Excellence in Compliance Testing

Certification Test Report

FCC ID: SQB-NIVISVN400
IC: 6546A-NIVISVN400

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

ACS Report Number: 12-0358.W06.1A

Manufacturer: Nivis, LLC
Model: VersaNode 400

Test Begin Date: August 22, 2012
Test End Date: October 12, 2012

Report Issue Date: November 8, 2012

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 25 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.

1.2 Product description

The VersaNode 400 is a FSK (frequency shift keying) transceiver module that is part of the Nivis Smart Objects product family. It operates in the 915 MHz ISM band (902-928 MHz) with an output range at the antenna port of -20 to +15dBm. The RF portion is controlled by a Freescale IC (MC12311) and the baseband portion is controlled by a Freescale K60 microprocessor (PK60N512VMC100). The RF carrier and microprocessor are each locked to individual high stability crystal oscillators. The module's firmware is currently set for the following data rates: 50 and 200 kbps.

Technical Details:

Frequency Range:	902.4 – 927.6 MHz
Number of Channels:	64
Channel Separation:	400 kHz
Data Rates Supported:	50 kbps, 200 kbps
Modulation Format:	FSK
Antenna Type / Gain:	½ wave whip, 2.0dBi
Operating Voltage:	3.3 VDC

Manufacturer Information:
NIVIS, LLC
1000 Circle 75 Parkway, Suite 300
Atlanta Georgia 30339 United States

Test Sample Serial Numbers: 2-34

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 EUT was tested for radiated emissions in multiple orientations and worst case data provided where applicable. Worst case was with the EUT in the Z orientation. See test setup photos for additional detail.

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:

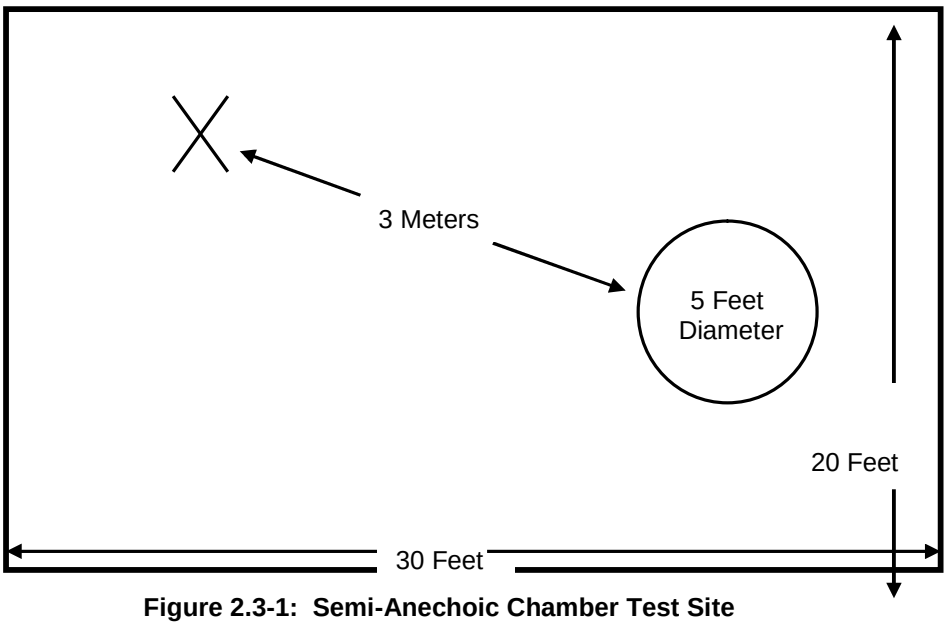

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

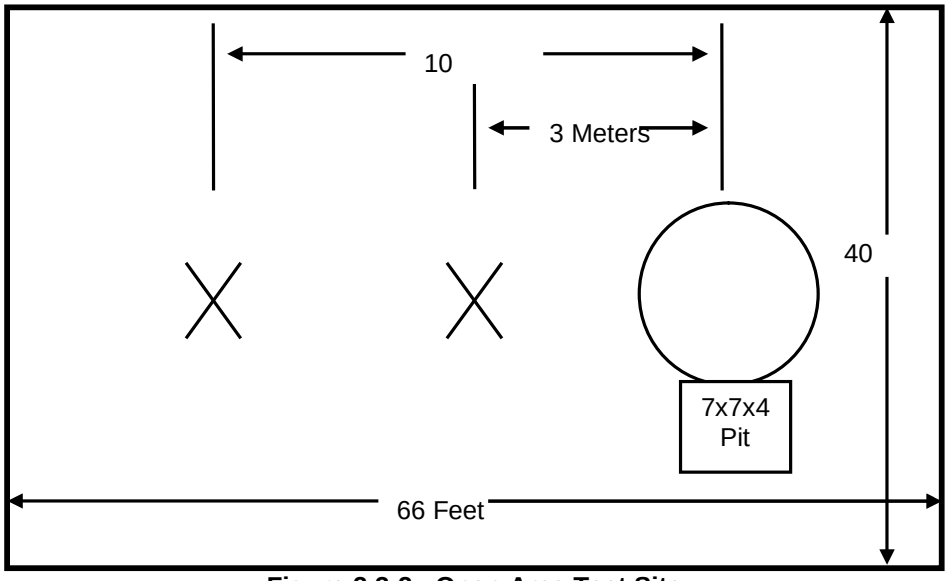

Figure 2.3-2: Open Area Test Site

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:

