TEST REPORT

Test Report No. : UL-RPT-RP14880601-1916A

Customer	:	Tedee Sp. z.o.o.
Model No.	:	TLV1.0
FCC ID	:	2BCK5TLV10
Technology	:	*Bluetooth* – Low Energy
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.247
Test Laboratory	:	UL International (UK) Ltd, Basingstoke, Hampshire, RG24 8AH, United Kingdom

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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 1.0.

Date of Issue: 23 October 2023

Checked by:

Ben Mercer
Lead Project Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
RF Operations Leader, Radio Laboratory

5772

Customer Information

Company Name:	Tedee Sp. z.o.o.
Address:	Ul. Karola Bohdanowicza 21/57, 02-127 Warsaw, Poland

Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	23/10/2023	Initial Version	Ben Mercer

Table of Contents

1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was a smart lock for accessing doors.

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 and 15.209
Site Registration:	FCC: 685609
FCC Lab. Designation No.:	UK2011
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, G24 8AH, United Kingdom
Test Dates:	27 September 2023 to 19 October 2023

1.3 Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.247(b)(3)	Transmitter Maximum Peak Output Power	✓
Part 15.247(e)	Transmitter Power Spectral Density	Note 1
Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	✓
Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	✓
Part 15.207	Transmitter AC Conducted Emissions	✓
Key to Results		
✓ = Complied ✗ = Did not comply		

Note(s):

1. 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 be equal to the measured output power.

1.4 Deviations from the Test Specification

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

2 Summary of Testing

2.1 Facilities and Accreditation

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

Site 1	X
Site 2	-
Site 17	X

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

2.2 Methods and Procedures

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 report, 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
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±4.59 %
Radiated Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±3.16 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%	±1.88 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 Bandwidth and Peak Output Power Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2023	12
K0001	3m RSE Chamber	MVG Industries UK Ltd.	N/A	N/A	06 Sep 2024	12
M236226	Test Receiver	Rohde & Schwarz	ESW26	103134	21 Apr 2024	12
A3179	Pre-Amplifier	Hewlett Packard	8449B	3008A00934	21 Aug 2024	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	23 Aug 2024	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	26 Jan 2024	12

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	09 Dec 2023	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	08 Nov 2023	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	02 Nov 2023	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	00653	02 Nov 2023	12
A2863	Pre-Amplifier	Keysight Technologies Inc	8449B	3008A02100	07 Nov 2023	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	25 Jan 2024	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#2	25 Jan 2024	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	31 Oct 2023	12
A3265	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-069	31 Oct 2023	12
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2023	12
K0001	3m RSE Chamber	MVG Industries UK Ltd.	N/A	N/A	06 Sep 2024	12
M236226	Test Receiver	Rohde & Schwarz	ESW26	103134	21 Apr 2024	12
A3095	High Pass Filter	AtlanTecRF	AFH-07000	18051600012	27 Jan 2024	12
A3139	Antenna	Schwarzbeck	HWRD750	00027	23 Aug 2024	12
A3224	Pre-Amplifier	Schwarzbeck	BBV 9718 C	00071	09 Mar 2024	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	26 Jan 2024	12
A3165	Mag Loop Antenna	ETS-Lindgren	6502	00224383	13 Apr 2024	12
A3010	Attenuator	AtlanTecRF	AN18-06	208801#5	27 Apr 2024	12
A231925	Antenna	Teseq, Inc	CBL6111D	63584	27 Apr 2024	12
A3154	Pre-Amplifier	Com Power	PAM-103	18020012	21 Aug 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)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2023	12
K0001	3m RSE Chamber	MVG Industries UK Ltd.	N/A	N/A	06 Sep 2024	12
M236226	Test Receiver	Rohde & Schwarz	ESW26	103134	21 Apr 2024	12
A3179	Pre-Amplifier	Hewlett Packard	8449B	3008A00934	21 Aug 2024	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	23 Aug 2024	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	26 Jan 2024	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 2023	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	16 Dec 2023	12
A649	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	825562/008	23 Aug 2024	36
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	01 Jun 2024	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)

Brand Name:	Tedee
Model Name or Number:	TLV1.0
Test Sample Serial Number:	6287458 *(Radiated sample #1)*
Hardware Version:	TLV1.0
Firmware Version:	2.4
FCC ID:	2BCK5TLV10
Date of Receipt:	01 September 2023

3.2 Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3 Additional Information Related to Testing

Technology Tested:	*Bluetooth* Low Energy (Digital Transmission System)		
Type of Unit:	Transceiver		
Channel Spacing:	2 MHz		
Modulation:	GFSK		
Data Rate: LE	1 Mbps		
Data Rate: LE2M	2 Mbps		
Power Supply Requirement(s):	Nominal	3.7 VDC	
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	37	2402
	Middle	17	2440
	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	2.1

3.5 Description of Test Setup

Support Equipment

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

Description:	Laptop
Brand Name:	Lenovo
Model Name or Number:	ThinkPad L440
Serial Number:	R9-019E9Z

Description:	USB to UART Converter
Brand Name:	Tedee
Model Name or Number:	Not marked or stated
Serial Number:	6407243

Description:	USB A to USB Mini A Cable. Length 2m
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Laptop
Brand Name:	Lenovo
Model Name or Number:	ThinkPad L470
Serial Number:	PF10T3HL

Description:	AC to DC Charger
Brand Name:	Not marked or stated
Model Name or Number:	KLT12-050100-BdUU
Serial Number:	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.
- Transmitting at maximum power in *Bluetooth* LE2M mode with modulation, maximum possible data length available and Pseudorandom Bit Sequence 9.

