

**§ 101.111 Emission limitations.**

(a) The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) When using transmissions other than those employing digital modulation techniques:

(i) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 decibels;

(ii) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 decibels;

(iii) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43+10 \text{ Log}_{10}$  (mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

(2) When using transmissions employing digital modulation techniques (see § 101.141(b)) in situations not covered in this section:

(i) For operating frequencies below 15 GHz, in any 4 KHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 50 decibels:

$$A = 35 + 0.8(P - 50) + 10 \text{ Log}_{10} B.$$

(Attenuation greater than 80 decibels is not required.)

where:

A = Attenuation (in decibels) below the mean output power level.

P = Percent removed from the carrier frequency.

B = Authorized bandwidth in MHz. MVDDS operations in the 12.2-12.7 GHz band shall use 24 megahertz for the value of B in the emission mask equation set forth in this section.

(ii) For operating frequencies above 15 GHz, in any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 11 decibels:

$$A = 11 + 0.4(P - 50) + 10 \text{ Log}_{10} B.$$

(Attenuation greater than 56 decibels is not required.)

(iii) In any 4 KHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43+10 \text{ Log}_{10}$  (mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

(iv) The emission mask for 24 GHz Service used the equation in paragraph (a)(2)(ii) of this section applies only to the edge of each channel, but not to subchannels established by licensees. The value of P in the equation is for the percentage removed from the carrier frequency and assumes that the carrier frequency is the center of the actual bandwidth used. The emission mask can be satisfied by locating a carrier of the subchannel sufficiently far from the channel edges so that the emission levels of the mask are satisfied. The 24 GHz emission mask shall use a value B (bandwidth) of 40 MHz, for all cases even in the case where a narrower subchannel is used (for instance the actual bandwidth is 10 MHz) and the mean output power used in the calculation is the sum of the output power of a fully populated channel.

(3) For Digital Termination System channels used in the Digital Electronic Message Service (DEMS) operating in the 10,550-10,680 MHz band:

(i) In any 4 KHz band, the center frequency of which is removed from the edge of the DEMS channel by up to and including 1.125 times the DEMS subchannel bandwidth: As specified by the following equation may in no event be less than  $50+10 \text{ log}_{10} N$  decibels:

$$A = 50 + 0.0333(F - 0.5B) + 10 \text{ log}_{10} N$$

decibels

Where:

A = Attenuation (in decibels) below means output power level contained within the DEMS channel for a given polarization.

B = Bandwidth of DEMS channel (in KHz).

F = Absolute value of the difference between the center frequency of the 4 KHz band measured and the center frequency of the DEMS channel (in KHz).

N = Number of active subchannels of the given polarization within the DEMS channel.

(ii) In any 4 KHz band within the authorized DEMS band the center frequency of which is removed from the center frequency of the DEMS channel by more than the sum of 50% of the DEMS channel bandwidth plus 1.125 times the subchannel bandwidth: As specified by the following equation but in no event less than 80 decibels:

$$A = 80 + 10 \log_{10} N \text{ decibels}$$

(iii) In any 4 KHz band the center frequency of which is outside the authorized DEMS band: At least  $43 + 10 \log_{10}$  (mean output power in watts) decibels.

(4) For DEMS channels in the 17,700-19,700 MHz band:

(i) In any 4 KHz band, the center frequency of which is removed from the frequency of the center of the DEMS channel by more than 50 percent of the DEMS channel bandwidth up to and including 50 percent plus 500 KHz: As specified by the following equation but in no event be less than  $50 + 10 \log_{10} N$  decibels:

$$A = 50 + 0.06(F - 0.5B) + 10 \log_{10} N \text{ decibels}$$

Where:

A = Attenuation (in decibels) below means output power level contained within the DEMS channel for a given polarization.

B = Bandwidth of DEMS channel (in KHz).

F = Absolute value of the difference between the center frequency of the 4 KHz band measured and the center frequency of the DEMS channel (in KHz).

N = Number of active subchannels of the given polarization within the DEMS channel.

(ii) In any 4 KHz band within the authorized DEMS band, the center frequency of which is removed from the center frequency of the DEMS channel by more than the sum of 50 percent of the channel bandwidth plus 500 KHz: As specified by the following equation but in no event less than 80 decibels:

$$A = 80 + 10 \log_{10} N \text{ decibels}$$

(iii) In any 4 KHz band the center frequency of which is outside the authorized Digital Message Service band: At least  $43 + 10 \log_{10}$  (mean output power in watts) decibels.

(5) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a 12.5 KHz bandwidth, the power of any emission must be at-

tenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

(i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 2.5 KHz up to and including 6.25 KHz: At least  $53 \log_{10} (fd/2.5)$  decibels;

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 6.25 KHz up to and including 9.5 KHz: At least  $103 \log_{10} (fd/3.9)$  decibels;

(iii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 9.5 KHz up to and including 15 KHz: At least  $157 \log_{10} (fd/5.3)$  decibels; and

(iv) On any frequency removed from the center of the authorized bandwidth by a displacement frequency greater than 15 KHz: At least 50 plus  $10 \log_{10}(P)$  or 70 decibels, whichever is the lesser attenuation.

(6) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a bandwidth greater than 12.5 KHz, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

(i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 5 KHz up to and including 10 KHz: At least  $83 \log_{10} (fd/5)$  decibels;

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 10 KHz up to and including 250 percent of the authorized bandwidth: At least  $116 \log_{10} (fd/6.1)$  decibels or 50 plus  $10 \log_{10} (P)$  or 70 decibels, whichever is the lesser attenuation; and

(iii) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 plus  $10 \log_{10}$  (output power in watts) decibels or 80 decibels, whichever is the lesser attenuation.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraph (a) of this section.

