§1.1307 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to §1.1307 and § 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.

Limits for General Population/Uncontrolled Exposure

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Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \le 1$$

For worst:

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BDR/EDR	2402-2480	1.5	1.41	6.0	3.98	20	0.001	1.0
BLE	2402-2480	1.5	1.41	6.0	3.98	20	0.001	1.0
2.4G Wi-Fi	2412-2472	1.5	1.41	11.5	14.13	20	0.004	1.0
GPRS/EDGE 850	824-849	0.5	1.12	32.1	1621.81	20	0.362	0.55
GPRS/EDGE 1900	1850-1910	0.5	1.12	29.5	891.25	20	0.199	1.0
WCDNA B2	1850-1910	0.5	1.12	23	199.53	20	0.045	1.0
WCDNA B5	824-849	0.5	1.12	22.5	177.83	20	0.040	0.55
LTE B2	1850-1910	0.5	1.12	23	199.53	20	0.045	1.0
LTE B4	1710-1755	0.5	1.12	22.5	177.83	20	0.040	1.0
LTE B5	824-849	0.5	1.12	23	199.53	20	0.045	0.55
LTE B7	2500-2570	0.5	1.12	23	199.53	20	0.045	1.0
LTE B12	699-716	0.5	1.12	23	199.53	20	0.045	0.47
LTE B17	704-716	0.5	1.12	23	199.53	20	0.045	0.47
LTE B38	2570-2620	0.5	1.12	23	199.53	20	0.045	1.0
LTE B66	1710-1780	0.5	1.12	22.5	177.83	20	0.040	1.0

Note: 1. The tune up conducted power was declared by the applicant.
2. The BT or Wi-Fi can transmit at the same time with the WWAN.

Simultaneous transmitting consideration (worst case):

The ratio=$MPE_{2.4G\ Wi\text{-}Fi}$/limit+$MPE_{GPRS/EDGE850}$/limit=0.004/1+0.362/0.55=0.662＜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