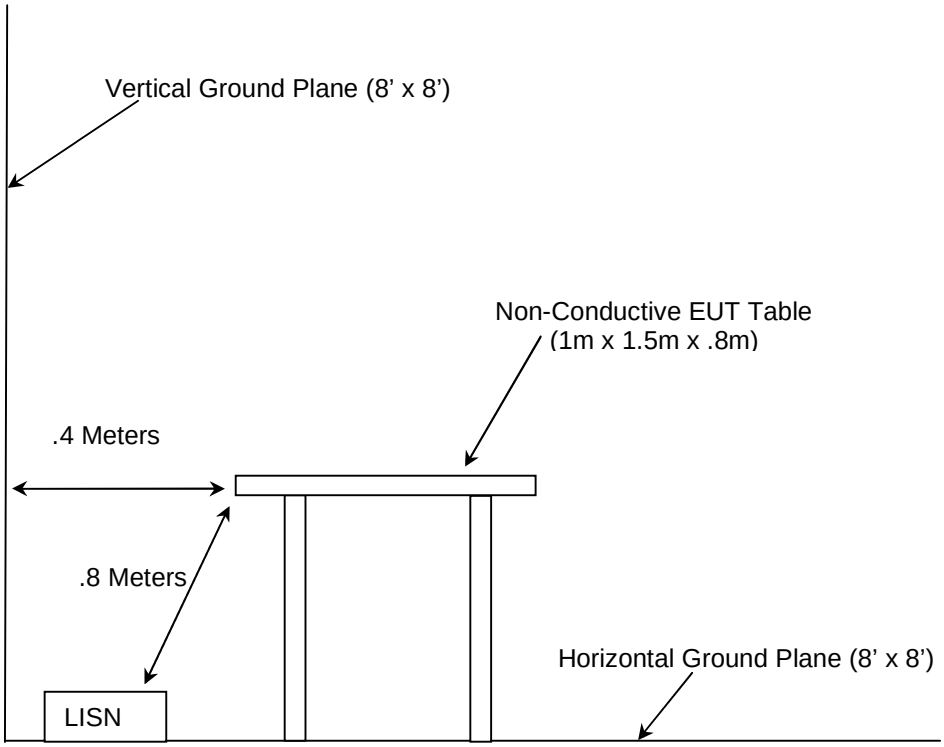

Figure 2.4-1: AC Mains Conducted EMI Site

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
- 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
153	EMCO	3825/2	LISN	9411-2268	1/13/2011	1/13/2013
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
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
331	Microwave Circuits	H1G513G1	Filters	31417	7/2/2012	7/2/2013
338	Hewlett Packard	8449B	Amplifiers	3008A01111	8/2/2012	8/2/2013
339	Aeroflex/Weinschel	AS-18	Attenuators	7142	6/4/2012	6/4/2013
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

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model/Part Number	Serial Number
1	Test Evaluation Board	Nivis, LLC	NA	NA
2	5V Power Supply	Gilsson Technologies	GUSB-5V-100240	NA

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

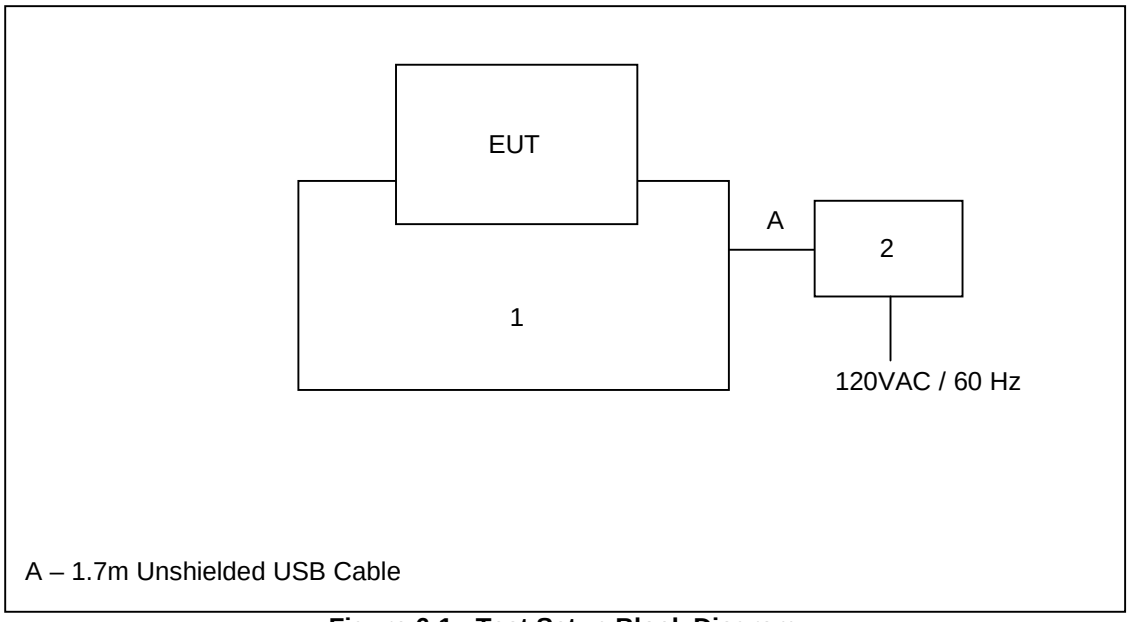

Figure 6-1: Test Setup Block Diagram

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 antenna used with the VersaNode 400 is a ½ wave whip antenna with a gain of 2.0dBi. The antenna connector is a MMCX with a female type board-mounted connector.

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: Conducted EMI Results - Line 1

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.162	45.8	10.4	65	19.5	L1	FLO	QP
0.324	47	10.5	60	12.6	L1	FLO	QP
0.486	45.1	10.5	56	11.1	L1	FLO	QP
0.648	43.9	10.4	56	12.1	L1	FLO	QP
0.81	43.6	10.5	56	12.4	L1	FLO	QP
0.972	44	10.5	56	12	L1	FLO	QP
1.128	38.7	10.5	56	17.3	L1	FLO	QP
1.296	39.6	10.5	56	16.4	L1	FLO	QP
1.452	39.4	10.5	56	16.6	L1	FLO	QP
1.614	41.8	10.5	56	14.2	L1	FLO	QP
0.162	40.4	10.4	55	15	L1	FLO	AVG
0.324	41.3	10.5	50	8.3	L1	FLO	AVG
0.486	39.1	10.5	46	7.2	L1	FLO	AVG
0.648	36.4	10.4	46	9.6	L1	FLO	AVG
0.81	36.4	10.5	46	9.6	L1	FLO	AVG
0.972	37.4	10.5	46	8.6	L1	FLO	AVG
1.128	27.9	10.5	46	18.1	L1	FLO	AVG
1.29	27	10.5	46	19	L1	FLO	AVG
1.452	27	10.5	46	19	L1	FLO	AVG
1.62	34.8	10.5	46	11.2	L1	FLO	AVG

Table 7.2.2-2: Conducted EMI Results – Line 2

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.162	38.3	10.4	65	27	L2	FLO	QP
0.324	38.9	10.5	60	20.7	L2	FLO	QP
0.486	37.2	10.5	56	19.1	L2	FLO	QP
0.648	35.4	10.4	56	20.6	L2	FLO	QP
0.81	35.2	10.5	56	20.8	L2	FLO	QP
0.972	36.5	10.5	56	19.5	L2	FLO	QP
1.14	33.5	10.5	56	22.5	L2	FLO	QP
1.314	19.9	10.5	56	36.1	L2	FLO	QP
1.494	12.4	10.5	56	43.7	L2	FLO	QP
1.62	35.1	10.5	56	20.9	L2	FLO	QP
0.228	8.2	10.4	53	44.3	L2	FLO	AVG
0.348	8.6	10.5	49	40.5	L2	FLO	AVG
0.486	29.6	10.5	46	16.6	L2	FLO	AVG
0.654	23.2	10.4	46	22.8	L2	FLO	AVG
0.81	26.6	10.5	46	19.4	L2	FLO	AVG
1.02	9.6	10.5	46	36.4	L2	FLO	AVG
1.128	18.4	10.5	46	27.6	L2	FLO	AVG
1.326	8.6	10.5	46	37.4	L2	FLO	AVG
1.512	8.7	10.5	46	37.3	L2	FLO	AVG
1.638	14.4	10.5	46	31.6	L2	FLO	AVG

