FCC §15.247 (I) & §1.1307 (B) (3) & §2.1091 - RF EXPOSURE EVALUATION

Applicable Standard

According to subpart 15.247 (i) 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)(3)(i)(C)] to support an exemptionfrom 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^2f.
1,500-100,000	19.2R^2.

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

For worst case:

For Module YL43752:

Mode	Frequency (MHz)	Tune up conducted power#	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
BT	2402-2480	8.5	3.51	1.36	9.86	9.68	0.2	768
BLE	2402-2480	8.0	3.51	1.36	9.36	8.63	0.2	768
2.4G Wi-Fi	2412-2462	18.5	3.51	1.36	19.86	96.83	0.2	768
5G Wi-Fi	5180-5240	12.0	3.39	1.24	13.24	21.09	0.2	768
	5260-5280	13.0	3.39	1.24	14.24	26.55	0.2	768
	5500-5700	12.0	3.39	1.24	13.24	21.09	0.2	768
	5745-5825	14.5	3.39	1.24	15.74	37.50	0.2	768

Note 1: The tune-up power and antenna gain was declared by the applicant.
Note 2: 0dBd=2.15dBi.
Note 3: according to module report, the BT can transmit at the same time with the Wi-Fi, the 2.4G Wi-Fi and 5G Wi-Fi cannot Simultaneous transmitting

Simultaneous transmitting consideration:

The ratio=ERP_{BT}/limit+$ERP_{Wi\text{-}Fi}$/limit=9.68/768+96.83/768=0.139＜1.0, so simultaneous exposure is compliant.

For Module YL43456:

Mode	Frequency (MHz)	Tune up conducted power#	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
BT	2402-2480	8.0	4.42	2.27	10.27	10.64	0.2	768
BLE	2402-2480	4.0	4.42	2.27	6.27	4.24	0.2	768
2.4G Wi-Fi	2412-2462	21.0	4.42	2.27	23.27	212.32	0.2	768
5G Wi-Fi	5180-5825	16.5	3.39	1.24	17.74	59.43	0.2	768

Note 1: The tune-up power and antenna gain was declared by the applicant.
Note 2: 0dBd=2.15dBi.
Note 3: according to module report, the BT cannot transmit at the same time with the Wi-Fi

The two WLAN module cannot transmit at same time.

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

Result: Compliant