



Test Report

**FCC ID: 2AUSA-CC1WRR
IC: 25535-CC1WRR**

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

Report Number: AT72153193-1C1

**Manufacturer: Flintec, Inc.
Model/HVIN: CC1WRR**

**Test Begin Date: January 2, 2020
Test End Date: January 20, 2020**

Report Issue Date: February 18, 2020



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
TÜV SÜD America Inc.**

Reviewed by:

**Ryan McGann
Team Leader
TÜV SÜD America Inc.**

This test report shall not be reproduced except in full. This report may be reproduced in part with prior written consent of TÜV SÜD America Inc. The results contained in this report are representative of the sample(s) submitted for evaluation.

This report contains 27 pages

TABLE OF CONTENTS

| | | |
|----------|--|-----------|
| 1 | GENERAL | 3 |
| 1.1 | PURPOSE | 3 |
| 1.2 | APPLICANT INFORMATION | 3 |
| 1.3 | PRODUCT DESCRIPTION | 3 |
| 1.4 | TEST METHODOLOGY AND CONSIDERATIONS | 4 |
| 2 | TEST FACILITIES | 5 |
| 2.1 | LOCATION | 5 |
| 2.2 | LABORATORY ACCREDITATIONS/RECOGNITIONS/CERTIFICATIONS | 5 |
| 2.3 | RADIATED EMISSIONS TEST SITE DESCRIPTION | 6 |
| 2.3.1 | <i>Semi-Anechoic Chamber Test Site – Chamber A</i> | <i>6</i> |
| 2.3.2 | <i>Semi-Anechoic Chamber Test Site – Chamber B</i> | <i>7</i> |
| 2.4 | CONDUCTED EMISSIONS TEST SITE DESCRIPTION | 8 |
| 2.4.1 | <i>Conducted Emissions Test Site</i> | <i>8</i> |
| 3 | APPLICABLE STANDARD REFERENCES | 9 |
| 4 | LIST OF TEST EQUIPMENT | 9 |
| 5 | SUPPORT EQUIPMENT..... | 10 |
| 6 | EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM..... | 10 |
| 7 | SUMMARY OF TESTS..... | 11 |
| 7.1 | ANTENNA REQUIREMENT – FCC 15.203..... | 11 |
| 7.2 | POWER LINE CONDUCTED EMISSIONS – FCC 15.207, ISED CANADA: RSS-GEN 8.8 | 11 |
| 7.2.1 | <i>Measurement Procedure</i> | <i>11</i> |
| 7.2.2 | <i>Measurement Results</i> | <i>11</i> |
| 7.3 | 6dB / 99% BANDWIDTH – FCC 15.247(A)(2), ISED CANADA: RSS-247 5.2(A), RSS-GEN 6.7 .. | 12 |
| 7.3.1 | <i>Measurement Procedure</i> | <i>12</i> |
| 7.3.2 | <i>Measurement Results</i> | <i>12</i> |
| 7.4 | FUNDAMENTAL EMISSION OUTPUT POWER – FCC 15.247(B)(3), ISED CANADA: RSS-247 5.4(D) | 15 |
| 7.4.1 | <i>Measurement Procedure</i> | <i>15</i> |
| 7.4.2 | <i>Measurement Results</i> | <i>15</i> |
| 7.5 | EMISSION LEVELS | 16 |
| 7.5.1 | <i>Emissions into Non-restricted Frequency Bands – FCC 15.247(d); ISED Canada: RSS-247 5.5.....</i> | <i>16</i> |
| 7.5.2 | <i>Emissions into Restricted Frequency Bands – FCC: 15.205, 15.209; ISED Canada: RSS-Gen 8.9 / 8.10.....</i> | <i>18</i> |
| 7.6 | MAXIMUM POWER SPECTRAL DENSITY IN THE FUNDAMENTAL EMISSION – FCC 15.247(E) ISED CANADA: RSS-247 5.2(B)..... | 20 |
| 7.6.1 | <i>Measurement Procedure</i> | <i>20</i> |
| 7.6.2 | <i>Measurement Results</i> | <i>20</i> |
| 8 | ESTIMATION OF MEASUREMENT UNCERTAINTY | 22 |
| 9 | CONCLUSION..... | 22 |
| | APPENDIX A: PLOTS | 23 |

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 for the tests documented herein.

1.2 Applicant Information

Flintec, Inc.
18 Kane Industrial Drive
Hudson, MA 01749 USA

1.3 Product Description

The CC1W is a wireless version of the CC1 pump off control load cell. The CC1W utilizes the same design attributes as the CC1 - stainless steel, hermetic seal, fatigue rating and intrinsically safe operation. The CC1W transmits polished rod load wirelessly which solves the industry wide problem of cable failures.

This report details the testing of the Remote Unit.

Technical Details:

| Detail | Description |
|---------------------------|--|
| Frequency Range (MHz) | 2405 – 2470 |
| Number of Channels | 14 |
| Channel Spacing | 5 MHz |
| Modulation Format | DSSS |
| Data Rates | 250kbps |
| Operating Voltage | 3.6Vdc Lithium Battery |
| Antenna Type(s) / Gain(s) | PCB Antenna / 3.2dBi (Molex, P/N: 146187) |

Test Sample Serial Number(s): 12871904

Test Sample Condition: The equipment was provided in good condition without any physical damage.

1.4 Test Methodology and Considerations

All modes of operation, including all data rates, were evaluated and the data presented in this report represents the worst case where applicable.

For radiated emissions, the EUT was evaluated in its intended mounting orientation.

For antenna port conducted emissions, a U.fl to SMA adapter was used to directly connect the DUT to the measuring equipment through suitable attenuation.

Power line conducted emissions was not applicable; the EUT was battery-powered with no facility to connect to the AC mains.

Power setting during test: -6.5

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 Designation Accreditation Number: | US1233 |
| 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.

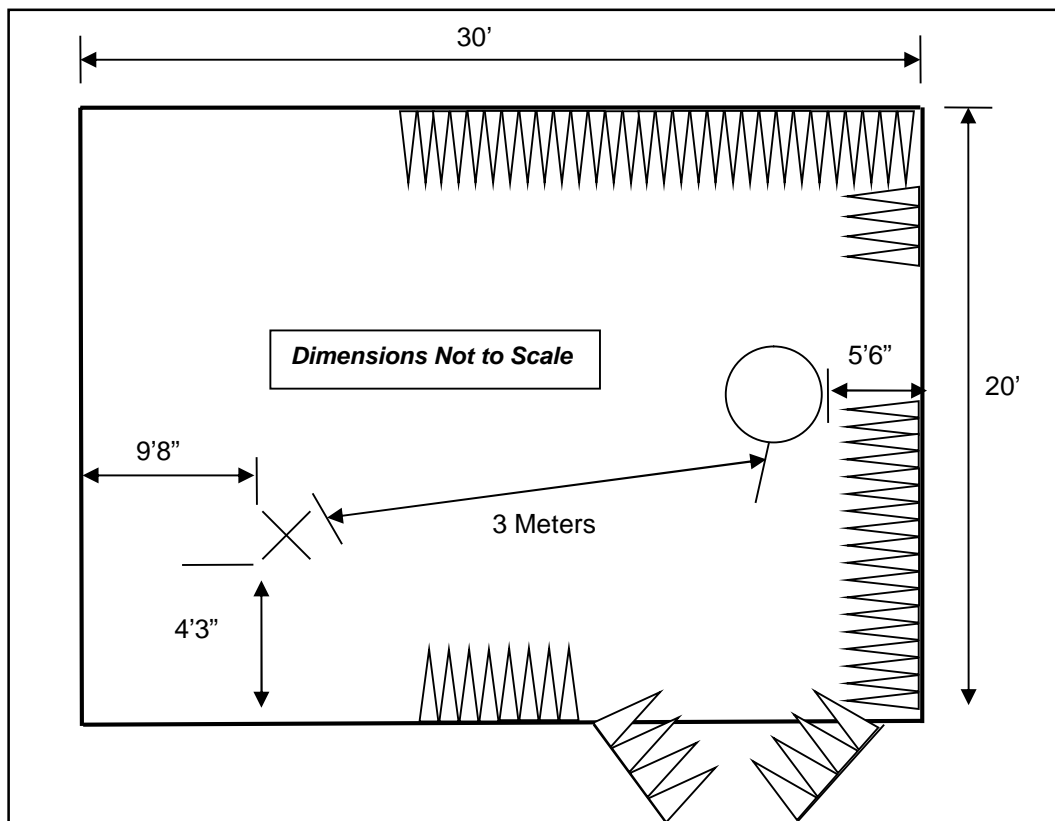


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site – Chamber A

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.