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 the spectrum analyzer. The spectrum analyzer RBW was set such that RBW > 20 dB bandwidth of the emission being measured. The trace was set to max hold with a peak detector active.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 and Figures 7.3.2-1 to 7.3.2-3 below:

Table 7.3.2-1: RF Output Power

Frequency [MHz]	Level [dBm]
902.4	11.55
915.0	12.59
927.6	12.30

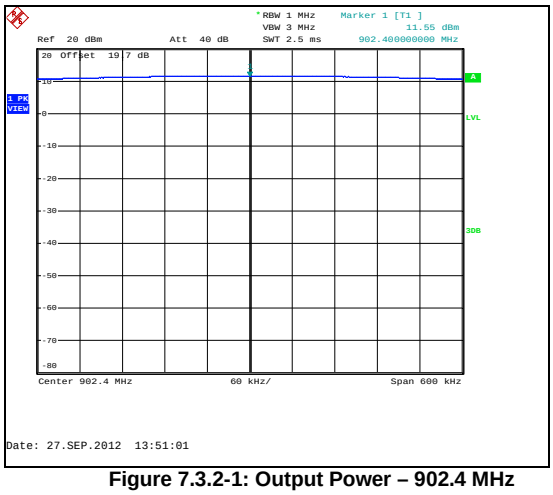

Figure 7.3.2-1: Output Power – 902.4 MHz

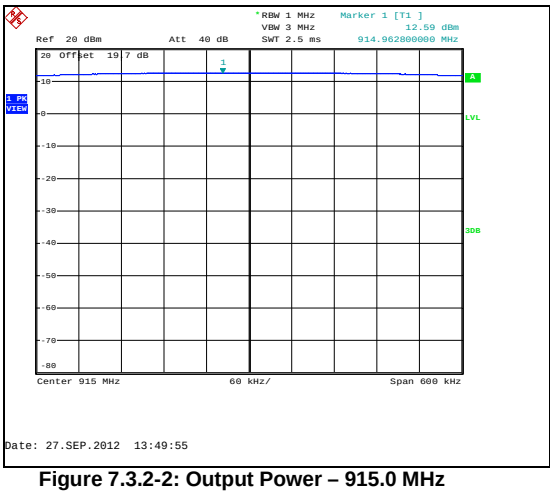

Figure 7.3.2-2: Output Power – 915.0 MHz

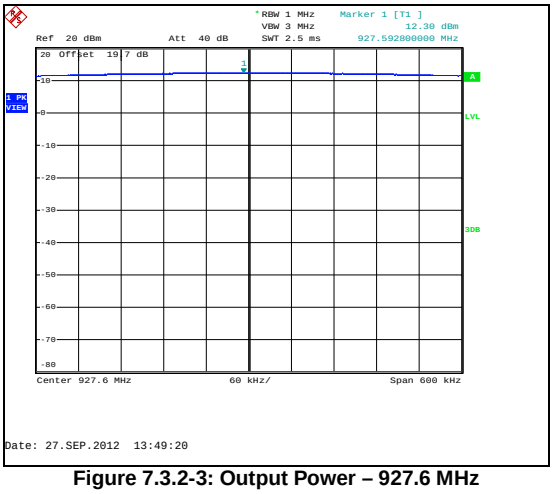

Figure 7.3.2-3: Output Power – 927.6 MHz

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

Results are shown below in Figure 7.4.1.2-1.

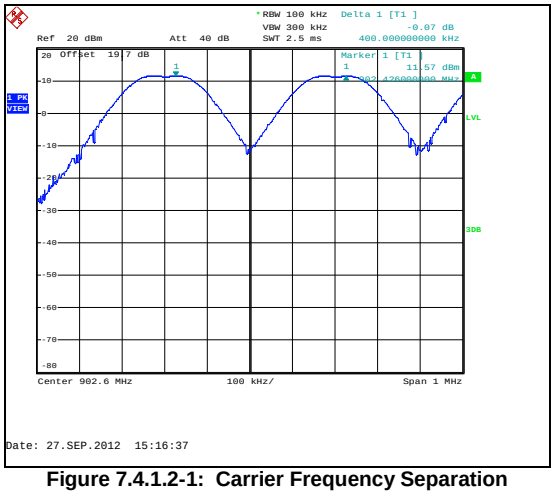

Figure 7.4.1.2-1: Carrier Frequency Separation

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 to encompass the entire frequency band of operation. The spectrum analyzer's RBW was set to ≥ 1% of the span, and the VBW was set to > RBW. The trace was set to max hold with a peak detector active.

7.4.2.2 Measurement Results

Results are shown below in Figure 7.4.2-1.

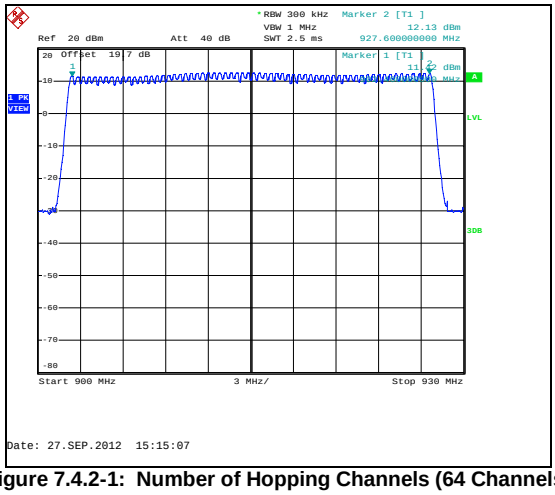

Figure 7.4.2-1: Number of Hopping Channels (64 Channels)

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 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 0 Hz centered on a hopping channel. The RBW of the spectrum analyzer was set to approximately 1 MHz and VBW set to ≥ RBW. The Marker Delta function of the analyzer was utilized to determine the dwell time.

7.4.3.2 Measurement Results

Results are shown below in Tables 7.4.3.2-1 through 7.4.3.2-2 and Figures 7.4.3.2-1 through 7.4.3.2-5.

