

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.

Calculated Formulary:

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:

Modes	Frequency Range (MHz)	Antenna Gain		Maximum Power Including Tolerance		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G SDR	2403.5-2477.5	4.1	2.57	28	630.96	20.00	0.32	1.0
5.8G SDR	5728.5-5846.5	4.3	2.69	22	158.49	20.00	0.08	1.0
2.4G WiFi	2412-2462	4.1	2.57	27	501.19	20.00	0.26	1.0
5.8G WiFi	5745-5825	4.3	2.69	18	63.10	20.00	0.03	1.0

Note: The Maximum Power Including Tolerance was declared by manufacturer.

The system configuration SDR and WiFi can transmit simultaneously when operated in difference frequency band, the worst as below:

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

$$=S_{SDR\ 2.4}/S_{limit-SDR\ 2.4} + S_{WIFI\ 5.8}/S_{limit-WIFI\ 5.8}$$

$$=0.32/1+0.03/1$$

$$=0.35$$

$$< 1.0$$

Result: Compliance, The device meet FCC MPE at 20 cm distance