



# TEST REPORT

**Test Report No. : UL-RPT-RP-12947326-1616-FCC**

**Applicant** : Boxine GmbH  
**Model No.** : Toniebox Starterset  
**FCC ID** : 2AU47-00001  
**Technology** : Intermodulations of WLAN2.4 GHz (802.11 b) & RFID – 13.56 MHz  
**Test Standard(s)** : FCC Parts 15.205,15.207,15.209(a),15.225(d) & 15.247

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-12947326-1616-FCC Version 1.1, Issue Date 21 AUGUST 2020 replaces  
Test Report No. UL-RPT-RP-12947326-1616-FCC Version 1.0, Issue Date 18 AUGUST 2020, which is no longer valid.
5. Result of the tested sample: **PASS**

Prepared by: Usta, Sercan  
Title: Laboratory Engineer  
Date: 21 August 2020

Approved by: Ajit, Phadtare  
Title: Lead Test Engineer  
Date: 21 August 2020



Deutsche  
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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.

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## **1. Customer Information**

### **1.1.Applicant Information**

<b>Company Name:</b>	Boxine GmbH
<b>Company Address:</b>	Am Wehrhahn 50, 40211 Düsseldorf, GERMANY
<b>Contact Person:</b>	Mr. Klaus Raske
<b>Contact E-Mail Address:</b>	klaus.raske@boxine.de
<b>Contact Phone No.:</b>	+49 211 54254049 / +49 176 80703188

### **1.2.Manufacturer Information**

<b>Company Name:</b>	Boxine GmbH
<b>Company Address:</b>	Grafenberger Allee 120, 40237 Düsseldorf, GERMANY
<b>Contact Person:</b>	Mr. Jürgen Popp
<b>Contact E-Mail Address:</b>	juergen.popp@boxine.de
<b>Contact Phone No.:</b>	+49 160 91682699

## **2. Summary of Testing**

### **2.1. General Information**

#### **Applied Standards**

<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>	47CFR15.225
<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>	47CFR15.205, 47CFR15.207 and 47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.205, 15.207 and 15.209

#### **Location**

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

#### **Date information**

<b>Order Date:</b>	23 July 2019
<b>EUT arrived:</b>	12 August 2019 & 29 October 2019
<b>Test Dates:</b>	17 April 2020 to 29 June 2020
<b>EUT returned:</b>	-/-

## 2.2. Summary of Test Results

Clause	Measurement	Complied	Did not comply	Not performed	Not applicable
Part 15.207	Transmitter AC Conducted Emissions <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(d), 15.225(d), 15.209(a)(c) & 15.205	Transmitter Radiated Emissions <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Note(s):

1. Intermodulation tests of WLAN 2.4 GHz (802.11 b) & RFID – 13.56 MHz.

## 2.3. Methods and Procedures

Reference:	ANSI C63.4-2014
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019
Title:	Guidance for compliance measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC rules
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

## 2.4. 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)**

<b>Brand Name:</b>	Toniebox Starterset
<b>Model Name or Number:</b>	03-xxxx (colour coding)
<b>Serial Number:</b>	TB1.2 PROT2 C ( <i>Radiated Sample</i> )
<b>MAC ID :</b>	50:F1:4A:7C:E6:DB
<b>Hardware Version Number:</b>	1.2
<b>Firmware Version Number:</b>	EU 3.0.4
<b>FCC ID:</b>	2AU47-00001

<b>Brand Name:</b>	Boxine
<b>Model Name or Number:</b>	Tonie Figure
<b>Serial Number:</b>	Not stated
<b>Hardware Version Number:</b>	Not Stated
<b>Firmware Version Number:</b>	Not Stated
<b>Additional Details:</b>	Passive RFID-13.56 MHz Key

<b>Brand Name:</b>	Tonies
<b>Model Name or Number:</b>	DYS-618-090150W
<b>Serial Number:</b>	DY618-090150-16525B
<b>Hardware Version Number:</b>	Not Stated
<b>Firmware Version Number:</b>	Not Stated
<b>Additional Details:</b>	AC-DC Adapter- Switching Mode Power Supply
	100-240 V AC / 0.5 A / 50Hz to 9 V DC / 1.5 A

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

The equipment under test was a Toniebox Starterset consists of the Toniebox itself, a power supply including docking station DYS 619 and Tonie Lauscher (headset). Toniebox Starterset is an Audio system for children. Tonie figures to be purchased separately are placed on the Toniebox (TB).

An RFID receiver in the Toniebox reads the product ID from the figure (passive RFID chip in the Tonie figure). Via the WLAN module in the TB, the audio content is downloaded from the Boxine-Tonie cloud to the TB's internal memory (flash drive) via the Internet and played back via the TB speaker or Headphone.

#### **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>	WLAN (IEEE 802.11b) / Digital Transmission System	
<b>Type of Unit:</b>	Transceiver	
<b>Modulation Type:</b>	DBPSK, DQPSK, DSSS, CCK	
<b>Data Rates:</b>	802.11b	1, 2, 5.5 & 11 Mbps
<b>Power Supply Type 1:</b>	AC-DC Adapter- Switching Mode Power Supply	
<b>Power Supply Requirement(s):</b>	100-240 V AC / 0.5 A / 50 Hz to 9 V DC / 1.5 A	
<b>Power Supply Type 2:</b>	Internal Rechargeable Battery via AC /DC Adapter	
<b>Power Supply Requirement(s):</b>	3.6 V DC / 0.1 A	
<b>Declared Antenna Gain:</b>	2.0 dBi	
<b>Channel Spacing:</b>	20 MHz	
<b>Transmit Frequency Range:</b>	2412 MHz to 2462 MHz	
<b>Transmit Channels:</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	1	2412
	6	2437
	11	2462

<b>Tested Technology:</b>	RFID 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>Power supply Type 1:</b>	AC-DC Adapter- Switching Mode Power supply
<b>Power supply Requirement(s):</b>	100-240 V AC / 0.5 A / 50 Hz to 9 V DC / 1.5 A
<b>Power supply Type 2:</b>	Internal Rechargeable Battery via AC /DC Adapter
<b>Power supply Requirement(s):</b>	3.6 V DC / 0.1 A

Intermodulation Transmit Channels Tested:	RFID 13.56 MHz	WLAN 2.4 GHz 802.11b	
	Channel Frequency (MHz)	Channel Number	Channel Frequency (MHz)
	13.56	1	2412
	13.56	6	2437
	13.56	11	2462

### **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	Laptop	Lenovo	L560	MP-16X73B 16/11

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

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Programming PCB	Boxine	Debug Board 1.0	N/A
2	USB Cable	N/A	N/A	N/A

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

### **4.1. Operating Modes**

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

- ☒ Continuous simultaneous transmissions of WLAN 2.4 GHz-b Mode & RFID 13.56 MHz
  - RFID 13.56 MHz: modulated carrier at maximum power
  - WLAN 2.4 GHz : Maximum Power Settings : PWR 0 | Worst Case Mode: 802.11b: 11 Mbit/s\*

\*As per applicant's declaration the EUT implement only 802.11b mode.

\*Multiple supported modulation schemes, nominal channel bandwidths were initially investigated to determine the above mentioned worst case data rates.

### **4.2. Configuration and Peripherals**

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

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

- The EUT can powered via either with AC/DC power adapter or charged internal battery.
- The results from AC/DC power adapter found to be worst case (maximum power); therefore radiated intermodulation spurious emissions have been performed only with EUT powered via AC/DC power adapter.
- For AC conducted line emissions measurement the EUT was powered via AC/DC power adapter. The measurements were carried out with 120 VAC /60 Hz & 240 VAC/60 Hz.

#### **Test Mode Activations:**

- For WLAN2.4 GHz test mode, the EUT programmed via programming PCB which supplied by customer. The EUT was controlled using a software application named CC3100 & CC3200 Radio Tool supplied by the customer. The application was used to enable continuous transmission and to select the test channels as required.
- The WLAN2.4 GHz transmitter test modes were configured to maximum supported power settings (PWR 0).
- For RFID 13.56 MHz test mode, the Tonie Figure was placed on the EUT; which then reads the product ID from the Tonie figure & activates the RFID communication.

