



■ Report No.:DDT-RE23021029-3E04

■ Issued Date: Jun. 27, 2023

# FCC AND ISED CERTIFICATION TEST REPORT

FOR

|                      |   |                                                                                                                                |
|----------------------|---|--------------------------------------------------------------------------------------------------------------------------------|
| Applicant            | : | Kingstate Electronics(Dongguan)Co.,Ltd                                                                                         |
| Address              | : | Shi Chong Industrial Park, Shi Chong Avenue,<br>Xiang Xi Village, Shi Pai Town, Dong Guan City,<br>Guang Dong Province, China. |
| Equipment under Test | : | True Wireless Earbuds                                                                                                          |
| Model No.            | : | TW-EF3A                                                                                                                        |
| Trade Mark           | : | YAMAHA                                                                                                                         |
| FCC ID               | : | 2AKMBTW-EF3A                                                                                                                   |
| IC                   | : | 12522A-EF3A                                                                                                                    |
| Manufacturer         | : | Kingstate Electronics(Dongguan)Co.,Ltd                                                                                         |
| Address              | : | Shi Chong Industrial Park, Shi Chong Avenue,<br>Xiang Xi Village, Shi Pai Town, Dong Guan City,<br>Guang Dong Province, China. |

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

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# REPORT

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## Test Report Declare

|                             |   |                                                                                                                             |
|-----------------------------|---|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Kingstate Electronics(Dongguan)Co.,Ltd                                                                                      |
| <b>Address</b>              | : | Shi Chong Industrial Park, Shi Chong Avenue, Xiang Xi Village,<br>Shi Pai Town, Dong Guan City, Guang Dong Province, China. |
| <b>Equipment under Test</b> | : | True Wireless Earbuds                                                                                                       |
| <b>Model No.</b>            | : | TW-EF3A                                                                                                                     |
| <b>Trade Mark</b>           | : | YAMAHA                                                                                                                      |
| <b>Manufacturer</b>         | : | Kingstate Electronics(Dongguan)Co.,Ltd                                                                                      |
| <b>Address</b>              | : | Shi Chong Industrial Park, Shi Chong Avenue, Xiang Xi Village,<br>Shi Pai Town, Dong Guan City, Guang Dong Province, China. |

**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-RE23021029-3E04 |                      |                               |
| <b>Date of Receipt:</b> | Apr. 06, 2023       | <b>Date of Test:</b> | Jun. 01, 2023 ~ Jun. 27, 2023 |

**Prepared By:****Johnny Wang/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 | Jun. 27, 2023 |            |
|      |               |               |            |

## 1. Summary of Test Results

| The EUT have been tested according to the applicable standards as referenced below. |                                                                                                                                                                 |         |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Description of Test Item                                                            | Standard                                                                                                                                                        | Verdict |
| 6dB Bandwidth and 99% Bandwidth                                                     | FCC Part 15: 15.247(a)(2)<br>RSS-247 Issue 2 clause 5.2(a)<br>RSS-Gen Issue 5 clause 6.7                                                                        | Pass    |
| Peak Output Power                                                                   | FCC Part 15: 15.247(b)(3)<br>RSS-247 Issue 2 clause 5.4(d)                                                                                                      | Pass    |
| Power Spectral Density                                                              | FCC Part 15:15.247(e)<br>RSS-247 Issue 2 clause 5.2(b)                                                                                                          | Pass    |
| Band Edge Compliance<br>(conducted method)                                          | FCC Part 15: 15.247(d)<br>RSS-247 Issue 2 clause 5.5                                                                                                            | Pass    |
| RF Conducted Spurious Emissions                                                     | FCC Part 15: 15.247(d)<br>RSS-247 Issue 2 clause 5.5                                                                                                            | Pass    |
| Radiation Emission                                                                  | FCC Part 15: 15.205<br>FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>RSS-247 Issue 2 clause 5.5<br>RSS-Gen Issue 5 clause 8.9<br>RSS-Gen Issue 5 clause 8.10 | Pass    |
| Emission in Restricted Frequency Bands                                              | FCC Part 15: 15.205<br>FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>RSS-247 Issue 2 clause 5.5<br>RSS-Gen Issue 5 clause 8.9<br>RSS-Gen Issue 5 clause 8.10 | Pass    |
| Power Line Conducted Emission                                                       | FCC Part 15: 15.207(a)<br>RSS-Gen Issue 5 clause 8.8                                                                                                            | Pass    |
| Antenna Requirement                                                                 | FCC Part 15: 15.203<br>RSS-Gen Issue 5 clause 6.8                                                                                                               | Pass    |



## 2. General Test Information

### 2.1. Description of EUT

|                            |                                                                                                                                                                   |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT Name                   | : True Wireless Earbuds                                                                                                                                           |
| Model Number               | : TW-EF3A                                                                                                                                                         |
| EUT Function Description   | : Please reference user manual of this device                                                                                                                     |
| Power Supply               | : Charging case: DC 5V/0.5A by an external adapter or a DC 3.7V/<br>280mAh built-in lithium battery.<br>Wireless Earbuds: DC 3.7V/60mAh built-in lithium battery. |
| Radio Specification        | : Bluetooth V5.3                                                                                                                                                  |
| Operation Frequency        | : 2402 MHz - 2480 MHz                                                                                                                                             |
| Internal Highest Frequency | : 120MHz (Bluetooth mode), 32MHz (Charging mode)                                                                                                                  |
| Modulation                 | : GFSK                                                                                                                                                            |
| Data Rate                  | : 1 Mbps, 2 Mbps                                                                                                                                                  |
| Antenna                    | : Left side: 0.66 dBi<br>Right side: 1.20 dBi                                                                                                                     |
| Sample Number              | : S23021029-108 for conductive,<br>S23021029-109 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 |
|----------------------------|--------------|--------------|---------------------------|--------|
| USB line                   | N/A          | N/A          | Length: 0.20m, Unshielded | N/A    |

### 2.3. Assistant equipment used for test

| Assistant equipment | Manufacturer | Model number | EMC Compliance | SN                                                        |
|---------------------|--------------|--------------|----------------|-----------------------------------------------------------|
| Adapter             | SAMSUNG      | EP-TA200     | N/A            | Input: 100-240~, 50/60Hz, 0.5A; Output: 9V/1.67A or 5V/2A |

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

EUT

Test software: Airoha.Tool.Kit.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) |
| GFSK 1M                           | 58               | CH0     | 2402            |
|                                   | 58               | CH19    | 2440            |
|                                   | 58               | CH39    | 2480            |
| GFSK 2M                           | 58               | CH0     | 2402            |
|                                   | 58               | CH19    | 2440            |
|                                   | 58               | CH39    | 2480            |

### 2.5. Test environment conditions

|                    |                   |
|--------------------|-------------------|
| Temperature range: | +15°C to +35 °C   |
| Humidity range:    | 20% to 75%        |
| Pressure range:    | 86 kPa to 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

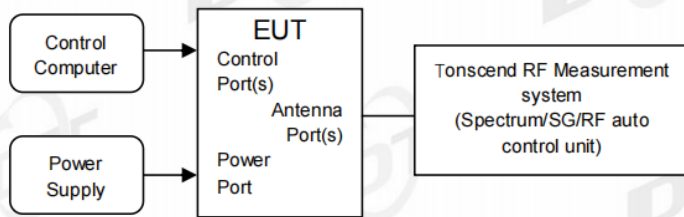
| Test Item                                                                                                                                     | Uncertainty                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 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 < 26.5 GHz)        |
| Uncertainty for radio frequency (RBW < 20 kHz)                                                                                                | 3×10 <sup>-8</sup>                                                                                        |
| Temperature                                                                                                                                   | 0.4 °C                                                                                                    |
| Humidity                                                                                                                                      | 2 %                                                                                                       |
| Uncertainty for Radiation Emission test<br>(9 kHz – 30 MHz)                                                                                   | 3.44 dB                                                                                                   |
| Uncertainty for Radiation Emission test<br>(30 MHz - 1 GHz)                                                                                   | 4.70 dB (Antenna Polarize: V)<br>4.84 dB (Antenna Polarize: H)                                            |
| Uncertainty for Radiation Emission test<br>(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 2#)</b> |                 |                                                  |              |               |               |
| Spectrum analyzer                                             | R&S             | FSU26                                            | 201124       | Sep. 28, 2022 | 1 Year        |
| Temp&Humi Programmable                                        | ZHIXIANG        | ZXGDJS-150L                                      | ZX170110-A   | May 15, 2023  | 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       | Apr. 23, 2023 | 1 Year        |
| Spectrum analyzer                                             | Agilent         | E4447A                                           | MY50180031   | Apr. 23, 2023 | 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          | Apr. 26, 2023 | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-118A                                         | 18040084     | Aug.17, 2022  | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-840A                                         | 461369       | Apr. 27, 2023 | 1 Year        |
| RE Cable                                                      | N/A             | W23.02 CP1-X2 + W23.09 AP1-X8+ JCT26S-NJ-NJ-1.5M | 4.5M+8M+1.5M | Apr. 21, 2023 | 1 Year        |
| RF Cable                                                      | Yuhu Technology | JCTB810-NJ-NJ-9M+ ZT26S-SMAJ-SMAJ-1M             | 21123964     | Apr. 23, 2023 | 1 Year        |
| Micro-Tronics filters                                         | REBES           | BRM50702                                         | G555         | N/A           | N/A           |
| Micro-Tronics filters                                         | REBES           | BRM50716                                         | G392         | N/A           | N/A           |
| High Pass filter                                              | XB              | XBLBQ-GTA67                                      | 210820-2-3   | N/A           | N/A           |
| 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

### 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) The test according to ANSI C63.10-2013 clause 11.8.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously
- (4) Use the following spectrum analyzer settings for 6 dB Bandwidth:
 

|                |                              |
|----------------|------------------------------|
| RBW:           | 100 kHz                      |
| VBW:           | $\geq [3 \times \text{RBW}]$ |
| Detector Mode: | Peak                         |
| Sweep time:    | Auto                         |
| Trace mode     | Max hold                     |
- (5) Allow the trace to stabilize, measure the 6 dB bandwidth of signal, and record the results in the report.

### 4.4. Test result

Left side:

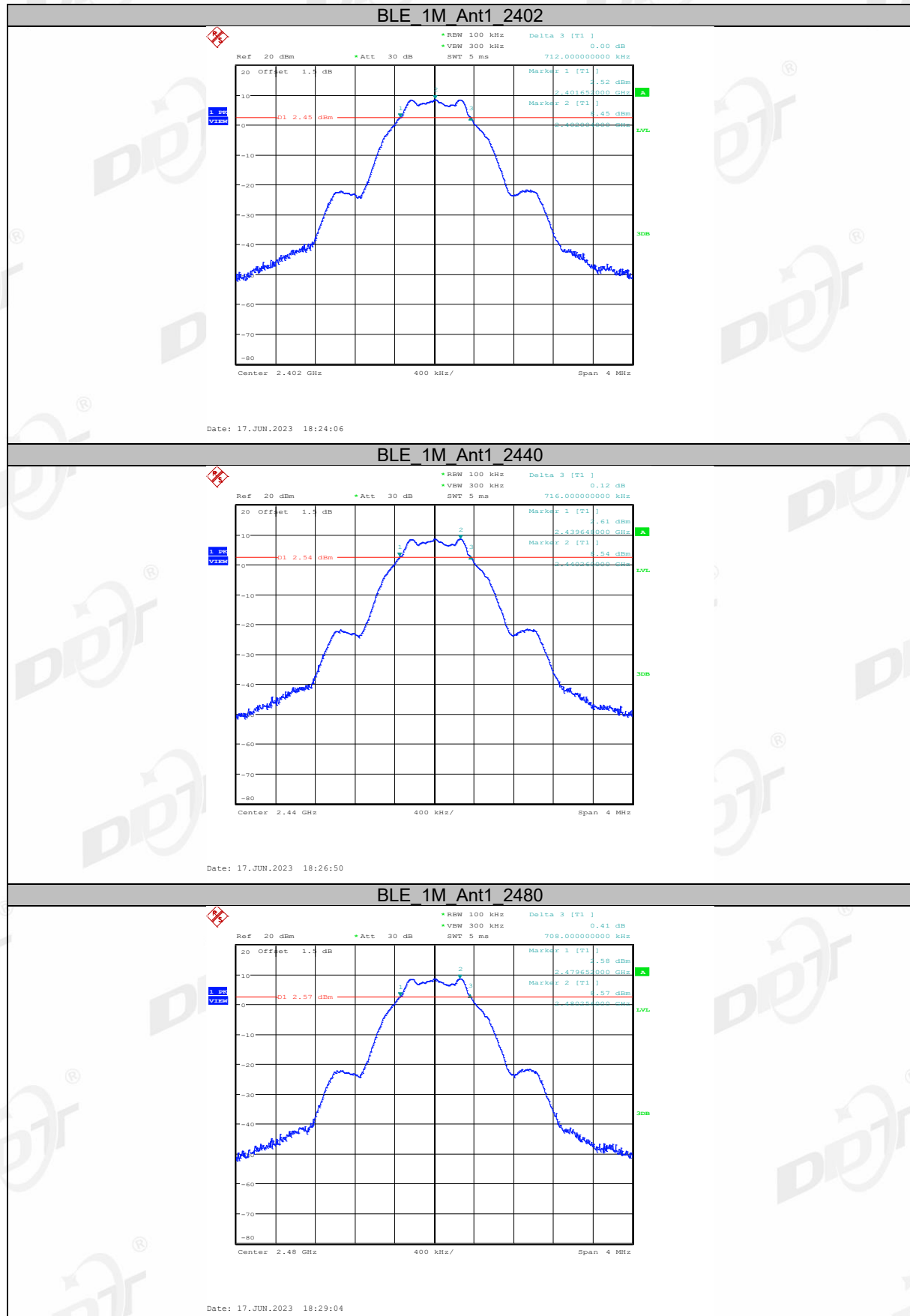
| Test Mode | Antenna | Frequency [MHz] | DTS BW [MHz] | FL[MHz] | FH[MHz] | Limit [MHz] | Verdict |
|-----------|---------|-----------------|--------------|---------|---------|-------------|---------|
| BLE_1M    | Ant1    | 2402            | 0.71         | 2401.65 | 2402.36 | 0.5         | PASS    |
|           |         | 2440            | 0.72         | 2439.65 | 2440.36 | 0.5         | PASS    |
|           |         | 2480            | 0.71         | 2479.65 | 2480.36 | 0.5         | PASS    |
| BLE_2M    | Ant1    | 2402            | 1.25         | 2401.36 | 2402.61 | 0.5         | PASS    |
|           |         | 2440            | 1.25         | 2439.36 | 2440.61 | 0.5         | PASS    |
|           |         | 2480            | 1.24         | 2479.36 | 2480.60 | 0.5         | PASS    |

Right side:

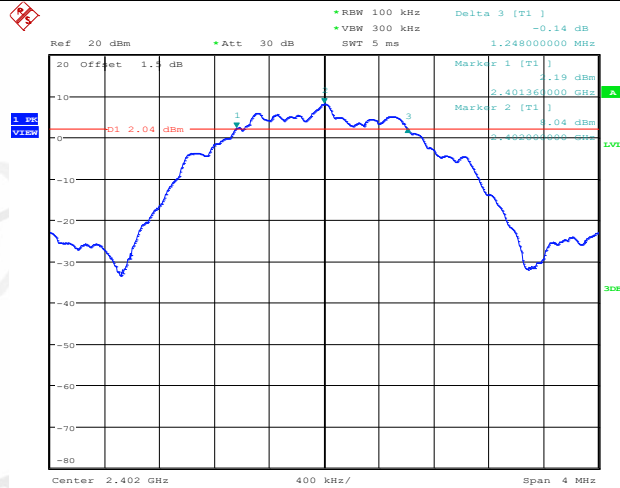
| Test Mode | Antenna | Frequency [MHz] | DTS BW [MHz] | FL[MHz] | FH[MHz] | Limit [MHz] | Verdict |
|-----------|---------|-----------------|--------------|---------|---------|-------------|---------|
| BLE_1M    | Ant1    | 2402            | 0.71         | 2401.65 | 2402.36 | 0.5         | PASS    |
|           |         | 2440            | 0.71         | 2439.65 | 2440.36 | 0.5         | PASS    |
|           |         | 2480            | 0.71         | 2479.65 | 2480.36 | 0.5         | PASS    |
| BLE_2M    | Ant1    | 2402            | 1.25         | 2401.36 | 2402.61 | 0.5         | PASS    |
|           |         | 2440            | 1.25         | 2439.36 | 2440.61 | 0.5         | PASS    |
|           |         | 2480            | 1.24         | 2479.36 | 2480.60 | 0.5         | PASS    |

#### 4.5. Test graphs

Left side:

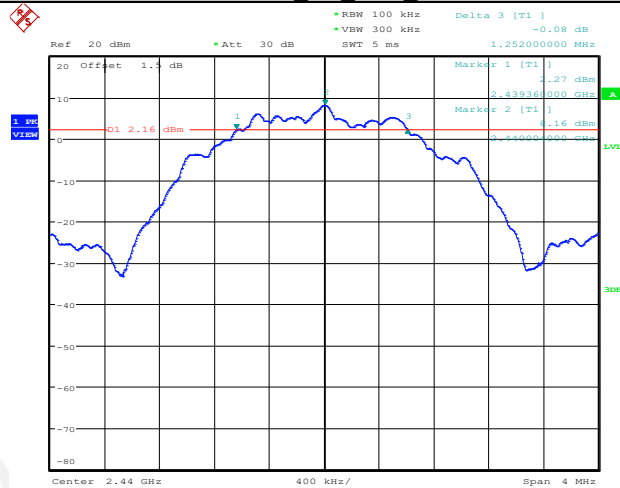


## BLE 2M Ant1 2402



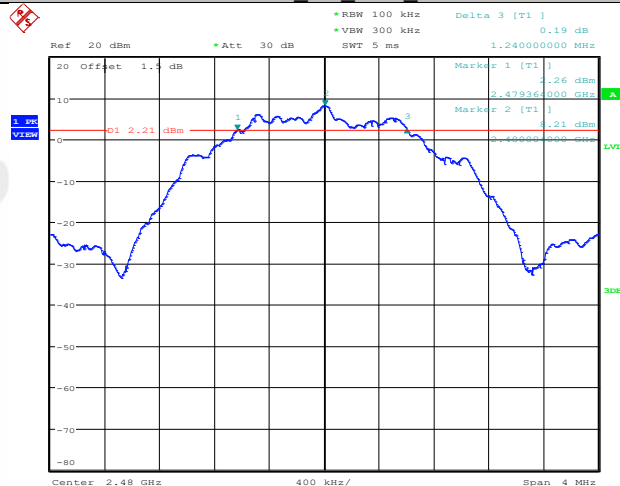
Date: 17.JUN.2023 18:31:10

## BLE 2M Ant1 2440



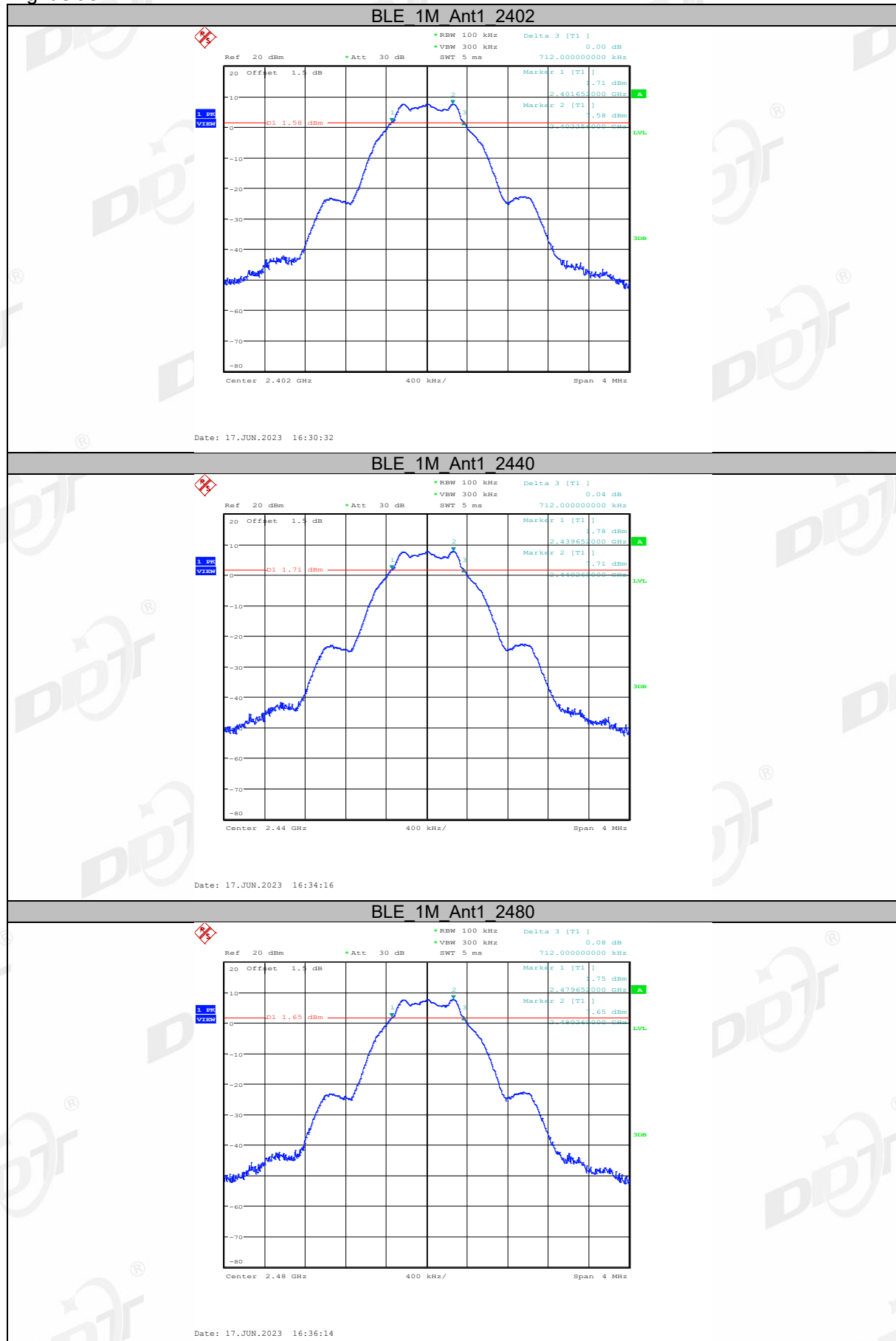
Date: 17.JUN.2023 18:33:32

## BLE 2M Ant1 2480



Date: 17.JUN.2023 18:36:01

Right side:

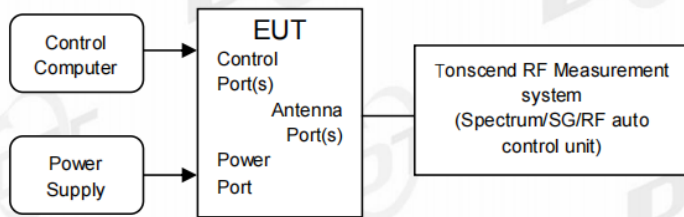






## 5. 99% Bandwidth

### 5.1. Block diagram of test setup



### 5.2. Limits

Just for Report.

### 5.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 6.9.3.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously
- (4) Use the following spectrum analyzer settings for the 99% Bandwidth:
 

|                |                                         |
|----------------|-----------------------------------------|
| RBW:           | 1% to 5% of the OBW                     |
| VBW:           | approximately three times RBW           |
| Span:          | between 1.5 times and 5.0 times the OBW |
| Detector Mode: | Peak                                    |
| Sweep time:    | Auto                                    |
| Trace mode     | Max hold                                |
- (5) Allow the trace to stabilize, measure the 99% bandwidth of signal, and record the results in the report.

### 5.4. Test Result

Left side:

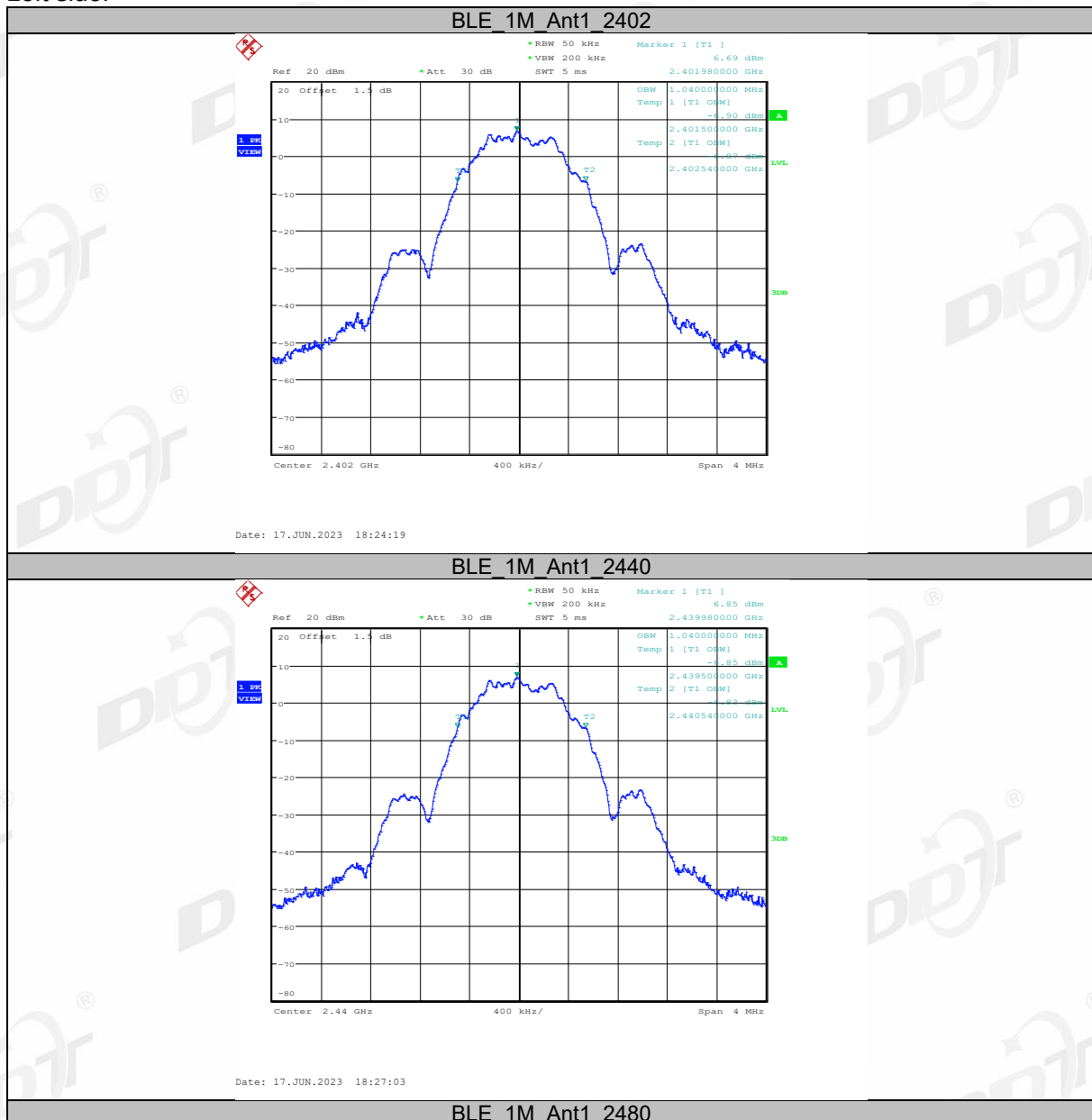
| Test Mode | Antenna | Frequency [MHz] | OCB [MHz] | FL[MHz]   | FH[MHz]   |
|-----------|---------|-----------------|-----------|-----------|-----------|
| BLE_1M    | Ant1    | 2402            | 1.04      | 2401.5000 | 2402.5400 |
|           |         | 2440            | 1.04      | 2439.5000 | 2440.5400 |
|           |         | 2480            | 1.04      | 2479.5000 | 2480.5400 |
| BLE_2M    | Ant1    | 2402            | 2.064     | 2400.9960 | 2403.0600 |
|           |         | 2440            | 2.064     | 2438.9960 | 2441.0600 |
|           |         | 2480            | 2.068     | 2478.9960 | 2481.0640 |

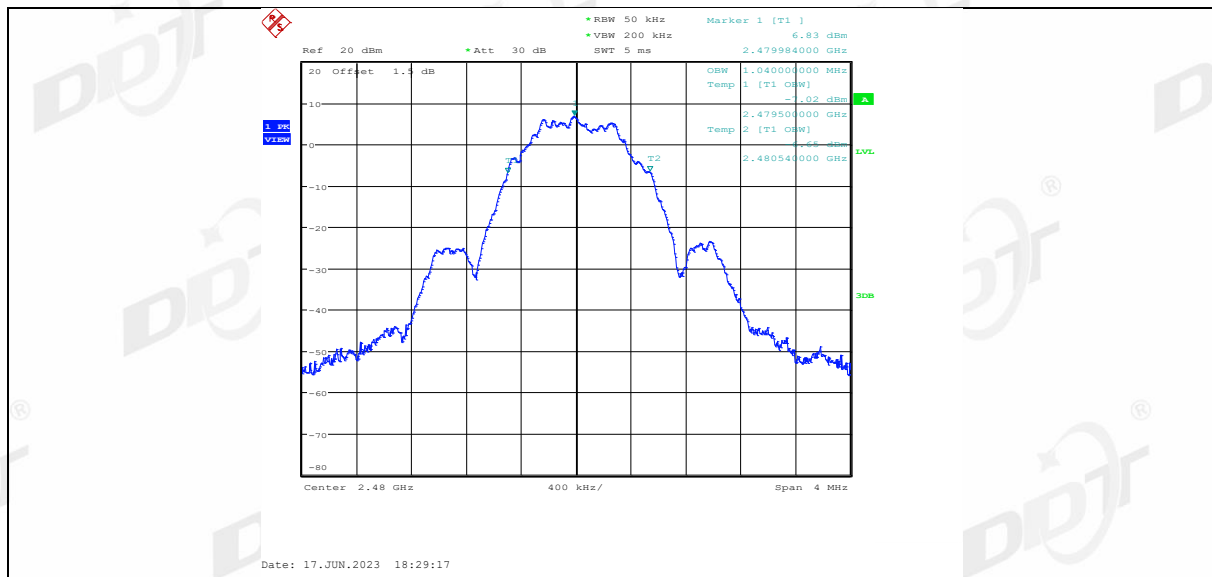
Right side:

| Test Mode | Antenna | Frequency [MHz] | OCB [MHz] | FL[MHz]   | FH[MHz]   |
|-----------|---------|-----------------|-----------|-----------|-----------|
| BLE_1M    | Ant1    | 2402            | 1.04      | 2401.5000 | 2402.5400 |
|           |         | 2440            | 1.04      | 2439.5000 | 2440.5400 |
|           |         | 2480            | 1.036     | 2479.5040 | 2480.5400 |
| BLE_2M    | Ant1    | 2402            | 2.068     | 2400.9960 | 2403.0640 |
|           |         | 2440            | 2.068     | 2438.9960 | 2441.0640 |
|           |         | 2480            | 2.068     | 2478.9960 | 2481.0640 |

## 5.5. Test Graphs

Left side:

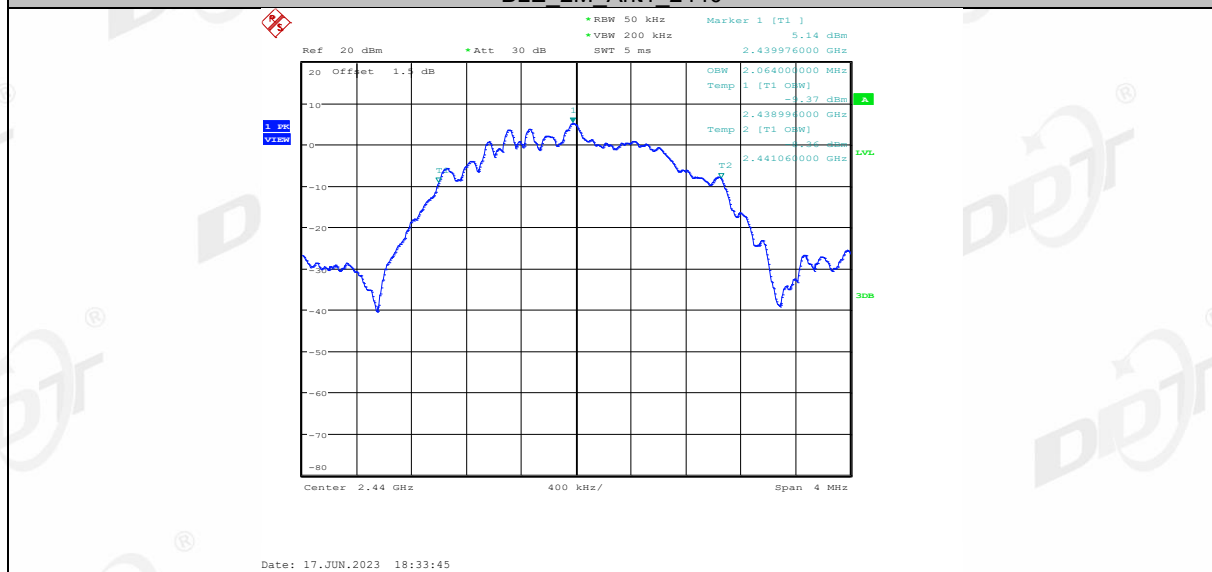




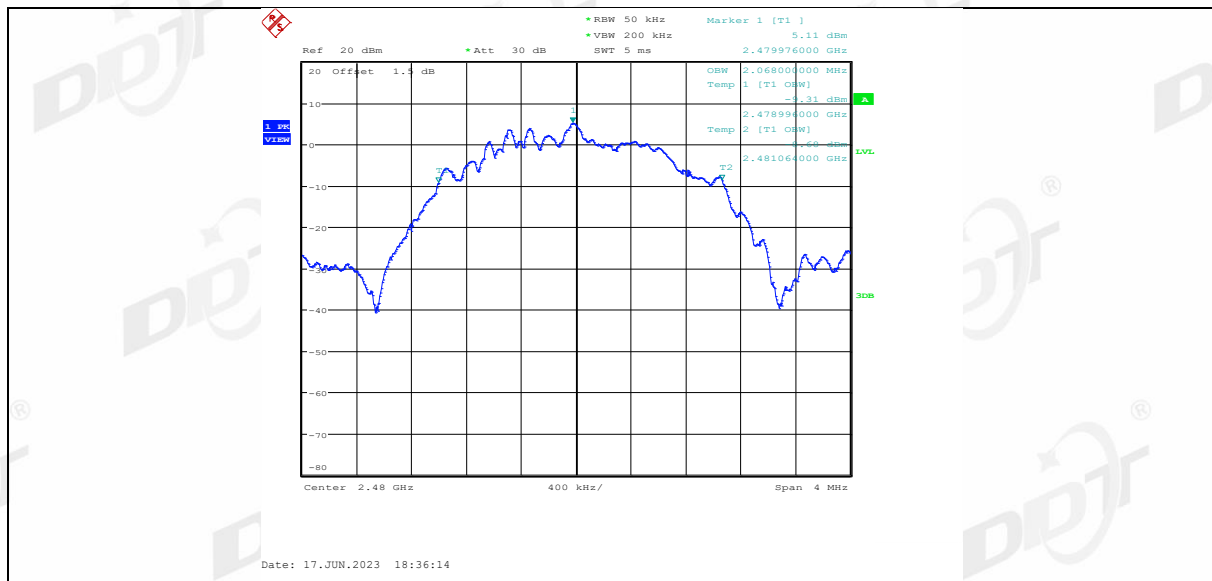
## BLE 2M Ant1 2402



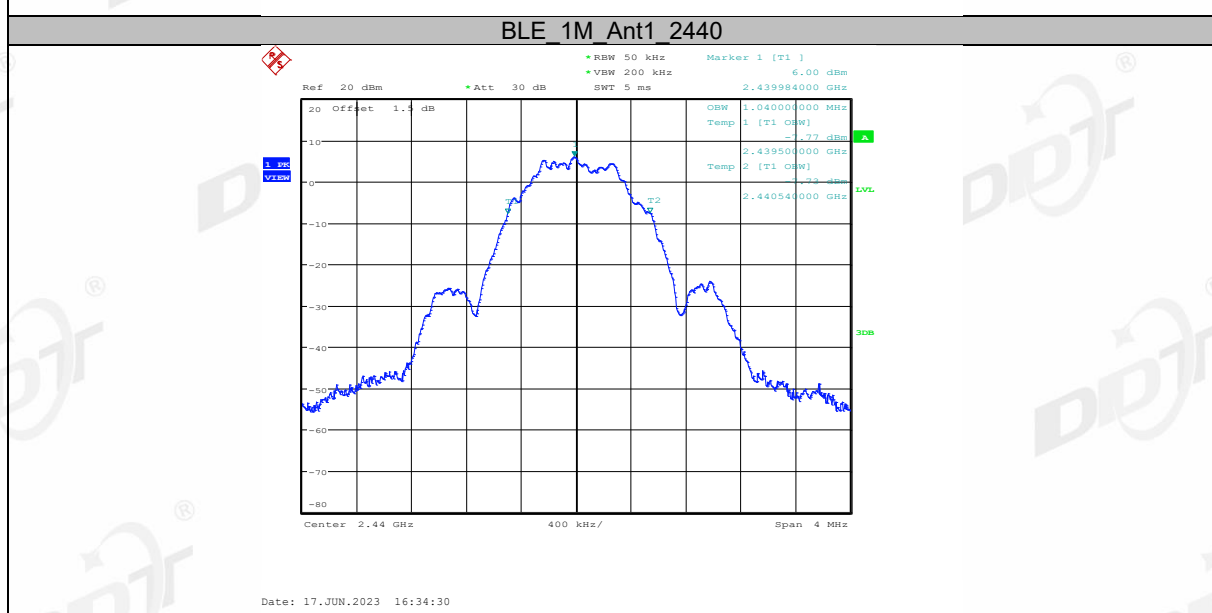
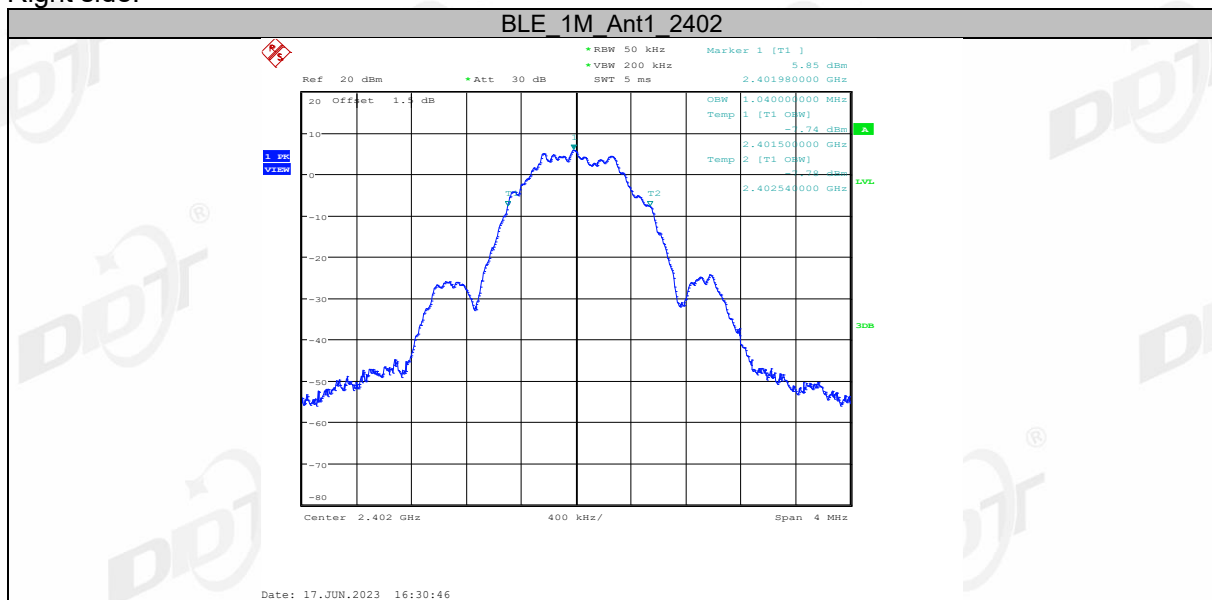
## BLE 2M Ant1 2440

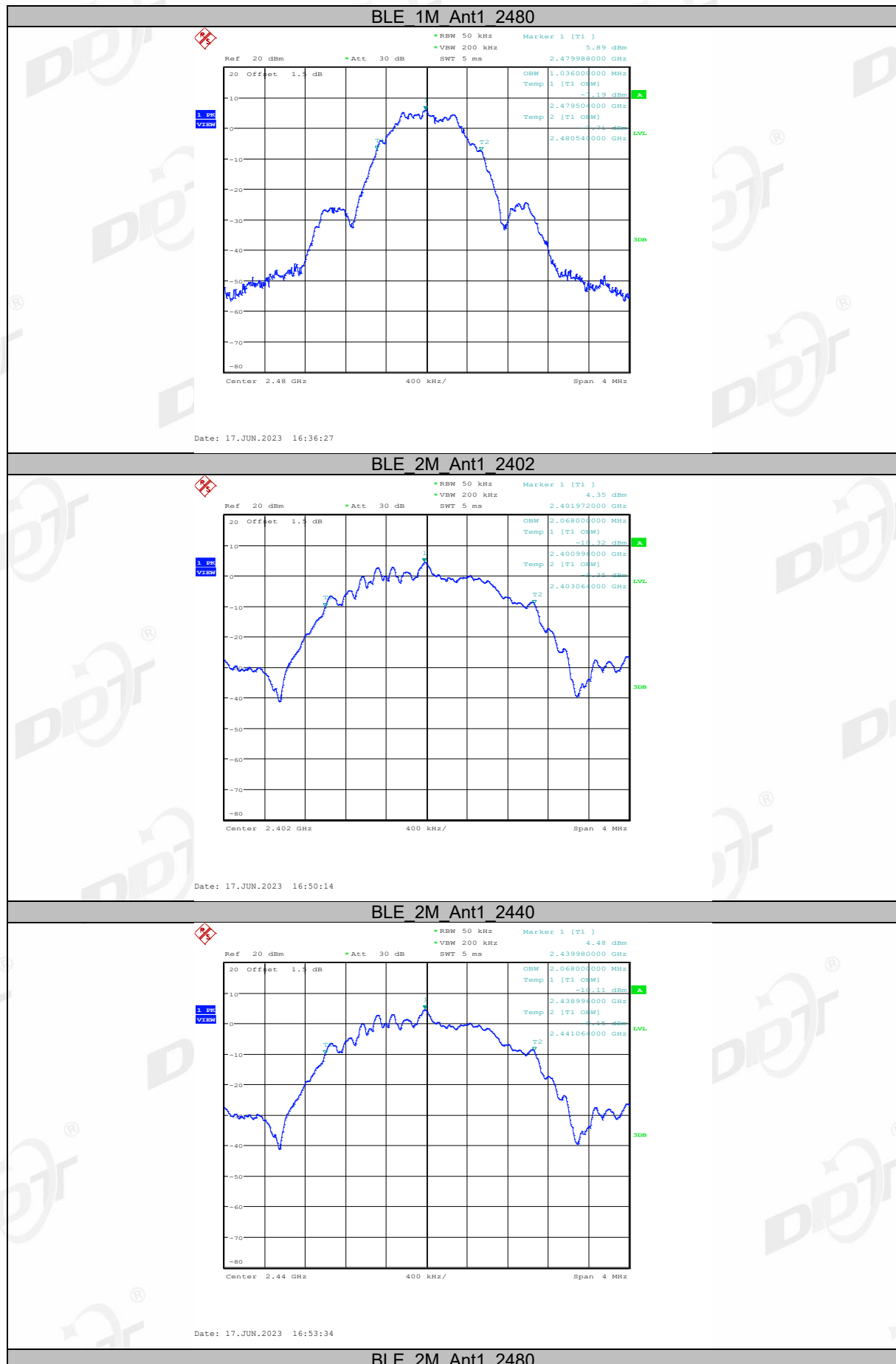


## BLE 2M Ant1 2480

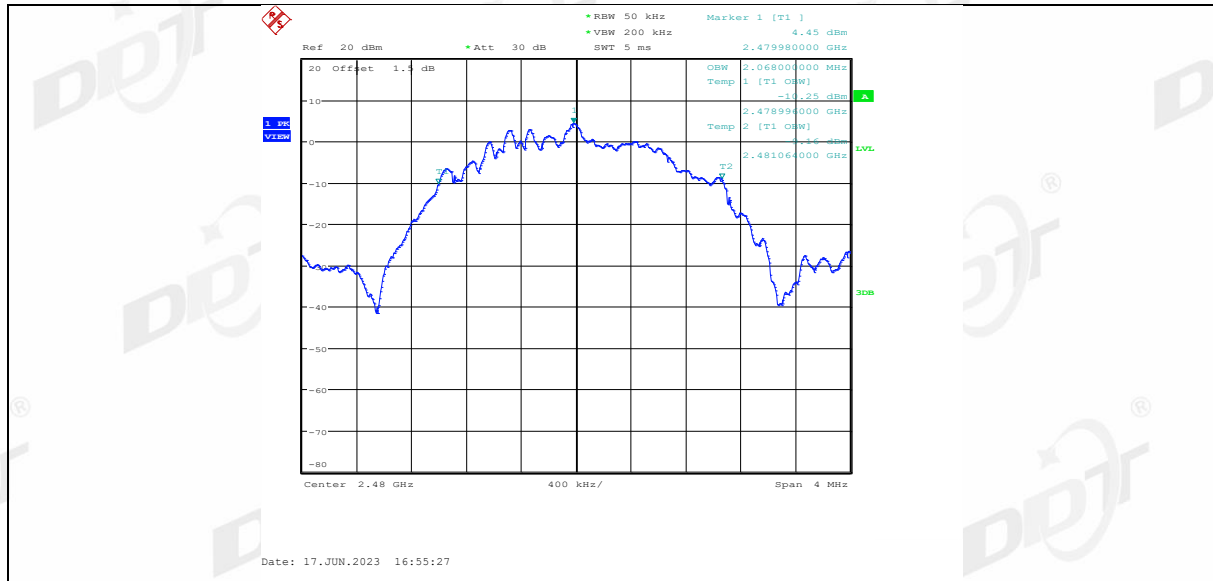


Right side:



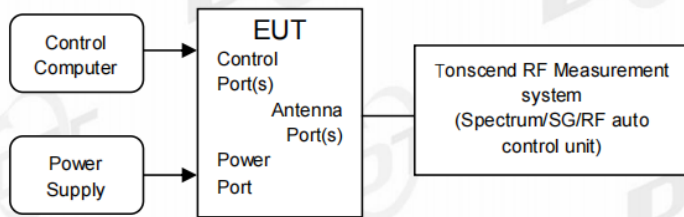






## 6. Maximum Peak Output Power

### 6.1. Block diagram of test setup



### 6.2. 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.

### 6.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 11.9.1.1.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously.
- (4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

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

- (5) Allow the trace to stabilize, use peak marker function to determine the peak amplitude level.

### 6.4. Test result peak

Left side:

| Test Mode | Antenna | Frequency [MHz] | Conducted Peak Power[dBm] | Conducted Limit[dBm] | EIRP[dBm]    | EIRP Limit[dBm] | Verdict |
|-----------|---------|-----------------|---------------------------|----------------------|--------------|-----------------|---------|
| BLE_1M    | Ant1    | 2402            | 10.04                     | ≤30                  | 10.70        | ≤36             | PASS    |
|           |         | 2440            | 10.14                     | ≤30                  | 10.80        | ≤36             | PASS    |
|           |         | 2480            | 10.16                     | ≤30                  | 10.82        | ≤36             | PASS    |
| BLE_2M    | Ant1    | 2402            | 10.05                     | ≤30                  | 10.71        | ≤36             | PASS    |
|           |         | 2440            | 10.15                     | ≤30                  | 10.81        | ≤36             | PASS    |
|           |         | 2480            | 10.19                     | ≤30                  | <b>10.85</b> | ≤36             | PASS    |

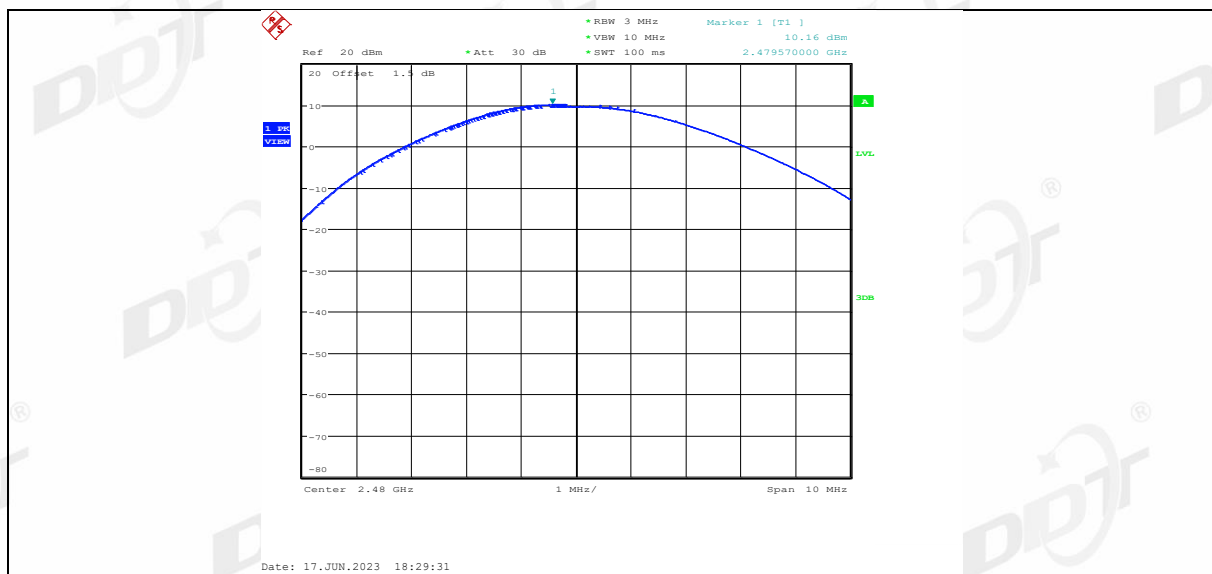
Right side:

| Test Mode | Antenna | Frequency [MHz] | Conducted Peak Power[dBm] | Conducted Limit[dBm] | EIRP[dBm]    | EIRP Limit[dBm] | Verdict |
|-----------|---------|-----------------|---------------------------|----------------------|--------------|-----------------|---------|
| BLE_1M    | Ant1    | 2402            | 9.15                      | ≤30                  | 10.35        | ≤36             | PASS    |
|           |         | 2440            | 9.31                      | ≤30                  | 10.51        | ≤36             | PASS    |
|           |         | 2480            | 9.25                      | ≤30                  | 10.45        | ≤36             | PASS    |
| BLE_2M    | Ant1    | 2402            | 9.31                      | ≤30                  | 10.51        | ≤36             | PASS    |
|           |         | 2440            | 9.43                      | ≤30                  | <b>10.63</b> | ≤36             | PASS    |
|           |         | 2480            | 9.41                      | ≤30                  | 10.61        | ≤36             | PASS    |

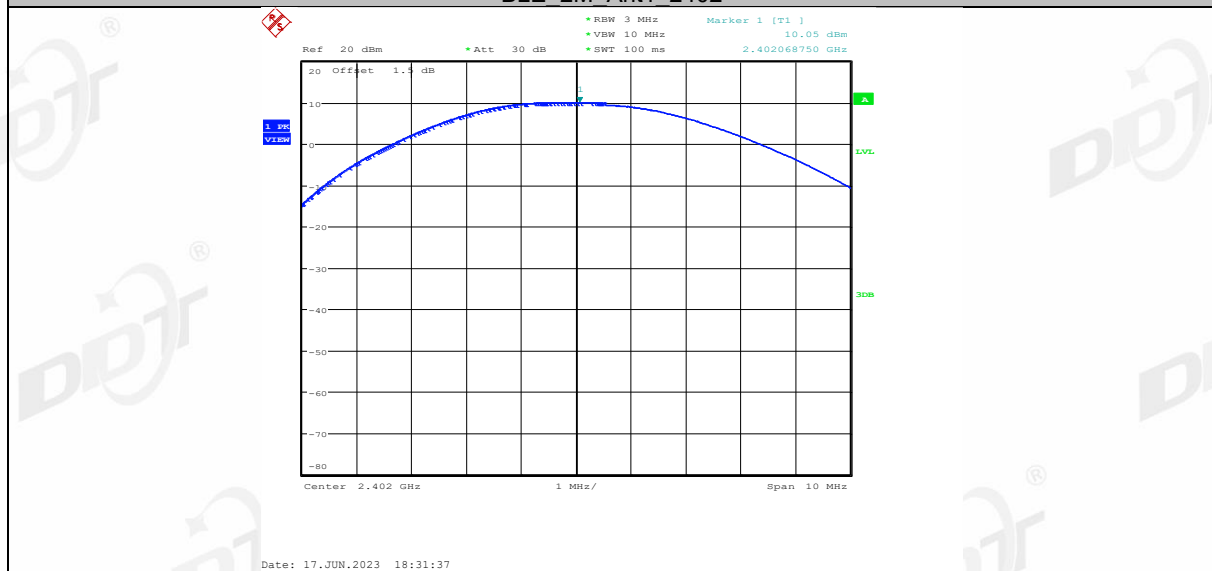
## 6.5. Test graphs peak

Left side:

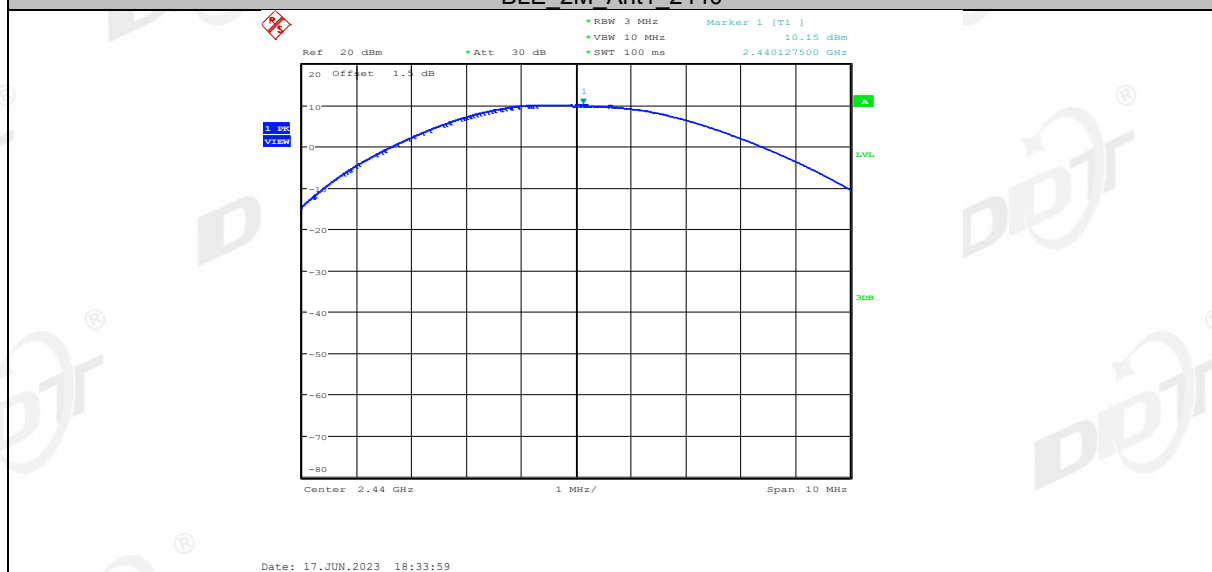




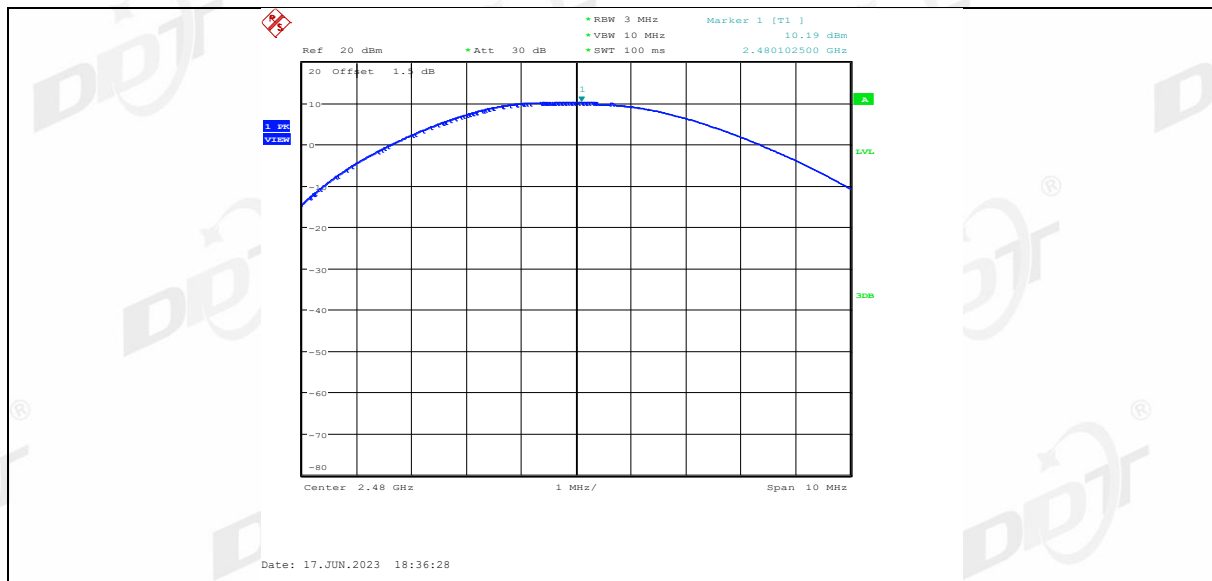
## BLE 2M Ant1 2402



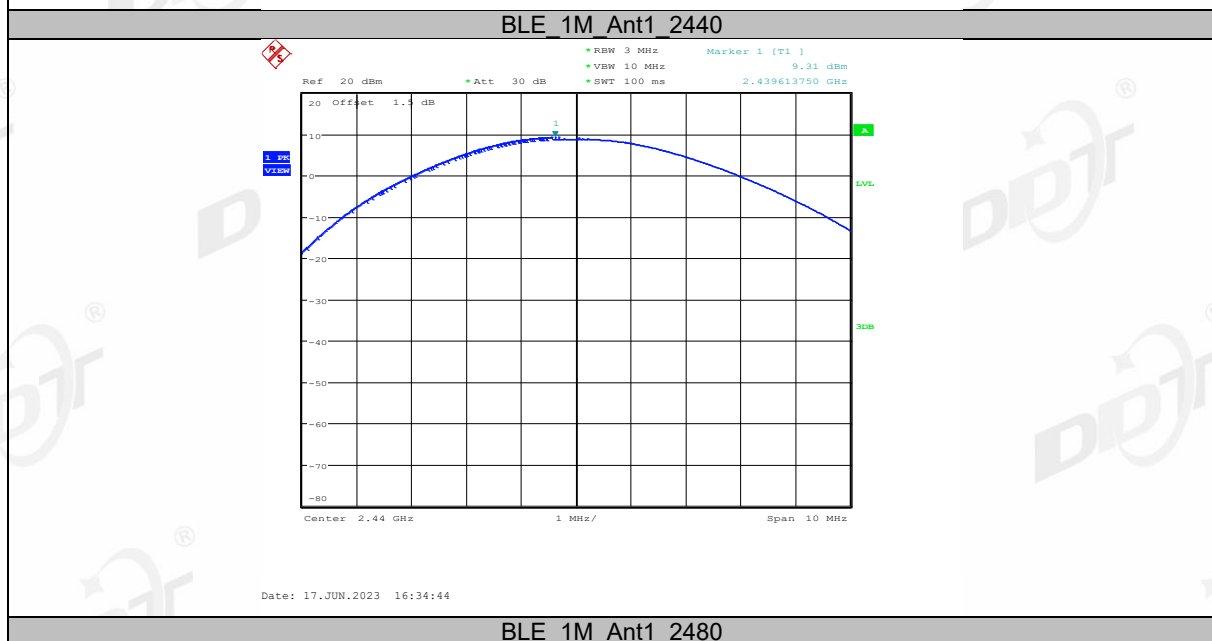
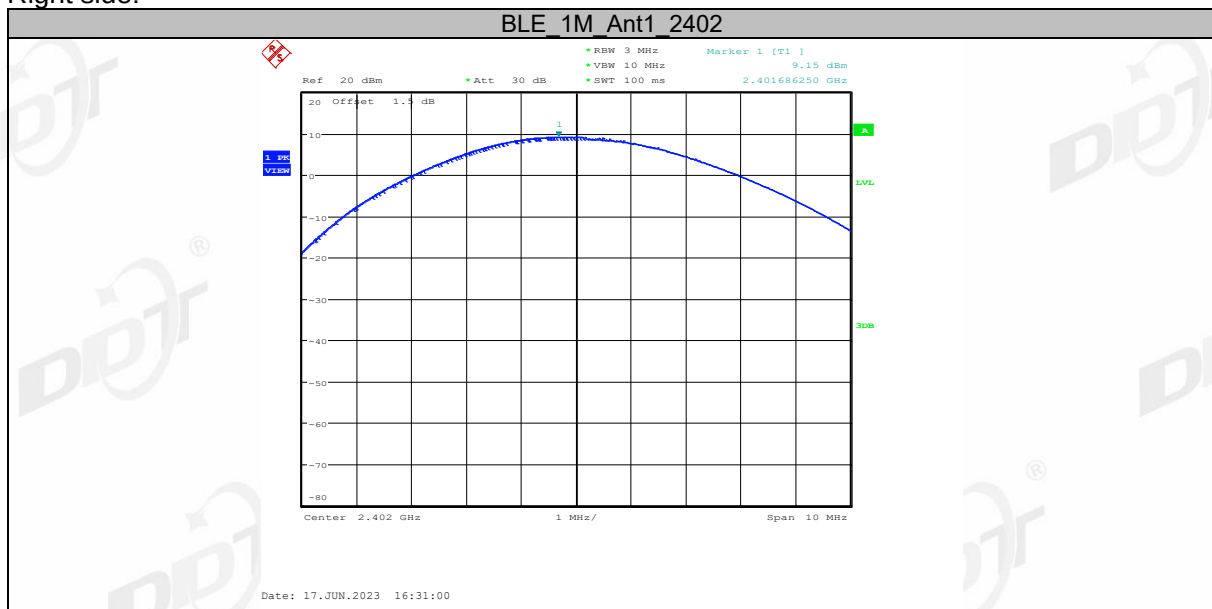
## BLE 2M Ant1 2440

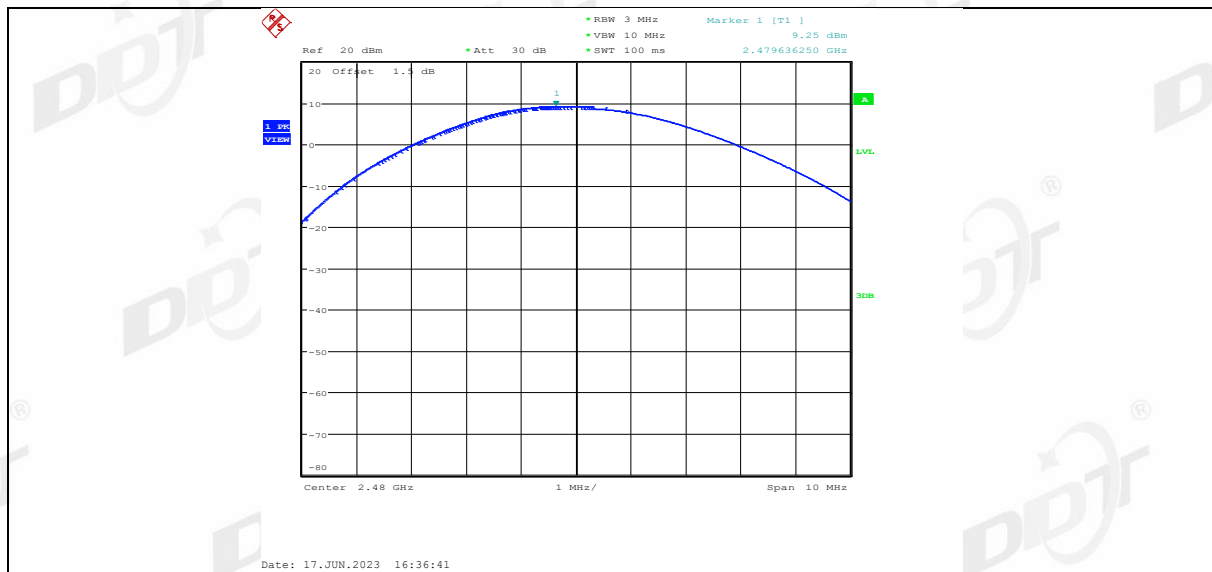


## BLE 2M Ant1 2480

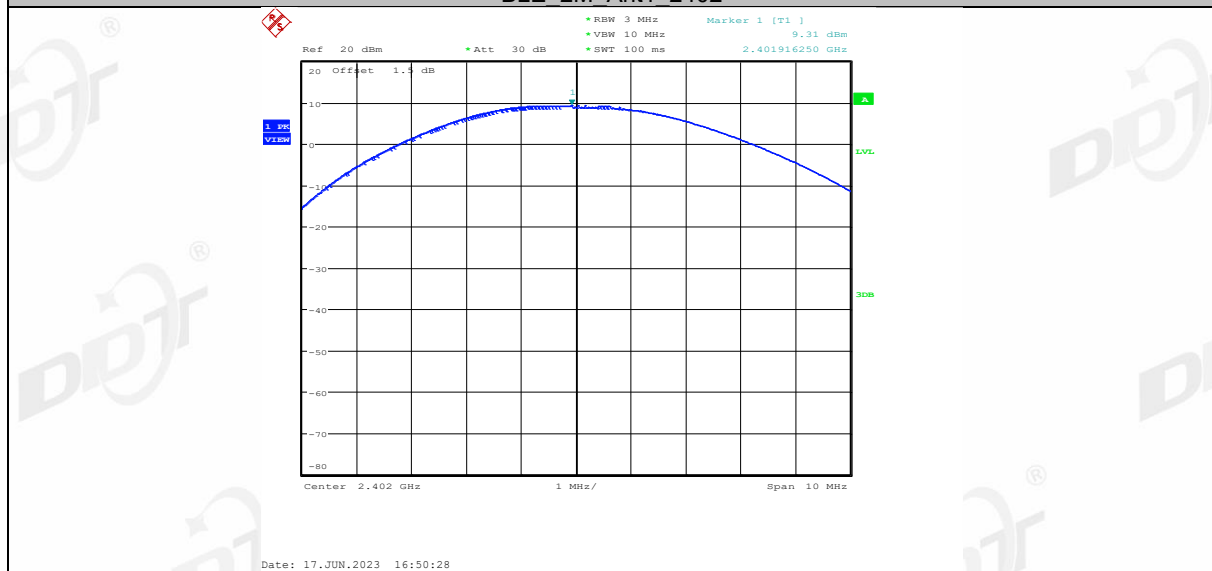


Right side:

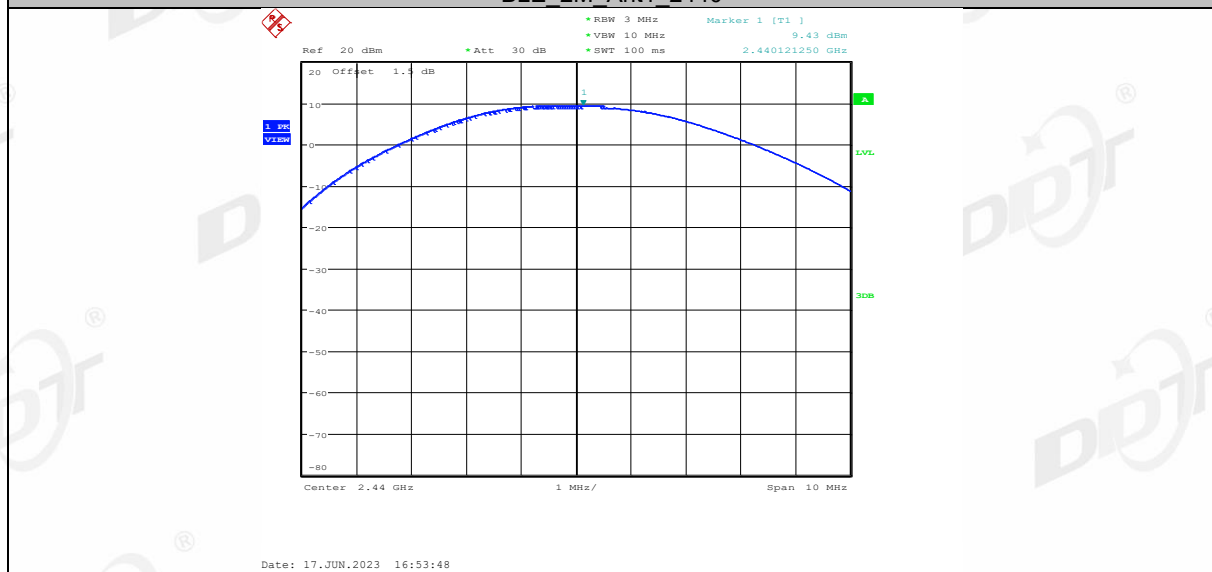




## BLE 2M Ant1 2402

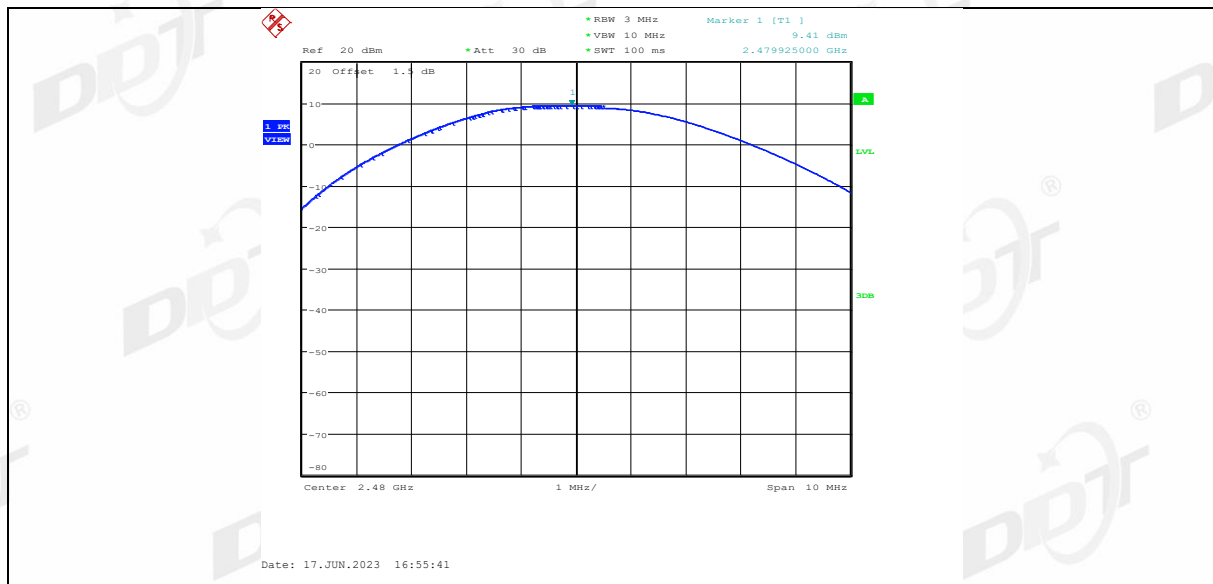


## BLE 2M Ant1 2440



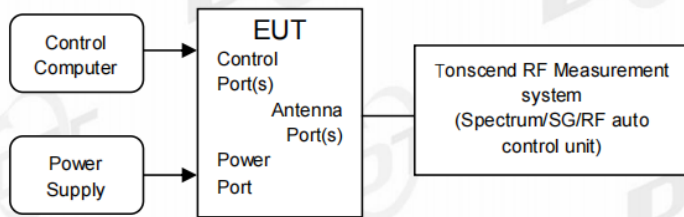
## BLE 2M Ant1 2480





## 7. Power Spectral Density

### 7.1. Block diagram of test setup



### 7.2. 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.

### 7.3. Test procedure

- (1) The test according to ANSI C63.10-2013 clause 11.10.2.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.
- (3) Set the EUT as maximum power setting and enable the EUT transmit continuously.
- (4) Use the following spectrum analyzer settings for Power Spectral Density measurement:
 

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

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

### 7.4. Test result

Left side:

| Test Mode | Antenna | Frequency [MHz] | Result [dBm/3kHz] | Limit [dBm/3kHz] | Verdict |
|-----------|---------|-----------------|-------------------|------------------|---------|
| BLE_1M    | Ant1    | 2402            | -6.17             | $\leq 8.00$      | PASS    |
|           |         | 2440            | -6.09             | $\leq 8.00$      | PASS    |
|           |         | 2480            | -6.09             | $\leq 8.00$      | PASS    |
| BLE_2M    | Ant1    | 2402            | -8.57             | $\leq 8.00$      | PASS    |
|           |         | 2440            | -8.41             | $\leq 8.00$      | PASS    |
|           |         | 2480            | -8.38             | $\leq 8.00$      | PASS    |

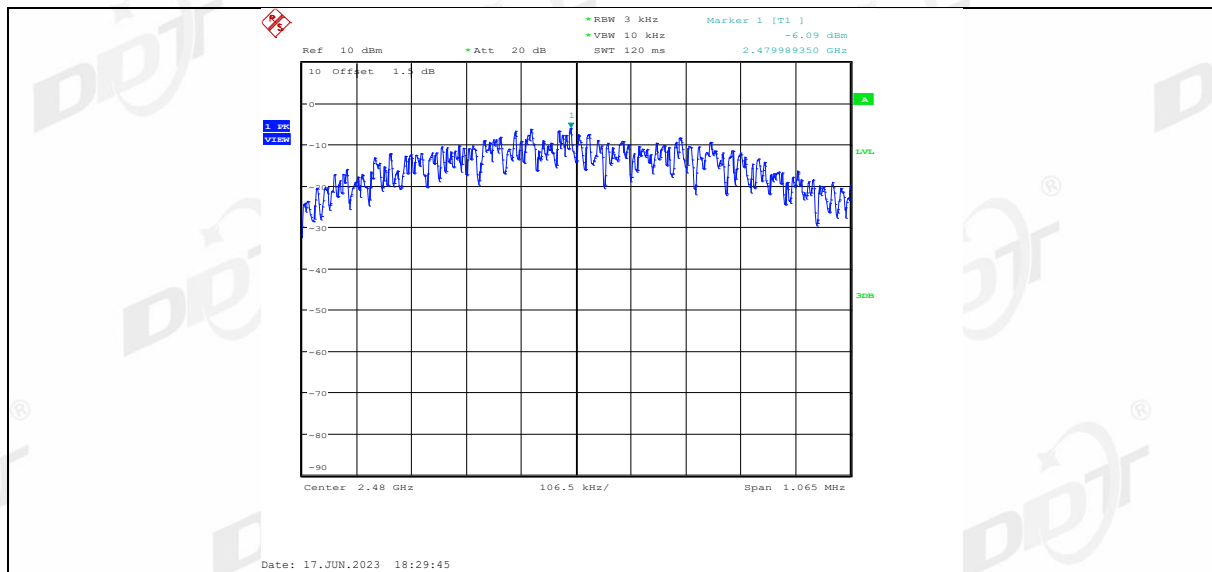
Right side:

| Test Mode | Antenna | Frequency [MHz] | Result [dBm/3kHz] | Limit [dBm/3kHz] | Verdict |
|-----------|---------|-----------------|-------------------|------------------|---------|
| BLE_1M    | Ant1    | 2402            | -7.02             | ≤8.00            | PASS    |
|           |         | 2440            | -6.81             | ≤8.00            | PASS    |
|           |         | 2480            | -6.93             | ≤8.00            | PASS    |
| BLE_2M    | Ant1    | 2402            | -9.21             | ≤8.00            | PASS    |
|           |         | 2440            | -9.19             | ≤8.00            | PASS    |
|           |         | 2480            | -9.23             | ≤8.00            | PASS    |

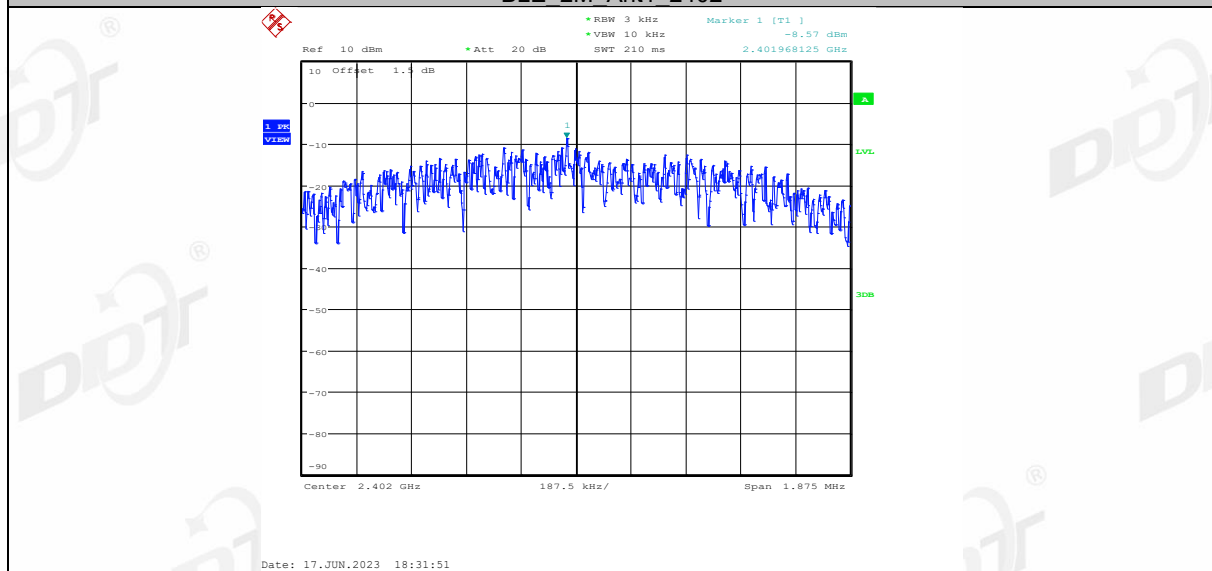
## 7.5. Test graphs

Left side:

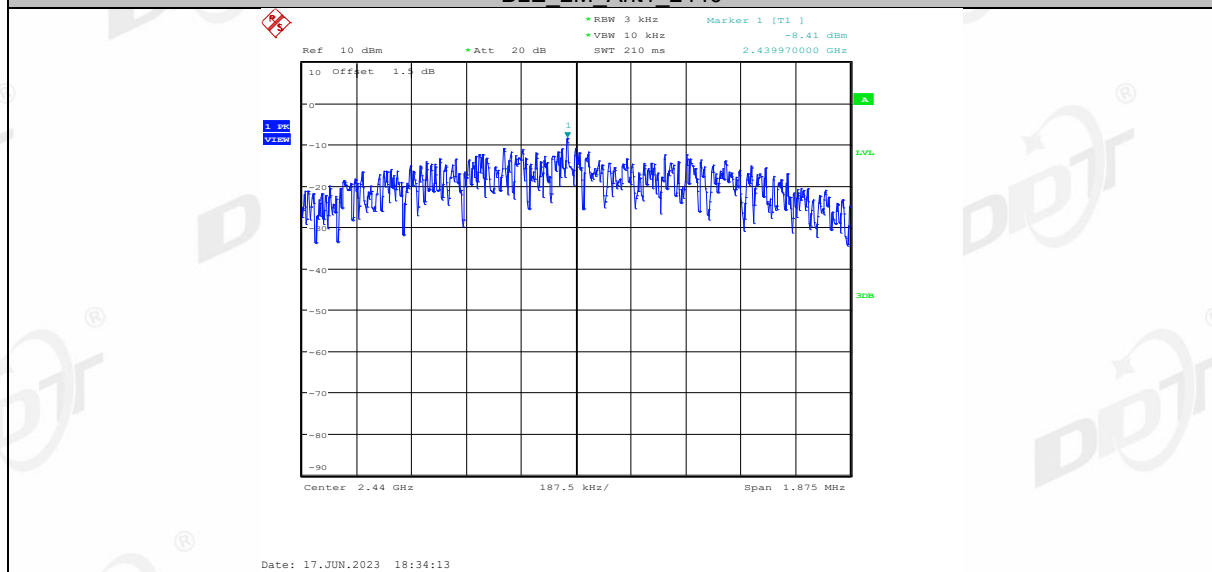




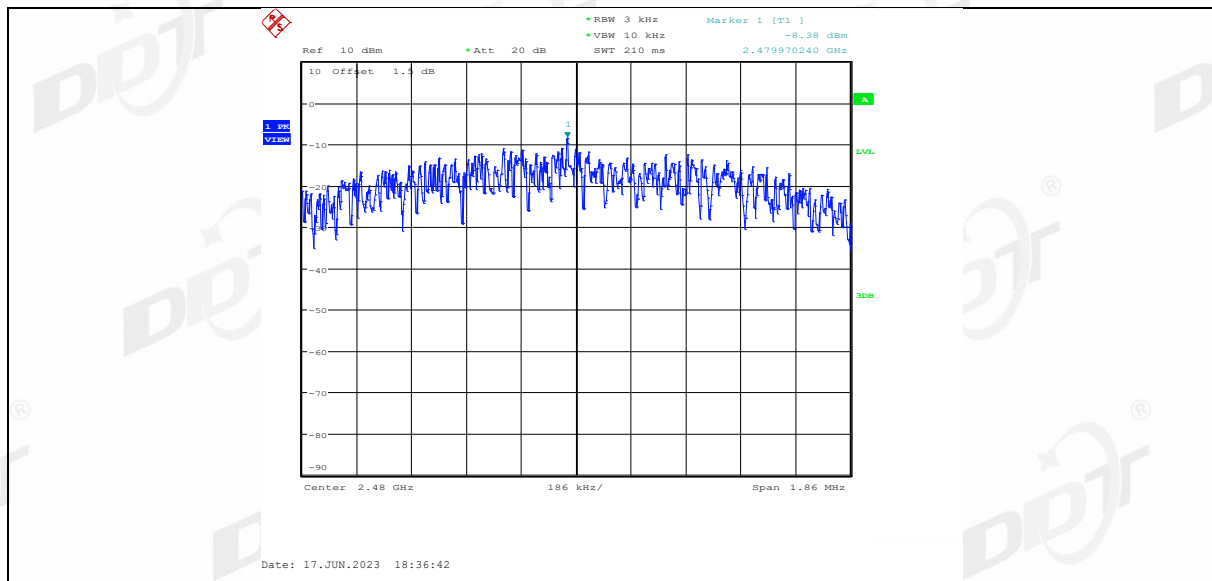
## BLE 2M Ant1 2402



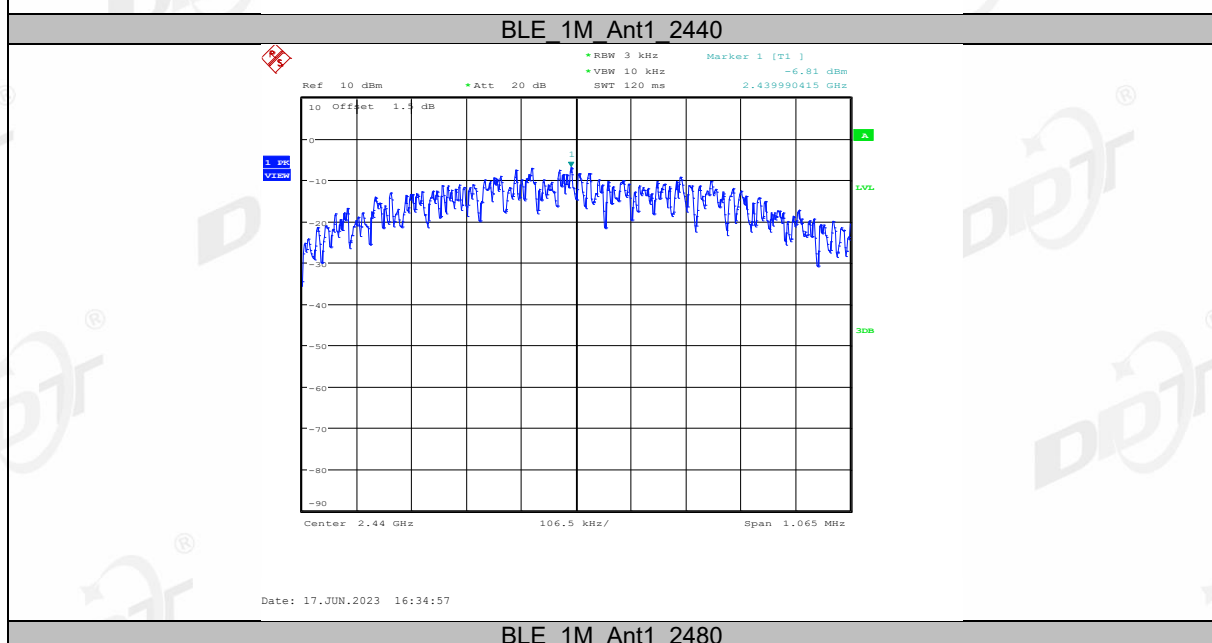
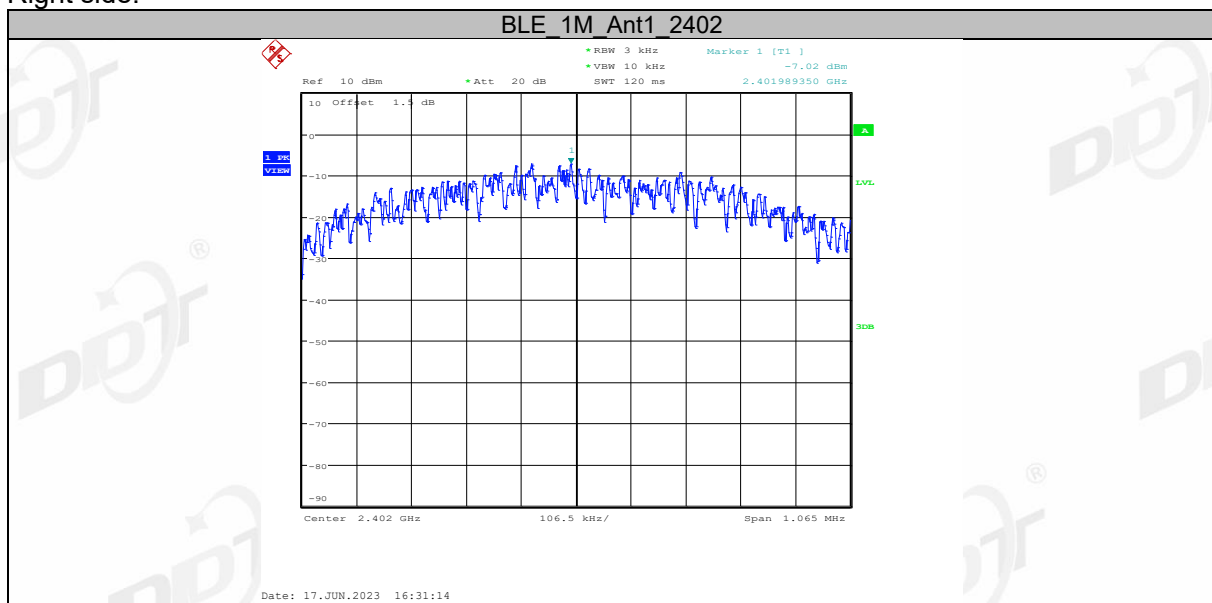
## BLE 2M Ant1 2440

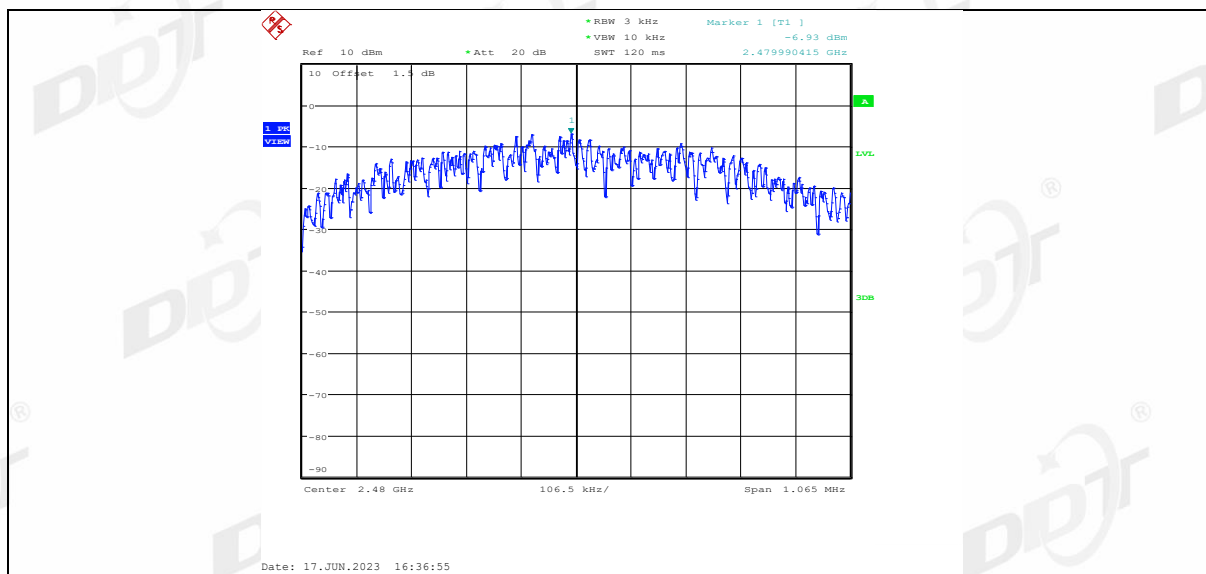


## BLE 2M Ant1 2480

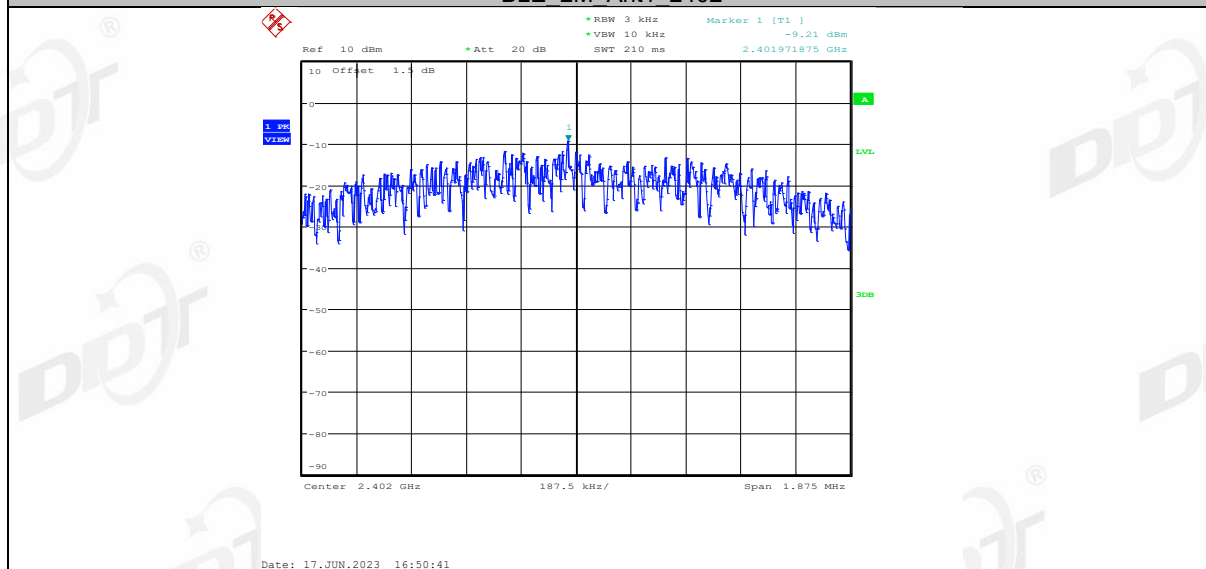


Right side:

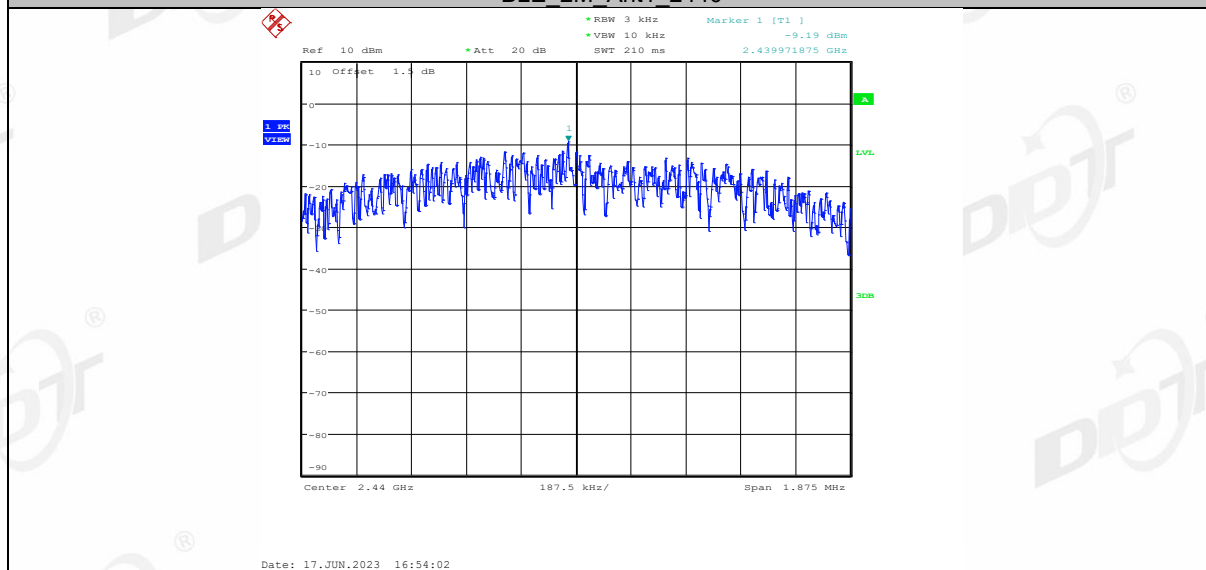




## BLE 2M Ant1 2402



## BLE 2M Ant1 2440



## BLE 2M Ant1 2480

