



## **FCC TEST REPORT**

**FCC ID: SY4-B01016**

On Behalf of

**Shanghai Huace Navigation Technology Ltd.**

**GNSS Data Collector**

**Model No.: LT60, LT60H**

Prepared for : Shanghai Huace Navigation Technology Ltd.  
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.  
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

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Date of Receipt : July 11, 2022  
Date of Test : July 11, 2022-August 17, 2022  
Date of Report : August 17, 2022  
Version Number : V0

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## TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology Ltd.  
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China  
Manufacturer : Shanghai Huace Navigation Technology Ltd.  
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China  
EUT Description : GNSS Data Collector

(A) Model No. LT60, LT60H

(B) Trademark



Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247**

**ANSI C63.10-2013**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Lucas Pang  
Project Engineer

A handwritten signature in black ink, appearing to read 'Lucas Pang', written over a horizontal dotted line.

Approved by (name + signature).....: Jack Xu  
Project Manager

A handwritten signature in black ink, appearing to read 'Jack Xu', written over a horizontal dotted line.

Date of issue.....: August 17, 2022

**Revision History**

| Revision | Issue Date      | Revisions              | Revised By |
|----------|-----------------|------------------------|------------|
| V0       | August 17, 2022 | Initial released Issue | Lucas Pang |

## 1. SUMMARY OF STANDARDS AND RESULTS

### 1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

| Test Item                               | Test Requirement | Standards Paragraph | Result |
|-----------------------------------------|------------------|---------------------|--------|
| Conducted Emission                      | FCC PART 15      | 15.207              | P      |
| 6dB Bandwidth                           | FCC PART 15      | 15.247 (a)(2)       | P      |
| Output Power                            | FCC PART 15      | 15.247 (b)(3)       | P      |
| Radiated Spurious Emission              | FCC PART 15      | 15.247 (c)          | P      |
| Conducted Spurious & Band Edge Emission | FCC PART 15      | 15.247 (d)          | P      |
| Power Spectral Density                  | FCC PART 15      | 15.247 (e)          | P      |
| Radiated Band Edge Emission             | FCC PART 15      | 15.205              | P      |
| Antenna Requirement                     | FCC PART 15      | 15.203              | P      |

Note: 1. P is an abbreviation for Pass.

2. F is an abbreviation for Fail.

3. N/A is an abbreviation for Not Applicable.

4. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.

## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

|                        |                                                                                                                              |
|------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Description            | : GNSS Data Collector                                                                                                        |
| Model Number           | : LT60, LT60H                                                                                                                |
| Diff                   | : All models have the same software and circuit, but GNSS modules are different.<br>All tests are made with the LT60H model. |
| Trademark              | :                                           |
| Power supply           | : DC 5V/9V from adapter with AC 120V/60Hz, DC 3.8V from battery                                                              |
| Radio Technology       | : Bluetooth V5.0 BLE                                                                                                         |
| Operation frequency    | : 2402-2480MHz                                                                                                               |
| Channel No.            | : 40 Channels                                                                                                                |
| Channel spacing        | : 2MHz                                                                                                                       |
| Rate                   | : 1Mbps                                                                                                                      |
| Modulation type        | : GFSK                                                                                                                       |
| Antenna Type           | : Internal antenna, Maximum Gain is 1.3dBi.<br>Antenna information is provided by applicant.                                 |
| Software version       | : LT60_V1.0                                                                                                                  |
| Hardware version       | : V2.0.0                                                                                                                     |
| Connector cable loss   | : N/A                                                                                                                        |
| Intend use environment | : Residential, commercial and light industrial environment                                                                   |

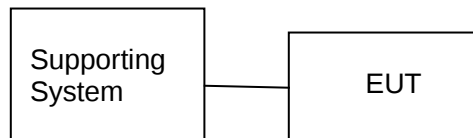
## 2.2. Accessories of Device (EUT)

Accessories : AC Adapter  
 Manufacturer : Shenzhen ACT Industrial Co., Ltd  
 Model : QC18W-G  
 Ratings : Input: 100~240V 50/60Hz 0.5A  
 Output: 5V=3A, 9V=2A, 12V=1.5A

## 2.3. Tested Supporting System Details

| No. | Description | Manufacturer | Model | Serial Number | Certification or SDoC |
|-----|-------------|--------------|-------|---------------|-----------------------|
| 1   | --          | --           | --    | --            | --                    |

## 2.4. Block Diagram of connection between EUT and simulators



## 2.5. Test Mode Description

| Tested mode, channel, and data rate information |              |                 |
|-------------------------------------------------|--------------|-----------------|
| Mode                                            | Channel      | Frequency (MHz) |
| GFSK (1M)                                       | Low :CH1     | 2402            |
|                                                 | Middle: CH20 | 2440            |
|                                                 | High: CH40   | 2480            |

## 2.6. Test Conditions

| Items              | Required  | Actual |
|--------------------|-----------|--------|
| Temperature range: | 15-35℃    | 24℃    |
| Humidity range:    | 25-75%    | 56%    |
| Pressure range:    | 86-106kPa | 980kPa |

## 2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd  
 Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,  
 Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission  
 Registration Number: 293961

July 25, 2017 Certificated by IC  
 Registration Number: CN0085

## 2.8. Measurement Uncertainty

(95% confidence levels, k=2)

| Item                                                                     | Uncertainty          |
|--------------------------------------------------------------------------|----------------------|
| Uncertainty for Power point Conducted Emissions Test                     | 2.74dB               |
| Uncertainty for Radiation Emission test in 3m chamber<br>(below 30MHz)   | 2.13 dB(Polarize: V) |
|                                                                          | 2.57dB(Polarize: H)  |
| Uncertainty for Radiation Emission test in 3m chamber<br>(30MHz to 1GHz) | 3.77dB(Polarize: V)  |
|                                                                          | 3.80dB(Polarize: H)  |
| Uncertainty for Radiation Emission test in 3m chamber<br>(1GHz to 25GHz) | 4.13dB(Polarize: H)  |
|                                                                          | 4.16dB(Polarize: V)  |
| Uncertainty for radio frequency                                          | $5.4 \times 10^{-8}$ |
| Uncertainty for conducted RF Power                                       | 0.37dB               |
| Uncertainty for temperature                                              | 0.2℃                 |
| Uncertainty for humidity                                                 | 1%                   |
| Uncertainty for DC and low frequency voltages                            | 0.06%                |

## 2.9. Test Equipment List

| Equipment                   | Manufacture   | Model No.            | Firmware version | Serial No.                 | Last cal.  | Cal Interval |
|-----------------------------|---------------|----------------------|------------------|----------------------------|------------|--------------|
| 9*6*6 anechoic chamber      | CHENYU        | 9*6*6                | N/A              | N/A                        | 2020.09.02 | 3Year        |
| Spectrum analyzer           | ROHDE&SCHWARZ | FSV40-N              | 2.3              | 102137                     | 2021.08.25 | 1Year        |
| Spectrum analyzer           | Agilent       | N9020A               | A.14.16          | MY499100060                | 2021.08.25 | 1Year        |
| Receiver                    | ROHDE&SCHWARZ | ESR                  | 2.28 SP1         | 1316.3003K03-10<br>2082-Wa | 2021.08.25 | 1Year        |
| Receiver                    | R&S           | ESCI                 | 4.42 SP1         | 101165                     | 2021.08.25 | 1Year        |
| Bilog Antenna               | Schwarzbeck   | VULB 9168            | N/A              | VULB 9168#627              | 2021.08.30 | 2Year        |
| Horn Antenna                | SCHWARZBECK   | BBHA 9120<br>D       | N/A              | 2106                       | 2021.08.30 | 2Year        |
| Active Loop Antenna         | SCHWARZBECK   | FMZB 1519B           | N/A              | 00059                      | 2021.08.30 | 2Year        |
| RF Cable                    | Resenberger   | Cable 1              | N/A              | RE1                        | 2021.08.25 | 1Year        |
| RF Cable                    | Resenberger   | Cable 2              | N/A              | RE2                        | 2021.08.25 | 1Year        |
| RF Cable                    | Resenberger   | Cable 3              | N/A              | CE1                        | 2021.08.25 | 1Year        |
| Pre-amplifier               | HP            | HP8347A              | N/A              | 2834A00455                 | 2021.08.25 | 1Year        |
| Pre-amplifier               | Agilent       | 8449B                | N/A              | 3008A02664                 | 2021.08.25 | 1Year        |
| L.I.S.N.#1                  | Schwarzbeck   | NSLK8126             | N/A              | 8126-466                   | 2021.08.25 | 1Year        |
| L.I.S.N.#2                  | ROHDE&SCHWARZ | ENV216               | N/A              | 101043                     | 2021.08.25 | 1 Year       |
| Horn Antenna                | SCHWARZBECK   | BBHA9170             | N/A              | 00946                      | 2021.08.30 | 2 Year       |
| Preamplifier                | SKET          | LNPA_1840<br>-50     | N/A              | SK2018101801               | 2021.08.25 | 1 Year       |
| Power Meter                 | Agilent       | E9300A               | N/A              | MY41496628                 | 2021.08.25 | 1 Year       |
| Power Sensor                | DARE          | RPR3006W             | N/A              | 15100041SNO91              | 2021.08.25 | 1 Year       |
| Temp. & Humid. Chamber      | Wei Huang     | WHTH-1000<br>-40-880 | N/A              | 100631                     | 2022.04.22 | 1 Year       |
| Switching Mode Power Supply | JUNKE         | JK12010S             | N/A              | 20140927-6                 | 2021.08.25 | 1 Year       |
| Adjustable attenuator       | MWRFTest      | N/A                  | N/A              | N/A                        | N/A        | N/A          |
| 10dB Attenuator             | Mini-Circuits | DC-6G                | N/A              | N/A                        | N/A        | N/A          |

| Software Information |               |              |           |
|----------------------|---------------|--------------|-----------|
| Test Item            | Software Name | Manufacturer | Version   |
| RE                   | EZ-EMC        | EZ           | Alpha-3A1 |
| CE                   | EZ-EMC        | EZ           | Alpha-3A1 |
| RF-CE                | MTS 8310      | MW           | V2.0.0.0  |

### 3. SPURIOUS EMISSION

#### 3.1. Test Limits

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/meter) | Measurement Distance<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009~0.490          | 2400/F(KHz)                          | 300                              |
| 0.490~1.705          | 24000/F(KHz)                         | 30                               |
| 1.705~30.0           | 30                                   | 30                               |
| 30~88                | 100                                  | 3                                |
| 88~216               | 150                                  | 3                                |
| 216~960              | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other 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 comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

