Excellence in Compliance Testing

Certification Test Report

FCC ID: SK9CRUG1
IC: 864G-CRUG1

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

ACS Report Number: 09-0255-15C-DSS

Manufacturer: Itron, Inc.
Model: C2SOR

Test Begin Date: August 7, 2009
Test End Date: September 15, 2009

Report Issue Date: September 28, 2009

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Prepared by: Ken Rivers

Ken Rivers
Wireless Certifications Technician
ACS, Inc.

Reviewed by:

Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 23 pages

Table of Contents

Additional Exhibits Included In Filing

Internal Photographs
External Photographs
Test Setup Photographs
Label information
RF Exposure
Manual
Theory of Operation
System Block Diagram
Schematics

1.0 GENERAL

1.1 Purpose
The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product Description

1.2.1 General
The C2SOR is an ANSI C12.22 relay that routes meter data traffic from a proprietary 900 MHz RFLAN mesh network to a Collection Engine server via a wide area network IP backhaul. The C2SOR performs C12.22 aptitle and routing translations on the data it is routing. The C2SOR also contains two short range Zigbee radios that are used for wireless device configuration.

Manufacturer Information:
Itron, Inc.
313 North Highway 11
West Union SC 29696

Test Sample Serial Number(s):
FCC UNIT #2

Test Sample Condition:
Test sample was in good working condition with no defects.

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use
The C2SOR is an ANSI C12.22 relay that routes meter data traffic from a proprietary 900 MHz RFLAN mesh network to a Collection Engine server via a wide area network IP backhaul. The C2SOR also contains two short range Zigbee radios that are used for wireless device configuration.

1.3 Test Methodology and Considerations
The EUT was tested in a configuration typical of normal use.

This device is considered a composite device by definition. The 900 MHz LAN and high power 2.4 GHz Zigbee radios operate under CFR 47 Part 15.247 and IC RSS-210. The low power 2.4 GHz Zigbee radio operates under CFR 47 Part 15.249 and IC RSS-210. This report addresses Part 15.247 and RSS 210 for the 900 MHz LAN radio only. Separate reports will be issued for Part 15.247 and RSS 210 in reference to the high power 2.4GHz Zigbee radio and FCC Part 15.249 and RSS 210 for the low power 2.4 GHz Zigbee radio.

The C2SOR also includes either pre-approved GSM cellular modem FCC ID: N7NMC8790 / IC: 2417C-MC8790 or pre-approved CDMA cellular modem FCC ID: N7N-MC5725 / IC: 2417C-MC5725 but not both. Where applicable, testing was performed on both configurations.

All radios including the cellular modem can transmit simultaneously therefore radiated inter-modulation products were performed and found to be in compliance.

See test setup photographs for additional information.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO/IEC 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

