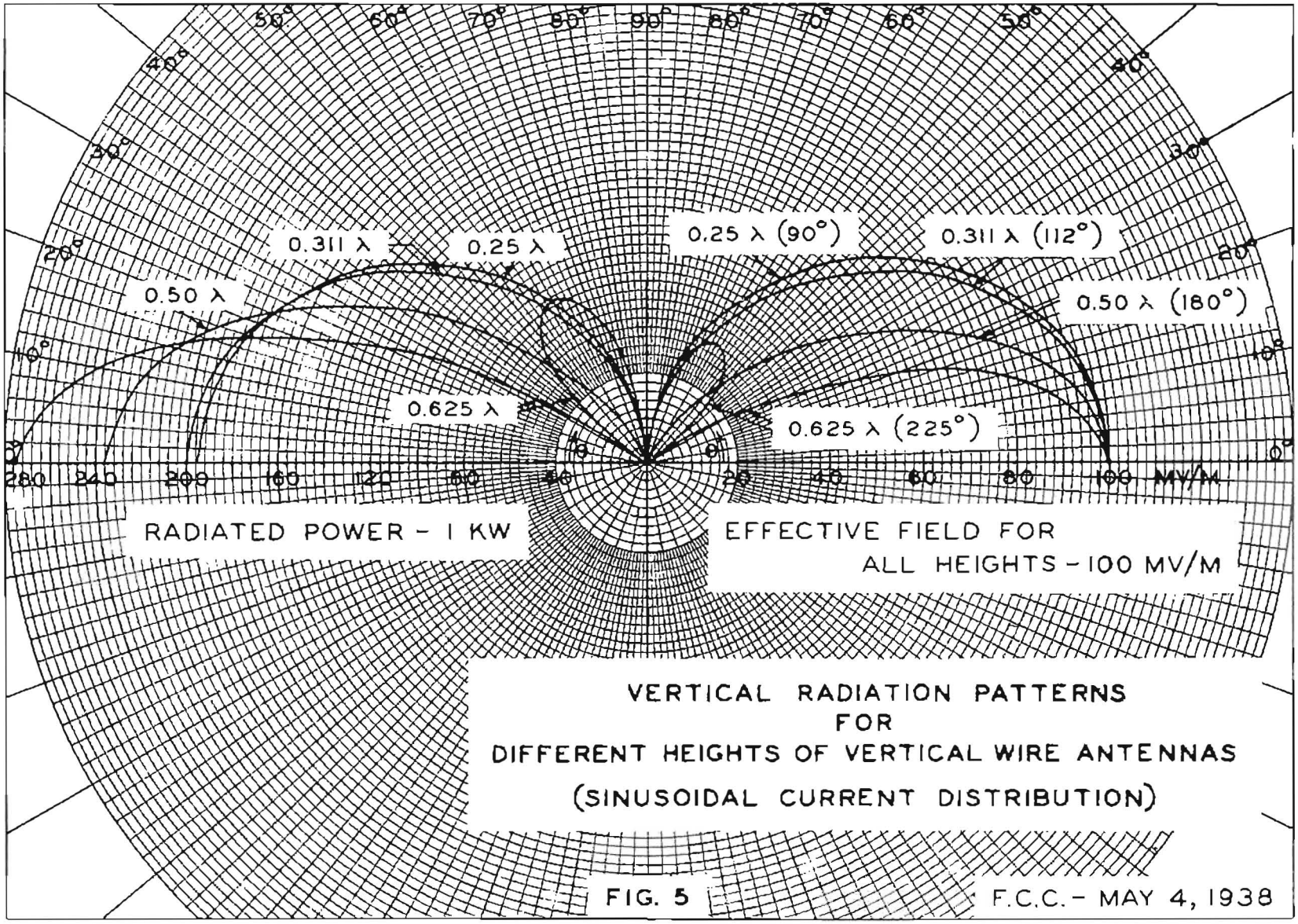


FIG. 4

GROUND CONDUCTIVITY
IN
CANADA

369781 O—56 (Face p. 32) No. 4



VERTICAL RADIATION PATTERNS
FOR
DIFFERENT HEIGHTS OF VERTICAL WIRE ANTENNAS
(SINUSOIDAL CURRENT DISTRIBUTION)

FIG. 5 F.C.C. - MAY 4, 1938

369781 O—50 (Face p. 32) No. 5

760684 O - 47 (Face p. 50) No. 6

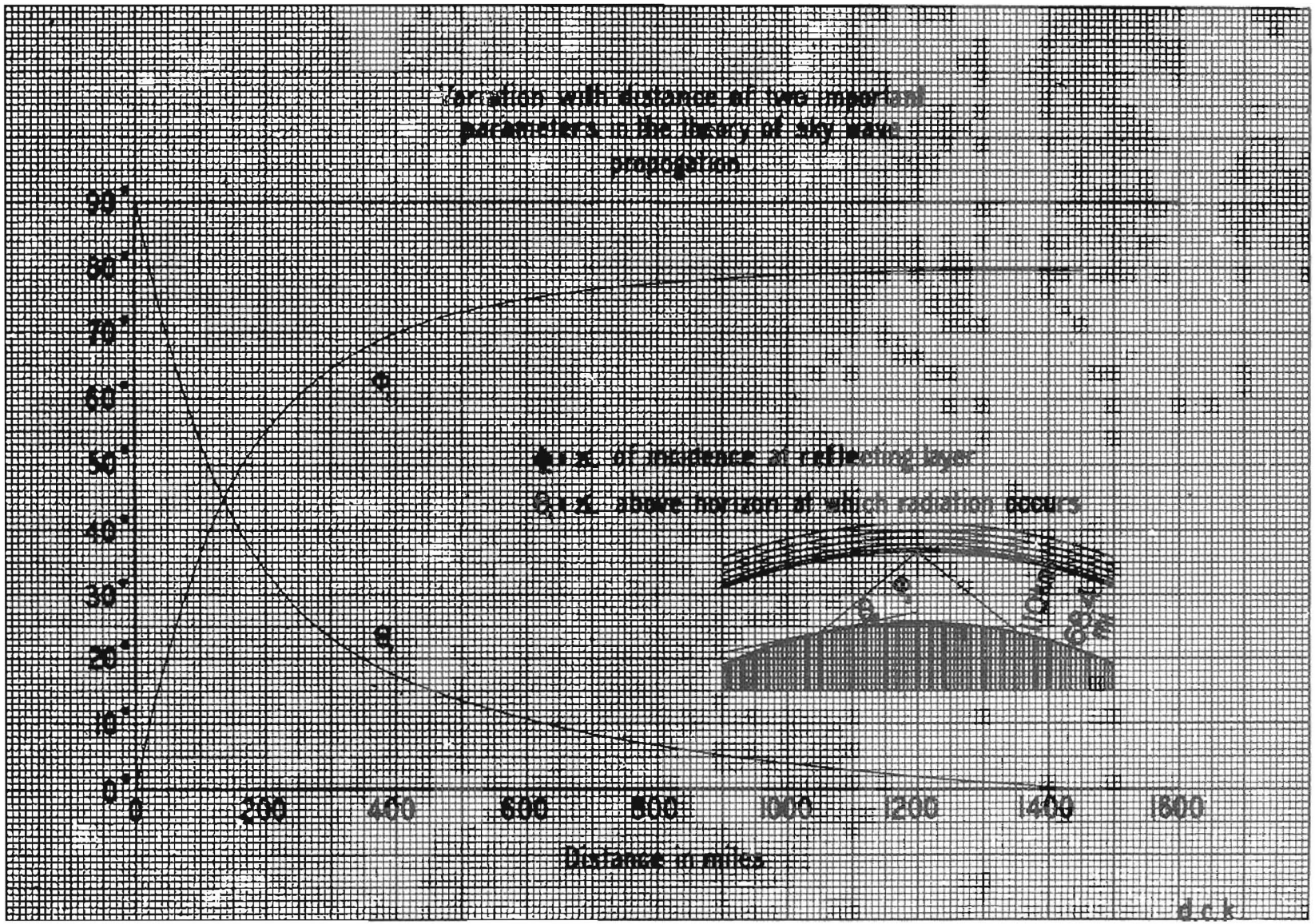


Fig. 6

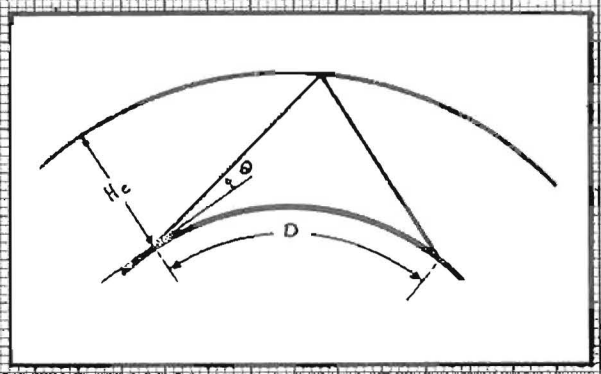
780684 O - 47 (Face p. 50)

FIGURE 6a

ANGLES OF DEPARTURE VERSUS TRANSMISSION RANGE

① θ FOR 1000 KC AVERAGE H_e
② θ FOR 1000 KC MAXIMUM H_e
③ θ FOR 1000 KC MINIMUM H_e
④ AND ⑤ CONTAIN ALSO AN ESTIMATED CORRECTION FOR DEVIATION FROM MID-POINT REFLECTION

FOR USE IN BAND 540 - 1600 Kc



θ

90
80
70
60
50
40
30
20
10
0

0 200 400 600 800 1000 1200 1400

D — MILES

369781 O—56 (Face p. 32) No 7

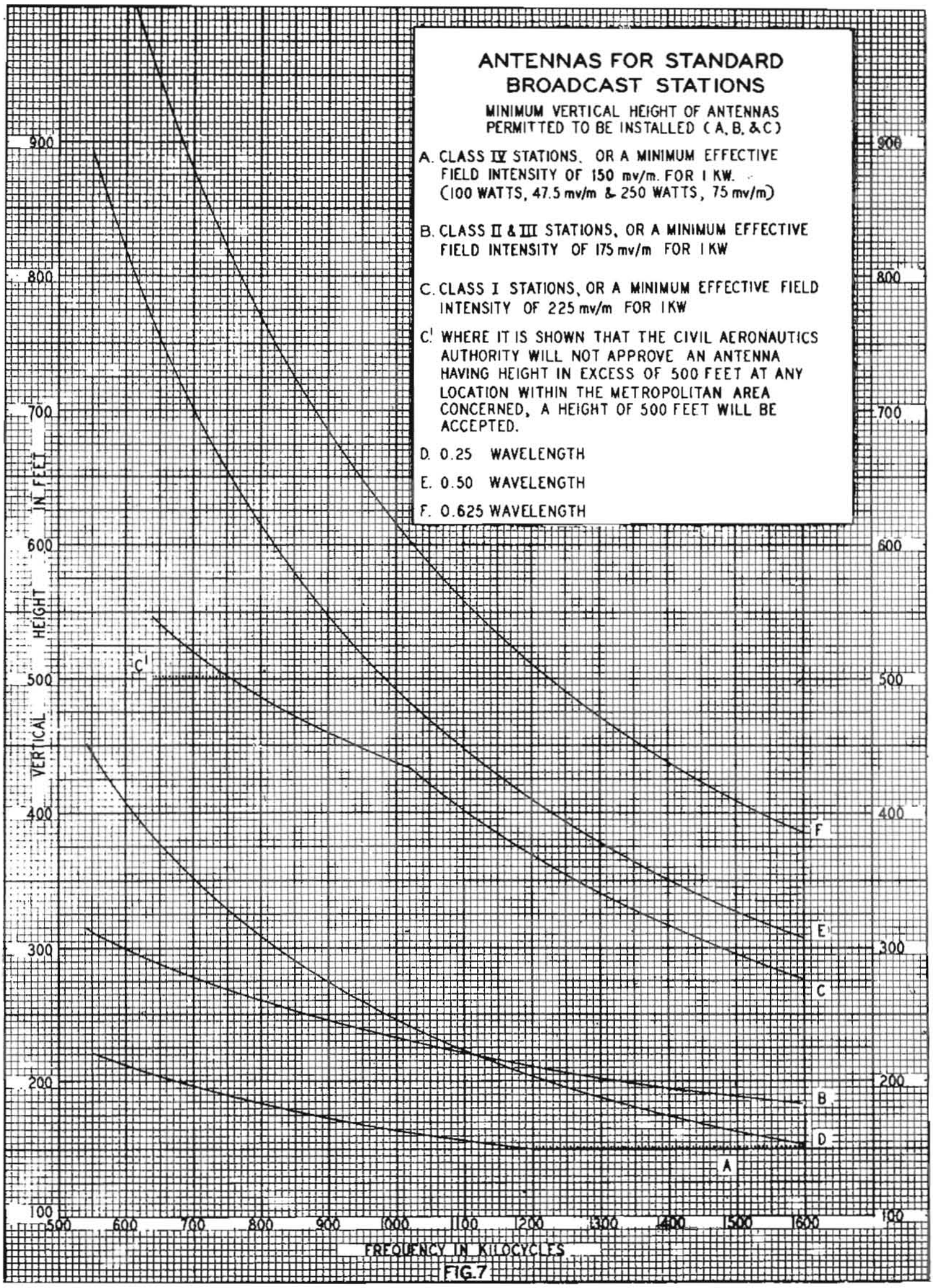


FIG. 7

309781 O—56 (Face p. 32) No. 8

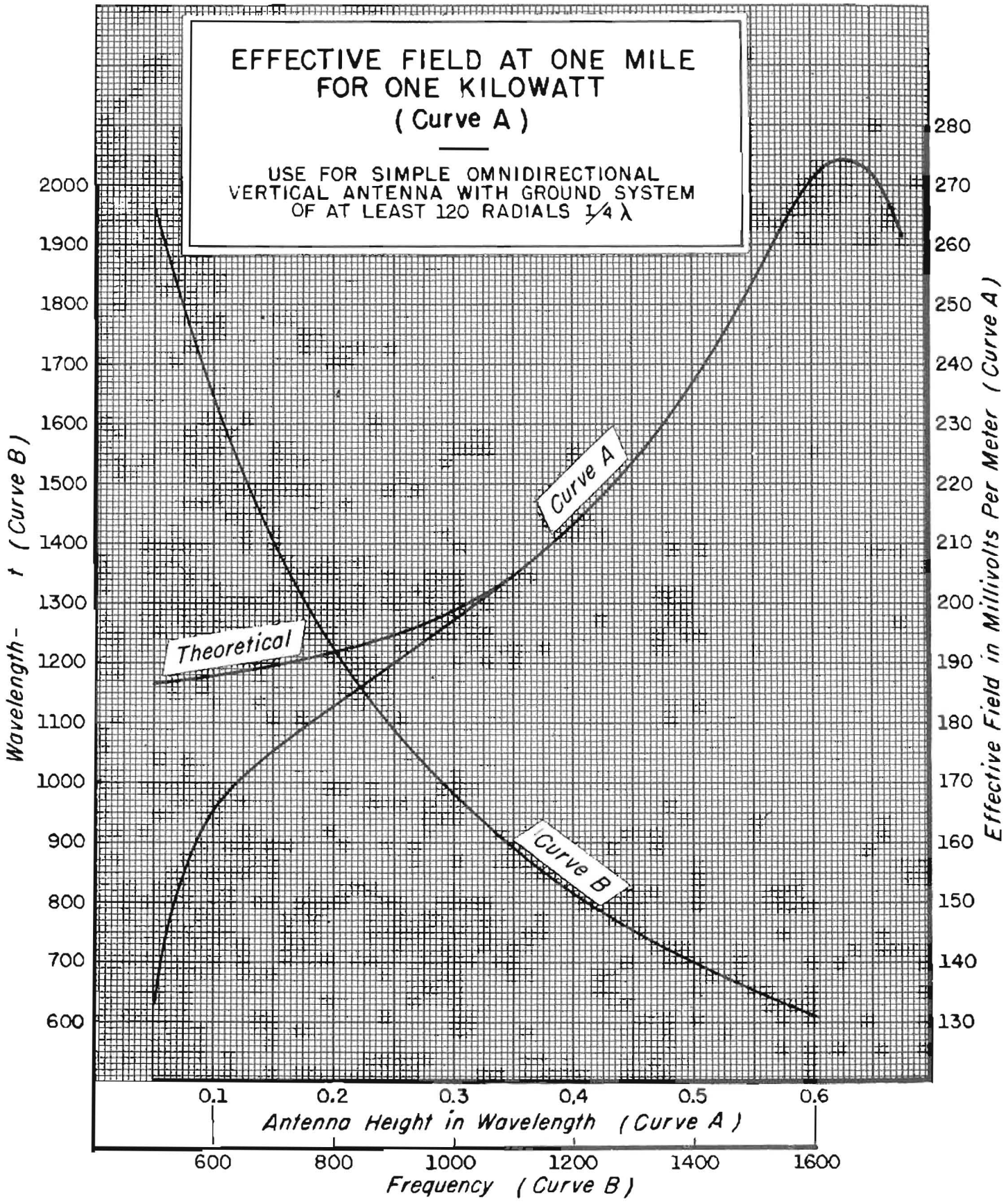

EFFECTIVE FIELD AT ONE MILE
FOR ONE KILOWATT
(Curve A)
USE FOR SIMPLE OMNIDIRECTIONAL
VERTICAL ANTENNA WITH GROUND SYSTEM
OF AT LEAST 120 RADIALS 1/4 λ
Wavelength - f (Curve B)
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
Effective Field in Millivolts Per Meter (Curve A)
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
Curve A
Theoretical
Curve B
0.1
0.2
0.3
0.4
0.5
0.6
Antenna Height in Wavelength (Curve A)
600
800
1000
1200
1400
1600
Frequency (Curve B)

FIGURE 8

SUBPART B—FM BROADCAST STATIONS

CLASSIFICATION OF FM BROADCAST STATIONS AND ALLOCATION OF FREQUENCIES

§ 3.201 *Numerical designation of FM broadcast channels.* For convenience, the frequencies available for FM broadcasting (including those assigned to noncommercial educational broadcasting) are given numerical designations which are shown in the table below:

Frequency (Mc):	Channel No.	Frequency (Mc):	Channel No.
88.1	201	95.5	238
88.3	202	95.7	239
88.5	203	95.9	240
88.7	204	96.1	241
88.9	205	96.3	242
89.1	206	96.5	243
89.3	207	96.7	244
89.5	208	96.9	245
89.7	209	97.1	246
89.9	210	97.3	247
90.1	211	97.5	248
90.3	212	97.7	249
90.5	213	97.9	250
90.7	214	98.1	251
90.9	215	98.3	252
91.1	216	98.5	253
91.3	217	98.7	254
91.5	218	98.9	255
91.7	219	99.1	256
91.9	220	99.3	257
92.1	221	99.5	258
92.3	222	99.7	259
92.5	223	99.9	260
92.7	224	100.1	261
92.9	225	100.3	262
93.1	226	100.5	263
93.3	227	100.7	264
93.5	228	100.9	265
93.7	229	101.1	266
93.9	230	101.3	267
94.1	231	101.5	268
94.3	232	101.7	269
94.5	233	101.9	270
94.7	234	102.1	271
94.9	235	102.3	272
95.1	236	102.5	273
95.3	237	102.7	274
102.9	275	105.5	288
103.1	276	105.7	289
103.3	277	105.9	290
103.5	278	106.1	291
103.7	279	106.3	292
103.9	280	106.5	293
104.1	281	106.7	294
104.3	282	106.9	295
104.5	283	107.1	296
104.7	284	107.3	297
104.9	285	107.5	298
105.1	286	107.7	299
105.3	287	107.9	300

§ 3.202 *Areas of the United States.* For the purpose of allocation the United States is divided into two areas. The first area—area I—includes southern New Hampshire; all of Massachusetts, Rhode Island, and Connecticut; southeastern New York as far north as Albany-Troy-Schenectady; all of New Jersey, Delaware, and the District of Columbia; Maryland as far west as Hagerstown; and eastern Pennsylvania as far west as Harrisburg. The second area—area II—comprehends the remainder of the United States not included in area I.

NOTE: In some of the territory contiguous to area I, the demand for frequencies requires that applications be given careful study and consideration to insure an equitable distribution of facilities throughout the region. This region includes the remainder of Maryland, Pennsylvania, and New York (except the northeastern corner) not included in area I; Virginia, West Virginia, North Carolina, South Carolina, Ohio, and Indiana; southern Michigan as far north as Saginaw; eastern Illinois as far west as Rockford-Decatur; and southeastern Wisconsin as far north as Sheboygan. Other regions may be added as required.

§ 3.203 *Class A stations.* (a) A Class A station is a station which operates on a Class A channel and is designed to render service primarily to a community or to a city or town other than the principal city of an area, and the surrounding rural area. The coverage of a Class A station shall be not more than the equivalent of 1 kilowatt effective radiated power and antenna height of 250 feet above average terrain, as determined by the methods prescribed in the Technical Standards of this subpart. (For the purpose of determining equivalent coverage, the 1 mv/m contour should be used.) A Class A station will not be licensed with more than 1 kilowatt effective radiated power. The power rating of the transmitter used for a Class A station shall be not less than 250 watts nor more than 1 kilowatt. The signal intensity requirements of § 3.311 shall determine the minimum coverage of a Class A station. Class A stations will normally be protected to the 1 mv/m contour; however, assignments will be made in a manner to insure, insofar as possible, a maximum of service to all listeners, whether urban or rural, giving consideration to the minimum signal capable of providing service.

(b) The following frequencies, except as provided in paragraphs (c) and (d) of this section, are designated as Class A channels and are assigned for use by Class A stations:

Frequency (Mc):	Channel No.	Frequency (Mc):	Channel No.
92.1	221	100.1	261
92.7	224	100.9	265
93.5	228	101.7	269
94.3	232	102.3	272
95.3	237	103.1	276
95.9	240	103.9	280
96.7	244	104.9	285
97.7	249	105.5	288
98.3	252	106.3	292
99.3	257	107.1	296

These channels are available for assignment (1) in cities which are not the central city or cities of a metropolitan

district, and (2) in central cities of metropolitan districts which have fewer than six Class B stations.

(c) In the Territory of Hawaii, the frequency band 98–108 Mc is allocated for nonbroadcast use. The frequencies 98.1 through 107.9 Mc, inclusive (Channels 251 through 300 inclusive) will not be assigned in the Territory of Hawaii for use by FM broadcast stations.

(d) In the Territory of Alaska the frequency band 88–100 Mc is allocated to Government radio services and the non-Government fixed service only. The frequencies 88.1 Mc through 99.9 Mc (Channels 201 through 260 inclusive) will not be assigned in the Territory of Alaska for use by FM Broadcast stations

§ 3.204 *Class B stations.* (a) A Class B station is a station which operates on a Class B channel and is designed to render service primarily to a metropolitan district or principal city and the surrounding rural area, or to rural areas removed from large centers of population The service area of a Class B station will not be protected beyond the 1 mv/m contour; however, Class B assignments will be made in a manner to insure, insofar as possible, a maximum of service to all listeners, whether urban or rural, giving consideration to the minimum signal capable of providing service. Standard power ratings of transmitters used for Class B stations shall be 1 kw. or greater. The signal intensity requirements of § 3.311 shall determine the minimum coverage of a Class B station. In the following subparagraphs antenna height above average terrain and effective radiated power are to be determined by the methods prescribed in the Technical Standards of this subpart.

(1) The coverage of a Class B station in Area I shall be not more than the equivalent of 20 kilowatts effective radiated power and antenna height of 500 feet above average terrain. (For the purpose of determining equivalent coverage, the 1 mv/m contour should be used.) A class B station in Area I will not be licensed with an effective radiated power greater than 20 kilowatts.

(2) The coverage of a Class B station in Area II shall normally be not more than the equivalent of 20 kilowatts effective radiated power and antenna height of 500 feet above average terrain. (For the purpose of determining equivalent coverage, the 1 mv/m contour should be used.) The use of greater power and antenna height will be encouraged in those portions of Area II where such use would not result in undue interference to stations already authorized or to probable assignments insofar as can be determined at the time of the grant. In such case, the power, antenna height, and area will be determined on the merits of each application with particular attention being given to rural areas which would not otherwise receive service.

(b) The following frequencies, except as provided in paragraphs (c) and (d) of this section, are designated as Class B channels and are assigned for use by Class B stations:

Frequency (Mc):	*Channel No.*	Frequency (Mc):	*Channel No.*
92.3	222	100.3	262
92.5	223	100.5	263
92.9	225	100.7	264
93.1	226	101.1	266
93.3	227	101.3	267
93.7	229	101.5	268
93.9	230	101.9	270
94.1	231	102.1	271
94.5	233	102.5	273
94.7	234	102.7	274
94.9	235	102.9	275
95.1	236	103.3	277
95.5	238	103.5	278
95.7	239	103.7	279
96.1	241	104.1	281
96.3	242	104.3	282
96.5	243	104.5	283
96.9	245	104.7	284
97.1	246	105.1	286
97.3	247	105.3	287
97.5	248	105.7	289
97.9	250	105.9	290
98.1	251	106.1	291
98.5	253	106.5	293
98.7	254	106.7	294
98.9	255	106.9	295
99.1	256	107.3	297
99.5	258	107.5	298
99.7	259	107.7	299
99.9	260	107.9	300

(c) In the Territory of Hawaii the frequency band 98–108 Mc is allocated for nonbroadcast use. The frequencies 98.1 through 107.9 Mc inclusive (Channels 251 through 300, inclusive) will not be assigned in the Territory of Hawaii for use by FM broadcast stations.

(d) In the Territory of Alaska the frequency band 88–100 Mc is allocated exclusively to Government radio services and the non-Government fixed service. The frequencies 88.1 Mc through 99.9 Mc (Channels 201 through 260 inclusive) will not be assigned in the Territory of Alaska for use by FM Broadcast stations.

§ 3.205 *Station location and program origination.* (a) Except as provided in paragraph (b) of this section, each FM broadcast station will be licensed to serve primarily a particular city, town, or other political subdivision which will be specified in the station license and the station will be considered to be located in such place. Each station shall maintain a studio, which will be known as the main studio, in the place where the station is located provided that the main studio may be located at the transmitter site whether or not the transmitter site is in the place where the station is located A majority (computed on the basis of duration and not number) of a station's programs or in the case of a station affiliated with a network, two-thirds of such station's non-network programs, whichever is smaller, shall originate from the main studio or from other studios or remote points situated in the place where the station is located.

(b) Stations will be licensed to serve more than one city, town, or other political subdivision, only where a satisfactory showing is made that each such place meets all the requirements of the rules and Technical Standards of this subpart with respect to the location of main studios; that the station can and will originate a substantial number of local live programs from each such place, and that the requirements as to origination of programs contained in paragraph (a) of this section would place an unreasonable burden on the station if it were licensed to serve only one city, town or other political subdivision. A station licensed to serve more than one place shall be considered to be located in and shall maintain main studios in each such place. With respect to such station the requirements as to origination of programs contained in paragraph (a) of this section shall be satisfied by the origination of programs from any or all of the main studios or from other studios and remote points situated in any or all of the places in which the main studios are located.

(c) The transmitter of each FM broadcast station shall be so located that satisfactory service is delivered to the city where the main studio is located, in accordance with the Technical Standards of this subpart: *Provided, however,* Upon special showing of need, authorization may be granted to locate the transmitter so that adequate service is not rendered to this city, but in no event shall this city be beyond the 50 uv/m contour.

ADMINISTRATIVE PROCEDURE

§ 3.211 *Application for FM broadcast stations.* If the application is for a construction permit or for modification of an existing authorization, FCC Form 301 shall be filed; if for a license, FCC Form 302 shall be filed; if for a renewal of license, FCC Form 303 shall be filed.

§ 3.212 *Full disclosures.* Each application shall contain full and complete disclosures with regard to the real party or parties in interest, and their legal, technical, financial, and other qualifications, and as to all matters and things required to be disclosed by the application forms.

§ 3.213 *Installation of apparatus.* Applications for construction permits or modification thereof involving the installation of new transmitting apparatus should be filed at least 60 days prior to the contemplated installation.

§ 3.214 *Period of construction.* Each construction permit will specify a maximum of 60 days from the date of granting thereof as the time within which construction of the station shall begin, and a maximum of 6 months thereafter as the time within which construction shall be completed and the station ready for operation, unless otherwise determined by the Commission upon proper showing in any particular case

§ 3.215 *Forfeiture of construction permits; extension of time.* (a) A construction permit shall be automatically forfeited if the station is not ready for operation within the time specified therein or within such further time as the Commission may have allowed for completion, and a notation of the forfeiture of any construction permit under this provision will be placed in the records of the Commission as of the expiration date.

(b) Any application for extension of time (FCC Form 701) within which to

construct a station shall be filed at least 30 days prior to the expiration date of such permit if the facts supporting such application for extension are known to the applicant in time to permit such filing. In other cases such applications will be accepted upon a showing satisfactory to the Commission of sufficient reasons for filing within less than 30 days prior to the expiration date. Such applications will be granted upon a specific and detailed showing that the failure to complete was due to causes not under the control of the grantee, or upon a specific and detailed showing of other matters sufficient to justify the extension.

(c) If a construction permit has been allowed to expire for any reason, application may be made for a new permit on FCC Form 321, "Application for Construction Permit to Replace Expired Permit."

§ 3.216 *Equipment tests.* (a) During the process of construction of an FM broadcast station, the permittee, after notifying the Commission and Engineer in Charge of the radio district in which the station is located, may without further authority of the Commission, conduct equipment tests for the purpose of such adjustments and measurements as may be necessary to assure compliance with the terms of the construction permit, the technical provisions of the application therefor, the rules and regulations, and the applicable engineering standards.

(b) The Commission may notify the permittee to conduct no tests or may cancel, suspend, or change the date for the beginning of equipment tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Equipment tests may be continued so long as the construction permit shall remain valid.

(d) Inspection of a station will ordinarily be required during the equipment test period and before the commencement of the program test. After construction and after adjustments and measurements have been completed to show compliance with the terms of the construction permit, the technical provisions of the application therefor, the rules and regulations and the applicable engineering standards, the permittee should notify the Engineer in Charge of the radio district in which the station is located that it is ready for inspection.

(e) The authorization for tests embodied in this section shall not be construed as constituting a license to operate but as a necessary part of construction

§ 3.217 *Program tests.* (a) Upon completion of construction of an FM broadcast station in accordance with the terms of the construction permit, the technical provisions of the application therefor, and the rules and regulations and the applicable engineering standards, and when an application for station license has been filed showing the station to be in satisfactory operating condition, the permittee may request authority to conduct program tests: *Provided*, That such request shall be filed with the Commission at least ten (10) days prior to the date on which it is desired to begin such operation and that the Engineer in Charge of the radio district in which the station is located is notified. (All data necessary to show compliance with the terms and conditions of the construction permit must be filed with the license application.)

(b) Program tests shall not commence until specific Commission authority is received. The Commission reserves the right to change the date of the beginning of such tests or to suspend or revoke the authority for program tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Unless sooner suspended or revoked program test authority continues valid during Commission consideration of the application for license and during this period further extension of the construction permit is not required. Program test authority shall be automatically terminated by final determination upon the application for station license.

(d) All operation under program test authority shall be in strict compliance with the rules governing FM broadcast stations and in strict accordance with representations made in the application for license pursuant to which the tests were authorized.

(e) The granting of program test authority shall not be construed as approval by the Commission of the application for station license.

§ 3.218 *Normal license period.* (a) All FM broadcast station licenses will be issued for a normal license period of three years. Licenses will be issued to expire at the hour of 3:00 a. m., e. s. t. in accordance with the following schedule and at three-year intervals thereafter.

(1) For stations located in Delaware and Pennsylvania, August 1, 1957.

(2) For stations located in Maryland, District of Columbia, Virginia, West Virginia, October 1, 1957.

(3) For stations located in North Carolina, South Carolina, December 1, 1957.

(4) For stations located in Florida, Puerto Rico and Virgin Islands, February 1, 1958.

(5) For stations located in Alabama and Georgia, April 1, 1958.

(6) For stations located in Arkansas, Louisiana and Mississippi, June 1, 1958.

(7) For stations located in Tennessee, Kentucky and Indiana, August 1, 1958.

(8) For stations located in Ohio and Michigan, October 1, 1958.

(9) For stations located in Illinois and Wisconsin, December 1, 1958.

(10) For stations located in Iowa and Missouri, February 1, 1956.

(11) For stations located in Minnesota, North Dakota, South Dakota, Montana and Colorado, April 1, 1956.

(12) For stations located in Kansas, Oklahoma, Nebraska, June 1, 1956.

(13) For stations located in Texas, August 1, 1956.

(14) For stations located in Wyoming, Nevada, Arizona, Utah, New Mexico and Idaho, October 1, 1956

(15) For stations located in California, December 1, 1956.

(16) For stations located in Washington, Oregon, Alaska and Hawaii, February 1, 1957.

(17) For stations located in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont, April 1, 1957.

(18) For stations located in New Jersey and New York, June 1, 1957.

§ 3.219 *License, simultaneous modification and renewal.* When an application is granted by the Commission necessitating the issuance of a modified license less than 60 days prior to the expiration date of the license sought to be modified, and an application for renewal of said license is granted subsequent or prior thereto (but within 30 days of expiration of the present license) the modified license as well as the renewal license shall be issued to conform to the combined action of the Commission.

§ 3.220 *Renewal of license.* (a) Unless otherwise directed by the Commission, each application for renewal of an FM broadcast station license shall be filed at least 90 days prior to the expiration date of the license sought to be renewed (FCC Form 303). No application for renewal of license of an FM broadcast station will be considered unless there is on file with the Commission, the information currently required by §§ 1.341 to 1.344 of this chapter, reference to which by date and file number shall be included in the application.

(b) Whenever the Commission regards an application for a renewal of an FM broadcast station license as essential to the proper conduct of a hearing or investigation, and specifically directs that it be filed by a date certain, such application shall be filed within the time thus specified. If the licensee fails to file such application within the prescribed time, the hearing or investigation shall proceed as if such renewal application had been received.

§ 3.221 [Reserved.]

§ 3.222 *Repetitious applications.* (a) Where an applicant has been afforded an opportunity to be heard with respect to a particular application for a new FM broadcast station, or for change of existing service or facilities, and the Commission has, after hearing or default, denied the application or dismissed it with prejudice, the Commission will not consider another application for a station of the same class to serve in whole or in part the same area, by the same applicant or by his successor or assignee, or on behalf of or for the benefit of the original parties in interest, until after the lapse of 12 months from the effective date of the Commission's order.

(b) Where an appeal has been taken from the action of the Commission in denying a particular application, another application for the same class of broadcast station and for the same area, in whole or in part, filed by the same applicant or by his successor or assignee, or on behalf or for the benefit of the original parties in interest, will not be considered until the final disposition of such appeal.

§ 3.223 *Assignment or transfer of control*—(a) *Voluntary.* Application for

consent to voluntary assignment of an FM broadcast station construction permit or license or for consent to voluntary transfer of control of a corporation holding an FM broadcast station construction permit or license shall be filed with the Commission on FCC Form 314 (Assignment of Licensee), FCC Form 315 (Transfer of Control) or FCC Form 316 (Short Form) at least 60 days prior to the contemplated effective date of assignment or transfer of control.

(b) *Pro forma.* Assignment or transfer applications shall be filed on FCC Form 316 where:

(1) There is an assignment from an individual or individuals (including partnerships) to a corporation owned and controlled by such individuals or partnerships without any substantial change in their relative interests,

(2) There is an assignment from a corporation to its individual stockholders without effecting any substantial change in the disposition of their interests;

(3) There is an assignment or transfer by which certain partners or stockholders retire but no new ones are brought in, provided that the interest transferred is not a controlling one;

(4) There is a corporate reorganization which involves no substantial change in the beneficial ownership of the corporation;

(5) There is an involuntary transfer to an Executor, Administrator or other court appointed officer caused by death or legal disability except that this form does not cover assignments (or transfers) from the Executor, Administrator or other court appointed officers to the ultimate beneficiary;

(6) There is an assignment or transfer from a corporation to a wholly owned subsidiary thereof or vice versa, or where there is an assignment from a corporation to a corporation owned or controlled by the assignor stockholders without substantial change in their interests.

(7) There is an assignment of less than a controlling interest in a partnership.

(c) *Involuntary.* In the event of the death or legal disability of a permittee or licensee, or a member of a partnership, or a person directly or indirectly in control of a corporation, which is a permittee or licensee,

(1) The Commission shall be notified in writing promptly of the occurrence of such death or legal disability, and

(2) Within 30 days after the occurrence of such death or legal disability, application on FCC Form 316 shall be filed for consent to involuntary assignment of such FM broadcast station permit or license or for involuntary transfer of control of such corporation to a person or entity legally qualified to succeed to the foregoing interests under the laws of the place having jurisdiction over the estate involved.

LICENSING POLICIES

§ 3.231 *Exclusive affiliation of station.* No license shall be granted to an FM broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization under which the station is prevented or hindered from, or penalized for, broadcasting the programs of any other network organization. (The term "network organization" as used herein includes national and regional network organizations. See ch. VII, J of Report on Chain Broadcasting.)

§ 3.232 *Territorial exclusivity.* No license shall be granted to an FM broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which prevents or hinders another broadcast station serving substantially the same area from broadcasting the network's programs not taken by the former station, or which prevents or hinders another broadcast station serving a substantially different area from broadcasting any program of the network organization. This section shall not be construed to prohibit any contract, arrangement, or understanding between a station and a network organization pursuant to which the station is granted the first call in its primary service area upon the programs of the network organization.

§ 3.233 *Term of affiliation.* No license shall be granted to an FM broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which provides, by original terms, provisions for renewal, or otherwise for the affiliation of the station with the network organization for a period longer than 2 years: *Provided*, That a contract, arrangement, or understanding for a period up to 2 years, may be entered into within 6 months prior to the commencement of such period.

§ 3.234 *Option time.* No license shall be granted to an FM broadcast station which options for network programs any time subject to call on less than 56 days' notice, or more time than a total of 3 hours within each of four segments of the broadcast day, as herein described. The broadcast day is divided into four segments, as follows: 8 a. m. to 1 p. m.; 1 p. m. to 6 p. m.; 6 p. m. to 11 p. m.; 11 p. m. to 8 a. m. (These segments are to be determined for each station in terms of local time at the location of the station but may remain constant throughout the year regardless of shifts from standard to daylight saving time or vice versa.) Such options may not be exclusive as against other network organizations and may not prevent or hinder the station from optioning or selling any or all of the time covered by the option, or other time, to other network organizations.

NOTE 1. As used in this section, an option is any contract, arrangement, or understanding, express or implied, between a station and a network organization which prevents or hinders the station from scheduling programs before the network agrees to utilize the time during which such programs are scheduled, or which requires the station to clear time already scheduled when the network organization seeks to utilize the time.

NOTE 2. All time options permitted under this section must be specified clock hours, expressed in terms of any time system set forth in the contract agreed upon by the station and network organization. Shifts from daylight saving to standard time or vice versa may or may not shift the specified hours correspondingly as agreed by the station and network organization.

§ 3.235 *Right to reject programs.* No license shall be granted to an FM broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which (a), with respect to programs offered pursuant to an affiliation contract, prevents or hinders the station from rejecting or refusing network programs which the station reasonably believes to be unsatisfactory or unsuitable; or which (b), with respect to network programs so offered or already contracted for prevents the station from rejecting or refusing any program which, in its opinion, is contrary to the public interest, or from substituting a program of outstanding local or national importance.

§ 3.236 *Network ownership of stations.* No license shall be granted to a network organization, or to any person directly or indirectly controlled by or under common control of a network organization, for an FM broadcast station in any locality where the existing FM broadcast stations are so few or of such unequal desirability (in terms of coverage, power, frequency, or other related matters) that competition would be substantially restrained by such licensing. (The word "control" as used herein is not limited to majority stock ownership, but includes actual working control in whatever manner exercised.)

§ 3.237 *Dual network operation.* No license shall be issued to an FM broadcast station affiliated with a network organization which maintains more than one network of FM broadcast stations: *Provided*, That this section shall not be applicable if such networks are not operated simultaneously, or if there is no substantial overlap in the territory served by the group of stations comprising each such network.

§ 3.238 *Control by networks of station rates.* No license shall be granted to an FM broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization under which the station is prevented or hindered from, or penalized for, fixing or altering its rates for the sale of broadcast time for other than the network's programs.

§ 3.239 *Use of common antenna site.* No FM broadcast station license or renewal of FM broadcast station license will be granted to any person who owns, leases, or controls a particular site which is peculiarly suitable for FM broadcasting in a particular area and (a) which is not available for use by other FM broadcast station licensees; and (b) no other comparable site is available in the area; and (c) where the exclusive use of such site by the applicant or licensee would unduly limit the number of FM broadcast stations that can be authorized in a particular area or would unduly restrict competition among FM broadcast stations.

§ 3.240 *Multiple ownership.* No license for an FM broadcast station shall be granted to any party (including all parties under common control) if:

(a) Such party directly or indirectly owns, operates, or controls another FM broadcast station which serves substantially the same service area; or

(b) Such party, or any stockholder, officer or director of such party, directly or indirectly owns, operates, controls, or has any interest in, or is an officer or director of any other FM broadcast station if the grant of such license would result in a concentration of control of FM broadcasting in a manner inconsistent with public interest, convenience, or necessity. In determining whether there is such a concentration of control, consideration will be given to the facts of each case with particular reference to such factors as the size, extent and location of areas served, the number of people served, classes of stations involved, and the extent of other competitive service to the areas in question. The Commission, however, will in any event consider that there would be such a concentration of control contrary to the public interest, convenience or necessity for any party or any of its stockholders, officers or directors to have a direct or indirect interest in, or be stockholders, officers, or directors of, more than seven FM broadcast stations.

NOTE 1: The word "control" as used herein is not limited to majority stock ownership, but includes actual working control in whatever manner exercised.

NOTE 2: In applying the foregoing provisions to the stockholders of a corporation which has more than 50 voting stockholders, only those stockholders need be considered who are officers or directors or who directly or indirectly own 1 percent or more of the outstanding voting stock.

§ 3.241 *Special rules relating to contracts providing for reservation of time upon sale of a station.* (a) No license, renewal of license, assignment of license, or transfer of control of a corporate licensee shall be granted or authorized to a FM broadcast station which has a contract, arrangement or understanding, express or implied, pursuant to which, as consideration or partial consideration for the assignment of license or transfer of control, the assignor of a station license or the transferor of stock, where transfer of a corporate licensee is involved, or the nominee of such assignor or transferor retains any right of reversion of the license or any right to the reassignment of the license in the future, or reserves the right to use the facilities of the station for any period whatsoever.

(b) In the case of assignment of license or transfer of control of a corporate licensee approved by the Commission before the effective date of this section, February 15, 1949, involving a contract, arrangement or understanding of the type covered by paragraph (a) of this section and the existence and terms of which were fully disclosed to the Commission at the time of execution, the Commission will give consideration to the issuance of a license despite the existence of such contract, arrangement or understanding, if the parties thereto modify such contract within 6 months from the effective date of this section. Such modification will be considered on the facts of each case but no such modification will be approved unless the modified contract contains at least the following provisions:

(1) A maximum limitation of the time subject to reservation so that no more than 12 hours per week shall be subject to reservation, of which no more than 4 hours shall be on any given day.

(2) A clause providing that the licensee reserves the right to reject or refuse programs which he reasonably believes to be unsatisfactory or unsuitable or for which, in his opinion, a program of outstanding local or national importance should be substituted, but provision may be made for the substitution of other radio time for programs so rejected or for the payment at the station card rate for the time made unavailable.

(3) A prohibition against the resale or reassignment of any of the broadcast time reserved by such modified contract.

(4) An express negation of any right with respect to reversion or reassignment of license.

(5) An express provision setting forth a definite expiration date of the contract arrangement or understanding. Such expiration date shall not extend beyond February 15, 1964, and shall in no event extend beyond the expiration date originally provided for in any such contract, agreement or understanding, in the event that such expiration date is a date prior to February 15, 1964.

(6) An express provision giving to the licensee the right to terminate the contract, arrangement or understanding for substantial cause, including, but not limited to, the assignment of license or the transfer of control of a corporate licensee, consistent disagreement over programs between the parties, or the acquisition of a network affiliation by the licensee, upon the payment of a lump sum or periodic payments, and providing that the amount initially fixed shall thereafter decrease as the amount of time reserved is decreased by performance of the contract. Any such payment should not be so unduly large as to constitute in practice an effective deterrent to the licensee exercising the right. In determining whether the amount is unduly large, the Commission will consider the amount by which consideration in return for the transfer of the station was decreased by reason of the reservation of time or the present value of the radio time still reserved and unused as of the date of the exercise of the right of termination.

§ 3.250 *Acceptability of broadcast transmitters for licensing.* (a) In order to facilitate the filing of, and action on applications for station authorizations, transmitters will be accepted for licensing by the Commission under one of the following conditions:

(1) A transmitter may be type-accepted upon the request of any manufacturer of transmitters built in quantity by following the type acceptance procedure set forth in Part 2 of this chapter, provided that the data and information submitted indicates that the transmitter meets the requirements of § 3.317. If accepted, such transmitter will be included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment" Applicants specifying transmitters included on such a list need not submit detailed descriptions and diagrams where the correct type number is specified, provided that the equipment proposed is identical with that accepted. Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(2) An application specifying a transmitter not included on the Radio Equipment List, Part B, may be accepted upon the request of a prospective licensee submitting with the application for construction permit a complete description of the transmitter, including the circuit diagram, listing of all tubes used, function of each, multiplication in each stage, plate current and voltage applied to each tube, a description of the oscillator circuit together with any devices installed for the purpose of frequency stabilization and the means of varying output power to compensate for power supply voltage variations. However, if this data has been filed with the Commission by a manufacturer in connection with a request for type acceptance, it need not be submitted with the application for construction permit but may be referred to as "on file" Measurement data for type acceptance made in accordance with subparagraph (1) of this paragraph shall be submitted with the license application.

(3) A transmitter shown on an instrument of authorization by manufacturer and type number, or as a composite, and which was in use prior to June 30, 1955 may continue to be used by the licensee, his successors or assignees, provided such transmitter continues to comply with the rules and regulations.

(b) Additional rules with respect to withdrawal of type-acceptance, modification of type-accepted equipment and limitations on the findings upon which type acceptance is based are set forth in Part 2 of this chapter.

§ 3.251 *Transmitter power.* The standard power rating and operating power range of transmitters shall be in accordance with § 3.317.

§ 3.252 *Frequency monitor.* (a) The licensee of each station shall have in operation, either at the transmitter or at the place where the transmitter is controlled, a frequency monitor of a type approved by the Commission which shall be independent of the frequency control of the transmitter.

NOTE: Approved frequency monitors are included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment". Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(b) In the event that the frequency monitor becomes defective the station may be operated without the monitor pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided,* That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the monitor was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the monitor is found to be defective and immediately after the repaired or replacement monitor has been installed and is functioning properly.

(3) The frequency of the station shall be compared with an external frequency source of known accuracy at sufficiently frequent intervals to insure that the frequency is maintained within the tolerance prescribed in § 3.269. An entry shall be made in the station log as to the method used and the results thereof.

(c) If conditions beyond the control of the licensee prevent the restoration of the monitor to service within the above allowed period, informal request in accordance with § 1.332 (d) of this chapter may be filed with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

§ 3.253 *Modulation monitor.* (a) The licensee of each station shall have in operation, either at the transmitter or at the place where the transmitter is controlled, a modulation monitor of the type approved by the Commission.

NOTE. Approved modulation monitors are included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment." Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(b) In the event that the modulation monitor becomes defective the station may be operated without the monitor pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided*, That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the monitor was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the monitor is found to be defective and immediately after the repaired or replacement monitor has been installed and is functioning properly.

(3) During the period when the station is operated without the modulation monitor the licensee shall provide other suitable means for insuring that the modulation is maintained within the tolerance prescribed in § 3.268.

(c) If conditions beyond the control of the licensee prevent the restoration of the monitor to service within the above allowed period, informal request in accordance with § 1.332 (d) of this chapter may be filed with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

§ 3.254 *Required transmitter performance.* (a) The construction, installation, operation and performance of the FM broadcast transmitting system shall be in accordance with § 3.317.

(b) The licensee of each FM broadcast station shall make the following equipment performance measurements at least at yearly intervals (One such set of measurements shall be made during the four-month period preceding the date of filing application for renewal of station license.)

(1) Audio frequency response from 50 to 15,000 cycles for approximately 25, 50 and 100 percent modulation. Measurements shall be made on at least the following audio frequencies: 50, 100, 400, 1000, 5000, 10,000 and 15,000 cycles. The frequency response measurements should normally be made without deemphasis; however, standard 75 microsecond deemphasis may be employed in the measuring equipment or system provided the accuracy of the deemphasis circuit is sufficient to insure that the measured response is within the prescribed limits.

(2) Audio frequency harmonic distortion for 25, 50 and 100 percent modulation for the fundamental frequencies of 50, 100, 400, 1000, and 5000 cycles Audio frequency harmonics for 100 percent modulation for fundamental frequencies of 10,000 and 15,000 cycles. Measurements shall normally include harmonics to 30,000 cycles. The distortion measurements shall be made employing 75 microsecond deemphasis in the measuring equipment or system.

(3) Output noise level (frequency modulation) in the band of 50 to 15,000 cycles in decibels below the audio frequency level representing a frequency swing of 75 kilocycles. The noise measurements shall be made employing 75 microsecond deemphasis in the measuring equipment or system.

(4) Output noise level (amplitude modulation) in the band of 50 to 15,000 cycles in decibels below the level representing 100 percent amplitude modulation The noise measurements shall be made employing 75 microsecond deemphasis in the measuring equipment or system. All measurements shall be made with the equipment adjusted for normal program operation and shall include all circuits between the main studio microphone terminals and the antenna output, including telephone lines, preemphasis circuits and any equalizers employed except for microphones, and without compression if a compression amplifier is installed.

(c) The data required by paragraph (b) of this section together with a description of instruments and procedure signed by the engineer making the measurements shall be kept on file at the transmitter and retained for a period of two years and shall be made available during that time upon request to any duly authorized representative of the Federal Communications Commission.

§ 3.255 *Auxiliary transmitter.* Upon showing that a need exists for the use of an auxiliary transmitter in addition to the regular transmitter of an FM broadcast station, a license therefor may be issued: *Provided*, That:

(a) An auxiliary transmitter may be installed either at the same location as the main transmitter or at another location.

(b) A licensed operator shall be in control whenever an auxiliary transmitter is placed in operation.

(c) The auxiliary transmitter shall be maintained so that it may be put into immediate operation at any time for the following purposes:

(1) The transmission of the regular programs upon the failure of the main transmitter.

(2) The transmission of regular programs during maintenance or modification work on the main transmitter, necessitating discontinuance of its operation for a period not to exceed 5 days. (This includes the equipment changes which may be made without authority as set forth elsewhere in the rules and regulations or as authorized by the Commission by letter or by construction permit. Where such operation is required for periods in excess of 5 days, request therefor shall be in accordance with § 1.324 of this chapter.)

(3) Upon request by a duly authorized representative of the Commission.

(d) The auxiliary transmitter shall be tested at least once each week to determine that it is in proper operating condition and that it is adjusted to the proper frequency, except that in the case of operation in accordance with paragraph (c) of this section during any week, the test in that week may be omitted provided the operation under paragraph (c) of this section is satisfactory. Tests shall be conducted only between midnight and 6 a. m., local standard time. A record shall be kept of the time and result of each test. Such records shall be retained for a period of two years.

(e) The auxiliary transmitter shall be equipped with satisfactory control equipment which will enable the maintenance of the frequency emitted by the station within the limits prescribed by the regulations in this part.

(f) The operating power of an auxiliary transmitter may be less than the authorized power of the main transmitter, but in no event shall it be greater than such power.

§ 3.256 *Alternate main transmitters.* The licensee of an FM broadcast station may be licensed for alternate main transmitters provided that a technical need for such alternate transmitters is shown (such as licensees maintaining 24-hour schedule and needing alternate operation for maintenance, or where developmental work requires alternate operation) and that the following conditions are met:

(a) Both transmitters are located at the same place.

(b) Both transmitters shall have the same power rating.

(c) Both transmitters shall meet the construction, installation, operation, and performance requirements of § 3.317.

§ 3.257 *Changes in equipment and antenna system.* Licensees of FM broadcast stations shall observe the following provisions with regard to changes in equipment and antenna system:

(a) No changes in equipment shall be made:

(1) That would result in the emission of signals outside of the authorized channel.

(2) That would result in the external performance of the transmitter being in disagreement with that prescribed in § 3.317.

(b) Specific authority, upon filing formal application (FCC Form 301) therefor, is required for a change in service area or for any of the following changes:

(1) Changes involving an increase or decrease in the power rating of the transmitter

(2) A replacement of the transmitter as a whole.

(3) Change in the location of the transmitting antenna.

(4) Change in antenna system, including transmission line.

(5) Change in location of main studio, if it is proposed to move the main studio to a different city from that specified in the license.

(6) Change in the power delivered to the antenna.

(7) Change in frequency control and/or modulation system.

(8) Change in the authorized transmitter remote control point(s)

(c) Other changes, except as above provided for in this section or in the Technical Standards of this subpart may be made at any time without the authority of the Commission: *Provided*, That the Commission shall be promptly notified thereof and such changes shall be shown in the next application for renewal of license.

§ 3.258 *Indicating instruments.* (a) Each FM broadcast station shall be equipped with indicating instruments, which conform with the specifications set forth in § 3.320, for measuring the direct plate voltage and current of the last radio stage and the transmission line radio frequency current, voltage or power.

(b) In the event that any one of these indicating instruments becomes defective when no substitute which conforms with the required specifications is available, the station may be operated without the defective instrument pending its repair or replacement for a period not in excess of 60 days: *Provided*, That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the meter was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified immediately after the instrument is found to be defective and immediately after the repaired or replaced instrument has been installed and functioning properly.

(3) If the defective instrument is a plate voltmeter or plate ammeter in the last radio stage, the operating power shall be maintained by means of the radio frequency transmission line meter.

(c) If conditions beyond the control of the licensee prevent the restoration of the meter to service within the above allowed period, informal request may be filed in accordance with § 1.332 (d) of this chapter with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

TECHNICAL OPERATION

§ 3.261 *Time of operation.* All FM broadcast stations will be licensed for unlimited time operation. A minimum of 36 hours per week during the hours of 6:00 a. m. to midnight, consisting of not less than 5 hours in any one day, must be devoted to the FM broadcast operation; time devoted to operations conducted pursuant to a Subsidiary Communications Authorization (see §§ 3.293–3.295) shall not be included in meeting this 36-hour broadcast requirement. In an emergency when, due to causes beyond the control of a licensee, it becomes impossible to continue operation, the station may cease operation for a period not to exceed 10 days, provided that the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified in writing immediately after the emergency develops.

§ 3.262 *Experimental operation.* The period between 1:00 a. m., and 6:00 a. m., local standard time, may be used for experimental purposes in testing and maintaining apparatus by the licensee of any FM broadcast station on its assigned frequency and not in excess of its authorized power without specific authorization by the Commission.

§ 3.263 *Station inspection.* The licensee of any FM broadcast station shall make the station available for inspection by representatives of the Commission at any reasonable hour.

§ 3.264 *Station and operator licenses; posting of.* (a) The station license and any other instrument of station authorization shall be posted in a conspicuous place and in such manner that all terms are visible, at the place the licensee considers to be the principal control point of the transmitter. At all other control points listed on the station authorization, a photocopy of the station license and other instruments of station authorization shall be posted.

(b) The original operator license, or FCC Form 759, of each station operator shall be posted at the place where he is on duty as an operator

§ 3.265 *Operator requirements.* (a) One or more radio operators holding a valid radiotelephone first-class operator license, except as provided in this section, shall be in actual charge of the transmitting apparatus and shall be on duty either at the transmitter location or remote control point.

(b) A station which is authorized with transmitter power output of 10 kilowatts or less may be operated by persons holding commercial radio operator license of any class, except an aircraft radiotelephone operator authorization or a temporary limited radiotelegraph second-class operator license, when the equipment is so designed that the stability of the frequency is maintained by the transmitter itself within the limits of tolerance specified, and none of the operations, except those specified in subparagraphs (1), (2) and (3) of this paragraph, necessary to be performed during the course of normal operation may cause off-frequency operation or result in any unauthorized radiation. Adjustments of transmitting equipment by such operators, except when under the immediate supervision of a radiotelephone first-class operator shall be limited to the following:

(1) Those necessary to commence or terminate transmitter emissions as a routine matter.

(2) Those external adjustments that may be required as a result of variations of primary power supply.

(3) Those external adjustments which may be necessary to insure modulation within the limits required.

Should the transmitting apparatus be observed to be operating in a manner inconsistent with the station's instrument of authorization and none of the above adjustments are effective in bringing it into proper operation, a person holding other than a radiotelephone first-class operator license and not acting under the immediate supervision of a radiotelephone first-class operator, shall be required to terminate the station's emissions.

