# TEST REPORT

## Test Report No.: UL-RPT-RP-14208157-316-FCC

| | | |
|---|---|---|
| **Applicant** | : | SECO SPA |
| **Model No.** | : | SYS-C31-DMV-01-IO |
| **FCC ID** | : | Contains FCC ID: 2ALZB-AW276 |
| **Technology** | : | Bluetooth – Basic Rate (BR) & Enhanced Data Rate (EDR) |
| **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: Muhammad Faiq, Khan
Title: Project Engineer
Date: 01 December 2022

Approved by: Rachid, Acharkaoui
Title: Operations Manager
Date: 01 December 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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# Table of Contents

# 1. Customer Information

## 1.1. Applicant Information

| | |
|---|---|
| **Company Name:** | SECO SPA |
| **Company Address:** | via Achille Grandini N-20, Arezzo, ITALY |
| **Contact Person:** | Mr. Giacomo Nucci and Mr. Giacomo Martini |
| **Contact E-Mail Address:** | giacomo.nucci@seco.com and giacomo.martini@seco.com |
| **Contact Phone No.:** | +39 057 5269 79 |

## 1.2. Manufacturer Information

| | |
|---|---|
| **Company Name:** | SECO SPA |
| **Company Address:** | via Achille Grandini N-20, Arezzo, ITALY |
| **Contact Person:** | Mr. Giacomo Nucci and Mr. Giacomo Martini |
| **Contact E-Mail Address:** | giacomo.nucci@seco.com and giacomo.martini@seco.com |
| **Contact Phone No.:** | +39 057 5269 79 |

# 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):<br>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):<br>Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209 |

### Location

| | |
|---|---|
| **Location of Testing:** | UL International Germany GmbH<br>Hedelfinger Strasse. 61,<br>70327 Stuttgart,<br>GERMANY |
| **Registration Number:** | 399704 |

### Date Information

| | |
|---|---|
| **Order Date:** | 09 February 2022 |
| **EUT Arrived:** | 19 April 2022 |
| **Test Dates:** | 05 May 2022 to 20 May 2022 |
| **EUT Returned:** | -/- |

## 2.2. Summary of Test Results

| Frequency Hopping Spread Spectrum (FHSS): 2400-2483.5 MHz | | | | | |
|---|---|---|---|---|---|
| FCC Part 15 Clause | Compliance Test Description | Test Result | | | |
| | | C | N.C. | N.P. | N.A. |
| 15.207 | Transmitter AC Conducted Emissions | ☒ | ☐ | ☐ | ☐ |
| 15.247(a)(1) | Transmitter Minimum 20 dB Bandwidth (2) | ☐ | ☐ | ☒ | ☐ |
| 15.35(c) | Transmitter Duty Cycle (1) | ☒ | ☐ | ☐ | ☐ |
| 15.247(a)(1) | Transmitter Carrier Frequency Separation (2) | ☐ | ☐ | ☒ | ☐ |
| 15.247(a)(1)(iii) | Transmitter Number of Hopping Frequencies and Average Time of Occupancy (2) | ☐ | ☐ | ☒ | ☐ |
| 15.247(b)(1) | Transmitter Maximum Peak Output Power (2) | ☐ | ☐ | ☒ | ☐ |
| 15.247(d) & 15.209(a) | Transmitter Radiated Emissions | ☒ | ☐ | ☐ | ☐ |
| 15.247(d) & 15.209(a) | Transmitter Band Edge Radiated Emissions | ☒ | ☐ | ☐ | ☐ |
| C: COMPLIED \| N.C.: NOT COMPLIED \| N.P.: NOT PERFORMED \| N.A.: NOT APPLICABLE | | | | | |

**Note(s):**

1. The measurement was performed to assist the other 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:** | 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:** | DMVI |
| **Model Name or Number:** | SYS-C31-DMV-01-IO |
| **Test Sample Serial Number:** | 220405435 (RF Test Sample) |
| **Hardware Version Number:** | IO |
| **Firmware Version Number:** | C31DMVYY.BBB |
| **FCC ID:** | Contains 2ALZB-AW276 |

## 3.2. Description of EUT

The equipment under test was an industrial PC gateway Model: SYS-C31-DMV-01-IO that contains a pre-certified radio module which supports 2.4 GHz WLAN, 5 GHz WLAN, Bluetooth BR/EDR and Bluetooth Low Energy RF technologies.

## 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 | | |
| **Type of Unit:** | Transceiver | | |
| **Power Supply Requirement(s):** | 12 V DC via External supply | | |
| **Operating Frequency Range:** | 2402 MHz to 2480 MHz | | |
| **Channel Spacing:** | 1 MHz | | |
| **Mode(s):** | Basic Rate (BR) | Enhanced Data Rate (EDR) | |
| **Modulation(s):** | GFSK | π/4-DQPSK | 8DPSK (Note 1) |
| **Active Packet Type (s):** | DH5 | 2DH5 | 3DH5 (Note 1) |
| **Data Rate (Mbit/s):** | 1 | 2 | 3 (Note 1) |
| **Maximum Conducted Output Power:** | 6.62 dBm (Note 2) | | |
| **Antenna Type:** | OEM Multifunctional Antenna Board | | |
| **Declared Antenna Gain:** | Blue channel: 2.1 dBi<br>Red channel: 2.7 dBi | | |

| **Transmit Channels Tested:** | **Channel ID** | **Transmit Channels Tested:** | **Channel ID** |
|---|---|---|---|
| | Bottom | 0 | Bottom |
| | Middle | 38 | 2440 |
| | Top | 78 | 2480 |

(Note 1) Since the unlicensed module is FCC pre-certified the worst-case modulation scheme was determined from the module report, serial number RF161216E08-3, on the basis of the highest conducted output power, for FCC ID: UAY-W8997-M1216.

Value taken from test report, serial number RF161216E08-3, for pre-certified radio module FCC ID: UAY-W8997-M1216

## 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 | Laboratory DC Power Supply | GW | GPS-1850D | 7662217 |
| 2 | Test Laptop with Test software:<br>Tera Term | HP | ProBook 650 | 5CG6143YWB |

## B. Support Equipment (Manufacturer supplied)

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

# 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<br>• Maximum Power: MAX PWR 7<br>• Test Channels: Bottom \| Middle \| Top<br>• BT-Mode & Packet Type : As required<br>  ○ BT-BR Mode : (DH5)<br>  ○ BT-EDR Mode : (2DH5) or (3DH5) |
| ☒ Continuous Transmitting Hopping Channels Frequency Mode (Hopping ON) with Modulated Carrier<br>• Maximum Power: MAX PWR 7<br>• Test Channels: Hopping ON<br>• BT-Mode & Packet Type : As required<br>  ○ BT-BR Mode : (DH5)<br>  ○ BT-EDR Mode : (2DH5) or (3DH5) |
| Note 1 : For all testing (with the exception of Radiated Band Edge Emissions) the worst case modulation scheme was used. This was taken from test report, serial number RF161216E08-3, for pre-certified radio module FCC ID: UAY-W8997-M1216 |

## 4.2. Configuration and Peripherals

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

- The applicant or manufacturer supplied test setup instructions "SYS-C31-DMV___Test_Radio_guidance_00" issued on 22 April 2022 was used to configure the EUT.

**EUT Power Supply:**

- The EUT was powered with 12V DC via an external AC/DC power supply

**Test Mode Activation:**

- The EUT can be connected with the Test laptop via USB-UART cables supplied by the customer. The cable was used only for configuration and was removed during the measurement.
- The test modes were activated by the terminal software ''Tera Term''. The commands to setup the respective modes and power were defined by the customer in the setup instructions.

**AC Conducted Emissions Measurements:**

- The EUT RF sample with antenna was used for AC conducted emissions measurements.
- The measurements were carried out with 120 VAC/60Hz & 240 VAC/60Hz.
- The Toyo EMI Software EP5/CE Ver 4.0.1. was used for these measurements.

**Radiated Measurements:**

- The EUT RF sample with antenna was used for radiated spurious emissions measurements.
- As per the applicant's declaration &/operational description of the EUT, the EUT is a tabletop equipment for its intended application. Therefore, EUT's test setup placement was performed in accordance with ANSI C63.10 section 6.2.3.2 & section 6.12 Figure 4.
- The EUT with its integrated antenna was evaluated for its worst-case position w.r.t to maximum radiated power measured and it was found that EUT in Standing position is the worst-case. Therefore, this report includes relevant results.
- The position of the Antenna was 90° vertical in the z-axis from the EUT.
- Radiated measurements below 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the loop antenna height was set at 100 cm.
- Radiated measurements above 30 MHz were performed with the EUT positioned on the turn table and rotating 360° while the antenna height varies from 1 to 4 m over the measurement frequency range.
- R&S® EMC32 V11.30 Software was used for the Radiated spurious emission measurements.

**Duty Cycle Correction Details:**

- As the continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and EUT was transmitting continuously at a worst-case Duty Cycles of 84.40%(duty cycle variations are less than ±2% at the respective data rate). Therefore, Duty Cycle Correction Factor of 0.74 dB was added to all average measurements, to compute the corrected average values of the emissions that would have been measured had the test been performed at 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 Engineer:** | Muhammad Faiq Khan | **Test Date:** | 20 May 2022 |
| **Test Sample Serial Number:** | 220405435 (RF 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):** | 25.6 |
| **Relative Humidity (%):** | 48.7 |

**Settings of the Instrument**

| | |
|---|---|
| **Detector** | Quasi Peak/ Average Peak |

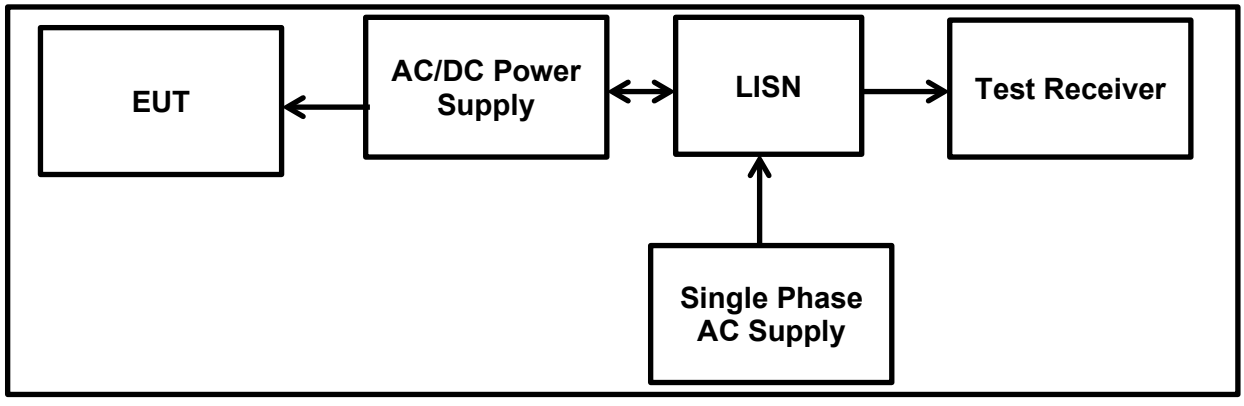
**Note(s):**

1. In accordance with FCC KDB 174176 Q4, tests were also 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.
2. The EUT was powered via AC/DC power supply which was connected with the LISN during the measurement.
3. The measurement was performed with following worst-case mode.

- BT-EDR Mode | Packet Type: 3DH5 | Hopping OFF | Bottom channel | MAX PWR 7

4. Pre-scans were performed, and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
5. The final measured value, for the given emission, in the table below incorporates the cable loss.
6. All other emissions shown on the pre-scan plot were investigated. Only the highest 6 emissions have been reported in the tables below in accordance with ANSI C63.10 section 6.2.5.
7. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.
8. Measurement software used: Toyo EMI Software; CE measurement software EP5/CE Ver 4.0.1.

