



Solutions

# TEST REPORT

**Test Report No.: UL-RPT-RP-13935019-516-2-FCC/ISED**

**Applicant \*** : EVBox North America Inc

**Model No. \*** : L24871NAC00

**FCC ID / ISED IC: \*** : WLAN / BT-LE -Contains FCC ID: 2A3C7-WIFIG5P  
Contains IC: 27924-WIFIG5P  
NFC-Contains FCC ID: 2A3C7-HMIGP5  
Contains IC: 27924-HMIGP5  
Cellular-Contains FCC ID: N7NHL78  
Contains IC: 2417C-HL78

**Technology \*** : Mode 1: WLAN 2.4 GHz + NFC + Cellular (LTE Band 2)  
Mode 2: BLE + NFC + Cellular (LTE Band 2)

**Test Standard(s)** : **FCC Parts 15.207, 15.209(a), 15.247, 15.225 & 24.238**  
**Innovation, Science and Economic Development Canada**  
**RSS-247 Issue 2 February 2017**  
**RSS-Gen Issue 5 April 2018**  
**RSS-133 Issue 6 January 2018 &**  
**RSS-210 Issue 10 December 2019**

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 supersedes Version 1.0 with immediate effect**  
Test Report No. UL-RPT-RP-13935019-516-2 Version 1.1, Issue Date 03 April 2023 replaces  
Test Report No. UL-RPT-RP-13935019-516-2 Version 1.0, Issue Date 01 September 2022, which is no longer valid
5. Result of the tested sample: **PASS**
6. All information marked with a (\*) were provided by customer / applicant or authorized representative

Prepared by: Muhammad Faiq Khan  
Title: Project Engineer  
Date: 03 April 2023

Approved by: Rachid, Acharkaoui  
Title: Operations Manager  
Date: 03 April 2023



Deutsche  
Akkreditierungsstelle  
D-PL-19381-02-00

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

**UL INTERNATIONAL GERMANY GMBH**

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## **1. Customer Information \***

### **1.1.Applicant Information**

<b>Company Name:</b>	EVBox North America Inc
<b>Company Address:</b>	1930 Innovation Way, Suite 200, Illinois, Libertyville, USA
<b>Contact Person:</b>	Susan Eckman
<b>Contact E-Mail Address:</b>	susan.eckman@evbox.com
<b>Contact Phone No.:</b>	+1 630 209 9060

### **1.2.Manufacturer Information**

<b>Company Name:</b>	EVBox BV
<b>Company Address:</b>	Kabelweg 47 1014 BA Amsterdam The Netherlands
<b>Contact Person:</b>	Marco Farina
<b>Contact E-Mail Address:</b>	marco.farina@evbox.com
<b>Contact Phone No.:</b>	+31620549130

## **2. Summary of Testing**

### **2.1. General Information**

<b>Specification Reference:</b>	47CFR15.247
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
<b>Specification Reference:</b>	47CFR15.207 and 47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
<b>Specification Reference:</b>	47CFR24
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 24 (Personal Communication Services)
<b>Specification Reference:</b>	47CFR15.225
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) - Section 15.225
<b>Specification Reference:</b>	RSS-Gen Issue 5 April 2018
<b>Specification Title:</b>	General Requirements for Compliance of Radio Apparatus
<b>Specification Reference:</b>	RSS-247 Issue 2 February 2017
<b>Specification Title:</b>	Digital Transmission Systems (DTSSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
<b>Specification Reference:</b>	RSS-133 – Issue 6
<b>Specification Title:</b>	2 GHz Personal Communications Services
<b>Specification Reference:</b>	RSS-210 Issue 10 December 2019, Amendment (April 2020)
<b>Specification Title:</b>	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment Annex B-Devices operating in frequency bands for any application B.6 Band 13.110-14.010 MHz

**Location**

<b>Location of Testing:</b>	UL International Germany GmbH Hedelfinger Str. 61 70327 Stuttgart Germany
<b>Test Firm Registration:</b>	399704
<b>Company Number.</b>	22511
<b>CABID:</b>	DE0008

**Date information**

<b>Order Date:</b>	22 July 2021
<b>EUT Arrived:</b>	19 April 2022
<b>Test Dates:</b>	21 July 2022 to 22 July 2022
<b>EUT Returned:</b>	-/-

## 2.2. Summary of Test Results

Measurement	FCC Reference (47CFR)	ISED Reference (RSS-)	Complied	Did not comply	Not performed	Not applicable
Transmitter AC Conducted Emissions	Part 15.207	RSS-Gen 8.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transmitter Radiated Emissions / Transmitter Out of Band Radiated Emission <sup>(1)</sup>	15.247(d),15.209(a) & Part 2.1053, 24.238 (a) & 15.225(d)	RSS-Gen 6.13 , RSS-247 5.5 & RSS 133 § 6.5, RSS-GEN §6.13 RSS-210 B.6(a)(iv)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Decision rule:**  
If the decision rule is not included in the applied customer specification or testing standard, the binary statement for simple acceptance, as defined in ILAC G8: 2019 Section 4.2.1, is applied as the decision rule for a pass/ fail statement.  
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: 2019.

### Note(s):

- As per applicant's declaration, the EUT is a host product integrating pre-certified radio module Therefore, only partial intermodulation of different technologies testing is performed [refer to section 3.4]. For further details refer to following filings.  
Cellular (FCC ID: N7NHL78 | IC: 2417C-HL78)  
WLAN / BT-LE (FCC ID: 2A3C7-WIFIG5P | IC: 27924-WIFIG5P)  
NFC (FCC ID: 2A3C7-HMIG5P | IC: 27924-HMIG5P)

## 2.3. Methods and Procedures

<b>Reference:</b>	ANSI C63.10-2013
<b>Title:</b>	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
<b>Reference:</b>	FCC KDB 558074 D01 DTS Meas Guidance v05r02 April 2, 2019
<b>Title:</b>	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
<b>Title:</b>	FCC KDB 996369 D04 Module Integration Guide v02 October 13, 2020
<b>Reference:</b>	Modular Transmitter Integration Guide Guidance for Host Product Manufacturers
<b>Reference:</b>	ANSI C63.26-2015
<b>Title:</b>	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.
<b>Reference:</b>	FCC KDB 971168 D01 v03r01, April 9 2018
<b>Title:</b>	Measurement Guidance for Certification of Licensed Digital Transmitters

## 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) \***

##### **FCC:**

<b>Brand Name:</b>	EVBox
<b>Model Name or Number:</b>	L24871NAC00
<b>Test Sample Serial Number:</b>	FCC / AT&T Sample 1
<b>Hardware Version Number:</b>	Com board Rev. G, US Power board Rev. F, HMI board Rev. E
<b>Firmware Version Number:</b>	Com board diagnostic image FW V5.0.1, HMI V1.1.0, Power v1.4.0, Safety 1.1.3
<b>FCC ID:</b>	WLAN / BT-LE -Contains FCC ID: 2A3C7-WIFIG5P NFC-Contains FCC ID: 2A3C7-HMIGP5 Cellular-Contains FCC ID: N7NHL78

##### **ISED:**

<b>Brand Name:</b>	EVBox
<b>PMN:</b>	WIFIG5P
<b>Test Sample Serial Number:</b>	FCC / AT&T Sample 1
<b>HVIN:</b>	WIFIG5P
<b>HMN:</b>	G5PL
<b>FVIN:</b>	N/A
<b>ISED ID:</b>	WLAN / BT-LE -Contains IC: 27924-WIFIG5P NFC-Contains IC: 27924-HMIGP5 Cellular-Contains IC: 2417C-HL78

#### **3.2. Description of EUT \***

The equipment under test was a stationary Level 2 Electric Vehicle Supply Equipment with Model Number: L24871NAC00, Contains FCC ID: 2A3C7-WIFIG5P, FCC ID: 2A3C7-HMIGP5 and FCC ID: N7NHL78 supporting NFC 13.56 MHz, Bluetooth, Bluetooth LE, WLAN 2.4 GHz, WLAN 5 GHz and Cellular technologies.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing \***

<b>Technology Tested:</b>	Cellular LTE CAT-M1 (Band 2)				
<b>Type of Unit:</b>	Transceiver				
<b>Maximum Conducted Output Power:</b>	24.10 dBm <sup>(Note 2)</sup>				
<b>Transmit Frequency Range:</b>	1930 MHz – 1990 MHz (Downlink) 1850 MHz – 1910 MHz (Uplink)				
<b>Transmit Channels Tested:</b> <b>LTE Band 26</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Frequency (MHz)</b>		
	Middle	18900 <sup>(Note 1) (Note 2)</sup>	1880		
<b>Antenna Type:</b>	Printed board antenna				
<b>Antenna Details:</b>	Custom printed board antenna, not removable				
<b>Declared Antenna Gain:</b>	B2 <2.7 dBi				
<b>Tested Technology:</b>	NFC 13.56 MHz				
<b>Category of Equipment:</b>	Transceiver				
<b>Channel Spacing:</b>	Single channel device				
<b>Transmit Frequency Range:</b>	13.56 MHz				
<b>Modulation:</b>	ASK				
<b>Supported Data Rates</b>	Signal Type	Bit Rate (kb/s)			
	NFC-A	212			
<b>Technology Tested:</b>	WLAN 2.4 GHz (IEEE 802.11b, g, n)				
<b>Type of Unit:</b>	Transceiver				
<b>Worst Case Data Rate(s):</b> <sup>(Note 1) (Note 2)</sup>	802.11g	6 Mbps (SISO)	BPSK		
<b>Declared Antenna Gain:</b>	<6.1 dBi				
<b>Antenna Type:</b>	Custom printed board antenna, not removable				
<b>Antenna Details:</b>	Printed board antenna				
<b>Maximum Conducted Power:</b>	23.93 dBm <sup>(Note 2)</sup>				
<b>Channel Spacing:</b>	20 MHz				
<b>Transmit Frequency Band:</b>	2412 MHz to 2462 MHz				
<b>Transmit Channels Tested:</b>	<b>Data rate</b>	<b>Bandwidth (MHz)</b>	<b>Channel Number</b>		
	802.11g	20	6		
			2437		

<b>Technology Tested:</b>	Bluetooth Low Energy 4.0 / Digital Transmission System					
<b>Type of Unit:</b>	Transceiver					
<b>Channel Spacing:</b>	2 MHz					
<b>Data Rate and Modulation:</b>	1 Mbps	GFSK				
<b>Measured Maximum Conducted Output Power:</b>	5.11 dBm					
<b>Declared Antenna Gain:</b>	<6.1 dBi					
<b>Antenna Type:</b>	Custom printed board antenna, not removable					
<b>Antenna Details:</b>	Printed board antenna					
<b>Transmit Frequency Range:</b>	2402 MHz to 2480 MHz					
<b>Transmit Channels Tested:</b>	Channel ID	RF Channel	Channel Frequency (MHz)			
	Bottom	37	2402			
<b>Power Supply Requirement(s):</b>	240V (V) L1-L2-PE US Splitted phase					
<b>Highest internally generated clock and/or oscillator frequency:</b>	Wi-Fi ref. clock 37.4 MHz (internal to the module) Oscillator freq. of NFC module of HMI board: 27.120 MHz LTE module: 32.768 KHz, 26MHz (internal to the module) Different other oscillator clocks are included for internal functionality e.g. bus/ CPU clock are present in the circuits: 32.768 KHz, 16 MHz, 24 MHz, 25 MHz 26 MHz					
(Note <sup>1</sup> ) The Host Product testing has been performed on unwanted (spurious) radiated emissions on the worst-case modulation and channel per frequency range as shown in original filing						
(Note <sup>2</sup> ) As per applicant's declaration, the EUT is a host product integrating pre-certified radio module. Therefore, only partial testing is performed.						

### **3.5. 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	-/-	-/-	-/-	-/-

#### **B. Support Equipment (Manufacturer supplied)**

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Raspberry PI	N/A	N/A	W65
2	Ethernet Switch	D-Link	EES105E C2E	QS3P111000361
3	EVBox Certification team Windows Laptop	Dell	N/A	EVB17001260

### **3.6. Operation and Monitoring of the EUT during Testing**

#### **3.7. Operating Modes**

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

Continuous Transmitting Fixed Channel Frequency Mode with Modulated Carrier

- 802.11g | 20 MHz | 6 Mbps | Bottom Channel | PWR 12 (Note 1) (Note 2) +
- LTE CAT-M1 Band 2 | 20 MHz | RB1 | Bottom channel | QPSK | +
- NFC-A | 212 kb/s | ASK at maximum power in NFC-13.56 MHz test mode |

Continuous Transmitting Fixed Channel Frequency Mode with Modulated Carrier

- Bluetooth Low Energy (BLE) | PRBS9 | 1 Mbps | Maximum Power Settings +
- LTE CAT-M1 Band 2 | 20 MHz | RB1 | Bottom channel | QPSK | +
- NFC-A | 212 kb/s | ASK at maximum power in NFC-13.56 MHz test mode |

#### **3.8. Configuration and Peripherals**

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

- The applicant or manufacturer supplied test setup instructions  
“DUT and testing - Board configuration and setting Quickguide Rev1.pdf” issued on 30/06/2022 was used to configure the EUT.

##### **EUT Power Supply:**

- The EUT was powered with 240V AC / 60 Hz split phase.

##### **Test Mode Activation:**

- The EUT can be connected with the Test laptop via Ethernet switch and ethernet cables supplied by the customer. The cable was used only for configuration and was removed during the measurement.
- The test modes for NFC and WLAN were activated by the terminal software “radio\_cert\_v12”. The commands to setup the respective modes and power were defined by the customer in the setup instructions.
- For LTE a direct communication link was setup with the Communication tester R&S CMW 500.

