Excellence in Compliance Testing

Certification Test Report

FCC ID: QHC-010201A

FCC Rule Part: 15.247

ACS Report Number: 12-0330.W06.1A

Manufacturer: Itron Inc.
Model: I210-AMP

Test Begin Date: December 3, 2012
Test End Date: December 8, 2012

Report Issue Date: January 2, 2013

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Reviewed by:
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 26 pages

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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 limited modular approval (LMA) certification.

1.2 Product Description

The I210-AMP is a SmartSynch Interface module that is integrated in a variety of GE I210 electronic single-phase electricity meter form factors. The I210-AMP includes (1) 2.4 GHz direct sequence spread spectrum 802.15.4 Zigbee radio and Sierra Wireless CDMA modem SL5011, FCC ID: N7NSL5011 / IC: 2417C-SL5011. The Sierra Wireless CDMA modem SL5011 is modular approved and not covered under the scope of this report.

The I210-AMP is designed to be integrated into 1S, 2S, 3S, 4S and 25S electric utility meter forms and be collocated and transmit simultaneously with Sierra Wireless CDMA modem SL5011, FCC ID: N7NSL5011 / IC: 2417C-SL5011.

Technical Details:

Detail	Description
Frequency Range	2405 – 2480 MHz
Number of Channels	16
Modulation Format	O-QPSK
Number of Inputs/Outputs	1
Operating Voltage	120 / 240 VAC
Antenna Type / Gain	Printed Inverted F, 3.3dBi gain

Manufacturer Information:
Itron Inc.
4400 Old Canton Road
Suite 300
Jackson, MS 39211

Test Sample Serial Number: 421W00223 (RF Conducted), 4212W00222 (Radiated)

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

1.3 Test Methodology and Considerations

The I210-AMP is designed to be integrated into 1S, 2S, 3S, 4S and 25S electric utility meter host forms and be collocated and transmit simultaneously with Sierra Wireless CDMA modem SL5011, FCC ID: N7NSL5011 / IC: 2417C-SL5011. Radiated inter-modulation testing was performed for all combinations of simultaneous transmission and found to be in compliance.

A reduced power setting was required at channel 26 (2480 MHz) therefore both channels 25 and 26 (2475 MHz and 2480 MHz) were evaluated.

Power Setting During Test: 2405 MHz: -8
2440 MHz: -8
2475 MHz: -8
2480 MHz: -15

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

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

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.

FCC Registration Number: 511277
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

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:

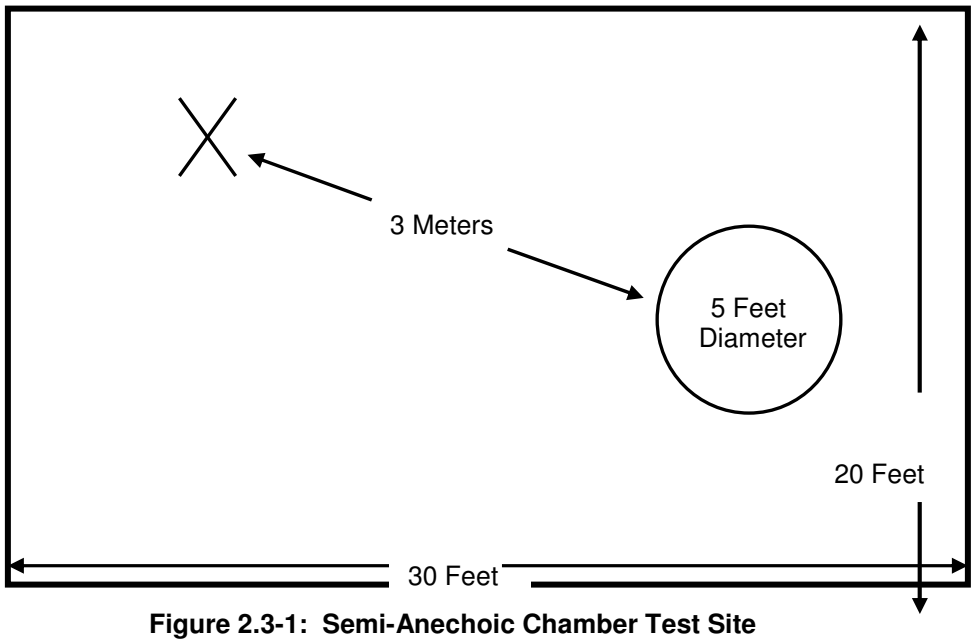

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

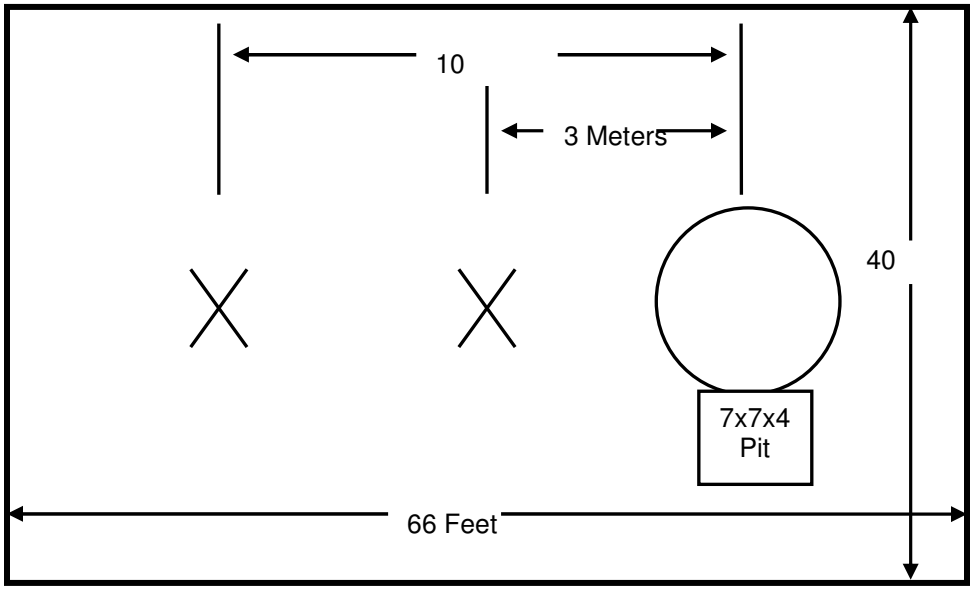

Figure 2.3-2: Open Area Test Site

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:

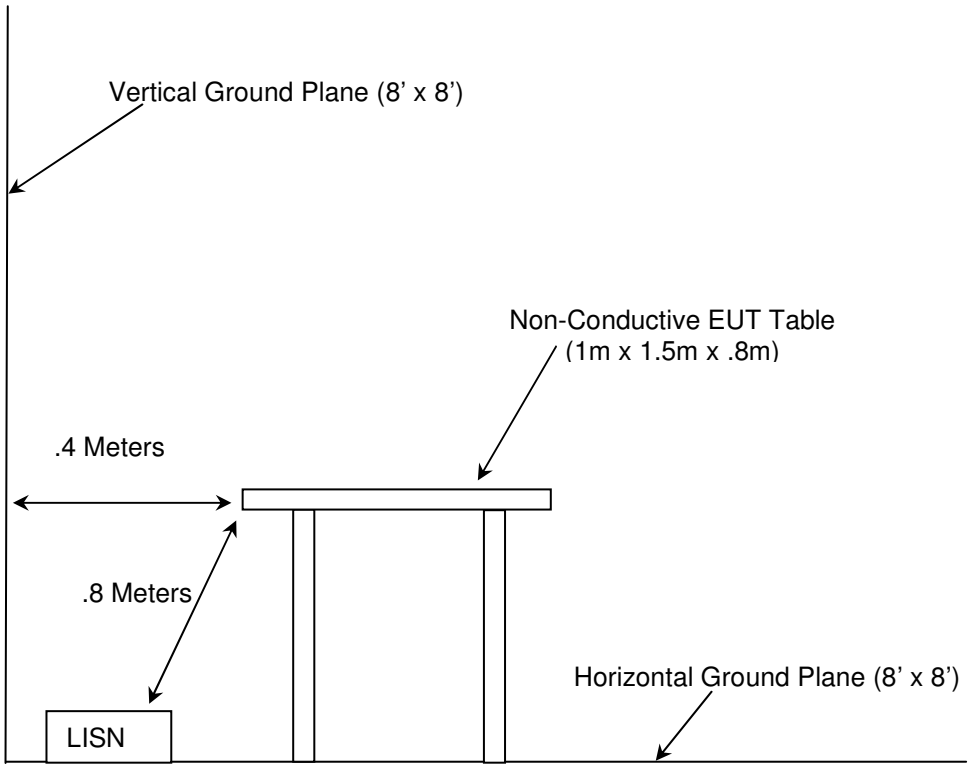

Figure 2.4-1: AC Mains Conducted EMI Site

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, 2012
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2012
- FCC KDB 558074 D01 DTS Meas Guidance v02 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, October 4, 2012
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, Dec 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, Dec 2010.

