



# TEST REPORT

**Test Report No. : UL-RPT-RP-13642680-116-FCC**

**Applicant** : SECO S.p.A.  
**Model No.** : E020AV20-FY  
**FCC ID** : Contains FCC ID: 2ALZBLBE616  
**Technology** : WLAN 2.4 GHz (802.11 b, g, n)  
**Test Standard(s)** : FCC Parts 15.207, 15.209(a) & 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 1.0
5. Result of the tested sample: **PASS**

Prepared by: Sercan, Usta  
Title: Laboratory Engineer  
Date: 17 November 2022

Approved by: Rachid, Acharkaoui  
Title: Operations Manager  
Date: 17 November 2022



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.

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## **1. Customer Information**

### **1.1. Applicant Information**

<b>Company Name:</b>	SECO S.p.A.
<b>Company Address:</b>	Via Achille Grandi 20, 52100 Arezzo AR, Italy
<b>Company Phone No.:</b>	+39057526979
<b>Company E-Mail:</b>	customerquality@seco.com
<b>Contact Person:</b>	Giacomo Nucci
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<b>Contact Phone No.:</b>	+39 0575 26979

### **1.2. Manufacturer Information**

<b>Company Name:</b>	SECO S.p.A.
<b>Company Address:</b>	Via Achille Grandi 20, 52100 Arezzo AR, Italy
<b>Company Phone No.:</b>	+39057526979
<b>Company E-Mail:</b>	customerquality@seco.com
<b>Contact Person:</b>	Alessandro Pali
<b>Contact E-Mail Address:</b>	alessandro.pali@seco.com
<b>Contact Phone No.:</b>	+39 0575 26979

## **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>	47CFR15.207 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

#### **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>	17 December 2020
<b>EUT arrived:</b>	18 February 2021 to 10 March 2021
<b>Test Dates:</b>	21 April 2021 to 29 April 2021
<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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth <sup>(2)</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Part 15.35(c)	Transmitter Duty Cycle <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(e)	Transmitter Power Spectral Density <sup>(2)</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Part 15.247(b)(3)	Transmitter Maximum Output Power <sup>(2)</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Note(s):

1. The measurement was performed to assist in the calculation of the average measurements.

## 2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 558074 D01 DTS 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>	Technogym
<b>Model Name:</b>	MyWellness Kiosk
<b>Model Number:</b>	E020AV20-FY
<b>Test Sample Serial Number:</b>	E020AV2020400117(Radiated Test Sample)
<b>Hardware Version Number:</b>	E020AV20-FY
<b>Firmware Version Number:</b>	D09_D33_FCC_cert_key_20210414
<b>FCC ID:</b>	Contains FCC ID: 2ALZBLBE616

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

The equipment under test was the MyWellness Kiosk which is a digital workstation that helps trainers in class management and improves the customer experience as digital coaching features.

It is provided by a control panel (touchscreen display): the customer can obtain class information, check personal goals, track their biometric data.

This equipment under test contains a pre-certified radio module which supports WLAN 2,4 GHz 802.11 b, g, n, WLAN 5 GHz a, n modes, Bluetooth and Bluetooth Low Energy operations.

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

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing**

Category of Equipment:	WLAN 2.4 GHz (IEEE 802.11b, g, n) / Digital Transmission System		
Type of Radio Device:	Transceiver		
Power Supply Requirement(s):	Nominal	100-240 VAC	
Temperature Requirement(s):	Nominal	25°C	
	Minimum	0°C	
	Maximum	50°C	
Relative Humidity	5-95%		
Supported Transmit Operating Mode(s):	802.11b/g/n HT20		
Worst Case Data Rates:	802.11g HT20	6 Mbps (SISO) <sup>(Note 2)</sup>	
Modulation Types:	DSSS, OFDM		
Nominal Channel Bandwidth:	20 MHz		
Maximum RF Output Power (conducted.):	23.83 dBm <sup>(Note 1)</sup>		
Declared Antenna Gain:	3.5 dBi		
Antenna Type:	PCB Antenna		
Antenna Details:	Type: Unbalanced dipole PCB antenna Part / Model No.: 616SE_400_IPX4 Manufacturer: Dynaflex		
Transmit Frequency Range:	2412 MHz to 2462 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2412
	Bottom +1	2	2417
	Bottom +2	3	2422
	Bottom +3	4	2427
	Middle	6	2437
	Top-2	9	2452
	Top-1	10	2457
	Top	11	2462
<sup>(Note 1)</sup> Value taken from test report, serial number 1802WSU008-U1, for pre-certified radio module FCC ID: VPYLBE5HY1MW			
<sup>(Note 2)</sup> Regarding KDB 996369 D04 Module Integration Guide v02: "b) Perform testing on unwanted (spurious) radiated emissions on the worst-case modulation and channel per frequency range as shown in original filing. So only worst case mode tested.			



### **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	USB Pen Drive	N/A	N/A	N/A

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

Item	Description	Brand Name	Model Name or Number	Serial Number
1	External Speaker	ZAFFIRO	N/A	N/A
2	External Microphone with Cable(5m)	ELKON	DM800	N/A
3	External LCD Screen	Asus	LCD Monitor	EBLMTF261423
4	HDMI Cable (2m)	N/A	N/A	N/A
5	LAN Cable (2m)	N/A	N/A	N/A
6	2 x AC Power Cable (2.4m)	N/A	N/A	N/A
7	Audio cable (1.8m)	N/A	N/A	N/A
8	Micro USB Cable (2m)	N/A	N/A	N/A

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

### 4.1. Operating Modes / Worst Case Identification

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

☒ Transmitter / Modulated Carrier Continuous Transmissions Mode WLAN 2.4 GHz, Worst Cases\*:

802.11g 6 Mbps: I Bottom Channel I Power Level 12

802.11g 6 Mbps: I Bottom + 1 Channel I Power Level 16

802.11g 6 Mbps: I Bottom +2 Channel I Power Level 20

802.11g 6 Mbps: I Bottom +3 Channel I Power Level 30

802.11g 6 Mbps: I Middle Channel I Power Level 30

802.11g 6 Mbps: I Top -2 Channel I Power Level 30

802.11g 6 Mbps: I Top -1 Channel I Power Level 20

802.11g 6 Mbps: I Top Channel I Power Level 20

\* Worst case data rate taken from test report, serial number 1802WSU008-U1, for pre-certified radio module FCC ID: VPYLBEE5HY1MW

\*Regarding KDB 996369 D04 Module Integration Guide v02: "b) Perform testing on unwanted (spurious) radiated emissions on the worst-case modulation and channel per frequency range as shown in original filing. So only worst case mode were tested.

## **4.2. Configuration and Peripherals**

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

- The applicant supplied a document containing the setup instructions "Quick guide - Radio Test \_ WiFi&BT \_ Kiosk with Murata.pdf"

### **EUT Power Supply:**

- The EUT was powered by 120 V / 60 Hz AC supply.

### **Test Mode Activation:**

- "The test modes were activated using touch screen. Touch screen was used to enable continuous transmission and to select the test channels as required.
- EUT were configured to transmit test modes continuously with power level 12 for bottom, 30 for Middle and 20 for Top Channel.
- As the EUT was transmitting continuously with a Duty Cycle of 97.18%, a Duty Cycle Correction Factor of 0.12 dB was added to all average measurements.

### **AC Conducted Line Measurements:**

- The EUT was connected to 120 VAC /60 Hz & 240 VAC/60 Hz single phase supply via a LISN.
- In accordance with ANSI 63.10 Section 6.3 "A typical arrangement for floor-standing equipment is shown in Figure 6, with LISNs located above the ground plane was used for AC Conducted emission measurements. The antenna of the EUT was located at a height of 1.5 m above the floor, and the intentional radiator circuitry was located within the system at a height of at least 0.8 m above the floor.

### **Radiated Measurements:**

- The EUT connected with all accessories.
- The radiated samples with integrated on PCB antenna were used for radiated spurious emission measurements.
- As per applicant's declaration, EUT must be placed in standing position for its' intended application therefore this report includes relevant results.
- In accordance with ANSI 63.10 Section 6.3 "A typical arrangement for floor-standing equipment is shown in Figure 6, except that the LISNs located above the ground plane was used for radiated measurements. The antenna of the EUT was located at a height of 1.5 m above the floor, and the intentional radiator circuitry was located within the system at a height of at least 0.8 m above the floor.
- 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 to 150 cm.
- Radiated measurements above 30 MHz 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.
- R&S® EMC32 V10.60.10 Software was used for the Radiated spurious emission measurements.