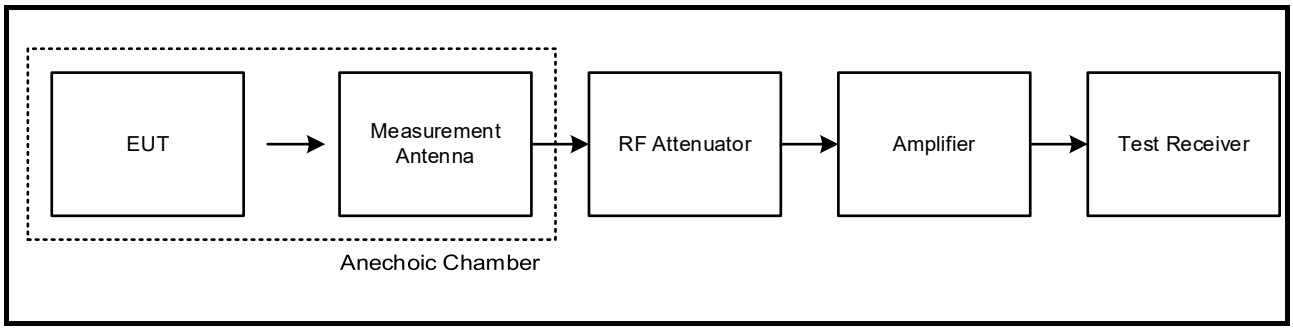
Configuration and Peripherals

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

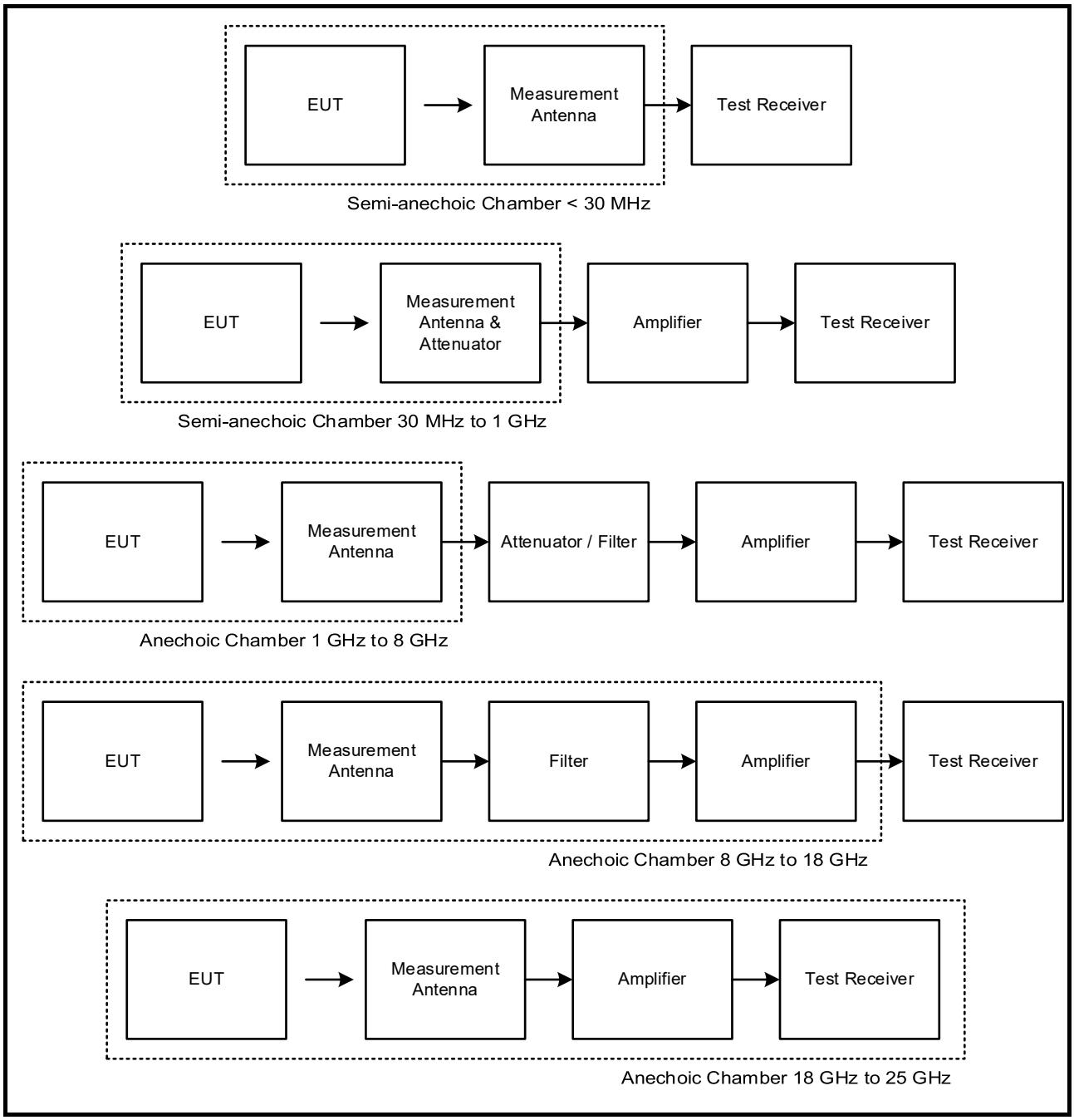
- Controlled in test mode using a set of commands entered into a terminal application on a test laptop. The commands were used to enable a continuous transmission and to select the test channels as required.
- Powered by its internal rechargeable battery.
- Transmitter radiated spurious emissions tests were performed with the EUT transmitting in LE2M mode as this was found to transmit the highest power.
- Transmitter radiated spurious emissions tests were performed with the EUT in the worst-case orientation. There were no active ports to terminate.
- For AC Conducted Emissions tests, the device was powered by its AC to DC charger via a USB to Mini-USB cable.

Test Setup Diagrams

Test Setup for Transmitter Bandwidth & Maximum Peak Output Power

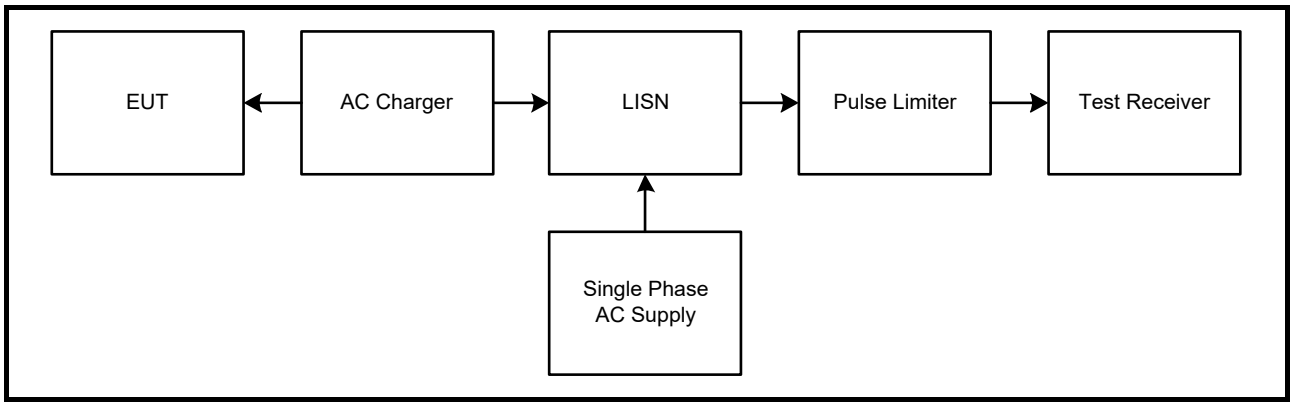


Test Setup for Transmitter Radiated Emissions



Test Setup Diagrams (continued)

Test Setup for AC Conducted Emissions



4 Test Results

4.1 Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	05 October 2023 & 06 October 2023
Test Sample Serial Number:	6287458		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 8.2 referencing ANSI C63.10 Section 11.8.1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	48

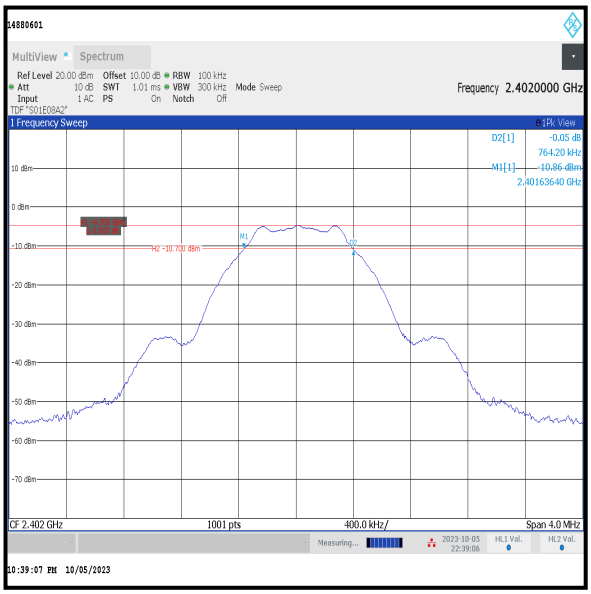
Note(s):

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 measurement was 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.

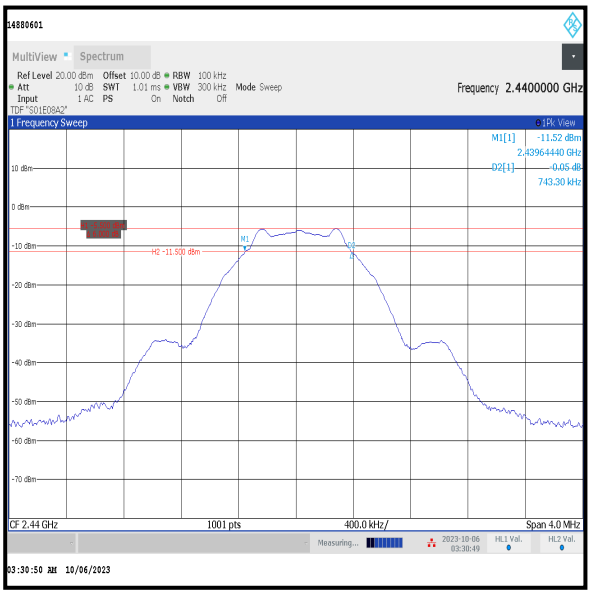
Transmitter Minimum 6 dB Bandwidth (continued)

Results: LE

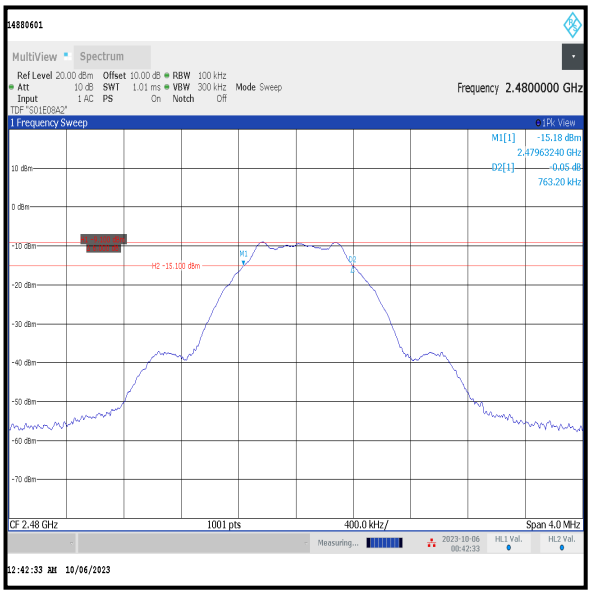
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	764.200	≥500	264.200	Complied
Middle	743.300	≥500	243.300	Complied
Top	763.200	≥500	263.200	Complied



Bottom Channel



Middle Channel

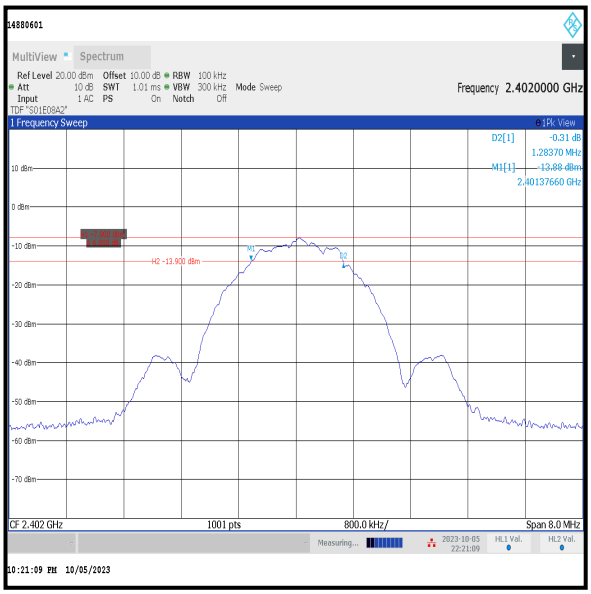


Top Channel

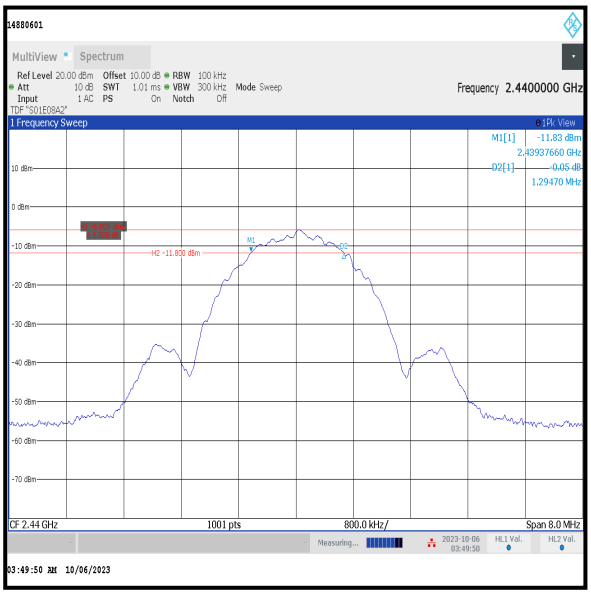
Transmitter Minimum 6 dB Bandwidth (continued)

Results: LE2M

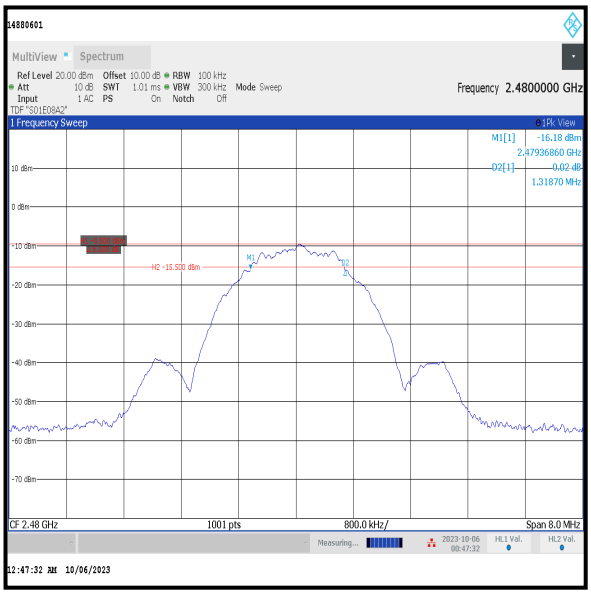
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	1283.700	≥500	783.700	Complied
Middle	1294.700	≥500	794.700	Complied
Top	1318.700	≥500	818.700	Complied



Bottom Channel



Middle Channel



Top Channel

4.2 Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	06 October 2023
Test Sample Serial Number:	6287458		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	FCC KDB 558074 Section 8.3.1.1 referencing ANSI C63.10 Section 11.9.1.1 and Notes below

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	48

Note(s):

1. Radiated power tests were performed using a signal analyser in accordance with ANSI C63.10 Section 11.9.1.1 with the RBW ≥ DTS bandwidth procedure.
2. The signal analyser resolution bandwidth was set to 2 MHz (LE) or 3 MHz (LE2M) and video bandwidth of 10 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 6 MHz (LE) or 10MHz (LE2M). A marker was placed at the peak of the signal and the results recorded in the tables below.
3. The measurement was 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 peak output power levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
4. An RF level offset was entered on the test receiver, to compensate for the loss of the attenuator.
5. The measured value in the table below, incorporates the calibrated antenna factor and cable loss.
6. The declared antenna gain was subtracted form the measured EIRP to obtain the conducted output power.

