

FCC/ISED - TEST REPORTReport Number : **709502203712-00A** Date of Issue: March 7, 2022Model : 9290034985,9290034986,9290034987Product Type : LED DeviceApplicant : Signify (China) Investment Co., Ltd.Address : Building no.9, Lane 888, Tianlin Road, Minhang District Shanghai,
200233 ChinaManufacturer : Signify (China) Investment Co., Ltd.Address : Building no.9, Lane 888, Tianlin Road, Minhang District Shanghai,
200233 ChinaTest Result : ☒ **Positive** ☐ **Negative**Total pages including
Appendices : 65

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road,
Shanghai 201108,
P.R. China

Designation
Number: CN1183

Test Firm FCC
Registration
Number: 820234

IC Company
Number: 25988

CAB identifier: CN0101

Telephone: +86 21 6141 0123
Fax: +86 21 6140 8600

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product: LED Device

HVIN: 34985

PMN: hue

Model no.: 9290034985,9290034986,9290034987

FCC ID: 2AGBW9290034985X

IC: 20812-34985X

Options and accessories: NA

Rating: 100-130V~,50/60Hz

RF Transmission Frequency: 2405~2480MHz (Zigbee);
2402~2480MHz (BT 5.0 LE)

Modulation: Zigbee:16-ary orthogonal modulation, O-QPSK PHY
BLE:GFSK PHY

Channel list:

Operation Frequency each of channel: Zigbee			
Channel	Frequency	Channel	Frequency
11	2405 MHz	19	2445 MHz
12	2410 MHz	20	2450 MHz
13	2415 MHz	21	2455 MHz
14	2420 MHz	22	2460 MHz
15	2425 MHz	23	2465 MHz
16	2430 MHz	24	2470 MHz
17	2435 MHz	25	2475 MHz
18	2440 MHz	26	2480 MHz

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

Antenna Type: Onboard PCB antenna

Antenna Gain: 2.08dBi

Description of the EUT: The Equipment Under Test (EUT) is a LED Device which support 2.4GHz Zigbee (250kbps data rate) and BT 5.0 LE (1Mbps,2Mbps,500kbps and 125kbps data rate). There are 3 models in all, only different is the size of the LED device. We chose model 9290034987 to perform all tests and listed the worst data in this report.

Test sample no.: SHA-601395-00

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment, antenna gain or any information supplied.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5 Amendment 1 March 2019	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207 & RSS-GEN 8.8	Conducted emission AC power port	13-15	---	☒	☐	☐
§15.247 (b) (3) & RSS-247 5.4(d)	Conducted peak output power	16-20	Site 1	☒	☐	☐
§15.247(a)(1) & RSS-247 5.1(b)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1) & RSS-247 5.1(b)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2) & RSS-247 5.2(a) & RSSGEN 6.7	6dB bandwidth and 99% Occupied Bandwidth	21-30	Site 1	☒	☐	☐
§15.247(e) & RSS-247 5.2(b)	Power spectral density	31-35	Site 1	☒	☐	☐
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	36-48	Site 1	☒	☐	☐
§15.247(d) & RSS-247 5.5	Band edge	49-53	Site 1	☒	☐	☐
§15.247(d) & §15.209 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	54-61	Site 1	☒	☐	☐
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses an onboard PCB antenna, which gain is 2.08dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AGBW9290034985X, IC: 20812-34985X complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-247, RSS-GEN.

This report is only for the 2.4GHz BLE test report, for the 2.4GHz Zigbee test report please refer to 709502203712-00B.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: January 12, 2022

Testing Start Date: January 26, 2022

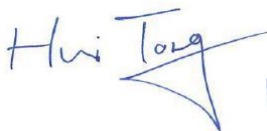
Testing End Date: March 3, 2022

-TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:

Prepared by:

Tested by:



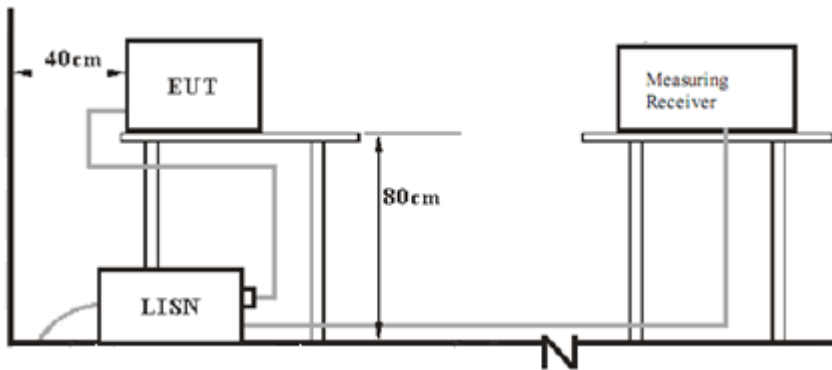
Hui TONG
Review Engineer

Jiaxi XU
Project Engineer

Wang Yiquan
Test Engineer

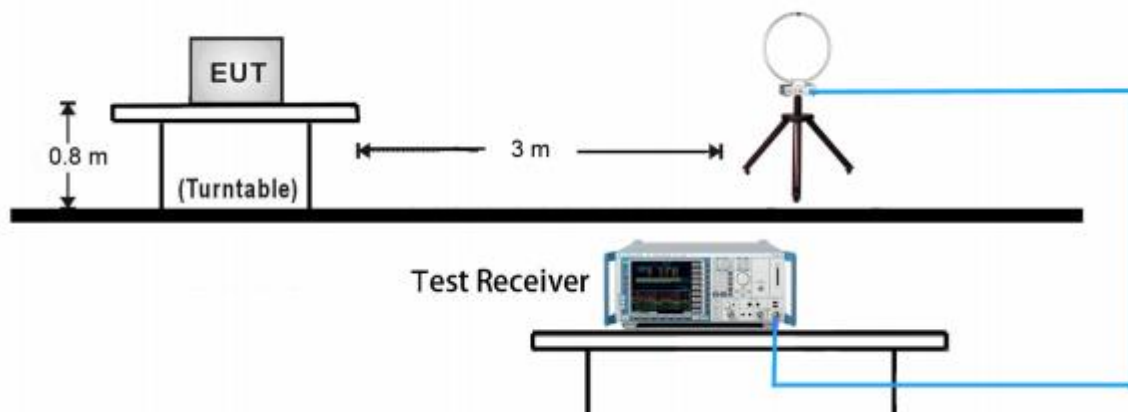
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