**Test Setup:**



## Transmitter AC Conducted Spurious Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

## Results: Live / Quasi Peak / 120 VAC 60 Hz

| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.157730 | Live | 32.70 | 65.60 | 32.90 | Complied |
| 0.191470 | Live | 28.30 | 64.00 | 35.70 | Complied |
| 0.633230 | Live | 18.40 | 56.00 | 37.60 | Complied |
| 9.806950 | Live | 29.60 | 60.00 | 30.40 | Complied |
| 12.373090 | Live | 31.50 | 60.00 | 28.50 | Complied |
| 14.094640 | Live | 43.10 | 60.00 | 16.90 | Complied |
| 14.247750 | Live | 42.20 | 60.00 | 17.80 | Complied |
| 14.561070 | Live | 42.40 | 60.00 | 17.60 | Complied |
| 14.876100 | Live | 40.40 | 60.00 | 19.60 | Complied |

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

| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.157730 | Live | 14.70 | 55.60 | 40.90 | Complied |
| 0.191470 | Live | 12.60 | 54.00 | 41.40 | Complied |
| 0.633230 | Live | 6.00 | 46.00 | 40.00 | Complied |
| 9.806950 | Live | 25.50 | 50.00 | 24.50 | Complied |
| 12.373090 | Live | 26.60 | 50.00 | 23.40 | Complied |
| 14.094640 | Live | 36.30 | 50.00 | 13.70 | Complied |
| 14.247750 | Live | 36.20 | 50.00 | 13.80 | Complied |
| 14.561070 | Live | 36.10 | 50.00 | 13.90 | Complied |
| 14.876100 | Live | 34.30 | 50.00 | 15.70 | Complied |

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

| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.156740 | Neutral | 32.90 | 65.60 | 32.70 | Complied |
| 0.170880 | Neutral | 29.40 | 64.90 | 35.50 | Complied |
| 0.605800 | Neutral | 16.90 | 56.00 | 39.10 | Complied |
| 9.780170 | Neutral | 29.90 | 60.00 | 30.10 | Complied |
| 12.071290 | Neutral | 30.50 | 60.00 | 29.50 | Complied |
| 12.427300 | Neutral | 32.40 | 60.00 | 27.60 | Complied |
| 14.088530 | Neutral | 42.70 | 60.00 | 17.30 | Complied |
| 14.557460 | Neutral | 42.20 | 60.00 | 17.80 | Complied |
| 15.100950 | Neutral | 39.70 | 60.00 | 20.30 | Complied |

## Transmitter AC Conducted Spurious Emissions (continued)

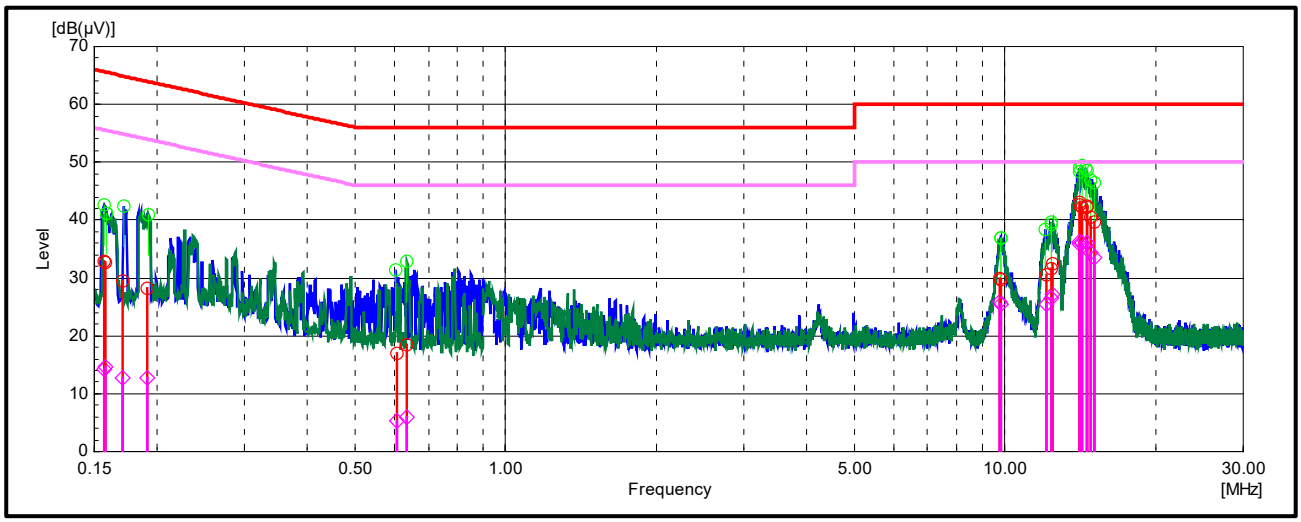
## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

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

| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.156740 | Neutral | 14.20 | 55.60 | 41.40 | Complied |
| 0.170880 | Neutral | 12.60 | 54.90 | 42.30 | Complied |
| 0.605800 | Neutral | 5.30 | 46.00 | 40.70 | Complied |
| 9.780170 | Neutral | 25.80 | 50.00 | 24.20 | Complied |
| 12.071290 | Neutral | 25.50 | 50.00 | 24.50 | Complied |
| 12.427300 | Neutral | 27.10 | 50.00 | 22.90 | Complied |
| 14.088530 | Neutral | 35.90 | 50.00 | 14.10 | Complied |
| 14.557460 | Neutral | 36.10 | 50.00 | 13.90 | Complied |
| 15.100950 | Neutral | 33.60 | 50.00 | 16.40 | Complied |

**Result:** Pass

### Plot: Live and Neutral Line / 120 VAC 60 Hz




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

## Transmitter AC Conducted Spurious Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

### Results: Live / Quasi Peak / 240 VAC 60 Hz

| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.153380 | Live | 30.30 | 65.80 | 35.50 | Complied |
| 0.304430 | Live | 27.00 | 60.10 | 33.10 | Complied |
| 0.351500 | Live | 29.40 | 58.90 | 29.50 | Complied |
| 0.391680 | Live | 30.30 | 58.00 | 27.70 | Complied |
| 0.464010 | Live | 28.80 | 56.60 | 27.80 | Complied |
| 0.489170 | Live | 27.60 | 56.20 | 28.60 | Complied |
| 0.539290 | Live | 25.30 | 56.00 | 30.70 | Complied |
| 0.649470 | Live | 22.10 | 56.00 | 33.90 | Complied |
| 14.250650 | Live | 33.40 | 60.00 | 26.60 | Complied |
| 14.520190 | Live | 35.00 | 60.00 | 25.00 | Complied |

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

| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.153380 | Live | 13.60 | 55.80 | 42.20 | Complied |
| 0.304430 | Live | 10.30 | 50.10 | 39.80 | Complied |
| 0.351500 | Live | 9.30 | 48.90 | 39.60 | Complied |
| 0.391680 | Live | 8.40 | 48.00 | 39.60 | Complied |
| 0.464010 | Live | 7.30 | 46.60 | 39.30 | Complied |
| 0.489170 | Live | 6.60 | 46.20 | 39.60 | Complied |
| 0.539290 | Live | 5.90 | 46.00 | 40.10 | Complied |
| 0.649470 | Live | 4.40 | 46.00 | 41.60 | Complied |
| 14.250650 | Live | 28.10 | 50.00 | 21.90 | Complied |
| 14.520190 | Live | 28.80 | 50.00 | 21.20 | Complied |

## Transmitter AC Conducted Spurious Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

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

| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.153440 | Neutral | 29.50 | 65.80 | 36.30 | Complied |
| 0.362920 | Neutral | 30.00 | 58.70 | 28.70 | Complied |
| 0.378800 | Neutral | 30.60 | 58.30 | 27.70 | Complied |
| 0.385880 | Neutral | 30.60 | 58.20 | 27.60 | Complied |
| 0.395110 | Neutral | 30.80 | 58.00 | 27.20 | Complied |
| 0.406850 | Neutral | 30.60 | 57.70 | 27.10 | Complied |
| 0.433010 | Neutral | 30.00 | 57.20 | 27.20 | Complied |
| 0.448940 | Neutral | 29.90 | 56.90 | 27.00 | Complied |
| 14.203660 | Neutral | 35.30 | 60.00 | 24.70 | Complied |
| 14.490130 | Neutral | 35.20 | 60.00 | 24.80 | Complied |

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

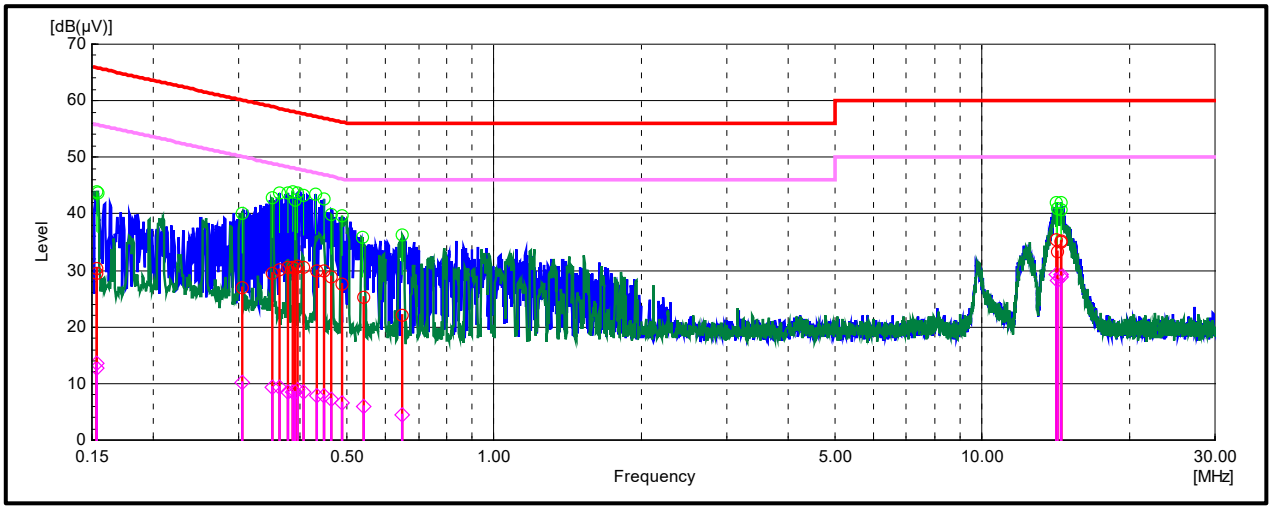
| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.153440 | Neutral | 12.60 | 55.80 | 43.20 | Complied |
| 0.362920 | Neutral | 9.30 | 48.70 | 39.40 | Complied |
| 0.378800 | Neutral | 8.40 | 48.30 | 39.90 | Complied |
| 0.385880 | Neutral | 8.40 | 48.20 | 39.80 | Complied |
| 0.395110 | Neutral | 8.90 | 48.00 | 39.10 | Complied |
| 0.406850 | Neutral | 8.40 | 47.70 | 39.30 | Complied |
| 0.433010 | Neutral | 7.90 | 47.20 | 39.30 | Complied |
| 0.448940 | Neutral | 7.90 | 46.90 | 39.00 | Complied |
| 14.203660 | Neutral | 29.20 | 50.00 | 20.80 | Complied |
| 14.490130 | Neutral | 29.20 | 50.00 | 20.80 | Complied |

**Result:** Pass

## Transmitter AC Conducted Spurious Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

### Plot: Live and Neutral Line / 240 VAC 60 Hz




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

## 5.2.2. Transmitter Duty Cycle

### Test Summary:

| | | | |
|---|---|---|---|
| **Test Engineer:** | Muhammad Faiq Khan | **Test Date:** | 12 May 2022 |
| **Test Sample Serial Number:** | 220405435 (RF Test Sample) | | |
| **Test Site Identification** | SR 1/2 | | |

| | |
|---|---|
| **FCC Reference:** | Part 15.35(c) |
| **Test Method Used:** | FCC KDB 558074 Section 9.b) referencing ANSI C63.10 Section 7.5 |

### Environmental Conditions:

| | |
|---|---|
| **Temperature (°C):** | 24.2 |
| **Relative Humidity (%):** | 41.4 |

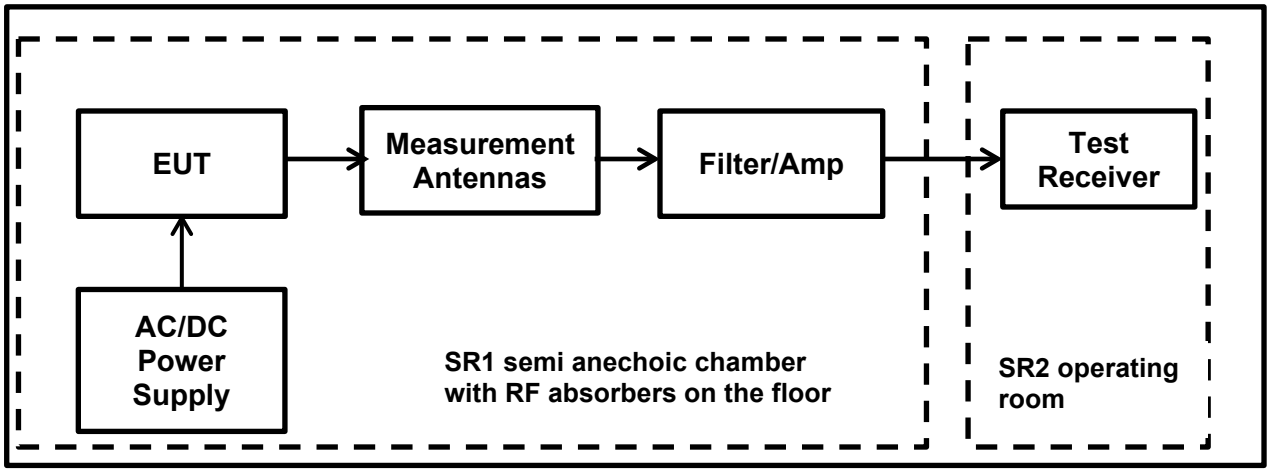
### Note:

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]*

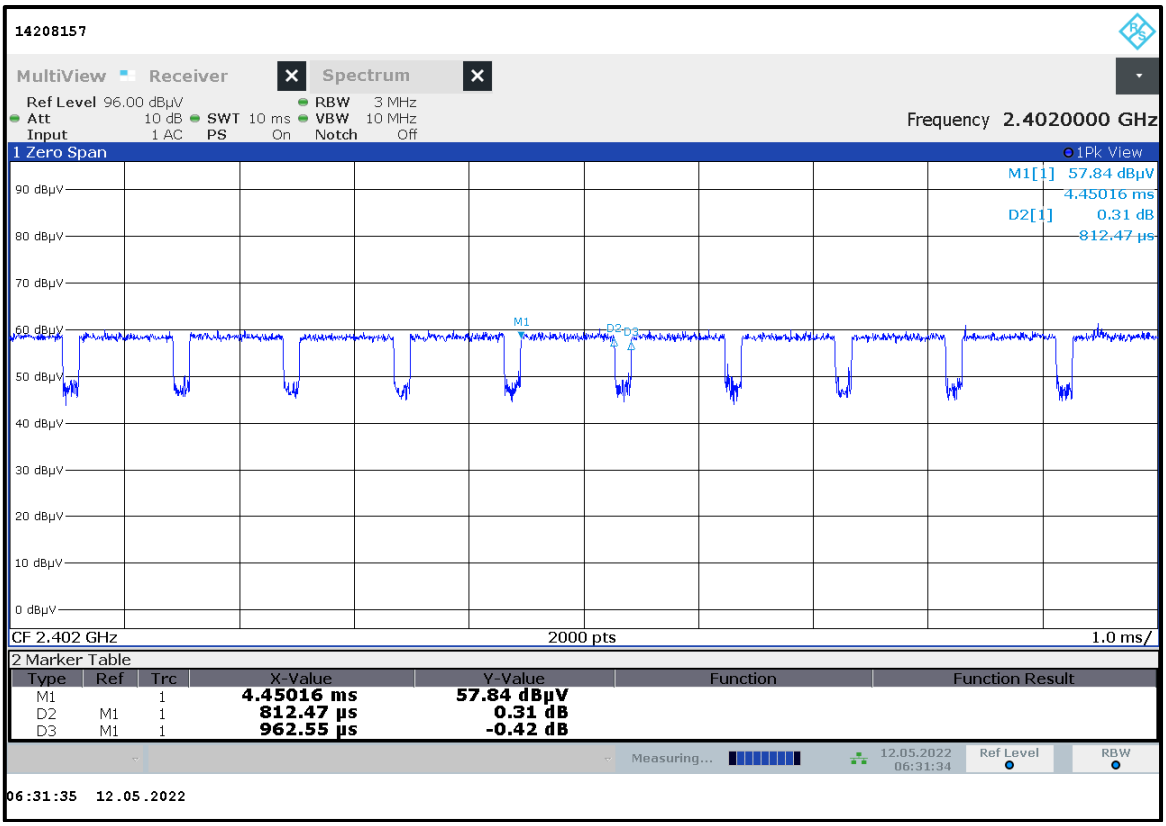
### Test Setup:



## Transmitter Duty Cycle (continued)

## Results: BT-BR Mode / Packet Type: DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

| Pulse On Time ($T_{ON}$) (ms) | Pulse Period ($T_{ON}$ +$T_{OFF}$) (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|---|---|---|---|
| 0.81247 | 0.96255 | 84.40 | 0.74 |

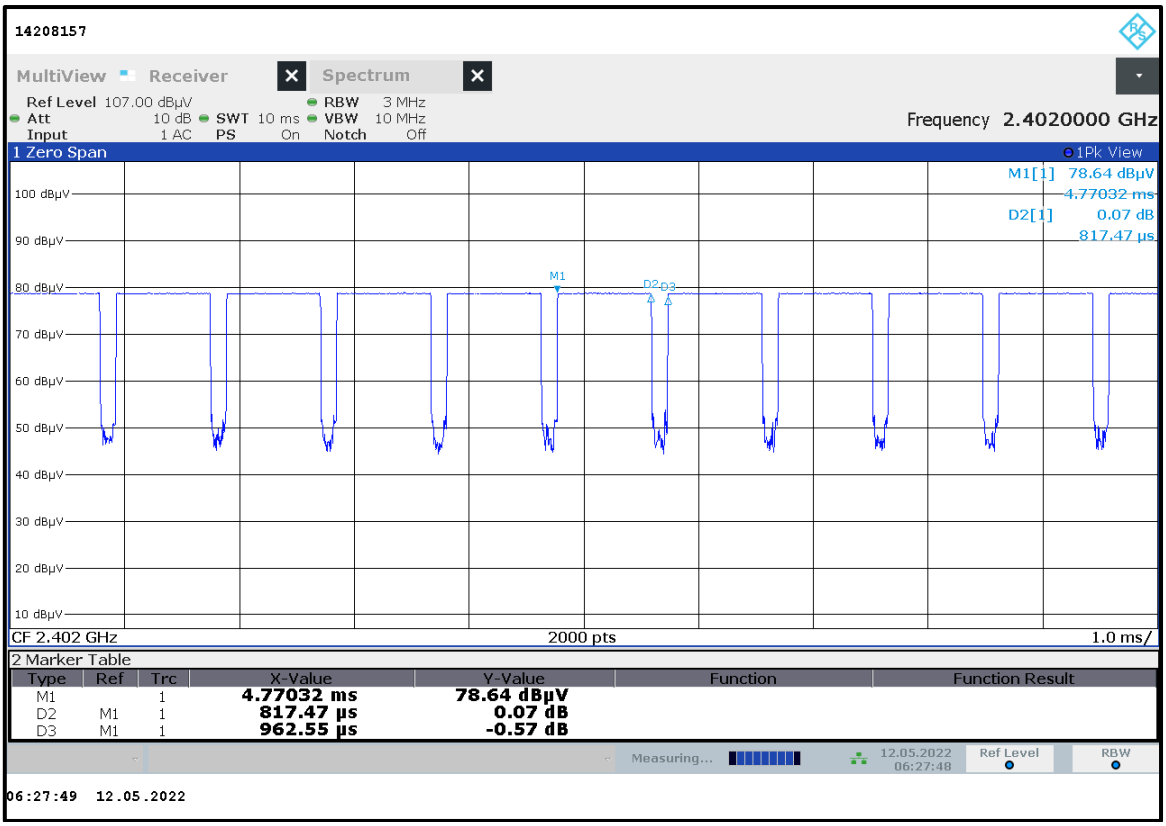



**Note**:
The correction factor of 0.74 dB was used to compute the Average values for all data rates since it is the worst-case duty cycle measured.

## Transmitter Duty Cycle (continued)

## Results: BT-EDR Mode / Packet Type: 2DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

| Pulse On Time ($T_{ON}$) (ms) | Pulse Period ($T_{ON}$ +$T_{OFF}$) (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|---|---|---|---|
| 0.81747 | 0.96255 | 84.93 | 0.71 |



## Transmitter Duty Cycle (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ Bottom Channel / MAX PWR 7

| Pulse On Time ($T_{ON}$) (ms) | Pulse Period ($T_{ON}$ +$T_{OFF}$) (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|---|---|---|---|
| 0.81747 | 0.96755 | 84.48 | 0.73 |

## 5.2.3. Transmitter Radiated Emissions

### Test Summary:

| | | | |
|---|---|---|---|
| **Test Engineer:** | Muhammad Faiq Khan | **Test Date:** | 16 May 2022 |
| **Test Sample Serial Number:** | 220405435 (RF Test Sample) | | |
| **Test Site Identification** | SR 1/2 | | |

| | |
|---|---|
| **FCC Reference:** | Parts 15.247(d) & 15.209(a) |
| **Test Method Used:** | ANSI C63.10:2013 Sections 6.3 and 6.4 |
| **Frequency Range** | 9 kHz to 30 MHz |

### Environmental Conditions:

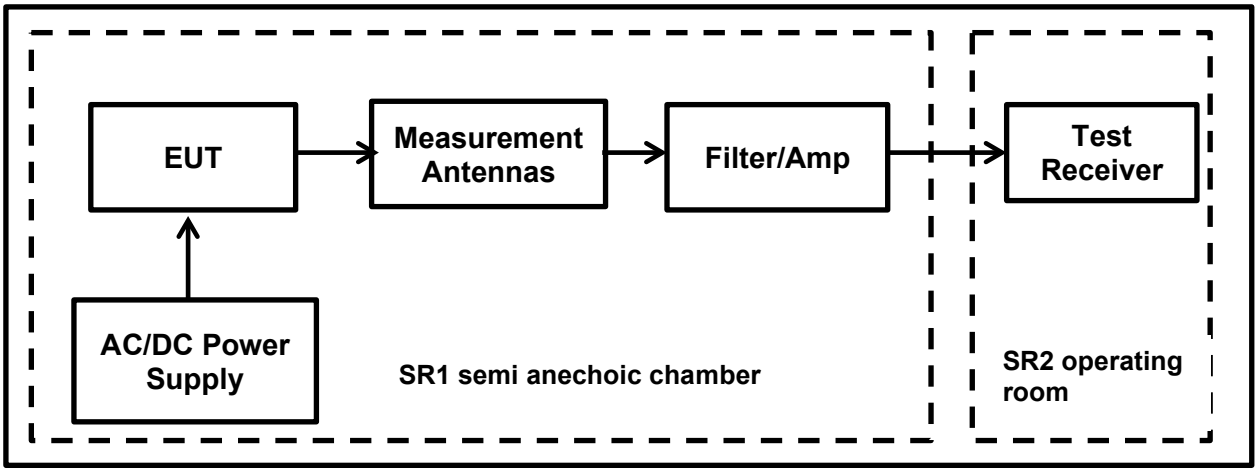
| | |
|---|---|
| **Temperature (°C):** | 25.1 |
| **Relative Humidity (%):** | 46.9 |

### Notes:

1. In accordance with FCC KDB 414788 D01 Radiated Test Site & ANSI C63.10 clause 5.2 an alternative test site that can demonstrate equivalence to a open area test site may be used. Therefore, the measurement was performed in a Semi Anechoic Chamber. (The OATS / SAC comparison data is available upon request).
2. The limits are specified at a test distances of 30 and 300 metres. However, as specified in FCC Section 15.31 (f)(2) & ANSI C63.10 clause 6.4.3, measurements may be performed at a closer distance and the measured level extrapolated to the specified measurement distance using the method described in clauses 6.4.4, specifically sub-clause 6.4.4.1 which specifies that the measured level shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 40 dB/decade.
   Therefore, measurements were performed at a measurement distance of 3 m.
3. Therefore, the limit values are extrapolated to a measurement distance of 3 m.
   - 9 kHz- 490 kHz: limits extrapolated from 300 m to 3 m by adding 80 dB at 40 dB /decade.
   - 490 kHz-1705 kHz: limits extrapolated from 30 m to 3 m by adding 40 dB at 40 dB /decade.
4. Measurements below 30 MHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The measurement loop antenna height was 100 cm.
5. The radiated emissions measurements were performed with the EUT set to the following worst-case mode.
   - BT-EDR Mode | Packet Type: 3DH5 | Hopping OFF | Bottom channel | MAX PWR 7
6. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
7. All other emissions shown on the pre-scan plot were investigated and found to be below the measurement system noise floor.
8. Pre-scans were performed, and markers placed on the highest measured levels. The test receiver was set to:
   - Frequency range: 9 kHz-150 kHz: RBW: 1 kHz /VBW: 3 kHz
   - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
   - Detector: Max-Peak detector
   - Trace Mode: Max Hold

**Transmitter Radiated Emissions (continued)**

**Test Setup:**

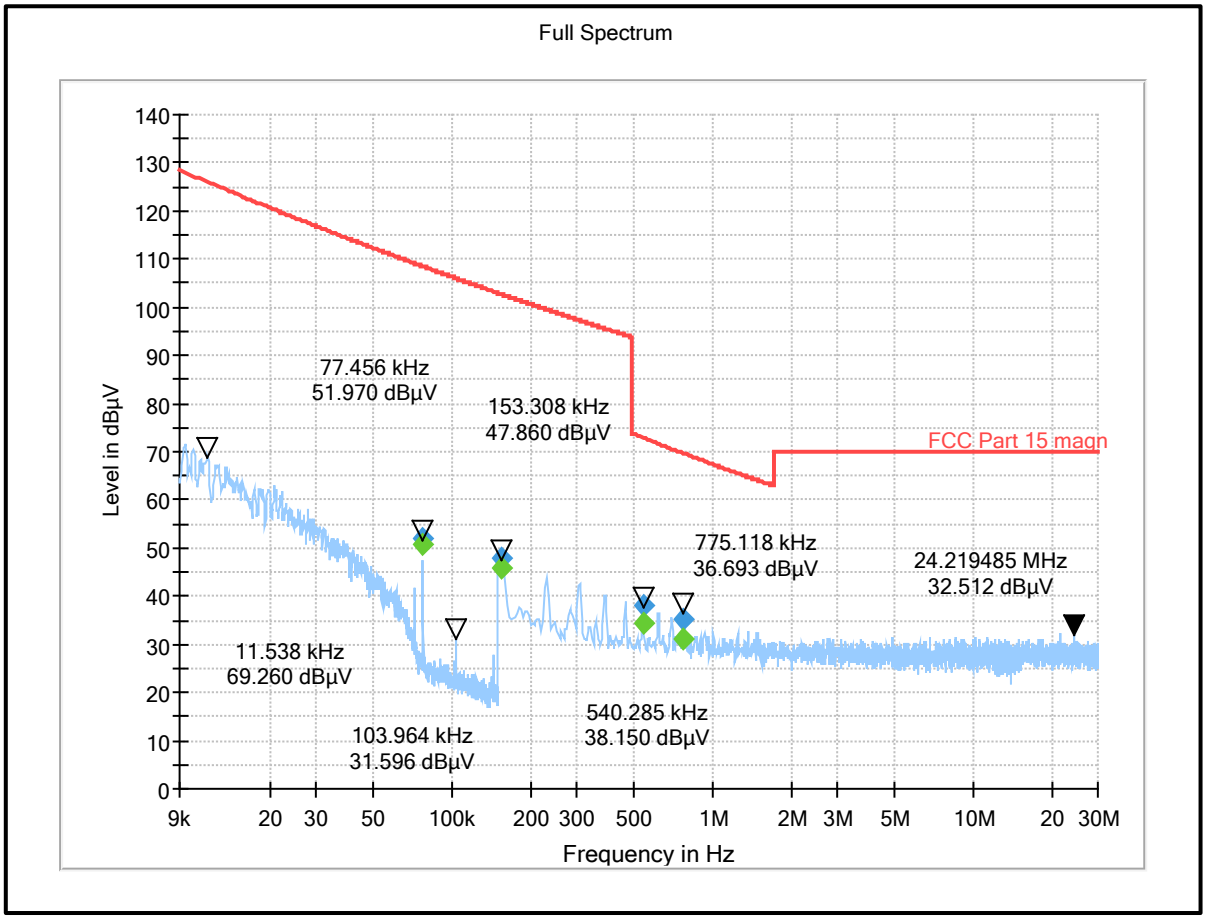


## Transmitter Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel

| Frequency (MHz) | Loop Antenna Orientation | MaxPeak Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.077456 | 0° to the EUT | 51.97 | 108.47 | 56.50 | Complied |
| 0.153308 | 0° to the EUT | 47.86 | 102.79 | 54.93 | Complied |
| 0.540285 | 0° to the EUT | 38.15 | 72.89 | 34.74 | Complied |
| 0.771810 | 0° to the EUT | 35.25 | 69.65 | 34.40 | Complied |

**Plot: 9 kHz – 30 MHz:**
**BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel**




**Result:** Pass

## Transmitter Radiated Emissions (continued)

## Test Summary:

| | | | |
|---|---|---|---|
| **Test Engineer:** | Muhammad Faiq Khan | **Test Date:** | 14 May 2022 |
| **Test Sample Serial Number:** | 220405435 (RF Test Sample) | | |
| **Test Site Identification** | SR 1/2 | | |

| | |
|---|---|
| **FCC Reference:** | Parts 15.247(d) & 15.209(a) |
| **Test Method Used:** | ANSI C63.10:2013 Sections 6.3 and 6.5 |
| **Frequency Range** | 30 MHz to 1000 MHz |

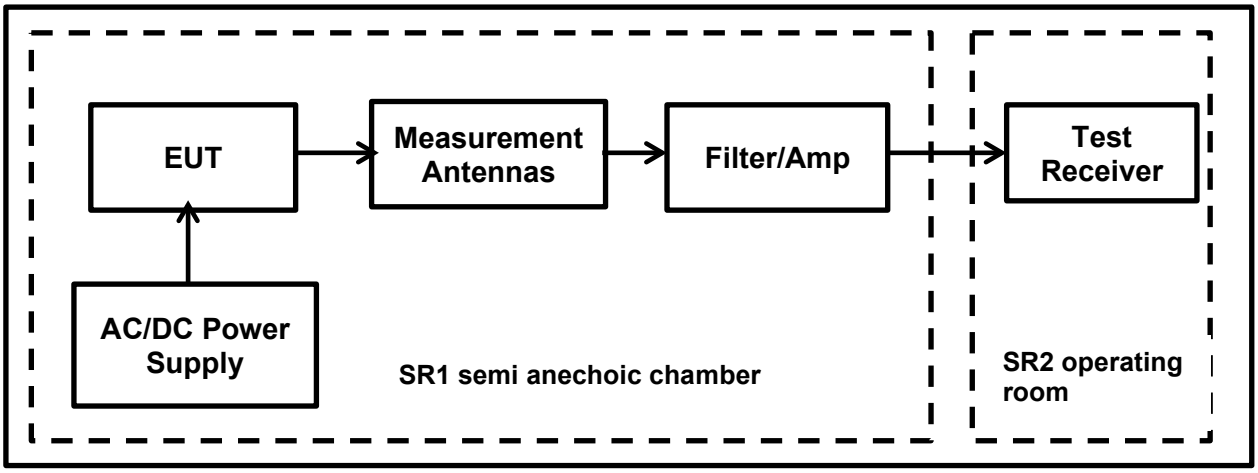
## Environmental Conditions:

| | |
|---|---|
| **Temperature (°C):** | 24.6 |
| **Relative Humidity (%):** | 43.9 |

## 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 radiated emissions measurements were performed with the EUT set to the following worst-case mode.
   - BT-EDR Mode | Packet Type: 3DH5 | Hopping OFF | Bottom channel | MAX PWR 7
4. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
5. All other emissions shown on the pre-scan plot were investigated and found to be below the measurement system noise floor.

## Test Setup:

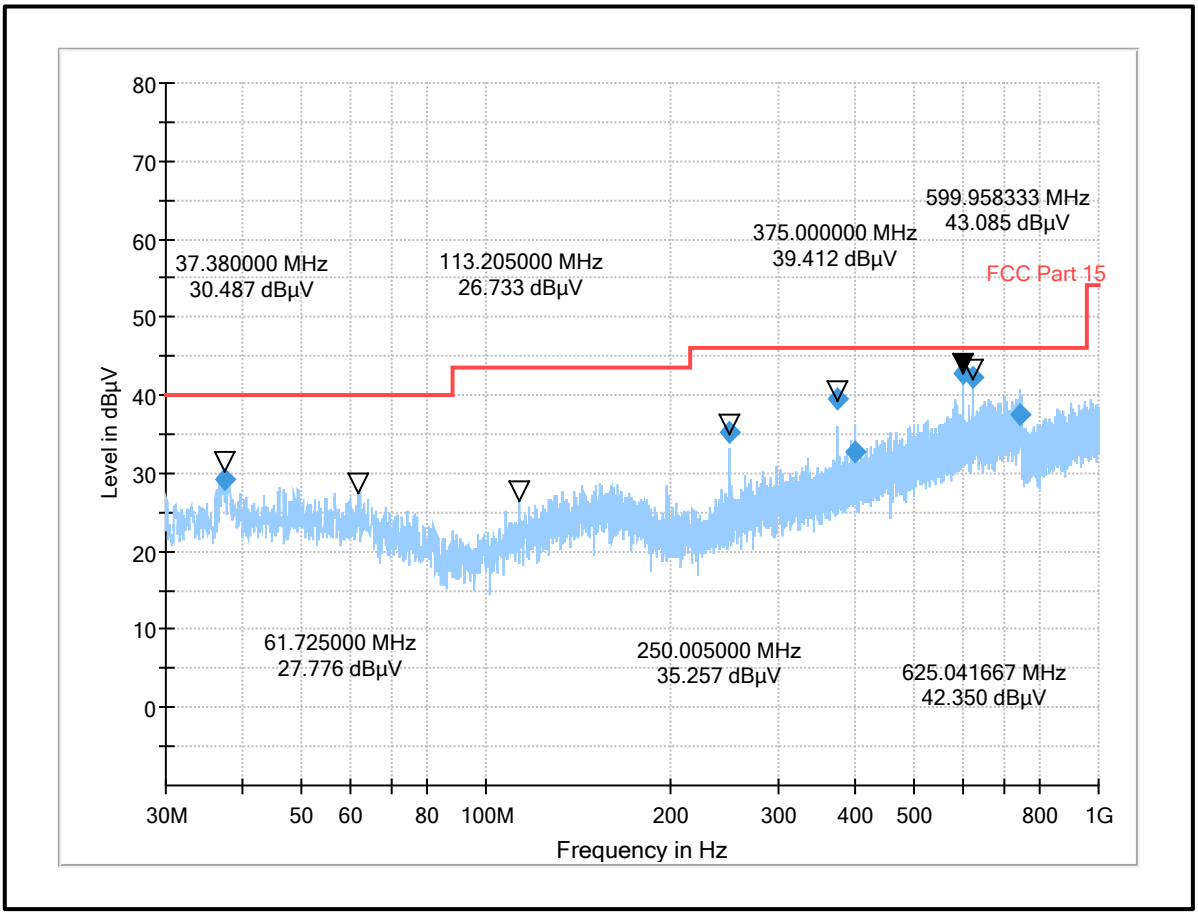


## Transmitter Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel

| Frequency (MHz) | Antenna Polarization | MaxPeak Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 37.380000 | Vertical | 29.12 | 40.00 | 10.88 | Complied |
| 250.005000 | Horizontal | 35.26 | 46.00 | 10.74 | Complied |
| 375.000000 | Vertical | 39.41 | 46.00 | 6.59 | Complied |
| 400.033333 | Vertical | 32.65 | 46.00 | 13.35 | Complied |
| 600.041667 | Horizontal | 42.87 | 46.00 | 3.13 | Complied |
| 625.041667 | Vertical | 42.35 | 46.00 | 3.65 | Complied |
| 746.583333 | Vertical | 37.51 | 46.00 | 8.49 | Complied |

**Plot: 30 MHz – 1 GHz:**
**BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel**




**Result:** Pass

## Transmitter Radiated Emissions (continued)

## Test Summary:

| | | | |
|---|---|---|---|
| **Test Engineer:** | Muhammad Faiq Khan | **Test Date:** | 09 May 2022 |
| **Test Sample Serial Number:** | 220405435 (RF Test Sample) | | |
| **Test Site Identification** | SR 1/2 | | |

| | |
|---|---|
| **FCC Reference:** | Parts 15.247(d) & 15.209(a) |
| **Test Method Used:** | ANSI C63.10:2013 Sections 6.3 and 6.5 |
| **Frequency Range** | 1 GHz to 26.5 GHz |

## Environmental Conditions:

| | |
|---|---|
| **Temperature (°C):** | 24.3 |
| **Relative Humidity (%):** | 41.9 |

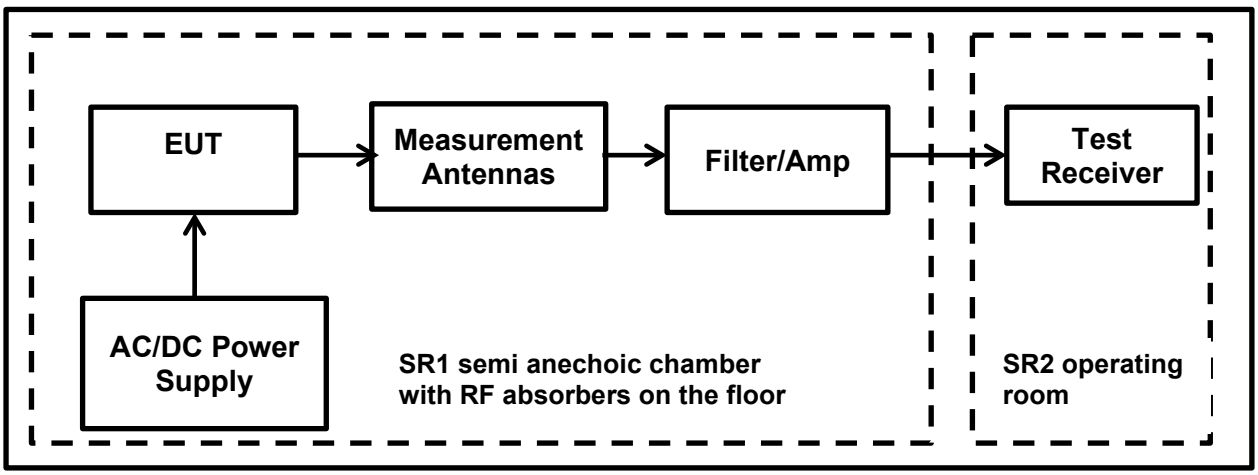
## Note(s):

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 channels.
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 radiated emissions measurements from 1 GHz to 18 GHz were performed with the following worst-case mode.
   - BT-EDR Mode | Packet Type: 3DH5 | Hopping OFF | Bottom/Middle/Top | MAX PWR 7
   - BT-EDR Mode | Packet Type: 3DH5 | Hopping ON | MAX PWR 7
5. The radiated emissions measurements above 18 GHz were performed with Hopping off and EUT set to bottom channel with the following worst-case mode.
   - BT-EDR Mode | Packet Type: 3DH5 | Hopping OFF | MAX PWR 7
6. For frequency range 1 GHz to 18 GHz, all emissions shown on the pre-scan plots were investigated and found to be below system noise floor.
7. 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.

For frequency range between 18 GHz and 26.5 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:

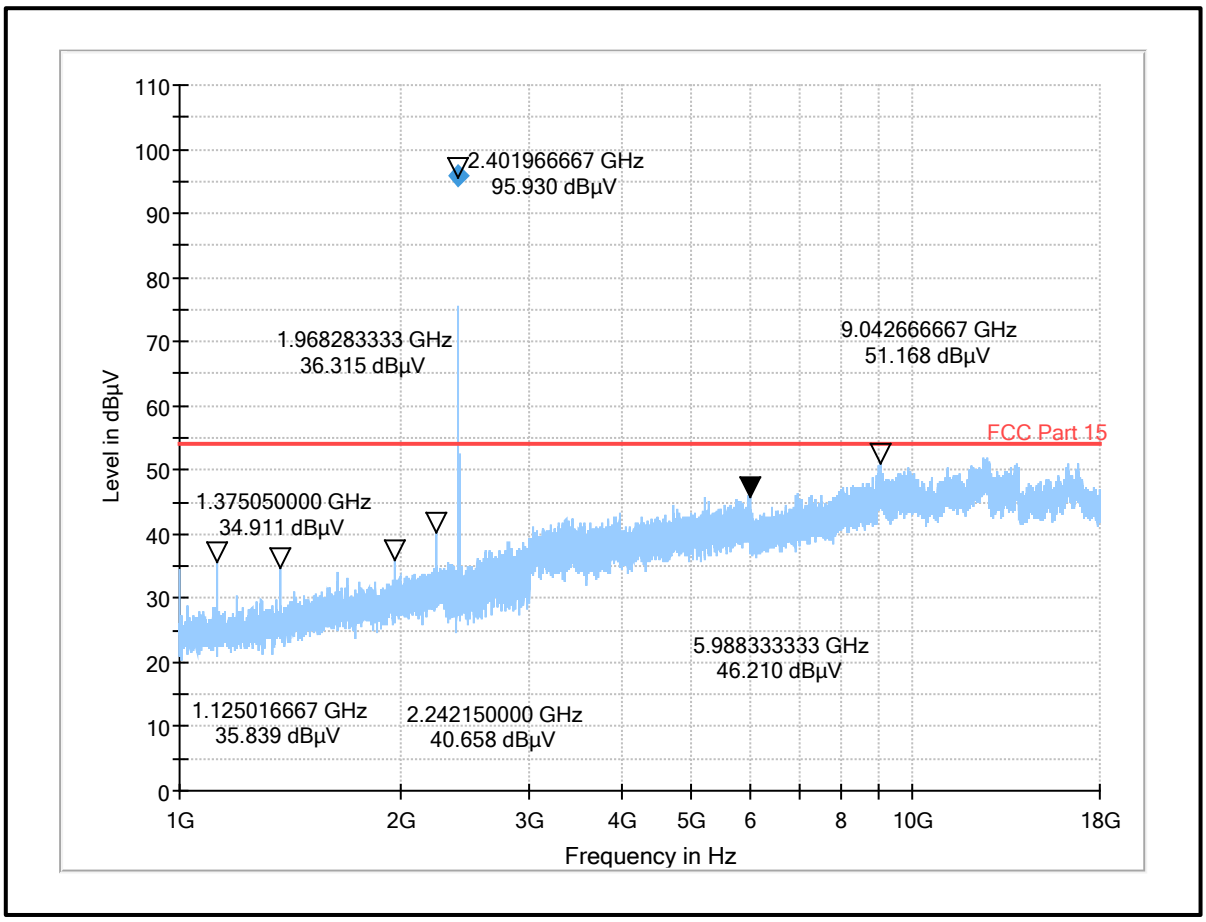


## Transmitter Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel

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

**Plot: 1 GHz – 18 GHz:**
**BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel**



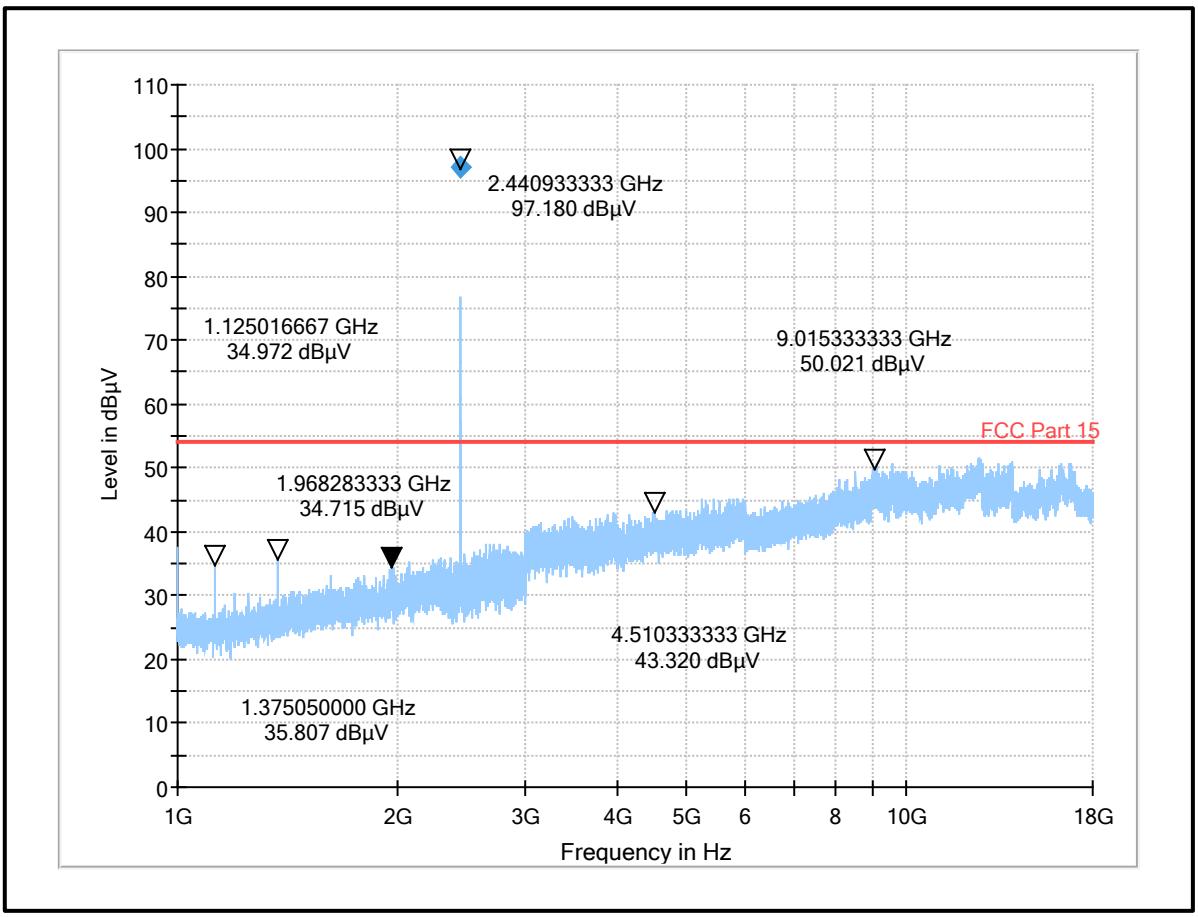

**Result:** Pass

## Transmitter Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Middle Channel

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

**Plot: 1 GHz – 18 GHz:**
**BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Middle Channel**



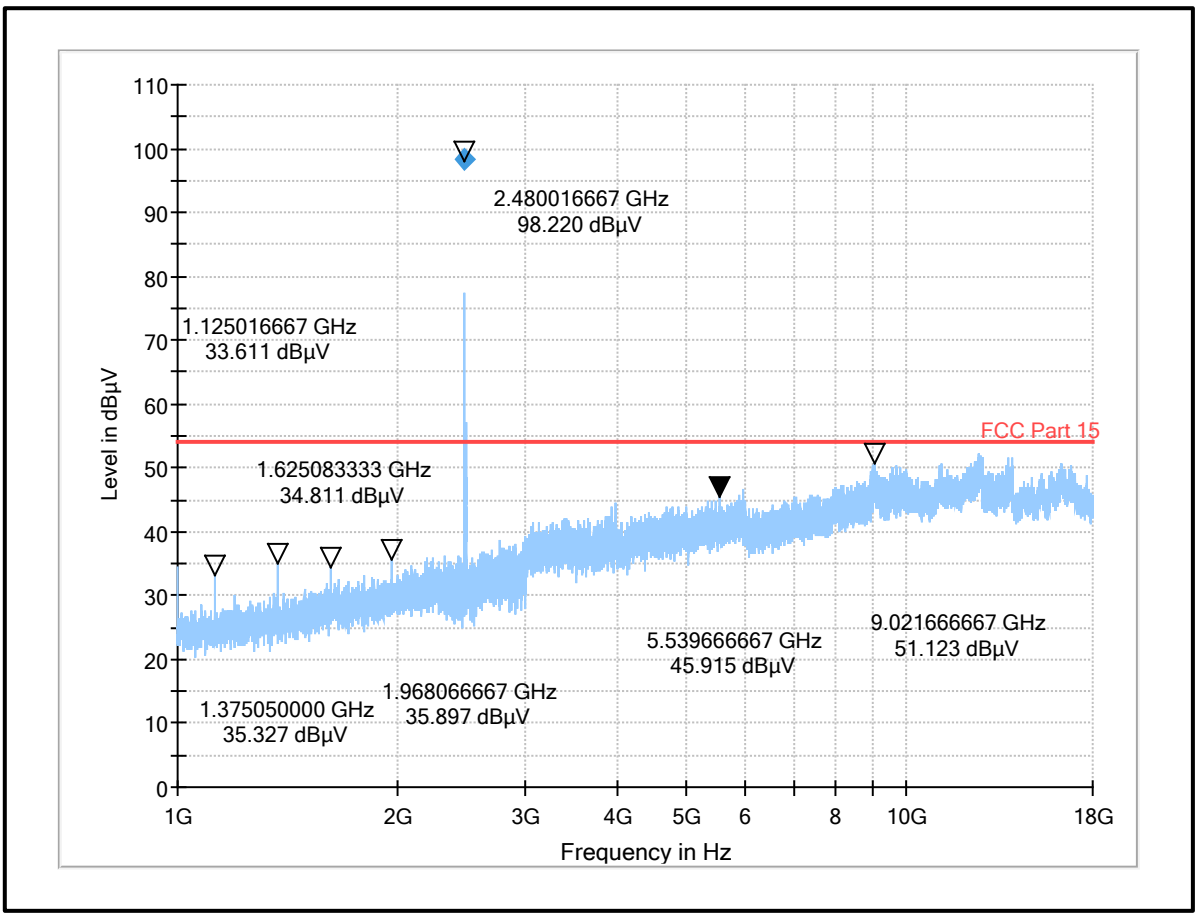

**Result:** Pass

## Transmitter Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Top Channel

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

**Plot: 1 GHz – 18 GHz:**
**BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Top Channel**



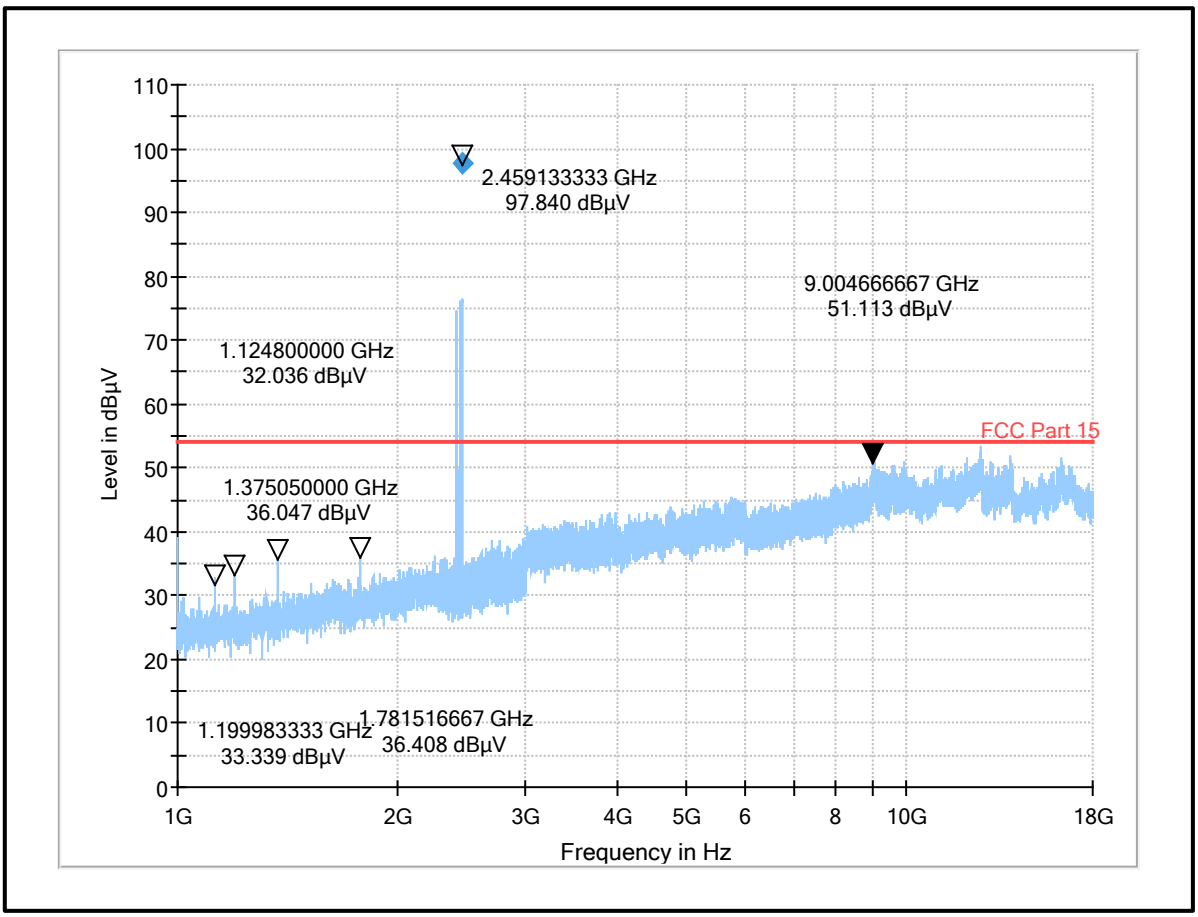

**Result:** Pass

## Transmitter Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping ON / MAX PWR 7

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

**Plot: 1 GHz – 18 GHz:**
**BT-EDR Mode / Packet Type: 3DH5 / Hopping ON / MAX PWR 7**



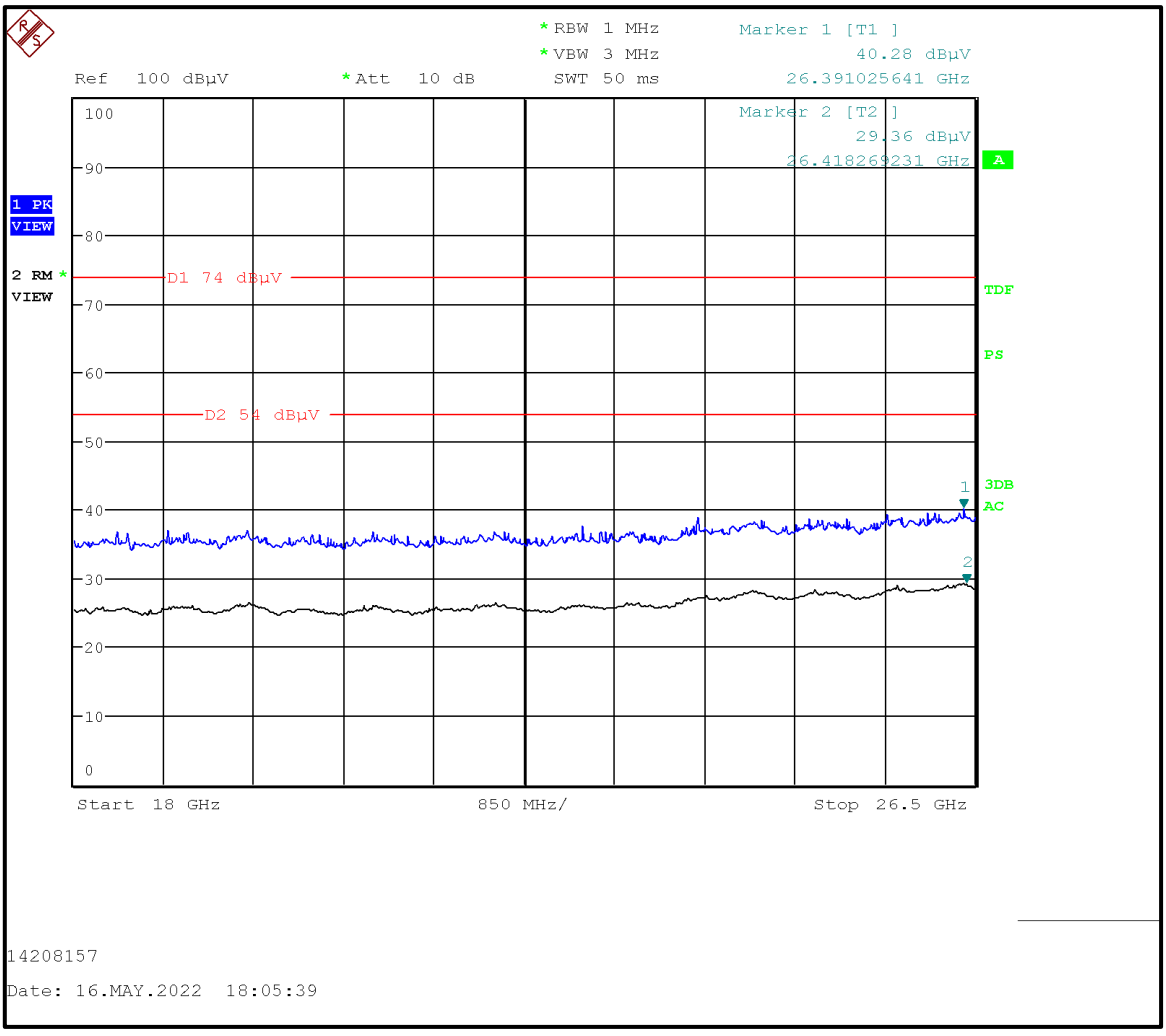

**Result:** Pass

## Transmitter Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel

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

**Plot: 18 GHz – 26.5 GHz:**
**BT-EDR Mode / Packet Type: 3DH5 / Hopping OFF/ MAX PWR 7 / Bottom Channel**




**Result:** Pass

## 5.2.4. Transmitter Band Edge Radiated Emissions

### Test Summary:

| | | | |
|---|---|---|---|
| **Test Engineer:** | Muhammad Faiq Khan | **Test Date:** | 05 May 2022 & 09 May 2022 |
| **Test Sample Serial Number:** | 220405435 (RF Test Sample) | | |
| **Test Site Identification** | SR 1/2 | | |

| | |
|---|---|
| **FCC Reference:** | Parts 15.247(d), 15.209(a) & 15.205(a) |
| **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):** | 22.9 to 25.1 |
| **Relative Humidity (%):** | 39.8 to 45.4 |

### Note(s):

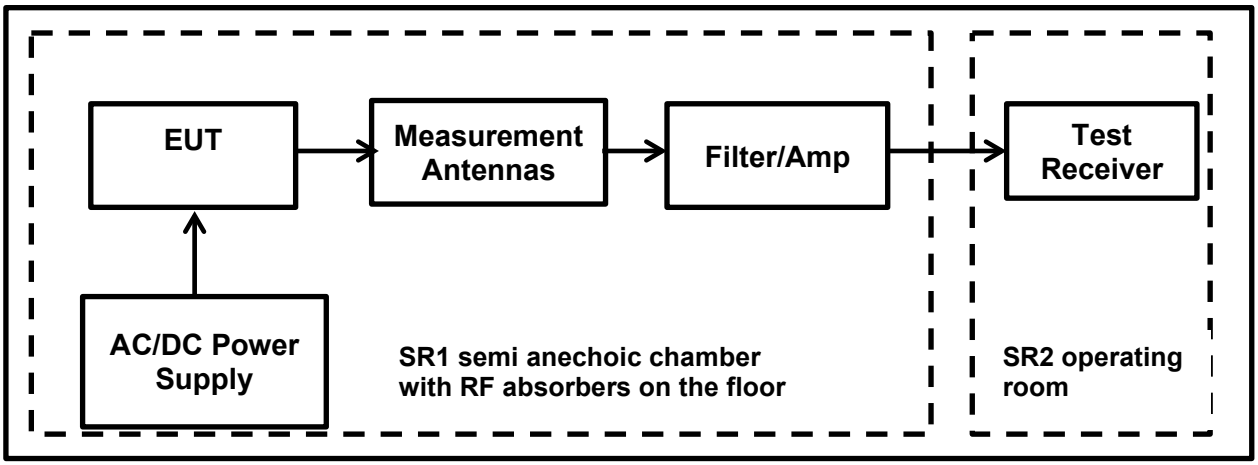
1. The measurements were in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. Maximum emission levels were determined by height searching 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.

## Transmitter Band Edge Radiated Emissions (continued)

## Note(s):

7. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
8. In accordance with ANSI C63.10 Section 6.10.4 the measurements were performed twice :
   - once with the Fixed Channel Frequency Mode (Hopping OFF)
   - repeated with Hopping Channels Frequency Mode (Hopping ON)
9. The final radiated emissions measurements were performed with the EUT set to the following worst-case mode with highest output power and on the mode with the widest bandwidth.
   - BT-BR Mode | Packet Type: DH5 | Hopping OFF | MAX PWR 7
   - BT-BR Mode | Packet Type: DH5 | Hopping ON | MAX PWR 7
   - BT-EDR Mode | Packet Type: 2DH5 | Hopping OFF | MAX PWR 7
   - BT-EDR Mode | Packet Type: 2DH5 | Hopping ON | MAX PWR 7
   - BT-EDR Mode | Packet Type: 3DH5 | Hopping OFF | MAX PWR 7
   - BT-EDR Mode | Packet Type: 3DH5 | Hopping ON | MAX PWR 7
10. As the continuous transmission of the EUT (D ≥ 98%) cannot be achieved and EUT was transmitting continuously at worst-case Duty Cycles of 84.40%(duty cycle variations are less than ±2% at the respective data rate). Therefore, Duty Cycle Correction Factor of 0.74 dB was added to all average measurements, to compute the corrected average values of the emissions that would have been measured had the test been performed at 100% Duty Cycle.

## Test Setup:



## Transmitter Band Edge Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: DH5 / Hopping OFF / MAX PWR 7

### Results: Lower Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | -20 dBc Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2399.90 | 41.46 | 81.40 | 39.94 | Complied |
| 2400.00 | 40.55 | 81.40 | 40.85 | Complied |

### Results: 2310 to 2390 MHz Restricted Band / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2379.09 | 45.70 | 74.00 | 28.3 | 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) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2381.72 | 44.16 | 0.74 | 44.90 | 54.00 | 9.10 | Complied |

### Results: Upper Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2483.5 | 49.21 | 74.00 | 24.79 | Complied |
| 2485.97 | 50.12 | 74.00 | 23.88 | Complied |

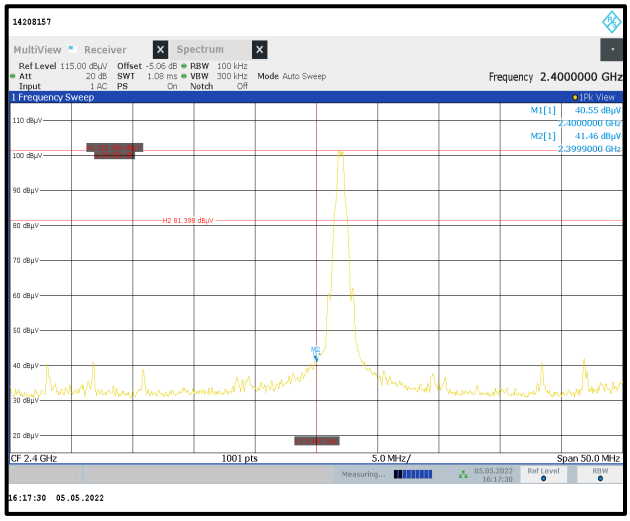
### Results: Upper Band Edge / Average

| Frequency (MHz) | Average Level (dBµV/m) | Duty Cycle Correction Factor (dB) | Corrected Average Level (dBµV/m) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2483.5 | 45.11 | 0.74 | 45.85 | 54.00 | 8.15 | Complied |
| 2484.59 | 46.30 | 0.74 | 47.04 | 54.00 | 6.96 | Complied |

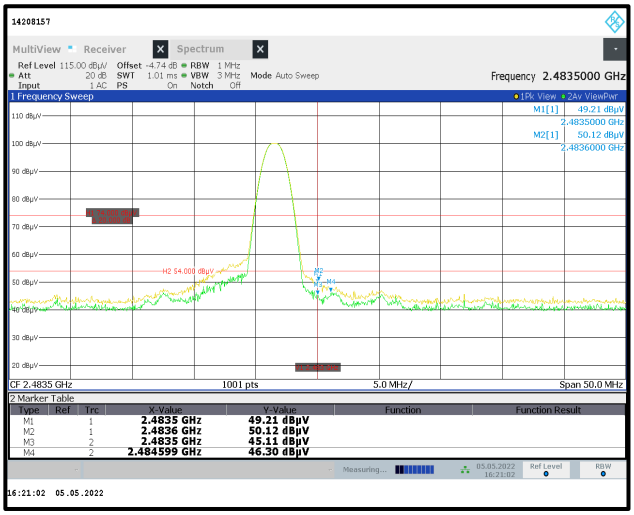
**Result:** Pass

## Transmitter Band Edge Radiated Emissions (continued)

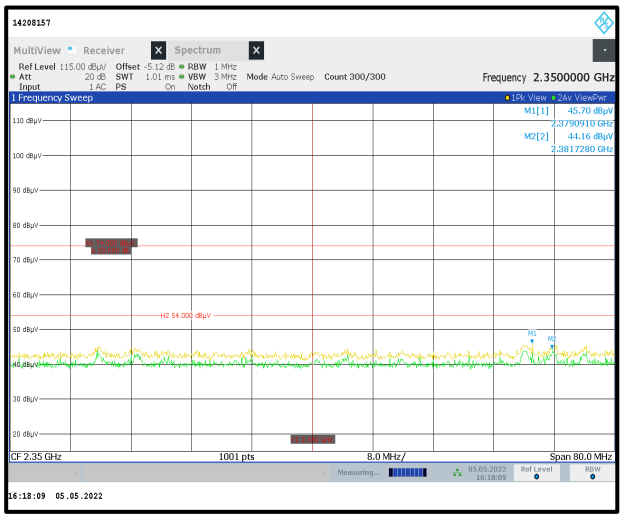
## Results: BT-EDR Mode / Packet Type: DH5 / Hopping OFF / MAX PWR 7




Lower Band Edge Peak Measurement




Upper Band Edge Peak & Average Measurement




2310 MHz to 2390 MHz Restricted Band

## Result: Pass

## Transmitter Band Edge Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: DH5 / Hopping ON / MAX PWR 7

### Results: Lower Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | -20 dBc Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2399.45 | 39.13 | 79.03 | 39.90 | Complied |
| 2400.00 | 36.89 | 79.03 | 42.14 | Complied |

### Results: 2310 to 2390 MHz Restricted Band / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2329.70 | 48.12 | 74.00 | 25.88 | 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) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2330.50 | 47.33 | 0.74 | 48.07 | 54.00 | 5.93 | Complied |

### Results: Upper Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2483.50 | 42.98 | 74.00 | 31.02 | Complied |
| 2484.34 | 46.88 | 74.00 | 27.12 | Complied |

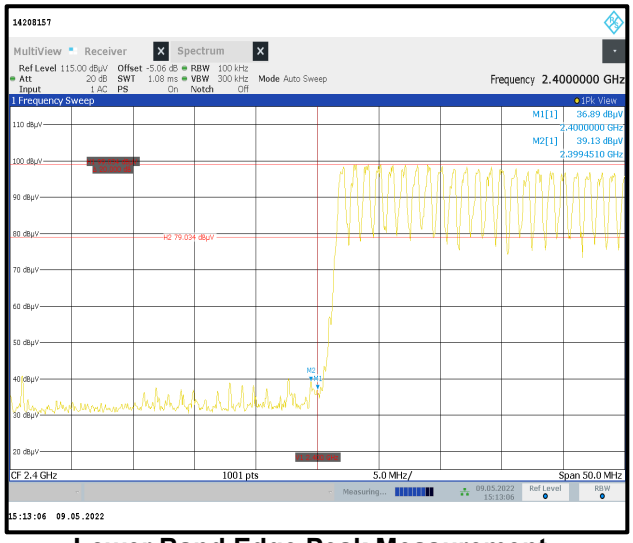
### Results: Upper Band Edge / Average

| 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 | 40.21 | 0.74 | 40.95 | 54.00 | 13.05 | Complied |
| 2505.52 | 45.44 | 0.74 | 46.18 | 54.00 | 7.82 | Complied |

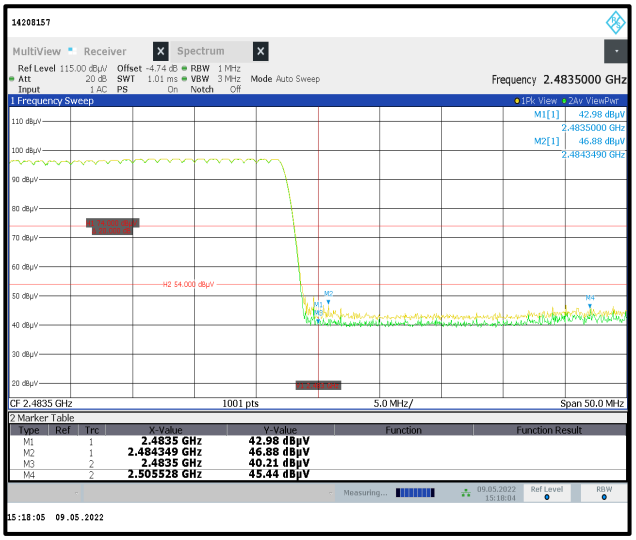
**Result:** Pass

## Transmitter Band Edge Radiated Emissions (continued)

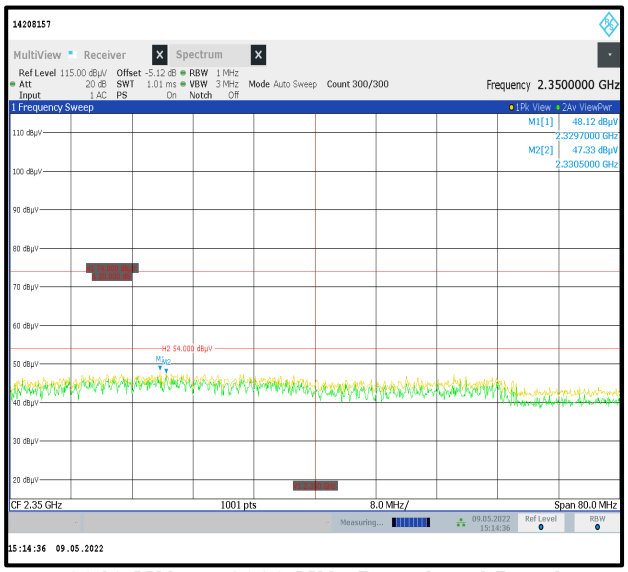
## Results: BT-EDR Mode / Packet Type: DH5 / Hopping ON / MAX PWR 7




Lower Band Edge Peak Measurement




Upper Band Edge Peak & Average Measurement




2310 MHz to 2390 MHz Restricted Band

**Result: Pass**

## Transmitter Band Edge Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 2-DH5 / Hopping OFF / MAX PWR 7

### Results: Lower Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | -20 dBc Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2399.50 | 49.07 | 81.17 | 32.10 | Complied |
| 2400.00 | 45.68 | 81.17 | 35.49 | Complied |

### Results: 2310 to 2390 MHz Restricted Band / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2311.15 | 45.47 | 74.00 | 28.53 | 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) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2315.03 | 43.24 | 0.74 | 43.98 | 54.00 | 10.02 | Complied |

### Results: Upper Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2483.5 | 54.03 | 74.00 | 19.97 | Complied |
| 2483.80 | 54.55 | 74.00 | 19.45 | Complied |

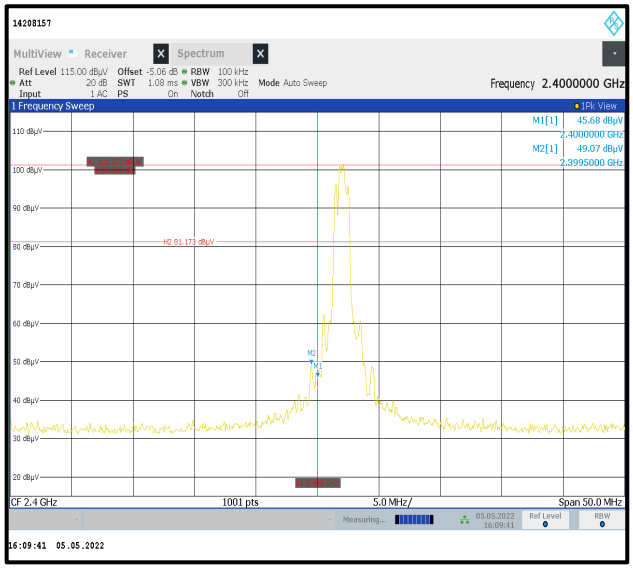
### Results: Upper Band Edge / Average

| Frequency (MHz) | Average Level (dBµV/m) | Duty Cycle Correction Factor (dB) | Corrected Average Level (dBµV/m) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2483.5 | 49.15 | 0.74 | 49.89 | 54.00 | 4.11 | Complied |
| 2483.95 | 49.84 | 0.74 | 50.58 | 54.00 | 3.42 | Complied |

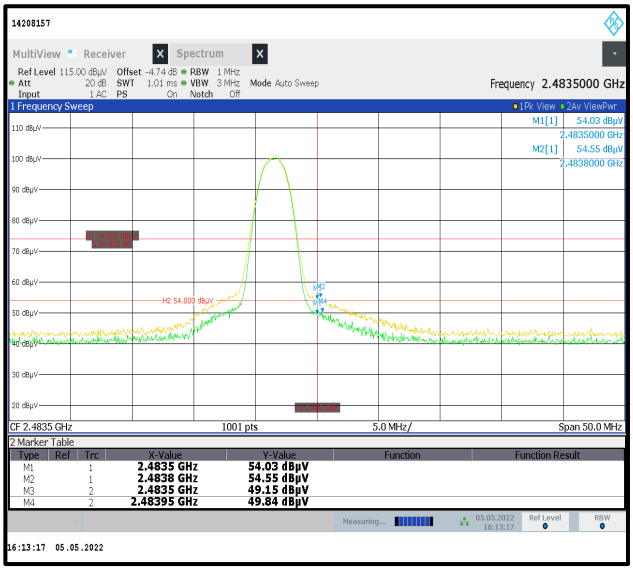
**Result:** Pass

## Transmitter Band Edge Radiated Emissions (continued)

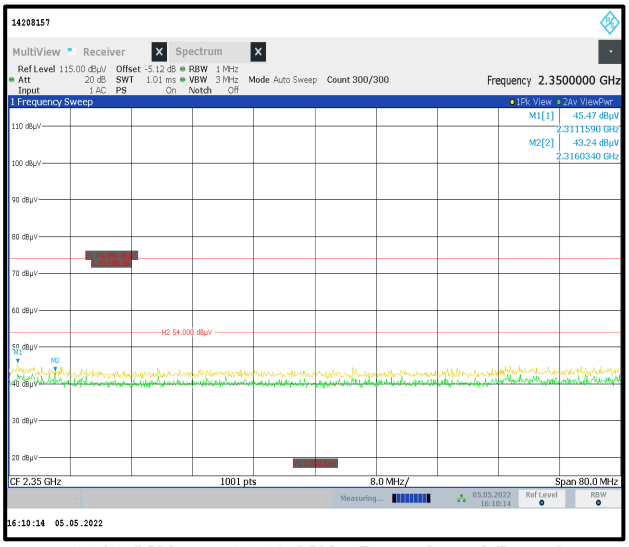
## Results: BT-EDR Mode / Packet Type: 2-DH5 / Hopping OFF / MAX PWR 7




**Lower Band Edge Peak Measurement**




**Upper Band Edge Peak & Average Measurement**




**2310 MHz to 2390 MHz Restricted Band**

**Result: Pass**

## Transmitter Band Edge Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 2-DH5 / Hopping ON / MAX PWR 7

### Results: Lower Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | -20 dBc Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2399.95 | 39.20 | 78.91 | 39.71 | Complied |
| 2400.00 | 38.98 | 78.91 | 39.93 | Complied |

### Results: 2310 to 2390 MHz Restricted Band / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2337.37 | 48.32 | 74.00 | 25.68 | 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) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2315.83 | 46.92 | 0.74 | 47.66 | 54.00 | 6.34 | Complied |

### Results: Upper Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2483.50 | 42.70 | 74.00 | 31.30 | Complied |
| 2483.70 | 47.97 | 74.00 | 26.03 | Complied |

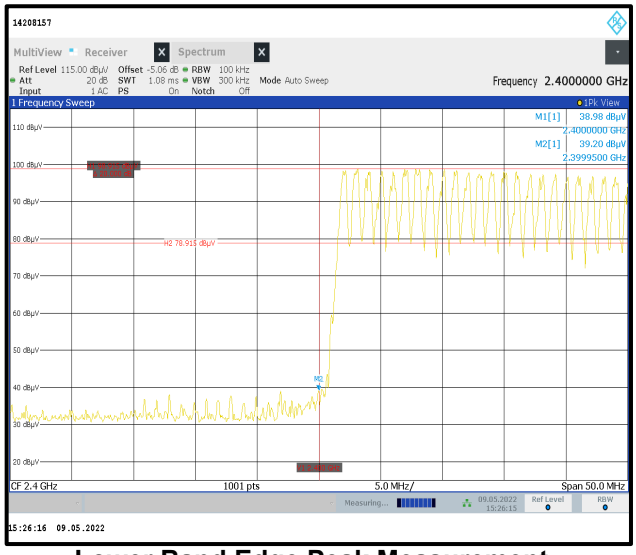
### Results: Upper Band Edge / Average

| 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 | 39.52 | 0.74 | 40.26 | 54.00 | 13.74 | Complied |
| 2505.52 | 44.62 | 0.74 | 45.36 | 54.00 | 8.64 | Complied |

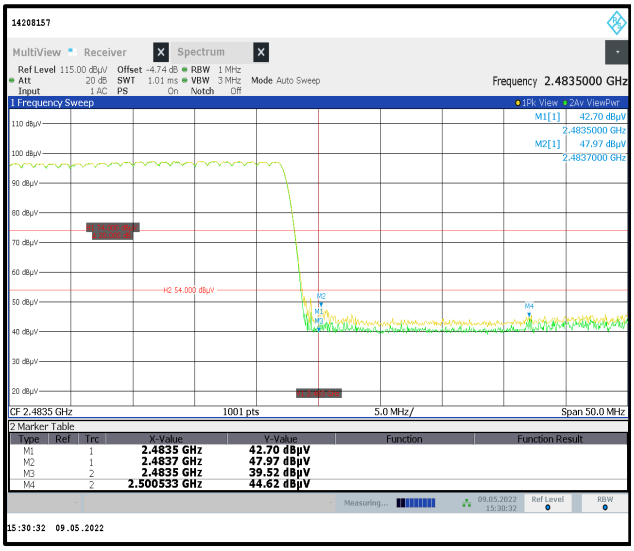
**Result:** Pass

## Transmitter Band Edge Radiated Emissions (continued)

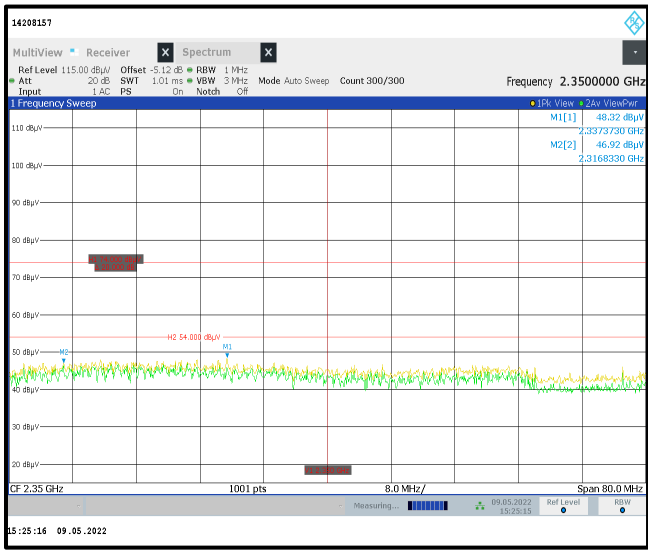
## Results: BT-EDR Mode / Packet Type: 2-DH5 / Hopping ON / MAX PWR 7




Lower Band Edge Peak Measurement




Upper Band Edge Peak & Average Measurement




2310 MHz to 2390 MHz Restricted Band

## Result: Pass

## Transmitter Band Edge Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3-DH5 / Hopping OFF / MAX PWR 7

### Results: Lower Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | -20 dBc Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2399.50 | 49.53 | 81.03 | 31.50 | Complied |
| 2400.00 | 46.51 | 81.03 | 34.52 | Complied |

### Results: 2310 to 2390 MHz Restricted Band / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2326.60 | 45.86 | 74.00 | 28.14 | 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) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2370.22 | 42.72 | 0.74 | 43.46 | 54.00 | 10.54 | Complied |

### Results: Upper Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2483.50 | 53.32 | 74.00 | 20.68 | Complied |
| 2483.60 | 54.02 | 74.00 | 19.98 | Complied |

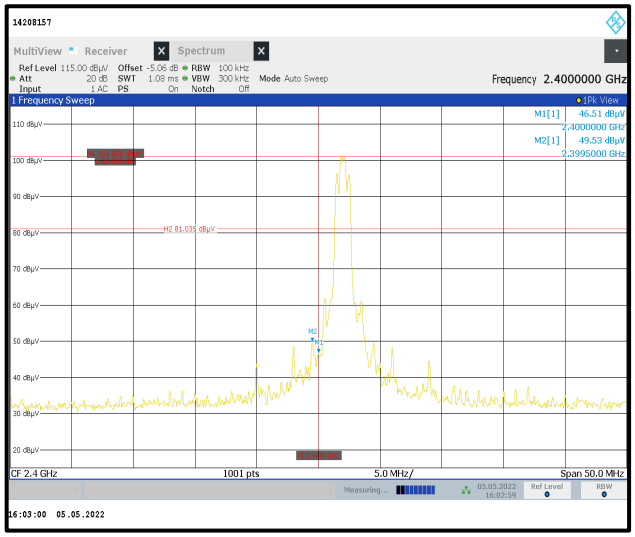
### Results: Upper Band Edge / Average

| 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 | 48.51 | 0.74 | 49.25 | 54.00 | 4.75 | Complied |
| 2483.55 | 49.94 | 0.74 | 50.68 | 54.00 | 3.32 | Complied |

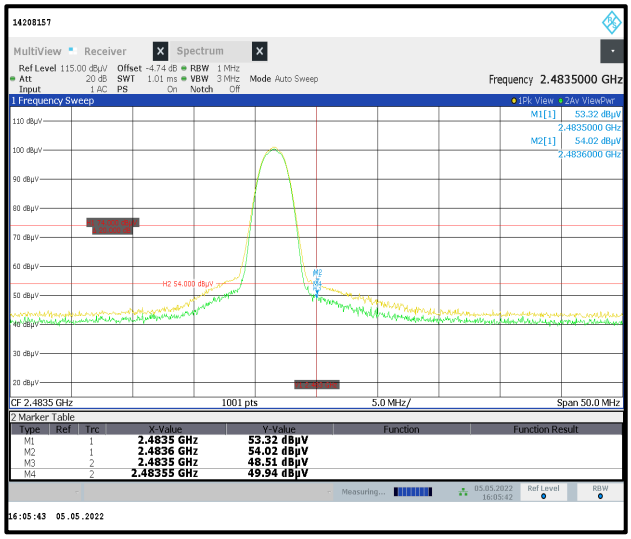
**Result:** Pass

## Transmitter Band Edge Radiated Emissions (continued)

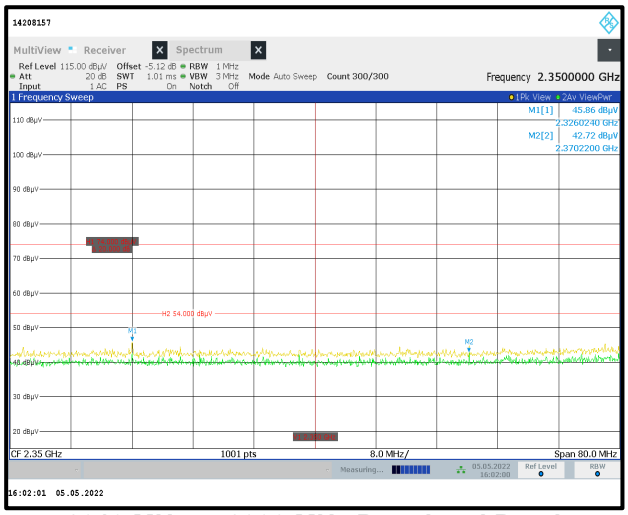
## Results: BT-EDR Mode / Packet Type: 3-DH5 / Hopping OFF / MAX PWR 7




**Lower Band Edge Peak Measurement**




**Upper Band Edge Peak & Average Measurement**




**2310 MHz to 2390 MHz Restricted Band**

## Result: Pass

## Transmitter Band Edge Radiated Emissions (continued)

## Results: BT-EDR Mode / Packet Type: 3-DH5 / Hopping ON / MAX PWR 7

### Results: Lower Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | -20 dBc Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2398.65 | 38.43 | 79.09 | 40.66 | Complied |
| 2400.00 | 37.78 | 79.09 | 41.31 | Complied |

### Results: 2310 to 2390 MHz Restricted Band / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2325.86 | 48.17 | 74.00 | 25.83 | 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) | Average Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| 2325.86 | 47.18 | 0.74 | 47.88 | 54.00 | 6.12 | Complied |

### Results: Upper Band Edge / Peak

| Frequency (MHz) | Peak Level (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|
| 2483.50 | 47.61 | 74.00 | 26.39 | Complied |
| 2484.14 | 49.94 | 74.00 | 24.06 | Complied |

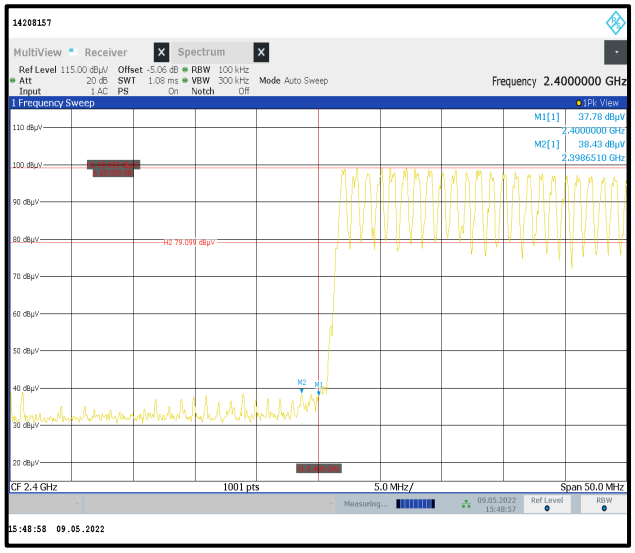
### Results: Upper Band Edge / Average

| 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 | 40.90 | 0.74 | 41.64 | 54.00 | 12.36 | Complied |
| 2502.58 | 44.91 | 0.74 | 45.65 | 54.00 | 8.35 | Complied |

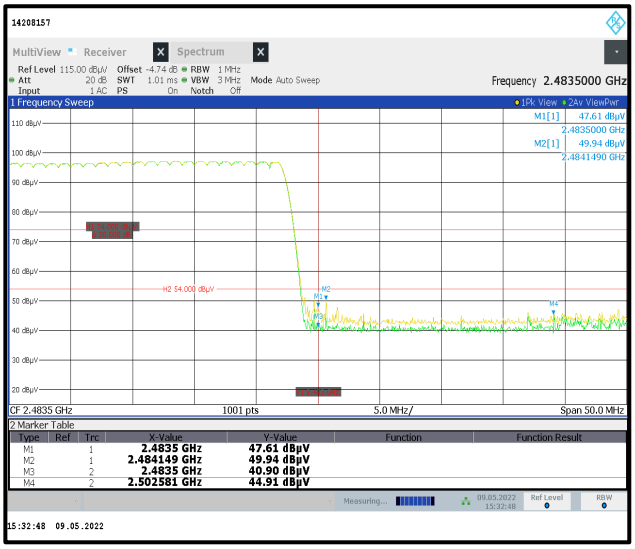
**Result:** Pass

## Transmitter Band Edge Radiated Emissions (continued)

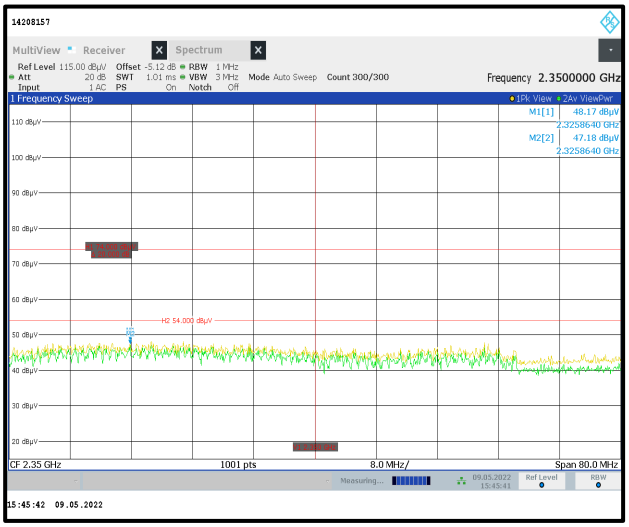
## Results: BT-EDR Mode / Packet Type: 3-DH5 / Hopping ON / MAX PWR 7




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 |
|---|---|---|
| AC Conducted Spurious Emissions | 95% | ±2.49 dB |
| Transmitter Duty Cycle | 95% | ±3.4% |
| Radiated Spurious Emissions | 95% | ±3.10 dB |
| Band Edge Radiated Emissions | 95% | ±3.10 dB |

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

# 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 |
| 377 | BONN Elektronik | Amplifier, Low Noise Pre | BLMA 0118-1A | 025294B | 14/07/2021 | 12 |
| 423 | Bonn Elektronik | Amplifier, Low Noise Pre | BLMA 1840-1A | 55929 | 16/07/2021 | 12 |
| 460 | Deisel | Turntable | DT 4250 S | n/a | n/a | n/a |
| 452 | Schwarzbeck | Antenna, Trilog Broadband | VULB 9168 | 9168-240 | 02/09/2020 | 24 |
| 496 | Rohde & Schwarz | Antenna, log. - periodical | HL050 | 100297 | 05/08/2020 | 36 |
| 607 | Schwarzbeck | Antenna broadband horn antenna | BBHA 9170 | 9170-561 | 15/10/2019 | 36 |
| 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 | 28/06/2021 | 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 | 14/07/2021 | 12 |
| 28 | Rohde & Schwarz | Passive Probe | ESH2-Z3 | none | 11/07/2019 | 36 |
| 349 | Rohde & Schwarz | Receiver, EMI Test | ESIB7 | 836697/009 | 13/07/2021 | 12 |
| 351 | Rohde & Schwarz | network, Artificial Mains | ESH3-Z5 | 862770/018 | 14/07/2021 | 12 |
| 564 | Teseq | Impedance stabilisation network (ISN) | ISN T800 | 26076 | 14/07/2021 | 24 |
| 616 | Rohde & Schwarz | ISN | ENY81-CA6 | 101656 | 07/07/2020 | 36 |
| -/- | Testo | Thermo-Hygrometer | 608-H1 | 08 | lab verification | n/a |
| 327 | SPS | AC/DC power distribution system | PAS 5000 | A2464 00/1 0200 | lab verification | n/a |

# 8. Report Revision History

| Version Number | Revision Details | | |
|---|---|---|---|
| | Page No(s) | Clause | Details |
| 1.0 | 51 | - | Initial Version |

--- END OF REPORT ---