Excellence in Compliance Testing

Certification Test Report

FCC ID: SK9AMI-4
IC: 864G-AMI4

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

ACS Report Number: 09-0210-15C-DTS-B

Manufacturer: Itron Electricity Metering, Inc.
Model: AMI4

Test Begin Date: July 6, 2009
Test End Date: July 9, 2009

Report Issue Date: July 21, 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 27 pages

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Additional Exhibits Included In Filing

Test Setup Photographs
External Photos
Internal Photos

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 class II permissive change. This permissive change is to address the addition of multiple meter form factor host devices to the AMI4 limited modular approval.

1.2 Product Description

1.2.1 General

The AMI4 module is a utility meter register board designed to be integrated into a variety of electric meter form factors. The AMI4 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 Serial Number(s):
4110001486
4110000454

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 AMI4 module is intended to be used in electric utility meters to provide automated meter reading capabilities.

1.3 Test Methodology and Considerations

This AMI4 module 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. Line conducted, unintentional and intentional radiated emissions were measured with AMI4 integrated into the multiple meter form factor hosts. This report addresses the 2.4 GHz Zigbee radio only. A separate report will be issued to address the 900 MHz LAN radio.

The meter forms evaluated are capable of multiple input voltages. The worst case voltage was applied with respect to emission levels and documented where applicable.

Radiated intermodulation products for all simultaneously transmitting radios were also evaluated for all host combinations and found in compliance.

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 2.3.1-1 below:

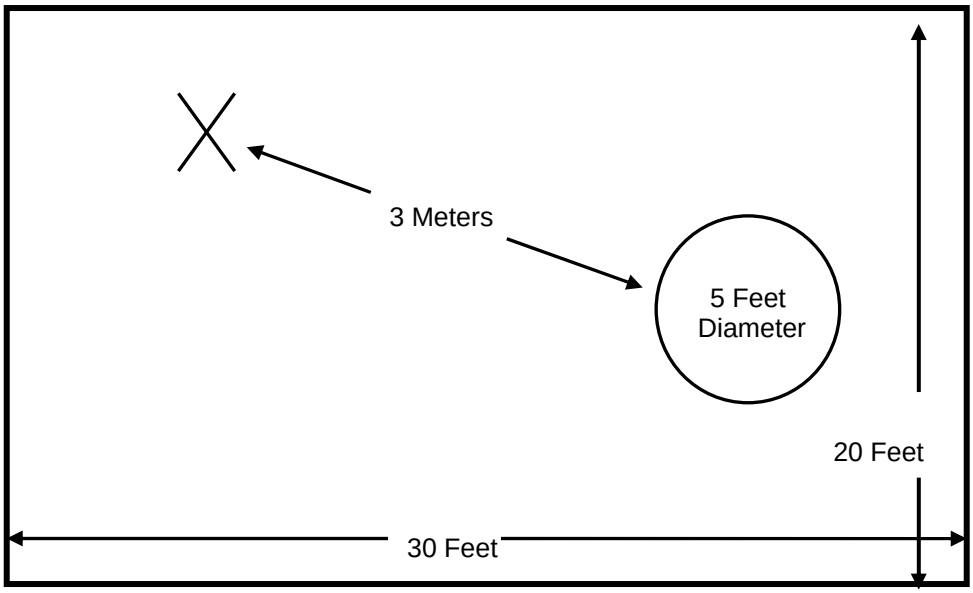

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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 2.3.2-2 below:

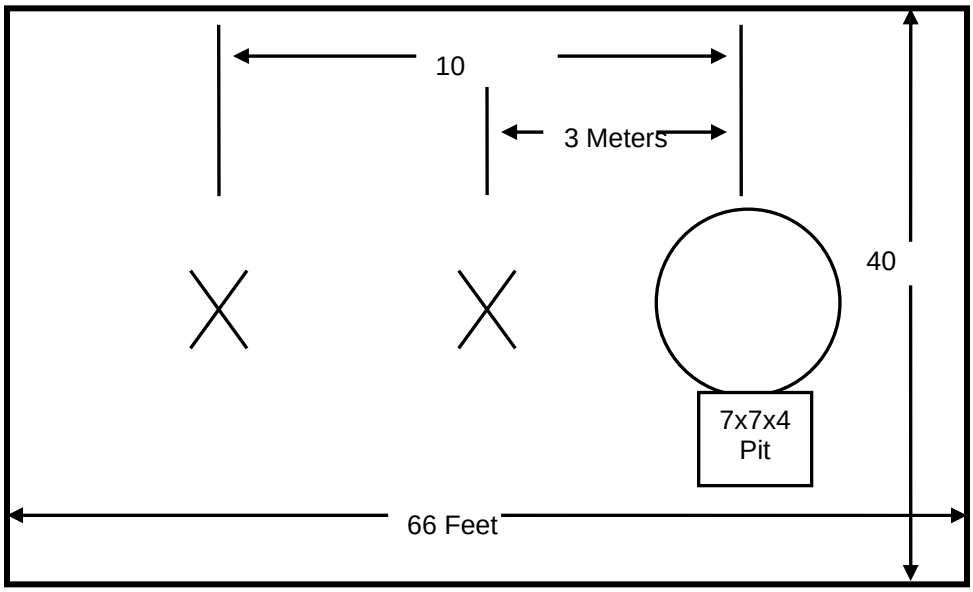

Figure 2.3.2-2: Open Area Test Site

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 2.4-1:

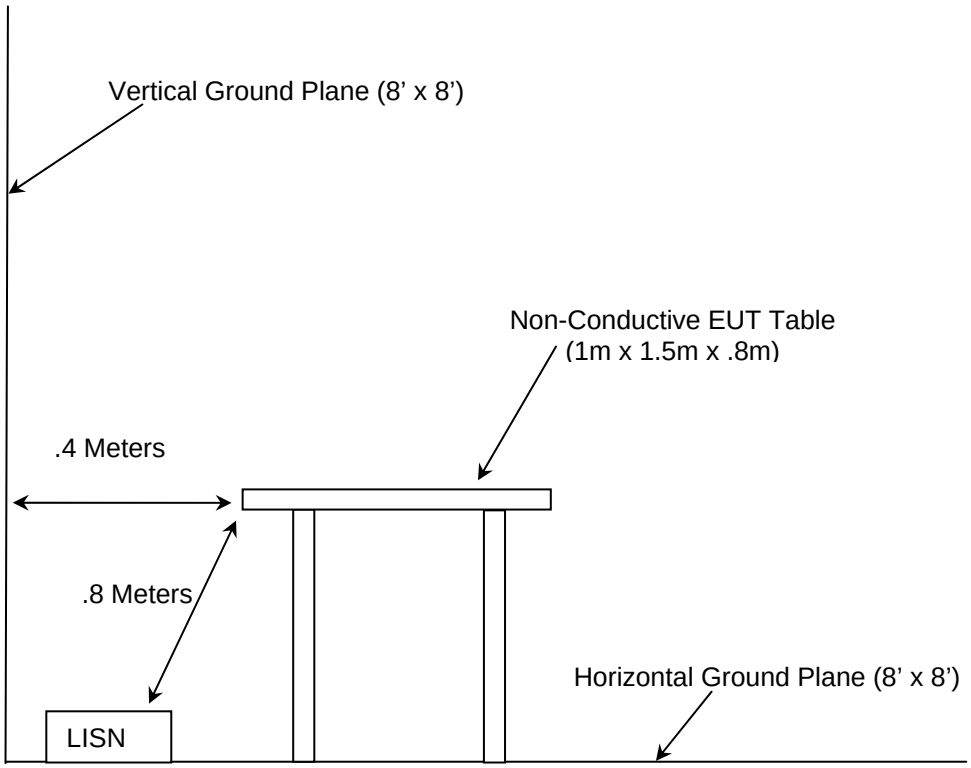

Figure 2.4-1: AC Mains Conducted EMI Site

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
- 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
22	Agilent	Amplifiers	8449B	3008A00526	10-22-2009
25	Chase	Antennas	CBL6111	1043	08-22-2009
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-08-2010
152	EMCO	LISN	Feb-25	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)
193	ACS	Cable Set	OATS Cable Set	0193	01-05-2010 (See Note1)
211	Eagle	Filter	C7RFM3NFNM	HLC-700	01-05-2010 (See Note1)
213	TEC	Amplifier	PA 102	44927	12-22-2009
282	Microwave Circuits	Filters	H2G020G4	74541	02-04-2010 (See Note1)
283	Rohde & Schwarz	Spectrum Analyzer	FSP40	1000033	09-19-2009
291	Florida RF Labs	Cables	SMRE-200W-12.0-SMRE	None	11-24-2009 (See Note1)
292	Florida RF Labs	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	07-28-2009 (See Note1)
338	Hewlett Packard	Amplifiers	8449B	3008A01111	10-22-2009
343	Florida RF Labs	Cables	SMRE-200W-12.0-SMRE	NA	05-04-2010 (See Note1)
422	Florida RF Labs	Cables	SMS-200AW-72.0-SMR	805	02-05-2010 (See Note1)
430	Florida RF Labs	Cables	SMS-290AW-480-SMS	NA	05-04-2010 (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	RF Register Board Module (EUT)	Itron Electricity Metering, Inc.	AMI4	4110000454, 4110001486
2A	3S Meter Socket (Host)	Itron Electricity Metering, Inc.	C2SO	60 359 815
2B	4S Meter Socket (Host)	Itron Electricity Metering, Inc.	C2SO	60 359 833
2C	9S(8S) Meter Socket (Host)	Itron Electricity Metering, Inc.	CP1SO	60 056 601
2D	9/36S Meter Socket (Host)	Itron Electricity Metering, Inc.	CP1SO	60 056 609
2E	12S Meter Socket (Host)	Itron Electricity Metering, Inc.	CP1SO	58 569 165
2F	16S Meter Socket (Host)	Itron Electricity Metering, Inc.	CP1SO	60 056 606
2G	45S(5S) Meter Socket (Host)	Itron Electricity Metering, Inc.	CP1SO	60 056 611
3	Meter Box	Milbank MFG.	NA	NA
4	Voltage Transformer	Sangamo Weston, Inc.	T-6A	8108966

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

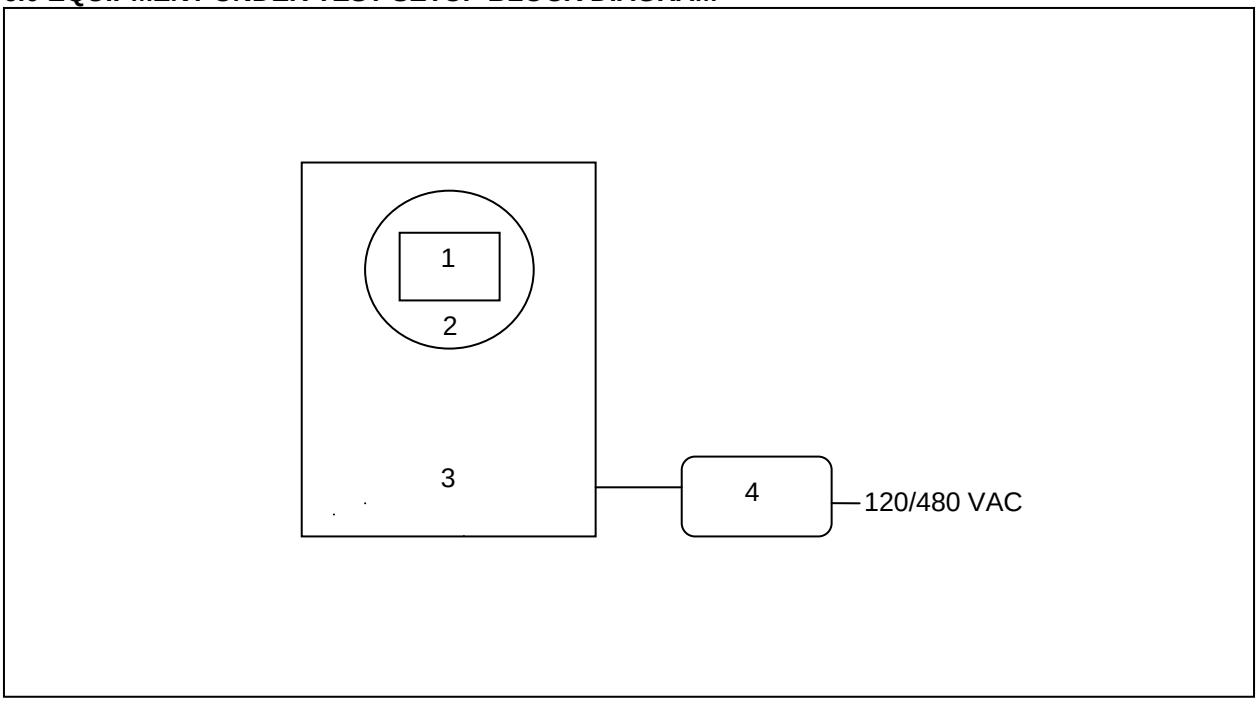

Figure 6-1: EUT Test Setup

Note1: The AMI4 was integrated into the various meter forms for showing compliance for radiated emissions and AC power line conducted emissions.

Note2: For meter forms capable of multiple input voltages, the worst case voltage was applied with respect to emission levels. For voltages other than 120VAC, a voltage transformer was used as indicated above.

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 antenna is a quarter wave embedded slot antenna in the ground plane with a measured gain of 4.4dBi.

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 Table2 7.2.2-1 to 7.2.2-14.

Table 7.2.2-1: Line 1 Conducted EMI Results – 3S Meter Form 120VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	42.3	9.9	66	23.7	L1	GND	QP
0.462	10.5	10	57	46.1	L1	GND	QP
0.654	10.3	10	56	45.7	L1	GND	QP
0.726	10.3	10.1	56	45.8	L1	GND	QP
1.398	9.8	10	56	46.2	L1	GND	QP
2.658	9.3	10	56	46.7	L1	GND	QP
3.624	9.3	9.9	56	46.7	L1	GND	QP
10.002	10.5	9.9	60	49.5	L1	GND	QP
17.07	8.9	9.8	60	51.1	L1	GND	QP
22.452	9.6	9.4	60	50.4	L1	GND	QP
0.192	11	9.9	54	42.9	L1	GND	AVG
0.462	7.4	10	47	39.3	L1	GND	AVG
0.618	7.2	10	46	38.8	L1	GND	AVG
0.792	7.3	10.1	46	38.7	L1	GND	AVG
1.404	7.1	10	46	38.9	L1	GND	AVG
2.736	6.6	10	46	39.4	L1	GND	AVG
3.636	6.7	9.9	46	39.3	L1	GND	AVG
10.002	7.5	9.9	50	42.5	L1	GND	AVG
17.178	6.5	9.8	50	43.5	L1	GND	AVG
22.308	6.5	9.4	50	43.5	L1	GND	AVG

Table 7.2.2-2: Line 2 Conducted EMI Results – 3S Meter Form 120VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	42.2	9.9	66	23.8	L2	GND	QP
0.294	20.3	10	60	40.1	L2	GND	QP
0.33	14.9	10	60	44.5	L2	GND	QP
0.6	10.4	10	56	45.6	L2	GND	QP
1.11	9.9	10	56	46.1	L2	GND	QP
1.65	9.8	10	56	46.2	L2	GND	QP
2.46	9.1	10	56	46.9	L2	GND	QP
4.32	9.3	9.9	56	46.7	L2	GND	QP
10.266	9.2	9.9	60	50.8	L2	GND	QP
27.468	10.2	9.3	60	49.8	L2	GND	QP
0.228	9.5	9.9	53	43.1	L2	GND	AVG
0.294	8.2	10	50	42.2	L2	GND	AVG
0.33	7.9	10	50	41.6	L2	GND	AVG
0.642	7.2	10	46	38.8	L2	GND	AVG
1.11	7.1	10	46	38.9	L2	GND	AVG
1.704	7.1	10	46	38.9	L2	GND	AVG
2.508	6.6	10	46	39.4	L2	GND	AVG
4.344	6.7	9.9	46	39.3	L2	GND	AVG
10.314	6.6	9.9	50	43.5	L2	GND	AVG
27.492	6.7	9.3	50	43.3	L2	GND	AVG

