

MPE Calculations – XS-3500-4

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	1230.2 ²	0.2	9.9

- ¹Equivalent isotropic output power is the total eirp summed across all active transmitters. There are 8 transmitters available, 4 that can use the 2.4 GHz band and all 8 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.
- ²This 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 9.9 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 4 Transmitter

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

- All transmitters do not transmit with a 100% duty cycle
- All of antennas used 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	-			
2401 - 2483.5	CCK	18.0	16.7	6.0	22.7	0.186					
5150 - 5250	OFDM	-	11.0	3.0	14.0	0.025	4	-			
5250 - 5350	OFDM	-	17.6	3.0	20.6	0.116	4	-			
5470 - 5725	OFDM	-	17.2	3.0	20.2	0.105	11	-			
5725 - 5850	OFDM	19.7	-	5.2	24.9	0.309	5	4	1.236	30.9	
Totals:								4		1.236	30.9

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 4 transceivers can operate in the 5150 - 5250MHz, 5250-5350MHz, 5470-5725MHz 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 4 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 four transceivers are allocated to that band.

Band	Mode	Output Power		Antenna gain (Max)	EIRP		Channels Available	Channels Used	Total EIRP		
		Peak	Average		dBm	W			W	dBm	
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1 transceiver can operate in the 2400-2483.5 MHz band. All 4 transceivers can operate in the 5150 - 5250MHz, 5250-5350MHz, 5470-5725MHz and 5725-5850MHz bands.

Maximum eirp is calculated as follows:

Uses the average power for each channel (where given), otherwise uses the peak power

As there are 4 transceivers available, the transceivers are assigned to the available channels in order of decreasing power (e.g. the 5725-5850 band has the highest eirp so the four transceivers are allocated to that band)