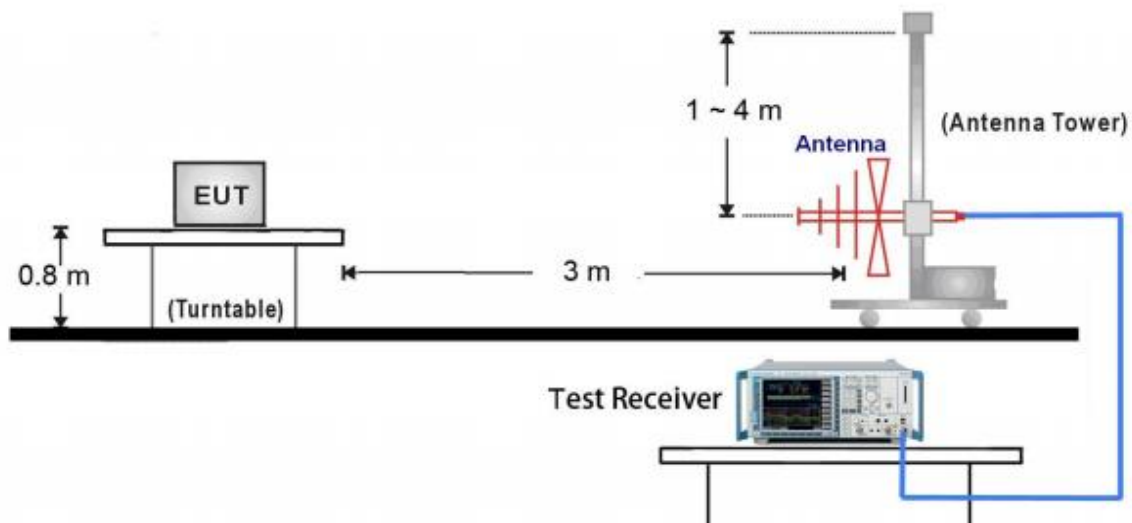


7.2 Radiated test setups

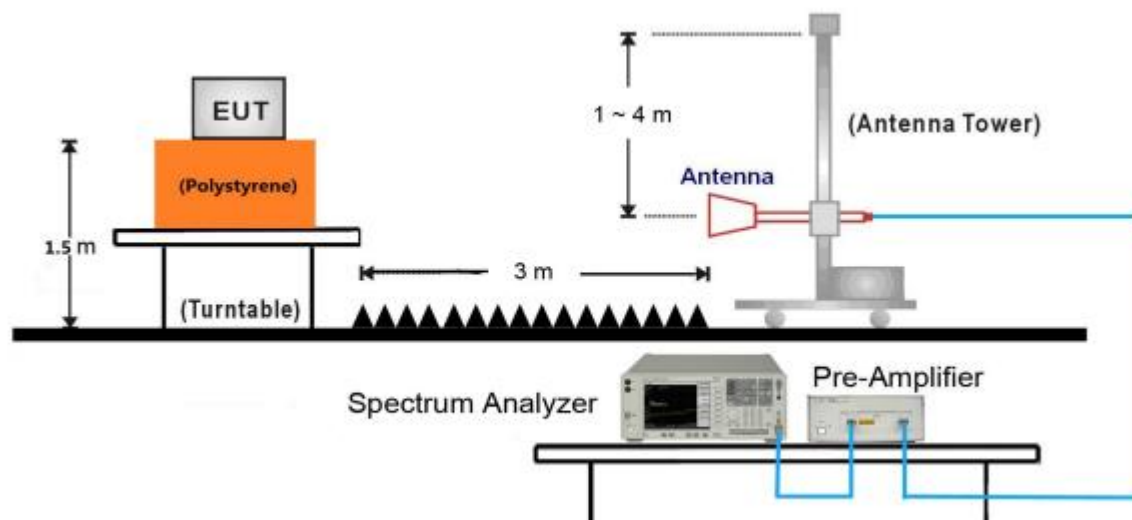
9kHz ~ 30MHz Test Setup:



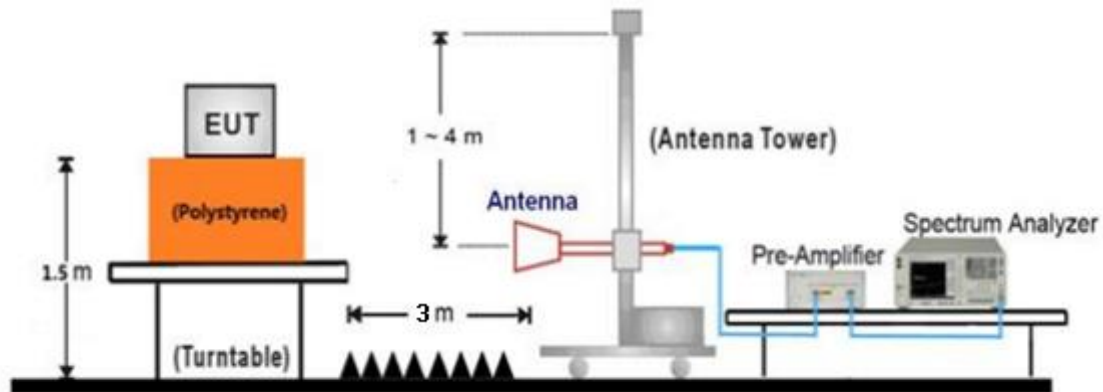
30MHz ~ 1GHz Test Setup:



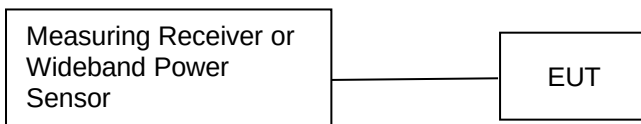
1GHz ~ 18GHz Test Setup:



18GHz ~ 40GHz Test Setup:



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenove	E470	PF-OU5TS7 17/09

Test software: HueApprobationTool

The system was configured to channel 0, 19, and 39 for the test.

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

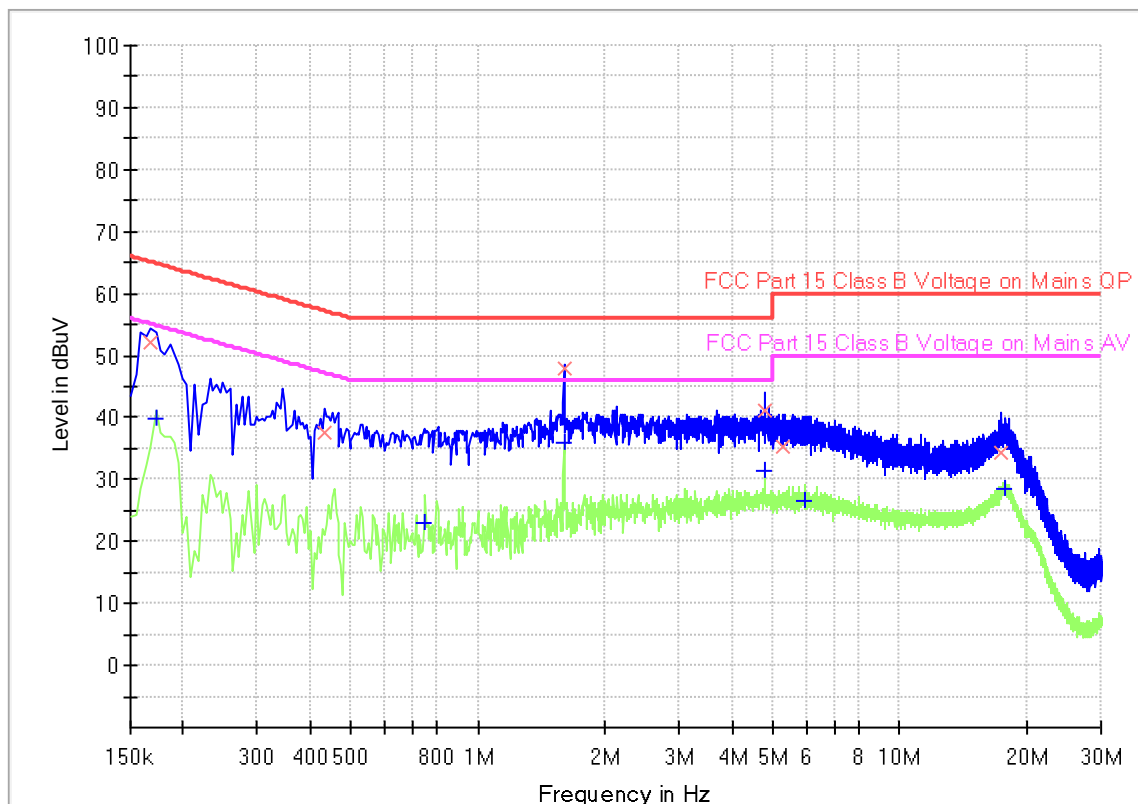
Limit

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

Conducted Emission

Product Type : LED Device
 M/N : 9290034987
 Operating Condition : Mode 1: Tx_2402MHz at 2M data rate
 Test Specification : L-line
 Comment : AC 120V/60Hz



