Excellence in Compliance Testing

Certification Test Report

FCC ID: SK9PLC-1
IC: 864G-PLC1

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

ACS Report Number: 09-0246-15C

Manufacturer: Itron Electricity Metering, Inc.
Model: C2SOD-P

Test Begin Date: July 9, 2009
Test End Date: July 22, 2009

Report Issue Date: August 3, 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 31 pages

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Internal Photographs
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1.0 GENERAL

1.1 Purpose

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

1.2 Product Description

The C2SOD-P is an electric utility meter designed to operate in a power line carrier (PLC) system to provide a wired based network to carry ANSI C12.22 messages. The C2SOD-P contains a single 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):
60 318 296 – C2SOD-P 1S Meter Form
60 359 833 – C2SOD-P 2S Meter Form
4110011417 Register Board (Used in 1S Meter Form)
4110011508 Register Board (Used in 2S Meter Form)

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.

1.3 Test Methodology and Considerations

Line conducted, unintentional and intentional radiated emissions were measured using 1S and 2S meter form factors. These form factors are electrically identical with respect to the RF circuitry and differ only in the interface to the utility infrastructure.

For the purpose of RF conducted measurements, the C2OSD-P was modified with a temporary 50 ohm antenna port.

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:

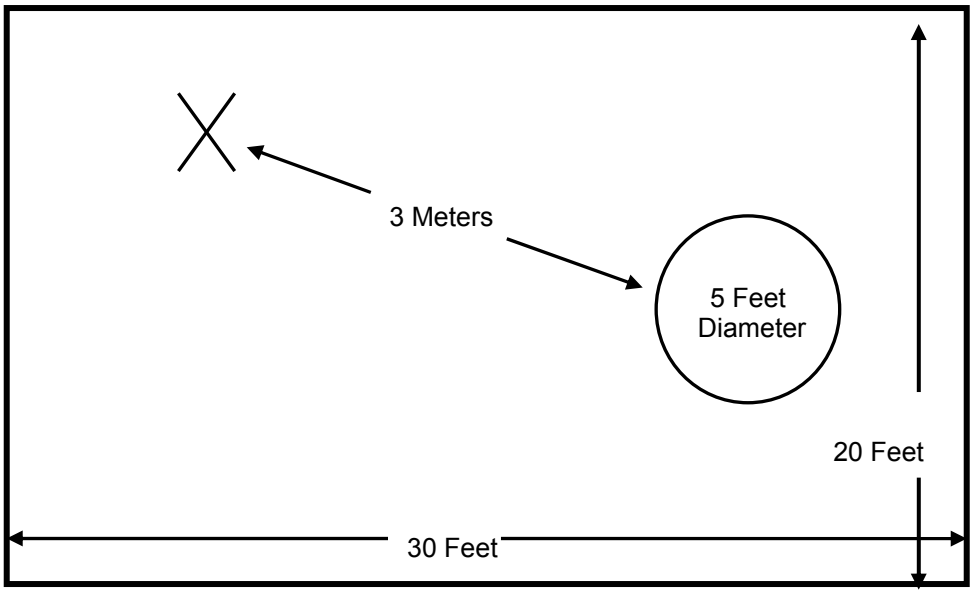

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

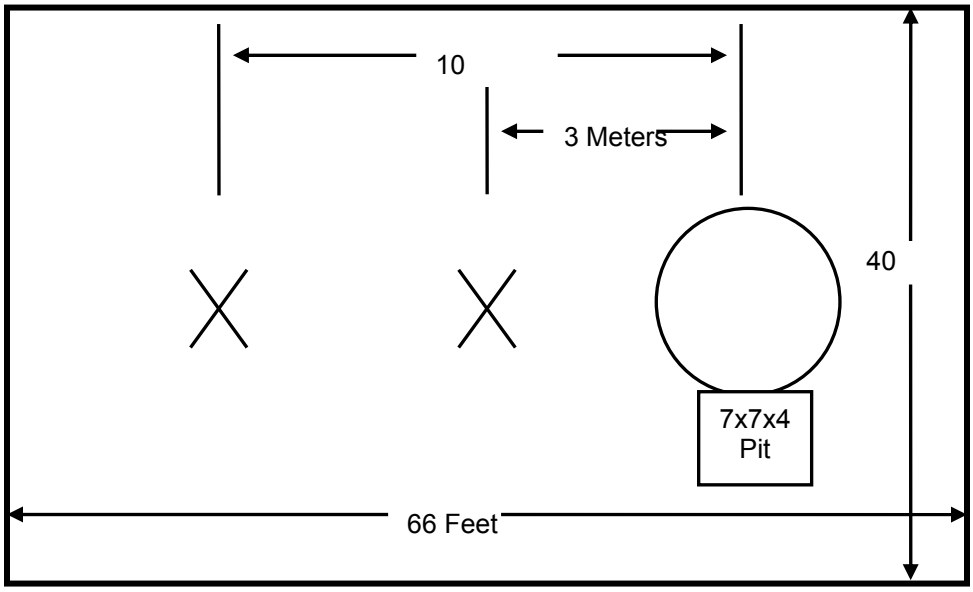

Figure 2.3.2-2: Open Area Test Site

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:

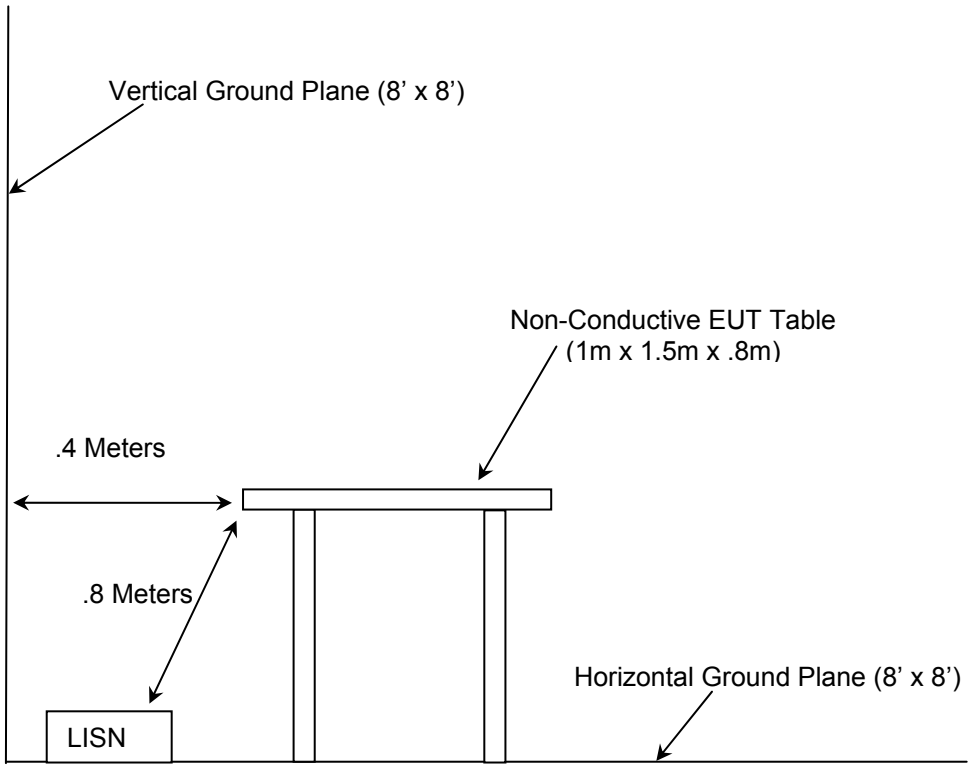

Figure 2.4-1: AC Mains Conducted EMI Site

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)
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)
422	Florida RF Labs	Cables	SMS-200AW-72.0-SMR	805	02-05-2010 (See Note1)
432	Microwave Circuits	Filters	H3G020G4 264066	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.

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Meter Base Enclosure (1S Meter Form Factor)	Milbank MFG.	B-5275	NA
2	Meter Base Enclosure (2S Meter Form Factor)	Milbank MFG.	B1930	NA
3	CENTRON II meter (EUT)	Itron Electricity Metering	C2SOD-P (1S)	60 318 296
4	CENTRON II meter (EUT)	Itron Electricity Metering	C2SOD-P (2S)	60 359 833
5	Voltage Transformer	Sangamo Weston, Inc.	Type T-6A	8108966

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

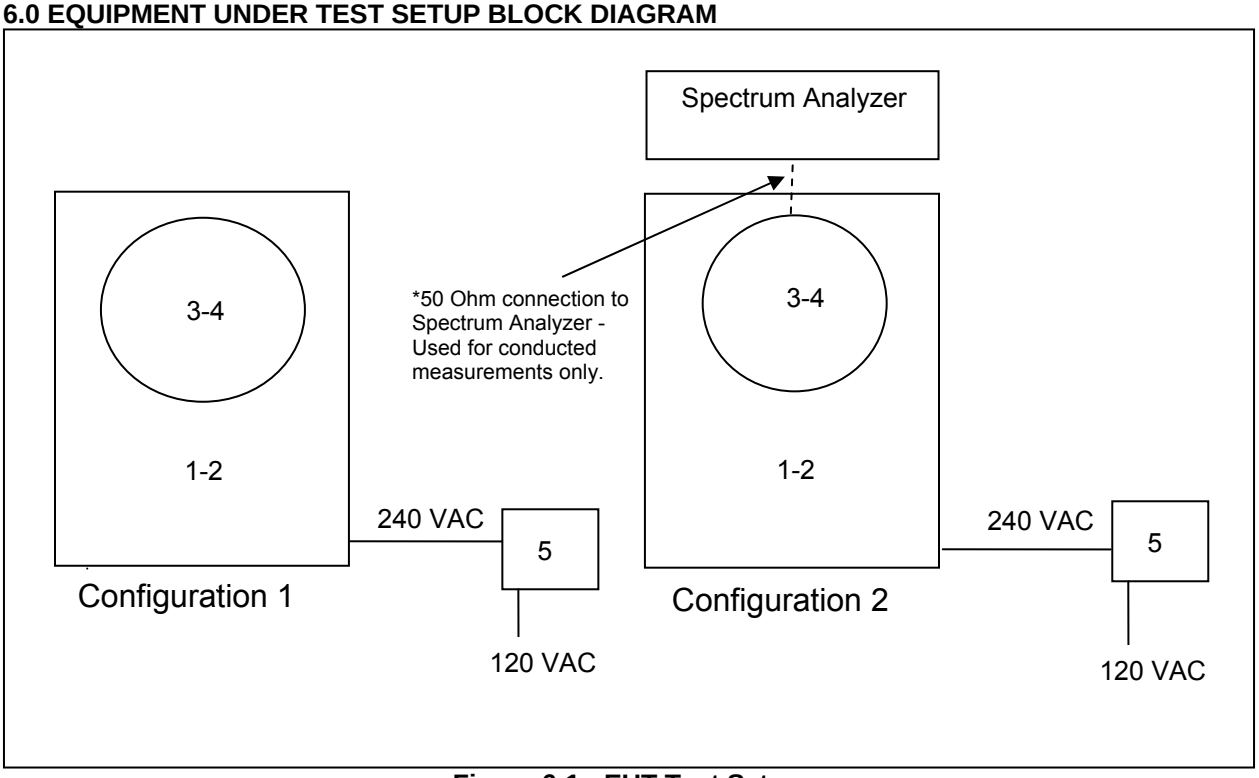

Figure 6-1: EUT Test Setup

Note1: 1S meter forms connects directly to 120vAC and did not use a transformer.