Transmitter Maximum Peak Output Power (continued)

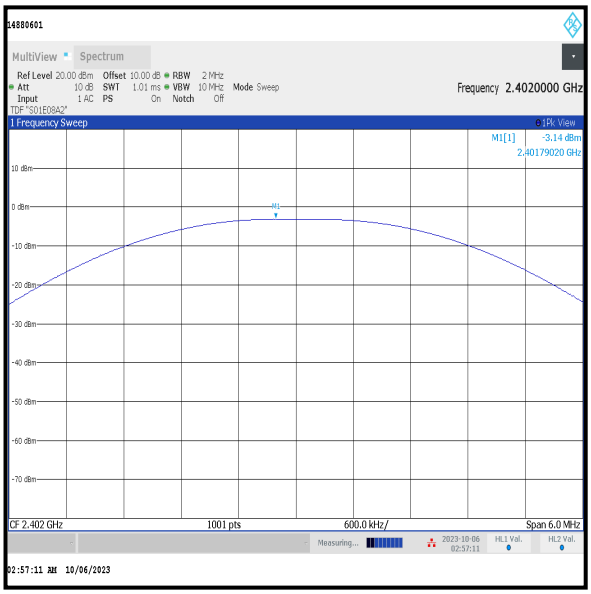
Results: LE

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-5.2	30.0	35.2	Complied
Middle	-7.0	30.0	37.0	Complied
Top	-8.7	30.0	38.7	Complied

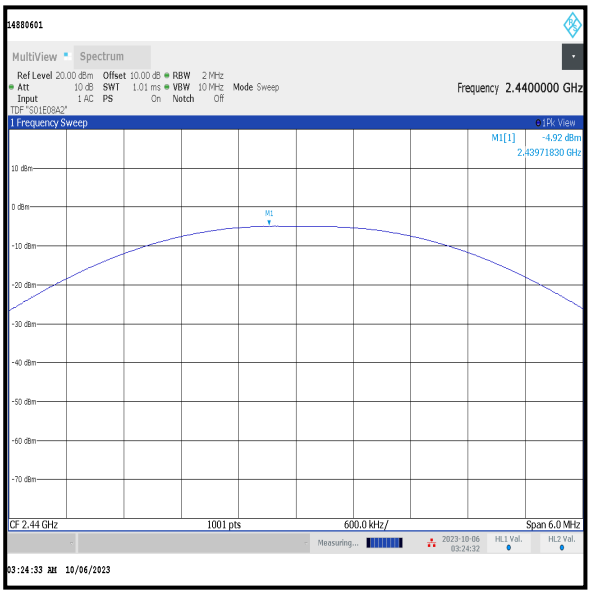
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-5.2	2.1	-3.1	36.0	39.1	Complied
Middle	-7.0	2.1	-4.9	36.0	40.9	Complied
Top	-8.7	2.1	-6.6	36.0	42.6	Complied

Transmitter Maximum Peak Output Power (continued)

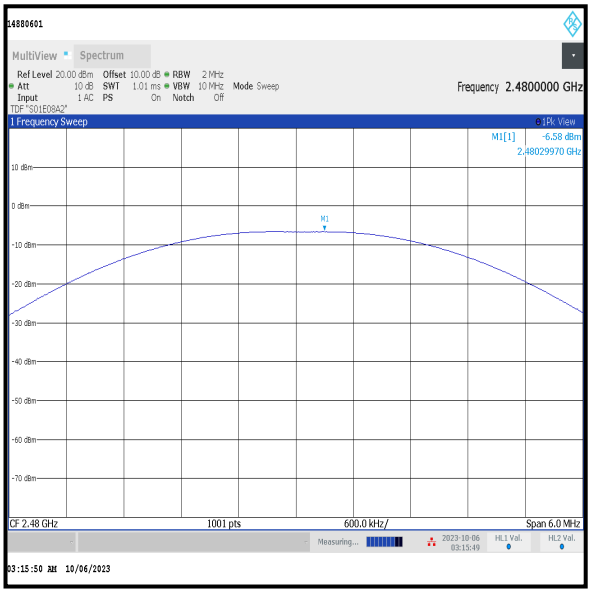
Results: LE



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Peak Output Power (continued)

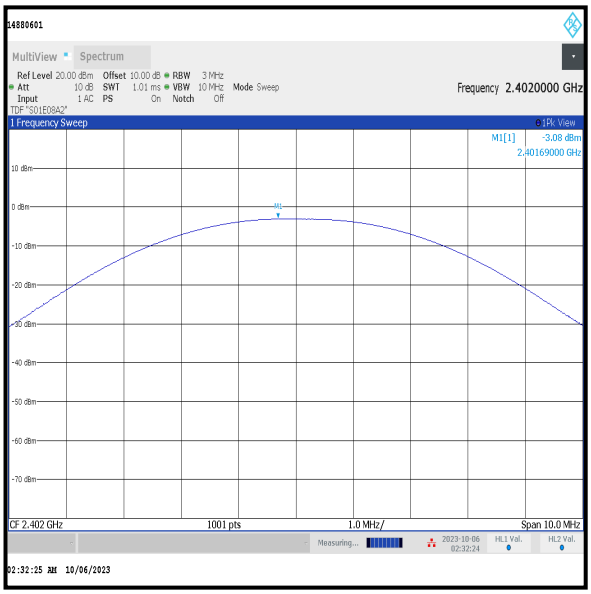
Results: LE2M

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-5.2	30.0	35.2	Complied
Middle	-6.9	30.0	36.9	Complied
Top	-8.4	30.0	38.4	Complied

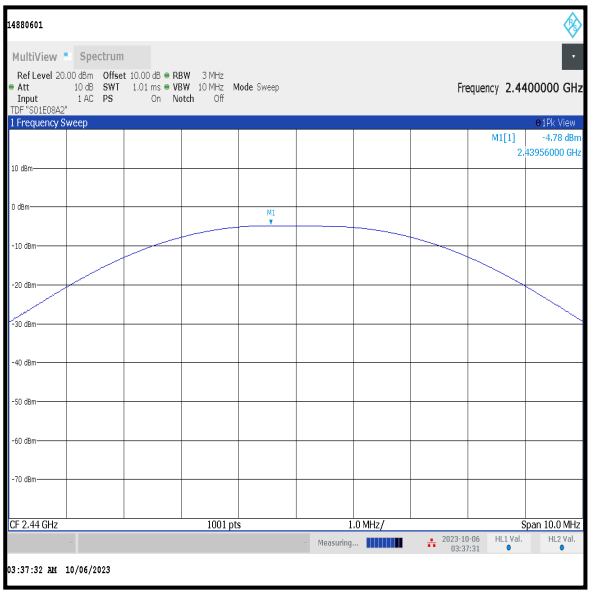
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-5.2	2.1	-3.1	36.0	39.1	Complied
Middle	-6.9	2.1	-4.8	36.0	40.8	Complied
Top	-8.4	2.1	-6.3	36.0	42.3	Complied

Transmitter Maximum Peak Output Power (continued)

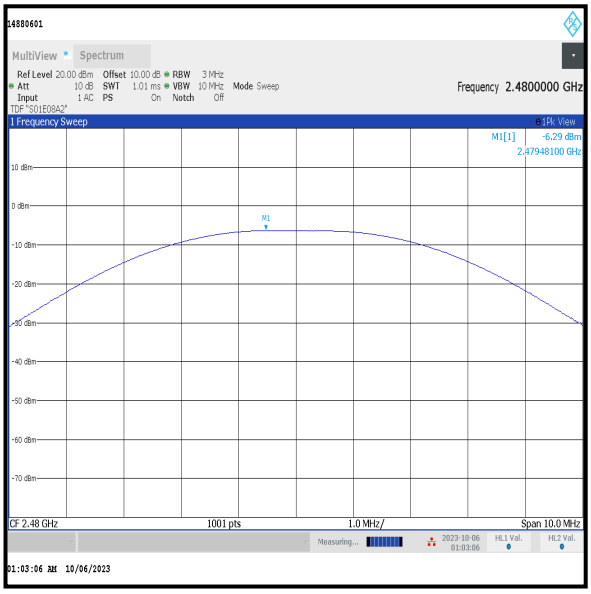
Results: LE2M



Bottom Channel



Middle Channel



Top Channel

4.3 Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	05 October 2023
Test Sample Serial Number:	6287458		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5
Frequency Range	9 kHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	47

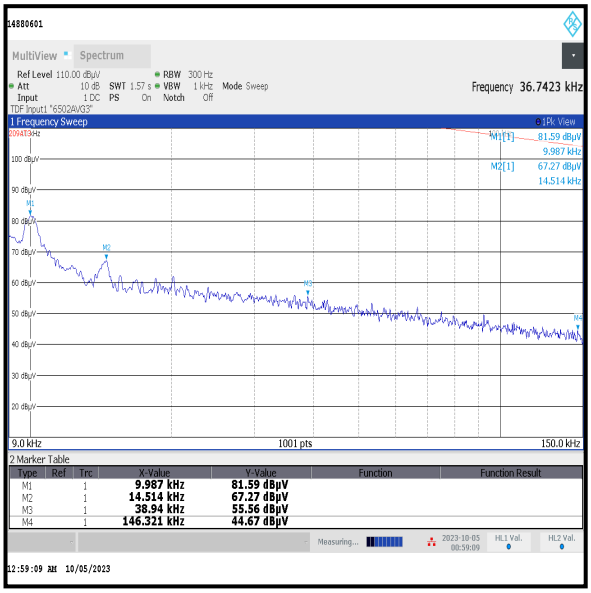
Note(s):

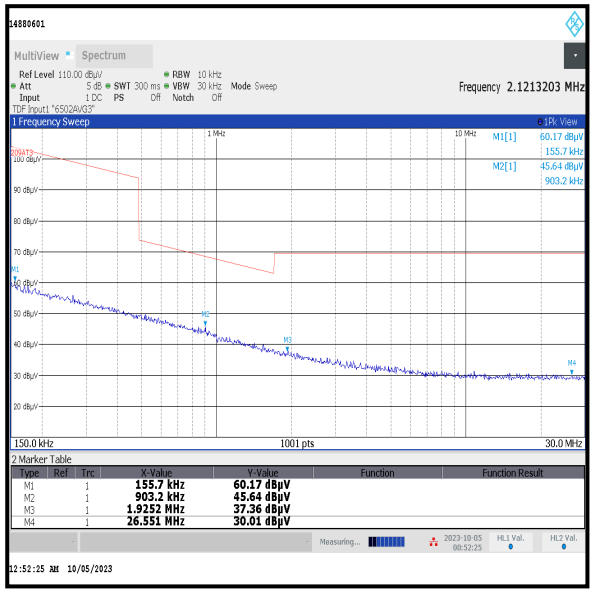
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017/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.
4. 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.

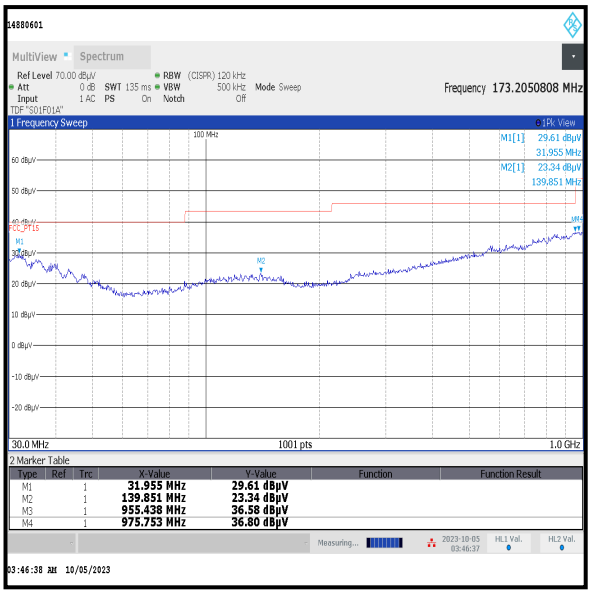
Transmitter Radiated Emissions (continued)

Results: Quasi-Peak / Middle Channel / LE2M

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
975.753	Vertical	36.8	54.0	17.2	Complied







4.4 Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineers:	Andrew Harding & John Ferdinand	**Test Dates:**	27 September 2023 to 04 October 2023
Test Sample Serial Number:	6287458		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	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
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	22 to 24
Relative Humidity (%):	47 to 51

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/K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT.
5. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001/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.

Transmitter Radiated Emissions (continued)

Results: Bottom Channel / Peak / LE2M

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4805.039	Vertical	56.1	74.0	17.9	Complied

Results: Bottom Channel / Average / LE2M

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4804.899	Vertical	50.4	54.0	3.6	Complied

Results: Middle Channel / Peak / LE2M

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4880.824	Vertical	55.3	74.0	18.7	Complied
7318.552	Vertical	55.5	74.0	18.5	Complied

Results: Middle Channel / Average / LE2M

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4880.824	Vertical	48.9	54.0	5.1	Complied
7321.416	Vertical	48.0	54.0	6.0	Complied

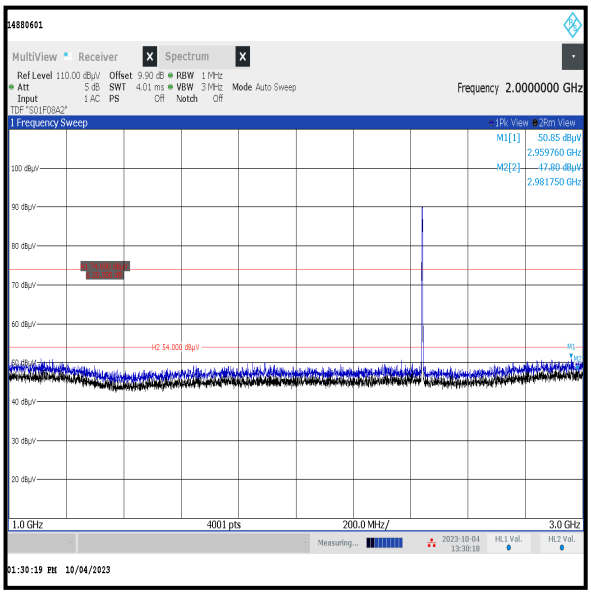
Results: Top Channel / Peak / LE2M

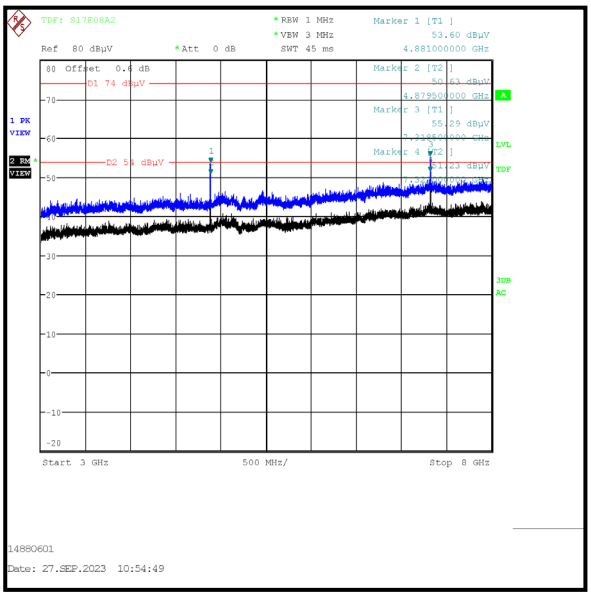
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4959.041	Vertical	57.5	74.0	16.5	Complied
7438.496	Vertical	56.4	74.0	17.6	Complied

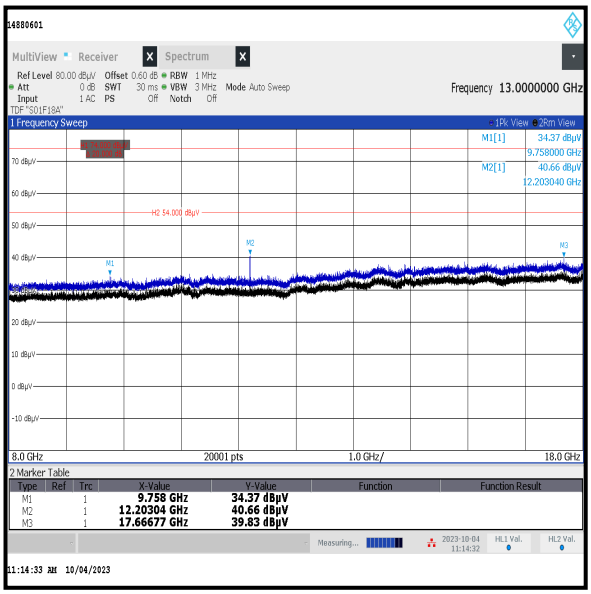
Results: Top Channel / Average / LE2M

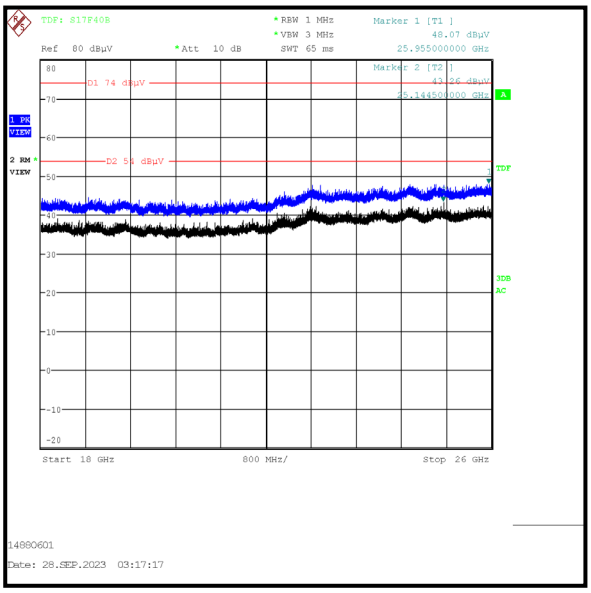
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4960.759	Vertical	52.2	54.0	1.8	Complied
7441.400	Vertical	48.2	54.0	5.8	Complied

Transmitter Radiated Emissions (continued)









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

4.5 Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineers:	Nick Steele & John Ferdinand	**Test Dates:**	06 October 2023 & 18 October 2023
Test Sample Serial Number:	6287458		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	KDB 558074 Section 8.7 referencing ANSI C63.10 Sections 11.11, 11.12 & 11.13

Environmental Conditions:

Temperature (°C):	22 to 24
Relative Humidity (%):	44 to 48

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 / LE

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.000	Vertical	41.0	71.8*	30.8	Complied
2483.500	Vertical	48.5	74.0	25.5	Complied
2496.287	Vertical	50.3	74.0	23.7	Complied

Results: Average / LE

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.500	Vertical	38.5	54.0	15.5	Complied
2484.449	Vertical	38.6	54.0	15.4	Complied

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

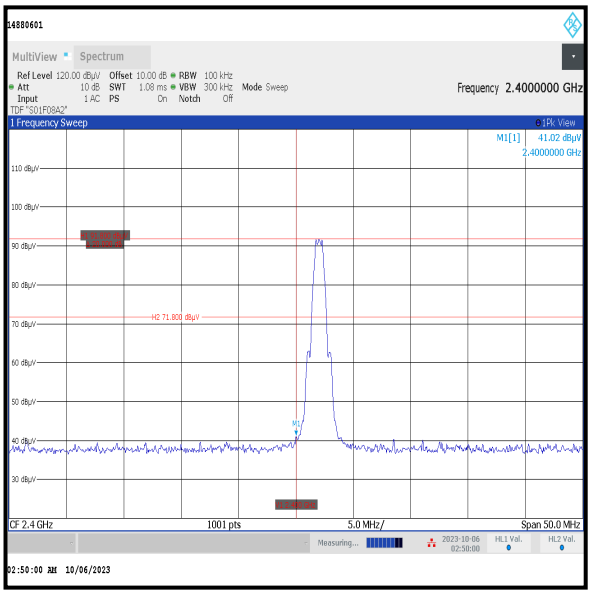
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2364.545	Vertical	50.6	74.0	23.4	Complied

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

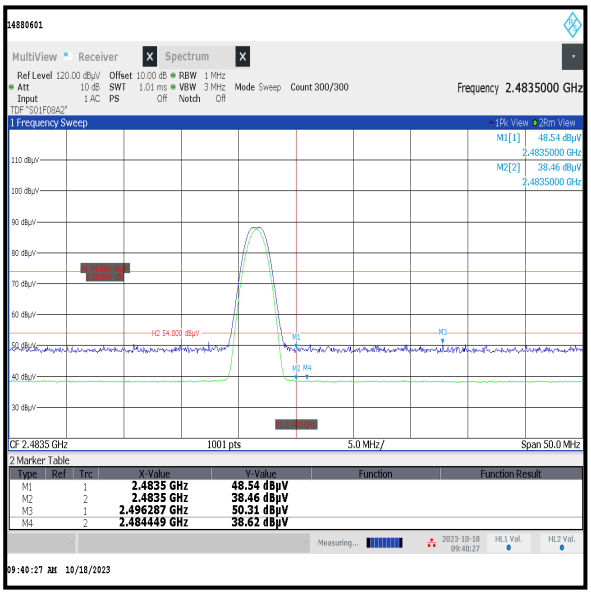
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2377.972	Vertical	39.2	54.0	14.8	Complied

Transmitter Band Edge Radiated Emissions (continued)

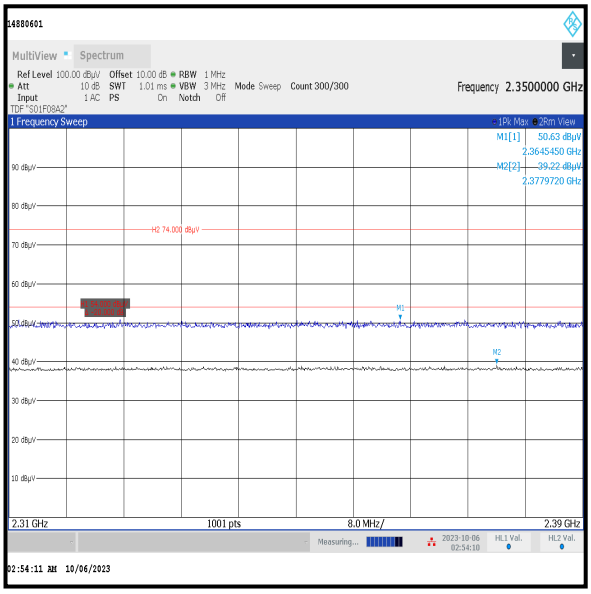
Results: LE



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

Transmitter Band Edge Radiated Emissions (continued)

Results: Peak / LE2M

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.000	Vertical	57.8	68.5*	10.7	Complied
2483.500	Vertical	50.0	74.0	24.0	Complied
2484.449	Vertical	51.3	74.0	22.7	Complied

Results: Average / LE2M

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.500	Vertical	40.1	54.0	13.9	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Peak / LE2M

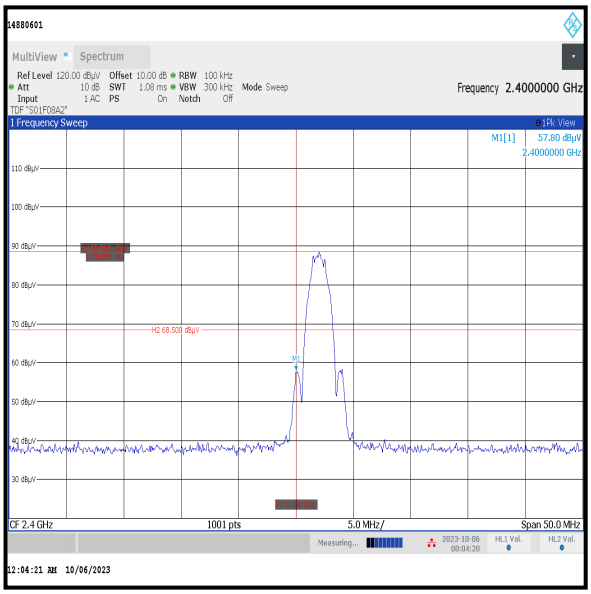
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2359.271	Vertical	51.0	74.0	23.0	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Average / LE2M

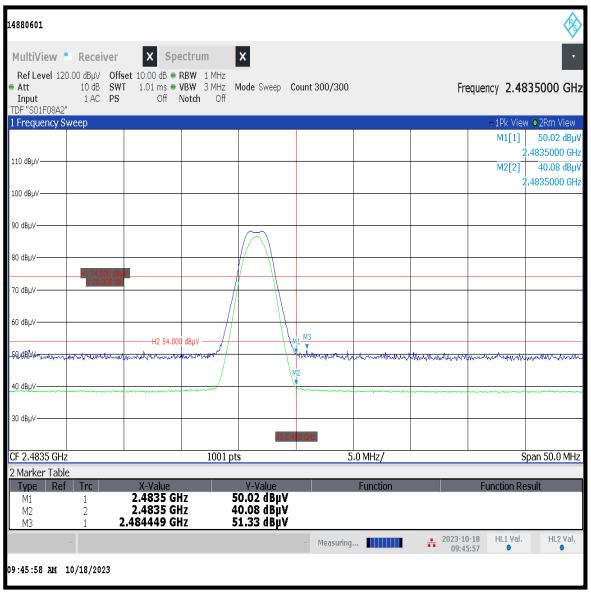
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2363.906	Vertical	38.1	54.0	15.9	Complied

Transmitter Band Edge Radiated Emissions (continued)

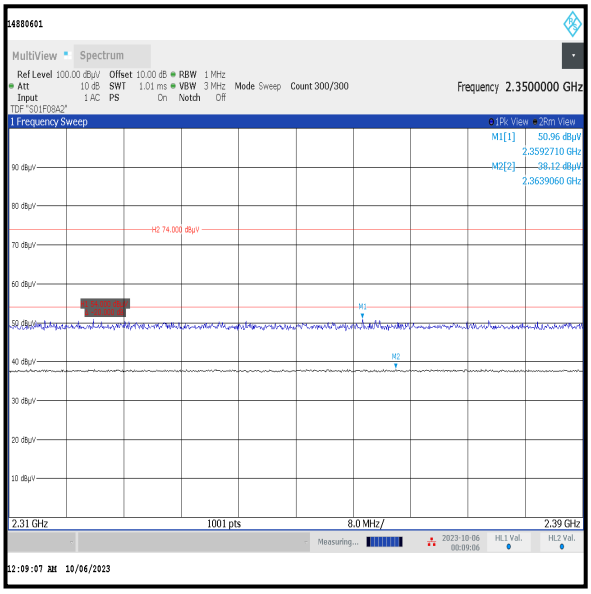
Results: LE2M



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

5 AC Power Line Conducted Emissions Test Results

5.1 Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Alison Johnston	**Test Dates:**	18 October 2023 to 19 October 2023
Test Sample Serial Number:	UL ID 6287458		

FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	54

Note(s):

1. The EUT was connected to an AC to DC charger via a USB cable which supplied the unit with 5 VDC. The AC to DC charger was connected to a 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 as this was within the voltage range marked on the KLT12-050100-BdUU power supply.
3. A pulse limiter was fitted between the LISN and the test receiver.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.474000	Live	31.3	56.4	10.0	Complied
2.440500	Live	33.2	56.0	10.1	Complied
3.561000	Live	32.1	56.0	10.2	Complied
4.159500	Live	36.8	56.0	10.2	Complied
7.399500	Live	40.8	60.0	10.4	Complied
26.920500	Live	40.9	60.0	11.3	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.469500	Live	22.3	46.5	24.2	Complied
3.961500	Live	26.3	46.0	19.7	Complied
7.359000	Live	31.3	50.0	18.7	Complied
8.079000	Live	30.7	50.0	19.3	Complied
20.040000	Live	29.3	50.0	20.7	Complied
26.961000	Live	31.9	50.0	18.1	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

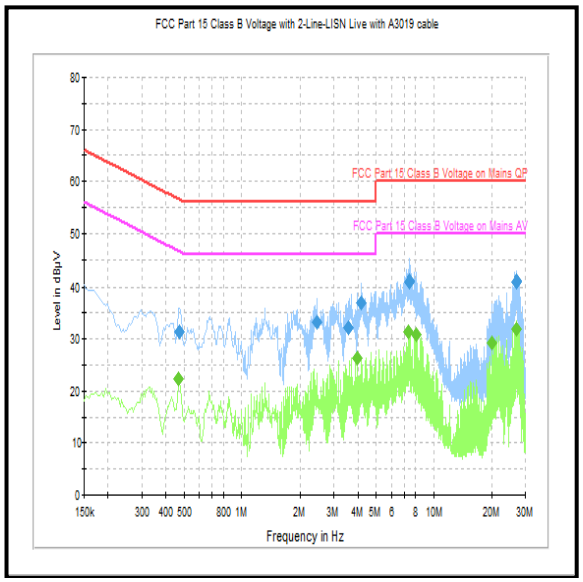
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.460500	Neutral	27.7	56.7	29.0	Complied
7.399500	Neutral	39.4	60.0	20.6	Complied
8.119500	Neutral	33.4	60.0	26.6	Complied
21.840000	Neutral	29.6	60.0	30.4	Complied
23.959500	Neutral	28.1	60.0	31.9	Complied
26.961000	Neutral	36.2	60.0	23.8	Complied

Results: Neutral / Average / 120 VAC 60 Hz

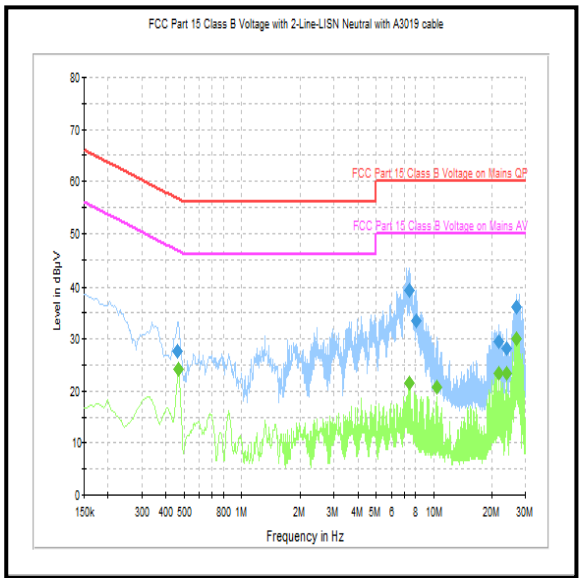
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.465000	Neutral	24.3	46.6	22.3	Complied
7.399500	Neutral	21.6	50.0	28.4	Complied
10.320000	Neutral	20.8	50.0	29.2	Complied
21.840000	Neutral	23.4	50.0	26.6	Complied
23.959500	Neutral	23.5	50.0	26.5	Complied
26.961000	Neutral	30.1	50.0	19.9	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 120 VAC 60 Hz



Live



Neutral

Note: These plots are pre-scans 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 (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.474000	Live	35.4	56.4	21.0	Complied
1.639500	Live	33.2	56.0	22.8	Complied
2.319000	Live	34.1	56.0	21.9	Complied
3.961500	Live	35.3	56.0	20.7	Complied
7.399500	Live	41.0	60.0	19.0	Complied
26.961000	Live	41.3	60.0	18.7	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.474000	Live	23.7	46.4	22.7	Complied
2.800500	Live	25.2	46.0	20.8	Complied
3.961500	Live	25.0	46.0	21.0	Complied
7.399500	Live	32.4	50.0	17.6	Complied
20.679000	Live	32.2	50.0	17.8	Complied
26.880000	Live	33.8	50.0	16.2	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

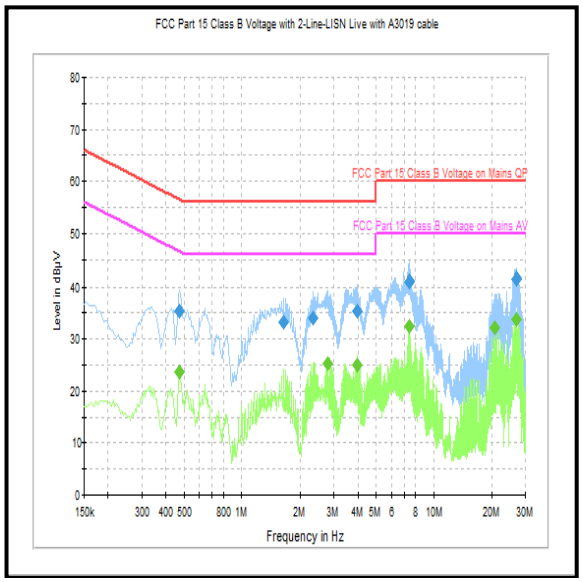
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.469500	Neutral	31.3	56.5	25.2	Complied
3.561000	Neutral	27.3	56.0	28.7	Complied
4.803000	Neutral	27.8	56.0	28.2	Complied
7.359000	Neutral	36.8	60.0	23.2	Complied
22.240500	Neutral	30.1	60.0	29.9	Complied
26.758500	Neutral	35.8	60.0	24.2	Complied

Results: Neutral / Average / 240 VAC 60 Hz

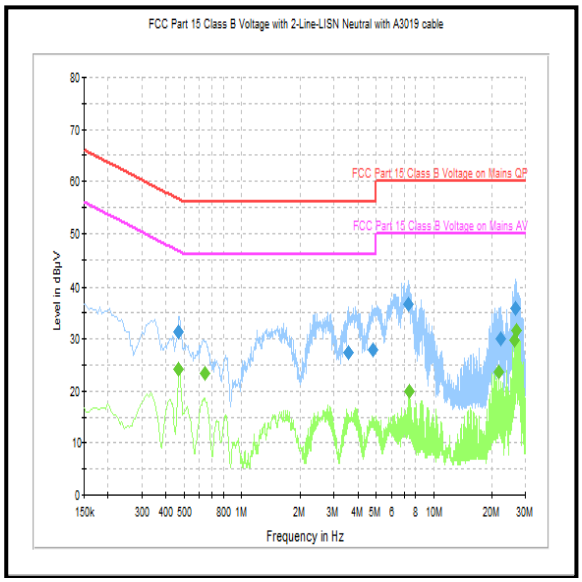
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.469500	Neutral	24.2	46.5	22.3	Complied
0.640500	Neutral	23.4	46.0	22.6	Complied
7.440000	Neutral	19.9	50.0	30.1	Complied
21.840000	Neutral	23.7	50.0	26.3	Complied
26.358000	Neutral	29.9	50.0	20.1	Complied
26.880000	Neutral	31.5	50.0	18.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 240 VAC 60 Hz



Live



Neutral

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