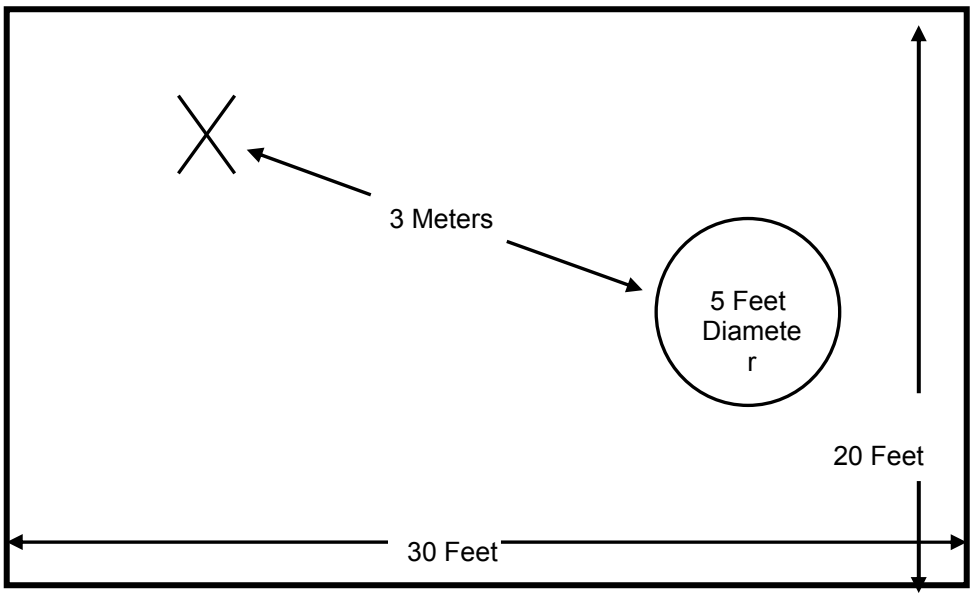

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

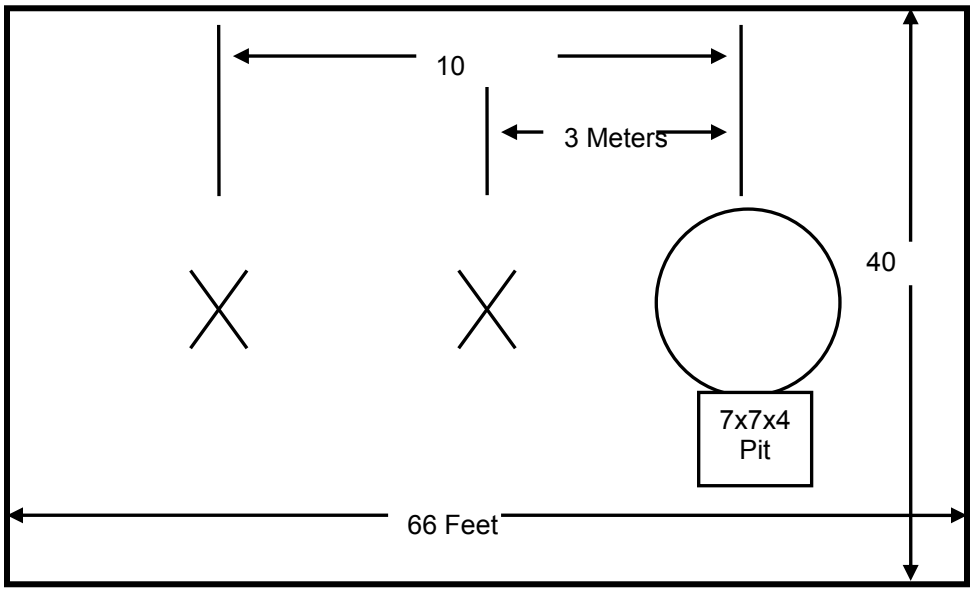

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

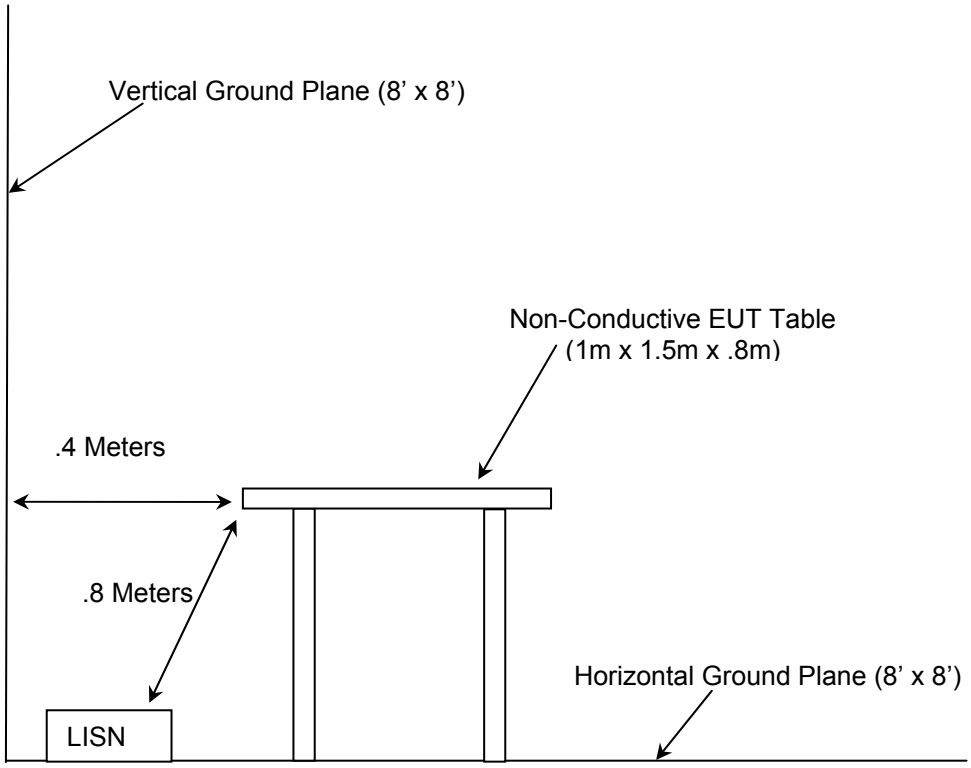

Figure 2.4-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2009
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2009
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 7 June 2007
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.
- FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, 2001
- FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000

4.0 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	09-19-2009
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	09-19-2009
3	Rohde & Schwarz	Spectrum Analyzers	ESMI-Display	839379/011	02-02-2010
4	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	833827/003	02-02-2010
22	Agilent	Amplifiers	8449B	3008A00526	10-22-2009
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-08-2010
40	Electro-Metrics	Antennas	3104	3211	01-22-2010
152	EMCO	LISN	3825/2	9111-1905	03-25-2010
167	ACS	Cable Set	Chamber EMI Cable Set	167	02-06-2010 (See Note1)
168	Hewlett Packard	Attenuators	11947A	44829	02-10-2010 (See Note2)
222	Andrew	Cables	F1-SMSM	473703-A0138A	08-14-2010 (See Note1)
277	Emco	Antennas	93146	9904-5199	09-18-2009
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	09-19-2009
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2009 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2009 (See Note1)
321	Hewlett Packard	Amplifiers	HPC 8447D	1937A02809	10-08-2009
324	ACS	Cables	Belden	8214	07-15-2010
338	Hewlett Packard	Amplifier	8449B	3008A01111	10-22-2009
340	Aeroflex/Weinschel	Attenuators	AS-20	7136	10-22-2009 (See Note2)
331	Microwave Circuits	Filters	H1G513G1	31417	07-17-2010
412	Electro Metrics	Antennas	LPA-25	1241	07-23-2010
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	02-05-2010 (See Note1)

Note1: Items characterized on an annual cycle. The date shown indicates the next characterization due date.
Note2: Items verified on an annual cycle. The date shown indicates the next verification due date.

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Meter Base Enclosure	Milbank MFG.	3R	NA
2	EUT	Itron Electricity Metering	C2SOR	FCC UNIT #2
3	Voltage Transformer	Sangamo Weston, Inc.	Type T-6A	8108966

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAMS

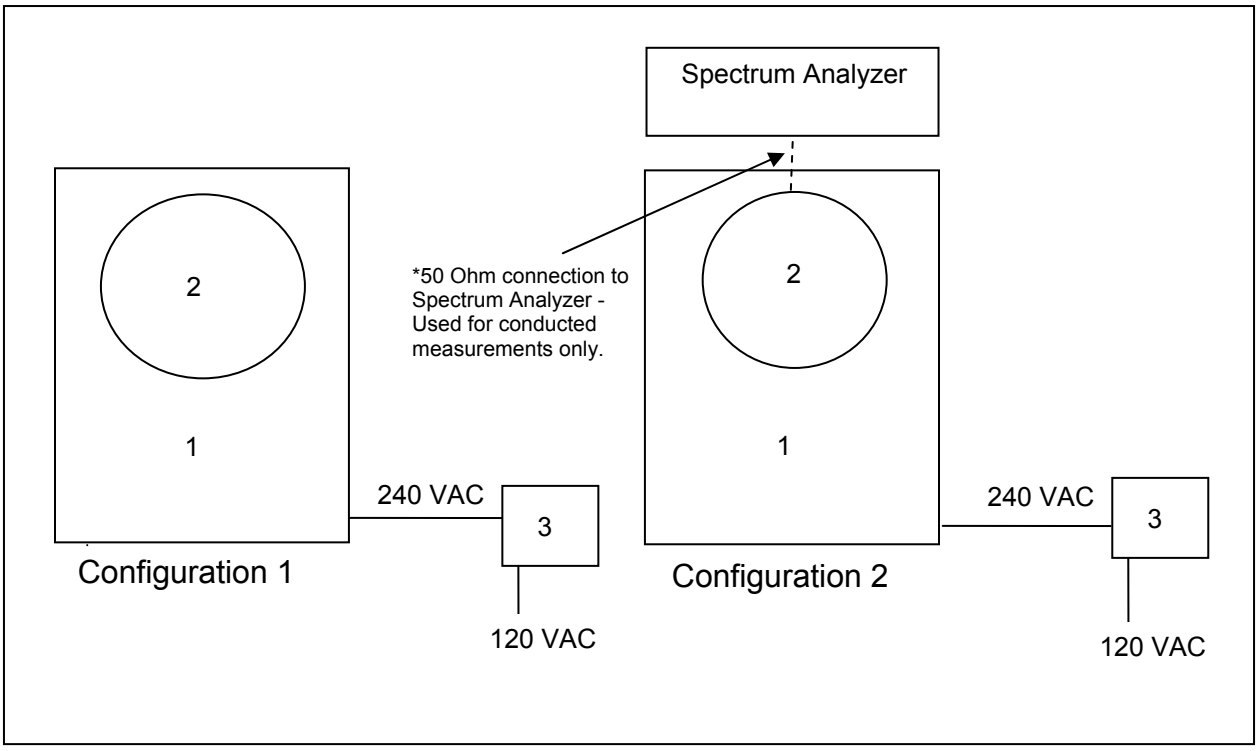

Figure 6-1: EUT Test Setup

*See Test Setup photographs for additional detail.

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The C2SOR includes a 900 MHz ¼ wave slot antenna with a measured gain of 2.2 dBi.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.2

7.2.1 Test Methodology

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Test Results

Results of the test are shown below in and Table 7.2.2-1 to 7.2.2-2 and figures 7.2.2-1 to 7.2.2-2.

Table 7.2.2-1: Line 1 Conducted EMI Results – GSM Modem

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.264	40.50	10.0	61	20.50	L1	GND	QP
0.462	10.80	10.0	57	46.20	L1	GND	QP
0.534	34.90	10.0	56	21.10	L1	GND	QP
0.828	43.40	10.0	56	12.60	L1	GND	QP
1.056	34.60	10.0	56	21.40	L1	GND	QP
1.062	35.40	10.0	56	20.60	L1	GND	QP
1.254	20.00	10.0	56	36.00	L1	GND	QP
1.650	39.10	10.0	56	16.90	L1	GND	QP
2.526	40.10	10.0	56	15.90	L1	GND	QP
3.306	33.40	9.9	56	22.60	L1	GND	QP
0.240	12.60	9.9	52	39.40	L1	GND	AVG
0.462	7.50	10.0	47	39.50	L1	GND	AVG
0.504	19.70	10.0	46	26.30	L1	GND	AVG
0.828	43.40	10.0	46	2.60	L1	GND	AVG
1.008	18.90	10.0	46	27.10	L1	GND	AVG
1.122	7.60	10.0	46	38.40	L1	GND	AVG
1.200	24.80	10.0	46	21.20	L1	GND	AVG
1.650	35.30	10.0	46	10.70	L1	GND	AVG
2.520	34.90	10.0	46	11.10	L1	GND	AVG
3.306	32.00	9.9	46	14.00	L1	GND	AVG

Table 7.2.2-2: Line 2 Conducted EMI Results – GSM Modem

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.828	43.90	10.0	56	12.10	L2	GND	QP
1.314	12.00	10.0	56	44.00	L2	GND	QP
1.404	18.40	10.0	56	37.60	L2	GND	QP
1.650	36.00	10.0	56	20.00	L2	GND	QP
1.974	37.40	10.0	56	18.60	L2	GND	QP
2.112	36.70	10.0	56	19.30	L2	GND	QP
2.316	17.50	10.0	56	38.50	L2	GND	QP
2.484	39.50	10.0	56	16.50	L2	GND	QP
2.496	40.60	10.0	56	15.40	L2	GND	QP
2.628	37.40	10.0	56	18.60	L2	GND	QP
0.828	44.20	10.0	46	1.80	L2	GND	AVG
1.314	34.10	10.0	46	11.90	L2	GND	AVG
1.446	33.70	10.0	46	12.30	L2	GND	AVG
1.650	37.00	10.0	46	9.00	L2	GND	AVG
2.028	10.50	10.0	46	35.50	L2	GND	AVG
2.148	9.50	10.0	46	36.50	L2	GND	AVG
2.244	27.50	10.0	46	18.50	L2	GND	AVG
2.472	20.40	10.0	46	25.60	L2	GND	AVG
2.496	33.30	10.0	46	12.70	L2	GND	AVG
2.628	31.50	10.0	46	14.50	L2	GND	AVG

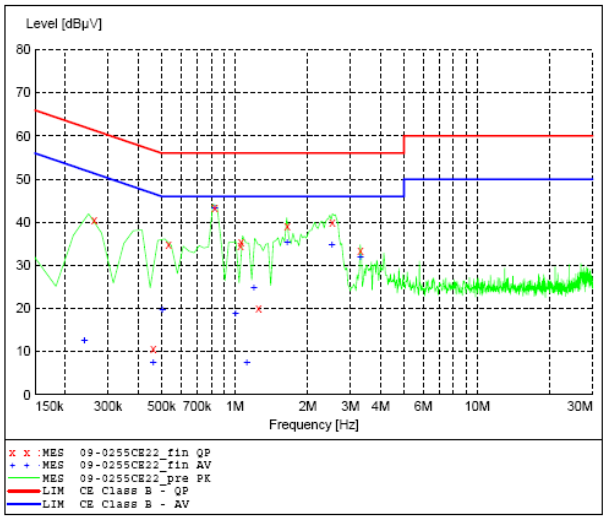

Figure 7.2.2-1: Line 1 Conducted EMI Results – GSM Modem

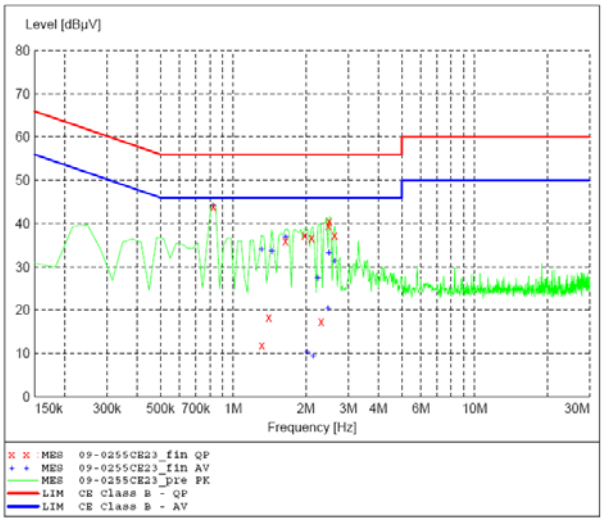

Figure 7.2.2-2: Line 2 Conducted EMI Results – GSM Modem

Table 7.2.2-3: Line 1 Conducted EMI Results – CDMA Modem

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.882	42.40	10.0	56	13.60	L1	GND	QP
1.206	33.90	10.0	56	22.10	L1	GND	QP
1.608	35.20	10.0	56	20.80	L1	GND	QP
1.740	35.70	10.0	56	20.30	L1	GND	QP
1.872	35.80	10.0	56	20.20	L1	GND	QP
2.004	36.80	10.0	56	19.20	L1	GND	QP
2.142	37.60	10.0	56	18.40	L1	GND	QP
2.274	37.20	10.0	56	18.80	L1	GND	QP
2.406	37.50	10.0	56	18.50	L1	GND	QP
2.538	37.00	9.9	56	19.00	L1	GND	QP
0.882	42.30	9.9	46	3.70	L1	GND	AVG
1.206	30.80	10.0	46	15.20	L1	GND	AVG
1.602	32.10	10.0	46	13.90	L1	GND	AVG
1.734	28.80	10.0	46	17.20	L1	GND	AVG
1.872	31.70	10.0	46	14.30	L1	GND	AVG
2.004	32.20	10.0	46	13.80	L1	GND	AVG
2.142	32.00	10.0	46	14.00	L1	GND	AVG
2.280	26.90	10.0	46	19.10	L1	GND	AVG
2.406	32.40	10.0	46	13.60	L1	GND	AVG
2.538	32.00	9.9	46	14.00	L1	GND	AVG

Table 7.2.2-4: Line 2 Conducted EMI Results – CDMA Modem

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.882	43.20	10.0	56	12.80	L2	GND	QP
1.338	36.20	10.0	56	19.80	L2	GND	QP
1.584	25.20	10.0	56	30.80	L2	GND	QP
1.746	36.30	10.0	56	19.70	L2	GND	QP
1.872	36.70	10.0	56	19.30	L2	GND	QP
2.010	36.40	10.0	56	19.60	L2	GND	QP
2.274	38.10	10.0	56	17.90	L2	GND	QP
2.412	39.40	10.0	56	16.60	L2	GND	QP
2.640	28.90	10.0	56	27.10	L2	GND	QP
2.754	10.70	10.0	56	45.30	L2	GND	QP
0.882	43.30	10.0	46	2.70	L2	GND	AVG
1.338	33.20	10.0	46	12.80	L2	GND	AVG
1.560	8.60	10.0	46	37.40	L2	GND	AVG
1.740	32.60	10.0	46	13.40	L2	GND	AVG
1.872	32.80	10.0	46	13.20	L2	GND	AVG
2.010	31.70	10.0	46	14.30	L2	GND	AVG
2.274	33.00	10.0	46	13.00	L2	GND	AVG
2.412	33.10	10.0	46	12.90	L2	GND	AVG
2.640	28.20	10.0	46	17.80	L2	GND	AVG
2.718	7.90	10.0	46	38.10	L2	GND	AVG

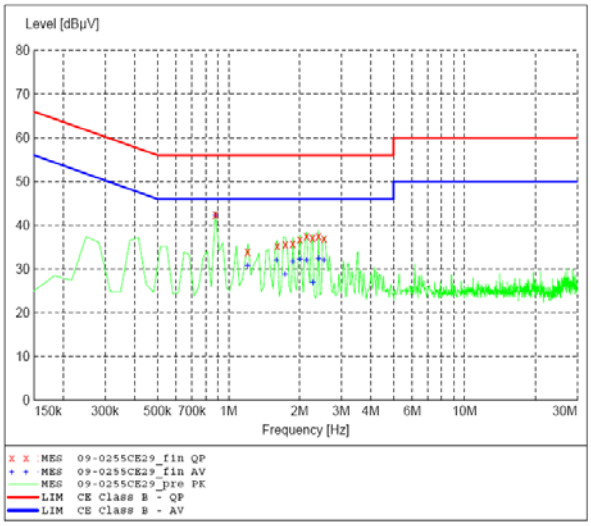

Figure 7.2.2-3: Line 1 Conducted EMI Results – CDMA Modem

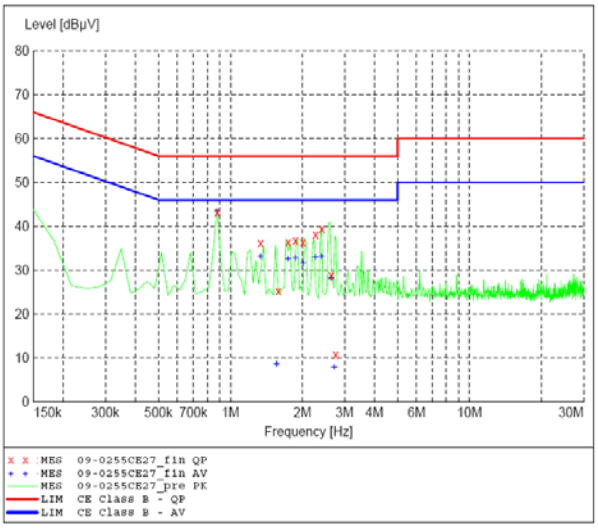

Figure 7.2.2-4: Line 2 Conducted EMI Results – CDMA Modem

7.3 Radiated Emissions – FCC: Section 15.109(Unintentional Radiation) IC: RSS-210 2.6

7.3.1 Test Methodology

Radiated emissions tests were performed over the frequency range of 30MHz to 12.5GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz and 3MHz respectively.

7.3.2 Test Results

Results of the test are given in Table 7.3.2-1 below:

Table 7.3.2-1 – Radiated Emissions (Unintentional)

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
97.091	---------	45.41	V	-14.72	---------	30.69	--------	43.5	---------	12.81
136.203	---------	42.90	V	-14.13	---------	28.77	--------	43.5	---------	14.73
239.991	---------	47.22	H	-13.30	---------	33.92	--------	46.0	---------	12.08
452.96	---------	45.11	V	-7.61	---------	37.50	--------	46.0	---------	8.50
494.917	---------	44.42	V	-6.25	---------	38.17	--------	46.0	---------	7.83
511.677	---------	40.18	H	-5.27	---------	34.91	--------	46.0	---------	11.09

* Note: All emissions above 511.677MHz were not detected above the noise floor of the measurement equipment and therefore attenuated below the permissible limit.

7.4 Peak Output Power - FCC Section 15.247(b)(2) IC: RSS-210 A8.4(1)

7.4.1 Test Methodology (Conducted Method)

The 20dB bandwidth of the EUT was within the resolution bandwidth of spectrum analyzer, therefore the power measurement was made using the spectrum analyzer method. The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The resolution and video bandwidth were set to >>> 20 dB bandwidth of the emission measured. The device employs >50 channels therefore the power is limited to 1 Watt which is equivalent to 30 dBm.

7.4.2 Test Results

Results are shown below in table 7.4.2-1 and the worst case was plotted and shown in figure 7.4.2-1 to 7.4.2-3 below:

Table 7.4.2-1: RF Output Power

Frequency [MHz]	Level [dBm]
902.25	23.24
914.75	23.27
927.75	22.60

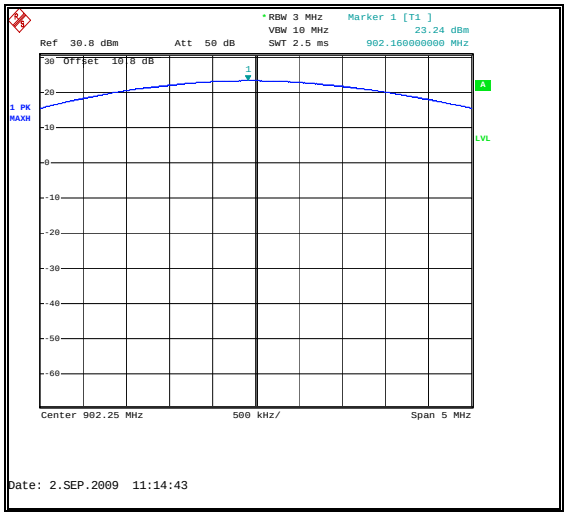

Figure 7.4.2-1: Output power – Low Channel

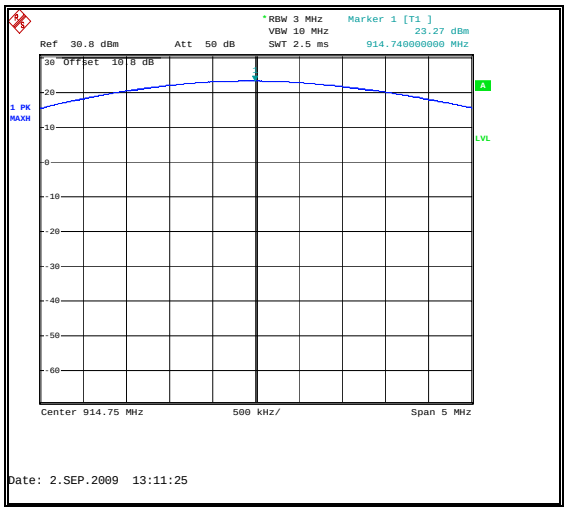

Figure 7.4.2-2: Output power – Mid Channel

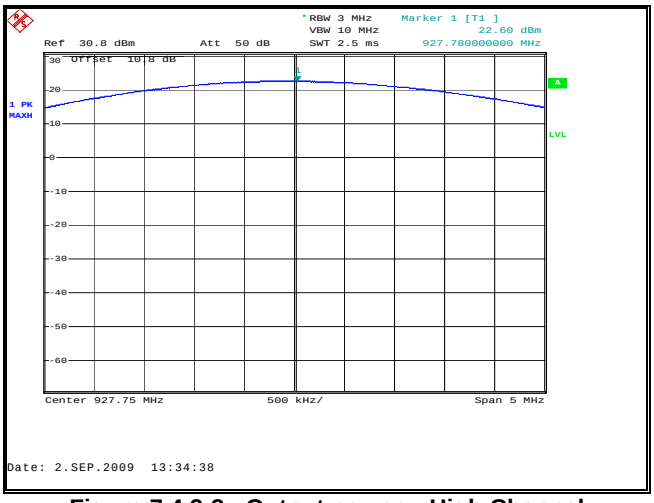

Figure 7.4.2-3: Output power – High Channel

7.5 Channel Usage Requirements

7.5.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1) IC: RSS-210 A8.1(b)

7.5.1.1 Test Methodology

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW and VBW were set to ≥ 1% of the span.

7.5.1.2 Test Results

The maximum 20dB bandwidth of the hopping channel was measured to be 98.1kHz (See figure 7.5.4.2-1 to 7.5.4.2-3 below). The adjacent channel separation was measured to be 500kHz. Results are shown in figure 7.5.1.2-1 below:

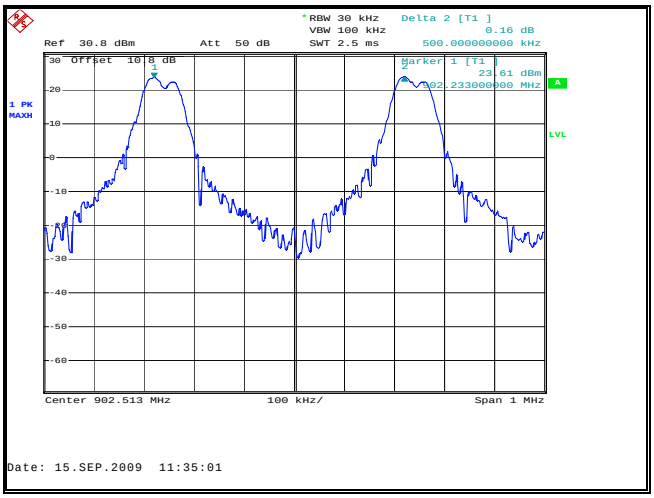

Figure 7.5.1.2-1: Carrier Frequency Separation

7.5.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

The 20dB bandwidth of the device is less than 250 kHz. The device employs more than 50 hopping channels as required. Results are shown in Figure 7.5.2-1 below:

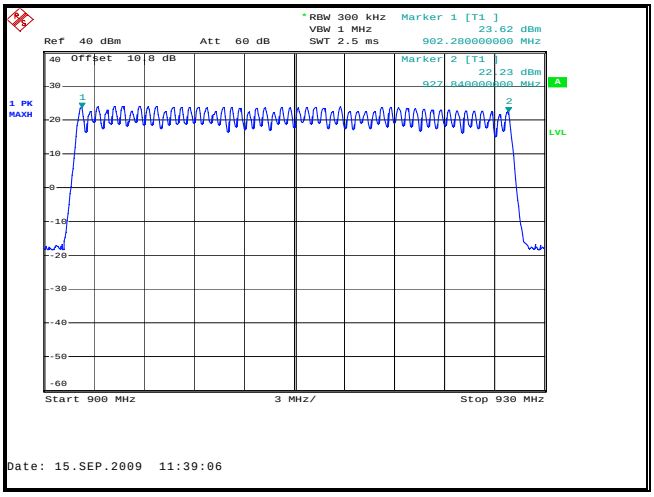

Figure 7.5.2-1: Number of Hopping Channels

7.5.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.5.3.1 Test Methodology

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The hopping channel is centered on the analyzer and the span set to 0 Hz. The RBW was set to 1 MHz and the VBW to 3 MHz. Sweep time was set to 200 ms to capture the burst duration of the emission. The marker – delta function of the analyzer was employed to measure the burst duration.

7.5.3.2 Test Results

The duration of the RF transmission is 123.2 ms. There is a minimum 7.8 second rest period in which the device hops to another channel according to the pseudorandom frequency table before transmitting another 123.2ms burst. Therefore the average time of occupancy on any channel in a 20 second period is 369.6ms. A single transmission is shown in figure 7.5.3.2-1 below:

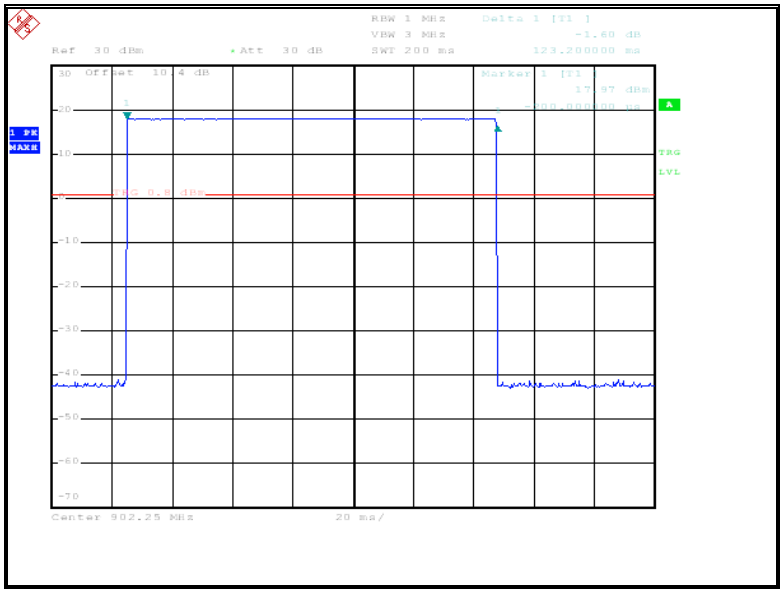

Figure 7.5.3.2-1: Channel Dwell Time

7.5.4 20dB Bandwidth - FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.5.4.1 Test Methodology

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The spectrum analyzer span was set to 2 to 3 times the estimated 20 dB bandwidth of the emission. The RBW was to ≥ 1% of the estimated 20 dB bandwidth. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission. The span and RBW were examined and re-adjusted if necessary to meet the requirements of 2 to 3 times the 20 bandwidth for the span and ≥ 1% of the 20 dB bandwidth for the RBW.