Table 7.2.2-3: Line 1 Conducted EMI Results – 4S Meter Form 240VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	46.8	9.9	66	19.2	L1	GND	QP
0.33	24.7	10	60	34.7	L1	GND	QP
0.69	12.4	10.1	56	43.6	L1	GND	QP
0.936	10	10	56	46	L1	GND	QP
1.86	10.1	10	56	45.9	L1	GND	QP
2.61	9.2	10	56	46.8	L1	GND	QP
4.506	9.4	10	56	46.6	L1	GND	QP
9.3	9.3	9.9	60	50.7	L1	GND	QP
14.136	9.4	9.8	60	50.6	L1	GND	QP
27.324	13.5	9.4	60	46.5	L1	GND	QP
0.228	11.8	9.9	53	40.7	L1	GND	AVG
0.324	8.8	10	50	40.8	L1	GND	AVG
0.684	7.5	10.1	46	38.5	L1	GND	AVG
0.948	7.2	10	46	38.9	L1	GND	AVG
1.836	7.2	10	46	38.8	L1	GND	AVG
2.586	6.6	10	46	39.4	L1	GND	AVG
4.542	6.7	10	46	39.3	L1	GND	AVG
9.384	6.6	9.9	50	43.4	L1	GND	AVG
14.316	6.7	9.8	50	43.3	L1	GND	AVG
27.792	9.1	9.3	50	40.9	L1	GND	AVG

Table 7.2.2-4: Line 2 Conducted EMI Results – 4S Meter Form 240VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	46.8	9.9	66	19.3	L2	GND	QP
0.264	32.2	10	61	29.1	L2	GND	QP
0.33	24.8	10	60	34.7	L2	GND	QP
0.51	17.3	10	56	38.7	L2	GND	QP
1.104	10.1	10	56	45.9	L2	GND	QP
1.374	9.9	10	56	46.1	L2	GND	QP
3.636	9.4	9.9	56	46.6	L2	GND	QP
4.266	9.4	9.9	56	46.6	L2	GND	QP
7.314	9.2	10	60	50.8	L2	GND	QP
16.428	9.1	9.8	60	50.9	L2	GND	QP
0.198	13.6	9.9	54	40.1	L2	GND	AVG
0.252	10.8	10	52	40.9	L2	GND	AVG
0.324	8.9	10	50	40.7	L2	GND	AVG
0.522	7.6	10	46	38.4	L2	GND	AVG
1.122	7.1	10	46	38.9	L2	GND	AVG
1.386	7.1	10	46	38.9	L2	GND	AVG
3.582	6.6	9.9	46	39.4	L2	GND	AVG
4.248	6.7	9.9	46	39.3	L2	GND	AVG
7.446	6.5	10	50	43.5	L2	GND	AVG
16.404	6.5	9.8	50	43.5	L2	GND	AVG

Table 7.2.2-5: Line 1 Conducted EMI Results – 9S(8S) Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.27	36.8	10	61	24.4	L1	GND	QP
0.396	32.1	10.1	58	25.9	L1	GND	QP
0.534	39.2	10	56	16.8	L1	GND	QP
0.78	27.9	10.1	56	28.1	L1	GND	QP
1.74	26.6	10	56	29.4	L1	GND	QP
2.766	22.3	10	56	33.7	L1	GND	QP
4.05	21.6	9.9	56	34.4	L1	GND	QP
7.956	15.4	9.9	60	44.6	L1	GND	QP
11.028	20.7	9.9	60	39.3	L1	GND	QP
18.432	27	9.8	60	33	L1	GND	QP
0.294	17	10	50	33.4	L1	GND	AVG
0.396	23.8	10.1	48	24.1	L1	GND	AVG
0.534	32.2	10	46	13.8	L1	GND	AVG
0.738	22.9	10.1	46	23.1	L1	GND	AVG
1.758	21.9	10	46	24.1	L1	GND	AVG
2.832	18.5	10	46	27.5	L1	GND	AVG
4.08	16.2	9.9	46	29.8	L1	GND	AVG
8.028	11.4	9.9	50	38.6	L1	GND	AVG
11.028	16.2	9.9	50	33.8	L1	GND	AVG
18.594	8.4	9.8	50	41.6	L1	GND	AVG

Table 7.2.2-6: Line 2 Conducted EMI Results – 9S(8S) Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.174	41.8	9.9	65	23	L2	GND	QP
0.444	37.1	10	57	19.9	L2	GND	QP
0.51	44.4	10	56	11.6	L2	GND	QP
0.72	39.5	10.1	56	16.5	L2	GND	QP
1.644	36.5	10	56	19.5	L2	GND	QP
2.724	33.5	10	56	22.5	L2	GND	QP
3.876	31.2	9.9	56	24.8	L2	GND	QP
6.294	27.5	10	60	32.5	L2	GND	QP
13.602	25.8	9.9	60	34.2	L2	GND	QP
18.324	16.3	9.8	60	43.7	L2	GND	QP
0.264	28.6	10	51	22.7	L2	GND	AVG
0.45	30.5	10	47	16.4	L2	GND	AVG
0.51	38.7	10	46	7.3	L2	GND	AVG
0.72	34.3	10.1	46	11.7	L2	GND	AVG
1.644	31.6	10	46	14.4	L2	GND	AVG
2.808	28.7	10	46	17.3	L2	GND	AVG
3.84	24.8	9.9	46	21.3	L2	GND	AVG
6.3	22.7	10	50	27.4	L2	GND	AVG
13.644	21.1	9.9	50	28.9	L2	GND	AVG
18.432	24.1	9.8	50	25.9	L2	GND	AVG

Table 7.2.2-7: Line 1 Conducted EMI Results – 9/36S Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.162	32.7	9.9	65	32.7	L1	GND	QP
0.396	32.4	10.1	58	25.5	L1	GND	QP
0.534	36.6	10	56	19.4	L1	GND	QP
0.708	31	10.1	56	25	L1	GND	QP
1.902	26.1	10	56	29.9	L1	GND	QP
2.13	26.3	10	56	29.7	L1	GND	QP
3.102	24.4	9.9	56	31.6	L1	GND	QP
4.626	19.6	10	56	36.4	L1	GND	QP
9.714	20.1	9.9	60	39.9	L1	GND	QP
11.844	20	9.8	60	40	L1	GND	QP
0.228	28.8	9.9	53	23.7	L1	GND	AVG
0.396	24.9	10.1	48	23	L1	GND	AVG
0.534	29.2	10	46	16.8	L1	GND	AVG
0.72	21.9	10.1	46	24.1	L1	GND	AVG
1.956	21.6	10	46	24.4	L1	GND	AVG
2.1	21.7	10	46	24.3	L1	GND	AVG
3.174	19.3	9.9	46	26.7	L1	GND	AVG
4.584	14.6	10	46	31.4	L1	GND	AVG
9.708	15.8	9.9	50	34.2	L1	GND	AVG
12.036	15.4	9.8	50	34.6	L1	GND	AVG

Table 7.2.2-8: Line 2 Conducted EMI Results – 9/36S Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.27	37.5	10	61	23.6	L2	GND	QP
0.402	41.3	10.1	58	16.5	L2	GND	QP
0.54	46.1	10	56	9.9	L2	GND	QP
0.708	41.1	10.1	56	14.9	L2	GND	QP
1.818	37	10	56	19	L2	GND	QP
2.91	34	9.9	56	22	L2	GND	QP
4.122	31.8	9.9	56	24.2	L2	GND	QP
6.264	27.6	10	60	32.4	L2	GND	QP
15.174	25.2	9.8	60	34.8	L2	GND	QP
18.432	27.7	9.8	60	32.3	L2	GND	QP
0.27	32.7	10	51	18.4	L2	GND	AVG
0.402	36.8	10.1	48	11	L2	GND	AVG
0.54	39.9	10	46	6.1	L2	GND	AVG
0.708	36.1	10.1	46	9.9	L2	GND	AVG
1.776	31.8	10	46	14.2	L2	GND	AVG
2.856	27.2	10	46	18.8	L2	GND	AVG
4.152	26.9	9.9	46	19.1	L2	GND	AVG
6.342	23.1	10	50	26.9	L2	GND	AVG
15.126	20.5	9.8	50	29.5	L2	GND	AVG
18.486	12.5	9.8	50	37.5	L2	GND	AVG

