

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^2)

EIRP = Equivalent Isotropic Radiated Power

R = 20 cm separation distance

Power Density for Zwave

The MPE limit for the above device operating at 908.4 MHz for uncontrolled environments is $0.6 \text{ mW}/\text{cm}^2$

EUT fundamental field strength at 908.4 MHz = 91.5 dBuV/m at 3 meters

$S = 0.00008 \text{ mW}/\text{cm}^2 = \text{at } 20 \text{ cm separation}$

Power Density for Image Sensor

Conducted power for the low band is 0.012 W (from DTS test report)

Maximum antenna gain for this frequency range of operation is -6.3 dBi / 0.24 numeric (Alarm.com antenna specification for this specific host)

$S = 0.0006 \text{ mW}/\text{cm}^2 = \text{at } 20 \text{ cm separation}$

Power Density for FCC ID: RI7CE910-DUAL

The MPE limit for the above device operating at 824.7 – 848.3 MHz for uncontrolled environments is 0.6 mW/cm²

Worst case conducted power for the low band is 0.292 W (from grant)

Maximum antenna gain for this frequency range of operation is -4.2 dBi / 0.38 numeric (Alarm.com antenna specification for this specific host)

$S = 0.02 \text{ mW/cm}^2 = \text{at } 20 \text{ cm separation}$

The MPE limit for the above device operating at 1851.25 - 1908.75 MHz for uncontrolled environments is 1 mW/cm²

Conducted power for this band is 0.278 W (from grant)

Maximum antenna gain for this frequency range of operation is 3.59 dBi / 2.3 numeric (Alarm.com antenna specification for this specific host)

$S = 0.13 \text{ mW/cm}^2 = \text{at } 20 \text{ cm separation}$

Co-location - Summary of MPE: Zwave + Image Sensor + RI7CE910-DUAL

Frequency (MHz)	MPE Result (mW/cm ²)	Limit (mW/cm ²)
908.4	0.00008	0.6
912 - 924	0.0006	0.6
1851.25 – 1908.75	0.13	1

MPE (1)	MPE (2)	MPE (3)	MPE Power Density Aggregate MPE(1) + MPE(2) + MPE(3) < 0.6 (mW/cm ²)	Power Density Limit (mW/cm ²)
908.4 MHz	912 - 924 MHz	1851.25 – 1908.75 MHz		
0.00008	0.0006	0.13	0.13	0.6

Note: only showing upper band for RI7CE910-DUAL 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: RI7UE910NA

The MPE limit for the above device operating at 824.2 – 848.8 MHz for uncontrolled environments is 0.6 mW/cm²

Worst case conducted power for the low band is 0.953 W (from RI7UE910NA RF exposure exhibit)

Maximum antenna gain for this frequency range of operation is -4.2 dBi / 0.38 numeric (Alarm.com antenna specification for this specific host)

$$S = 0.26 \text{ mW/cm}^2 = \text{at 20 cm separation}$$

The MPE limit for the above device operating at 1850.2 - 1909.8 MHz for uncontrolled environments is 1 mW/cm²

Conducted power for this band is 0.234 W (from RI7UE910NA RF exposure exhibit)

Maximum antenna gain for this frequency range of operation is 3.59 dBi / 2.3 numeric (Alarm.com antenna specification for this specific host)

$$S = 0.41 \text{ mW/cm}^2 = \text{at 20 cm separation}$$

Co-location - Summary of MPE: Zwave + Image Sensor + RI7UE910NA

Frequency (MHz)	MPE Result (mW/cm ²)	Limit (mW/cm ²)
908.4	0.00008	0.6
912 - 924	0.0006	0.6
1850.2 - 1909.8	0.11	1

MPE (1)	MPE (2)	MPE (3)	MPE Power Density Aggregate MPE(1) + MPE(2) + MPE(3) < 0.6 (mW/cm ²)	Power Density Limit (mW/cm ²)
908.4 MHz	912 - 924 MHz	1850.2 - 1909.8 MHz		
0.00008	0.0006	0.11	0.11	0.6

Note: only showing upper band for RI7UE910NA 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: RI7HE910NA

The MPE limit for the above device operating at 824.2 – 848.8 MHz for uncontrolled environments is 0.6 mW/cm²

Worst case conducted power for the low band is 1.64 W (from RI7HE910NA RF exposure exhibit)

Maximum antenna gain for this frequency range of operation is -4.2 dBi / 0.38 numeric (Alarm.com antenna specification for this specific host)

$$S = 0.45 \text{ mW/cm}^2 = \text{at 20 cm separation}$$

The MPE limit for the above device operating at 1850.2 - 1909.8 MHz for uncontrolled environments is 1 mW/cm²

Conducted power for this band is 0.793 W (from RI7HE910NA RF exposure exhibit)

Maximum antenna gain for this frequency range of operation is 3.59 dBi / 2.3 numeric (Alarm.com antenna specification for this specific host)

$$S = 0.36 \text{ mW/cm}^2 = \text{at 20 cm separation}$$

Co-location - Summary of MPE: Zwave + Image Sensor + RI7HE910NA

Frequency (MHz)	MPE Result (mW/cm ²)	Limit (mW/cm ²)
908.4	0.00008	0.6
912 - 924	0.0006	0.6
1850.2 – 1909.8	0.36	1

MPE (1)	MPE (2)	MPE (3)	MPE Power Density Aggregate MPE(1) + MPE(2) + MPE(3) < 0.6 (mW/cm ²)	Power Density Limit (mW/cm ²)
908.4 MHz	912 - 924 MHz	1851.25 – 1908.75 MHz		
0.00008	0.0006	0.36	0.36	0.6

Note: only showing upper band for RI7HE910NA since it represents worst case

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