(c) The licensee of a station which is operated by one or more operators holding other than a radiotelephone first-class operator license shall have one or more operators holding a radiotelephone first-class operator license in regular full-time employment at the station whose primary duties shall be to effect and insure the proper functioning of the transmitting equipment. In the event that the licensee also operates a standard broadcast station in the same community, a regular full-time radiotelephone first-class operator or operators employed in connection with the FM broadcast station may concurrently be employed to satisfy the requirements of § 3.93 (c): *Provided*, That the duties of such operator or operators concerning the standard broadcast transmitting equipment shall in nowise interfere with the proper performance of his duties with respect to the FM broadcast transmitter.

(d) The licensed operator on duty and in charge of an FM broadcast transmitter may, at the discretion of the licensee, be employed for other duties or for the operation of another radio station or stations in accordance with the class of operator's license which he holds and the rules and regulations governing such other stations: *Provided, however*, That such duties shall in nowise interfere with the proper operation of the FM broadcast transmitter.

§ 3.266 *Facsimile broadcasting and multiplex transmission.* (a) FM broadcast stations may transmit simplex facsimile in accordance with transmission standards set forth in § 3.318 during periods not devoted to FM aural broadcasting. Such transmissions may not exceed one hour during the period between 7 a. m. and midnight (no limit for the hours between midnight and 7 a. m.) and may not be counted toward the minimum operation required by § 3.261. The Commission shall be notified by the licensee

of the FM broadcast station of its intent to transmit such facsimile.

(b) FM broadcast stations may, upon securing authorization from the Commission, transmit multiplex facsimile in accordance with transmission standards set forth in § 3.318: *Provided*, That the transmission of such facsimile does not reduce the quality of aural programs simultaneously transmitted by the licensee below that required by the Technical Standards of this subpart and that no degradation of such aural programs will result from such facsimile transmissions when received on FM receivers not equipped with filter or other additional equipment.

§ 3.267 *Operating power; determination and maintenance of.* (a) The operating power of each station shall be determined by the indirect method. This is the product of the plate voltage (E_p) and the plate current (I_p) of the last radio stage, and an efficiency factor, F; that is:

$$\text{Operating power} = E_p \times I_p \times F$$

The efficiency factor, F, shall be established by the transmitter manufacturer for each type of transmitter for which Commission approval is requested, and shall be specified in the instruction books supplied to the customer with each transmitter. In the case of composite equipment the factor, F, shall be furnished to the Commission along with a statement of the basis used in determining such factor.

(b) The operating power of each station shall be maintained as near as practicable to the authorized operating power, and shall not exceed the limits of 5 percent above and 10 percent below the authorized power, except that in an emergency when it becomes impossible to operate with the authorized power, the station may be operated with reduced power for a period not to exceed 10 days, provided the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified immediately after the emergency develops, and also upon the resumption of normal operating power.

§ 3.268 *Modulation.* The percentage of modulation of FM broadcast stations shall be maintained as high as possible consistent with good quality of transmission and good broadcast practice and in no case less than 85 percent nor more than 100 percent on peaks of frequent recurrence during any selection which normally is transmitted at the highest level of the program under consideration.

§ 3.269 *Frequency tolerance.* The center frequency of each FM broadcast station shall be maintained within 2000 cycles of the assigned center frequency.

§ 3.270 *Antenna structure, marking and lighting.* Where an antenna structure(s) is required to be painted or lighted see § 17.29, *Inspection of tower lights and associated control equipment;* § 17.39, *Cleaning and repainting;* § 17.40 *Time when lights shall be exhibited;* § 17.41 *Spare lamps;* and § 17.42, *Lighting equipment;* of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.271 *Discontinuance of operation.* The licensee of each station shall notify the Commission in Washington, D. C., and the Engineer in Charge of the radio district where such station is located of permanent discontinuance of operation at least two days before operation is discontinued. The licensee shall, in addition, immediately forward the station license and other instruments of authorization to the Washington, D. C., office of the Commission for cancellation.

§ 3.272 *Field intensity measurements.* The Commission may require field intensity measurements in connection with applications and in other cases where such measurements are found to be necessary. For example, any application which asserts that interference predicted under the Technical Standards of this subpart would not be realized may require supplementary data including appropriate field intensity measurements. Furthermore, in order that FM broadcast station coverage data may be accumulated it is desirable that existing FM broadcast stations make such measurements where feasible and file the data with the Commission.

§ 3.273 *Emergency antenna.* In the event it becomes impossible to operate with the regularly authorized antenna, the station may, without further authority, be operated with an emergency antenna for a period of 10 days or less pending necessary repairs: *Provided*, That the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified in writing immediately upon the beginning of such operation and upon the resumption of normal operation

§ 3.274 *Remote control operation.* A station which is authorized with transmitter power output of 10 kilowatts or less may, upon prior authorization from the Commission, be operated by remote control at the point(s) which shall be specified in the station license. An application for authorization to operate by remote control may be made as a part of an application for construction permit or license or modification thereof by specifying the proposed remote control point(s). Operation by remote control shall be subject to the following conditions:

(a) The equipment at the operating and transmitting positions shall be so installed and protected that it is not accessible to or capable of operation by persons other than those duly authorized by the licensee.

(b) The control circuits from the operating position to the transmitter shall provide positive on and off control and shall be such that open circuits, short circuits, grounds or other line faults will not actuate the transmitter and any fault causing loss of such control will automatically place the transmitter in an inoperative condition.

(c) Control and monitoring equipment shall be installed so as to allow the licensed operator either at the remote control point or at the transmitter to perform all of the functions in a manner required by the Commission's rules and Standards.

OTHER OPERATING REQUIREMENTS

§ 3.281 *Logs.* The licensee or permittee of each FM broadcast station shall maintain separate program and operating logs for such station: *Provided, however*, If the same licensee or permittee operates an FM broadcast station and a standard broadcast station and simultaneously broadcasts the same programs over the facilities of both such stations, one program log may be maintained for both stations for such periods as both stations simultaneously broadcast the same programs. Such licensee or permittee shall require entries to be made as follows:

(a) In the program log:

(1) An entry of the time each station identification announcement (call letters and location) is made.

(2) An entry briefly describing each program broadcast, such as "music," "drama," "speech," etc., together with the name or title thereof and the sponsor's name, with the time of the beginning and ending of the complete program. If a mechanical record is used, the entry shall show the exact nature thereof, such as "record," "transcription," etc., and the time it is announced as a mechanical reproduction. If a speech is made by a political candidate, the name and political affiliations of such speaker shall be entered.

(3) An entry showing that each sponsored program broadcast has been announced as sponsored, paid for, or furnished by the sponsor.

(4) An entry showing, for each program of network origin, the name of the network originating the program.

(b) In the operating log:

(1) An entry of the time the station begins to supply power to the antenna, and the time is stops.

(2) An entry of the time the program begins and ends.

(3) An entry of each interruption to the carrier wave, its cause, and duration.

(4) An entry of the following each 30 minutes:

(i) Operating constants of last radio stage (total plate current and plate voltage).

(ii) RF transmission line meter reading.

(iii) Frequency monitor reading.

(5) Log of experimental operation during experimental period (if regular operation is maintained during this period, the above logs shall be kept).

(i) A log must be kept of all operation during the experimental period. If the entries required above are not applicable thereto, then the entries shall be made so as to fully describe the operation.

(c) Where an antenna structure(s) is required to be illuminated see § 17.38, *Recording of tower light inspections in the station record*, of Part 17 of this chapter, (Construction, Marking and Lighting of Antenna Structures).

§ 3.282 *Logs; retention of.* Logs of FM broadcast stations shall be retained by the licensee or permittee for a period of two years: *Provided, however*, That logs involving communications incident to a disaster or which include communications incident to or involved in an investigation by the Commission and

concerning which the licensee or permittee has been notified, shall be retained by the licensee or permittee until he is specifically authorized in writing by the Commission to destroy them: *Provided, further,* That logs incident to or involved in any claim or complaint of which the licensee or permittee has notice shall be retained by the licensee or permittee until such claim or complaint has been fully satisfied or until the same has been barred by statute limiting the time for the filing of suits upon such claims.

§ 3.283 *Logs; by whom kept.* Each log shall be kept by the person or persons competent to do so, having actual knowledge of the facts required, who shall sign the log when starting duty and again when going off duty. The logs shall be made available upon request by an authorized representative of the Commission.

§ 3.284 *Log form.* The log shall be kept in an orderly manner, in suitable form, and in such detail that the data required for the particular class of station concerned are readily available. Key letters or abbreviations may be used if proper meaning or explanation is contained elsewhere in the log.

§ 3.285 *Correction of logs.* No log or portion thereof shall be erased, obliterated, or willfully destroyed within the period of retention provided by the rules. Any necessary correction may be made only by the person originating the entry who shall strike out the erroneous portion, initial the correction made, and indicate the date of correction.

§ 3.286 *Rough logs.* Rough logs may be transcribed into condensed form, but in such case the original log or memoranda and all portions thereof shall be preserved and made a part of the complete log.

§ 3.287 *Station identification.* (a) A licensee of an FM broadcast station shall make separate station identification announcement (call letters and location) for such station: *Provided, however,* That, if the same licensee operates an FM broadcast station and a standard broadcast station and simultaneously broadcasts the same programs over the facilities of both such stations, station identification announcements may be made jointly for both stations for periods of such simultaneous operation. If the call letters of the FM station do not clearly reveal that it is an FM station, the joint announcement shall state that one of the stations is an FM station. Station identification announcement shall be made at the beginning and ending of each time of operation and during operation (1) on the hour and (2) either on the half hour or at the quarter hour following the hour and at the quarter hour preceding the next hour: *Provided,*

(b) Such identification announcement need not be made on the hour when to make such announcement would interrupt a single consecutive speech, play, religious service, symphony concert, or operatic production of longer duration than 30 minutes. In such cases the identification announcement shall be made at the beginning of the program, at the first interruption of the entertainment continuity, and at the conclusion of the program.

(c) Such identification announcement need not be made on the half hour or quarter hours when to make such announcement would interrupt a single consecutive speech, play, religious service, symphony concert, or operatic production. In such cases an identification announcement shall be made at the first interruption of the entertainment continuity and at the conclusion of the program: *Provided,* That an announcement within 5 minutes of the times specified in paragraph (a) (2) of this section will satisfy the requirements of identification announcements.

(d) In the case of variety show programs, baseball game programs or similar programs of longer duration than 30 minutes, the identification announcement shall be made within 5 minutes of the hour and of the times specified in paragraph (a) (2) of this section.

(e) In the case of all other programs, the identification announcement shall be made within 2 minutes of the hour and of the times specified in paragraph (a) (2) of this section.

(f) In making the identification announcement the call letters shall be given only on the channel of the station identified thereby except as otherwise provided herein.

§ 3.288 *Mechanical records.* Each program broadcast which consists in whole or in part of one or more mechanical reproductions shall be announced in the manner and to the extent set out in paragraphs (a) to (e) of this section.

(a) Each such program of longer duration than 30 minutes, consisting in whole or in part of one or more mechanical reproductions, shall be identified by appropriate announcement at the beginning of the program, at each 30-minute interval and at the conclusion of the program: *Provided, however,* That the identifying announcement at each 30-minute interval is not required in case of a mechanical reproduction consisting of a continuous uninterrupted speech, play, religious service, symphony concert, or operatic production of longer than 30 minutes.

(b) Each such program of a longer duration than 5 minutes and not in excess of 30 minutes, consisting in whole or in part of one or more mechanical reproductions, shall be identified by an appropriate announcement at the beginning and end of the program.

(c) Each such program of duration of 5 minutes or less, consisting in whole or in part of mechanical reproductions, shall be identified by appropriate announcement immediately preceding the use thereof: *Provided, however,* That each such program of one minute or less need not be announced as such.

(d) In case a mechanical reproduction is used for background music, sound effects, station identification, program identification (theme music of short duration) or identification of the sponsorship of the program proper, no announcement of the mechanical reproduction is required.

(e) The exact form of identifying announcement is not prescribed, but the language shall be clear and in terms commonly used and understood. A licensee shall not attempt affirmatively to create the impression that any program being broadcast by mechanical reproduction consists of live talent.

§ 3.289 *Sponsored programs; announcement of.* (a) In the case of each program for the broadcasting of which money, services, or other valuable consideration is either directly or indirectly paid or promised to, or charged or received by, any radio broadcast station, the station broadcasting such program shall make, or cause to be made, an appropriate announcement that the program is sponsored, paid for, or furnished, either in whole or in part.

(b) In the case of any political program or any program involving the discussion of public controversial issues for which any records, transcriptions, talent, scripts, or other material or services of any kind are furnished, either directly or indirectly, to a station as an inducement to the broadcasting of such program, an announcement shall be made both at the beginning and conclusion of such program on which such material or services are used that such records, transcriptions, talent, scripts, or other material or services have been furnished to such station in connection with the broadcasting of such program: *Provided, however,* That only one such announcement need be made in the case of any such program of 5 minutes' duration or less, which announcement may be made either at the beginning or conclusion of the program.

(c) The announcement required by this section shall fully and fairly disclose the true identity of the person or persons by whom or in whose behalf such payment is made or promised, or from whom or in whose behalf such services or other valuable consideration is received, or by whom the material or services referred to in paragraph (b) of this section are furnished. Where an agent or other person contracts or otherwise makes arrangements with a station on behalf of another, and such fact is known to the station, the announcement shall disclose the identity of the person or persons in whose behalf such agent is acting instead of the name of such agent.

(d) In the case of any program, other than a program advertising commercial products or services, which is sponsored, paid for, or furnished, either in whole or in part, or for which material or services referred to in paragraph (b) of this section are furnished, by a corporation, committee, association or other unincorporated group, the announcement required by this section, shall disclose the name of such corporation, committee, association or other unincorporated group. In each such case the station shall require that a list of the chief executive officers or members of the executive committee or of the board of directors of the corporation, committee, association or other unincorporated group shall be made available for public inspection at one of the radio stations carrying the program.

(e) In the case of programs advertising commercial products or services, an announcement stating the sponsor's corporate or trade name or the name of the sponsor's product, shall be deemed sufficient for the purposes of this section and only one such announcement need be made at any time during the course of the program.

§ 3.290 *Broadcasts by candidates for public office*—(a) *Definitions.* A "legally qualified candidate" means any person who has publicly announced that he is a candidate for nomination by a convention of a political party or for nomination or election in a primary, special, or general election, municipal, county, state or national, and who meets the qualifications prescribed by the applicable laws to hold the office for which he is a candidate, so that he may be voted for by the electorate directly or by means of delegates or electors, and who—

(1) Has qualified for a place on the ballot or

(2) Is eligible under the applicable law to be voted for by sticker, by writing in his name on the ballot, or other method, and (i) has been duly nominated by a political party which is commonly known and regarded as such, or (ii) makes a substantial showing that he is a bona fide candidate for nomination or office, as the case may be.

(b) *General requirements.* No station licensee is required to permit the use of its facilities by any legally qualified candidate for public office, but if any licensee shall permit any such candidate to use its facilities, it shall afford equal opportunities to all other such candidates for that office to use such facilities: *Provided*, That such licensee shall have no power of censorship over the material broadcast by any such candidate.

(c) *Rates and practices.* (1) The rates, if any, charged all such candidates for the same office shall be uniform and shall not be rebated by any means direct or indirect. A candidate shall, in each case, be charged no more than the rate the station would charge if the candidate were a commercial advertiser whose advertising was directed to promoting its business within the same area as that encompassed by the particular office for which such person is a candidate. All discount privileges otherwise offered by a station to commercial advertisers shall be available upon equal terms to all candidates for public office.

(2) In making time available to candidates for public office no licensee shall make any discrimination between candidates in charges, practices, regulations, facilities, or services for or in connection with the service rendered pursuant to this part, or make or give any preference to any candidate for public office or subject any such candidate to any prejudice or disadvantage; nor shall any licensee make any contract or other agreement which shall have the effect of permitting any legally qualified candidate for any public office to broadcast to the exclusion of other legally qualified candidates for the same public office.

(d) *Inspection of records.* Every licensee shall keep and permit public inspection of a complete record of all requests for broadcast time made by or on behalf of candidates for public office, together with an appropriate notation showing the disposition made by the licensee of such requests, and the charges made, if any, if request is granted. Such records shall be retained for a period of two years.

§ 3.291 *Rebroadcast.* (a) The term "rebroadcast" means reception by radio of the program of a radio station, and the simultaneous or subsequent retransmission of such program by a broadcast station.

NOTE 1: As used in this section, program includes any complete program or part thereof.

NOTE 2. In case a program is transmitted from its point of origin to a broadcast station entirely by telephone facilities in which a section of such transmission is by radio, the broadcasting of this program is not considered a rebroadcast.

(b) The licensee of an FM broadcast station may, without further authority of the Commission, rebroadcast the program of a United States standard, FM or noncommercial educational FM broadcast station, provided the Commission is notified of the call letters of each station rebroadcast and the licensee certifies that express authority has been received from the licensee of the station originating the program.

NOTE: The notice and certification of consent shall be given within 3 days of any single rebroadcast, but in case of the regular practice of rebroadcasting certain programs of a standard or FM broadcast station several times during a license period, notice and certification of consent shall be given for the ensuing license period with the application for renewal of license, or at the beginning of such rebroadcast practice if begun during a license period.

(c) (1) The licensee of an FM broadcast station located within a State or the District of Columbia may, without further authority of the Commission, rebroadcast on a noncommercial basis a noncommercial program of a United States international broadcast station.

(2) The licensee of an FM broadcast station located in any territory or insular possession of the United States may, without further authority of the Commission, rebroadcast any program of a United States international broadcast station.

(3) In the case of any rebroadcast under the provisions of this paragraph, the Commission shall be notified of the call letters of each station whose program is rebroadcast and the licensee shall certify that express authority has been received from the licensee of the station originating the program.

(d) No licensee of an FM broadcast station shall rebroadcast the program of any United States radio station not designated in paragraph (b) or (c) of this section without written authority having first been obtained from the Commission upon application (informal) accompanied by written consent or certification of consent of the licensee of the station originating the program.

NOTE 1: The broadcasting of a program relayed by a remote pickup broadcast station or an ST broadcast station is not considered a rebroadcast.

NOTE 2: By Order No. 82, dated and effective June 24, 1941, until further order of the Commission, § 3.291 (d) is suspended only insofar as it requires prior written authority of the Commission for the rebroadcasting of programs originated for that express purpose by United States Government radio stations.

§ 3.292 *Lotteries.* (a) An application for construction permit, license, renewal of license, or any other authorization for the operation of a broadcast station, will not be granted where the applicant proposes to follow or continue to follow a policy or practice of broadcasting or permitting "the broadcasting of, any advertisement of or information concerning any lottery, gift enterprise, or similar scheme, offering prizes dependent in whole or in part upon lot or chance, or any list of the prizes drawn or awarded by means of any such lottery, gift enterprise, or scheme, whether said list contains any part or all of such prizes." (See 18 U. S. C. 1304.)

(b) The determination whether a particular program comes within the provisions of paragraph (a) of this section depends on the facts of each case. However, the Commission will in any event consider that a program comes within the provisions of paragraph (a) of this section if in connection with such program a prize consisting of money or thing of value is awarded to any person whose selection is dependent in whole or in part upon lot or chance, if as a condition of winning or competing for such prize, such winner or winners are required to furnish any money or thing of value or are required to have in their possession any product sold, manufactured, furnished or distributed by a sponsor of a program broadcast on the station in question.

§ 3.293 *Subsidiary communications authorization.* An FM broadcast licensee or permittee may apply for a Subsidiary Communications Authorization (SCA) to engage in a limited type of non-broadcast service. These services are restricted to those involving programming consisting of news, music, time, weather, and other similar programming categories. (The functional music services whereby FM stations undertake to supply programs of a predominantly musical nature to commercial establishments is an example of such an SCA service.) FCC Form 318—Application for Subsidiary Communications Authorization shall be submitted; the applicant for the SCA shall there specify the particular nature or purposes of the SCA operation or operations sought, and whether it will be conducted on a simplex or multiplex basis, or both. If on a multiplex basis, it may be carried on without restriction as to time; if on a simplex basis, the SCA operation shall be conducted during those times not devoted to the 36 hours required under § 3.261 for FM broadcast operation. (Subsidiary Communications Authorizations on a simplex basis will be issued to expire July 1, 1956.)

§ 3.294 *Nature of the SCA.* (a) The SCA is of a subsidiary or secondary nature and shall not exist apart from the

FM license or permit. No transfer or assignment of it shall be made separate from the FM broadcast license, and failure to transfer the SCA (through application on FCC Form 318) with the FM license or permit renders the SCA void. The licensee or permittee must seek renewal of the SCA (on FCC Form 318) at the same time it applies for its renewal of FM license or permit; failure to renew the latter automatically terminates the SCA.

(b) The grant or renewal of an FM license or permit shall not be furthered or promoted by the proposed or past operation under an SCA; the licensee must establish that his broadcast operation is in the public interest wholly apart from the SCA activities. (Violation of rules applicable to the SCA operation would, of course, reflect on the licensee's qualifications to hold its broadcast license or permit.)

§ 3.295 *Operation under the SCA.* (a) The SCA holder must restrict its operation to the uses or purposes granted by the Commission in acting upon his application; prior permission to engage in any additional or new activity must be obtained from the Commission.

(b) Supersonic tones or other similar devices may be employed with respect to material transmitted during the SCA operation in order to promote or maintain its commercial marketability, with the station using appropriate actuating devices with the subscribers' receivers.

(c) In all arrangements entered into under the SCA with outside parties, the licensee or permittee must pass on all material to be transmitted over the station's facilities, with the right to reject any material which it deems inappropriate or undesirable; when the SCA operation is conducted on a simplex basis, the licensee must be able, through appropriate contractual arrangement, to substitute a broadcast program at any time it deems it in the public interest to do so.

(d) The requirements of §§ 3.290 and 3.291 are equally applicable when the FM licensee or permittee is engaged in operations pursuant to the SCA.

(e) The requirements of § 3.287 with respect to station identification announcements must be met by identification on the main carrier when a station is engaged in SCA operations. The licensee may prevent their reception on subscribers' receivers through the use of supersonic tones capable of deactivating these specialized receivers.

(f) The requirements of §§ 3.288 and 3.289 are applicable to the SCA operation when the latter is conducted on a simplex basis; provided that the station may employ supersonic tones or other devices to prevent the reception of such announcements over subscribers' receivers. The requirement of § 3.289 shall be deemed to have been met by the SCA operator by the latter's announcement that the program is being transmitted for a fee to commercial subscribers.

(g) The FM licensee or permittee shall maintain logs for the SCA operations. In the program log, the following entries shall be made:

(1) An entry of the time each station identification announcement (call letters and location) is made.

(2) An entry describing the material transmitted in each hour segment. If a speech is made by a political candidate, the name and political affiliations of such speaker shall be entered.

(3) An entry showing that sponsorship and mechanical record announcements, when required under paragraph (f) of this section, have been made, and the time of the latter announcements.

(h) The requirements of § 3.281 (b), (1)–(4), inclusive and (c), and §§ 3.282 to 3.286, inclusive, are equally applicable to logs to be maintained during the SCA operation.

(i) The requirements of § 3.265 with respect to operators and the provisions of § 3.274 relating to remote control operation are equally applicable to operation during the SCA period.

(j) The licensee must observe all technical rules and standards applicable to FM broadcast stations when conducting the SCA operation. (For criteria applicable to the multiplex SCA operation, see § 3.318.)

FM TECHNICAL STANDARDS

§ 3.301 *Introduction.* (a) There are presented herein the Commission's engineering standards relating to the allocation and operation of FM broadcast stations. These standards also apply to noncommercial educational FM broadcast stations, except as noted herein. The Commission's rules and regulations contain references to these standards, which have been approved by the Commission and thus are considered as reflecting its opinion in all matters involved.

(b) The standards set forth herein are those deemed necessary for the construction and operation of FM broadcast stations to meet the requirements of technical regulations and for operation in the public interest along technical lines not otherwise enunciated. These standards are based upon the best engineering data available, including evidence at hearings, conferences with radio engineers, and data supplied by manufacturers of radio equipment and by licensees of FM broadcast stations. These standards are complete in themselves and supersede previous engineering standards or policies of the Commission concerning FM broadcast stations. While these standards provide for flexibility and indicate the conditions under which they are applicable, it is not expected that material deviation from the fundamental principles will be recognized unless full information is submitted as to the need and reasons therefor.

(c) These standards will necessarily be revised from time to time as progress is made in the art. The Commission will accumulate and analyze engineering data available as to the progress of the art so that these standards may be kept current with technical developments.

§ 3.310 *Definitions*—(a) *FM broadcast station.* The term "FM broadcast station" means a station employing frequency modulation in the FM broadcast band and licensed primarily for the transmission of radiotelephone emissions intended to be received by the general public.

(b) *Frequency modulation.* The term "frequency modulation" means a system of modulation where the instantaneous radio frequency varies in proportion to the instantaneous amplitude of the modulating signal (amplitude of modulating signal to be measured after pre-emphasis, if used) and the instantaneous radio frequency is independent of the frequency of the modulating signal.

(c) *FM broadcast band.* The term "FM broadcast band" means the band of frequencies extending from 88 to 108 megacycles, which includes those assigned to noncommercial educational broadcasting.

(d) *Center frequency.* The term "center frequency" means:

(1) The average frequency of the emitted wave when modulated by a sinusoidal signal.

(2) The frequency of the emitted wave without modulation.

(e) *Frequency swing.* The term "frequency swing" means the instantaneous departure of the frequency of the emitted wave from the center frequency resulting from modulation.

(f) *FM broadcast channel.* The term "FM broadcast channel" means a band of frequencies 200 kilocycles wide and is designated by its center frequency. Channels for FM broadcast stations begin at 88.1 megacycles and continue in successive steps of 200 kilocycles to and including 107.9 megacycles.

(g) *Antenna field gain.* The term "antenna field gain" of an FM broadcast antenna means the ratio of the effective free space field intensity produced at one mile in the horizontal plane expressed in millivolts per meter for 1 kilowatt antenna input power to 137.6 mv/m.

(h) *Free space field intensity.* The term "free space field intensity" means the field intensity that would exist at a point in the absence of waves reflected from the earth or other reflecting objects.

(i) *Multiplex transmission.* The term "multiplex transmission" means the simultaneous transmission of two or more signals within a single channel. Multiplex transmission as applied to FM broadcast stations means the transmission of facsimile or other signals in addition to the regular broadcast signals.

(j) *Percentage modulation.* The term "percentage modulation" as applied to frequency modulation means the ratio of the actual frequency swing to the frequency swing defined as 100 percent modulation, expressed in percentage. For FM broadcast stations a frequency swing of ±75 kilocycles is defined as 100 percent modulation.

(k) *Effective radiated power.* The term "effective radiated power" means the product of the antenna power (transmitter output power less transmission line loss) times (1) the antenna power gain, or (2) the antenna field gain squared. Where circular or elliptical polarization is employed the term effective radiated power is applied separately

to the horizontal and vertical components of radiation. For allocation purposes, the effective radiated power authorized is the horizontally polarized component of radiation only.

(l) *Service area.* The term "service area" as applied to FM broadcasting means the service resulting from an assigned effective radiated power and antenna height above average terrain.

(m) *Antenna height above average terrain.* (1) The term "antenna height above average terrain" means the height of the radiation center of the antenna above the terrain 2 to 10 miles from the antenna. (In general a different antenna height will be determined for each direction from the antenna. The average of these various heights is considered as the antenna height above average terrain.)

(2) Where circular or elliptical polarization is employed the antenna height above average terrain shall be based upon the height of the radiation center of the antenna which transmits the horizontal component of radiation.

(n) *Field intensity.* The term "field intensity" as used in these standards shall mean the electric field intensity in the horizontal direction.

(o) *Index of cooperation.* The index of cooperation as applied to facsimile broadcasting is the product of the number of lines per inch, the available line length in inches, and the reciprocal of the line-use ratio (e. g., $105 \times 8.2 \times 8/7 = 984$).

(p) *Line-use ratio.* The term "line-use ratio" as applied to facsimile broadcasting is the ratio of the available line to the total length of scanning line.

(q) *Available line.* The term "available line" means the portion of the total length of scanning line that can be used specifically for picture signals.

(r) *Rectilinear scanning.* The term "rectilinear scanning" means the process of scanning an area in a predetermined sequence of narrow straight parallel strips.

(s) *Optical density.* The term "optical density" means the logarithm (to the base 10) of the ratio of incident to transmitted or reflected light.

§ 3.311 *Engineering standards of allocation.* (a) Sections 3.202 to 3.205 inclusive of the rules and regulations describe the basis for allocation of FM broadcast stations, including the division of the United States into Areas I and II.

(b) FM broadcast stations shall determine the extent of their 1 mv/m and 50 uv/m contours in accordance with the methods prescribed in these Standards.

(c) Although some service is provided by tropospheric waves, the service area is considered to be only that served by the ground wave. The extent of service is determined by the point at which the ground wave is no longer of sufficient intensity to provide satisfactory broadcast service. The field intensity considered necessary for service is as follows:

Area:	*Median field intensity*
City business or factory areas	1 mv/m
Rural areas	50 uv/m

A median field intensity of 3 to 5 mv/m should be placed over the principal city to be served and for class B stations, a median field intensity of 1 mv/m should be placed over the business district of cities of 10,000 or greater within the metropolitan district served. A field intensity of 5 mv/m should be provided over the main studio of a class B station except as otherwise provided in § 3.205. These figures are based upon the usual noise levels encountered in the several areas and upon the absence of interference from other FM stations.

(d) A basis for allocation of satellite stations has not yet been determined. For the present, applications will be considered on their individual merits.

(e) The service area is predicted as follows: Profile graphs must be drawn for at least eight radials from the proposed antenna site. These profiles should be prepared for each radial beginning at the antenna site and extending to 10 miles therefrom. Normally the radials are drawn for each 45° of azimuth; however, where feasible the radials should be drawn for angles along which roads tend to follow. (The latter method may be helpful in obtaining topographical data where otherwise unavailable, and is particularly useful in connection with mobile field intensity measurements of the station and the correlation of such measurements with predicted field intensities.) In each case one or more radials must include the principal city or cities to be served, particularly in cases of rugged terrain, even though the city may be more than 10 miles from the antenna site. The profile graph for each radial should be plotted by contour intervals of from 40 to 100 feet and, where the data permits, at least 50 points of elevation (generally uniformly spaced) should be used for each radial. In instances of very rugged terrain where the use of contour intervals of 100 feet would result in several points in a short distance, 200- or 400-foot contour intervals may be used for such distances. On the other hand, where the terrain is uniform or gently sloping the smallest contour interval indicated on the topographic map (see below) should be used, although only a relatively few points may be available. The profile graph should accurately indicate the topography for each radial, and the graphs should be plotted with the distance in miles as the abscissa and the elevation in feet above mean sea level as the ordinate. The profile graphs should indicate the source of the topographical data employed. The graph should also show the elevation of the center of the radiating system. The graph may be plotted either on rectangular coordinate paper or on special paper which shows the curvature of the earth. It is not necessary to take the curvature of the earth into consideration in this procedure, as this factor is taken care of in the chart showing signal intensities (Fig. 1 of § 3.333).

(f) The average elevation of the 8-mile distance between 2 and 10 miles from the antenna site should then be determined from the profile graph for each radial. This may be obtained by averaging a large number of equally spaced points, by using a planimeter, or by obtaining the median elevation (that exceeded for 50 percent of the distance) in sectors and averaging these values.

(g) To determine the distance to a particular contour, Figure 1 of § 3.333 concerning the range of FM broadcast stations should be used. This chart has been prepared for a frequency in the center of the band and is to be used for all FM broadcast channels, since little change results over this frequency range. The distance to a contour is determined by the effective radiated power and the antenna height. The height of the antenna used in connection with Figure 1 of § 3.333 should be the height of the center of the proposed antenna radiator above the average elevation obtained by the preceding method. The distances shown by Figure 1 of § 3.333 are based upon an effective radiated power of 1 kilowatt; to use the chart for other powers, the sliding scale associated with the chart should be trimmed and used as the ordinate scale. This sliding scale is placed on the chart with the appropriate graduation for power in line with the lower line of the top edge of the chart. The right edge of the scale is placed in line with the appropriate antenna height graduations and the chart then becomes direct reading for this power and antenna height. Where the antenna height is not one of those for which a scale is provided, the signal strength or distance is determined by interpolation between the curves connecting the equidistant points.

(h) The foregoing process of determining the extent of the required contours shall be followed in determining the boundary of the proposed service area. The areas within the required contours must be determined and submitted with each application for an FM broadcast station. Each application shall include a map showing these contours, and for this purpose sectional aeronautical charts or other maps having a convenient scale may be used. The map shall show the radials along which the profile charts and expected field strengths have been determined. The area within each contour should then be measured (by planimeter or other approximate means) to determine the number of square miles therein. In computing the area within the contours, exclude (1) areas beyond the borders of the United States, and (2) large bodies of water, such as ocean areas, gulfs, sounds, bays, large lakes, etc., but not rivers.

(i) In cases where the terrain in one or more directions from the antenna site departs widely from the average elevation of the 2 to 10 mile sector, the application of this prediction method may indicate contour distances that are different from those which may be expected in practice. In such cases the prediction method should be followed, but a showing may be made if desired concerning the distance to the contour as determined by other means. Such showing should include data concerning the procedure employed and sample calculations. For example, a mountain ridge may indicate the practical limit of service although the prediction method may indicate the contour elsewhere. In cases of such limitation, the map of predicted coverage should show both the regular predicted

area and the area as limited or extended by terrain. Both areas should be measured as previously described; the area obtained by the regular prediction method should be given in the application form, with a supplementary note giving the limited or extended area. In special cases the Commission may require additional information as to the terrain in the proposed service area.

(j) In determining the population served by FM broadcast stations, it is considered that the built-up city areas and business districts in cities having over 10,000 population and located beyond the 1 mv/m contour do not receive adequate service. Minor civil division maps (1950 census) should be used in making population counts, excluding cities not receiving adequate service. Where a contour divides a minor division, uniform distribution of population within the division should be assumed in order to determine the population included within the contour unless a more accurate count is available.

§ 3.312 *Topographic data.* (a) In the preparation of the profile graphs previously described, and in determining the location and height above mean sea level of the antenna site, the elevation or contour intervals shall be taken from United States Geological Survey Topographic Quadrangle Maps, United States Army Corps of Engineers Maps or Tennessee Valley Authority maps, whichever is the latest, for all areas for which such maps are available. If such maps are not published for the area in question, the next best topographic information should be used. Topographic data may sometimes be obtained from state and municipal agencies. The data from the Sectional Aeronautical Charts (including bench marks) or railroad depot elevations and highway elevations from road maps may be used where no better information is available. In cases where limited topographic data can be obtained, use may be made of an altimeter in a car driven along roads extending generally radially from the transmitter site.

(b) The Commission will not ordinarily require the submission of topographical maps for areas beyond 15 miles from the antenna site, but the maps must include the principal city or cities to be served. If it appears necessary, additional data may be requested.

(c) The United States Geological Survey Topography Quadrangle Sheets may be obtained from the United States Geological Survey Department of the Interior, Washington, D. C., for 20 cents each. The Sectional Aeronautical Charts are available from the United States Coast and Geodetic Survey, Department of Commerce, Washington, D. C., for 25 cents each. These maps may also be secured from branch offices and from authorized agents or dealers in most principal cities.

§ 3.313 *Interference standard.* (a) Field intensity measurements are preferable in predicting interference between FM broadcast stations and should be used, when available, in determining the extent of interference. (For methods and procedure, see § 3.314.) In lieu of measurements, the interference should be predicted in accordance with the method described herein.

(b) Objectionable interference is considered to exist when the interfering signal exceeds that given by the following ratios. (The desired signal is median field and the undesired signal is the tropospheric signal intensity exceeded for 1 percent of the time.)

Channel separation	*Ratio of desired to undesired signals*
Same channel	10:1
200 kc	2:1.
400 kc	1:10.
600 kc	1:100.
800 kc and above	No restriction.[1]

[1] Intermediate frequency amplifiers of most FM broadcast receivers are designed to operate on 10.7 megacycles. For this reason the assignment of two stations in the same area, one with a frequency 10.6 or 10.8 megacycles removed from that of the other, should be avoided if possible.

(c) Stations normally will not be authorized to operate in the same city or in nearby cities with a frequency separation of less than 800 kc.: *Provided*, That stations may be authorized to operate in nearby cities with a frequency separation of not less than 400 kc. where necessary in order to provide an equitable and efficient distribution of facilities: *And provided further*, That class B stations will not be authorized in the same metropolitan district with a frequency separation of less than 800 kc. In the assignment of FM broadcast facilities the Commission will endeavor to provide the optimum use of the channels in the band, and accordingly may assign a channel different from that requested in an application.

(d) In predicting the extent of interference within the ground wave service area of a station, use should be made of the groundwave chart. (Figure 1 of § 3.333.)

(e) In determining the points at which the interference ratio is equal to the values shown in paragraph (b) of this section, the field intensities for the two interfering signals under consideration should be computed for a considerable number of points along the line between the two stations. Using this data, field intensity versus distance curves should be plotted (e. g., cross-curves on graph paper) in order to determine the points on this path where the interference ratios exist. The points established by this method together with the points along the contours where the same ratios are determined, are considered to be generally sufficient to predict the area of interference. Additional points may be required in the case of irregular terrain or the use of directional antenna systems.

(f) The area of interference, if any, shall be shown in connection with the map of predicted coverage required by the application form, together with the basic data employed in computing such interference. The map shall show the interference within the 50 uv/m contour.

§ 3.314 *Field intensity measurements in allocation.* (a) When field intensity measurements are required by the Commission's rules or when employed in determining the extent of service or interference of existing stations, such measurements should be made in accordance with the procedure outlined herein.

(b) Measurements made to determine the service and interference areas of FM broadcast stations should be made with mobile equipment along roads which are as close and similar as possible to the radials showing topography which were submitted with the application for construction permit. Suitable measuring equipment and a continuous recording device must be employed, the chart of which is either directly driven from the speedometer of the automobile in which the equipment is mounted or so arranged that distances and identifying landmarks may be readily noted. The measuring equipment must be calibrated against recognized standards of field intensity and so constructed that it will maintain an acceptable accuracy of measurement while in motion or when stationary. The equipment should be so operated that the recorder chart can be calibrated directly in field intensity in order to facilitate analysis of the chart. The receiving antenna shall be primarily responsive to the horizontal electric field and should be nondirectional unless otherwise authorized. Authorization to use a half-wave dipole may be requested by filing application with the Commission prior to the making of measurements. The application may be filed by letter describing the proposed antenna, the method of installation and operation, and calibration procedures. Such authorization will remain in effect throughout the series of measurements for which granted.

(c) Mobile measurements should be made with a minimum chart speed of 3 inches per mile and preferably 5 or 6 inches per mile. Locations shall be noted on the recorder chart as frequently as necessary to definitely fix the relation between the measured field intensity and the location. The time constant of the equipment should be such to permit adequate analysis of the charts, and the time constant employed shall be shown. Measurements should be made to a point on each radial well beyond the particular contour under investigation. The transmitter power shall be maintained as close as possible to the authorized power throughout the survey.

(d) After the measurements are completed, the recorder chart shall be divided into not less than 15 sections on each equivalent radial from the station. The field intensity in each section of the chart shall be analyzed to determine the field intensity received 50 percent of the distance (median field) throughout the section, and this median field intensity associated with the corresponding sector of the radial. The field intensity figures must be corrected for a receiving antenna elevation of 30 feet and for any directional effects of the automobile not otherwise compensated. This data should be plotted for each radial, using log-log coordinate paper with distance as the abscissa and field intensity as the ordinate. A smooth curve should be drawn through these points (of median fields for all sectors), and this curve used

to determine the distance to the desired contour. The distances obtained for each radial may then be plotted on the map of predicted coverage or on polar coordinate paper (excluding water areas, etc.) to determine the service and interference areas of a station.

(e) In making measurements to establish the field intensity contours of a station, mobile recordings should be made along each of the radials drawn in § 3.311 (e). Measurements should extend from the vicinity of the station out to the 1 mv/m measured contour and somewhat beyond (at the present time it is not considered practical to conduct mobile measurements far beyond this contour due to the fading ratio at weak fields, which complicates analysis of the charts). These measurements would be made for the purpose of determining the variation of the measured contours from those predicted, and it is expected that initially the correlation of the measured 1 mv/m with the predicted 1 mv/m contour will be used as a basis in determining adherence to authorized service areas within the 50 uv/m contour.

(f) In addition to the 1 mv/m contour, the map of measured coverage shall show the 50 uv/m contour as determined by employing Figure 1 of § 3.333 and the distance to the 1 mv/m contour along each radial. The sliding scale shall be placed on the figure at the appropriate antenna height for the radial in question and then moved so the distance to the 1 mv/m contour (as measured) and the 1 mv/m mark are opposite. The distance to the 50 uv/m contour is then given opposite the 50 uv/m mark on the scale.

(g) In certain cases the Commission may desire more information or recordings and in these instances special instructions will be issued. This may include fixed location measurements to determine tropospheric propagation and fading ratios.

(h) Complete data taken in conjunction with field intensity measurements shall be submitted to the Commission in affidavit form including the following:

(1) Map or maps showing the roads or points where measurements were made, the service and/or interference areas determined by the prediction method and by the measurements, and any unusual terrain characteristics existing in these areas. (This map may preferably be of a type showing topography in the area.)

(2) If a directional transmitting antenna is employed, a diagram on polar coordinate paper showing the predicted free space field intensity in millivolts per meter at one mile in all directions. (See § 3.316.)

(3) A full description of the procedures and methods employed including the type of equipment, the method of installation and operation, and calibration procedures.

(4) A representative sample of the recording tape, including calibration.

(5) Antenna system and power employed during the survey.

(6) Name, address, and qualifications of the engineer or engineers making the measurements.

(i) All data shall be submitted to the Commission in triplicate.

§ 3.315 *Transmitter location.* (a) The transmitter location should be as near the center of the proposed service area as possible consistent with the applicant's ability to find a site with sufficient elevation to provide service throughout the area. Location of the antenna at a point of high elevation is necessary to reduce to a minimum the shadow effect on propagation due to hills and buildings which may reduce materially the intensity of the station's signals in a particular direction. The transmitting site should be selected consistent with the purpose of the station, i. e., whether it is intended to serve a small city, a metropolitan area, or a large region. Inasmuch as service may be provided by signals of 1 mv/m or greater field intensities in metropolitan areas, and inasmuch as signals as low as 20 uv/m may provide service in rural areas, considerable latitude in the geographical location of the transmitter is permitted; however, the necessity for a high elevation for the antenna may render this problem difficult In general, the transmitting antenna of a station should be located at the most central point at the highest elevation available. In providing the best degree of service to an area, it is usually preferable to use a high antenna rather than a lower antenna with increased transmitter power. The location should be so chosen that line-of-sight can be obtained from the antenna over the principal city or cities to be served; in no event should there be a major obstruction in this path.

(b) The transmitting location should be selected so that the 1 mv/m contour encompasses the urban population within the area to be served and the 50 uv/m or the interference free contour coincides generally with the limits of the area to be served. It is recognized that topography, shape of the desired service area, and population distribution may make the choice of a transmitter location difficult. In such cases consideration may be given to the use of a directional antenna system, although it is generally preferable to choose a site where a nondirectional antenna may be employed.

(c) In cases of questionable antenna locations it is desirable to conduct propagation tests to indicate the field intensity expected in the principal city or cities to be served and in other areas, particularly where severe shadow problems may be expected. In considering applications proposing the use of such locations, the Commission may require site tests to be made. Such tests should be made in accordance with the measurement procedure previously described, and full data thereon must be supplied to the Commission. Test transmitters should employ an antenna having a height as close as possible to the proposed antenna height, using a balloon or other support if necessary and feasible. Information concerning the authorization of site tests may be obtained from the Commission upon request.

(d) Present information is not sufficiently complete to establish "blanket areas" of FM broadcast stations, which are defined as those areas adjacent to the transmitters in which the reception of other stations is subject to interference due to the strong signal from the stations. Where it is found necessary to locate the transmitter in a residential area where blanketing problems may appear to be excessive, the application must include a showing concerning the availability of other sites. The authorization of station construction in areas where blanketing problems appear to be excessive will be on the basis that the applicant will assume full responsibility for the adjustment of reasonable complaints arising from excessively strong signals of the applicant's station. As a means of minimizing interference problems it is expected that stations adjacent in location will generally be assigned frequencies that are generally adjacent. Insofar as is feasible, frequency assignments for stations at separated locations will also be separated.

(e) Cognizance must of course be taken regarding the possible hazard of the proposed antenna structure to aviation and the proximity of the proposed site to airports and airways. Procedures and standards with respect to the Commission's consideration of proposed antenna structures which will serve as a guide to persons intending to apply for radio station licenses are contained in Part 17 of this chapter (Rules Concerning the Construction, Marking and Lighting of Antenna Structures).

§ 3.316 *Antenna systems.* (a) It shall be standard to employ horizontal polarization; however, circular or elliptical polarization may be employed if desired. Clockwise or counterclockwise rotation may be used. The supplemental vertically polarized effective radiated power required for circular or elliptical polarization shall in no event exceed the effective radiated power authorized.

(b) The antenna must be constructed so that it is as clear as possible of surrounding buildings or objects that would cause shadow problems.

(c) Applications proposing the use of directional antenna systems must be accompanied by the following:

(1) Complete description of the proposed antenna system

(2) Orientation of array with respect to true north; time phasing of fields from elements (degrees leading or lagging); space phasing of elements (in feet and in degrees); ratio of fields from elements.

(3) Calculated field intensity pattern (on letter-size polar coordinate paper) giving the free space field intensity in millivolts per meter at one mile in the horizontal plane, together with the formula used, constants employed, sample calculations and tabulation of calculation data.

(4) Name, address, and qualifications of the engineer making the calculations.

(d) Applications proposing the use of FM broadcast antennas in the immediate vicinity (i. e., 200 feet or less) of (1) other FM broadcast antennas, or (2) television broadcast antennas for frequencies adjacent to the FM broadcast band, must include a showing as to the expected effect, if any, of such proximate operation.

(e) In cases where it is proposed to use a tower of a standard broadcast station as a supporting structure for an FM broadcast antenna, an application for construction permit (or modification of construction permit) for such station must be filed for consideration with the FM application. Applications may be required for other classes of stations when their towers are to be used in connection with FM broadcast stations.

(f) When an FM broadcast antenna is mounted on a nondirectional standard broadcast antenna, new resistance measurements must be made of the standard broadcast antenna after installation and testing of the FM broadcast antenna. During the installation and until the new resistance determination is approved, the standard broadcast station licensee should apply for authority (informal application) to operate by the indirect method of power determination. The FM broadcast license application will not be considered until the application form concerning resistance measurements is filed for the standard broadcast station.

(g) When an FM broadcast antenna is mounted on an element of a standard broadcast directional antenna, a full engineering study concerning the effect of the FM broadcast antenna on the directional pattern must be filed with the application concerning the standard broadcast station. Depending upon the individual case, the Commission may require readjustment and certain field intensity measurements of the standard broadcast station following the completion of the FM broadcast antenna system.

(h) When the proposed FM broadcast antenna is to be mounted on a tower in the vicinity of a standard broadcast directional array and it appears that the operation of the directional antenna system may be affected, an engineering study must be filed with the FM broadcast application concerning the effect of the FM broadcast antenna on the directional pattern. Readjustment and field intensity measurements of the standard broadcast station may be required following construction of the FM broadcast antenna.

(i) Information regarding data required in connection with standard broadcast directional antenna systems may be found in § 3.160 of this chapter. (See also Standard Broadcast Technical Standards.)

(j) In the event a common tower is used by two or more licensees for antenna and/or antenna supporting purposes, the licensee who is owner of the tower shall assume full responsibility for the installation and maintenance of any painting or lighting requirements. In the event of shared ownership, one licensee shall assume such responsibility and advise the Commission accordingly.

(k) It is recommended that an emergency FM broadcast antenna be installed, or, alternately, an auxiliary transmission line or lines if feasible in the particular circumstances. Data thereon should be supplied with the application for construction permit; if proposed after station construction, an informal application should be submitted to the Commission.

(l) When necessary for the protection of air navigation, the antenna and supporting structure shall be painted and illuminated in accordance with the specifications supplied by the Commission pursuant to section 303 (q) of the Communications Act of 1934, as amended.

§ 3.317 *Transmitters and associated equipment*—(a) *Electrical performance standards* The general design of the FM broadcast transmitting system (from input terminals of microphone preamplifier, through audio facilities at the studio, through lines or other circuits between studio and transmitter, through audio facilities at the transmitter, and through the transmitter, but excluding equalizers for the correction of deficiencies in microphone response) shall be in accordance with the following principles and specifications:

(1) Standard power ratings and operating power range of FM broadcast transmitters shall be in accordance with the following table:

Standard power rating:	*Operating power range*
10 watts [1]	10 watts or less.
250 watts	250 watts or less.
1 kw	250 watts–1 kw.
3 kw	1–3 kw.
5 kw	1–5 kw.
10 kw	3–10 kw.
25 kw	10–25 kw.
50 kw	10–50 kw.
100 kw	50–100 kw.

[1] For noncommercial educational FM stations

(i) Composite transmitters may be authorized with a power rating different from the above table, provided full data is supplied in the application concerning the basis employed in establishing the rating and the need therefor. The operating range of such transmitters shall be from one-third of the power rating to the power rating.

(ii) The transmitter shall operate satisfactorily in the operating power range with a frequency swing of ±75 kilocycles, which is defined as 100 percent modulation.

(2) The transmitting system shall be capable of transmitting a band of frequencies from 50 to 15,000 cycles Preemphasis shall be employed in accordance with the impedance-frequency characteristic of a series inductance-resistance network having a time constant of 75 microseconds. (See Fig. 2 of § 3.333.) The deviation of the system response from the standard preemphasis curve shall lie between two limits as shown in Figure 2 of § 3.333. The upper of these limits shall be uniform (no deviation) from 50 to 15,000 cycles. The lower limit shall be uniform from 100 to 7,500 cycles, and 3 db. below the upper limit; from 100 to 50 cycles the lower limit shall fall from the 3 db. limit at a uniform rate of 1 db. per octave (4 db. at 50 cycles); from 7,500 to 15,000 cycles the lower limit shall fall from the 3 db. limit at a uniform rate of 2 db. per octave (5 db. at 15,000 cycles).

(3) At any modulation frequency between 50 and 15,000 cycles and at modulation percentages of 25, 50, and 100 percent, the combined audio frequency harmonics measured in the output of the system shall not exceed the root-mean-square values given in the following table:

Modulating frequency:	*Distortion percent*
50 to 100 cycles	3.5
100 to 7,500 cycles	2.5
7,500 to 15,000 cycles	3.0

(i) Measurements shall be made employing 75 microsecond deemphasis in the measuring equipment and 75 microsecond preemphasis in the transmitting equipment, and without compression if a compression amplifier is employed. Harmonics shall be included to 30 kc.

(ii) It is recommended that none of the three main divisions of the system (transmitter, studio to transmitter circuit, and audio facilities) contribute over one-half of these percentages since at some frequencies the total distortion may become the arithmetic sum of the distortions of the divisions.

(4) The transmitting system output noise level (frequency modulation) in the band of 50 to 15,000 cycles shall be at least 60 decibels below 100 percent modulation (frequency swing of ±75 kilocycles). The measurement shall be made using 400 cycle modulation as a reference. The noise-measuring equipment shall be provided with standard 75 microsecond deemphasis; the ballistic characteristics of the instrument shall be similar to those of the standard VU meter.

(5) The transmitting system output noise level (amplitude modulation) in the band of 50 to 15,000 cycles shall be at least 50 decibels below the level representing 100 percent amplitude modulation. The noise-measuring equipment shall be provided with standard 75-microsecond deemphasis; the ballistic characteristics of the instrument shall be similar to those of the standard VU meter.

(6) Automatic means shall be provided in the transmitter to maintain the assigned center frequency within the allowable tolerance (±2000 cycles).

(7) The transmitter shall be equipped with suitable indicating instruments for the determination of operating power and with other instruments as are necessary for proper adjustment, operation, and maintenance of the equipment (see § 3.320).

(8) Adequate provision shall be made for varying the transmitter output power to compensate for excessive variations in line voltage or for other factors affecting the output power.

(9) Adequate provision shall be provided in all component parts to avoid overheating at the rated maximum output power.

(10) Means should be provided for connection and continuous operation of approved frequency and modulation monitors.

(11) If a limiting or compression amplifier is employed, precaution should be maintained in its connection in the circuit due to the use of preemphasis in the transmitting system.

(b) *Construction.* In general, the transmitter shall be constructed either on racks and panels or in totally enclosed frames protected as required by article 810 of the National Electrical Code and set forth below:

NOTE: The pertinent sections of article 810 of the National Electrical Code read as follows:

"8191. *General.* Transmitters shall comply with the following:

"a. *Enclosing* The transmitter shall be enclosed in a metal frame or grille, or separated from the operating space by a barrier or other equivalent means, all metallic parts of which are effectually connected to ground.

"b *Grounding of controls.* All external metallic handles and controls accessible to the operating personnel shall be effectually grounded. No circuit in excess of 150 volts shall have any parts exposed to direct contact. A complete dead-front type of switchboard is preferred.

"c. *Interlocks on doors* All access doors shall be provided with interlocks which will disconnect all voltages in excess of 350 volts when any access door is opened."

(1) Means shall be provided for making all tuning adjustments, requiring voltages in excess of 350 volts to be applied to the circuit, from the front of the panels with all access doors closed.

(2) Proper bleeder resistors or other automatic means shall be installed across all capacitor banks to lower any voltage which may remain accessible with access door open to less than 350 volts within 2 seconds after the access door is opened.

(3) All plate supply and other high voltage equipment, including transformers, filters, rectifiers and motor generators, shall be protected so as to prevent injury to operating personnel.

(i) Commutator guards shall be provided on all high voltage rotating machinery. Coupling guards should be provided on motor generators.

(ii) Power equipment and control panels of the transmitter shall meet the above requirements (exposed 220 volt AC switching equipment on the front of the power control panels is not recommended but is not prohibited).

(iii) Power equipment located at a broadcast station but not directly associated with the transmitter (not purchased as part of same), such as power distribution panels, are not under the jurisdiction of the Commission; therefore § 3.254 does not apply

(4) Metering equipment·

(i) All instruments having more than 1,000 volts potential to ground on the movement shall be protected by a cage or cover in addition to the regular case (Some instruments are designed by the manufacturer to operate safely with voltages in excess of 1,000 volts on the movement. If it can be shown by the manufacturer's rating that the instrument will operate safely at the applied potential, additional protection is not necessary.)

(ii) In case the plate voltmeter is located on the low potential side of the multiplier resistor with the potential of the high potential terminal of the instrument at or less than 1,000 volts above ground, no protective case is required. However, it is good practice to protect voltmeters subject to more than 5,000 volts with suitable over-voltage protective devices across the instrument terminals in case the winding opens

(iii) Transmission line meters and any other radio frequency instrument which may be necessary for the operator to read shall be so installed as to be easily and accurately read without the operator having to risk contact with circuits carrying high potential radio frequency energy.

(5) It is recommended that component parts comply as much as possible with the component specifications designated by the Army-Navy Electronics Standards Agency.

(c) *Wiring and shielding.* (1) The transmitter panels or units shall be wired in accordance with standard switchboard practice, either with insulated leads properly cabled and supported or with rigid bus bar properly insulated and protected.

(2) Wiring between units of the transmitter, with the exception of circuits carrying radio frequency energy, shall be installed in conduits or approved fiber or metal raceways for protection from mechanical injury.

(3) Circuits carrying radio frequency energy between units shall be coaxial, two wire balanced lines, or properly shielded.

(4) All stages or units shall be adequately shielded and filtered to prevent interaction and radiation

(5) The frequency and modulation monitors and associated radio frequency lines to the transmitter shall be thoroughly shielded.

(d) *Installation* (1) The installation shall be made in suitable quarters.

(2) Since an operator must be on duty at the transmitter control point during operation, suitable facilities for his welfare and comfort shall be provided at the control point.

(e) *Spare tubes.* A spare tube of every type employed in the transmitter and frequency and modulation monitors shall be kept on hand at the equipment location. When more than one tube of any type are employed, the following table determines the number of spares of that type required:

Number of each type employed	*Spares required*
1 or 2	1
3 to 5	2
6 to 8	3
9 or more	4

An accurate circuit diagram and list of required spare tubes, as furnished by the manufacturer of the equipment, shall be retained at the transmitter location.

