

§ 15.247, Bluetooth, Wi-Fi § 15.407, UNII-1, UNII-3

§ 15.407(f) Maximum Permissible Exposure

- Test Requirement(s):** §15.407(f): U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a “general population/uncontrolled” environment.
- 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.

MPE Limit:

EUT’s operating frequencies 15.247 Bluetooth @ 2402 – 2480 MHz; 15.247 Wi-Fi @ 2412 – 2462 MHz; 15.407 UNII-1 @ 5180 – 5245 MHz; 15.407 UNII-3 @ 5735 – 5840 MHz

Limit for Uncontrolled exposure: 1 mW/cm² or 10 W/m²

Equation from page 18 of OET 65, Edition 97-01

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

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

Test Results:

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Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm ²)	Limit (mW/cm ²)	Margin	Distance (cm)	Result
2480	7.71	5.90 *	5.1	3.24	0.01	1.0	-0.99	20	Pass
2437	17.87	61.24 *	2	3.24	0.02	1.0	-0.98	20	Pass
5245	25.27	336.51 *	3	2.00	0.13	1.0	-0.87	20	Pass
5760	20.43	110.41 *	3	2.00	0.05	1.0	-0.95	20	Pass

* The LBE-5AC-XR may have simultaneously transmission of the 15.247 Bluetooth, 15.247 2.4 GHz Wi-Fi, 15.407 UNII-1 or UNII-3. Asterisk notes the worst case of the possible simultaneously transmitter combinations.

Due to the 1 for 1 back off while using the higher gain antenna, the EIRP remains the same and therefore the MPE calculation does not change.

Simultaneously Transmitters Summed:

$$\begin{aligned} & 0.01 \text{ (Bluetooth)} \\ & + 0.02 \text{ (2.4 GHz WiFi)} \\ & + 0.13 \text{ (UNII-1)} \\ & + \underline{0.05 \text{ (UNII-3)}} \\ & = 0.21 \end{aligned}$$

$$\text{Limit of } 1.0 - 0.26 \text{ (summed value)} = -0.79 \text{ Margin}$$

The safe distance for SWX-LBE5ACXR where Power Density is less than the MPE Limit listed above was found to be 20 cm.