Table 7.4.3.2-1: Channel Dwell Time (50kbps)

Data Rate (kbps)	Single Occupation On Time (ms)	Number of Occupations / 20s	Total Dwell Time (ms)
50	23.17	13	301.21
Total:			301.21

Table 7.4.3.2-2: Channel Dwell Time (200kbps)

Data Rate (kbps)	Single Occupation On Time (ms)	Number of Occupations / 20s	Total Dwell Time (ms)
200	57.78	5	288.90
200	23.17	2	46.34
Total:			335.24

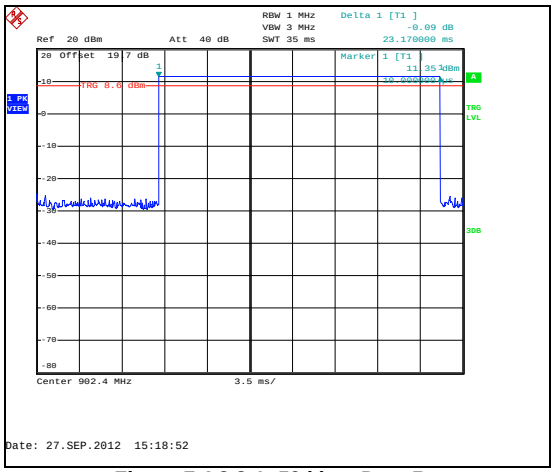

Figure 7.4.3.2-1: 50 kbps Data Rate

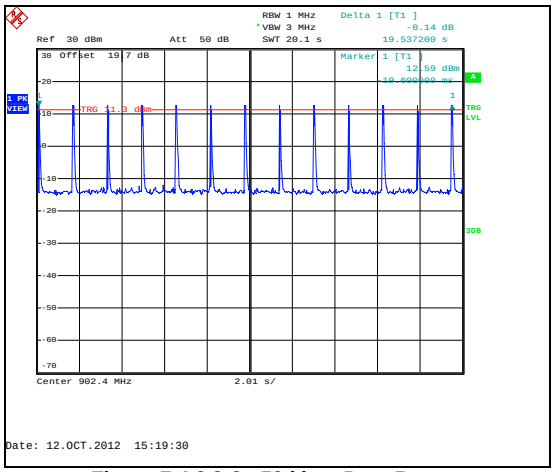

Figure 7.4.3.2-2: 50 kbps Data Rate

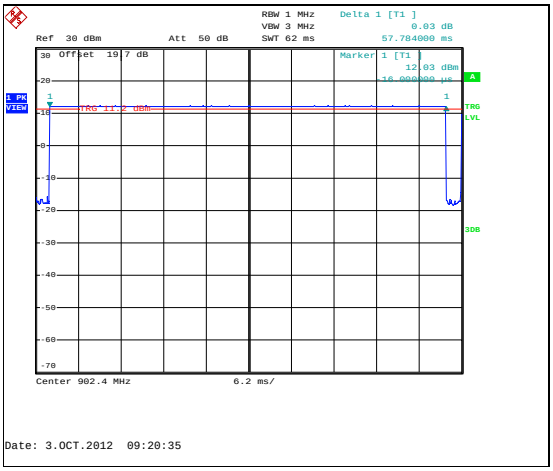

Figure 7.4.3.2-3: 200 kbps Data Rate

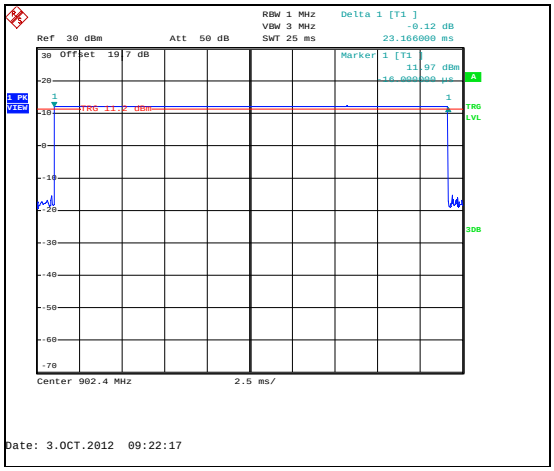

Figure 7.4.3.2-4: 200 kbps Data Rate

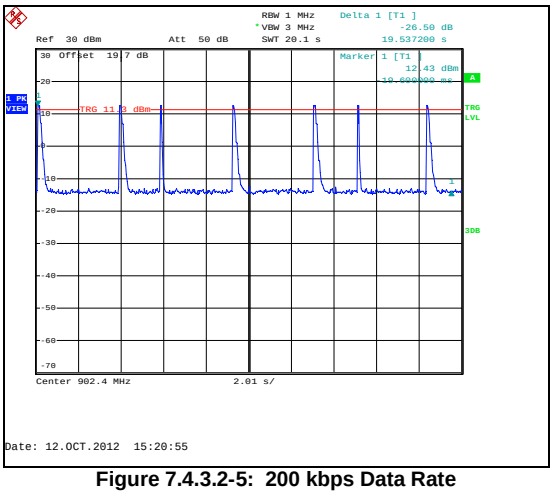

Figure 7.4.3.2-5: 200 kbps Data Rate

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 function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission and side bands. The RBW was to ~ 1% of the span. The trace was set to max hold with a sample detector. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

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 7.4.4.2-12.

Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Data Rate (kbps)
902.4	118.2	120.0	50
915.0	119.4	121.8	50
927.6	118.8	122.4	50
902.4	213.0	214.0	200
915.0	220.0	218.0	200
927.6	223.0	227.0	200

