# Certification Test Report

**FCC ID: SK9NIC**
**IC: 864G-NIC**

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

**Report Number: AT72147858-1C0**

Manufacturer: Itron, Inc.
Model: NIC

Test Begin Date: April 02, 2019
Test End Date: April 11, 2019

Report Issue Date: May 2, 2019

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:**

**Jeremy Pickens**
**Senior Wireless Engineer**
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**TÜV SÜD America Inc.**




**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 NIC is an electricity metering module which includes a 902.4 MHz to 927.6 MHz transmitter. 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 FHSS 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<br>OFDM: 200kbps, 600kbps, 1200kbps(1)<br>DSSS: 12.5kbps |
| Operating Voltage | 12Vdc |
| Antenna Type(s) / Gain(s) | 1) External Omnidirectional / 3dBi (Laird, P/N: TRA9023P)<br>2) External Monopole / 2.8dBi (CISCO, P/N: ANT-MP-INT-OUT-M) |

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

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

Test Sample Serial Number: 110900000671

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 QMR to SMA adapter. The EUT was programmed to generate a continuously modulated signal on each channel evaluated.

| | |
|---|---|
| Software power setting during test: | FSK/DSSS: RFIC Attn: 9, DMCC Scale 0x3FFF<br>OFDM: RFIC Attn: 9, DMCC Scale 0x1826 |

# 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 – Chamber A

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 5’ in diameter and 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 ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted EMCO Model 1060 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 chase from the turntable to the pit that allows 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 chamber rear wall is covered with a mixture of Siepel pyramidal absorber. The side walls of the chamber are partially covered with Siepel pyramidal absorber.

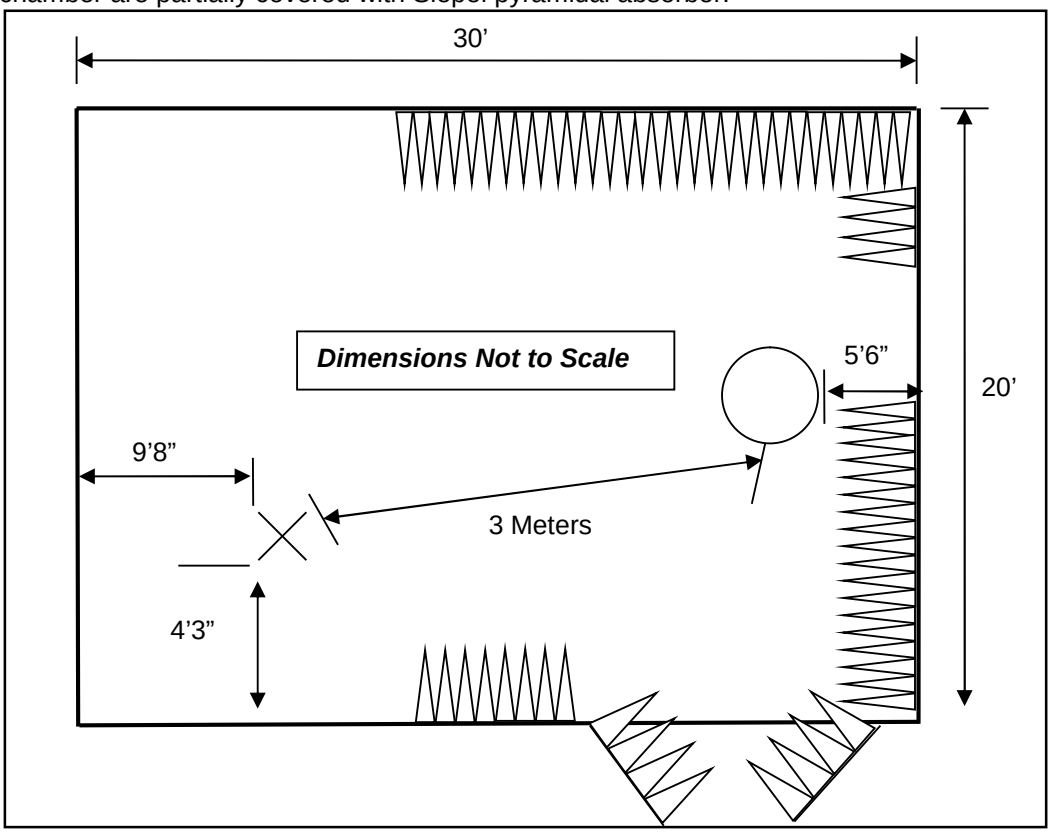


**Figure 2.3.1-1: Semi-Anechoic Chamber Test Site – Chamber A**

### 2.3.2 Semi-Anechoic Chamber Test Site – Chamber B

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.

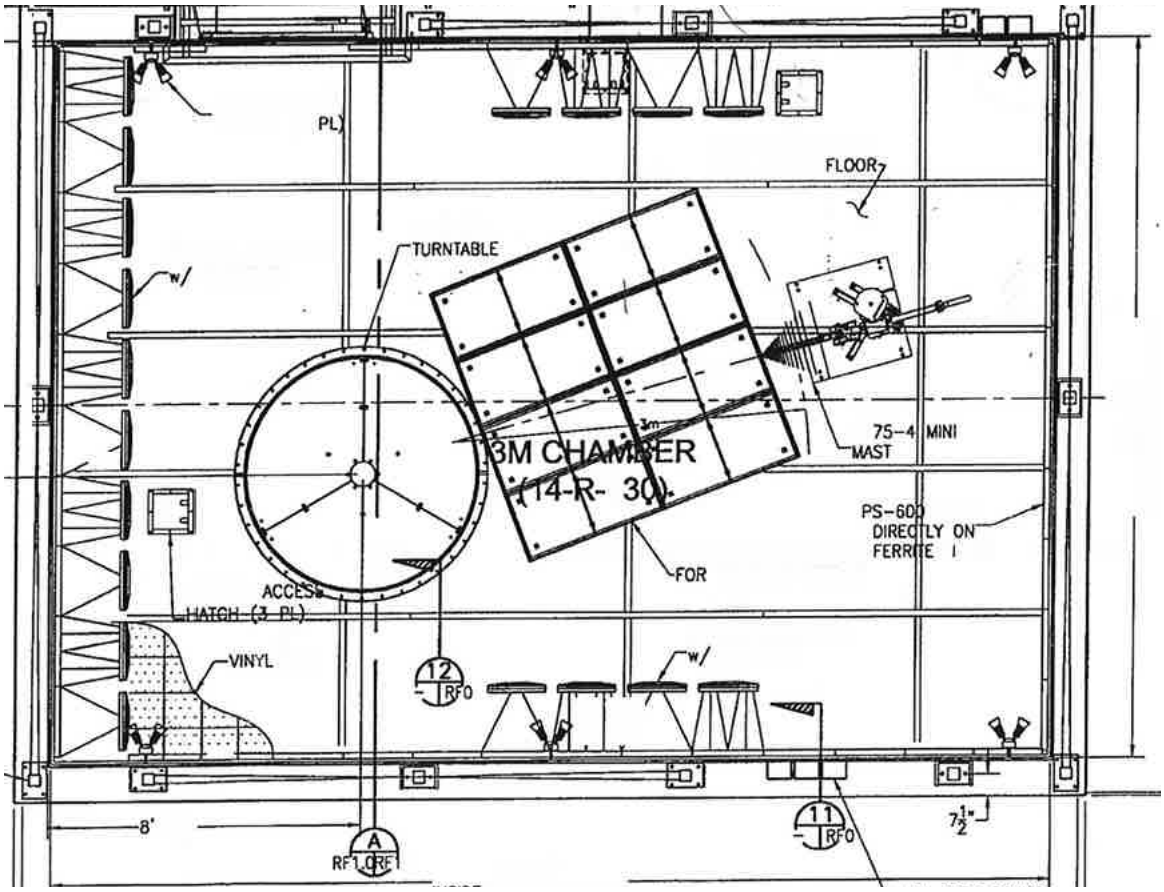


**Figure 2.3.2-1: Semi-Anechoic Chamber Test Site – Chamber B**

## 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.

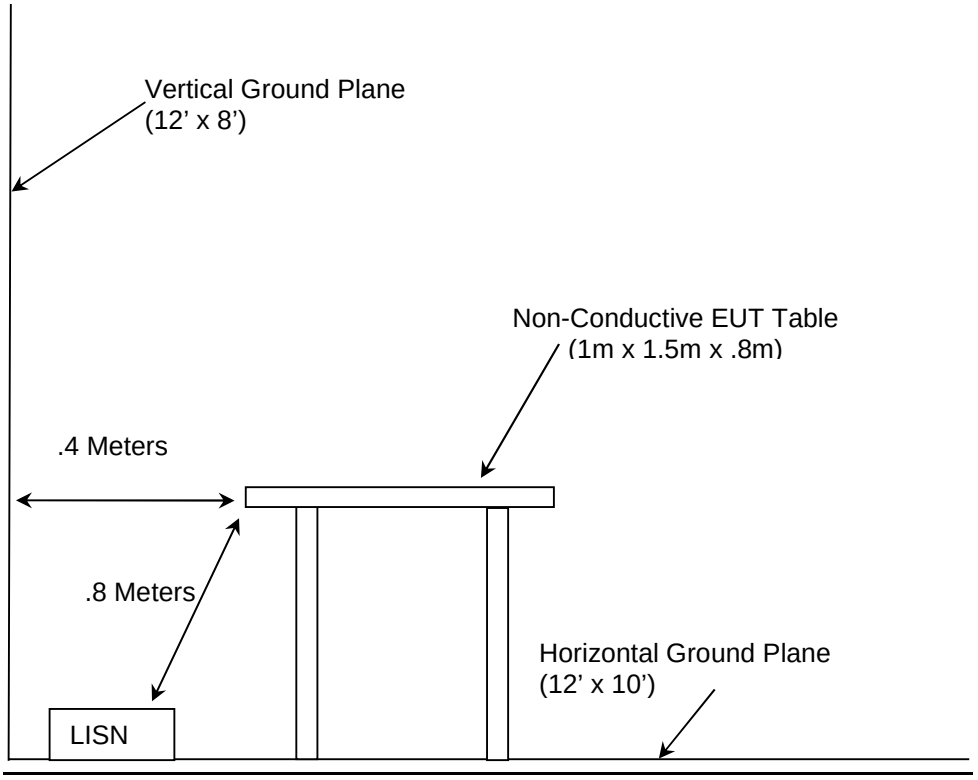


**Figure 2.4.1-1: AC Mains Conducted EMI Site**

## 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, 2019
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2019
- 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 + Amendment 1, March 2019