(f) *Operation.* In addition to specific requirements of the rules governing FM broadcast stations, the following operating requirements are specified:

(1) The maximum percentage of modulation shall be maintained in accordance with § 3.268. However, precautions shall be taken so as not to substantially alter the dynamic characteristics of musical programs

(2) Spurious emissions, including radio frequency harmonics, shall be maintained at as low a level as practicable at all times in accordance with good engineering practice.

(3) If a limiting or compression amplifier is employed, care should be maintained in its use due to preemphasis in the transmitting system.

(g) *Studio equipment.* (1) Studio equipment shall be subject to all the above requirements where applicable except as follows:

(i) If properly covered by an underwriter's certificate, it will be considered as satisfying safety requirements.

(ii) Section 8191 of article 810 of the National Electrical Code shall apply for voltages only in excess of 500 volts.

(2) No specific requirements are made with regard to the microphones to be employed. However, microphone performance (including compensating networks, if employed) shall be compatible with the required performance of the transmitting system.

(3) No specific requirements are made relative to the design and acoustical treatement of studios. However, the design of studios particularly the main studio, shall be compatible with the required performance characteristics of FM broadcast stations

§ 3.318 *Facsimile: engineering standards.* The following standards apply to facsimile broadcasting under § 3.266:

(a) Rectilinear scanning shall be employed, with scanning spot progressing from left to right and scanned lines progressing from top to bottom of subject copy.

(b) The standard index of cooperation shall be 984.

(c) The number of scanning lines per minute shall be 360.

(d) The line-use ratio shall be ⅞, or 315° of the full scanning cycle.

(e) The ⅛ cycle or 45° not included in the available scanning line shall be divided into 3 equal parts, the first 15° being used for transmission at approximately white level, the second 15° for transmission at approximately black level, and the third 15° for transmission at approximately white level.

(f) An interval of not more than 12 seconds shall be available between two pages of subject copy, for the transmission of a page-separation signal and/or other services.

(g) Amplitude or frequency (frequency-shift) modulation of the subcarrier shall be used.

(h) Subcarrier modulation shall normally vary approximately linearly with the optical density of the subject copy

(i) Negative modulation shall be used, i. e., for amplitude modulation of subcarrier, maximum subcarrier amplitude and maximum radio frequency swing on black; for frequency modulation of subcarrier, highest instantaneous frequency of subcarrier on black.

(j) Subcarrier noise level shall be maintained at least 30 db. below maximum (black) picture modulation level, at the radio transmitter input.

(k) The facsimile subcarrier transmission shall be conducted in the frequency range between 22 and 28 kilocycles Should amplitude modulation of the subcarrier be employed the subcarrier frequency shall be 25 kilocycles with sidebands extending not more than 3 kilocycles in either direction from the subcarrier frequency. Should frequency modulation of the subcarrier be employed the total swing of the subcarrier shall be within the range from 22 to 28 kilocycles, with 22 kilocycles corresponding to white and 28 kilocycles corresponding to black on the transmitted copy In multiplex operation the modulation of the FM carrier by the modulated subcarrier shall not exceed 5 percent. In simplex operation the modulation of the FM carrier by the

modulated subcarrier shall not exceed 30 percent.

(1) During periods of multiplex facsimile transmission, frequency modulation of the FM carrier caused by the aural signals shall, in the frequency range from 20 to 30 kilocycles, be at least 60 db. below 100 percent modulation. Frequency modulation of the FM carrier caused by the facsimile signals shall, in the frequency range from 50 to 15,000 cycles, be at least 60 db below 100 percent modulation.

§ 3.319 *Subsidiary communications multiplex operations: engineering standards.* The following standards apply to subsidiary communications multiplex operations under §§ 3.293 to 3.295.

(a) Frequency modulation of subcarrier shall be used.

(b) The instantaneous frequency of the subcarriers shall at all times lie within the range 20 to 75 kilocycles.

(c) The arithmetic sum of the modulation of the main carrier by the subcarriers shall not exceed 30 percent.

NOTE: Inasmuch as presently approved FM modulation monitors have been designed to meet requirements for modulation frequencies of from 50 to 15,000 cycles, the use of such monitors for reading the modulation percentages during multiplex operation may not be appropriate since the subcarriers utilized are above 20,000 cycles

(d) The total modulation of the main carrier, including the subcarriers, shall meet the requirements of § 3.268

(e) Frequency modulation of the main carrier caused by the subcarrier operation shall, in the frequency range 50 to 15,000 cycles, be at least 60 db. below 100 percent modulation.

§ 3.320 *Indicating instruments—specifications* The following requirements and specifications shall apply to indicating instruments used by FM broadcast stations:

(a) Instruments indicating the plate current or plate voltage of the last radio stage (linear scale instruments) shall meet the following specifications:

(1) Length of scale shall be not less than 2 3/10 inches.

(2) Accuracy shall be at least 2 percent of the full scale reading

(3) Scale shall have at least 40 divisions.

(4) Full scale reading shall not be greater than five times the minimum normal indication

(b) Instruments indicating transmission line current or voltage shall meet the following specifications:

(1) Instruments having linear scales shall meet the requirements of paragraph (a) (1), (2), (3), and (4) of this section.

(2) Instruments having logarithmic or square law scales:

(i) Shall meet the requirements of paragraph (a) (1) and (2) of this section for linear scale instruments.

(ii) Full scale reading shall not be greater than three times the minimum normal indication.

(iii) No scale division above one-third full scale reading shall be greater than one-thirtieth of the full scale reading

(c) Radio frequency instruments having expanded scales:

(1) Shall meet the requirements of paragraph (a) (1), (2), and (4) of this section for linear scale instruments.

(2) No scale division above one-fifth full scale reading shall be greater than one-fiftieth of the full scale reading.

(3) The meter face shall be marked with the words "Expanded scale" or the abbreviation thereof (E. S.).

(d) No required instrument, the accuracy of which is questionable, shall be employed Repairs and recalibration of instruments shall be made by the manufacturer, or by an authorized instrument repair service of the manufacturer, or by some other properly qualified and equipped instrument repair service. In any event the repaired instrument must be supplied with a certificate of calibration.

(e) Recording instruments may be employed in addition to the indicating instruments to record the transmission line current or voltage and the direct plate current and/or direct plate voltage of the last radio stage, provided that they do not affect the operation of the circuits or accuracy of the indicating instruments. If the records are to be used in any proceeding before the Commission as representative of operation, the accuracy must be the equivalent of the indicating instruments and the calibration shall be checked at such intervals as to insure the retention of the accuracy.

(f) The function of each instrument used in the equipment shall be clearly and permanently shown on the instrument itself or on the panel immediately adjacent thereto.

§ 3.321 *Auxiliary transmitters.* Auxiliary transmitters may not exceed the power rating or operating power range of the main transmitter, but need not conform to the performance characteristics specified by § 3.317 (a) (2) to (a) (5) inclusive. The subsequent portions of § 3.317 apply to auxiliary transmitters.

§ 3.330 *Frequency and modulation monitors at auxiliary transmitters.* (a) The following shall govern the installation of approved frequency and modulation monitors at auxiliary transmitters of FM broadcast stations in compliance with these rules:

(1) In case the auxiliary transmitter location is at a site different from that of the main transmitter, an approved frequency monitor shall be installed at the auxiliary transmitter except when the frequency of the auxiliary transmitter can be monitored by means of the frequency monitor at the main transmitter. When the auxiliary transmitter is operated without a frequency monitor under this exemption, it shall be monitored by means of the frequency monitor at the main transmitter.

(2) The licensee will be held strictly responsible for any center frequency deviation of the auxiliary transmitter in excess of 2,000 cycles from the assigned frequency, even though exempted by the above from installing an approved frequency monitor.

(3) Installation of an approved modulation monitor at the location of the auxiliary transmitter, when different from that of the main transmitter, is optional with the licensee. However, when it is necessary to operate the auxiliary transmitter beyond two calendar days, a modulation monitor shall be installed and operated at the auxiliary transmitter. The monitor (if taken from the main transmitter) shall be reinstalled at the main transmitter immediately upon resumption of operation of the main transmitter.

(4) In all cases where the auxiliary transmitter and the main transmitter have the same location, the same frequency and modulation monitors may be used for monitoring both transmitters, provided they are so arranged as to be readily switched from one transmitter to the other.

§ 3.331 *Requirements for type approval of frequency monitors.* (a) *General requirements.* In general a frequency monitor for FM broadcast stations requires a stable source of radio frequency energy whose frequency is accurately known and a means of comparing the transmitter center frequency with this stable source. The visual indicator is calibrated to indicate the deviation of the transmitter center frequency from the frequency assigned.

(1) Approval of a frequency monitor for FM broadcast stations will be considered on the basis of data submitted by the manufacturer. Any manufacturer desiring to submit a monitor for approval shall supply the Commission with full details (two sworn copies)

(2) In approving a frequency monitor based on these tests and specifications, the Commission merely recognizes that the type of monitor has the inherent capability of functioning in compliance with § 3.252, if properly constructed, maintained and operated. The Commission accepts no responsibility beyond this and further realizes that monitors may have a limited range over which the visual indicator will determine deviations. Accordingly, it may be necessary that adjunct equipment be used to determine major deviations.

(3) No change whatsoever will be permitted in the monitors sold under approval number issued by the Commission except when the licensee or the manufacturer is specifically authorized to make such changes. When it is desired to make any change, either mechanical or electrical, the details shall be submitted to the Commission for its consideration.

(4) Approval is given subject to withdrawal if the unit proves defective in service and cannot be relied upon under usual conditions of maintenance and operation encountered in the average FM broadcast station Withdrawal of approval means that no further units may be installed by FM broadcast stations for the purpose of complying with § 3.252; however, this will not affect units already sold unless it is found that there has been an unauthorized change in design or construction or that the material or workmanship is defective.

(b) *General specifications.* The general specifications that frequency monitors shall meet before they will be approved by the Commission are as follows: (In connection with its type approval of FM equipment, the Commission may send a representative to observe

tests made of such equipment by the manufacturer.)

(1) The unit shall have an accuracy of at least ±1000 cycles under ordinary conditions (temperature, humidity, power supply variations and other conditions which may affect its accuracy) encountered in FM broadcast stations throughout the United States, for any channel within the FM broadcast band.

(2) The range of the indicating device shall be at least from 2000 cycles below to 2000 cycles above the assigned center frequency.

(3) The scale of the indicating device shall be so calibrated as to be accurately read within at least 100 cycles.

(4) Means shall be provided for adjustment of the monitor indication to agree with an external standard.

(5) The monitor shall be capable of continuous operation and its circuit shall be such as to permit continuous monitoring of the transmitter center frequency.

(6) Operation of the monitor shall have no deleterious effect on the operation of the transmitter or the signal emitted therefrom

(c) *Tests to be made for approval of FM broadcast frequency monitors.* The manufacturer of a monitor shall submit data on the following at the time of requesting approval:

(1) Constancy of oscillator frequency as measured several times in 1 month.

(2) Contancy of oscillator frequency when subjected to vibration tests which would correspond to the treatment received in shipping, handling and installing the instrument.

(3) Accuracy of readings of the frequency deviation instrument.

(4) Functioning of frequency adjustment device.

(5) Effects on frequency and readings, of the changing of tubes, of voltage variations, and of variations of room temperature through a range not to exceed 10° to 40° C.

(6) Response of indicating instrument to small changes of frequency.

(7) General information on the effect of tilting or tipping or other tests to determine ability of equipment to withstand shipment.

(d) Various other tests may be made or required, such as effects of variation of input from the transmitter depending upon the character of the apparatus.

(e) Tests shall be conducted in such a manner as to approximate actual operating conditions as nearly as possible The equipment under test shall be operated on any channel in the FM broadcast band.

§ 3.332 *Requirements for type approval of modulation monitors.* (a) The modulation monitors may be a part of the frequency monitor. Approval of a modulation monitor for FM broadcast stations will be considered on the basis of data submitted by the manufacturer. Any manufacturer desiring to submit a monitor for approval shall supply the Commission with full details (two sworn copies).

(b) The specifications that the modulation monitor shall meet before it will be approved by the Commission are as follows: (In connection with its type approval of FM equipment, the Commission may send a representative to observe tests made of such equipment by the manufacturer.)

(1) A means for insuring that the transmitter input to the modulation monitor is proper.

(2) A modulation peak indicating device that can be set at any predetermined value from 50 to 120 percent modulation (±75 kc swing is defined as 100 percent modulation) and for either positive or negative swings (i. e., either above or below transmitter center frequency).

(3) A semi-peak indicator with a meter having the characteristics given below shall be used with a circuit such that peaks of modulation of duration between 40 and 90 milliseconds are indicated to 90 percent of full value and the discharge rate adjusted so that the pointer returns from full reading to 10 percent of zero within 500 to 800 milliseconds. A switch shall be provided so that this meter will read either positive or negative swings.

(i) The characteristics of the indicating meter are: (*a*) *Speed.* The time for one complete oscillation of the pointer shall be 290 to 350 milliseconds. The damping factor shall be between 16 and 200. (*b*) *Scale.* The meter scale shall be similar in appearance to that of a standard VU meter. The scale length between 0 and 100 percent modulation markings should be at least 2.3 inches. In addition to other markings a small mark for 133 percent modulation and designated as such should be included for the purpose of testing transmitters with 100 kc swing.

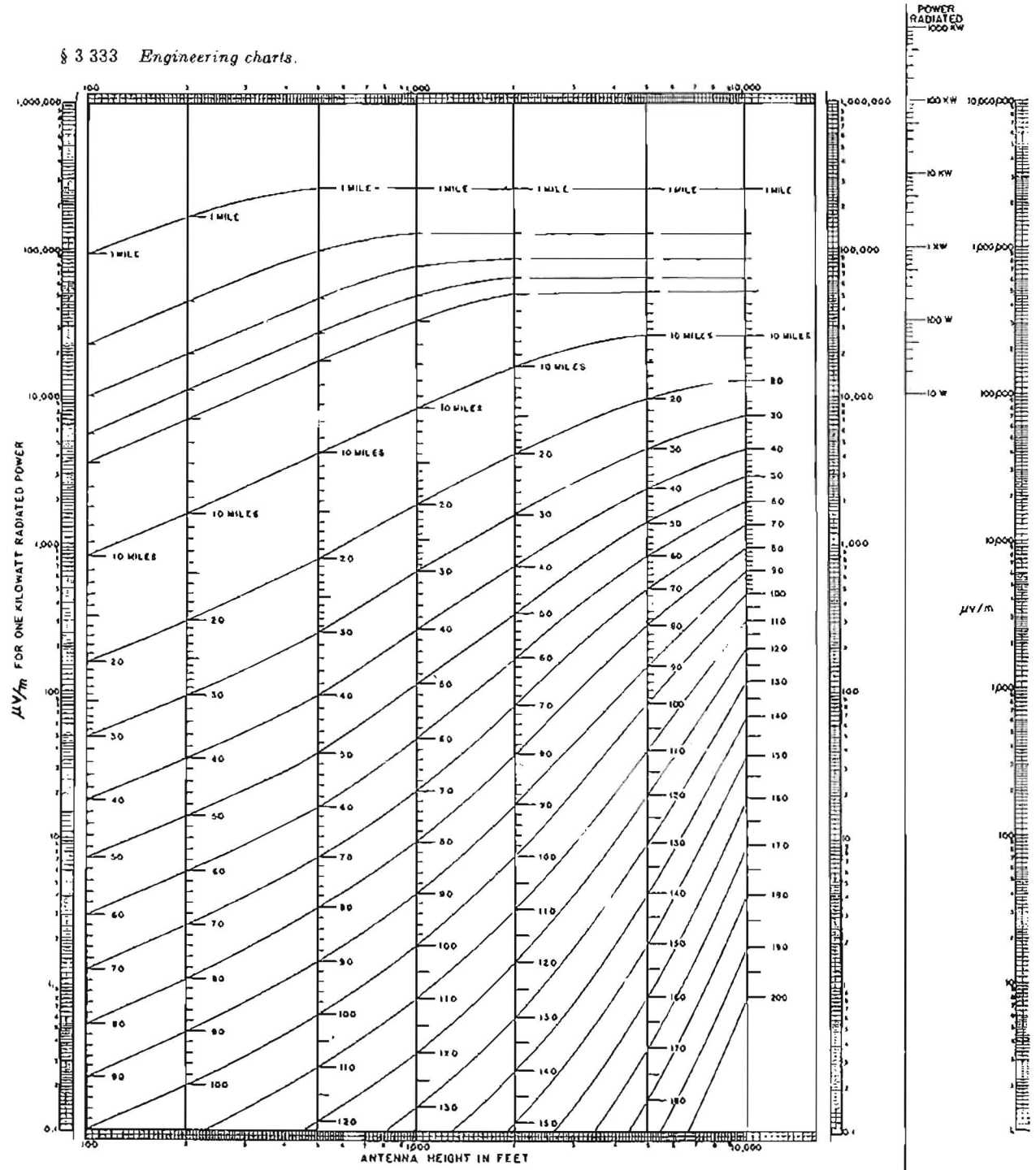
(4) The accuracy of reading of percentage of modulation shall be within ±5 percent modulation percentage at any percentage of modulation up to 100 percent modulation.

(5) The frequency characteristic curve shall not depart from a straight line more than ±½ db. from 50 to 15,000 cycles. Distortion shall be kept to a minimum.

(6) The monitor shall not absorb appreciable power from the transmitter.

(7) Operation of the monitor shall have no deleterious effect on the operation of the transmitter.

(8) General design, construction, and operation shall be in accordance with good engineering practice.



GROUND WAVE SIGNAL RANGE FOR F M BROADCASTING

88 MC, $\sigma = 5 \times 10^{-14}$ E.M.U., $\epsilon = 15$, RECEIVING ANTENNA HEIGHT 30 FEET
FOR HORIZONTAL (AND APPROX FOR VERTICAL) POLARIZATION

SLIDING SCALE FOR USE WITH FIGURE 1

FIGURE 1

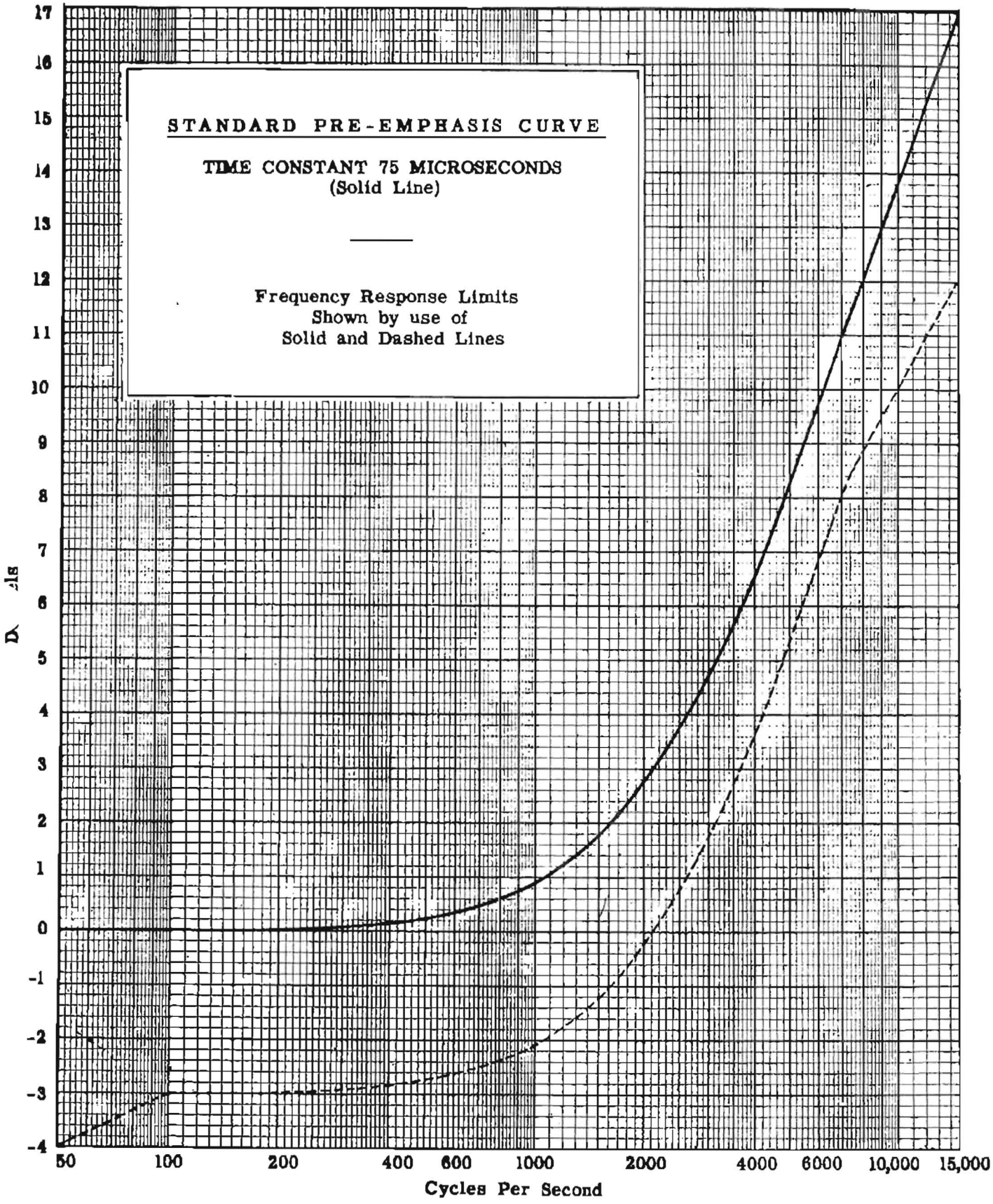

STANDARD PRE-EMPHASIS CURVE
TIME CONSTANT 75 MICROSECONDS
(Solid Line)
Frequency Response Limits
Shown by use of
Solid and Dashed Lines
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
50
100
200
400
600
1000
2000
4000
6000
10,000
15,000
Cycles Per Second

FIGURE 2

SUBPART C—NONCOMMERCIAL EDUCATIONAL FM BROADCAST STATIONS

CLASSIFICATION OF STATIONS AND ALLOCATION OF FREQUENCIES

§ 3.501 *Channels available for assignment.* The channels available for noncommercial educational FM broadcasting are listed in the table below, together with numerical designations for convenience:

Frequency (Mc):	Channel No.	Frequency (Mc):	Channel No.
88.1	201	90.1	211
88.3	202	90.3	212
88.5	203	90.5	213
88.7	204	90.7	214
88.9	205	90.9	215
89.1	[1] 206	91.1	216
89.3	207	91.3	217
89.5	208	91.5	218
89.7	209	91.7	219
89.9	210	91.9	220

[1] The frequency 89.1 Mc., Channel No. 206 in the New York City metropolitan area is reserved for the use of the United Nations with the equivalent of an antenna height of 500 feet above average terrain and effective radiated power of 20 kw., and the Commission will make no assignments which would cause objectionable interference with such use.

§ 3.502 *State-wide plans.* In considering the assignment of a channel for a noncommercial educational FM broadcast station, the Commission will take into consideration the extent to which each application meets the requirements of any state-wide plan for noncommercial educational FM broadcast stations filed with the Commission, provided that such plans afford fair treatment to public and private educational institutions, urban and rural, at the primary, secondary, higher, and adult educational levels, and appear otherwise fair and equitable.

§ 3.503 *Licensing requirements and service.* The operation of, and the service furnished by noncommercial educational FM broadcast stations shall be governed by the following:

(a) A noncommercial educational FM broadcast station will be licensed only to a nonprofit educational organization and upon showing that the station will be used for the advancement of an educational program.

(1) In determining the eligibility of publicly supported educational organizations, the accreditation of their respective state departments of education shall be taken into consideration.

(2) In determining the eligibility of privately controlled educational organizations, the accreditation of state departments of education and/or recognized regional and national educational accrediting organizations shall be taken into consideration.

(b) Each station may transmit programs directed to specific schools in a system or systems for use in connection with the regular courses as well as routine and administrative material pertaining thereto and may transmit educational, cultural, and entertainment programs to the public.

(c) Each station shall furnish a nonprofit and noncommercial broadcast service. No sponsored or commercial program shall be transmitted nor shall commercial announcements of any character be made. A station shall not transmit the programs of other classes of broadcast stations unless all commercial announcements and commercial references in the continuity are eliminated.

§ 3.504 *Frequency, power and service area.* (a) In the assignment of frequency and power to a noncommercial educational FM broadcast station the Commission will consider with the application: (1) the area served by applicant's existing educational facilities; and (2) the provisions of any statewide plan on file with the Commission which meets the requirements of § 3.502. A station licensed for transmitter power output of 10 watts or less normally will be licensed to operate on the frequency 88.1 megacycles; however, should it appear that operation on this frequency would cause objectionable interference, such station may be licensed to operate on the next higher frequency that would not cause objectionable interference.

(b) The license of each noncommercial educational FM broadcast station licensed for transmitter power output of 10 watts or less shall specify the maximum authorized operating power output of the transmitter. The license of each noncommercial educational FM broadcast station licensed for transmitter power output above 10 watts shall specify the authorized effective radiated power of the station and the authorized operating power output of the transmitter.

(c) Each application for a new noncommercial educational FM broadcast station or increase in facilities of an existing station which proposes transmitter power output above 10 watts shall contain a determination of the antenna height above average terrain and the extent of the 1 mv/m and 50 uv/m contours of the proposed station by the methods prescribed in the FM Technical Standards in Subpart B of this part.

§ 3.505 *Standards of good engineering practice.* The definitions and interference standards contained in the FM Technical Standards in Subpart B of this part shall be applicable to noncommercial educational FM broadcast stations. Other portions of such Standards shall be applicable to the extent specifically prescribed by this part.

ADMINISTRATIVE PROCEDURE

§ 3.511 *Application for noncommercial educational FM broadcast stations.* Each applicant for a construction permit for a new noncommercial educational FM broadcast station, change in facilities of any existing noncommercial educational FM broadcast station, or noncommercial educational FM broadcast station license or modification of license shall file with the Commission in Washington, D. C., two copies of applications and a like number of exhibits and other papers incorporated therein and made a part thereof. Only the original copy need be sworn to. If the application is for authority to construct or make changes in a noncommercial educational FM broadcast station, FCC Form 340 should be filed, for a noncommercial educational FM license, FCC Form 341 should be filed.

§ 3.512 *Full disclosures.* Each application shall contain full and complete disclosures with regard to all matters and things required to be disclosed by the application forms.

§ 3.513 *Installation of apparatus.* Applications for construction permits or modification thereof involving the installation of new transmitting apparatus

should be filed at least 60 days prior to the contemplated installation.

§ 3.514 *Period of construction.* Each construction permit will specify a maximum of 8 months from the date of granting thereof as the time within which construction of the station shall be completed and the station ready for operation, unless otherwise determined by the Commission upon proper showing in any particular case. Each construction permit shall bear the date of the Commission's action authorizing the issuance of the construction permit. Where a conditional grant is ordered, the construction permit shall be dated as of the time when all conditions have been satisfied.

§ 3.515 *Forfeiture of construction permits; extension of time.* (a) A construction permit shall be automatically forfeited if the station is not ready for operation within the time specified therein or within such further time as the Commission may have allowed for completion, and a notation of the forfeiture of any construction permit under this provision will be placed in the records of the Commission as of the expiration date.

(b) Any application for extension of time (FCC Form 701) within which to construct a station shall be filed at least 30 days prior to the expiration date of such permit if the facts supporting such application for extension are known to the applicant in time to permit such filing. In other cases such applications will be accepted upon a showing satisfactory to the Commission of sufficient reasons for filing within less than 30 days prior to the expiration date. Such applications will be granted upon a specific and detailed showing that the failure to complete was due to causes not under the control of the grantee, or upon a specific and detailed showing of other matters sufficient to justify the extension.

(c) If a construction permit has been allowed to expire for any reason, application may be made for a new permit on FCC Form 321 "Application for a Construction Permit to Replace Expired Permit".

§ 3.516 *Equipment tests.* (a) During the process of construction of a noncommercial educational FM broadcast station, the permittee, after notifying the Commission and Engineer in Charge of the radio district in which the station is located, may without further authority of the Commission, conduct equipment tests for the purpose of such adjustments and measurements as may be necessary to assure compliance with the terms of the construction permit, the technical provisions of the application therefor, the rules and regulations, and the applicable engineering standards.

(b) The Commission may notify the permittee to conduct no tests or may cancel, suspend, or change the date for the beginning of equipment tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Equipment tests may be continued so long as the construction permit shall remain valid.

(d) Inspection of a station will ordinarily be required during the equipment test period and before the commencement of the program test. After construction and after adjustments and measurements have been completed to show compliance with the terms of the construction permit, the technical provisions of the application therefor, the rules and regulations and the applicable engineering standards, the permittee should notify the Engineer in Charge of the radio district in which the station is located that it is ready for inspection.

(e) The authorization for tests embodied in this section shall not be construed as constituting a license to operate but as a necessary part of construction.

§ 3.517 *Program tests.* (a) Upon completion of construction of a noncommercial educational FM broadcast station in accordance with the terms of the construction permit, the technical provisions of the application therefor, and the rules and regulations and applicable engineering standards, and when an application for station license has been filed showing the station to be in satisfactory operating condition, the permittee may request authority to conduct program tests: *Provided,* That such request shall be filed with the Commission at least ten (10) days prior to the date on which it is desired to begin such operation and that the Engineer in Charge of the radio district in which the station is located is notified. (All data necessary to show compliance with the terms and conditions of the construction permit must be filed with the license application.)

(b) Program tests shall not commence until specific Commission authority is received. The Commission reserves the right to change the date of the beginning of such tests, or to suspend or revoke the authority for program tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Unless sooner suspended or revoked program test authority continues valid during Commission consideration of the application for license and during this period further extension of the construction permit is not required. Program test authority shall be automatically terminated by final determination upon the application for station license.

(d) All operation under program test authority shall be in strict compliance with the rules governing noncommercial educational FM broadcast stations and in strict accordance with representations made in the application for license pursuant to which the tests were authorized.

(e) The grant of program test authority shall not be construed as approval by the Commission of the application for station license.

§ 3.518 *Normal license period.* (a) All noncommercial educational FM broadcast station licenses will be issued for a normal license period of three years. Licenses will be issued to expire at the hour of 3:00 a. m., e. s. t., in accordance with the following schedule and at three-year intervals thereafter.

(1) For stations located in Delaware and Pennsylvania, August 1, 1957.

(2) For stations located in Maryland, District of Columbia, Virginia, West Virginia, October 1, 1957.

(3) For stations located in North Carolina, South Carolina, December 1, 1957.

(4) For stations located in Florida, Puerto Rico, and Virgin Islands, February 1, 1958.

(5) For stations located in Alabama and Georgia, April 1, 1958.

(6) For stations located in Arkansas, Louisiana, and Mississippi, June 1, 1958.

(7) For stations located in Tennessee, Kentucky, and Indiana, August 1, 1958.

(8) For stations located in Ohio and Michigan, October 1, 1958.

(9) For stations located in Illinois and Wisconsin, December 1, 1958.

(10) For stations located in Iowa and Missouri, February 1, 1956.

(11) For stations located in Minnesota, North Dakota, South Dakota, Montana, and Colorado, April 1, 1956.

(12) For stations located in Kansas, Oklahoma, Nebraska, June 1, 1956.

(13) For stations located in Texas, August 1, 1956.

(14) For stations located in Wyoming, Nevada, Arizona, Utah, New Mexico, and Idaho, October 1, 1956.

(15) For stations located in California, December 1, 1956.

(16) For stations located in Washington, Oregon, Alaska, and Hawaii, February 1, 1957.

(17) For stations located in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont, April 1, 1957.

(18) For stations located in New Jersey and New York, June 1, 1957.

NOTE: Renewals of licenses will be granted for the period specified in the rule. *Provided, however,* That if as a result of the transition from the previous schedule to the above schedule the period for which a license is renewed is 6 months or less, the licensee may within the period 60 days to 30 days before the expiration date of such renewed license file, in lieu of renewal application (FCC Form 342), a written application under oath for the next renewal of license which shall consist of (1) a request that its license be renewed, (2) a statement that no substantial changes have been made in its operations or in its plans for future operations since its last renewal application, or if changes have been made or proposed, a statement specifying such changes; and (3) a statement that the applicant waives any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise. Upon review of such statements the Commission may grant a renewal of license for the full period provided for in the rule, or if the Commission requires additional information, it may require the filing of renewal application (FCC Form 342).

§ 3.519 *License, simultaneous modification and renewal.* When an application is granted by the Commission necessitating the issuance of a modified license less than 60 days prior to the expiration date of the license sought to be modified, and an application for renewal of said license is granted subsequent or prior thereto (but within 30 days of expiration of the present license) the modified license as well as the renewal license

shall be issued to conform to the combined action of the Commission.

§ 3.520 *Renewal of license.* (a) Unless otherwise directed by the Commission, each application for renewal of a noncommercial educational FM broadcast station license shall be filed at least 90 days prior to the expiration date of the license sought to be renewed (FCC Form 342).

§ 3.521 (Reserved.)

§ 3.522 *Repetitious applications.* (a) Where an applicant has been afforded an opportunity to be heard with respect to a particular application for a new noncommercial educational FM broadcast station, or for change of existing service or facilities, and the Commission has, after hearing or default, denied the application or dismissed it with prejudice, the Commission will not consider another application for a station of the same class to serve in whole or in part the same area, by the same applicant or by his successor or assignee, or on behalf of or for the benefit of the original parties in interest, until after the lapse of 12 months from the effective date of the Commission's order.

(b) Where an appeal has been taken from the action of the Commission in denying a particular application, another application for the same class of broadcast station and for the same area, in whole or in part, filed by the same applicant or by his successor or assignee, or on behalf or for the benefit of the original parties in interest, will not be considered until after the final disposition of such appeal.

§ 3.523 *Assignment or transfer of control.* (a) Application for consent to assignment of a noncommercial educational FM construction permit or license or for consent to voluntary transfer of control of a corporation holding a noncommercial education FM construction permit or license shall be filed with the Commission on FCC Form 314 (Assignment of License), FCC Form 315 (Transfer of Control) or FCC Form 316 (Short Form) at least 60 days prior to the contemplated effective date of assignment or transfer of control.

(b) *Pro forma* assignment or transfer applications shall be filed on FCC Form 316. Such cases are defined as cases in which:

(1) There is an assignment from an individual or individuals (including partnerships) to a corporation owned and controlled by such individuals or partnerships without any substantial change in their relative interests;

(2) There is an assignment from a corporation to its individual stockholders without effecting any substantial change in the disposition of their interests;

(3) There is an assignment or transfer by which certain partners or stockholders retire but no new ones are brought in, provided that the interest transferred is not a controlling one;

(4) There is a corporate reorganization which involves no substantial change in the beneficial ownership of the corporation;

(5) There is an involuntary transfer to an Executor, Administrator or other court appointed officer caused by death or legal disability except that this form does not cover assignments (or transfers) from the Executor, Administrator or other court appointed officers to the ultimate beneficiary;

(6) There is an assignment or transfer from a corporation to a wholly owned subsidiary thereof or vice versa, or where there is an assignment from a corporation to a corporation owned or controlled by the assignor stockholders without substantial change in their interests.

(7) There is an assignment of less than a controlling interest in a partnership.

EQUIPMENT

§ 3.550 *Acceptability of broadcast transmitters for licensing.* (a) In order to facilitate the filing of, and action on, applications for station authorizations, transmitters will be accepted for licensing by the Commission under one of the following conditions:

(1) A transmitter may be type-accepted upon the request of any manufacturer of transmitters built in quantity by following the type acceptance procedure set forth in Part 2 of this chapter, provided that the data and information submitted indicates that the transmitter meets the requirements of § 3.317. If accepted, such transmitter will be included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment". Applicants specifying transmitters included on such a list need not submit detailed descriptions and diagrams where the correct type number is specified, provided that the equipment proposed is identical with that accepted. Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(2) An application specifying a transmitter not included on the Radio Equipment List, Part B, may be accepted upon the request of a prospective licensee submitting with the application for construction permit a complete description of the transmitter, including the circuit diagram, listing of all tubes used, function of each, multiplication in each stage, plate current and voltage applied to each tube, a description of the oscillator circuit together with any devices installed for the purpose of frequency stabilization and the means of varying output power to compensate for power supply voltage variations. However, if this data has been filed with the Commission by a manufacturer in connection with a request for type acceptance, it need not be submitted with the application for construction permit but may be referred to as "on file". Measurement data for type acceptance made in accordance with subparagraph (1) of this paragraph shall be submitted with the license application.

(3) A transmitter shown on an instrument of authorization by manufacturer and type number, or as a composite, and which was in use prior to June 30, 1955 may continue to be used by the licensee, his successors or assignees, provided such transmitter continues to comply with the rules and regulations.

(b) Additional rules with respect to withdrawal of type-acceptance, modification of type-accepted equipment and limitations on the findings upon which type acceptance is based are set forth in Part 2 of this chapter.

§ 3.551 *Transmitter power.* (a) The standard power rating of the transmitter of a noncommercial educational FM broadcast station licensed for transmitter power output above 10 watts shall be in accordance with § 3.317

(b) The standard power rating of the transmitter of a noncommercial educational FM broadcast station licensed for transmitter power output of 10 watts or less shall be not less than the authorized operating power and not more than 10 watts

§ 3.552 *Frequency monitor.* (a) The licensee of each station licensed for transmitter power output above 10 watts shall have in operation, either at the transmitter or at the place where the transmitter is controlled, a frequency monitor of a type approved by the Commission which shall be independent of the frequency control of the transmitter.

NOTE: Approved frequency monitors are included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment". Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(b) In the event that the frequency monitor becomes defective the station may be operated without the monitor pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided,* That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the monitor was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the monitor is found to be defective and immediately after the repaired or replacement instrument has been installed and is functioning properly.

(3) The frequency of the station shall be compared with an external frequency source of known accuracy at sufficiently frequent intervals to insure that the frequency is maintained within the tolerance prescribed in § 3.568. An entry shall be made in the station log as to the method used and the results thereof.

(c) If conditions beyond the control of the licensee prevent the restoration of the monitor to service within the above-allowed period, informal request may be filed in accordance with § 1.332 (d) of this chapter with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

(d) The licensee of each non-commercial educational FM broadcast station licensed for transmitter power output of 10 watts or less shall provide for the measurement of the station frequency by a means independent of the frequency

control of the transmitter. The station frequency shall be measured (1) when the transmitter is initially installed, (2) at any time the frequency determining elements are changed, and (3) at any time the licensee may have reason to believe the frequency has shifted beyond the tolerance specified by the Commission's rules.

§ 3.553 *Modulation monitor.* (a) The licensee of each station licensed for transmitter power output above 10 watts shall have in operation, either at the transmitter or at the place where the transmitter is controlled, a modulation monitor of a type approved by the Commission.

NOTE: Approved modulation monitors are included on the Commission's "Radio Equipment List, Part B, Aural Broadcast Equipment". Copies of this list are available for inspection at the Commission's office in Washington D. C., and at each of its field offices.

(b) In the event that the modulation monitor becomes defective the station may be operated without the monitor pending its repair or replacement for a period not in excess of 60 days, *Provided*, That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the monitor was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the monitor is found to be defective and immediately after the repaired or replacement monitor has been installed and is functioning properly.

(3) During the period when the station is operated without the modulation monitor the licensee shall provide other suitable means for insuring that the modulation is maintained within the tolerance prescribed in § 3.568.

(c) If conditions beyond the control of the licensee prevent the restoration of the monitor to service within the above allowed period, informal request may be filed in accordance with § 1.332 (d) of this chapter with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

(d) The licensee of each non-commercial educational FM broadcast station licensed for transmitter power output of 10 watts or less shall provide a percentage modulation indicator or a calibrated program level meter from which a satisfactory indication of the percentage of modulation of the transmitter can be determined.

§ 3.554 *Transmitter performance.* (a) The transmitter proper and associated transmitting equipment of each noncommercial educational FM broadcast station licensed for transmitter power output above 10 watts shall be designed, constructed and operated in accordance with § 3.317.

(b) The transmitter proper and associated transmitting equipment of each noncommercial educational FM broadcast station licensed for transmitter power output of 10 watts or less, although not required to meet all requirements of § 3.317 shall be constructed with safety features in accordance with the specifications of article 810 of the current National Electrical Code as approved by the American Standards Association and shall be so operated, tuned, and adjusted that emissions are not radiated outside the authorized band which cause or which are capable of causing interference to the communications of other stations. The audio distortion, audio frequency range, carrier hum, noise level, and other essential phases of the operation which control the external effects, shall at all times be capable of providing satisfactory broadcast service. Studio equipment properly covered by an underwriter's certificate will be considered as satisfying safety requirements.

§ 3.555 *Auxiliary transmitter.* Upon showing that a need exists for the use of an auxiliary transmitter in addition to the regular transmitter of a broadcast station, a license therefor may be issued: *Provided*, That.

(a) An auxiliary transmitter may be installed either at the same location as the main transmitter or at another location.

(b) A licensed operator shall be in control whenever an auxiliary transmitter is placed in operation.

(c) The auxiliary transmitter shall be maintained so that it may be placed into immediate operation at any time for the following purposes:

(1) The transmission of the regular programs upon the failure of the main transmitter

(2) The transmission of regular programs during maintenance or modification work on the main transmitter, necessitating discontinuance of its operation for a period not to exceed 5 days. (This includes the equipment changes which may be made without authority as set forth elsewhere in the rules and regulations or as authorized by the Commission by letter or by construction permit. Where such operation is required for periods in excess of 5 days, request therefor shall be in accordance with § 1.324 of this chapter.)

(3) Upon request by a duly authorized representative of the Commission.

(d) The auxiliary transmitter shall be tested at least once each week to determine that it is in proper operating condition and that it is adjusted to the proper frequency, except that in case of operation in accordance with paragraph (c) of this section during any week, the test in that week may be omitted provided the operation under paragraph (c) is satisfactory. A record shall be kept of the time and result of each test. Such records shall be retained for a period of two years.

(e) The auxiliary transmitter shall be equipped with satisfactory control equipment which will enable the maintenance of the frequency emitted by the station within the limits prescribed by the regulations in this part.

(f) The operating power of an auxiliary transmitter may be less than the authorized power of the main transmitter, but in no event shall it be greater than such power.

§ 3.556 *Alternate main transmitters.* The licensee of a noncommercial educational FM broadcast station may be licensed for alternate main transmitters provided that a technical need for such alternate transmitters is shown (such as licensees maintaining 24-hour schedule and needing alternate operation for maintenance, or where developmental work requires alternate operation) and that the following conditions are met:

(a) Both transmitters are located at the same place.

(b) Both transmitters shall have the same power rating.

(c) Both transmitters shall meet the requirements of § 3.554.

§ 3.557 *Changes in equipment and antenna system.* Licenses of noncommercial educational FM broadcast stations shall observe the following provisions with regard to changes in equipment and antenna system:

(a) No changes in equipment shall be made:

(1) That would result in the emission of signals outside of the authorized channel.

(2) That would result in the external performance of the transmitter being in disagreement with § 3.554.

(b) Specific authority, upon filing formal application (FCC Form 340) therefor, is required for a change in service area or for any of the following changes:

(1) Changes involving an increase or decrease in the power rating of the transmitter.

(2) A replacement of the transmitter as a whole.

(3) Change in the location of the transmitting antenna.

(4) Change in antenna system, including transmission line

(5) Change in location of main studio, if it is proposed to move the main studio to a different city from that specified in the license.

(6) Change in the power delivered to the antenna.

(7) Change in frequency control and/or modulation system.

(8) Change in the authorized transmitter remote control point(s).

(c) Other changes, except as above provided for in this section, may be made at any time without the authority of the Commission, provided that the Commission shall be promptly notified thereof and such changes shall be shown in the next application for renewal of license.

§ 3.558 *Indicating instruments.* (a) Each noncommercial FM broadcast station licensed for transmitter power above 10 watts shall be equipped with indicating instruments, which conform with the specifications set forth in § 3.320 for measuring the direct plate voltage and current of the last radio stage and the transmission line radio frequency current, voltage, or power.

(b) In the event that any one of these indicating instruments becomes defective when no substitute which conforms with the required specifications is available, the station may be operated without the defective instrument pending its repair or replacement for a period not in excess of 60 days: *Provided*, That:

(1) Appropriate entries shall be made in the operating log of the station showing the date and time the meter was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the instrument is found to be defective and immediately after the repaired or replaced instrument has been installed and functioning properly.

(3) If the defective instrument is a plate voltmeter or plate ammeter in the last radio stage, the operating power shall be maintained by means of the radio frequency transmission line meter.

(c) If conditions beyond the control of the licensee prevent the restoration of the meter to service within the above allowed period, informal request may be filed in accordance with § 1.332 (d) of this chapter with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

TECHNICAL OPERATION

§ 3.561 *Operating schedule.* Noncommercial educational FM broadcast stations are not required to operate on a regular schedule and no minimum number of hours of operation is specified; but the hours of actual operation during a license period shall be taken into consideration in considering the renewal of noncommercial educational FM broadcast licenses wherever it appears that the channels available for such stations are insufficient to meet the demand.

§ 3.562 *Experimental operation.* The period between 1:00 a. m., and 6:00 a. m., local standard time, may be used for experimental purposes in testing and maintaining apparatus by the licensee of any noncommercial educational FM broadcast station on its assigned frequency and not in excess of its authorized power, without specific authorization from the Commission.

§ 3.563 *Station inspection.* The licensee of any noncommercial educational FM broadcast station shall make the station available for inspection by representatives of the Commission at any reasonable hour.

§ 3.564 *Station and operator licenses; posting of.* (a) The station license and any other instrument of station authorization shall be posted in a conspicuous place and in such manner that all terms are visible, at the place the licensee considers to be the principal control point of the transmitter. At all other control points listed on the station authorization, a photocopy of the station license and other instruments of station authorization shall be posted.

(b) The original operator license, or FCC Form 759, of each station operator shall be posted at the place where he is on duty as an operator.

§ 3.565 *Operator requirements.* (a) One or more radio operators holding a valid radiotelephone first-class operator license, except as provided in this section, shall be in actual charge of the transmitting apparatus and shall be on duty either at the transmitter location or remote control point.

(b) A station which is authorized with transmitter power output of 10 kilowatts or less may be operated by persons holding commercial radio operator license of any class, except an aircraft radiotelephone operator authorization or a temporary limited radiotelegraph second-class operator license, when the equipment is so designed that the stability of the frequency is maintained by the transmitter itself within the limits of tolerance specified, and none of the operations, except those specified in subparagraphs (1), (2) and (3) of this paragraph, necessary to be performed during the course of normal operation may cause off-frequency operation or result in any unauthorized radiation. Adjustments of transmitting equipment by such operators, except when under the immediate supervision of radiotelephone first-class operator, shall be limited to the following:

(1) Those necessary to commence or terminate transmitter emissions as a routine matter.

(2) Those external adjustments that may be required as a result of variations of primary power supply.

(3) Those external adjustments which may be necessary to insure modulation within the limits required.

Should the transmitting apparatus be observed to be operating in a manner inconsistent with the station's instrument of authorization and none of the above adjustments are effective in bringing into proper operation, a person holding other than a radiotelephone first-class operator license and not acting under the immediate supervision of a radiotelephone first-class operator, shall be required to terminate the station's emissions.

(c) The licensee of a station which is operated by one or more operators holding other than a radiotelephone first-class operator license shall have one or more operators holding a radiotelephone first-class operator license in regular full-time employment at the station, whose primary duties shall be to effect and insure the proper functioning of the transmitting equipment. In the event that the licensee also operates a standard broadcast station in the same community, a regular full-time radiotelephone first-class operator or operators employed in connection with the FM broadcast station may concurrently be employed to satisfy the requirements of § 3.93 (c): *Provided*, That the duties of such operator or operators concerning the standard broadcast transmitting equipment shall in nowise interfere with the proper performance of his duties with respect to the FM broadcast transmitter: Except, that (1) if the transmitter power output is in excess of 10 watts but not greater than 1 kw, an operator holding radiotelephone second-class operator license may be on duty and perform the functions required of the radiotelephone first-class operator, or (2) if the transmitter power output is 10 watts or less, a radiotelephone second-class or radiotelegraph first- or second-class operator may be on duty and perform the functions of the radiotelephone first-class operator but need not be in regular full-time employment at the station.

(d) The licensed operator on duty and in charge of a non-commercial educational FM broadcast transmitter may, at the discretion of the licensee, be employed for other duties or for the operation of another radio station or stations in accordance with the class of operator's license which he holds and the rules and regulations governing such other stations: *Provided, however*, That such duties shall in nowise interfere with the proper operation of the FM broadcast transmitter.

§ 3.566 *Facsimile broadcasting and multiplex transmission.* (a) Noncommercial educational FM broadcast stations may transmit simplex facsimile in accordance with transmission standards set forth in § 3.318 during periods not devoted to FM aural broadcasting. Such transmissions may not exceed one hour during the period between 7 a. m. and midnight (no limit is placed upon the hours between midnight and 7 a. m.). The Commission shall be notified by the licensee of the noncommercial educational FM broadcast station of its intent to transmit such facsimile.

(b) Noncommercial educational FM broadcast stations may, upon securing authorization from the Commission, transmit multiplex facsimile in accordance with transmission standards set forth in § 3.318: *Provided*, That the transmission of such facsimile does not reduce the quality of the aural program simultaneously transmitted by the licensee below that required by the FM Technical Standards in Subpart B of this part and that no degradation of such aural programs will result from such facsimile transmissions when received on FM receivers not equipped with filters or other additional equipment.

§ 3.567 *Operating power; determination and maintenance of.* (a) The operating power of each station shall be determined by the indirect method. This is the product of the plate voltage (E_p) and the plate current (I_p) of the last radio stage, and an efficiency factor, F; that is:

$$\text{Operating power} = E_p \times I_p \times F$$

The efficiency factor, F, shall be established by the transmitter manufacturer for each type of transmitter for which Commission approval is requested, and shall be specified in the instruction books supplied to the customer with each transmitter. In the case of composite equipment the factor, F, shall be furnished to the Commission along with a statement of the basis used in determining such factor.

(b) The operating power of each station licensed for transmitter power output above 10 watts shall be maintained as near as practicable to the authorized power, and shall not exceed the limits of 5 percent above and 10 percent below the authorized power, except that in an emergency when it becomes impossible to operate with the authorized power, the station may be operated with reduced power for a period not to exceed 10 days

provided the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified immediately after the emergency develops and also upon the resumption of normal operating power. With respect to each station licensed for transmitter power output of 10 watts or less, the power at which the station is operated may be less than the licensed power, but shall in no event be more than 5 percent above the licensed power. The transmitter of each station shall be so maintained as to be capable of operation at a maximum licensed power.

§ 3.568 *Modulation.* The percentage of modulation of all stations shall be maintained as high as possible consistent with good quality of transmission and good broadcast practice and in no case less than 85 percent or more than 100 percent on peaks of frequent recurrence during any selection which normally is transmitted at the highest level of the program under consideration.

§ 3.569 *Frequency tolerance.* (a) The center frequency of each noncommercial educational FM broadcast station licensed for transmitter power output of 10 watts or less shall be maintained within 3,000 cycles of the assigned center frequency.

(b) The center frequency of each noncommercial educational FM broadcast station licensed for transmitter power output above 10 watts shall be maintained within 2,000 cycles of the assigned center frequency.

§ 3.570 *Antenna structure, marking and lighting* Where an antenna structure(s) is required to be painted or lighted see § 17.37, *Inspection of tower lights and associated control equipment*, § 17.39, *Cleaning and repainting;* § 17.40, *Time when lights shall be exhibited;* § 17.41, *Spare lamps;* and § 17.42, *Lighting equipment;* of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.571 *Discontinuance of operation.* The licensee of each station shall notify the Commission in Washington, D. C., and the Engineer in Charge of the radio district in which the station is located of permanent discontinuance of operation at least two days before operation is discontinued. The licensee shall, in addition, immediately forward the station license and other instruments of authorization to the Washington, D. C., office of the Commission for cancellation.

§ 3.572 *Remote control operation.* A station which is authorized with transmitter power output of 10 kilowatts or less may, upon prior authorization from the Commission, be operated by remote control at the point(s) which shall be specified in the station license. An application for authorization to operate by remote control may be made as a part of an application for construction permit or license or modification thereof by specifying the proposed remote control point(s). Operation by remote control shall be subject to the following conditions:

(a) The equipment at the operating and transmitting positions shall be so installed and protected that it is not accessible to or capable of operation by persons other than those duly authorized by the licensee.

(b) The control circuits from the operating position to the transmitter shall provide positive on and off control and shall be such that open circuits, short circuits, grounds or other line faults will not actuate the transmitter and any fault causing loss of such control will automatically place the transmitter in an inoperative condition.

(c) Control and monitoring equipment shall be installed so as to allow the licensed operator either at the remote control point or at the transmitter to perform all of the functions in a manner required by the Commission's rules and Standards: Except, that in the case of a station licensed for a transmitter output power of 10 watts or less the monitoring equipment shall be installed at the remote control point so as to continuously monitor the actual FM carrier and audibly indicate the nature and quality of the program being broadcast

OTHER OPERATING REQUIREMENTS

§ 3.581 *Logs* The licensee or permittee of each noncommercial educational FM broadcast station shall maintain program and operating logs and shall require entries to be made as follows:

(a) In the program log:

(1) An entry of the time each station identification announcement (call letters and location) is made.

(2) An entry briefly describing each program broadcast, such as "music," "drama," "speech," etc., together with the name or title thereof, with the time of the beginning and ending of the complete program. If a mechanical record is used, the entry shall show the exact nature thereof, such as "record," "transcription," etc., and the time it is announced. If the program is of network origin, its source shall be indicated. If the broadcast is under the auspices of an institution or organization other than the licensee, its name shall be noted.

(b) In the operating log:

(1) An entry of the time the station begins to supply power to the antenna, and the time it stops.

(2) An entry of the time the program service begins and ends.

(3) An entry of each interruption to the carrier wave, its cause and duration

(4) For each station licensed for transmitter power output above 10 watts, an entry of the following each 30 minutes:

(i) Operating constants of last radio stage (total plate current and plate voltage).

(ii) Radio frequency transmission line meter reading.

(iii) Frequency monitor reading.

(5) A log must be kept of all operation during the experimental period If the entries required above are not applicable thereto, then the entries shall be made so as to fully describe the operation.

(c) Where an antenna structure(s) is required to be illuminated see § 17.38, *Recording of tower light inspections in the station record*, of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.582 *Logs; retention of.* Logs of noncommercial, educational FM broadcast stations shall be retained by the licensee or permittee for a period of two years: *Provided, however,* That logs involving communications incident to a disaster or which include communications incident to or involved in an investigation by the Commission and concerning which the licensee or permittee has been notified, shall be retained by the licensee or permittee until he is specifically authorized in writing by the Commission to destroy them: *Provided, further,* That logs incident to or involved in any claim or complaint of which the licensee or permittee has notice shall be retained by the licensee or permittee until such claim or complaint has been fully satisfied or until the same has been barred by statute limiting the time for the filing of suits upon such claims.

§ 3.583 *Logs; by whom kept.* Each log shall be kept by the person or persons competent to do so, having actual knowledge of the facts required, who shall sign the log when starting duty and again when going off duty. The logs shall be made available upon request by an authorized representative of the Commission.

§ 3.584 *Log form.* The log shall be kept in an orderly manner, in suitable form, and in such detail that the data required for the particular class of station concerned are readily available. Key letters or abbreviations may be used if proper meaning or explanation is contained elsewhere in the log.

§ 3.585 *Correction of logs.* No log or portion thereof shall be erased, obliterated, or willfully destroyed within the period of retention provided by the rules. Any necessary correction may be made only by the person originating the entry who shall strike out the erroneous portion, initial the correction made, and indicate the date of correction.

§ 3.586 *Rough logs.* Rough logs may be transcribed into condensed form, but in such case the original log or memoranda and all portions thereof shall be preserved and made a part of the complete log.

§ 3.587 *Station identification.* (a) A licensee of a noncommercial educational FM broadcast station shall make at least the following station identification announcements (call letters and location): (1) at the beginning and ending of each time of operation; and (2) within 2 minutes of each hour and each half hour during operation: *Provided,*

(b) Such identification announcement need not be made on the hour or half hour when to make such announcement would interrupt a single continuous program of longer duration than 30 minutes. In such cases the identification announcement shall be made at the beginning of the program, at the first interruption of the continuity, and at the conclusion of the program.

(c) In making the identification announcement, the call letters shall be

given only on the channel of the station identified thereby.

§ 3.588 *Mechanical records.* Each program broadcast, except when designed specifically for in-school listening, which consists in whole or in part of one or more mechanical reproductions shall be announced in the manner and to the extent set out below.

(a) Each such program of longer duration than 30 minutes, consisting in whole or in part of one or more mechanical reproductions, shall be identified by appropriate announcement at the beginning of the program, at each 30-minute interval and at the conclusion of the program: *Provided, however,* That the identifying announcement at each 30-minute interval is not required in case of a mechanical reproduction consisting of a continuous uninterrupted speech, play, religious service, symphony concert, or operatic production of longer than 30 minutes.

(b) Each such program of a longer duration than 5 minutes and not in excess of 30 minutes, consisting in whole or in part of one or more mechanical reproductions, shall be identified by an appropriate announcement at the beginning and end of the program.

(c) Each such program of 5 minutes or less, consisting in whole or in part of mechanical reproductions, shall be identified by appropriate announcement immediately preceding the use thereof: *Provided, however,* That each such program of one minute or less need not be announced as such.

(d) In case a mechanical reproduction is used for background music, sound effects, station identification, program identification (theme music of short duration) or identification of the sponsorship of the program proper, no announcement of the mechanical reproduction is required.

(e) The exact form of identifying announcement is not prescribed, but the language shall be clear and in terms commonly used and understood. A licensee shall not attempt affirmatively to create the impression that any program being broadcast by mechanical reproduction consists of live talent.

§ 3.589 [Reserved.]

§ 3.590 *Broadcasts by candidates for public office*—(a) *Definitions.* A "legally qualified candidate" means any person who has publicly announced that he is a candidate for nomination by a convention of a political party or for nomination or election in a primary, special, or general election, municipal, county, state or national, and who meets the qualifications prescribed by the applicable laws to hold the office for which he is a candidate, so that he may be voted for by the electorate directly or by means of delegates or electors, and who—

(1) Has qualified for a place on the ballot or

(2) Is eligible under the applicable law to be voted for by sticker, by writing in his name on the ballot, or other method and (i) has been duly nominated by a political party which is commonly known and regarded as such, or (ii) makes a substantial showing that he is a bona fide candidate for nomination or office, as the case may be.

(b) *General requirements.* No station licensee is required to permit the use of its facilities by any legally qualified candidate for public office, but if any licensee shall permit any such candidate to use its facilities, it shall afford equal opportunities to all other such candidates for that office to use such facilities: *Provided,* That such licensee shall have no power of censorship over the material broadcast by any such candidate.

(c) *Practices.* No licensee shall make any discrimination in practices, regulations, facilities, or services for or in connection with the service rendered pursuant to this part, or make or give any preference to any candidate for public office or subject any such candidate to any prejudice or disadvantage; nor shall any licensee make any contract or other agreement which shall have the effect of permitting any legally qualified candidate for any public office to broadcast to the exclusion of other legally qualified candidates for the same public office.

(d) *Records; inspection.* Every licensee shall keep and permit public inspection of a complete record of all requests for broadcast time made by or on behalf of candidates for public office, together with an appropriate notation showing the disposition made by the licensee of such requests. Such records shall be retained for a period of two years.

§ 3.591 *Rebroadcast.* (a) The term "rebroadcast" means reception by radio of the program of a radio station, and the simultaneous or subsequent retransmission of such program by a broadcast station. The broadcasting of a program relayed by a remote pick-up broadcast station or studio transmitter link is not considered a rebroadcast. In case a program is transmitted from its point of origin to a broadcast station entirely by telephone facilities in which a section of such transmission is by radio, the broadcasting of this program is not considered a rebroadcast.

NOTE: As used in this section, program includes any complete program or part thereof.

(b) The licensee of a noncommercial educational FM broadcast station may, without further authority of the Commission, rebroadcast the program of a United States standard, FM, noncommercial educational, or international broadcast station, provided the Commission is notified of the call letters of each station rebroadcast and the licensee certifies that express authority has been received from the licensee of the station originating the program.

NOTE 1. The notice and certification of consent shall be given within 3 days of any single rebroadcast, but in case of the regular practice of rebroadcasting certain programs several times during a license period, notice and certification of consent shall be given for the ensuing license period with the application for renewal of license, or at the beginning of such rebroadcast practice if begun during a license period.

NOTE 2: See § 3.503 (c).

(c) No licensee of a noncommercial educational FM broadcast station shall rebroadcast the program of any United States radio station not designated in paragraph (b) of this section without written authority having first been obtained from the Commission upon application (informal) accompanied by written consent or certification of consent of the licensee of the station originating the program.

NOTE: By Order No. 82, dated and effective June 24, 1941, until further order of the Commission, § 3.591 (c) is suspended only insofar as it requires prior written authority of the Commission for the rebroadcasting of programs originated for the express purpose by U. S. Government radio stations.

SUBPART D—[RESERVED]

SUBPART E—TELEVISION BROADCAST STATIONS

GENERAL

§ 3.601 *Scope of subpart.* This subpart contains the rules and regulations (including engineering standards) governing television broadcast stations, including noncommercial educational television broadcast stations, in the United States, its Territories and possessions.

§ 3.602 *Other pertinent rules.* Other pertinent provisions of the Commission's rules and regulations relating to the television broadcast service are included in the following parts of this chapter:

Part 1—Practice and procedure.
Part 2—Frequency allocations and radio treaty matters; general rules and regulations.
Part 4—Experimental and auxiliary broadcast services.
Part 17—Construction, marking, and lighting of antenna towers and/or their supporting structures

§ 3.603 *Numerical designation of television channels*

(a)

Channel No.	Frequency band (megacycles)	Channel No.	Frequency band megacycles)
2	54-60	43	644-650
3	60-66	44	650-656
4	66-72	45	656-662
5	76-82	46	662-668
6	82-88	47	668-674
7	174-180	48	674-680
8	180-186	49	680-686
9	186-192	50	686-692
10	192-198	51	692-698
11	198-204	52	698-704
12	204-210	53	704-710
13	210-216	54	710-716
14	470-476	55	716-722
15	476-482	56	722-728
16	482-488	57	728-734
17	488-494	58	734-740
18	494-500	59	740-746
19	500-506	60	746-752
20	506-512	61	752-758
21	512-518	62	758-764
22	518-524	63	764-770
23	524-530	64	770-776
24	530-536	65	776-782
25	536-542	66	782-788
26	542-548	67	788-794
27	548-554	68	794-800
28	554-560	69	800-806
29	560-566	70	806-812
30	566-572	71	812-818
31	572-578	72	818-824
32	578-584	73	824-830
33	584-590	74	830-836
34	590-596	75	836-842
35	596-602	76	842-848
36	602-608	77	848-854
37	608-614	78	854-860
38	614-620	79	860-866
39	620-626	80	866-872
40	626-632	81	872-878
41	632-638	82	878-884
42	638-644	83	884-890

(b) In the Territories of Alaska and Hawaii the frequency bands 76–82 Mc and 82–88 Mc are allocated for non-Broadcast use. These frequency bands (Channels 5 and 6) will not be assigned in the Territories of Alaska or Hawaii for use by television broadcast stations.

CHANNEL UTILIZATION

§ 3.606 *Table of assignments*—(a) *General.* The following table of assignments contains the channels assigned to the listed communities in the United States, its Territories, and possessions. Channels designated with an asterisk are assigned for use by noncommercial educational broadcast stations only. A station on a channel identified by a plus or minus mark is required to operate with its carrier frequencies offset 10 kc above or below, respectively, the normal carrier frequencies.

(b) *Table of assignments.*

	Channel No.
Alabama:	
Andalusia	*2−, 29
Anniston	70+
Auburn	*56
Bessemer	54
Birmingham	6−, *10−, 13−, 42+, 48
Brewton	23+
Clanton	14
Cullman	60+
Decatur	23−
Demopolis	18
Dothan	9+, 19−
Enterprise	40
Eufaula	44
Florence	41
Fort Payne	19
Gadsden	15+, 21
Greenville	49−
Guntersville	40−
Huntsville	31+
Jasper	17
Mobile	5+, 10, *42, 48+
Montgomery	12, 20, *26+, 32
Munford	*7−
Opelika	22−
Selma	8−, 58+
Sheffield	47−
Sylacauga	24−
Talladega	64
Thomasville	27−
Troy	38−
Tuscaloosa	45, 51−
Tuskegee	16−
University	*74+
Arizona:	
Ajo	14−
Bisbee	15
Casa Grande	18−
Clifton	26−
Coolidge	30+
Douglas	3−
Eloy	24
Flagstaff	9, 13
Globe	34+
Holbrook	14
Kingman	6−
Mesa	12−
Miami	28+
Morenci	31
Nogales	17−
Phoenix	3+, 5−, *8+, 10−
Prescott	15
Safford	21
Tucson	4−, *6+, 9−, 13−
Williams	25
Winslow	16−
Yuma	11−, 13+
Arkansas:	
Arkadelphia	34+
Batesville	30−
Benton	40
Blytheville	64+, 74
Camden	50
Conway	62
El Dorado	10−, 26−
Fayetteville	*13−, 41−
Forrest City	22+
Fort Smith	5−, *10, 22, 39
Harrison	24
Helena	54−
Hope	15−
Hot Springs	9+, 52+
Jonesboro	8, 39+
Little Rock	*2−, 4, 11−, 17−, 23
Magnolia	28+
Malvern	46
Morrilton	43−
Newport	28
Paragould	58−
Pine Bluff	7−, 36
Russellville	19
Searcy	33
Springdale	35−
Stuttgart	14+
California	
Alturas	9
Bakersfield	10−, 29
Brawley	25+
Chico	12−
Corona	52
Delano	37+
El Centro	16, 56
Eureka	3−, 13−
Fresno	12+, *18−, 24, 47, 53
Hanford	21
Los Angeles	2, 4, 5, 7, 9, 11, 13, 22, *28, 34
Madera	30+
Merced	34−, 66
Modesto	14+, 58
Monterey. (*See* Salinas.)	
Napa	62
Oakland. (*See* San Francisco.)	
Oxnard	32
Palm Springs	14
Petaluma	68
Pittsburg	16
Port Chicago	70
Porterville	55
Red Bluff	15
Redding	7
Riverside	40, 46
Sacramento	3, *6, 10, 40−, 46+
Salinas-Monterey	8+, 35
San Bernardino	18, *24−, 30
San Buenaventura	38−
San Diego	8, 10, *15+, 21−, 27, 33, 39
San Francisco-Oakland	2+, 4−, 5+ 7−, *9+, 20−, 26−, 32+, 38, 44−
San Jose	11+, 48, *54, 60
San Luis Obispo	6+
Santa Barbara	3−, 20, 28
Santa Cruz	56
Santa Maria	44
Santa Paula	16+
Santa Rosa	50
Stockton	13+, 36, *42, 64
Tulare	27+
Ukiah	18
Visalia	43, 49
Watsonville	22−
Yreka City	11
Yuba City	52−
Colorado:	
Alamosa	19+
Boulder	*12, 22+
Canon City	36
Colorado Springs	11, 13, *17+, 23+
Craig	19
Delta	24−
Denver	2, 4−, *6−, 7, 9−, 20, 26+
Durango	6+, 15
Fort Collins	44+
Fort Morgan	15+
Grand Junction	5−, 21+
Greeley	60
La Junta	24
Lamar	18−
Leadville	14+
Longmont	32
Loveland	38
Montrose	10+, 18
Pueblo	3−, 5, *8, 28−, 34−
Salida	25
Sterling	25−
Trinidad	21−
Walsenburg	30−
Connecticut:	
Bridgeport	43−, 49−, *71
Hartford	3+, 18−, *24
Meriden	65−
New Britain	30+
New Haven	8+, 59+
New London	26+, 81
Norwalk. (*See* Stamford.)	
Norwich	57+, *63−
Stamford-Norwalk	27
Waterbury	53
Delaware	
Dover	40
Wilmington	12, *59−, 83+
District of Columbia:	
Washington	4−, 5−, 7+, 9−, 14−, 20+, *28−, 50−
Florida:	
Belle Glade	27+

Florida—Continued	Channel No.
Bradenton	28—
Clearwater	32+, 50
Daytona Beach	2—, 53
De Land	44+
Fort Lauderdale	17—, 39
Fort Myers	11+
Fort Pierce	19
Gainesville	*5—, 20+
Jacksonville	4+, *7, 12—, 30+, 36—
Key West	14+, 20
Lake City	33+
Lakeland	16+, 22+
Lake Wales	14
Leesburg	26—
Marianna	17+
Melbourne	37—
Miami	*2, 4, 7—, 10+, 23—, 33
Ocala	15+
Orlando	6—, 9, 18, *24—, 47
Palatka	17
Panama City	7+, *30, 36+
Pensacola	3—, 15—, *21, 46
Quincy	54+
St. Augustine	25+
St. Petersburg. (*See* Tampa.)	
Sanford	35+
Sarasota	34+
Tallahassee	*11—, 24, 51
Tampa-St. Petersburg	*3, 8—, 13—, 38
West Palm Beach	5, 12, *15, 21+
Georgia	
Albany	10, 25
Americus	31
Athens	*8, 60—
Atlanta	2, 5—, 11+, *30, 36
Augusta	6+, 12+
Bainbridge	35—
Brunswick	28+, 34—
Cairo	45+
Carrollton	33
Cartersville	63—
Cedartown	53—
Columbus	4, 28, *34
Cordele	43
Dalton	25+
Douglas	32—
Dublin	15
Elberton	24+
Fitzgerald	53+
Fort Valley	18+
Gainesville	52
Griffin	39+
La Grange	50
Macon	*41+, 47+
Marietta	57+
Milledgeville	51+
Moultrie	48—
Newnan	61+
Rome	9, 59
Savannah	3+, *9—, 11
Statesboro	22
Swainsboro	20—
Thomasville	6, 27
Tifton	14—
Toccoa	35
Valdosta	37+
Vidalia	26
Warner Robins	13+
Waycross	16
Idaho:	
Blackfoot	33
Boise	2, *4+, 7
Burley	15—
Caldwell	9—
Coeur d'Alene	12—
Emmett	28—
Gooding	23
Idaho Falls	3, 8+
Jerome	17
Kellogg	33—
Lewiston	3—
Moscow	*15
Nampa	6, 12+
Payette	14+
Pocatello	6—, 10
Preston	41
Rexburg	27+
Rupert	21
Sandpoint	9+
Twin Falls	11, 13—
Wallace	27—

Idaho—Continued	Channel No.
Weiser	20—
Illinois:	
Alton	48
Aurora	16
Belleville	54+
Bloomington	15—
Cairo	24—
Carbondale	34, *81—
Centralia	32+, 59+
Champaign-Urbana	3+, *12—, 21, 27, 33
Chicago	2—, 5, 7, 9+, *11, 20, 26, 32, 38, 44
Danville	24
Decatur	17, 23+
De Kalb	*87
Dixon	47+
Elgin	28+
Freeport	23
Galesburg	40—
Harrisburg	22
Jacksonville	29
Joliet	48+
Kankakee	14
Kewanee	60—
La Salle	35
Lincoln	53+
Macomb	61+
Marion	40
Mattoon	46—
Moline. (*See* Davenport, Iowa.)	
Mt. Vernon	38—
Olney	16—
Pekin	69+
Peoria	8, 19, *37—, 43+
Quincy	10—, 21+
Rockford	13+, 39+, *45+
Rock Island (*See* Davenport, Iowa.)	
Springfield	2—, 20+, *66+
Streator	65—
Urbana. (*See* Champaign.)	
Vandalia	28—
Waukegan	22+
Indiana:	
Anderson	61
Angola	15+
Bedford	68
Bloomington	4, *30—, 36
Columbus	42—
Connersville	38+
Elkhart	52
Evansville	7, 50—, *56, 62
Fort Wayne	*27+, 33—, 69
Gary	50, *66
Hammond	56—
Hatfield	9+
Huntington	21+
Indianapolis. 6, 8—, 13—, *20—, 26+, 67—
Jasper	19+
Kokomo	31
Lafayette	*47, 59
Lebanon	18
Logansport	51
Madison	25—
Marion	29+
Michigan City	62+
Muncie	49, 56+, *71
Princeton	52+
Richmond	32—
Shelbyville	58+
South Bend	34—, *40+, 46
Tell City	31—
Terre Haute	10, *57+, 63—, 73+
Vincennes	44+
Washington	60+
Iowa:	
Algona	37+
Ames	5, 25—
Atlantic	45—
Boone	19—
Burlington	32—, 38+
Carroll	39
Cedar Rapids	2, 9—, 20—, *26+
Centerville	31—
Charles City	18—
Cherokee	14
Clinton	64
Creston	43
Davenport-Rock Island-Moline, Ill.	4+, 6+, *30+, 36+, 42—
Decorah	44+
Des Moines	8—, *11+, 13—, 17+, 23—

Iowa—Continued	Channel No.
Dubuque	58+, 62—
Estherville	24+
Fairfield	54
Fort Dodge	21
Fort Madison	50+
Grinnell	71
Iowa City	*12+, 24—
Keokuk	44—
Knoxville	33—
Marshalltown	49
Mason City	3+, 35—
Muscatine	68
Newton	65+
Oelwein	28
Oskaloosa	52+
Ottumwa	15+, 63
Red Oak	32+
Shenandoah	20+
Sioux City	4, 9, *30, 36—
Spencer	42+
Storm Lake	34+
Waterloo	7+, 18—, *22—, 46+
Webster City	27
Kansas:	
Abilene	31+
Arkansas City	49
Atchison	60+
Chanute	50—
Coffeyville	33—
Colby	22—
Concordia	47—
Dodge City	6+, 23
El Dorado	55+
Emporia	39—
Fort Scott	37
Garden City	9, 11+
Goodland	10, 31
Great Bend	2, 28
Hays	7—, 20—
Hutchinson	12, 18
Independence	20
Iola	44+
Junction City	29+
Larned	15—
Lawrence	*11, 17—
Leavenworth	54—
Liberal	14
McPherson	36—
Manhattan	*8, 23+
Newton	14+
Olathe	52—
Ottawa	21—
Parsons	46—
Pittsburg	7+, 38—
Pratt	36+
Salina	34
Topeka	13+, 42, *48+
Wellington	24—
Wichita	3—, 10—, 16—, *22+
Winfield	43+
Kentucky:	
Ashland	59—
Bowling Green	13, 17+
Campbellsville	40+
Corbin	16
Danville	35+
Elizabethtown	23
Frankfort	43—
Glasgow	28+
Harlan	73+
Hazard	19—
Hopkinsville	20
Lexington	18+, 27—, 64, 70+
Louisville	3—, 11+, *15, 21—, 41—, 51—
Madisonville	28
Mayfield	63
Maysville	24+
Middlesborough	57, 63+
Murray	33—
Owensboro	14—
Paducah	6+, 43, 72
Pikeville	14—
Princeton	45—
Richmond	60
Somerset	29—
Winchester	37+
Louisiana:	
Abbeville	27+
Alexandria	5, 62+, 74
Bastrop	53+
Baton Rouge	2, 28, *34, 40—
Bogalusa	69, 78

Louisiana—Continued	Channel No.
Crowley	21+
De Ridder	14
Eunice	64−
Franklin	46+
Hammond	57
Houma	30+
Jackson	18−
Jennings	48
Lafayette	10, 38−, 67−
Lake Charles	7−, *19, 25, 60+
Minden	30
Monroe	8+, *13, 43+
Morgan City	36+
Natchitoches	17+
New Iberia	15+
New Orleans	4+, 6+, *8, 20−, 26, 32+, 61
Oakdale	54+
Opelousas	58
Ruston	20
Shreveport	3−, 12
Thibodaux	24
Winnfield	22−
Maine:	
Auburn	23+
Augusta	10−, 20+
Bangor	2−, 5+, *16−
Bar Harbor	22−
Bath	65
Belfast	41−
Biddeford	59
Calais	7−, 20−
Dover-Foxcroft	18+
Fort Kent	17+
Houlton	24
Lewiston	8−, 17
Millinocket	14+
Orono	*12−
Portland	6+, 13+, *47−, 53+
Presque Isle	8, 19
Rockland	25−
Rumford	55−
Van Buren	15−
Waterville	35+
Maryland:	
Annapolis	53−
Baltimore	2+, 11−, 13+, 18, *24+, 72−
Cambridge	22+
Cumberland	17+, 30−
Frederick	62+
Hagerstown	52, 68+
Salisbury	16+
Massachusetts:	
Amherst	*32
Barnstable	25+
Boston	*2+, 4−, 5−, 7+, 38, 44+, 56
Brockton	62
Easthampton	51
Fall River	46−, 68
Greenfield	58−
Holyoke. (*See* Springfield.)	
Lawrence	72
Lowell	32+
New Bedford	28−, 34+
North Adams	19, *80+
Pittsfield	64+
Springfield-Holyoke	22, 55
Worcester	14, 20
Michigan:	
Alma	41+
Alpena	9+, *11, 30−
Ann Arbor	20+, *26−
Bad Axe	46−
Battle Creek	58−, 64−
Bay City	5−, 63−, *73+
Benton Harbor	42
Big Rapids	39
Cadillac	13−, 45
Calumet	13+
Cheboygan	4+, 36+
Coldwater	24−
Detroit	2+, 4, 7−, 50−, *56, 62
East Lansing	60+
East Tawas	25−
Escanaba	3+, *49
Flint	12−, 18−, *22−, 28
Gladstone	40−
Grand Rapids	8+, *17+, 23−
Hancock	10−
Houghton	*25
Iron Mountain	9, 27

Michigan—Continued	Channel No.
Iron River	33−
Ironwood	12−, 31−
Jackson	48
Kalamazoo	3−, 36−, *74
Lansing	6−, 54
Ludington	18+
Manistee	15−
Manistique	14+
Marquette	6−, 17, *35
Midland	19+
Mount Pleasant	47−
Muskegon	29−, 35+
Parma-Onondago	10−
Petoskey	31
Pontiac	44+
Port Huron	34+
Rogers City	24
Saginaw	51−, 57−
Sault Ste. Marie	8, 10+, 28−, *34
Traverse City	7+, 20−, *26+
West Branch	21
Minnesota:	
Albert Lea	57−
Alexandria	36
Austin	6−, 51+
Bemidji	13−, 24−
Brainerd	12
Cloquet	44
Crookston	21−
Detroit Lakes	18+
Duluth-Superior, Wis.	3, 6+, *8−, 32, 38
Ely	16
Fairmont	40+
Faribault	20
Fergus Falls	16−
Grand Rapids	20−
Hastings	29+
Hibbing	10+
International Falls	11
Little Falls	14+
Mankato	15−
Marshall	22+
Minneapolis-St. Paul	*2−, 4, 5−, 9+, 11−, 17, 23+
Montevideo	19
New Ulm	43−
Northfield	26
Owatonna	45
Red Wing	63−
Rochester	10, 55−
St Cloud	7, 33
St. Paul. (*See* Minneapolis.)	
Stillwater	39−
Thief River Falls	16
Virginia	26+
Wadena	27+
Willmar	31+
Winona	61
Worthington	32
Mississippi:	
Biloxi	13+, *44+, 50−
Brookhaven	37+
Canton	16
Clarksdale	6, 32
Columbia	35+
Columbus	4−, 28−
Corinth	29−
Greenville	21−, 27
Greenwood	24+
Grenada	15
Gulfport	56−
Hattiesburg	9, 17−
Jackson	3+, 12+, *19+, 25−, 47
Kosciusko	52−
Laurel	33−
Laurel-Pachuta	7
Louisville	46−
McComb	31−
Meridian	11−, 30−, *36−
Natchez	29+
Pascagoula	22
Picayune	14−
Starkville	34−
State College	*2+
Tupelo	9−, 38
University	*20+
Vicksburg	41+
West Point	56+
Yazoo City	49
Missouri:	
Cape Girardeau	12, 18+, 69
Carthage	56−

Missouri—Continued	Channel No.
Caruthersville	27−
Chillicothe	14−
Clinton	49−
Columbia	8+, 16+, 22−
Farmington	52
Festus	14+
Fulton	24+
Hannibal	7−, 27+
Jefferson City	13, 38+
Joplin	12+, 30+
Kansas City	4, 5+, 9+, *19+, 25+, 65
Kennett	21
Kirksville	3−, 18
Lebanon	23
Marshall	40+
Maryville	26
Mexico	45
Moberly	35+
Monett	14
Nevada	18−
Poplar Bluff	15+
Rolla	46
St. Joseph	2−, 30−, *36
St. Louis	4−, 5−, *9, 11−, 30, 36−, 42+
Sedalia	6−, 28+
Sikeston	37
Springfield	3+, 10, *26+, 32
West Plains	20−
Montana:	
Anaconda	2+
Billings	2, 8, *11
Bozeman	*9, 22−
Butte	4, 6+, *7−, 15+
Cut Bank	20+
Deer Lodge	25+
Dillon	20
Glasgow	16
Glendive	18−
Great Falls	3+, 5+, *23−
Hamilton	17+
Hardin	4+
Havre	9+, 11+
Helena	10+, 12
Kalispell	8−
Laurel	14+
Lewistown	13
Livingston	16−
Miles City	3−, *6, 10
Missoula	*11−, 13−, 21+
Polson	18
Red Lodge	18+
Shelby	14−
Sidney	14
Whitefish	16+
Wolf Point	20−
Nebraska:	
Alliance	13−, 21
Beatrice	40
Broken Bow	14−
Columbus	49+
Fairbury	35
Falls City	38
Fremont	52
Grand Island	11−, 21+
Hastings	5−, 27−
Hayes Center	6
Kearney	13, 19
Lexington	23−
Lincoln	10+, 12−, *18+, 24
McCook	8−, 17
Nebraska City	50
Norfolk	33+
North Platte	2−, 4+
Omaha	3, 6+, 7, *16, 22, 28−
Scottsbluff	10−, 16+
York	15
Nevada:	
Boulder City	4+
Carlin	14
Carson City	37
Elko	10−
Ely	3−, 6+
Fallon	29−
Goldfield	5−
Hawthorne	31
Henderson	2−
Las Vegas	8−, *10+, 13−
Lovelock	18+
McGill	8+
Reno	4, 8, *21+, 27−
Tonopah	9−
Winnemucca	7+

Nevada—Continued	Channel No.
Yerington	33
New Hampshire:	
Berlin	26
Claremont	37
Concord	75+
Durham	*11
Hanover	*27+
Keene	45—
Laconia	43
Littleton	24—
Manchester	9—, 48+
Nashua	54
Portsmouth	15
Rochester	51
New Jersey:	
Andover	*69
Asbury Park	58
Atlantic City	46, 52+
Bridgeton	64—
Camden	*80
Freehold	*74
Hammonton	*70
Montclair	*77
Newark	13—
New Brunswick	*19—, 47+
Paterson	37+
Trenton	41+
Wildwood	48—
New Mexico:	
Alamogordo	17
Albuquerque	4+, *5+, 7+, 13+
Artesia	21+
Atrisco-Five Points	18
Belen	24+
Carlsbad	6—, 23
Clayton	27—
Clovis	12+, 35
Deming	14+
Farmington	17—
Gallup	3, *8—, 10
Hobbs	46
Hot Springs	19
Las Cruces	22—
Las Vegas	14—
Lordsburg	23+
Los Alamos	20—
Lovington	27
Portales	22+
Raton	46—, *52
Roswell	*3+, 8, 10—
Santa Fe	2+, *9+, 11—
Silver City	*10+, 12
Socorro	15+
Tucumcari	25+
New York:	
Albany-Schenectady-Troy	6, *17+, 23—, 35, 41
Amsterdam	52—
Auburn	37—
Batavia	33—
Binghamton	12—, 40—, *46+
Buffalo (*also see* Buffalo-Niagara Falls)	17, *23
Buffalo-Niagara Falls	2, 4—, 7+, 59
Carthage	7—
Cortland	56+
Dunkirk	46
Elmira	18+, 24—
Glens Falls	39+
Gloversville	29—
Hornell	50
Ithaca	*14+, 20—
Jamestown	58+
Kingston	66—
Lake Placid	5
Malone	20+, *66
Massena	14—
Middletown	60
New York	2—, 4, 5+, 7, 9+, 11+, *25, 31—
Niagara Falls (*See* Buffalo-Niagara Falls.)	
Ogdensburg	24+
Olean	54+
Oneonta	62—
Oswego	31
Patchogue	75
Plattsburg	28+
Poughkeepsie	21—, *83
Rochester	5—, 10+, 15—, *21, 27+
Rome (*See* Utica.)	
Saranac Lake	18

New York—Continued	Channel No.
Schenectady (See Albany.)	
Syracuse	3—, 8, *43+
Troy (*See* Albany.)	
Utica-Rome	13, *25+, 54—
Vail Mills	10—
Watertown	48
North Carolina:	
Ahoskie	53
Albemarle	20
Asheville	13—, *58—, 62+, 78
Burlington	63
Burnsville	18
Chapel Hill	*4+
Charlotte	3, 9+, 36+, *42+
Durham	11+, *40—, 46+, 73—
Elizabeth City	31+
Fayetteville	18—, 54—
Gastonia	48
Goldsboro	34, 72
Greensboro	2—, *51—, 57—
Greenville	9
Henderson	52—
Hendersonville	27
Hickory	30—
High Point	15+
Jacksonville	16
Kannapolis	59+
Kinston	45
Laurinburg	41—
Lumberton	21+
Mount Airy	55
New Bern	13—
Raleigh	5, *22—, 28—
Roanoke Rapids	30+
Rocky Mount	50+
Salisbury	60
Sanford	38
Shelby	39
Southern Pines	49
Statesville	64—
Washington	7
Wilmington	3—, 6, 29—, *35+
Wilson	56
Winston-Salem	12, 26+, *32—
North Dakota:	
Bismarck	5, 12—, 18, *24
Bottineau	16+
Carrington	26—
Devils Lake	8+, 14—
Dickinson	2+, 4, *17
Fargo	6, 11+, *34—, 40
Grafton	17
Grand Forks	*2, 10
Harvey	22+
Jamestown	7—, 42
Lisbon	23
Minot	*6+, 10—, 13+
New Rockford	20+
Rugby	38—
Valley City	4—, 32—
Wahpeton	45+
Williston	8—, 11—, *34+
Ohio:	
Akron	49+, *55—, 61+
Ashtabula	15
Athens	62—
Bellefontaine	63
Bowling Green	*70
Cambridge	26
Canton	29
Chillicothe	58+
Cincinnati	5—, 9, 12, *48—, 54—, 74—
Cleveland	3, 5+, 8, 19, *25+, 65+
Columbus	4—, 6+, 10+, *34, 40—
Coshocton	20
Dayton	2, 7+, *16+, 22+
Defiance	43
Findlay	53
Fremont	59+
Gallipolis	72
Hamilton-Middletown	65
Lancaster	28—
Lima	35—, 73
Lorain	31—
Mansfield	36+
Marion	17—
Massillon	23+
Middletown. (*See* Hamilton.)	
Mount Vernon	58
Newark	60—
Oxford	*14+
Piqua	44—

Ohio—Continued	Channel No.
Portsmouth	30
Sandusky	42+
Springfield	52—, 76
Steubenville. (*See* Wheeling, W. Va.)	
Tiffin	47+
Toledo	11—, 13, *30+, 79
Warren	67+
Youngstown	21—, 27, 73—
Zanesville	18—, 50—
Oklahoma:	
Ada	10+, 50—
Altus	36
Alva	30
Anadarko	58—
Ardmore	12—, 55—
Bartlesville	62—
Blackwell	51—
Chickasha	64
Claremore	15
Clinton	32—
Duncan	39—
Durant	27—
Elk City	15+, 26+
El Reno	56+
Enid	5, 21, *27+
Frederick	44
Guthrie	48
Guymon	20+
Hobart	23+
Holdenville	14—
Hugo	21+
Lawton	7+, *28+, 34—
McAlester	47
Miami	58+
Muskogee	8—, *45+, 56+
Norman	31—, *37—
Oklahoma City	4—, 9, *13, 19+, 25—
Okmulgee	26
Pauls Valley	61
Ponca City	40—
Pryor Creek	53
Sapulpa	42—
Seminole	59
Shawnee	53—
Stillwater	25—, *69
Tulsa	2+, 6, *11—, 17+, 23
Vinita	28—
Woodward	8+
Oregon:	
Albany	55+
Ashland	14—
Astoria	30—
Baker	37+
Bend	15—
Burns	16
Corvallis	*7—, 49—
Eugene	*9+, 13, 20+, 26
Grants Pass	30
Klamath Falls	2—, 17
La Grande	13+
Lebanon	43+
McMinnville	46—
Medford	5
North Bend	16+
Pendleton	28
Portland	6+, 8—, *10, 12, 21—, 27+
Roseburg	4+, 28+
Salem	3+, *18—, 24+, 66
Springfield	37—
The Dalles	32
Pennsylvania:	
Allentown	39, 67
Altoona	10—, 19+, 25—
Bethlehem	51—
Bradford	70—
Butler	43—
Chambersburg	46—
Du Bois	31+
Easton	57—
Emporium	42—
Erie	12, 35+, *41—, 66+
Harrisburg	27—, 55+, 71+
Hazleton	63
Irwin	4+
Johnstown	6, 56—
Lancaster	8—, 21+
Lebanon	15+
Lewistown	74—
Lock Haven	32—
Meadville	37
New Castle	45—

	Channel No.
Pennsylvania—Continued	
Oil City	64
Philadelphia	3, 6—, 10, 17—, 23+, 29, *35—
Pittsburgh	2—, 11, *13—, 16, 47—, 53+
Reading	33+, 61—
Scranton	16—, 22—, 44
Shamokin	65
Sharon	39+
State College	*48+
Sunbury	38
Uniontown	14
Washington	63+
Wilkes-Barre	28, 34
Williamsport	36—
York	43, 49
Rhode Island:	
Providence	10+, 12+, 16, *36+
South Carolina:	
Aiken	54
Anderson	40, 58—
Camden	14
Charleston	2+, 5+, *13, 17+
Clemson	*68
Columbia	10—, *19+, 25—, 67+
Conway	23—
Florence	8—, 60
Georgetown	27—
Greenville	4—, 23+, *29
Greenwood	21—
Lake City	56+
Lancaster	31—
Laurens	45—
Marion	43—
Newberry	70
Orangeburg	44—
Rock Hill	61—
Spartanburg	7+, 17—, 74—
Sumter	47
Union	65—
South Dakota:	
Aberdeen	9—, 17+
Belle Fourche	23+
Brookings	*8, 25
Hot Springs	17+
Huron	13+, 15+
Lead	5—, 26
Madison	46
Mitchell	5+, 20—
Mobridge	27—
Pierre	6—, 10+, *22+
Rapid City	3+, 7+, 15—
Sioux Falls	11, 13+, 38+, *44—
Sturgis	20
Vermillion	*2+, 41
Watertown	3—, 35+
Winner	18—
Yankton	17—
Tennessee:	
Athens	14+
Bristol, Tenn.-Bristol, Va.	5+, 46—
Chattanooga	3+, 12—, 43+, 49+, *55—
Clarksville	53
Cleveland	38+
Columbia	39—
Cookeville	24, *69
Crousville	*77
Covington	19—
Dyersburg	46+
Elizabethton	22+
Fayetteville	27+
Gallatin	48+
Harriman	67
Humboldt	25
Jackson	7+, 16+
Johnson City	11—, 34+
Kingsport	28
Knoxville	6, 10+, *20+, 26—
Lawrenceburg	50+
Lebanon	58
Lexington	*11
McMinnville	46
Maryville	51
Memphis	3, 5+, *10+, 13+, 42—, 48—
Morristown	54+
Murfreesboro	18—
Nashville	*2—, 4+, 8+, 30+, 36+
Oak Ridge	32+
Old Hickory	6
Paris	51+
Pulaski	44—
Shelbyville	62—
Sneedville	*2+
Springfield	42
Tullahoma	68—
Union City	55
Texas:	
Abilene	9+, 33—
Alice	34+
Alpine	12—
Amarillo	*2—, 4, 7, 10
Athens	25+
Austin	7+, 18—, 24, *70—
Ballinger	25
Bay City	33
Beaumont-Port Arthur	4—, 6—, 31+, *37
Beeville	38—
Big Spring	4—, 34+
Bonham	43
Borger	33
Brady	16—
Breckenridge	14+
Brenham	52—
Brownfield	15
Brownsville (*also see* Brownsville-Harlingen-Weslaco)	36
Brownsville-Harlingen-Weslaco[1]	4+, 5—
Brownwood	19
Bryan	54—
Childress	40
Cleburne	57
Coleman	21—
College Station	*3+, 48—
Conroe	20+
Corpus Christi	6+, 10—, *16+, 22, 43
Corsicana	47+
Crockett	56
Crystal City	28+
Cuero	25—
Dalhart	18
Dallas	4+, 8, *13+, 23, 29, 73
Del Rio	16—
Denison	52
Denton	*2, 17
Eagle Pass	26
Edinburg	26—
El Campo	27
El Paso	4, *7, 9, 13, 20+, 26+
Falfurrias	62
Floydada	45
Fort Stockton	22
Fort Worth	5+, 11, 20—, *26—
Gainesville	49—
Galveston	11+, 35—, 41—, *47—
Gonzales	64+
Greenville	69—
Harlingen (*also see* Brownsville-Harlingen-Weslaco)	23
Hebbronville	58
Henderson	42+
Hereford	19—
Hillsboro	63
Houston	2—, *8—, 13—, 23+, 29—, 39—
Huntsville	15
Jacksonville	36—
Jasper	49+
Kermit	14
Kilgore	59—
Kingsville	40
Lamesa	28
Lampasas	40—
Laredo	8, 13, *15+
Levelland	38—
Littlefield	32
Longview	32, 38+
Lubbock	5—, 11, 13—, *20, 26
Lufkin	9, 46—
McAllen	20—
McKinney	65—
Marfa	19+
Marshall	16—
Mercedes	32
Mexia	50—
Midland	2+, 18
Mineral Wells	38
Mission	14
Monahans	9—
Mount Pleasant	35
Nacogdoches	40+
New Braunfels	62—
Odessa	7—, 24—
Orange	43—
Pampa	17—
Paris	33+
Pearsall	31
Pecos	16+
Perryton	22
Plainview	29+
Port Arthur. (*See* Beaumont.)	
Quanah	42
Raymondville	42
Rosenberg	17—
San Angelo	3—, 8+, 17+, *23—
San Antonio	4, 5, *9—, 12+, 35+, 41+
San Benito	48
San Marcos	53+
Seguin	14—
Seymour	24+
Sherman	46+
Snyder	30+
Stephenville	32+
Sulphur Springs	41
Sweetwater	12
Taylor	58+
Temple	6, 16, 22+
Terrell	53
Texarkana	6+, *18, 24—
Tyler	7, 19—, 72
Uvalde	20
Vernon	18+
Victoria	19+
Waco	10+, *28—, 34
Waxahachie	46—
Weatherford	51
Weslaco (*See* Brownsville-Harlingen-Weslaco.)	
Wichita Falls	3, 6—, *16+, 22—
Utah:	
Brigham	36—
Cedar City	5
Logan	12—, 30, *48
Ogden	9+, *18—, 24
Price	6
Provo	11+, 22, *28
Richfield	13+
St. George	18+
Salt Lake City	2—, 4— 5+, *7—, 20+, 26
Tooele	44
Vernal	3+
Vermont:	
Bennington	74+
Brattleboro	77+
Burlington	3, *16+, 22+
Montpelier	40
Newport	46
Rutland	49+
St. Albans	34—
St. Johnsbury	30
Virginia:	
Blacksburg	*60+
Bristol. (*See* Bristol, Tenn.)	
Charlottesville	*45+, 64+
Covington	44+
Danville	24—
Emporia	25+
Farmville	19
Fredericksburg	47
Front Royal	39—
Harrisonburg	3—, 34—
Lexington	54
Lynchburg	13, 16—
Marion	50
Martinsville	35—
Newport News. (*See* Norfolk-Portsmouth-Newport News.)	
Norfolk-Portsmouth (*also see* Norfolk-Portsmouth-Newport News)	27
Norfolk-Portsmouth-Newport News (*also see* Norfolk-Portsmouth)	3+, 10+, 15, *21—, 33
Norton	52+
Petersburg	8, 41
Portsmouth. (*See* Norfolk-Portsmouth and *also see* Norfolk, Portsmouth-Newport News.)	
Pulaski	37—
Richmond	6+, 12—, *23, 29+
Roanoke	7—, 10, 27+, *33—
South Boston	14+
Staunton	36

[1] These assignments may be utilized in any community lying within the area of the triangle formed by Brownsville, Harlingen and Weslaco.

Virginia—Continued	Channel No.
Waynesboro	42
Williamsburg	17
Winchester	28+
Washington:	
Aberdeen	58
Anacortes	34
Bellingham	12+, 18+, 24−
Bremerton	44, 50
Centralia	17
Ellensburg	49, *65
Ephrata	43
Everett	22−, 28−
Grand Coulee	37
Hoquiam	62
Kelso	39
Kennewick (*also see* Kennewick-Richland-Pasco)	25
Kennewick-Richland-Pasco	*41
Longview	33
Olympia	60
Omak-Okanogan	*35−
Okanogan. (*See* Omak.)	
Pasco (*also see* Kennewick-Richland-Pasco)	19−
Port Angeles	16−
Pullman	*10−, 24
Richland (*also see* Kennewick-Richland-Pasco)	31
Seattle	4, 5+, 7, *9, 20, 26+
Spokane	2−, 4−, 6−, *7+
Tacoma	11+, 13−, *56, 62
Walla Walla	5−, 8, *22
Wenatchee	*45, 55, 67
Yakima	23+, 29+, *47
West Virginia:	
Beckley	4, 21, 66
Bluefield	6−, 41+
Charleston	8+, '43+, 49−
Clarksburg	12+, 22, 69−
Elkins	40+
Fairmont	35
Hinton	31
Huntington	3+, 13+, *53−
Logan	23−
Martinsburg	58−

West Virginia—Continued	Channel No.
Morgantown	*24
Parkersburg	15−
Welch	25
Weston	*5, 32
Wheeling (*also see* Wheeling-Steubenville, Ohio)	*57+
Wheeling-Steubenville, Ohio	7, 9+, 51+
Williamson	17
Wisconsin:	
Adams	*58+
Appleton	42+
Ashland	15+
Beaver Dam	37
Beloit	57
Chilton	*24+
Eau Claire	13, *19+, 25+
Fond du Lac	54+
Green Bay	2+, 5+, 70+
Janesville	63+
Kenosha	61−
La Crosse	8+, *32+, 38−, 72
Madison	3, *21−, 27−, 33+
Manitowoc	65
Marinette	11−, 32−, *38+
Milwaukee	4−, *10+, 12, 19−, 25, 31+
Oshkosh	48−
Park Falls	*18
Portage	17−
Prairie du Chien	34
Racine	49−, 55
Rhinelander	22
Rice Lake	21+
Richland Center	15, *66−
Sheboygan	59−
Shell Lake	*30−
Sparta	50−
Stevens Point	20+, 26−
Sturgeon Bay	44−
Superior. (*See* Duluth, Minn.)	
Wausau	7−, 16+, *46−
Whitefish Bay	6
Wisconsin Rapids	14−
Wyoming:	
Buffalo	29
Casper	2+, 6+

Wyoming—Continued	Channel No.
Cheyenne	3, 5+
Cody	24−
Douglas	14
Evanston	14−
Gillette	31−
Green River	16
Greybull	40
Lander	17−
Laramie	*8+, 18+
Lovell	36+
Lusk	19−
Newcastle	28+
Powell	30+
Rawlins	11−
Riverton	10+
Rock Springs	13
Sheridan	9−, 12+
Thermopolis	16
Torrington	27
Wheatland	24+
Worland	34

U. S. TERRITORIES AND POSSESSIONS

Alaska:	
Anchorage	2−, *7−, 11, 13−
Fairbanks	2+, 4+, 7+, *9+, 11+, 13+
Juneau	*3, 8, 10
Ketchikan	2, 4, *9
Seward	4−, 9−
Sitka	13
Hawaiian Islands:	
Hilo, Hawaii	2, *4, 7, 9, 11, 13
Honolulu, Oahu	2+, 4−, *7+, 9−, 11+, 13−
Lihue, Kauai	3+, *8−, 10+, 12−
Wailuku, Maui	3, 8, *10, 12
Puerto Rico:	
Arecibo	13+
Caguas	11−
Mayaguez	3+, 5−
Ponce	7+, 9−
San Juan	2+, 4−, *6+
Virgin Islands:	
Charlotte Amalie	10−, 12+
Christiansted	8+

§ 3.607 *Availability of channels.* (a) Subject to the provisions of paragraph (b) of this section, applications may be filed to construct television broadcast stations only on the channels assigned in the Table of Assignments (§ 3.606 (b)) and only in the communities listed therein. Applications which fail to comply with this requirement, whether or not accompanied by a petition to amend the table, will not be accepted for filing.

(b) A channel assigned to a community listed in the Table of Assignments is available upon application in any unlisted community which is located within 15 miles of the listed community. In addition, a channel assigned to a community listed in the Table of Assignments and not designated for use by noncommercial educational stations only, is available upon application in any other community within 15 miles thereof which, although listed in the Table, is assigned only a channel designated for use only by noncommercial educational stations. Where channels are assigned to two or more communities listed in combination in the Table of Assignments the provisions of this paragraph shall apply separately to each community so listed. The distance between communities shall be determined by the distance between the respective coordinates thereof as set forth in the publication of the United States Department of Commerce entitled "Air Line Distance Between Cities in the United States." (This publication may be purchased from the Government Printing Office, Washington, D. C.) If said publication does not contain the coordinates of either or both communities, the coordinates of the main post office in either or both of such communities shall be used. The method to be followed in making the measurements is set forth in § 3.611 (d).

§ 3.608 *International agreements.* Authorizations issued by the Commission for television broadcast facilities will be subject to the provisions of any agreements entered into by the United States with Canada and Mexico concerning television assignments and authorizations. Where, pursuant to such an agreement, timely objection is received from the foreign country involved to an authorization granted by the Commission, the Commission may, on its own motion, set aside such authorization pending consideration of such objection. Upon receipt of such objection, the Commission will notify the person to whom such authorization has been issued.

§ 3.609 *Zones.* (a) For the purpose of allocation and assignment, the United States is divided into three zones as follows:

(1) Zone I consists of that portion of the United States located within the confines of the following lines drawn on the United States Albers Equal Area Projection Map (based on standard parallels 29½° and 45½°; North American datum): Beginning at the most easterly point on the State boundary line between North Carolina and Virginia; thence in a straight line to a point on the Virginia, West Virginia boundary line located at North Latitude 37° 49′ and West Longitude 80° 12′ 30″; thence westerly along the southern boundary lines of the States of West Virginia, Ohio, Indiana and Illinois to a point at the junction of the Illinois, Kentucky, and Missouri State boundary lines; thence northerly along the western boundary line of the State of Illinois to a point at the junction of the Illinois, Iowa, and Wisconsin State boundary lines; thence easterly along the northern State boundary line of Illinois to the 90th meridian, thence north along this meridian to the 43 5° parallel; thence east along this parallel to the 71st meridian; thence in a straight line to the intersection of the 69th meridian and the 45th parallel; thence east along the 45th parallel to the Atlantic Ocean. When any of the above lines pass through a city, the city shall be considered to be located in Zone I. (See Figure 1 of § 3.699.)

(2) Zone II consists of that portion of the United States which is not located in either Zone I or Zone III, and Puerto Rico, Alaska, Hawaiian Islands and the Virgin Islands.

(3) Zone III consists of that portion of the United States located south of a line, drawn on the United States Albers Equal Area Projection Map (based on standard parallels 29½° and 45½°; North American datum), beginning at a point on the east coast of Georgia and the 31st parallel and ending at the United States-Mexican border, consisting of arcs drawn with a 150 mile radius to the north from the following specified points:

	North latitude	*West longitude*
(a)	29°40′00″	83°24′00″
(b)	30°07′00″	84°12′00″
(c)	30°31′00″	86°30′00″
(d)	30°48′00″	87°56′30″
(e)	30°05′00″	90°38′30″
(f)	30°04′30″	93°19′00″
(g)	29°46′00″	95°05′00″
(h)	28°43′00″	96°30′30″
(i)	27°52′30″	97°32′00″

When any of the above arcs pass through a city, the city shall be considered to be located in Zone II. (See Figure 2 of § 3.699.)

§ 3.610 *Separations.* (a) The provisions of this section relate to assignment separations and station separations. Petitions to amend the Table of Assignments (§ 3.606 (b)) (other than those also expressly requesting amendment of this section or § 3.609) will be dismissed and all applications for new television broadcast stations or for changes in the transmitter sites of existing stations will not be accepted for filing if they fail to comply with the requirements specified in paragraphs (b), (c) and (d) of this section:

NOTE: Licensees and permittees of television broadcast stations which were operating on April 14, 1952 pursuant to one or more separations below those set forth in § 3.610 may continue to so operate, but in no event may they further reduce the separations below the minimum. As the existing separations of such stations are increased, the new separations will become the required minimum separations until separations are reached which comply with the requirements of § 3.610. Thereafter, the provisions of said section shall be applicable.

(b) Minimum co-channel assignment and station separations:

(1)

Zone	Channels 2-13	Channels 14-83
	Miles	*Miles*
I	170	155
II	190	175
III	220	205

(2) The minimum co-channel mileage separation between a station in one zone and a station in another zone shall be that of the zone requiring the lower separation.

(c) Minimum assignment and station adjacent channel separations applicable to all zones:

(1) Channels 2–13	Channels 14–83
60 miles	55 miles

(2) Due to the frequency spacing which exists between Channels 4 and 5, between Channels 6 and 7, and between Channels 13 and 14, the minimum adjacent channel separations specified above shall not be applicable to these pairs of channels (see § 3.603).

(d) In addition to the requirements of paragraphs (a), (b) and (c) of this section, the minimum assignment and station separations between stations on Channels 14–83, inclusive, as set forth in Table IV of § 3.698 must be met in either rule-making proceedings looking towards the amendment of the Table of Assignments (§ 3.606 (b)) or in licensing proceedings. No channel listed in column (1) of Table IV of § 3.698 will be assigned to any city, and no application for an authorization to operate on such a channel will be granted unless the mileage separations indicated at the top of columns (2)–(7), inclusive, are met with respect to each of the channels listed in those columns and parallel with the channel in column (1).

(e) The zone in which the transmitter of a television station is located or proposed to be located determines the applicable rules with respect to co-channel mileage separations where the transmitter is located in a different zone from that in which the channel to be employed is located.

§ 3.611 *Reference points and distance computations.* (a) In considering petitions to amend the Table of Assignments (§ 3.606 (b)), the following reference points shall be used by the Commission in determining assignment separations between communities:

(1) Where transmitter sites for the pertinent channels have been authorized in communities involved in a petition to amend the Table of Assignments, separations between such communities shall be determined by the distance between the coordinates of the authorized transmitter sites in the respective communities as set forth in the Commission's authorizations therefor.

(2) Where an authorized transmitter site is available for use as a reference point in one community but not in the other for the pertinent channels, separations shall be determined by the distance between the coordinates of the transmitter site as set forth in the Commission's authorization therefor and the coordinates of the other community as set forth in the publication of the United States Department of Commerce entitled "Air Line Distances Between Cities in the United States." If said publication does not contain the coordinates for said other community, the coordinates of the main post office thereof shall be used.

(3) Where no authorized transmitter sites are available for use as reference points in both communities for the pertinent channels, the distance between the two communities listed in the above publication shall be used. If said publication does not contain such distance, the separation between the two communities shall be determined by the distance between the coordinates thereof as set forth in said publication. Where such coordinates are not contained in said publication, the coordinates of the main post offices of said communities shall be used.

(b) Station separations in licensing proceedings shall be determined by the distance between the coordinates of the proposed transmitter site in one community and

(1) The coordinates of an authorized transmitter site for the pertinent channel in the other community; or, where such transmitter site is not available for use as a reference point,

(2) The coordinates of the other community as set forth in the above-described publication of the United States Department of Commerce; or, if not contained therein,

(3) The coordinates of the main post office of such other community.

(4) In addition, where there are pending applications in other communities which, if granted, would have to be considered in determining station separations, the coordinates of the transmitter sites proposed in such applications must be used to determine whether the requirements with respect to minimum separations between the proposed stations in the respective cities have been met.

(c) In measuring assignment and station separations involving cities listed in the Table in combination, where there is no authorized transmitter site in any of the combination cities on the channel involved, separation measurements shall be made from the reference point which will result in the lowest separation.

(d) The distance between reference points is considered to be the length of the hypotenuse of a right triangle, one side of which is the difference in latitude of the reference points and the other side the difference in longitude of the two reference points, and shall be computed as follows: (This method is appropriate for determining distances up to 220 miles, and for such distances will normally be more accurate than using spherical trigonometry without correction for the spheroidal shape of the earth. However, its accuracy deteriorates rapidly at distances beyond 300 miles and this method should not be used to compute greater distances.)

(1) Determine the difference in latitude and the difference in longitude between the two reference points. Convert these two differences into degrees and decimal parts of a degree in accordance with Table I of § 3.698.

(2) Determine the middle latitude of the two reference points to the nearest second of latitude (average the latitudes of the two points)

(3) Multiply the difference in latitude by the number of miles per degree of latitude difference obtained from Table II of § 3.698 for the appropriate middle latitude (interpolate linearly). This determines the North-South distance in statute miles.

NOTE: In determining necessary distance computations for the Territories, the appropriate mileage per degree may be obtained by linear interpolation of the data given on pages 122 and 123 of the tables in publication H. O. No. 9 (Bowditch-American Practical Navigator—1943 Edition) of the U. S. Navy Dept., Hydrographic Office. This publication may be purchased from the Government Printing Office, Washington, D. C

(4) Multiply the difference in longitude by the number of miles per degree of longitude difference obtained from Table III of § 3.698, for the appropriate middle latitude (interpolate linearly). This determines the East-West distance in statute miles.

(5) Determine the distance between the two reference points by the square root of the sum of the squares of the distances obtained in subparagraphs (3) and (4) of this paragraph, i. e.

$$D = (L_a^2 + L_o^2)^{1/2}$$

where:

D = Distance in statute miles
L_a = North-South distance in miles from (3) above
L_o = East-West distance in miles from (4) above

In computing the above, sufficient decimal figures shall be used to determine the distance to the nearest mile

§ 3.612 *Protection from interference.* Permittees and licensees of television broadcast stations are not protected from any interference which may be caused by the grant of a new station or of authority to modify the facilities of an existing station in accordance with the provisions of this subpart. The nature and extent of the protection from interference accorded to television broadcast stations is limited solely to the protection which results from the minimum assignment and station separation requirements and the rules with respect to maximum powers and antenna heights set forth in this subpart.

NOTE: The nature and extent of the protection from interference accorded to television broadcast stations which were authorized prior to April 14, 1952, and which were operating on said date is limited not only as specified above but is further limited by any smaller separations existing between such stations on said date. Where, as a result of the adoption of the Table of Assignments, or of changes in transmitter sites made by such stations after said date, separations smaller than the required minimum are increased but still remain lower than the required minimum, protection accorded such stations will be limited to the new separations.

§ 3.613 *Main studio location.* (a) The main studio of a television broadcast station shall be located in the principal community to be served. Where the principal community to be served is a city, town, village or other political subdivision, the main studio shall be located within the corporate boundaries of such city, town, village or other political sub-

division. Where the principal community to be served does not have specifically defined political boundaries, applications will be considered on a case-to-case basis in the light of the particular facts involved to determine whether the main studio is located within the principal community to be served.

(b) In cases where an adequate showing is made that there is good cause for locating a main studio outside the principal community to be served and that to do so would not be inconsistent with the operation of the station in the public interest, the Commission will permit the use of a main studio location other than that specified in paragraph (a) of this section. The licensee or permittee of a television broadcast station shall not move his main studio outside the principal community in which it is located without first securing a modification of construction permit or license. Such licensee or permittee shall notify the Commission promptly of any change of the location of the main studio within the community. In any case where the main studio is located outside the principal community to be served, the licensee or permittee of a television broadcast station shall not move his main studio without first securing a modification of construction permit or license.

§ 3.614 *Power and antenna height requirements*—(a) *Minimum requirements.* Applications will not be accepted for filing if they specify less than −10 dbk (100 watts) visual effective radiated power in any horizontal direction. No minimum antenna height above average terrain is specified.

(b) *Maximum power.* Applications will not be accepted for filing if they specify a power in excess of that provided for in this paragraph. Except as provided in subparagraph (1) of this paragraph, the maximum effective radiated powers of television broadcast stations operating on the channels set forth below with antenna heights not in excess of 2,000 feet above average terrain shall be as follows:

Channel Nos.	Maximum visual effective radiated power in db. above one kilowatt (dbk.)
2–6	20 dbk. (100 kw.).
7–13	25 dbk. (316 kw.).
14–83	30 dbk. (1000 kw.)

(1) In Zone I, on Channels 2–13, inclusive, the maximum powers specified above for these channels may be used only with antenna heights not in excess of 1,000 feet above average terrain. Where antenna heights exceeding 1,000 feet above average terrain are used on Channels 2–13, or antenna heights exceeding 2,000 feet above average terrain are used on Channels 14–83, the maximum power shall be based on the chart designated as Figure 3 of § 3.699.

(2) In Zones II and III, the maximum powers which may be used by television broadcast stations operating on the respective channels set forth in the above table with antenna heights exceeding 2,000 feet above average terrain shall be based on the chart designated as Figure 4 of § 3.699.

