

## **Certification Test Report**

**FCC ID: SK9AMI6**

**IC: 864G-AMI6**

**FCC Rule Part: 15.247**

**IC Radio Standards Specification: RSS-210**

**ACS Report Number: 10-0158.W06.22.A**

**Manufacturer: Itron Electricity Metering, Inc.**

**Model: AMI6**

**Test Begin Date: May 10, 2010**

**Test End Date: May 20, 2010**

**Report Issue Date: June 1, 2010**



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.

**Reviewed by:**

A handwritten signature in black ink, appearing to read 'Kirby Munroe', is written over a horizontal line.

**Kirby Munroe**  
**Director, Wireless Certifications**  
**ACS, Inc.**

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**This report contains 26 pages**

# TABLE OF CONTENTS

<b>1</b>	<b>GENERAL</b>	<b>3</b>
1.1	PURPOSE	3
1.2	PRODUCT DESCRIPTION	3
1.3	TEST METHODOLOGY AND CONSIDERATIONS	3
<b>2</b>	<b>TEST FACILITIES</b>	<b>4</b>
2.1	LOCATION	4
2.2	LABORATORY ACCREDITATIONS/RECOGNITIONS/CERTIFICATIONS	4
2.3	RADIATED EMISSIONS TEST SITE DESCRIPTION	5
2.3.1	<i>Semi-Anechoic Chamber Test Site</i>	5
2.3.2	<i>Open Area Tests Site (OATS)</i>	6
2.4	CONDUCTED EMISSIONS TEST SITE DESCRIPTION	7
<b>3</b>	<b>APPLICABLE STANDARD REFERENCES</b>	<b>7</b>
<b>4</b>	<b>LIST OF TEST EQUIPMENT</b>	<b>8</b>
<b>5</b>	<b>SUPPORT EQUIPMENT</b>	<b>9</b>
<b>6</b>	<b>EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM</b>	<b>9</b>
<b>7</b>	<b>SUMMARY OF TESTS</b>	<b>10</b>
7.1	ANTENNA REQUIREMENT – FCC: SECTION 15.203	10
7.2	POWER LINE CONDUCTED EMISSIONS – FCC: SECTION 15.207 IC: RSS-GEN 7.2.2	10
7.2.1	<i>Measurement Procedure</i>	10
7.2.2	<i>Measurement Results</i>	10
7.3	RADIATED EMISSIONS – FCC: SECTION 15.109 (UNINTENTIONAL RADIATION) IC: RSS-210 2.6	14
7.3.1	<i>Measurement Procedure</i>	14
7.3.2	<i>Measurement Results</i>	14
7.4	6dB / 99% BANDWIDTH – FCC: SECTION 15.247(A)(2) IC: RSS-210 A8.2(A)	15
7.4.1	<i>Measurement Procedure</i>	15
7.4.2	<i>Measurement Results</i>	15
7.5	PEAK OUTPUT POWER REQUIREMENT - FCC SECTION 15.247(B)(3) IC: RSS-210 A8.4(4)	17
7.5.1	<i>Measurement Procedure</i>	17
7.5.2	<i>Measurement Results</i>	17
7.6	BAND-EDGE COMPLIANCE AND SPURIOUS EMISSIONS-FCC 15.247D IC:RSS-210 2.6, A8.5	18
7.6.1	<i>Band-Edge Compliance of RF Conducted Emissions</i>	18
7.6.1.1	<i>Measurement Procedure</i>	18
7.6.1.2	<i>Measurement Results</i>	18
7.6.2	<i>RF Conducted Spurious Emissions</i>	20
7.6.2.1	<i>Measurement Procedure</i>	20
7.6.2.2	<i>Measurement Results</i>	20
7.6.3	<i>Radiated Spurious Emissions (Restricted Bands) - FCC Sec. 15.205 IC: RSS-210 2.6</i>	22
7.6.3.1	<i>Measurement Procedure</i>	22
7.6.3.2	<i>Duty Cycle Correction</i>	22
7.6.3.3	<i>Measurement Results</i>	23
7.6.3.4	<i>Sample Calculation:</i>	24
7.7	PEAK POWER SPECTRAL DENSITY- FCC SECTION 15.247(E) IC: RSS-210 A8.2(B)	25
7.7.1	<i>Measurement Procedure</i>	25
7.7.2	<i>Measurement Results</i>	25
<b>8</b>	<b>CONCLUSION</b>	<b>26</b>

## 1 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 Certification of a single limited modular approval.

### 1.2 Product description

The AMI6 module is a utility meter register board designed to be integrated into a variety of electric meter form factors. The AMI6 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): 6060000997-001

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

### 1.3 Test Methodology and Considerations

This AMI6 is 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, 10-0158.W06.12.A, will be issued to address the 900 MHz LAN radio.

The AMI6 was integrated into the 1S, 2S, and 12S meter forms for AC power line conducted emissions and radiated emissions.

Both the 900 MHz LAN radio and the 2.4 GHz Zigbee radio can transmit simultaneously therefore radiated inter-modulation products were evaluated and found to be in compliance.

For the purpose of RF conducted measurements, the AMI6 module was modified with a temporary 50 ohm antenna port.

## **2 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 Site 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:

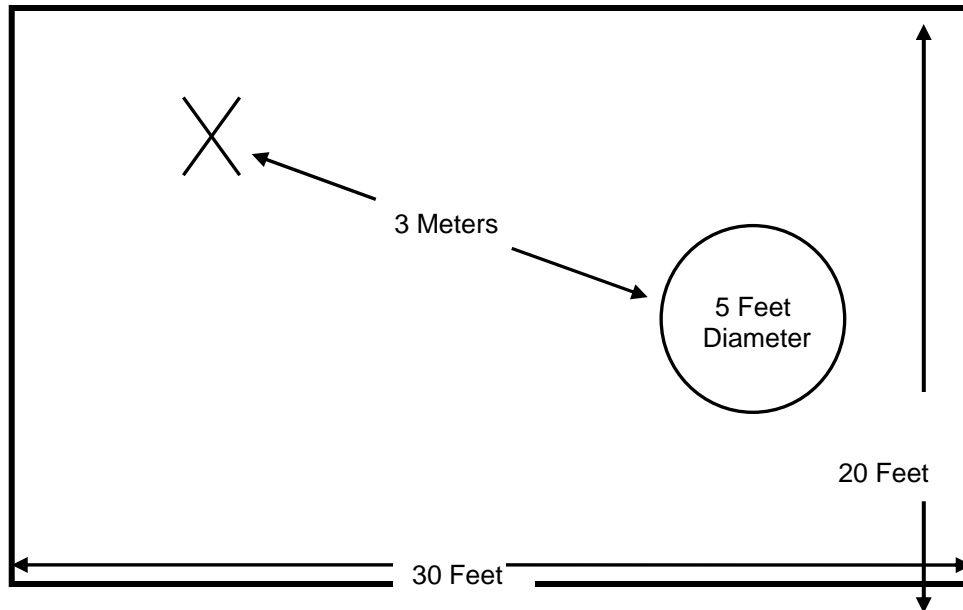


Figure 2.3-1: Semi-Anechoic Chamber Test Site

**2.3.2 Open Area Tests Site (OATS)**

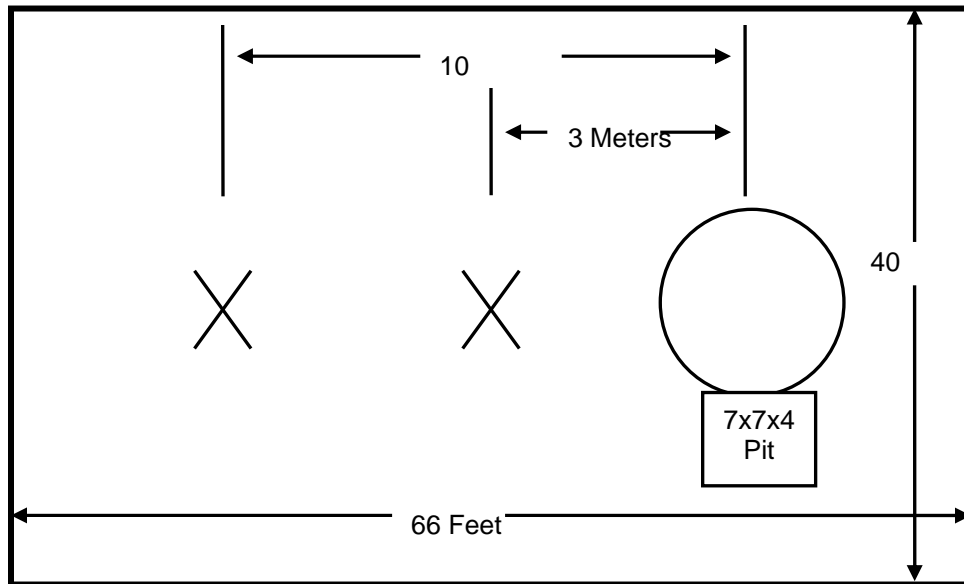
The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide 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 ground 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:

