

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(i) Maximum Permissible Exposure

RF Exposure Requirements: §1.1307(b)(1) and §1.1307(b)(2): Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: §1.1310: As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

Table 1. RF Exposure Limits

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{(PG / 4\pi S)}$$

where, S = Power Density (mW/cm²)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

For Antenna Gain → dBi = 10log(Numeric)

Antenna Type:	Manufacturer	Gain (dBi):	Impedance	Polarization
PCB Trace	Allergan	2402 MHz: -0.2 dBi 2442 MHz: -0.5 dBi 2480 MHz: -0.1 dBi	50 Ω	Linear

Table 2. Antenna Specification

Test Results:

Frequency (MHz)	Maximum Rated Conducted Power (dBm)	Tune Up Power (dBm)	Conducted Power (mW)	Antenna Gain (dBi)	Antenna Gain (Num)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Margin	Distance (cm)	Result
2480	0.0	1.0	1.258	- 0.1	0.977	0.391	1	-0,60	0.5	Pass

Table 3. MPE Calculation

Tune Up Power: ±1dBm

The safe distance where Power Density is less than the MPE Limit listed above was found to be 0.5cm. This distance is provided by the plastic casing of the device.

SAR Exclusion Consideration:

Per FCC KDB 447498 D01 Section 4.3.1, for 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,

Where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as numeric thresholds

Therefore $[1.258 / 5] \times [\sqrt{2.480}] \leq 3.0$
 $0.2516 \times 1.574 \leq 3.0$
 $0.396 \leq 3.0 \rightarrow (\text{Pass})$