Certification Test Report

FCC ID: QZC-REXUA
IC: 4557A-REXUA

FCC Rule Part: 15.247
ISED Canada Radio Standards Specification: RSS-247

Report Number: AT72132228-1P1

Manufacturer: Elster Solutions LLC
Model: REXUA

Test Begin Date: February 12, 2018
Test End Date: May 30, 2018

Report Issue Date: July 5, 2018

FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: 2955.09

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Prepared By:

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TÜV SÜD America Inc.

This report contains 29 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 Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-247 Certification for Class II Permissive Change.

The purpose of this Class II Permissive Change is to address a new third-party firmware load that enables additional data rates and a wider frequency range for the 900MHz frequency hopping spread spectrum radio.

1.2 Product description

The REXUA module contains (1) 900MHz frequency hopping spread spectrum radio and (1) 2.4GHz direct sequence spread spectrum Zigbee radio. This report addresses the 900MHz frequency hopping spread spectrum radio only. The REXUA forms a complete electricity meter when installed in a housing and meter base.

Technical Details:

Detail	Description
Frequency Range	902.3 – 927.8 MHz
Number of Channels	239 (100kHz spacing) 86 (300kHz Spacing)
Modulation Format	GFSK
Data Rates (kbps)	9.6, 19.2, 38.4, 115.2(1)
Operating Voltage	18Vdc
Antenna Type(s) / Gain(s)	Printed circuit open-end slot antenna / 4.1dBi

(1) Note: 86th channel disabled in firmware for the 115.2kbps data rate.

Manufacturer Information:
Elster Solutions, LLC.
208 S. Rogers Lane
Raleigh, NC 27610

Test Sample Serial Number: Radiated Emissions: 1172901831
RF Conducted Emissions: 1172901834

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.

For radiated emissions, the EUT was evaluated in three orthogonal orientations. The worst-case orientation was X-position. The EUT was programmed to generate a continuously modulated signal on each channel evaluated.

For RF Conducted measurements, the EUT was connected to the test equipment with a U.FL to SMA connector. The EUT was programmed to generate a continuously modulated signal on each channel evaluated.

Software power setting during test: 32

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following addresses:

TÜV SÜD America, Inc.
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

TÜV SÜD America, Inc.
5945 Cabot Pkwy, Suite 100
Alpharetta, GA 30005
Phone: (678) 341-5900
Fax: N/A

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. (Buford Facility) is accredited to ISO/IEC 17025 by the ANSI-ASQ National Accreditation Board/ANAB accreditation program and has been issued certificate number AT-2021 in recognition of this accreditation.

TÜV SÜD America, Inc. (Alpharetta Facility) is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation/A2LA accreditation program and has been issued certificate number 2955.09 in recognition of this accreditation.

Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scopes of accreditation.

The Semi-Anechoic Chamber Test Sites, Open Area Test Sites (OATS) and Conducted Emissions Sites have been fully described, submitted to, and accepted by the FCC, ISED Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

Buford Facility

FCC Registration Number:	391271
ISED Canada Lab Code:	23597
VCCI Member Number:	1831
• VCCI Registration Number	A-0259

Alpharetta Facility

FCC Registration Number:	967699
ISED Canada Lab Code:	23932
VCCI Member Number:	1831
• VCCI Registration Number	A-0295

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site (Buford Facility)

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:

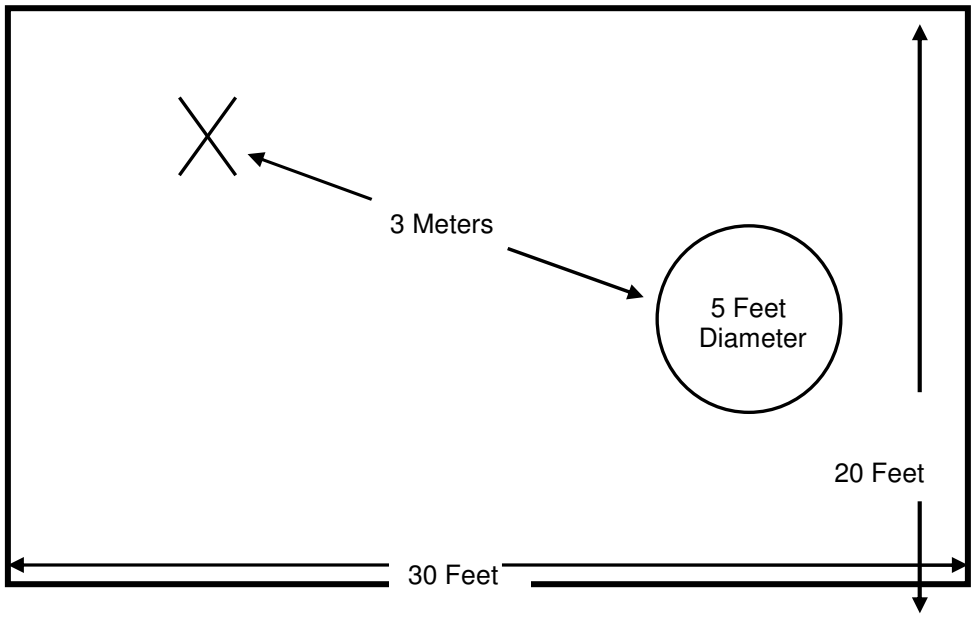

Figure 2.3.1: Semi-Anechoic Chamber Test Site (Buford Facility)

2.3.2 Semi-Anechoic Chamber Test Site (Alpharetta Facility)

The Semi-Anechoic Chamber Test Site consists of a 20'W x 30'L x 20'H shielded enclosure. The chamber is lined with ETS-Lindgren Ferrite Absorber, model number FT-1500. The ferrite tile 600 mm x 600 mm (2.62 in x 23.62 in) panels and are mounted directly on the inner walls of the chamber shield.

The specular regions of the chamber are lined with additional ETS-Lindgren PS-600 hybrid absorber to extend its frequency range up to 18GHz and beyond.

The turntable is a 2m ETS-Lindgren Model 2170, and installed off the center axis is located 5'6" 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 shield using #8 solid copper wire.

The antenna mast is an EMCO 1060 and is remotely controlled from the control room for both antenna height and polarization.

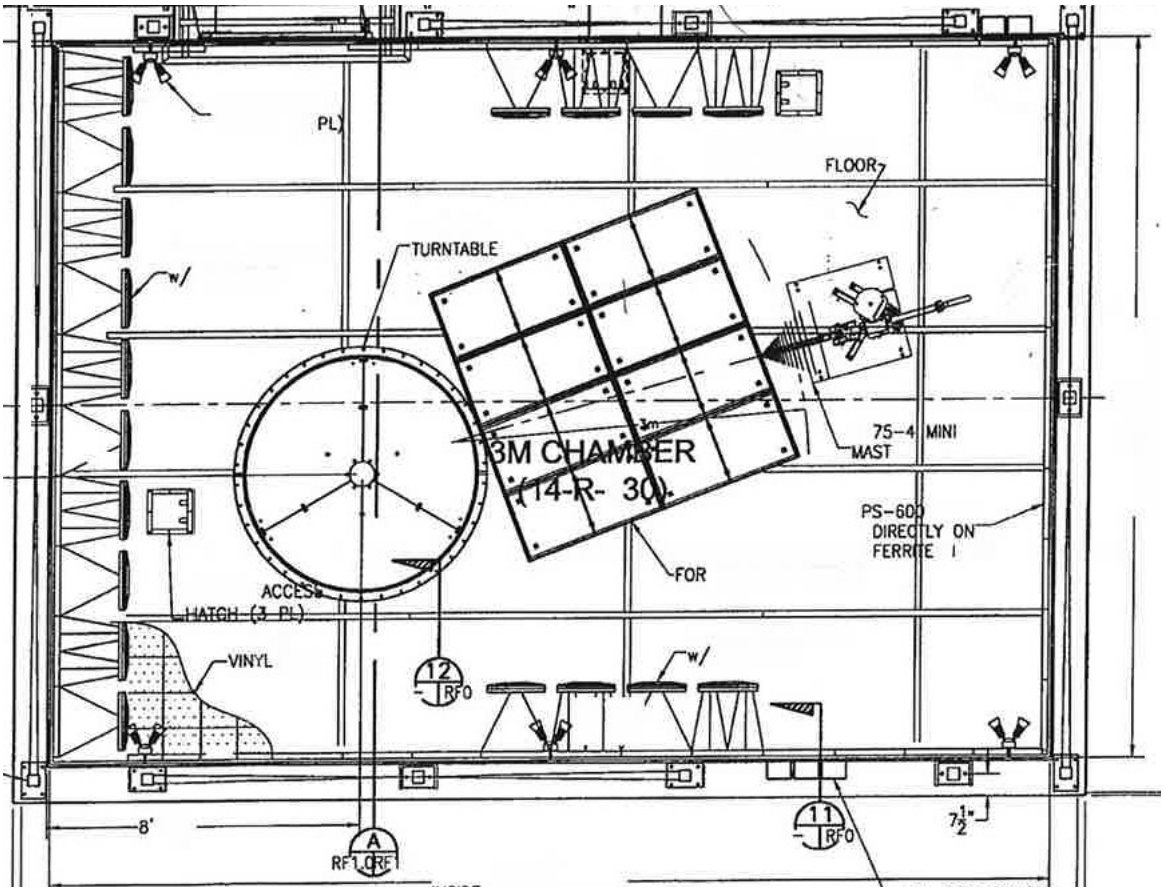

Figure 2.3.2: Semi-Anechoic Chamber Test Site (Alpharetta Facility)

