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6. Spurious Emissions at Antenna Terminal

6.1. Limit

FCC

- \$22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

- \$24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

- 27.53(c)(2), on any frequency outside the 776-788 Mb band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

- s27.53(g), the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

- \$27.53(h)(1), for operations in the 1 695-1 710 Mb, 1 710-1 755 Mb, 1 755-1 780 Mb, 1 915-1 920 Mb, 1 995-2 000 Mb, 2 000-2 020 Mb, 2 110-2 155 Mb, 2 155-2 180 Mb, and 2 180-2 200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log₁₀ (P) dB.

- $\S27.53(m)(4)$, for mobile digital stations, the attenuation factor shall be not less than 40 + 10 log₁₀ (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log₁₀ (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log₁₀ (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log₁₀ (P) dB on all frequencies between 2 490.5 Mb and 2 496 Mb and 55 + 10 log₁₀ (P) dB at or below 2 490.5 Mb. Mobile Satellite Service licensees operating on frequencies below 2 495 Mb may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

- §90.691(a), out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log₁₀ (f / 6.1) decibels or 50 + 10 Log₁₀ (P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 Log₁₀ (P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

- §90.543(e), For operations in the 758-768 Mb and the 788-798 Mb bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:



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- RSS-130 Issue 2

4.7.1, the unwanted emissions in any 100 k bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dB W), by at least 43 + 10 log₁₀ p (watts), dB. However, in the 100 kb band immediately outside the equipment's operating frequency block range, a resolution bandwidth of 30 kb may be employed.

- RSS-132 Issue 3

5.5, Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

(i) In the first 1.0 Mb band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1 % of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p (watts).

(ii) After the first 1.0 Mb immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kb bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p (watts). If the measurement is performed using 1 % of the occupied bandwidth, power integration over 100 kb is required.

- RSS-133 Issue 6

6.5, Equipment shall comply with the limits in (i) and (ii) below.

(i) In the 1.0 Mb bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1 % of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p(watts).

(ii) After the first 1.0 Mb, the emission power in any 1 Mb bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p(watts). If the measurement is performed using 1 % of the emission bandwidth, power integration over 1.0 Mb is required.

- RSS-139 Issue 3

6.6, (i) In the first 1.0 Mb bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1 % of the emission bandwidth shall be attenuated below the transmitter output power P (in dB W) by at least 43 + 10 log₁₀ p (watts) dB.

(ii) After the first 1.0 Mb outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 Mb bandwidth shall be attenuated below the transmitter output power P (in dB W) by at least 43 + 10 log₁₀ p (watts) dB.

- RSS-140 Issue 1

4.4, The power of any unwanted emission outside the bands 758-768 Mb and 788-798 Mb shall be attenuated below the transmitter output power P in dB W as follows, where p is the transmitter output power in watts:

a) For any frequency between 769-775 $\,\rm Mz\,$ and 799-806 $\,\rm Mz$:

i) 76 + 10 log (p), dB in a 6.25 $\,\rm klz\,$ band for fixed and base station equipment

ii) 65 + 10 log (p), dB in a 6.25 kHz band for mobile and portable/hand-held equipment

b) For any frequency between 775-788 Mb, above 806 Mb, and below 758 Mb: $43 + 10 \log (p)$, dB in a bandwidth of 100 kb or greater. However, in the 100 kb bands immediately outside and adjacent to the frequency bands 758-768 Mb and 788-798 Mb, a resolution bandwidth of 30 kb may be employed.



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- RSS-199 Issue 3

4.5, In the 1 Mb band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 Mb band, a resolution bandwidth of 1 Mb shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 Mb, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dB W), by at least 43 + 10 log₁₀ p for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dB W), by at least:

- i. 40 + 10 log₁₀ p from the channel edges to 5 MHz away
- ii. 43 + 10 log₁₀ p between 5 MHz and X MHz from the channel edges, and
- iii. 55 + 10 \log_{10} p at X M and beyond from the channel edges

In addition, the attenuation shall not be less than $43 + 10 \log_{10} p$ on all frequencies between 2 490.5 Mb and 2 496 Mb, and 55 + 10 log₁₀ p at or below 2 490.5 Mb.

In (a) and (b), p is the transmitter power measured in watts and X is 6 $M_{\mathbb{Z}}$ or the equipment occupied bandwidth, whichever is greater.



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6.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

- 1. Start frequency was set to 9 kl and stop frequency was set to at least 10* the fundamental frequency.
- 2. Detector = RMS.
- 3. Trace mode = Max hold.
- 4. Sweep time = Auto couple.
- 5. The trace was allowed to stabilize.
- 6. Please see notes below for RBW and VBW settings.
- 7. For plots showing conducted spurious emissions from 9 klz to 26 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as TDF function.



Note;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.



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6.3. Test Results

Ambient temperature	:	(23	±1) ℃
Relative humidity	:	47	% R.H.

- Test plots

NR band 7



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NR band 12





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NR band 13



NR band 14

LPS Max			M2[1]		-20.35 dBn	
20 dBm			M1[1]		6.980659 GH 26.15 dBn 793.359 MH	
10 10-						
10 dBm				- I - I	0.009 Mit	
0 dBm						
0.000						
-10 dBm						
01 -1	3.000 dam				M2	
-20 dBm-			a second backs		(Land	
		and an an and an and and and and and and			and the party of a law	
-30 dBm		And the second se			the part line should be	
-40 dBm						
-50 dBm						
-60 dBm						
-70 dBm						



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NR band 25/2





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NR band 26/5_Part 22





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NR band 26_Part 90





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NR band 66





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NR band 71





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7. Band Edge and Emission Mask

7.1. Limit

FCC

- \$22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

- \$24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

- 27.53(c)(2), on any frequency outside the 776-788 Mb band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

- 27.53(c)(4), on all frequencies between 763-775 Mb and 793-805 Mb, by a factor not less than 65 + 10 log (P) dB in a 6.25 kb band segment, for mobile and portable stations;

- s27.53(g), the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

- \$27.53(h)(1), for operations in the 1 695-1 710 Mb, 1 710-1 755 Mb, 1 755-1 780 Mb, 1 915-1 920 Mb, 1 995-2 000 Mb, 2 000-2 020 Mb, 2 110-2 155 Mb, 2 155-2 180 Mb, and 2 180-2 200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log₁₀ (P) dB.

- $\S27.53(m)(4)$, for mobile digital stations, the attenuation factor shall be not less than 40 + 10 log₁₀ (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log₁₀ (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log₁₀ (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log₁₀ (P) dB on all frequencies between 2 490.5 Mb and 2 496 Mb and 55 + 10 log₁₀ (P) dB at or below 2 490.5 Mb. Mobile Satellite Service licensees operating on frequencies below 2 495 Mb may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

- §90.691(a), out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 klz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log_{10} (f / 6.1) decibels or 50 + 10 Log_{10} (P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 klz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 Log₁₀ (P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.



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- 90.543(e), For operations in the 758-768 Mb and the 788-798 Mb bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 Mb and 799-805 Mb, by a factor not less than 76 + 10 log (P) dB in a 6.25 kb band segment, for base and fixed stations.

(2) On all frequencies between 769-775 Mb and 799-805 Mb, by a factor not less than 65 + 10 log (P) dB in a 6.25 kb band segment, for mobile and portable stations.

(3) On any frequency between 775-788 Miz, above 805 Miz, and below 758 Miz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 klz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.



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IC

- RSS-130 Issue 2

4.7.1, the unwanted emissions in any 100 k bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dB W), by at least 43 + 10 log₁₀ p (watts), dB. However, in the 100 k band immediately outside the equipment's operating frequency block range, a resolution bandwidth of 30 kb may be employed.

4.7.2 In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 Mb and 777-787 Mb shall also comply with the following restrictions:

a) The power of any unwanted emissions in any 6.25 klz bandwidth for all frequencies between 763-775 klz and 793-806 klz shall be attenuated below the transmitter power, P (dB W), by at least:

(i) 76 + 10 log10 p (watts), dB, for base and fixed equipment, and

(ii) 65 + 10 log10 p (watts), dB, for mobile and portable equipment.

b) The e.i.r.p. in the band 1 559-1 610 \mathbb{W} shall not exceed -70 dB W/ \mathbb{W} for wideband signal and -80 dB W for discrete emission with bandwidth less than 700 Hz.

- RSS-132 Issue 3

5.5, Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

(i) In the first 1.0 Mb band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1 % of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p (watts).

(ii) After the first 1.0 Mb immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kb bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p (watts). If the measurement is performed using 1 % of the occupied bandwidth, power integration over 100 kb is required.

- RSS-133 Issue 6

6.5, Equipment shall comply with the limits in (i) and (ii) below.

(i) In the 1.0 Mb bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1 % of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p(watts).

(ii) After the first 1.0 Mb, the emission power in any 1 Mb bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least 43 + 10 log₁₀ p(watts). If the measurement is performed using 1 % of the emission bandwidth, power integration over 1.0 Mb is required.

- RSS-139 Issue 3

6.6, (i) In the first 1.0 Mb bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1 % of the emission bandwidth shall be attenuated below the transmitter output power P (in dB W) by at least 43 + 10 log₁₀ p (watts) dB.

(ii) After the first 1.0 Mb outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 Mb bandwidth shall be attenuated below the transmitter output power P (in dB W) by at least 43 + 10 log₁₀ p (watts) dB.



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- RSS-140 Issue 1

4.4, The power of any unwanted emission outside the bands 758-768 Mz and 788-798 Mz shall be attenuated below the transmitter output power P in dB W as follows, where p is the transmitter output power in watts:

a) For any frequency between 769-775 Mz and 799-806 Mz:

i) 76 + 10 log (p), dB in a 6.25 $\,\mathrm{klz}\,$ band for fixed and base station equipment

ii) 65 + 10 log (p), dB in a 6.25 kHz band for mobile and portable/hand-held equipment

b) For any frequency between 775-788 Mz, above 806 Mz, and below 758 Mz: $43 + 10 \log (p)$, dB in a bandwidth of 100 kz or greater. However, in the 100 kz bands immediately outside and adjacent to the frequency bands 758-768 Mz and 788-798 Mz, a resolution bandwidth of 30 kz may be employed.

- RSS-199 Issue 3

4.5, In the 1 Mb band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 Mb band, a resolution bandwidth of 1 Mb shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 Mb, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dB W), by at least 43 + 10 log10 p for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dB W), by at least 43 + 10 log10 p for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dB W), by at least 43 + 10 log10 p for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dB W), by at least:

i. 40 + 10 log10 p from the channel edges to 5 Mb away ii. 43 + 10 log10 p between 5 Mb and X Mb from the channel edges, and iii. 55 + 10 log10 p at X Mb and beyond from the channel edges

In addition, the attenuation shall not be less than $43 + 10 \log 10 p$ on all frequencies between 2 490.5 Mb and 2 496 Mb, and 55 + 10 log10 p at or below 2 490.5 Mb.

In (a) and (b), p is the transmitter power measured in watts and X is 6 Mb or the equipment occupied bandwidth, whichever is greater.



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7.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

- a. Span was set large enough so as to capture all out of band emissions near the band edge.
- b. RBW ≥ 1 % of OBW
- c. VBW \ge 3 x RBW.
- d. Detector = RMS.
- e. Trace mode = Average.
- f. Sweep time = Auto.
- g. The trace was allowed to stabilize.
- h. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.





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7.3. Test Results

Ambient temperature	:	(23 ± 1) ℃	
Relative humidity	:	47	% R.H.

- Test plots





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