# REPORT

For

## Guard RFID Solutions Inc

#140 – 766 Cliveden Place
Delta, British Columbia
V3M 6C7, Canada

Date of Issue: 5 July 2023
Report No.: 20.01.22039-2
Project No.: 22039
Equipment: Patient Tag
Model No.: PT-4-BLE

# TABLE OF CONTENTS

# Intentional Transmitter Emissions Test Report

## 47 CFR § 15.249

Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz

| | | |
|---|---|---|
| **Report No**. ..... : | 20.01.22039-2 | |
| **Compiled by** ..... | Zara Vali |  |
| **Approved by** ..... | David Johanson |  |
| **Date of issue** ..... : | July 5, 2023 | |
| **Laboratory information:** | | |
| Testing Laboratory ..... : | LabTest Certification Inc. | |
| Address ..... : | Delta Lab: *Unit 205 – 8291 92ST. Delta, B.C. V4G 0A4, Canada*<br>Richmond Lab: *Unit 3128-20800 Westminster HWY, Richmond, B.C. V6V 2W3 Canada* | |
| FCC Site Registration No.: | CA5970 | |
| IC Site Registration No.: | 5970A-2 | |
| **Applicant's name**..... : | Guard RFID Solutions Inc. | |
| Address ..... : | #140 - 766 Cliveden Place, Delta, BC, V3M-6C7 Canada | |
| **Manufacture's Name** ..... : | Guard RFID Solutions Inc. | |
| Address ..... : | #140 - 766 Cliveden Place, Delta, BC, V3M-6C7 Canada | |
| **Test item description :** | | |
| Trade Mark ..... : | guard RFID | |
| Equipment name: ..... | Patient Tag | |
| Model/Type reference ..... : | PT-4-BLE | |
| Serial Number ..... : | 08-ED-02-c8-00-24<br>08-ED-02-c8-00-30 | |
| FCC ID ..... : | VZKPT4 | |
| IC ID ..... : | 9937A-PT4 | |
| **Possible test case verdicts:** | | |
| - test case does not apply to the test object..... : | N/A | |
| - test object does meet the requirement ..... : | Pass | |

| | |
|---|---|
| - test object does not meet the requirement .....: | Fail |
| **Testing:** | |
| Date of receipt of test item .....: | 9 May 2023 |
| Date (s) of performance of tests.....: | 15 May – 27 June 2023 |

## Revision History

| Revision | Date | Reason For Change | Author(s) |
|---|---|---|---|
| 0 | July 5, 2023 | Initial Data | Zara vali |

## Result Summary

The tests indicated in result summary were performed on the product constructed as described below. The test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test method, a list of the actual test equipment used, documentation photos, results, and raw data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.
The compliance status is a judgment based on the direct measurements and calculated highest emissions to appropriate standard limits. Measurement uncertainty values, provided on calibration certificates, were not be used in the judgment of the final status of compliance.
Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. LabTest does not make any claims of compliance for samples or variants which were not tested.

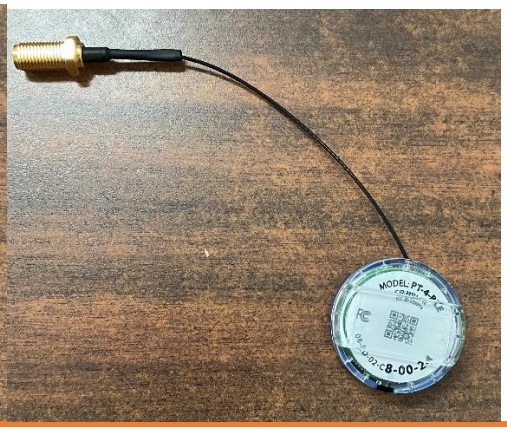
| FCC § 15.249 and RSS-210 Issue 10 | | | |
|---|---|---|---|
| **Test Type** | **Standard** | **Test Method** | **Result** |
| Bandwidth of the emission | 47 CFR § 15.215 (c)<br>RSS-210 Issue 10 | RSS Gen, Issue 5 | Pass |
| RF conducted peak output power | 47 CFR § 15.249<br>47 CFR §15.205<br>RSS-210 Issue 10 | ANSI C63.10:2013, Clause 6<br>RSS- Gen Issue 5 | Pass |
| Out of band emission | 47 CFR § 15.249 (d)<br>47 CFR § 15.209<br>RSS-210 Issue 10 | RSS-Gen Issue 5<br>ANSI C63.10 2013 | Pass |
| Frequency stability (Temperature variation) | 47 CFR § 2 2.1055(a) (1) & (b)<br>47 CFR § 15.215 | RSS-Gen Issue 5 (6.11)<br>ANSI C63.10:2013, Clause 6 | Pass |
| Radiated emission | 47 CFR § 15.209<br>47 CFR § 15.249<br>47 CFR § 15.205<br>RSS-210 Issue 10 2019 | RSS-Gen Issue 5, April 2018<br>ANSI C63,10 2013 | Pass |
| Antenna requirement | 47 CFR Part 15.203<br>RSS-Gen Issue 5 | Inspection | Pass |
| Non-standard test method | NA | | |

## Description of Equipment Under Test and Variant Models

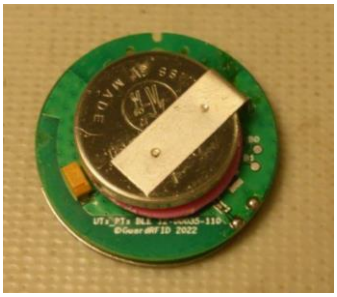
**Description:**
The PT-4-BLE is an is an active tag that features 12 months of battery life. The tag advertises its location using Bluetooth Low Energy (BLE) signal and contains a low frequency receiver for detecting signals from GuardRFID® Tag Exciters.
Patient Tags work with the GuardRFID AllGuard® software to provide real-time location services. The AllGuard software can be configured to control doors to speed patient flow to scheduled medical examinations or protect patients from suspicious activity.

- Front view

- Back View



Internal Photos


Note. The EUT was modified with a pigtail connector for the conducted emissions measurements. Radiated Emissions were done without the pigtail.

**Variant Models:**
The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. LabTest does not make any claims of compliance for samples or variants which were not tested.

None

## Radio Device Under Test Description

| | |
|---|---|
| Application for ..... : | Tag used for healthcare patients for security, workflow and location purposes |
| Operating Transmit Frequency ..... : | 2400 – 2483.5 MHz |
| Operating Receive Frequency ..... : | 2400 – 2483.5 MHz |
| Number of Channels ..... : | NA |
| Peak Output Power ..... : | 5.57 dBm |
| Modulation Type ..... : | GFSK |
| Data Rate ..... : | 1 Mbps |
| Hop Timing ..... : | NA |
| Antenna Type/Gain ..... : | Internal wire loop antenna/ Unknown |
| Equipment mobility ..... : | Mobile |
| Operating condition ..... : | -30°C to +50°C |
| Mass of equipment ..... : | 6.6 g |
| Dimension | 28 mm x 14.5 mm |
| Nominal Voltages for: | ☐ stand-alone equipment<br>☒ combined (or host) equipment |
| Supply Voltage: | 3V DC<br>6mA Maximum Amps |

| | |
|---|---|
| If DC Power: | ☐ Internal Power Supply<br>☐ External Power Supply or AC/DC adapter<br>☒ Battery: 12 Months battery life |

## EUT Internal Operating Frequencies

| # | Frequency (MHz) | Description |
|---|---|---|
| 1 | 2400 – 2483.5 MHz | Highest frequency: Bluetooth transmitter |
| 2 | 32 KHz | Lowest frequency |

## Client Equipment Used During Test

| Use* | Product Type | Manufacturer | Model | Comments |
|---|---|---|---|---|
| 1 | Patient Tag | Guard RFID Solutions Inc. | PT-4-BLE | |

Abbreviations:
EUT - Equipment Under Test,
AE - Auxiliary/Associated Equipment, or
SIM - Simulator (Not Subjected to Test)

## Software and Firmware

| Use* | Firmware name | Version |
|---|---|---|
| | 14-00051-110 (UTx_PTx BLE Application FW).hex | v1.1.0 |

Abbreviations:
EUT - Equipment Under Test,
AE - Auxiliary/Associated Equipment, or
SIM - Simulator (Not Subjected to Test)

## Input/Output Ports

| Port # | Name | Type* | Cable Max. >3m | Cable Shielded | Comments |
|---|---|---|---|---|---|
| | NA | | | | |

*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

## Power Interface

| Mode # | Voltage | Current | Power | Frequency | Phases | Comments |
|---|---|---|---|---|---|---|
| 1 | 3V | 6mA Max | | - | - | Battery |

## EUT Operation Modes

| Mode # | Description |
|---|---|
| 1 | EUT was on the continuous transmission mode. |

## EUT Configuration Modes

| Mode # | Description |
|---|---|
| 1 | Same as operation mode. |

## Test Equipment Verified for Function

| Model # | Description | Checked Function | Results |
|---|---|---|---|
| N9038A | Spectrum Analyzer | Frequency and Amplitude | Connected 50MHz and -20 dBm Ref_siganl and checked OK. |
| JB1 | Antenna, 30 to 2000MHz | Checked structure | Normal – no damage. |
| SAS-571 | Antenna, 1 to 18GHz | Checked structure | Normal – no damage. |
| SAS-572 | Antenna, 18- 26 GHz | Checked structure | Normal – no damage. |
| AL-130 | Antenna, 9kHz to 30MHz | Checked structure | Normal – no damage. |

## Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests:

| Parameter | Uncertainty |
|---|---|
| Radio Frequency | ± 1 ppm |
| Total RF Power: Conducted | ± 1 dB |
| RF Power Density: Conducted | ± 2.75 dB |
| Spurious Emissions: Conducted | ± 3.0 dB |
| Temperature | ± 1.0 °C |
| Humidity | ± 5.0 % |
| DC and Low Frequency Voltages | ± 3.0 % |
| Radiated Emission, 30 to 6,000MHz | ± 4.93 dB |
| Conducted Measurements, 0.15 to 30MHz | ± 3.52 dB |

Uncertainty figures are valid to a confidence level of 95%.

## 1- Bandwidth of the Emission

| | | | |
|---|---|---|---|
| Standard | 47 CFR § 15.215 (c)<br>RSS-210 Issue 10 | Room Temperature | 24.2 (°C) |
| Test Method | RSS Gen, Issue 5 | Relative Humidity | 45.8 (% RH) |
| Test Location | Richmond lab | Barometric Pressure | 1013.3 (hPa) |
| Test Engineer | Zara Vali | Date of Test | 9 June 2023 |

| Test Equipment Used | Manufacturer | Model | Identifier | Calibration | Calibration due |
|---|---|---|---|---|---|
| Spectrum Analyzer | Keysight | N9038A | 702 | 02-Nov-2022 | 02-Nov-2023 |
| RF Cable | MRO | n/a | n/a | IHC[1] | IHC[1] |

Note1) In House Calibration.

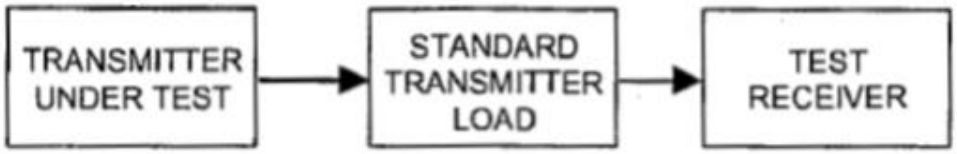
| Test Method | Freqeuncy (MHz) | Bandwidth(kHz) | Comments |
|---|---|---|---|
| 20dB[1] | 2402 | 1,146 | Pass |
| | 2426 | 1,110 | Pass |
| | 2479 | 1,128 | Pass |

Note 1) referenced by FCC 15.215 (c), " Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission, is contained within the frequency band designated in the rule section under which the equipment is operated."

Compliant ☒ Non-Compliant ☐ Not Applicable ☐

**Test Setup**

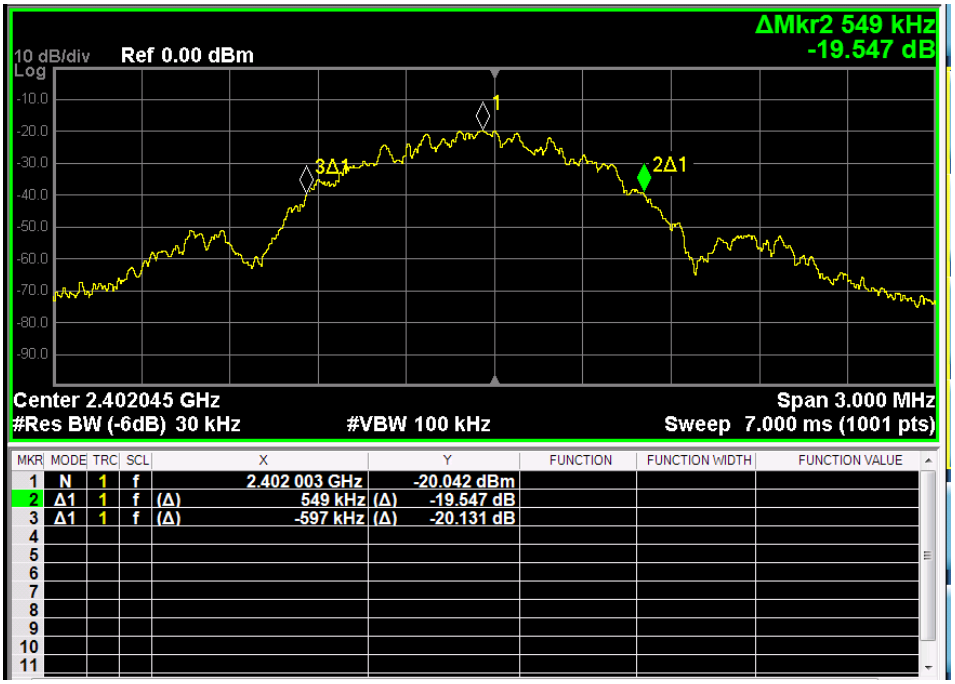
Description of test set-up:



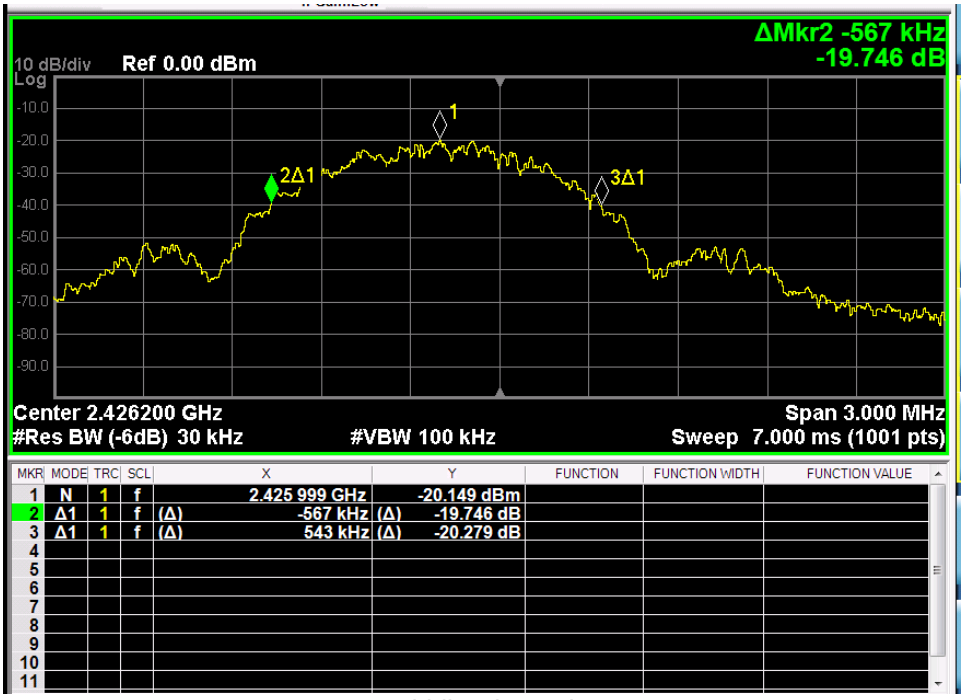

Set the EUT to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth. Repeat above procedures until all frequencies measured were complete.

- The EUT was connected directly to the spectrum analyzer/receiver with appropriate attenuation to make sure no signal saturation.
- The EUT was set to **Operation Mode #1 with configuration Mode #1**.

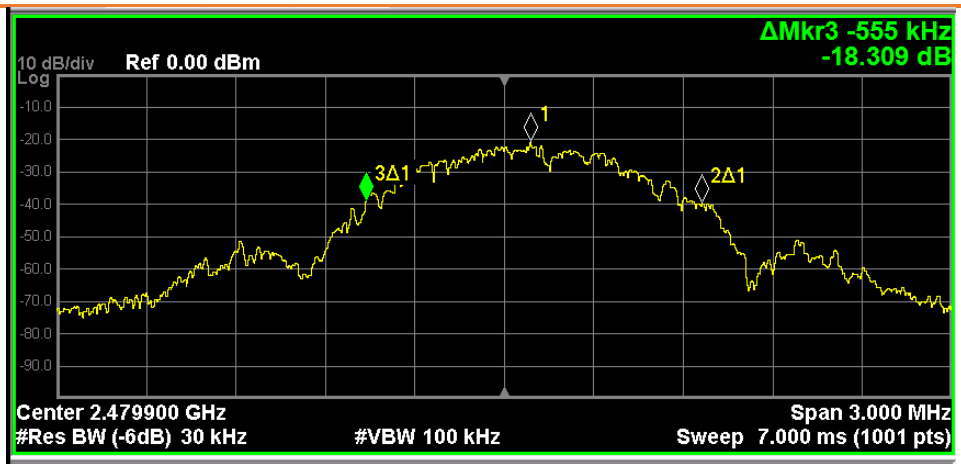
**Test Results**




Low Channel




Middle Channel




| MKR | MODE | TRC | SCL | X | Y | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.479 990 GHz | -21.161 dBm | | | |
| 2 | Δ1 | 1 | f | (Δ) 573 kHz | (Δ) -19.132 dB | | | |
| 3 | Δ1 | 1 | f | (Δ) -555 kHz | (Δ) -18.309 dB | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |

High Channel

## 2- RF Radiated Peak Output Power

| | | | |
|---|---|---|---|
| Standard | 47 CFR § 15.249<br>47 CFR §15.205<br>RSS-210 Issue 10 | Room Temperature | 24.1 (°C) |
| Test Method | ANSI C63.10:2013,Clause 6 | Relative Humidity | 45.7 (%RH) |
| Test Location | Richmond lab | Barometric Pressure | 1013.2 (hPa) |
| Test Engineer | Zara Vali | Date of Test | 10 June 2023 |

| Test Equipment Used | Manufacturer | Model | Identifier | Calibration | Calibration due |
|---|---|---|---|---|---|
| Spectrum Analyzer | KeySight | N9038A | 702 | 02-Nov-2022 | 02-Nov-2023 |
| Double-ridged Guide Horn Antenna | A.H.Systems | SAS-571 | 227C | 13 September 2022 | 13 September 2024 |
| EMC Shielded Enclosure | USC | USC-26 | 374 | IHC[1] | IHC[1] |

Note1) In House Calibration

| | |
|---|---|
| Detector: | ☒ Peak |
| Type of Facility: | ☒ Test bench |
| Distance: | ☒ Direct |
| Arrangement of EUT: | ☒ Table-top only ☐ Floor-standing only ☐ Rack Mounted |

According to FCC 15.249 (a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Frequency range | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (microvolts/meter) |
|---|---|---|
| 2400–2483.5 MHz | 50 | 500 |

According to FCC 15. 249 (e): As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.
Thus, the peak field strength of fundamental is **114 dBuV/m**.

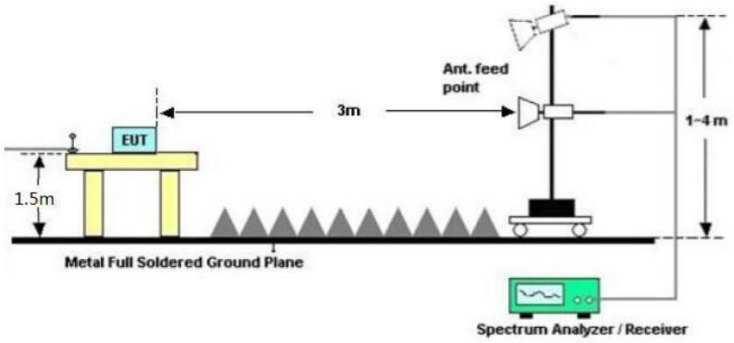
Compliant ☒ Non-Compliant ☐ Not Applicable ☐

**Test Method**

This test measures the peak power of the EUT in a radiated test configuration according to ANSI C63.10: 2013 Annex G. The EUT is set 3 meters away from the testing antenna, which is varied from 1- 4 meters. The EUT is placed on a turntable, which is 1.5 meters above the ground plane. The table shall be rotated 360 degrees to find the highest radiated peak power and the worst-case results are shown. The measurement is repeated for both vertical and horizontal polarization of the receiving antenna. RBW and VBW are set to 8 MHz and 50 MHz, respectively. Spectrum analyzer is set to both peak and average detection mode. EUT was tested in all XYZ directions and worst case is shown here.

**Test Setup**

Description of test set-up:




The EUT was set to **Operation Mode #1 with configuration Mode #1.**

**Test Results**

| Frequency (GHz) | Raw E(dBuV/m) | | Turntable degree | Antenna Polar | Correction Factor (dB) | Corrected E(dBuV/m) | | Peak /Av Limit (dBuV/m) |
|---|---|---|---|---|---|---|---|---|
| | Pk | AV | | | | Pk | AV | |
| 2.40215 | 49.110 | 39.682 | 331 | V | 36 | 85.11 | 75.68 | 114/94 |
| 2.40215 | 48.400 | 39.056 | 70 | H | 36 | 84.4 | 75.06 | 114/94 |
| 2.42615 | 48.342 | 39.183 | 104 | V | 36 | 84.34 | 75.18 | 114/94 |
| 2.42615 | 48.486 | 38.441 | 349 | H | 36 | 84.49 | 74.44 | 114/94 |
| 2.47985 | 47.941 | 40.922 | 61 | V | 36 | 83.94 | 76.92 | 114/94 |
| 2.47985 | 48.410 | 37.826 | 59 | H | 36 | 84.41 | 73.83 | 114/94 |

Antenna height for veritcal polarization is 155 cm and for horizontal polarization is 187 cm.
Corrected E (dBuV/m) = Raw E (dBuV) + Correction Factor (dB)
Correction Factor (dB) = Antenna Factor (dB/m) + Cable Loss (dB)

## 3- Out of Band Emissions

| | | | |
|---|---|---|---|
| Standard | 47 CFR § 15.249 (d)<br>47 CFR § 15.209<br>RSS-210 Issue 10 | Room Temperature | 24.2 (°C) |
| Test Method | RSS-Gen Issue 5<br>ANSI C63.10 2013 | Relative Humidity | 45.8 (% RH) |
| Test Location | Richmond lab | Barometric Pressure | 1013.3 (hPa) |
| Test Engineer | Zara Vali | Date of Test | 27 June 2023 |

| Test Equipment Used | Manufacturer | Model | Identifier | Calibration | Calibration due |
|---|---|---|---|---|---|
| EMC Analyzer | Keysight | N9038A | 702 | 02-Nov-2022 | 02-Nov-2023 |
| Horn Antenna | A.H Systems | SAS-571 | 227C | 13-Sept-2022 | 13-Sept-2024 |
| RF Preamplifier | Agilent | 8449B | 273 | IHC[1] | IHC[1] |
| RF Cable | MRO | n/a | n/a | IHC[1] | IHC[1] |
| EMC Shielded Enclosure | USC | USC-26 | 374 | IHC[1] | IHC[1] |

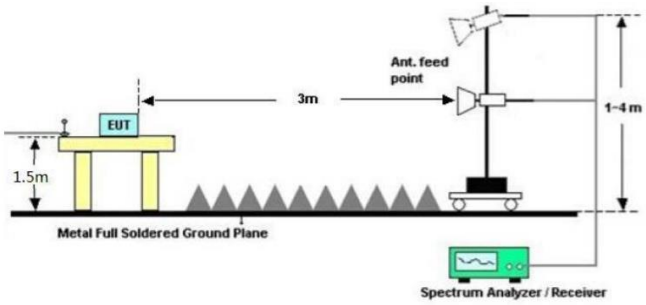
Note1) In House Calibration.

| | |
|---|---|
| Detector: | ☒ Peak |
| RBW/VBW: | ☒120/300kHz |
| Type of Facility: | ☒ Testbench |
| Distance: | ☒ Direct Connection |
| Arrangement of EUT: | ☒ Table-top only ☐ Floor-standing only ☐ Rack Mounted |

§ 15.249 (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Compliant ☒ Non-Compliant ☐ Not Applicable ☐

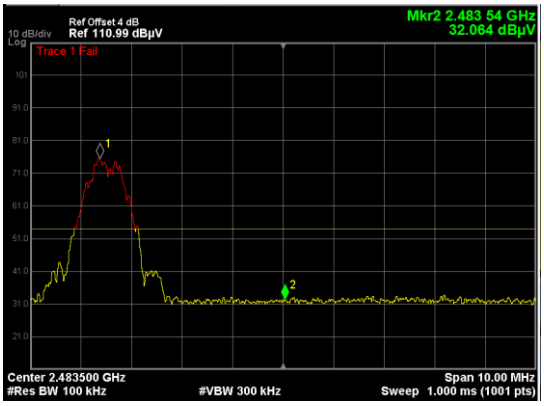
**Test Setup**



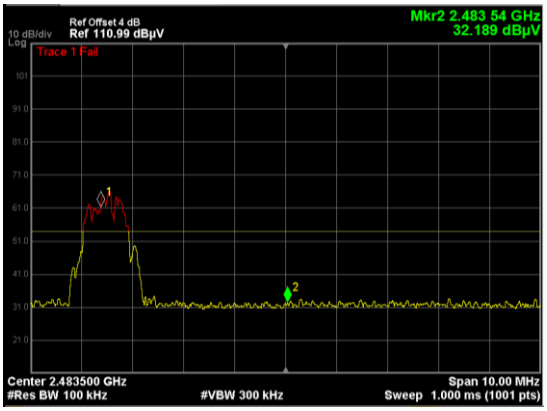

The EUT is set 3 meter away from the testing antenna and the antenna is moved from 1-4 meter. The EUT is placed on a turntable, which is 1.5 meter above the ground plane, the table is rotated for 360 degrees to find out the highest emission at the band edge. The reciving antenna should be changed the polarization both of horizontal and vertical.

The EUT was set to **Operation Mode #1 with configuration Mode #1.**

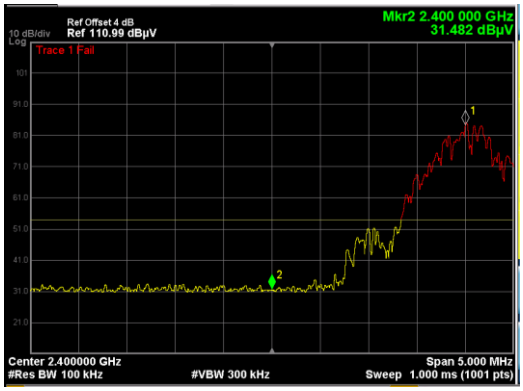
**Test Results**



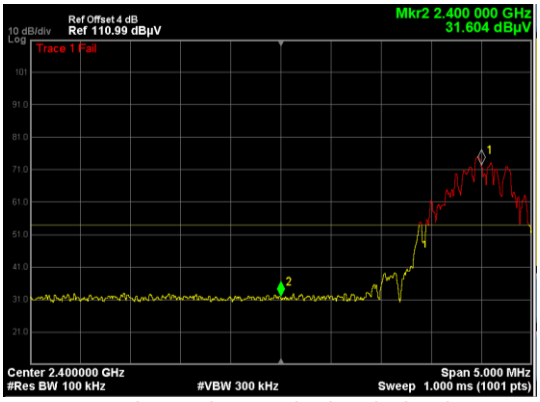

High Channel – Horizontal Polarization




High Channel – Vertical Polarization




Low Channel – Horizontal Polarization




Low Channel – Vertical Polarization

| Frequency (MHz) | Detector | Antenna Polarization | Antenna Factor (dB/m) | Correction Factor (dB/m) | Corrected Amplitude (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| **2400** | Peak | H | 29.6 | 4 | 31.482 | 74 | 42.518 |
| **2400** | Peak | V | 29.6 | 4 | 31.604 | 74 | 42.396 |
| **2483.5** | Peak | H | 29.6 | 4 | 32.064 | 74 | 41.936 |
| **2483.5** | Peak | V | 29.6 | 4 | 32.189 | 74 | 41.811 |

Note. Above test results are the worse case among varuious antenna heights, turn table rotation angles and polarizations.

Corrected Amplitude (dBuV/m) = Reading (dBuV) + Correction Factor (dB) + Antenna Factor (dB/m)
Correction Factor (dB/m) = Cable Losses (dB) – Preaplmifier Gain (dB)
Margin (dB)= Limit (dBuV/m) – Corrected Amplitude (dBuV/m)

## 4- Frequency Stability (Temperature Variation)

| | | | |
|---|---|---|---|
| Standard | 47 CFR § 2 2.1055(a) (1) & (b)<br>47 CFR § 15.215 | Room Temperature (°C) | 24.2 |
| Test Method | RSS-Gen Issue 5 (6.11)<br>ANSI C63.10:2013, Clause 6 | Relative Humidity (% RH) | 45.8 |
| Test Location | Richmond Lab | Barometric Pressure (hPa) | 1013 |
| Test Engineer | Zara Vali | Date of Test | June 14 2023 |

| Test Equipment | Manufacturer | Model | Identifier | Calibration | Calibration due |
|---|---|---|---|---|---|
| EMC Analyzer | Agilent | E7405A | 272 | 07 September, 2022 | 07 September, 2023 |
| Temperature Chamber | Haida International Equipment Co Ltd | HD-E702-100-7 | 1068 | NA | NA |
| Temperature data logger | Omega | EL-USB-TC-LCD | 974 | 22 July, 2022 | 22 July, 2023 |
| RF Cable | MRO | n/a | n/a | IHC[1] | IHC[1] |

Note1) In House Calibration

| | |
|---|---|
| Frequency Range: | ☒ 2400 – 2483 MHz |
| Detector: | ☒ Peak |
| RBW/VBW: | ☒100/300kHz |
| Type of Facility: | ☒ Tabletop |
| Distance: | ☒ Direct |

Compliant ☒ Non-Compliant ☐ Not Applicable ☐

**Test Setup**


EUT with external SMA connector was setup inside the temperature chamber and test equipment configured to provide continuous measurement. The temperature was varied over the manufacturer's temperature range specified and continuous measurement of the transmitter frequency made.

- The EUT was connected directly to the spectrum analyser with appropriate attenuation (20 dB) to make sure no signal saturation.
- The EUT was set to **Operation Mode #1 with configuration Mode #1**.

**Test Results**

The manufacturer's declared temperature range is -30 to 50ºC.

| | Low channel | | Middle Channel | | High Channel | |
|---|---|---|---|---|---|---|
| **Temperature (ºc)** | **Frequency (GHz)** | **Power (dBm)** | **Frequency (GHz)** | **Power (dBm)** | **Frequency (GHz)** | **Power (dBm)** |
| 50 | 2.402025 | 2.35 | 2.426000 | 3.86 | 2.480000 | 2.98 |
| 40 | 2.402025 | 1.93 | 2.426025 | 1.77 | 2.479975 | 3.1 |
| 30 | 2.401975 | 3.37 | 2.426000 | 3.4 | 2.479975 | 3.28 |
| **20** | **2.402025** | **3.46** | **2.426150** | **3.42** | **2.480000** | **3.24** |
| 10 | 2.402050 | -4.32 | 2.426000 | -3.45 | 2.479950 | -4.63 |
| 0 | 2.402025 | -2.93 | 2.426075 | -4.33 | 2.480025 | -5.35 |
| -10 | 2.402000 | -3.09 | 2.425950 | -3.7 | 2.480000 | -2.06 |
| -20 | 2.401975 | 0.95 | 2.426075 | 0.55 | 2.479975 | -0.95 |
| -30 | 2.401975 | 0.95 | 2.425950 | -1.77 | 2.479950 | -0.3 |

Frequency variance of low, mid and high channels are respectively 75 KHz, 200 KHz, and 75 KHz which are within the 20 dB bandwidth of emission. Power variations are below the limit line.

## 5- Radiated Emissions

| | | | |
|---|---|---|---|
| Standard | 47 CFR § 15.209<br>47 CFR § 15.249<br>47 CFR § 15.205<br>RSS-210 Issue 10 2019 | Room Temperature | 24.1 (°C) |
| Test Method | RSS-Gen Issue 5, April 2018<br>ANSI C63,10 2013 | Relative Humidity | 45.7 (% RH) |
| Test Location | Richmond lab | Barometric Pressure | 1013.2 (hPa) |
| Test Engineer | Zara Vali | Date of Test | 17 – 29 May 2023 |

| Test Equipment Used | Manufacturer | Model | Identifier | Calibration | Calibration due |
|---|---|---|---|---|---|
| Spectrum Analyzer | KeySight | N9038A | 702 | 02-Nov-2022 | 02-Nov-2023 |
| Horn Antenna | A.H Systems | SAS-571 | 227C | 13-Sept-2022 | 13-Sept-2024 |
| Broadband Antenna | Sunol | JB1 | 371 | 24-Oct-2022 | 24-Oct-2024 |
| Loop Antenna | ComPower | AL-130 | 241 | 12 January, 2022 | 12 January, 2024 |
| Horn Antenna | A.H Systems | SAS-572 | 227D | NA | NA |
| RF Preamplifier | Agilent | 8449B | 273 | IHC[1] | IHC[1] |
| Low Pass Filter | Mini-Circuts | VLF-1800+ | NA | IHC[1] | IHC[1] |
| High Pass Filter | Mini-Circuts | VHF-3100+ | NA | IHC[1] | IHC[1] |
| RF Cable from antenna to amplifier | MRO | n/a | n/a | IHC[1] | IHC[1] |
| RF Cable from Amplifier to S/A | MRO | n/a | n/a | IHC[1] | IHC[1] |
| EMC Shielded Enclosure | USC | USC-26 | 374 | IHC[1] | IHC[1] |
| Used Template of Tile 7! | | | | | |

Note1) In House Calibration

| | | | | |
|---|---|---|---|---|
| Frequency Range: | ☒ 9kHz-30MHz | ☒ 30-1000MHz | ☒ 1-18GHz | ☒ 18-26GHz |
| Detector: | ☒ Peak | ☒ Quasi-Peak | | |
| RBW/VBW: | ☐ 9/30kHz | ☒ 120/300kHz | ☒ 1/3MHz | |
| Type of Facility: | ☒ SAC | ☒ FAC | ☐ *in-situ* | |
| Distance: | ☒ 3meter | ☐ 10meter | ☐ 1meter | |
| Arrangement of EUT: | ☒ Table-top only | ☐ Floor-standing only | ☐ Rack Mounted | |
| Classification: | ☒ Class B | ☐ Class A | | |
| Compliant ☒ | Non-Compliant ☐ | Not Applicable ☐ | | |

**Test Setup**

This test measures the radiating levels from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Testing was performed in accordance with the test standard(s) referenced in the test summary section of this report. The Equipment Under Test (EUT) was configured based upon the requirements of the applicable test standard. Initially, the primary emission frequencies are identified by positioning a broadband receive antenna three meter from the EUT.

A scan was made with an EMC Analyzer, controlled by EMC Test Software, Tile7!, from 30kHz to 1,000 MHz with the receiver in the peak mode. The receiver IF bandwidth was 9/120 kHz and scan step was about 3/30kHz. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities while the turntable is rotated to determine the worst emitting configuration. Under 30MHz was only tested at 1meter height and Antenna was changed both polarization, Horizontal and Vertical. Measurements were then made using CISPR quasi peak when the peak readings were within 10dB of the limit line. The numerical results are included herein to demonstrate compliance.

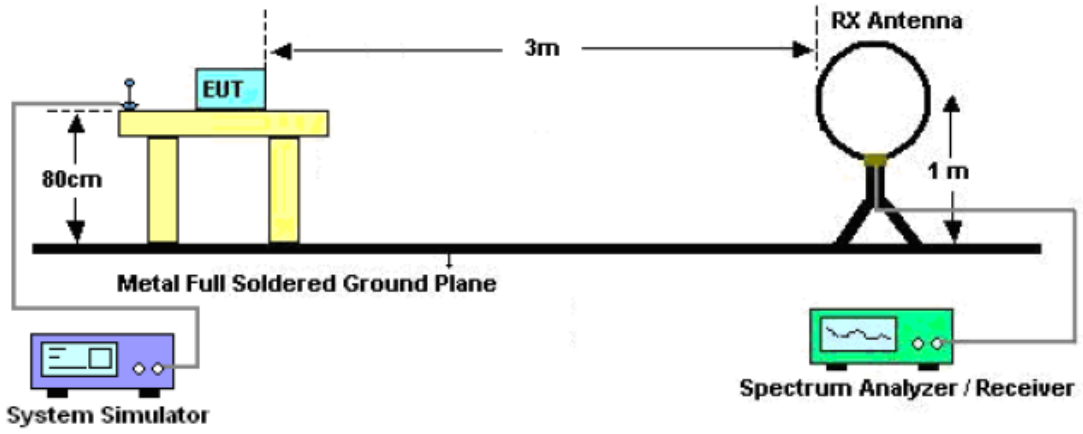
Note. XYZ orthogonal orientations are investigated and the highest emissions for the worstcase orientation are shown here.

The EUT was placed on a 0.8 m non-conducting table above a Turn table in SAC for below 1 GHz.

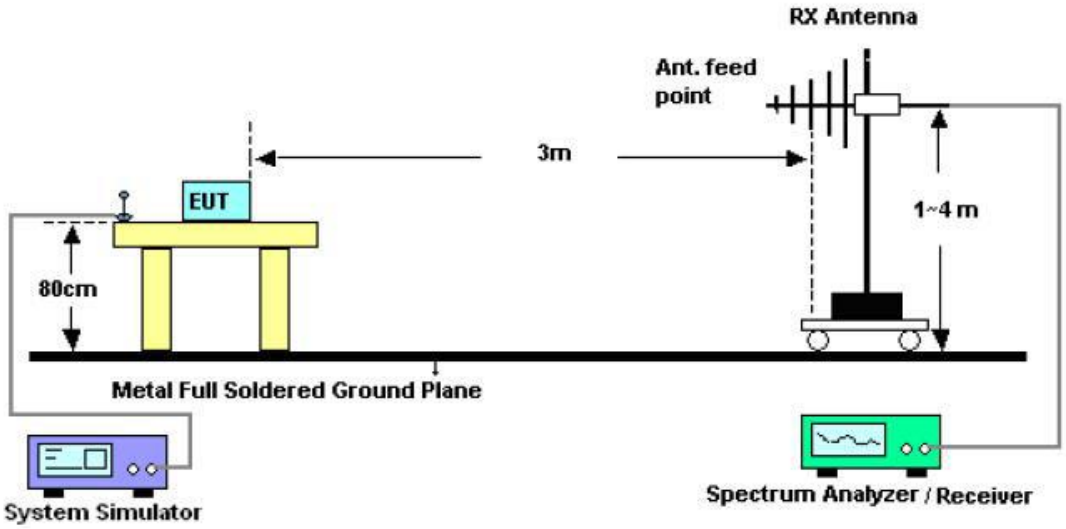
The EUT was placed on a 1.5 m non-conducting table above a Turn table in SAC for above 1 GHz.

The EUT was set to **Operation Mode #1 with configuration Mode #1.**

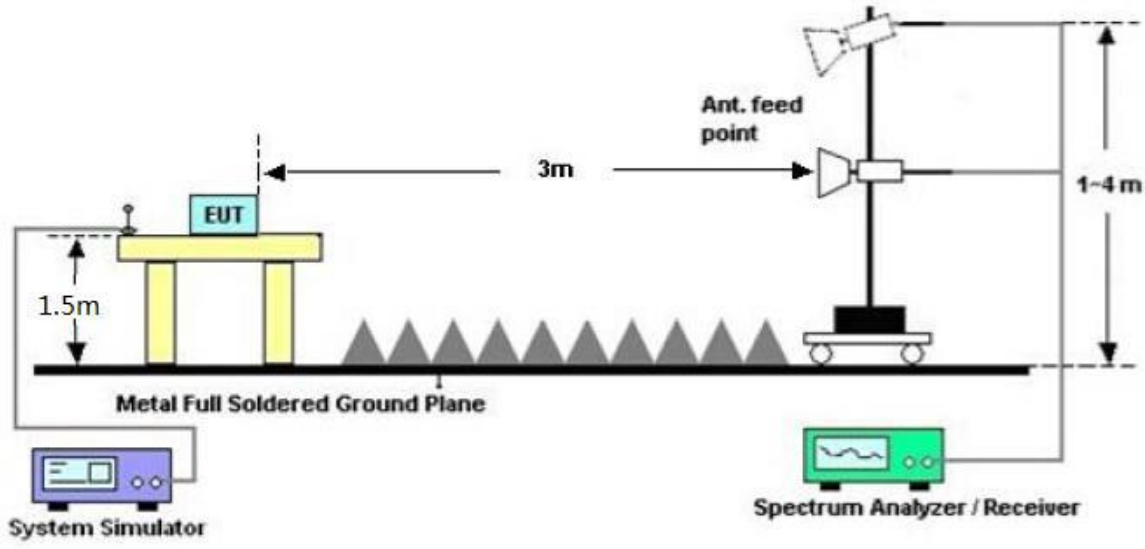
- Radiated Emission below 30MHz, with AL-130



- Radiated Emission 30 to 1,000 MHz with JB-1

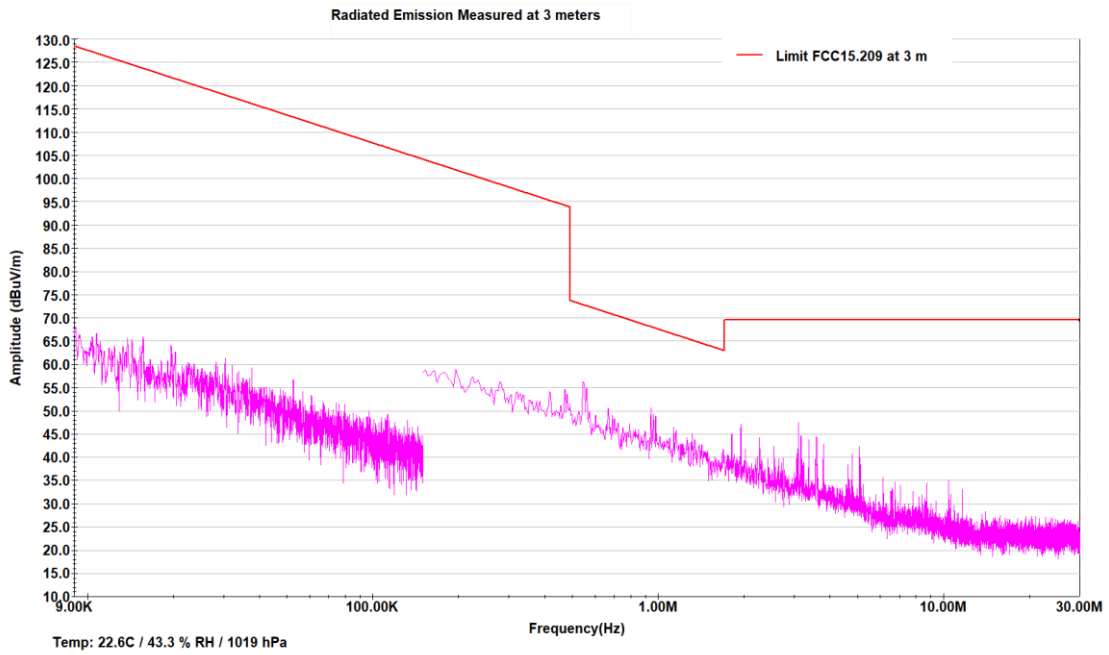



- Radiated Emission 1 to 18GHz, with SAS-571
- Radiated Emission 18 to 26.5 GHz, with SAS-572



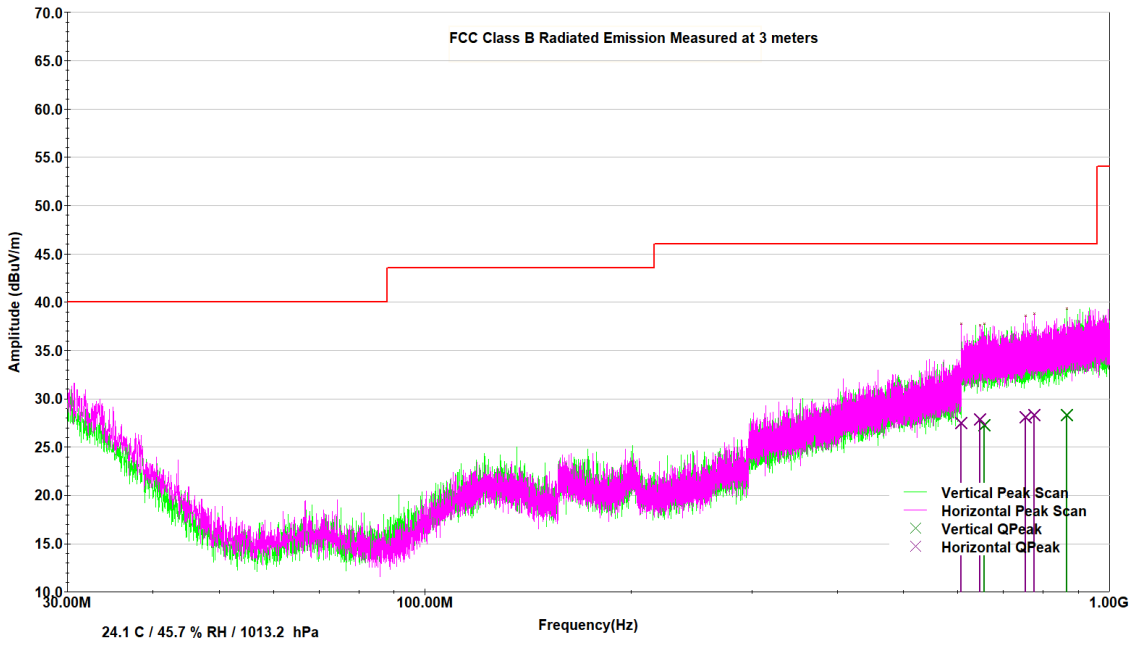
**Test Result**

Graphical Representation for Radiated Emission 9 kHz to 30MHz




Note: The field measurement is more than 20 dB below the limit line or is identified as ambient noise.

Graphical Representation for Radiated Emission 30MHz to 1GHz




| Frequency | Antenna Polarization | Raw QPeak | Antenna Factor | Correction Factor | QPeak | Margin | Limit |
|---|---|---|---|---|---|---|---|
| MHz | V/H | dBuV | dB/m | dB | dBuV/m | dB | dBuV/m |
| 607.6578 | H | 1.5 | 23.6 | 2.4 | 27.5 | 18.5 | 46 |
| 646.5063 | H | 1 | 24.3 | 2.5 | 27.9 | 18.1 | 46 |
| 753.416 | H | -0.1 | 25.4 | 2.7 | 28.1 | 17.9 | 46 |
| 776.7845 | H | -0.1 | 25.7 | 2.7 | 28.3 | 17.7 | 46 |

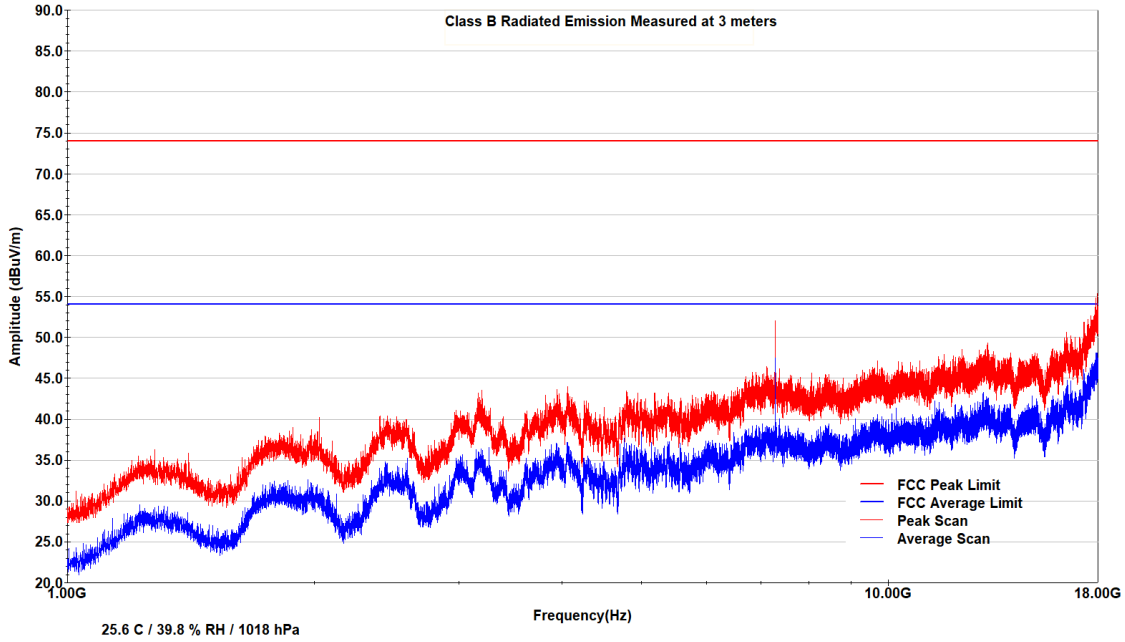
| Frequency | Antenna Polarization | Raw QPeak | Antenna Factor | Correction Factor | QPeak | Margin | Limit |
|---|---|---|---|---|---|---|---|
| MHz | V/H | dBuV | dB/m | dB | dBuV/m | dB | dBuV/m |
| 656.6328 | V | 0.9 | 23.8 | 2.5 | 27.2 | 18.8 | 46 |
| 866.1285 | V | -0.8 | 26.1 | 2.9 | 28.3 | 17.7 | 46 |

Emission level (dBuV/m) = Quasi-Peak detected level (dBuV) +Correction Factor (dB) + Antenna Factor (dB/m)

Correction Factors = Cable Losses (dB)

Note: The frequencies not measured are more than 20 dB below the limit line, or are identified as ambient noise.

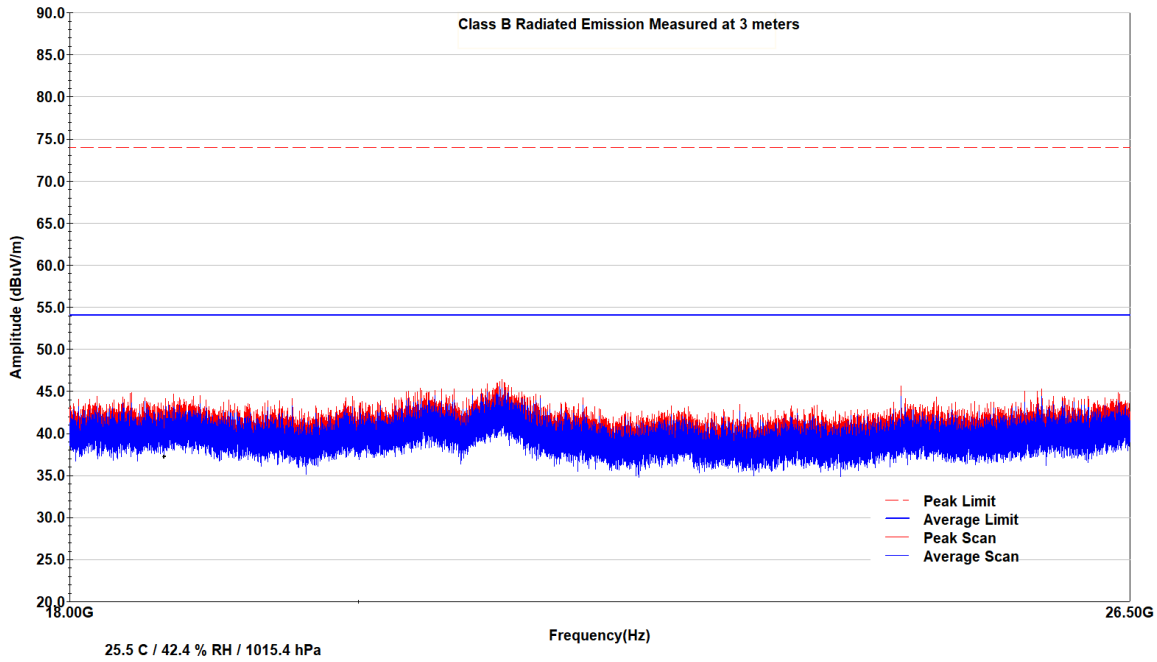
Table Representation for Radiated Emission 1GHz to 18GHz




| Frequency | Antenna Factor | Correction Factor | Raw Average | Average | Average Margin | Average Limit |
|---|---|---|---|---|---|---|
| **MHz** | dB/m | dB | dBuV | dBuV/m | dB | dBuV/m |
| **7275.925** | 37.6 | -21.7 | 16.8 | 32.7 | 21.3 | 54 |
| **17280.98** | 42.5 | -11.5 | 7.3 | 38.4 | 15.6 | 54 |
| **17890.38** | 43.5 | -10 | 8.1 | 41.6 | 12.4 | 54 |

Note: Correction Factor = Cable Loss (dB) - Pre-Amplifier Gain (dB)+ Filter Loss
Note: The frequencies not measured because are more 20 dB below the limit line or are identified as ambient noise.
Note: A high-pass filter with a cutoff frequency of approximately 3.4 GHz and a low-pass filter with a cutoff frequency of approximately 2 GHz were placed between the preamplifier and the measurement antenna to attenuate the 2.4 GHz fundamental signal.

Graphical Representation for Radiated Emission 18 to 26 GHz



## 6- Antenna Requirement

| | | | |
|---|---|---|---|
| Standard | 47 CFR Part 15.203<br>RSS-Gen Issue 5 | Room Temperature (°C) | 24.4 |
| Test Method | Inspection | Relative Humidity (% RH) | 45.9 |
| Test Location | Richmond lab | Barometric Pressure (hPa) | 1013.5 |
| Test Engineer | Zara Vali | Date of Test | 31 May 2023 |
| Compliant ☒ | Non-Compliant ☐ | Not Applicable ☐ | |

**Test Methods**

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**Test Results**

The EUT has an internal wire-loop antenna and is not accessible to the end user. Accordance to the above sections, it is considered sufficient to comply with the provisions of these section. Please see EUT photos for details.

## Annex 1. ISO 17025 ACCREDITATION CERTIFICATE

For complete scope of certification use

**https://labtestcert.com/wp-content/uploads/2023/07/LabTestCertificationCertScope-V017.pdf**

**END OF REPORT**