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 C2SOD-P includes a 2.4GHz 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 Table 7.2.2-1 to 7.2.2-4 and Figures 7.2.2-1 to 7.2.2-4.

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
0.162	38.4	9.9	65	26.9	L1	GND	QP
0.396	24.9	10.1	58	33	L1	GND	QP
1.038	40.3	10	56	15.7	L1	GND	QP
1.14	34.3	10	56	21.7	L1	GND	QP
1.56	45.5	10	56	10.5	L1	GND	QP
2.076	40.2	10	56	15.8	L1	GND	QP
2.628	9.2	10	56	46.8	L1	GND	QP
3.15	9.3	9.9	56	46.7	L1	GND	QP
3.636	26.7	9.9	56	29.3	L1	GND	QP
4.11	9.3	9.9	56	46.7	L1	GND	QP
0.198	13.7	9.9	54	40	L1	GND	AVG
0.378	9.6	10	48	38.7	L1	GND	AVG
1.038	31.1	10	46	14.9	L1	GND	AVG
1.134	21.7	10	46	24.3	L1	GND	AVG
1.56	36.3	10	46	9.7	L1	GND	AVG
2.076	31.4	10	46	14.6	L1	GND	AVG
2.598	23.7	10	46	22.3	L1	GND	AVG
3.126	7.7	9.9	46	38.3	L1	GND	AVG
3.708	6.7	9.9	46	39.3	L1	GND	AVG
4.17	6.7	9.9	46	39.3	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
0.222	35.3	9.9	63	27.4	L2	GND	QP
0.33	28.7	10	60	30.7	L2	GND	QP
0.51	21.4	10	56	34.6	L2	GND	QP
1.038	40.8	10	56	15.2	L2	GND	QP
1.14	34.7	10	56	21.3	L2	GND	QP
1.56	46.2	10	56	9.8	L2	GND	QP
2.076	40.6	10	56	15.4	L2	GND	QP
2.598	31.2	10	56	24.8	L2	GND	QP
3.114	30.7	9.9	56	25.3	L2	GND	QP
3.66	9.4	9.9	56	46.6	L2	GND	QP
0.222	35.3	9.9	63	27.4	L2	GND	AVG
0.33	28.7	10	60	30.7	L2	GND	AVG
0.51	21.4	10	56	34.6	L2	GND	AVG
1.038	40.8	10	56	15.2	L2	GND	AVG
1.14	34.7	10	56	21.3	L2	GND	AVG
1.56	46.2	10	56	9.8	L2	GND	AVG
2.076	40.6	10	56	15.4	L2	GND	AVG
2.598	31.2	10	56	24.8	L2	GND	AVG
3.114	30.7	9.9	56	25.3	L2	GND	AVG
3.66	9.4	9.9	56	46.6	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
0.156	46.7	9.9	66	19	L1	GND	QP
0.33	25.9	10	60	33.6	L1	GND	QP
0.492	18.9	10	56	37.2	L1	GND	QP
1.074	41.2	10	56	14.8	L1	GND	QP
1.14	36.1	10	56	19.9	L1	GND	QP
1.608	46.3	10	56	9.7	L1	GND	QP
2.148	36	10	56	20	L1	GND	QP
2.682	30.5	10	56	25.5	L1	GND	QP
3.774	9.4	9.9	56	46.6	L1	GND	QP
29.616	10.5	9.2	60	49.5	L1	GND	QP
0.198	13.2	9.9	54	40.5	L1	GND	AVG
0.324	10.5	10	50	39.1	L1	GND	AVG
0.48	9.6	10	46	36.8	L1	GND	AVG
1.074	32.9	10	46	13.1	L1	GND	AVG
1.146	32.7	10	46	13.3	L1	GND	AVG
1.608	37.4	10	46	8.6	L1	GND	AVG
2.148	28.2	10	46	17.8	L1	GND	AVG
2.7	6.8	10	46	39.2	L1	GND	AVG
3.756	21.5	9.9	46	24.5	L1	GND	AVG
29.814	7	9.2	50	43	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
0.15	45	9.9	66	21	L2	GND	QP
0.36	26.2	10	59	32.5	L2	GND	QP
0.51	22	10	56	34	L2	GND	QP
1.074	40.9	10	56	15.1	L2	GND	QP
1.608	47.8	10	56	8.2	L2	GND	QP
2.142	36.5	10	56	19.5	L2	GND	QP
2.148	35.6	10	56	20.4	L2	GND	QP
2.682	31.2	10	56	24.8	L2	GND	QP
3.216	29	9.9	56	27	L2	GND	QP
3.75	26.3	9.9	56	29.7	L2	GND	QP
0.192	14.1	9.9	54	39.9	L2	GND	AVG
0.348	10.3	10	49	38.7	L2	GND	AVG
0.516	9.2	10	46	36.8	L2	GND	AVG
1.074	32.9	10	46	13.1	L2	GND	AVG
1.608	39.2	10	46	6.8	L2	GND	AVG
2.142	28.8	10	46	17.2	L2	GND	AVG
2.646	6.8	10	46	39.2	L2	GND	AVG
3.222	16.8	9.9	46	29.2	L2	GND	AVG
3.81	6.8	9.9	46	39.2	L2	GND	AVG

