



# TEST REPORT

**Test Report No. : UL-RPT-RP14247018JD05A**

**Customer** : Apple Inc.  
**Model No. / HVIN** : A2854  
**PMN** : Siri Remote  
**FCC ID** : BCGA2854  
**ISED Certification No.** : IC: 579C-A2854  
**Technology** : *Bluetooth – Low Energy*  
**Test Standard(s)** : FCC Parts 15.207, 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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3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 1.0.

**Date of Issue:** 26 September 2022

**Checked by:** Sarah Williams  
Sarah Williams  
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**Company Signatory:** Ben Mercer  
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## Customer Information

<b>Company Name:</b>	Apple Inc.
<b>Address:</b>	One Apple Park Way Cupertino, California 95014 U.S.A.
<b>Contact Name:</b>	Stuart Thomas

## Report Revision History

<b>Version Number</b>	<b>Issue Date</b>	<b>Revision Details</b>	<b>Revised By</b>
1.0	26/09/2022	Initial Version	Sarah Williams

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## **1 Attestation of Test Results**

### **1.1 Description of EUT**

The equipment under test was an Apple *Bluetooth*® remote control for an Apple TV. It features a capacitive sensor, microphone, accelerometer, buttons for control via *Bluetooth* connection to Apple TV and rechargeable battery with Lightning port for charging.

### **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>	47CFR15.207 & 47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.207 & 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>	03 August 2022 to 22 September 2022

### **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	Complied
Part 15.247(a)(2)	RSS-Gen 6.7 / RSS-247 5.2(a)	Transmitter Minimum 6 dB Bandwidth	Complied
Part 15.247(b)(3)	RSS-Gen 6.12 / RSS-247 5.4(d)	Transmitter Maximum Peak Output Power	Complied
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	Complied
Part 15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Band Edge Radiated Emissions	Complied
Part 15.207	RSS-Gen 8.8	Transmitter AC Conducted Emissions	Complied

#### **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	-

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
<b>Reference:</b>	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
<b>Title:</b>	AC Power-Line Conducted Emissions Frequently Asked Questions

## **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%	±3.16 dB
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±1.96 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	09 Dec 2022	12
A213953	Attenuator	Atlantic Microwave	ATT10KXP-483082-N4N5	21415050	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	13 Mar 2023	12
G0615	Signal Generator	Rohde & Schwarz	SMBV100A	260473	19 Mar 2023	36

### **Test Equipment Used for Transmitter Duty Cycle Tests**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2022	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	06 Sep 2022	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	29 Apr 2023	12
A3179	Pre-Amplifier	Hewlett Packard	8449B	3008A00934	24 Aug 2022	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	27 Aug 2022	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	27 Jan 2023	12

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

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2022	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	06 Sep 2022	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	29 Apr 2023	12
A3141	Pre-Amplifier	Schwarzbeck	BBV 9718 B	00021	24 Aug 2022	12
A3154	Pre-Amplifier	Com Power	PAM-103	18020012	24 Aug 2022	12
A3179	Pre-Amplifier	Hewlett Packard	8449B	3008A00934	24 Aug 2022	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	24 Mar 2023	12
A553	Antenna	Chase	CBL6111A	1593	23 Nov 2022	12
A2895	Antenna	Schwarzbeck	BBHA 9170	9170-728	23 Mar 2023	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	27 Aug 2022	12
A3139	Antenna	Schwarzbeck	HWRD750	00027	27 Aug 2022	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	27 Jan 2023	12
A3085	Low Pass Filter	AtlanTecRF	AFL-02000	18051600014	27 Jan 2023	12
A3093	High Pass Filter	AtlanTecRF	AFH-03000	18051800077	27 Jan 2023	12
A3095	High Pass Filter	AtlanTecRF	AFH-07000	18051600012	27 Jan 2023	12
A3165	Magnetic Loop Antenna	ETS-Lindgren	6502	00224383	05 May 2023	12

**Test and Measurement Equipment (continued)****Test Equipment Used for Transmitter Band Edge Radiated Emissions Tests**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2022	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	06 Sep 2022	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	29 Apr 2023	12
A3179	Pre-Amplifier	Hewlett Packard	8449B	3008A00934	24 Aug 2022	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	27 Aug 2022	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	27 Jan 2023	12

**Test Equipment Used for Transmitter AC Conducted Spurious Emissions:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2037	Thermohygrometer	Testo	608-H1	45124925	08 Dec 2022	12
M1237	Test Receiver	Rohde & Schwarz	ESIB 26	100275	25 Nov 2022	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	01 Sep 2023	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	31 May 2023	12

**Test Measurement Software/Firmware Used:**

Name	Version	Release Date
Rohde & Schwarz EMC32	6.30.0	2018

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

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

<b>Brand Name:</b>	Apple
<b>Model Name or Number / HVIN:</b>	A2854
<b>PMN:</b>	Siri Remote
<b>Test Sample Serial Number:</b>	C08HJ0N81PL8 ( <i>Conducted sample #1</i> )
<b>Hardware Version:</b>	REV 1.0
<b>Software Version:</b>	V0016
<b>FCC ID:</b>	BCGA2854
<b>ISED Canada Certification Number:</b>	IC: 579C-A2854

<b>Brand Name:</b>	Apple
<b>Model Name or Number / HVIN:</b>	A2854
<b>PMN:</b>	Siri Remote
<b>Test Sample Serial Number:</b>	C08HK17Q1PL8 ( <i>Radiated sample #1</i> )
<b>Hardware Version:</b>	REV 1.0
<b>Software Version:</b>	V0016
<b>FCC ID:</b>	BCGA2854
<b>ISED Canada Certification Number:</b>	IC: 579C-A2854

<b>Brand Name:</b>	Apple
<b>Model Name or Number / HVIN:</b>	A2854
<b>PMN:</b>	Siri Remote
<b>Test Sample Serial Number:</b>	C08HR0S71PL8 ( <i>Radiated sample #2</i> )
<b>Hardware Version:</b>	REV 1.0
<b>Software Version:</b>	V0016
<b>FCC ID:</b>	BCGA2854
<b>ISED Canada Certification Number:</b>	IC: 579C-A2854

#### **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: LE</b>	1 Mbps		
<b>Power Supply Requirement(s):</b>	Nominal	3.8 VDC	
<b>Maximum Conducted Output Power:</b>	7.4 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	37	2402
	Middle	18	2442
	Top	39	2480

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

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

Frequency Range (MHz)	Antenna Gain (dBi)
2400-2480	-3.6

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

#### **Support Equipment**

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

<b>Description:</b>	Test Laptop
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	MacBook Pro
<b>Serial Number:</b>	G9NQ6P9WQ7

<b>Description:</b>	USB Diagnostic Cable
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	Chimp
<b>Serial Number:</b>	30A72D

<b>Description:</b>	Test Laptop
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	MacBook Pro
<b>Serial Number:</b>	C706NT6R9D

<b>Description:</b>	USB Diagnostic Cable
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	Chimp
<b>Serial Number:</b>	428A74

<b>Description:</b>	AC to DC USB Power Adaptor
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A2347
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	USB-C Cable
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1977
<b>Serial Number:</b>	Not marked or stated

## **Operating Modes**

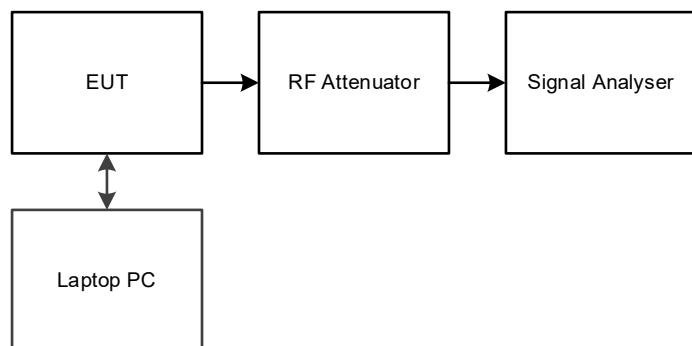
The EUT was tested in the following operating mode(s):

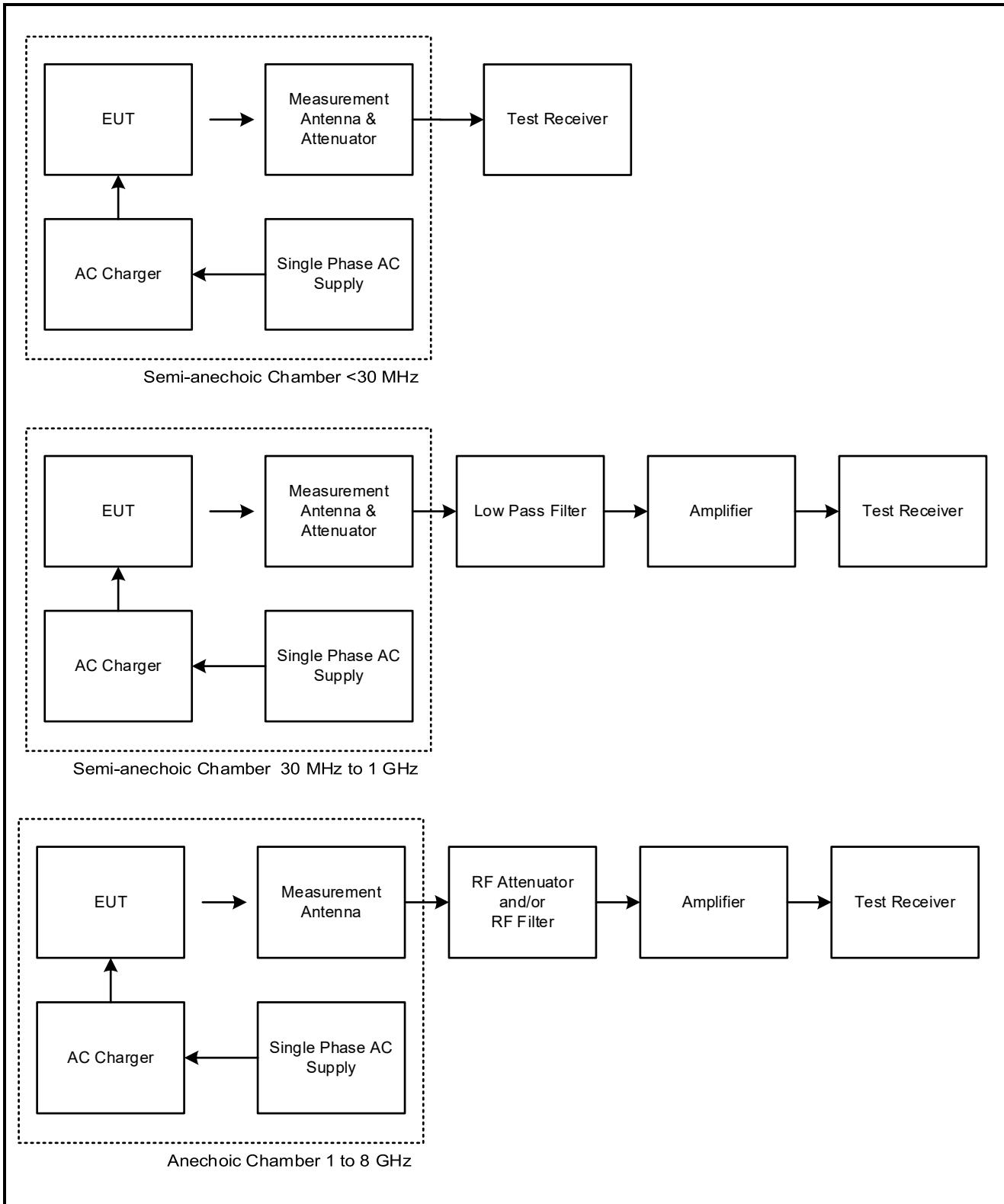
- Transmitting at maximum power in *Bluetooth LE* mode with modulation, maximum possible data length available and Pseudorandom Bit Sequence 9.

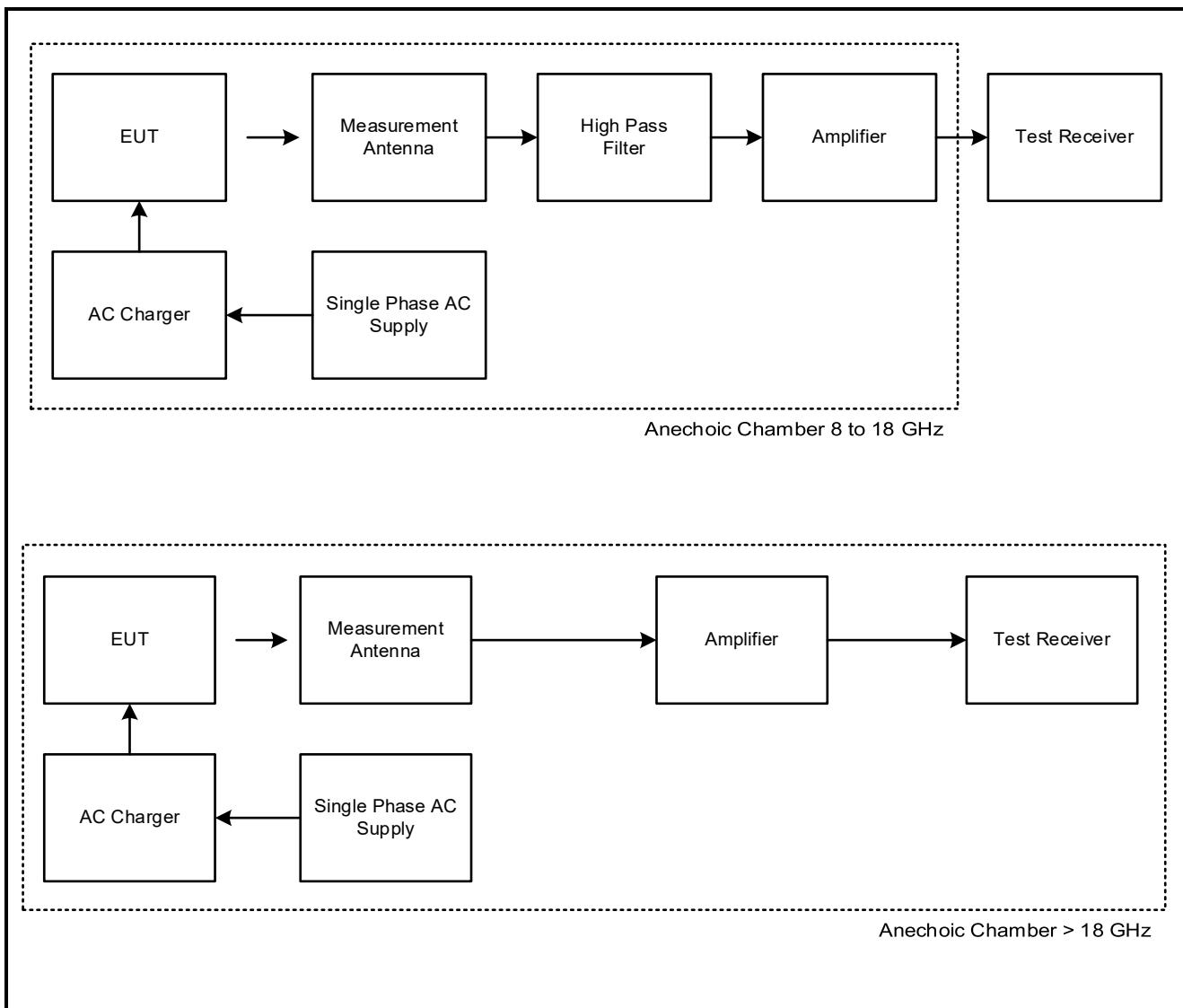
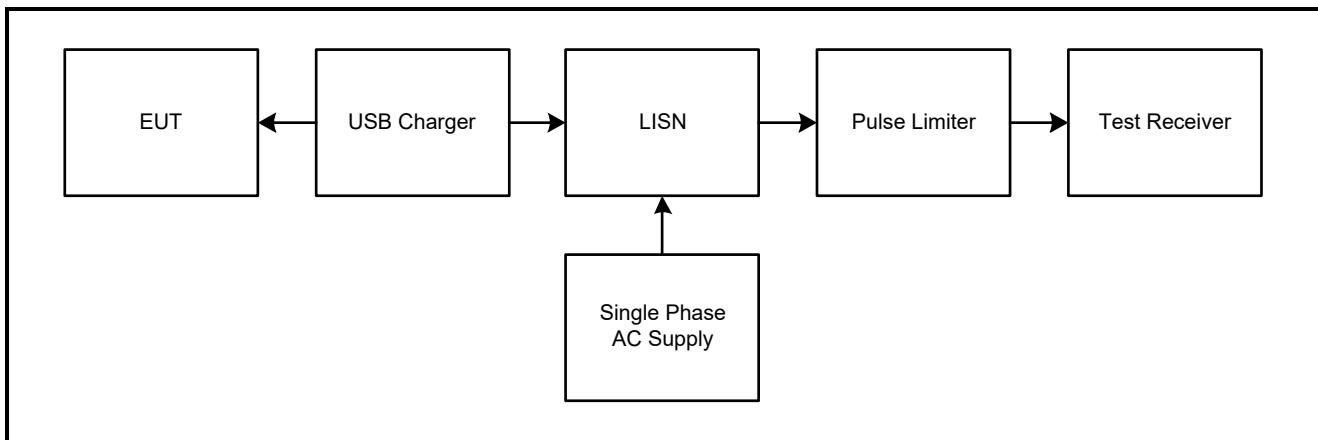
## **Configuration and Peripherals**

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

- Controlled in test mode using a set of commands entered into a terminal application on the test laptop supplied by the customer. The commands were used to enable a continuous transmission and to select the test channels as required. The customer supplied a document containing the setup instructions.
- The EUT was powered from the USB diagnostic cable connected to the test laptop for conducted tests.
- The customer supplied RF test cable for connection to the internal EUT antenna ports in order to perform conducted measurements. The respective path losses were added to the measurements.
- Transmitter radiated spurious emissions tests were performed with the EUT in the worst case position with the AC Charger connected to the EUT.

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

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

**Test Setup Diagrams (continued)****Test Setup for Transmitter Radiated Emissions (continued)****Test Setup for Transmitter AC Conducted Spurious Emissions**

## 4 Antenna Port Test Results

### 4.1 Transmitter Duty Cycle

#### Test Summary:

Test Engineer:	Andrew Harding	Test Date:	03 August 2022
Test Sample Serial Number:	C08HK17Q1PL8		

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

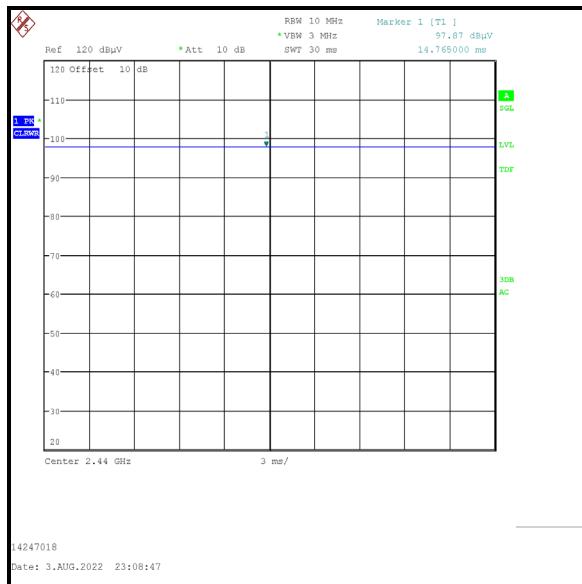
#### Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	46

#### Note(s):

1. The duty cycle was measured and found to be greater than 98%. No duty cycle correction is required to assist with calculating the average emission levels.

#### Results:



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

### **Test Summary:**

<b>Test Engineer:</b>	Stefan Ho	<b>Test Date:</b>	16 August 2022
<b>Test Sample Serial Number:</b>	C08HJ0N81PL8		

<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:**

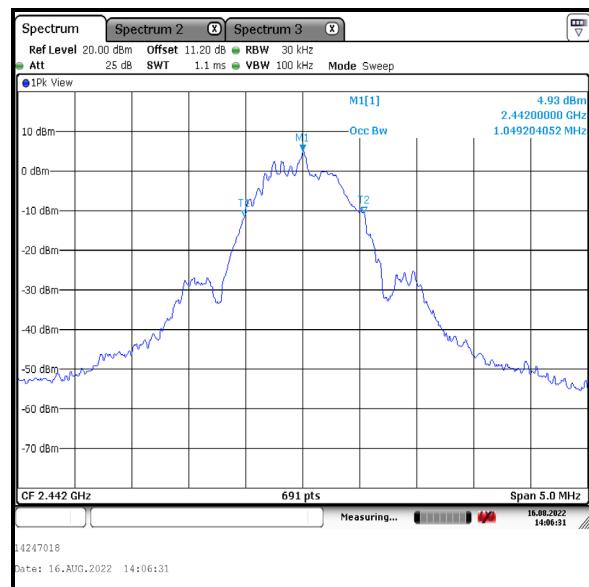
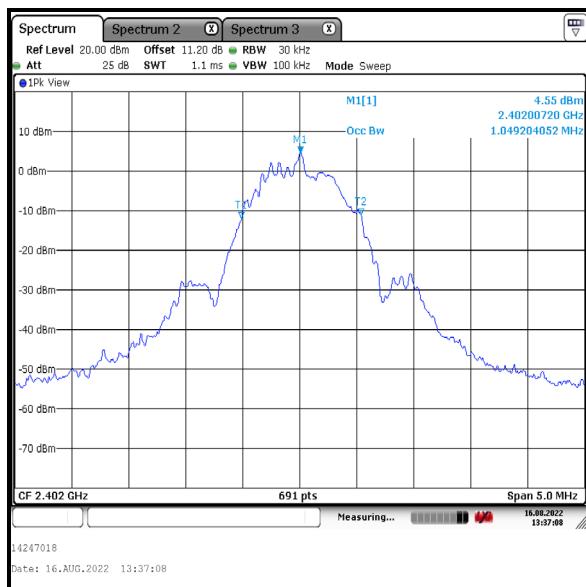
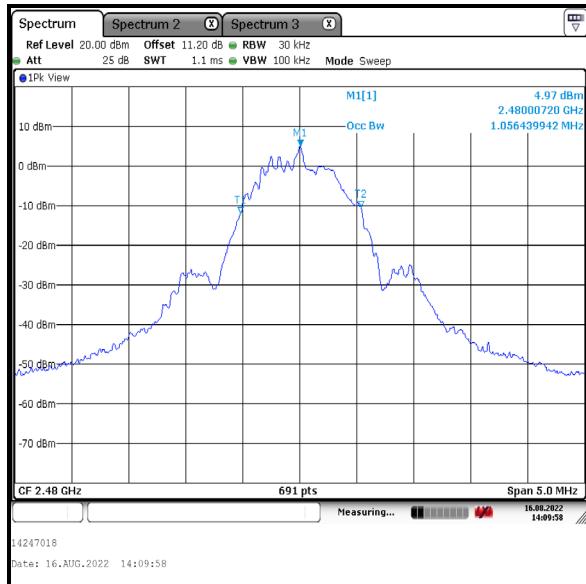
<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	58

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

1. 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.
2. 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	1056.440

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

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

#### **Test Summary:**

<b>Test Engineer:</b>	Stefan Ho	<b>Test Date:</b>	16 August 2022
<b>Test Sample Serial Number:</b>	C08HJ0N81PL8		

<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:**

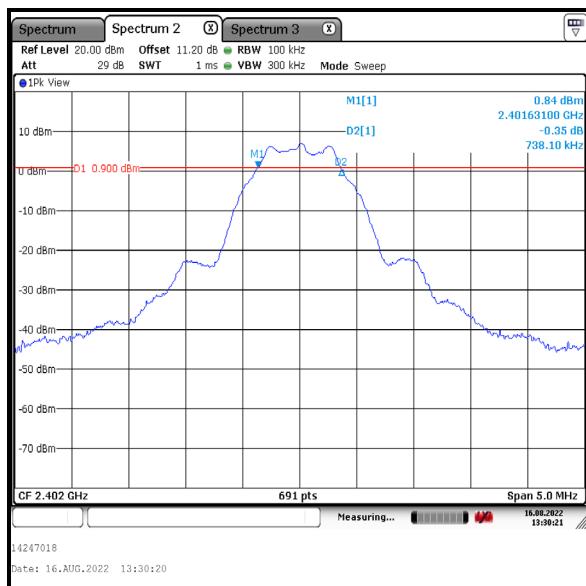
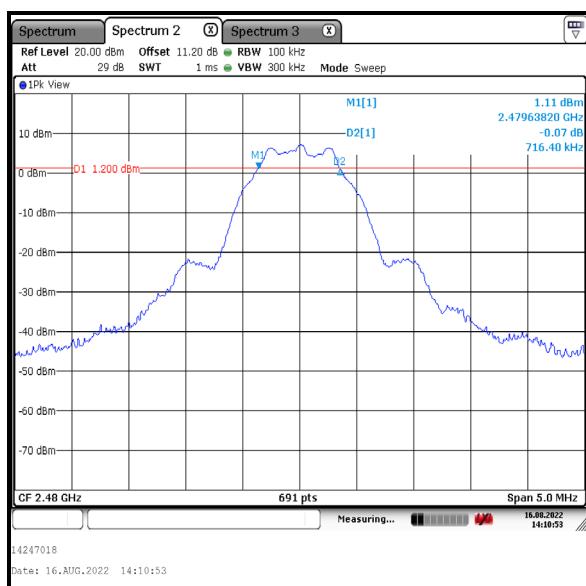
<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	58

#### **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	738.100	≥500	238.100	Complied
Middle	723.600	≥500	223.600	Complied
Top	716.400	≥500	216.400	Complied

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

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

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

<b>Test Engineer:</b>	Stefan Ho	<b>Test Date:</b>	16 August 2022
<b>Test Sample Serial Number:</b>	C08HJ0N81PL8		

<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>	22
<b>Relative Humidity (%):</b>	58

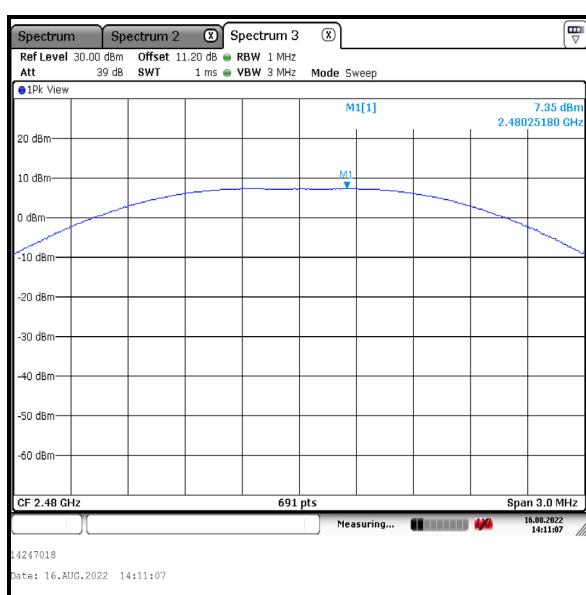
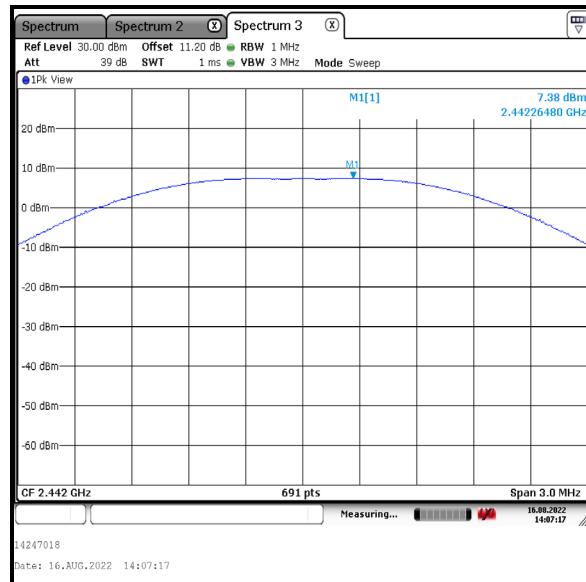
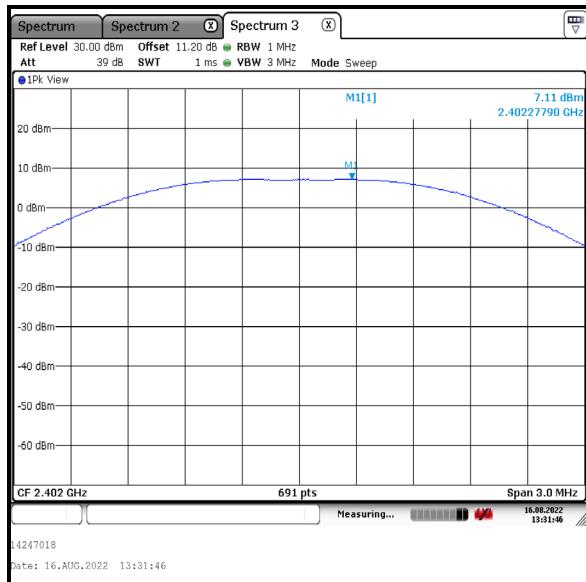
##### **Note(s):**

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	7.1	30.0	22.9	Complied
Middle	7.4	30.0	22.6	Complied
Top	7.4	30.0	22.6	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	7.1	-3.6	3.5	36.0	32.5	Complied
Middle	7.4	-3.6	3.8	36.0	32.2	Complied
Top	7.4	-3.6	3.8	36.0	32.2	Complied

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

## **5 Radiated Test Results**

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

#### **Test Summary:**

<b>Test Engineer:</b>	Andrew Harding	<b>Test Date:</b>	04 August 2022
<b>Test Sample Serial Number:</b>	C08HK17Q1PL8		

<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:**

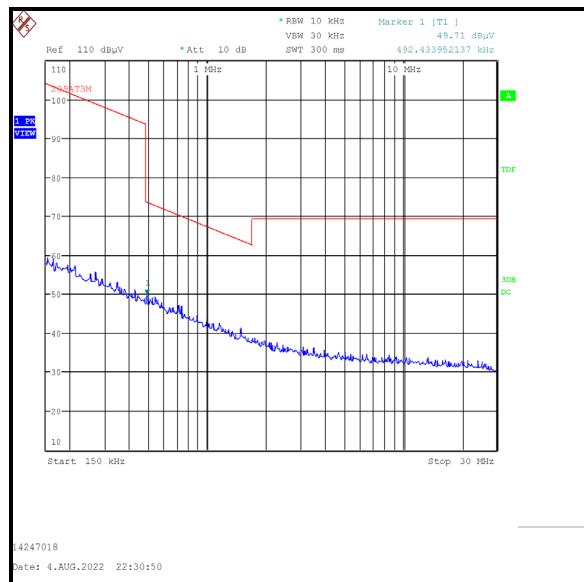
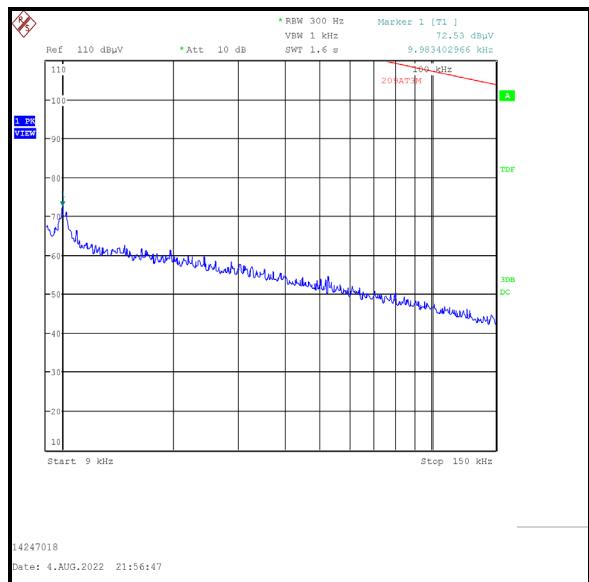
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	46

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

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below.
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 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) 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.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was configured as follows: For 9 kHz to 150 kHz, 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, 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.

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

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
30.169	Horizontal	34.3	40.0	5.7	Complied



**5.1.0.1 Transmitter Radiated Emissions >1 GHz****Test Summary:**

<b>Test Engineer:</b>	Andrew Harding	<b>Test Dates:</b>	03 August 2022 & 04 August 2022
<b>Test Sample Serial Number:</b>	C08HK17Q1PL8		

<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>	25
<b>Relative Humidity (%):</b>	44 to 46

**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, or > 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. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0001) 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.
5. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) 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.
6. 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.

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

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
7320.200	Horizontal	52.5	74.0	21.5	Complied

**Results: Middle Channel / Average**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
7319.930	Horizontal	48.0	54.0	6.0	Complied

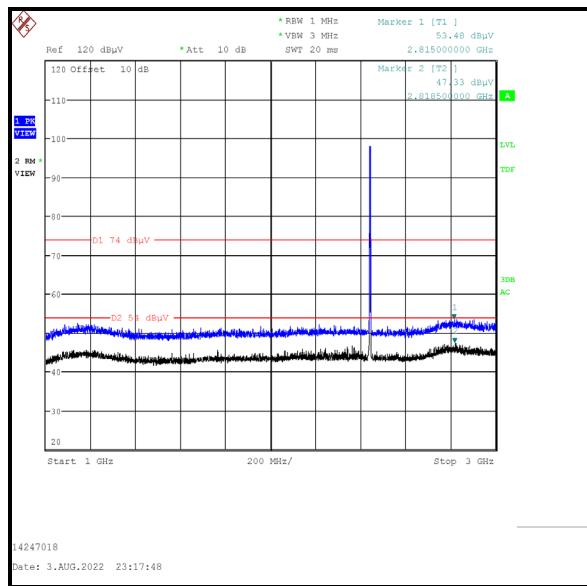
**Results: Top Channel / Peak**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
7439.850	Horizontal	51.9	74.0	22.1	Complied

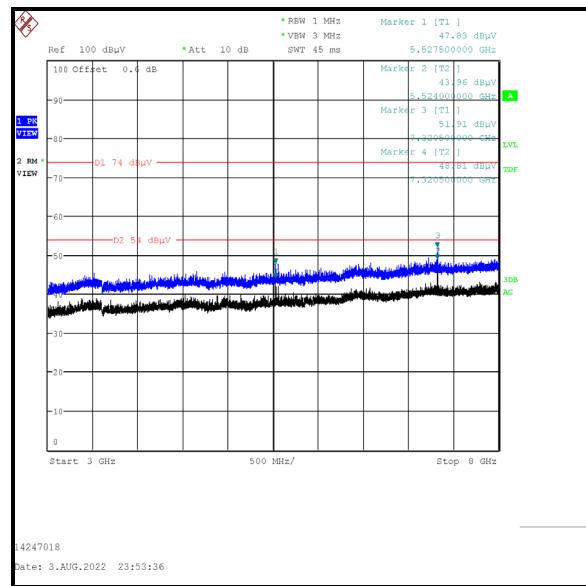
**Results: Top Channel / Average**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
7440.000	Horizontal	48.1	54.0	5.9	Complied

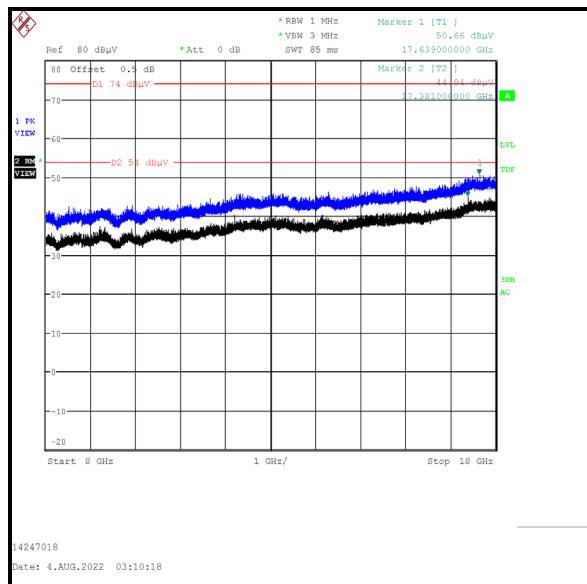
## Transmitter Radiated Emissions (continued)



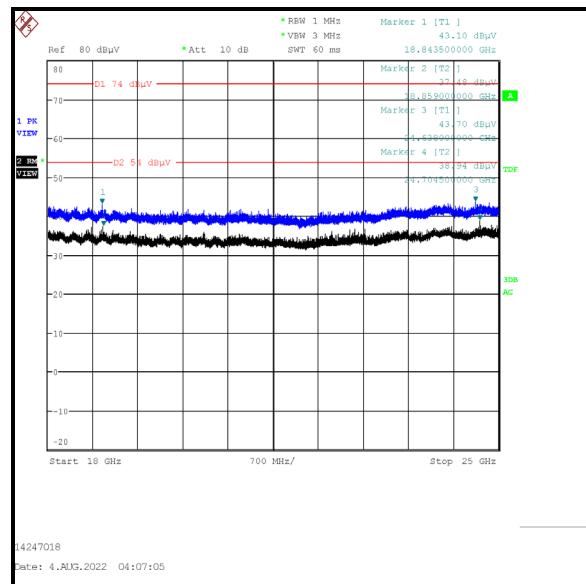
14247018  
Date: 3.AUG.2022 23:17:48



14247018  
Date: 3.AUG.2022 23:53:36



14247018  
Date: 4.AUG.2022 03:10:18



14247018  
Date: 4.AUG.2022 04:07:05

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

## **5.2 Transmitter Band Edge Radiated Emissions**

### **Test Summary:**

<b>Test Engineer:</b>	Andrew Harding	<b>Test Date:</b>	04 August 2022
<b>Test Sample Serial Number:</b>	C08HK17Q1PL8		

<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>	25
<b>Relative Humidity (%):</b>	46

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

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. 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 an 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.
3. 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 and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
4. 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.
5. \* -20 dBc limit.

**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
2393.738	Horizontal	42.5	75.6*	33.1	Complied
2400.000	Horizontal	41.7	75.6*	33.9	Complied
2483.500	Horizontal	50.1	74.0	23.9	Complied
2495.000	Horizontal	51.0	74.0	23.0	Complied

**Results: Average**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.500	Horizontal	39.5	54.0	14.5	Complied

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

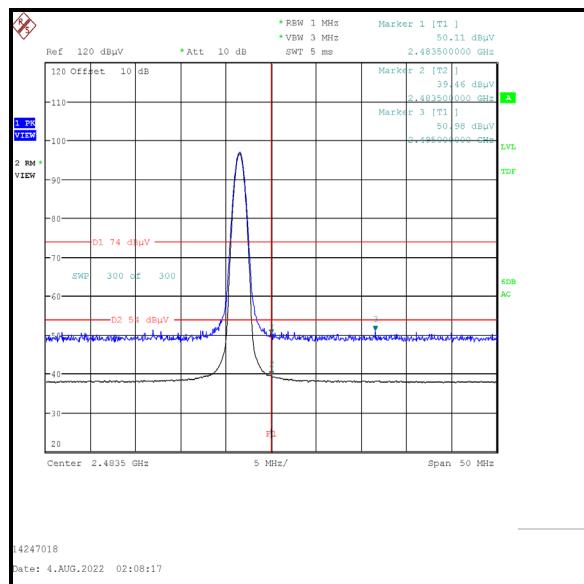
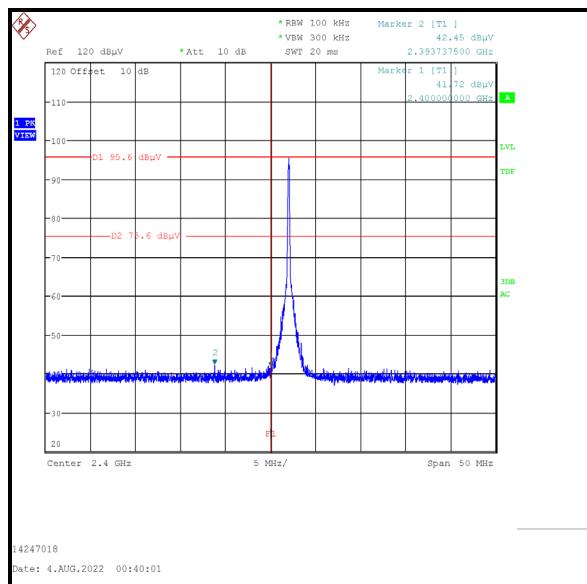
Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2358.000	Horizontal	53.1	74.0	20.9	Complied

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

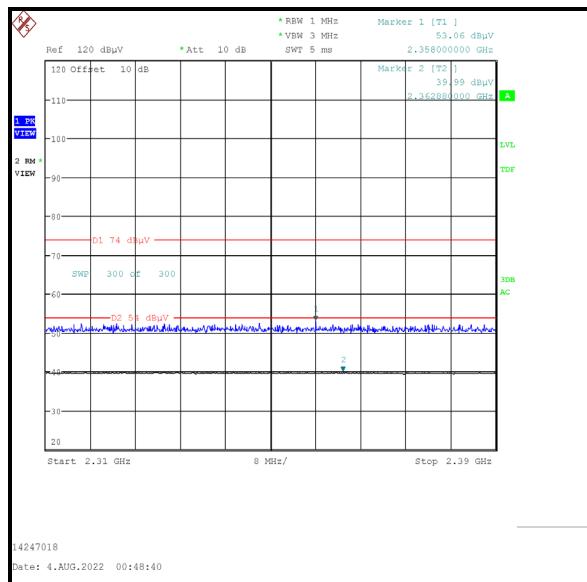
Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2362.880	Horizontal	40.0	54.0	14.0	Complied

## Transmitter Band Edge Radiated Emissions (continued)

### Results:



### Lower Band Edge



### Upper Band Edge

### 2310 MHz to 2390 MHz Restricted Band

## **6 AC Power Line Conducted Emissions Test Results**

### **6.1 Transmitter AC Conducted Spurious Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	22 September 2022
<b>Test Sample Serial Number:</b>	C08HR0S71PL8		

<b>FCC Reference:</b>	Part 15.207
<b>ISED Canada Reference:</b>	RSS-Gen 8.8
<b>Test Method Used:</b>	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	48

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

1. The EUT was plugged into a USB cable which is connected to an AC charger. The AC charger was connected to 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply.
3. A pulse limiter was fitted between the LISN and the test receiver.
4. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.191	Live	23.0	64.0	41.0	Complied
0.209	Live	23.9	63.3	39.4	Complied
0.213	Live	23.6	63.1	39.5	Complied
0.236	Live	23.3	62.3	39.0	Complied
0.749	Live	11.7	56.0	44.4	Complied
8.457	Live	9.9	60.0	50.1	Complied

**Results: Live / Average / 120 VAC 60 Hz**

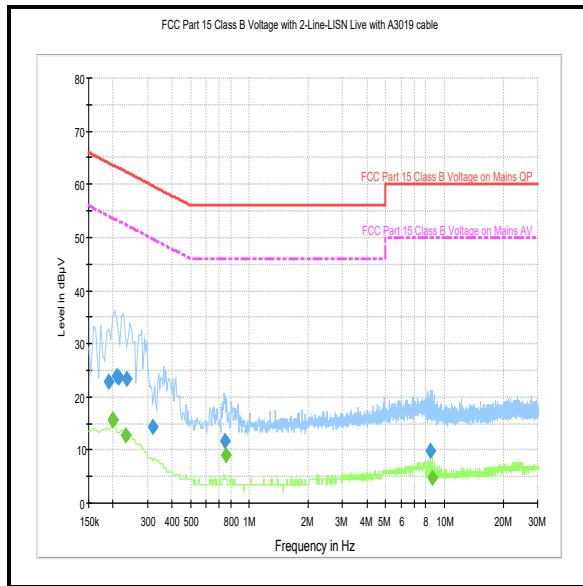
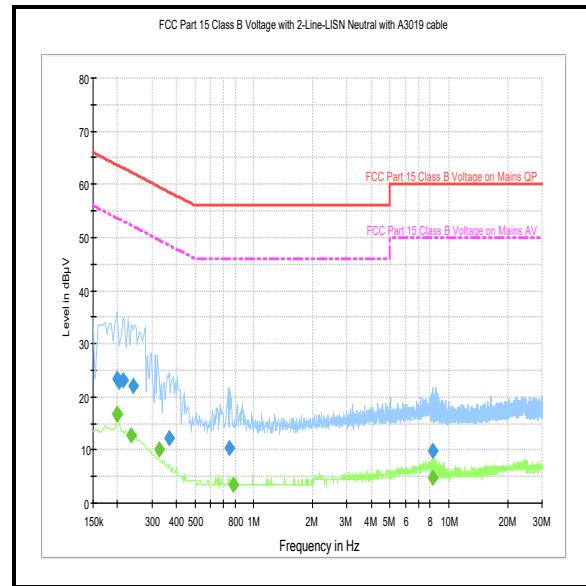
Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.199	Live	15.7	53.7	38.0	Complied
0.200	Live	15.7	53.6	37.9	Complied
0.201	Live	15.7	53.6	37.9	Complied
0.231	Live	12.7	52.4	39.7	Complied
0.758	Live	9.0	46.0	37.0	Complied
8.687	Live	4.7	50.0	45.3	Complied

**Results: Neutral / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.199	Neutral	23.3	63.6	40.3	Complied
0.204	Neutral	22.8	63.4	40.6	Complied
0.213	Neutral	23.1	63.1	40.0	Complied
0.240	Neutral	22.1	62.1	40.0	Complied
0.371	Neutral	12.3	58.5	46.2	Complied
0.753	Neutral	10.4	56.0	45.6	Complied

**Results: Neutral / Average / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.200	Neutral	16.8	53.6	36.8	Complied
0.201	Neutral	16.8	53.6	36.8	Complied
0.236	Neutral	12.7	52.3	39.6	Complied
0.326	Neutral	10.0	49.6	39.6	Complied
0.785	Neutral	3.5	46.0	42.5	Complied
8.309	Neutral	4.8	50.0	45.2	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: 120 VAC 60 Hz****Live****Neutral**

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.209	Live	25.5	63.3	37.8	Complied
0.231	Live	24.9	62.4	37.5	Complied
0.240	Live	24.8	62.1	37.3	Complied
0.375	Live	18.5	58.4	39.9	Complied
0.596	Live	11.7	56.0	44.3	Complied
0.614	Live	12.0	56.0	44.0	Complied

**Results: Live / Average / 240 VAC 60 Hz**

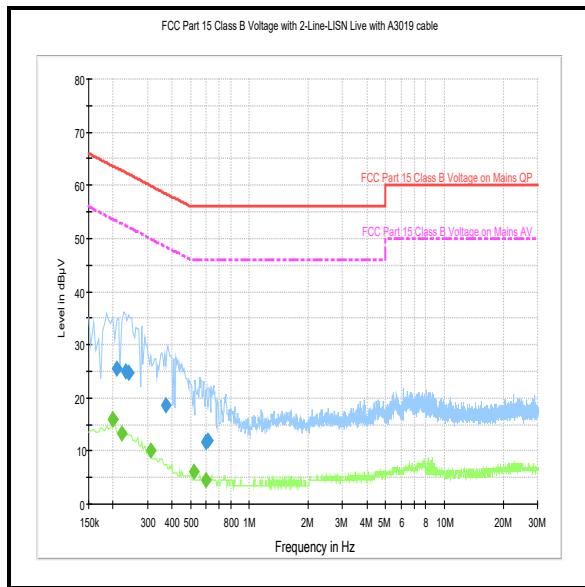
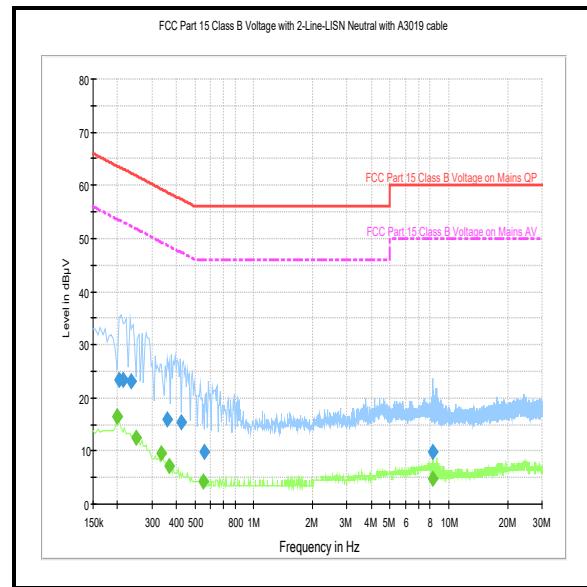
Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.209	Live	25.5	63.3	37.8	Complied
0.231	Live	24.9	62.4	37.5	Complied
0.240	Live	24.8	62.1	37.3	Complied
0.375	Live	18.5	58.4	39.9	Complied
0.596	Live	11.7	56.0	44.3	Complied
0.614	Live	12.0	56.0	44.0	Complied

**Results: Neutral / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.204	Neutral	23.5	63.4	39.9	Complied
0.213	Neutral	23.4	63.1	39.7	Complied
0.236	Neutral	23.1	62.3	39.2	Complied
0.362	Neutral	16.0	58.7	42.7	Complied
0.425	Neutral	15.5	57.4	41.9	Complied
0.560	Neutral	9.9	56.0	46.1	Complied

**Results: Neutral / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.200	Neutral	16.4	53.6	37.2	Complied
0.201	Neutral	16.4	53.6	37.2	Complied
0.249	Neutral	12.4	51.8	39.4	Complied
0.335	Neutral	9.5	49.3	39.8	Complied
0.371	Neutral	7.3	48.5	41.2	Complied
0.551	Neutral	4.3	46.0	41.7	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: 240 VAC 60 Hz****Live****Neutral****--- END OF REPORT ---**