

TEST REPORT

Test Report No. : UL-RPT-RP15026790-116A

Customer : Telensa Limited
Model No. / HVIN : BS4.1
PMN : BS4.1
FCC ID : XYD-BS4AB
ISED Certification No. : IC: 12199A-BS4AB
Technology : UNB
Test Standard(s) : FCC Parts 15.207, 15.209(a) & 15.247,
Innovation, Science and Economic Development Canada
RSS-247 Issue 3 August 2023
RSS-Gen Issue 5 February 2021

1. This test report shall not be reproduced except in full, without the written approval of UL International (UK) Ltd.
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 3.0 supersedes all previous versions.

Date of Issue: 01 May 2024

Checked by:



Ben Mercer
Lead Project Engineer, Radio Laboratory

Company Signatory:



Sarah Williams
RF Operations Leader, Radio Laboratory



This page has been left intentionally blank.

Customer Information

Company Name:	Telensa Limited
Address:	Iconix 3 Park, London Road Pampisford Cambridge CB22 3EG United Kingdom

Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	04/04/2024	Initial Version	Ben Mercer
2.0	01/05/2024	PMN & HVIN corrected	Ben Mercer
3.0	01/05/2024	Measurement uncertainty ranges corrected	Ben Mercer

Table of Contents

Customer Information	3
Report Revision History	3
Table of Contents	4
1 Attestation of Test Results	5
1.1 Description of EUT	5
1.2 General Information	5
1.3. Summary of Test Results	6
1.4. Deviations from the Test Specification	6
2 Summary of Testing	7
2.1 Facilities and Accreditation	7
2.2 Methods and Procedures	7
2.3 Calibration and Uncertainty	8
2.4 Test and Measurement Equipment	9
3. Equipment Under Test (EUT)	11
3.1 Identification of Equipment Under Test (EUT)	11
3.2. Modifications Incorporated in the EUT	11
3.3. Additional Information Related to Testing	12
3.4 Description of Available Antennas	12
3.5 Description of Test Setup	13
4 Antenna Port Test Results	17
4.1 Transmitter 99% Occupied Bandwidth	17
4.2. Transmitter 20 dB Bandwidth	19
4.3. Transmitter Carrier Frequency Separation	21
4.4. Transmitter Number of Hopping Frequencies and Average Time of Occupancy	23
4.5. Transmitter Maximum Peak Output Power	25
5. Radiated Test Results	28
5.1. Transmitter Radiated Emissions <1 GHz	28
5.2. Transmitter Radiated Emissions >1 GHz	30
5.3. Transmitter Band Edge Radiated Emissions	33
6 AC Power Line Conducted Emissions Test Results	35
6.1 Transmitter AC Conducted Spurious Emissions	35

1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was a street light controller base station containing an Ultra Narrow Band (UNB) transceiver operating over six sub-bands in the 902 MHz to 928 MHz frequency band.

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 and 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 February 2021
Specification Title:	General Requirements for Compliance of Radio Apparatus
Specification Reference:	RSS-247 Issue 3 August 2023
Specification Title:	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Site Registration:	FCC: 685609, ISEDC: 20903
FCC Lab. Designation No.:	UK2011
ISEDC CABID:	UK0001
Location of Testing:	Units 3 & 4 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, G24 8AH, United Kingdom
Test Dates:	11 March 2024 to 26 March 2024

1.3. Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
N/A	RSS-Gen 6.7	Transmitter 99% Occupied Bandwidth	Complied
Part 15.247(a)(1)(i)	RSS-Gen 6.7 / RSS-247 5.1(c)	Transmitter 20 dB Bandwidth	Complied
Part 15.247(a)(1)	RSS-247 5.1(b)	Transmitter Carrier Frequency Separation	Complied
Part 15.247(a)(1)(i)	RSS-247 5.1(c)	Transmitter Number of Hopping Frequencies and Average Time of Occupancy	Complied
Part 15.247(b)(2)	RSS-Gen 6.12 / RSS-247 5.4(a)	Transmitter Maximum Peak Output Power	Complied
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

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
Site 32	-
Site 33	-

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

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
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	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

Measurement system instrumentation shall be used with an accuracy specification meeting the accuracy specification limits according to IEC/IECEE OD-5014.

As applicable, unless specified otherwise in this quotation, the compliance "Decision Rule" is based on Simple Acceptance. If the measured value is on the limit, the result is defined as a pass. In this case the risk of a false positive is 50%. For further information regarding risk assessment refer to ILAC G8:09/2019.

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
99% Occupied Bandwidth	902 MHz to 928 MHz	95%	±3.92 %
20 dB Bandwidth	902 MHz to 928 MHz	95%	±4.59 %
Carrier Frequency Separation	902 MHz to 928 MHz	95%	±4.59 %
Average Time of Occupancy	902 MHz to 928 MHz	95%	±3.53 ns
Conducted Maximum Peak Output Power	902 MHz to 928 MHz	95%	±1.13 dB
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±3.30 dB
Radiated Spurious Emissions	1 GHz to 9.3 GHz	95%	±3.13 dB
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±1.88 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)
M2042	Thermohygrometer	Testo	608-H1	45124926	27 Dec 2024	12
M231909	Signal Analyser	Keysight	N9020B	MY63430168	15 Nov 2024	12
A237326	Attenuator	Pasternack	PE7013-10	#17	Calibrated before use	-
A231993	Switching Unit	Mini-Circuits	ZT-400	12211020014	Calibrated before use	-
M241601	Network Analyser	Keysight	P5007B	MY61100200	30 Sep 2025	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	27 Dec 2024	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	09 Nov 2024	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	20 Nov 2024	12
A3167	Pre-Amplifier	Com Power Corp	PAM-103	18020010	31 Oct 2024	12
A490	Antenna	Chase EMC Ltd	CBL6111A	1590	06 Feb 2025	12
A2148	Attenuator	Atlan TecRF	AN18-06	09020206-06#2	06 Feb 2025	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#4	25 Jan 2025	12
A2863	Pre-Amplifier	Keysight	8449B	3008A02100	30 Oct 2024	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	00653	06 Nov 2024	12
A2908	High Pass Filter	Wainwright Instruments	WHJE5-920-1000-4000-60EE	3	25 Jan 2025	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	06 Nov 2024	12
A245208	Band Reject Filter	Wainwright Instruments	WRCG880/915-870/925-40/8SSFL	40	10 Nov 2024	12
A245207	Band Reject Filter	Wainwright Instruments	WRCG925/960-910/975-25/6SSFL	48	10 Nov 2024	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	06 Sep 2024	12
M236226	Test Receiver	Rohde & Schwarz	ESW26	103134	21 Apr 2024	12
M2040	Thermohygrometer	Testo	608-H1	45124934	27 Dec 2024	12
A3198	Magnetic Loop Antenna	ETS-Lindgren	6502	00221887	18 Oct 2024	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)
M2003	Thermohygrometer	Testo	608-H1	45046641	27 Dec 2024	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	09 Nov 2024	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	20 Nov 2024	12
A3167	Pre-Amplifier	Com Power Corp	PAM-103	18020010	31 Oct 2024	12
A490	Antenna	Chase EMC Ltd	CBL6111A	1590	06 Feb 2025	12
A2148	Attenuator	Atlan TecRF	AN18-06	09020206-06#2	06 Feb 2025	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#4	25 Jan 2025	12

Test Equipment Used for Transmitter AC Conducted Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1124	Test Receiver	Rohde & Schwarz	ESIB26	100046	02 Oct 2024	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	01 Jun 2024	12
A649	ESH3-Z5 LISN	Rohde & Schwarz	ESH3-Z5	825562/008	23 Aug 2024	12
M2037	Thermohygrometer	Testo	608-H1	45124925	27 Dec 2024	12

3. Equipment Under Test (EUT)

3.1 Identification of Equipment Under Test (EUT)

Brand Name:	Telensa
Model Number / HVIN:	BS4.1
PMN:	BS4.1
Test Sample Serial Number:	50000026 (<i>Conducted sample</i>)
Hardware Version:	BSN TL-014261-BS
Software Version:	1.1.12
FCC ID:	XYD-BS4AB
ISED Certification Number:	IC: 12199A-BS4AB
Date of Receipt:	07 March 2024

Brand Name:	Telensa
Model Number / HVIN:	BS4.1
PMN:	BS4.1
Test Sample Serial Number:	50000027 (<i>Radiated sample</i>)
Hardware Version:	BSN TL-014261-BS
Software Version:	1.1.12
FCC ID:	XYD-BS4AB
ISED Certification Number:	IC: 12199A-BS4AB
Date of Receipt:	12 March 2024

3.2. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3. Additional Information Related to Testing

Tested Technology:	FHSS		
Radiated Power Supply Requirement:	Nominal	120 VAC 60 Hz	
Type of Unit:	Transceiver		
Channel Spacing:	25 KHz		
Modulation:	FSK		
Data Rate (bps):	500		
Transmit Frequency Range:	902 MHz to 928 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	Sub-band 0, Channel 0	902.200000
	Middle	Sub-band 2, Channel 58	915.093750
	Top	Sub-band 10, Channel 58	927.787500

3.4 Description of Available Antennas

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

Frequency Range (MHz)	Antenna Gain (dBi)
902 to 928	8.0

3.5 Description of Test Setup

Support Equipment

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

Description:	Support Laptop
Brand Name:	Lenovo
Model Name or Number:	Thinkstation
Serial Number:	HMP0323EM00LT4N

Description:	Support Laptop
Brand Name:	Dell
Model Name or Number:	Latitude E5470
Serial Number:	5415351

Description:	USB to Ethernet cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Operating Modes

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

- Continuously transmitting at maximum power with a modulated carrier on bottom, middle and top channels as required.
- Continuously transmitting at maximum power with a modulated carrier in hopping mode.

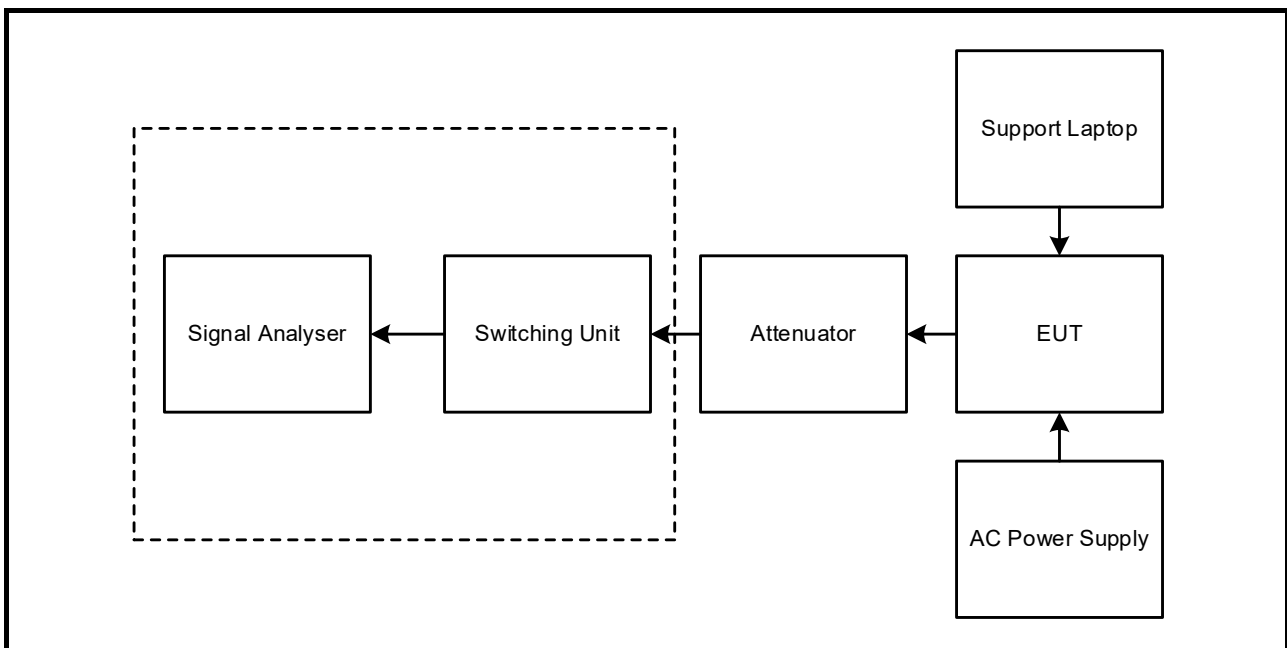
Configuration and Peripherals

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

- Controlled via a support laptop. Commands were sent to the device using a serial port connection. The commands were used to enable a continuous transmission and to select the test channels as required.
- The EUT was powered from a 120 VAC mains supply.
- Radiated emissions tests were performed with the EUT in its normal orientation. The support laptop was disconnected once the EUT was configured.

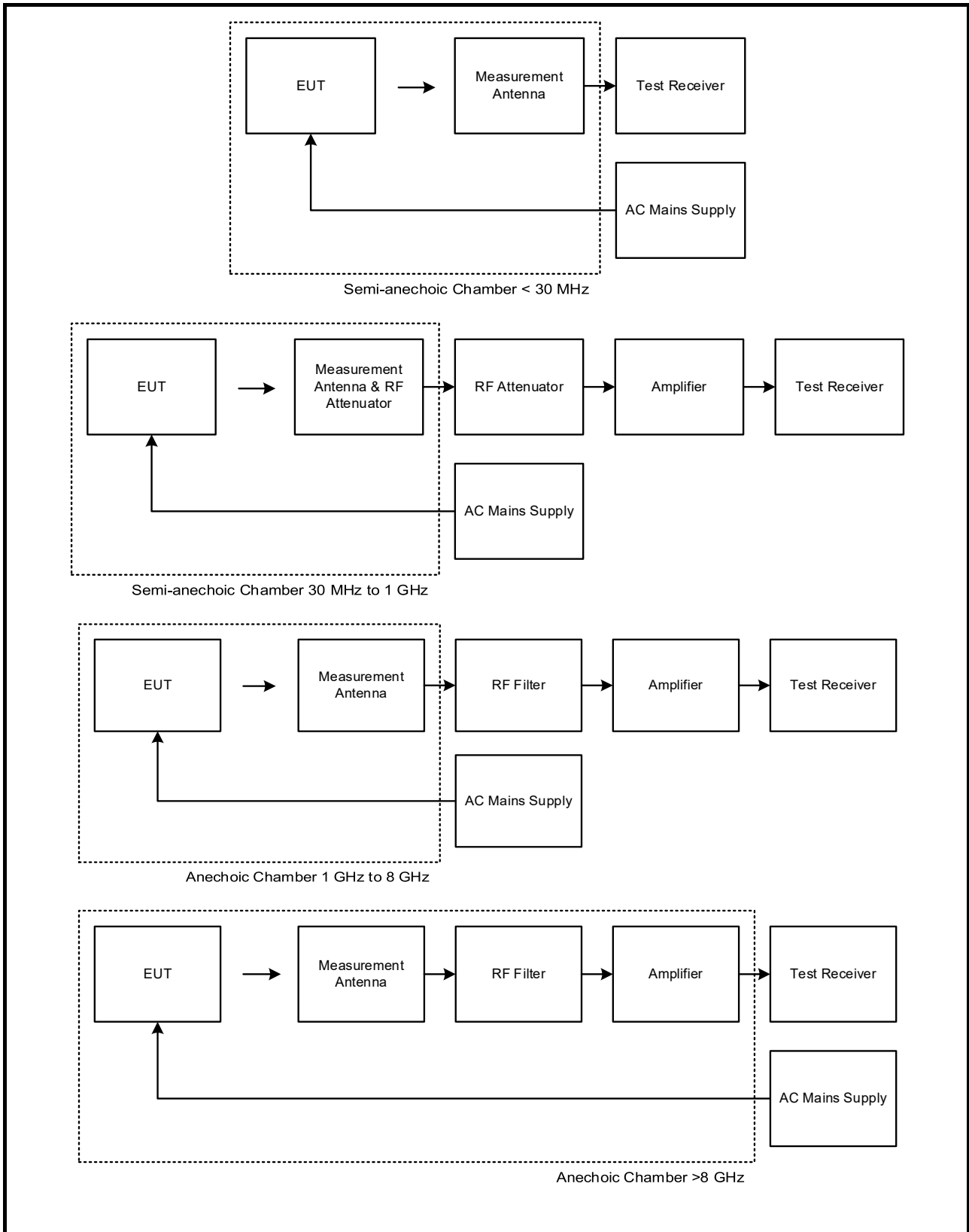
Test Setup Diagrams

Test Setup for Transmitter Conducted Tests



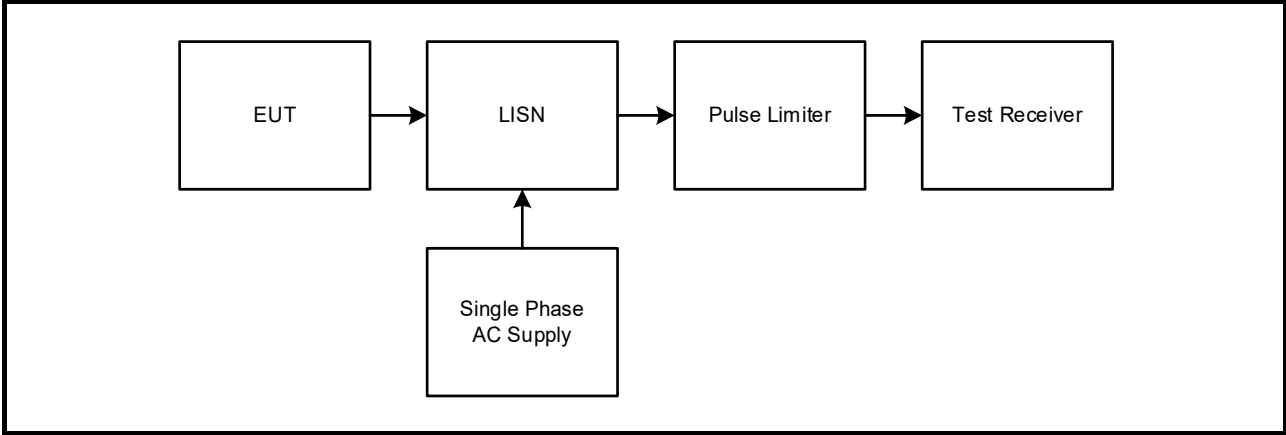
Test Setup Diagrams (continued)

Test Setup for Transmitter Radiated Emissions:



Test Setup Diagrams (continued)

Test Setup for AC Conducted Emissions



4 Antenna Port Test Results

4.1 Transmitter 99% Occupied Bandwidth

Test Summary:

Test Engineer:	Max Passell	Test Date:	12 March 2024
Test Sample Serial Number:	50000026		

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

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	44

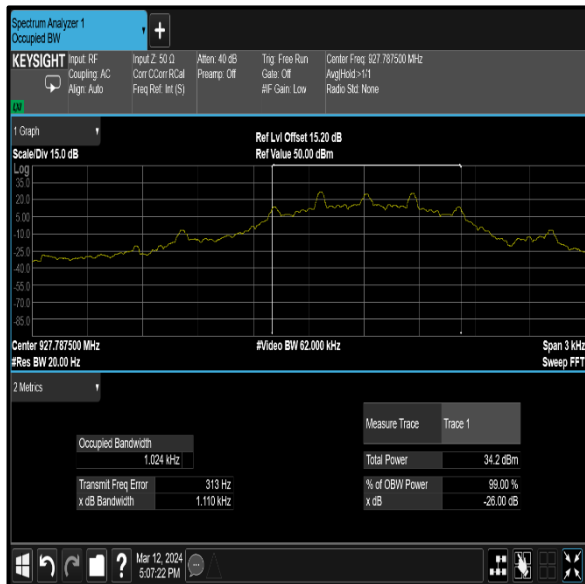
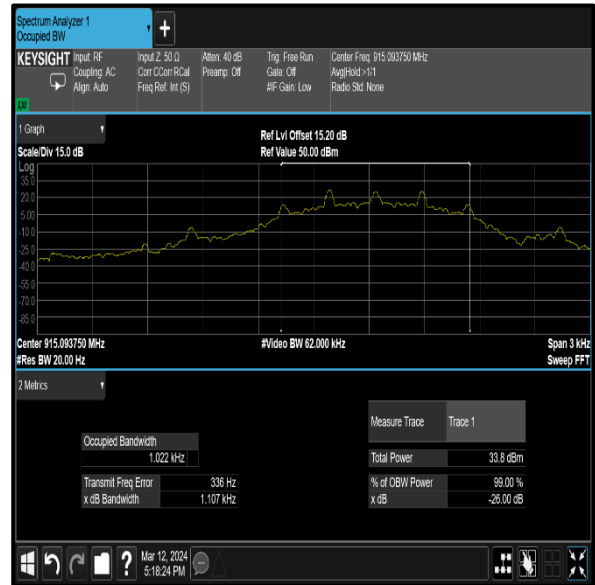
Note(s):

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.

Transmitter 99% Occupied Bandwidth (continued)

Results: 500 bps

Channel	99% Occupied Bandwidth (kHz)
Bottom	1.023
Middle	1.022
Top	1.024



4.2. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	Max Passell	Test Date:	12 March 2024
Test Sample Serial Number:	50000026		

FCC Reference:	Part 15.247(a)(1)(i)
ISED Canada Reference:	RSS-Gen 6.7 / RSS-247 5.1(c)
Test Method Used:	ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	44

Note(s):

1. The signal analyser resolution bandwidth was set to 30 Hz and video bandwidth 100 Hz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 2.7 KHz. Normal and delta markers were placed 20 dB down from the peak of the carrier.

Transmitter 20 dB Bandwidth (continued)

Results: 500 bps

Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	1.0746	≤500	498.9254	Complied
Middle	1.0773	≤500	498.9227	Complied
Top	1.0773	≤500	498.9227	Complied



Bottom Channel



Middle Channel



Top Channel

4.3. Transmitter Carrier Frequency Separation

Test Summary:

Test Engineer:	Max Passell	Test Dates:	13 March 2024
Test Sample Serial Number:	50000026		

FCC Reference:	Part 15.247(a)(1)
ISED Canada Reference:	RSS-247 5.1(b)
Test Method Used:	FCC KDB 558074 D01 Section 9 referencing ANSI C63.10 Section 7.8.2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	41

Note(s):

1. *The limit is a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
2. The signal analyser resolution bandwidth was set to 1 kHz and video bandwidth of 1 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 50 KHz. Marker peak function was used to identify the separation between the adjacent channels.

Transmitter Carrier Frequency Separation (continued)

Results: 500 bps

Carrier Frequency Separation (kHz)	Limit* (kHz)	Margin (kHz)	Result
25.30	25.0	0.30	Complied



4.4. Transmitter Number of Hopping Frequencies and Average Time of Occupancy

Test Summary:

Test Engineer:	Max Passell	Test Dates:	13 March 2024 & 14 March 2024
Test Sample Serial Number:	50000026		

FCC Reference:	Part 15.247(a)(1)(i)
ISED Canada Reference:	RSS-247 5.1(c)
Test Method Used:	FCC KDB 558074 D01 Section 9 referencing ANSI C63.10 Sections 7.8.3 & 7.8.4

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	41 to 50

Note(s):

1. The test system signal analyser was set up for the Number of Hopping Frequencies measurement as follows: the resolution bandwidth was set to 1.1 KHz and video bandwidth of 1.8 KHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 1.8375 MHz.
2. The test system signal analyser was set up for the Average Time of Occupancy measurement as follows: the resolution bandwidth was set to 2 kHz and video bandwidth of 6.2 kHz. A peak detector was used and sweep time was set to 20 seconds. The EUT was set to transmit in a hopping mode with zero span. The total number of hopping frequencies were recorded in the table below.

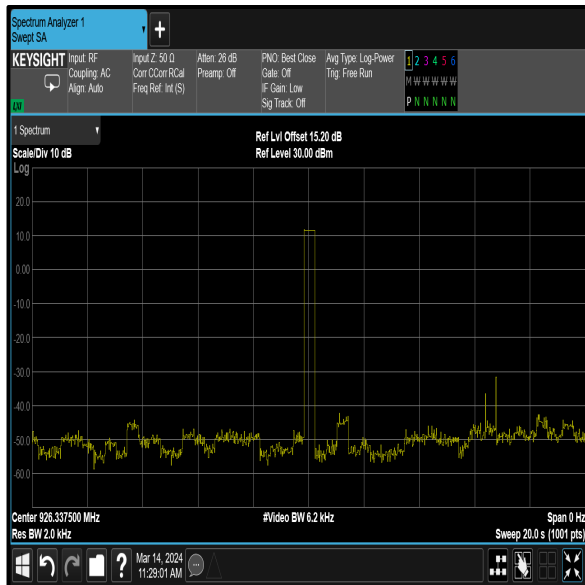
Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)

Results: Number of Hopping Frequencies / 500 bps

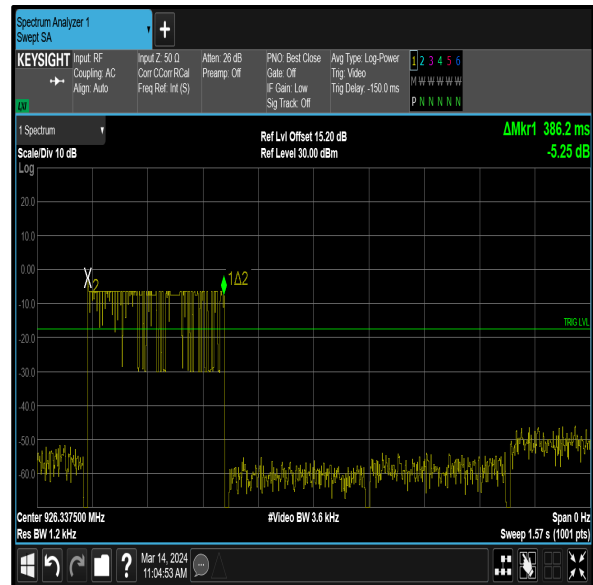
Number of Hops	Limit (Hops)	Result
59	≥50	Complied

Results: Average Time of Occupancy

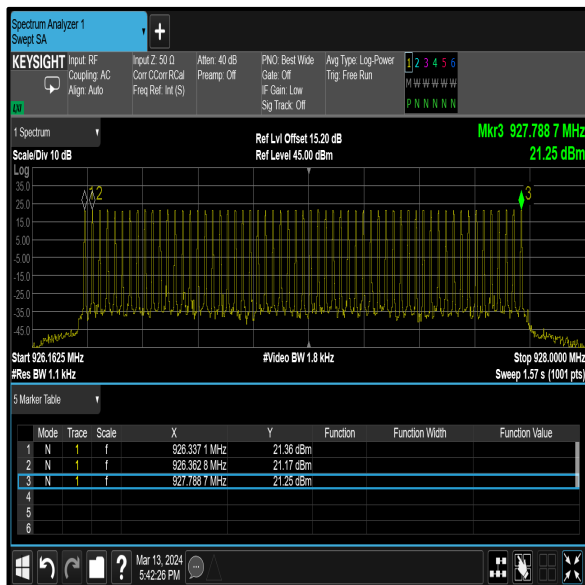
Emission Width (ms)	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
386.2	0.3862	0.4	0.0138	Complied



TX on time in 20 second period



TX on period



Number Of Hopping Channels

4.5. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Max Passell	Test Date:	13 March 2024
Test Sample Serial Number:	50000026		

FCC Reference:	Part 15.247(b)(2)
ISED Canada Reference:	RSS-Gen 6.12 / RSS-247 5.4(a)
Test Method Used:	FCC KDB 558074 D01 Section 9 referencing ANSI C63.10 Section 7.8.5

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	41

Note(s):

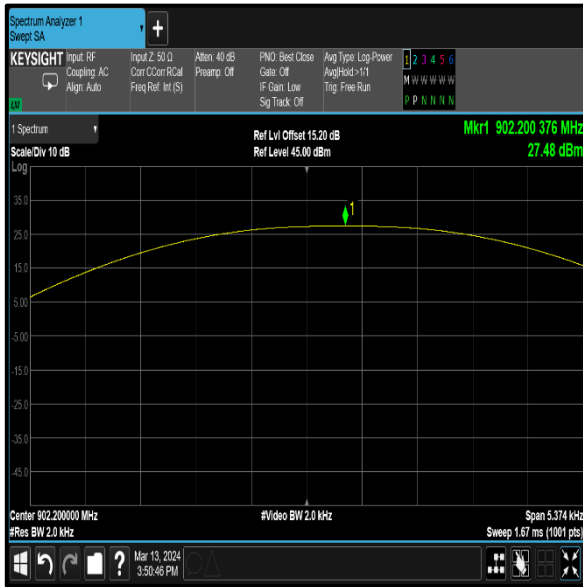
1. The signal analyser resolution bandwidth was set to 2 KHz and video bandwidth of 2 KHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to approximately five times the 20 dB bandwidth. A marker was placed at the peak of the signal and the results recorded in the table below.
2. The antenna gain is > 6 dBi. In accordance with Part 15.247 (b)(4), the limit was reduced by the amount in dB the antenna gain exceeds 6 dBi. Therefore, the limit of 30.0 dBm has been reduced by 2.0 dB to 28.0 dBm.

Transmitter Maximum Peak Output Power (continued)**Results: 500 bps**

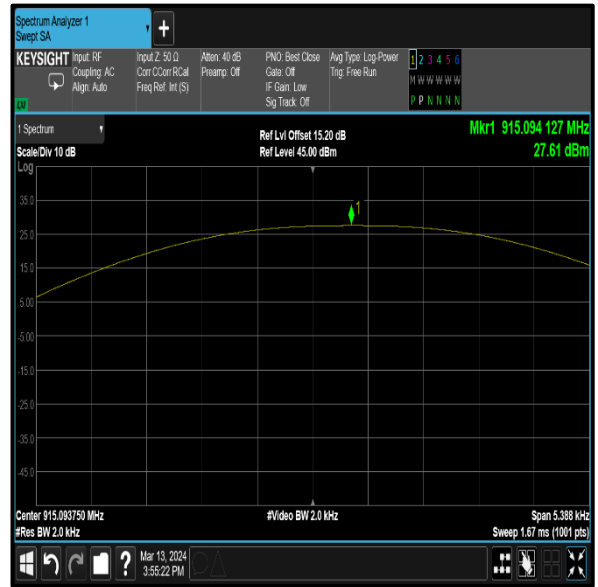
Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	27.48	28.0	0.52	Complied
Middle	27.61	28.0	0.39	Complied
Top	27.55	28.0	0.45	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	27.48	8.0	35.48	36.0	0.52	Complied
Middle	27.61	8.0	35.61	36.0	0.39	Complied
Top	27.55	8.0	35.55	36.0	0.45	Complied

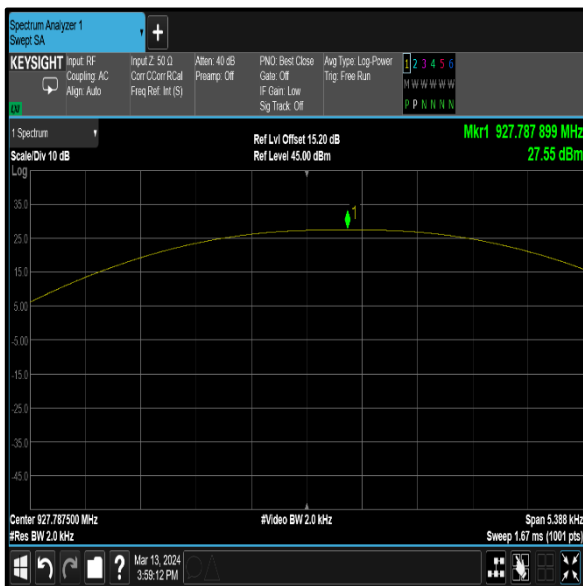
Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

5. Radiated Test Results

5.1. Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineers:	John Ferdinand & Nick Steele	Test Dates:	13 March 2024 to 25 March 2024
Test Sample Serial Number:	50000027		

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):	21 to 22
Relative Humidity (%):	39 to 45

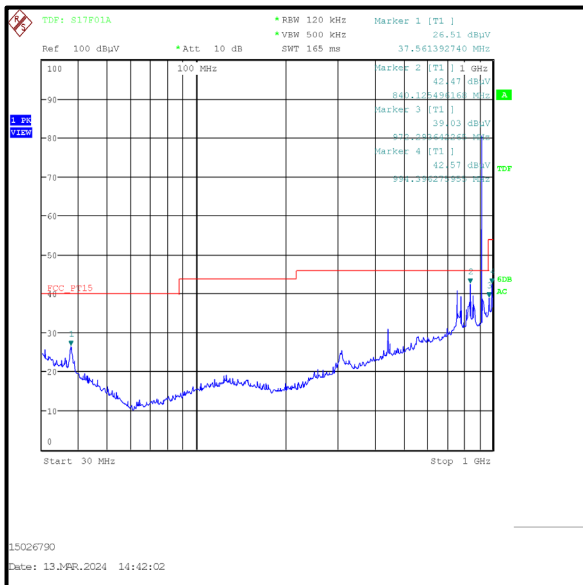
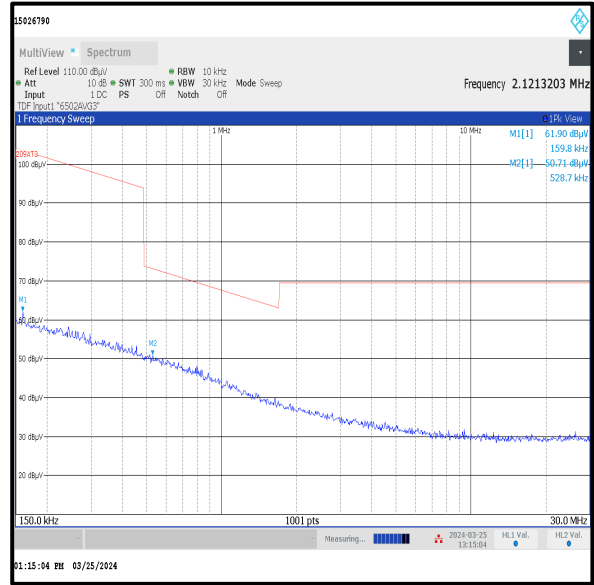
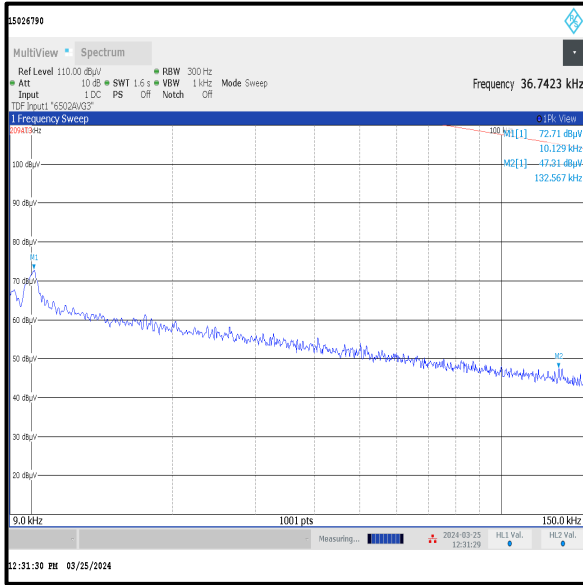
Note(s):

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 plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. The emission at 915 MHz shown on the 30 MHz to 1 GHz plot is the EUT fundamental.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001 and 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.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
6. 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 big enough to see the whole emission.

Results: Middle Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
972.196	Vertical	26.4	54.0	27.6	Complied

Transmitter Radiated Emissions (continued)



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

5.2. Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineers:	John Ferdinand	Test Dates:	11 March 2024 to 13 March 2024
Test Sample Serial Number:	50000027		

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 6.6
Frequency Range	1 GHz to 9.3 GHz

Environmental Conditions:

Temperature (°C):	21 to 22
Relative Humidity (%):	40 to 45

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 plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. Pre-scans 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.
4. As the EUT operates below 10 GHz Transmitter Radiated Spurious Emissions pre-scans were performed up to the 10th harmonic frequency (9.3 GHz).
5. 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.
6. 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 the average measurement.

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

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
1006.570	Vertical	51.6	54.0	2.4	Complied
1076.565	Vertical	48.2	54.0	5.8	Complied
3608.670	Vertical	48.7	54.0	5.3	Complied
4511.038	Vertical	49.2	54.0	4.8	Complied
5413.073	Vertical	51.1	54.0	2.9	Complied
8119.767	Vertical	46.8	54.0	7.2	Complied
9022.187	Vertical	46.6	54.0	7.4	Complied

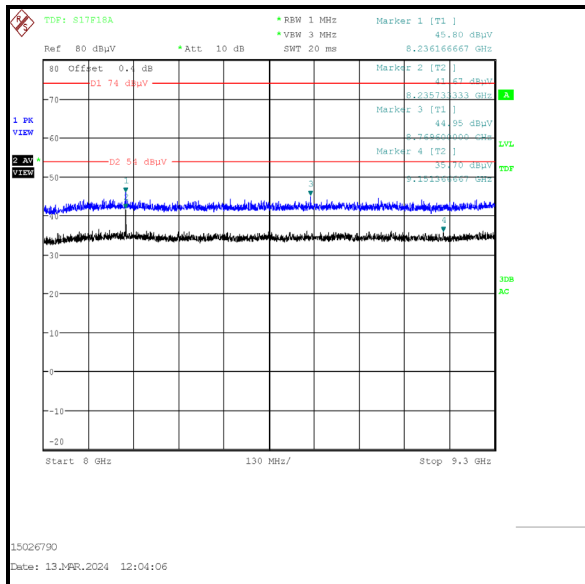
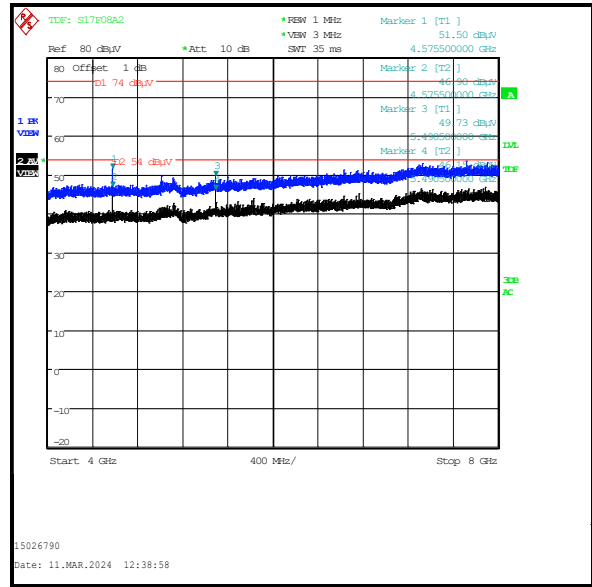
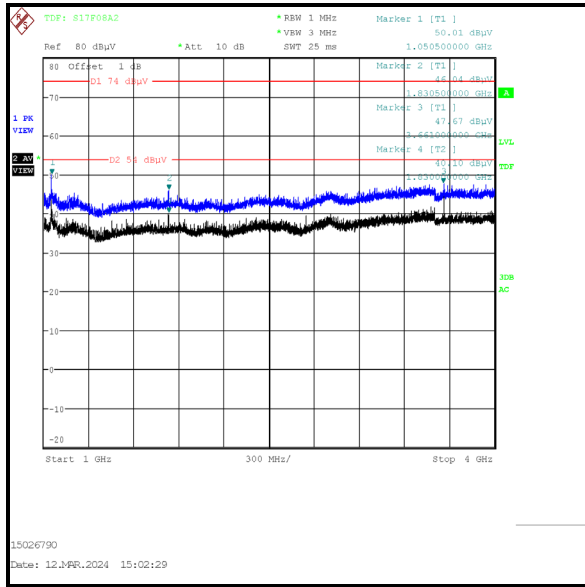
Results: Middle Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
1050.220	Vertical	52.5	54.0	1.5	Complied
3660.465	Vertical	49.6	54.0	4.4	Complied
4575.294	Vertical	50.0	54.0	4.0	Complied
5490.775	Vertical	50.4	54.0	3.6	Complied
8235.936	Vertical	47.2	54.0	6.8	Complied

Results: Top Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
1008.718	Vertical	53.4	54.0	0.6	Complied
1075.605	Vertical	50.2	54.0	3.8	Complied
2783.280	Vertical	47.8	54.0	6.2	Complied
3711.190	Vertical	49.5	54.0	4.5	Complied
4638.813	Vertical	50.7	54.0	3.3	Complied
5566.600	Vertical	50.9	54.0	3.1	Complied
8350.268	Vertical	44.3	54.0	9.7	Complied

Transmitter Radiated Emissions (continued)



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

5.3. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	John Ferdinand	Test Date:	20 March 2024
Test Sample Serial Number:	50000027		

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):	22
Relative Humidity (%):	40

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 both band edges fall within the non-restricted band, 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.

Results: Static Mode / 500 bps

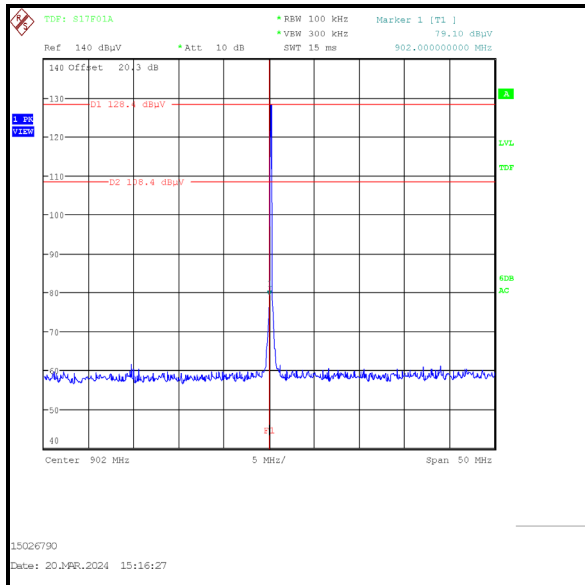
Frequency (MHz)	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
902	79.1	108.4	29.3	Complied
928	72.2	106.5	34.3	Complied

Results: Hopping Mode / 500 bps

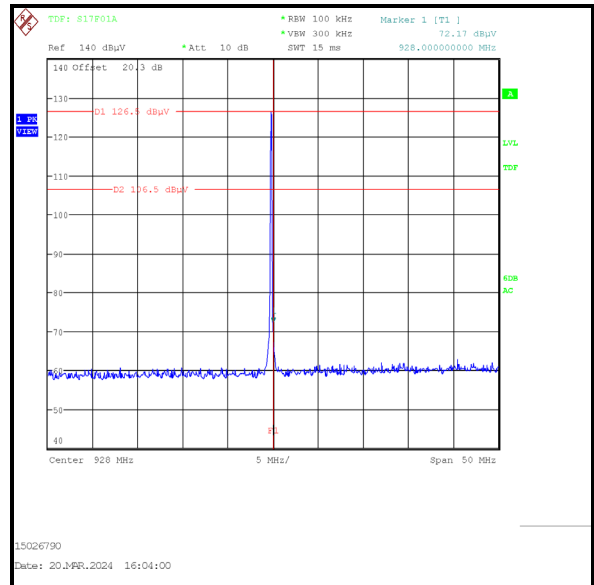
Frequency (MHz)	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
902	63.1	107.7	44.6	Complied
928	61.5	107.5	46.0	Complied
942.022	63.2	107.5	44.3	Complied

Transmitter Band Edge Radiated Emissions (continued)

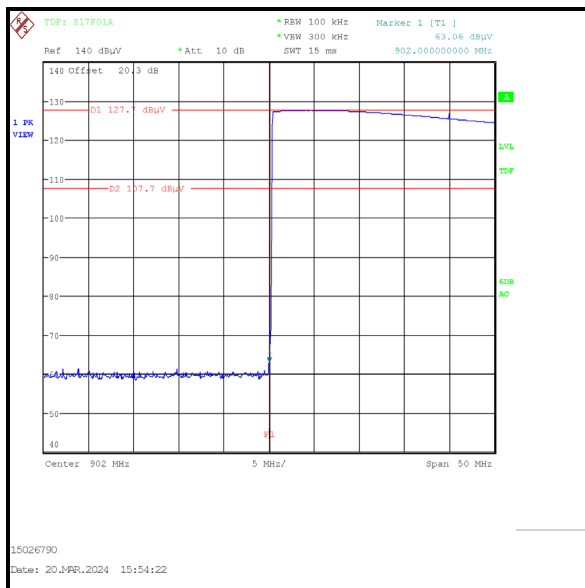
Results: 500 bps



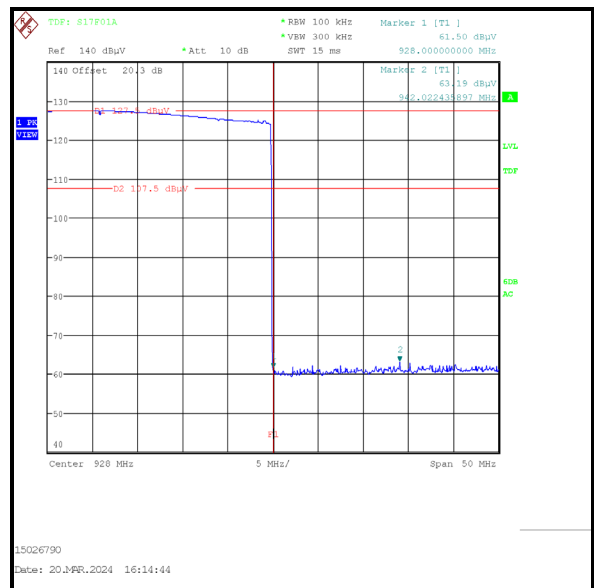
Lower Band Edge / Bottom Channel / Static



Upper Band Edge / Top Channel / Static



Lower Band Edge / Bottom Channel / Hopping



Upper Band Edge / Top Channel / Hopping

6 AC Power Line Conducted Emissions Test Results

6.1 Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Alison Johnston	Test Date:	26 March 2024
Test Sample Serial Number:	50000026		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	35

Note(s):

1. The EUT was connected to a 120 VAC 60 Hz single phase supply via a LISN.
2. A pulse limiter was fitted between the LISN and the test receiver.
3. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range stated in the supplied documentation.

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
0.249000	Live	41.3	61.8	20.5	Complied
0.609000	Live	46.0	56.0	10.0	Complied
0.613500	Live	45.5	56.0	10.5	Complied
2.107500	Live	31.4	56.0	24.6	Complied
14.743500	Live	26.9	60.0	33.1	Complied
14.932500	Live	28.9	60.0	31.1	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.217500	Live	38.7	52.9	14.2	Complied
0.285000	Live	37.4	50.7	13.3	Complied
0.604500	Live	40.5	46.0	5.5	Complied
1.792500	Live	28.2	46.0	17.8	Complied
14.653500	Live	23.9	50.0	26.1	Complied
14.811000	Live	18.2	50.0	31.8	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

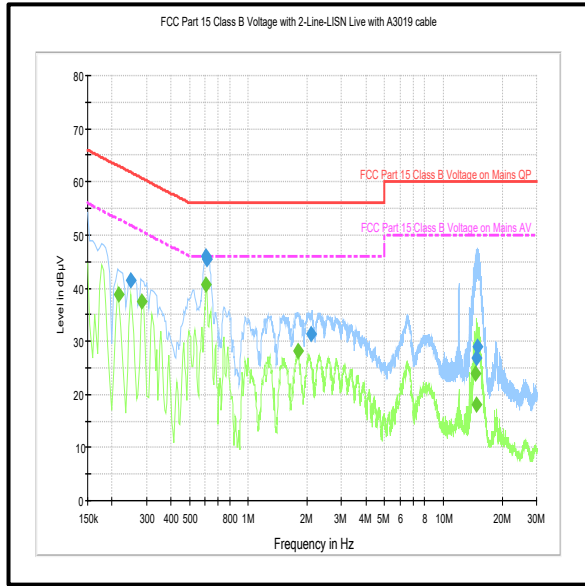
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.406500	Neutral	40.8	57.7	16.9	Complied
0.595500	Neutral	46.3	56.0	9.7	Complied
0.982500	Neutral	37.7	56.0	18.3	Complied
1.486500	Neutral	37.4	56.0	18.6	Complied
14.743500	Neutral	26.5	60.0	33.5	Complied
14.932500	Neutral	29.4	60.0	30.6	Complied

Results: Neutral / Average / 120 VAC 60 Hz

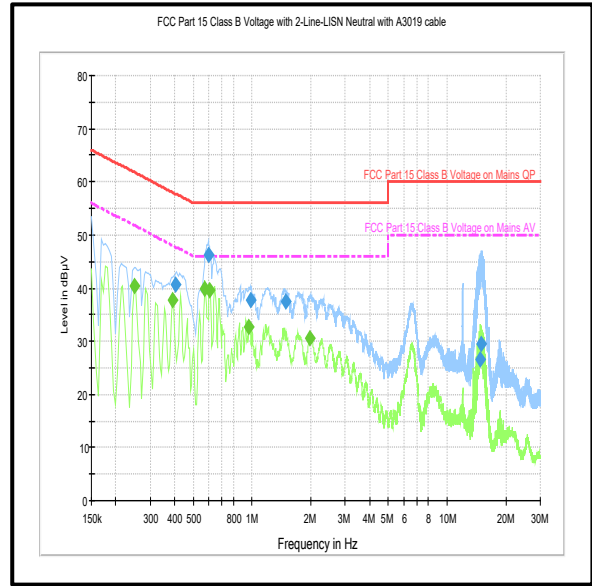
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.249000	Neutral	40.3	51.8	11.5	Complied
0.393000	Neutral	37.6	48.0	10.4	Complied
0.573000	Neutral	39.8	46.0	6.2	Complied
0.604500	Neutral	39.7	46.0	6.3	Complied
0.964500	Neutral	32.8	46.0	13.2	Complied
1.986000	Neutral	30.6	46.0	15.4	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
0.658500	Live	44.2	56.0	11.8	Complied
0.663000	Live	44.5	56.0	11.5	Complied
1.662000	Live	35.5	56.0	20.5	Complied
2.112000	Live	35.7	56.0	20.3	Complied
2.517000	Live	35.5	56.0	20.5	Complied
14.932500	Live	28.9	60.0	31.1	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.420000	Live	30.1	47.4	17.3	Complied
0.672000	Live	38.0	46.0	8.0	Complied
1.612500	Live	29.8	46.0	16.2	Complied
2.053500	Live	30.5	46.0	15.5	Complied
2.508000	Live	29.3	46.0	16.7	Complied
14.874000	Live	17.7	50.0	32.3	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

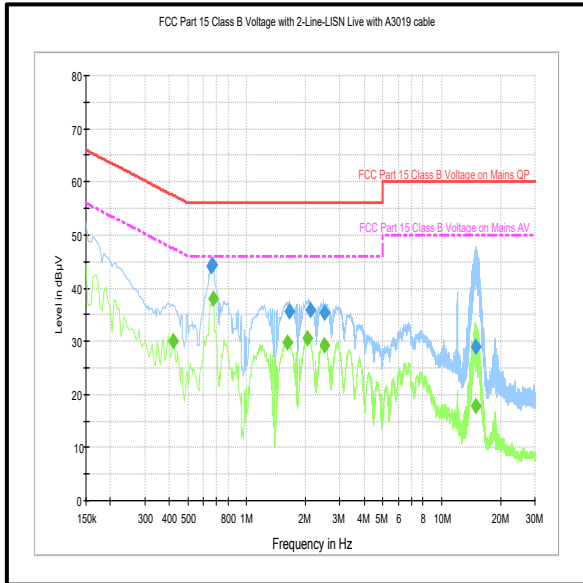
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.649500	Neutral	42.5	56.0	13.5	Complied
0.663000	Neutral	45.1	56.0	10.9	Complied
1.104000	Neutral	39.8	56.0	16.2	Complied
1.572000	Neutral	38.9	56.0	17.1	Complied
2.031000	Neutral	38.0	56.0	18.0	Complied
14.932500	Neutral	28.4	60.0	31.6	Complied

Results: Neutral / Average / 240 VAC 60 Hz

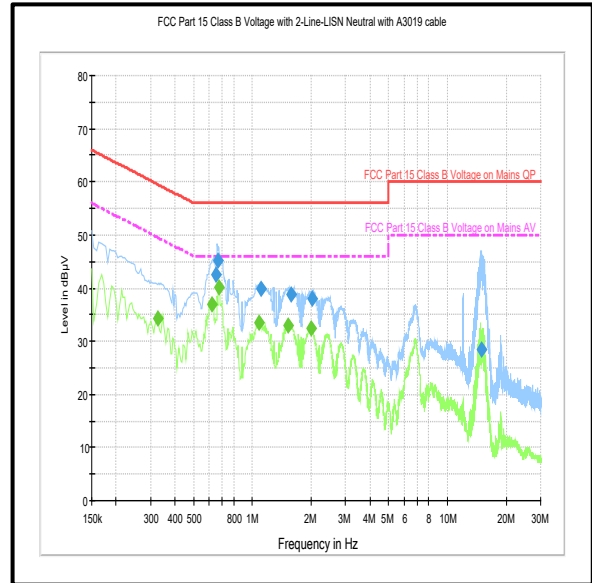
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.325500	Neutral	34.4	49.6	15.2	Complied
0.622500	Neutral	37.0	46.0	9.0	Complied
0.672000	Neutral	40.2	46.0	5.8	Complied
1.086000	Neutral	33.4	46.0	12.6	Complied
1.527000	Neutral	32.9	46.0	13.1	Complied
2.004000	Neutral	32.5	46.0	13.5	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 ---