TEST REPORT

Test Report No. : UL-RPT-RP13534277-916C

Customer	:	Umpi S.r.l
Model No	:	Syra RE 61456NF-915-H-6L
FCC ID	:	2A3M2-25A080
Technology	:	802.15.4 (6LoWPAN / WiMesh)
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.249
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: 28 February 2022

Checked by:

Ben Mercer
Lead Project Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
Operations Leader, Radio Laboratory

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Customer Information

Company Name:	Umpi S.r.l
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Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	28/02/2022	Initial Version	Ben Mercer

Table of Contents

1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was a point-to-point transceiver used for street lighting control in urban and rural installations. The EUT incorporates LoRaWAN and 6LowPAN wireless technology to provide communication in the 902-928 MHz frequency band.

1.2 General Information

Specification Reference:	47CFR15.249
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.249
Specification Reference:	47CFR15.207 & 15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.207 & 15.209
FCC Site Registration:	685609
FCC Lab. Designation No.:	UK2011
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	14 October 2021 to 18 January 2022

1.3 Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.249(a)(e)	Transmitter Fundamental Field Strength	✓
Part 2.1049	Transmitter 20 dB Bandwidth	✓
Part 15.249(d)(e) / 15.209(a)	Transmitter Radiated Emissions	✓
Part 15.249(d) / 15.209(a)	Transmitter Band Edge Radiated Emissions	✓
Part 15.207	Transmitter AC Conducted Emissions	✓

Key to Results

✓ = Complied ✗ = Did not comply

1.4 Deviations from the Test Specification

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

2 Summary of Testing

2.1 Facilities and Accreditation

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

Site 1	X
Site 2	-
Site 17	-

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

2.2 Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
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

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
Fundamental Field Strength	902 MHz to 928 MHz	95%	±3.30 dB
20 dB Bandwidth	902 MHz to 928 MHz	95%	±4.59 %
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 Transmitter Fundamental Field Strength, Transmitter 20 dB Bandwidth & Transmitter Band Edge Radiated Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2022	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	06 Sep 2022	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	29 Apr 2022	12
A3154	Pre-Amplifier	Com Power	PAM-103	18020012	24 Aug 2022	12
A553	Antenna	Chase	CBL6111A	1593	15 Mar 2022	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	03 Feb 2022	12
A2937	Attenuator	AtlanTecRF	AN18W5-06	208147#1	03 Feb 2022	12

Test Equipment Used for Transmitter Radiated Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	10 Dec 2021	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	06 Sep 2022	12
M2044	Test Receiver	Rohde & Schwarz	ESU26	100122	29 Apr 2022	12
A3141	Pre-Amplifier	Schwarzbeck	BBV 9718 B	00021	24 Aug 2022	12
A3154	Pre-Amplifier	Com Power	PAM-103	18020012	24 Aug 2022	12
A3155	Pre-Amplifier	Com Power	PAM-118A	18040037	24 Aug 2022	12
A553	Antenna	Chase	CBL6111A	1593	15 Mar 2022	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	27 Aug 2022	12
A3139	Antenna	Schwarzbeck	HWRD750	00027	27 Aug 2022	12
A2972	High Pass Filter	AtlanTecRF	AFH-01000	02371	10 Nov 2022	12
A3093	High Pass Filter	AtlanTecRF	AFH-03000	18051800077	03 Feb 2022	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	09 Dec 2021	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	04 Aug 2022	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	21 Apr 2022	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	14 Dec 2021	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:	Umpi
Model Name or Number:	Syra RE 61456NF-915-H-6L
Test Sample Serial Number:	AZ000014
Hardware Version:	25A080 + 25A022
Software Version:	N/A
Firmware Version:	1.1.1
FCC ID:	2A3M2-25A080

3.2 Untested Variants

Model Name or Number:	Syra RE 61456NF-915-H-WS
Model Name or Number:	Syra RE 61456NF-915-L-6L
Model Name or Number:	Syra RE 61456NF-915-L-WS

The customer declared that these variants are identical to the tested model from an RF perspective. Further information is provided in Annex A.

3.3 Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4 Additional Information Related to Testing

Technology Tested:	802.15.4 (6LoWPAN / WiMesh)		
Type of Unit:	Transceiver		
Modulation Type:	FSK		
Data Rate:	50, 100 & 300 kbps		
Power Supply Requirement(s):	Nominal	120.0 VAC	
Channel Spacing:	500 KHz		
Transmit Frequency Range:	915.25 MHz to 927.25 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	915.25
	Middle	24	921.25
	Top	48	927.25

3.5 Description of Available Antenna

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

Frequency Range (MHz)	Antenna Gain (dBi)
902 to 928	0.0

3.6 Description of Test Setup

Support Equipment

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

Description:	Test Laptop
Brand Name:	Lenovo
Model Name or Number:	ThinkPad L480
Serial Number:	PF1EHZQQ

Description:	USB Interface Board and USB Cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Syra RE Test HW Tool
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

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

Operating Modes

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

- Transmitting continuously with a modulated carrier and a power setting of 6 dBm on bottom, middle and top channels as required.

Configuration and Peripherals

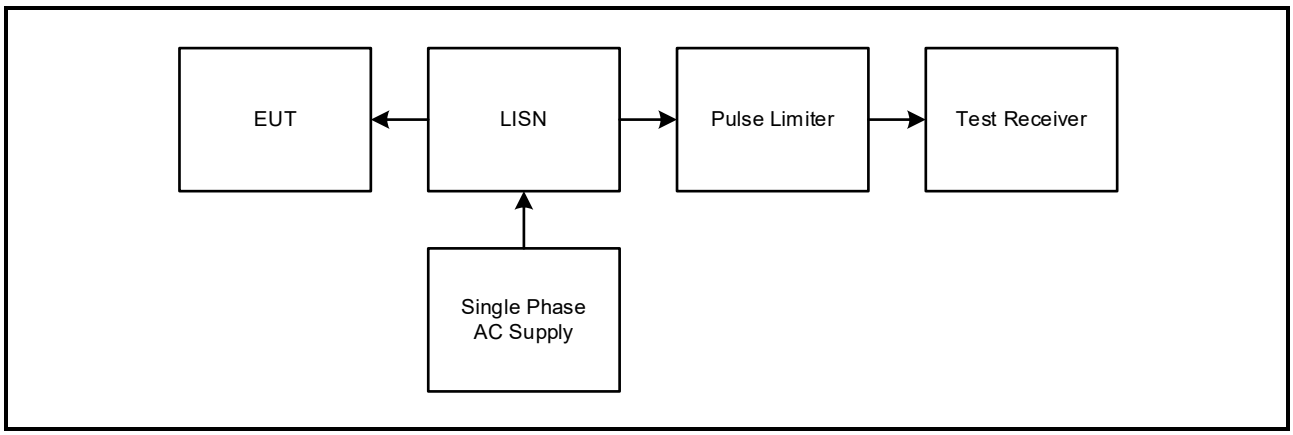
The EUT was tested in the following configuration(s):

- Controlled in test mode using a software application on the laptop PC. The application was used to enable continuous transmission and to select the test channels, data rate and packet length as required. The customer supplied a document containing the setup instructions ‘EX01-T001_Syra_Radio_Node_Test_Instructions.pdf’. The laptop PC was connected to the EUT via the USB interface board and the Syra RE Test HW Tool. The laptop was disconnected after the EUT was configured.
- All tests were performed with the EUT in the worst case orientation/position for the applicable test.
- Transmitter radiated spurious emission tests were performed with the EUT transmitting at 300 kbps, as this was found to be the worst case mode after preliminary prescans. There were no active ports to terminate.

