

## 4 FCC §2.1091 & §15.407(f) - RF Exposure

According to FCC §15.407(f) and §1.1307(b)(1), 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 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)
Limits for General Population/Uncontrolled Exposure				
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

### 4.1 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

### 4.2 MPE Results

#### Standalone 5 GHz Wi-Fi

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>22.81</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>190.985</u>
<u>Prediction distance (cm):</u>	<u>30</u>
<u>Prediction frequency (MHz):</u>	<u>5610</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>5.906</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>3.8958</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.066</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.066 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

The conducted power used for MPE calculation is the total power across all chains, and the maximum antenna gain used for MPE calculation is the directional gain.

### Standalone 2.4 GHz Wi-Fi

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>29.05</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>803.526</u>
<u>Prediction distance (cm):</u>	<u>30</u>
<u>Prediction frequency (MHz):</u>	<u>2437</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>4.384</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>2.744</u>
<u>Power density of prediction frequency at 30.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.195</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.195 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>. Please refer to Report: R1711062-247 for the output power measurement result.

### Radio Co-location

5 GHz and 2.4 GHz Wi-Fi are able to transmit simultaneously. Per FCC KDB 447498, when RF sources have difference frequencies, the fraction of the FCC power density limit shall be determined and the sum of all fractional components shall be less than 1.

Frequency Band	Max Conducted Power (dBm)	Evaluated Distance (cm)	Worst Case MPE (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Worst Case MPE Ratios	Sum of MPE Ratios	Limit
<b>Worst Case</b>							
2.4 GHz Wi-Fi	29.05	30	0.195	1.0	19.5 %	26.1 %	100 %
5 GHz Wi-Fi	22.81	30	0.066	1.0	6.6 %		