##### **Radiated Measurements:**

- The EUT needs to use in standing position as a used case. Therefore, this report includes relevant results.
- The position of the Antenna was 90° vertical in the z-axis from the EUT.
- 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 measurements above 30 MHz were performed with the EUT positioned on the turn table and rotating 360° while the antenna height varies from 1 to 4 m over the measurement frequency range.
- R&S® EMC32 V11.30 Software was used for the Radiated spurious emission measurements.

## **4. Measurements, Examinations and Derived Results**

### **4.1. 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.

## **4.2. Test Results**

### **4.2.1. Transmitter AC Conducted Spurious Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	Tobias Koch	<b>Test Date:</b>	22 July 2022
<b>Test Sample Serial Number:</b>	FCC / AT&T Sample 1		
<b>Test Site Identification</b>	SR 7/8		

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

#### **Environmental Conditions:**

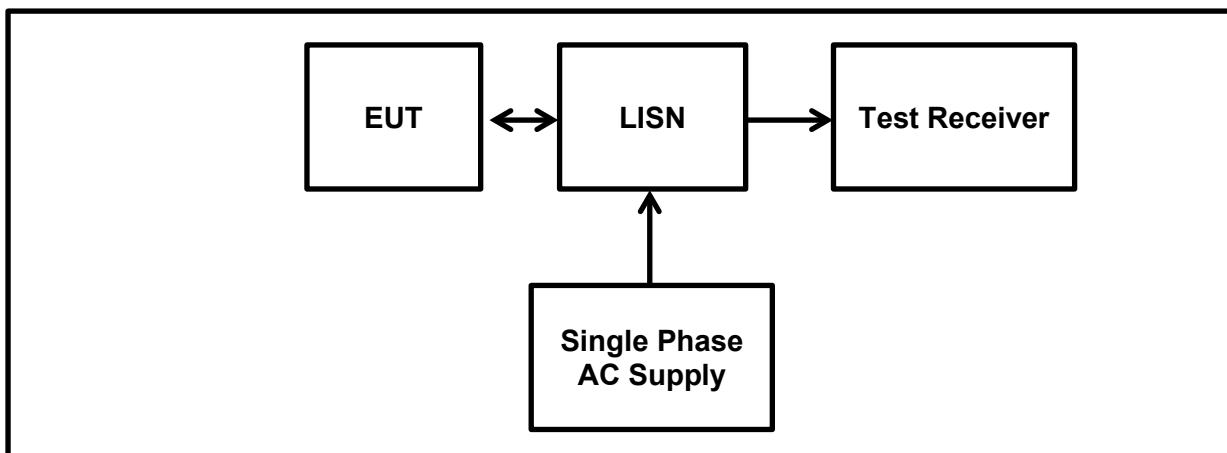
<b>Temperature (°C):</b>	20
<b>Relative Humidity (%):</b>	33

#### **Settings of the Instrument**

<b>Detector</b>	Quasi Peak/ Average Peak
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#### **Note(s):**

1. The EUT was powered via AC/DC power supply which was connected with the LISN during the measurement.
2. The radiated emissions measurements were performed with the EUT set to the following worst-case mode simultaneously.
  - 802.11g | 20 MHz | 6 Mbps | Bottom Channel | PWR 12 (Note 1) (Note 2) +
  - LTE CAT-M1 Band 2 | 20 MHz | RB1 | Bottom channel | QPSK | +
  - NFC-A | 212 kb/s | ASK at maximum power in NFC-13.56 MHz test mode |
3. Pre-scans were performed, and markers placed on the highest L1 and L2 measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
4. The final measured value, for the given emission, in the table below incorporates the cable loss.
5. 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.
6. 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.
7. 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: WLAN 2.4 GHz / 802.11q / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

**Results: L1 / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.154440	L1	51.30	65.80	14.50	Complied
0.171500	L1	48.20	64.90	16.70	Complied
0.215690	L1	40.60	63.00	22.40	Complied
4.030330	L1	32.10	56.00	23.90	Complied
4.932270	L1	32.50	56.00	23.50	Complied
13.560170	L1	43.90	60.00	16.10	Complied
23.128700	L1	45.70	60.00	14.30	Complied

**Results: L1 / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.154440	L1	26.10	55.80	29.70	Complied
0.171500	L1	24.00	54.90	30.90	Complied
0.215690	L1	19.80	53.00	33.20	Complied
4.030330	L1	27.70	46.00	18.30	Complied
4.932270	L1	27.90	46.00	18.10	Complied
13.560170	L1	43.50	50.00	6.50	Complied
23.128700	L1	43.00	50.00	7.00	Complied

**Results: L2 / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.151000	L2	52.10	65.90	13.80	Complied
0.170930	L2	48.10	64.90	16.80	Complied
0.201280	L2	42.90	63.60	20.70	Complied
0.259660	L2	34.80	61.40	26.60	Complied
3.171480	L2	31.90	56.00	24.10	Complied
5.705850	L2	34.10	60.00	25.90	Complied
7.397840	L2	34.00	60.00	26.00	Complied
10.060080	L2	37.40	60.00	22.60	Complied
23.130110	L2	44.50	60.00	15.50	Complied

**Transmitter AC Conducted Spurious Emissions (continued)**

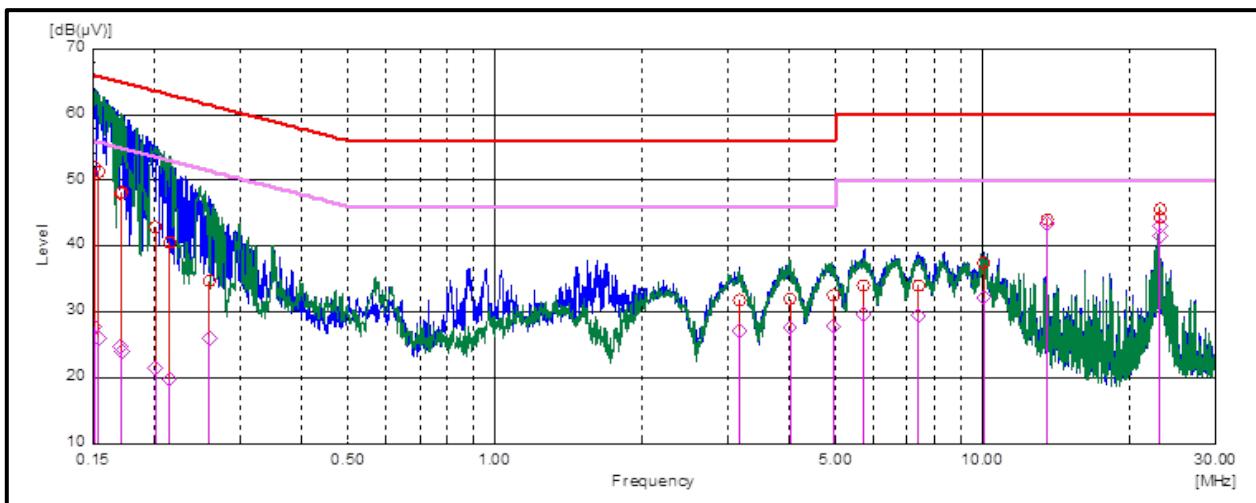
**Results: WLAN 2.4 GHz / 802.11q / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

