

BLE

RSS-102(3.2)

RF Exposure Evaluation of Devices

RF Exposure Requirements:

RSS-102(3.2): A device requiring an RF exposure evaluation shall be made in accordance with the latest version of IEEE C95.3.

If the device is designed such that more than one antenna can functionally transmit at the same time, the RF exposure evaluation shall be conducted while all antennas are transmitting. The individual exposure level ratios shall be totaled and used for compliance purposes.

If the device has more than one antenna, but is not designed to have more than one antenna functionally transmit at the same time, the RF exposure evaluation of the device shall be performed for each of the individually transmitting antennas. The maximum RF field strength value shall be recorded and used for compliance purposes.

If the device combines groups of simultaneous and non-simultaneous transmitting antennas, the worst-case of the above scenarios applies.

Exposure Limit:

For a device operating between 300 – 6000 MHz the power density limit for RF Evaluation can be determined from the equation $0.02619 \times f^{0.6834} \text{ W/m}^2$, where f is the frequency in MHz.

The Time-Averaged Maximum e.i.r.p. RF Evaluation Exemption limit for devices operating between 300 – 6000 MHz can be found from the equation $0.0131 \times f^{0.6834} \text{ W}$, where f is the frequency in MHz.

Test Result:

IC											
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (W/m^2)	MPE Limit (W/m^2)	Margin	Distance (cm)	e.i.r.p. (W)	e.i.r.p. Exempt Limit (W)	Result
2479	-0.823	0.827	3	1.995	N/A	N/A	N/A	20	0.00165	2.7348	Exempt

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

WiFi

§ 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.

MPE Limit: EUT's operating frequencies @ 2400-2483.5 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:

FCC									
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
2412	14.91	30.974	-3	0.501	0.00309	1	0.99691	20	Pass

Table 1. MPE, SISO, Test Results

FCC									
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
2462	16.09	40.644	-3	0.501	0.00405	1	0.99595	20	Pass

Table 2. MPE, MIMO, Test Results