(3) The effective radiated power in any horizontal or vertical direction may not exceed the maximum values permitted by this section and Figures 3 and 4 of § 3.699.

(4) The maximum effective radiated power in any direction above the horizontal plane shall be as low as the state of the art permits and may not exceed the effective radiated power in the horizontal direction in the same vertical plane.

(c) *Determination of applicable rules.* The zone in which the transmitter of a television station is located or proposed to be located determines the applicable rules with respect to maximum antenna heights and powers for VHF stations when the transmitter is located in Zone I and the channel to be employed is located in Zone II, or the transmitter is located in Zone II and the channel to be employed is located in Zone I.

§ 3.615 *Administrative changes in authorizations.* In the issuance of television broadcast station authorizations, the Commission will specify the transmitter output power and effective radiated power to the nearest 0.1 dbk. Powers specified by kilowatts shall be obtained by converting dbk to kilowatts to 3 significant figures. Antenna heights above average terrain will be specified to the nearest 10 feet. Midway figures will be authorized in the lower alternative.

APPLICATIONS AND AUTHORIZATIONS

§ 3.621 *Noncommercial educational stations.* In addition to the other provisions of this subpart, the following shall be applicable to noncommercial educational television broadcast stations:

(a) Except as provided in paragraph (b) of this section, noncommercial educational broadcast stations will be licensed only to nonprofit educational organizations upon a showing that the proposed stations will be used primarily to serve the educational needs of the community; for the advancement of educational programs; and to furnish a nonprofit and noncommercial television broadcast service.

(1) In determining the eligibility of publicly supported educational organizations, the accreditation of their respective state departments of education shall be taken into consideration.

(2) In determining the eligibility of privately controlled educational organizations, the accreditation of state departments of education or recognized regional and national educational accrediting organizations shall be taken into consideration.

(b) Where a municipality or other political subdivision has no independently constituted educational organization such as, for example, a board of education having autonomy with respect to carrying out the municipality's educational program, such municipality shall be eligible for a noncommercial educational television broadcast station. In such circumstances, a full and detailed showing must be made that a grant of the application will be consistent with the intent and purpose of the Commission's Rules relating to such stations.

(c) Noncommercial educational television broadcast stations may transmit educational, cultural and entertainment programs, and programs designed for use by schools and school systems in connection with regular school courses, as well as routine and administrative material pertaining thereto.

(d) An educational station may not broadcast programs for which a consideration is received, except programs produced by or at the expense of or furnished by others than the licensee for which no other consideration than the furnishing of the program is received by the licensee. The payment of line charges by another station or network shall not be considered as being prohibited by this paragraph.

(e) To the extent applicable to programs broadcast by a noncommercial educational station produced by or at the expense of or furnished by others than the licensee of said station, the provisions of § 3.654 relating to announcements regarding sponsored programs shall be applicable, except that no announcements (visual or aural) promoting the sale of a product or service shall be transmitted in connection with any program: *Provided, however,* That where a sponsor's name or product appears on the visual image during the course of a simultaneous or rebroadcast program either on the backdrop or in similar form, the portions of the program showing such information need not be deleted.

§ 3.622 *Applications for television stations.* Applications for new stations or for modifications of existing authorizations shall be filed on FCC Form 301; for licenses, on FCC Form 302; for renewal of licenses, on FCC Form 303. Separate applications shall be filed by each applicant for the voluntary sharing of television channels. Such applications shall be accompanied by copies of the time-sharing agreements under which the applicants propose to operate.

§ 3.623 *Full disclosures.* Applications shall contain full and complete disclosures with regard to the real party or parties in interest, and their legal, technical, financial, and other qualifications, and as to all matters and things required to be disclosed thereby.

§ 3.624 *Repetitious applications.* (a) Where an applicant has been afforded an opportunity to be heard with respect to a particular application for a new television broadcast station, or for change of existing service or facilities, and the Commission has, after hearing or default, denied the application or dismissed it with prejudice, the Commission will not consider another application for a station of the same class to serve in whole or in part the same area, by the same applicant or by his successor or assignee, or on behalf of or for the benefit of the original parties in interest, until after the lapse of 12 months from the effective date of the Commission's order.

(b) Where an appeal has been taken from the action of the Commission in denying a particular application, another

application for the same class of broadcast station and for the same area, in whole or in part, filed by the same applicant or by his successor or assignee, or on behalf or for the benefit of the original parties in interest, will not be considered until the final disposition of such appeal.

§ 3.625 *Installation of apparatus.* Applications for construction permits or modification thereof involving the installation of new transmitting apparatus should be filed at least 60 days prior to the contemplated installation.

§ 3.626 *Period of construction.* Each construction permit will specify a maximum of 60 days from the date of granting thereof as the time within which construction of the station shall begin, and a maximum of 6 months thereafter as the time within which construction shall be completed and the station ready for operation, unless otherwise determined by the Commission upon proper showing in any particular case.

§ 3.627 *Forfeiture of construction permits; extension of time.* (a) A construction permit shall be automatically forfeited if the station is not ready for operation within the time specified therein or within such further time as the Commission may have allowed for completion, and a notation of the forfeiture of any construction permit under this provision will be placed in the records of the Commission as of the expiration date.

(b) An application (FCC Form 701) for extension of time within which to construct a station shall be filed at least 30 days prior to the expiration date of such permit if the facts supporting such application for extension are known to the applicant in time to permit such filing. In other cases, such applications will be accepted upon a showing satisfactory to the Commission of sufficient reasons for filing within less than 30 days prior to the expiration date. Such applications will be granted upon a specific and detailed showing that the failure to complete was due to causes not under the control of the grantee, or upon a specific and detailed showing of other matters sufficient to justify the extension.

(c) If a construction permit has been allowed to expire for any reason, application may be made for a new permit on FCC Form 321, "Application for Construction Permit to Replace Expired Permit."

§ 3.628 *Equipment tests.* (a) During the process of construction of a television broadcast station, the permittee, after notifying the Commission and Engineer in Charge of the radio district in which the station is located may, without further authority of the Commission, conduct equipment tests for the purpose of such adjustments and measurements as may be necessary to assure compliance with the terms of the construction permit, the technical provisions of the application therefor, and the rules and regulations.

(b) The Commission may notify the permittee to conduct no tests or may cancel, suspend, or change the date for the beginning of equipment tests as and when such action may appear to be in the public interest, convenience, and necessity

(c) Equipment tests may be continued so long as the construction permit shall remain valid.

(d) Inspection of a station will ordinarily be required during the equipment test period and before the commencement of program tests. After construction and after adjustments and measurements have been completed to show compliance with the terms of the construction permit, the technical provisions of the application therefor, and the rules and regulations, the permittee should notify the Engineer in Charge of the radio district in which the station is located that it is ready for inspection.

(e) The authorization for tests embodied in this section shall not be construed as constituting a license to operate but as a necessary part of construction.

§ 3.629 *Program tests* (a) Upon completion of construction of a television broadcast station in accordance with the terms of the construction permit, the technical provisions of the application therefor, and the rules and regulations, and when an application for station license has been filed showing the station to be in satisfactory operating condition, the permittee may request authority to conduct program tests: *Provided*, That such request shall be filed with the Commission at least ten (10) days prior to the date on which it is desired to begin such operation and that the Engineer in Charge of the radio district in which the station is located is notified. (All data necessary to show compliance with the terms and conditions of the construction permit must be filed with the license application.)

(b) Program tests shall not commence until specific Commission authority is received. The Commission reserves the right to change the date of the beginning of such tests or to suspend or revoke the authority for program tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Unless sooner suspended or revoked, the program test authority continues valid during Commission consideration of the application for license and during this period further extension of the construction permit is not required. Program test authority shall be automatically terminated by final determination upon the application for station license.

(d) All operation under program test authority shall be in strict compliance with the rules governing television broadcast stations and in strict accordance with representations made in the application for license pursuant to which the tests were authorized.

(e) The granting of program test authority shall not be construed as approval by the Commission of the application for station license.

§ 3.630 *Normal license period.* (a) All television broadcast station licenses will be issued for a normal license period of three years. Licenses will be issued to expire at the hour of 3:00 a. m., e. s. t., in accordance with the following schedule and at three-year intervals thereafter,

(1) For stations located in Delaware and Pennsylvania, August 1, 1957.

(2) For stations located in Maryland, District of Columbia, Virginia, West Virginia, October 1, 1957.

(3) For stations located in North Carolina, South Carolina, December 1, 1957.

(4) For stations located in Florida, Puerto Rico, and Virgin Islands, February 1, 1958.

(5) For stations located in Alabama and Georgia, April 1, 1958.

(6) For stations located in Arkansas, Louisiana, and Mississippi, June 1, 1958.

(7) For stations located in Tennessee, Kentucky, and Indiana, August 1, 1958.

(8) For stations located in Ohio and Michigan, October 1, 1958.

(9) For stations located in Illinois and Wisconsin, December 1, 1958.

(10) For stations located in Iowa and Missouri, February 1, 1956.

(11) For stations located in Minnesota, North Dakota, South Dakota, Montana, and Colorado, April 1, 1956.

(12) For stations located in Kansas, Oklahoma, Nebraska, June 1, 1956.

(13) For stations located in Texas, August 1, 1956.

(14) For stations located in Wyoming, Nevada, Arizona, Utah, New Mexico, and Idaho, October 1, 1956.

(15) For stations located in California, December 1, 1956.

(16) For stations located in Washington, Oregon, Alaska, and Hawaii, February 1, 1957.

(17) For stations located in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, April 1, 1957.

(18) For stations located in New Jersey and New York, June 1, 1957.

NOTE: Renewals of licenses will be granted for the period specified in the rule: *Provided, however*, That if as a result of the transition from the previous schedule to the above schedule the period for which a license is renewed is 6 months or less, the licensee may within the period 60 days to 30 days before the expiration date of such renewed license file, in lieu of renewal application (FCC Form 303), a written application under oath for the next renewal of license which shall consist of (1) a request that its license be renewed; (2) a statement that no substantial changes have been made in its operations or in its plans for future operations since its last renewal application; or if changes have been made or proposed, a statement specifying such changes; and (3) a statement that the applicant waives any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise. Upon review of such statements, the Commission may grant a renewal of license for the full period provided for in the rule; or if the Commission requires additional information, it may require the filing of renewal application (FCC Form 303).

§ 3.631 *Renewal of license.* (a) Unless otherwise directed by the Commission, each application for renewal of a television station license shall be filed at least 90 days prior to the expiration date of the license sought to be renewed (FCC Form 303) No application for

renewal of a television broadcast station will be considered unless there is on file with the Commission the information currently required by §§ 1.341-1.344 of this chapter, reference to which by date and file number shall be included in the application.

(b) Whenever the Commission regards an application for a renewal of a television station license as essential to the proper conduct of a hearing or investigation, and specifically directs that it be filed by a certain date, such application shall be filed within the time thus specified. If the licensee fails to file such application within the prescribed time, the hearing or investigation shall proceed as if such renewal application had been received.

§ 3.632 [Reserved.]

§ 3.633 *License, simultaneous modification and renewal.* When an application is granted by the Commission necessitating the issuance of a modified license less than 60 days prior to the expiration date of the license sought to be modified, and an application for renewal of said license is granted subsequent or prior thereto (but within 30 days of expiration of the present license), the modified license as well as the renewal license shall be issued to conform to the combined action of the Commission.

§ 3.634 *Assignment or transfer of control.*- (a) *Voluntary.* Application for consent to voluntary assignment of a television station construction permit or license or for consent to voluntary transfer of control of a corporation holding a television station construction permit or license shall be filed with the Commission on FCC Form 314 (Assignment of License), FCC Form 315 (Transfer of Control) or FCC Form 316 (Short Form) at least 60 days prior to the contemplated effective date of assignment or transfer of control.

(b) *Pro forma.* Assignment or transfer application shall be filed on FCC Form 316 where:

(1) There is an assignment from an individual or individuals (including partnerships) to a corporation owned and controlled by such individuals or partnerships without any substantial change in their relative interests;

(2) There is an assignment from a corporation to its individual stockholders without effecting any substantial change in the disposition of their interests;

(3) There is an assignment or transfer by which certain partners or stockholders retire but no new ones are brought in, provided that the interest transferred is not a controlling one;

(4) There is a corporate reorganization which involves no substantial change in the beneficial ownership of the corporation;

(5) There is an involuntary transfer to an Executor, Administrator or other court appointed officer caused by death or legal disability, except that this form does not cover assignments (or transfers) from the Executor, Administrator or other court appointed officers to the ultimate beneficiary;

(6) There is an assignment or transfer from a corporation to a wholly owned subsidiary thereof or vice versa, or where there is an assignment from a corporation to a corporation owned or controlled by the assignor stockholders without substantial change in their interests;

(7) There is an assignment of less than a controlling interest in a partnership.

(c) *Involuntary.* In the event of the death or legal disability of a permittee or licensee, or a member of a partnership, or a person directly or indirectly in control of a corporation, which is a permittee or licensee:

(1) The Commission shall be notified in writing promptly of the occurrence of such death or legal disability, and

(2) Within 30 days after the occurrence of such death or legal disability, application on FCC Form 316 shall be filed for consent to involuntary transfer of control of such corporation to a person or entity qualified to succeed to the foregoing interests under the laws of the place having jurisdiction over the estate involved

§ 3.635 *Use of common antenna site.* No television license or renewal of a television license will be granted to any person who owns, leases, or controls a particular site which is peculiarly suitable for television broadcasting in a particular area and (a) which is not available for use by other television licensees; and (b) no other comparable site is available in the area; and (c) where the exclusive use of such site by the applicant or licensee would unduly limit the number of television stations that can be authorized in a particular area or would unduly restrict competition among television stations.

§ 3.636 *Multiple ownership.* (a) No license for a television broadcast station shall be granted to any party (including all parties under common control) if:

(1) Such party directly or indirectly owns, operates, or controls another television broadcast station which serves substantially the same area; or

(2) Such party, or any stockholder, officer or director of such party, directly or indirectly owns, operates, controls, or has any interest in, or is an officer or director of any other television broadcast station if the grant of such license would result in a concentration of control of television broadcasting in a manner inconsistent with public interest, convenience, or necessity. In determining whether there is such a concentration of control, consideration will be given to the facts of each case with particular reference to such factors as the size, extent and location of area served, the number of people served, and the extent of other competitive service to the areas in question. The Commission, however, will in any event consider that there would be such a concentration of control contrary to the public interest, convenience or necessity for any party or any of its stockholders, officers or directors to have a direct or indirect interest in, or be stockholders, officers, or directors of, more than seven television broadcast stations, no more than five of which may be in the VHF band.

(b) Paragraph (a) of this section is not applicable to non-commercial educational stations.

NOTE 1: The word "control" as used herein is not limited to majority stock ownership, but includes actual working control in whatever manner exercised.

NOTE 2. In applying the provisions of paragraph (a) of this section to the stockholders of a corporation which has more than 50 voting stockholders, only those stockholders need be considered who are officers or directors or who directly or indirectly own 1 percent or more of the outstanding voting stock

§ 3.637 *Alternate main transmitters.* The licensee of a television broadcast station may be licensed for alternate main transmitters provided that a technical need for such alternate transmitters is shown and that the following conditions are met:

(a) Both transmitters are located at the same place.

(b) Both transmitters shall have the same power rating.

(c) Both transmitters shall meet the construction, installation, operation and performance requirements of this subpart.

§ 3.638 *Auxiliary transmitter.* Upon showing that a need exists for the use of auxiliary transmitters in addition to the regular transmitters of a television station, a license therefor may be issued: *Provided*, That:

(a) Auxiliary transmitters may be installed either at the same location as the main transmitters or at another location.

(b) A licensed operator shall be in control whenever auxiliary transmitters are placed in operation

(c) The auxiliary transmitters shall be maintained so that they may be put into immediate operation at any time for the following purposes:

(1) The transmission of the regular programs upon the failure of the main transmitters.

(2) The transmission of regular programs during maintenance or modification work on the main transmitters necessitating discontinuance of their operation for a period not to exceed 5 days.

NOTE: This includes the equipment changes which may be made without authority as set forth elsewhere in the rules and regulations or as authorized by the Commission by letter or by construction permit. Where such operation is required for periods in excess of 5 days, request therefor shall be in accordance with § 1.324 of the Commission's rules.

(3) Upon request by a duly authorized representative of the Commission.

(d) The auxiliary transmitters shall be tested at least once each week to determine that they are in proper operating condition and that they are adjusted to the proper frequency, except that in the case of operation in accordance with paragraph (c) of this section during any week, the test in that week may be omitted provided the operation under paragraph (c) of this section is satisfactory. A record shall be kept of the time and result of each test. Such records shall be retained for a period of two years.

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(e) The auxiliary transmitters shall be equipped with satisfactory control equipment which will enable the maintenance of the frequency emitted by the station within the limits prescribed by the regulations in this subpart.

(f) The operating power of an auxiliary transmitter may be less than the authorized power of the main transmitters, but in no event shall it be greater than such power.

§ 3.639 *Changes in equipment and antenna system.* Licensees of television broadcast stations shall observe the following provisions with regard to changes in equipment and antenna system.

(a) No changes in equipment shall be made:

(1) That would result in the emission of signals outside of the authorized channel.

(2) That would result in the external performance of the transmitter being in disagreement with that prescribed in this subpart.

(b) Specific authority, upon filing formal application therefor (FCC Form 301 or such other form as is provided therefor), is required for any of the following changes:

(1) Changes involving an increase or decrease in the power rating of the transmitters.

(2) A replacement of the transmitters as a whole.

(3) Change in the location of the transmitting antenna.

(4) Change in antenna system, including transmission line.

(5) Change in the power delivered to the antenna.

(6) Change in frequency control and/or modulation system.

(c) Other changes, except as above provided for in this section or in the provisions of this subpart, may be made at any time without the authority of the Commission, provided that the Commission shall be promptly notified thereof and such changes shall be shown in the next application for renewal of license.

§ 3.640 *Acceptability of broadcast transmitters for licensing.* (a) In order to facilitate the filing of, and action on, applications for station authorizations, transmitters will be accepted for licensing by the Commission under one of the following conditions:

(1) A transmitter may be type-accepted upon the request of any manufacturer of transmitters built in quantity by following the type acceptance procedure set forth in Part 2 of this chapter, provided that the data and information submitted indicates that the transmitter meets the requirements of § 3.687. If accepted, such transmitter will be included on the Commission's "Radio Equipment List, Part A, Television Broadcast Equipment." Applicants specifying transmitters included on such a list need not submit detailed descriptions and diagrams where the correct type number is specified, provided that the equipment proposed is identical with that accepted. Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(2) An application specifying a transmitter not included on the Radio Equipment List, Part A, may be accepted upon the request of a prospective licensee submitting with the application for construction permit a complete description of the transmitter, including the circuit diagram, listing of all tubes used, function of each, multiplication in each stage, plate current and voltage applied to each tube, a description of the oscillator circuit together with any devices installed for the purpose of frequency stabilization and the means of varying output power to compensate for power supply voltage variations. However, if this data has been filed with the Commission by a manufacturer in connection with a request for type acceptance, it need not be submitted with the application for construction permit but may be referred to as "on file." Measurement data for type acceptance made in accordance with subparagraph (1) of this paragraph shall be submitted with the license application.

(3) A transmitter shown on an instrument of authorization by manufacturer and type number, or as a composite, and which was in use prior to June 30, 1955, may continue to be used by the licensee, his successors or assignees, provided such transmitter continues to comply with the rules and regulations.

(b) Additional rules with respect to withdrawal of type-acceptance, modification of type-accepted equipment and limitations on the findings upon which type acceptance is based are set forth in Part 2 of this chapter.

GENERAL OPERATING REQUIREMENTS

§ 3.651 *Time of operation.* (a) All television broadcast stations will be licensed for unlimited time operation. Each such station shall maintain a regular program operating schedule as follows: not less than 2 hours daily in any five broadcast days per week and not less than a total of 12 hours per week during the first 18 months of the station's operation; not less than 2 hours daily in any 5 broadcast days per week and not less than a total of 16 hours, 20 hours and 24 hours per week for each successive 6-month period of operation, respectively; and not less than 2 hours in each of the 7 days of the week and not less than a total of 28 hours per week thereafter. "Operation" includes the period during which a station is operated pursuant to special temporary authority or during program tests, as well as during the license period. Time devoted to test patterns, or to aural presentations accompanied by the incidental use of fixed visual images which have no substantial relationship to the subject matter of such aural presentations, shall not be considered in computing periods of program service. If, in the event of an emergency due to causes beyond the control of a licensee, it becomes impossible to continue operation, the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified in writing immediately after the emergency develops and immediately after the emergency ceases and operation is resumed.

(b) Noncommercial educational television broadcast stations are not required to operate on a regular schedule and no minimum number of hours of operation is specified; but the hours of actual operation during a license period shall be taken into consideration in considering the renewal of noncommercial educational television broadcast licenses.

(c) (1) The aural transmitter of a television station shall not be operated separately from the visual transmitter except for the following purposes:

(i) For actual tests of station equipment or actual experimentation in accordance with § 3.666; and

(ii) For emergency "fills" in case of visual equipment failure or unscheduled and unavoidable delays in presenting visual programs. In such situations the aural transmitter may be used to advise the audience of difficulties and to transmit for a short period program material of such nature that the audience will be enabled to remain tuned to the station; for example, music or news accompanying a test pattern or other visual presentation.

(2) During periods of transmission of a test pattern on the visual transmitter of a television station, aural transmission shall consist only of a single tone or series of variable tones. During periods when still pictures or slides are employed to produce visual transmissions which are accompanied by aural transmissions, the aural and visual transmissions shall be integral parts of a program or announcement and shall have a substantial relationship to each other: *Provided,* That nothing herein shall preclude the transmission of a test pattern, still pictures or slides for the following purposes and periods:

(i) To accompany aural announcements of the station's program schedule and aural news broadcasts or news commentaries, for a total period not to exceed one hour in any broadcast day.

(ii) To accompany aural transmissions for a period of time not to exceed fifteen minutes immediately prior to the commencement of a programming schedule.

Examples. (1) Duplication of AM or FM programs on the aural transmitter of a television station while the same program is broadcast on the visual transmitter (i. e., a "simulcast") is consistent with this paragraph.

(2) Duplication of AM or FM programs on the aural transmitter of a television station while a test pattern is broadcast on the visual transmitter is not consistent with this paragraph, except for the specific purposes and periods specified in paragraph (c) (2).

(3) A travel lecture in which the words of the lecturer are broadcast simultaneously with still pictures or slides of scenes illustrating the lecture, and a newscast in which the words of the newscaster are broadcast simultaneously with still pictures or slides of the news events, are examples of programs in which the aural and visual transmissions are integral parts of the same program having a substantial relationship to each other, within the meaning of paragraph (c) (2). Mood music unrelated to the visual transmission is not consistent with this paragraph.

(4) The broadcast of a test pattern accompanied by a musical composition for the purpose of demonstration, sale, installation or orientation of television receivers, or re-

ceiving antennas is not consistent with this paragraph.

(5) Music accompanying the transmission of a test pattern upon which is visually imposed a moving text consisting of continuous program material, such as a running newscast or news commentary, is consistent with this paragraph.

(6) Music accompanying the transmission of a test pattern upon which is visually imposed a clock indicating the time of day, or a text that is changed at spaced intervals, is not consistent with this paragraph.

§ 3.652 *Station identification.* (a) A licensee of a television broadcast station shall make station identification announcement (call letters and location) at the beginning and ending of each time of operation and during the operation on the hour. The announcement at the beginning and ending of each time of operation shall be by both aural and visual means. Other announcements may be by either aural or visual means.

(b) Identification announcements during operation need not be made when to make such announcement would interrupt a single consecutive speech, play, religious service, symphony concert, or any type of production. In such cases, the identification announcement shall be made at the first interruption of the entertainment continuity and at the conclusion thereof.

§ 3.653 *Mechanical reproductions.* (a) Each program which consists in whole or in part of one or more mechanical reproductions, either visual or aural, shall be accompanied by an appropriate announcement to that effect either at the beginning or end of such reproduction or at the beginning or end of the program in which such reproduction is used. No such announcement shall be required where a mechanical reproduction is used for background music, sound effects, station identification, program identification (theme music of short duration) or identification of sponsorship of the program proper.

(b) The exact form of identifying announcement is not prescribed but the language shall be clear and in terms commonly used and understood. The licensee shall not attempt affirmatively to create the impression that any program being broadcast by mechanical reproduction consists of live talent.

§ 3.654 *Sponsored programs, announcement.* (a) In the case of each program for the broadcasting of which money, services, or other valuable consideration is either directly or indirectly paid or promised to, or charged or received by, any television broadcast station, the station broadcasting such program shall make, or cause to be made, an appropriate announcement that the program is sponsored, paid for, or furnished, either in whole or in part.

(b) In the case of any political program or any program involving the discussion of public controversial issues for which any films, records, transcriptions, talent, scripts, or other material or services of any kind are furnished, either directly or indirectly, to a station as an inducement to the broadcasting of such program, an announcement shall be made both at the beginning and conclusion of such program on which such material or services are used that such films, records, transcriptions, talent, scripts, or other material or services have been furnished to such station in connection with the broadcasting of such program: *Provided, however,* That only one such announcement need be made in the case of any such program of 5 minutes' duration or less, which announcement may be made either at the beginning or conclusion of the program.

(c) The announcement required by this section shall fully and fairly disclose the true identity of the person or persons by whom or in whose behalf such payment is made or promised, or from whom or in whose behalf such services or other valuable consideration is received, or by whom the material or services referred to in paragraph (b) of this section are furnished. Where an agent or other person contracts or otherwise makes arrangements with a station on behalf of another, and such fact is known to the station, the announcement shall disclose the identity of the person or persons in whose behalf such agent is acting instead of the name of such agent.

(d) In the case of any program, other than a program advertising commercial products or services, which is sponsored, paid for or furnished, either in whole or in part, or for which material or services referred to in paragraph (b) of this section are furnished, by a corporation, committee, association or other unincorporated group, the announcement required by this section shall disclose the name of such corporation, committee, association or other unincorporated group. In each such case the station shall require that a list of the chief executive officers or members of the executive committee or of the board of directors of the corporation, committee, association or other unincorporated group shall be made available for public inspection at one of the television broadcast stations carrying the program.

(e) In the case of programs advertising commercial products or services, an announcement stating the sponsor's corporate or trade name or the name of the sponsor's product, shall be deemed sufficient for the purposes of this section and only one such announcement need be made at any time during the course of the program.

§ 3.655 *Rebroadcast.* (a) The term "rebroadcast" as used below means reception by radio of the program of a television broadcast station, and the simultaneous or subsequent retransmission of such program by a broadcast station. The broadcasting of a program relayed by an auxiliary broadcast station licensed to the television broadcast station is not considered a rebroadcast. (As used in this section, program includes any complete program or part thereof.)

(b) The licensee of a television broadcast station may, without further authority of the Commission, rebroadcast the program of a United States television broadcast station, provided the Commission is notified of the call letters of each station rebroadcast and the licensee certifies that express authority has been received from the licensee of the station originating the program.

NOTE: The notice and certification of consent shall be given within 3 days of any single rebroadcast, but in case of the regular practice of rebroadcasting certain programs of a television broadcast station several times during a license period, notice and certification of consent shall be given for the ensuing license period with the application for renewal of license, or at the beginning of such rebroadcast practice if begun during a license period.

(c) No licensee of a television broadcast station shall rebroadcast the program of any United States radio station not designated in paragraph (b) of this section without written authority having first been obtained from the Commission upon application (informal) accompanied by written consent or certification of consent of the licensee of the station originating the program.

NOTE: By Order No. 82, dated and effective June 24, 1941, until further order of the Commission, § 3.655 (c) is suspended only insofar as it requires prior written authority of the Commission for the rebroadcasting of programs originated for that express purpose by U. S. Government radio stations.

§ 3.656 *Lotteries.* (a) An application for construction permit, license, renewal of license, or any other authorization for the operation of a broadcast station, will not be granted where the applicant proposes to follow or continue to follow a policy or practice of broadcasting or permitting "the broadcasting of, any advertisement of or information concerning any lottery, gift enterprise, or similar scheme, offering prizes dependent in whole or in part upon lot or chance, or any list of the prizes drawn or awarded by means of any such lottery, gift enterprise, or scheme, whether said list contains any part or all of such prizes." (See 18 U. S. C. 1304.)

(b) The determination whether a particular program comes within the provisions of paragraph (a) of this section depends on the facts of each case. However, the Commission will in any event consider that a program comes within the provisions of paragraph (a) of this section if in connection with such program a prize consisting of money or thing of value is awarded to any person whose selection is dependent in whole or in part upon lot or chance, if as a condition of winning or competing for such prize, such winner or winners are required to furnish any money or thing of value or are required to have in their possession any product sold, manufactured, furnished or distributed by a sponsor of a program broadcast on the station in question.

§ 3.657 *Broadcasts by candidates for public office*—(a) *Legally qualified candidate.* A "legally qualified candidate" means any person who has publicly announced that he is a candidate for nomination by a convention of a political party or for nomination or election in a primary, special, or general election, municipal, county, state or national, and who meets the qualifications prescribed by the applicable laws to hold the office for which he is a candidate, so that he

may be voted for by the electorate directly or by means of delegates or electors, and who:

(1) Has qualified for a place on the ballot, or

(2) Is eligible under the applicable law to be voted for by sticker, by writing in his name on the ballot, or other method, and (i) has been duly nominated by a political party which is commonly known and regarded as such, or (ii) makes a substantial showing that he is a bona fide candidate for nomination or office, as the case may be.

(b) *General requirements.* No station licensee is required to permit the use of its facilities by any legally qualified candidate for public office, but if any licensee shall permit any such candidate to use its facilities, it shall afford equal opportunities to all other such candidates for that office to use such facilities: *Provided,* That such licensee shall have no power of censorship over the material broadcast by any such candidate.

(c) *Rates and practices.* (1) The rates, if any, charged all such candidates for the same office shall be uniform and shall not be rebated by any means direct or indirect. A candidate shall, in each case, be charged no more than the rate the station would charge if the candidate were a commercial advertiser whose advertising was directed to promoting its business within the same area as that encompassed by the particular office for which such person is a candidate. All discount privileges otherwise offered by a station to commercial advertisers shall be available upon equal terms to all candidates for public office.

(2) In making time available to candidates for public office no licensee shall make any discrimination between candidates in charges, practices, regulations, facilities, or services for or in connection with the service rendered pursuant to this part, or make or give any preference to any candidate for public office or subject any such candidate to any prejudice or disadvantage; nor shall any licensee make any contract or other agreement which shall have the effect of permitting any legally qualified candidate for any public office to broadcast to the exclusion of other legally qualified candidates for the same public office.

(d) *Inspection of records.* Every licensee shall keep and permit public inspection of a complete record of all requests for broadcast time made by or on behalf of candidates for public office, together with an appropriate notation showing the disposition made by the licensee of such requests, and the charges made, if any, if request is granted. Such records shall be retained for a period of two years.

§ 3.658 *Affiliation agreements*—(a) *Exclusive affiliation of station.* No license shall be granted to a television broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization under which the station is prevented or hindered from, or penalized for, broadcasting the programs of any other network organization. (The term "network organization" as used herein includes national and regional network organizations. See ch. VII, J, of Report on Chain Broadcasting.)

(b) *Territorial exclusivity.* No license shall be granted to a television broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which prevents or hinders another broadcast station located in the same community from broadcasting the network's programs not taken by the former station, or which prevents or hinders another broadcast station located in a different community from broadcasting any program of the network organization. This section shall not be construed to prohibit any contract, arrangement, or understanding between a station and a network organization pursuant to which the station is granted the first call in its community upon the programs of the network organization. As employed in this paragraph, the term "community" is defined as the community specified in the instrument of authorization as the location of the station.

(c) *Term of affiliation.* No license shall be granted to a television broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which provides, by original terms, provisions for renewal, or otherwise for the affiliation of the station with the network organization for a period longer than 2 years: *Provided,* That a contract, arrangement, or understanding for a period up to 2 years may be entered into within 6 months prior to the commencement of such period.

(d) *Option time.* No license shall be granted to a television broadcast station which options for network programs any time subject to call on less than 56 days' notice, or more time than a total of 3 hours within each of four segments of the broadcast day, as herein described. The broadcast day is divided into four segments, as follows: 8 a. m. to 1 p. m.; 1 p. m. to 6 p. m.; 6 p. m. to 11 p. m.; 11 p. m. to 8 a. m. (These segments are to be determined for each station in terms of local time at the location of the station but may remain constant throughout the year regardless of shifts from standard to daylight saving time or vice versa.) Such options may not be exclusive as against other network organizations and may not prevent or hinder the station from optioning or selling any or all of the time covered by the option, or other time, to other network organizations.

NOTE 1: As used in this section, an option is any contract, arrangement, or understanding, express or implied, between a station and a network organization which prevents or hinders the station from scheduling programs before the network agrees to utilize the time during which such programs are scheduled, or which requires the station to clear time already scheduled when the network organization seeks to utilize the time.

NOTE 2: All time options permitted under this section must be specified clock hours, expressed in terms of any time system set forth in the contract agreed upon by the station and network organization. Shifts from daylight saving to standard time or vice versa may or may not shift the specified hours correspondingly as agreed by the station and network organization.

(e) *Right to reject programs.* No license shall be granted to a television broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization which (1), with respect to programs offered pursuant to an affiliation contract, prevents or hinders the station from rejecting or refusing network programs which the station reasonably believes to be unsatisfactory or unsuitable; or which (2) with respect to network programs so offered or already contracted for, prevents the station from rejecting or refusing any program which, in its opinion, is contrary to the public interest, or from substituting a program of outstanding local or national importance.

(f) *Network ownership of stations.* No license shall be granted to a network organization, or to any person directly or indirectly controlled by or under common control of a network organization, for a television broadcast station in any locality where the existing television broadcast stations are so few or of such unequal desirability (in terms of coverage, power, frequency, or other related matters) that competition would be substantially restrained by such licensing. (The word "control" as used in this section, is not limited to full control but includes such a measure of control as would substantially affect the availability of the station to other networks.)

(g) *Dual network operation.* No license shall be issued to a television broadcast station affiliated with a network organization which maintains more than one network of television broadcast stations: *Provided,* That this section shall not be applicable if such networks are not operated simultaneously, or if there is no substantial overlap in the territory served by the group of stations comprising each such network.

(h) *Control by networks of station rates.* No license shall be granted to a television broadcast station having any contract, arrangement, or understanding, express or implied, with a network organization under which the station is prevented or hindered from, or penalized for, fixing or altering its rates for the sale of broadcast time for other than the network's programs.

§ 3.659 *Special rules relating to contracts providing for reservation of time upon sale of a station.* (a) No license, renewal of license, assignment of license, or transfer of control of a corporate licensee shall be granted or authorized to a television broadcast station which has a contract, arrangement or understanding, express or implied, pursuant to which, as consideration or partial consideration for the assignment of license or transfer of control, the assignor of a station license or the transferor of stock, where transfer of a corporate licensee is involved, or the nominee of such assignor or transferor retains any right of reversion of the license or any right to the reassignment of the license in the future, or reserves the right to use the facilities of the station for any period whatsoever.

(b) In the case of assignment of license or transfer of control of a corpo-

rate licensee approved by the Commission before the effective date of this section, February 15, 1949, involving a contract, arrangement or understanding of the type covered by paragraph (a) of this section and the existence and terms of which were fully disclosed to the Commission at the time of execution, the Commission will give consideration to the issuance of a license despite the existence of such contract, arrangement or understanding, if the parties thereto modify such contract within 6 months from the effective date of this section. Such modifications will be considered on the facts of each case but no such modification will be approved unless the modified contract contains at least the following provisions:

(1) A maximum limitation of the time subject to reservation so that no more than 12 hours per week shall be subject to reservation, of which no more than 4 hours shall be on any given day.

(2) A clause providing that the licensee reserves the right to reject or refuse programs which he reasonably believes to be unsatisfactory or unsuitable or for which, in his opinion, a program of outstanding local or national importance should be substituted, but provision may be made for the substitution of other television time for programs so rejected or for the payment at the station card rate for the time made unavailable.

(3) A prohibition against the resale or reassignment of any of the broadcast time reserved by such modified contract.

(4) An express negation of any right with respect to reversion or reassignment of license.

(5) An express provision setting forth a definite expiration date of the contract, arrangement or understanding. Such expiration date shall not extend beyond February 15, 1964, and shall in no event extend beyond the expiration date originally provided for in any such contract, agreement or understanding, in the event that such expiration date is a date prior to February 15, 1964.

(6) An express provision giving to the licensee the right to terminate the contract, arrangement or understanding for substantial cause, including, but not limited to, the assignment of license or the transfer of control of a corporate licensee, consistent disagreement over programs between the parties, or the acquisition of a network affiliation by the licensee, upon the payment of a lump sum or periodic payments, and providing that the amount initially fixed shall thereafter decrease as the amount of time reserved is decreased by performance of the contract. Any such payment should not be so unduly large as to constitute in practice an effective deterrent to the licensee exercising the right. In determining whether the amount is unduly large, the Commission will consider the amount by which consideration in return for the transfer of the station was decreased by reason of the reservation of time or the present value of the television time still reserved and unused as of the date of the exercise of the right of termination.

§ 3.660 *Station license, posting of.* The original of each station license shall be posted in the transmitter room.

§ 3.661 *Operator requirements.* One or more licensed radio-telephone first class operators shall be on duty at the place where the transmitting apparatus of each station is located and in actual charge thereof whenever it is being operated. The original license (or FCC Form 759) of each station operator shall be posted at the place where he is on duty. The licensed operator on duty and in charge of a television broadcast transmitter may, at the discretion of the licensee, be employed for other duties or for the operation of another station or stations in accordance with the class of operator's license which he holds and by the rules and regulations governing such stations. However, such duties shall in nowise interfere with the operation of the broadcast transmitter.

§ 3.662 *Antenna structure, marking and lighting.* Where an antenna structure(s) is required to be painted or lighted see § 17.37, *Inspection of tower lights and associated control equipment;* § 17.39, *Cleaning and repainting;* § 17.40, *Time when lights shall be exhibited;* § 17.41, *Spare lamps;* and § 17.42, *Lighting equipment;* of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.663 *Logs; maintenance of.* The licensee or permittee of each television station shall maintain program and operating logs and shall require entries to be made as follows:

(a) In the program log:

(1) An entry of the time each station identification announcement (call letters and location) is made.

(2) An entry briefly describing each program broadcast, such as "music," "drama," "speech," etc., together with the name or title thereof and the sponsor's name, with the time of the beginning and ending of the complete program. If a mechanical reproduction, either visual or aural, is used, the entry shall show the exact nature thereof and the time it is announced as a mechanical reproduction. If a speech is made by a political candidate, the name and political affiliations of such speaker shall be entered.

(3) An entry showing that each sponsored program broadcast has been announced as sponsored, paid for, or furnished by the sponsor; or that the broadcast is under the auspices of a nonprofit educational organization other than the licensee or permittee.

(4) An entry showing, for each program of network origin, the name of the network originating the program.

(b) In the operating log:

(1) An entry of the time the station begins to supply power to the antenna, and the time it stops.

(2) An entry of the time the program begins and ends.

(3) An entry of each interruption to the carrier wave, its cause, and duration.

(4) An entry of the following each 30 minutes:

(i) Operating constants of last radio stage of the aural transmitter (total plate current and plate voltage).

(ii) Transmission line meter readings for both transmitters.

(iii) Frequency monitor readings.

(5) Log of experimental operation during experimental period (if regular operation is maintained during this period, the above logs shall be kept).

(i) A log must be kept of all operation during the experimental period. If the entries required above are not applicable thereto, then the entries shall be made so as to describe the operation fully.

(c) Where an antenna structure(s) is required to be illuminated see § 17.38, *Recording the tower light inspections in the station record,* of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.664 *Logs; retention of, etc.*—(a) *Logs; retention of.* Logs of television broadcast stations shall be retained by the licensee or permittee for a period of two years: *Provided, however,* That logs involving communications incident to a disaster or which include communications incident to or involved in an investigation by the Commission and concerning which the licensee or permittee has been notified, shall be retained by the licensee or permittee until he is specifically authorized in writing by the Commission to destroy them: *Provided further,* That logs incident to or involved in any claim or complaint of which the licensee or permittee has notice shall be retained by the licensee or permittee until such claim or complaint has been fully satisfied or until the same has been barred by statute limiting the time for the filing of suits upon such claims.

(b) *Logs, by whom kept.* Each log shall be kept by the person or persons competent to do so, having actual knowledge of the facts required, who shall sign the log when starting duty and again when going off duty. The logs shall be made available upon request by an authorized representative of the Commission.

(c) *Log form.* The log shall be kept in an orderly manner, in suitable form, and in such detail that the data required for the particular class of station concerned are readily available. Key letters or abbreviations may be used if proper meaning or explanation is contained elsewhere in the log.

(d) *Correction of logs* No log or portion thereof shall be erased, obliterated, or wilfully destroyed within the period of retention provided by the rules. Any necessary correction may be made only by the person originating the entry who shall strike out the erroneous portion, initial the correction made, and indicate the date of correction.

(e) *Rough logs.* Rough logs may be transcribed into condensed form, but in such case the original log or memoranda and all portions thereof shall be preserved and made a part of the complete log.

§ 3.665 *Station inspection.* The licensee of a television broadcast station shall make the station available for in-

spection by representatives of the Commission at any reasonable hour.

§ 3.666 *Experimental operation.* Television broadcast stations may (upon informal application) conduct technical experimentation directed to the improvement of technical phases of operation and for such purposes may utilize a signal other than the standard television signal subject to the following conditions:

(a) That the licensee complies with the provisions of § 3.651 with regard to the minimum number of hours of transmission with a standard television signal.

(b) That no transmissions are radiated outside of the authorized channel and subject to the condition that no interference is caused to the transmissions of a standard television signal by other television broadcast stations.

(c) No charges either direct or indirect shall be made by the licensee of a television broadcast station for the production or transmission of programs when conducting technical experimentation.

§ 3.667 *Discontinuance of operation.* The licensee of each station shall notify the Commission in Washington, D. C., and the Engineer in Charge of the radio district where such station is located of permanent discontinuance of operation at least two days before operation is discontinued. The licensee shall, in addition, immediately forward the station license and other instruments of authorization to the Washington, D. C., office of the Commission for cancellation.

§ 3.668 *Frequency tolerance.* (a) The carrier frequency of the visual transmitter shall be maintained within ±1000 cycles of the authorized carrier frequency.

(b) The center frequency of the aural transmitter shall be maintained 4.5 megacycles, ±1000 cycles, above the visual carrier frequency.

TV TECHNICAL STANDARDS

§ 3.681 *Definitions.*

Amplitude modulation (AM). A system of modulation in which the envelope of the transmitted wave contains a component similar to the wave form of the signal to be transmitted.

Antenna height above average terrain. The average of the antenna heights above the terrain from two to ten miles from the antenna for the eight directions spaced evenly for each 45 degrees of azimuth starting with True North. (In general, a different antenna height will be determined in each direction from the antenna. The average of these various heights is considered the antenna height above the average terrain. In some cases less than 8 directions may be used. See § 3.684 (d)).

Antenna power gain. The square of the ratio of the root-mean-square free space field intensity produced at one mile in the horizontal plane, in millivolts per meter for one kilowatt antenna input power to 137.6 mv/m. This ratio should be expressed in decibels (db). (If specified for a particular direction, antenna power gain is based on the field strength in that direction only.)

Aspect ratio. The ratio of picture width to picture height as transmitted.

Aural transmitter. The radio equipment for the transmission of the aural signal only.

Aural center frequency. (1) The average frequency of the emitted wave when modulated by a sinusoidal signal; (2) the frequency of the emitted wave without modulation.

Blanking level. The level of the signal during the blanking interval, except the interval during the scanning synchronizing pulse and the chrominance subcarrier synchronizing burst.

Chrominance. The colorimetric difference between any color and a reference color of equal luminance, the reference color having a specific chromaticity.

Chrominance subcarrier. The carrier which is modulated by the chrominance information.

Color transmission. The transmission of color television signals which can be reproduced with different values of hue, saturation, and luminance.

Effective radiated power. The product of the antenna input power and the antenna power gain. This product should be expressed in kilowatts and in decibels above one kilowatt (dbk). (If specified for a particular direction, effective radiated power is based on the antenna power gain in that direction only. The licensed effective radiated power is based on the average antenna power gain for each horizontal plane direction.)

Field. Scanning through the picture area once in the chosen scanning pattern. In the line interlaced scanning pattern of two to one, the scanning of the alternate lines of the picture area once.

Frame. Scanning all of the picture area once. In the line interlaced scanning pattern of two to one, a frame consists of two fields.

Free space field intensity. The field intensity that would exist at a point in the absence of waves reflected from the earth or other reflecting objects.

Frequency modulation (FM). A system of modulation where the instantaneous radio frequency varies in proportion to the instantaneous amplitude of the modulating signal (amplitude of modulating signal to be measured after pre-emphasis, if used) and the instantaneous radio frequency is independent of the frequency of the modulating signal.

Frequency swing. The instantaneous departure of the frequency of the emitted wave from the center frequency resulting from modulation.

Interlaced scanning. A scanning process in which successively scanned lines are spaced an integral number of line widths, and in which the adjacent lines are scanned during successive cycles of the field frequency.

Luminance. Luminous flux emitted, reflected, or transmitted per unit solid angle per unit projected area of the source.

Monochrome transmission. The transmission of television signals which can be reproduced in gradations of a single color only.

Negative transmission. Where a decrease in initial light intensity causes an increase in the transmitted power.

Peak power. The power over a radio frequency cycle corresponding in amplitude to synchronizing peaks.

Percentage modulation. As applied to frequency modulation, the ratio of the actual frequency swing to the frequency swing defined as 100 percent modulation, expressed in percentage. For the aural transmitter of television broadcast stations, a frequency swing of ±25 kilocycles is defined as 100 percent modulation.

Polarization. The direction of the electric field as radiated from the transmitting antenna.

Reference black level. The level corresponding to the specified maximum excursion of the luminance signal in the black direction.

Reference white level of the luminance signal. The level corresponding to the specified maximum excursion of the luminance signal in the white direction.

Scanning. The process of analyzing successively, according to a predetermined method, the light values of picture elements constituting the total picture area.

Scanning line. A single continuous narrow strip of the picture area containing highlights, shadows, and half-tones, determined by the process of scanning.

Standard television signal. A signal which conforms to the television transmission standards.

Synchronization. The maintenance of one operation in step with another.

Television broadcast band. The frequencies in the band extending from 54 to 890 megacycles which are assignable to television broadcast stations. These frequencies are 54 to 72 megacycles (channels 2 through 4), 76 to 88 megacycles (channels 5 and 6), 174 to 216 megacycles (channels 7 through 13), and 470 to 890 megacycles (channels 14 through 83).

Television broadcast station. A station in the television broadcast band transmitting simultaneous visual and aural signals intended to be received by the general public.

Television channel. A band of frequencies 6 megacycles wide in the television broadcast band and designated either by number or by the extreme lower and upper frequencies.

Television transmission standards. The standards which determine the characteristics of a television signal as radiated by a television broadcast station.

Television transmitter. The radio transmitter or transmitters for the transmission of both visual and aural signals.

Vestigial sideband transmission. A system of transmission wherein one of the generated sidebands is partially attenuated at the transmitter and radiated only in part.

Visual carrier frequency. The frequency of the carrier which is modulated by the picture information.

Visual transmitter. The radio equipment for the transmission of the visual signal only.

Visual transmitter power. The peak power output when transmitting a standard television signal.

§ 3.682 *Transmission standards and changes*—(a) *Transmission standards.* (1) The width of the television broadcast channel shall be six megacycles per second.

(2) The visual carrier frequency shall be nominally 1.25 mc above the lower boundary of the channel.

(3) The aural center frequency shall be 4.5 mc higher than the visual carrier frequency.

(4 The visual transmission amplitude characteristic shall be in accordance with the chart designated as Fig. 5 of § 3.699.

(5) The chrominance subcarrier frequency shall be 3.579545 mc ± 10 cycles per second with a maximum rate of change not to exceed one tenth cycle per second per second.

(6) For monochrome and color transmissions the number of scanning lines per frame shall be 525, interlaced two to one in successive fields. The horizontal scanning frequency shall be $\frac{3}{455}$ times the chrominance subcarrier frequency; this corresponds nominally to 15,750 cycles per second (with an actual value of 15,734.264 ± 0.044 cycles per second). The vertical scanning frequency is $\frac{3}{525}$ times the horizontal scanning frequency; this corresponds nominally to 60 cycles per second (the actual value is 59.94 cycles per second). For monochrome transmissions only, the nominal values of line and field frequencies may be used.

(7) The aspect ratio of the transmitted television picture shall be 4 units horizontally to 3 units vertically.

(8) During active scanning intervals, the scene shall be scanned from left to right horizontally and from top to bottom vertically, at uniform velocities.

(9) A carrier shall be modulated within a single television channel for both picture and synchronizing signals. For monochrome transmission, the two signals comprise different modulation ranges in amplitude, in acordance with the charts designated as Figures 5 and 7 of § 3.699. For color transmission, the two signals comprise different modulation ranges in amplitude except where the chrominance penetrates the synchronizing region and the burst penetrates the picture region, in accordance with the charts designated as Figures 5 and 6 of § 3.699.

(10) A decrease in initial light intensity shall cause an increase in radiated power (negative transmission).

(11) The reference black level shall be represented by a definite carrier level, independent of light and shade in the picture.

(12) The blanking level shall be transmitted at 75±2.5 percent of the peak carrier level.

(13) The reference white level of the luminance signal shall be 12.5±2.5 percent of the peak carrier level.

(14) The signals radiated shall have horizontal polarization.

(15) An effective radiated power of the aural transmitter not less than 50 percent nor more than 70 percent of the peak radiated power of the visual transmitter shall be employed.

(16) The peak-to-peak variation of transmitter output within one frame of video signal due to all causes, including hum, noise, and low-frequency response, measured at both scanning synchronizing peak and blanking level, shall not exceed 5 percent of the average scanning synchronizing peak signal amplitude. This provision is subject to change but is considered the best practice under the present state of the art. It will not be enforced pending a further determination thereof.

(17) The reference black level shall be separated from the blanking level by the setup interval, which shall be 7.5±2.5 percent of the video range from blanking level to the reference white level.

(18) For monochrome transmission, the transmitter output shall vary in substantially inverse logarithmic relation to the brightness of the subject. No tolerances are set at this time. This provision is subject to change but is considered the best practice under the present state of the art. It will not be enforced pending a further determination thereof.

(19) The color picture signal shall correspond to a luminance component transmitted as amplitude modulation of the picture carrier and a simultaneous pair of chrominance components transmitted as the amplitude modulation sidebands of a pair of suppressed subcarriers in quadrature.

(20) Equation of complete color signal.

(i) The color picture signal has the following composition:

$$E_M = E_Y' + \{E_Q' \sin(\omega t + 33°) + E_I' \cos(\omega t + 33°)\}$$

Where:

$E_Q' = 0.41(E_B' - E_Y') + 0.48(E_R' - E_Y')$.

$E_I' = -0.27(E_B' - E_Y') + 0.74(E_R' - E_Y')$.

$E_Y' = 0.30E_R' + 0.59E_G' + 0.11E_B'$.

For color-difference frequencies below 500 kc (see (iii) below), the signal can be represented by:

$$E_M = E_Y' + \left\{ \frac{1}{1.14} \left[\frac{1}{1.78}(E_B' - E_Y') \sin \omega t + (E_R' \quad E_Y') \cos \omega t \right] \right\}$$

(ii) The symbols in subdivision (i) of this subparagraph have the following significance:

E_M is the total video voltage, corresponding to the scanning of a particular picture element, applied to the modulator of the picture transmitter.

E_Y' is the gamma-corrected voltage of the monochrome (black-and-white) portion of the color picture signal, corresponding to the given picture element.

NOTE: Forming of the high frequency portion of the monochrome signal in a different manner is permissible and may in fact be desirable in order to improve the sharpness on saturated colors.

E_Q' and E_I' are the amplitudes of two orthogonal components of the chrominance signal corresponding respectively to narrow-band and wide-band axes.

E_R', E_G', and E_B' are the gamma-corrected voltages corresponding to red, green, and blue signals during the scanning of the given picture element.

ω is the angular frequency and is 2π times the frequency of the chrominance subcarrier.

The portion of each expression between brackets in (i) represents the chrominance subcarrier signal which carries the chrominance information.

The phase reference in the E_M equation in (i) is the phase of the burst + 180°, as shown in Figure 8 of § 3.699. The burst corresponds to amplitude modulation of a continuous sine wave.

(iii) The equivalent bandwidth assigned prior to modulation to the color difference signals E_Q' and E_I' are as follows:

Q-channel bandwidth.
- At 400 kc less than 2 db down.
- At 500 kc less than 6 db down.
- At 600 kc at least 6 db down.

I-channel bandwidth:
- At 1.3 mc less than 2 db down.
- At 3.6 mc at least 20 db down.

(iv) The gamma corrected voltages E_R', E_G', and E_B' are suitable for a color picture tube having primary colors with the following chromaticities in the CIE system of specification:

	x	y
Red (R)	0.67	0.33
Green (G)	0.21	0.71
Blue (B)	0.14	0.08

and having a transfer gradient (gamma exponent) of 2.2 associated with each primary color. The voltages E_R', E_G', and E_B' may be respectively of the form $E_R^{1/\gamma}$, $E_G^{1/\gamma}$, and $E_B^{1/\gamma}$ although other forms may be used with advances in the state of the art.

NOTE: At the present state of the art it is considered inadvisable to set a tolerance on the value of gamma and correspondingly this portion of the specification will not be enforced.

(v) The radiated chrominance subcarrier shall vanish on the reference white of the scene.

NOTE: The numerical values of the signal specification assume that this condition will be reproduced as CIE Illuminant C ($x=0.310$, $y=0.316$).

(vi) E_Y', E_Q', E_I', and the components of these signals shall match each other in time to 0.05 μsecs.

(vii) The angles of the subcarrier measured with respect to the burst phase, when reproducing saturated primaries and their complements at 75 percent of full amplitude, shall be within ±10° and their amplitudes shall be within ±20 percent of the values specified above. The ratios of the measured amplitudes of the subcarrier to the luminance signal for the same saturated primaries and their complements shall fall between the limits of 0.8 and 1.2 of the values specified for their ratios. Closer tolerances may prove to be practicable and desirable with advance in the art.

(b) *Changes in transmission standards.* The Commission will consider the question whether a proposed change or modification of transmission standards adopted for television would be in the public interest, convenience and necessity, upon petition being filed by the per-

son proposing such change or modification, setting forth the following:

(1) The exact character of the change or modification proposed;

(2) The effect of the proposed change or modification upon all other transmission standards that have been adopted by the Commission for television broadcast stations;

(3) The experimentation and field tests that have been made to show that the proposed change or modification accomplishes an improvement and is technically feasible;

(4) The effect of the proposed change or modification in the adopted standards upon operation and obsolescence of receivers;

(5) The change in equipment required in existing television broadcast stations for incorporating the proposed change or modification in the adopted standards; and

(6) The facts and reasons upon which the petitioner bases his conclusion that the proposed change or modification would be in the public interest, convenience, and necessity.

Should a change or modification in the transmission standards be adopted by the Commission, the effective date thereof will be determined in the light of the considerations mentioned in subparagraph (4) of this paragraph.

§ 3.683 *Field intensity contours.* (a) In the authorization of television broadcast stations, two field intensity contours are considered. These are specified as Grade A and Grade B and indicate the approximate extent of coverage over average terrain in the absence of interference from other television stations. Under actual conditions, the true coverage may vary greatly from these estimates because the terrain over any specific path is expected to be different from the average terrain on which the field strength charts were based. The required field intensities, F (50, 50), in decibels above one microvolt per meter (dbu) for the Grade A and Grade B contours are as follows:

NOTE: It should be realized that the F (50, 50) curves when used for Channels 14–83 are not based on measured data at distances beyond about 30 miles. Theory would indicate that the field intensities for Channels 14–83 should decrease more rapidly with distance beyond the horizon than for Channels 2–6, and modification of the curves for Channels 14–83 may be expected as a result of measurements to be made at a later date. For these reasons, the curves should be used with appreciation of their limitations in estimating levels of field intensity. Further, the actual extent of service will usually be less than indicated by these estimates due to interference from other stations. Because of these factors, the predicted field intensity contours give no assurance of service to any specific percentage of receiver locations within the distances indicated. In licensing proceedings these variations will not be considered.

	Grade A (dbu)	Grade B (dbu)
Channels 2–6	68	47
Channels 7–13	71	56
Channels 14–83	74	64

(b) The field intensity contours provided for herein shall be considered for the following purposes only:

(1) In the estimation of coverage resulting from the selection of a particular transmitter site by an applicant for a television station.

(2) In connection with problems of coverage arising out of application of § 3.636.

