

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

### 4.1 Applicable Standards

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

### 4.2 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

### 4.3 MPE Results

#### 5.2 GHz Band

##### Non-Beamforming

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>24.83</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>304.0885</u>
<u>Prediction distance (cm):</u>	<u>25</u>
<u>Prediction frequency (MHz):</u>	<u>5230</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>11.13</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>12.9718</u>
<u>Power density of prediction frequency at 25.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.5025</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

**Beamforming**

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>24.28</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>267.9168</u>
<u>Prediction distance (cm):</u>	<u>25</u>
<u>Prediction frequency (MHz):</u>	<u>5230</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>11.13</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>12.9718</u>
<u>Power density of prediction frequency at 25.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.4425</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 at the distance of 25 cm.

**Co-location Evaluation:**

2.4 GHz and 5 GHz bands can 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. Please refer 2.4GHz WiFi data with original application report results. (FCC ID: WBV-AP230).

**2.4 GHz Wi-Fi, Non-Beamforming**

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>26.71</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>468.8134</u>
<u>Prediction distance (cm):</u>	<u>25</u>
<u>Prediction frequency (MHz):</u>	<u>2437</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>8.87</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>7.709</u>
<u>Power density of prediction frequency at 25.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.4602</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

**2.4 GHz Wi-Fi, Beamforming**

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>26.8</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>478.6301</u>
<u>Prediction distance (cm):</u>	<u>25</u>
<u>Prediction frequency (MHz):</u>	<u>2437</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>8.87</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>7.709</u>
<u>Power density of prediction frequency at 25.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.47</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

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
Non-Beamforming							
2.4 GHz	26.71	25	0.4602	1.0	46.02 %	96.27 %	100 %
5.2 GHz	24.83	25	0.5025	1.0	50.25 %		
Beamforming							
2.4 GHz	26.8	25	0.47	1.0	47 %	91.25 %	100 %
5.2 GHz	24.28	25	0.4425	1.0	44.25 %		

The device is compliant with the requirement MPE limit for uncontrolled exposure at the distance of 25 cm.