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Certification Test Report

FCC ID: SK9AMI-3
IC: 864G-AMI3

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

ACS Report Number 09-0130-15C-2400-DTS

Manufacturer: Itron Electricity Metering, Inc.
Model(s): CN2SO

Test Begin Date: April 7, 2009
Test End Date: April 8, 2009

Report Issue Date: April 27, 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.

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This report contains 14 pages

Table of Contents

1.0 General 3
1.1 Purpose 3
1.2 Product Description 3
1.2.1 General 3
1.2.2 Intended Use 3
1.3 Test Methodology and Considerations 3
2.0 Test Facilities 4
2.1 Location 4
2.2 Laboratory Accreditations/Recognitions/Certifications 4
2.3 Radiated Emissions Test Site Description 5
2.3.1 Semi-Anechoic Chamber Test Site 5
2.3.2 Open Area Tests Site (OATS) 6
2.4 Conducted Emissions Test Site Description 7
3.0 Applicable Standards and References 7
4.0 List of Test Equipment 8
5.0 Support Equipment 9
6.0 EUT Setup Block Diagram 9
7.0 Summary of Tests 10
7.1 Antenna Requirement 10
7.2 Power Line Conducted Emissions 10
7.2.1 Test Methodology 10
7.2.2 Test Results 10
7.3 Radiated Emissions 12
7.3.1 Test Methodology 12
7.3.2 Test Results 12
7.4 Radiated Spurious Emissions 13
7.4.1 Test Methodology 13
7.4.2 Duty Cycle Correction 13
7.4.3 Test Results 13
7.4.4 Sample Calculations 14
8.0 CONCLUSION 14

Additional Exhibits Included In Filing

Internal Photographs
External Photographs
Test Setup Photographs

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 for a Permissive Change.

This permissive change report is to address a different meter form. A previous permissive change was filed for a 12S electric meter form factor model CN2SOD. This permissive change is for model CN2SO which is identical to the 12S CN2SOD but with the remote disconnect switch removed.

1.2 Product Description

1.2.1 General

The OpenWay CENTRON meter is a solid-state meter used for measuring electrical energy consumption. The OpenWay CENTRON meter incorporates a two-piece design combining a base metrology with a variety of OpenWay registers or options. The metrology portion of the meter contains all measurement circuitry and calibration information, while the personality modules contain the register functionality and communication mediums.

The register board contains (1) 900 MHz LAN frequency hopping spread spectrum radio and (1) 2.4 GHz direct sequence spread spectrum Zigbee radio.

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

Test Sample Identification:
58 290 332

Test Sample Condition:
The test samples were provided in good working order with no visible defects.

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

1.2.2 Intended Use

The OpenWay CENTRON meter is a solid-state meter used for measuring electrical energy consumption.

1.3 Test Methodology and Considerations

This device is considered a composite device by definition. The 900 MHz LAN radio and the 2.4 GHz Zigbee radio operate under CFR 47 Part 15.247 and IC RSS-210. This report addresses the 2.4 GHz Zigbee radio only. A separate report will be issued to address the 900 MHz LAN radio.

Based on changes from the previously certified device, only radiated emissions and AC power line conducted emissions measurements were performed.

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 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 4175
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:

