



# **FCC TEST REPORT**

**FCC ID: 2A43M-YLCUL**

On Behalf of

**Shenzhen Yilin Technology Co., LTD**

**Car Underglow Lights**

**Model No.: YLCUL001, YLCUL002**

Prepared for : Shenzhen Yilin Technology Co., LTD  
Address : Room 601, Unit 2, Building 7, Century Fashion Mansion, Fengshen Avenue, Fenggang Town, Dongguan City, Guangdong Province

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.  
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Date of Test : February 21, 2022- February 28, 2022  
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Version Number : V0

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## TEST REPORT DECLARATION

Applicant : Shenzhen Yilin Technology Co., LTD  
Address : Room 601, Unit 2, Building 7, Century Fashion Mansion, Fengshen Avenue,  
Fenggang Town, Dongguan City, Guangdong Province  
Manufacturer : Shenzhen Yilin Technology Co., LTD  
Address : Room 601, Unit 2, Building 7, Century Fashion Mansion, Fengshen Avenue,  
Fenggang Town, Dongguan City, Guangdong Province  
EUT Description : Car Underglow Lights  
(A) Model No. : YLCUL001, YLCUL002  
(B) Trademark : N/A

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).....: Yannis Wen  
Project Engineer

  
.....

Approved by (name + signature).....: Simple Guan  
Project Manager

  
.....

Date of issue.....: February 24, 2022

**Revision History**

| Revision | Issue Date        | Revisions              | Revised By |
|----------|-------------------|------------------------|------------|
| V0       | February 24, 2022 | Initial released Issue | Yannis Wen |

## 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 15:2017 | 15.207              | P      |
| 6dB Bandwidth                                                                                                                                                                                      | FCC PART 15:2017 | 15.247 (a)(2)       | P      |
| Output Power                                                                                                                                                                                       | FCC PART 15:2017 | 15.247 (b)(3)       | P      |
| Radiated Spurious Emission                                                                                                                                                                         | FCC PART 15:2017 | 15.247 (c)          | P      |
| Conducted Spurious & Band Edge Emission                                                                                                                                                            | FCC PART 15:2017 | 15.247 (d)          | P      |
| Power Spectral Density                                                                                                                                                                             | FCC PART 15:2017 | 15.247 (e)          | P      |
| Radiated Band Edge Emission                                                                                                                                                                        | FCC PART 15:2017 | 15.205              | P      |
| Antenna Requirement                                                                                                                                                                                | FCC PART 15:2017 | 15.203              | P      |
| <p>Note:</p> <ol style="list-style-type: none"> <li>1. P is an abbreviation for Pass.</li> <li>2. F is an abbreviation for Fail.</li> <li>3. N/A is an abbreviation for Not Applicable.</li> </ol> |                  |                     |        |

## 2. General information

### 2.1. Description of Device (EUT)

|                       |                                                                                                                               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Description/PMN       | : Car Underglow Lights                                                                                                        |
| Model Number/HVIN(s)  | : YLCUL001, YLCUL002                                                                                                          |
| Diff.                 | : There is no 433MHz receiving part on the driver board of model YLCUL002. All the test were performed on the model YLCUL001. |
| Trademark             | : N/A                                                                                                                         |
| Test Voltage          | : DC 12V from DC Power                                                                                                        |
| Radio Technology      | : Bluetooth LE                                                                                                                |
| Operation frequency   | : 2402-2480MHz                                                                                                                |
| Channel No.           | : 40 Channels                                                                                                                 |
| Modulation type       | : GFSK                                                                                                                        |
| Antenna Type          | : Internal antenna, Maximum Gain is 2dBi                                                                                      |
| Software version      | : V1.0                                                                                                                        |
| Hardware Version/FVIN | : V1.0                                                                                                                        |

Remark: The worst-case simultaneous transmission configuration was evaluated with no non-compliance found. Results in this report are only for Bluetooth LE function, and there is no other transmitter involved.

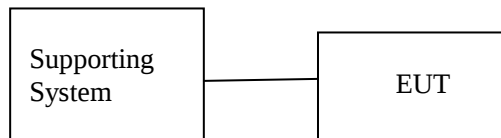
## 2.2.Accessories of Device (EUT)

Accessories1 : /  
 Manufacturer : /  
 Model : /  
 Ratings : /

## 2.3.Tested Supporting System Details

| No. | Description | Manufacturer | Model        | Serial Number | Certification |
|-----|-------------|--------------|--------------|---------------|---------------|
| 1.  | Notebook    | Lenovo       | ThinkPad E14 | N/A           | N/A           |

## 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                                            | 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 | 98kPa  |

## 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 15, 2019 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°C                |
| Uncertainty for humidity                                                 | 1%                   |
| Uncertainty for DC and low frequency voltages                            | 0.06%                |

## 2.9. Test Equipment List

| Equipment                   | Manufacture   | Model No.            | Serial No.                 | Last cal.  | Cal Interval |
|-----------------------------|---------------|----------------------|----------------------------|------------|--------------|
| 9*6*6 anechoic chamber      | CHENYU        | 9*6*6                | N/A                        | 2020.09.02 | 3Year        |
| Spectrum analyzer           | ROHDE&SCHWARZ | FSV40-N              | 102137                     | 2021.08.25 | 1Year        |
| Spectrum analyzer           | Agilent       | N9020A               | MY499100060                | 2021.08.25 | 1Year        |
| Receiver                    | ROHDE&SCHWARZ | ESR                  | 1316.3003K03-10208<br>2-Wa | 2021.08.25 | 1Year        |
| Receiver                    | R&S           | ESCI                 | 101165                     | 2021.08.25 | 1Year        |
| Bilog Antenna               | Schwarzbeck   | VULB 9168            | VULB9168-438               | 2020.04.12 | 2Year        |
| Horn Antenna                | SCHWARZBECK   | BBHA 9120<br>D       | BBHA 9120 D(1201)          | 2020.04.12 | 2Year        |
| Active Loop Antenna         | SCHWARZBECK   | FMZB<br>1519B        | 00059                      | 2019.09.07 | 2Year        |
| RF Cable                    | Resenberger   | Cable 1              | RE1                        | 2021.08.25 | 1Year        |
| RF Cable                    | Resenberger   | Cable 2              | RE2                        | 2021.08.25 | 1Year        |
| RF Cable                    | Resenberger   | Cable 3              | CE1                        | 2021.08.25 | 1Year        |
| Pre-amplifier               | HP            | HP8347A              | 2834A00455                 | 2021.08.25 | 1Year        |
| Pre-amplifier               | Agilent       | 8449B                | 3008A02664                 | 2021.08.25 | 1Year        |
| L.I.S.N.#1                  | Schwarzbeck   | NSLK8126             | 8126-466                   | 2021.08.25 | 1Year        |
| L.I.S.N.#2                  | ROHDE&SCHWARZ | ENV216               | 101043                     | 2021.08.25 | 1 Year       |
| Horn Antenna                | SCHWARZBECK   | BBHA9170             | 00946                      | 2021.08.30 | 2 Year       |
| Preamplifier                | SKET          | LNPA_1840<br>-50     | SK2018101801               | 2021.08.25 | 1 Year       |
| Power Meter                 | Agilent       | E9300A               | MY41496628                 | 2021.08.25 | 1 Year       |
| Power Sensor                | DARE          | RPR3006W             | 15100041SNO91              | 2021.08.25 | 1 Year       |
| Temp. & Humid. Chamber      | Wei Huang     | WHTH-1000<br>-40-880 | 100631                     | 2021.04.21 | 1 Year       |
| Switching Mode Power Supply | JUNKE         | JK12010S             | 20140927-6                 | 2021.08.25 | 1 Year       |
| Adjustable attenuator       | MWRfTest      | N/A                  | N/A                        | N/A        | N/A          |
| 10dB Attenuator             | Mini-Circuits | DC-6G                | 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

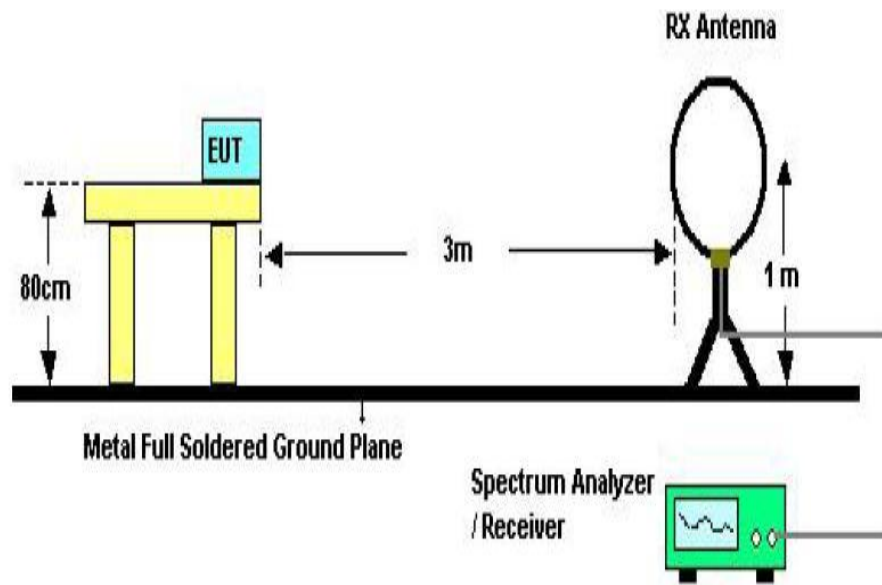
The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above1GHz testing, The table was rotated 360 degrees to determine the position of the highest radiation

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

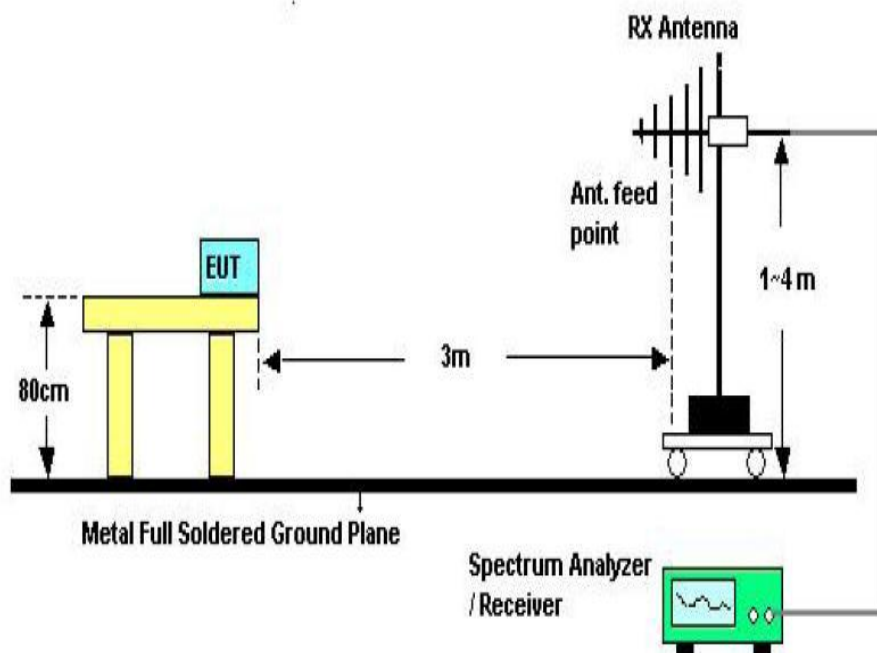
The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured

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.

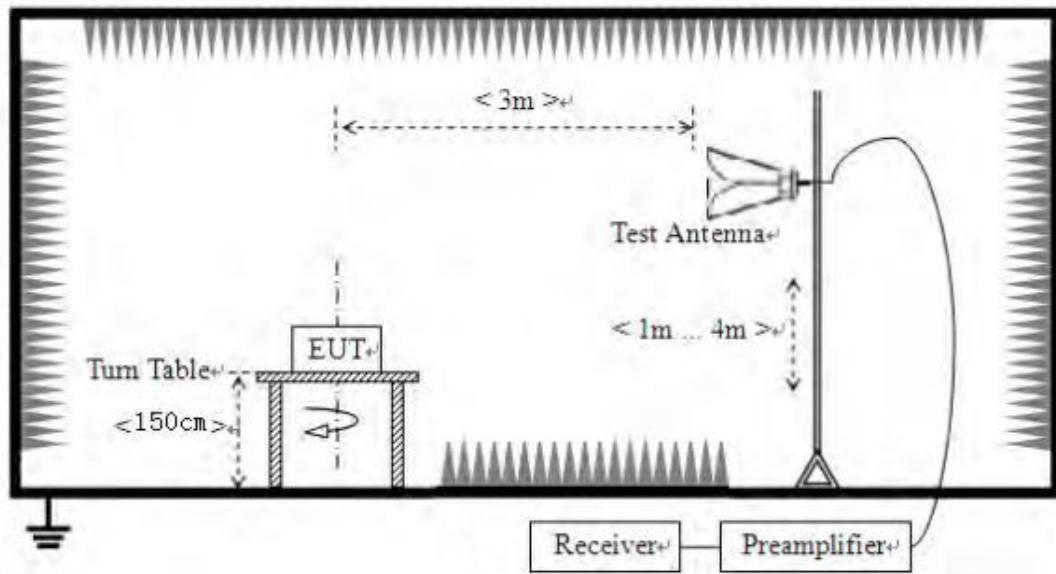
### 3.3.Test Setup



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.

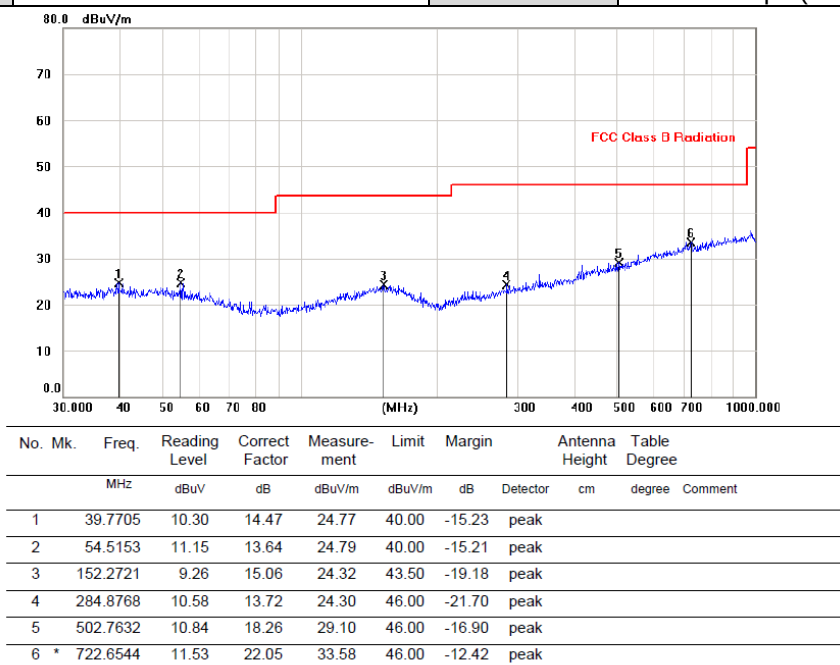
From 9KHz to 30MHz: Conclusion: PASS

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

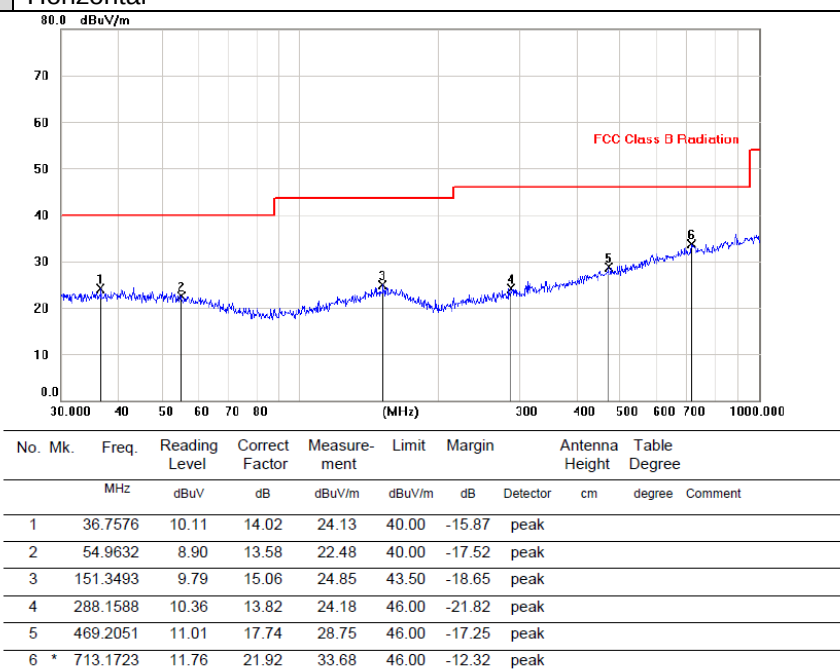
2. Only show the test data of the worst Channel in this report.