Table 7.2.2-9: Line 1 Conducted EMI Results – 12S Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	40.8	9.9	66	25.2	L1	GND	QP
0.33	29.9	10	60	29.5	L1	GND	QP
0.462	31.2	10	57	25.4	L1	GND	QP
0.534	40.6	10	56	15.4	L1	GND	QP
0.666	39	10	56	17	L1	GND	QP
0.816	34.7	10.1	56	21.3	L1	GND	QP
1.452	30.9	10	56	25.1	L1	GND	QP
2.724	27.4	10	56	28.6	L1	GND	QP
3.798	24.4	9.9	56	31.6	L1	GND	QP
26.778	25.5	9.4	60	34.5	L1	GND	QP
0.198	19.8	9.9	54	33.9	L1	GND	AVG
0.33	22	10	50	27.5	L1	GND	AVG
0.462	22.6	10	47	24	L1	GND	AVG
0.534	33.7	10	46	12.3	L1	GND	AVG
0.666	31.2	10	46	14.8	L1	GND	AVG
0.834	25	10	46	21	L1	GND	AVG
1.47	24	10	46	22	L1	GND	AVG
2.73	20.4	10	46	25.6	L1	GND	AVG
3.81	17.8	9.9	46	28.2	L1	GND	AVG
26.988	17	9.4	50	33	L1	GND	AVG

Table 7.2.2-10: Line 2 Conducted EMI Results – 12S Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.156	40.2	9.9	66	25.4	L2	GND	QP
0.33	27.4	10	60	32.1	L2	GND	QP
0.534	38.3	10	56	17.7	L2	GND	QP
0.798	33	10.1	56	23	L2	GND	QP
1.614	30.1	10	56	25.9	L2	GND	QP
3.006	25.8	9.9	56	30.2	L2	GND	QP
3.828	23.5	9.9	56	32.6	L2	GND	QP
8.622	14.7	9.9	60	45.3	L2	GND	QP
12.492	12.4	9.9	60	47.6	L2	GND	QP
27.198	26.1	9.4	60	33.9	L2	GND	QP
0.192	19.1	9.9	54	34.9	L2	GND	AVG
0.33	16.9	10	50	32.5	L2	GND	AVG
0.528	31.2	10	46	14.9	L2	GND	AVG
0.774	22.1	10.1	46	23.9	L2	GND	AVG
1.596	22.5	10	46	23.5	L2	GND	AVG
3.012	19.2	9.9	46	26.8	L2	GND	AVG
3.816	16.7	9.9	46	29.3	L2	GND	AVG
8.604	9.8	9.9	50	40.2	L2	GND	AVG
12.282	8.8	9.9	50	41.2	L2	GND	AVG
27.072	17.1	9.4	50	32.9	L2	GND	AVG

Table 7.2.2-11: Line 1 Conducted EMI Results – 16S Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.174	43.1	9.9	65	21.7	L1	GND	QP
0.402	43.4	10.1	58	14.5	L1	GND	QP
0.54	46.8	10	56	9.2	L1	GND	QP
0.708	39.7	10.1	56	16.3	L1	GND	QP
1.782	31.9	10	56	24.1	L1	GND	QP
3.09	29.2	9.9	56	26.8	L1	GND	QP
4.116	27.8	9.9	56	28.2	L1	GND	QP
6.66	25.1	10	60	34.9	L1	GND	QP
14.19	20.5	9.8	60	39.5	L1	GND	QP
20.016	12.5	9.8	60	47.5	L1	GND	QP
0.228	35.2	9.9	53	17.3	L1	GND	AVG
0.402	39	10.1	48	8.8	L1	GND	AVG
0.534	40.9	10	46	5.1	L1	GND	AVG
0.714	34.7	10.1	46	11.3	L1	GND	AVG
1.818	27	10	46	19	L1	GND	AVG
3.168	23.9	9.9	46	22.1	L1	GND	AVG
4.086	23	9.9	46	23	L1	GND	AVG
6.552	21.6	10	50	28.4	L1	GND	AVG
14.34	16.2	9.8	50	33.8	L1	GND	AVG
19.854	6.8	9.8	50	43.2	L1	GND	AVG

Table 7.2.2-12: Line 2 Conducted EMI Results – 16S Meter Form 277VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.27	41.8	10	61	19.3	L2	GND	QP
0.402	41.9	10.1	58	15.9	L2	GND	QP
0.54	48	10	56	8	L2	GND	QP
0.714	40.8	10.1	56	15.2	L2	GND	QP
1.68	30.2	10	56	25.8	L2	GND	QP
2.196	24.9	10	56	31.1	L2	GND	QP
4.896	17.3	10	56	38.7	L2	GND	QP
6.294	24.8	10	60	35.2	L2	GND	QP
13.95	13	9.9	60	47	L2	GND	QP
29.172	10.5	9.2	60	49.5	L2	GND	QP
0.27	38.3	10	51	12.8	L2	GND	AVG
0.402	40.5	10.1	48	7.3	L2	GND	AVG
0.54	42.6	10	46	3.4	L2	GND	AVG
0.714	36	10.1	46	10	L2	GND	AVG
1.71	25.5	10	46	20.5	L2	GND	AVG
2.238	19	10	46	27	L2	GND	AVG
4.878	12.2	10	46	33.8	L2	GND	AVG
6.324	20.4	10	50	29.6	L2	GND	AVG
14.046	10.5	9.8	50	39.5	L2	GND	AVG
29.346	7.2	9.2	50	42.8	L2	GND	AVG

Table 7.2.2-13: Line 1 Conducted EMI Results – 45S(5S) Meter Form 480VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	42.5	9.9	66	23.5	L1	GND	QP
0.33	26	10	60	33.5	L1	GND	QP
0.666	36.1	10	56	19.9	L1	GND	QP
0.798	37.3	10.1	56	18.7	L1	GND	QP
2.13	32.9	10	56	23.1	L1	GND	QP
2.286	34	10	56	22	L1	GND	QP
4.182	29.9	9.9	56	26.1	L1	GND	QP
9.222	26.1	9.9	60	33.9	L1	GND	QP
10.764	23.6	9.9	60	36.4	L1	GND	QP
18.366	15.8	9.8	60	44.2	L1	GND	QP
0.198	21.9	9.9	54	31.8	L1	GND	AVG
0.33	17.5	10	50	31.9	L1	GND	AVG
0.69	27	10.1	46	19	L1	GND	AVG
0.804	29.8	10.1	46	16.2	L1	GND	AVG
2.07	23.7	10	46	22.3	L1	GND	AVG
2.304	26.9	10	46	19.1	L1	GND	AVG
4.182	22.6	9.9	46	23.4	L1	GND	AVG
9.15	19.4	9.9	50	30.6	L1	GND	AVG
10.71	17.1	9.9	50	32.9	L1	GND	AVG
18.306	12.1	9.8	50	37.9	L1	GND	AVG

Table 7.2.2-14: Line 2 Conducted EMI Results – 45S(5S) Meter Form 480VAC

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	41.6	9.9	66	24.4	L2	GND	QP
0.402	42.1	10.1	58	15.7	L2	GND	QP
0.66	42.5	10	56	13.5	L2	GND	QP
0.924	41.4	10	56	14.6	L2	GND	QP
1.32	34.6	10	56	21.4	L2	GND	QP
2.166	32.7	10	56	23.3	L2	GND	QP
4.128	29.9	9.9	56	26.1	L2	GND	QP
7.944	26	9.9	60	34	L2	GND	QP
10.878	22.7	9.9	60	37.3	L2	GND	QP
27.354	21.7	9.4	60	38.3	L2	GND	QP
0.222	24.7	9.9	53	28.1	L2	GND	AVG
0.408	34	10.1	48	13.7	L2	GND	AVG
0.672	35.1	10	46	10.9	L2	GND	AVG
0.93	33.4	10	46	12.6	L2	GND	AVG
1.35	24.9	10	46	21.1	L2	GND	AVG
2.16	25.4	10	46	20.6	L2	GND	AVG
4.11	22.5	9.9	46	23.5	L2	GND	AVG
7.866	18.7	9.9	50	31.3	L2	GND	AVG
10.878	16.2	9.9	50	33.8	L2	GND	AVG
27.36	13.9	9.4	50	36.1	L2	GND	AVG

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 Tables 7.3.2-1 – 7.3.2.7 below:

Table 7.3.2-1: Radiated Emissions Tabulated Data – 3S Meter Form 120VAC

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
34.997	---------	28.28	H	-9.80	---------	18.48	--------	40.0	---------	21.52
102.168	---------	31.33	H	-15.25	---------	16.08	--------	43.5	---------	27.42
239.991	---------	32.47	H	-13.60	---------	18.87	--------	46.0	---------	27.13
285.981	---------	33.36	H	-11.92	---------	21.44	--------	46.0	---------	24.56
467.988	---------	35.27	V	-6.02	---------	29.25	--------	46.0	---------	16.75
572	---------	31.74	V	-3.28	---------	28.46	--------	46.0	---------	17.54

* Note: All emissions above 572 MHz were attenuated below the permissible limit.

