TEST REPORT

Test Report No. : UL-RPT-RP-13534277-3416-2-FCC

Applicant	:	Umpi S.r.l
Model No.	:	Syra RE-C 61456NCF-915-H-6L
FCC ID	:	Contains FCC ID: 2A3M2-25A083
Technology	:	802.15.4 (6LoWPAN/WiMesh)
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.249 For details of applied tests refer to test result summary

1. This test report shall not be reproduced in full or partial, without the written approval of UL International Germany GmbH.
2. The results in this report apply only to the sample tested.
3. The test results in this report are traceable to the national or international standards.
4. **Test Report Version 1.1 supersede Version 1.0 with immediate effect**
   Test Report No. UL-RPT-RP-13534277-3416-2-V1.1-FCC Version 1.1, Issue Date 05 DECEMBER 2022 replaces
   Test Report No. UL-RPT-RP-13534277-3416-2-FCC Version 1.0, Issue Date 16 NOVEMBER 2022, which is no longer valid.
5. Result of the tested sample: **PASS**

Prepared by: Muhamamd Faiq, Khan
Title: Project Engineer
Date: 05 December 2022

Approved by: Rachid, Acharkaoui
Title: Operations Manager
Date: 05 December 2022

ilac-MRA

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

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1. Customer Information

1.1. Applicant Information

Company Name:	Umpi S.r.l
Company Address:	Via S.S. Consolare Rimini-RSM 11, 47923 Rimini, Italy
Company Phone No.:	+39 0541 833160
Company E-Mail:	info@umpi.it
Contact Person:	Luca Pietro Borsani
Contact E-Mail Address:	lucapietro.borsani@dplatforms.it
Contact Phone No.:	+39 0331 4561 59

1.2. Manufacturer Information

Company Name:	Umpi S.r.l
Company Address:	Via S.S. Consolare Rimini-RSM 11, 47923 Rimini, Italy
Company Phone No.:	+39 0541 833160
Company E-Mail:	info@umpi.it
Contact Person:	Luca Pietro Borsani
Contact E-Mail Address:	lucapietro.borsani@dplatforms.it
Contact Phone No.:	+39 0331 4561 59

2. Summary of Testing

2.1. General Information

Applied Standards

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 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.209

Location

Location of Testing:	UL International Germany GmbH Hedelfinger Str. 61 70327 Stuttgart Germany
Test Firm Registration:	399704

Date information

Order Date:	30 September 2020
EUT Arrived:	09 June 2022
Test Dates:	21 July 2022 to 01 December 2022
EUT Returned:	-/-

2.2. Summary of Test Results

Clause	Measurement	Complied	Did not comply	Not performed	Not applicable
Part 15.207	Transmitter AC Conducted Emissions	☒	☐	☐	☐
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	☒	☐	☐	☐

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	FCC KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.4. 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.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Umpi
Model Name or Number:	Syra RE-C 61456NCF-915-H-6L
Test Sample Serial Number:	BB915003 (Radiated Test Sample)
Hardware Version Number:	25A080 + 25A022
Firmware Version Number:	1.1.1
FCC ID:	Contains FCC ID: 2A3M2-25A083

Brand Name:	Umpi
Model Name or Number:	Syra RE-C 61456NCF-915-H-6L
Test Sample Serial Number:	BB915002 (Conducted Test Sample)
Hardware Version Number:	25A080 + 25A022
Firmware Version Number:	1.1.1
FCC ID:	Contains FCC ID: 2A3M2-25A083

3.2. Untested Variants

Model Name or Number:	Syra RE-C 61456NCF-915-H-WS
Model Name or Number:	Syra RE-C 61456NCF-915-L-6L
Model Name or Number:	Syra RE-C 61456NCF-915-L-WS
Model Name or Number:	Syra RE-ZC 61556CF-915-6L
Model Name or Number:	Syra RE-ZC 61556CF-915-WS

Note(s):

1. As per applicant's declaration these variants are identical to the tested model from an RF perspective. Further information is provided in Annex A.

3.3. Description of EUT

The equipment under test was an point-to-point transceiver used for lightning system control in urban and rural installations with Model: Syra RE-C 61456NCF-915-H-LW supporting 6LoWPAN technology in 902-928MHz range containing module with FCC ID: 2A3M2-25A083.

3.4. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.5. Additional Information Related to Testing

Technology Tested:	802.15.4 (6LoWPAN / WiMesh)		
Type of Unit:	Transceiver		
Modulation Type:	FSK		
Tested Data Rates:	50, 100 & 300 kbps		
Power Supply Requirement(s):	Nominal	120 VAC	
Channel Spacing:	500 kHz		
Antenna Gain:	2.0 dBi		
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	40	925.25

3.6. Support Equipment

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

A. Support Equipment (In-house)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Test Laptop PC With test software Tera Term	HP	HP Probook 650 G1	5CG614419V

B. Support Equipment (Manufacturer supplied)

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

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):
☒ Continuous Transmitting Mode - Fixed Channel Frequency Mode. • | Bottom Channel | 915.25 MHz | Data rate 50/100/300 kbps | MAX PWR 22 dBm | • | Middle Channel | 921.25 MHz | Data rate 50/100/300 kbps | MAX PWR 22 dBm | • | Top Channel | 925.25 MHz | Data rate 50/100/300 kbps | MAX PWR 22 dBm |

4.2. Configuration and Peripherals

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

EUT Power Supply:

- The EUT was powered via AC power supply. The measurements were carried out with 120 VAC / 60 Hz.

Test Mode Activation:

- The customer provided Test instruction guide ‘’EX01-T0004_20220503_A_Syra_MiniGW_Test_Instructions’’ issued on 03 May 2022 was used to configure the EUT into respective testmodes.
- The EUT was connected to the Test laptop via a USB-UART cable. The Terminal software ‘’Tera Term’’ was used to give the commands for respective modes.
- It was possible to select the above mentioned three different channels in continuous transmit mode , the data rate and the power levels.

AC Conducted Emissions Measurements:

- The EUT radiated sample was used for AC conducted emissions measurements.
- The Toyo EMI Software EP5/CE Ver 4.0.1. was used for these measurements.

Conducted Measurements:

- All conducted measurements were carried out by using conducted samples.
- The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values takes into consideration the external attenuation correction factors.The U.FL-SMA (Female) RF Cable with maximum attenuation of 0.4 dB at the tested frequencies.The RF cable attenuation maximum 0.3 dB@ tested frequencies from the EUT to Analyzer including the 10 dB attenuation at the input of Spectrum Analyzer Therefore, total a reference level offset 10.7 dB was added to each of the at the tested frequencies conducted plots.

Radiated Measurements:

- The radiated samples were used for radiated testing.
- Before starting final radiated measurments “worst case verification” with the EUT in Standing-position & Laying-position was performed by Lab.
- The EUT in Standing-position was found to be the worst case therefore this report includes relevant results.
- Radiated measurements below 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the loop antenna height was set at 100 cm.
- Radiated measurments were performed with the EUT positioned on the turn table and rotating 360 degrees while the antenna height varies from 1 m to 4 m over the measurement frequency range
- EMC32 V11.30.0 Software was used for the Radiated spurious emission measurements.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 6 *Measurement Uncertainty* for details.

In accordance with DAkkS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Muhammad Faiq Khan	**Test Date:**	28 September 2022 & 30 November 2022
Test Sample Serial Number:	BB915003 (Radiated Test Sample)		
Test Site Identification	SR 7/8		

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

Environmental Conditions:

Temperature (°C):	20.1 to 24.6
Relative Humidity (%):	41.8 to 48.6

Settings of the Instrument:

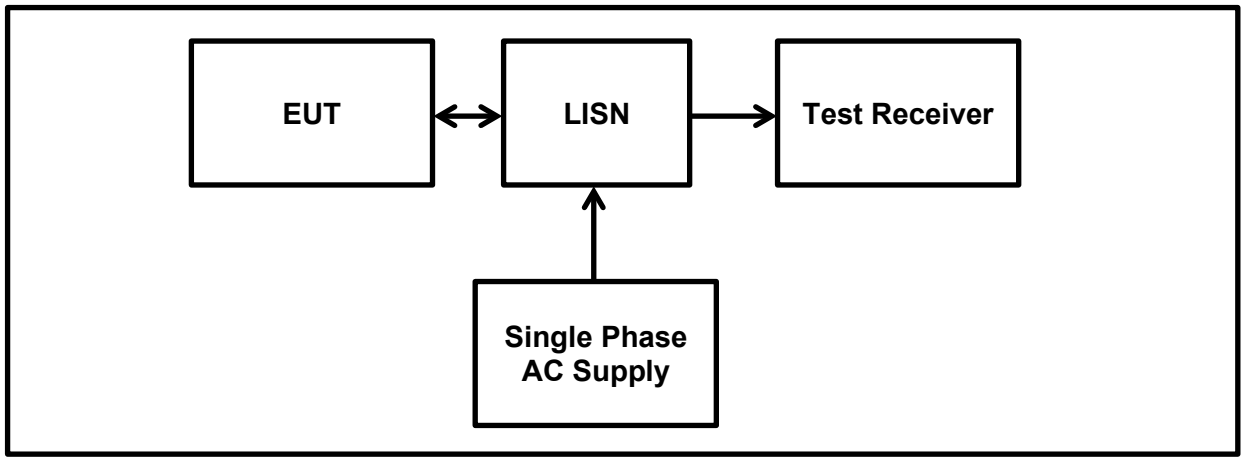
Detector:	Quasi Peak/ Average Peak

Note(s):

1. The EUT radiated sample was used for AC conducted emissions measurements.
2. The EUT was powered via AC power supply. The measurement was performed with 120 VAC/60Hz and 240VAC/60Hz as it was within the voltage range of the device.
3. The EUT was configured on the following worst-case mode.
   - LoWPAN / MAX PWR / Middle Channel / 300 kbps
4. Pre-scans were performed, and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
5. The final measured value, for the given emission, in the table below incorporates the cable loss.
6. All other emissions shown on the pre-scan plot were investigated. Only the highest 6 emissions have been reported in the tables below in accordance with ANSI C63.10 section 6.2.5.
7. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.
8. Measurement software used: Toyo EMI Software; CE measurement software EP5/CE Ver 4.0.1.