(3) In connection with problems of coverage arising out of application of § 3.658 (b).

(4) In determining compliance with § 3.685 (a) concerning the minimum field intensity to be provided over the principal community to be served.

§ 3.684 *Prediction of coverage.* (a) All predictions of coverage made pursuant to this paragraph shall be made without regard to interference and shall be made only on the basis of estimated field intensities. The peak power of the visual signal is used in making predictions of coverage.

(b) Predictions of coverage shall be made only for the same purposes as relate to the use of field intensity contours as specified in § 3.683 (b).

(c) In predicting the distance to the field intensity contours, the F (50, 50) field intensity charts (Figures 10 and 11 of § 3.699) shall be used. If the 50 percent field intensity is defined as that value exceeded for 50 percent of the time, these F (50, 50) charts give the estimated 50 percent field intensities exceeded at 50 percent of the locations in decibels above one microvolt per meter. The charts are based on an effective power of one kilowatt radiated from a half-wave dipole in free space, which produces an unattenuated field strength at one mile of about 103 db above one microvolt per meter (137.6 millivolts per meter). To use the charts for other powers, the sliding scale associated with the charts should be trimmed and used as the ordinate scale. This sliding scale is placed on the charts with the appropriate gradation for power in line with the horizontal 40 db line on the charts. The right edge of the scale is placed in line with the appropriate antenna height gradations, and the charts then become direct reading (in uv/m and in db above 1 uv/m) for this power and antenna height. Where the antenna height is not one of those for which a scale is provided, the signal strength or distance is determined by interpolation between the curves connecting the equidistant points. Dividers may be used in lieu of the sliding scale. In predicting the distance to the Grade A and Grade B field intensity contours, the effective radiated power to be used is that in the horizontal plane in the pertinent direction. In predicting other field intensities over areas not in the horizontal plane, the effective radiated power to be used is the power in the direction of such areas; the appropriate vertical plane radiation pattern must, of course, be considered in determining this power.

(d) The antenna height to be used with these charts is the height of the radiation center of the antenna above the average terrain along the radial in question. In determining the average elevation of the terrain, the elevations between 2 and 10 miles from the antenna site are employed. Profile graphs shall be drawn for 8 radials beginning at the antenna site and extending 10 miles therefrom. The radials should be drawn for each 45 degrees of azimuth starting with True North. At least one radial must include the principal community to be served even though such community may be more than 10 miles from the antenna site. However, in the event none of the evenly spaced radials include the principal community to be served and one or more such radials are drawn in addition to the 8 evenly spaced radials, such additional radials shall not be employed in computing the antenna height above average terrain. Where the 2 to 10 mile portion of a radial extends in whole or in part over large bodies of water as specified in paragraph (e) of this section or extends over foreign territory but the Grade B intensity contour encompasses land area within the United States beyond the 10 mile portion of the radial, the entire 2 to 10 mile portion of the radial shall be included in the computation of antenna height above average terrain. However, where the Grade B contour does not so encompass United States land area and (1) the entire 2 to 10 mile portion of the radial extends over large bodies of water or foreign territory, such radial shall be completely omitted from the computation of antenna height above average terrain, and (2) where a part of the 2 to 10 mile portion of a radial extends over large bodies of water or over foreign territory, only that part of the radial extending from the 2 mile sector to the outermost portion of land area within the United States covered by the radial shall be employed in the computation of antenna height above average terrain. The profile graph for each radial should be plotted by contour intervals of from 40 to 100 feet and, where the data permits, at least 50 points of elevation (generally uniformly spaced) should be used for each radial. In instances of very rugged terrain where the use of contour intervals of 100 feet would result in several points in a short distance, 200- or 400-foot contour intervals may be used for such distances. On the other hand, where the terrain is uniform or gently sloping the smallest contour interval indicated on the topographic map (see paragraph (g) of this section) should be used, although only relatively few points may be available. The profile graphs should indicate the topography accurately for each radial, and the graphs should be plotted with the distance in miles as the abscissa and the elevation in feet above mean sea level as the ordinate. The profile graphs should indicate the source of the topographical data employed. The graph should also show the elevation of the center of the radiating system. The graph may be plotted either on rectangular coordinate paper or on special paper which shows the curvature of the earth. It is not necessary to take the curvature of the earth into consideration in this procedure, as this factor is taken care

of in the charts showing signal intensities. The average elevation of the 8-mile distance between 2 and 10 miles from the antenna site should then be determined from the profile graph for each radial. This may be obtained by averaging a large number of equally spaced points, by using a planimeter, or by obtaining the median elevation (that exceeded for 50 percent of the distance) in sectors and averaging those values.

NOTE 1: This paragraph does not apply to any application designated for hearing in which the engineering portions have been heard or the engineering exhibits exchanged prior to June 1, 1953, the effective date of the amendment of this subsection unless the subsection as amended would materially affect the outcome of the hearing.

NOTE 2: The Commission will, upon a proper showing by an existing station that the application of this rule will result in an unreasonable power reduction in relation to other stations in close proximity, consider requests for adjustment in power on the basis of a common average terrain figure for the stations in question as determined by the Commission.

(e) In instances where it is desired to determine the area in square miles within the Grade A and Grade B field intensity contours, the area may be determined from the coverage map by planimeter or other approximate means; in computing such areas, exclude (1) areas beyond the borders of the United States, and (2) large bodies of water, such as ocean areas, gulfs, sounds, bays, large lakes, etc., but not rivers.

(f) In cases where the terrain in one or more directions from the antenna site departs widely from the average elevation of the 2 to 10 mile sector, the prediction method may indicate contour distances that are different from what may be expected in practice. For example, a mountain ridge may indicate the practical limit of service although the prediction method may indicate otherwise. In such cases the prediction method should be followed, but a supplemental showing may be made concerning the contour distances as determined by other means. Such supplemental showing should describe the procedure employed and should include sample calculations. Maps of predicted coverage should include both the coverage as predicted by the regular method and as predicted by a supplemental method. When measurements of area are required, these should include the area obtained by the regular prediction method and the area obtained by the supplemental method. In directions where the terrain is such that negative antenna heights or heights below 100 feet for the 2 to 10 mile sector are obtained, a supplemental showing of expected coverage must be included together with a description of the method employed in predicting such coverage. In special cases, the Commission may require additional information as to terrain and coverage.

(g) In the preparation of the profile graphs previously described, and in determining the location and height above sea level of the antenna site, the elevation or contour intervals shall be taken from the United States Geological Survey Topographic Quadrangle Maps, United States Army Corps of Engineers maps or Tennessee Valley Authority maps, whichever is the latest, for all areas for which such maps are available. If such maps are not published for the area in question, the next best topographic information should be used. Topographic data may sometimes be obtained from State and municipal agencies. Data from Sectional Aeronautical Charts (including bench marks) or railroad depot elevations and highway elevations from road maps may be used where no better information is available. In cases where limited topographic data is available, use may be made of an altimeter in a car driven along roads extending generally radially from the transmitter site. Ordinarily the Commission will not require the submission of topographical maps for areas beyond 15 miles from the antenna site, but the maps must include the principal community to be served. If it appears necessary, additional data may be requested. United States Geological Survey Topographic Quadrangle Maps may be obtained from the Department of the Interior, Geological Survey, Washington, D. C. Sectional Aeronautical Charts are available from the Department of Commerce, Coast and Geodetic Survey, Washington, D. C.

§ 3.685 *Transmitter location and antenna system.* (a) The transmitter location shall be chosen so that, on the basis of the effective radiated power and antenna height above average terrain employed, the following minimum field intensity in decibels above one microvolt per meter (dbu) will be provided over the entire principal community to be served:

Channels 2-4	Channels 7-13	Channels 14-83
74 dbu	77 dbu	80 dbu

(b) Location of the antenna at a point of high elevation is necessary to reduce to a minimum the shadow effect on propagation due to hills and buildings which may reduce materially the intensity of the station's signals. In general, the transmitting antenna of a station should be located at the most central point at the highest elevation available. To provide the best degree of service to an area, it is usually preferable to use a high antenna rather than a low antenna with increased transmitter power. The location should be so chosen that line-of-sight can be obtained from the antenna over the principal community to be served; in no event should there be a major obstruction in this path. The antenna must be constructed so that it is as clear as possible of surrounding buildings or objects that would cause shadow problems. It is recognized that topography, shape of the desired service area, and population distribution may make the choice of a transmitter location difficult. In such cases, consideration may be given to the use of a directional antenna system, although it is generally preferable to choose a site where a non-directional antenna may be employed.

(c) In cases of questionable antenna locations it is desirable to conduct propagation tests to indicate the field intensity expected in the principal community to be served and in other areas, particularly where severe shadow problems may be expected. In considering applications proposing the use of such locations, the commission may require site tests to be made. Such tests should be made in accordance with the measurement procedure hereafter described, and full data thereon must be supplied to the Commission. Test transmitters should employ an antenna having a height as close as possible to the proposed antenna height, using a balloon or other support if necessary and feasible. Information concerning the authorization of site tests may be obtained from the Commission upon request.

(d) Present information is not sufficiently complete to establish "blanket areas" of television broadcast stations. A "blanket area" is that area adjacent to a transmitter in which the reception of other stations is subject to interference due to the strong signal from this station. The authorization of station construction in areas where blanketing is found to be excessive will be on the basis that the applicant will assume full responsibility for the adjustment of reasonable complaints arising from excessively strong signals of the applicant's station or take other corrective action.

(e) A directional antenna is considered to be an antenna that is designed or altered for the purpose of obtaining a noncircular radiation pattern. Directional antennas may not be used for the purpose of reducing minimum mileage separation requirements but may be employed for the purpose of improving service or for the purpose of using a particular site; however, directional antennas with a ratio of minimum to maximum radiation in the horizontal plane of more than 10 decibels will not be permitted.

(f) Applications proposing the use of directional antenna systems must be accompanied by the following:

(1) Complete description of the proposed antenna system.

(2) Orientation of array with respect to true north; time phasing of fields from elements (degrees leading or lagging); space phasing of elements (in feet and degrees), and ratio of fields from elements.

(3) Horizontal and vertical plane radiation patterns showing the free space field intensity in millivolts per meter at 1 mile and the effective radiated power, in dbk, for each direction. The method by which the radiation patterns were computed or measured shall be fully described, including formulas used, equipment employed, sample calculations and tabulations of data. Sufficient vertical plane patterns shall be included to indicate clearly the radiation characteristics of the antenna above and below the horizontal plane. The horizontal plane pattern shall be plotted on polar coordinate paper with reference to true north. The vertical plane patterns shall be plotted on rectangular coordinate paper with reference to the horizontal plane.

(4) Name, address, and qualifications of the engineer making the calculations.

(g) Applications proposing the use of television broadcast antennas within 200 feet of other television broadcast antennas operating on a channel within 20 percent in frequency of the proposed channel, or proposing the use of television broadcast antennas on Channels 5 or 6 within 200 feet of FM broadcast antennas, must include a showing as to the expected effect, if any, of such proximate operation.

(h) Where simultaneous use of antennas or antenna structures is proposed, the following provisions shall apply:

(1) In cases where it is proposed to use a tower of a standard broadcast station as a supporting structure for a television broadcast antenna, an appropriate application for changes in the radiating system of the standard broadcast station must be filed by the licensee thereof. A formal application (FCC Form 301) will be required if the proposal involves substantial change in the physical height or radiation characteristics of the standard broadcast antennas; otherwise an informal application will be acceptable. (In case of doubt, an informal application (letter) together with complete engineering data should be submitted.) An application may be required for other classes of stations when the tower is to be used in connection with a television station.

(2) When the proposed television antenna is to be mounted on a tower in the vicinity of a standard broadcast directional array and it appears that the operation of the directional antenna system may be affected, an engineering study must be filed with the television application concerning the effect of the television antenna on the directional pattern. Readjustment and field intensity measurements of the standard broadcast station may be required following construction of the television antenna.

(i) The provisions of Part 17 of this chapter shall govern the construction, marking and lighting requirements of antenna structures used by television broadcast stations. In the event a common tower is used by two or more licensees or permittees for antenna and/or antenna supporting purposes, the licensee or permittee who is owner of the tower shall assume full responsibility for the installation and maintenance of any painting and/or lighting requirements. In the event of shared ownership, one licensee or permittee shall assume such responsibility and advise the Commission accordingly.

§ 3.686 *Measurements for rule making purposes and upon request of the Commission.* (a) Except as provided for in § 3.612, television broadcast stations shall not be protected against any type of interference or propagation effect. Persons desiring to submit testimony, evidence, or data to the Commission for the purpose of showing that the technical standards contained in this subpart do not properly reflect any given types of interference or propagation effects may do so only in appropriate rule making proceedings to amend such technical standards. Persons making field intensity measurements for formal submission to the Commission in rule making proceedings, or making such measurements upon the request of the Commission, should comply with the procedure for making such measurements as outlined below.

(b) Measurements made to determine field intensities of television broadcast stations should be made with mobile equipment along roads which are as close and similar as possible to the radials showing topography which were submitted with the application for construction permit. Cluster and spot measurements may also be submitted, if accompanied by a complete showing of the procedures employed. Suitable measuring equipment and a continuous recording device must be employed, the chart of which is either directly driven from the speedometer of the automobile in which the equipment is mounted or so arranged that distances and identifying landmarks can be readily noted. The measuring equipment must be calibrated against recognized standards of field intensity and so constructed that it will maintain an acceptable accuracy of measurement while in motion or when stationary. The equipment should be so operated that the recorder chart can be calibrated directly in field intensity in order to facilitate analysis of the chart. The receiving antenna must be horizontally polarized and should be nondirectional.

(c) Mobile measurements should be made with a minimum chart speed of 3 inches per mile and preferably 5 or 6 inches per mile. Locations shall be noted on the recorder chart as frequently as necessary to fix definitely the relation between the measured field intensity and the location. The time constant of the equipment should be such as to permit adequate analysis of the charts, and the time constant employed shall be shown. Measurements should be made to a point on each radial well beyond the particular contour under investigation.

(d) While making field intensity measurements either the visual or the aural transmitter may be used. If the visual transmitter is used, it is recommended that a black picture be transmitted or that the transmitter be operated at black level without synchronization peaks. Operation at a power somewhat less than black level is permissible but too great a reduction in power is not recommended due to the difficulty of recording weak signals. In any event, an appropriate factor shall be used to convert the readings obtained to the field strength that would exist on synchronization peaks while operating at the authorized power.

(e) After the measurements are completed, the recorder chart should be divided into not less than 15 sections on each equivalent radial from the station. The field intensity in each section of the chart should be analyzed to determine the field intensity received 50 percent of the distance (median field) throughout the section, and this median field intensity associated with the corresponding sector of the radial. The field intensity figures must be corrected for a receiving antenna elevation of 30 feet and for any directional effects of the automobile and receiving antenna not otherwise compensated. This data should be plotted for each radial, using log-log coordinate paper with distance as the abscissa and field intensity as the ordinate. A smooth curve should be drawn through these points (of median fields for all sectors) and this curve used to determine the distance to the desired contour. The distances obtained for each radial may then be plotted on the map of predicted coverage or on polar coordinate paper (excluding water areas, etc.) to determine the service and interference areas of a station.

(f) In certain cases the Commission may desire more information or recordings and in these instances special instructions will be issued.

(g) Data obtained in conjunction with field intensity measurements shall be submitted to the Commission in affidavit form in triplicate, including the following:

(1) Map or maps showing the roads or points where measurements were made, the service and/or interference areas determined by the prediction method and by the measurements, and any unusual terrain characteristics existing in these areas. The maps, preferably of a type showing topography in the area, should show the Grade A and Grade B field intensity contours.

(2) If a directional transmitting antenna is employed, a diagram on polar coordinate paper showing the predicted free space field intensity in millivolts per meter at 1 mile in all directions.

(3) A full description of the procedures and methods employed, including the type of equipment, the method of installation and operation, and calibration procedures.

(4) Complete data obtained during the survey, including calibration. (Only the original or one photostatic copy of the recording tapes, or representative samples, need be submitted.)

(5) Antenna system and power employed during the survey.

(6) Name, address, and qualifications of the engineer or engineers making the measurements.

§ 3.687 *Transmitters and associated equipment*—(a) *Visual transmitter.* (1) For monochrome transmission only, the overall attenuation characteristics of the transmitter, measured in the antenna transmission line after the vestigial sideband filter (if used), shall not be greater than the following amounts below the ideal demodulated curve. (See Figure 11 of § 3.699.)

2 db at 0.5 mc.
2 db at 1.25 mc.
3 db at 2.0 mc.
6 db at 3.0 mc.
12 db at 3.5 mc.

The curve shall be substantially smooth between these specified points, exclusive of the region from 0.75 to 1.25 mc. Output measurement shall be made with the transmitter operating into a dummy load of pure resistance and the demodulated voltage measured across this load. The ideal demodulated curve is that shown in Figure 11 of § 3.699.

(2) For color transmission, the standard given by subparagraph (1) of this

paragraph applies except as modified by the following: A sine wave of 3.58 mc introduced at those terminals of the transmitter which are normally fed the composite color picture signal shall produce a radiated signal having an amplitude (as measured with a diode on the R. F. transmission line supplying power to the antenna), which is down 6±2 db with respect to a signal produced by a sine wave of 200 kc. In addition, the amplitude of the signal shall not vary by more than ±2 db between the modulating frequencies of 2.1 and 4.18 mc.

(3) The field strength or voltage of the lower sideband, as radiated or dissipated and measured as described in subparagraph (4) of this paragraph, shall not be greater than −20 db for a modulating frequency of 1.25 mc or greater and in addition, for color, shall not be greater than −42 db for a modulating frequency of 3.579545 mc (the color subcarrier frequency). For both monochrome and color, the field strength or voltage of the upper sideband as radiated or dissipated and measured as described in subparagraph (4) of this paragraph shall not be greater than · 20 db for a modulating frequency of 4.75 mc or greater.

NOTE: Field strength measurements are desired. It is anticipated that these may not yield data which are consistent enough to prove compliance with the attenuation standards prescribed above. In that case, measurements with a dummy load of pure resistance, together with data on the antenna characteristics, shall be taken in place of over-all field measurements.

(4) The attenuation charactertistics of a visual transmitter shall be measured by application of a modulating signal to the transmitter input terminals in place of the normal composite television video signal. The signal applied shall be a composite signal composed of a synchronizing signal to establish peak output voltage plus a variable frequency sine wave voltage occupying the interval between synchronizing pulses. (The "synchronizing signal" referred to in this section means either a standard synchronizing wave form or any pulse that will properly set the peak.) The axis of the sine wave in the composite signal observed in the output monitor shall be maintained at an amplitude 0.5 of the voltage at synchronizing peaks. The amplitude of the sine wave input shall be held at a constant value. This constant value should be such that at no modulating frequency does the maximum excursion of the sine wave, observed in the composite output signal monitor, exceed the value 0.75 of peak output voltage. The amplitude of the 200 kilocycle sideband shall be measured and designated zero db as a basis for comparison. The modulation signal frequency shall then be varied over the desired range and the field strength or signal voltage of the corresponding sidebands measured. As an alternate method of measuring, in those cases in which the automatic d-c insertion can be replaced by manual control, the above characteristic may be taken by the use of a video sweep generator and without the use of pedestal synchronizing pulses. The d-c level shall be set for midcharacteristic operation.

(5) A sine wave, introduced at those terminals of the transmitter which are normally fed the composite color picture signal, shall produce a radiated signal having an envelope delay, relative to the average envelope delay between 0.05 and 0.20 mc, of zero microseconds up to a frequency of 3.0 mc; and then linearly decreasing to 4.18 mc so as to be equal to −0.17 μsecs at 3.58 mc. The tolerance on the envelope delay shall be ±0.05 μsecs at 3.58 mc. The tolerance shall increase linearly to ±0.1 μsec down to 2.1 mc, and remain at ±0.1 μsec down to 0.2 mc. (Tolerances for the interval of 0.0 to 0.2 mc are not specified at the present time.) The tolerance shall also increase linearly to +0.1 μsec at 4.18 mc.

(6) The radio frequency signal, as radiated, shall have an envelope as would be produced by a modulating signal in conformity with Figures 6 or 7 of § 3.699, as modified by vestigial sideband operation specified by Figure 5 of § 3.699.

(7) The time interval between the leading edges of successive horizontal pulses shall vary less than one half of one percent of the average interval. However, for color transmissions, § 3.682 (a) (5) and § 3.682 (a) (6) shall be controlling.

(8) The rate of change of the frequency of recurrence of the leading edges of the horizontal synchronizing signals shall be not greater than 0.15 percent per second, the frequency to be determined by an averaging process carried out over a period of not less than 20, nor more than 100 lines, such lines not to include any portion of the blanking interval. However, for color transmissions, § 3.682 (a) (5) and § 3.682 (a) (6) shall be controlling.

(9) For color transmission the transfer characteristic (that is the relationship between the transmitter RF output and video signal input) shall be substantially linear between the reference black and reference white levels.

(b) *Aural transmitter.* (1) The transmitter shall operate satisfactorily with a frequency swing of ±25 kilocycles, which is considered 100 percent modulation. It is recommended, however, that the transmitter be designed to operate satisfactorily with a frequency swing of at least +40 kilocycles.

(2) The transmitting system (from input terminals of microphone pre-amplifier, through audio facilities at the studio, through telephone lines or other circuits between studio and transmitter, through audio facilities at the transmitter, and through the transmitter, but excluding equalizers for the correction of deficiencies in microphone response) shall be capable of transmitting a band of frequencies from 50 to 15,000 cycles. Pre-emphasis shall be employed in accordance with the impedance-frequency characteristic of a series inductance-resistance network having a time constant of 75 microseconds. (See Figure 12 of § 3.699.) The deviation of the system response from the standard pre-emphasis curve shall lie between two limits as shown by Figure 12 of § 3.699. The upper of these limits shall be uniform (no deviation) from 50 to 15,000 cycles. The lower limit shall be uniform from 100 to 7,500 cycles, and three db below the upper limit; from 100 to 50 cycles the lower limit shall fall from three db limit at a uniform rate of one db per octave (4 db at 50 cycles); from 7,500 to 15,000 cycles the lower limit shall fall from three db limit at a uniform rate of two db per octave (5 db at 15,000 cycles).

(3) At any modulating frequency between 50 and 15,000 cycles and at modulation percentages of 25 percent, 50 percent, and 100 percent, the combined audio frequency harmonics measured in the output of the system shall not exceed the root-mean-square values given in the following table:

Modulation frequency	*Distortion (percent)*
50 to 100 cycles	3.5
100 to 7,500 cycles	2.5
7,500 to 15,000 cycles	3.0

(i) Measurement shall be made employing 75 microsecond de-emphasis in the measuring equipment and 75 microsecond pre-emphasis in the transmitting equipment, and without compression if a compression amplifier is employed. Harmonics shall be included to 30 kc.

NOTE: Measurements of distortion using de-emphasis in the measuring equipment are not practical at the present time for the range 7,500 to 15,000 cycles for 25 and 50 percent modulation. Therefore, measurements should be made at 100 percent modulation and on at least the following modulating frequencies: 50, 100, 400, 1,000, 5,000, 10,000, and 15,000 cycles. At 25 and 50 percent modulation, measurements should be made on at least the following modulating frequencies: 50, 100, 400, 1,000 and 5,000 cycles.

(ii) It is recommended that none of the three main divisions of the system (transmitter, studio to transmitter circuit, and audio facilities) contribute over one-half of these percentages, since at some frequencies the total distortion may become the arithmetic sum of the distortions of the divisions.

(4) The transmitting system output noise level (frequency modulation) in the band of 50 to 15,000 cycles shall be at least 55 db below the audio frequency level representing a frequency swing of ±25 kc.

NOTE: For the purpose of these measurements, the visual transmitter should be inoperative since the exact amount of noise permissible from that source is not known at this time.

(5) The transmitting system output noise level (amplitude modulation) in the band of 50 to 15,000 cycles shall be at least 50 db below the level representing 100 percent amplitude modulation.

NOTE: For the purpose of these measurements, the visual transmitter should be inoperative since the exact amount of noise permissible from that source is not known at this time.

(6) If a limiting or compression amplifier is employed, precaution should be maintained in its connection in the circuit due to the use of pre-emphasis in the transmitting system.

(7) The percentage of modulation of the aural transmissions shall be maintained as high as possible consistent with

good quality of transmission and good broadcast practice and in no case less than 85 percent nor more than 100 percent on peaks of frequent recurrence during any selection which normally is transmitted at the highest level of the program under consideration.

(c) *Requirements applicable to both visual and aural transmitters.* (1) Automatic means shall be provided in the visual transmitter to maintain the carrier frequency within one kilocycle of the authorized frequency; automatic means shall be provided in the aural transmitter to maintain the carrier frequency 4.5 megacycles above the actual visual carrier frequency within ±one kilocycle.

(2) The transmitters shall be equipped with suitable indicating instruments for the determination of operating power and with other instruments necessary for proper adjustment, operation, and maintenance of the equipment.

(3) Adequate provision shall be made for varying the output power of the transmitters to compensate for excessive variations in line voltage or for other factors affecting the output power.

(4) Adequate provisions shall be provided in all component parts to avoid overheating at the rated maximum output powers.

(d) *Construction.* In general, the transmitters shall be mounted either on racks and panels or in totally enclosed frames protected as required by article 810 of the National Electrical Code, and as set forth below:

NOTE: The pertinent sections of article 810 of the National Electrical Code read as follows: "8191. General: Transmitters shall comply with the following:

"a. *Enclosing.* The transmitter shall be enclosed in a metal frame or grille, or separated from the operating space by a barrier or other equivalent means, all metallic parts of which are effectually connected to ground.

"b. *Grounding of controls.* All external metallic handles and controls accessible to the operating personnel shall be effectually grounded. No circuit in excess of 150 volts shall have any parts exposed to direct contact. A complete dead-front type of switchboard is preferred.

"c. *Interlocks on doors.* All access doors shall be provided with interlocks which will disconnect all voltages in excess of 350 volts when any access door is opened."

(1) Means shall be provided for making all tuning adjustments, requiring voltages in excess of 350 volts to be applied to the circuit, from the front of the panels with all access doors closed.

(2) Proper bleeder resistors or other automatic means shall be installed across all the capacitor banks to lower any voltage which may remain accessible with access door open to less than 350 volts within two seconds after the access door is opened.

(3) All plate supply and other high voltage equipment, including transformers, filters, rectifiers and motor generators, shall be protected so as to prevent injury to operating personnel.

(i) Commutator guards shall be provided on all high voltage rotating machinery. Coupling guards should be provided on motor generators.

(ii) Power equipment and control panels of the transmitters shall meet the above requirements (exposed 220-volt A. C. switching equipment on the front of the power control panels is not recommended but is not prohibited).

(iii) Power equipment located at a television broadcast station not directly associated with the transmitters (not purchased as part of same), such as power distribution panels, are not subject to the provisions of this subpart.

(4) The following provisions shall be applicable to metering equipment:

(i) All instruments having more than 1,000 volts potential to ground on the movement shall be protected by a cage or cover in addition to the regular case. (Some instruments are designed by the manufacturers to operate safely with voltages in excess of 1,000 volts on the movement. If it can be shown by the manufacturer's rating that the instrument will operate safely at the applied potential, additional protection is not necessary.)

(ii) In case the plate voltmeters are located on the low potential side of the multiplier resistors with the high potential terminal of the instruments at or less than 1,000 volts above ground, no protective case is required. However, it is good practice to protect voltmeters subject to more than 5,000 volts with suitable over-voltage protective devices across the instrument terminals in case the winding opens.

(iii) Transmission line meters and any other radio frequency instrument which may be necessary for the operator to read shall be so installed as to be read easily and accurately without the operator having to risk contact with circuits carrying high potential radio frequency energy.

(e) *Wiring and shielding.* (1) The transmitter panels or units shall be wired in accordance with standard practice, such as insulated leads properly cabled and supported, coaxial cables, or rigid bus bar properly insulated and protected.

(2) Wiring between units of the transmitters, with the exception of circuits carrying radio frequency energy or video energy, shall be installed in conduits or approved fiber or metal raceways to protect it from mechanical injury.

(3) Circuits carrying radio frequency or video energy between units shall be coaxial cables, two wire balanced lines, or properly shielded lines.

(4) All stages or units shall be adequately shielded and filtered to prevent interaction and radiation.

(5) The frequency and modulation monitors and associated radio frequency lines to the transmitter shall be thoroughly shielded.

(f) *Auxiliary transmitters.* Auxiliary transmitters may not exceed the power rating of the main transmitters. As a general guide, specifications for auxiliary transmitters should conform as much as possible to those of the main transmitters. No requirements are set forth at this time.

(g) *Installation.* (1) The installation of transmitting equipment shall be made in suitable quarters.

(2) Suitable facilities shall be provided for the welfare and comfort of the operator.

(h) *Spare tubes.* (1) A spare tube of every type employed in the transmitters and the frequency and modulation monitors shall be kept on hand at the equipment location. When more than one tube of any type is employed, the following table determines the number of spares of that type required:

Number of each type employed:	*Spares required*
1 or 2	1
3 to 5	2
6 to 8	3
9 or more	4

(2) An accurate circuit diagram and list of required spare tubes, as furnished by the manufacturer of the equipment, shall be supplied and retained at the transmitter location.

(i) *Operation.* (1) Spurious emissions, including radio frequency harmonics, shall be maintained at as low a level as the state of the art permits. As measured at the output terminals of the transmitter (including harmonic filters, if required) all emissions removed in frequency in excess of 3 Mc above or below the respective channel edge shall be attenuated no less than 60 db. below the visual transmitted power. (The 60 db. value for television transmitters specified in this rule should be considered as a temporary requirement which may be increased at a later date, especially when more higher-powered equipment is utilized. Stations should, therefore, give consideration to the installation of equipment with greater attenuation than 60 db.) In the event of interference caused to any service greater attenuation will be required.

(2) If a limiting or compression amplifier is used in conjunction with the aural transmitter, due operating precautions should be maintained because of pre-emphasis in the transmitting system.

(j) *Studio equipment.* Studio equipment shall be subject to all the above requirements where applicable, except as follows.

(1) If properly covered by an underwriter's certificate, it will be considered as satisfying safety requirements.

(2) Section 8191 of article 810 of the National Electrical Code shall apply for voltages only in excess of 500 volts.

(3) No specific requirements are made relative to the design and acoustical treatment of studios. However, the design of studios, particularly the main studio, shall be compatible with the required performance characteristics of television broadcast stations.

§ 3.688 *Indicating instruments.* (a) Each television broadcast station shall be equipped with indicating instruments for measuring the direct plate voltage and current of the last radio stage of the visual and aural transmitters and the transmission line radio frequency current, voltage, or power of both transmitters; such instruments shall conform to the specifications therefor set forth in this subpart.

(b) The following requirements and specifications shall apply to indicating instruments used by television broadcast stations in compliance with paragraph (a) of this section:

(1) Length of scale shall be not less than 2¾6 inches.

(2) Accuracy shall be at least 2 percent of the full scale reading.

(3) Scale shall have at least 40 divisions.

(4) Full scale reading shall be not greater than five times the minimum normal indication.

(5) No specifications are prescribed at this time regarding the peak indicating device required by § 3.689 (b).

(c) Any required instrument, the accuracy of which is questionable, shall not be employed. Repairs and calibration of instruments shall be made by the manufacturer, or by an authorized instrument repair service of the manufacturer, or by some other properly qualified or equipped instrument repair service. In any case, the repaired instrument must be supplied with a certificate of calibration.

(d) Recording instruments may be employed in addition to the indicating instruments to record the direct plate current and/or voltage to the last radio stage provided that they do not affect the operation of the circuits or accuracy of the indicating instruments. If the records are to be used in any proceeding before the Commission, as representative of operation, the accuracy must be the equivalent of the indicating instruments and the calibration shall be checked at such intervals as to insure the retention of such accuracy.

(e) The function of each instrument used in the equipment shall be clearly and permanently shown on the instrument itself or on the panel immediately adjacent thereto.

(f) In the event that any one of the indicating instruments required by paragraph (a) of this section becomes defective when no substitute which conforms with the required specifications is available, the station may be operated without the defective instrument pending its repair or replacement for a period not in excess of 60 days: *Provided*, That—

(1) Appropriate entries shall be made in the operating log of the station, showing the date and time the meter was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the instrument is found to be defective and immediately after the repaired or replacement instrument has been installed and is functioning properly.

(3) If the defective instrument is a plate voltmeter or plate ammeter in the last radio stage, the operating power shall be maintained by means of the radio frequency transmission line meter.

(4) If conditions beyond the control of the licensee prevent the restoration of the meter to service within the above allowed period, informal request may be filed in accordance with § 1.332 (d) of this chapter with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument.

§ 3.689 *Operating power*- (a) *Determination* -(1) *Visual transmitter*. The operating power of the visual transmitter shall be determined at the output terminal of the vestigial sideband filter, if such filter is used; otherwise, at the transmitter output terminal. The average power shall be measured while operating into a dummy load of substantially zero reactance and a resistance equal to the transmission line surge impedance, while transmitting a standard black television picture. The peak power shall be the power obtained by this method, multiplied by the factor 1.68. During this measurement the direct plate voltage and current of the last radio stage and the peak output voltage or current shall be read for use below.

(2) *Aural transmitter*. The operating power of the aural transmitter shall be determined by the indirect method. This is the product of the plate voltage (Ep) and the plate current (Ip) of the last radio stage, and an efficiency factor, F; that is:

$$\text{Operating power} = Ep \times Ip \times F$$

(i) The efficiency factor, F, shall be established by the transmitter manufacturer for each type of transmitter for which he submits data to the Commission, and shall be shown in the instruction books supplied to the customer with each transmitter. In the case of composite equipment, the factor F shall be furnished to the Commission by the applicant along with a statement of the basis used in determining such factor

(b) *Maintenance*—(1) *Visual transmitter*. The peak power shall be monitered by a peak reading device which reads proportionally to voltage, current, or power in the radio frequency transmission line, the meter to be calibrated during the measurement described in paragraph (a) (1) of this section. The operating power as so monitored shall be maintained as near as practicable to the authorized operating power and shall not exceed the limits of 10 percent above and 20 percent below the authorized power except in emergencies. As a further check, both the plate voltage and plate current of the output stage shall be measured with a standard black television picture with the transmitter operating into the antenna. These values must agree substantially with corresponding readings taken under paragraph (a) (1) of this section.

(2) *Aural transmitter*. The operating power of the aural transmitter shall be maintained as near as practicable to the authorized operating power, and shall not exceed the limits of 10 percent above and 20 percent below the authorized power except in emergencies.

(3) *Reduced power*. In the event it becomes impossible to operate with the authorized power, the station may be operated with reduced power for a period of 10 days or less provided the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified in writing immediately thereafter and also upon the resumption of the normal operating power

MONITORING EQUIPMENT

§ 3.690 *Frequency monitors*. (a) The licensee of each television broadcast station shall have in operation at the transmitter approved frequency monitors independent of the frequency control of the transmitters

NOTE: Approved frequency monitors are included on the Commission's "Radio Equipment List, Part A, Television Broadcast Equipment." Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(b) In the event the visual or aural frequency monitor becomes defective, the station may be operated without such equipment pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided*, That:

(1) Appropriate entries shall be made in the operating log of the station to show the date and time the equipment was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the equipment is found to be defective and immediately after the repaired or replacement equipment has been installed and is functioning properly.

(3) During the period when the station is operated without the visual or aural frequency monitor, the respective carrier frequency shall be compared with an external frequency source of known accuracy at sufficiently frequent intervals to insure that the frequency is maintained within the tolerance prescribed in § 3.687 (c) (1). An entry shall be made in the station log as to the method used and the results thereof.

(4) If conditions beyond the control of the licensee or permittee prevent the restoration of the monitor or monitoring equipment to service within the period specified above, an informal request in accordance with § 1.332 (d) of this chapter may be filed with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument or equipment.

§ 3.691 *Modulation monitors*. (a) The licensee of each television broadcast station shall have in operation at the transmitter an approved modulation monitor for the aural transmitter. There shall also be employed sufficient monitoring equipment for the visual signal to determine that the signal complies with the requirements of this subpart.

NOTE: Approved aural modulation monitors are included on the Commission's "Radio Equipment List, Part A, Television Broadcast Equipment." Copies of this list are available for inspection at the Commission's office in Washington, D. C., and at each of its field offices.

(b) In the event the visual monitoring equipment or the aural modulation monitor becomes defective, the station may be operated without such equipment pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission: *Provided*, That:

(1) Appropriate entries shall be made in the operating log of the station to show the date and time the equipment

was removed from and restored to service.

(2) The Engineer in Charge of the radio district in which the station is located shall be notified both immediately after the equipment is found to be defective and immediately after the repaired or replacement equipment has been installed and is functioning properly.

(3) During the period when the station is operated without the aural modulation monitor or the visual monitoring equipment, the licensee shall provide other suitable means for insuring that the aural modulation is maintained within the tolerance prescribed in § 3.687 (b) (7) and that the visual signal is maintained in accordance with the requirements of this subpart.

(4) If conditions beyond the control of the licensee or permittee prevent the restoration of the monitor or monitoring equipment to service within the period specified above, an informal request in accordance with § 1.332 (d) of this chapter may be filed with the Engineer in Charge of the radio district in which the station is located for such additional time as may be required to complete repairs of the defective instrument or equipment.

§ 3.692 *General requirements for type approval of frequency and modulation monitors.* (a) Any manufacturer desiring to submit a monitor for type approval shall supply the Commission with full specification details (two sworn copies) as well as the test data specified in §§ 3.693 and 3.694. If this information appears to meet the requirements of the rules, shipping instructions will be issued to the manufacturer. The shipping charges to and from the Laboratory at Laurel, Maryland, shall be paid for by the manufacturer. Approval of a monitor will only be given on the basis of the data obtained from the sample monitor submitted to the Commission for test.

(b) In approving a monitor upon the basis of the tests conducted by the Laboratory, the Commission merely recognizes that the type of monitor has the inherent capability of functioning in compliance with the rules, if properly constructed, maintained, and operated. The Commission realizes that the frequency monitor may have limited range over which the visual indicator will determine deviations. Accordingly, it is necessary that adjunct equipment be used to determine major deviations.

(c) Additional rules with respect to withdrawal of type approval, modification of type approved equipment and limitations on the findings upon which type approval is based are set forth in Part 2, Subpart F, of this chapter.

(d) A monitor which is not included on the Commission's Radio Equipment List, Part A, Television Broadcast Equipment, but is in use at a television station prior to December 12, 1955, may continue to be used by the licensee, his successors or assignees in business until June 1, 1957.

§ 3.693 *Requirements for type approval of frequency monitors.* (a) The specifications that frequency monitors shall meet before they will be approved by the Commission are as follows:

(1) The monitors shall have an accuracy of better than 500 cycles for 30 days under ordinary conditions (ambient, temperature from 10° centigrade to 40° centigrade above zero, humidity from 10 percent to 95 percent relative humidity, power supply variations from 90 percent to 110 percent, and other conditions which may affect its accuracy) encountered in television broadcast stations throughout the United States.

(2) The range of the indicating device for the aural monitor shall be at least 3000 cycles below to 3000 cycles above the assigned center frequency. Alternatively, the aural monitor may use an indicating device with a similar scale to indicate the difference-frequency between the aural and visual carriers. The range of the indicating device for the visual monitor shall be at least 1500 cycles below to 1500 cycles above the assigned carrier frequency.

(3) The scale of the indicating device shall be calibrated in divisions of not more than 100 cycles.

(4) Means shall be provided for adjustment of the monitor indication to agree with an external standard.

(5) The monitors shall be capable of continuous operation and the circuits shall be such as to permit continuous monitoring of the transmitter carrier frequencies, and the difference-frequency between the visual and aural carriers if this method of measurement is used.

(6) Operation of the monitors shall have no adverse effect on the operation of either the aural or visual transmitters or the signals emitted therefrom and shall be independent of the frequency control of the transmitters.

(7) Means shall be provided for insuring power input level.

(8) General design, construction and operation shall be in accordance with good engineering practice.

(b) Tests to be made for approval of television broadcast frequency monitors. The manufacturer of a monitor shall submit data on the following at the time of requesting approval:

(1) Constancy of oscillator frequency, as measured daily for one month, or more.

(2) Constancy of oscillator frequency when subject to vibration tests which would correspond to the treatment received in shipping, handling and installing the instrument.

(3) Accuracy of reading of the frequency deviation instrument.

(4) Functioning of frequency adjustment device.

(5) Effects on frequency readings, of the changing of tubes, of voltage variations, and of variations of room temperature through a range from 10° to 40° C.

(6) Response of indicating instrument to small changes of frequency.

(7) General information on the effect of tilting or tipping or other tests to determine ability of equipment to withstand shipment.

(c) Various other tests may be made or required, such as effects of variation of input from the transmitter depending upon the character of the apparatus.

(d) Tests shall be conducted in such a manner as to approximate actual operating conditions as nearly as possible. The equipment shall be tested on the highest channel for which it is designed.

§ 3.694 *Requirements for type approval of aural modulation monitors.* (a) The required aural modulation monitor may or may not be a part of the frequency monitor.

(b) The specifications that the aural modulation monitor shall meet before it will be approved by the Commission are as follows:

(1) Means shall be provided for indicating that the signal input to the modulation monitor is in the range required for proper operations.

(2) A modulation peak indicating device shall be provided that can be set at any pre-determined value from 50 to 120 percent modulation (±25 kc swing is defined as 100 percent modulation) and for either positive or negative swings (i. e. either above or below transmitter center frequency)

(3) A quasi-peak indicator with a meter having the characteristics given below shall be used with a circuit such that peaks of modulation of duration between 40 and 90 milliseconds are indicated to 90 percent of full value and the discharge rate adjusted so that the pointer returns from full reading to within 10 percent of zero within 500 to 800 milliseconds. A switch shall be provided so that this meter will read either positive or negative swings. Until June 1, 1957, however, monitors having meters which read either positive or negative swings will be eligible for type approval.

(4) When modulation of a magnitude necessary to produce a deflection equivalent to 100 percent modulation is suddenly applied and left on, the indicating instrument shall not deflect beyond 110 percent on the first passage of the 100 percent mark and shall have excursion from the final value of less than 1 percent after one second or more.

(5) The meter scale shall be similar in appearance to that of a standard VU meter. The scale length between 0 and 100 percent modulation markings shall be at least 2.3 inches. In addition to other markings a small marker for 133 percent modulation, designated as such, should be included for the purpose of testing the transmitter with 33.3 kc swing.

(6) The indicated reading in percentage shall be accurate within ±5 (based on 100 percent modulation) at any percentage of modulation up to 100.

(7) The frequency characteristic curve as measured at 50 percent modulation shall not depart from a straight line more than ± ½ db from 50 to 15,000 cycles. Distortion shall be kept to a minimum.

(8) The monitor shall not absorb appreciable power from the transmitter.

(9) Operation of the monitor shall have no adverse effect on the operation of the transmitter.

(10) General design, construction, and operation shall be in accordance with good engineering practice.

(c) Tests to be made for approval of television broadcast aural modulation monitors. The manufacturer of a monitor shall submit data on the following at the time of requesting approval:

(1) Audio frequency response of the monitor from 50 to 15,000 cycles in db from the response at 400 cycles.

(2) Distortion in the response.

(3) Input signal power required.

(4) Permissible tolerance on input signal power to keep the meter reading correct within 5 percent units.

(5) Ballistic characteristics of the monitor indicator.

(d) Various other tests may be made or required depending on the character of the apparatus.

(e) Tests shall be conducted in such a manner as to approximate actual operating conditions as nearly as possible. The equipment shall be tested on the highest channel for which it is designed.

§§ 3.695–3.697 [Reserved.]

§ 3.698 *Tables.*

TABLE I

MINUTES TO DECIMAL PARTS OF A DEGREE

Minutes	Degrees	Minutes	Degrees
1	0.01667	31	0.51667
2	.03333	32	.53333
3	.05	33	.55
4	.06667	34	.56667
5	.08333	35	.58333
6	.10	36	.60
7	.11667	37	.61667
8	.13333	38	.63333
9	.15	39	.65
10	.16667	40	.66667
11	.18333	41	.68333
12	.20	42	.70
13	.21667	43	.71667
14	.23333	44	.73333
15	.25	45	.75
16	.26667	46	.76667
17	.28333	47	.78333
18	.30	48	.80
19	.31667	49	.81667
20	.33333	50	.83333
21	.35	51	.85
22	.36667	52	.86667
23	.38333	53	.88333
24	.40	54	.90
25	.41667	55	.91667
26	.43333	56	.93333
27	.45	57	.95
28	.46667	58	.96667
29	.48333	59	.98333
30	.50	60	1.00

TABLE I—Continued

SECONDS TO DECIMAL PARTS OF A DEGREE

Seconds	Degrees	Seconds	Degrees
1	0.00028	31	0.00861
2	.00056	32	.00889
3	.00083	33	.00917
4	.00111	34	.00944
5	.00139	35	.00972
6	.00167	36	.01
7	.00194	37	.01028
8	.00222	38	.01056
9	.0025	39	.01083
10	.00278	40	.01111
11	.00306	41	.01139
12	.00333	42	.01167
13	.00361	43	.01194
14	.00389	44	.01222
15	.00417	45	.0125
16	.00444	46	.01278
17	.00472	47	.01306
18	.005	48	.01333
19	.00528	49	.01361
20	.00556	50	.01389
21	.00583	51	.01417
22	.00611	52	.01444
23	.00639	53	.01472
24	.00667	54	.015
25	.00694	55	.01528
26	.00722	56	.01556
27	.0075	57	.01583
28	.00778	58	.01611
29	.00806	59	.01639
30	.00833	60	.01667

TABLE II

MILES PER DEGREE OF LATITUDE DIFFERENCE

Middle latitude	Statute miles	Middle latitude	Statute miles
° ′		°	
25 0	68.628	38 0	68.963
30	68.633	30	68.974
26 0	68.637	39 0	68.980
30	68.642	30	68.986
27 0	68.647	40 0	68.992
30	68.652	30	68.998
28 0	68.657	41 0	69.004
30	68.662	30	69.011
29 0	68.667	42 0	69.017
30	68.673	30	69.023
30 0	68.678	43 0	69.029
30	68.683	30	69.035
31 0	68.689	44 0	69.041
30	68.694	30	69.047
32 0	68.699	45 0	69.053
30	68.905	30	69.060
33 0	68.911	46 0	69.066
30	68.916	30	69.072
34 0	68.922	47 0	69.078
30	68.928	30	69.084
35 0	68.933	48 0	69.090
30	68.939	30	69.096
36 0	68.945	49 0	69.102
30	68.951	30	69.108
37 0	68.957	50 0	69.115
30	68.962		

TABLE III

Middle latitude degrees	Miles per degree of longitude difference (statute miles)									
	25	26	27	28	29	30	31	32	33	34
Minutes										
0	62.728	62.211	61.675	61.120	60.547	59.955	59.345	58.716	58.070	57.406
1	62.720	62.202	61.666	61.111	60.537	59.945	59.335	58.706	58.059	57.395
2	62.712	62.193	61.657	61.101	60.528	59.935	59.324	58.695	58.048	57.384
3	62.703	62.184	61.648	61.092	60.517	59.925	59.314	58.684	58.037	57.373
4	62.694	62.176	61.639	61.082	60.508	59.915	59.303	58.674	58.026	57.362
5	62.686	62.167	61.630	61.073	60.498	59.905	59.293	58.663	58.015	57.350
6	62.677	62.158	61.621	61.064	60.488	59.895	59.282	58.652	58.004	57.339
7	62.669	62.149	61.611	61.054	60.478	59.885	59.272	58.642	57.994	57.328
8	62.660	62.140	61.602	61.045	60.469	59.875	59.262	58.631	57.983	57.316
9	62.652	62.132	61.593	61.035	60.458	59.865	59.252	58.620	57.972	57.305
10	62.644	62.123	61.584	61.026	60.449	59.855	59.241	58.610	57.961	57.294
11	62.635	62.114	61.575	61.017	60.440	59.845	59.231	58.599	57.950	57.283
12	62.627	62.105	61.566	61.007	60.430	59.835	59.221	58.588	57.939	57.271
13	62.618	62.096	61.557	60.997	60.420	59.825	59.210	58.578	57.928	57.260
14	62.609	62.088	61.547	60.988	60.410	59.814	59.200	58.567	57.917	57.249
15	62.601	62.079	61.538	60.979	60.400	59.804	59.189	58.556	57.906	57.238
16	62.592	62.070	61.529	60.969	60.390	59.794	59.179	58.546	57.895	57.227
17	62.583	62.061	61.520	60.959	60.381	59.784	59.168	58.535	57.884	57.215
18	62.575	62.052	61.510	60.950	60.371	59.774	59.158	58.524	57.873	57.204
19	62.567	62.044	61.501	60.940	60.361	59.764	59.147	58.514	57.862	57.192
20	62.559	62.035	61.492	60.931	60.352	59.754	59.137	58.503	57.851	57.181
21	62.550	62.026	61.483	60.921	60.342	59.744	59.127	58.492	57.840	57.170
22	62.541	62.017	61.474	60.912	60.332	59.734	59.116	58.481	57.829	57.159
23	62.532	62.008	61.465	60.902	60.322	59.723	59.106	58.470	57.818	57.147
24	62.524	61.999	61.455	60.893	60.312	59.713	59.095	58.460	57.807	57.136
25	62.515	61.990	61.446	60.883	60.302	59.703	59.085	58.449	57.796	57.125
26	62.507	61.981	61.437	60.874	60.292	59.693	59.074	58.438	57.785	57.113
27	62.498	61.972	61.428	60.865	60.282	59.683	59.064	58.428	57.774	57.102
28	62.489	61.963	61.419	60.855	60.273	59.672	59.054	58.417	57.763	57.090
29	62.480	61.955	61.409	60.845	60.263	59.662	59.043	58.406	57.752	57.079
30	62.472	61.946	61.400	60.836	60.253	59.652	59.033	58.396	57.741	57.068
31	62.463	61.937	61.391	60.826	60.243	59.642	59.022	58.385	57.729	57.057
32	62.455	61.928	61.381	60.817	60.233	59.632	59.012	58.374	57.718	57.045
33	62.446	61.918	61.372	60.807	60.223	59.622	59.001	58.363	57.707	57.034
34	62.438	61.909	61.363	60.798	60.213	59.611	58.991	58.352	57.696	57.022
35	62.429	61.900	61.354	60.788	60.203	59.601	58.980	58.341	57.685	57.011
36	62.420	61.891	61.344	60.778	60.194	59.591	58.970	58.331	57.674	56.999
37	62.412	61.882	61.335	60.768	60.184	59.581	58.960	58.320	57.663	56.988
38	62.403	61.874	61.325	60.759	60.174	59.571	58.949	58.309	57.652	56.977
39	62.395	61.865	61.316	60.750	60.164	59.561	58.939	58.298	57.641	56.966
40	62.386	61.856	61.307	60.740	60.154	59.550	58.928	58.288	57.629	56.954
41	62.377	61.847	61.298	60.730	60.144	59.540	58.917	58.277	57.618	56.943
42	62.369	61.838	61.289	60.721	60.134	59.530	58.907	58.266	57.607	56.931
43	62.360	61.829	61.279	60.711	60.124	59.520	58.896	58.255	57.596	56.919
44	62.351	61.820	61.270	60.701	60.114	59.510	58.886	58.244	57.585	56.908
45	62.342	61.811	61.261	60.692	60.104	59.500	58.875	58.233	57.574	56.897
46	62.334	61.802	61.252	60.682	60.094	59.489	58.865	58.223	57.563	56.885
47	62.325	61.793	61.242	60.672	60.084	59.479	58.854	58.212	57.552	56.874
48	62.316	61.784	61.233	60.663	60.074	59.468	58.843	58.201	57.541	56.863
49	62.308	61.775	61.223	60.654	60.065	59.458	58.833	58.190	57.529	56.851
50	62.299	61.766	61.214	60.644	60.055	59.448	58.822	58.179	57.518	56.840
51	62.290	61.757	61.205	60.634	60.045	59.438	58.812	58.168	57.507	56.829
52	62.281	61.748	61.195	60.625	60.035	59.427	58.801	58.157	57.496	56.817
53	62.272	61.739	61.186	60.615	60.025	59.417	58.790	58.147	57.485	56.805
54	62.264	61.730	61.176	60.605	60.015	59.406	58.780	58.136	57.473	56.794
55	62.255	61.721	61.167	60.595	60.005	59.396	58.769	58.125	57.462	56.782
56	62.246	61.712	61.158	60.586	59.995	59.386	58.759	58.114	57.451	56.771
57	62.237	61.702	61.148	60.576	59.985	59.376	58.748	58.103	57.440	56.759
58	62.228	61.693	61.139	60.566	59.975	59.365	58.737	58.092	57.429	56.748
59	62.220	61.684	61.129	60.557	59.965	59.355	58.727	58.081	57.418	56.737

Middle latitude degrees	Miles per degree of longitude difference (statute miles)														
	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Minutes															
0	56.725	56.026	55.311	54.578	53.828	53.063	52.280	51.482	50.669	49.839	48.995	48.135	47.260	46.371	45.468
1	56.713	56.014	55.299	54.565	53.816	53.050	52.267	51.469	50.655	49.825	48.980	48.120	47.245	46.356	45.453
2	56.702	56.002	55.286	54.553	53.803	53.037	52.254	51.455	50.641	49.811	48.966	48.106	47.231	46.341	45.438
3	56.690	55.991	55.274	54.541	53.791	53.024	52.241	51.442	50.627	49.797	48.952	48.091	47.216	46.326	45.422
4	56.678	55.979	55.262	54.528	53.778	53.011	52.229	51.429	50.614	49.783	48.937	48.077	47.201	46.311	45.407
5	56.667	55.967	55.250	54.516	53.765	52.998	52.215	51.415	50.600	49.769	48.923	48.063	47.187	46.296	45.392
6	56.655	55.955	55.238	54.503	53.753	52.985	52.201	51.402	50.586	49.755	48.909	48.048	47.172	46.281	45.377
7	56.644	55.943	55.226	54.491	53.740	52.972	52.188	51.388	50.573	49.741	48.895	48.034	47.158	46.266	45.362
8	56.632	55.931	55.213	54.479	53.727	52.959	52.175	51.375	50.559	49.727	48.881	48.019	47.143	46.252	45.346
9	56.621	55.920	55.201	54.466	53.715	52.946	52.162	51.361	50.545	49.713	48.867	48.005	47.128	46.237	45.331
10	56.610	55.908	55.189	54.454	53.702	52.933	52.149	51.348	50.531	49.699	48.852	47.990	47.114	46.222	45.317
11	56.598	55.896	55.177	54.441	53.689	52.920	52.135	51.335	50.517	49.685	48.838	47.975	47.099	46.207	45.301
12	56.586	55.884	55.165	54.429	53.677	52.907	52.122	51.321	50.504	49.671	48.824	47.961	47.084	46.192	45.286
13	56.575	55.872	55.153	54.417	53.664	52.894	52.109	51.307	50.490	49.657	48.809	47.946	47.069	46.177	45.270
14	56.563	55.860	55.141	54.404	53.651	52.881	52.096	51.294	50.476	49.643	48.795	47.932	47.054	46.162	45.255
15	56.552	55.849	55.128	54.392	53.639	52.868	52.082	51.280	50.462	49.629	48.781	47.917	47.040	46.147	45.240
16	56.540	55.837	55.116	54.380	53.626	52.855	52.069	51.267	50.449	49.615	48.767	47.903	47.025	46.132	45.225
17	56.529	55.825	55.104	54.367	53.613	52.842	52.056	51.253	50.435	49.601	48.752	47.888	47.010	46.117	45.210
18	56.517	55.813	55.093	54.354	53.601	52.830	52.043	51.240	50.421	49.587	48.738	47.874	46.995	46.102	45.194
19	56.505	55.802	55.080	54.342	53.588	52.817	52.030	51.226	50.408	49.573	48.724	47.859	46.980	46.087	45.179
20	56.493	55.790	55.068	54.330	53.575	52.804	52.016	51.213	50.394	49.559	48.709	47.845	46.966	46.072	45.164
21	56.482	55.778	55.056	54.317	53.562	52.791	52.003	51.199	50.380	49.545	48.695	47.830	46.951	46.057	45.149
22	56.470	55.766	55.043	54.304	53.549	52.778	51.990	51.185	50.366	49.531	48.681	47.816	46.936	46.042	45.134
23	56.459	55.754	55.031	54.292	53.536	52.765	51.977	51.172	50.352	49.517	48.667	47.801	46.921	46.027	45.118
24	56.447	55.742	55.019	54.280	53.524	52.752	51.963	51.159	50.338	49.503	48.653	47.787	46.906	46.012	45.103
25	56.435	55.730	55.007	54.267	53.511	52.739	51.950	51.145	50.325	49.489	48.638	47.772	46.891	45.997	45.088
26	56.424	55.718	54.995	54.255	53.498	52.726	51.936	51.132	50.311	49.475	48.623	47.758	46.877	45.982	45.073
27	56.412	55.706	54.983	54.242	53.486	52.713	51.923	51.118	50.297	49.461	48.609	47.743	46.862	45.967	45.057
28	56.401	55.694	54.970	54.230	53.473	52.700	51.910	51.104	50.283	49.447	48.595	47.729	46.847	45.952	45.042
29	56.389	55.682	54.958	54.217	53.460	52.687	51.897	51.091	50.270	49.433	48.581	47.714	46.832	45.937	45.026
30	56.378	55.671	54.946	54.205	53.448	52.674	51.883	51.077	50.256	49.419	48.567	47.699	46.818	45.922	45.011
31	56.366	55.659	54.934	54.192	53.435	52.661	51.870	51.064	50.242	49.405	48.552	47.685	46.803	45.906	44.996
32	56.354	55.647	54.922	54.180	53.422	52.648	51.857	51.050	50.228	49.391	48.538	47.671	46.788	45.891	44.981
33	56.343	55.635	54.909	54.167	53.409	52.635	51.843	51.036	50.214	49.377	48.524	47.656	46.773	45.876	44.965
34	56.331	55.623	54.897	54.155	53.396	52.622	51.830	51.023	50.200	49.362	48.509	47.641	46.759	45.861	44.950
35	56.319	55.611	54.885	54.142	53.384	52.608	51.817	51.010	50.186	49.348	48.494	47.627	46.744	45.846	44.935
36	56.308	55.599	54.872	54.130	53.371	52.595	51.804	50.996	50.173	49.334	48.480	47.612	46.729	45.831	44.920
37	56.296	55.587	54.861	54.117	53.358	52.582	51.790	50.982	50.159	49.320	48.466	47.597	46.714	45.816	44.904
38	56.284	55.575	54.848	54.104	53.345	52.569	51.777	50.968	50.145	49.306	48.452	47.583	46.699	45.801	44.889

