



TEST REPORT

Test Report No. : UL-RPT-RP12983714-716A

Manufacturer : Sports & Wellbeing Analytics Limited
Model No. : R0002
PMN : PROTECHT
HVIN : R0002
FCC ID : 2AT9A-R0002NA
ISED Certification No. : IC: 25409-R0002NA
Technology : SRD
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 March 2019

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2. The results in this report apply only to the sample(s) tested.
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 2.0 supersedes all previous versions.

Date of Issue: 27 January 2022

Checked by:

pp 

Ian Watch
Senior Test Engineer, Radio Laboratory

Company Signatory:



Sarah Williams
RF Operations Leader, Radio Laboratory



This laboratory is accredited by UKAS.
The tests reported herein have been performed in accordance with its terms of accreditation.

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Customer Information

Company Name:	Sports & Wellbeing Analytics Limited
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Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	24/11/2020	Initial Version	Ian Watch
2.0	27/01/2022	Admin update	Ben Mercer

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1. Attestation of Test Results










1.1. Description of EUT

The Equipment Under Test was a gateway that relays communication between sensors and the cloud. The frequency band 902-928 MHz is used to communicate with the sensors and Ethernet or cellular is used to communicate to the cloud. The equipment is powered from USB.

1.2. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.247
Specification Reference:	47CFR15.207 & 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.207 & 15.209
Specification Reference:	RSS-Gen Issue 5 April 2019
Specification Title:	General Requirements for Compliance of Radio Apparatus
Specification Reference:	RSS-247 Issue 2 February 2017
Specification Title:	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
FCC Site Registration:	685609
ISED Site Registration:	20903
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, G24 8AH, United Kingdom
Test Dates:	09 November 2020 to 18 November 2020

1.3. Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Part 15.247(a)(2)	RSS-Gen 6.7 / RSS-247 5.2(a)	Transmitter Minimum 6 dB Bandwidth	
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(b)(3)	RSS-Gen 6.12 / RSS-247 5.4(d)	Transmitter Maximum Average Output Power	
Part 15.247(e)	RSS-247 5.2(b)	Transmitter Power Spectral Density	
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	
FCC Part 15.207	RSS-Gen 8.8	Transmitter AC Conducted 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.

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
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2.2. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019
Title:	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. 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
Minimum 6 dB Bandwidth	902 MHz to 928 MHz	95%	±4.59 %
Duty Cycle	902 MHz to 928 MHz	95%	±3.53 ns
99% Occupied Bandwidth	902 MHz to 928 MHz	95%	±3.92 %
Maximum Peak Output Power	902 MHz to 928 MHz	95%	±1.13 dB
Power Spectral Density	902 MHz to 928 MHz	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 9.3 GHz	95%	±2.94 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 Conducted RF Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	05 Jan 2021	12
M1996	Signal Analyser	Rhode & Schwarz	FSV13	100975	24 Jan 2021	12
G0628	Vector Signal Generator	Rhode & Schwarz	SMBV100A	261847	08 Oct 2023	36
A2525	Attenuator	AtlanTecRF	AN18W5-10	832827#3	Calibrated Before use	-

Test Equipment Used for Transmitter Radiated Emissions Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	14 Oct 2021	12
M2040	Thermohygrometer	Testo	608-H1	45124934	07 Jan 2021	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	03 Sep 2021	12
A3154	Pre Amplifier	Com Power	PAM-103	18020012	29 Sep 2021	12
A3155	Pre Amplifier	Com Power	PAM-118A	18040037	29 Sep 2021	12
A3198	Antenna	ETS-Lindgren	6502	00221887	01 Apr 2021	12
A553	Antenna	Chase	CBL6111A	1593	21 Sep 2021	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	06 Oct 2021	12
A3139	Antenna	Schwarzbeck	HWRD750	00027	06 Oct 2021	12
A2937	Attenuator	AtlanTecRF	AN18W5-06	208147#1	21 Feb 2021	12
A2467	High Pass Filter	Wainwright	WHJE5-920-1000-4000-60EE	2	18 Nov 2020	12
A3093	High Pass Filter	AtlanTecRF	AFH-03000	18051800077	20 Feb 2021	12
A3095	High Pass Filter	AtlanTecRF	AFH-07000	18051600012	20 Mar 2021	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)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	14 Oct 2021	12
M2040	Thermohygrometer	Testo	608-H1	45124934	07 Jan 2021	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	03 Sep 2021	12
A3154	Pre Amplifier	Com Power	PAM-103	18020012	29 Sep 2021	12
A2937	Attenuator	AtlanTecRF	AN18W5-06	208147#1	21 Feb 2021	12
A553	Antenna	Chase	CBL6111A	1593	21 Sep 2021	12

Test Equipment Used for Transmitter AC Conducted Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2037	Thermohygrometer	Testo	608-H1	45124925	07 Jan 2021	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	82556/008	03 Aug 2021	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	07 Apr 2021	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	03 Dec 2020	12

Test Measurement Software/Firmware Used:

Name	Version	Release Date
Rohde & Schwarz EMC32	6.30.0	2008

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	PROTECHT
Model Name or Number / PMN:	R0002
Test Sample Serial Number:	FCC01
Hardware Version / HVIN:	NRG3
Software Version:	20f2dc7
Firmware Version:	306
FCC ID:	2AT9A-R0002NA
ISED Certification Number:	IC: 25409-R0002NA

3.2. Modifications Incorporated in the EUT

The EUT enclosure was opened, and the antenna removed to facilitate conducted measurements. No other modifications were applied to the EUT during testing.