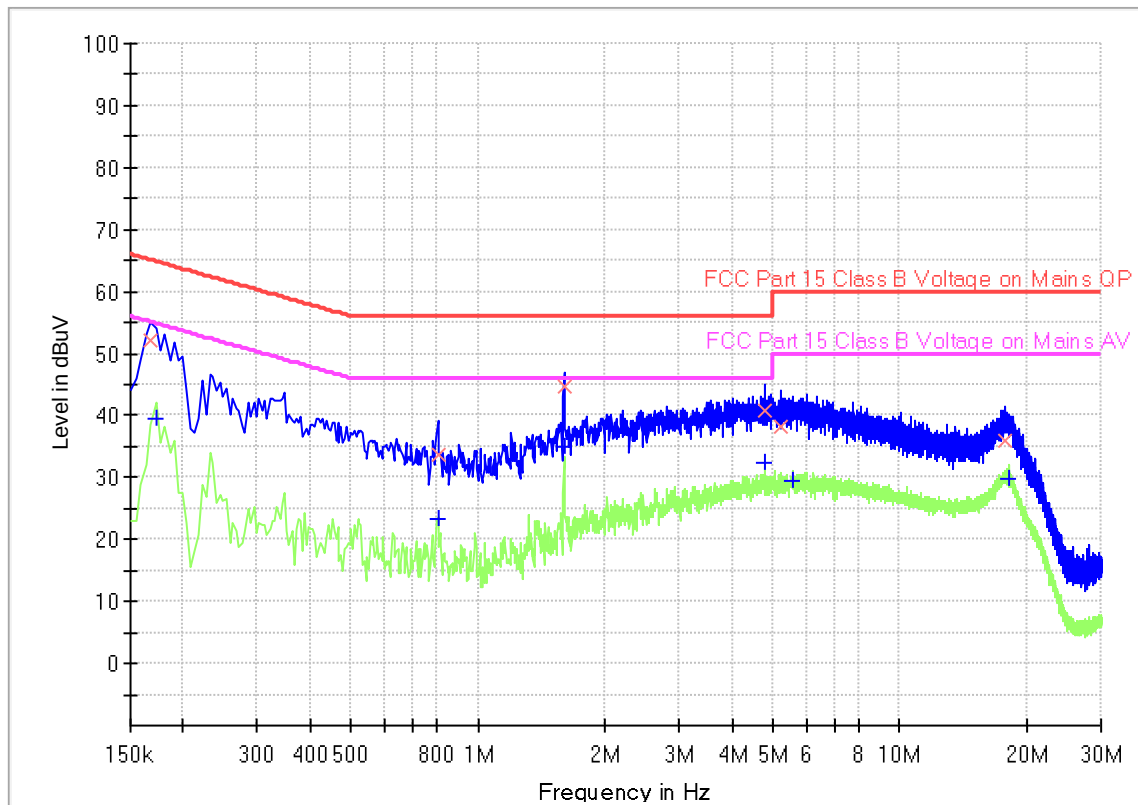
Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.168000	52.14	---	65.06	12.92	1000.0	9.000	L1	19.5
0.172500	---	39.73	54.84	15.11	1000.0	9.000	L1	19.5
0.433500	37.55	---	57.19	19.64	1000.0	9.000	L1	19.5
0.748500	---	23.11	46.00	22.89	1000.0	9.000	L1	19.5
1.599000	---	35.81	46.00	10.19	1000.0	9.000	L1	19.5
1.599000	47.75	---	56.00	8.25	1000.0	9.000	L1	19.5
4.798500	40.98	---	56.00	15.02	1000.0	9.000	L1	19.6
4.798500	---	31.46	46.00	14.54	1000.0	9.000	L1	19.6
5.262000	35.22	---	60.00	24.78	1000.0	9.000	L1	19.6
5.946000	---	26.63	50.00	23.37	1000.0	9.000	L1	19.6
17.335500	34.38	---	60.00	25.62	1000.0	9.000	L1	19.8
17.722500	---	28.51	50.00	21.49	1000.0	9.000	L1	19.8

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

Product Type : LED Device
 M/N : 9290034987
 Operating Condition : Mode 1: Tx_2402MHz at 2M data rate
 Test Specification : N-line
 Comment : AC 120V/60Hz



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.168000	52.26	---	65.06	12.80	1000.0	9.000	L1	19.5
0.172500	---	39.58	54.84	15.26	1000.0	9.000	L1	19.5
0.802500	---	23.38	46.00	22.62	1000.0	9.000	L1	19.5
0.802500	33.72	---	56.00	22.28	1000.0	9.000	L1	19.5
1.599000	---	34.99	46.00	11.01	1000.0	9.000	L1	19.5
1.599000	44.59	---	56.00	11.41	1000.0	9.000	L1	19.5
4.798500	40.67	---	56.00	15.33	1000.0	9.000	L1	19.6
4.798500	---	32.45	46.00	13.55	1000.0	9.000	L1	19.6
5.217000	38.08	---	60.00	21.92	1000.0	9.000	L1	19.6
5.568000	---	29.35	50.00	20.65	1000.0	9.000	L1	19.6
17.799000	36.05	---	60.00	23.95	1000.0	9.000	L1	19.8
18.096000	---	29.95	50.00	20.05	1000.0	9.000	L1	19.8

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
 Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

9.2 Conducted peak output power and e.i.r.p.

Test Method

1. Use the following spectrum analyzer settings:
RBW > the 6 dB bandwidth of the emission being measured, VBW $\geq$ 3RBW, Span $\geq$ 3RBW
Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Use a power meter to measure the conducted peak output power.

Limits

According to §15.247 (b) (1) & RSS-247 5.4(d), limit as below:

Conducted peak output power		
Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤ 1	≤ 30

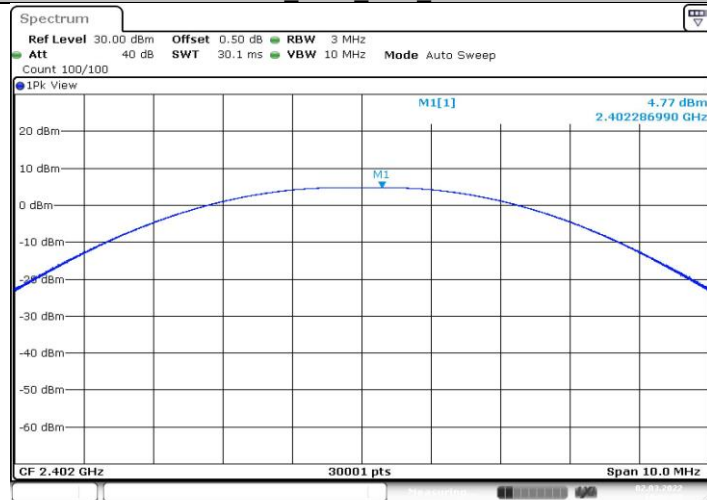
e.i.r.p.		
Frequency Range MHz	Limit (EIRP) W	Limit dBm
2400-2483.5	≤ 4	≤ 36

Test result as below table

TestMode	Channel	Result[dBm] Conducted peak output power	Limit[dBm]	Verdict
BLE_125K	2402	4.77	≤ 30	PASS
	2440	4.28	≤ 30	PASS
	2480	3.85	≤ 30	PASS
BLE_1M	2402	4.77	≤ 30	PASS
	2440	4.30	≤ 30	PASS
	2480	3.87	≤ 30	PASS
BLE_2M	2402	4.78	≤ 30	PASS
	2440	4.29	≤ 30	PASS
	2480	3.86	≤ 30	PASS
BLE_500K	2402	4.74	≤ 30	PASS
	2440	4.25	≤ 30	PASS
	2480	3.82	≤ 30	PASS

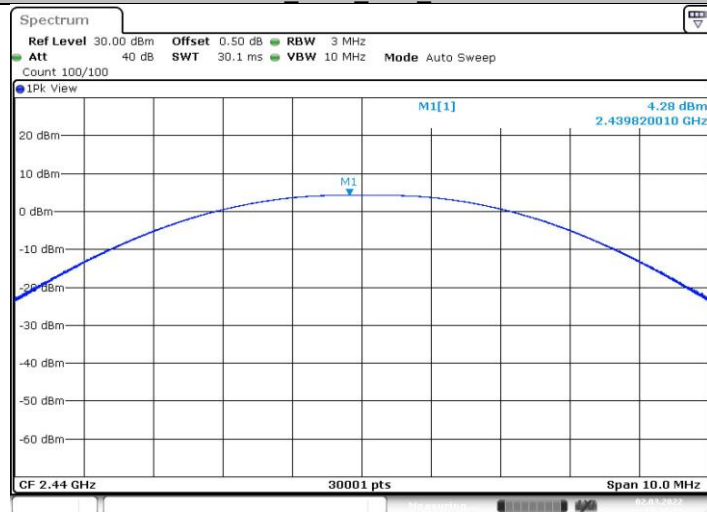
TestMode	Channel	Result[dBm] e.i.r.p.	Limit[dBm]	Verdict
BLE_125K	2402	6.85	≤ 36	PASS
	2440	6.36	≤ 36	PASS
	2480	5.93	≤ 36	PASS
BLE_1M	2402	6.85	≤ 36	PASS
	2440	6.38	≤ 36	PASS
	2480	5.95	≤ 36	PASS
BLE_2M	2402	6.86	≤ 36	PASS
	2440	6.37	≤ 36	PASS
	2480	5.94	≤ 36	PASS
BLE_500K	2402	6.82	≤ 36	PASS
	2440	6.33	≤ 36	PASS
	2480	5.90	≤ 36	PASS

BLE_125K_Ant1_2402



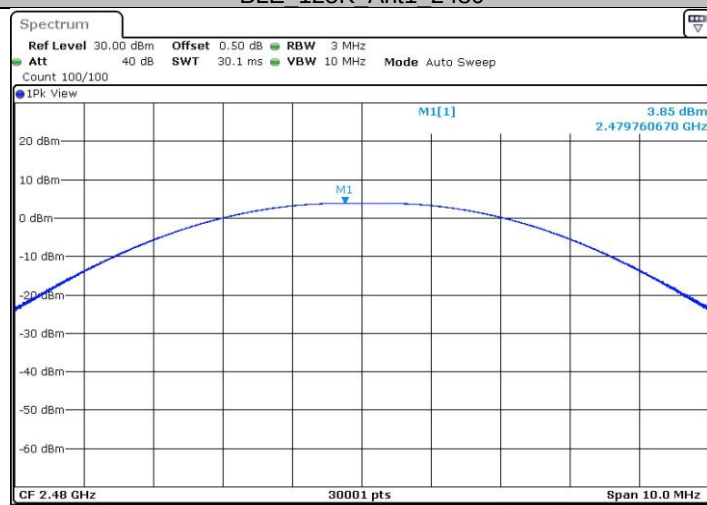
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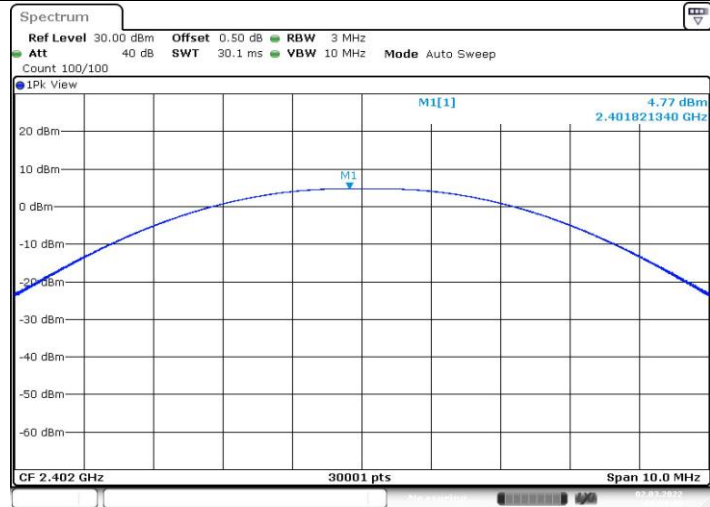
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BLE_125K_Ant1_2480



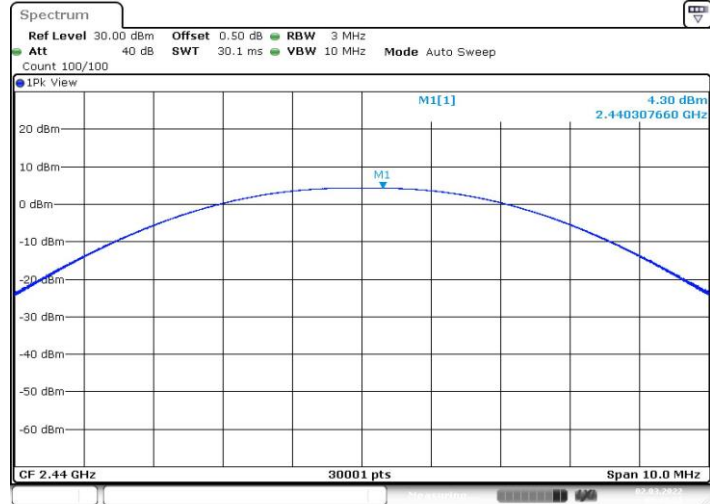
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BLE 1M Ant1 2402



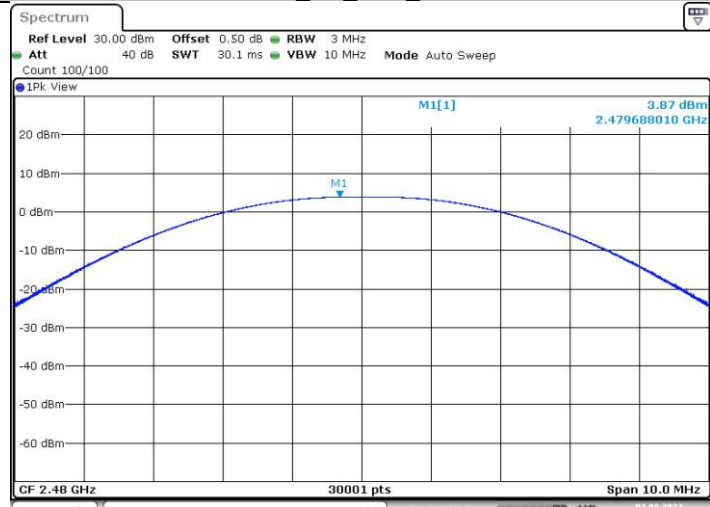
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BLE 1M Ant1 2440



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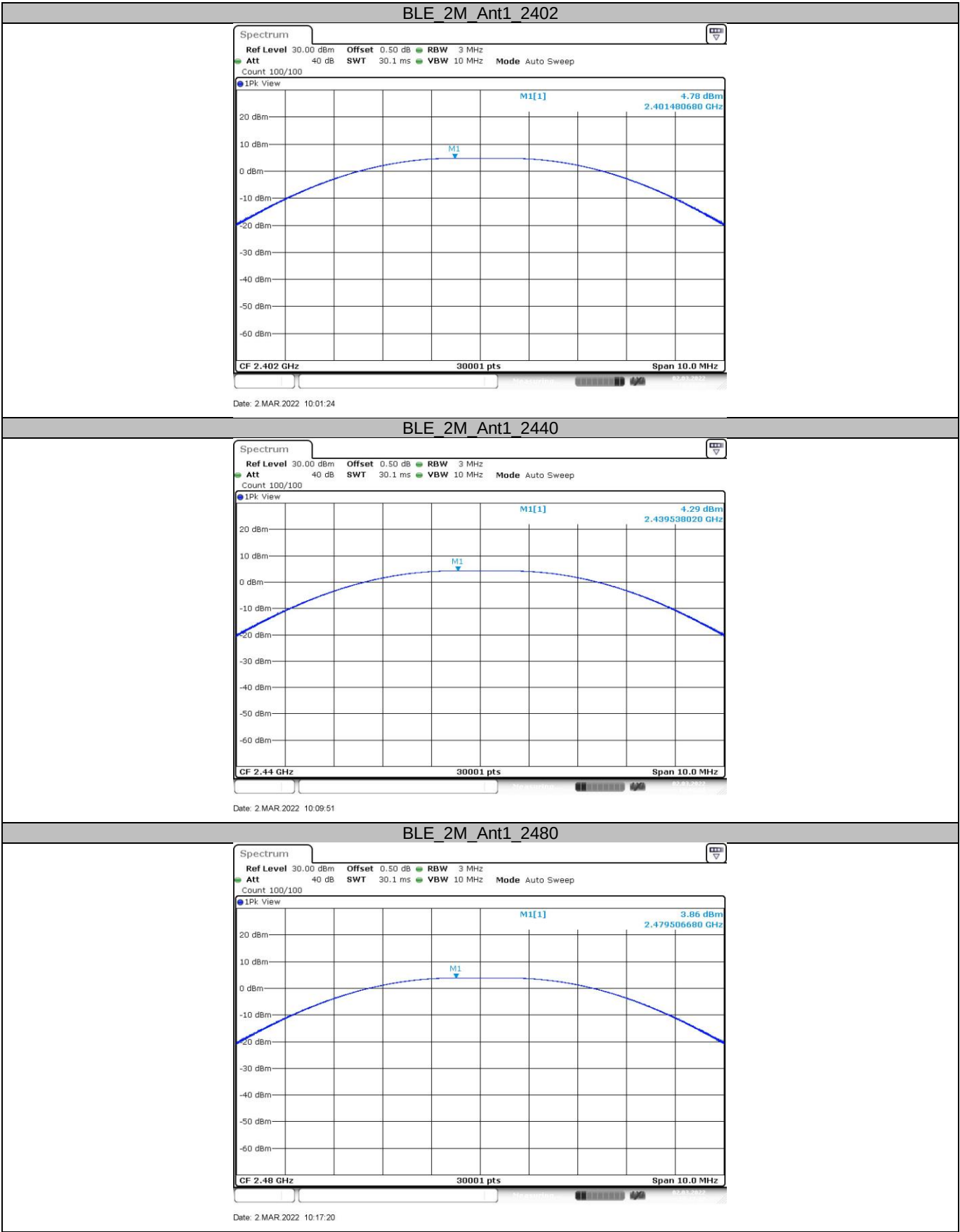
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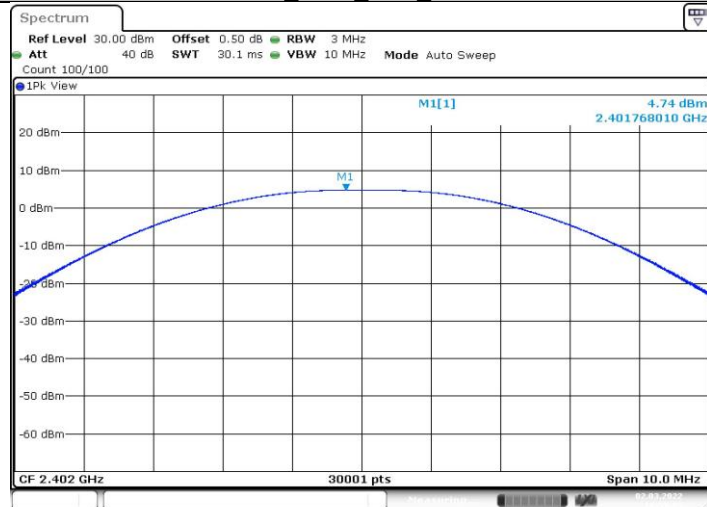
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China

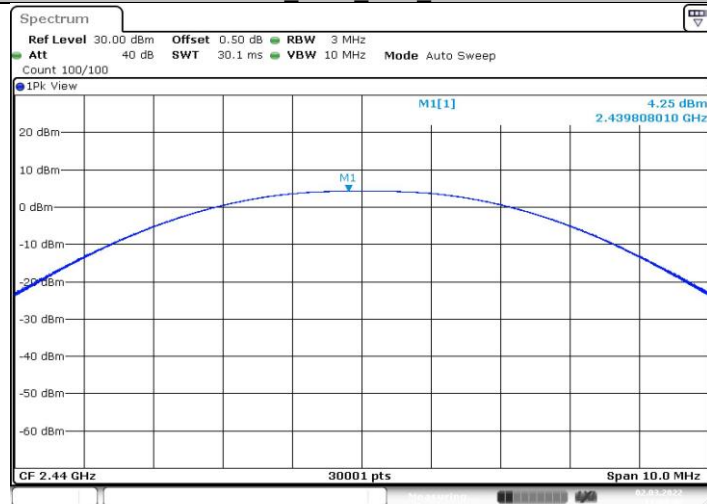


BLE 500K Ant1 2402



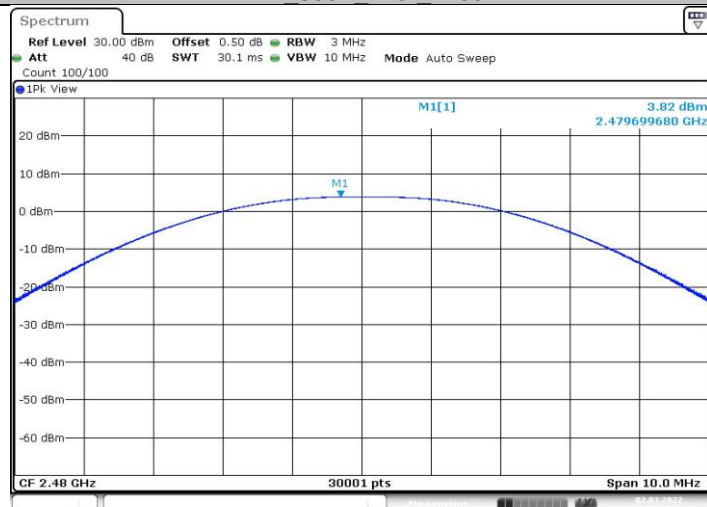
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BLE 500K Ant1 2440



Date: 2 MAR 2022 11:04:42

BLE 500K Ant1 2480



Date: 2 MAR 2022 11:54:00

9.3 6dB bandwidth and 99% Occupied Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be $\geq$ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

≥ 500

Test Method for 99 % Bandwidth

1. Use the following spectrum analyzer settings:
RBW=1% to 5% of the actual occupied, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be $\geq$ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

N/A

Test result

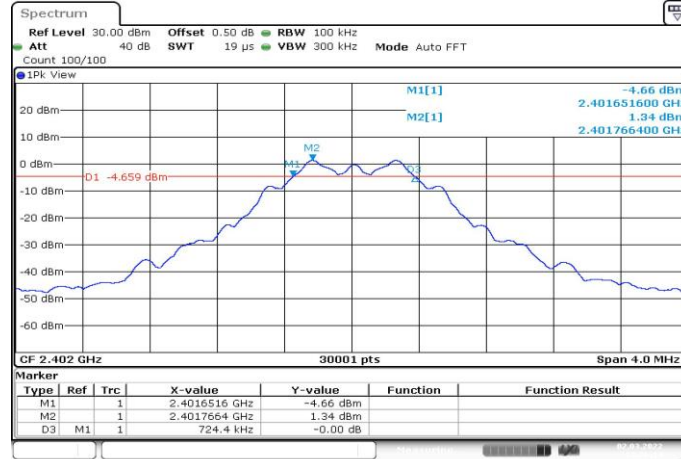
Test Mode	Frequency MHz	6dB bandwidth KHz	Result	99% occupied bandwidth MHz
BLE_125K	2402	724	Pass	1.149
	2440	724	Pass	1.146
	2480	722	Pass	1.140



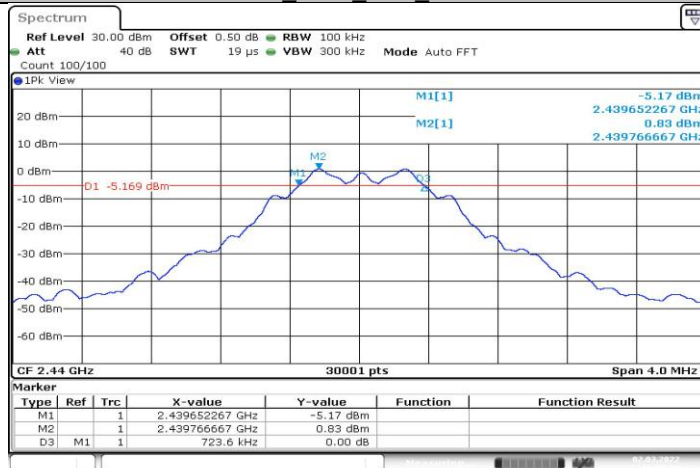
Test Mode	Frequency MHz	6dB bandwidth KHz	Result	99% occupied bandwidth MHz
BLE_1M	2402	686	Pass	1.069
	2440	683	Pass	1.066
	2480	697	Pass	1.066

Test Mode	Frequency MHz	6dB bandwidth KHz	Result	99% occupied bandwidth MHz
BLE_2M	2402	1371	Pass	2.165
	2440	1371	Pass	2.166
	2480	1370	Pass	2.173

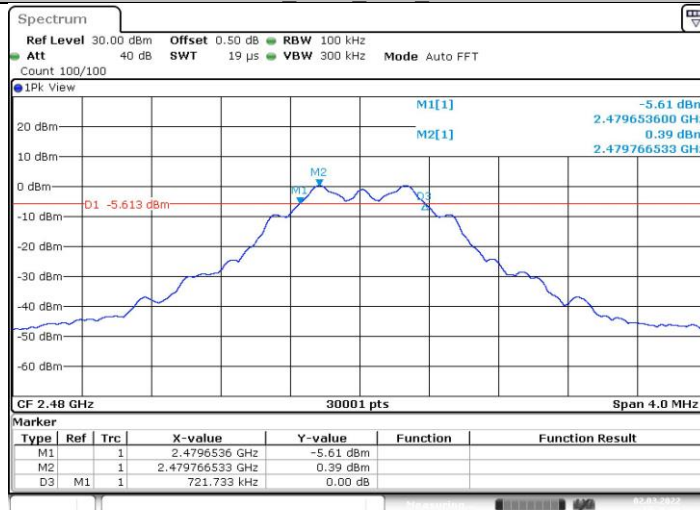
Test Mode	Frequency MHz	6dB bandwidth KHz	Result	99% occupied bandwidth MHz
BLE_500K	2402	791	Pass	1.142
	2440	768	Pass	1.138
	2480	767	Pass	1.135

6dB Bandwidth**BLE 125K Ant1 2402**

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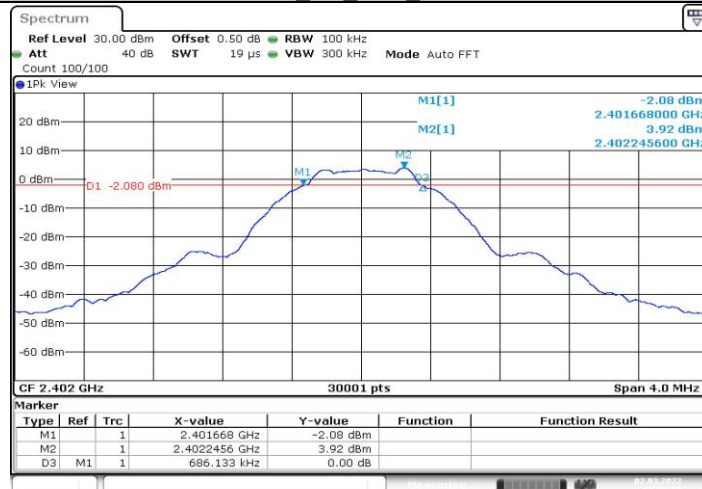
BLE 125K Ant1 2440

Date: 2 MAR 2022 10:37:59

BLE 125K Ant1 2480

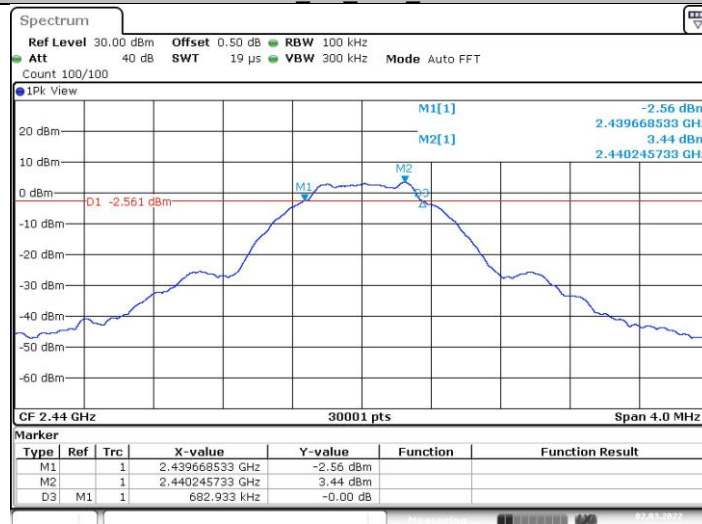
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BLE 1M Ant1 2402



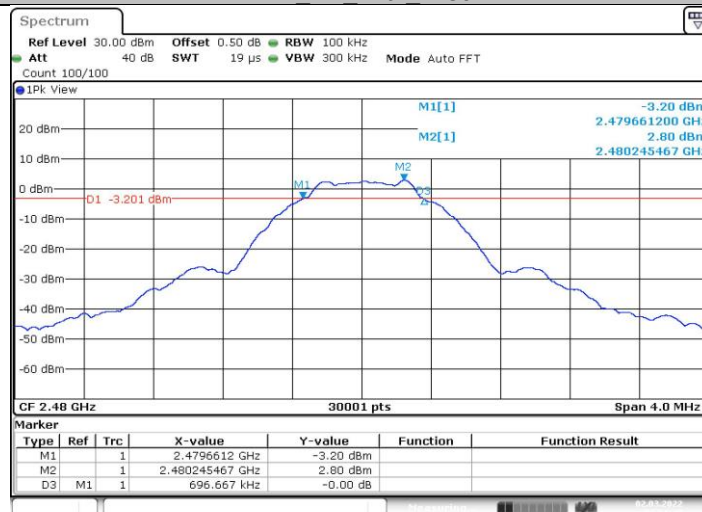
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BLE 1M Ant1 2440



Date: 2.MAR.2022 09:43:03

BLE 1M Ant1 2480

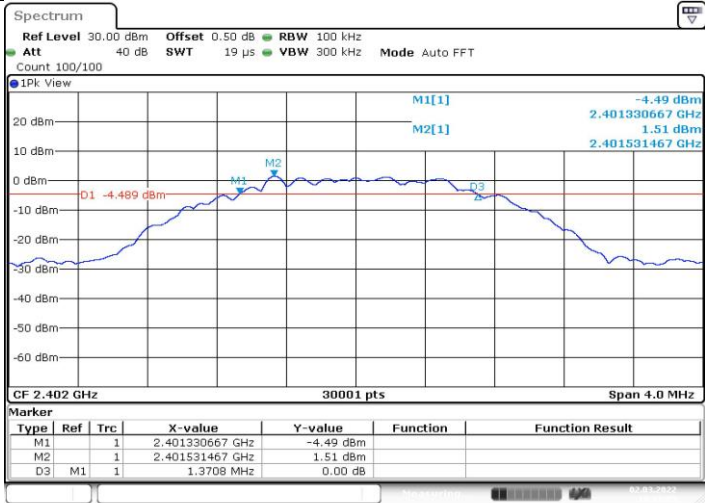


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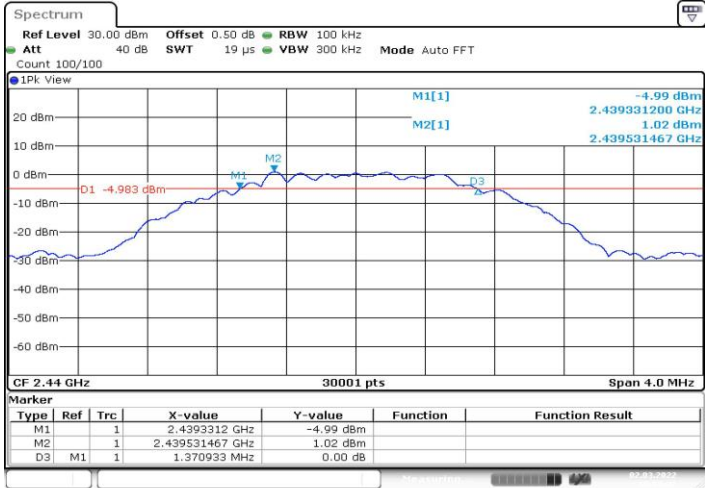
China