2.3.3 Open Area Tests Site (Buford Facility)

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:

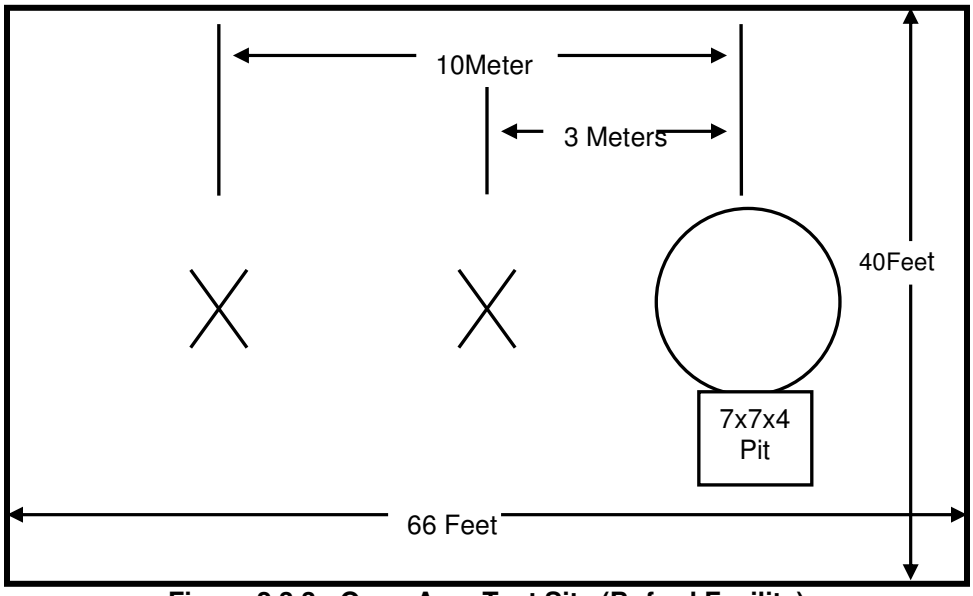

Figure 2.3.3: Open Area Test Site (Buford Facility)

2.4 Conducted Emissions Test Site Description

2.4.1 Conducted Emissions Test Site (Buford Facility)

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.

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

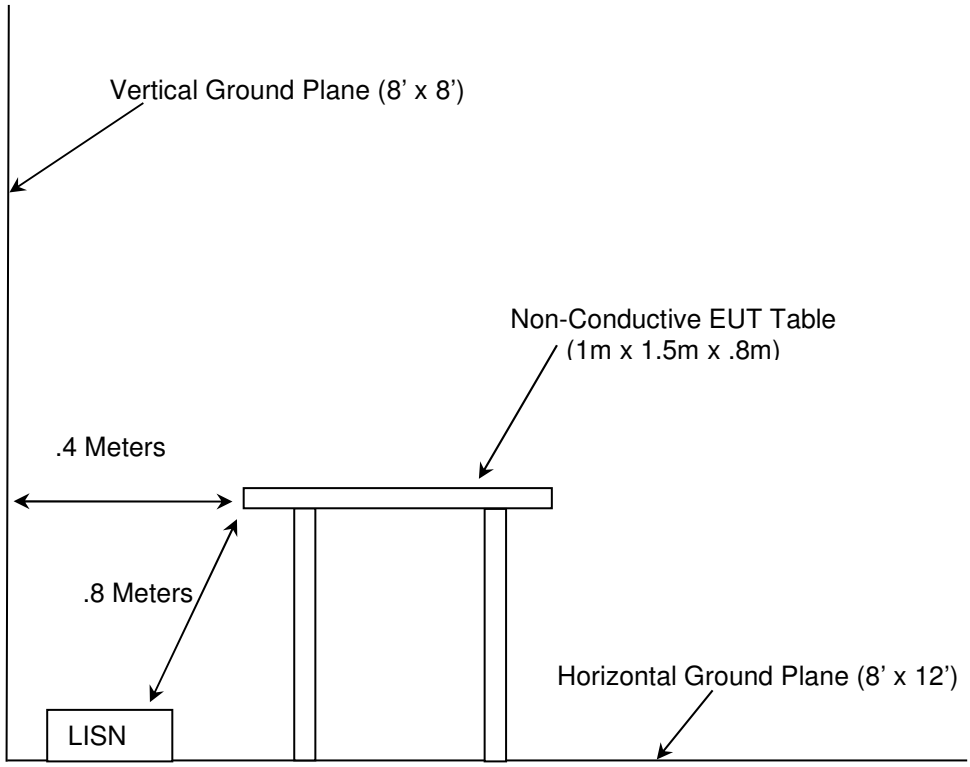

Figure 2.4.1: AC Mains Conducted EMI Site (Buford Facility)

2.4.2 Conducted Emissions Test Site (Alpharetta Facility)

The AC mains conducted EMI site is located in the main EMC lab. It consists of a 12' x 10' horizontal coupling plane(HCP) as well as a 12'x8' vertical coupling plane(VCP). The HGP is constructed of 4' x 10' sheets of particle board sandwiched by galvanized steel sheets. These panels are bonded using 11AWG 1/8" x 2" by 10' galvanized sheet steel secured to the panels via by screws. The VCP is constructed of three 4'x8' sheets of 11AWG solid aluminum.

The HCP and VCP are electrically bonded together using 1"x1" angled aluminum secured with screws.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4:2003 and 2009.

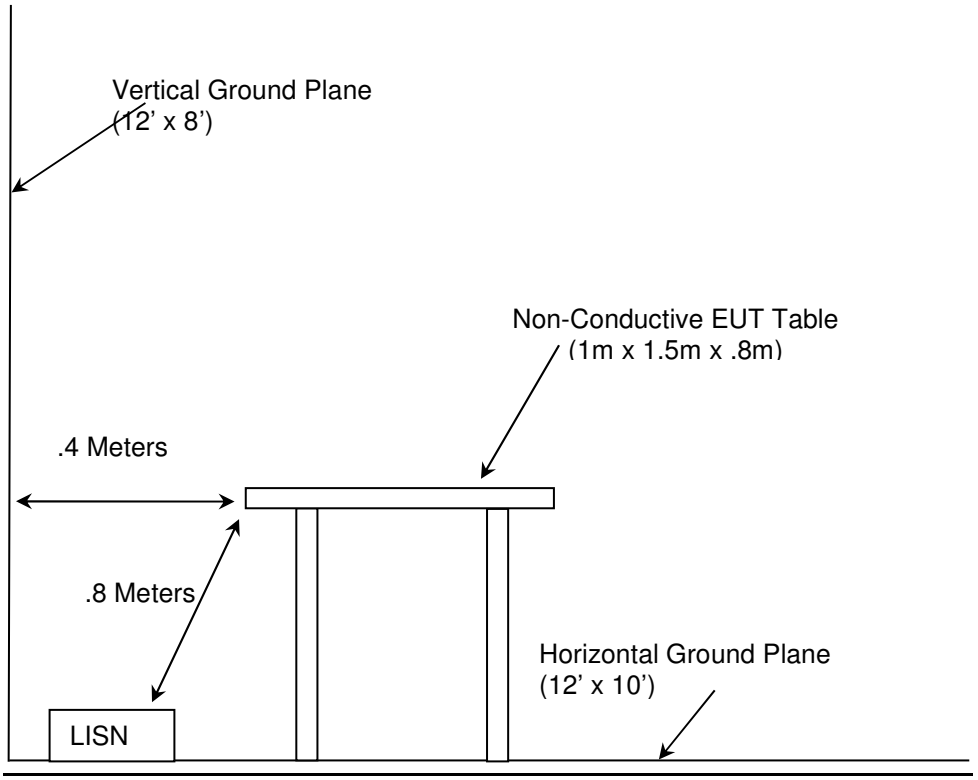

Figure 2.4.2: AC Mains Conducted EMI Site (Alpharetta Facility)

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2018
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2018
- FCC KDB 558074 D01 DTS Meas Guidance v04 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, April 5, 2017
- ISED Canada Radio Standards Specification: RSS-247 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017.
- ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 5, April 2018.

