



Solutions

TEST REPORT

Test Report No.: UL-RPT-RP-15158661-1016

Applicant * : EUROTECH SPA

Model No. * : RC1032

FCC ID / ISED IC: * : FCC ID: UKMRC1032
IC: 21442-RC1032

Technology * : Bluetooth – Basic Rate (BR) & Enhanced Data Rate (EDR)

Test Standard(s) : **FCC Parts 15.207 15.209(a) & 15.247**
RSS-247 Issue 3, August 2023 &
RSS-Gen Issue 5, April 2018 Amendment 2 (February 2021)

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 1.5 supersede Version 1.4 with immediate effect**
Test Report No. UL-RPT-RP-15158661-1016 Version 1.5, Issue Date 14 March 2025 replaces
Test Report No. UL-RPT-RP-15158661-1016 Version 1.4, Issue Date 7 March 2025, which is no longer valid.
5. Result of the tested sample: **Pass**
6. All information marked with a (*) were provided by customer / applicant or authorized representative

Yixiang Lin

Prepared by: Yixiang Lin
Title: Project Engineer
Date: 14 March 2025

Faiq Khan

Approved by: Muhammad Faiq Khan
Title: Project Engineer
Date: 14 March 2025



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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

Company Name:	EUROTECH SPA
Company Address:	Via FRATELLI SOLARI 3/A AMARO, Udine 33020 Italy
Contact Person:	Omar Toniutti
Contact E-Mail Address:	omar.toniutti@eurotech.com
Contact Phone No.:	-/-

1.2. Manufacturer Information

Company Name:	EUROTECH SPA
Company Address:	Via FRATELLI SOLARI 3/A AMARO, Udine 33020 Italy
Contact Person:	Omar Toniutti
Contact E-Mail Address:	omar.toniutti@eurotech.com
Contact Phone No.:	-/-

2. Summary of Testing

2.1. General Information

Applied FCC Rule Part(s)

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 15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 15.209
Specification Reference:	RSS-Gen Issue 5 April 2018 Amendment 2 (February 2021)
Specification Title:	General Requirements for Compliance of Radio Apparatus
Specification Reference:	RSS-247 Issue 3 August 2023
Specification Title:	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Location

Location of Testing:	UL International Germany GmbH Hedelfinger Strasse. 61, 70327 Stuttgart, GERMANY
Site Registration:	FCC: 399704, ISEDC: 22511
FCC Lab. Designation No.:	DE0019
ISEDC CABID:	DE0008

Date Information

Order Date:	26 January 2024
EUT arrived:	15 July 2024
Test Dates:	15 July 2024 to 31 July 2024
EUT returned:	-/-

2.2. Summary of Test Results

Frequency Hopping Spread Spectrum (FHSS): 2400-2483.5 MHz						
FCC Part 15 Clause	ISED Clause	Compliance Test Description	Test Result			
			C	N.C.	N.P.	N.A.
15.207	RSS-Gen 8.8	Transmitter AC Conducted Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.247(a)(1)	RSS-Gen 6.7 / RSS-247 5.1(b)	Transmitter Minimum 20 dB Bandwidth	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
-/-	RSS-Gen 6.7	Transmitter 99% Occupied Bandwidth	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.35(c)	RSS-Gen 8.2	Transmitter Duty Cycle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.247(a)(1)	RSS-Gen 6.6 / RSS-247 5.1(2)	Transmitter Carrier Frequency Separation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.247(a)(1)(iii)	RSS-Gen 6.6 / RSS-247 5.1(4)	Transmitter Number of Hopping Frequencies and Average Time of Occupancy	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.247(b)(1)	RSS-Gen 6.12 / RSS-247 5.4(1)	Transmitter Maximum Peak Output Power	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Band Edge Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C: COMPLIED N.C.: NOT COMPLIED N.P.: NOT PERFORMED N.A.: NOT APPLICABLE						
Decision rule: If the decision rule is not included in the applied customer specification or testing standard, the binary statement for simple acceptance, as defined in ILAC G8: 2019 Section 4.2.1, is applied as the decision rule for a pass/ fail statement. If the measured value is on the limit, the result is defined as a pass. In this case the risk of a false positive is 50%. For further information regarding risk assessment refer to ILAC G8: 2019.						

Note(s):

1. The Duty Cycle measurement was performed to assist in the calculation of the level of emissions.
2. The test was performed partially because the module is already certified and the tests were performed for the C2PC which concerns the antenna change and installation on a specific host.

2.3. Methods and Procedures

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

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT) *

Brand Name:	EUROTECH
Model Name or Number:	RC1032
Test Sample Serial Number:	B54292 900002
HMN:	RECELL-10-32
HVIN:	RC1032
FVIN:	/
FCC ID:	UKMRC1032
ISED Certification Number:	21442-RC1032

3.2. Description of EUT *

The EUT is the BT/WiFi Module installed in specific host (ReliaCELL 10-32).

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 – BR/EDR		
FCC Equipment Classification:	Frequency hopping spread spectrum (FHSS)		
Type of Unit:	Transceiver		
Power Supply Requirement(s):	5V DC		
Tested data rate:	2-DH5 ($\pi/4$ -DQPSK)		
Antenna Gain:	Wi-Fi/BT 2.4GHz: 4.71 dBi		
Antenna Type:	External dipole antenna		
Antenna Details:	Quectel YEWN001AA		
Operating Frequency Range:	2402 MHz to 2480 MHz		
Channel Spacing:	1 MHz		
Transmit Channels Tested:	Channel ID	RF Channel	Frequency (MHz)
	Middle	39	2441

3.5. Support Equipment

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

A. Support Equipment (In-house)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	-/-	-/-	-/-	-/-

B. Support Equipment (Manufacturer supplied) *

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Host CPU Unit	Eurotech	ReliaGATE-15a-14 Rev.A	Host CPU-1
2	AC/DC Adaptor	Sunny	SYS1541-2424 Input: 100-240 VAC, 50-60 Hz, 1.0 A Output: 24 VDC, 1.0 A	-/-
3	Extension Card for ReliaCELL-10-32	Eurotech	BRD3123_001A1	Extension Card-0R2
4	8-port Gb LAN switch	Netgear	GS608	-/-
5	Laptop with QRCT	HP	HP ZBook 15U G6 (Intel Core i7; 8th Gen)	CAM02WKS452/5CG9518S1M

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

Continuous Transmitting Fixed Channel Frequency Mode (Hopping OFF) with Modulated Carrier

- Maximum Power: PWR 9
- Test Channels: | Middle |⁽¹⁾
- BT-Mode & Packet Type: PRBS9
 - BT-EDR Mode : (2DH5)

1) As a C2PC application, tests were performed on middle channel only based on pre-scan tests.

2) As the same antenna is used for all 2.4GHz band operations, the pre-scan on the Bluetooth LE and Classic modes showed that the Bluetooth Classic was the worst case mode, test were performed with Bluetooth Clasic mode only.

4.2. Configuration and Peripherals

- The customer supplied document containing the setup instructions "RC1032-RF-TEST-FCC-B03.pdf" was used for configuration.

EUT Power Supply:

- The host was powered with 120 V AC 60 Hz, and EUT powered by the host.
- For AC conducted line emissions measurement the host was powered via AC/DC power adapter
The measurements were carried out with 120 VAC /60 Hz & 240 VAC/60 Hz.

Test Mode Activation:

- The EUT can be installed into a host unit and a test laptop via ethernet cable supplied by the customer is used to control the EUT.
- The test modes were activated by Qualcomm Radio Control Tool.

