Certification Test Report

FCC ID: SK9OW1
IC: 864G-OW1

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

Report Number: AT72127781-1P1

Manufacturer: Itron, Inc.
Model: OW1

Test Begin Date: May 9, 2017
Test End Date: June 9, 2017

Report Issue Date: July 25, 2017

FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: AT-2021

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

Prepared by:

Ryan McGann
Senior Engineer
TÜV SÜD America Inc.

Reviewed by:

Thierry Jean-Charles
EMC Engineer
TÜV SÜD America Inc.

This report contains 25 pages

TABLE OF CONTENTS

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 evaluation for Class II Permissive Change is to address a new data rate for FSK modulation as well as two additional antennas.

1.2 Product description

The Itron OW1 is a communications module which includes a 902.2 MHz to 927.8 MHz transmitter. The module operates on DC voltage which is supplied by a host device.

This test report documents the compliance of the 900 MHz transceiver frequency hopping spread spectrum mode of operation.

Technical Details:

Detail	Description
Frequency Range	902.2 – 927.8 MHz
Number of Channels	FSK 10kbps: 513 FSK 50kbps: 64 FSK 150kbps: 64 OFDM: 64 DSSS: 64
Modulation Format	FSK, OFDM, DSSS
Data Rates (kbps)	FSK: 10 (new), 50, 150 OFDM: 200, 600 DSSS: 6.25, 12.5
Operating Voltage	24Vdc
Antenna Type(s) / Gain(s)	Monopole Antenna (original): 2.8 dBi PCTel BOA9028 Omni Antenna (new): 8.15dBi* Antenna Products AMR 360-902-5-T0-N Omni Antenna (new): 5.1dBi

* The PCTel BOA9028 Omni Antenna requires a minimum of 2.2dB between the antenna and the EUT.

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

EUT Serial Numbers: FSK 10kbps Unit: 9110000636
FSK 50kbps Unit: 9110000675
FSK 150kbps, OFDM, DSSS Unit: 9110000875

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 for each mode. The data presented in this report represents the worst case where applicable. A single test sample was not capable of supporting all modulation formats for test mode, therefore multiple samples were used to evaluate the compliance of all available modulation formats.

The evaluation of the OFDM and DSSS modes of operation was limited to radiated emissions only due to the additional antennas under this Class II Permissive Change. The new antennas were evaluated for a worst-case configuration with respect to radiated emissions. The worst-case antenna was the PCTel BOA9028 Omni antenna with 8.15dBi gain. RF Conducted measurements were performed on the FSK 10kbps mode of operation only due to the addition of this mode under this Class II Permissive Change.

For radiated emissions, the EUT was evaluated in three orthogonal orientations. The worst-case orientation was the Y-orientation for FSK 10kbps and Z-orientation for all other data rates. See test setup photos for more information. All data rates were evaluated for worst case operation for each modulation format. The worst-case data rates evaluated were FSK 10kbps, OFDM 600kbps, and DSSS 12.5kbps.

For AC power line conducted emissions the EUT was evaluated with a commercially available wall wart power supply.

For RF conducted emissions, the EUT was coupled to the measurement equipment via SMA connector.

Radiated inter-modulation testing was performed for all combinations of simultaneous transmission and found to comply.

Power setting during test – FSK Modulation:	-4
Power setting during test – OFDM Modulation:	-2
Power setting during test – DSSS Modulation:	-2

2 TEST FACILITIES

2.1 Location

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

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

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. 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. 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, Innovation, Science, and Economic Development Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 391271
Innovation, Science, and Economic Development Canada Lab Code: IC 4175A
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:

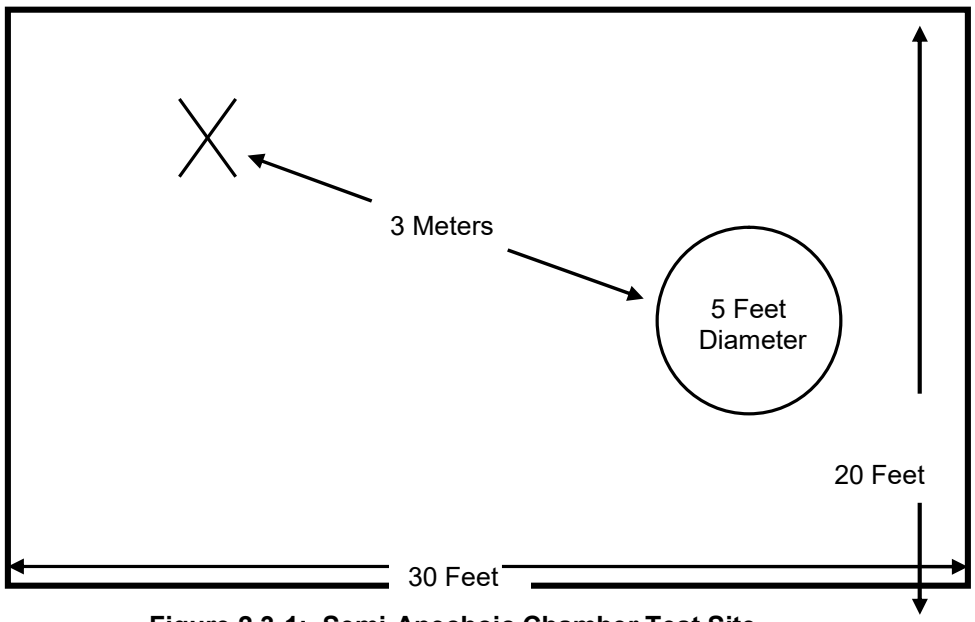

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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 C63.10.

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

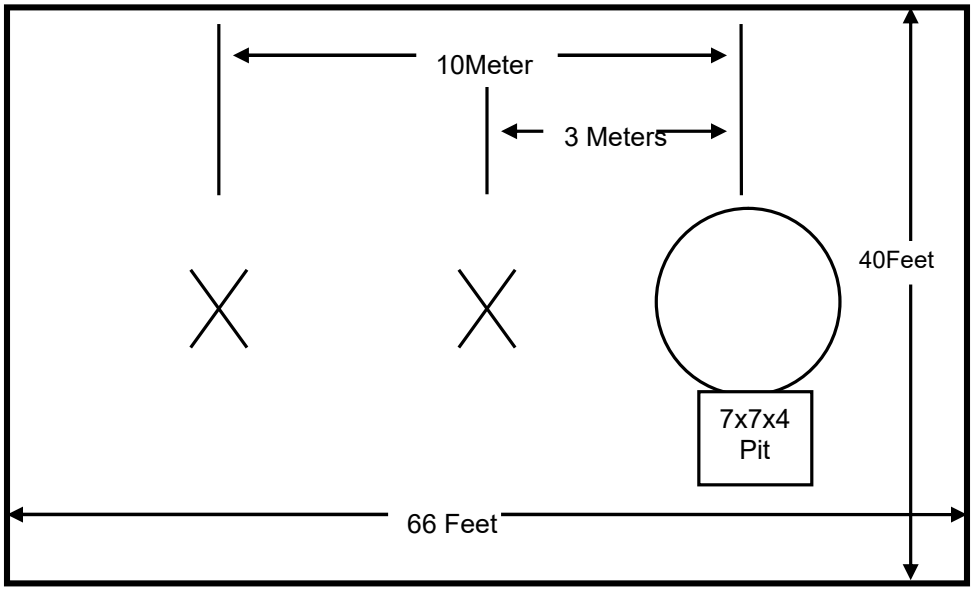

Figure 2.3-2: Open Area Test Site

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 ANSI C63.10.

A diagram of the room is shown below in figure 2.4-1:

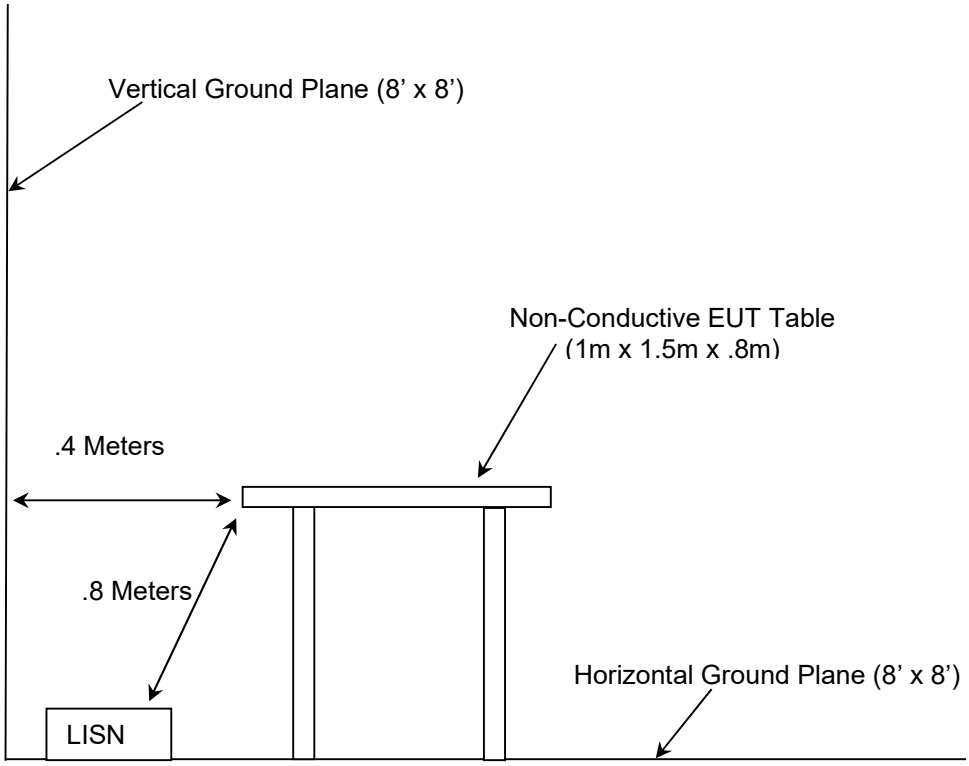

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: 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, 2017
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2017
- ISED Canada Radio Standards Specification: RSS-247 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices, Issue 2, Feb 2017
- ISED Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 4, Nov 2014.

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
30	Spectrum Technologies	DRH-0118	Antennas	970102	5/9/2017	5/9/2019
40	EMCO	3104	Antennas	3211	6/8/2016	6/8/2018
73	Agilent	8447D	Amplifiers	2727A05624	7/21/2016	7/21/2017
167	ACS	hamber EMI Cable S	Cable Set	167	9/30/2016	9/30/2017
267	Agilent	N1911A	Meters	MY45100129	8/24/2015	8/24/2017
268	Agilent	N1921A	Sensors	MY45240184	8/13/2015	8/13/2017
324	ACS	Belden	Cables	8214	3/21/2017	3/21/2018
329	A.H.Systems	SAS-571	Antennas	721	7/22/2015	7/22/2017
331	Microwave Circuits	H1G513G1	Filters	31417	5/13/2017	5/13/2018
331	Microwave Circuits	H1G513G1	Filters	31417	5/13/2016	5/13/2017
338	Hewlett Packard	8449B	Amplifiers	3008A01111	8/21/2015	8/21/2017
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	7/12/2016	7/12/2017
412	Electro Metrics	LPA-25	Antennas	1241	8/8/2016	8/8/2018
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	10/27/2016	10/27/2017
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	9/2/2016	9/2/2017
622	Rohde & Schwarz	FSV40	Analyzers	101338	7/15/2016	7/15/2018
676	Florida RF Labs	SMS-290AW-480.0-SMS	Cables	MFR2Y194	11/4/2016	11/4/2017
812	PMM	9030	Receiver	121WW30401	2/6/2017	2/6/2018
3010	Rohde & Schwarz	ENV216	LISN	3010	7/11/2016	7/11/2017
RE135	Rohde & Schwarz	FSP30	Spectrum Analyzers	835618/031	10/31/2016	10/31/2017

NCR = No Calibration Required
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	Power Supply	TRIAD	WSU120-1000	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
B	RF Cable	1.85 m	Yes	EUT to Antenna

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

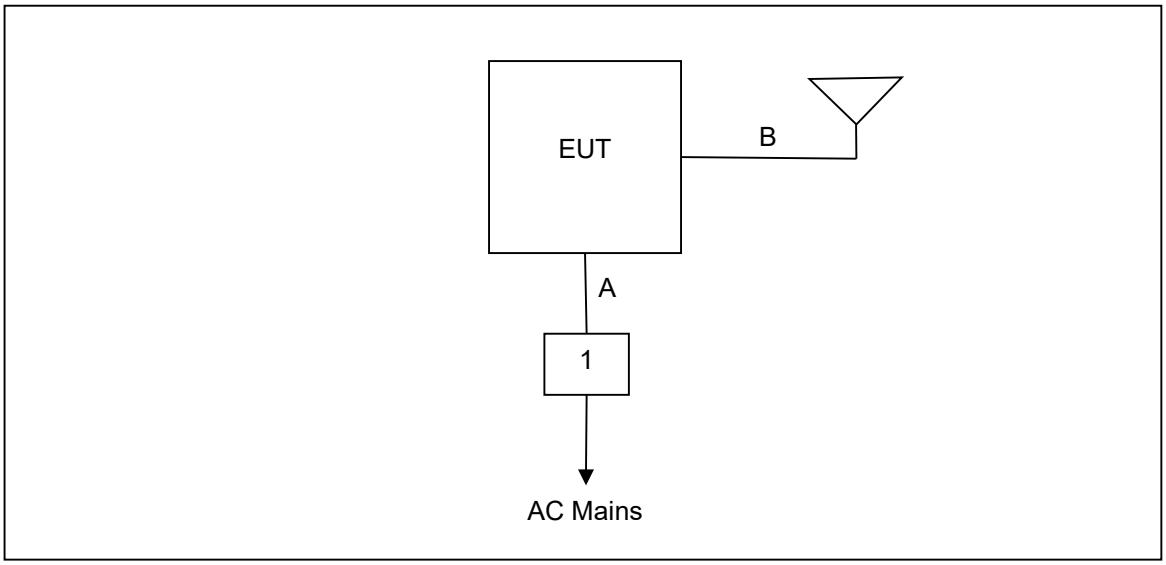

Figure 6-1: Test Setup Block Diagram

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 Monopole Antenna (original) with 2.8 dBi gain, a PCTel BOA9028 Omni Antenna (new) with 8.15dBi gain, and an Antenna Products AMR 360-902-5-T0-N Omni Antenna (new) with 5.1dBi gain. The PCTel BOA9028 Omni Antenna requires a minimum of 2.2dB between the antenna and the EUT. See the product manual for more information. All antennas couple to the EUT via a cable using specialized connectors converted to SMA and then N-Type and require professional installation, therefore meeting the requirements of 15.203.

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

7.2.1 Measurement Procedure

Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. 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: Ryan McGann

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)	
0.378	43	29.47	58.32	48.32	-15.32	-18.85	9.59
0.386	49.88	39.73	58.15	48.15	-8.27	-8.42	9.59
0.394	49.16	37.09	57.98	47.98	-8.82	-10.89	9.59
0.438	47.81	34.9	57.1	47.1	-9.29	-12.2	9.59
0.462	46.25	25.78	56.66	46.66	-10.41	-20.88	9.59
1.35	41.13	28.22	56	46	-14.87	-17.78	9.64
1.386	41.9	28.77	56	46	-14.1	-17.23	9.64
2.01	40.02	24.62	56	46	-15.98	-21.38	9.71
2.174	39.97	24.21	56	46	-16.03	-21.79	9.71
2.874	39.29	26.05	56	46	-16.71	-19.95	9.72

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)	
0.166	40.12	28.58	65.16	55.16	-25.04	-26.58	9.58
0.21	39.12	27.32	63.21	53.21	-24.09	-25.89	9.58
0.374	43.24	24.79	58.41	48.41	-15.17	-23.62	9.59
0.386	44.03	27.82	58.15	48.15	-14.12	-20.33	9.59
0.43	43.99	25.52	57.25	47.25	-13.26	-21.73	9.59
0.458	43.41	25.48	56.73	46.73	-13.32	-21.25	9.59
0.47	43.31	22.5	56.51	46.51	-13.2	-24.01	9.59
1.174	38.31	22.37	56	46	-17.69	-23.63	9.62
1.998	38.41	17.61	56	46	-17.59	-28.39	9.71
2.146	36.53	19.64	56	46	-19.47	-26.36	9.71

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

7.3.1 Measurement Procedure

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: Ryan McGann

Table 7.3.2-1: Maximum Conducted Peak Output Power

Frequency [MHz]	Level [dBm]	Modulation Format	Data Rate [kbps]
902.2	27.79	FSK	10
915.2	28.83	FSK	10
927.8	28.51	FSK	10

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 using suitable attenuation. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks. The RBW was set to approximately 30 % of the channel spacing and adjusted as necessary to best identify the center of each channel. The VBW was set > RBW.

7.4.1.2 Measurement Results

Performed by: Ryan McGann

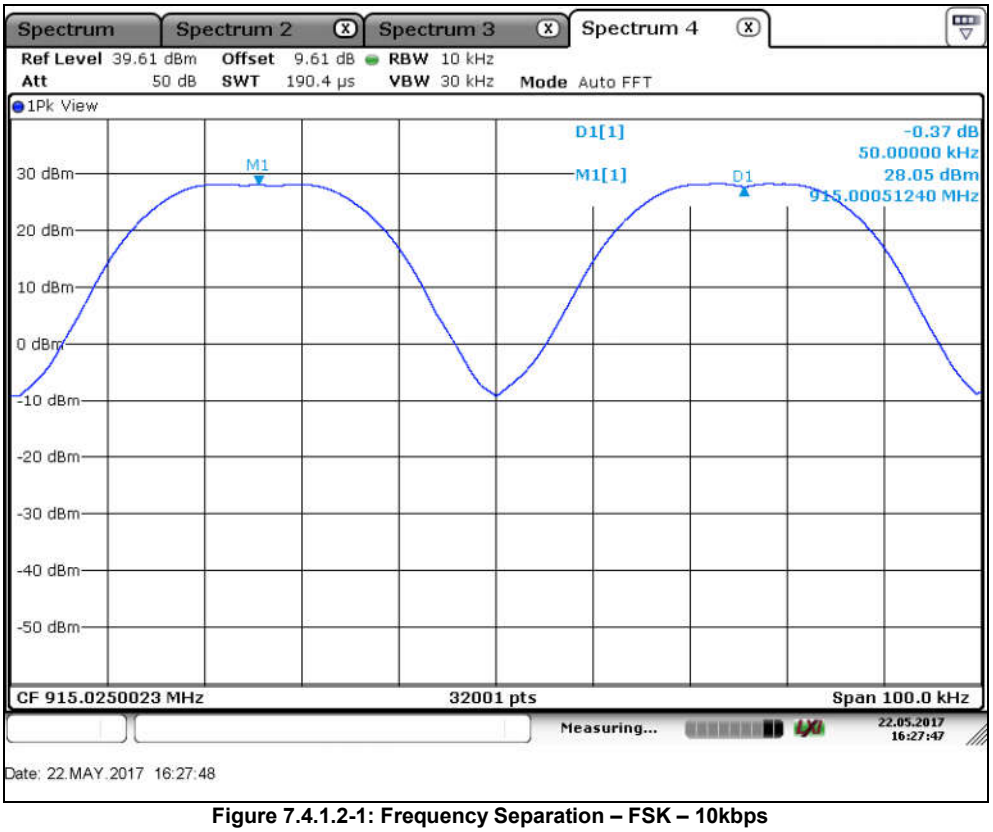

Figure 7.4.1.2-1: Frequency Separation – FSK – 10kbps

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 using suitable attenuation. The span of the spectrum analyzer was set wide enough to capture the frequency band of operation. The RBW was set to < 30 % of the channel spacing and VBW set to ≥ RBW. The EUT uses 513 total channels in this mode of operation.

7.4.2.2 Measurement Results

Performed by: Ryan McGann

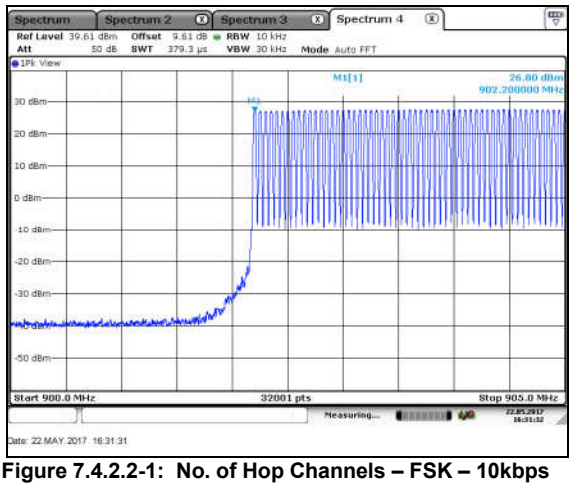

Figure 7.4.2.2-1: No. of Hop Channels – FSK – 10kbps

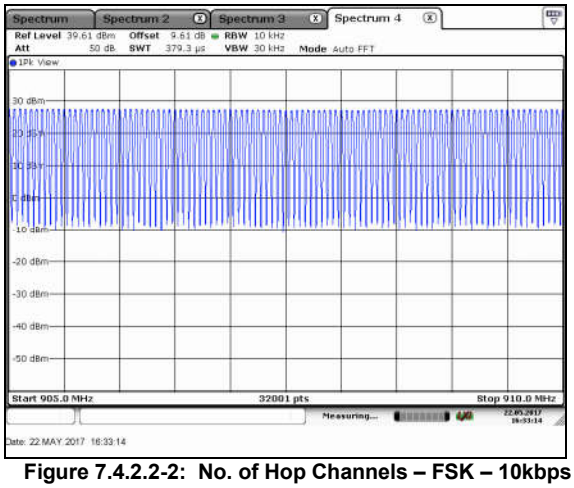

Figure 7.4.2.2-2: No. of Hop Channels – FSK – 10kbps

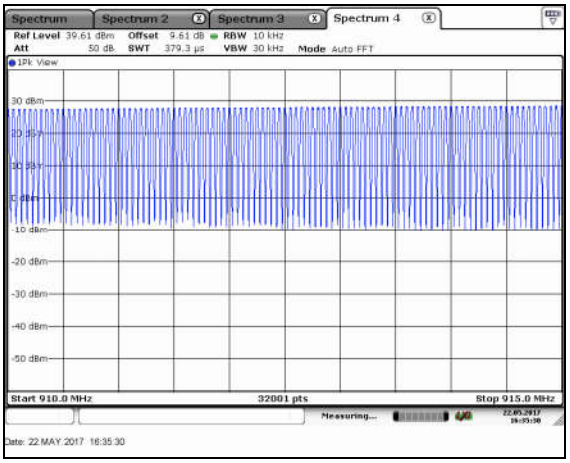

Figure 7.4.2.2-3: No. of Hop Channels – FSK – 10kbps

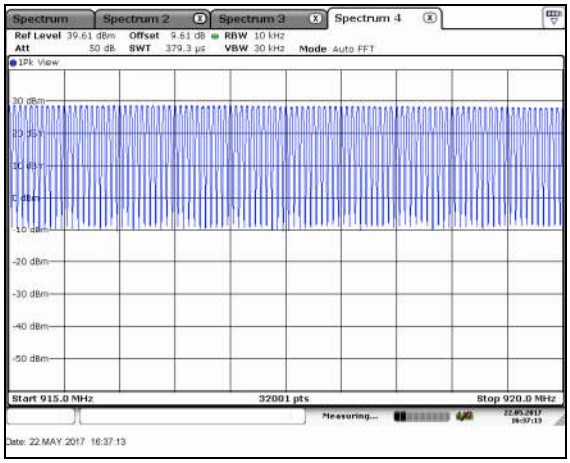

Figure 7.4.2.2-4: No. of Hop Channels – FSK – 10kbps

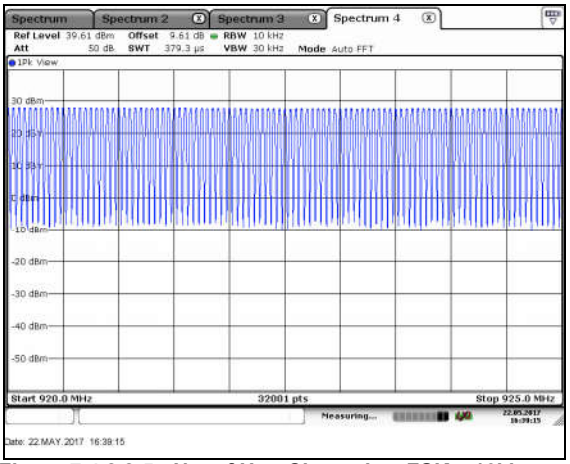

Figure 7.4.2.2-5: No. of Hop Channels – FSK – 10kbps

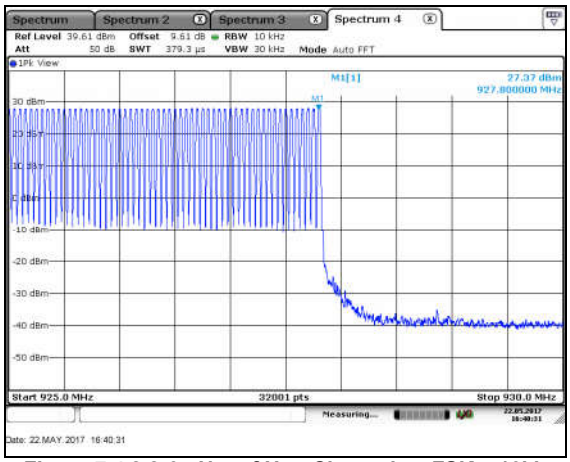

Figure 7.4.2.2-6: No. of Hop Channels – FSK – 10kbps

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 was not capable of producing a worst-case channel dwell time. A detailed analysis of the channel dwell time is available in the Theory of Operations accompanying this report.

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 using 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 marker delta measurement 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: Ryan McGann

Table 7.4.4.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Modulation Format	Data Rate [kbps]
902.2	20.576	17.604	FSK	10
915.2	20.373	17.376	FSK	10
927.8	20.432	17.510	FSK	10

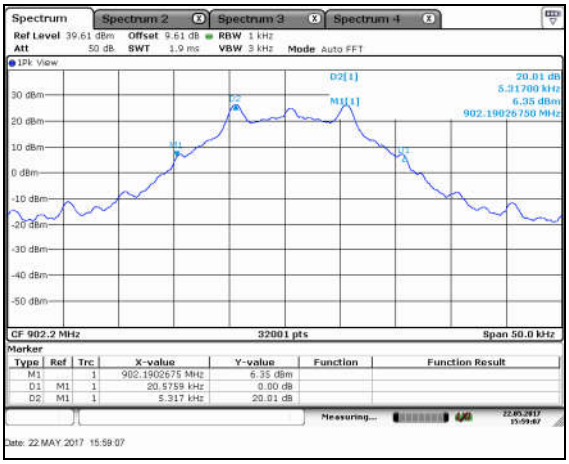

Figure 7.4.4.2-1: 20dB BW Low Ch – FSK – 10kbps

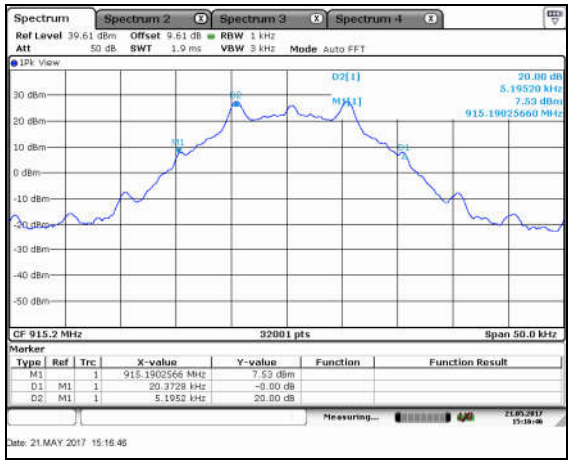

Figure 7.4.4.2-2: 20dB BW Mid Ch – FSK – 10kbps

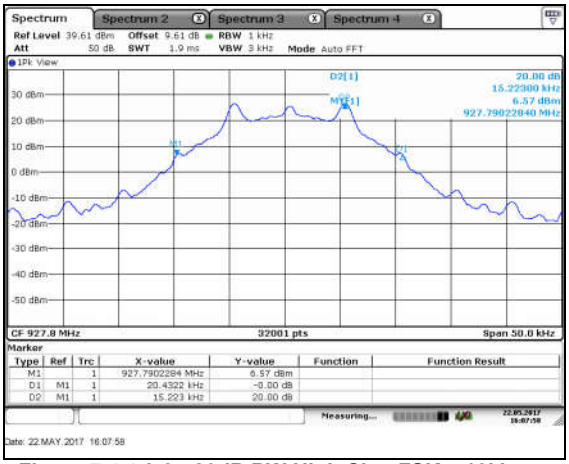

Figure 7.4.4.2-3: 20dB BW High Ch – FSK – 10kbps

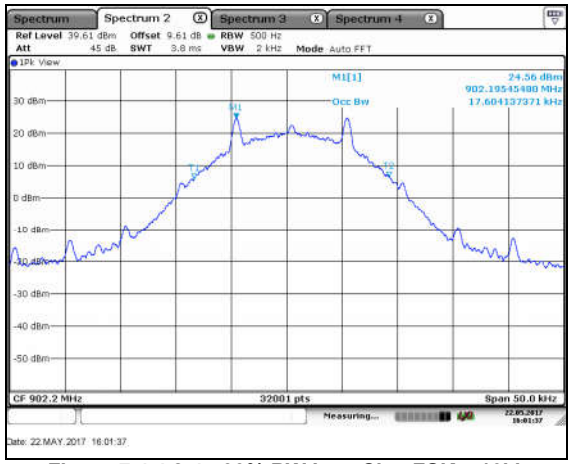

Figure 7.4.4.2-4: 99% BW Low Ch – FSK – 10kbps

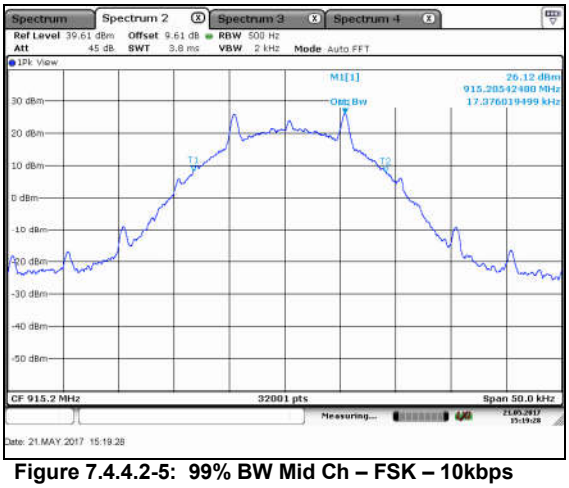

Figure 7.4.4.2-5: 99% BW Mid Ch – FSK – 10kbps

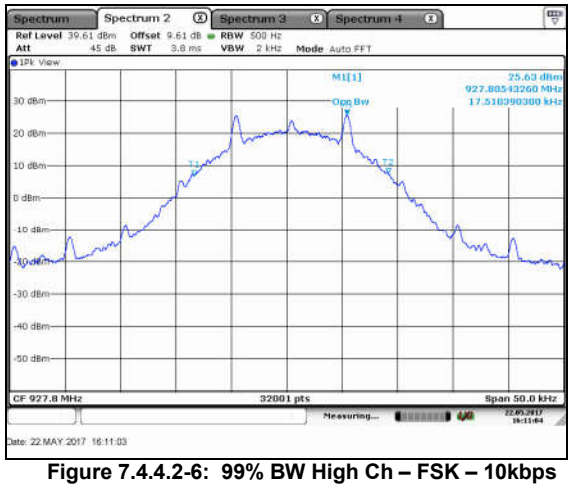

Figure 7.4.4.2-6: 99% BW High Ch – FSK – 10kbps

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 using 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 100 kHz, and the VBW was set to 300 kHz.

7.5.1.2 Measurement Results

Performed by: Ryan McGann

NON-HOPPING MODE:

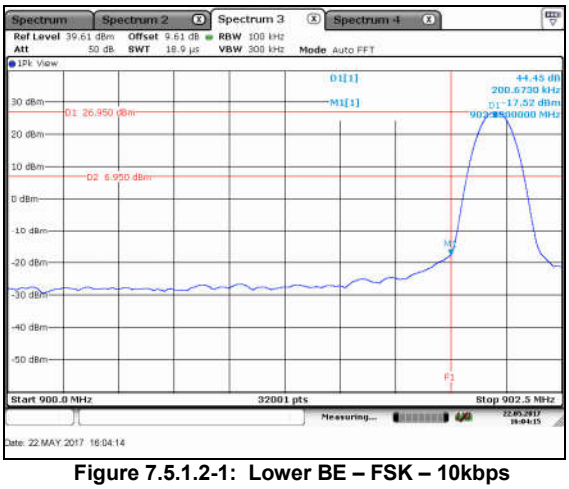

Figure 7.5.1.2-1: Lower BE – FSK – 10kbps

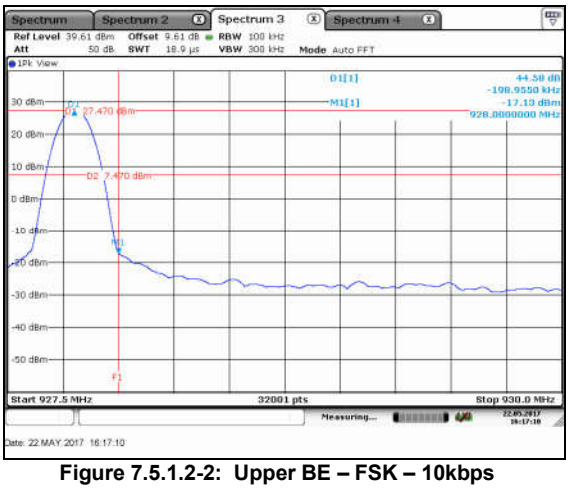

Figure 7.5.1.2-2: Upper BE – FSK – 10kbps

HOPPING MODE:

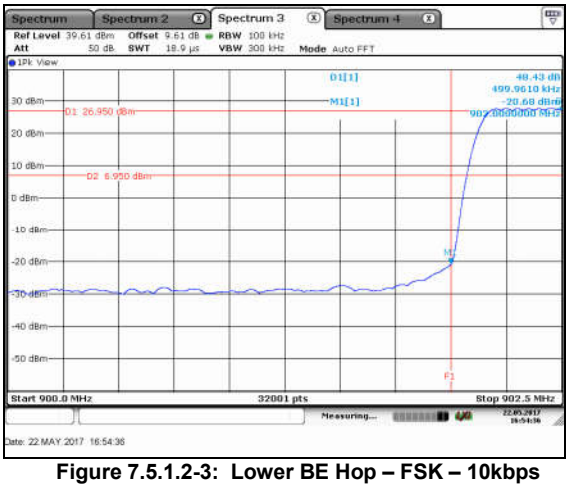

Figure 7.5.1.2-3: Lower BE Hop – FSK – 10kbps

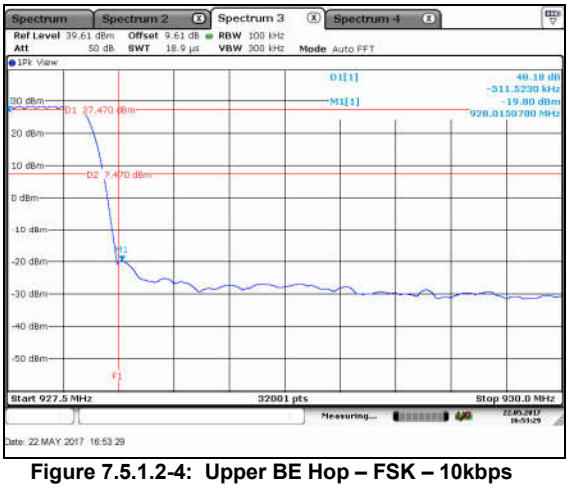

Figure 7.5.1.2-4: Upper BE Hop – FSK – 10kbps

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 using suitable attenuation. The EUT was investigated for conducted spurious emissions from 30 MHz to 10 GHz, 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 100 kHz. A peak detector function was used with the trace set to max hold.

7.5.2.2 Measurement Results

Performed by: Ryan McGann

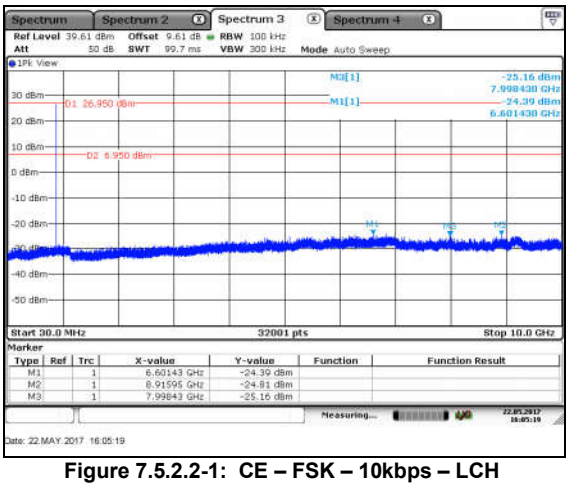

Figure 7.5.2.2-1: CE – FSK – 10kbps – LCH

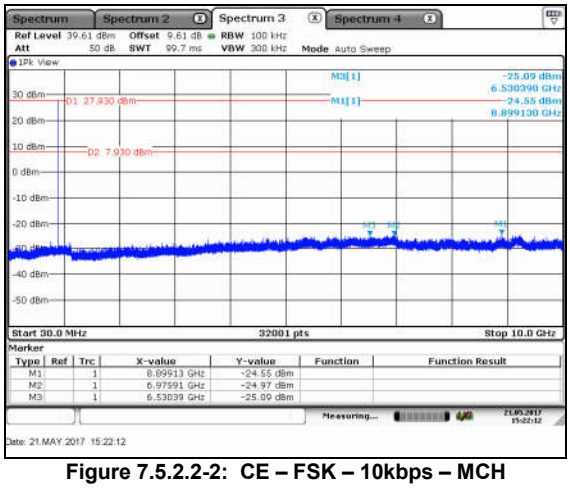

Figure 7.5.2.2-2: CE – FSK – 10kbps – MCH

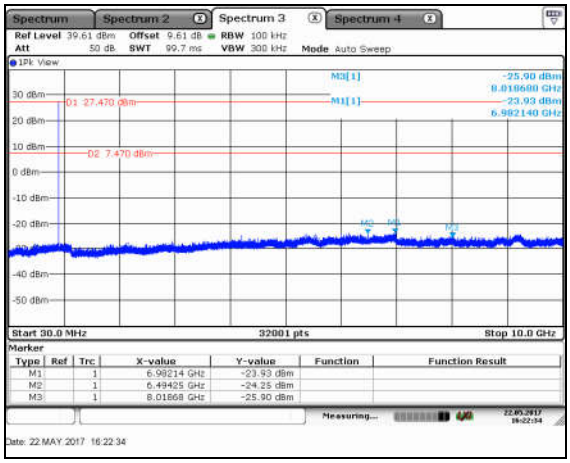

Figure 7.5.2.2-3: CE – FSK – 10kbps – HCH

7.5.3 Radiated Spurious Emissions – FCC: Sections 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 30 MHz to 10 GHz, 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.

7.5.3.2 Measurement Results

Performed by: Ryan McGann, Arthur Sumner, Wayne Orwig

Table 7.5.3.2-1: Radiated Spurious Emissions Tabulated Data – FSK Modulation

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	56.36	52.52	H	-4.00	52.36	48.52	74.0	54.0	21.6	5.5
2706.6	53.14	47.20	V	-4.00	49.14	43.20	74.0	54.0	24.9	10.8
3608.8	52.64	43.72	H	-1.01	51.63	42.71	74.0	54.0	22.4	11.3
3608.8	51.93	42.64	V	-1.01	50.92	41.63	74.0	54.0	23.1	12.4
4511	50.80	40.48	H	0.60	51.40	41.08	74.0	54.0	22.6	12.9
4511	50.40	41.01	V	0.60	51.00	41.61	74.0	54.0	23.0	12.4
Middle Channel										
2745.6	57.84	55.63	H	-3.80	54.04	51.83	74.0	54.0	20.0	2.2
2745.6	52.57	49.08	V	-3.80	48.77	45.28	74.0	54.0	25.2	8.7
3660.8	47.72	36.91	H	-0.79	46.93	36.12	74.0	54.0	27.1	17.9
3660.8	46.94	36.10	V	-0.79	46.15	35.31	74.0	54.0	27.9	18.7
4576	44.42	34.02	H	0.75	45.17	34.77	74.0	54.0	28.8	19.2
4576	44.89	34.01	V	0.75	45.64	34.76	74.0	54.0	28.4	19.2
High Channel										
2783.4	59.06	56.54	H	-3.77	55.29	52.77	74.0	54.0	18.7	1.2
2783.4	55.47	51.41	V	-3.77	51.70	47.64	74.0	54.0	22.3	6.4
3711.2	52.06	42.85	H	-0.65	51.41	42.20	74.0	54.0	22.6	11.8
3711.2	52.20	43.14	V	-0.65	51.55	42.49	74.0	54.0	22.4	11.5
4639	49.13	39.27	H	1.06	50.19	40.33	74.0	54.0	23.8	13.7
4639	49.54	40.16	V	1.06	50.60	41.22	74.0	54.0	23.4	12.8

Table 7.5.3.2-2: Radiated Spurious Emissions Tabulated Data – OFDM Modulation

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										
2707.2	47.59	42.36	H	-3.91	43.68	38.45	74.0	54.0	30.3	15.5
2707.2	48.42	41.48	V	-3.91	44.51	37.57	74.0	54.0	29.5	16.4
Middle Channel										
2745.6	50.92	46.76	H	-3.80	47.12	42.96	74.0	54.0	26.9	11.0
High Channel										
2782.8	51.34	43.97	H	-3.69	47.65	40.28	74.0	54.0	26.4	13.7
2782.8	52.05	45.20	V	-3.69	48.36	41.51	74.0	54.0	25.6	12.5

Table 7.5.3.2-3: Radiated Spurious Emissions Tabulated Data – DSSS Modulation

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										
2707.2	52.41	46.22	H	-3.91	48.50	42.31	74.0	54.0	25.5	11.7
2707.2	52.78	45.59	V	-3.91	48.87	41.68	74.0	54.0	25.1	12.3
3609.6	49.34	37.73	H	-0.98	48.36	36.75	74.0	54.0	25.6	17.3
3609.6	49.82	37.39	V	-0.98	48.84	36.41	74.0	54.0	25.2	17.6
Middle Channel										
2745.6	54.04	49.08	H	-3.80	50.24	45.28	74.0	54.0	23.8	8.7
2745.6	54.11	49.23	V	-3.80	50.31	45.43	74.0	54.0	23.7	8.6
3660.8	50.45	40.07	H	-0.79	49.66	39.28	74.0	54.0	24.3	14.7
3660.8	49.23	38.23	V	-0.79	48.44	37.44	74.0	54.0	25.6	16.6
High Channel										
2782.8	55.13	50.50	H	-3.69	51.44	46.81	74.0	54.0	22.6	7.2
2782.8	54.06	48.36	V	-3.69	50.37	44.67	74.0	54.0	23.6	9.3
3710.4	49.57	37.46	H	-0.61	48.96	36.85	74.0	54.0	25.0	17.2
3710.4	50.69	37.69	V	-0.61	50.08	37.08	74.0	54.0	23.9	16.9

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 Modulation 10kbps

Corrected Level: 56.36 - 4.00 = 52.36dBuV/m
Margin: 74dBuV/m – 52.36dBuV/m = 21.6dB

Example Calculation: Average – FSK Modulation 10kbps

Corrected Level: 52.52 - 4.00 - 0 = 48.52dBuV
Margin: 54dBuV – 48.52dBuV = 5.5dB

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%.

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 OW1, 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 in this test report.

END REPORT