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

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	8/2/2012	8/2/2014
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	8/2/2012	8/2/2014
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/27/2011	4/27/2013
40	EMCO	3104	Antennas	3211	2/11/2011	2/11/2013
73	Agilent	8447D	Amplifiers	2727A05624	9/28/2012	9/28/2013
153	EMCO	3825/2	LISN	9411-2268	7/31/2012	7/31/2014
167	ACS	Chamber EMI Cable Set	Cable Set	167	12/21/2011	12/21/2012
168	Hewlett Packard	11947A	Attenuators	44829	2/1/2012	2/1/2013
267	Agilent	N1911A	Meters	MY45100129	1/23/2012	1/23/2014
268	Agilent	N1921A	Sensors	MY45240184	1/17/2012	1/17/2014
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/1/2012	8/1/2013
291	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	None	11/20/2012	11/20/2013
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	4/2/2012	4/2/2013
324	ACS	Belden	Cables	8214	6/26/2012	6/26/2013
334	Rohde&Schwarz	3160-09	Antennas	49404	11/4/2010	NCR
335	Suhner	SF-102A	Cables	882/2A	8/2/2012	8/2/2013
338	Hewlett Packard	8449B	Amplifiers	3008A01111	8/2/2012	8/2/2013
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	8/2/2012	8/2/2013
345	Suhner Sucoflex	102A	Cables	1077/2A	8/2/2012	8/2/2013
412	Electro Metrics	LPA-25	Antennas	1241	7/27/2012	7/27/2014
422	Florida RF	SMR	Cables	805	11/20/2012	11/20/2013
486	Hewlett Packard	8591E	Analyzers	3543A04709	6/20/2012	6/20/2013
RE90	Agilent	E7404A	Analyzers	US40240143	11/28/2012	11/28/2013

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Form 1S, 2S, 3S, 4S and 25S Electric Utility Meters	General Electric	1S 2S 3S 4S 25S	1S: 55377395 (RF Conducted) 1S: 44336813 2S: IND 52500362E 3S: 3QD 52500670E 4S: 3RD 53526619E 25S: 56210810
2	Step-up Transformer	N/A	N/A	N/A

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

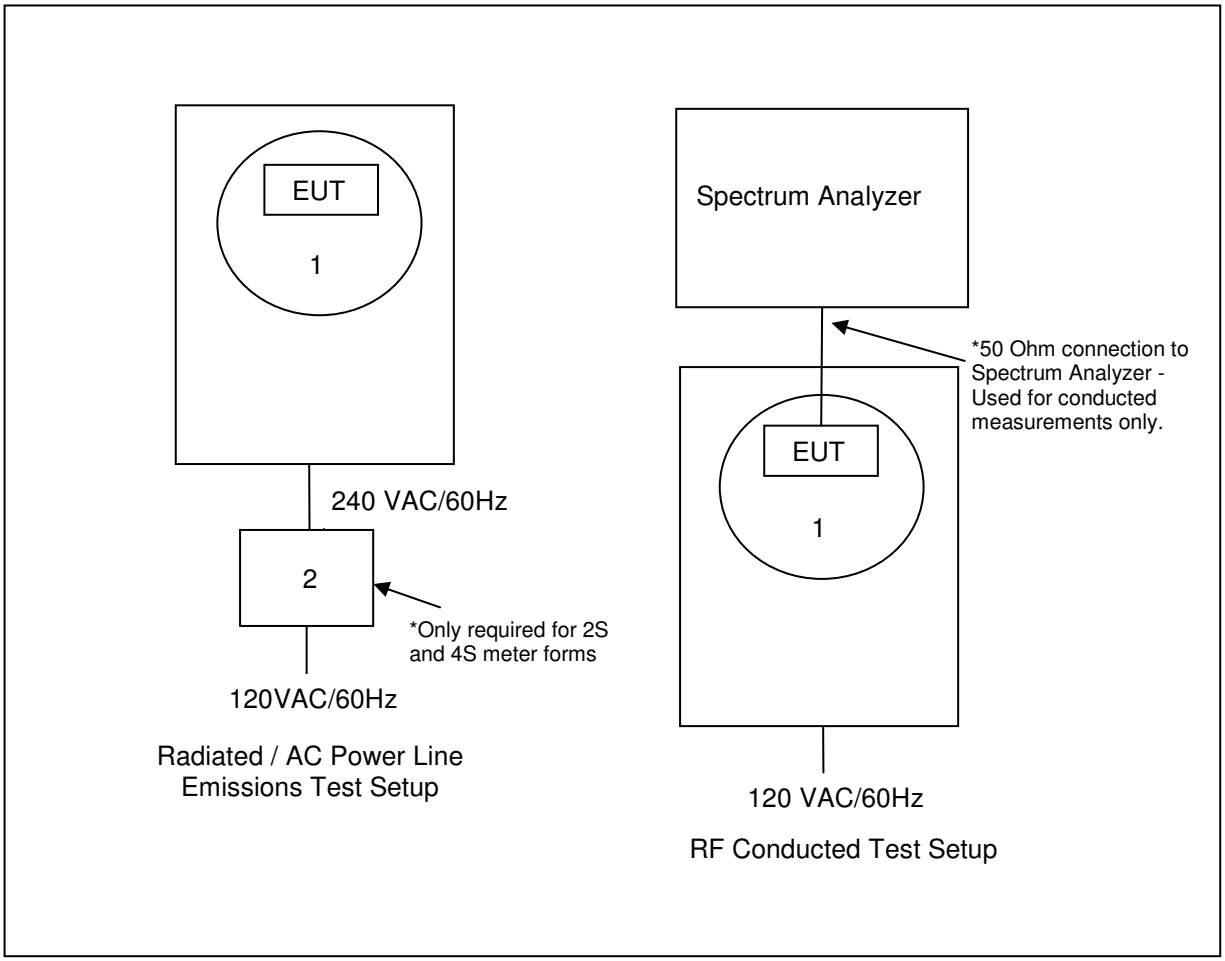

Figure 6-1: EUT Test Setup

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 printed inverted F antenna with a maximum gain of 3.3dBi and therefore meets the requirements of Section 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.4

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:

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

7.2.2 Measurement Results

Results of the test are shown below in and Tables 7.2.2-1 to 7.2.2-10.

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

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
1.31731	41.711	10.49	56	14.289	L1	FLO	QP
0.966337	42.925	10.487	56	13.075	L1	FLO	QP
0.556613	45.329	10.49	56	10.671	L1	FLO	QP
0.50805	42.864	10.49	56	13.136	L1	FLO	QP
0.322356	49.417	10.493	61.076	11.659	L1	FLO	QP
0.150297	51.152	10.432	65.992	14.839	L1	FLO	QP
1.31731	34.132	10.49	46	11.868	L1	FLO	AVG
0.966337	33.606	10.487	46	12.394	L1	FLO	AVG
0.556613	37.52	10.49	46	8.48	L1	FLO	AVG
0.50805	34.821	10.49	46	11.179	L1	FLO	AVG
0.322356	43.654	10.493	51.076	7.422	L1	FLO	AVG
0.150297	44.767	10.432	55.992	11.224	L1	FLO	AVG

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

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
1.16179	43.022	10.489	56	12.978	L2	FLO	QP
0.595688	46.021	10.491	56	9.979	L2	FLO	QP
0.455838	44.785	10.489	57.262	12.477	L2	FLO	QP
0.402538	49.229	10.489	58.785	9.556	L2	FLO	QP
0.31678	50.773	10.493	61.235	10.462	L2	FLO	QP
0.200738	50.85	10.409	64.55	13.7	L2	FLO	QP
1.16179	35.312	10.489	46	10.688	L2	FLO	AVG
0.595688	38.527	10.491	46	7.473	L2	FLO	AVG
0.455838	37.239	10.489	47.262	10.023	L2	FLO	AVG
0.402538	41.248	10.489	48.785	7.536	L2	FLO	AVG
0.31678	43.95	10.493	51.235	7.285	L2	FLO	AVG
0.200738	45.586	10.409	54.55	8.964	L2	FLO	AVG