Radiated Measurements:

- 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 Standing-position was found to be the worst case, with horizontal antennas orientation.
- The 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 80 cm.
- The 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 V11.30.00 Software was used for the Radiated spurious emission measurements.
- The continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and EUT was transmitting with 76.06% duty cycle. Duty Cycle Correction Factors of 1.2 dB was added to all average measurements to compensate as if it was transmitting with 100% duty cycle.

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 Engineers:	Abbas Al-Hussainy	Test Dates:	19 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 7/8		

FCC Reference:	Part 15.207
ISED Reference:	RSS-Gen 8.8
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 RSS-Gen 8.8 and notes below

Environmental Conditions:

Temperature (°C):	22.5
Relative Humidity (%):	40.3

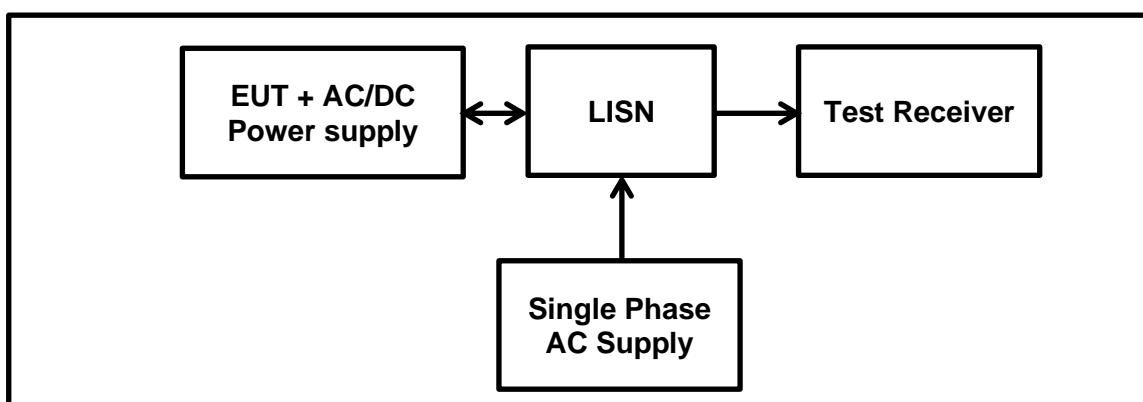
Settings of the Instrument

Detector	Quasi Peak/ Average
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Note(s):

1. The EUT was powered with 120VAC / 60 Hz and also 240 VAC / 60 Hz as it is in the range of the used power supply.
2. The EUT was configured with the following modes w.r.t output power:
Bluetooth | BR-EDR | 2-DH5 | Channel 39
3. 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 tables below.
4. The final measured value, for the given emission, in the table below incorporates the cable loss.
5. All other emissions shown on the pre-scan plot were investigated. Only the highest 6 emissions have been reported in the tables below in accordance with ANSI C63.10 section 6.2.5.
6. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.

Test setup:



Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.22011	Live	51.60	62.80	11.20	0.22011
0.34062	Live	44.20	59.20	15.00	0.34062
0.68991	Live	22.00	56.00	34.00	0.68991
1.00759	Live	18.30	56.00	37.70	1.00759
2.09962	Live	16.30	56.00	39.70	2.09962
15.16578	Live	13.10	60.00	46.90	15.16578

Results: Live / Average / 120 VAC 60 Hz

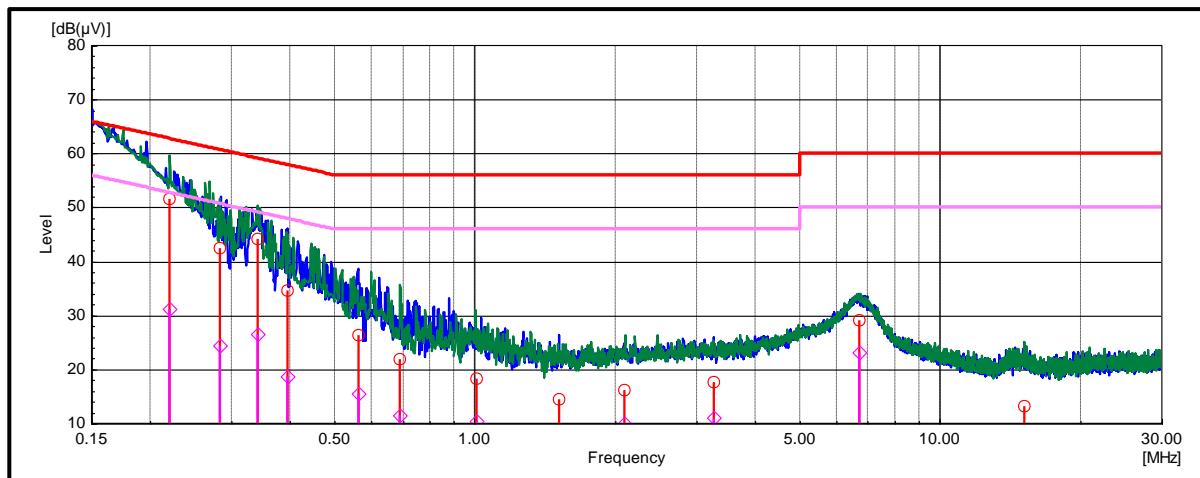
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.22011	Live	31.20	52.80	21.60	0.22011
0.34062	Live	26.60	49.20	22.60	0.34062
0.68991	Live	11.60	46.00	34.40	0.68991
1.00759	Live	10.40	46.00	35.60	1.00759
2.09962	Live	10.00	46.00	36.00	2.09962
15.16578	Live	8.40	50.00	41.60	15.16578

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.28389	Neutral	42.40	60.70	18.30	Complied
0.39565	Neutral	34.60	57.90	23.30	Complied
0.56208	Neutral	26.30	56.00	29.70	Complied
1.51599	Neutral	14.50	56.00	41.50	Complied
3.26451	Neutral	17.60	56.00	38.40	Complied
6.71678	Neutral	29.00	60.00	31.00	Complied

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.28389	Neutral	24.50	50.70	26.20	Complied
0.39565	Neutral	18.70	47.90	29.20	Complied
0.56208	Neutral	15.50	46.00	30.50	Complied
1.51599	Neutral	7.40	46.00	38.60	Complied
3.26451	Neutral	11.00	46.00	35.00	Complied
6.71678	Neutral	23.10	50.00	26.90	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Plot: Live & Neutral Line / 120 VAC 60 Hz**

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

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
11.39024	Live	13.30	60.00	46.70	Complied
6.56198	Live	30.40	60.00	29.60	Complied
3.88239	Live	23.00	56.00	33.00	Complied
0.63036	Live	26.50	56.00	29.50	Complied
0.30983	Live	41.10	60.00	18.90	Complied
0.21159	Live	52.20	63.10	10.90	Complied

