

**§ 95.635 Unwanted radiation.**

(a) In addition to the procedures in part 2, the following requirements apply to each transmitter both with and without the connection of all attachments acceptable for use with the

transmitter, such as an external speaker, microphone, power cord, antenna, etc.

(b) The power of each unwanted emission shall be less than TP as specified in the applicable paragraphs listed in the following table:

Transmitter	Emission type	Applicable paragraphs (b)
GMRS .....	A1D, A3E, F1D, G1D, F3E, G3E with filtering .....	(1), (3), (7).
	A1D, A3E, F1D, G1D, F3E, G3E without filtering .....	(5), (6), (7).
	H1D, J1D, R1D, H3E, J3E, R3E .....	(2), (4), (7).
FRS .....	F3E with filtering .....	(1), (3), (7).
R/C:		
27 MHz .....	As specified in § 95.631(b) .....	(1), (3), (7).
72–76 MHz .....	As specified in § 95.631(b) .....	(1), (3), (7), (10), (11), (12).
CB .....	A1D, A3E .....	(1), (3), (8), (9).
	H1D, J1D, R1D, H3E, J3E, R3E .....	(2), (4), (8), (9).
	A1D, A3E type accepted before September 10, 1976 .....	(1), (3), (7).
	H1D, J1D, R1D, H3E, J3E, R3E type accepted before September 10, 1986.	(2), (4), (7).
LPRS .....	As specified in paragraph (c).	
MedRadio .....	As specified in paragraph (d).	
DSRCS–OBU .....	As specified in paragraph (f) of this section.	

(1) At least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

(2) At least 25 dB on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 150% of the authorized bandwidth.

(3) At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.

(4) At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 150% up to and including 250% of the authorized bandwidth.

(5) At least  $83 \log_{10} (f_d/5)$  dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz), of more than 5 kHz up to and including 10 kHz.

(6) At least  $116 \log_{10} (f_d/6.1)$  dB, or if less,  $50 + 10 \log_{10} (T)$  dB, on any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz), of more than 10 kHz up to and including 250% of the authorized bandwidth.

(7) At least  $43 + 10 \log_{10} (T)$  dB on any frequency removed from the center of

the authorized bandwidth by more than 250%.

(8) At least  $53 + 10 \log_{10} (T)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

(9) At least 60 dB on any frequency twice or greater than twice the fundamental frequency.

(10) At least 45 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 125% of the authorized bandwidth.

(11) At least 55 dB on any frequency removed from the center of the authorized bandwidth by more than 125% up to and including 250% of the authorized bandwidth.

(12) At least  $56 + 10 \log_{10} (T)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

(c) For transmitters designed to operate in the LPRS, emissions shall be attenuated in accordance with the following:

(1) Emissions for LPRS transmitters operating on standard band channels (25 kHz) shall be attenuated below the unmodulated carrier in accordance with the following:

(i) Emissions 12.5 kHz to 22.5 kHz away from the channel center frequency: at least 30 dB; and

(ii) Emissions more than 22.5 kHz away from the channel center frequency: at least  $43 + 10\log(\text{carrier power in watts})$  dB.

(2) Emissions for LPRS transmitters operating on extra band channels (50 kHz) shall be attenuated below the unmodulated carrier in accordance with the following:

(i) Emissions 25 kHz to 35 kHz from the channel center frequency: at least 30 dB; and

(ii) Emissions more than 35 kHz away from the channel center frequency: at least  $43 + 10\log(\text{carrier power in watts})$  dB.

(3) Emissions for LPRS transmitters operating on narrowband channels (5 kHz) shall be attenuated below the power (P) of the highest emission, measured in peak values, contained within the authorized bandwidth (4 kHz) in accordance with the following:

(i) On any frequency within the authorized bandwidth: Zero dB;

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 2 kHz up to and including 3.75 kHz: The lesser of  $30 + 20(f_d - 2)$  dB, or  $55 + 10 \log(P)$ , or 65 dB; and

(iii) On any frequency beyond 3.75 kHz removed from the center of the authorized bandwidth: At least  $55 + 10 \log(P)$  dB.