### **4.3. Used Power Settings**

The EUT was configured with following GUI Power Settings (PWL) & test channels

<b>2.4 GHz g Mode 6 Mbps</b>	
<b>Nominal Channel Bandwidth 20 MHz</b>	
<b>Test Channel</b>	<b>Power Setting</b>
1	12
2	16
3	20
4	30
6	30
9	30
10	20
11	20

## **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:	Bernd Woerl	Test Date:	22 April 2021
Test Sample Serial Number:	E020AV2020400117(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:

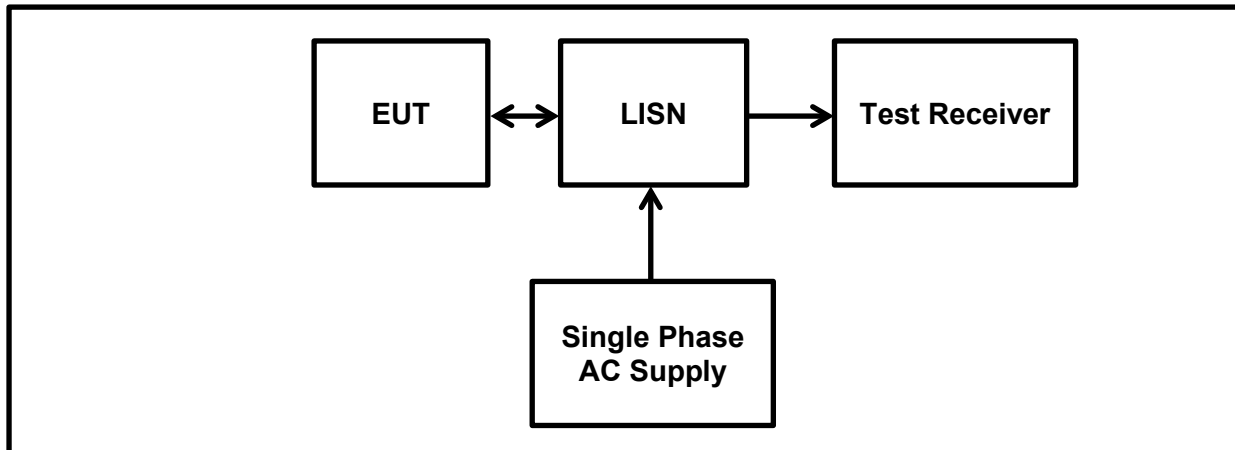
Temperature (°C):	23
Relative Humidity (%):	35

#### Settings of the Instrument

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

1. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 10 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.
2. Measurement software used: Toyo EMI Software; CE measurement software EP5/CE Ver 4.0.1.
3. The EUT was powered via 120 VAC 60 Hz or 240 V AC / 60 Hz single phase supply via a LISN.
4. 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.
5. The EUT was configured on middle channel with the power setting of 30.
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. The final measured value, for the given emission, in the table below incorporates the cable loss. Calculation: Level = test receiver reading + path loss (cable attenuation + correction LISN).

**Transmitter AC Conducted Spurious Emissions (continued)****Test setup:**

**Transmitter AC Conducted Spurious Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel****Results: 120 VAC 60 Hz / Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1923	Live	43.6	63.9	20.3	Complied
0.2044	Live	43.5	63.4	19.9	Complied
0.2437	Live	43.1	62.0	18.9	Complied
19.7164	Live	46.7	60.0	13.3	Complied
20.3609	Live	45.6	60.0	14.4	Complied
21.1514	Live	45.8	60.0	14.2	Complied

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

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1923	Live	28.7	53.9	25.2	Complied
0.2044	Live	27.0	53.4	26.4	Complied
0.2437	Live	26.0	52.0	26.0	Complied
19.7164	Live	43.6	50.0	6.4	Complied
20.3609	Live	41.2	50.0	8.8	Complied
21.1514	Live	42.5	50.0	7.5	Complied

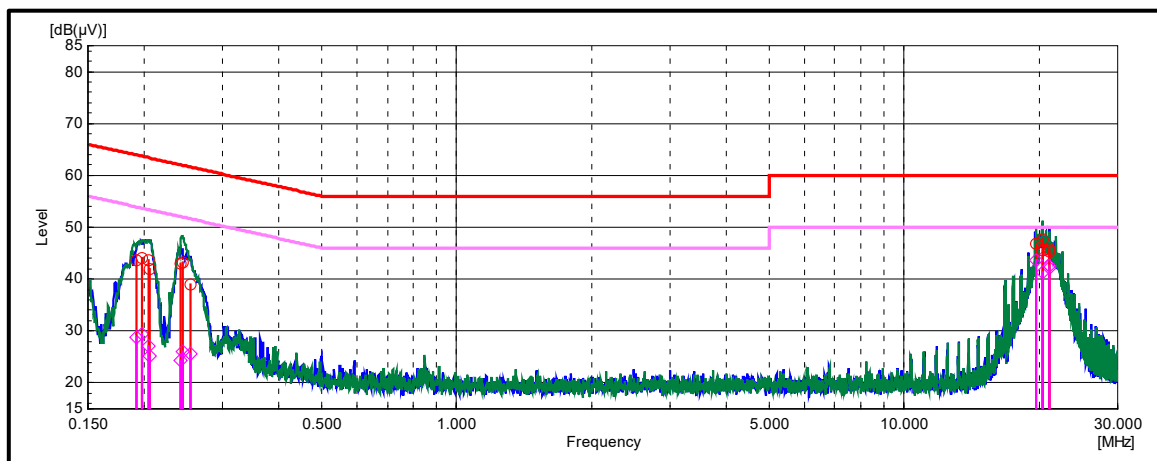
**Results: 120 VAC 60 Hz / Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1975	Neutral	44.0	63.7	19.7	Complied
0.2059	Neutral	42.0	63.4	21.4	Complied
0.2413	Neutral	43.1	62.1	19.0	Complied
0.2539	Neutral	39.0	61.6	22.6	Complied
20.4311	Neutral	47.7	60.0	12.3	Complied
21.1497	Neutral	45.4	60.0	14.6	Complied



**Transmitter AC Conducted Spurious Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel****Results: 120 VAC 60 Hz / Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1975	Neutral	29.3	53.7	24.4	Complied
0.2059	Neutral	25.1	53.4	28.3	Complied
0.2413	Neutral	24.3	52.1	27.8	Complied
0.2539	Neutral	25.6	51.6	26.0	Complied
20.4311	Neutral	44.0	50.0	6.0	Complied
21.1497	Neutral	42.2	50.0	7.8	Complied

**Result: Pass****Plot: 120 VAC 60 Hz / Live and Neutral Line**

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

**Transmitter AC Conducted Spurious Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel****Results: 240 VAC 60 Hz / Live / Quasi Peak**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1852	Live	45.5	64.3	18.8	Complied
0.1958	Live	45.5	63.8	18.3	Complied
0.2429	Live	40.9	62.0	21.1	Complied
19.7193	Live	45.0	60.0	15.0	Complied
20.5125	Live	47.5	60.0	12.5	Complied
21.1511	Live	43.2	60.0	16.8	Complied

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

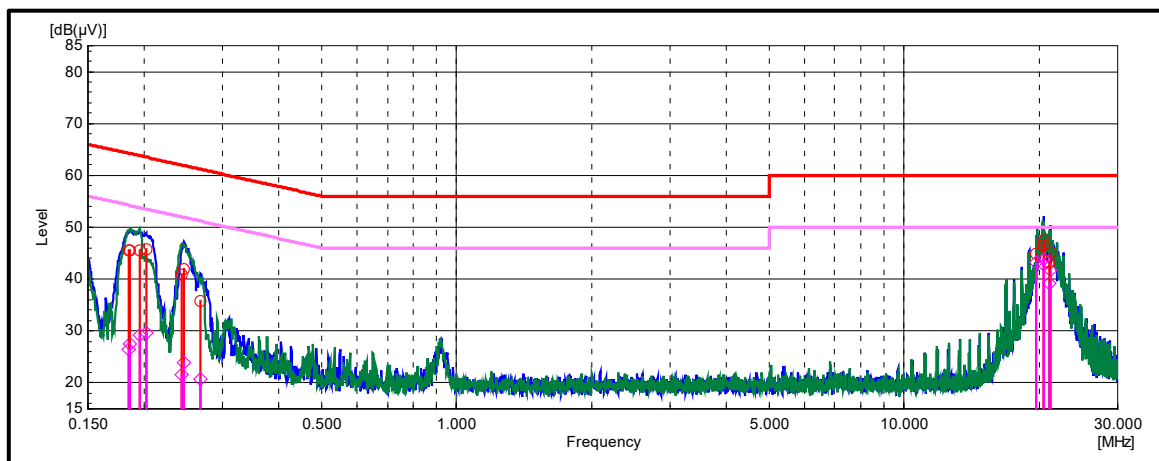
Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1852	Live	26.5	54.3	27.8	Complied
0.1958	Live	29.2	53.8	24.6	Complied
0.2429	Live	21.6	52.0	30.4	Complied
19.7193	Live	43.2	50.0	6.8	Complied
20.5125	Live	43.8	50.0	6.2	Complied
21.1511	Live	39.1	50.0	10.9	Complied

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

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1866	Neutral	45.6	64.2	18.6	Complied
0.2028	Neutral	45.7	63.5	17.8	Complied
0.2457	Neutral	42.0	61.9	19.9	Complied
0.2682	Neutral	35.7	61.2	25.5	Complied
20.5147	Neutral	46.6	60.0	13.4	Complied
21.2341	Neutral	45.1	60.0	14.9	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel****Results: 120 VAC 60 Hz / Neutral / Average**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1866	Neutral	27.6	54.2	26.6	Complied
0.2028	Neutral	29.7	53.5	23.8	Complied
0.2457	Neutral	23.9	51.9	28.0	Complied
0.2682	Neutral	20.6	51.2	30.6	Complied
20.5147	Neutral	42.8	50.0	7.2	Complied
21.2341	Neutral	41.8	50.0	8.2	Complied

