

Reference: transmit powers are taken from original module EMF report I17D00184-MPE01

RF Exposure – USA

Following installation and commissioning, the safe distance from the antenna is the greater of:

20cm

Or

r cm, where $r = \sqrt{(PG/4\pi S)}$

P: power input to antenna(s) in mW

G: numeric gain of antenna relative to isotropic radiator

S: power density in mW/cm^2

The maximum permitted values of S for general population / uncontrolled exposure are:

- $F/1500 \text{ mW}/\text{cm}^2$ for frequencies 300 – 1500 MHz
- $1.0 \text{ mW}/\text{cm}^2$ for frequencies above 1500 MHz

The calculation of minimum distance “r” is made by summing the EIRP of the two radios:

r cm, where $r = \sqrt{((PG + PG)/4\pi S)}$

The safe distance from the antenna shall be the greater of:

20 cm or $\sqrt{(PG/4\pi S)}$

Frequency Band	Frequency (MHz)	Cellular modem			Mesh radio EIRP (mW)	S (mW/cm^2)	Minimum r (cm)
		Transmit power (dBm)	Antenna gain (dBi)	EIRP (mW)			
LTE band 2	1850	25	2	501.2	10.50	1.00	6.38
LTE band 4	1710	25	2	501.2	10.50	1.00	6.38
LTE band 5	824	25	0	316.2	10.50	0.55	6.88
LTE band 7	2500	25	2.5	562.3	10.50	1.00	6.75
LTE band 12	698	25	0	316.2	10.50	0.47	7.47
LTE band 18	815	25	0	316.2	10.50	0.54	6.92
LTE band 19	830	25	0	316.2	10.50	0.55	6.85
GSM 850	824	25.97	0	395.4	10.50	0.55	7.67
GSM 1900	1850	22.97	2	314.1	10.50	1.00	5.08
UMTS band 2	1850	25	2	501.2	10.50	1.00	6.38
UMTS band 4	1710	25	2	501.2	10.50	1.00	6.38
UMTS band 5	824	25	0	316.2	10.50	0.55	6.88

All values of r are < 20 cm so the safe distance is 20 cm

RF Exposure –Canada

The Gateway is not portable or mobile and designed to be used at a distance of at least 20cm.

Worst case operation would be simultaneous transmission with the cellular modem

Industry Canada Maximum Permissible Exposure (MPE) limits for equipment operating in the frequency range 300 – 6000 MHz range is $1.31 \times 10^{-2} f^{0.6834}$ W/m² which equates to the “MPE limit” in the following table

Frequency Band	Frequency (MHz)	Transmit power (dBm)	Antenna gain (dBi)	EIRP (mW)	MPE limit (W)	Canada ratio
LTE band 2	1850.0	25	2.0	501.2	2.24	0.224
LTE band 4	1710.0	25	2.0	501.2	2.12	0.236
LTE band 5	824.0	25	0.0	316.2	1.29	0.245
LTE band 7	2500.0	25	2.5	562.3	2.75	0.204
LTE band 12	698.0	25	0.0	316.2	1.15	0.275
LTE band 18	815.0	25	0.0	316.2	1.28	0.247
LTE band 19	830.0	25	0.0	316.2	1.29	0.244
GSM 850	824.0	25.97	0.0	395.4	1.29	0.307
GSM 1900	1850.0	22.97	2.0	314.1	2.24	0.140
UMTS band 2	1850.0	25	2.0	501.2	2.24	0.224
UMTS band 4	1710.0	25	2.0	501.2	2.12	0.236
UMTS band 5	824.0	25	0.0	316.2	1.29	0.245

(reference: original module EMF report I17D00184-MPE01)

The transmit power of the mesh radio is 10.5 mW against a limit of 2.67 W at 2.4 GHz

FM3Gateway - simultaneous operation of Gemalto PLS62W modem and 802.15 radios

As per section 7.2 of FCC KDB 447498 D01 General RF Exposure Guidance v06, simultaneous transmission meets the requirements when the sum of the MPE ratios is ≤ 1.0

Looking at the above table, the worst ratio is GSM850 = 0.307

$$\text{The ratio for the mesh radio} = \frac{0.0105}{2.67} = 0.0039$$

The sum of the two ratios = 0.311

This is < 1.0 so the total power meets the exemption requirements