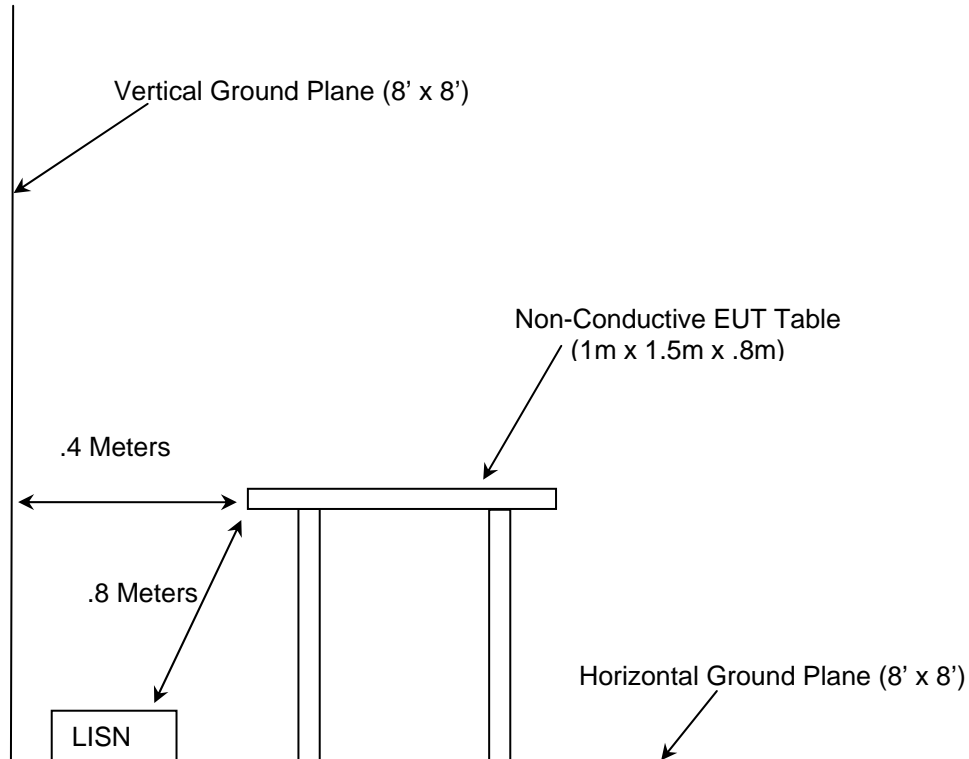


Figure 2.4-1: AC Mains Conducted EMI Site

## 3 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, 2010
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010
- ❖ 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 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	09-21-2010
2	Rohde & Schwarz	Spectrum Analyzers	ESMI - Receiver	839587/003	09-21-2010
3	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	839379/011	02-02-2011
4	Rohde & Schwarz	Spectrum Analyzers	ESMI - Receiver	833827/003	02-02-2011
22	Agilent	Amplifiers	8449B	3008A00526	09-21-2010
25	Chase	Antennas	CBL6111	1043	09-02-2010
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-08-2011
73	Agilent	Amplifier	8447D	2727A05624	05-26-2011
153	EMCO	LISN	Feb-25	9411-2268	01-11-2011
167	ACS	Cable Set	Chamber EMI Cable Set	167	01-25-2011 (See Note1)
168	Hewlett Packard	Attenuators	11947A	44829	02-04-2011 (See Note2)
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	09-21-2010
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2010 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2010 (See Note1)
324	ACS	Cables	Belden	8214	07-15-2010 (See Note1)
329	A.H. Systems	Antennas	SAS-571	721	08-04-2011
340	Aeroflex/Weinschel	Attenuators	AS-20	7136	10-16-2010 (See Note2)
343	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	N/A	04-27-2011 (See Note1)
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	01-26-2011 (See Note1)
432	Microwave Circuits	Filters	H3G020G4	264066	07-17-2010 (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 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Electric Meter	Itron Electricity Metering	C2SOD (1S)	300 307 547
2	Electric Meter	Itron Electricity Metering	C2SOD (2S)	300 307 531
3	Electric Meter	Itron Electricity Metering	CN2SOD (12S)	300 307 250
4	Transformer	Sagamo Weston	Type T-6A	325827 002

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

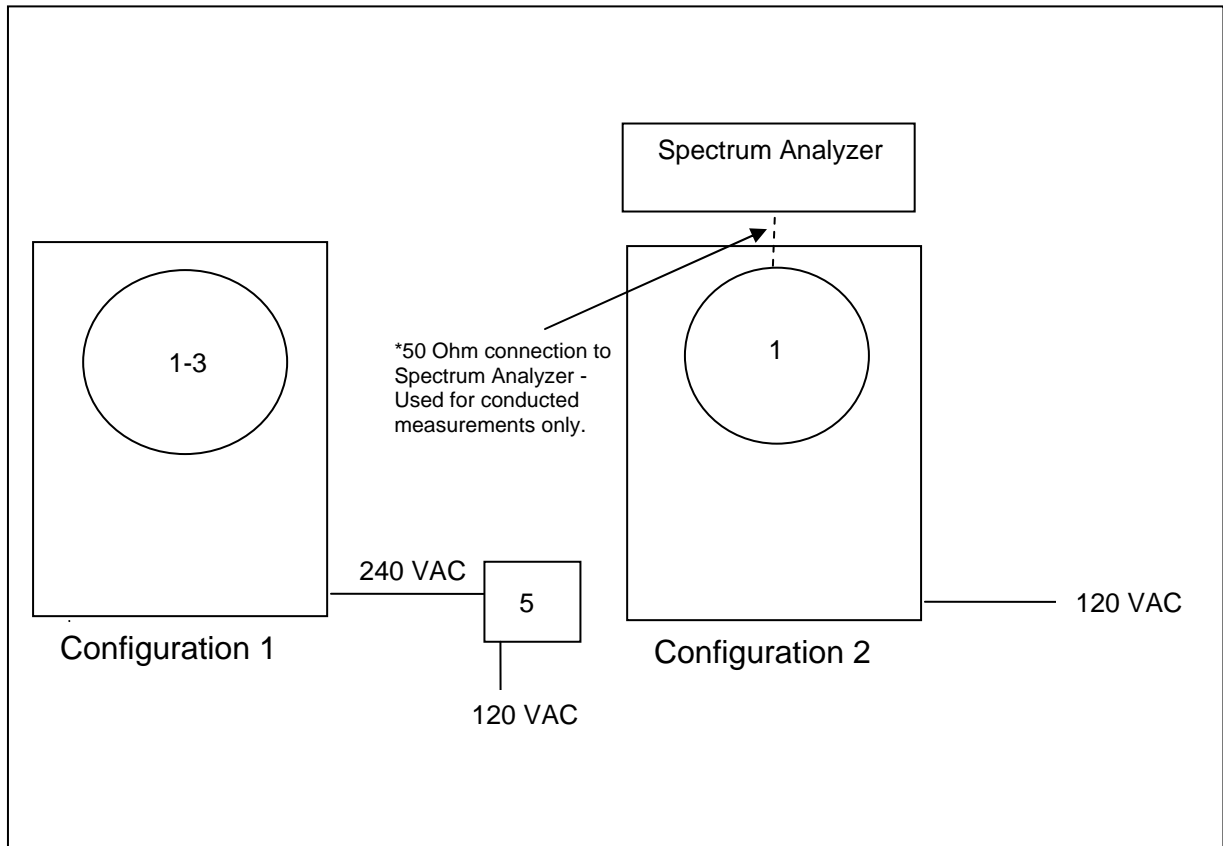


Figure 6-1: EUT Test Setup

Note1: The 1S meter form was utilized to power the AMI6 modules for RF conducted measurements. The AMI6 was also integrated into the 1S, 2S, and 12S meter forms for showing compliance for radiated emissions and AC power line conducted emissions.

