

FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$ = 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:

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

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G WIFI	2412-2462	7.00	5.01	20	100	20	0.100	1.00
GSM850	824-849	3.50	2.24	26	398	20	0.177	0.55
GSM1900	1850-1910	5.42	3.48	23	200	20	0.138	1.00
WCDMA B2	1850-1910	5.42	3.48	25	316	20	0.219	1.00
WCDMA B4	1710-1755	4.11	2.58	25	316	20	0.162	1.00
WCDMA B5	824-849	3.50	2.24	25	316	20	0.141	0.55
LTE B2	1850-1910	5.42	3.48	25	316	20	0.219	1.00
LTE B4	1710-1755	4.11	2.58	25	316	20	0.162	1.00
LTE B5	824-849	3.50	2.24	25	316	20	0.141	0.55
LTE B12	699-716	3.50	2.24	25	316	20	0.141	0.47
LTE B13	777-787	3.50	2.24	25	316	20	0.141	0.52
LTE B25	1850-1915	5.42	3.48	25	316	20	0.219	1.00
LTE B26(814-824)	814-824	3.50	2.24	25	316	20	0.141	0.54
LTE B26(824-849)	824-849	3.50	2.24	25	316	20	0.141	0.55
LTE B38	2570-2620	4.70	2.95	25	316	20	0.186	1.00
LTE B41	2496-2690	4.70	2.95	25	316	20	0.186	1.00

Note: The WWAN tune-up power please refer to the FCC ID: XMR201903EG25G.

So the worst simultaneous transmitting consideration:

The Ratio= $MPE_{2.4G\ WIFI}/Limit + MPE_{GSM850}/Limit = 0.100/1.00 + 0.177/0.55 = 0.4 < 1$;

So simultaneous exposure is not required.

Result: The device meet FCC MPE at 20 cm distance.