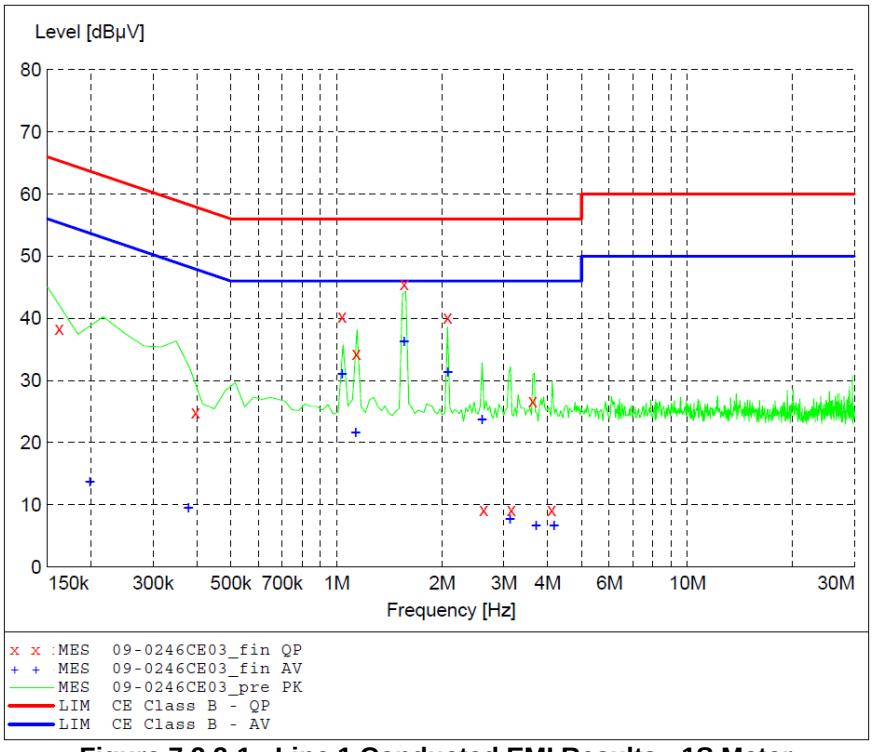

Figure 7.2.2-1: Line 1 Conducted EMI Results - 1S Meter

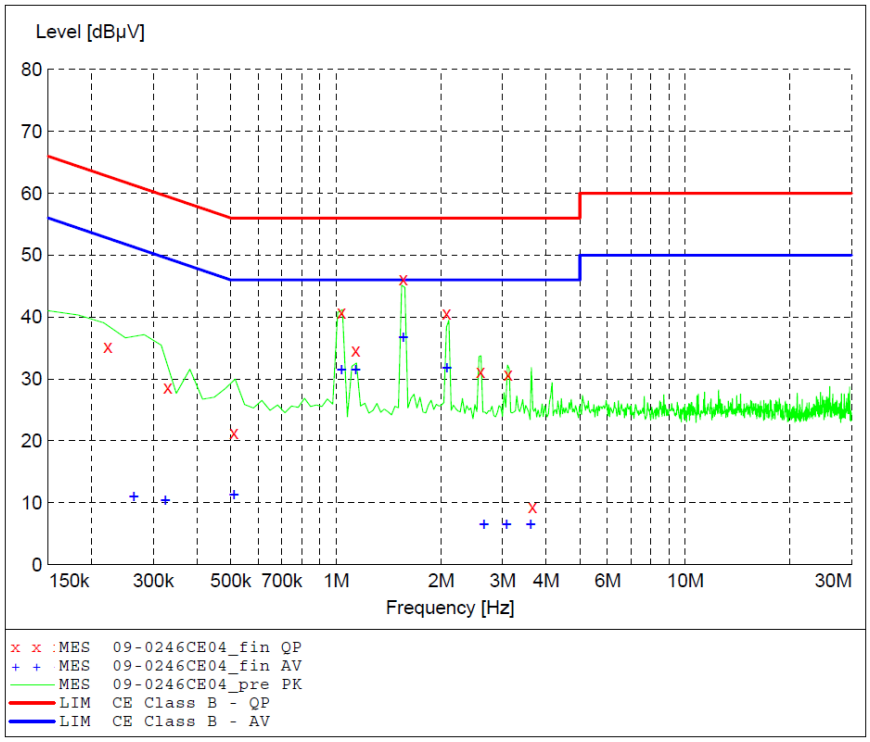

Figure 7.2.2-2: Line 2 Conducted EMI Results - 1S Meter

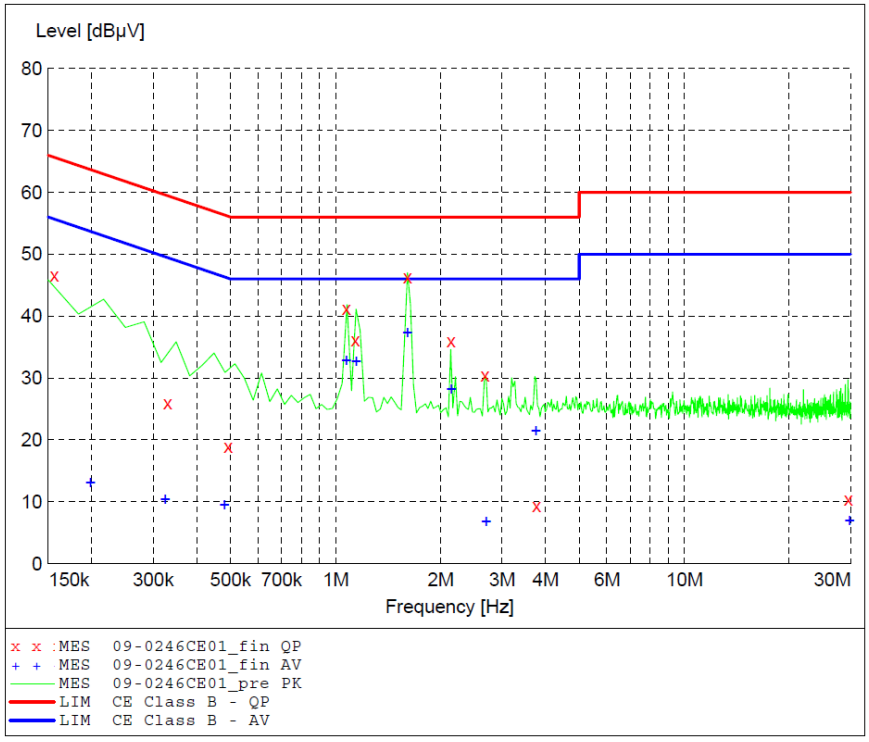

Figure 7.2.2-3: Line 1 Conducted EMI Results - 2S Meter

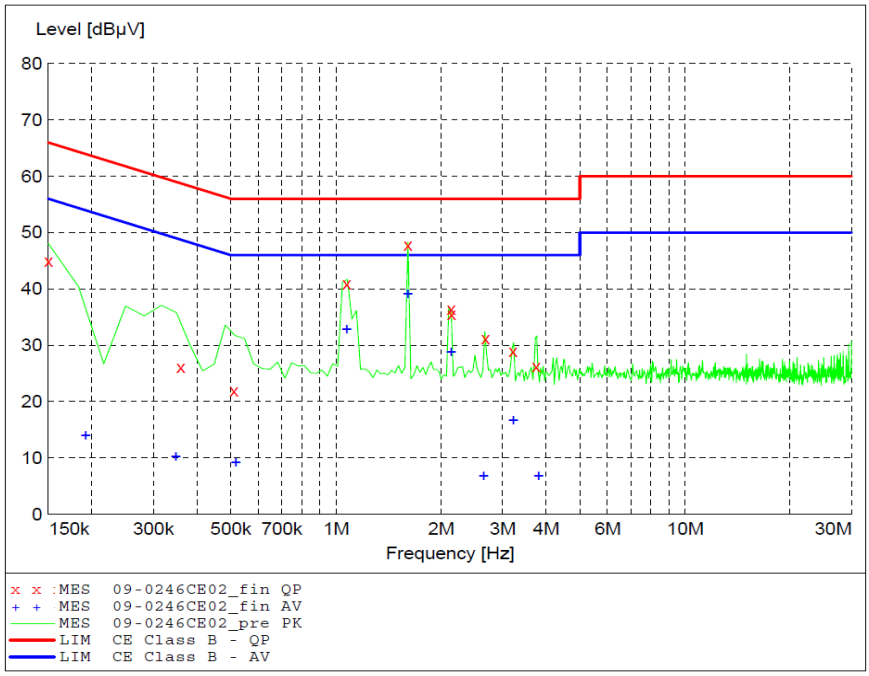

Figure 7.2.2-4: Line 2 Conducted EMI Results - 2S Meter

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

7.3.1 Test Methodology

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

7.3.2 Test Results

Results of the test are given in Table 7.3.2-1 to 7.3.2-2.

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

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
239.986	---------	46.80	V	-12.80	---------	34.00	--------	46.0	---------	12.00
279.976	---------	50.91	H	-11.40	---------	39.51	--------	46.0	---------	6.49
299.975	---------	49.39	H	-10.90	---------	38.49	--------	46.0	---------	7.51
327.128	---------	45.86	H	-9.99	---------	35.87	--------	46.0	---------	10.13
335.535	---------	45.20	H	-9.68	---------	35.52	--------	46.0	---------	10.48
339.984	---------	45.75	H	-9.50	---------	36.25	--------	46.0	---------	9.75

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

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
299.972	---------	49.54	H	-10.90	---------	38.64	--------	46.0	---------	7.36
310.359	---------	47.89	H	-10.87	---------	37.02	--------	46.0	---------	8.98
319.97	---------	45.10	H	-10.20	---------	34.90	--------	46.0	---------	11.10
339.979	---------	47.15	H	-9.50	---------	37.65	--------	46.0	---------	8.35
503.302	---------	43.04	V	-5.63	---------	37.41	--------	46.0	---------	8.59
511.688	---------	42.91	V	-5.48	---------	37.43	--------	46.0	---------	8.57
520.062	---------	42.43	V	-5.40	---------	37.03	--------	46.0	---------	8.97

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

7.4.1 Test Methodology

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 2 to 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% 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 Test 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	1.63	2.33
2440	1.58	2.30
2475	1.62	2.34

