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 61.

Table 61 Exposure Separation Distances

Module Type	Separation Distance from Persons
PMP 450 SM	At least 20 cm (approx 8 in)
PMP 450 SM with Reflector Dish	At least 1.5 m (approx 5 ft)
PMP 450 SM with LENS	At least 50 cm (approx 20 in)
PMP 450 AP with Sector Antenna	At least 50 cm (approx 20 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/m2 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^2
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 62 shows calculated minimum separation distances *d*, recommended distances and resulting power compliance margins for each frequency band and antenna combination.

Table 62 Calculated Exposure Distances and Power Compliance Margins

Freq. Band	Antenna	Variable			*d* (calculated)	Recommended Separation Distance	Power Compliance Margin
		P	G	S			
5.4 / 5.8 GHz OFDM	Integrated SM, 9 dBi patch	0.079 W (19 dBm)	7.9 mW (9 dB)	10 W/m² or 1 mW/cm²	7 cm	20 cm (7.8 in)	8.1
	Integrated SM, 9 dBi patch with 9 dBi Cassegrain LENS	0.079 W (19 dBm)	39.8 mW (16 dB)	10 W/m² or 1 mW/cm²	16 cm	50 cm (19.6 in)	9.7
	Integrated SM, 9 dBi patch with 18 dBi Reflector Dish	0.079 W (19 dBm)	251.2 (24 dB)	10 W/m² or 1 mW/cm²	40 cm	1.5 m (5 ft)	14
	Connectorized AP, with 17 dBi Sector Antenna	0.079 W (19 dBm)	50.1 mW (17 dB)	10 W/m² or 1 mW/cm²	18 cm	50 cm (19.6 in)	7.7

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.

Transmitter Output Power

Table 60 PMP 450 AP transmitter output power

Radio/ Frequency	Channel Size	Region(s)	Transmit Output Power Range	TX Default Setting	Antenna Gain (18 dBi – 1dB cable loss)	Max EIRP (Tx + Antenna Gain)
PMP 450 AP 5.4 GHz OFDM	10 MHz	United States, Canada, Europe, India, Russia, Brazil and Australia	-30 to +10 dBm	10 dBm	17 dBm	27 dBm
	20 MHz		-30 to +13 dBm	13 dBm	17 dBm	30 dBm
PMP 450 AP 5.8 GHz OFDM	10 MHz	United States and Canada	-30 to +19 dBm	19 dBm	17 dBi	36 dBm
		Europe and India	-30 to +16 dBm	16 dBm	17 dBi	33 dBm
	20 MHz	United States, Canada, Europe and India	-30 to +19 dBm	19 dBm	17 dBi	36 dBm