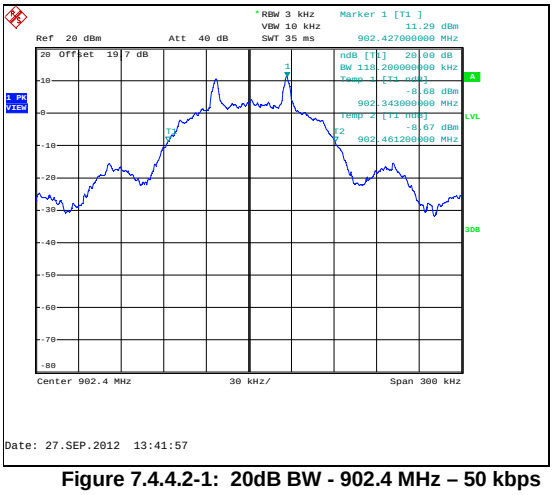

Figure 7.4.4.2-1: 20dB BW - 902.4 MHz – 50 kbps

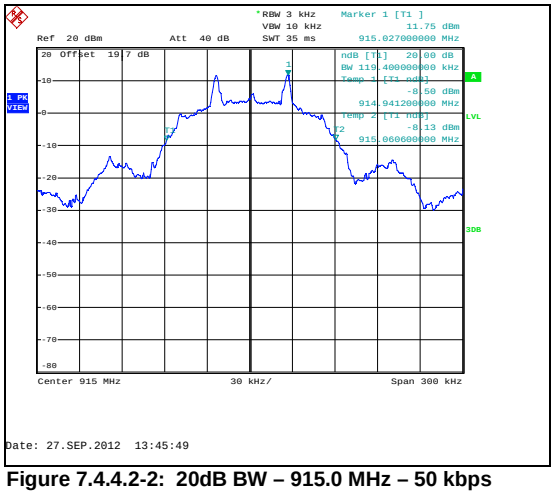

Figure 7.4.4.2-2: 20dB BW – 915.0 MHz – 50 kbps

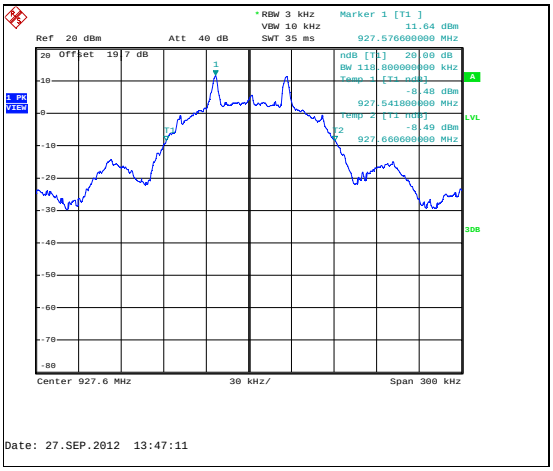

Figure 7.4.4.2-3: 20dB BW – 927.6 MHz – 50 kbps

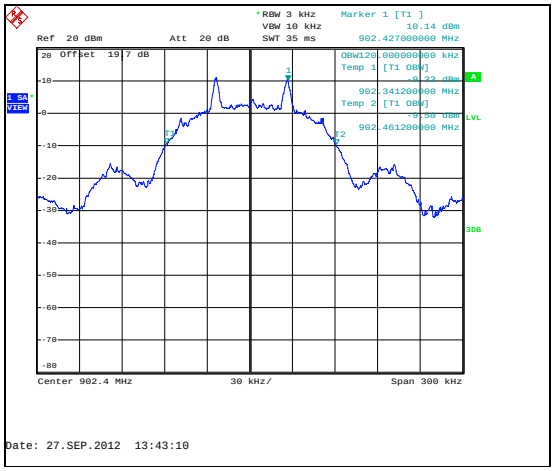

Figure 7.4.4.2-4: 99% BW - 902.4 MHz – 50 kbps

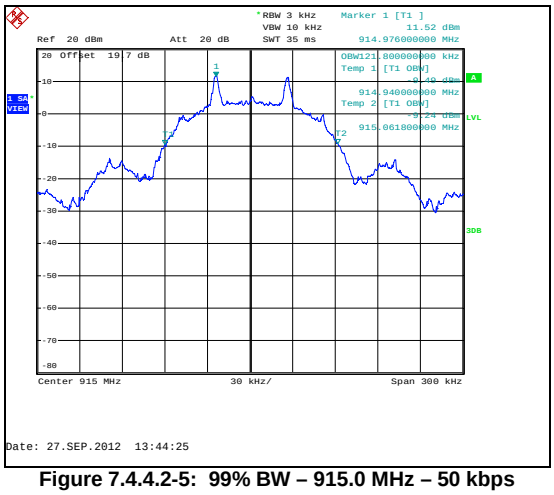

Figure 7.4.4.2-5: 99% BW – 915.0 MHz – 50 kbps

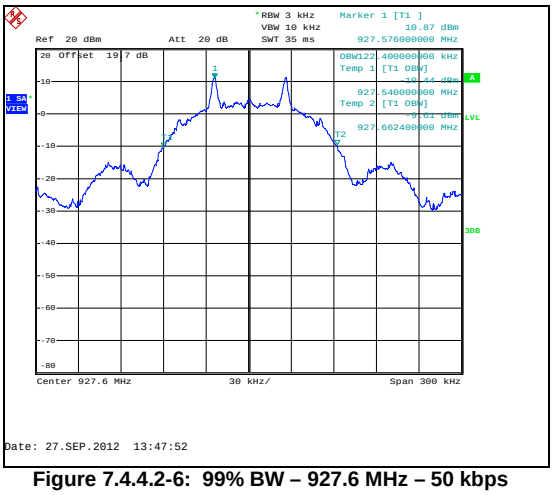

Figure 7.4.4.2-6: 99% BW – 927.6 MHz – 50 kbps

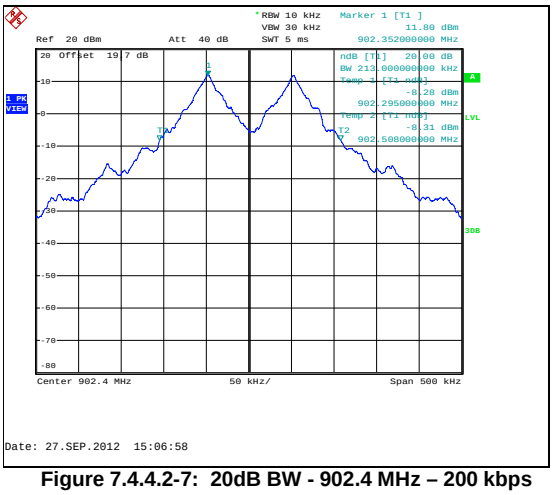

Figure 7.4.4.2-7: 20dB BW - 902.4 MHz – 200 kbps

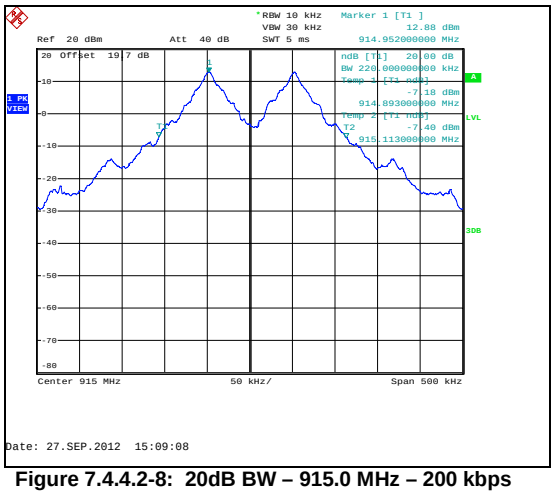

Figure 7.4.4.2-8: 20dB BW – 915.0 MHz – 200 kbps

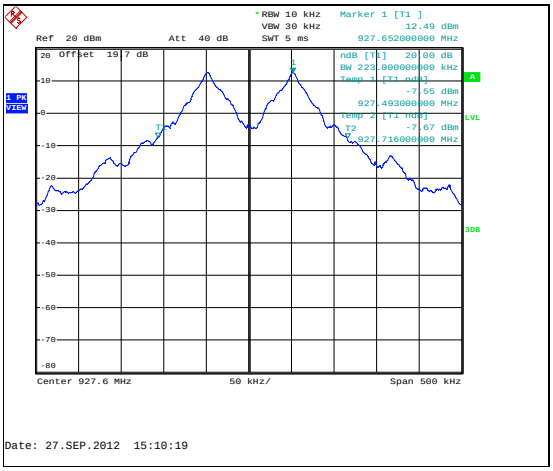

Figure 7.4.4.2-9: 20dB BW – 927.6 MHz – 200 kbps

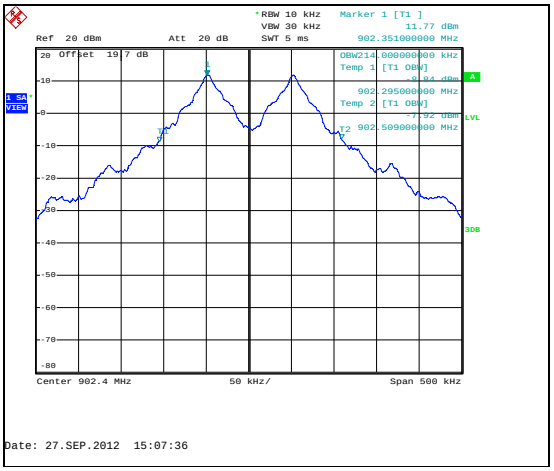

Figure 7.4.4.2-10: 99% BW - 902.4 MHz – 200 kbps