Table 7.3.2-2: Radiated Emissions Tabulated Data – 4S Meter Form 240VAC

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
34.992	--------	21.63	H	-9.80	---------	11.83	--------	40.0	---------	28.17
102.183	--------	36.41	H	-15.25	---------	21.16	--------	43.5	---------	22.34
239.984	--------	31.12	H	-13.60	---------	17.52	--------	46.0	---------	28.48
285.989	--------	27.09	V	-11.58	---------	15.51	--------	46.0	---------	30.49
493.991	--------	30.82	V	-5.26	---------	25.56	--------	46.0	---------	20.44
545.993	--------	28.08	V	-3.64	---------	24.44	--------	46.0	---------	21.56

* Note: All emissions above 545 MHz were attenuated below the permissible limit.

Table 7.3.2-3: Radiated Emissions Tabulated Data – 9S(8S) Meter Form 277VAC

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
50.022	---------	55.10	V	-15.81	---------	39.29	--------	40.0	---------	0.71
66.488	---------	45.20	V	-18.71	---------	26.49	--------	40.0	---------	13.51
545.994	---------	40.02	V	-3.04	---------	36.98	--------	46.0	---------	9.02
906	---------	20.74	V	2.42	---------	23.16	--------	46.0	---------	22.84
913	---------	20.69	V	2.68	---------	23.37	--------	46.0	---------	22.63
923	---------	20.64	V	3.31	---------	23.95	--------	46.0	---------	22.05

* Note: All emissions above 923 MHz were attenuated below the permissible limit.

Table 7.3.2-4: Radiated Emissions Tabulated Data – 9/36S Meter Form 277VAC

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
49.531	---------	49.54	V	-15.60	---------	33.94	--------	40.0	---------	6.06
138.8	---------	38.62	V	-11.23	---------	27.39	--------	43.5	---------	16.11
441.988	---------	36.87	H	-5.44	---------	31.43	--------	46.0	---------	14.57
493.983	---------	37.63	V	-4.34	---------	33.29	--------	46.0	---------	12.71
545.983	---------	40.17	V	-3.04	---------	37.13	--------	46.0	---------	8.87
774.155	---------	32.93	H	0.60	---------	33.53	--------	46.0	---------	12.47

* Note: All emissions above 774 MHz were attenuated below the permissible limit.

Table 7.3.2-5: Radiated Emissions Tabulated Data – 12S Meter Form 277VAC

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
51.889	---------	50.02	V	-16.29	---------	33.73	--------	40.0	---------	6.27
102.916	---------	49.95	V	-11.77	---------	38.18	--------	43.5	---------	5.32
545.993	---------	40.45	V	-3.04	---------	37.41	--------	46.0	---------	8.59
897	---------	20.87	V	2.21	---------	23.08	--------	46.0	---------	22.92
904	---------	20.72	H	2.48	---------	23.20	--------	46.0	---------	22.80
929	---------	20.64	V	3.73	---------	24.37	--------	46.0	---------	21.63

* Note: All emissions above 929 MHz were attenuated below the permissible limit.

Table 7.3.2-6: Radiated Emissions Tabulated Data – 16S Meter Form 277VAC

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
53.049	---------	49.13	V	-16.59	---------	32.54	--------	40.0	---------	7.46
545.984	---------	37.73	V	-3.04	---------	34.69	--------	46.0	---------	11.31
800	---------	20.69	H	1.10	---------	21.79	--------	46.0	---------	24.21
870	---------	20.87	H	2.10	---------	22.97	--------	46.0	---------	23.03
905	---------	20.80	H	2.50	---------	23.30	--------	46.0	---------	22.70
918	---------	20.72	V	2.98	---------	23.70	--------	46.0	---------	22.30

* Note: All emissions above 918 MHz were attenuated below the permissible limit.

Table 7.3.2-7: Radiated Emissions Tabulated Data – 45S(5S) Meter Form 480VAC

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
50.772	---------	44.34	V	-16.00	---------	28.34	--------	40.0	---------	11.66
191.965	---------	38.77	V	-13.44	---------	25.33	--------	43.5	---------	18.17
211.275	---------	39.21	H	-12.70	---------	26.51	--------	43.5	---------	16.99
493.977	---------	38.22	V	-4.34	---------	33.88	--------	46.0	---------	12.12
545.988	---------	42.13	V	-3.04	---------	39.09	--------	46.0	---------	6.91
800	---------	20.47	H	1.10	---------	21.57	--------	46.0	---------	24.43
918.07	---------	20.47	V	2.98	---------	23.45	--------	46.0	---------	22.55

* Note: All emissions above 918 MHz were attenuated below the permissible limit.

7.4 Band-Edge Compliance and Spurious Emissions

7.4.1 Band-Edge Compliance of RF Emissions - FCC Section 15.247(d) IC: RSS-210 2.6, A8.5

7.4.1.1 Test Methodology

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. All antenna types were evaluated. Because the upper band-edge coincides with a restricted band, band-edge compliance for the upper band-edge was determined using the radiated mark-delta method as outlined in FCC DA 00-705. The radiated field strength of the fundamental emission was first determined and then the mark-delta method was used to determine the field strength of the band-edge emissions.

The band-edge measurements provided are for each meter form factor evaluated.

7.4.1.2 Test Results

Band-edge compliance is displayed in Tables 7.4.1.2-1 to 7.4.1.2-7 and Figure 7.4.1.2-1 – 7.4.1.2-14.

Table 7.4.1.2-1: Upper Band-edge Marker Delta Method – 3S Meter Form

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2475	114.47	108.47	H	-4.28	110.19	92.82	52.09	58.10	40.73	15.90	13.27
2475	119.89	114.11	V	-4.09	115.80	98.64	52.34	63.46	46.30	10.54	7.70

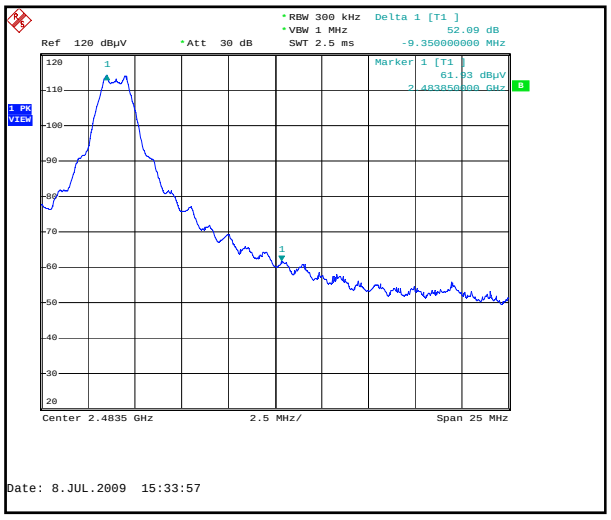

Figure 7.4.1.2-1: Upper Band-edge Hpol – 3S

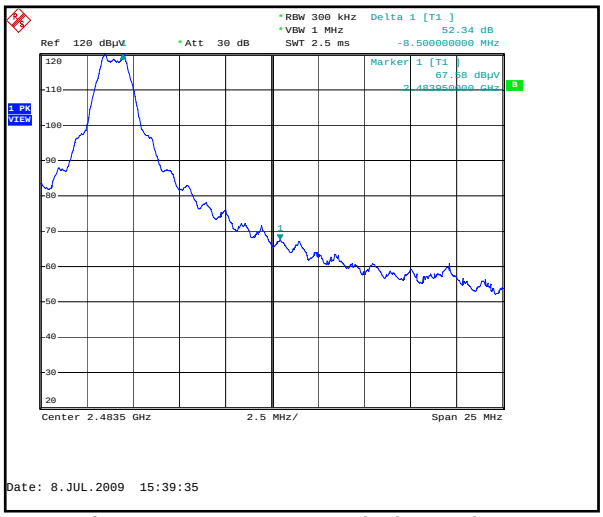

Figure 7.4.1.2-2: Upper Band-edge Vpol – 3S

Table 7.4.1.2-2: Upper Band-edge Marker Delta Method – 4S Meter Form

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2475	115.90	110.04	H	-4.28	111.62	94.39	51.69	59.93	42.70	14.07	11.30
2475	121.32	115.70	V	-4.09	117.23	100.23	52.35	64.88	47.88	9.12	6.12