Results: Live / Average / 240 VAC 60 Hz

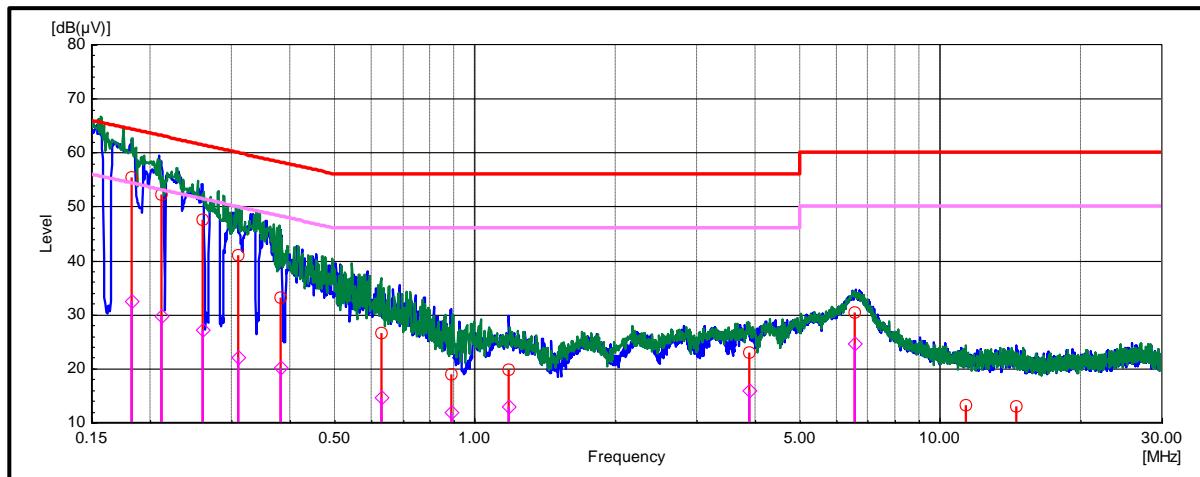
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
11.39024	Live	8.20	50.00	41.80	Complied
6.56198	Live	24.70	50.00	25.30	Complied
3.88239	Live	15.90	46.00	30.10	Complied
0.63036	Live	14.70	46.00	31.30	Complied
0.30983	Live	22.10	50.00	27.90	Complied
0.21159	Live	29.70	53.10	23.40	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.18271	Neutral	55.30	64.40	9.10	Complied
0.2601	Neutral	47.60	61.40	13.80	Complied
0.38173	Neutral	33.20	58.20	25.00	Complied
0.88905	Neutral	19.00	56.00	37.00	Complied
1.18321	Neutral	19.90	56.00	36.10	Complied
14.59724	Neutral	13.00	60.00	47.00	Complied

Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.18271	Neutral	32.50	54.40	21.90	Complied
0.2601	Neutral	27.30	51.40	24.10	Complied
0.38173	Neutral	20.10	48.20	28.10	Complied
0.88905	Neutral	11.90	46.00	34.10	Complied
1.18321	Neutral	13.10	46.00	32.90	Complied
14.59724	Neutral	8.30	50.00	41.70	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Plot: Live & Neutral Line / 240VAC 60 Hz**

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

Result: Pass

5.2.2. Transmitter Duty Cycle

Test Summary:

Test Engineers:	Muhammad Faiq Khan	Test Dates:	25 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 7/8		

FCC Reference:	Part 15.35(c)
ISED Reference:	RSS-Gen 8.2
Test Method Used:	FCC KDB 558074 Section 9.b) referencing ANSI C63.10 Section 7.5

Environmental Conditions:

Temperature (°C):	22.7
Relative Humidity (%):	47.2

Note:

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

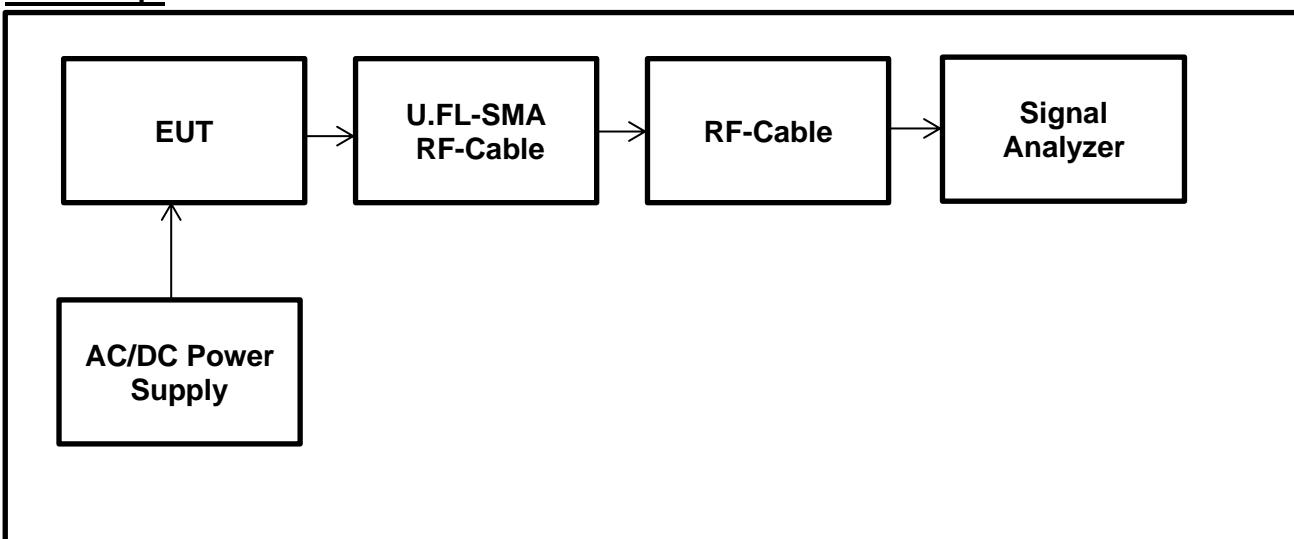
$$\text{Duty Cycle (\%)} = 100 \times [\text{On Time (T}_{\text{ON}}\text{)}] / [\text{Period}(\text{T}_{\text{ON}} + \text{T}_{\text{OFF}}) \text{ or } 100\text{ms whichever is the lesser}]$$

$$\text{Duty Cycle Correction Factor} = 10 \log 1 / [\text{On Time (T}_{\text{ON}}\text{)}] / [\text{Period}(\text{T}_{\text{ON}} + \text{T}_{\text{OFF}}) \text{ or } 100\text{ms whichever is the lesser}]$$
2. The EUT was configured with the following modes w.r.t output power:

Bluetooth | BR-EDR | 2-DH5 | Channel 39
3. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.
 - o The UFL to SMA Cable from PCB with maximum attenuation of 0.7 dB at the tested frequencies.
 - o The RF cable from the EUT to Analyzer with maximum attenuation of 0.9 dB at the tested frequencies.

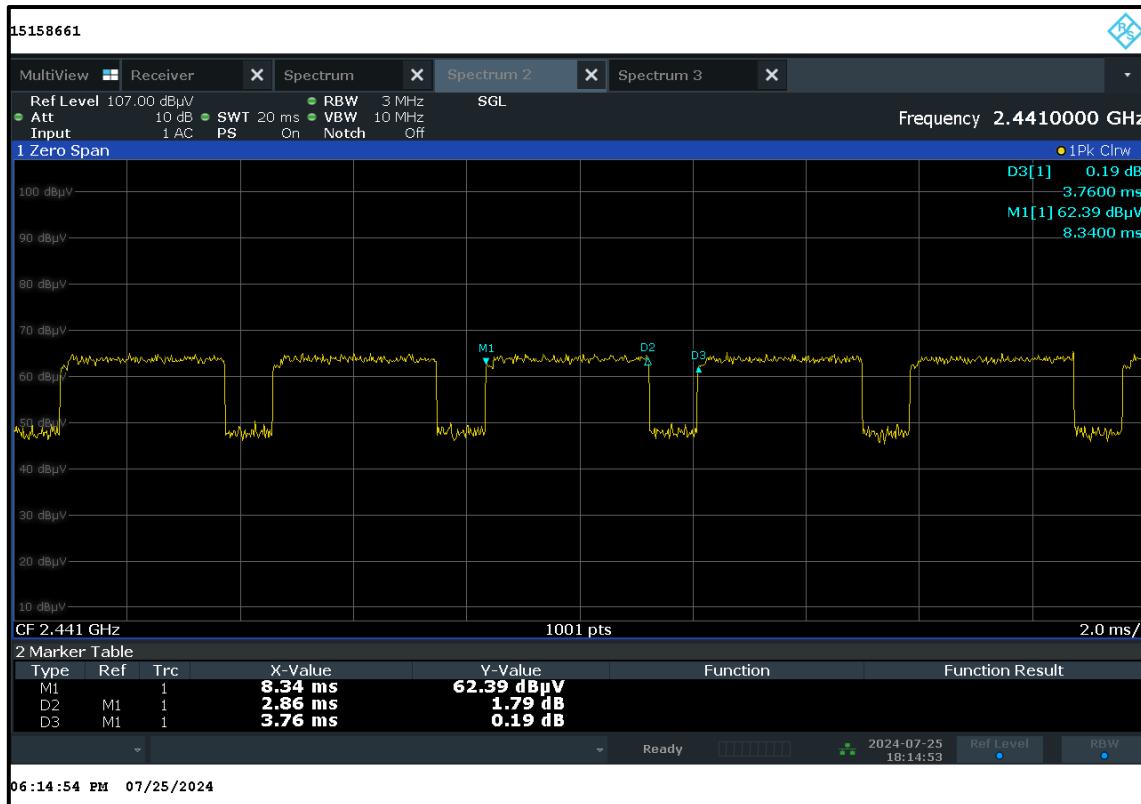
Therefore, total a reference level offset 1.60 dB was added to each of the at the tested frequencies conducted plots.

Test Setup:



Transmitter Duty Cycle (continued)**Results: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**

Pulse On Time (T_{ON}) (ms)	Pulse Period ($T_{ON} + T_{OFF}$) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
2.86	3.76	76.06	1.2



5.2.3. Transmitter Radiated Emissions

Test Summary:

Test Engineers:	Muhammad Faiq Khan	Test Dates:	30 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 7/8		

FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Reference:	RSS-Gen 6.13 / RSS-247 5.5
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.4
Frequency Range	9 kHz to 30 MHz

Environmental Conditions:

Temperature (°C):	24.9
Relative Humidity (%):	49.0

Note(s):

1. As allowed by ANSI C63.10 clause 5.2 an alternative test site that can demonstrate equivalence to a open area test site may be used. Therefore, the measurement was performed in a Semi Anechoic Chamber. The OATS / SAC comparison data is detailed in section 8. Open-Area-Test Site comparison of this report.
2. FCC rule part 15.209(a) specifies limits at 300 m / 30 m in μ V/m but RSS GEN specifies limits at 300 m / 30 m in μ A/m. The relevant limits are the same after accounting for E-field to H-field correction. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table). According to Notice 2020-DRS0023 converting the magnetic field strength into electrical field strength using the following equation while considering free space impedance of 377 Ω results in a factor of 51.5 $\text{dB}\Omega$.

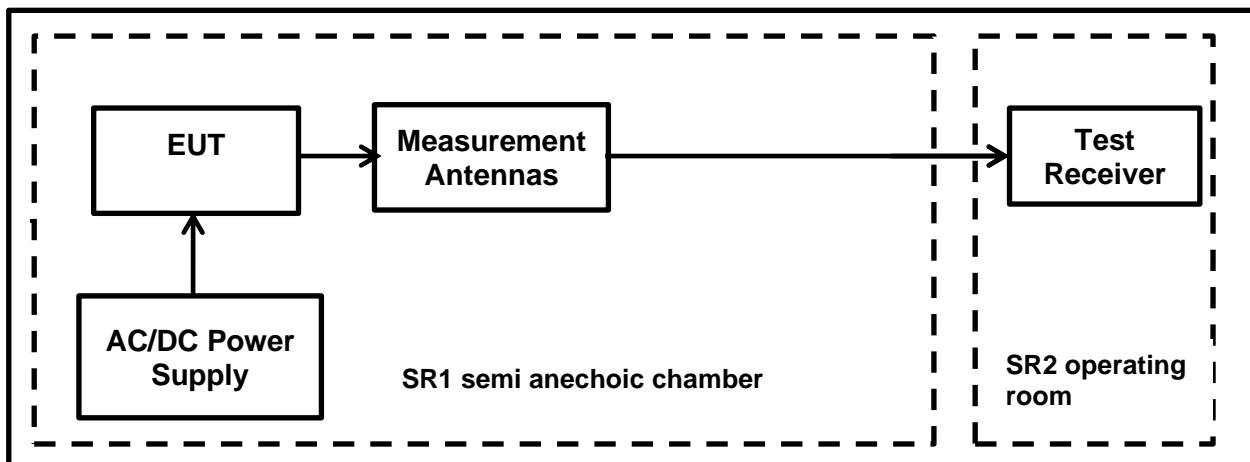
$$AF^E [\text{dB}(\text{m}^{-1})] = AF^H [\text{dB}(\Omega^{-1}\text{m}^{-1})] + Z_0[\text{dB}\Omega]$$

For example, the measurement frequency X KHz resulted in a level of Y dB μ V/m, which is equivalent to $Y - 51.5 = Z$ dB μ A/m, which has the same margin, W dB, to the corresponding RSS-GEN Section 8.9, Table 6 limit as it has to the 15.209(a) limit.

3. The limits are specified at a test distances of 30 m & 300 metres. However, as specified in ANSI C63.10 clause 6.4.3, measurements may be performed at a closer distance and the measured level extrapolated to the specified measurement distance using the method described in clauses 6.4.4, specifically sub-clause 6.4.4.1 which specifies that the measured level shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 40 dB/decade. Therefore, measurements were performed at a measurement distance of 3 m.
4. The measured values at 3 m were extrapolated to the required measurement distances of 300 m and 30 m and compared the specified limits at those distances as follows:
 - 9 kHz- 490 kHz: measured value extrapolated from 3 m to 300 m by subtracting 80 dB at 40 dB/decade.
 - 490 kHz-30 MHz: measured value extrapolated from 3 m to 30 m by subtracting 40 dB at 40 dB/decade.

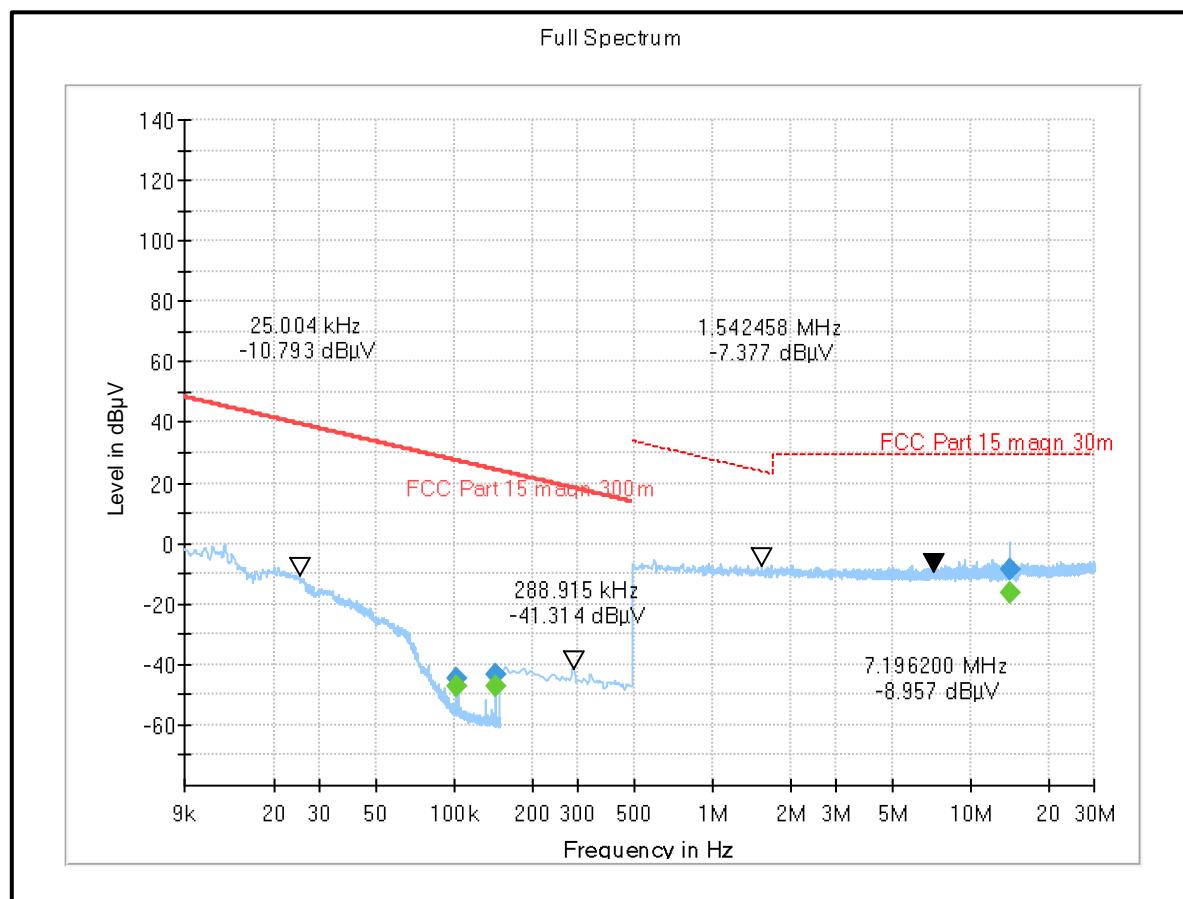
Transmitter Radiated Emissions (continued)**Note(s):**

5. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
6. Measurements below 30 MHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT placed on table 80 cm from ground plane in the centre of the chamber turntable. The measurement loop antenna height was at 1 m.
7. The EUT was configured with the following modes w.r.t output power:
Bluetooth | BR-EDR | 2-DH5 | Channel 39
8. Pre-scans were performed, and markers placed on the highest measured levels. The test receiver was set to:
 - Frequency range: 9 kHz-150 kHz : RBW: 300 Hz /VBW: 1 kHz
 - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
 - Detector: Peak detector
 - Trace Mode: Max Hold
9. Final measurements performed with Quasi-peak detector as per CISPR requirements.
- 10.

Test Setup:

Transmitter Radiated Emissions (continued)**Results: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**

Frequency (MHz)	Loop Antenna Orientation	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
0.101778	90° to the EUT	-44.60	22.62	67.22	Complied
0.144713	0° to the EUT	-43.03	20.25	63.28	Complied
14.193880	0° to the EUT	-8.46	29.03	37.49	Complied

Plot: 9 kHz – 30 MHz: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**Result: Pass**

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

Test Engineers:	Muhammad Faiq Khan	Test Dates:	23 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 7/8		

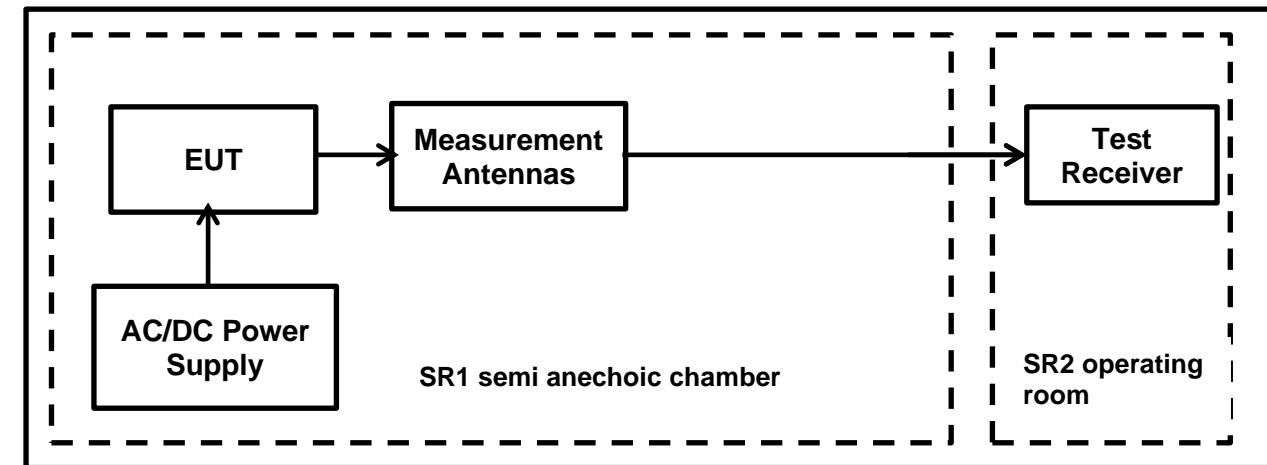
FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Reference:	RSS-Gen 6.13 / RSS-247 5.5
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	24.0
Relative Humidity (%):	49.4

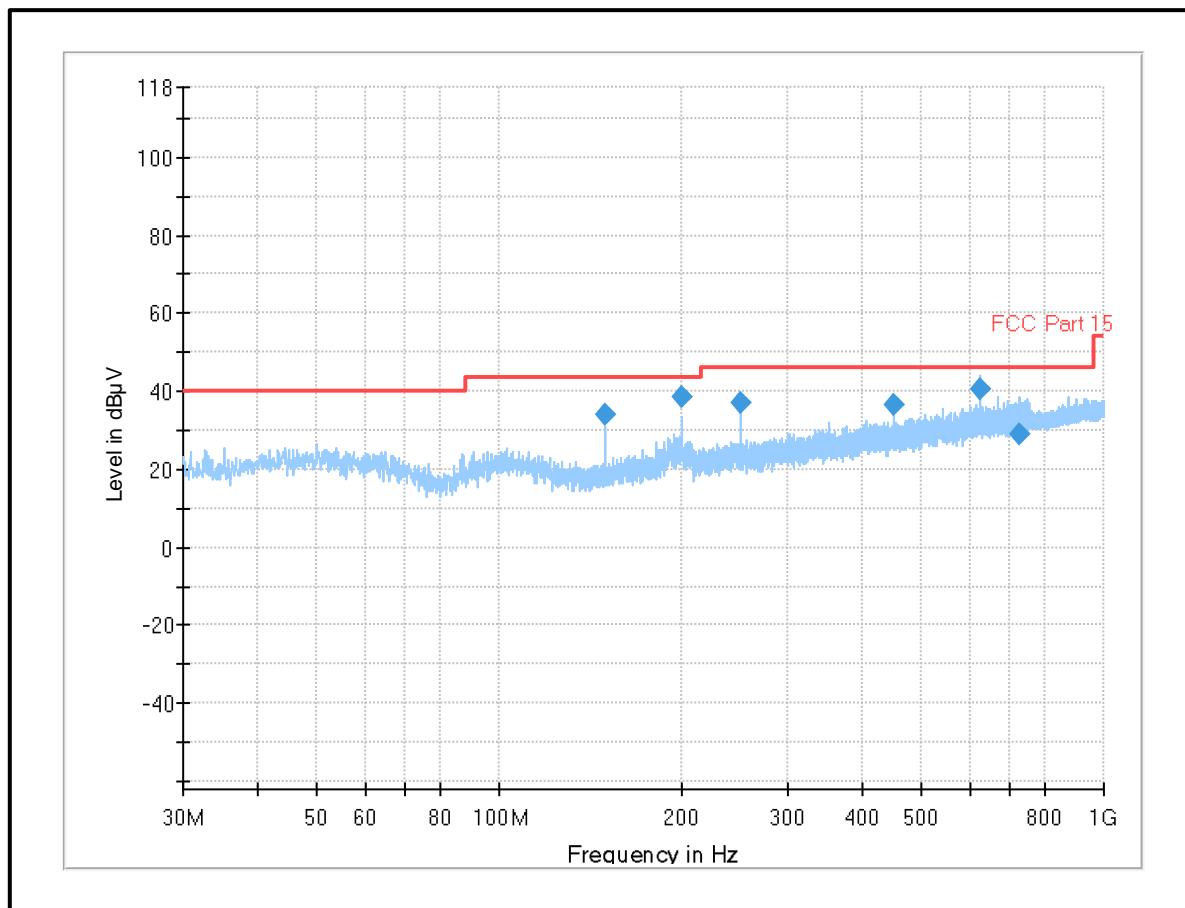
Note(s):

1. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
2. 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.
3. The EUT set to the following worst case (in terms of highest output power).
 - | Bluetooth | BR-EDR | 2-DH5 | Channel 39
4. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
5. Final measurements were performed on the marker frequencies. The results entered in the table below incorporates the calibrated antenna factor and cable loss. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span big enough to see the whole emission.
6. All other emissions shown on the pre-scan plot were investigated and found to be below the measurement system noise floor.

Test Setup:

Transmitter Radiated Emissions (continued)**Results: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**

Frequency (MHz)	Antenna Polarization	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
150.015000	Horizontal	34.03	43.50	9.47	Complied
200.010000	Horizontal	38.32	43.50	5.18	Complied
250.005000	Horizontal	37.07	46.00	8.93	Complied
450.000000	Horizontal	36.40	46.00	9.60	Complied
625.000000	Horizontal	40.61	46.00	5.39	Complied
725.666667	Horizontal	29.15	46.00	16.85	Complied

Plot: 30 MHz – 1 GHz: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**Result: Pass**

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

Test Engineers:	Muhammad Faiq Khan	Test Dates:	15 July 2024 & 31 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 7/8		

FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Reference:	RSS-Gen 6.13 / RSS-247 5.5
Test Method Used:	ANSI C63.10:2013 Sections 6.3 and 6.5
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

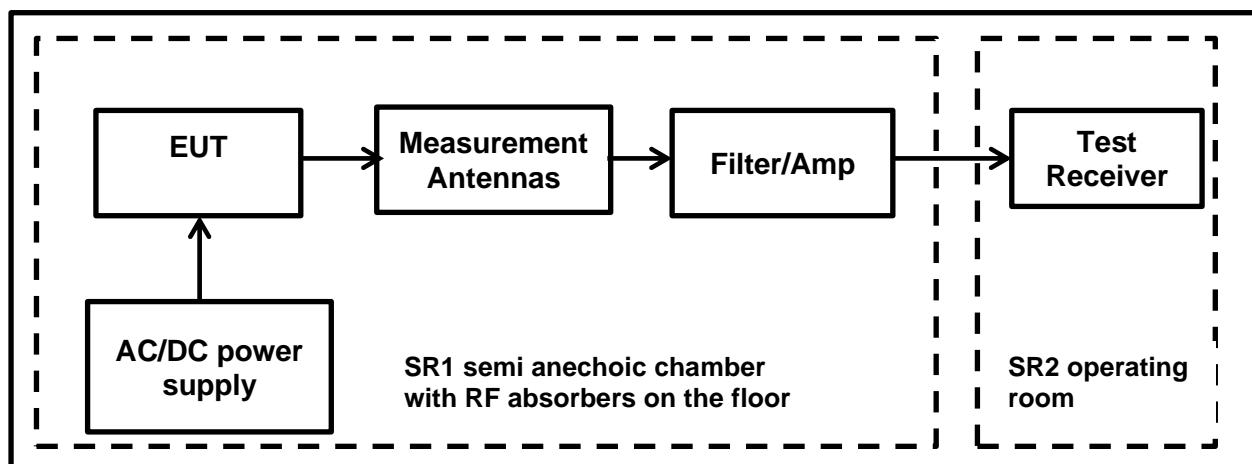
Temperature (°C):	24.0 to 24.9
Relative Humidity (%):	49.0 to 53.2

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 placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 m above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with absorber on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m.
2. 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.
3. 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.
4. 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 following worst case (in terms of highest output power).

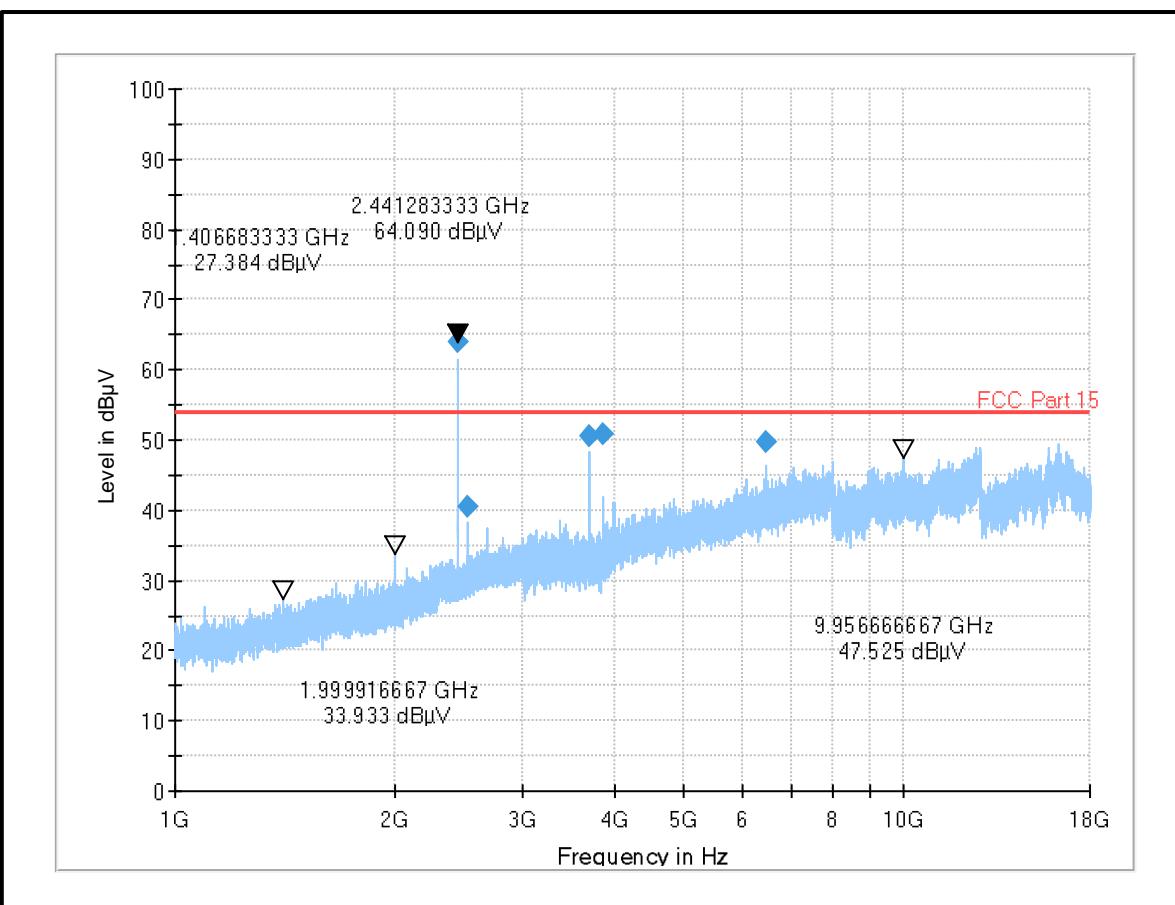
| Bluetooth | BR-EDR | 2-DH5 | Channel 39

5. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
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."
7. For frequency range 1 GHz to 18 GHz, all other emissions shown on the pre-scan plots were investigated and found to be below system noise floor.
8. In accordance with ANSI C63.10-2013 Section 5.3.3 & 6.5.3 measurements above 18 GHz were performed at closer distance (1 m); because at specified measurement distance (3m) for compliance the instrumentation noise floor was typically close to the radiated emission limit.
9. For frequency range between 18 GHz and 25 GHz, no critical emissions were found. All emissions shown on the pre-scans were investigated and found to be below the noise floor of the measurement system.

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

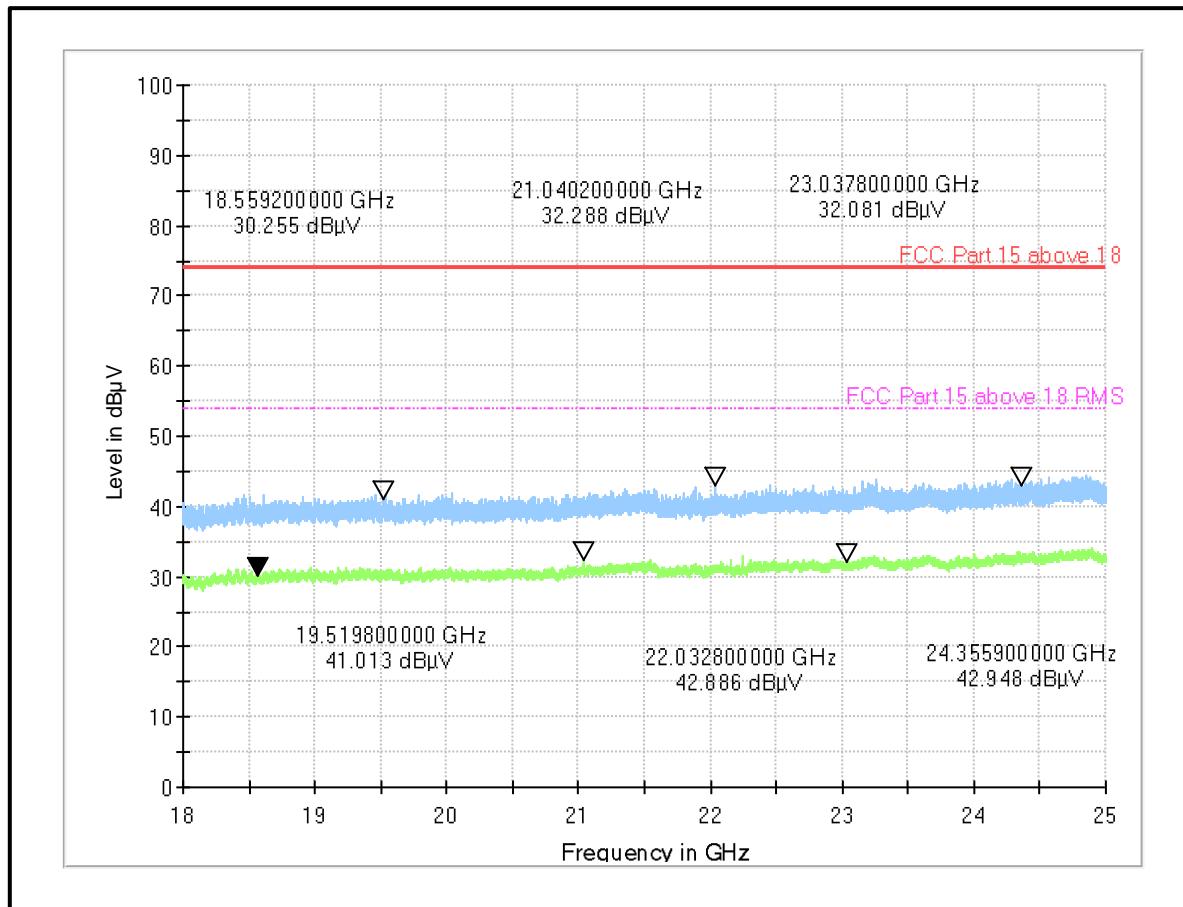
Transmitter Radiated Emissions (continued)**Results: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**

Frequency (MHz)	Antenna Polarization	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
2524.466667	Horizontal	40.64	54.00	13.36	Complied
3712.500000	Vertical	50.46	54.00	3.54	Complied
3861.000000	Vertical	50.86	54.00	3.14	Complied
6449.333333	Horizontal	49.76	54.00	4.24	Complied

Plot: 1 GHz – 18 GHz: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**Result: Pass**

Transmitter Radiated Emissions (continued)**Results: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**

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

Plot: 18 GHz – 25 GHz: BT-BR/EDR / Packet Type: 2-DH5 / Middle Channel**Result: Pass**

5.2.4. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineers:	Muhammad Faiq Khan	Test Dates:	30 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 7/8		

FCC Reference:	Parts 15.247(d), 15.209(a) & 15.205(a)
ISED:	RSS-Gen 6.13 / RSS-247 5.5
Test Method Used:	FCC KDB 558074 Section 9
	ANSI C63.10:2013 Section 7.8.6 referencing Section 6.10
	Emissions in Authorized-band / non-restricted frequency bands: ANSI C63.10:2013 Section 6.10.4
	Emissions in restricted frequency bands: ANSI C63.10:2013 Section 6.10.5

Environmental Conditions:

Temperature (°C):	23.4 to 27.2
Relative Humidity (%):	54.8 to 55.5

Note(s):

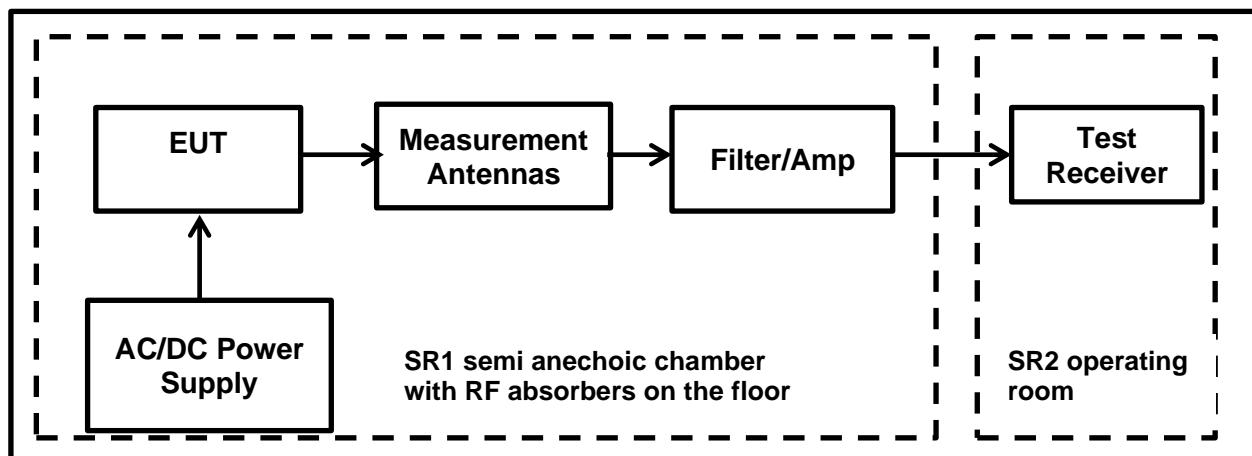
1. The measurements were in a semi-anechoic chamber SR1/2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. Maximum emission levels were determined by height searching 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 ANSI C63.10:2013 Section 6.10.4. As the maximum peak conducted output power was previously measured, in accordance with FCC Part 15.247(d) 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 C63.10:2013 Section 6.10.5
5. 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 and Average detector was used, the trace mode was Max hold. 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.
6. 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.

7. Transmitter Band Edge Radiated Emissions (continued)

Note(s):

8. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
9. The EUT was configured with the following modes w.r.t output power:
Bluetooth | BR-EDR | 2-DH5 | Channel 39
10. ** The continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and EUT was transmitting with 76.06% duty cycle. Duty Cycle Correction Factors of 1.2 dB was added to all average measurements to compensate as if it was transmitting with 100% duty cycle.

Test Setup:



Transmitter Band Edge Radiated Emissions (continued)**Results: BT-EDR Mode / Packet Type: 2-DH5 / Hopping OFF****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
2383.26	32.82	59.59	26.77	Complied
2400.00	32.48	59.59	27.11	Complied

Results: 2310 to 2390 MHz Restricted Band / Peak

Frequency (MHz)	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
2334.33	43.20	74.00	30.80	Complied

Results: 2310 to 2390 MHz Restricted Band / Average

Frequency (MHz)	Average Level (dB μ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
2321.14	31.13	1.2	32.33**	54.00	21.67	Complied

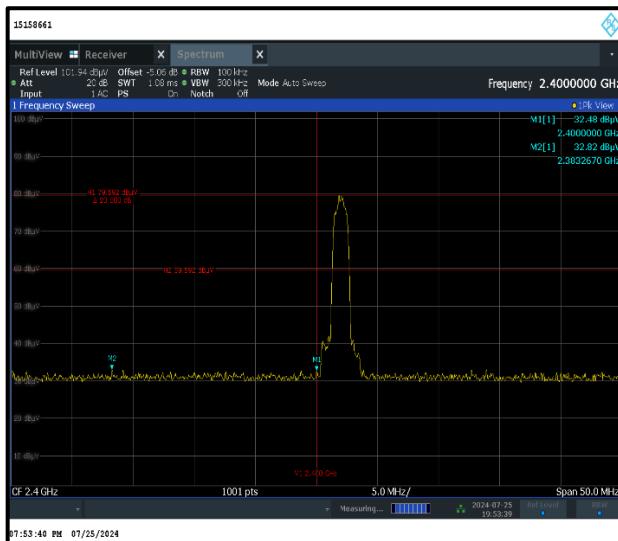
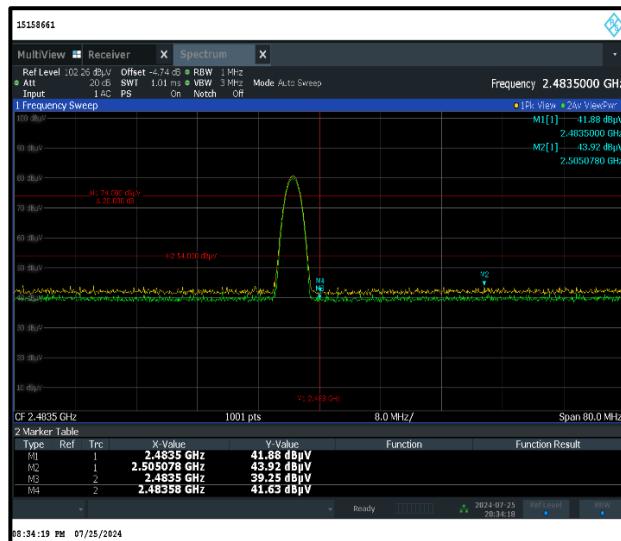
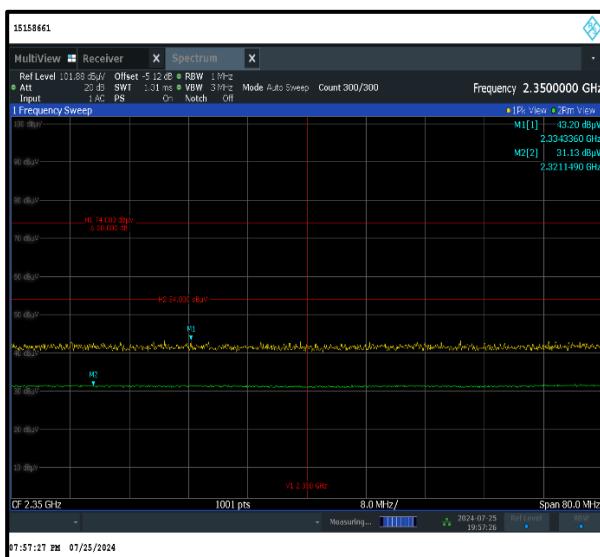
Results: Upper Band Edge / Peak

Frequency (MHz)	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
2483.50	41.88	74.00	32.12	Complied
2505.07	43.92	74.00	30.08	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Average Level (dB μ V/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
2483.50	39.25	1.2	40.45**	54.00	13.55	Complied
2483.58	41.63	1.2	42.83**	54.00	11.17	Complied

Result: Pass

Transmitter Band Edge Radiated Emissions (continued)**Results: BT-EDR Mode / Packet Type: 2-DH5 / Hopping OFF****Lower Band Edge Peak Measurement****Upper Band Edge Peak & Average Measurement****2310 MHz to 2390 MHz Restricted Band****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
Radiated Spurious Emissions	95%	±3.10 dB
Band Edge Radiated Emissions	95%	±3.10 dB
AC Conducted Spurious Emissions	95%	±2.49 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	18/07/2023	36
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	18/07/2023	24
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	18/07/2022	24
460	Deisel	Turntable	DT 4250 S	n/a	n/a	n/a
495	Schwarzbeck	Antenna, Trilog Broadband	VULB 9163	01691	30/11/2023	36
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	16/08/2022	36
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
591	Rohde & Schwarz	Receiver	ESU 40	100244/040	09/07/2024	12
669	Rohde & Schwarz	EMI Test Receiver	ESW 44	103087	13/07/2023	24
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	13/05/2024	36
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
681	Maturo	Antenna mast, tilting	BAM4.5-P	402/0718.1	n/a	n/a

Test site: SR 7/8

ID	Manufacturer	Type	Model	Serial No.	Calibration Date	Cal. Cycle
22	Rohde & Schwarz	Artificial Mains	ESH3-Z5	831767/014	09.07.2024	12
23	Rohde & Schwarz	Artificial Mains	ESH3-Z5	831767/013	09.07.2024	12
349	Rohde & Schwarz	Receiver, EMI Test	ESIB7	836697/009	09.07.2024	12

8. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
1.1	1	Cover	Model No. updated
	6	2.2	Notes updated
	8	3.1	EUT information updated
	10	4.1, 4.2	Notes updated
	20	5.2.3	Notes updated
	33	7	Equipment list updated
1.2	Page No(s)	Clause	Details
	8	3.1	EUT information updated
	10	4.1	Notes updated
	14	5.2.1	Typo corrected
1.3	5	2.1	Location table updated
1.4	13-14	5.2.1	Conducted emission result updated
Test Report Version 1.5 supersede Version 1.4 with immediate effect Test Report No. UL-RPT-RP-15158661-1016 Version 1.5, Issue Date 14 March 2025 replaces Test Report No. UL-RPT-RP-15158661-1016 Version 1.4, Issue 7 March 2025, which is no longer valid.			
1.5	Page No(s)	Clause	Details
	10	4.1	Notes updated
	13-16	5.2.1	Conducted emission result updated

--- END OF REPORT ---