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

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
4.29819	50.919	10.534	56	5.081	L1	FLO	QP
4.23929	51.102	10.533	56	4.898	L1	FLO	QP
4.13338	50.39	10.531	56	5.61	L1	FLO	QP
3.97126	50.714	10.529	56	5.286	L1	FLO	QP
0.403787	55.153	10.489	58.749	3.596	L1	FLO	QP
0.158201	50.367	10.427	65.766	15.399	L1	FLO	QP
4.29819	44.797	10.534	46	1.203	L1	FLO	AVG
4.23929	44.653	10.533	46	1.347	L1	FLO	AVG
4.13338	44.15	10.531	46	1.85	L1	FLO	AVG
3.97126	44.106	10.529	46	1.894	L1	FLO	AVG
0.403787	46.141	10.489	48.749	2.607	L1	FLO	AVG
0.158201	43.343	10.427	55.766	12.423	L1	FLO	AVG

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

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
4.42564	51.321	10.537	56	4.679	L2	FLO	QP
4.23568	52.029	10.533	56	3.971	L2	FLO	QP
4.05917	50.863	10.53	56	5.137	L2	FLO	QP
4.01458	51.272	10.529	56	4.728	L2	FLO	QP
0.401475	57.015	10.489	58.815	1.8	L2	FLO	QP
0.318813	55.295	10.493	61.177	5.882	L2	FLO	QP
4.42564	45.118	10.537	46	0.882	L2	FLO	AVG
4.23568	45.688	10.533	46	0.312	L2	FLO	AVG
4.05917	44.748	10.53	46	1.252	L2	FLO	AVG
4.01458	44.428	10.529	46	1.572	L2	FLO	AVG
0.401475	46.97	10.489	48.815	1.845	L2	FLO	AVG
0.318813	47.149	10.493	51.177	4.028	L2	FLO	AVG

Table 7.2.2-5: Conducted EMI Results – Line 1 – 3S Meter Form Host

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
1.08563	45.205	10.488	56	10.795	L1	FLO	QP
1.01027	44.271	10.487	56	11.729	L1	FLO	QP
0.755144	45.768	10.396	56	10.232	L1	FLO	QP
0.397718	43.536	10.489	58.922	15.386	L1	FLO	QP
0.274694	55.282	10.471	62.437	7.155	L1	FLO	QP
0.17455	47.862	10.419	65.299	17.437	L1	FLO	QP
1.08563	33.075	10.488	46	12.925	L1	FLO	AVG
1.01027	34.02	10.487	46	11.98	L1	FLO	AVG
0.755144	37.052	10.396	46	8.948	L1	FLO	AVG
0.397718	35.283	10.489	48.922	13.64	L1	FLO	AVG
0.274694	49.237	10.471	52.437	3.201	L1	FLO	AVG
0.17455	40.999	10.419	55.299	14.3	L1	FLO	AVG

Table 7.2.2-6: Conducted EMI Results – Line 2 - 3S Meter Form Host

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
1.54763	44.333	10.493	56	11.667	L2	FLO	QP
0.485799	50.023	10.489	56.406	6.383	L2	FLO	QP
0.472149	51.106	10.489	56.796	5.69	L2	FLO	QP
0.404537	51.601	10.489	58.728	7.127	L2	FLO	QP
0.202587	56.617	10.411	64.498	7.881	L2	FLO	QP
0.151591	48.993	10.431	65.955	16.962	L2	FLO	QP
1.54763	35.753	10.493	46	10.247	L2	FLO	AVG
0.485799	43.359	10.489	46.406	3.047	L2	FLO	AVG
0.472149	42.614	10.489	46.796	4.182	L2	FLO	AVG
0.404537	42.094	10.489	48.728	6.634	L2	FLO	AVG
0.202587	50.699	10.411	54.498	3.798	L2	FLO	AVG
0.151591	40.38	10.431	55.955	15.575	L2	FLO	AVG

Table 7.2.2-7: Conducted EMI Results – Line 1 – 4S Meter Form Host

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.538174	51.289	10.49	56	4.711	L1	FLO	QP
0.4825	49.381	10.489	56.5	7.119	L1	FLO	QP
0.464	49.496	10.489	57.029	7.533	L1	FLO	QP
0.2771	54.061	10.473	62.369	8.307	L1	FLO	QP
0.209544	53.602	10.416	64.299	10.697	L1	FLO	QP
0.151007	49.596	10.431	65.971	16.375	L1	FLO	QP
0.538174	41.031	10.49	46	4.969	L1	FLO	AVG
0.4825	42.903	10.489	46.5	3.597	L1	FLO	AVG
0.464	41.925	10.489	47.029	5.103	L1	FLO	AVG
0.2771	48.199	10.473	52.369	4.17	L1	FLO	AVG
0.209544	48.283	10.416	54.299	6.015	L1	FLO	AVG
0.151007	39.928	10.431	55.971	16.043	L1	FLO	AVG

Table 7.2.2-8: Conducted EMI Results – Line 2 - 4S Meter Form Host

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.8365	45.19	10.487	56	10.81	L2	FLO	QP
0.542624	52.41	10.49	56	3.59	L2	FLO	QP
0.404206	56.437	10.489	58.737	2.3	L2	FLO	QP
0.27678	56.248	10.473	62.378	6.13	L2	FLO	QP
0.20433	54.977	10.412	64.448	9.471	L2	FLO	QP
0.162444	49.795	10.425	65.644	15.85	L2	FLO	QP
0.8365	36.967	10.487	46	9.033	L2	FLO	AVG
0.542624	43.016	10.49	46	2.984	L2	FLO	AVG
0.404206	47.289	10.489	48.737	1.448	L2	FLO	AVG
0.27678	49.724	10.473	52.378	2.654	L2	FLO	AVG
0.20433	48.969	10.412	54.448	5.478	L2	FLO	AVG
0.162444	40.831	10.425	55.644	14.814	L2	FLO	AVG

Table 7.2.2-9: Conducted EMI Results – Line 1 – 25S Meter Form Host

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.8088	46.211	10.486	56	9.789	L1	FLO	QP
0.698144	46.391	10.289	56	9.609	L1	FLO	QP
0.4911	46.379	10.489	56.254	9.875	L1	FLO	QP
0.367844	50.441	10.49	59.776	9.335	L1	FLO	QP
0.314506	49.315	10.493	61.3	11.985	L1	FLO	QP
0.1725	50.992	10.42	65.357	14.365	L1	FLO	QP
0.8088	36.697	10.486	46	9.303	L1	FLO	AVG
0.698144	37.099	10.289	46	8.901	L1	FLO	AVG
0.4911	38.571	10.489	46.254	7.683	L1	FLO	AVG
0.367844	44.372	10.49	49.776	5.404	L1	FLO	AVG
0.314506	43.854	10.493	51.3	7.445	L1	FLO	AVG
0.1725	46.08	10.42	55.357	9.277	L1	FLO	AVG

Table 7.2.2-10: Conducted EMI Results – Line 2 - 25S Meter Form Host

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
1.31088	44.039	10.49	56	11.961	L2	FLO	QP
1.26363	46.437	10.49	56	9.563	L2	FLO	QP
0.502349	48.333	10.489	56	7.667	L2	FLO	QP
0.368263	52.04	10.49	59.764	7.724	L2	FLO	QP
0.248569	47.029	10.448	63.184	16.154	L2	FLO	QP
0.161487	50.11	10.426	65.672	15.561	L2	FLO	QP
1.31088	36.84	10.49	46	9.16	L2	FLO	AVG
1.26363	37.525	10.49	46	8.475	L2	FLO	AVG
0.502349	41.674	10.489	46	4.326	L2	FLO	AVG
0.368263	46.063	10.49	49.764	3.701	L2	FLO	AVG
0.248569	41.485	10.448	53.184	11.698	L2	FLO	AVG
0.161487	43.783	10.426	55.672	11.888	L2	FLO	AVG

7.3 6dB / 99% Bandwidth – FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(a)

7.3.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v02. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to approximately 1% to 5% of the DTS Bandwidth (6 dB bandwidth), not to exceed 100 kHz. The Video Bandwidth (VBW) was set to ≥ 3 times the RBW. The trace was set to max hold with a peak detector active. The marker-delta function of the spectrum analyzer was utilized to determine the 6 dB bandwidth of the emission, Option 1.

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The resolution bandwidth was set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth was set to 3 times the resolution bandwidth. A sampling detector was used.