7.5.4.2 Test Results

The maximum 20dB bandwidth was found to be approximately 98.1kHz. Results are shown below in Table 7.5.4.2-1 and Figures 7.5.4.2-1 through 7.5.4.2-3.

Table 7.5.4.2-1

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
902.25	96.9	77.7
914.75	98.1	77.4
927.75	97.5	77.4

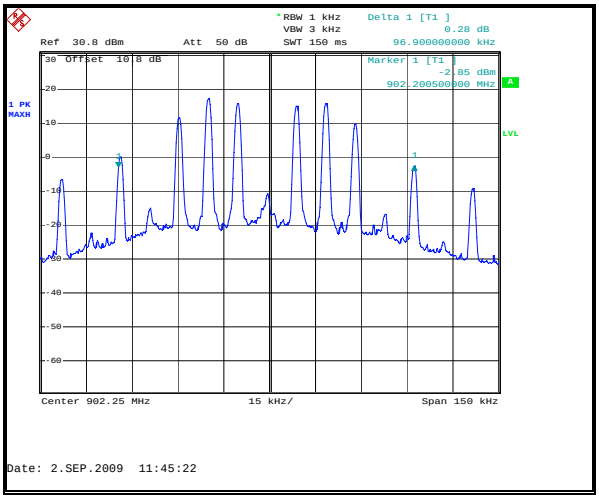

Figure 7.5.4.2-1: 20dB Bandwidth Low Channel

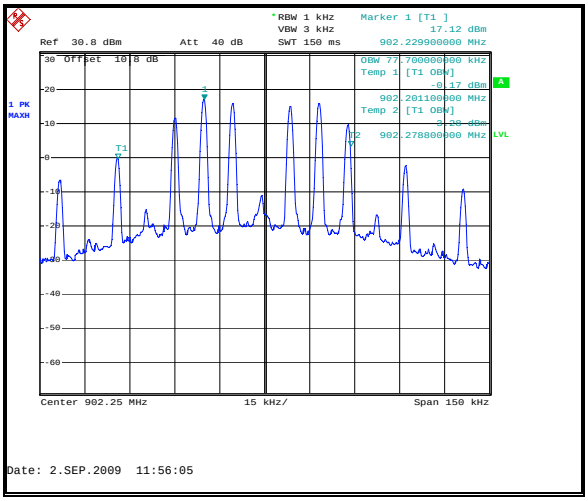

Figure 7.5.4.2-2: 99% Bandwidth Low Channel

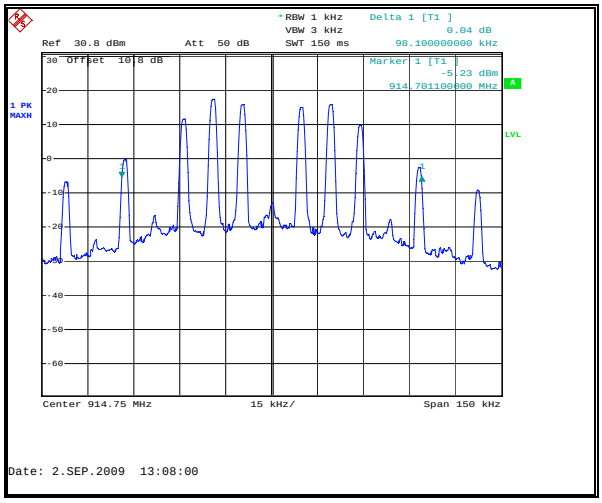

Figure 7.5.4.2-3: 20dB Bandwidth Mid Channel

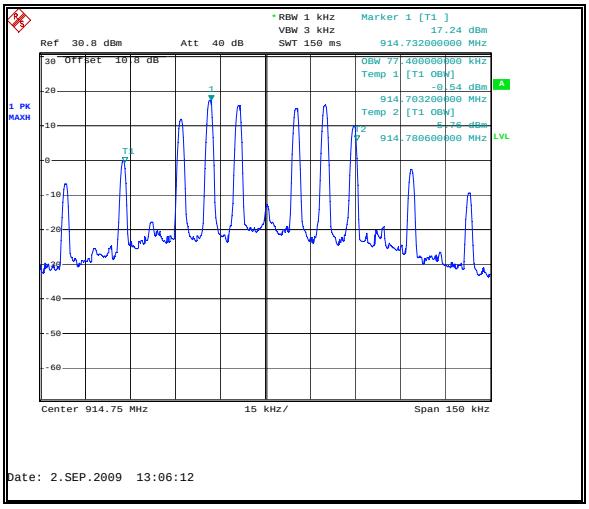

Figure 7.5.4.2-4: 99% Bandwidth Mid Channel

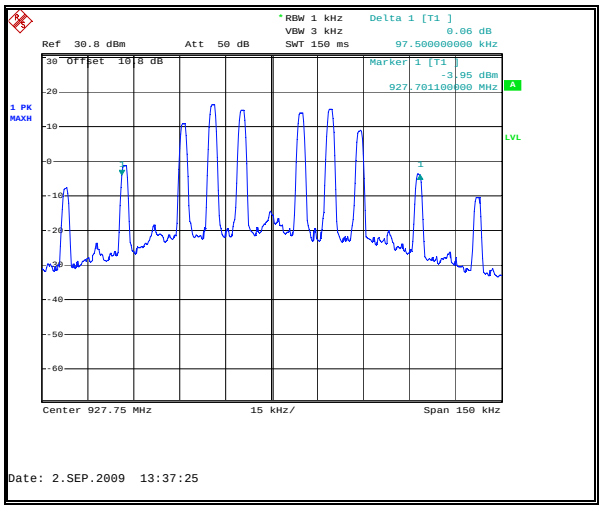

Figure 7.5.4.2-5: 20dB Bandwidth High Channel

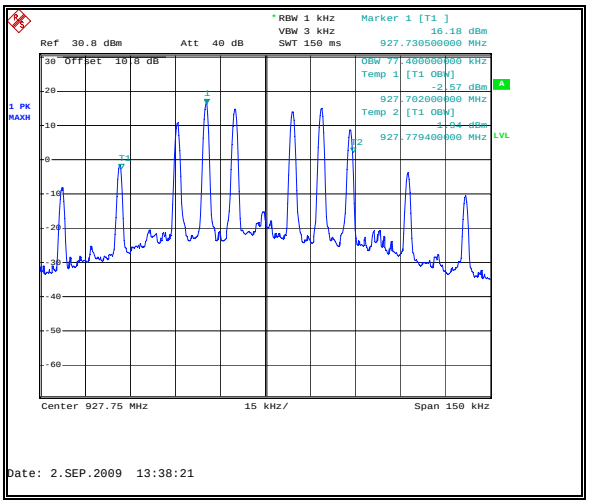

Figure 7.5.4.2-6: 99% Bandwidth High Channel

7.6 Band-Edge Compliance and Spurious Emissions - FCC Section 15.247(d) IC: RSS-210 2.6, A8.5

7.6.1 Band-Edge Compliance of RF Conducted Emissions

7.6.1.1 Test Methodology

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 30 kHz, which is ~ 1% of the span, and the VBW was set to 100kHz.

7.6.1.2 Test Results

At the lower and upper band-edge, the radio frequency power that was produced by the EUT is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power. Band-edge compliance is displayed in Figures 7.6.1.2-1 and 7.6.2.2-4.

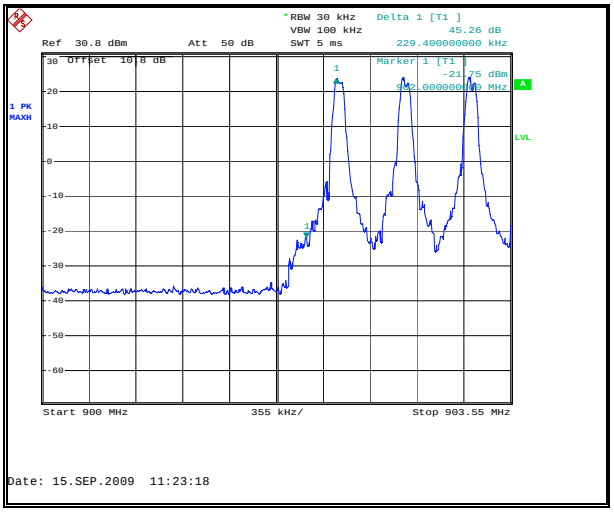

Figure 7.6.1-1: Lower Band-edge – Hopping Enabled

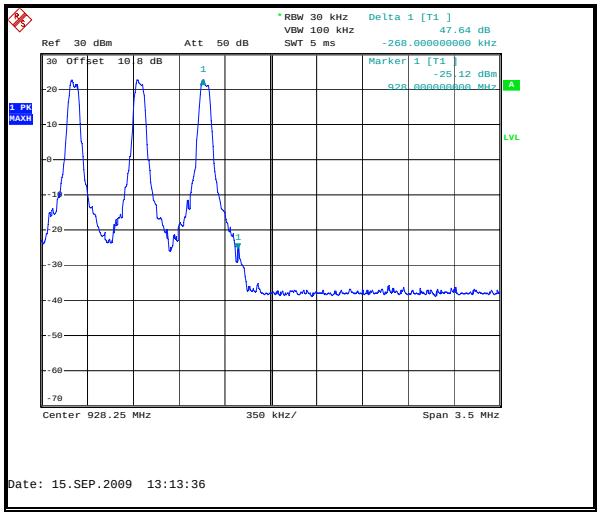

Figure 7.6.1-2: Upper Band-edge - Hopping Enabled

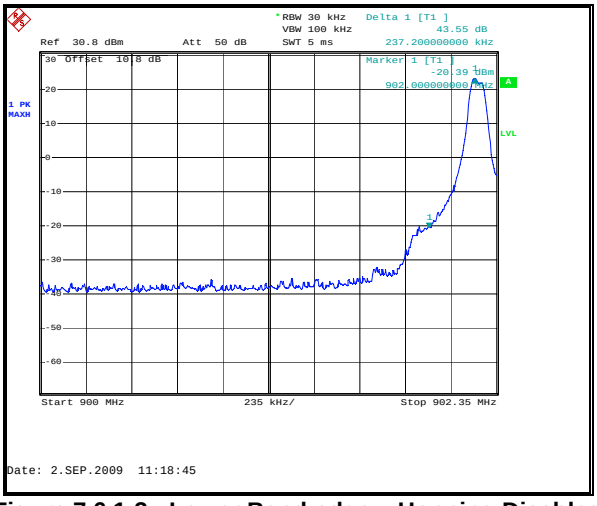

Figure 7.6.1-3: Lower Band-edge – Hopping Disabled

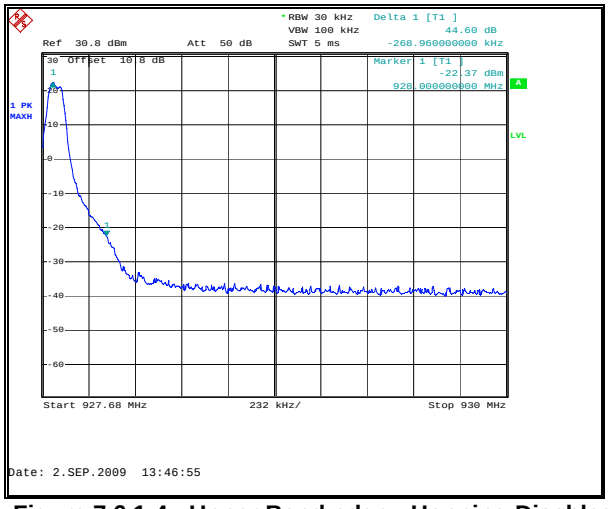

Figure 7.6.1-4: Upper Band-edge - Hopping Disabled

7.6.2 RF Conducted Spurious Emissions

7.6.2.1 Test Methodology

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 10GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100kHz. A peak detector function was used with the trace set to max hold.

7.6.2.2 Test Results

All emission found were greater than 20dB down from the fundamental carrier. The RF conducted spurious emissions were measured in the band of 30MHz to 10GHz. Results are shown below in Figure 7.6.2.2-1 through 7.6.2.2-6.

