FCC RF Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	XT2321-3, XT2321-5
FCC ID	:	IHDT56AJ3
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	Dec. 23, 2022 ~ Jan. 13, 2023

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

This report contains data that were produced under subcontract by Sporton International Inc. (Shenzhen)

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

ACCREDITED
Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

TABLE OF CONTENTS

REVISION HISTORY **3**
SUMMARY OF TEST RESULT **4**
1 GENERAL DESCRIPTION **5**
1.1 Applicant 5
1.2 Manufacturer 5
1.3 Product Feature of Equipment Under Test 5
1.4 Product Specification of Equipment Under Test 5
1.5 Modification of EUT 6
1.6 Testing Location 6
1.7 Test Software 6
1.8 Applicable Standards 7
1.9 Specification of Accessory 7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST **8**
2.1 Carrier Frequency Channel 8
2.2 Test Mode 9
2.3 Connection Diagram of Test System 10
2.4 Support Unit used in test configuration and system 11
2.5 EUT Operation Test Setup 11
2.6 Measurement Results Explanation Example 11
3 TEST RESULT **12**
3.1 6dB and 99% Bandwidth Measurement 12
3.2 Output Power Measurement 13
3.3 Power Spectral Density Measurement 16
3.4 Conducted Band Edges and Spurious Emission Measurement 17
3.5 Radiated Band Edges and Spurious Emission Measurement 18
3.6 AC Conducted Emission Measurement 22
3.7 Antenna Requirements 24
4 LIST OF MEASURING EQUIPMENT **25**
5 UNCERTAINTY OF EVALUATION **26**
APPENDIX A. CONDUCTED TEST RESULTS
APPENDIX B. AC CONDUCTED EMISSION TEST RESULT
APPENDIX C. RADIATED SPURIOUS EMISSION
APPENDIX D. RADIATED SPURIOUS EMISSION PLOTS
APPENDIX E. DUTY CYCLE PLOTS
APPENDIX F. SETUP PHOTOGRAPHS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR2D0913B	Rev. 01	Initial issue of report	Feb. 01, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report only	-
3.2	15.247(b)(3)	Peak Output Power	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 8.94 dB at 192.96 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 9.00 dB at 0.192 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-
Remark: Not required means after assessing, test items are not necessary to carry out.					

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2321-3, XT2321-5
FCC ID	IHDT56AJ3
IMEI Code	Conducted: 358041760019911/358041760019929 Conduction: 358041760025975/358041760025983 Radiation: 358041760025512/358041760025520
HW Version	DVT2
SW Version	TTZ 33.50
EUT Stage	Identical Prototype

Remark: The EUT has two working states, flip open state and flip close state, by verifying these two states, we choose the worst flip open state for all tests.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	<Ant.4> BLE1Mbps: 9.72 dBm (0.0094 W) <Ant.4> BLE2Mbps: 9.83 dBm (0.0096 W) <Ant.5> BLE1Mbps: 7.33 dBm (0.0054 W) <Ant.5> BLE2Mbps: 7.47 dBm (0.0056 W)
99% Occupied Bandwidth	<Ant.4> BLE1Mbps: 1.027MHz <Ant.4> BLE2Mbps: 2.014MHz <Ant.5> BLE1Mbps: 1.019MHz <Ant.5> BLE2Mbps: 2.01MHz
Antenna Type / Gain	<Ant.4> IFA Antenna type with gain -6.8 dBi <Ant.5> IFA Antenna type with gain -2.5 dBi
Type of Modulation	Bluetooth LE : GFSK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS TH01-KS	CN1257	314309

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103 TEL: +86-755-33202398		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-SZ	CN1256	421272

Test data subcontracted: RSE test case in section 3.5 of this report,

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	CO01-KS	AUDIX	E3	6.2009-8-24
2.	03CH04-SZ	AUDIX	E3	6.2009-8-24

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

1.9 Specification of Accessory

Specification of Accessory				
AC Adapter	**Brand Name**	Motorola(Salom)	**Model Name**	MC-301
Battery	**Brand Name**	Motorola(ATL)	**Model Name**	PM29
USB Cable 1	**Brand Name**	Motorola(Cabletech)	**Model Name**	SC18D13216
USB Cable 2	**Brand Name**	Motorola(Luxshare)	**Model Name**	SC18D13217
USB Cable 3	**Brand Name**	Motorola(Saibao)	**Model Name**	SC18D86732

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

2.2 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane for Ant 4/ X plane for Ant 5) were recorded in this report.

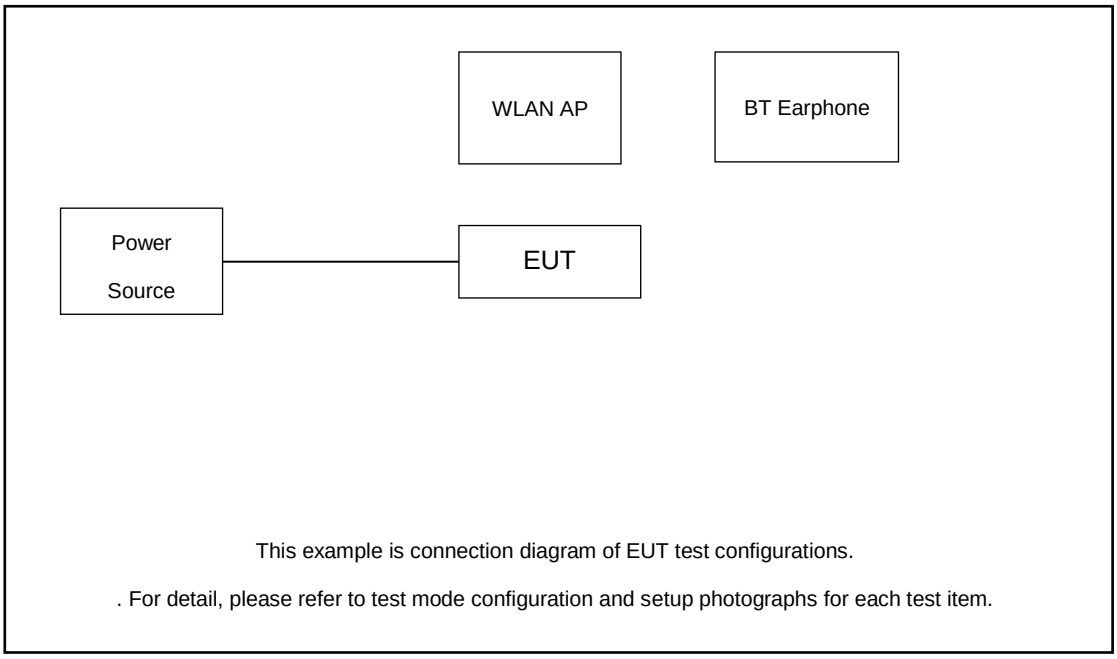
b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

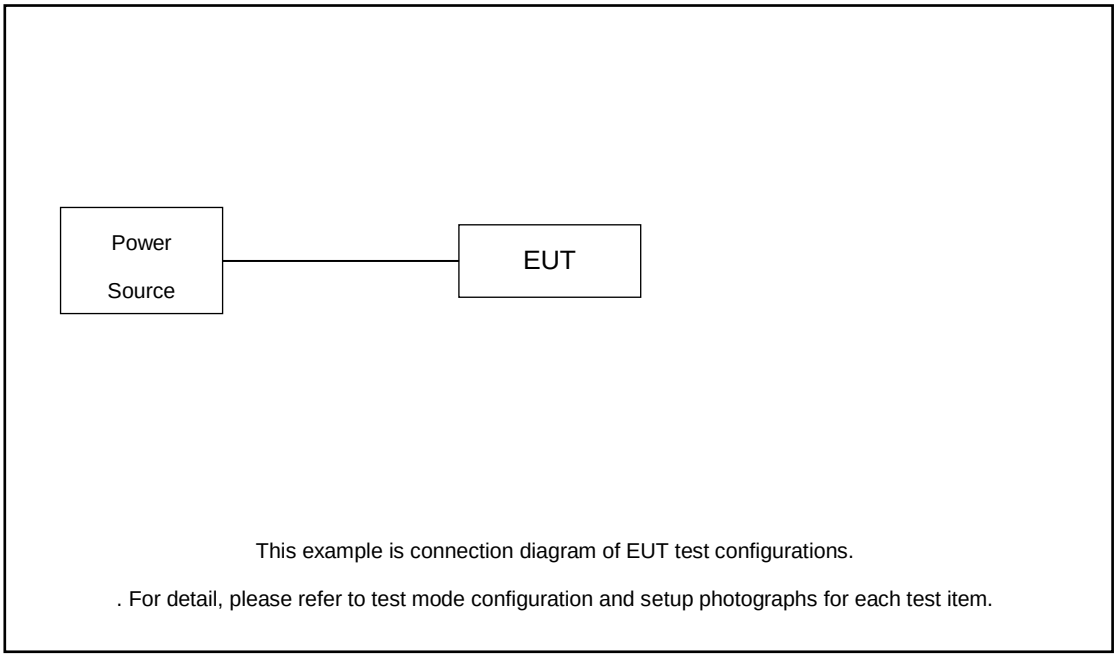
Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
	Bluetooth – LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz Mode 2: Bluetooth Tx CH19_2440 MHz Mode 3: Bluetooth Tx CH39_2480 MHz
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz Mode 2: Bluetooth Tx CH19_2440 MHz Mode 3: Bluetooth Tx CH39_2480 MHz
AC Conducted Emission	Mode 1: BT Link + WLAN Link(2.4G) + USB Cable (3)(Charging From Adaptor)
Remark: For Radiated Test Cases, The tests were performance with Adapter and USB Cable 1	

2.3 Connection Diagram of Test System

AC Conducted Emission:



Radiated Emission:



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
2.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
3.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For BLE function, the engineering test program was provided and enabled to make EUT continuous transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 2.89 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 2.89 + 10 = 12.89 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

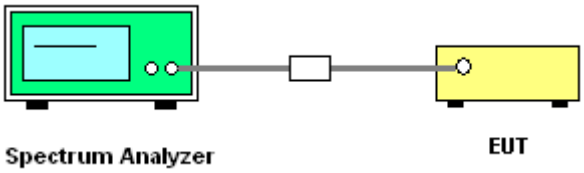
3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1% to 5% of the 99% OBW and the VBW is set to 3 times of the RBW.
6. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

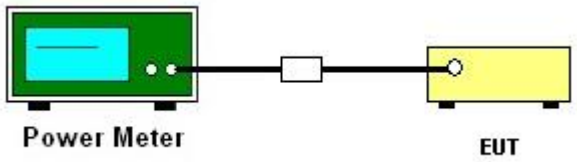
3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

<Ant.4>

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	8.61	30.00	-6.80	1.81	36.00	Pass
BLE	1Mbps	1	19	2440	9.72	30.00	-6.80	2.92	36.00	Pass
BLE	1Mbps	1	39	2480	7.55	30.00	-6.80	0.75	36.00	Pass

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	8.71	30.00	-6.80	1.91	36.00	Pass
BLE	2Mbps	1	19	2440	9.83	30.00	-6.80	3.03	36.00	Pass
BLE	2Mbps	1	39	2480	7.64	30.00	-6.80	0.84	36.00	Pass

<Ant.5>

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	6.79	30.00	-2.50	4.29	36.00	Pass
BLE	1Mbps	1	19	2440	7.33	30.00	-2.50	4.83	36.00	Pass
BLE	1Mbps	1	39	2480	5.17	30.00	-2.50	2.67	36.00	Pass

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	6.92	30.00	-2.50	4.42	36.00	Pass
BLE	2Mbps	1	19	2440	7.47	30.00	-2.50	4.97	36.00	Pass
BLE	2Mbps	1	39	2480	5.27	30.00	-2.50	2.77	36.00	Pass

3.2.6 Test Result of Average Output Power (Reporting Only)

<Ant.4>

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	2.08	8.51
BLE	1Mbps	1	19	2440	2.08	9.59
BLE	1Mbps	1	39	2480	2.08	7.36

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	2Mbps	1	0	2402	4.87	8.60
BLE	2Mbps	1	19	2440	4.87	9.71
BLE	2Mbps	1	39	2480	4.87	7.43

<Ant.5>

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	2.07	6.68
BLE	1Mbps	1	19	2440	2.07	7.25
BLE	1Mbps	1	39	2480	2.07	5.02

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	2Mbps	1	0	2402	4.89	6.75
BLE	2Mbps	1	19	2440	4.89	7.33
BLE	2Mbps	1	39	2480	4.89	5.07

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

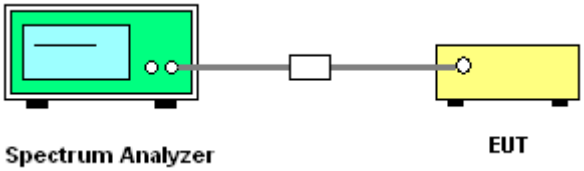
3.3.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

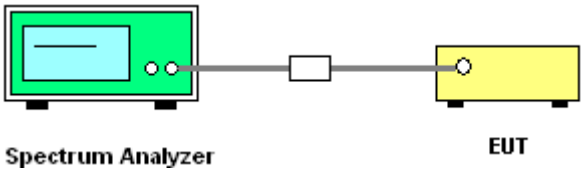
3.4.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.4.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 11.13
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



3.4.5 Test Result of Conducted Band Edges Plots

Please refer to Appendix A.

