

RF Exposure Evaluation

Reference: CFR 47 FCC Part 1.1310

Description: Both transmitters in the device have the possibility of transmitting simultaneously. The worst-case exposure for each transmitter was used to calculate the percentage of the allowable limit that each transmitter contributed. All of the percentages were then added together to verify that at the specified operating distance, they were below the allowable limit.

All measurements were peak or RMS power readings taken from test reports from accredited test labs. Antenna gains were taken from the manufacturer’s specifications.

Limits: Maximum exposure limits from CFR 47, FCC Part 1.1310:

Table 1 - 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)
(A) 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
(B) 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

RF Exposure Evaluation

FCC RFx Calculations:

Transmitter	Frequency	Antenna Gain	Power	Power +10% for tolerance	Power Density	Limit at specified distance	% of limit	Highest	Total	FCC ID
	MHz	numerical	mW	mW	mW/cm ²	mW/cm ²				
1	902.3	0.91	47.34	52.07	0.0094	0.6015	1.57%	1	1.57%	2A0WY-004B
2A	779	1.54	230.00	253.00	0.078	0.5193	14.93%			RI7LE866SV1
2A	1710	2.09	181.55	199.705	0.0830	1.0000	8.30%			RI7LE866SV1
2B	1720	2.09	238.8	262.68	0.1092	1.0000	10.92%			RI7XE866A1NA
2B	704	1.54	212.3	233.53	0.0715	0.4693	15.24%			RI7XE866A1NA
2C	1850	2.09	302.00	332.2	0.1382	1.0000	13.82%			XPY2AGQN4NNN
2C	824	1.54	316.0	347.6	0.1065	0.5493	19.39%	1	19.39%	XPY2AGQN4NNN
								TOTAL	20.96%	

Table 2 - Calculations according to CFR 47, Part 1.1310, Table 1(B)

Specified distance = 20 cm

For each radio, the frequency with the lowest limit was used and the highest power of all frequency bands to calculate the worse-case RF exposure.

When measurements were performed as EIRP, the antenna gain is listed as 1. In cases where the antenna gain is not listed as 1, the power measurement was performed as conducted and the antenna gain from the manufacturer's datasheet was used.

Transmitter 1 peak antenna gain = -0.4 dBi = 0.91 numeric gain

RF Exposure Evaluation

Transmitter 1: FCC ID: 2A0WY-0048

Transmitter 2: Is only one of the following:

Transmitter	Description	Part Number	FCC ID
2A	Digi XBee Cellular LTE CAT 1	XBC-V1-UT-001	RI7LE866SV1
2B	Digi XBee3 Cellular LTE CAT 1	XB3-C-A1-UT-001	RI7XE866A1NA*
2C	Digi XBee3 Cellular LTE-M	XB3-C-A2-UT-001	XPY2AGQN4NNN*

Module 2A through 2c antenna gain = 1.9 dBi = 1.54 numeric in 698 – 960 MHz band.

= 3.2 dBi = 2.09 numeric in the 1710 – 2690 band. See datasheet for details

The power density is calculated as shown below:

$$S = (P \times G) / (4 \times \pi \times d^2)$$

d = 20 cm - used to calculate exposure at 20 cm

$$1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

*Note: This device also includes Bluetooth functionality, but is not used. It is blocked in the firmware and the user has no way of accessing it. The module will also show FCC ID: MCQ-XB3M1. FCC ID: MCQ-XB3C1, but no functionality contained under this certification is used or available to the user.