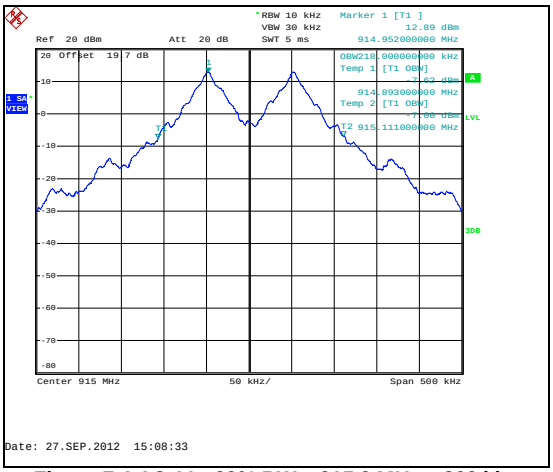

Figure 7.4.4.2-11: 99% BW – 915.0 MHz – 200 kbps

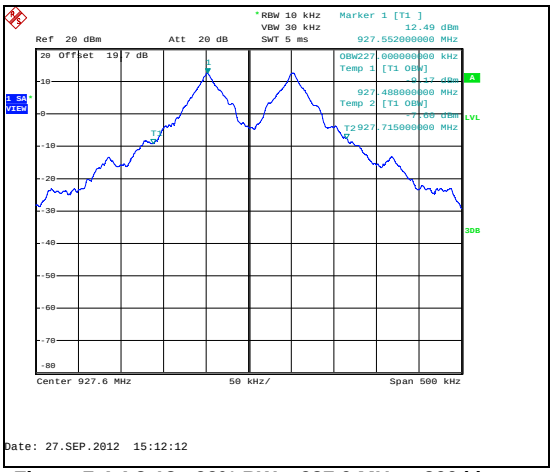

Figure 7.4.4.2-12: 99% BW – 927.6 MHz – 200 kbps

7.5 Band-Edge Compliance and Spurious Emissions-FCC 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 ≥ 1% of the span, and the VBW was set to >> RBW.

Band-edge was evaluated for all combinations of operating modes and data rates.

7.5.1.2 Measurement Results

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

NON-HOPPING MODE:

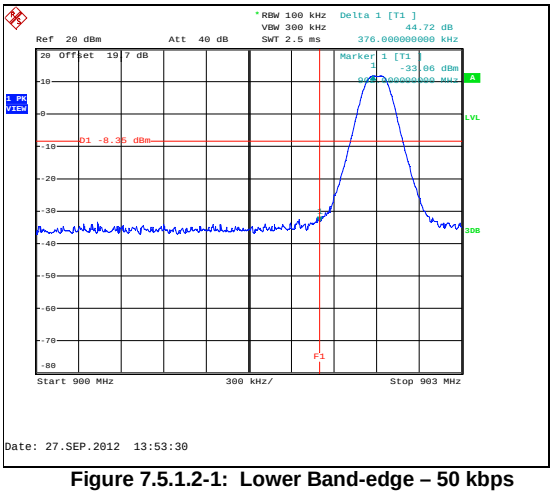

Figure 7.5.1.2-1: Lower Band-edge – 50 kbps

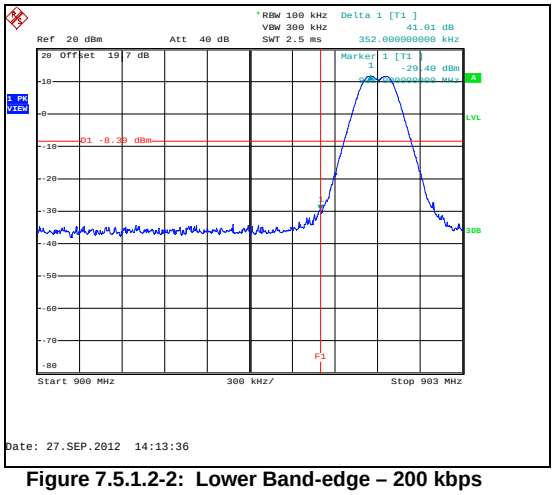

Figure 7.5.1.2-2: Lower Band-edge – 200 kbps

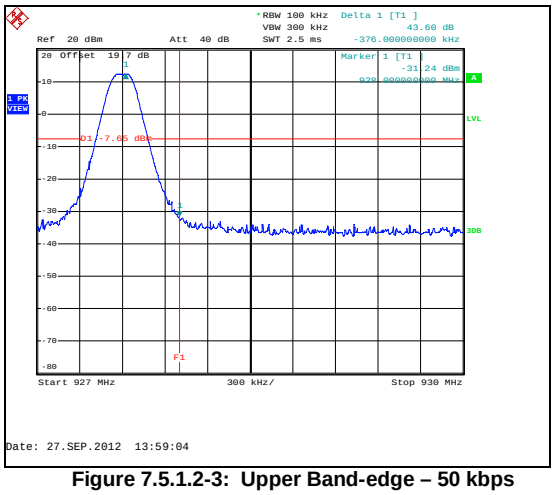

Figure 7.5.1.2-3: Upper Band-edge – 50 kbps

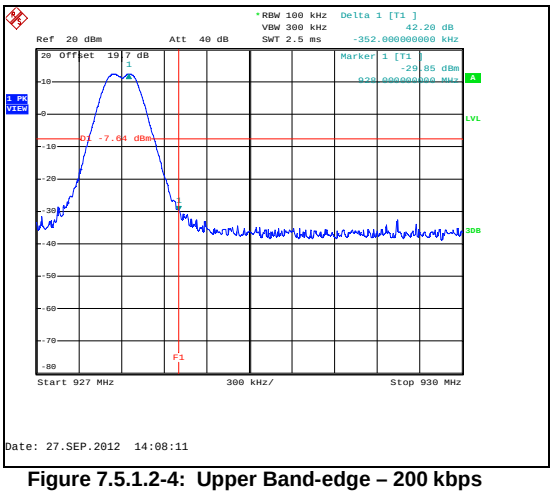

Figure 7.5.1.2-4: Upper Band-edge – 200 kbps

HOPPING MODE:

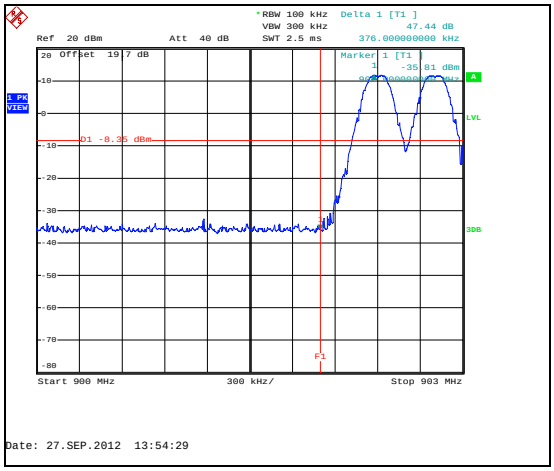

Figure 7.5.1.2-5: Lower Band-edge – 50 kbps

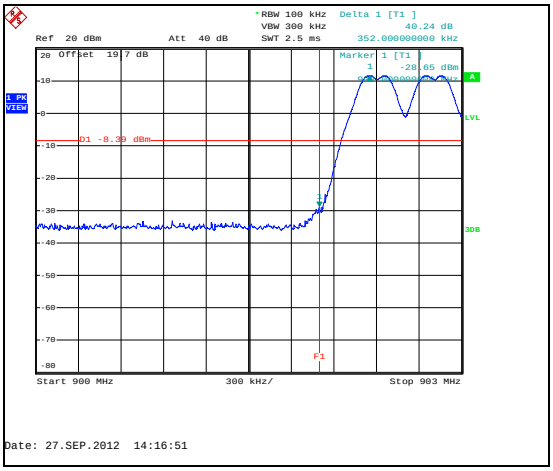

Figure 7.5.1.2-6: Lower Band-edge – 200 kbps

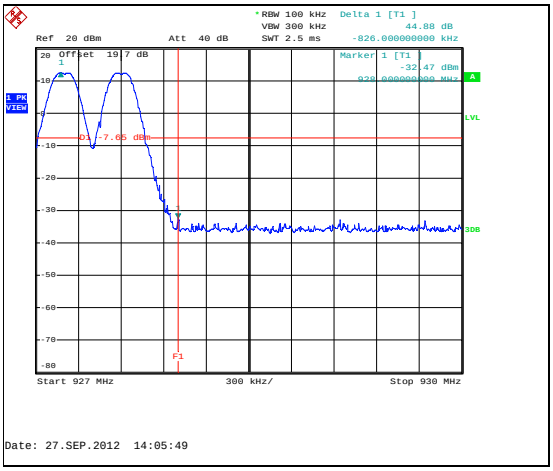

Figure 7.5.1.2-7: Upper Band-edge – 50 kbps

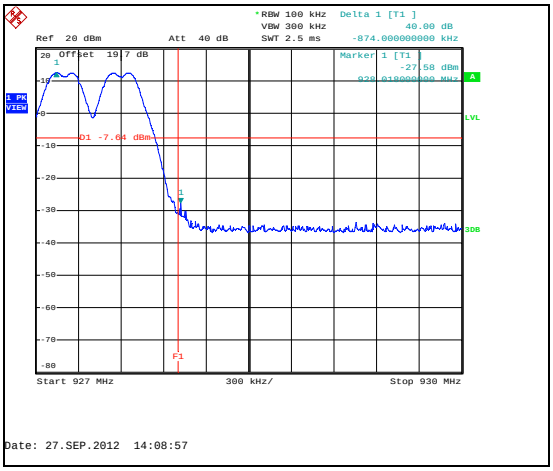

Figure 7.5.1.2-8: Upper Band-edge – 200 kbps

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 50.0kbps.