Note2: 1S and 12S meter form connects directly to 120vAC and did not use a transformer (5).

## 7 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 PWB ground plane with a measured gain of ~3.8dBi

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

#### 7.2.1 Measurement Procedure

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:

$$\text{Corrected Reading} = \text{Analyzer Reading} + \text{LISN Loss} + \text{Cable Loss}$$

$$\text{Margin} = \text{Applicable Limit} - \text{Corrected Reading}$$

#### 7.2.2 Measurement Results

Results of the test are shown below in and Tables 7.2.2-1 to 7.2.2-6.

**Table 7.2.2-1: Line 1 Conducted EMI Results – 1S Meter**

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.768	10.6	10.1	56	45.5	L1	GND	QP
0.978	11	10	56	45	L1	GND	QP
1.368	10.6	10	56	45.4	L1	GND	QP
1.698	10.5	10	56	45.5	L1	GND	QP
1.824	10.4	10	56	45.6	L1	GND	QP
1.992	10.5	10	56	45.5	L1	GND	QP
2.232	9.7	10	56	46.3	L1	GND	QP
2.886	9.4	9.9	56	46.6	L1	GND	QP
18.702	10.4	9.8	60	49.6	L1	GND	QP
28.794	11.6	9.2	60	48.4	L1	GND	QP
0.816	7.4	10.1	46	38.6	L1	GND	AVG
0.918	7.6	10	46	38.4	L1	GND	AVG
1.458	7.9	10	46	38.1	L1	GND	AVG
1.704	7.2	10	46	38.8	L1	GND	AVG
1.806	7.3	10	46	38.7	L1	GND	AVG
1.98	7.1	10	46	38.9	L1	GND	AVG
2.268	6.8	10	46	39.2	L1	GND	AVG
2.874	6.7	10	46	39.3	L1	GND	AVG
18.666	6.9	9.8	50	43.1	L1	GND	AVG
28.98	7.5	9.2	50	42.5	L1	GND	AVG

Table 7.2.2-2: Line 2 Conducted EMI Results - 1S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	21.1	9.9	66	44.9	L2	GND	QP
0.57	10.5	10	56	45.6	L2	GND	QP
0.804	10.6	10.1	56	45.4	L2	GND	QP
1.026	10.2	10	56	45.8	L2	GND	QP
1.308	10.6	10	56	45.4	L2	GND	QP
1.47	10.6	10	56	45.4	L2	GND	QP
1.752	10.6	10	56	45.4	L2	GND	QP
2.31	9.9	10	56	46.1	L2	GND	QP
3.774	9.6	9.9	56	46.4	L2	GND	QP
3.924	9.5	9.9	56	46.5	L2	GND	QP
0.192	11.5	9.9	54	42.4	L2	GND	AVG
0.576	7.3	10	46	38.7	L2	GND	AVG
0.858	7.3	10	46	38.7	L2	GND	AVG
1.008	7.2	10	46	38.8	L2	GND	AVG
1.29	7.5	10	46	38.5	L2	GND	AVG
1.422	7.9	10	46	38.1	L2	GND	AVG
1.734	7.2	10	46	38.8	L2	GND	AVG
2.34	6.7	10	46	39.3	L2	GND	AVG
3.786	6.7	9.9	46	39.3	L2	GND	AVG
3.936	6.7	9.9	46	39.3	L2	GND	AVG

Table 7.2.2-3: Line 1 Conducted EMI Results – 2S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.15	33.7	9.9	66	32.3	L1	GND	QP
0.462	20.8	10	57	35.8	L1	GND	QP
0.498	20.7	10	56	35.4	L1	GND	QP
0.72	16.6	10.1	56	39.4	L1	GND	QP
0.87	15.4	10	56	40.6	L1	GND	QP
1.086	14.2	10	56	41.8	L1	GND	QP
1.452	13.4	10	56	42.6	L1	GND	QP
1.554	13.1	10	56	42.9	L1	GND	QP
2.424	11.4	10	56	44.6	L1	GND	QP
2.49	11	10	56	45	L1	GND	QP
0.198	11.6	9.9	54	42.1	L1	GND	AVG
0.456	8.7	10	47	38.1	L1	GND	AVG
0.546	8.4	10	46	37.6	L1	GND	AVG
0.786	8.1	10.1	46	37.9	L1	GND	AVG
0.9	8	10	46	38	L1	GND	AVG
1.008	7.9	10	46	38.1	L1	GND	AVG
1.488	7.5	10	46	38.5	L1	GND	AVG
1.596	7.6	10	46	38.4	L1	GND	AVG
2.484	6.8	10	46	39.2	L1	GND	AVG
2.586	6.9	10	46	39.1	L1	GND	AVG

Table 7.2.2-4: Line 2 Conducted EMI Results - 2S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.156	33.7	9.9	66	32	L2	GND	QP
0.264	23.1	10	61	38.2	L2	GND	QP
0.39	20.4	10.1	58	37.6	L2	GND	QP
0.456	21.3	10	57	35.5	L2	GND	QP
0.528	21.1	10	56	34.9	L2	GND	QP
0.558	20.2	10	56	35.8	L2	GND	QP
0.678	18.2	10	56	37.8	L2	GND	QP
0.918	14.9	10	56	41.1	L2	GND	QP
0.954	22.1	10	56	33.9	L2	GND	QP
2.19	11.8	10	56	44.2	L2	GND	QP
0.192	13.6	9.9	54	40.4	L2	GND	AVG
0.264	9.1	10	51	42.2	L2	GND	AVG
0.396	8.9	10.1	48	39.1	L2	GND	AVG
0.45	8.7	10	47	38.2	L2	GND	AVG
0.528	8.6	10	46	37.5	L2	GND	AVG
0.582	8.4	10	46	37.6	L2	GND	AVG
0.654	8.6	10	46	37.4	L2	GND	AVG
0.87	7.9	10	46	38.1	L2	GND	AVG
0.942	8.6	10	46	37.4	L2	GND	AVG
2.178	7	10	46	39	L2	GND	AVG

Table 7.2.2-5: Line 1 Conducted EMI Results - 12S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.48	20.3	10	56	36	L1	GND	QP
0.552	20.1	10	56	35.9	L1	GND	QP
0.648	20	10	56	36	L1	GND	QP
0.804	20.1	10.1	56	35.9	L1	GND	QP
1.194	20.6	10	56	35.4	L1	GND	QP
1.434	21.6	10	56	34.4	L1	GND	QP
1.722	21.2	10	56	34.8	L1	GND	QP
2.178	20.6	10	56	35.4	L1	GND	QP
2.394	20.3	10	56	35.7	L1	GND	QP
2.76	19.4	10	56	36.6	L1	GND	QP
0.48	11.7	10	46	34.6	L1	GND	AVG
0.576	8.9	10	46	37.1	L1	GND	AVG
0.702	8.9	10.1	46	37.1	L1	GND	AVG
0.84	9.1	10	46	36.9	L1	GND	AVG
1.188	9	10	46	37	L1	GND	AVG
1.422	10.6	10	46	35.4	L1	GND	AVG
1.692	9.2	10	46	36.8	L1	GND	AVG
2.166	8.8	10	46	37.2	L1	GND	AVG
2.37	8.7	10	46	37.3	L1	GND	AVG
2.802	8.3	10	46	37.7	L1	GND	AVG