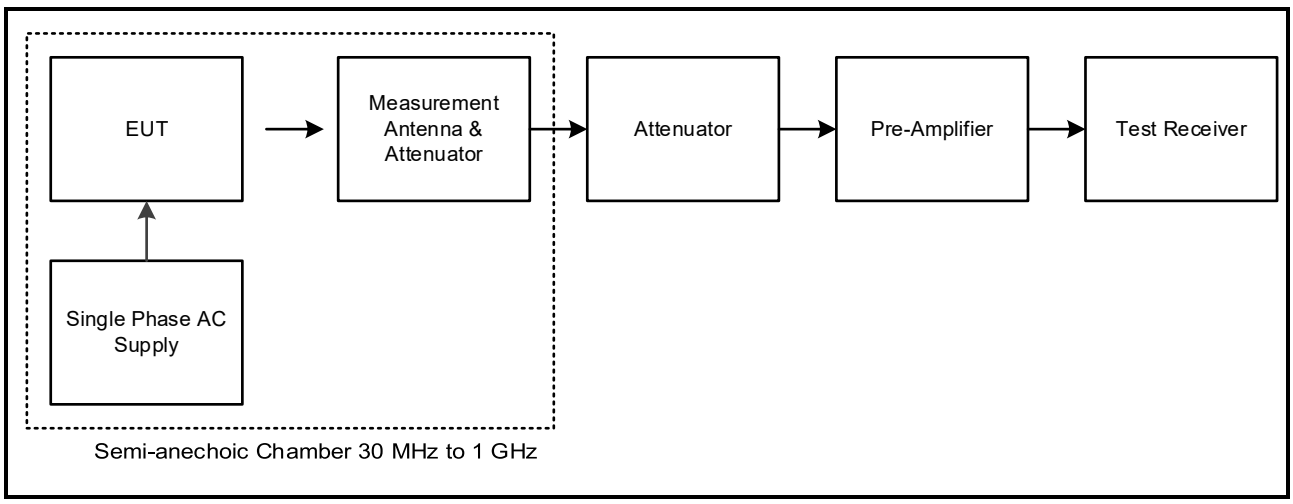
Test Setup Diagrams

Radiated Tests:

Test Setup for Transmitter AC Conducted Spurious Emissions

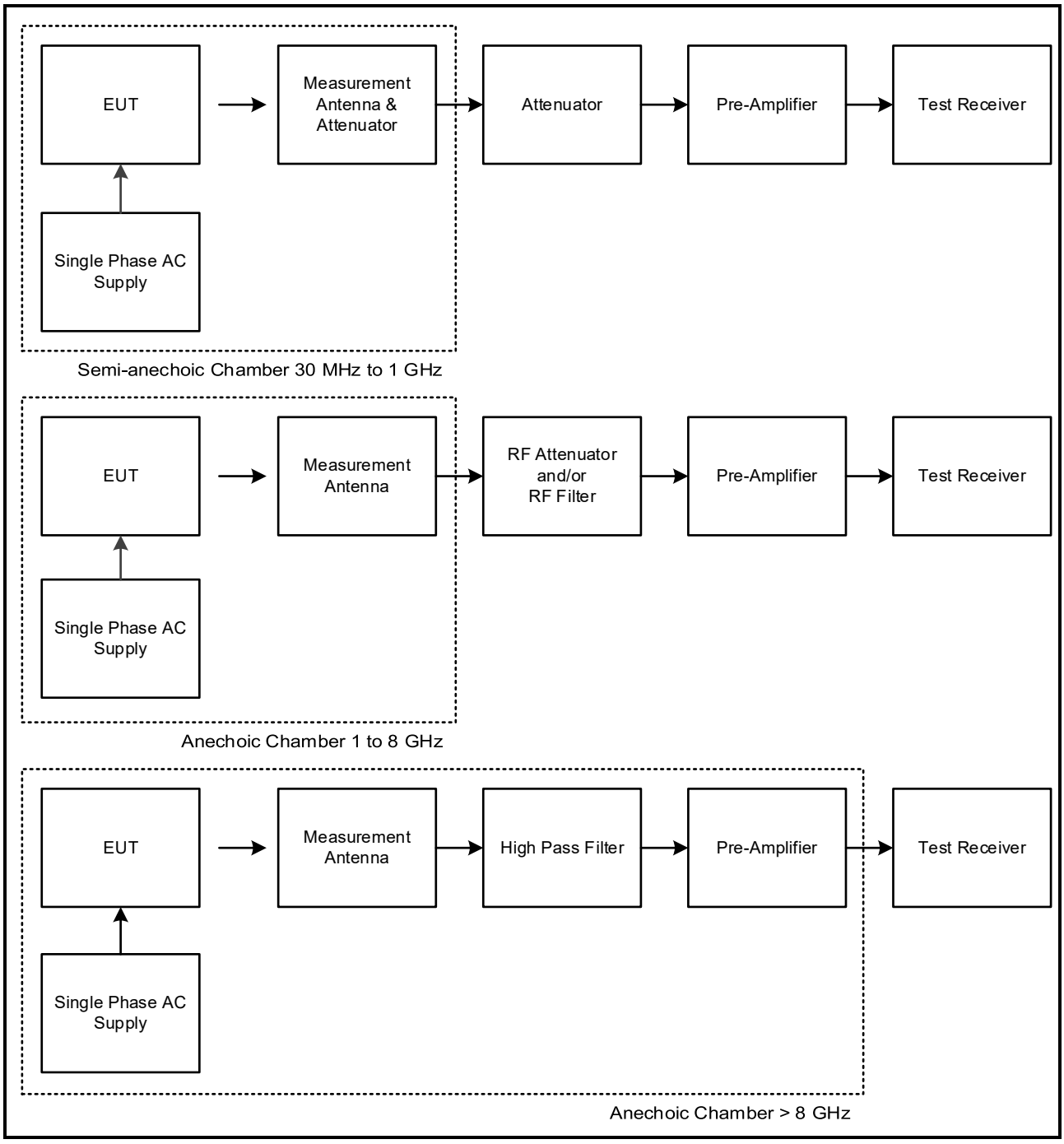


Test Setup for Transmitter Fundamental Field Strength, Transmitter 20 dB Bandwidth & Transmitter Band Edge Radiated Emissions



Test Setup Diagrams (continued)

Test Setup for Transmitter Radiated Emissions



4 Radiated Test Results

4.1. Transmitter Fundamental Field Strength

Test Summary:

Test Engineer:	John Ferdinand	**Test Date:**	14 October 2021
Test Sample Serial Number:	AZ000014		

FCC Reference:	Part 15.249(a)(e)
Test Method Used:	ANSI C63.10 Section 6.5

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	46

Note(s):

1. The final measured value in the tables below incorporates the calibrated antenna factor and cable loss.
2. Measurements 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.
3. Pre-scans were performed and markers placed on the highest measured levels. The test receiver 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.
4. Final measurements were performed on the marker frequencies and results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector.

Transmitter Fundamental Field Strength (continued)

Results: 50 kbps / Bottom Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
915.231	Vertical	86.2	94.0	7.8	Complied

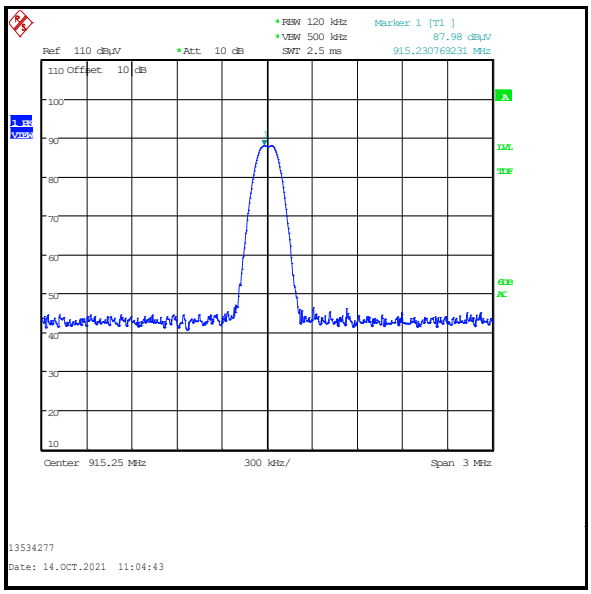
Results: 50 kbps / Middle Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
921.231	Vertical	83.7	94.0	10.3	Complied

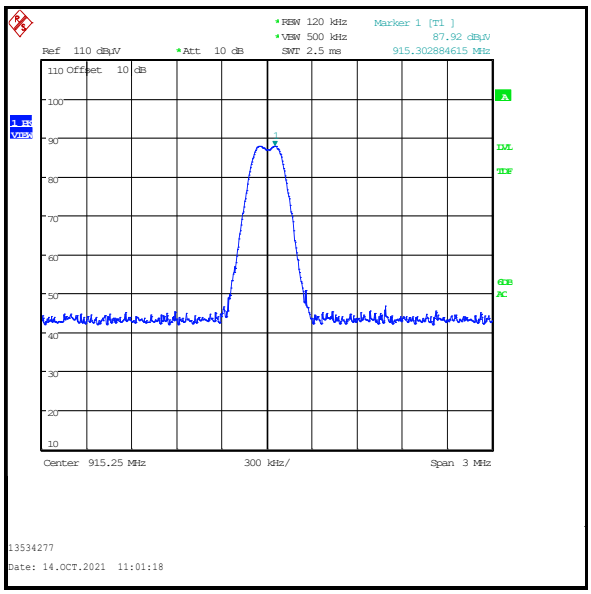
Results: 50 kbps / Top Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
927.226	Vertical	81.8	94.0	12.2	Complied

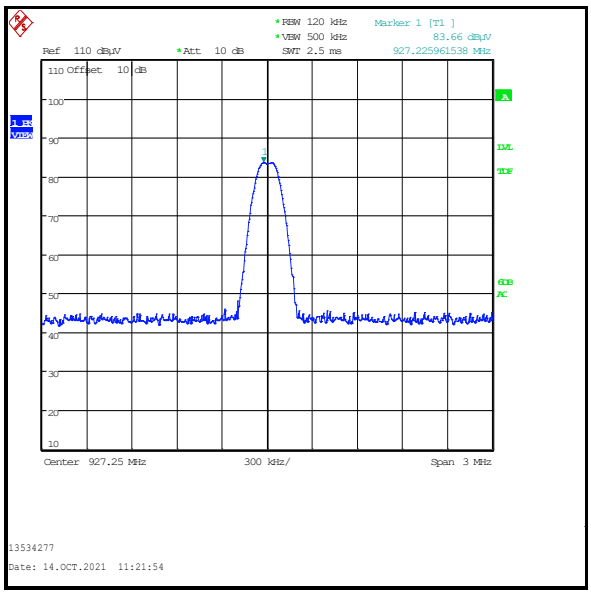
Transmitter Fundamental Field Strength (continued)



Bottom Channel



Middle Channel



Top Channel

Transmitter Fundamental Field Strength (continued)

Results: 100 kbps / Bottom Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
915.303	Vertical	85.8	94.0	8.2	Complied

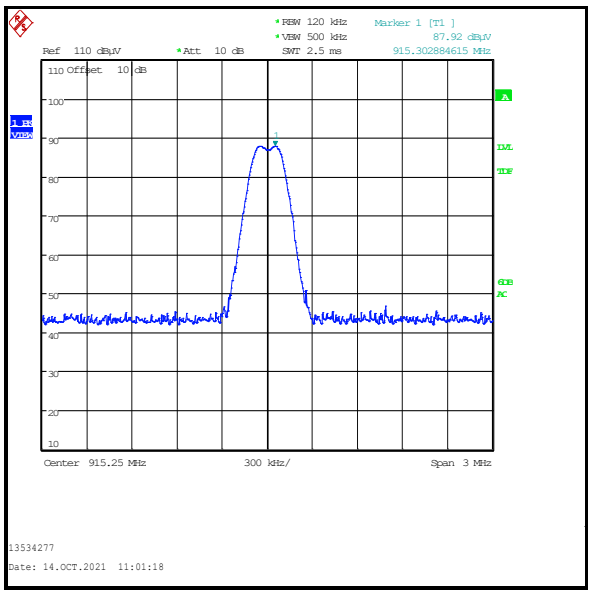
Results: 100 kbps / Middle Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
921.197	Vertical	83.3	94.0	10.7	Complied

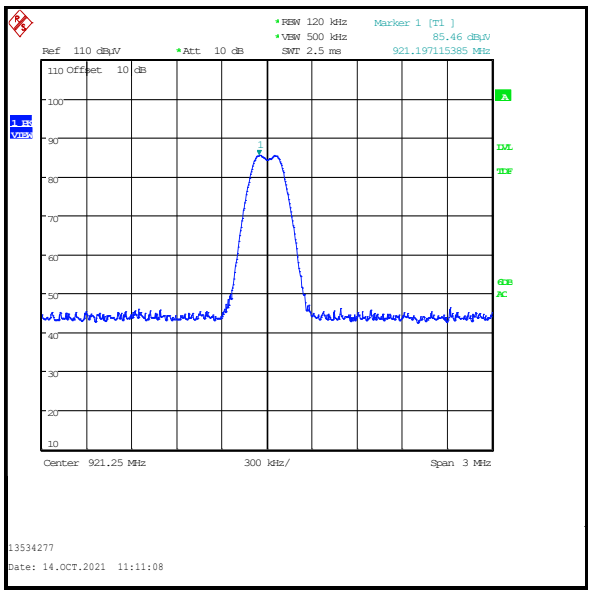
Results: 100 kbps / Top Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
927.202	Vertical	81.4	94.0	12.6	Complied

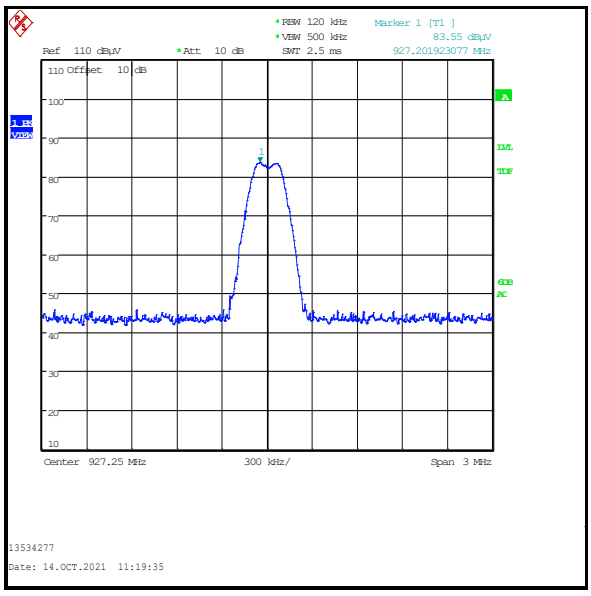
Transmitter Fundamental Field Strength (continued)



Bottom Channel



Middle Channel



Top Channel

Transmitter Fundamental Field Strength (continued)

Results: 300 kbps / Bottom Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
915.096	Vertical	82.9	94.0	11.1	Complied

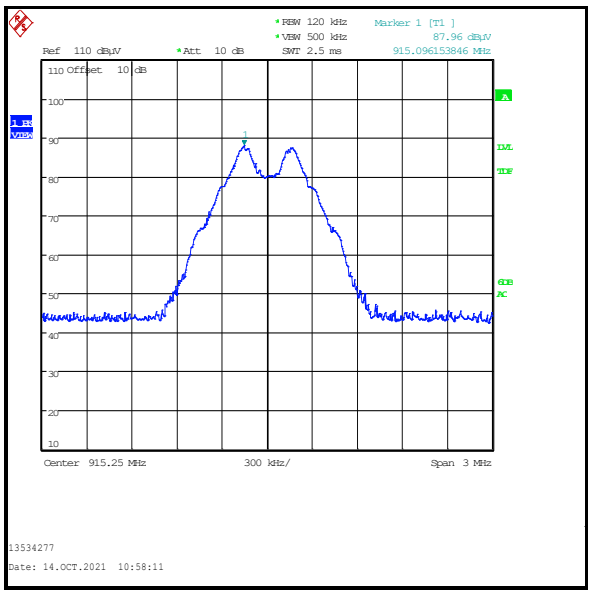
Results: 300 kbps / Middle Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
921.399	Vertical	80.5	94.0	13.5	Complied

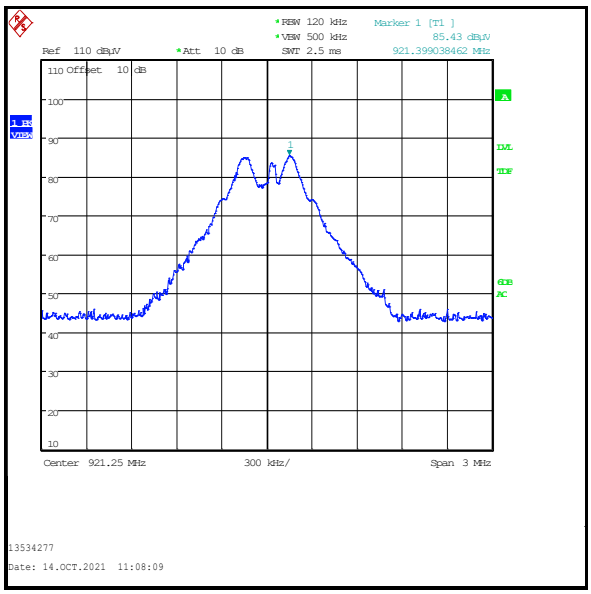
Results: 300 kbps / Top Channel / Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
927.413	Vertical	78.5	94.0	15.5	Complied

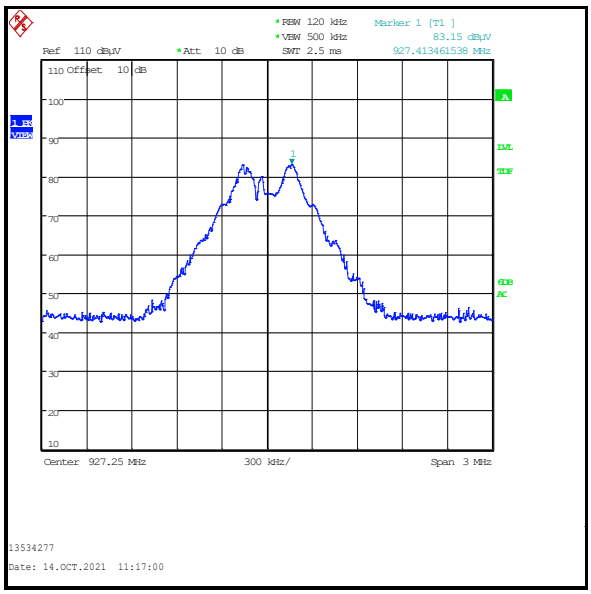
Transmitter Fundamental Field Strength (continued)



Bottom Channel



Middle Channel



Top Channel

4.2. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	John Ferdinand	**Test Dates:**	14 October 2021 & 18 January 2022
Test Sample Serial Number:	AZ000014		

FCC Reference:	Part 2.1049
Test Method Used:	ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	19 to 23
Relative Humidity (%):	36 to 46

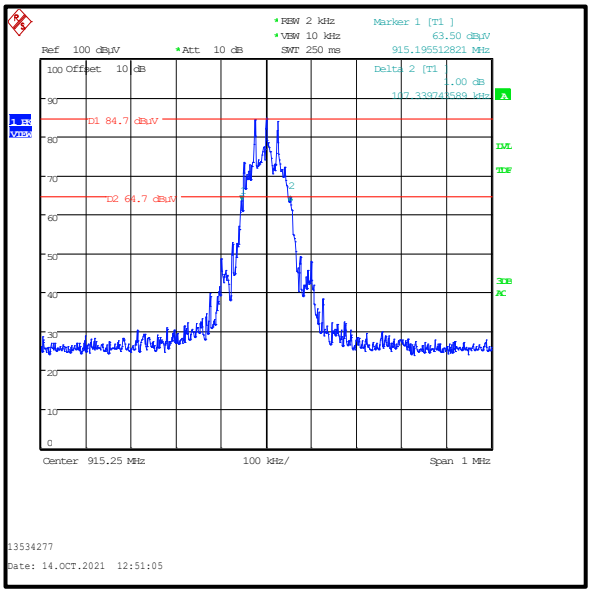
Note(s):

1. Transmitter 20 dB bandwidth was measured using the marker delta function of a spectrum analyser. The resolution bandwidth was set between 1 % and 5% of the occupied bandwidth and the video bandwidth set to 3 times the resolution bandwidth.
2. The spectrum analyser resolution bandwidth was set to 2 kHz (50 kbps), 3 kHz (100 kbps) or 10 kHz (300 kbps) and video bandwidth to 10 kHz (50 and 100 kbps) or 30 kHz (300 kbps). A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 1 MHz (50 and 100 kbps) or 3 MHz(300 kbps). Markers were placed 20 dB above and below the peak of the carrier. The marker delta function was used to calculate the 20 dB bandwidth. The results are recorded in the table below.

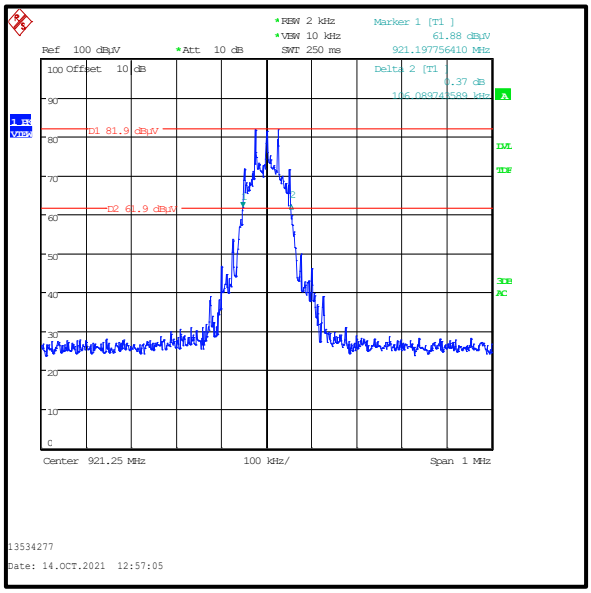
Transmitter 20 dB Bandwidth (continued)

Results: 50 kbps

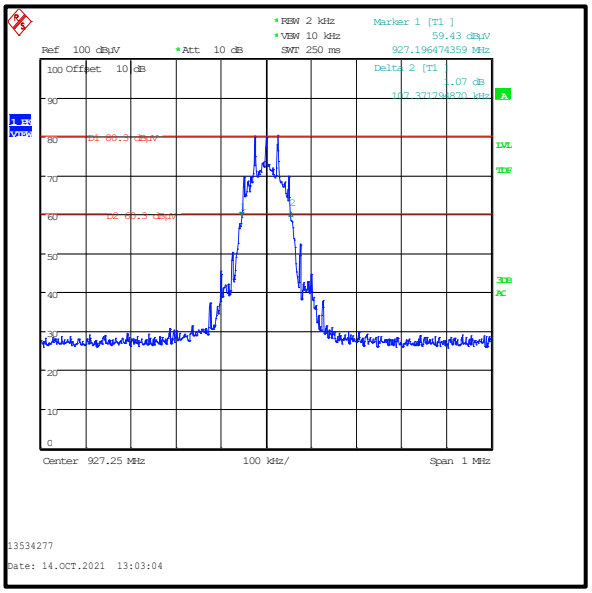
Channel	20dB Bandwidth (kHz)
Bottom	107.340
Middle	106.090
Top	107.372



Bottom Channel



Middle Channel

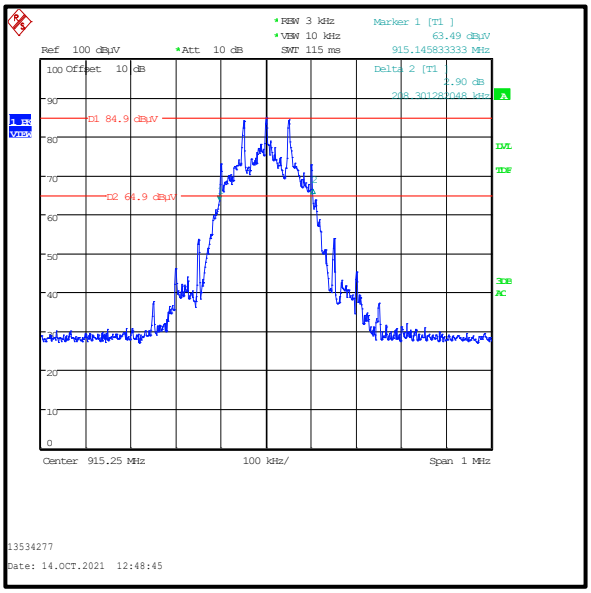


Top Channel

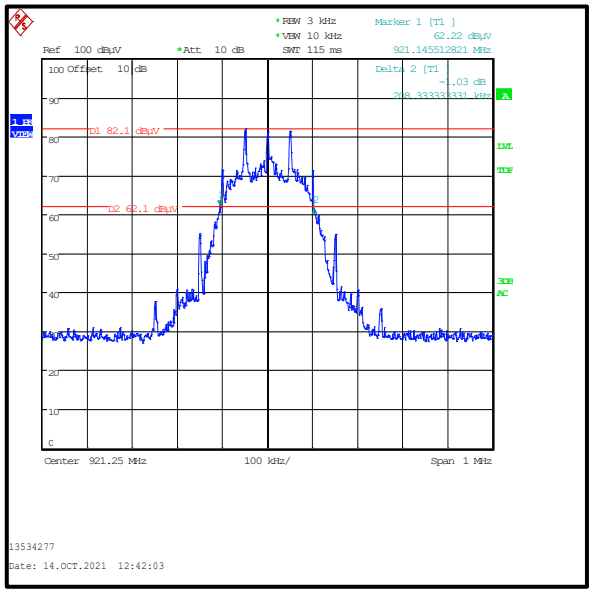
Transmitter 20 dB Bandwidth (continued)

Results: 100 kbps

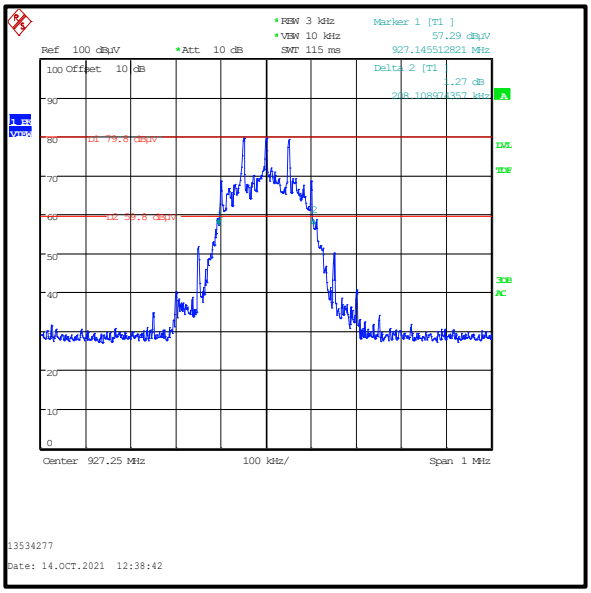
Channel	20dB Bandwidth (kHz)
Bottom	208.301
Middle	208.333
Top	208.109



Bottom Channel



Middle Channel

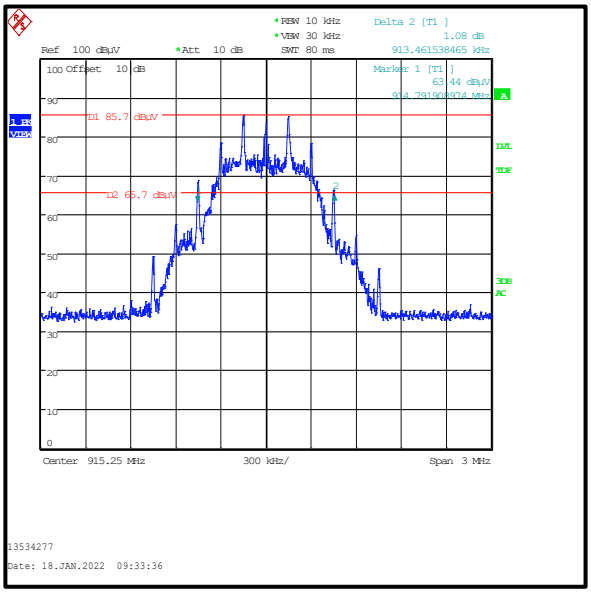


Top Channel

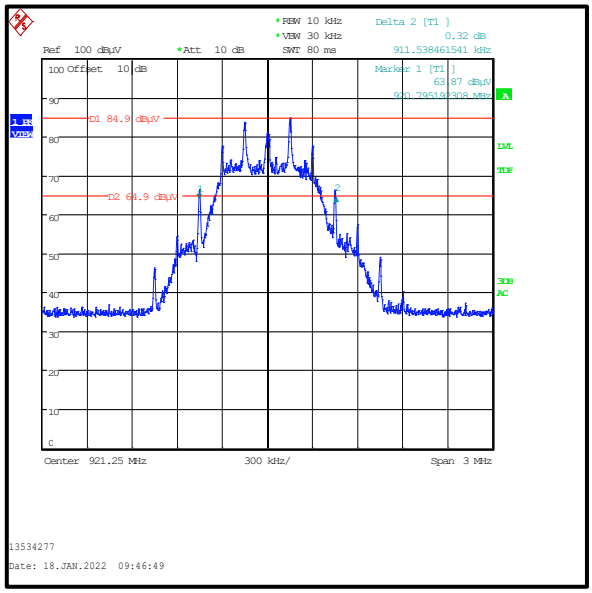
Transmitter 20 dB Bandwidth (continued)

Results: 300 kbps

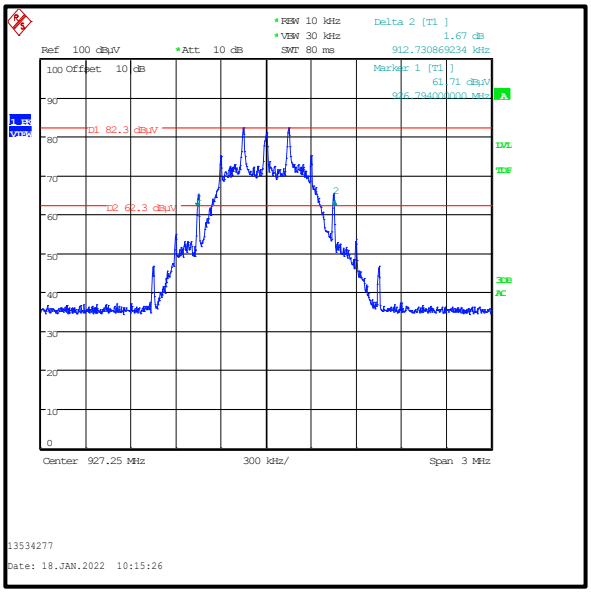
Channel	20dB Bandwidth (kHz)
Bottom	914.792
Middle	920.795
Top	926.794



Bottom Channel



Middle Channel



Top Channel

4.3 Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineer:	John Ferdinand	**Test Date:**	19 October 202
Test Sample Serial Number:	AZ000014		

FCC Reference:	Parts 15.249(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	47 to 50

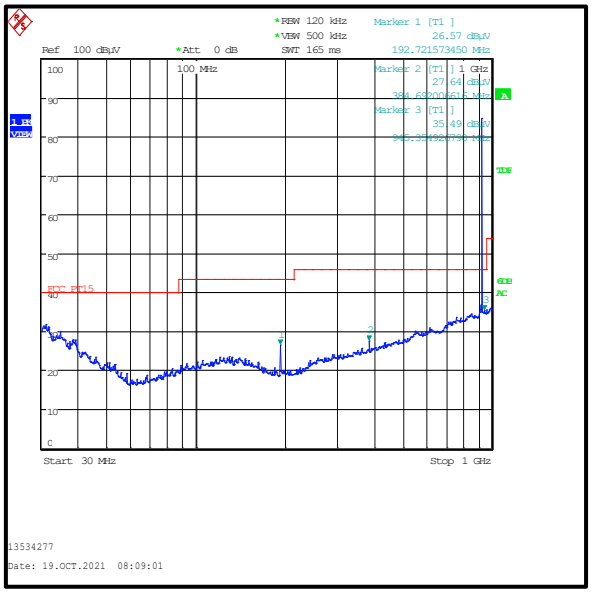
Note(s):

1. The emission at approximately 921 MHz 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-scans were investigated and found to be ambient, > 20 dB below the appropriate limit or below the noise floor of the measurement system. Therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Prescans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth 500 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.

Transmitter Radiated Emissions (continued)

Results: Middle Channel / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
945.354	Vertical	35.5	46.0	10.5	Complied



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

4.4 Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineer:	John Ferdinand	**Test Dates:**	19 October 2021 & 20 October 2021
Test Sample Serial Number:	AZ000014		

FCC Reference:	Parts 15.249(d)(e) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.6
Frequency Range	1 GHz to 9.3 GHz

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	47 to 50

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, >20 dB below the appropriate limit or below the measurement system noise floor.
3. *In accordance with ANSI C63.10 Section 6.6.4.3, Note 1, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
4. Pre-scans and final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K00001) 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. During prescans, all measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed with the EUT placed at a height of 1.5 metres 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. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz. The sweep time was set to auto. Peak and average measurements were performed with their respective detectors.

Transmitter Radiated Emissions (continued)

Results: Bottom Channel / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4575.626	Horizontal	49.7	54.0*	4.3	Complied
8238.657	Vertical	50.4	54.0*	3.6	Complied

Results: Middle Channel / Peak

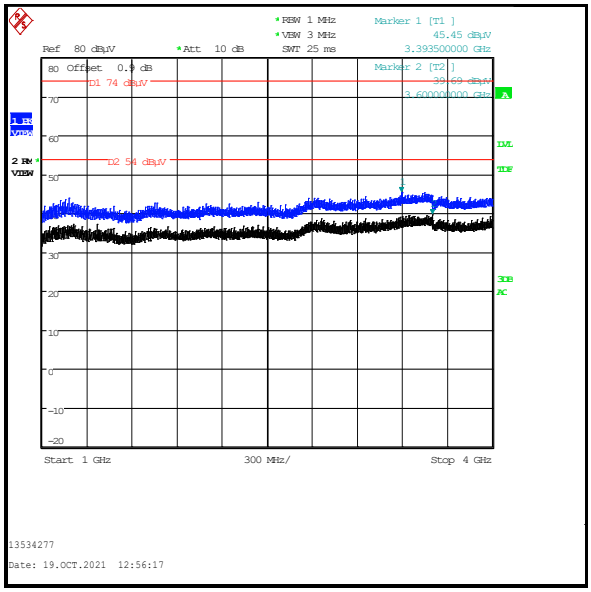
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4607.534	Horizontal	49.3	54.0*	7.0	Complied
8289.003	Vertical	53.0	54.0*	1.0	Complied

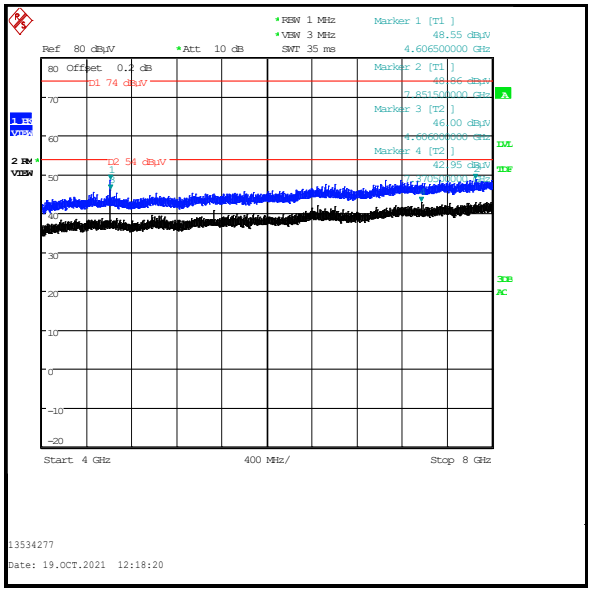
Results: Top Channel / Peak

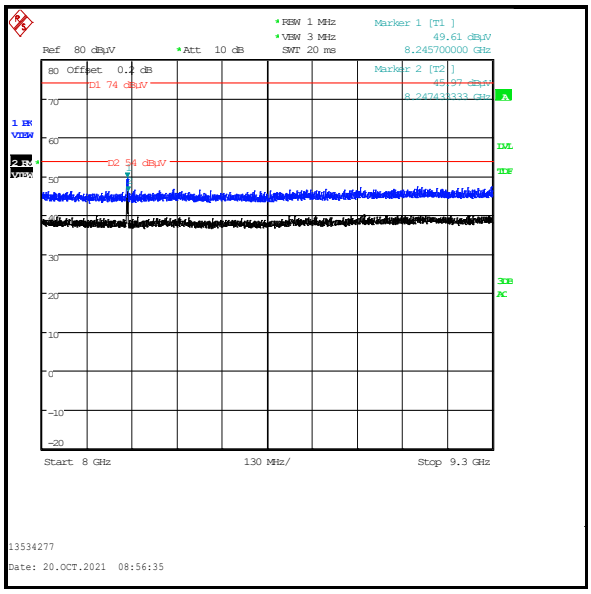
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4636.746	Horizontal	50.0	54.0*	4.0	Complied
8346.517	Vertical	52.2	54.0*	1.8	Complied

Transmitter Radiated Emissions (continued)

Results:







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

4.5 Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	John Ferdinand	**Test Date:**	14 October 2021
Test Sample Serial Number:	AZ000014		

FCC Reference:	Parts 15.249(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5 and 6.10

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	46

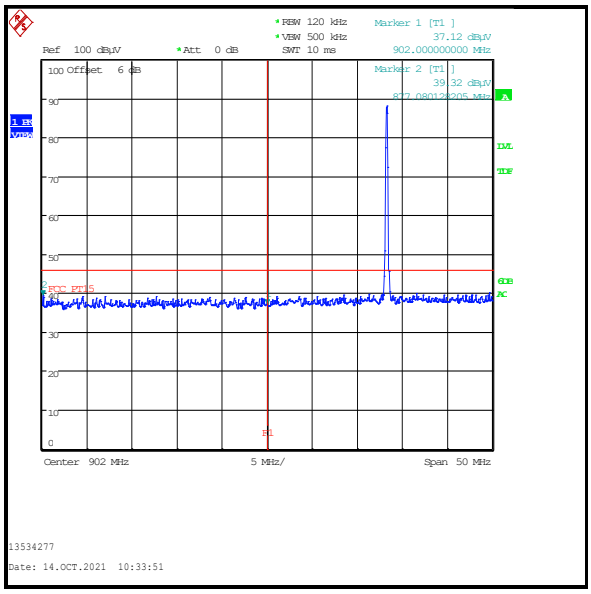
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. In accordance with FCC part 15.249(d), all emissions outside of the specified frequency band shall be attenuated by at least 50 dBc or the general radiated emission limits in 15.209 whichever has less attenuation.
3. As both band edges are adjacent to non-restricted bands, only peak measurements are required in accordance with ANSI C63.10 Section 6.10.4. The test receiver 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. 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 and an out-of-band limit line was placed below the peak level. Markers were placed on the band edge spot frequencies. Additional markers were placed on the highest emission levels outside the band edges (where a higher level emission was present). Marker frequencies and levels were recorded.

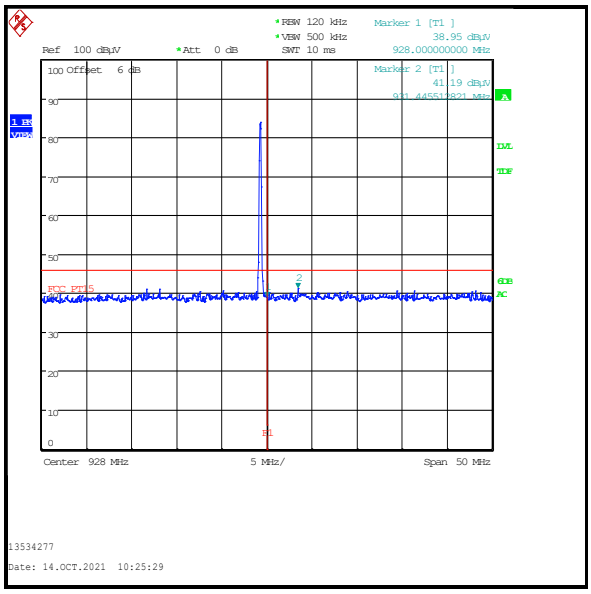
Transmitter Band Edge Radiated Emissions (continued)

Results: Peak / 50 kbps

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
877.080	Vertical	39.3	46.0	6.7	Complied
902	Vertical	37.1	46.0	8.9	Complied
928	Vertical	39.0	46.0	7.0	Complied
931.446	Vertical	41.2	46.0	4.8	Complied



Lower Band Edge

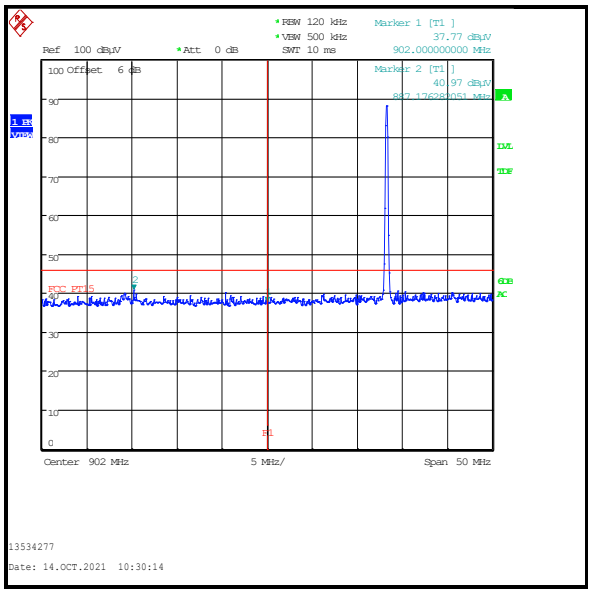


Upper Band Edge

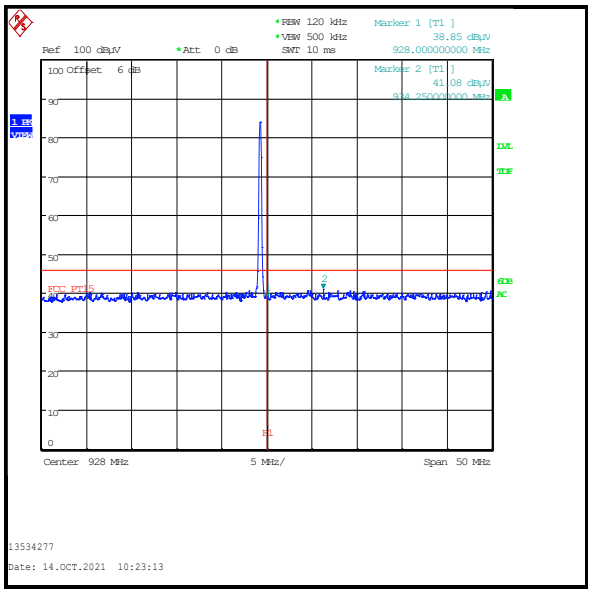
Transmitter Band Edge Radiated Emissions (continued)

Results: Peak / 100 kbps

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
887.176	Vertical	41.0	46.0	5.0	Complied
902	Vertical	37.8	46.0	8.2	Complied
928	Vertical	38.9	46.0	7.1	Complied
934.250	Vertical	41.1	46.0	4.9	Complied



Lower Band Edge

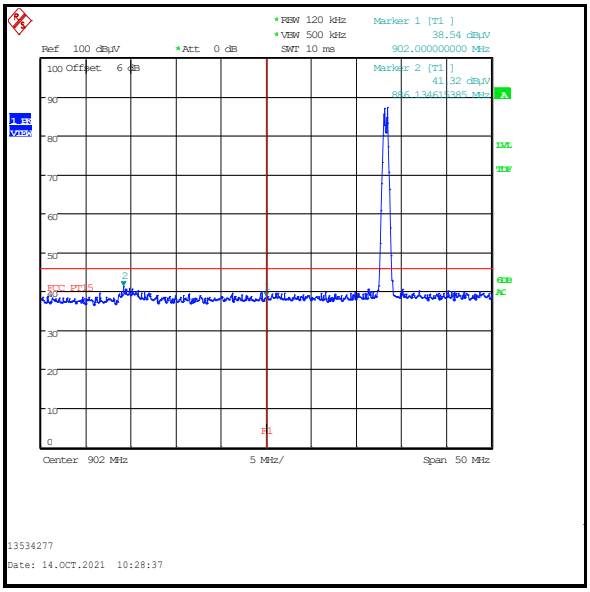


Upper Band Edge

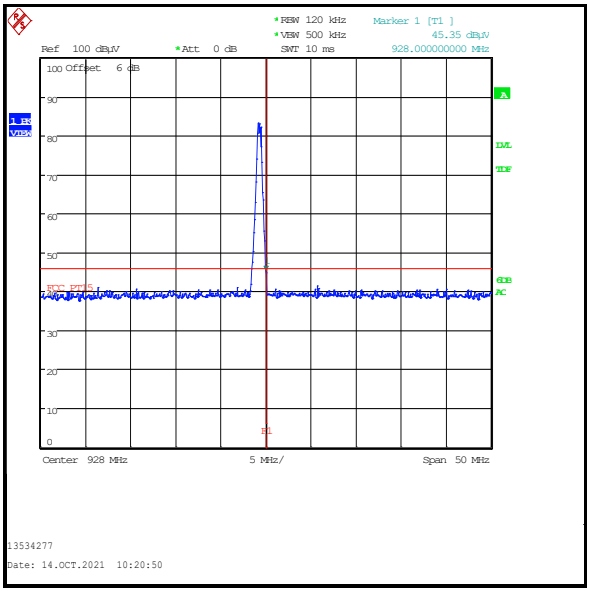
Transmitter Band Edge Radiated Emissions (continued)

Results: Peak / 300 kbps

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
886.135	Vertical	41.3	46.0	4.7	Complied
902	Vertical	38.5	46.0	7.5	Complied
928	Vertical	45.4	46.0	0.6	Complied



Lower Band Edge



Upper Band Edge

5 AC Power Line Conducted Emissions Test Results

5.1 Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineers:	Alison Johnston & Nick Raptopoulos	**Test Date:**	28 September 2021
Test Sample Serial Number:	AZ000014		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	50

Note(s):

1. The EUT 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 EUT power supply (120 -277 VAC).
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 recorded in the tables below.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.249000	Live	29.6	61.8	32.2	Complied
0.451500	Live	27.8	56.8	29.0	Complied
0.703500	Live	27.7	56.0	28.3	Complied
1.126500	Live	30.5	56.0	25.5	Complied
5.653500	Live	30.3	60.0	29.7	Complied
7.989000	Live	25.1	60.0	34.9	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.231000	Live	22.1	52.4	30.3	Complied
0.451500	Live	21.0	46.8	25.8	Complied
0.820500	Live	21.1	46.0	24.9	Complied
1.122000	Live	22.4	46.0	23.6	Complied
3.223500	Live	16.7	46.0	29.3	Complied
5.685000	Live	24.8	50.0	25.2	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

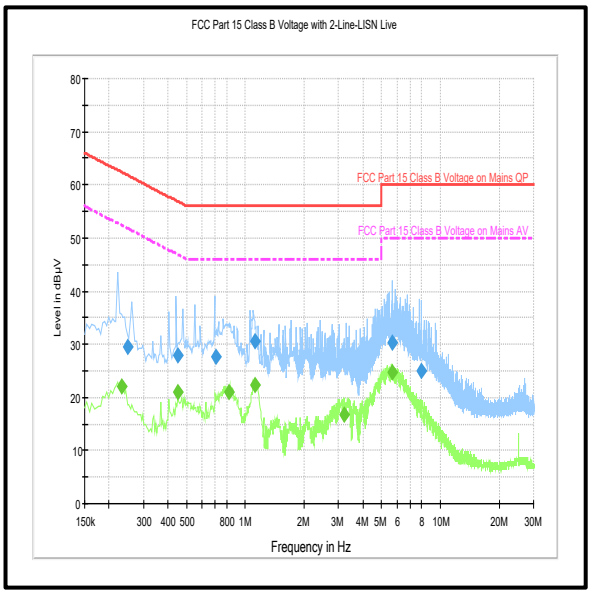
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.213000	Neutral	31.2	63.1	31.9	Complied
0.442500	Neutral	27.8	57.0	29.2	Complied
0.951000	Neutral	25.8	56.0	30.2	Complied
1.414500	Neutral	25.8	56.0	30.2	Complied
2.053500	Neutral	25.4	56.0	30.6	Complied
5.347500	Neutral	30.1	60.0	29.9	Complied

Results: Neutral / Average / 120 VAC 60 Hz

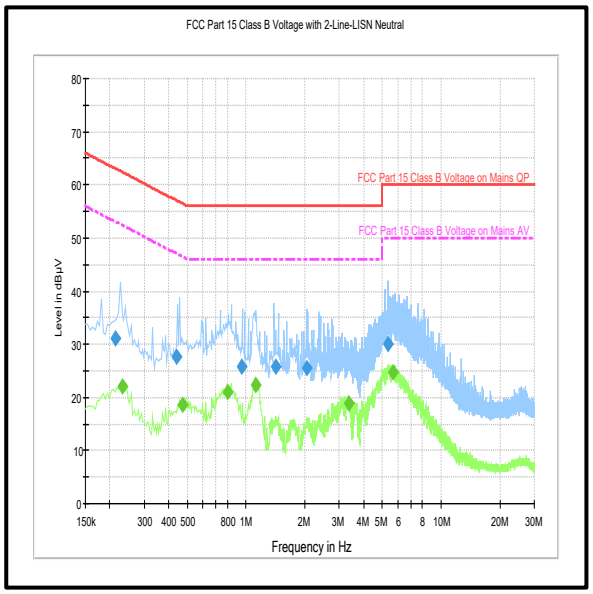
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.231000	Neutral	22.1	52.4	30.3	Complied
0.474000	Neutral	18.5	46.4	27.9	Complied
0.807000	Neutral	21.1	46.0	24.9	Complied
1.117500	Neutral	22.4	46.0	23.6	Complied
3.358500	Neutral	18.8	46.0	27.2	Complied
5.644500	Neutral	24.7	50.0	25.3	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 (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.330000	Live	33.7	59.5	25.8	Complied
0.438000	Live	31.8	57.1	25.3	Complied
0.870000	Live	31.0	56.0	25.0	Complied
1.149000	Live	31.0	56.0	25.0	Complied
5.752500	Live	32.5	60.0	27.5	Complied
7.656000	Live	28.2	60.0	31.8	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.240000	Live	26.2	52.1	25.9	Complied
0.784500	Live	23.7	46.0	22.3	Complied
1.122000	Live	23.0	46.0	23.0	Complied
3.925500	Live	23.0	46.0	23.0	Complied
5.329500	Live	29.3	50.0	20.7	Complied
6.936000	Live	26.3	50.0	23.7	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

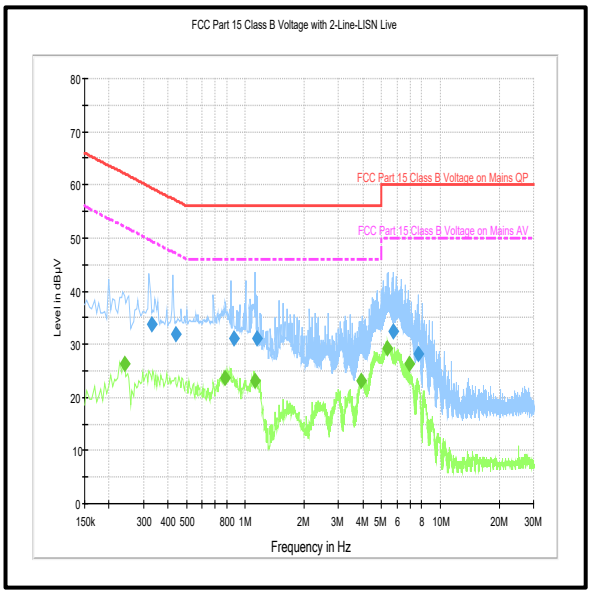
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.280500	Neutral	31.6	60.8	29.2	Complied
0.501000	Neutral	31.5	56.0	24.5	Complied
1.122000	Neutral	33.7	56.0	22.3	Complied
1.968000	Neutral	23.7	56.0	32.3	Complied
4.722000	Neutral	31.2	56.0	24.8	Complied
5.667000	Neutral	33.1	60.0	27.0	Complied

Results: Neutral / Average / 240 VAC 60 Hz

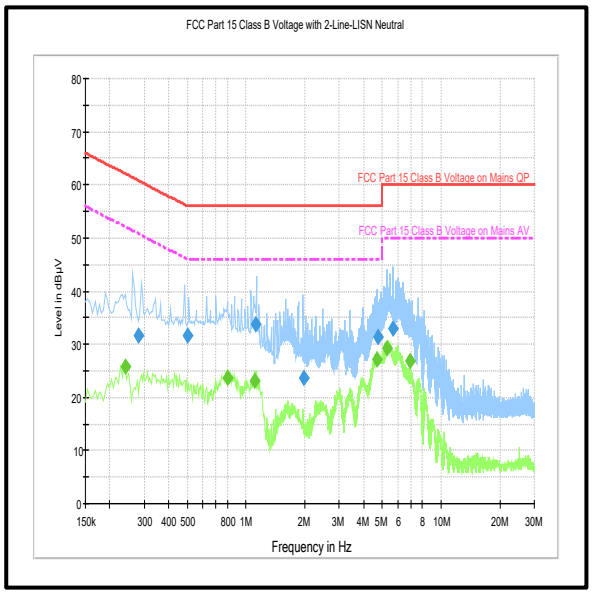
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.240000	Neutral	25.9	52.1	26.2	Complied
0.802500	Neutral	23.7	46.0	22.3	Complied
1.113000	Neutral	23.2	46.0	22.8	Complied
4.659000	Neutral	27.1	46.0	18.9	Complied
5.298000	Neutral	29.2	50.0	20.8	Complied
6.949500	Neutral	26.8	50.0	23.2	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.

Annex A

Untested Variants

The customer has declared that the following model numbers are identical in RF performance to the tested EUT as detailed in section 3.1.

Model Name or Number:	Syra RE 61456NF-915-H-WS
Model Name or Number:	Syra RE 61456NF-915-L-6L
Model Name or Number:	Syra RE 61456NF-915-L-WS

'L' and 'H' indicate whether a low or high voltage relay is used (120-230V vs 120-277V).

'6L' and 'WS' indicate whether 6LoWPAN or WiMesh firmware is used (both using the same 802.15.4 physical layer and RF parameters).

--- END OF REPORT ---