3.4.6 Test Result of Conducted Spurious Emission Plots

Please refer to Appendix A.

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

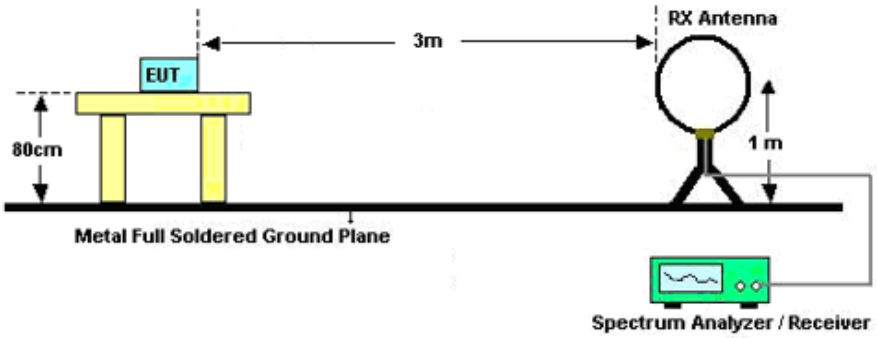
The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.5.3 Test Procedures

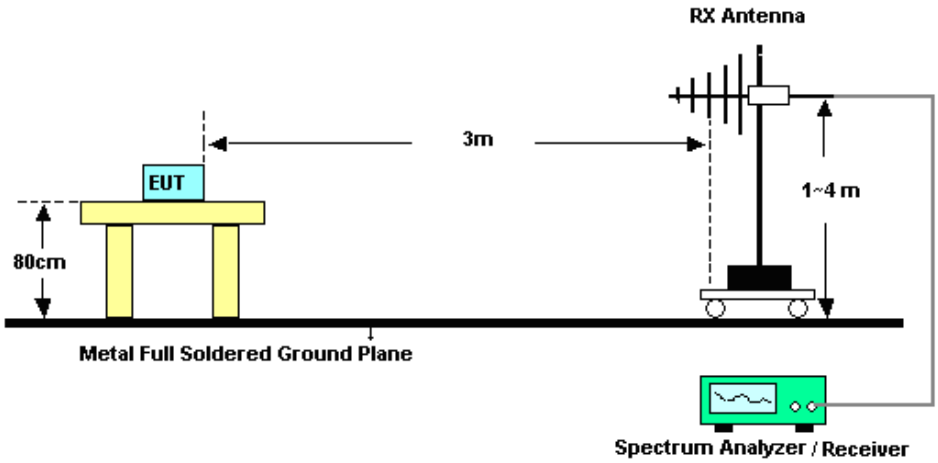
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

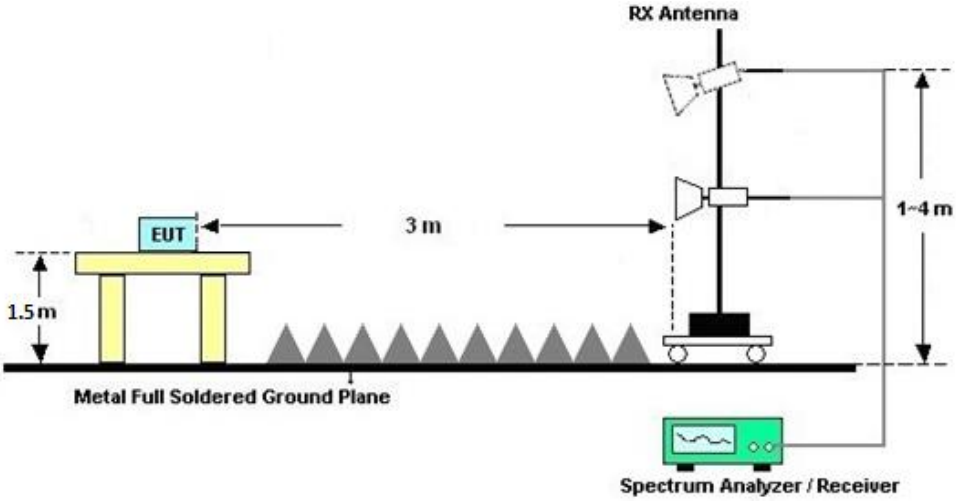
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C&D.

3.5.7 Duty Cycle

Please refer to Appendix E.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C&D.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

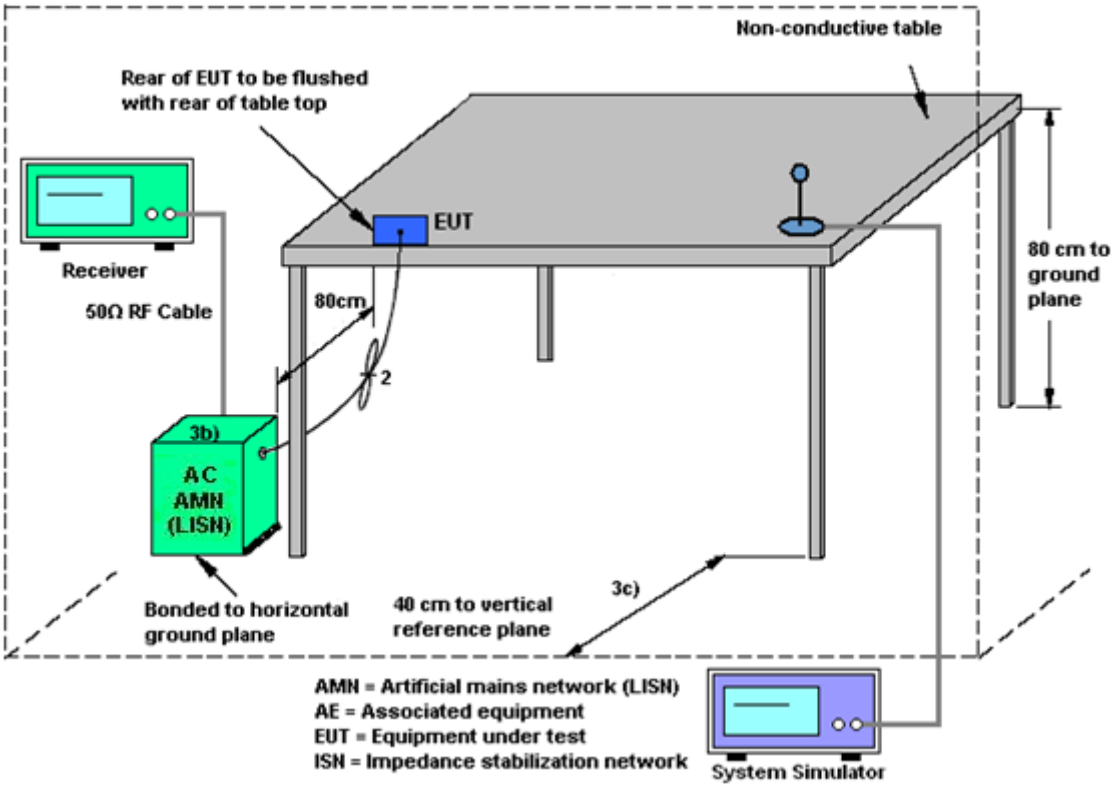
3.6.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 24, 2022	Jan. 13, 2023	May 23, 2023	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	Jan. 13, 2023	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 24, 2022	Jan. 13, 2023	May 23, 2023	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	Jan. 13, 2023	Oct. 11, 2023	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 19, 2022	Dec. 27, 2022~ Jan. 06, 2023	Oct. 18, 2023	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Jul. 07, 2022	Dec. 27, 2022~ Jan. 06, 2023	Jul. 06, 2023	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 28, 2022	Dec. 27, 2022~ Jan. 06, 2023	Jun. 27, 2024	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Apr. 27, 2022	Dec. 27, 2022~ Jan. 06, 2023	Apr. 27, 2023	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBE CK	BBHA9120D	9120D-147 4	1GHz~18GHz	Jul. 07, 2022	Dec. 27, 2022~ Jan. 06, 2023	Jul. 06, 2023	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBE CK	BBHA9170	9170#679	15GHz~40GHz	Jul. 07, 2022	Dec. 27, 2022~ Jan. 06, 2023	Jul. 06, 2023	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 19, 2022	Dec. 27, 2022~ Jan. 06, 2023	Oct. 18, 2023	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1943528	1GHz~18GHz	Oct. 19, 2022	Dec. 27, 2022~ Jan. 06, 2023	Oct. 18, 2023	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 06, 2022	Dec. 27, 2022~ Jan. 06, 2023	Jul. 05, 2023	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY572801 36	500MHz~26.5G Hz	Sep. 30, 2022	Dec. 27, 2022~ Jan. 06, 2023	Sep. 29, 2023	Radiation (03CH04-SZ)
AC Power Source	APC	AFV-S-600B	F11905001 9	N/A	Nov. 10, 2022	Dec. 27, 2022~ Jan. 06, 2023	Nov. 10, 2023	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Dec. 27, 2022~ Jan. 06, 2023	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Dec. 27, 2022~ Jan. 06, 2023	NCR	Radiation (03CH04-SZ)
Thermo meter	Anymetre	JR593	#12	- 10℃ ～ 50℃ 10%RH ~99%RH	Dec. 31, 2021	Dec. 27, 2022~ Jan. 06, 2023	Dec. 30, 2022	Radiation (03CH04-SZ)
Thermo meter	Anymetre	JR593	#12	- 10℃ ～ 50℃ 10%RH ~99%RH	Dec. 30, 2022		Dec. 29, 2023	Radiation (03CH04-SZ)
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	May 25, 2022	Dec. 23, 2022	May 24, 2023	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	Dec. 23, 2022	Oct. 11, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GH z	Jan. 05, 2022	Dec. 23, 2022	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Oct. 12, 2022	Dec. 23, 2022	Oct. 11, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	1339163	300MHz~40GH z	Oct. 12, 2022	Dec. 23, 2022	Oct. 11, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1435004	50MHz Bandwidth	Mar. 02, 2022	Dec. 23, 2022	Mar. 01, 2023	Conducted (TH01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±0.46 dB
Conducted Emissions	±0.48 dB
Occupied Channel Bandwidth	±0.001 %
Conducted Power Spectral Density	±0.40 dB

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.78 dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.8 dB

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1 dB

---------- THE END ----------

Appendix A. Conducted Test Results

Ambient Condition: 25 ℃, 45 %RH	
According Standard: ■Part15C	
Test Date: 2022/12/23	**Test Engineer:** Long Wu

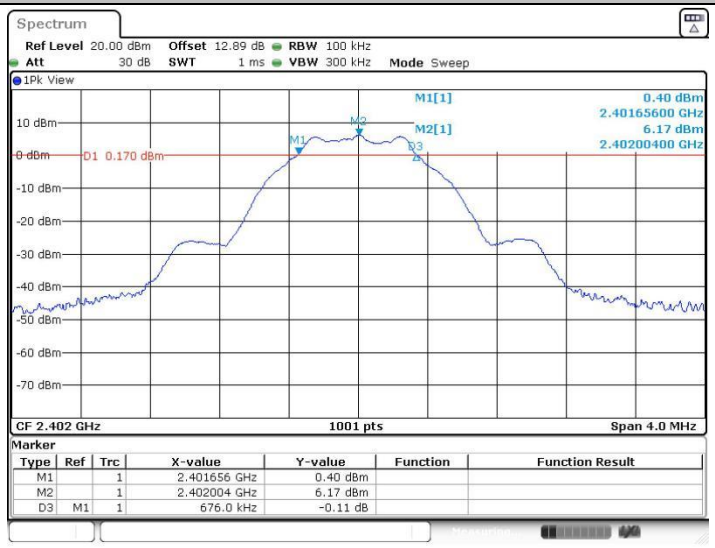
DTS Bandwidth

Test Result

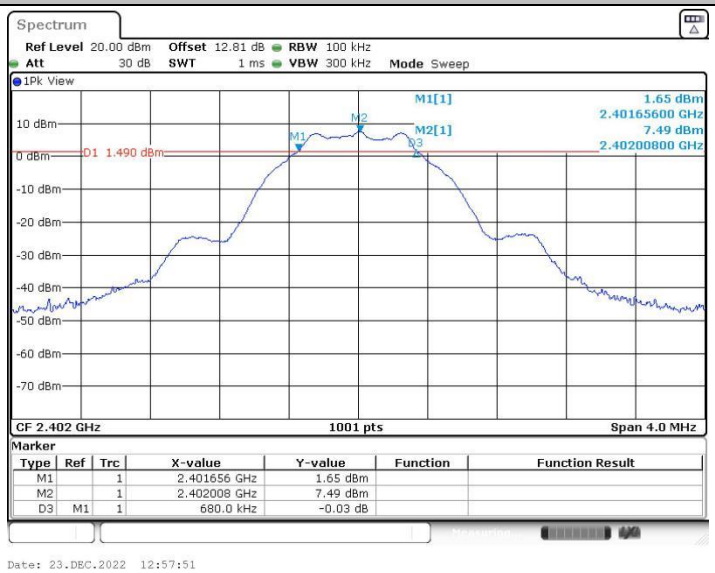
TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant5	2402	0.68	2401.66	2402.33	0.5	PASS
	Ant4	2402	0.68	2401.66	2402.34	0.5	PASS
	Ant5	2440	0.68	2439.65	2440.34	0.5	PASS
	Ant4	2440	0.67	2439.66	2440.33	0.5	PASS
	Ant5	2480	0.68	2479.66	2480.33	0.5	PASS
	Ant4	2480	0.68	2479.66	2480.34	0.5	PASS
BLE_2M	Ant5	2402	1.16	2401.42	2402.58	0.5	PASS
	Ant4	2402	1.15	2401.43	2402.58	0.5	PASS
	Ant5	2440	1.16	2439.42	2440.58	0.5	PASS
	Ant4	2440	1.16	2439.43	2440.58	0.5	PASS
	Ant5	2480	1.16	2479.42	2480.58	0.5	PASS
	Ant4	2480	1.16	2479.42	2480.58	0.5	PASS