Table 7.2.2-6: Line 2 Conducted EMI Results - 12S Meter

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.462	20.8	10	57	35.9	L2	GND	QP
0.492	20.6	10	56	35.5	L2	GND	QP
0.588	20.4	10	56	35.6	L2	GND	QP
0.624	20.4	10	56	35.6	L2	GND	QP
0.738	20.4	10.1	56	35.6	L2	GND	QP
1.194	20	10	56	36	L2	GND	QP
1.248	20.2	10	56	35.8	L2	GND	QP
1.41	20.5	10	56	35.5	L2	GND	QP
1.764	20.7	10	56	35.3	L2	GND	QP
1.944	20.6	10	56	35.4	L2	GND	QP
0.462	8.8	10	47	37.9	L2	GND	AVG
0.48	11.7	10	46	34.6	L2	GND	AVG
0.552	8.9	10	46	37.2	L2	GND	AVG
0.588	8.9	10	46	37.2	L2	GND	AVG
0.75	9	10.1	46	37.1	L2	GND	AVG
1.194	9	10	46	37	L2	GND	AVG
1.242	9.1	10	46	36.9	L2	GND	AVG
1.404	9.5	10	46	36.5	L2	GND	AVG
1.806	9.2	10	46	36.8	L2	GND	AVG
1.938	9.3	10	46	36.7	L2	GND	AVG

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

**7.3.1 Measurement Procedure**

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 Measurement Results**

Results of the test are given in Tables 7.3.2-1 to 7.3.2-3 below:

**Table 7.3.2-1: Radiated Emissions Tabulated Data – 1S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
30	-----	18.71	V	-6.70	-----	12.01	-----	40.0	-----	28.0
190.05	-----	35.37	V	-15.80	-----	19.57	-----	43.5	-----	23.9
312	-----	36.92	H	-11.20	-----	25.72	-----	46.0	-----	20.3
476	-----	21.28	H	-6.00	-----	15.28	-----	46.0	-----	30.7
697	-----	20.57	H	-1.92	-----	18.65	-----	46.0	-----	27.4
951	-----	20.51	H	2.77	-----	23.28	-----	46.0	-----	22.7
2604.5	44.46	42.43	H	6.34	50.80	48.77	74.0	54.0	23.2	5.2

**Table 7.3.2-2: Radiated Emissions Tabulated Data – 2S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
30	-----	18.33	V	-6.70	-----	11.63	-----	40.0	-----	28.4
194.51	-----	33.57	V	-15.80	-----	17.77	-----	43.5	-----	25.7
311.986	-----	35.32	H	-11.20	-----	24.12	-----	46.0	-----	21.9
441.982	-----	38.21	V	-6.48	-----	31.73	-----	46.0	-----	14.3
700	-----	20.51	H	-1.80	-----	18.71	-----	46.0	-----	27.3
948	-----	20.36	V	2.54	-----	22.90	-----	46.0	-----	23.1
2604.5	46.18	41.15	H	6.34	52.52	47.49	74.0	54.0	21.5	6.5

**Table 7.3.2-3: Radiated Emissions Tabulated Data – 12S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
30	-----	21.20	V	-6.70	-----	14.50	-----	40.0	-----	25.5
109.8	-----	23.33	H	-13.80	-----	9.53	-----	43.5	-----	34.0
311.972	-----	38.24	H	-11.20	-----	27.04	-----	46.0	-----	19.0
441.984	-----	40.75	H	-6.48	-----	34.27	-----	46.0	-----	11.7
703	-----	20.26	H	-1.77	-----	18.49	-----	46.0	-----	27.5
946	-----	19.96	V	2.38	-----	22.34	-----	46.0	-----	23.7
2604.5	45.87	40.21	H	6.34	52.21	46.55	74.0	54.0	21.8	7.5

\* Note: All emissions above 2604.5 MHz were attenuated below the permissible limit.

7.4 6dB / 99% Bandwidth – FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(a)

7.4.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)”. The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the entire emissions and >> RBW.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission and approximately 20 dB below the peak level. The RBW was to 1% - 3% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

7.4.2 Measurement Results

Results are shown below in table 7.4.2-1 and figure 7.4.2-1 to 7.4.2-6:

Table 7.4.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2405	1.62	2.26
2440	1.64	2.28
2475	1.60	2.28