#### **Radiated Measurements:**

- In accordance with ANSI C63.10 section 5.10.7, the EUT allows for the connection of external accessories, including external electrical control signals. Hence emission tests shall be performed with the EUT and accessories configured in a manner that tends to produce maximum emissions; therefore all radiated tests were with EUT powered via AC/DC power adapter 120 VAC / 60 Hz.
- Before starting final radiated spurious emission measurements "worst case verification" with the EUT in Standing-position & Laying-position was performed by Lab.
- The EUT in Laying-position was found to be the worst case therefore this report includes relevant results.
- Radiated spurious emissions were performed with the EUT positioned on the turn table and rotating 360 degrees while the antenna height varies from 1 to 4 m over the measurement frequency range
- EMC32 V10.1.0 Software was used for the Radiated spurious emission measurements. EMC32 V10.1.0 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:	Devang Chauhan	Test Date:	29 June 2020
Test Sample Serial Number:	TB1.2 PROT2 C ( <i>Radiated Sample</i> )		
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):	23
Relative Humidity (%):	56

#### Settings of the Instrument

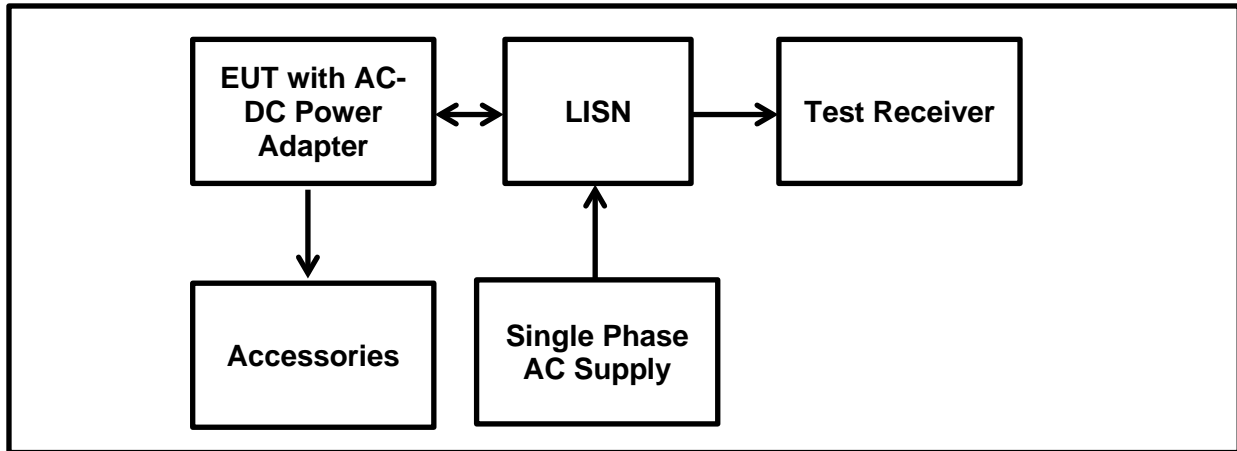
Detector	Quasi Peak/ Average Peak
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#### Note(s):

1. The EUT was plugged into an AC/DC Power Supply. The Power Supply was connected to 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 100-240 VAC~50/60 Hz power supply.
3. The EUT was configured on
  - WLAN 2.4 GHz: Middle Channel | 802.11b – 11 Mbps | Power Level: 0
  - RFID 3.56 MHz : Single Channel
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: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.152	Live	52.90	65.90	13.00	Complied
0.167	Live	53.00	65.10	12.10	Complied
0.204	Live	45.00	63.40	18.40	Complied
0.271	Live	39.70	61.10	21.40	Complied
10.204	Live	20.70	60.00	39.30	Complied
13.559	Live	40.00	60.00	20.00	Complied

#### **Results: Live / Average / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.152	Live	33.20	55.90	22.70	Complied
0.167	Live	36.00	55.10	19.10	Complied
0.204	Live	31.10	53.40	22.30	Complied
0.271	Live	26.80	51.10	24.30	Complied
10.204	Live	15.30	50.00	34.70	Complied
13.559	Live	27.60	50.00	22.40	Complied

#### **Results: Neutral / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.152	Neutral	52.50	65.80	13.30	Complied
0.160	Neutral	48.80	65.40	16.60	Complied
0.206	Neutral	46.80	63.40	16.60	Complied
0.278	Neutral	41.00	60.90	19.90	Complied
1.992	Neutral	28.00	56.00	28.00	Complied
13.560	Neutral	40.00	60.00	20.00	Complied

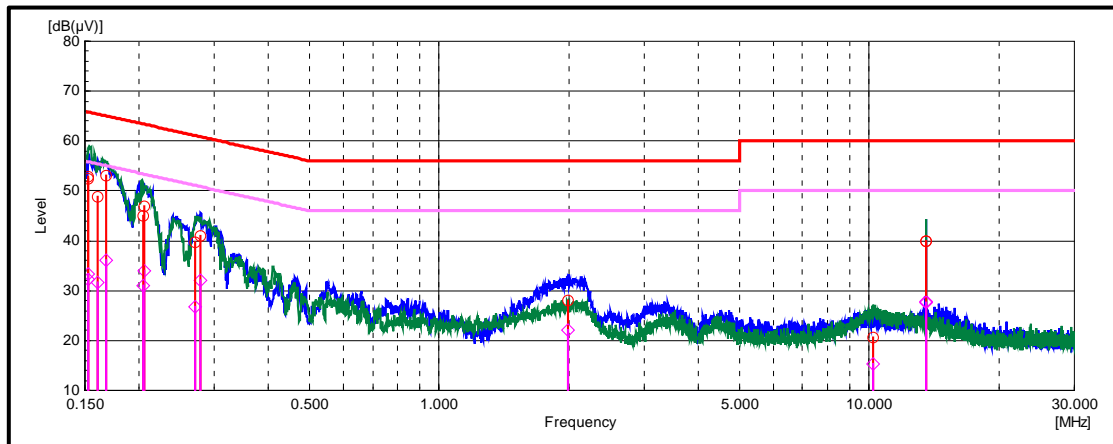
#### **Results: Neutral / Average / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.152	Neutral	32.30	55.80	23.50	Complied
0.160	Neutral	31.60	55.40	23.80	Complied
0.206	Neutral	34.00	53.40	19.40	Complied
0.278	Neutral	32.10	50.90	18.80	Complied
1.992	Neutral	22.10	46.00	23.90	Complied
13.560	Neutral	27.80	50.00	22.20	Complied

Result: **Pass**

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

**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: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.159	Live	51.40	65.50	14.10	Complied
0.195	Live	41.10	63.80	22.70	Complied
0.170	Live	49.50	64.90	15.40	Complied
0.248	Live	41.20	61.80	20.60	Complied
2.038	Live	25.80	56.00	30.20	Complied
13.559	Live	40.00	60.00	20.00	Complied

#### **Results: Live / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.159	Live	33.20	55.50	22.30	Complied
0.195	Live	28.00	53.80	25.80	Complied
0.170	Live	34.90	54.90	20.00	Complied
0.248	Live	28.00	51.80	23.80	Complied
2.038	Live	19.00	46.00	27.00	Complied
13.559	Live	27.50	50.00	22.50	Complied

#### **Results: Neutral / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.157	Neutral	51.50	65.60	14.10	Complied
0.208	Neutral	43.10	63.20	20.10	Complied
0.254	Neutral	45.00	61.60	16.60	Complied
2.180	Neutral	30.70	56.00	25.30	Complied
3.956	Neutral	21.00	56.00	35.00	Complied
13.559	Neutral	39.80	60.00	20.20	Complied

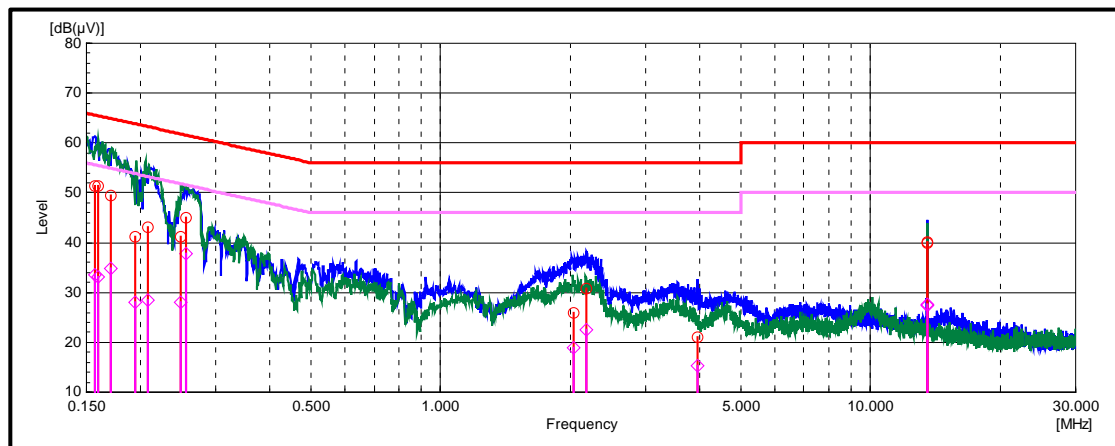
#### **Results: Neutral / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.157	Neutral	33.50	55.60	22.10	Complied
0.208	Neutral	28.50	53.20	24.70	Complied
0.254	Neutral	37.80	51.60	13.80	Complied
2.180	Neutral	22.50	46.00	23.50	Complied
3.956	Neutral	15.20	46.00	30.80	Complied
13.559	Neutral	27.50	50.00	22.50	Complied