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

Device-No.	Name	Manufacturer	Model	Serial-No.	Last Calibration	Valid Until
30	1-18GHz Horn Antenna	Spectrum Technologies	DRH-0118	970102	05/09/2017	05/09/2019
40	Bicon Antenna	EMCO	3104	3211	06/08/2016	06/08/2018
73	Pre-Amp	Hewlett Packard	8447D	2727A05624	07/24/2017	07/24/2018
167	Consisits of cables 485, 242, 204 and 10	ACS	Chamber EMI Cable Set	167	09/29/2017	09/29/2018
267	Power Meter	Hewlett Packard	N1911A	MY45100129	08/22/2017	08/22/2019
268	Power Sensor	Hewlett Packard	N1921A	MY45240184	08/22/2017	08/22/2019
331	Filter	Microwave Circuits	H1G513G1	31417	05/13/2017	05/13/2018
331	Filter	Microwave Circuits	H1G513G1	31417	05/16/2018	05/16/2019
338	High Frequency Pre-Amp	Hewlett Packard	8449B	3008A01111	07/11/2017	07/11/2019
412	Log Periodic Antenna	Electro Metrics	LPA-25	1241	08/08/2016	08/08/2018
422	Cable	Florida RF	SMS-200AW-72.0-SMR	805	11/27/2017	11/27/2018
616	High Frequency Cable	Florida RF Cables	SMRE-200W-12.0-SMRE	N/A	10/07/2017	10/07/2018
622	FSV Signal Analyzer 10Hz to 40GHz	Rohde & Schwarz	FSV40 (v3.40)	101338	07/15/2016	07/15/2018
676	Cable	Florida RF Labs	SMS-290AW-480.0-SMS	MFR2Y194	01/08/2018	01/08/2019
819	EMI Test Receiver	Rohde & Schwarz USA, Inc.	ESR26	101345	10/31/2017	10/31/2018

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	DC Power Supply	Hewlett Packard	6622A	3448A03980
2	Personal Computer	Dell	Latitude E5450	N/A

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Wiring harness (USB / DC)	2.3 m	Yes	1, 2

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

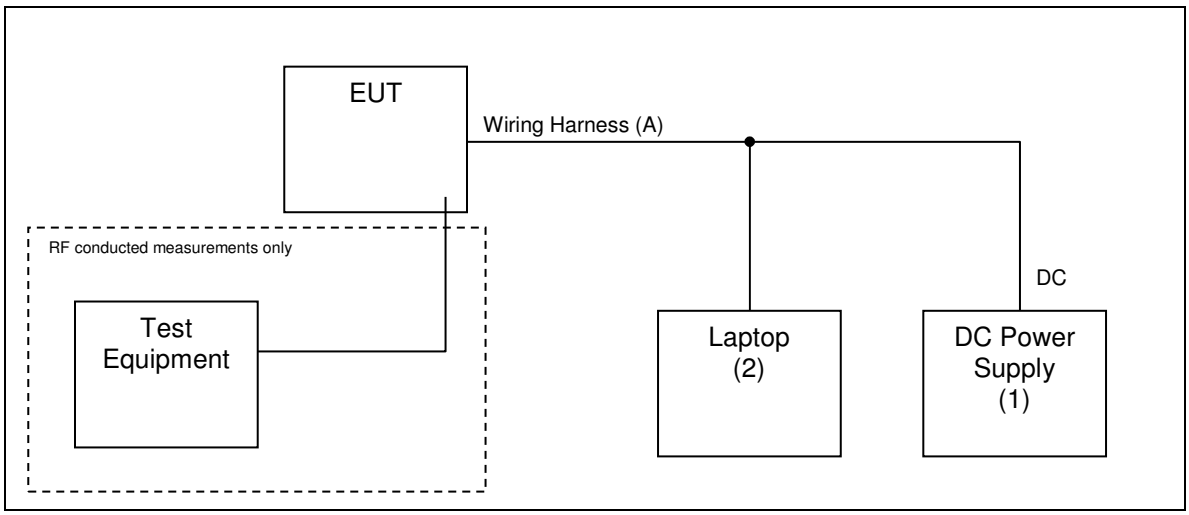

Figure 6-1: Test Setup Block Diagram

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 utilizes a printed circuit open-end slot antenna therefore satisfying the requirements of Section 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207; ISED Canada: RSS-Gen 8.8

7.2.1 Measurement Procedure

AC conducted emissions was not performed as part of this permissive change. Refer to the original filing for test data.

7.3 Peak Output Power – FCC: Section 15.247(b)(2); ISED Canada: RSS-247 5.4(a)

7.3.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was directly connected to the input of a power meter using suitable attenuation. The device employs > 50 channels at any given time therefore the power is limited to 1 Watt.

7.3.2 Measurement Results

Performed by: Jeremy Pickens in Alpharetta Facility

Table 7.3.2-1: Maximum Conducted Peak Output Power

Frequency [MHz]	Level [dBm]	Data Rate [kbps]
902.3	26.3	9.6
915.0	26.2	9.6
927.8	26.0	9.6
902.3	26.1	19.2
915.0	26.1	19.2
927.8	26.1	19.2
902.3	26.1	38.4
915.0	26.0	38.4
927.8	25.9	38.4
902.3	26.0	115.2
915.0	26.1	115.2
927.5	26.2	115.2

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation – FCC: Section 15.247(a)(1); ISED Canada: RSS-247 5.1(b)

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW started at approximately 30% of the channel spacing and adjusted as necessary to best identify the center of each individual channel. The VBW was set to ≥ RBW.

Carrier frequency separation was measured for the highest data rate at each channel spacing and data presented in section 7.4.1.2 below.

7.4.1.2 Measurement Results

Performed by: Jeremy Pickens in Alpharetta Facility

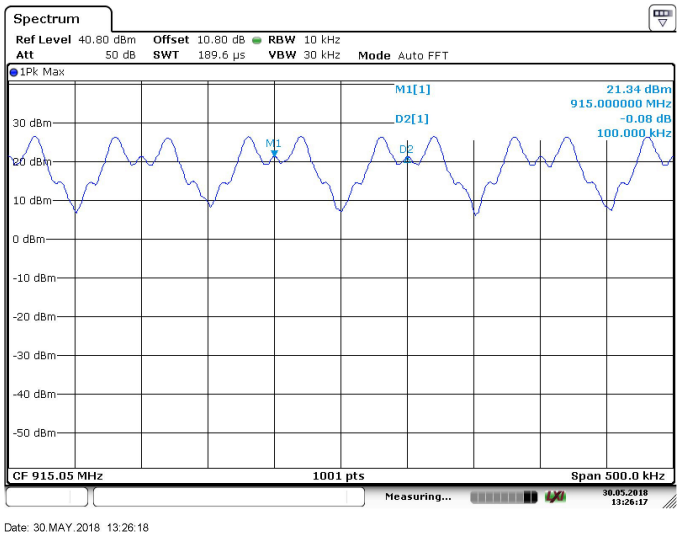

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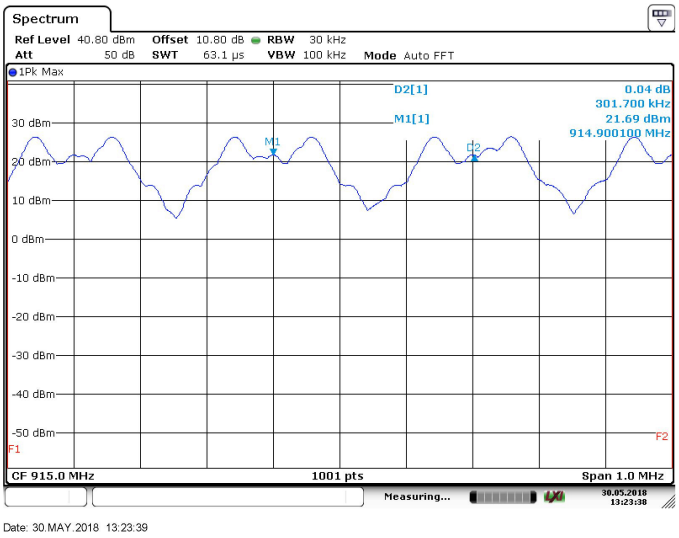
Figure 7.4.1.2-1: Freq. Separation – 100kHz Separation



Date: 30.MAY.2018 13:23:39

Figure 7.4.1.2-2: Freq. Separation – 300kHz Separation

7.4.2 Number of Hopping Channels – FCC: Section 15.247(a)(1)(i); ISED Canada: RSS-247 5.1(c)

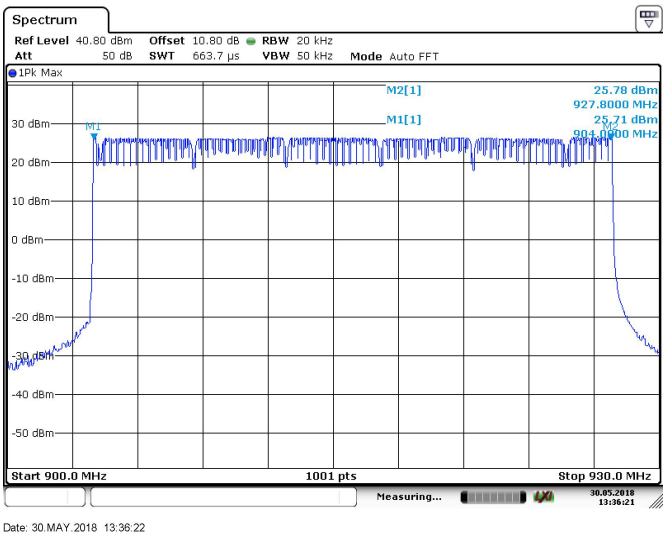
7.4.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. The span of the spectrum analyzer was set wide enough to capture the frequency band of operation. The RBW was set to less than 30% of the channel spacing or the 20dB bandwidth, whichever is smaller. The VBW was set to ≥ RBW.

The number of hopping channels was measured for the highest data rate at each channel spacing and data presented in section 7.4.2.2 below.

7.4.2.2 Measurement Results

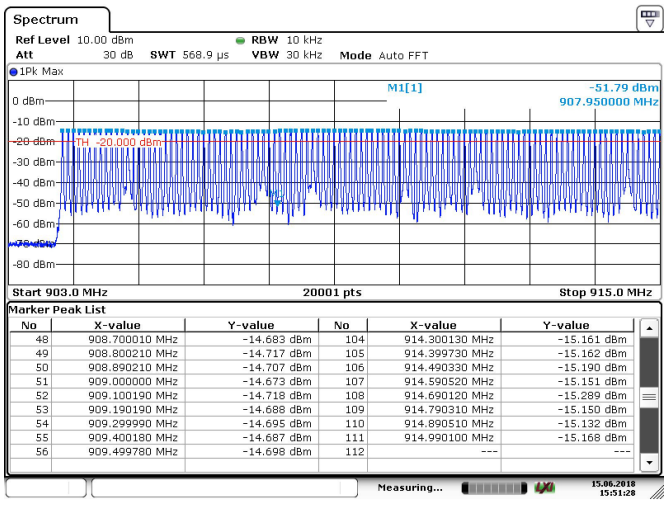
Performed by: Jeremy Pickens in Alpharetta Facility



Date: 30.MAY.2018 13:36:22

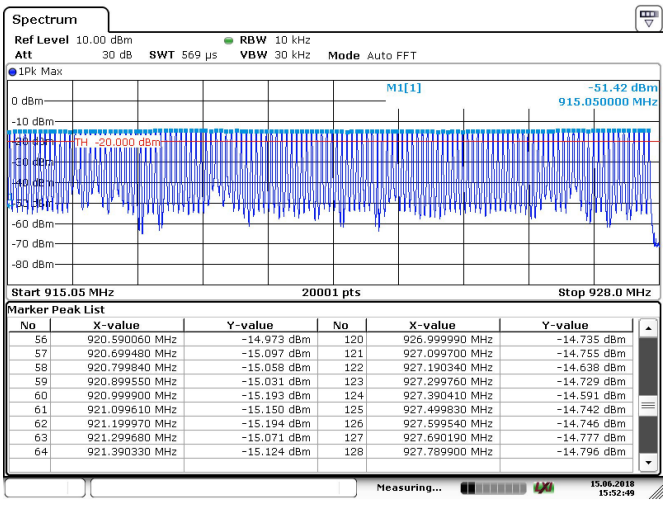
(904-927.8)/0.1 + 1 = 239 Channels

Figure 7.4.2.2-1: No. of Channels – 100kHz Spacing – 38.4kbps



Date: 15.JUN.2018 15:51:28

Figure 7.4.2.2-2: No. of Channels – 100kHz Spacing – 38.4kbps 903-915MHz



Date: 15.JUN.2018 15:52:48

Figure 7.4.2.2-3: No. of Channels – 100kHz Spacing – 38.4kbps 915-928MHz

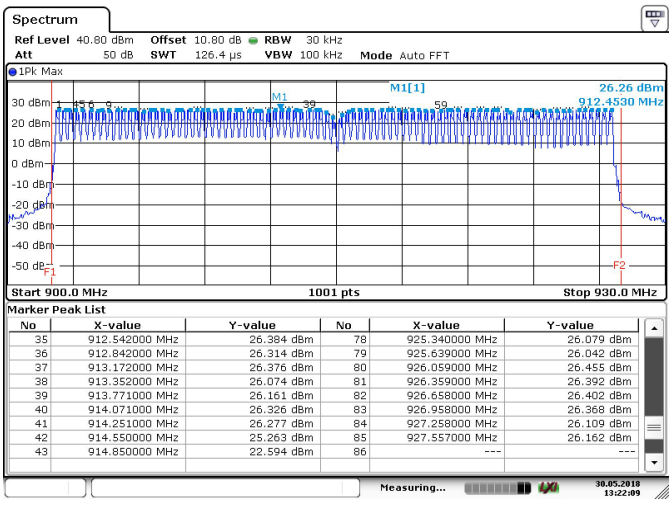


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Figure 7.4.2.2-4: No. of Channels – 300kHz Spacing – 115.2kbps

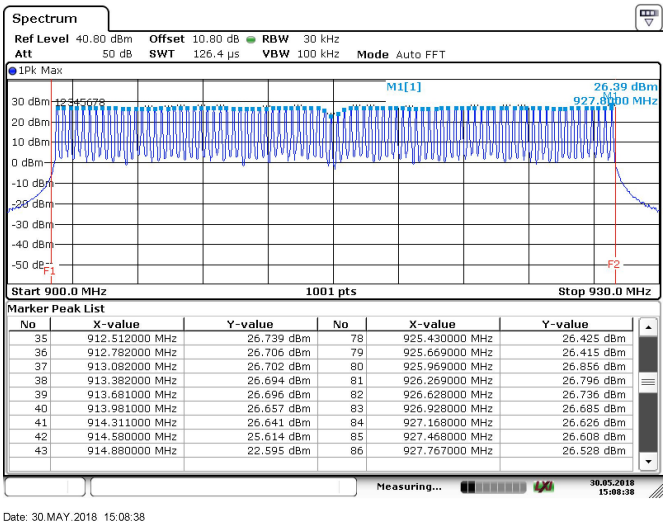


Figure 7.4.2.2-5: No. of Channels – 300kHz Spacing – 38.4kbps

7.4.3 Channel Dwell Time – FCC: Section 15.247(a)(1)(i); ISED Canada: RSS-247 5.1(c)

7.4.3.1 Measurement Procedure

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

7.4.4 20dB / 99% Bandwidth – FCC: Section 15.247(a)(1)(i); ISED Canada: RSS-247 5.1(c)

7.4.4.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. 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 ndB down function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

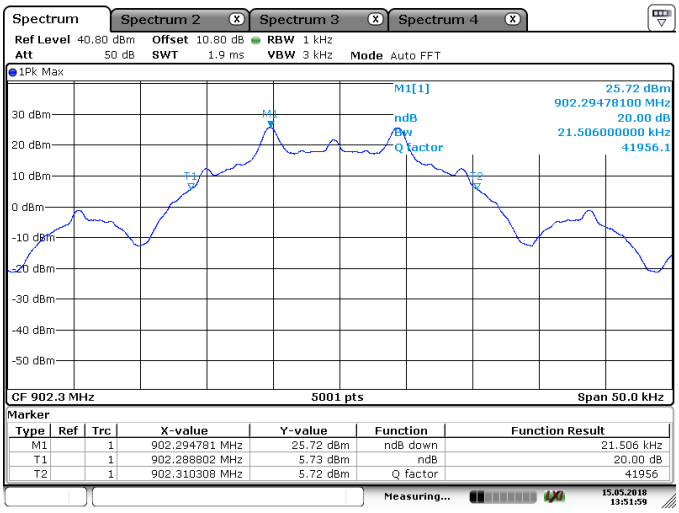
The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The resolution bandwidth was set to 1% to 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth. A peak detector was used.

7.4.4.2 Measurement Results

Performed by: Jeremy Pickens in Alpharetta Facility

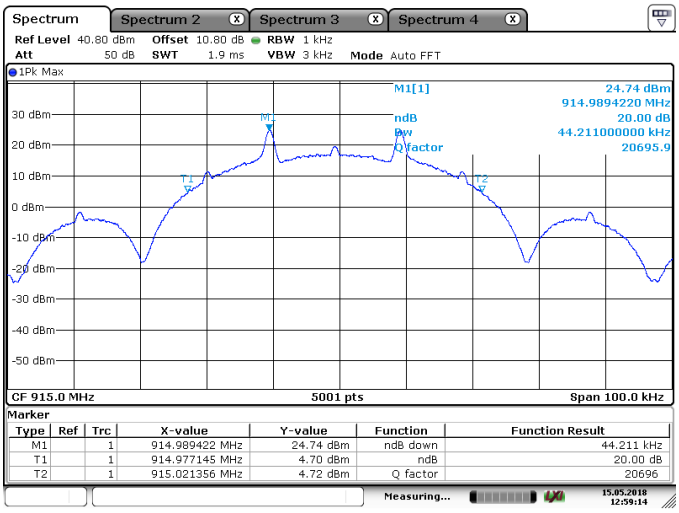
Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Data Rate [kbps]
902.3	21.51	20.76	9.6
902.3	43.51	44.45	19.2
902.3	90.78	90.42	38.4
902.3	255.20	266.80	115.2
915.0	22.85	20.73	9.6
915.0	44.21	44.25	19.2
915.0	90.70	90.30	38.4
915.0	250.90	266.90	115.2
927.8	21.49	20.76	9.6
927.8	44.57	44.27	19.2
927.8	91.86	90.14	38.4
927.5	252.78	265.21	115.2



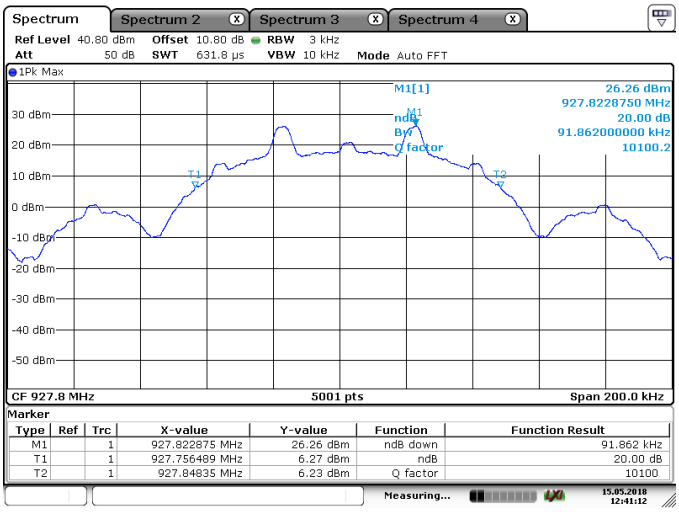
Date: 15.MAY.2018 13:51:59

Figure 7.4.4.2-1: Sample Plot 20dB BW- 9.6kbps



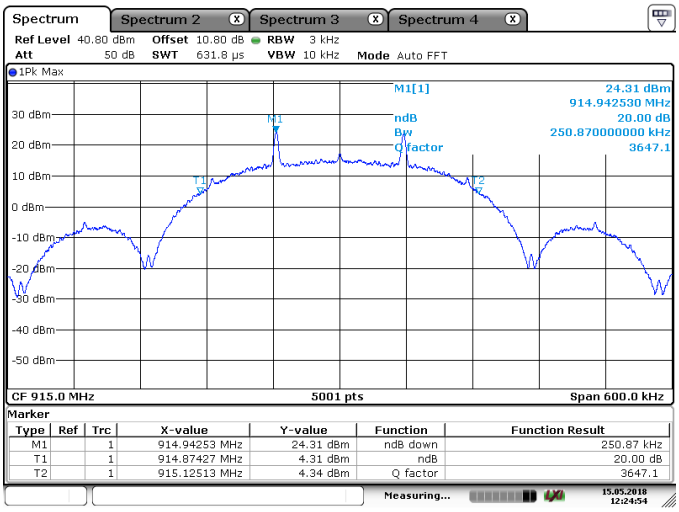
Date: 15.MAY.2018 12:59:14

Figure 7.4.4.2-2: Sample Plot 20dB BW- 19.2kbps



Date: 15.MAY.2018 12:41:12

Figure 7.4.4.2-3: Sample Plot 20dB BW- 38.4kbps



Date: 15.MAY.2018 12:24:54

Figure 7.4.4.2-4: Sample Plot 20dB BW- 115.2kbps

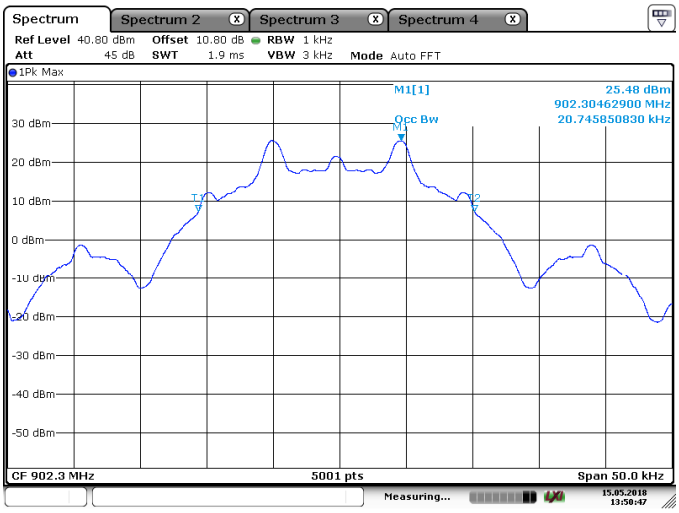


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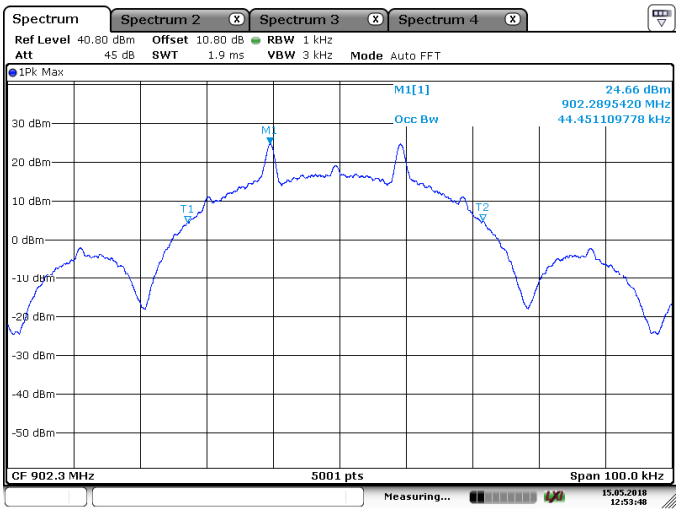
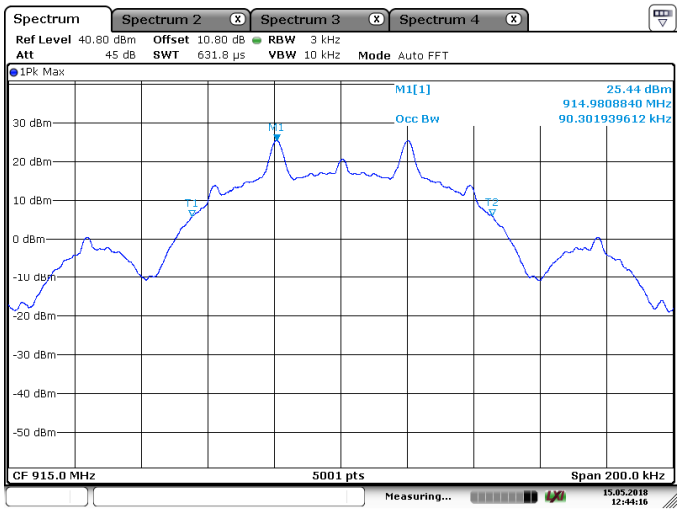
Figure 7.4.4.2-5: Sample Plot 99% OBW- 9.6kbps



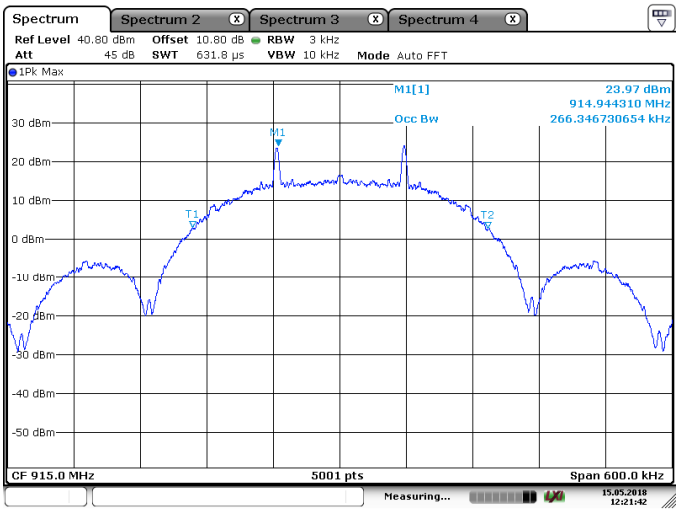
Date: 15.MAY.2018 12:53:48

Figure 7.4.4.2-6: Sample Plot 99% OBW- 19.2kbps



Date: 15.MAY.2018 12:44:16

Figure 7.4.4.2-7: Sample Plot 99% OBW- 38.4kbps



Date: 15.MAY.2018 12:21:42

Figure 7.4.4.2-8: Sample Plot 99% OBW- 115.2kbps

7.5 Band-Edge Compliance and Spurious Emissions

7.5.1 Band-Edge Compliance of RF Conducted Emissions – FCC: Section 15.247(d); ISED Canada: RSS-247 5.5

7.5.1.1 Measurement Procedure

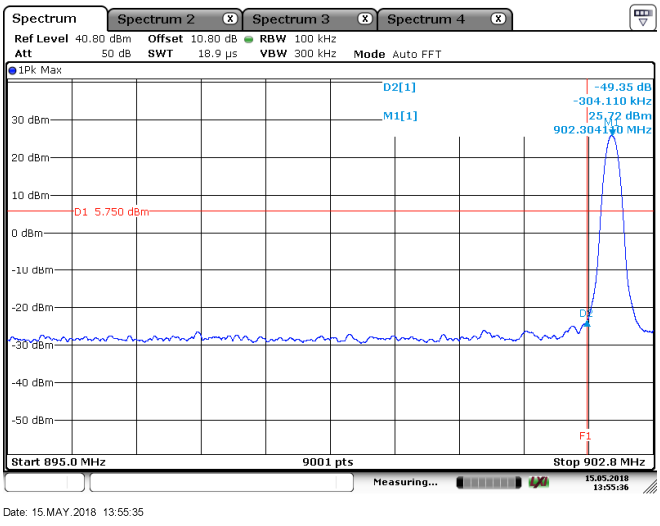
The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement, the spectrum analyzer's RBW was set to 100kHz and the VBW was set to 300kHz.

Band-edge was evaluated for all combinations of operating modes and data rates. In hopping mode, the highest data rate at each channel spacing was used to show compliance. For the 300kHz spacing, the data was repeated at the next highest data rate to show the added channel at 907.8MHz which is not used at 115.2kbps.

7.5.1.2 Measurement Results

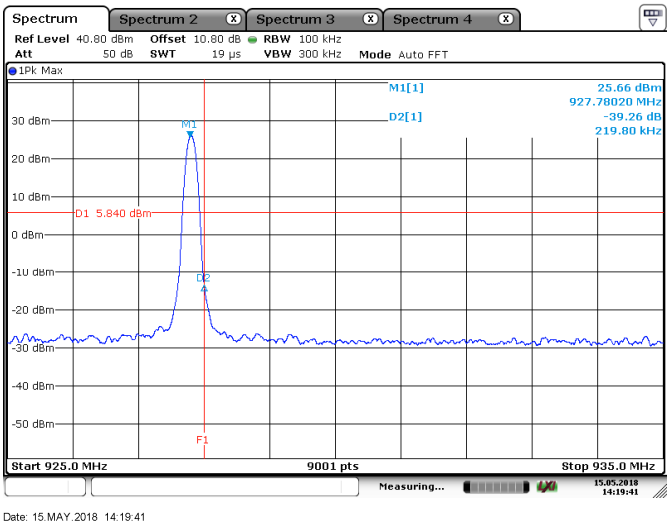
Performed by: Jeremy Pickens in Alpharetta Facility

NON-HOPPING MODE:



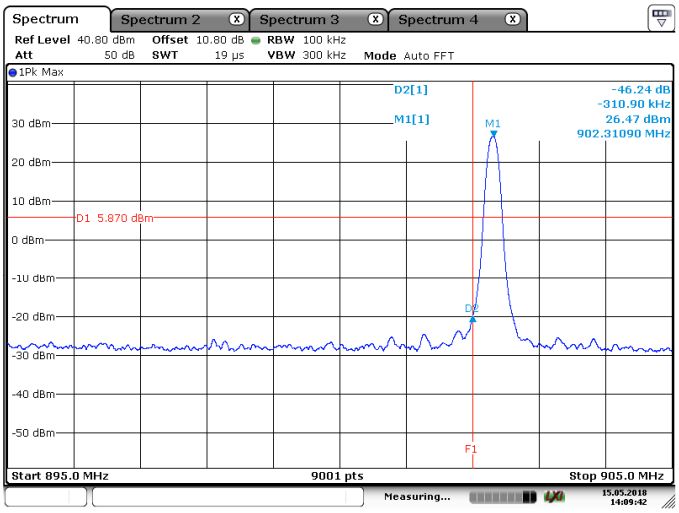
Date: 15.MAY.2018 13:55:35

Figure 7.5.1.2-1: Lower Band-edge – 9.6kbps



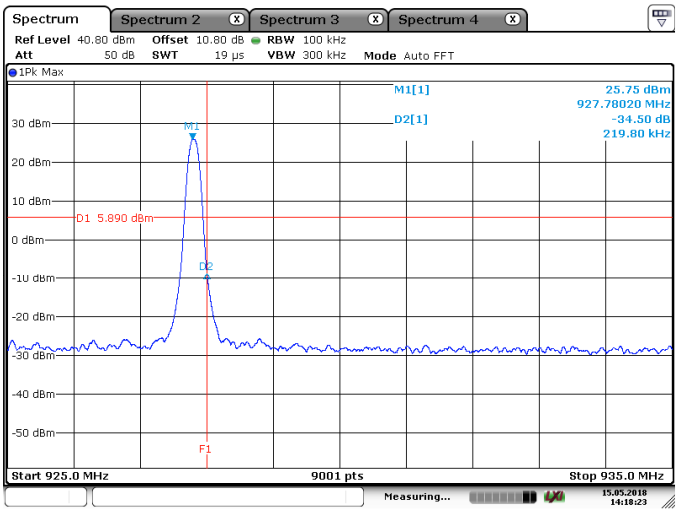
Date: 15.MAY.2018 14:19:41

Figure 7.5.1.2-2: Upper Band-edge – 9.6kbps



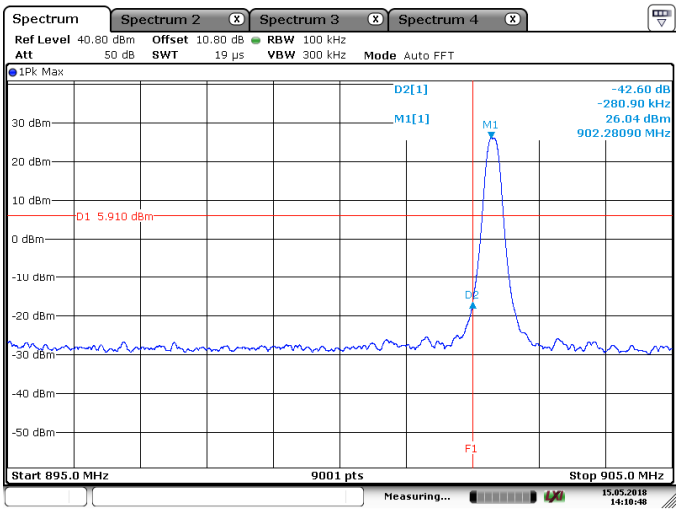
Date: 15.MAY.2018 14:09:43

Figure 7.5.1.2-3: Lower Band-edge – 19.2kbps



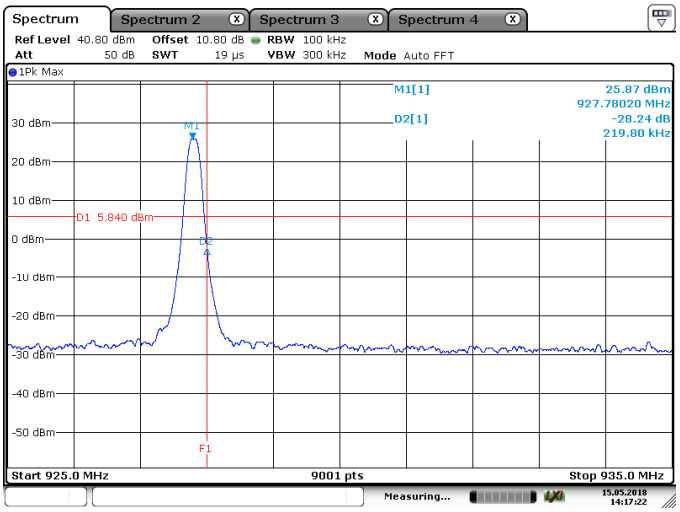
Date: 15.MAY.2018 14:18:23

Figure 7.5.1.2-4: Upper Band-edge – 19.2kbps



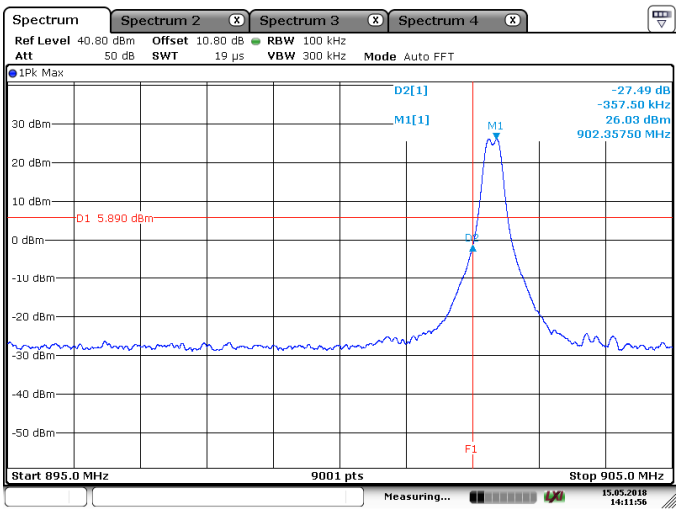
Date: 15.MAY.2018 14:10:48

Figure 7.5.1.2-5: Lower Band-edge – 38.4kbps



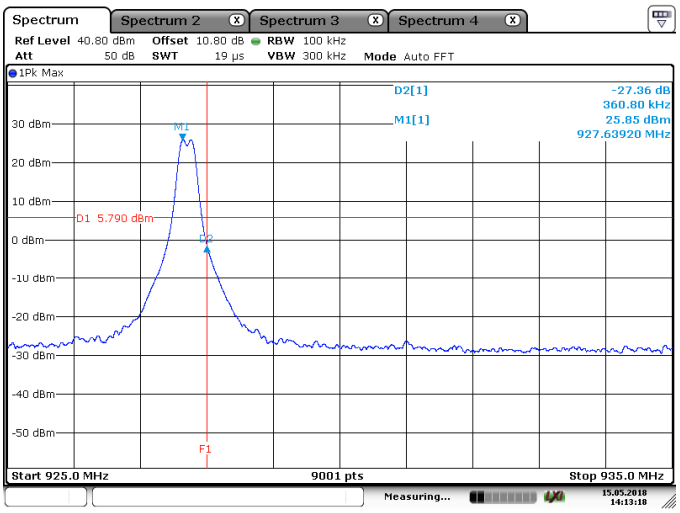
Date: 15.MAY.2018 14:17:22

Figure 7.5.1.2-6: Upper Band-edge – 38.4kbps



Date: 15.MAY.2018 14:11:57

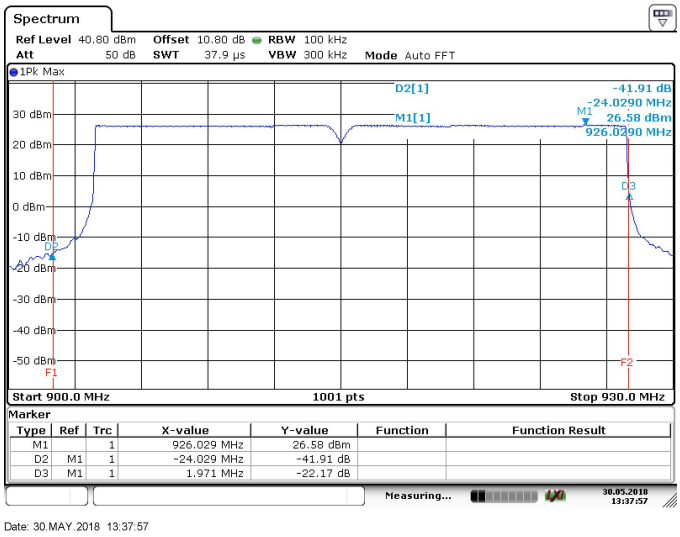
Figure 7.5.1.2-7: Lower Band-edge – 115.2kbps



Date: 15.MAY.2018 14:13:19

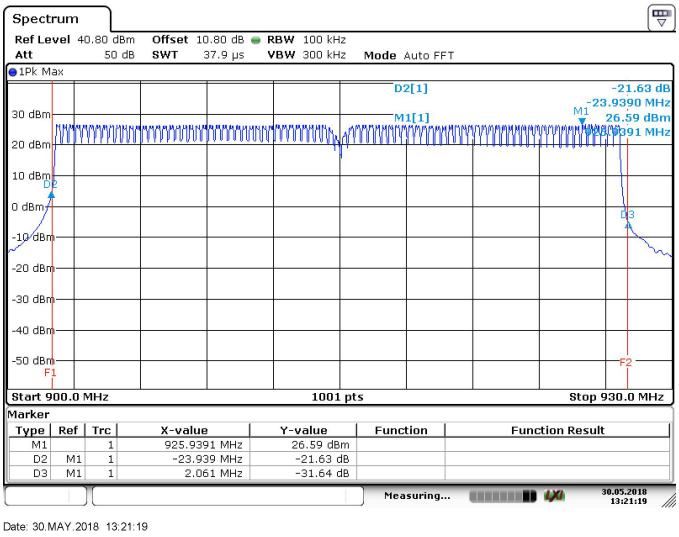
Figure 7.5.1.2-8: Upper Band-edge – 115.2kbps

HOPPING MODE:



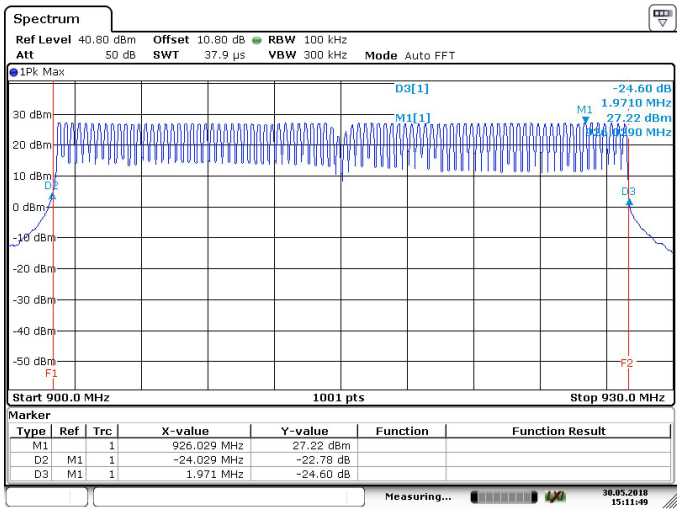
Date: 30.MAY.2018 13:37:57

Figure 7.5.1.2-9: Band Edges – 100kHz Spacing – 38.4kbps



Date: 30.MAY.2018 13:21:19

Figure 7.5.1.2-10: Band Edges – 300kHz Spacing – 115.2kbps



Date: 30.MAY.2018 15:11:49

Figure 7.5.1.2-11: Band Edges – 300kHz Spacing – 38.4kbps

7.5.2 RF Conducted Spurious Emissions – FCC: Section 15.247(d); ISED Canada: RSS-247 5.5

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. Worst-case data presented (9.6kbps)

7.5.2.2 Measurement Results

Performed by: Jeremy Pickens in Alpharetta Facility

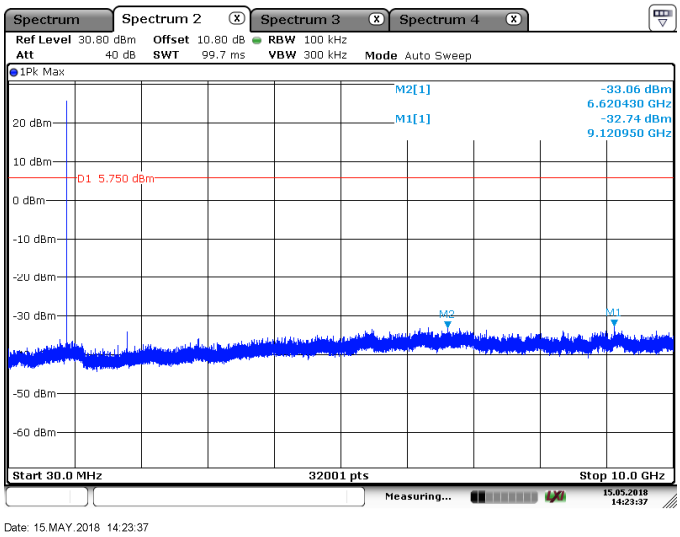


Figure 7.5.2.2-1: 30 MHz – 10 GHz – Low Channel

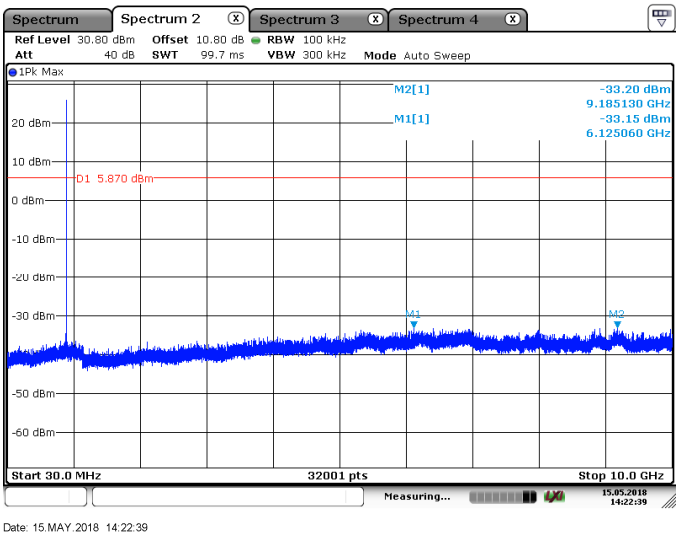


Figure 7.5.2.2-2: 30 MHz – 10 GHz – Middle Channel

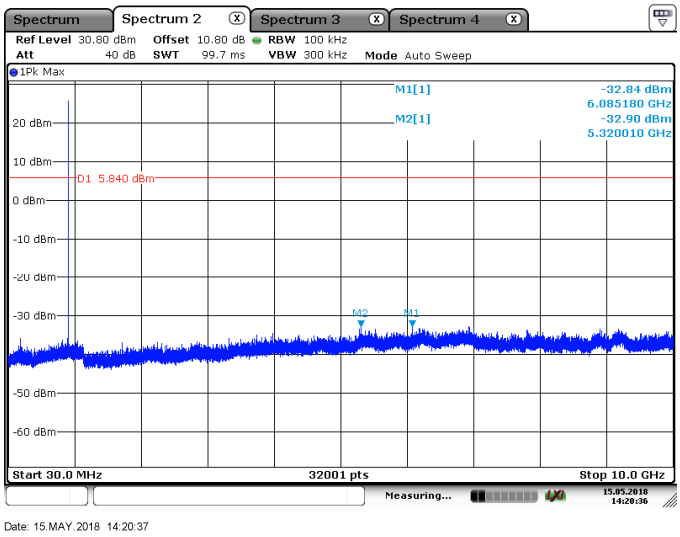


Figure 7.5.2.2-3: 30 MHz – 10 GHz –High Channel

7.5.3 Radiated Spurious Emissions – FCC: Section 15.205, 15.209; ISED Canada: RSS-Gen 8.9/8.10

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 1 meter to 4 meters so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz 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.

7.5.3.2 Measurement Results

Performed by: Mark Afroozi in Buford Facility

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	49.60	39.70	H	-2.95	46.65	36.75	74.0	54.0	27.3	17.2
2706.6	50.50	41.20	V	-2.95	47.55	38.25	74.0	54.0	26.4	15.7
3608.8	49.70	36.40	H	0.41	50.11	36.81	74.0	54.0	23.9	17.2
3608.8	50.10	36.20	V	0.41	50.51	36.61	74.0	54.0	23.5	17.4
4511	50.10	37.00	H	2.23	52.33	39.23	74.0	54.0	21.7	14.8
4511	49.40	36.60	V	2.23	51.63	38.83	74.0	54.0	22.4	15.2
5413.2	48.60	38.20	H	5.02	53.62	43.22	74.0	54.0	20.4	10.8
5413.2	48.30	37.60	V	5.02	53.32	42.62	74.0	54.0	20.7	11.4
8119.8	49.80	36.43	H	9.01	58.81	45.44	74.0	54.0	15.2	8.6
8119.8	50.30	36.00	V	9.01	59.31	45.01	74.0	54.0	14.7	9.0
Middle Channel										
2745	50.70	39.90	H	-2.81	47.89	37.09	74.0	54.0	26.1	16.9
2745	51.80	39.90	V	-2.81	48.99	37.09	74.0	54.0	25.0	16.9
3660	52.10	36.20	H	0.62	52.72	36.82	74.0	54.0	21.3	17.2
4575	51.70	42.90	H	2.47	54.17	45.37	74.0	54.0	19.8	8.6
4575	51.30	41.30	V	2.47	53.77	43.77	74.0	54.0	20.2	10.2
High Channel										
2783.4	51.50	40.90	H	-2.68	48.82	38.22	74.0	54.0	25.2	15.8
2783.4	52.70	40.90	V	-2.68	50.02	38.22	74.0	54.0	24.0	15.8
3711.2	51.20	37.60	H	0.83	52.03	38.43	74.0	54.0	22.0	15.6
3711.2	49.60	36.50	V	0.83	50.43	37.33	74.0	54.0	23.6	16.7
4639	52.30	44.50	H	2.71	55.01	47.21	74.0	54.0	19.0	6.8
4639	51.40	42.90	V	2.71	54.11	45.61	74.0	54.0	19.9	8.4

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: 52.30 + 2.71 = 55.01dBuV/m
Margin: 74dBuV/m – 55.01dBuV/m = 19.0dB

Example Calculation: Average

Corrected Level: 44.50 + 2.71 - 0 = 47.21dBuV
Margin: 54dBuV – 47.21dBuV = 6.8dB

8 ESTIMATION OF MEASUREMENT UNCERTAINTY

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

Table 8-1: Estimation of Measurement Uncertainty

Parameter	U_{lab}
Occupied Channel Bandwidth	± 0.009 %
RF Conducted Output Power	± 0.349 dB
Power Spectral Density	± 0.372 dB
Antenna Port Conducted Emissions	± 1.264 dB
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB
Temperature	± 0.860 °C
Radio Frequency	± 2.832 x 10^{-8}
AC Power Line Conducted Emissions	± 3.360 dB

9 CONCLUSION

In the opinion of TÜV SÜD America, Inc. the REXUA, manufactured by Elster Solutions, LLC meets the requirements of FCC Part 15 subpart C and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented herein.

END REPORT

10 Appendix A – ANAB Accreditation Certificate (Buford Facility)

CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board
500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

TÜV SÜD America, Inc.
5015 B. U. Bowman Drive
Buford, GA 30518

has been assessed by ANAB
and meets the requirements of international standard

ISO/IEC 17025:2005

while demonstrating technical competence in the field of

TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of tests to which this accreditation applies.

AT-2021
Certificate Number

ANAB Approval

Certificate Valid: 03/14/2018 - 12/17/2018
Version No. 013 Issued: 03/14/2018

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).