3.3. Additional Information Related to Testing

Tested Technology:	Short Range Device (Digital Transmission System)	
Power Supply Requirement:	Nominal	5.0 VDC via USB
Type of Unit:	Transceiver	
Channel Spacing:	Single channel	
Modulation:	GFSK	
Transmit Frequency Range:	902 MHz to 928 MHz	
Transmit Channel Tested:	Channel ID	Channel Frequency (MHz)
	Fixed	921.4

3.4. Description of Available Antennas

The radio utilizes a stub antenna with the maximum gain stated below:

Frequency Range (MHz)	Antenna Gain (dBi)
902-928	5.0

3.5. Description of Test Setup

Support Equipment

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

Description:	Mains power supply. 120-240 VAC 60 Hz to 5 VDC (USB)
Brand Name:	Griffin Technology
Model Name or Number:	GP-010-BLK
Serial Number:	N/A

Description:	Laptop PC
Brand Name:	Lenovo
Model Name or Number:	ThinkPad L480
Serial Number:	PF1EHZPL

Description:	PSU for laptop PC
Brand Name:	Lenovo
Model Name or Number:	ADLX65YCC3A
Serial Number:	8SSA10M13950C1SG9170HF8

Operating Modes

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

- Continuously transmitting at maximum power on 921.4 MHz with a modulated carrier.

Configuration and Peripherals

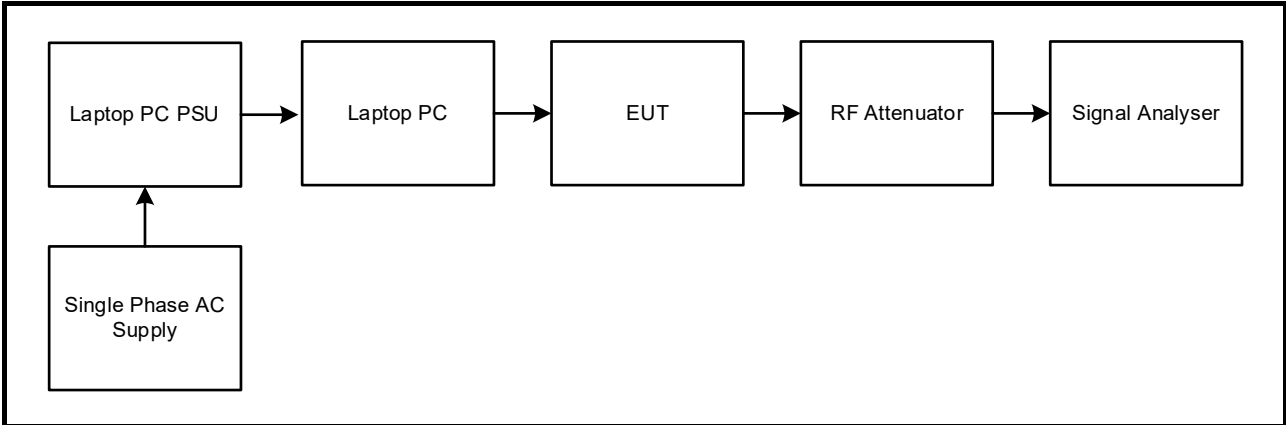
The EUT was tested in the following configuration(s):

- The customer configured the EUT with test firmware. This caused the EUT to transmit as soon as USB power was connected.
- Radiated emissions tests were performed with the EUT in the worst case orientation/position with respect to the emission levels. The EUT was powered from a USB power supply placed underneath the test chamber turntable.
- The EUT enclosure was opened, and the antenna removed to facilitate conducted measurements.
- The EUT was powered from a USB power supply during AC line conducted emission tests. The USB power supply input was connected to a LISN. The input to the LISN was connected to a single phase mains supply.

Test Setup Diagrams

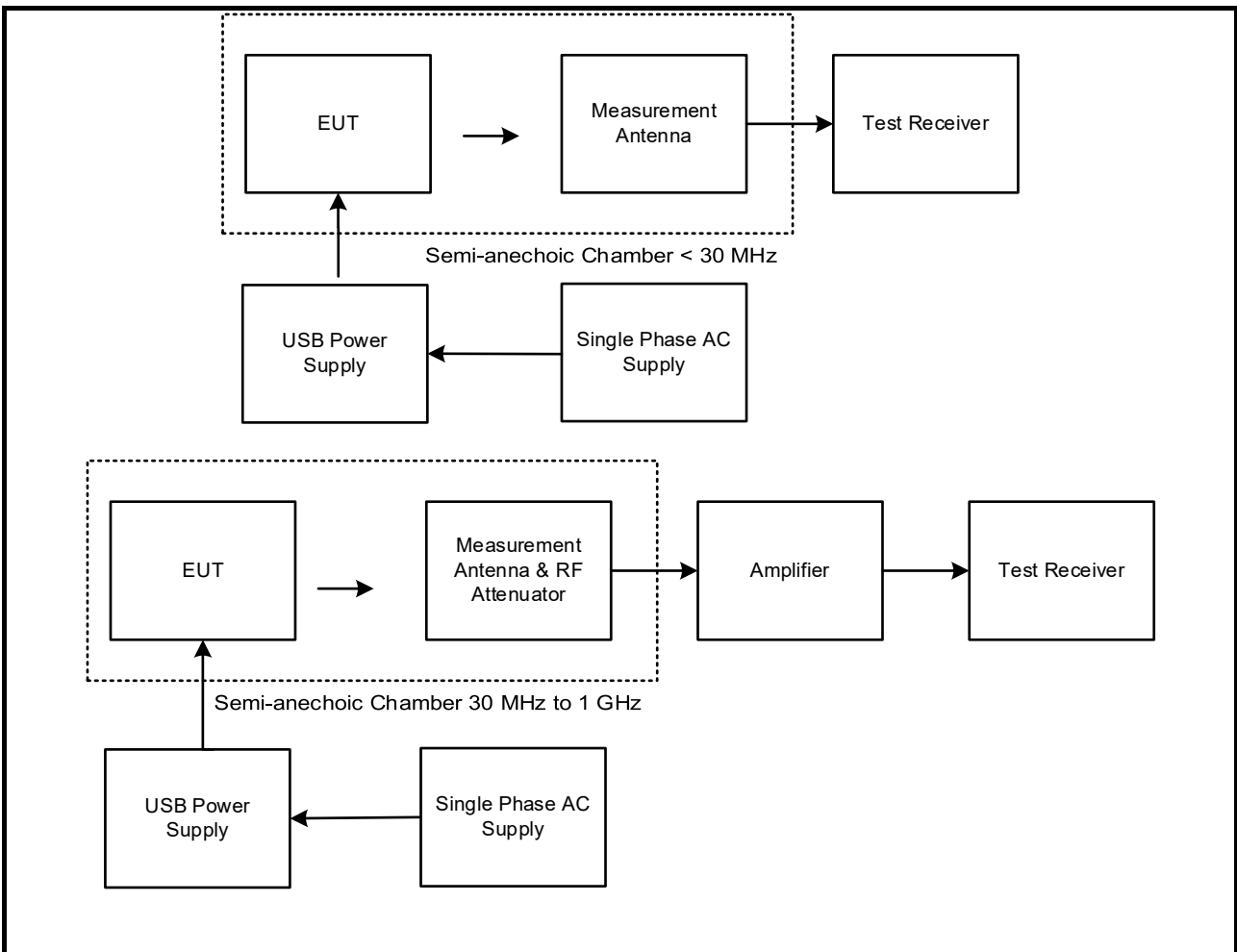
Conducted Tests:

Test Setup for all Transmitter Conducted RF Tests

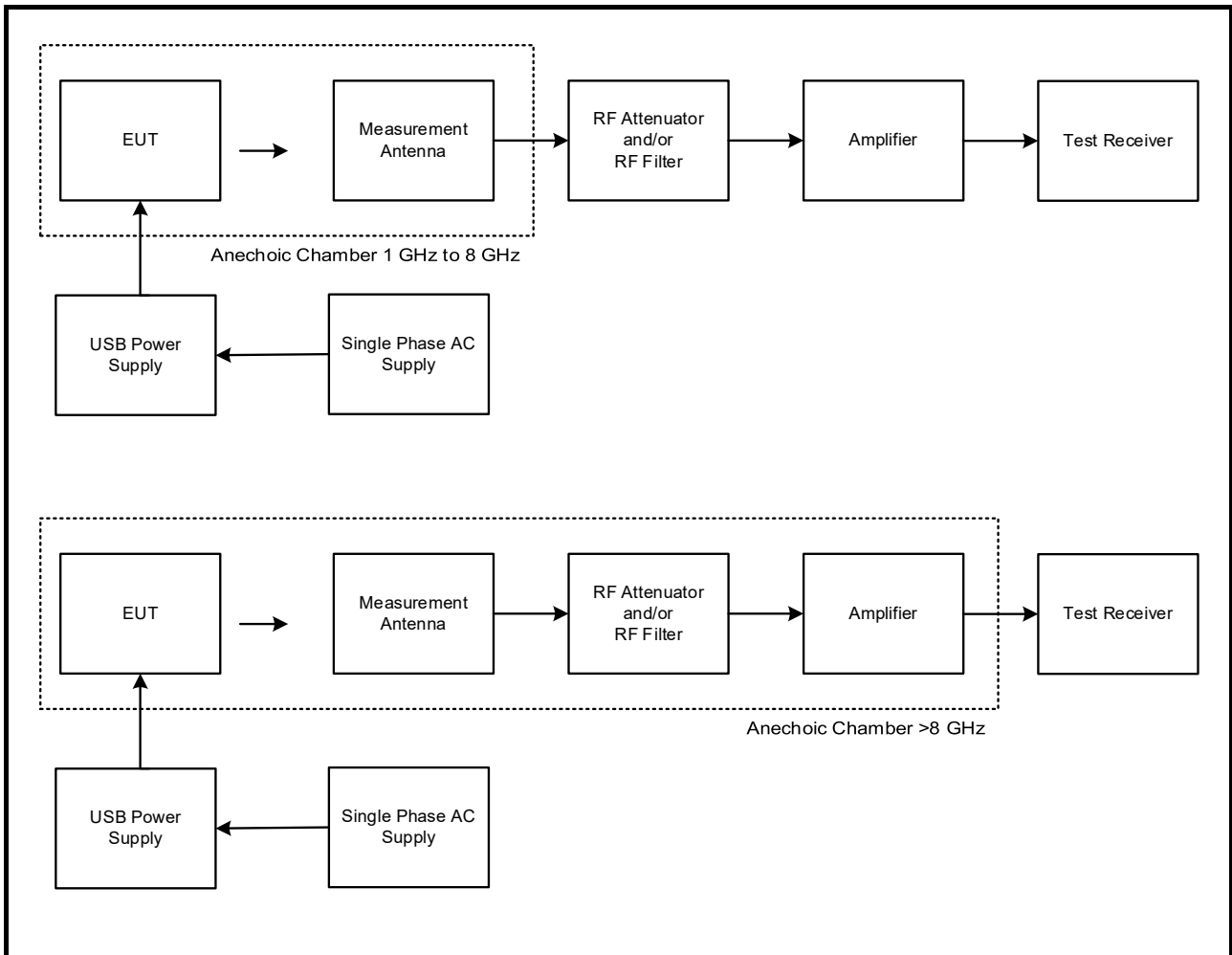


Radiated Tests:

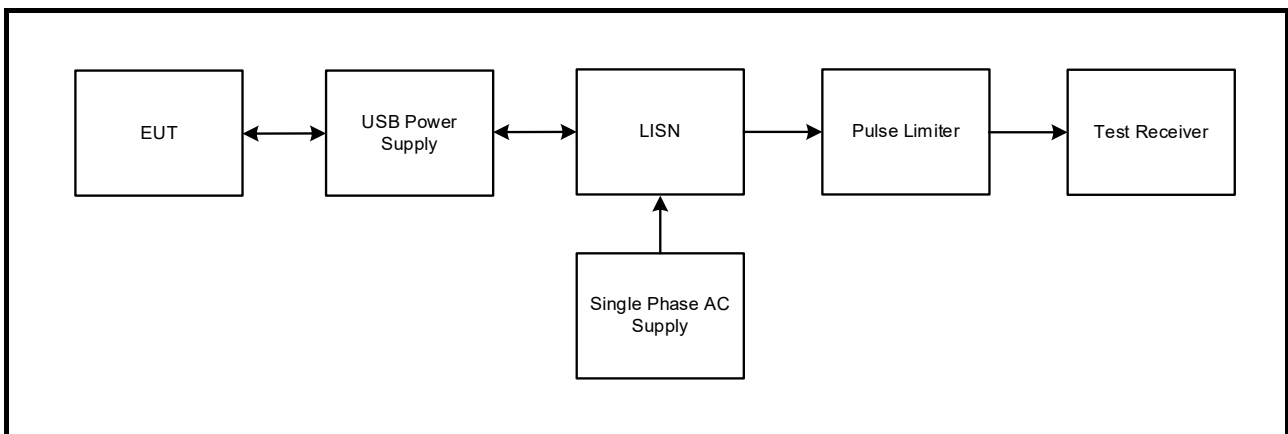
Test Setup for Transmitter Radiated Emissions: Semi-Anechoic Chamber



