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)(1)(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

Mode	Frequency (MHz)	Tune up conducted power#	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
BT	2402-2480	10.0	2.16	0.01	10.01	10.02	0.2	768
BLE	2402-2480	-2.5	2.16	0.01	-2.49	0.56	0.2	768
2.4G Wi-Fi	2412-2462	23.5	2.16	0.01	23.51	224.39	0.2	768
5.2G Wi-Fi	5180-5240	15.0	0	-2.15	12.85	19.28	0.2	768
GSM850*	824-849	25.98	-4.91	-7.06	18.92	77.98	0.2	422
PCS1900*	1850-1910	20.48	2.30	0.15	20.63	115.61	0.2	768
WCDMA B2	1850-1910	22.0	2.30	0.15	22.15	164.06	0.2	768
WCDMA B5	824-849	23.0	-4.91	-7.06	15.94	39.26	0.2	422
LTE B2	1850-1910	23.0	2.30	0.15	23.15	206.54	0.2	768
LTE B4	1710-1755	23.0	1.88	-0.27	22.73	187.50	0.2	768
LTE B7	2500-2570	22.0	2.95	0.8	22.8	190.55	0.2	768
LTE B38	2570-2620	22.5	3.34	1.19	23.69	233.88	0.2	768

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

Note*: It was the time average power according to the duty cycle.

Mode		Tune-up Peak Output Power (dBm)			Tune-up Average Output Power (dBm)		
		Low	Middle	High	Low	Middle	High
GPRS850	1 slot	33.5	33.5	33.5	24.47	24.47	24.47
	2 slots	32.0	32.0	32.0	**25.98**	**25.98**	**25.98**
	3 slots	30.0	30.0	30.0	25.74	25.74	25.74
	4 slots	28.5	28.5	28.5	25.49	25.49	25.49
GPRS1900	1 slot	27.5	27.5	27.5	18.47	18.47	18.47
	2 slots	26.5	26.5	26.5	**20.48**	**20.48**	**20.48**
	3 slots	24.0	24.0	24.0	19.74	19.74	19.74
	4 slots	23.0	23.0	23.0	19.99	19.99	19.99

Note: the duty cycle for 1 slot is 1/8, 2 slots is 1/4, 3 slots is 3/8, 4 slots is 1/2
The average power=Peak power+ duty cycle factor
Duty cycle factor=10*log (duty cycle)

NFC:

Mode	Frequency (MHz)	Maximum E-Field (dBuV/m@3m)	Maximum EIRP (dBm)	ERP		Evaluation Distance (m)	ERP Limit (mW)
				(dBm)	(mW)		
NFC	13.56	69.98	-25.22	-27.37	0.002	0.2	751

Note: EIRP = E-Field – 95.2 @3m, ERP = EIRP-2.15

Simultaneous transmitting consideration (worst case):

The ratio= $ERP_{2.4G\ Wi\text{-}Fi}$/limit +$ERP_{LTE\ B38}$/limit+ ERP_{NFC}/limit= 224.39/768+ 233.88/768+ 0.002/751 =0.597＜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