**NOTE:**

- a) The tighter limit applies at the band edges.
- b) Emission Level(dB uV/m)=20log Emission Level(uv/m)

#### 3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency up to 1GH and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above1GHz testing, The table was rotated 360 degrees to determine the position of the highest radiation

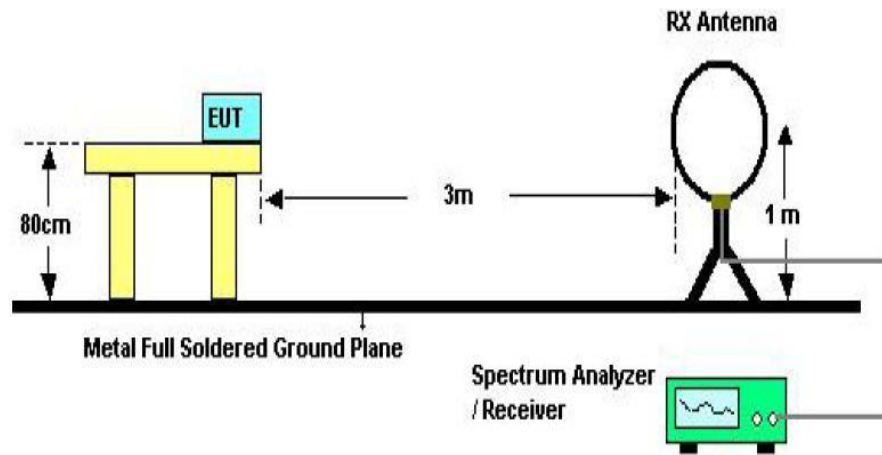
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured

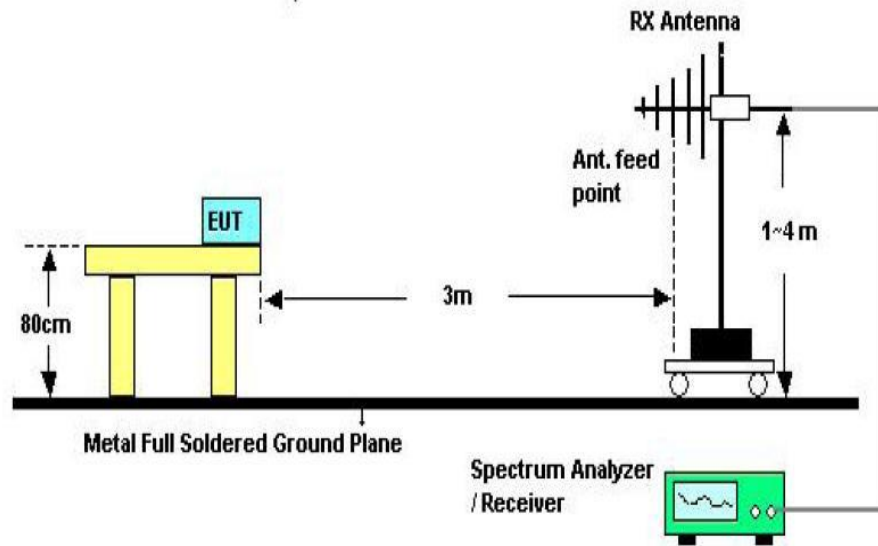
If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

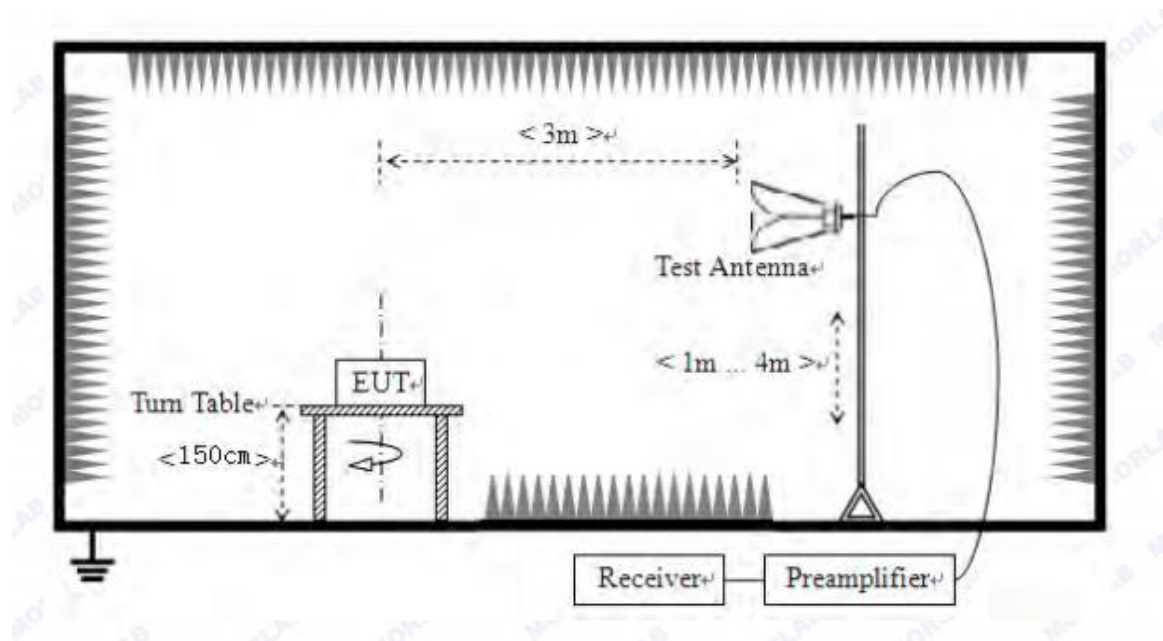
### 3.3. Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

### 3.4. Test Results

#### Test Condition

Continual Transmitting in maximum power.

|              |           |            |
|--------------|-----------|------------|
| 9KHz~150KHz  | RBW200Hz  | VBW1KHz    |
| 150KHz~30MHz | RBW9KHz   | VBW 30KHz  |
| 30MHz~1GHz   | RBW120KHz | VBW 300KHz |
| Above1GHz    | RBW1MHz   | VBW 3MHz   |

We have scanned the 10th harmonic from 9 kHz to the EUT.

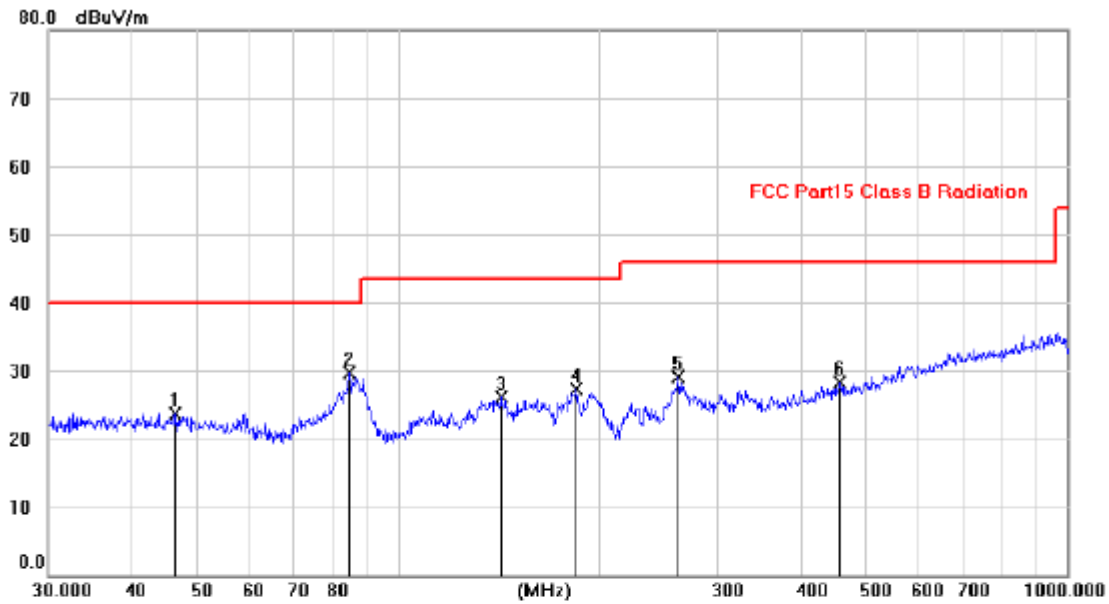
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: 1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

2. Only show the test data of the worst Channel in this report.

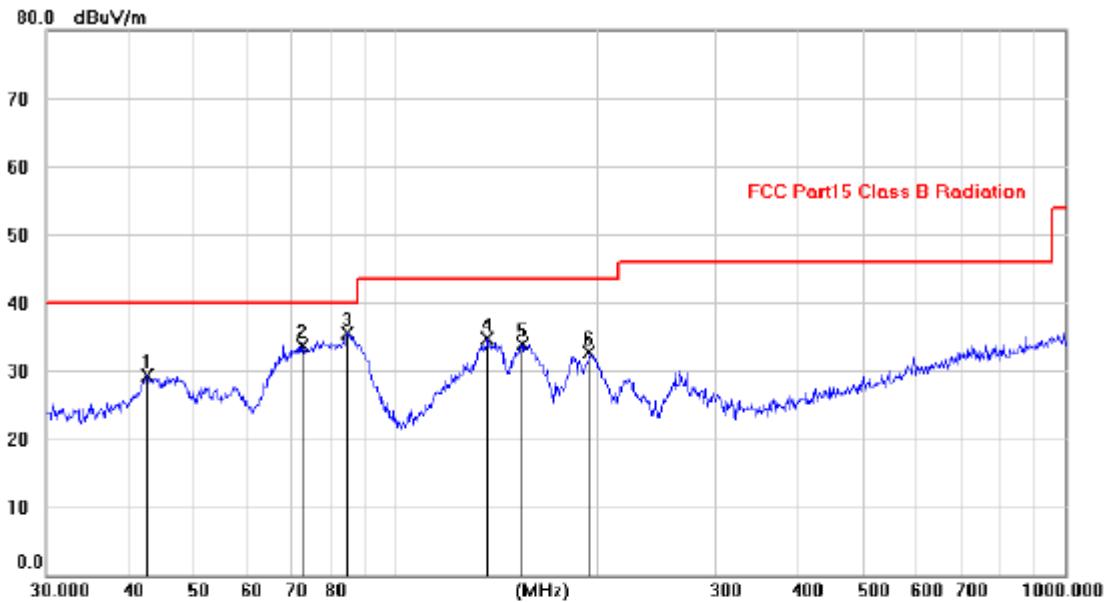
## Antenna polarity: Horizontal



| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit  | Margin | Antenna | Table  |         |
|-----|-----|----------|---------|---------|----------|--------|--------|---------|--------|---------|
|     |     | MHz      | Level   | Factor  | ment     |        |        | Height  | Degree |         |
|     |     |          | dBuV    | dB      | dBuV/m   | dBuV/m | dB     | cm      | degree | Comment |
| 1   |     | 46.6010  | 9.65    | 14.09   | 23.74    | 40.00  | -16.26 | peak    |        |         |
| 2   | *   | 84.6722  | 19.74   | 9.97    | 29.71    | 40.00  | -10.29 | peak    |        |         |
| 3   |     | 142.6075 | 11.56   | 14.51   | 26.07    | 43.50  | -17.43 | peak    |        |         |
| 4   |     | 184.6408 | 15.15   | 12.12   | 27.27    | 43.50  | -16.23 | peak    |        |         |
| 5   |     | 262.4043 | 16.02   | 13.05   | 29.07    | 46.00  | -16.93 | peak    |        |         |
| 6   |     | 456.0657 | 10.74   | 17.62   | 28.36    | 46.00  | -17.64 | peak    |        |         |