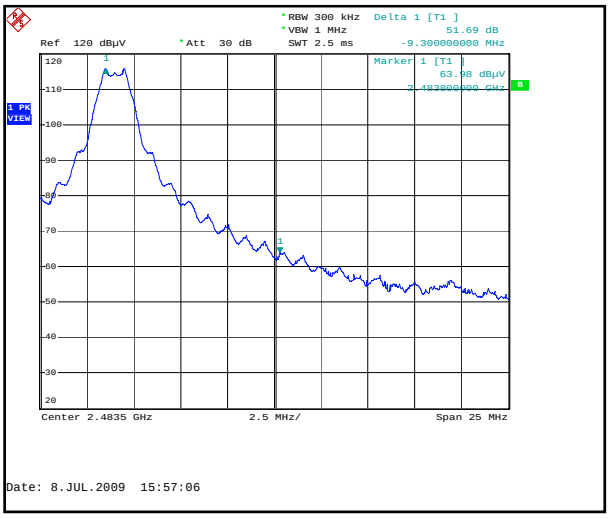

Figure 7.4.1.2-3: Upper Band-edge Hpol – 4S

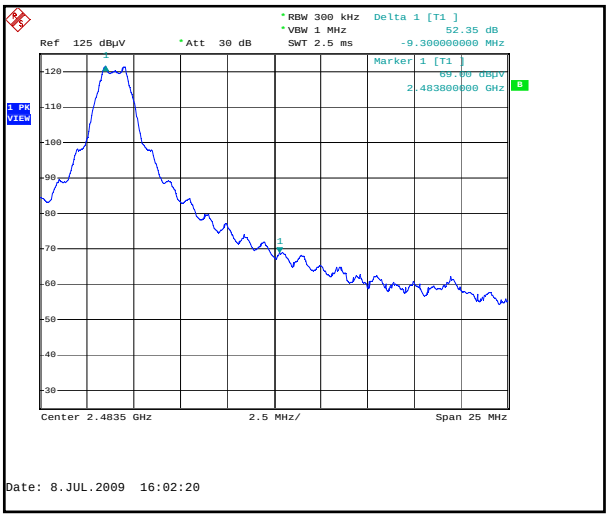

Figure 7.4.1.2-4: Upper Band-edge Vpol – 4S

Table 7.4.1.2-3: Upper Band-edge Marker Delta Method – 9S(8S) Meter Form

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2475	113.64	113.30	H	0.05	113.69	101.98	52.49	61.20	49.49	12.80	4.51
2475	114.89	114.52	V	0.05	114.94	103.20	52.49	62.45	50.71	11.55	3.29

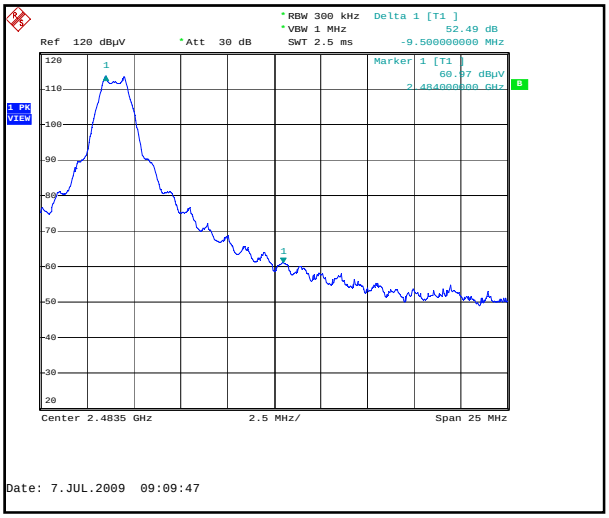

Figure 7.4.1.2-5: Upper Band-edge Hpol – 9S(8S)

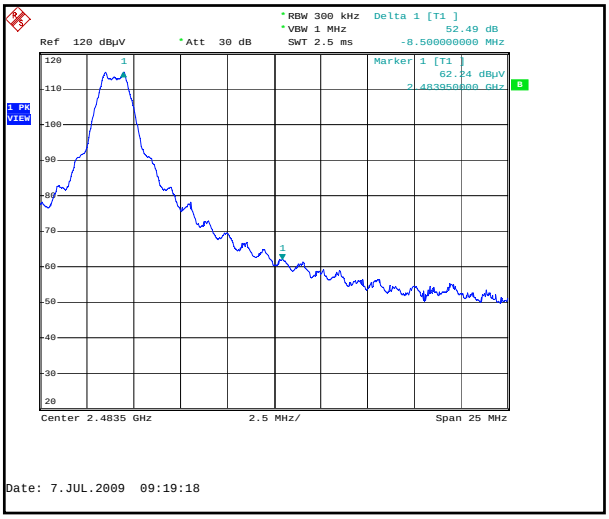

Figure 7.4.1.2-6: Upper Band-edge Vpol – 9S(8S)

Table 7.4.1.2-4: Upper Band-edge Marker Delta Method – 9/36S Meter Form

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2475	109.25	108.75	H	0.05	109.30	97.43	50.13	59.17	47.30	14.83	6.70
2475	112.08	111.41	V	0.05	112.13	100.09	50.87	61.26	49.22	12.74	4.78

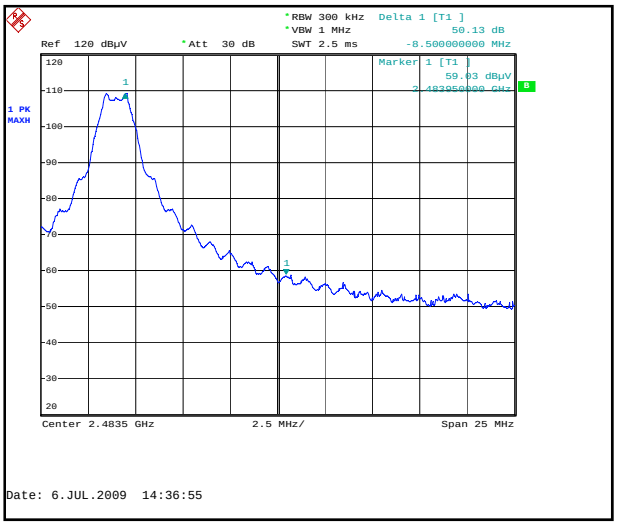

Figure 7.4.1.2-7: Upper Band-edge Hpol – 9/36S

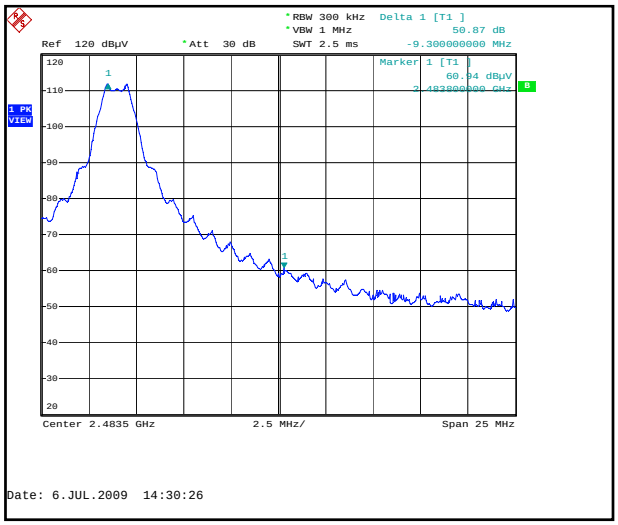

Figure 7.4.1.2-8: Upper Band-edge Vpol – 9/36S

Table 7.4.1.2-5: Upper Band-edge Marker Delta Method – 12S Meter Form

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2475	110.72	110.17	H	0.05	110.77	98.85	52.04	58.73	46.81	15.27	7.19
2475	114.74	114.36	V	0.05	114.79	103.04	51.62	63.17	51.42	10.83	2.58