7.3.2 Measurement Results

Results are shown below in table 7.3.2-1 and figures 7.3.2-1 to 7.3.2-8:

Table 7.3.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2405	1.82	2.42
2440	1.82	2.41
2475	1.82	2.40
2480	1.82	2.40

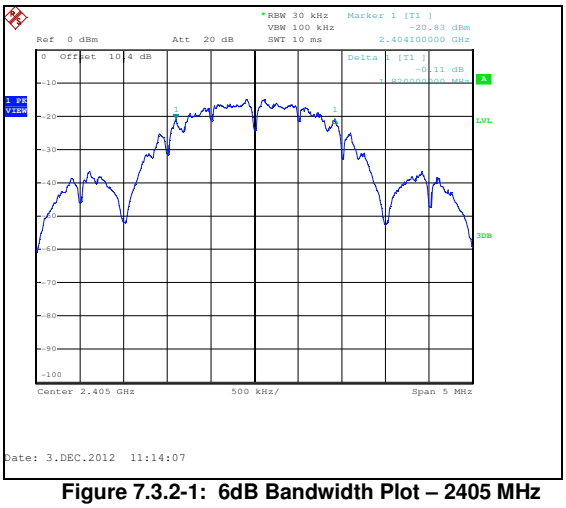

Figure 7.3.2-1: 6dB Bandwidth Plot – 2405 MHz

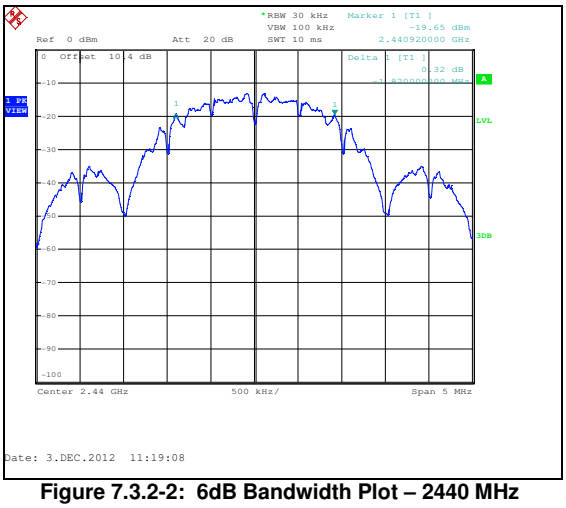

Figure 7.3.2-2: 6dB Bandwidth Plot – 2440 MHz

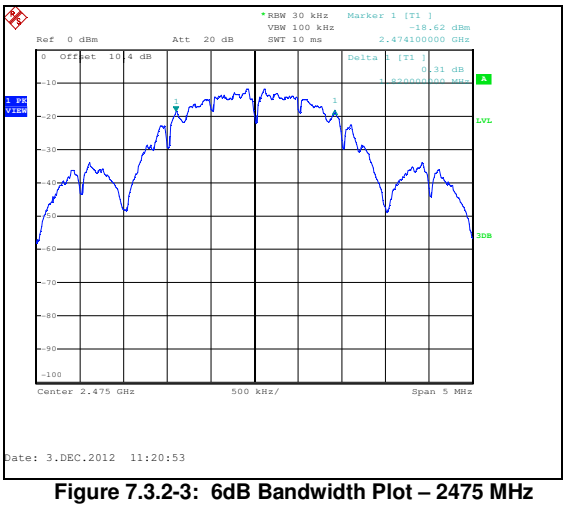

Figure 7.3.2-3: 6dB Bandwidth Plot – 2475 MHz

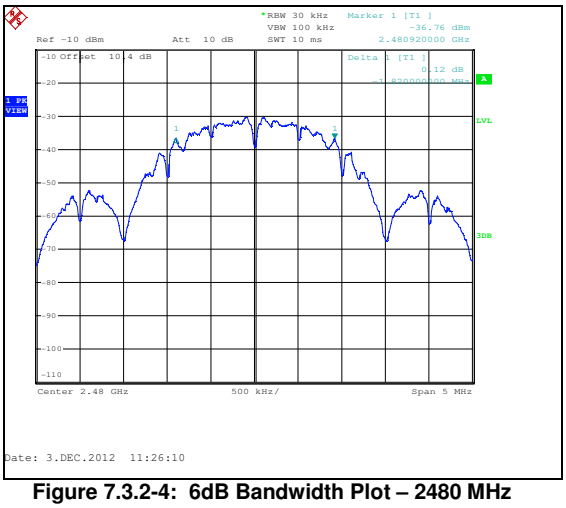

Figure 7.3.2-4: 6dB Bandwidth Plot – 2480 MHz

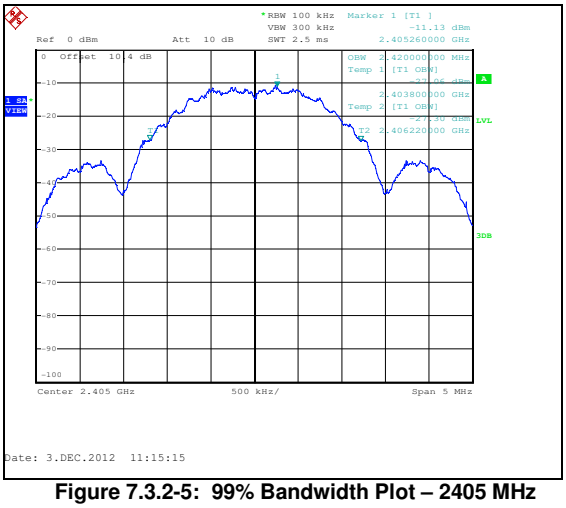

Figure 7.3.2-5: 99% Bandwidth Plot – 2405 MHz

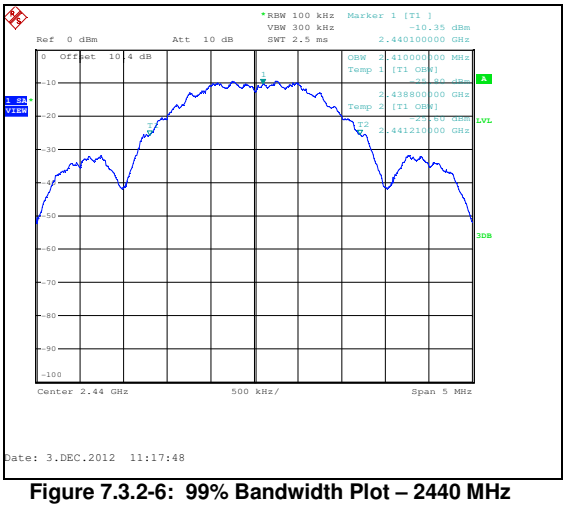

Figure 7.3.2-6: 99% Bandwidth Plot – 2440 MHz

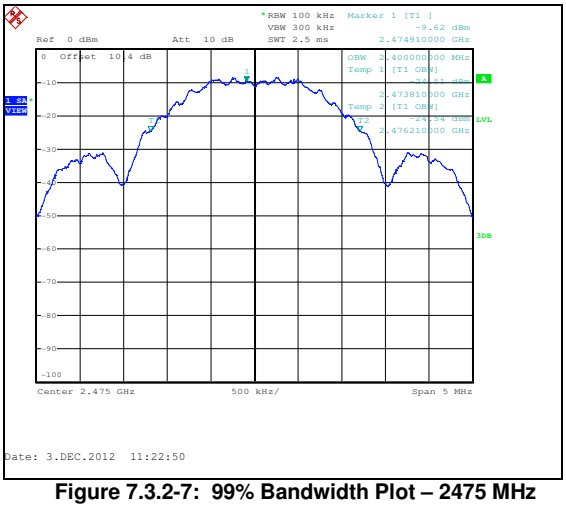

Figure 7.3.2-7: 99% Bandwidth Plot – 2475 MHz

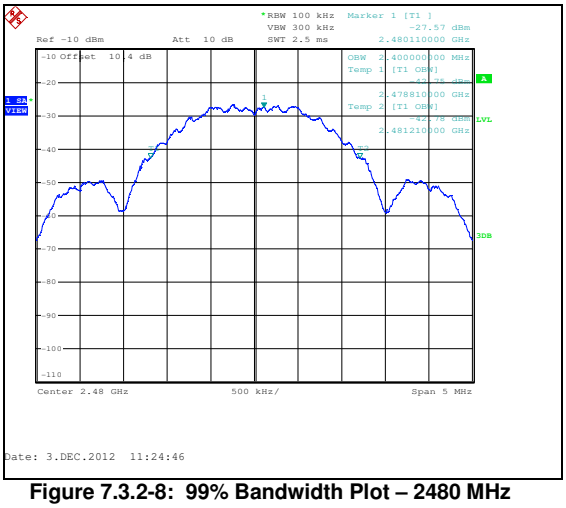

Figure 7.3.2-8: 99% Bandwidth Plot – 2480 MHz

7.4 Fundamental Emission Output Power – FCC: Section 15.247(b)(3) IC: RSS-210 A8.4(4)

7.4.1 Measurement Procedure

The maximum peak conducted output power was measured in accordance with FCC KDB 558074 D01 DTS Meas Guidance v02 Option 3 (Peak Power Meter Method). The RF output of the equipment under test was directly connected to the input of the peak power meter applying suitable attenuation.

7.4.2 Measurement Results

Results are shown below in Table 7.4.2-1.