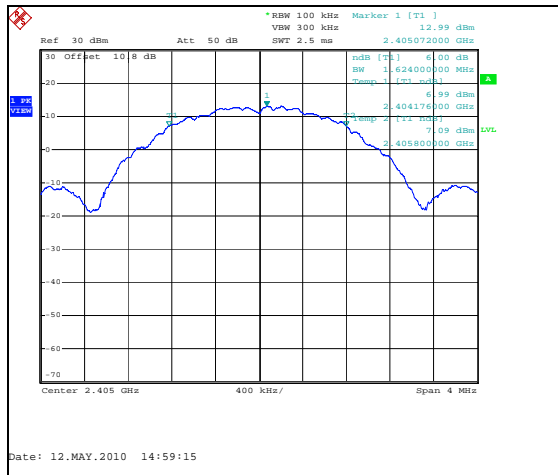


Figure 7.4.2-1: 6dB Bandwidth Plot – Low Channel

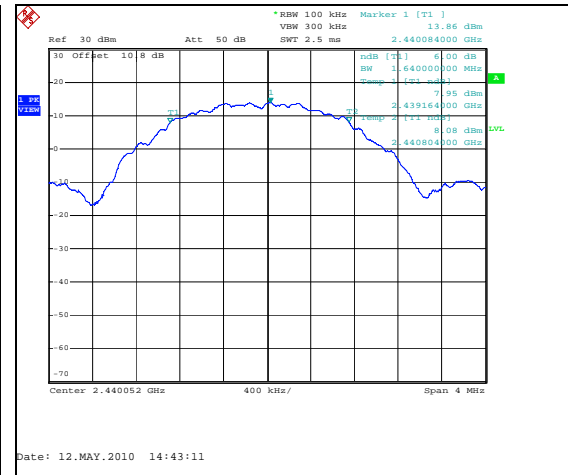


Figure 7.4.2-2: 6dB Bandwidth Plot – Mid Channel

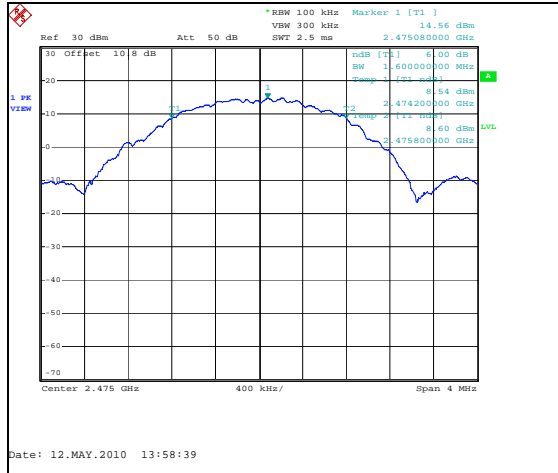


Figure 7.4.2-3: 6dB Bandwidth Plot – High Channel

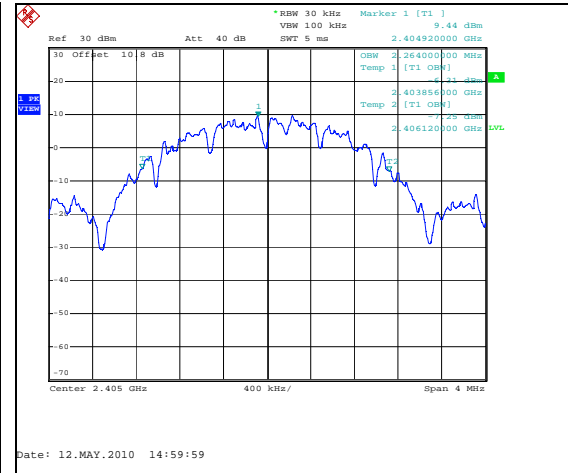


Figure 7.4.2-4: 99% Bandwidth Plot – Low Channel

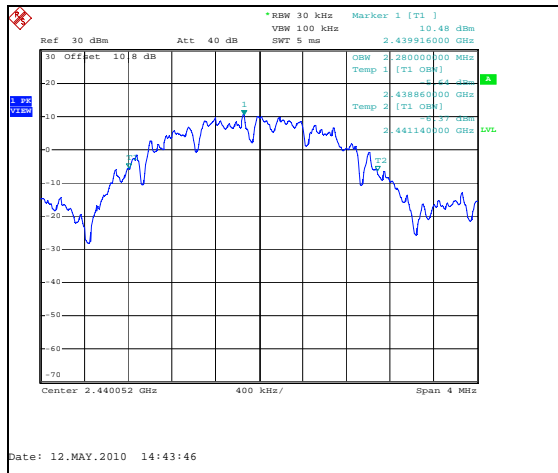


Figure 7.4.2-5: 99% Bandwidth Plot – Mid Channel

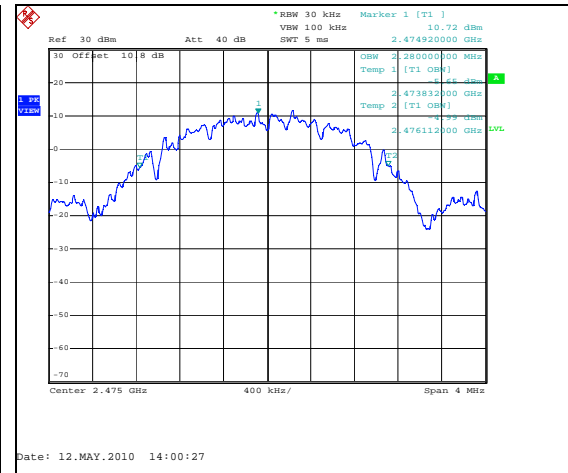


Figure 7.4.2-6: 99% Bandwidth Plot – High Channel



7.5 Peak Output Power Requirement - FCC Section 15.247(b)(3) IC: RSS-210 A8.4(4)

7.5.1 Measurement Procedure

The Peak Output Power was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)" Power Option 1. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer and the RBW was set >> than the emission BW. The insertion loss for all cables and attenuators was included as an offset value. The EUT operating at maximum power.

7.5.2 Measurement Results

Results are shown below in Table 7.5.2-1 and Figures 7.5.2-2 to 7.5.2-3 below.

Table 7.5.2-1: Peak Output Power

Frequency (MHz)	Output Power (dBm)
2405	17.59
2440	18.69
2475	18.94

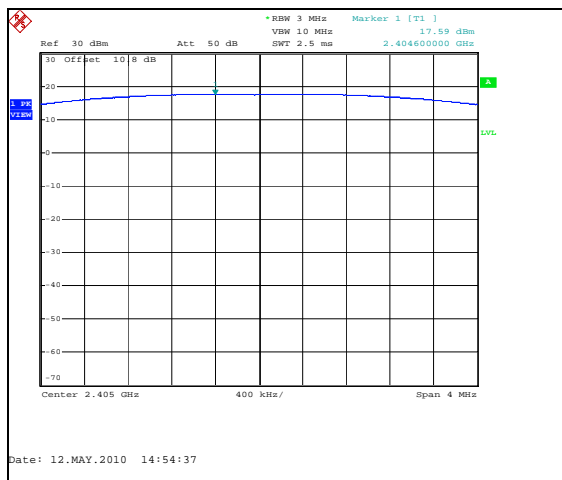


Figure 7.5.2-1: Peak Power Output – Low Channel

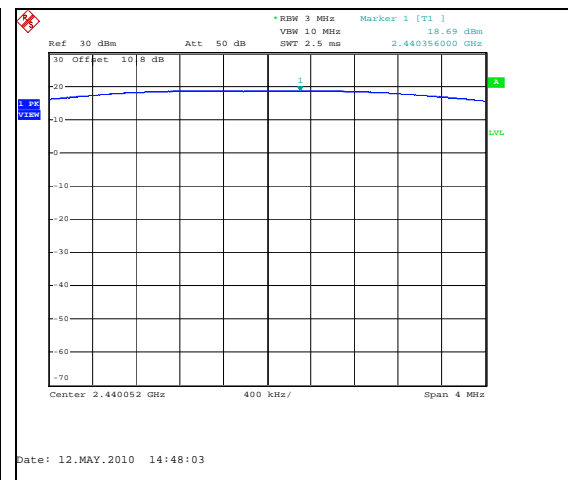


Figure 7.5.2-2: Peak Power Output – Mid Channel

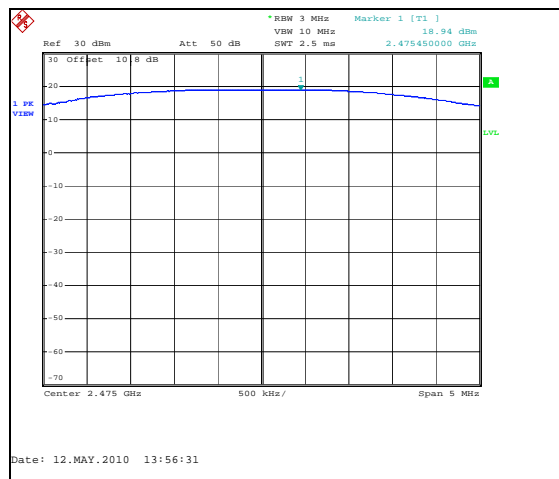


Figure 7.5.2-3: Peak Power Output – High Channel

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

**7.6.1 Band-Edge Compliance of RF Conducted Emissions**

**7.6.1.1 Measurement Procedure**

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. 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. 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 lower band-edge compliance was determined using the marker-delta method in which the radio frequency power that is 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.

**7.6.1.2 Measurement Results**

Band-edge data is displayed in Tables 7.6.1.2-1 - 7.6.1.2-3 and Figures 7.6.1.2-1 – 7.6.1.2-7.

**Table 7.6.1.2-1: Upper Band-edge Marker Delta Method – 1S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Field Strength (dBuV/m)		Delta-Marker (dB)	Band-edge Field Strength (dBuV/m)		Margin to Limit (dBuV/m)	
	pk	avg			pk	avg		pk	avg	74	54
	Fundamental Frequency										
2475	113.53	110.12	H	0.94	114.47	99.69	53.18	61.29	46.51	12.71	7.49
2475	114.40	111.19	V	0.94	115.34	100.76	53.88	61.46	46.88	12.54	7.12

**Table 7.6.1.2-2: Upper Band-edge Marker Delta Method – 2S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Field Strength (dBuV/m)		Delta-Marker (dB)	Band-edge Field Strength (dBuV/m)		Margin to Limit (dBuV/m)	
	pk	avg			pk	avg		pk	avg	74	54
	Fundamental Frequency										
2475	113.12	110.75	H	0.94	114.06	100.32	52.33	61.73	47.99	12.27	6.01
2475	113.98	111.60	V	0.94	114.92	101.17	52.94	61.98	48.23	12.02	5.77

**Table 7.6.1.2-3: Upper Band-edge Marker Delta Method – 12S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Fundamental Field Strength (dBuV/m)		Delta-Marker (dB)	Band-edge Field Strength (dBuV/m)		Margin to Limit (dBuV/m)	
	pk	avg			pk	avg		pk	avg	74	54
	Fundamental Frequency										
2475	113.62	110.23	H	0.94	114.56	99.80	52.41	62.15	47.39	11.85	6.61
2475	113.77	110.58	V	0.94	114.71	100.15	52.74	61.97	47.41	12.03	6.59