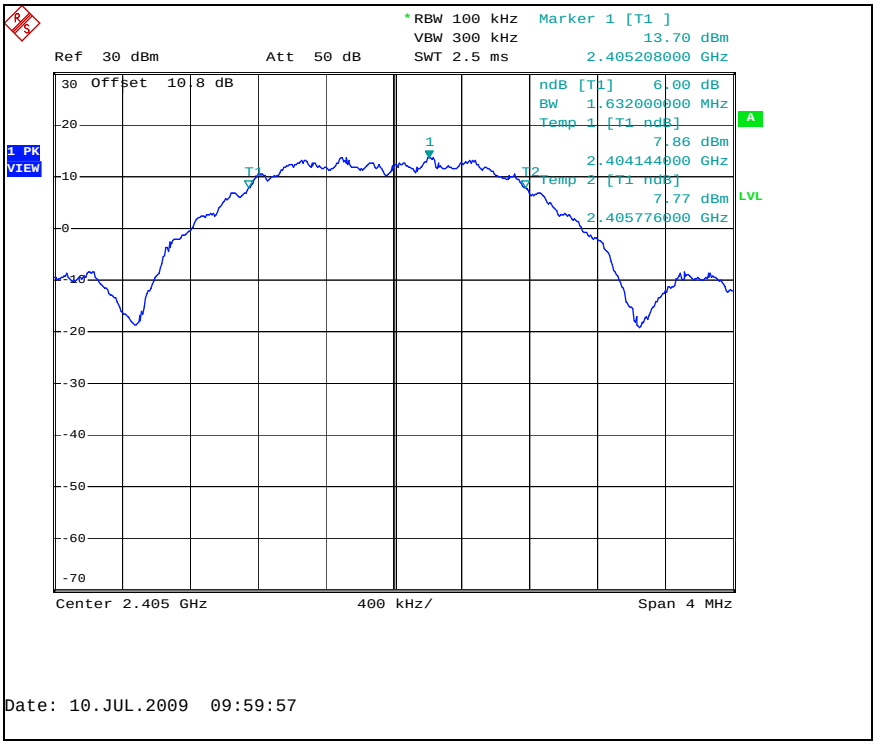

Figure 7.4.2-1: 6dB Bandwidth Plot – Low Channel

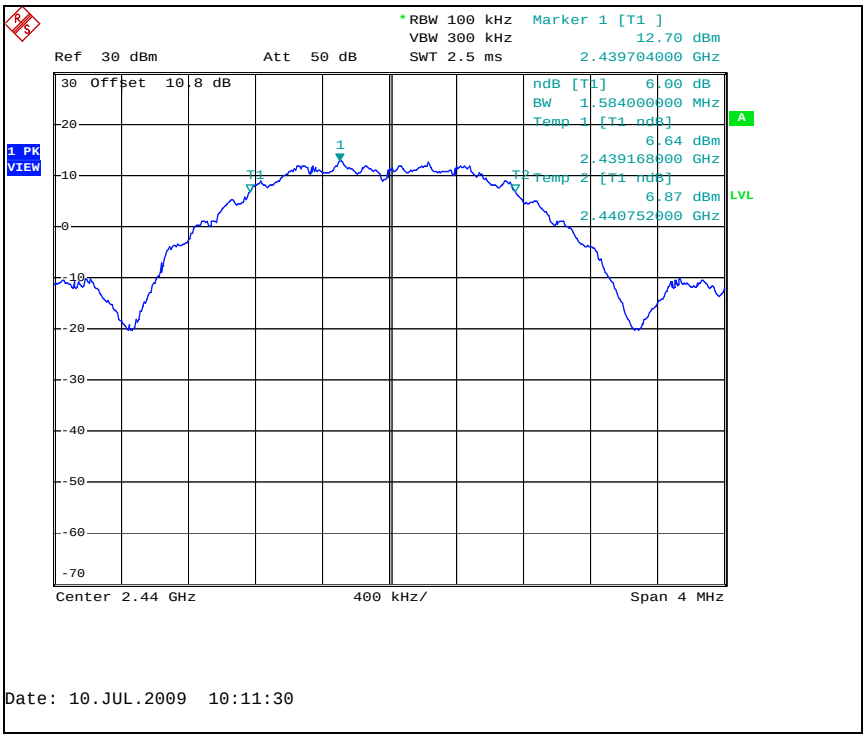

Figure 7.4.2-2: 6dB Bandwidth Plot – Mid Channel

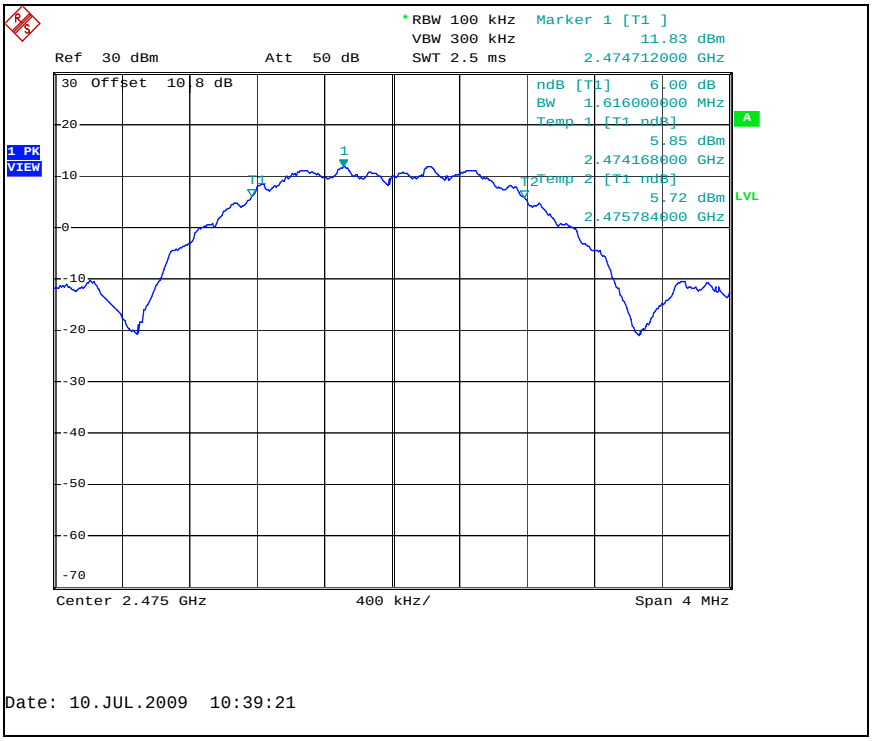

Figure 7.4.2-3: 6dB Bandwidth Plot – High Channel

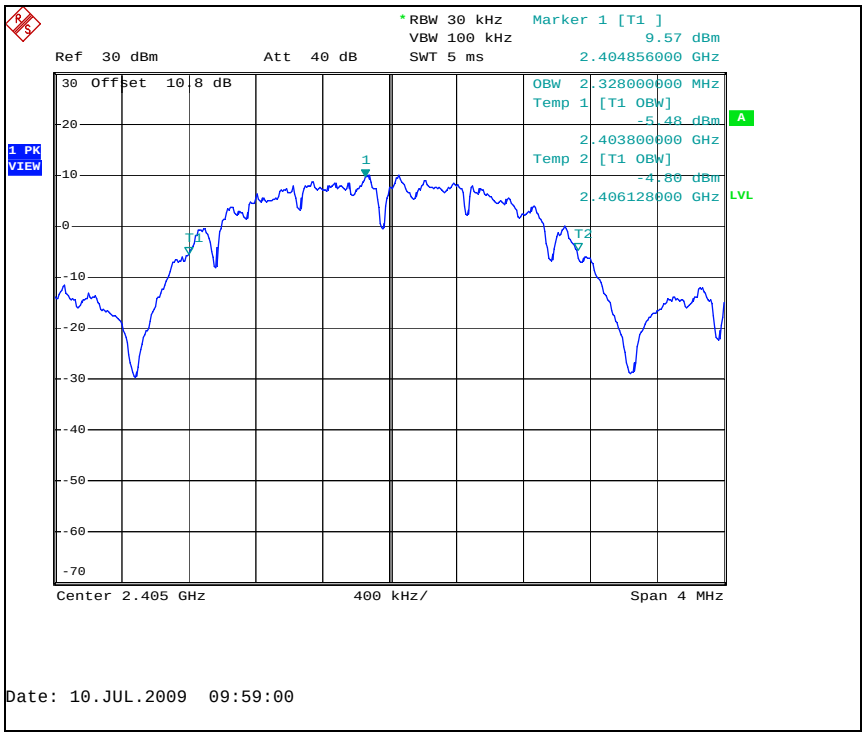

Figure 7.4.2-4: 99% Bandwidth Plot – Low Channel

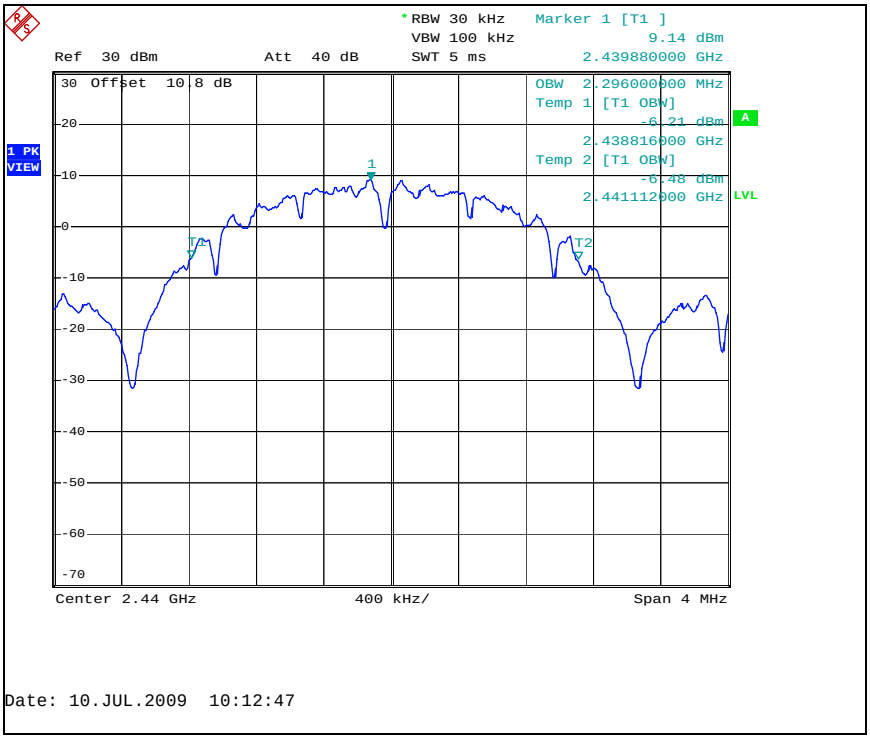

Figure 7.4.2-5: 99% Bandwidth Plot – Mid Channel

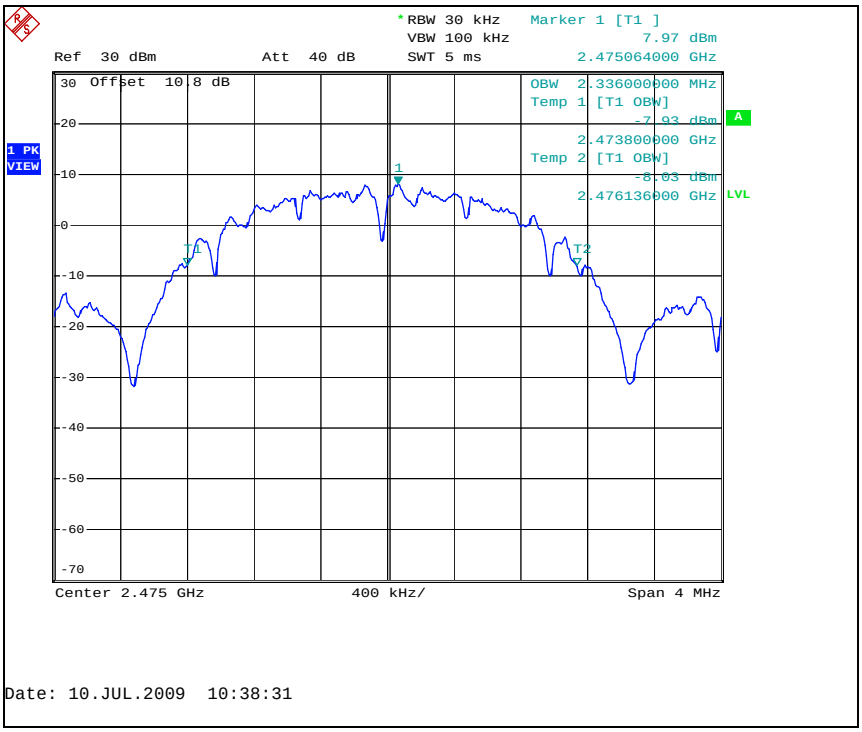

Figure 7.4.2-6: 99% Bandwidth Plot – High Channel

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

7.5.1 Test Methodology

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.

Data was collected with the EUT operating at maximum power.

7.5.2 Test Results

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

Table 7.5.2-1: Peak Output Power

Frequency (MHz)	Output Power (dBm)
2405	17.37
2440	16.64
2475	15.91

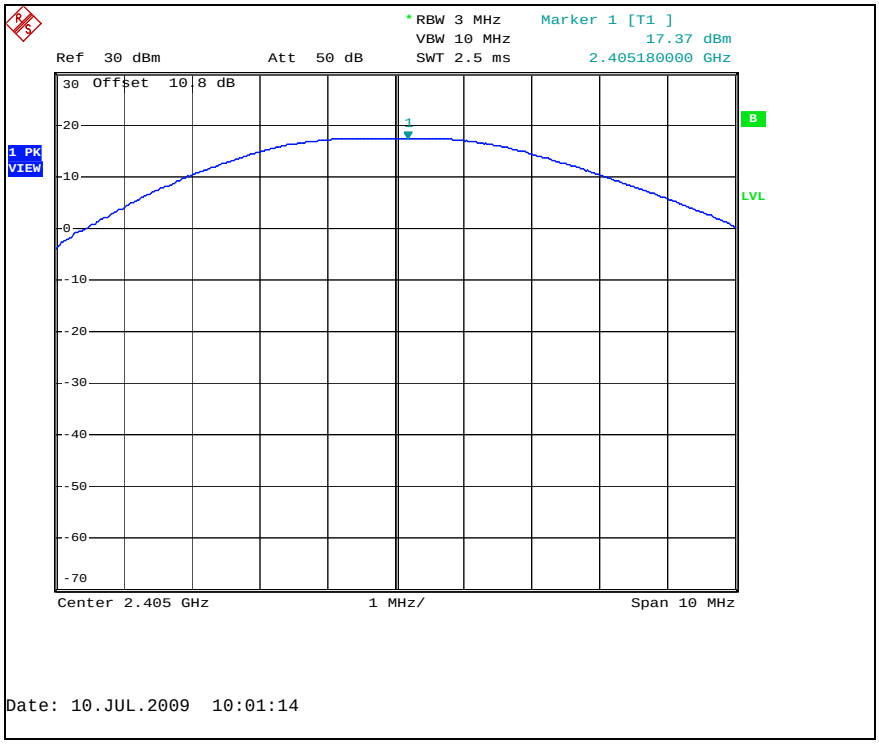

Figure 7.5.2-1: Output power – Low Channel

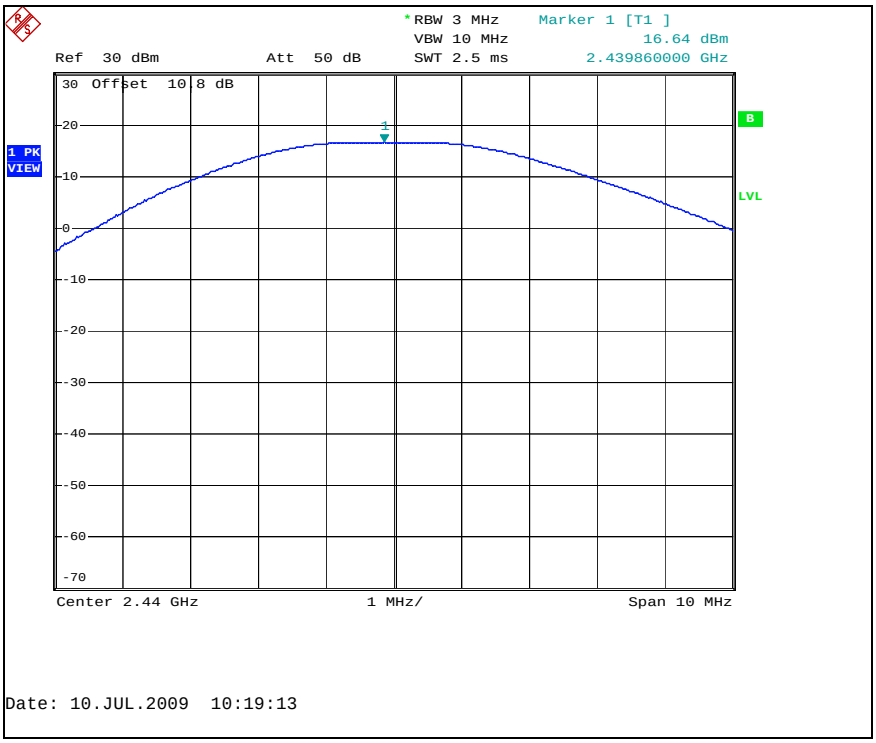

Figure 7.5.2-2: Output power – Mid Channel

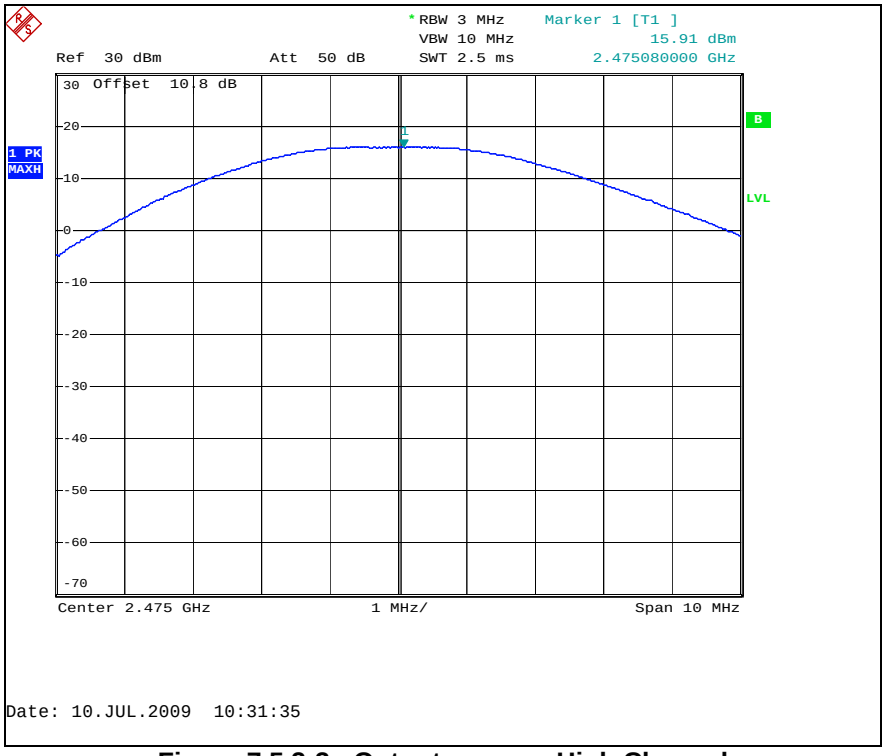

Figure 7.5.2-3: Output power – High Channel

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

7.6.1 Band-Edge Compliance of RF Emissions

7.6.1.1 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 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 Test Results

Band-edge compliance is displayed in Tables 7.6.1.2-1 - 7.6.1.2-2 and Figure 7.6.1.2-1 – 7.6.1.2-3.

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

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Field Strength (dBuV/m)		Delta-Marker (dB)	Band-edge Field Strength (dBuV/m)		Margin to Limit (dBuV/m) 74	54
	pk	avg	(H/V)	(dB)	pk	avg		pk	avg	pk	avg
Fundamental Frequency											
2475	115.84	113.58	V	1.32	117.16	103.53	51.88	65.28	51.65	8.72	2.35

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

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Field Strength (dBuV/m)		Delta-Marker (dB)	Band-edge Field Strength (dBuV/m)		Margin to Limit (dBuV/m) 74	54
	pk	avg	(H/V)	(dB)	pk	avg		pk	avg	pk	avg
Fundamental Frequency											
2475	120.50	114.79	V	-4.09	116.41	99.32	51.87	64.54	47.45	9.46	6.55

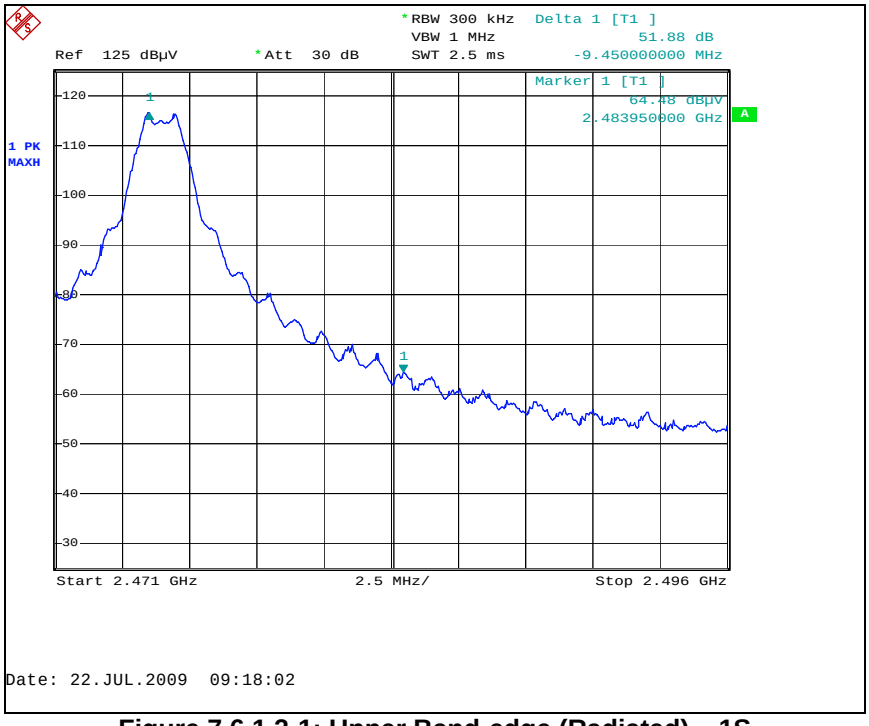

Figure 7.6.1.2-1: Upper Band-edge (Radiated) – 1S

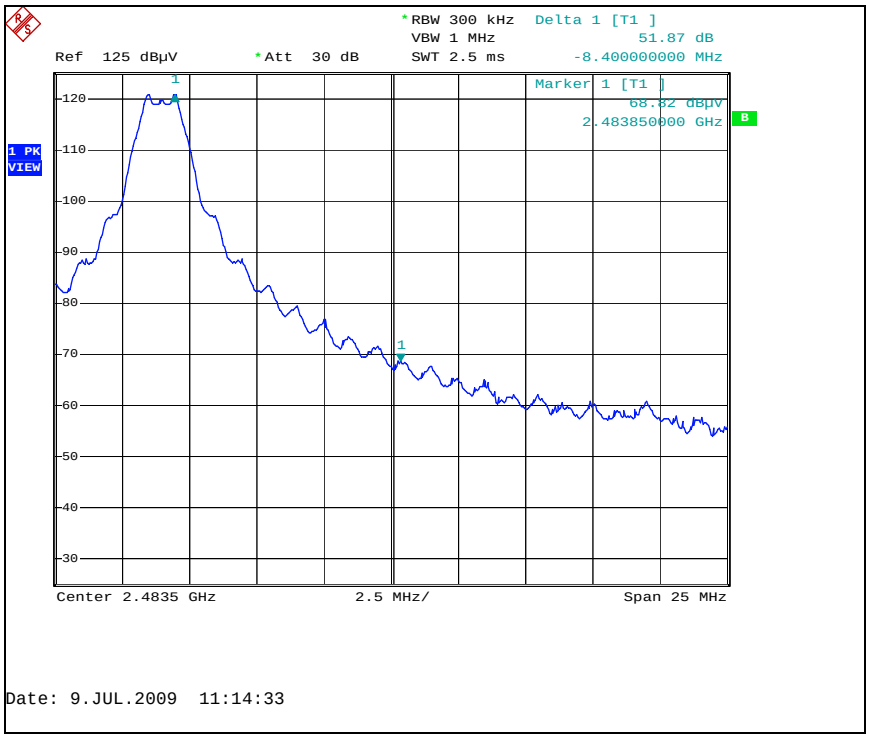

Figure 7.6.1.2-2: Upper Band-edge (Radiated) – 2S

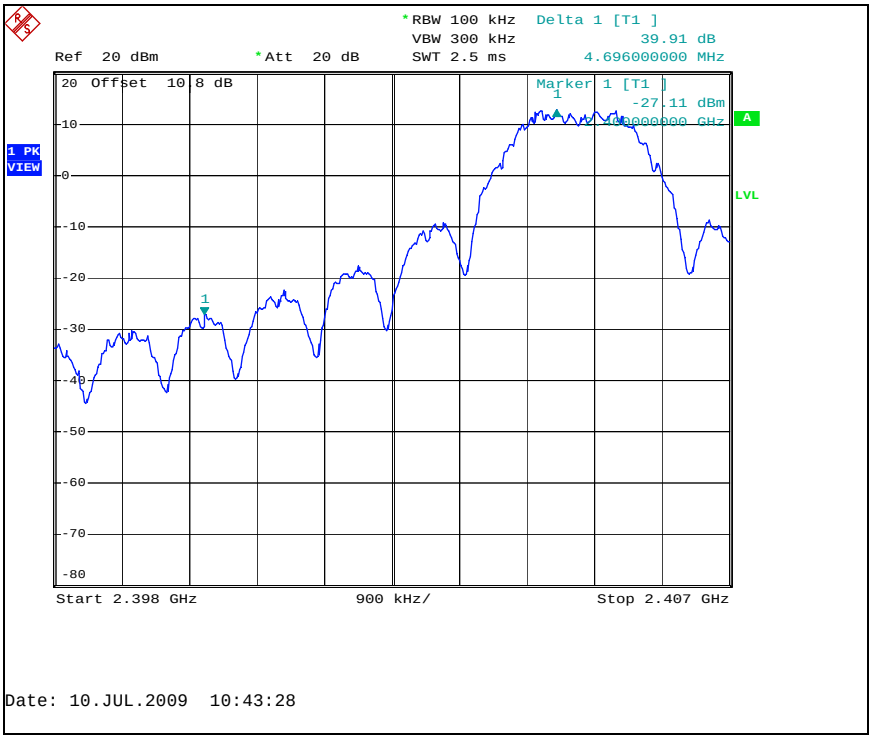

Figure 7.6.1.2-4: Lower Band-edge (Conducted)

7.6.2 RF Conducted Spurious Emissions

7.6.2.1 Test Methodology

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 Test 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.