## 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 |
| 321 | Hewlett Packard | HPC 8447D | Low Freq. Pre-Amp | 1937A02809 | 09/12/2018 | 09/12/2019 |
| 324 | ACS | Belden | Conducted EMI Cable | 8214 | 03/19/2019 | 03/19/2020 |
| 337 | Microwave Circuits | H1G513G1 | Microwave Bandpass Filter | 282706 | 05/16/2018 | 05/16/2019 |
| 338 | Hewlett Packard | 8449B | High Frequency Pre-Amp | 3008A01111 | 07/11/2017 | 07/11/2019 |
| 622 | Rohde & Schwarz | FSV40 (v3.40) | FSV Signal Analyzer 10Hz to 40GHz | 101338 | 07/30/2018 | 07/30/2020 |
| 628 | EMCO | 6502 | Active Loop Antenna 10kHz-30MHz | 9407-2877 | 02/11/2019 | 11/02/2021 |
| 813 | PMM | 9010 | EMI Receiver; RF Input 50ohm; 10Hz-50MHz; 10Hz-30MHz | 697WW30606 | 02/25/2019 | 02/25/2020 |
| 819 | Rohde & Schwarz | ESR26 | EMI Test Receiver | 101345 | 11/06/2018 | 11/06/2019 |
| 827 | (-) | TS8997 Rack Cable Set | TS8997 Rack Cable Set | N/A | 08/13/2018 | 08/13/2019 |
| 851 | TUV ATLANTA | FMC0101951-100CM | ASAC Cable Set Consisting of 566, 619, and 643 | N/A | 09/26/2018 | 09/26/2019 |
| 852 | Teseq | CBL 6112D | Bilog Antenna; Attenuator | 51617 | 10/15/2018 | 10/15/2019 |
| 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 | Triad Magnetics | WSU120-1000 | N/A |
| 2 | Antenna | Laird | TRA9023P | N/A |
| | | CISCO | ANT-MP-INT-OUT-M | N/A |

**Table 5-2: Cable Description**

| Cable | Cable Type | Length | Shield | Termination |
|---|---|---|---|---|
| A | DC Power Cable | 1.75m | No | EUT to Power Supply |
| B | Coax | 0.2m[1]<br>0.3m[2] | Coax | EUT to Antenna |

1) Coax with Laird antenna
2) Coax with CISCO antenna

## 6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

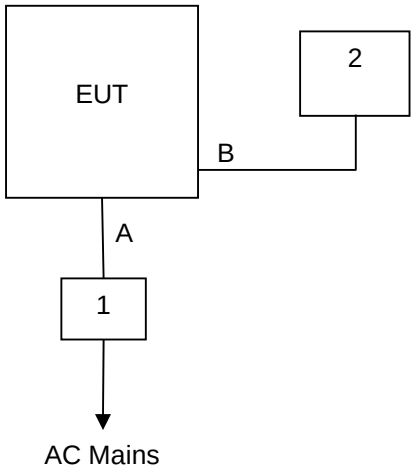


**Figure 6-1: Test Setup Block Diagram**

# 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 was evaluated with two separate omnidirectional external / detachable antennas:

1) Laird, P/N: TRA9023P, 3dBi Max
2) CISCO, P/N: ANT-MP-INT-OUT-M, 2.8dBi Max

The NIC module utilizes a female QMR connector which meets the unique antenna connector requirements in 15.203.

## 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 – Laird Antenna - Line 1**

| Frequency (MHz) | Corrected Reading | | Limit | | Margin | | Correction (dB) |
|---|---|---|---|---|---|---|---|
| | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average | |
| | (dBµV) | (dBµV) | (dBµV) | (dBµV) | (dB) | (dB) | |
| 0.154 | 61.08 | 32.35 | 65.78 | 55.78 | 4.7 | 23.43 | 9.6 |
| 0.17 | 60.92 | 31.81 | 64.96 | 54.96 | 4.04 | 23.15 | 9.56 |
| 0.178 | 59.48 | 34.5 | 64.58 | 54.58 | 5.1 | 20.08 | 9.57 |
| 0.194 | 58.77 | 29.65 | 63.86 | 53.86 | 5.09 | 24.21 | 9.59 |
| 0.202 | 58.29 | 29.11 | 63.53 | 53.53 | 5.24 | 24.42 | 9.6 |
| 0.214 | 57.33 | 34.21 | 63.05 | 53.05 | 5.72 | 18.84 | 9.61 |
| 0.234 | 56.57 | 26.62 | 62.31 | 52.31 | 5.74 | 25.69 | 9.61 |
| 0.266 | 55.43 | 24.76 | 61.24 | 51.24 | 5.81 | 26.48 | 9.62 |
| 0.278 | 53.57 | 25.71 | 60.88 | 50.88 | 7.31 | 25.17 | 9.61 |
| 0.298 | 52.96 | 23.03 | 60.3 | 50.3 | 7.34 | 27.27 | 9.61 |

**Table 7.2.2-2: Conducted EMI Results – Laird Antenna - Line 2**

| Frequency (MHz) | Corrected Reading | | Limit | | Margin | | Correction (dB) |
|---|---|---|---|---|---|---|---|
| | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average | |
| | (dBµV) | (dBµV) | (dBµV) | (dBµV) | (dB) | (dB) | |
| 0.158 | 61.57 | 32.7 | 65.57 | 55.57 | 4.0 | 22.87 | 9.63 |
| 0.186 | 61.22 | 30.59 | 64.21 | 54.21 | 2.99 | 23.62 | 9.63 |
| 0.198 | 59.29 | 30.04 | 63.69 | 53.69 | 4.4 | 23.65 | 9.62 |
| 0.218 | 58.58 | 29.06 | 62.89 | 52.89 | 4.31 | 23.83 | 9.62 |
| 0.238 | 57.16 | 27.6 | 62.17 | 52.17 | 5.01 | 24.57 | 9.62 |
| 0.258 | 55.97 | 26.16 | 61.5 | 51.5 | 5.53 | 25.34 | 9.62 |
| 0.27 | 54.95 | 25.4 | 61.12 | 51.12 | 6.17 | 25.72 | 9.62 |
| 0.294 | 54.23 | 24.02 | 60.41 | 50.41 | 6.18 | 26.39 | 9.62 |
| 0.314 | 52.93 | 23.27 | 59.86 | 49.86 | 6.93 | 26.59 | 9.62 |
| 0.342 | 51.69 | 22.28 | 59.15 | 49.15 | 7.46 | 26.87 | 9.64 |

**Table 7.2.2-3: Conducted EMI Results – CISCO Antenna – Line 1**

| Frequency (MHz) | Corrected Reading | | Limit | | Margin | | Correction (dB) |
|---|---|---|---|---|---|---|---|
| | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average | |
| | (dBµV) | (dBµV) | (dBµV) | (dBµV) | (dB) | (dB) | |
| 0.15 | 62.53 | 34.59 | 66 | 56 | 3.47 | 21.41 | 9.61 |
| 0.162 | 61.85 | 32.83 | 65.36 | 55.36 | 3.51 | 22.53 | 9.58 |
| 0.186 | 61.38 | 32.91 | 64.21 | 54.21 | 2.83 | 21.3 | 9.58 |
| 0.206 | 59.68 | 30.03 | 63.37 | 53.37 | 3.69 | 23.34 | 9.6 |
| 0.218 | 58.68 | 35.25 | 62.89 | 52.89 | 4.21 | 17.64 | 9.61 |
| 0.234 | 57.9 | 28 | 62.31 | 52.31 | 4.41 | 24.31 | 9.61 |
| 0.258 | 56.54 | 31.3 | 61.5 | 51.5 | 4.96 | 20.2 | 9.62 |
| 0.278 | 55.41 | 25.45 | 60.88 | 50.88 | 5.47 | 25.43 | 9.61 |
| 0.294 | 54.24 | 25.21 | 60.41 | 50.41 | 6.17 | 25.2 | 9.61 |
| 0.31 | 53.43 | 23.68 | 59.97 | 49.97 | 6.54 | 26.29 | 9.61 |

**Table 7.2.2-4: Conducted EMI Results – CISCO Antenna - Line 2**

| Frequency (MHz) | Corrected Reading | | Limit | | Margin | | Correction (dB) |
|---|---|---|---|---|---|---|---|
| | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average | |
| | (dBµV) | (dBµV) | (dBµV) | (dBµV) | (dB) | (dB) | |
| 0.15 | 62.62 | 34.07 | 66 | 56 | 3.38 | 21.93 | 9.62 |
| 0.162 | 61.68 | 32.84 | 65.36 | 55.36 | 3.68 | 22.52 | 9.63 |
| 0.174 | 61.49 | 31.73 | 64.77 | 54.77 | 3.28 | 23.04 | 9.64 |
| 0.194 | 60.12 | 30.82 | 63.86 | 53.86 | 3.74 | 23.04 | 9.62 |
| 0.206 | 59.44 | 29.96 | 63.37 | 53.37 | 3.93 | 23.41 | 9.62 |
| 0.218 | 58.64 | 30.8 | 62.89 | 52.89 | 4.25 | 22.09 | 9.62 |
| 0.234 | 57.95 | 28.17 | 62.31 | 52.31 | 4.36 | 24.14 | 9.62 |
| 0.246 | 56.68 | 27.75 | 61.89 | 51.89 | 5.21 | 24.14 | 9.62 |
| 0.266 | 56.1 | 26.27 | 61.24 | 51.24 | 5.14 | 24.97 | 9.62 |
| 0.286 | 55.03 | 25.4 | 60.64 | 50.64 | 5.61 | 25.24 | 9.62 |

## 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) |
|---|---|---|---|
| 902.4 | 28.1 | FSK | 50 |
| 915.2 | 28.8 | FSK | 50 |
| 927.6 | 27.7 | FSK | 50 |
| 902.4 | 28.1 | FSK | 150 |
| 915.2 | 28.8 | FSK | 150 |
| 927.6 | 27.7 | FSK | 150 |
| 902.4 | 28.6 | OFDM | 200 |
| 915.2 | 29.3 | OFDM | 200 |
| 927.6 | 28.2 | OFDM | 200 |
| 902.4 | 28.6 | OFDM | 600 |
| 915.2 | 29.4 | OFDM | 600 |
| 927.6 | 28.2 | OFDM | 600 |
| 902.4 | 28.2 | DSSS | 12.5 |
| 915.2 | 28.9 | DSSS | 12.5 |
| 927.6 | 27.8 | 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

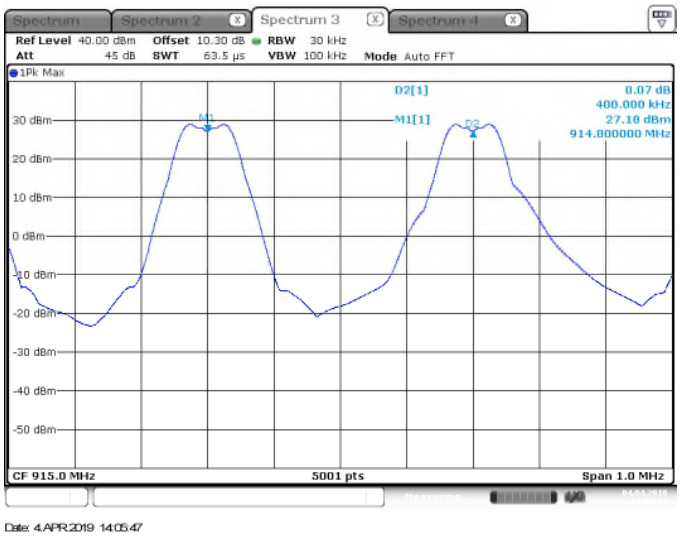


Figure 7.4.1.2-1: Freq. Separation – FSK – 50kbps

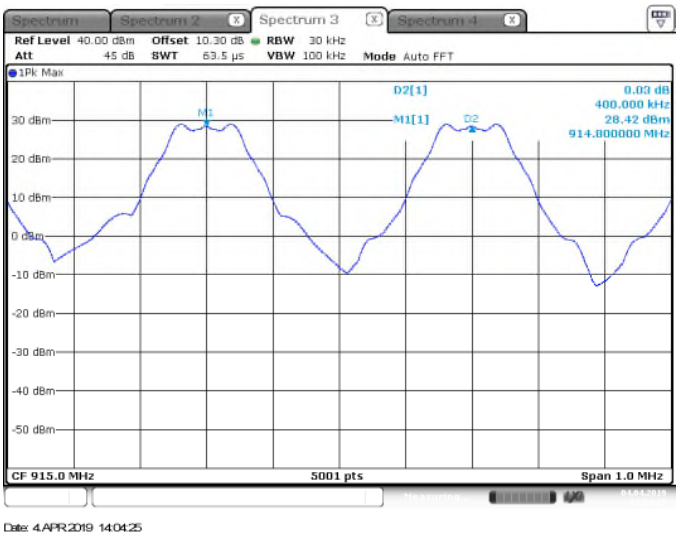


Figure 7.4.1.2-2: Freq. Separation – FSK – 150kbps

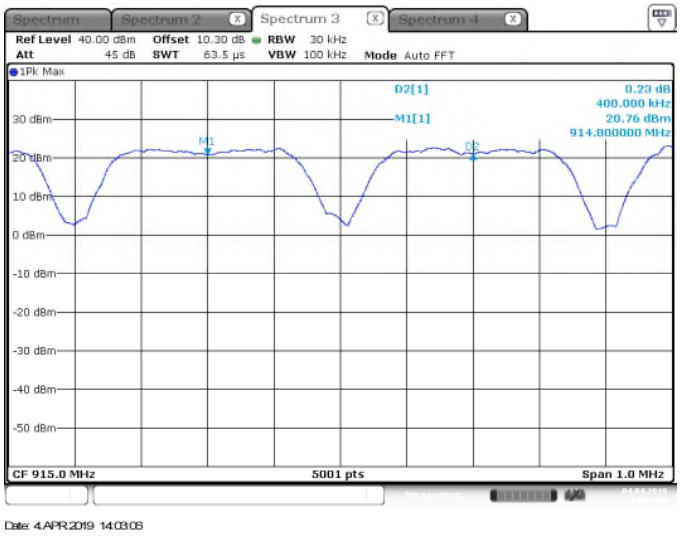


Figure 7.4.1.2-3: Freq. Separation – OFDM – 200kbps

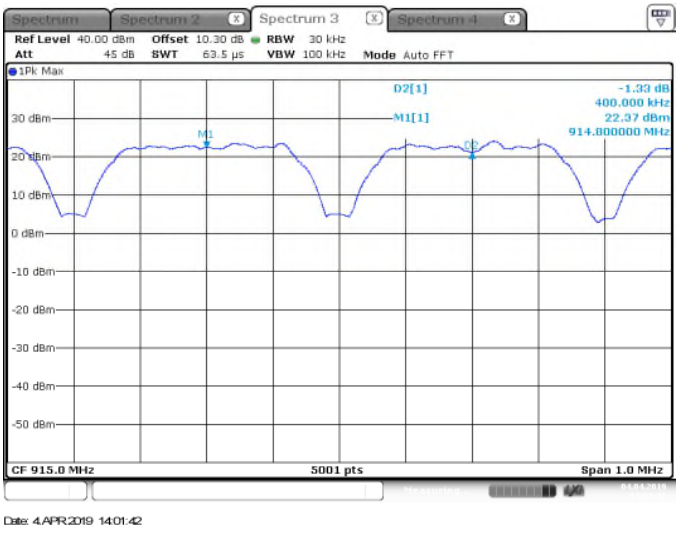


Figure 7.4.1.2-4: Freq. Separation – OFDM – 600kbps

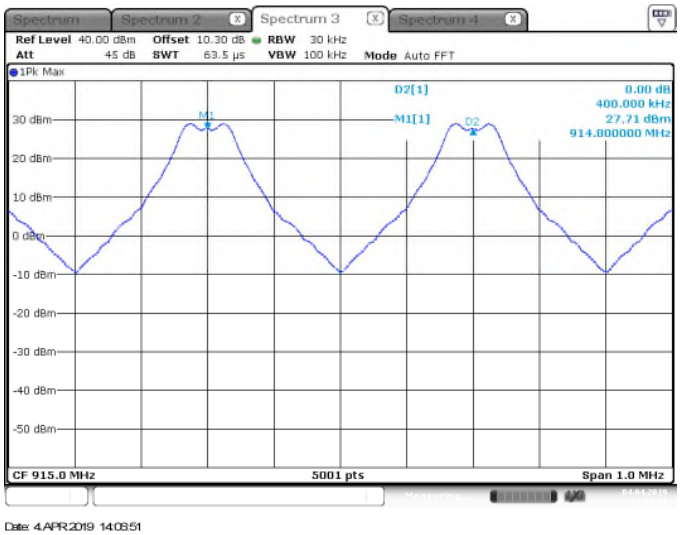


**Figure 7.4.1.2-5: Freq. Separation – DSSS – 12.5kbps**

### 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

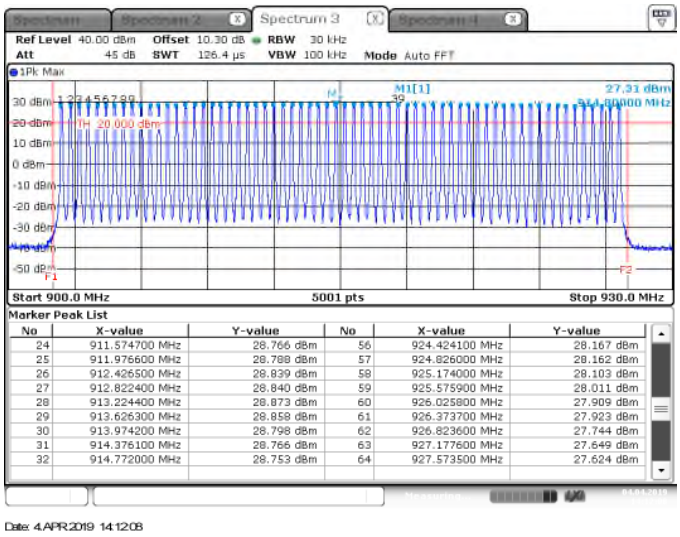


**Figure 7.4.2.2-1: No. of Channels – FSK – 50kbps**

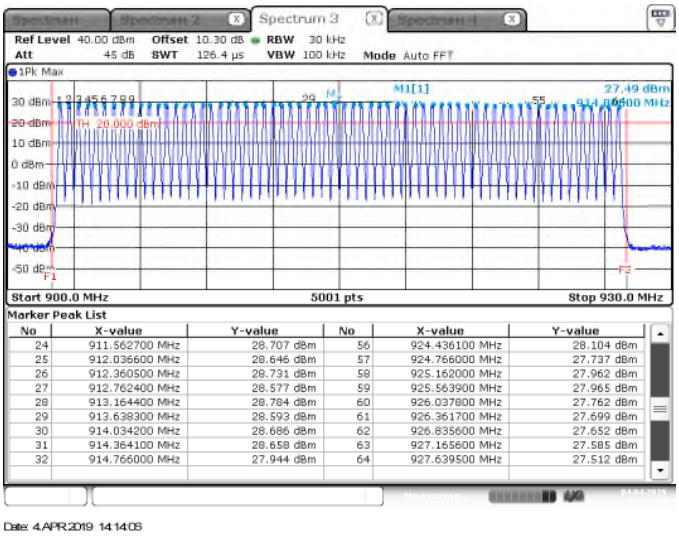


**Figure 7.4.2.2-2: No. of Channels – FSK – 150kbps**

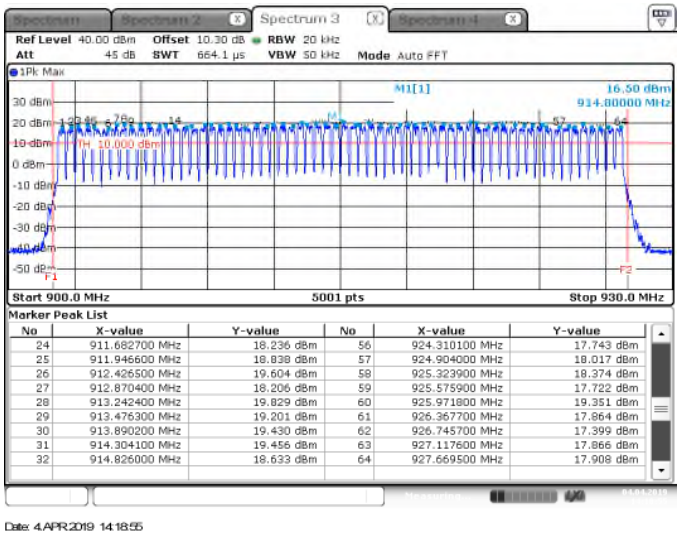


**Figure 7.4.2.2-3: No. of Channels – OFDM – 200kbps**

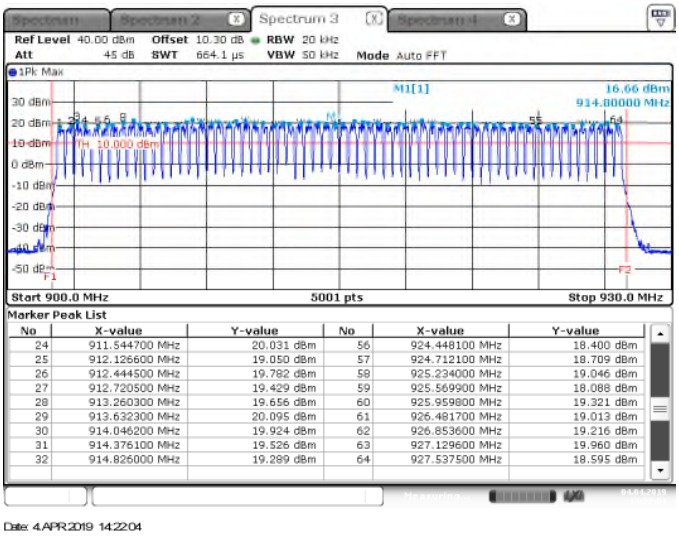


**Figure 7.4.2.2-4: No. of Channels – OFDM – 600kbps**

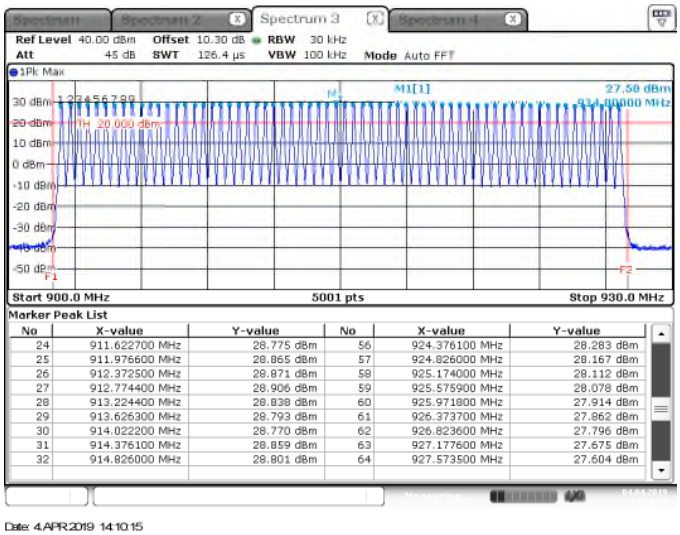


**Figure 7.4.2.2-5: No. of Channels – DSSS – 12.5kbps**

### 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 | 104.1 | 92.3 | 50 | FSK |
| 902.4 | 181.8 | 159.3 | 150 | FSK |
| 902.4 | 336.5 | 289.7 | 200 | OFDM |
| 902.4 | 327.3 | 288.0 | 600 | OFDM |
| 902.4 | 132.1 | 124.8 | 12.5 | DSSS |
| 915.2 | 104.1 | 92.3 | 50 | FSK |
| 915.2 | 182.6 | 159.0 | 150 | FSK |
| 915.2 | 338.5 | 291.2 | 200 | OFDM |
| 915.2 | 331.9 | 289.4 | 600 | OFDM |
| 915.2 | 132.1 | 124.6 | 12.5 | DSSS |
| 927.6 | 104.2 | 92.5 | 50 | FSK |
| 927.6 | 183.9 | 159.6 | 150 | FSK |
| 927.6 | 339.9 | 292.8 | 200 | OFDM |
| 927.6 | 331.7 | 289.3 | 600 | OFDM |
| 927.6 | 133.1 | 126.0 | 12.5 | DSSS |

