MPE Calculations

The device is not a portable device (i.e. intended to be worn on the body or be hand-held), so it is classified as being either a mobile device or a fixed mounted device. The user's manual specifies a minimum separation distance of at least 20cm, consistent with this classification.

FCC part 1.1310, Table 1 limits the power density for uncontrolled exposure. The power density, P_d (mW/cm^2) calculated from the maximum EIRP, P_t (mW) and the distance, d (m), between the transmitting antenna and the closest person, can be calculated using:

$$P_d = P_t/(4 \pi d^2)$$

Frequency	MPE Limit (mW/cm^2)	Eirp (mW) [1]	Pd at 20cm (mW/cm^2)	Distance where Pd = limit (cm)
2400 to 5850 MHz	1.00	3672.8 [2]	0.7	17.1

- [1]Equivalent isotropic output power is the total eirp summed across all active transmitters. There are 16 transmitters available, 4 that can use the 2.4 GHz band and all 16 are capable of operating in the 5GHz bands. The worst case eirp in the table above is for the worst case configuration, based on the channels used being those with the highest output power. Refer to the table on the following page for the total eirp calculations.
- [2]This calculation assumes that all transceivers are connected to antennas with gains of 6dBi (highest gain antenna available in any band).

As shown in the calculations above, the power density 17.1 cm from the device is below the maximum permitted level for uncontrolled exposure. The instructions in the user's manual require a separation distance of at least 25cm.

Calculation Tables For Determining Total EIRP Across All 16 Transmitters

The calculations for maximum eirp do not take into account the fact that:

- All transmitters do not transmit with a 100% duty cycle
- The majority of antennas used (at least 12 of the 16) are directional antennas with little overlap in the main beams from each antenna

The calculations are, therefore, a conservative estimate for the rf hazard presented by the device.

Band	Mode	Output Power		Antenna gain (Max)	EIRP		Channels Available	Channels Used	Total EIRP	
		Peak	Average		dBm	W			W	dBm
2400 - 2483.5	OFDM	21.3	16.7	6.0	22.7	0.186	11	4	0.745	28.72
2401 - 2483.5	CCK	18.0	16.7	6.0	22.7	0.186				
5150 - 5250	OFDM		11.0	6.0	17.0	0.050	4	3	0.149	21.73
5250 - 5350	OFDM		17.6	6.0	23.6	0.231	4	4	0.923	29.65
5725 - 5850	OFDM	19.7	-	6.0	25.7	0.372	5	5	1.858	32.69
						Totals:		16	3.674	35.65

The system incorporates a lock-out mechanism to prevent a channel being used more than once, therefore the maximum number of transmitters in each band is limited to the lower of number of channels available or number of transceivers capable of operating in the band.

4 transceivers can operate in the 2400-2483.5 MHz band. All 16 transceivers can operate in the 5150 - 5250MHz, 5250-5350MHz and 5725-5850MHz bands. Operation in any band does not allow any two radios to use the same channel or to use overlapping channels (the only band with overlapping channels is the 2.4GHz band which has a 5 MHz channel spacing and a 6dB signal bandwidth of between 12 MHz (for 802.11b) and 17 MHz (802.11g).

Maximum eirp is calculated using the highest average power for each channel (where given), otherwise it uses the highest peak power.

As there are 16 transceivers available, the transceivers are assigned to the available channels in order of decreasing power as follows:

- The 5725-5850 MHz band has the highest eirp, and 5 channels available so the first five transceivers are allocated to that band;
- The band with the next highest eirp per channel is the 5250-5350 MHz band, with four channels, so the next four transceivers are placed in that band (total of nine transceivers used so far);
- There are only four radios capable of operating in the 2400 – 2483.5 MHz band, which has the third highest eirp, so all four of the remaining seven transceivers are allocated to that band;
- The remaining three radios are allocated to the last remaining band, the 5150 - 5250 MHz band.