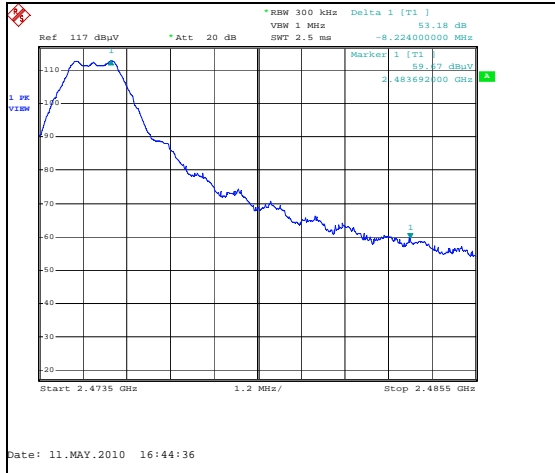


Figure 7.6.1.2-1: Upper Band-edge – Hpol – 1S Meter

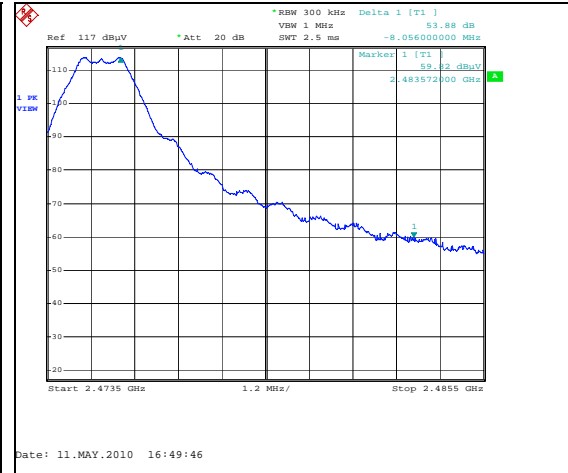


Figure 7.6.1.2-2: Upper Band-edge– Vpol – 1S Meter

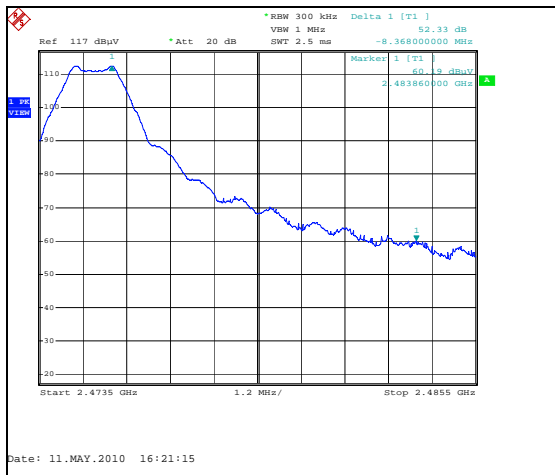


Figure 7.6.1.2-3: Upper Band-edge – Hpol – 2S Meter

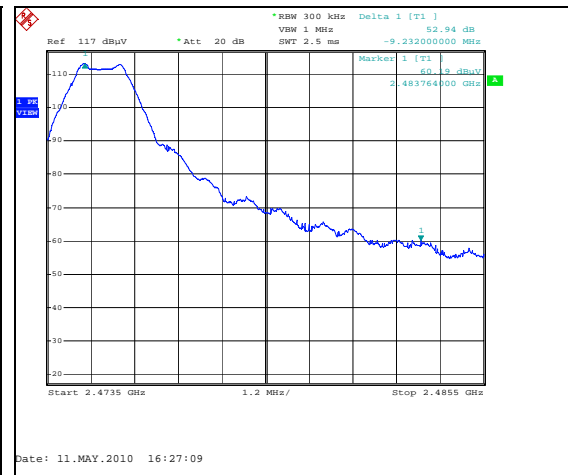


Figure 7.6.1.2-4: Upper Band-edge– Vpol – 2S Meter

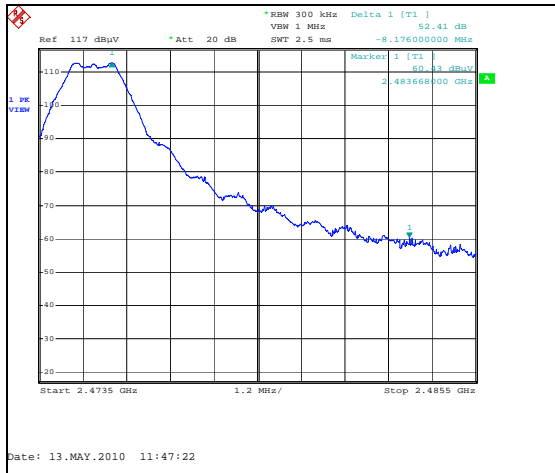


Figure 7.6.1.2-5: Upper Band-edge – Hpol – 12S Meter

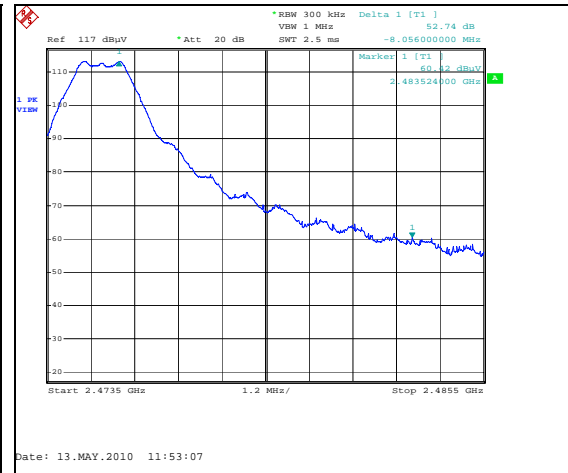


Figure 7.6.1.2-6: Upper Band-edge– Vpol – 12S Meter

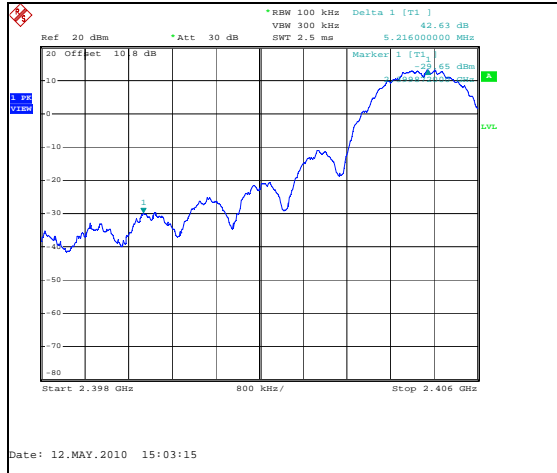


Figure 7.6.1.2-7: Lower Band-edge (Conducted)

## 7.6.2 RF Conducted Spurious Emissions

### 7.6.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with the FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)”. The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 25GHz, 10 times the highest fundamental frequency. For each measurement, the spectrum analyzer’s RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak detector and Max Hold function of the analyzer were utilized.

### 7.6.2.2 Measurement Results

In a 100 kHz bandwidth, the radio frequency power that was produced by the EUT emissions is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power. RF Conducted Emissions are displayed in Figures 7.6.2.2-1 through 7.6.2.2-9.

