RF EXPOSURE EVALUATION

1. PRODUCT INFORMATION

Product Description	Industrial LoRaWAN Gateway
Model Name	R3000-LG4LB, R3000-LG4LA
FCC ID	2AAJGR3000-LG

2. EVALUATION METHOD AND LIMIT

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons.

LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE

Frequency Range (MHz)	E-field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	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

*Note:

1. f= Frequency in MHz * Plane-wave Equivalent Power Density
2. The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirement for mobile and portable transmitters.

$S=PG/4\pi R^2$

Where:

S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

CALCULATION

A minimum test separation distance ⩾ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20.8 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated.

Mode	Frequency (MHz)	Antenna Gain (linear)	Output Power (dBm)	Output Power (mW)	Power Density ($mW/cm^{2)}$	Power Density Limit ($mW/cm^{2)}$
GPRS 850	824.2	2.24	30.74	1185.77	0.4886	0.55
GPRS 1900	1850.2	2.24	29.34	859.01	0.3540	1.00
WCDMA850	826.4	2.24	23.36	216.77	0.0893	0.55
WCDMA 1900	1907.6	2.24	24.87	306.90	0.1265	1.00
LTE BAND 2	1907.5	2.24	22.25	167.88	0.0692	1.00
LTE BAND 4	1732.5	2.24	23.96	248.89	0.1026	1.00
LTE BAND 5	846.5	2.24	22.91	195.43	0.0805	0.56
LTE BAND 7	2560	2.24	23.97	249.46	0.1028	1.00
LTE BAND 12	714.5	2.24	23.97	249.46	0.1028	0.48
LTE BAND 13	779.5	2.24	23.45	221.31	0.0912	0.52
LTE BAND 25	1852.5	2.24	23.72	235.50	0.0970	1.00
LTE BAND 26A	841.5	2.24	23.39	218.27	0.0899	0.56
LTE BAND 26B	823.3	2.24	22.79	190.11	0.0783	0.56
LTE BAND 38	2575	2.24	23.27	212.32	0.0875	1.00
LTE BAND 41	2687.5	2.24	23.86	243.22	0.1002	1.00
DTS	903.0	2.51	21.252	133.41	0.0616	0.60

Simultaneous transmission of:

Mode	Frequency (MHz)	Antenna Gain (linear)	Output Power (dBm)	Output Power (mW)	Power Density ($mW/cm^{2)}$	Power Density Limit ($mW/cm^{2)}$
GPRS 850	824.2	2.24	30.74	1185.77	0.4886	0.55
DTS	903.0	2.51	21.252	133.41	0.0616	0.60

Note:

1. Only the worst case recorded.
2. The GPRS 900 and DTS can transmit simultaneously.

0.4886 /0.55+0.0616 /0.60=0.99111931493<1

3. The reference antenna used is the maximum power of the Suction Cup Antenna (gain is 3.5dBi), and it is evaluated to comply with the granting conditions of RF exposure and the applicable maximum ERP/EIRP rules.

3. conclusion

Compliance the RF exposure requirement