BLE_2M_Ant1_2402



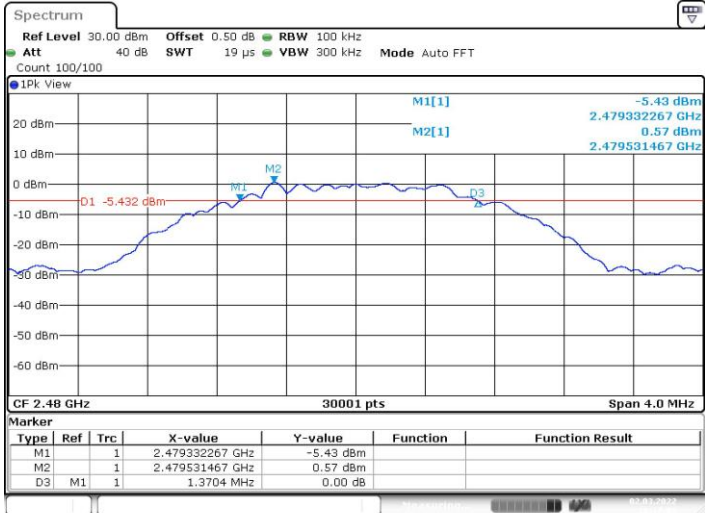
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BLE_2M_Ant1_2440



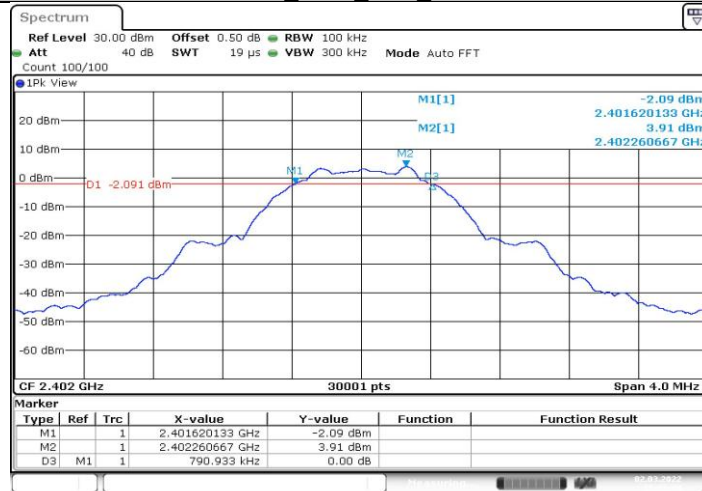
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BLE_2M_Ant1_2480