Test Graphs

BLE_1M_Ant5_2402



BLE_1M_Ant4_2402



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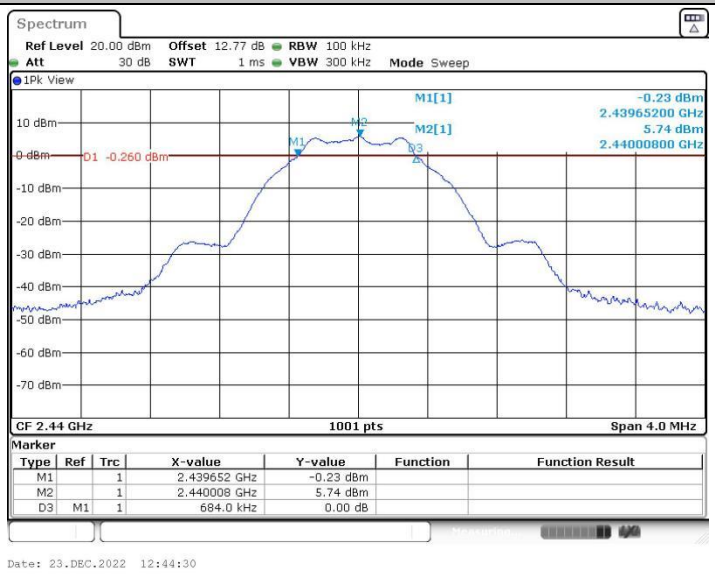

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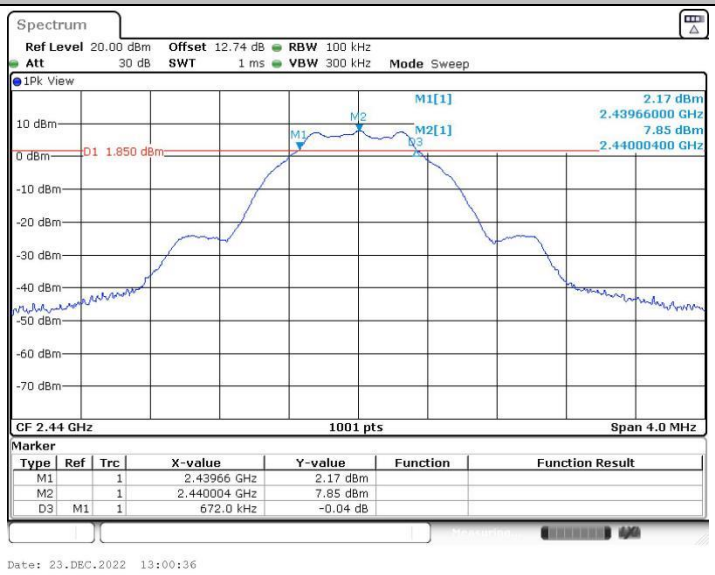
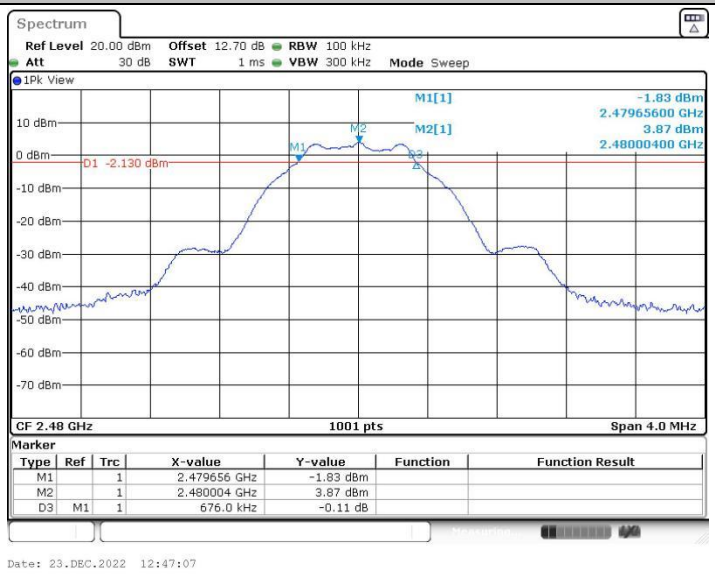


BLE_1M_Ant5_2480



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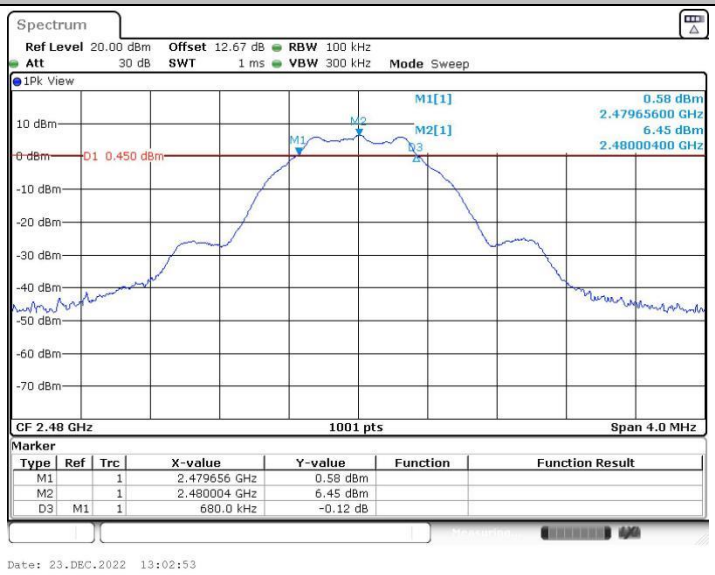
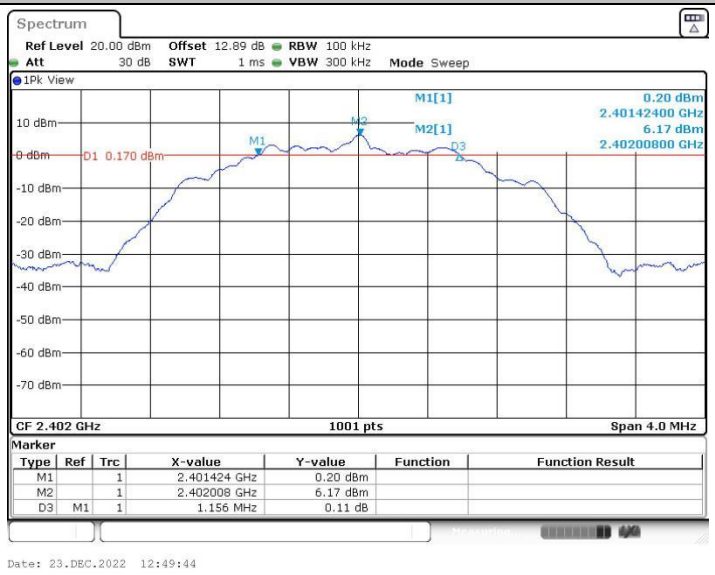
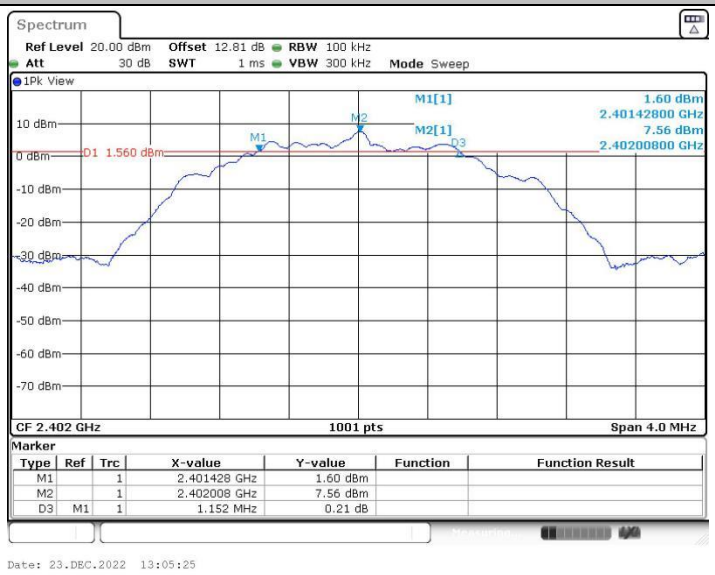


