TEST REPORT

Test Report No. : UL-RPT-RP-13642680-316-FCC

Applicant	:	SECO S.p.A.
Model No.	:	E020AV20-FY
FCC ID	:	Contains FCC ID: 2ALZBLBE616
Technology	:	Bluetooth – Low Energy
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.

UL INTERNATIONAL GERMANY GMBH
Hedelfinger Str. 61
70327 Stuttgart, Germany
STU.CTECHLab@ul.com

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1. Customer Information

1.1. Applicant Information

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

1.2. Manufacturer Information

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

2. Summary of Testing

2.1. General Information

Applied Standards

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209

Location

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

Date information

Order Date:	17 December 2020
EUT arrived:	18 February 2021 to 10 March 2021
Test Dates:	21 April 2021 to 29 April 2021
EUT returned:	-/-

2.2. Summary of Test Results

Clause	Measurement	Complied	Did not comply	Not performed	Not applicable
Part 15.207	Transmitter AC Conducted Emissions	☒	☐	☐	☐
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth(2)	☐	☐	☒	☐
Part 15.35(c)	Transmitter Duty Cycle(1)	☒	☐	☐	☐
Part 15.247(e)	Transmitter Power Spectral Density(2)	☐	☐	☒	☐
Part 15.247(b)(3)	Transmitter Maximum Output Power(2)	☐	☐	☒	☐
Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	☒	☐	☐	☐
Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	☒	☐	☐	☐

Note(s):

1. The measurement was performed to assist in the calculation of the average measurements.
2. At the clients request, only partial testing was performed as the EUT is a host product that contains a pre-certified radio module.

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)

Brand Name:	Technogym
Model Name:	MyWellness Kiosk
Model Number:	E020AV20-FY
Test Sample Serial Number:	E020AV2020400117(Radiated Test Sample)
Hardware Version Number:	E020AV20-FY
Firmware Version Number:	D09_D33_FCC_cert_key_20210414
FCC ID:	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

Technology Tested:	Bluetooth Low Energy / Digital Transmission System		
Type of Unit:	Transceiver		
Channel Spacing:	2 MHz		
Modulation:	GFSK		
Data Rate:	1 Mbps		
Power Supply Requirement(s):	100-240 VAC		
Maximum RF Output Power conducted):	5.11 dBm (Note 1)		
Declared Antenna Gain:	3.5 dBi max		
Antenna Type:	PCB Antenna		
Antenna Details:	Type: Unbalanced dipole PCB antenna Part / Model No.: 616SE_400_IPX4 Manufacturer: Dynaflex		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**RF Channel**	**Channel Frequency (MHz)**
	Bottom	37	2402
	Middle	17	2440
	Top	39	2480
(Note 1) Value taken from test report, serial number 1802WSU008-U3, for pre-certified radio module FCC ID: VPYLBEE5HY1MW			

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 able (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 Bluetooth LE, Worst Cases*: • BT-LE Test Mode :1 Mbps | PRBS9 | Power Settings: Max
* Worst case data rate taken from test report, serial number 1802WSU008-U3, for pre-certified radio module FCC ID: VPYLBEE5HY1MW

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 GUI touch screen interface to enable continuous transmission and to select the test channels as required.
- The EUTs were configured to transmit test modes continuously with max power level.
- As the EUT was transmitting continuously with a Duty Cycle of 85.32 %, a Duty Cycle Correction Factor of 0.69 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.

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

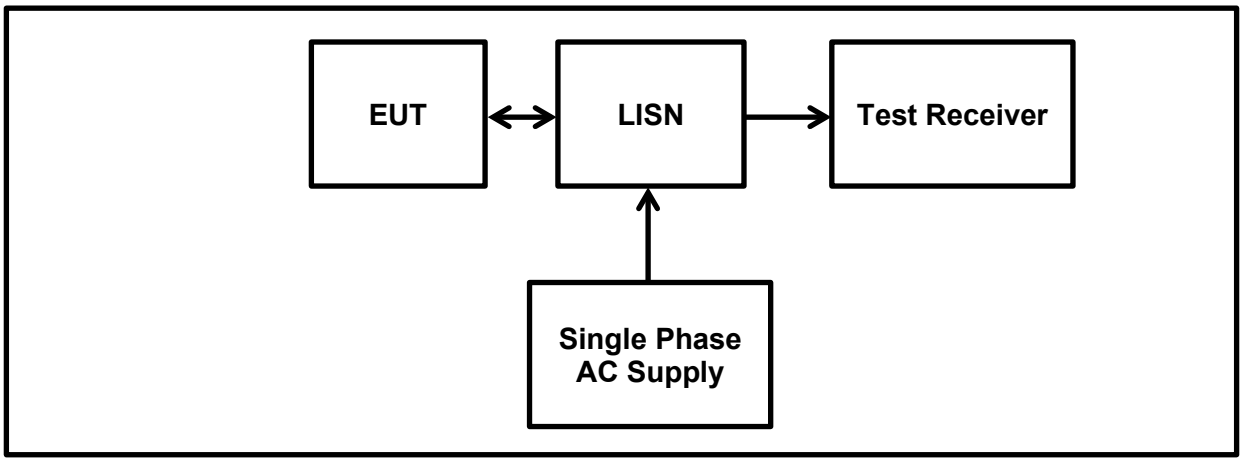
Detector	Quasi Peak/ Average Peak

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 plugged into a AC/DC Power Supply. The Power Supply was connected to 120 VAC / 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 BT-LE Test Mode :1 Mbps | PRBS9 | Power Settings: Max | Bottom Channel
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: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

Results: 120 VAC 60 Hz / Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1818	Live	42.4	64.4	22.0	Complied
0.1937	Live	43.5	63.9	20.4	Complied
0.2016	Live	43.8	63.5	19.7	Complied
0.2449	Live	41.9	61.9	20.0	Complied
20.4595	Live	45.7	60.0	14.3	Complied
21.1834	Live	45.4	60.0	14.6	Complied

