

5. RF EXPOSURE EVALUATION

5.1 Applicable Standard

FCC §15.247 (i)

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. See §1.1307(b)(1) of this chapter.

5.2 Procedure

According to §1.1307(b)(3)(i)

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.

5.3 Measurement Result

Operation Modes	Frequency (MHz)	$\lambda/2\pi$ (mm)	Distance (mm)	Exemption ERP		Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	MPE-Based Exemption
				(mW)	(dBm)					
WLAN 2.4G	2412-2462	19.80	200	768	28.85	15.0	3.29	16.14	41.11	Compliant
WLAN 5.2G	5150-5250	9.22	200	768	28.85	12.0	4.42	14.27	26.73	Compliant
WLAN 5.3G	5250-5350	9.08	200	768	28.85	16.0	1.07	14.92	31.05	Compliant
WLAN 5.6G	5470-5725	8.69	200	768	28.85	16.0	3.05	16.9	48.98	Compliant
WLAN 5.8G	5725-5850	8.321	200	768	28.85	12.5	4.42	14.77	29.99	Compliant
Bluetooth BDR/EDR	2402-2480	19.89	200	768	28.85	6.5	3.05	7.4	5.50	Compliant
Bluetooth LE	2402-2480	19.89	200	768	28.85	4.5	3.05	5.4	3.47	Compliant

Result: The device compliant the MPE-Based Exemption at 20cm distances.

WLAN 2.4G and 5G can't transmit simultaneously, Bluetooth and WLAN can transmission simultaneously.

$$\sum_{i=1}^a \left(\frac{P_i}{P_{th_i}} \right) + \sum_{j=1}^b \left(\frac{ERP_j}{ERP_{th_j}} \right) + \sum_{k=1}^c \left(\frac{Evaluated_k}{Exposure Limit_k} \right)$$

$$= ERP_{BT} / ERP_{th-BT} + ERP_{WLAN} / ERP_{th-WLAN}$$

$$= 5.50/768 + 48.98/768$$

$$= 0.07$$

Result: The device compliant the Exemption at 20cm distances.

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