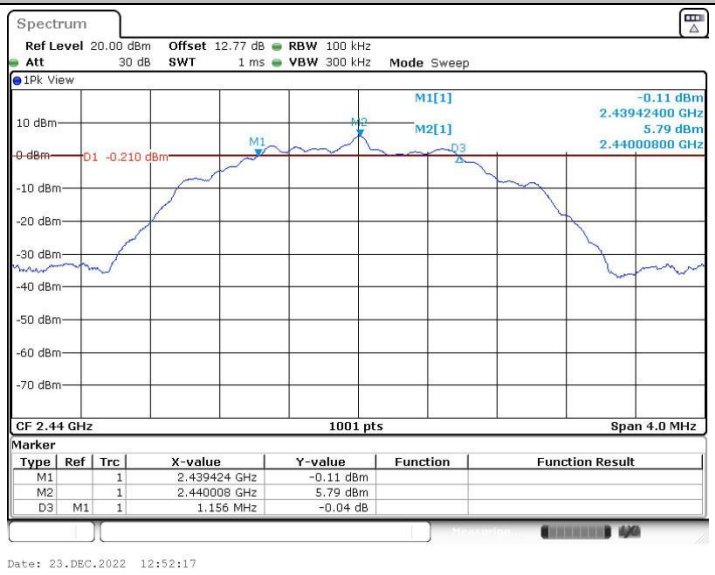
BLE_2M_Ant5_2402



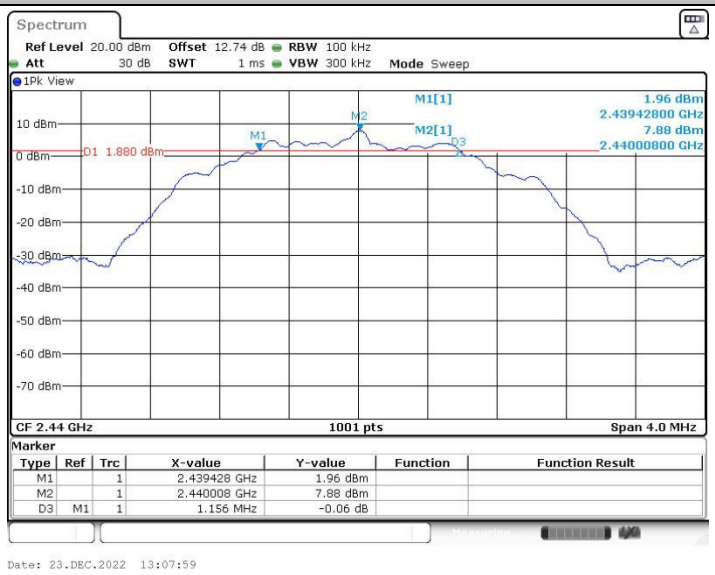
BLE_2M_Ant4_2402



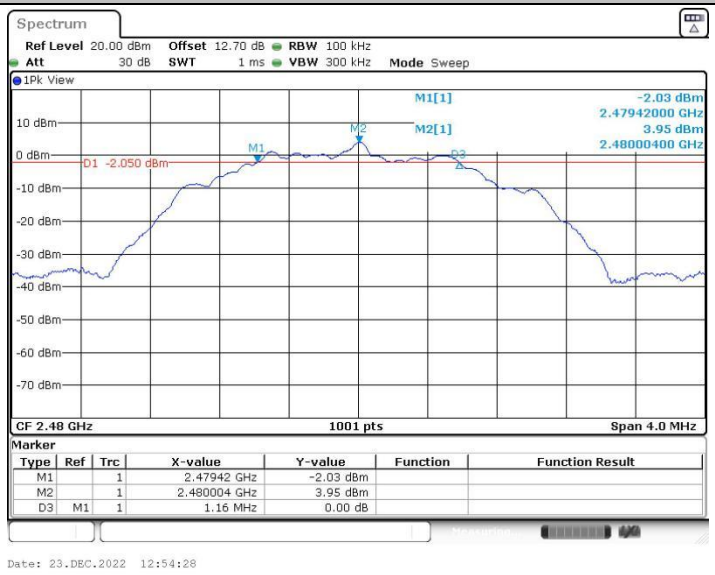
BLE_2M_Ant5_2440



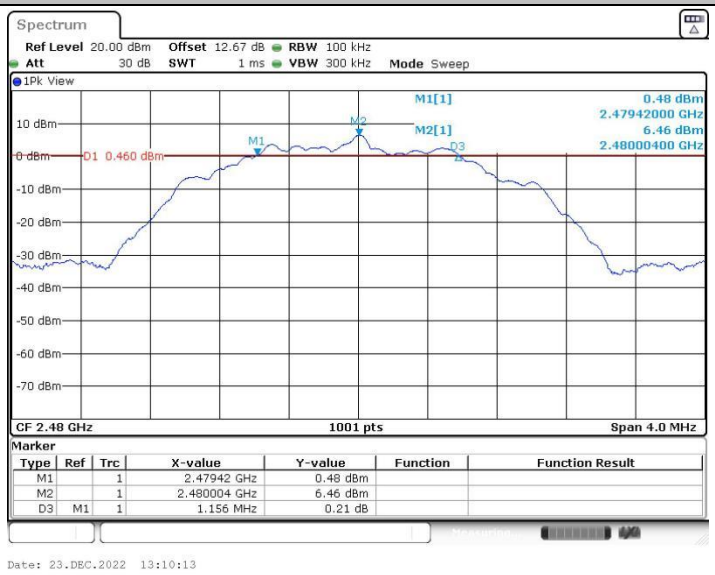
BLE_2M_Ant4_2440



BLE_2M_Ant5_2480



BLE_2M_Ant4_2480



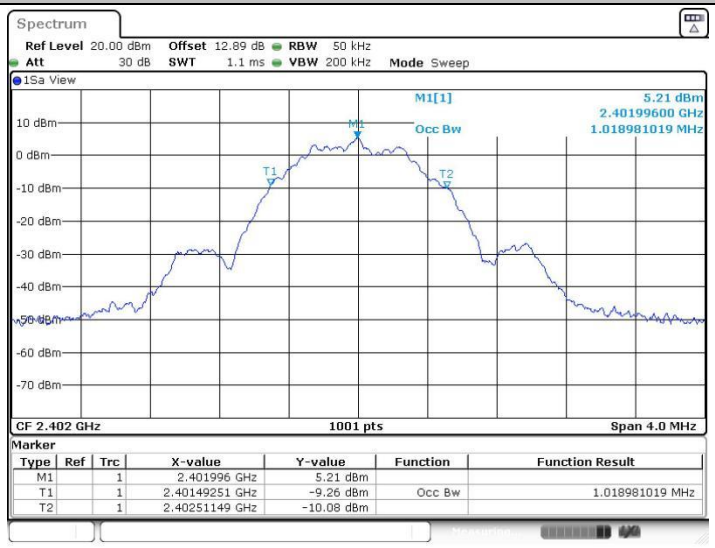
Occupied Channel Bandwidth

Test Result

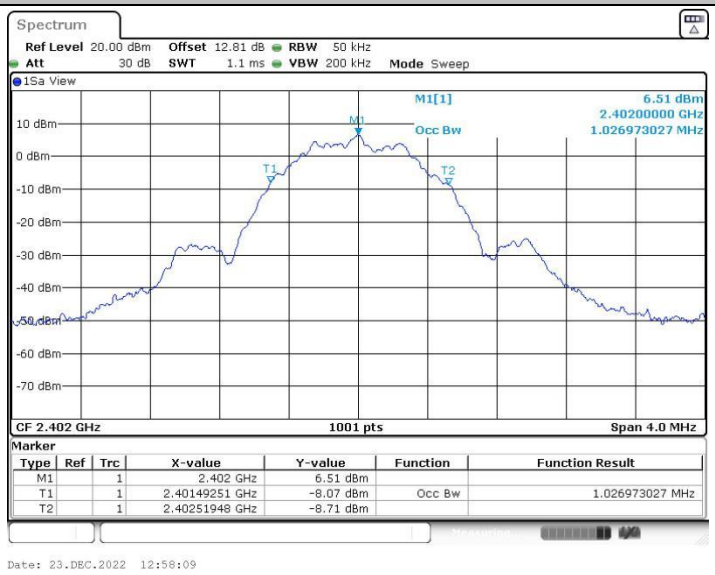
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant5	2402	1.019	2401.4925	2402.5115	---	---
	Ant4	2402	1.027	2401.4925	2402.5195	---	---
	Ant5	2440	1.019	2439.4925	2440.5115	---	---
	Ant4	2440	1.019	2439.4965	2440.5155	---	---
	Ant5	2480	1.019	2479.4925	2480.5115	---	---
	Ant4	2480	1.015	2479.4965	2480.5115	---	---
BLE_2M	Ant5	2402	2.01	2401.0090	2403.0190	---	---
	Ant4	2402	2.014	2401.0090	2403.0230	---	---
	Ant5	2440	2.01	2439.0090	2441.0190	---	---
	Ant4	2440	2.014	2439.0090	2441.0230	---	---
	Ant5	2480	2.01	2479.0050	2481.0150	---	---
	Ant4	2480	2.01	2479.0050	2481.0150	---	---

Test Graphs

BLE_1M_Ant5_2402



BLE_1M_Ant4_2402



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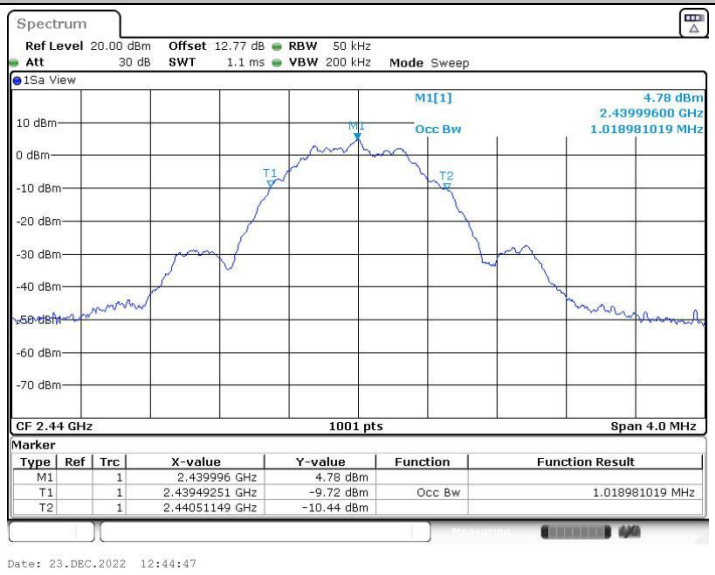

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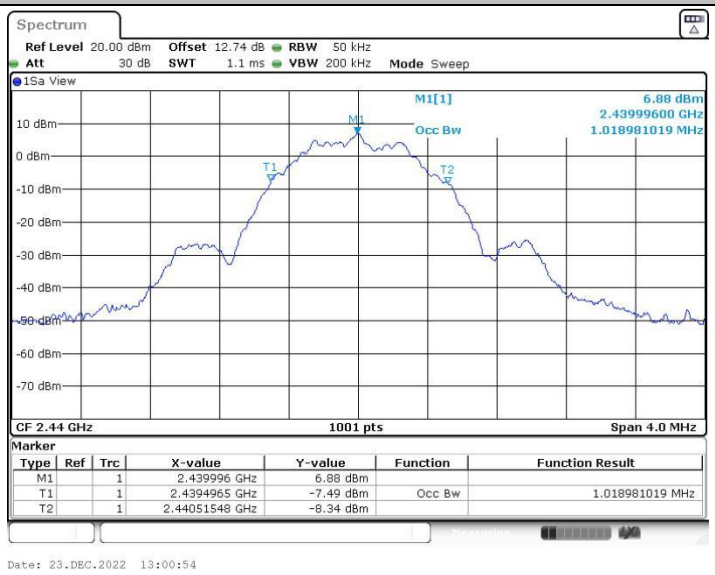
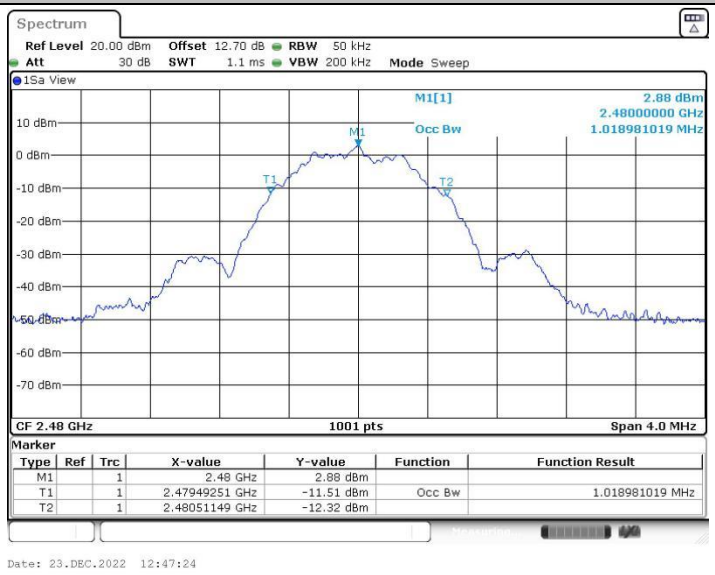


BLE_1M_Ant5_2480



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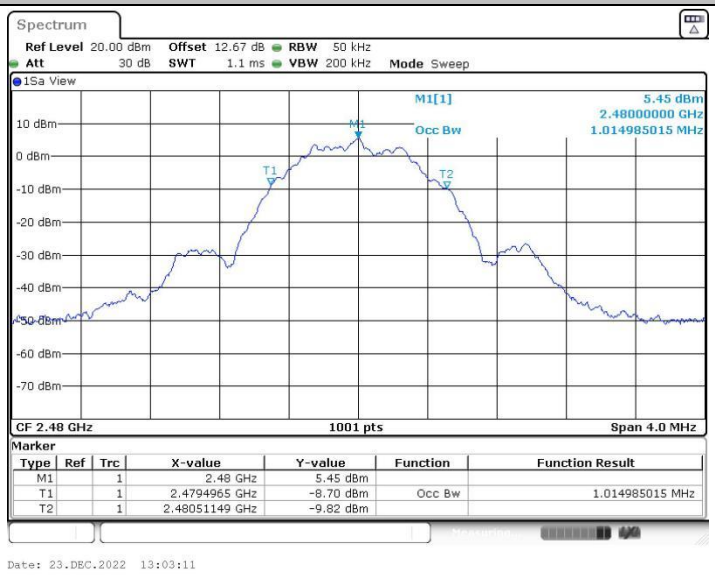
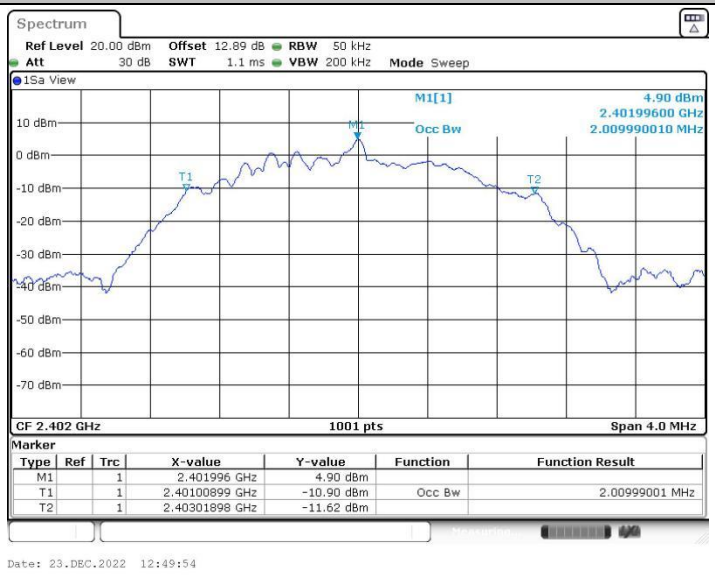
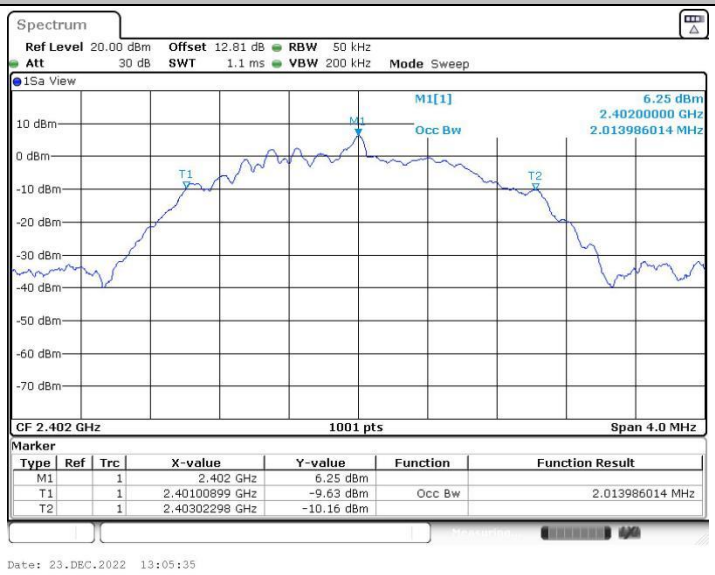


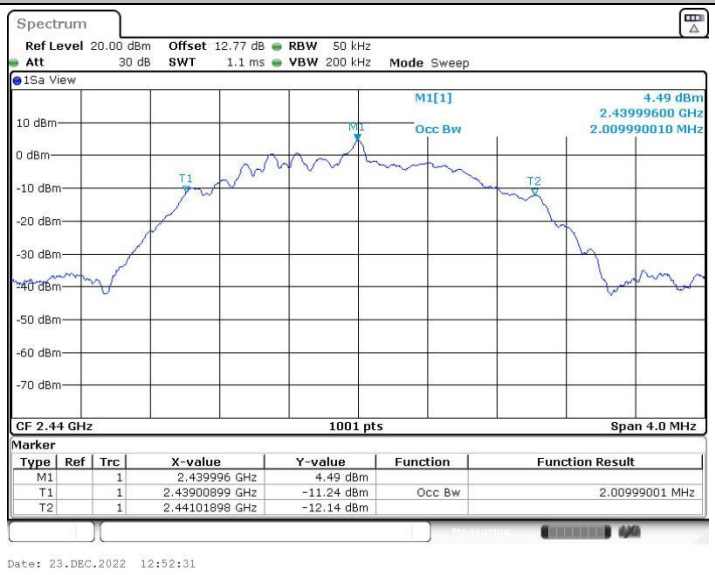
BLE_2M_Ant5_2402



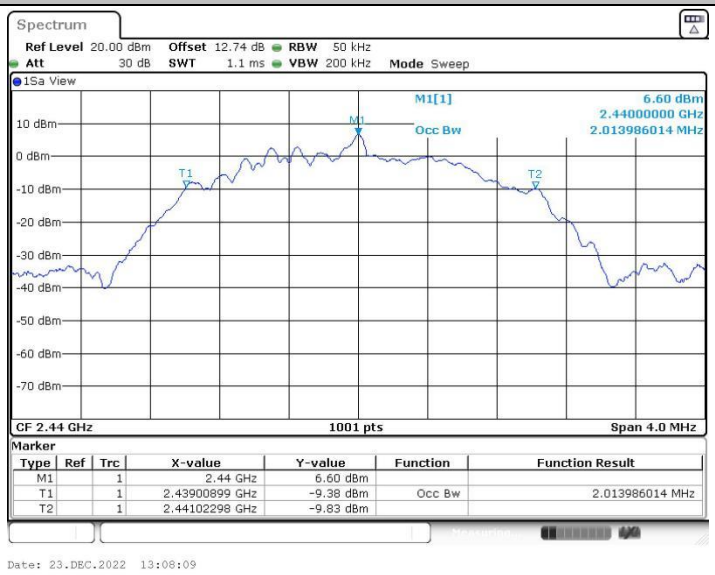
BLE_2M_Ant4_2402



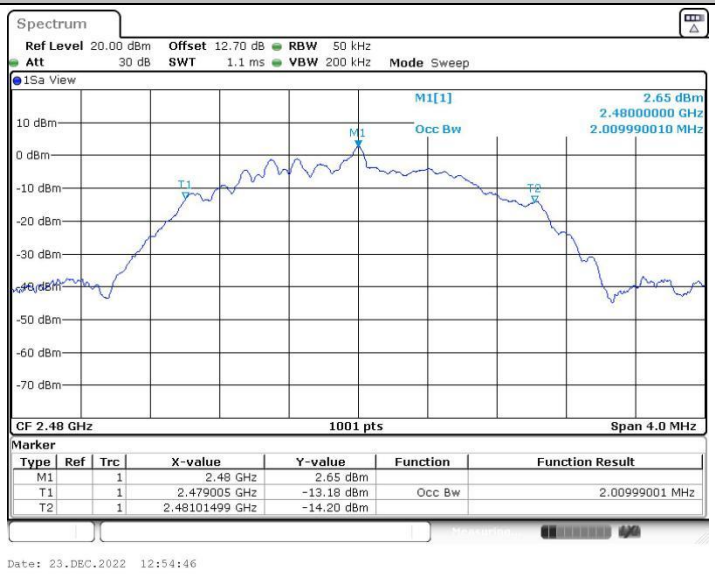
BLE_2M_Ant5_2440



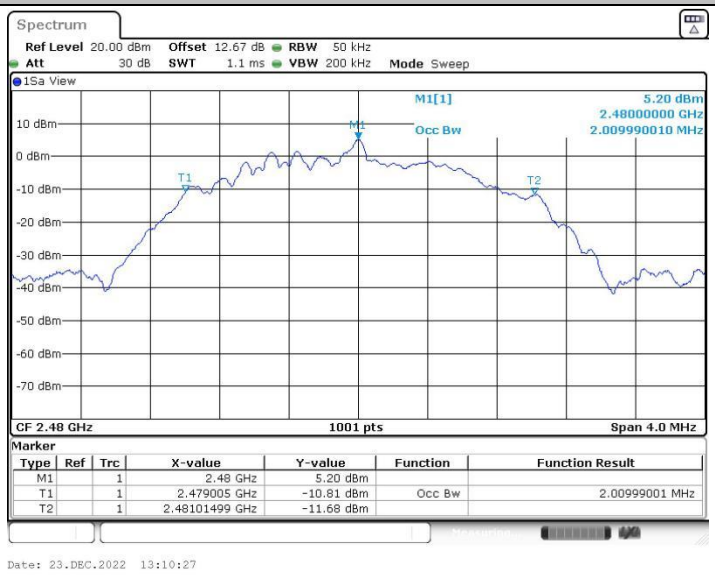
BLE_2M_Ant4_2440



BLE_2M_Ant5_2480



BLE_2M_Ant4_2480



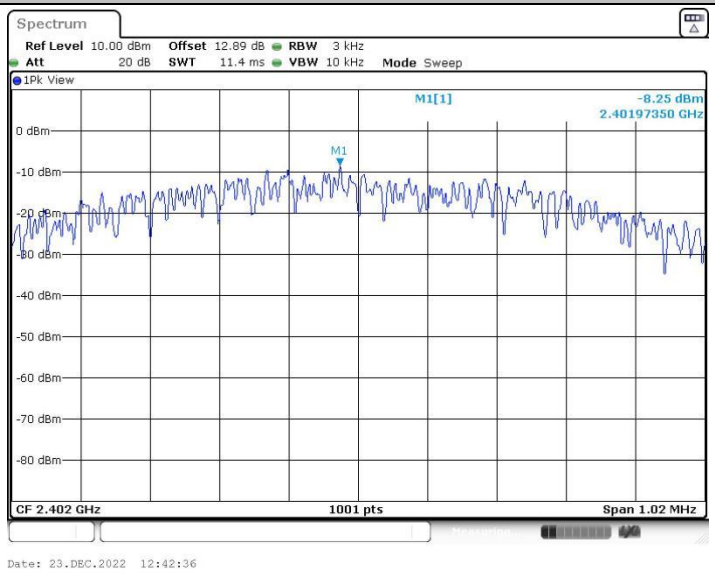
Maximum power spectral density

Test Result

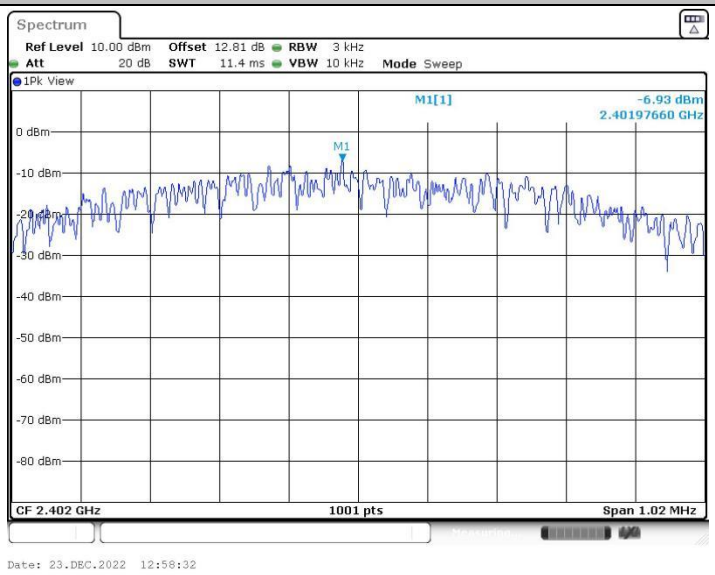
TestMode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant5	2402	-8.25	≤8.00	PASS
	Ant4	2402	-6.93	≤8.00	PASS
	Ant5	2440	-8.59	≤8.00	PASS
	Ant4	2440	-6.48	≤8.00	PASS
	Ant5	2480	-10.47	≤8.00	PASS
	Ant4	2480	-7.93	≤8.00	PASS
BLE_2M	Ant5	2402	-11.17	≤8.00	PASS
	Ant4	2402	-9.83	≤8.00	PASS
	Ant5	2440	-11.46	≤8.00	PASS
	Ant4	2440	-9.42	≤8.00	PASS
	Ant5	2480	-13.37	≤8.00	PASS
	Ant4	2480	-10.86	≤8.00	PASS

Test Graphs

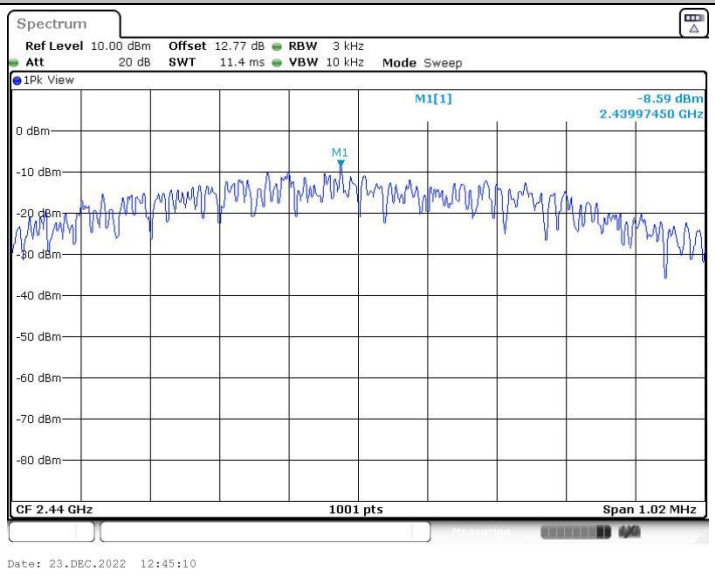
BLE_1M_Ant5_2402



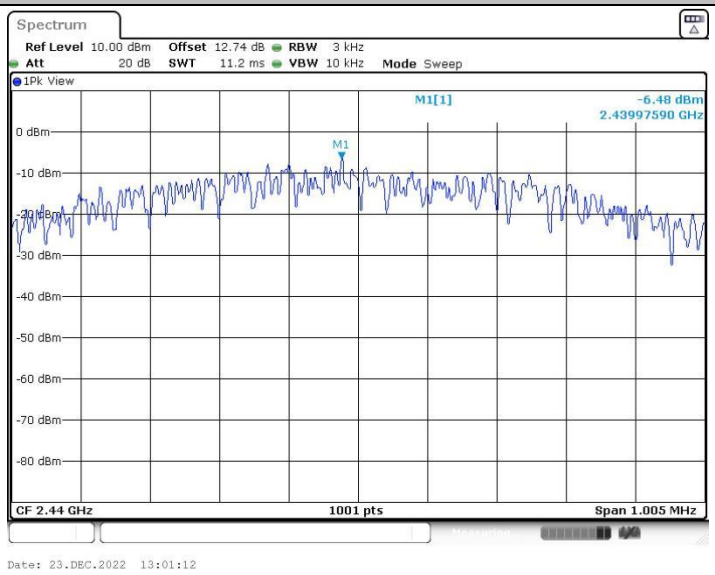
BLE_1M_Ant4_2402



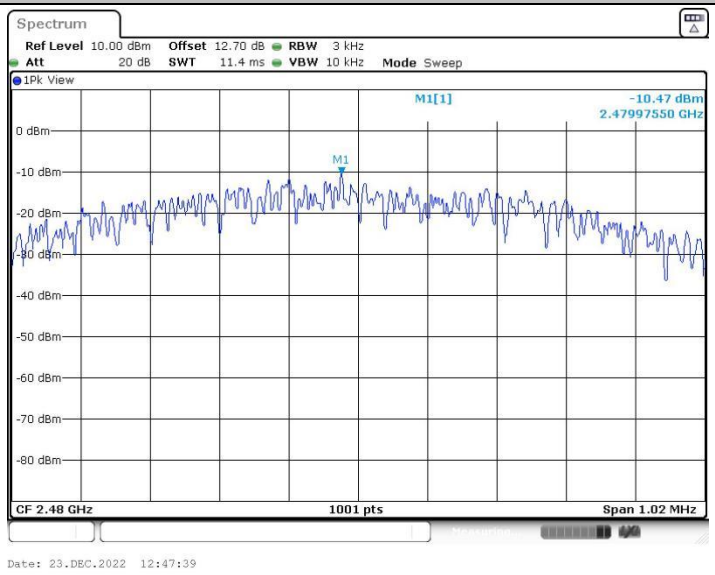
BLE_1M_Ant5_2440



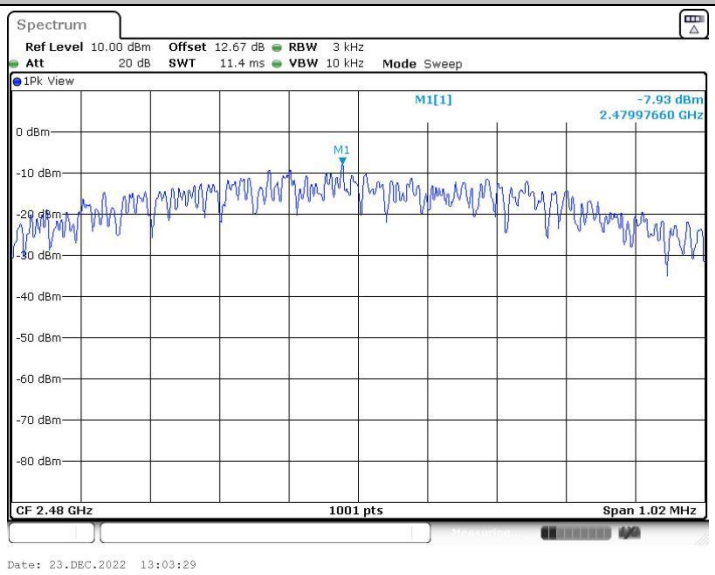
BLE_1M_Ant4_2440



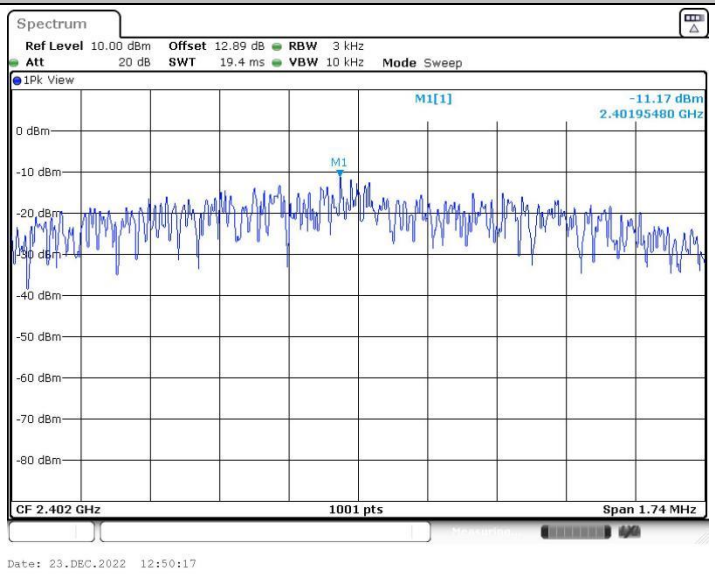
BLE_1M_Ant5_2480



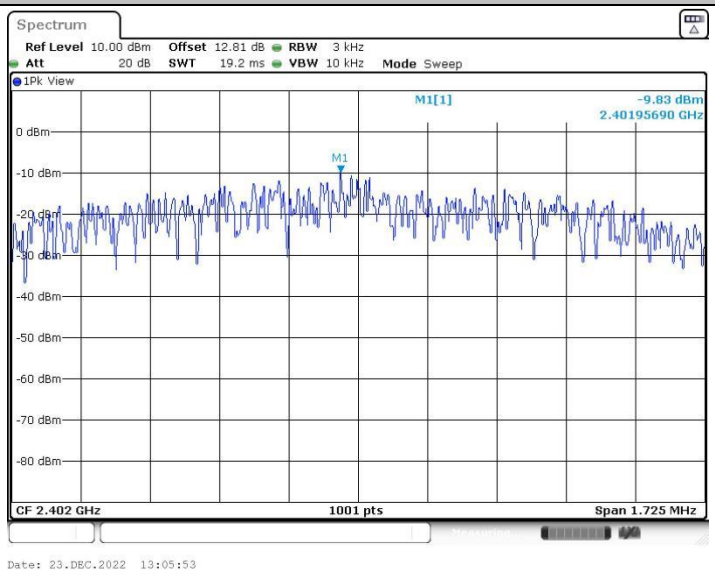
BLE_1M_Ant4_2480



BLE_2M_Ant5_2402



BLE_2M_Ant4_2402



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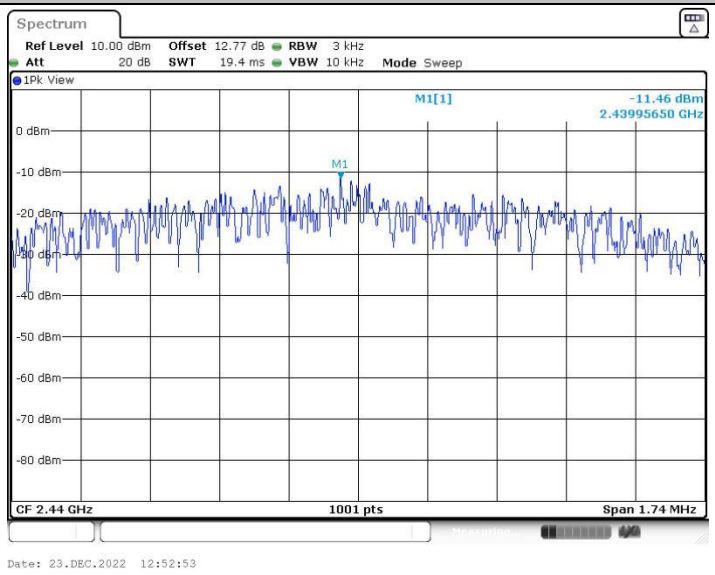
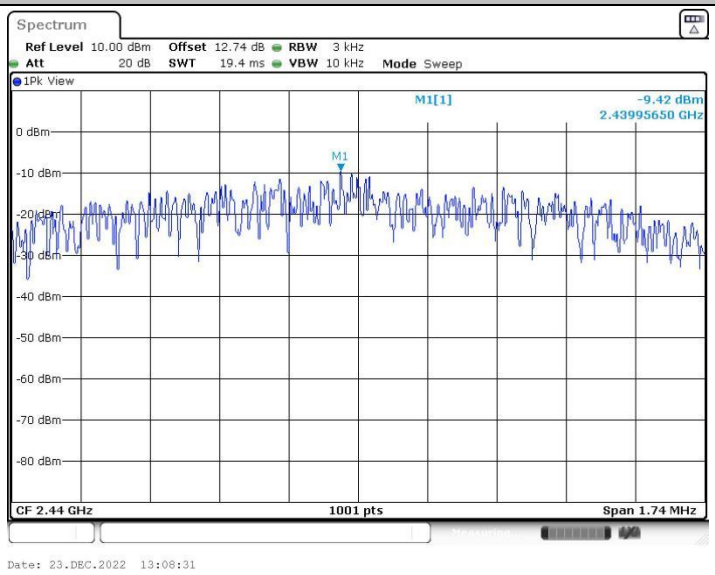
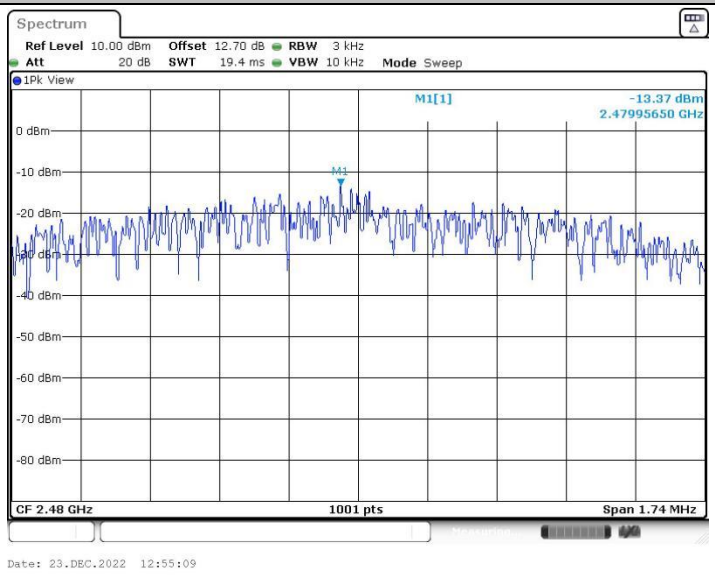


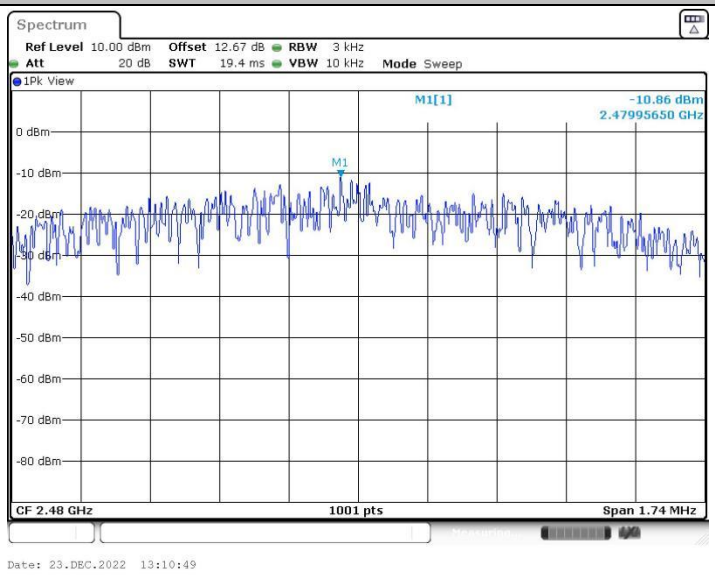
BLE_2M_Ant4_2440



BLE_2M_Ant5_2480



BLE_2M_Ant4_2480



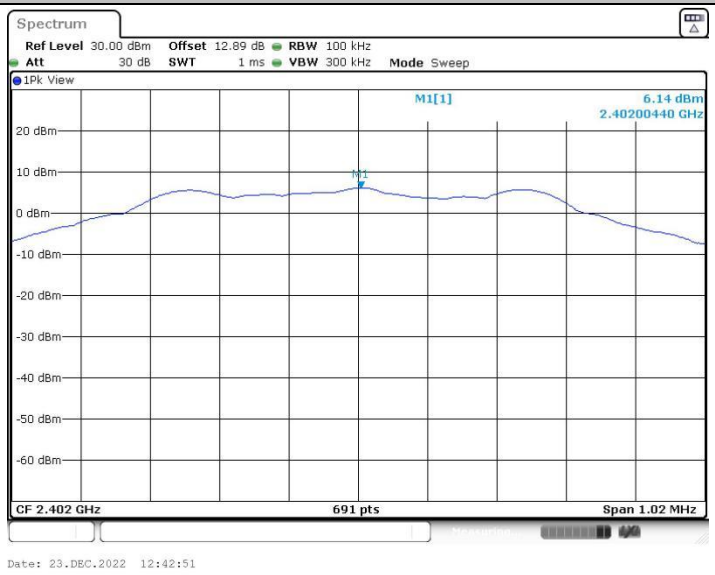
Reference level measurement

Test Result

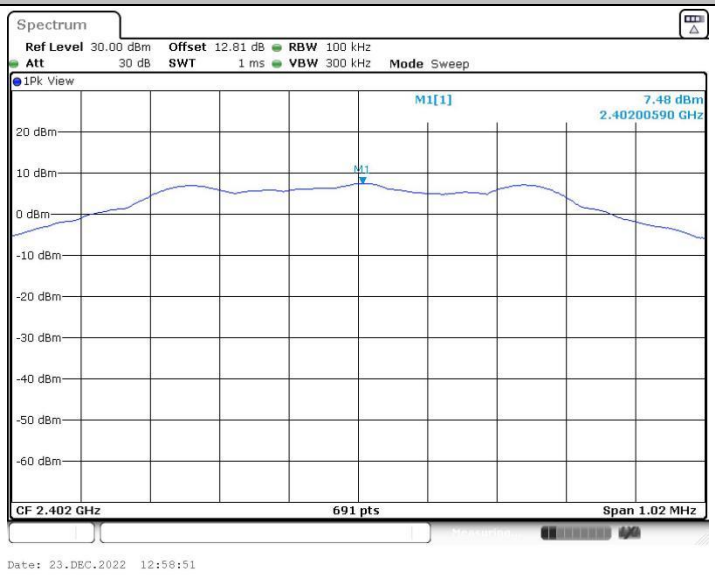
TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
BLE_1M	Ant5	2402	2402.00	6.14
	Ant4	2402	2402.01	7.48
	Ant5	2440	2440.00	5.72
	Ant4	2440	2440.01	7.84
	Ant5	2480	2480.01	3.82
	Ant4	2480	2480.01	6.41
BLE_2M	Ant5	2402	2402.01	6.16
	Ant4	2402	2402.01	7.52
	Ant5	2440	2440.01	5.76
	Ant4	2440	2440.01	7.85
	Ant5	2480	2480.01	3.91
	Ant4	2480	2480.01	6.41

Test Graphs

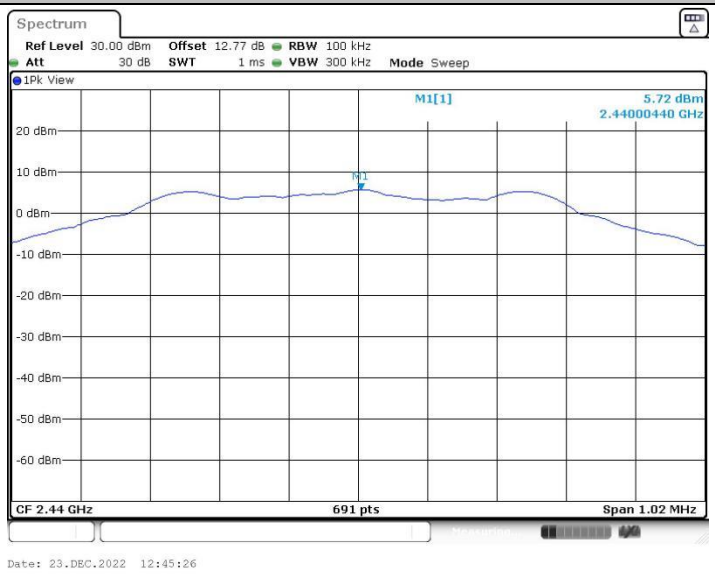
BLE_1M_Ant5_2402



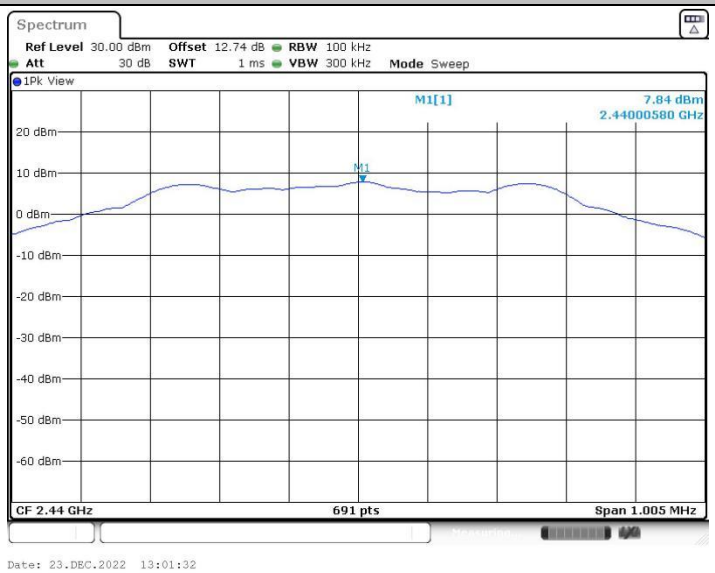
BLE_1M_Ant4_2402



BLE_1M_Ant5_2440



BLE_1M_Ant4_2440



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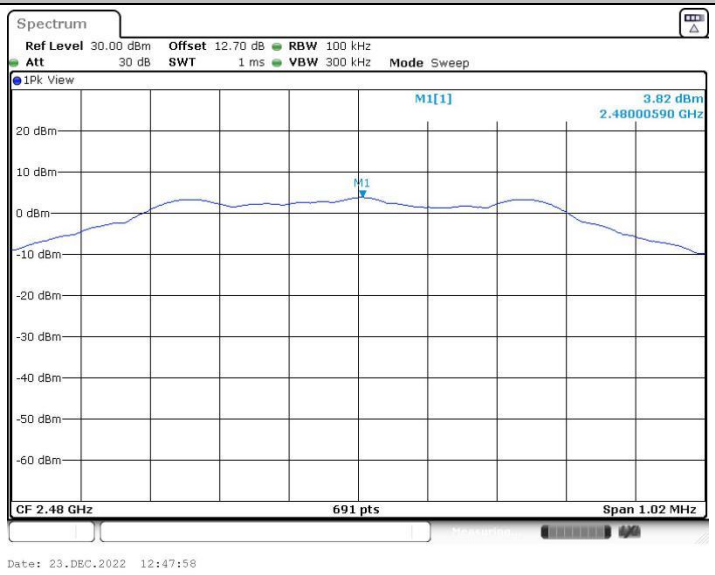
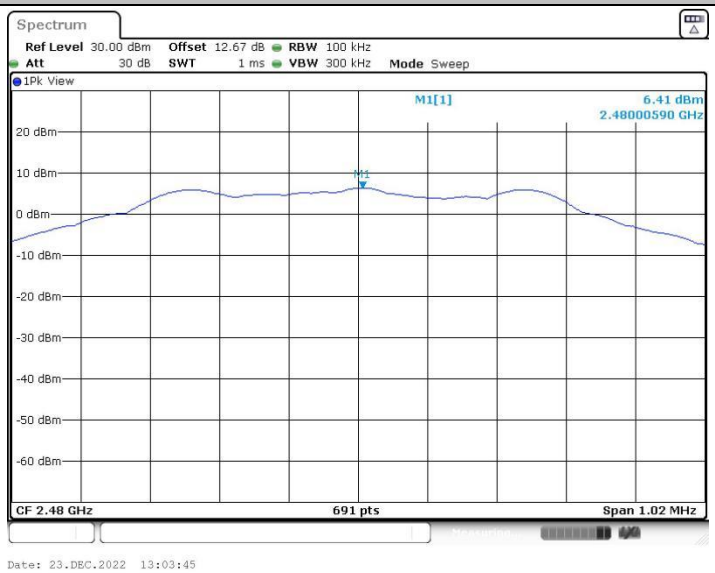
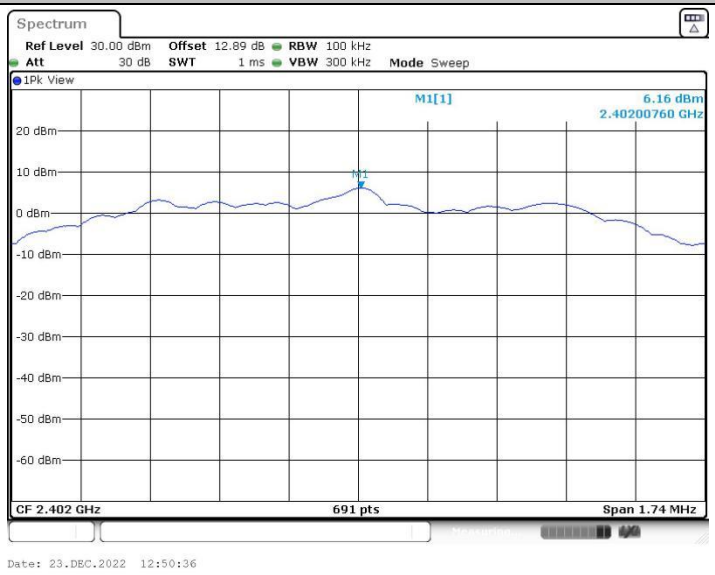


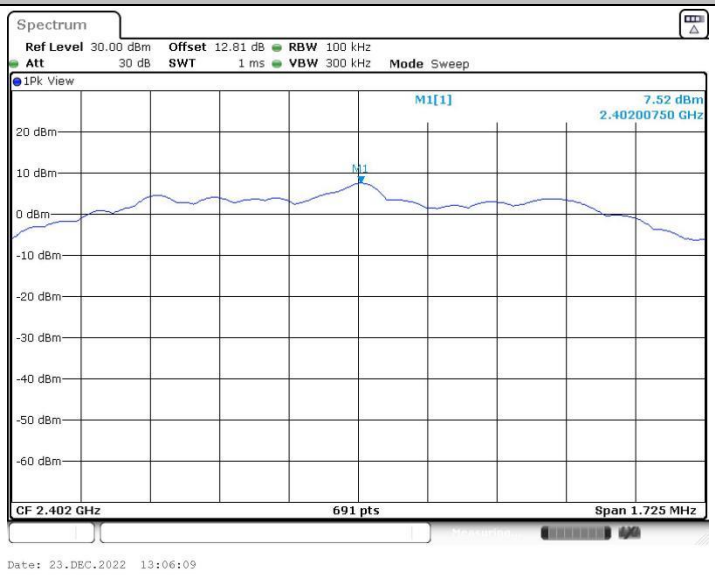
BLE_1M_Ant4_2480



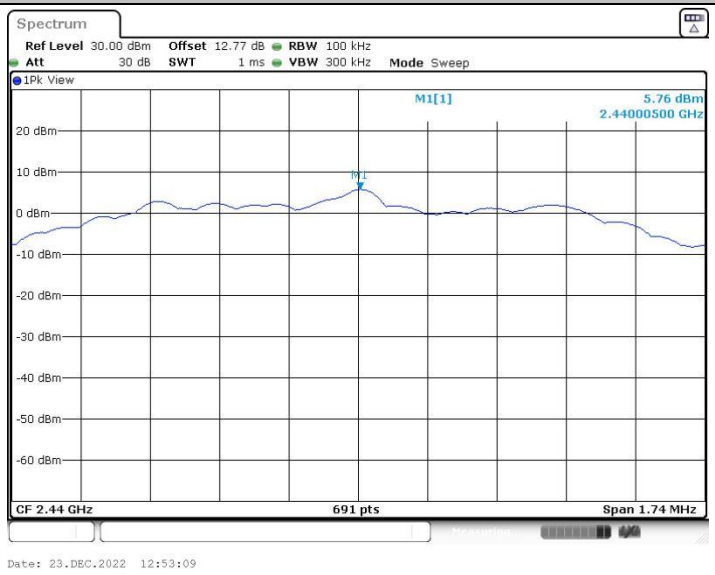
BLE_2M_Ant5_2402



BLE_2M_Ant4_2402



BLE_2M_Ant5_2440



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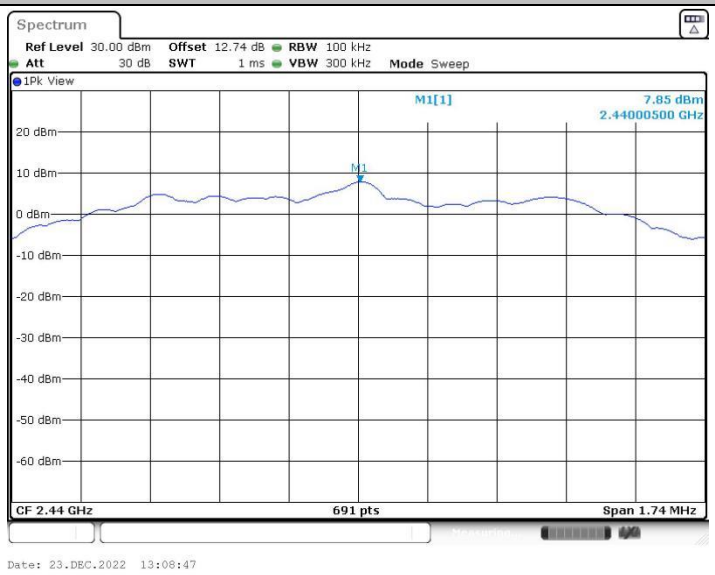
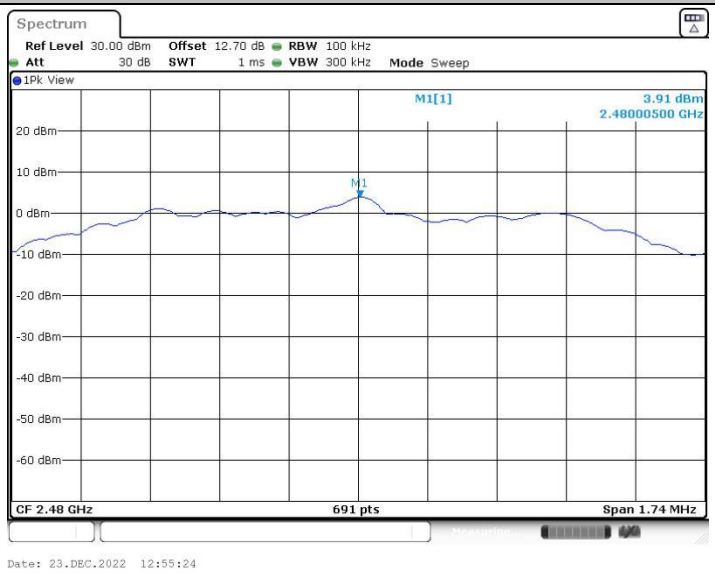
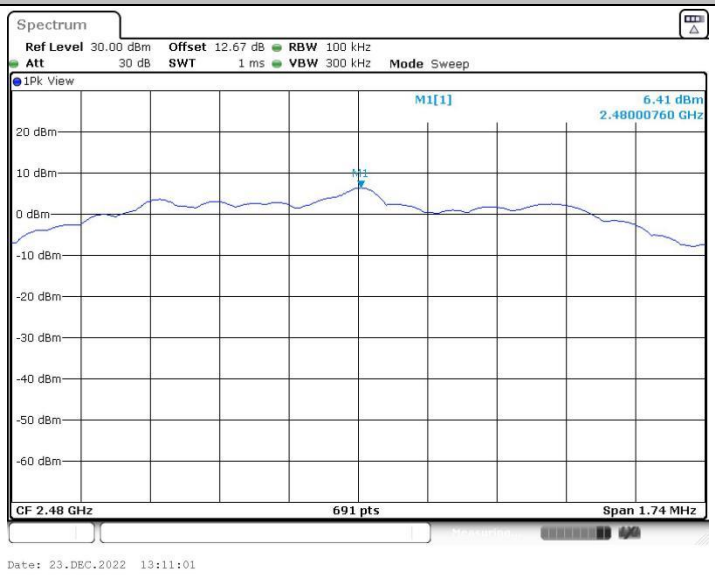


BLE_2M_Ant5_2480



BLE_2M_Ant4_2480



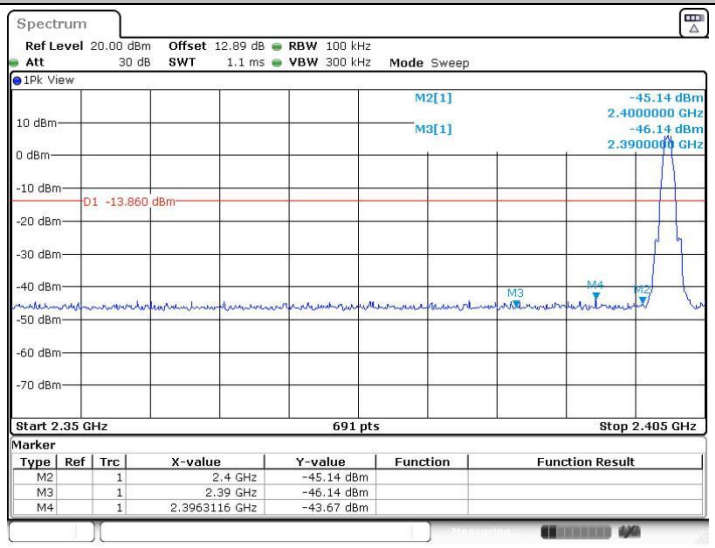
Band edge measurements

Test Result

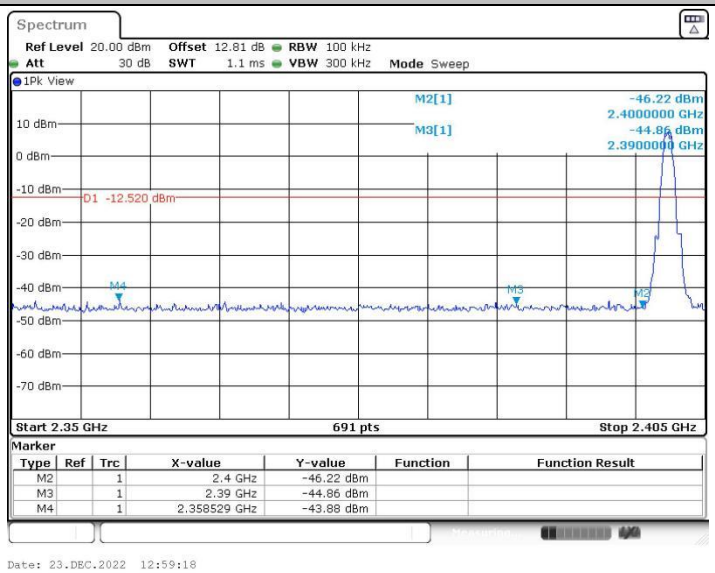
TestMode	Antenna	ChName	Freq (MHz)	RefLevel [dBm/100KHz]	Result [dBm/100KHz]	Limit [dBm/100KHz]	Verdict
BLE_1M	Ant5	Low	2402	6.14	-43.67	≤-13.86	PASS
	Ant4	Low	2402	7.48	-43.88	≤-12.52	PASS
	Ant5	High	2480	3.82	-43.69	≤-16.18	PASS
	Ant4	High	2480	6.41	-43.29	≤-13.59	PASS
BLE_2M	Ant5	Low	2402	6.16	-33.34	≤-13.84	PASS
	Ant4	Low	2402	7.52	-30.59	≤-12.48	PASS
	Ant5	High	2480	3.91	-43.58	≤-16.09	PASS
	Ant4	High	2480	6.41	-43.42	≤-13.59	PASS

Test Graphs

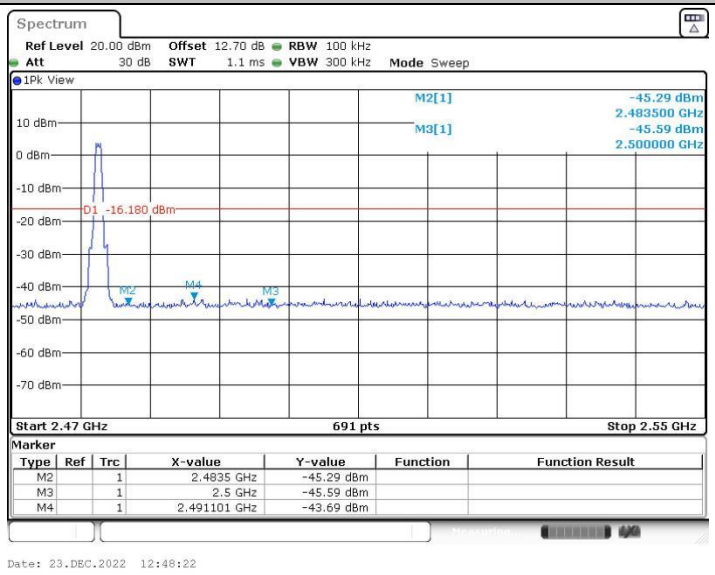
BLE_1M_Ant5_Low_2402



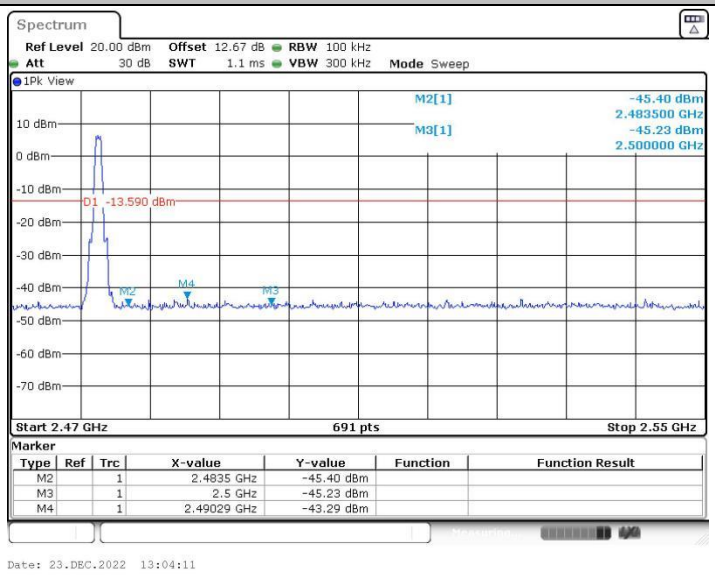
BLE_1M_Ant4_Low_2402



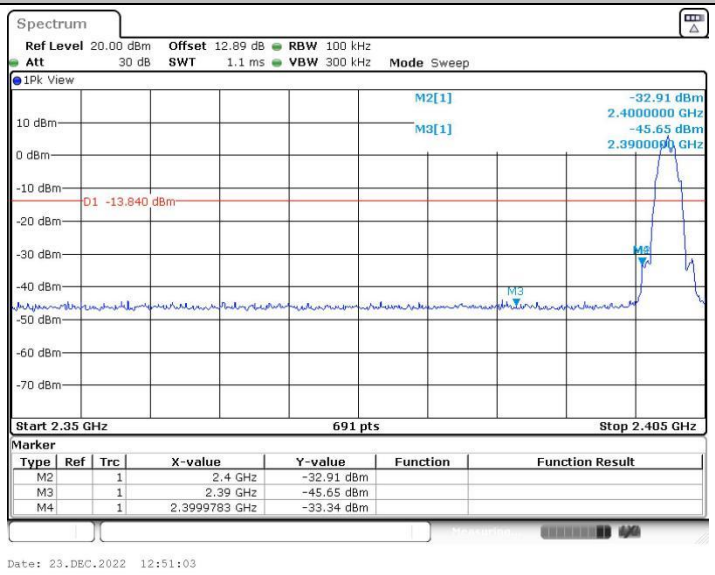
BLE_1M_Ant5_High_2480



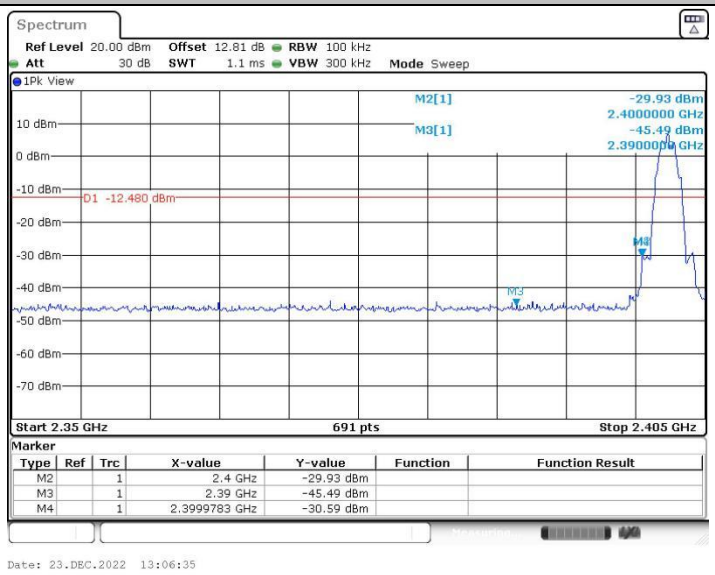
BLE_1M_Ant4_High_2480



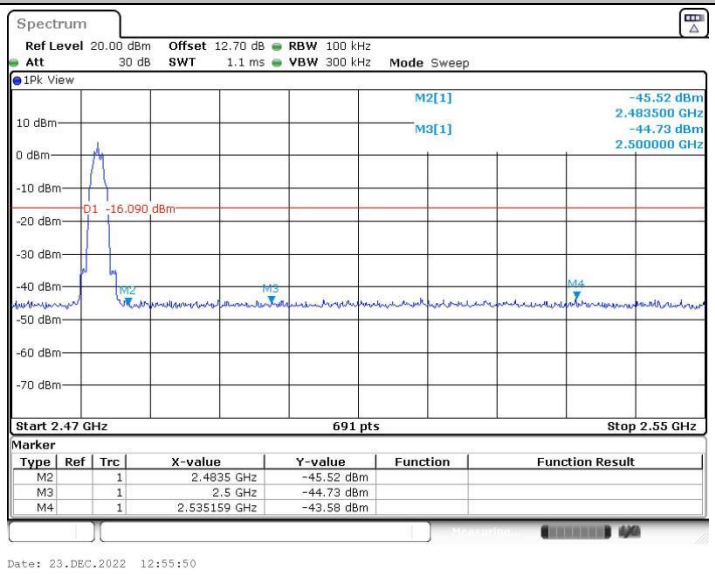
BLE_2M_Ant5_Low_2402



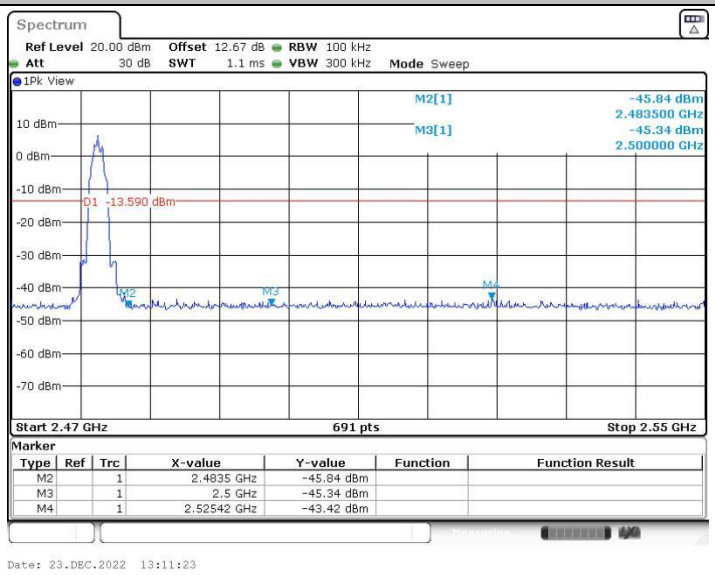
BLE_2M_Ant4_Low_2402



BLE_2M_Ant5_High_2480



BLE_2M_Ant4_High_2480



Conducted Spurious Emission

Test Result

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm/100KHz]	Result [dBm/100KHz]	Limit [dBm/100KHz]	Verdict
BLE_1M	Ant5	2402	30~1000	6.14	-55.15	≤-13.86	PASS
			1000~26500	6.14	-46.45	≤-13.86	PASS
	Ant4	2402	30~1000	7.48	-54.66	≤-12.52	PASS
			1000~26500	7.48	-46.38	≤-12.52	PASS
	Ant5	2440	30~1000	5.72	-55.61	≤-14.28	PASS
			1000~26500	5.72	-45.67	≤-14.28	PASS
	Ant4	2440	30~1000	7.84	-55.12	≤-12.16	PASS
			1000~26500	7.84	-46.96	≤-12.16	PASS
	Ant5	2480	30~1000	3.82	-55.28	≤-16.18	PASS
			1000~26500	3.82	-46.73	≤-16.18	PASS
	Ant4	2480	30~1000	6.41	-55.07	≤-13.59	PASS
			1000~26500	6.41	-46.35	≤-13.59	PASS
BLE_2M	Ant5	2402	30~1000	6.16	-55.26	≤-13.84	PASS
			1000~26500	6.16	-46.33	≤-13.84	PASS
	Ant4	2402	30~1000	7.52	-54.92	≤-12.48	PASS
			1000~26500	7.52	-46.35	≤-12.48	PASS
	Ant5	2440	30~1000	5.76	-55.12	≤-14.24	PASS
			1000~26500	5.76	-46.95	≤-14.24	PASS
	Ant4	2440	30~1000	7.85	-54.85	≤-12.15	PASS
			1000~26500	7.85	-46.68	≤-12.15	PASS
	Ant5	2480	30~1000	3.91	-55.67	≤-16.09	PASS
			1000~26500	3.91	-46.39	≤-16.09	PASS
	Ant4	2480	30~1000	6.41	-55.18	≤-13.59	PASS
			1000~26500	6.41	-46.14	≤-13.59	PASS