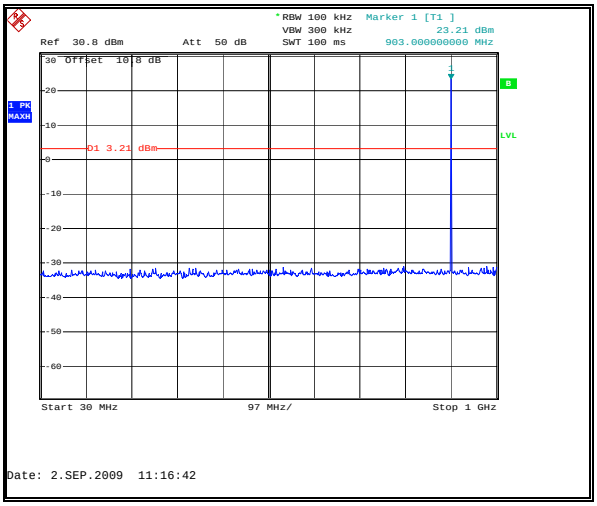

Figure 7.6.2.2-1: 30 MHz – 1 GHz – Low Channel

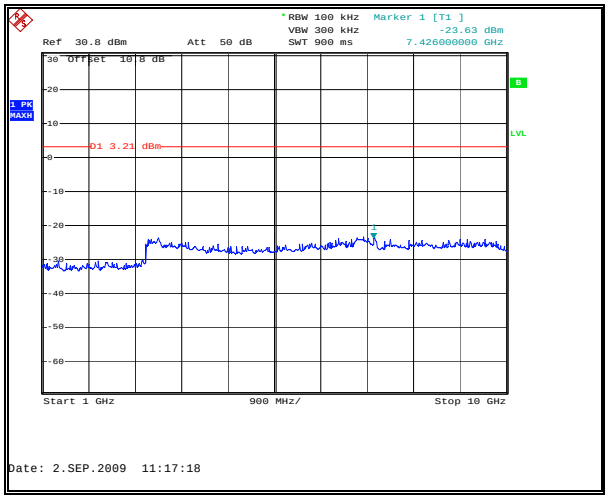

Figure 7.6.2.2-2: 1 GHz – 10 GHz – Low Channel

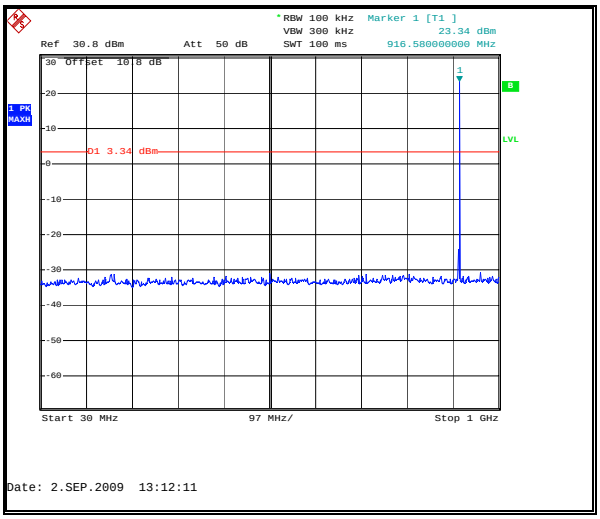

Figure 7.6.2.2-3: 30 MHz – 1 GHz –Mid Channel

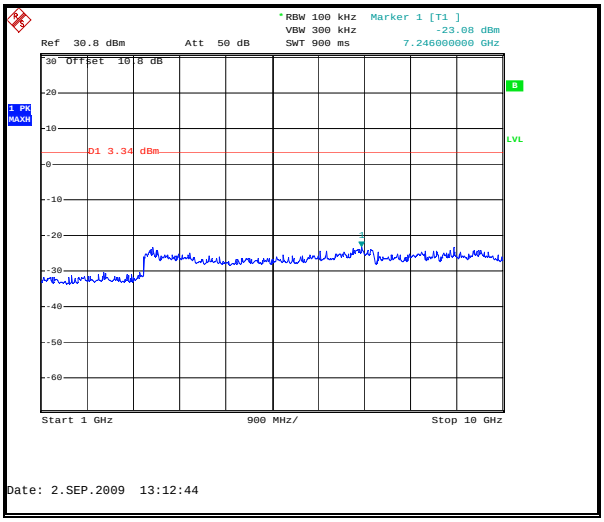

Figure 7.6.2.2-4: 1 GHz – 10 GHz – Mid Channel

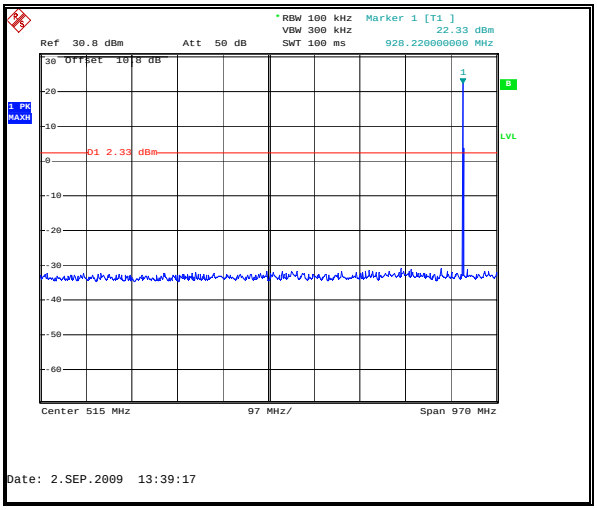

Figure 7.6.2.2-5: 30 MHz – 1 GHz – High Channel

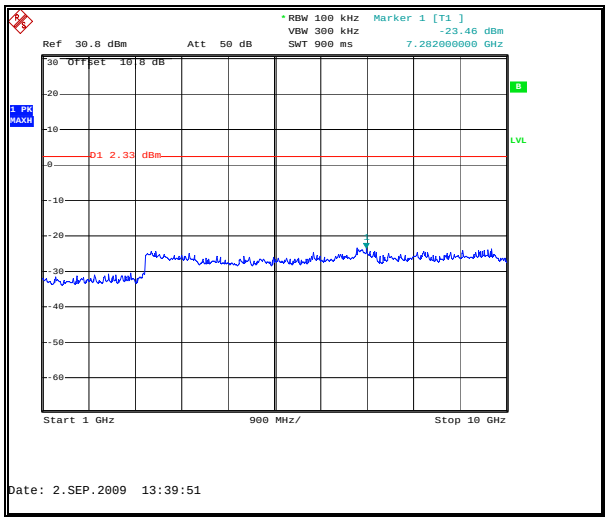

Figure 7.6.2.2-6: 1 GHz – 10 GHz –High Channel

7.6.3 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.6

7.6.3.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 10GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements made with a RBW of 1 MHz and VBW of 3MHz.

The EUT was caused to generate a continuous carrier signal on the hopping channel.

7.6.3.2 Test Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in Table 7.6.3.3-1. Emissions not reported were below the noise floor of the measurement instrumentation.

Table 7.6.3.3-1: Radiated Spurious Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2706.75	54.43	46.20	H	2.43	56.86	48.63	74.0	54.0	17.14	5.37
2706.75	50.65	37.39	V	2.43	53.08	39.82	74.0	54.0	20.92	14.18
Middle Channel										
2744.25	54.75	43.40	H	2.56	57.31	45.96	74.0	54.0	16.69	8.04
2744.25	47.98	35.77	V	2.56	50.54	38.33	74.0	54.0	23.46	15.67
High Channel										
2783.25	51.00	38.60	H	2.70	53.70	41.30	74.0	54.0	20.30	12.70
2783.25	46.31	34.56	V	2.70	49.01	37.26	74.0	54.0	24.99	16.74

8.0 CONCLUSION

In the opinion of ACS, Inc. the C2SOR, manufactured by Itron, Inc.meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT