

# FCC AND ISED CERTIFICATION TEST REPORT

FOR

<b>Applicant</b>	:	Kingstate Electronics(Dongguan)Co.,Ltd
<b>Address</b>	:	Shi Chong Industrial Park, Shi Chong Avenue, Xiang Xi Village, 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>FCC ID</b>	:	2AKMBTW-EF3A
<b>IC</b>	:	12522A-EF3A
<b>Manufacturer</b>	:	Kingstate Electronics(Dongguan)Co.,Ltd
<b>Address</b>	:	Shi Chong Industrial Park, Shi Chong Avenue, Xiang Xi Village, Shi Pai Town, Dong Guan City, Guang Dong Province, China.

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

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

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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, 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, 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*

**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) RSS-247 Issue 2 clause 5.2(a) RSS-Gen Issue 5 clause 6.7	Pass
Peak Output Power	FCC Part 15: 15.247(b)(3) RSS-247 Issue 2 clause 5.4(d)	Pass
Power Spectral Density	FCC Part 15:15.247(e) RSS-247 Issue 2 clause 5.2(b)	Pass
Band Edge Compliance (conducted method)	FCC Part 15: 15.247(d) RSS-247 Issue 2 clause 5.5	Pass
RF Conducted Spurious Emissions	FCC Part 15: 15.247(d) RSS-247 Issue 2 clause 5.5	Pass
Radiation Emission	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) RSS-247 Issue 2 clause 5.5 RSS-Gen Issue 5 clause 8.9 RSS-Gen Issue 5 clause 8.10	Pass
Emission in Restricted Frequency Bands	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) RSS-247 Issue 2 clause 5.5 RSS-Gen Issue 5 clause 8.9 RSS-Gen Issue 5 clause 8.10	Pass
Power Line Conducted Emission	FCC Part 15: 15.207(a) RSS-Gen Issue 5 clause 8.8	Pass
Antenna Requirement	FCC Part 15: 15.203 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/ 280mAh built-in lithium battery. 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 Right side: 1.20 dBi
Sample Number	: S23021029-108 for conductive, 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



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

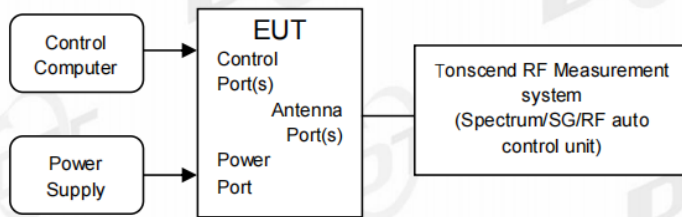
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Frequencies Stability	6.7 x 10 <sup>-8</sup> (Antenna couple method)
	5.5 x 10 <sup>-8</sup> (Conducted method)
Conducted spurious emissions	0.86 dB (10 MHz ≤ f < 3.6 GHz);
	1.40 dB (3.6 GHz ≤ f < 8 GHz)
	1.66 dB (8 GHz ≤ f < 26.5 GHz)
Uncertainty for radio frequency (RBW < 20 kHz)	3x10 <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)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz - 40 GHz)	4.10 dB (1 - 6 GHz)
	4.40 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power line conduction emission test	3.34dB (150KHz-30MHz)
	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:

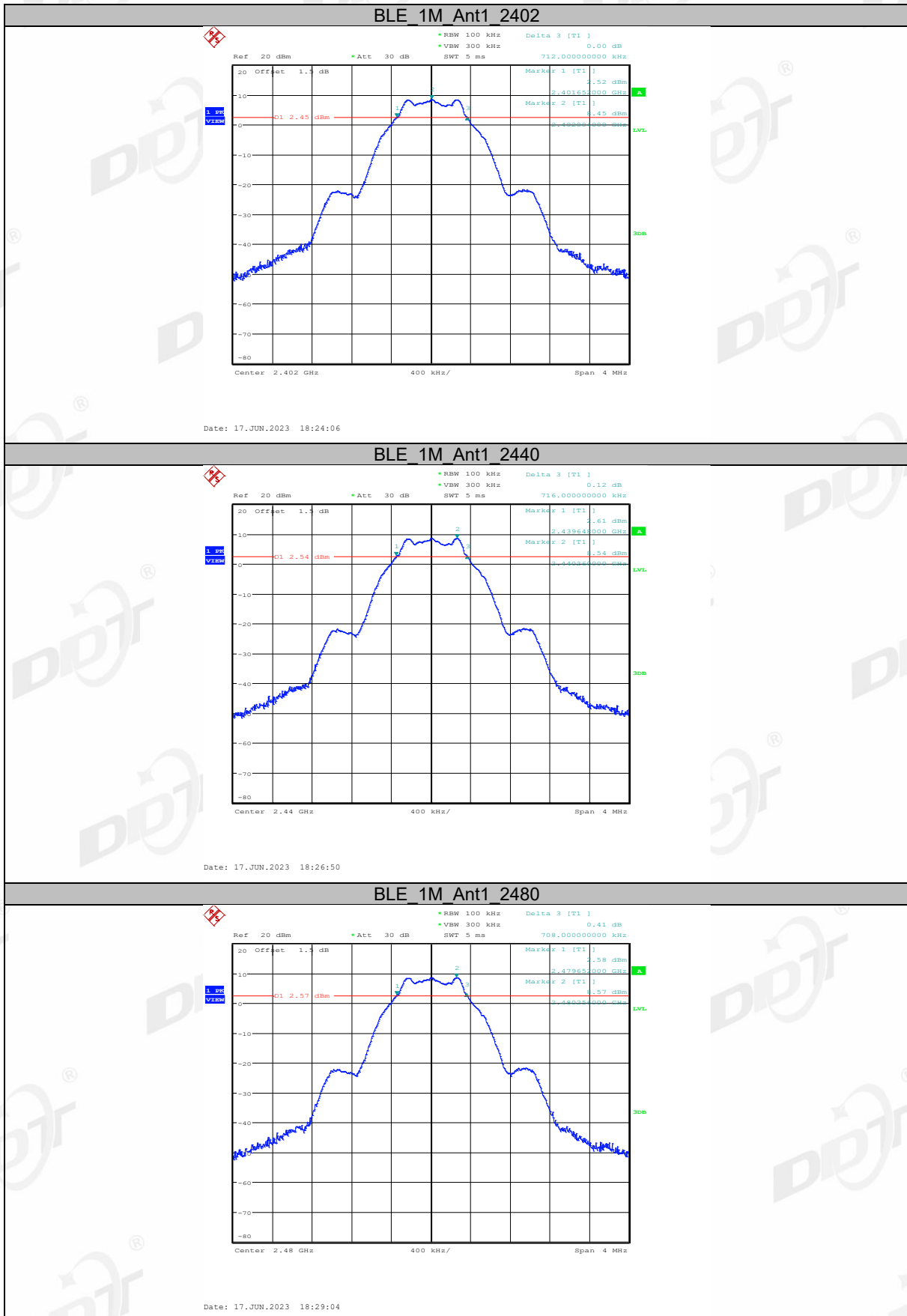
Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	0.71	2401.65	2402.36	0.5	PASS
		2440	0.72	2439.65	2440.36	0.5	PASS
		2480	0.71	2479.65	2480.36	0.5	PASS
BLE_2M	Ant1	2402	1.25	2401.36	2402.61	0.5	PASS
		2440	1.25	2439.36	2440.61	0.5	PASS
		2480	1.24	2479.36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

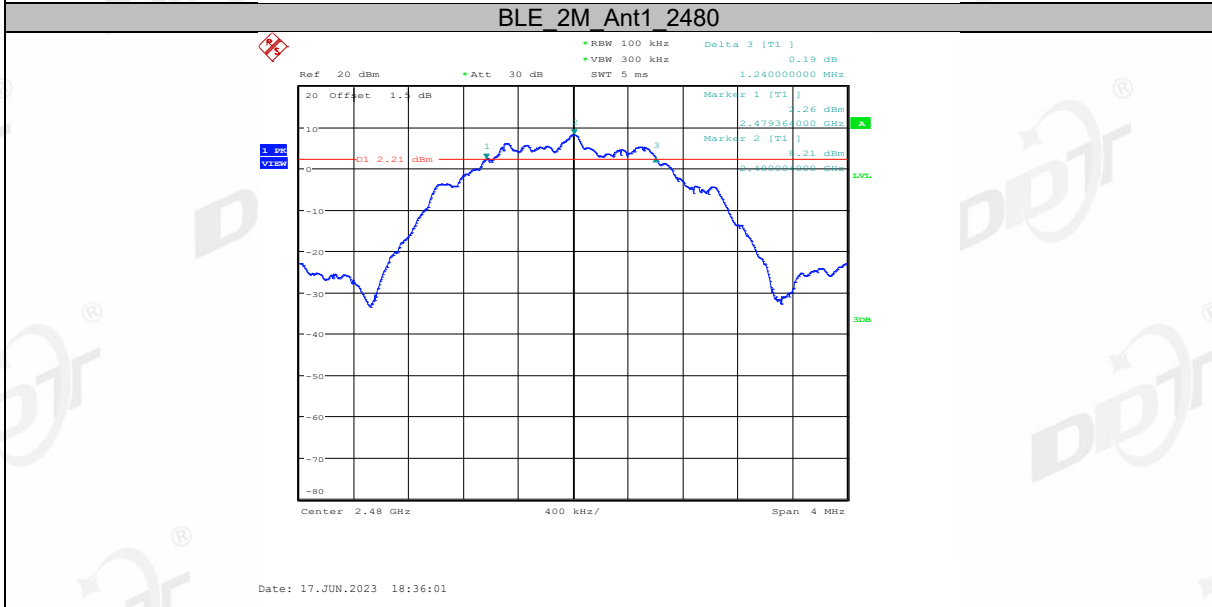
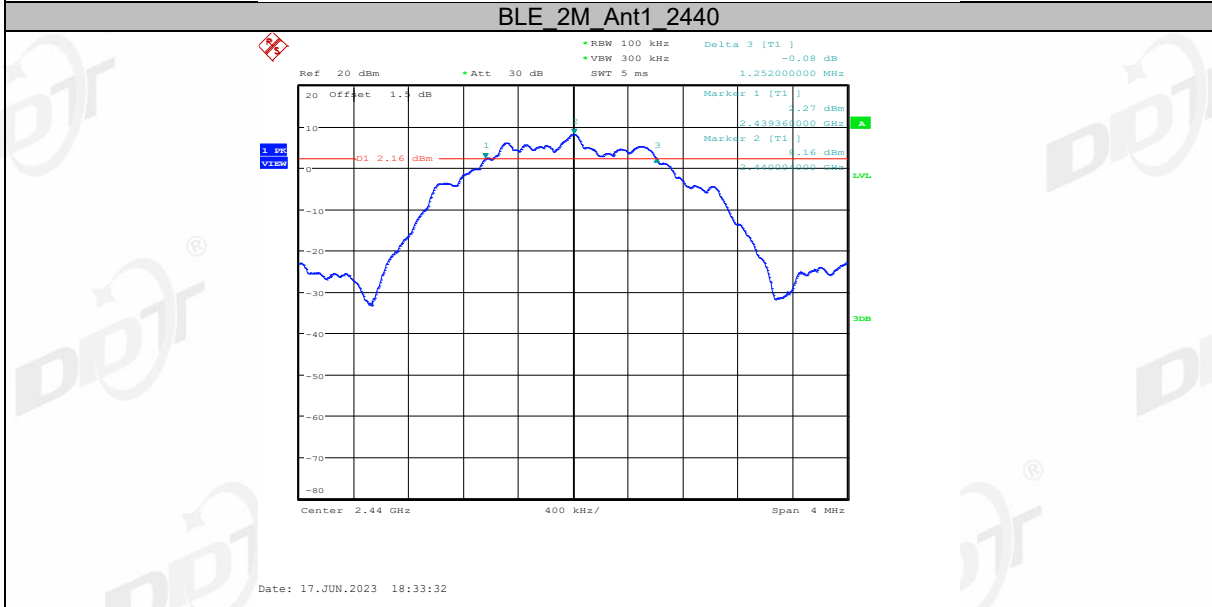
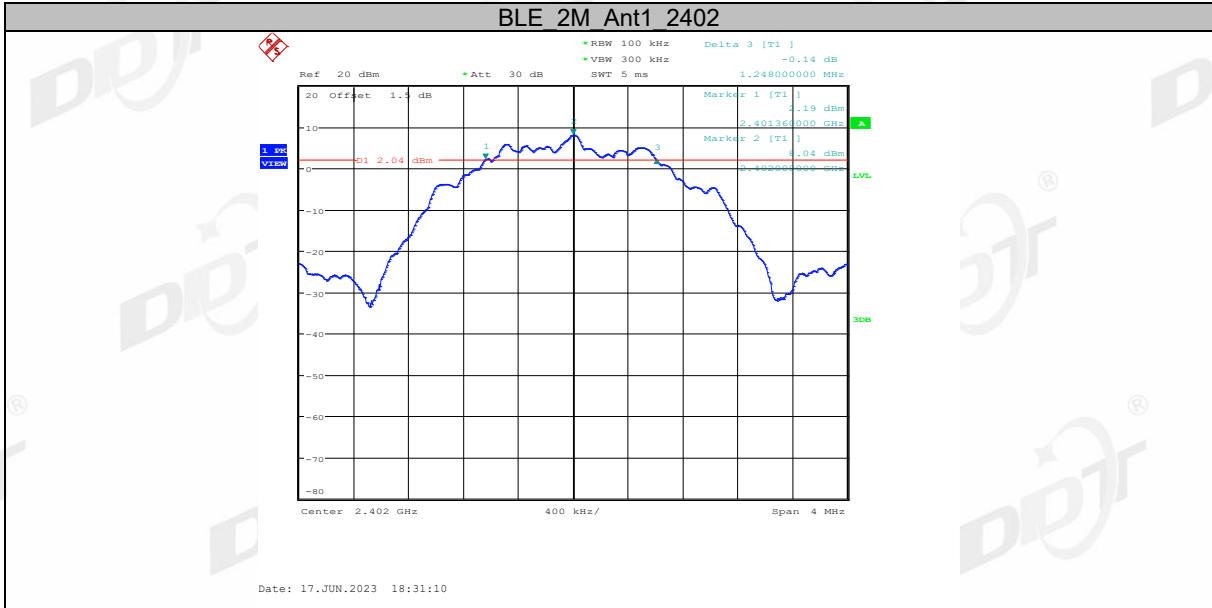
Right side:

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

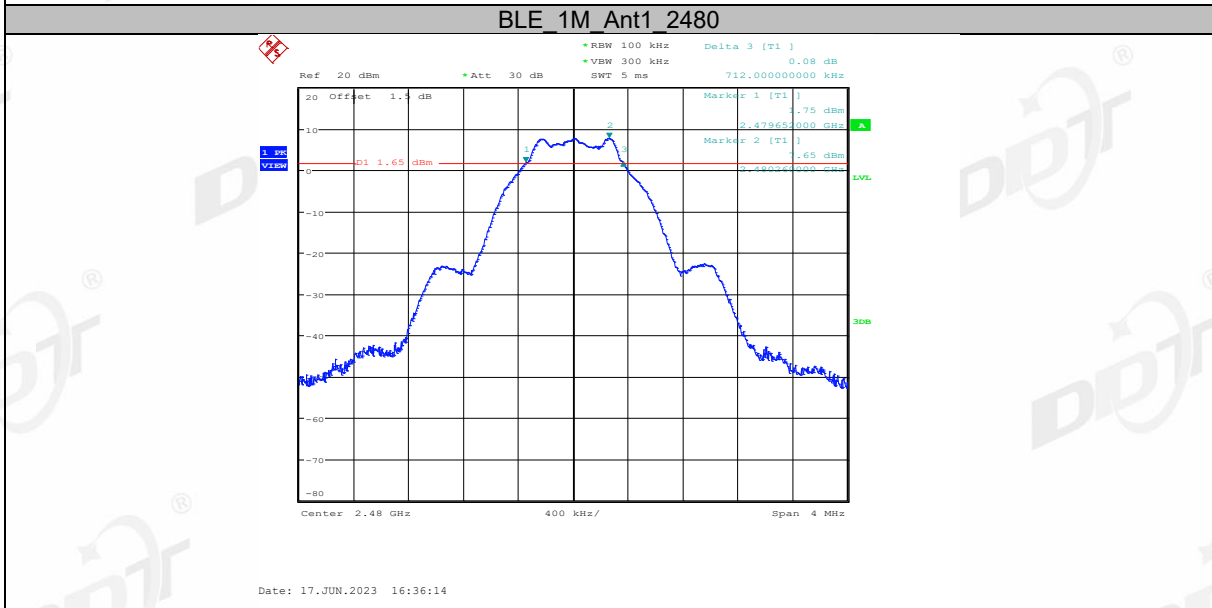
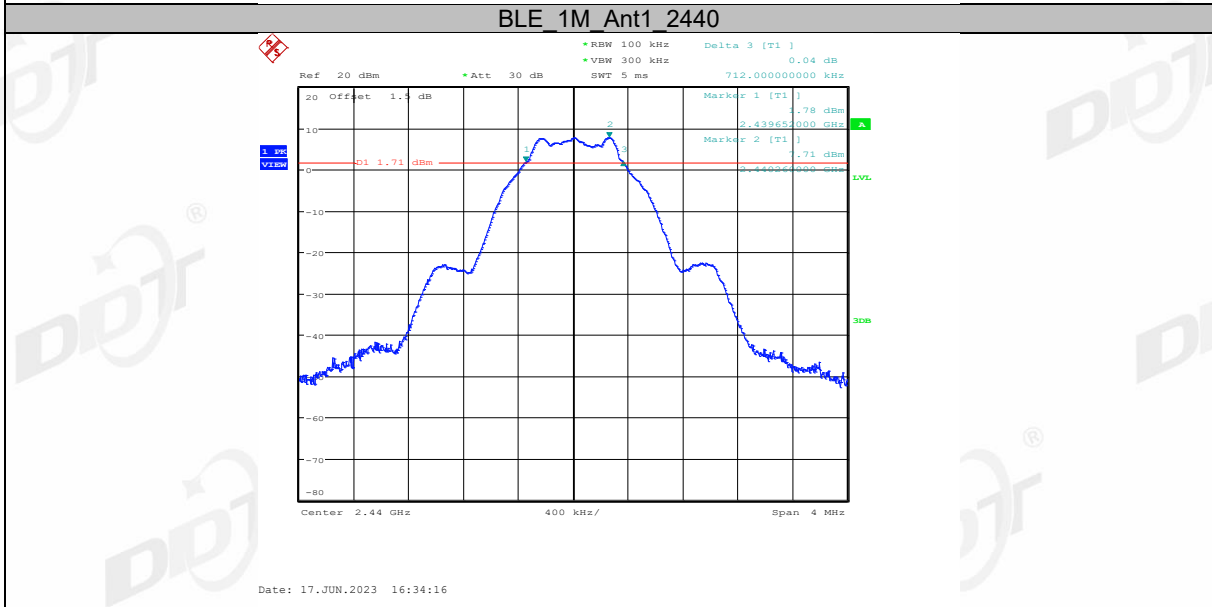
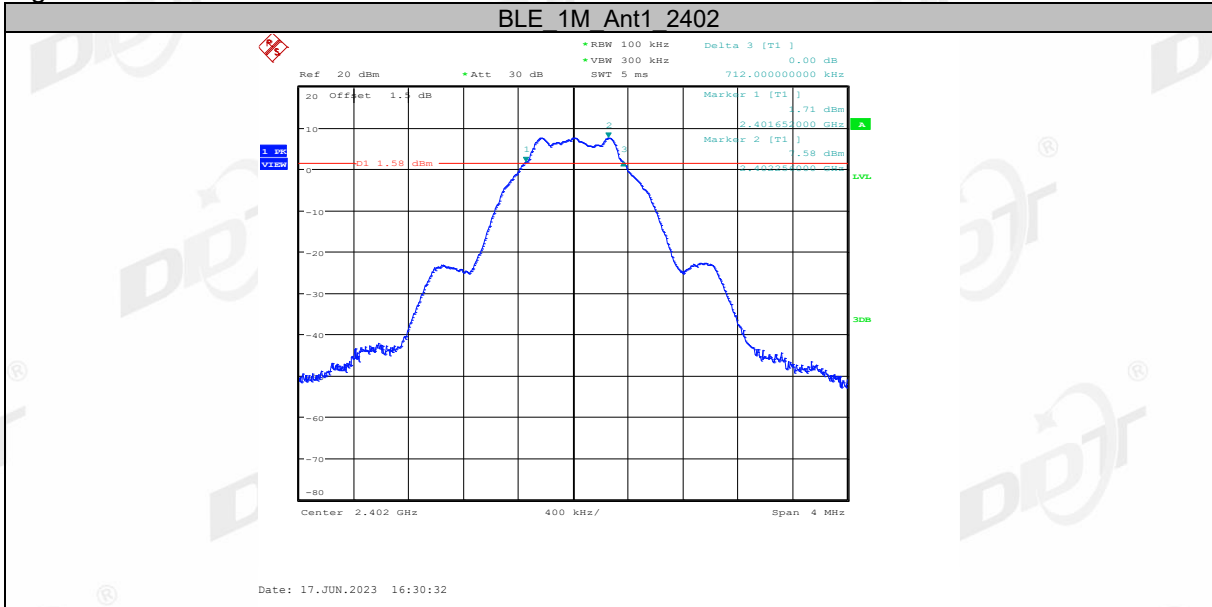
### 4.5. Test graphs

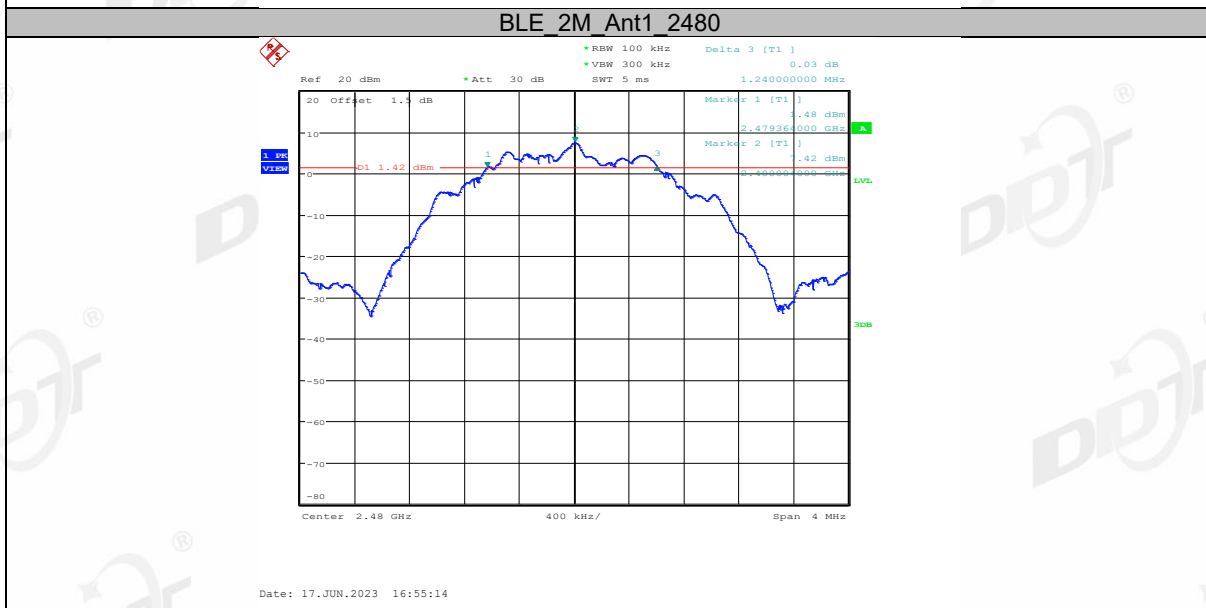
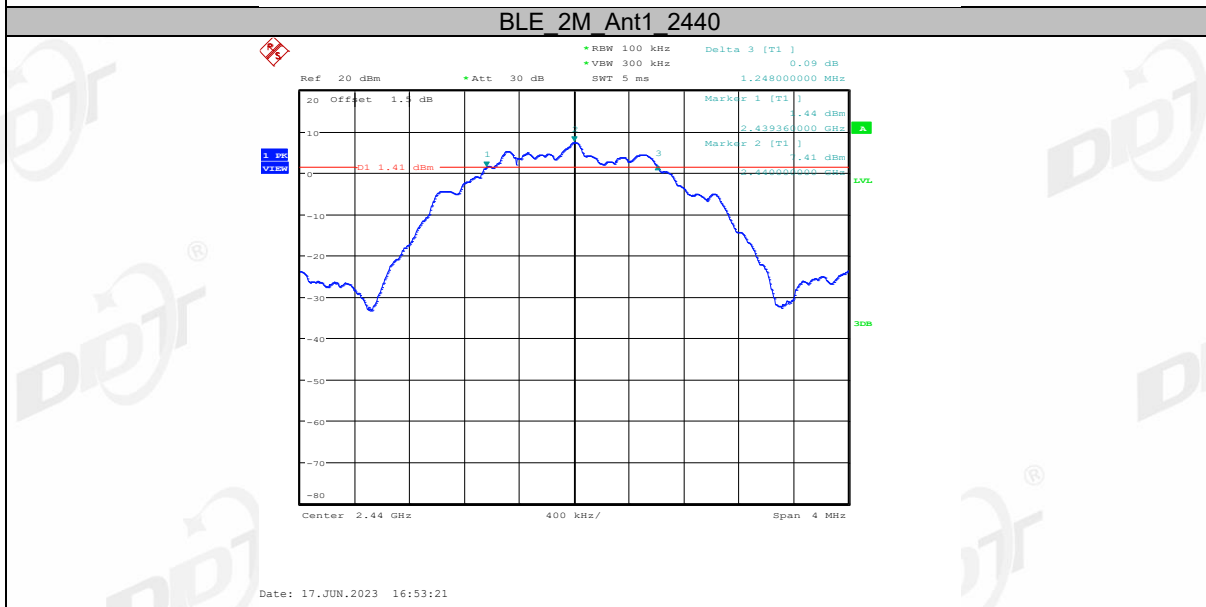
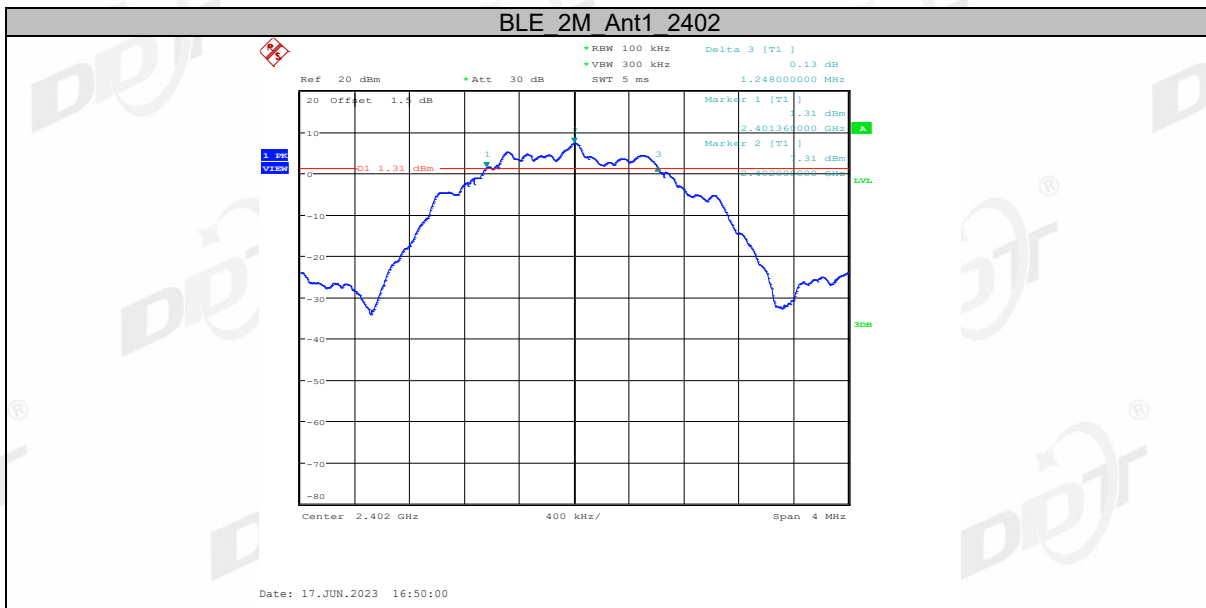
Left side:





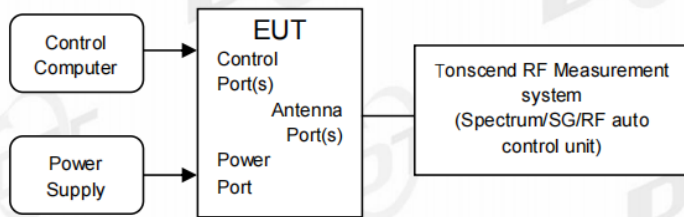
Right side:





## 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

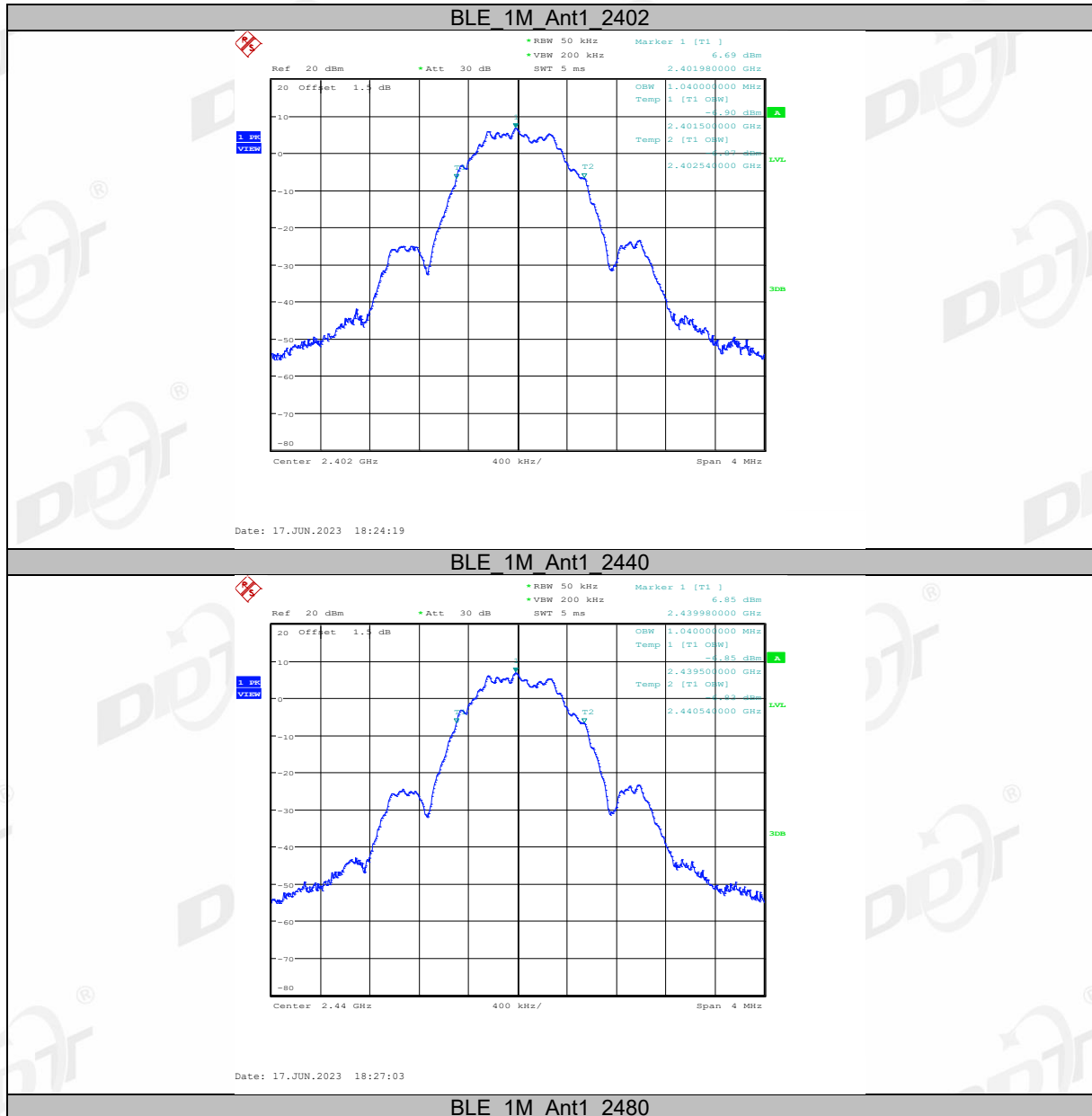


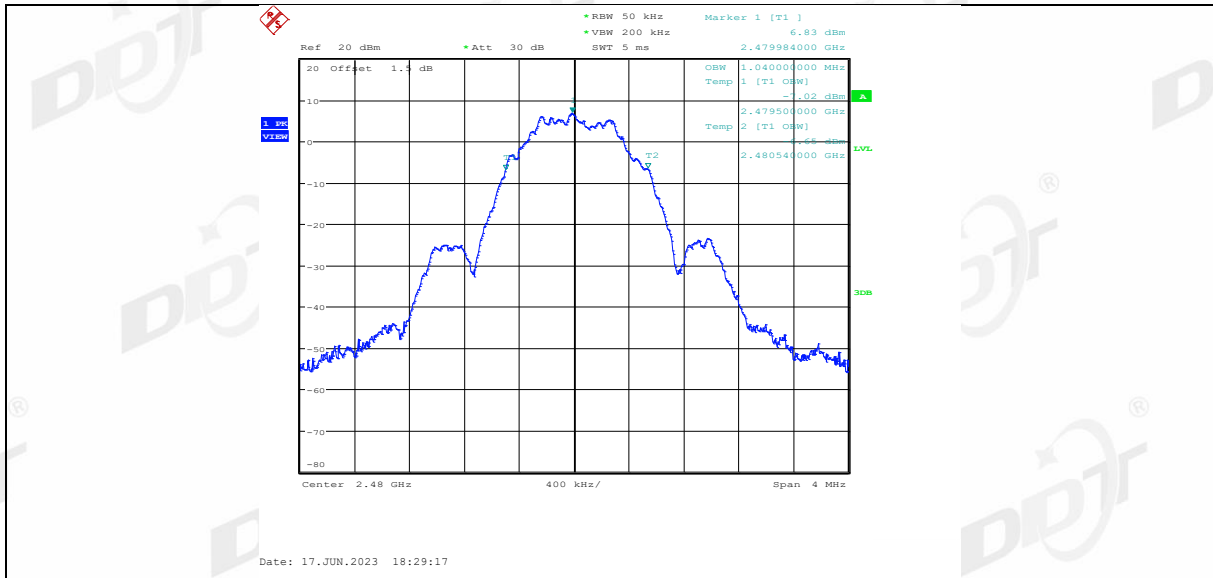
Right side:

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

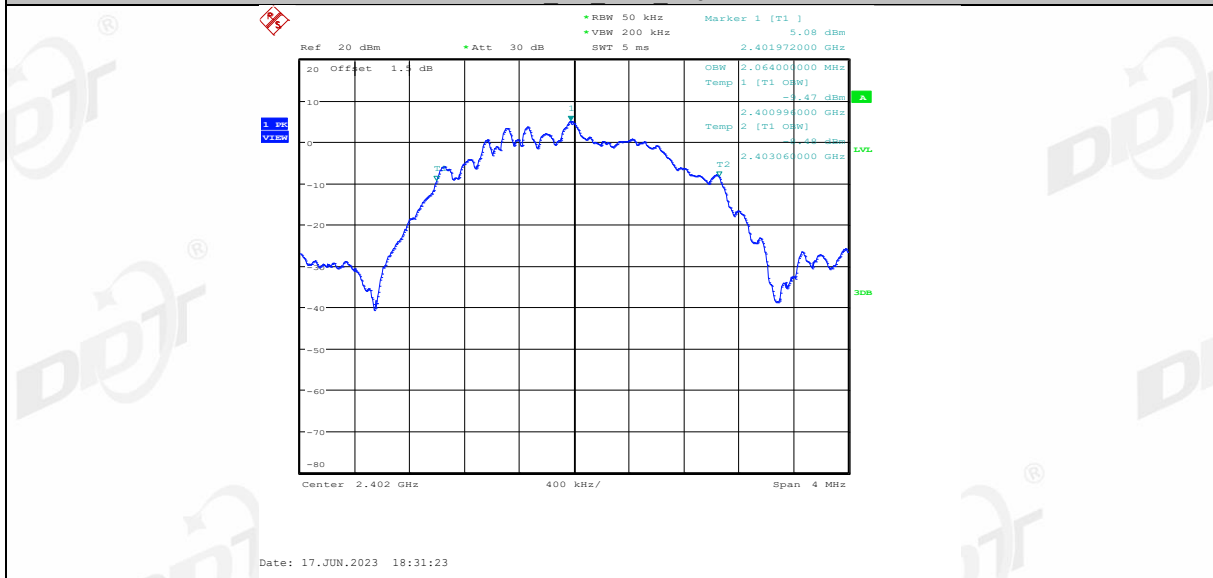
### 5.5. Test Graphs

Left side:





BLE 2M Ant1\_2402



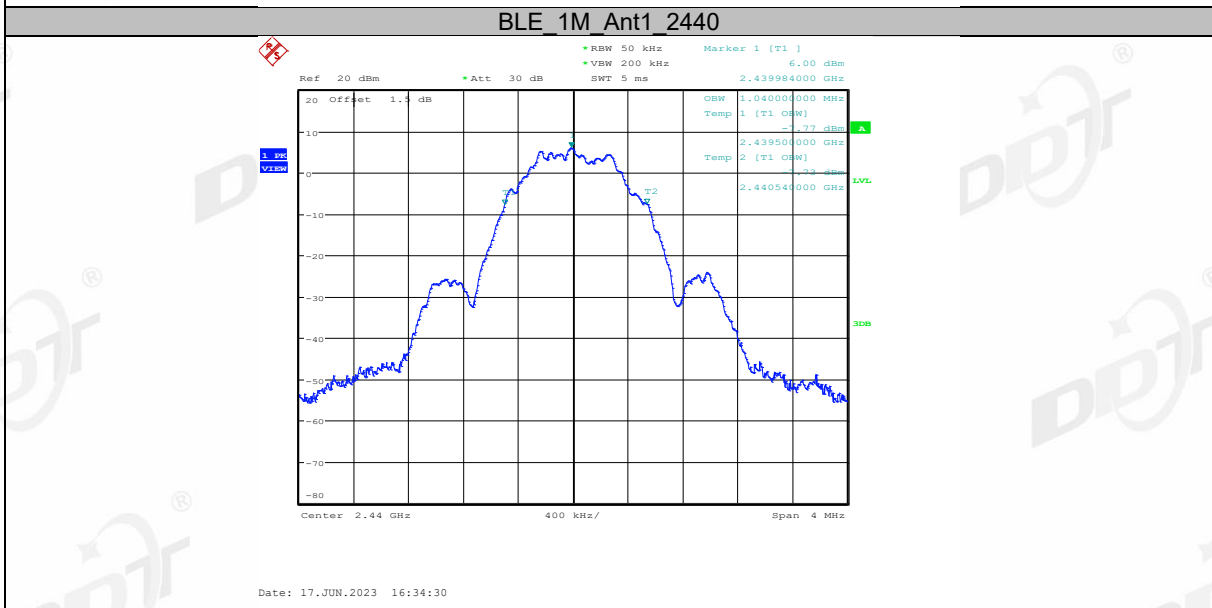
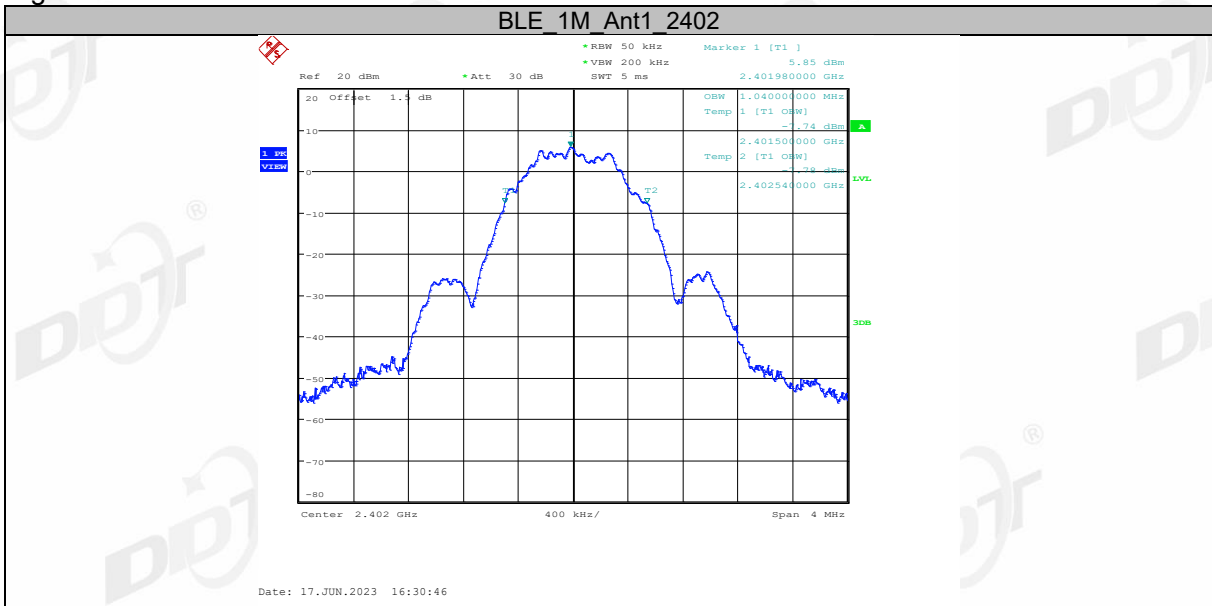
BLE 2M Ant1\_2440

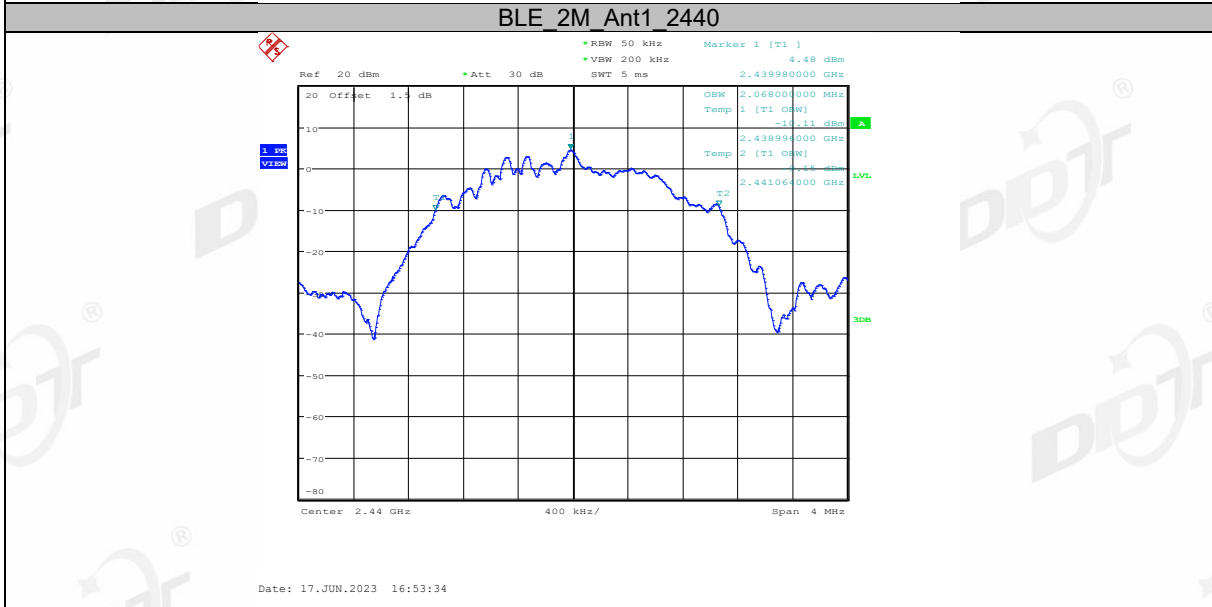
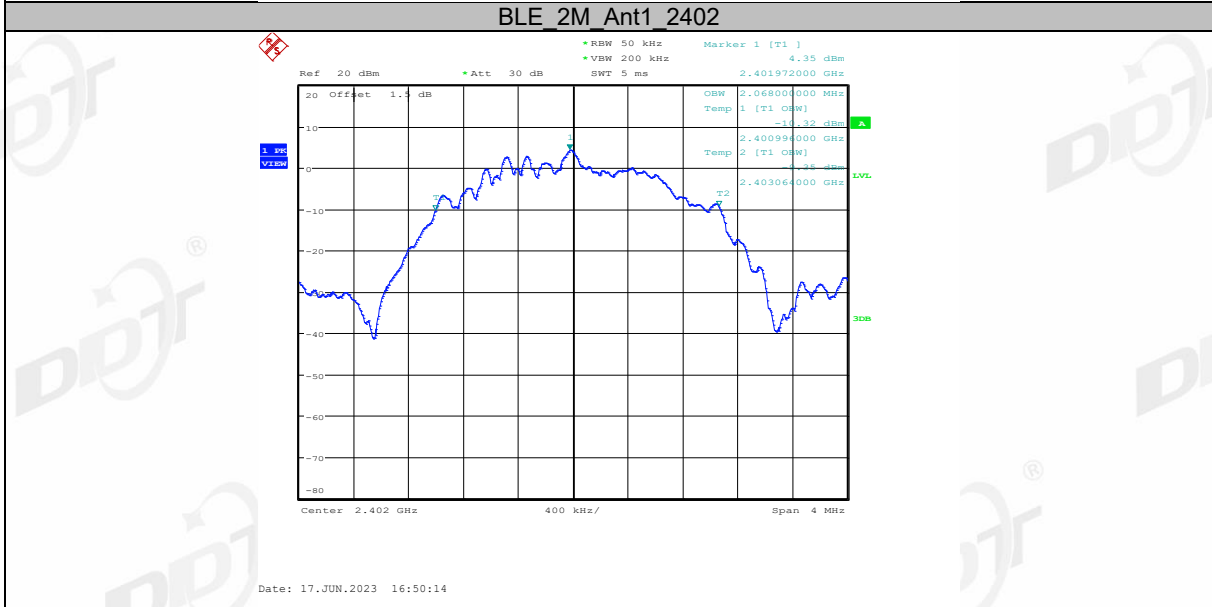
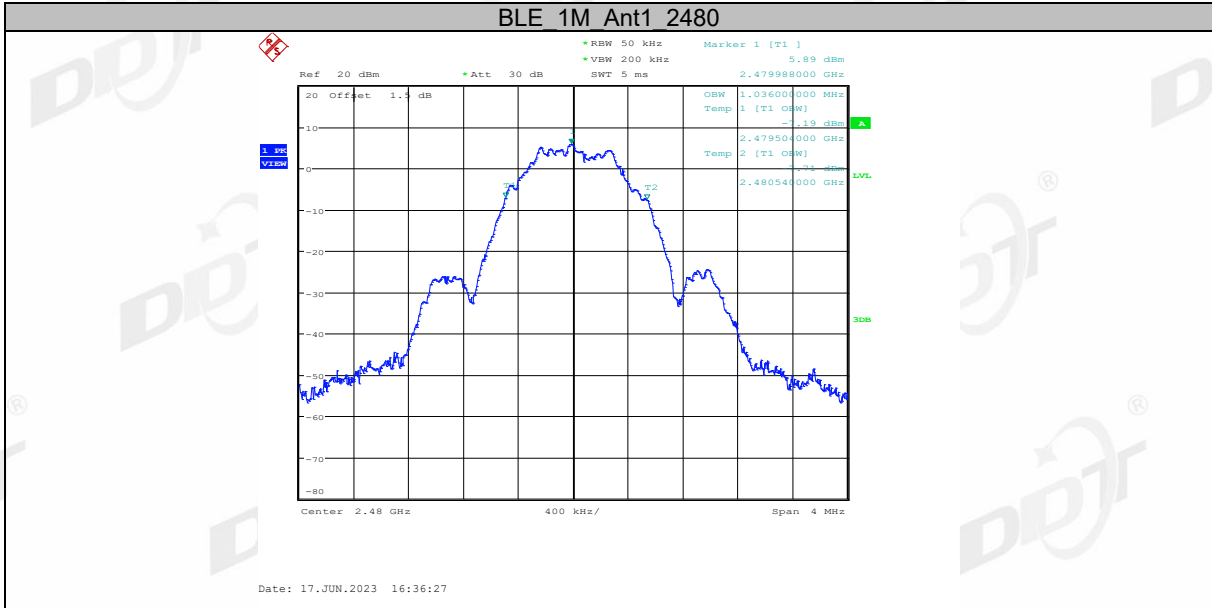


BLE 2M Ant1\_2480



Right side:



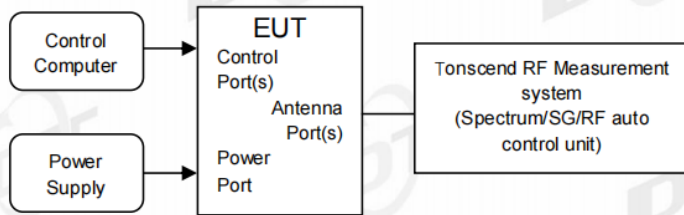


### BLE 2M Ant1 2480



## 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

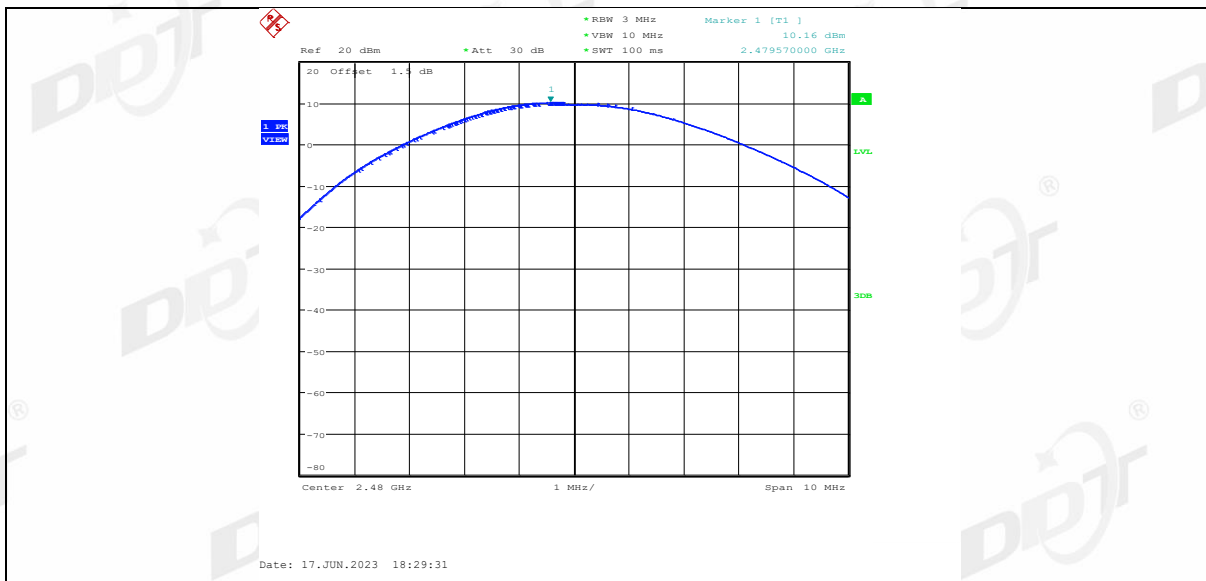
Right side:

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

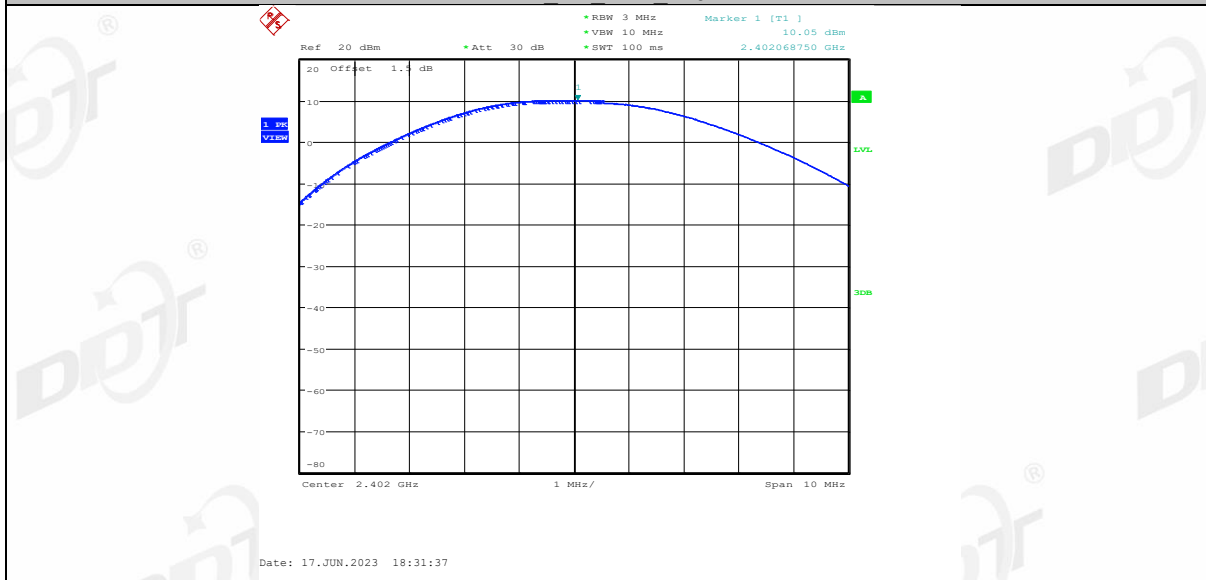
### 6.5. Test graphs peak

Left side:

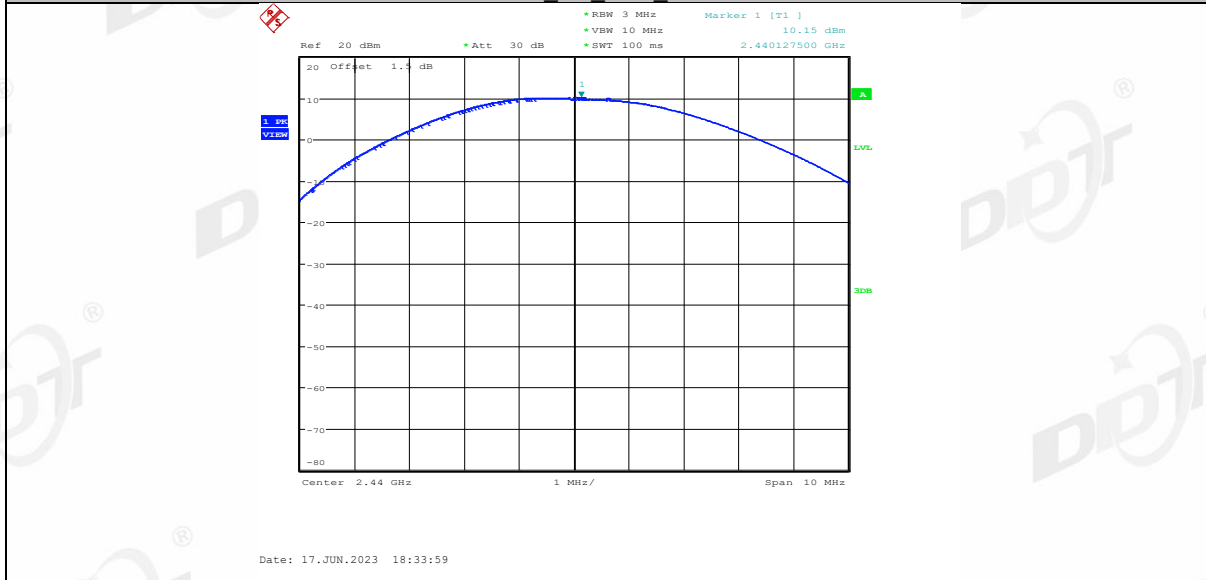




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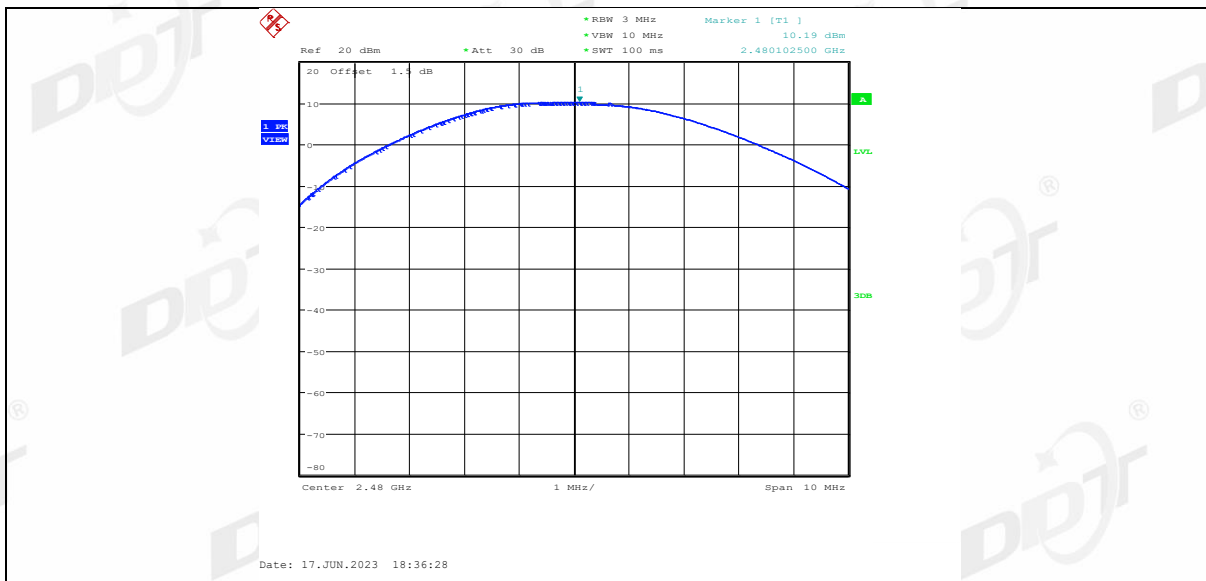


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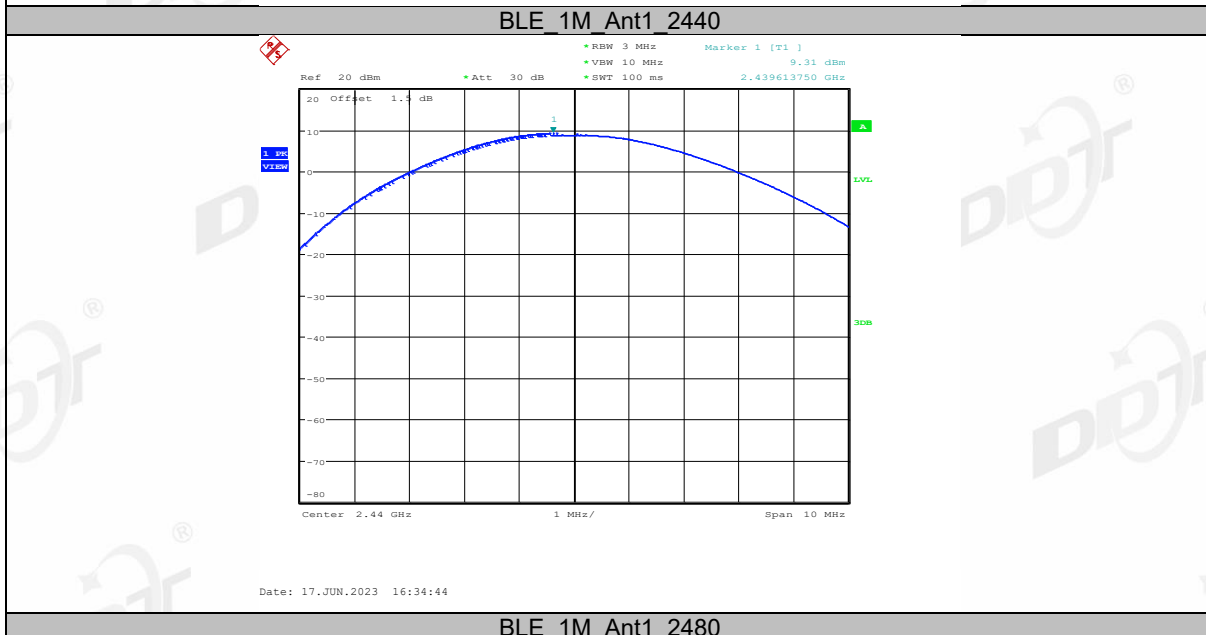
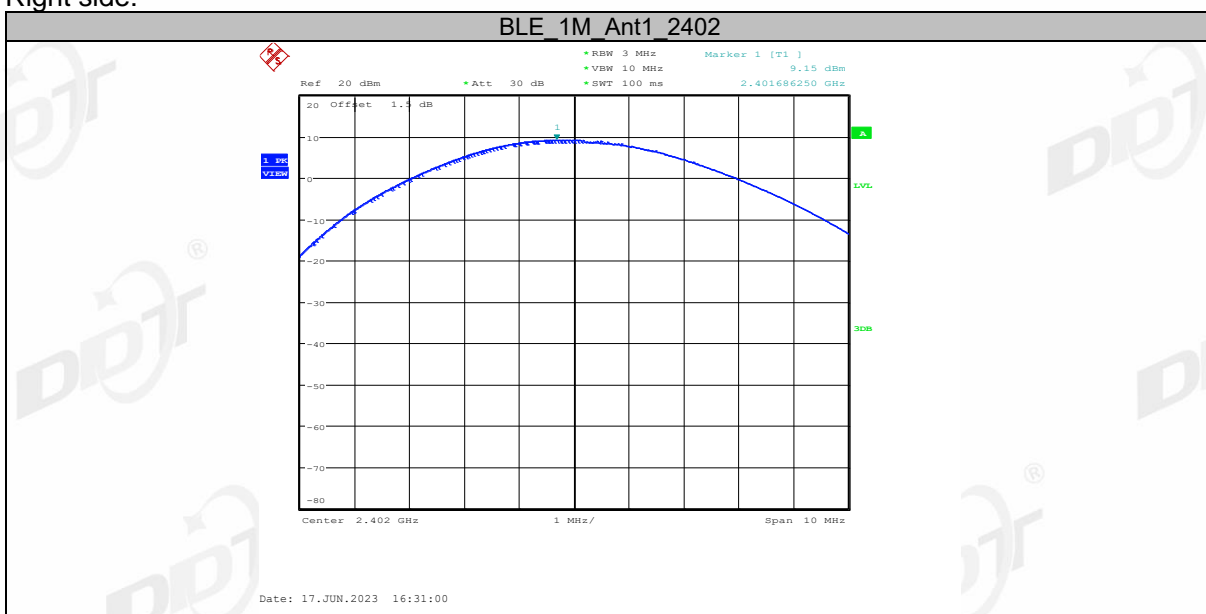


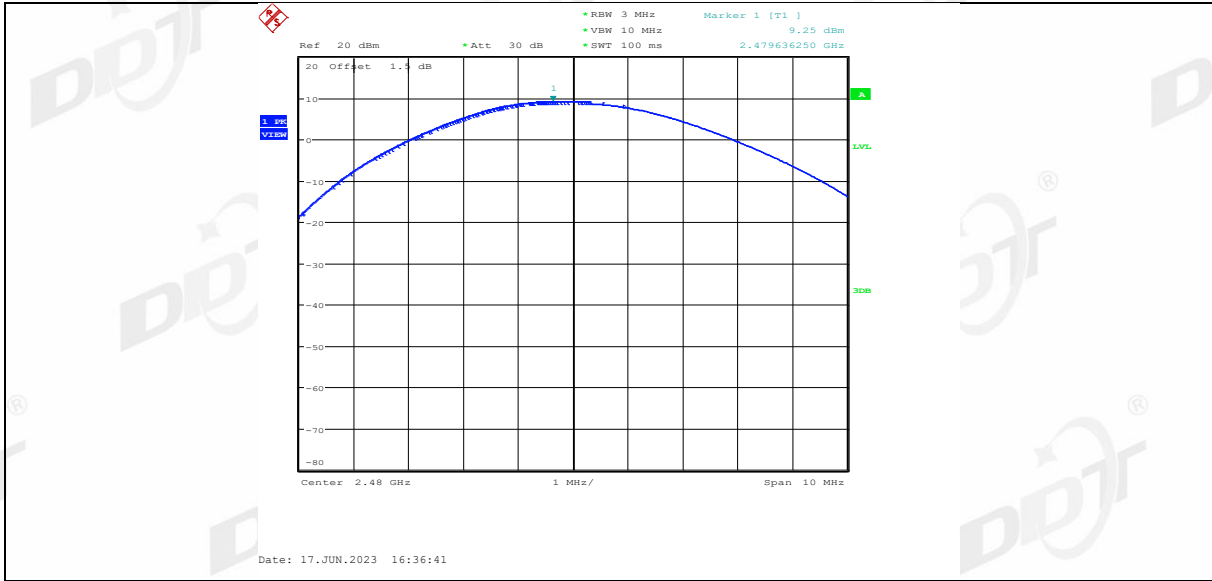
BLE 2M Ant1 2480



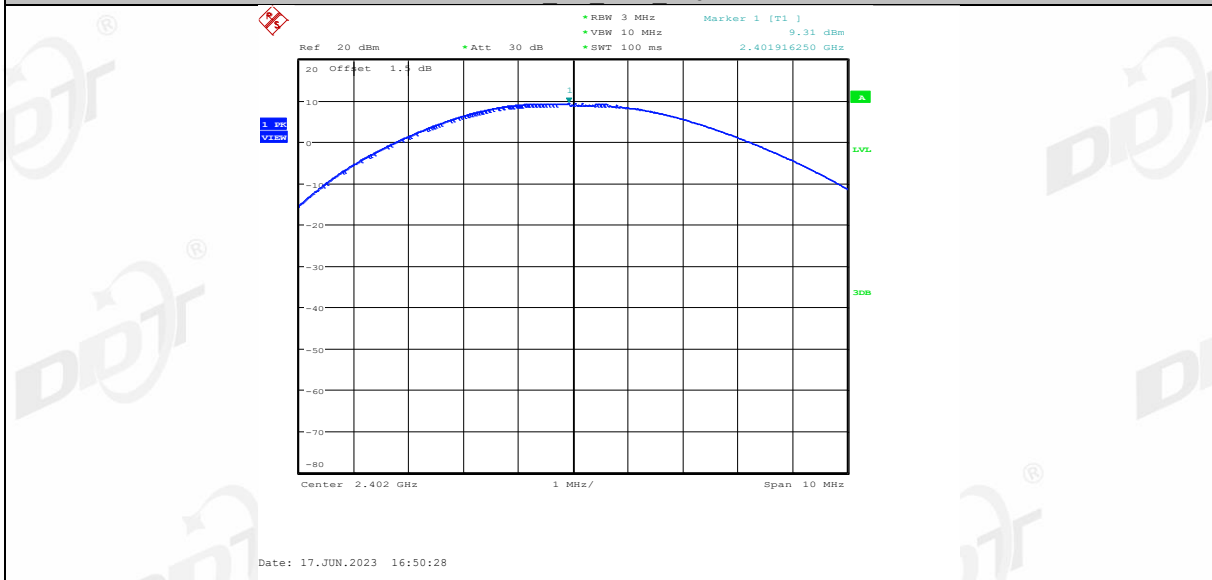


Right side:

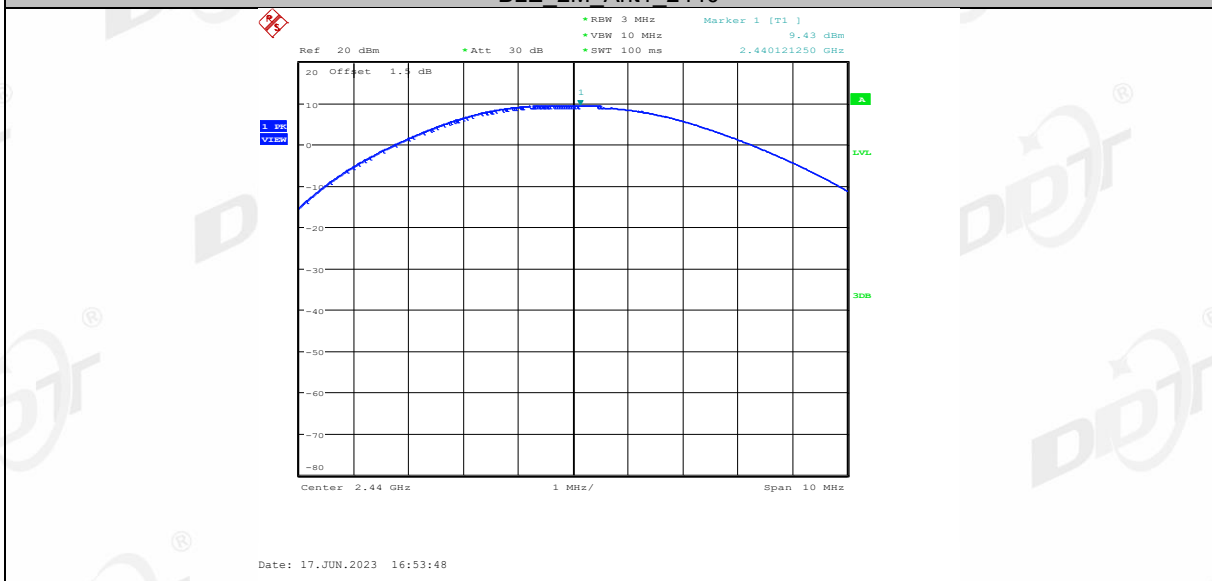




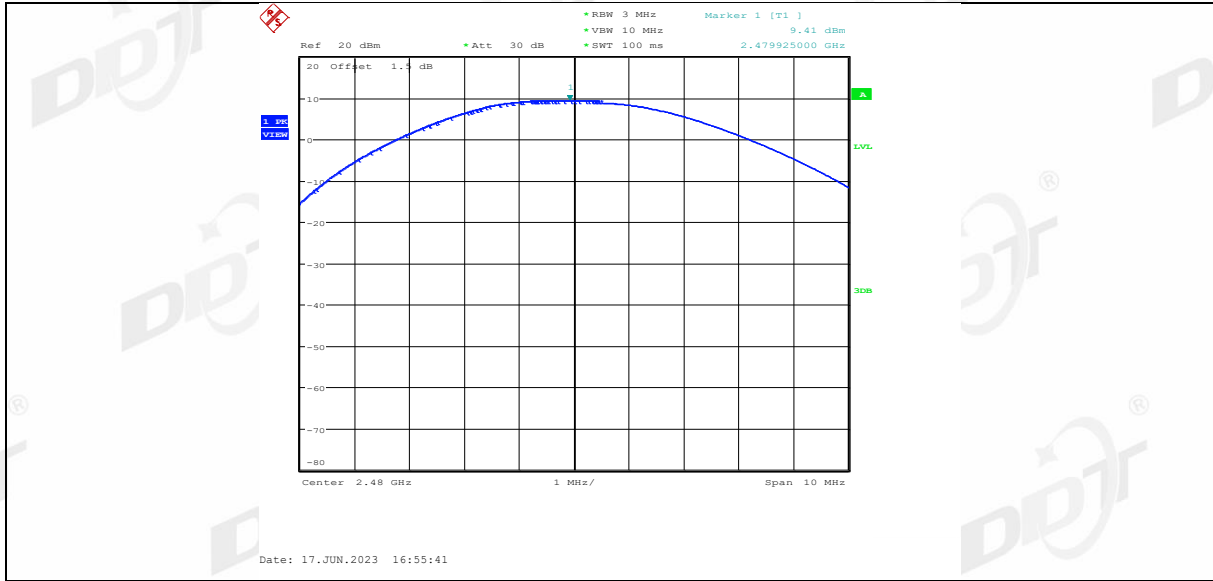
**BLE 2M Ant1 2402**



**BLE 2M Ant1 2440**

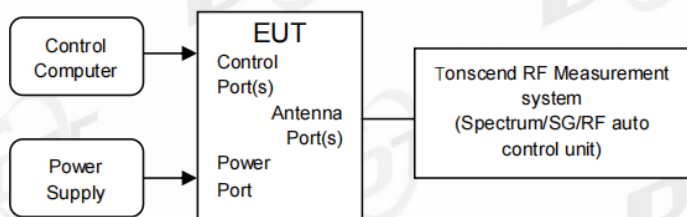


**BLE 2M Ant1 2480**



## 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:

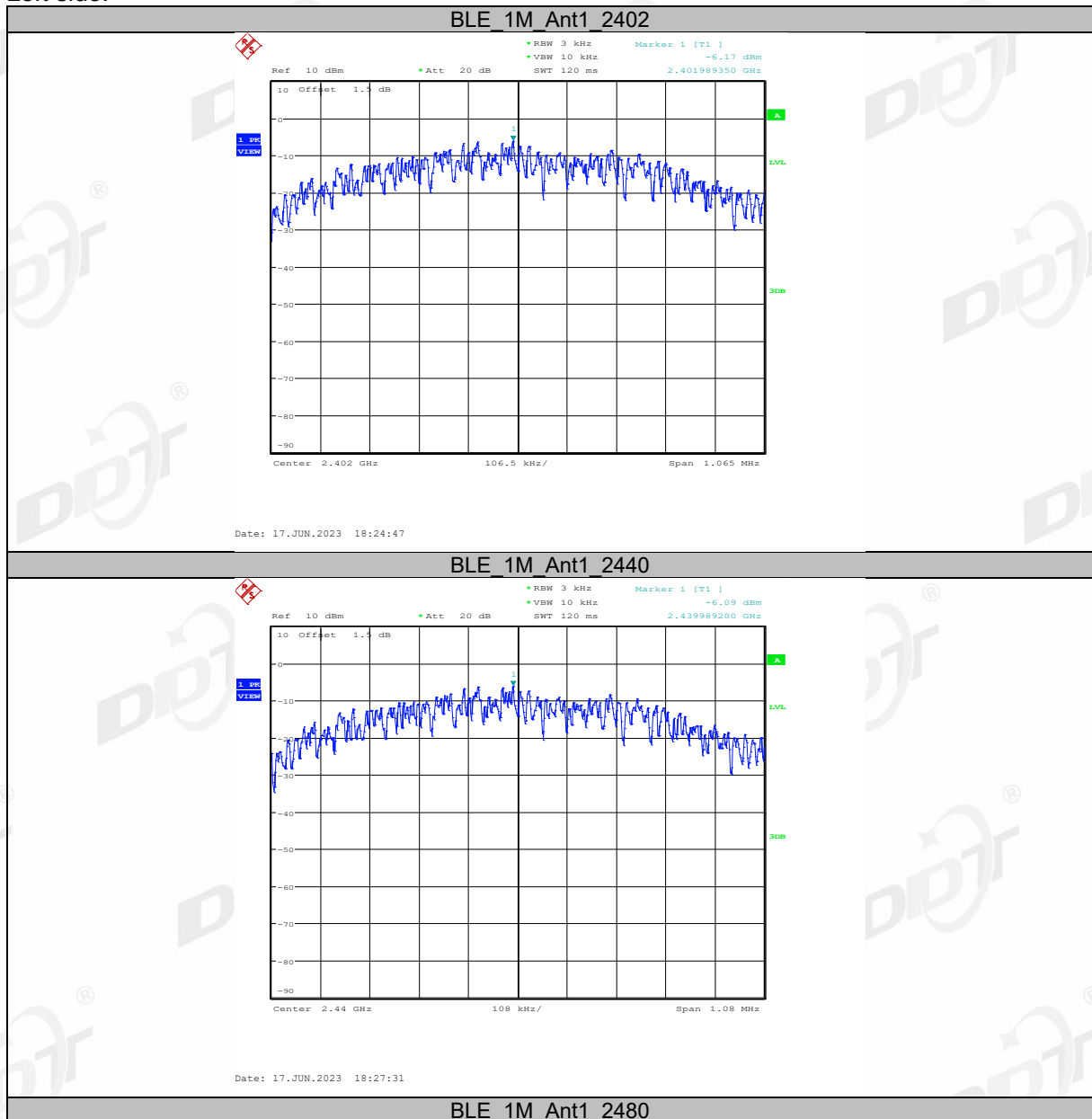
Test Mode	Antenna	Frequency [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-6.17	$\leq 8.00$	PASS
		2440	-6.09	$\leq 8.00$	PASS
		2480	-6.09	$\leq 8.00$	PASS
BLE_2M	Ant1	2402	-8.57	$\leq 8.00$	PASS
		2440	-8.41	$\leq 8.00$	PASS
		2480	-8.38	$\leq 8.00$	PASS

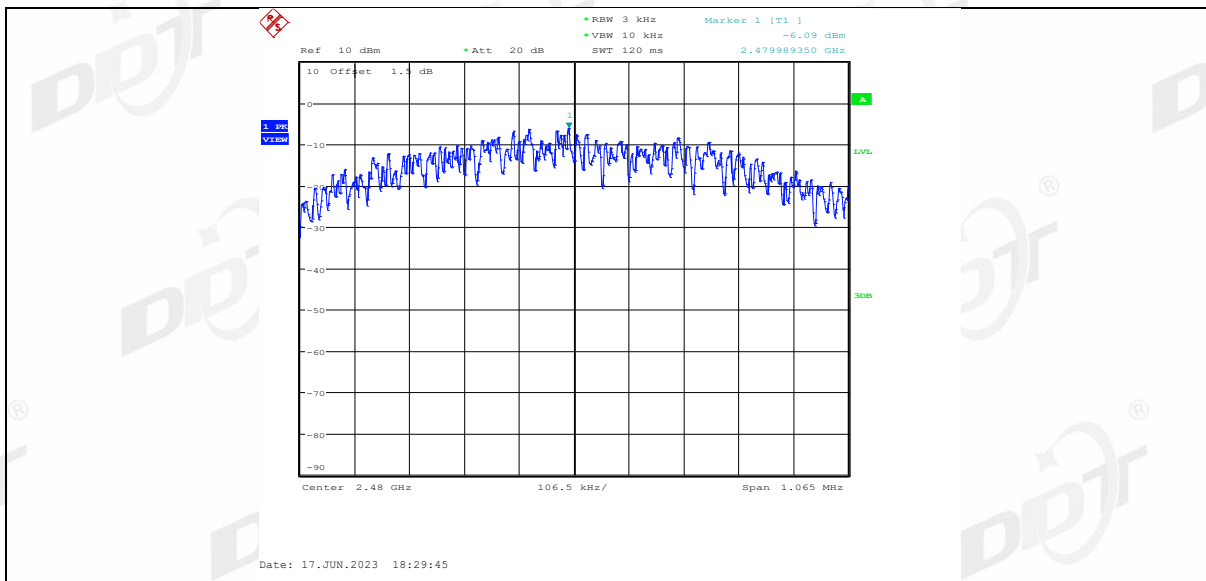
Right side:

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

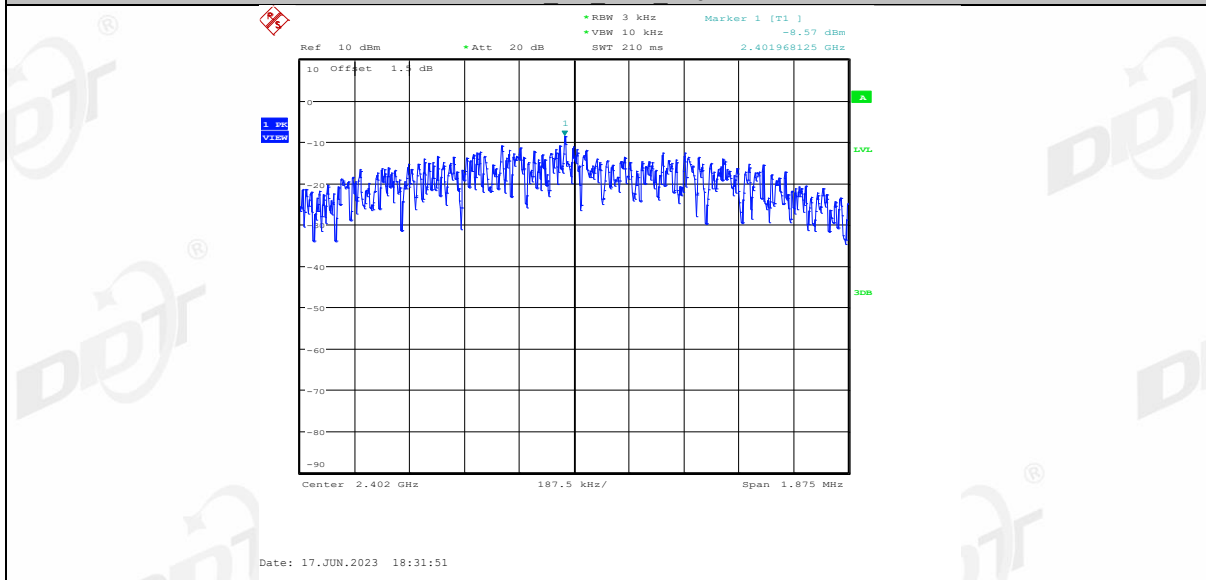
### 7.5. Test graphs

Left side:

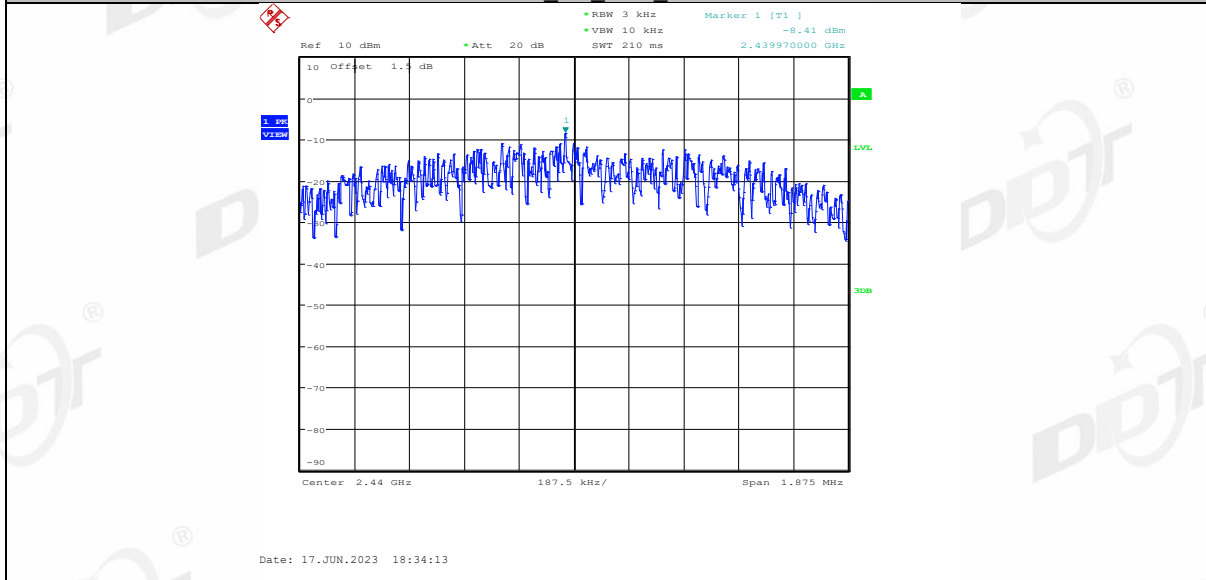




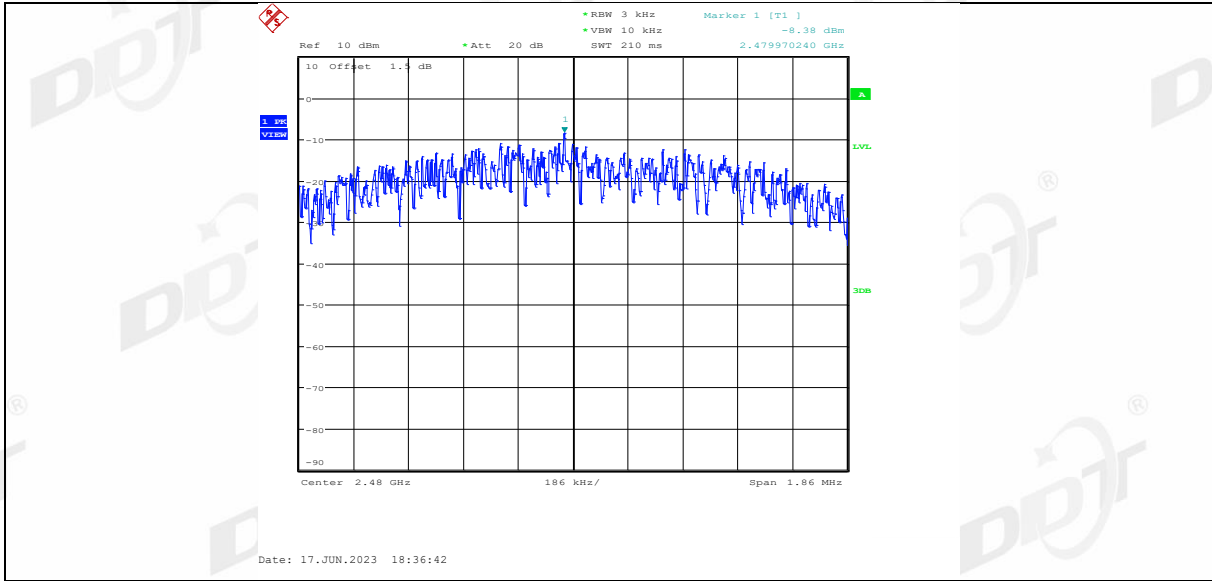
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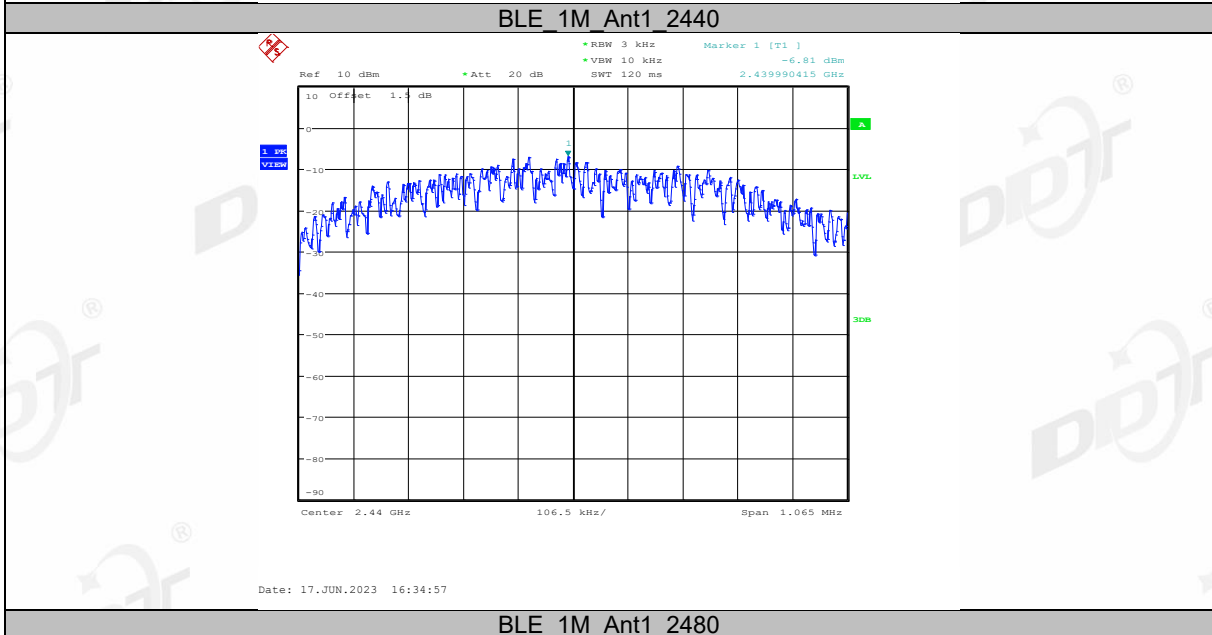
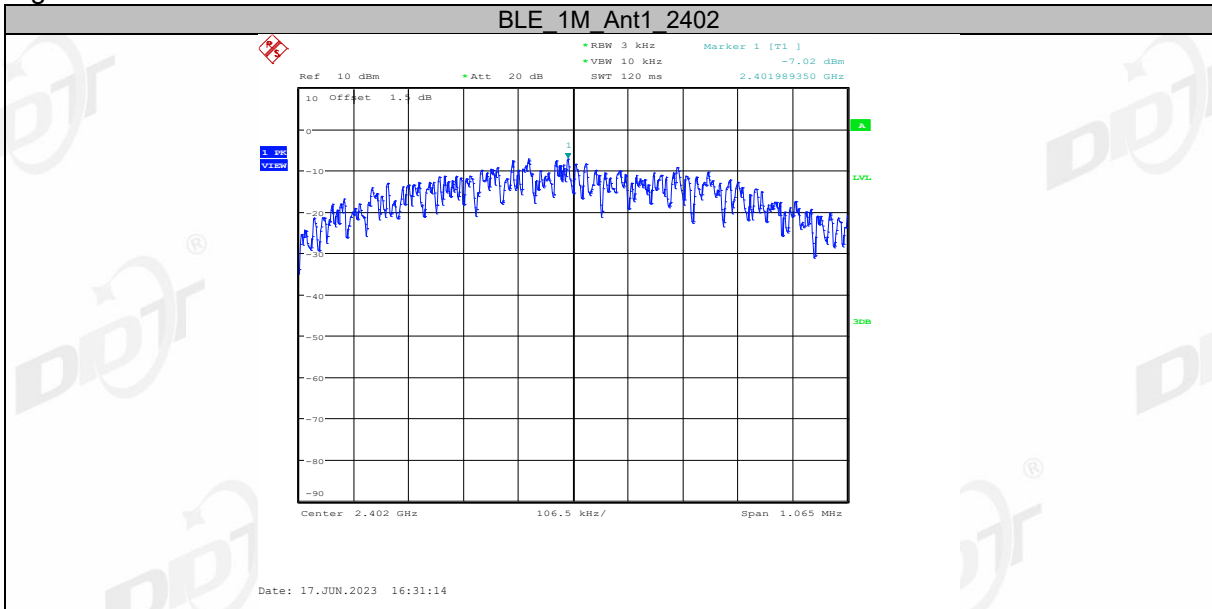
BLE 2M Ant1 2440

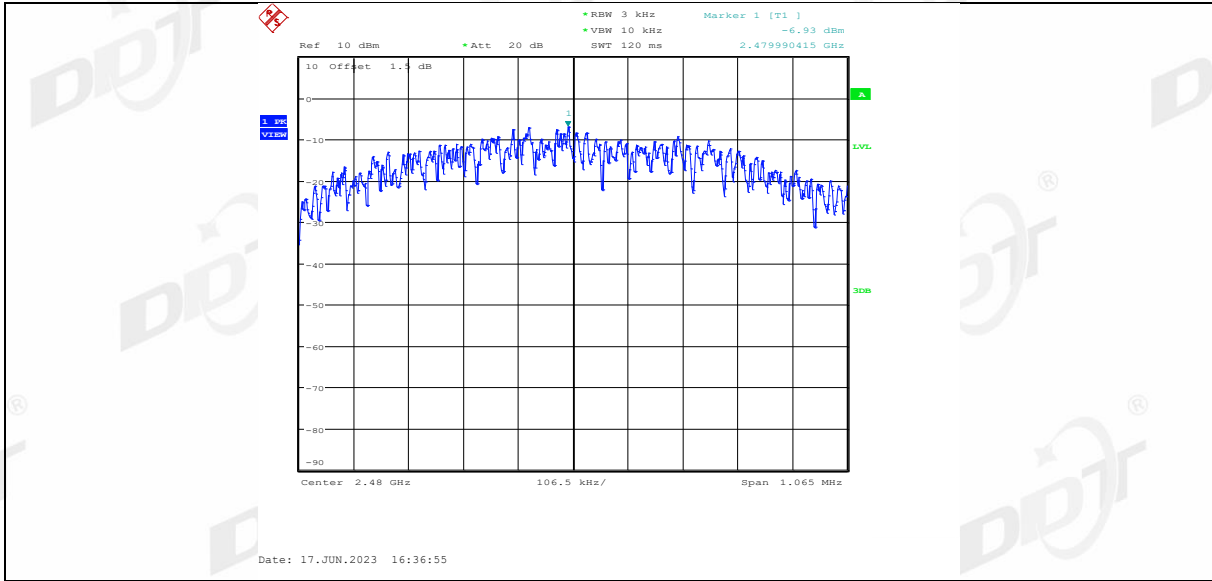


BLE 2M Ant1 2480

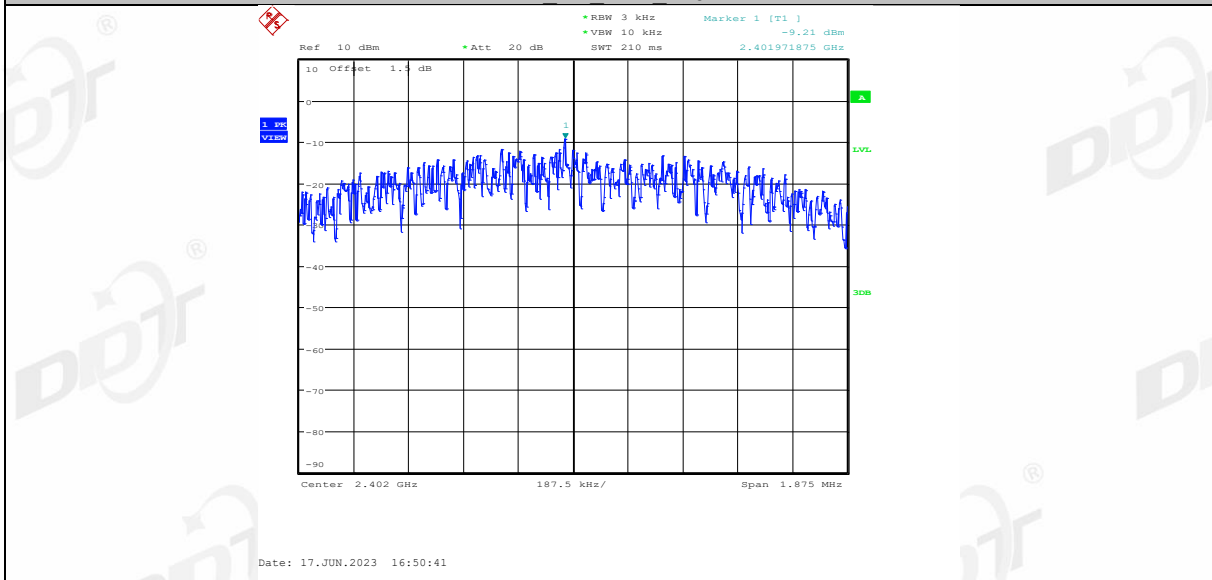


Right side:

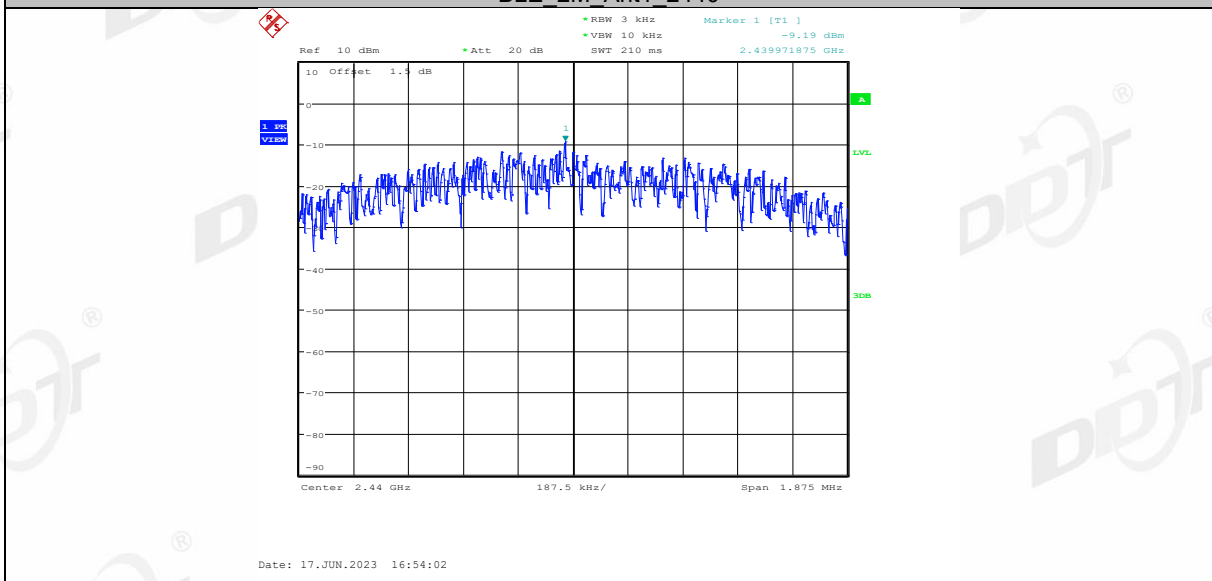




BLE 2M Ant1 2402



BLE 2M Ant1 2440



BLE 2M Ant1 2480