Note: 1. \*:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

**Antenna polarity: Vertical**

| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit  | Margin | Antenna | Table  |         |
|-----|-----|----------|---------|---------|----------|--------|--------|---------|--------|---------|
|     |     | MHz      | Level   | Factor  | ment     |        |        | Height  | Degree |         |
|     |     |          | dBuV    | dB      | dBuV/m   | dBuV/m | dB     | cm      | degree | Comment |
| 1   |     | 42.5950  | 15.04   | 14.28   | 29.32    | 40.00  | -10.68 | peak    |        |         |
| 2   |     | 72.3968  | 22.67   | 10.99   | 33.66    | 40.00  | -6.34  | peak    |        |         |
| 3   | *   | 84.4054  | 25.50   | 9.96    | 35.46    | 40.00  | -4.54  | peak    |        |         |
| 4   |     | 137.4042 | 20.53   | 14.12   | 34.65    | 43.50  | -8.85  | peak    |        |         |
| 5   |     | 154.4049 | 18.86   | 15.05   | 33.91    | 43.50  | -9.59  | peak    |        |         |
| 6   |     | 194.5898 | 21.40   | 11.21   | 32.61    | 43.50  | -10.89 | peak    |        |         |

Note: 1. \*: Maximum data; x: Over limit; !: over margin.

2. Measurement = Reading Level + Correct Factor; Correct Factor = Antenna Factor + Cable Loss.

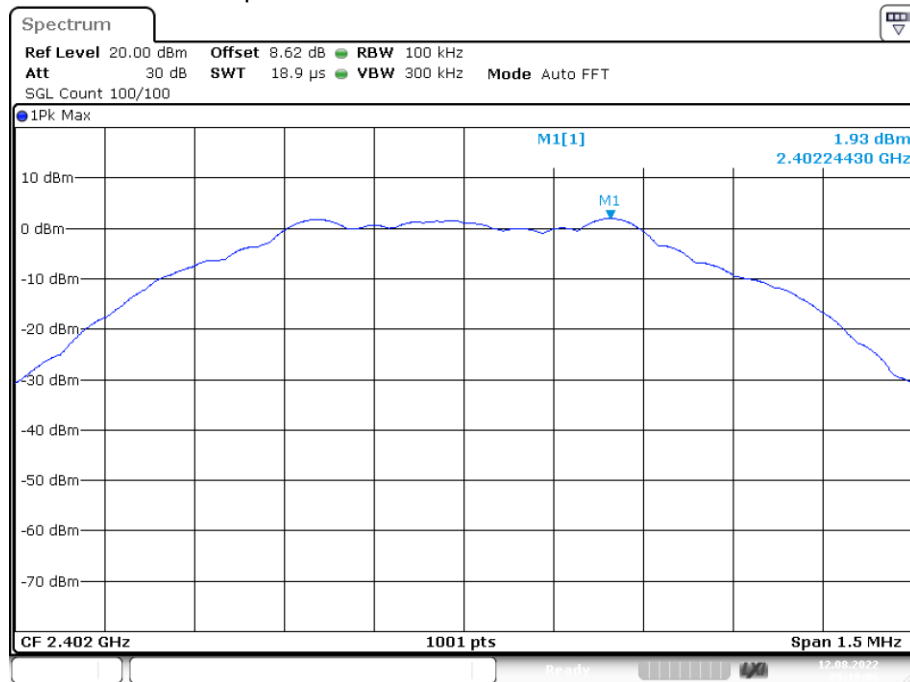
**Notes:** Above is below 1GHz test data. This report only shall the worst case mode for TX 2402MHz.

From 1G-25GHz

| Test Mode: TX Low                                                                                                                                                             |                     |             |                       |                |                 |                 |                |             |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------|-----------------------|----------------|-----------------|-----------------|----------------|-------------|--------|
| Freq (MHz)                                                                                                                                                                    | Read Level (dBuV/m) | Polar (H/V) | Antenna Factor (dB/m) | Cable loss(dB) | Amp Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
| 4804                                                                                                                                                                          | 46.49               | V           | 33.95                 | 10.18          | 34.26           | 56.36           | 74             | -17.64      | PK     |
| 4804                                                                                                                                                                          | 35.00               | V           | 33.95                 | 10.18          | 34.26           | 44.87           | 54             | -9.13       | AV     |
| 7206                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9608                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4804                                                                                                                                                                          | 47.76               | H           | 33.95                 | 10.18          | 34.26           | 57.63           | 74             | -16.37      | PK     |
| 4804                                                                                                                                                                          | 34.36               | H           | 33.95                 | 10.18          | 34.26           | 44.23           | 54             | -9.77       | AV     |
| 7206                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9608                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| Test Mode: TX Mid                                                                                                                                                             |                     |             |                       |                |                 |                 |                |             |        |
| 4880                                                                                                                                                                          | 49.47               | V           | 33.95                 | 10.18          | 34.26           | 59.34           | 74             | -14.66      | PK     |
| 4880                                                                                                                                                                          | 34.68               | V           | 33.95                 | 10.18          | 34.26           | 44.55           | 54             | -9.45       | AV     |
| 7320                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9760                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4880                                                                                                                                                                          | 48.89               | H           | 33.95                 | 10.18          | 34.26           | 58.76           | 74             | -15.24      | PK     |
| 4880                                                                                                                                                                          | 32.06               | H           | 33.95                 | 10.18          | 34.26           | 41.93           | 54             | -12.07      | AV     |
| 7320                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9760                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| Test Mode: TX High                                                                                                                                                            |                     |             |                       |                |                 |                 |                |             |        |
| 4960                                                                                                                                                                          | 46.87               | V           | 33.98                 | 10.22          | 34.25           | 56.82           | 74             | -17.18      | PK     |
| 4960                                                                                                                                                                          | 33.28               | V           | 33.98                 | 10.22          | 34.25           | 43.23           | 54             | -10.77      | AV     |
| 7440                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9920                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4960                                                                                                                                                                          | 47.99               | H           | 33.98                 | 10.22          | 34.25           | 57.94           | 74             | -16.06      | PK     |
| 4960                                                                                                                                                                          | 32.34               | H           | 33.98                 | 10.22          | 34.25           | 42.29           | 54             | -11.71      | AV     |
| 7440                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9920                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| Note:<br>1, Result = Read level + Antenna factor + cable loss-Amp factor<br>2, All the other emissions not reported were too low to read and deemed to comply with FCC limit. |                     |             |                       |                |                 |                 |                |             |        |

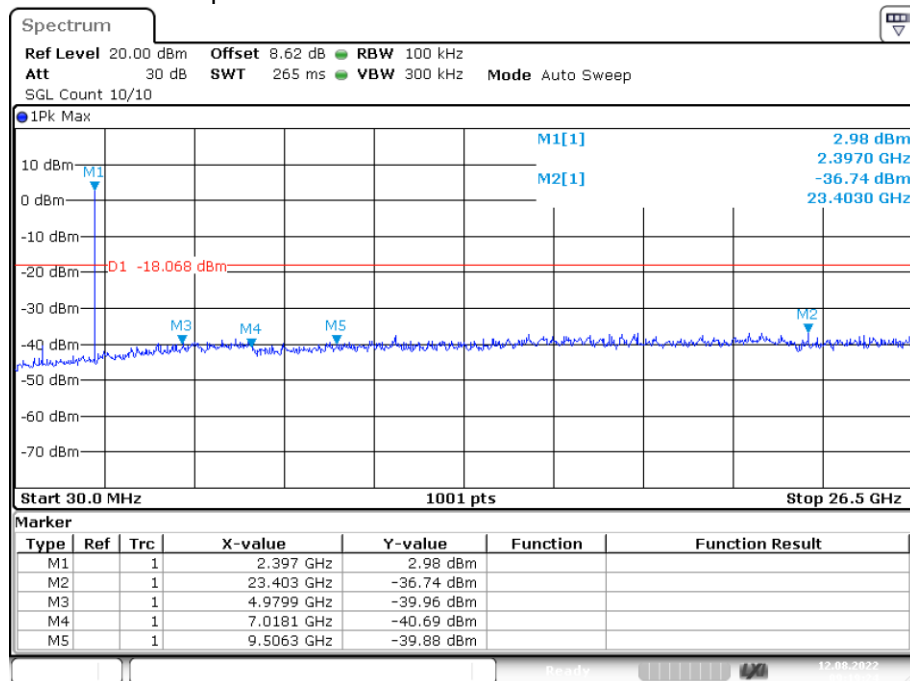
**Conducted RF Spurious Emission**

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref



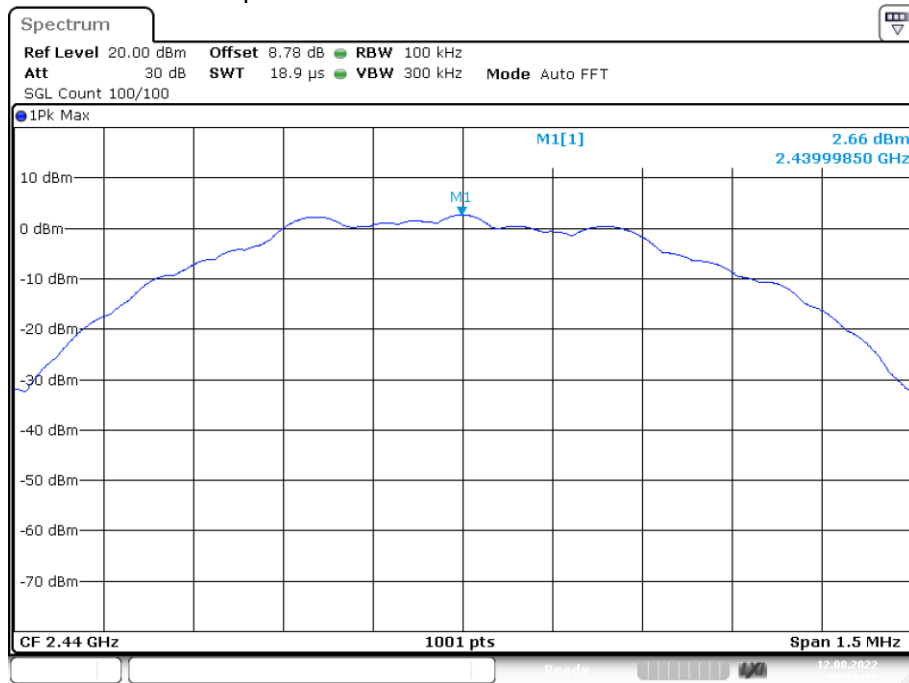
Date: 12.AUG.2022 09:19:06

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



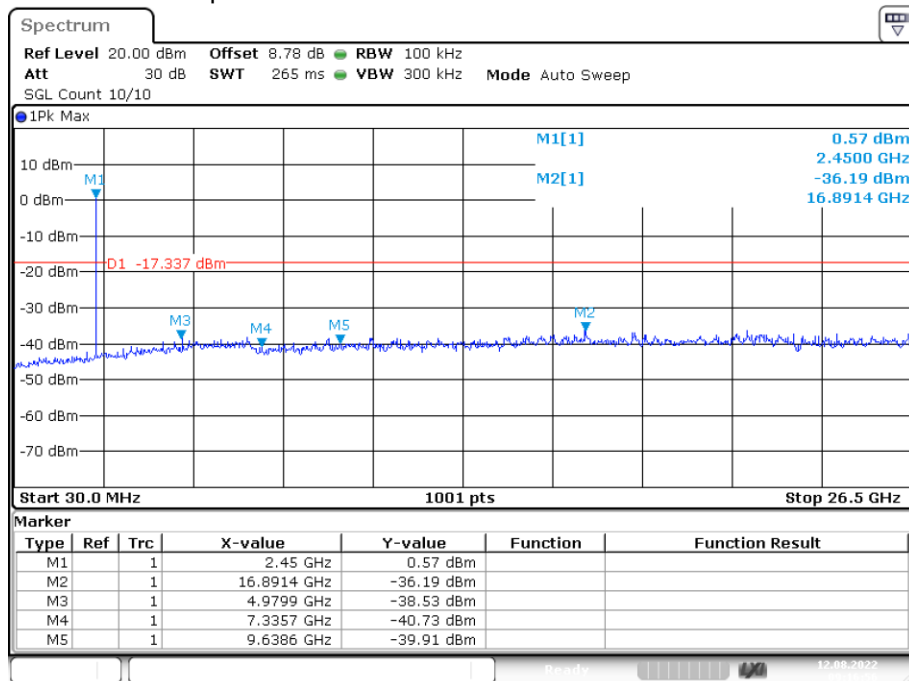
Date: 12.AUG.2022 09:19:24

## Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Ref



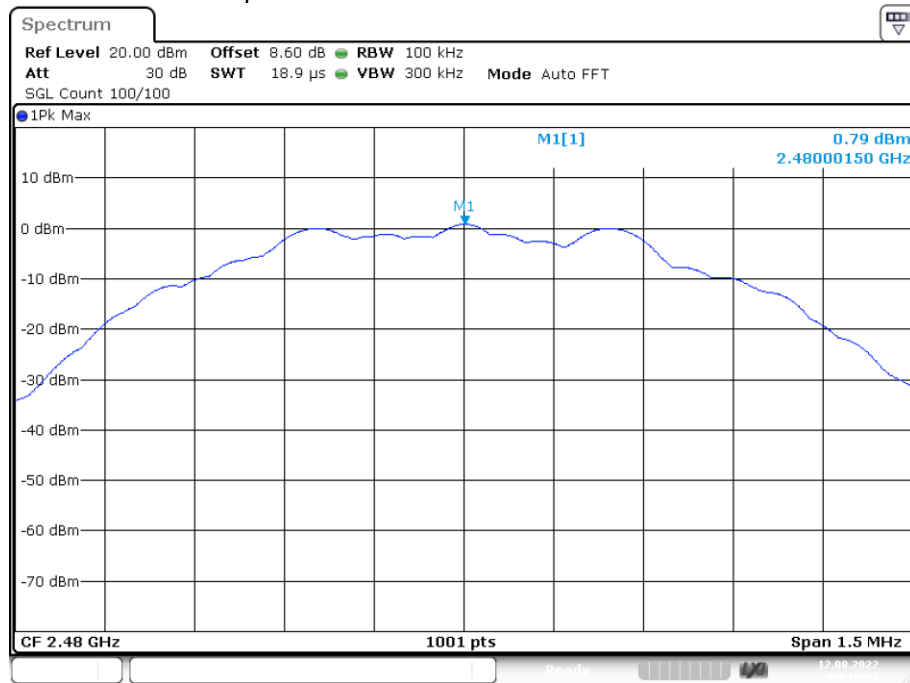
Date: 12.AUG.2022 09:16:38

## Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission



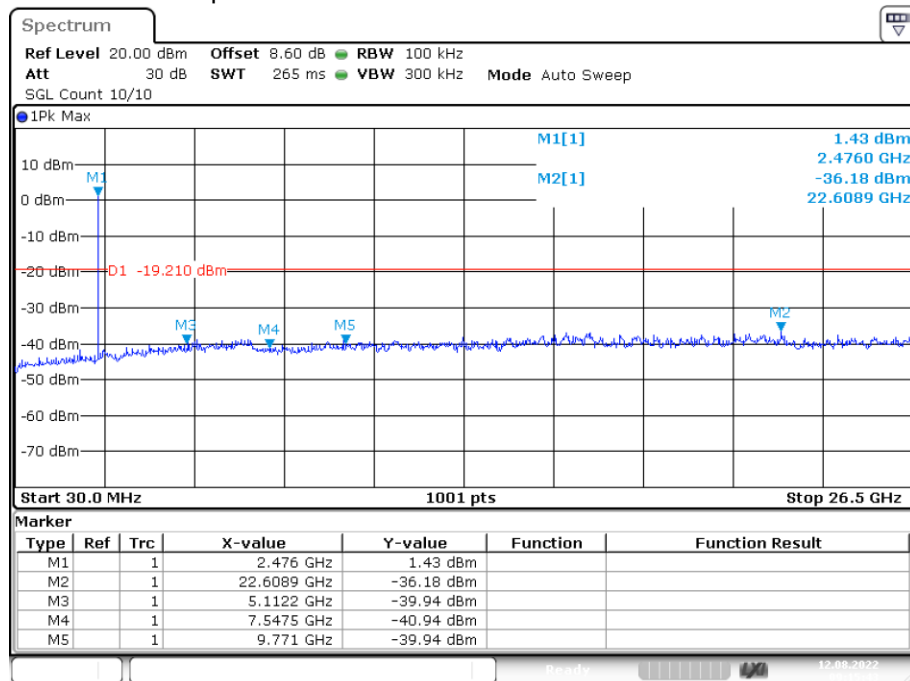
Date: 12.AUG.2022 09:16:56

## Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



Date: 12.AUG.2022 09:15:25

## Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



Date: 12.AUG.2022 09:15:43

## 4. POWER LINE CONDUCTED EMISSION

### 4.1. Test Limits

| Frequency<br>MHz | Limits dB( $\mu$ V) |               |
|------------------|---------------------|---------------|
|                  | Quasi-peak Level    | Average Level |
| 0.15 -0.50       | 66 -56*             | 56 - 46*      |
| 0.50 -5.00       | 56                  | 46            |
| 5.00 -30.00      | 60                  | 50            |

Notes: 1. \*Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

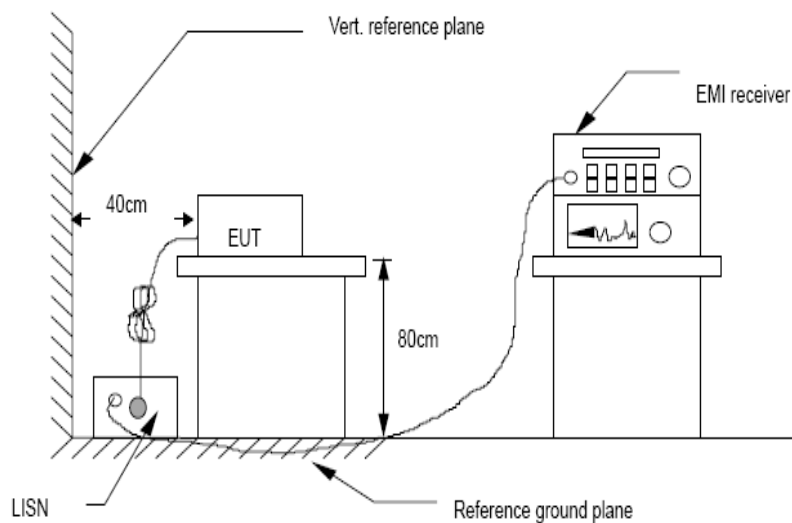
3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

### 4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.

The bandwidth of test receiver is set at 9 kHz.

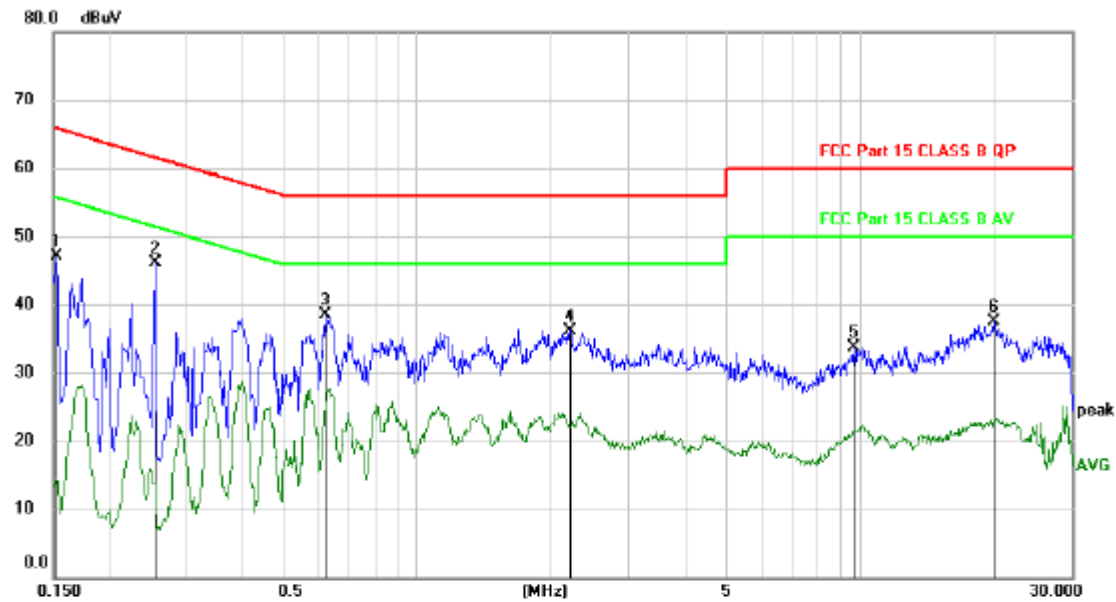
### 4.3. Test Setup



### 4.4. Test Results

Pass

Polarity: L



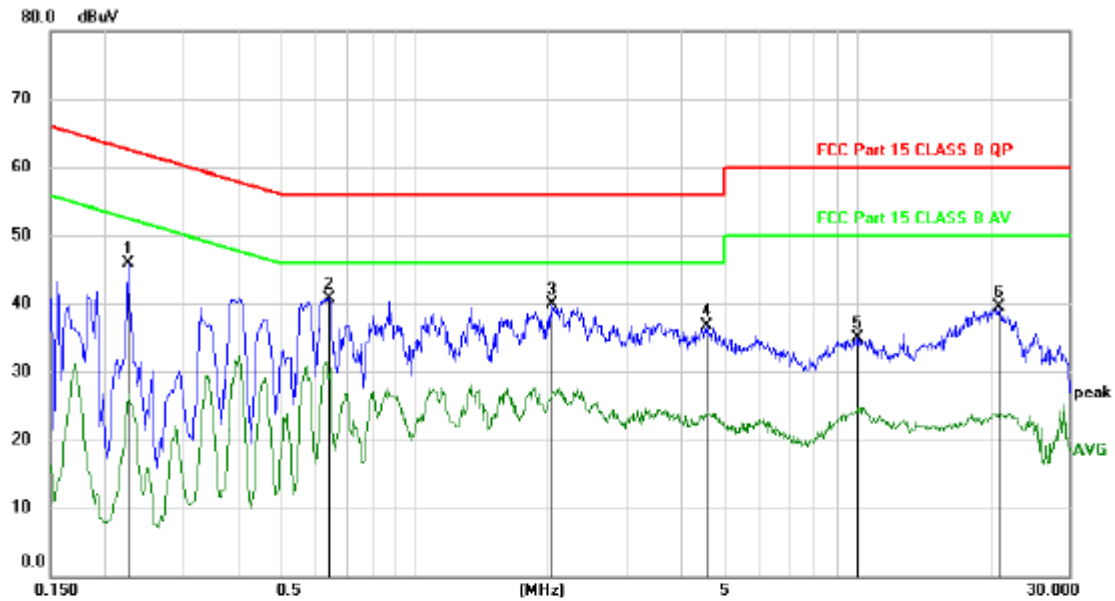
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1   |     | 0.1530       | 37.17                    | 9.94                    | 47.11                    | 65.84         | -18.73       | peak     |         |
| 2   | *   | 0.2550       | 36.15                    | 9.96                    | 46.11                    | 61.59         | -15.48       | peak     |         |
| 3   |     | 0.6180       | 28.54                    | 9.92                    | 38.46                    | 56.00         | -17.54       | peak     |         |
| 4   |     | 2.2080       | 26.25                    | 9.89                    | 36.14                    | 56.00         | -19.86       | peak     |         |
| 5   |     | 9.6600       | 23.58                    | 10.20                   | 33.78                    | 60.00         | -26.22       | peak     |         |
| 6   |     | 19.9980      | 26.98                    | 10.47                   | 37.45                    | 60.00         | -22.55       | peak     |         |

\*:Maximum data    x:Over limit    !:over margin

(Reference Only)

Note: Measurement=Reading Level+Correc Factor.    Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

## Polarity: N



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1   |     | 0.2250       | 36.05                    | 9.94                    | 45.99                    | 62.63         | -16.64       | peak     |         |
| 2   | *   | 0.6419       | 30.75                    | 9.92                    | 40.67                    | 56.00         | -15.33       | peak     |         |
| 3   |     | 2.0490       | 30.06                    | 9.88                    | 39.94                    | 56.00         | -16.06       | peak     |         |
| 4   |     | 4.5930       | 26.60                    | 10.01                   | 36.61                    | 56.00         | -19.39       | peak     |         |
| 5   |     | 10.0050      | 24.70                    | 10.21                   | 34.91                    | 60.00         | -25.09       | peak     |         |
| 6   |     | 20.8770      | 29.12                    | 10.46                   | 39.58                    | 60.00         | -20.42       | peak     |         |

\*:Maximum data    x:Over limit    !:over margin

(Reference Only)

Note: Measurement=Reading Level+Correc Factor.    Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Note: All modes and channels have been tested and only the LE 2402MHz mode with the worst data is listed.

## 5. CONDUCTED MAXIMUM OUTPUT POWER

### 5.1. Test limits

Please refer section RSS-247 & 15.247.

### 5.2. Test Procedure

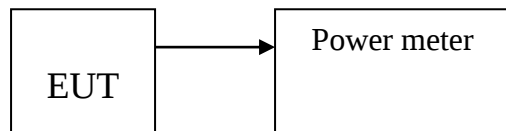
Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

### 5.3. Test Setup



### 5.4. Test Results

GFSK(1M)

| Channel | Frequency (MHz) | PK Output Power (dBm) | PK Output Power (mW) | Limit (dBm) | Result |
|---------|-----------------|-----------------------|----------------------|-------------|--------|
| CH1     | 2402            | 2.872                 | 1.937                | 30          | Pass   |
| CH20    | 2440            | 3.172                 | 2.076                | 30          | Pass   |
| CH40    | 2480            | 1.08                  | 1.282                | 30          | Pass   |

## 6. PEAK POWER SPECTRAL DENSITY

### 6.1. Test limits

6.1.1 Please refer section RSS-247 & 15.247.

6.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

### 6.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

6.2.1 Place the EUT on the table and set it in transmitting mode.

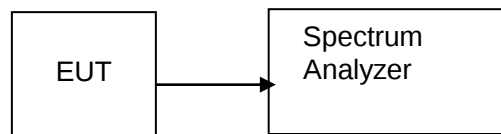
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as  $RBW = 3\text{kHz}$  (Set the RBW to:  $3\text{ kHz} \leq RBW \leq 100\text{ kHz}$ .),  $VBW = 10\text{kHz}$  (Set the  $VBW \geq 3 \times RBW$ ),  $\text{span} = 1.5 \times \text{DTS bandwidth}$ ., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

### 6.3. Test Setup



### 6.4. Test Results

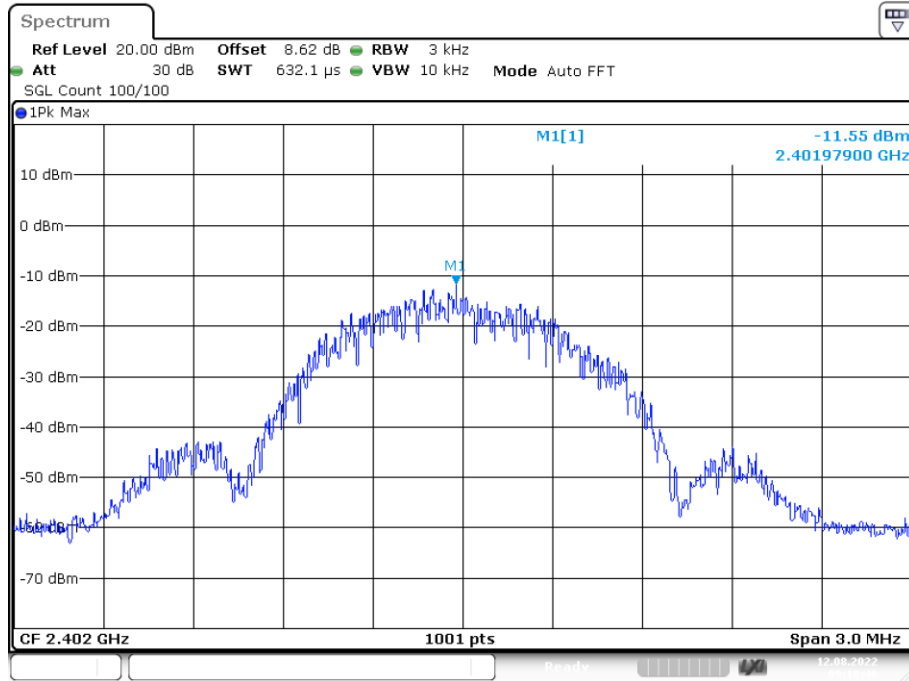
Pass

The test results are listed in next pages.

## GFSK (1M)

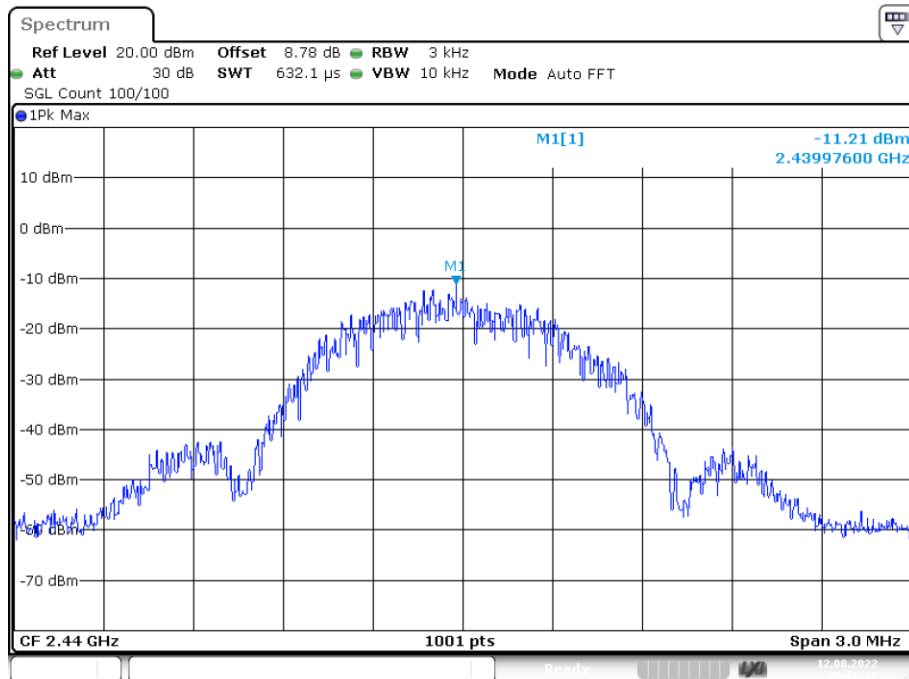
| Condition | Mode | Frequency (MHz) | Antenna | Max PSD (dBm/3kHz) | Limit (dBm/3kHz) | Verdict |
|-----------|------|-----------------|---------|--------------------|------------------|---------|
| NVNT      | BLE  | 2402            | Ant 1   | -11.553            | 8                | Pass    |
| NVNT      | BLE  | 2440            | Ant 1   | -11.207            | 8                | Pass    |
| NVNT      | BLE  | 2480            | Ant 1   | -13.566            | 8                | Pass    |

PSD NVNT BLE 1M 2402MHz Ant1



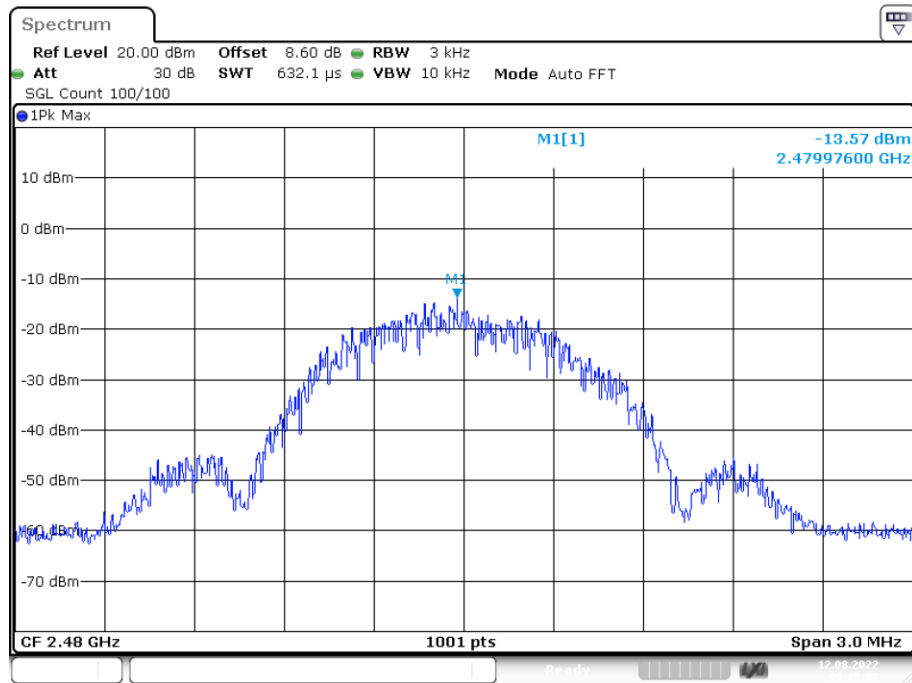
Date: 12.AUG.2022 09:18:45

PSD NVNT BLE 1M 2440MHz Ant1



Date: 12.AUG.2022 09:16:31

## PSD NVNT BLE 1M 2480MHz Ant1



Date: 12.AUG.2022 09:15:07

## 7. BANDWIDTH

### 7.1. Test limits

Please refer section RSS-247 & 15.247

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

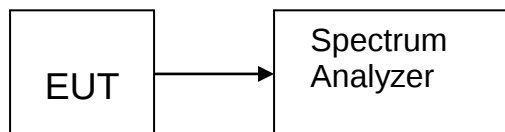
### 7.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

b) The test receiver set RBW = 100kHz, VBW $\geq$ 3\*RBW =300kHz, sweep time set auto, detail see the test plot.

### 7.3. Test Setup

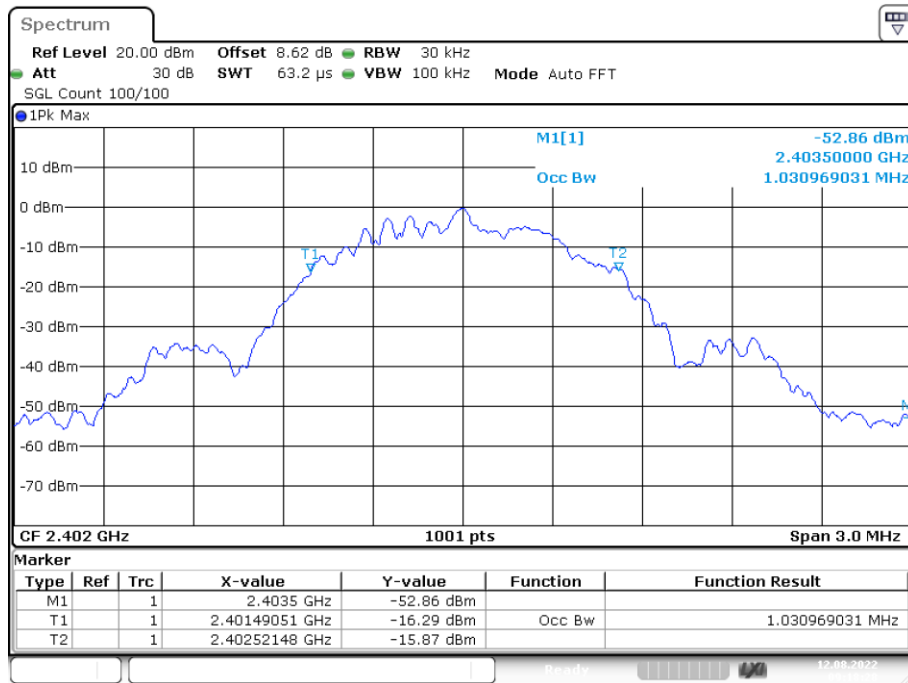


### 7.4. Test Results

GFSK(1M)

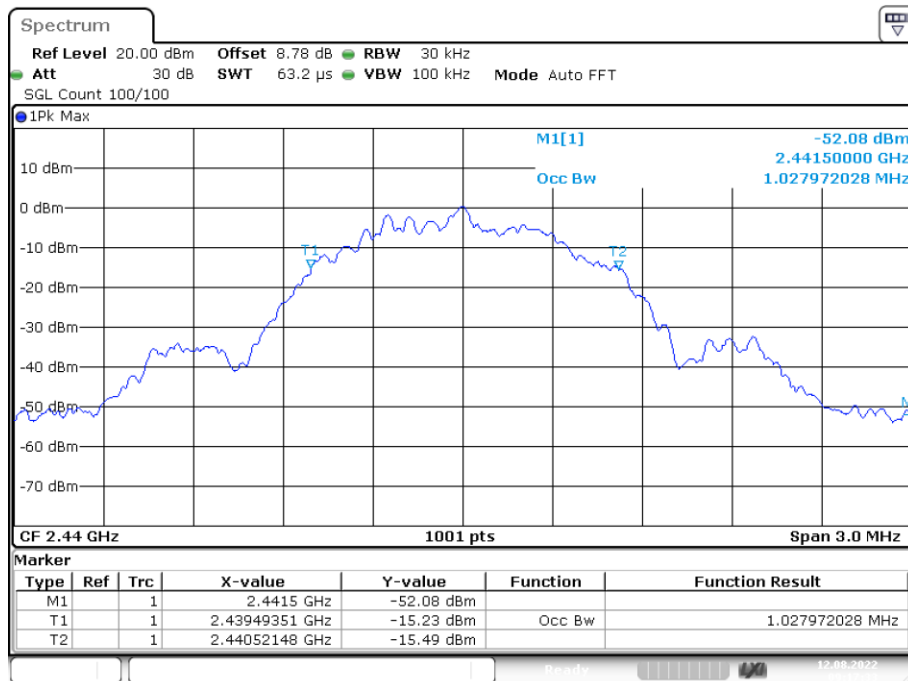
| Condition | Mode | Frequency (MHz) | Antenna | 99% OBW (MHz) | -6 dB Bandwidth (MHz) | Limit -6 dB Bandwidth (MHz) | Verdict |
|-----------|------|-----------------|---------|---------------|-----------------------|-----------------------------|---------|
| NVNT      | BLE  | 2402            | Ant 1   | 1.031         | 0.664                 | 0.5                         | Pass    |
| NVNT      | BLE  | 2440            | Ant 1   | 1.028         | 0.753                 | 0.5                         | Pass    |
| NVNT      | BLE  | 2480            | Ant 1   | 1.037         | 0.656                 | 0.5                         | Pass    |

## OBW NVNT BLE 1M 2402MHz Ant1



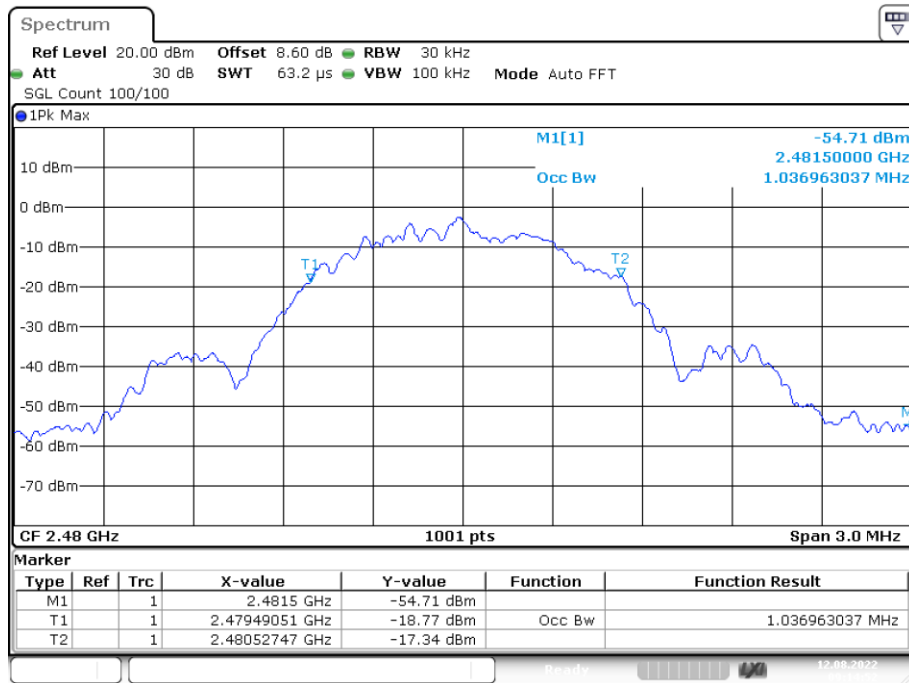
Date: 12.AUG.2022 09:18:28

## OBW NVNT BLE 1M 2440MHz Ant1



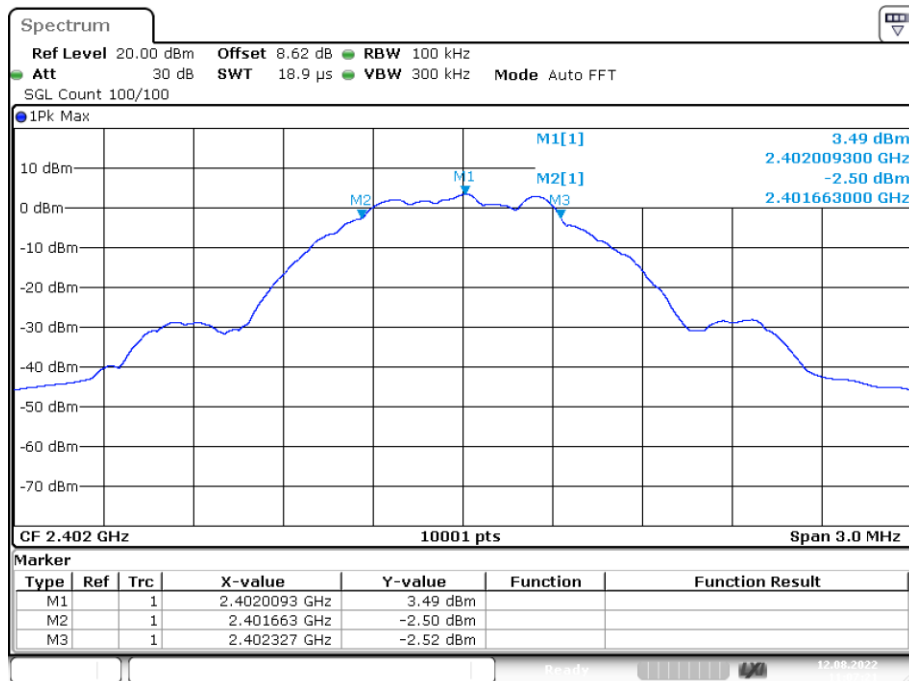
Date: 12.AUG.2022 09:17:33

## OBW NVNT BLE 1M 2480MHz Ant1



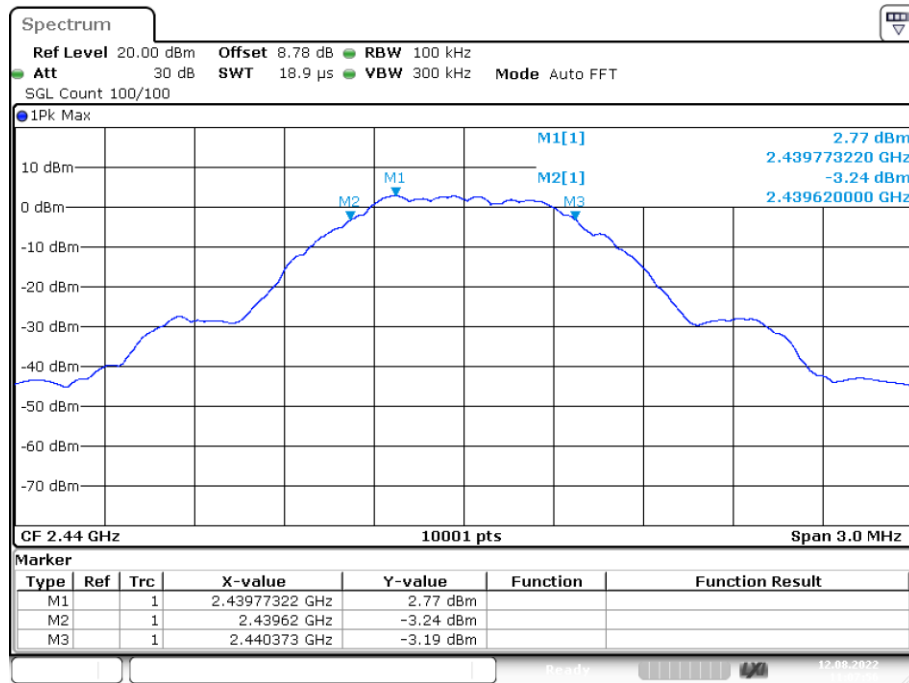
Date: 12.AUG.2022 09:14:52

## -6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



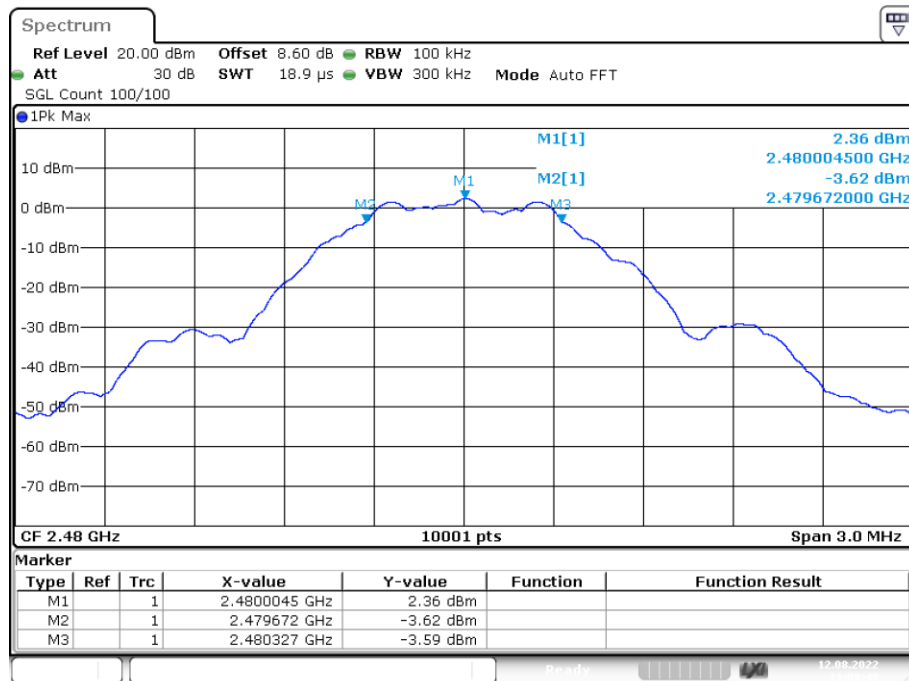
Date: 12.AUG.2022 11:07:21

## -6dB Bandwidth NVNT BLE 1M 2440MHz Ant1



Date: 12.AUG.2022 11:07:55

## -6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



Date: 12.AUG.2022 11:09:48

## **8. BAND EDGE CHECK**

### **8.1. Test limits**

Please refer section RSS-GEN&15.247.

### **8.2. Test Procedure**

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

8.2.1 Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value, RBW 1MHz, VBW 3MHz, RMS detector for AV value.

### **8.3. Test Setup**

Same as 5.2.2.

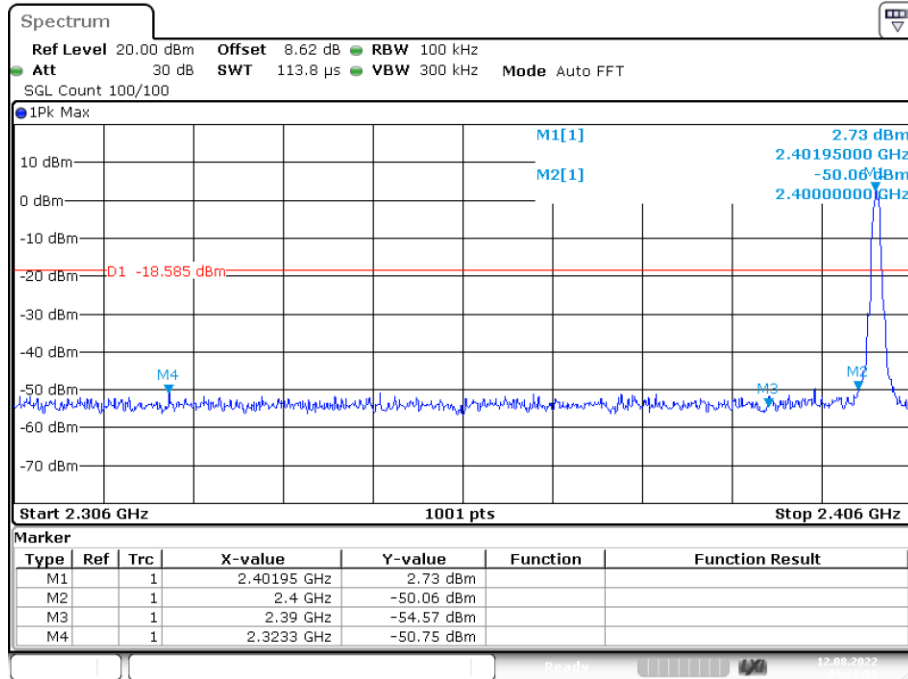
### **8.4. Test Results**

Pass

The test results are listed in next pages.

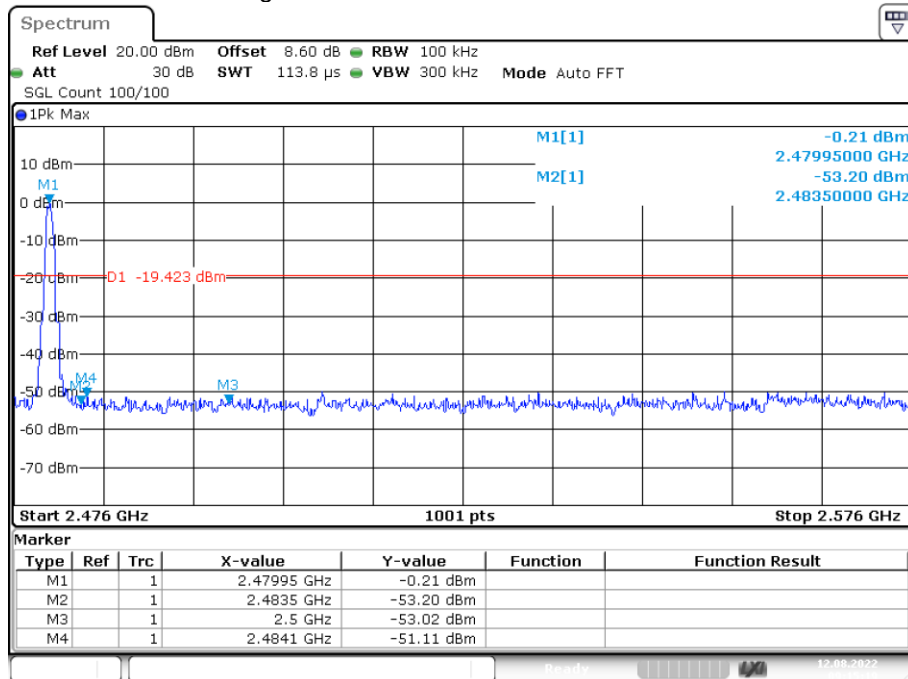
GFSK (1M)

## Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



Date: 12.AUG.2022 09:18:59

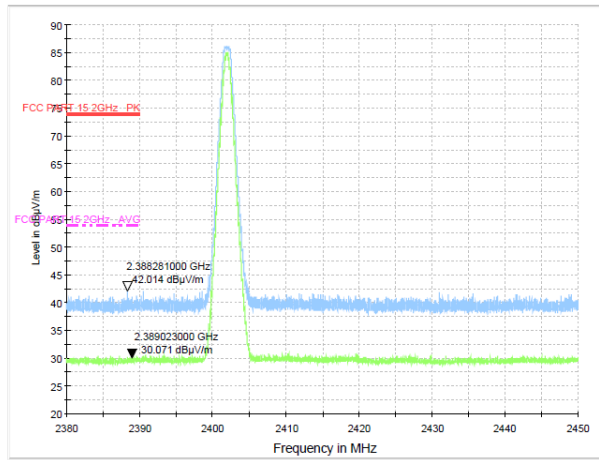
## Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



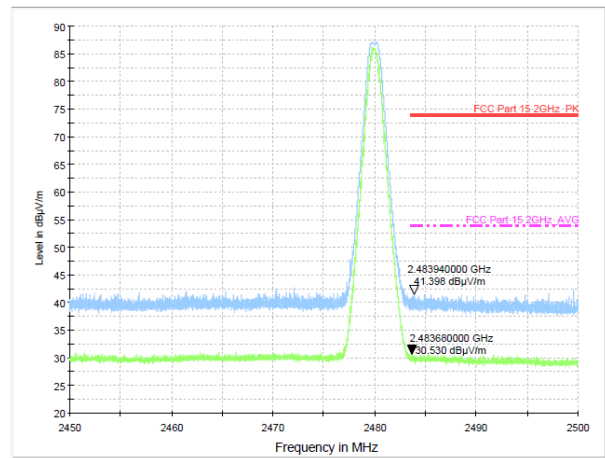
Date: 12.AUG.2022 09:15:19

Radiated Method: GFSK(1M)

Test Mode: CH-L



Test Mode: CH-H



## **9. ANTENNA REQUIREMENT**

### **9.1. Standard Requirement**

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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### **9.2. Antenna Connected Construction**

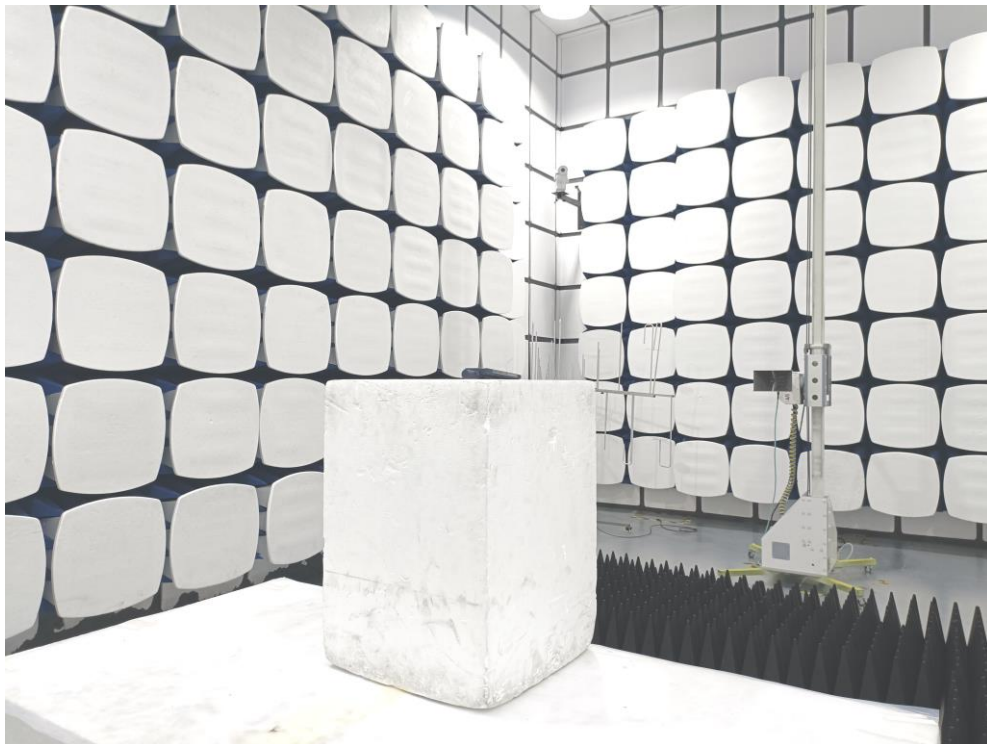
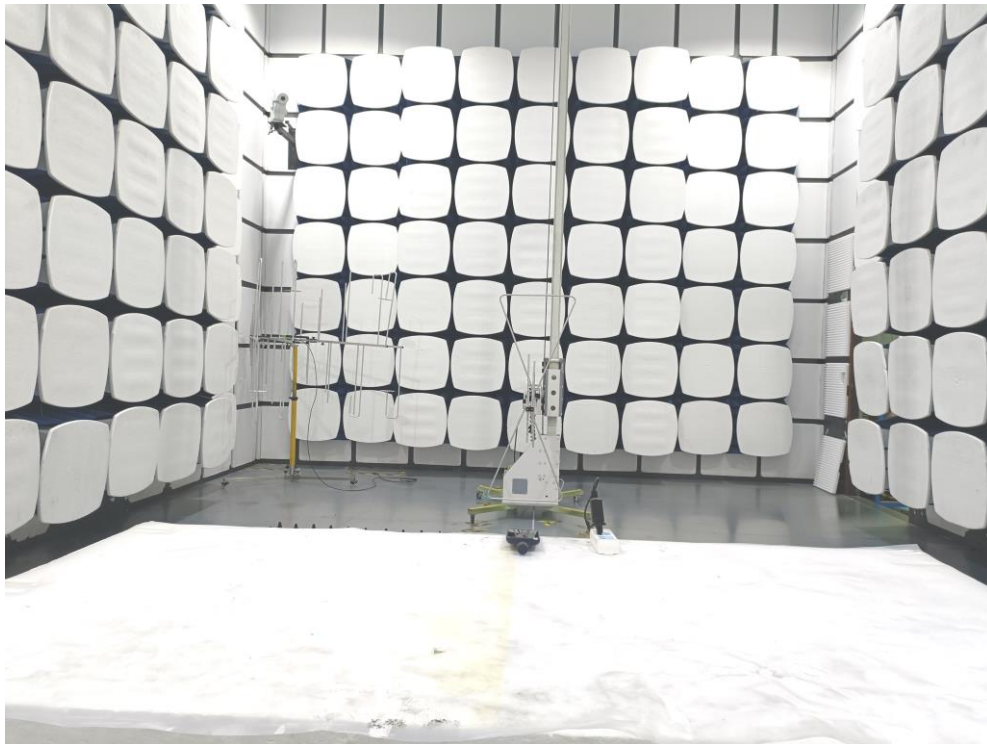
The antenna is internal antenna and no consideration of replacement. Please see EUT photo for details.

### **9.3. Results**

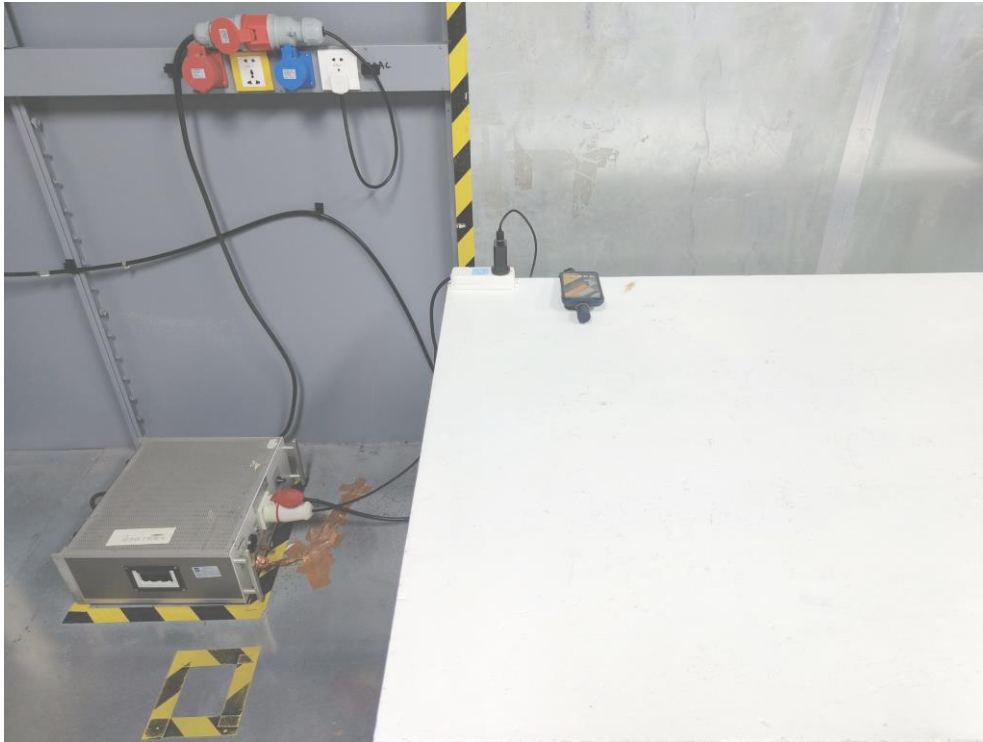
The EUT antenna is Internal Antenna. It complies with the standard requirement.

## 10. TEST SETUP PHOTO

### 10.1. Photo of Radiated Emission test



## 10.2.Photo of Conducted Emission test



-----END OF REPORT-----