

RF EXPOSURE EVALUATION

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 v01 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 [#] (dBm)	Antenna Gain [#]		ERP		Evaluation Distance (m)	ERP Limit (mW)
			(dBi)	(dBd)	(dBm)	(mW)		
For module YL43752								
BLE	2402-2480	6.0	4.58	2.43	8.43	6.97	0.2	768
2.4G Wi-Fi	2412-2462	21.5	4.58	2.43	23.93	247.17	0.2	768
5.2G Wi-Fi	5180-5240	11.0	4.49	2.34	13.34	21.58	0.2	768
5.8G Wi-Fi	5745-5825	11.5	4.49	2.34	13.84	24.21	0.2	768
For module YL43456								
2.4G Wi-Fi	2412-2462	18.0	4.58	2.43	20.43	110.41	0.2	768
5.2G Wi-Fi	5180-5240	15.0	4.49	2.34	17.34	54.20	0.2	768
5.3G Wi-Fi	5260-5320	14.0	4.49	2.34	16.34	43.05	0.2	768
5.6G Wi-Fi	5500-5720	15.0	4.49	2.34	17.34	54.20	0.2	768
5.8G Wi-Fi	5745-5825	15.0	4.49	2.34	17.34	54.20	0.2	768

- Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
 2. 0dBd=2.15dBi
 3. The BLE and Wi-Fi can transmit at same time, the 2.4G and 5G Wi-Fi cannot transmit at same time.
 4. The two Wi-Fi modules can transmit at same time.

Simultaneous transmitting consideration (worst case):

$$\text{The ratio} = \text{ERP}_{\text{BLE}} / \text{limit} + \text{ERP}_{2.4\text{G_YL43752}} / \text{limit} + \text{ERP}_{2.4\text{G_YL43456}} / \text{limit} = 6.97/768 + 247.17/768 + 110.41/768 = 0.475 < 1.0$$

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