(4) Emissions from AMTS transmitters using a single 250 kHz channel shall be attenuated below the unmodulated carrier in accordance with the following:

(i) Emissions from 125 kHz to 135 kHz away from the channel center frequency; at least 30 dB; and

(ii) Emissions more than 135 kHz away from the channel center frequency; at least  $43 + 10\log(\text{carrier power in watts})$  dB.

(d) For transmitters designed to operate in the MedRadio service, emissions shall be attenuated in accordance with the following: (paragraphs (d)(1) through (d)(5) pertain to MedRadio transmitters operating in the 402–405 MHz band; paragraphs (d)(6) through (d)(10) pertain to MedRadio transmitters operating in the 401–402 MHz or 405–406 MHz bands).

(1) Emissions from a MedRadio transmitter more than 250 kHz outside of

the 402–405 MHz band shall be attenuated to a level no greater than the following field strength limits:

Frequency (MHz)	Field strength ( $\mu\text{V/m}$ )	Measurement distance (m)
30–88 .....	100	3
88–216 .....	150	3
216–960 .....	200	3
960 and above .....	500	3

Note—At band edges, the tighter limit applies.

(2) The emission limits shown in the table of paragraph (d)(1) are based on measurements employing a CISPR quasi-peak detector except that above 1 GHz, the limit is based on measurements employing an average detector. Measurements above 1 GHz shall be performed using a minimum resolution bandwidth of 1 MHz. See also §95.605.

(3) The emissions from a MedRadio transmitter must be measured to at least the tenth harmonic of the highest fundamental frequency designed to be emitted by the transmitter.

(4) Emissions within the 402–405 MHz band more than 150 kHz away from the center frequency of the spectrum the transmission is intended to occupy will be attenuated below the transmitter output power by at least 20 dB. Compliance with this limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(5) Emissions 250 kHz or less that are above or below the 402–405 MHz band will be attenuated below the maximum permitted output power by at least 20 dB. Compliance with this limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(6) Emissions from a MedRadio transmitter operating in the 401–402 MHz or 405–406 MHz bands that are more than 100 kHz outside of either the 401–402 MHz or 405–406 MHz bands, and all emissions from such transmitter in the band 406.000–406.100 MHz shall be attenuated to a level no greater than the following field strength limits:

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Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30–88 .....	100	3
88–216 .....	150	3
216–960 .....	200	3
960 and above .....	500	3

Note—At band edges, the tighter limit applies.

(7) The emission limits shown in paragraph (d)(6) are based on measurements employing a CISPR quasi-peak detector except that above 1 GHz, the limit is based on measurements employing an average detector. Measurements above 1 GHz shall be performed using a minimum resolution bandwidth of 1 MHz. See also § 95.605.

(8) The emissions from a MedRadio transmitter operating in the MedRadio bands (between 401–402 MHz or 405–406 MHz) must be measured to at least the tenth harmonic of the highest fundamental frequency designed to be emitted by the transmitter.

(9) Emissions between 401–401.85 MHz or 405–406 MHz within the MedRadio bands that are more than 50 kHz away from the center frequency of the spectrum the transmission is intended to occupy (or more than 75 kHz away from the center frequency of MedRadio transmitters operating between 401.85–402 MHz) shall be attenuated below the transmitter output power by at least 20 dB. Compliance with this limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(10) Emissions 100 kHz or less below 401 MHz or above 406 MHz shall be attenuated below the maximum permitted output power by at least 20 dB. Compliance with this limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(e) For transmitters designed to operate in the MURS, transmitters shall comply with the following:

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Frequency	Mask with audio low pass filter	Mask without audio low pass filter
151.820 MHz, 151.880 MHz and 151.940 MHz .....	(1)	(1)
154.570 MHz and 154.600 MHz	(2)	(3)

(1) *Emission Mask 1*—For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(i) On any frequency from the center of the authorized bandwidth  $f_c$  to 5.625 kHz removed from  $f_c$ : Zero dB.

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz: at least  $7.27(f_d - 2.88)$  dB.

(iii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: at least  $50 + 10 \log(P)$  dB or 70 dB, whichever is the lesser attenuation.

