

FCC §15.407 (f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.407(f) 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 fac vhtor, 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)			
WLAN-2.4G	2412-2462	2.5	1.78	23	199.53	25.00	0.05	1.00
WLAN-5.2G	5150-5250	2.5	1.78	14	25.12	25.00	0.01	1.00
WLAN-5.8G	5725-5850	2.5	1.78	15	31.62	25.00	0.01	1.00
GSM850	824-849	1.75	1.50	33	1995.26	25.00	0.38	0.55
PCS1900	1850-1910	-0.24	0.95	31	1258.93	25.00	0.15	1.00
WCDMA Band 2	1850-1910	-0.24	0.95	24.5	281.84	25.00	0.03	1.00
WCDMA Band 4	1710-1755	1.05	1.27	23.5	223.87	25.00	0.04	1.00
WCDMA Band 5	824-849	1.75	1.50	25	316.23	25.00	0.06	0.55
LTE Band 2	1850-1910	-0.24	0.95	23	199.53	25.00	0.02	1.00
LTE Band 4	1710-1755	1.05	1.27	24	251.19	25.00	0.04	1.00
LTE Band 5	824-849	1.75	1.50	24	251.19	25.00	0.05	0.55
LTE Band 7	2500-2570	0.29	1.07	24	251.19	25.00	0.03	1.00
LTE Band 12	699-716	-1.71	0.67	24	251.19	25.00	0.02	0.47
LTE Band 13	777-787	0.12	1.03	24	251.19	25.00	0.03	0.52
LTE Band 17	704-716	-1.71	0.67	24	251.19	25.00	0.02	0.47
LTE Band 26	814-849	1.75	1.50	22	158.49	25.00	0.03	0.54
LTE Band 38	2570-2620	-1.37	0.73	24	251.19	25.00	0.02	1.00
LTE Band 40	2305-2315	0.69	1.17	22	158.49	25.00	0.02	1.00
LTE Band 41	2535-2655	-1.37	0.73	24	251.19	25.00	0.02	1.00

Note: the device contains a WWAN module, FCC ID: 2AC88-GLMM18A02.

The WLAN 2.4G ,5G and WWAN can transmit simultaneously:

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

$$= S_{2.4}/S_{limit-2.4} + S_5/S_{limit-5} + S_{WWAN}/S_{limit-WWAN}$$

$$= 0.05/1 + 0.01/1 + 0.38/0.55$$

$$= 0.75$$

$$< 1.0$$

Result: The device meet FCC MPE at **25 cm** distance