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(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

[51 FR 31213, Sept. 2, 1986, as amended at 54 FR 40058, Sept. 29, 1989; 54 FR 49994, Dec. 4, 1989; 56 FR 11516, Mar. 19, 1991; 62 FR 40306, July 28, 1997; 73 FR 4482, Jan. 25, 2008; 78 FR 25175, Apr. 29, 2013]

§ 80.213 Modulation requirements.

(a) Transmitters must meet the following modulation requirements:

(1) When double sideband emission is used the peak modulation must be maintained between 75 and 100 percent;

(2) When phase or frequency modulation is used in the 156–162 MHz band the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of ± 5 kHz is defined as 100 percent peak modulation; and

(3) In single sideband operation the upper sideband must be transmitted. Single sideband transmitters must automatically limit the peak envelope power to their authorized operating power and meet the requirements in § 80.207(c).

(b) Radiotelephone transmitters using A3E, F3E and G3E emission must have a modulation limiter to prevent any modulation over 100 percent. This requirement does not apply to survival craft transmitters, to transmitters that do not require a license or to transmitters whose output power does not exceed 3 watts.

(c) Coast station transmitters operated in the 72.0–73.0 MHz and 75.4–76.0 MHz bands must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 15 kHz it must have an attenuation greater than at 1 kHz by at least $40\log_{10}(f/3)$ dB where “f” is the frequency in kilohertz. At frequencies above 15 kHz the attenuation must be at least 28 dB greater than at 1 kHz.

(d) Ship and coast station transmitters operating in the 156–162 MHz and 216–220 bands must be capable of proper operation with a frequency deviation that does not exceed ± 5 kHz when using any emission authorized by § 80.207.

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(e) Coast station transmitters operated in the 156–162 MHz band must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 20 kHz it must have an attenuation greater than at 1 kHz by at least $60\log_{10}(f/3)$ dB where “f” is the audio frequency in kilohertz. At frequencies above 20 kHz the attenuation must be at least 50 dB greater than at 1 kHz.

(f) Radiodetermination ship stations operating on 154.585 MHz, 159.480 MHz, 160.725 MHz, 160.785 MHz, 454.000 MHz and 459.000 MHz must employ a duty cycle with a maximum transmission period of 60 seconds followed by a minimum quiescent period four times the duration of the transmission period.

(g) Radar stations operating in the bands above 2.4 GHz may use any type of modulation consistent with the bandwidth requirements in § 80.209(b).

(h) Radar transponder coast stations using the 2900–3100 MHz or 9300–9500 MHz band must operate in a variable frequency mode and respond on their operating frequencies with a maximum error equivalent to 100 meters. Additionally, their response must be encoded with a Morse character starting with a dash. The duration of a Morse dot is defined as equal to the width of a space and $\frac{1}{3}$ of the width of a Morse dash. The duration of the response code must not exceed 50 microseconds. The sensitivity of the stations must be adjustable so that received signals below -10 dBm at the antenna will not activate the transponder. Antenna polarization must be horizontal when operating in the 9300–9500 MHz band and either horizontal or both horizontal and vertical when operating in the 2900–3100 MHz band. Racons using frequency agile transmitting techniques must include circuitry designed to reduce interference caused by triggering from radar antenna sidelobes.

(i) Variable frequency ship station transponders operating in the 2900–3100 MHz or 9300–9500 MHz band that are not used for search and rescue purposes must meet the following requirements:

(1) Non-selectable transponders must have the following characteristics:

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(i) They must respond on all their frequencies with a maximum range error equivalent to 100 meters;

(ii) They must use a Morse encoding of "PS" (dot-dash-dash-dot, dot-dot-dot), meaning "You should not come any closer". The width of a Morse dot is defined as equal to the width of a space and 1/3 of the width of a Morse dash;

(iii) When they employ swept frequency techniques they must not transmit on any frequency for more than 10 seconds in any 120 second period;

(iv) Any range offset of their response must occur during their pause on the fixed frequency;

(v) The duration of the response code must not exceed 50 microseconds;

(vi) The sensitivity of the stations must be adjustable so that received signals below -10 dBm at the antenna input will not activate the transponder;

(vii) Antenna polarization must be horizontal when operating in the 9300-9500 MHz band and either horizontal or both horizontal and vertical when operating in the 2900-3100 MHz band.

(viii) Transponders using frequency agile techniques must include circuitry designed to reduce interference caused by triggering from radar antenna sidelobes.

(2) Selectable transponders must be authorized under part 5 of the Commission's rules until standards for their use are developed.

(j) The transmitted signals of search and rescue transponders must cause to appear on a radar display a series of at least 20 equally spaced dots.

(k) The modulation requirements for EPIRB's are contained in subpart V.

[51 FR 31213, Sept. 2, 1986, as amended at 52 FR 7418, Mar. 11, 1987; 52 FR 28825, Aug. 4, 1987; 54 FR 40058, Sept. 29, 1989; 57 FR 43407, Sept. 21, 1992; 65 FR 77824, Dec. 13, 2000; 68 FR 46965, Aug. 7, 2003; 69 FR 64673, Nov. 8, 2004]

§ 80.215 Transmitter power.

(a) Transmitter power shown on the radio station authorization is the maximum power the licensee is authorized to use. Power is expressed in the following terms:

(1) For single sideband emission: Peak envelope power;

(2) For G3E emission: Carrier power;

(3) For PON and F3N emission: Mean power;

(4) For all emissions in the 1626.5-1646.5 MHz band: equivalent isotropic radiated power.

(5) For all other emissions: the carrier power multiplied by 1.67.

(b) *Coast station frequencies below 27500 kHz.* The maximum power must not exceed the values listed below.

(1) Public coast stations, except Alaska:

- (i) Radiotelegraphy:
 - 100-160 kHz—80kW
 - 405-525 kHz—40kW
 - 2035-2065 kHz—6.6kW
 - 4000-8000 kHz—10kW
 - 8000-9000 kHz—20kW
 - 12000-27500 kHz—30kW

(ii) Radiotelephony:

- 2000-4000 kHz—day—800W
- 2000-4000 kHz—night—400W
- 4000-27500 kHz—10kW

(2) Private coast stations, except in Alaska: 1kW

(3) Coast stations in Alaska, public and private:

- 405-525 kHz—265W
- 1605-12000 kHz—150W

(c) *Coast station frequencies above 27500 kHz.* The maximum power must not exceed the values listed below.

(1) Coast stations:

- 156-162 MHz—50W^{1 2 13}
- 216-220 MHz²

(2) Marine utility stations:

- 156-162 MHz—10W

(d) *Ship station frequencies below 27500 kHz.* The maximum power must not exceed the values listed below:

(1) Radiotelegraphy: All ships—2kW³

(2) Radiotelephony:

- (i) All ships—Great Lakes and Inland Waters—150W
- (ii) All ships—Open waters; 2000-4000 kHz—150W

¹Maximum authorized power at the input terminals of the station antenna.

²See paragraph (h) of this section.

³For passenger ships 5000 gross tons and over—8kW. For cable-repair ships operating on radiodetermination frequencies, 15 watts; see § 80.375(b).