Table 7.4.2-1: Maximum Peak Conducted Output Power

Frequency (MHz)	Output Power (dBm)
2405	18.41
2440	19.64
2475	19.87
2480	1.63

7.5 Maximum Unwanted Emission Levels – FCC: Section 15.247(d), 15.205 IC: RSS-210 2.2, A8.5

7.5.1 Unwanted Emissions into Non-restricted Frequency Bands

7.5.1.1 Measurement Procedure

The unwanted emissions into non-restricted bands were measured conducted in accordance with FCC KDB 558074 D01 DTS Meas Guidance v02. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to ≥ 300 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active. The resulting spectrum analyzer peak level was used to determine the reference level with respect to the 20 dBc limit. The spectrum span was then adjusted for the measurement of spurious emissions from 30MHz to 25GHz, 10 times the highest fundamental frequency.

Band-edge compliance was determined using the conducted 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.

7.5.1.2 Measurement Results

RF Conducted Emissions are displayed in Figures 7.5.1.2-1 through 7.5.1.2-15.

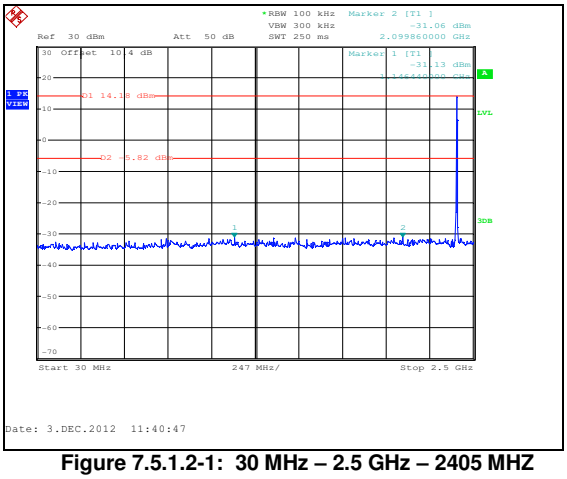

Figure 7.5.1.2-1: 30 MHz – 2.5 GHz – 2405 MHZ

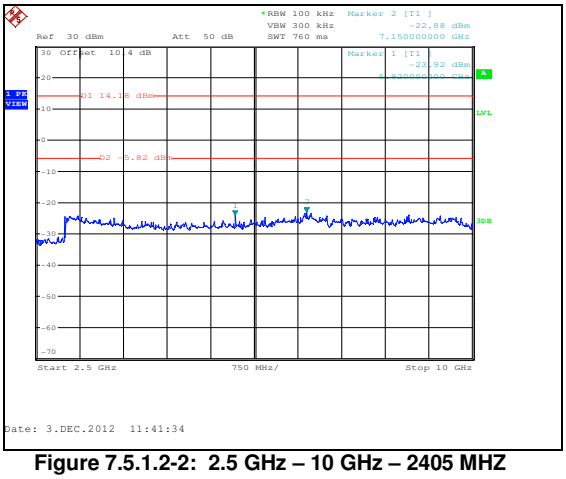

Figure 7.5.1.2-2: 2.5 GHz – 10 GHz – 2405 MHZ

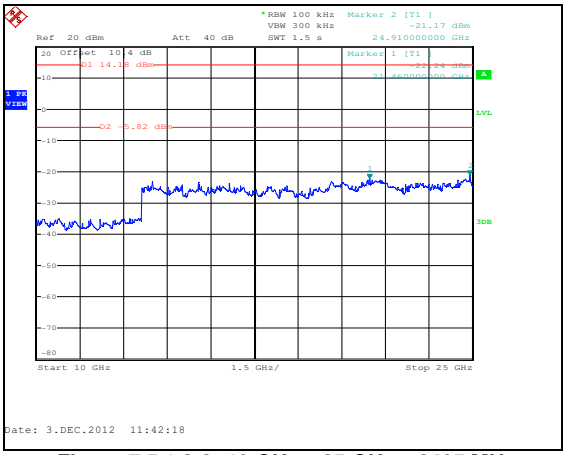

Figure 7.5.1.2-3: 10 GHz – 25 GHz – 2405 MHz

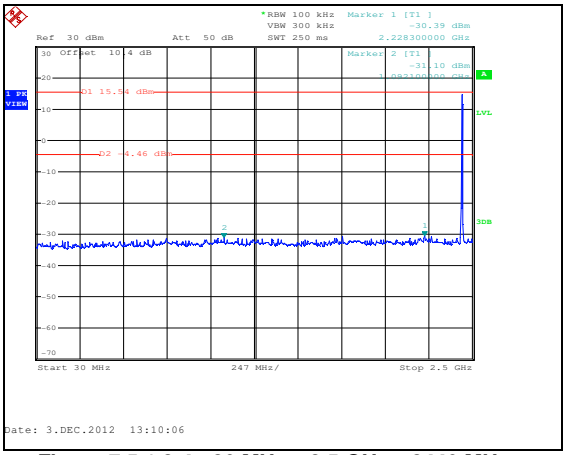

Figure 7.5.1.2-4: 30 MHz – 2.5 GHz – 2440 MHz

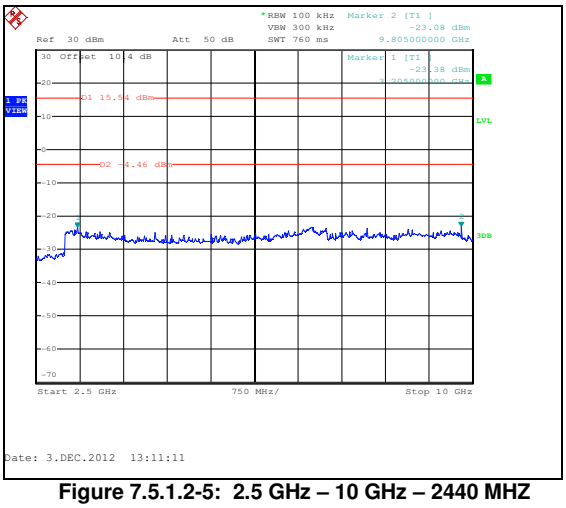

Figure 7.5.1.2-5: 2.5 GHz – 10 GHz – 2440 MHZ

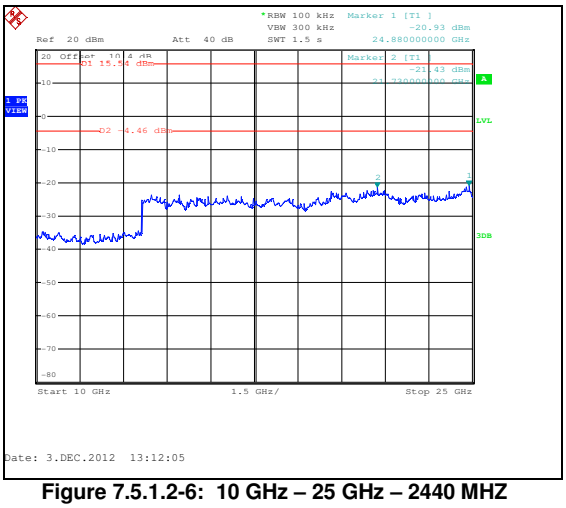

Figure 7.5.1.2-6: 10 GHz – 25 GHz – 2440 MHZ

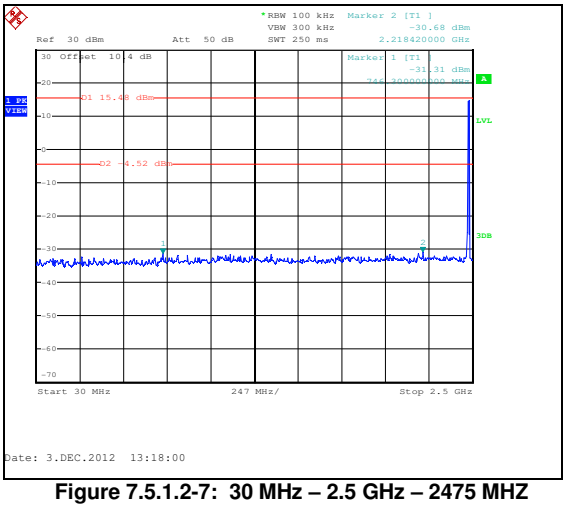

Figure 7.5.1.2-7: 30 MHz – 2.5 GHz – 2475 MHZ

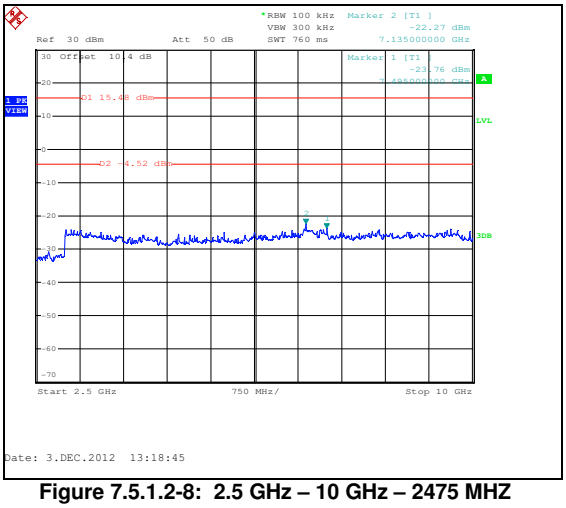

Figure 7.5.1.2-8: 2.5 GHz – 10 GHz – 2475 MHZ

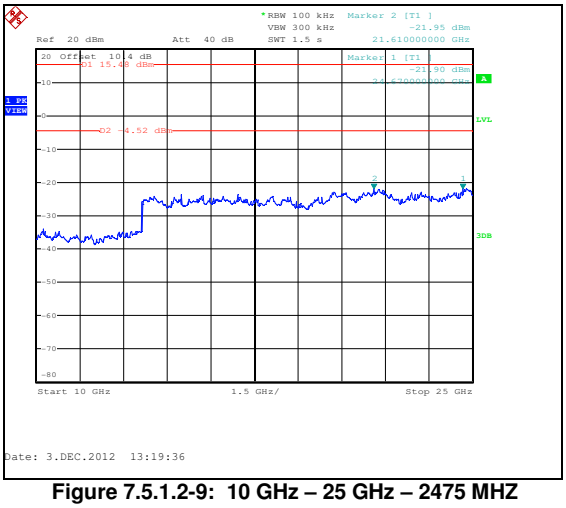

Figure 7.5.1.2-9: 10 GHz – 25 GHz – 2475 MHZ

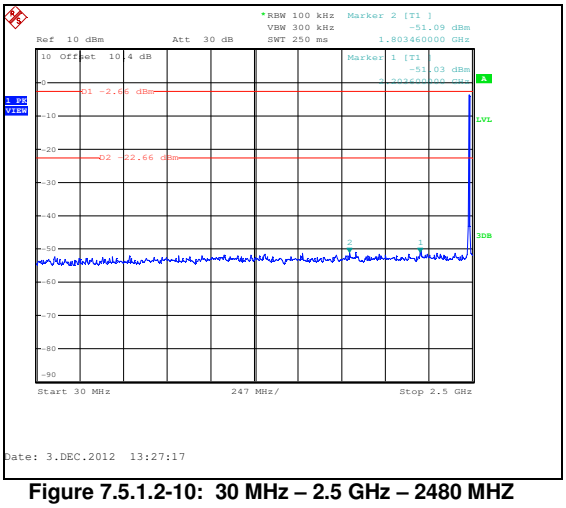

Figure 7.5.1.2-10: 30 MHz – 2.5 GHz – 2480 MHZ

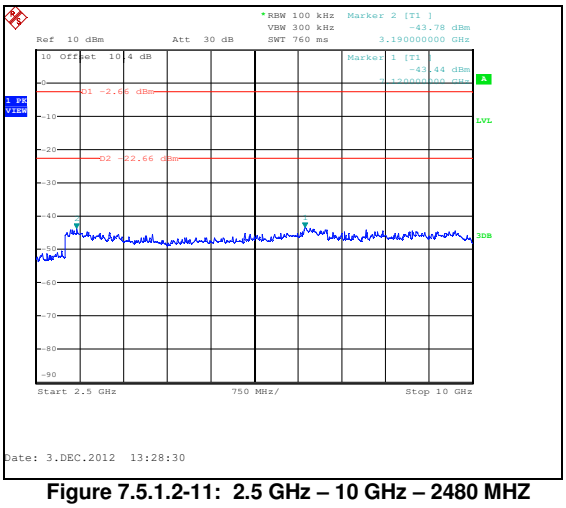

Figure 7.5.1.2-11: 2.5 GHz – 10 GHz – 2480 MHZ

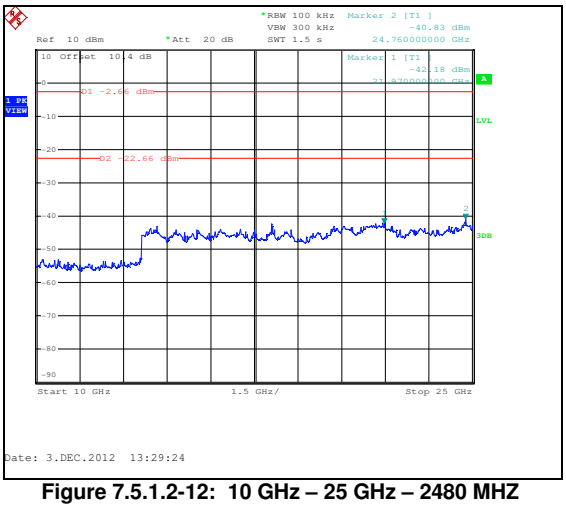

Figure 7.5.1.2-12: 10 GHz – 25 GHz – 2480 MHZ

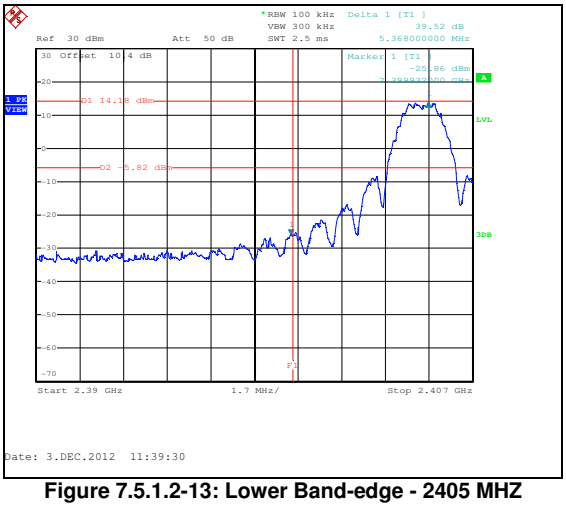

Figure 7.5.1.2-13: Lower Band-edge - 2405 MHZ

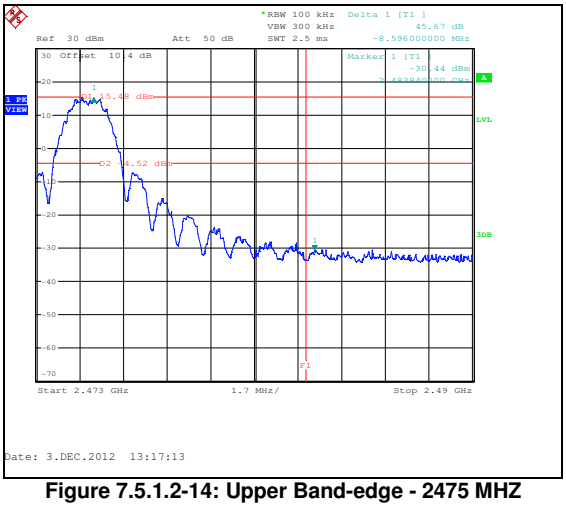

Figure 7.5.1.2-14: Upper Band-edge - 2475 MHZ

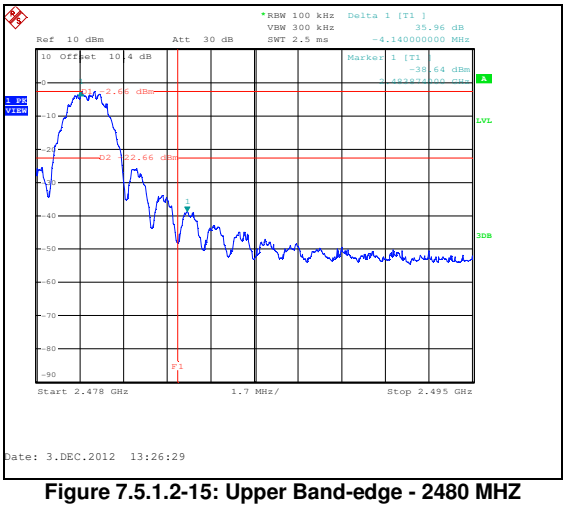

Figure 7.5.1.2-15: Upper Band-edge - 2480 MHZ

7.5.2 Unwanted Emissions into Restricted Frequency Bands

7.5.2.1 Measurement Procedure

The unwanted emissions into restricted bands were measured radiated 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 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, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

7.5.2.2 Duty Cycle Correction

For average radiated measurements, using a 27% duty cycle, the measured level was reduced by a factor 11.37dB. 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 accompanying the application for certification.

7.5.2.3 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 25GHz are reported in the tables 7.5.2.3-1 7.5.2.3-5 below.

Table 7.5.2.3-1: Radiated Spurious Emissions Tabulated Data – 1S Meter Form Host

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
2405 MHz										
4810	52.37	43.51	H	2.14	54.51	34.28	74.0	54.0	19.5	19.7
4810	50.78	40.85	V	2.14	52.92	31.62	74.0	54.0	21.1	22.4
12025	53.20	43.74	H	14.38	67.58	46.75	83.5	63.5	15.9	16.8
12025	52.38	43.16	V	14.38	66.76	46.17	83.5	63.5	16.7	17.4
2389.4	66.29	55.68	H	-5.31	60.98	39.00	74.0	54.0	13.0	15.0
2389.4	62.12	51.67	V	-5.31	56.81	34.99	74.0	54.0	17.2	19.0
2440 MHz										
4880	52.24	43.16	H	2.31	54.55	34.09	74.0	54.0	19.5	19.9
4880	48.35	37.70	V	2.31	50.66	28.63	74.0	54.0	23.3	25.4
7320	50.34	41.05	H	7.68	58.02	37.36	74.0	54.0	16.0	16.6
7320	50.17	40.39	V	7.68	57.85	36.70	74.0	54.0	16.1	17.3
12200	55.12	46.28	H	15.35	70.47	50.26	83.5	63.5	13.0	13.3
12200	55.35	47.15	V	15.35	70.71	51.13	83.5	63.5	12.8	12.4
2475 MHz										
4950	52.54	42.45	H	2.47	55.01	33.55	74.0	54.0	19.0	20.5
4950	48.42	37.83	V	2.47	50.89	28.93	74.0	54.0	23.1	25.1
7425	49.81	39.78	H	7.82	57.63	36.23	74.0	54.0	16.4	17.8
7425	48.17	37.52	V	7.82	55.99	33.97	74.0	54.0	18.0	20.0
12375	54.31	45.19	H	16.32	70.63	50.14	83.5	63.5	12.9	13.4
12375	53.17	43.54	V	16.32	69.49	48.49	83.5	63.5	14.0	15.1
2483.5	76.47	66.57	H	-4.89	71.58	50.31	74.0	54.0	2.4	3.7
2483.5	71.22	61.52	V	-4.89	66.33	45.26	74.0	54.0	7.7	8.7
2480 MHz										
2483.5	74.64	64.92	H	-4.89	69.75	48.66	74.0	54.0	4.3	5.3
2483.5	69.03	59.36	V	-4.89	64.14	43.10	74.0	54.0	9.9	10.9

Table 7.5.2.3-2: Radiated Spurious Emissions Tabulated Data – 2S Meter Form Host

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
2405 MHz										
4810	53.26	44.81	H	2.14	55.40	35.58	74.0	54.0	18.6	18.4
4810	51.83	41.99	V	2.14	53.97	32.76	74.0	54.0	20.0	21.2
12025	54.51	45.80	H	14.38	68.89	48.81	83.5	63.5	14.6	14.7
12025	53.77	44.38	V	14.38	68.15	47.39	83.5	63.5	15.3	16.2
2389.4	66.27	55.35	H	-5.31	60.96	38.67	74.0	54.0	13.0	15.3
2389.4	62.91	52.15	V	-5.31	57.60	35.47	74.0	54.0	16.4	18.5
2440 MHz										
4880	52.48	43.65	H	2.31	54.79	34.58	74.0	54.0	19.2	19.4
4880	50.31	40.67	V	2.31	52.62	31.60	74.0	54.0	21.4	22.4
7320	49.16	38.71	H	7.68	56.84	35.02	74.0	54.0	17.2	19.0
7320	48.59	38.33	V	7.68	56.27	34.64	74.0	54.0	17.7	19.4
12200	55.13	46.21	H	15.35	70.48	50.19	83.5	63.5	13.0	13.4
12200	53.49	44.17	V	15.35	68.84	48.15	83.5	63.5	14.7	15.4
2475 MHz										
4950	51.44	42.34	H	2.47	53.91	33.44	74.0	54.0	20.1	20.6
4950	49.11	38.46	V	2.47	51.58	29.56	74.0	54.0	22.4	24.4
7425	49.24	38.16	H	7.82	57.06	34.61	74.0	54.0	16.9	19.4
7425	48.12	36.73	V	7.82	55.94	33.18	74.0	54.0	18.1	20.8
12375	52.93	43.34	H	16.32	69.25	48.29	83.5	63.5	14.2	15.3
12375	51.88	41.79	V	16.32	68.20	46.74	83.5	63.5	15.3	16.8
2483.5	71.14	61.06	H	-4.89	66.25	44.80	74.0	54.0	7.8	9.2
2483.5	71.35	60.93	V	-4.89	66.46	44.67	74.0	54.0	7.5	9.3
2480 MHz										
2483.5	70.48	60.73	H	-4.89	65.59	44.47	74.0	54.0	8.4	9.5
2483.5	72.56	62.71	V	-4.89	67.67	46.45	74.0	54.0	6.3	7.6

Table 7.5.2.3-3: Radiated Spurious Emissions Tabulated Data – 3S Meter Form Host

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
2405 MHz										
4810	52.70	43.89	H	2.14	54.84	34.66	74.0	54.0	19.2	19.3
4810	52.07	43.08	V	2.14	54.21	33.85	74.0	54.0	19.8	20.1
12025	57.41	48.57	H	14.38	71.79	51.58	83.5	63.5	11.7	12.0
12025	55.19	46.51	V	14.38	69.57	49.52	83.5	63.5	13.9	14.0
2389.4	62.48	51.92	H	-5.31	57.17	35.24	74.0	54.0	16.8	18.8
2389.4	64.84	54.30	V	-5.31	59.53	37.62	74.0	54.0	14.5	16.4
2440 MHz										
4880	51.38	42.37	H	2.31	53.69	33.30	74.0	54.0	20.3	20.7
4880	49.31	39.07	V	2.31	51.62	30.00	74.0	54.0	22.4	24.0
7320	50.22	40.87	H	7.68	57.90	37.18	74.0	54.0	16.1	16.8
7320	50.31	39.88	V	7.68	57.99	36.19	74.0	54.0	16.0	17.8
12200	56.11	47.65	H	15.35	71.46	51.63	83.5	63.5	12.0	11.9
12200	56.06	47.42	V	15.35	71.41	51.40	83.5	63.5	12.1	12.1
2475 MHz										
4950	52.01	42.60	H	2.47	54.48	33.70	74.0	54.0	19.5	20.3
4950	50.33	40.21	V	2.47	52.80	31.31	74.0	54.0	21.2	22.7
7425	49.53	39.20	H	7.82	57.35	35.65	74.0	54.0	16.6	18.4
7425	47.35	36.81	V	7.82	55.17	33.26	74.0	54.0	18.8	20.7
12375	54.13	44.91	H	16.32	70.45	49.86	83.5	63.5	13.0	13.7
12375	52.26	42.37	V	16.32	68.58	47.32	83.5	63.5	14.9	16.2
2483.5	72.68	62.81	H	-4.89	67.79	46.55	74.0	54.0	6.2	7.5
2483.5	74.08	64.13	V	-4.89	69.19	47.87	74.0	54.0	4.8	6.1
2480 MHz										
2483.5	74.47	64.74	H	-4.89	69.58	48.48	74.0	54.0	4.4	5.5
2483.5	72.56	62.74	V	-4.89	67.67	46.48	74.0	54.0	6.3	7.5

