

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

Applicable Standard

According to 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)(3)(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 (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
UHF	917-922.2	9.0	-2.75	-4.90	4.10	2.57	0.2	470
BT	2402-2480	9.0	3.40	1.25	10.25	10.59	0.2	768
BLE	2402-2480	7.0	3.40	1.25	8.25	6.68	0.2	768
Wi-Fi	2412-2462	27.0	3.40	1.25	28.25	668.34	0.2	768

Note:

1. The tune up conducted power and antenna gain was declared by the applicant.
The device contains a certified BT/Wi-Fi module (model: ESP32-WROVER-E, FCC ID: 2AC7Z-ESP32WROVERE)
2. The BT and Wi-Fi cannot transmit at same time, the UHF and BT/Wi-Fi can transmit at same time.
3. 0dBd=2.15dBi

Simultaneous transmitting consideration (worst case):

The ratio= $ERP_{UHF}/limit + ERP_{Wi-Fi}/limit = 2.57/470 + 668.34/768 = 0.876 < 1.0$,
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