Excellence in Compliance Testing

Certification Test Report

FCC ID: R7PEC6R1S2
IC: 5294A-EC6R1S2

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

ACS Report Number: 12-0296.W06.1A

Manufacturer: Landis+Gyr Technology, Inc.
Model: Gridstream RF Enhanced A3

Test Begin Date: September 5, 2012
Test End Date: November 7, 2012

Report Issue Date: April 18, 2013

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Reviewed by: _____
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 Certification for modular approval.

1.2 Product Description

The Gridstream RF Enhanced A3 is an electronic endpoint module that will be integrated into the Elster A2 C&I meter. This device contains two separate radios on a single PCB: a 900 MHz ISM band frequency-hopping spread spectrum (FHSS) transceiver and a 2.4 MHz ISM band transceiver employing 802.15.4/Zigbee.

The Gridstream RF Enhanced A3 is a composite device. The 900 MHz LAN radio and the 2.4 GHz Zigbee radio operate under CFR 47 Part 15.247 and IC RSS-210. This report addresses the 900 MHz LAN radio only. A separate report will be issued to address the 2.4 GHz Zigbee radio.

Technical Details:
The EUT provides 3 distinct frequency hopping modes of operation as outlined below.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Data Rates Supported (kbps)
1	902.3 - 927.8	86	300	9.6, 19.2, 38.4, 115.2
2	904.0 - 927.9	240	100	9.6, 19.2, 38.4
3	902.2 – 927.8	129	200	50.0

Modulation Format: GFSK
Antenna Type / Gain: PCB Inverted F (External), +1dBi
Operating Voltage: 12 VDC

Manufacturer Information:
Landis+Gyr Technology, Inc.
30000 Mill Creek Ave., Suite 100
Alpharetta, GA 30022

Test Sample Serial Numbers: E144M331200023760

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

1.3 Test Methodology and Considerations

All modes of operation, including all available data rates, were evaluated. The data presented in this report represents the worst case where applicable

The EUT was tested for radiated emissions in an orientation representative of final installation.

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:

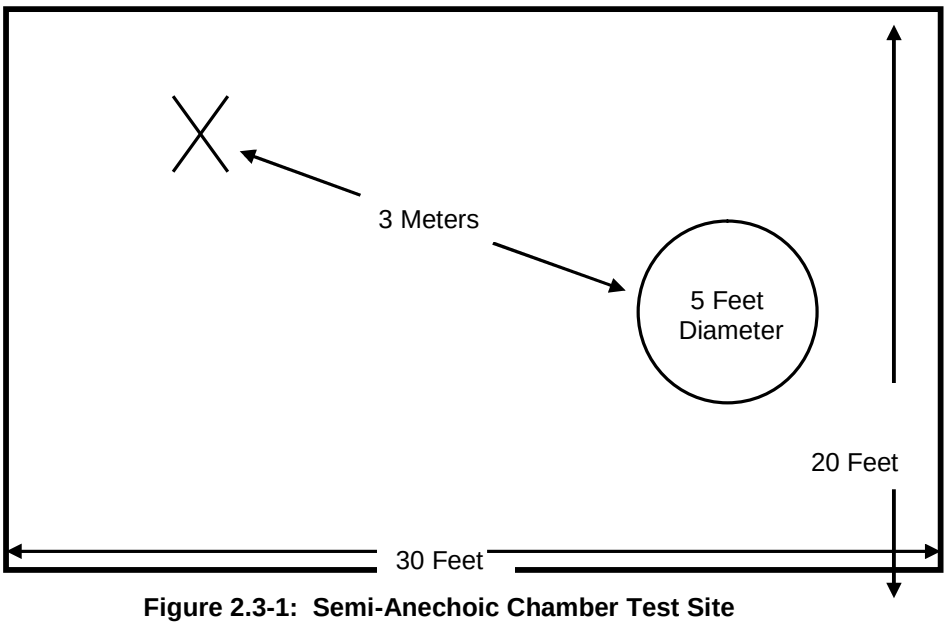

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

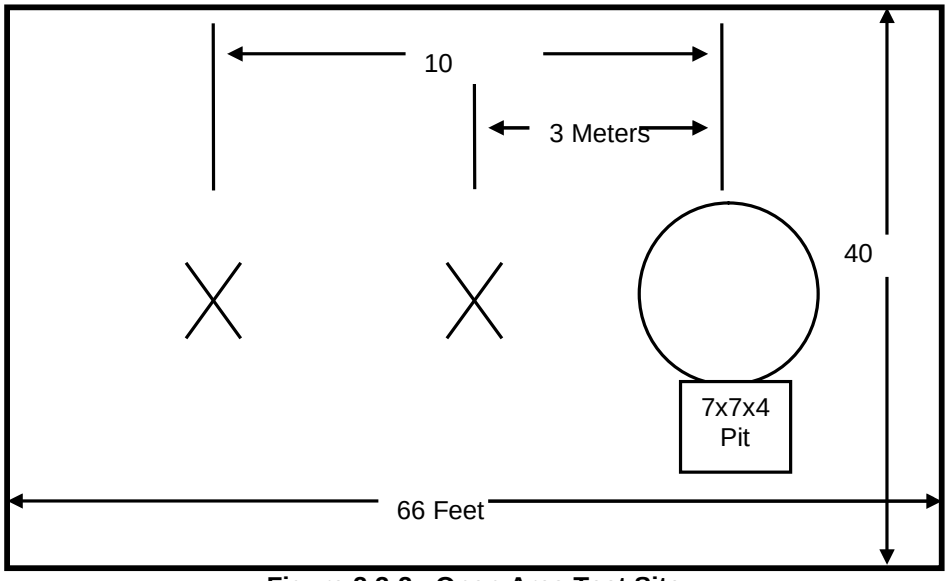

Figure 2.3-2: Open Area Test Site

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 2.4-1:

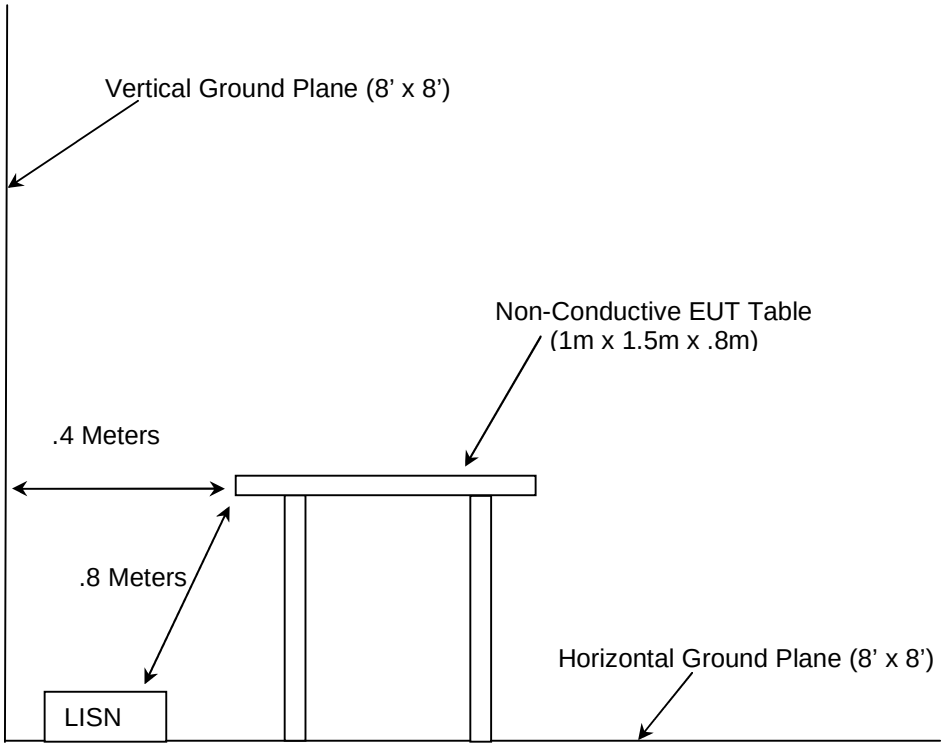

Figure 2.4-1: AC Mains Conducted EMI Site

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
- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices
- 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 Public Notice DA 00-705 – Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- 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	8/2/2012	8/2/2014
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	8/2/2012	8/2/2014
3	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	839379/011	5/26/2011	5/26/2013
4	Rohde & Schwarz	ESMI - Receiver	Spectrum Analyzers	833827/003	5/26/2011	5/26/2013
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	9/30/2011	9/30/2012
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	12/2/2011	12/2/2012
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
337	Microwave Circuits	H1G513G1	Filters	282706	7/2/2012	7/2/2013
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
412	Electro Metrics	LPA-25	Antennas	1241	7/27/2012	7/27/2014
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	12/2/2011	12/2/2012
562	United Microwave Products, Inc.	AA-190-00.48.0	Cables	562	7/31/2012	7/31/2013

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Bench Power Supply	TryGon Electronics	DL40-1	489512
2	Wall Wart Power Supply	Utilitnet	EPAS-101W-12	N/A

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

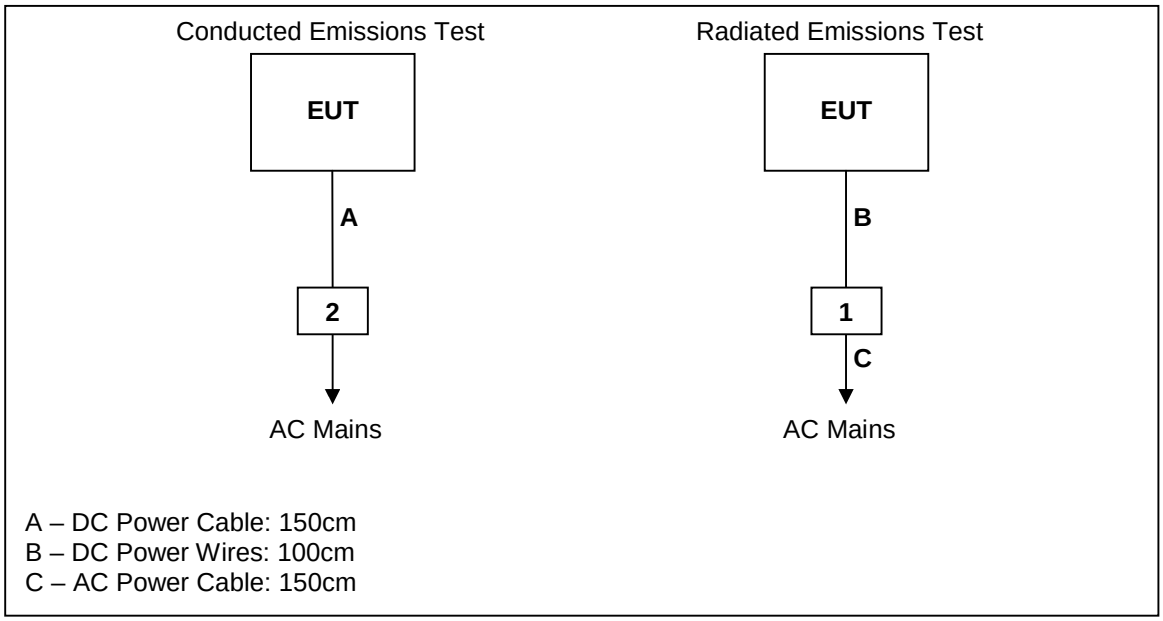

Figure 6-1: Test Setup Block Diagram

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 EUT includes an external PCB Integrated F type antenna. The antenna coupling is MCX.

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 Table 7.2.2-1.

Table 7.2.2-1: Conducted EMI Results

Frequency (MHz)	Uncorrected Reading (dBuV)		Total Correction Factor (dB)	Corrected Level (dBuV)		Limit (dBuV)		Margin (dB)		Line
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	
Line 1										
4.12	20.32	4.54	10.53	30.85	15.07	56.00	46.00	25.2	30.9	FLO
0.38	36.71	28.06	10.49	47.20	38.55	58.28	48.28	11.1	9.7	FLO
3.42	22.08	4.97	10.51	32.59	15.48	56.00	46.00	23.4	30.5	FLO
0.757	37.76	25.81	10.31	48.07	36.12	56.00	46.00	7.9	9.9	FLO
1.14	35.96	20.91	10.49	46.45	31.40	56.00	46.00	9.6	14.6	FLO
2.27	28.14	11.35	10.50	38.64	21.85	56.00	46.00	17.4	24.2	FLO
Line 2										
0.38	38.67	29.87	10.49	49.16	40.36	58.28	48.28	9.1	7.9	FLO
0.757	35.88	24.69	10.31	46.19	35.00	56.00	46.00	9.8	11.0	FLO
1.14	35.11	22.46	10.49	45.60	32.95	56.00	46.00	10.4	13.1	FLO
2.27	26.85	9.87	10.50	37.35	20.37	56.00	46.00	18.7	25.6	FLO
3.42	22.35	4.31	10.51	32.86	14.82	56.00	46.00	23.1	31.2	FLO
4.12	24.04	4.71	10.53	34.57	15.24	56.00	46.00	21.4	30.8	FLO

7.3 Peak Output Power – FCC: Section 15.247(b)(2) IC: RSS-210 A8.4(1)

7.3.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was directly connected to the input of a power meter. The device employs > 50 channels therefore the power is limited to 1 Watt.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 below:

Table 7.3.2-1: RF Output Power

Frequency [MHz]	Level [dBm]
902.2	26.68
915.0	26.55
927.9	26.29

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1) IC: RSS-210 A8.1(b)

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW and VBW were set to ≥ 1% of the span.

Carrier frequency separation was measured for all modes of operation and data presented in section 7.4.1.2 below.

7.4.1.2 Measurement Results

Carrier frequency separation was measured to be 300kHz for mode 1 (86 channels), 100 kHz for mode 2 (240 channels) and 200kHz for Mode 3 (129 channels). Results are shown below in Figures 7.4.1.2-1 to 7.4.1.2-3.

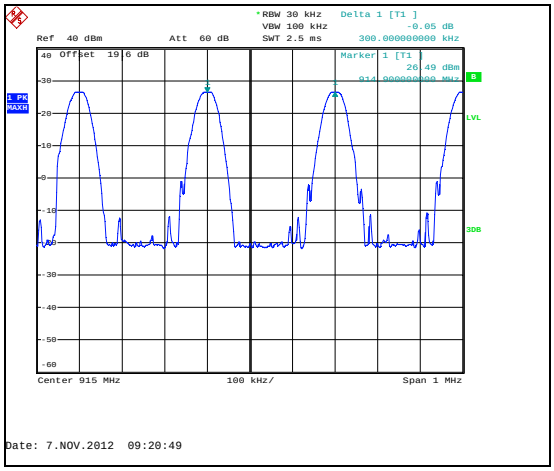

Figure 7.4.1.2-1: Mode 1

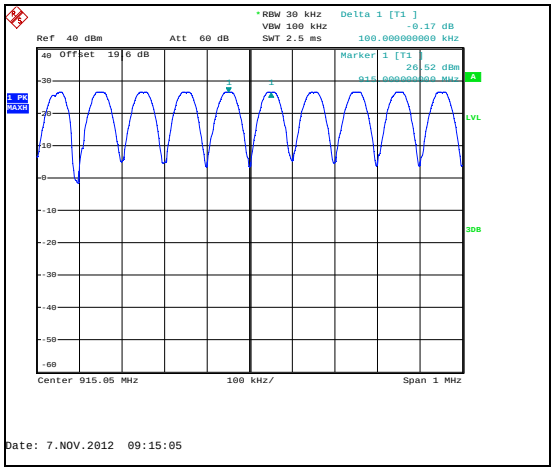

Figure 7.4.1.2-2: Mode 2

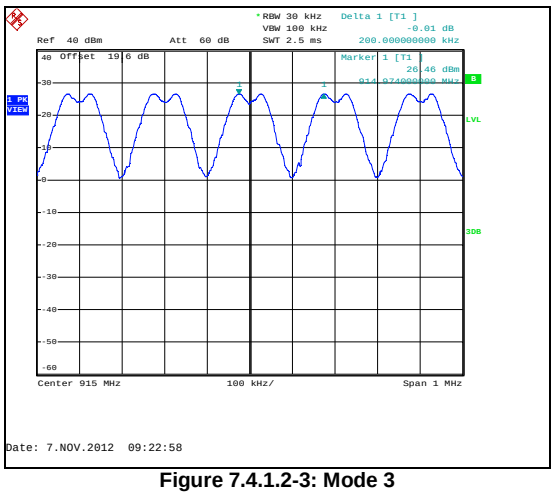

Figure 7.4.1.2-3: Mode 3

7.4.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.4.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set wide enough to provide enough resolution to identify individual channels. The RBW was set to ≥ 1% of the span and VBW set to ≥ RBW. The trace was set to max hold with a peak detector active.

Carrier frequency separation was measured for all modes of operation.

7.4.2.2 Measurement Results

The device employs > 50 hopping channels under all modes and data rates. Results are shown below in Figures 7.4.2.2-1 to 7.4.2.2-10.

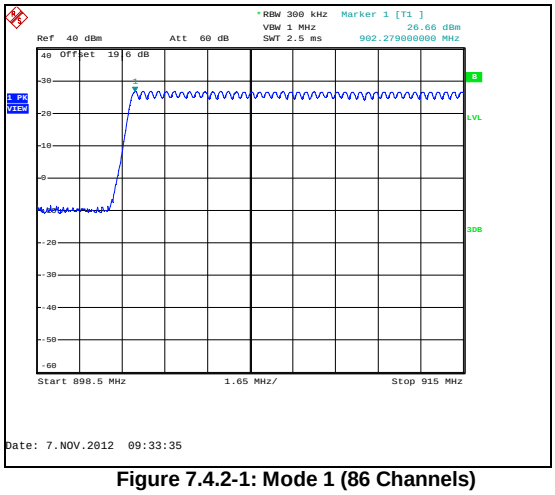

Figure 7.4.2-1: Mode 1 (86 Channels)

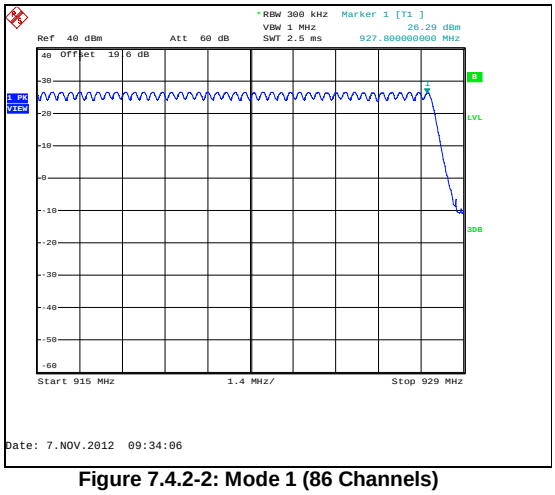

Figure 7.4.2-2: Mode 1 (86 Channels)

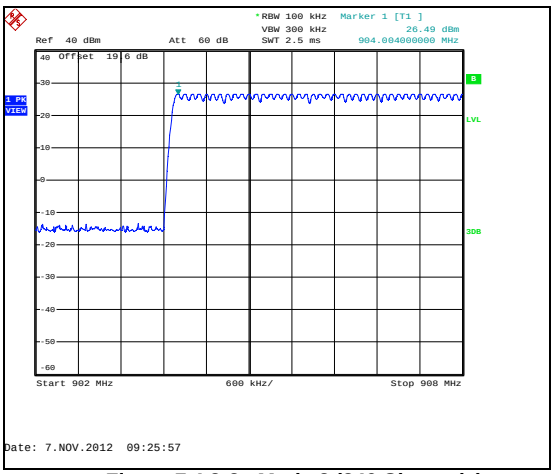

Figure 7.4.2-3: Mode 2 (240 Channels)

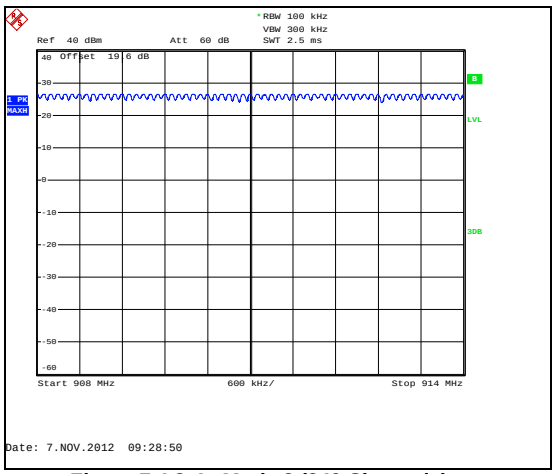

Figure 7.4.2-4: Mode 2 (240 Channels)

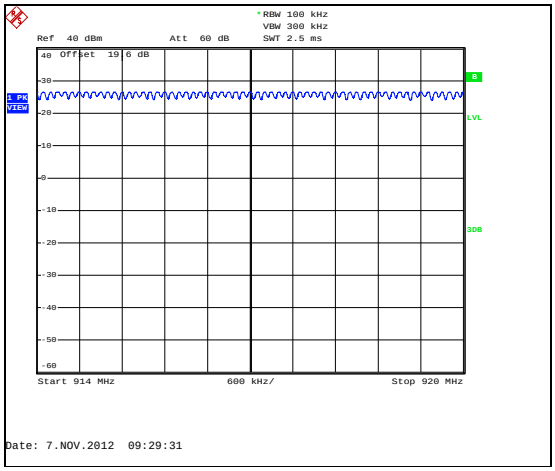

Figure 7.4.2-5: Mode 2 (240 Channels)

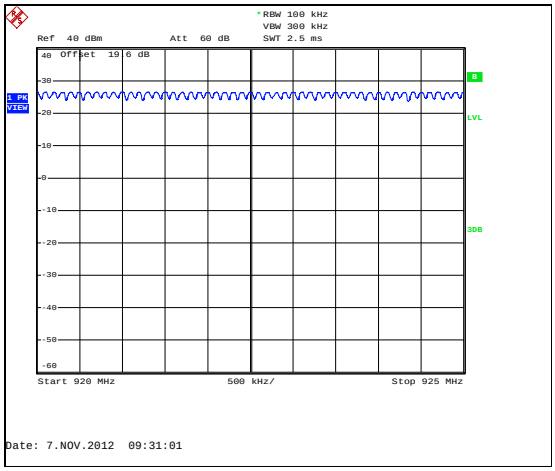

Figure 7.4.2-6: Mode 2 (240 Channels)

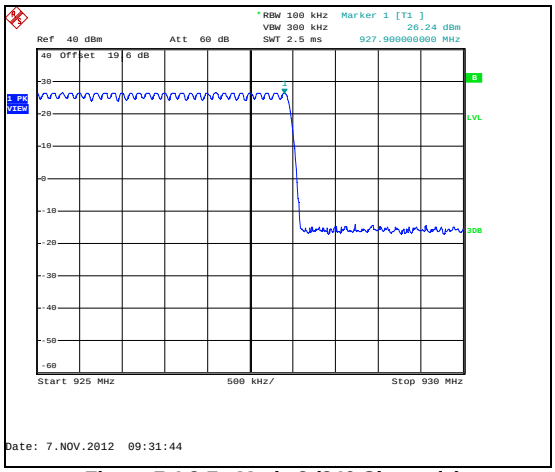

Figure 7.4.2-7: Mode 2 (240 Channels)

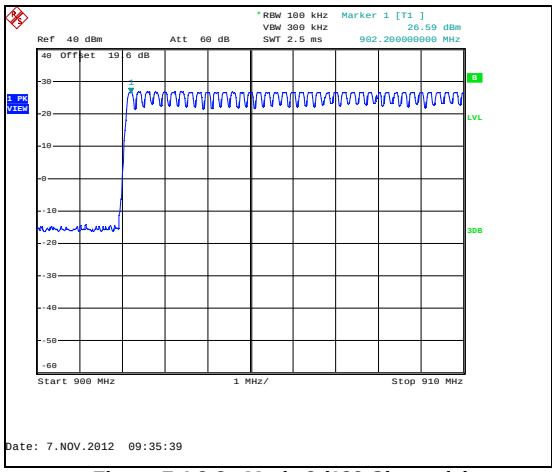

Figure 7.4.2-8: Mode 3 (129 Channels)

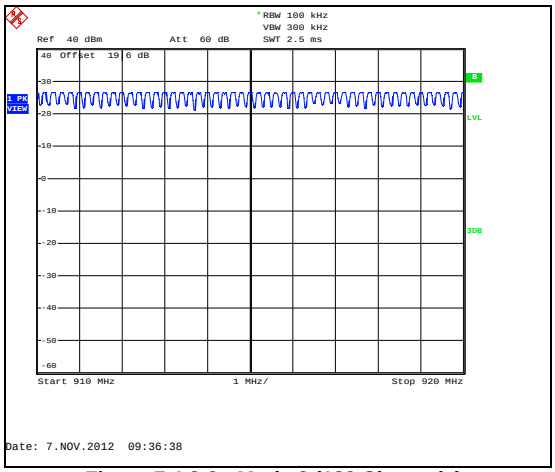

Figure 7.4.2-9: Mode 3 (129 Channels)

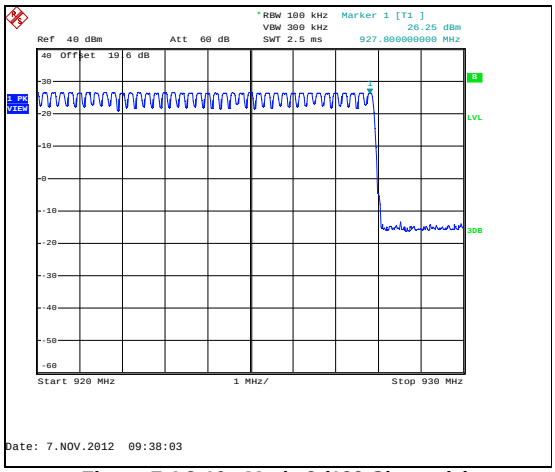

Figure 7.4.2-10: Mode 3 (129 Channels)

7.4.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.4.3.1 Measurement Procedure

The EUT test mode does not generate a worst case channel dwell time in test mode therefore a detailed engineering analysis is provided in the theory of operation.

As described in the theory of operation, the maximum channel transmitter dwell time is < 400ms per channel hop with the minimum period of 700ms between hops. Therefore the maximum time of occupancy on any one channel within a 10s or 20s period is <400ms for all modes of operation.

7.4.4 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.4.4.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer display was set between two times and five times the occupied bandwidth (OBW) of the emission. The RBW of the spectrum analyzer was set to approximately 1 % to 5 % of the OBW. The trace was set to max hold with a peak detector active. The Delta or automatic n dB down marker function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

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.

7.4.4.2 Measurement Results

Results are shown below in Table 7.4.4.2-1 and Figures 7.4.4.2-1 through 7.4.4.2-30.

Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Data Rate (kbps)
902.3	22.6	21.3	9.6
902.3	44.0	44.0	19.2
902.3	90.8	88.8	38.4
902.2	119.5	117.0	50.0
902.3	265.2	253.2	115.2
915.0	22.5	21.4	9.6
915.0	43.6	44.8	19.2
915.0	92.0	89.2	38.4
915.0	119.5	117.0	50.0
915.0	268.8	253.2	115.2
927.9	22.9	21.6	9.6
927.9	44.2	44.6	19.2
927.9	92.4	88.8	38.4
927.8	118.0	116.5	50.0
927.8	268.8	253.2	115.2

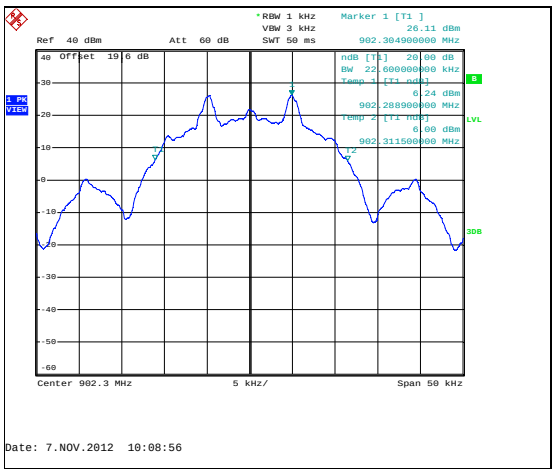

Figure 7.4.4.2-1: 20dB BW Low Channel - 9.6kbps

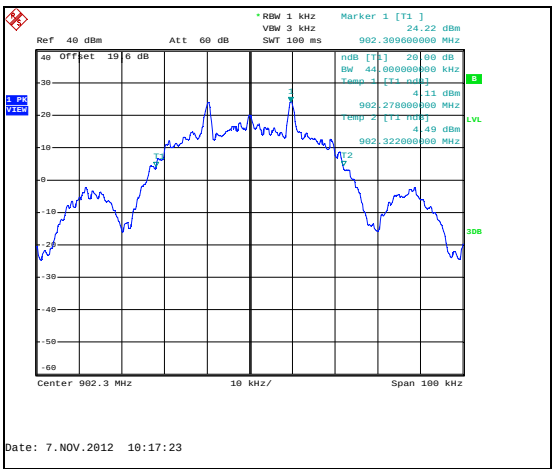

Figure 7.4.4.2-2: 20dB BW Low Channel – 19.2kbps

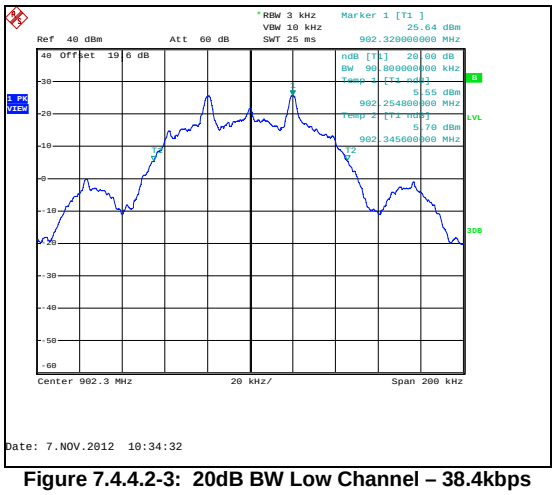

Figure 7.4.4.2-3: 20dB BW Low Channel – 38.4kbps

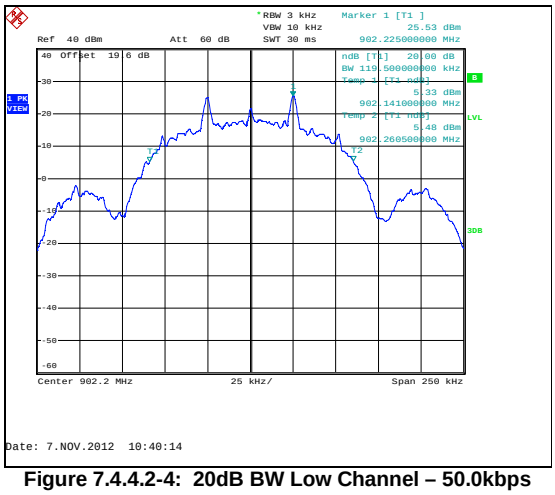

Figure 7.4.4.2-4: 20dB BW Low Channel – 50.0kbps

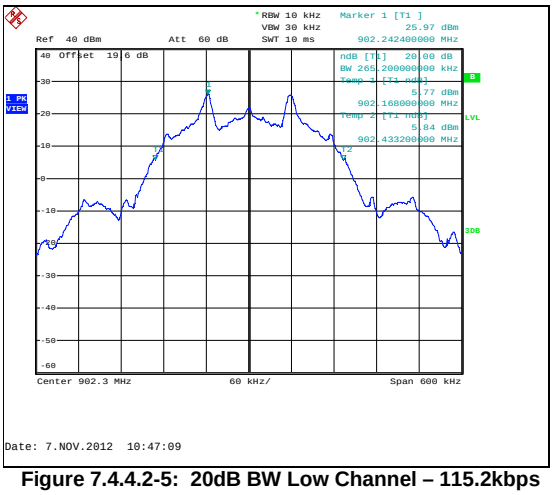

Figure 7.4.4.2-5: 20dB BW Low Channel – 115.2kbps

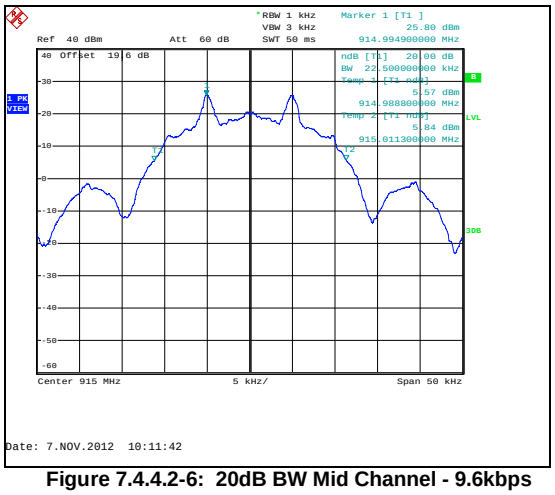

Figure 7.4.4.2-6: 20dB BW Mid Channel - 9.6kbps

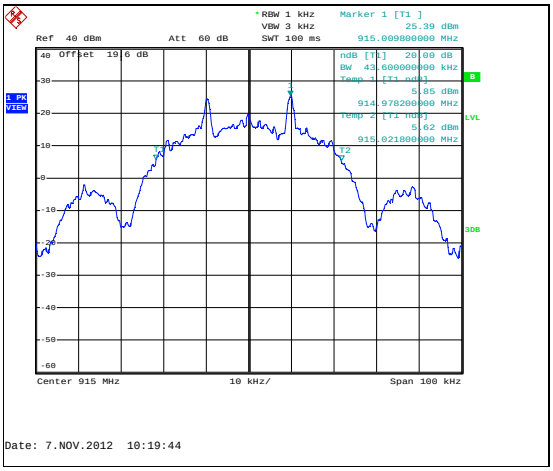

Figure 7.4.4.2-7: 20dB BW Mid Channel – 19.2kbps

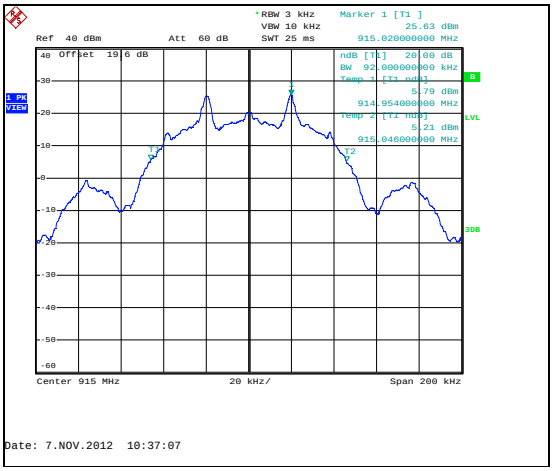

Figure 7.4.4.2-8: 20dB BW Mid Channel – 38.4kbps

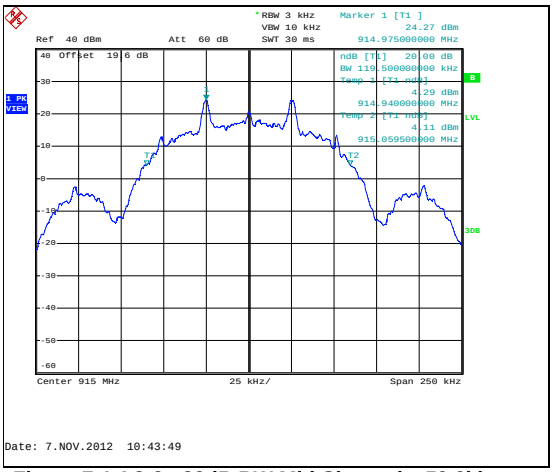

Figure 7.4.4.2-9: 20dB BW Mid Channel – 50.0kbps

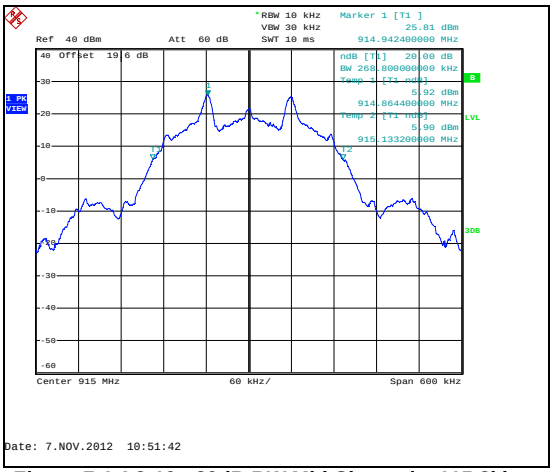

Figure 7.4.4.2-10: 20dB BW Mid Channel – 115.2kbps

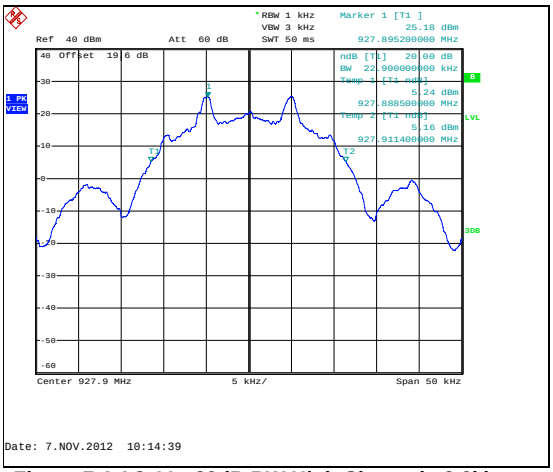

Figure 7.4.4.2-11: 20dB BW High Channel - 9.6kbps

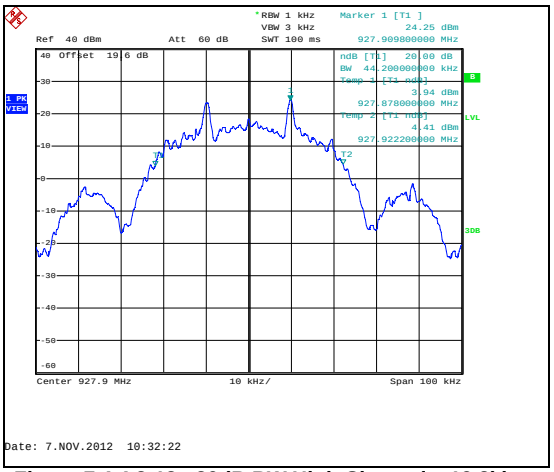

Figure 7.4.4.2-12: 20dB BW High Channel – 19.2kbps

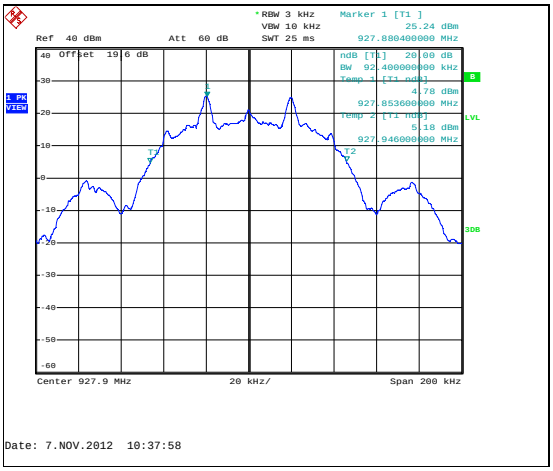

Figure 7.4.4.2-13: 20dB BW High Channel – 38.4kbps

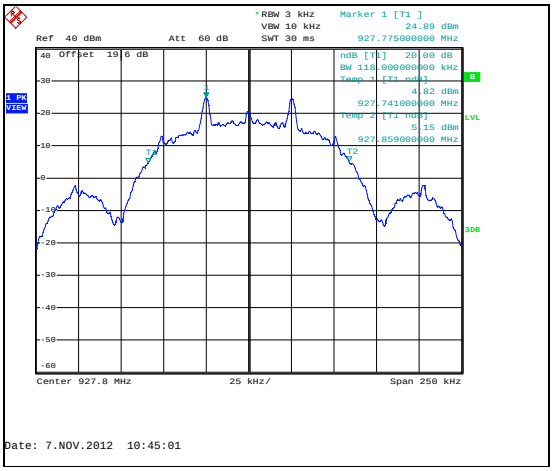

Figure 7.4.4.2-14: 20dB BW High Channel – 50.0kbps

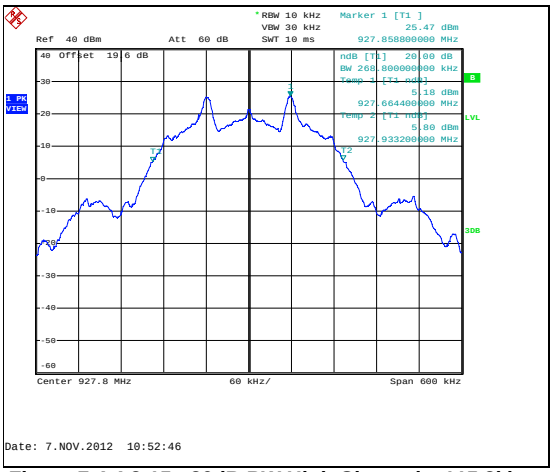

Figure 7.4.4.2-15: 20dB BW High Channel – 115.2kbps

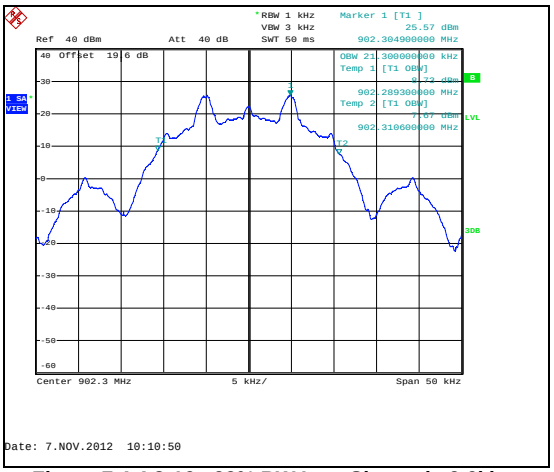

Figure 7.4.4.2-16: 99% BW Low Channel - 9.6kbps

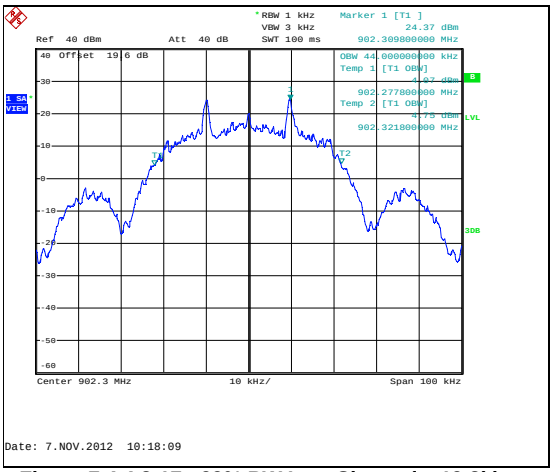

Figure 7.4.4.2-17: 99% BW Low Channel – 19.2kbps

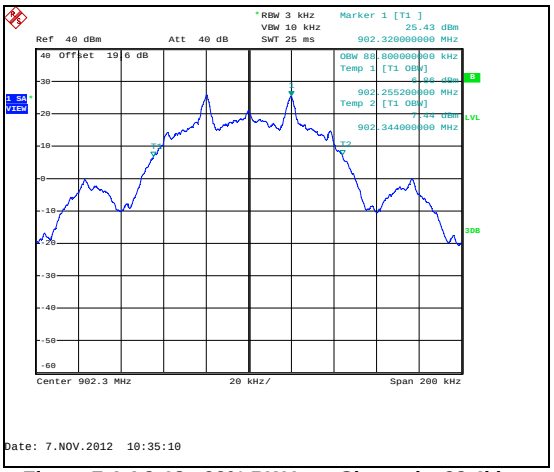

Figure 7.4.4.2-18: 99% BW Low Channel – 38.4kbps

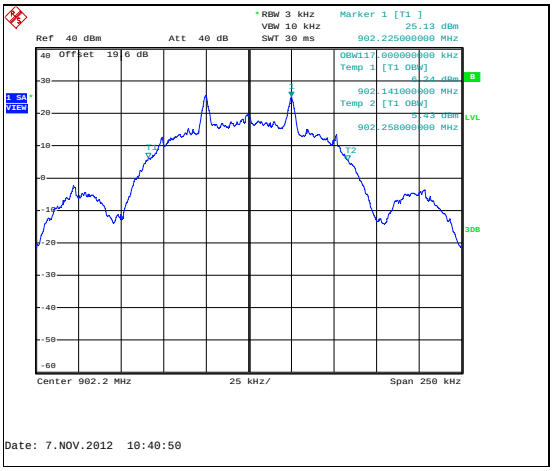

Figure 7.4.4.2-19: 99% BW Low Channel – 50.0kbps

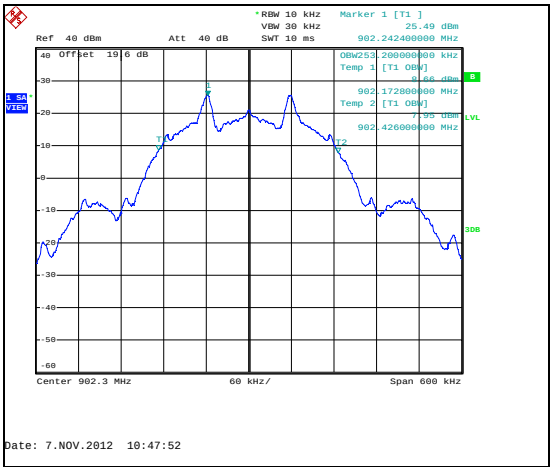

Figure 7.4.4.2-20: 99% BW Low Channel – 115.2kbps

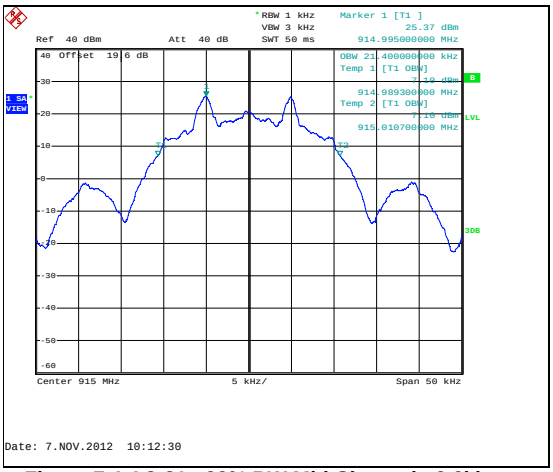

Figure 7.4.4.2-21: 99% BW Mid Channel - 9.6kbps

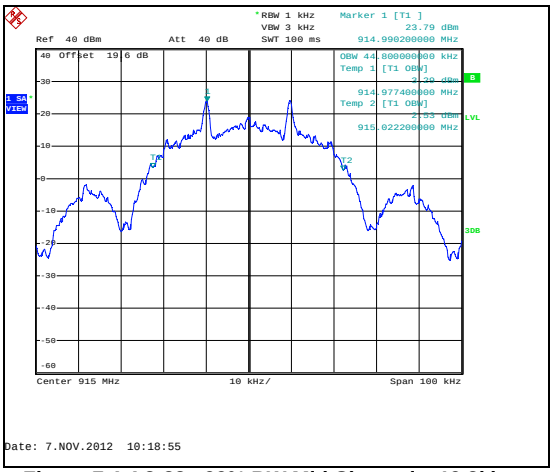

Figure 7.4.4.2-22: 99% BW Mid Channel – 19.2kbps

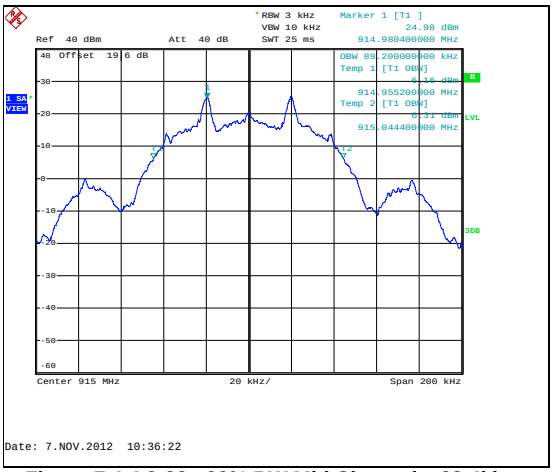

Figure 7.4.4.2-23: 99% BW Mid Channel – 38.4kbps

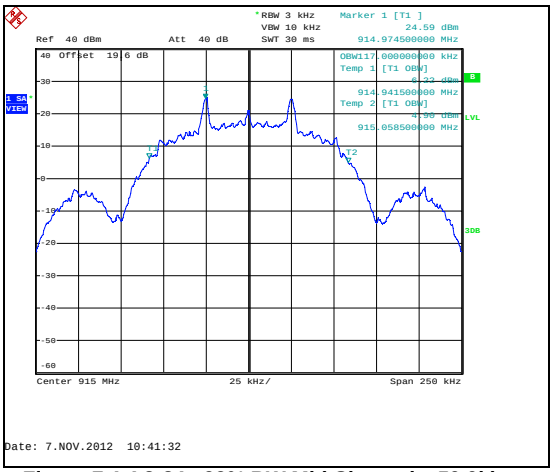

Figure 7.4.4.2-24: 99% BW Mid Channel – 50.0kbps

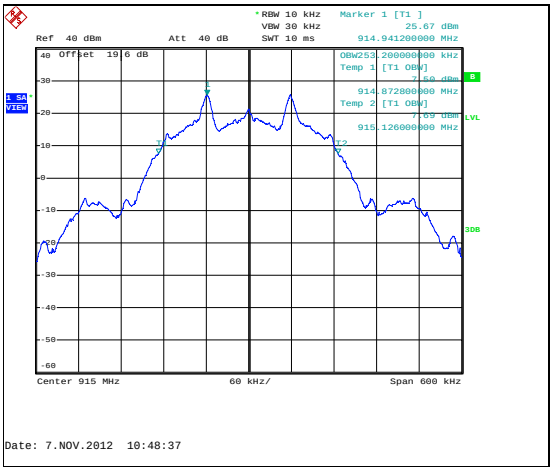

Figure 7.4.4.2-25: 99% BW Mid Channel – 115.2kbps

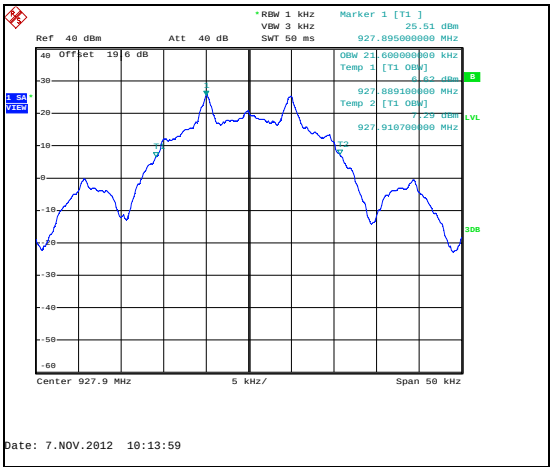

Figure 7.4.4.2-26: 99% BW High Channel - 9.6kbps

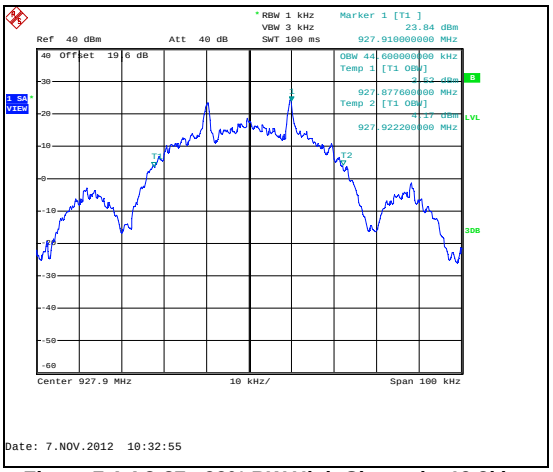

Figure 7.4.4.2-27: 99% BW High Channel – 19.2kbps

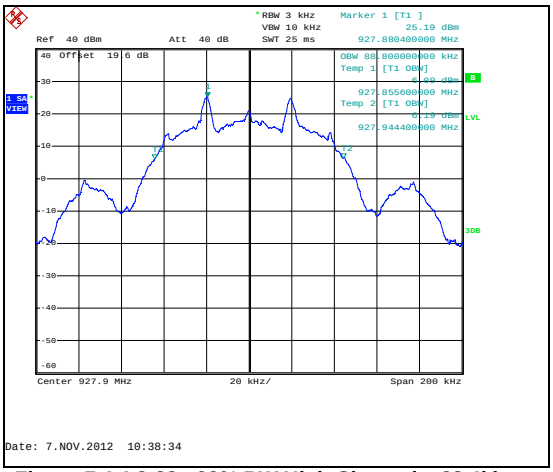

Figure 7.4.4.2-28: 99% BW High Channel – 38.4kbps

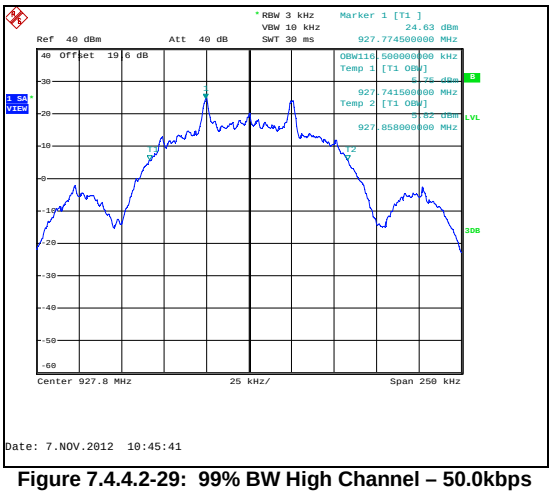

Figure 7.4.4.2-29: 99% BW High Channel – 50.0kbps

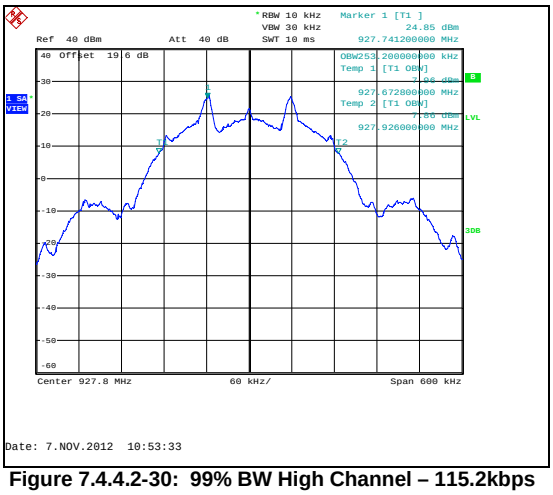

Figure 7.4.4.2-30: 99% BW High Channel – 115.2kbps

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

7.5.1 Band-Edge Compliance of RF Conducted Emissions

7.5.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 30 kHz, which is ≥ 1% of the span, and the VBW was set to 100kHz.

Band-edge was evaluated for all combinations of operating modes and data rates with worst case data provided. Worst case reported utilized 115.2kbps in Mode 1, 38.4kbps in Mode 2 and 50.0kbps in Mode 3.

7.5.1.2 Measurement Results

Results are shown in the figures 7.5.1.2-1 to 7.5.1.2-8 below.

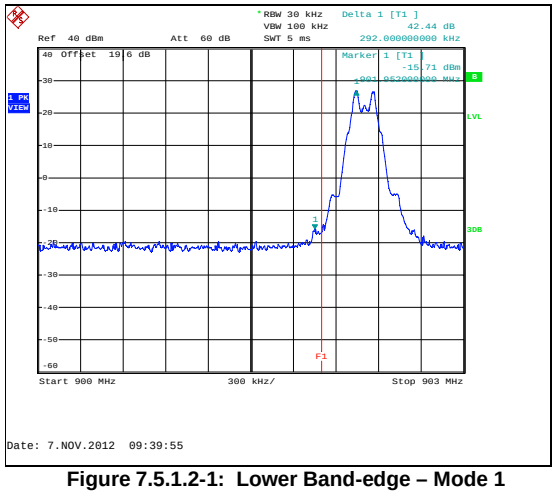

Figure 7.5.1.2-1: Lower Band-edge – Mode 1

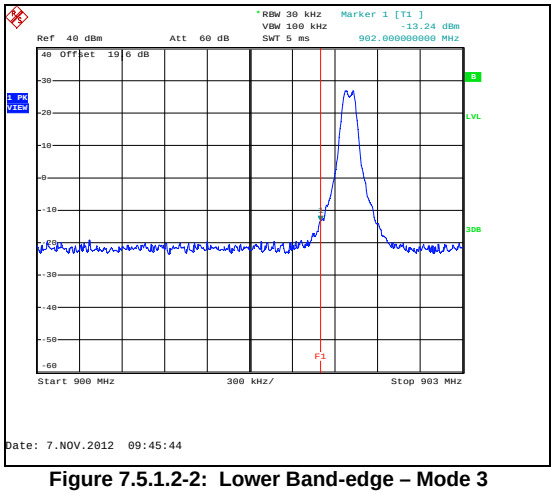

Figure 7.5.1.2-2: Lower Band-edge – Mode 3

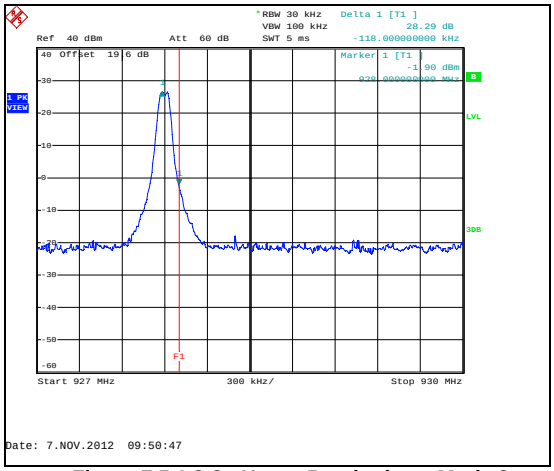

Figure 7.5.1.2-3: Upper Band-edge – Mode 2

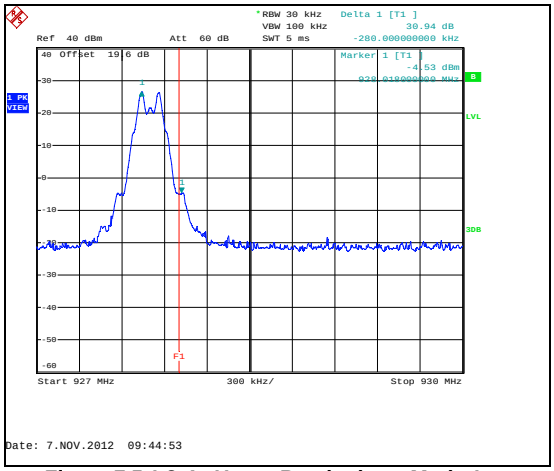

Figure 7.5.1.2-4: Upper Band-edge – Mode 1

HOPPING MODE:

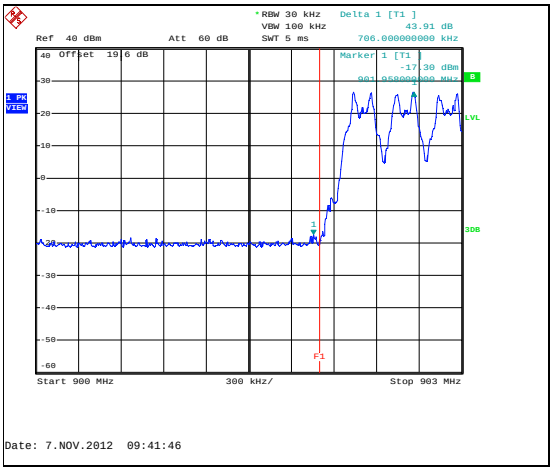

Figure 7.5.1.2-5: Lower Band-edge – Mode 1

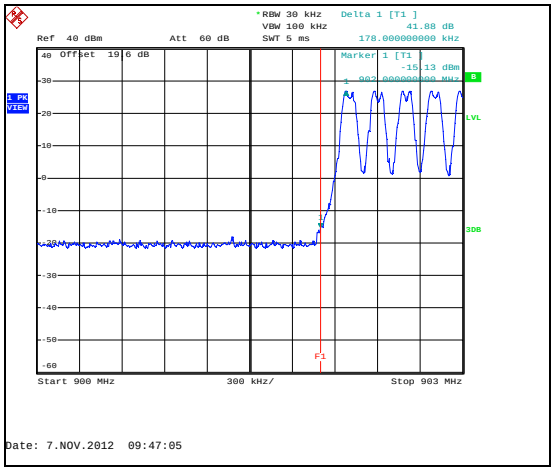

Figure 7.5.1.2-6: Lower Band-edge – Mode 3

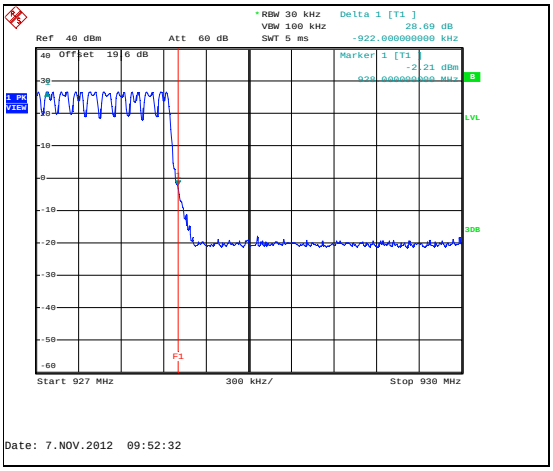

Figure 7.5.1.2-7: Upper Band-edge – Mode 2

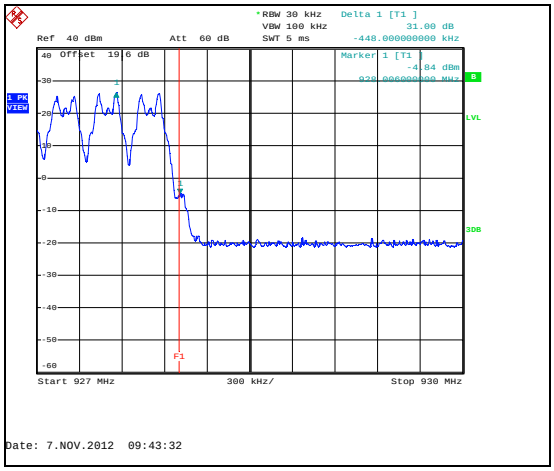

Figure 7.5.1.2-8: Upper Band-edge – Mode 1

7.5.2 RF Conducted Spurious Emissions

7.5.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 10GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100kHz. A peak detector function was used with the trace set to max hold.

RF conducted spurious emissions were evaluated for all combinations of operating modes and data rates with worst case data provided. Worst case report utilized 9.6kbps measured at 902.3 MHz for low channel, 915 MHz for mid channel and 927.9 for high channel.

7.5.2.2 Measurement Results

Results are shown below in Figures 7.5.2.2-1 to 7.5.2.2-6:

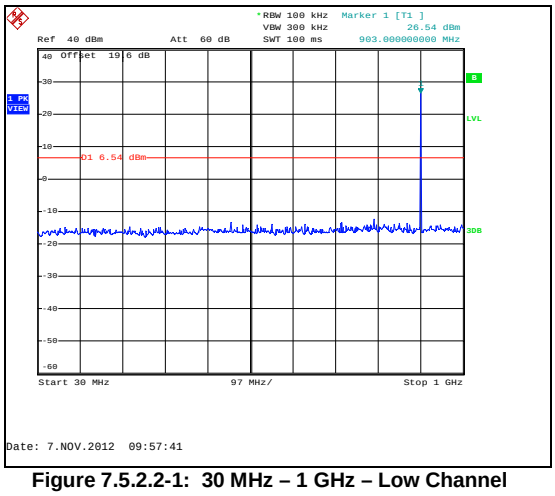

Figure 7.5.2.2-1: 30 MHz – 1 GHz – Low Channel

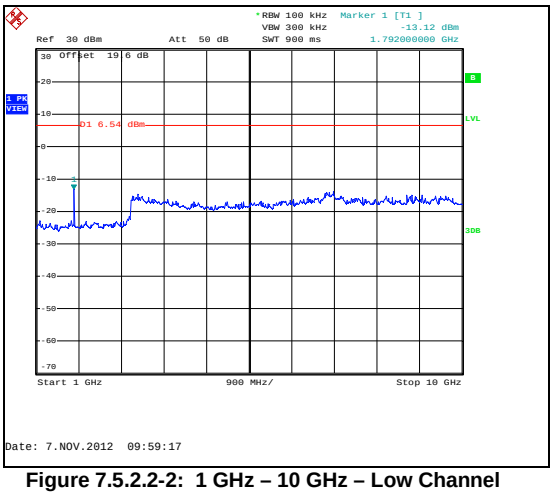

Figure 7.5.2.2-2: 1 GHz – 10 GHz – Low Channel

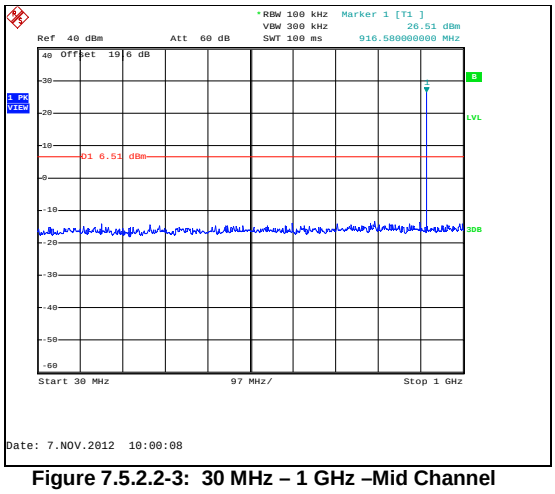

Figure 7.5.2.2-3: 30 MHz – 1 GHz –Mid Channel

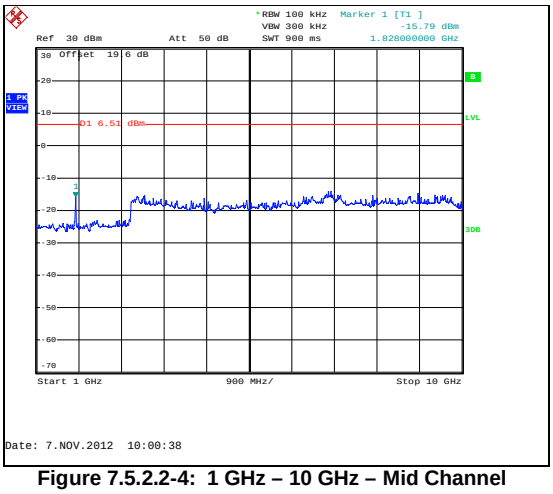

Figure 7.5.2.2-4: 1 GHz – 10 GHz – Mid Channel

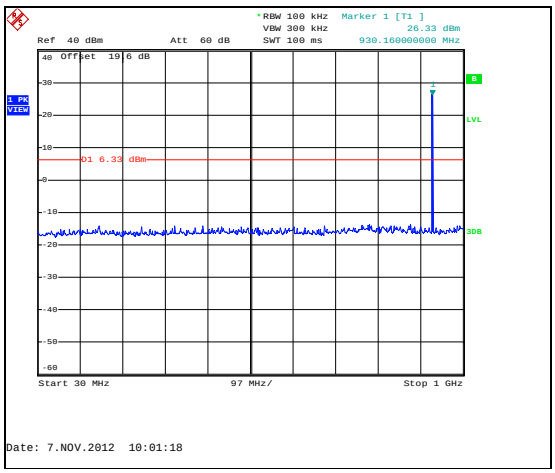

Figure 7.5.2.2-5: 30 MHz – 1 GHz – High Channel

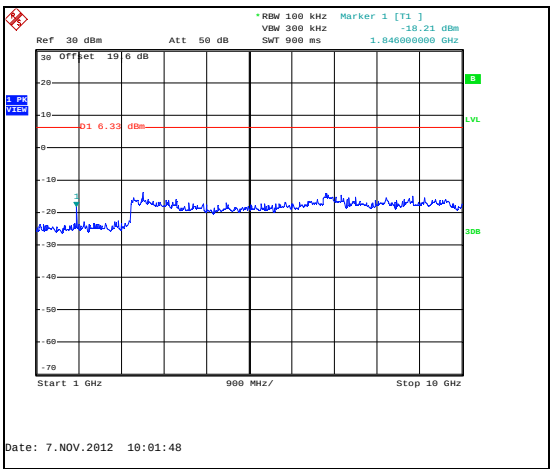

Figure 7.5.2.2-6: 1 GHz – 10 GHz –High Channel

7.5.3 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.6

7.5.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 10GHz, 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 3MHz respectively.

The EUT was caused to generate a continuous modulated carrier on the hopping channel.

Each emission found to be in a restricted band was compared to the applicable radiated emission limits.

Radiated spurious emissions were evaluated for all combinations of operating modes and data rates with worst case data provided. Worst case data rate reported was 9.6kbps. The EUT was positioned in an orientation of typical installation.

7.5.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in Table 7.3.2-1 below.

Table 7.3.2-1: Radiated Spurious Emissions Tabulated Data

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										
2706.3	51.07	44.83	H	-3.67	47.40	41.16	74.0	54.0	26.6	12.8
2706.3	50.47	44.10	V	-3.67	46.80	40.43	74.0	54.0	27.2	13.6
8118.9	47.17	39.04	H	7.94	55.11	46.98	74.0	54.0	18.9	7.0
Middle Channel										
2745	50.55	43.87	H	-3.55	47.00	40.32	74.0	54.0	27.0	13.7
2745	51.24	44.68	V	-3.55	47.69	41.13	74.0	54.0	26.3	12.9
7320	46.68	36.40	H	7.81	54.49	44.21	74.0	54.0	19.5	9.8
8235	46.72	37.80	H	8.12	54.84	45.92	74.0	54.0	19.2	8.1
High Channel										
2783.7	51.18	44.76	H	-3.43	47.75	41.33	74.0	54.0	26.3	12.7
2783.7	52.17	47.04	V	-3.43	48.74	43.61	74.0	54.0	25.3	10.4
8351.1	47.31	39.10	H	8.31	55.62	47.41	74.0	54.0	18.4	6.6

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: 51.07 - 3.67 = 47.40dBuV/m
Margin: 74dBuV/m – 47.40dBuV/m = 26.6dB

Example Calculation: Average

Corrected Level: 44.83 - 3.67 - 0 = 41.16dBuV
Margin: 54dBuV – 41.16dBuV = 12.8dB

8 CONCLUSION

In the opinion of ACS, Inc. Gridstream RF Enhanced A3, manufactured by Landis+Gyr Technology, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT