Certification Test Report

FCC ID: SK9ACT2
IC: 864G-ACT2

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

Report Number: AT72139651-2C1

Manufacturer: Itron, Inc.
Model: RIVA 4.1

Test Begin Date: May 22, 2018
Test End Date: July 9, 2018

Report Issue Date: August 1, 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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This report contains 30 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 modular approval.

1.2 Product description

The Itron ACT2 is an electricity metering module which includes a 902.4 MHz to 927.6 MHz transmitter as well as 2.4GHz WLAN. The module operates on AC as well as DC voltage which is supplied by a host device.

This test report documents the compliance of the 902.4 MHz to 927.6 MHz transceiver mode of operation.

Technical Details:

Detail	Description
Frequency Range	902.4 – 927.6 MHz
Number of Channels	64
Channel Spacing	400kHz
Modulation Format	FSK, OFDM, DSSS
Data Rates	FSK: 50kbps, 150kbps OFDM: 200kbps, 600kbps, 1200kbps(1) DSSS: 12.5kbps
Operating Voltage	24Vdc
Antenna Type(s) / Gain(s)	¼ Wave Embedded Slot Antenna / 2.5dBi

(1) Note: The 1200kbps results were recorded in a separate Hybrid test report

Manufacturer Information:
Itron, Inc.
313 N Hwy 11
West Union, SC 29696

Test Sample Serial Number: Radiated Emissions: 105900002044
Power Line Conducted Emissions: 105900002044
RF Conducted Emissions: 105900002047

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 worst-case data rate for FSK modulation was 50kbps. The worst-case data rate for OFDM modulation was 200kbps. The worst-case data rate for DSSS modulation was 12.5kbps.

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 power line conducted emissions, the EUT was powered by a representative wall wart power supply.

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:	FSK/DSSS: RFIC Attn: 6, DMCC Scale 32D5 OFDM: RFIC Attn: 9, DMCC Scale 1586

2 TEST FACILITIES

2.1 Location

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

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

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. 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 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.

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

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.

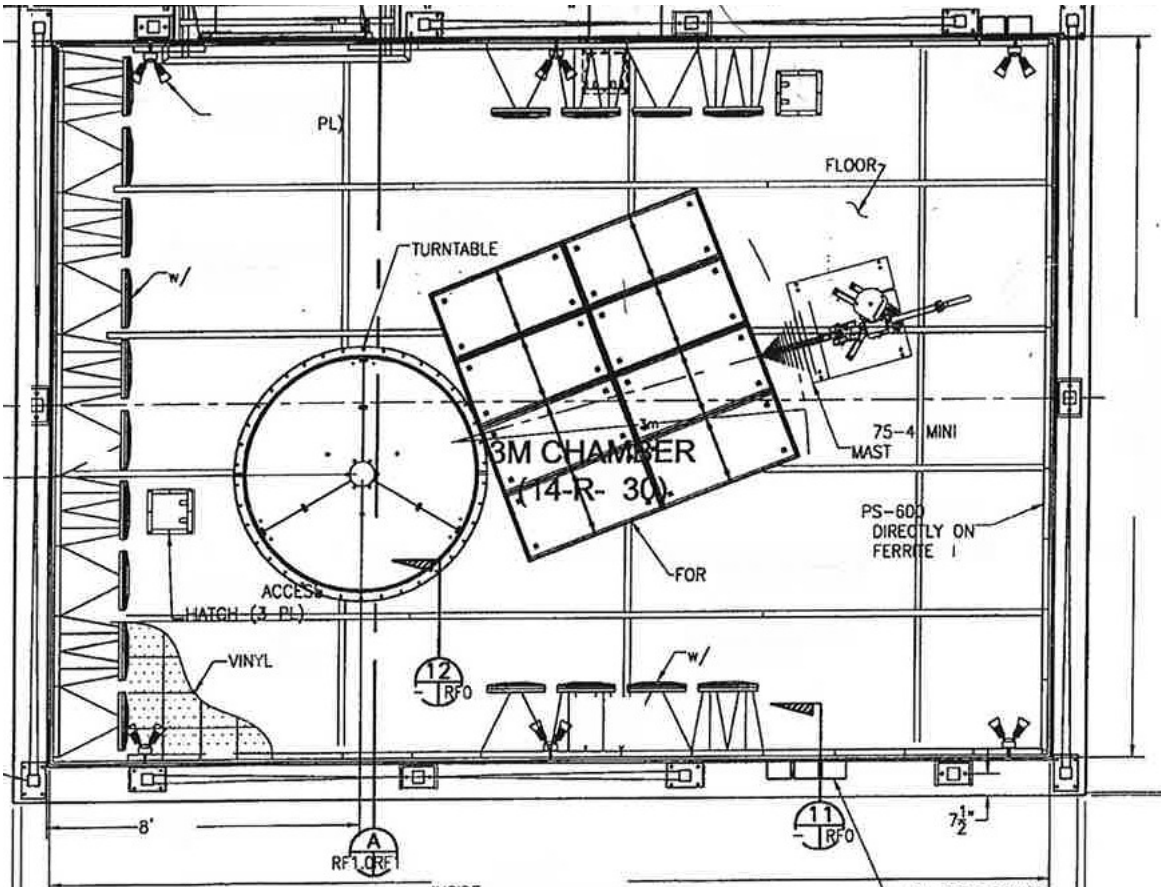

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.4 Conducted Emissions Test Site Description

2.4.1 Conducted Emissions Test Site

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 C63.10.

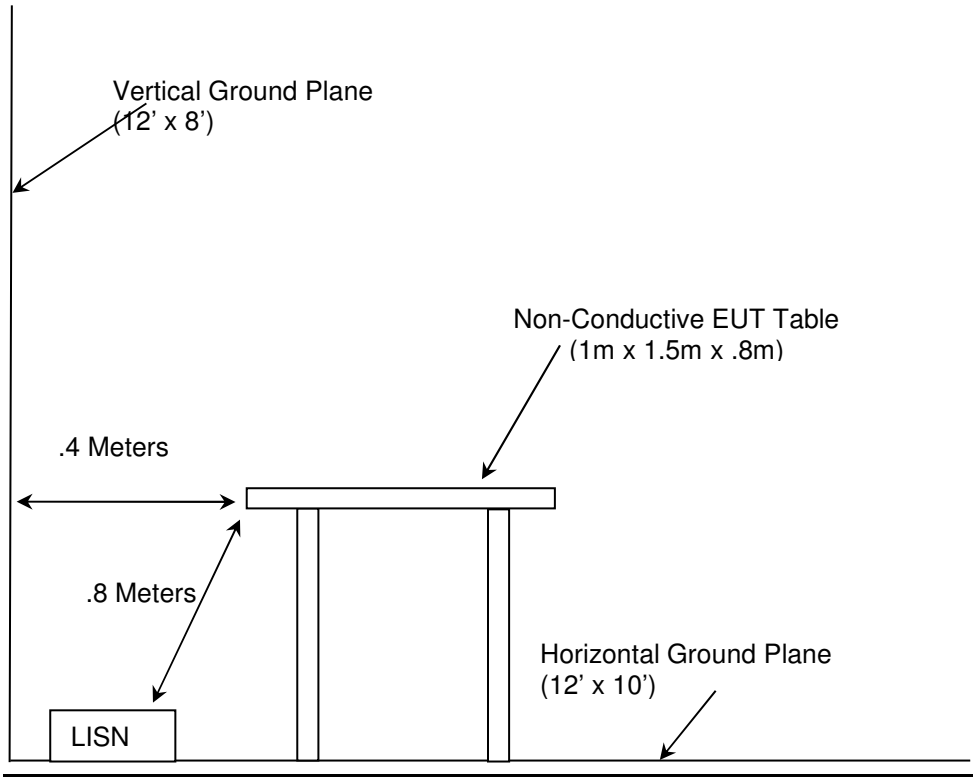

Figure 2.4.1-1: AC Mains Conducted EMI Site

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
- 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

Asset ID	Manufacturer	Model	Equipment Type	Serial Number	Last Calibration Date	Calibration Due Date
30	Spectrum Technologies	DRH-0118	1-18GHz Horn Antenna	970102	05/09/2017	05/09/2019
213	TEC	PA 102	Amplifier	44927	07/24/2017	07/24/2018
324	TUV	Belden	Conducted EMI Cable	8214	04/05/2018	04/05/2019
331	Microwave Circuits	H1G513G1	Microwave Bandpass Filter	31417	05/16/2018	05/16/2019
338	Hewlett Packard	8449B	High Frequency Pre-Amp	3008A01111	07/11/2017	07/11/2019
412	Electro Metrics	LPA-25	Log Periodic Antenna	1241	08/08/2016	08/08/2018
622	Rohde & Schwarz	FSV40 (v3.40)	FSV Signal Analyzer 10Hz to 40GHz	101338	07/15/2016	07/15/2018
731	EMCO	3104	Bicon Antenna	2659	11/09/2016	11/09/2018
813	PMM	9010	EMI Receiver; RF Input 50ohm; 10Hz-50MHz; 10Hz-30MHz	697WW30606	02/12/2018	02/12/2019
819	Rohde & Schwarz	ESR26	EMI Test Receiver	101345	10/31/2017	10/31/2018
827	Rohde & Schwarz	TS8997 Rack Cable Set	TS8997 Rack Cable Set	N/A	07/28/2017	07/28/2018
836	ETS Lindgren	SAC Cable Set	SAC Cable Set includes 620, 837, 838	N/A	05/01/2018	05/01/2019
3010	Rohde & Schwarz	ENV216	Two-Line V-Network	3010	07/11/2017	07/11/2018
3010	Rohde & Schwarz	ENV216	Two-Line V-Network	3010	07/11/2018	07/11/2019

NOTE: All test equipment was used only during active calibration cycles.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model/Part Number	Serial Number
1	AC/DC Adapter	Cincon Electronics	TRG1524-A	N/A

Table 5-2: Cable Description

Cable	Cable Type	Length	Shield	Termination
A	DC Power Cable	1.75 m	No	EUT to Power Supply

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

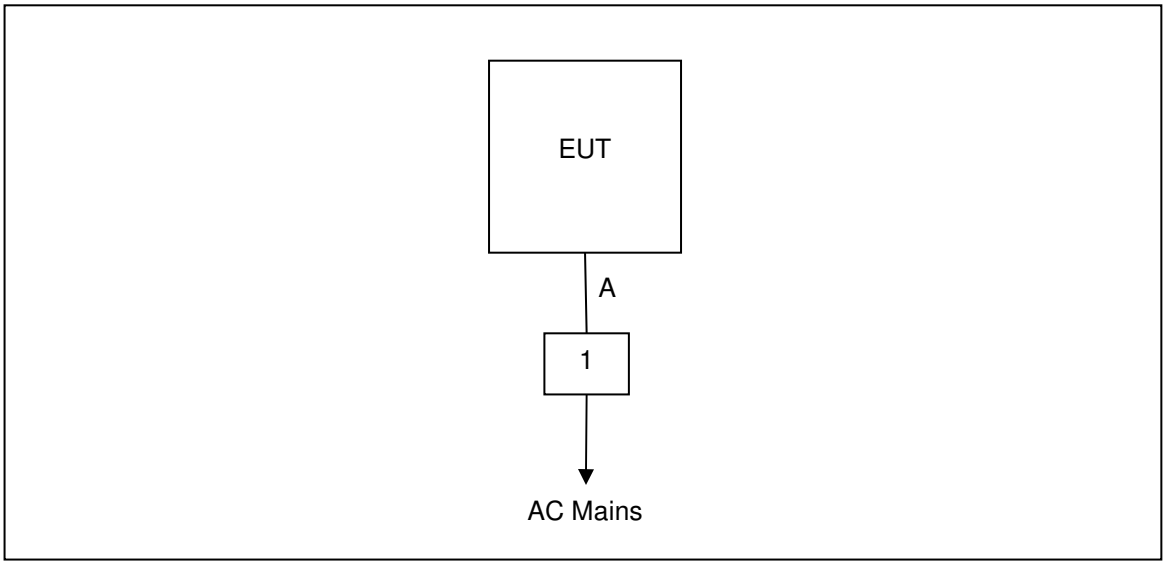

Figure 6-1: Test Setup Block Diagram

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 ¼ wave embedded slot antenna. The antenna is integral to the device and cannot be removed or replaced by the end user. The gain of the antenna is 2.5 dBi.

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

7.2.1 Measurement Procedure

ANSI C63.10 was the guiding document 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

Performed by: Tyler Leeson

Table 7.2.2-1: Conducted EMI Results – Line 1

Frequency (MHz)	Corrected Reading		Limit		Margin		Correction (dB)
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	
0.15	31.42	17.89	66	56	34.58	38.11	9.59
0.17	35.92	29.12	64.96	54.96	29.04	25.84	9.58
0.182	34.21	17.54	64.39	54.39	30.18	36.85	9.58
0.194	27.68	13.36	63.86	53.86	36.18	40.5	9.58
0.418	28.69	15.77	57.49	47.49	28.8	31.72	9.59
0.454	35.13	23.13	56.8	46.8	21.67	23.67	9.59
0.47	36.42	19.84	56.51	46.51	20.09	26.67	9.59
0.482	35.3	15.25	56.3	46.3	21	31.05	9.59
0.646	29.15	15.64	56	46	26.85	30.36	9.59
29.986	27.48	13.4	60	50	32.52	36.6	9.91

Table 7.2.2-2: Conducted EMI Results – Line 2

Frequency (MHz)	Corrected Reading		Limit		Margin		Correction (dB)
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	
0.15	26.58	17.94	66	56	39.42	38.06	9.59
0.162	26.55	20.43	65.36	55.36	38.81	34.93	9.58
0.198	25.38	13.04	63.69	53.69	38.31	40.65	9.58
0.418	25.37	14.41	57.49	47.49	32.12	33.08	9.59
0.458	34.4	24.18	56.73	46.73	22.33	22.55	9.59
0.466	34.54	22.02	56.58	46.58	22.04	24.56	9.59
0.474	34.39	16.49	56.44	46.44	22.05	29.95	9.59
2.618	25.2	10.63	56	46	30.8	35.37	9.62
2.682	24.74	10.65	56	46	31.26	35.35	9.62
29.998	28.8	13.49	60	50	31.2	36.51	10

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

Table 7.3.2-1: Maximum Conducted Peak Output Power

Frequency [MHz]	Level [dBm]	Modulation Format	Data Rate [kbps]
902.2	28.9	FSK	50
915.0	29.1	FSK	50
927.8	29.3	FSK	50
902.2	29.1	FSK	150
915.0	29.2	FSK	150
927.8	29.4	FSK	150
902.4	29.4	OFDM	200
915.0	29.6	OFDM	200
927.6	29.8	OFDM	200
902.4	29.5	OFDM	600
915.0	29.6	OFDM	600
927.6	29.8	OFDM	600
902.2	29.0	DSSS	12.5
915.0	29.1	DSSS	12.5
927.8	29.3	DSSS	12.5

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 all modes of operation and data presented in section 7.4.1.2 below.

7.4.1.2 Measurement Results

Performed by: Jeremy Pickens

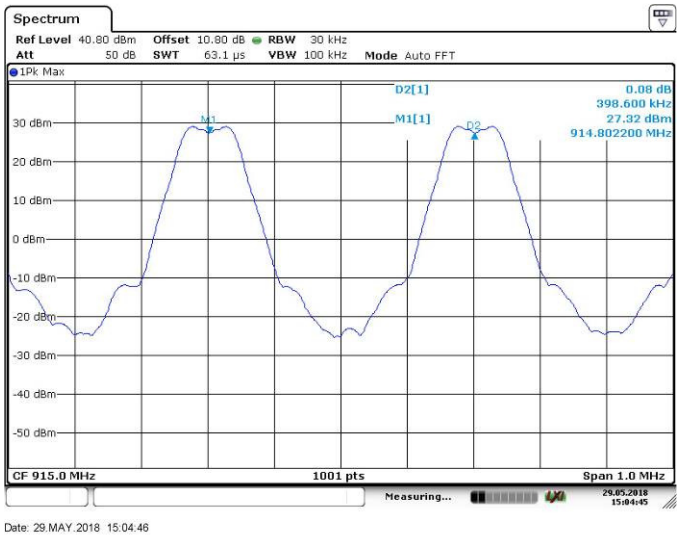

Figure 7.4.1.2-1: Freq. Separation – FSK – 50kbps

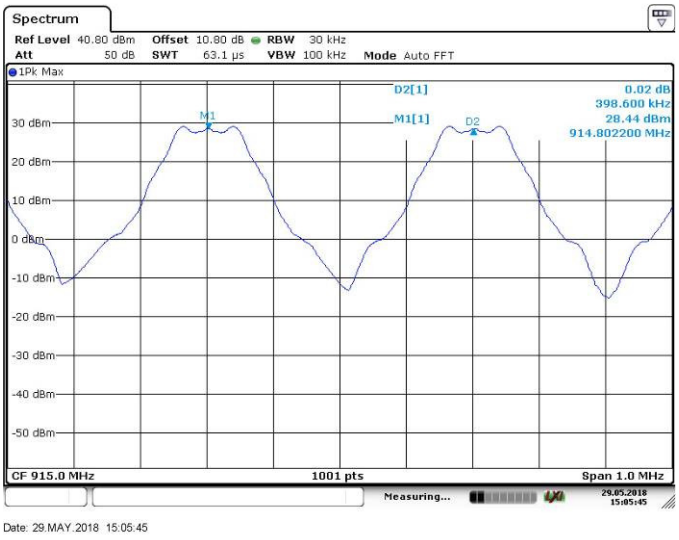

Figure 7.4.1.2-2: Freq. Separation – FSK – 150kbps

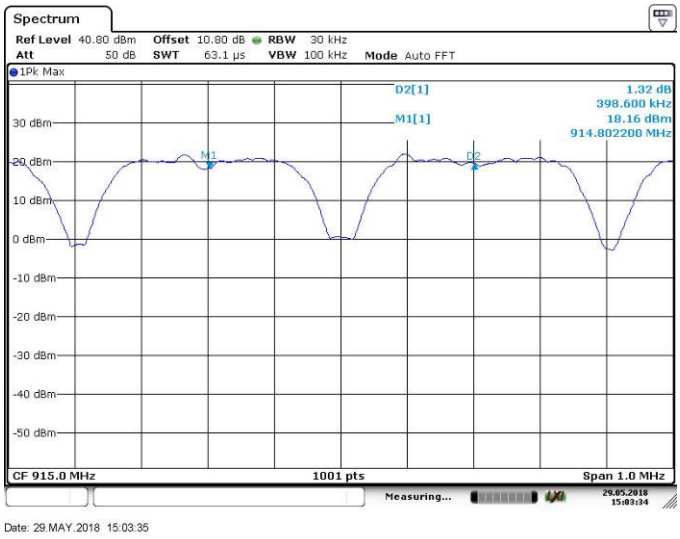

Figure 7.4.1.2-3: Freq. Separation – OFDM – 200kbps

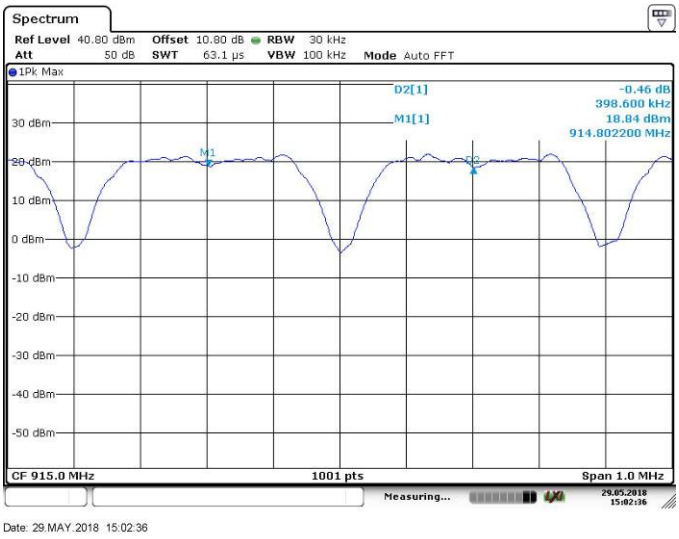

Figure 7.4.1.2-4: Freq. Separation – OFDM – 600kbps

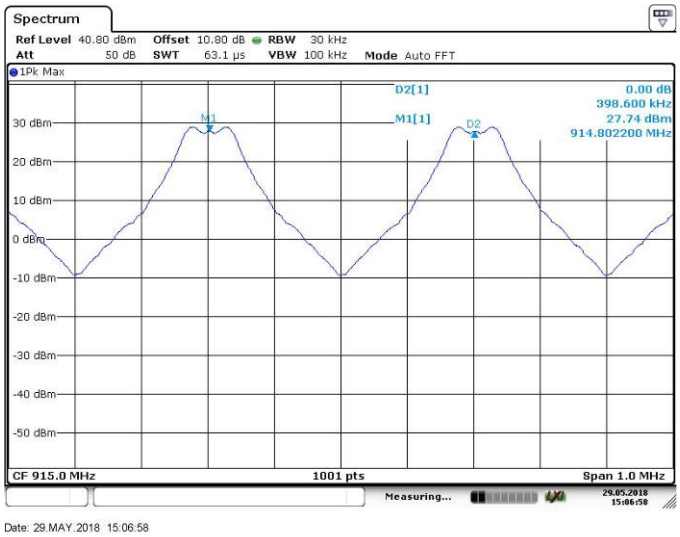

Figure 7.4.1.2-5: Freq. Separation – DSSS – 12.5kbps

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 modes of operation and data presented in section 7.4.2.2 below.

7.4.2.2 Measurement Results

Performed by: Jeremy Pickens

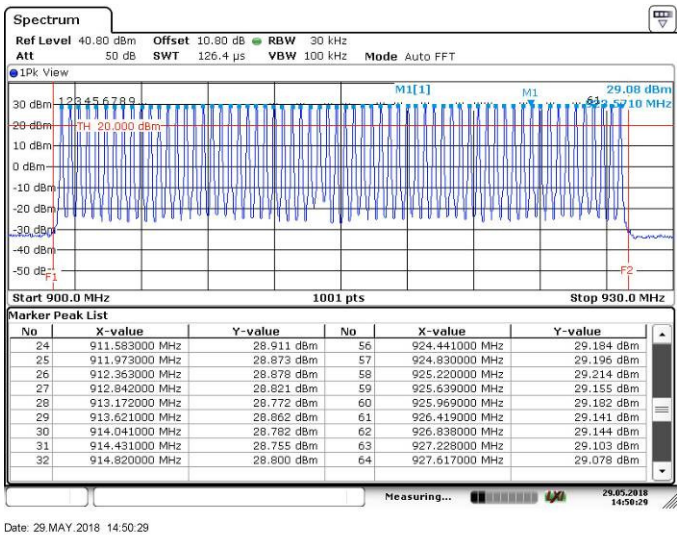

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Figure 7.4.2.2-1: No. of Channels – FSK – 50kbps

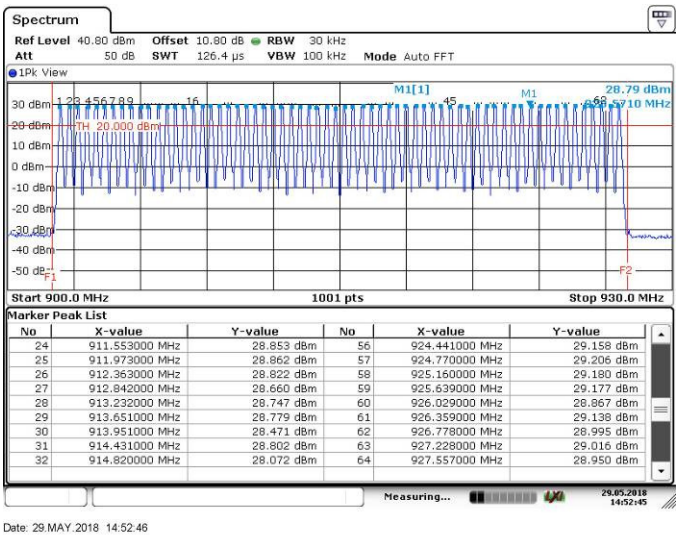

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Figure 7.4.2.2-2: No. of Channels – FSK – 150kbps

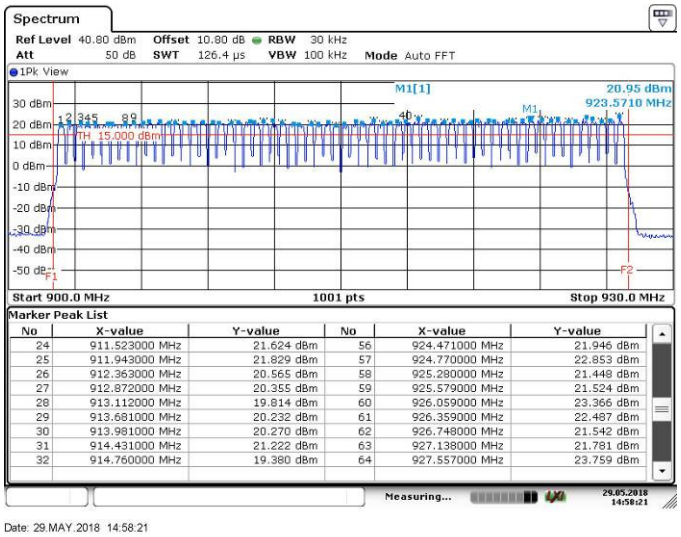

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Figure 7.4.2.2-3: No. of Channels – OFDM – 200kbps

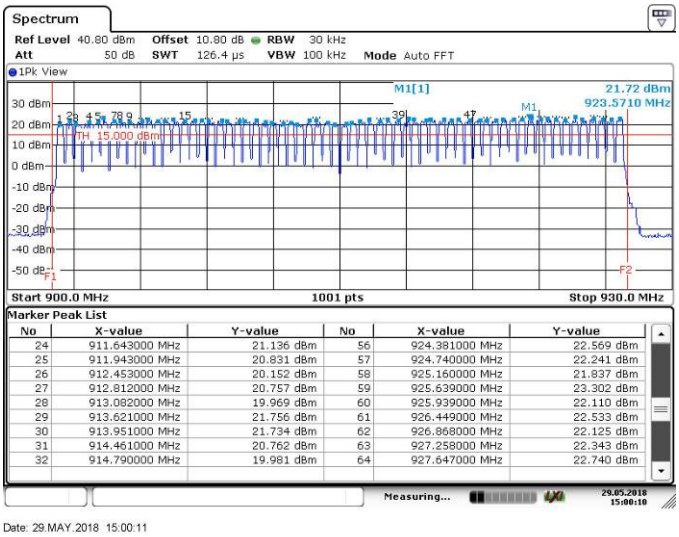

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Figure 7.4.2.2-4: No. of Channels – OFDM – 600kbps

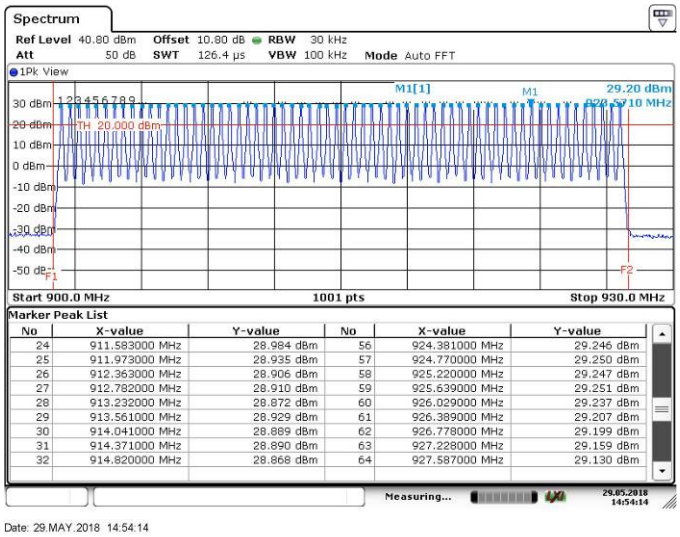

Figure 7.4.2.2-5: No. of Channels – DSSS – 12.5kbps

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 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); 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

Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Data Rate [kbps]	Mode(s)
902.4	102.68	92.86	50	FSK
902.4	183.66	158.42	150	FSK
902.4	335.33	288.24	200	OFDM
902.4	326.13	286.94	600	OFDM
902.4	130.87	118.86	12.5	DSSS
915.0	95.08	92.74	50	FSK
915.0	178.66	157.54	150	FSK
915.0	335.73	286.94	200	OFDM
915.0	330.73	286.24	600	OFDM
915.0	130.47	118.02	12.5	DSSS
927.6	95.48	92.65	50	FSK
927.6	181.56	158.04	150	FSK
927.6	337.93	289.54	200	OFDM
927.6	330.13	287.74	600	OFDM
927.6	130.77	118.14	12.5	DSSS

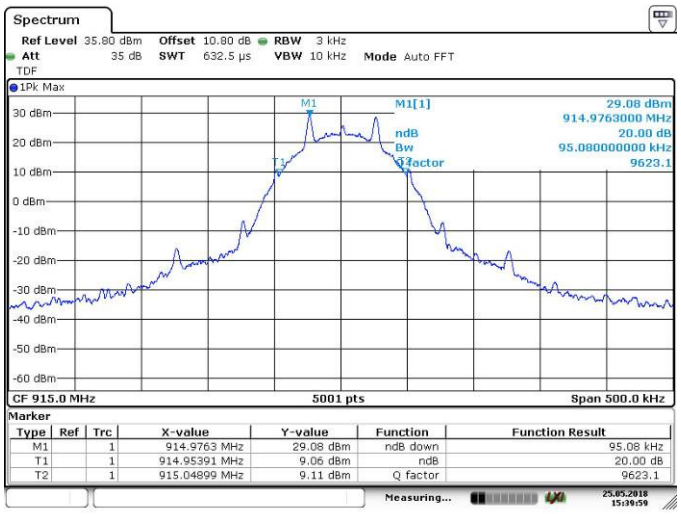

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Figure 7.4.4.2-1: Sample Plot 20dB BW- FSK – 50kbps

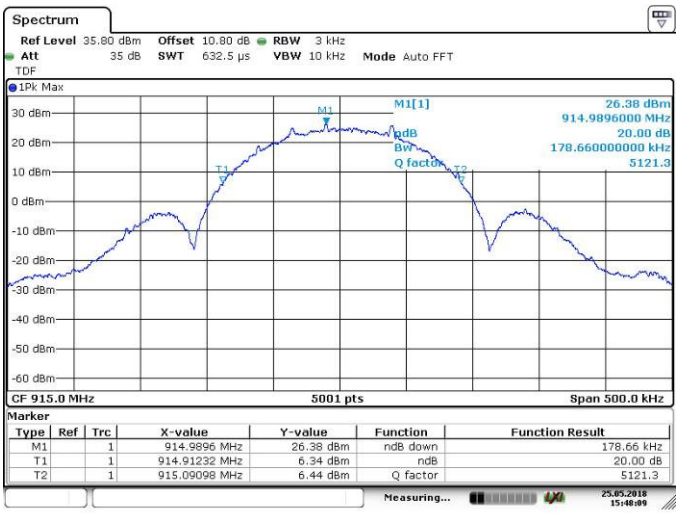

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Figure 7.4.4.2-2: Sample Plot 20dB BW- FSK – 150kbps

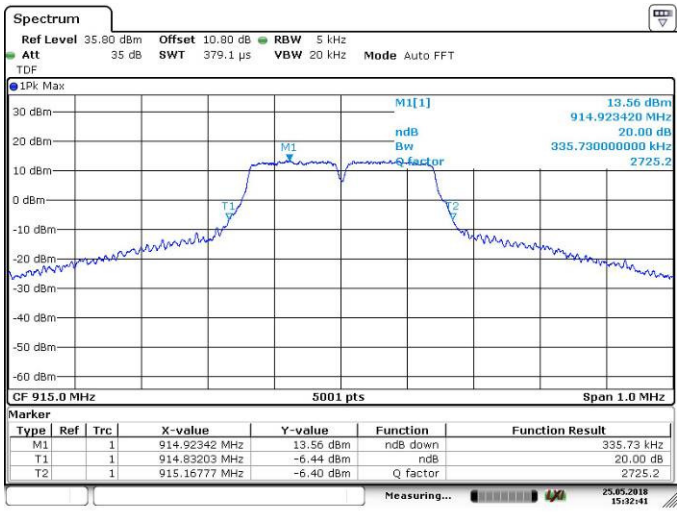

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Figure 7.4.4.2-3: Sample Plot 20dB BW- OFDM – 200kbps

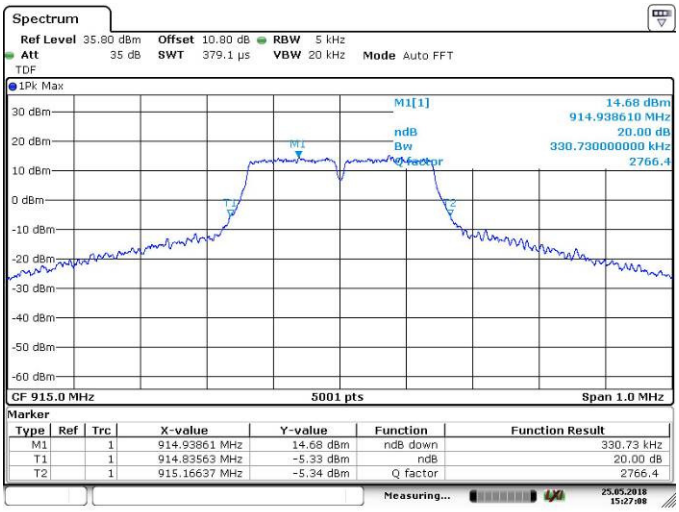

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Figure 7.4.4.2-4: Sample Plot 20dB BW- OFDM – 600kbps

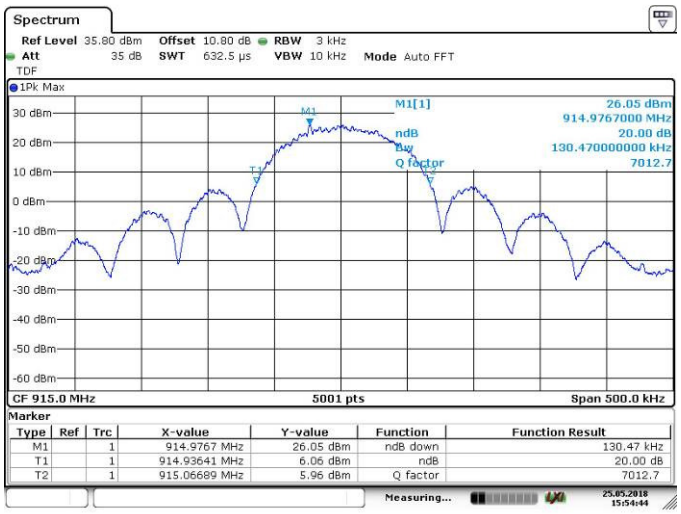

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Figure 7.4.4.2-5: Sample Plot 20dB BW- DSSS – 12.5kbps

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Figure 7.4.4.2-6: Sample Plot 99% OBW- FSK – 50kbps

Figure 7.4.4.2-7: Sample Plot 99% OBW- FSK – 150kbps

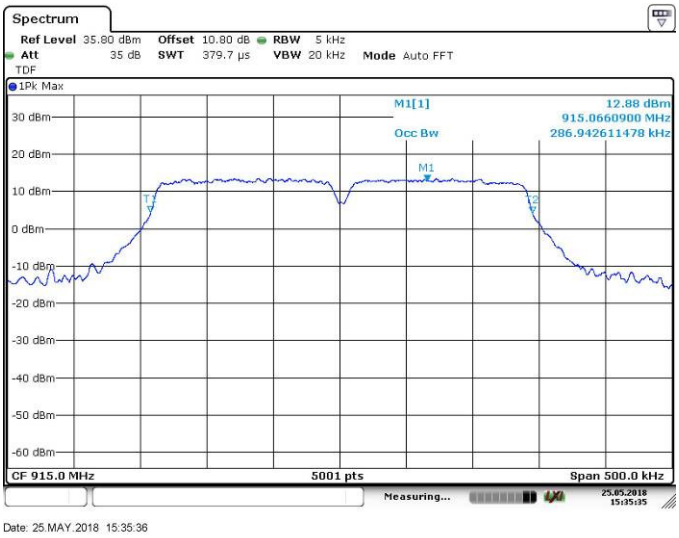


Figure 7.4.4.2-8: Sample Plot 99% OBW- OFDM – 200kbps

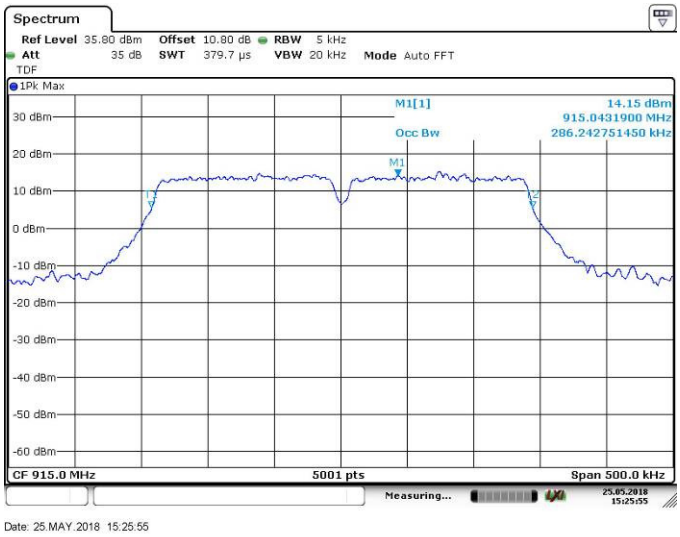


Figure 7.4.4.2-9: Sample Plot 99% OBW- OFDM – 600kbps

Figure 7.4.4.2-10: Sample Plot 99% OBW- DSSS – 12.5kbps

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.

7.5.1.2 Measurement Results

Performed by: Jeremy Pickens

NON-HOPPING MODE:

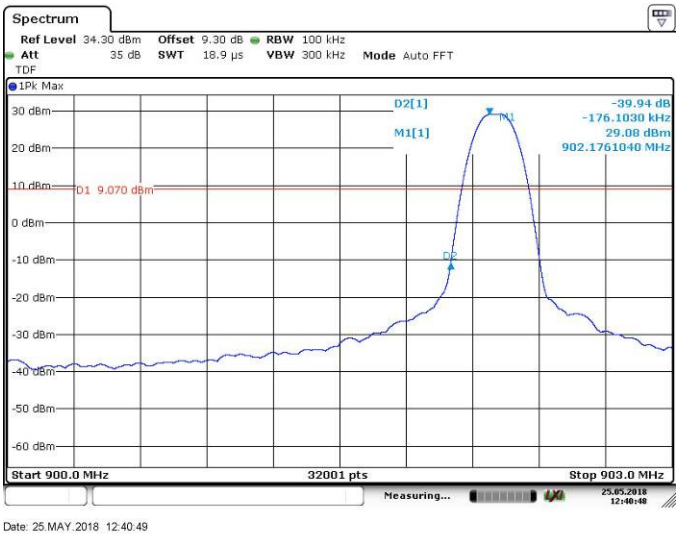


Figure 7.5.1.2-1: Lower Band-edge – FSK – 50kbps

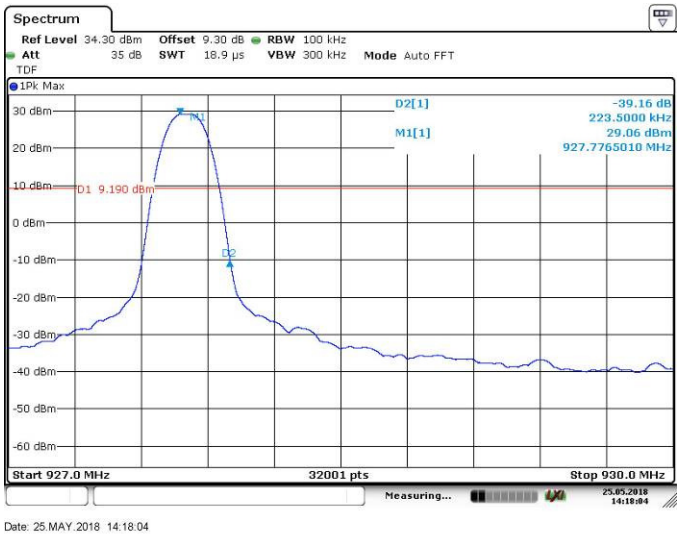


Figure 7.5.1.2-2: Upper Band-edge – FSK – 50kbps

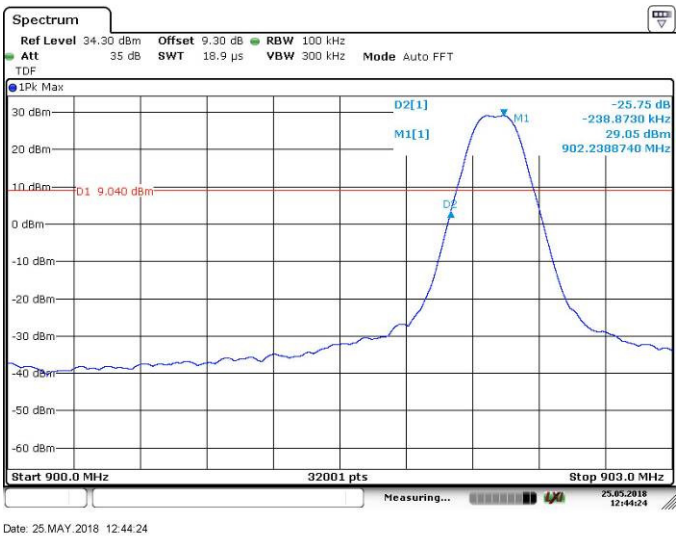


Figure 7.5.1.2-3: Lower Band-edge – FSK – 150kbps

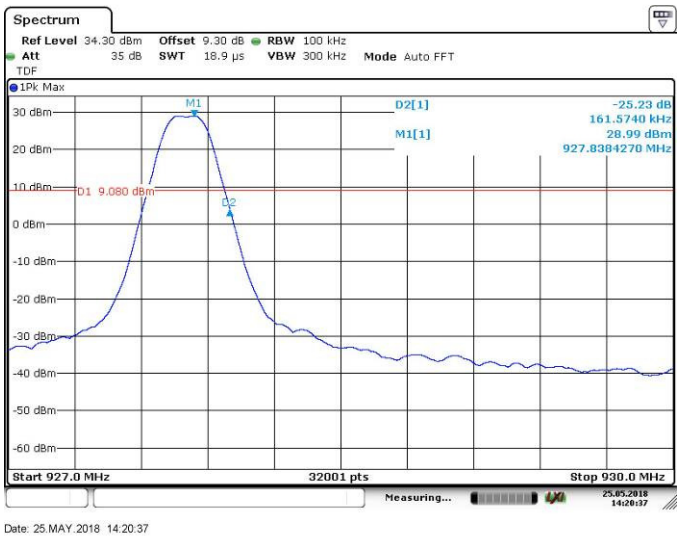


Figure 7.5.1.2-4: Upper Band-edge – FSK – 150kbps

Figure 7.5.1.2-5: Lower Band-edge – OFDM – 200kbps

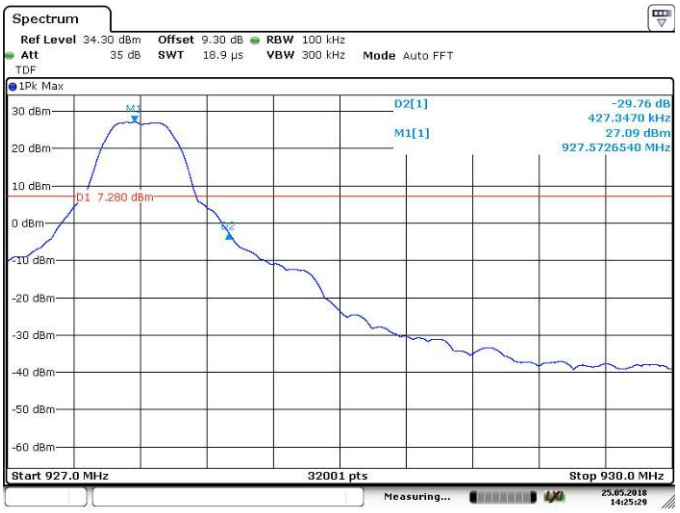


Figure 7.5.1.2-6: Upper Band-edge – OFDM – 200kbps

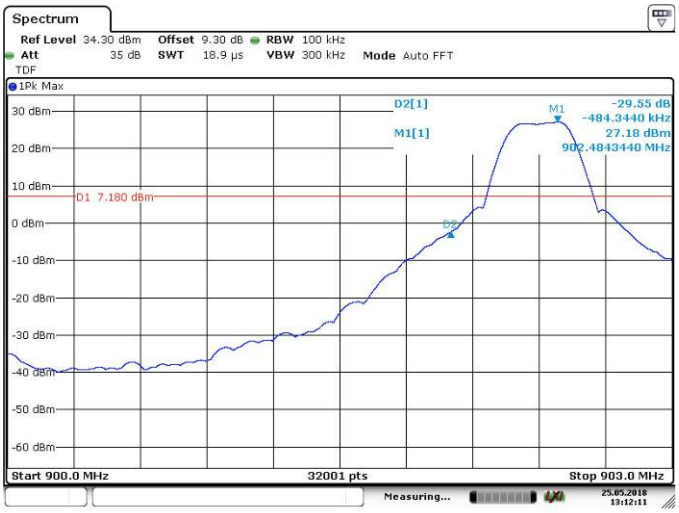


Figure 7.5.1.2-7: Lower Band-edge – OFDM – 600kbps

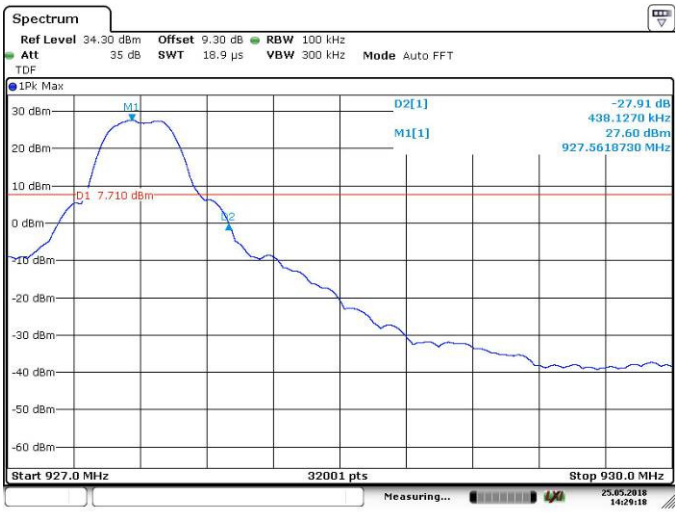


Figure 7.5.1.2-8: Upper Band-edge – OFDM – 600kbps

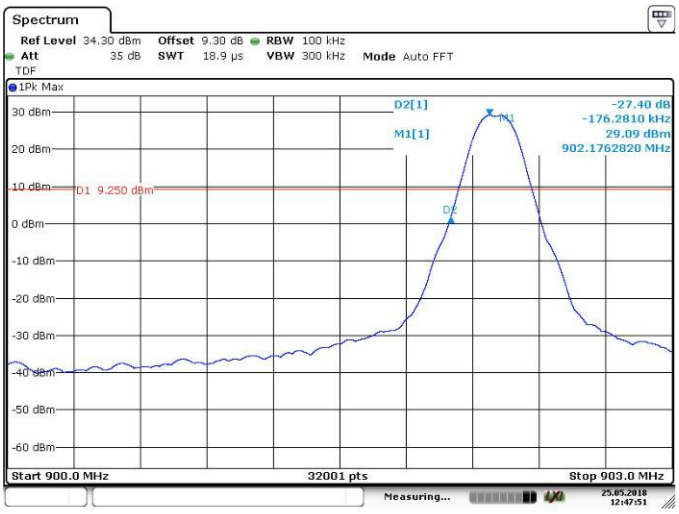


Figure 7.5.1.2-9: Lower Band-edge – DSSS – 12.5kbps

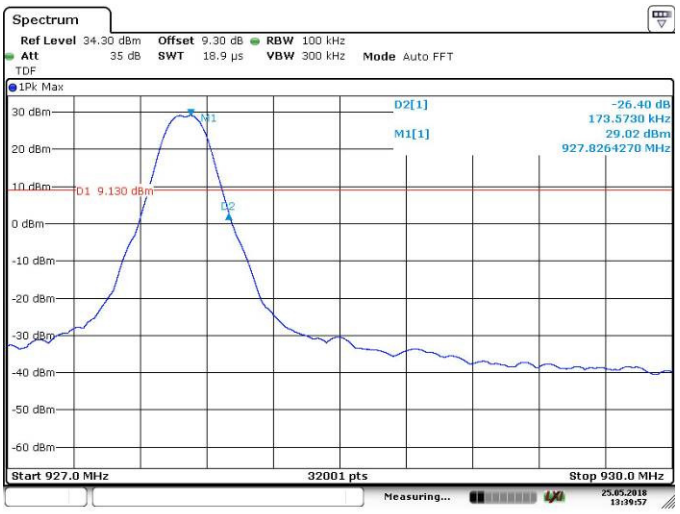
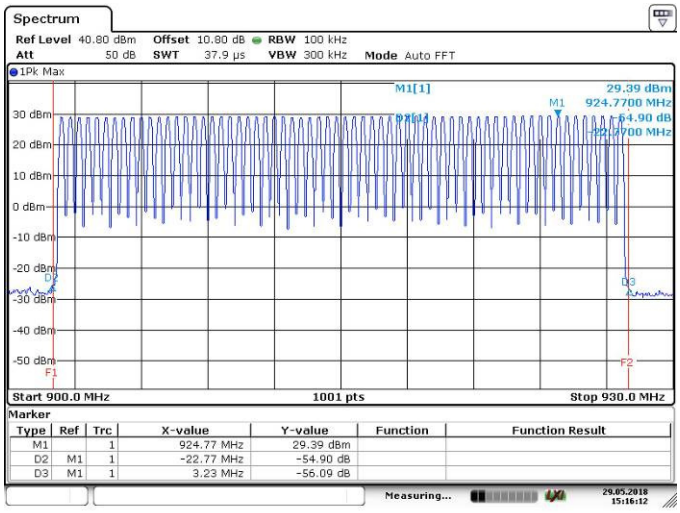


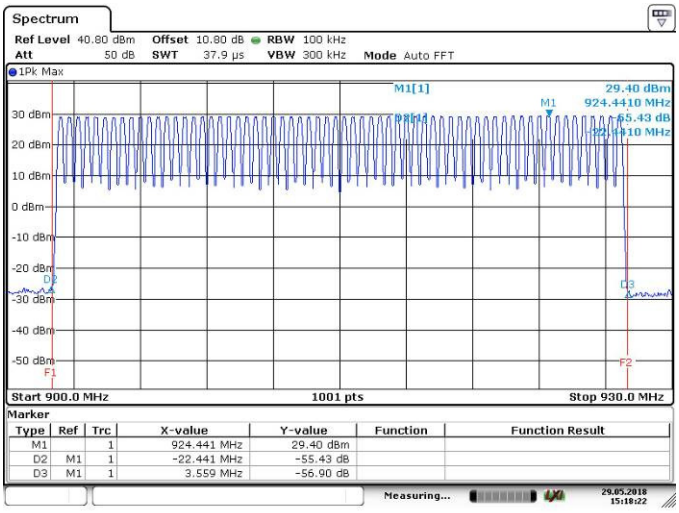
Figure 7.5.1.2-10: Upper Band-edge – DSSS – 12.5kbps

HOPPING MODE:



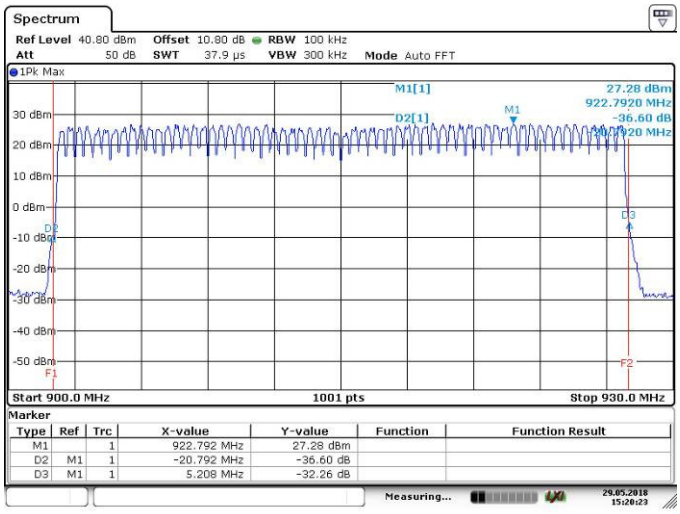
Date: 29.MAY.2018 15:16:11

Figure 7.5.1.2-11: Band Edges – FSK – 50kbps



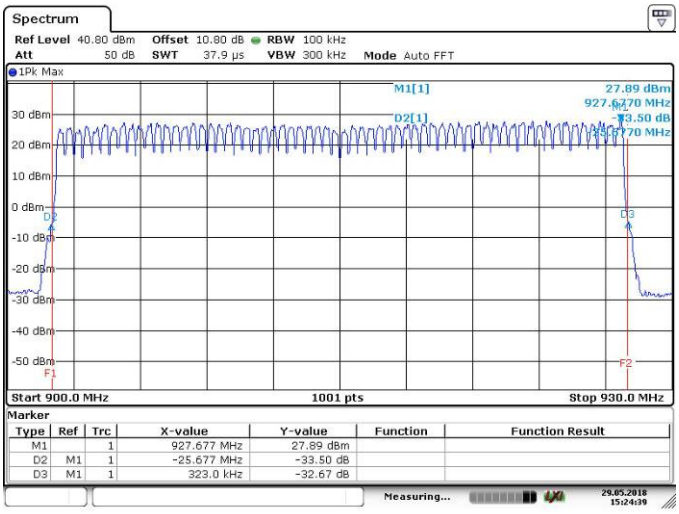
Date: 29.MAY.2018 15:18:23

Figure 7.5.1.2-12: Band Edges – FSK – 150kbps



Date: 29.MAY.2018 15:20:23

Figure 7.5.1.2-13: Band Edges – OFDM – 200kbps



Date: 29.MAY.2018 15:24:39

Figure 7.5.1.2-14: Band Edges – OFDM – 600kbps

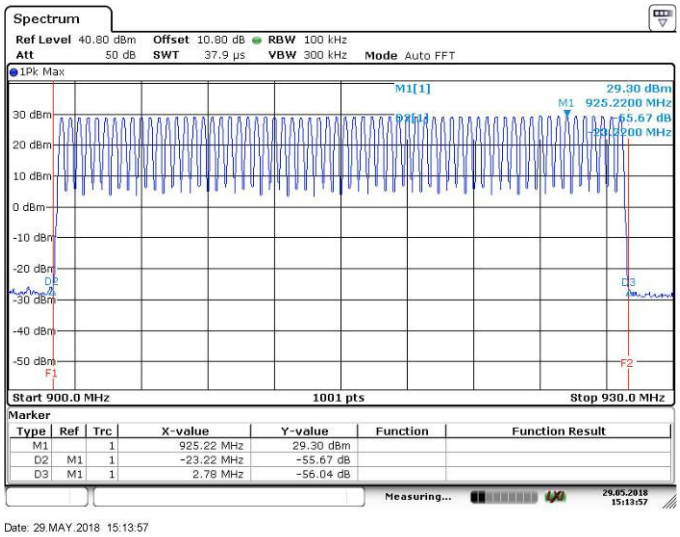


Figure 7.5.1.2-15: Band Edges – DSSS – 12.5kbps

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 (FSK / 150kbps)

7.5.2.2 Measurement Results

Performed by: Jeremy Pickens

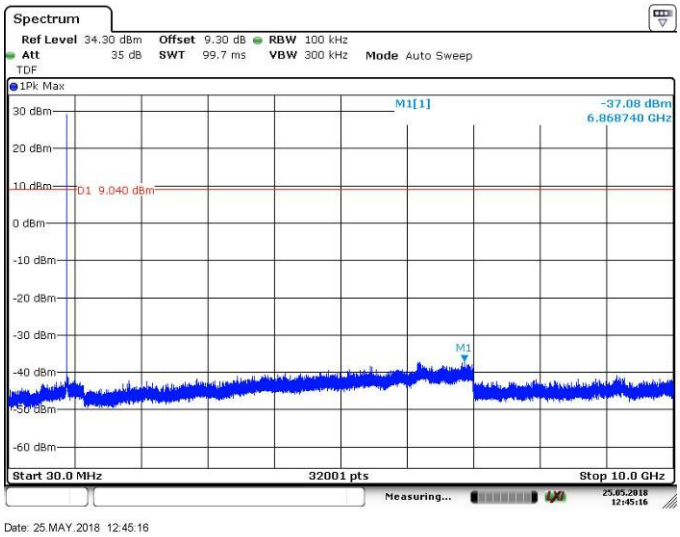


Figure 7.5.2.2-1: 30 MHz – 10 GHz – Low Channel

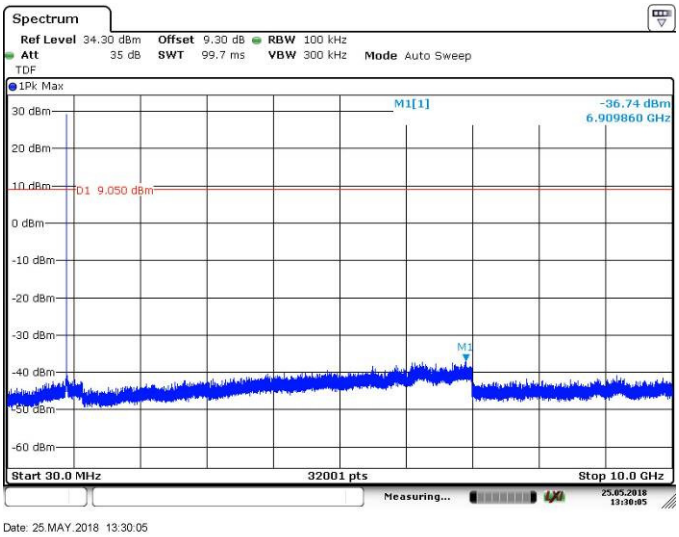


Figure 7.5.2.2-2: 30 MHz – 10 GHz – Middle Channel

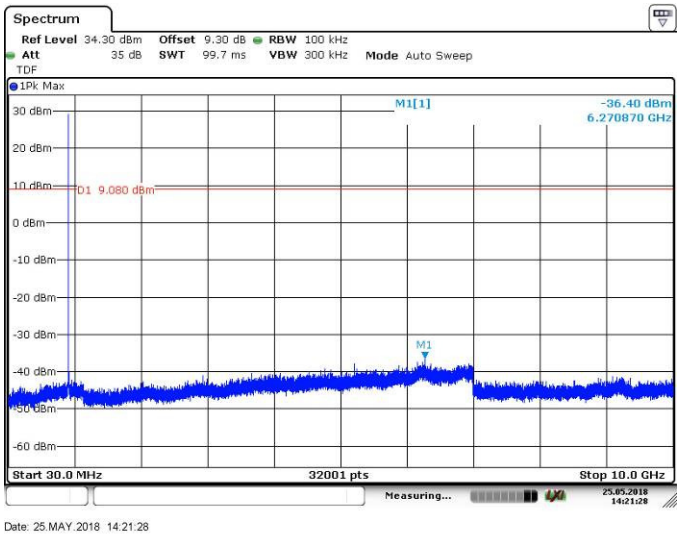


Figure 7.5.2.2-3: 30 MHz – 10 GHz –High Channel

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: Tyler Leeson, Jeremy Pickens

Table 7.5.3.2-1: Radiated Spurious Emissions Tabulated Data (FSK 50kHz)

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	48.40	37.80	H	-3.29	45.11	34.51	74.0	54.0	28.9	19.5
2706.6	48.00	36.50	V	-3.29	44.71	33.21	74.0	54.0	29.3	20.8
3608.8	49.10	38.50	H	0.11	49.21	38.61	74.0	54.0	24.8	15.4
3608.8	50.80	42.40	V	0.11	50.91	42.51	74.0	54.0	23.1	11.5
Middle Channel										
2745.6	50.10	41.90	H	-3.13	46.97	38.77	74.0	54.0	27.0	15.2
2745.6	48.60	38.10	V	-3.13	45.47	34.97	74.0	54.0	28.5	19.0
3660.8	48.60	37.30	H	0.28	48.88	37.58	74.0	54.0	25.1	16.4
3660.8	49.80	40.60	V	0.28	50.08	40.88	74.0	54.0	23.9	13.1
High Channel										
2783.4	49.10	39.90	H	-2.99	46.11	36.91	74.0	54.0	27.9	17.1
2783.4	49.50	41.30	V	-2.99	46.51	38.31	74.0	54.0	27.5	15.7
3711.2	48.80	38.10	H	0.46	49.26	38.56	74.0	54.0	24.7	15.4
3711.2	50.10	41.60	V	0.46	50.56	42.06	74.0	54.0	23.4	11.9

Table 7.5.3.2-2: Radiated Spurious Emissions Tabulated Data (LR 12.5kHz)

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	48.10	36.70	H	-3.29	44.81	33.41	74.0	54.0	29.2	20.6
2706.6	48.70	36.30	V	-3.29	45.41	33.01	74.0	54.0	28.6	21.0
3608.8	48.50	38.50	H	0.11	48.61	38.61	74.0	54.0	25.4	15.4
3608.8	50.40	42.60	V	0.11	50.51	42.71	74.0	54.0	23.5	11.3
Middle Channel										
2745.6	47.90	35.30	H	-3.13	44.77	32.17	74.0	54.0	29.2	21.8
2745.6	48.20	35.40	V	-3.13	45.07	32.27	74.0	54.0	28.9	21.7
3660.8	47.60	33.80	H	0.28	47.88	34.08	74.0	54.0	26.1	19.9
3660.8	47.80	34.60	V	0.28	48.08	34.88	74.0	54.0	25.9	19.1
High Channel										
2783.4	49.20	40.70	H	-2.99	46.21	37.71	74.0	54.0	27.8	16.3
2783.4	49.50	41.00	V	-2.99	46.51	38.01	74.0	54.0	27.5	16.0
3711.2	48.80	38.60	H	0.46	49.26	39.06	74.0	54.0	24.7	14.9
3711.2	50.10	41.60	V	0.46	50.56	42.06	74.0	54.0	23.4	11.9

Table 7.5.3.2-3: Radiated Spurious Emissions Tabulated Data (OFDM 200kHz)

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										
3608.8	48.50	38.30	H	0.11	48.61	38.41	74.0	54.0	25.4	15.6
3608.8	49.80	41.70	V	0.11	49.91	41.81	74.0	54.0	24.1	12.2
Middle Channel										
*** No restricted band emissions detected above the noise floor.**										
High Channel										
2783.4	48.00	36.40	V	-2.99	46.21	37.71	74.0	54.0	27.8	16.3
3711.2	47.90	37.70	H	-2.99	46.51	38.01	74.0	54.0	27.5	16.0
3711.2	49.80	40.70	V	0.46	49.26	39.06	74.0	54.0	24.7	14.9

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 – FSK 50kbps

Corrected Level: 48.40 - 3.29 = 45.11dBuV/m
Margin: 74dBuV/m – 50.91dBuV/m = 28.9dB

Example Calculation: Average – FSK 50kbps

Corrected Level: 37.80 - 3.29 - 0 = 34.51dBuV
Margin: 54dBuV – 42.51dBuV = 19.5dB

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 ACT2, manufactured by Itron, Inc. 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