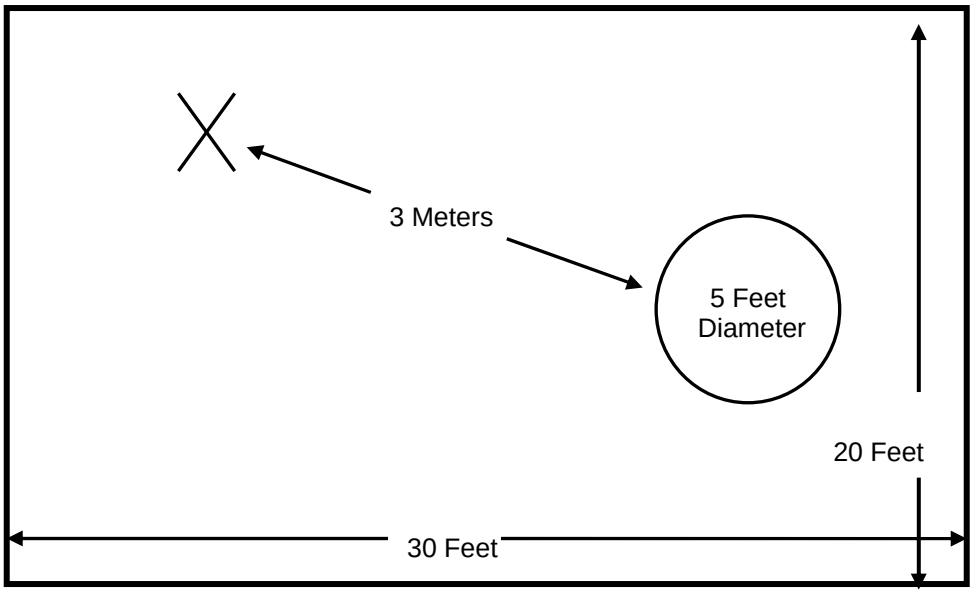

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

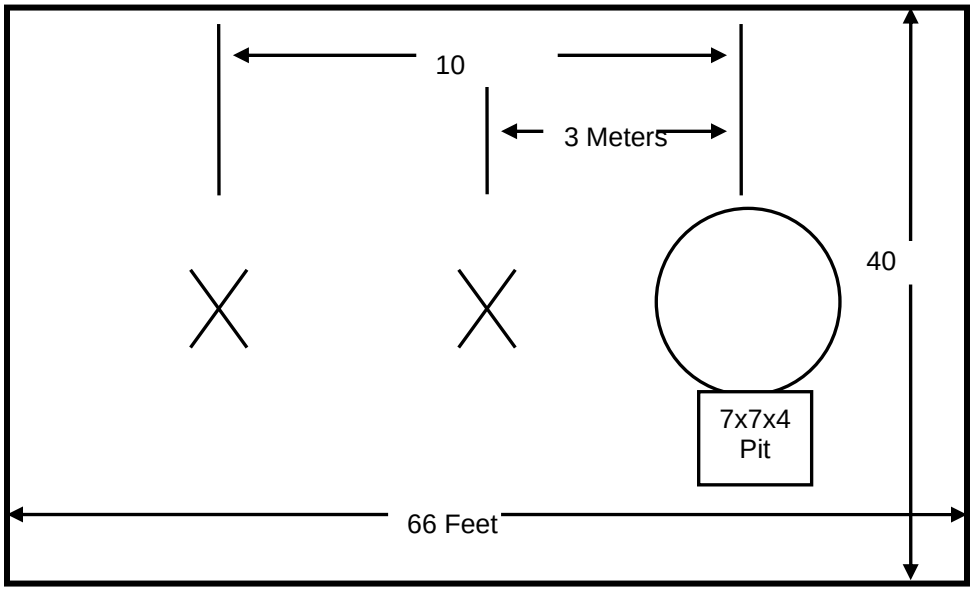

Figure 2.3-2: Open Area Test Site

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:

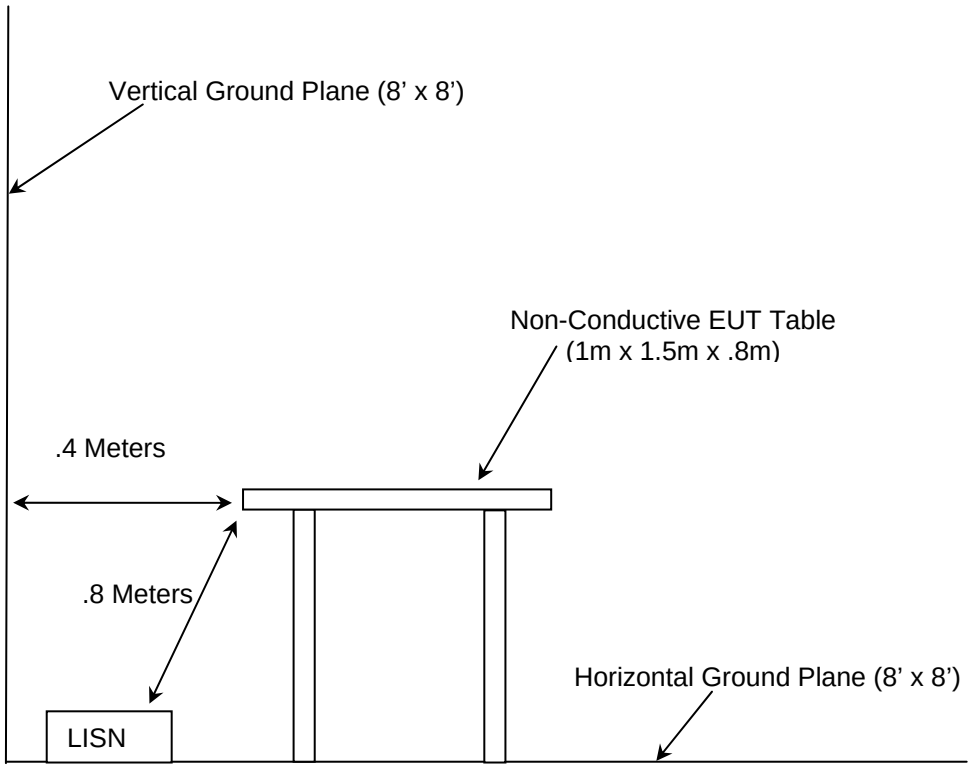

Figure 2.4-1: AC Mains Conducted EMI Site

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, 2008
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2008
- FCC KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), March 2005
- 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.

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
25	Chase	Antennas	CBL6111	1043	08/22/2009
30	Spectrum Technologies	Antennas	DRH-0118	970102	05/07/2009
153	EMCO	LISN	3825/2	9411-2268	01/27/2010
167	ACS	Cable Set	Chamber EMI Cable Set	167	02/06/2010 (See Note1)
168	Hewlett Packard	Attenuators	11947A	44829	02/09/2010 (See Note2)
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	06/16/2009
338	Hewlett Packard	Amplifiers	8449B	3008A01111	10/22/2009
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	02/05/2010 (See Note1)
432	Microwave Circuits	Filters	H3G020G4	264066	07/17/2009 (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	EUT	Itron Electricity Metering	CN2SO (12S)	58 290 332
2	Meter Enclosure (Box)	Milbank	Type R3	NA

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

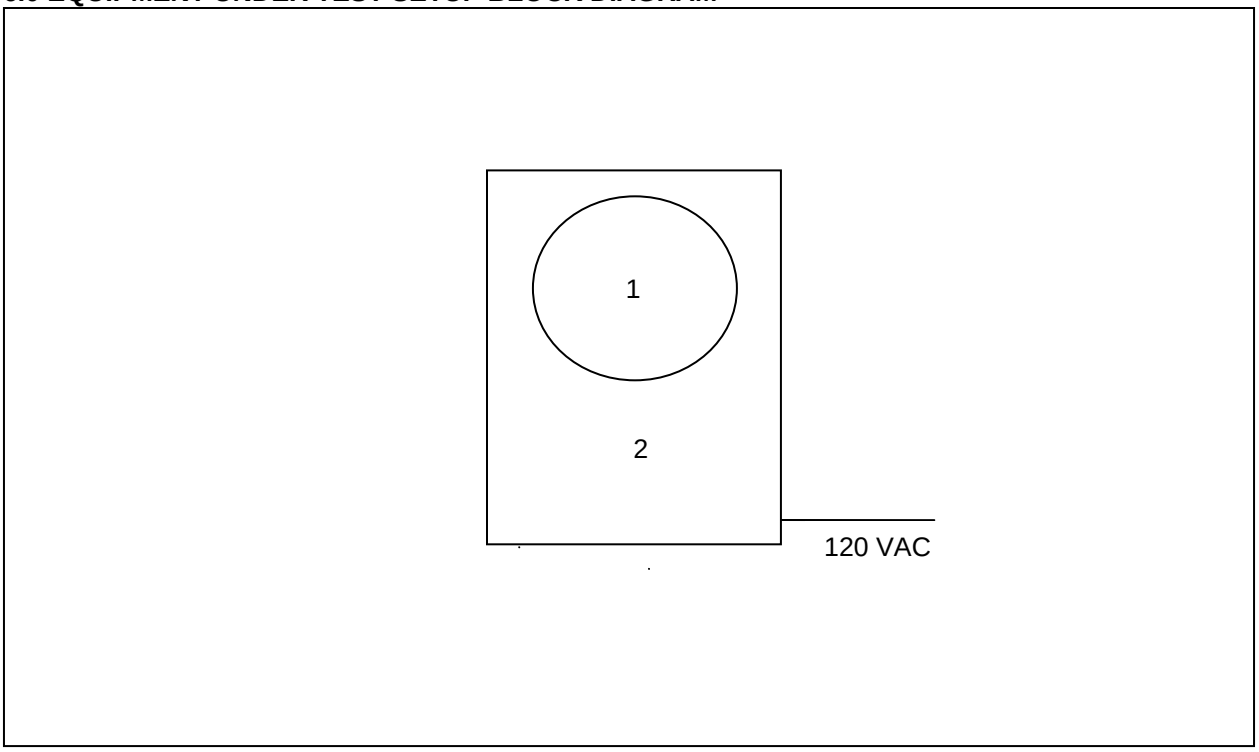

Figure 6-1: EUT Test Setup.