**Result: Pass****Plot: 240 VAC 60 Hz / Live and Neutral Line**

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

**5.2.2. Transmitter Duty Cycle****Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	21 April 2021
<b>Test Sample Serial Number:</b>	E020AV2020400117 (Radiated Test Sample)		
<b>Test Site Identification</b>	SR 1/2		

<b>FCC Reference:</b>	Part 15.35(c)
<b>Test Method Used:</b>	FCC KDB 558074 Section 6.0 referencing ANSI C63.10 Section 11.6

**Environmental Conditions:**

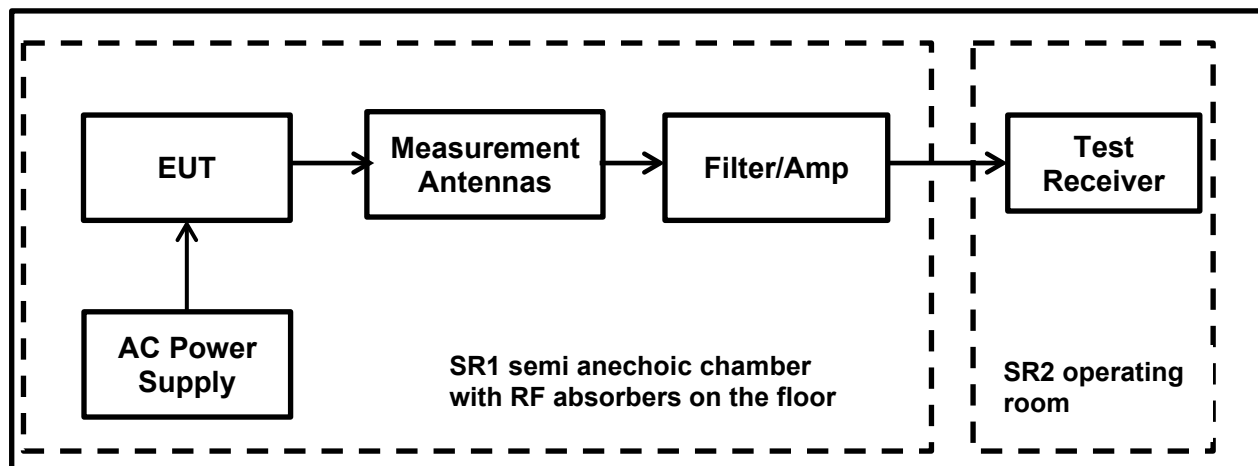
<b>Temperature (°C):</b>	29
<b>Relative Humidity (%):</b>	47

**Notes:**

- The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by using the following calculation:

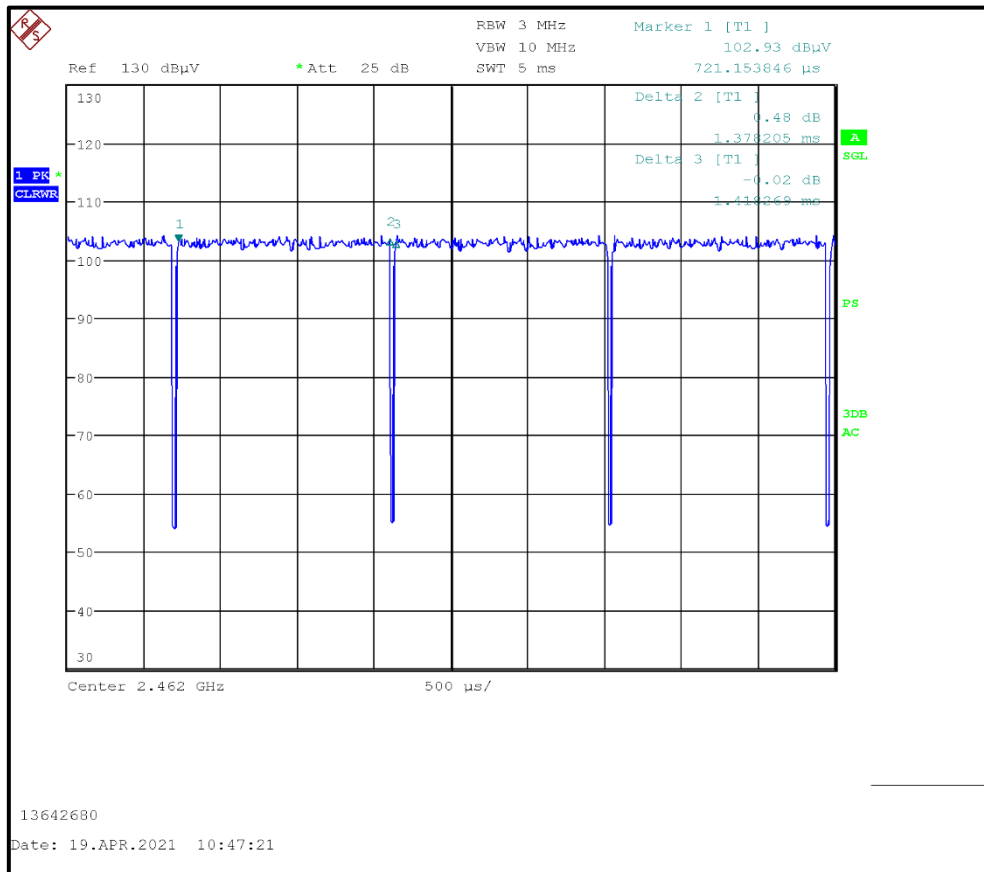
$$\text{Duty Cycle (\%)} = 100 \times [\text{On Time (T}_{\text{ON}})] / [\text{Period(T}_{\text{ON}} + \text{T}_{\text{OFF}}) \text{ or } 100\text{ms whichever is the lesser}]$$

$$\text{Duty Cycle Correction Factor} = 10 \log 1 / [\text{On Time (T}_{\text{ON}})] / [\text{Period(T}_{\text{ON}} + \text{T}_{\text{OFF}}) \text{ or } 100\text{ms whichever is the lesser}]$$

**Test Setup:**

**Transmitter Duty Cycle (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel**

Pulse On Time (T <sub>ON</sub> ) (ms)	Pulse Period (T <sub>ON</sub> + T <sub>OFF</sub> ) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
1.378	1.418	97.18	0.12

**Result: Pass**

**5.2.3. Transmitter Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	26 April 2021
<b>Test Sample Serial Number:</b>	E020AV2020400117 (Radiated Test Sample)		
<b>Test Site Identification</b>	SR 1/2		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<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 6.4
<b>Frequency Range:</b>	9 kHz to 30 MHz

**Environmental Conditions:**

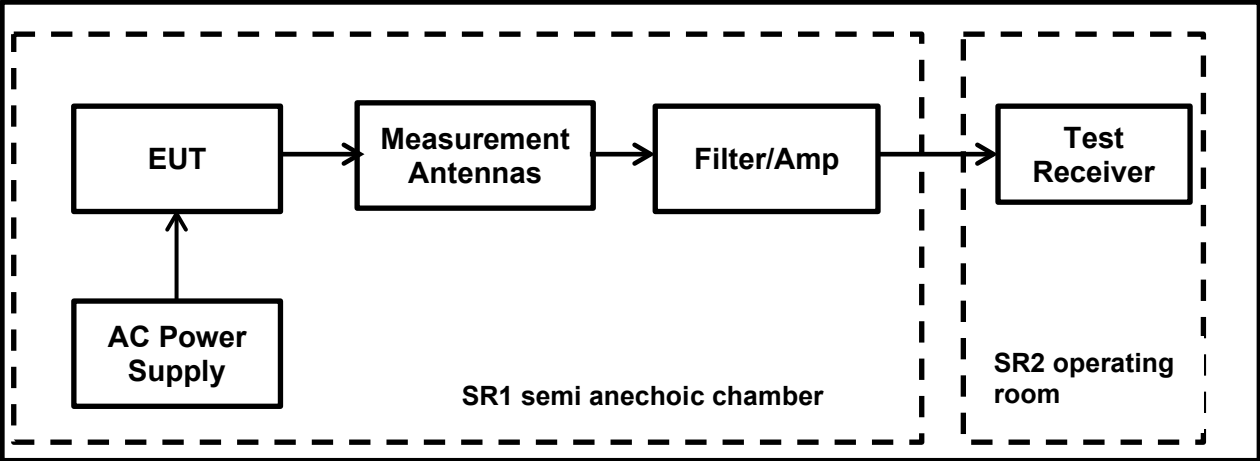
<b>Temperature (°C):</b>	21.7
<b>Relative Humidity (%):</b>	47.2

**Note(s):**

- 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.
- 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.
- Therefore, the limit values are extrapolated to a measurement distance of 3 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.
- 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 a floor standing equipment which 120 cm height. EUT was placed in the centre of the chamber turntable on 30 cm non-conductive material. The EUT was a floor standing equipment which 120 cm height. The EUT was placed in the centre of the chamber turntable on 30 cm non-conductive material. The measurement loop antenna height was 150 cm.
- 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
- The preliminary scans showed similar emission levels below 30 MHz, for each channel & modes of operation. Therefore, final radiated emissions measurements were performed with the EUT set to the middle channel only.
- The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.