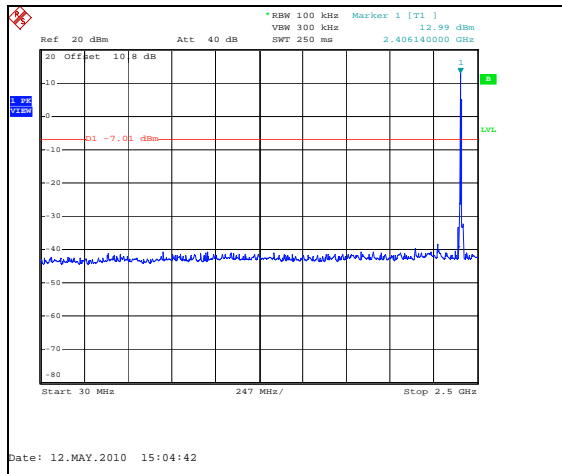


Figure 7.6.2.2-1: 30 MHz – 2.5 GHz – Low Channel

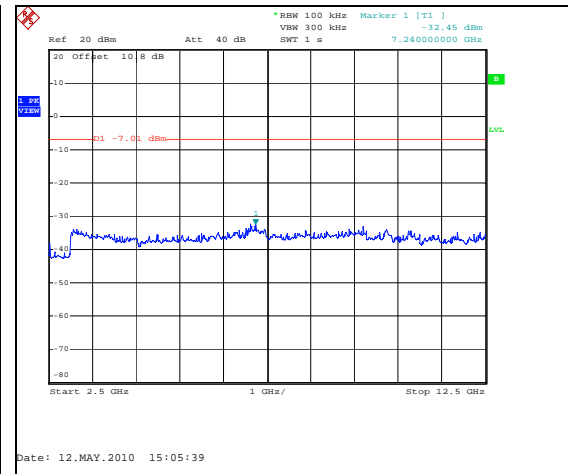


Figure 7.6.2.2-2: 2.5 GHz – 12.5 GHz – Low Channel

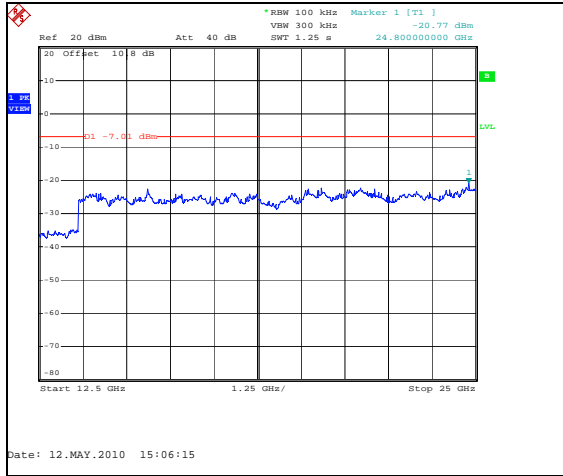


Figure 7.6.2.2-3: 12.5 GHz – 25 GHz – Low Channel

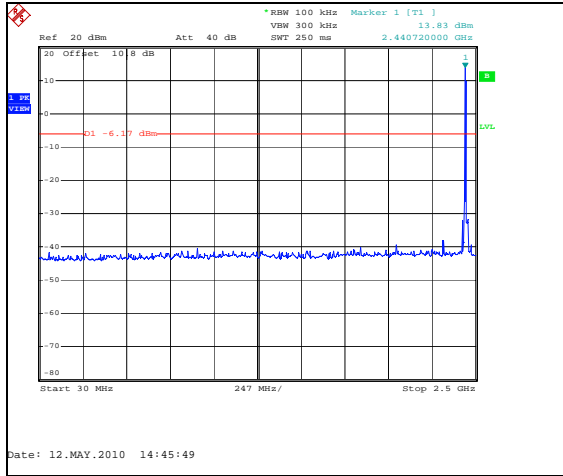


Figure 7.6.2.2-4: 30 MHz – 2.5 GHz – Mid Channel

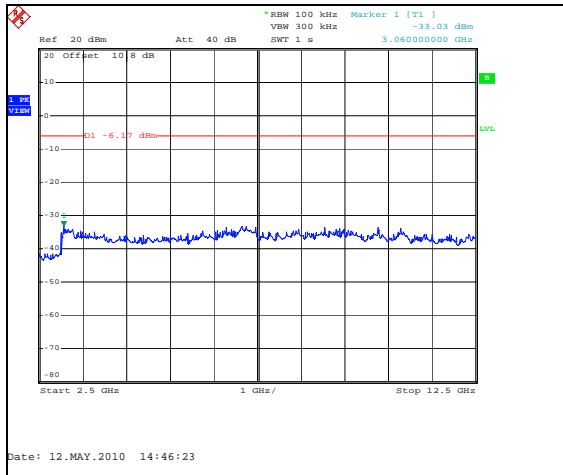


Figure 7.6.2.2-5: 2.5 GHz – 12.5 GHz – Mid Channel

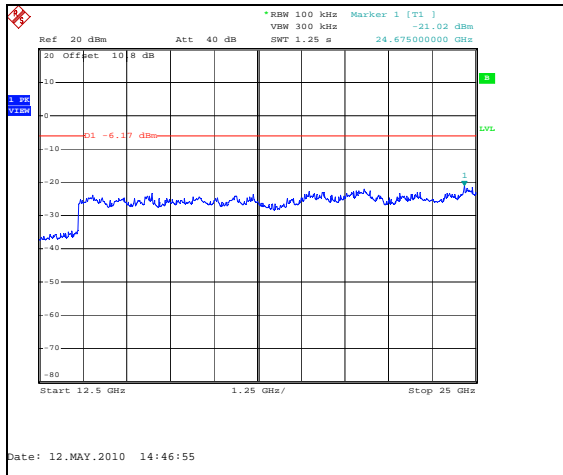


Figure 7.6.2.2-6: 12.5 GHz – 25 GHz – Mid Channel

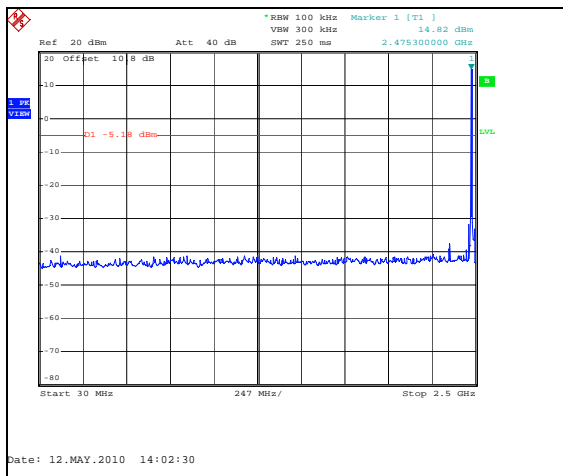


Figure 7.6.2.2-7: 30 MHz – 2.5 GHz – High Channel

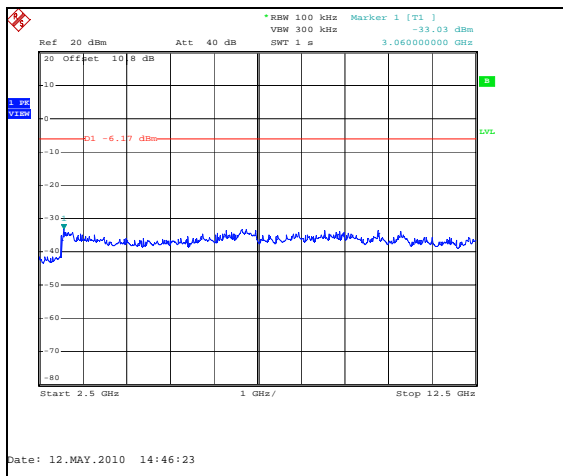


Figure 7.6.2.2-8: 2.5 GHz – 12.5 GHz – High Channel

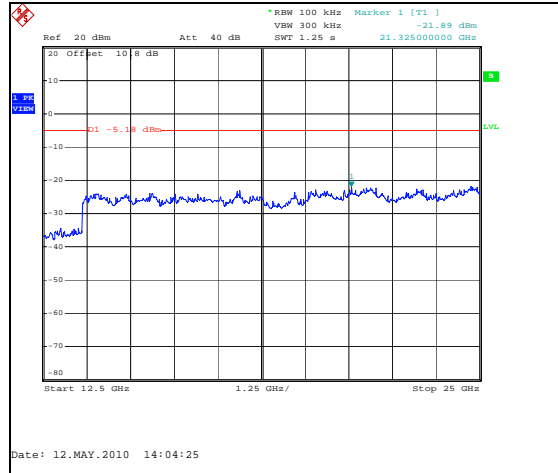


Figure 7.6.2.2-9: 12.5 GHz – 25 GHz – High Channel

### 7.6.3 Radiated Spurious Emissions (Restricted Bands) - FCC Sec. 15.205 IC: RSS-210 2.6

#### 7.6.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 25 GHz, 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 were made with RBW and VBW of 1 MHz and 3 MHz respectively. The average emissions were further corrected by applying the duty cycle correction of the EUT 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.

#### 7.6.3.2 Duty Cycle Correction

The device operates with a 27% duty cycle, therefore for average radiated measurements the measured level was reduced by a factor 11.37dB. The duty cycle correction factor is determined using the formula:  $20\log(27/100) = -11.37\text{dB}$ .

A detailed analysis of the duty cycle timing is provided in the Theory of Operation accompanying this report.

7.6.3.3 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 25GHz are reported in the table 7.6.3.3-1 to 7.6.3.3-3 below.

