

REGULATORY COMPLIANCE REPORT

TITLE: FCC & IC MPE Report for 15.247 & RSS-210 Frequency Hopping Device

CCU/Repeater: FCC ID: EO9CCU100A; IC: 864A-CCU100A

AUTHOR:

REV	CCO	DESCRIPTION OF CHANGE	DATE	<u>APPROVALS</u>	
001		INITIAL RELEASE		Engineering	
				Regulatory	

REVISION HISTORY

a		initial upload		Engineering	
				Regulatory	
				Engineering	
				Regulatory	
				Engineering	
				Regulatory	

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Test Data Summary**FCC 15.247 / IC RSS-210; Frequency Hopping Transmitter;**

903MHz – 926.8 MHz for EUT

FCC ID:EO9CCU100A; IC:864A-CCU100A

IC Device Models (for IC): CCU100A; CCU100RA; CCU100A Repeater; CCU100RA Repeater

Rule	Description	Spec Limit	Max. Reading	Pass/Fail
Parts 1.1310 & 2.1091(mobile) or 2.1093 (portable) / RSS-102 Sec 4.2	Limits for Maximum Permissible Exposure (MPE)	formula	0.55 mW / cm ² @ 29 cm 5.5 W/m ² @ 0.29 M	Pass

*Rule versions: FCC Part 1; FCC Part 2; FCC Part 15, RSS-102 Issue 4 (03-2010); RSS-210 Issue 8 (12-2010); RSS-Gen Issue 3 (12-2010).**Reference docs: ANSI C63.4-2003; DA 00-705 (03-30-2000); OET65 (08-1997); OET65C (06-2001); IEEE C95.3-2002.*

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CONDITIONS DURING TESTING

No Modifications to the EUT were necessary during the testing.

ANSI C63.4 - Temperature and Humidity During Testing

The temperature during testing was within +10° C and +40° C.

The Relative humidity was between 10% and 90%.

RSS-Gen 4.3: Tests shall be performed at ambient temperature

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Ittron declares that the EUT tested was representative of a production unit.

EQUIPMENT UNDER TEST**EUT Module**

Manuf: Ittron, Inc.

Peripheral Devices

None

**1.1310 & 2.1091(mobile) or 2.1093(portable) / RSS-102 Sec 4.2-Canada Safety
Code 6; Table 5**

Maximum Permissible Exposure (MPE)

Radiofrequency radiation exposure limits. - The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

1.1307 (b) In addition to the actions listed in paragraph (a) of this section, Commission actions granting construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities, require the preparation of an Environmental Assessment (EA) if the particular facility, operation or transmitter would cause human exposure to levels of radiofrequency radiation in excess of the limits in §§1.1310 and 2.1093 of this chapter.

MPE reports:

WiFi	CKC 90893-15
ISM	CKC 91909-10
WWAN	N7N-MC8790 09U12924-1

radio	frequency range (MHz)	measured output power (dbm)	conducted power (watts)	maximum mobile antenna gain (dbi)	antenna gain numeric	maximum EIRP (dBm)
WiFi	2400-2483.5	16.4	0.0437	0.5	1.12	16.90
ISM	902-928	29.7	0.933	5.15	3.27	34.85
WWAN	824.2-848.8	32	1.585	5	3.16	37
	2.4GHz	18.08	0.064	5	3.16	23.08

FCC:

radio	frequency range (MHz)	EIRP (mW)	distance (cm)	power density (mW/cm^2)	limit (mW/cm^2)	Duty Cycle
WiFi	2400-2483.5	49	20	0.0097	1.0	100%
ISM	902-928	3055	20	0.608	0.610	100%
WWAN	824/850	2506	20	0.499	0.55	50%
	2.4GHz	203.2	20	0.040	1.0	100%
	(combined)			(0.539)	(0.55)	(75%)
total			29	0.55	0.55	87.5%

Industry Canada:

radio	frequency range (MHz)	EIRP (W)	distance (m)	power density (W/m^2)	limit (W/m^2)	Duty Cycle
WiFi	2400-2483.5	0.049	0.2	0.097	10	100%
ISM	902-928	3.055	0.2	6.078	6.10	100%
WWAN	824/850	2.506	0.2	4.986	5.5	50%
	2.4GHz	0.2032	0.2	0.404	1.0	100%
	(combined)			(5.39)	(5.5)	(75%)
total			0.29	5.5	5.5	87.5%