**Results: L2 / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.151000	L2	27.80	55.90	28.10	Complied
0.170930	L2	24.60	54.90	30.30	Complied
0.201280	L2	21.50	53.60	32.10	Complied
0.259660	L2	25.90	51.40	25.50	Complied
3.171480	L2	27.10	46.00	18.90	Complied
5.705850	L2	29.60	50.00	20.40	Complied
7.397840	L2	29.50	50.00	20.50	Complied
10.060080	L2	32.10	50.00	17.90	Complied
23.130110	L2	41.50	50.00	8.50	Complied

**Result: Pass**

**Plot: L1 and L2 Line / 240 VAC 60 Hz**



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

## **4.2.2. Transmitter Radiated Emissions / Transmitter out of band Radiated Emission**

### **Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	21 July 2022
<b>Test Sample Serial Number:</b>	FCC / AT&T Sample 1		
<b>Test Site Identification</b>	SR 1/2		

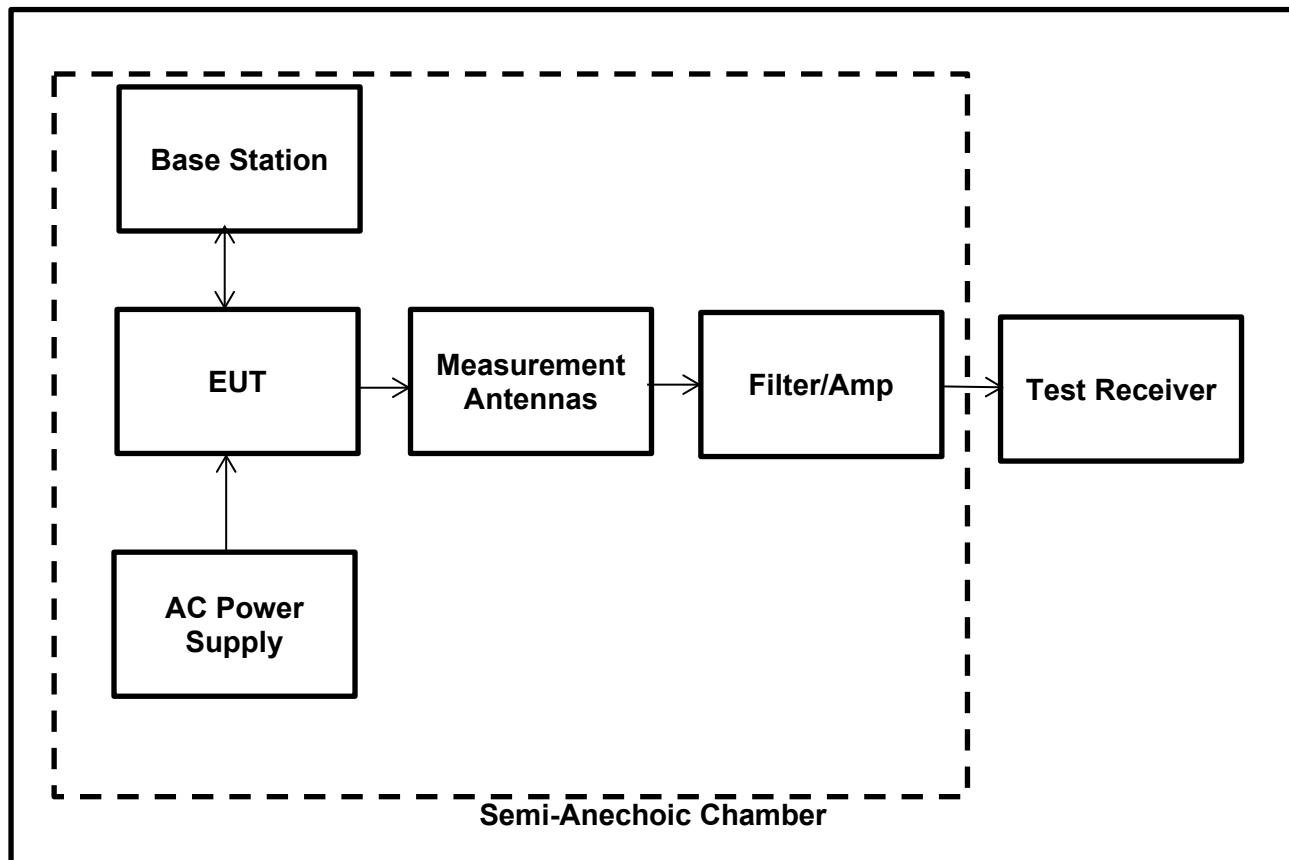
<b>FCC Reference:</b>	Part 2.1053 & 24.238 (a) & 15.225(d) & 15.247(d) & 15.209(a) &
<b>ISED Reference:</b>	RSS-Gen 6.13 & RSS-247 5.5 & RSS 133 § 6.5 & RSS-GEN §6.13 & RSS-210 B.6(a)(iv)
<b>Test Method Used:</b>	ANSI C63.10:2013 Sections 6.3 and 6.4
<b>Frequency Range</b>	9 kHz to 30 MHz

### **Environmental Conditions:**

<b>Temperature (°C):</b>	24.0
<b>Relative Humidity (%):</b>	42.0

### **Notes:**

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. 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.
5. The radiated emission measurements were performed with the EUT set to following worst-case mode.
  - 802.11g | 20 MHz | 6 Mbps | Bottom Channel | PWR 12 (Note 1) (Note 2) +
  - LTE CAT-M1 Band 2 | 20 MHz | RB1 | Bottom channel | QPSK | +
  - NFC-A | 212 kb/s | ASK at maximum power in NFC-13.56 MHz test mode |
6. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
7. All other emissions shown on the pre-scan plot were investigated and found to be below the measurement system noise floor.
8. 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
  - Tracer Mode: Max Hold

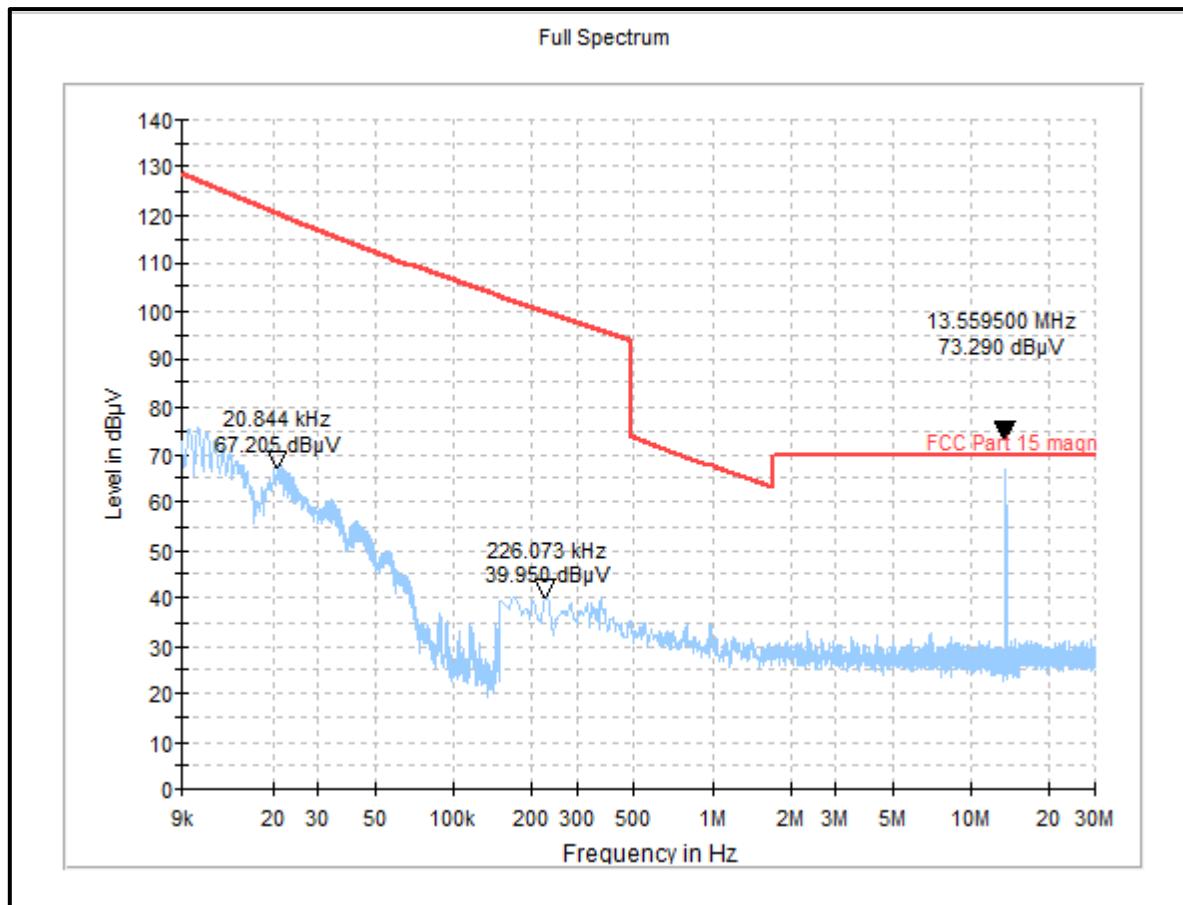
**Transmitter Radiated Emissions / Transmitter out of band Radiated Emission (continued)****Test Setup:**

**Transmitter Radiated Emissions / Transmitter out of band Radiated Emission (continued)**

**Results: WLAN 2.4 GHz / 802.11q / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

Frequency (MHz)	Loop Antenna Orientation	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
No critical emissions were found					

**Plot: 9 kHz – 30 MHz: WLAN 2.4 GHz / 802.11g / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**



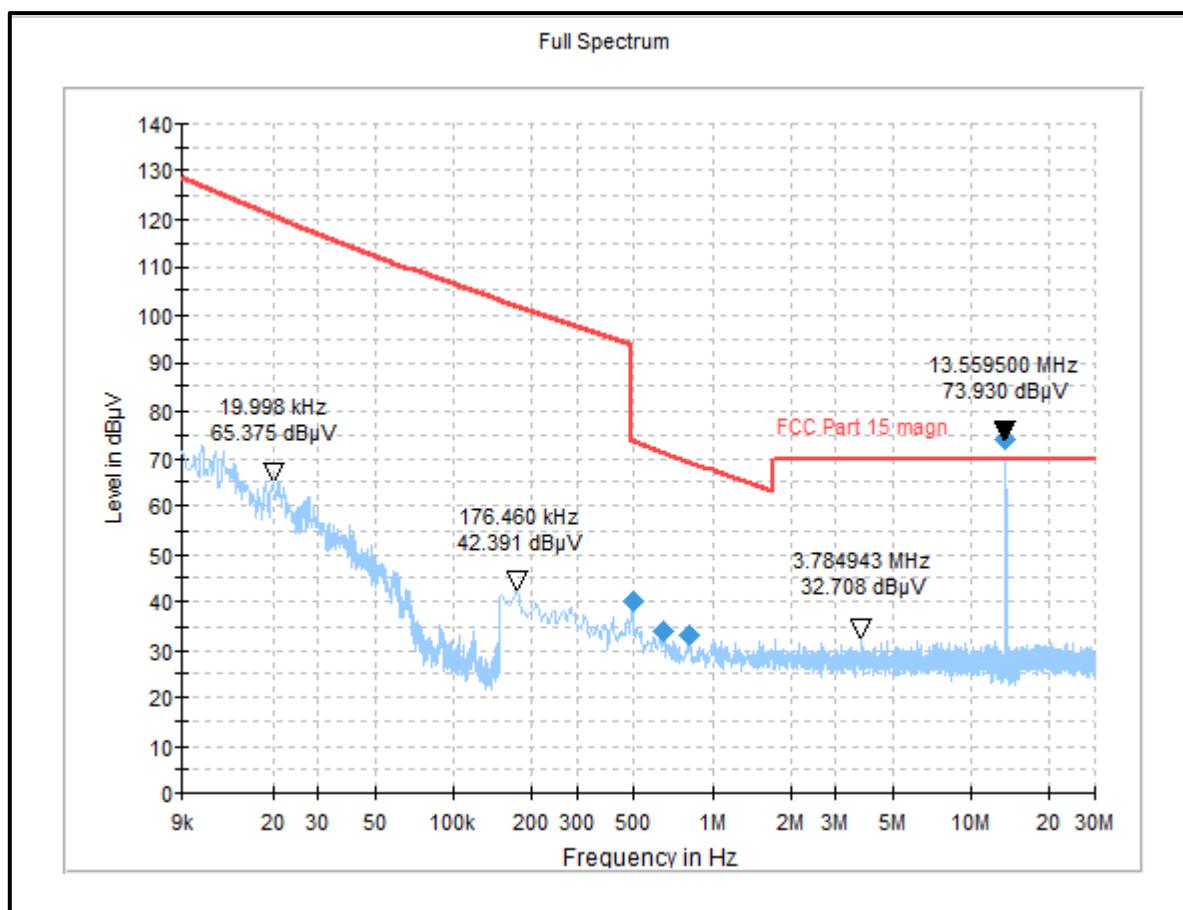
*Note: The emission at 13.56 MHz is from NFC and we cannot de-activate it during the measurement.*

**Result: Pass**

**Transmitter Radiated Emissions / Transmitter out of band Radiated Emission (continued)****Results: BT-LE Mode / 1 Mbps/ Bottom Channel / MAX PWR / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

Frequency (MHz)	Loop Antenna Orientation	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
0.493980	90° to the EUT	40.04	73.72	33.68	Complied
0.649433	90° to the EUT	33.86	71.20	37.34	Complied
0.808193	90° to the EUT	33.26	69.25	35.99	Complied

**Plot: 9 kHz – 30 MHz: BT-LE Mode / 1 Mbps/ Bottom Channel / MAX PWR / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**



*Note: The emission at 13.56 MHz is from NFC and we cannot de-activate it during the measurement.*

**Result: Pass**

**Transmitter Radiated Emissions / Transmitter out of band Radiated Emission (continued)****Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	21 & 22 July 2022
<b>Test Sample Serial Number:</b>	FCC / AT&T Sample 1		
<b>Test Site Identification</b>	SR 1/2		

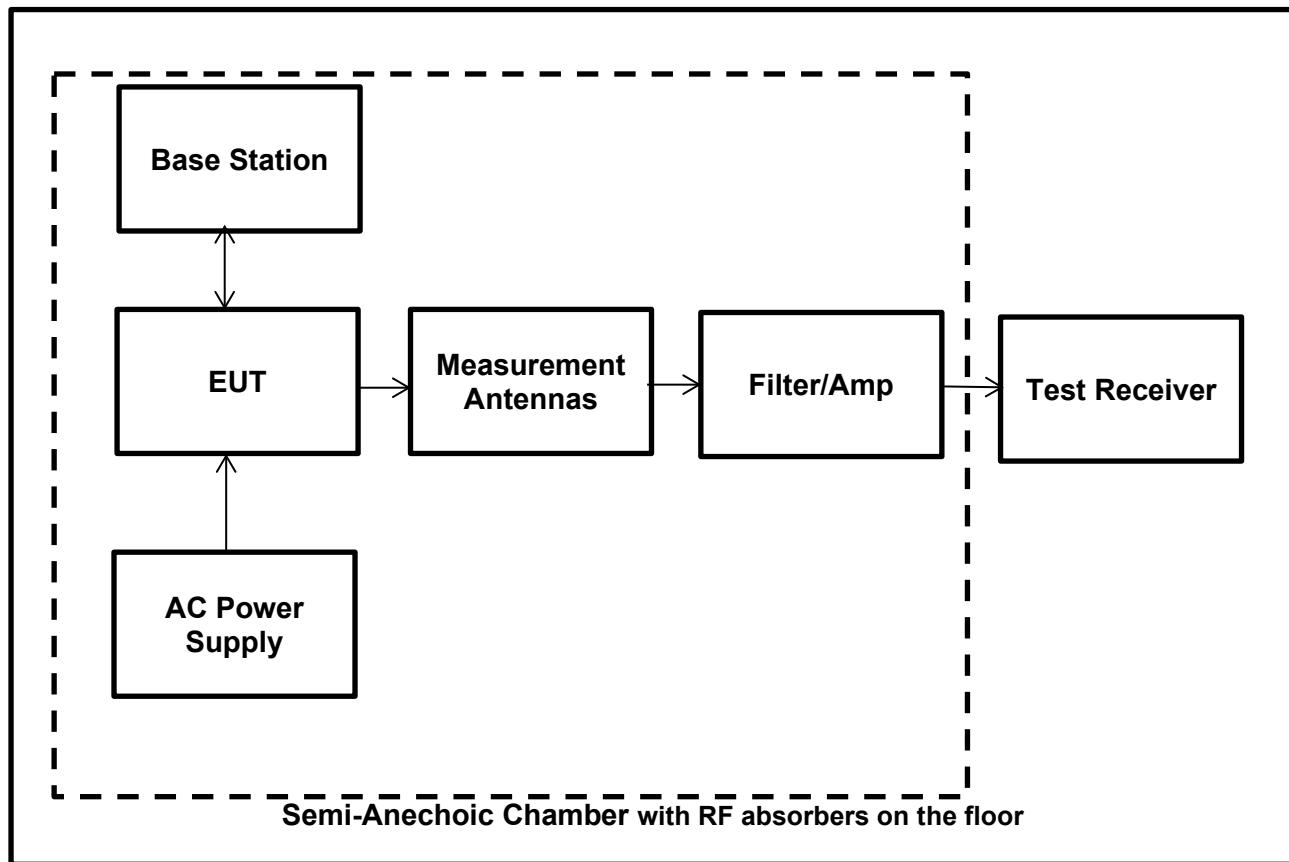
<b>FCC Reference:</b>	Part 2.1053 & 24.238 (a) & 15.225(d) & 15.247(d) & 15.209(a) &
<b>ISED Reference:</b>	RSS-Gen 6.13 & RSS-247 5.5 & RSS 133 § 6.5 & RSS-GEN §6.13 & RSS-210 B.6(a)(iv)
<b>Test Method Used:</b>	ANSI C63.10:2013 Sections 6.3 and 6.5 KDB 971168 Section 6.1 referencing ANSI C63.26:2015 section 5.7
<b>Frequency Range</b>	30 MHz to 25 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	24.0 & 24.4
<b>Relative Humidity (%):</b>	42.0 & 44.1

**Note(s):**

1. Pre-scans were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with absorber on the floor at a distance of 3 meters. 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.
2. Pre-scans above performed, and a marker placed on the highest measured level of the appropriate plot.
3. The minimum permissible attenuation level of any spurious emissions is  $43 + 10 \log (P)$  dB where transmitting power (P) in Watts.
4. The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.
5. For each out of band emissions measurement:
  - Set RBW & VBW to 100 kHz & 300 kHz for the measurement below 1 GHz, and 1 MHz and 3MHz for the measurement above 1 GHz.
6. The EUT was configured on following worst-case mode.
  - 802.11g | 20 MHz | 6 Mbps | Bottom Channel | PWR 12 (Note 1) (Note 2) +
  - LTE CAT-M1 Band 2 | 20 MHz | RB1 | Bottom channel | QPSK | +
  - NFC-A | 212 kb/s | ASK at maximum power in NFC-13.56 MHz test mode |
7. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
8. All other emissions shown on the pre-scan plot were investigated and found to be below the measurement system noise floor.

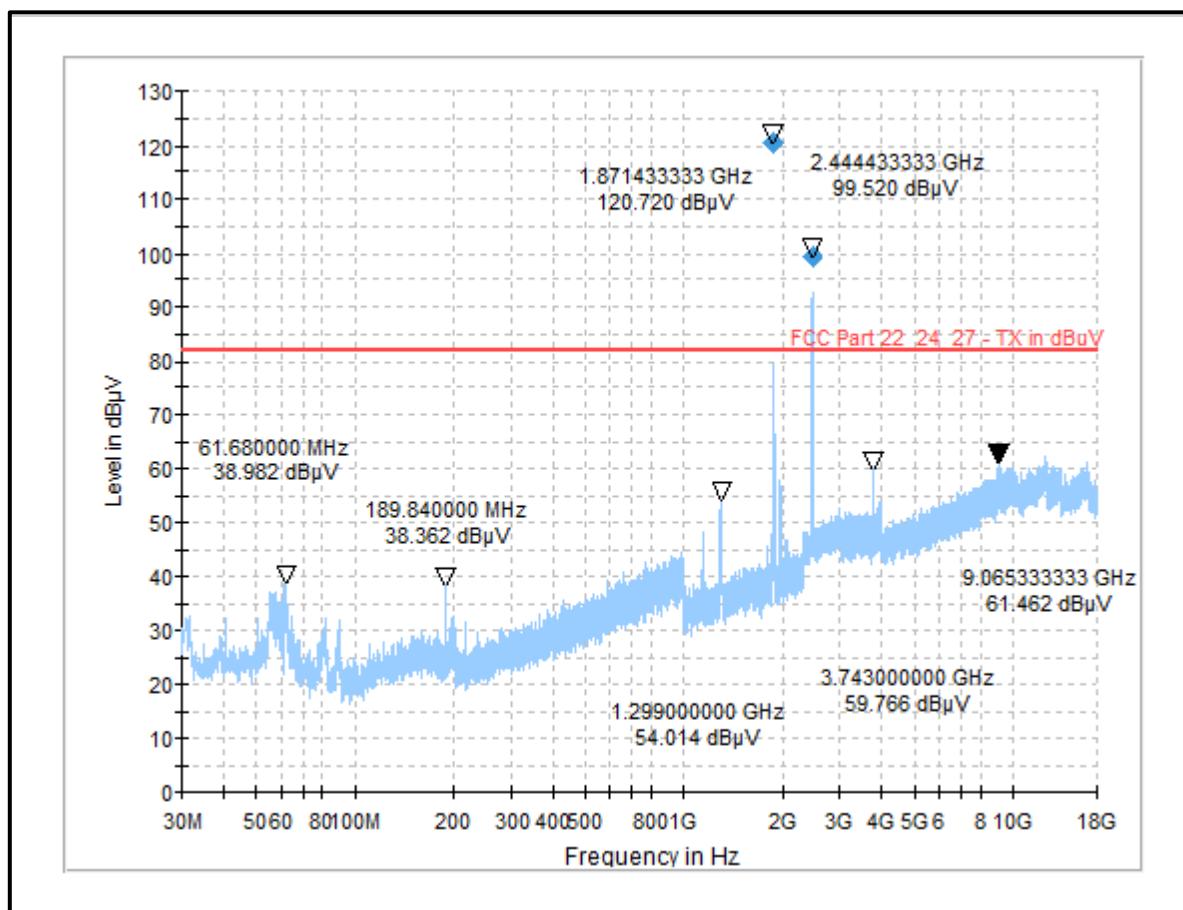
**Transmitter Radiated Emissions / Transmitter out of band Radiated Emission (continued)****Test Setup:**

**Transmitter Radiated Emissions (continued)**

**WLAN 2.4 GHz / 802.11g / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
No critical emissions were found					

**Plot: 30 MHz – 18 GHz: WLAN 2.4 GHz / 802.11g / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**



Note: The peak at 1871.43 MHz is the uplink frequency of the respective cellular band tested.

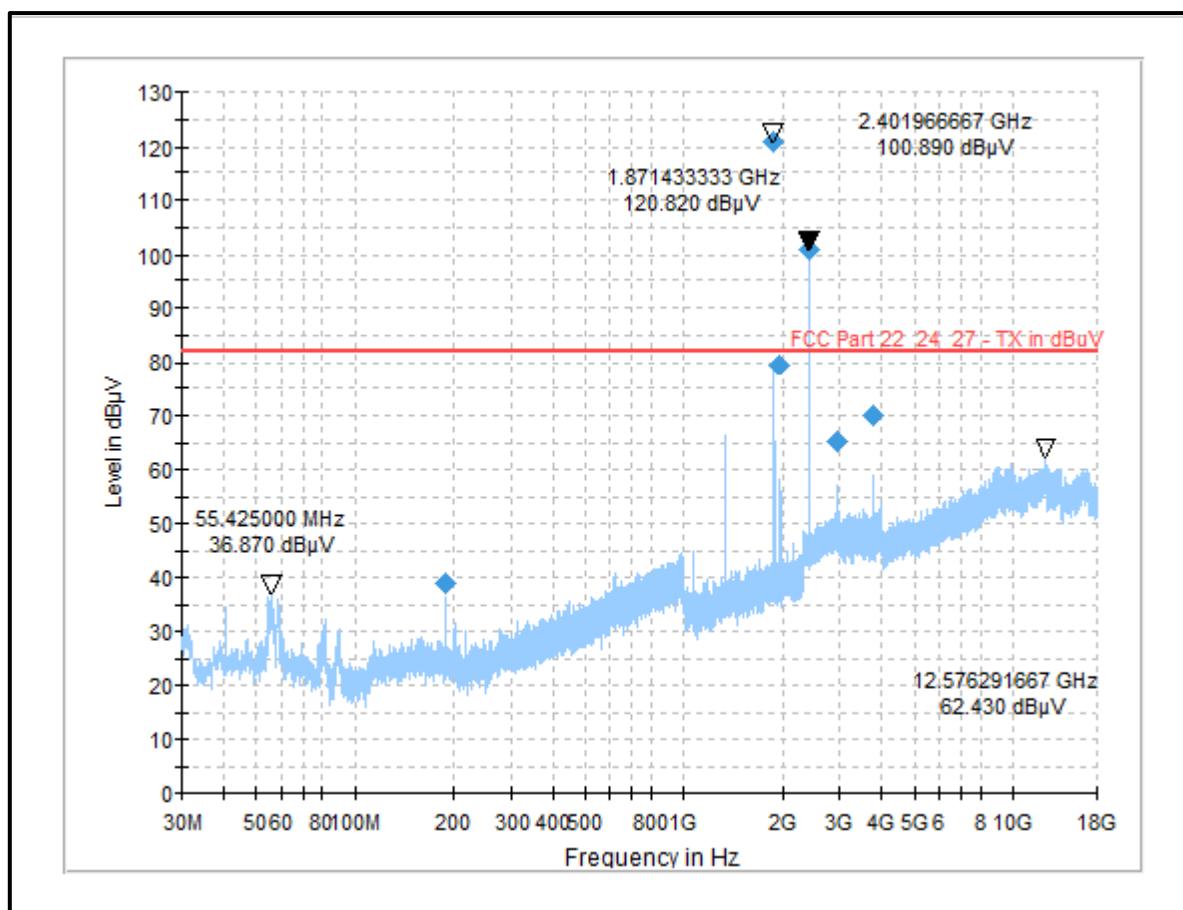
Note: The peak at 2444.43 MHz is the frequency of the WiFi band tested.

**Result: Pass**

**Transmitter Radiated Emissions (continued)****Results: BT-LE Mode / 1 Mbps/ Bottom Channel / MAX PWR / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
189.84	Vertical	38.96	82.20	43.24	Complied
1340.82	Horizontal	78.53	82.20	3.67	Complied
1956.37	Vertical	79.53	82.20	2.67	Complied
2933.03	Horizontal	65.52	82.20	16.68	Complied
3743.00	Horizontal	70.24	82.20	11.96	Complied

**Plot: 30 MHz – 1 GHz: BT-LE Mode / 1 Mbps/ Bottom Channel / MAX PWR / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**



Note: The peak at 1871.43 MHz is the uplink frequency of the respective cellular band tested.

Note: The peak at 2401.96 MHz is the frequency of the WiFi band tested.

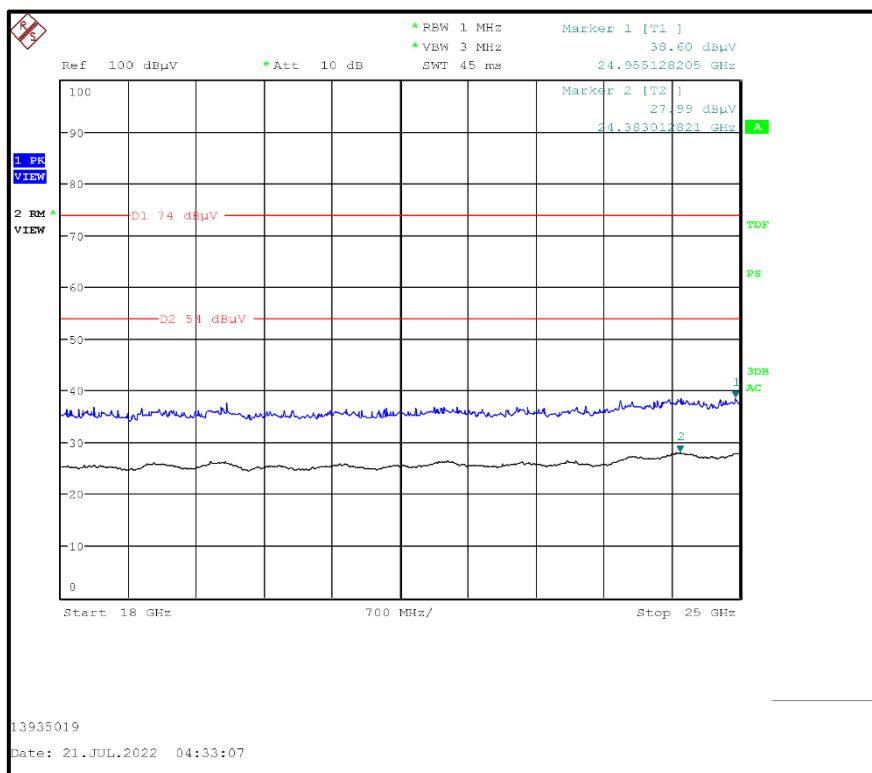
**Result: Pass**

**Transmitter Radiated Emissions (continued)**

**Results: WLAN 2.4 GHz / 802.11q / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
No critical emissions were found					

**Plot: 18 GHz – 25 GHz: WLAN 2.4 GHz / 802.11g / 20 MHz / 6 Mbps / PWR 12 / Middle Channel / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

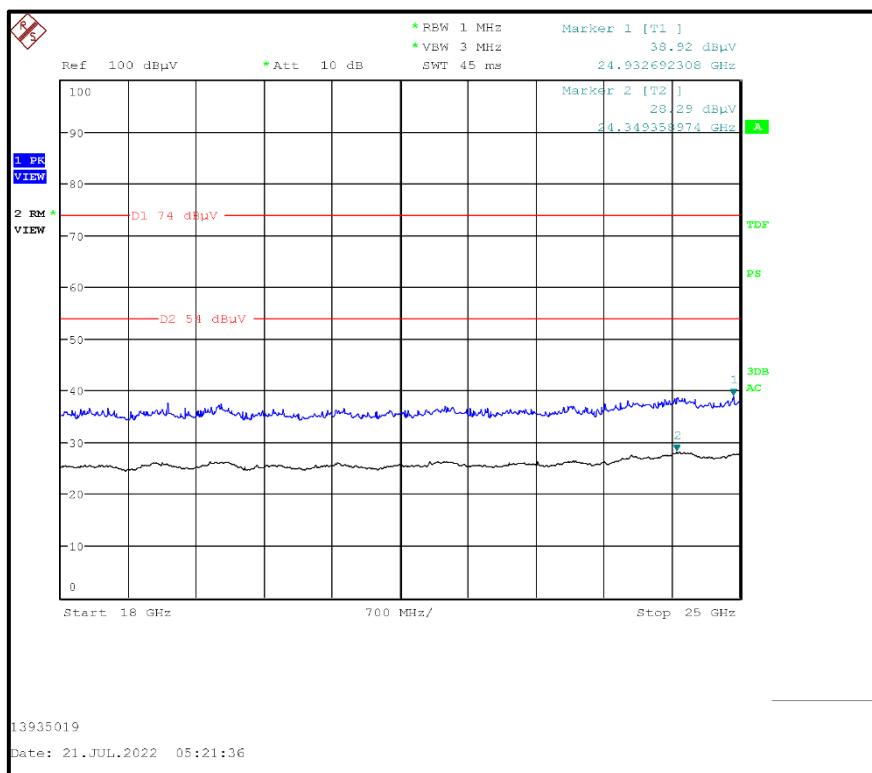


**Result: Pass**

**Transmitter Radiated Emissions (continued)****Results: BT-LE Mode / 1 Mbps/ Bottom Channel / MAX PWR / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
No critical emissions were found					

**Plot: 18 GHz – 25 GHz: BT-LE Mode / 1 Mbps/ Bottom Channel / MAX PWR / + LTE Band 2 / Bottom channel / RB1 / QPSK + NFC 13.56 MHz / NFC-A 212 kb/s**



**Result: Pass**

## **5. 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
AC Conducted Spurious Emissions	95%	±2.49 dB
Radiated Spurious 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.

## 6. 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
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	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
495	Rohde & Schwarz	Antenna, log. - periodical	HL050	100296	06/08/2021	24
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	22/08/2022	24
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
591	Rohde & Schwarz	Receiver	ESU 40	100244/040	13/07/2022	12
669	Rohde & Schwarz	EMI Test Receiver	ESW 44	103087	03/02/2022	18
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
328	SPS	AC/DC power distribution system	PAS 5000	A2464 00/2 0200	lab verification	n/a
1603665	Siemens Matsushita Components	semi-anechoic chamber SR1/2	-/-	B83117-A1421-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 stabilisation network (ISN)	ISN T800	26076	14/07/2021	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

## 7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	30	-	Initial Version
<b>Test Report Version 1.1 supersedes Version 1.0 with immediate effect</b> Test Report No. UL-RPT-RP-13935019-516-2 Version 1.1, Issue Date 03 April 2023 replaces Test Report No. UL-RPT-RP-13935019-516-2 Version 1.0, Issue Date 01 September 2022, which is no longer valid			
1.1	as below	as below	Current Version
	-	-	Report template updated
	1	-	Model name, FCC ID and IC updated
	4	1.2	Manufacturer name updated
	7	2.2	Notes updated
	7	2.3	Methods and procedures updated
	8	3.1	Identification of EUT updated
	8	3.2	Description of EUT updated
	10	3.4	Notes updated
	10	3.5	Support equipment table updated
	15 & 16	5.2.1	Tables updated
	28	7	Used equipment list updated

--- END OF REPORT ---