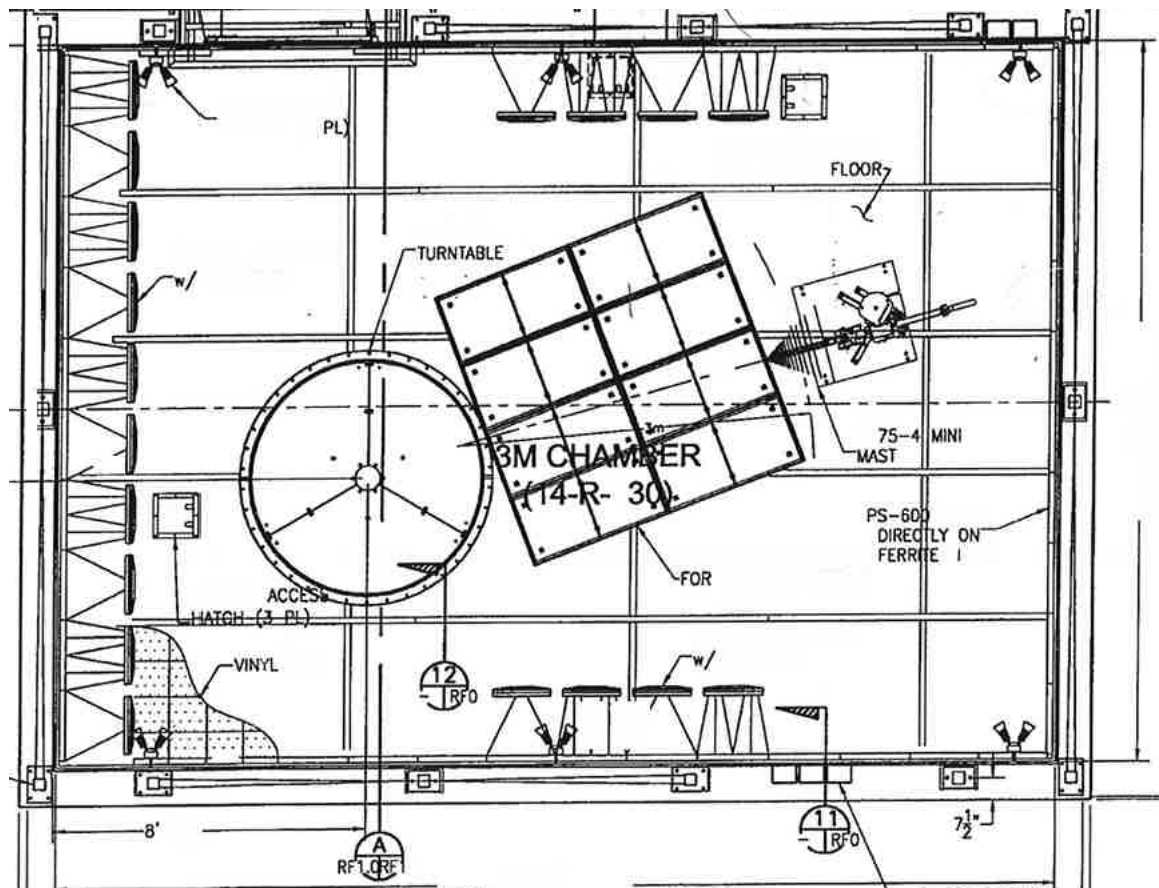


Figure 2.3.2-1: Semi-Anechoic Chamber Test Site – Chamber B

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 tabletop and floor standing equipment in accordance with section 6.1.4 of ANSI C63.10.