From 30MHz to 1000MHz: Conclusion: PASS

|                        |                      |                  |                      |
|------------------------|----------------------|------------------|----------------------|
| <b>EUT Description</b> | Car Underglow Lights | <b>Model No.</b> | YLCUG001             |
| <b>Temperature</b>     | 24°C                 | <b>Humidity</b>  | 56%                  |
| <b>Pol</b>             | Vertical             | <b>Test date</b> | 2022/02/23           |
| <b>Test Voltage</b>    | DC 12V from DC Power | <b>Test mode</b> | GFSK 1Mbps (2480MHz) |



|            |            |
|------------|------------|
| <b>Pol</b> | Horizontal |
|------------|------------|



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

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

*Remark: All modes have been tested, and only worst data of GFSK 1Mbps (2480MHz) was listed in this report.*

### For 1Mbps

| 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                                                                                                                                                                          | 43.24               | V           | 33.95                 | 10.18          | 34.26           | 53.11           | 74             | -20.89      | PK     |
| 4804                                                                                                                                                                          | 35.24               | V           | 33.95                 | 10.18          | 34.26           | 45.11           | 54             | -8.89       | AV     |
| 7206                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9608                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4804                                                                                                                                                                          | 46.37               | H           | 33.95                 | 10.18          | 34.26           | 56.24           | 74             | -17.76      | PK     |
| 4804                                                                                                                                                                          | 34.79               | H           | 33.95                 | 10.18          | 34.26           | 44.66           | 54             | -9.34       | AV     |
| 7206                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9608                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| Test Mode: TX Mid                                                                                                                                                             |                     |             |                       |                |                 |                 |                |             |        |
| 4880                                                                                                                                                                          | 41.35               | V           | 33.93                 | 10.2           | 34.29           | 51.19           | 74             | -22.81      | PK     |
| 4880                                                                                                                                                                          | 36.03               | V           | 33.93                 | 10.2           | 34.29           | 45.87           | 54             | -8.13       | AV     |
| 7320                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9760                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4880                                                                                                                                                                          | 45.86               | H           | 33.93                 | 10.2           | 34.29           | 55.70           | 74             | -18.30      | PK     |
| 4880                                                                                                                                                                          | 35.35               | H           | 33.93                 | 10.2           | 34.29           | 45.19           | 54             | -8.81       | AV     |
| 7320                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9760                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| Test Mode: TX High                                                                                                                                                            |                     |             |                       |                |                 |                 |                |             |        |
| 4960                                                                                                                                                                          | 45.40               | V           | 33.98                 | 10.22          | 34.25           | 55.35           | 74             | -18.65      | PK     |
| 4960                                                                                                                                                                          | 35.87               | V           | 33.98                 | 10.22          | 34.25           | 45.82           | 54             | -8.18       | AV     |
| 7440                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9920                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4960                                                                                                                                                                          | 43.77               | H           | 33.98                 | 10.22          | 34.25           | 53.72           | 74             | -20.28      | PK     |
| 4960                                                                                                                                                                          | 34.79               | H           | 33.98                 | 10.22          | 34.25           | 44.74           | 54             | -9.26       | 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. |                     |             |                       |                |                 |                 |                |             |        |

| 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                                                                                                                                                                          | 42.03               | V           | 33.95                 | 10.18          | 34.26           | 51.90           | 74             | -22.10      | PK     |
| 4804                                                                                                                                                                          | 35.73               | V           | 33.95                 | 10.18          | 34.26           | 45.60           | 54             | -8.40       | AV     |
| 7206                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9608                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4804                                                                                                                                                                          | 43.48               | H           | 33.95                 | 10.18          | 34.26           | 53.35           | 74             | -20.65      | PK     |
| 4804                                                                                                                                                                          | 37.73               | H           | 33.95                 | 10.18          | 34.26           | 47.60           | 54             | -6.40       | AV     |
| 7206                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9608                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| Test Mode: TX Mid                                                                                                                                                             |                     |             |                       |                |                 |                 |                |             |        |
| 4880                                                                                                                                                                          | 42.32               | V           | 33.93                 | 10.2           | 34.29           | 52.16           | 74             | -21.84      | PK     |
| 4880                                                                                                                                                                          | 33.48               | V           | 33.93                 | 10.2           | 34.29           | 43.32           | 54             | -10.68      | AV     |
| 7320                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9760                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4880                                                                                                                                                                          | 42.80               | H           | 33.93                 | 10.2           | 34.29           | 52.64           | 74             | -21.36      | PK     |
| 4880                                                                                                                                                                          | 36.11               | H           | 33.93                 | 10.2           | 34.29           | 45.95           | 54             | -8.05       | AV     |
| 7320                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9760                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| Test Mode: TX High                                                                                                                                                            |                     |             |                       |                |                 |                 |                |             |        |
| 4960                                                                                                                                                                          | 43.40               | V           | 33.98                 | 10.22          | 34.25           | 53.35           | 74             | -20.65      | PK     |
| 4960                                                                                                                                                                          | 33.11               | V           | 33.98                 | 10.22          | 34.25           | 43.06           | 54             | -10.94      | AV     |
| 7440                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 9920                                                                                                                                                                          | /                   | /           | /                     | /              | /               | /               | /              | /           | /      |
| 4960                                                                                                                                                                          | 45.08               | H           | 33.98                 | 10.22          | 34.25           | 55.03           | 74             | -18.97      | PK     |
| 4960                                                                                                                                                                          | 33.99               | H           | 33.98                 | 10.22          | 34.25           | 43.94           | 54             | -10.06      | 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 method:  
For 1Mbps

|                 |                      |           |                |
|-----------------|----------------------|-----------|----------------|
| EUT Description | Car Underglow Lights | Model No. | YLCUG001       |
| Temperature     | 24°C                 | Humidity  | 56%            |
| Test mode       | GFSK (2402MHz)       | Test mode | GFSK (2440MHz) |

Spectrum

Ref Level 20.00 dBm Offset 7.62 dB RBW 100 kHz Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep SGL Count 10/10

1Pk Max

M1[1]

4.62 dBm

2.3970 GHz

M2[1]

-37.70 dBm

15.1973 GHz

D1

-24.326 dBm

M3

M4

M5

M2

Start 30.0 MHz 1001 pts Stop 26.5 GHz

Marker

| Type | Ref | Trc | X-value     | Y-value    | Function | Function Result |
|------|-----|-----|-------------|------------|----------|-----------------|
| M1   | 1   |     | 2.397 GHz   | 4.62 dBm   |          |                 |
| M2   | 1   |     | 15.1973 GHz | -37.70 dBm |          |                 |
| M3   | 1   |     | 4.9534 GHz  | -41.34 dBm |          |                 |
| M4   | 1   |     | 7.0181 GHz  | -42.57 dBm |          |                 |
| M5   | 1   |     | 9.7445 GHz  | -41.56 dBm |          |                 |

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Spectrum

Ref Level 20.00 dBm Offset 7.76 dB RBW 100 kHz Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep SGL Count 10/10

1Pk Max

M1[1]

3.82 dBm

2.4500 GHz

M2[1]

-37.60 dBm

22.0001 GHz

D1

-25.013 dBm

M3

M4

M5

M2

Start 30.0 MHz 1001 pts Stop 26.5 GHz

Marker

| Type | Ref | Trc | X-value     | Y-value    | Function | Function Result |
|------|-----|-----|-------------|------------|----------|-----------------|
| M1   | 1   |     | 2.45 GHz    | 3.82 dBm   |          |                 |
| M2   | 1   |     | 22.0001 GHz | -37.60 dBm |          |                 |
| M3   | 1   |     | 4.6887 GHz  | -40.98 dBm |          |                 |
| M4   | 1   |     | 7.124 GHz   | -41.80 dBm |          |                 |
| M5   | 1   |     | 9.8239 GHz  | -39.94 dBm |          |                 |

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|           |                |
|-----------|----------------|
| Test mode | GFSK (2480MHz) |
|-----------|----------------|

Spectrum

Ref Level 20.00 dBm Offset 7.60 dB RBW 100 kHz Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep SGL Count 10/10

1Pk Max

M1[1]

4.35 dBm

2.4760 GHz

M2[1]

-37.64 dBm

15.2503 GHz

D1

-25.082 dBm

M3

M4

M5

M2

Start 30.0 MHz 1001 pts Stop 26.5 GHz

Marker

| Type | Ref | Trc | X-value     | Y-value    | Function | Function Result |
|------|-----|-----|-------------|------------|----------|-----------------|
| M1   | 1   |     | 2.476 GHz   | 4.35 dBm   |          |                 |
| M2   | 1   |     | 15.2503 GHz | -37.64 dBm |          |                 |
| M3   | 1   |     | 5.0858 GHz  | -40.88 dBm |          |                 |
| M4   | 1   |     | 7.6269 GHz  | -41.58 dBm |          |                 |
| M5   | 1   |     | 9.7445 GHz  | -41.06 dBm |          |                 |

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## For 2Mbps

|                 |                      |           |                |
|-----------------|----------------------|-----------|----------------|
| EUT Description | Car Underglow Lights | Model No. | YLCUG001       |
| Temperature     | 24°C                 | Humidity  | 56%            |
| Test mode       | GFSK (2402MHz)       | Test mode | GFSK (2440MHz) |

Spectrum

Ref Level 20.00 dBm Offset 7.62 dB RBW 100 kHz  
Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep  
SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1[1]

M2[1]

D1 -25.712 dBm

M3

M4

M5

M2

3.09 dBm

2.3970 GHz

-37.46 dBm

21.6825 GHz

Start 30.0 MHz

1001 pts

Stop 26.5 GHz

Marker

| Type | Ref | Trc | X-value     | Y-value    | Function | Function Result |
|------|-----|-----|-------------|------------|----------|-----------------|
| M1   | 1   |     | 2.397 GHz   | 3.09 dBm   |          |                 |
| M2   | 1   |     | 21.6825 GHz | -37.46 dBm |          |                 |
| M3   | 1   |     | 4.8211 GHz  | -41.98 dBm |          |                 |
| M4   | 1   |     | 7.0446 GHz  | -41.17 dBm |          |                 |
| M5   | 1   |     | 9.5857 GHz  | -41.08 dBm |          |                 |

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Spectrum

Ref Level 20.00 dBm Offset 7.76 dB RBW 100 kHz  
Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep  
SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1[1]

M2[1]

D1 -24.571 dBm

M3

M4

M5

M2

5.67 dBm

2.4500 GHz

-37.84 dBm

22.0530 GHz

Start 30.0 MHz

1001 pts

Stop 26.5 GHz

Marker

| Type | Ref | Trc | X-value    | Y-value    | Function | Function Result |
|------|-----|-----|------------|------------|----------|-----------------|
| M1   | 1   |     | 2.45 GHz   | 5.67 dBm   |          |                 |
| M2   | 1   |     | 22.053 GHz | -37.84 dBm |          |                 |
| M3   | 1   |     | 4.9005 GHz | -41.31 dBm |          |                 |
| M4   | 1   |     | 7.3357 GHz | -42.06 dBm |          |                 |
| M5   | 1   |     | 9.7974 GHz | -41.26 dBm |          |                 |

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|           |                |
|-----------|----------------|
| Test mode | GFSK (2480MHz) |
|-----------|----------------|

Spectrum

Ref Level 20.00 dBm Offset 7.60 dB RBW 100 kHz  
Att 30 dB SWT 265 ms VBW 300 kHz Mode Auto Sweep  
SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1[1]

M2[1]

D1 -24.733 dBm

M3

M4

M5

M2

4.86 dBm

2.4760 GHz

-37.49 dBm

22.1060 GHz

Start 30.0 MHz

1001 pts

Stop 26.5 GHz

Marker

| Type | Ref | Trc | X-value    | Y-value    | Function | Function Result |
|------|-----|-----|------------|------------|----------|-----------------|
| M1   | 1   |     | 2.476 GHz  | 4.86 dBm   |          |                 |
| M2   | 1   |     | 22.106 GHz | -37.49 dBm |          |                 |
| M3   | 1   |     | 4.9534 GHz | -41.35 dBm |          |                 |
| M4   | 1   |     | 7.4945 GHz | -41.22 dBm |          |                 |
| M5   | 1   |     | 9.8768 GHz | -40.22 dBm |          |                 |

Date: 22.FEB.2022 09:26:00

## 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            |

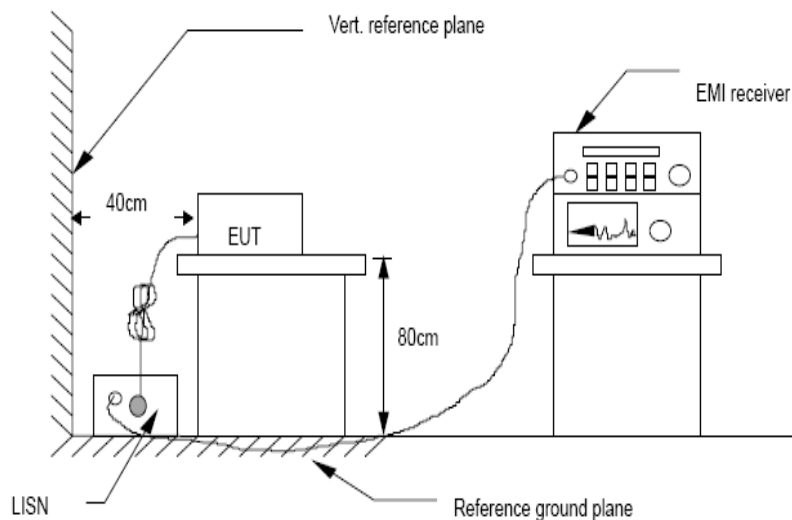
Notes: 1. \*Decreasing linearly with logarithm of frequency.  
 2. The lower limit shall apply at the transition frequencies.  
 3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

### 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.

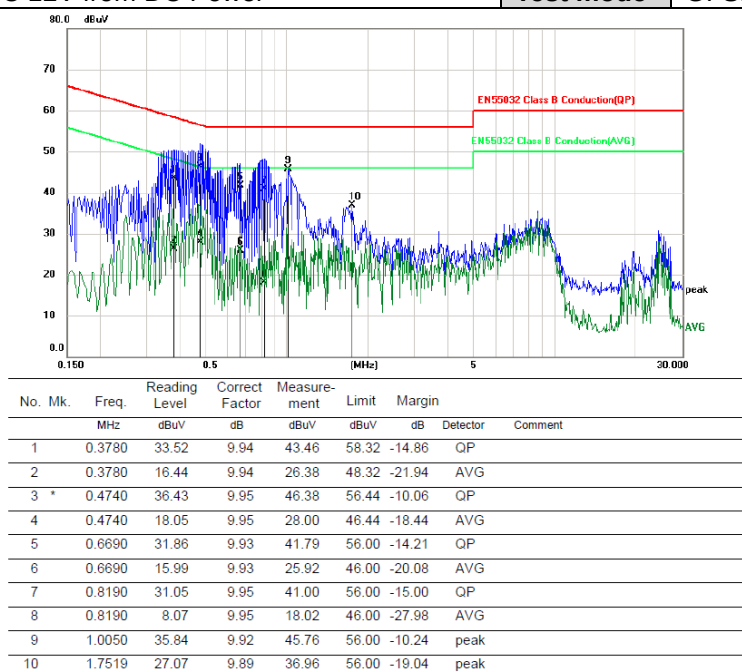
The bandwidth of test receiver is set at 9 kHz.

### 4.3. Test Setup

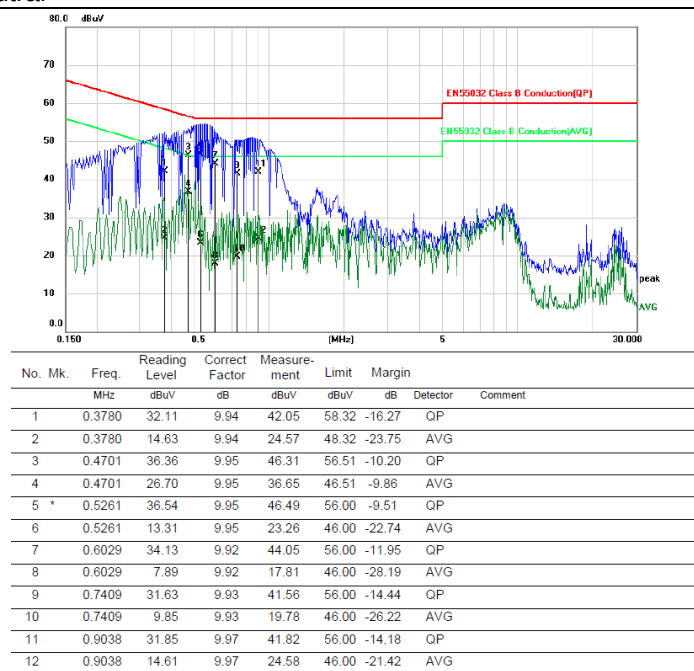


### 4.4. Test Results

|                        |                      |                  |                      |
|------------------------|----------------------|------------------|----------------------|
| <b>EUT Description</b> | Car Underglow Lights | <b>Model No.</b> | YLCUG001             |
| <b>Temperature</b>     | 24°C                 | <b>Humidity</b>  | 56%                  |
| <b>Pol</b>             | Line                 | <b>Test date</b> | 2022/02/21           |
| <b>Test Voltage</b>    | DC 12V from DC Power | <b>Test mode</b> | GFSK 1Mbps (2480MHz) |



|            |         |
|------------|---------|
| <b>Pol</b> | Neutral |
|------------|---------|



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

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

Remark: All modes have been tested, and only worst data of GFSK 1Mbps (2480MHz)was listed in this report.

## 5. Conducted Maximum Output Power

### 5.1. Test limits

Please refer section RSS-247 & 15.247.

### 5.2. Test Procedure

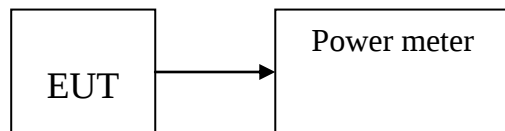
Details see the KDB558074 D01 Meas Guidance V05

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

| For 1Mbps        |                 |                         |             |
|------------------|-----------------|-------------------------|-------------|
| Channel          | Frequency (MHz) | Peak Output Power (dBm) | Limit (dBm) |
| CH1              | 2402            | 6.127                   | 30          |
| CH20             | 2440            | 6.036                   | 30          |
| CH40             | 2480            | 5.763                   | 30          |
| Conclusion: PASS |                 |                         |             |

| For 2Mbps        |                 |                         |             |
|------------------|-----------------|-------------------------|-------------|
| Channel          | Frequency (MHz) | Peak Output Power (dBm) | Limit (dBm) |
| CH1              | 2402            | 6.319                   | 30          |
| CH20             | 2440            | 6.23                    | 30          |
| CH40             | 2480            | 5.939                   | 30          |
| Conclusion: PASS |                 |                         |             |

## 6. 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 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 KDB558074 D01 Meas Guidance V05

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

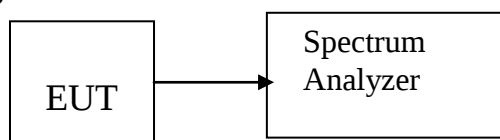
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

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

6.2.4 Record the max reading.

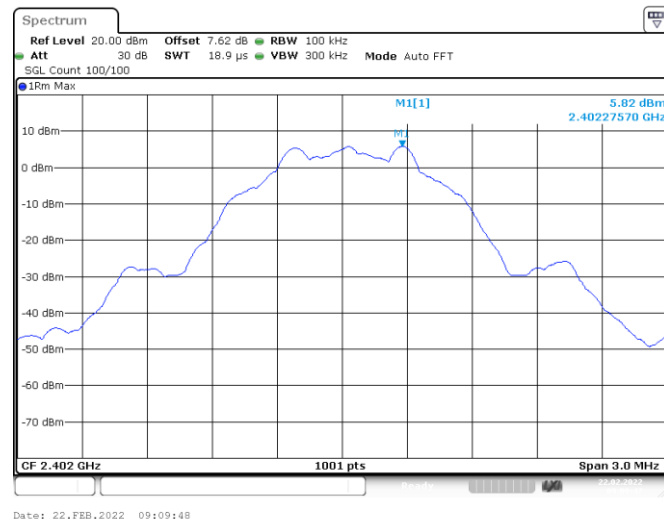
6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

### 6.3. Test Setup

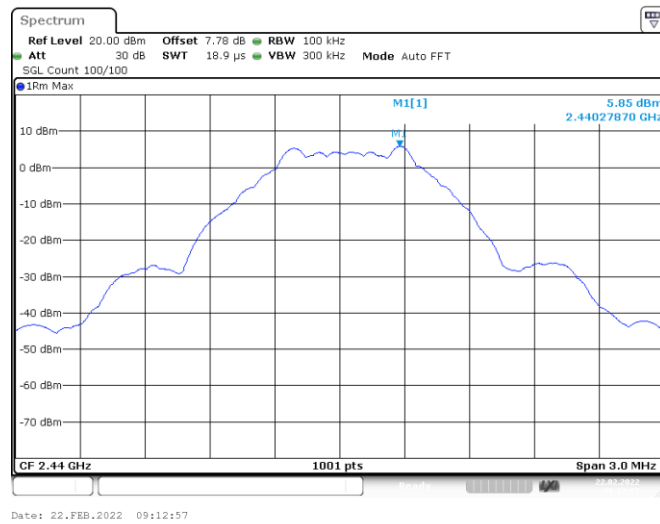


### 6.4. Test Results

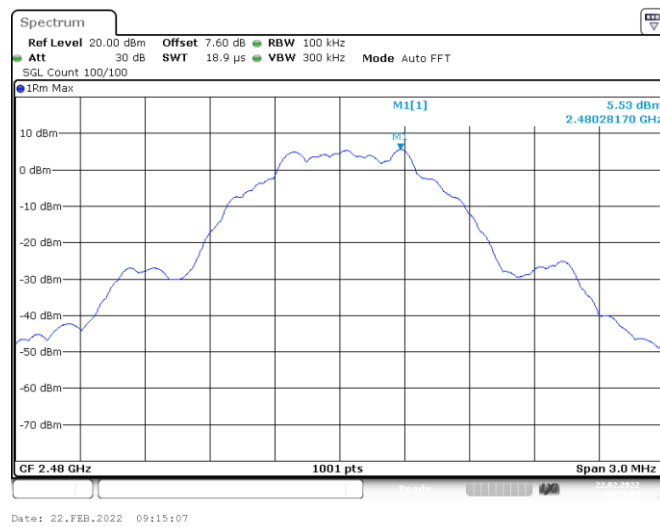
| For 1Mbps        |                 |                              |             |        |
|------------------|-----------------|------------------------------|-------------|--------|
| Channel          | Frequency (MHz) | Power Spectral Density (dBm) | Limit (dBm) | Result |
| CH1              | 2402            | 5.816                        | 8           | PASS   |
| CH20             | 2440            | 5.851                        | 8           | PASS   |
| CH40             | 2480            | 5.535                        | 8           | PASS   |
| Conclusion: PASS |                 |                              |             |        |



Lowest channel

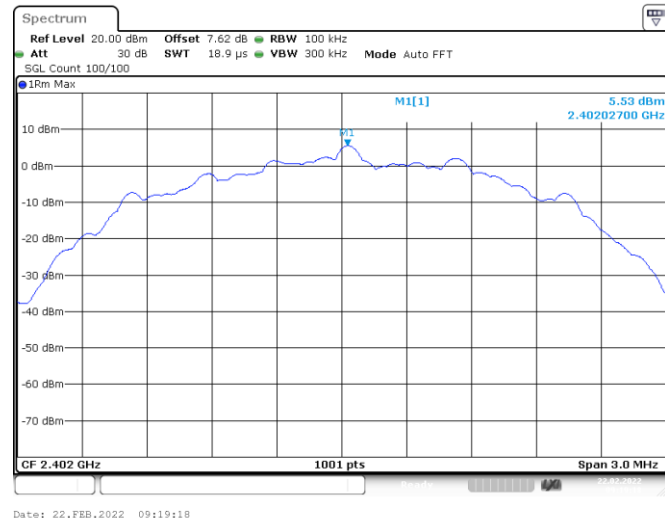


Middle channel

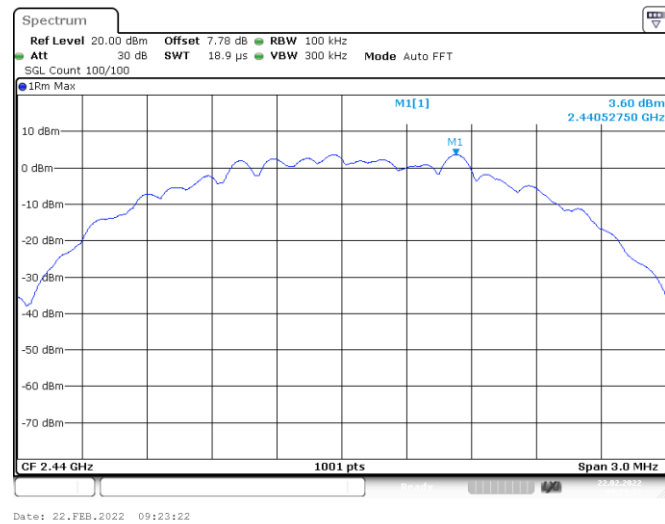


Highest channel

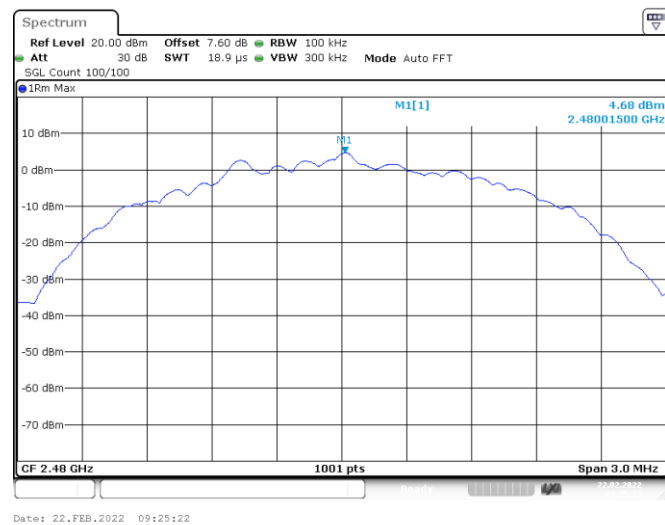
| For 2Mbps        |                 |                              |             |        |
|------------------|-----------------|------------------------------|-------------|--------|
| Channel          | Frequency (MHz) | Power Spectral Density (dBm) | Limit (dBm) | Result |
| CH1              | 2402            | 5.528                        | 8           | PASS   |
| CH20             | 2440            | 3.596                        | 8           | PASS   |
| CH40             | 2480            | 4.68                         | 8           | PASS   |
| Conclusion: PASS |                 |                              |             |        |



Lowest channel



Middle channel



Highest channel

## 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.

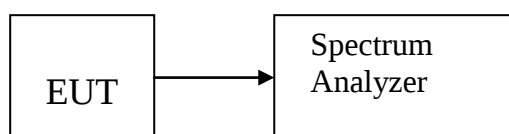
### 7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V05

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  $\geq 3 \times$  RBW = 300kHz,, Sweep time set auto, detail see the test plot.

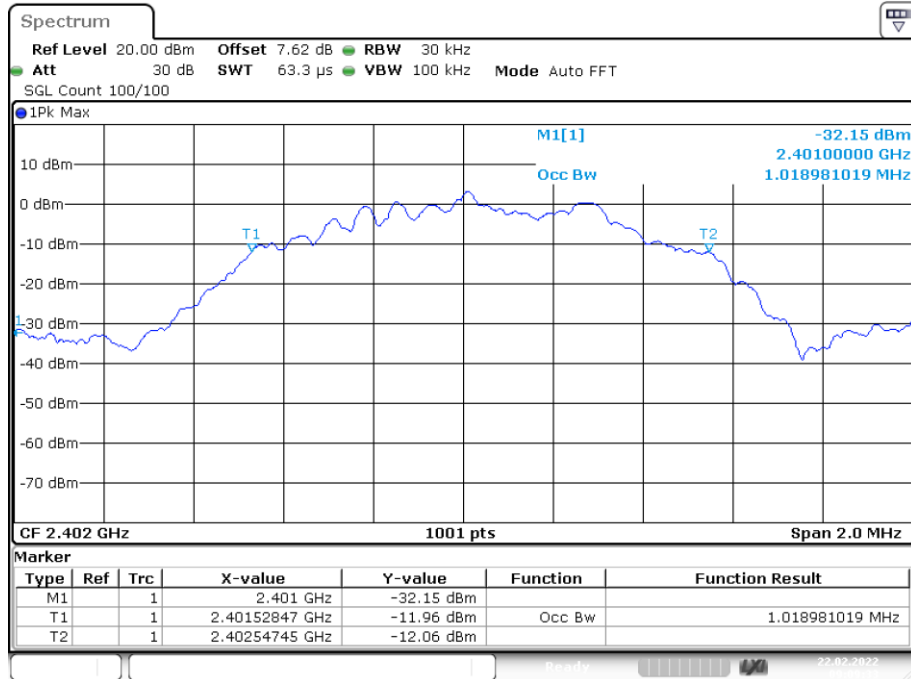
### 7.3. Test Setup



### 7.4. Test Results

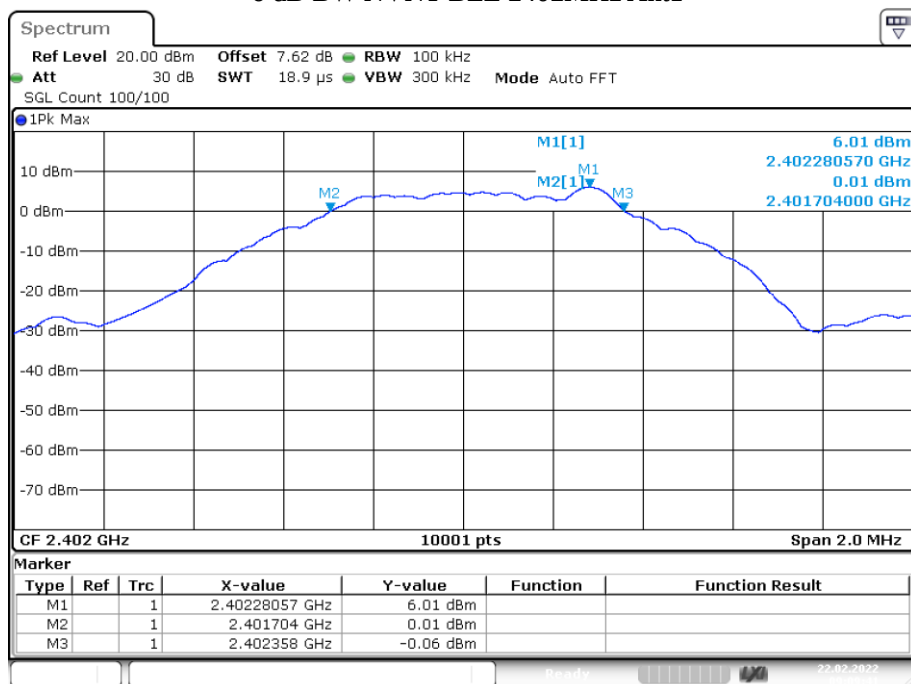
| For 1Mbps |      |                 |         |               |                       |                             |         |
|-----------|------|-----------------|---------|---------------|-----------------------|-----------------------------|---------|
| Condition | Mode | Frequency (MHz) | Antenna | 99% OBW (MHz) | -6 dB Bandwidth (MHz) | Limit -6 dB Bandwidth (MHz) | Verdict |
| NVNT      | BLE  | 2402            | Ant 1   | 1.019         | 0.654                 | 0.5                         | Pass    |
| NVNT      | BLE  | 2440            | Ant 1   | 1.023         | 0.706                 | 0.5                         | Pass    |
| NVNT      | BLE  | 2480            | Ant 1   | 1.025         | 0.64                  | 0.5                         | Pass    |

## OBW NVNT BLE 2402MHz Ant1



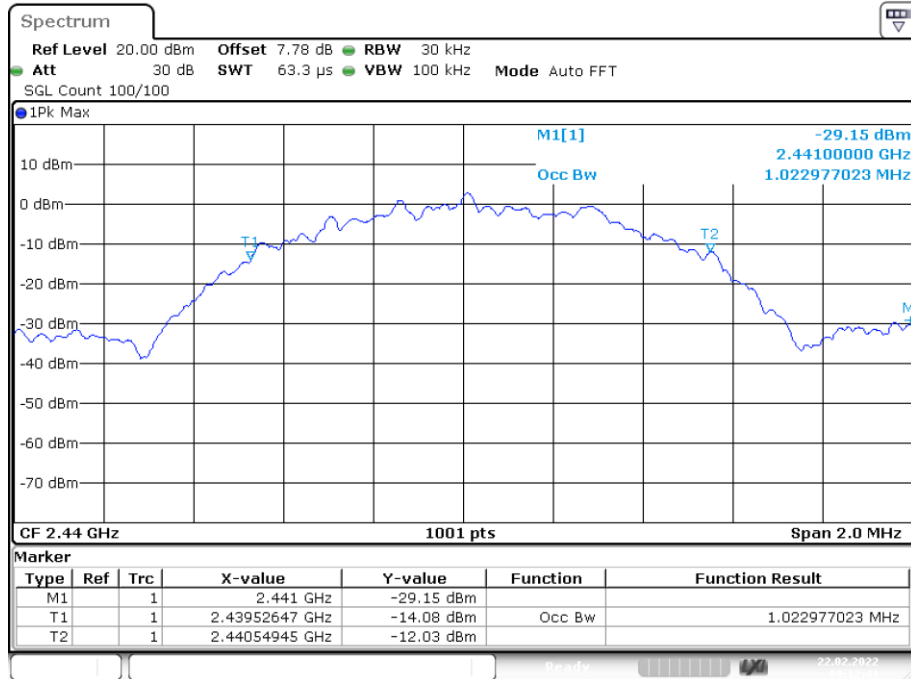
Date: 22.FEB.2022 09:09:33

## -6 dB BW NVNT BLE 2402MHz Ant1



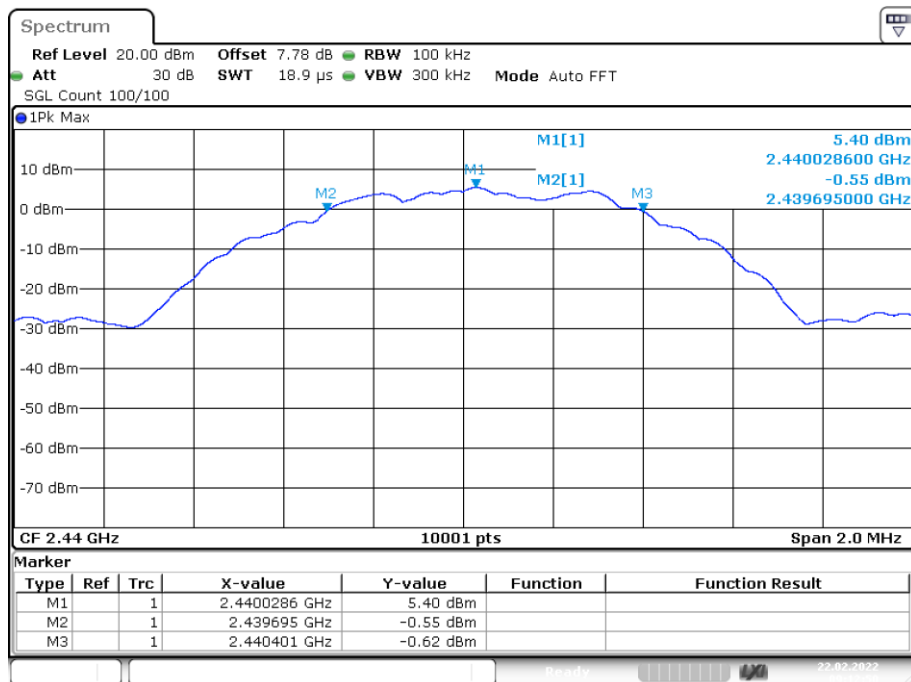
Date: 22.FEB.2022 09:09:41

## OBW NVNT BLE 2440MHz Ant1



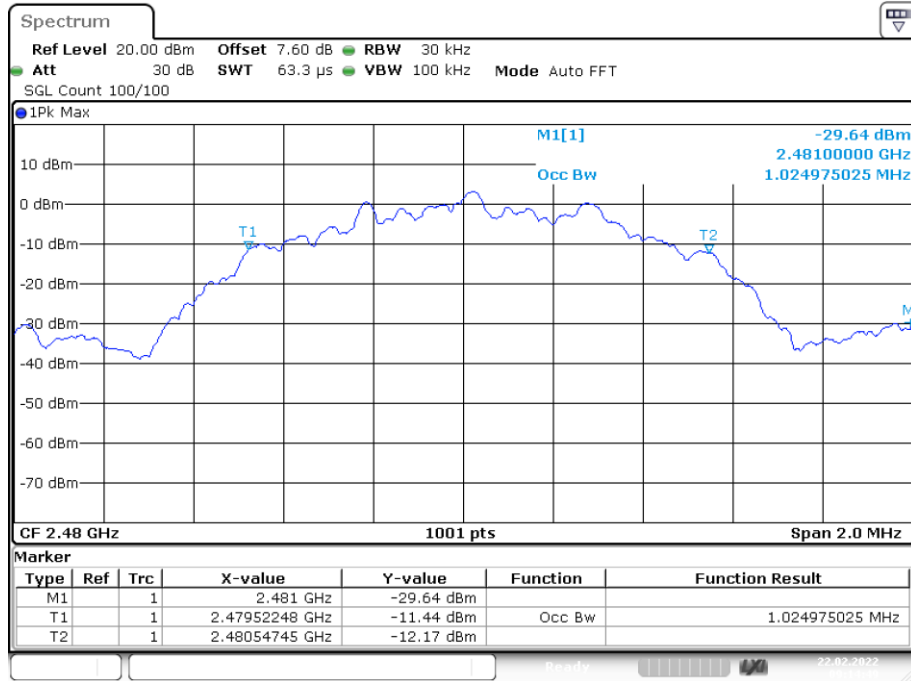
Date: 22.FEB.2022 09:12:41

## -6 dB BW NVNT BLE 2440MHz Ant1



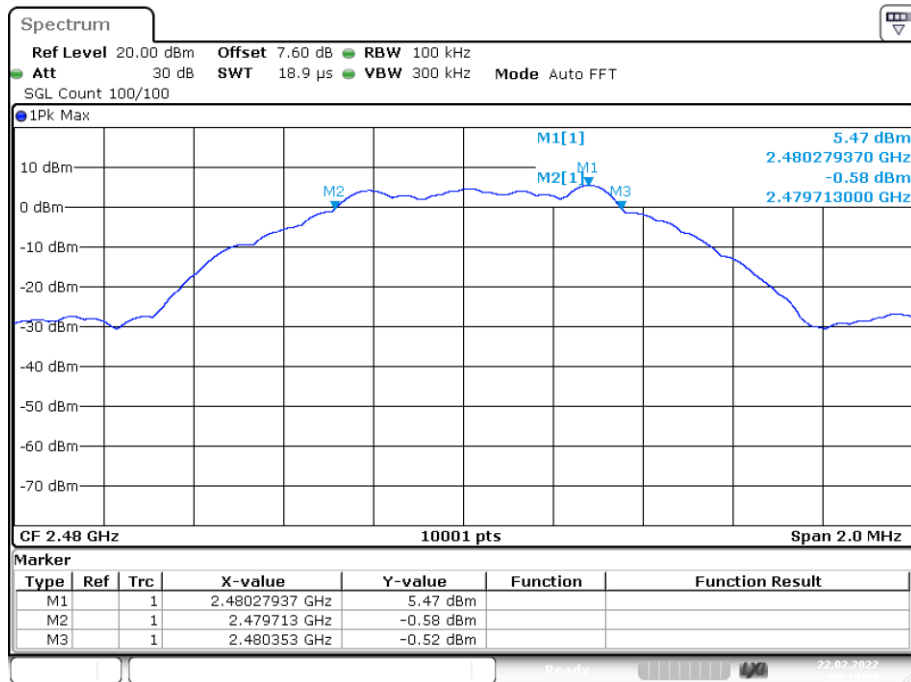
Date: 22.FEB.2022 09:12:49

## OBW NVNT BLE 2480MHz Ant1



Date: 22.FEB.2022 09:14:48

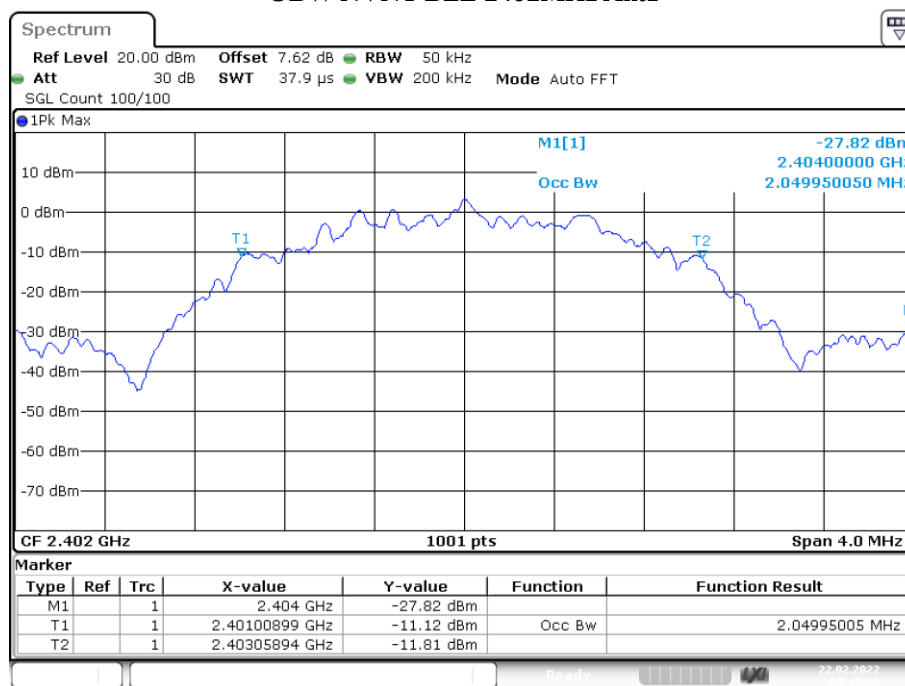
## -6 dB BW NVNT BLE 2480MHz Ant1



Date: 22.FEB.2022 09:14:58

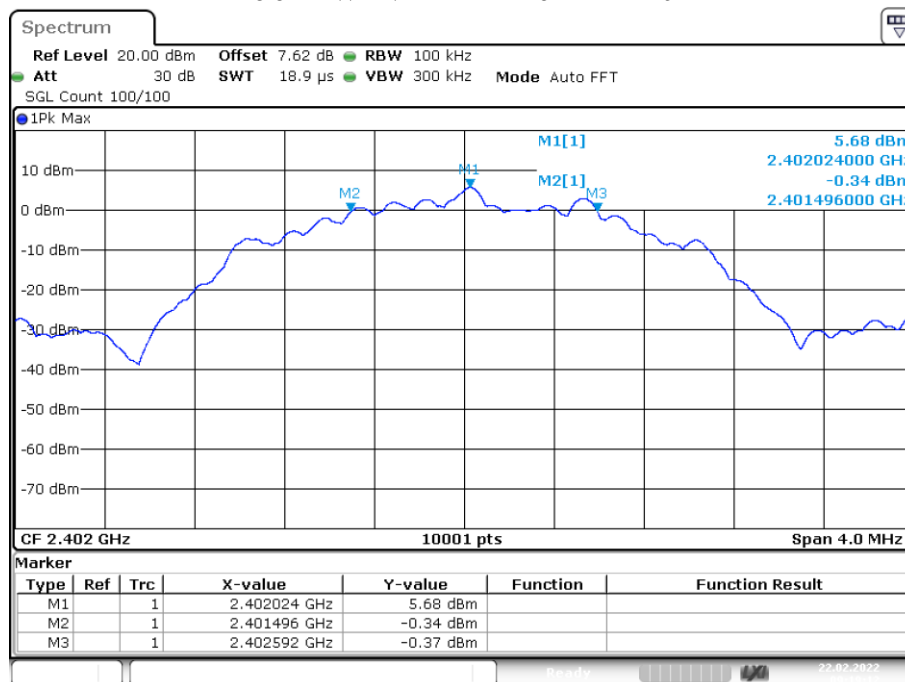
| For 2Mbps |      |                 |         |               |                       |                             |         |
|-----------|------|-----------------|---------|---------------|-----------------------|-----------------------------|---------|
| Condition | Mode | Frequency (MHz) | Antenna | 99% OBW (MHz) | -6 dB Bandwidth (MHz) | Limit -6 dB Bandwidth (MHz) | Verdict |
| NVNT      | BLE  | 2402            | Ant 1   | 2.05          | 1.096                 | 0.5                         | Pass    |
| NVNT      | BLE  | 2440            | Ant 1   | 2.054         | 1.151                 | 0.5                         | Pass    |
| NVNT      | BLE  | 2480            | Ant 1   | 2.054         | 1.021                 | 0.5                         | Pass    |

OBW NVNT BLE 2402MHz Ant1



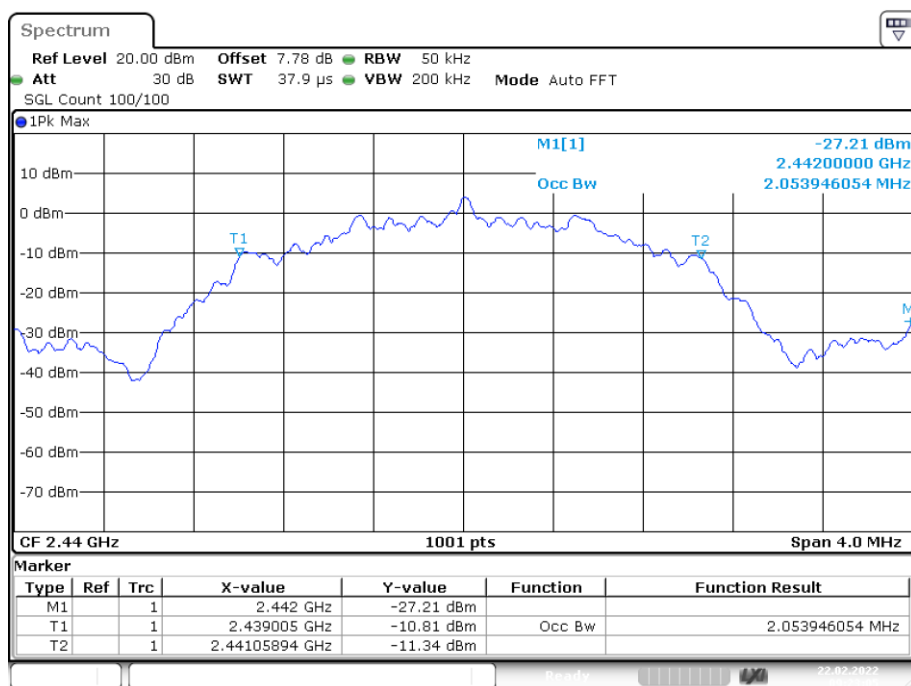
Date: 22.FEB.2022 09:19:04

-6 dB BW NVNT BLE 2402MHz Ant1

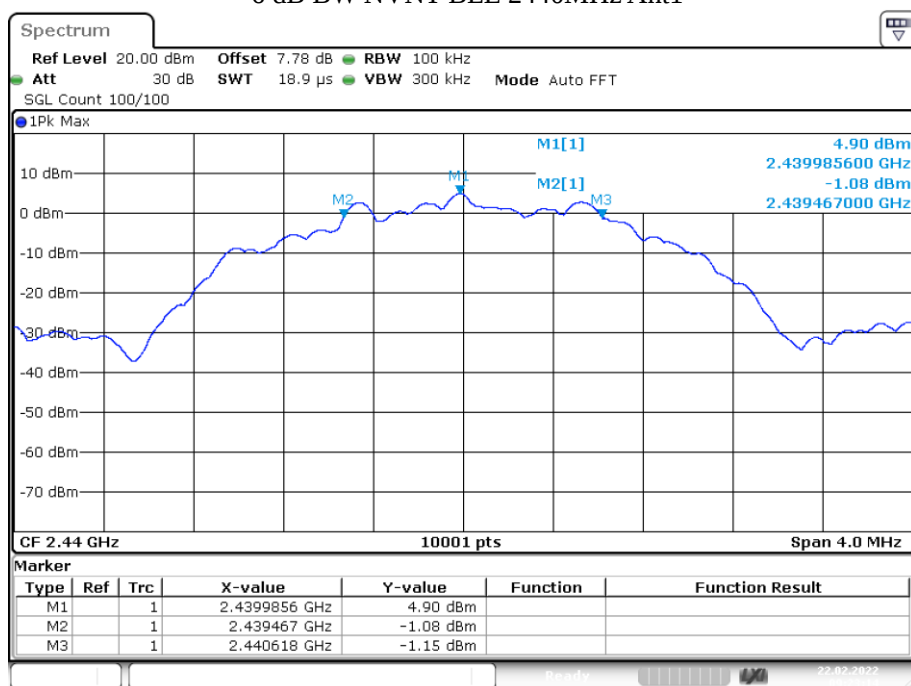


Date: 22.FEB.2022 09:19:11

OBW NVNT BLE 2440MHz Ant1

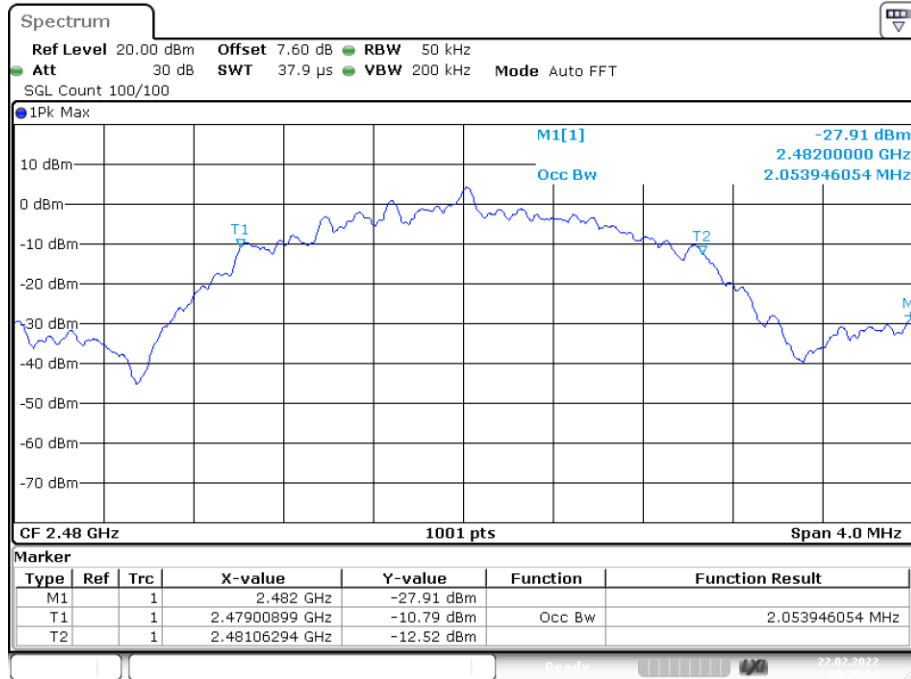


Date: 22.FEB.2022 09:23:06

**-6 dB BW NVNT BLE 2440MHz Ant1**

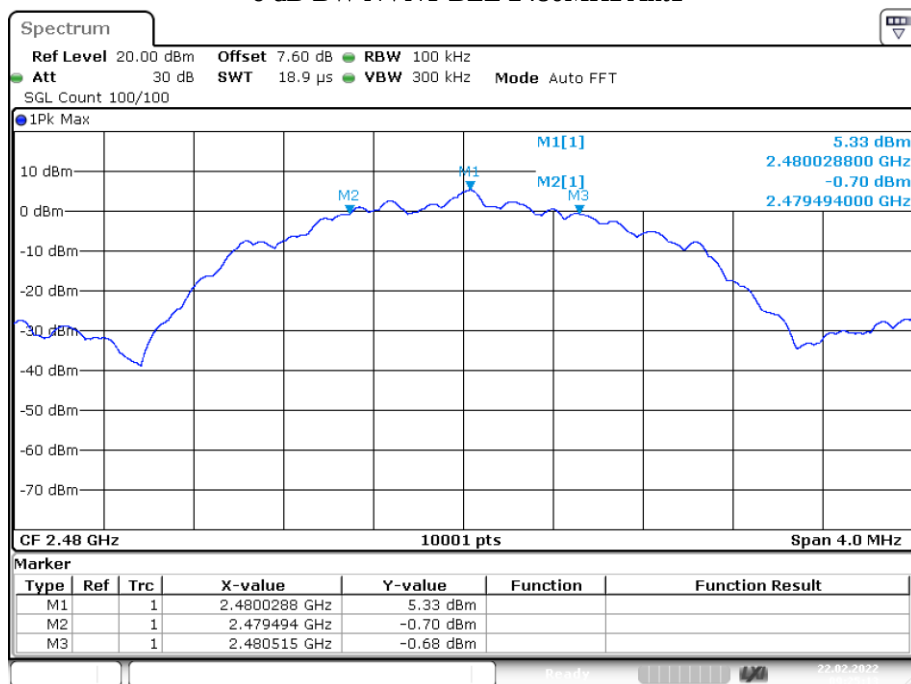
Date: 22.FEB.2022 09:23:15

## OBW NVNT BLE 2480MHz Ant1



Date: 22.FEB.2022 09:25:03

## -6 dB BW NVNT BLE 2480MHz Ant1



Date: 22.FEB.2022 09:25:13

## **8. Band Edge Check**

### **8.1. Test limits**

Please refer section RSS-GEN&15.247.

### **8.2. Test Procedure**

Details see the KDB558074 D01 Meas Guidance V05

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.

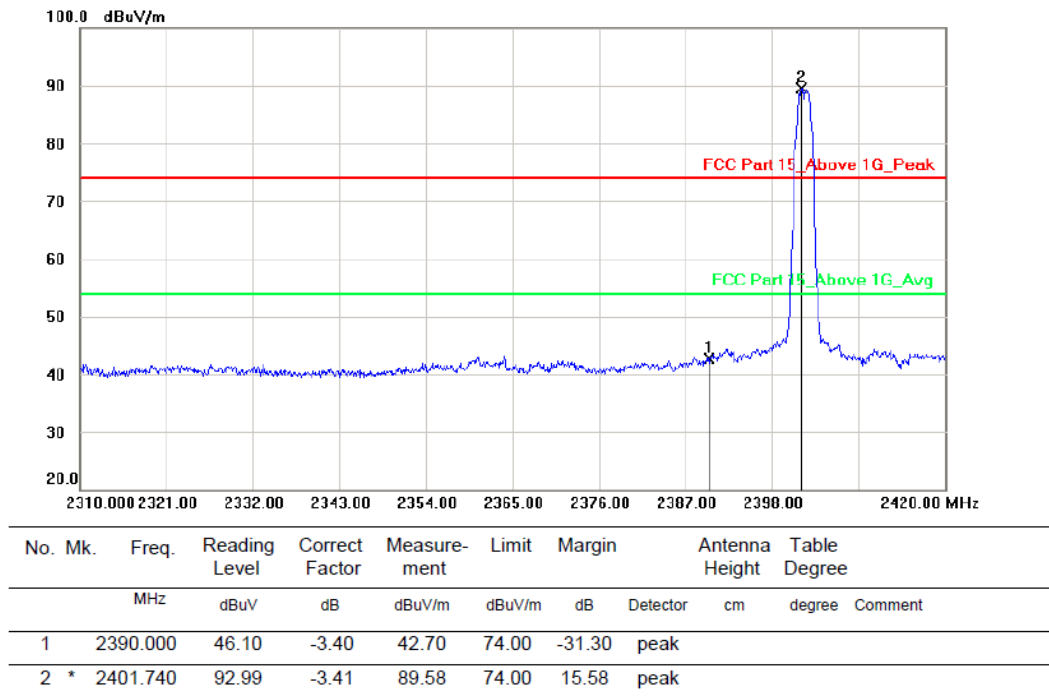
### **8.4. Test Results**

**For 1Mbps**

Radiated Method:

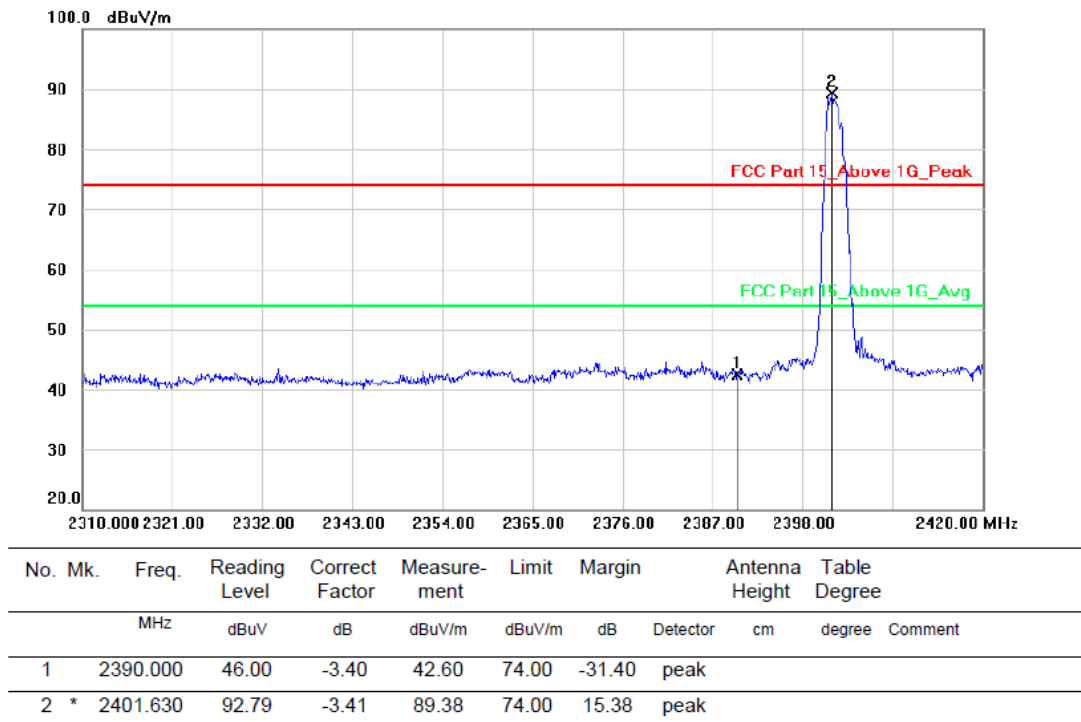
Test Mode: Low

Polarization: Vertical



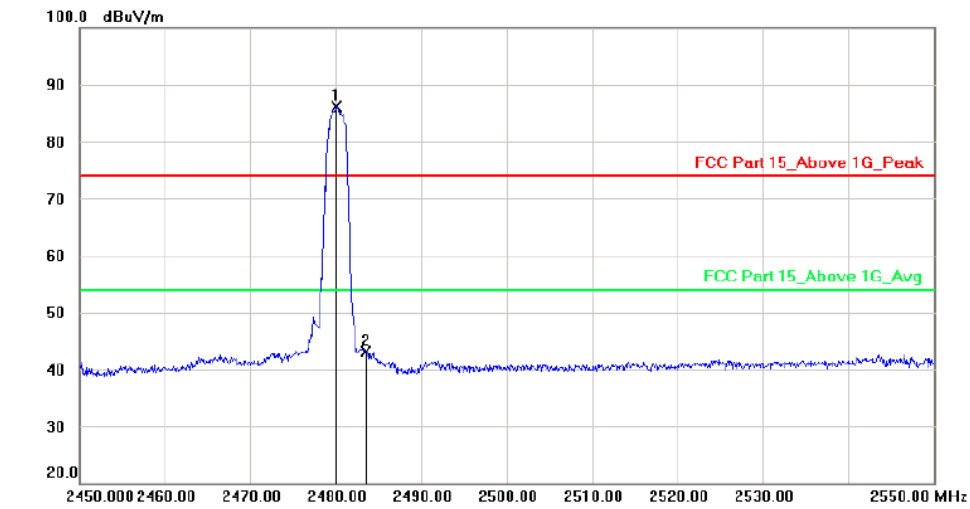
Test Mode: Low

Polarization: Horizontal



Test Mode: High

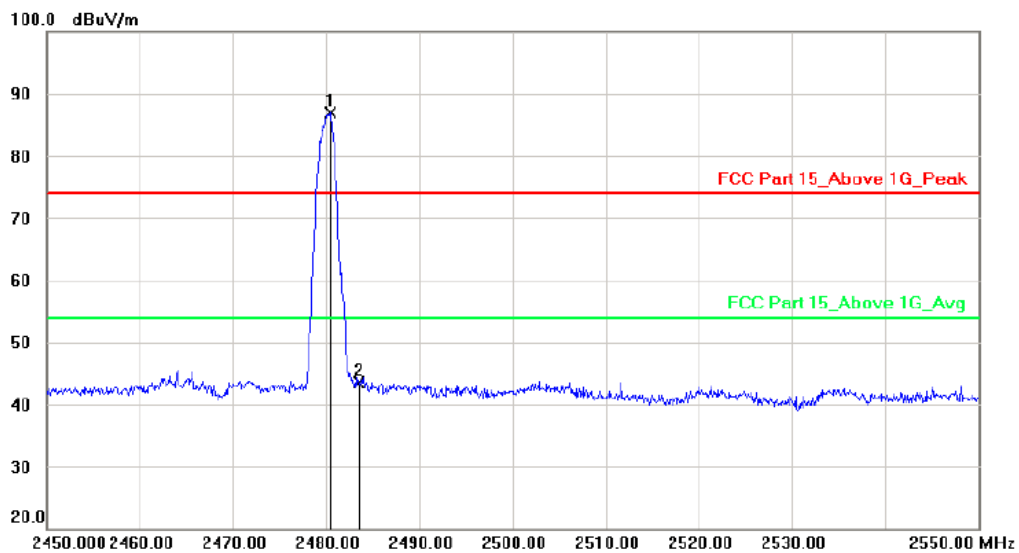
Polarization: Vertical



| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit  | Margin | Antenna  | Table  |        |
|-----|-----|----------|---------|---------|----------|--------|--------|----------|--------|--------|
|     |     | MHz      | Level   | Factor  | ment     |        |        | Height   | Degree |        |
|     |     |          | dBuV    | dB      | dBuV/m   | dBuV/m | dB     | Detector | cm     | degree |
| 1   | *   | 2480.100 | 89.54   | -3.38   | 86.16    | 74.00  | 12.16  | peak     |        |        |
| 2   |     | 2483.500 | 46.39   | -3.38   | 43.01    | 74.00  | -30.99 | peak     |        |        |

Test Mode: High

Polarization: Horizontal



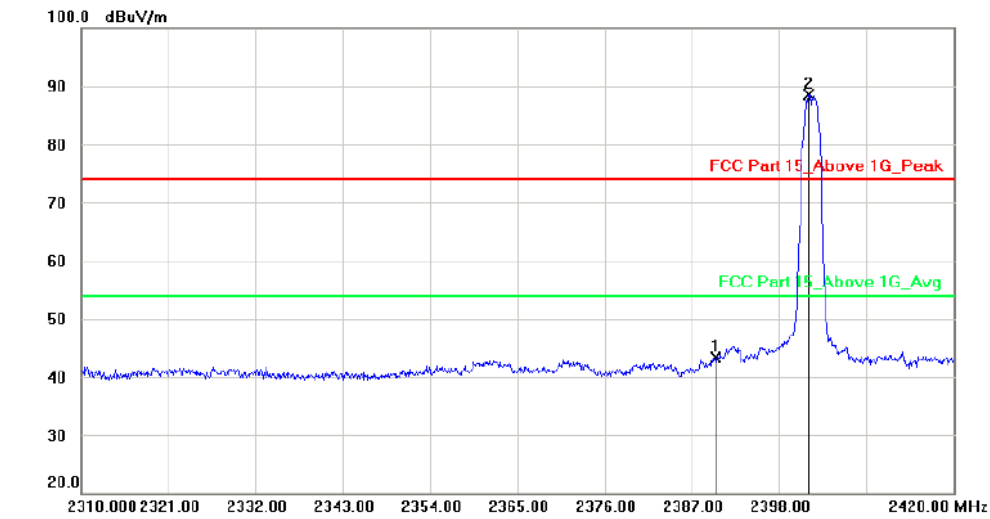
| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit  | Margin | Antenna  | Table  |        |
|-----|-----|----------|---------|---------|----------|--------|--------|----------|--------|--------|
|     |     | MHz      | Level   | Factor  | ment     |        |        | Height   | Degree |        |
|     |     |          | dBuV    | dB      | dBuV/m   | dBuV/m | dB     | Detector | cm     | degree |
| 1   | *   | 2480.400 | 90.27   | -3.38   | 86.89    | 74.00  | 12.89  | peak     |        |        |
| 2   |     | 2483.500 | 46.84   | -3.38   | 43.46    | 74.00  | -30.54 | peak     |        |        |

**For2Mbps**

Radiated Method:

Test Mode: Low

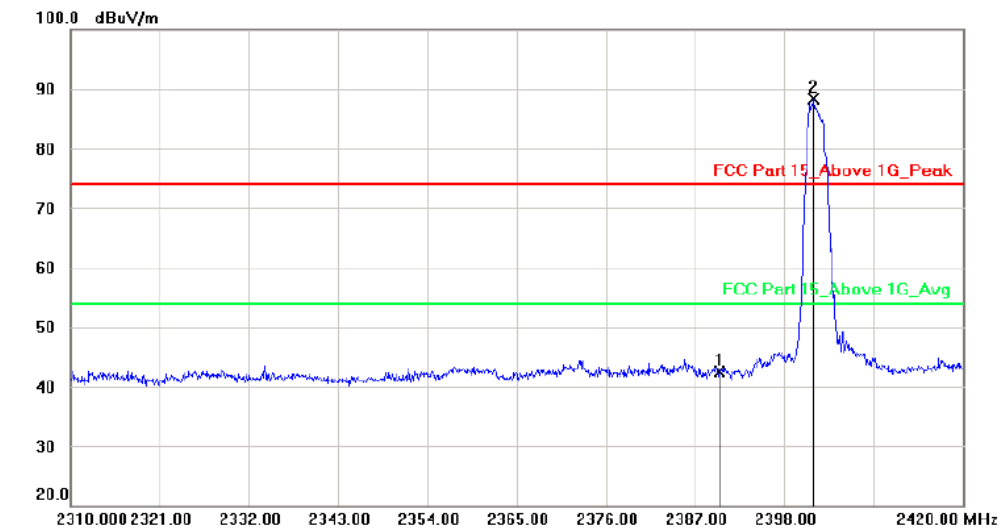
Polarization:Vertical



| 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   |     | 2390.000 | 46.60   | -3.40   | 43.20    | 74.00  | -30.80 | peak    |        |         |
| 2   | *   | 2401.740 | 91.99   | -3.41   | 88.58    | 74.00  | 14.58  | peak    |        |         |

Test Mode: Low

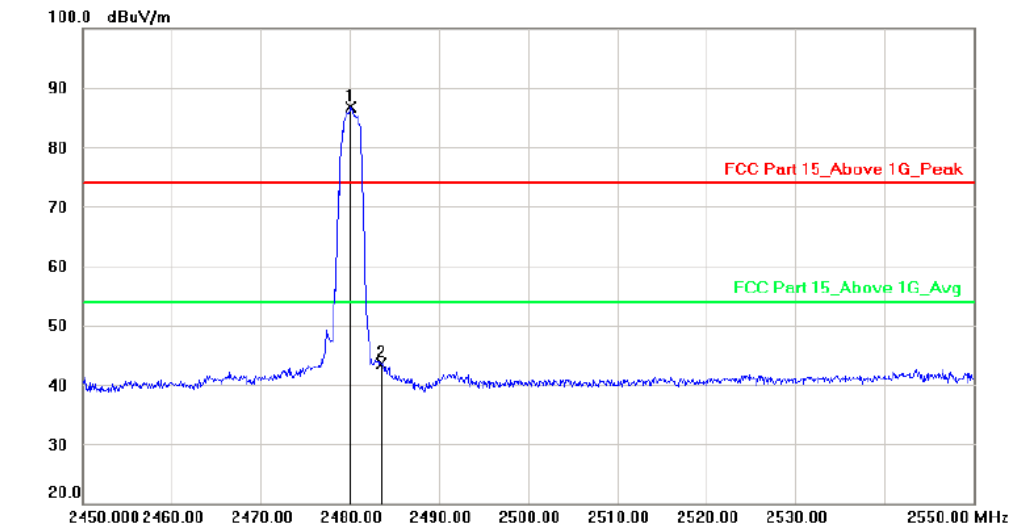
Polarization: Horizontal



| 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   |     | 2390.000 | 46.00   | -3.40   | 42.60    | 74.00  | -31.40 | peak    |        |         |
| 2   | *   | 2401.630 | 91.79   | -3.41   | 88.38    | 74.00  | 14.38  | peak    |        |         |

Test Mode: High

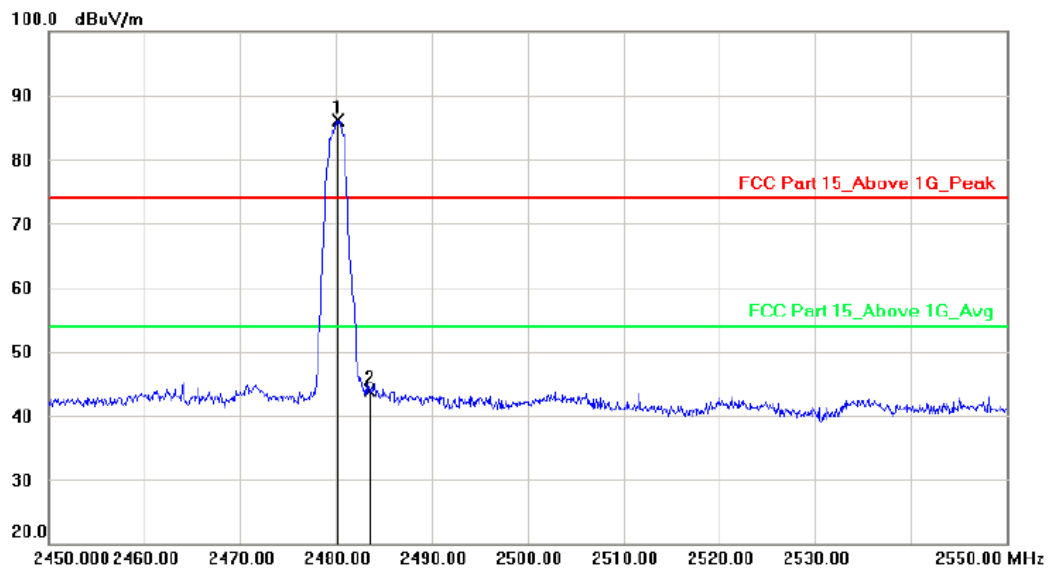
Polarization: Vertical



| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit  | Margin | Antenna  | Table  |        |
|-----|-----|----------|---------|---------|----------|--------|--------|----------|--------|--------|
|     |     | MHz      | Level   | Factor  | ment     |        |        | Height   | Degree |        |
|     |     |          | dBuV    | dB      | dBuV/m   | dBuV/m | dB     | Detector | cm     | degree |
| 1   | *   | 2480.100 | 90.04   | -3.38   | 86.66    | 74.00  | 12.66  | peak     |        |        |
| 2   |     | 2483.500 | 46.89   | -3.38   | 43.51    | 74.00  | -30.49 | peak     |        |        |

Test Mode: High

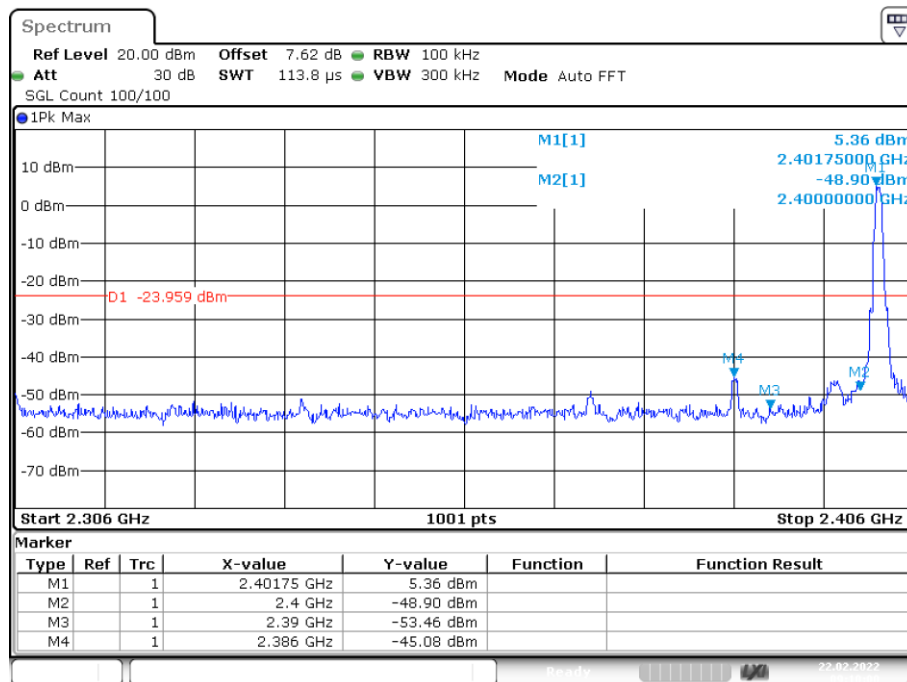
Polarization: Horizontal



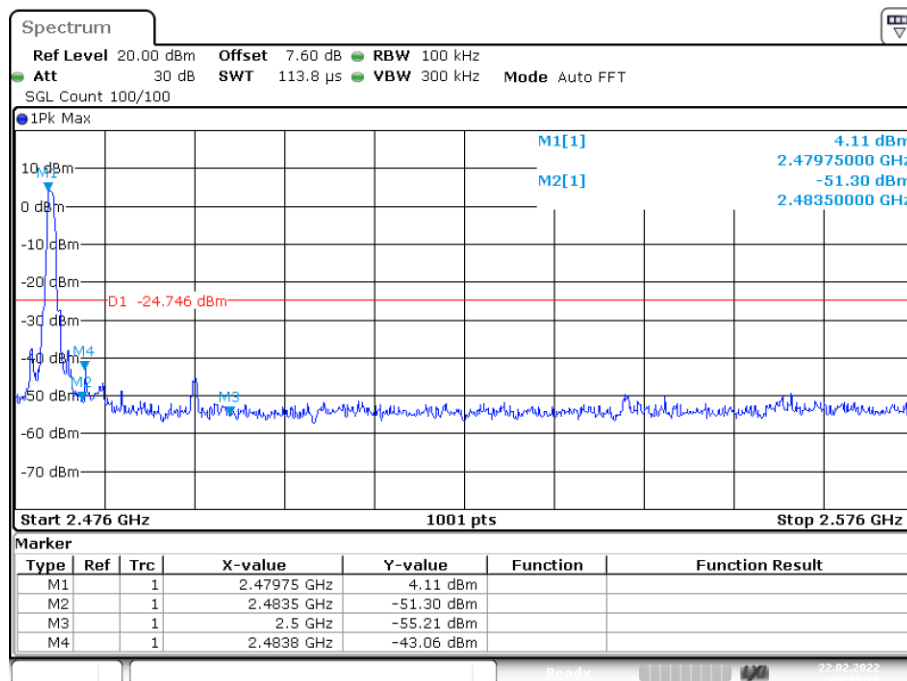
| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit  | Margin | Antenna  | Table  |        |
|-----|-----|----------|---------|---------|----------|--------|--------|----------|--------|--------|
|     |     | MHz      | Level   | Factor  | ment     |        |        | Height   | Degree |        |
|     |     |          | dBuV    | dB      | dBuV/m   | dBuV/m | dB     | Detector | cm     | degree |
| 1   | *   | 2480.200 | 89.41   | -3.38   | 86.03    | 74.00  | 12.03  | peak     |        |        |
| 2   |     | 2483.500 | 47.34   | -3.38   | 43.96    | 74.00  | -30.04 | peak     |        |        |

**For 1Mbps**

Conducted Method:



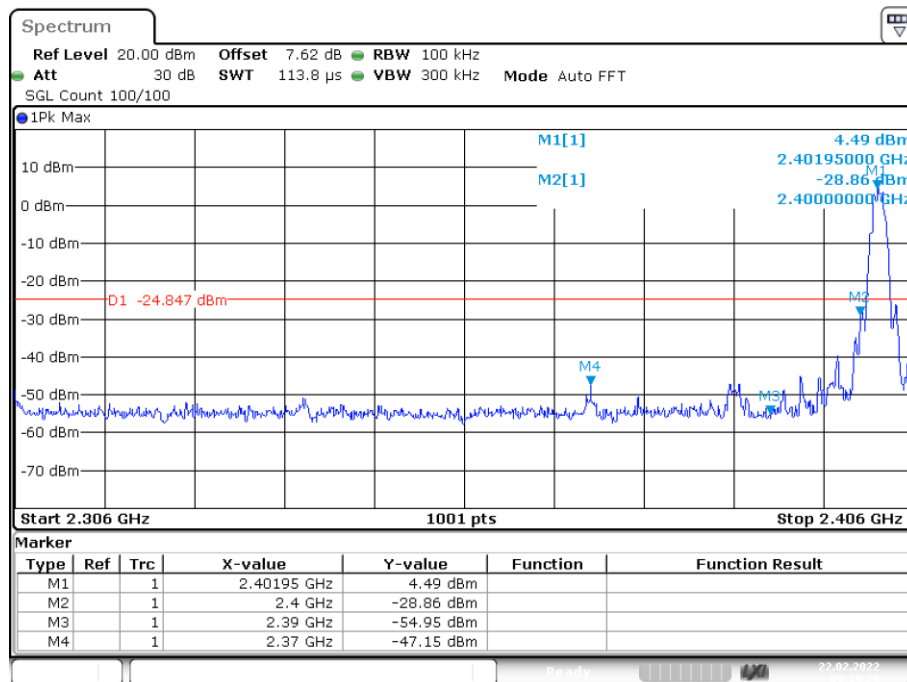
Lowest channel



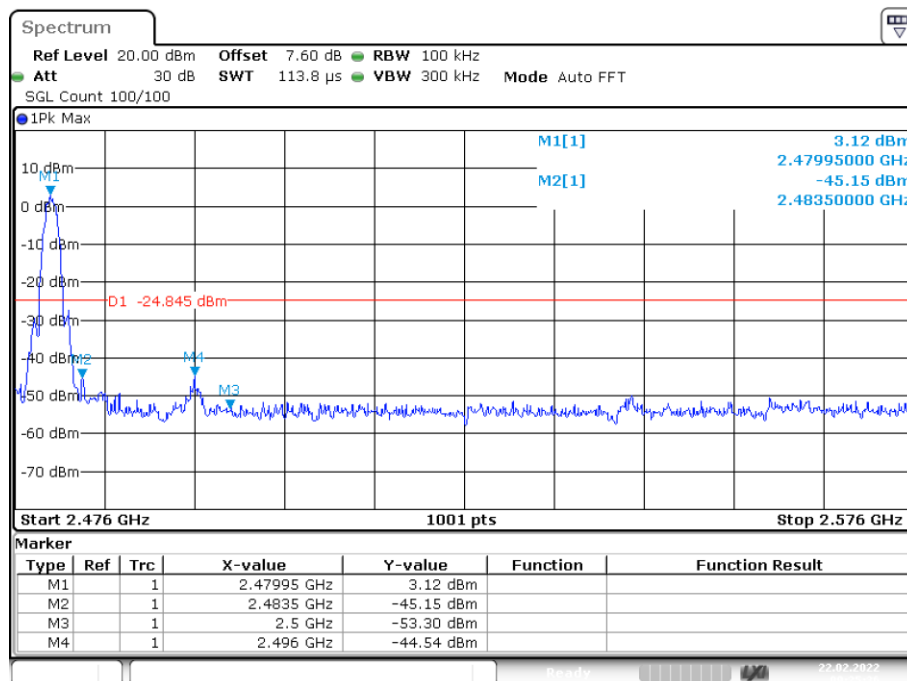
Highest channel

**For 2Mbps**

Conducted Method:



Lowest channel



Highest channel

## **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**

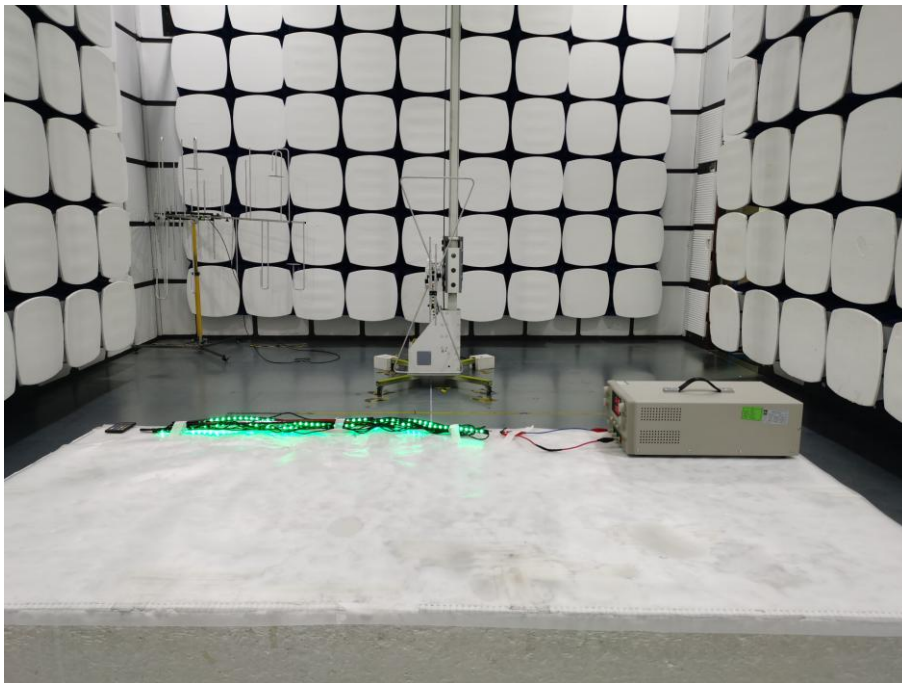
The antenna is PCB antenna and no consideration of replacement. Please see EUT photo for details.

### **9.3. Results**

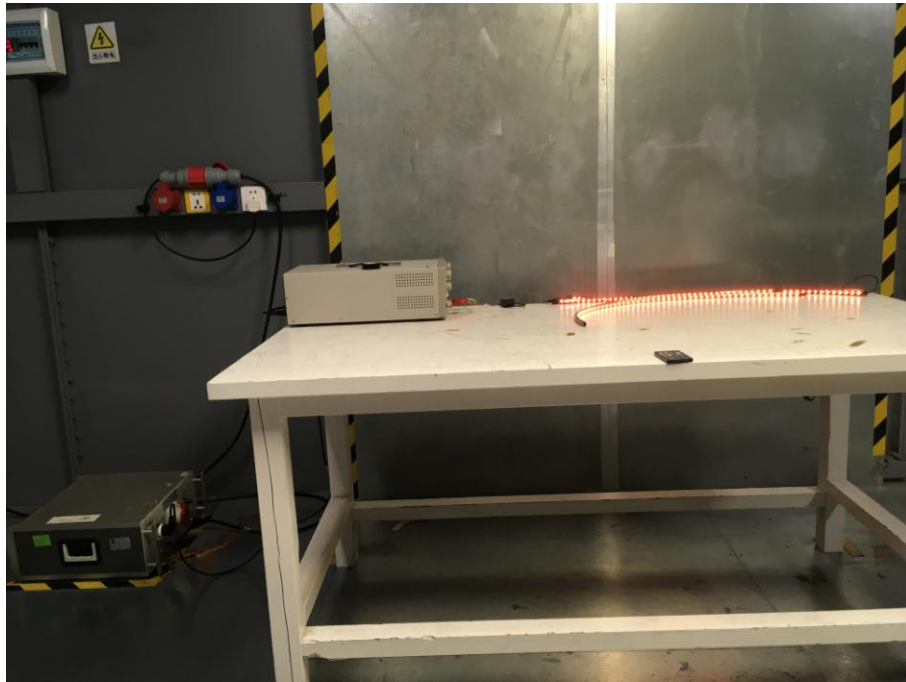
The EUT antenna 1 is Internal antenna. It complies with the standard requirement.

## 10. Test Setup Photo

### 10.1. Photos of Radiated emission



## 10.2.Photos of Conducted Emission test



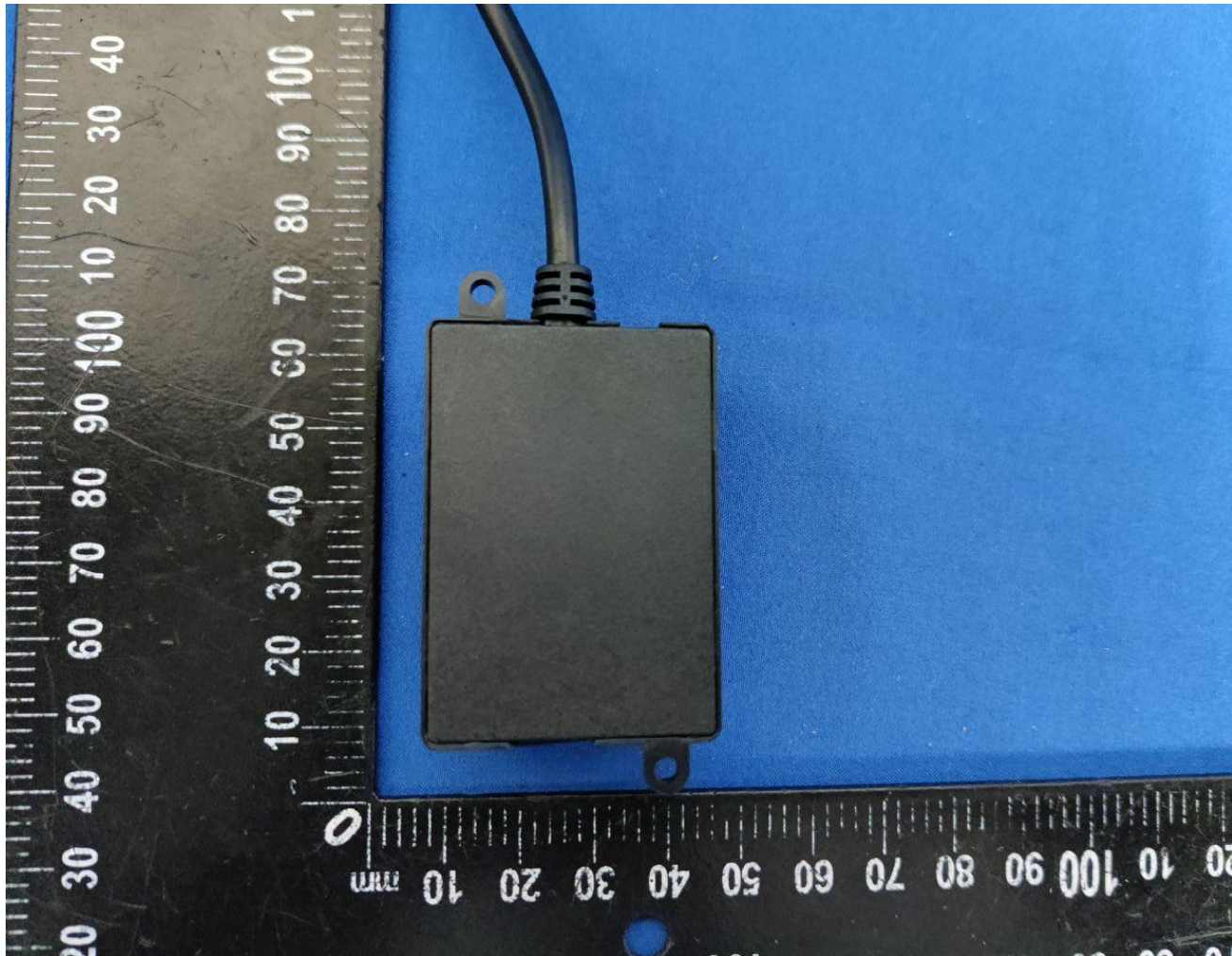
## 11.EUT Photo

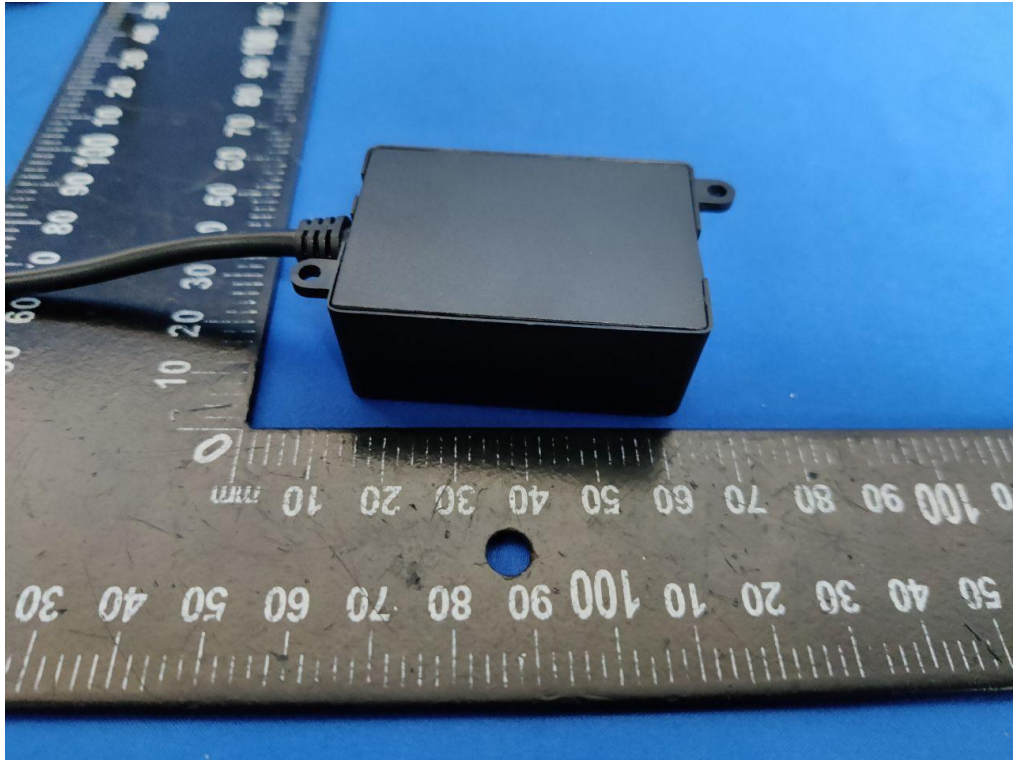


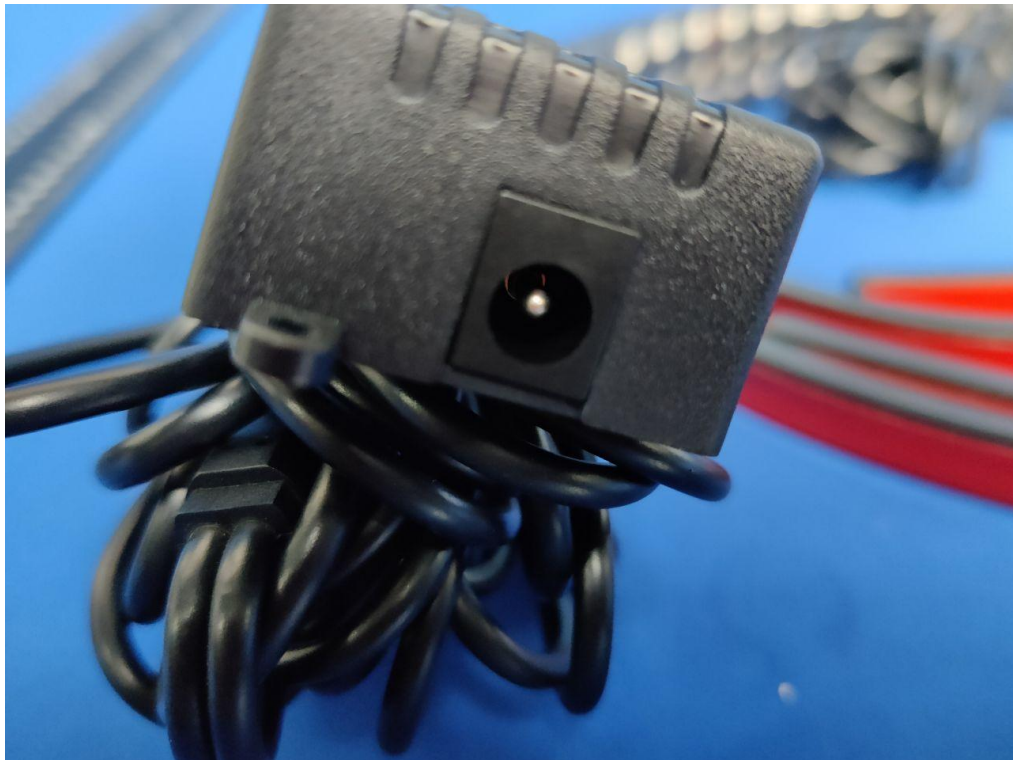
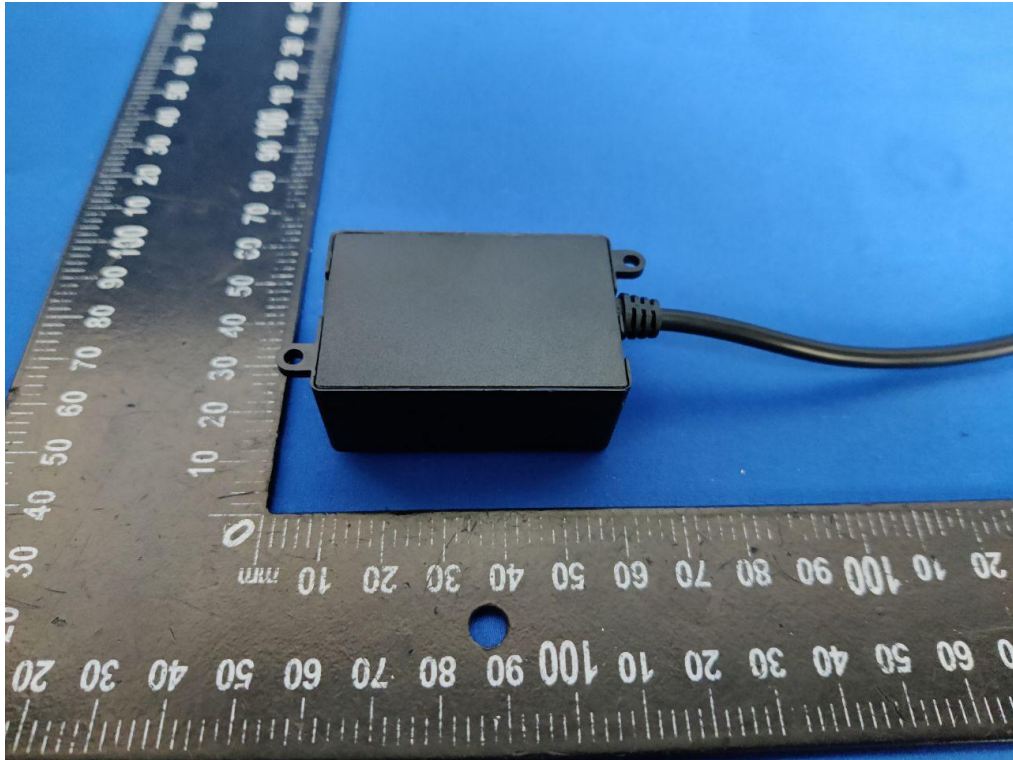


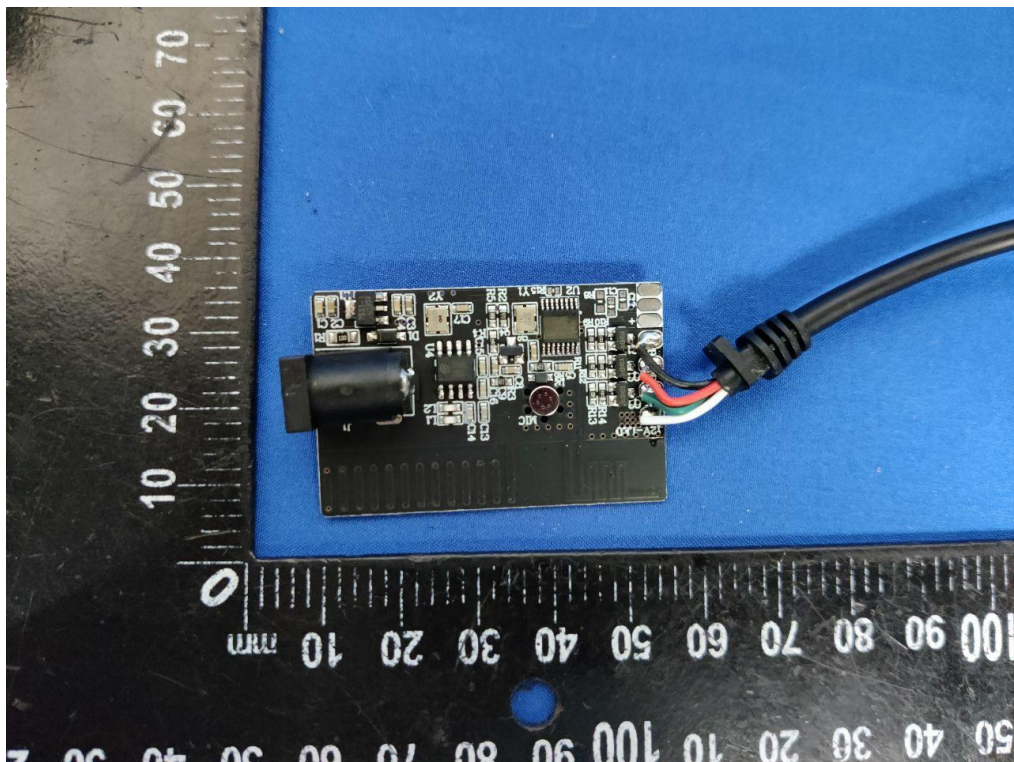
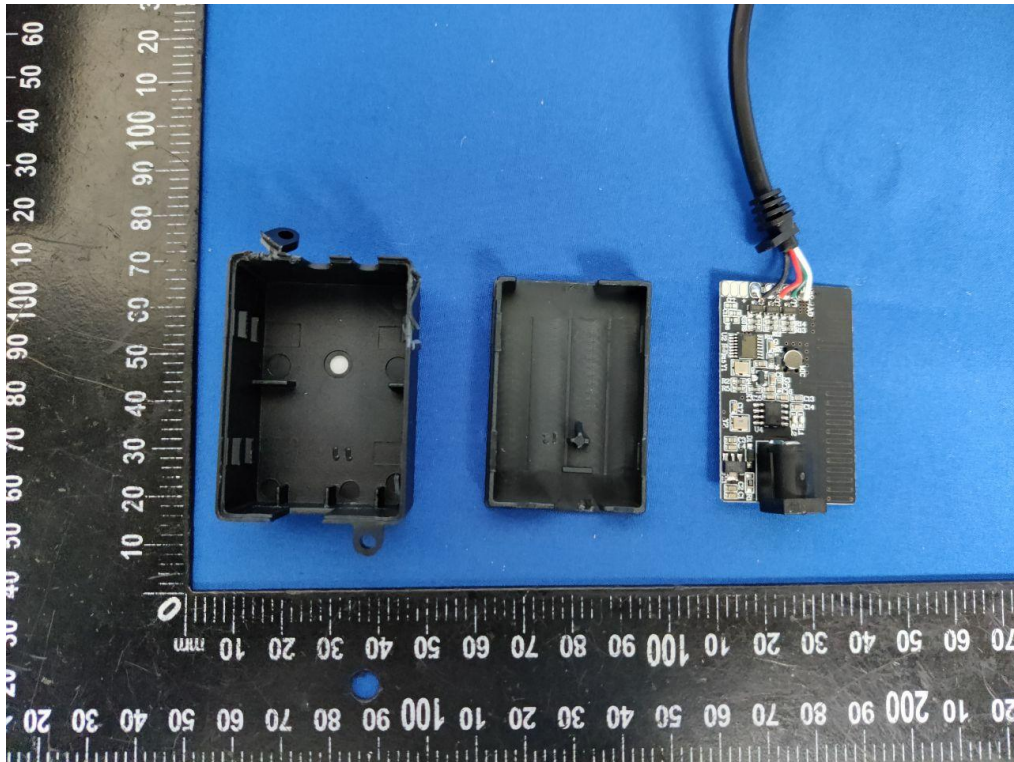


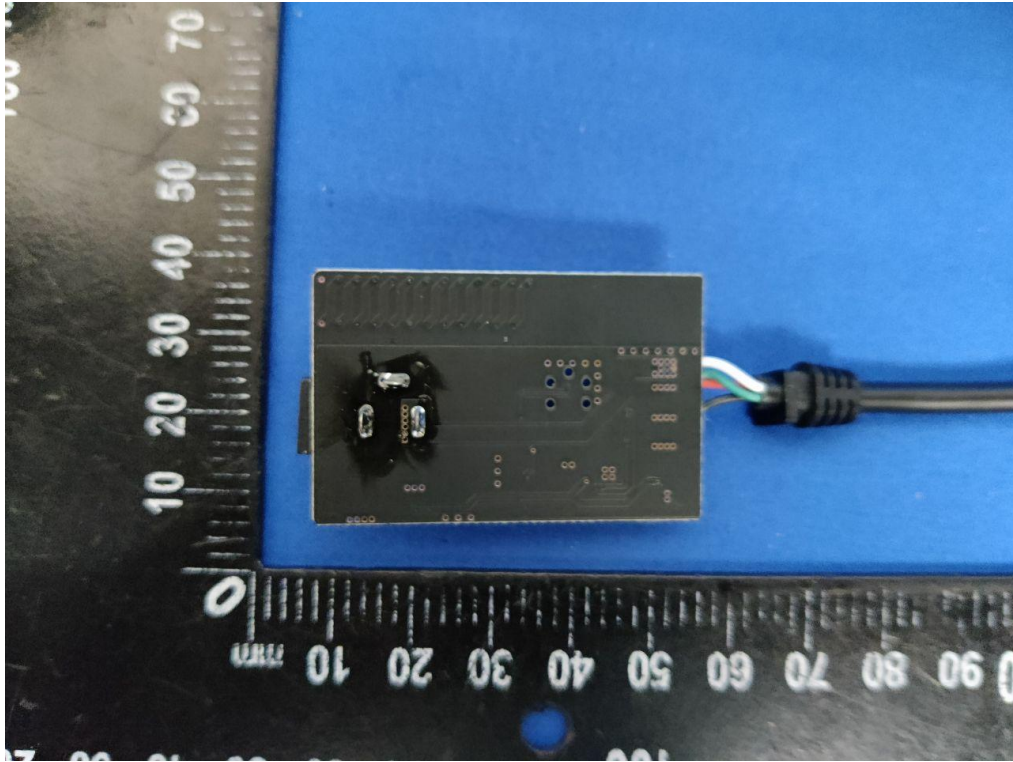












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