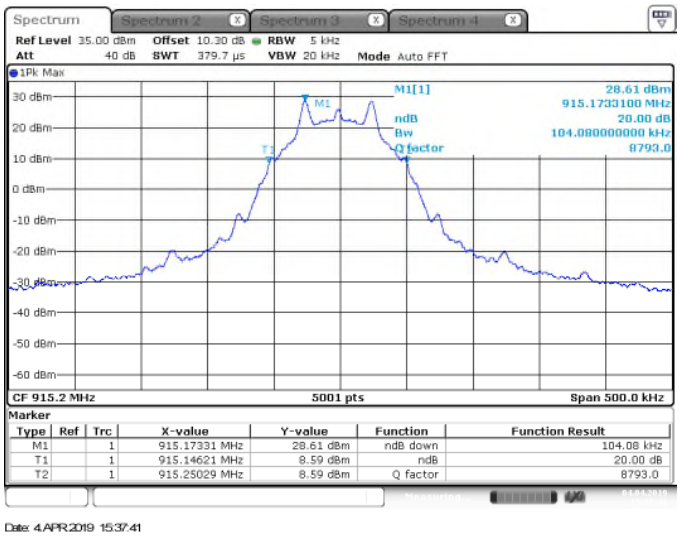


**Figure 7.4.4.2-1: Sample Plot 20dB BW- FSK – 50kbps**

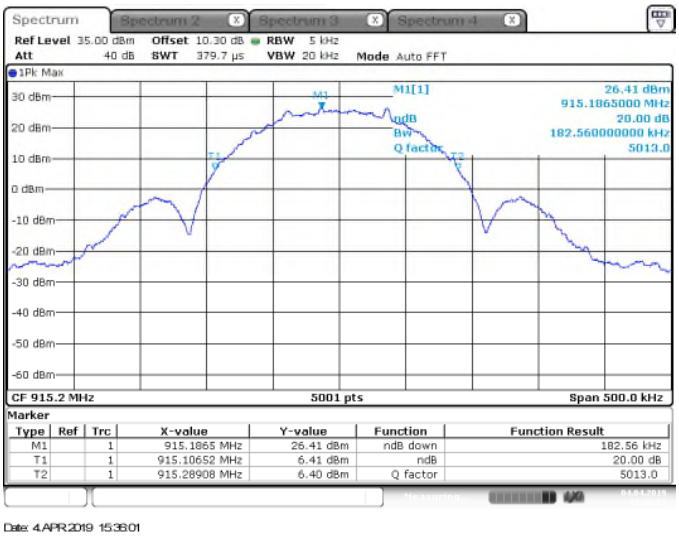


**Figure 7.4.4.2-2: Sample Plot 20dB BW- FSK – 150kbps**

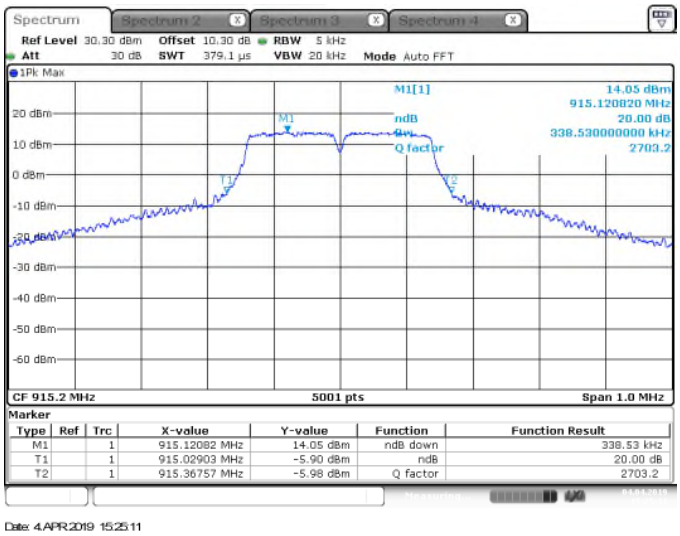


**Figure 7.4.4.2-3: Sample Plot 20dB BW- OFDM – 200kbps**

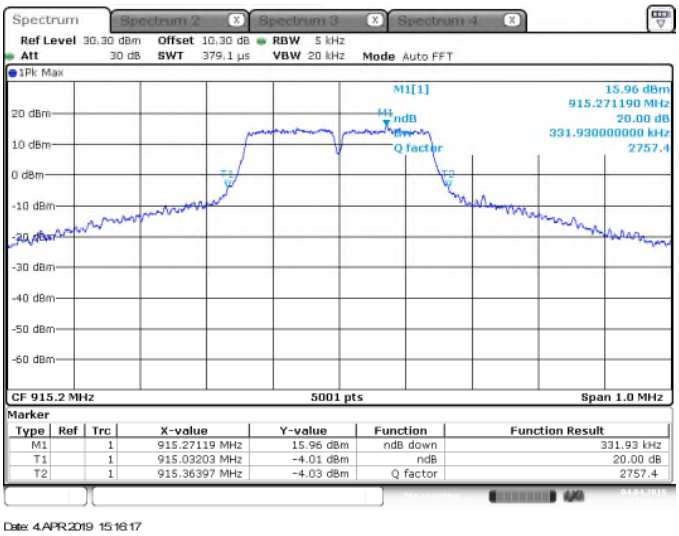


**Figure 7.4.4.2-4: Sample Plot 20dB BW- OFDM – 600kbps**


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

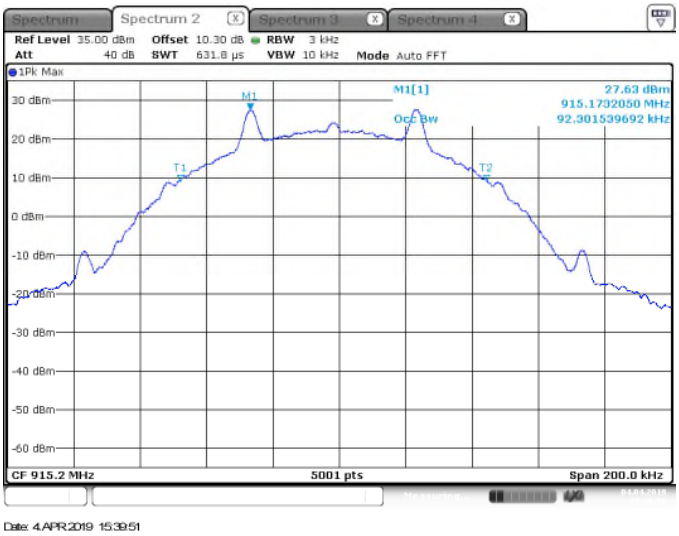


**Figure 7.4.4.2-6: Sample Plot 99% OBW- FSK – 50kbps**

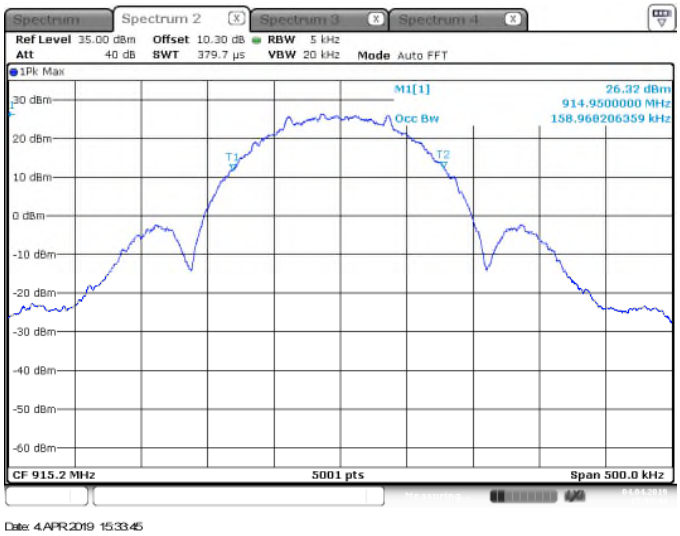


Figure 7.4.4.2-7: Sample Plot 99% OBW- FSK – 150kbps

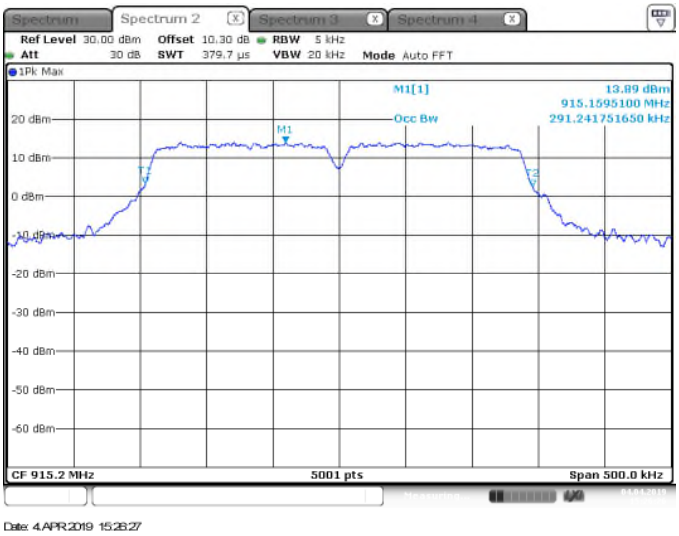


Figure 7.4.4.2-8: Sample Plot 99% OBW- OFDM – 200kbps


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

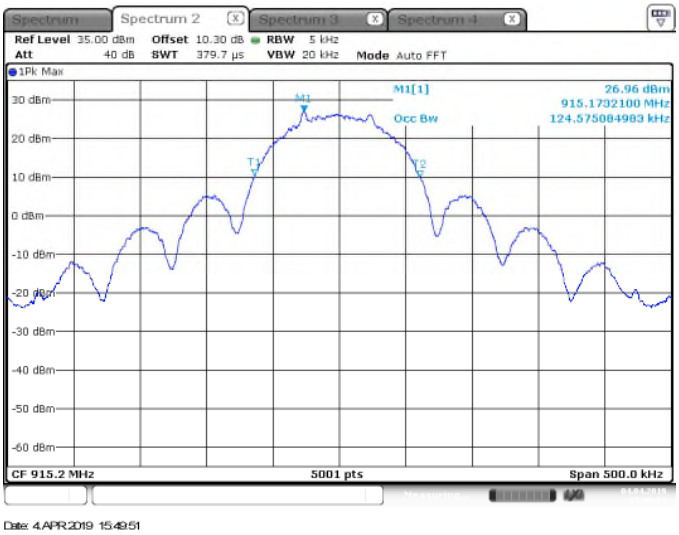


Figure 7.4.4.2-10: Sample Plot 99% OBW- DSSS – 12.5kbps

## 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:**

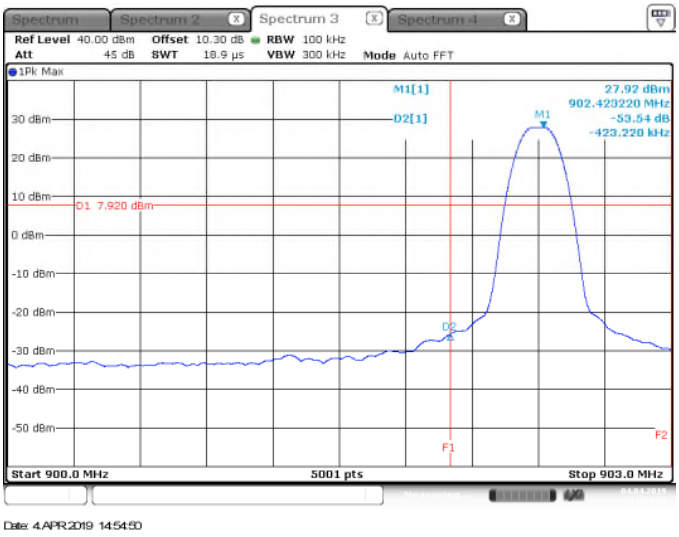


Figure 7.5.1.2-1: Lower Band-edge – FSK – 50kbps

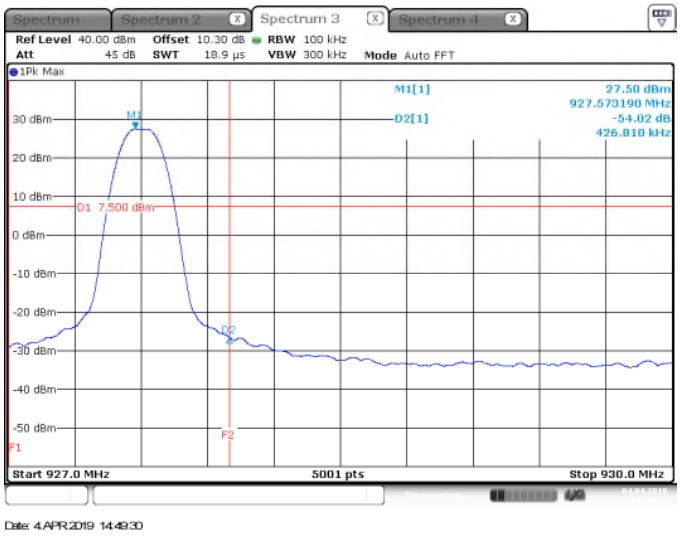


Figure 7.5.1.2-2: Upper Band-edge – FSK – 50kbps

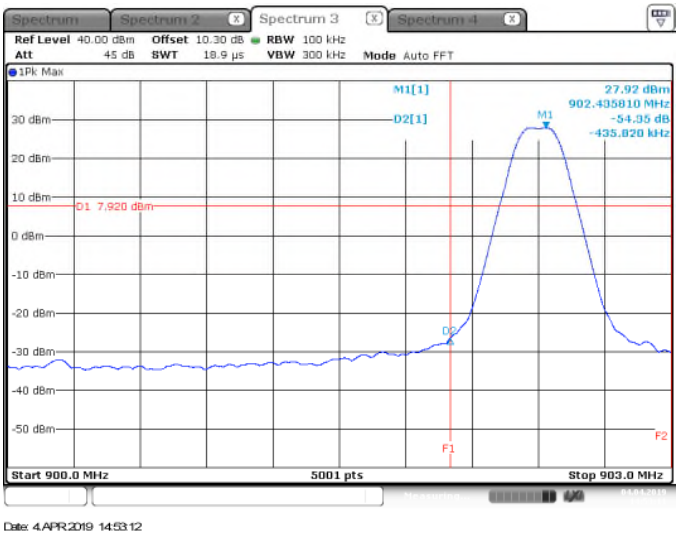


Figure 7.5.1.2-3: Lower Band-edge – FSK – 150kbps

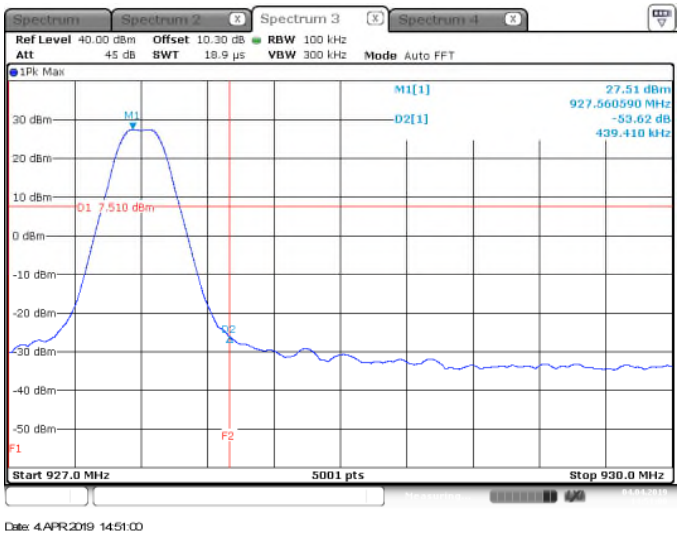


Figure 7.5.1.2-4: Upper Band-edge – FSK – 150kbps

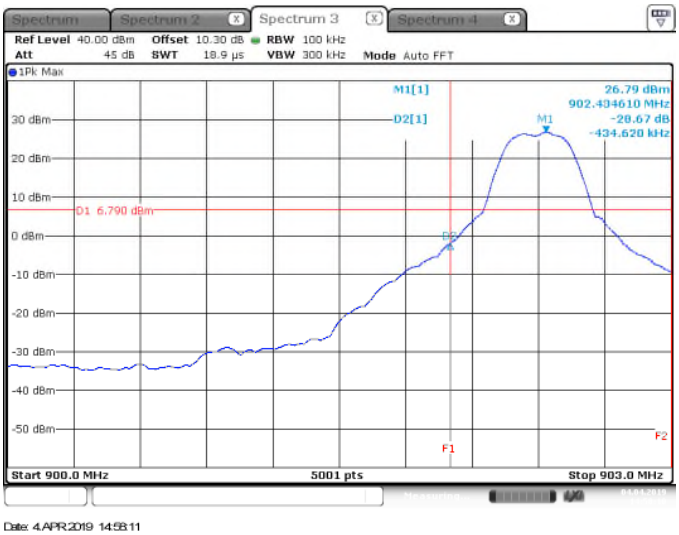


Figure 7.5.1.2-5: Lower Band-edge – OFDM – 200kbps

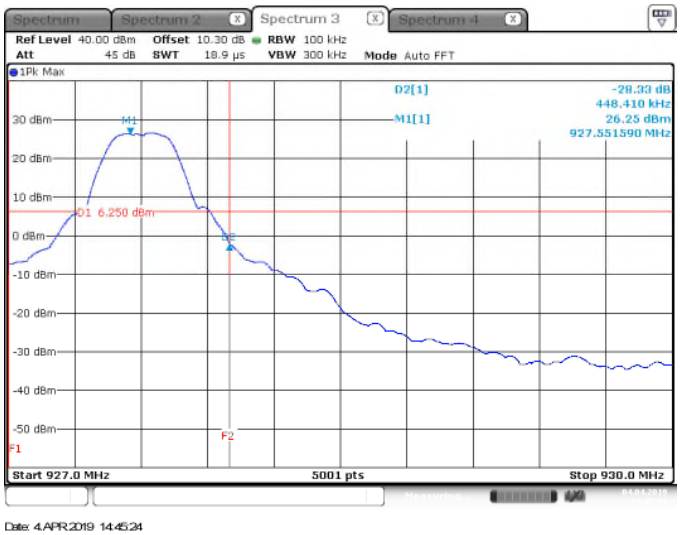


Figure 7.5.1.2-6: Upper Band-edge – OFDM – 200kbps

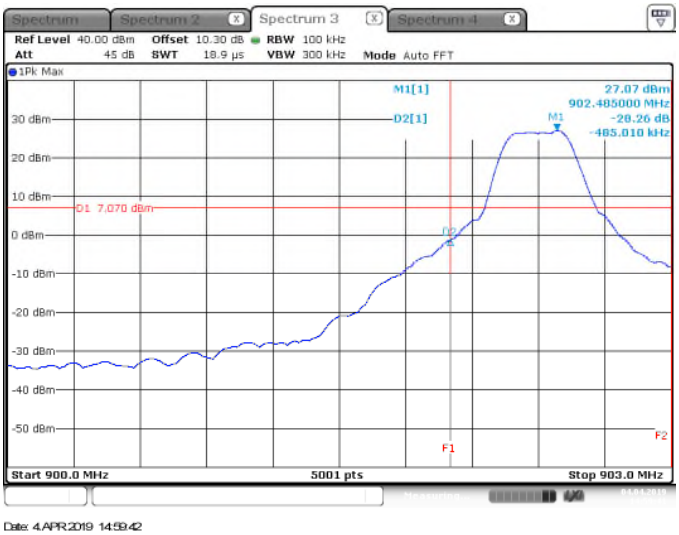


Figure 7.5.1.2-7: Lower Band-edge – OFDM – 600kbps

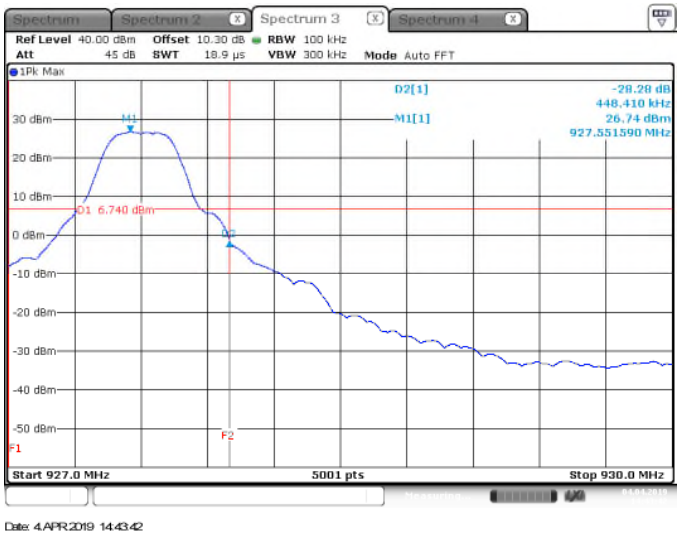


Figure 7.5.1.2-8: Upper Band-edge – OFDM – 600kbps

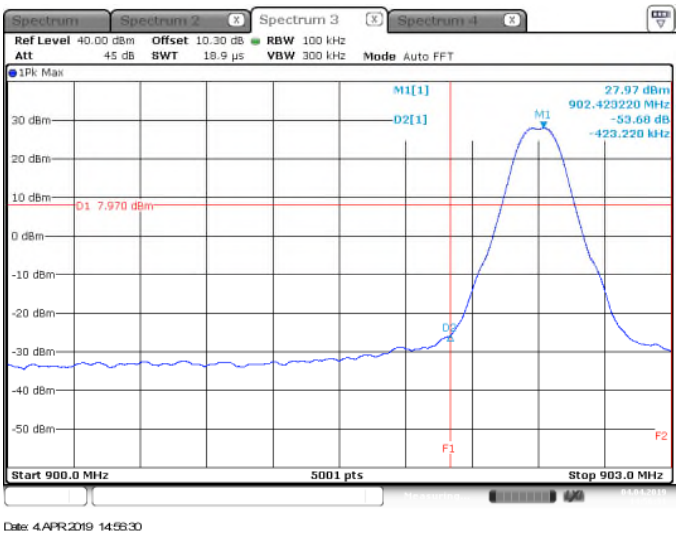


Figure 7.5.1.2-9: Lower Band-edge – DSSS – 12.5kbps

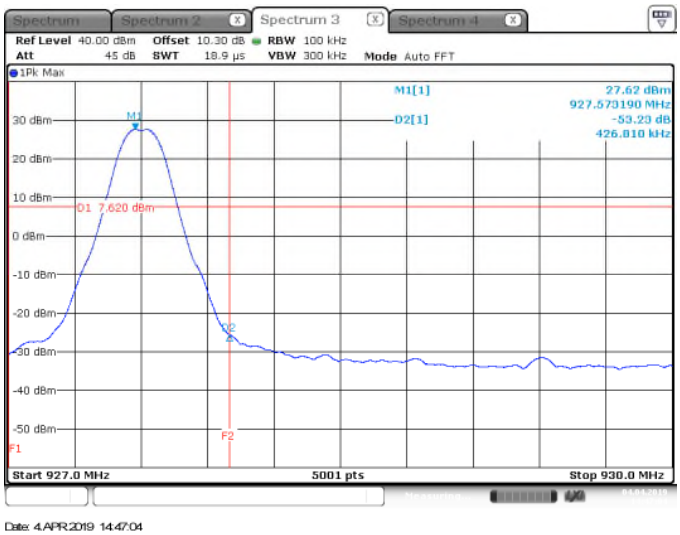


Figure 7.5.1.2-10: Upper Band-edge – DSSS – 12.5kbps

## HOPPING MODE:

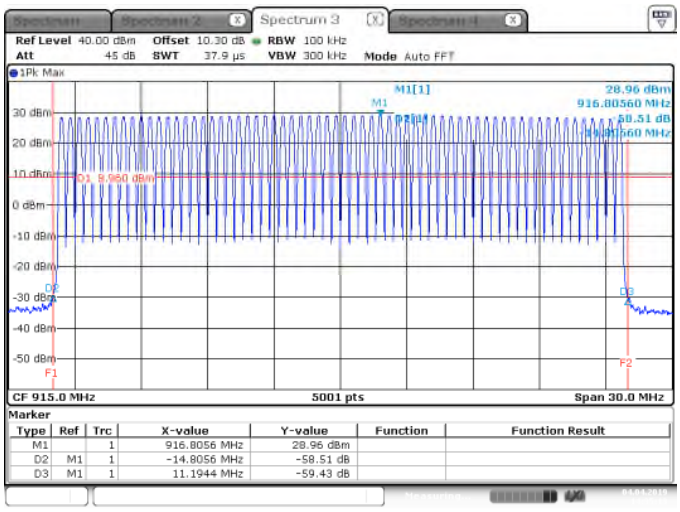


**Figure 7.5.1.2-11: Band Edges – FSK – 50kbps**

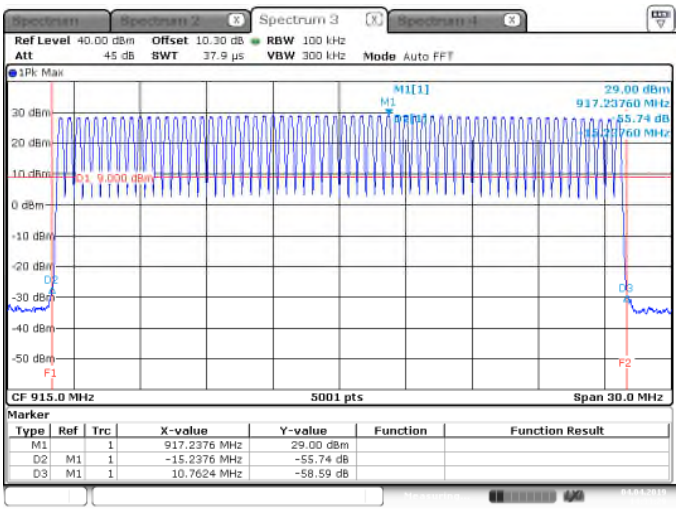


**Figure 7.5.1.2-12: Band Edges – FSK – 150kbps**

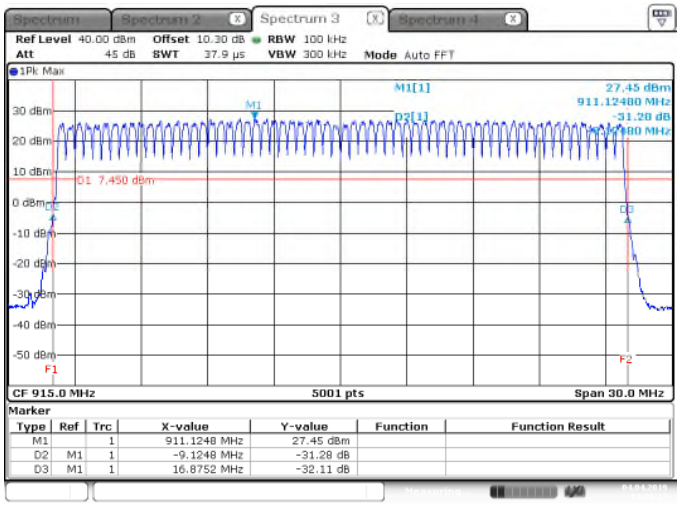


**Figure 7.5.1.2-13: Band Edges – OFDM – 200kbps**

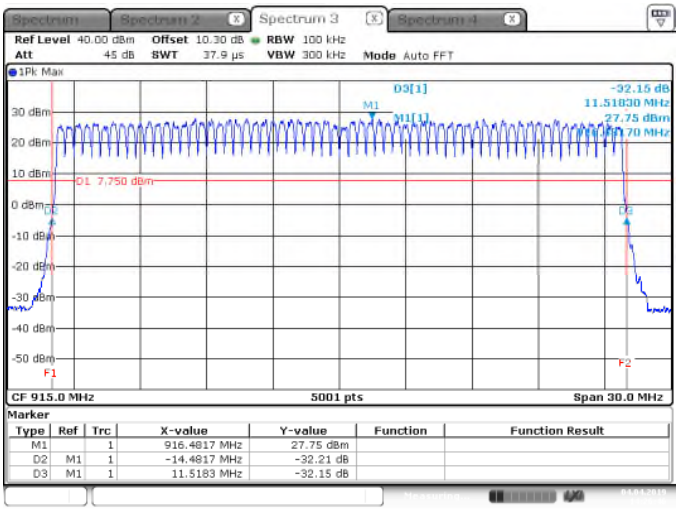


**Figure 7.5.1.2-14: Band Edges – OFDM – 600kbps**

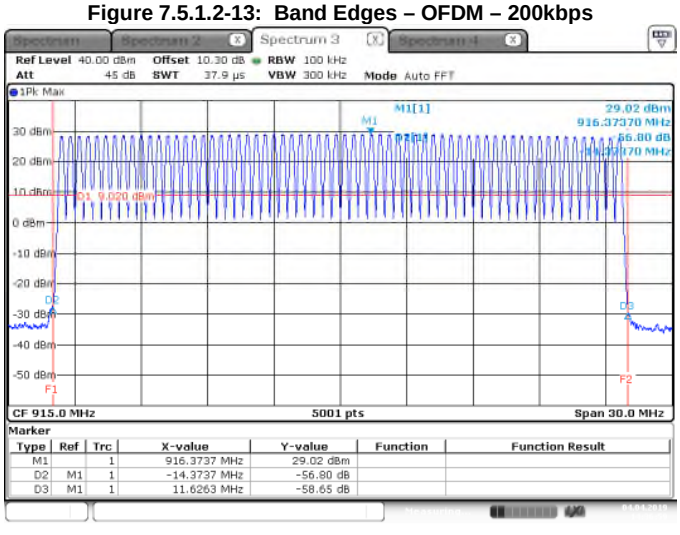


**Figure 7.5.1.2-15: Band Edges – DSSS – 12.5kbps**

### 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 / 50kbps)

#### 7.5.2.2 Measurement Results

Performed by: Jeremy Pickens

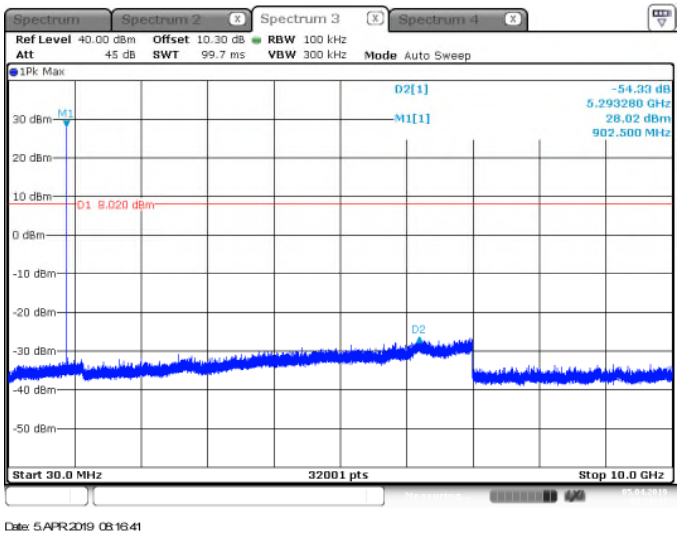


Figure 7.5.2.2-1: 30 MHz – 10 GHz – Low Channel

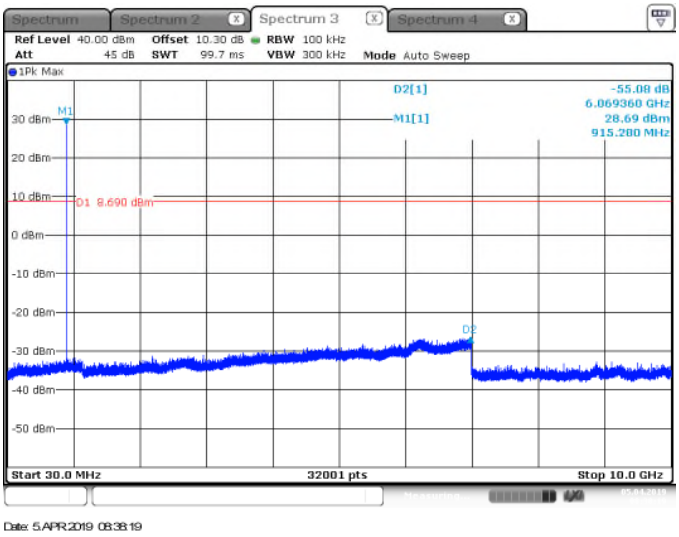


Figure 7.5.2.2-2: 30 MHz – 10 GHz – Middle Channel

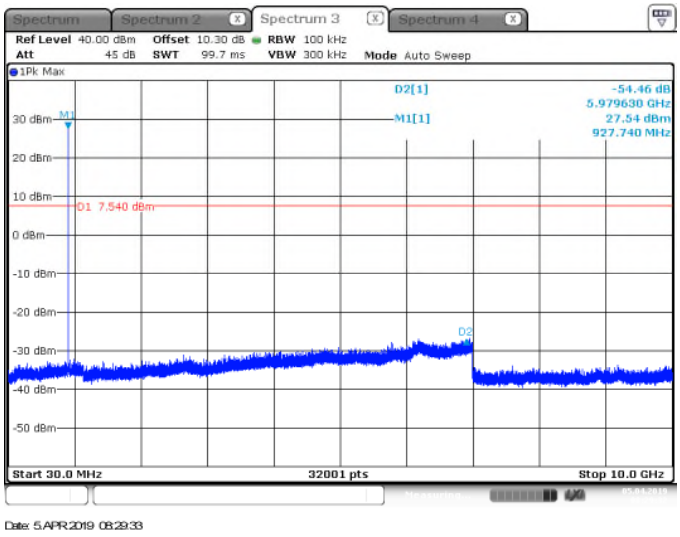


Figure 7.5.2.2-3: 30 MHz – 10 GHz –High Channel

### 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 9kHz 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. Emissions not reported were below the noise floor of the measurement system. Peak data below 30MHz was more than 20dB below the applicable limits.

#### 7.5.3.2 Measurement Results

Performed by: Jeremy Pickens

**Table 7.5.3.2-1: Radiated Spurious Emissions Tabulated Data (FSK 50kHz) – Laird Antenna**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBµV/m) | | Limit (dBµV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **902.4 MHz** | | | | | | | | | | |
| **1804.8** | 48.90 | 35.30 | H | -6.22 | 42.68 | 29.08 | 74.0 | 54.0 | 31.3 | 24.9 |
| **1804.8** | 48.80 | 36.00 | V | -6.22 | 42.58 | 29.78 | 74.0 | 54.0 | 31.4 | 24.2 |
| **2707.2** | 47.50 | 33.00 | H | -2.06 | 45.44 | 30.94 | 74.0 | 54.0 | 28.6 | 23.1 |
| **2707.2** | 47.00 | 33.00 | V | -2.06 | 44.94 | 30.94 | 74.0 | 54.0 | 29.1 | 23.1 |
| **3609.6** | 47.70 | 33.80 | H | 1.18 | 48.88 | 34.98 | 74.0 | 54.0 | 25.1 | 19.0 |
| **3609.6** | 47.20 | 33.60 | V | 1.18 | 48.38 | 34.78 | 74.0 | 54.0 | 25.6 | 19.2 |
| **915.2 MHz** | | | | | | | | | | |
| **1830.4** | 48.40 | 34.10 | H | -6.07 | 42.33 | 28.03 | 74.0 | 54.0 | 31.7 | 26.0 |
| **1830.4** | 48.60 | 34.70 | V | -6.07 | 42.53 | 28.63 | 74.0 | 54.0 | 31.5 | 25.4 |
| **2745.6** | 48.50 | 33.80 | H | -1.93 | 46.57 | 31.87 | 74.0 | 54.0 | 27.4 | 22.1 |
| **2745.6** | 47.20 | 33.20 | V | -1.93 | 45.27 | 31.27 | 74.0 | 54.0 | 28.7 | 22.7 |
| **3660.8** | 47.60 | 33.70 | H | 1.44 | 49.04 | 35.14 | 74.0 | 54.0 | 25.0 | 18.9 |
| **3660.8** | 47.10 | 33.50 | V | 1.44 | 48.54 | 34.94 | 74.0 | 54.0 | 25.5 | 19.1 |
| **927.6 MHz** | | | | | | | | | | |
| **1855.2** | 48.40 | 34.70 | H | -5.93 | 42.47 | 28.77 | 74.0 | 54.0 | 31.5 | 25.2 |
| **1855.2** | 48.30 | 35.30 | V | -5.93 | 42.37 | 29.37 | 74.0 | 54.0 | 31.6 | 24.6 |
| **2782.8** | 47.6 | 34.3 | H | -1.81 | 45.79 | 32.49 | 74.0 | 54.0 | 28.2 | 21.5 |
| **2782.8** | 48.4 | 34.3 | V | -1.81 | 46.59 | 32.49 | 74.0 | 54.0 | 27.4 | 21.5 |
| **3707.9** | 48 | 34.6 | H | 1.68 | 49.68 | 36.28 | 74.0 | 54.0 | 24.3 | 17.7 |
| **3707.9** | 47.8 | 34.2 | V | 1.68 | 49.48 | 35.88 | 74.0 | 54.0 | 24.5 | 18.1 |

**Table 7.5.3.2-2: Radiated Spurious Emissions Tabulated Data (LR 12.5kHz) – Laird Antenna**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBµV/m) | | Limit (dBµV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **902.4 MHz** | | | | | | | | | | |
| **1804.8** | 48.00 | 35.20 | H | -6.22 | 41.78 | 28.98 | 74.0 | 54.0 | 32.2 | 25.0 |
| **1804.8** | 48.50 | 35.50 | V | -6.22 | 42.28 | 29.28 | 74.0 | 54.0 | 31.7 | 24.7 |
| **2707.2** | 47.40 | 33.20 | H | -2.06 | 45.34 | 31.14 | 74.0 | 54.0 | 28.7 | 22.9 |
| **2707.2** | 47.50 | 33.30 | V | -2.06 | 45.44 | 31.24 | 74.0 | 54.0 | 28.6 | 22.8 |
| **3609.6** | 47.80 | 34.20 | H | 1.18 | 48.98 | 35.38 | 74.0 | 54.0 | 25.0 | 18.6 |
| **3609.6** | 47.50 | 33.70 | V | 1.18 | 48.68 | 34.88 | 74.0 | 54.0 | 25.3 | 19.1 |
| **915.2 MHz** | | | | | | | | | | |
| **1830.4** | 48.40 | 34.20 | H | -6.07 | 42.33 | 28.13 | 74.0 | 54.0 | 31.7 | 25.9 |
| **1830.4** | 48.50 | 35.00 | V | -6.07 | 42.43 | 28.93 | 74.0 | 54.0 | 31.6 | 25.1 |
| **2745.6** | 47.80 | 34.00 | H | -1.93 | 45.87 | 32.07 | 74.0 | 54.0 | 28.1 | 21.9 |
| **2745.6** | 47.80 | 33.50 | V | -1.93 | 45.87 | 31.57 | 74.0 | 54.0 | 28.1 | 22.4 |
| **3660.8** | 47.60 | 33.70 | H | 1.44 | 49.04 | 35.14 | 74.0 | 54.0 | 25.0 | 18.9 |
| **3660.8** | 47.00 | 33.50 | V | 1.44 | 48.44 | 34.94 | 74.0 | 54.0 | 25.6 | 19.1 |
| **927.6 MHz** | | | | | | | | | | |
| **1855.2** | 48.60 | 34.80 | H | -5.93 | 42.67 | 28.87 | 74.0 | 54.0 | 31.3 | 25.1 |
| **1855.2** | 48.40 | 35.40 | V | -5.93 | 42.47 | 29.47 | 74.0 | 54.0 | 31.5 | 24.5 |
| **2782.8** | 47.9 | 34.1 | H | -1.81 | 46.09 | 32.29 | 74.0 | 54.0 | 27.9 | 21.7 |
| **2782.8** | 48 | 34.4 | V | -1.81 | 46.19 | 32.59 | 74.0 | 54.0 | 27.8 | 21.4 |
| **3707.9** | 48 | 34.4 | H | 1.68 | 49.68 | 36.08 | 74.0 | 54.0 | 24.3 | 17.9 |
| **3707.9** | 48.1 | 34.1 | V | 1.68 | 49.78 | 35.78 | 74.0 | 54.0 | 24.2 | 18.2 |

**Table 7.5.3.2-3: Radiated Spurious Emissions Tabulated Data (OFDM 200kHz) – Laird Antenna**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBµV/m) | | Limit (dBµV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **902.4 MHz** | | | | | | | | | | |
| **1804.8** | 48.30 | 33.90 | H | -6.22 | 42.08 | 27.68 | 74.0 | 54.0 | 31.9 | 26.3 |
| **1804.8** | 48.00 | 34.10 | V | -6.22 | 41.78 | 27.88 | 74.0 | 54.0 | 32.2 | 26.1 |
| **3609.6** | 47.90 | 34.00 | H | 1.18 | 49.08 | 35.18 | 74.0 | 54.0 | 24.9 | 18.8 |
| **3609.6** | 46.80 | 33.70 | V | 1.18 | 47.98 | 34.88 | 74.0 | 54.0 | 26.0 | 19.1 |
| **915.2 MHz** | | | | | | | | | | |
| **1830.4** | 47.90 | 34.10 | H | -6.07 | 41.83 | 28.03 | 74.0 | 54.0 | 32.2 | 26.0 |
| **1830.4** | 48.10 | 34.40 | V | -6.07 | 42.03 | 28.33 | 74.0 | 54.0 | 32.0 | 25.7 |
| **3660.8** | 48.10 | 34.40 | H | 1.44 | 49.54 | 35.84 | 74.0 | 54.0 | 24.5 | 18.2 |
| **3660.8** | 48.40 | 33.70 | V | 1.44 | 49.84 | 35.14 | 74.0 | 54.0 | 24.2 | 18.9 |
| **927.6 MHz** | | | | | | | | | | |
| **1855.2** | 48.60 | 34.40 | H | -5.93 | 42.67 | 28.47 | 74.0 | 54.0 | 31.3 | 25.5 |
| **1855.2** | 48.60 | 34.60 | V | -5.93 | 42.67 | 28.67 | 74.0 | 54.0 | 31.3 | 25.3 |
| **3707.9** | 48.60 | 34.60 | H | 1.68 | 50.28 | 36.28 | 74.0 | 54.0 | 23.7 | 17.7 |
| **3707.9** | 47.10 | 34.40 | V | 1.68 | 48.78 | 36.08 | 74.0 | 54.0 | 25.2 | 17.9 |

**Table 7.5.3.2-4: Radiated Spurious Emissions Tabulated Data (FSK 50kHz) – CISCO Antenna**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBµV/m) | | Limit (dBµV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **902.4 MHz** | | | | | | | | | | |
| **1804.8** | 48.70 | 34.90 | H | -6.47 | 42.23 | 28.43 | 74.0 | 54.0 | 31.8 | 25.6 |
| **1804.8** | 49.90 | 36.00 | V | -6.47 | 43.43 | 29.53 | 74.0 | 54.0 | 30.6 | 24.5 |
| **2707.2** | 48.30 | 34.60 | H | -2.31 | 45.99 | 32.29 | 74.0 | 54.0 | 28.0 | 21.7 |
| **2707.2** | 49.00 | 36.90 | V | -2.31 | 46.69 | 34.59 | 74.0 | 54.0 | 27.3 | 19.4 |
| **3609.6** | 48.20 | 34.50 | H | 0.87 | 49.07 | 35.37 | 74.0 | 54.0 | 24.9 | 18.6 |
| **3609.6** | 47.90 | 34.10 | V | 0.87 | 48.77 | 34.97 | 74.0 | 54.0 | 25.2 | 19.0 |
| **915.2 MHz** | | | | | | | | | | |
| **1830.4** | 48.70 | 34.80 | H | -6.32 | 42.38 | 28.48 | 74.0 | 54.0 | 31.6 | 25.5 |
| **1830.4** | 50.80 | 35.30 | V | -6.32 | 44.48 | 28.98 | 74.0 | 54.0 | 29.5 | 25.0 |
| **2745.6** | 48.30 | 34.40 | H | -2.18 | 46.12 | 32.22 | 74.0 | 54.0 | 27.9 | 21.8 |
| **2745.6** | 47.50 | 34.10 | V | -2.18 | 45.32 | 31.92 | 74.0 | 54.0 | 28.7 | 22.1 |
| **3660.8** | 48.40 | 34.30 | H | 1.12 | 49.52 | 35.42 | 74.0 | 54.0 | 24.5 | 18.6 |
| **3660.8** | 47.80 | 34.00 | V | 1.12 | 48.92 | 35.12 | 74.0 | 54.0 | 25.1 | 18.9 |
| **927.6 MHz** | | | | | | | | | | |
| **1855.2** | 48.60 | 35.10 | H | -6.17 | 42.33 | 29.43 | 74.0 | 54.0 | 31.7 | 24.6 |
| **1855.2** | 50.20 | 36.10 | V | -6.17 | 43.23 | 30.83 | 74.0 | 54.0 | 30.8 | 23.2 |
| **2782.8** | 48.1 | 34.9 | H | -2.06 | 45.44 | 32.24 | 74.0 | 54.0 | 28.6 | 21.8 |
| **2782.8** | 48.7 | 36.1 | V | -2.06 | 46.44 | 32.84 | 74.0 | 54.0 | 27.6 | 21.2 |
| **3710.4** | 48.2 | 34.8 | H | 1.36 | 49.56 | 36.36 | 74.0 | 54.0 | 24.4 | 17.6 |
| **3710.4** | 47.9 | 34.5 | V | 1.36 | 49.86 | 36.26 | 74.0 | 54.0 | 24.1 | 17.7 |

**Table 7.5.3.2-5: Radiated Spurious Emissions Tabulated Data (LR 12.5kHz) – CISCO Antenna**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBµV/m) | | Limit (dBµV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **902.4 MHz** | | | | | | | | | | |
| **1804.8** | 48.80 | 35.30 | H | -6.47 | 42.33 | 28.83 | 74.0 | 54.0 | 31.7 | 25.2 |
| **1804.8** | 49.50 | 36.20 | V | -6.47 | 43.03 | 29.73 | 74.0 | 54.0 | 31.0 | 24.3 |
| **2707.2** | 48.70 | 35.10 | H | -2.31 | 46.39 | 32.79 | 74.0 | 54.0 | 27.6 | 21.2 |
| **2707.2** | 49.90 | 38.30 | V | -2.31 | 47.59 | 35.99 | 74.0 | 54.0 | 26.4 | 18.0 |
| **3609.6** | 48.60 | 34.40 | H | 0.87 | 49.47 | 35.27 | 74.0 | 54.0 | 24.5 | 18.7 |
| **3609.6** | 47.90 | 34.30 | V | 0.87 | 48.77 | 35.17 | 74.0 | 54.0 | 25.2 | 18.8 |
| **915.2 MHz** | | | | | | | | | | |
| **1830.4** | 47.90 | 34.50 | H | -6.32 | 41.58 | 28.18 | 74.0 | 54.0 | 32.4 | 25.8 |
| **1830.4** | 48.80 | 35.60 | V | -6.32 | 42.48 | 29.28 | 74.0 | 54.0 | 31.5 | 24.7 |
| **2745.6** | 48.80 | 35.80 | H | -2.18 | 46.62 | 33.62 | 74.0 | 54.0 | 27.4 | 20.4 |
| **2745.6** | 50.20 | 41.00 | V | -2.18 | 48.02 | 38.82 | 74.0 | 54.0 | 26.0 | 15.2 |
| **3660.8** | 47.00 | 34.20 | H | 1.12 | 48.12 | 35.32 | 74.0 | 54.0 | 25.9 | 18.7 |
| **3660.8** | 47.40 | 34.00 | V | 1.12 | 48.52 | 35.12 | 74.0 | 54.0 | 25.5 | 18.9 |
| **927.6 MHz** | | | | | | | | | | |
| **1855.2** | 48.50 | 35.60 | H | -6.17 | 42.33 | 29.43 | 74.0 | 54.0 | 31.7 | 24.6 |
| **1855.2** | 49.40 | 37.00 | V | -6.17 | 43.23 | 30.83 | 74.0 | 54.0 | 30.8 | 23.2 |
| **2782.8** | 47.50 | 34.30 | H | -2.06 | 45.44 | 32.24 | 74.0 | 54.0 | 28.6 | 21.8 |
| **2782.8** | 48.50 | 34.90 | V | -2.06 | 46.44 | 32.84 | 74.0 | 54.0 | 27.6 | 21.2 |
| **3710.4** | 48.20 | 35.00 | H | 1.36 | 49.56 | 36.36 | 74.0 | 54.0 | 24.4 | 17.6 |
| **3710.4** | 48.50 | 34.90 | V | 1.36 | 49.86 | 36.26 | 74.0 | 54.0 | 24.1 | 17.7 |

**Table 7.5.3.2-6: Radiated Spurious Emissions Tabulated Data (OFDM 200kHz) – CISCO Antenna**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBµV/m) | | Limit (dBµV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **902.4 MHz** | | | | | | | | | | |
| **1804.8** | 47.60 | 34.40 | H | -6.47 | 41.13 | 27.93 | 74.0 | 54.0 | 32.9 | 26.1 |
| **1804.8** | 47.90 | 34.80 | V | -6.47 | 41.43 | 28.33 | 74.0 | 54.0 | 32.6 | 25.7 |
| **3609.6** | 48.10 | 34.30 | H | 0.87 | 48.97 | 35.17 | 74.0 | 54.0 | 25.0 | 18.8 |
| **3609.6** | 47.10 | 34.00 | V | 0.87 | 47.97 | 34.87 | 74.0 | 54.0 | 26.0 | 19.1 |
| **915.2 MHz** | | | | | | | | | | |
| **1830.4** | 47.80 | 34.40 | H | -6.32 | 41.48 | 28.08 | 74.0 | 54.0 | 32.5 | 25.9 |
| **1830.4** | 48.30 | 34.90 | V | -6.32 | 41.98 | 28.58 | 74.0 | 54.0 | 32.0 | 25.4 |
| **3660.8** | 48.00 | 34.10 | H | 1.12 | 49.12 | 35.22 | 74.0 | 54.0 | 24.9 | 18.8 |
| **3660.8** | 48.30 | 34.00 | V | 1.12 | 49.42 | 35.12 | 74.0 | 54.0 | 24.6 | 18.9 |
| **927.6 MHz** | | | | | | | | | | |
| **1855.2** | 48.20 | 34.70 | H | -6.17 | 42.03 | 28.53 | 74.0 | 54.0 | 32.0 | 25.5 |
| **1855.2** | 48.50 | 35.00 | V | -6.17 | 42.33 | 28.83 | 74.0 | 54.0 | 31.7 | 25.2 |
| **3710.4** | 48.20 | 34.60 | H | 1.36 | 49.56 | 35.96 | 74.0 | 54.0 | 24.4 | 18.0 |
| **3710.4** | 48.10 | 34.40 | V | 1.36 | 49.46 | 35.76 | 74.0 | 54.0 | 24.5 | 18.2 |

#### 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 – LR 12.5kbps – Antenna 2**

Corrected Level: 50.20 + -2.18 = 48.02dBuV/m
Margin: 74dBuV/m – 48.02dBuV/m = 26.0dB

**Example Calculation: Average – LR 12.5kbps – Antenna 2**

Corrected Level: 41.00 + -2.18 - 0 = 38.82dBuV
Margin: 54dBuV – 38.82dBuV = 15.2dB

## 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 NIC, 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