Excellence in Compliance Testing

Certification Exhibit

FCC ID: SK9CRUG1
IC: 864G-CRUG1

FCC Rule Part: 15.247, 15.249
IC Radio Standards Specification: RSS-210

ACS Report Number(s): 09-0255

Manufacturer: Itron Inc.
Model(s): C2SOR

RF Exposure

General Information:

Applicant: Itron Electricity Metering Inc.
ACS Project: 09-0255
FCC ID: SK9CRUG1
Device Category: Mobile
Environment: General Population/Uncontrolled Exposure
Exposure Conditions: Greater than 20 centimeters
Simultaneous Tx: Yes

Technical Information:

Radio	900 MHz LAN	2.4GHz Zigbee (Register PCB)	2.4GHz Zigbee (Cell Relay PCB)	GSM Modem Module *FCC ID: N7NMC8790 IC:2417C-MC8790*	CDMA Modem Module *FCC ID: N7N-MC5725 IC:2417C-MC5725*
Antenna Type	¼ Wave Slot	¼ Wave Slot	Patch	Patch	Patch
Antenna Gain	2.2 dBi	4.4 dBi	3 dBi	GSM850: 2.5 dBi GSM 1900: 3.2 dBi	CDMA850: 2.5 dBi CDMA 1900: 3.2 dBi
Conducted Power	23.27dBm	15.00dBm	-6.88 dBm	GSM 850: 31.8dBm GSM 1900: 28.7dBm	CDMA 850: 25.13dBm CDMA 1900: 24.84dBm
Maximum EIRP	352 mW	87 mW	0.40 mW	GSM 850: 2.69 W GSM 1900: 1.54 W	CDMA 850: 0.579 W CDMA 1900: 0.636 W
Maximum ERP	214 mW	53 mW	0.24 mW	GSM 850: 1.64 W GSM 1900: 0.944 W	CDMA 850: 0.353 W CDMA 1900: 0.388 W

MPE Calculation:

Calculated Conducted Power (15.249) – Cell Relay 2.4GHz Zigbee Radio
For the purpose of determining Power Density for the 2.4GHz Zigbee radio on the Cell Relay PCB the conducted RF power must first be calculated.

The power was calculated using the following equation:

$$P = (E * d)^2 / 30 * G$$

Where: G = Numeric Gain of the transmitting antenna with reference to an isotropic radiator
d = The distance in meters from which the field strength was measured
E = The measured maximum fundamental field strength in V/m

Table 1: Maximum Fundamental Field Strength

Frequency (MHz)	Uncorrected Reading (dBµV/m)	Antenna Polarity (H/V)	Total Correction Factor (dB)	Corrected Reading (dBµV/m)
2480	90.03	H	1.35	91.38

Table 2: Peak Output Power

Frequency (MHz)	Numeric Gain	Distance (m)	Max. Fund. Field Strength (V/m)	Output Power (dBm)
2480	2.00	3	0.04	-6.88

Power Density

The Power Density (mW/cm^2) is calculated as follows:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Source Based Time Averaging of GPRS/EDGE Modem

The GPRS Modem is a Class 12 modem with a 50% source-based time averaged duty cycle. The measured level was reduced by a factor 3dB to account for the duty cycle of the Modem. The duty cycle correction factor is determined using the formula: 10log (0.50) = 3dB.

Corrected Level 850 = 31.8 – 3.0 = 28.8dBm
Corrected Level 1900 = 28.7 – 3.0 = 25.7dBm

MPE Calculator for Mobile Equipment Limits for General Population/Uncontrolled Exposure*							
Transmit Frequency (MHz)	**Radio Power (dBm)**	**Power Density Limit (mW/Cm2)**	**Radio Power (mW)**	**Antenna Gain (dBi)**	**Antenna Gain (mW eq.)**	**Distance (cm)**	**Power Density (mW/cm^2)**
902.25	23.27	0.60	212.32	2.2	1.660	20	0.070
2405	15	1.00	31.62	4.4	2.754	20	0.017
2480	-6.88	1.00	0.21	3	1.995	20	0.000
824	28.8	0.55	758.58	2.5	1.778	20	0.268
1850	25.7	1.00	371.54	3.2	2.089	20	0.154
824	25.13	0.55	325.84	2.5	1.778	20	0.115
1850	24.84	1.00	304.79	3.2	2.089	20	0.127

Summation of Power Densities – Simultaneous Transmissions

This device contains multiple transmitters which can operate simultaneously and therefore the maximum RF exposure is determined by the summation of power densities. The 900 MHz LAN and high power Zigbee radio can not operate simultaneously there it is not appropriate to include both of those power density values in the same summation of power densities. For the sake of providing the worst case data, the highest power density from those two transmitters will be applied for the calculations.

The maximum power density as calculated by a summation of power densities for each simultaneous transmission combination as follows:

GSM Modem Operating in the 800MHz Cellular Band:

900MHz LAN:	0.070 (mW/cm^2)
2.4GHz Zigbee:	0.017 (mW/cm^2)
GSM 850:	0.268 (mW/cm^2)
TOTAL:	**0.355 (mW/cm^2)**

GSM Modem Operating in the 1900MHz PCS Band:

900MHz LAN:	0.070 (mW/cm^2)
2.4GHz Zigbee:	0.017 (mW/cm^2)
GSM 1900:	0.154 (mW/cm^2)
TOTAL:	**0.241 (mW/cm^2)**

CDMA Modem Operating in the 800MHz Cellular Band:

900MHz LAN:	0.070 (mW/cm^2)
2.4GHz Zigbee:	0.017 (mW/cm^2)
CDMA 850:	0.115 (mW/cm^2)
TOTAL:	**0.202 (mW/cm^2)**

CDMA Modem Operating in the 1900MHz PCS Band:

900MHz LAN:	0.070 (mW/cm^2)
2.4GHz Zigbee:	0.017 (mW/cm^2)
CDMA 1900:	0.127 (mW/cm^2)
TOTAL:	**0.214 (mW/cm^2)**

Installation Guidelines:

The installation manual shall contain text similar to the following advising how to install the equipment to maintain compliance with the FCC RF exposure requirements:

"RF Exposure (Intentional Radiators Only)
In accordance with FCC requirements of human exposure to radiofrequency fields, the radiating element shall be installed such that a minimum separation distance of 20cm is maintained from the general population."

Conclusion:

This device complies with the MPE requirements by providing adequate separation between the device, any radiating structure and the general population.