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

## 4.1 Applicable Standards

According to FCC §15.247(i), §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/cm²)	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	$*(180/f^2)$	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

## 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

## 8 dBi Antenna

## 5.3 GHz band:

Maximum average output power at antenna input terminal (dBm):21.253Maximum average output power at antenna input terminal (mW):133.444Prediction distance (cm):20Prediction frequency (MHz):5270Maximum Antenna Gain, typical (dBi):8

Maximum Antenna Gain (numeric): 6.310

Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>): 0.1675 FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>): 1.0

<sup>\* =</sup> Plane-wave equivalent power density

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#### 5.6 GHz band:

Maximum average output power at antenna input terminal (dBm): 20.36

Maximum average output power at antenna input terminal (mW): 108.643

Prediction distance (cm): 20

Prediction frequency (MHz): 5510
Maximum Antenna Gain, typical (dBi): 8

Maximum Antenna Gain (numeric): 6.310

Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>): 0.1364

FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>): 1.0

#### 25 dBi Antenna

#### 5.3 GHz band:

Maximum average output power at antenna input terminal (dBm):-13.345Maximum average output power at antenna input terminal (mW):0.0463Prediction distance (cm):20Prediction frequency (MHz):5260Maximum Antenna Gain, typical (dBi):25Maximum Antenna Gain (numeric):316.23

Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>): 0.0029 FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>): 1.0

#### 5.6 GHz band:

Maximum average output power at antenna input terminal (dBm): -9.677

Maximum average output power at antenna input terminal (mW): 0.108

Prediction distance (cm): 20

<u>Prediction frequency (MHz):</u> 5510 <u>Maximum Antenna Gain, typical (dBi):</u> 25

Maximum Antenna Gain (numeric): 316.23

Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>): 0.0068

FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>): 1.0

### Conclusion

The device is compliant with the requirement MPE limit for uncontrolled exposure. All transceiver modules must be installed with a separation distance of no less than **20** cm from all persons.