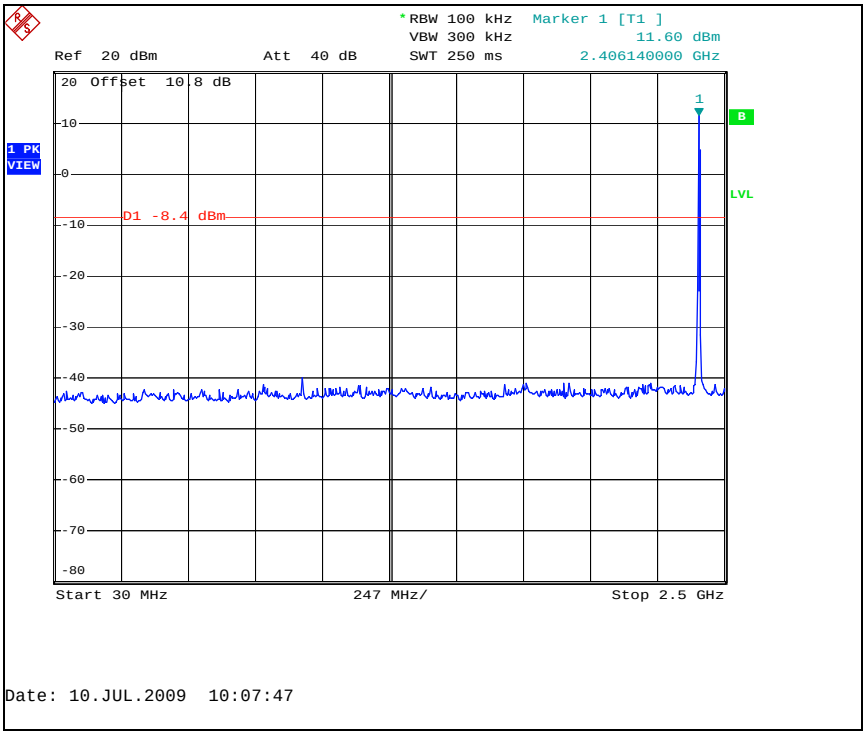

Figure 7.6.2.2-1: 30 MHz – 2.5 GHz – Low Channel

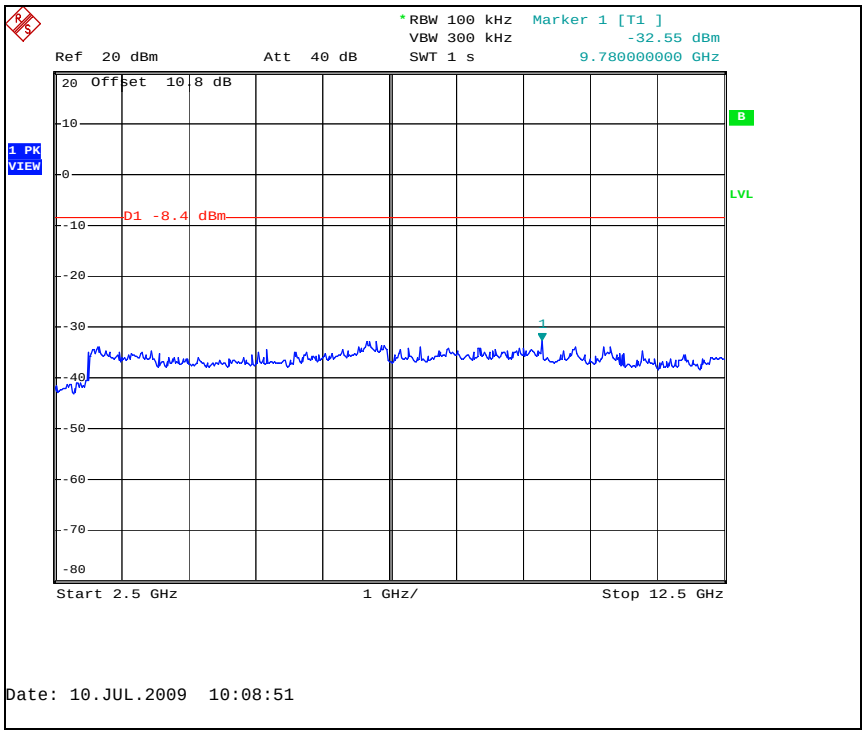

Figure 7.6.2.2-2: 2.5 GHz – 12.5 GHz – Low Channel

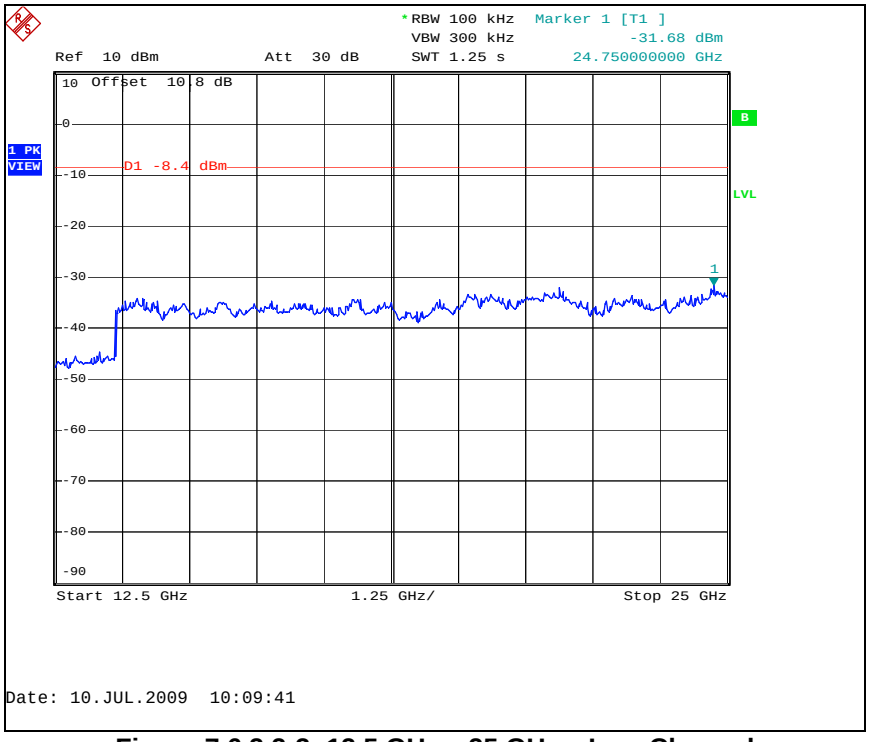

Figure 7.6.2.2-3: 12.5 GHz – 25 GHz – Low Channel

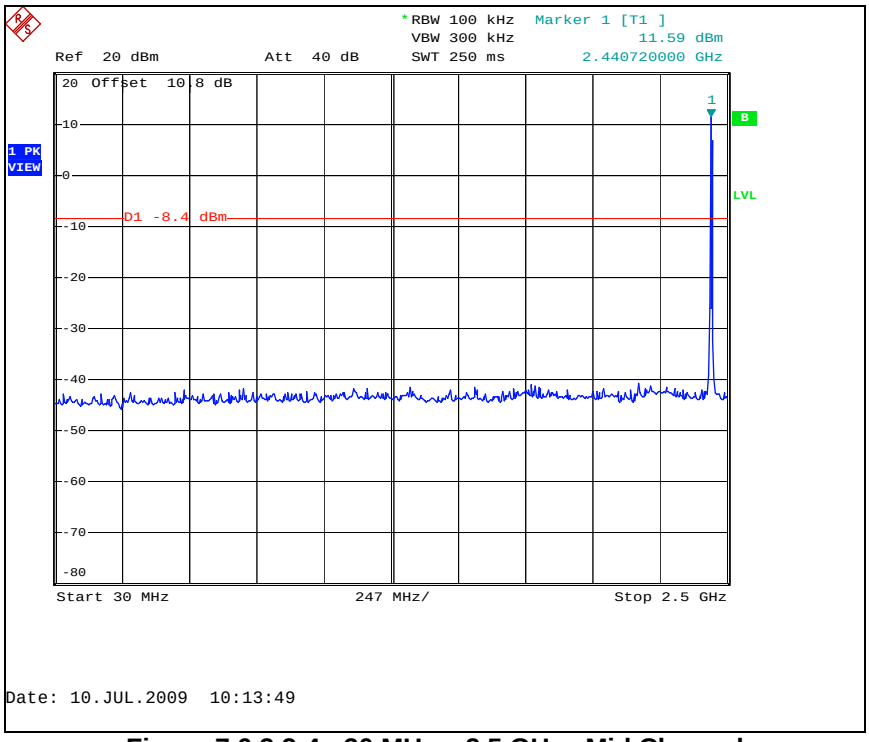

Figure 7.6.2.2-4: 30 MHz – 2.5 GHz –Mid Channel

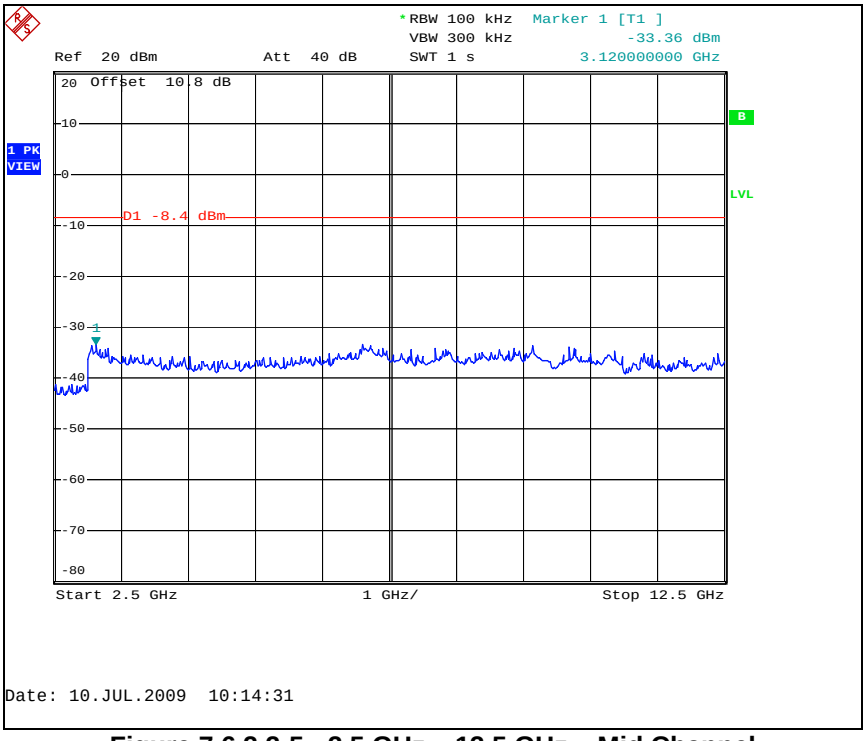

Figure 7.6.2.2-5: 2.5 GHz – 12.5 GHz – Mid Channel

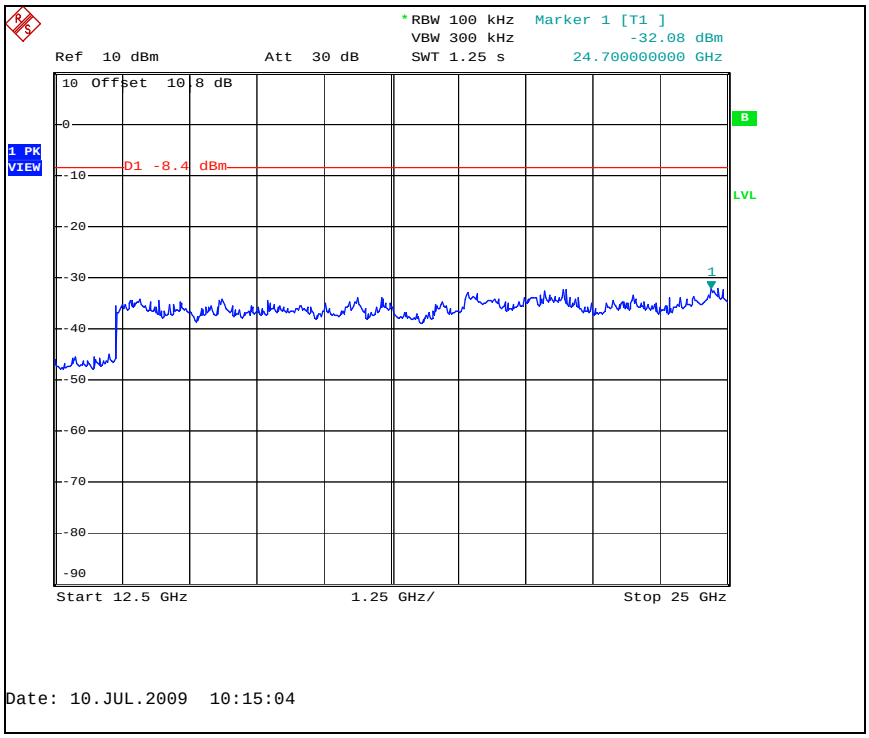

Figure 7.6.2.2-6: 12.5 GHz – 25 GHz – Mid Channel

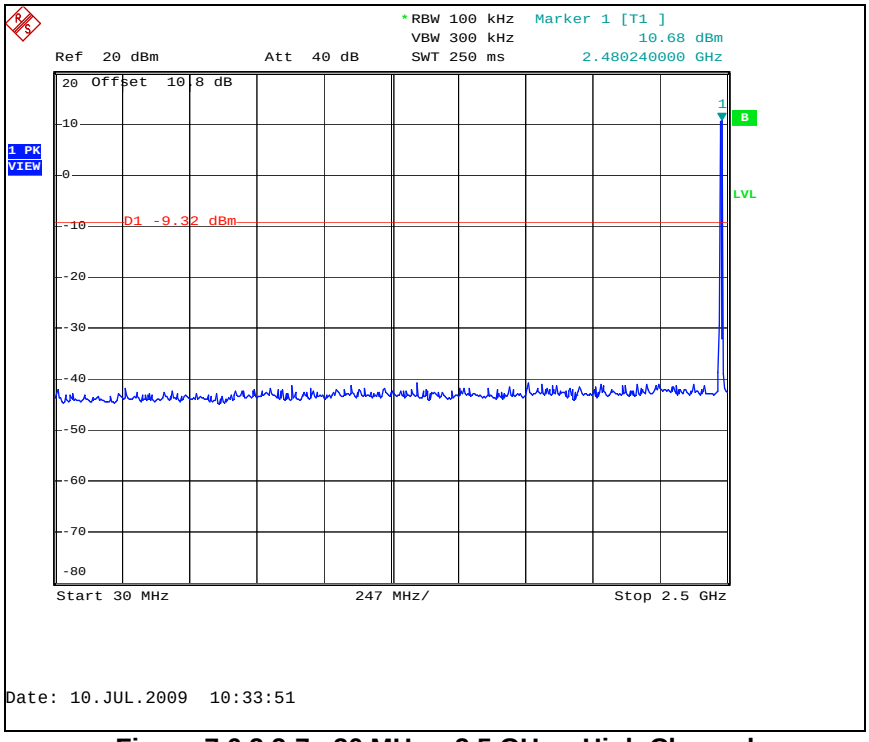

Figure 7.6.2.2-7: 30 MHz – 2.5 GHz – High Channel

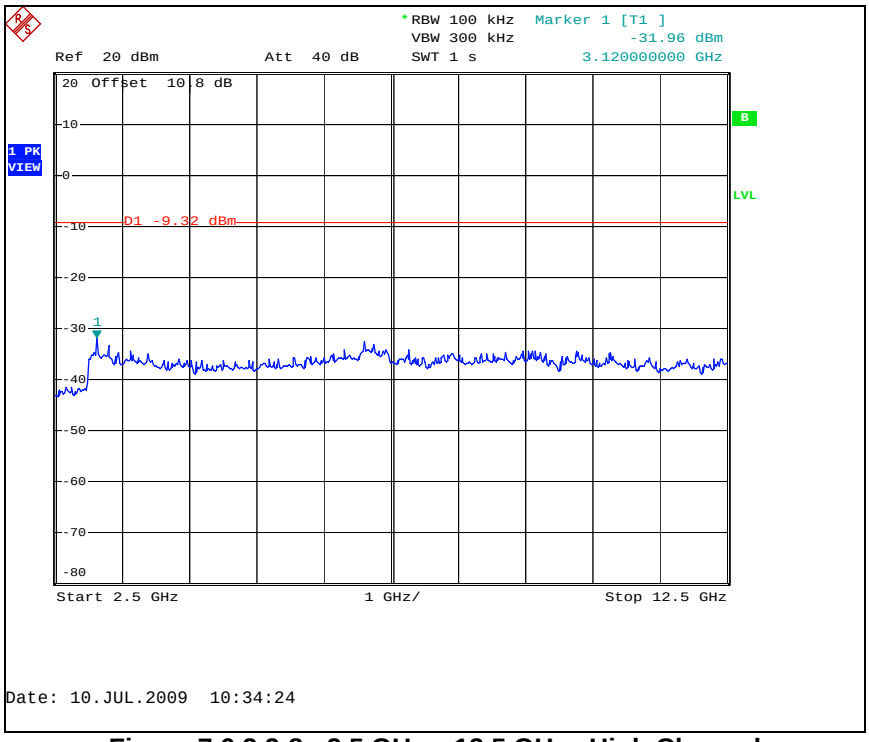

Figure 7.6.2.2-8: 2.5 GHz – 12.5 GHz –High Channel

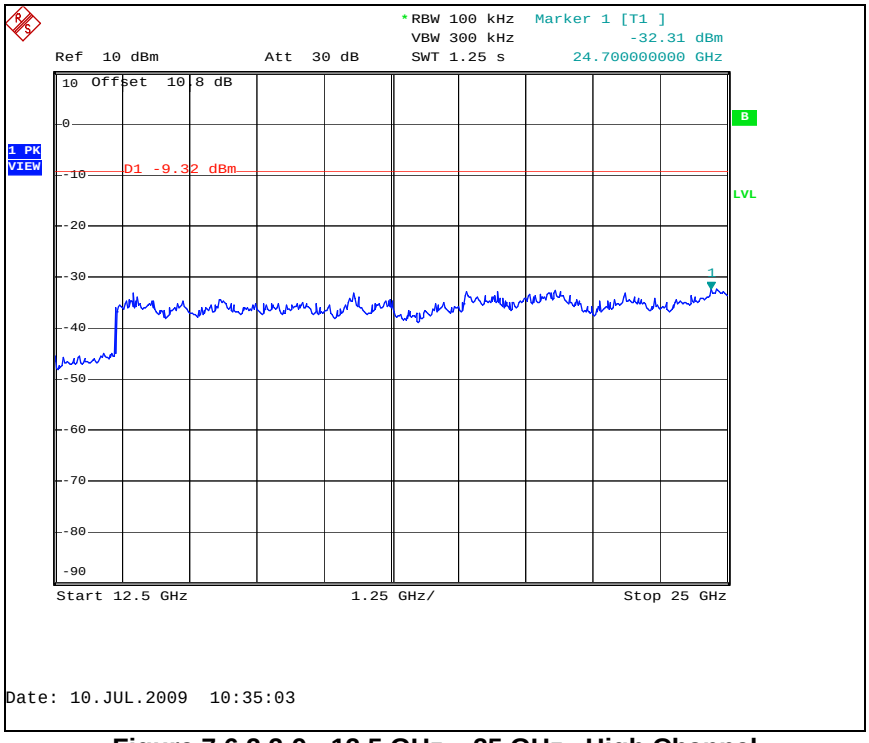

Figure 7.6.2.2-9: 12.5 GHz – 25 GHz –High Channel

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

7.6.3.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 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.