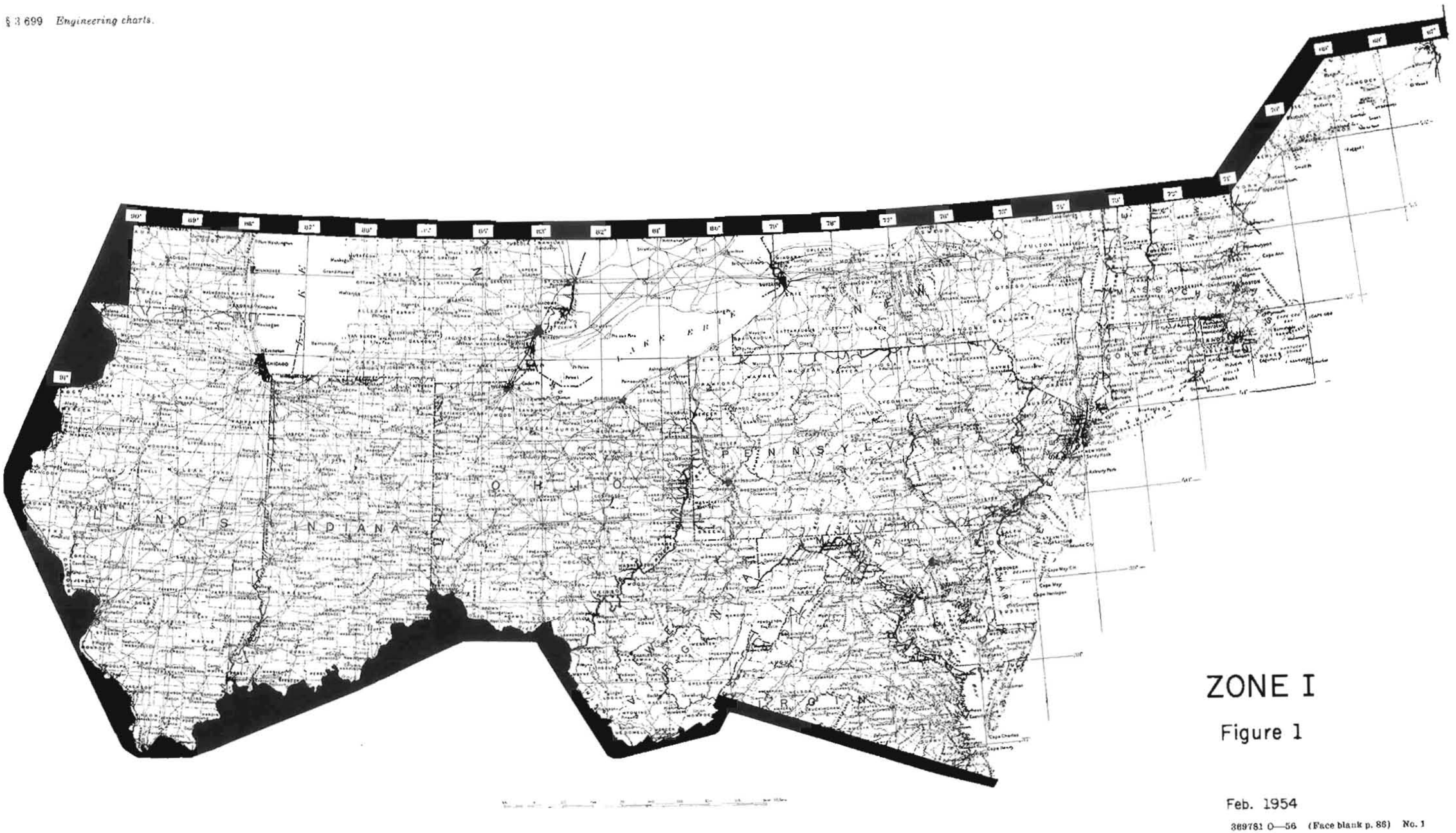
TABLE III—Continued

Middle latitude degrees	Miles per degree of longitude difference (statute miles)														
	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Minutes															
39	56.273	55.563	54.836	54.092	53.332	52.556	51.763	50.955	50.131	49.292	48.437	47.568	46.684	45.786	44.874
40	56.261	55.551	54.824	54.080	53.320	52.543	51.750	50.942	50.117	49.277	48.423	47.553	46.669	46.771	44.858
41	56.249	55.539	54.811	54.067	53.307	52.530	51.736	50.928	50.103	49.263	48.409	47.539	46.654	45.756	44.843
42	56.238	55.527	54.799	54.054	53.294	52.517	51.723	50.914	50.089	49.249	48.395	47.524	46.639	46.741	44.827
43	56.226	55.515	54.787	54.042	53.281	52.504	51.710	50.901	50.076	49.235	48.380	47.509	46.624	45.726	44.812
44	56.214	55.503	54.775	54.030	53.268	52.491	51.697	50.887	50.062	49.221	48.365	47.495	46.609	45.710	44.797
45	56.202	55.491	54.762	54.017	53.255	52.478	51.684	50.873	50.048	49.207	48.351	47.480	46.595	45.695	44.782
46	56.191	55.479	54.750	54.005	53.243	52.465	51.670	50.860	50.034	49.193	48.336	47.465	46.580	45.680	44.766
47	56.179	55.467	54.738	53.992	53.230	52.452	51.657	50.846	50.020	49.179	48.322	47.451	46.565	45.665	44.751
48	56.167	55.455	54.726	53.979	53.217	52.438	51.643	50.833	50.006	49.165	48.308	47.436	46.551	45.650	44.736
49	56.156	55.443	54.713	53.967	53.204	52.425	51.630	50.819	49.992	49.151	48.293	47.421	46.536	45.635	44.720
50	56.144	55.431	54.701	53.955	53.191	52.412	51.616	50.805	49.978	49.136	48.279	47.407	46.521	45.620	44.705
51	56.132	55.419	54.688	53.942	53.178	52.399	51.603	50.792	49.965	49.122	48.265	47.392	46.506	45.604	44.689
52	56.120	55.407	54.676	53.929	53.165	52.386	51.590	50.778	49.951	49.108	48.250	47.377	46.491	45.589	44.674
53	56.109	55.395	54.664	53.917	53.152	52.373	51.576	50.764	49.937	49.094	48.236	47.363	46.476	45.574	44.659
54	56.097	55.383	54.652	53.904	53.140	52.359	51.563	50.751	49.923	49.080	48.222	47.348	46.461	45.559	44.643
55	56.085	55.371	54.639	53.891	53.127	52.346	51.549	50.737	49.909	49.066	48.207	47.333	46.446	45.544	44.628
56	56.073	55.359	54.627	53.879	53.114	52.333	51.536	50.723	49.895	49.051	48.192	47.319	46.431	45.529	44.613
57	56.061	55.347	54.614	53.867	53.101	52.320	51.523	50.710	49.881	49.037	48.178	47.304	46.416	45.514	44.597
58	56.050	55.335	54.602	53.854	53.088	52.307	51.509	50.696	49.867	49.023	48.163	47.289	46.401	45.499	44.582
59	56.038	55.323	54.590	53.841	53.075	52.294	51.496	50.682	49.853	49.009	48.149	47.275	46.386	45.484	44.566

TABLE IV

(1) Channel	(2) 20 miles (IF beat)	(3) 20 miles (intermodulation)	(4) 56 miles (adjacent channel)	(5) 60 miles (oscillator)	(6) 60 miles (sound image)	(7) 76 miles (picture image)
14	22	16-19	15	21	28	29
15	23	17-20	14, 16	22	29	30
16	24	14, 18-21	15, 17	23	30	31
17	25	14-15, 19-22	16, 18	24	31	32
18	26	14-16, 20-23	17, 19	25	32	33
19	27	14-17, 21-24	18, 20	26	33	34
20	28	15-18, 22-25	19, 21	27	34	35
21	29	16-19, 23-26	20, 22	28, 14	35	36
22	30, 14	17-20, 24-27	21, 23	29, 15	36	37
23	31, 15	18-21, 25-28	22, 24	30, 16	37	38
24	32, 16	19-22, 26-29	23, 25	31, 17	38	39
25	33, 17	20-23, 27-30	24, 26	32, 18	39	40
26	34, 18	21-24, 28-31	25, 27	33, 19	40	41
27	35, 19	22-25, 29-32	26, 28	34, 20	41	42
28	36, 20	23-26, 30-33	27, 29	35, 21	42, 14	43
29	37, 21	24-27, 31-34	28, 30	36, 22	43, 16	44, 14
30	38, 22	25-28, 32-35	29, 31	37, 23	44, 16	45, 15
31	39, 23	26-29, 33-36	30, 32	38, 24	45, 17	46, 16
32	40, 24	27-30, 34-37	31, 33	39, 25	46, 18	47, 17
33	41, 25	28-31, 35-38	32, 34	40, 26	47, 19	48, 18
34	42, 26	29-32, 36-39	33, 35	41, 27	48, 20	49, 19
35	43, 27	30-33, 37-40	34, 36	42, 28	49, 21	50, 20
36	44, 28	31-34, 38-41	35, 37	43, 29	50, 22	51, 21
37	45, 29	32-35, 39-42	36, 38	44, 30	51, 23	52, 22
38	46, 30	33-36, 40-43	37, 39	45, 31	52, 24	53, 23
39	47, 31	34-37, 41-44	38, 40	46, 32	53, 25	54, 24
40	48, 32	35-38, 42-46	39, 41	47, 33	54, 26	55, 25
41	49, 33	36-39, 43-46	40, 42	48, 34	55, 27	56, 26
42	50, 34	37-40, 44-47	41, 43	49, 35	56, 28	57, 27
43	51, 35	38-41, 45-48	42, 44	50, 36	57, 29	58, 28
44	52, 36	39-42, 46-49	43, 45	51, 37	58, 30	59, 29
45	53, 37	40-43, 47-50	44, 46	52, 38	59, 31	60, 30
46	54, 38	41-44, 48-51	45, 47	53, 39	60, 32	61, 31
47	55, 39	42-45, 49-52	46, 48	54, 40	61, 33	62, 32
48	56, 40	43-46, 50-53	47, 49	55, 41	62, 34	63, 33
49	57, 41	44-47, 51-54	48, 50	56, 42	63, 35	64, 34
50	58, 42	45-48, 52-55	49, 51	57, 43	64, 36	65, 35
51	59, 43	46-49, 53-56	50, 52	58, 44	65, 37	66, 36
52	60, 44	47-50, 54-57	51, 53	59, 45	66, 38	67, 37
53	61, 45	48-51, 55-58	52, 54	60, 46	67, 39	68, 38
54	62, 46	49-52, 56-59	53, 55	61, 47	68, 40	69, 39
55	63, 47	50-53, 57-60	54, 56	62, 48	69, 41	70, 40
56	64, 48	51-54, 58-61	55, 57	63, 49	70, 42	71, 41
57	65, 49	52-55, 59-62	56, 58	64, 50	71, 43	72, 42
58	66, 50	53-56, 60-63	57, 59	65, 51	72, 44	73, 43
59	67, 51	54-57, 61-64	58, 60	66, 52	73, 45	74, 44
60	68, 52	55-58, 62-65	59, 61	67, 53	74, 46	75, 45
61	69, 53	56-59, 63-66	60, 62	68, 54	75, 47	76, 46
62	70, 54	57-60, 64-67	61, 63	69, 55	76, 48	77, 47
63	71, 55	58-61, 65-68	62, 64	70, 56	77, 49	78, 48
64	72, 56	59-62, 66-69	63, 65	71, 57	78, 50	79, 49
65	73, 57	60-63, 67-70	64, 66	72, 58	79, 51	80, 50
66	74, 58	61-64, 68-71	65, 67	73, 59	80, 52	81, 51
67	75, 59	62-65, 69-72	66, 68	74, 60	81, 53	82, 52
68	76, 60	63-66, 70-73	67, 69	75, 61	82, 54	83, 53
69	77, 61	64-67, 71-74	68, 70	76, 62	83, 55	54
70	78, 62	65-68, 72-75	69, 71	77, 63	56	55
71	79, 63	66-69, 73-76	70, 72	78, 64	57	56
72	80, 64	67-70, 74-77	71, 73	79, 65	58	57
73	81, 65	68-71, 75-78	72, 74	80, 66	59	58
74	82, 66	69-72, 76-79	73, 75	81, 67	60	59
75	83, 67	70-73, 77-80	74, 76	82, 68	61	60
76	68	71-74, 78-81	75, 77	83, 69	62	61
77	69	72-75, 79-82	76, 78	70	63	62
78	70	73-76, 80-83	77, 79	71	64	63
79	71	74-77, 81-83	78, 80	72	65	64
80	72	75-78, 82-83	79, 81	73	66	65
81	73	76-79, 83	80, 82	74	67	66
82	74	77-80	81, 83	75	68	67
83	75	78-81	82	76	69	68

NOTE: The parenthetical reference beneath the mileage figures in columns 2 through 7, inclusive, indicate, in abbreviated form, the bases for the required mileage separations. For a discussion of these bases, see the "Sixth Report and Order" of the Commission (FCC 52-294). The hyphenated numbers listed in column (3) are both inclusive.

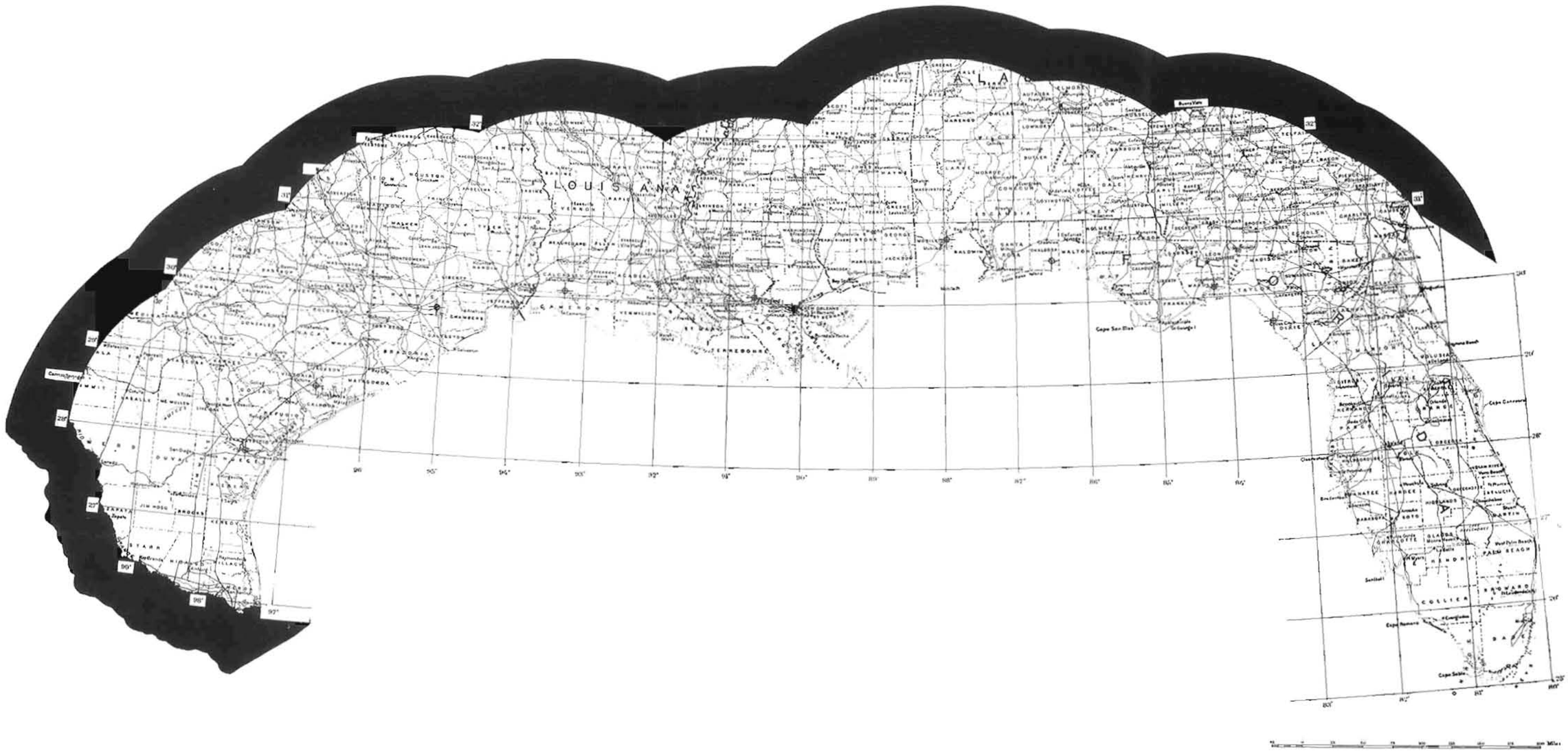


ZONE I

Figure 1

Feb. 1954

369781 O—56 (Face blank p. 86) No. 1



ZONE III

Figure 2

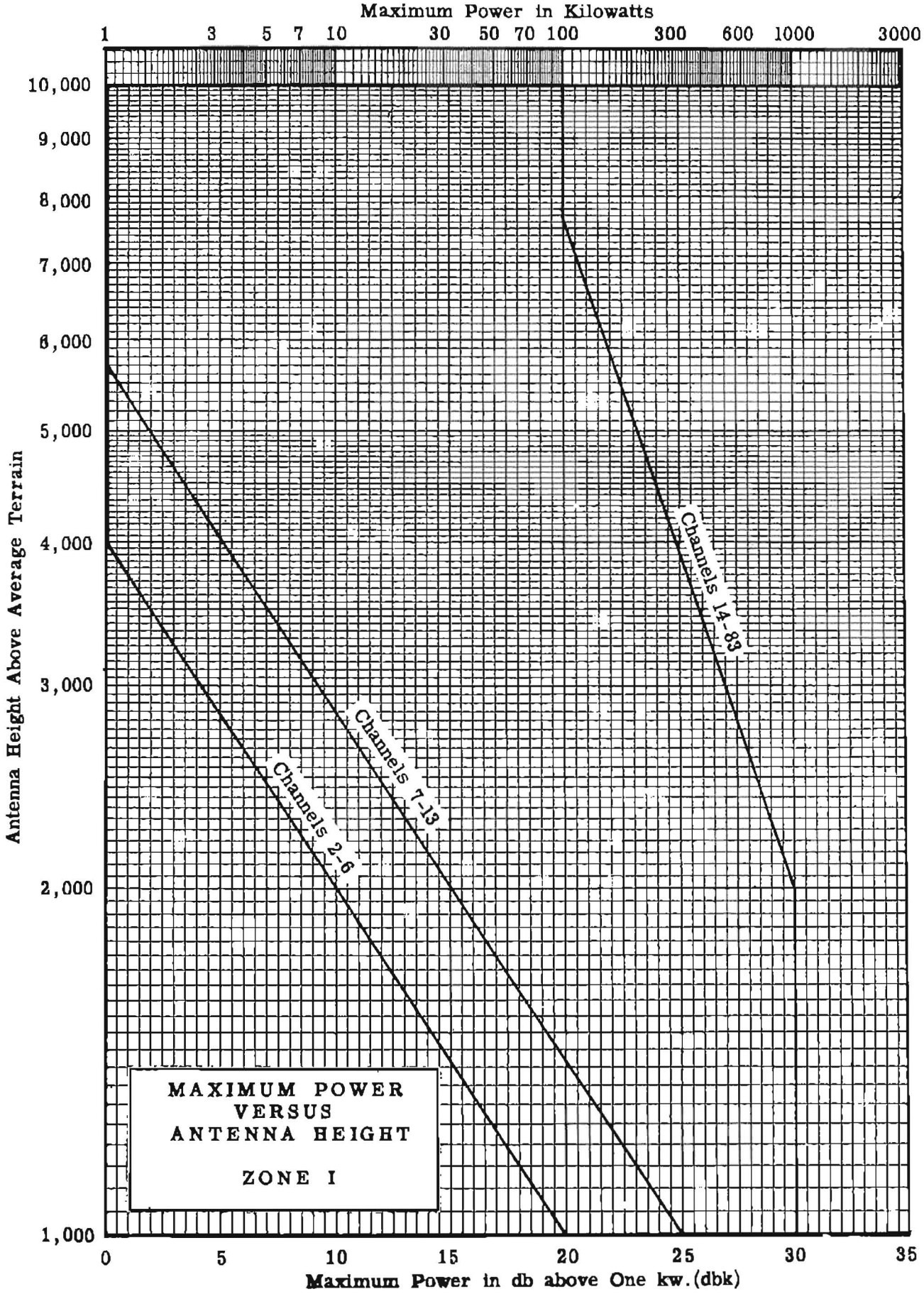

Maximum Power in Kilowatts
1
3
5
7
10
30
50
70
100
300
600
1000
3000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
Antenna Height Above Average Terrain
Channels 14-83
Channels 7-13
Channels 2-6
MAXIMUM POWER
VERSUS
ANTENNA HEIGHT
ZONE I
0
5
10
15
20
25
30
35
Maximum Power in db above One kw.(dbk)

Figure 3

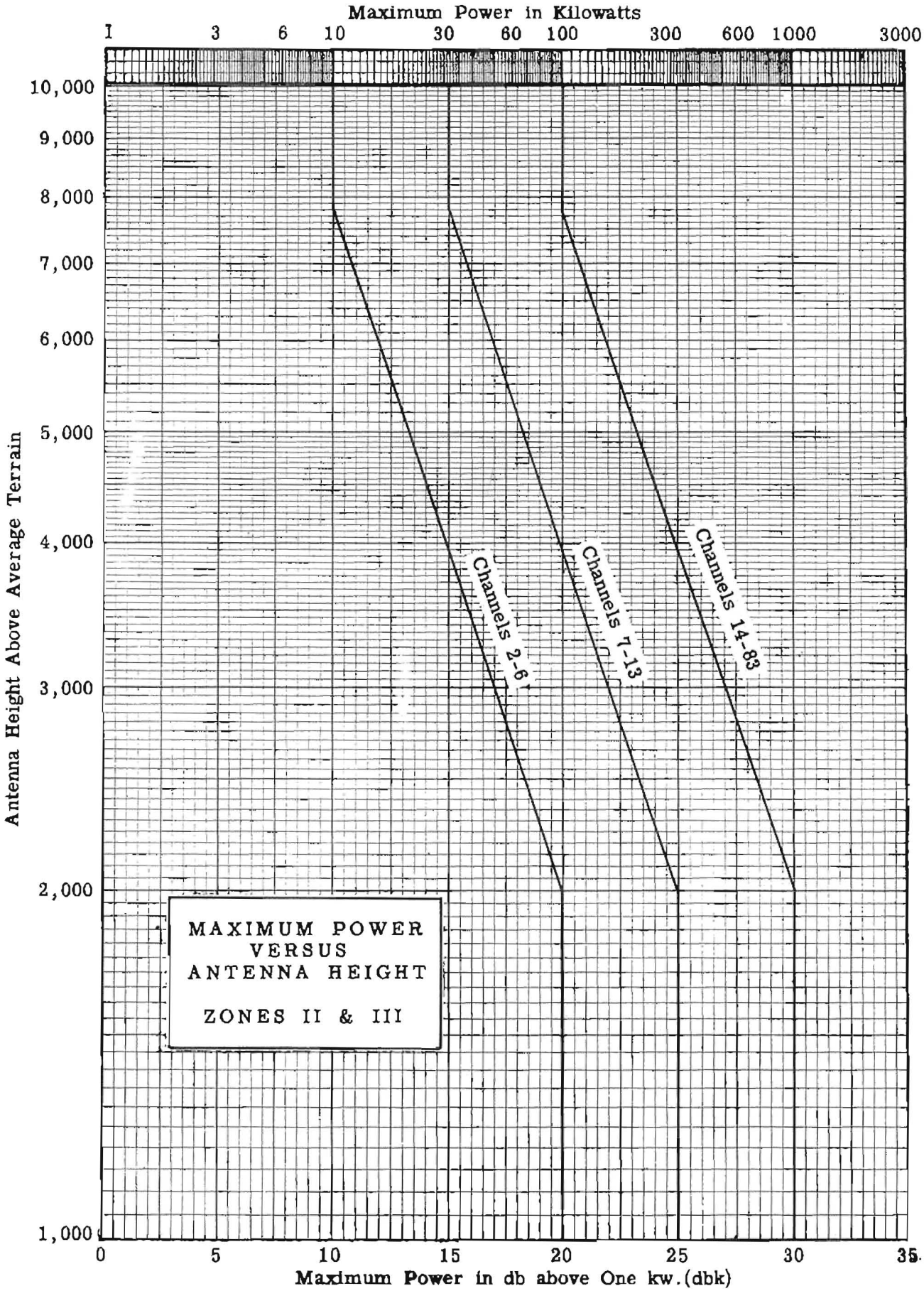

Maximum Power in Kilowatts
1
3
6
10
30
60
100
300
600
1000
3000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
Antenna Height Above Average Terrain
Channels 2-6
Channels 7-13
Channels 14-83
MAXIMUM POWER
VERSUS
ANTENNA HEIGHT
ZONES II & III
0
5
10
15
20
25
30
35
Maximum Power in db above One kw.(dbk)

Figure 4

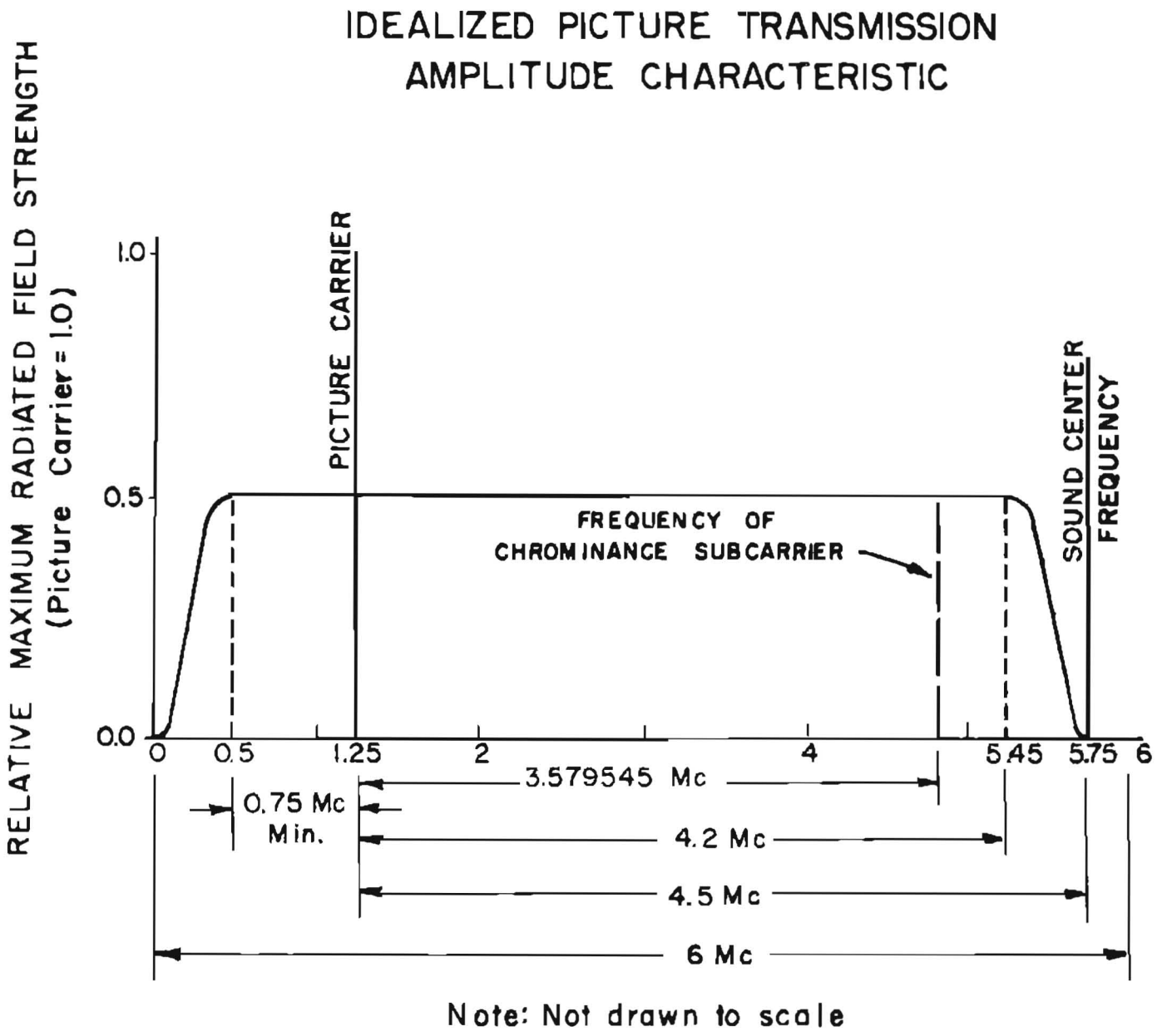
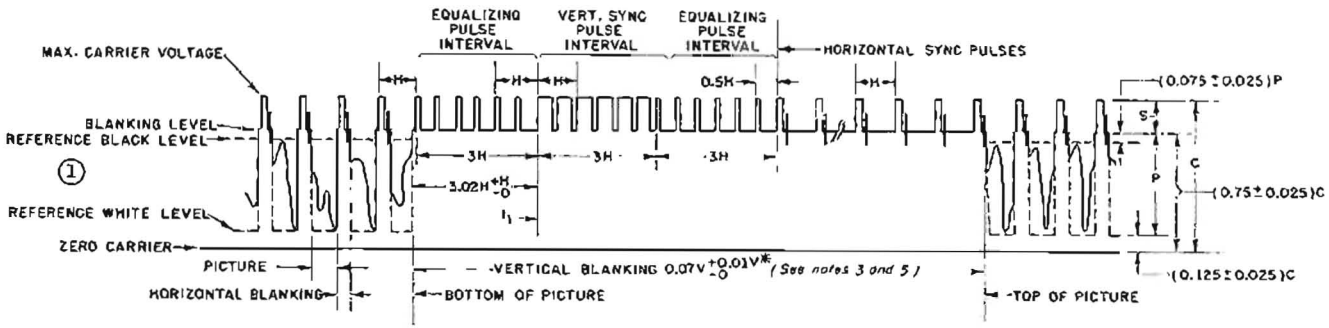
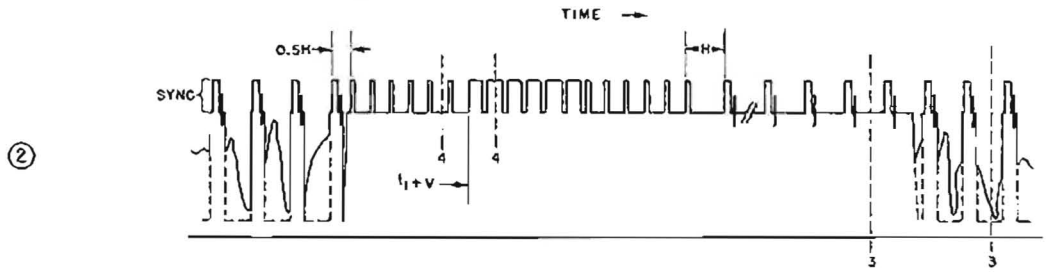

IDEALIZED PICTURE TRANSMISSION
AMPLITUDE CHARACTERISTIC
RELATIVE MAXIMUM RADIATED FIELD STRENGTH
(Picture Carrier = 1.0)
1.0
0.5
0.0
PICTURE CARRIER
SOUND CENTER FREQUENCY
FREQUENCY OF
CHROMINANCE SUBCARRIER
0
0.5
1.25
2
4
5.45
5.75
6
3.579545 Mc
0.75 Mc
Min.
4.2 Mc
4.5 Mc
6 Mc
Note: Not drawn to scale

FIGURE 5

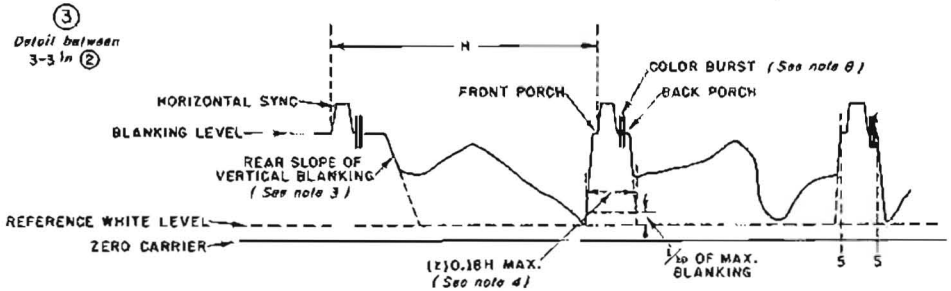
TELEVISION SYNCHRONIZING WAVEFORM

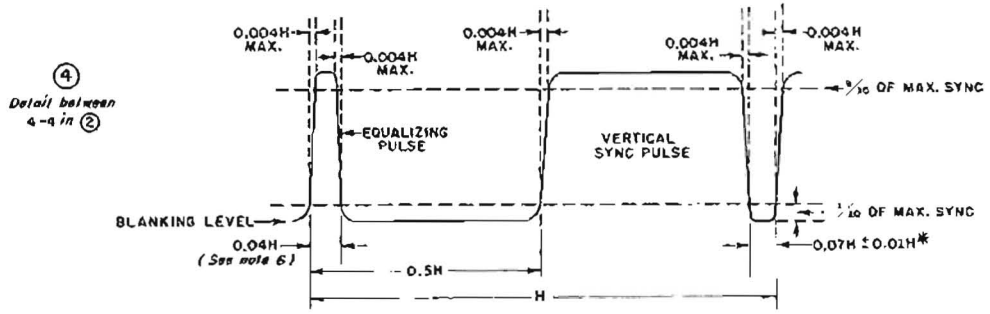
FOR COLOR TRANSMISSION

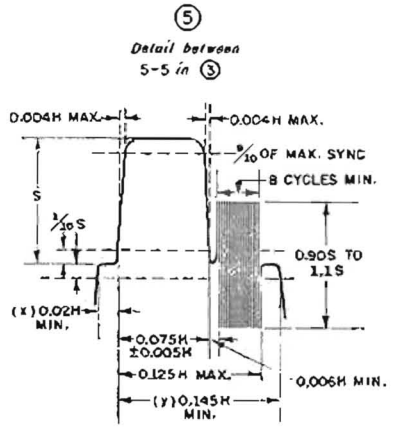




Horizontal dimensions not to scale in 1, 2 and 3







NOTES

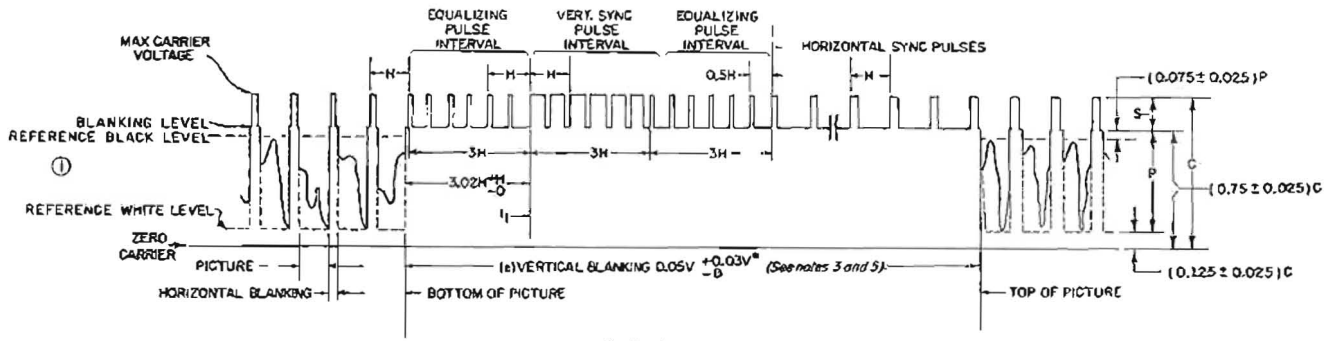
1. H = Time from start of one line to start of next line.
2. V = Time from start of one field to start of next field.
3. Leading and trailing edges of vertical blanking should be complete in less than 0.1 H.
4. Leading and trailing slopes of horizontal blanking must be steep enough to preserve minimum and maximum values of (x+y) and (z) under all conditions of picture content.
5. * Dimensions marked with asterisk indicate that tolerances given are permitted only for long time variations and not for successive cycles.
6. Equalizing pulse area shall be between 0.45 and 0.5 of area of a horizontal sync pulse.
7. Color burst follows each horizontal pulse, but is omitted following the equalizing pulses and during the broad vertical pulses.
8. Color bursts to be omitted during monochrome transmission.
9. The burst frequency shall be 3.579545 mc. The tolerance on the frequency shall be ±10 cycles with a maximum rate of change of frequency not to exceed 1/10 cycle per second per second.
10. The horizontal scanning frequency shall be $\frac{2}{455}$ times the burst frequency.
11. The dimensions specified for the burst determine the times of starting and stopping the burst, but not its phase. The color burst consists of amplitude modulation of a continuous sine wave.
12. Dimension "P" represents the peak excursion of the luminance signal from blanking level, but does not include the chrominance signal. Dimension "S" is the sync amplitude above blanking level. Dimension "C" is the peak carrier amplitude.
13. Refer to text for further explanations and tolerances.

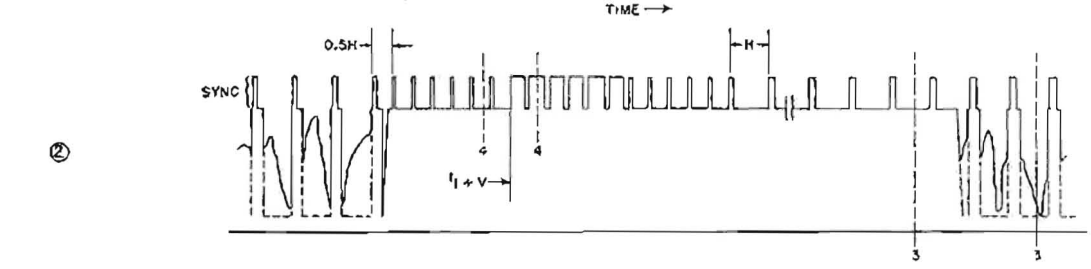
FIGURE 6

380781 O—58 (Face blank p. 80) No. 6

TELEVISION SYNCHRONIZING WAVEFORM

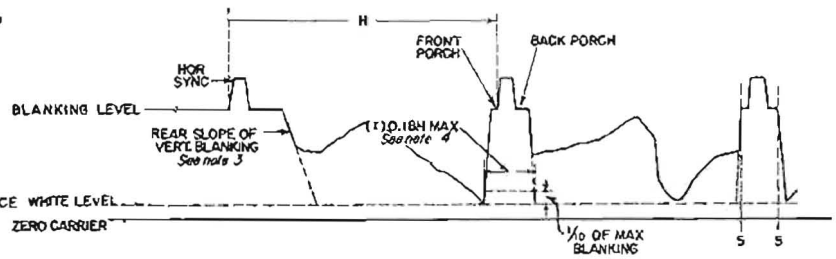
FOR MONOCHROME TRANSMISSION ONLY



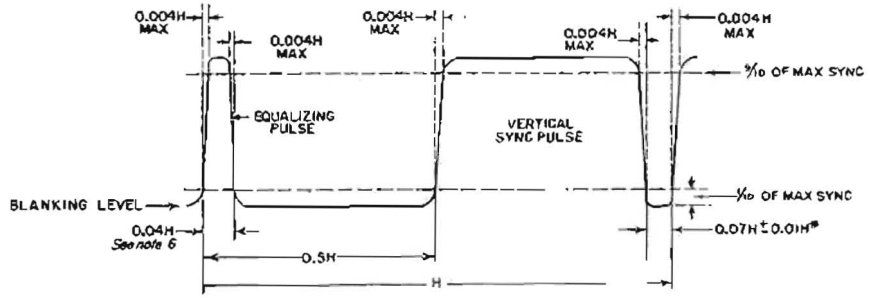


Horizontal dimensions not to scale in 1, 2 and 3

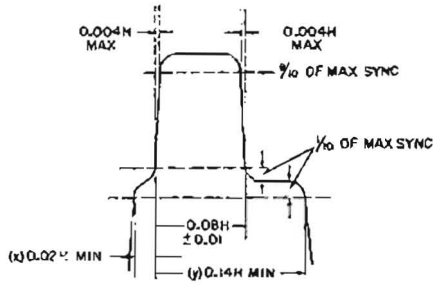
③ *Detail between 3-3 in ②*



④ *Detail between 4-4 in ②*



⑤ *Detail between 5-5 in ③*



NOTES

1. H = Time from start of one line to start of next line.
2. V = Time from start of one field to start of next field.
3. Leading and trailing edges of vertical blanking should be complete in less than 0.1H.
4. Leading and trailing slopes of horizontal blanking must be steep enough to preserve minimum and maximum values of (x+y) and (z) under all conditions of picture content.
5. * Dimensions marked with asterisk indicate that tolerances given are permitted only for long time variations and not for successive cycles.
6. Equalizing pulse area shall be between 0.45 and 0.5 of area of a horizontal sync pulse.
7. Refer to text for further explanations and tolerances.

FIGURE 7

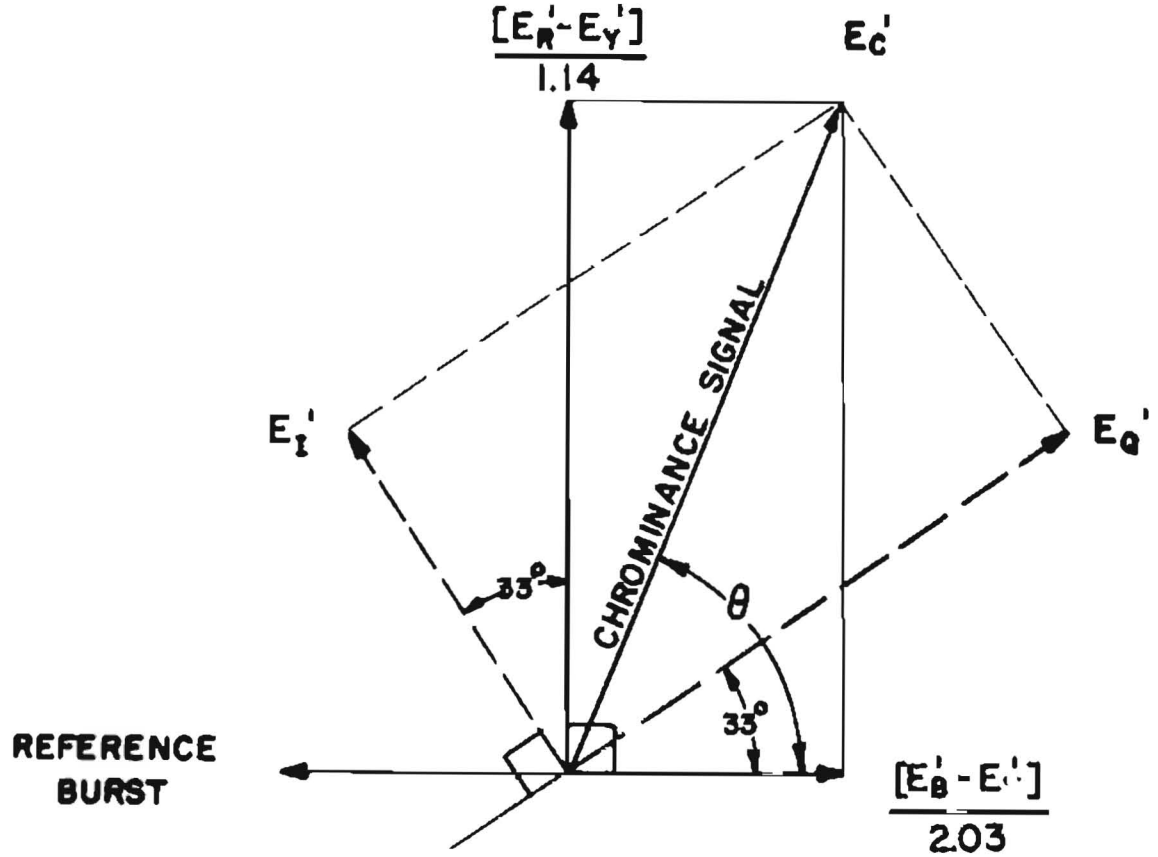
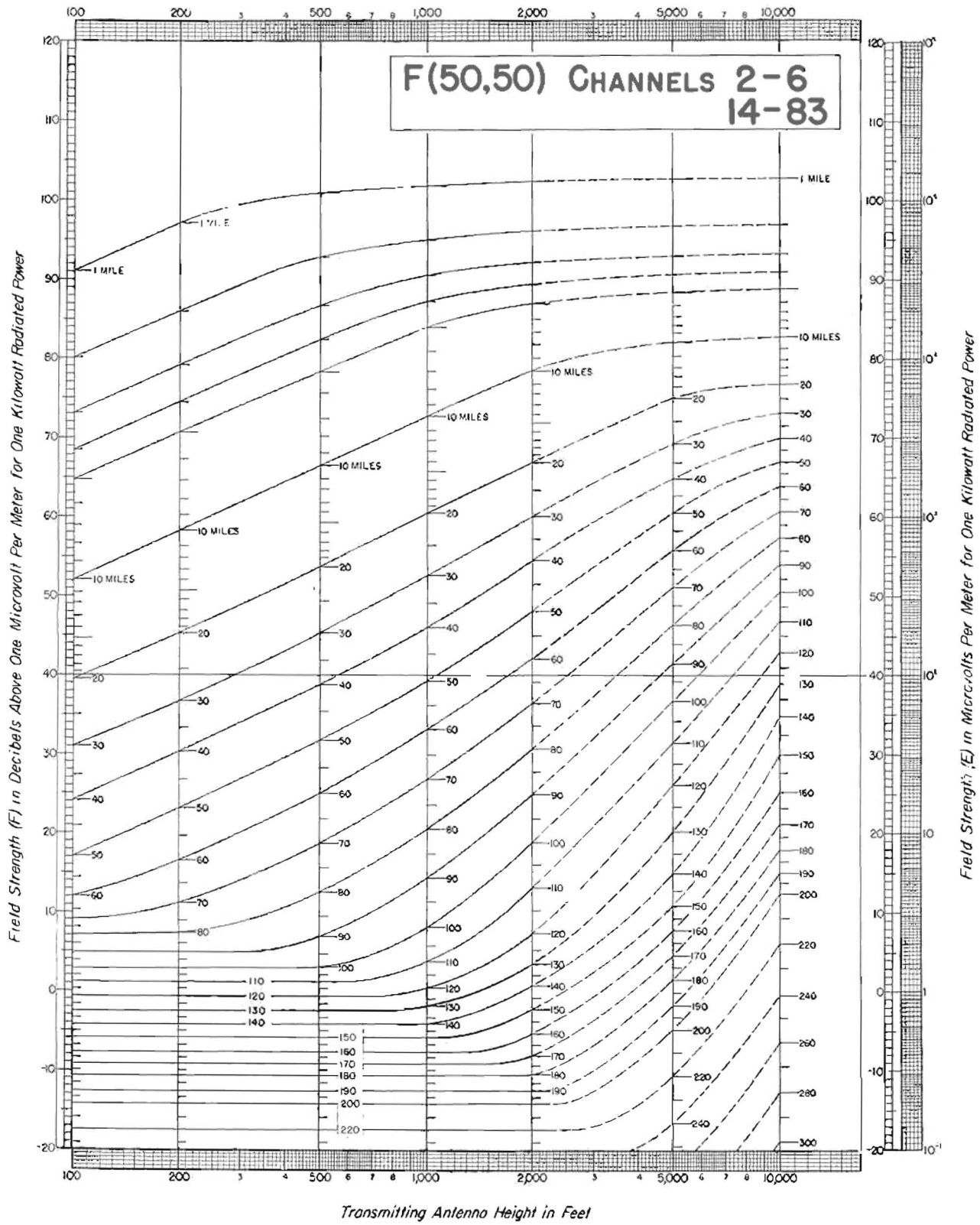

[E'R-E'Y']
1.14
E'C
E'I
E'Q
CHROMINANCE SIGNAL
33°
θ
33°
REFERENCE
BURST
[E'B-E'Y']
2.03

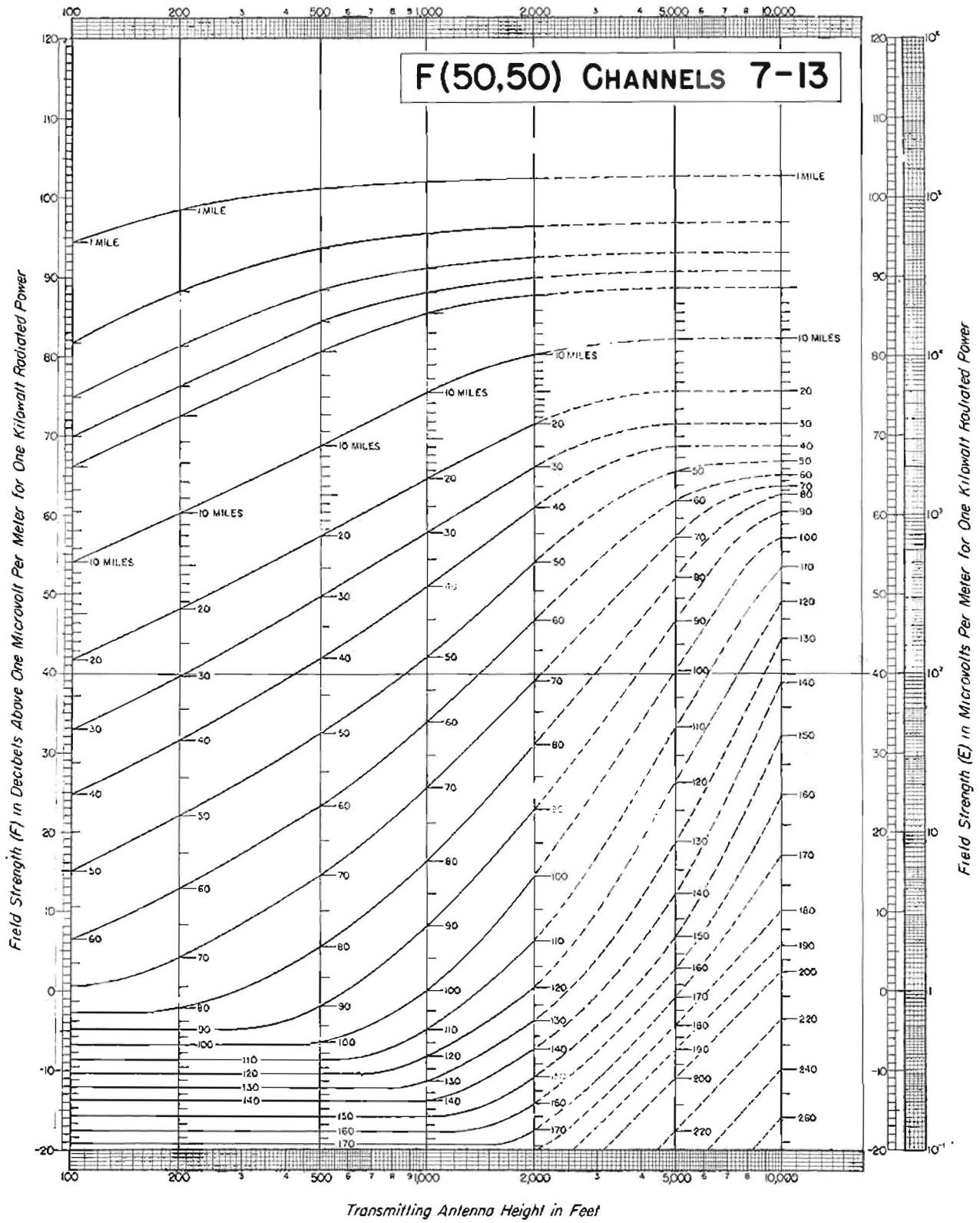
FIGURE 8



TELEVISION CHANNELS 2-6, 14-83

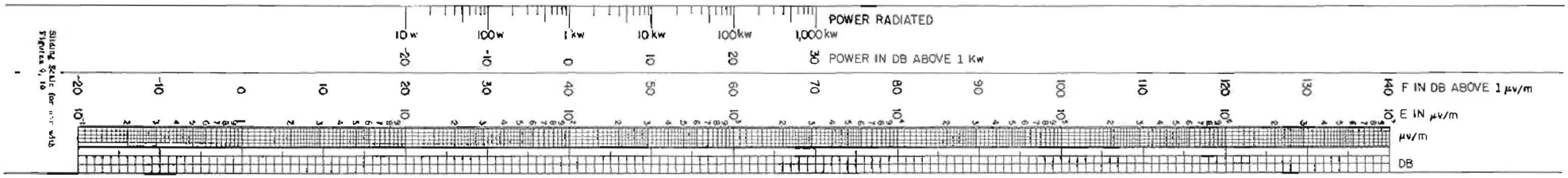
ESTIMATED FIELD STRENGTH EXCEEDED AT 50 PERCENT OF THE POTENTIAL RECEIVER LOCATIONS FOR AT LEAST 50 PERCENT OF THE TIME AT A RECEIVING ANTENNA HEIGHT OF 30 FEET

FIGURE 9



TELEVISION CHANNELS 7-13
ESTIMATED FIELD STRENGTH EXCEEDED AT 50 PERCENT OF THE POTENTIAL RECEIVER LOCATIONS FOR AT LEAST 50 PERCENT OF THE TIME AT A RECEIVING ANTENNA HEIGHT OF 30 FEET

FIGURE 10


POWER RADIATED
10 w
100 w
1 kw
10 kw
100 kw
1,000 kw
POWER IN DB ABOVE 1 Kw
F IN DB ABOVE 1 μv/m
E IN μv/m
μv/m
DB

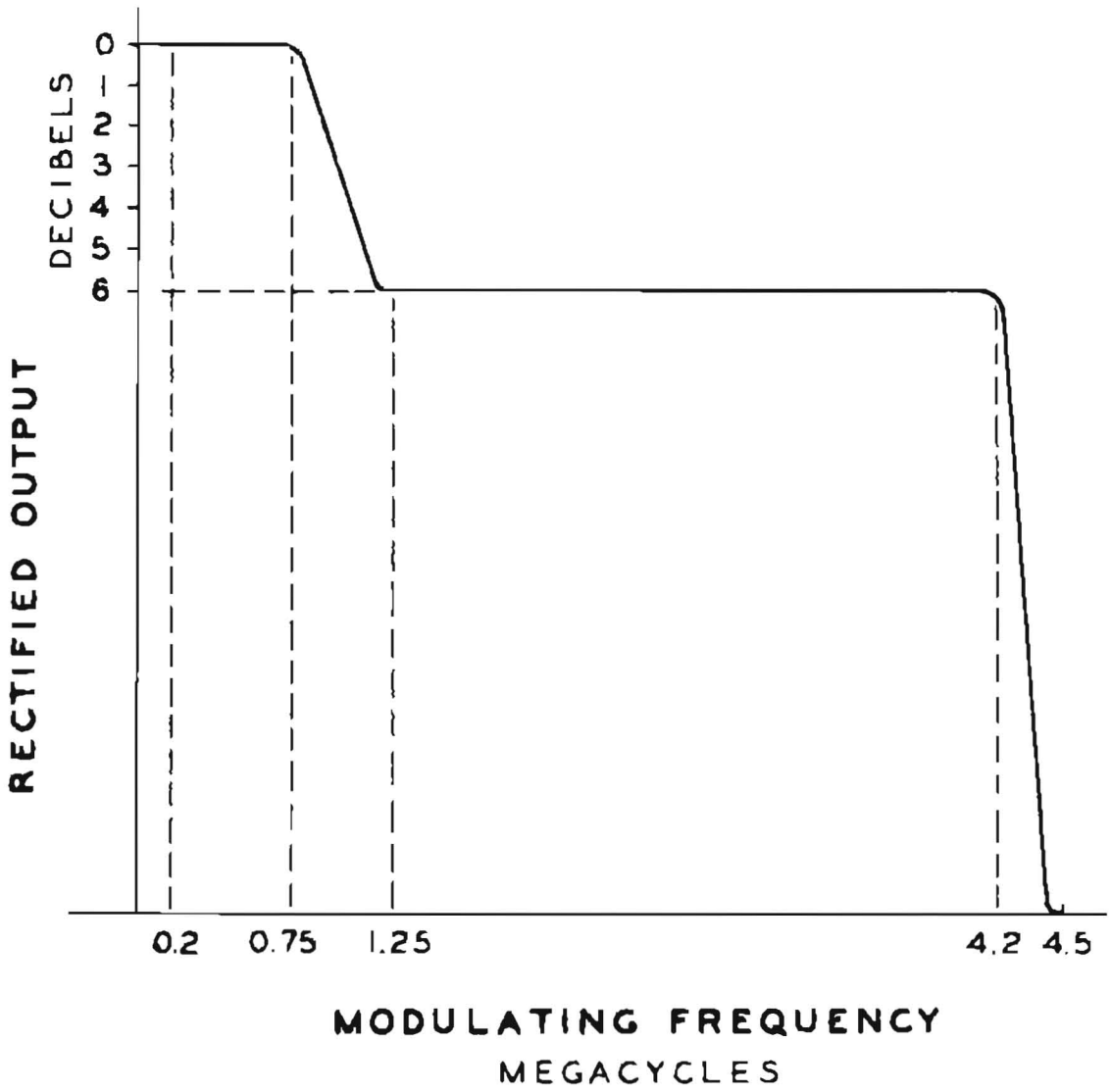

ASSUMED IDEAL DETECTOR OUTPUT
RECTIFIED OUTPUT
DECIBELS
0
1
2
3
4
5
6
0.2
0.75
1.25
4.2
4.5
MODULATING FREQUENCY
MEGACYCLES

FIGURE 11

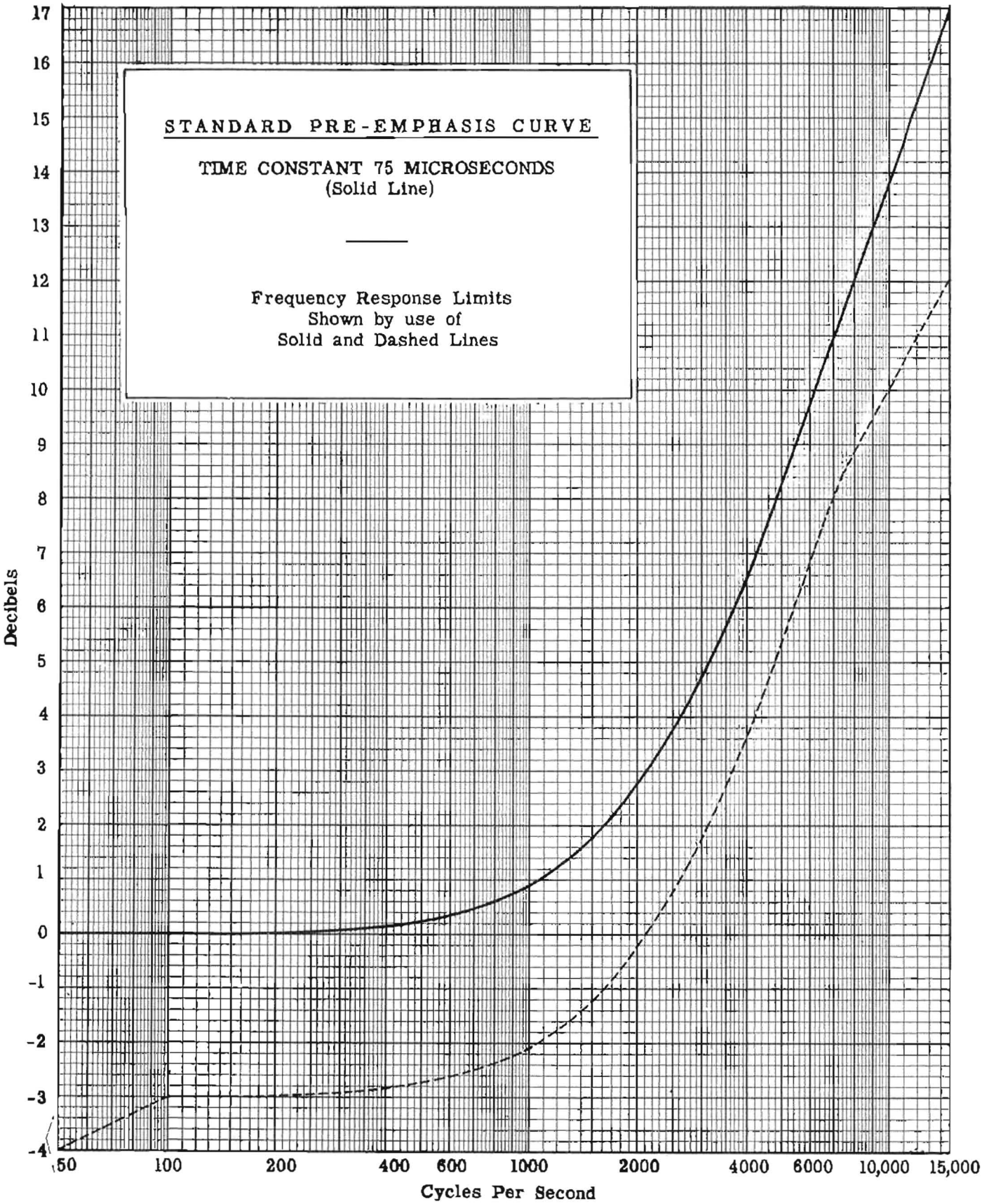

STANDARD PRE-EMPHASIS CURVE
TIME CONSTANT 75 MICROSECONDS
(Solid Line)
Frequency Response Limits
Shown by use of
Solid and Dashed Lines
Decibels
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
50
100
200
400
600
1000
2000
4000
6000
10,000
15,000
Cycles Per Second

FIGURE 12

SUBPART F—INTERNATIONAL BROADCAST STATIONS

DEFINITIONS AND ALLOCATION OF FACILITIES

§ 3.701 *Definitions.* The following definitions apply to terminology employed in this subpart:

(a) *International broadcast station.* A broadcasting station employing frequencies allocated to the broadcasting service between 5950 and 26100 kc, whose transmissions are intended to be received directly by the general public in foreign countries.

