

The Device is a carrier grade gateway designed for IoT applications. The Kona Micro POE gateway is designed to be used as indoor table top equipment for home or small office.

The device has 1 antenna port, which must be used with antenna respecting the requirement specified in the technical documentation.

Gateway evaluated for RF radiation exposure according to the provisions of FCC §2.1091, MPE guidelines identified in FCC §1.1310 and FCC KDB 447498:2015.

Limits for General Population/Uncontrolled Exposure: 47 CFR 1.1310 Table 1 (B)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

Where f is in MHz

The worst-case scenario at 923 MHz is $S = 0.615 \text{ mW/cm}^2$, for uncontrolled exposure

Equations

To determine the minimum safe distance, each transmitted power density is calculated using the equation,

$$S = \text{EIRP} / (4\pi R^2)$$

Where: S, power density in 'mW/cm²'

EIRP, Effective Isotropic Radiated Power in 'mW'

R, distance to the center of the radiation of the antenna in 'cm'

The power density calculations for the EM7355 at an exposure minimum separation distance of 20cm are shown in the table below for each mode of operation. The worst case value is highlighted below.

When EM7455 module transmits as a stand-alone mobile device, the source-based time-averaged EIRP is calculated by summing up conducted power and antenna gain. A 100% duty cycle is used for calculations to present a worse-case analysis.

Technology	Frequency (MHz)	Max. Avg Cond.	Actual Antenna Gain (dBi)	Avg EIRP (W)	[Pd] Power density (mW/cm ²) @20 cm	[Limit] FCC MPE Limit	Ratio Pd/limit
WCDMA Band II LTE Band 2	1850-1910	0.25	3.4	0.550	0.109	1	0.109
WCDMA Band IV LTE Band 4	1710-1755	0.25	3.4	0.550	0.109	1	0.109
WCDMA Band V LTE Band 5	824-849	0.25	2.9	0.490	0.097	0.549	0.177
LTE Band 7	2500-2570	0.20	3.8	0.480	0.095	1	0.095
LTE Band 12	699-716	0.25	2.9	0.490	0.097	1	0.097
LTE Band 13	777-787	0.25	2.9	0.490	0.097	0.518	0.187
LTE Band 25	1850-1915	0.25	3.4	0.550	0.109	1	0.109
LTE Band 26	814-849	0.25	2.9	0.490	0.097	0.543	0.179
LTE Band 30	2305-2315	0.20	3.8	0.480	0.095	1	0.095
LTE Band 41	2496-2690	0.20	3.8	0.480	0.095	1	0.095

LoRa RF conducted power measurement and antenna gain as per ETC test report t29e20a131-FCC are reported below. The worst case value is highlighted below.

Technology	Frequency (MHz)	Measured Power (Conducted) (dBm)	Antenna Gain (dBi)	Measured EIRP (dBm)	Measured EIRP (W)	[Pd] Power density (mW/cm ²) @ 20cm	[Limit] FCC MPE Limit (mW/cm ²)	Ratio Pd/limit
LoRa	923.3	26.87	0	26.87	0.486	0.0967	0.615	0.157
	925.1	26.83	0	26.83	0.482	0.0960	0.617	0.156
	927.5	26.70	0	26.70	0.468	0.0931	0.618	0.151
After Tune up		27.5	0	27.5	0.562	0.112	0.615	0.182

Conclusion

Both GSM and LoRa can transmit simultaneously. The formula to calculate the MPE is:

$$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots < 1$$

Where, CPD: Calculated Power Density

LPD: Limit of Power Density

$$\text{GSM} / \text{Limit} + \text{LoRa} / \text{Limit} = 0.187 + 0.182 = 0.369$$

Therefore, the maximum exposure at a distance of **20 cm** is less than the maximum allowed exposure.