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:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = 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:

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

Calculated Data:
MPE evaluation for single transmission:

Frequency Range (MHz)	Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
			(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	2.4G-802.11b	2462	5.0	3.16	23.00	199.53	20	0.125	1.0
	2.4G-802.11g	2437	5.0	3.16	25.59	362.24	20	0.228	1.0
	2.4G-802.11n HT20	2412	5.0	3.16	24.92	310.46	20	0.195	1.0
	2.4G-802.11n HT40	2422	5.0	3.16	23.70	234.42	20	0.147	1.0
5150-5250	5G-802.11a	5180	5.0	3.16	17.32	53.95	20	0.034	1.0
	5G-802.11n HT20	5180	5.0	3.16	15.59	36.22	20	0.023	1.0
	5G-802.11n HT40	5190	5.0	3.16	12.21	16.63	20	0.010	1.0
5725-5850	802.11a	5825	5.0	3.16	14.81	30.27	20	0.019	1.0
	5G-802.11n HT20	5825	5.0	3.16	14.18	26.18	20	0.016	1.0
	5G-802.11n HT40	5755	5.0	3.16	10.36	10.86	20	0.007	1.0

MPE evaluation for simultaneous transmission:

2.4 G and 5G can transmit at the same time, MPE evaluation is as below formula:

PD1/Limit1+PD2/Limit2+……＜1, PD (Power Density)

MPE evaluation= Max MPE of 2.4G + Max MPE of 5G = 0.228/1+0.034/1=0.262＜1

Result: MPE evaluation of single and simultaneous transmission meet the requirement of standard.