Excellence in Compliance Testing

Certification Test Report

FCC ID: SK9ITR24001
IC: 864G-ITR24001

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

ACS Report Number: 11-0105.W06.11.A

Manufacturer: Itron Electricity Metering, Inc.
Model: ITR24001

Test Begin Date: March 30, 2011
Test End Date: April 4, 2011

Report Issue Date: April 18, 2011

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 27 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 Certification of a single limited modular approval.

1.2 Product description

The Itron ITR24001 module is a CPU unit which acts as a Cell master within an electricity grid system. Located in the ITR24001 module is a WiFi transmitter that operates in the 2400 MHz to 2484.5 MHz band. The ITR24001 can be installed in a larger weatherproof box and control the functions of a GPRS or CDMA modem and a 900 MHz LAN radio. The module operates on direct current voltage which is supplied by a host device.

Technical Details:

Operating Range	2412GHz – 2462MHz
Number of Channels	11
Modulation	802.11b: DSSS (BPSK / QPSK / CCK); 802.11g: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate	802.11b: 11, 5.5, 2, 1 Mbps; 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps; 802.11n: 65, 58.5, 52, 39, 26, 19.5, 13, 6.5 Mbps;
RF Connector	SMA
Antenna / Gain	WP Wireless P/N:WPANT30005-SA, Omni Directional Whip, 3.9dBi
Input Voltage	5VDC

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

Test Sample Serial Number(s): ACS23

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

1.3 Test Methodology and Considerations

The EUT was pre-scanned in all modes of operation and for all data rates. The following modes/data rates were determined to be worst case and therefore used for final measurements:

802.11b: 1 Mbps, 802.11g: 6 Mbps, 802.11n: 6.5 Mbps (MCS0)

For radiated emissions, including band edge, multiple orientations were evaluated and worst case data presented. Worst case orientation was determined to be the X orientation.

All available EUT ports were populated with representative loads as detailed in section 5.0 – 6.0.

The ITR24001 can be collocated with Itron Electricity Metering, Inc. FCC ID:SK9ITR9002 / IC: 864G-ITR9002 and either Sierra Wireless FCC ID: N7N–MC5728 / IC: 2417C-MC5728 or FCC ID: N7NMC8790 / IC: 2417C-MC8790 in the Itron Electricity Metering, Inc. Prism Cell Relay host device. Radiated inter-modulation testing was performed for all combinations of simultaneous transmission and found to be in compliance.

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: 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

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

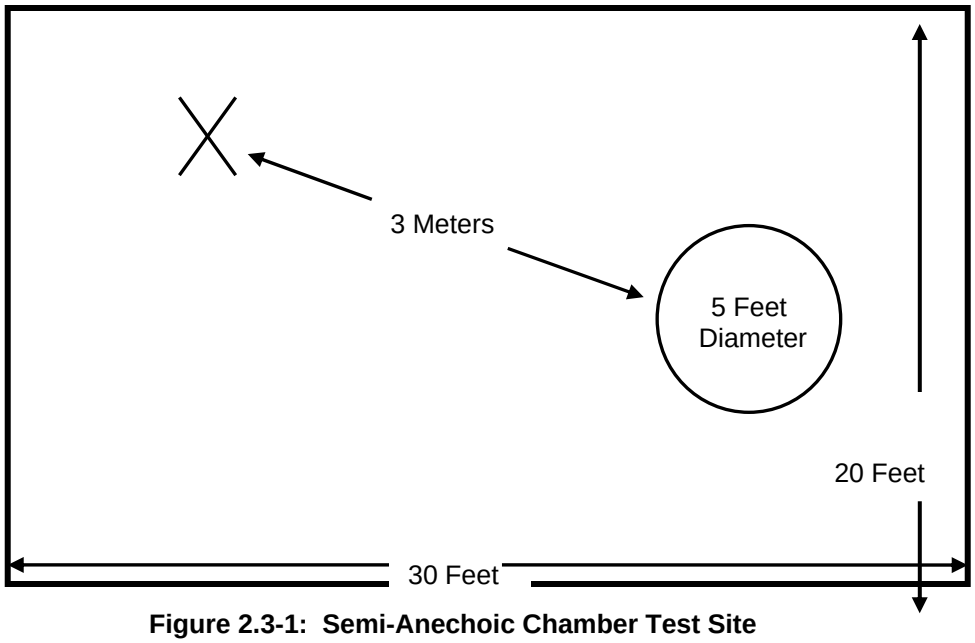


Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40’ x 66’ concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8” holes that are staggered every 3/16”. The individual sheets are placed to overlap each other by 1/4” and are riveted together to provide a continuous seam. Rivets are spaced every 3” in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12’ beyond the turntable edge and 16’ beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8’ copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10’ flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40’ from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7’ x 7’ square and 4’ deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4” PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

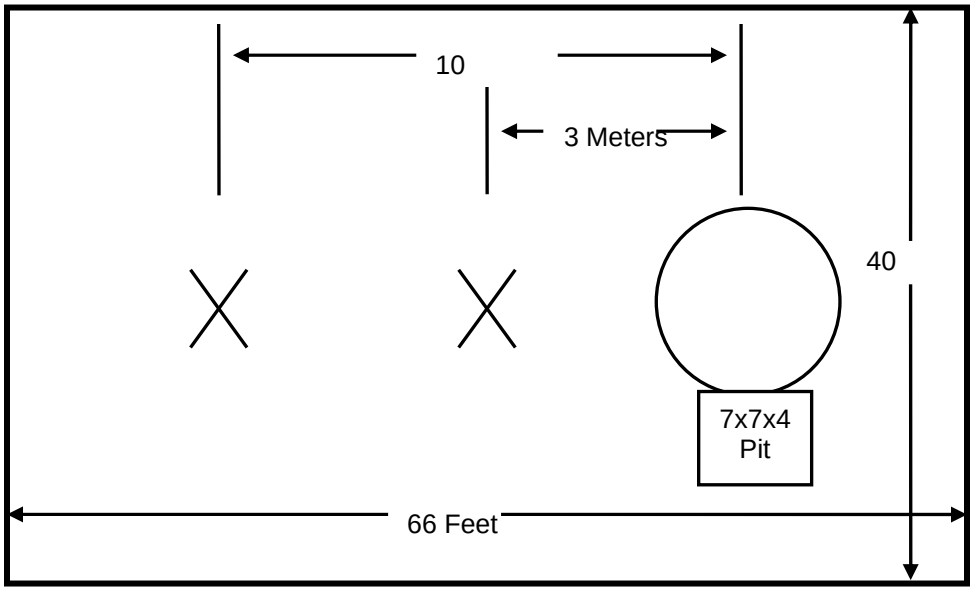


Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

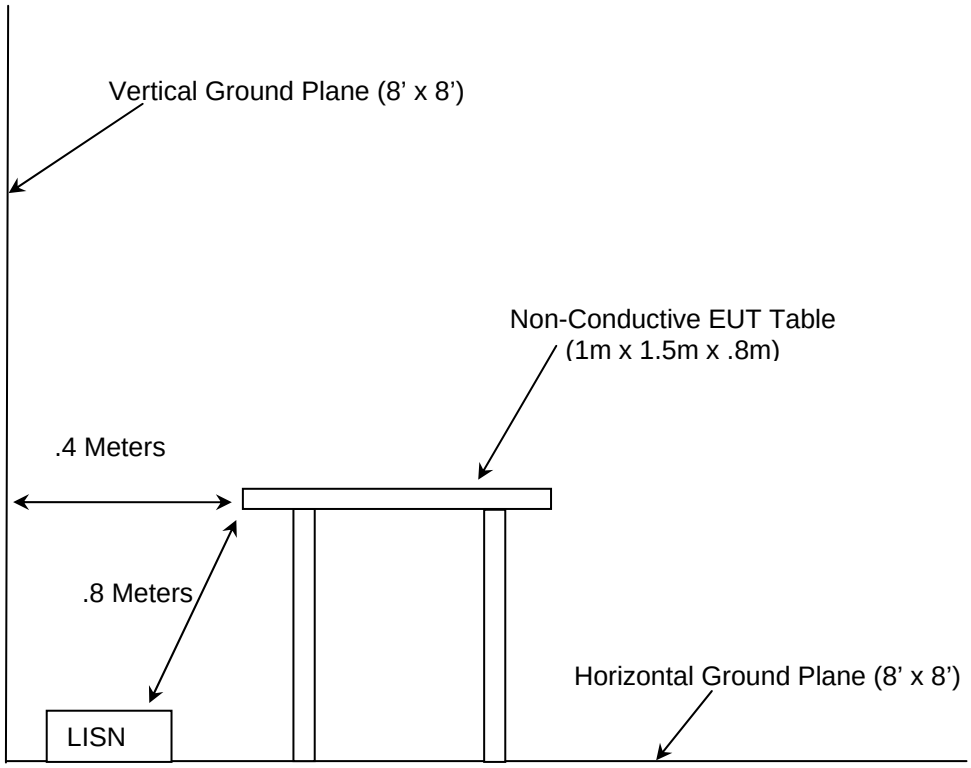


Figure 2.4-1: AC Mains Conducted EMI Site

3 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 8 December 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3 December 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

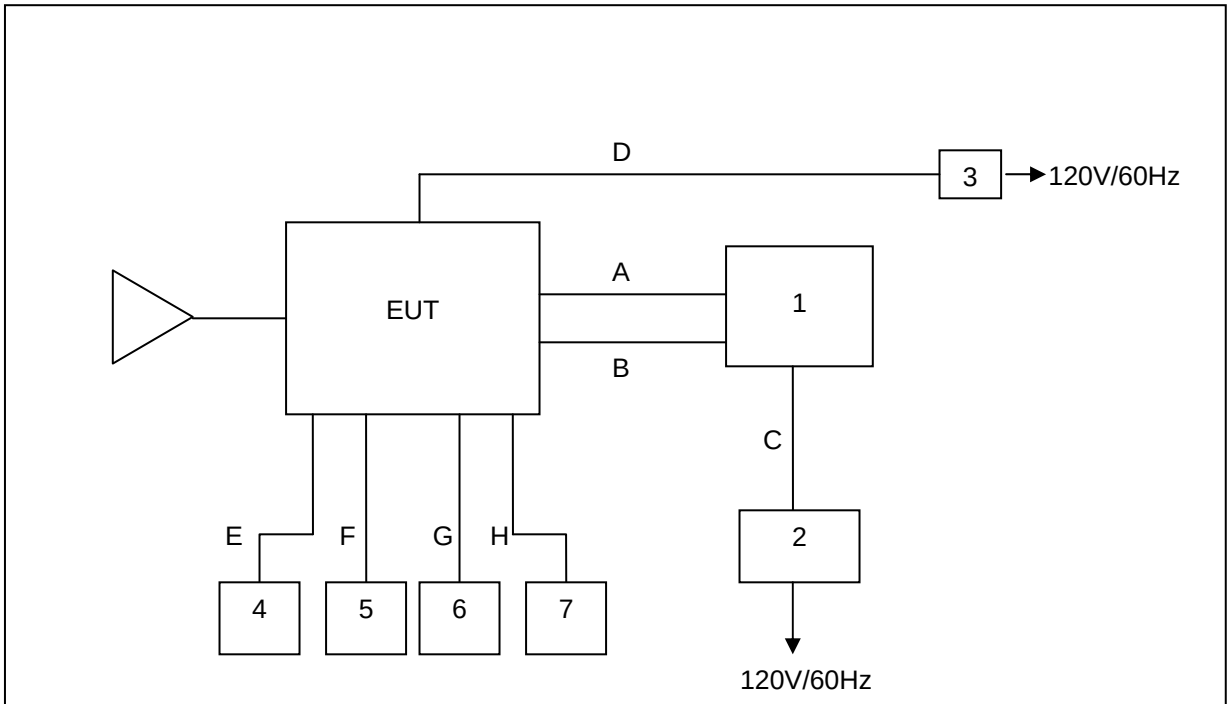
AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	9/23/2010	9/23/2012
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	9/23/2010	9/23/2012
25	Chase	CBL6111	Antennas	1043	9/13/2010	9/13/2012
30	Spectrum Technologies	DRH-0118	Antennas	970102	5/8/2009	5/8/2011
73	Agilent	8447D	Amplifiers	2727A05624	3/21/2011	3/21/2012
152	EMCO	3825/2	LISN	9111-1905	11/2/2010	11/2/2012
153	EMCO	3825/2	LISN	9411-2268	1/13/2011	1/13/2012
167	ACS	Chamber EMI Cable Set	Cable Set	167	1/26/2011	1/26/2012
168	Hewlett Packard	11947A	Attenuators	44829	2/4/2011	2/4/2012
267	Agilent	N1911A	Meters	MY45100129	11/2/2010	11/2/2011
268	Agilent	N1921A	Sensors	MY45240184	12/2/2010	12/2/2011
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/31/2010	8/31/2011
291	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	None	12/7/2010	12/7/2011
324	ACS	Belden	Cables	8214	7/9/2010	7/9/2011
338	Hewlett Packard	8449B	Amplifiers	3008A01111	3/24/2011	3/24/2012
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	10/5/2010	10/5/2011
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	12/29/2010	12/29/2011
430	RF Cables	SMS-290AW-480-SMS	Cables	N/A	4/27/2010	4/27/2011
432	Microwave Circuits	H3G020G4	Filters	264066	7/16/2010	7/16/2011
RE40	Agilent Technologies	E7405A	Spectrum Analyzers	US39150132	7/20/2010	7/20/2011

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Router	Linksys	BEFSR41	C2181J307098
2	Power Supply	Linksys	AD12V/0.5A-SW	N/A
3	Power Supply	Itron	N/A	N/A
4	USBLAN	Itron	USBLAN	443823
5	USBLAN	Itron	USBLAN	443823
6	Test Board	Itron	Power Plus Test Board	443919
7	Test Board	Itron	Power Plus Test Board	443919

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



A: Ethernet 10' non shielded
B: Ethernet 10' non shielded
C: Power 150cm non shielded
D: Power 200cm non shielded
E: USB 150cm non shielded
F: USB 150cm non shielded
G: Powered USB 150 cm non shielded
H: Powered USB 150cm non shielded

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 2.4GHz ISM Band Omni Directional Whip Antenna with a maximum measured gain of 3.9dBi; it connects to the EUT using a standard SMA male connector. Professional installation is required.

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 7.2.2-2.

Table 7.2.2-1: Line 1 Conducted EMI Results

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.162	32.2	31.56	10.09	42.29	41.65	65.36	55.36	23.1	13.7
0.216	30.87	28.74	10.02	40.89	38.76	62.97	52.97	22.1	14.2
0.269	27.04	24.81	10.02	37.06	34.83	61.15	51.15	24.1	16.3
0.546	29.68	25.21	10.00	39.68	35.21	56.00	46.00	16.3	10.8
0.598	24.87	23.03	10.00	34.87	33.03	56.00	46.00	21.1	13.0
3.99	19.36	12.78	10.12	29.48	22.90	56.00	46.00	26.5	23.1

Table 7.2.2-2: Line 2 Conducted EMI Results

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.163	27.59	25.53	10.09	37.68	35.62	65.31	55.31	27.6	19.7
0.218	24.41	23.22	10.02	34.43	33.24	62.89	52.89	28.5	19.7
0.38	20.59	18.97	10.20	30.79	29.17	58.28	48.28	27.5	19.1
0.545	32.48	29.42	10.00	42.48	39.42	56.00	46.00	13.5	6.6
0.597	31.01	28.54	10.00	41.01	38.54	56.00	46.00	15.0	7.5
2.58	21.83	25.95	10.11	31.94	36.06	56.00	46.00	24.1	9.9

7.3 6dB / 99% Bandwidth – FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(a), RSS-Gen 4.6.1

7.3.1 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 emission and >> RBW.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission. The RBW was to as close to 1% of the span without going below 1%. The trace was set to max hold with a sample detector active. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

7.3.2 Measurement Results

Results are shown below in table 7.3.2-1 to 7.3.2-3 and figure 7.3.2-1 to 7.3.2-18:

Table 7.3.2-1: 6dB / 99% Bandwidth – 802.11b

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2412	10.04	14.08
2437	10.04	14.08
2462	10.04	14.00

Table 7.3.2-2: 6dB / 99% Bandwidth – 802.11g

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2412	16.28	16.68
2437	16.09	16.52
2462	16.06	16.49

Table 7.3.2-3: 6dB / 99% Bandwidth – 802.11n

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2412	16.92	17.76
2437	16.88	17.76
2462	17.04	17.76

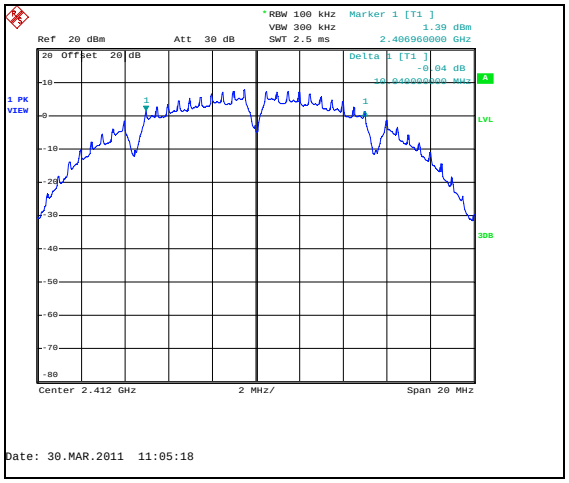


Figure 7.3.2-1: 6dB Bandwidth Plot – LCH-802.11b

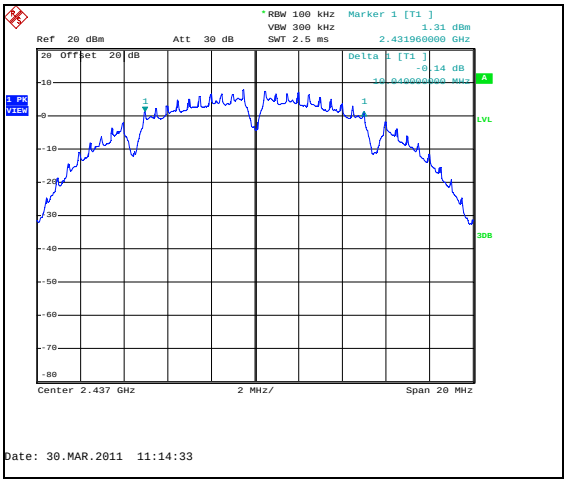


Figure 7.3.2-2: 6dB Bandwidth Plot – MCH-802.11b

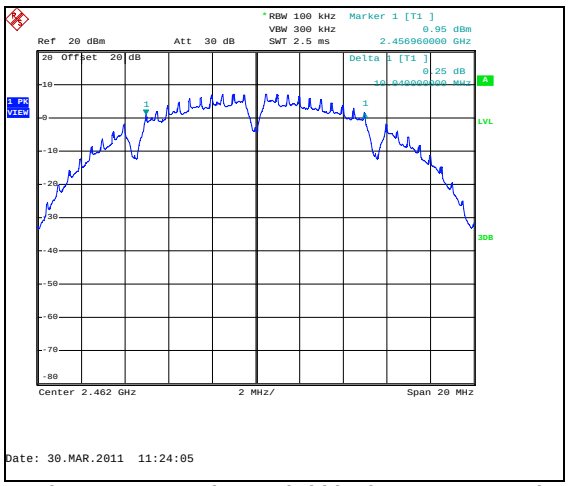


Figure 7.3.2-3: 6dB Bandwidth Plot – HCH-802.11b

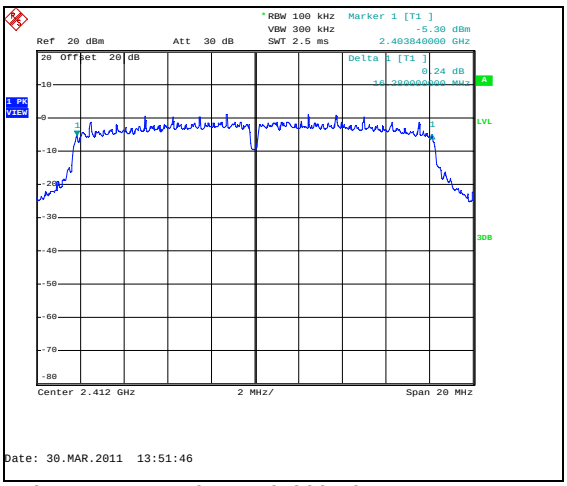


Figure 7.3.2-4: 6dB Bandwidth Plot – LCH-802.11g

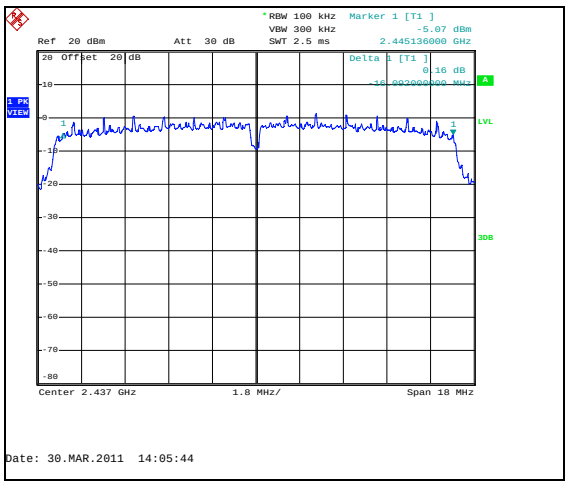


Figure 7.3.2-5: 6dB Bandwidth Plot – MCH-802.11g

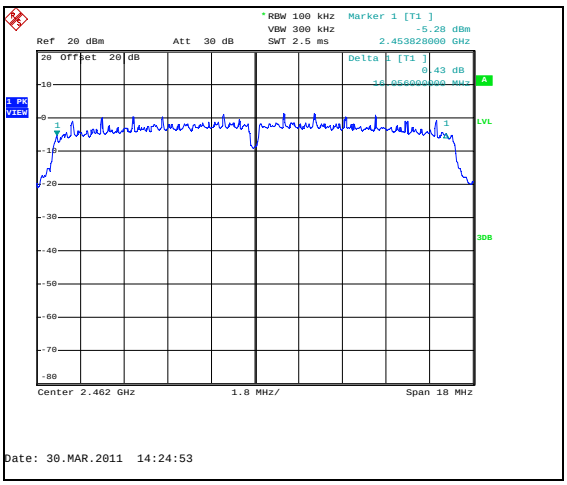


Figure 7.3.2-6: 6dB Bandwidth Plot – HCH-802.11g

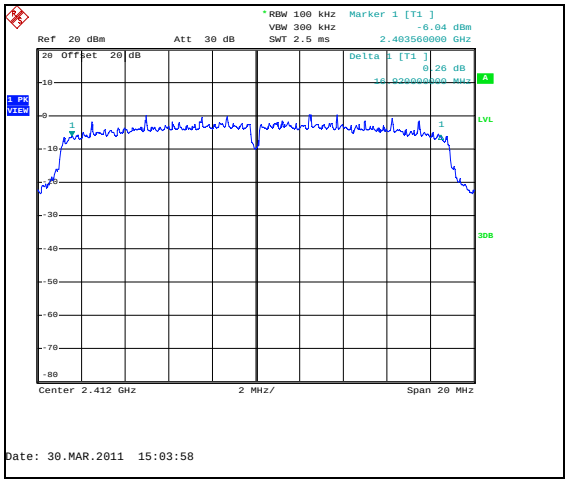


Figure 7.3.2-7: 6dB Bandwidth Plot – LCH-802.11n

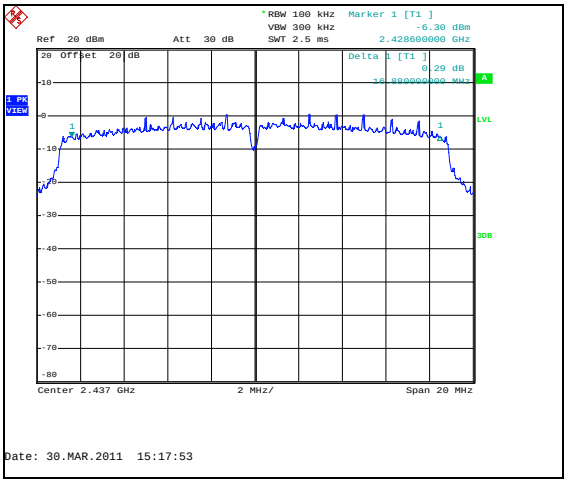


Figure 7.3.2-8: 6dB Bandwidth Plot – MCH-802.11n

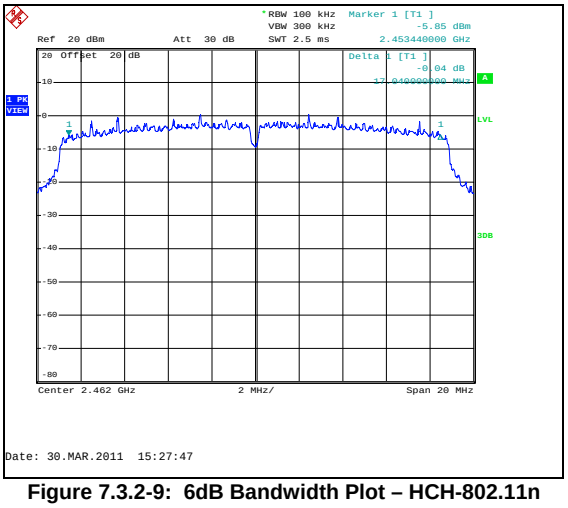


Figure 7.3.2-9: 6dB Bandwidth Plot – HCH-802.11n

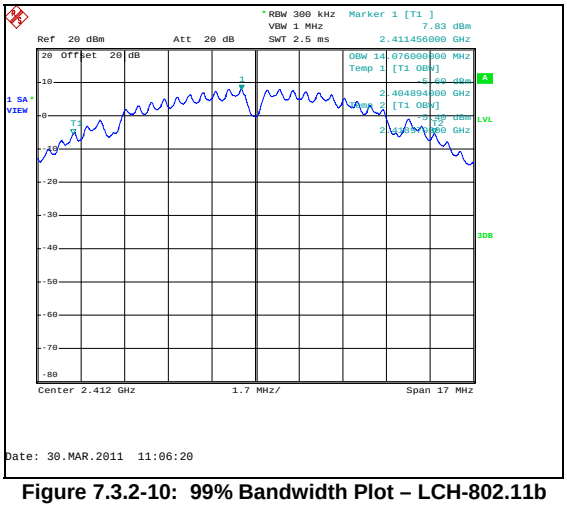


Figure 7.3.2-10: 99% Bandwidth Plot – LCH-802.11b

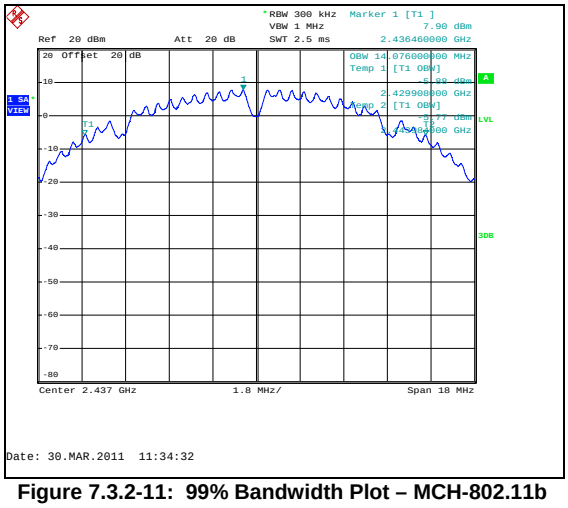


Figure 7.3.2-11: 99% Bandwidth Plot – MCH-802.11b

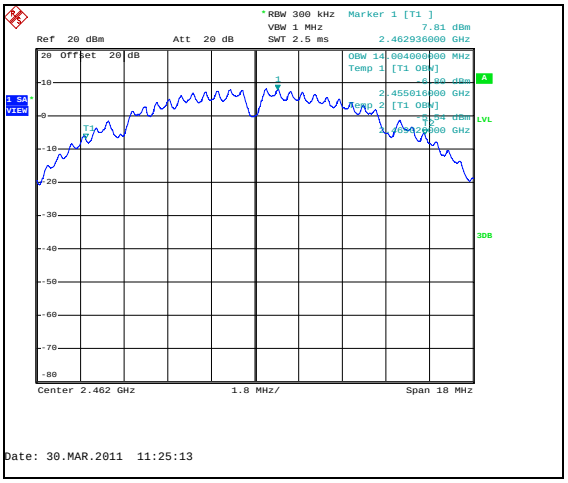


Figure 7.3.2-12: 99% Bandwidth Plot – HCH-802.11b

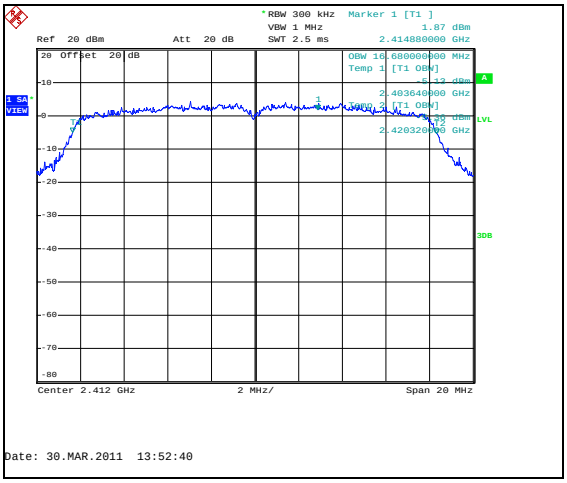


Figure 7.3.2-13: 99% Bandwidth Plot – LCH-802.11g

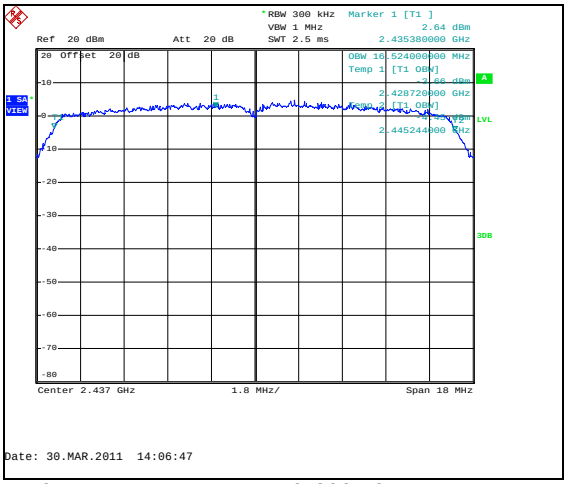


Figure 7.3.2-14: 99% Bandwidth Plot – MCH-802.11g

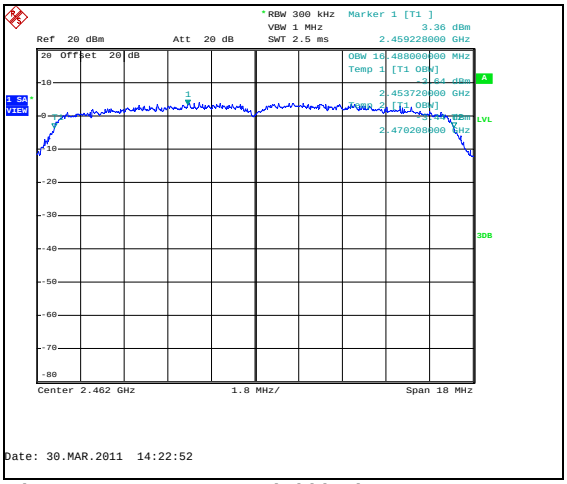


Figure 7.3.2-15: 99% Bandwidth Plot – HCH-802.11g

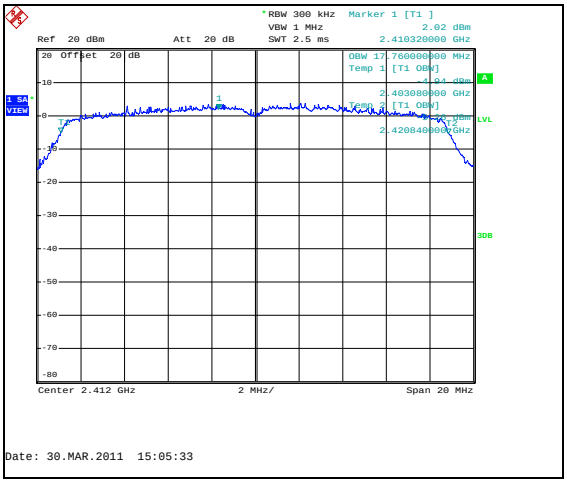


Figure 7.3.2-16: 99% Bandwidth Plot – LCH-802.11n

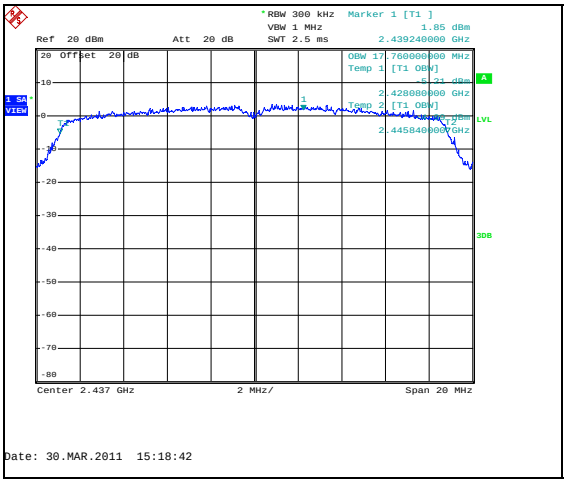


Figure 7.3.2-17: 99% Bandwidth Plot – MCH-802.11n

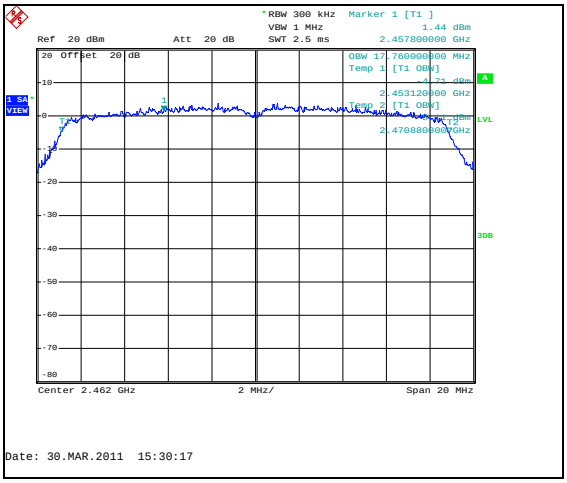


Figure 7.3.2-18: 99% Bandwidth Plot – HCH-802.11n

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

7.4.1 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 power meter. The insertion loss for all cables and attenuators was included as an offset value. The EUT was operating at maximum power.

7.4.2 Measurement Results

Results are shown below in Tables 7.4.2-1 to 7.4.2-3 below.

Table 7.4.2-1: Peak Output Power – 802.11b

Frequency (MHz)	Output Power (dBm)
2412	18.47
2437	18.46
2462	18.54

Table 7.4.2-2: Peak Output Power – 802.11g

Frequency (MHz)	Output Power (dBm)
2412	22.23
2437	22.40
2462	22.36

Table 7.4.2-3: Peak Output Power – 802.11n

Frequency (MHz)	Output Power (dBm)
2412	22.02
2437	22.13
2462	22.28

7.5 Band-Edge Compliance and Spurious Emissions-FCC 15.247d IC:RSS-210 2.2, A8.5

7.5.1 Band-Edge Compliance of RF Conducted Emissions

7.5.1.1 Measurement Procedure

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 based on absolute radiated field strength measurements.

The lower 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

Band-edge data is displayed in Table 7.5.1.2-1 to 7.5.1.2-3 and Figure 7.5.1.2-1 to 7.5.1.2-3.

Table 7.5.1.2-1: Upper Band-edge Radiated Emissions – 802.11b

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
2483.5	47.53	35.90	H	-4.94	42.59	30.96	74.0	54.0	31.4	23.0
2483.5	50.76	39.97	V	-4.94	45.82	35.03	74.0	54.0	28.2	19.0

Table 7.5.1.2-2: Upper Band-edge Radiated Emissions – 802.11g

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
2483.5	56.29	41.74	H	-4.94	51.35	36.80	74.0	54.0	22.7	17.2
2483.5	61.03	45.16	V	-4.94	56.09	40.22	74.0	54.0	17.9	13.8

Table 7.5.1.2-3: Upper Band-edge Radiated Emissions – 802.11n

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
2483.5	55.22	39.88	H	-4.94	50.28	34.94	74.0	54.0	23.7	19.1
2483.5	61.12	45.85	V	-4.94	56.18	40.91	74.0	54.0	17.8	13.1

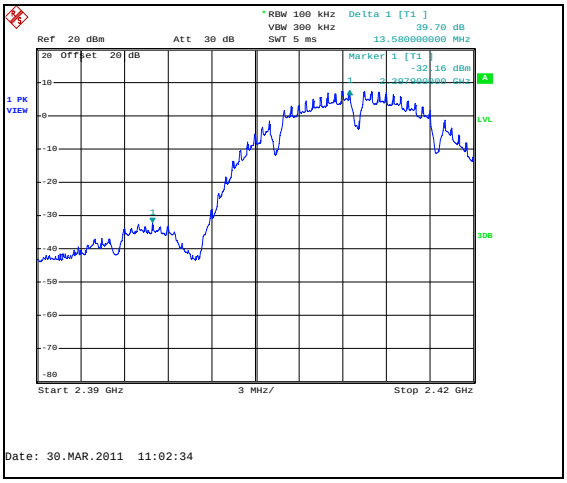


Figure 7.5.1.2-1: Lower Band-edge – 802.11b

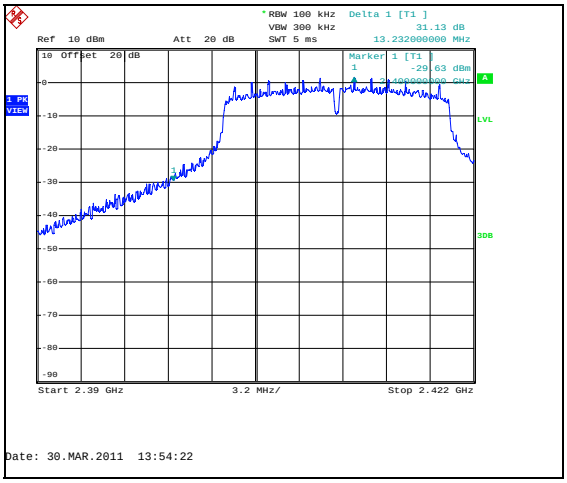


Figure 7.5.1.2-2: Lower Band-edge - 802.11g

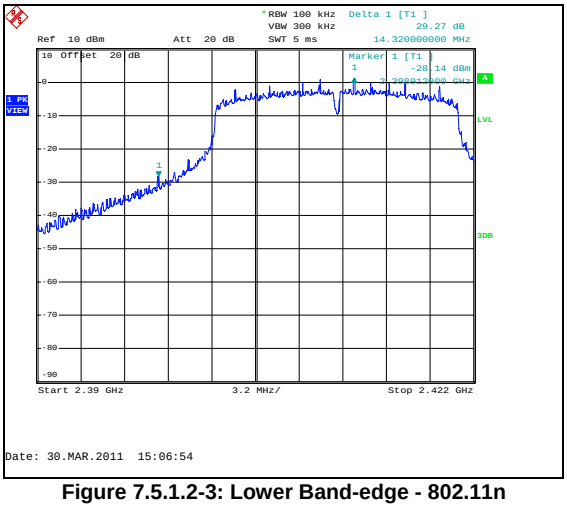


Figure 7.5.1.2-3: Lower Band-edge - 802.11n

7.5.2 RF Conducted Spurious Emissions

7.5.2.1 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.

7.5.2.2 Measurement Results

RF Conducted Emissions are displayed in Figures 7.5.2.2-1 through 7.5.2.2-27.

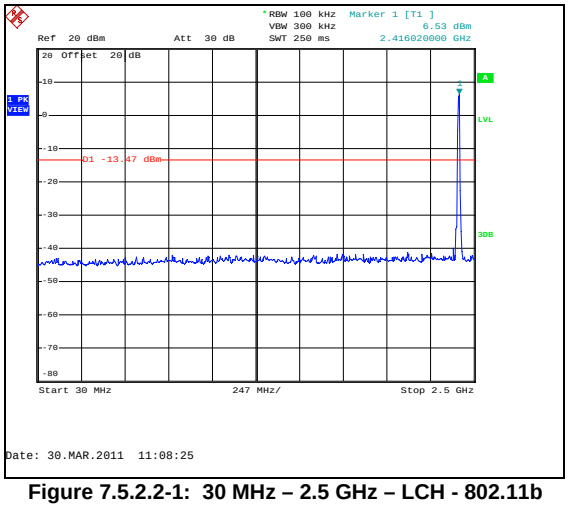


Figure 7.5.2.2-1: 30 MHz – 2.5 GHz – LCH - 802.11b

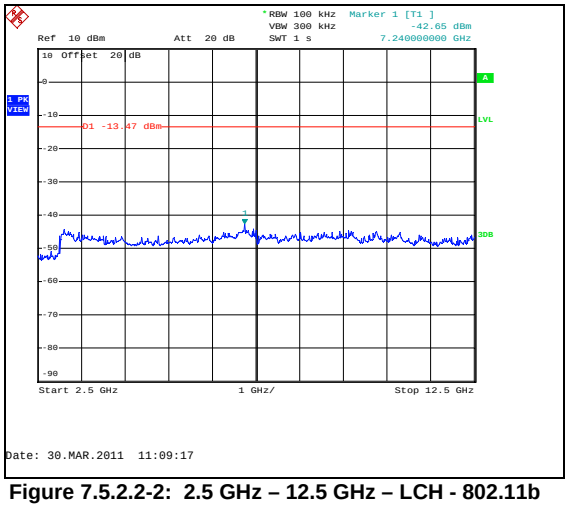


Figure 7.5.2.2-2: 2.5 GHz – 12.5 GHz – LCH - 802.11b

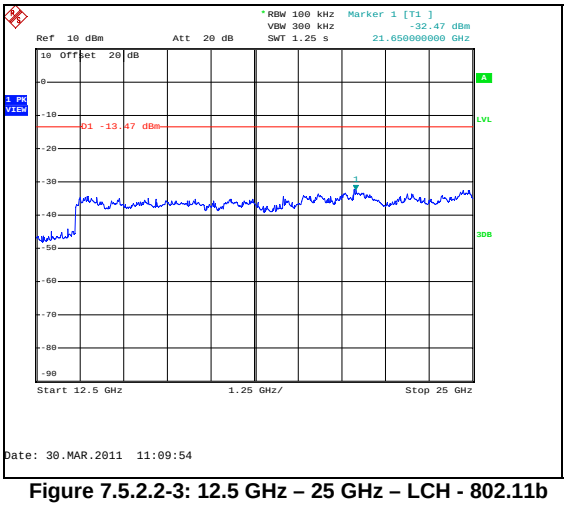


Figure 7.5.2.2-3: 12.5 GHz – 25 GHz – LCH - 802.11b

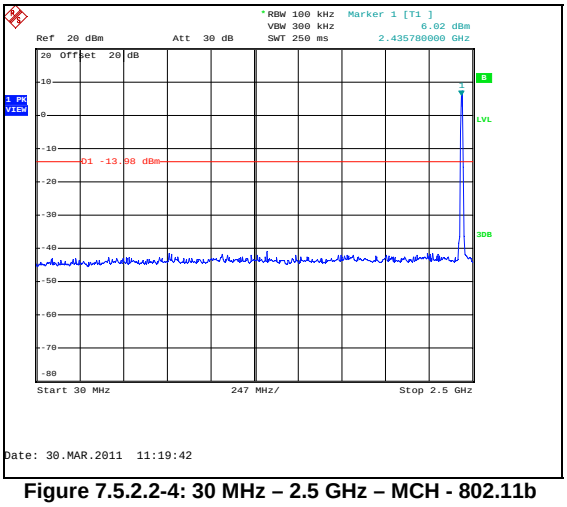


Figure 7.5.2.2-4: 30 MHz – 2.5 GHz – MCH - 802.11b

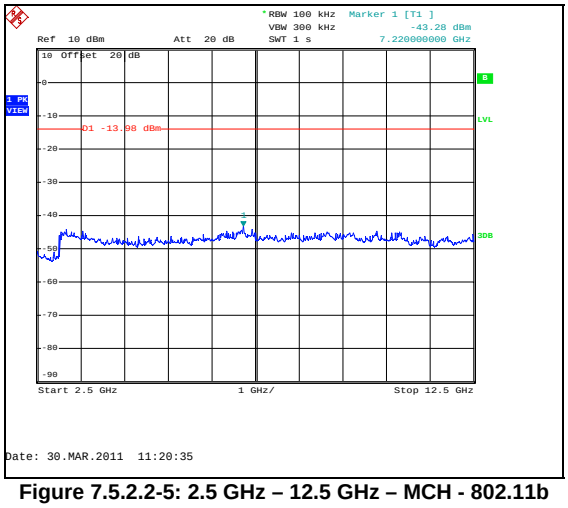


Figure 7.5.2.2-5: 2.5 GHz – 12.5 GHz – MCH - 802.11b

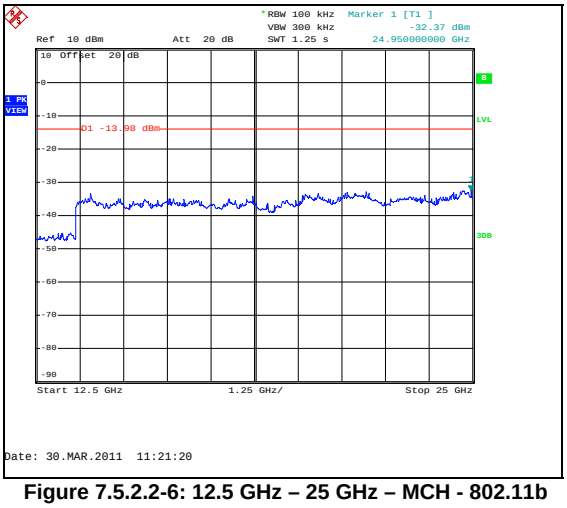


Figure 7.5.2.2-6: 12.5 GHz – 25 GHz – MCH - 802.11b

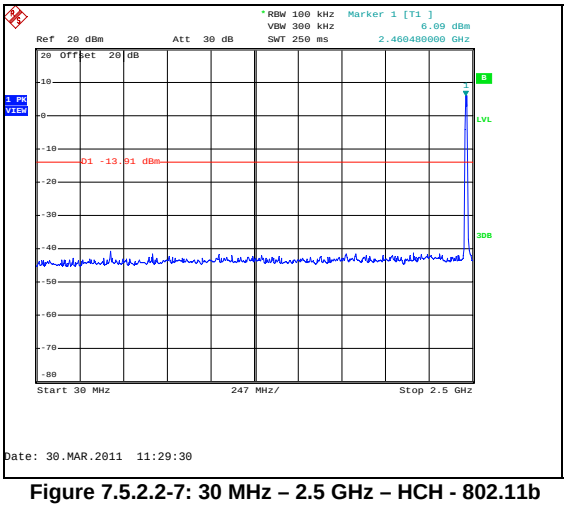


Figure 7.5.2.2-7: 30 MHz – 2.5 GHz – HCH - 802.11b

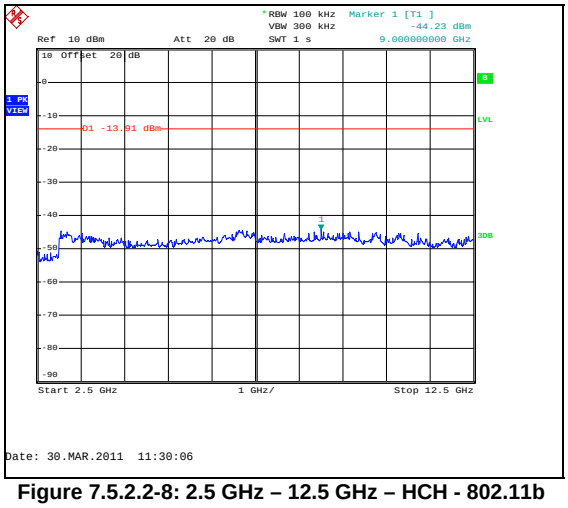


Figure 7.5.2.2-8: 2.5 GHz – 12.5 GHz – HCH - 802.11b

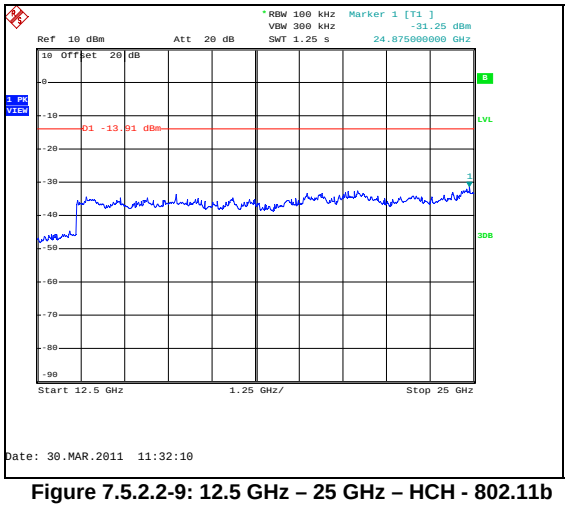


Figure 7.5.2.2-9: 12.5 GHz – 25 GHz – HCH - 802.11b

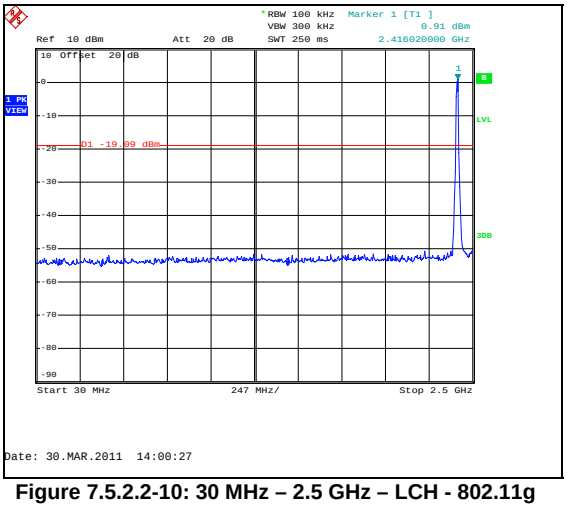


Figure 7.5.2.2-10: 30 MHz – 2.5 GHz – LCH - 802.11g

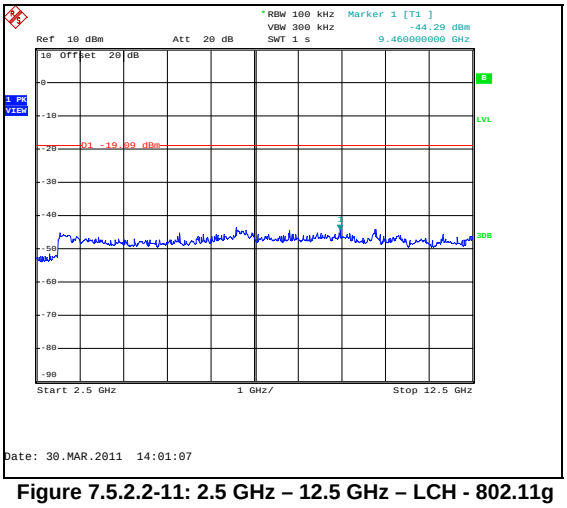


Figure 7.5.2.2-11: 2.5 GHz – 12.5 GHz – LCH - 802.11g

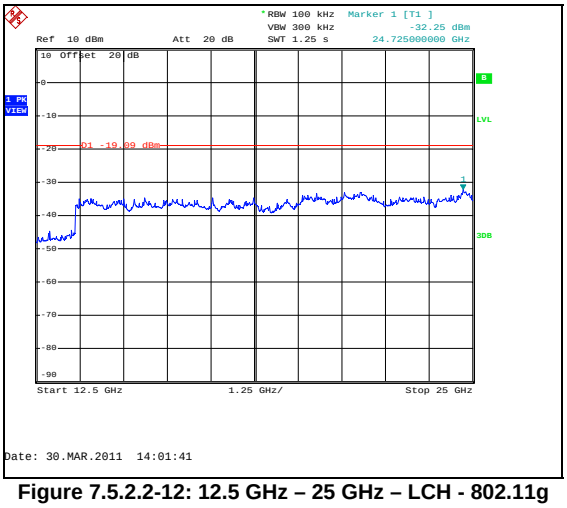


Figure 7.5.2.2-12: 12.5 GHz – 25 GHz – LCH - 802.11g

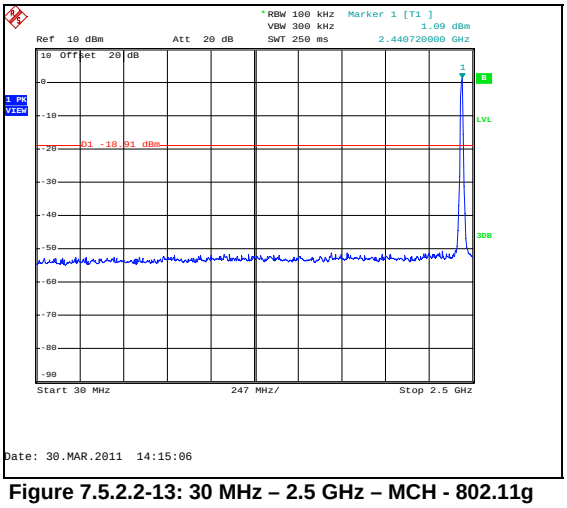


Figure 7.5.2.2-13: 30 MHz – 2.5 GHz – MCH - 802.11g

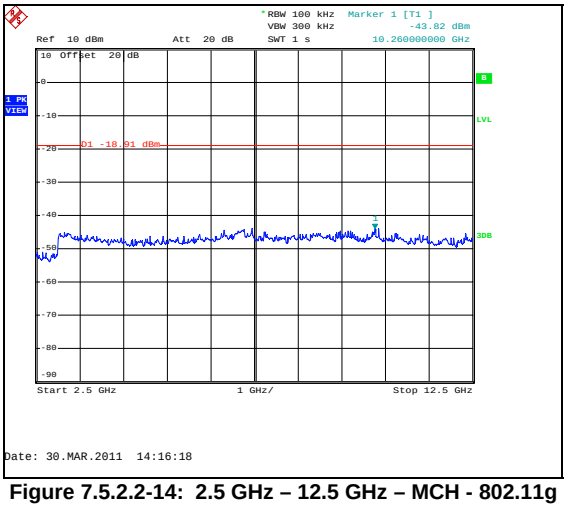


Figure 7.5.2.2-14: 2.5 GHz – 12.5 GHz – MCH - 802.11g

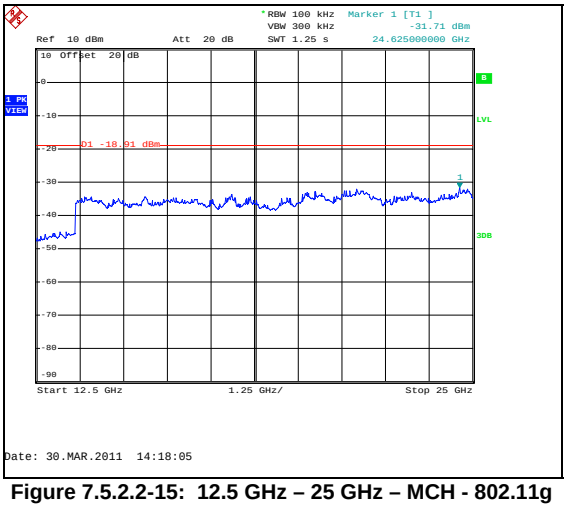


Figure 7.5.2.2-15: 12.5 GHz – 25 GHz – MCH - 802.11g

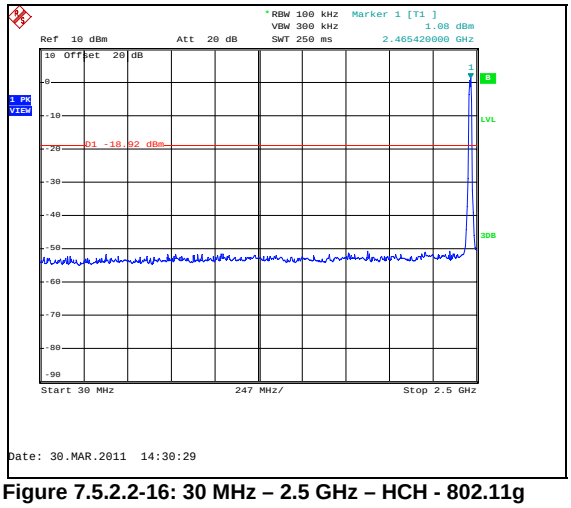


Figure 7.5.2.2-16: 30 MHz – 2.5 GHz – HCH - 802.11g

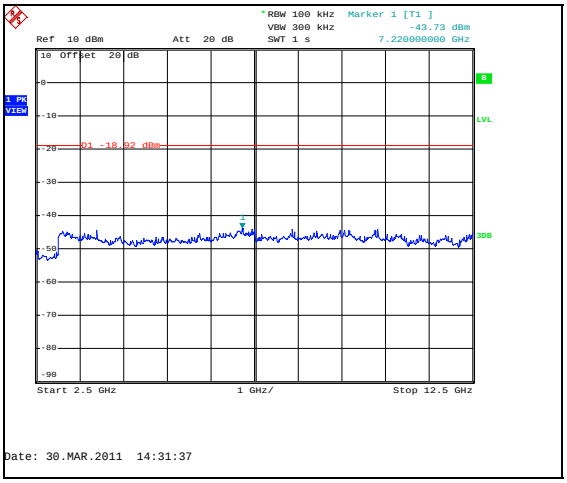


Figure 7.5.2.2-17: 2.5 GHz – 12.5 GHz – HCH - 802.11g

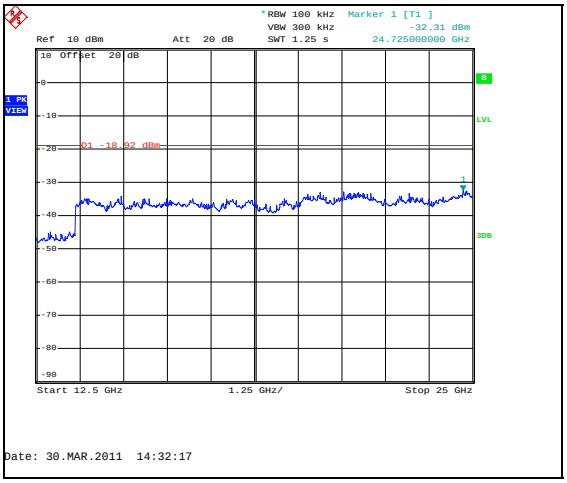


Figure 7.5.2.2-18: 12.5 GHz – 25 GHz – HCH - 802.11g

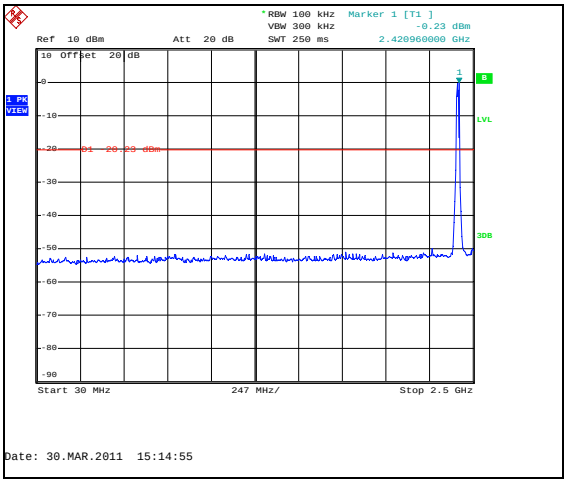


Figure 7.5.2.2-19: 30 MHz – 2.5 GHz – LCH - 802.11n

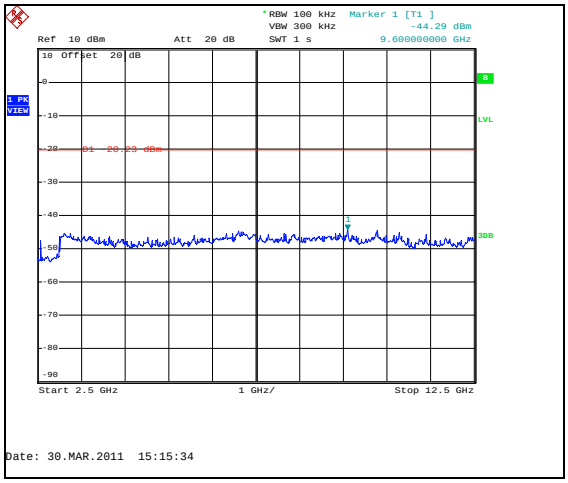


Figure 7.5.2.2-20: 2.5 GHz – 12.5 GHz – LCH - 802.11n

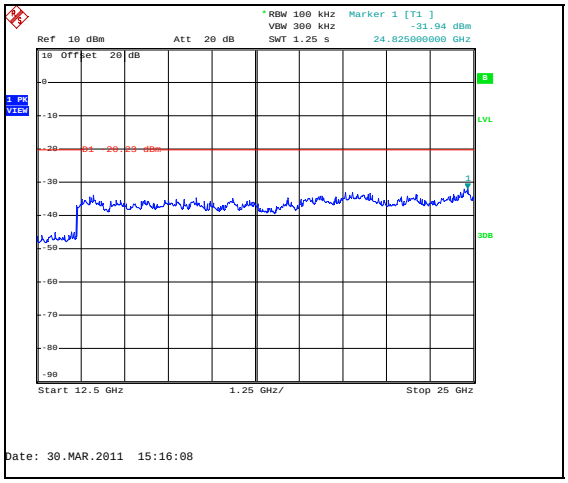


Figure 7.5.2.2-21: 12.5 GHz – 25 GHz – LCH - 802.11n

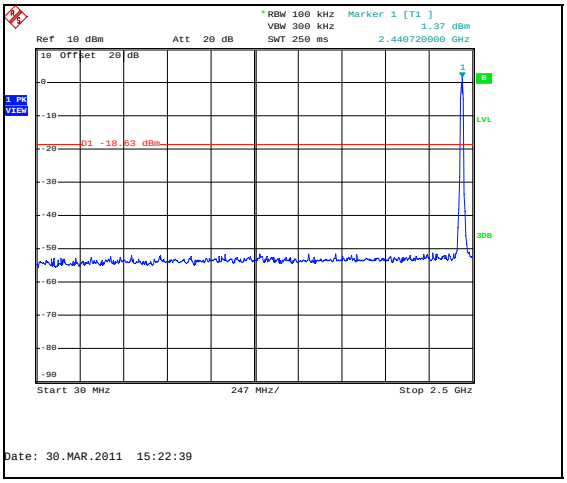


Figure 7.5.2.2-22: 30 MHz – 2.5 GHz – MCH - 802.11n

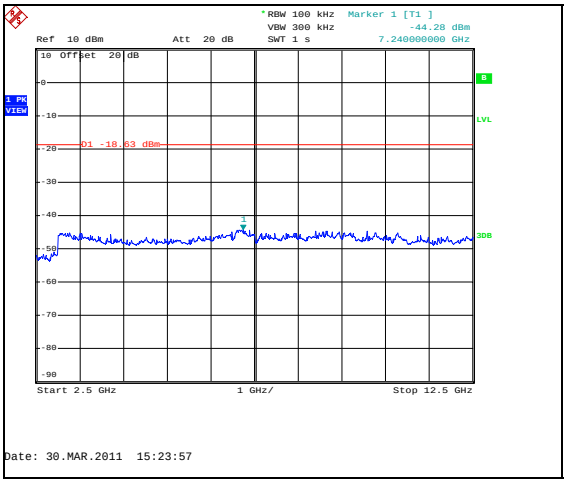


Figure 7.5.2.2-23: 2.5 GHz – 12.5 GHz – MCH - 802.11n

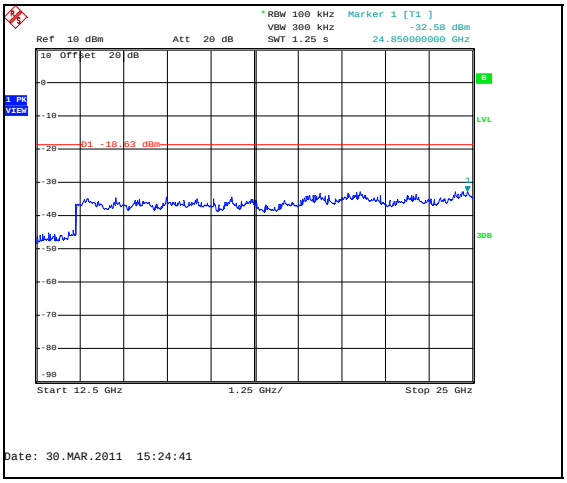


Figure 7.5.2.2-24: 12.5 GHz – 25 GHz – MCH - 802.11n

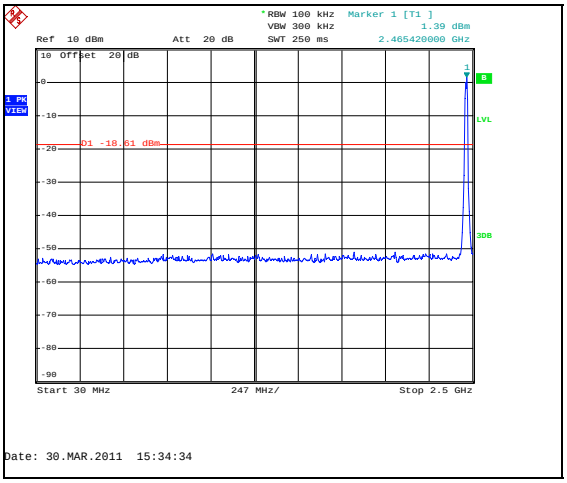


Figure 7.5.2.2-25: 30 MHz – 2.5 GHz – HCH - 802.11n

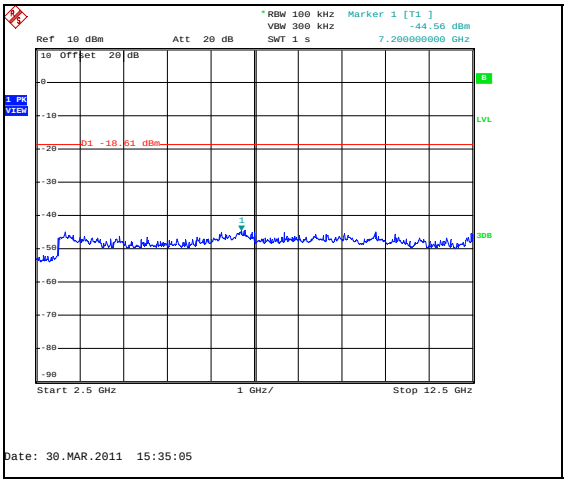


Figure 7.5.2.2-26: 2.5 GHz – 12.5 GHz – HCH - 802.11n

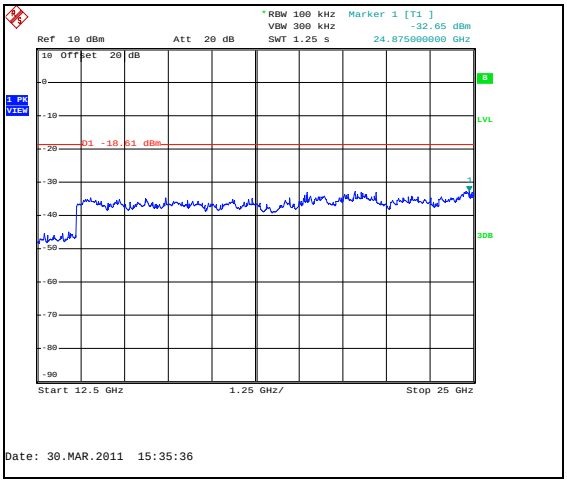


Figure 7.5.2.2-27: 12.5 GHz – 25 GHz – HCH - 802.11n

7.5.3 Radiated Spurious Emissions (Restricted Bands) - FCC Sec. 15.205 IC: RSS-210 2.2

7.5.3.1 Measurement Procedure

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

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.

7.5.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 25GHz are reported in the table 7.5.3.2-1 below.

Table 7.5.3.2-1: Radiated Spurious Emissions

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
802.11b										
4824	46.05	35.84	V	2.00	48.05	37.84	74.0	54.0	26.00	16.20
802.11g										
All spurious emissions were below the noise floor of measurement system.										
802.11n										
All spurious emissions were below the noise floor of measurement system.										

7.5.3.3 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: 46.05 + 2.00 = 48.05dBuV/m
Margin: 74dBuV/m – 48.05dBuV/m = 26.0dB

Example Calculation: Average
Corrected Level: 35.84 + 2.00 + 0 = 37.84dBuV
Margin: 54dBuV – 37.84dBuV = 16.2dB

7.6 Peak Power Spectral Density- 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 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).

7.6.2 Measurement Results

Results are shown below in table 7.6.2-1 to 7.6.2-3 and figure 7.6.2-1 to 7.6.2-9.

Table 7.6.2-1: Peak Power Spectral Density – 802.11b

Frequency (MHz)	PSD Level (dBm)
2412	-4.47
2437	-5.52
2462	-4.61

Table 7.6.2-2: Peak Power Spectral Density – 802.11g

Frequency (MHz)	PSD Level (dBm)
2413	-10.48
2437	-10.61
2462	-11.33

Table 7.6.2-3: Peak Power Spectral Density – 802.11n

Frequency (MHz)	PSD Level (dBm)
2413	-11.56
2437	-12.50
2462	-12.06

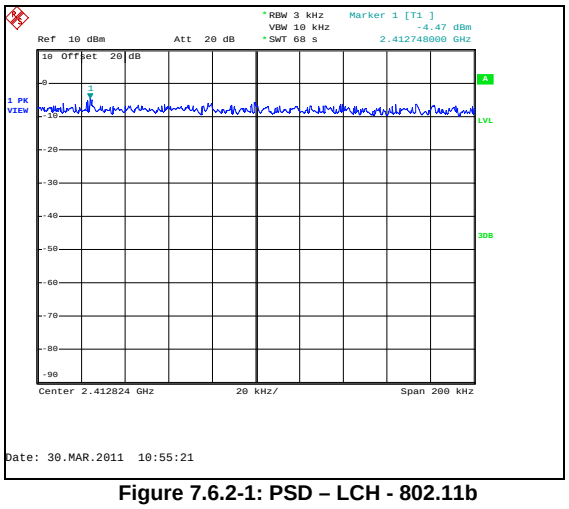


Figure 7.6.2-1: PSD – LCH - 802.11b

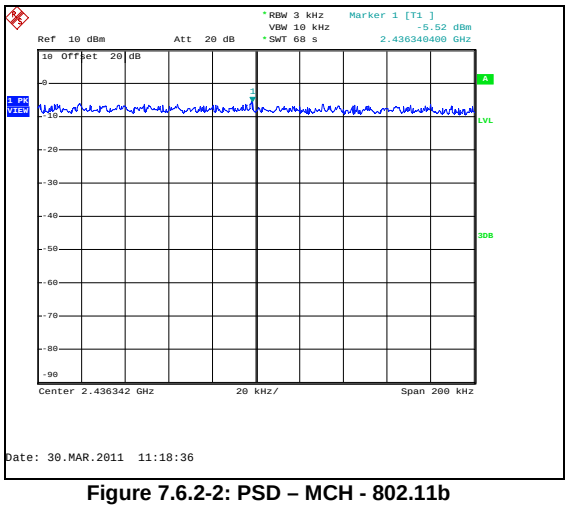


Figure 7.6.2-2: PSD – MCH - 802.11b

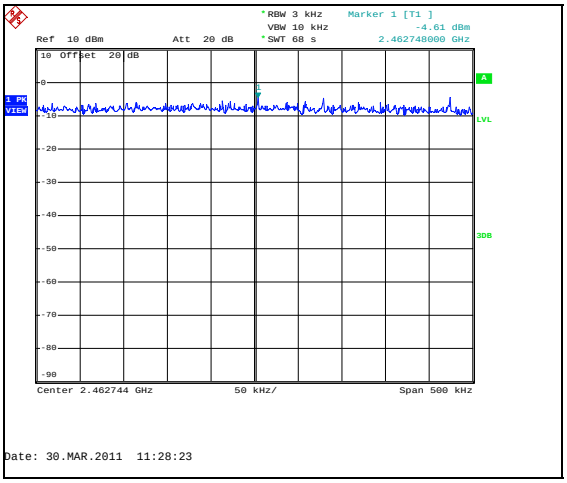


Figure 7.6.2-3: PSD – HCH - 802.11b

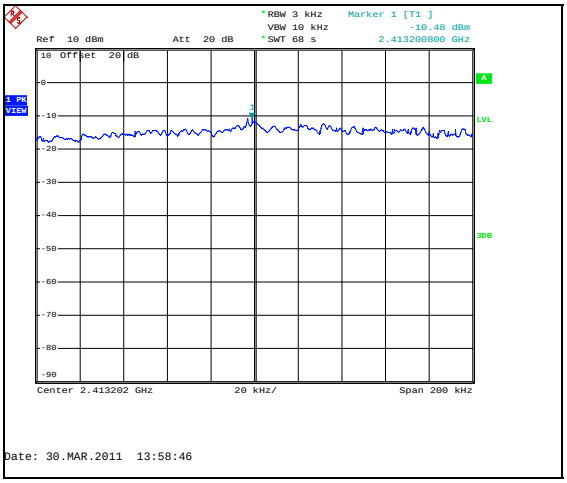


Figure 7.6.2-4: PSD – LCH - 802.11g

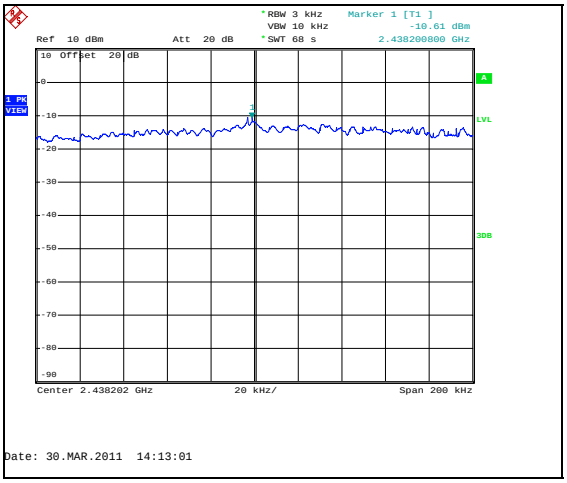


Figure 7.6.2-5: PSD – MCH - 802.11g

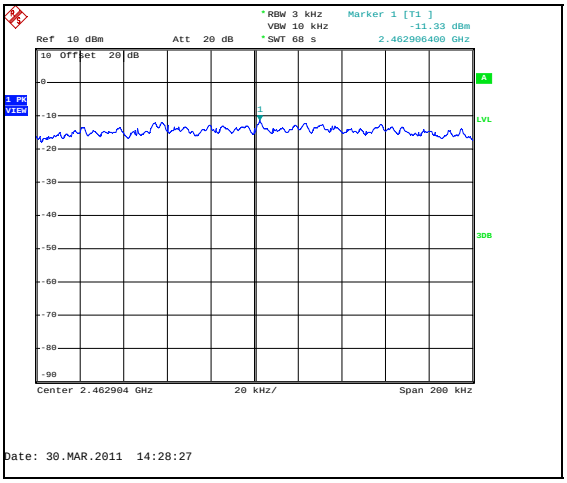


Figure 7.6.2-6: PSD – HCH - 802.11g

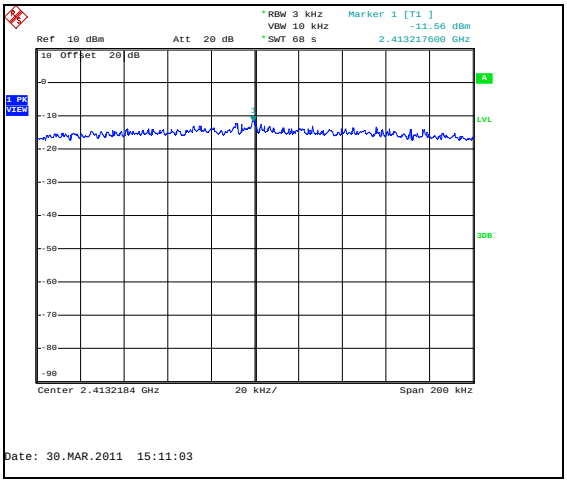


Figure 7.6.2-7: PSD – LCH - 802.11n

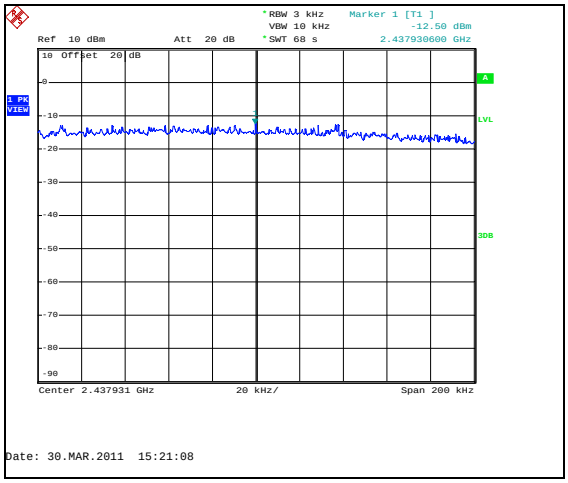


Figure 7.6.2-8: PSD – MCH - 802.11n

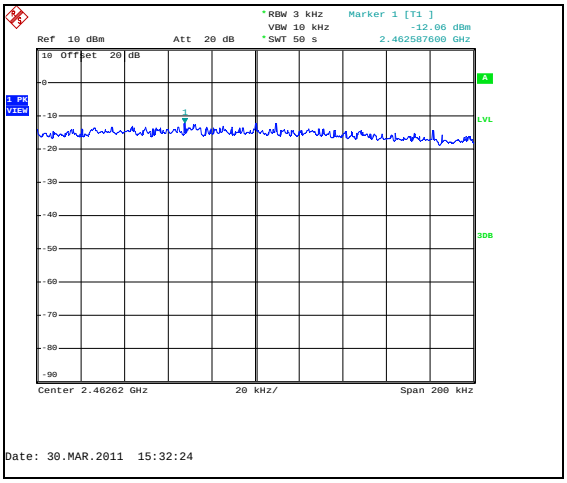


Figure 7.6.2-9: PSD – HCH - 802.11n

8 CONCLUSION

In the opinion of ACS, Inc. the ITR24001, 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