Table 7.5.2.3-4: Radiated Spurious Emissions Tabulated Data – 4S Meter Form Host

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
2405 MHz										
4810	52.75	44.07	H	2.14	54.89	34.84	74.0	54.0	19.1	19.2
4810	51.73	42.47	V	2.14	53.87	33.24	74.0	54.0	20.1	20.8
12025	58.79	50.67	H	14.38	73.17	53.68	83.5	63.5	10.3	9.9
12025	55.47	47.07	V	14.38	69.85	50.08	83.5	63.5	13.6	13.5
2389.4	64.56	54.61	H	-5.31	59.25	37.93	74.0	54.0	14.7	16.1
2389.4	64.28	53.49	V	-5.31	58.97	36.81	74.0	54.0	15.0	17.2
2440 MHz										
4880	52.06	42.85	H	2.31	54.37	33.78	74.0	54.0	19.6	20.2
4880	51.09	40.87	V	2.31	53.40	31.80	74.0	54.0	20.6	22.2
7320	50.51	40.54	H	7.68	58.19	36.85	74.0	54.0	15.8	17.1
7320	50.09	40.82	V	7.68	57.77	37.13	74.0	54.0	16.2	16.9
12200	55.70	47.12	H	15.35	71.05	51.10	83.5	63.5	12.4	12.4
12200	54.48	45.72	V	15.35	69.83	49.70	83.5	63.5	13.7	13.8
2475 MHz										
4950	51.33	41.91	H	2.47	53.80	33.01	74.0	54.0	20.2	21.0
4950	49.91	39.17	V	2.47	52.38	30.27	74.0	54.0	21.6	23.7
7425	50.14	40.24	H	7.82	57.96	36.69	74.0	54.0	16.0	17.3
7425	48.77	38.54	V	7.82	56.59	34.99	74.0	54.0	17.4	19.0
12375	54.58	45.54	H	16.32	70.90	50.49	83.5	63.5	12.6	13.1
12375	53.62	44.58	V	16.32	69.94	49.53	83.5	63.5	13.6	14.0
2483.5	73.12	62.86	H	-4.89	68.23	46.60	74.0	54.0	5.8	7.4
2483.5	72.46	62.05	V	-4.89	67.57	45.79	74.0	54.0	6.4	8.2
2480 MHz										
2483.5	71.57	61.72	H	-4.89	66.68	45.46	74.0	54.0	7.3	8.5
2483.5	70.43	60.68	V	-4.89	65.54	44.42	74.0	54.0	8.5	9.6

Table 7.5.2.3-5: Radiated Spurious Emissions Tabulated Data – 25S Meter Form Host

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
2405 MHz										
4810	53.24	44.74	H	2.14	55.38	35.51	74.0	54.0	18.6	18.5
4810	52.30	43.82	V	2.14	54.44	34.59	74.0	54.0	19.6	19.4
12025	54.02	45.11	H	14.38	68.40	48.12	83.5	63.5	15.1	15.4
12025	53.16	44.20	V	14.38	67.54	47.21	83.5	63.5	16.0	16.3
2389.4	66.87	55.85	H	-5.31	61.56	39.17	74.0	54.0	12.4	14.8
2389.4	62.10	51.23	V	-5.31	56.79	34.55	74.0	54.0	17.2	19.5
2440 MHz										
4880	52.15	43.61	H	2.31	54.46	34.54	74.0	54.0	19.5	19.5
4880	49.35	39.75	V	2.31	51.66	30.68	74.0	54.0	22.3	23.3
7320	51.14	41.63	H	7.68	58.82	37.94	74.0	54.0	15.2	16.1
7320	51.26	41.94	V	7.68	58.94	38.25	74.0	54.0	15.1	15.7
12200	55.19	46.84	H	15.35	70.54	50.82	83.5	63.5	13.0	12.7
12200	55.12	46.23	V	15.35	70.47	50.21	83.5	63.5	13.0	13.3
2475 MHz										
4950	52.17	43.16	H	2.47	54.64	34.26	74.0	54.0	19.4	19.7
4950	50.22	40.41	V	2.47	52.69	31.51	74.0	54.0	21.3	22.5
7425	50.79	40.67	H	7.82	58.61	37.12	74.0	54.0	15.4	16.9
12375	53.71	44.76	H	16.32	70.03	49.71	83.5	63.5	13.5	13.8
12375	52.59	42.47	V	16.32	68.91	47.42	83.5	63.5	14.6	16.1
2483.5	73.68	63.42	H	-4.89	68.79	47.16	74.0	54.0	5.2	6.8
2483.5	73.43	63.22	V	-4.89	68.54	46.96	74.0	54.0	5.5	7.0
2480 MHz										
2483.5	72.23	62.38	H	-4.89	67.34	46.12	74.0	54.0	6.7	7.9
2483.5	71.45	61.42	V	-4.89	66.56	45.16	74.0	54.0	7.4	8.8

7.5.2.4 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: 52.37 + 2.14 = 54.51dBuV/m
Margin: 74dBuV/m – 54.51dBuV/m = 19.5dB

Example Calculation: Average

Corrected Level: 43.51 + 2.14 - 11.37 = 34.28dBuV
Margin: 54dBuV – 34.28dBuV = 19.7dB

7.6 Maximum Power Spectral Density in the Fundamental Emission – FCC: Section 15.247(e) IC: RSS-210 A8.2(b)

7.6.1 Measurement Procedure

The power spectral density was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v02 Option 1. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 3 kHz. The Video Bandwidth (VBW) was set to 10 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active.

7.6.2 Measurement Results

Results are shown below in table 7.6.2-1 and figures 7.6.2-1 to 7.6.2-4.

Table 7.6.2-1: Peak Power Spectral Density

Frequency (MHz)	PSD Level (dBm)
2405	2.36
2440	3.38
2475	3.76
2480	-14.15

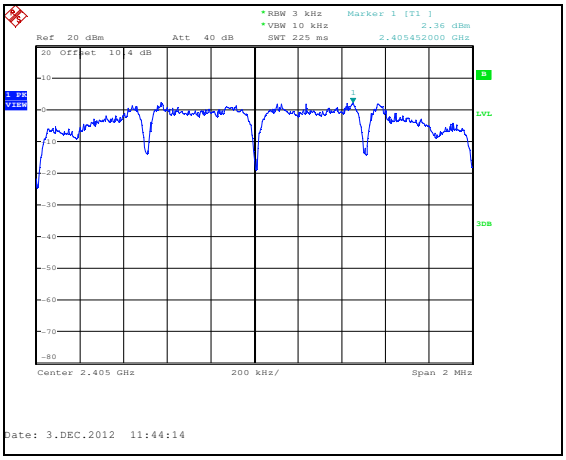

Figure 7.6.2-1: PSD Plot – 2405 MHz

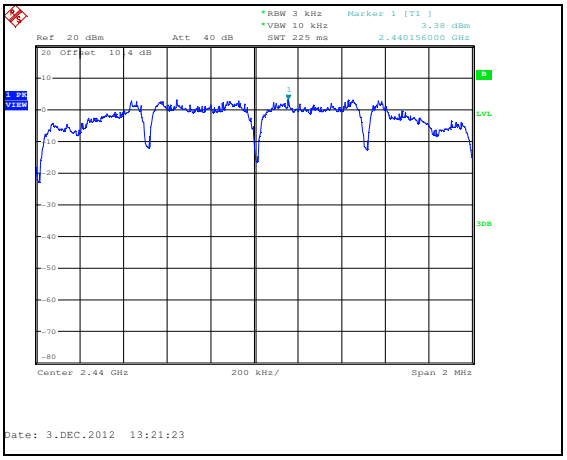

Figure 7.6.2-2: PSD Plot – 2440 MHz

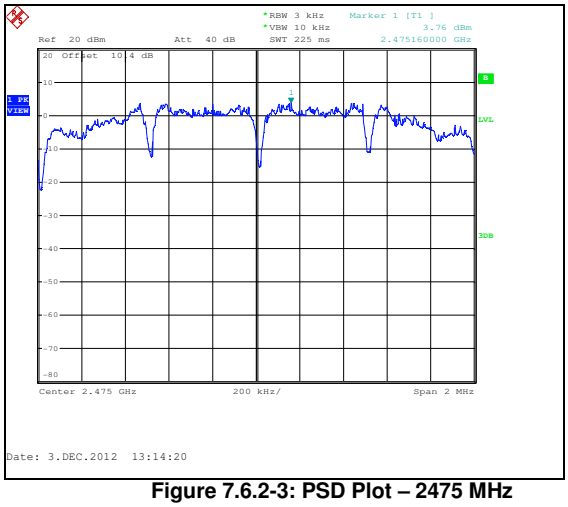

Figure 7.6.2-3: PSD Plot – 2475 MHz

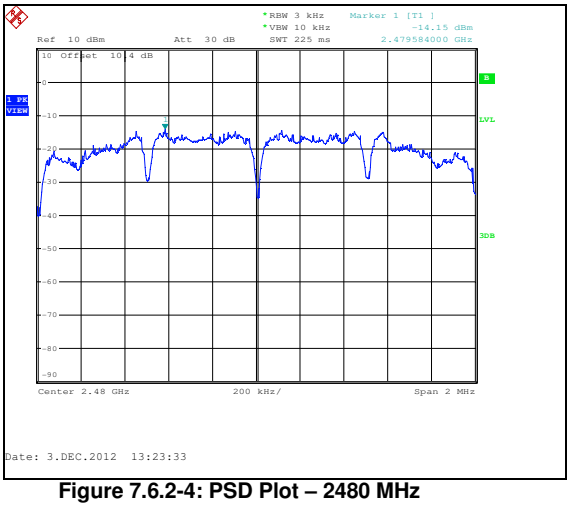

Figure 7.6.2-4: PSD Plot – 2480 MHz

8 CONCLUSION

In the opinion of ACS, Inc. I210-AMP, manufactured by Itron Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT