

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 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	$19.2 R^2$.

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 (cm)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
BT	2402-2480	7.5	2.48	0.33	7.83	6.07	25	1200
BLE	2402-2480	-1.5	2.48	0.33	-1.17	0.76	25	1200
2.4G Wi-Fi	2412-2462	25.5	2.48	0.33	25.83	382.82	25	1200
5.2G Wi-Fi	5180-5240	11.0	2.49	0.34	11.34	13.61	25	1200
GSM850*	824-849	25.49	0.69	-1.46	24.03	252.93	25	659
PCS1900*	1850-1910	22.49	1.31	-0.84	21.65	146.22	25	1200
WCDMA B2	1850-1910	22.5	1.31	-0.84	21.66	146.55	25	1200
WCDMA B5	824-849	22.0	0.69	-1.46	20.54	113.24	25	659
LTE B2	1850-1910	22.5	1.31	-0.84	21.66	146.55	25	1200
LTE B4	1710-1755	21.5	0.07	-2.08	19.42	87.50	25	1200
LTE B7	2500-2570	21.5	4.54	2.39	23.89	244.91	25	1200
LTE B38	2570-2620	21.5	4.07	1.92	23.42	219.79	25	1200

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	33.0	33.0	33.0	23.97	23.97	23.97
	2 slots	31.5	31.5	31.5	25.48	25.48	25.48
	3 slots	29.5	29.5	29.5	25.24	25.24	25.24
	4 slots	28.5	28.5	28.5	25.49	25.49	25.49
GPRS1900	1 slot	29.5	29.5	29.5	20.47	20.47	20.47
	2 slots	28.5	28.5	28.5	22.48	22.48	22.48
	3 slots	26.5	26.5	26.5	22.24	22.24	22.24
	4 slots	25.5	25.5	25.5	22.49	22.49	22.49

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 (cm)	ERP Limit (mW)
				(dBm)	(mW)		
NFC	13.56	71.68	-23.52	-25.67	0.0027	25	1173

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

Simultaneous transmitting consideration (worst case):

The ratio= $ERP_{2.4G\ Wi-Fi}/limit + ERP_{GSM850}/limit + ERP_{NFC}/limit = 382.82/1200 + 252.93/659 + 0.0027/1173 = 0.703 < 1.0$

So simultaneous exposure is compliant.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 25cm from nearby persons.

Result: Compliant.