§ 2.1511 Measurements of radiated emissions.

The Commission’s Rules require that the peak effective radiated power (PERP) of a Class A, B or S EPIRB not be less than 75 mW under certain specified conditions. The PERP of an EPIRB transmitter is determined by comparing its level to a reference PERP generated by a standard quarter-wave monopole antenna located on a one wavelength minimum diameter metal ground plane. The Rules also require that all spurious and harmonic emissions be attenuated by a specified amount with respect to the reference PERP. In addition, there is a limit on the PERP of radiated emissions with the switch in the test mode. These measurements are to be made in accordance with the following procedure.

(a) General set-up instructions. Measurements of radiated electromagnetic emissions (EME) are to be performed on the 30 meter open field test site described in § 2.1503(a) of this part and on one of the pair of frequencies listed in § 2.1507 of this part. A receiver, tuned dipole antennas and a calibrated signal generator as described in § 2.1505 of this part are required. The EPIRB should be powered by its own internal battery with its standard antenna attached and deployed.

(b) Set-up for radiated EME tests.

Step (1) Place a 121.5 MHz quarter-wave vertical antenna element at the center of the ground plane and connect the output of the calibrated signal generator to the antenna.
Step (2) Mount the tuned dipole antenna on the antenna mast, tune the elements to 121.5 MHz and connect the antenna to the receiver.
Step (3) After an appropriate warm up, turn the receiver to the frequency of the test unit, set the detector to peak mode and the bandwidth to 100 KHz.

\[ \text{PERP} = 75 \times \log_{10} \left[ \frac{\text{dBm}_{\text{meas}} - \text{dBm}_{\text{ref}}}{10} \right] \]

where:
\( \text{dBm}_{\text{meas}} \) is the measured receiver reading in dBm, and
\( \text{dBm}_{\text{ref}} \) is the reference receiver reading found in step 2 of §2.1511(c).
Step (10) Record the PERP in mW. The FCC limit for minimum power in the normal operation mode (i.e., with the EPIRB switch in the normal operating position) is 75 mW. The FCC limit for maximum power in the test mode is 0.0001 mW.

(c) Radiated EME tests.

Fundamental emissions—peak effective radiated power

Step (1) Turn on the signal generator and adjust the output to 75 mW at 121.5 MHz.
Step (2) Vary the antenna height from one to four meters in both vertical and horizontal polarization. Record the highest receiver reading in dBm and the instrument settings, antenna height and direction for maximum radiation, antenna polarization and conversion factors, if any, associated with that reading.
Step (8) Repeat §2.1511(b) and Steps 1 through 7 for 243 MHz.
Step (9) Compute the peak effective radiated power for the maximum level of each measured emission using the following formula:

\[ \text{PERP} = 75 \times \log_{10} \left[ \frac{\text{dBm}_{\text{meas}} - \text{dBm}_{\text{ref}}}{10} \right] \]

Spurious emissions

Step (11) Reset the signal generator to operate at 121.5 MHz.
Step (12) For each spurious and harmonic emission to be measured, retune the receive antenna to the appropriate frequency and repeat Steps 5 and 7.
§ 2.1513 Measurements of modulation characteristics.

(a) Set-up. Test of modulation characteristics are to be performed in an RF shielded room.

Step (1) Place the EPIRB directly on a metal ground plane, such as the shielded room floor.

Step (2) Place a suitable receiving antenna at a convenient distance from the EPIRB and connect it to the input of the spectrum analyzer or receiver to observe the radiated signal from the EPIRB.

Step (3) Set the spectrum analyzer or receiver controls as follows:
- I.F. bandwidth: 300 kHz minimum
- Video filter: OFF or as wide as possible
- Amplitude scale: Linear
- Frequency: 121.5 MHz
- Scan width: 0 Hz

Step (4) Connect the detected output of the spectrum analyzer or receiver to the input of the storage oscilloscope.

Step (5) Set the oscilloscope controls as necessary to allow the demodulated waveform to be viewed. The input signal is to be DC coupled.

(b) Measurement of Audio Frequencies.

Step (1) Activate the EPIRB.

Step (2) Trigger the oscilloscope and store at least one complete cycle of the audio waveform.

Step (3) Measure the period (T) of the waveform. The period is the time difference between the half voltage points at the beginning and end of one cycle of the waveform. See Figure 2.

Step (4) Measure the pulse width (t_p) of the waveform. The pulse width is the time difference between the half voltage points on the rising and falling portions of the waveform. See Figure 2.

Step (5) Calculate the duty cycle (D) as follows:

\[ D = \frac{t_p}{T} \]

Step (6) Repeat Steps 2 through 5 a sufficient number of times to determine the highest and lowest duty cycles.

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