

obtained under assumed free-space propagation conditions.

(v) In the band 2496-2500 MHz, the power flux-density at the Earth's surface produced by emissions from non-geostationary space stations for all conditions and all methods of modulation shall not exceed the following values (these values are obtained under assumed free-space propagation conditions):

(1) -144 dB (W/m²) in 4 kHz for all angles of arrival between 0 and 5 degrees above the horizontal plane; -144 dB (W/m²) + 0.65(δ - 5) in 4 kHz for all angles of arrival between 5 and 25 degrees above the horizontal plane; and -131 dB (W/m²) in 4 kHz and for all angles of arrival between 25 and 90 degrees above the horizontal plane.

(2) -126 dB (W/m²) in 1 MHz for all angles of arrival between 0 and 5 degrees above the horizontal plane; -126 dB (W/m²) + 0.65(δ - 5) in 1 MHz for all angles of arrival between 5 and 25 degrees above the horizontal plane; and

-113 dB (W/m²) in 1 MHz and for all angles of arrival between 25 and 90 degrees above the horizontal plane.

(w) The power flux density at the Earth's surface produced by emissions from a 17/24 GHz BSS space station operating in the 17.3-17.7 GHz band for all conditions, including clear sky, and for all methods of modulation shall not ex-

ceed the regional power flux density levels defined below.

(1) In the region of the contiguous United States, located south of 38° North Latitude and east of 100 West Longitude: -115 dBW/m²/MHz.

(2) In the region of the contiguous United States, located north of 38° North Latitude and east of 100° West Longitude: -118 dBW/m²/MHz.

(3) In the region of the contiguous United States, located west of 100 West Longitude: -121 dBW/m²/MHz.

(4) For all regions outside of the contiguous United States including Alaska and Hawaii: -115 dBW/m²/MHz.

[48 FR 40255, Sept. 6, 1983]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §25.208, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at www.fdsys.gov.

§25.209 Antenna performance standards.

(a) The gain of any antenna to be employed in transmission from an earth station in the fixed-satellite service shall lie below the envelope defined below:

(1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location, for earth stations not operating in the Ka-band or conventional Ku-band:

29-25log ₁₀ θ	dBi	For	1.5° ≤ θ ≤ 7°
8	dBi	For	7° < θ ≤ 9.2°
32-25log ₁₀ θ	dBi	For	9.2° < θ ≤ 48°
- 10	dBi	For	48° < θ ≤ 180°

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above for θ between 1.5 and 7.0 degrees. For θ greater than 7.0 degrees, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual

sidelobe exceeds the gain envelope given above by more than 3 dB.

(2) In the plane of the geostationary satellite orbit as it appears at the particular earth station location, for earth stations operating in the Ka-band or conventional Ku-band:

29-25log ₁₀ θ	dBi	For	1.5° ≤ θ ≤ 7°
8	dBi	For	7° < θ ≤ 9.2°
32-25log ₁₀ θ	dBi	For	9.2° < θ ≤ 48°
- 10	dBi	For	48° < θ ≤ 85°
0	dBi	For	85° < θ ≤ 180°

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(3) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths, for all earth stations not

operating in the Ka-band or conventional Ku-band:

Outside the main beam, the gain of the antenna shall lie below the envelope defined by:

32–25log ₁₀ θ	dBi	For	3° < θ ≤ 48°
– 10	dBi	For	48° < θ ≤ 180°

where θ and dBi are defined above. For the purposes of this section, the envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given above by more than 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(4) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths, for all earth stations operating in the Ka-band or conventional Ku-band:

Outside the main beam, the gain of the antenna shall lie below the envelope defined by:

32–25log ₁₀ θ.	dBi	For	3° < θ ≤ 48°
– 10	dBi	For	48° < θ ≤ 85°
0	dBi	For	85° < θ ≤ 180°

where θ and dBi are defined above. For the purposes of this section, the envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given above by more than 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(5) Elliptical earth station antennas may be operated only when the major axis of the antenna is aligned with the plane of the geostationary satellite orbit as it appears at the particular earth station location.

(b) The off-axis cross-polarization gain of any antenna to be employed in transmission from an earth station to a space station in the domestic fixed-satellite service shall be defined as follows:

(1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

19–25log ₁₀ θ.	dBi	For	1.8° < θ ≤ 7°
– 2	dBi	For	7° < θ ≤ 9.2°

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator.

