

## 4 FCC §1.1310, §2.1091, §15.407(f) - Maximum Permissible Exposure (MPE)

### 4.1 Applicable Standard

According to §15.407(f), U-NII devices are subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), and 2.1091 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request

#### 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 <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	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<sup>2</sup>);

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

### 4.2 RF Exposure Evaluation Result

#### MPE Evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
Wi-Fi 2.4G	2412-2462	4.81	3.0269	28.00	630.9573	20	0.3801	1.0
UNII-1	5150-5250	4.86	3.0620	19.00	79.4328	20	0.0484	1.0
UNII-3	5745-5850	4.86	3.0620	15.50	35.4813	20	0.0216	1.0

The Wi-Fi 2.4G and 5G can transmit simultaneously:

$$=S_{2.4G}/S_{limit2.4G} + S_{5G UNII-1}/S_{limit5G UNII-1} = 0.3801 + 0.0484 = 0.4285 < 1.0$$

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