**Table 7.6.3.3-1: Radiated Spurious Emissions – 1S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2276.8	60.45	53.77	H	-0.12	60.33	42.28	74.0	54.0	13.7	11.7
2276.8	59.09	52.15	V	-0.12	58.97	40.66	74.0	54.0	15.0	13.3
2389	68.36	61.77	H	0.48	68.84	50.88	74.0	54.0	5.2	3.1
2389	68.00	61.52	V	0.48	68.48	50.63	74.0	54.0	5.5	3.4
4810	43.03	34.27	V	8.36	51.39	31.26	74.0	54.0	22.6	22.7
<b>Middle Channel</b>										
4880	44.02	34.52	V	8.61	52.63	31.76	74.0	54.0	21.4	22.2
7320	46.08	35.16	H	13.19	59.27	36.98	74.0	54.0	14.7	17.0
7320	48.34	37.11	V	13.19	61.53	38.93	74.0	54.0	12.5	15.1
12200	43.33	33.51	H	23.73	67.06	45.87	83.5	63.5	16.4	17.6
<b>High Channel</b>										
2491	66.16	57.96	H	1.02	67.18	47.61	74.0	54.0	6.8	6.4
2491	66.13	59.05	V	1.02	67.15	48.70	74.0	54.0	6.8	5.3
4950	43.39	32.26	H	8.87	52.26	29.75	74.0	54.0	21.7	24.2
4950	44.35	33.33	V	8.87	53.22	30.82	74.0	54.0	20.8	23.2
12375	48.44	39.40	H	24.90	73.34	52.92	83.5	63.5	10.2	10.6
12375	48.32	39.75	V	24.90	73.22	53.27	83.5	63.5	10.3	10.2

**Table 7.6.3.3-2: Radiated Spurious Emissions – 2S Meter**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2276.8	60.44	53.90	H	-0.12	60.32	42.41	74.0	54.0	13.7	11.6
2276.8	61.22	53.85	V	-0.12	61.10	42.36	74.0	54.0	12.9	11.6
2389	68.66	61.90	H	0.48	69.14	51.01	74.0	54.0	4.9	3.0
2389	68.33	61.90	V	0.48	68.81	51.01	74.0	54.0	5.2	3.0
4810	42.61	33.25	H	8.36	50.97	30.24	74.0	54.0	23.0	23.8
4810	43.51	34.17	V	8.36	51.87	31.16	74.0	54.0	22.1	22.8
<b>Middle Channel</b>										
4880	44.16	36.12	V	8.61	52.77	33.36	74.0	54.0	21.2	20.6
7320	44.42	33.51	H	13.19	57.61	35.33	74.0	54.0	16.4	18.7
7320	47.01	37.70	V	13.19	60.20	39.52	74.0	54.0	13.8	14.5
12200	44.29	33.81	H	23.73	68.02	46.17	83.5	63.5	15.5	17.3
<b>High Channel</b>										
2491	59.34	52.65	H	1.02	60.36	42.30	74.0	54.0	13.6	11.7
2491	65.59	58.42	V	1.02	66.61	48.07	74.0	54.0	7.4	5.9
4950	44.85	33.94	V	8.87	53.72	31.43	74.0	54.0	20.3	22.6
12375	50.23	43.06	H	24.90	75.13	56.58	83.5	63.5	8.4	6.9
12375	49.39	41.81	V	24.90	74.29	55.33	83.5	63.5	9.2	8.2

Table 7.6.3.3-3: Radiated Spurious Emissions – 12S Meter

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel</b>										
2276.8	57.48	50.98	H	-0.12	57.36	39.49	74.0	54.0	16.6	14.5
2276.8	59.23	52.81	V	-0.12	59.11	41.32	74.0	54.0	14.9	12.7
2389	68.60	62.35	H	0.48	69.08	51.46	74.0	54.0	4.9	2.5
2389	67.53	60.70	V	0.48	68.01	49.81	74.0	54.0	6.0	4.2
4810	42.83	33.53	V	8.36	51.19	30.52	74.0	54.0	22.8	23.5
<b>Middle Channel</b>										
4880	44.35	36.05	V	8.61	52.96	33.29	74.0	54.0	21.0	20.7
7320	44.13	33.10	H	13.19	57.32	34.92	74.0	54.0	16.7	19.1
7320	47.25	37.29	V	13.19	60.44	39.11	74.0	54.0	13.6	14.9
12200	43.64	32.69	H	23.73	67.37	45.05	83.5	63.5	16.1	18.5
12200	45.09	34.75	V	23.73	68.82	47.11	83.5	63.5	14.7	16.4
<b>High Channel</b>										
2491	62.05	54.46	H	1.02	63.07	44.11	74.0	54.0	10.9	9.9
2491	65.81	58.29	V	1.02	66.83	47.94	74.0	54.0	7.2	6.1
4950	45.37	34.68	V	8.87	54.24	32.17	74.0	54.0	19.8	21.8
7425	43.80	33.28	V	13.27	57.07	35.18	74.0	54.0	16.9	18.8
12375	46.52	38.66	H	24.90	71.42	52.18	83.5	63.5	12.1	11.3
12375	48.40	40.36	V	24.90	73.30	53.88	83.5	63.5	10.2	9.6

**7.6.3.4 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:  $60.45 - 0.12 = 60.33\text{dBuV/m}$ Margin:  $74\text{dBuV/m} - 60.33\text{dBuV/m} = 13.7\text{dB}$ **Example Calculation: Average**Corrected Level:  $53.77 - 0.12 - 11.37 = 42.28\text{dBuV}$ Margin:  $54\text{dBuV} - 42.28\text{dBuV} = 11.7\text{dB}$



7.7 Peak Power Spectral Density- FCC Section 15.247(e) IC: RSS-210 A8.2(b)

7.7.1 Measurement Procedure

The power spectral density was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The emission peaks within the pass band were located and zoomed in on. The spectrum analyzer RBW was set to 3 kHz and VBW 10 kHz. Span was adjusted to 500 kHz and the sweep time was calculated to be 170s (~Span/3 kHz).

7.7.2 Measurement Results

Results are shown below in table 7.7.2-1 and figure 7.7.2-1 to 7.7.2-3.

Table 7.7.2-1: Peak Power Spectral Density

Frequency (MHz)	PSD Level (dBm)
2405	5.15
2440	6.09
2475	5.65

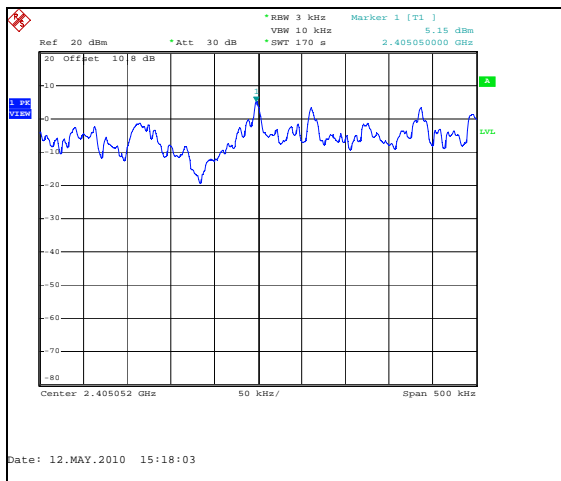


Figure 7.7.2-1: PSD – Low Channel

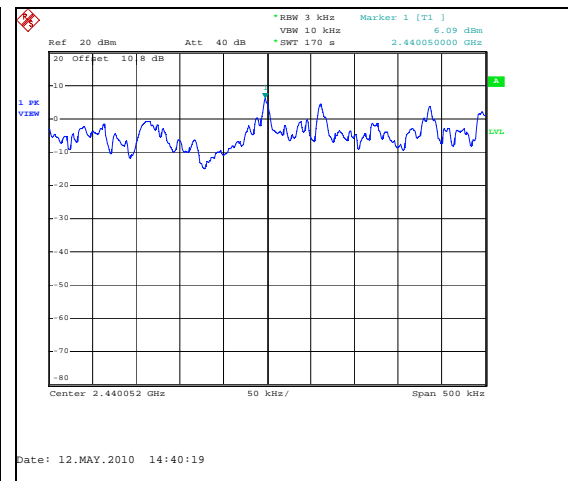


Figure 7.7.2-2: PSD – Mid Channel

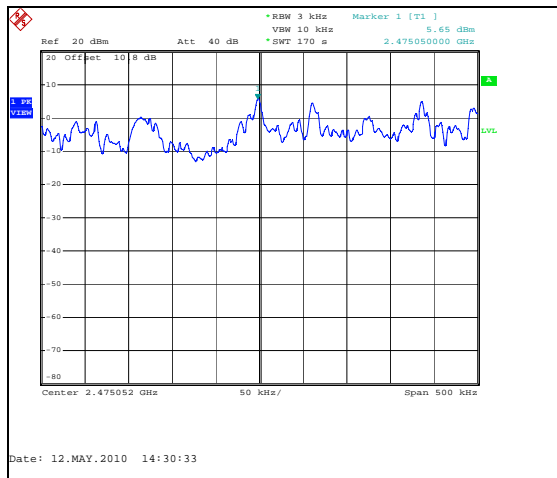


Figure 7.7.2-3: PSD – High Channel

**8 CONCLUSION**

In the opinion of ACS, Inc. the AMI6, 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**