7.6.3.2 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.

7.6.3.3 Test Results

Radiated spurious emissions found in the band of 30MHz to 25GHz for Meter Forms 1S and 2S are reported in Tables 7.6.3.3-1 to 7.6.3.3-2. Emissions not reported were below the noise floor of the measurement instrumentation.

Table 7.6.3.3-1: Radiated Spurious Emissions – 1S

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	48.78	41.35	H	8.65	57.43	38.63	74.0	54.0	16.57	15.37
4810	53.37	46.61	V	8.65	62.02	43.89	74.0	54.0	11.98	10.11
Middle Channel										
4880	47.18	38.64	H	8.90	56.08	36.17	74.0	54.0	17.92	17.83
4880	52.23	45.01	V	8.90	61.13	42.54	74.0	54.0	12.87	11.46
7320	46.85	37.87	H	13.53	60.38	40.03	74.0	54.0	13.62	13.97
7320	53.73	46.13	V	13.53	67.26	48.29	74.0	54.0	6.74	5.71
High Channel										
4950	48.98	41.23	H	9.16	58.14	39.01	74.0	54.0	15.86	14.99
4950	52.94	45.67	V	9.16	62.10	43.45	74.0	54.0	11.90	10.55
7425	46.75	37.11	H	13.61	60.36	39.35	74.0	54.0	13.64	14.65
7425	53.32	45.62	V	13.61	66.93	47.86	74.0	54.0	7.07	6.14

Table 7.6.3.3-2: Radiated Spurious Emissions – 2S

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	54.50	46.10	H	2.86	57.36	37.59	74.0	54.0	16.64	16.41
4810	59.07	51.49	V	3.15	62.22	43.27	74.0	54.0	11.78	10.73
Middle Channel										
4880	55.19	47.27	H	3.20	58.39	39.09	74.0	54.0	15.61	14.91
4880	58.92	52.40	V	3.53	62.45	44.55	74.0	54.0	11.55	9.45
7320	53.97	44.71	H	7.72	61.69	41.06	74.0	54.0	12.31	12.94
7320	61.08	52.83	V	7.75	68.83	49.21	74.0	54.0	5.17	4.79
High Channel										
4950	56.91	47.85	H	3.53	60.44	40.01	74.0	54.0	13.56	13.99
4950	59.20	52.70	V	3.90	63.10	45.23	74.0	54.0	10.90	8.77
7425	54.50	45.09	H	7.65	62.15	41.37	74.0	54.0	11.85	12.63
7425	60.82	52.86	V	7.72	68.54	49.21	74.0	54.0	5.46	4.79

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: 48.78 + 8.65 = 57.43dBuV/m
Margin: 74dBuV/m – 57.43dBuV/m = 16.57dB

Example Calculation: Average

Corrected Level: 41.35 + 8.65 - 11.37 = 38.63dBuV
Margin: 54dBuV – 38.63dBuV = 15.37dB

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

7.7.1 Test Methodology

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 200 kHz and the sweep time was calculated to be 68s (Span/3 kHz).

7.7.2 Test Results

Results are shown below in table 7.7.2-1 and figures 7.7.2-1 – 7.7.2-3:

Table 7.7.2-1: Peak Power Spectral Density

Frequency (MHz)	PSD Level (dBm)
2405	2.98
2440	1.55
2475	1.31

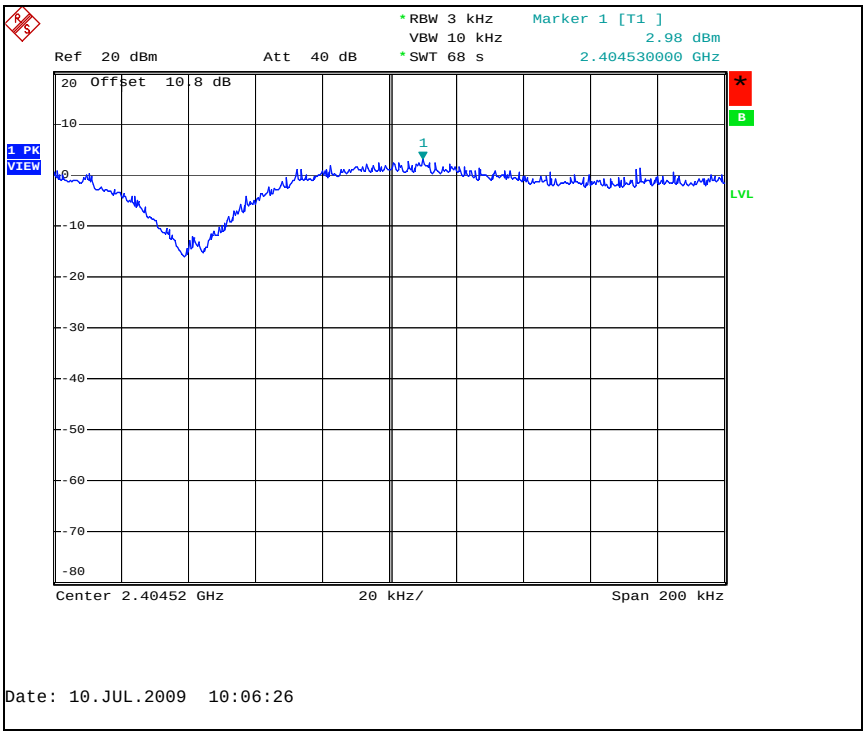

Figure 7.7.2-1: Power Spectral Density Plot – Low Channel

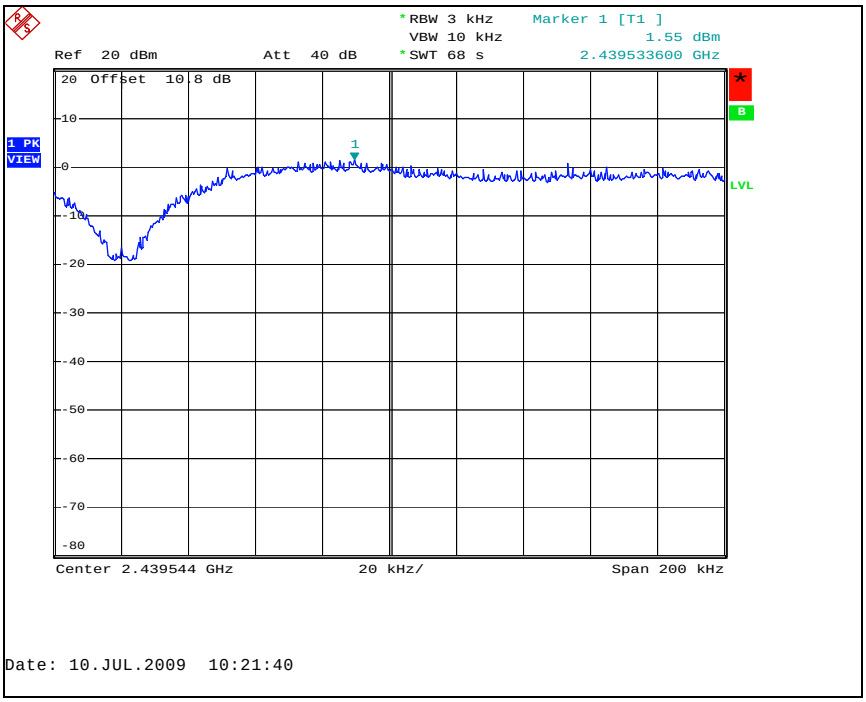

Figure 7.7.2-2: Power Spectral Density Plot – Mid Channel

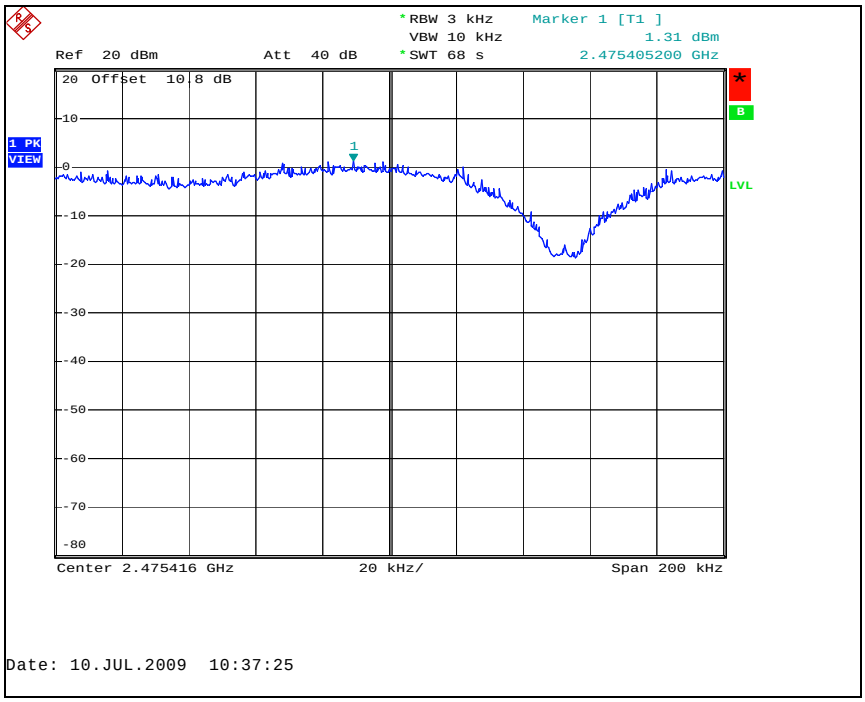

Figure 7.7.2-3: Power Spectral Density Plot – High Channel

8.0 CONCLUSION

In the opinion of ACS, Inc. the C2SOD-P 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