FCC §1.1310 & §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1091 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/f²)	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:

2.4G Wi-Fi (Chain0&Chain1)

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE Ratio
		(dBi)	(numeric)	(dBm)	(mW)				
802.11b	2412~2462	9.0	7.94	26.50	446.68	30	0.3136	1.0	0.3136
802.11g		9.0	7.94	26.00	398.11	30	0.2795	1.0	0.2795
802.11n-HT20		9.0	7.94	27.00	501.19	30	0.3518	1.0	**0.3518**
802.11n-HT40	2422~2452	9.0	7.94	26.00	398.11	30	0.2795	1.0	0.2795

5G Wi-Fi (Chain0&Chain1)

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE Ratio
802.11a	5150~5250	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
	5725~5850	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
802.11ac20	5150~5250	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
	5725~5850	18.0	63.10	16.50	44.67	30	0.2492	1.0	0.2492
802.11n20	5150~5250	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
	5725~5850	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
802.11ac40	5150~5250	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
	5725~5850	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
802.11n40	5150~5250	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
	5725~5850	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
802.11ac80	5210	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796
	5775	18.0	63.10	17.00	50.12	30	0.2796	1.0	0.2796

Note:
(1) The Tune-up output power was declared by the Manufacturer.
(2) 2.4G Wi-Fi and 5G Wi-Fi can transmit simultaneously, The worst condition is 2.4G Wi-Fi (Chain0&Chain1) & 5G Wi-Fi (Chain0&Chain1), as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.3518/1.00+0.2796/1.00=0.3518+0.2796=0.6314<1.0$$

Conclusion: The device meets MPE at distance 30cm.