(2) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths:

19–25log ₁₀ θ.	dBi	For	3° < θ ≤ 7°
– 2	dBi	For	7° < θ ≤ 9.2°

where θ and dBi are defined above.

(c)(1) Earth station antennas licensed for reception of radio transmissions from a space station in the fixed-satellite service are protected from radio interference caused by other space stations only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the referenced patterns defined in paragraphs (a) and

(b) of this section, and protected from radio interference caused by terrestrial radio transmitters identified by the frequency coordination process only to the degree to which harmful interference would not be expected to be caused to an earth station conforming to the reference pattern defined in paragraphs (a)(3) and (a)(4) of this section.

(2) 17/24 GHz BSS telemetry earth stations are protected from harmful interference caused by other space stations to the extent set forth in paragraph (c)(1) of this section. Receive-only earth stations in the 17/24 GHz BSS are protected from harmful interference caused by other space stations to the extent set forth in § 25.224 of this part.

(d) The patterns specified in paragraphs (a) and (b) of this section shall apply to all new earth station antennas initially authorized after February 15, 1985 and shall apply to all earth station antennas after March 11, 1994.

(e) The operations of any earth station with an antenna not conforming to the standards of paragraphs (a) and (b) of this section shall impose no limitations upon the operation, location or design of any terrestrial station, any other earth station, or any space station beyond those limitations that would be expected to be imposed by an earth station employing an antenna conforming to the reference patterns defined in paragraphs (a) and (b) of this section.

(f) An earth station with an antenna not conforming to the standards of paragraphs (a) and (b) of this section will be authorized only if the applicant meets its burden of demonstrating that its antenna will not cause unacceptable interference. For ESVs in the C-band, this demonstration must comply with the procedures set forth in § 25.221. For ESVs in the Ku-band, this demonstration must comply with the procedures set forth in § 25.222. For VMES, this demonstration shall comply with the procedures set forth in § 25.226. For feeder-link earth stations in the 17/24 GHz BSS, this demonstration must comply with the procedures set forth in § 25.223. For other FSS earth stations, this demonstration must comply with the procedures set forth in §§ 25.218 or 25.220. In any case, the Commission will impose appropriate terms and conditions in its authorization of such facilities and operations.

(g) The antenna performance standards of small antennas operating in the 12/14 GHz band with diameters as small as 1.2 meters starts at 1.25° instead of 1° as stipulated in paragraph (a) of this section.

(h)(1) The gain of any antennas to be employed in transmission from a gateway earth station antenna operating in the frequency bands 10.7–11.7 GHz, 12.75–13.15 GHz, 13.2125–13.25 GHz, 13.8–14.0 GHz, and 14.4–14.5 GHz and communicating with NGSO FSS satellites shall lie below the envelope defined as follows:

$$29 - 25 \log_{10} (\theta) \text{ dBi} - 10 \text{ dBi}$$

$$1^{\text{B}} \leq \theta \leq 36^{\text{B}}$$

$$36^{\text{B}} \leq \theta \leq 180^{\text{B}}$$

Where: θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator.

(2) For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined in paragraph (h)(1) of this section.

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§ 25.210 Technical requirements for space stations in the Fixed-Satellite Service.

(a) All space stations in the Fixed-Satellite Service used for domestic service in the 3700–4200 MHz and 5925–6425 MHz frequency bands shall:

(1) Use orthogonal linear polarization with one of the planes defined by the equatorial plane;

(2) Be designed so that the polarization sense of uplink transmissions is opposite to that of downlink transmissions on the same transponder; and

(3) Shall be capable of switching polarization sense upon ground command.

(b) All space stations in the Fixed-Satellite Service in the 20/30 GHz band shall use either orthogonal linear or orthogonal circular polarization. Those space stations utilizing orthogonal linear polarization shall also comply with paragraph (a) of this section.

(c) All space stations in the Fixed-Satellite Service shall have a minimum capability to change transponder saturation flux densities by ground command in 4 dB steps over a range of 12 dB.

(d) All space stations in the Fixed-Satellite Service in the 20/30 GHz band shall employ state-of-the-art full frequency reuse either through the use of