(c) The emission of an unmodulated carrier is prohibited except for test purposes as required for proper station and system maintenance.

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**§ 101.113 Transmitter power limitations.**

(a) On any authorized frequency, the average power delivered to an antenna in this service must be the minimum amount of power necessary to carry out the communications desired. Application of this principle includes, but is not to be limited to, requiring a licensee who replaces one or more of its antennas with larger antennas to reduce its antenna input power by an amount appropriate to compensate for the increased primary lobe gain of the replacement antenna(s). In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed the values specified below. In cases of harmful interference, the Commission may, after notice and opportunity for hearing, order a change in the effective radiated power of this station. Further, the output power of a transmitter on any authorized frequency in this service may not exceed the following:

Frequency band (MHz)	Maximum allowable EIRP <sup>1 2</sup>	
	Fixed (DbW)	Mobile (dBW)
928.0–929.0(2) .....	+17	
932.0–932.5(2) .....	+17	
932.5–935.0 .....	+40	
941.0–941.5(2) .....	+30	+14
941.5–944.0 .....	+40	
952.0–960.0(2) .....	+40	+14
1,850–1,990 .....	+45	
2,110–2,150 .....	+45	
2,150–2,180 <sup>3</sup> .....	+45	
2,180–2,200 .....	+45	
2,450–2,500 .....	+45	
2,500–2,686 .....		
2,686–2,690 .....	+45	
3,700–4,200 .....	+55	
5,925–6,425 .....	+55	
6,425–6,525 .....		+35
6,525–6,875 .....	+55	
10,550–10,680 <sup>5</sup> .....	+55	
10,700–11,700 .....	+55	

Frequency band (MHz)	Maximum allowable EIRP <sup>1 2</sup>	
	Fixed (DbW)	Mobile (dBW)
12,200–12,700 <sup>11</sup> .....	+50	
12,700–13,250 <sup>4</sup> .....	+50	
14,200–14,400 .....	+45	
17,700–18,600 .....	+55	
18,600–18,800 <sup>6</sup> .....	+35	
18,800–19,700 .....	<sup>5</sup> +55	
21,200–23,600 <sup>10</sup> .....	+55	
24,250–25,250 .....	<sup>5</sup> +55	
27,500–28,350 <sup>9</sup> .....	+55	
29,100–29,250 .....	(7)	
31,000 to 31,075 <sup>8, 9</sup> .....	30 dBW/MHz	30 dBW/MHz
31,075 to 31,225 <sup>8, 9</sup> .....	30 dBW/MHz	30 dBW/MHz
31,225 to 31,300 <sup>8, 9</sup> .....	30 dBW/MHz	30 dBW/MHz
38,600–40,000 .....	+55	

<sup>1</sup> Per polarization.  
<sup>2</sup> For multiple address operations, see § 101.147. Remote alarm units that are part of a multiple address central station projection system are authorized a maximum of 2 watts.  
<sup>3</sup> When an omnidirectional antenna is authorized in the 2150–2160 MHz band, the maximum power shall be 60 dBm.  
<sup>4</sup> Also see § 101.145.  
<sup>5</sup> The output power of a DEMS System nodal transmitter shall not exceed 0.5 watts per 250 kHz. The output power of a DEMS System user transmitter shall not exceed 0.04 watts per 250 kHz. The transmitter power in terms of the watts specified is the peak envelope power of the emission measured at the associated antenna input port. The operating power shall not exceed the authorized power by more than 10 percent of the authorized power in watts at any time. Frequencies from 10,600–10,680 MHz are subject to footnote US265 in the Table of Frequency Allocations in Section 2.106 of the Commission's Rules.  
<sup>6</sup> Maximum power delivered to the antenna shall not exceed -3 dBw.  
<sup>7</sup> See § 101.113(c).  
<sup>8</sup> For stations authorized prior to March 11, 1997, and for non-Local Multipoint Distribution Service stations authorized pursuant to applications refilled no later than June 26, 1998, the transmitter output power shall not exceed 0.050 watt.  
<sup>9</sup> For subscriber transceivers authorized in these bands, the EIRP shall not exceed 55 dBw or 42 dBw/MHz.  
<sup>10</sup> See § 101.147(s).  
<sup>11</sup> The EIRP for MVDDS stations is limited to 14.0 dBm per 24 MHz (-16.0 dBW per 24 MHz). Incumbent point-to-point stations may use up to +50 dBW except for low power systems which were licensed under § 101.147(q).

(b) The power of transmitters that use Automatic Transmitter Power Control shall not exceed the power input or output specified in the instrument of station authorization. The power of non-ATPC transmitters shall be maintained as near as practicable to the power input or output specified in the instrument of station authorization.

(c)(1) *Transmitter power limitations.* Point-to-point stations in the 29.1–29.25 GHz band for the LMDS backbone between LMDS hubs shall be limited to a maximum allowable e.i.r.p. density per carrier of 23 dBW/MHz in any one megahertz in clear air, and may exceed this limit by employment of adaptive power control in cases where link propagation attenuation exceeds the clear air value due to precipitation and only to the extent that the link is impaired.

(2) *Hub transmitter EIRP spectral area, density limit.* LMDS applicants shall