MPE Calculations

FCC part 1.1310, Table 1 limits the power density for uncontrolled exposure to 1mW/ cm^2 for systems operating in the 2400-2483.5MHz band. The distance, d(cm) from the antenna at which the power density, P_d (mW/cm^2) is below this limit is calculated from the maximum EIRP, P_t (mW) using the equation:

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

Re-arranging for the distance at which the power density is 1mW/cm2 gives:

$$d = \sqrt{(P_t/(4 \pi))}$$

The device tested is designed to use various antenna with a gains of between 2dBi and 18dBi. The maximum output power from the bi-directional amplifier is 27.12dBm.

The attached document shows the calculated distance from each antenna that can be used with the device at which the rf exposure requirements are met and the actual power density at a distance of 20cm from the antenna. As the device is intended for mobile applications with the omni-directional antennas and fixed, point-to-point applications for the high gain patch antennas, the minimum separation distance is 20cm for the mobile antennas and 25cm or 50cm for the 12dBi and 18dBi panel antennas. The user's manual states separation distances of 20cm for the omni-directional antennas and 50cm for the panel antennas.

The installation guide for the system details the minimum cable lengths to be used with each antenna and the minimum separation distances to meet the FCC's and Industry Canada's rf exposure requirements.

Systems That Include The DC Injector

ME103 Output Power (Max, dBm)	cable length ME103 to dc injector (m)	Min Cable Loss (dB)	DC injector loss (dB)	cable length dc injector to booster (m)	Min Cable Loss (dB)	Input Power to Booster (dBm)	Booster Output Power (Max, dBm)	Cable Length, booster to antenna (m)	Input Power to Antenna (dBm)	Antenna type	Antenna Gain (dBi)	Maximum Permitted Output Power (dBm)	EIRP (dBm)	EIRP (Watts)	Power Density at 20cm (mW/cm^2)	MPE Distance (cm)	Comments
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	1.5	25.96	Patch	12.0	28.0	38.0	6.3	1.2	22.30	Minimum separation shall be 50cm. For point-to-point applications only.
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	1.5	25.96	Patch	18.0	26.0	44.0	24.9	5.0	44.50	Minimum separation shall be 50cm. For point-to-point applications only.
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	0.0	27.12	Omni	2.0	30.0	29.1	0.8	0.2	8.06	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	0.0	27.12	Omni	3.0	30.0	30.1	1.0	0.2	9.04	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	0.0	27.12	Omni	4.0	30.0	31.1	1.3	0.3	10.15	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	0.0	27.12	Omni Triband	4.0	30.0	31.1	1.3	0.3	10.15	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	0.0	27.12	Omni Stand	5.0	30.0	32.1	1.6	0.3	11.39	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	0.0	27.12	Omni	5.0	30.0	32.1	1.6	0.3	11.39	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	0.0	27.12	Omni	7.0	29.0	34.1	2.6	0.5	14.33	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	1.5	25.96	Omni	9.0	27.0	35.0	3.1	0.6	15.79	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	1.5	25.96	Omni Triband	9.0	27.0	35.0	3.1	0.6	15.79	Minimum separation shall be 20cm
18	1.5	1.4	1.5	1.5	1.4	13.7	27.12	1.5	25.96	Ceiling	5.0	30.0	31.0	1.2	0.2	9.96	Minimum separation shall be 20cm

Systems Without The DC Injector

ME103 Output Power (Max, dBm)	cable length ME103 to dc injector (m)	Min Cable Loss (dB)	DC injector loss (dB)	cable length dc injector to booster (m)	Min Cable Loss (dB)	Input Power to Booster (dBm)	Booster Output Power (Max, dBm)	Cable Length, booster to antenna (m)	Input Power to Antenna (dBm)	Antenna type	Antenna Gain (dBi)	Maximum Permitted Output Power (dBm)	EIRP (dBm)	EIRP (Watts)	Power Density at 20cm (mW/cm^2)	MPE Distance (cm)	Comments
18	1.5	1.4				16.6	27.12	1.5	25.96	Patch	12.0	28.0	38.0	6.3	1.2	22.3	Minimum separation shall be 50cm. For point-to-point applications only.
18	1.5	1.4				16.6	27.12	1.5	25.96	Patch	18.0	26.0	44.0	24.9	5.0	44.5	Minimum separation shall be 50cm. For point-to-point applications only.
18	1.5	1.4				16.6	27.12	0.0	27.12	Omni	2.0	30.0	29.1	0.8	0.2	8.1	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	0.0	27.12	Omni	3.0	30.0	30.1	1.0	0.2	9.0	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	0.0	27.12	Omni	4.0	30.0	31.1	1.3	0.3	10.1	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	0.0	27.12	Omni Triband	4.0	30.0	31.1	1.3	0.3	10.1	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	0.0	27.12	Omni Stand	5.0	30.0	32.1	1.6	0.3	11.4	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	0.0	27.12	Omni	5.0	30.0	32.1	1.6	0.3	11.4	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	0.0	27.12	Omni	7.0	29.0	34.1	2.6	0.5	14.3	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	1.5	25.96	Omni	9.0	27.0	35.0	3.1	0.6	15.8	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	1.5	25.96	Omni Triband	9.0	27.0	35.0	3.1	0.6	15.8	Minimum separation shall be 20cm
18	1.5	1.4				16.6	27.12	1.5	25.96	Ceiling	5.0	30.0	31.0	1.2	0.2	10.0	Minimum separation shall be 20cm

The separation distances and minimum cable lengths in the table above are reflected in the installation instructions for the antennas and for the transmission system.
The minimum cable length available is 1.5m. The test configuration in the report used cable lengths of 0.5m between ME103 Access Point and DC injector. Netgear will not be providing a 0.5m cable to end users to ensure that the minimum cable length used between the booster and any antenna requiring a cable connection to the booster output is 1.5m.
The output power in the table above is the maximum output power recorded at the direct output of the booster or at the end of the 1.5m cable connected to the booster during testing.
The maximum output power for the Patch antennas is based on point-to-point operation which allows the antenna gain to exceed 6dBi provided there is a reduction in maximum output power of 30dB, by 1dB for every 3dB that the antennas gain exceeds 6dBi. As the output power into the antenna is below 26dBm the 18dBi and 12dBi antennas can be used for point-to-point applications only. For all other antenna types the maximum output power is reduced from 30dBm for every 1dB that the antenna gain exceeds 6dBi.