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 CN2SO utilizes an embedded quarter wave slot antenna with an estimated gain of 0dBi.

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 Tables 7.2-1 to 7.2-4 and Figures 7.2-1 to 7.2.2..

Table 7.2-1: Conducted EMI Results – Quasi-Peak Line 1

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.15	39.3	9.9	66	26.7	L1	GND
0.264	23.3	10	61	38	L1	GND
0.702	9.9	10.1	56	46.1	L1	GND
1.086	11.9	10	56	44.1	L1	GND
1.488	9.5	10	56	46.5	L1	GND
2.832	9	10	56	47	L1	GND
4.194	43.5	9.9	56	12.5	L1	GND
20.97	30.9	9.3	60	29.1	L1	GND
25.296	8.8	9.4	60	51.2	L1	GND
29.358	32.7	9.2	60	27.3	L1	GND

Table 7.2-2: Conducted EMI Results – Average Line 1

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.198	10.2	9.9	54	43.5	L1	GND
0.264	8.2	10	51	43.2	L1	GND
0.678	6.8	10	46	39.2	L1	GND
1.056	6.7	10	46	39.3	L1	GND
1.428	6.6	10	46	39.4	L1	GND
2.844	6.2	10	46	39.8	L1	GND
4.194	36.1	9.9	46	9.9	L1	GND
20.97	30.6	9.3	50	19.4	L1	GND
25.188	5.9	9.4	50	44.1	L1	GND
29.358	32.6	9.2	50	17.4	L1	GND

Table 7.2-3: Conducted EMI Results – Quasi-Peak Line 2

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.15	39.6	9.9	66	26.4	L2	GND
0.666	9.7	10	56	46.3	L2	GND
1.122	9.5	10	56	46.5	L2	GND
1.74	9.5	10	56	46.5	L2	GND
3.138	8.8	9.9	56	47.2	L2	GND
4.194	43.9	9.9	56	12.1	L2	GND
7.686	8.7	10	60	51.3	L2	GND
12.618	8.7	9.9	60	51.3	L2	GND
20.97	29.5	9.3	60	30.5	L2	GND
29.358	26.7	9.2	60	33.3	L2	GND

Table 7.2-4: Conducted EMI Results – Average Line 2

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.198	10.4	9.9	54	43.3	L2	GND
0.678	6.8	10	46	39.2	L2	GND
1.146	6.6	10	46	39.4	L2	GND
1.812	7.2	10	46	38.8	L2	GND
3.132	6.2	9.9	46	39.8	L2	GND
4.194	35.7	9.9	46	10.3	L2	GND
7.662	6.1	10	50	43.9	L2	GND
12.528	6.2	9.9	50	43.8	L2	GND
20.814	6.1	9.5	50	43.9	L2	GND
29.154	8.3	9.2	50	41.7	L2	GND

