



■ Report No.:DDT-R22092806-2E02

■ Issued Date: Nov. 10, 2022

# FCC AND ISED CERTIFICATION TEST REPORT

FOR

|                      |   |                                                               |
|----------------------|---|---------------------------------------------------------------|
| Applicant            | : | Harman International Industries, Inc.                         |
| Address              | : | 8500 Balboa Boulevard, Northridge, CA 91329,<br>UNITED STATES |
| Equipment under Test | : | BLUETOOTH HEADSET                                             |
| Model No.            | : | TOUR PRO 2                                                    |
| Trade Mark           | : | JBL                                                           |
| FCC ID               | : | APITOURPRO2                                                   |
| IC                   | : | 6132A-TOURPRO2                                                |
| Manufacturer         | : | Harman International Industries, Inc.                         |
| Address              | : | 8500 Balboa Boulevard, Northridge, CA 91329,<br>UNITED STATES |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

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# REPORT

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## Test Report Declare

|                             |   |                                                            |
|-----------------------------|---|------------------------------------------------------------|
| <b>Applicant</b>            | : | Harman International Industries, Inc.                      |
| <b>Address</b>              | : | 8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES |
| <b>Equipment under Test</b> | : | BLUETOOTH HEADSET                                          |
| <b>Model No.</b>            | : | TOUR PRO 2                                                 |
| <b>Trade Mark</b>           | : | JBL                                                        |
| <b>Manufacturer</b>         | : | Harman International Industries, Inc.                      |
| <b>Address</b>              | : | 8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES |

### Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C, RSS-247 Issue 2 February 2017.

### Test Procedure Used:

ANSI C63.10:2013, RSS-Gen Issue 5, Apr. 2018, Amendment 2 (February 2021)

### We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC&ISED standards.**

|                         |                    |                      |                               |
|-------------------------|--------------------|----------------------|-------------------------------|
| <b>Report No.:</b>      | DDT-R22092806-2E02 |                      |                               |
| <b>Date of Receipt:</b> | Nov. 04, 2022      | <b>Date of Test:</b> | Nov. 04, 2022 ~ Nov. 09, 2022 |

**Prepared By:**

*Bobo Chen*

**Bobo Chen/Engineer**

**Approved By:**



**Damon Hu/EMC Manager**

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

## Revision History

| Rev. | Revisions     | Issue Date    | Revised By |
|------|---------------|---------------|------------|
| ---  | Initial issue | Nov. 10, 2022 |            |
|      |               |               |            |

## 1. Summary of Test Results

| The EUT have been tested according to the applicable standards as referenced below. |                                                                                                       |         |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------|
| Description of Test Item                                                            | Standard                                                                                              | Verdict |
| 6 dB Bandwidth and 99% Bandwidth                                                    | FCC Part 15: 15.247<br>ANSI C63.10:2013<br>RSS-247 Issue 2                                            | Pass    |
| Peak Output Power                                                                   | FCC Part 15: 15.247<br>ANSI C63.10:2013<br>RSS-247 Issue 2                                            | Pass    |
| Power Spectral Density                                                              | FCC Part 15:15.247<br>ANSI C63.10:2013<br>RSS-247 Issue 2                                             | Pass    |
| Band Edge Compliance<br>(conducted method)                                          | FCC Part 15: 15.209<br>FCC Part 15: 15.247<br>ANSI C63.10: 2013<br>RSS-247 Issue 2<br>RSS-Gen Issue 5 | Pass    |
| Radiation Emission                                                                  | FCC Part 15: 15.247<br>ANSI C63.10:2013<br>RSS-247 Issue 2<br>RSS-Gen Issue 5                         | Pass    |
| RF Conducted Spurious Emissions                                                     | FCC Part 15: 15.209<br>FCC Part 15: 15.247<br>ANSI C63.10: 2013<br>RSS-247 Issue 2<br>RSS-Gen Issue 5 | Pass    |
| Emission in Restricted Frequency Bands                                              | FCC Part 15: 15.209<br>FCC Part 15: 15.247<br>ANSI C63.10: 2013<br>RSS-247 Issue 2<br>RSS-Gen Issue 5 | Pass    |
| Power Line Conducted Emission                                                       | FCC Part 15: 15.207<br>ANSI C63.10: 2013<br>RSS-Gen Issue 5                                           | Pass    |
| Antenna Requirement                                                                 | FCC Part 15: 15.203<br>RSS-Gen Issue 5                                                                | Pass    |

## 2. General Test Information

### 2.1. Description of EUT

|                          |                                                                                 |
|--------------------------|---------------------------------------------------------------------------------|
| EUT* Name                | : BLUETOOTH HEADSET                                                             |
| Model Number             | : TOUR PRO 2                                                                    |
| EUT Function Description | : Please reference user manual of this device                                   |
| Power Supply             | : DC 5V from external charging case<br>DC 3.85V Polymer Li-ion built-in battery |
| Radio Specification      | : Bluetooth V5.3                                                                |
| Operation Frequency      | : 2402 MHz - 2480 MHz                                                           |
| Modulation               | : GFSK                                                                          |
| Data Rate                | : 1 Mbps, 2 Mbps                                                                |
| Antenna Gain             | : Left side: -0.33 dBi<br>Right side: -0.65 dBi                                 |
| Sample Type              | : Series production                                                             |
| Sample Number            | : S22092806-03 for conductive<br>S22092806-04 for radiation                     |

Note: EUT is the ab. of equipment under test.

| Channel information |                 |         |                 |         |                 |
|---------------------|-----------------|---------|-----------------|---------|-----------------|
| Channel             | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 0                   | 2402            | 14      | 2430            | 28      | 2458            |
| 1                   | 2404            | 15      | 2432            | 29      | 2460            |
| 2                   | 2406            | 16      | 2434            | 30      | 2462            |
| 3                   | 2408            | 17      | 2436            | 31      | 2464            |
| 4                   | 2410            | 18      | 2438            | 32      | 2466            |
| 5                   | 2412            | 19      | 2440            | 33      | 2468            |
| 6                   | 2414            | 20      | 2442            | 34      | 2470            |
| 7                   | 2416            | 21      | 2444            | 35      | 2472            |
| 8                   | 2418            | 22      | 2446            | 36      | 2474            |
| 9                   | 2420            | 23      | 2448            | 37      | 2476            |
| 10                  | 2422            | 24      | 2450            | 38      | 2478            |
| 11                  | 2424            | 25      | 2452            | 39      | 2480            |
| 12                  | 2426            | 26      | 2454            |         |                 |
| 13                  | 2428            | 27      | 2456            |         |                 |

### 2.2. Accessories of EUT

| Description of Accessories | Manufacturer | Model number | Description  | Remark |
|----------------------------|--------------|--------------|--------------|--------|
| Type-C Cable               | Harman       | N/A          | Length: 0.2m | N/A    |

### 2.3. Assistant equipment used for test

| Assistant equipment | Manufacturer | Model number | EMC Compliance                                                      | SN  |
|---------------------|--------------|--------------|---------------------------------------------------------------------|-----|
| Adapter             | HUAWEI       | HW-050450C00 | Input: 100-240V~<br>50/60Hz, Output: 5V/2A or<br>4.5V/5A or 5V/4.5A | N/A |

### 2.4. Block diagram of EUT configuration for test



Test software: BQB.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

The pathloss of external cable: 0.5dB (According to the manufacturer's claims)

| Tested mode, channel, information |                  |         |                 |
|-----------------------------------|------------------|---------|-----------------|
| Mode                              | Setting Tx Power | Channel | Frequency (MHz) |
| BLE 1M                            | /                | CH0     | 2402            |
|                                   | /                | CH19    | 2440            |
|                                   | /                | CH39    | 2480            |
| BLE 2M                            | /                | CH0     | 2402            |
|                                   | /                | CH19    | 2440            |
|                                   | /                | CH39    | 2480            |

### 2.5. Test environment conditions

|                    |            |
|--------------------|------------|
| Temperature range: | 21-25 °C   |
| Humidity range:    | 40-75%     |
| Pressure range:    | 86-106 kPa |

### 2.6. Deviations of test standard

No deviation.

## 2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: [ddt@dgddt.com](mailto:ddt@dgddt.com).

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118

## 2.8. Measurement uncertainty

| Test Item                                                | Uncertainty                                                                                               |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Bandwidth                                                | 1.1%                                                                                                      |
| Peak Output Power (Conducted) (Spectrum analyzer)        | 0.86 dB (10 MHz ≤ f < 3.6 GHz);<br>1.38 dB (3.6 GHz ≤ f < 8 GHz)                                          |
| Peak Output Power (Conducted) (Power Sensor)             | 0.74 dB                                                                                                   |
| Power Spectral Density                                   | 0.74 dB (10 MHz ≤ f < 3.6 GHz);<br>1.38 dB (3.6 GHz ≤ f < 8 GHz)                                          |
| Frequencies Stability                                    | 6.7 × 10 <sup>-8</sup> (Antenna couple method)<br>5.5 × 10 <sup>-8</sup> (Conducted method)               |
| Conducted spurious emissions                             | 0.86 dB (10 MHz ≤ f < 3.6 GHz);<br>1.40 dB (3.6 GHz ≤ f < 8 GHz)<br>1.66 dB (8 GHz ≤ f < 22 GHz)          |
| Uncertainty for radio frequency (RBW < 20 kHz)           | 3×10 <sup>-8</sup>                                                                                        |
| Temperature                                              | 0.4 °C                                                                                                    |
| Humidity                                                 | 2 %                                                                                                       |
| Uncertainty for Radiation Emission test (9 kHz – 30 MHz) | 3.44 dB                                                                                                   |
| Uncertainty for Radiation Emission test (30 MHz - 1 GHz) | 4.70 dB (Antenna Polarize: V)<br>4.84 dB (Antenna Polarize: H)                                            |
| Uncertainty for Radiation Emission test (1 GHz - 40 GHz) | 4.10 dB (1 - 6 GHz)<br>4.40 dB (6 GHz - 18 GHz)<br>3.54 dB (18 GHz - 26 GHz)<br>4.30 dB (26 GHz - 40 GHz) |
| Uncertainty for Power line conduction emission test      | 3.34dB (150KHz-30MHz)<br>3.72dB (9KHz-150KHz)                                                             |

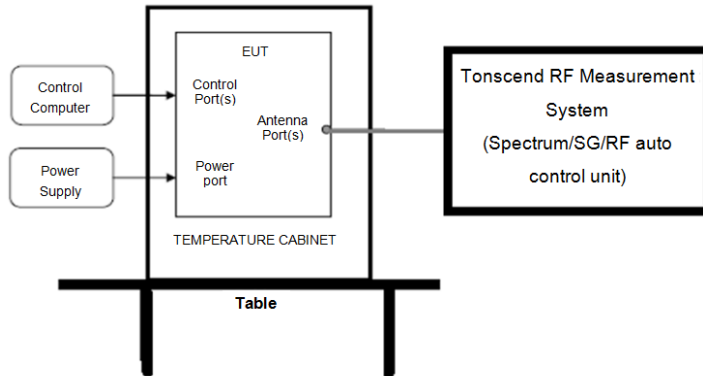
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. Equipment Used During Test

| Equipment                                                     | Manufacturer    | Model No.                                                           | Serial No.        | Last Cal.     | Cal. Interval |
|---------------------------------------------------------------|-----------------|---------------------------------------------------------------------|-------------------|---------------|---------------|
| <b>☑RF Connected Test (Tonscend RF Measurement System 4#)</b> |                 |                                                                     |                   |               |               |
| Signal & Spectrum analyzer                                    | R&S             | FSV3044                                                             | 101173            | Apr. 13, 2022 | 1 Year        |
| Wideband Radio Communication tester                           | R&S             | CMW500                                                              | 120259            | May 26, 2022  | 1 Year        |
| EXG Analog Signal Generator                                   | KEYSIGHT        | N5173A                                                              | MY62152058        | May 26, 2022  | 1 Year        |
| Vector Signal Generator                                       | Agilent         | E8267D                                                              | US49060192        | Sep. 28, 2022 | 1 Year        |
| RF Control Unit                                               | Tonsend         | JS0806-2                                                            | 2118060485        | May 28, 2022  | 1 Year        |
| Temp&Humi Programmable                                        | ZHIXIANG        | ZXGDJS-150L                                                         | ZX170110-A        | May 26, 2022  | 1 Year        |
| Test Software                                                 | JS Tonscend     | JS1120-3                                                            | Ver.3.2.22        | N/A           | N/A           |
| <b>☑Radiation 3#chamber</b>                                   |                 |                                                                     |                   |               |               |
| EMI Test Receiver                                             | R&S             | ESU26                                                               | 100472            | May 19, 2022  | 1 Year        |
| Spectrum analyzer                                             | Agilent         | E4447A                                                              | MY50180031        | May 17, 2022  | 1 Year        |
| Active Loop antenna                                           | Schwarzbeck     | FMZB-1519                                                           | 1519-038          | Sep. 29, 2022 | 1 Year        |
| Trilog Broadband Antenna                                      | Schwarzbeck     | VULB 9163                                                           | 01429             | Jul. 22, 2022 | 1 Year        |
| Double Ridged Horn Antenna                                    | Schwarzbeck     | BBHA9120 D                                                          | 02468             | Sep. 29, 2022 | 1 Year        |
| Broad Band Horn Antenna                                       | Schwarzbeck     | BBHA 9170                                                           | 790               | May 06, 2022  | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-118A                                                            | 18040084          | Aug.17, 2022  | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-840A                                                            | 461369            | Apr. 11, 2022 | 1 Year        |
| RE Cable                                                      | N/A             | W23.02 CP1-X2 + W23.09 AP1-X8+ JCT26S-NJ-NJ-1.5M+ JCT26S-NJ-NJ-1.5M | 4.5M+8M+1.5M+1.5M | Aug.17, 2022  | 1 Year        |
| RF Cable                                                      | Yuhu Technology | JCTB810-NJ-NJ-9M                                                    | 21123964          | May. 19,2022  | 1 Year        |
| RF Cable                                                      | Yuhu Technology | ZT26S-SMAJ-SMAJ-1M                                                  | 21073466          | Aug.17, 2022  | 1 Year        |
| Test software                                                 | Tonscend        | JS32-RE                                                             | V 5.0.0.1         | N/A           | N/A           |
| <b>☑Power Line Conducted Emissions Test 1#</b>                |                 |                                                                     |                   |               |               |
| Test Receiver                                                 | R&S             | ESCI                                                                | 100551            | Aug. 26, 2022 | 1 Year        |
| LISN 1                                                        | R&S             | ENV216                                                              | 101109            | Aug. 26, 2022 | 1 Year        |
| LISN 2                                                        | R&S             | ESH2-Z5                                                             | 100309            | Aug. 26, 2022 | 1 Year        |
| Pulse Limiter                                                 | R&S             | ESH3-Z2                                                             | 101242            | Aug. 26, 2022 | 1 Year        |
| CE Cable 1                                                    | HUBSER          | N/A                                                                 | W10.01            | Aug. 26, 2022 | 1 Year        |
| Test software                                                 | Audix           | E3                                                                  | V 6.11111b        | N/A           | N/A           |
| Test Receiver                                                 | R&S             | ESCI                                                                | 100551            | Aug. 26, 2022 | 1 Year        |

## 4. 6 dB Bandwidth and 99% Bandwidth

### 4.1. Block diagram of test setup



### 4.2. Limits

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

### 4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) 99% Bandwidth set the spectrum analyzer as follows:

|                |                               |
|----------------|-------------------------------|
| RBW:           | 1% to 5% of the OBW           |
| VBW:           | approximately three times RBW |
| Detector Mode: | Peak                          |
| Sweep time:    | auto                          |
| Trace mode     | Max hold                      |

(3) 6 dB Bandwidth set the spectrum analyzer as follows:

|                |          |
|----------------|----------|
| RBW:           | 100 kHz  |
| VBW:           | 300 kHz  |
| Detector Mode: | Peak     |
| Sweep time:    | auto     |
| Trace mode     | Max hold |

(4) Allow the trace to stabilize, measure the 6 dB and 99% bandwidth of signal.

#### 4.4. Test result

Left side:

| Mode   | Channel | 99% bandwidth<br>Result (MHz) | 6 dB bandwidth<br>Result (MHz) | 6 dB width Limit<br>(MHz) | Verdict |
|--------|---------|-------------------------------|--------------------------------|---------------------------|---------|
| BLE 1M | CH0     | 1.013                         | 0.672                          | >0.5                      | Pass    |
|        | CH19    | 1.012                         | 0.676                          | >0.5                      | Pass    |
|        | CH39    | 1.011                         | 0.668                          | >0.5                      | Pass    |
| BLE 2M | CH0     | 2.003                         | 1.128                          | >0.5                      | Pass    |
|        | CH19    | 2.003                         | 1.128                          | >0.5                      | Pass    |
|        | CH39    | 2.003                         | 1.128                          | >0.5                      | Pass    |

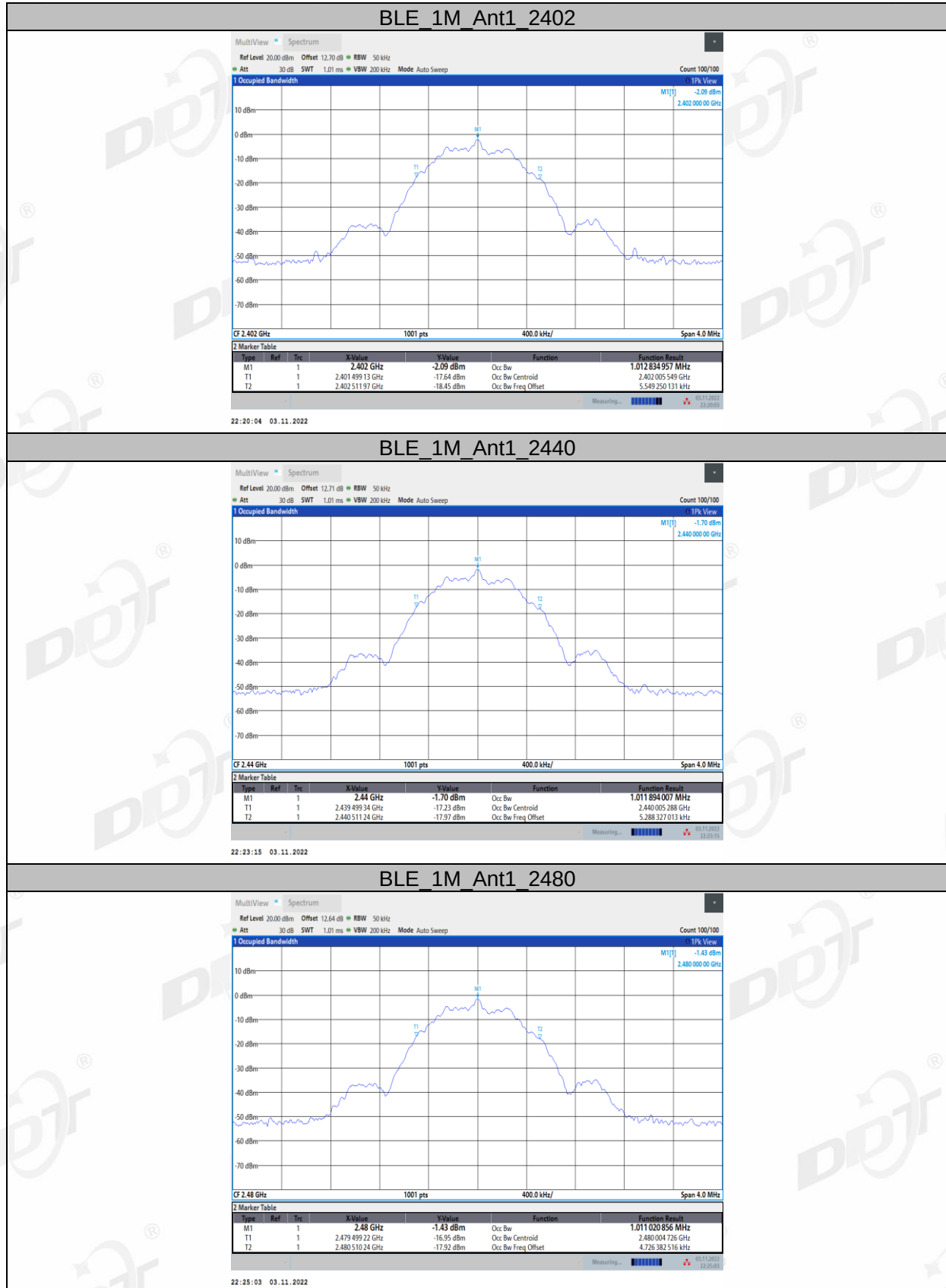
Right side:

| Mode   | Channel | 99% bandwidth<br>Result (MHz) | 6 dB bandwidth<br>Result (MHz) | 6 dB width Limit<br>(MHz) | Verdict |
|--------|---------|-------------------------------|--------------------------------|---------------------------|---------|
| BLE 1M | CH0     | 1.015                         | 0.672                          | >0.5                      | Pass    |
|        | CH19    | 1.014                         | 0.672                          | >0.5                      | Pass    |
|        | CH39    | 1.015                         | 0.668                          | >0.5                      | Pass    |
| BLE 2M | CH0     | 2.006                         | 1.128                          | >0.5                      | Pass    |
|        | CH19    | 2.006                         | 1.128                          | >0.5                      | Pass    |
|        | CH39    | 2.008                         | 1.124                          | >0.5                      | Pass    |

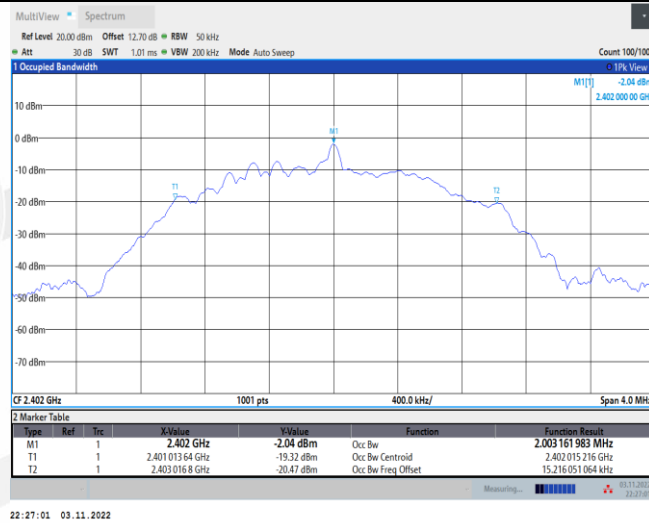
#### 4.5. Original test data

99% bandwidth:

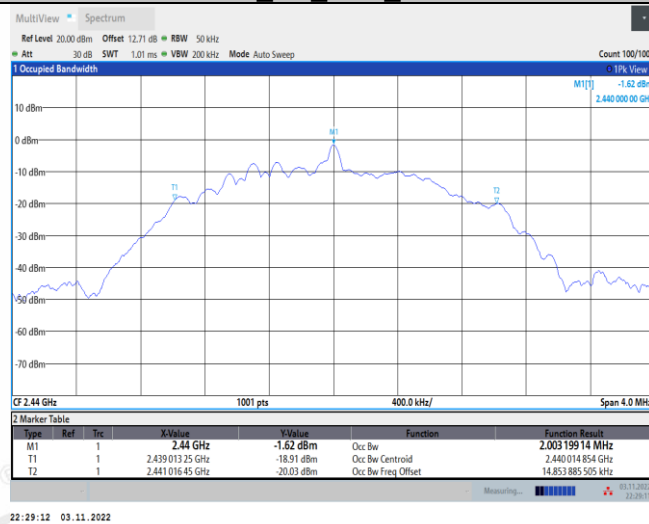
Left side:



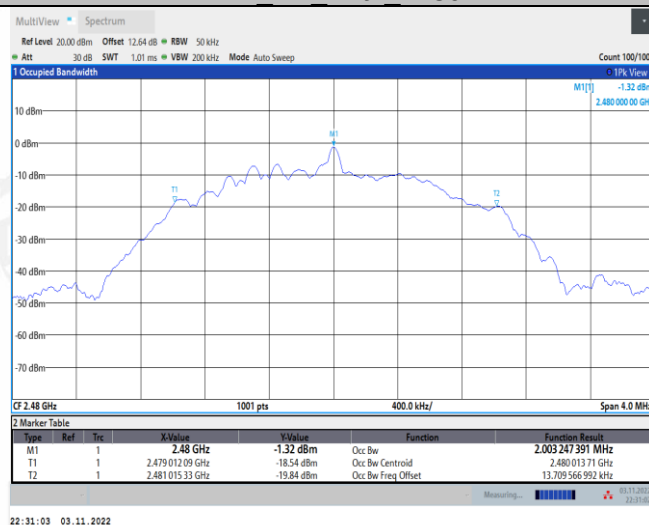
## BLE 2M Ant1 2402



## BLE 2M Ant1 2440

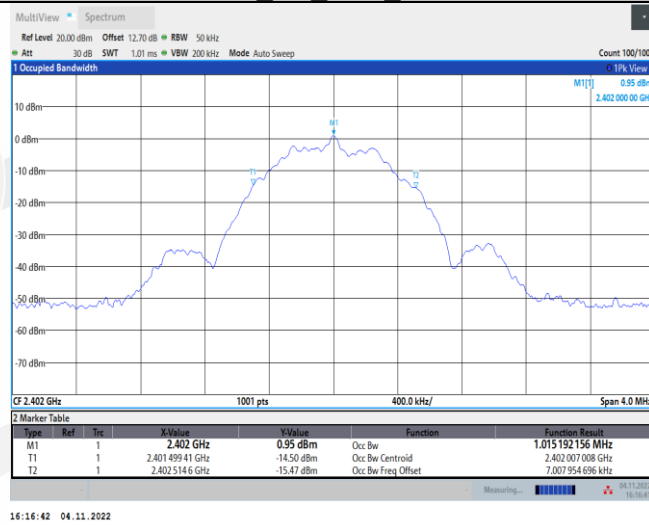


## BLE 2M Ant1 2480

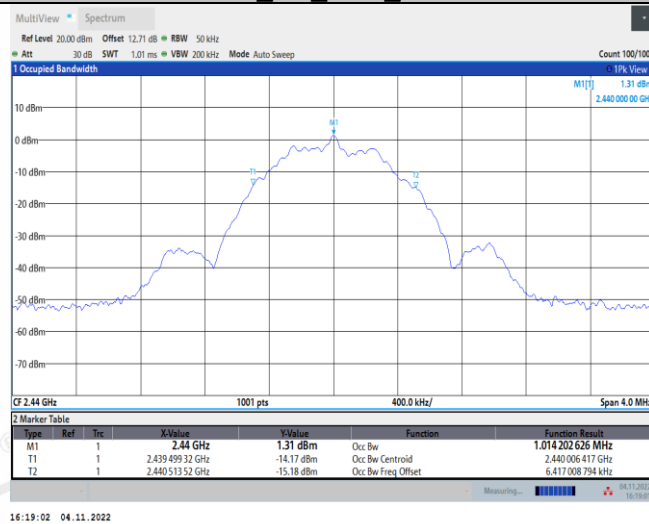


Right side:

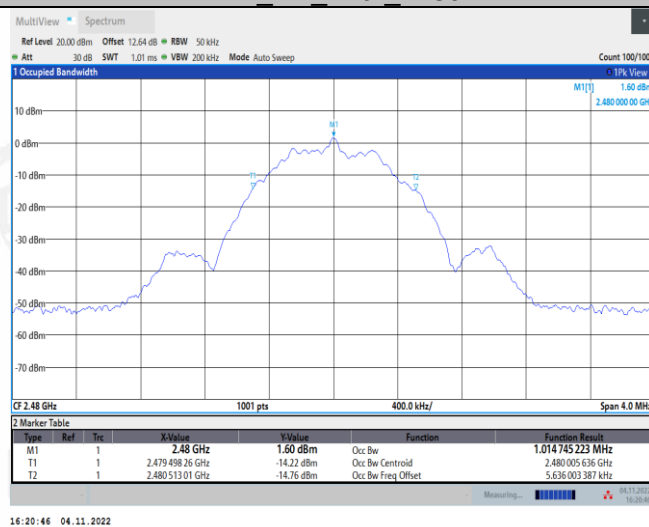
## BLE\_1M\_Ant1\_2402



## BLE\_1M\_Ant1\_2440



## BLE\_1M\_Ant1\_2480

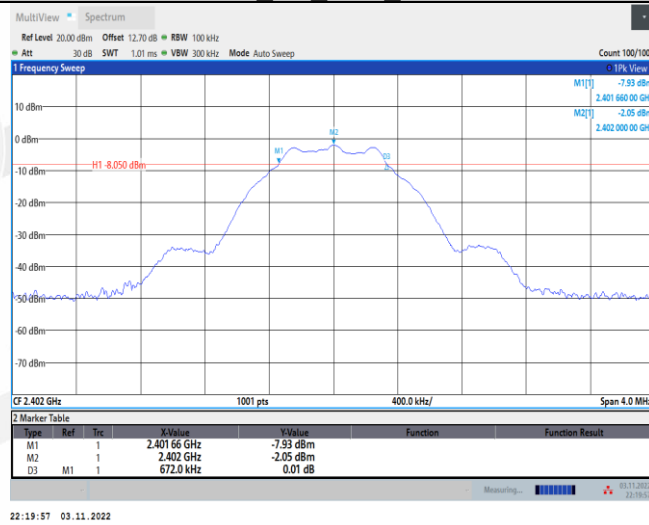


## BLE\_2M\_Ant1\_2402

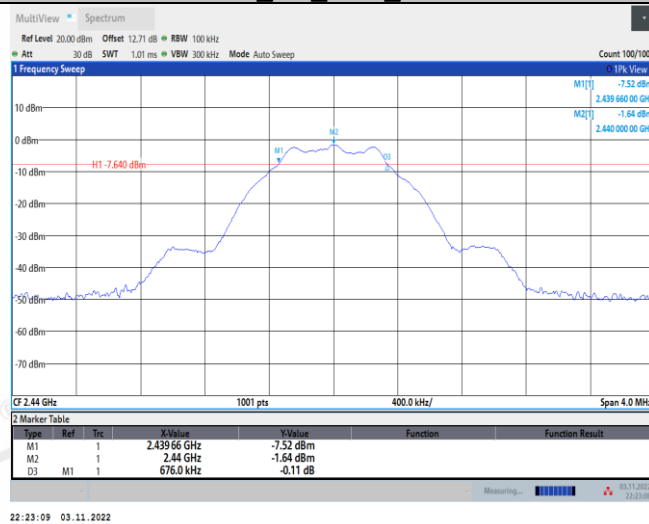


6 dB bandwidth:  
Left side:

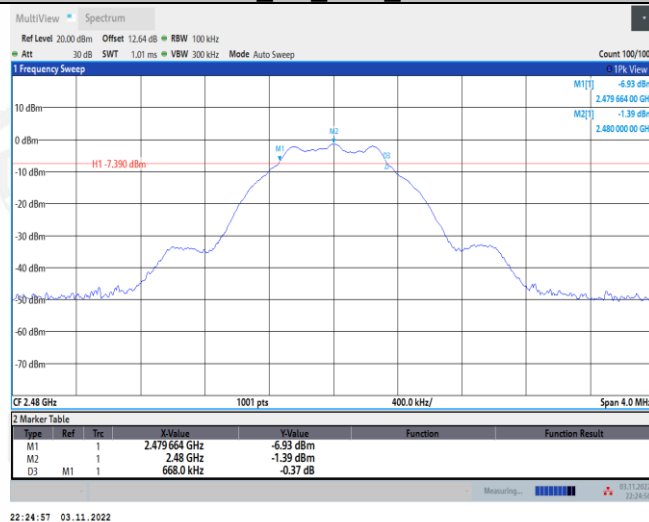
## BLE\_1M\_Ant1\_2402



## BLE\_1M\_Ant1\_2440



## BLE\_1M\_Ant1\_2480

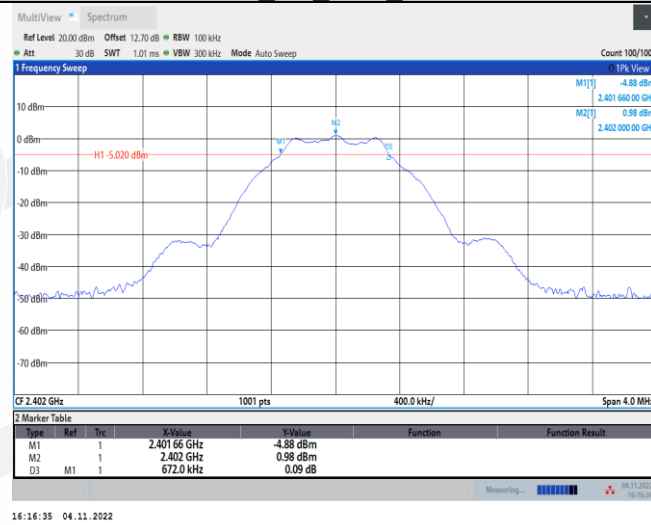


## BLE\_2M\_Ant1\_2402

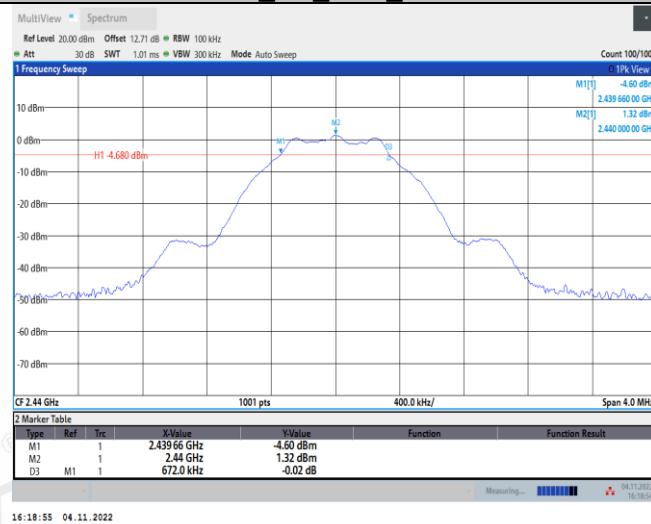


Right side:

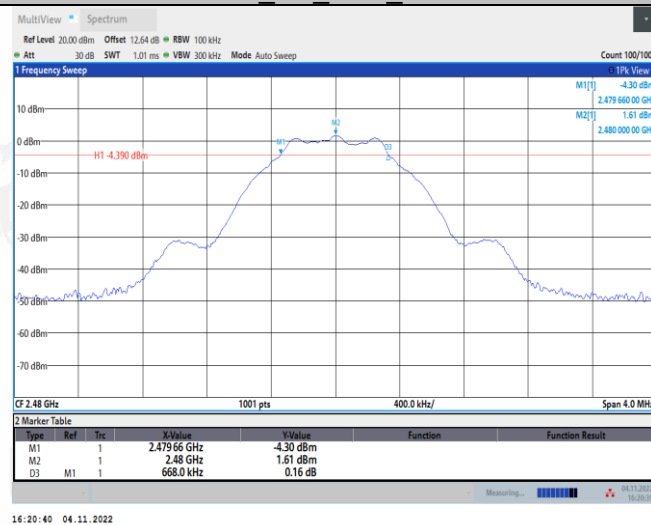
## BLE\_1M\_Ant1\_2402



## BLE\_1M\_Ant1\_2440



## BLE\_1M\_Ant1\_2480



## BLE\_2M\_Ant1\_2402



## 5. Maximum Peak Output Power

### 5.1. Block diagram of test setup

Same with 4.1

### 5.2. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi, the e.i.r.p shall not exceed 4W.

### 5.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

|                |                |
|----------------|----------------|
| RBW:           | ≥DTS bandwidth |
| VBW:           | ≥3 x RBW       |
| Span           | ≥3 x RBW       |
| Detector Mode: | Peak           |
| Sweep time:    | auto           |
| Trace mode     | Max hold       |

(3) Allow the trace to stabilize, Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges measure out the conducted output power.

#### 5.4. Test result

Left side:

| Mode   | Freq. (MHz) | Conducted Output Power (dBm) | Limit (dBm) | Verdict |
|--------|-------------|------------------------------|-------------|---------|
| BLE 1M | 2402        | -1.68                        | 30          | Pass    |
|        | 2440        | -1.32                        | 30          | Pass    |
|        | 2480        | -1.03                        | 30          | Pass    |
| BLE 2M | 2402        | -1.77                        | 30          | Pass    |
|        | 2440        | -1.34                        | 30          | Pass    |
|        | 2480        | <b>-1.02</b>                 | 30          | Pass    |

| Mode   | Freq. (MHz) | EIRP (dBm)   | Limit (dBm) | Verdict |
|--------|-------------|--------------|-------------|---------|
| BLE 1M | 2402        | -2.01        | 36          | Pass    |
|        | 2440        | -1.65        | 36          | Pass    |
|        | 2480        | -1.36        | 36          | Pass    |
| BLE 2M | 2402        | -2.10        | 36          | Pass    |
|        | 2440        | -1.67        | 36          | Pass    |
|        | 2480        | <b>-1.35</b> | 36          | Pass    |

Note: EIRP (dBm)=Conducted Output Power (dBm)+ Antenna Gain (dBi)

Right side:

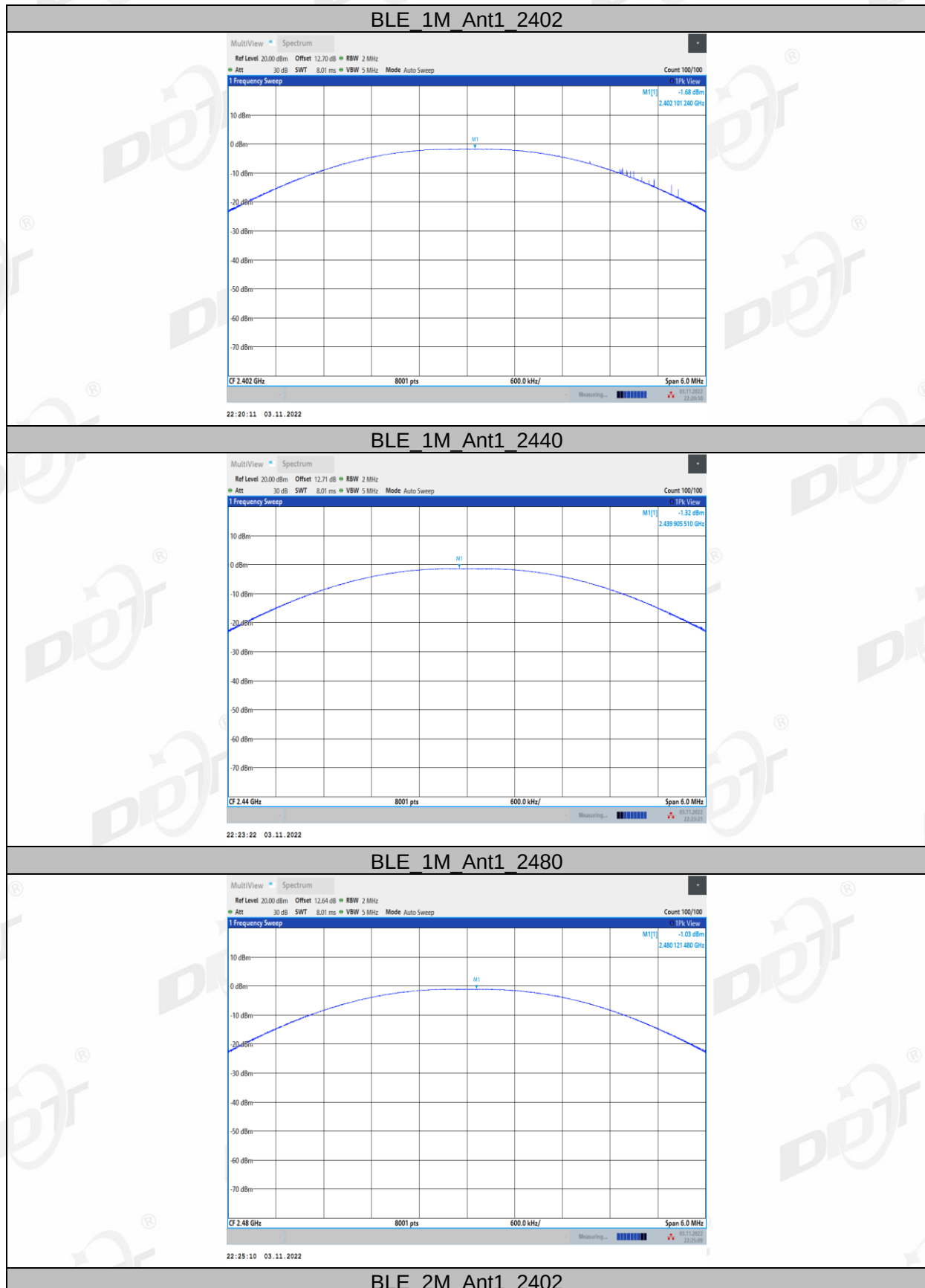
| Mode   | Freq. (MHz) | Conducted Output Power (dBm) | Limit (dBm) | Verdict |
|--------|-------------|------------------------------|-------------|---------|
| BLE 1M | 2402        | 1.23                         | 30          | Pass    |
|        | 2440        | 1.52                         | 30          | Pass    |
|        | 2480        | <b>1.81</b>                  | 30          | Pass    |
| BLE 2M | 2402        | 1.17                         | 30          | Pass    |
|        | 2440        | 1.55                         | 30          | Pass    |
|        | 2480        | 1.85                         | 30          | Pass    |

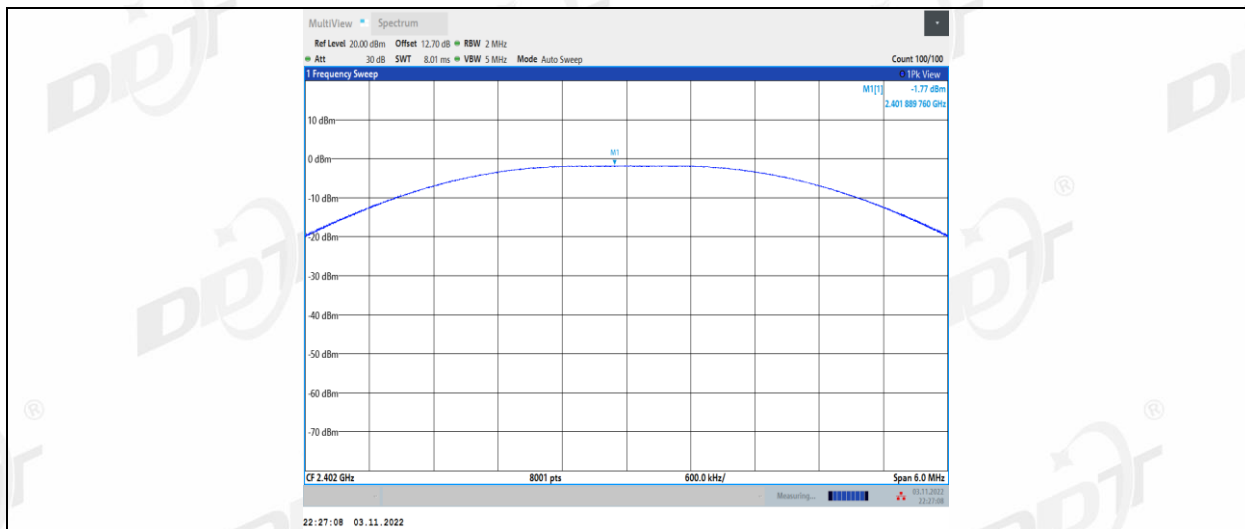
| Mode   | Freq. (MHz) | EIRP (dBm)  | Limit (dBm) | Verdict |
|--------|-------------|-------------|-------------|---------|
| BLE 1M | 2402        | 0.58        | 36          | Pass    |
|        | 2440        | 0.87        | 36          | Pass    |
|        | 2480        | <b>1.16</b> | 36          | Pass    |
| BLE 2M | 2402        | 0.52        | 36          | Pass    |
|        | 2440        | 0.90        | 36          | Pass    |
|        | 2480        | 1.20        | 36          | Pass    |

Note: EIRP (dBm)=Conducted Output Power (dBm)+ Antenna Gain (dBi)

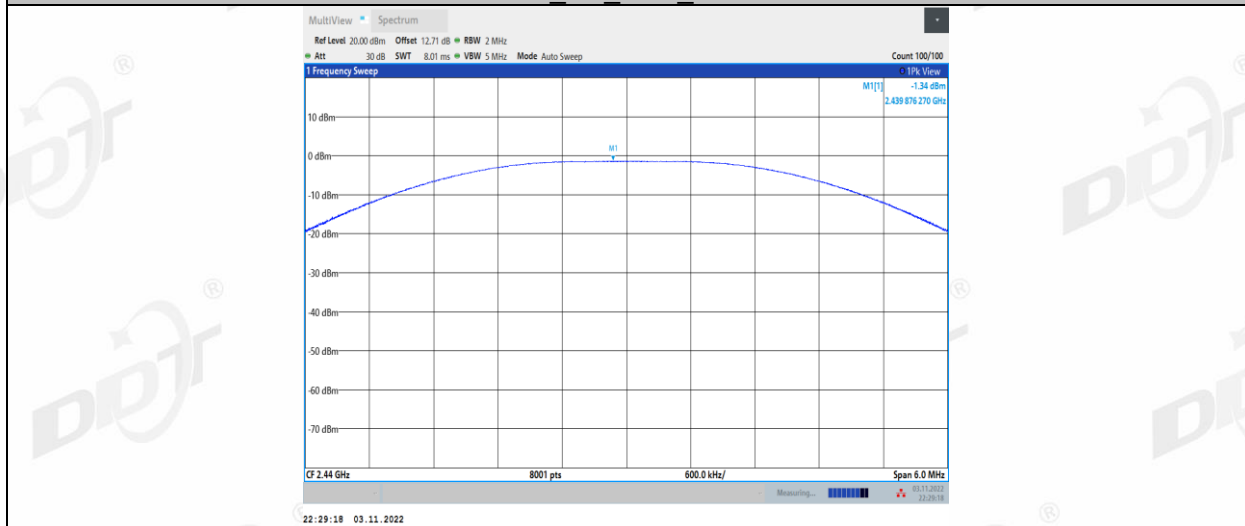
## 5.5. Original test data

Left side:

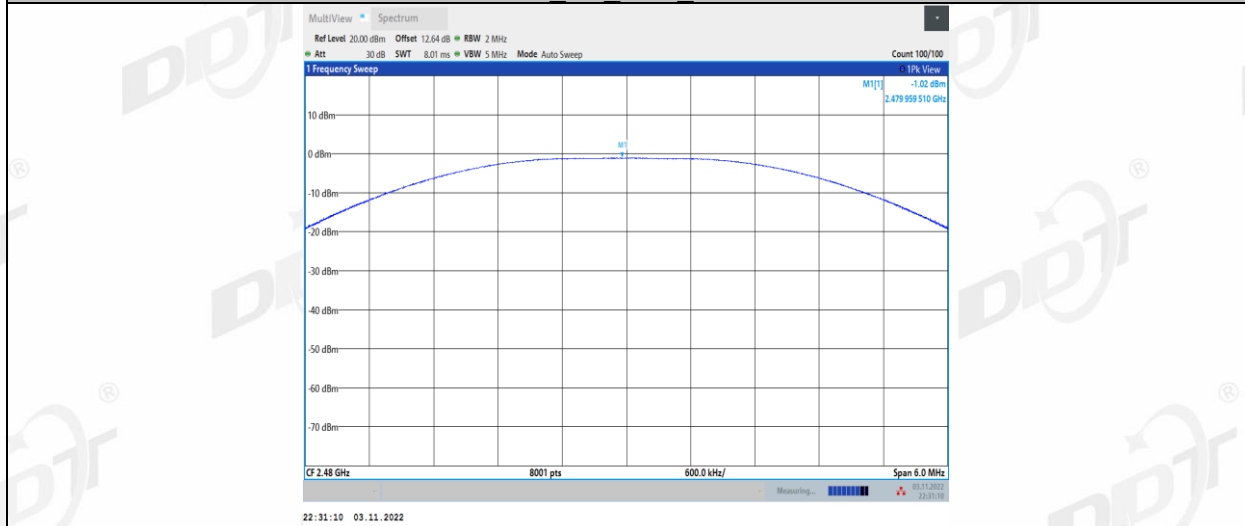




BLE\_2M\_Ant1\_2440

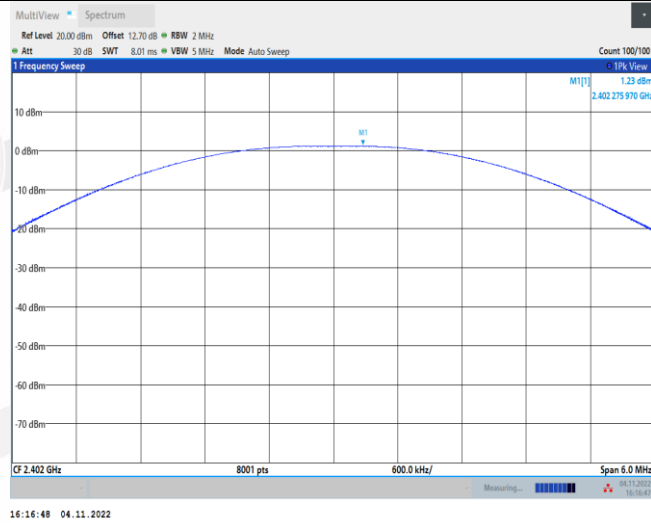


BLE\_2M\_Ant1\_2480

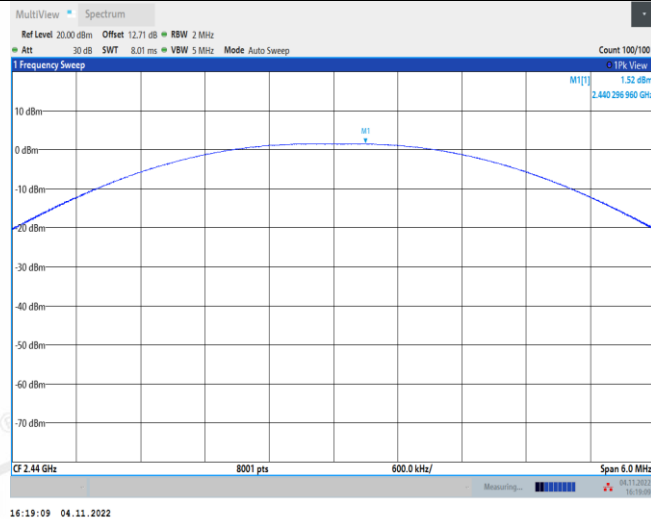


Right side:

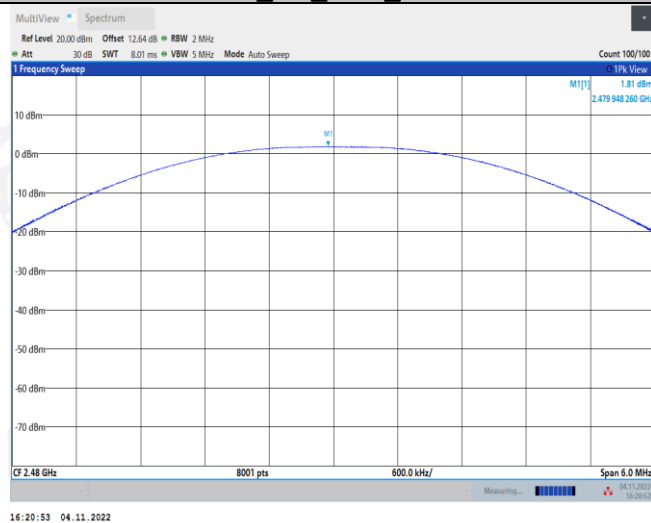
## BLE\_1M\_Ant1\_2402



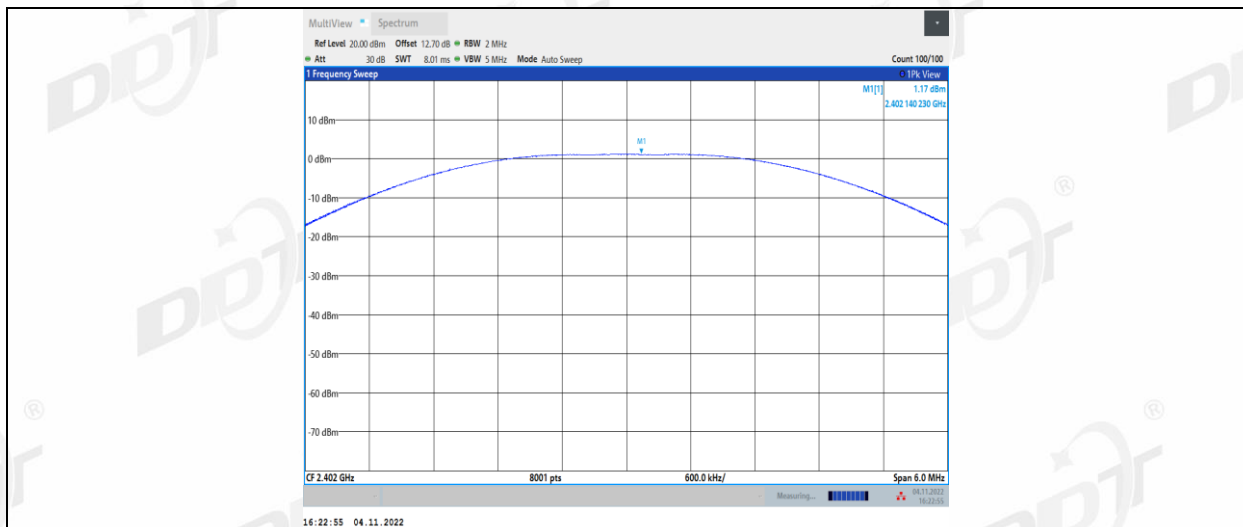
## BLE\_1M\_Ant1\_2440



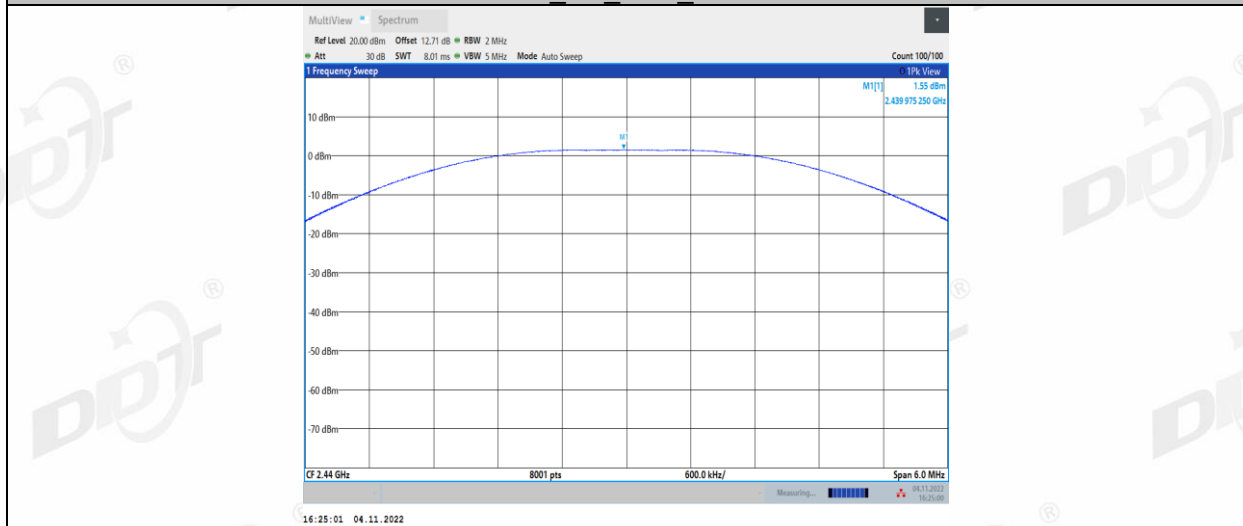
## BLE\_1M\_Ant1\_2480



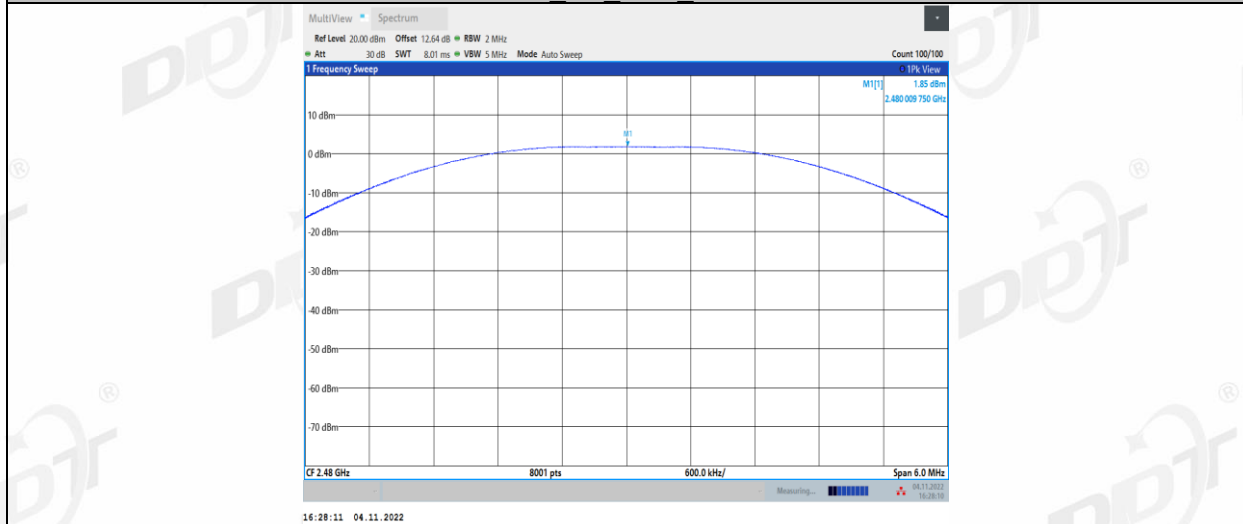
## BLE\_2M\_Ant1\_2402



BLE\_2M\_Ant1\_2440



BLE\_2M\_Ant1\_2480



## 6. Power Spectral Density

### 6.1. Block diagram of test setup

Same with 4.1

### 6.2. Limits

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

### 6.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

|                  |                                                      |
|------------------|------------------------------------------------------|
| Center frequency | DTS Channel center frequency                         |
| RBW:             | $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ |
| VBW:             | $\geq 3\text{RBW}$                                   |
| Span             | 1.5 times the DTS bandwidth                          |
| Detector Mode:   | Peak                                                 |
| Sweep time:      | auto                                                 |
| Trace mode       | Max hold                                             |

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### 6.4. Test result

Left side:

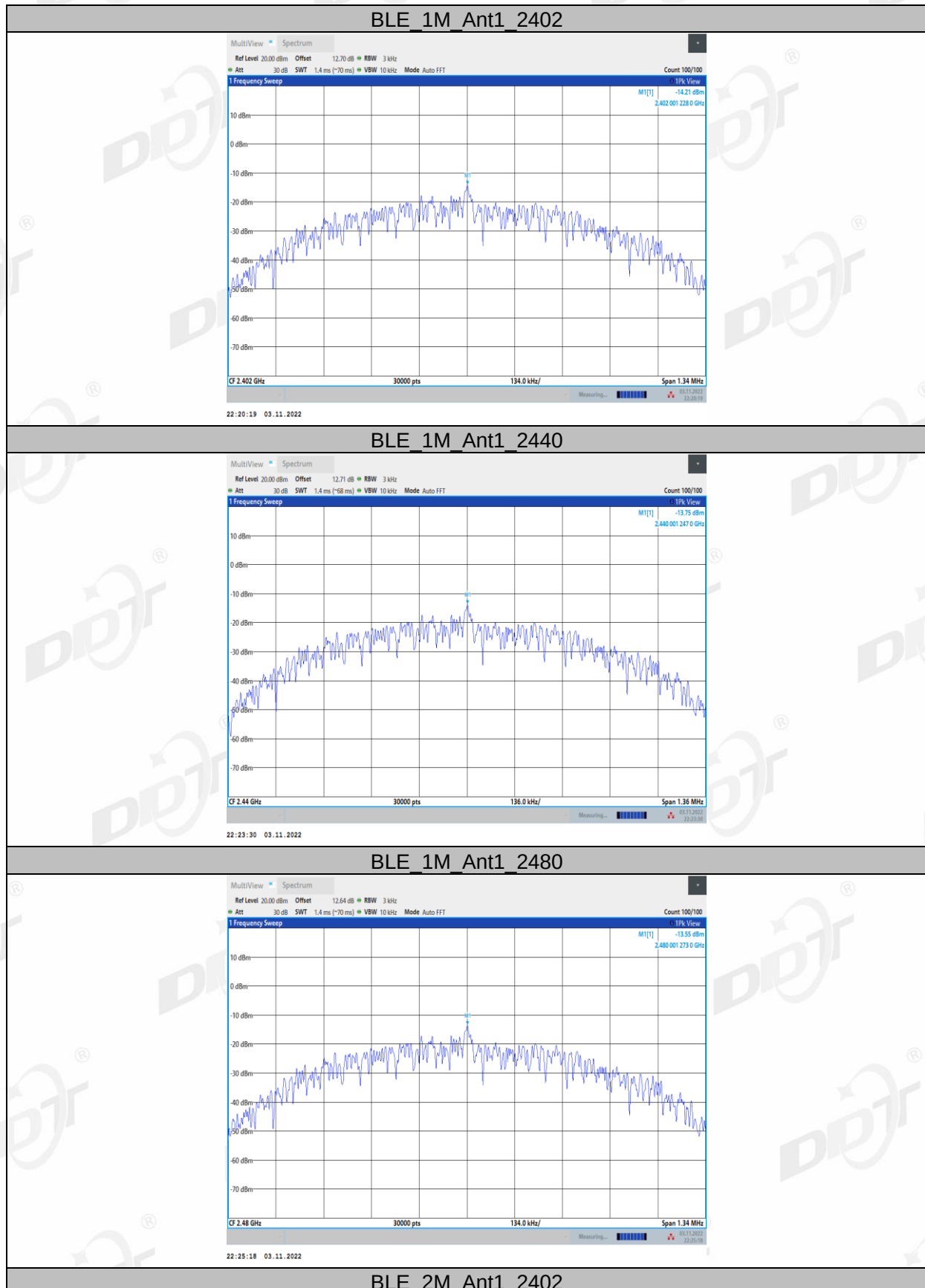
| EUT Set Mode        | Antenna | Channel | Result (dBm/3 kHz) |
|---------------------|---------|---------|--------------------|
| BLE 1M              | ANT1    | CH0     | -14.21             |
|                     | ANT1    | CH19    | -13.75             |
|                     | ANT1    | CH39    | -13.55             |
| BLE 2M              | ANT1    | CH0     | -14.45             |
|                     | ANT1    | CH19    | -14.05             |
|                     | ANT1    | CH39    | -13.78             |
| Limit: <8 dBm/3 kHz |         |         | Verdict: Pass      |

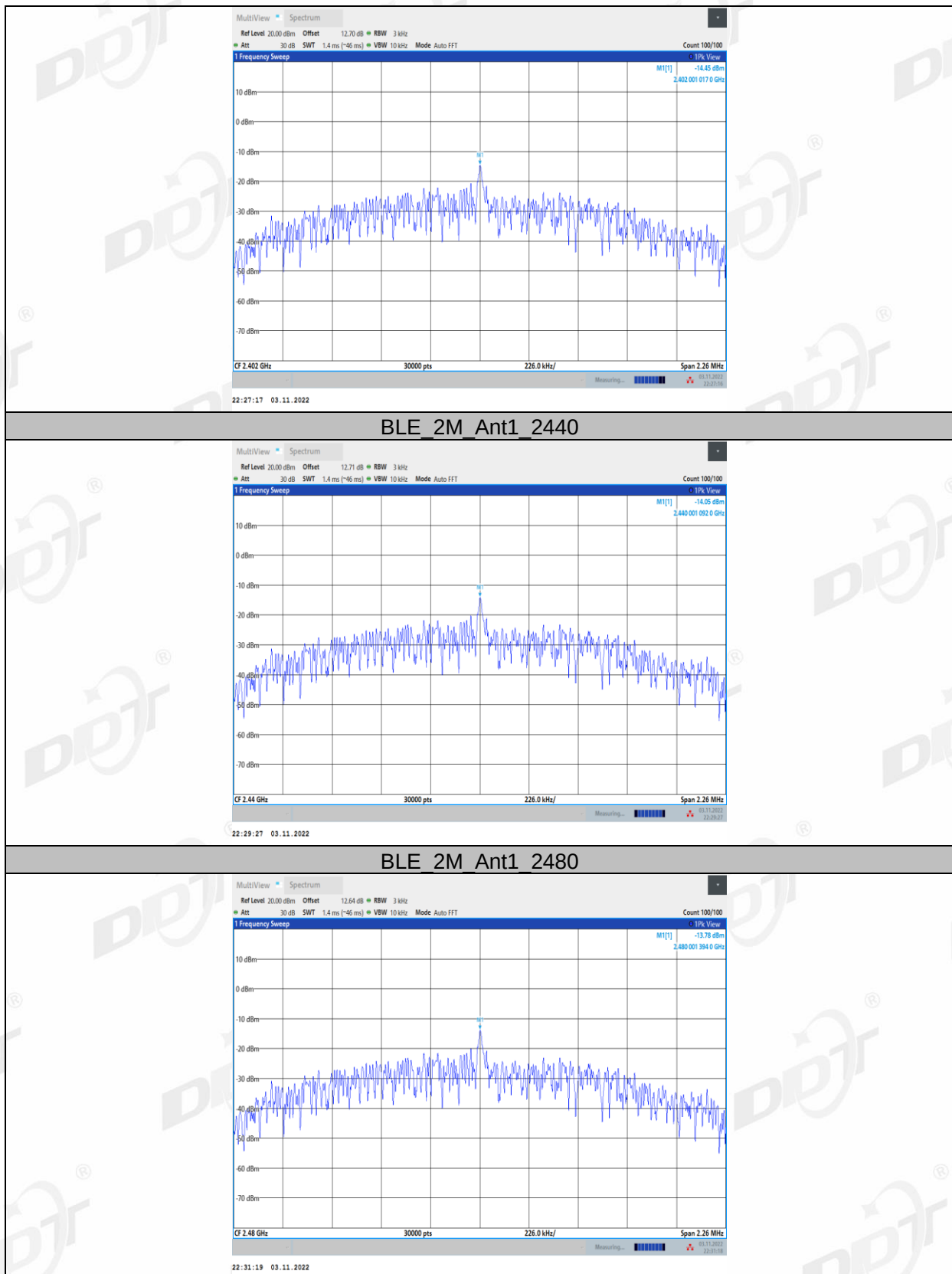
Right side:

| EUT Set Mode        | Antenna | Channel | Result (dBm/3 kHz) |
|---------------------|---------|---------|--------------------|
| BLE 1M              | ANT1    | CH0     | -11.05             |
|                     | ANT1    | CH19    | -10.73             |
|                     | ANT1    | CH39    | -10.44             |
| BLE 2M              | ANT1    | CH0     | -11.41             |
|                     | ANT1    | CH19    | -11.01             |
|                     | ANT1    | CH39    | -10.69             |
| Limit: <8 dBm/3 kHz |         |         | Verdict: Pass      |

## 6.5. Original test data

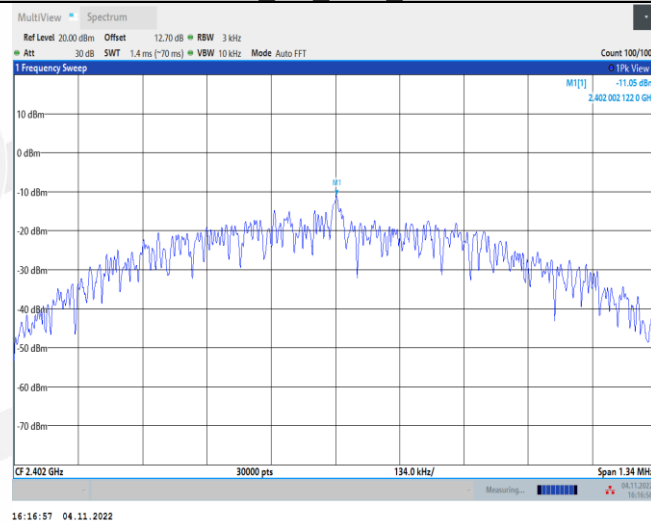
Left side:



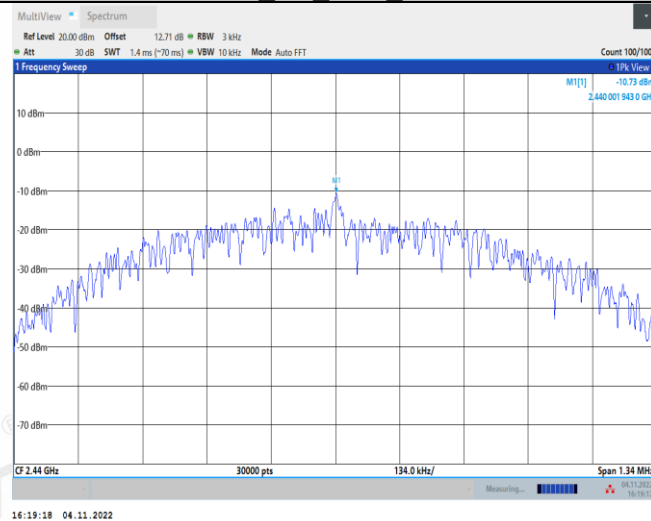


Right side:

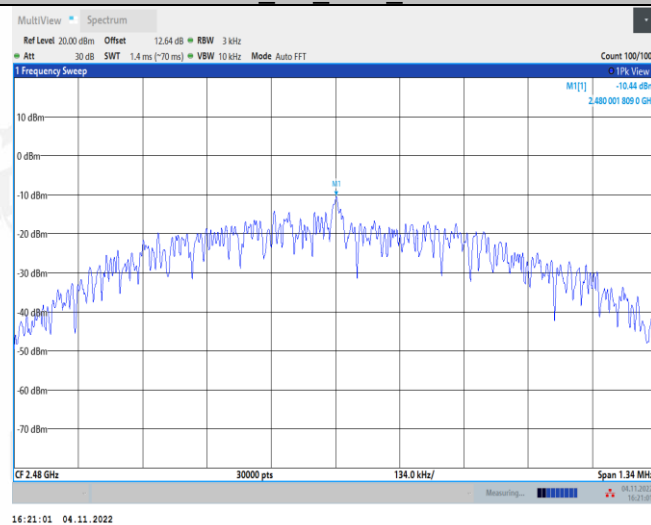
BLE\_1M\_Ant1\_2402



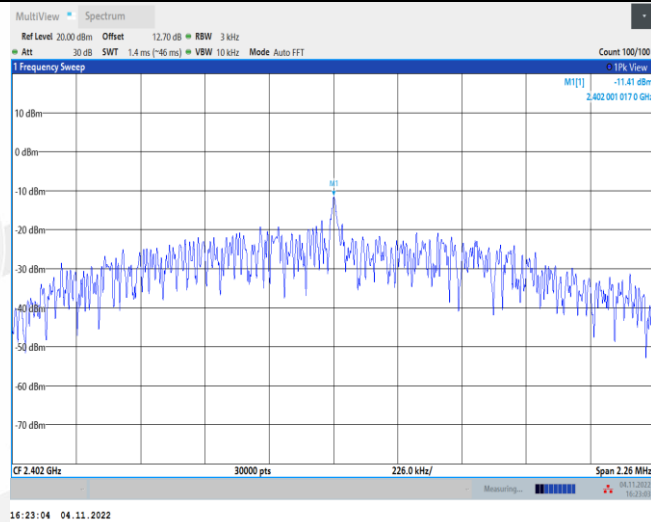
BLE\_1M\_Ant1\_2440



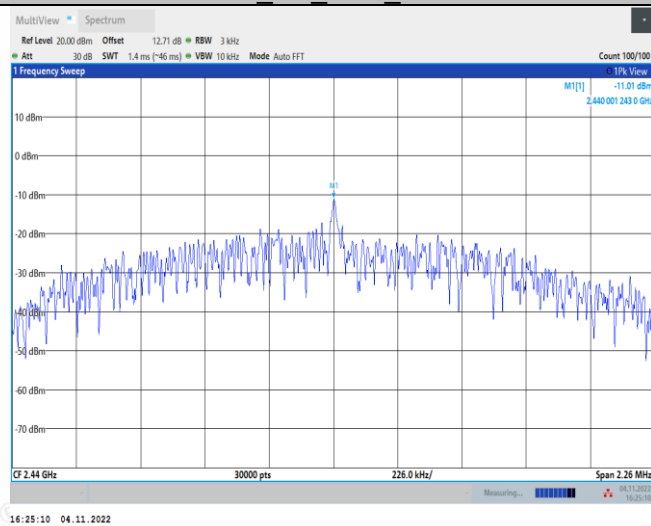
BLE\_1M\_Ant1\_2480



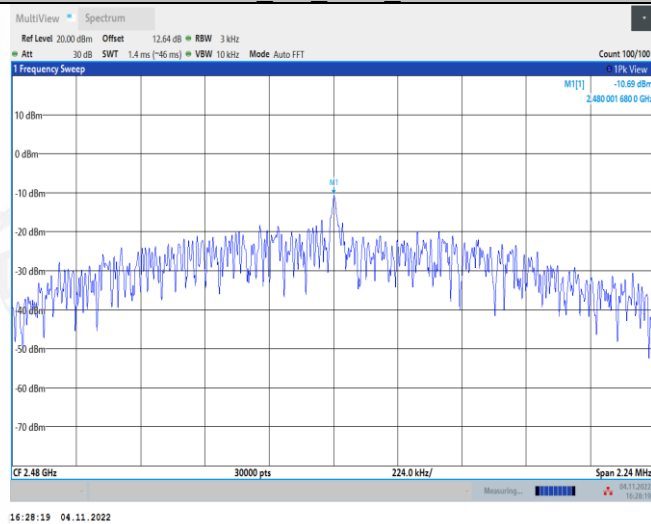
BLE\_2M\_Ant1\_2402



BLE\_2M\_Ant1\_2440



BLE\_2M\_Ant1\_2480



## 7. Band Edge Compliance (Conducted Method)

### 7.1. Block diagram of test setup

Same with 4.1

### 7.2. Limits

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

### 7.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

|                |                                          |
|----------------|------------------------------------------|
| RBW:           | 100 kHz                                  |
| VBW:           | 300 kHz                                  |
| Span           | Encompass frequency range to be measured |
| Detector Mode: | Peak                                     |
| Sweep time:    | auto                                     |
| Trace mode     | Max hold                                 |

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

### 7.4. Test result

Left side:

| EUT Set Mode | CH or Frequency | Measured Range      | Verdict |
|--------------|-----------------|---------------------|---------|
| BLE 1M       | CH0             | 2.31 GHz - 2.41 GHz | Pass    |
|              | CH39            | 2.47 GHz - 2.50 GHz | Pass    |
| BLE 2M       | CH0             | 2.31 GHz - 2.41 GHz | Pass    |
|              | CH39            | 2.47 GHz - 2.50 GHz | Pass    |

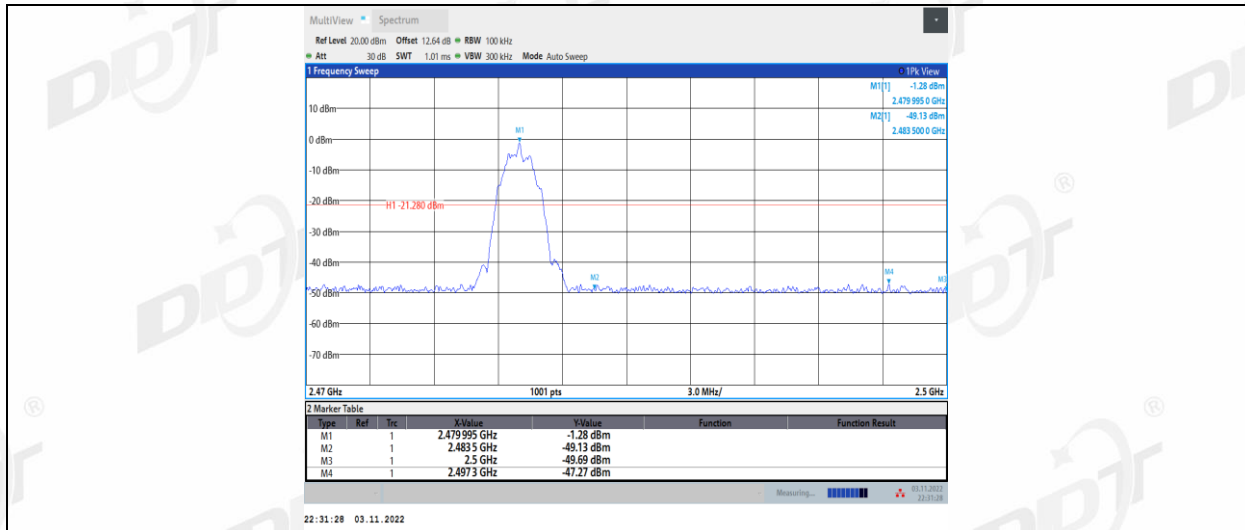
Right side:

| EUT Set Mode | CH or Frequency | Measured Range      | Verdict |
|--------------|-----------------|---------------------|---------|
| BLE 1M       | CH0             | 2.31 GHz - 2.41 GHz | Pass    |
|              | CH39            | 2.47 GHz - 2.50 GHz | Pass    |
| BLE 2M       | CH0             | 2.31 GHz - 2.41 GHz | Pass    |
|              | CH39            | 2.47 GHz - 2.50 GHz | Pass    |

## 7.5. Original test data

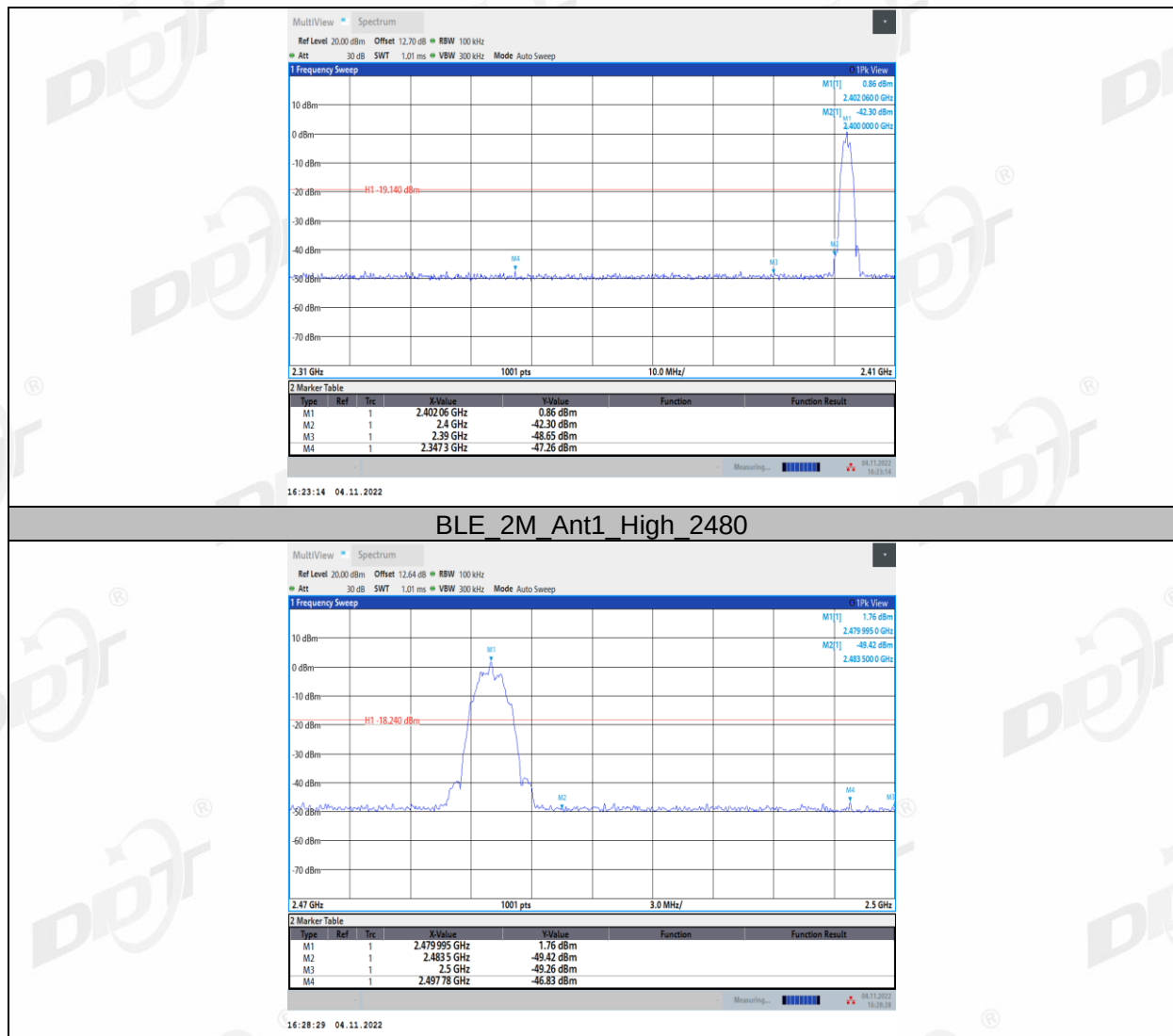
Left side:





Right side:

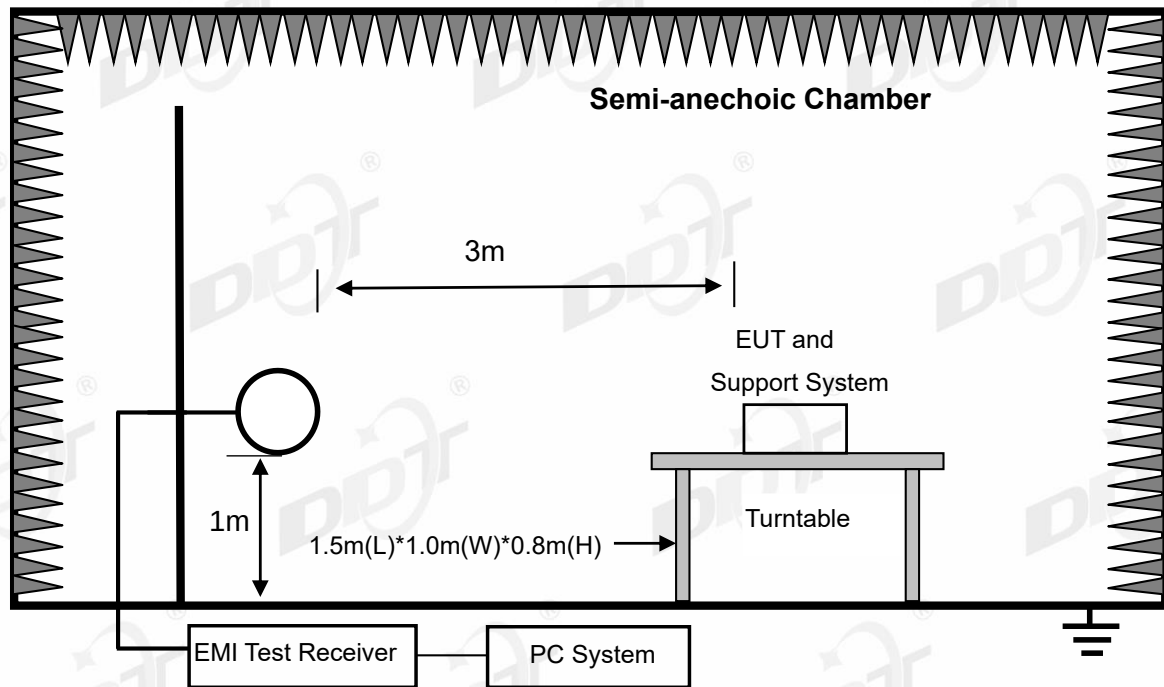




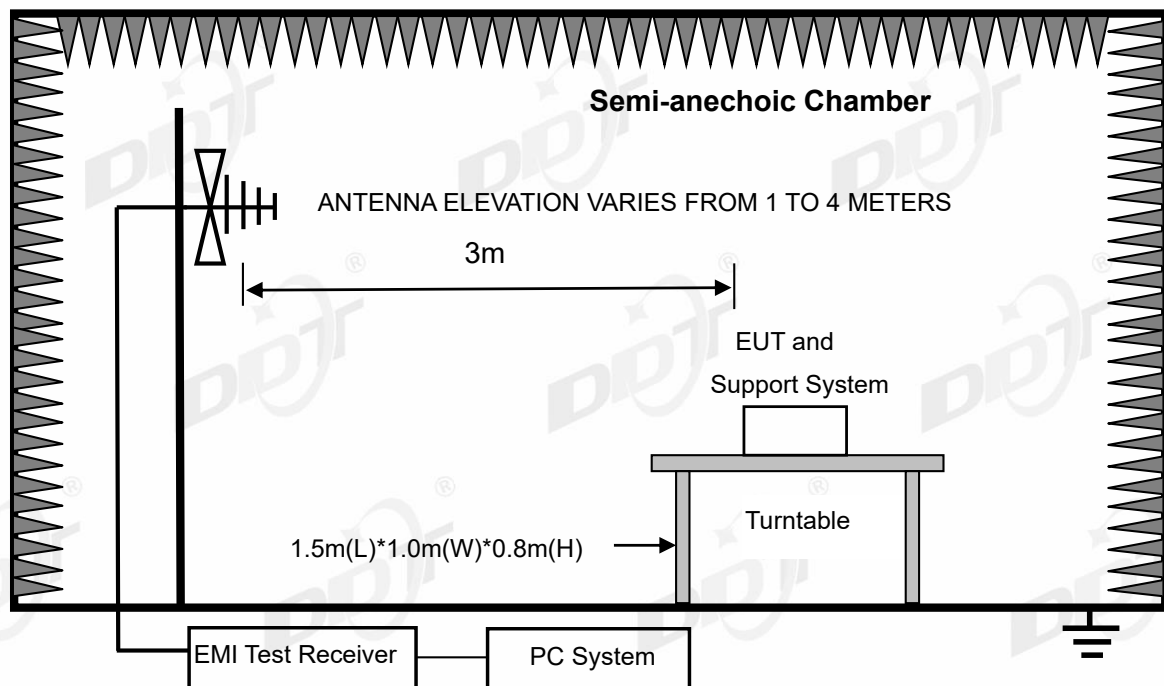
## 8. Radiated Emission

### 8.1. Block diagram of test setup

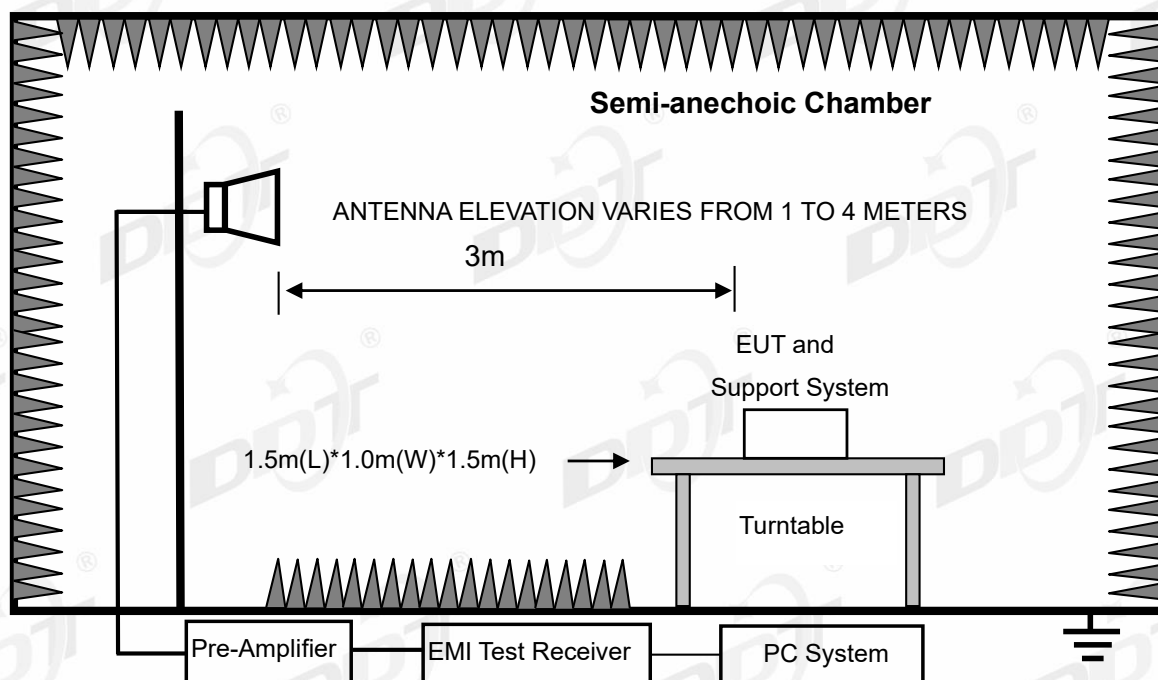
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

## 8.2. Limit

(1) FCC 15.205 Restricted frequency band

| MHz                      | MHz                 | MHz           | GHz              |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| <sup>1</sup> 0.495-0.505 | 16.69475-16.69525   | 608-614       | 5.35-5.46        |
| 2.1735-2.1905            | 16.80425-16.80475   | 960-1240      | 7.25-7.75        |
| 4.125-4.128              | 25.5-25.67          | 1300-1427     | 8.025-8.5        |
| 4.1772&4.17775           | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.2072&4.20775           | 73-74.6             | 1645.5-1646.5 | 9.3-9.5          |
| 6.215-6.218              | 74.8-75.2           | 1660-1710     | 10.6-12.7        |
| 6.26775-6.26825          | 108-121.94          | 1718.8-1722.2 | 13.25-13.4       |
| 6.31175-6.31225          | 123-138             | 2200-2300     | 14.47-14.5       |
| 8.291-8.294              | 149.9-150.05        | 2310-2390     | 15.35-16.2       |
| 8.362-8.366              | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4        |
| 8.37625-8.38675          | 156.7-156.9         | 2690-2900     | 22.01-23.12      |
| 8.41425-8.41475          | 162.0125-167.17     | 3260-3267     | 23.6-24.0        |
| 12.29-12.293             | 167.72-173.2        | 3332-3339     | 31.2-31.8        |
| 12.51975-12.52025        | 240-285             | 3345.8-3358   | 36.43-36.5       |
| 12.57675-12.57725        | 322-335.4           | 3600-4400     | ( <sup>2</sup> ) |
| 13.36-13.41              |                     |               |                  |

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6

## RSS-Gen section 8.10 Restricted frequency bands\*

| MHz             | MHz                 | MHz           | GHz         |
|-----------------|---------------------|---------------|-------------|
| 0.090-0.110     | 12.51975-12.52025   | 240-285       | 3.5-4.4     |
| 0.495-0.505     | 12.57675-12.57725   | 322-335.4     | 4.5-5.15    |
| 2.1735-2.1905   | 13.36-13.41         | 399.9-410     | 5.35-5.46   |
| 3.020-3.026     | 16.42-16.423        | 608-614       | 7.25-7.75   |
| 4.125-4.128     | 16.69475-16.69525   | 960-1427      | 8.025-8.5   |
| 4.1772&4.17775  | 16.80425-16.80475   | 1435-1626.5   | 9.0-9.2     |
| 4.2072&4.20775  | 25.5-25.67          | 1645.5-1646.5 | 9.3-9.5     |
| 5.677-5.683     | 37.5-38.25          | 1660-1710     | 10.6-12.7   |
| 6.215-6.218     | 73-74.6             | 1718.8-1722.2 | 13.25-13.4  |
| 6.26775-6.26825 | 74.8-75.2           | 2200-2300     | 14.47-14.5  |
| 6.31175-6.31225 | 108-138             | 2310-2390     | 15.35-16.2  |
| 8.291-8.294     | 149.9-150.05        | 2483.5-2500   | 17.7-21.4   |
| 8.362-8.366     | 156.52475-156.52525 | 2655-2900     | 22.01-23.12 |
| 8.37625-8.38675 | 156.7-156.9         | 3260-3267     | 23.6-24.0   |
| 8.41425-8.41475 | 162.0125-167.17     | 3332-3339     | 31.2-31.8   |
| 12.29-12.293    | 167.72-173.2        | 3345.8-3358   | 36.43-36.5  |
|                 |                     |               | Above 38.6  |

\* Certain frequency bands listed in table and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

## (2) FCC 15.209 Limit &amp; RSS-Gen section 8.9 Limit

| FREQUENCY<br>MHz | DISTANCE<br>Meters | FIELD STRENGTHS LIMIT                                                                             |                                   |
|------------------|--------------------|---------------------------------------------------------------------------------------------------|-----------------------------------|
|                  |                    | $\mu\text{V/m}$                                                                                   | $\text{dB}(\mu\text{V})/\text{m}$ |
| 0.009 ~ 0.490    | 300                | $2400/F(\text{kHz})$                                                                              | $67.6-20\log(F)$                  |
| 0.490 ~ 1.705    | 30                 | $24000/F(\text{kHz})$                                                                             | $87.6-20\log(F)$                  |
| 1.705 ~ 30.0     | 30                 | 30                                                                                                | 29.54                             |
| 30 ~ 88          | 3                  | 100                                                                                               | 40.0                              |
| 88 ~ 216         | 3                  | 150                                                                                               | 43.5                              |
| 216 ~ 960        | 3                  | 200                                                                                               | 46.0                              |
| 960 ~ 1000       | 3                  | 500                                                                                               | 54.0                              |
| Above 1000       | 3                  | 74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak)<br>54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average) |                                   |

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V}/\text{m}) + 40\log(30\text{m}/3\text{m})$$

## (3) Limit for this EUT

The emissions appearing within 15.205 restricted frequency bands shall not exceed the limits

shown in 15.209, and the emissions appearing within RSS-Gen section 8.10 Restricted frequency bands shall not exceed the limits shown in RSS-Gen section 8.9, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits and RSS-Gen section 8.9 limits.

### 8.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1 G and 150 cm above the ground plane inside a semi-anechoic chamber for above 1 G.
- (2) Test antenna was located 3 m from the EUT on an adjustable mast, and the antenna used as below table.

| Test frequency range | Test antenna used                              | Test antenna distance |
|----------------------|------------------------------------------------|-----------------------|
| 9 kHz - 30 MHz       | Active Loop antenna                            | 3 m                   |
| 30 MHz - 1 GHz       | Trilog Broadband Antenna                       | 3 m                   |
| 1 GHz - 18 GHz       | Double Ridged Horn Antenna<br>(1 GHz - 18 GHz) | 3 m                   |
| 18 GHz - 40 GHz      | Horn Antenna<br>(18 GHz - 40 GHz)              | 1 m                   |

According ANSI C63.10:2013 clause 6.4.6 and 6.5.3, for measurements below 30 MHz, Antenna was located 3 m from EUT, the loop antenna was positioned in three antenna orientations (parallel, perpendicular, and round-parallel), for each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable, and the lowest height of the magnetic antenna shall be 1 m above the ground. For measurement above 30 MHz, the trilog Broadband Antenna or Horn Antenna was located 3 m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

- (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)

- (b) Change work frequency or channel of device if practicable.

- (c) Change modulation type of device if practicable.

- (d) Change power supply range from 85% to 115% of the rated supply voltage

- (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so below final test was performed with frequency range from 30 MHz to 18 GHz.