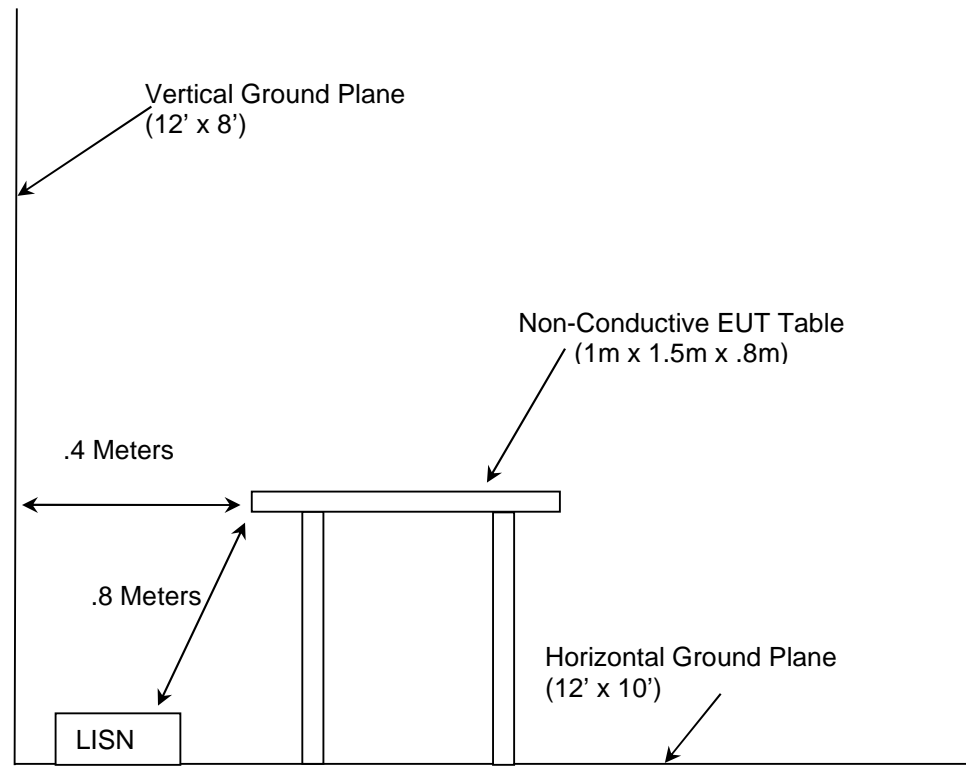


Figure 2.4.1-1: AC Mains Conducted EMI Site

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, 2020
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2020
- ❖ FCC KDB 558074 D01 DTS Meas Guidance v05r02 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, April 2, 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 |
|----------|---------------------|-----------------------|---|------------------|-----------------------|----------------------|
| 213 | TEC | PA 102 | Amplifier | 44927 | 07/22/2019 | 07/22/2020 |
| 335 | Suhner | SF-102A | Cable (40GHz) | 882/2A | 07/08/2019 | 07/08/2020 |
| 338 | Hewlett Packard | 8449B | High Frequency Pre-Amp | 3008A01111 | 07/15/2019 | 07/15/2021 |
| 345 | Suhner Sucoflex | 102A | Cable 42(GHZ) | 1077/2A | 07/09/2019 | 07/09/2020 |
| 432 | Microwave Circuits | H3G020G4 | Highpass Filter | 264066 | 05/31/2019 | 05/31/2020 |
| 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 |
| 638 | Rohde & Schwarz | OSP 120 | Open Switch and Control Unit | 101229 | 06/11/2019 | 06/11/2021 |
| 651 | Rohde & Schwarz | TS-PR26 | 18GHz to 26.5GHz Pre-Amplifier | 100023 | 07/10/2019 | 07/10/2020 |
| 652 | Rohde & Schwarz | 3160-09 | High Frequency Antenna 18GHz to 26.5GHz | 060922-21894 | NCR | NCR |
| 819 | Rohde & Schwarz | ESR26 | EMI Test Receiver | 101345 | 11/1/2018 | 05/01/2020 |
| 827 | (-) | TS8997 Rack Cable Set | TS8997 Rack Cable Set | N/A | 05/01/2019 | 05/01/2020 |
| 836 | ETS Lindgren | SAC Cable Set | SAC Cable Set includes 620, 837, 838 | N/A | 05/01/2019 | 05/01/2020 |
| 853 | Teseq | CBL 6112D; 6804.17.A | Bilog Antenna; Attenuator | 51616; 20181110A | 10/15/2018 | 10/15/2020 |
| 857 | ETS Lindgren | 3117 | Horn Antenna 1-18GHz | 00153608 | 10/15/2018 | 11/12/2021 |
| RE880 | Rhode & Schwarz USA | Test Receiver | R&S ESW44 | 1206247 | 11/06/2019 | 11/6/2020 |

NCR = No Calibration Required

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

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

| Item | Equipment Type | Manufacturer | Model Number | Serial Number |
|------|----------------|---------------|--------------|---------------|
| 1 | Remote Unit | Flintec, Inc. | CC1WRR | 12871904 |

Table 5-2: Cable Description

| Item | Cable Type | Length | Shield | Termination |
|---|------------|--------|--------|-------------|
| The device was battery-powered with no interface leads. | | | | |

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

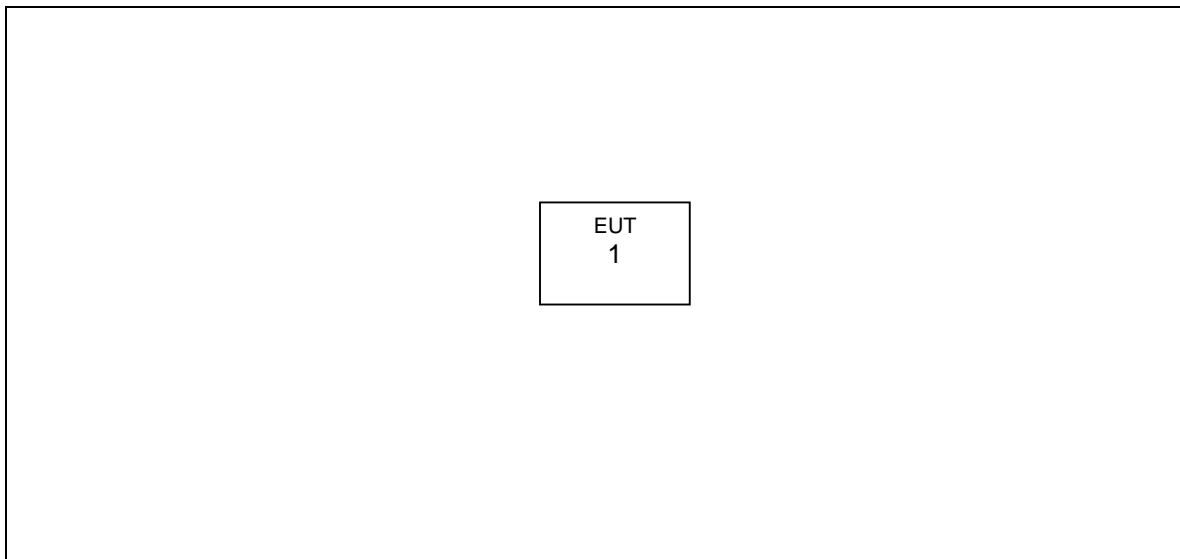


Figure 6-1: Test Setup Block Diagram

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 15.203

The EUT utilizes a PCB antenna affixed inside the device and connected to the radio via a U.fl cable. The gain of the antenna is 3.2dBi.

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

7.2.1 Measurement Procedure

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 = Corrected Reading – Applicable Limit

7.2.2 Measurement Results

Power line conducted emissions was not applicable; the EUT was battery-powered with no facility to connect to the AC mains.

7.3 6dB / 99% Bandwidth – FCC 15.247(a)(2), ISSED Canada: RSS-247 5.2(a), RSS-GEN 6.7**7.3.1 Measurement Procedure**

The 6dB bandwidth was measured in accordance with the FCC KDB 558074 D01 Section 8.2 which references Subclause 11.8 of ANSI C63.10. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to ≥ 3 times the RBW. The trace was set to max hold with a peak detector active. The marker-delta function of the spectrum analyzer was utilized to determine the 6 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 from 1% to 5% of the occupied bandwidth and the video bandwidth set to at least 3 times the resolution bandwidth. A peak detector was used.

7.3.2 Measurement Results

Performed by: Jeremy Pickens

Table 7.3.2-1: 6dB / 99% Bandwidth

| Modulation | Frequency [MHz] | 6dB Bandwidth [MHz] | 99% Bandwidth [MHz] |
|------------|-----------------|---------------------|---------------------|
| GFSK | 2405 | 1.535 | 2.282282 |
| | 2440 | 1.584 | 2.342342 |
| | 2470 | 1.188 | 2.312312 |

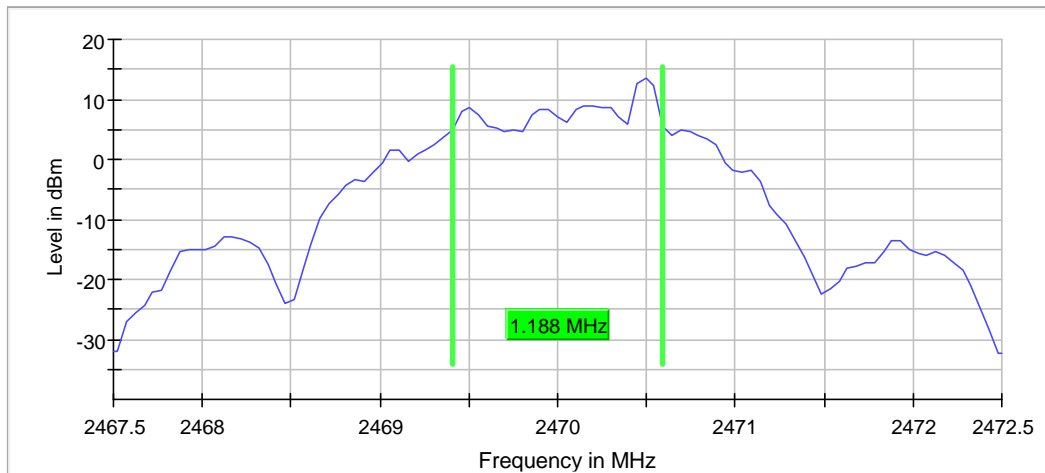


Figure 7.3.2-1: Sample Plot - 6dB BW

Table 7.3.2-2: Sample Measurement Settings (6dB BW)

