

## Exposure Separation Distances

To protect from overexposure to RF energy, install PMP 450 radios so as to provide and maintain the minimum separation distances from all persons shown in [Table 64](#).

**Table 64** Exposure Separation Distances

Module Type	Separation Distance from Persons
PMP 450 AP or SM	At least 20 cm (approx 8 in)

## Details of Exposure Separation Distances Calculations and Power Compliance Margins

Limits and guidelines for RF exposure come from:

- US FCC limits for the general population. See the FCC web site at <http://www.fcc.gov>, and the policies, guidelines, and requirements in Part 1 of Title 47 of the Code of Federal Regulations, as well as the guidelines and suggestions for evaluating compliance in FCC OET Bulletin 65.
- Health Canada limits for the general population. See Safety Code 6 on the Health Canada web site at <http://www.hc-sc.gc.ca/>.
- ICNIRP (International Commission on Non-Ionizing Radiation Protection) guidelines for the general public. See the ICNIRP web site at <http://www.icnirp.de/> and Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields.

The applicable power density exposure limits from the documents referenced above are

- 10 W/m<sup>2</sup> for RF energy in the 5.7-GHz frequency band.

Peak power density in the far field of a radio frequency point source is calculated as follows:

$$S = \frac{P \cdot G}{4 \pi d^2}$$

where  
 $S$  = power density in W/m<sup>2</sup>  
 $P$  = RMS transmit power capability of the radio, in W  
 $G$  = total Tx gain as a factor, converted from dB  
 $d$  = distance from point source, in m

Rearranging terms to solve for distance yields

$$d = \sqrt{\frac{P \cdot G}{4 \pi S}}$$

[Table 65](#) shows calculated minimum separation distances  $d$ , recommended distances and resulting power compliance margins for each frequency band and antenna combination.

**Table 65** Calculated Exposure Distances and Power Compliance Margins

Freq. Band	Antenna	Variable			<i>d</i> (calculated)	Recommended Separation Distance	Power Compliance Margin
		P	G	S			
5.4 / 5.8 GHz OFDM	Integrated, 9 dBi patch	0.079 W (19 dBm)	.08 W (9 dBi)	10 W/m <sup>2</sup> or 1 mW/cm <sup>2</sup>	8 cm	20 cm (8 in)	8
	Integrated, 9 dBi patch with 9 dBi Cassegrain LENS	0.079 W (19 dBm)	.05 W (18 dBi)	10 W/m <sup>2</sup> or 1 mW/cm <sup>2</sup>	18 cm	50 cm (20 in)	8
	Integrated, 9 dBi patch with 18 dBi Reflector Dish	0.079 W (19 dBm)	.5 W (27 dBi)	10 W/m <sup>2</sup> or 1 mW/cm <sup>2</sup>	56 cm	150 cm (60 in)	7

The “Recommended Distances” are chosen to give significant compliance margin in all cases. They are also chosen so that an OFDM module has the same exposure distance as a Canopy module, to simplify communicating and heeding exposure distances in the field.

These are conservative distances:

- They are along the beam direction (the direction of greatest energy). Exposure to the sides and back of the module will be significantly less.
- They meet sustained exposure limits for the general population (not just short term occupational exposure limits), with considerable margin.
- The calculated compliance distance *d* is overestimated because the far-field equation models the antenna as a point source and neglects the physical dimension of the antenna.