

FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
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

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

S = power density (in appropriate units, e.g. mW/cm²)

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:

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

Mode	Frequency (MHz)	Antenna Gain		Max Tune Up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	0.8	1.20	-1.00	0.79	20	0.0002	1.00
GSM850	824-849	1.2	1.32	25.97	395.37	20	0.1037	0.55
GSM1900	1850-1910	2.0	1.58	22.97	198.15	20	0.0625	1.00
LTE Band 2	1850-1910	2.0	1.58	22.00	158.49	20	0.0500	1.00
LTE Band 4	1710-1755	1.4	1.38	22.00	158.49	20	0.0435	1.00
LTE Band 5	824-849	1.2	1.32	22.00	158.49	20	0.0416	0.55
LTE Band 12	699-716	0.5	1.12	22.00	158.49	20	0.0354	0.47
LTE Band 13	777-787	1.0	1.26	22.00	158.49	20	0.0397	0.52
LTE Band 14	788-798	1.0	1.26	22.00	158.49	20	0.0397	0.53
LTE Band 25	1850-1915	2.0	1.58	22.00	158.49	20	0.0500	1.00
LTE Band 26	814-849	1.2	1.32	22.00	158.49	20	0.0416	0.54
LTE Band 66	1710-1780	1.5	1.41	22.00	158.49	20	0.0446	1.00
LTE Band 85	698-716	0.5	1.12	22.00	158.49	20	0.0354	0.47
NB-IoT Band 2	1850-1910	2.0	1.58	22.00	158.49	20	0.0500	1.00
NB-IoT Band 4	1710-1755	1.4	1.38	22.00	158.49	20	0.0435	1.00
NB-IoT Band 5	824-849	1.2	1.32	22.00	158.49	20	0.0416	0.55
NB-IoT Band 12	699-716	0.5	1.12	22.00	158.49	20	0.0354	0.47
NB-IoT Band 13	777-787	1.0	1.26	22.00	158.49	20	0.0397	0.52
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NB-IoT Band 26	814-849	1.2	1.32	22.00	158.49	20	0.0416	0.54
NB-IoT Band 66	1710-1780	1.5	1.41	22.00	158.49	20	0.0446	1.00
NB-IoT Band 71	663-698	0.5	1.12	22.00	158.49	20	0.0354	0.44
NB-IoT Band 85	698-716	0.5	1.12	22.00	158.49	20	0.0354	0.47

- Note: 1. the tune up conducted power was declared by the applicant.
2. the BLE function can transmit at the same time with the LTE.
3. please refer to the MPE report of the FCC ID: XMR201910BG95M3 for the LTE output power.

So the worst simultaneous transmitting consideration:

$$\text{The ratio} = \text{MPE}_{\text{BLE}}/\text{limit} + \text{MPE}_{\text{GSM850}}/\text{limit} = 0.0002/1.0 + 0.1037/0.55 \\ = 0.189 < 1.0$$

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

Result: Compliance