

## **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/cm<sup>2</sup>)

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/cm<sup>2</sup>

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  $0.6 \text{ mW/cm}^2$

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  $1 \text{ mW/cm}^2$

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 <sup>2</sup> )	FCC Limit (mW/cm <sup>2</sup> )	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
			<b>Sum of Ratios</b>	<b>0.48</b>

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/cm<sup>2</sup>

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/cm<sup>2</sup>

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 <sup>2</sup> )	FCC Limit (mW/cm <sup>2</sup> )	FCC Ratio	ISED Limit (mW/cm <sup>2</sup> )	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
			<b>Sum of Ratios</b>	<b>0.50</b>	<b>Sum of Ratios</b>	<b>0.88</b>

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.