

The Device is a carrier grade gateway designed for IoT applications. The Kona micro indoor 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.

Per OET Bulletin 65 Edition 97-01, Appendix A Limits for Maximum Permissible Exposure (MPE)

Table-1(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) V/m)	Magnetic Field Strength (H) (A/m)	Power Density(S) (mW/cm²)	Averaging Time E ², H ² or S (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
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30
f = frequency in MHz			*Plane-wave equivalent power density	

Equations

To determine the minimum safe distance, each transmitted power density is calculated using the equation (4) from the OET bulletin 65,

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

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 0.3m are shown in the table below for each mode of operation. The worst case value is highlighted below.

GSM Module Pre- Certified ¹ .								
Technology	Frequency (MHz)	Max. Cond. Power (W)	duty Cycle	Actual Antenna Gain (dBi)	Avg EIRP (W)	[Pd] Power density (mW/cm ²) @ 20cm	[Limit] FCC MPE Limit (mW/cm ²)	Ratio Pd/limit
LTE	1850-1910	0.3	1	3.4	0.656	0.131	1.233	0.106
	1710-1755	0.3	1	3.4	0.656	0.131	1.140	0.115
	824-849	0.3	1	2.9	0.585	0.116	0.549	0.212
	777-787	0.3	1	2.9	0.585	0.116	0.518	0.225
	704-716	0.3	1	2.9	0.585	0.116	0.469	0.248
	1850-1915	0.3	1	3.4	0.656	0.131	1.233	0.106
UMTS	1850-1910	0.251	1	3.4	0.549	0.109	1.233	0.089
	1710-1755	0.251	1	3.4	0.549	0.109	1.140	0.096
	824-849	0.251	1	2.9	0.489	0.097	0.549	0.177
GSM	824-849	2	0.25	2.9	0.975	0.194	0.549	0.353
	1850-1910	1	0.25	3.4	0.547	0.109	1.233	0.088
CDMA	824-849	0.3	1	2.9	0.585	0.116	0.549	0.212
	1850-1910	0.3	1	3.4	0.656	0.131	1.233	0.106
	817-824	0.3	1	2.9	0.585	0.116	0.544	0.214

¹ Sierra Wireless, MPE Evaluation for EM7355 Radio Module, February 5, 2013

LoRa RF conducted power measurement and antenna gain as per ETC test report t29e18a130-FCC are reported below. The worst case value is highlighted below.

Technology	Frequency (MHz)	Measured EIRP (W)	[Pd] Power density (mW/cm ²) @ 20cm	[Limit] FCC MPE Limit (mW/cm ²)	Ratio Pd/limit
LoRa	923.3	1.941	0.386	0.616	0.627
	925.1	1.845	0.367	0.617	0.595
	927.5	1.849	0.368	0.618	0.595

Conclusion

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

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots < 1$$

Where, CPD: Calculated Power Density

LPD: Limit of Power Density

$$GSM / Limit + LoRa / Limit = 0.353 + 0.627 = 0.981$$

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