Results: 120 VAC 60 Hz / Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1818	Live	23.3	54.4	31.1	Complied
0.1937	Live	28.3	53.9	25.6	Complied
0.2016	Live	29.1	53.5	24.4	Complied
0.2449	Live	25.9	51.9	26.0	Complied
20.4595	Live	40.7	50.0	9.3	Complied
21.1834	Live	42.2	50.0	7.8	Complied

Results: 120 VAC 60 Hz / Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1867	Neutral	43.2	64.2	21.0	Complied
0.2025	Neutral	43.9	63.5	19.6	Complied
0.2428	Neutral	42.1	62.0	19.9	Complied
19.7496	Neutral	45.8	60.0	14.2	Complied
20.4656	Neutral	46.6	60.0	13.4	Complied
21.1027	Neutral	42.8	60.0	17.2	Complied

Transmitter AC Conducted Spurious Emissions (continued)

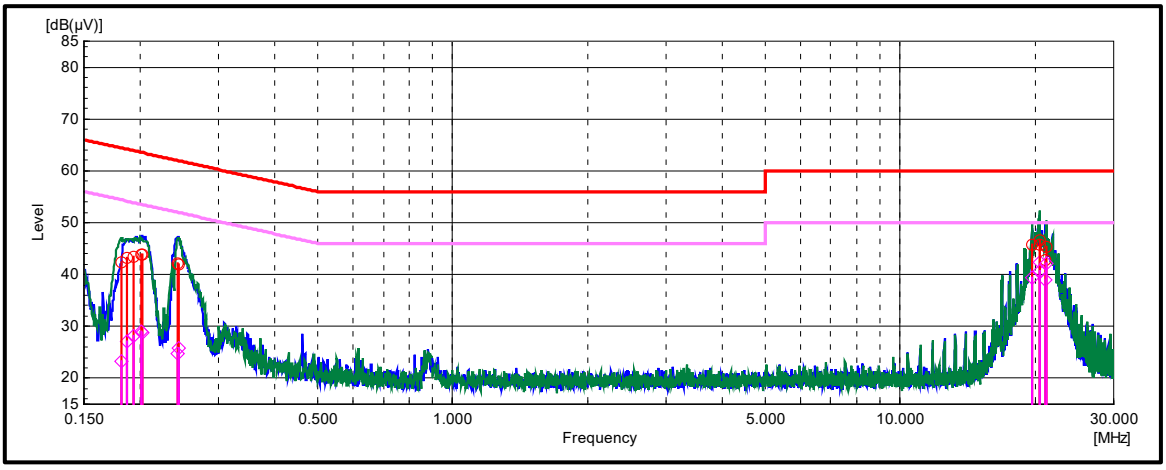
Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

Results: 120 VAC 60 Hz / Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1867	Neutral	27.0	54.2	27.2	Complied
0.2025	Neutral	28.7	53.5	24.8	Complied
0.2428	Neutral	24.8	52.0	27.2	Complied
19.7496	Neutral	39.3	50.0	10.7	Complied
20.4656	Neutral	42.3	50.0	7.7	Complied
21.1027	Neutral	39.0	50.0	11.0	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: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

Results: 240 VAC 60 Hz / Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1838	Live	44.7	64.3	19.6	Complied
0.2056	Live	44.0	63.4	19.4	Complied
0.2457	Live	41.7	61.9	20.2	Complied
19.7906	Live	42.8	60.0	17.2	Complied
20.4234	Live	45.9	60.0	14.1	Complied
21.1419	Live	43.1	60.0	16.9	Complied

Results: 240 VAC 60 Hz / Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1838	Live	25.1	54.3	29.2	Complied
0.2056	Live	26.3	53.4	27.1	Complied
0.2457	Live	23.9	51.9	28.0	Complied
19.7906	Live	35.0	50.0	15.0	Complied
20.4234	Live	42.2	50.0	7.8	Complied
21.1419	Live	39.3	50.0	10.7	Complied

Results: 240 VAC 60 Hz / Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1941	Neutral	44.9	63.9	19.0	Complied
0.2062	Neutral	43.4	63.4	20.0	Complied
0.2432	Neutral	41.3	62.0	20.7	Complied
0.2555	Neutral	38.7	61.6	22.9	Complied
20.4226	Neutral	45.9	60.0	14.1	Complied
21.2209	Neutral	45.9	60.0	14.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)

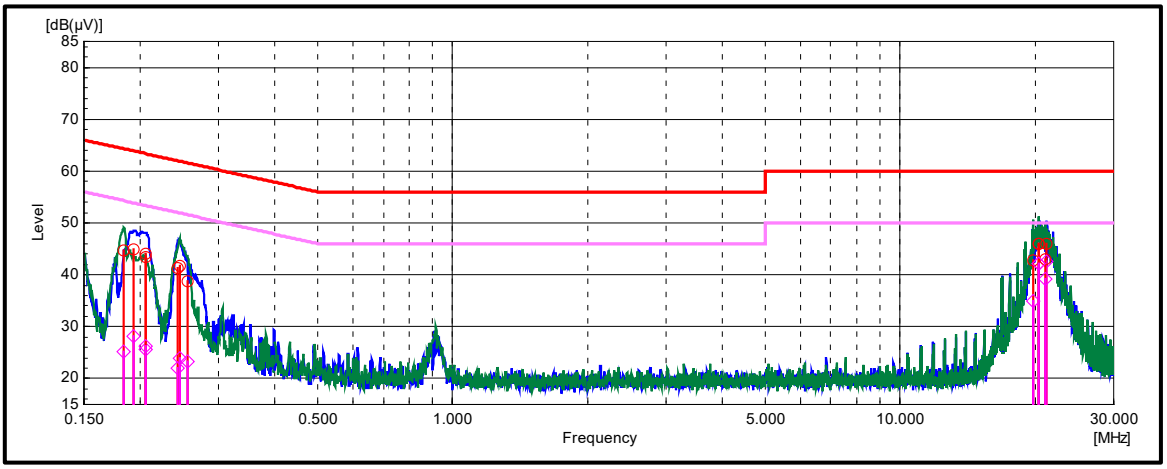
Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

Results: 240 VAC 60 Hz / Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1941	Neutral	28.2	53.9	25.7	Complied
0.2062	Neutral	25.5	53.4	27.9	Complied
0.2432	Neutral	22.0	52.0	30.0	Complied
0.2555	Neutral	23.2	51.6	28.4	Complied
20.4226	Neutral	42.2	50.0	7.8	Complied
21.2209	Neutral	42.6	50.0	7.4	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:

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

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

Environmental Conditions:

Temperature (°C):	29
Relative Humidity (%):	47

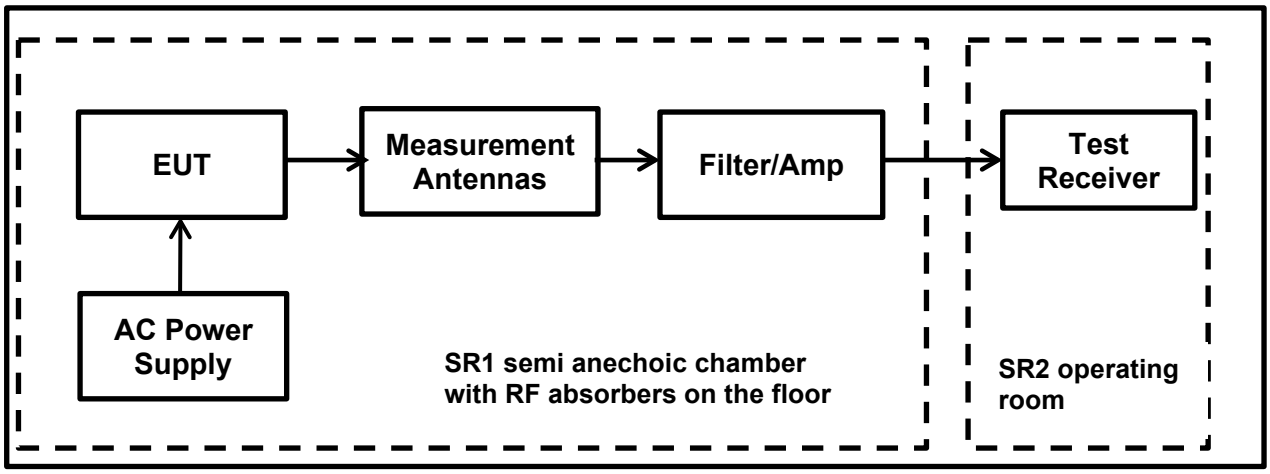
Notes:

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

   Duty Cycle (%) = 100 X [On Time (T_{ON})] / [Period(T_{ON}+ T_{OFF}) or 100ms whichever is the lesser]

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

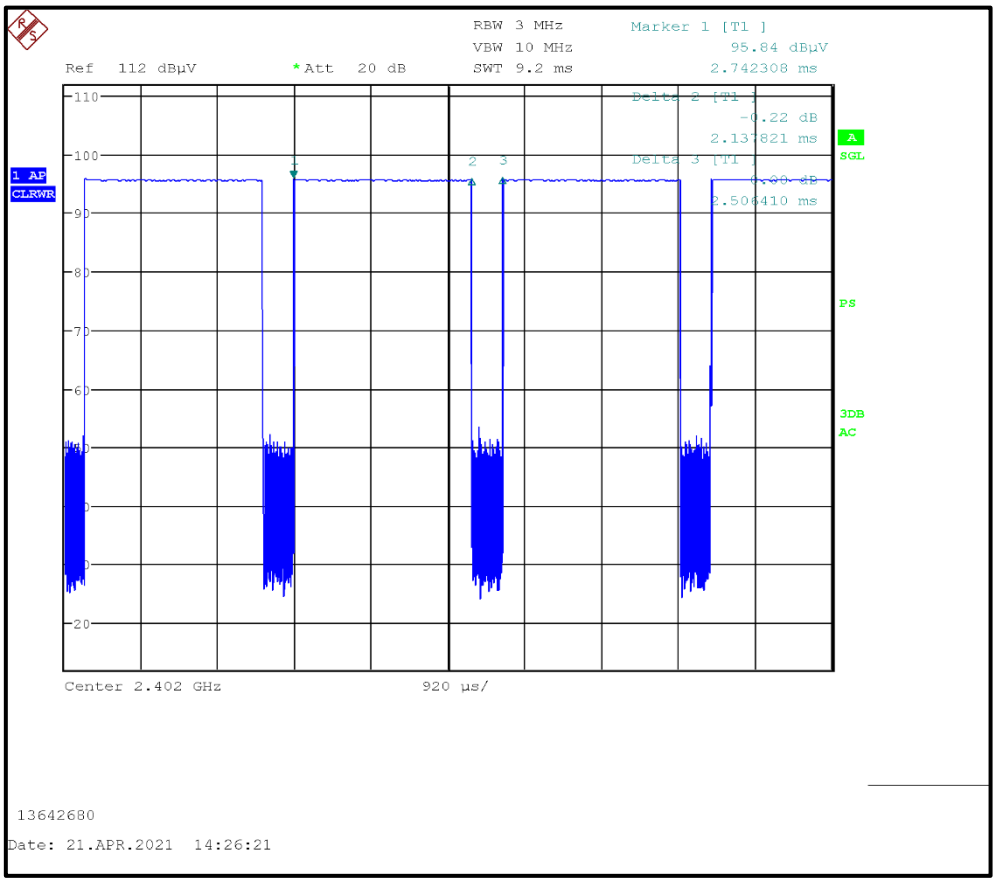
Test Setup:



Transmitter Duty Cycle (continued)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

Pulse On Time (T_{ON}) (ms)	Pulse Period (T_{ON} +T_{OFF}) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
2.138	2.506	85.32	0.69



Result: Pass

5.2.3. Transmitter Radiated Emissions

Test Summary:

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

FCC Reference:	Parts 15.247(d) & 15.209(a)
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:

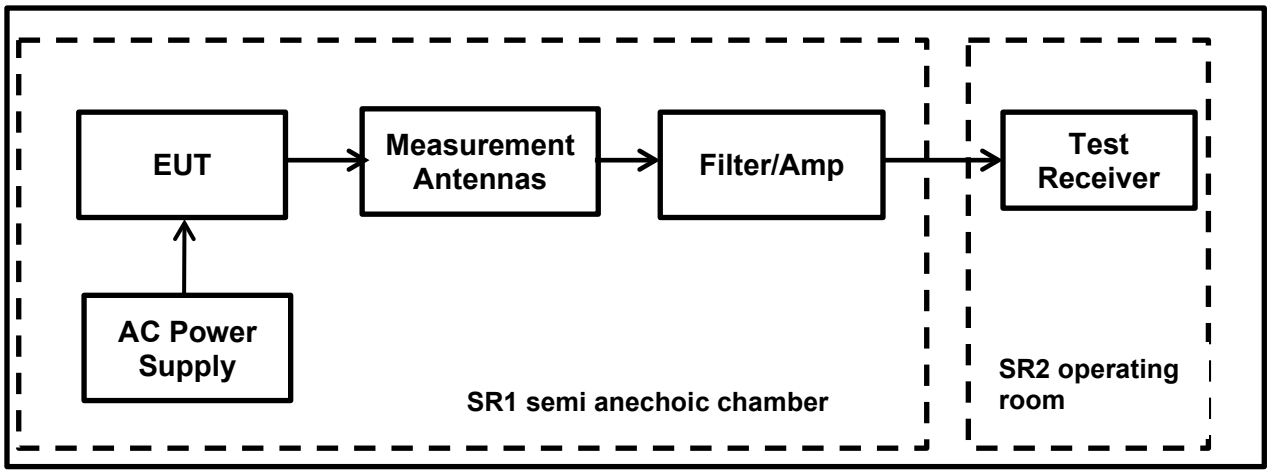
Temperature (°C):	23.4
Relative Humidity (%):	40.1

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 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. 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.
5. 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
6. 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 bottom channel only.
7. 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:

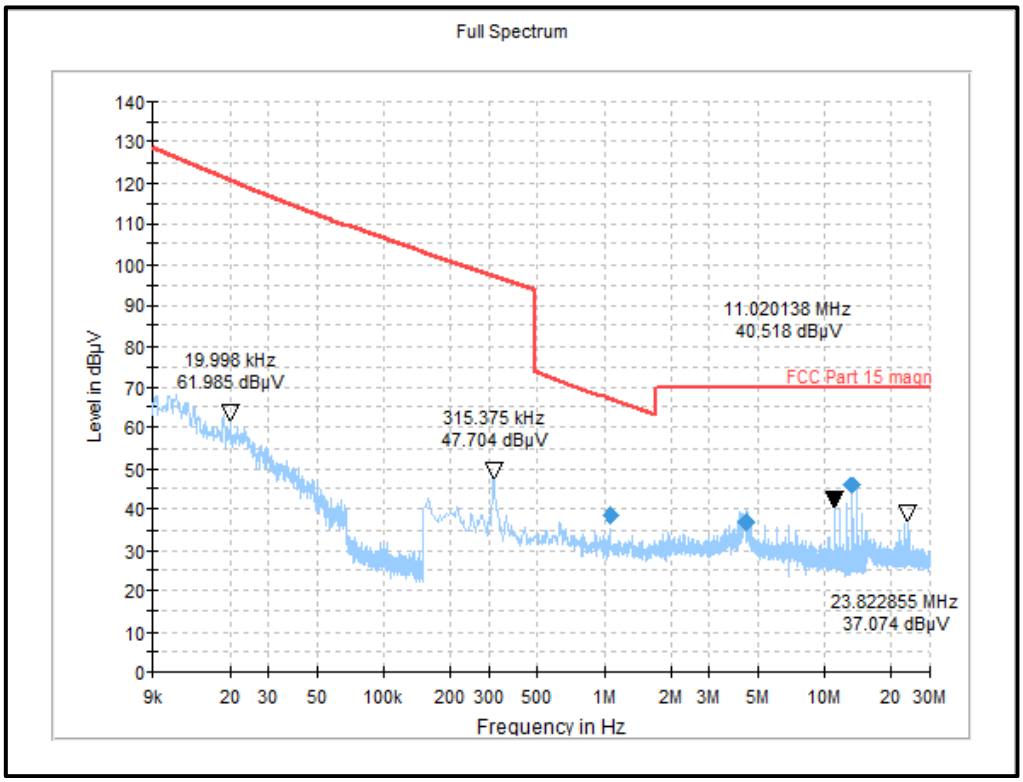


Transmitter Radiated Emissions (continued)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

Frequency (MHz)	Loop Antenna Orientation	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1.07	90º to EUT	38.35	66.82	28.47	Complied
4.37	0º to EUT	36.96	70.00	33.04	Complied
13.20	90º to EUT	45.77	70.00	24.23	Complied

Plot: 9 kHz – 30 MHz: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel



Result: Pass

Transmitter Radiated Emissions (continued)

Test Summary:

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

FCC Reference:	Parts 15.247(d) & 15.209(a)
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 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

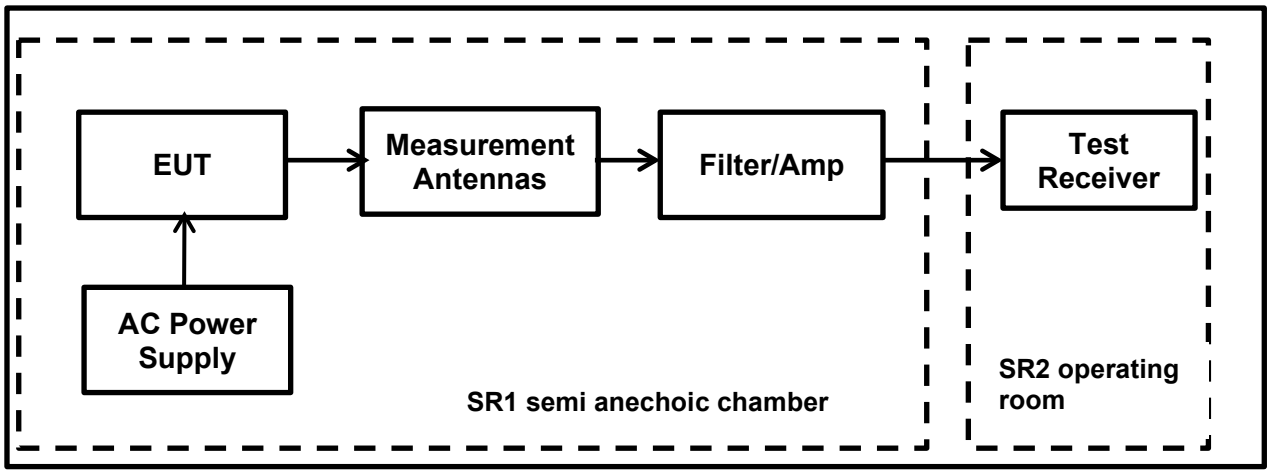
Temperature (°C):	23.4
Relative Humidity (%):	40.1

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 Bottom 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:

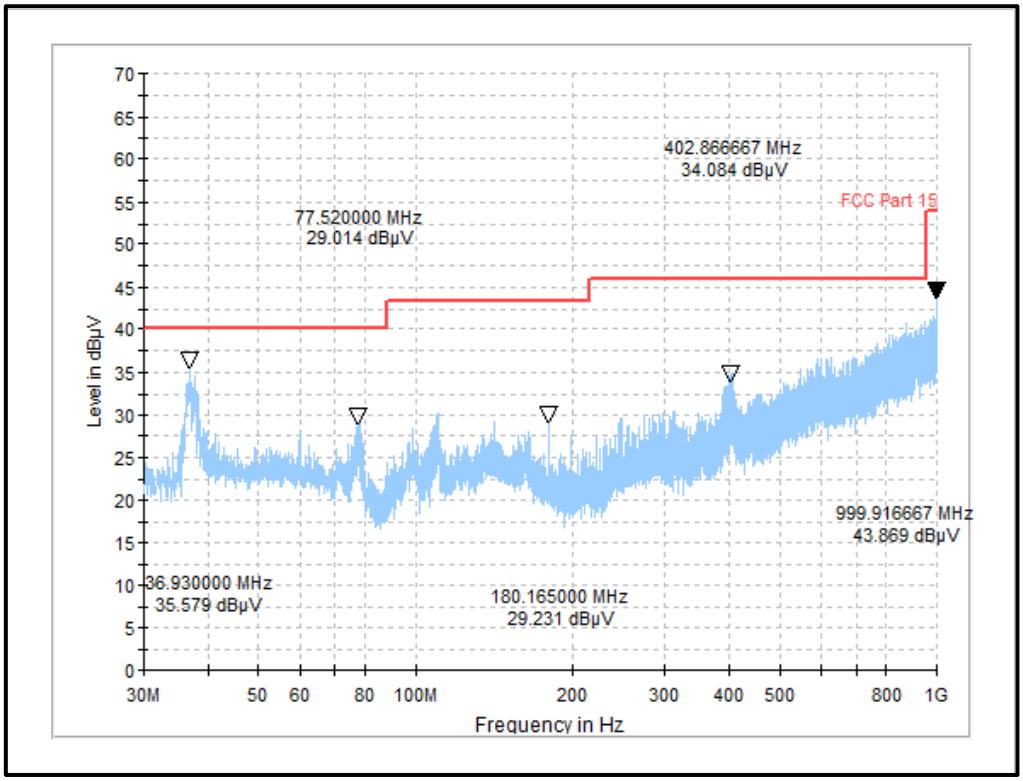


Transmitter Radiated Emissions (continued)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

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

Plot: 30 MHz – 1 GHz: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel



Result: Pass

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Sercan Usta	**Test Date:**	22 & 29 April 2021
Test Sample Serial Number:	E020AV2020400117(Radiated Test Sample)		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
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 6.6
Frequency Range:	1 GHz to 25 GHz

Environmental Conditions:

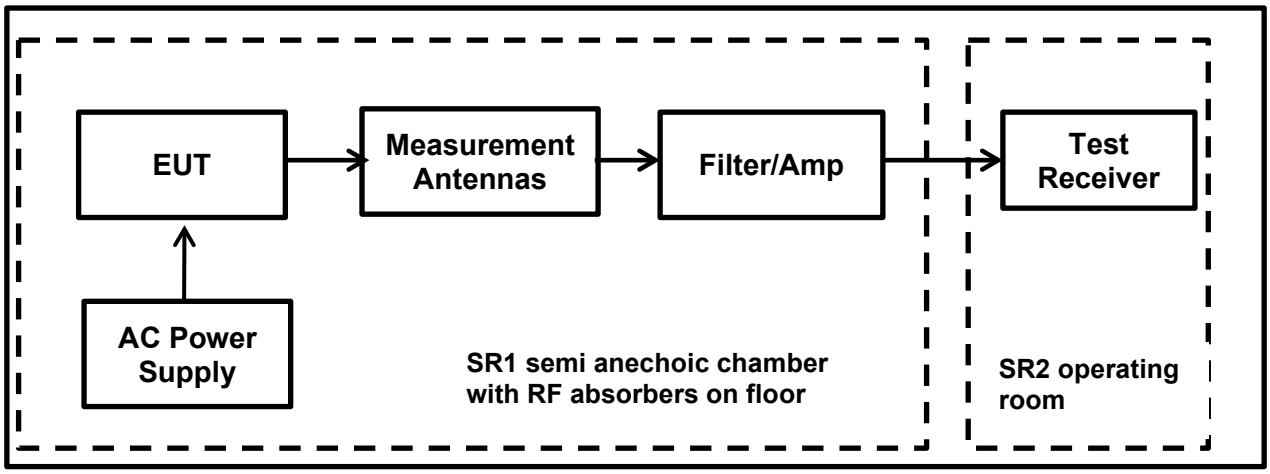
Temperature (°C):	23 & 23.4
Relative Humidity (%):	40 & 40.1

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 spurious emissions were detected.
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 bottom channel only.
6. For frequency range between 18 GHz and 25 GHz, no critical emissions were found.

Transmitter Radiated Emissions Test setup

Test Setup:

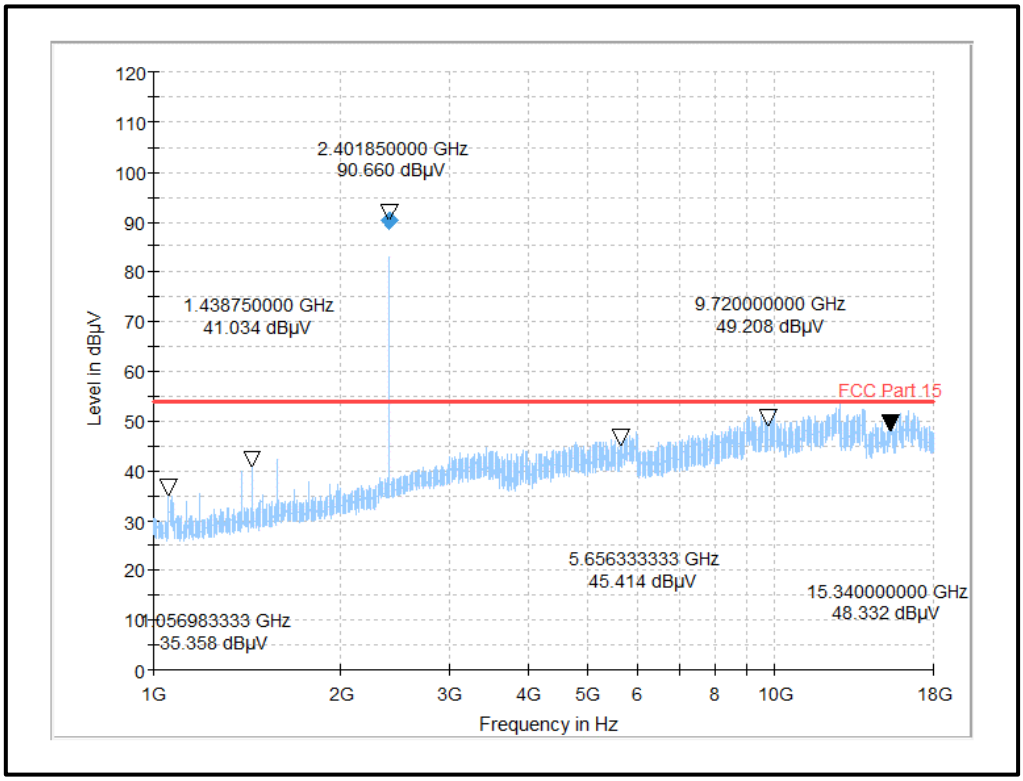


Transmitter Radiated Emissions (continued)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

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

Plot: 1 GHz – 18 GHz: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel



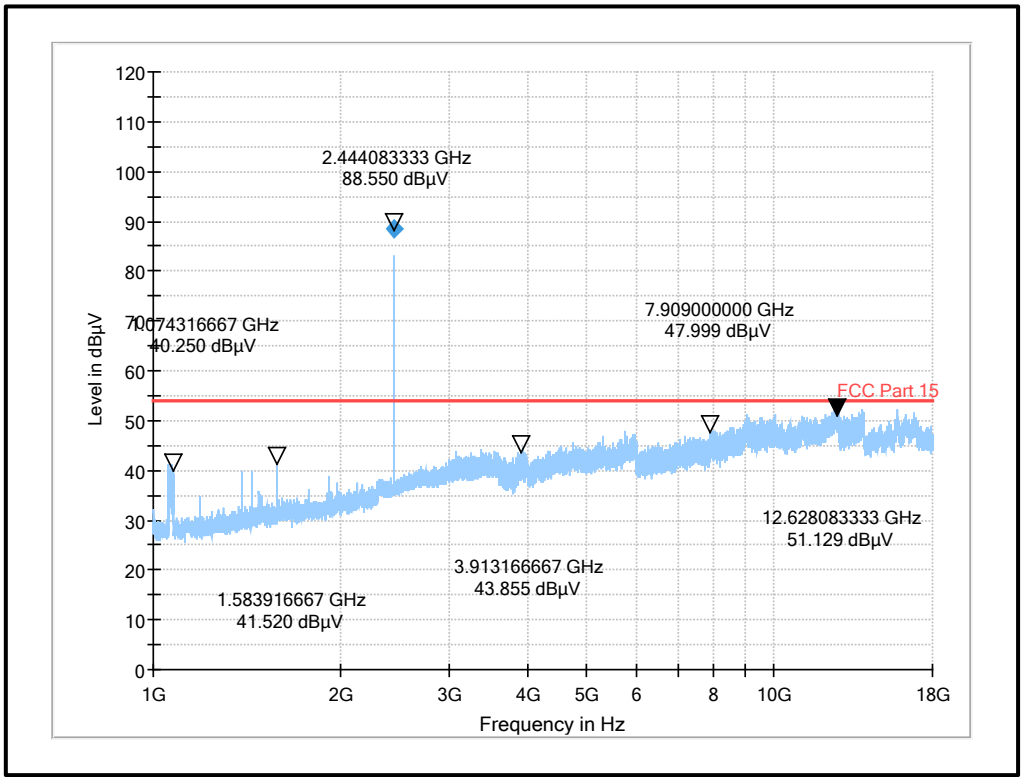
Result: Pass

Transmitter Radiated Emissions (continued)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Middle Channel

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

Plot: 1 GHz – 18 GHz: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Middle Channel



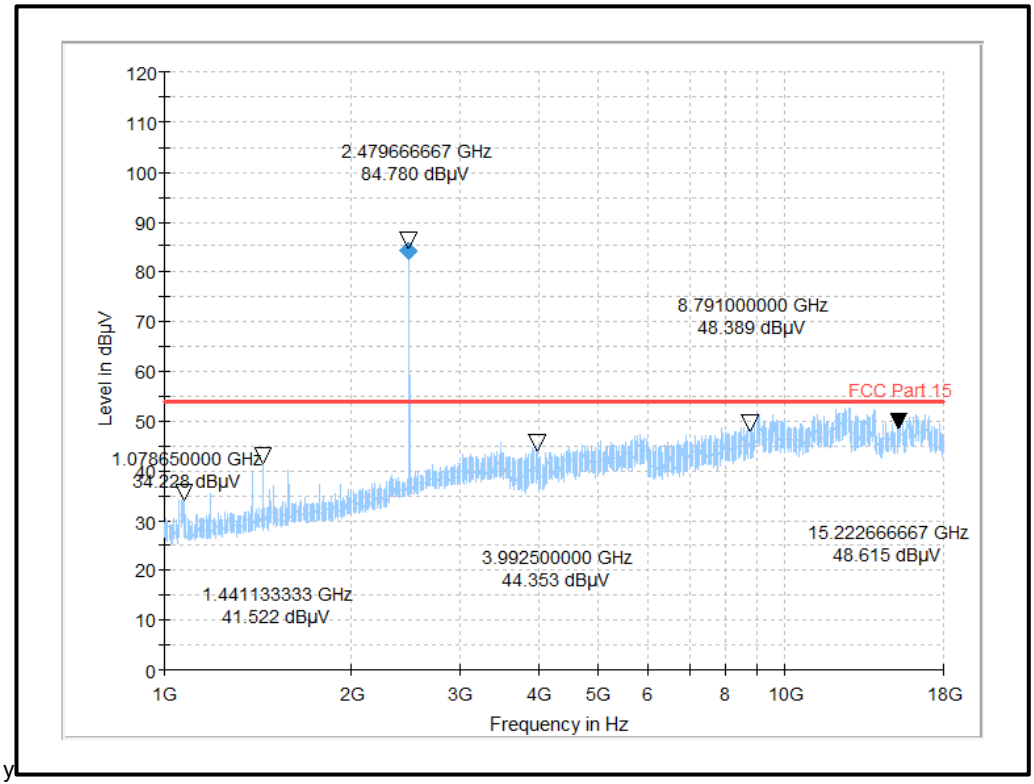
Result: Pass

Transmitter Radiated Emissions (continud)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Top Channel

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

Plot: 1 GHz – 18 GHz: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Top Channel



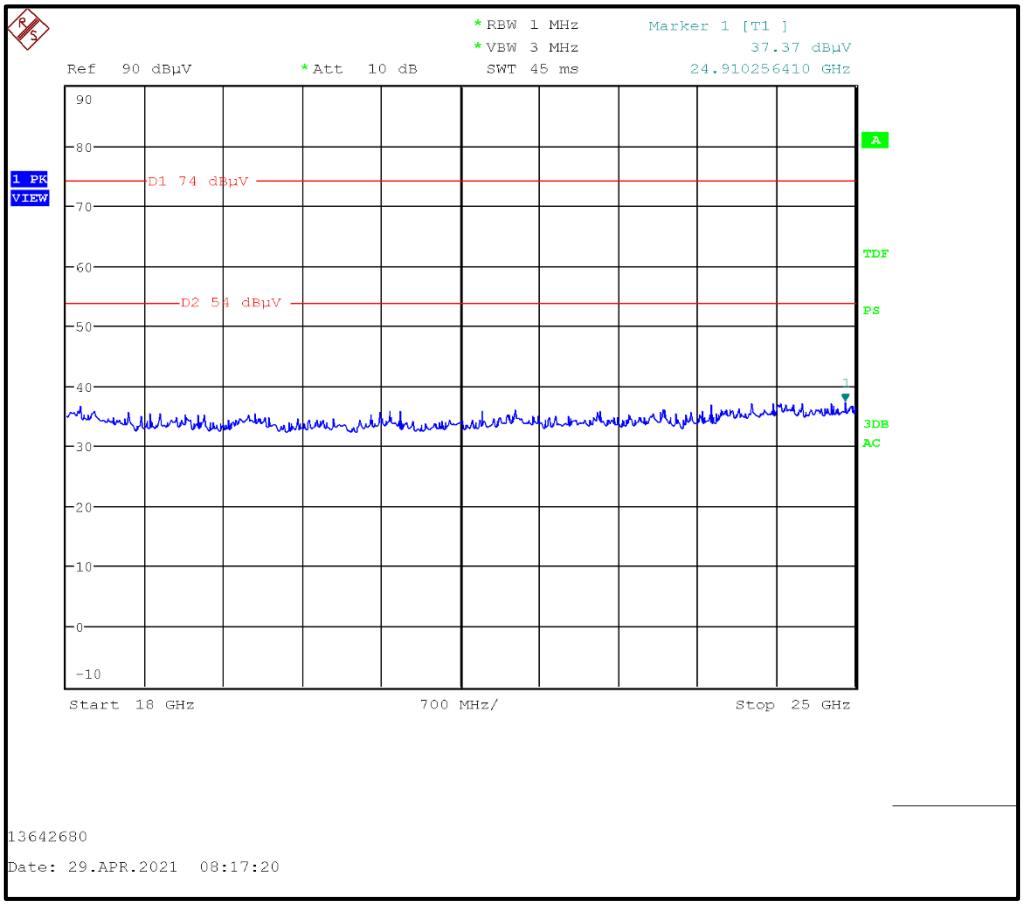
Result: Pass

Transmitter Radiated Emissions (continued)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel

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

Plot: 18 GHz – 25 GHz: BT-LE Mode / 1 Mbps / PRBS9 / Max Power / Bottom Channel



Result: Pass

5.2.4. Transmitter Band Edge Radiated Emissions

Test Summary:

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

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	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:

Temperature (°C):	21.7
Relative Humidity (%):	47.2

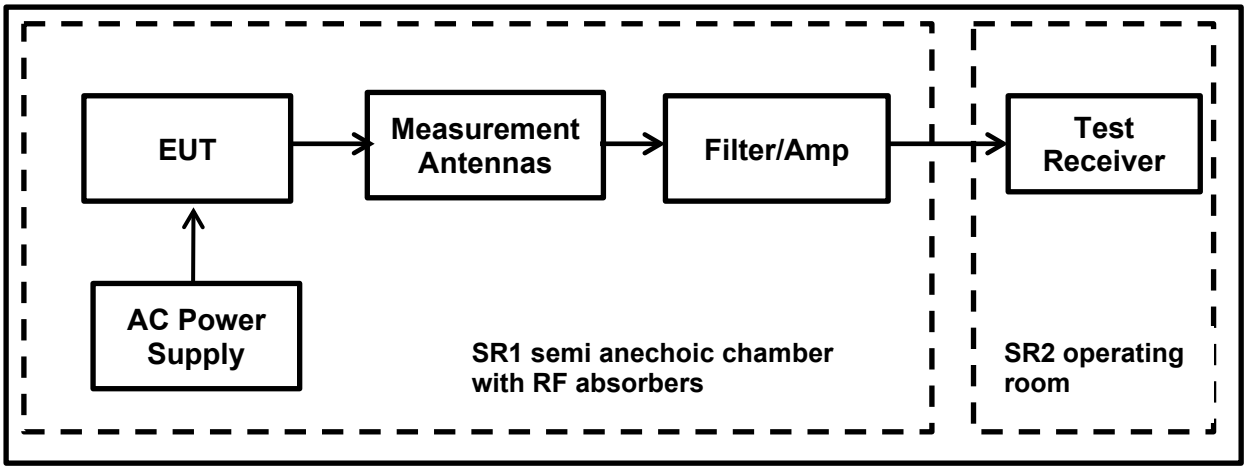
Note(s):

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 ±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.
9. **As the EUT was transmitting continuously with a Duty Cycle of 85.30 %, a Duty Cycle Correction Factor of 0.69 dB was added to all average measurements.

Test Setup:



Transmitter Band Edge Radiated Emissions (continued)

Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power

Results: Lower Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2389.58	42.64	70.01	27.37	Complied
2400.00	40.41	70.01	29.60	Complied

Results: 2310 to 2390 MHz Restricted Band / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2389.62	48.39	74.0	25.61	Complied

Results: 2310 to 2390 MHz Restricted Band / Average

Frequency (MHz)	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2389.87	36.91	0.69	37.6	54.0	16.4	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.50	49.49	74.0	24.51	Complied
2483.51	49.49	74.0	24.51	Complied

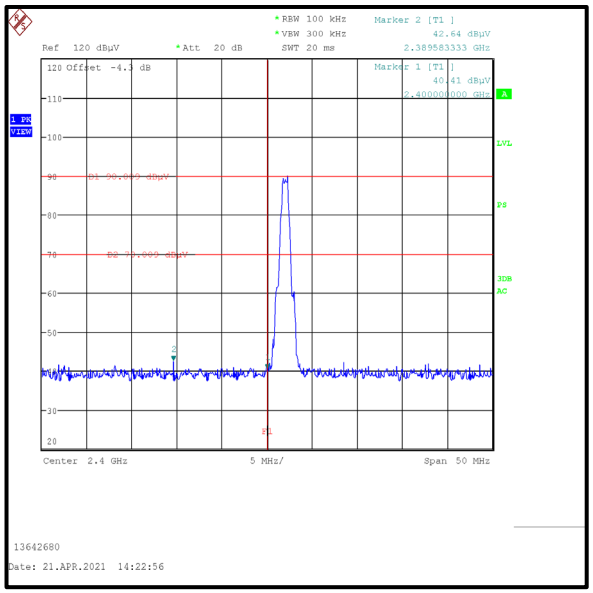
Results: Upper Band Edge / Average

Frequency (MHz)	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level ** (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.50	40.44	0.69	41.13	54.0	12.87	Complied
2483.51	40.44	0.69	41.13	54.0	12.87	Complied

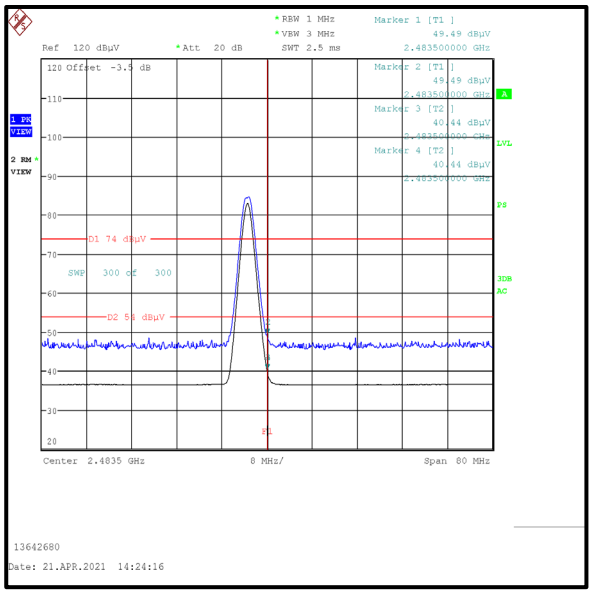
Result: Pass

Transmitter Band Edge Radiated Emissions (continued)

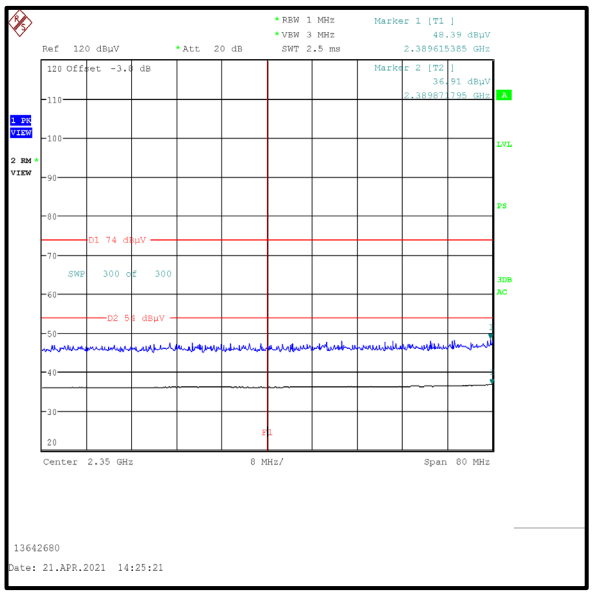
Results: BT-LE Mode / 1 Mbps / PRBS9 / Max Power



Lower Band Edge Measurement



Upper Band Edge Measurement



2310 MHz to 2390 MHz Restricted Band Plot

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%	±2.49 dB
Radiated Spurious Emissions	95%	±3.10 dB
Band Edge Radiated Emissions	95%	±3.10 dB
Transmitter Duty Cycle	95%	±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	37	-	Initial Version

--- END OF REPORT ---