Determine the maximum power density for the general / uncontrolled population minimum separation distance of 20 cm.

$$\begin{array}{lll} \text{for frequencies } < 1 \text{ GHz:} & f_{\text{MHz}} / 1500 \text{ mW/cm}^2 & == f_{\text{MHz}} / 150 \text{ W/m}^2 \\ \text{for frequencies } > 1 \text{ GHz:} & 1 \text{ mW/cm}^2 & == 10 \text{ W/cm}^2 \end{array}$$

The power density is calculated as:

$$P_d = \text{power density in mW/cm}^2$$

$$P_t = \text{transmit power in milliwatts} \quad P_d = \frac{P_t \times G}{4 \times \pi \times r^2}$$

G = numeric antenna gain

r = distance between body and transmitter in centimeters.

$$\begin{array}{ll} \text{FCC Limits: } 2.4 \text{ GHz} & = 1 \text{ mW/cm}^2 @ 20 \text{ cm} \\ 926.8 \text{ MHz} / 1500 & = 0.618 \text{ mW/cm}^2 @ 20 \text{ cm} \\ 824.2 \text{ MHz} / 1500 & = 0.55 \text{ mW/cm}^2 @ 20 \text{ cm} \end{array}$$

$$\begin{array}{ll} \text{IC Limits: } 2.4 \text{ GHz} & = 10 \text{ W/m}^2 @ 0.2 \text{ m} \\ 926.8 \text{ MHz} / 150 & = 6.18 \text{ W/m}^2 @ 0.2 \text{ m} \\ 824.2 \text{ MHz} / 150 & = 5.5 \text{ W/m}^2 @ 0.1 \text{ m} \end{array}$$

WiFi

Max antenna gain = 0.5 dBi = 1.12 numeric

Max TX power = 16.4 dBm = 43.7 milliwatts

$$\begin{array}{ll} \text{results: } P_D = (43.7 \times 1.12) / (4 \times \pi \times 20 \text{ cm}^2) & = 0.0097 \text{ mW/cm}^2 @ 20 \text{ cm} \\ \text{W/m}^2 = 10 \text{ times mW/cm}^2 & = 0.0974 \text{ W/m}^2 @ 0.2 \text{ m} \end{array}$$

ISM

Max antenna gain = 5.15 dBi = 3.27 numeric

Max TX power = 29.7 dBm = 933 milliwatts

$$\begin{array}{ll} \text{results: } P_D = (933 \times 3.27) / (4 \times \pi \times 20 \text{ cm}^2) & = 0.608 \text{ mW/cm}^2 @ 20 \text{ cm} \\ \text{W/m}^2 = 10 \text{ times mW/cm}^2 & = 6.078 \text{ W/m}^2 @ 0.2 \text{ m} \end{array}$$

WWAN - 824MHz

Max antenna gain = 5 dBi = 3.16 numeric

Max TX power = 32 dBm = 1585 milliwatts

$$\begin{array}{ll} \text{results: } P_D = (1585 \times 3.16) / (4 \times \pi \times 20 \text{ cm}^2) * 50\% \text{ duty cycle} & = 0.498 \text{ mW/cm}^2 @ 20 \text{ cm} \\ \text{W/m}^2 = 10 \text{ times mW/cm}^2 * 50\% \text{ duty cycle} & = 4.983 \text{ W/m}^2 @ 0.2 \text{ m} \end{array}$$

WWAN - 2.4GHz

Max antenna gain = 5 dBi = 3.16 numeric

Max TX power = 18.08 dBm = 64 milliwatts

$$\begin{array}{ll} \text{results: } P_D = (64 \times 3.16) / (4 \times \pi \times 20 \text{ cm}^2) & = 0.040 \text{ mW/cm}^2 @ 20 \text{ cm} \\ \text{W/m}^2 = 10 \text{ times mW/cm}^2 & = 0.404 \text{ W/m}^2 @ 0.2 \text{ m} \end{array}$$