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|---------------|
| Start Frequency | 2.46750 GHz | 2.46750 GHz |
| Stop Frequency | 2.47250 GHz | 2.47250 GHz |
| Span | 5.000 MHz | 5.000 MHz |
| RBW | 100.000 kHz | ~ 100.000 kHz |
| VBW | 300.000 kHz | ~ 300.000 kHz |
| SweepPoints | 101 | ~ 100 |
| SweepTime | 18.938 μ s | AUTO |
| Reference Level | 0.000 dBm | 0.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | FFT | AUTO |
| Preamplifier | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 11 / max. 150 | max. 150 |
| Stable | 5 / 5 | 5 |
| Max Stable Difference | 0.04 dB | 0.50 dB |

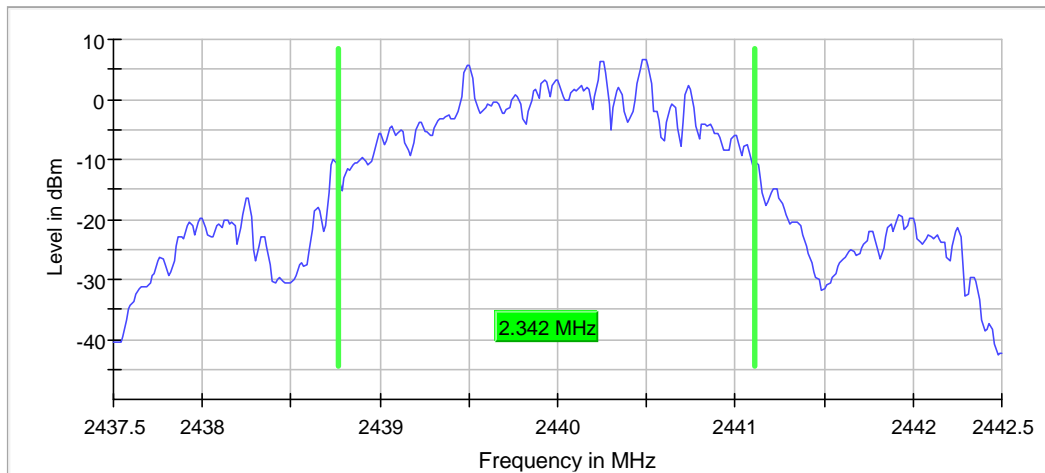


Figure 7.3.2-2: Sample Plot - 99% OBW

Table 7.3.2-3: Sample Measurement Settings (OBW)

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|-------------------|
| Start Frequency | 2.43750 GHz | 2.43750 GHz |
| Stop Frequency | 2.44250 GHz | 2.44250 GHz |
| Span | 5.000 MHz | 5.000 MHz |
| RBW | 30.000 kHz | ≥ 25.000 kHz |
| VBW | 100.000 kHz | ≥ 90.000 kHz |
| SweepPoints | 333 | ~ 333 |
| SweepTime | 63.218 μ s | AUTO |
| Reference Level | 0.000 dBm | 0.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.30 dB | 0.30 dB |
| Run | 17 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.26 dB | 0.30 dB |

7.4 Fundamental Emission Output Power – FCC 15.247(b)(3), ISED Canada: RSS-247 5.4(d)

7.4.1 Measurement Procedure

The maximum conducted output power was measured in accordance with FCC KDB 558074 D01 utilizing the RBW \geq DTS Bandwidth method. The RF output of the equipment under test was directly connected to the input of the analyzer applying suitable attenuation. Worst-case power across all data rates is reported.

7.4.2 Measurement Results

Performed by: Jeremy Pickens

Table 7.4.2-1: Conducted Output Power

| Modulation | Frequency [MHz] | Peak Power [dBm] |
|------------|-----------------|------------------|
| GFSK | 2405 | 12.4 |
| | 2440 | 13.2 |
| | 2470 | 13.5 |

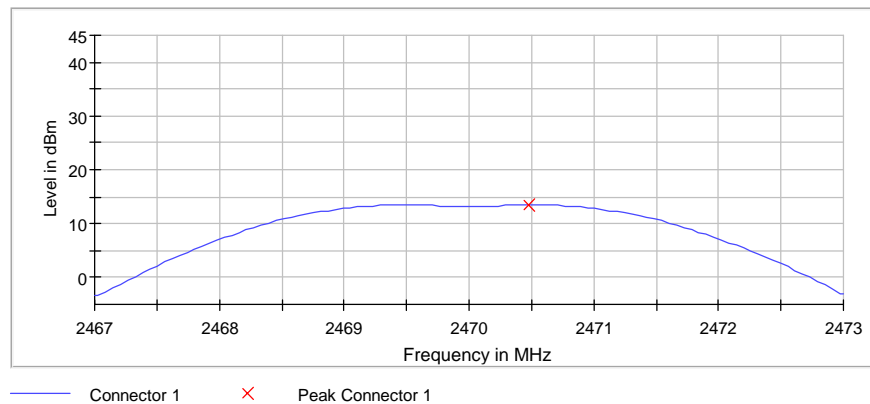


Figure 7.4.2-1: Sample Plot

Table 7.4.2-2: Sample Measurement Settings

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|------------------|
| Start Frequency | 2.46700 GHz | 2.46700 GHz |
| Stop Frequency | 2.47300 GHz | 2.47300 GHz |
| Span | 6.000 MHz | 6.000 MHz |
| RBW | 2.000 MHz | ≥ 1.188 MHz |
| VBW | 10.000 MHz | ≥ 6.000 MHz |
| SweepPoints | 101 | ~ 101 |
| SweepTime | 953.450 ns | AUTO |
| Reference Level | 10.000 dBm | 10.000 dBm |
| Attenuation | 30.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 4 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.03 dB | 0.50 dB |

7.5 Emission Levels

7.5.1 Emissions into Non-restricted Frequency Bands – FCC 15.247(d); ISD Canada: RSS-247 5.5

7.5.1.1 Measurement Procedure

The unwanted emissions into non-restricted bands were measured conducted in accordance with FCC KDB 558074 D01 Section 8.5. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to ≥ 300 kHz. The resulting spectrum analyzer peak level was used to determine the reference level with respect to the 20 dBc limit at the band edges. The spectrum span was then adjusted for the measurement of spurious emissions from 30MHz to 25GHz, 10 times the highest fundamental frequency. The worst-case for each modulation was investigated at the lower and upper band edges.

7.5.1.2 Measurement Results

Performed by: Jeremy Pickens

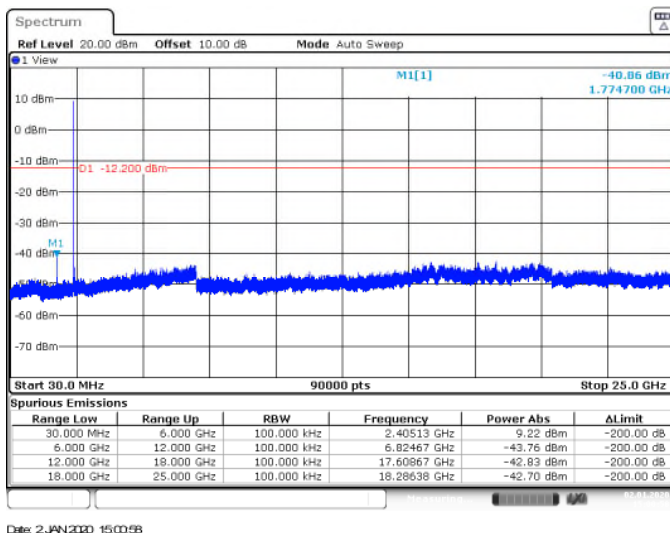


Figure 7.5.1.2-1: LCH – 30MHz–25GHz

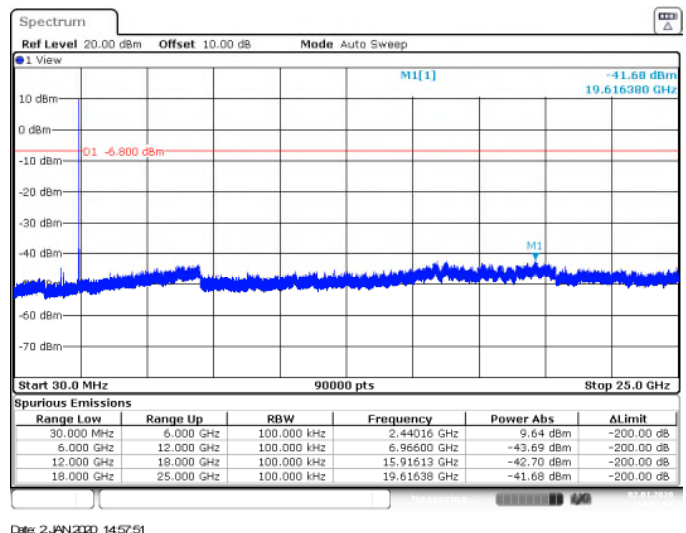


Figure 7.5.1.2-2: MCH – 30MHz–25GHz

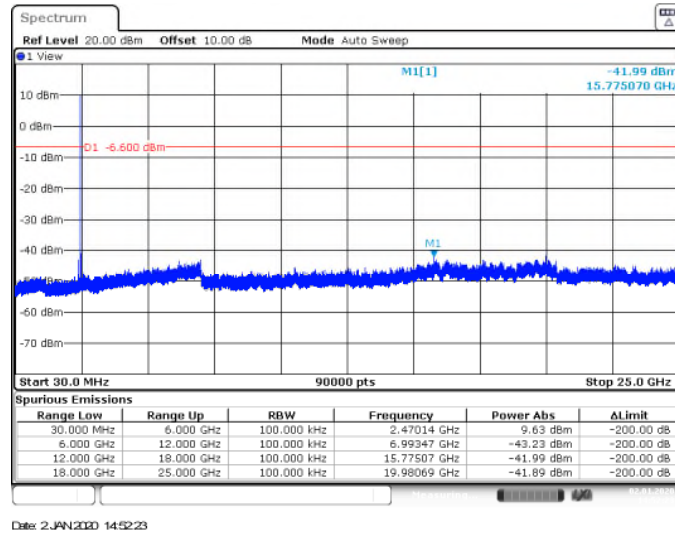


Figure 7.5.1.2-3: HCH – 30MHz–25GHz

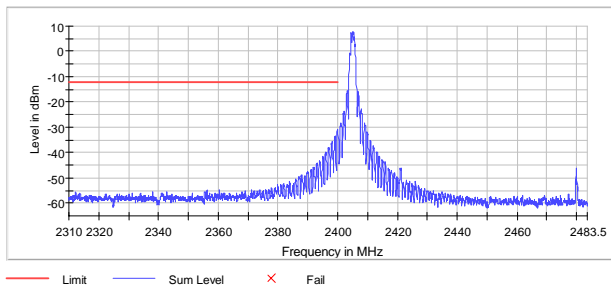


Figure 7.5.1.2-4: Lower Band-edge – Channel 11

Table 7.5.1.2-1: Lower Band-edge – Low Channel

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2399.875000 | -30.9 | 18.6 | -12.2 | PASS |
| 2399.825000 | -31.1 | 18.8 | -12.2 | PASS |
| 2399.975000 | -31.1 | 18.9 | -12.2 | PASS |
| 2399.925000 | -31.3 | 19.1 | -12.2 | PASS |
| 2399.775000 | -31.6 | 19.4 | -12.2 | PASS |
| 2399.725000 | -32.8 | 20.6 | -12.2 | PASS |
| 2399.125000 | -33.4 | 21.1 | -12.2 | PASS |
| 2399.175000 | -33.4 | 21.2 | -12.2 | PASS |
| 2398.925000 | -33.9 | 21.7 | -12.2 | PASS |
| 2398.875000 | -33.9 | 21.7 | -12.2 | PASS |
| 2399.075000 | -34.1 | 21.8 | -12.2 | PASS |
| 2399.025000 | -34.1 | 21.9 | -12.2 | PASS |
| 2398.975000 | -34.3 | 22.1 | -12.2 | PASS |
| 2399.225000 | -34.5 | 22.3 | -12.2 | PASS |
| 2399.275000 | -35.0 | 22.8 | -12.2 | PASS |

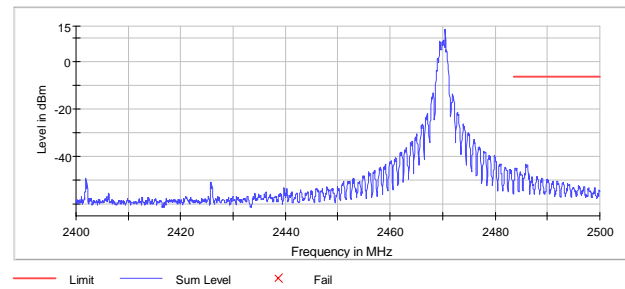


Figure 7.5.1.2-5: Upper Band-edge – Channel 24

Table 7.5.1.2-2: Upper Band-edge – High Channel

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2485.925000 | -43.1 | 36.6 | -6.6 | PASS |
| 2485.875000 | -43.4 | 36.8 | -6.6 | PASS |
| 2486.125000 | -43.5 | 36.9 | -6.6 | PASS |
| 2486.175000 | -43.6 | 37.1 | -6.6 | PASS |
| 2485.975000 | -44.2 | 37.7 | -6.6 | PASS |
| 2486.075000 | -44.4 | 37.8 | -6.6 | PASS |
| 2486.025000 | -44.5 | 37.9 | -6.6 | PASS |
| 2486.225000 | -44.6 | 38.0 | -6.6 | PASS |
| 2486.275000 | -44.9 | 38.3 | -6.6 | PASS |
| 2483.925000 | -44.9 | 38.3 | -6.6 | PASS |
| 2483.875000 | -45.0 | 38.5 | -6.6 | PASS |
| 2484.175000 | -45.1 | 38.6 | -6.6 | PASS |
| 2484.125000 | -45.1 | 38.6 | -6.6 | PASS |
| 2486.325000 | -45.5 | 38.9 | -6.6 | PASS |
| 2485.825000 | -45.7 | 39.2 | -6.6 | PASS |

7.5.2 Emissions into Restricted Frequency Bands – FCC: 15.205, 15.209; ISD Canada: RSS-Gen 8.9 / 8.10

7.5.2.1 Measurement Procedure

The unwanted emissions into restricted bands were measured radiated over the frequency range of 30MHz to 25GHz, 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.

Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

7.5.2.2 Duty Cycle Correction

An operational duty cycle of 8% was provided by the applicant; therefore, the average measurements were adjusted by $20 \cdot \log(1/DC) = 21.94\text{dB}$. This is the maximum operational duty-cycle and is hardwired such that under no condition can it be changed or modified by either the device or end user.

7.5.2.3 Measurement Results

Performed by: Jeremy Pickens

Table 7.5.2.2-1: Radiated Spurious Emissions Tabulated Data

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity (H/V) | Correction Factors (dB) | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|--------------------|-----------------|---------|------------------------------|-------------------------------|-----------------------------|---------|-------------------|---------|----------------|---------|
| | pk | Qpk/Avg | | | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| 2405 MHz | | | | | | | | | | |
| 2390 | 57.50 | 43.90 | H | -1.17 | 56.33 | 20.79 | 74.0 | 54.0 | 17.7 | 33.2 |
| 2390 | 57.60 | 44.30 | V | -1.17 | 56.43 | 21.19 | 74.0 | 54.0 | 17.6 | 32.8 |
| 4810 | 53.60 | 43.90 | H | 3.87 | 57.47 | 25.83 | 74.0 | 54.0 | 16.5 | 28.2 |
| 4810 | 53 | 42.8 | V | 3.87 | 56.87 | 24.73 | 74.0 | 54.0 | 17.1 | 29.3 |
| 7215 | 48 | 35.9 | H | 7.35 | 55.35 | 21.31 | 74.0 | 54.0 | 18.6 | 32.7 |
| 7215 | 48.9 | 37.1 | V | 7.35 | 56.25 | 22.51 | 74.0 | 54.0 | 17.7 | 31.5 |
| 2440 MHz | | | | | | | | | | |
| 4880 | 53 | 43 | H | 3.91 | 56.91 | 24.97 | 74.0 | 54.0 | 17.1 | 29.0 |
| 4880 | 52.7 | 43.3 | V | 3.91 | 56.61 | 25.27 | 74.0 | 54.0 | 17.4 | 28.7 |
| 7320 | 51.7 | 41.1 | H | 7.47 | 59.17 | 26.63 | 74.0 | 54.0 | 14.8 | 27.4 |
| 7320 | 53.7 | 44.3 | V | 7.47 | 61.17 | 29.83 | 74.0 | 54.0 | 12.8 | 24.2 |
| 2470 MHz | | | | | | | | | | |
| 2483.5 | 66.80 | 53.50 | H | -0.96 | 65.84 | 30.60 | 74.0 | 54.0 | 8.2 | 23.4 |
| 2483.5 | 66.50 | 54.00 | V | -0.96 | 65.54 | 31.10 | 74.0 | 54.0 | 8.5 | 22.9 |
| 4940 | 52.00 | 42.50 | H | 3.95 | 55.95 | 24.51 | 74.0 | 54.0 | 18.1 | 29.5 |
| 4940 | 55.00 | 46.70 | V | 3.95 | 58.95 | 28.71 | 74.0 | 54.0 | 15.1 | 25.3 |
| 7410 | 54.00 | 44.60 | H | 7.56 | 61.56 | 30.23 | 74.0 | 54.0 | 12.4 | 23.8 |
| 7410 | 58.40 | 50.40 | V | 7.56 | 65.96 | 36.03 | 74.0 | 54.0 | 8.0 | 18.0 |

7.5.2.4 Sample Calculation:

$$R_C = R_U + CF_T$$

Where:

| | | |
|--------|---|---|
| CF_T | = | Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only) |
| R_U | = | Uncorrected Reading |
| R_C | = | Corrected Level |
| AF | = | Antenna Factor |
| CA | = | Cable Attenuation |
| AG | = | Amplifier Gain |
| DC | = | Duty Cycle Correction Factor |

Example Calculation: Peak

Corrected Level: $58.4 + 7.56 = 65.96\text{dBuV/m}$

Margin: $74\text{dBuV/m} - 65.96\text{dBuV/m} = 8.0\text{dB}$

Example Calculation: Average

Corrected Level: $50.4 + 7.56 - 21.94 = 36.03\text{dBuV}$

Margin: $54\text{dBuV} - 36.03\text{dBuV} = 18.0\text{dB}$

**7.6 Maximum Power Spectral Density in the Fundamental Emission – FCC 15.247(e)
ISED Canada: RSS-247 5.2(b)****7.6.1 Measurement Procedure**

The power spectral density was measured in accordance with the FCC KDB 558074 D01 utilizing Section 8.4. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 10 kHz. The Video Bandwidth (VBW) was set to 30 kHz. Span was set to 1.5 times the channel bandwidth. The trace was set to max hold with the peak detector active.

7.6.2 Measurement Results

Performed by: Jeremy Pickens

Table 7.6.2-1: Power Spectral Density

| Modulation | Frequency [MHz] | PSD [dBm] |
|------------|--------------------|--------------|
| GFSK | 2405 | 4.363 |
| | 2440 | 6.305 |
| | 2470 | 4.411 |

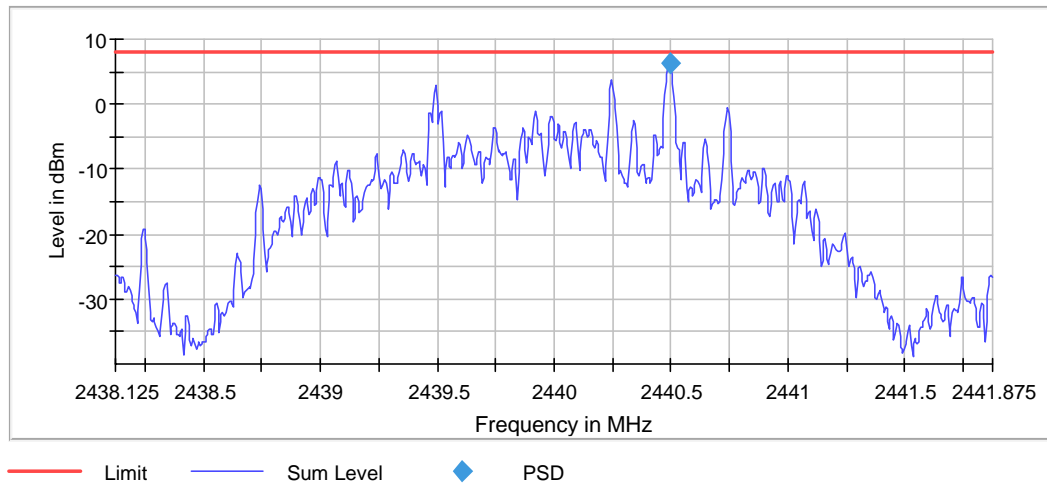


Figure 7.6.2-1: Sample PSD Plot

Table 7.6.2-2: Sample Measurement Settings (PSD)

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|-------------------|
| Start Frequency | 2.43813 GHz | 2.43813 GHz |
| Stop Frequency | 2.44188 GHz | 2.44188 GHz |
| Span | 3.750 MHz | 3.750 MHz |
| RBW | 10.000 kHz | ≤ 10.000 kHz |
| VBW | 30.000 kHz | ≥ 30.000 kHz |
| SweepPoints | 750 | ~ 750 |
| SweepTime | 3.750 ms | AUTO |
| Reference Level | 0.000 dBm | 0.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | Sweep | Sweep |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 11 / max. 150 | max. 150 |
| Stable | 2 / 2 | 2 |
| Max Stable Difference | 0.05 dB | 0.50 dB |

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%.

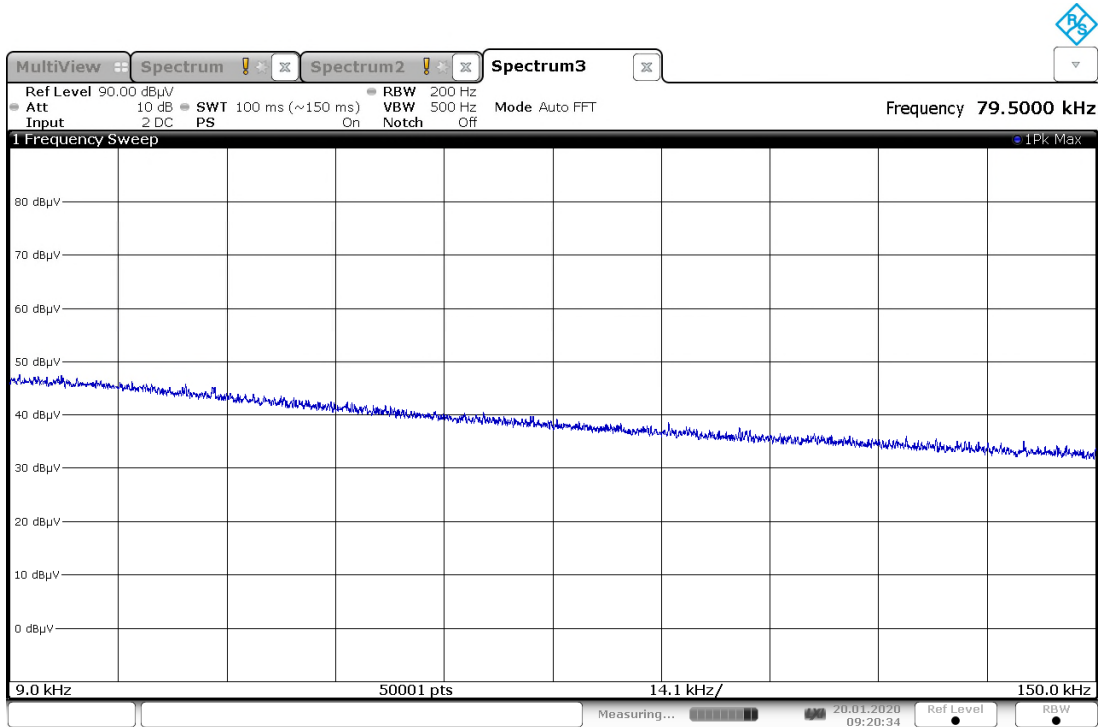
Table 8-1: Estimation of Measurement Uncertainty

| Parameter | U_{lab} |
|---|--------------------------------------|
| Occupied Channel Bandwidth | $\pm 0.009 \%$ |
| RF Conducted Output Power | $\pm 0.349 \text{ dB}$ |
| Power Spectral Density | $\pm 0.372 \text{ dB}$ |
| Antenna Port Conducted Emissions | $\pm 1.264 \text{ dB}$ |
| Radiated Emissions $\leq 1 \text{ GHz}$ | $\pm 5.814 \text{ dB}$ |
| Radiated Emissions $> 1 \text{ GHz}$ | $\pm 4.318 \text{ dB}$ |
| Temperature | $\pm 0.860 \text{ }^{\circ}\text{C}$ |
| Radio Frequency | $\pm 2.832 \times 10^{-8}$ |
| AC Power Line Conducted Emissions | $\pm 3.360 \text{ dB}$ |

9 CONCLUSION

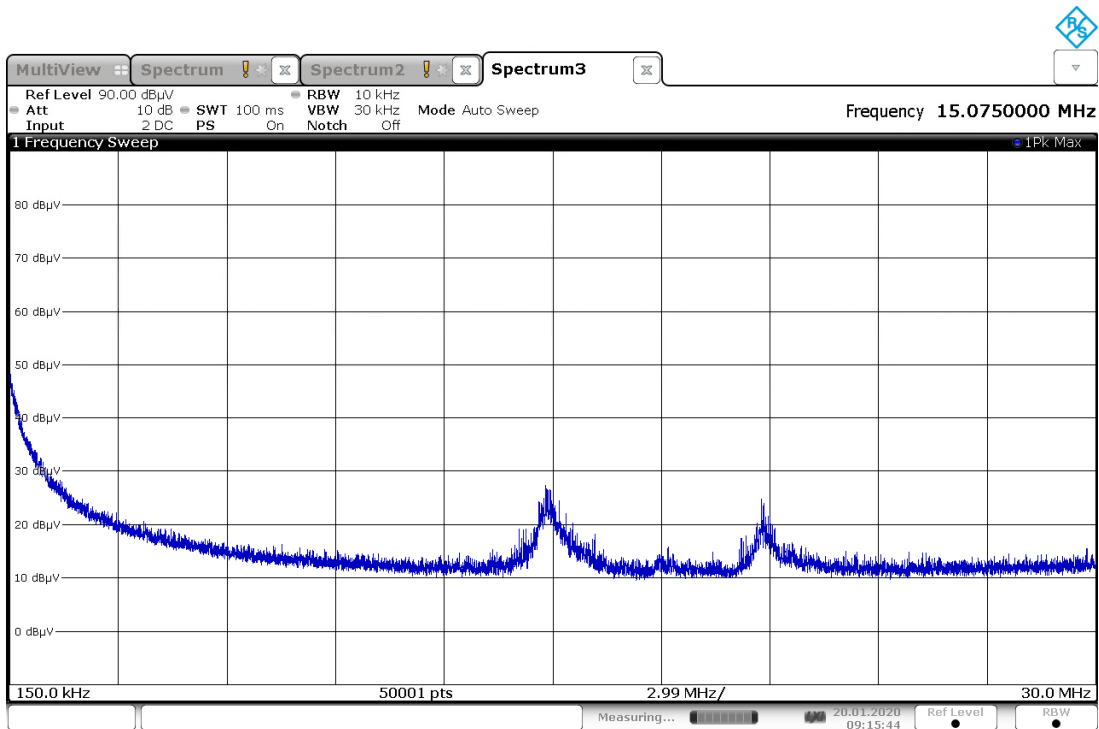
In the opinion of TUV SUD the CC1WRR, manufactured by Flintec, Inc. meets the requirements of FCC Part 15 subpart C and ISED Canada's Radio Standards Specification RSS-247 for the tests documented herein.

Appendix A: Plots



09:20:35 20.01.2020

Figure A-1: 9kHz-150kHz

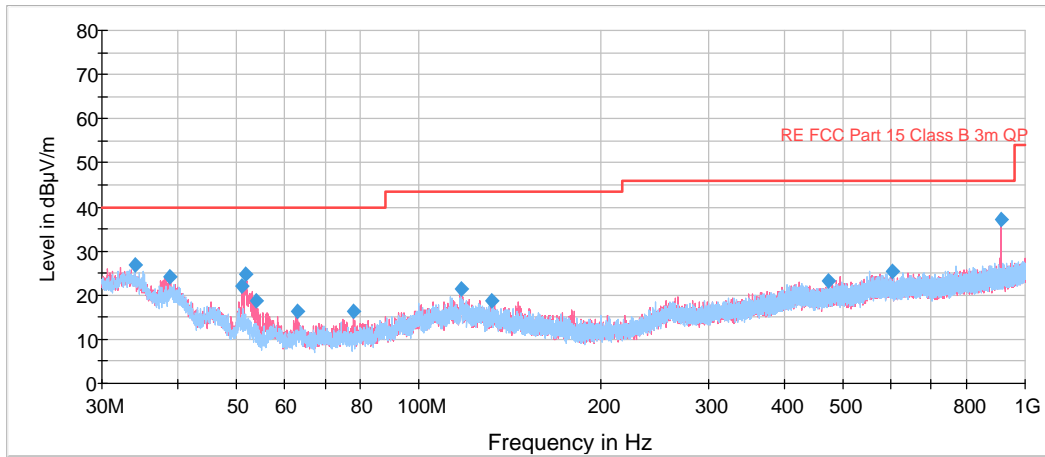


09:15:45 20.01.2020

Note: Emissions above the noise floor are not related to the DUT radio.

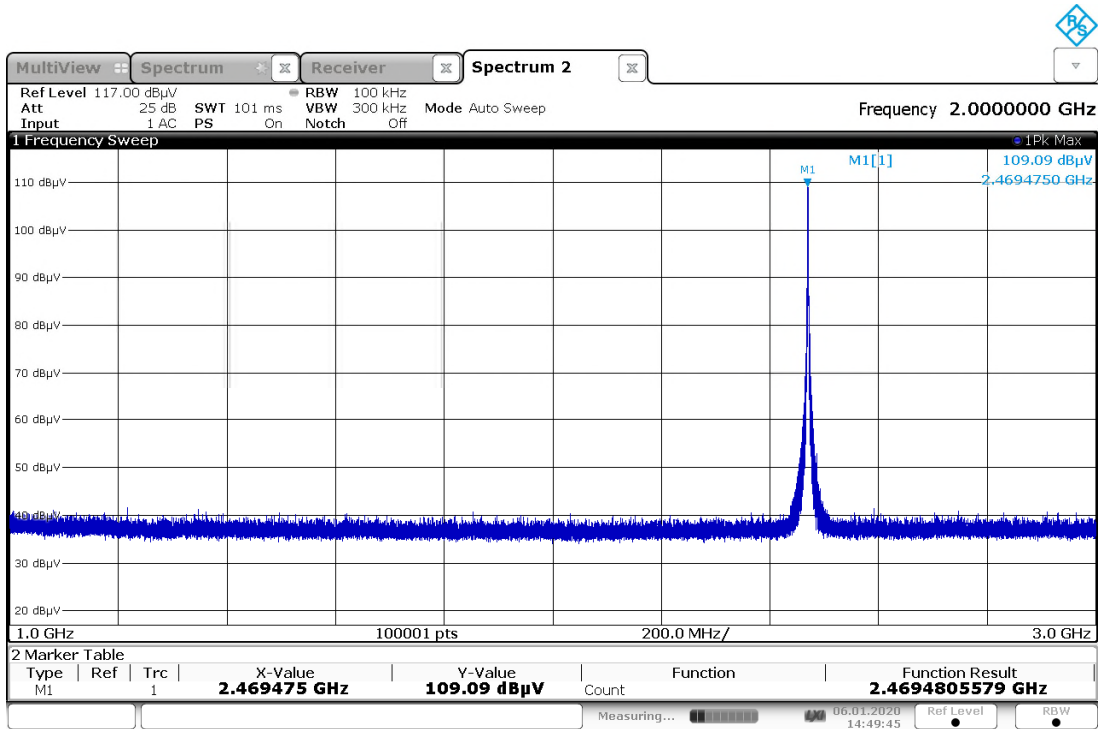
Figure A-2: 150kHz-30MHz

Full Spectrum



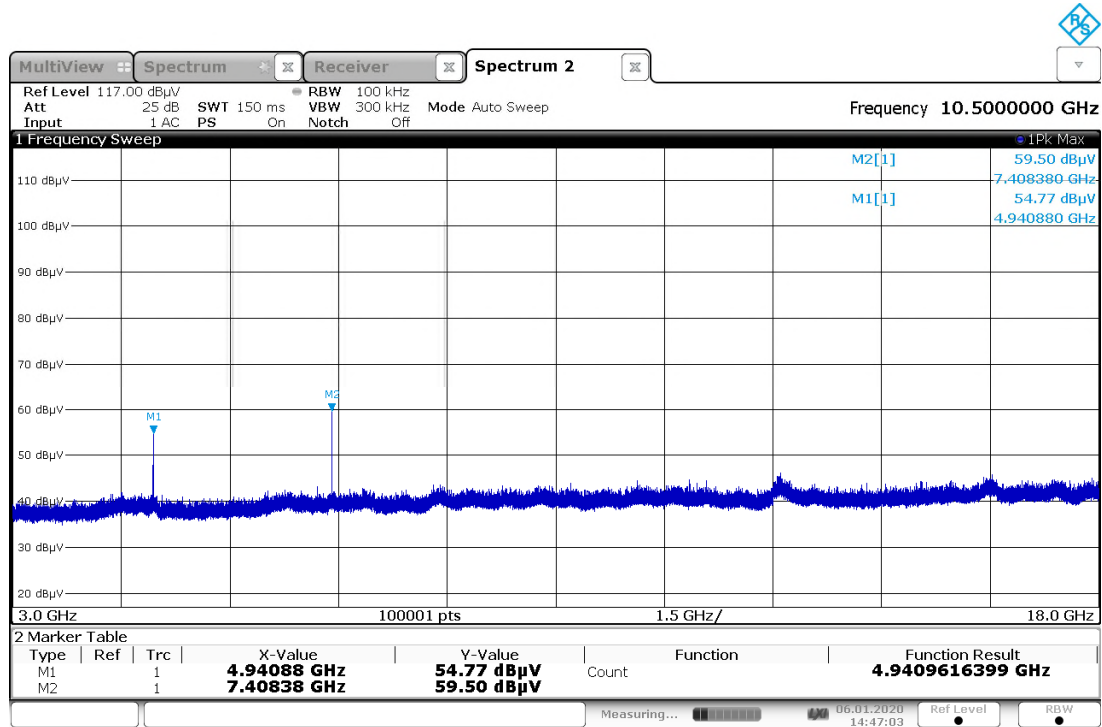
Note: Emissions above the noise floor are from the digital sections of the DUT and not associated with the radio.

Figure A-3: 30MHz-1GHz



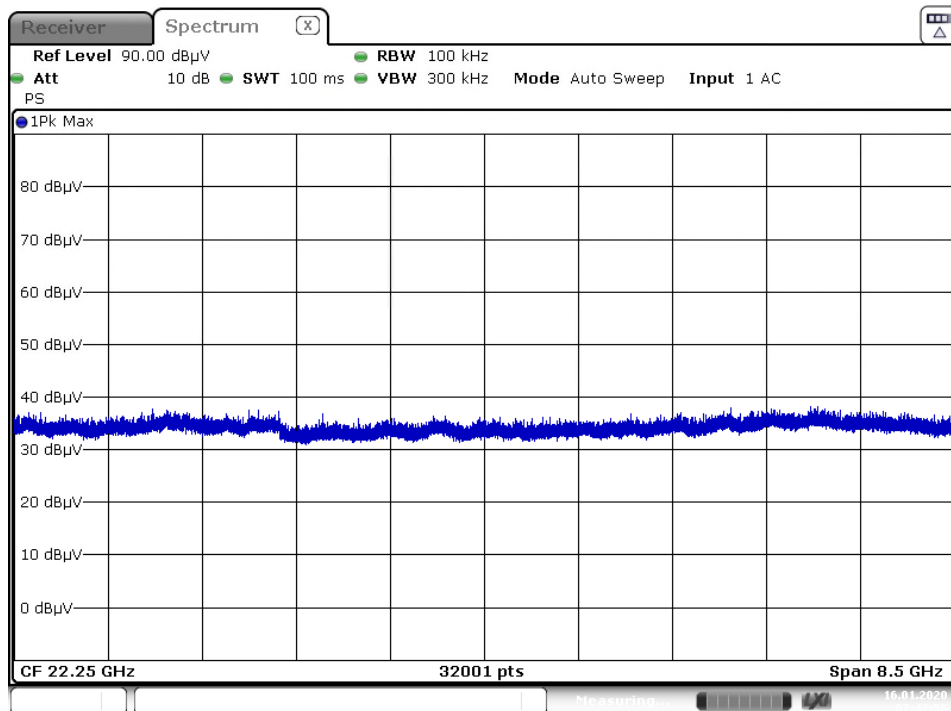
14:49:46 06.01.2020

Figure A-4: 1GHz-3GHz



14:47:03 06.01.2020

Figure A-5: 3GHz-18GHz



Date: 16.JAN.2020 07:42:56

Figure A-6: 18GHz-25GHz

END REPORT