

Appendix A: FCC Part 1.1307, 1.1310, 2.1091, 2.1093; IC RSS-Gen: RF Exposure

MPE Co-location Calculations

The maximum permissible RF exposure for an uncontrolled environment is specified in FCC 1.1310 table 1B.

From OET 65, $S = \text{EIRP} / 4\pi R^2$

where:

S = Power density (mW/cm²)

EIRP = Equivalent Isotropic Radiated Power

R = 20 cm separation distance

Power Density for Z-Wave

The MPE limit for the above device operating at 908.4 MHz for uncontrolled environments is 0.6 mW/cm²

EUT fundamental field strength at 908.4 MHz = 93.8 dBuV/m at 3 meters (from DXT test report)

$S = 0.00015 \text{ mW/cm}^2 = \text{at } 20 \text{ cm separation}$

Power Density for BOLT

Conducted power is 0.008 W (from DTS test report)

Maximum antenna gain for this frequency range of operation is 1.1 numeric (Alarm.com antenna specification)

$S = 0.0018 \text{ mW/cm}^2 = \text{at } 20 \text{ cm separation}$

Power Density for UAY-W8997-M1216 BT

Conducted power is 0.003 W (from grant)

Maximum antenna gain for this frequency range of operation is 1.66 numeric (Alarm.com antenna specification)

$S = 0.001 \text{ mW/cm}^2 = \text{at } 20 \text{ cm separation}$

Power Density for UAY-W8997-M1216 2.4 GHz Wi-Fi

Conducted power is 0.932 W (from grant)

Maximum antenna gain for this frequency range of operation is 1.66 numeric (Alarm.com antenna specification)

$S = 0.308 \text{ mW/cm}^2 = \text{at } 20 \text{ cm separation}$

Power Density for UAY-W8997-M1216 5 GHz Wi-Fi

Conducted power is 0.152 W (from grant)

Maximum antenna gain for this frequency range of operation is 3.09 numeric (Alarm.com antenna specification)

$S = 0.093 \text{ mW/cm}^2 =$ at 20 cm separation (worst-case for the 5 GHz band)

Power Density for FCC ID: RI7LE910SVL

The MPE limit for the above device operating at 779.5 – 784.5 MHz for uncontrolled environments is 0.6 mW/cm^2

Worst case conducted power for the low band is 0.170 W (from grant)

Maximum antenna gain for this frequency range of operation is -0.21 dBi / 0.95 numeric (Alarm.com antenna specification)

$S = 0.032 \text{ mW/cm}^2 =$ at 20 cm separation

The MPE limit for the above device operating at 1710.7 – 1754.3 MHz for uncontrolled environments is 1 mW/cm^2

Conducted power for this band is 0.194 W (from grant)

Maximum antenna gain for this frequency range of operation is 3.05 dBi / 2.02 numeric (Alarm.com antenna specification)

$S = 0.078 \text{ mW/cm}^2 =$ at 20 cm separation

Co-location - Summary of MPE: Z-Wave + BOLT + UAY-W8997-M1216 + RI7LE910SVL

Transmitter	Frequency (MHz)	MPE Result (mW/cm ²)	FCC Limit (mW/cm ²)	Ratio
Z-Wave	908.4	0.00015	0.6	0.00025
BOLT	912 – 924	0.0018	0.6	0.003
BT	2402 - 2480	0.001	1	0.001
2.4 GHz Wi-Fi	2412 – 2462	0.308	1	0.308
5 GHz Wi-Fi	5180 – 5240	0.093	1	0.093
LTE	1717.5 – 1747.5	0.078	1	0.078
			Sum of Ratios	0.48

Sum of ratios = $0.48 < 1$, therefore compliant.

Note: only showing upper band for RI7LE910SVL since it represents worst case

Thus, the EUT meets the uncontrolled exposure limit at 20 cm when all transmitters are transmitting simultaneously.

Power Density for FCC ID: RI7LE910NAV2

The MPE limit for the above device operating in the low band for uncontrolled environments is 0.6 mW/cm²

Worst case conducted power for the low band is 0.229 W (from grant)

Maximum antenna gain for this frequency range of operation is 0.77 dBi / 1.19 numeric (Alarm.com antenna specification)

$S = 0.05 \text{ mW/cm}^2 =$ at 20 cm separation

The MPE limit for the above device operating in the high band for uncontrolled environments is 1 mW/cm²

Conducted power for this band is 0.232 W (from grant)

Maximum antenna gain for this frequency range of operation is 2.92 dBi / 1.96 numeric (Alarm.com antenna specification)

$S = 0.09 \text{ mW/cm}^2 =$ at 20 cm separation

Co-location - Summary of MPE: Z-Wave + BOLT + UAY-W8997-M1216 + RI7LE910NAV2

Transmitter	Frequency (MHz)	MPE Result (mW/cm ²)	FCC Limit (mW/cm ²)	FCC Ratio	ISED Limit (mW/cm ²)	ISED Ratio
Z-Wave	908.4	0.00015	0.6	0.00025	0.28	0.0005
BOLT	912 – 924	0.0018	0.6	0.003	0.28	0.0064
BT	2402 - 2480	0.001	1	0.001	0.54	0.0019
2.4 GHz Wi-Fi	2412 – 2462	0.308	1	0.308	0.54	0.5704
5 GHz Wi-Fi	5180 – 5240	0.093	1	0.093	0.9	0.1033
LTE	1852.4 – 1907.6	0.09	1	0.09	0.45	0.20
			Sum of Ratios	0.50	Sum of Ratios	0.88

Sum of FCC ratios = 0.50 < 1, therefore compliant.

Sum of ISED ratios = 0.88 < 1, therefore compliant

Note: only showing upper band for RI7LE910NAV2 since it represents worst case

Thus, the EUT meets the uncontrolled exposure limit at 20 cm when all transmitters are transmitting simultaneously.