Transmitter AC Conducted Spurious Emissions (continued)

Test setup:



Transmitter AC Conducted Spurious Emissions (continued)

Results : Middle Channel / MAX PWR / 300 kbps

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.217130	Live	22.80	62.90	40.10	Complied
0.759720	Live	28.80	56.00	27.20	Complied
3.214430	Live	24.50	56.00	31.50	Complied
9.042080	Live	27.50	60.00	32.50	Complied
10.079160	Live	25.20	60.00	34.80	Complied
13.432870	Live	20.40	60.00	39.60	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.217130	Live	15.30	52.90	37.60	Complied
0.759720	Live	19.80	46.00	26.20	Complied
3.214430	Live	16.80	46.00	29.20	Complied
9.042080	Live	21.10	50.00	28.90	Complied
10.079160	Live	17.90	50.00	32.10	Complied
13.432870	Live	13.50	50.00	36.50	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.184570	Neutral	26.90	64.30	37.40	Complied
0.243690	Neutral	34.80	62.00	27.20	Complied
0.257210	Neutral	36.50	61.50	25.00	Complied
0.529260	Neutral	28.70	56.00	27.30	Complied
1.135870	Neutral	33.20	56.00	22.80	Complied
4.757520	Neutral	33.50	56.00	22.50	Complied
5.977960	Neutral	38.60	60.00	21.40	Complied

Transmitter AC Conducted Spurious Emissions (continued)

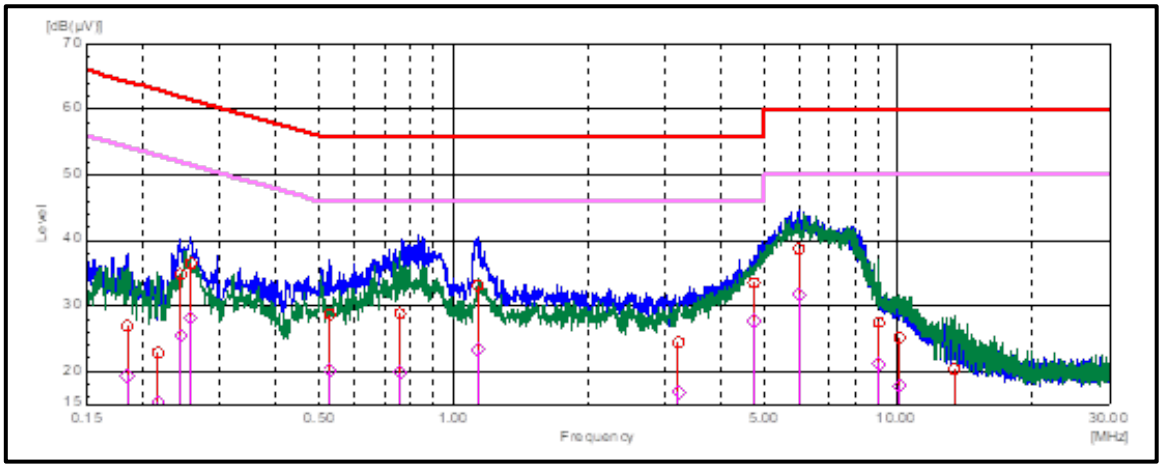
Results : Middle Channel / MAX PWR / 300 kbps

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.184570	Neutral	19.40	54.30	34.90	Complied
0.243690	Neutral	25.50	52.00	26.50	Complied
0.257210	Neutral	28.20	51.50	23.30	Complied
0.529260	Neutral	20.10	46.00	25.90	Complied
1.135870	Neutral	23.30	46.00	22.70	Complied
4.757520	Neutral	27.60	46.00	18.40	Complied
5.977960	Neutral	31.60	50.00	18.40	Complied

Result: Pass

Plot: Live and Neutral Line / 120 VAC 60 Hz



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

Transmitter AC Conducted Spurious Emissions (continued)

Results : Middle Channel / MAX PWR / 300 kbps

Results: Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.236670	Live	35.60	62.20	26.60	Complied
0.264730	Live	33.40	61.30	27.90	Complied
0.352400	Live	29.60	58.90	29.30	Complied
0.857920	Live	38.30	56.00	17.70	Complied
1.173350	Live	42.60	56.00	13.40	Complied
5.718440	Live	40.30	60.00	19.70	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.236670	Live	28.20	52.20	24.00	Complied
0.264730	Live	27.10	51.30	24.20	Complied
0.352400	Live	22.10	48.90	26.80	Complied
0.857920	Live	28.70	46.00	17.30	Complied
1.173350	Live	30.50	46.00	15.50	Complied
5.718440	Live	34.30	50.00	15.70	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.165530	Neutral	32.40	65.20	32.80	Complied
0.506210	Neutral	28.40	56.00	27.60	Complied
0.643490	Neutral	30.50	56.00	25.50	Complied
1.790580	Neutral	28.00	56.00	28.00	Complied
4.140280	Neutral	32.00	56.00	24.00	Complied
12.511020	Neutral	15.30	60.00	44.70	Complied

Transmitter AC Conducted Spurious Emissions (continued)

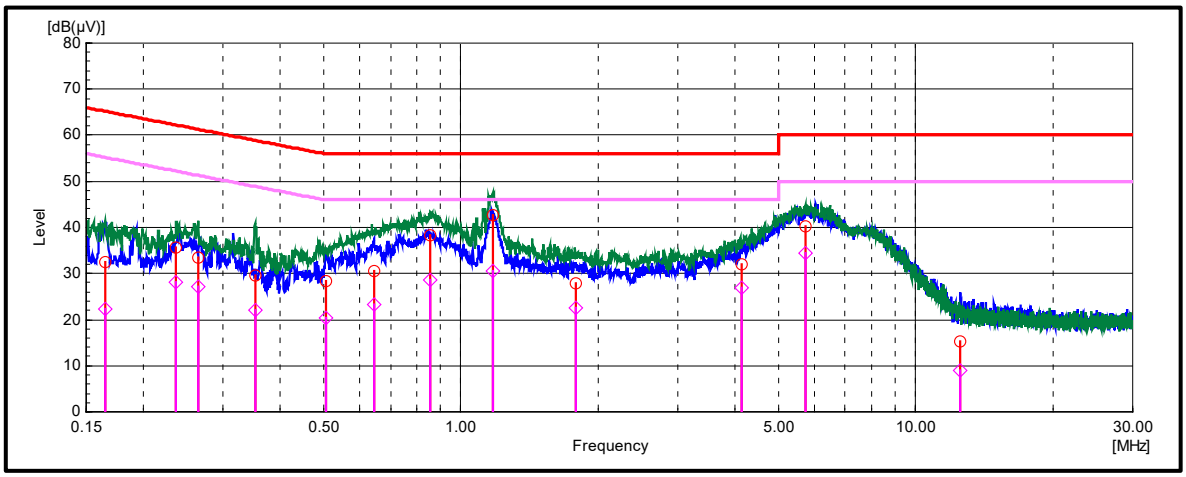
Results : Middle Channel / MAX PWR / 300 kbps

Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.165530	Neutral	22.30	55.20	32.90	Complied
0.506210	Neutral	20.30	46.00	25.70	Complied
0.643490	Neutral	23.20	46.00	22.80	Complied
1.790580	Neutral	22.50	46.00	23.50	Complied
4.140280	Neutral	26.80	46.00	19.20	Complied
12.511020	Neutral	9.00	50.00	41.00	Complied

Result: Pass

Plot: Live and Neutral Line / 240 VAC 60 Hz



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

5.2.2. Transmitter Fundemantal Field Strength

Test Summary:

Test Engineer:	Muhammad Faiq Khan	**Test Date:**	08 September 2022
Test Sample Serial Number:	BB915003 (Radiated Test Sample)		
Test Site Identification	SR 1/2		

FCC Reference:	Part 15.249(a)(e)
Test Method Used:	ANSI C63.10:2013 Section 6.5

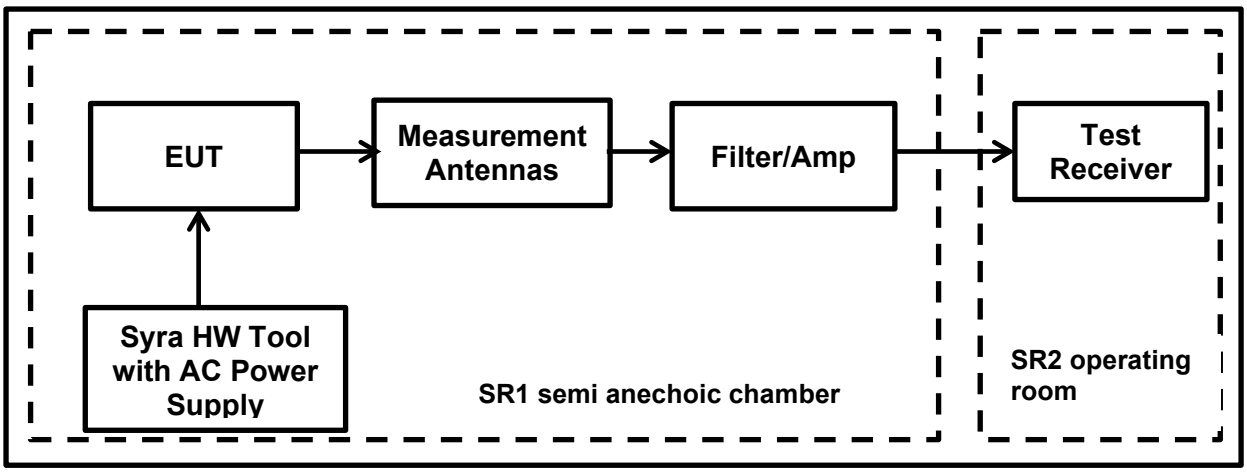
Environmental Conditions:

Temperature (°C):	22.5
Relative Humidity (%):	51.1

Notes:

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 100 kHz and video bandwidth 300 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.

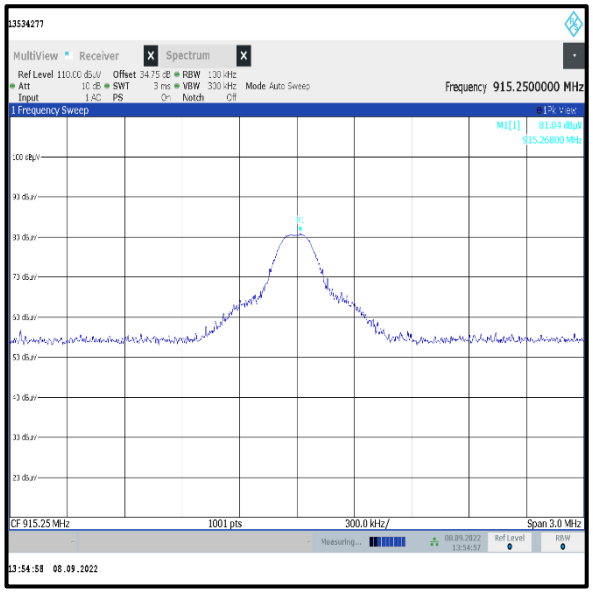
Test Setup:



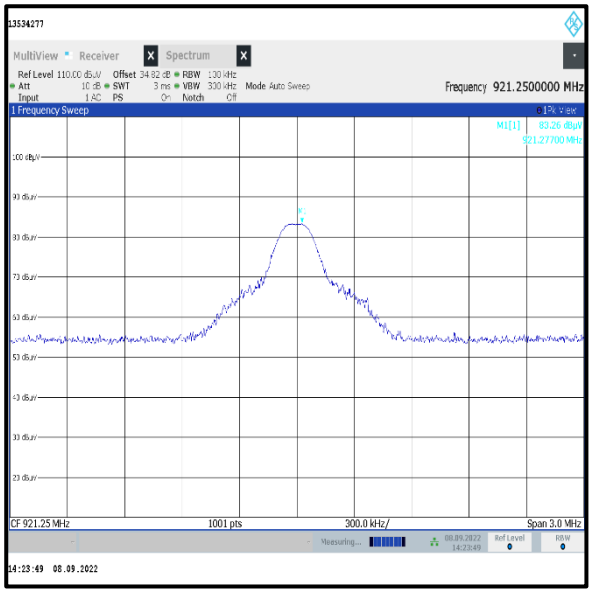
Transmitter Fundemantal Field Strength (continued)

Results: 50 kbps / Quasi-Peak

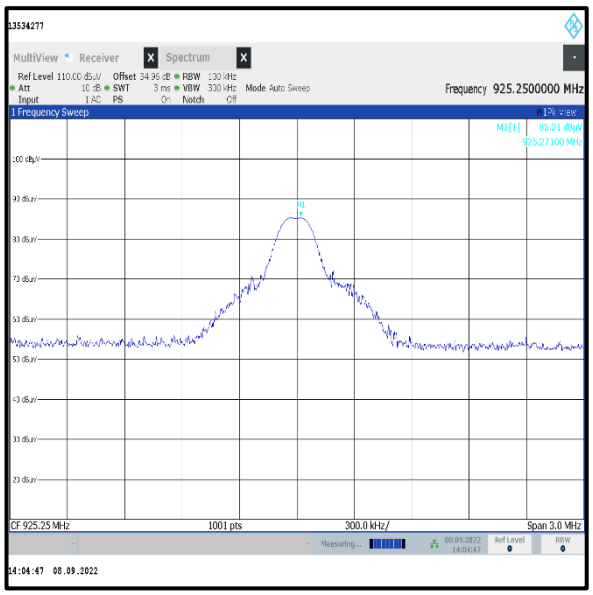
Channel	Frequency (MHz)	Antenna Polarity	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
Bottom	915.268	0° to EUT	81.04	94.00	12.96	Complied
Middle	921.277	0° to EUT	83.26	94.00	10.74	Complied
Top	925.271	0° to EUT	85.31	94.00	8.69	Complied



Bottom Channel



Middle Channel



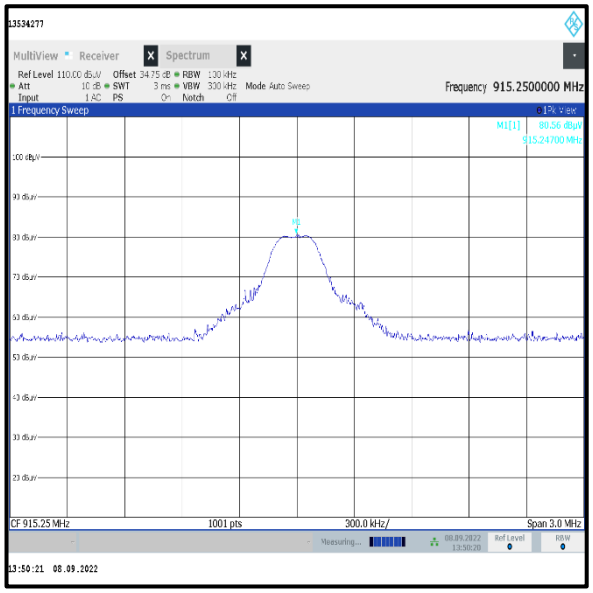
Top Channel

Result: Pass

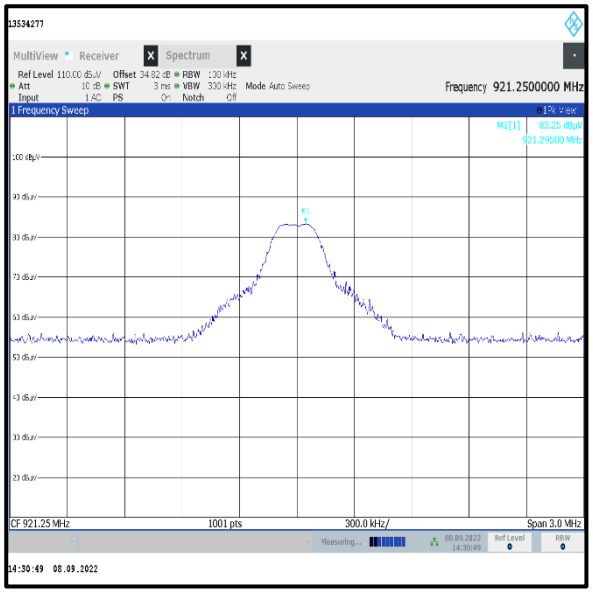
Transmitter Fundemantal Field Strength (continued)

Results: 100 kbps / Quasi-Peak

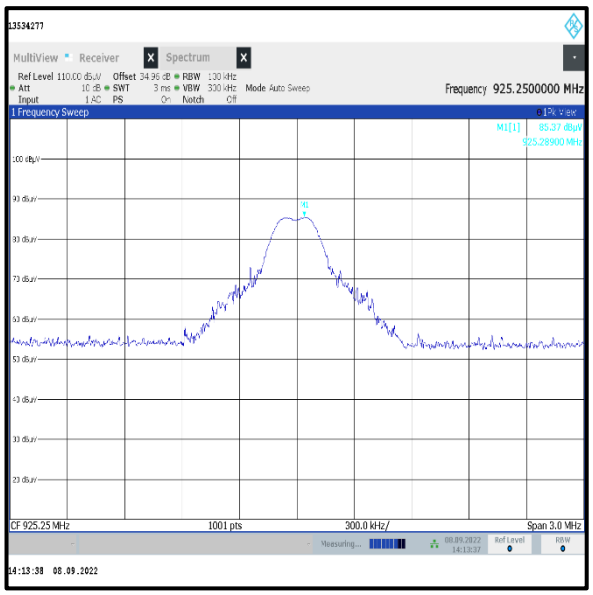
Channel	Frequency (MHz)	Antenna Polarity	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
Bottom	915.247	0° to EUT	80.56	94.00	13.44	Complied
Middle	921.295	0° to EUT	83.25	94.00	10.75	Complied
Top	925.289	0° to EUT	85.37	94.00	8.63	Complied



Bottom Channel



Middle Channel



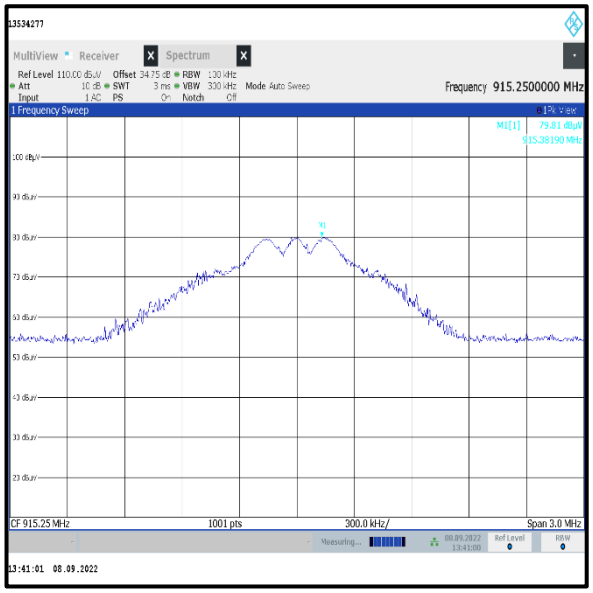
Top Channel

Result: Pass

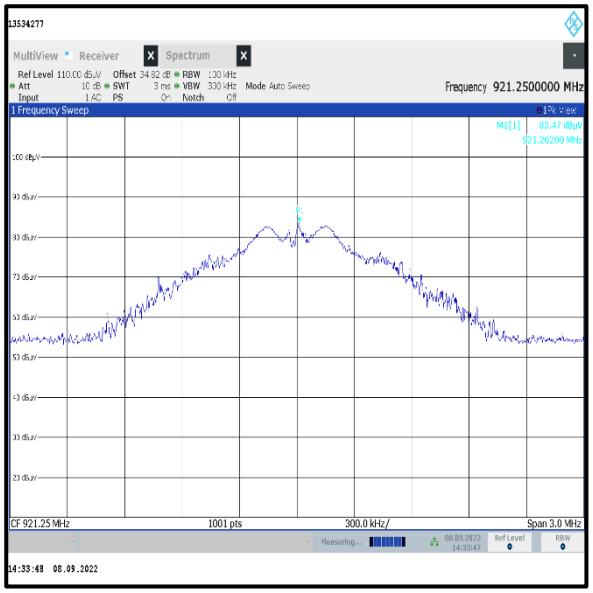
Transmitter Fundemantal Field Strength (continued)

Results: 300 kbps / Quasi-Peak

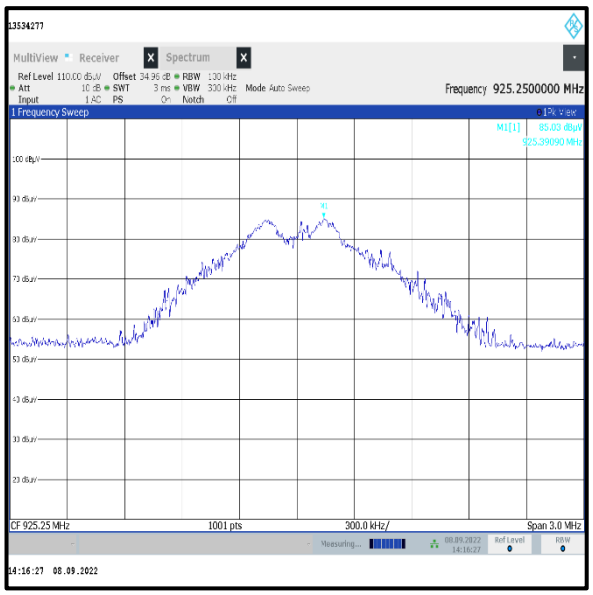
Channel	Frequency (MHz)	Antenna Polarity	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
Bottom	915.381	0° to EUT	79.81	94.00	14.19	Complied
Middle	921.262	0° to EUT	83.47	94.00	10.53	Complied
Top	925.391	0° to EUT	85.03	94.00	8.97	Complied



Bottom Channel



Middle Channel



Top Channel

Result: Pass

5.2.3. Transmitter Minimum 20 dB Bandwidth

Test Summary:

Test Engineer:	Muhammad Faiq Khan	**Test Date:**	21 July 2022 & 30 September 2022
Test Sample Serial Number:	BB915002 (Conducted Test Sample)		
Test Site Identification	SR 9		

FCC Reference:	Part 2.1049
Test Method Used:	ANSI C63.10:2013 Section 6.9.2

Environmental Conditions:

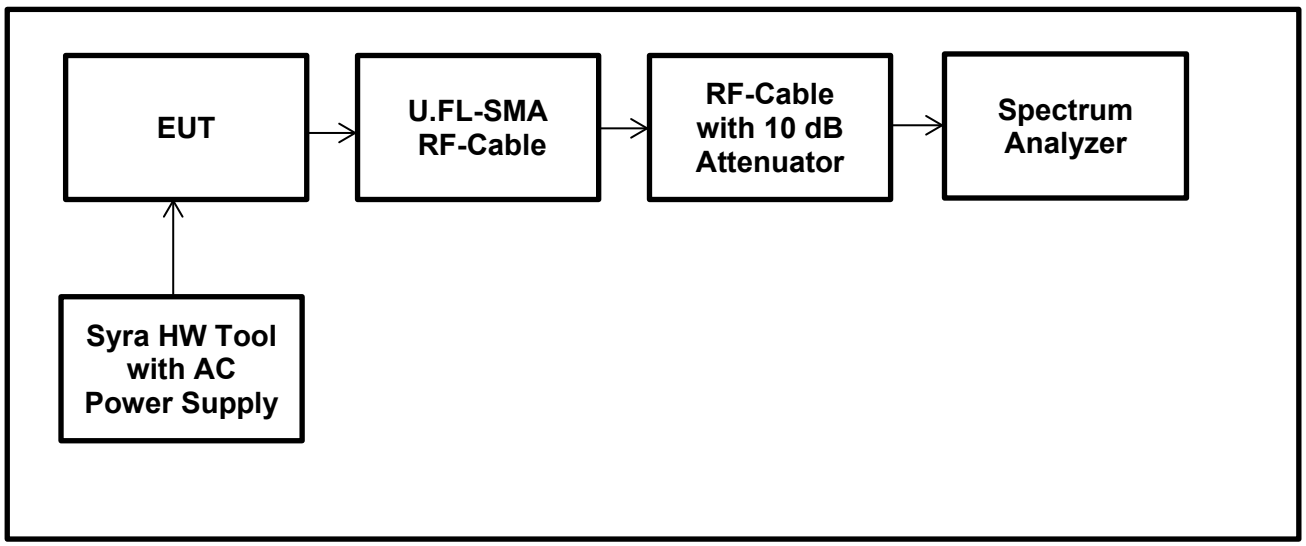
Temperature (°C):	22.3 to 24.8
Relative Humidity (%):	40.9 to 60.5

Notes:

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 3 kHz (50 kbps), 3 kHz (100 kbps) and 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 500kHz (50 kbps), 1 MHz (100 kbps) and 3 MHz(300 kbps). Markers were placed 20 dB 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.
3. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values takes into consideration the external attenuation correction factors.
   - The U.FL-SMA (Female) RF Cable with maximum attenuation of 0.3 dB at the tested frequencies.
   - The RF cable attenuation maximum 0.4 dB@ tested frequencies from the EUT to Analyzer including the 10 dB attenuation at the input of Spectrum Analyzer

   Therefore, total a reference level offset 10.7 dB was added to each of the at the tested frequencies conducted plots.

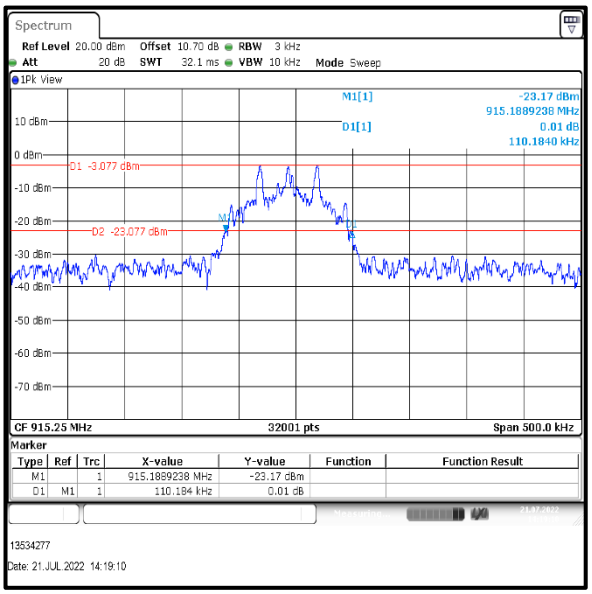
Test Setup:



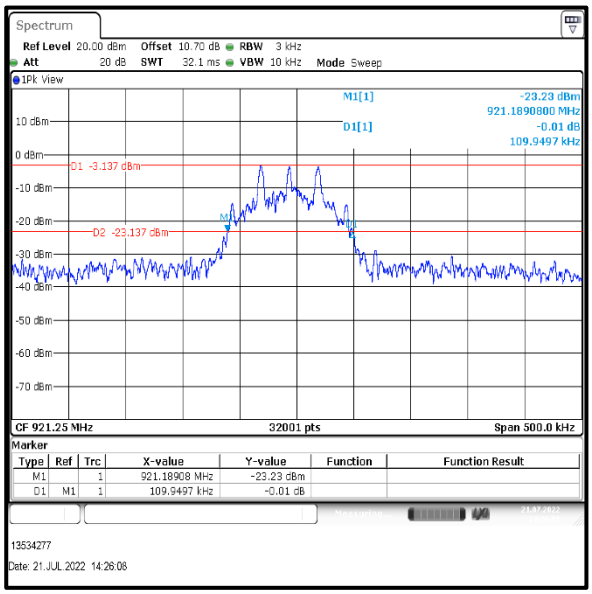
Transmitter Minimum 20 dB Bandwidth (continued)

Results : 50 kbps

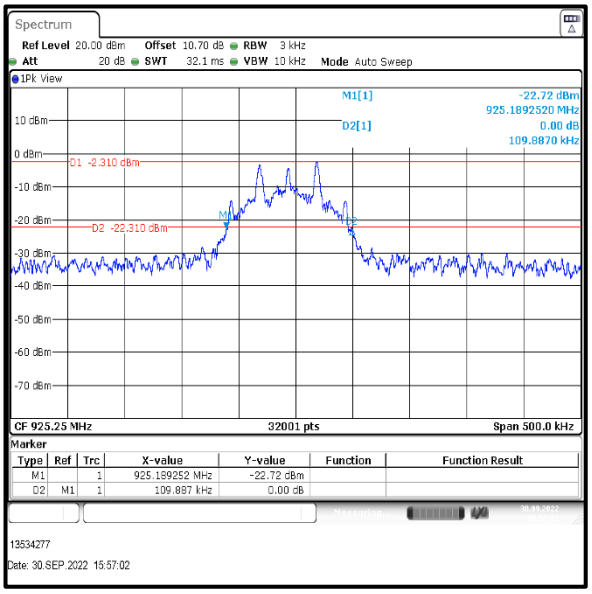
Channel	20 dB Bandwidth (kHz)
Bottom	110.184
Middle	109.950
Top	109.887



Bottom Channel



Middle Channel



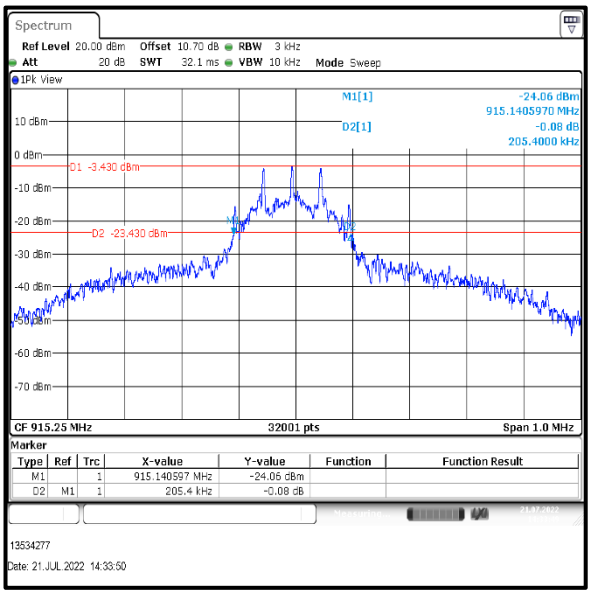
Top Channel

Result: Pass

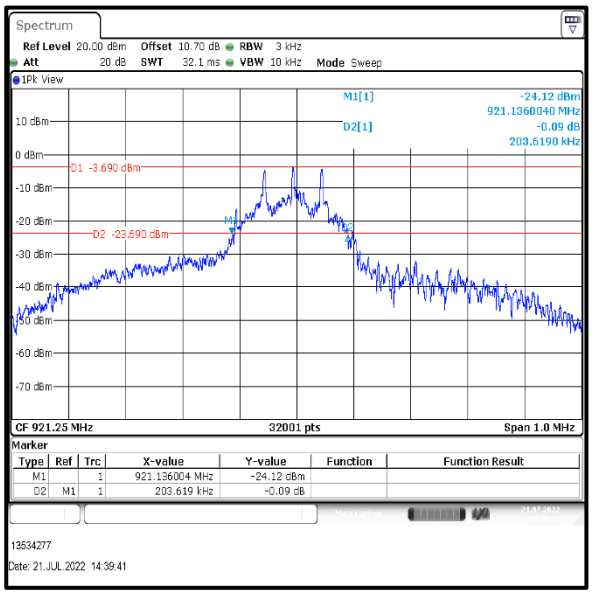
Transmitter Minimum 20 dB Bandwidth (continued)

Results : 100 kbps

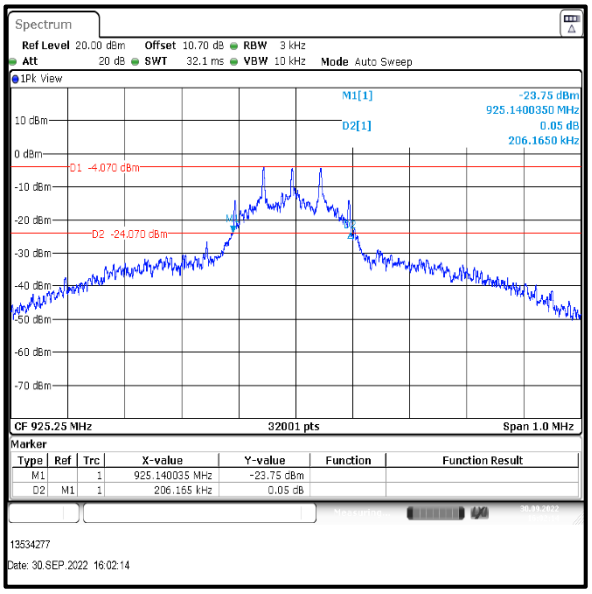
Channel	20 dB Bandwidth (kHz)
Bottom	205.400
Middle	203.619
Top	206.165



Bottom Channel



Middle Channel



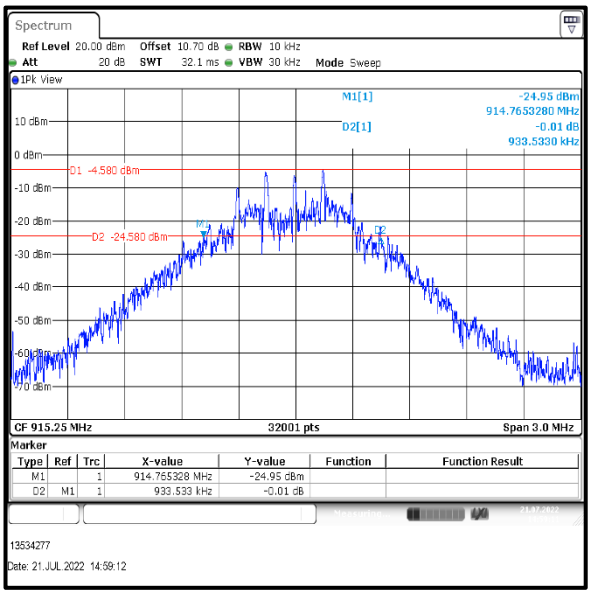
Top Channel

Result: Pass

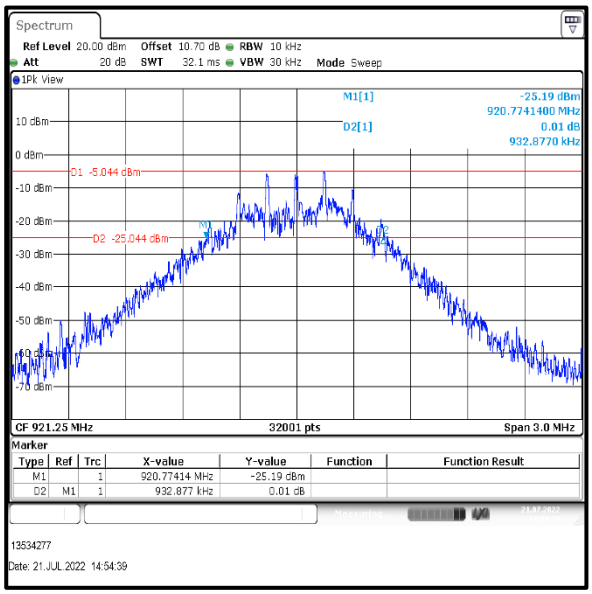
Transmitter Minimum 20 dB Bandwidth (continued)

Results : 300 kbps

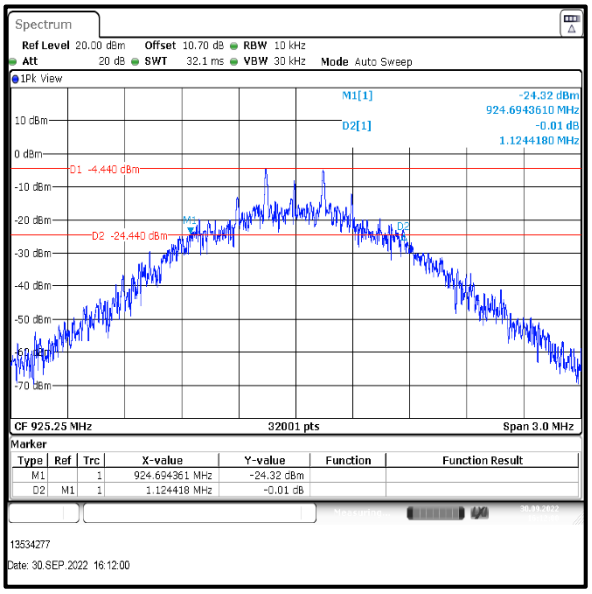
Channel	20 dB Bandwidth (kHz)
Bottom	933.533
Middle	932.877
Top	1124.418



Bottom Channel



Middle Channel



Top Channel

Result: Pass

5.2.4. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Muhammad Faiq Khan	**Test Date:**	19 September 2022
Test Sample Serial Number:	BB915003 (Radiated Test Sample)		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.249(d) & 15.209(a)
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.4
Frequency Range	9 kHz to 30 MHz

Environmental Conditions:

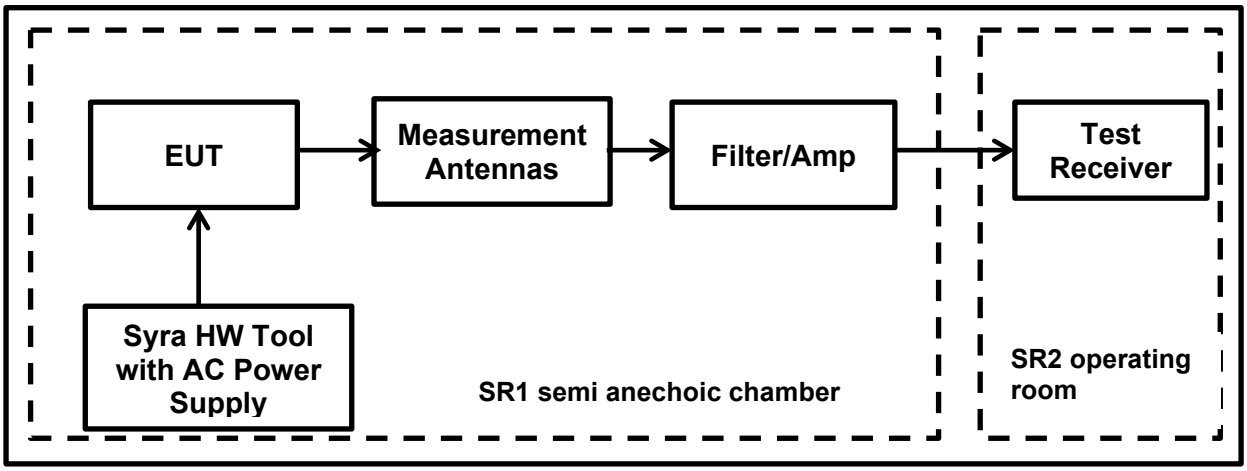
Temperature (°C):	22.0
Relative Humidity (%):	47.0

Note(s):

1. In accordance with FCC KDB 414788 D01 Radiated Test Site & ANSI C63.10 clause 5.2 an alternative test site that can demonstrate equivalence to a open area test site may be used. Therefore, the measurement was performed in a Semi Anechoic Chamber. (The OATS / SAC comparison data is available upon request).
2. The limits are specified at a test distances of 30 and 300 metres. However, as specified in FCC Section 15.31 (f)(2) & ANSI C63.10 clause 6.4.3, measurements may be performed at a closer distance and the measured level extrapolated to the specified measurement distance using the method described in clauses 6.4.4, specifically sub-clause 6.4.4.1 which specifies that the measured level shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 40 dB/decade.
   Therefore, measurements were performed at a measurement distance of 3 m.
3. Therefore, the limit values are extrapolated to a measurement distance of 3 m.
   - 9 kHz- 490 kHz: limits extrapolated from 300 m to 3 m by adding 80 dB at 40 dB /decade.
   - 490 kHz-1705 kHz: limits extrapolated from 30 m to 3 m by adding 40 dB at 40 dB /decade.
4. The preliminary scans showed similar emission levels below 30 MHz, for each channel. Therefore, final radiated emissions measurements were performed with the EUT set to the Middle Channel with following worst-case configuration.
   - LoWPAN / MAX PWR / Middle Channel / 300 kbps
5. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
6. Measurements below 30 MHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The measurement loop antenna height was 100 cm.
7. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was set to:
   - Frequency range: 9 kHz-150 kHz : RBW: 1 kHz /VBW: 3 kHz
   - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
   - Detector: Max-Peak detector
   - Trace Mode: Max Hold

Transmitter Radiated Emissions (continued)

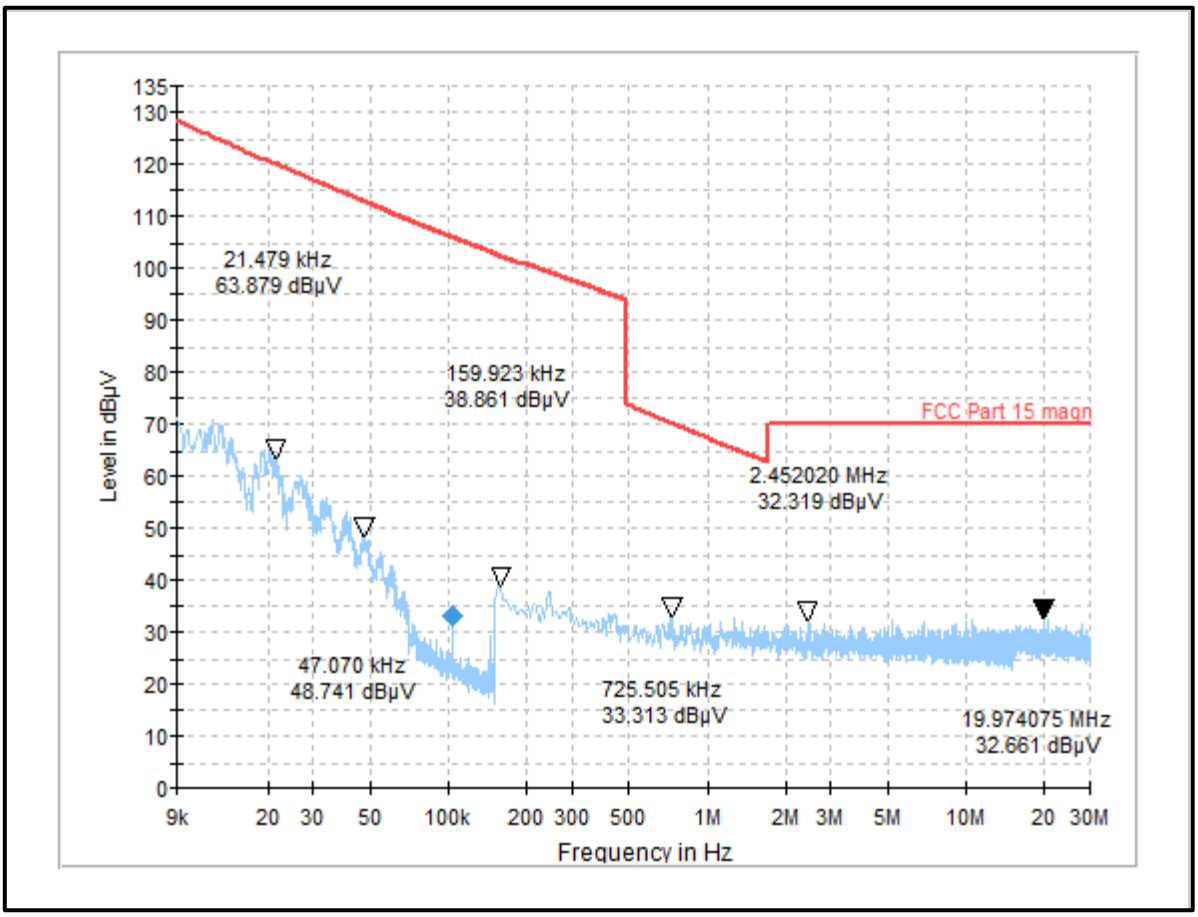
Test Setup:



Transmitter Radiated Emissions (continued)

Results: Middle Channel / MAX PWR

Frequency (MHz)	Loop Antenna orientation	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
0.104	0° to EUT	33.30	105.96	72.66	Complied



Result: Pass

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Muhammad Faiq Khan	**Test Date:**	09 August 2022
Test Sample Serial Number:	BB915003 (Radiated Test Sample)		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.249(d) & 15.209(a)
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

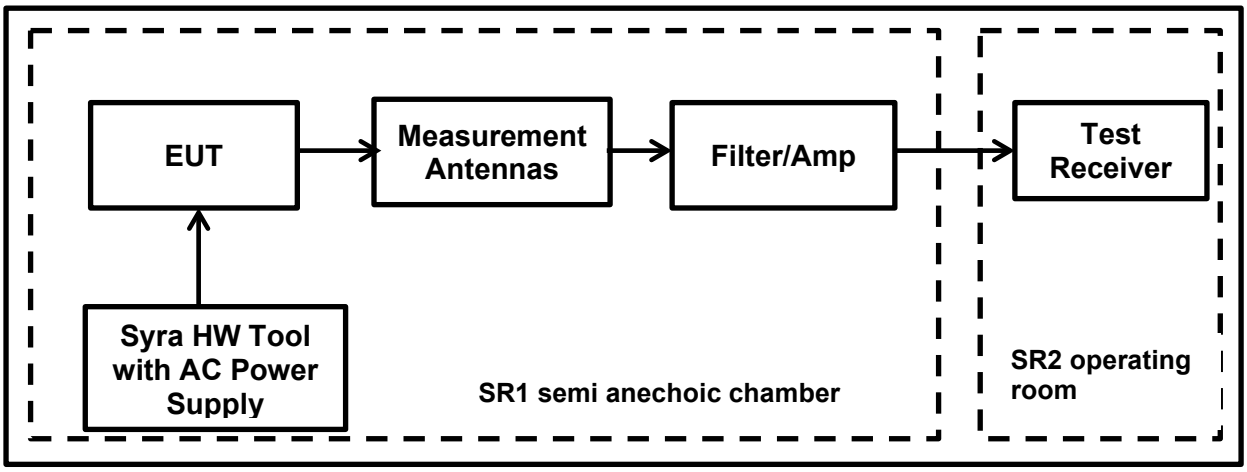
Environmental Conditions:

Temperature (°C):	22.4
Relative Humidity (%):	49.4

Note(s):

1. Measurements below 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. 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 m to 4 m.
2. The emissions shown at frequencies approximately 915 MHz to 928 MHz on the 30 MHz to 1 GHz plots are the EUT fundamental for the tested channel.
3. 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. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
4. The preliminary scans showed similar emission levels below 1 GHz, for each channel. Therefore, final radiated emissions measurements were performed with the EUT set to the Middle Channel with following worst-case configuration.
   - LoWPAN / MAX PWR / Middle Channel / 300 kbps
5. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.

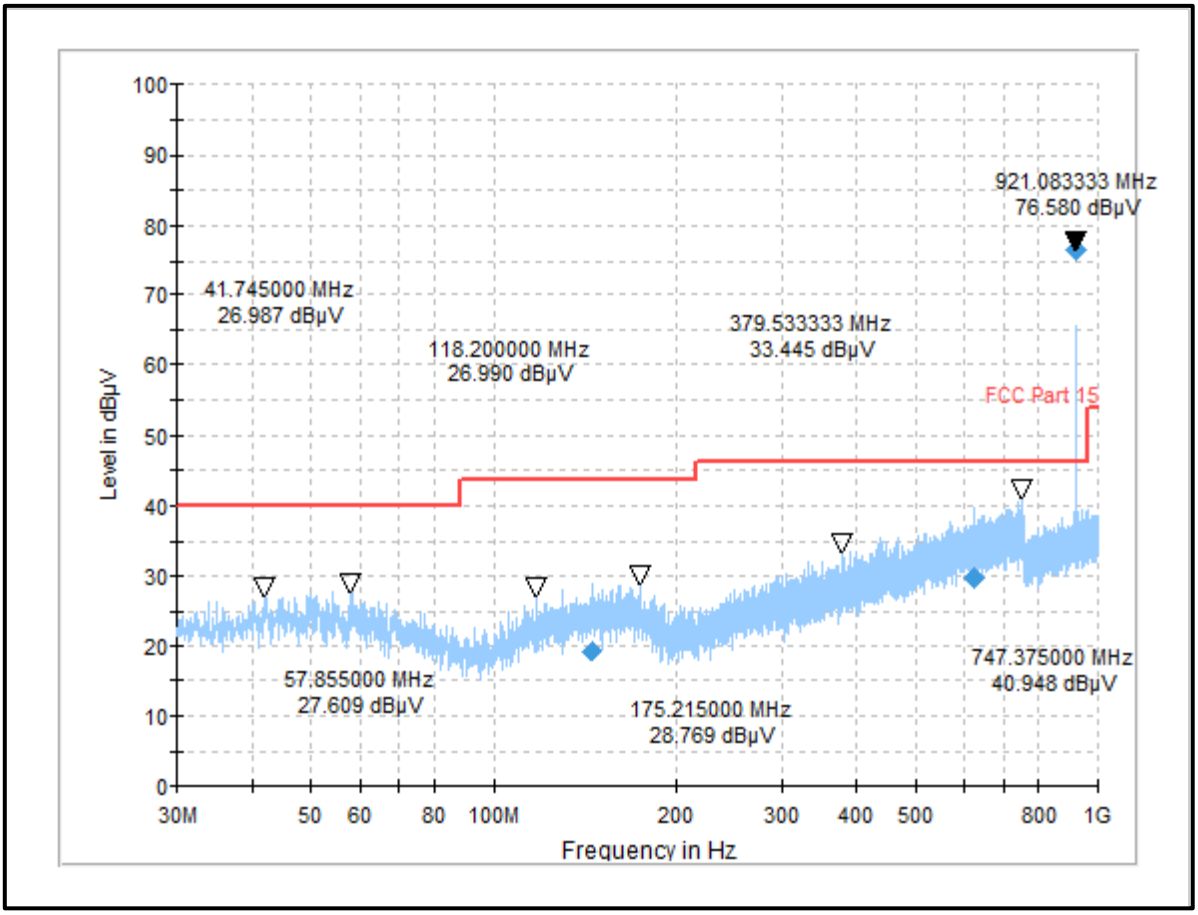
Test Setup:



Transmitter Radiated Emissions (continued)

Results: Middle Channel / MAX PWR

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
144.885	Horizontal	19.34	43.50	24.16	Complied
622.708	Vertical	29.56	46.00	16.44	Complied



Result: Pass

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Muhammad Faiq Khan	**Test Date:**	29 August 2022 & 09 September 2022
Test Sample Serial Number:	BB915003 (Radiated Test Sample)		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.249(d) & 15.209(a)
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.6
Frequency Range	1 GHz to 10 GHz

Environmental Conditions:

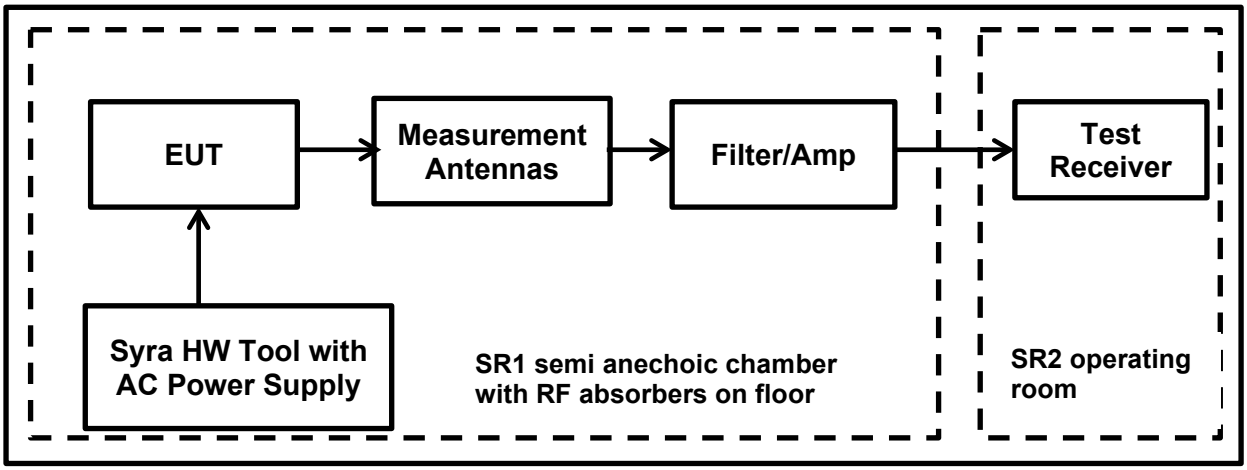
Temperature (°C):	23.2 & 21.5
Relative Humidity (%):	55.4 & 57.5

Note(s):

1. Pre-scans above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 m above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with absorber on the floor at a distance of 3 m. 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 m to 4 m.
2. 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.
3. The tests were performed on Bottom, Middle and Top Channel with the EUT set to following worst-case configuration.
   - LoWPAN / MAX PWR / 300 kbps
4. All other emissions shown on the pre-scans were investigated and found to be below the noise floor of the measurement system.

Transmitter Radiated Emissions (continued)

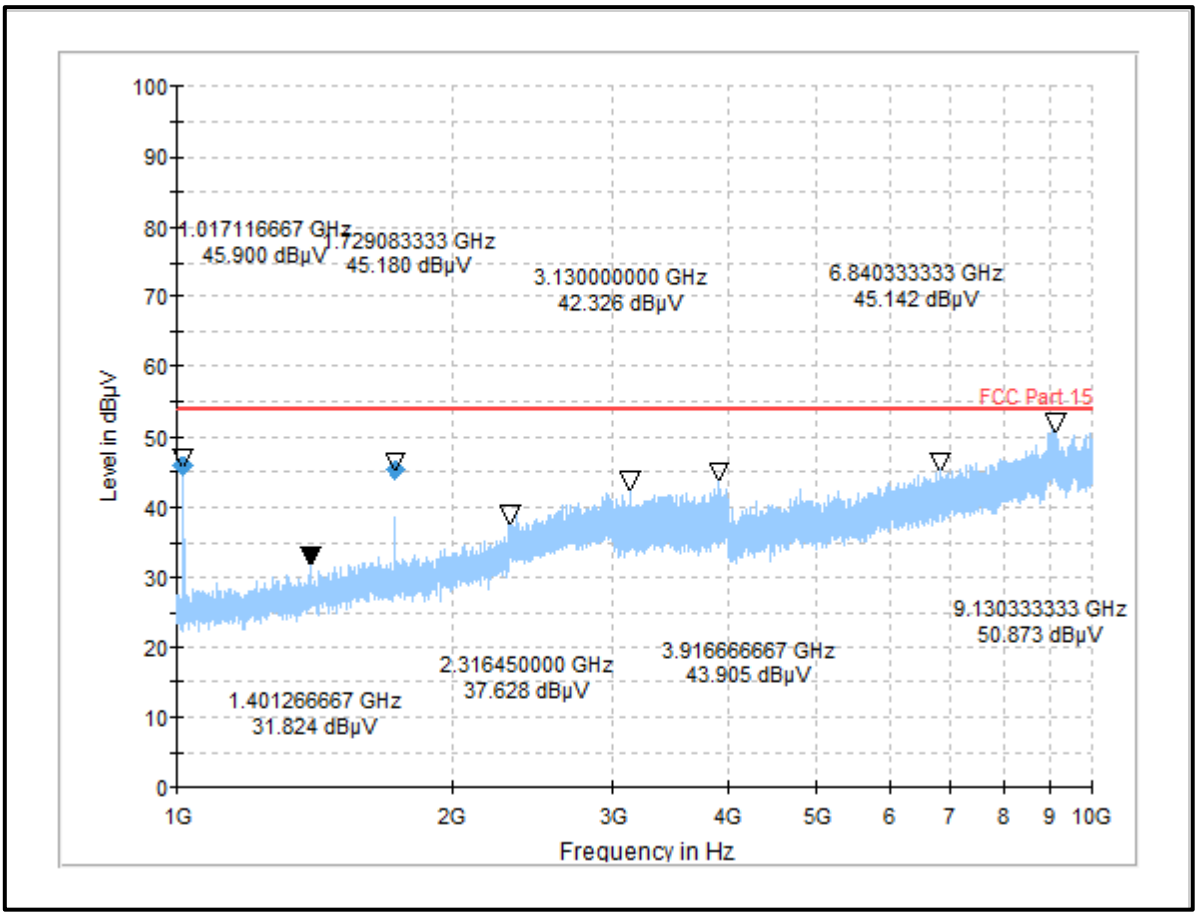
Test Setup:



Transmitter Radiated Emissions (continued)

Results: Bottom Channel / MAX PWR

Frequency (MHz)	Antenna Polarization	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1017.117	Horizontal	45.90	54.00	8.10	Complied
1729.083	Vertical	45.18	54.00	8.82	Complied

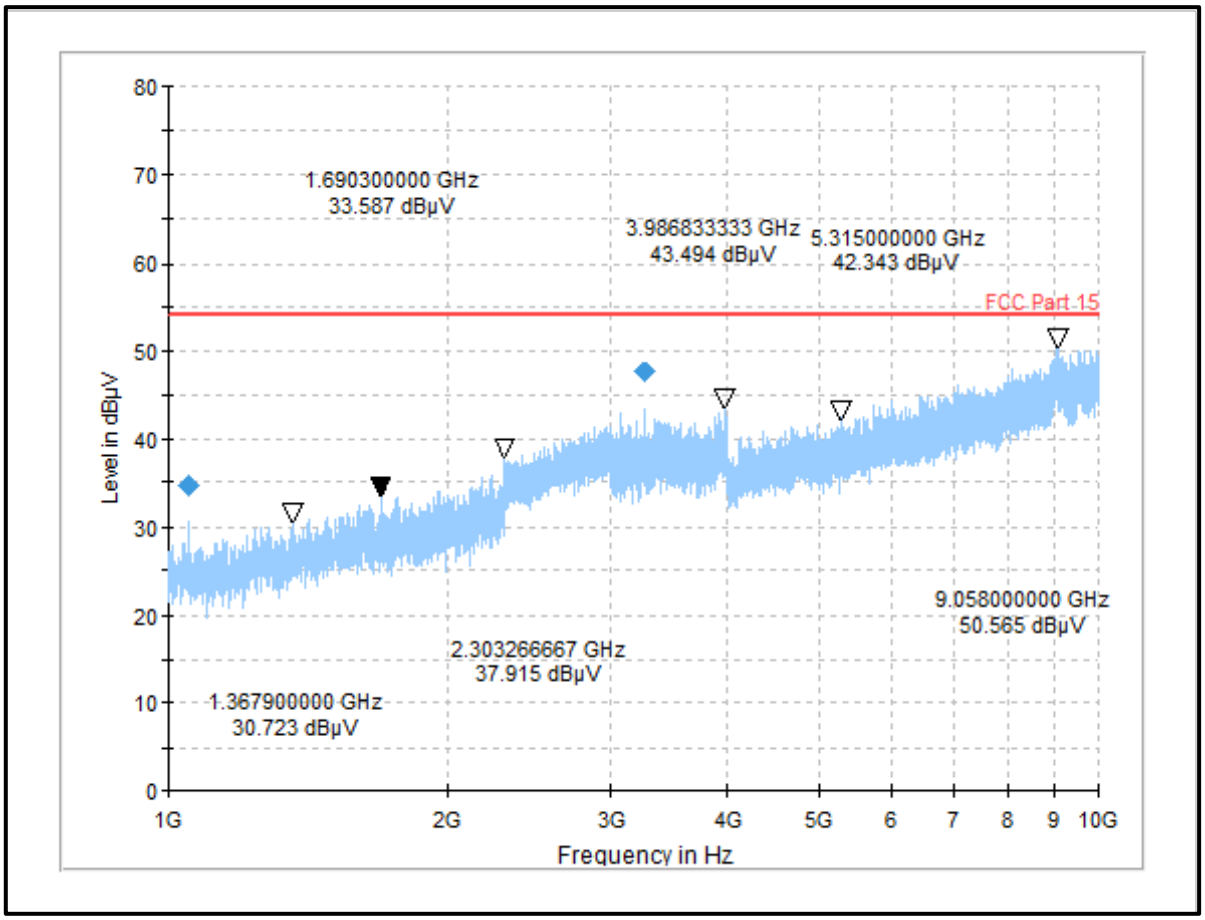


Result: Pass

Transmitter Radiated Emissions (continued)

Results: Middle Channel / MAX PWR

Frequency (MHz)	Antenna Polarization	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1056.550	Vertical	34.66	54.00	19.34	Complied
3257.333	Horizontal	47.66	54.00	6.34	Complied

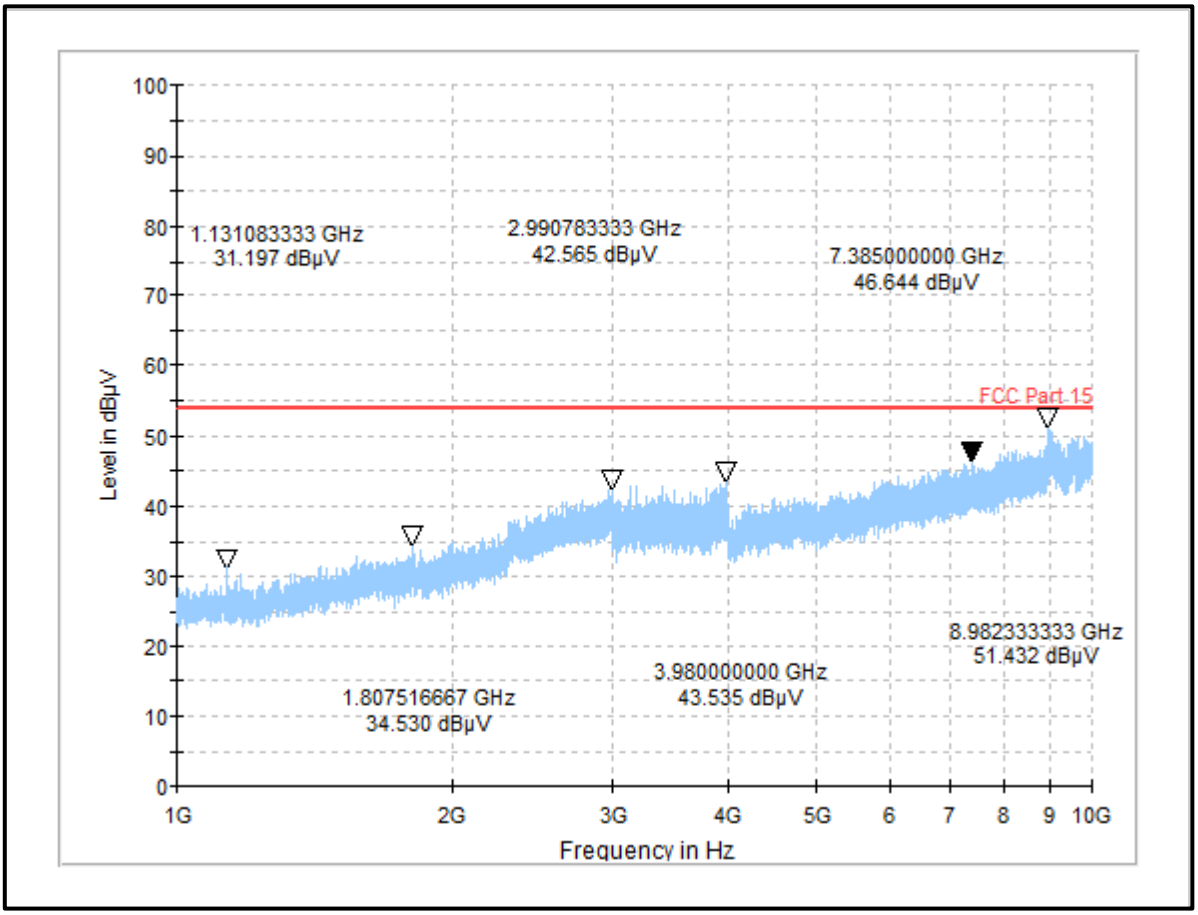


Result: Pass

Transmitter Radiated Emissions (continued)

Results: Top Channel / MAX PWR

Frequency (MHz)	Antenna Polarization	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical emissions were detected					



Result: Pass

5.2.5. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Muhammad Faiq Khan	**Test Date:**	08 September 2022
Test Sample Serial Number:	BB915003 (Radiated Test Sample)		
Test Site Identification	SR 1/2		

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

Environmental Conditions:

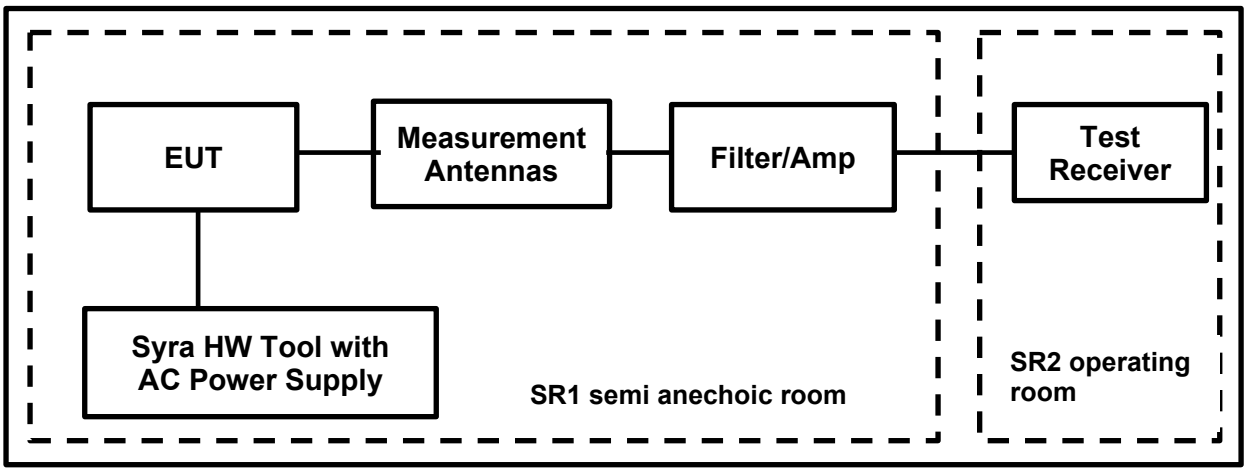
Temperature (°C):	22.5
Relative Humidity (%):	51.1

Note(s):

1. The measurements were in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. 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.
4. 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 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 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)

Test Setup:



Transmitter Band Edge Radiated Emissions (Continued)

Results: Peak / 50 kbps / MAX PWR

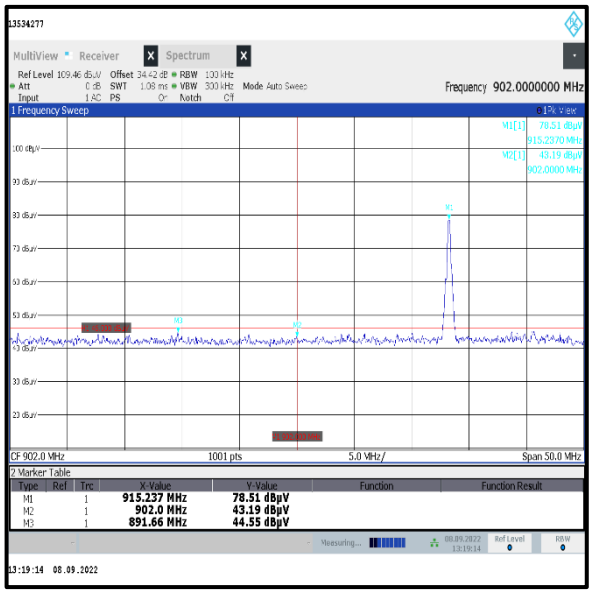
Results: Lower Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
891.66	44.55	46.00	1.45	Complied
902.00	43.19	46.00	2.81	Complied

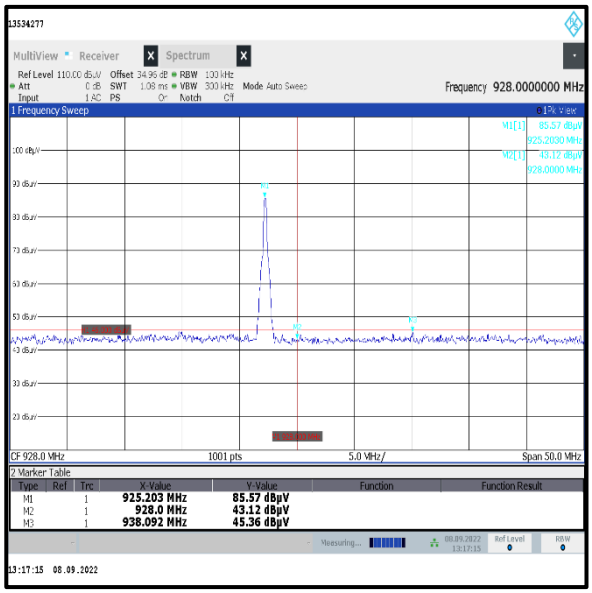
Results: Upper Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
928.000	43.12	46.00	2.88	Complied
938.092	45.36	46.00	0.64	Complied

Plots:



Lower Band Edge Peak Measurement



Upper Band Edge Measurement

Result: Pass within measurement uncertainity

Transmitter Band Edge Radiated Emissions (Continued)

Results: Peak / 100 kbps / MAX PWR

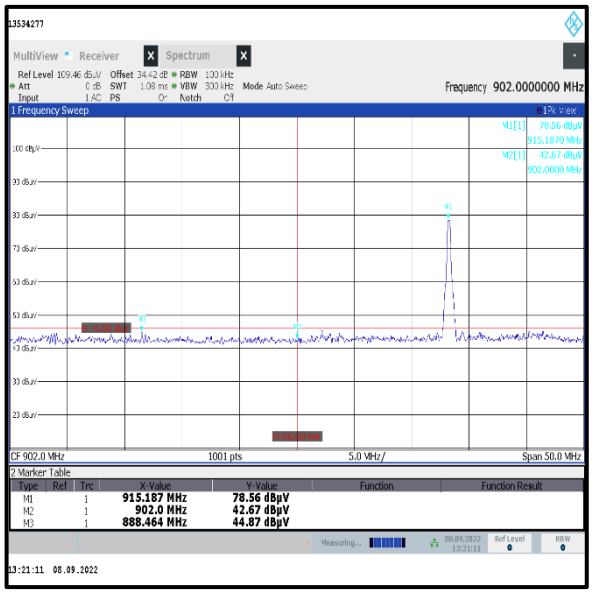
Results: Lower Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
888.464	44.87	46.00	1.13	Complied
902.00	42.67	46.00	3.33	Complied

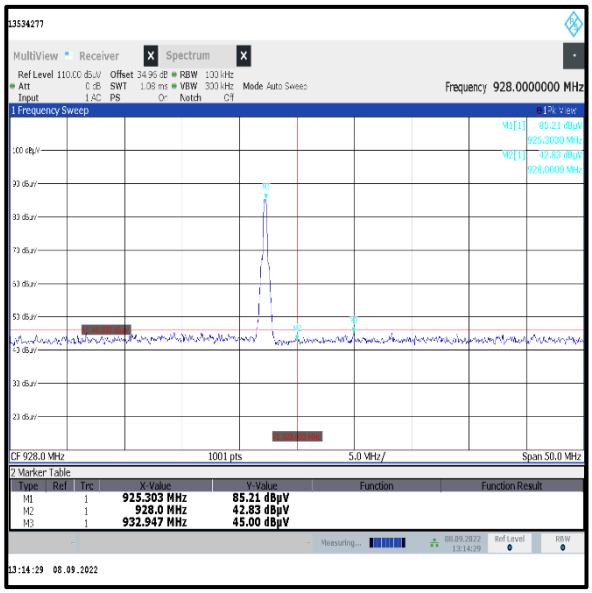
Results: Upper Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
928.000	42.83	46.00	3.17	Complied
932.947	45.00	46.00	1.00	Complied

Plots:



Lower Band Edge Peak Measurement



Upper Band Edge Measurement

Result: Pass within measurement uncertainity

Transmitter Band Edge Radiated Emissions (Continued)

Results: Peak / 300 kbps / MAX PWR

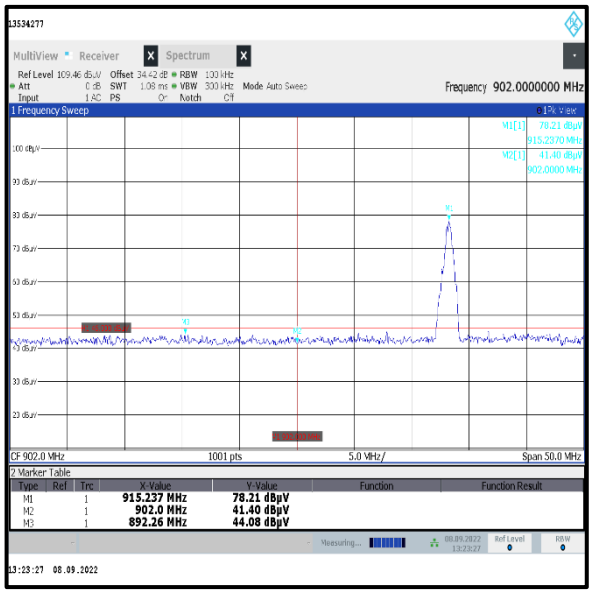
Results: Lower Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
892.26	44.08	46.00	1.92	Complied
902.00	41.40	46.00	4.60	Complied

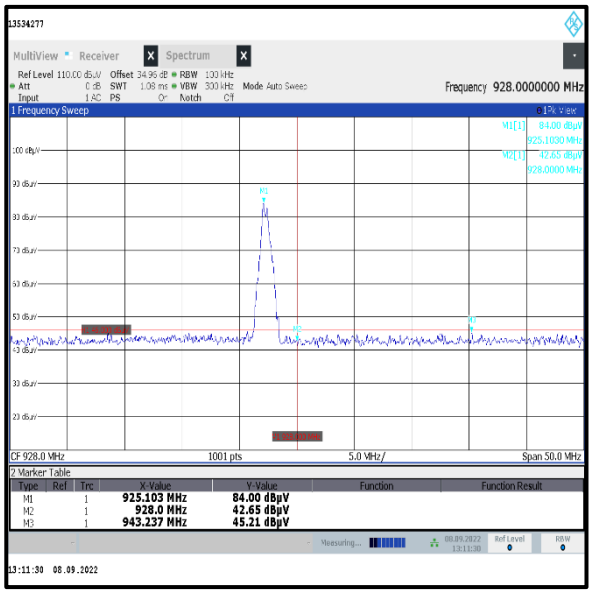
Results: Upper Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
928.000	42.65	46.00	3.35	Complied
943.237	45.21	46.00	0.79	Complied

Plots:



Lower Band Edge Peak Measurement



Upper Band Edge Measurement

Result: Pass within measurement uncertainity

6. Measurement Uncertainty

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

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	Confidence Level (%)	Calculated Uncertainty
Transmitter AC Conducted Emissions	95%	±2.49 dB
Transmitter Fundamental Field Strength	95%	±3.10 dB
Transmitter 20 dB Bandwidth	95%	±0.59 dB
Transmitter Radiated Emissions	95%	±3.10 dB
Transmitter Band Edge Radiated Emissions	95%	±3.10 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.

7. Used equipment

Test site: SR 1/2

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
1	Rohde & Schwarz	Antenna, Loop	HFH2-Z2	831247/012	10/07/2020	36
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	13/07/2022	12
460	Deisel	Turntable	DT 4250 S	n/a	n/a	n/a
452	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	02/09/2020	36
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	05/08/2020	36
587	Maturo	antenna mast, tilting	TAM 4.0-E	011/7180311	n/a	n/a
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
669	Rohde & Schwarz	EMI Test Receiver	ESW 44	103087	03/02/2022	12
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	lab verification	n/a
628	Maturo	Antenna mast	CAM 4.0-P	224/19590716	n/a	n/a
629	Maturo	Kippeinrichtung	KE 2.5-R-M	MAT002	n/a	n/a
-/-	Testo	Thermo-Hygrometer	608-H1	01	lab verification	n/a
1603665	Siemens Matsushita Components	semi-anechoic chamber SR1/ 2	-/-	B83117-A1421-T161	n/a	n/a

Test site: SR 9

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
445	Huber & Suhner	RF Attenuator (10 dB)	6810.17.AC	--	lab verification	12
637	Rohde & Schwarz	Spectrum Analyzer	FSV40	101587	15/07/2022	12
-/-	Huber+Suhner	RF Cable -OSP120-DUT1	ST18/SMAm/SMAm/72	605505	lab verification	n/a
-/-	Testo	Thermo-Hygrometer	608-H1	07	lab verification	n/a
1603668	Siemens Matsushita Components	shielded room	--	B83117-B1422-T161	n/a	n/a

Test site: SR 7/8

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
23	Rohde & Schwarz	Artificial Mains	ESH3-Z5	831767/013	11/07/2022	12
28	Rohde & Schwarz	Passive Probe	ESH2-Z3	none	12/07/2022	36
349	Rohde & Schwarz	Receiver, EMI Test	ESIB7	836697/009	12/07/2022	12
351	Rohde & Schwarz	network, Artificial Mains	ESH3-Z5	862770/018	11/07/2022	12
564	Teseq	Impedance stabilization network (ISN)	ISN T800	26076	12/07/2021	24
616	Rohde & Schwarz	ISN	ENY81-CA6	101656	07/07/2020	36
-/-	Testo	Thermo-Hygrometer	608-H1	08	lab verification	n/a
327	SPS	AC/DC power distribution system	PAS 5000	A2464 00/1 0200	lab verification	n/a

8. 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-C 61456NCF-915-H-WS
Model Name or Number:	Syra RE-C 61456NCF-915-L-6L
Model Name or Number:	Syra RE-C 61456NCF-915-L-WS
Model Name or Number:	Syra RE-ZC 61556CF-915-6L
Model Name or Number:	Syra RE-ZC 61556CF-915-WS

Note(s):

1. 'L' and 'H' indicate whether a low or high voltage relay is used (120-230V vs 120-277V)
2. '6L' and 'WS' use the radio FSK modulation (both using the same 802.15.4 physical layer and RF parameters)

9. Report Revision History

Version Number	Revision Details		
	Page No(s)	**Clause**	**Details**
1.0	43	-	Initial Version
Test Report Version 1.1 supersede Version 1.0 with immediate effect Test Report No. UL-RPT-RP-13534277-3416-2-V1.1-FCC Version 1.1, Issue Date 05 DECEMBER 2022 replaces Test Report No. UL-RPT-RP-13534277-3416-2-FCC Version 1.0, Issue Date 16 NOVEMBER 2022, which is no longer valid.			
1.1	as below	as below	Current Version
	11-16	5.2.1	Transmitter AC conducted measurements repeated with 240VAC 60Hz and notes updated.
	22-24	5.2.3	Page title updated
	30	5.2.4	Notes updated
	38-39	5.2.5	Limit updated
	-	-	Tested dates, temperature and humidity values updated

--- END OF REPORT ---