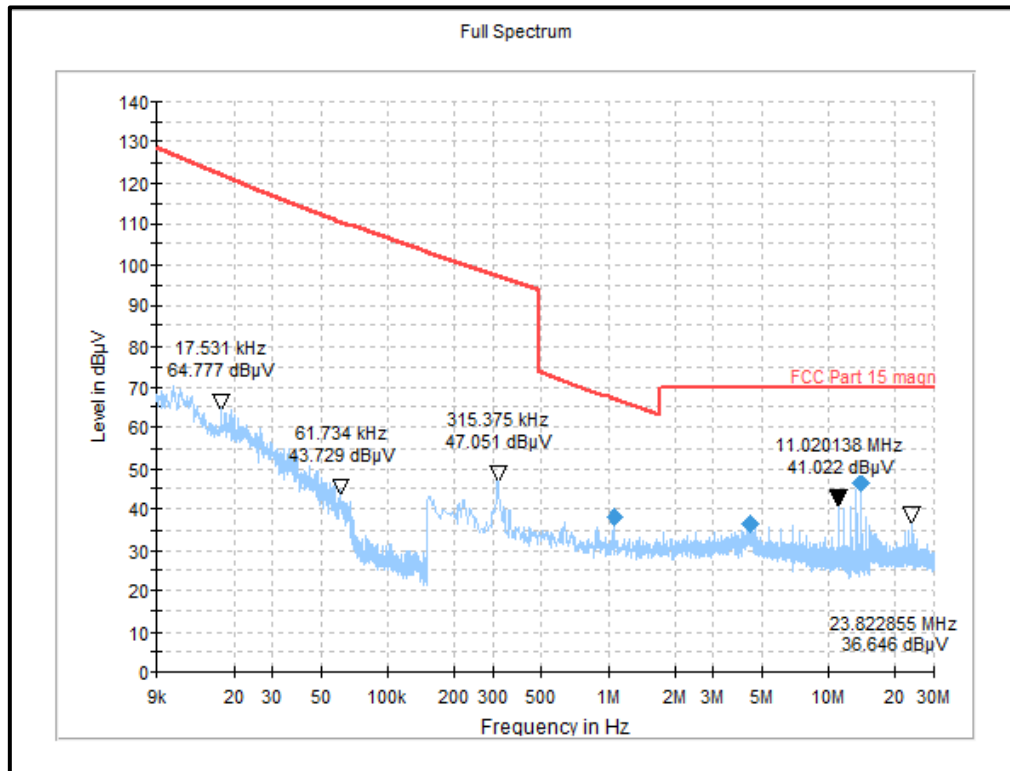
**Transmitter Radiated Emissions (continued)**

**Test Setup:**



**Transmitter Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel**

Frequency (MHz)	Loop Antenna Orientation	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1.07	90° to EUT	38.14	66.85	28.71	Complied
4.44	0° to EUT	36.25	70.00	33.75	Complied
13.91	90° to EUT	46.19	70.00	23.81	Complied

**Plot: 9 kHz – 30 MHz: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel****Result: Pass**



**Transmitter Radiated Emissions (continued)****Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	26 April 2021
<b>Test Sample Serial Number:</b>	E020AV2020400117 (Radiated Test Sample)		
<b>Test Site Identification</b>	SR 1/2		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<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:**

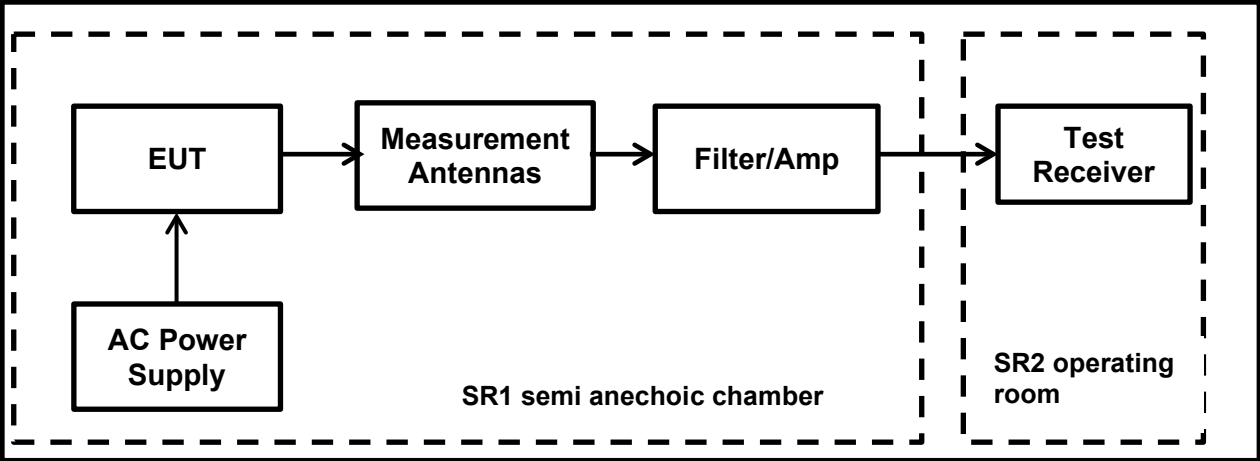
<b>Temperature (°C):</b>	21.7
<b>Relative Humidity (%):</b>	47.2

**Note(s):**

1. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the Middle Channel only.
2. 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 a floor standing equipment which 120 cm height. EUT was placed in the centre of the chamber turntable on 30 cm non-conductive material. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m.
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. All emissions shown on the pre-scans were investigated and no critical emissions were found

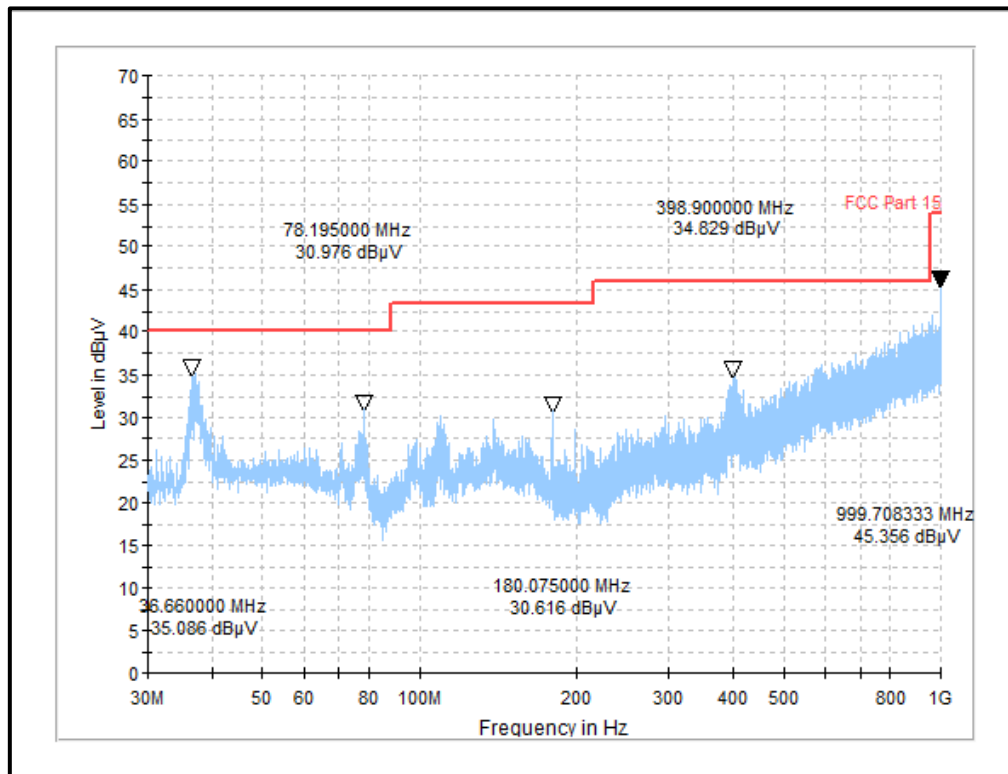
**Transmitter Radiated Emissions (continued)**

**Test Setup:**



**Transmitter Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel**

Frequency (MHz)	Antenna Polarization	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
All emissions were below the level of the measurement system noise floor.					