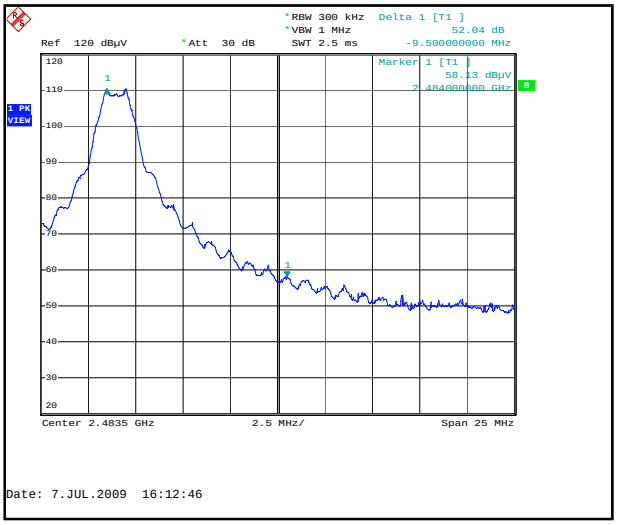

Figure 7.4.1.2-9: Upper Band-edge Hpol – 12S

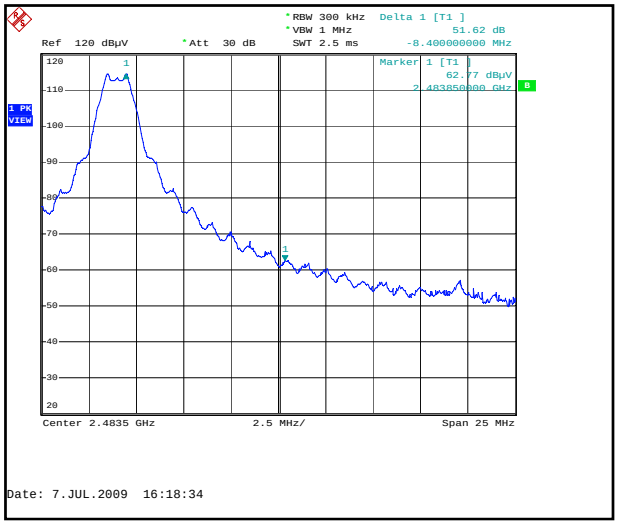

Figure 7.4.1.2-10: Upper Band-edge Vpol – 12S

Table 7.4.1.2-6: Upper Band-edge Marker Delta Method – 16S Meter Form

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2475	111.71	111.38	H	0.05	111.76	100.06	52.05	59.71	48.01	14.29	5.99
2475	113.35	113.16	V	0.05	113.40	101.84	52.14	61.26	49.70	12.74	4.30

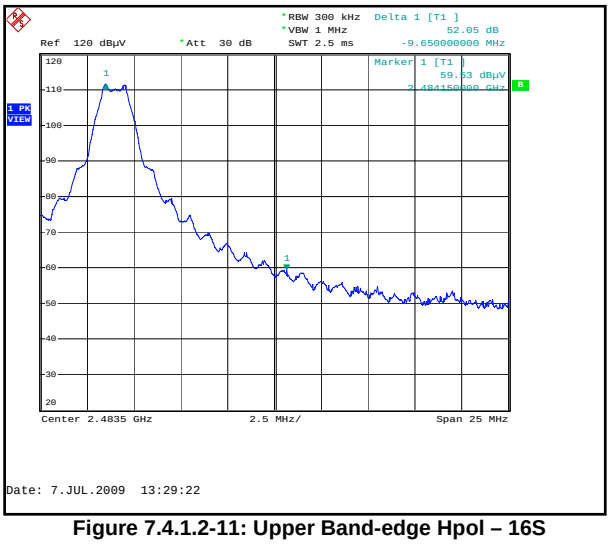

Figure 7.4.1.2-11: Upper Band-edge Hpol – 16S

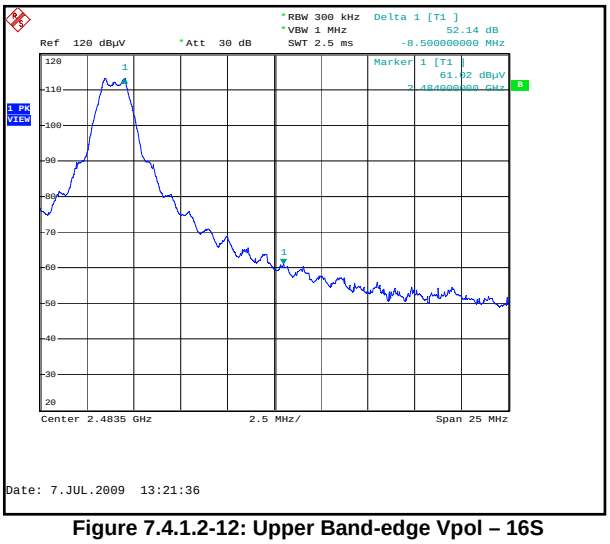

Figure 7.4.1.2-12: Upper Band-edge Vpol – 16S

Table 7.4.1.2-7: Upper Band-edge Marker Delta Method – 45S(5S) Meter Form

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg
2475	110.32	109.77	H	0.05	110.37	98.45	51.47	58.90	46.98	15.10	7.02
2475	112.50	112.01	V	0.05	112.55	100.69	51.49	61.06	49.20	12.94	4.80

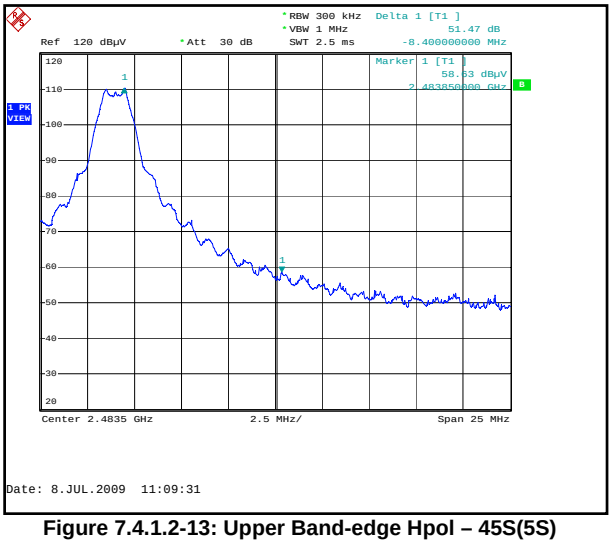

Figure 7.4.1.2-13: Upper Band-edge Hpol – 45S(5S)

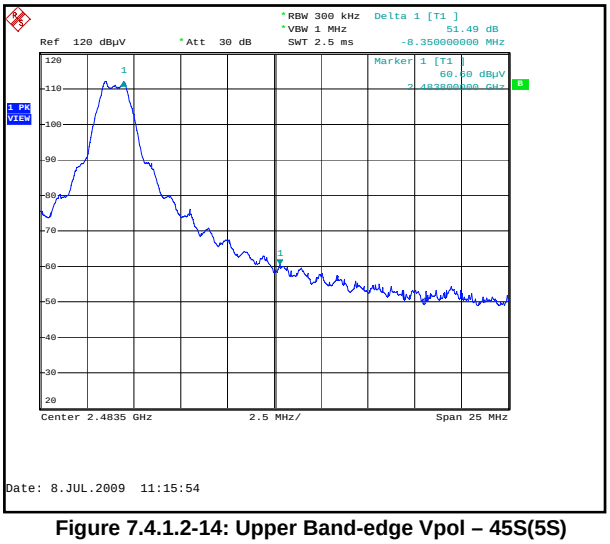

Figure 7.4.1.2-14: Upper Band-edge Vpol – 45S(5S)

7.4.2 Radiated Spurious Emissions (Restricted Bands) - FCC Section 15.205 IC: RSS-210 2.6

7.4.2.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 25GHz, 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 RBW and VBW of 1 MHz. The average emissions were further corrected by applying the duty cycle correction of the EUT to the average measurements for comparison to the average limit.

Each emission found to be in a restricted band as defined by section 15.205, was compared to the radiated emission limits as defined in section 15.209.

Radiated intermodulation products were evaluated for all simultaneously operating transmitters for each meter form factor host combination and found to be in compliance.

7.4.2.2 Duty Cycle Correction

For average radiated measurements, the measured level was reduced by a factor 11.37dB to account for the duty cycle of the EUT. The packet transmissions length is 27ms. The duty cycle correction factor is determined using the formula: 20log (.27/100) = 11.37dB. A detailed analysis of the duty cycle timing is provided in the Theory of Operation of the original filing.

7.4.2.3 Test Results

Radiated spurious emissions found in the band of 30MHz to 25GHz for each meter form are reported in Tables 7.4.2.3-1 to 7.4.2.3-7. Emissions not reported were below the noise floor of the measurement instrumentation.