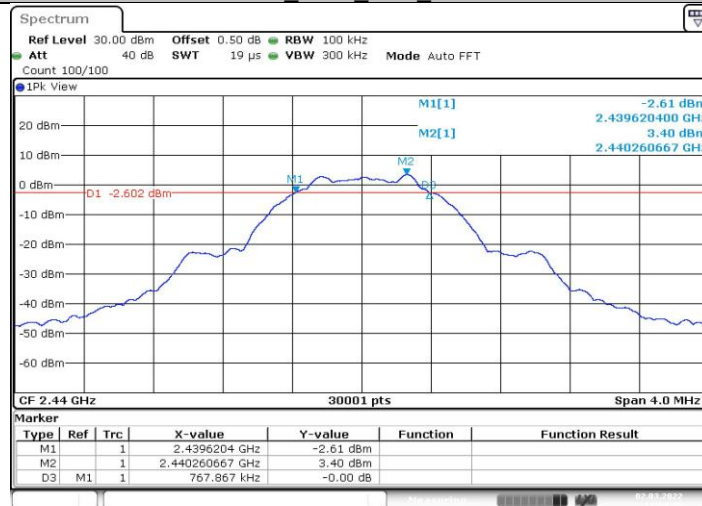
Date: 2.MAR.2022 10:17:01

BLE 500K Ant1 2402



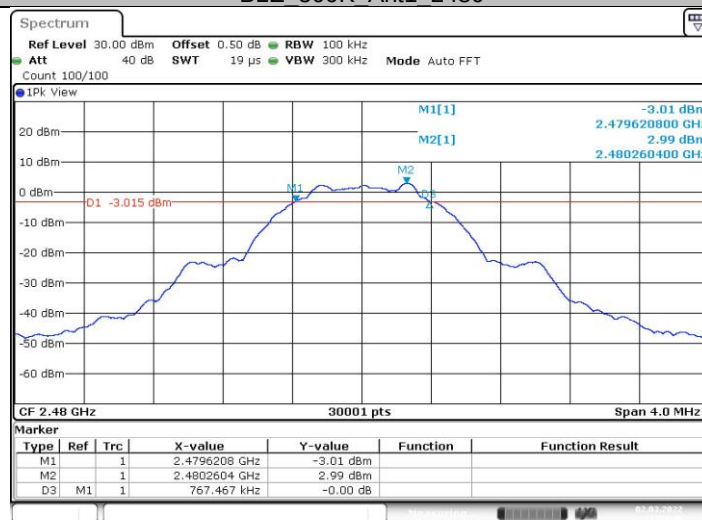
Date: 2.MAR.2022 10:55:35

BLE 500K Ant1 2440

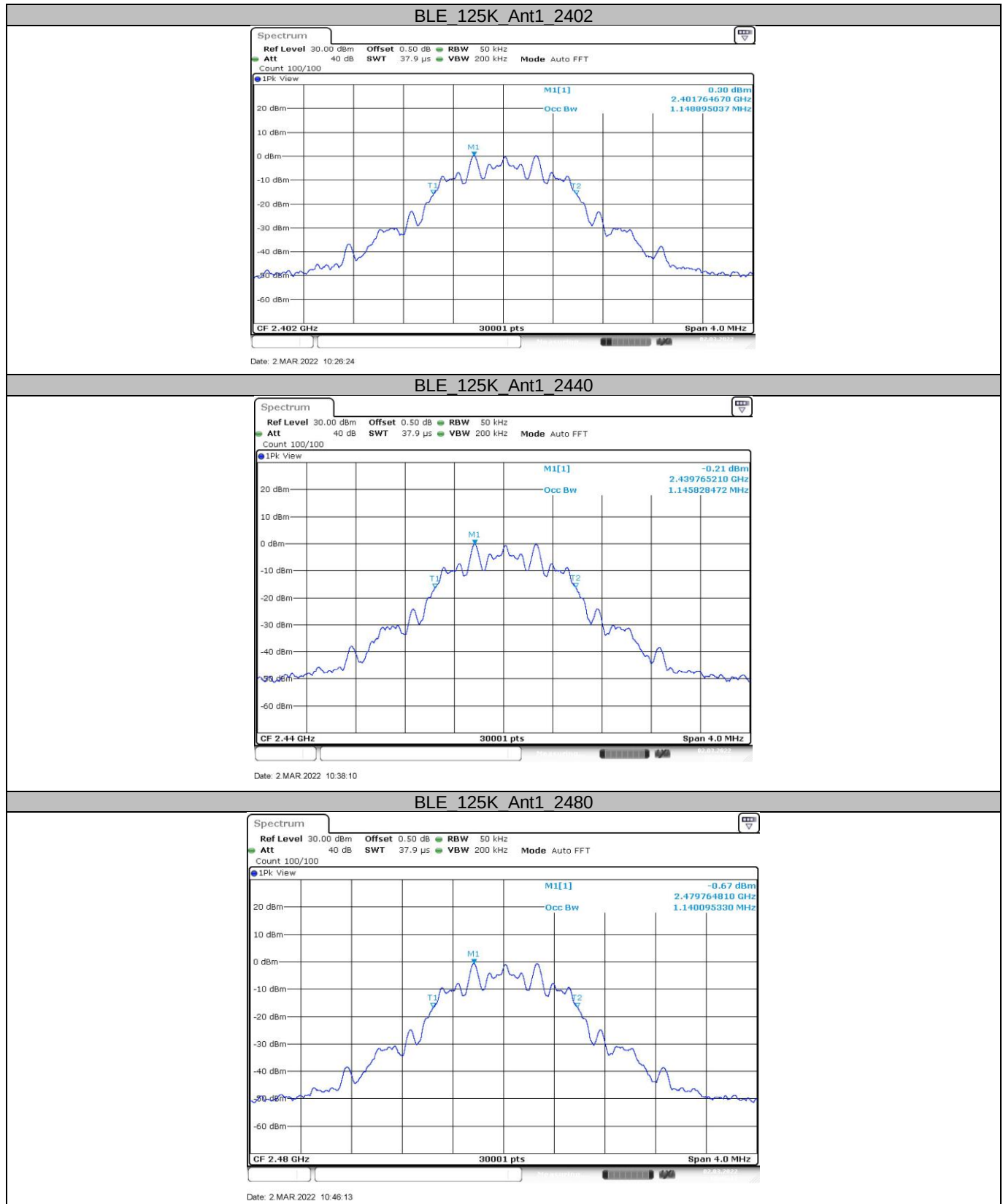


Date: 2.MAR.2022 11:04:23

BLE 500K Ant1 2480



Date: 2.MAR.2022 11:53:41

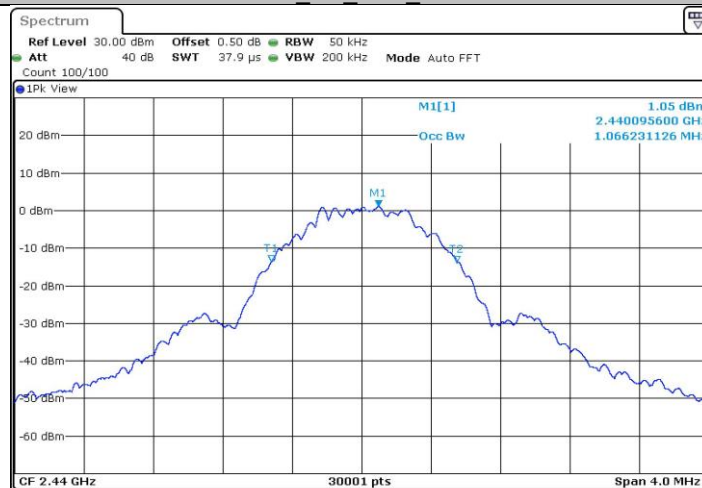
99% Occupied Bandwidth

BLE 1M Ant1 2402



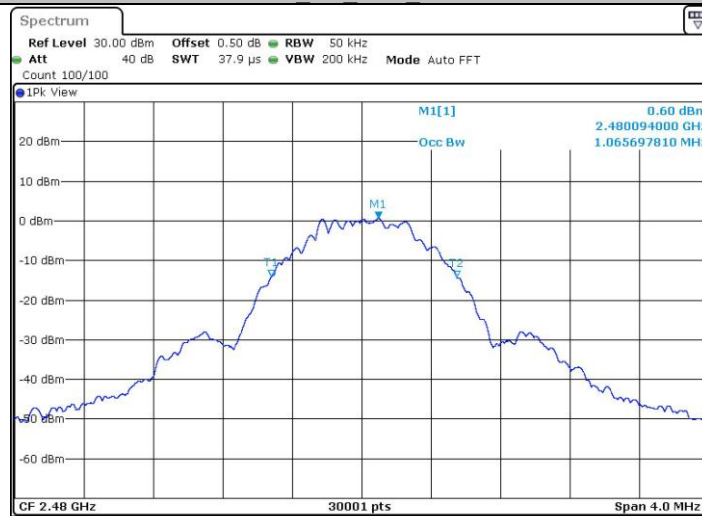
Date: 2.MAR.2022 09:34:00

BLE 1M Ant1 2440



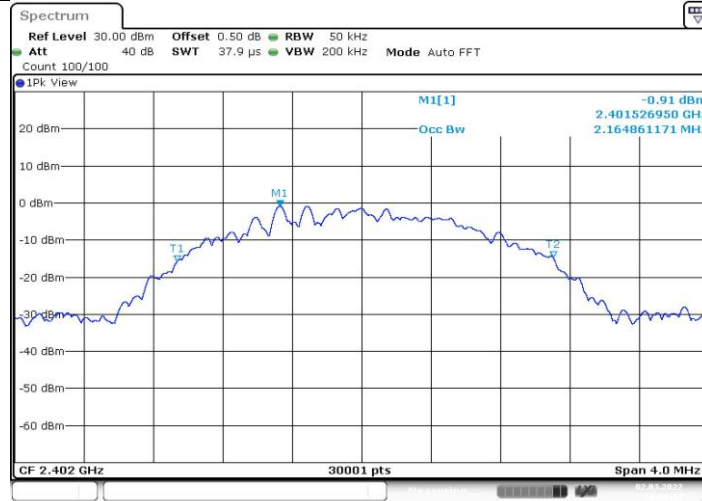
Date: 2.MAR.2022 09:43:13

BLE 1M Ant1 2480



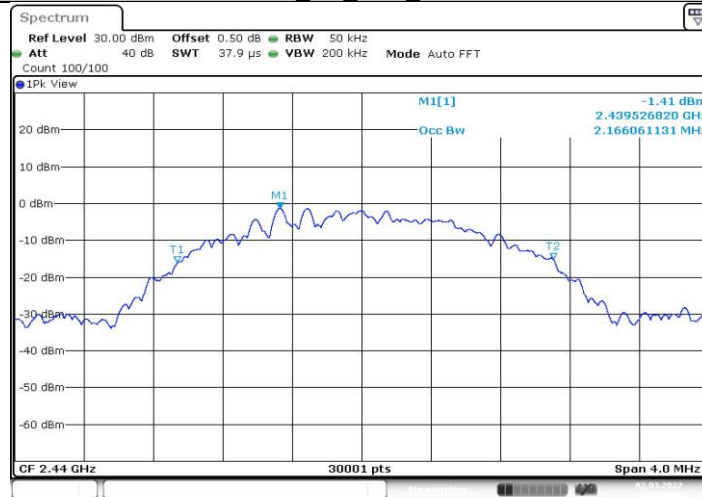
Date: 2.MAR.2022 09:51:56

BLE 2M Ant1_2402



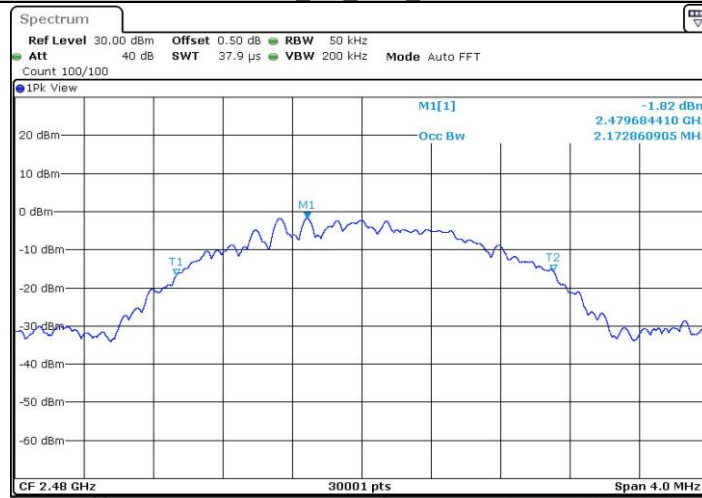
Date: 2.MAR.2022 10:01:15

BLE 2M Ant1_2440



Date: 2.MAR.2022 10:09:42

BLE 2M Ant1_2480



Date: 2.MAR.2022 10:17:12

BLE 500K Ant1 2402



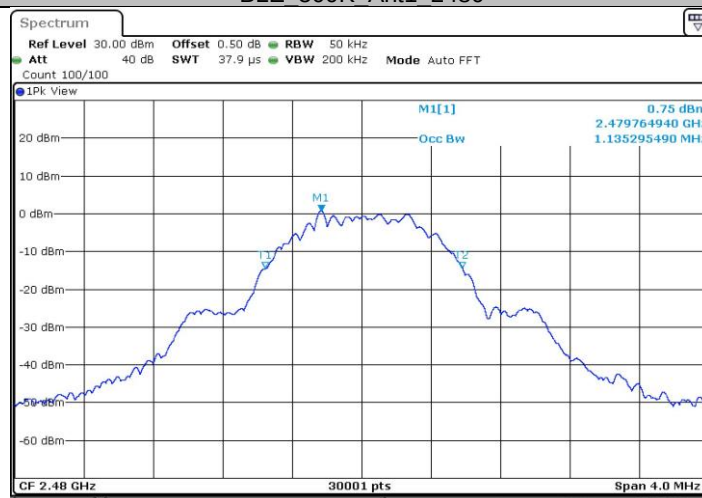
Date: 2 MAR 2022 10:55:45

BLE 500K Ant1 2440



Date: 2 MAR 2022 11:04:33

BLE 500K Ant1 2480



Date: 2 MAR 2022 11:53:51