Test Setup for Transmitter Radiated Emissions: Anechoic Chamber



Test Setup for Transmitter AC Conducted



4. Test Results

4.1. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineers:	Chanthu Thevarajah & Matthew Botfield	Test Date:	09 November 2020
Test Sample Serial Number:	FCC01		

FCC Reference:	Part 15.247(a)(2)
ISED Canada Reference:	RSS-Gen 6.6 / RSS-247 5.2(a)
Test Method Used:	ANSI C63.10 Section 11.8.1 Option 1

Environmental Conditions:

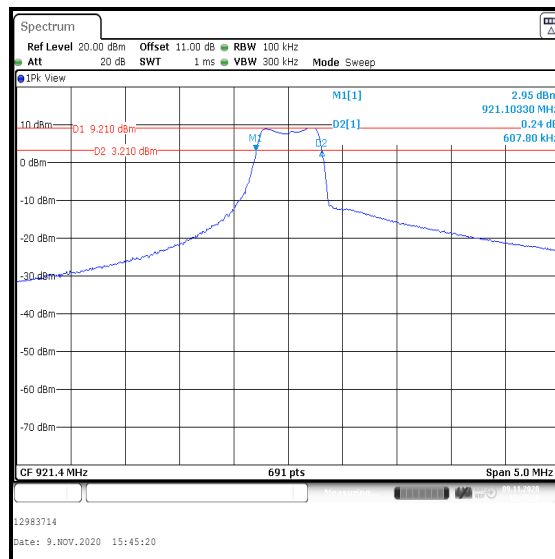
Temperature (°C):	22
Relative Humidity (%):	51

Note(s):

- 6 dB DTS bandwidth tests were performed using a test receiver in accordance with ANSI C63.10 Section 11.8.1 Option 1 measurement procedure. 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 the trace mode was Max Hold. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
- The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable.

Results:

6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
607.800	≥500	107.800	Complied



4.2. Transmitter Duty Cycle

Test Summary:

Test Engineers:	Chanthu Thevarajah & Matthew Botfield	Test Date:	09 November 2020
Test Sample Serial Number:	FCC01		

FCC Reference:	Part 15.35(c)
Test Method Used:	FCC KDB 558074 Section 6 referencing ANSI C63.10 Section 11.6

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	51

Note(s):

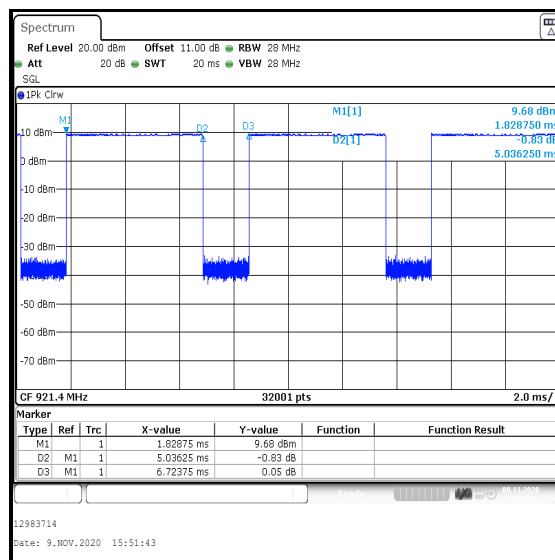
- In order to assist with the determination of the average level of power and spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a signal analyser in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

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

$$10 \log (1 / (5.036/6.724)) = 1.3 \text{ dB}$$

Results:

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
5.036	6.724	1.3



4.3. Transmitter 99% Occupied Bandwidth

Test Summary:

Test Engineers:	Chanthu Thevarajah & Matthew Botfield	Test Date:	09 November 2020
Test Sample Serial Number:	FCC01		

ISED Canada Reference:	RSS-Gen 6.6
Test Method Used:	RSS-Gen 6.6

Environmental Conditions:

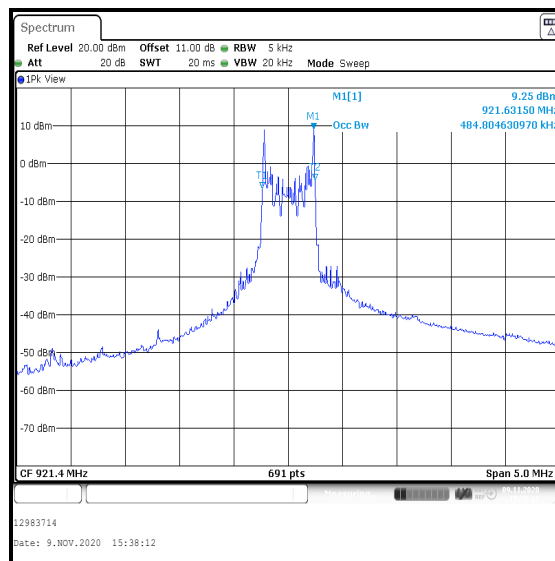
Temperature (°C):	22
Relative Humidity (%):	51

Note(s):

1. The 99% emission bandwidth was measured using the test receiver's 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 test receiver's resolution bandwidth was set to 5 kHz and video bandwidth 20 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.
3. The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable.

Results:

99% Occupied Bandwidth (kHz)
484.805



4.4. Transmitter Maximum (Average) Output Power

Test Summary:

Test Engineers:	Chanthu Thevarajah & Matthew Botfield	Test Date:	09 November 2020
Test Sample Serial Number:	FCC01		

FCC Reference:	Part 15.247(b)(3)
ISED Canada Reference:	RSS-Gen 6.12 / RSS-247 5.4(d)
Test Method Used:	ANSI C63.10 Section 11.9.2.2.4

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	51

Note(s):

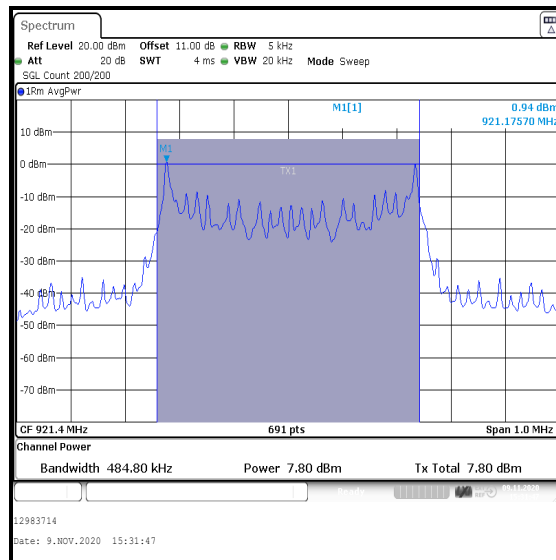
1. The EUT was transmitting at <98% duty cycle and testing was performed in accordance with ANSI C63.10 Section 11.9.2.2.4 Method AVGSA-2. The signal analyser resolution bandwidth was set to 5 kHz and video bandwidth of 20 kHz. An RMS detector was used, sweep time was set to auto, averaging over 200 traces. The span was set to 1 MHz. The measured power was referenced to the previously measured occupied bandwidth.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF offset level was entered on the signal analyser to compensate for the loss of the attenuator and RF cable.

Transmitter Maximum (Average) Output Power (continued)

Results:

Conducted Power (dBm)	Duty Cycle Correction Factor (dB)	Conducted Power + Duty Cycle (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
7.8	1.3	9.1	30.0	20.9	Complied

Channel	Conducted Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Middle	9.1	5.0	14.1	36.0	21.9	Complied



4.5. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	Matthew Botfield	Test Date:	09 November 2020
Test Sample Serial Number:	FCC01		

FCC Reference:	Part 15.247(e)
ISED Canada Reference:	RSS-247 5.2(b)
Test Method Used:	FCC KDB 558074 Section 8.4 referencing ANSI C63.10 Section 11.10.5

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	51

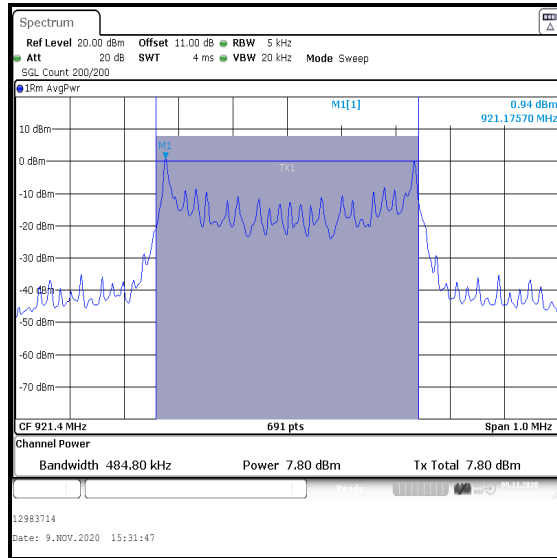
Note(s):

1. The EUT was transmitting at <98% duty cycle and testing was performed in accordance with ANSI C63.10 Section 11.10.5 Method AVGPSD-2. The signal analyser resolution bandwidth was set to 5 kHz and video bandwidth 20 kHz. An RMS detector was used and sweep time set manually to perform trace averaging over 200 traces. The span was set greater than 1.5 times the measured DTS bandwidth.
2. 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.

Transmitter Power Spectral Density (continued)

Results:

PSD (dBm / 5 kHz)	Duty Cycle Correction Factor (dB)	Corrected PSD (dBm / 5 kHz)	Limit (dBm / 3 kHz)	Margin (dBm / 3 kHz)	Result
0.9	1.3	2.2	8.0	5.8	Complied



4.6. Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineer:	Marco Zunarelli	Test Dates:	10 November 2020 & 11 November 2020
Test Sample Serial Number:	FCC01		

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

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	47

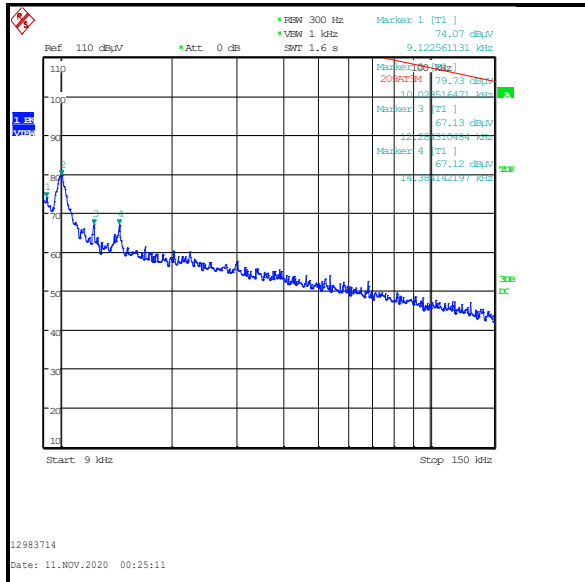
Note(s):

1. The emission at 921.4 MHz shown on the 30 MHz to 1 GHz plot is the EUT fundamental.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. All emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the level of the noise floor. The highest level of the noise floor in the 30 MHz to 1000 MHz range has been recorded in the result table.
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. Limits below 30 MHz are specified at a test distance of 30 metres, whilst below 0.49 MHz they are specified at a test distance of 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
5. Measurements between 30 MHz to 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.
6. The emissions observed between 9 kHz to 30 MHz on the pre-scan plots were investigated and found to be ambient emissions.

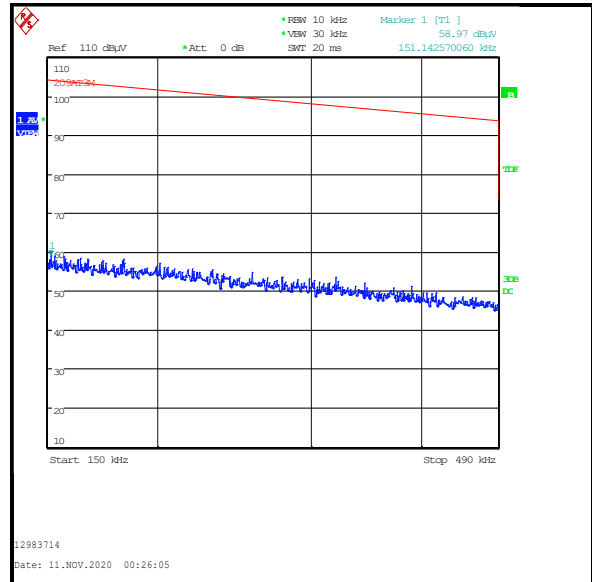
Transmitter Radiated Emissions (continued)

Results:

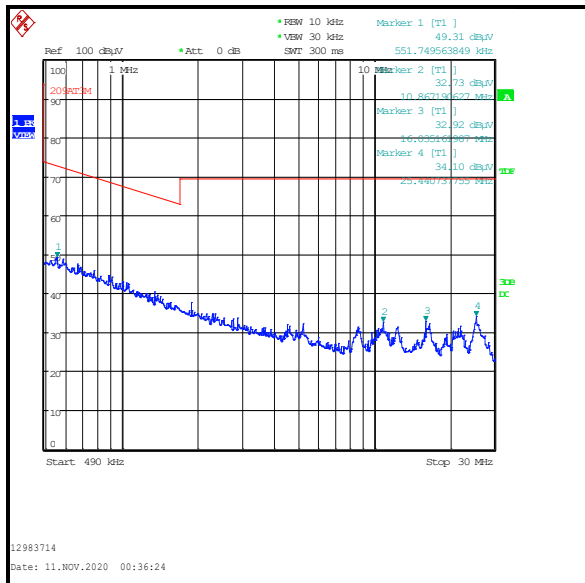
Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1000	Vertical	39.4	54.0	14.6	Complied



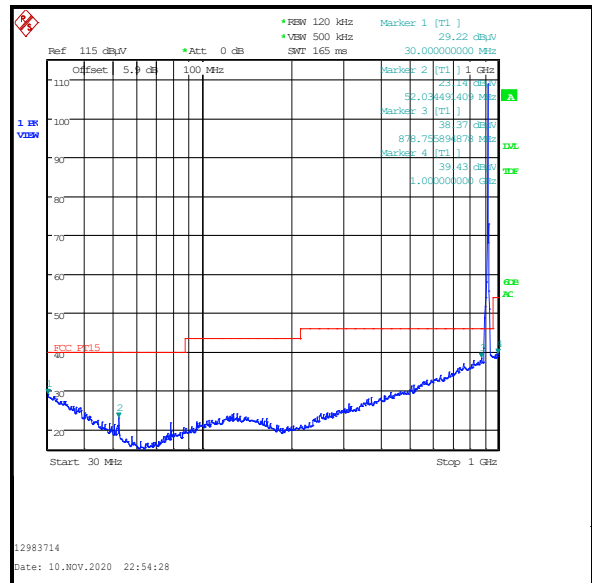
9 kHz to 150 kHz / peak detector / measured in a semi-anechoic chamber at 3 metres



150 kHz to 490 kHz / average detector / EUT operating / measured at 3 metres in a semi-anechoic chamber



490 kHz to 30 MHz / peak detector / measured in a semi-anechoic chamber at 3 metres



30 MHz to 1 GHz / peak detector / measured in a semi-anechoic chamber at 3 metres

4.7. Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineers:	Marco Zunarelli	Test Date:	11 November 2020
Test Sample Serial Number:	FCC01		

FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.6
Frequency Range	1 GHz to 9.3 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	47

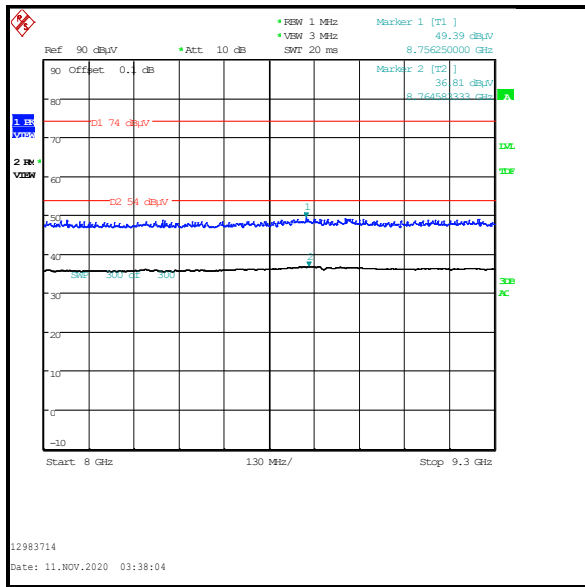
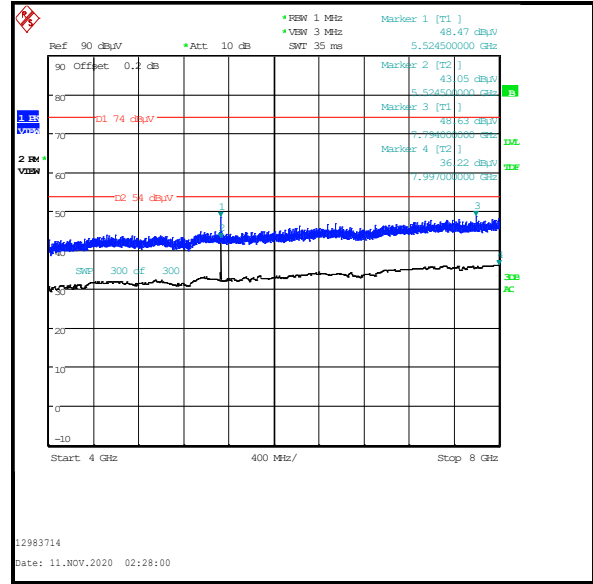
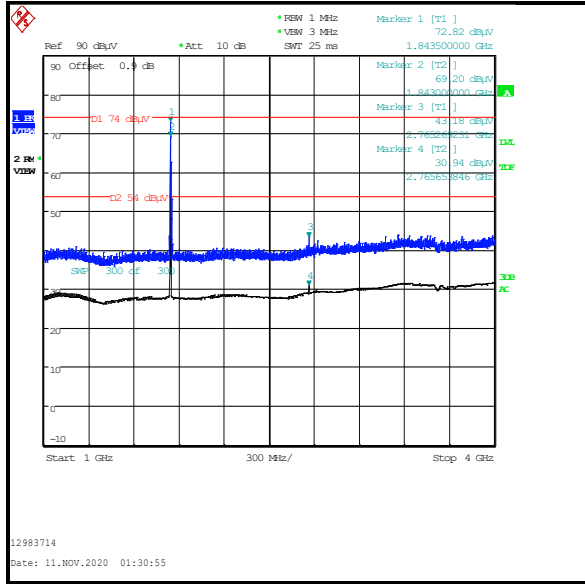
Note(s):

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-scan plots were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. 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.
4. 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.
5. ** -30 dBc limit.

Transmitter Radiated Emissions (continued)

Results:

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1843.281	Vertical	72.3	78.8**	6.5	Complied



Note: These plots are prescans and for indication purposes only. For final measurements, see accompanying tables.

4.8. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Marco Zunarelli	Test Date:	10 November 2020
Test Sample Serial Number:	FCC01		

FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Section 6.10

Environmental Conditions:

Temperature (°C):	46
Relative Humidity (%):	22

Note(s):

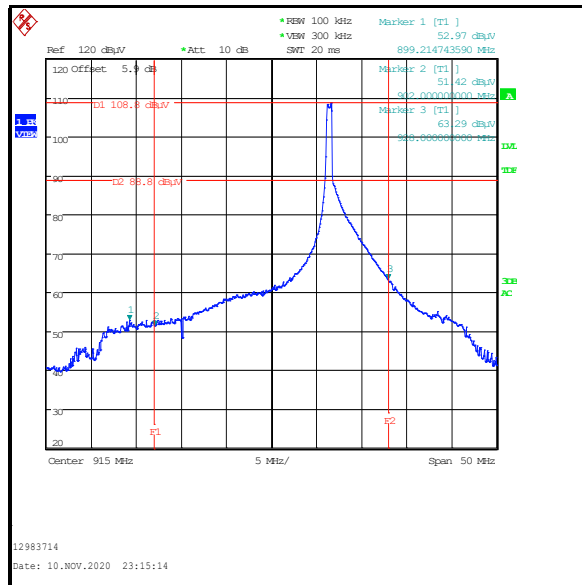
1. The final measured value, for the given emissions, in the tables below incorporates the calibrated antenna factor and cable loss.
2. As both band edges are adjacent to non-restricted bands, only peak measurements are required. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 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. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent band (where a higher level emission was present). Marker frequencies and levels were recorded.
3. The limit line shown on the result plots at 88 dB μ V/m is incorrect. The correct limit is 78 dB μ V/m as shown in the result tables.

Transmitter Band Edge Radiated Emissions (continued)

Results:

Frequency (MHz)	Peak Level (dBµV/m)	-30 dBc Limit (dBµV/m)	Margin (dB)	Result
899.215	53.0	78.8	25.8	Complied
902	51.4	78.8	27.4	Complied
928	63.3	78.8	15.5	Complied

Results:



5. AC Power Line Conducted Emissions Test Results

5.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Alison Johnston	Test Date:	18 November 2020
Test Sample Serial Number:	FCC01		

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

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	42

Note(s):

1. The EUT was powered from a USB power supply during AC line conducted emission tests. The USB power supply input was connected to a LISN. The input to the LISN was connected to a single phase mains supply.
2. In accordance with FCC KDB 174176 Q4, tests were also performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the USB power 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 μ V)	Limit (dB μ V)	Margin (dB)	Result
0.195000	Live	37.5	63.8	26.3	Complied
0.307500	Live	41.3	60.0	18.7	Complied
0.424500	Live	23.1	57.4	34.3	Complied
2.418000	Live	23.6	56.0	32.4	Complied
6.184500	Live	22.3	60.0	37.7	Complied
11.998500	Live	13.5	60.0	46.5	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.262500	Live	25.2	51.4	26.2	Complied
0.307500	Live	31.8	50.0	18.2	Complied
0.613500	Live	19.1	46.0	26.9	Complied
1.540500	Live	14.5	46.0	31.5	Complied
6.202500	Live	14.2	50.0	35.8	Complied
25.057500	Live	20.4	50.0	29.6	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

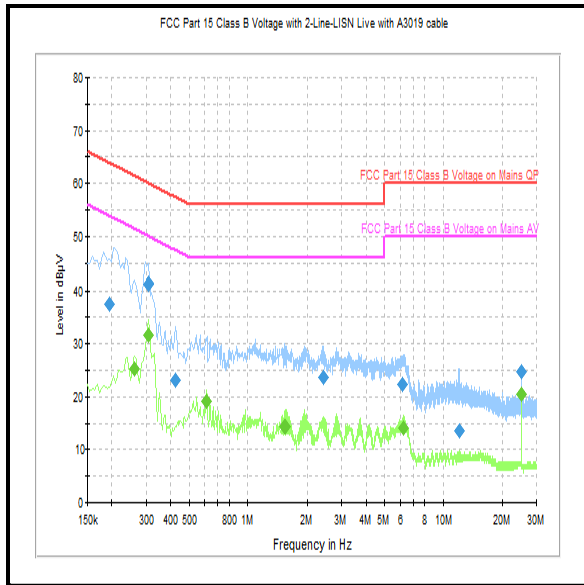
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.199500	Neutral	38.5	63.6	25.1	Complied
0.307500	Neutral	41.5	60.0	18.5	Complied
1.959000	Neutral	24.4	56.0	31.6	Complied
2.391000	Neutral	23.4	56.0	32.6	Complied
6.175500	Neutral	22.6	60.0	37.4	Complied
25.057500	Neutral	24.4	60.0	35.6	Complied

Results: Neutral / Average / 120 VAC 60 Hz

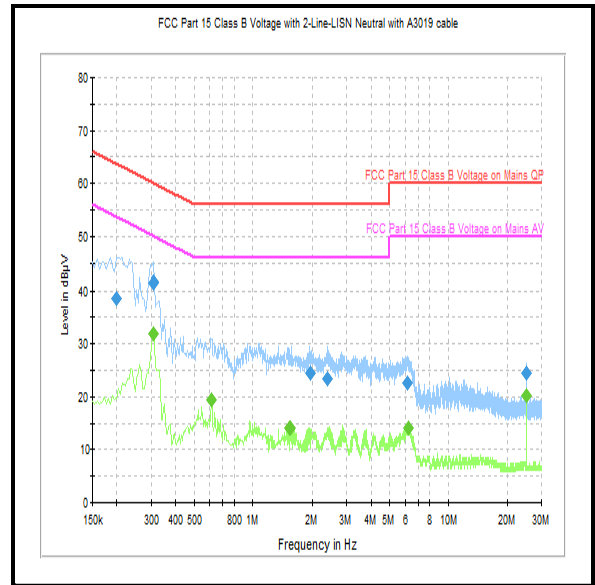
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.307500	Neutral	31.9	50.0	18.1	Complied
0.613500	Neutral	19.4	46.0	26.6	Complied
1.540500	Neutral	14.2	46.0	31.8	Complied
6.247500	Neutral	14.2	50.0	35.8	Complied
25.057500	Neutral	20.1	50.0	29.9	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 120 VAC 60 Hz



Live



Neutral

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

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

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.208500	Live	40.7	63.3	22.6	Complied
0.303000	Live	43.9	60.2	16.3	Complied
0.370500	Live	34.7	58.5	23.8	Complied
0.982500	Live	34.5	56.0	21.5	Complied
6.049500	Live	30.6	60.0	29.4	Complied
25.057500	Live	24.9	60.0	35.1	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.303000	Live	34.9	50.2	15.3	Complied
0.960000	Live	24.8	46.0	21.2	Complied
1.590000	Live	20.2	46.0	25.8	Complied
6.072000	Live	20.5	50.0	29.5	Complied
25.057500	Live	20.4	50.0	29.6	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

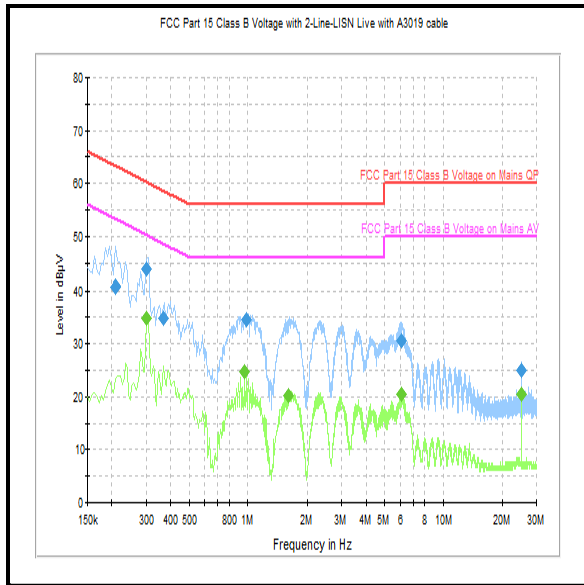
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.208500	Neutral	41.0	63.3	22.3	Complied
0.303000	Neutral	44.2	60.2	16.0	Complied
0.388500	Neutral	34.1	58.1	24.0	Complied
0.982500	Neutral	34.2	56.0	21.8	Complied
5.955000	Neutral	29.9	60.0	30.1	Complied
25.057500	Neutral	24.5	60.0	35.5	Complied

Results: Neutral / Average / 240 VAC 60 Hz

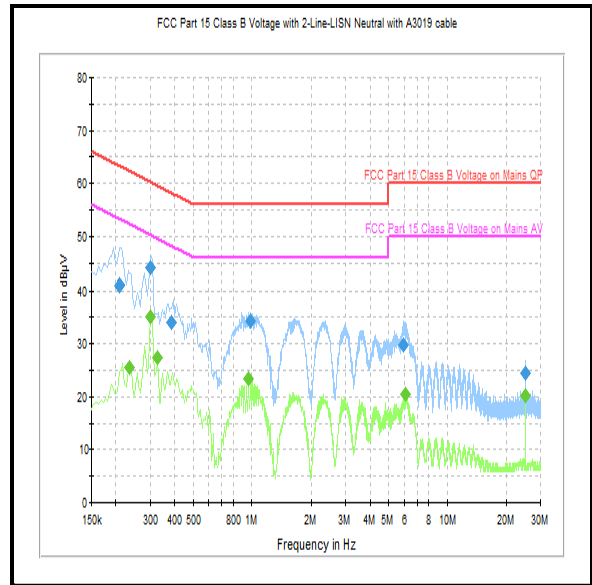
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.235500	Neutral	25.6	52.3	26.7	Complied
0.303000	Neutral	35.1	50.2	15.1	Complied
0.325500	Neutral	27.5	49.6	22.1	Complied
0.960000	Neutral	23.5	46.0	22.5	Complied
6.045000	Neutral	20.5	50.0	29.5	Complied
25.057500	Neutral	20.1	50.0	29.9	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 240 VAC 60 Hz



Live



Neutral

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

--- END OF REPORT ---