Table 7.4.2.3-1: Radiated Spurious Emissions – 3S Meter Form

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	56.77	50.52	H	2.86	59.63	42.01	74.0	54.0	14.37	11.99
4810	61.72	55.07	V	3.15	64.87	46.85	74.0	54.0	9.13	7.15
Middle Channel										
4880	58.29	50.62	H	3.20	61.49	42.44	74.0	54.0	12.51	11.56
4880	64.26	57.66	V	3.53	67.79	49.81	74.0	54.0	6.21	4.19
7320	60.98	53.57	H	7.72	68.70	49.92	74.0	54.0	5.30	4.08
7320	61.49	54.15	V	7.75	69.24	50.53	74.0	54.0	4.76	3.47
High Channel										
4950	57.71	50.65	H	3.53	61.24	42.81	74.0	54.0	12.76	11.19
4950	65.00	57.68	V	3.90	68.90	50.21	74.0	54.0	5.10	3.79
7425	57.66	49.63	H	7.65	65.31	45.91	74.0	54.0	8.69	8.09
7425	61.11	53.47	V	7.72	68.83	49.82	74.0	54.0	5.17	4.18

Table 7.4.2.3-2: Radiated Spurious Emissions – 4S Meter Form

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	60.44	53.11	H	2.86	63.30	44.60	74.0	54.0	10.70	9.40
4810	63.51	56.41	V	3.15	66.66	48.19	74.0	54.0	7.34	5.81
Middle Channel										
4880	58.64	51.77	H	3.20	61.84	43.59	74.0	54.0	12.16	10.41
4880	63.44	57.15	V	3.53	66.97	49.30	74.0	54.0	7.03	4.70
7320	59.68	51.46	H	7.72	67.40	47.81	74.0	54.0	6.60	6.19
7320	61.21	53.64	V	7.75	68.96	50.02	74.0	54.0	5.04	3.98
High Channel										
4950	57.58	49.94	H	3.53	61.11	42.10	74.0	54.0	12.89	11.90
4950	64.92	58.24	V	3.90	68.82	50.77	74.0	54.0	5.18	3.23
7425	60.02	52.40	H	7.65	67.67	48.68	74.0	54.0	6.33	5.32
7425	61.06	53.42	V	7.72	68.78	49.77	74.0	54.0	5.22	4.23

Table 7.4.2.3-3: Radiated Spurious Emissions – 9S(8S) Meter Form

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	52.54	46.05	H	6.74	59.28	41.42	74.0	54.0	14.72	12.58
4810	57.31	52.11	V	6.74	64.05	47.48	74.0	54.0	9.95	6.52
Middle Channel										
4880	51.37	44.32	H	6.97	58.34	39.92	74.0	54.0	15.66	14.08
4880	56.61	51.68	V	6.97	63.58	47.28	74.0	54.0	10.42	6.72
7320	53.69	47.02	H	11.63	65.32	47.28	74.0	54.0	8.68	6.72
7320	62.20	54.94	V	7.75	69.95	51.32	74.0	54.0	4.05	2.68
High Channel										
4950	53.05	47.04	H	7.20	60.25	42.87	74.0	54.0	13.75	11.13
4950	53.26	47.12	V	7.20	60.46	42.95	74.0	54.0	13.54	11.05
7425	55.67	49.03	H	11.70	67.37	49.36	74.0	54.0	6.63	4.64
7425	57.18	50.85	V	11.70	68.88	51.18	74.0	54.0	5.12	2.82

Table 7.4.2.3-4: Radiated Spurious Emissions – 9/36S Meter Form

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	53.73	48.08	H	6.74	60.47	43.45	74.0	54.0	13.53	10.55
4810	55.83	50.54	V	6.74	62.57	45.91	74.0	54.0	11.43	8.09
Middle Channel										
4880	51.95	45.80	H	6.97	58.92	41.40	74.0	54.0	15.08	12.60
4880	54.88	49.58	V	6.97	61.85	45.18	74.0	54.0	12.15	8.82
7320	52.64	45.24	H	11.63	64.27	45.50	74.0	54.0	9.73	8.50
7320	58.54	53.30	V	11.63	70.17	53.56	74.0	54.0	3.83	0.44
High Channel										
4950	51.09	45.17	H	7.20	58.29	41.00	74.0	54.0	15.71	13.00
4950	54.61	49.26	V	7.20	61.81	45.09	74.0	54.0	12.19	8.91
7425	52.97	46.62	H	11.70	64.67	46.95	74.0	54.0	9.33	7.05
7425	56.63	50.74	V	11.70	68.33	51.07	74.0	54.0	5.67	2.93

Table 7.4.2.3-5: Radiated Spurious Emissions – 12S Meter Form

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	53.69	48.22	H	6.74	60.43	43.59	74.0	54.0	13.57	10.41
4810	57.52	52.22	V	6.74	64.26	47.59	74.0	54.0	9.74	6.41
Middle Channel										
4880	53.36	47.74	H	6.97	60.33	43.34	74.0	54.0	13.67	10.66
4880	58.80	54.16	V	6.97	65.77	49.76	74.0	54.0	8.23	4.24
7320	57.62	51.91	H	11.63	69.25	52.17	74.0	54.0	4.75	1.83
7320	61.67	54.30	V	7.75	69.42	50.68	74.0	54.0	4.58	3.32
High Channel										
4950	52.58	46.93	H	7.20	59.78	42.76	74.0	54.0	14.22	11.24
4950	55.72	50.59	V	7.20	62.92	46.42	74.0	54.0	11.08	7.58
7425	54.87	48.49	H	11.70	66.57	48.82	74.0	54.0	7.43	5.18
7425	57.35	51.72	V	11.70	69.05	52.05	74.0	54.0	4.95	1.95

Table 7.4.2.3-6: Radiated Spurious Emissions – 16S Meter Form

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	51.35	44.99	H	6.74	58.09	40.36	74.0	54.0	15.91	13.64
4810	56.37	50.98	V	6.74	63.11	46.35	74.0	54.0	10.89	7.65
Middle Channel										
4880	52.22	45.70	H	6.97	59.19	41.30	74.0	54.0	14.81	12.70
4880	57.92	52.64	V	6.97	64.89	48.24	74.0	54.0	9.11	5.76
7320	53.55	46.92	H	11.63	65.18	47.18	74.0	54.0	8.82	6.82
7320	58.68	52.89	V	11.63	70.31	53.15	74.0	54.0	3.69	0.85
High Channel										
4950	52.23	45.95	H	7.20	59.43	41.78	74.0	54.0	14.57	12.22
4950	54.06	48.10	V	7.20	61.26	43.93	74.0	54.0	12.74	10.07
7425	51.93	45.64	H	11.70	63.63	45.97	74.0	54.0	10.37	8.03
7425	57.69	51.94	V	11.70	69.39	52.27	74.0	54.0	4.61	1.73

Table 7.4.2.3-7: Radiated Spurious Emissions – 45S(5) Meter Form

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	53.01	46.14	H	6.74	59.75	41.51	74.0	54.0	14.25	12.49
4810	56.24	50.60	V	6.74	62.98	45.97	74.0	54.0	11.02	8.03
Middle Channel										
4880	51.59	44.98	H	6.97	58.56	40.58	74.0	54.0	15.44	13.42
4880	54.74	49.06	V	6.97	61.71	44.66	74.0	54.0	12.29	9.34
7320	53.51	45.99	H	11.63	65.14	46.25	74.0	54.0	8.86	7.75
7320	59.64	51.77	V	7.75	67.39	48.15	74.0	54.0	6.61	5.85
High Channel										
4950	52.23	45.96	H	7.20	59.43	41.79	74.0	54.0	14.57	12.21
4950	52.21	46.19	V	7.20	59.41	42.02	74.0	54.0	14.59	11.98
7425	53.75	47.07	H	11.70	65.45	47.40	74.0	54.0	8.55	6.60
7425	61.34	53.29	V	7.72	69.06	49.64	74.0	54.0	4.94	4.36

7.4.2.4 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: 56.77+ 2.86 = 59.63dBuV/m
Margin: 74dBuV/m – 59.63dBuV/m = 14.37dB

Example Calculation: Average
Corrected Level: 50.52+ 2.86 - 11.37 = 42.01dBuV
Margin: 54dBuV – 42.01dBuV = 11.99dB

8.0 CONCLUSION
In the opinion of ACS, Inc. the AMI4 module, 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