

# **Certification Test Report**

FCC ID: GV3-20SP0M1 IC: 6128A-20SP0M1

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

# TÜV SÜD Report Number: RD72159794.602

Manufacturer: ACCO Brands USA, LLC Model: SensorPod-M

> Test Begin Date: May 20, 2020 Test End Date: July 27, 2020

Report Issue Date: August 28, 2020



A2LA Cert. No. 2955.18

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

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Report: RD72159794.602

**TÜV SÜD America Inc.** 

Page 1 of 29

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# TABLE OF CONTENTS

| 1 | GENERAL  | 3  |
|---|--|----|
|   | 1.1 Purpose  |    |
|   | 1.2 PRODUCT DESCRIPTION  |    |
|   | 1.3 TEST METHODOLOGY AND CONSIDERATIONS  | 3  |
| 2 | TEST FACILITIES  | 4  |
|   | 2.1 LOCATION   | 1  |
|   | 2.1 LABORATORY ACCREDITATIONS/RECOGNITIONS/CERTIFICATIONS                              |    |
|   | 2.3 RADIATED EMISSIONS TEST SITE DESCRIPTION   |    |
|   | 2.3.1 Semi-Anechoic Chamber Test Site  |    |
|   | 2.4 CONDUCTED EMISSIONS TEST SITE DESCRIPTION  |    |
| 3 |  |    |
| 3 | AI I LICADLE 5 I ANDARD REFERENCES   | /  |
| 4 | LIST OF TEST EQUIPMENT   | 7  |
| - |  | 0  |
| 5 | SUPPORT EQUIPMENT  | 8  |
| 6 | EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM   | 8  |
|   |  |    |
| 7 | SUMMARY OF TESTS   | 9  |
|   | 7.1 ANTENNA REQUIREMENT – FCC: 15.203  | 9  |
|   | 7.2 POWER LINE CONDUCTED EMISSIONS – FCC: 15.207; ISED CANADA: RSS-GEN 8.8             |    |
|   | 7.2.1 Measurement Procedure  | 9  |
|   | 7.2.2 Measurement Results  | 9  |
|   | 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 Measurement Procedure  | 12 |
|   | 7.3.2 Measurement Results  |    |
|   | 7.4 FUNDAMENTAL EMISSION OUTPUT POWER – FCC: 15.247(B)(3); ISED CANADA: RSS-247 5.4(I  | D) |
|   | 16   |    |
|   | 7.4.1 Measurement Procedure  |    |
|   | 7.4.2 Measurement Results  | 16 |
|   | 7.5 EMISSION LEVELS – FCC: 15.247(d), 15.205, 15.209; ISED CANADA RSS-247 5.5, RSS-GEN |    |
|   | 8.9/8.10   |    |
|   | 7.5.1 Emissions into Non-restricted Frequency Bands                                    |    |
|   | 7.5.1.1 Measurement Procedure  |    |
|   | 7.5.1.2 Measurement Results  |    |
|   | 7.5.2 Emissions into Restricted Frequency Bands  |    |
|   | <ul> <li>7.5.2.1 Measurement Procedure</li></ul>                                       |    |
|   | 7.5.2.3 Measurement Results  |    |
|   | 7.5.2.4 Sample Calculation:  |    |
|   | 7.6 POWER SPECTRAL DENSITY – FCC: 15.247(E); ISED CANADA: RSS-247 5.2(B)               |    |
|   | 7.6.1 Measurement Procedure  |    |
|   | 7.6.2 Measurement Results  |    |
| 8 | MEASUREMENT UNCERTAINTY  | 29 |
| - |  |    |
| 9 | CONCLUSION   | 29 |
|   |  |    |

Report: RD72159794.602

TÜV SÜD America Inc.

## 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 Radio Standards Specification: RSS-247 Certification.

## 1.2 **Product Description**

The SensorPod-M sends air quality data over-the-air to the Z-2500 and Z-3500 line of air purifiers.

Technical Information:

| Detail                | Description                        |
|-----------------------|------------------------------------|
| Frequency Range       | 2402 – 2480MHz                     |
| Channel Spacing       | 2MHz                               |
| Number of Channels    | 40                                 |
| Modulation Format     | GFSK                               |
| Rated RF Output Power | -3dBm (Conducted)                  |
| Operating Voltage     | 100-240Vac 50/60Hz (AC/DC Adapter) |
| Antenna Type / Gain   | PCB Trace Antenna / 2.0 dBi        |
| Hardware Version      | Z3500_1.0                          |
| Software Release      | Z3500_1.0                          |

Manufacturer Information: ACCO Brands USA, LLC 4 Corporate Drive Lake Zurich, IL 60047

EUT Serial Numbers: 004

Test Sample Condition: The test samples were provided in good working order with no visible defects.

#### **1.3 Test Methodology and Considerations**

The EUT was configured with special firmware to allow selection of operating frequency.

The power level was set to -6dB for all testing.

# 2 TEST FACILITIES

## 2.1 Location

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

TÜV SÜD America Inc. 2320 Presidential Drive, Suite 101 Durham, NC 27703 Phone: (919) 748-4615

# 2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America Inc. (Durham) is accredited to ISO/IEC 17025 by A2LA accreditation program, and has been issued certificate number 2955.18 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 and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC and Innovation, Science and Economic Development (ISED) Canada.

FCC Designation Number: US1245 FCC Test Firm Registration Number: 238628 ISED Canada Company Number: 20446

# 2.3 Radiated Emissions Test Site Description2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 18' x 28' x 18' shielded enclosure. The chamber is lined with Samwha Electronics Co. LTD Ferrite Absorber, model number SFA300 (HSN-1). The ferrite tile is 10cm x 10 cm and weighs approximately 1.4lbs. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber. On top of the ferrite tiles is DMAS HT-45 (Dutch Microwave Absorber Solutions) hybrid absorber on all walls except the wall behind the antenna mast which has a shorter DMAS HT-25 absorber.

The turntable is 1.50m in diameter and is located 150cm 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 short #6 copper wire. 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 turntable. 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.

Behind the turntable is a 2' x 6' x 1.5' deep shielded pit used for support equipment if necessary. The pit is equipped with 2 - 4" PVC chase 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.

12 Control Room access panel antenna mast Dimension not to scale

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

# 2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 10' sheet galvanized steel horizontal ground reference plane (GRP) bonded every 6" to an 8' X 8' aluminum vertical ground plane.

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

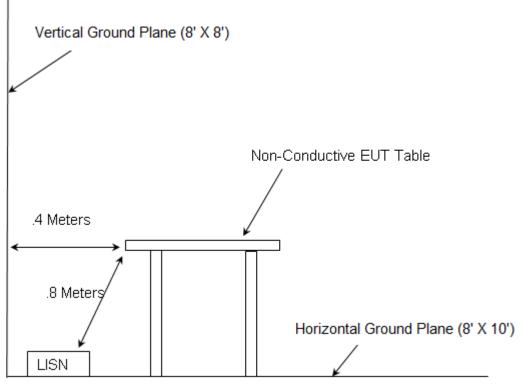


Figure 2.4-1: AC Mains Conducted EMI Site

#### 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, 2020
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2020
- FCC 558074 D01 15.247 Meas Guidance v05r02 Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules, 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, 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.

| Asset ID | Manufacturer   | Model #                   | Equipment<br>Type      | Serial # | Last<br>Calibration<br>Date | Calibration<br>Due Date |
|----------|--|---------------------------|------------------------|----------|-----------------------------|-------------------------|
| DEMC3002 | Rohde & Schwarz  | ESU40                     | Receiver               | 100346   | 1/22/2020                   | 1/22/2021               |
| DEMC3006 | Rohde & Schwarz  | TS-PR18                   | Amplifier              | 122006   | 1/23/2020                   | 1/23/2021               |
| DEMC3007 | Rohde & Schwarz  | TS-PR26                   | Amplifier              | 100051   | 1/23/2020                   | 1/23/2021               |
| DEMC3012 | Rohde & Schwarz  | EMC32-EB                  | Software               | 100731   | NCR                         | NCR                     |
| DEMC3016 | Fei Teng Wireless HA-07M18G-<br>Technology NF Antenna 20131202 |                           | 2013120203             | 4/8/2020 | 4/8/2021                    |                         |
| DEMC3027 | Micro-Tronics  | BRM50702                  | 2.4GHz<br>Notch Filter | 175      | 1/27/2020                   | 1/27/2021               |
| DEMC3032 | Hasco, Inc.  | HLL142-S1-<br>S1-192/WA   | Cable                  | 3075     | 1/23/2020                   | 1/23/2021               |
| DEMC3038 | Florida RF Labs  | NMSE-290AW-<br>60.0-NMSE  | Cable Set              | 1448     | 1/27/2020                   | 1/27/2021               |
| DEMC3039 | Florida RF Labs  | NMSE-290AW-<br>396.0-NMSE | Cable Set              | 1447     | 1/27/2020                   | 1/27/2021               |
| DEMC3055 | Rohde & Schwarz  | 3005                      | Cable                  | 3055     | 1/23/2020                   | 1/23/2021               |
| DEMC3085 | Rohde & Schwarz  | FSW43                     | Spectrum<br>Analyzer   | 103997   | 1/22/2020                   | 1/22/2021               |
| DEMC3161 | TESEQ  | CBL-6112D                 | Antenna                | 51323    | 2/18/2020                   | 2/18/2021               |

Table 4-1: Test Equipment

NCR = No Calibration Required

DMAS MT-25 RF absorber material was used on the floor for all final measurements above 1 GHz. Asset DEMC3002: Firmware Version: ESU40 is 4.73 SP4

Asset DEMC3012: Software Version: EMC32-B is 10.50.00

# 5 SUPPORT EQUIPMENT

| Item Equipment Type |                 | Manufacturer                                    | Model Number       | Serial Number   |  |  |  |  |  |
|---------------------|-----------------|---|--------------------|-----------------|--|--|--|--|--|
| 1                   | EUT             | ACCO Brands<br>USA, LLC                         | SensorPod-M        | See Section 1.2 |  |  |  |  |  |
| 2                   | AC/DC Wall Wart | ShenZhen<br>Rongweixin<br>Technology Co,<br>Ltd | R062-<br>0900500UC | N/A             |  |  |  |  |  |

 Table 5-1:
 Support Equipment

Notes:

# 6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

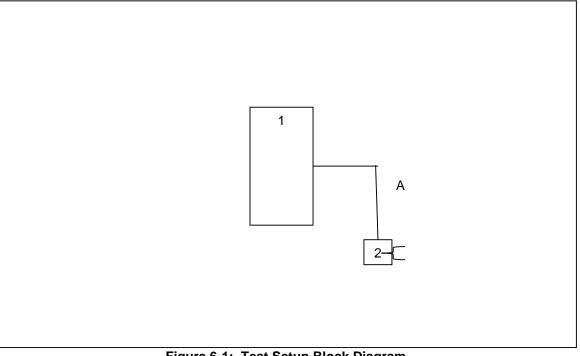


Figure 6-1: Test Setup Block Diagram

| Cable # | Cable Type     | Length | Shield | Termination |
|---------|----------------|--------|--------|-------------|
| А       | DC Power Cable | 1.9m   | No     | 1 to 2      |

#### 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 antenna is integral to the device and cannot be removed or replaced by the end user. The peak gain of the antenna is 2.0 dBi.

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

## 7.2.1 Measurement Procedure

ANSI C63.10-2013 section 6 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: Chris Gormley

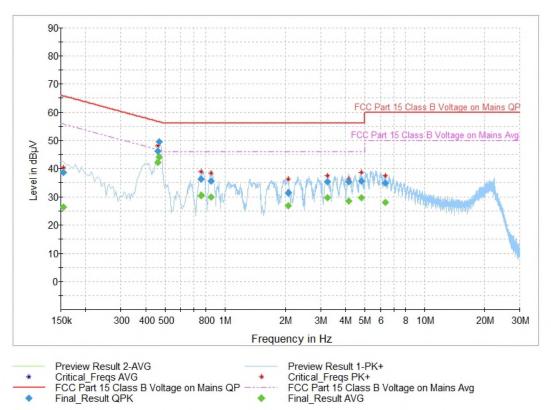
| Table 7.2.2-1: 0 | Conducted | EIVII Kesu | its – Lin | e and N | eutral - | - Senso | rPod-IVI |
|------------------|-----------|------------|-----------|---------|----------|---------|----------|
| Frequency        | QuasiPeak | Average    | Limit     | Margin  | Line     | Filter  | Corr.    |
| (MHz)            | (dBµV)    | (dBµV)     | (dBµV)    | (dB)    |          |         | (dB)     |
| 0.154500         |           | 26.45      | 55.75     | 29.31   | Ν        | OFF     | 9.6      |
| 0.154500         | 38.62     |            | 65.75     | 27.14   | Ν        | OFF     | 9.6      |
| 0.460500         |           | 42.09      | 46.68     | 4.59    | Ν        | OFF     | 9.6      |
| 0.460500         | 46.12     |            | 56.68     | 10.56   | Ν        | OFF     | 9.6      |
| 0.469500         | 49.50     |            | 56.52     | 7.03    | Ν        | OFF     | 9.6      |
| 0.469500         |           | 44.04      | 46.52     | 2.48    | Ν        | OFF     | 9.6      |
| 0.762000         | 36.25     |            | 56.00     | 19.75   | Ν        | OFF     | 9.6      |
| 0.762000         |           | 30.53      | 46.00     | 15.47   | Ν        | OFF     | 9.6      |
| 0.852000         | 35.59     |            | 56.00     | 20.41   | L1       | OFF     | 9.6      |
| 0.852000         |           | 29.99      | 46.00     | 16.01   | L1       | OFF     | 9.6      |
| 2.067000         | 31.56     |            | 56.00     | 24.44   | L1       | OFF     | 9.8      |
| 2.067000         |           | 26.98      | 46.00     | 19.02   | L1       | OFF     | 9.8      |
| 3.246000         | 35.28     |            | 56.00     | 20.72   | Ν        | OFF     | 9.8      |
| 3.246000         |           | 29.88      | 46.00     | 16.12   | Ν        | OFF     | 9.8      |
| 4.141500         | 35.37     |            | 56.00     | 20.63   | Ν        | OFF     | 9.8      |
| 4.141500         |           | 28.74      | 46.00     | 17.26   | Ν        | OFF     | 9.8      |
| 4.798500         | 35.54     |            | 56.00     | 20.46   | Ν        | OFF     | 9.8      |
| 4.798500         |           | 29.88      | 46.00     | 16.12   | Ν        | OFF     | 9.8      |
| 6.342000         | 34.76     |            | 60.00     | 25.24   | L1       | OFF     | 9.9      |
| 6.342000         |           | 28.20      | 50.00     | 21.80   | L1       | OFF     | 9.9      |

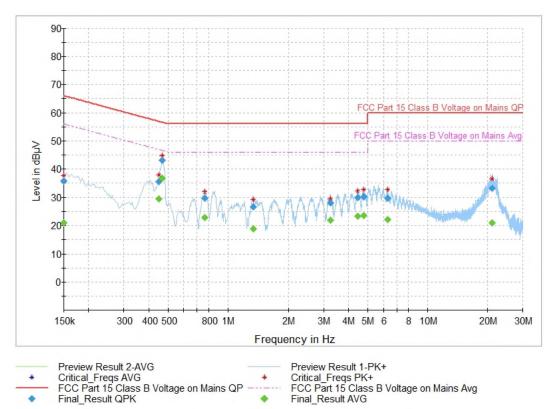
#### Table 7.2.2-1: Conducted EMI Results – Line and Neutral – SensorPod-M

| Table 7.2.2-2: | Conducte  | d EMI Re | sults – I | _ine and | Neutra | I – Wall | Wart  |
|----------------|-----------|----------|-----------|----------|--------|----------|-------|
| Frequency      | QuasiPeak | Average  | Limit     | Margin   | Line   | Filter   | Corr. |
| (MHz)          | (dBµV)    | (dBµV)   | (dBµV)    | (dB)     |        |          | (dB)  |
| 0.150000       |           | 20.93    | 56.00     | 35.07    | L1     | OFF      | 9.6   |
| 0.150000       | 35.79     |          | 66.00     | 30.21    | L1     | OFF      | 9.6   |
| 0.451500       | 35.59     |          | 56.85     | 21.26    | Ν      | OFF      | 9.6   |
| 0.451500       |           | 29.52    | 46.85     | 17.33    | Ν      | OFF      | 9.6   |
| 0.469500       | 43.03     |          | 56.52     | 13.49    | L1     | OFF      | 9.6   |
| 0.469500       |           | 36.68    | 46.52     | 9.85     | L1     | OFF      | 9.6   |
| 0.766500       |           | 23.05    | 46.00     | 22.95    | L1     | OFF      | 9.6   |
| 0.766500       | 29.90     |          | 56.00     | 26.10    | L1     | OFF      | 9.6   |
| 1.338000       | 26.79     |          | 56.00     | 29.21    | L1     | OFF      | 9.7   |
| 1.338000       |           | 18.94    | 46.00     | 27.06    | L1     | OFF      | 9.7   |
| 3.259500       |           | 22.04    | 46.00     | 23.96    | L1     | OFF      | 9.8   |
| 3.259500       | 28.23     |          | 56.00     | 27.77    | L1     | OFF      | 9.8   |
| 4.461000       | 30.10     |          | 56.00     | 25.90    | L1     | OFF      | 9.8   |
| 4.461000       |           | 23.31    | 46.00     | 22.69    | L1     | OFF      | 9.8   |
| 4.776000       | 30.31     |          | 56.00     | 25.69    | L1     | OFF      | 9.8   |
| 4.776000       |           | 23.76    | 46.00     | 22.24    | L1     | OFF      | 9.8   |
| 6.315000       |           | 22.31    | 50.00     | 27.69    | L1     | OFF      | 9.9   |
| 6.315000       | 29.80     |          | 60.00     | 30.20    | L1     | OFF      | 9.9   |
| 21.124500      | 33.12     |          | 60.00     | 26.88    | L1     | OFF      | 10.1  |
| 21.124500      |           | 20.97    | 50.00     | 29.03    | L1     | OFF      | 10.1  |

 Table 7.2.2-2:
 Conducted EMI Results – Line and Neutral – Wall Wart







#### Figure 7.2.2-2: Conducted EMI Emission Plot – Line and Neutral – Wall Wart

# 7.3 6dB / 99% Bandwidth – FCC: 15.247(a)(2); ISED Canada: RSS-247 5.2(a), RSS-Gen 6.7

#### 7.3.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC558074 D01 15.247 Meas Guidance v05r02. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to  $\geq$  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 to 1% to 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth.

#### 7.3.2 Measurement Results

Performed by: Chris Gormley

| Frequency<br>(MHz) | 6dB Bandwidth<br>(MHz) | 99% Bandwidth<br>(MHz) |
|--------------------|------------------------|------------------------|
| 2402               | 0.8442                 | 1.901                  |
| 2440               | 0.8442                 | 1.729                  |
| 2480               | 0.7692                 | 1.764                  |

Table 7.3.2-1: 6dB / 99% Bandwidth

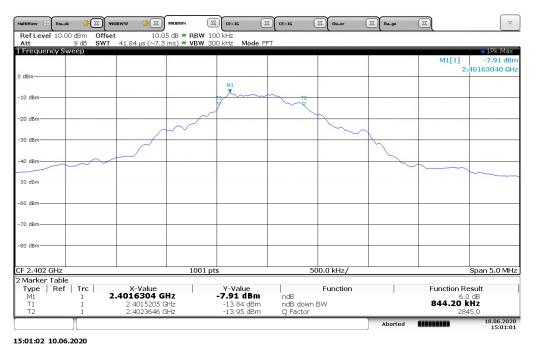
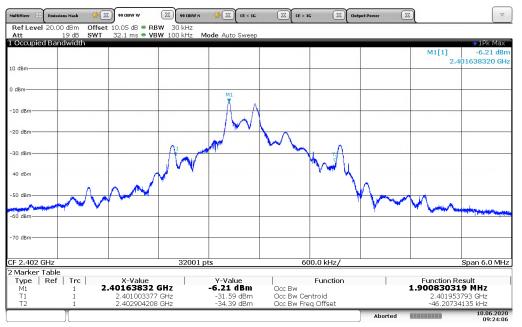
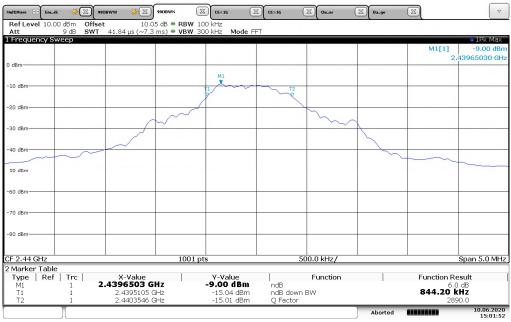


Figure 7.3.2-1: 6dB Bandwidth Low Channel



09:24:06 10.06.2020

Figure 7.3.2-2: 99% Bandwidth Low Channel



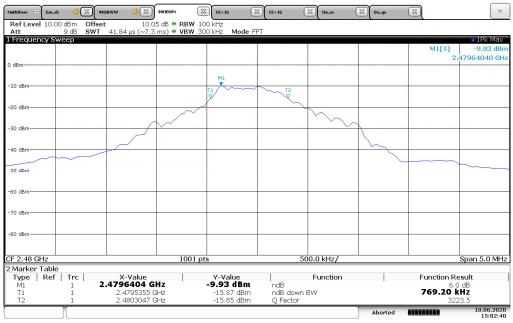
15:01:52 10.06.2020

Figure 7.3.2-3: 6dB Bandwidth Mid Channel



09:34:46 10.06.2020

Figure 7.3.2-4: 99% Bandwidth Mid Channel



15:02:40 10.06.2020

Figure 7.3.2-5: 6dB Bandwidth High Channel



09:36:26 10.06.2020



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

#### 7.4.1 Measurement Procedure

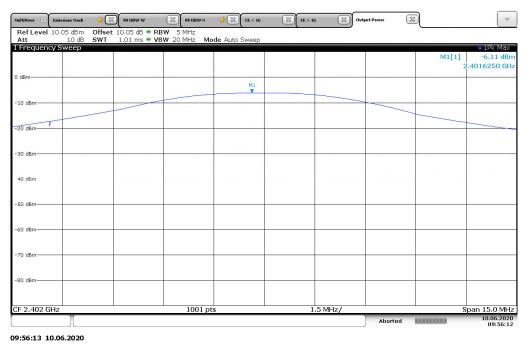
The maximum peak conducted output power was measured in accordance with FCC 558074 D01 15.247 Meas Guidance v05r02 utilizing the spectrum analyzer RBW  $\geq$  DTS bandwidth method. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation.

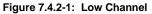
#### 7.4.2 Measurement Results

Performed by: Chris Gormley

| Frequency<br>(MHz) | Output Power<br>(dBm) |
|--------------------|-----------------------|
| 2402               | -6.11                 |
| 2440               | -6.97                 |
| 2480               | -7.81                 |

 Table 7.4.2-1: Maximum Peak Conducted Output Power





| MultiView 88     | Emissions Mask     | ¥2 | 99 OBW W     | 99 OBW N                   | 🄆 🖾 🕻 CE < 1G  | (E > 10 | G 🖾 Di    | itput Power | D     |                            |
|------------------|--------------------|----|--------------|----------------------------|----------------|---------|-----------|-------------|-------|----------------------------|
| Ref Level<br>Att | 10.05 dBm<br>10 dB |    | 10.05 dB = R | BWI 5 MHz<br>BWI 20 MHz MH | ode Auto Sweep |         |           |             |       |                            |
| 1 Frequence      | cy Sweep           |    |              |                            |                |         |           |             |       | 1Pk Max                    |
|                  |                    |    |              |                            |                |         |           |             | M1[1] | -6.97 dBm<br>2.4396850 GHz |
| 0 dBm            |                    |    |              |                            |                |         |           |             |       |                            |
|                  |                    |    |              |                            | M1             |         |           |             |       |                            |
| -10 dBm          |                    |    |              |                            |                |         |           | -           |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| -20 dBm          |                    |    |              | -                          |                |         |           |             |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| -30 dBm          |                    |    |              |                            |                |         |           |             |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| 40 dBm           |                    |    |              |                            |                |         |           |             |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| -50 dBm          |                    |    |              |                            |                |         |           |             |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| -60 dBm          |                    |    |              |                            |                |         |           |             |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| -70 dBm          |                    |    |              |                            |                |         |           |             |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| -80 dBm          |                    |    |              |                            |                |         |           |             |       |                            |
|                  |                    |    |              |                            |                |         |           |             |       |                            |
| CF 2.44 GH       | 17                 |    | 1            | 1001 p                     | <br> s         | 1       | .5 MHz/   | 1           |       | Span 15.0 MHz              |
|                  | 12<br>1            |    |              | 1001 p                     |                |         | 10 11112/ |             |       | 10.06.2020                 |
| L                |                    |    |              |                            |                |         |           | Aborted     |       | 09:56:55                   |

09:56:55 10.06.2020

#### Figure 7.4.2-2: Mid Channel

| Ref Level 10.05<br>Att |   | t 10.05 dB • RE<br>1.01 ms • VE | W 20 MHz Mo | de Auto Sweep |   |         |         |          |                      |
|------------------------|---|---------------------------------|-------------|---------------|---|---------|---------|----------|----------------------|
| Frequency Sw           |   |                                 |             |               |   |         |         |          | ●1Pk Ma>             |
|                        |   |                                 |             |               |   |         |         | M1[1     |                      |
|                        |   |                                 |             |               |   |         |         |          | 2.4795500 GI         |
| dBm                    |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             | M1            |   |         |         |          |                      |
| 10 dBm                 |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| 20 dBm                 |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| 30 dBm                 |   |                                 |             |               |   |         |         |          |                      |
| -30 dBm                |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| 40 dBm                 |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| 50 dBm                 |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| -60 dBm                |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| 70 dBm                 |   |                                 |             |               |   |         |         |          |                      |
| 70 uBm                 |   |                                 |             |               |   |         |         |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| 80 dBm                 |   | 1                               | -           |               |   |         | 1       |          |                      |
|                        |   |                                 |             |               |   |         |         |          |                      |
| F 2.48 GHz             |   | 1                               | 1001 pt     | s             | 1 | .5 MHz/ | I       |          | Span 15.0 MH         |
| . 2110 0112            | Y |                                 | 1001 pt     | •             |   | 10      | Aborted | 00000000 | 10.06.202<br>09:58:4 |

#### Figure 7.4.2-3: High Channel

#### 7.5 Emission Levels – FCC: 15.247(d), 15.205, 15.209; ISED Canada RSS-247 5.5, RSS-Gen 8.9/8.10

#### 7.5.1 Emissions into Non-restricted Frequency Bands

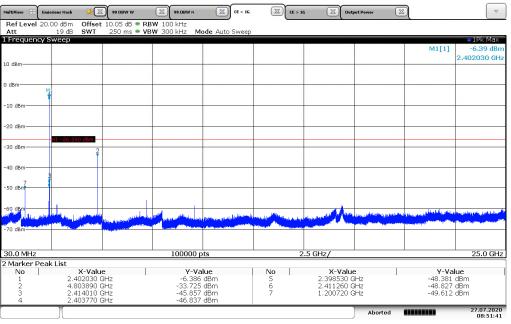
#### 7.5.1.1 Measurement Procedure

The unwanted emissions into non-restricted bands were measured conducted in accordance with FCC 558074 D01 15.247 Meas Guidance v05r02. 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  $\geq$  300 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active. The resulting spectrum analyzer peak level was used to determine the reference level with respect to the 20 dBc limit. The spectrum span was then adjusted for the measurement of spurious emissions from 30 MHz to 25GHz, 10 times the highest fundamental frequency. Additionally, a prescan was performed from 9 kHz or the lowest frequency generated to 30 MHz.

Band-edge compliance was determined using the conducted marker-delta method in which the radio frequency power that is produced by the EUT is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

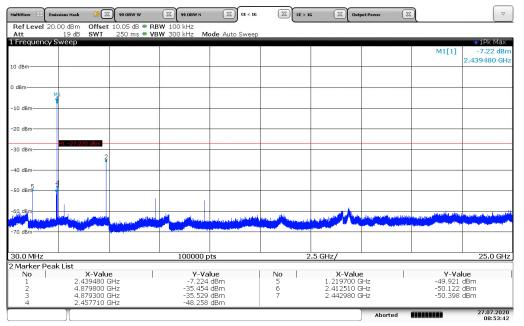
#### 7.5.1.2 Measurement Results

Performed by: Chris Gormley



08:51:41 27.07.2020

Figure 7.5.1.2-1: 30 MHz - 25 GHz – LCH



08:53:42 27.07.2020

Figure 7.5.1.2-2: 30 MHz – 25 GHz – MCH

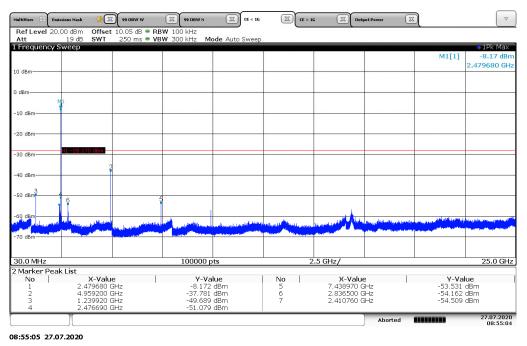
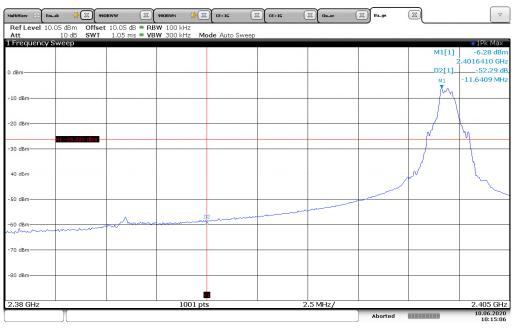


Figure 7.5.1.2-3: 30 MHz - 25 GHz - HCH



10:15:06 10.06.2020



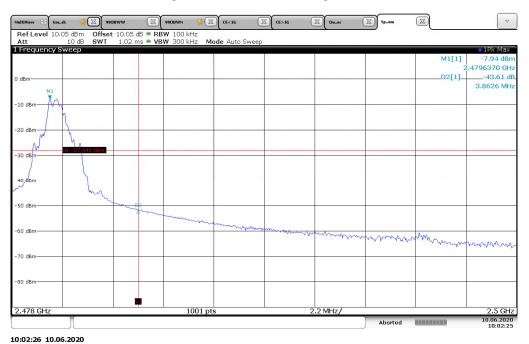


Figure 7.5.1.2-5: Upper Band-edge - HCH

## 7.5.2 Emissions into Restricted Frequency Bands

#### 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 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a RBW of 120 kHz and a VBW of 300 kHz. For frequencies above 1000MHz, 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

The Duty Cycle Correction was not required.

#### 7.5.2.3 Measurement Results

Performed by: Chris Gormley

|                    |                 |         |                     | 2.5-1. Kaul | ateu Spu | rious Emis |                   | abuiateu |                |         |       |         |
|--------------------|-----------------|---------|---------------------|-------------|----------|------------|-------------------|----------|----------------|---------|-------|---------|
| Frequency<br>(MHz) | Level<br>(dBuV) |         | Antenna<br>Polarity |             |          |            | Limit<br>(dBuV/m) |          | Margin<br>(dB) |         |       |         |
|                    | pk              | Qpk/Avg | (H/V)               | (o)         | (cm)     | (dB)       | pk                | Qpk/Avg  | pk             | Qpk/Avg | pk    | Qpk/Avg |
| Low Channel        |                 |         |                     |             |          |            |                   |          |                |         |       |         |
| 2390               | 59.46           | 25.00   | V                   | 281         | 100      | -3.01      | 56.45             | 21.99    | 74.0           | 54.0    | 17.55 | 32.01   |
| 4804               | 59.00           | 34.30   | Н                   | 304         | 100      | 3.45       | 62.45             | 37.75    | 74.0           | 54.0    | 11.55 | 16.25   |
| 4804               | 64.00           | 37.90   | V                   | 51          | 126      | 3.45       | 67.45             | 41.35    | 74.0           | 54.0    | 6.55  | 12.65   |
| 12010              | 37.00           | 23.00   | Н                   | 0           | 100      | 13.36      | 50.36             | 36.36    | 74.0           | 54.0    | 23.64 | 17.64   |
| 12010              | 36.60           | 23.00   | V                   | 0           | 100      | 13.36      | 49.96             | 36.36    | 74.0           | 54.0    | 24.04 | 17.64   |
| 19216              | 44.00           | 29.70   | Н                   | 0           | 150      | 8.80       | 52.80             | 38.50    | 74.0           | 54.0    | 21.20 | 15.50   |
| 19216              | 43.00           | 29.70   | V                   | 0           | 150      | 8.80       | 51.80             | 38.50    | 74.0           | 54.0    | 22.20 | 15.50   |
| Mid Channel        |                 |         |                     |             |          |            |                   |          |                |         |       |         |
| 4880               | 58.10           | 32.90   | Н                   | 301         | 100      | 3.76       | 61.86             | 36.66    | 74.0           | 54.0    | 12.14 | 17.34   |
| 4880               | 64.60           | 38.60   | V                   | 41          | 107      | 3.76       | 68.36             | 42.36    | 74.0           | 54.0    | 5.64  | 11.64   |
| 7320               | 51.90           | 27.90   | Н                   | 11          | 100      | 8.38       | 60.28             | 36.28    | 74.0           | 54.0    | 13.72 | 17.72   |
| 7320               | 48.20           | 25.30   | V                   | 300         | 100      | 8.38       | 56.58             | 33.68    | 74.0           | 54.0    | 17.42 | 20.32   |
| 12200              | 35.90           | 22.40   | Н                   | 0           | 100      | 13.06      | 48.96             | 35.46    | 74.0           | 54.0    | 25.04 | 18.54   |
| 12200              | 35.60           | 22.40   | V                   | 0           | 100      | 13.06      | 48.66             | 35.46    | 74.0           | 54.0    | 25.34 | 18.54   |
| 19520              | 43.40           | 29.40   | Н                   | 0           | 150      | 9.17       | 52.57             | 38.57    | 74.0           | 54.0    | 21.43 | 15.43   |
| 19520              | 42.90           | 29.30   | V                   | 0           | 150      | 9.17       | 52.07             | 38.47    | 74.0           | 54.0    | 21.93 | 15.53   |
|                    |                 |         |                     |             | High     | n Channel  |                   |          |                |         |       |         |
| 2483.5             | 63.41           | 25.30   | Н                   | 248         | 111      | -3.16      | 60.25             | 22.14    | 74.0           | 54.0    | 13.75 | 31.86   |
| 4960               | 57.10           | 31.90   | Н                   | 87          | 100      | 3.81       | 60.91             | 35.71    | 74.0           | 54.0    | 13.09 | 18.29   |
| 4960               | 63.00           | 37.70   | V                   | 273         | 100      | 3.81       | 66.81             | 41.51    | 74.0           | 54.0    | 7.19  | 12.49   |
| 7440               | 50.60           | 26.80   | Н                   | 13          | 100      | 8.93       | 59.53             | 35.73    | 74.0           | 54.0    | 14.47 | 18.27   |
| 7440               | 49.90           | 26.50   | V                   | 302         | 100      | 8.93       | 58.83             | 35.43    | 74.0           | 54.0    | 15.17 | 18.57   |
| 12400              | 36.70           | 22.90   | Н                   | 0           | 100      | 12.32      | 49.02             | 35.22    | 74.0           | 54.0    | 24.98 | 18.78   |
| 12400              | 36.70           | 22.80   | V                   | 0           | 100      | 12.32      | 49.02             | 35.12    | 74.0           | 54.0    | 24.98 | 18.88   |
| 19840              | 43.50           | 29.90   | Н                   | 0           | 150      | 9.35       | 52.85             | 39.25    | 74.0           | 54.0    | 21.15 | 14.75   |
| 19840              | 43.30           | 29.90   | V                   | 0           | 150      | 9.35       | 52.65             | 39.25    | 74.0           | 54.0    | 21.35 | 14.75   |
| 22320              | 43.10           | 30.00   | Н                   | 0           | 150      | 11.87      | 54.97             | 41.87    | 74.0           | 54.0    | 19.03 | 12.13   |
| 22320              | 42.80           | 30.00   | V                   | 0           | 150      | 11.87      | 54.67             | 41.87    | 74.0           | 54.0    | 19.33 | 12.13   |

Table 7.5.2.3-1: Radiated Spurious Emissions Tabulated Data

Note: All emissions not listed were attenuated below the noise floor of the measurement instrumentation or greater than 20dB from the limit.



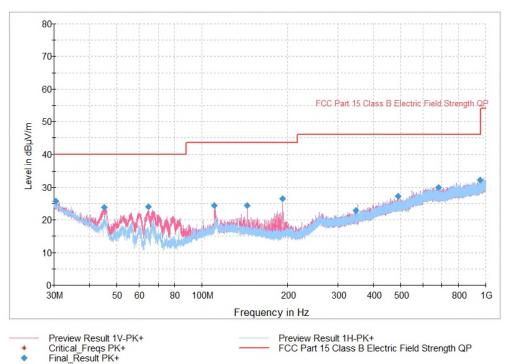
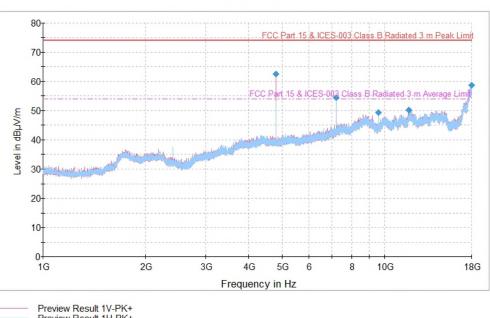


Figure 7.5.2.3-1: Radiated Spurious Emissions Below 1GHz Emission Profile

Full Spectrum



Preview Result 1H-PK+

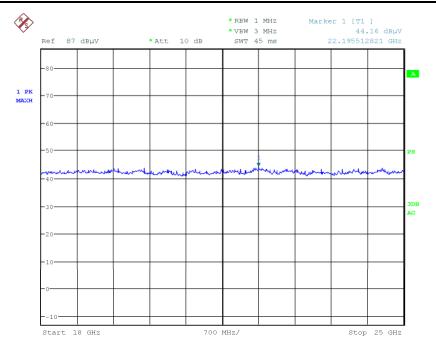
\*

Critical\_Freqs PK+ FCC Part 15 & ICES-003 Class B Radiated 3 m Peak Limit FCC Part 15 & ICES-003 Class B Radiated 3 m Average Limit Final\_Result PK+

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Figure 7.5.2.3-2: Radiated Spurious Emissions Above 1GHz Emission Profile

FCC ID: GV3-20SP0M1



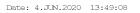


Figure 7.5.2.3-3: Radiated Spurious Emissions Above 18GHz Emission Profile

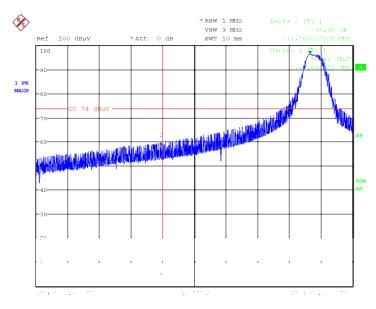




Figure 7.5.2.3-4: Radiated Spurious Emissions – Low Channel Band Edge

FCC ID: GV3-20SP0M1

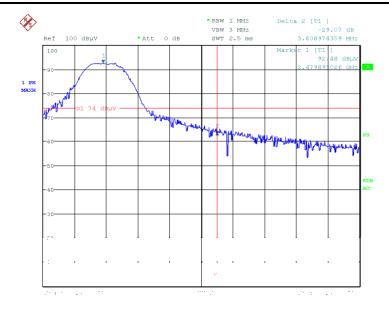




Figure 7.5.2.3-5: Radiated Spurious Emissions – High Channel Band Edge

# 7.5.2.4 Sample Calculation:

 $R_C = R_U + CF_T$ 

#### Where:

- CF<sub>T</sub> = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
- R<sub>U</sub> = Uncorrected Reading
- R<sub>C</sub> = Corrected Level
- AF = Antenna Factor
- CA = Cable Attenuation
- AG = Amplifier Gain
- DC = Duty Cycle Correction Factor

# Example Calculation: Peak

Corrected Level: 59.46 + -3.01 = 56.45dBuV/m Margin: 74dBuV/m - 56.45dBuV/m = 17.55dB

# Example Calculation: Average

Corrected Level: 25.00 + -3.01 = 21.99dBuV Margin: 54dBuV - 21.99dBuV = 32.01dB

## 7.6 Power Spectral Density – FCC: 15.247(e); ISED Canada: RSS-247 5.2(b)

#### 7.6.1 Measurement Procedure

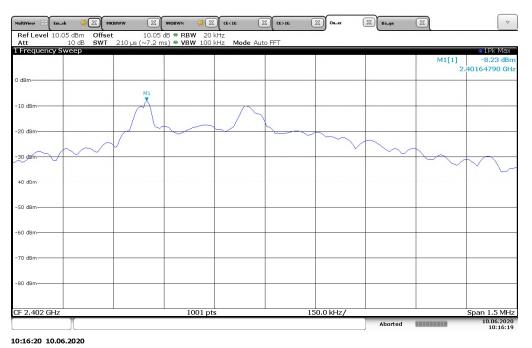
The power spectral density was measured in accordance with the FCC 558074 D01 15.247 Meas Guidance v05r02 utilizing the PKPSD (peak PSD) method. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 20 kHz. The Video Bandwidth (VBW) was set to 100 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active.

#### 7.6.2 Measurement Results

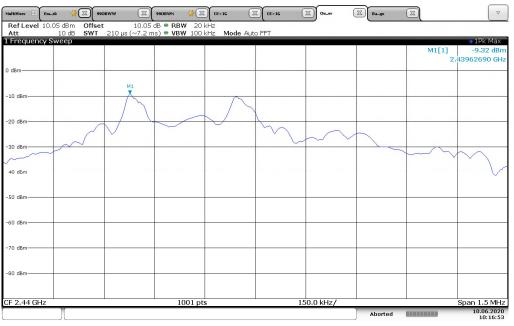
Performed by: Chris Gormley

| Table 7.0.2-1. Teak Tower Opectral Density |           |  |  |  |  |  |
|--|-----------|--|--|--|--|--|
| Frequency                                  | PSD Level |  |  |  |  |  |
| (MHz)                                      | (dBm)     |  |  |  |  |  |
| 2402                                       | -8.23     |  |  |  |  |  |
| 2440                                       | -9.32     |  |  |  |  |  |
| 2480                                       | -10.30    |  |  |  |  |  |



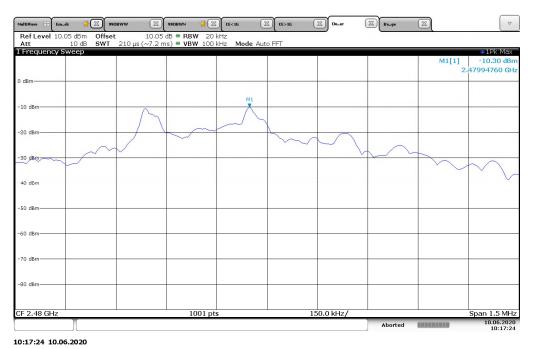






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Figure 7.6.2-2: PSD Plot – MCH





# 8 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 <sub>lab</sub> |
|-----------------------------------|------------------|
| Occupied Channel Bandwidth        | ± 0.004%         |
| RF Conducted Output Power         | ± 0.689 dB       |
| Power Spectral Density            | ±0.5 dB          |
| Antenna Port Conducted Emissions  | ± 2.717 dB       |
| Radiated Emissions                | ± 5.877 dB       |
| Temperature                       | ± 0.860 °C       |
| Radio Frequency                   | ±2.832 x 10-8    |
| AC Power Line Conducted Emissions | ±2.85            |

# 9 CONCLUSION

In the opinion of TÜV SÜD America Inc. the SensorPod-M, manufactured by ACCO Brands USA, LLC meets the requirements of FCC Part 15 subpart C and ISED Canada Radio Standards Specification: RSS-247 for the tests documented herein.

# **END REPORT**