(b) *Frequency-hour.* One frequency used for one hour.

(c) *Day.* Any twenty-four hour period beginning 0000 EST and ending 2400 EST.

(d) *Sunspot number.* The predicted 12 month running average of the number of sunspots for any month as indicated in the National Bureau of Standards CRPL Series D publications.

(e) *Vernal equinox season.* That period of any calendar year starting at 0000 EST on 1 February and ending at 2400 EST on 30 April.

(f) *Summer season.* That period of any calendar year starting at 0000 EST on 1 May and ending at 2400 EST on 31 July.

(g) *Autumnal equinox season.* That period of any calendar year starting at 0000 EST on 1 August and ending at 2400 EST on 31 October.

(h) *Winter season.* That period of any calendar year starting at 0000 EST on 1 November and ending at 2400 EST on 31 January

(i) *Maximum usable frequency (MUF).* The highest frequency which is returned to the surface of the earth for a particular path and time of day on 50 percent of the days of the reference month.

(j) *Optimum working frequency (OWF).* The frequency which is returned to the surface of the earth for a particular path and time of day on 90 percent of the days of the reference month.

(k) *Reference month.* The middle month of any season listed in § 3.704 "Daily Frequency Hour Availability Table."

(l) *Delivered median field intensity or field intensity.* The field intensity incident upon the target area expressed in microvolts per meter, or decibels above

one microvolt per meter, which is exceeded by the hourly median value on 50 percent of the days of the reference month.

(m) *Target area.* Geographic area in which the reception of particular programs is specifically intended and in which adequate broadcast coverage is contemplated.

(n) *Contract operation.* Any non-Government operation of an international broadcast station pursuant to a contract with an agency of the United States Government and subject to Governmental control as to program content, target areas to be covered, and time of broadcast.

(o) *Private operation* Any non-Government operation of an International Broadcast station which is not contract operation.

§ 3.702 *Assignment and use of frequencies*

NOTE: Paragraphs (c) through (k) do not apply to stations when engaged in contract operations as defined in § 3.701.

(a) Frequencies will be assigned by the Commission from time to time and in accordance with the provisions of this section, to authorized international broadcast stations for use at specified hours and for transmission to specified target areas. Licensees may request the assignment of specific frequencies for transmission during given hours of operation to specified target areas by filing informal requests in triplicate with the Commission no less than 15 days prior to the start of a new season. Such requests will be honored to the extent that interference and propagation conditions permit and that they are otherwise in accordance with the provisions of this section. Requests for changes in frequency or hour assignments at other times during the year or which are received less than 15 days before the start of a new season will be processed as rapidly as practical. All specific frequency authorizations will be made only on the express understanding that they are subject to immediate cancellation or change without hearing whenever the Commission determines that interference or propagation conditions so require and that each assignment of frequency hours for a given season is unique unto itself and not subject to renewal, with the result that completely new assignments must be secured for the forthcoming season. Where a station is simultaneously engaged in both private and contract broadcasting, as defined in § 3.701, it must receive separate frequency hour authorizations for each of these operations

(b) Any foreign standard target areas shown in Figure 1 of § 3.792 may be specified by the licensee, in which case field intensity calculations should be based on the transmission path between the corresponding reference points listed in § 3.703. In the event a broadcast is to be directed to more than one target area in the same region, the *primary* target area should be specified and the reasons for selecting that particular target area given, with special reference to the nature and special suitability, if any, of the programming proposed. Field intensity calculations should be based on the transmission path to the standard reference point in § 3.703 for the primary target area In the event a licensee wishes to specify target areas other than those shown in Figure 1 of § 3.792, adequate justification must be given to show that the use of standard target areas is inappropriate, with special reference given to any specialized programming proposed which appears suitable only for the nonstandard target areas designated. When nonstandard target areas are proposed, special reference points must be specified (by geographical coordinates) and reasonably chosen so as to insure complete and adequate coverage of the target areas.

(c) Frequencies assigned by the Commission will be within the following bands:

	Kilocycles
Band A	5950–6200
Band B	9500–9775
Band C	11700–11975
Band D	15100–15450
Band E	17700–17900
Band F	21450–21750
Band G	25600–26100

(d) No frequency will be assigned which would provide a Delivered Median Field Intensity, either measured or calculated, of less than 150 uv/m—50 percent or 43.5 decibels above one uv/m at the distant foreign target area. (This value of Delivered Median Field Intensity is expected to provide protection against atmospheric and industrial noise for at least 90 percent of each hour during 90 percent of the days of the month.) With each request for frequency assignment, licensees must submit computations which adequately show that this requirement would be met.

NOTE: Standard OWF propagation curves and Delivered Median Field Intensity curves for the various hours and seasons throughout the eleven year sunspot cycle have been computed for transmission paths between standard reference points listed in § 3.703 for the standard target areas shown in Figure 1 of § 3.792. These curves, which were developed and used at the Mexico City High Frequency Broadcasting Conference (1948–1949), are available at the Commission's Washington offices and may be used in calculating the propagation data which licensees are required to provide under these Rules The methods used in computing these data are described in Chapter 7, paragraph 7.7 of the National Bureau of Standards Circular 462. In lieu of that data, and in all cases where nonstandard target areas are specified as provided in paragraph (b) of this section, licensees must develop their own propagation curves for use in computing values of OWF and Delivered Median Field Intensity for the particular transmission paths involved. In doing so, use may be made of the published propagation data of the National Bureau of Standards known as CRPL Series D, "Basic Radio Propagation Predictions", published monthly in conjunction with National Bureau of Standards Circular 465, "Instructions for the use of Basic Radio Propagation Predictions." These publications are available from the Superintendent of Documents, Washington 25, D. C A typical example of a computation for a transmission path between standard target areas is from New York (Area 8) to Buenos Aires (Area 15). The Delivered Median Field Intensity for the equinox season, sunspot 5, and for the 8 Mc band for the hours 0200 to 0400 GMT is indicated by the appropriate propagation curve as 24 decibels above one microvolt per meter for 1 kw radiated power. The transmitter power output of 20 decibels (100 kw) is added. The transmitting antenna gain of 12 decibels is added. The resultant total (56 decibels) exceeds the level of 43.5 decibels required to deliver a median field intensity of 150 uv/m at the distant target area.

(e) Frequencies assigned will be as near as possible to the Optimum Working Frequency. In no case will they exceed the Maximum Usable Frequency for more than a total of 15 minutes during any period of transmission. With each request for frequency assignment, licensees must submit computations which adequately show that this requirement would be met. (See note in paragraph (d) of this section regarding methods for computation.)

(f) Not more than one frequency will be authorized for use at any one time for any one program transmission except in instances where a program is intended for reception in more than one target area and the intended target areas cannot be served by a single frequency.

(g) No authorization for use of a particular frequency will be issued which fails to provide a minimum co-channel Delivered Median Field Intensity protection ratio of 40 db to the transmissions of other broadcasting stations at the reference point in the target area being served by such stations which, in the opinion of the Commission, have priority of assignment.

(h) Authorization for use of a particular frequency will not be issued which does not provide a minimum adjacent channel Delivered Median Field Intensity protection ratio of 11 db to the transmissions of other international broadcasting stations at the reference points in the target areas being served by such stations which, in the opinion of the Commission, have priority of assignment.

(i) Any frequency authorized to an international broadcast station shall also be available for assignment to other international broadcast stations.

(j) Not more than one frequency shall be used simultaneously under the same authorization and call letter and equipment installation number designation.

(k) Subject to all other pertinent provisions of this subpart, the total maximum number of frequency-hours which will be authorized to all licensees of private international broadcast stations for private operation combined in any frequency band for any pertinent season during any one day will be those in § 3.704 less the number of frequency-hours in those bands scheduled for use by both (1) government international broadcasting stations, and (2) international broadcast stations licensed by the Commission to use frequencies in these bands for contract operations.

(l) In the event the total number of frequency hours in any band scheduled for both (1) government international broadcasting stations, and (2) international broadcast stations licensed by the

Commission to use frequencies in these bands for contract operations equals or exceeds 75 percent of the frequency hour figures given in § 3.704, the maximum number of frequency-hours which will be authorized to all licensees of international broadcast stations for private operation in any frequency band for any pertinent season during any one day will be 25 percent of the frequency hours shown in § 3.704.

(m) If the requests for international broadcasting frequency-hours for private operation in any band or bands exceed those available under the terms of these Rules, in the absence of any voluntary agreement for reduction of frequency-hours requested, the Commission will designate all requests for frequency-hours in the band or bands in question for hearing. Pending such hearing the Commission will temporarily assign the available frequency-hours equally among the several applicants: *Provided, however,* That with respect to such temporary allocation:

(1) An existing license shall not, to the extent such frequency hours are available, receive less than the number of frequency-hours utilized during the preceding season or requested for the forthcoming season, whichever is lesser.

(2) Where the number of frequency-hours available for private international broadcasting during a forthcoming season are insufficient to permit existing licensees to secure a temporary allocation equal to that previously utilized or requested, whichever is lesser, the allocation shall be pro-rated among such persons in a manner which will give them a share of the available frequency-hours proportionate to that utilized in the preceding season.

(3) In any event, where an applicant's share of the available frequency hours would be more than requested, the surplus shal be divided among the remaining applicants in the manner herein prescribed.

§ 3.703 *Latitude and longitude of areas used for field intensity calculations.*

Area No.	Latitude degrees	Longitude degrees
1	65 N.	150 W.
2	60 N.	125 W.
3	60 N.	100 W.
4	60 N.	80 W.
5	70 N.	40 W.
6	40 N.	120 W.
7	40 N.	100 W.
8	40 N.	80 W.
9	50 N.	60 W.
10	20 N	100 W.
11	10 N.	80 W.
12	10 S.	70 W.
13	10 S.	50 W.
14	30 S.	60 W
15	25 S.	50 W
16	45 S.	70 W
17	65 N.	20 W.
18	65 N.	15 E.
19	65 N.	10 E.
20	70 N.	60 E.
21	70 N.	80 E.
22	70 N.	100 E.
23	70 N.	120 E.
24	65 N.	140 E.
25	65 N.	160 E.
26	65 N.	180 E.
27	50 N.	0°
28	50 N.	20 E.
29	50 N.	40 E.
30	50 N.	60 E.
31	50 N.	80 E.
32	50 N.	100 E.
33	50 N.	120 E.
34	55 N.	140 E.
35	55 N.	160 E.
36	40 N.	25 W.
37	30 N.	0°
38	30 N.	20 E.
39	30 N.	40 E.
40	30 N.	60 E.
41	20 N.	80 E.
42	40 N.	85 E.
43	35 N.	100 E.
44	30 N.	120 E.
45	35 N.	140 E.
46	10 N.	5 W.
47	10 N.	20 E.
48	10 N.	40 E.
49	15 N.	100 E
50	10 N.	120 E.
51	0°	140 E.
52	10 S.	20 E
53	10 S.	40 E.
54	5 S.	105 E.
55	15 S.	140 E.
56	20 S.	165 E.
57	30 S.	25 E.
58	25 S.	120 E.
59	35 S.	150 E.
60	40 S.	170 E.
61	20 N.	160 W.
62	20 S.	170 W.
63	20 S.	150 W.
64	15 N.	145 E.
65	10 N.	170 E.

§ 3.704 *Daily frequency hour availability table.*

Band	Season	Sunspot Numbers								
		0-20	20-35	35-50	50-65	65-80	80-95	95-110	110-125	125-140
Mc.										
6	June	0	0	0	-	0	0	0	0	0
	March-September	29	21	14	7	0	0	0	0	0
	December	45	47	48	49	50				32
9	June	34	30	27	24	21	16	11	5	2
	March-September	52	42	35	31	27	23	19	12	10
	December	54	50	47	44	42	39	36	33	32
11	June	53	50	48	46	45	39	31	23	14
	March-September	47	50	52	54	65	49	40	31	24
	December	31	34	36	38	39	34	30	26	22
15	June	84	88	91	94	96	87	79	69	58
15	March-September	49	54	58	61	64	47	33	21	7
	December	35	35	35	35	35	33	31	29	27
17	June	23	32	40	47	53	59	66	75	84
	March-September	23	22	22	21	20	24	29	34	30
	December	14	18	21	23	25	23	20	17	10
21	June	2	9	14	18	22	39	52	68	80
	March-September	0	9	16	22	27	36	45	56	65
	December	6	11	15	18	21	29	36	47	53
26		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Totals	June	196	209	220	229	237	240	239	239	238
	March-September	200	198	198	196	193	179	166	154	145
	December	185	195	202	207	212	158	153	152	181

[1] No limit.

ADMINISTRATIVE PROCEDURE

§ 3.711 *Application for international broadcast stations.* (a) If the application is for a construction permit or for modification of an existing authorization, FCC Form 309 shall be filed; if for a license, FCC Form 310 shall be filed, if for a renewal of license, FCC Form 311 shall be filed.

NOTE: Until these forms are revised, information required by these Rules and not required by the forms shall be submitted as a supplement to the application and will be considered a part thereof.

(b) Authorizations issued to international broadcast stations by the Commission will not specify the frequencies or hours of use, but will be authorizations to permit the construction or use of a particular transmitting equipment combination and related antenna systems for international broadcasting.

NOTE: Requests for the use of frequencies and frequency hours for transmissions to specific target areas should be submitted separately as provided in § 3.702.

(c) In the case of applications for authorizations to permit contract operations, as defined in § 3.701 (n), the contracting agency and contract number should be indicated for each operation.

§ 3.712 *Full disclosures.* Each application shall contain full and complete disclosures with regard to the real party or parties in interest, and their legal, technical, financial, and other qualifications, and as to all matters and things required to be disclosed by the application forms.

§ 3.713 *Installation of apparatus.* Applications for construction permit or modification thereof, involving the installation of new transmitting apparatus, shall be filed at least 60 days prior to the contemplated installation.

§ 3.714 *Period of construction.* Each construction permit will specify a maximum of 60 days from the date of granting thereof as the time within which construction of the station shall begin, and a maximum of six months thereafter as the time within which construction shall be completed and the station ready for operation, unless otherwise determined by the Commission upon proper showing in any particular case.

§ 3.715 *Forfeiture of construction permits; extension of time.* (a) A construction permit shall be automatically forfeited if the station is not ready for operation within the time specified therein or within such further time as the Commission may have allowed for completion, and a notation of the forfeiture of any construction permit under this provision will be placed in the records of the Commission as of the expiration date.

(b) An application (FCC Form 701) for extension of time within which to construct a station shall be filed at least 30 days prior to the expiration date of such permit if the facts supporting such application for extension are

known to the applicant in time to permit such filing. In other cases such applications will be accepted upon a showing satisfactory to the Commission of sufficient reasons for filing within less than 30 days prior to the expiration date. Such applications will be granted upon a specific and detailed showing that the failure to complete was due to causes not under the control of the grantee, or upon a specific and detailed showing of other matters sufficient to justify the extension.

(c) If a construction permit has been allowed to expire for any reason, application may be made for a new permit on FCC Form 321, "Application for Construction Permit to Replace Expired Permit."

§ 3.716 *Equipment tests.* (a) During the process of construction of an international broadcast station, the permittee after notifying the Commission and Engineer in Charge of the radio district in which the station is located may, without further authority of the Commission, conduct equipment tests for the purpose of such adjustments and measurements as may be necessary to assure compliance with the terms of the construction permit, the technical provisions of the application therefore, and the rules and regulations. No programming shall be conducted during equipment tests.

(b) The Commission may notify the permittee to conduct no tests or may cancel, suspend, or change the date for the beginning of equipment tests as and when such action may appear to be in the public interest, convenience, and necessity.

(c) Equipment tests may be continued so long as the construction permit shall remain valid.

(d) Inspection of a station will ordinarily be required during the equipment test period. After construction and after adjustments and measurements have been completed to show compliance with the terms of the construction permit, the technical provisions of the application therefore, and the rules and regulations, the permittee should notify the Engineer in Charge of the radio district in which the station is located that it is ready for inspection.

(e) The authorization for tests embodied in this section shall not be construed as constituting a license to operate but as a necessary part of construction.

§ 3.717 [Reserved.]

§ 3.718 *Normal license period.* All international broadcast station licenses will be issued so as to expire at the hour of 3 a. m. eastern standard time and will be issued for a normal license period of 1 year expiring November 1.

§ 3.719 *License; simultaneous modification and renewal.* When an application is granted by the Commission necessitating the issuance of a modified license less than 60 days prior to the expiration date of the license sought to be modified, and an application for renewal of said license is granted subsequent or prior thereto (but within 30 days of expiration of the present license) the modified license as well as the renewal license shall be issued to conform to the combined action of the Commission.

§ 3.720 *Renewal of license.* (a) Unless otherwise directed by the Commission, each application for renewal of an international broadcast station license shall be filed at least 90 days prior to the expiration date of the license sought to be renewed (FCC Form 311). No application for renewal of license of an international broadcast station will be considered unless there is on file with the Commission, the information currently required by §§ 1.341–1.344 of this chapter reference to which by date and file number shall be included in the application.

(b) Whenever the Commission regards an application for a renewal of an international broadcast station license as essential to the proper conduct of a hearing or investigation, and specifically directs that it be filed by a date certain, such application shall be filed within the time thus specified. If the licensee fails to file such application within the prescribed time, the hearing or investigation shall proceed as if such renewal application had been received.

§ 3.721 [Reserved.]

§ 3.722 *Repetitious applications.* (a) Where an applicant has been afforded an opportunity to be heard with respect to a particular application for a new international broadcast station, or for change of existing service or facilities, and the Commission has, after hearing or default, denied the application or dismissed it with prejudice, the Commission will not consider another application for a station of the same class to serve in whole or in part the same area, by the same applicant or by his successor or assignee, or on behalf of or for the benefit of the original parties in interest, until after the lapse of 12 months from the effective date of the Commission's order.

(b) Where an appeal has been taken from the action of the Commission in denying a particular application, another application for the same class of broadcast station and for the same area, in whole or in part, filed by the same applicant or by his successor or assignee, or on behalf or for the benefit of the original parties in interest, will not be considered until the final disposition of such appeal.

§ 3.723 *Assignment or transfer of control*—(a) *Voluntary.* Application for consent to voluntary assignment of an international station construction permit or license or for consent to voluntary transfer of control of a corporation holding an international station construction permit or license shall be filed with the Commission on FCC Form 314 (Assignment of License), FCC Form 315 (Transfer of Control) or FCC Form 316 (Short Form) at least 60 days prior to the contemplated effective date of assignment or transfer of control.

(b) *Pro forma.* Assignment or transfer applications shall be filed on FCC Form 316 where:

(1) There is an assignment from an individual or individuals (including partnerships) to a corporation owned and controlled by such individuals or partnerships without any substantial change in their relative interests;

(2) There is an assignment from a corporation to its individual stockholders without effecting any substantial change in the disposition of their interests;

(3) There is an assignment or transfer by which certain partners or stockholders retire but no new ones are brought in, provided that the interest transferred is not a controlling one;

(4) There is a corporate reorganization which involves no substantial change in the beneficial ownership of the corporation;

(5) There is an involuntary transfer to an Executor, Administrator or other court appointed officer caused by death or legal disability except that this form does not cover assignments (or transfers) from the Executor, Administrator or other court appointed officers to the ultimate beneficiary;

(6) There is an assignment or transfer from a corporation to a wholly owned subsidiary thereof or vice versa, or where there is an assignment from a corporation to a corporation owned or controlled by the assignor stockholders without substantial change in their interests;

(7) There is an assignment of less than a controlling interest in a partnership.

(c) *Involuntary.* In the event of the death or legal disability of a permittee or licensee, or a member of a partnership, or a person directly or indirectly in control of a corporation, which is a permittee or licensee:

(1) The Commission shall be notified in writing promptly of the occurrence of such death or legal disability, and

(2) Within thirty days after the occurrence of such death or legal disability, application on FCC Form 316 shall be filed for consent to involuntary assignment of such international station permit or license or for involuntary transfer of control of such corporation to a person or entity legally qualified to succeed to the foregoing interests under the laws of the place having jurisdiction over the estate involved.

LICENSING POLICIES

§ 3.731 *Licensing requirements; necessary showing.* A license for an international broadcast station will be issued only after a satisfactory showing has been made in regard to the following, among others:

(a) That there is a need for the international broadcast service proposed to be rendered.

(b) That the necessary program sources are available to the applicant to render an effective international service.

(c) That directive antennas and other technical facilities will be employed to deliver maximum signals to the target area or areas for which the service is designed.

(d) That the production of the program service and the technical operation of the proposed station will be conducted by qualified persons.

(e) That the applicant is technically and financially qualified and possesses adequate technical facilities to carry forward the service proposed.

(f) That the public interest, convenience and necessity will be served through the operation of the proposed station.

EQUIPMENT

§ 3.751 *Power requirement.* No international broadcast station will be authorized to install equipment or licensed for operation with a power less than 50 kilowatts.

§ 3.752 *Frequency control.* The transmitter of each international broadcast station shall be equipped with automatic frequency control apparatus so designed and constructed that it is capable of maintaining the operating frequency within the following limits:

(a) Until July 1, 1956, the frequency tolerance will be plus or minus 0.005 percent.

(b) After July 1, 1956, the frequency tolerance will be plus or minus 0.003 percent.

§ 3.753 *Antenna.* The antenna shall be so designed and operated that the signal (field intensity) toward the specific foreign country or countries served shall be at least 3.16 times the average effective signal from the station (power gain of 10).

§ 3.754 *Frequency monitors.* (a) The licensee of each international broadcast station shall operate at the transmitter a frequency monitor independent of the frequency control of the transmitter.

(b) The frequency monitor shall be designed and constructed in accordance with good engineering practice and shall have an accuracy sufficient to determine that the operating frequency is within one-half of the allowed tolerance.

§ 3.755 *Modulation monitors.* The licensee of each international broadcast station shall have in operation at the transmitter a modulation monitor.

§ 3.756 *Required transmitter performance.* (a) The construction, installation, operation, and performance of the international broadcast transmitter system shall be in accordance with good engineering practice.

NOTE: The establishment of specific levels of attenuation for spurious emissions will be the subject of further Rule Making in Docket 10962 pending the completion of additional studies of this matter.

(b) In addition to the requirements of paragraph (a) of this section in the event spurious emissions cause harmful interference, such additional steps as may be necessary to eliminate the interference must be taken immediately by the licensee.

§ 3.757 *Auxiliary transmitters.* Upon showing that a need exists for the use of auxiliary transmitters in addition to the regular transmitters of an international broadcast station, a license therefor may be issued provided that:

(a) Auxiliary transmitters may be installed either at the same location as the main transmitters or at another location.

(b) A licensed operator shall be in control whenever auxiliary transmitters are placed in operation.

(c) The auxiliary transmitters shall be maintained so that they may be put into immediate operation at any time for the following purposes:

(1) The transmission of the regular programs upon the failure of the main transmitters.

(2) The transmission of regular programs during maintenance or modification work on the main transmitter, necessitating discontinuance of its operation for a period not to exceed 5 days. (This includes the equipment changes which may be made without authority as set forth elsewhere in the Rules and Regulations or as authorized by the Commission by letter or by construction permit. Where such operation is required for periods in excess of 5 days, request therefor shall be in accordance with § 1.324 of this chapter.)

(3) Upon request by a duly authorized representative of the Commission.

(d) The auxiliary transmitters shall be tested at least once each week to determine that they are in proper operating condition and that they are adjusted to the proper frequency except that in the case of operation in accordance with paragraph (c) of this section during any week, the test in that week may be omitted provided the operation under paragraph (c) of this section is satisfactory. A record shall be kept of the time and result of each test. Such records shall be retained for a period of two years.

(e) The auxiliary transmitters shall be equipped with satisfactory control equipment which will enable the maintenance of the frequency emitted by the station within the limits prescribed by the regulations in this part.

(f) The operating power of an auxiliary transmitter may be less than the authorized power of the main transmitters, but in no event shall it be greater than such power.

§ 3.758 *Alternate main transmitters.* The licensee of an international broadcast station may be licensed for alternate main transmitters provided that a technical need for such alternate transmitters is shown and that the following conditions are met:

(a) Both transmitters are located at the same place.

(b) Both transmitters shall have the same power rating.

(c) Both transmitters shall meet the construction, installation, operation, and performance requirements of good engineering practice.

§ 3.759 *Changes in equipment and antenna system.* Licensees of international broadcast stations shall observe the following provisions with regard to changes in equipment and antenna system:

(a) No changes in equipment shall be made:

(1) That would result in the emission of signals outside of the authorized channel.

(b) Specific authority, upon filing formal application (FCC Form 309) therefor, is required for any of the following changes:

(1) Changes involving an increase or decrease in the power rating of the transmitters.

(2) A replacement of the transmitters as a whole.

(3) Change in the location of the transmitting antenna.

(4) Change in location of main studio, if it is proposed to move the main studio to a different city from that specified in the license.

(5) Change in the power delivered to the antenna.

(6) Change in frequency control and/or modulation system.

(c) Other changes, except as above provided for in this section may be made at any time without the authority of the Commission, provided that the Commission shall be promptly notified thereof and such changes shall be shown in the next application for renewal of license.

TECHNICAL OPERATION

§ 3.761 *Time of operation.* (a) All international broadcast stations will be licensed for unlimited time operation except as may be directed by the Commission from time to time. In an emergency however, when, due to causes beyond the control of the licensee, it becomes impossible to continue operation, the station may cease operation for a period not to exceed 10 days, provided that the Commission and the Engineer in Charge of the radio district in which the station is located shall be notified in writing immediately after the emergency develops.

(b) Persons desiring to enter into a voluntary sharing arrangement of an international channel may file application therefor with the Commission. Copies of the time-sharing agreement should be filed with the application.

§ 3.762 *Station inspection.* The licensee of any international broadcast station shall make the station available for inspection by representatives of the Commission at any reasonable hour.

§ 3.763 *Station license, posting of.* The original of each station license shall be posted in the transmitter room.

§ 3.764 *Operator requirements.* One or more licensed radiotelephone first class operators shall be on duty at the place where the transmitting apparatus of each station is located and in actual charge thereof whenever it is being operated. The original license (or FCC Form 759) of each station operator shall be posted at the place where he is on duty. The licensed operator on duty and in charge of an international broadcast transmitter may, at the discretion of the licensee, be employed for other duties or for the operation of another station or stations in accordance with the class of operator's license which he holds and by the rules and regulations governing such stations. However, such duties shall in nowise interfere with the operation of the broadcast transmitter.

§ 3.765 *Operating power; how determined.* The operating power, and its maintenance, of each international broadcast station shall be in conformity with good engineering practice.

§ 3.766 *Modulation.* The percentage of modulation of the transmissions shall be maintained as high as possible consistent with good quality of transmission and good broadcast practice and in no case less than 50 percent nor more than 100 percent on peaks of frequent recurrence during any selection which normally is transmitted at the highest level of the program under consideration.

§ 3.767 *Frequency tolerance.* The operating frequencies of international broadcast station transmitters shall, at all times, be maintained within the frequency tolerances specified in § 3.752.

§ 3.768 *Antenna structure, marking and lighting.* Where an antenna structure(s) is required to be painted or lighted see § 17.37, *Inspection of tower lights and associated control equipment;* § 17.39, *Cleaning and repainting;* § 17.40 *Time when lights shall be exhibited;* § 17.41, *Spare lamps;* and § 17.42, *Lighting equipment;* of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures).

§ 3.769 *Discontinuance of operation.* The licensee of each station, except stations operating in Alaska, shall notify the Engineer in Charge of the radio district in which the station is located of any of the following changes in the status of such station at least two days before such change.

(a) Temporary discontinuance of operation for a period of ten days or more;

(b) The date of resumption of operation after temporary discontinuance of operation for a period of ten days or more;

(c) Permanent discontinuance of operation.

In all cases of permanent discontinuance of operation the licensee shall, in addition to notifying the Engineer in Charge of the radio district in which the station is located of intention to discontinue operation, immediately forward the station license to the Washington, D. C., office of the Commission for cancellation.

OTHER OPERATION

§ 3.781 *Logs.* The licensee or permittee of each international broadcast station shall maintain program and operating logs in the following manner:

(a) In the program log:

(1) An entry of the time each station identification announcement (call letters and location) is made.

(2) An entry briefly describing each program broadcast, such as "music", "drama", "speech", etc., together with the name or title thereof, language, and the sponsor's name, with the time of the beginning and ending of the complete program.

(3) An entry showing, for each program of network origin, the name of the network originating the program.

(b) In the operating log:

(1) An entry of the time the station begins to supply power to the antenna, and the time it stops.

(2) An entry of the time the program begins and ends.

(3) An entry of each interruption to the carrier wave, its cause, and duration.

(4) An entry of the following each 30 minutes:

(i) Operating constants of last radio stage of the transmitter (total plate current and plate voltage).

(ii) Frequency monitor reading.

(5) A log must be kept of all experimental operation. If the entries required above are not applicable thereto, then the entries shall be made so as to fully describe the operation.

(c) Where an antenna structure(s) is required to be illuminated, see § 17.38, *Recording of tower light inspections in the station record,* of Part 17 of this chapter (Construction, Marking and Lighting of Antenna Structures)

§ 3.782 *Logs; retention of.* Logs of international broadcast stations shall be retained by the licensee or permittee for a period of two years. *Provided, however,* That logs involving communications incident to a disaster or which include communications incident to or involved in an investigation by the Commission and concerning which the licensee or permittee has been notified, shall be retained by the licensee or permittee until he is specifically authorized in writing by the Commission to destroy them: *Provided, further,* That logs incident to or involved in any claim or complaint of which the licensee or permittee has notice shall be retained by the licensee or permittee until such claim or complaint has been fully satisfied or until the same has been barred by statute limiting the time for the filing of suits upon such claims.

§ 3.783 *Logs; by whom kept.* Each log shall be kept by the person or persons competent to do so, having actual knowledge of the facts required, who shall sign the log when starting duty and again when going off duty. The logs shall be made available upon request by an authorized representative of the Commission.

§ 3.784 *Log form.* The log shall be kept in an orderly manner, in suitable form, and in such detail that the data required for the particular class of station concerned are readily available. Key letters or abbreviations may be used if proper meaning or explanation is contained elsewhere in the log.

§ 3.785 *Correction of logs.* No log or portion thereof shall be erased, obliterated, or willfully destroyed within the period of retention provided by the rules. Any necessary correction may be made only by the person originating the entry who shall strike out the erroneous portion, initial the correction made, and indicate the date of correction.

§ 3.786 *Rough logs.* Rough logs may be transcribed into condensed form, but in such case, the original log or memoranda and all portions thereof shall be preserved and made a part of the complete log.

§ 3.787 *Station identification.* (a) A licensee of an international broadcast station shall make station identification announcement (call letters and location), at the beginning and ending of each time of operation and during the operation on the hour.

(b) Station identification, program announcements, and oral continuity shall be made with international significance (language particularly) which is designed for the foreign country or countries for which the service is primarily intended.

(c) Identification announcements during operation need not be made when to make such announcement would interrupt a single consecutive speech, play, religious service, symphony concert, or any type of production. In such cases the identification announcement shall be made at the first interruption of the entertainment continuity and at the conclusion thereof.

§ 3.788 *Service; commercial or sponsored programs.* (a) A licensee of an international broadcast station shall render only an international broadcast service which will reflect the culture of this country and which will promote international goodwill, understanding, and cooperation. Any program solely intended for, and directed to an audience in the continental United States does not meet the requirements for this service.

(b) Such international broadcast service may include commercial or sponsored programs: *Provided,* That:

(1) Commercial program continuities give no more than the name of the sponsor of the program and the name and general character of the commodity, utility or service, or attraction advertised.

(2) In case of advertising a commodity, the commodity is regularly sold or is being promoted for sale on the open market in the foreign country or countries to which the program is directed in accordance with paragraph (c) of this section.

(3) In case of advertising an American utility or service to prospective tourists or visitors to the United States, the advertisement continuity is particularly directed to such persons in the foreign country or countries where they reside and to which the program is directed in accordance with paragraph (c) of this section.

(4) In case of advertising an international attraction (such as a world fair, resort, spa, etc.) to prospective tourists or visitors to the United States, the oral continuity concerning such attraction is consistent with the purpose and intent of this section.

(5) In case of any other type of advertising, such advertising is directed to the foreign country or countries to which the program is directed and is consistent with the purpose and intent of this section.

(c) The geographic areas to be served by international broadcast stations are the foreign standard target areas shown in Figure 1 of § 3.792, or foreign nonstandard target areas as provided in § 3.702 (d), and directive antennas shall be employed to direct the transmission to these specific target areas.

(d) An international broadcast station may transmit the program of a standard

broadcast station or network system: *Provided,* The conditions in paragraph (b) of this section in regard to any commercial continuities are observed and when station identifications are made, only the call letter designation of the international station is given on its assigned frequency: *And provided further,* That in the case of chain broadcasting the program is not carried simultaneously by another international station (except another station owned by the same licensee operated on a frequency in a different group to obtain continuity of signal service), the signals from which are directed to the same area. (See section 3 (p) of the Communications Act of 1934 for the definition of "chain broadcasting.")

§ 3.789 *Sponsored programs; announcement of.* (a) In the case of each program for the broadcasting of which money, services, or other valuable consideration is either directly or indirectly paid or promised to, or charged or received by, any radio broadcast station, the station broadcasting such program shall make, or cause to be made, an appropriate announcement that the program is sponsored, paid for, or furnished, either in whole or in part.

(b) In the case of any political program or any program involving the discussion of public controversial issues for which any films, records, transcriptions, talent, scripts, or other material or services of any kind are furnished, either directly or indirectly, to a station as an inducement to the broadcasting of such program, an announcement shall be made both at the beginning and conclusion of such program on which such material or services are used that such films, records, transcriptions, talent, scripts, or other material or services have been furnished to such station in connection with the broadcasting of such program: *Provided, however,* That only one such announcement need be made in the case of any such program of 5 minutes' duration or less, which announcement may be made either at the beginning or conclusion of the program.

(c) The announcement required by this section shall fully and fairly disclose the true identity of the person or persons by whom or in whose behalf such payment is made or promised, or from whom or in whose behalf such services or other valuable consideration is received, or by whom the material or services referred to in paragraph (b) of this section are furnished. Where an agent or other person contracts or otherwise makes arrangements with a station on behalf of another, and such fact is known to the station, the announcement shall disclose the identity of the person or persons in whose behalf such agent is acting instead of the name of such agent.

(d) In the case of any program, other than a program advertising commercial products or services, which is sponsored, paid for or furnished, either in whole or in part, or for which material or services referred to in paragraph (b) of this section are furnished, by a corporation, committee, association or other unincorporated group, the announcement required by this section, shall disclose the name of such corporation, committee, association, or other unincorporated group. In each such case the station shall require that a list of the chief executive officers or members of the executive committee or of the board of directors of the corporation, committee, association, or other unincorporated group shall be made available for public inspection at one of the international broadcast stations carrying the program

(e) In the case of programs advertising commercial products or services, an announcement stating the sponsor's corporate or trade name or the name of the sponsor's product, shall be deemed sufficient for the purposes of this section and only one such announcement need be made at any time during the course of the program.

§ 3.790 *Rebroadcast.* (a) The licensee of an international broadcast station may, without further authority of the Commission, rebroadcast the program of a United States standard, FM non-commercial educational, or FM broadcast station, provided the Commission is notified of the call letters of each station rebroadcast and the licensee certifies that express authority has been received from the licensee of the station originating the program. The notice and certification of consent must be given within 3 days of any single rebroadcast, but in case of the regular practice of rebroadcasting certain programs of another broadcast station several times during a license period, notice and certification of consent must be given for the ensuing license period with the application for renewal of license, or at the beginning of such rebroadcast practice if begun during a license period.

NOTE: The broadcasting of a program relayed by a remote pickup broadcast station is not considered a rebroadcast.

(b) No licensee of an international broadcast station shall rebroadcast the programs of any other class of United States radio station without written authority having first been obtained from the Commission

(c) A licensee of an international broadcast station may authorize the rebroadcast of its programs by any station outside the limits of the North American continent without permission from the Commission: *Provided,* That the station rebroadcasting the programs cannot be received consistently in the United States.

§ 3.791 *Supplemental report with renewal application.* A supplemental report shall be filed with and made a part of each application for renewal of license and shall include statements of the following:

(a) The number of hours operated on each frequency, listing contract operations and private operations separately.

(b) Outline of reports of reception and interference and conclusions with regard to propagation characteristics of assigned frequencies. (If such information is not available to the applicant in the case of contract operations, a statement to this effect will be considered adequate.)

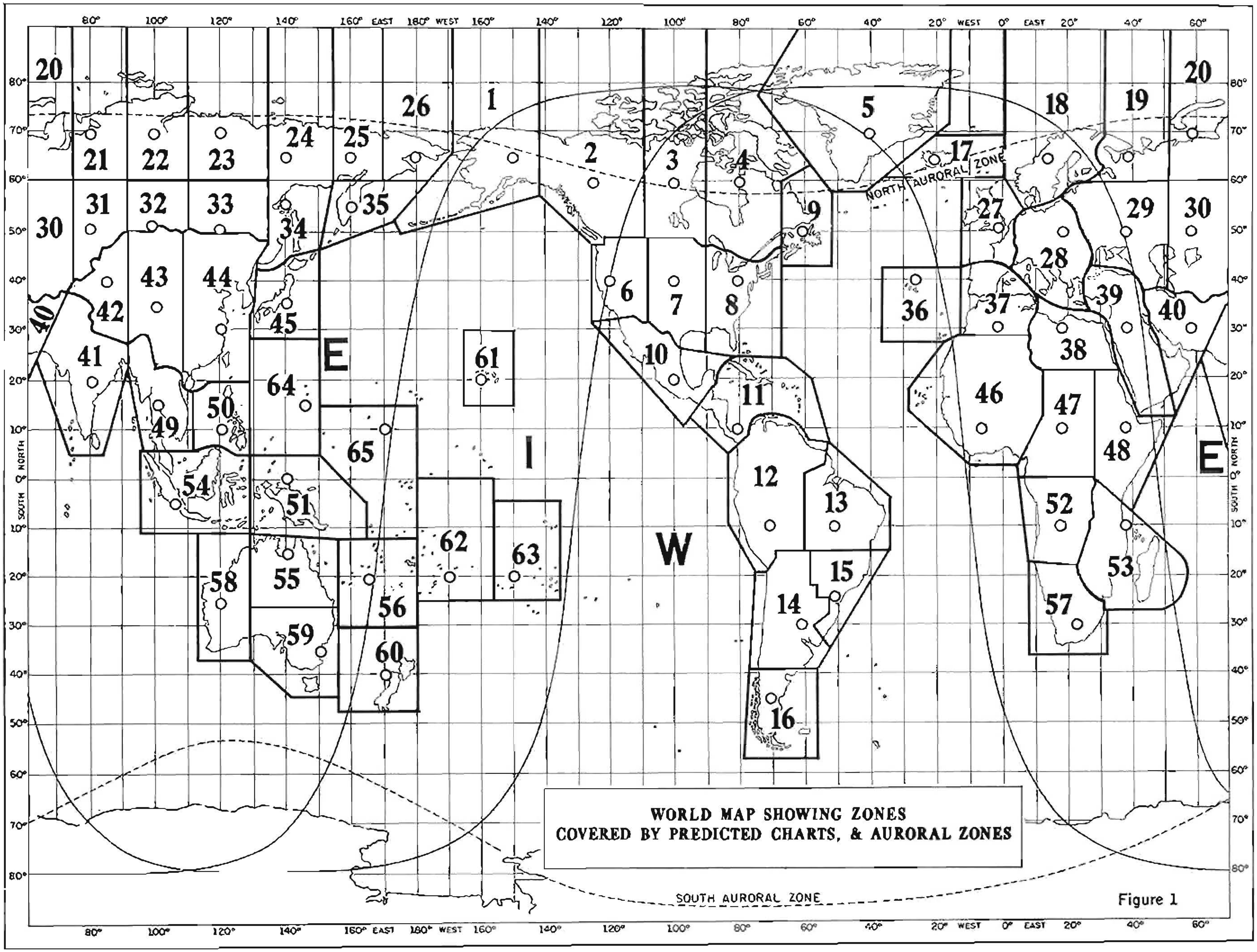


Figure 1

389781 O—56 (Face blank p. 84).

SUBPART G—CONELRAD

SCOPE AND OBJECTIVE

§ 3.901 *Scope of subpart.* This subpart applies to all standard, FM and TV broadcast stations and is for the purpose of providing for operation of certain stations located within the Continental United States during periods of enemy air attack or imminent threat thereof.

§ 3.902 *Object of plan.* The aim of this plan is to minimize the navigational aid that may be obtained from the continued operation of broadcast stations while at the same time providing for transmission of civil defense information to the public. During CONELRAD radio alert periods, when not broadcasting civil defense programs or alert or all-clear notification messages, these stations may, on their own responsibility, broadcast such other programs as they may desire.

DEFINITIONS

§ 3.910 *CONELRAD.* The word CONELRAD is a contraction of the words Control of Electromagnetic Radiation and is the general name given to required procedures under authority of Executive Order 10312 dated December 10, 1951 (3 CFR, 1951 Supp.)

§ 3.911 *Air Defense Control Center (ADCC).* An air operations center from which an air division (defense) commander supervises and coordinates air defense activities within an air defense sector, including dissemination of warnings, identification and security control of air traffic and utilization of available combat forces in support of the national air defense effort.

§ 3.912 *Basic key station.* A station that receives the radio alert by telephone directly from the ADCC. Basic key stations relay radio alerts to other stations by radio and by telephone.

§ 3.913 *Relay key station.* A station that receives the radio alert by telephone or radio broadcast from a basic key station or other relay key station. Relay key stations pass the radio alert on to other stations by radio broadcast or telephone.

§ 3.914 *Skywave key station.* A station designated to disseminate a radio alert by broadcast primarily during the experimental period as an alternate for local key stations which may not be in operation. It will normally be capable of disseminating the alert over a wide area by means of skywave transmission.

§ 3.915 *Radio alert.* The radio alert is the Department of Defense order to operate stations in accordance with CONELRAD requirements for a period of time, as determined by the Air Division Commander or higher military authority.

§ 3.916 *Radio all clear.* The radio all clear is the Department of Defense order to discontinue CONELRAD requirements, as imposed by an outstanding radio alert, with authorization to return to normal operation. It is initiated by the Air Division Commander or higher military authority.

§ 3.917 *Cluster.* A cluster is a group of broadcast stations serving a single area, all operating on the same CONELRAD system frequency. All stations in a cluster will be inter-connected by wire lines and will carry a common program.

§ 3.918 *Sequential control lines.* Sequential control lines are the wire lines inter-connecting the several stations in a cluster. By means of a mechanical, manual or electronic device at a central control point, the stations in a cluster are turned on and off in sequence over the circuits provided by the sequential control lines. In some cases these lines may also carry the cluster program.

§ 3.919 *CONELRAD manual.* The CONELRAD manual is the document containing the detailed description of how broadcast stations will be alerted and operated in the CONELRAD system. The manual will be subject to modification from time to time as experience indicates a need for such changes.

SUPERVISION

§ 3.920 *Zones.* CONELRAD activities under the authority of FCC are under the immediate supervision of three FCC Zone Supervisors whose respective zones are coextensive with the three Air Defense Force Areas (Each broadcast

station will be furnished the name and address of the Zone Supervisor of its Zone.)

§ 3.921 *Divisions.* Each zone is divided into several divisions corresponding to the USAF Air Divisions. An FCC Coordinating Engineer is assigned to each Air Division and has responsibility under the Zone Supervisor for all CONELRAD activities under the authority of FCC in his division.

RADIO ALERTS

§ 3.930 *Notification of a radio alert.* (a) All notifications of radio alerts and all clears shall be issued by the Air Defense Control Center(s) (ADCC) under the authority of the Air Division Commander or his duly authorized representative, to all basic key stations. All relay key stations will, in turn be notified by the basic key stations or other relay key stations. The remaining stations will then be notified by basic key stations or relay key stations. These notifications will be accomplished either by telephone messages or by radio broadcast.

(b) During the experimental period many of the regular key stations may be off the air. All standard, FM and TV stations will be supplied with the list of skywave key stations at least one of which must be monitored during any period of operation when the regularly used key station is not on the air.

§ 3.931 *Reception of a radio alert* All standard, FM and TV broadcast stations, including basic key and relay key stations, must install the necessary equipment to receive notifications of radio alerts and radio all clears by means of reception of radio broadcast messages, and must maintain this equipment in a state of readiness for reception, including arrangements for human listening watch or automatic alarm devices or both. Such equipment should have its termination at the transmitter control location.

§ 3.932 *Operation during a radio alert.* (a) Immediately upon receipt of a radio alert, either by radio broadcast or telephone, all standard, FM and TV broadcast stations, including such stations operating under equipment or program test authority, will follow the prescribed procedure and transmit an approved sign-off message as set forth in the CONELRAD Manual For Broadcast Stations, then remove the transmitter from the air.

(b) Those stations which are authorized to participate in the operating system will immediately take necessary steps and begin operations on assigned frequencies in accordance with the terms of their CONELRAD authorizations and current operating instructions. All other broadcast stations will observe radio silence until the radio all clear.

(c) No identification may be broadcast between the time the radio alert is received and the time the radio all clear is announced, unless expressly authorized by the FCC. The transmission of any information which would serve to identify the geographical location of the station is prohibited.

(d) A station operating in the CONELRAD system may transmit in accordance with its CONELRAD authorization during a radio alert beyond its normal hours and nothing in its regular license or other instrument of authorization shall prevent such operation in the CONELRAD system.

(e) Prior to commencing routine operation or originating any emissions under program test, equipment test, experimental or other authorization or for any other purpose, licensees or permittees shall first ascertain whether a state of radio alert exists and if so shall refrain from operation or operate in the CONELRAD system whichever is appropriate.

RADIO ALL CLEAR

§ 3.940 *Notification of a radio all clear.* The radio all clear notification will be transmitted through the same channels as the radio alert. Stations operating in the CONELRAD system will transmit the radio all clear message on the CONELRAD system frequency. Key stations will, as soon as possible thereafter, follow the prescribed procedure and broadcast the radio all clear message on their regular operating frequency. All stations, including FM and TV stations, upon resuming regular operation will follow the prescribed procedure and immediately broadcast the radio all clear message

SYSTEM OPERATION

§ 3.950 *Procedure.* Each broadcast station permitted to operate during a radio alert must observe operating procedures for the mode of operation to which it is assigned, as set forth in detail in the CONELRAD Manual For Broadcast Stations.

§ 3.951 *Participation.* (a) Any standard broadcast station desiring to participate in a CONELRAD operating system should contact the Zone Supervisor, indicate the station's willingness to make such technical modification of the station equipment as might be necessary to permit operation on a system frequency and with such power limitations as might be necessary. The Commission will then issue a CONELRAD authorization to the station specifying the frequency to be used by the station. Stations which have indicated a willingness to participate in CONELRAD on a voluntary basis prior to the effective date of this rule need not take any further steps.

(b) At such time as technical consideration may warrant the inclusion of FM and TV broadcast stations within the operating CONELRAD system, appropriate announcement will be made by the Commission and application for participation made as above set forth.

(c) Any station participating in CONELRAD system operations may withdraw from the system by giving thirty days' notice to the FCC Zone Supervisor in writing and by submitting its CONELRAD authorization for cancellation.

(d) Broadcast stations are specifically exempt from complying with § 3.57 while operating under their CONELRAD authorization.

TESTS

§ 3.960 *Alerting system.* Tests of the alerting system will be conducted periodically.

§ 3.961 *Sequential control lines.* Sequential control and program lines must be tested at frequent intervals and results reported in the prescribed manner to the FCC Zone Supervisor.

§ 3.962 *Entire system.* Tests of the entire system will be conducted from time to time. During such tests, all stations which are authorized to operate in the CONELRAD system will operate in accordance with terms of the CONELRAD authorization. Other stations will not be required to go off the air during such tests but will be subject to any interference which might result from the CONELRAD operation. Such tests will be scheduled to take place during the experimental period. Industry representatives will be consulted prior to conducting CONELRAD system tests to obtain views relative to the action and to coordinate the activity.

§ 3.963 *Equipment.* The licensee of each station authorized to participate in CONELRAD system operation shall make such tests of his equipment as may be necessary to assure it is ready for instant use.

§ 3.964 *Log entries.* Appropriate entries of all tests shall be made in the station log.

DRILLS

§ 3.970 *Notification of a drill.* At some time it may be necessary to conduct an Air Defense Drill under conditions of simulated attack. Industry representatives will be consulted prior to conducting CONELRAD drills to obtain views relative to the action and to coordinate the activity. Such drills will only be called when the Department of Defense, the Office of Defense Mobilization, and the Federal Communications Commission concurrently agree that the drill is necessary. All stations will be notified well in advance of such a drill.

§ 3.971 *Operation during a drill.* During a drill, all standard, FM and TV broadcast stations will take the same steps as such stations would be required to take in the event of an actual radio alert under this part of the rules and current operating instructions as set forth in the CONELRAD Manual For Broadcast Stations, except for special drill messages.

[F. R. Doc. 55-9821; Filed, Dec. 8, 1955; 8:45 a. m.]

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NOTICE

This form should be completed and forwarded to the Federal Communications Commission, Washington, D. C., and upon receipt of same, any amendment to this Part of the Rules and Regulations adopted after the date of this publication will be mailed to the addressee indicated, except as noted below.[1]

Part No. 3—Radio Broadcast Services

January, 1956, Edition.

Name

Address

City

State

All new rules and amendments to the Rules and Regulations adopted by the Federal Communications Commission are also printed in the Federal Register and are available in this form for reference or use by interested parties.

[1] Purchasers of this part will be advised where a particular amendment may be obtained, including the cost, if not available from the F. C. C.

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