

FCC §1.1307 (B) (3) & §2.1091- MPE-BASED EXEMPTION

Applicable Standard

According to subpart 1.1307 (b) (3) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

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	$19.2 R^2$.

R is the minimum separation distance in meters

f = frequency in MHz

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Result

Mode	Frequency (MHz)	Tune up conducted power	Antenna Gain		ERP		Evaluation Distance (m)	ERP Limit (W)
		(dBm)	(dBi)	(dBd)	(dBm)	(W)		
ZigBee	2405-2480	17.0	5	2.85	19.85	0.097	0.2	0.768
2.4G Wi-Fi	2412-2462	18.0	5	2.85	20.85	0.122	0.2	0.768
5G Wi-Fi	5150-5250	19.0	5	2.85	21.85	0.153	0.2	0.768
	5250-5350	21.0	5	2.85	23.85	0.243	0.2	0.768
	5470-5725	21.0	5	2.85	23.85	0.243	0.2	0.768
	5725-5850	20.0	5	2.85	22.85	0.193	0.2	0.768

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
 2. The ZigBee, 2.4G Wi-Fi and 5G Wi-Fi can Simultaneous transmitting
 3. 0dBd=2.15dBi

Simultaneous transmitting consideration (worst case):

The ratio= $\text{ERP}_{\text{Zigbee}}/\text{limit} + \text{ERP}_{\text{2.4G Wi-Fi}}/\text{limit} + \text{ERP}_{\text{5G Wi-Fi}}/\text{limit}$
 $= 0.097/0.768 + 0.122/0.768 + 0.243/0.768 = 0.602 < 1.0$, so simultaneous exposure is compliant.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.