**Result: Pass**

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

**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 Radiated Emissions

### Test Summary:

Test Engineer:	Sercan Usta	Test Date:	17 April 2020
Test Sample Serial Number:	TB1.2 PROT2 C ( Radiated Sample)		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d), 15.225(d), 15.209(a) & 15.205
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.4
Frequency Range	9 kHz to 30 MHz

### Environmental Conditions:

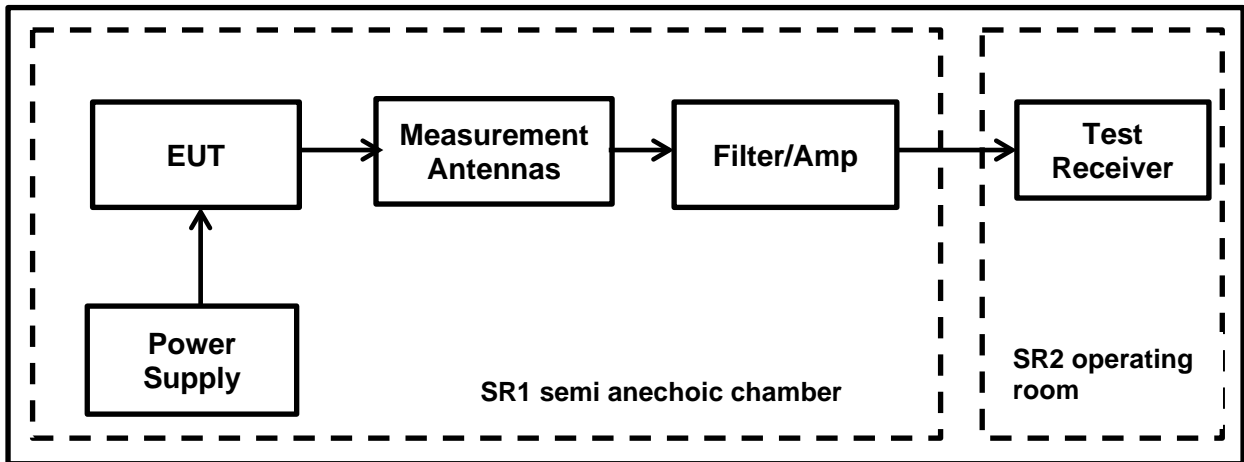
Temperature (°C):	25
Relative Humidity (%):	40

### Note(s):

1. In accordance with FCC KDB 414788, an alternative test site may be used for the measurement below 30 MHz (The OATS / SAC comparison data is available upon request). Therefore the result from the semi-anechoic chamber tests is shown in this section of the test report.
2. The limits are specified at a test distance of 30 meters & 300 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor.
3. Therefore the limit values are extrapolated to a measurement distance of 3 m where field strength of X dBuV/m was measured.
  - 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 final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
5. All emissions shown on the pre-scan plots were investigated and found to be ambient or > 20 dB below the appropriate limit.
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 1 m.
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: 300 Hz /VBW: 1 kHz
  - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
  - Detector: Max-Peak detector
  - Trace Mode: Max Hold
8. Final measurements were performed on the marker frequencies and the results entered into the table below.
9. The emissions shown at frequencies approximately 13.56 MHz on the 9 kHz to 30 MHz plots are the EUT RFID 13.56 MHz fundamental for the tested channel.

**Transmitter Radiated Emissions (continued)**

**Test Setup:**

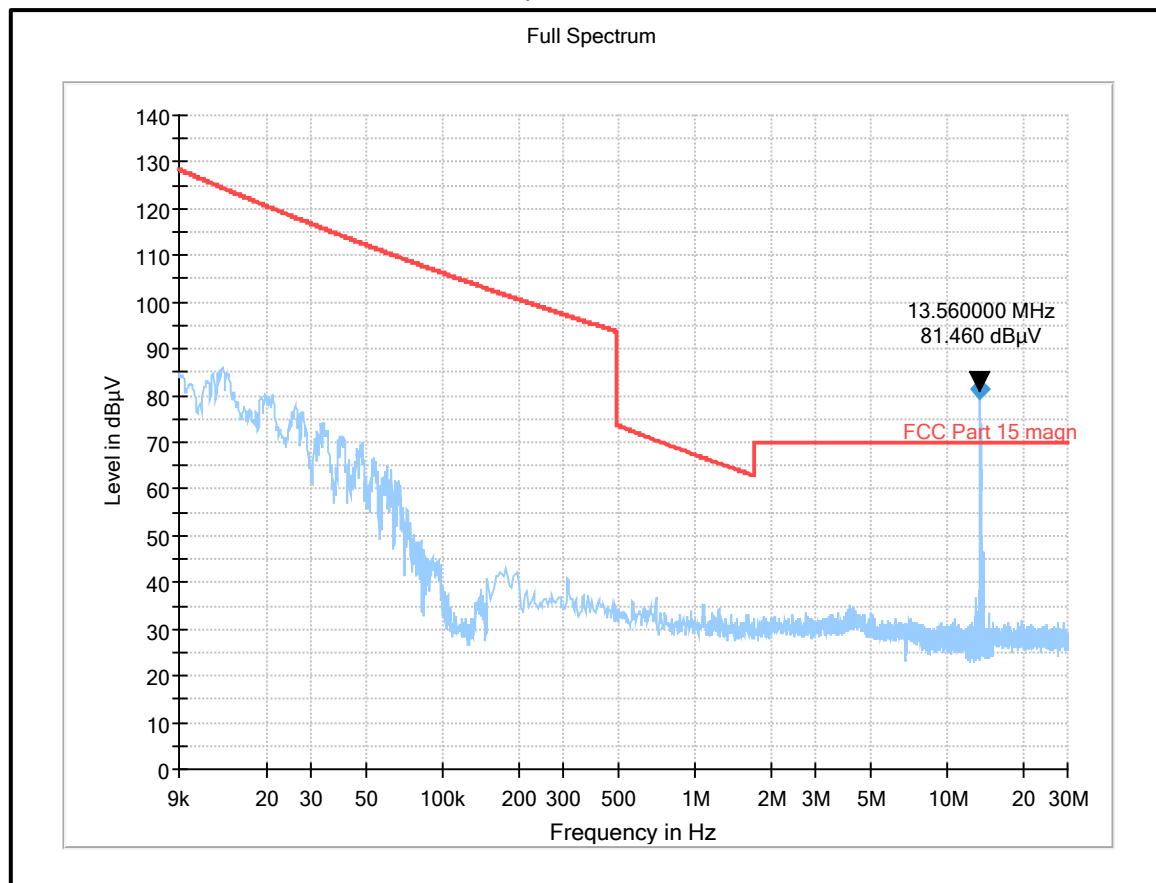


### Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Bottom Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 9 kHz – 30 MHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

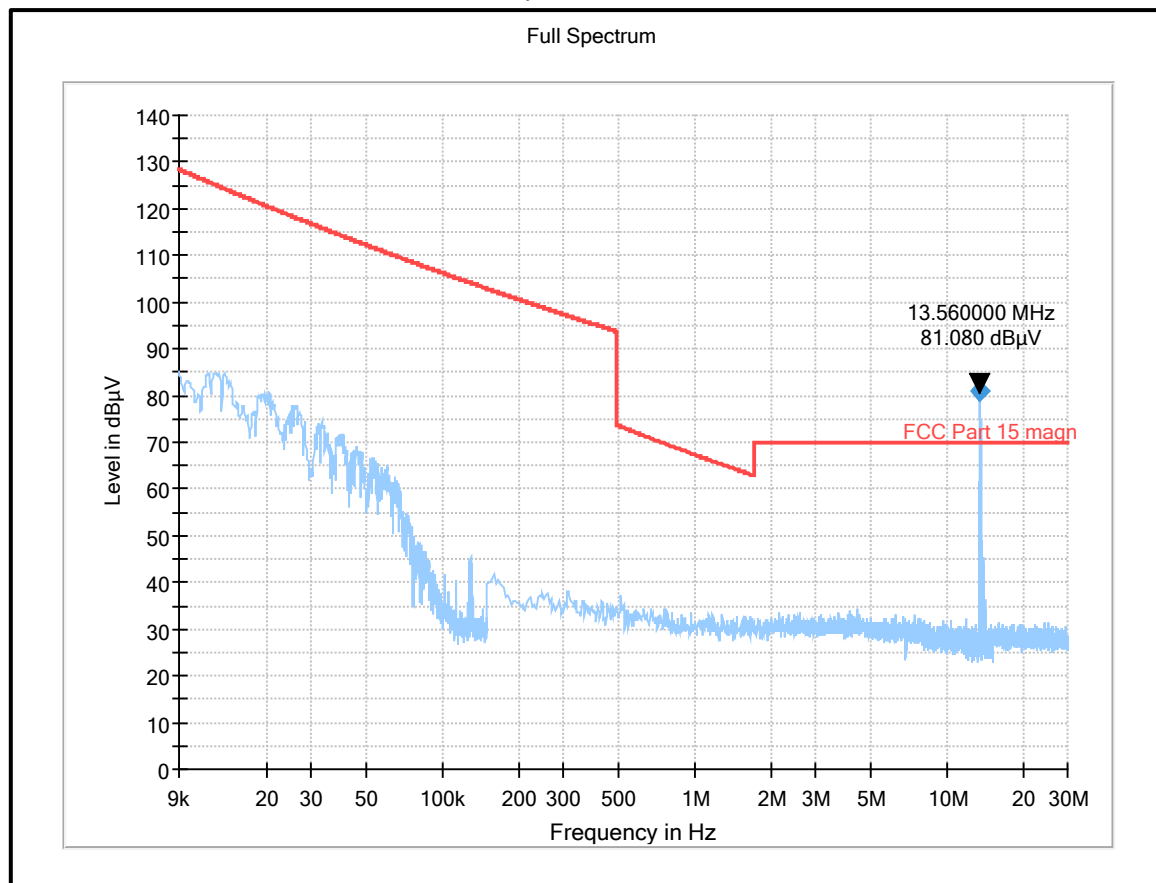
**Result: Pass**

# Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Middle Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 9 kHz – 30 MHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

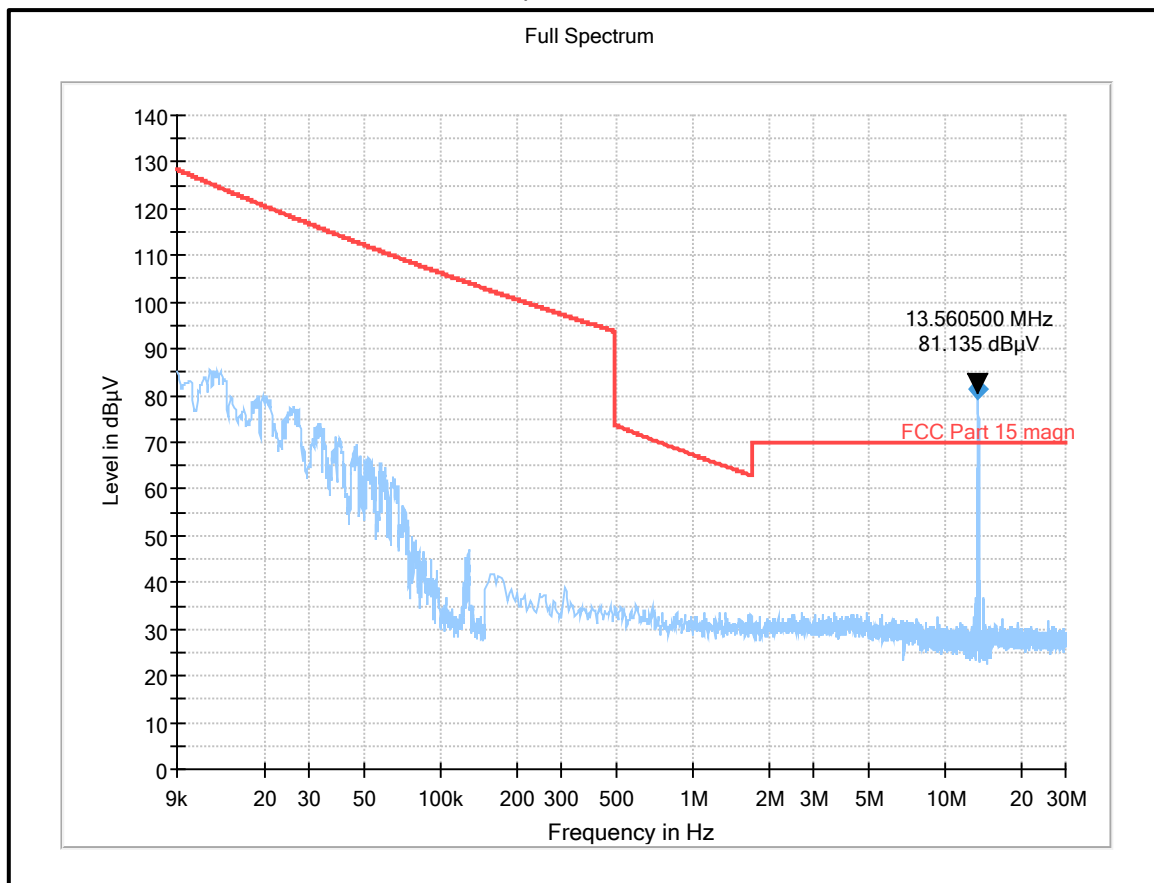
**Result: Pass**

# Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Top Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 9 kHz – 30 MHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

**Result: Pass**

## **Transmitter Radiated Emissions (continued)**

### **Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	17 April 2020
<b>Test Sample Serial Number:</b>	TB1.2 PROT2 C ( <i>Radiated Sample</i> )		
<b>Test Site Identification</b>	SR 1/2		

<b>FCC Reference:</b>	Parts 15.247(d), 15.225(d), 15.209(a) & 15.205
<b>Test Method Used:</b>	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.5
<b>Frequency Range</b>	30 MHz to 1000 MHz

### **Environmental Conditions:**

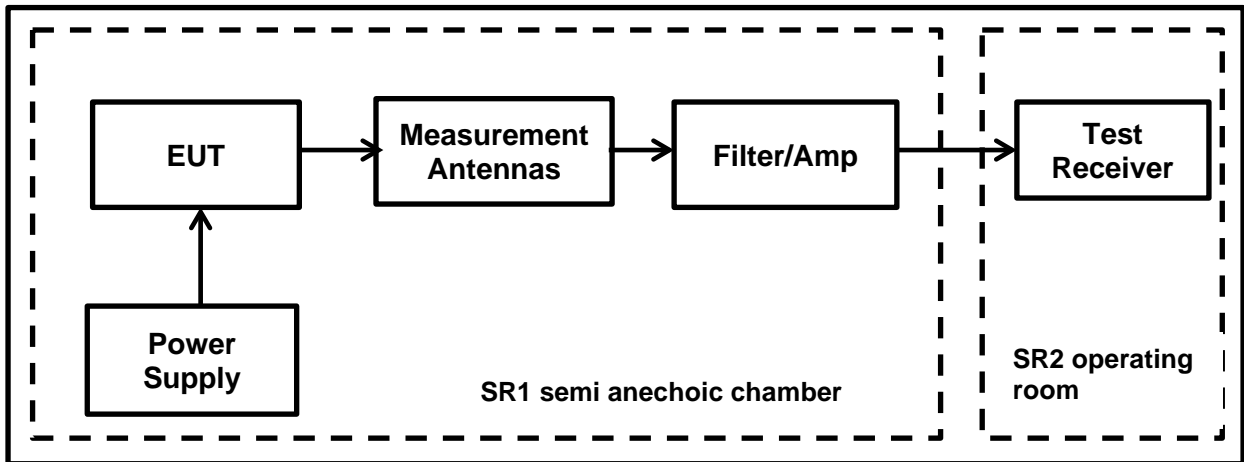
<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	41

### **Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the appropriate limit or below the measurement system noise floor.
3. 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.
4. 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.
5. Final measurements were performed on the marker frequencies and the results entered into the table below.

**Transmitter Radiated Emissions (continued)**

**Test Setup:**

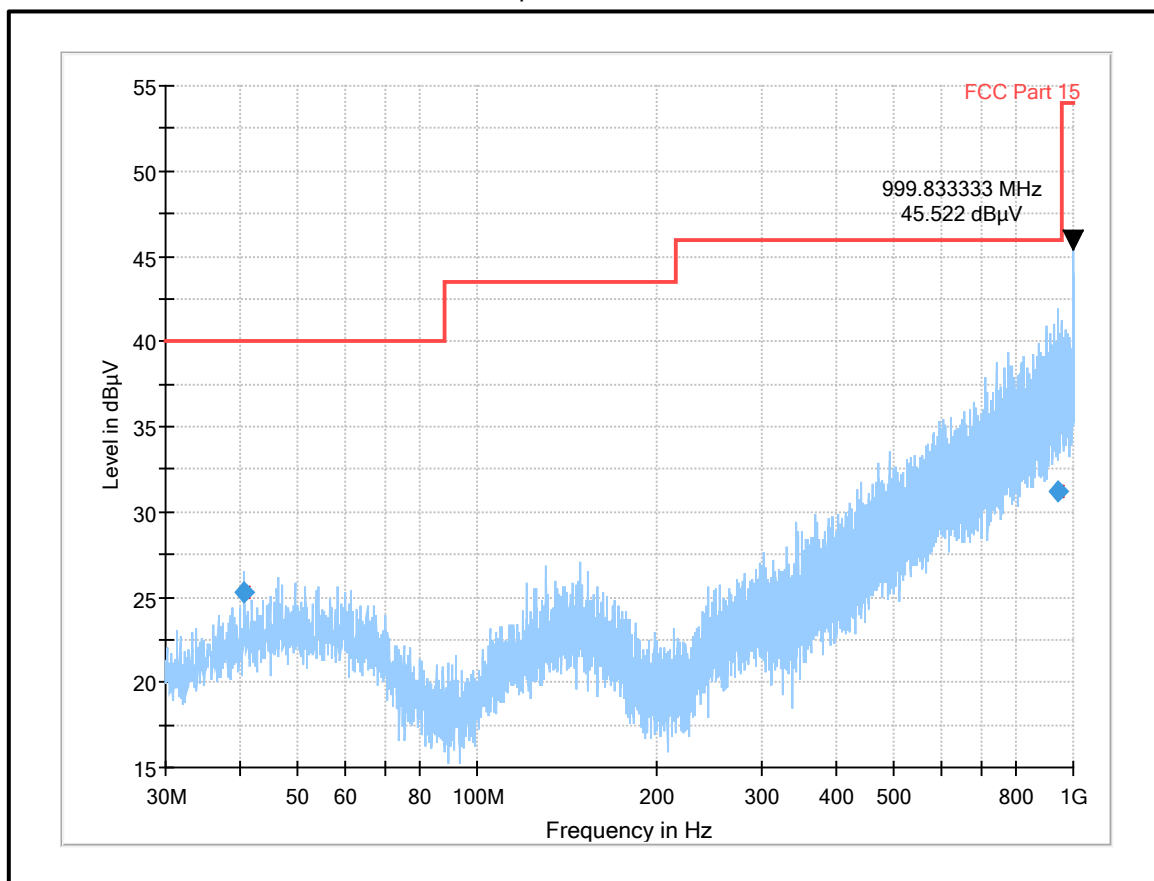


### Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Bottom Channel + RFID 13.56 MHz**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
40.665	Vertical	25.28	40.00	14.72	Complied
940.00	Horizontal	31.23	46.00	14.77	Complied

Plot: Radiated Transmitter spurious emission from 30 MHz – 1 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

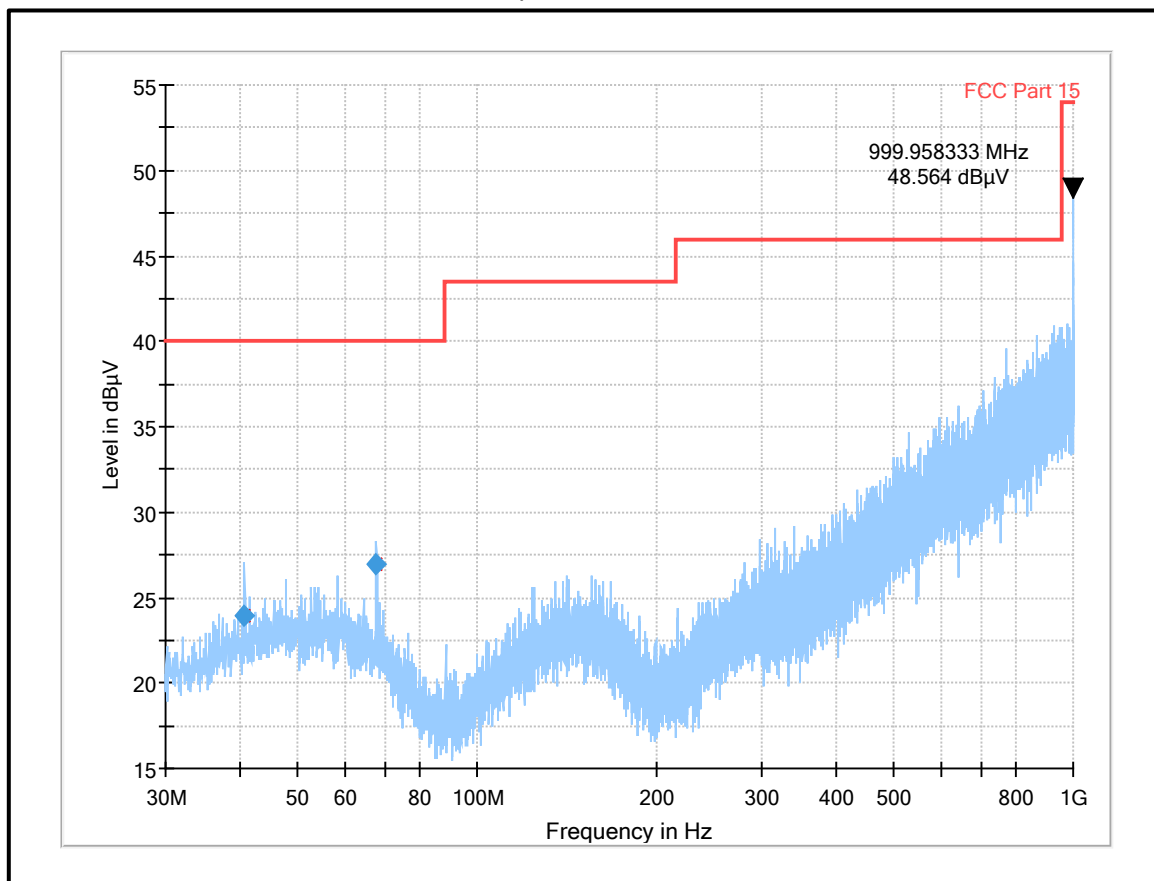
**Result: Pass**

# Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Middle Channel + RFID 13.56 MHz**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
40.710	Vertical	23.91	40.00	16.09	Complied
67.800	Vertical	27.00	40.00	13.00	Complied

Plot: Radiated Transmitter spurious emission from 30 MHz – 1 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

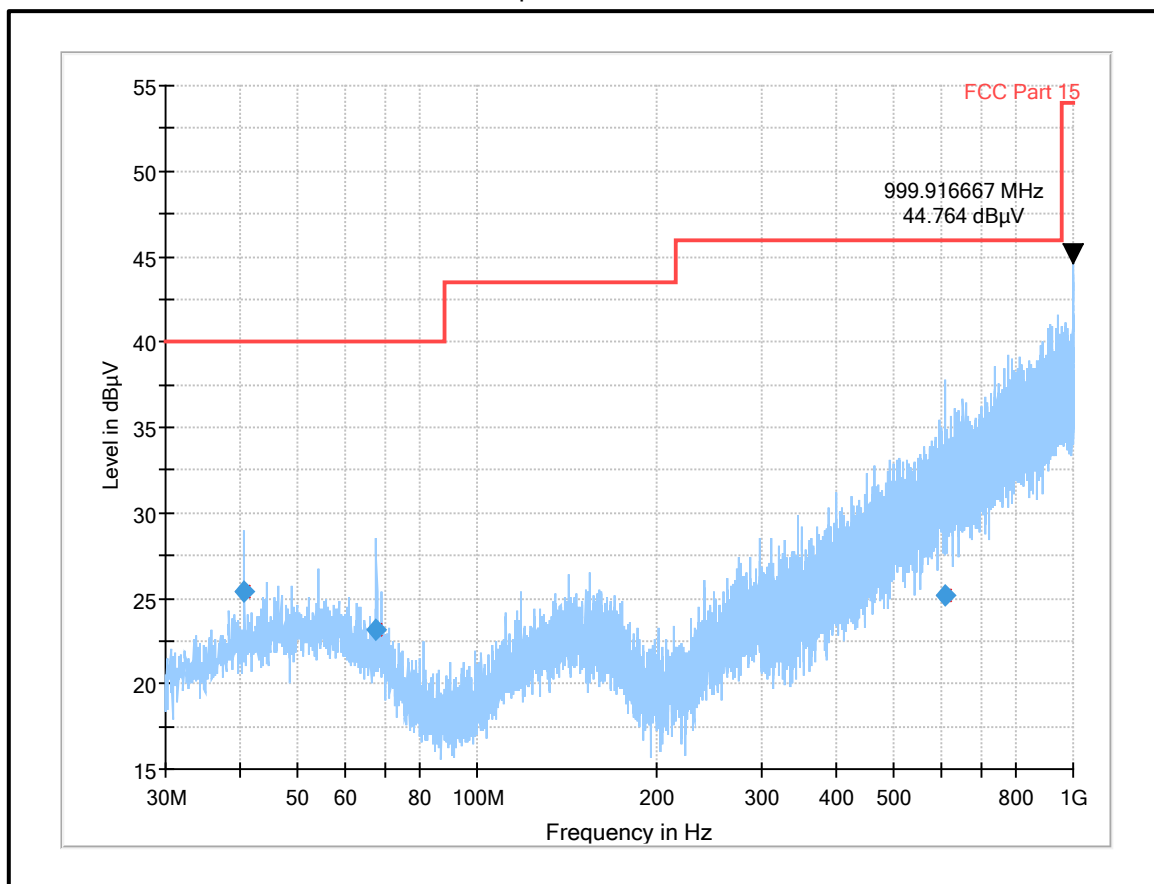
**Result: Pass**

# Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Top Channel + RFID 13.56 MHz**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
40.665	Vertical	25.37	40.00	14.63	Complied
67.755	Vertical	23.18	40.00	16.82	Complied
611.000	Horizontal	25.16	46.00	20.84	Complied

Plot: Radiated Transmitter spurious emission from 30 MHz – 1 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

**Result: Pass**

## **Transmitter Radiated Emissions (continued)**

### **Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	17 April 2020 & 27 April 2020
<b>Test Sample Serial Number:</b>	TB1.2 PROT2 C ( <i>Radiated Sample</i> )		
<b>Test Site Identification</b>	SR 1/2		

<b>FCC Reference:</b>	Parts 15.247(d), 15.225(d), 15.209(a) & 15.205
<b>Test Method Used:</b>	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.6
<b>Frequency Range</b>	1 GHz to 26 GHz

### **Environmental Conditions:**

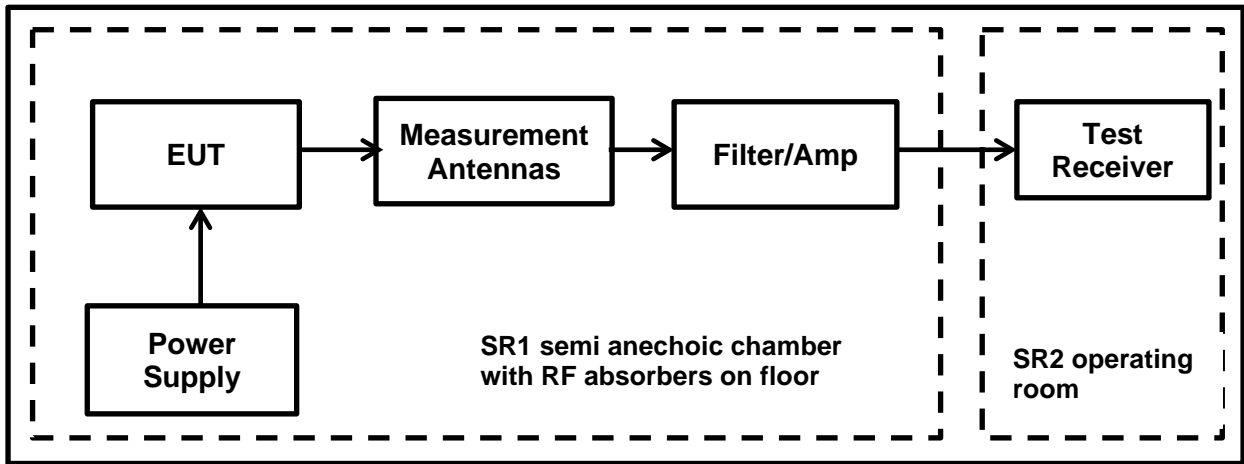
<b>Temperature (°C):</b>	21 & 25
<b>Relative Humidity (%):</b>	29 & 36

### **Note(s):**

1. The emissions shown at frequencies approximately 2.4 GHz to 2.4835 GHz on the 1 GHz to 18 GHz plots are the EUT WLAN 2.4 GHz for the tested channel.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the appropriate limit or below the measurement system noise floor.
4. Pre-scans 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 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.
5. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
6. \*In accordance with ANSI C63.10 Section 6.6.4.3 (Note 1), if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

**Transmitter Radiated Emissions (continued)**

**Test Setup:**

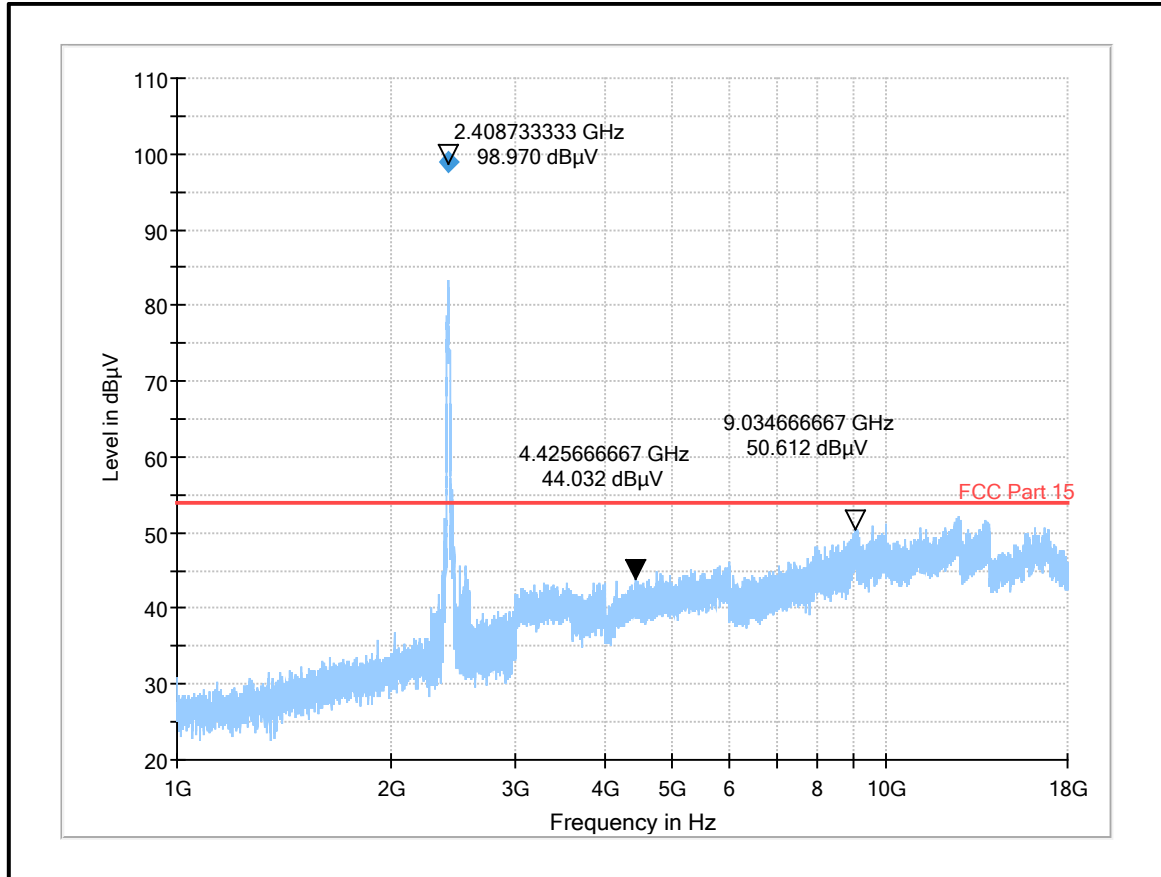


### Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Bottom Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

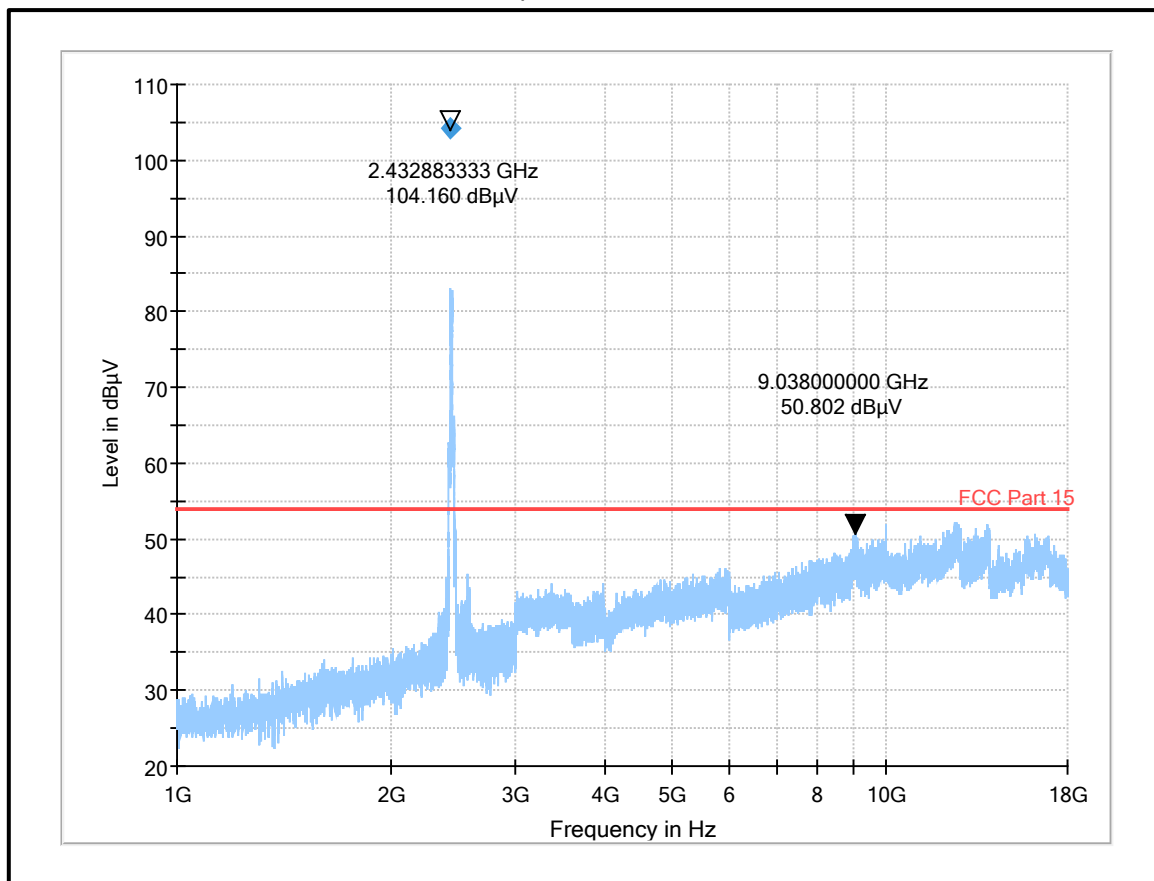
**Result: Pass**

### Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Middle Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

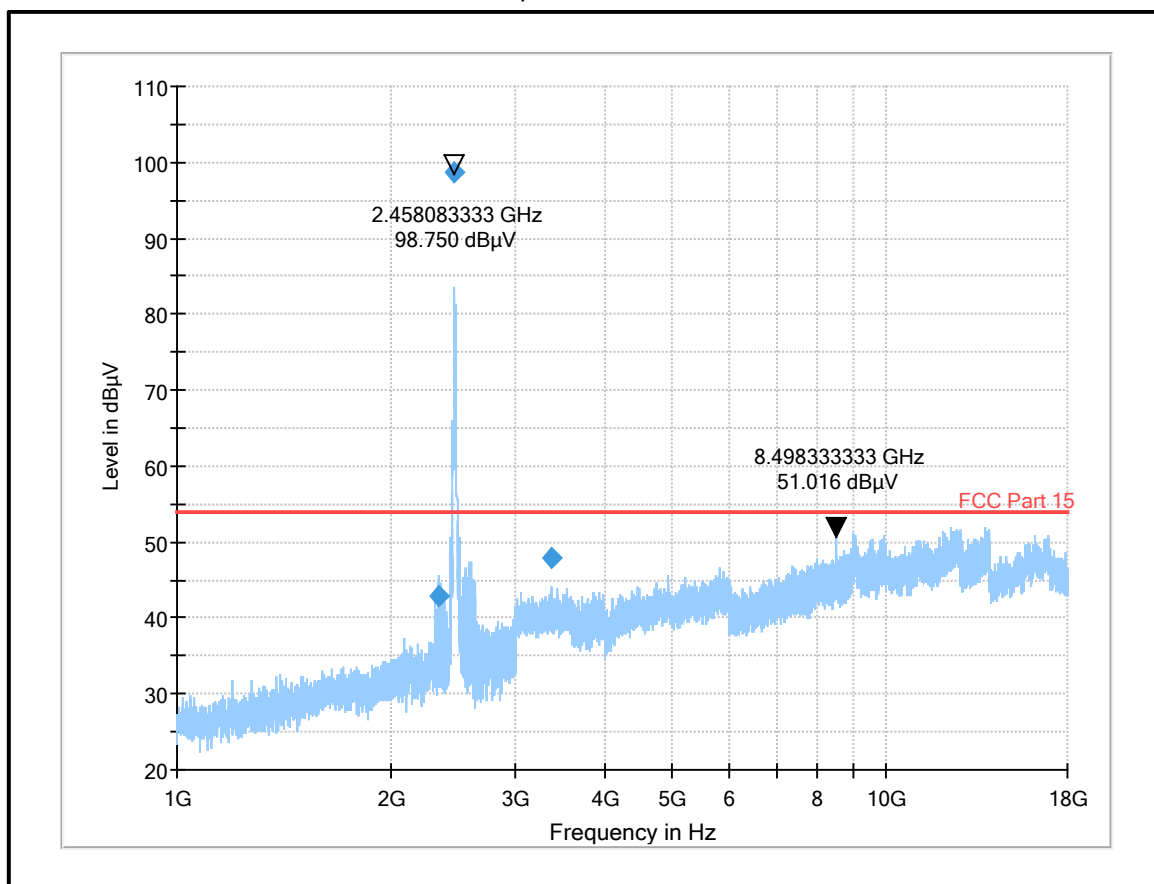
**Result: Pass**

# Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Top Channel + RFID 13.56 MHz**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2333.02	Vertical	42.93	54.00*	11.07	Complied
3374.67	Vertical	47.87	54.00*	6.13	Complied

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

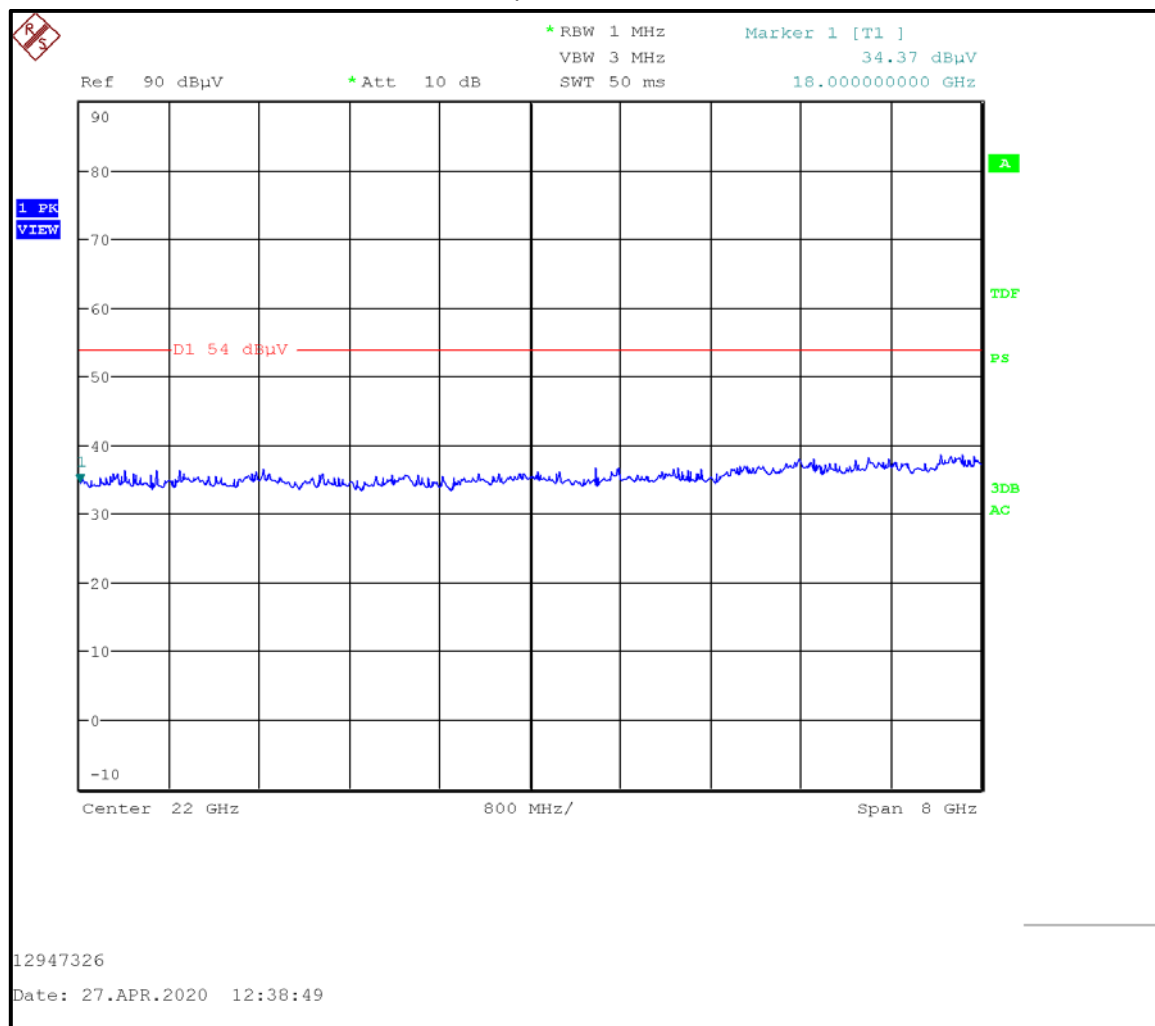
**Result: Pass**

### Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Bottom Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 18 GHz – 25 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

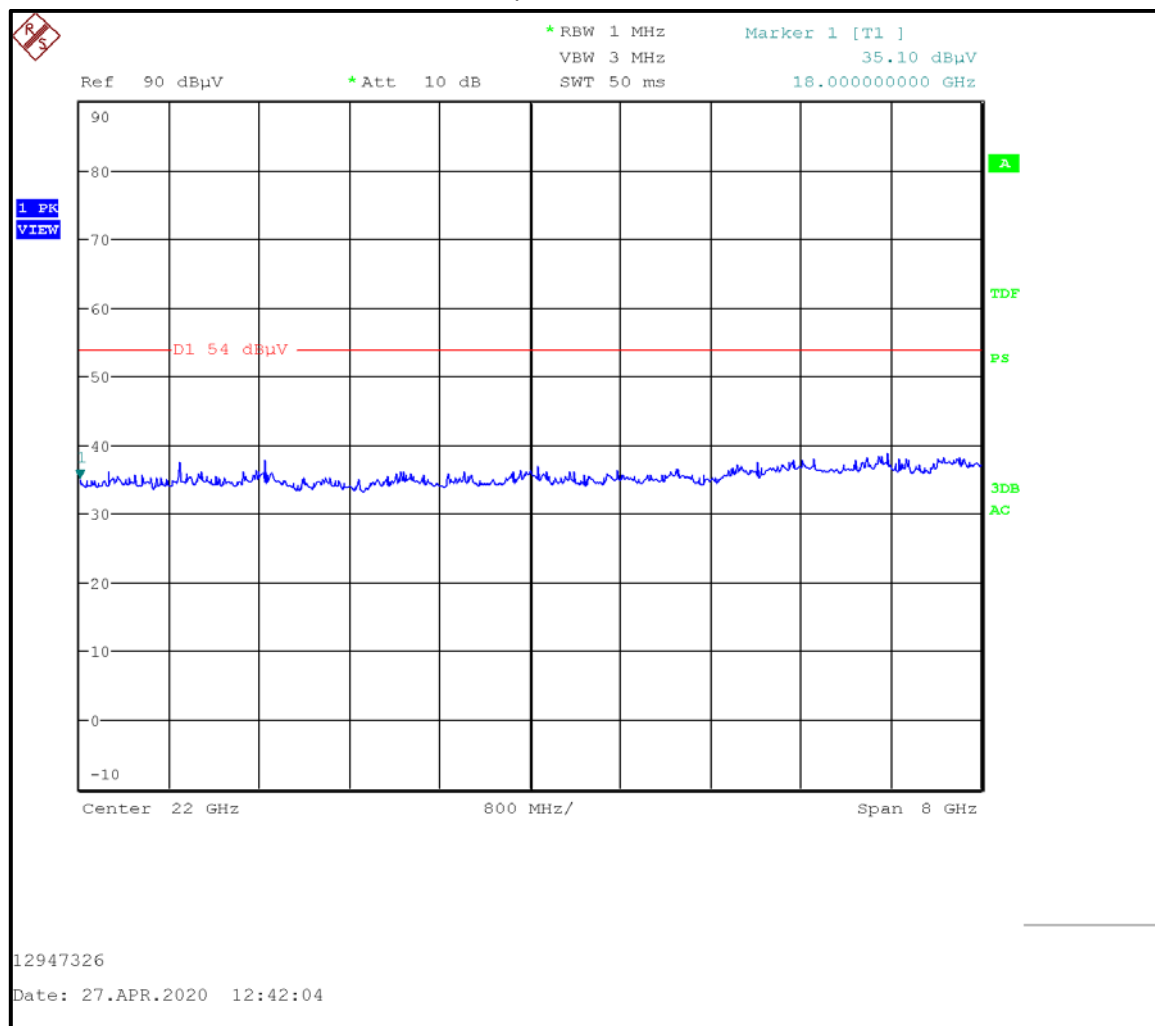
**Result: Pass**

# Transmitter Radiated Emissions (continued)

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Middle Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 18 GHz – 26 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

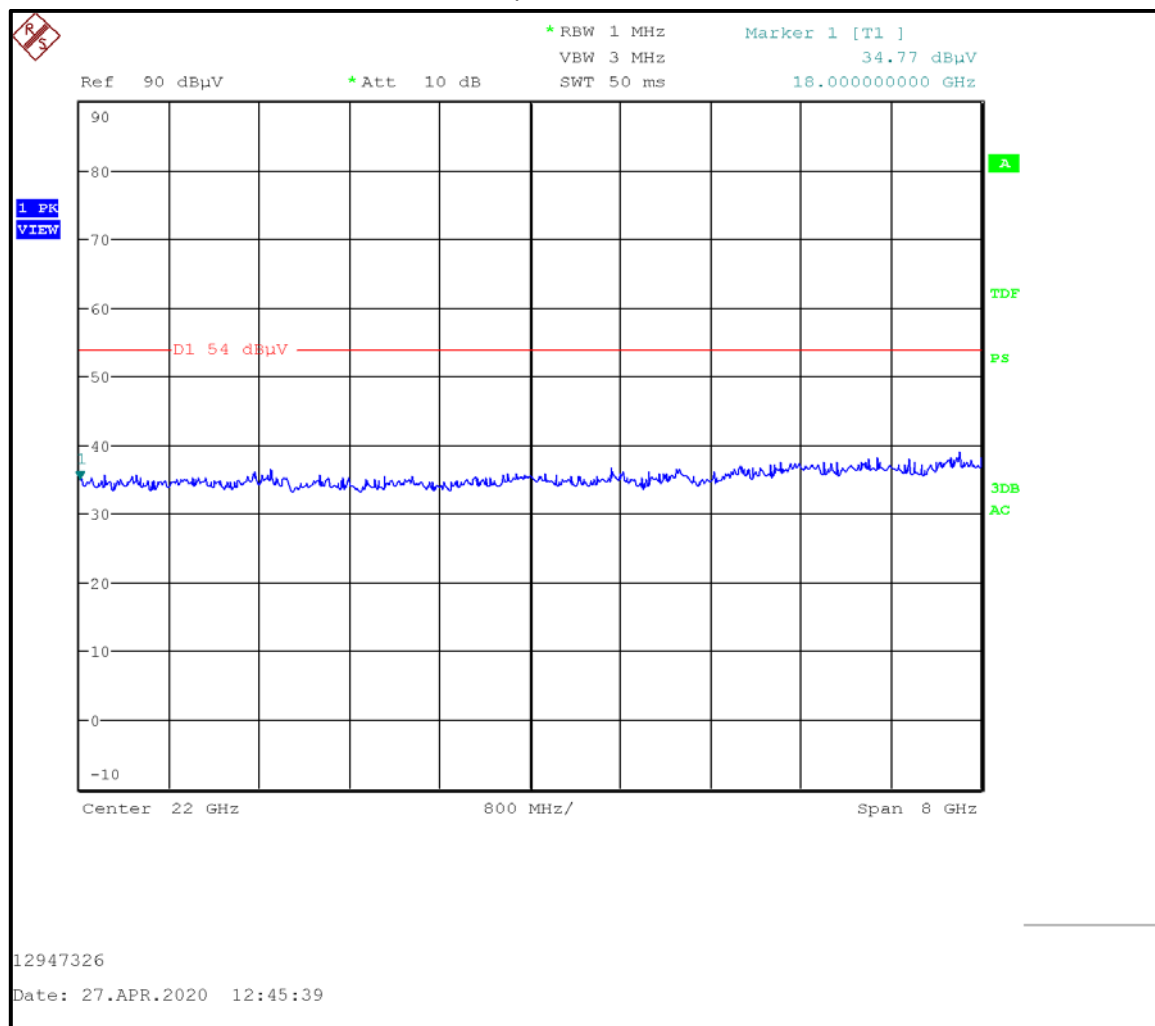
**Result: Pass**

# **Transmitter Radiated Emissions (continued)**

**Results: WLAN 2.4 GHz / 802.11b / 11 Mbps / PWR 0 / Top Channel + RFID 13.56 MHz**

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

Plot: Radiated Transmitter spurious emission from 18 GHz – 26 GHz



*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

**Result: Pass**

## **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
AC Conducted Spurious Emissions	95%	$\pm 2.49$ dB
Radiated Spurious Emissions	95%	$\pm 3.10$ 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	7/11/2019	36
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	7/10/2019	12
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	7/16/2019	12
460	Deisl	Turntable	DT 4250 S	n/a	n/a	n/a
465	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	3/20/2019	24
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	2/19/2019	36
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	15/10/2019	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	7/9/2019	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
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	9/7/2019	12
349	Rohde & Schwarz	Receiver, EMI Test	ESIB7	836697/009	10/7/2019	12
-/-	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. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
<b>Test Report Version 1.1 supersede Version 1.0 with immediate effect</b> Test Report No. UL-RPT-RP-12947326-1616-FCC Version 1.1, Issue Date 21 AUGUST 2020 replaces Test Report No. UL-RPT-RP-12947326-1616-FCC Version 1.0, Issue Date 18 AUGUST 2020, which is no longer valid.			
1.1	as below	as below	Current Version
	1	--	Reference to FCC Part 15.225(d) & Part 15.205 added
	5	2.1	Reference to FCC Part 15.225(d) & Part 15.205 added
	6	2.2	Reference to FCC Part 15.225(d) & Part 15.205 added
	18,23 & 28	5.2.2	Reference to FCC Part 15.225(d) & Part 15.205 added
	28	5.2.2	Notes section updated