**Plot: 30 MHz – 1GHz: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel****Result: Pass**

**Transmitter Radiated Emissions (continued)****Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	21 & 29 April 2021
<b>Test Sample Serial Number:</b>	E020AV2020400117 (Radiated Test Sample)		
<b>Test Site Identification</b>	SR 1/2		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<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 25 GHz

**Environmental Conditions:**

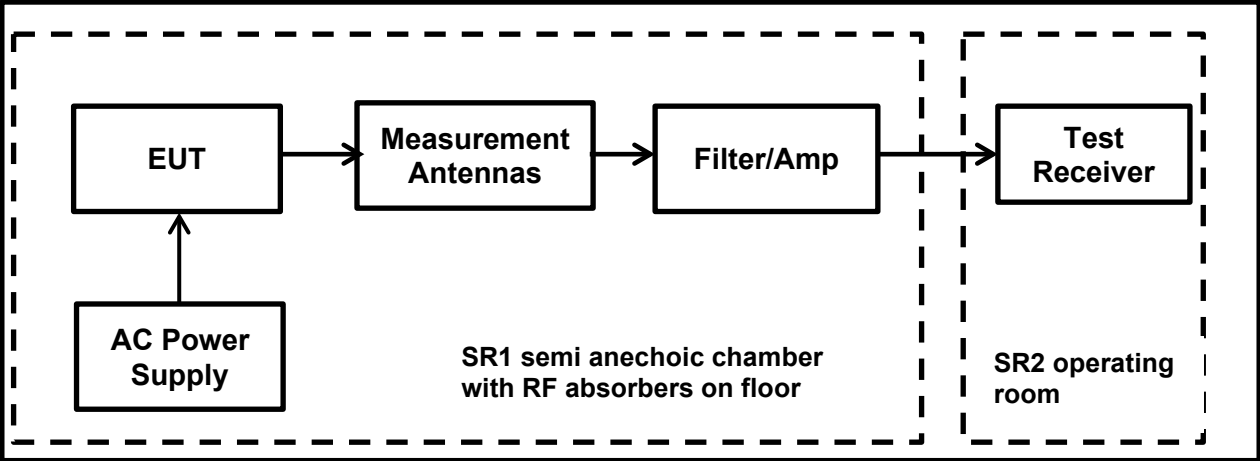
<b>Temperature (°C):</b>	21.7
<b>Relative Humidity (%):</b>	47.2

**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 a floor standing equipment which 120 cm height. EUT was placed in the centre of the chamber turntable on 30 cm non-conductive material. 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 emissions shown at frequencies approximately 2.4 GHz to 2.4835 GHz on the 1 GHz to 18 GHz plots are the EUT fundamental for the tested channel.
4. For frequency range between 1 GHz and 18 GHz, no critical emissions were found.
5. The preliminary scans showed similar emission levels above 18 GHz, for each channel & modes of operation. Therefore, final radiated emissions measurements were performed with the EUT set to the middle channel only.
6. For frequency range between 18 GHz and 25 GHz, no critical emissions were found.
7. \*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.

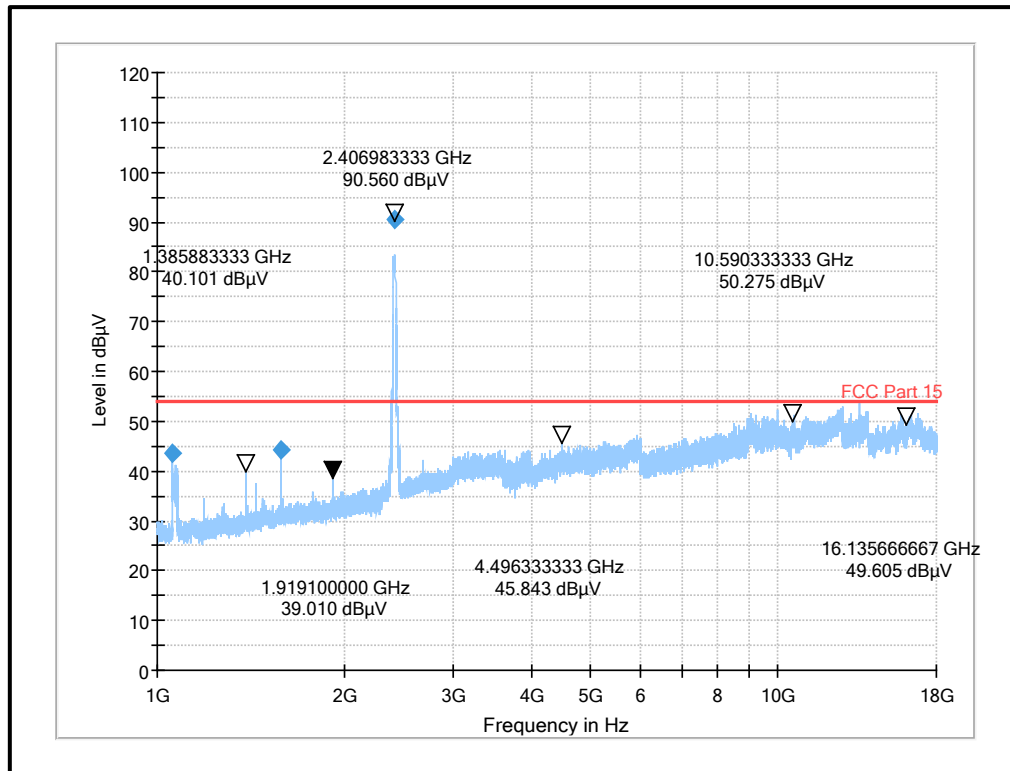
**Transmitter Radiated Emissions Test setup**

**Test Setup:**



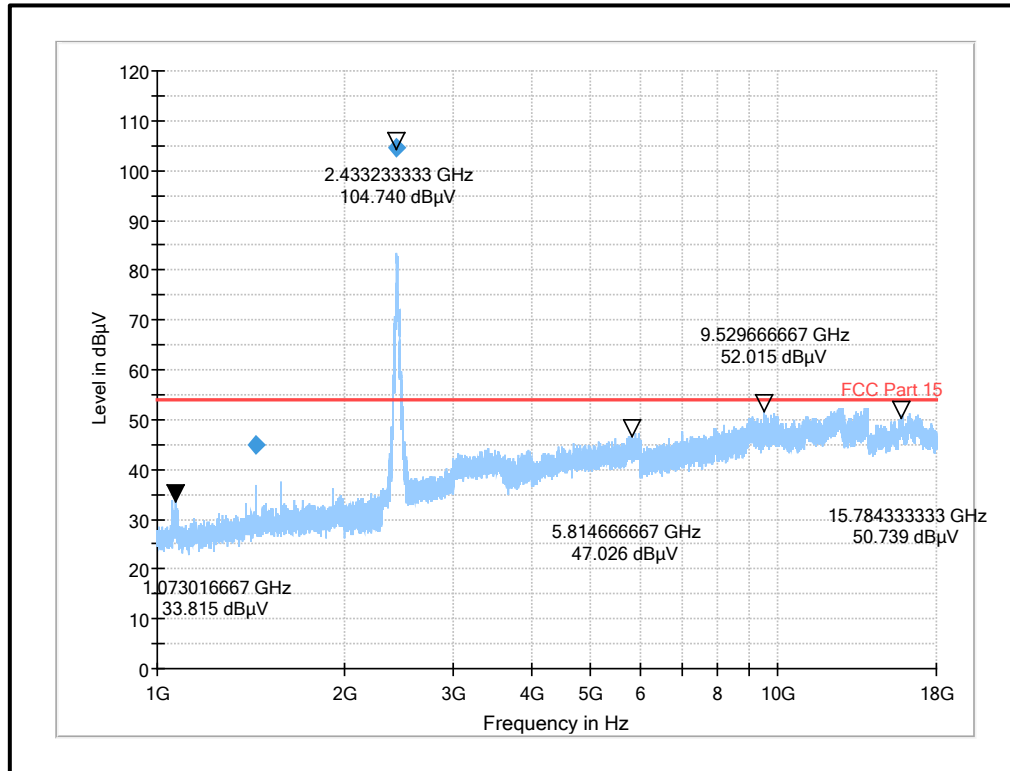
**Transmitter Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 12 / Bottom Channel**

Frequency (MHz)	Antenna Polarization	Peak Level (dB $\mu$ V/m)	Limit* (dB $\mu$ V/m)	Margin (dB)	Result
1056.98	Vertical	43.59	54.00	10.41	Complied
1584.13	Vertical	44.37	54.00	9.63	Complied

**Plot: 1 GHz – 18 GHz: 802.11g / 20 MHz / 6 Mbps / PWR 12 / Bottom Channel****Result: Pass**

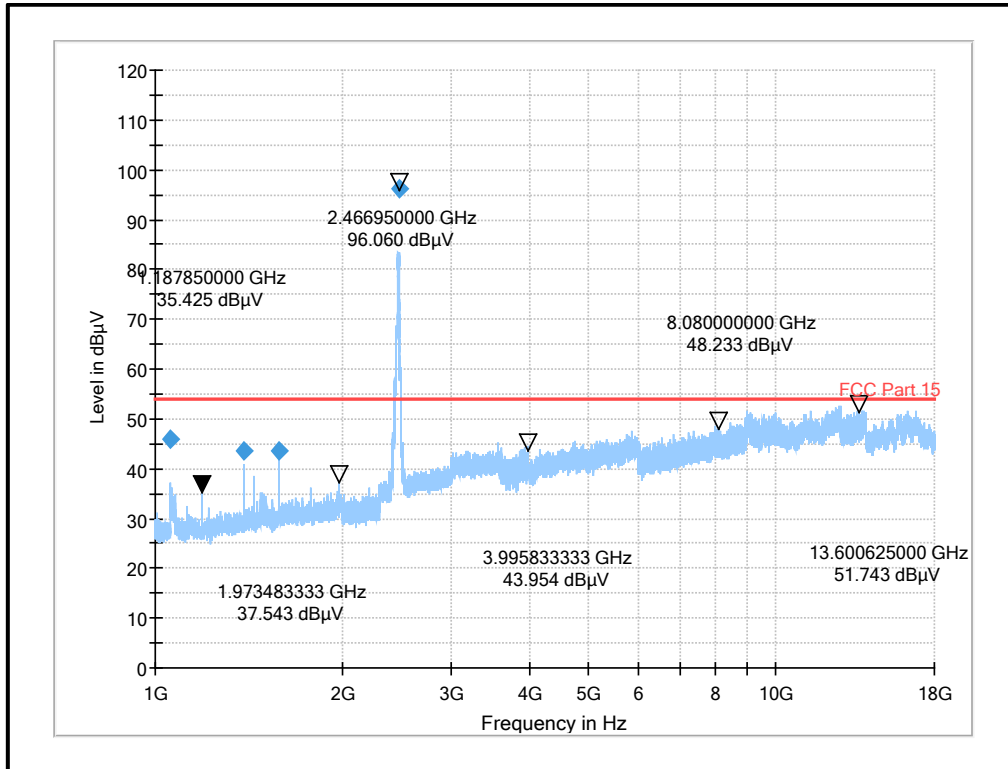
**Transmitter Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 12 / Middle Channel**

Frequency (MHz)	Antenna Polarization	Peak Level (dB $\mu$ V/m)	Limit* (dB $\mu$ V/m)	Margin (dB)	Result
1438.10	Vertical	44.96	54.00	9.04	Complied

**Plot: 1 GHz – 18 GHz: 802.11g / 20 MHz / 6 Mbps / PWR 30 / Middle Channel****Result: Pass**

**Transmitter Radiated Emissions (continud)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 20 / Top Channel**

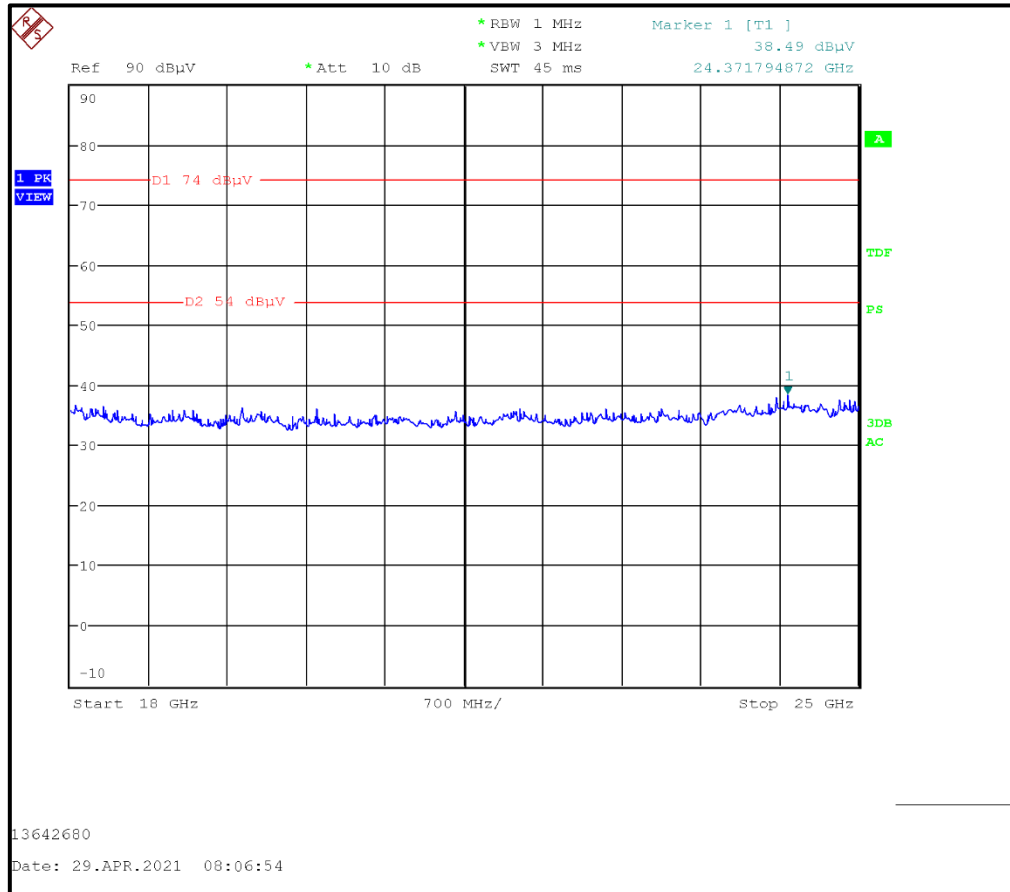
Frequency (MHz)	Antenna Polarization	Peak Level (dB $\mu$ V/m)	Limit* (dB $\mu$ V/m)	Margin (dB)	Result
1056.98	Vertical	45.76	54.00	8.24	Complied
1385.88	Vertical	43.43	54.00	10.57	Complied
1583.92	Vertical	43.49	54.00	10.51	Complied

**Plot: 1 GHz – 18 GHz: 802.11g / 20 MHz / 6 Mbps / PWR 20 / Top Channel****Result: Pass**



**Transmitter Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps / PWR 20 / Middle Channel**

Frequency (MHz)	Antenna Polarization	Peak Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
All emissions were below the level of the measurement system noise floor.					

**Plot: 18 GHz – 25 GHz : 802.11g / 20 MHz / 6 Mbps / PWR 20 / Middle Channel****Result: Pass**

**5.2.4. Transmitter Band Edge Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	21 April 2021
<b>Test Sample Serial Number:</b>	E020AV2020400117 (Radiated Test Sample)		
<b>Test Site Identification</b>	SR 1/2		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Test Method Used:</b>	DTS emissions in non-restricted frequency bands: FCC KDB 558074 Section 8.5 referencing ANSI C63.10:2013 Sections 11.11
	DTS emissions in restricted frequency bands: FCC KDB 558074 Section 8.6 referencing ANSI C63.10:2013 Sections 11.12
	ANSI C63.10:2013 Sections 6.10.4, 6.10.5

**Environmental Conditions:**

<b>Temperature (°C):</b>	21.7
<b>Relative Humidity (%):</b>	47.2

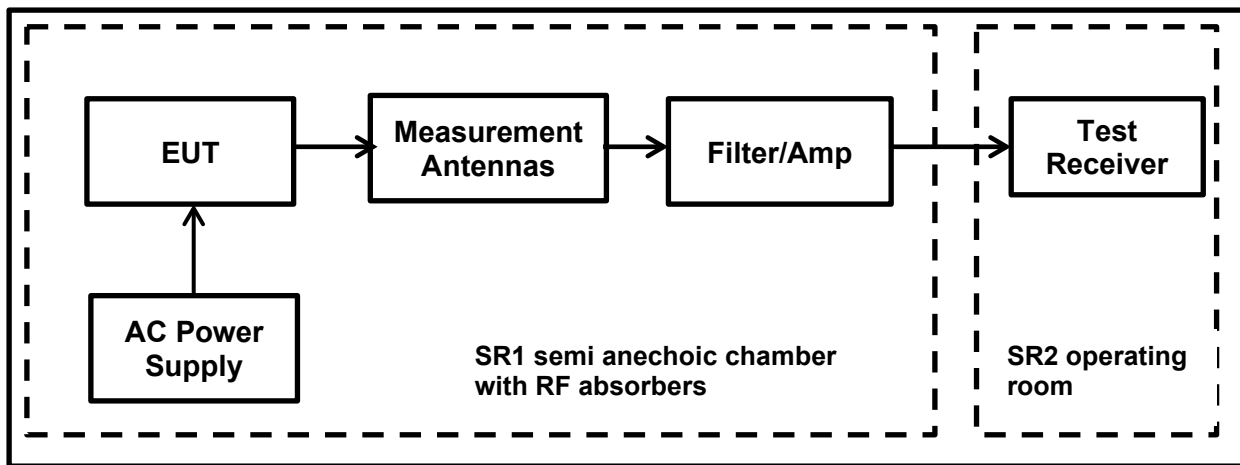
**Note(s):**

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. As the lower band edge falls within a non-restricted band, measurements were performed in accordance with FCC KDB 558074 Section 8.5 referencing ANSI C63.10 Section 11.11.  
As the maximum peak conducted output power was previously measured, in accordance with ANSI C63.10 Section 11.11.1(a) lower band edge measurement was performed with a peak detector and the -20 dBc limit applied.
3. As the lower band edge falls within a non-restricted band, only peak measurements are required. 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. Marker frequencies and levels were recorded.
4. The restricted band peak measurements were performed in accordance with ANSI C63.10 Section 11.12.2.4.
5. As the EUT continuous transmission of the EUT ( $D \geq 98\%$ ) cannot be achieved and the duty cycle is constant (duty cycle variations are less than  $\pm 2\%$ ), the restricted band average measurements were performed in accordance with ANSI C63.10 Section 11.12.2.5.2.
6. As the upper band edge falls within a restricted band both peak and average measurements were recorded by placing a marker at the edge of the band. For peak measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A RMS detector in linear power averaging mode was used. 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 was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.

**Transmitter Band Edge Radiated Emissions (continued)**

7. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.
8. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.

\*\*As the EUT was transmitting continuously with a Duty Cycle of 97.18%, a Duty Cycle Correction Factor of 0.12 dB was added to all average measurements.

**Test Setup:**

**Transmitter Band Edge Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps****Results: Lower Band Edge / Peak / Bottom Channel / PWR 12**

Frequency (MHz)	Peak Level (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
2399.44	65.76	71.45	5.69	Complied
2400.00	60.90	71.45	10.55	Complied

**Results: 2310 to 2390 MHz Restricted Band / Peak / Bottom Channel / PWR 12**

Frequency (MHz)	Peak Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Margin (dB)	Result
2390.00	63.15	74.0	10.85	Complied

**Results: 2310 to 2390 MHz Restricted Band / Average / Bottom Channel / PWR 12**

Frequency (MHz)	Average Level (dB $\mu$ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
2390.00	49.05	0.12	49.17	54.0	4.83	Complied

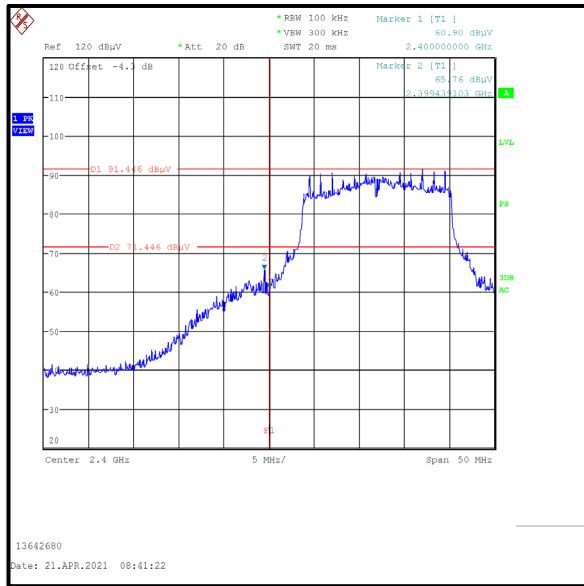
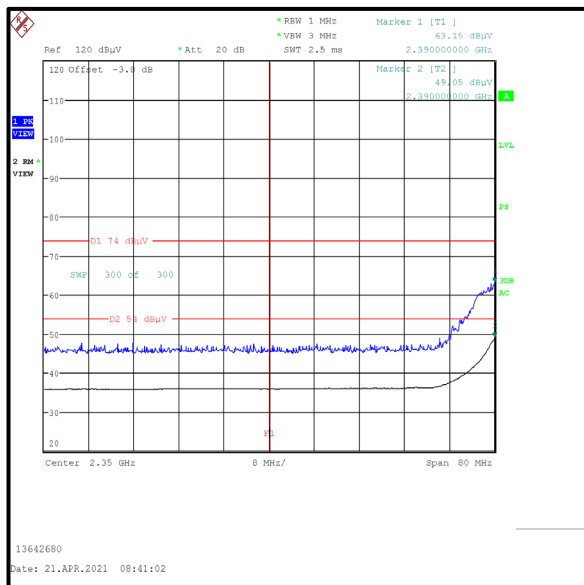
**Results: Upper Band Edge / Peak / Top Channel / PWR 20**

Frequency (MHz)	Peak Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.50	64.12	74.0	9.88	Complied
2484.01	64.74	74.0	9.26	Complied

**Results: Upper Band Edge / Average / Top Channel / PWR 20**

Frequency (MHz)	Average Level (dB $\mu$ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.50	50.71	0.12	50.83	54.0	3.17	Complied

**Result: Pass**

**Transmitter Band Edge Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps****Lower Band Edge Measurement- Bottom****Upper Band Edge Measurement-Top****2310 MHz to 2390 MHz Restricted Band Plot**

**Transmitter Band Edge Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps****Results: Lower Band Edge / Peak / Bottom +1 Channel / PWR 16**

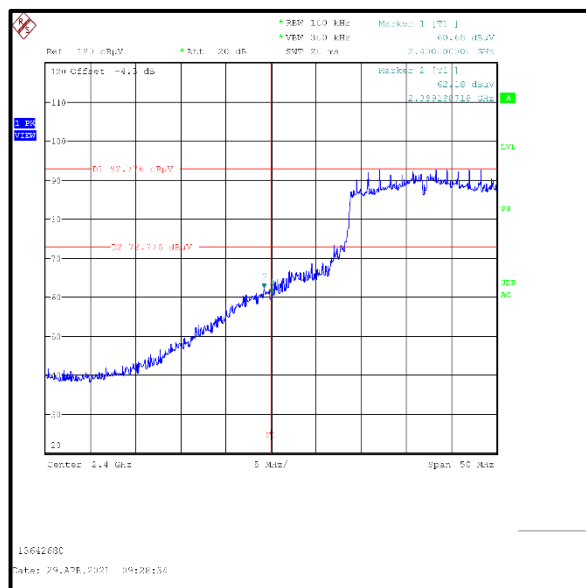
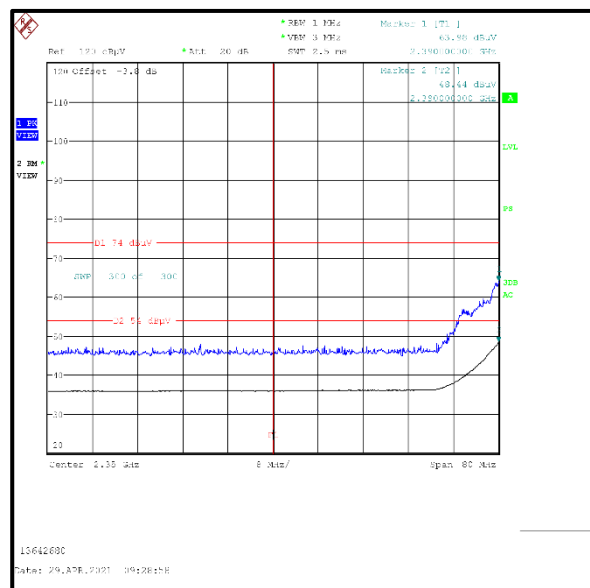
Frequency (MHz)	Peak Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
2399.19	62.18	72.78	10.60	Complied
2400.00	60.68	72.78	12.10	Complied

**Results: 2310 to 2390 MHz Restricted Band / Peak / Bottom +1 Channel / PWR 16**

Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)	Result
2390.00	63.98	74.0	10.02	Complied

**Results: 2310 to 2390 MHz Restricted Band / Average / Bottom +1 Channel / PWR 16**

Frequency (MHz)	Average Level (dBμV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
2390.00	48.44	0.12	48.56	54.0	5.44	Complied

**Plot: 802.11g / 20 MHz / 6 Mbps / Bottom +1 Channel / PWR 16****Lower Band Edge Measurement- Bottom +1****2310 MHz to 2390 MHz Restricted Band Plot****Result: Pass**

**Transmitter Band Edge Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps****Results: Lower Band Edge / Peak / Bottom +2 Channel / PWR 20**

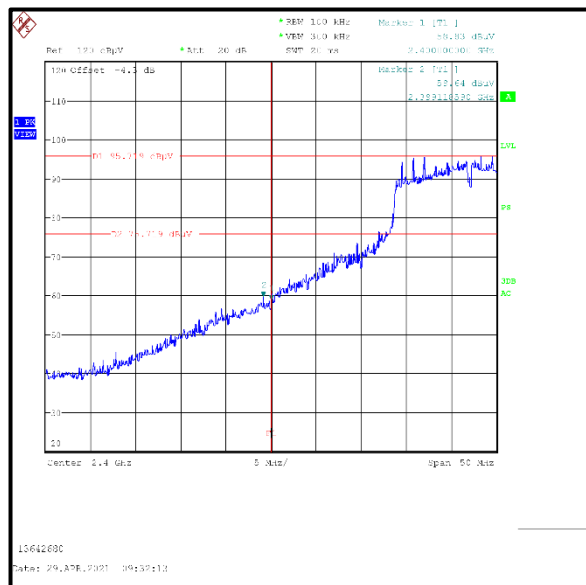
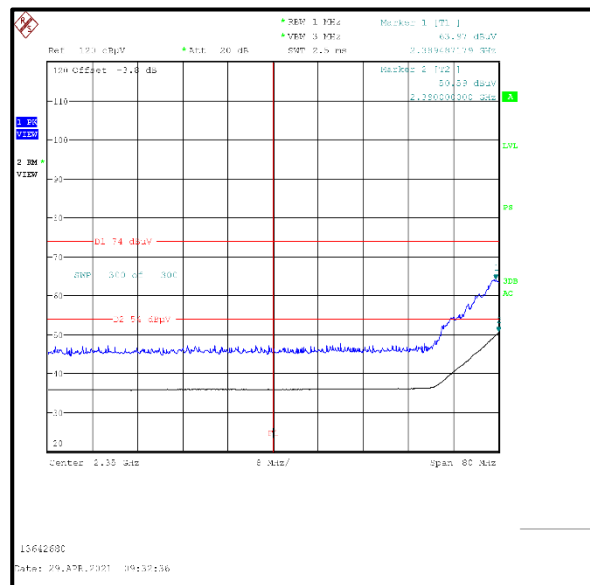
Frequency (MHz)	Peak Level (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
2399.12	59.64	75.72	16.08	Complied
2400.00	58.83	75.72	16.89	Complied

**Results: 2310 to 2390 MHz Restricted Band / Peak / Bottom +2 Channel / PWR 20**

Frequency (MHz)	Peak Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Margin (dB)	Result
2390.00	63.97	74.0	10.03	Complied

**Results: 2310 to 2390 MHz Restricted Band / Average / Bottom +2 Channel / PWR 20**

Frequency (MHz)	Average Level (dB $\mu$ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
2390.00	50.59	0.12	50.71	54.0	3.29	Complied

**Plot: 802.11g / 20 MHz / 6 Mbps / Bottom +2 Channel / PWR 20****Lower Band Edge Measurement-Bottom+2****2310 MHz to 2390 MHz Restricted Band Plot****Result: Pass**

**Transmitter Band Edge Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps****Results: Lower Band Edge / Peak / Bottom +3 Channel / PWR 30**

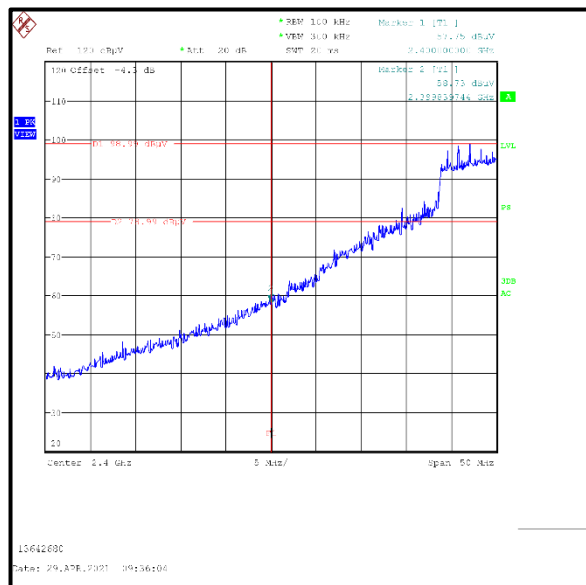
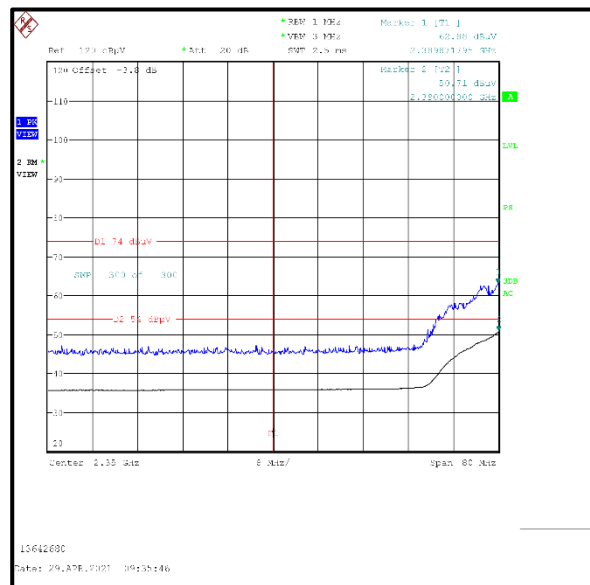
Frequency (MHz)	Peak Level (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
2399.84	58.73	78.99	20.26	Complied
2400.00	57.75	78.99	21.24	Complied

**Results: 2310 to 2390 MHz Restricted Band / Peak / Bottom +3 Channel / PWR 30**

Frequency (MHz)	Peak Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Margin (dB)	Result
2389.98	62.88	74.0	11.12	Complied

**Results: 2310 to 2390 MHz Restricted Band / Average / Bottom +3 Channel / PWR 30**

Frequency (MHz)	Average Level (dB $\mu$ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
2390.00	50.71	0.12	50.83	54.0	3.17	Complied

**Plot: 802.11g / 20 MHz / 6 Mbps / Bottom +3 Channel / PWR 30****Lower Band Edge Measurement-Bottom+3****2310 MHz to 2390 MHz Restricted Band Plot****Result: Pass**

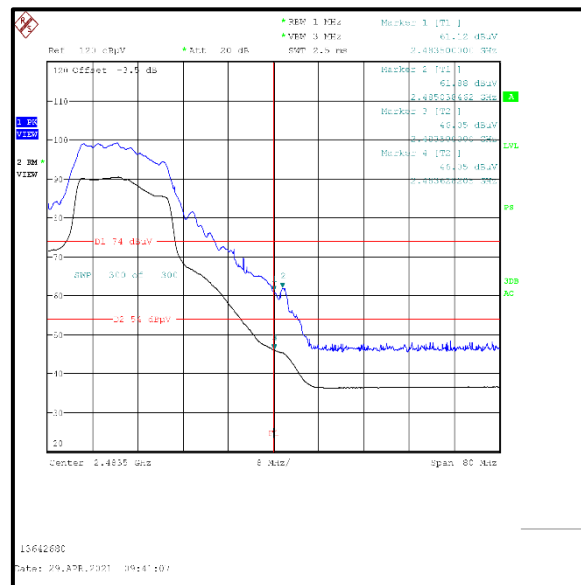


**Transmitter Band Edge Radiated Emissions (continued)****Results: 802.11g / 20 MHz / 6 Mbps****Results: Upper Band Edge / Peak / Top-1 Channel / PWR 20**

Frequency (MHz)	Peak Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.50	61.12	74.0	12.88	Complied
2485.04	61.88	74.0	12.12	Complied

**Results: Upper Band Edge / Average / Top-1 Channel / PWR 20**

Frequency (MHz)	Average Level (dB $\mu$ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.50	46.05	0.12	46.17	54.0	7.83	Complied

**Plot: 802.11g / 20 MHz / 6 Mbps/ Top-1 Channel / PWR 20****Upper Band Edge Measurement-Top-1****Result: Pass**

### Transmitter Band Edge Radiated Emissions (continued)

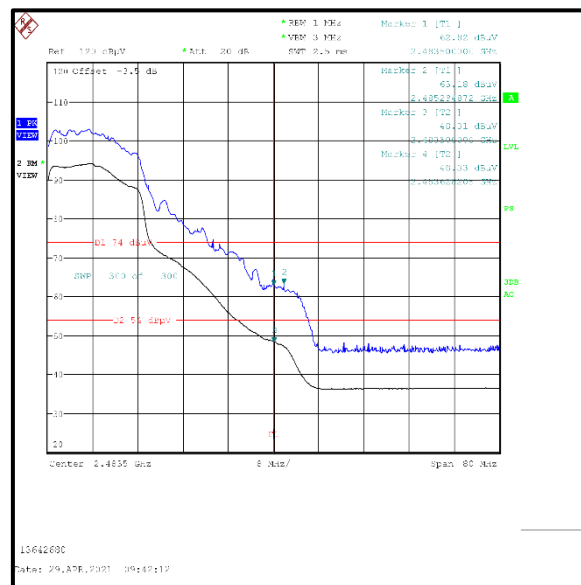
**Results: 802.11g / 20 MHz / 6 Mbps**

**Results: Upper Band Edge / Peak / Top-2 Channel / PWR 30**

Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)	Result
2483.50	62.82	74.0	11.18	Complied
2485.29	63.18	74.0	10.82	Complied

**Results: Upper Band Edge / Average / Top-2 Channel / PWR 30**

Frequency (MHz)	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2483.50	48.31	0.12	48.43	54.0	5.57	Complied
2483.62	48.33	0.12	48.45	54.0	5.55	Complied

**Plot: 802.11g / 20 MHz / 6 Mbps/ Top-2 Channel / PWR 30**

### Upper Band Edge Measurement-Top-2

**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
Band Edge Radiated Emissions	95%	$\pm 3.10$ dB
Transmitter Duty Cycle	95%	$\pm 3.4\%$

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
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	09/07/2020	12
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	15/10/2019	24
460	Deisl	Turntable	DT 4250 S	n/a	n/a	n/a
452	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	02/09/2020	24
496	Rohde & Schwarz	Antenna, Log-Periodic Broadband	HL050	100297	05/08/2020	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	07/07/2020	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	07/07/2020	12
28	Rohde & Schwarz	Passive Probe	ESH2-Z3	none	11/07/2020	12
349	Rohde & Schwarz	Receiver, EMI Test	ESIB7	836697/009	09/07/2020	12
351	Rohde & Schwarz	network, Artificial Mains	ESH3-Z5	862770/018	07/07/2020	12
564	Teseq	Impedance stabilisation network (ISN)	ISN T800	26076	07/07/2020	24
616	Rohde & Schwarz	ISN	ENY81-CA6	101656	07/07/2020	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	45	-	Initial Version

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