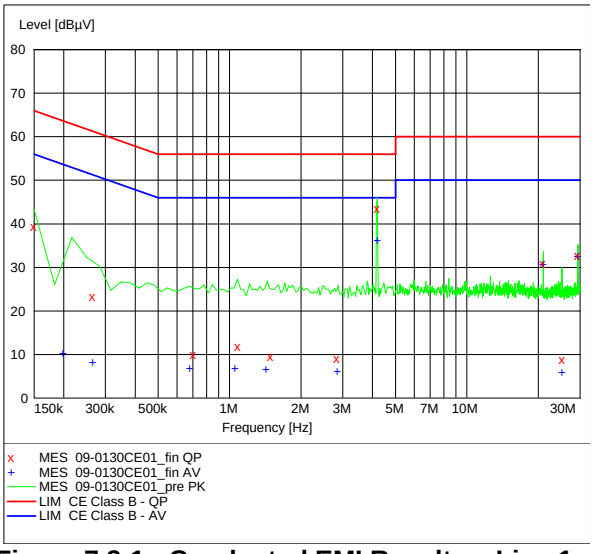

Figure 7.2-1: Conducted EMI Results – Line 1

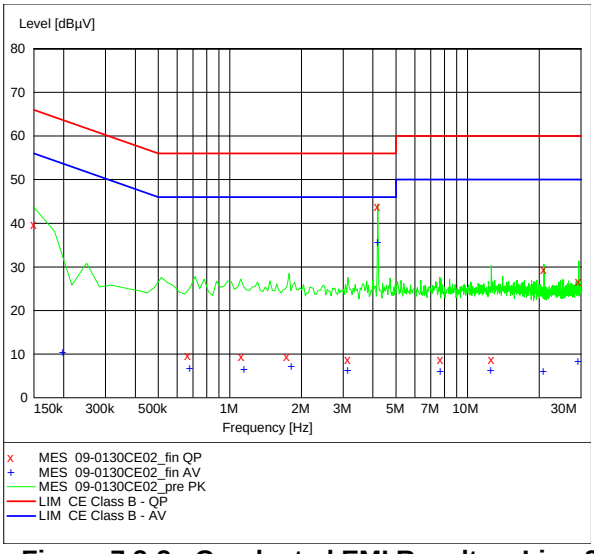

Figure 7.2-2: Conducted EMI Results – Line 2

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 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, average and peak 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 7.3-1 below:

Table 7.3-1: Radiated Emissions Tabulated Data

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
360.87	---------	43.42	H	-8.61	---------	34.81	--------	46.0	---------	11.19
369.5	---------	43.96	H	-8.70	---------	35.27	--------	46.0	---------	10.74
378.12	---------	42.79	H	-8.46	---------	34.33	--------	46.0	---------	11.67
386.74	---------	41.14	H	-8.06	---------	33.08	--------	46.0	---------	12.92
486.97	---------	41.44	H	-6.10	---------	35.34	--------	46.0	---------	10.66
504.22	---------	40.86	H	-5.39	---------	35.47	--------	46.0	---------	10.53

* Note: All emissions above 504.22 MHz were attenuated below the permissible limit.

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

7.4.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 25GHz, 10 times the highest fundamental frequency for low, middle, and high channels within the frequency band of operation (2405 – 2475 MHz).

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 were made using an RBW of 1 MHz and a VBW of 3 MHz and the average emission was calculated by correcting for the duty cycle of the EUT.

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

7.4.2 Duty Cycle Correction

For average radiated measurements, the measured level was reduced by a factor 11.38dB to account for the duty cycle of the EUT. The EUT transmits for approximately 27mS within a 100ms period. The duty cycle correction factor is determined using the formula: 20log (0.27/100) = 11.38dB.

Duty cycle justification is provided in the original application for certification.

7.4.3 Test Results

Radiated spurious emissions found in the band of 30MHz to 25GHz are reported in Table 7.4-1.

Table 7.4-1: Radiated Emissions Tabulated Data

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										
4810	57.53	51.00	H	8.32	65.85	47.94	74.0	54.0	8.15	6.06
4810	55.22	48.97	V	8.60	63.82	46.20	74.0	54.0	10.18	7.80
Mid Channel										
4880	54.33	47.14	H	8.64	62.97	44.41	74.0	54.0	11.03	9.59
4880	55.55	49.17	V	8.97	64.52	46.77	74.0	54.0	9.48	7.23
7320	53.77	45.52	H	12.94	66.71	47.09	74.0	54.0	7.29	6.91
7320	52.81	44.73	V	12.97	65.78	46.33	74.0	54.0	8.22	7.67
High Channel										
4950	50.83	43.21	H	8.97	59.80	40.81	74.0	54.0	14.20	13.19
4950	52.53	45.32	V	9.34	61.87	43.29	74.0	54.0	12.13	10.71
7425	53.16	44.93	H	12.86	66.02	46.41	74.0	54.0	7.98	7.59
7425	52.91	45.14	V	12.93	65.84	46.69	74.0	54.0	8.16	7.31
12375	46.08	36.89	H	21.22	67.30	46.74	83.5	63.5	16.24	16.80
12375	46.08	38.46	V	21.17	67.25	48.26	83.5	63.5	16.29	15.28

***** The magnitude of all emissions not reported were below the noise floor of the measurement system.

7.4.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak

Corrected Level: 57.53 + 8.32= 65.85dBuV/m

Margin: 74dBuV/m – 65.85dBuV/m = 8.15dB

Example Calculation: Average

Corrected Level: 51.00 + 8.32 - 11.38= 47.94dBuV

Margin: 54dBuV – 47.94dBuV = 6.06dB

8.0 CONCLUSION

In the opinion of ACS, Inc. the CN2SO, manufactured by Itron Electricity Metering, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT