



# TEST REPORT

**Test Report No. : UL-RPT-RP13720501-1416A**

**Customer** : Sound Devices, LLC

**Model No. / HVIN** : 9295

**PMN** : A20-MINI

**FCC ID** : 2AKLX-9295

**ISED Certification No.** : IC: 22225-9295

**Technology** : *Bluetooth – Low Energy*

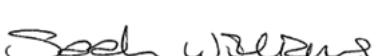
**Test Standard(s)** : FCC Parts 15.209(a) & 15.247  
Innovation, Science and Economic Development Canada  
RSS-247 Issue 2 February 2017  
RSS-Gen Issue 5 February 2021

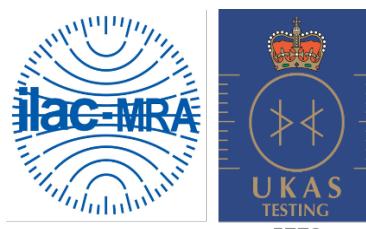
**Test Laboratory** : UL International (UK) Ltd, Basingstoke, Hampshire, RG24 8AH, United Kingdom

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5. Version 1.0.

**Date of Issue:** 20 October 2021

**Checked by:**   
Ben Mercer  
Lead Project Engineer, Radio Laboratory

**Company Signatory:**   
Sarah Williams  
Operations Leader, Radio Laboratory



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**UL International (UK) LTD**

Unit 1-3 Horizon, Kingsland Business Park, Wade Road, Basingstoke, Hampshire, RG24 8AH, UK  
Telephone: +44 (0)1256 312000  
Facsimile: +44 (0)1256 312001

## Customer Information

<b>Company Name:</b>	Sound Devices LLC
<b>Address:</b>	PO Box 576, E7556 State Rd 23-33, Reedsburg, WI 53959, United States

## Report Revision History

<b>Version Number</b>	<b>Issue Date</b>	<b>Revision Details</b>	<b>Revised By</b>
1.0	20/10/2021	Initial Version	Ben Mercer

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## **1 Attestation of Test Results**

### **1.1 Description of EUT**

The equipment under test was a Miniature Wireless Microphone Transmitter, containing Bluetooth LE technology.

### **1.2 General Information**

<b>Specification Reference:</b>	47CFR15.247
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.247
<b>Specification Reference:</b>	47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.209
<b>Specification Reference:</b>	RSS-Gen Issue 5 February 2021
<b>Specification Title:</b>	General Requirements for Compliance of Radio Apparatus
<b>Specification Reference:</b>	RSS-247 Issue 2 February 2017
<b>Specification Title:</b>	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
<b>Site Registration:</b>	FCC: 685609, ISEDC: 20903
<b>FCC Lab. Designation No.:</b>	UK2011
<b>ISEDC CABID:</b>	UK0001
<b>Location of Testing:</b>	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, G24 8AH, United Kingdom
<b>Test Dates:</b>	28 July 2021 to 17 August 2021

### **1.3 Summary of Test Results**

<b>FCC Reference (47CFR)</b>	<b>ISED Canada Reference</b>	<b>Measurement</b>	<b>Result</b>
Part 15.35(c)	RSS-Gen 8.2	Transmitter Duty Cycle	Note 1
N/A	RSS-Gen 6.7	Transmitter 99% Occupied Bandwidth	✓
Part 15.247(a)(2)	RSS-Gen 6.7 / RSS-247 5.2(a)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.247(b)(3)	RSS-Gen 6.12 / RSS-247 5.4(d)	Transmitter Maximum Peak Output Power	✓
Part 15.247(e)	RSS-247 5.4(b)	Transmitter Power Spectral Density	Note 2
Part 15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Radiated Emissions	✓
Part 15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Band Edge Radiated Emissions	✓

#### **Key to Results**

✓ = Complied    ✗ = Did not comply

#### **Note(s):**

1. The measurement was performed to assist in the calculation of the level of the emissions. The EUT cannot transmit continuously and sweep triggering/signal gating cannot be implemented.
2. In accordance with ANSI C63.10 Section 11.10.1, PSD measurements are not required if the maximum conducted output power is less than the PSD limit of 8 dBm / 3 kHz. The PSD level is therefore deemed to be equal to the measured output power.

### **1.4 Deviations from the Test Specification**

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

## **2 Summary of Testing**

### **2.1 Facilities and Accreditation**

The test site and measurement facilities used to collect data are located at Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom. The following table identifies which facilities were utilised for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

Site 1	X
Site 2	
Site 17	X

UL International (UK) Ltd is accredited by the United Kingdom Accreditation Service (UKAS). UKAS is one of the signatories to the International Laboratory Accreditation Co-operation (ILAC) Arrangement for the mutual recognition of test reports. The tests reported herein have been performed in accordance with its terms of accreditation.

### **2.2 Methods and Procedures**

<b>Reference:</b>	ANSI C63.10-2013
<b>Title:</b>	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
<b>Reference:</b>	KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019
<b>Title:</b>	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

## **2.3 Calibration and Uncertainty**

### **Measuring Instrument Calibration**

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

### **Measurement Uncertainty & Decision Rule**

#### **Overview**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

#### **Decision Rule**

The decision rule applied is based upon the accuracy method criteria. The measurement uncertainty is met and the result is considered in conformance with the requirement criteria if the observed value is within the prescribed limit.

#### **Measurement Uncertainty**

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Duty Cycle	2.4 GHz to 2.4835 GHz	95%	±1.14 %
99% Occupied Bandwidth	2.4 GHz to 2.4835 GHz	95%	±3.92 %
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±4.59 %
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	±5.32 dB
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±3.30 dB
Radiated Spurious Emissions	1 GHz to 25 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

## **2.4 Test and Measurement Equipment**

### **Test Equipment Used for Transmitter Conducted Tests**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	10 Dec 2021	12
A3117	Attenuator	AtlanTecRF	AN18-10	237378#1	Calibrated before use	-
M2036	Signal Analyser	Rohde & Schwarz	FSV30	101791	21 May 2022	12
G0615	Vector Signal Generator	Rohde & Schwarz	SMBV100A	260473	19 Mar 2023	24

### **Test Equipment Used for Transmitter Radiated Emissions Tests**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	10 Dec 2021	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Oct 2021	12
M1794	Test Receiver	Rohde & Schwarz	FSU26	100027	02 Mar 2022	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	19 May 2022	12
A3142	Pre-Amplifier	Schwarzbeck	BBV 9718 B	00020	21 Oct 2021	12
A2948	Pre-Amplifier	Com Power	PAM-118A	551087	21 Oct 2021	12
A3161	Antenna	Chase	CBL6111D	50859	04 May 2022	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	00653	23 Oct 2022	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	27 Oct 2022	12
A2943	Attenuator	AtlanTecRF	AN18W5-06	208147#2	01 Feb 2022	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	01 Feb 2022	12
A3014	High Pass Filter	AtlanTecRF	AFH-06000	17042400007	01 Feb 2022	12
A3265	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-069	16 Feb 2022	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	30 Oct 2021	12
M2040	Thermohygrometer	Testo	608-H1	451224934	10 Dec 2021	12
K0001	3m RSE Chamber	Rainford	N/A	N/A	06 Sep 2022	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	29 Apr 2022	12
A3198	Magnetic Loop Antenna	ETS Lindgren	6502	00221887	12 Aug 2022	12

**Test Equipment Used for Transmitter Band Edge Radiated Emissions Tests**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	10 Dec 2021	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Oct 2021	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	19 May 2022	12
A2948	Pre-Amplifier	Com Power	PAM-118A	551087	21 Oct 2021	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	00653	23 Oct 2022	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#2	01 Feb 2022	12

### **3 Equipment Under Test (EUT)**

#### **3.1 Identification of Equipment Under Test (EUT)**

<b>Brand Name:</b>	A20-MINI
<b>Model Name or Number / HVIN:</b>	9295
<b>PMN:</b>	A20-MINI
<b>Test Sample Serial Number:</b>	GE0521097000 ( <i>Conducted sample #1</i> )
<b>Hardware Version:</b>	2.0
<b>Software Version:</b>	0.01.1868
<b>FCC ID:</b>	2AKLX-9295
<b>ISED Canada Certification Number:</b>	IC: 22225-9295

<b>Brand Name:</b>	A20-MINI
<b>Model Name or Number / HVIN:</b>	9295
<b>PMN:</b>	A20-MINI
<b>Test Sample Serial Number:</b>	GE0321091000 ( <i>Radiated sample #1</i> )
<b>Hardware Version:</b>	2.0
<b>Firmware Version:</b>	0.01.1868
<b>FCC ID:</b>	2AKLX-9295
<b>ISED Canada Certification Number:</b>	IC: 22225-9295

#### **3.2 Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

### **3.3 Additional Information Related to Testing**

<b>Technology Tested:</b>	<i>Bluetooth Low Energy (Digital Transmission System)</i>		
<b>Type of Unit:</b>	Transceiver		
<b>Channel Spacing:</b>	2 MHz		
<b>Modulation:</b>	GFSK		
<b>Data Rate:</b>	1 Mbps		
<b>Power Supply Requirement(s):</b>	Nominal	3.6 VDC	
<b>Maximum Conducted Output Power:</b>	6.0 dBm		
<b>Transmit Frequency Range:</b>	2402 MHz to 2480 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	0	2402
	Middle	19	2440
	Top	39	2480

### **3.4 Description of Available Antennas**

The radio utilizes an integrated antenna, with the following maximum gain:

Type	Model	Frequency Range (MHz)	Antenna Gain (dBi)
Chip	A5645H	2400-2480	1.8

### **3.5 Description of Test Setup**

#### **Support Equipment**

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	Laptop
<b>Brand Name:</b>	Hewlett Packard
<b>Model Name or Number:</b>	Spectre Pro x360
<b>Serial Number:</b>	5CD6218MQ8

<b>Description:</b>	USB/TTL Interface Cable
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	Lavalier Microphone
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated
<b>Serial Number:</b>	Not marked or stated

#### **Operating Modes**

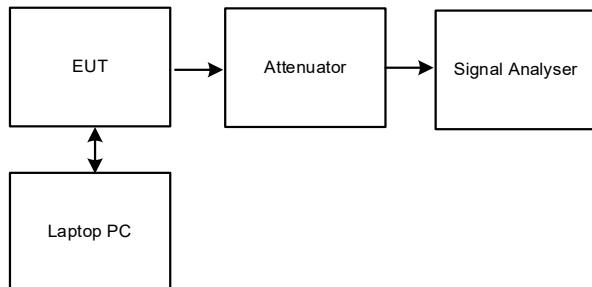
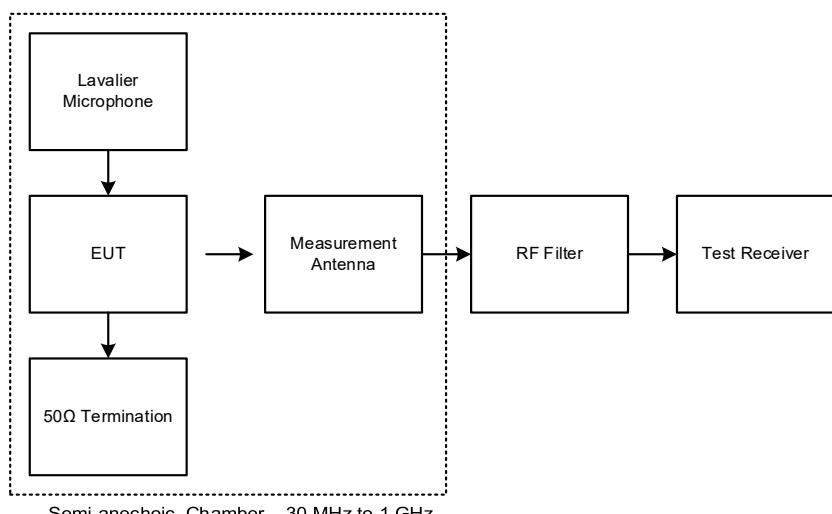
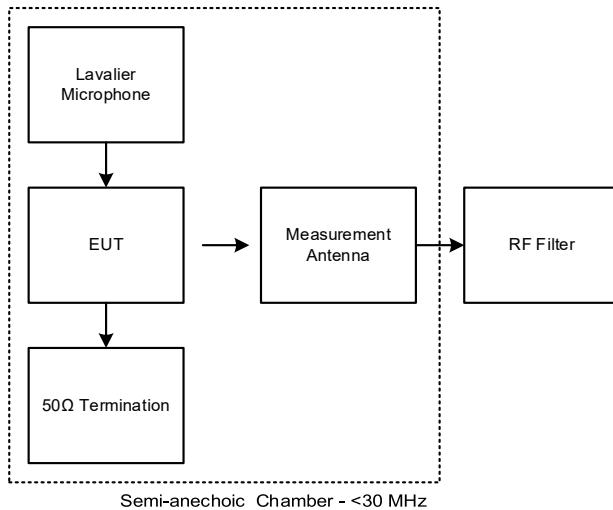
The EUT was tested in the following operating mode(s):

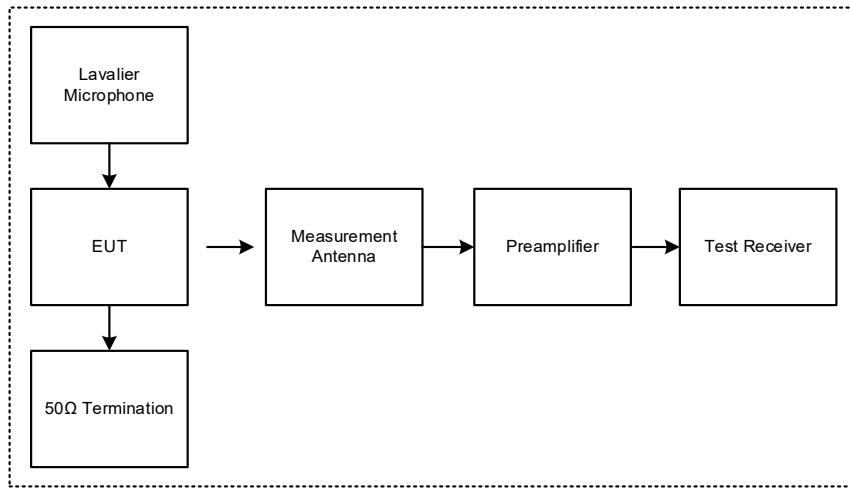
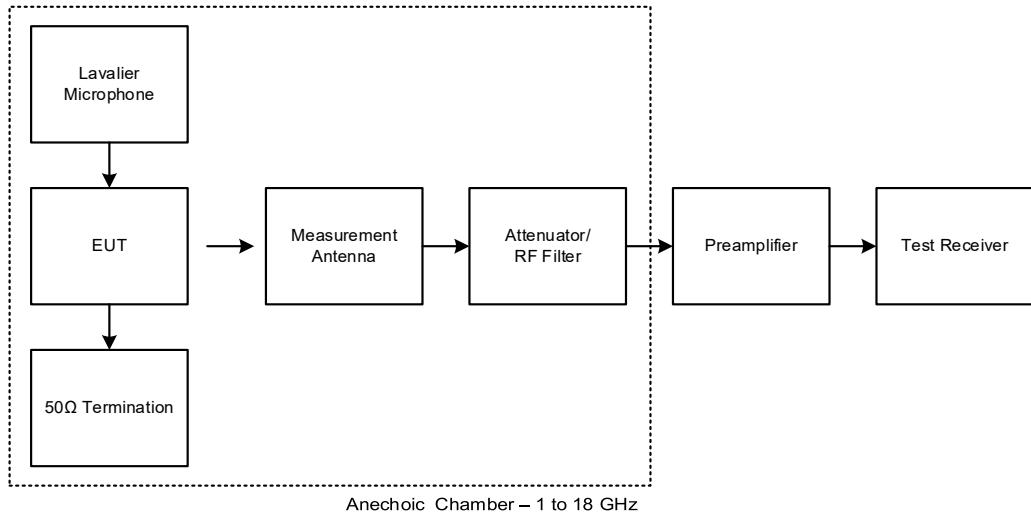
- Transmitting at maximum power in *Bluetooth LE* mode with modulation, maximum possible data length available and Pseudorandom Bit Sequence 9.

#### **Configuration and Peripherals**

The EUT was tested in the following configuration(s):

- The EUT was controlled with a test laptop and a third party test software application using commands supplied by the customer. Channels, packet lengths and other settings were then set using this software application as required.
- The EUT incorporates a chip antenna. A modified sample was supplied with an external antenna connector to facilitate conducted measurements.
- Powered by a fully charged 3.6 VDC battery pack. The battery voltage was monitored throughout testing.
- Transmitter radiated spurious emissions and band edge tests were performed with the EUT in the worst-case position/orientation with respect to emissions.
- During radiated spurious emissions and band edge testing, a lavalier microphone was connected to the 3-pin LEMO connector and a 50Ω termination was connected to the UHF connector.

**Test Setup Diagrams****Conducted Tests:****Test Setup for Transmitter Conducted Tests****Radiated Tests:****Test Setup for Transmitter Radiated Emissions**

**Test Setup Diagrams (continued)****Radiated Tests:****Test Setup for Transmitter Radiated Emissions**

## 4 Antenna Port Test Results

### 4.1 Transmitter Duty Cycle

#### Test Summary:

Test Engineer:	Chanthu Thevarajah	Test Date:	10 August 2021
Test Sample Serial Number:	GE0521097000		

FCC Reference:	Part 15.35(c)
ISED Canada Reference:	RSS-Gen 8.2
Test Method Used:	FCC KDB 558074 Section 6 referencing ANSI C63.10 Section 11.6

#### Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	60

#### Note(s):

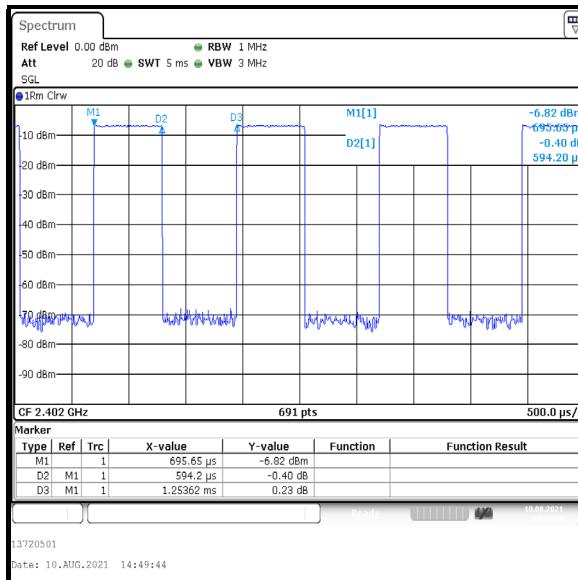
1. In order to assist with the determination of the average level of spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a spectrum/signal analyser in the time domain and calculated by using the following calculation:

$$10 \log (1 / (\text{On Time} / [\text{Period or } 100 \text{ ms whichever is the lesser}])).$$

$$10 \log (1 / (594.200 / 1253.620)) = 3.2 \text{ dB}$$

#### Results:

Pulse Duration (μs)	Period (μs)	Duty Cycle (dB)
594.200	1253.620	3.2



## **4.2 Transmitter 99% Occupied Bandwidth**

### **Test Summary:**

<b>Test Engineer:</b>	Chanthu Thevarajah	<b>Test Date:</b>	11 August 2021
<b>Test Sample Serial Number:</b>	GE0521097000		

<b>FCC Reference:</b>	N/A
<b>ISED Canada Reference:</b>	RSS-Gen 6.7
<b>Test Method Used:</b>	RSS-Gen 6.7 and Notes below

### **Environmental Conditions:**

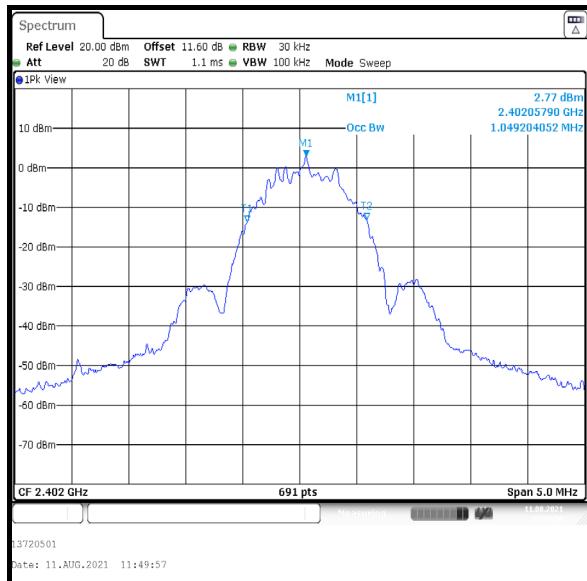
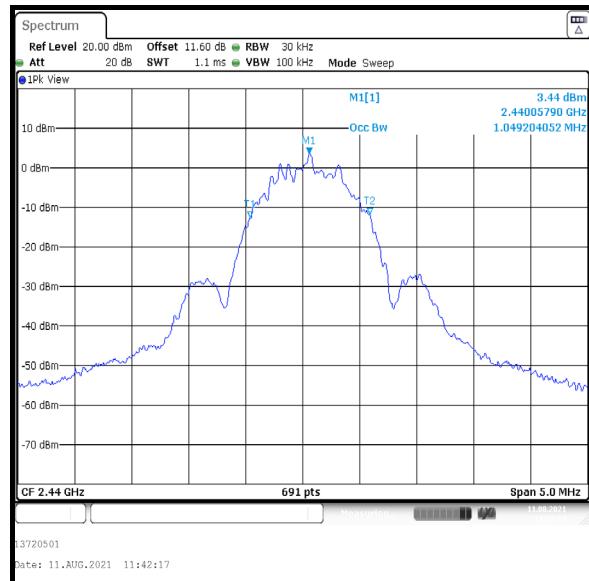
<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	58

### **Note(s):**

1. The 99% emission bandwidth was measured using the signal analyser occupied bandwidth function. The resolution bandwidth was set in the range of 1% to 5% of the occupied bandwidth and the video bandwidth set to 3 times the resolution bandwidth. The span was set to capture all products of the modulation process including emission skirts.
2. The signal analyser resolution bandwidth was set to 30 kHz and video bandwidth 100 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 5 MHz. The signal analyser function set the measurements to be made at 99% of the emission bandwidth. The results are given in the tables below.
3. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

**Transmitter 99% Occupied Bandwidth (continued)****Results:**

Channel	99% Occupied Bandwidth (kHz)
Bottom	1049.204
Middle	1049.204
Top	1063.676

**Bottom Channel****Middle Channel****Top Channel**

### **4.3 Transmitter Minimum 6 dB Bandwidth**

#### **Test Summary:**

<b>Test Engineer:</b>	Chanthu Thevarajah	<b>Test Dates:</b>	10 August 2021 & 11 August 2021
<b>Test Sample Serial Number:</b>	GE0521097000		

<b>FCC Reference:</b>	Part 15.247(a)(2)
<b>ISED Canada Reference:</b>	RSS-Gen 6.7 / RSS-247 5.2(a)
<b>Test Method Used:</b>	FCC KDB 558074 Section 8.2 referencing ANSI C63.10 Section 11.8.1

#### **Environmental Conditions:**

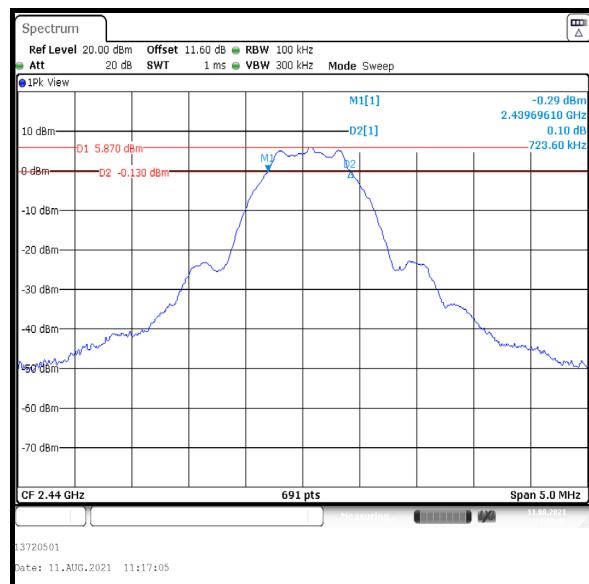
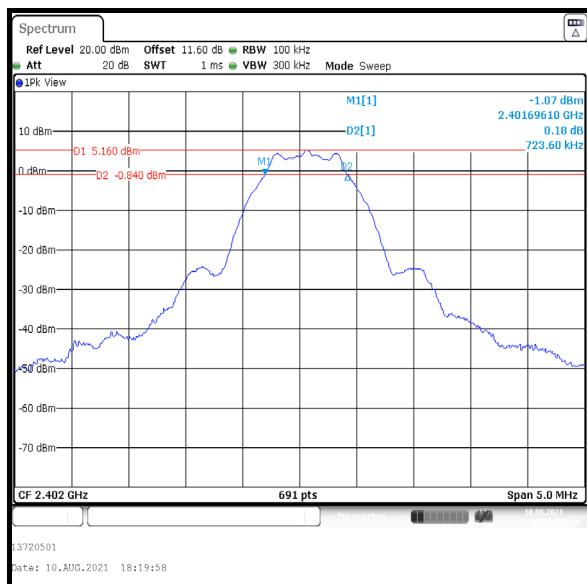
<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	58 to 60

#### **Note(s):**

1. 6 dB DTS bandwidth tests were performed using a signal analyser in accordance with ANSI C63.10 Section 11.8.1 Option 1 measurement procedure. The signal analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

**Transmitter Minimum 6 dB Bandwidth (continued)****Results:**

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	723.600	≥500	223.600	Complied
Middle	723.600	≥500	223.600	Complied
Top	730.800	≥500	230.800	Complied

**Bottom Channel****Top Channel****Middle Channel**

#### **4.4 Transmitter Maximum Peak Output Power**

##### **Test Summary:**

<b>Test Engineer:</b>	Chanthu Thevarajah	<b>Test Date:</b>	11 August 2021
<b>Test Sample Serial Number:</b>	GE0521097000		

<b>FCC Reference:</b>	Part 15.247(b)(3)
<b>ISED Canada Reference:</b>	RSS-Gen 6.12 / RSS-247 5.4(d)
<b>Test Method Used:</b>	FCC KDB 558074 Section 8.3.1.1 referencing ANSI C63.10 Section 11.9.1.1 and Notes below

##### **Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	58

##### **Note(s):**

1. Conducted power tests were performed using a signal analyser in accordance with ANSI C63.10 Section 11.9.1.1 with the  $RBW \geq DTS$  bandwidth procedure.
2. The signal analyser resolution bandwidth was set to 1 MHz and video bandwidth of 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 3 MHz. A marker was placed at the peak of the signal and the results recorded in the tables below.
3. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the signal analyser to compensate for the loss of the attenuator and RF cable.
4. The conducted power was added to the declared antenna gain to obtain the EIRP.

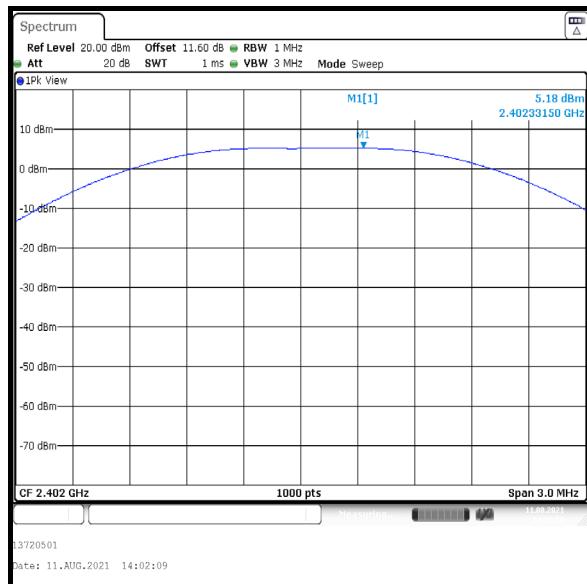
**Transmitter Maximum Peak Output Power (continued)****Results:**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	5.2	30.0	24.8	Complied
Middle	6.0	30.0	24.0	Complied
Top	5.5	30.0	24.5	Complied

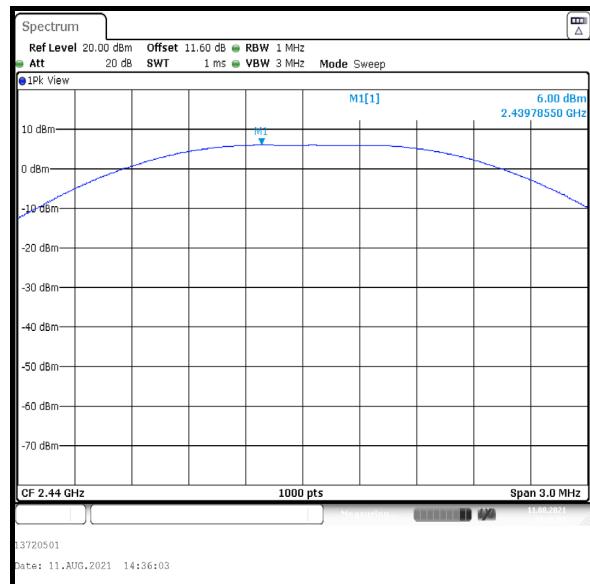
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	5.2	1.8	7.0	36.0	29.0	Complied
Middle	6.0	1.8	7.8	36.0	28.2	Complied
Top	5.5	1.8	7.3	36.0	28.7	Complied

## Transmitter Maximum Peak Output Power (continued)

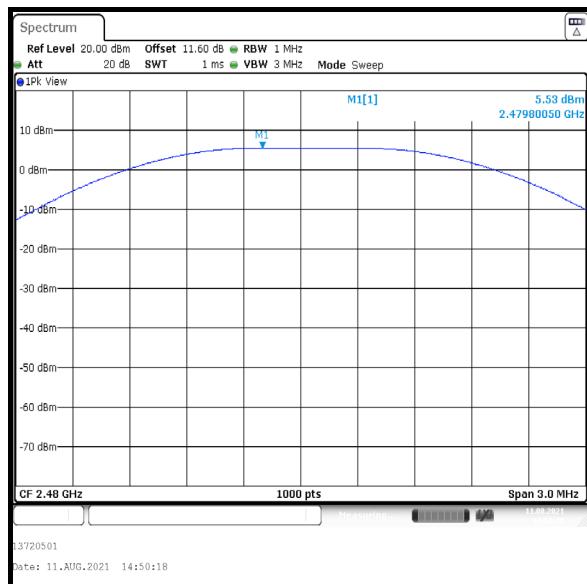
### Results:



**Bottom Channel**



**Middle Channel**



**Top Channel**

## **5 Radiated Test Results**

### **5.1 Transmitter Radiated Emissions <1 GHz**

#### **Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Dates:</b>	30 July 2021 & 17 August 2021
<b>Test Sample Serial Number:</b>	GE0321091000		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>ISED Canada Reference:</b>	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
<b>Test Method Used:</b>	ANSI C63.10 Sections 6.3, 6.4 and 6.5
<b>Frequency Range</b>	9 kHz to 1000 MHz

#### **Environmental Conditions:**

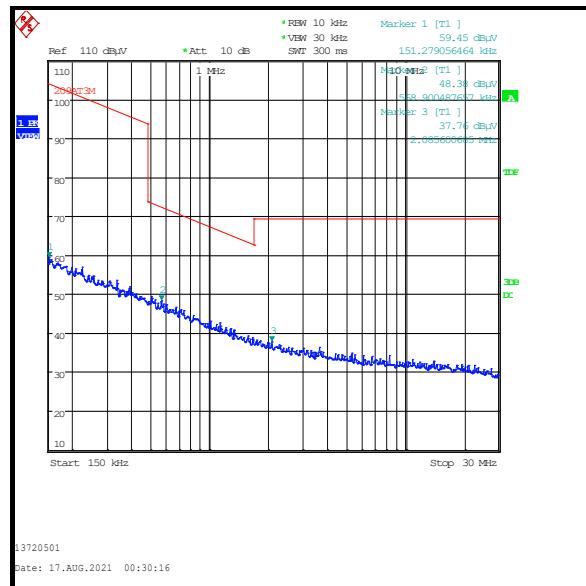
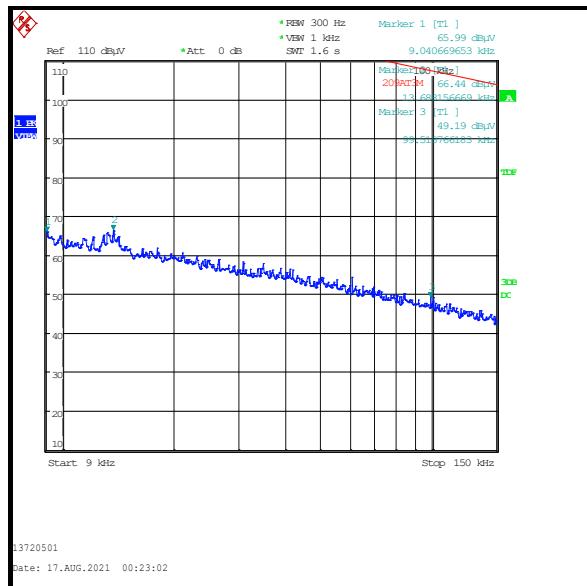
<b>Temperature (°C):</b>	23 to 24
<b>Relative Humidity (%):</b>	48 to 51

**Transmitter Radiated Emissions (continued)****Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scans were investigated and found to be ambient, > 20 dB below the appropriate limit or below the noise floor of the measurement system.
3. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore, final radiated emissions measurements were performed with the EUT set to the middle channel only.
4. Measurements below 30 MHz were performed in a semi-anechoic chamber (Asset Number K0001) at 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The limit was extrapolated to 3 metres in accordance with ANSI C63.10 Section 6.4.4.2. Correlation data between the semi-anechoic chamber and an open-field test site is available upon request.
5. The limits in CFR47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of  $377\Omega$ . For example, the measurement frequency  $X$  kHz resulted in a level of  $Y$   $\text{dB}\mu\text{V/m}$ , which is equivalent to  $Y - 51.5 = Z$   $\text{dB}\mu\text{A/m}$ , which has the same margin,  $W$  dB, to the corresponding RSS-Gen Table 6 limit as it has to the 15.209(a) limit.
6. Measurements between 30 MHz to 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was configured as follows: During 9 kHz to 150 kHz tests, the resolution bandwidth was set to 300 Hz and video bandwidth 1 kHz. A peak detector was used and trace mode was Max Hold. For 150 kHz to 30 MHz, the resolution bandwidth was set to 10 kHz and video bandwidth 30 kHz. A peak detector was used and trace mode was Max Hold. For 30 MHz to 1 GHz, the resolution bandwidth was set to 120 kHz and video bandwidth 500 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
8. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span wide enough to see the whole emission.

**Transmitter Radiated Emissions (continued)****Results: Quasi-Peak / Middle Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
249.996	Horizontal	23.4	46.0	22.6	Complied
450.016	Horizontal	25.4	46.0	20.6	Complied



*Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.*

## **5.2 Transmitter Radiated Emissions >1 GHz**

### **Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Dates:</b>	29 July 2021 to 02 August 2021
<b>Test Sample Serial Number:</b>	GE0321091000		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>ISED Canada Reference:</b>	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
<b>Test Method Used:</b>	FCC KDB 558074 Sections 8.1 c)3), 8.5 & 8.6 referencing ANSI C63.10 Sections 6.3, 6.6, 11.11 & 11.12
<b>Frequency Range</b>	1 GHz to 25 GHz

### **Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	48 to 53

### **Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scans were investigated and found to be ambient, > 20 dB below the appropriate limit or below the noise floor of the measurement system.
3. The emission shown on the 1 GHz to 3 GHz plot is the EUT fundamental.
4. \*In accordance with ANSI C63.10 Section 6.6.4.3, Note 1, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
5. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT.
6. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto. Peak and average measurements were performed with their own appropriate detectors during the pre-scan measurements.
8. The reference level for the emission in the non-restricted band was established by following ANSI C63.10 Section 11.11.2 procedure.
9. \*\*-20 dBc limit applies in non-restricted band as the conducted output power measurements were performed using a peak detector.

**Transmitter Radiated Emissions (continued)****Results: Bottom Channel / Peak**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
4803.386	Horizontal	48.0	54.0*	6.0	Complied
7207.034	Horizontal	53.0	54.0*	1.0	Complied

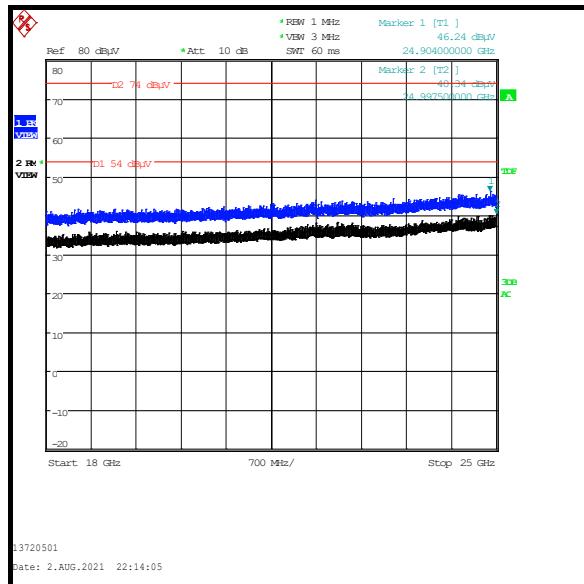
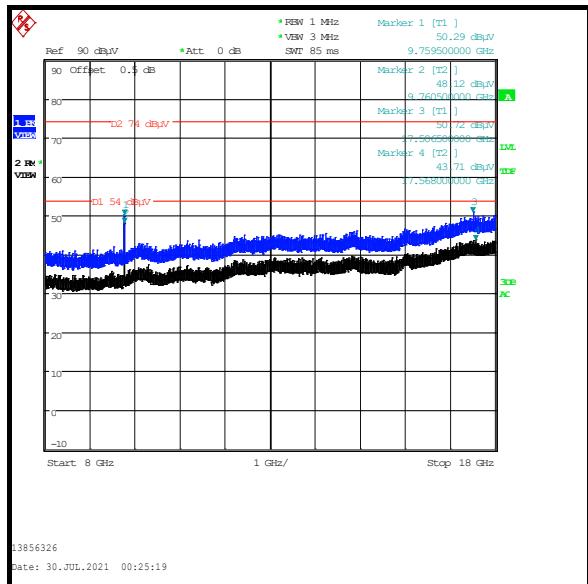
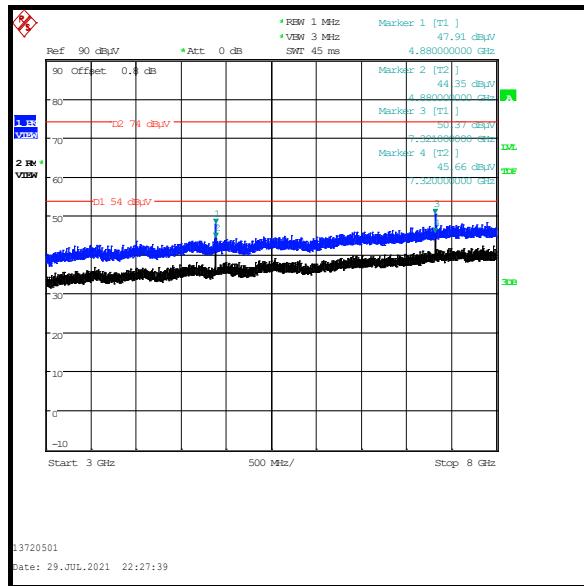
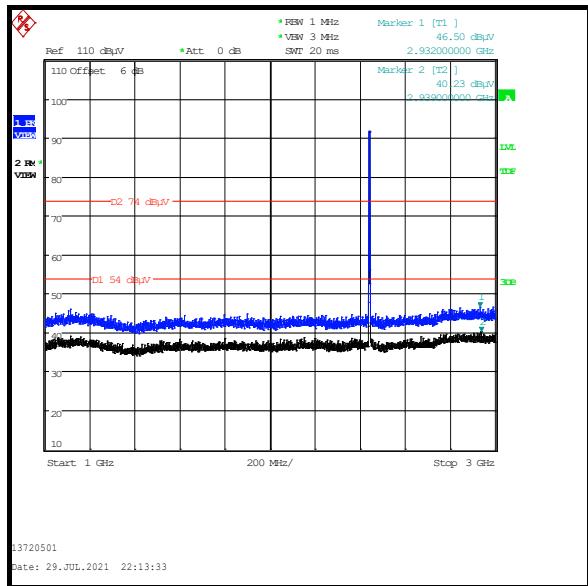
**Results: Middle Channel / Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4879.784	Horizontal	49.8	54.0*	4.2	Complied
7320.544	Horizontal	53.0	54.0*	1.0	Complied

**Results: Top Channel / Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4960.080	Horizontal	48.6	54.0*	5.4	Complied
7439.759	Horizontal	52.6	54.0*	1.4	Complied

## Transmitter Radiated Emissions (continued)



Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

### **5.3 Transmitter Band Edge Radiated Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	02 August 2021
<b>Test Sample Serial Number:</b>	GE0321091000		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>ISED Canada Reference:</b>	RSS-Gen 6.13 / RSS-247 5.5
<b>Test Method Used:</b>	KDB 558074 Section 8.7 referencing ANSI C63.10 Sections 11.11, 11.12 & 11.13

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	53

#### **Note(s):**

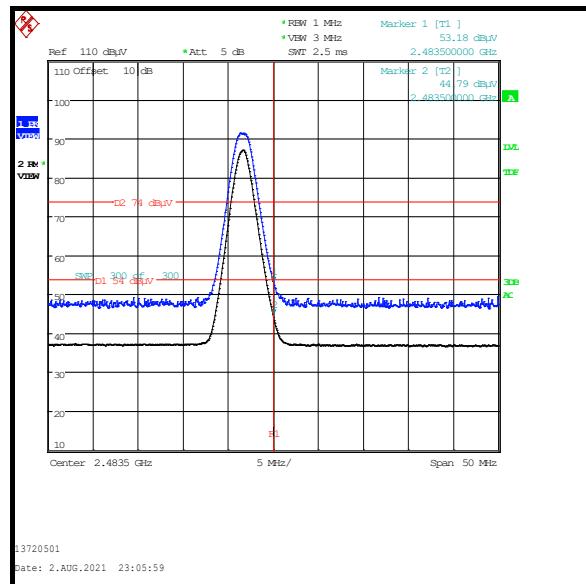
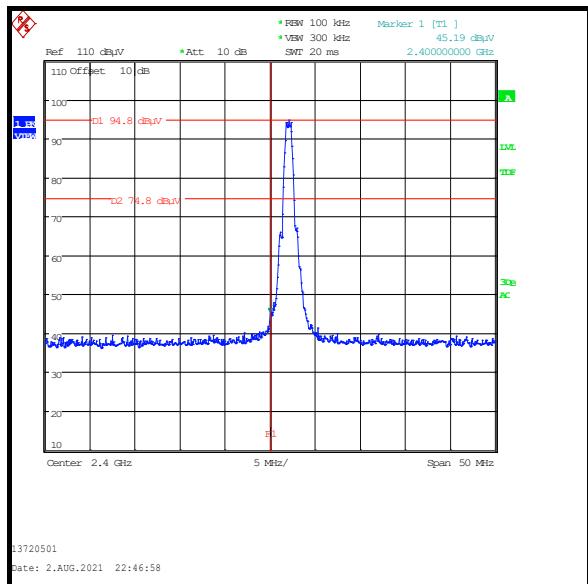
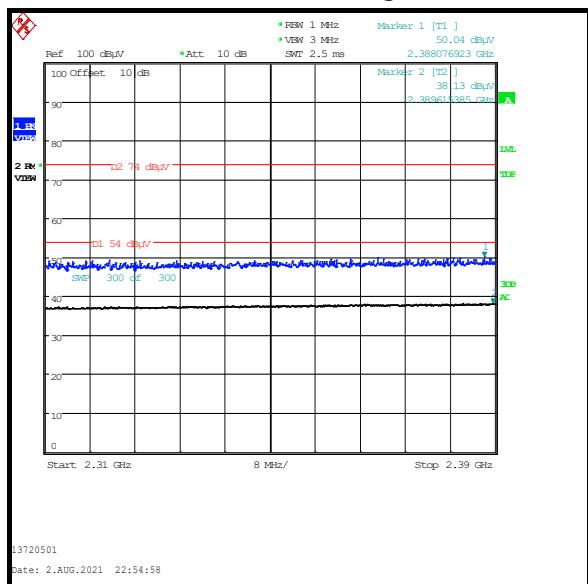
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The maximum peak conducted output power was measured. In accordance with ANSI C63.10 Section 11.11.1(a), the lower band edge measurement was performed with a peak detector and the -20dBc limit applied.
3. As the lower band edge is adjacent to a non-restricted band, only peak measurements are required. In accordance with ANSI C63.10 Section 11.11.1, the test method in Section 11.11.3 was followed: the test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. As the maximum peak conducted output power was measured using a peak detector in accordance with ANSI C63.10 Section 11.9.1.1 an out-of-band limit line was placed 20 dB (ANSI C63.10 Section 11.11.1(a)) below the peak level. A marker was placed on the band edge spot frequencies. Marker frequency and levels were recorded.
4. As the upper band edge is adjacent to a restricted band, both peak and average measurements were recorded by placing a marker at the edge of the band. For peak measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. An RMS detector was used, sweep time was set to auto and trace mode was trace averaging over 300 sweeps. A marker was placed on the band edge spot frequencies. Marker frequencies and levels were recorded.
5. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with peak and RMS detectors respectively. Markers were placed on the highest point on each trace.
6. \*-20 dBc limit.
7. \*\*In accordance with ANSI C63.10 Section 6.6.4.3, Note 1, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

**Transmitter Band Edge Radiated Emissions (continued)****Results: Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.000	Horizontal	45.2	74.8*	29.6	Complied
2483.500	Horizontal	53.2	54.0**	0.8	Complied

**Results: 2310 MHz to 2390 MHz Restricted Band / Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2388.077	Horizontal	50.0	54.0**	4.0	Complied

**Transmitter Band Edge Radiated Emissions (continued)****Results:****Lower Band Edge****Upper Band Edge****2310 MHz to 2390 MHz Restricted Band****--- END OF REPORT ---**