(2) *Emission Mask 2*—For transmitters designed to operate with a 25 kHz channel bandwidth that are equipped with an audio low-pass filter, the power of any emission must be below the unmodulated carrier power (P) as follows:

(i) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: at least 25 dB.

(ii) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: at least 35 dB.

(iii) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: at least  $43 + 10 \log(P)$  dB.

(3) *Emission Mask 3*—For transmitters designed to operate with a 25 kHz channel bandwidth that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz)

of more than 5 kHz, but not more than 10 kHz; at least  $83 \log(f_d/5)$  dB.

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: at least  $29 \log(f_d^2/11)$  dB or 50 dB, whichever is the lesser attenuation.

(iii) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: at least  $43 + 10 \log(P)$  dB.

(f) DSRCS-OBUs are governed under subpart L of this part.

[53 FR 36789, Sept. 22, 1988, as amended at 56 FR 15837, Apr. 18, 1991. Redesignated and amended at 61 FR 28769, 28770, June 6, 1996, and further redesignated and amended at 61 FR 46567, 46568, Sept. 4, 1996; 63 FR 36610, July 7, 1998; 64 FR 69931, Dec. 15, 1999; 65 FR 60878, Oct. 13, 2000; 67 FR 63289, Oct. 11, 2002; 69 FR 46446, Aug. 3, 2004; 74 FR 22707, May 14, 2009]

#### § 95.637 Modulation standards.

(a) A GMRS transmitter that transmits emission types F1D, G1D, or G3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A GMRS transmitter that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5 kHz, and the audio frequency response must not exceed 3.125 kHz.

(b) Each GMRS transmitter, except a mobile station transmitter with a power output of 2.5 W or less, must automatically prevent a greater than normal audio level from causing over-modulation. The transmitter also must include audio frequency low pass filtering, unless it complies with the applicable paragraphs of § 95.631 (without filtering.) The filter must be between the modulation limiter and the modulated stage of the transmitter. At any frequency ( $f$  in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least  $60 \log_{10}(f/3)$  dB greater than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB greater than the attenuation at 1 kHz.

(c) When emission type A3E is transmitted, the modulation must be greater than 85% but must not exceed 100%. Simultaneous amplitude modulation and frequency or phase modulation of a transmitter are not permitted.

(d) When emission type A3E is transmitted by a CB transmitter having a TP of greater than 2.5 W, the CB transmitter must automatically prevent the modulation from exceeding 100%.

(e) Each CB transmitter that transmits emission type H3E, J3E or R3E must be capable of transmitting the upper sideband. The capability of also transmitting the lower sideband is permitted.

(f) DSRCS-OBUs are governed under subpart L of this part.

[53 FR 36789, Sept. 22, 1988. Redesignated and amended at 61 FR 28769, 28770, June 6, 1996, and further redesignated at 61 FR 46567, Sept. 4, 1996; 69 FR 46446, Aug. 3, 2004]

#### § 95.639 Maximum transmitter power.

(a) No GMRS transmitter, under any condition of modulation, shall exceed:

(1) 50 W *Carrier power* (average TP during one unmodulated RF cycle) when transmitting emission type A1D, F1D, G1D, A3E, F3E or G3E.

(2) 50 W peak envelope TP when transmitting emission type H1D, J1D, R1D, H3E, J3E or R3E.

(b) No R/C transmitter, under any condition of modulation, shall exceed a carrier power or peak envelope TP (single-sideband only) of:

(1) 4 W in the 26–27 MHz frequency band, except on channel frequency 27.255 MHz;

(2) 25 W on channel frequency 27.255 MHz;

(3) 0.75 W in the 72–76 MHz frequency band.

(c) No CB transmitter, under any condition of modulation, shall exceed:

(1) 4 W *Carrier power* when transmitting emission type A1D or A3E;

(2) 12 W peak envelope TP when transmitting emission type H1D, J1D, R1D, H3E, J3E or R3E. Each CB transmitter which transmits emission type H3E, J3E or R3E must automatically prevent the TP from exceeding 12 W peak envelope TP or the manufacturer's rated peak envelope TP, whichever is less.