The Device is a carrier grade gateway designed for IoT applications. The device is intended to be installed in controlled area like tower or roof top building with restricted access to general public. The installation and maintenance must be performed by professional trained RF technician.

The device has 1 transmit antenna port, which must be used with the RF amplifier (TTU) supplied and antenna respecting the requirement specified in the technical documentation.

Kona Mega gateway is evaluated for RF radiation exposure according to the provisions of FCC §2.1091, MPE guidelines identified in FCC §1.1310 and FCC KDB 447498 D04 Interim General RF Exposure Guidance v01.

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)
(i) Limits for Occupational/Controlled Exposure				
0.3- 3.0	614	1.63	*(100)	≤6
3.0- 30	1842/f	4.89/f	*(900/f^2)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
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			*Plane-wave equivalent power density	

The worst-case scenario for **LoRa Radio at 902.5 MHz** is

S = 0.602 mW/cm^2, for General Population/Uncontrolled Exposure

S = 3.01 mW/cm^2, for Occupational/Controlled Exposure

LoRa RF conducted power measurement and antenna gain as per ETC test reports t29e23a158-DTS/DSS_FCC section 2.3.5 are reported below. The maximum duty cycle of the radio in real life operation is 33%. Calculations are done with the worst-case values.

TX	Frequency (MHz)	Max Avg Conducted RF Output 100% Duty Cycle (dBm)	[1]Cable Loss BTW ANT Port & ANT (dB)	Max. antenna gain (dBi)	EIRP 100% Duty Cycle (dBm)	EIRP 100% Duty Cycle (mW)
LoRa 500 KHz (DTS)	903.65	26.78	0.5	8	34.28	2680
	909.95	27.14	0.5	8	34.64	2911
	927.5	25.07	0.5	8	32.57	1810
LoRa 125 KHz (FHSS)	912.31	27.263	0.5	8	34.763	2994
	919.51	26.918	0.5	8	34.42	2770
	927.0125	26.004	0.5	8	33.504	2241
Worse LoRa FSK (FHSS)	902.5	26.530	0.5	8	34.03	2529
	915.0	27.290	0.5	8	34.79	3013
	927.0	25.813	0.5	8	33.313	2144
Worse Case (with 8dBi antenna)		28	0.5	8	35.5	3548

Conclusion (Worse Case)

Total Worse Case EIRP = Worse LoRa EIRP (mW)

EIRP = 3548 mW

To determine the minimum safe distance, the sum of all transmitted power is used

$S = EIRP / (4\pi R2)$

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'

And then re-arrange to determine the minimum safe distance for General Population/Uncontrolled Exposure.

$R = \sqrt{[EIRP / (4\pi S)]}$
$R = \sqrt{[3548 / (4\pi \times 0.602)]}$
R = 21.65651786 cm
R = rounded up to 22 cm distance Uncontrolled Exposure

Power Density using calculated distance

$S = EIRP / (4\pi R2)$

$S = 3548 / [4\pi (22)2]$

$S = 0.583348903 < 0.602$ mW/cm2

$S = 0.583 < 0.602$ mW/cm2

[1] As per manufacturer used manual cable loss between TX antenna and EUT antenna ports is 0.5dB.

To determine the minimum safe distance for Occupational/Controlled Exposure.

R = √ [EIRP / (4πS)]

R = √ [3548 / (4π x 3.01)]

R = 9.685089219 cm

R = rounded up to 10.0 cm

Power Density using calculated distance

S = EIRP / (4πR2)

S = 3548 / [4π (10)2]

S = 2.82340869 < 3.01 mW/cm2

S = 2.83 < 3.01 mW/cm2

R = 22 cm, for uncontrolled exposure (rounded up to the first decimal)

R = 10 cm, for controlled exposure (rounded up to the first decimal)

The device is intended to be installed in a fix controlled area location like tower or roof top building with restricted access to general public. The installation and maintenance must be performed by professional trained RF technician. The device has 1 antenna ports, which must be used with approved antenna respecting the requirement specified in the technical documentation.