7.5.2.2 Measurement Results

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

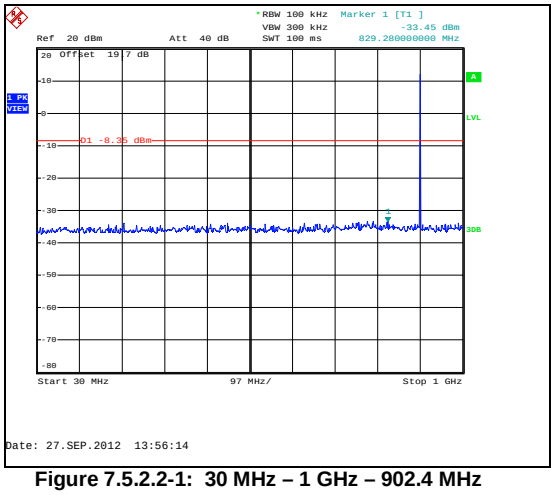

Figure 7.5.2.2-1: 30 MHz – 1 GHz – 902.4 MHz

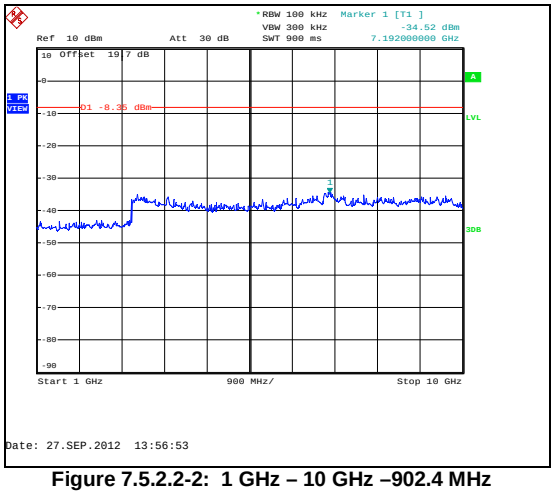

Figure 7.5.2.2-2: 1 GHz – 10 GHz –902.4 MHz

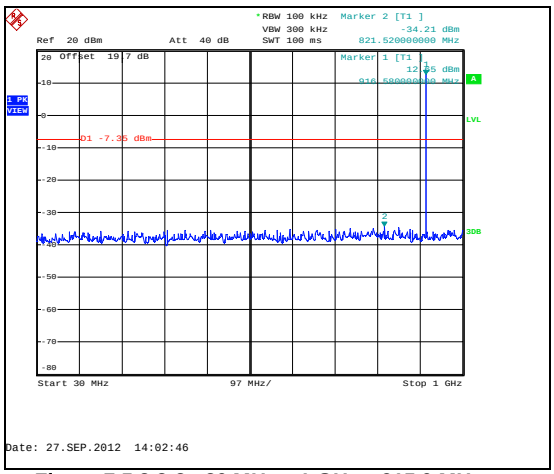

Figure 7.5.2.2-3: 30 MHz – 1 GHz – 915.0 MHz

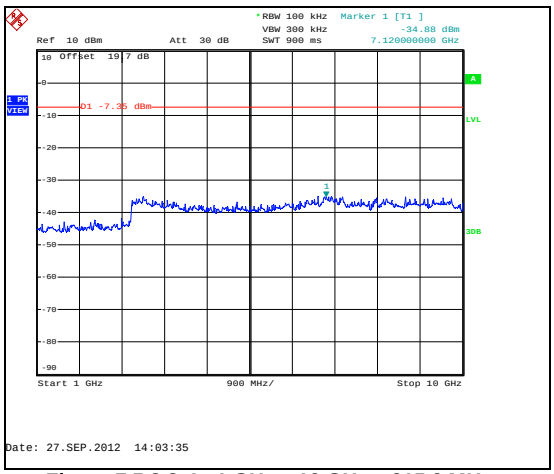

Figure 7.5.2.2-4: 1 GHz – 10 GHz – 915.0 MHz

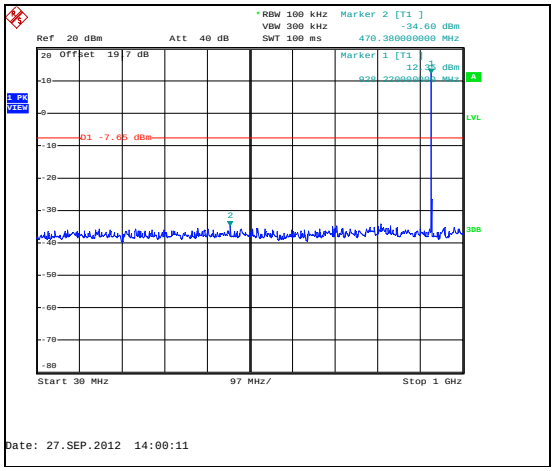

Figure 7.5.2.2-5: 30 MHz – 1 GHz – 927.6 MHz

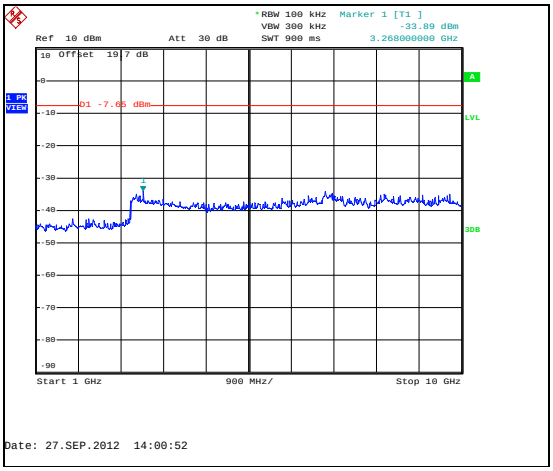

Figure 7.5.2.2-6: 1 GHz – 10 GHz – 927.6 MHz

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.

Radiated spurious emissions were evaluated for all combinations of operating modes, data rates and orientations with worst case data provided. Worst case reported was 50.0kbps. The EUT was evaluated in 3 orientations with worst case being the Z orientation. Worst case data for Z orientation is presented below.

7.5.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in the Table 7.5.3.2-1 below.

Table 7.5.3.2-1: 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										
2706.6	55.02	51.21	H	-3.67	51.35	47.54	74.0	54.0	22.6	6.5
2706.6	57.66	54.74	V	-3.67	53.99	51.07	74.0	54.0	20.0	2.9
4511	50.55	43.92	H	1.65	52.20	45.57	74.0	54.0	21.8	8.4
4511	50.12	42.68	V	1.65	51.77	44.33	74.0	54.0	22.2	9.7
5413.2	47.13	38.92	H	4.15	51.28	43.07	74.0	54.0	22.7	10.9
5413.2	47.15	38.84	V	4.15	51.30	42.99	74.0	54.0	22.7	11.0
8119.8	49.89	42.40	H	7.94	57.83	50.34	74.0	54.0	16.2	3.7
8119.8	46.99	39.12	V	7.94	54.93	47.06	74.0	54.0	19.1	6.9
9022	47.55	39.91	H	8.50	56.05	48.41	74.0	54.0	18.0	5.6
9022	48.02	39.27	V	8.50	56.52	47.77	74.0	54.0	17.5	6.2
Middle Channel										
2745	53.11	48.72	H	-3.55	49.56	45.17	74.0	54.0	24.4	8.8
2745	59.05	56.92	V	-3.55	55.50	53.37	74.0	54.0	18.5	0.6
3660	48.14	38.21	H	-0.29	47.85	37.92	74.0	54.0	26.2	16.1
3660	48.08	38.56	V	-0.29	47.79	38.27	74.0	54.0	26.2	15.7
4575	50.85	44.53	H	1.79	52.64	46.32	74.0	54.0	21.4	7.7
4575	49.10	41.43	V	1.79	50.89	43.22	74.0	54.0	23.1	10.8
7320	47.30	39.40	H	7.81	55.11	47.21	74.0	54.0	18.9	6.8
7320	47.40	39.70	V	7.81	55.21	47.51	74.0	54.0	18.8	6.5
8235	49.02	42.04	H	8.12	57.14	50.16	74.0	54.0	16.9	3.8
8235	48.06	40.36	V	8.12	56.18	48.48	74.0	54.0	17.8	5.5
9150	49.10	41.23	H	8.65	57.75	49.88	74.0	54.0	16.2	4.1
9150	50.09	42.24	V	8.65	58.74	50.89	74.0	54.0	15.3	3.1
High Channel										
2782.8	55.83	53.01	H	-3.43	52.40	49.58	74.0	54.0	21.6	4.4
2782.8	55.83	52.86	V	-3.43	52.40	49.43	74.0	54.0	21.6	4.6
4638	49.91	43.72	H	1.93	51.84	45.65	74.0	54.0	22.2	8.3
4638	50.14	43.23	V	1.93	52.07	45.16	74.0	54.0	21.9	8.8
7420.8	48.02	42.02	H	7.92	55.94	49.94	74.0	54.0	18.1	4.1
7420.8	49.07	42.88	V	7.92	56.99	50.80	74.0	54.0	17.0	3.2
8348.4	48.59	41.69	H	8.31	56.90	50.00	74.0	54.0	17.1	4.0
8348.4	47.81	39.32	V	8.31	56.12	47.63	74.0	54.0	17.9	6.4

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: 55.02 - 3.67 = 51.35dBuV/m
Margin: 74dBuV/m – 51.35dBuV/m = 22.6dB

Example Calculation: Average

Corrected Level: 51.21 - 3.67 - 0 = 47.54dBuV
Margin: 54dBuV – 47.54dBuV = 6.5dB

8 CONCLUSION

In the opinion of ACS, Inc. VersaNode 400, manufactured by NIVIS, LLC meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT