

# Test Report

Verified code: 184483

Report No.: E20230828994601-6

Customer: Lumi United Technology Co., Ltd

Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District,  
Nanshan District, Shenzhen, China

Sample Name: Motion and Light Sensor P2

Sample Model: ML-S03D

Receive Sample Date: Aug.28,2023

Test Date: Sep.04,2023 ~ Sep.05,2023

Reference Document: 47 CFR FCC Part 15 Subpart C  
RADIO FREQUENCY DEVICES:Subpart C—Intentional Radiators

Test Result: Pass

Prepared by: Chen Xiaocong  
Chen Xiaocong

Reviewed by: Jiang Tao  
Jiang Tao

Approved by: Xiao Liang  
Xiao Liang



GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2023-11-21

GRG METROLOGY & TEST GROUP CO., LTD.

Address: No.163, Pingyun Road, West of Huangpu Avenue, Guangzhou, Guangdong, China  
Tel: (+86) 400-602-0999 FAX: (+86) 020-38698685 Web: <http://www.grgtest.com>



## Statement

1. The report is invalid without "special seal for inspection and testing"; some copies are invalid; The report is invalid if it is altered or missing; The report is invalid without the signature of the person who prepared, reviewed and approved it.
2. The sample information is provided by the client and responsible for its authenticity; The content of the report is only valid for the samples sent this time.
3. When there are reports in both Chinese and English, the Chinese version will prevail when the language problems are inconsistent.
4. If there is any objection concerning the report, please inform us within 15 days from the date of receiving the report.
5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

----- The following blanks -----

## TABLE OF CONTENTS

1.	TEST RESULT SUMMARY .....	6
2.	GENERAL DESCRIPTION OF EUT.....	7
2.1	APPLICANT .....	7
2.2	MANUFACTURER .....	7
2.3	BASIC DESCRIPTION OF EQUIPMENT UNDER TEST .....	7
2.4	CHANNELLIST .....	8
2.5	TEST OPERATION MODE .....	8
2.6	LOCAL SUPPORTIVE .....	8
2.7	CONFIGURATION OF SYSTEM UNDER TEST .....	9
2.8	DUTY CYCLE.....	10
3.	LABORATORY AND ACCREDITATIONS .....	11
3.1	LABORATORY .....	11
3.2	ACCREDITATIONS .....	11
4.	MEASUREMENT UNCERTAINTY .....	12
5.	LIST OF USED TEST EQUIPMENT AT GRGT .....	13
6.	RADIATED SPURIOUS EMISSIONS .....	14
6.1	LIMITS.....	14
6.2	TEST PROCEDURES .....	14
6.3	TEST SETUP .....	17
6.4	DATA SAMPLE .....	19
6.5	TEST RESULTS .....	20
7.	6dB BANDWIDTH.....	30
7.1	LIMITS.....	30
7.2	TEST PROCEDURES .....	30
7.3	TEST SETUP .....	30
7.4	TEST RESULTS .....	31
8.	MAXIMUM PEAK OUTPUT POWER .....	35
8.1	LIMITS.....	35
8.2	TEST PROCEDURES .....	35
8.3	TEST SETUP .....	35
8.4	TEST RESULTS .....	35
9.	POWER SPECTRAL DENSITY .....	36
9.1	LIMITS.....	36
9.2	TEST PROCEDURES .....	36
9.3	TEST SETUP .....	36
9.4	TEST RESULTS .....	36
10.	CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS .....	41
10.1	LIMITS.....	41
10.2	TEST PROCEDURES .....	41
10.3	TEST SETUP .....	41
10.4	TEST RESULTS .....	42

11. RESTRICTED BANDS OF OPERATION..... 55

11.1 LIMITS..... 55

11.2 TEST PROCEDURES ..... 56

11.3 TEST SETUP ..... 56

11.4 TEST RESULTS ..... 57

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM ..... 68

APPENDIX B. PHOTOGRAPH OF THE EUT ..... 68

----- The following blanks -----

REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20230828994601-6	Original Issue	2023-11-02

----- The following blanks -----

**1. TEST RESULT SUMMARY**

<b>Technical Requirements</b>		
47 CFR FCC Part 15 Subpart C 15.247 ANSI C63.10-2013 KDB 558074 D01 15.247 measurement guidance v05r02		
<b>Limit / Severity</b>	<b>Item</b>	<b>Result</b>
§15.203	Antenna Requirement	Pass
§15.207(a)	Conducted Emission	N/A <sup>1)</sup>
§15.247(d)&15.205& 15.209	Radiated Spurious Emission	Pass
§15.247(b)(3)	Maximum Peak Output Power	Pass
§15.247(e)	Power Spectral Density	Pass
§15.247(a)(2)	6dB bandwidth	Pass
§15.247(d)	Conducted band edges and Spurious Emission	Pass
§15.247(d)&15.205& 15.209	Restricted bands of operation	Pass

Note:

<sup>1)</sup>Test is not applicable to this Equipment. This EUT is no AC mains power ports.

2)The antenna is PIFA antenna. The max gain of antenna is 0.95dBi, which accordance 15.203, is considered sufficient to comply with the provisions of this section.

----- The following blanks -----



## 2. GENERAL DESCRIPTION OF EUT

### 2.1 APPLICANT

Name: Lumi United Technology Co., Ltd  
Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

### 2.2 MANUFACTURER

Name: Lumi United Technology Co., Ltd  
Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

### 2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Motion and Light Sensor P2  
Model No.: ML-S03D  
Adding Model: ML-S03E  
Models Difference: ML-S03E & ML-S03D have the same technical construction including circuit diagram, PCB LAYOUT, hardware version and software version identical, except sales area and packaging are different.

Trade Name: Aqara  
FCC ID: 2AKIT-MLS03  
Power supply: DC 3V power supplied by battery  
Battery Specification: Model:CR2450  
Nominal Voltage:3.0Vdc  
Frequency Band: 2402MHz-2480MHz  
Transmit Power: GFSK for 1Mbps:9.82dBm  
GFSK for 2Mbps:9.81dBm  
Modulation type: GFSK for 1Mbps  
GFSK for 2Mbps  
Channel space: 2MHz  
Antenna Specification: PIFA antenna with 0.95dBi gain (Max.)  
Temperature Range: -10 °C ~ 55 °C  
Hardware Version: X3  
Software Version: 0.0.0.1

Sample No: E20230828994601-0002, E20230828994601-0009

Note 1: The EUT antenna gain is provided by the applicant. This report is made solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

Note 2: All the tests were performed on the model ML-S03D.

## 2.4 CHANNELLIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
<b>*00</b>	<b>2402</b>	10	2422	20	2442	30	2462
01	2404	11	2424	21	2444	31	2464
02	2406	12	2426	22	2446	32	2466
03	2408	13	2428	23	2448	33	2468
04	2410	14	2430	24	2450	34	2470
05	2412	15	2432	25	2452	35	2472
06	2414	16	2434	26	2454	36	2474
07	2416	17	2436	27	2456	37	2476
08	2418	18	2438	28	2458	38	2478
09	2420	<b>*19</b>	<b>2440</b>	29	2460	<b>*39</b>	<b>2480</b>

\* is the test frequency

## 2.5 TEST OPERATION MODE

Mode No.	Description of the modes
1	Bluetooth (BLE) fixed frequency transmitting

## 2.6 LOCAL SUPPORTIVE

Name of equipment	Manufacturer	Model	Serial number	Note
Notebook	LENOVO	TianYi 310-14ISK	MP18DLC6	/
Test board	/	/	/	/

No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	DC cable	1	No	0	0.3m
2	DC cable	1	No	0	1.0m



2.7 CONFIGURATION OF SYSTEM UNDER TEST



Test software:

Software version	Test level
QCOM_V1.0	BLE 1M 2402MHz: 8 BLE 1M 2440MHz: 8 BLE 1M 2480MHz: 8 BLE 2M 2402MHz: 8 BLE 2M 2440MHz: 8 BLE 2M 2480MHz: 8

----- The following blanks -----

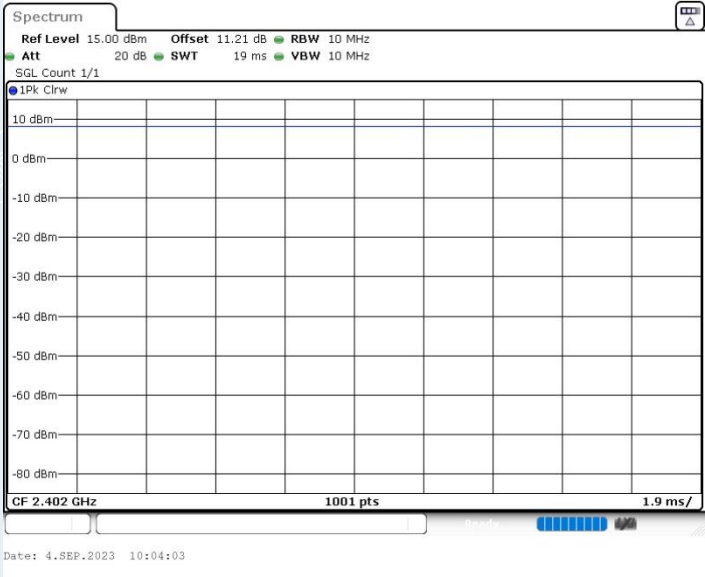
2.8 DUTY CYCLE

Environment: 23.8℃/47%RH/101.0kPa  
Tested By: Qin Tingting

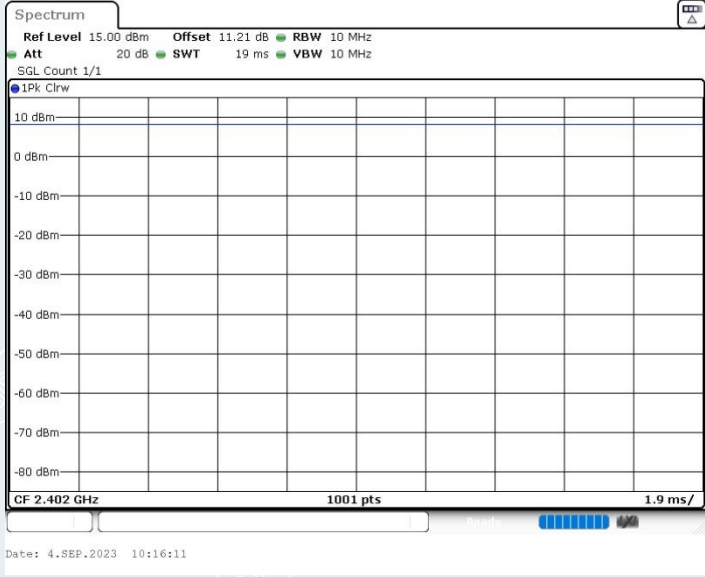
Voltage: DC 3V  
Date: 2023-09-04

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	DC [%]	T [s]
BLE_1M	Ant1	2402	1.00	1.00	100.00	/
BLE_2M	Ant1	2402	1.00	1.00	100.00	/

BLE\_1M\_2402MHz



BLE\_2M\_2402MHz



### 3. LABORATORY AND ACCREDITATIONS

#### 3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

Add.: No.1301 Guangang Road Xinlan Community, Guanlan Street, Longhua District  
Shenzhen, 518110, People's Republic of China

P.C.: 518110

Tel : 0755-61180008

Fax: 0755-61180008

#### 3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

**USA** A2LA(Certificate #2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

**Canada** ISED (Company Number: 24897, CAB identifier:CN0069)

**USA** FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site,  
<http://www.grgtest.com>

----- The following blanks -----

#### 4. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Radiated Emission	Coplanar	9kHz~30MHz	4.4dB <sup>1)</sup>
	Coaxial	9kHz~30MHz	4.4dB <sup>1)</sup>
	Horizontal	30MHz~200MHz	4.6dB <sup>1)</sup>
		200MHz~1000MHz	4.8dB <sup>1)</sup>
		1GHz~18GHz	5.0dB <sup>1)</sup>
		18GHz~26.5GHz	5.2dB <sup>1)</sup>
	Vertical	30MHz~200MHz	4.7dB <sup>1)</sup>
		200MHz~1000MHz	4.7dB <sup>1)</sup>
		1GHz~18GHz	5.1dB <sup>1)</sup>
		18GHz~26.5GHz	5.4dB <sup>1)</sup>
Conduction Emission		150kHz~30MHz	3.3dB <sup>1)</sup>

Measurement	Uncertainty
RF frequency	$6.0 \times 10^{-6}$
RF power conducted	0.80dB
Power spectral density conducted	0.80dB
Occupied channel bandwidth	0.40dB
Unwanted emission, conducted	0.70dB
Humidity	6.0%
Temperature	2.0°C

Note:

<sup>1)</sup> This uncertainty represents an expanded uncertainty expressed at approximately the 95%.  
This uncertainty represents an expanded uncertainty factor of  $k=2$ .

**5. LIST OF USED TEST EQUIPMENT AT GRGT**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
<b>Radiated Spurious Emission&amp;Restricted bands of operation</b>				
Test S/W	EZ	CCS-03A1		
Test Receiver	R&S	ESR7	102444	2024-08-11
Preamplifier	EMEC	EM330	I00426	2024-02-06
Bi-log Antenna	Schwarzbeck	CBL6143A	26039	2024-10-23
Loop Antenna	TESEQ	HLA6121	52599	2024-02-03
Test Receiver	R&S	ESR26	101758	2023-10-27
Horn Antenna	Schwarzbeck	BBHA9120D	02143	2023-10-15
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170-497	2023-10-14
Amplifier	Tonscend	TAP01018048	AP20E8060075	2024-04-11
Amplifier	SHIRONG ELECTRONIC	DLNA-1G18G- G40	20200928005	2024-08-17
Test S/W	Tonscend	JS36-RE/2.5.1.5		
<b>6dB Bandwidth&amp;Conducted band edges and Spurious Emission&amp;Power Spectral Density&amp; Maximum Peak Output Power</b>				
Spectrum Analyzer	R&S	FSV30	104381	2024-10-13
Automatic power measuring unit	TONSCEND	JS0806-2	21B8060365	2023-11-17
BT/WIFI System	Tonscend	JS1120-3		

Note:

1. The calibration cycle of the above instruments is 12 months.



## 6. RADIATED SPURIOUS EMISSIONS

### 6.1 LIMITS

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required.

Frequency (MHz)	Quasi-peak( $\mu\text{V/m}$ )	Measurement distance(m)	Quasi-peak(dB $\mu\text{V/m}$ )@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

**NOTE:**

- (1) The emission limits for the ranges 9-90kHz and 110-490kHz are based on measurements employing a linear average detector.
- (2) The lower limit shall apply at the transition frequencies.
- (3) Above 18GHz test distance is 1m, so the Peak Limit=74+20\*log(3/1)=83.54 (dB $\mu\text{V/m}$ ).  
The Avg Limit=54+20\*log(3/1)=63.54 (dB $\mu\text{V/m}$ ).

### 6.2 TEST PROCEDURES

#### 1) Sequence of testing 9kHz to 30MHz

**Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate fixed frequency transmitting conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3meter.
- The EUT was set into operation.

**Pre measurement:**

- The turntable rotates from 0 ° to 360 °.
- The antenna height is 1.0 meter.
- The antenna is polarized X,Y and Z.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**

- Identified emissions during the pre measurement the software maximizes by rotating the turntable

position (0 ° to 360 °) and by rotating the elevation axes (0 ° to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

## 2) Sequence of testing 30MHz to 1GHz

### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate fixed frequency transmitting conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

### Pre measurement:

--- The turntable rotates from 0 ° to 360 °.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

## 3) Sequence of testing 1GHz to 18GHz

### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate fixed frequency transmitting conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Pre measurement:**

- The turntable rotates from 0 ° to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

**Final measurement:**

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

**4) Sequence of testing above 18GHz****Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate fixed frequency transmitting conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

**Pre measurement:**

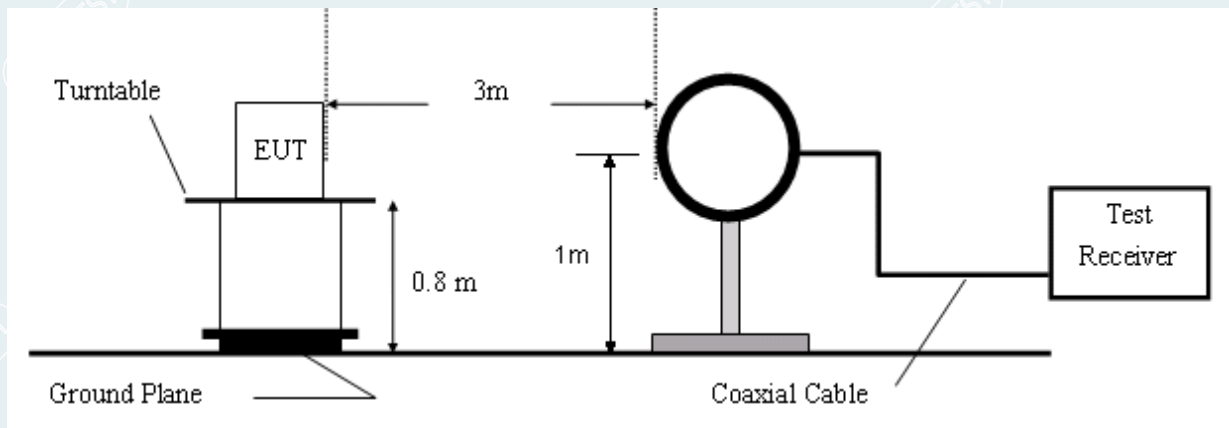
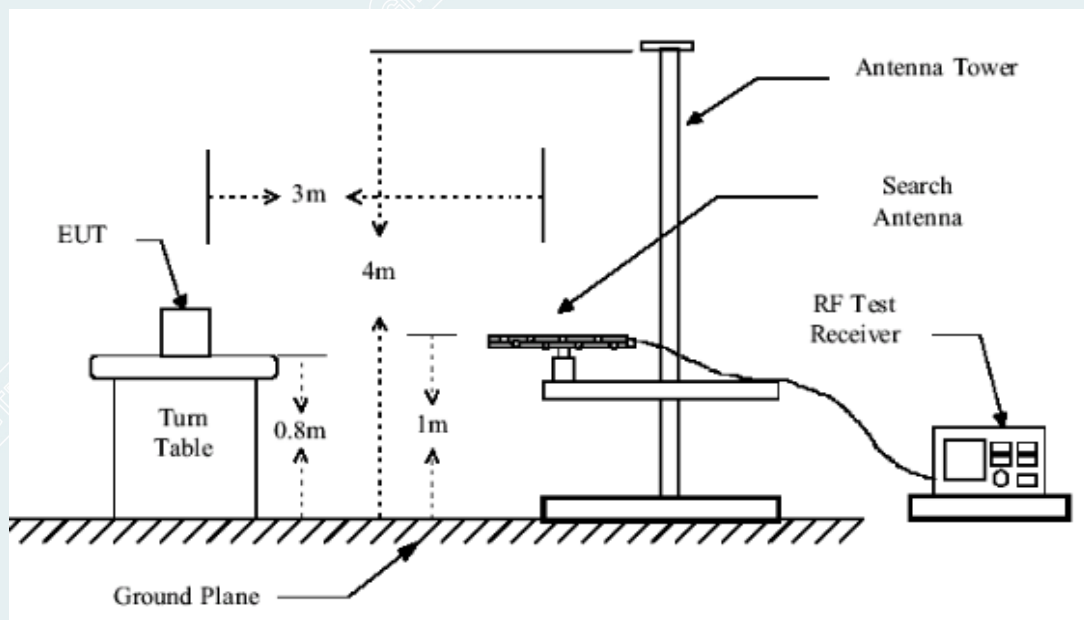
- The turntable rotates from 0 ° to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

**Final measurement:**

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

**NOTE:**

- (a). The frequency from 9kHz to 150kHz, Set RBW=300Hz (for Peak&AVG), VBW=300Hz (for Peak&AVG). The frequency from 150kHz to 30MHz, Set RBW=9kHz, VBW=9kHz, (for QP Detector).
- (b). The frequency from 30MHz to 1GHz, Set RBW=120kHz, VBW=300kHz, (for QP Detector).
- (c). The frequency above 1GHz, for Peak detector: Set RBW=1MHz, VBW=3MHz.
- (d). The frequency above 1GHz, for Avg detector: Set RBW=1MHz, if the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set  $VBW \leq RBW/100$  (i.e., 10kHz) but not less than 10 Hz. If the EUT duty cycle is  $< 98\%$ , set  $VBW \geq 1/T$ , Where T is defined in section 2.8.

**6.3 TEST SETUP****Figure 1. 9kHz to 30MHz radiated emissions test configuration****Figure 2. 30MHz to 1GHz radiated emissions test configuration**



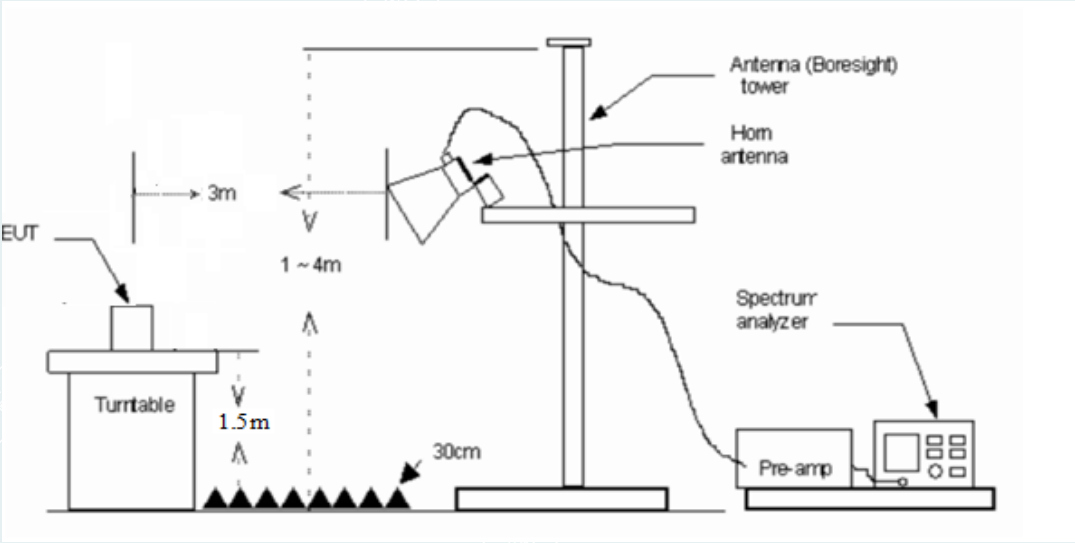


Figure 3. 1GHz to 18GHz radiated emissions test configuration

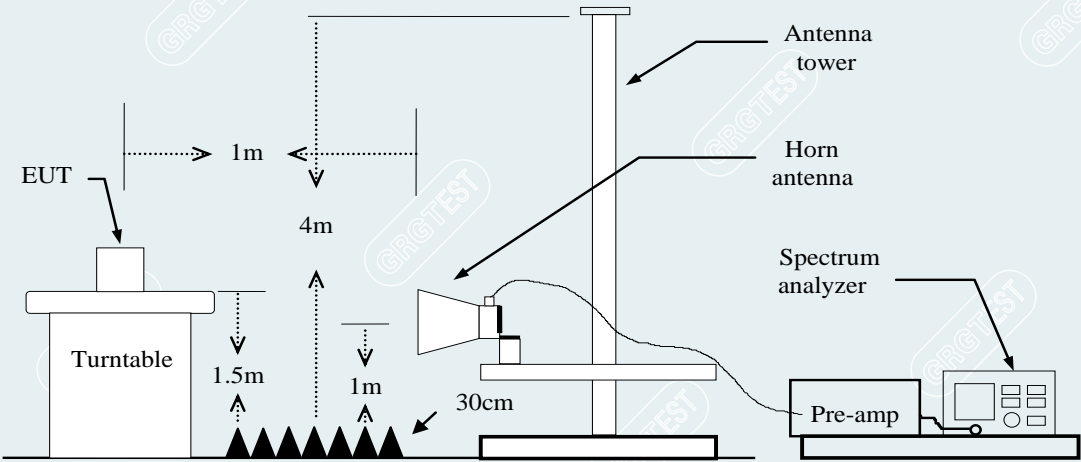


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

----- The following blanks -----



**6.4 DATA SAMPLE****30MHz to 1GHz**

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Heigh (cm)	Detectortype
XXX.XXXX	48.49	-9.91	38.58	47.00	-8.42	100	108	QP

Frequency (MHz)	= Emission frequency in MHz
Reading (dBuV)	= Uncorrected Analyzer / Receiver reading
Correct Factor (dB/m)	= Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m)	= Reading (dBuV) + Correct Factor (dB/m)
Limit (dBuV/m)	= Limit stated in standard
Margin (dB)	= Result (dBuV/m)-Limit (dBuV/m)
Peak	= Peak Reading
QP	= Quasi-peak Reading

**1GHz-18GHz**

No.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Remark
xxx	xxxx	78.01	55.30	-22.71	74.00	18.70	100	50	Horizontal	Peak
xxx	xxxx	66.37	43.66	-22.71	54.00	10.34	100	50	Horizontal	AVG

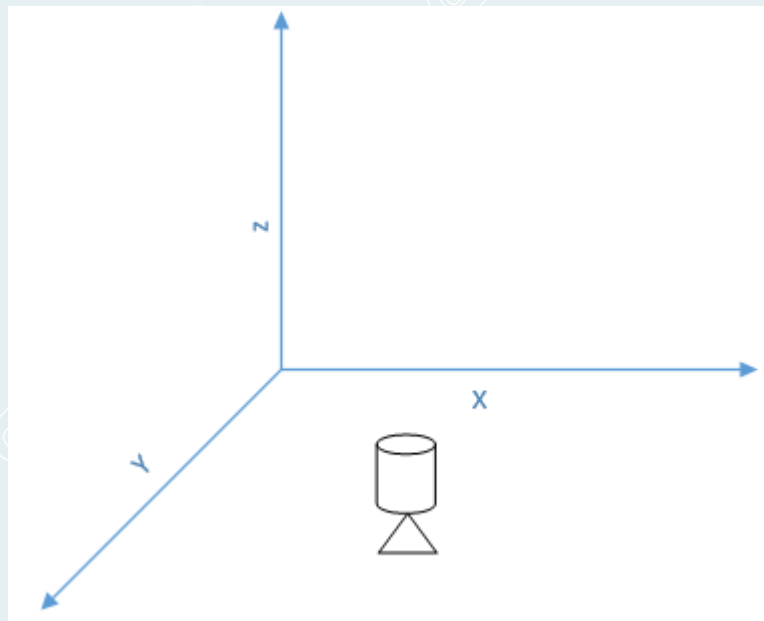
**Above 18GHz**

NO.	Freq. [MHz]	Reading [dBμV/m]	Level for 1m [dBμV/m]	Level for 3m [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Remark
xxx	xxxx	54.49	42.38	32.84	-12.11	74	41.16	100	211	Horizontal	Peak
xxx	xxxx	43.99	31.88	22.34	-12.11	54	31.66	100	211	Horizontal	AVG

Frequency (MHz)	= Emission frequency in MHz
Reading (dBuV/m)	= Uncorrected Analyzer / Receiver reading
Factor (dB)	= Antenna factor + Cable loss – Amplifier gain
Level for 1m (dBuV/m)	= Reading (dBuV/m) + Factor (dB)
Level for 3m (dBuV/m)	= Level for 1m (dBuV/m) + 20*log(1/3)
Limit (dBuV/m)	= Limit stated in standard
Margin (dB)	= Limit (dBuV/m) – Level (dBuV/m)
Polarity	= Antenna polarization
Peak	= Peak Reading
AVG	= Average Reading

## 6.5 TEST RESULTS

The test are under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the Z position. So the data shown the Z position only.

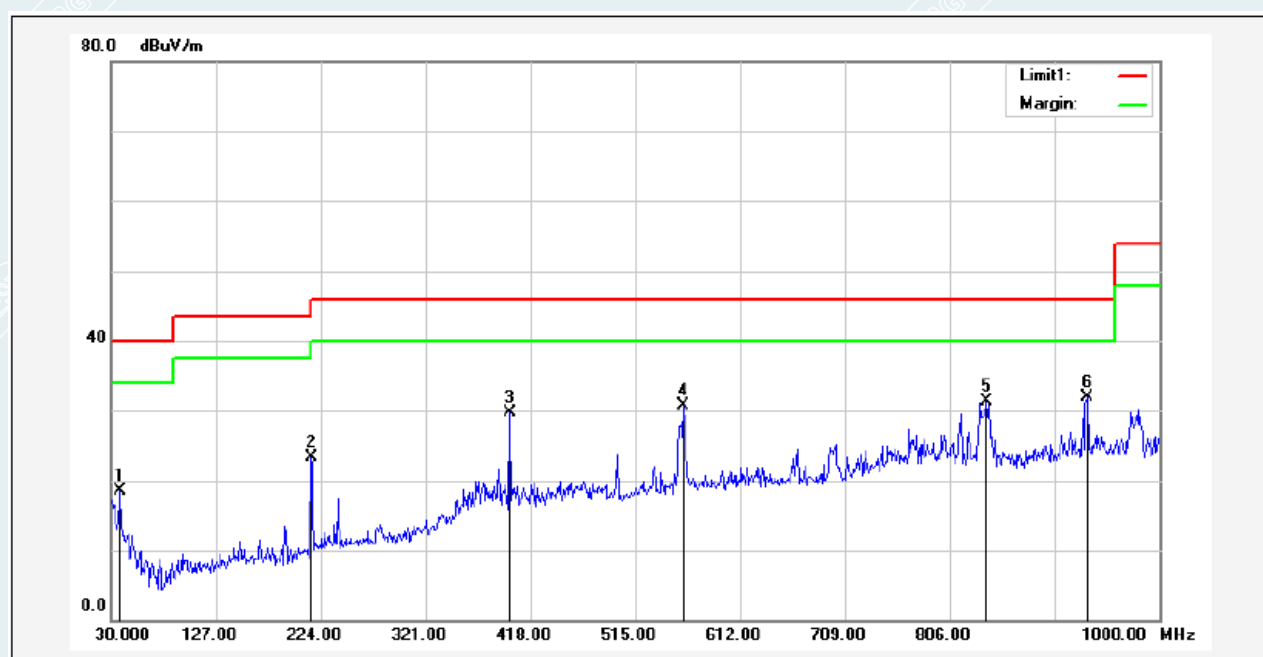


----- The following blanks -----

**Below 1GHz**

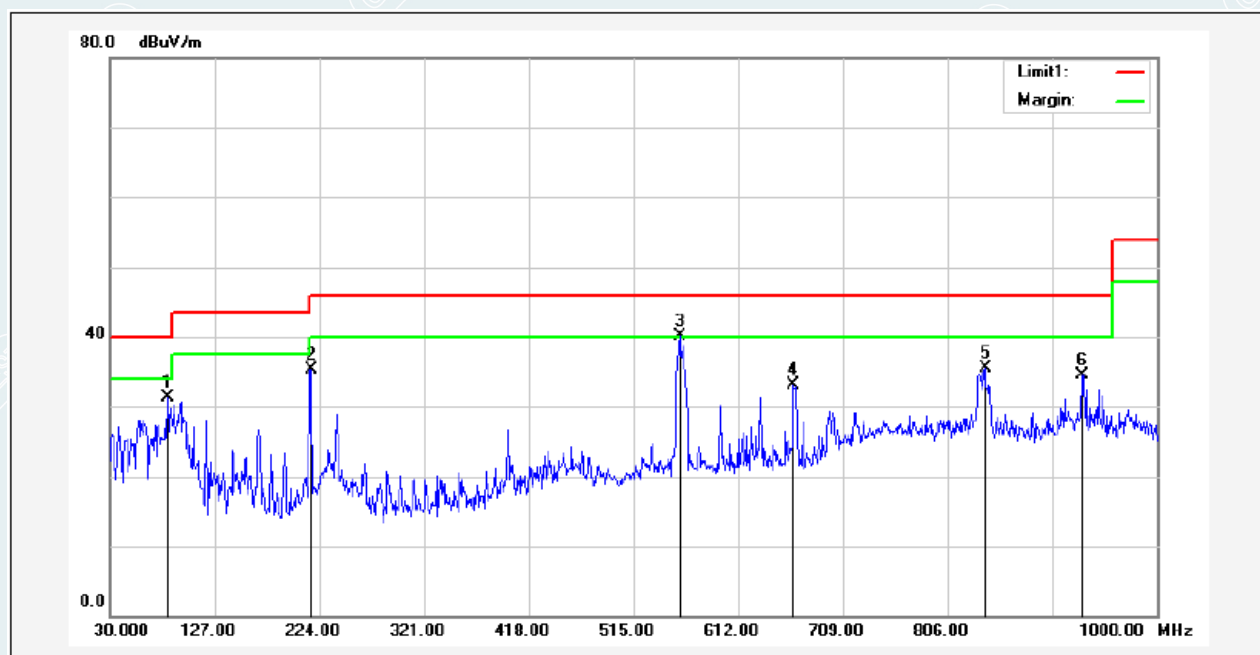
Only the worst mode and Frequency were recorded in this report. Middle Frequency (2440MHz\_2M)

EUT Name:	Motion and Light Sensor P2	Test Mode:	Mode 1
Model:	ML-S03D	Sample No:	E20230828994601-0009
Power supply:	DC 3V	Environmental Conditions:	25.6°C/58%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-09-05
Frequency	2440MHz(TX/ BLE_2M)	Polarity:	Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Detector type
1	38.7300	39.99	-21.41	18.58	40.00	-21.42	272	100	QP
2	215.2700	48.92	-25.67	23.25	43.50	-20.25	162	200	QP
3	398.6000	49.34	-19.73	29.61	46.00	-16.39	360	189	QP
4	559.6200	46.96	-16.19	30.77	46.00	-15.23	93	200	QP
5	839.9500	44.57	-13.23	31.34	46.00	-14.66	360	196	QP
6*	933.0700	44.23	-12.26	31.97	46.00	-14.03	360	119	QP

EUT Name:	Motion and Light Sensor P2	Test Mode:	Mode 1
Model:	ML-S03D	Sample No:	E20230828994601-0009
Power supply:	DC 3V	Environmental Conditions:	25.6°C/58%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-09-05
Frequency	2440MHz(TX/ BLE_2M)	Polarity:	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Detector type
1	83.3500	62.55	-31.23	31.32	40.00	-8.68	248	100	QP
2	216.2400	60.92	-25.64	35.28	46.00	-10.72	204	100	QP
3*	557.6800	56.37	-16.21	40.16	46.00	-5.84	0	100	QP
4	663.4100	48.41	-15.30	33.11	46.00	-12.89	342	100	QP
5	840.9200	48.78	-13.22	35.56	46.00	-10.44	42	100	QP
6	930.1600	46.85	-12.31	34.54	46.00	-11.46	20	100	QP

**Remark:**

- 1 No emission found between lowest internal used/generated frequency to 30MHz.
- 2 Radiated emissions measured in frequency range from 9kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
- 3 The IF bandwidth of Receiver between 30MHz to 1GHz was 120kHz.

**1GHz-18GHz:**

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Mode: TX/ BLE\_1M

Lowest Frequency (2402MHz)

Environment: 25.8°C/53%RH/101.0kPa

Tested By:Zhang Zishan

Voltage: DC 3V

Date: 2023-09-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1112.8000	56.50	46.99	-9.51	74.00	27.01	100	140	Horizontal
2	1784.0000	51.63	44.06	-7.57	74.00	29.94	100	77	Horizontal
3	2543.4000	49.45	47.15	-2.30	74.00	26.85	100	150	Horizontal
4	3370.5000	61.10	49.42	-11.68	74.00	24.58	100	221	Horizontal
5	7204.5000	46.99	50.23	3.24	74.00	23.77	100	138	Horizontal
6	15676.5000	39.04	50.65	11.61	74.00	23.35	100	16	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	3378.2555	-11.68	41.30	29.62	54.00	24.38	114	216.5	Horizontal
2	7205.9575	3.24	40.97	44.21	54.00	9.79	100	135.5	Horizontal
3	15752.9575	11.61	27.48	39.09	54.00	14.91	100	310	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1120.2000	56.32	45.44	-10.88	74.00	28.56	100	210	Vertical
2	1248.0000	55.30	47.95	-7.35	74.00	26.05	100	231	Vertical
3	1783.8000	54.57	47.00	-7.57	74.00	27.00	100	281	Vertical
4	2520.6000	50.94	47.98	-2.96	74.00	26.02	100	231	Vertical
5	4803.0000	53.33	50.98	-2.35	74.00	23.02	100	324	Vertical
6	7204.5000	50.13	53.34	3.21	74.00	20.66	100	128	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	4803.9730	-2.35	51.76	49.41	54.00	4.59	112	303.5	Vertical
2	7205.9575	3.21	43.44	46.65	54.00	7.35	120	124.3	Vertical



Mode: TX/ BLE\_1M  
 Middle Frequency (2440MHz)  
 Environment: 25.8°C/53%RH/101.0kPa  
 Tested By:Zhang Zishan

Voltage: DC 3V  
 Date: 2023-09-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1118.0000	54.80	45.34	-9.46	74.00	28.66	100	140	Horizontal
2	1920.8000	54.22	47.54	-6.68	74.00	26.46	100	119	Horizontal
3	2915.0000	47.92	47.13	-0.79	74.00	26.87	100	171	Horizontal
4	4879.5000	50.37	48.24	-2.13	74.00	25.76	200	344	Horizontal
5	7318.5000	46.78	49.83	3.05	74.00	24.17	100	129	Horizontal
6	15673.5000	39.10	50.86	11.76	74.00	23.14	200	210	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4879.9945	-2.13	44.01	41.88	54.00	12.12	159	128.2	Horizontal
2	7319.9875	3.05	40.10	43.15	54.00	10.85	115	131.4	Horizontal
3	15750.6225	11.76	27.50	39.26	54.00	14.74	118	221.3	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1119.2000	56.57	45.67	-10.90	74.00	28.33	100	312	Vertical
2	3193.5000	59.26	46.96	-12.30	74.00	27.04	100	98	Vertical
3	4242.0000	52.98	46.12	-6.86	74.00	27.88	100	263	Vertical
4	4879.5000	54.82	52.27	-2.55	74.00	21.73	100	119	Vertical
5	7318.5000	49.27	52.38	3.11	74.00	21.62	100	128	Vertical
6	17994.0000	38.66	52.14	13.48	74.00	21.86	200	159	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4879.9945	-2.55	52.48	49.93	54.00	4.07	101	143.8	Vertical
2	7319.8775	3.11	43.31	46.42	54.00	7.58	142	110	Vertical
3	17880.3400	13.48	26.06	39.54	54.00	14.46	118	199.7	Vertical

Mode: TX/ BLE\_1M  
Highest Frequency (2480MHz)  
Environment: 25.8℃/53%RH/101.0kPa  
Tested By:Zhang Zishan

Voltage: DC 3V  
Date: 2023-09-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1120.0000	56.97	47.53	-9.44	74.00	26.47	100	138	Horizontal
2	1957.8000	51.51	45.23	-6.28	74.00	28.77	200	313	Horizontal
3	2990.6000	47.77	47.26	-0.51	74.00	26.74	100	232	Horizontal
4	4960.5000	51.34	50.23	-1.11	74.00	23.77	200	346	Horizontal
5	7438.5000	44.49	47.85	3.36	74.00	26.15	100	150	Horizontal
6	15667.5000	37.95	50.01	12.06	74.00	23.99	200	202	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	4959.8535	-1.11	45.89	44.78	54.00	9.22	200	343.5	Horizontal
2	15687.4525	12.06	27.42	39.48	54.00	14.52	144	230.6	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1120.4000	56.75	45.87	-10.88	74.00	28.13	100	315	Vertical
2	1677.8000	53.27	44.79	-8.48	74.00	29.21	100	191	Vertical
3	1999.8000	52.70	45.99	-6.71	74.00	28.01	100	191	Vertical
4	3198.0000	57.69	45.40	-12.29	74.00	28.60	100	138	Vertical
5	4959.0000	56.40	54.89	-1.51	74.00	19.11	100	128	Vertical
6	7438.5000	46.94	50.42	3.48	74.00	23.58	100	118	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	4959.9330	-1.51	54.33	52.82	54.00	1.18	100	118.3	Vertical
2	7440.0075	3.48	42.65	46.13	54.00	7.87	115	130.9	Vertical

Mode: TX/ BLE\_2M

Lowest Frequency (2402MHz)

Environment: 25.8°C/53%RH/101.0kPa

Tested By:Zhang Zishan

Voltage: DC 3V

Date: 2023-09-05

**Suspected Data List**

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1114.6000	56.22	46.73	-9.49	74.00	27.27	100	140	Horizontal
2	1992.2000	53.80	48.24	-5.56	74.00	25.76	100	262	Horizontal
3	2538.0000	50.28	47.92	-2.36	74.00	26.08	100	180	Horizontal
4	3369.0000	60.65	48.94	-11.71	74.00	25.06	100	168	Horizontal
5	4803.0000	50.10	47.77	-2.33	74.00	26.23	200	333	Horizontal
6	7207.5000	45.90	49.13	3.23	74.00	24.87	200	179	Horizontal

**AV Final Data List**

NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1983.5510	-5.56	37.89	32.33	54.00	21.67	114	249	Horizontal
2	3384.3090	-11.71	49.43	37.72	54.00	16.28	100	196.7	Horizontal
3	7204.6825	3.23	37.65	40.88	54.00	13.12	200	176.2	Horizontal

**Suspected Data List**

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1122.4000	55.99	45.15	-10.84	74.00	28.85	100	322	Vertical
2	1672.8000	51.98	43.51	-8.47	74.00	30.49	100	198	Vertical
3	1997.0000	52.53	45.82	-6.71	74.00	28.18	100	179	Vertical
4	2998.8000	48.02	47.04	-0.98	74.00	26.96	200	65	Vertical
5	4803.0000	53.23	50.88	-2.35	74.00	23.12	100	263	Vertical
6	7204.5000	48.90	52.11	3.21	74.00	21.89	100	130	Vertical

**AV Final Data List**

NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	4804.0430	-2.35	47.06	44.71	54.00	9.29	114	304.1	Vertical
2	7204.8175	3.21	41.23	44.44	54.00	9.56	122	126.2	Vertical

Mode: TX/ BLE\_2M  
 Middle Frequency (2440MHz)  
 Environment: 25.8°C/53%RH/101.0kPa  
 Tested By:Zhang Zishan

Voltage: DC 3V  
 Date: 2023-09-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1115.8000	60.46	50.98	-9.48	74.00	23.02	100	86	Horizontal
2	1685.0000	51.30	43.71	-7.59	74.00	30.29	100	118	Horizontal
3	2980.0000	47.53	46.99	-0.54	74.00	27.01	100	14	Horizontal
4	4252.5000	53.80	47.02	-6.78	74.00	26.98	100	17	Horizontal
5	5092.5000	47.88	48.08	0.20	74.00	25.92	100	6	Horizontal
6	15649.5000	38.30	51.25	12.95	74.00	22.75	100	333	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1116.1710	-9.48	44.91	35.43	54.00	18.57	101	82.9	Horizontal
2	5104.8815	0.20	35.72	35.92	54.00	18.08	115	141	Horizontal
3	15679.8525	12.95	27.33	40.28	54.00	13.72	189	288	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1113.4000	63.63	52.63	-11.00	74.00	21.37	100	138	Vertical
2	1816.8000	53.46	46.15	-7.31	74.00	27.85	100	106	Vertical
3	3181.5000	59.75	47.43	-12.32	74.00	26.57	100	77	Vertical
4	4878.0000	54.10	51.55	-2.55	74.00	22.45	100	231	Vertical
5	7318.5000	49.22	52.33	3.11	74.00	21.67	100	16	Vertical
6	17899.5000	37.62	51.17	13.55	74.00	22.83	100	108	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1117.2510	-11.00	49.27	38.27	54.00	15.73	149	133.2	Vertical
2	4879.9060	-2.55	47.34	44.79	54.00	9.21	114	226.9	Vertical
3	7318.7075	3.11	39.97	43.08	54.00	10.92	100	25	Vertical
4	17873.0825	13.55	25.88	39.43	54.00	14.57	148	137.5	Vertical

Mode: TX/ BLE\_2M

Highest Frequency (2480MHz)

Environment: 25.8°C/53%RH/101.0kPa

Tested By:Zhang Zishan

Voltage: DC 3V

Date: 2023-09-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1115.6000	59.37	49.88	-9.49	74.00	24.12	100	111	Horizontal
2	1666.4000	50.97	43.30	-7.67	74.00	30.70	100	100	Horizontal
3	2989.4000	47.42	46.91	-0.51	74.00	27.09	100	38	Horizontal
4	4776.0000	49.90	46.63	-3.27	74.00	27.37	200	88	Horizontal
5	6399.0000	47.69	47.31	-0.38	74.00	26.69	100	128	Horizontal
6	15652.5000	37.94	50.77	12.83	74.00	23.23	200	37	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1119.3940	-9.49	44.34	34.85	54.00	19.15	101	122.3	Horizontal
2	15690.0975	12.83	27.39	40.22	54.00	13.78	180	102.8	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	1112.8000	58.10	47.09	-11.01	74.00	26.91	100	190	Vertical
2	1677.8000	52.80	44.32	-8.48	74.00	29.68	100	118	Vertical
3	1992.6000	52.94	46.21	-6.73	74.00	27.79	100	139	Vertical
4	4959.0000	55.66	54.15	-1.51	74.00	19.85	100	222	Vertical
5	7438.5000	46.73	50.21	3.48	74.00	23.79	100	47	Vertical
6	17919.0000	38.08	51.61	13.53	74.00	22.39	200	221	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [ °]	Polarity
1	4960.0050	-1.51	49.15	47.64	54.00	6.36	100	226.7	Vertical
2	7438.7175	3.48	39.33	42.81	54.00	11.19	100	22	Vertical
3	17919.0000	13.53	28.58	42.11	54.00	11.89	200	221	Vertical

**Remark:**

- 1 Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- 2 Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3 Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4 Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



**18GHz to 26.5GHz**

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Only the worst mode and channel were recorded in this report. Lowest Frequency (2402MHz\_2M)

Mode: TX/ BLE\_2M

Lowest Frequency (2402MHz\_2M)

Environment: 25.8°C/53%RH/101.0kPa

Tested By: Zhang Zishan

Voltage: DC 3V

Date: 2023-09-05

**Suspected Data List**

NO.	Freq. [MHz]	Reading [dBμV/m]	Level for 1m [dBμV/m]	Level for 3m [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18218.8750	48.70	30.59	21.05	-18.11	74	52.95	150	15	Horizontal
2	19887.8500	48.49	31.91	22.37	-16.58	74	51.63	150	102	Horizontal
3	22195.6000	45.39	29.78	20.24	-15.61	74	53.76	150	53	Horizontal
4	24120.4250	47.10	32.85	23.31	-14.25	74	50.69	150	15	Horizontal
5	24999.3250	47.21	33.38	23.84	-13.83	74	50.16	150	356	Horizontal
6	26295.1500	46.42	32.27	22.73	-14.15	74	51.27	150	344	Horizontal

**Suspected Data List**

NO.	Freq. [MHz]	Reading [dBμV/m]	Level for 1m [dBμV/m]	Level for 3m [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18359.1250	48.02	30.17	20.63	-17.85	74	53.37	150	308	Vertical
2	19904.0000	46.89	30.06	20.52	-16.83	74	53.48	150	282	Vertical
3	20827.5250	45.52	29.29	19.75	-16.23	74	54.25	150	184	Vertical
4	22909.1750	44.93	30.03	20.49	-14.90	74	53.51	150	62	Vertical
5	24095.7750	45.25	30.75	21.21	-14.50	74	52.79	150	37	Vertical
6	25470.2250	45.76	31.71	22.17	-14.05	74	51.83	150	172	Vertical

**Remark:**

- 1 Above 18G test distance is 1m, so the Level for 3m= Level for 1m + 20\*log(1/3).

## 7. 6dB BANDWIDTH

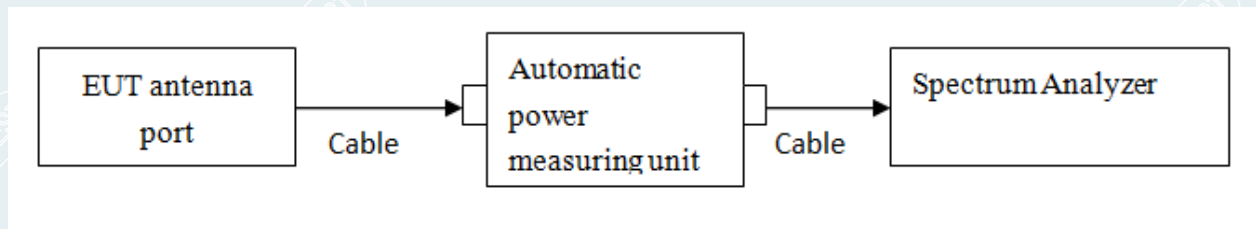
### 7.1 LIMITS

Systems using digital modulation techniques may operate in the 902–928MHz, 2400–2483.5MHz, and 5725–5850MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.

### 7.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the Automatic power measuring unit.
- 2) Set resolution bandwidth (RBW) = 100kHz. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize, record 6dB bandwidth value.
- 3) Repeat above procedures until all frequencies measured were complete.

### 7.3 TEST SETUP



----- The following blanks -----

7.4 TEST RESULTS

Environment: 23.8℃/47%RH/101.0kPa  
Tested By: Qin Tingting

Voltage: DC 3V  
Date: 2023-09-04

BLE\_1M

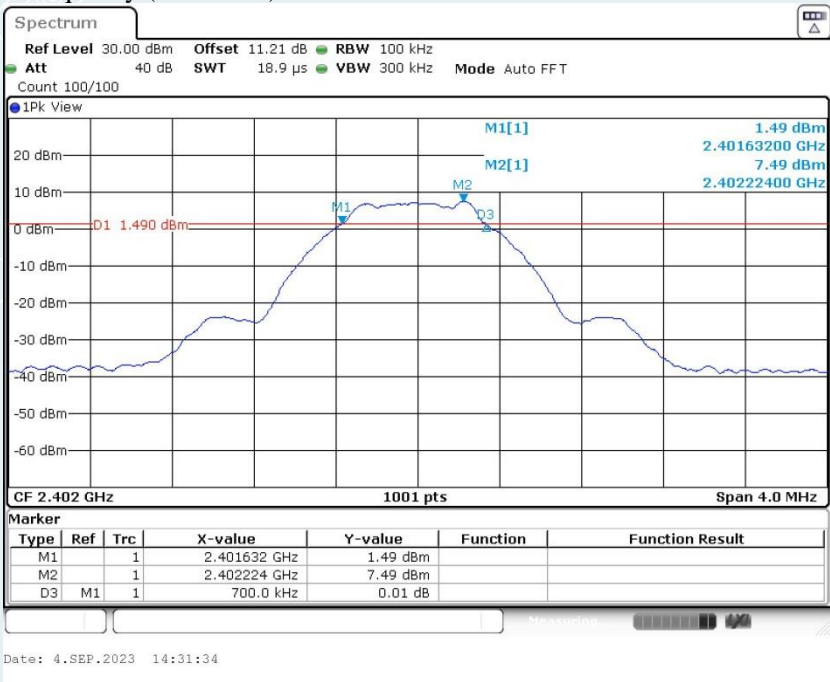
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	700	≥500	PASS
Middle	2440	704		PASS
Highest	2480	700		PASS

BLE\_2M

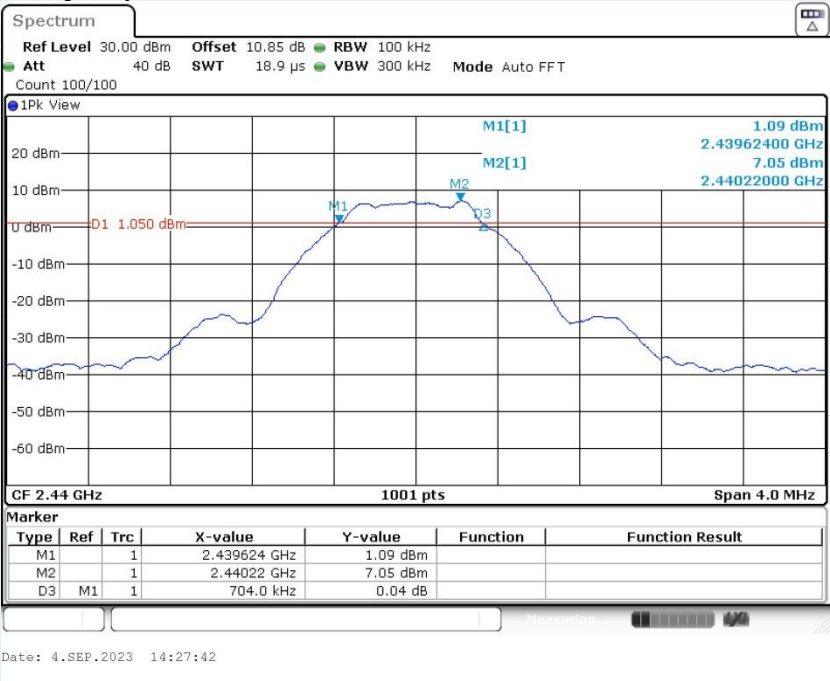
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	1376	≥500	PASS
Middle	2440	1376		PASS
Highest	2480	1376		PASS

BLE\_1M

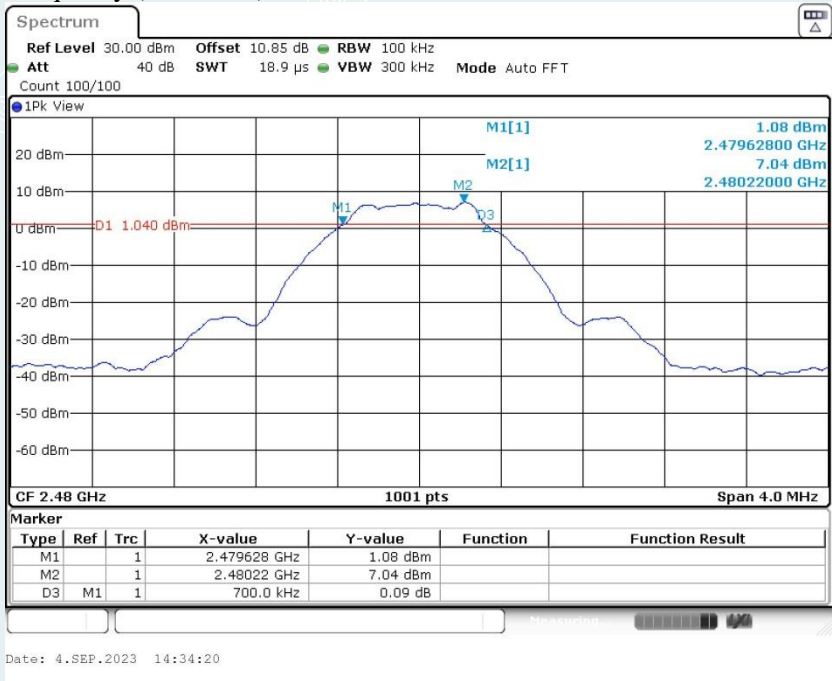
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)

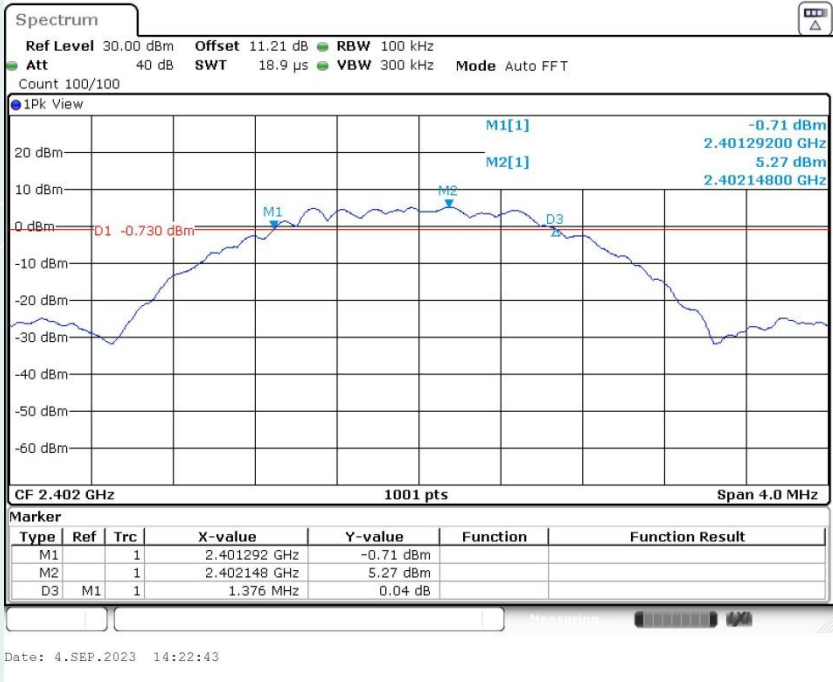


Highest Frequency (2480MHz)

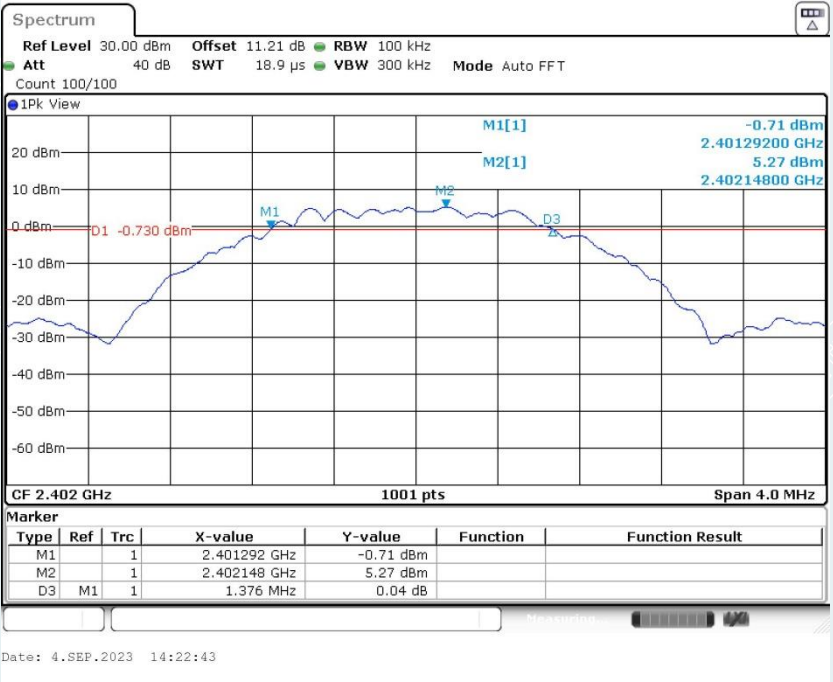


BLE\_2M

Lowest Frequency (2402MHz)

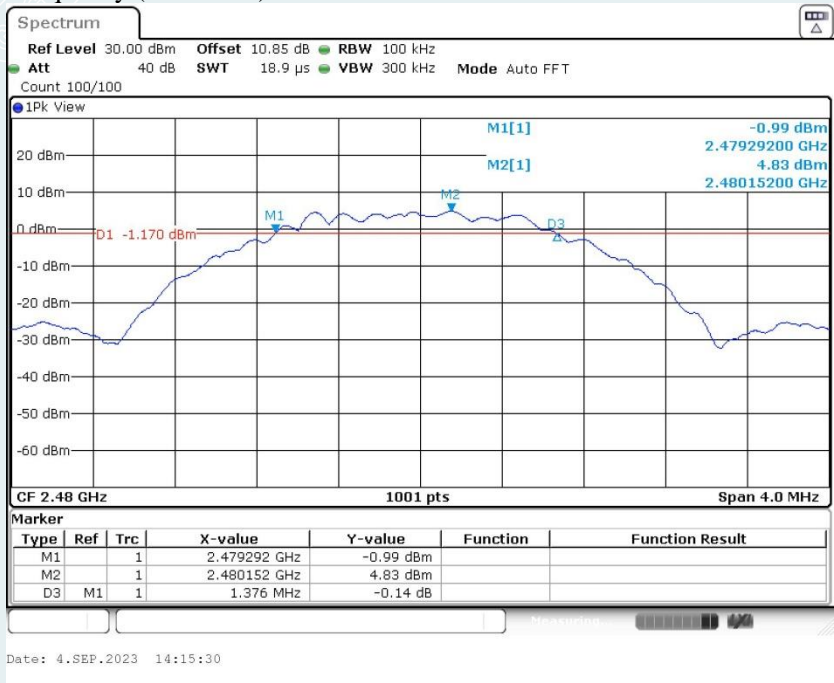


Middle Frequency (2440 MHz)





Highest Frequency (2480MHz)



----- The following blanks -----

## 8. MAXIMUM PEAK OUTPUT POWER

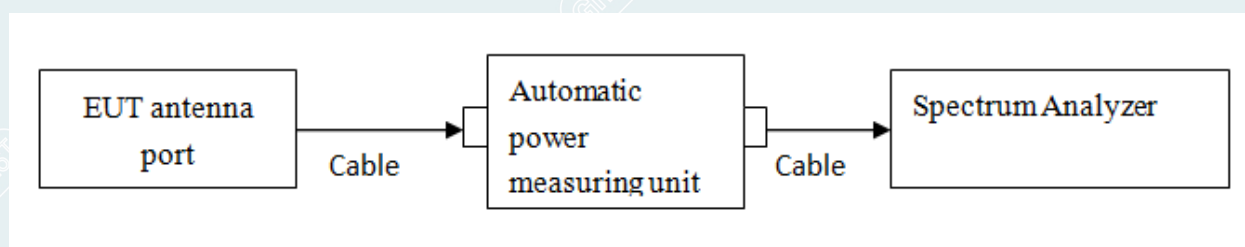
### 8.1 LIMITS

The maximum Peak output power measurement is 1W

### 8.2 TEST PROCEDURES

- 1) RF output of EUT was connected to the broadband peak RF power meter by RF cable. The path loss was compensated to the results for each measurement.
- 2) Set to the maximum power setting and enable the EUT transmit continuously.
- 3) Measure the conducted output power and record the results in the test report.

### 8.3 TEST SETUP



### 8.4 TEST RESULTS

Environment: 23.8°C/47%RH/101.0kPa  
Tested By: Qin Tingting

Voltage: DC 3V  
Date: 2023-09-04

#### BLE\_1M

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	9.82	1W (30dBm)	Peak	Pass
Middle	2440	9.76			Pass
Highest	2480	9.65			Pass

#### BLE\_2M

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	9.81	1W (30dBm)	Peak	Pass
Middle	2440	9.76			Pass
Highest	2480	9.64			Pass

## 9. POWER SPECTRAL DENSITY

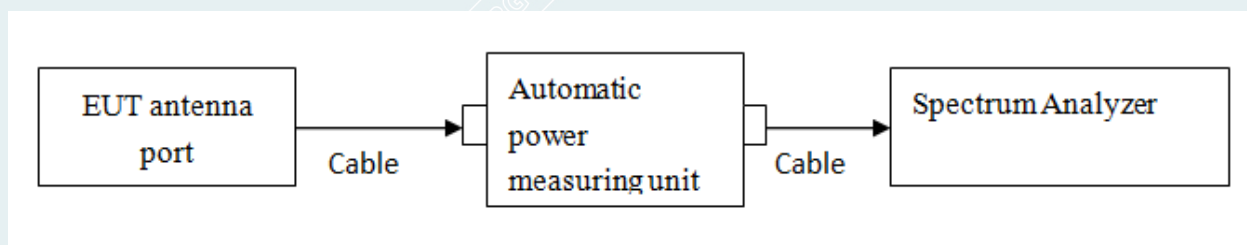
### 9.1 LIMITS

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 9.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- 2) Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 3) Set the analyzer span to 1.5 times the DTS bandwidth. Set the RBW to  $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$ . Set the VBW  $\geq [3 \times \text{RBW}]$ . Detector = peak. Sweep time = auto couple. Trace mode = max hold. Allow trace to fully stabilize. Use the peak marker function to determine the maximum amplitude level within the RBW. If measured value exceeds requirement, then reduce RBW (but no less than 3kHz) and repeat.
- 4) Repeat above procedures until all frequencies measured were complete.

### 9.3 TEST SETUP



### 9.4 TEST RESULTS

Environment: 23.8°C/47%RH/101.0kPa  
 Tested By: Qin Tingting

Voltage: DC 3V  
 Date: 2023-09-04

BLE\_1M

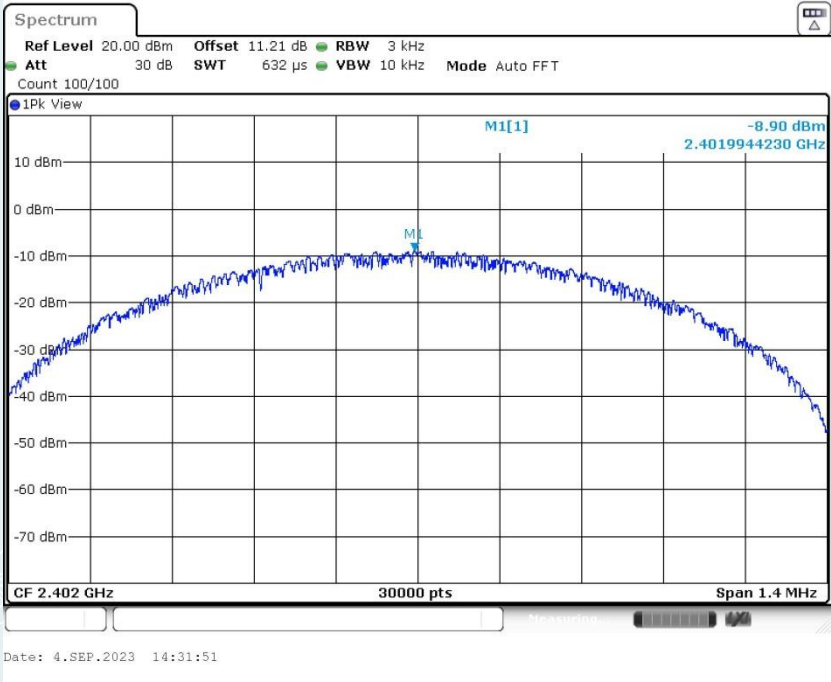
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-8.9	8.00	PASS
Middle	2440	-9.23		PASS
Highest	2480	-9.36		PASS

BLE\_2M

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-14.2	8.00	PASS
Middle	2440	-14.61		PASS
Highest	2480	-14.62		PASS

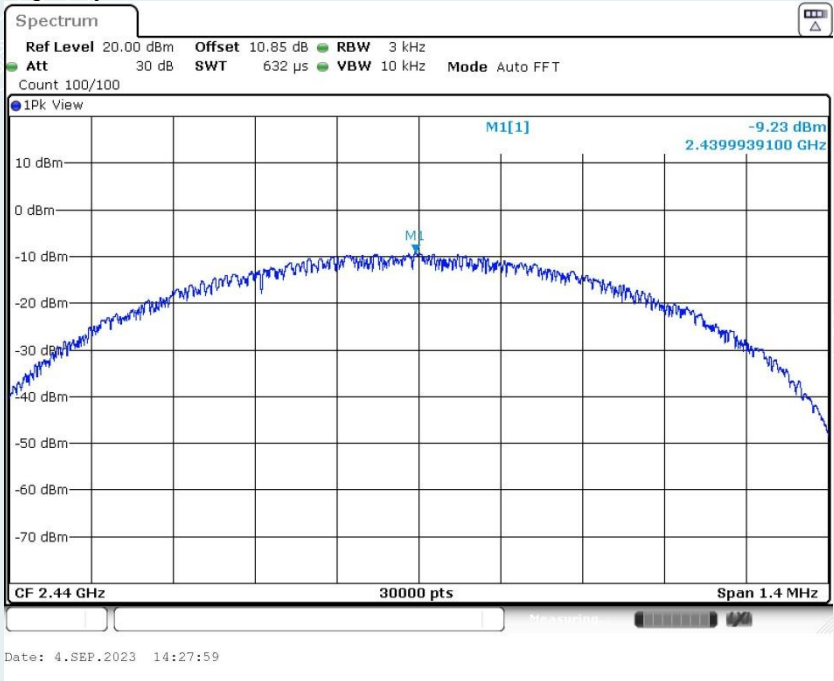
BLE\_1M

Lowest Frequency (2402MHz)

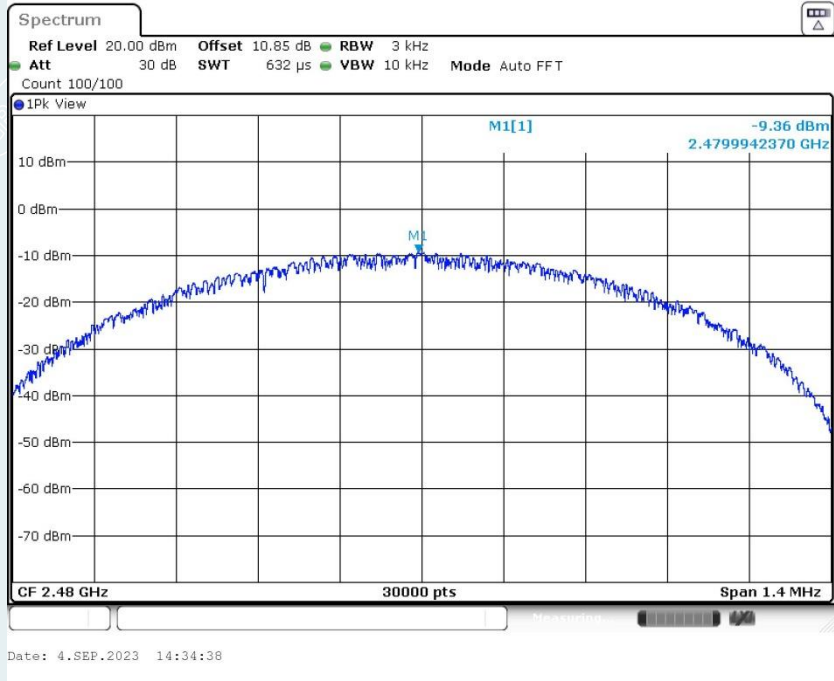


----- The following blanks -----

Middle Frequency (2440 MHz)



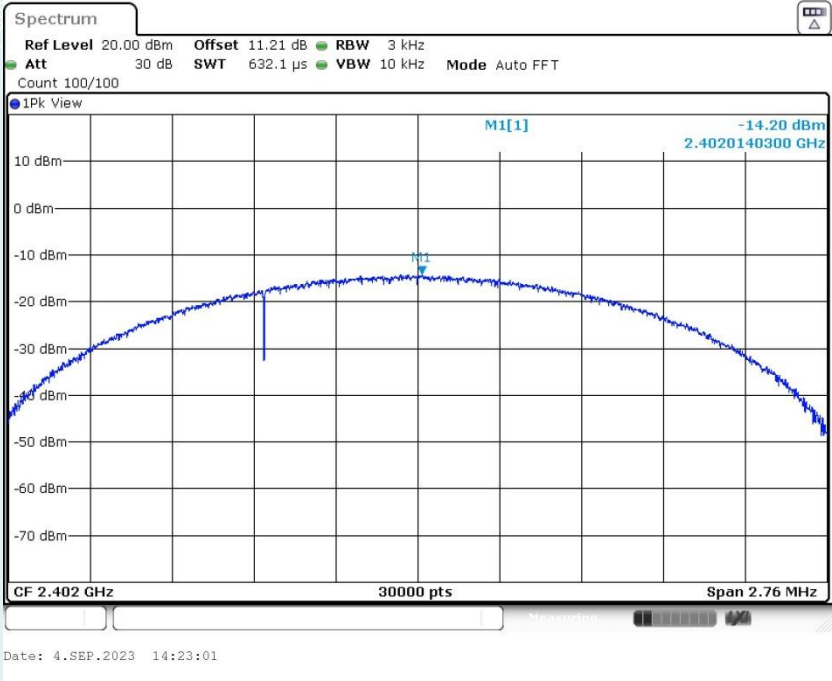
Highest Frequency (2480MHz)



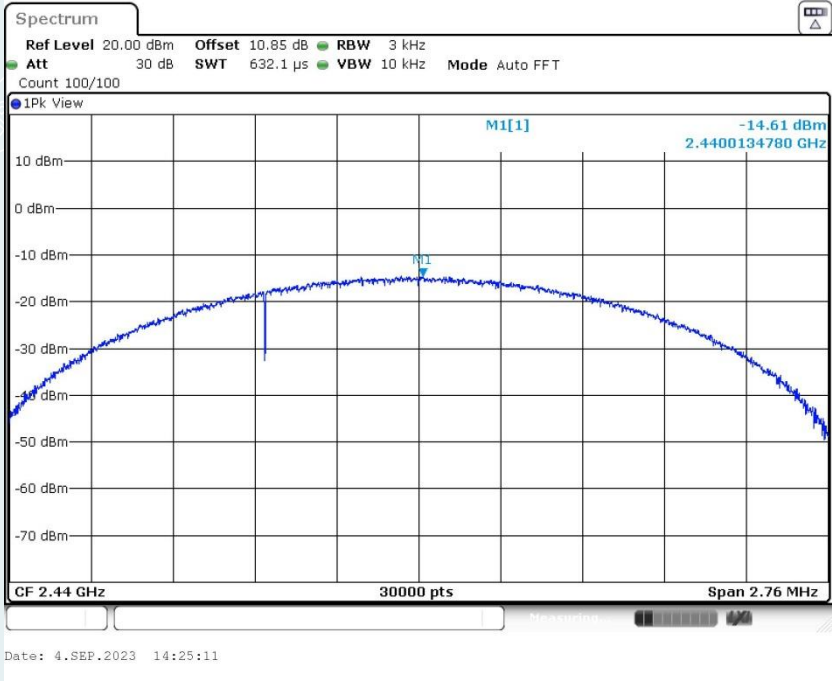


BLE\_2M

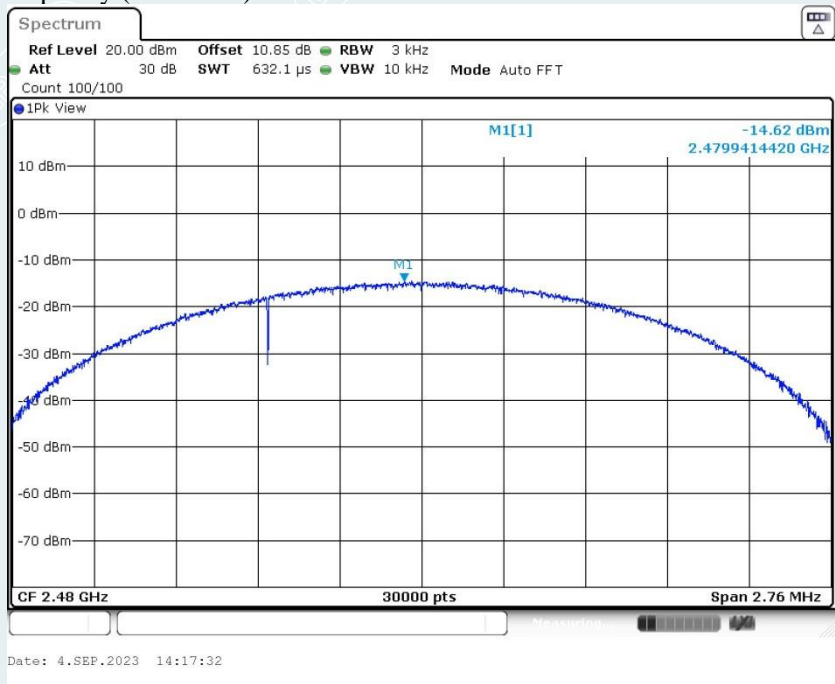
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



----- The following blanks -----

## 10. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS

### 10.1 LIMITS

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB.

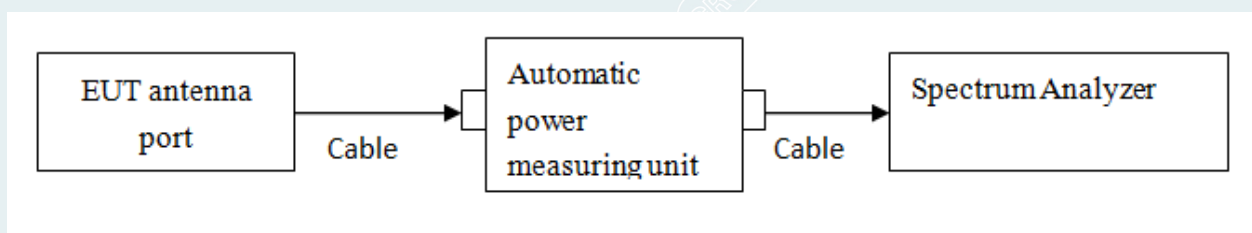
### 10.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 15.247 Measurement Guidance v05r02.

Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.

- 1) Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.
- 2) Set the spectrum analyzer: RBW =100kHz; VBW =300kHz, Frequency range = 30MHz to 26.5GHz; Sweep = auto; Detector Function = Peak. Trace = Max, hold.
- 3) Measure and record the results in the test report.
- 4) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 10.3 TEST SETUP



## 10.4 TEST RESULTS

Environment: 23.8°C/47%RH/101.0kPa  
Tested By: Qin Tingting

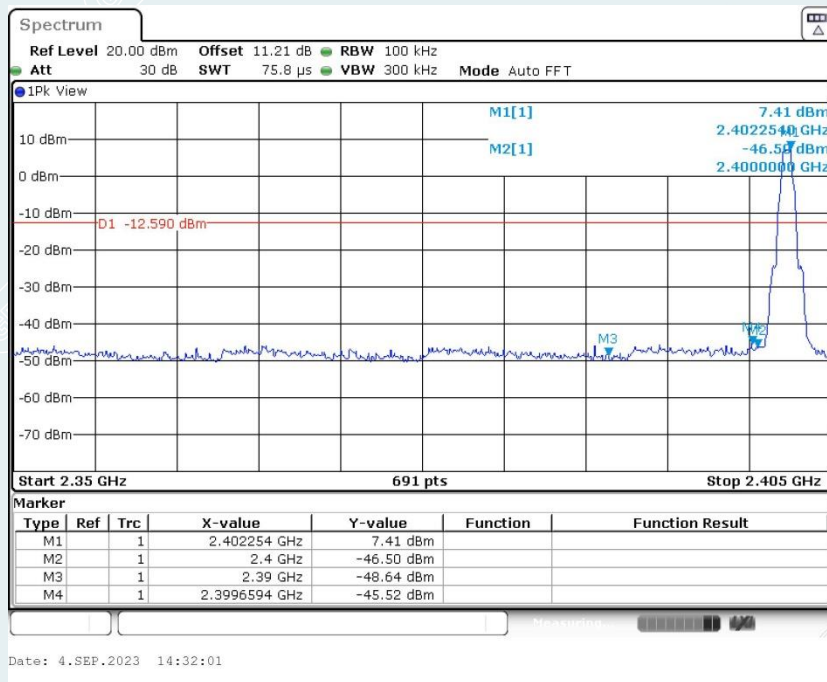
Voltage: DC 3V  
Date: 2023-09-04

### Band edge measurements

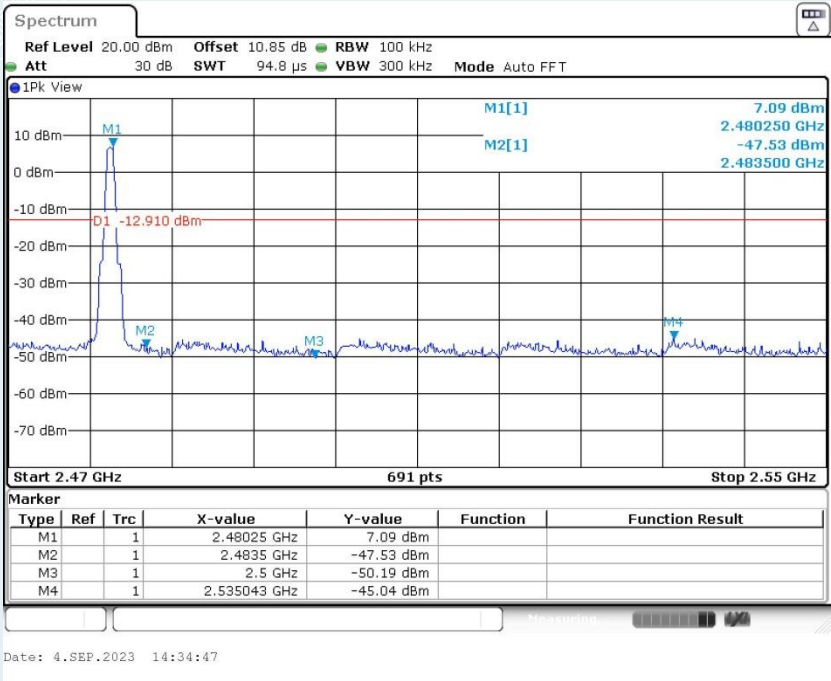
TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	7.41	-45.52	≤-12.59	PASS
		High	2480	7.09	-45.04	≤-12.91	PASS
BLE_2M	Ant1	Low	2402	5.19	-27.53	≤-14.81	PASS
		High	2480	4.76	-45.57	≤-15.24	PASS

BLE\_1M

Lowest Frequency (2402MHz)  
2.35GHz-2.405GHz

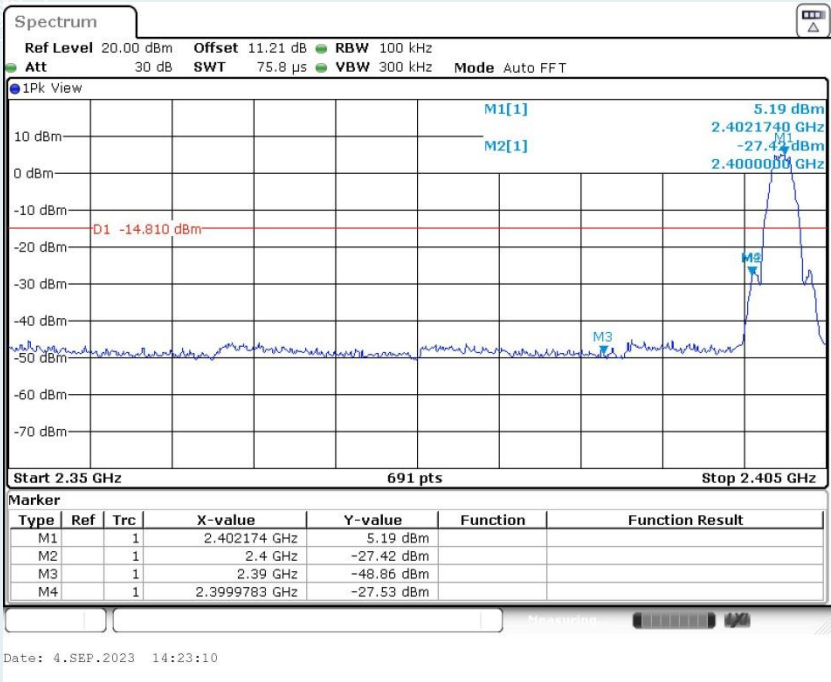


Highest Frequency (2480MHz)  
2.47GHz-2.55GHz



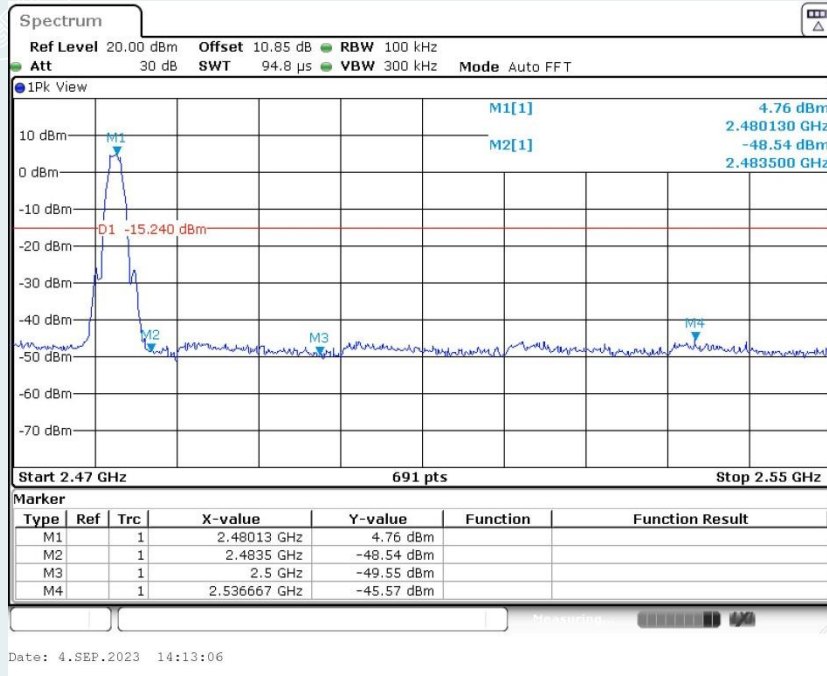
BLE\_2M

Lowest Frequency (2402MHz)  
2.35GHz-2.405GHz





Highest Frequency (2480MHz)  
2.47GHz-2.55GHz

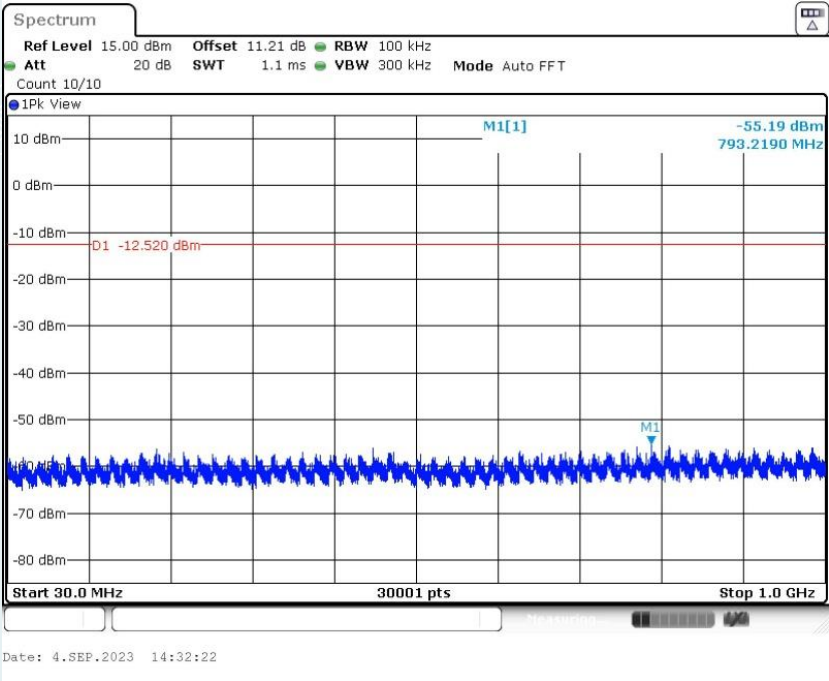
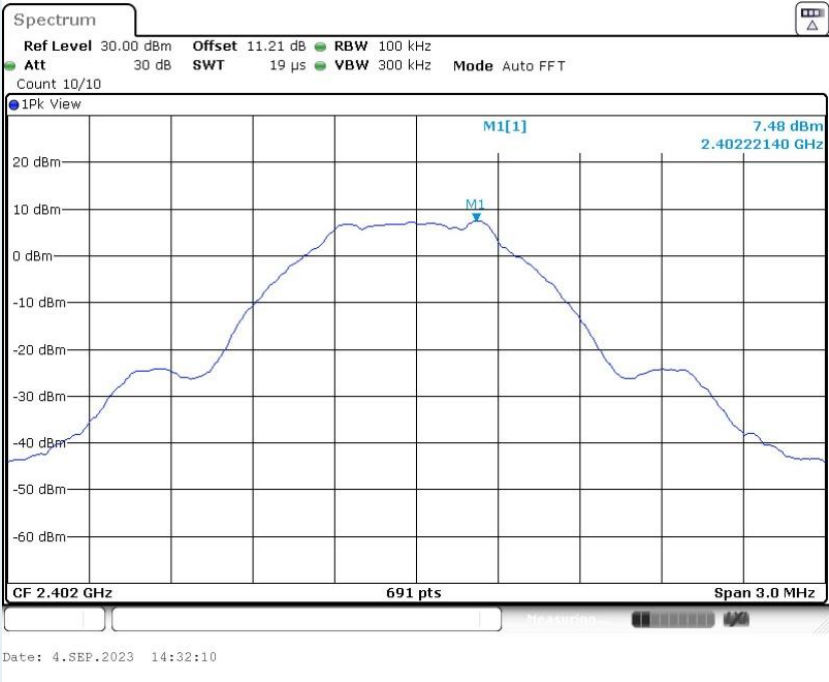


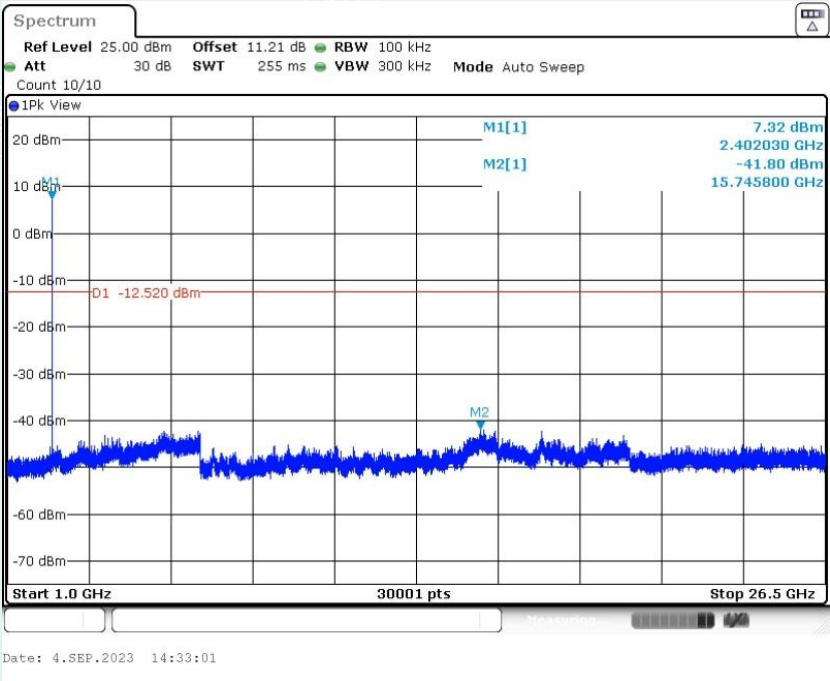
### Conducted Spurious Emission

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	7.48	7.48	---	PASS
			30~1000	7.48	-55.19	≤-12.52	PASS
			1000~26500	7.48	-41.8	≤-12.52	PASS
		2440	Reference	7.02	7.02	---	PASS
			30~1000	7.02	-56.08	≤-12.98	PASS
			1000~26500	7.02	-41.55	≤-12.98	PASS
		2480	Reference	7.04	7.04	---	PASS
			30~1000	7.04	-56.61	≤-12.96	PASS
			1000~26500	7.04	-42.52	≤-12.96	PASS
BLE_2M	Ant1	2402	Reference	5.29	5.29	---	PASS
			30~1000	5.29	-54.92	≤-14.71	PASS
			1000~26500	5.29	-41.81	≤-14.71	PASS
		2440	Reference	4.83	4.83	---	PASS
			30~1000	4.83	-55.35	≤-15.17	PASS
			1000~26500	4.83	-42.45	≤-15.17	PASS
		2480	Reference	4.84	4.84	---	PASS
			30~1000	4.84	-56.36	≤-15.16	PASS
			1000~26500	4.84	-41.49	≤-15.16	PASS

BLE\_1M

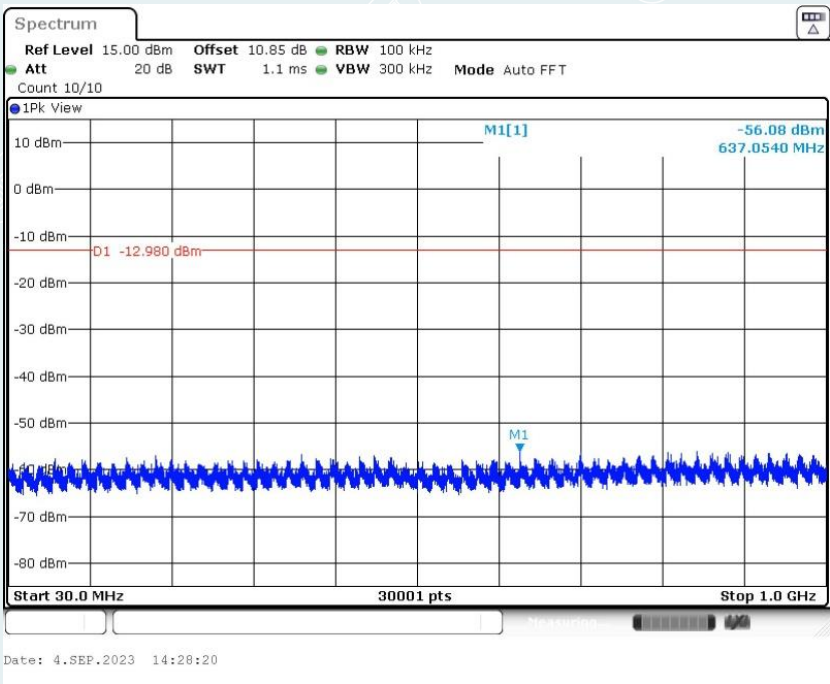
Lowest Frequency (2402MHz)

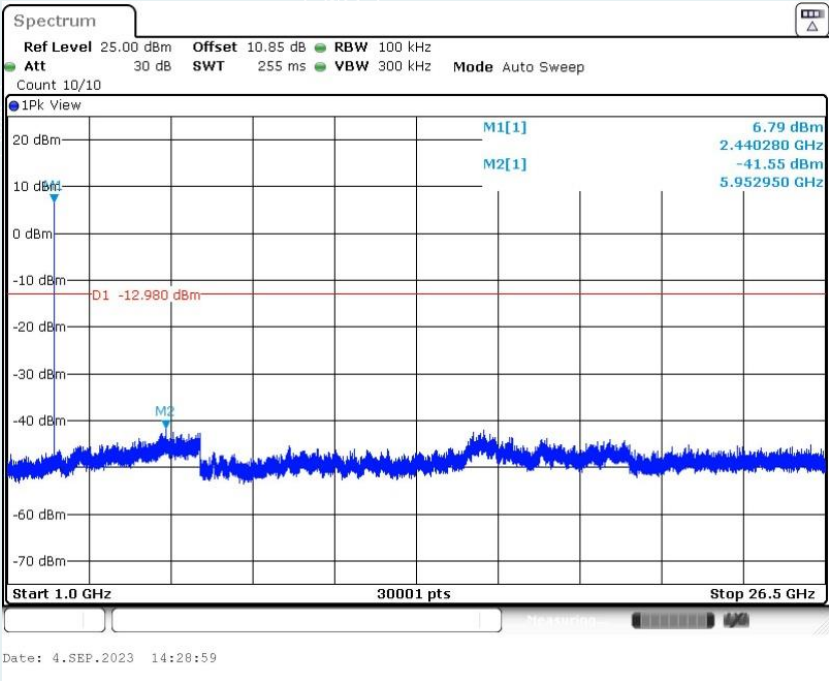




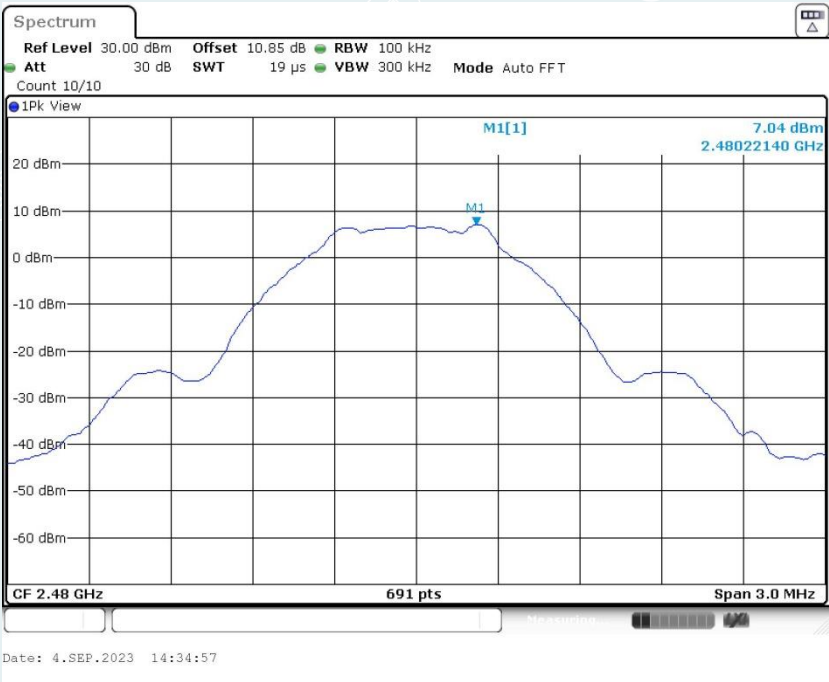
----- The following blanks -----

Middle Frequency (2440MHz)

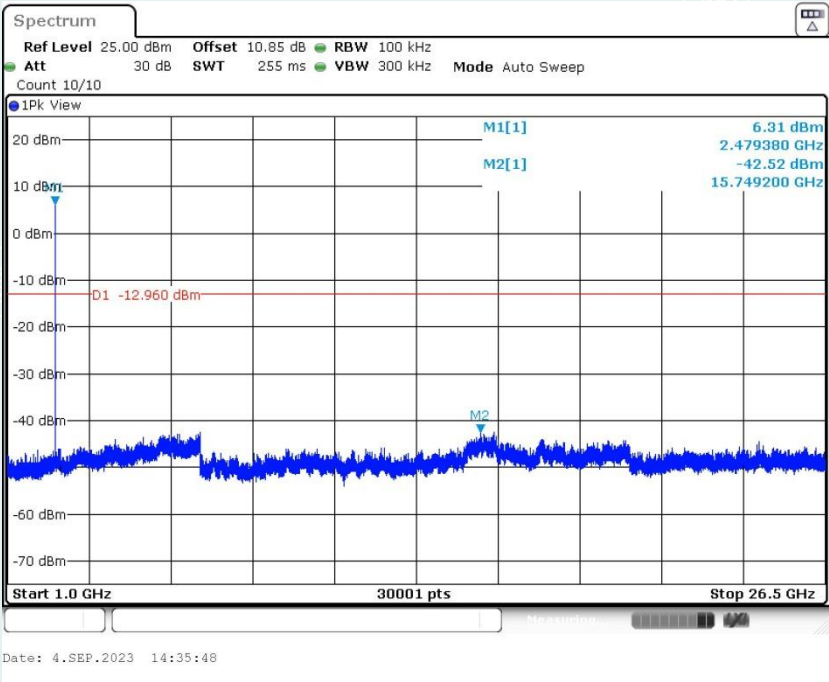
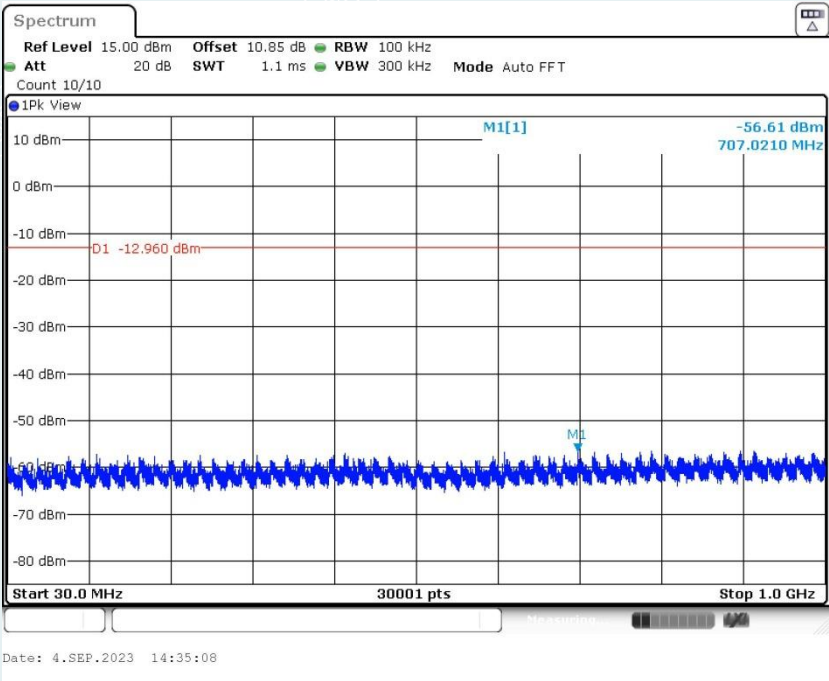




Highest Frequency (2480MHz)

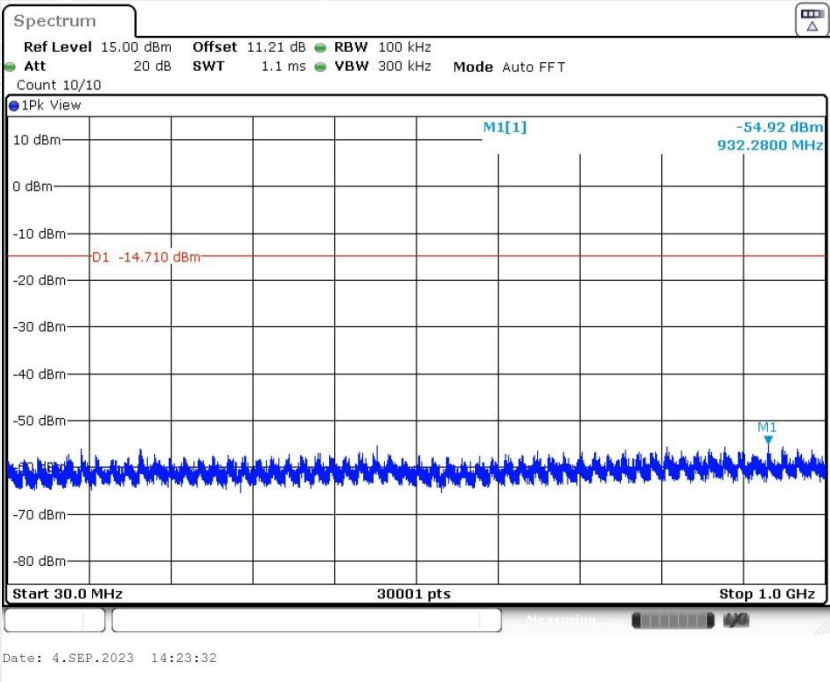
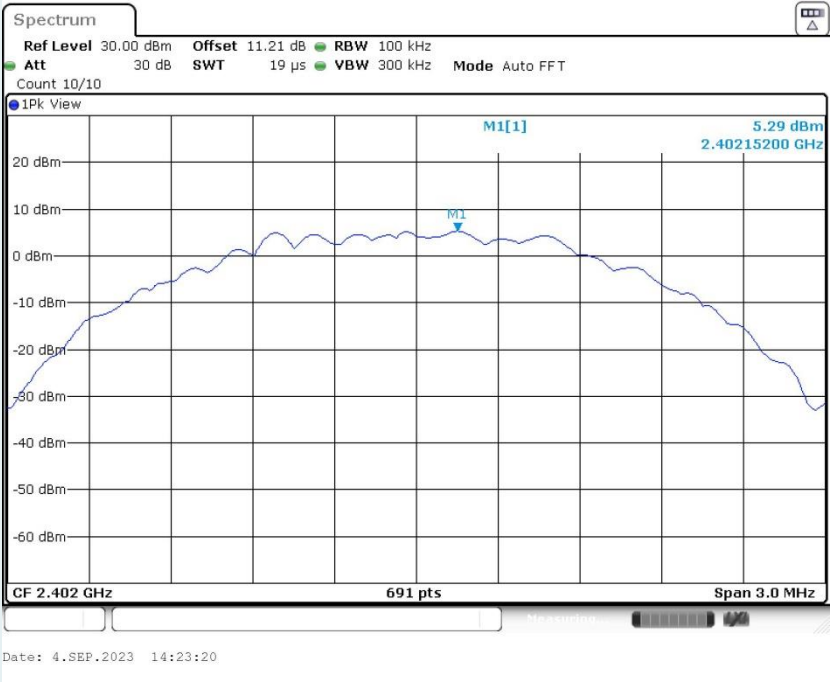


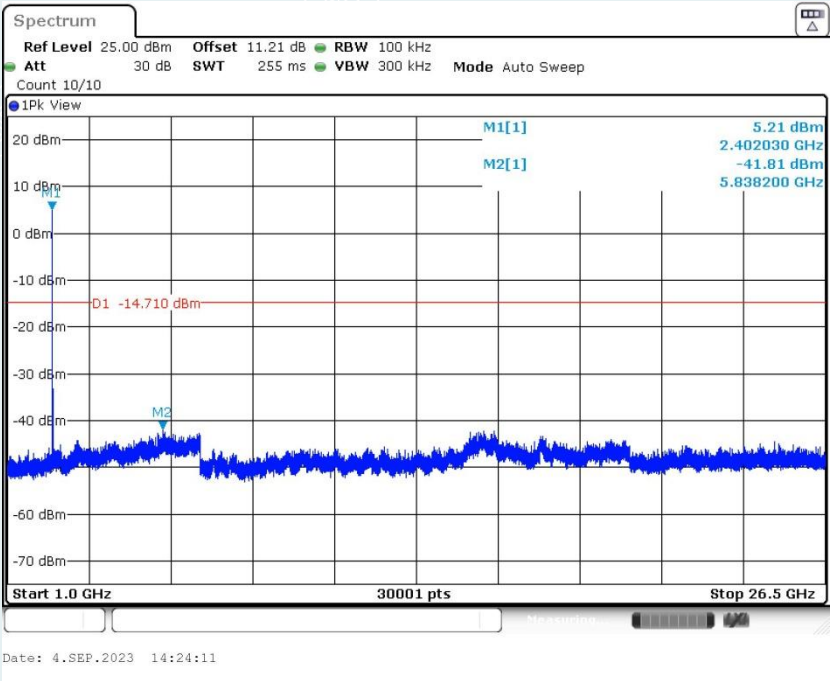




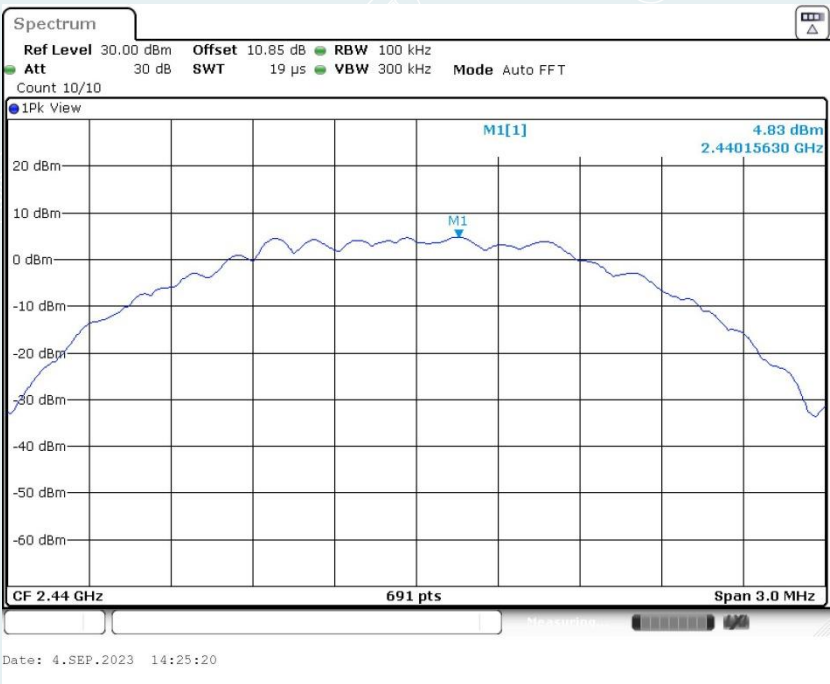
BLE\_2M

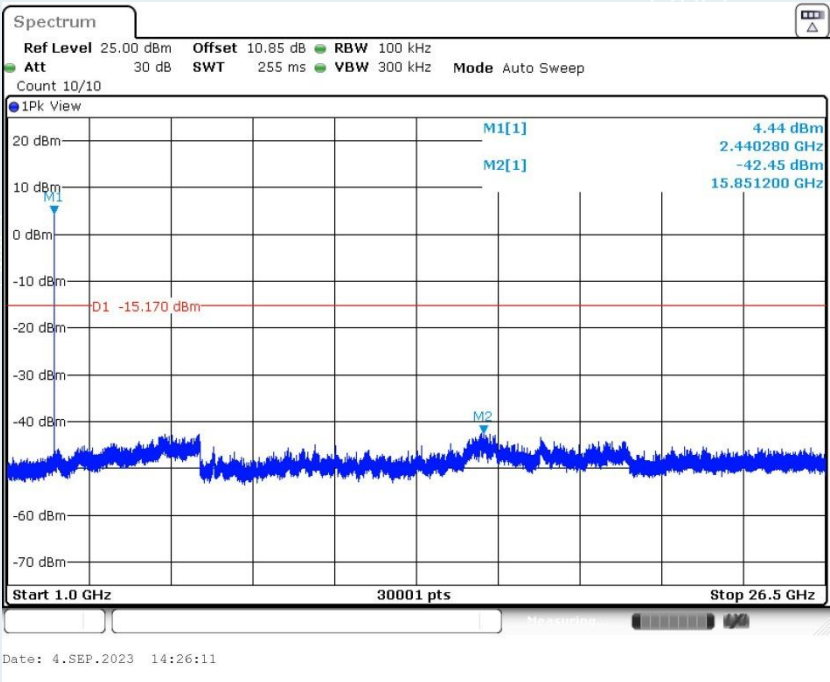
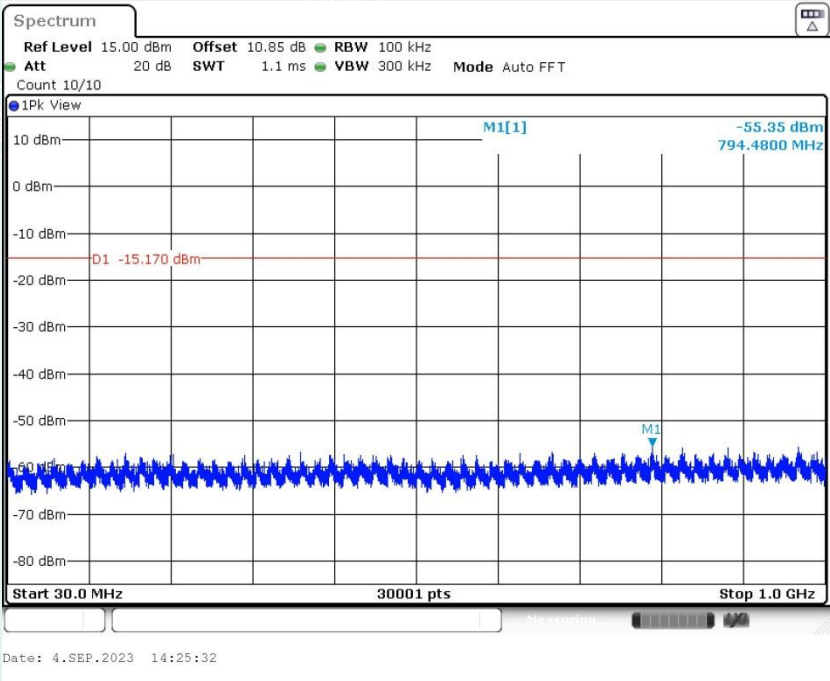
Lowest Frequency (2402MHz)



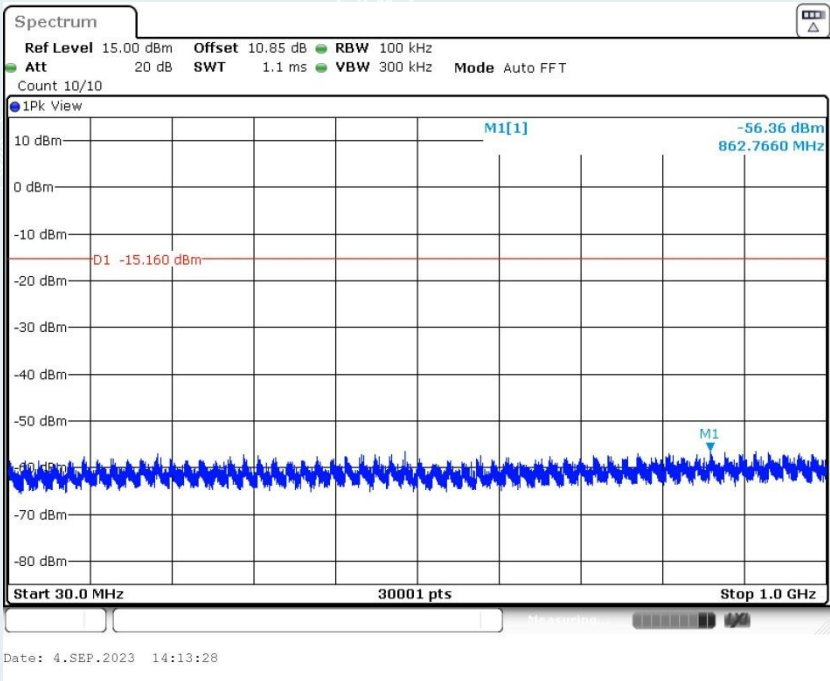
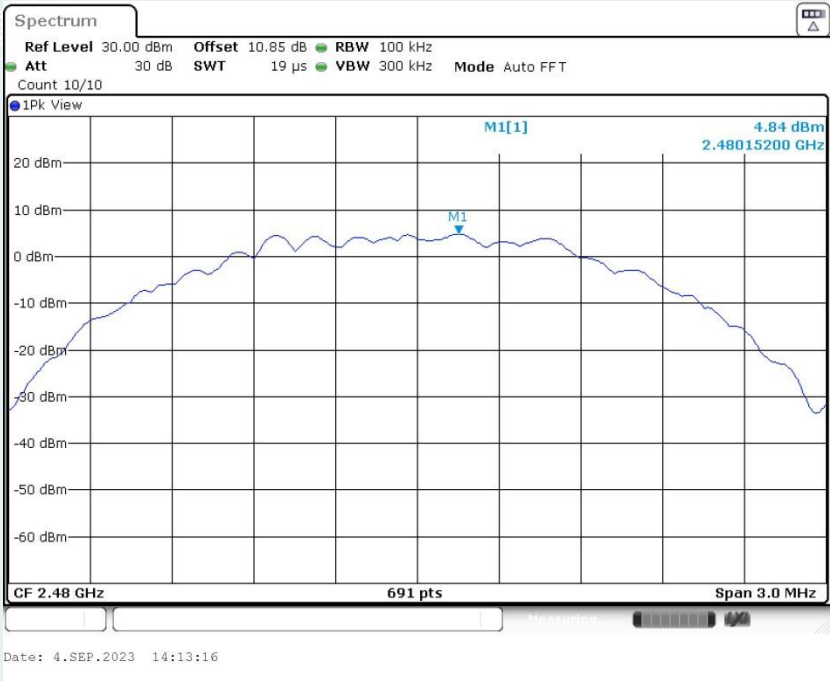


Middle Frequency (2440MHz)

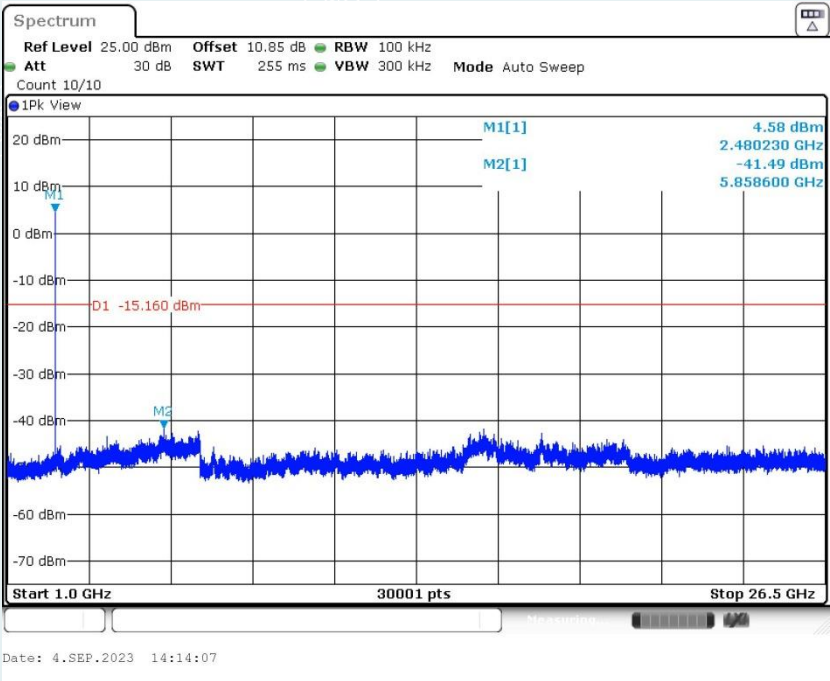




Highest Frequency (2480MHz)







----- The following blanks -----

## 11. RESTRICTED BANDS OF OPERATION

### 11.1 LIMITS

Section 15.247(d) In addition, Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	
13.36 - 13.41			

Frequency (MHz)	Quasi-peak( $\mu$ V/m)	Measurement distance(m)	Quasi-peak(dB $\mu$ V/m)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

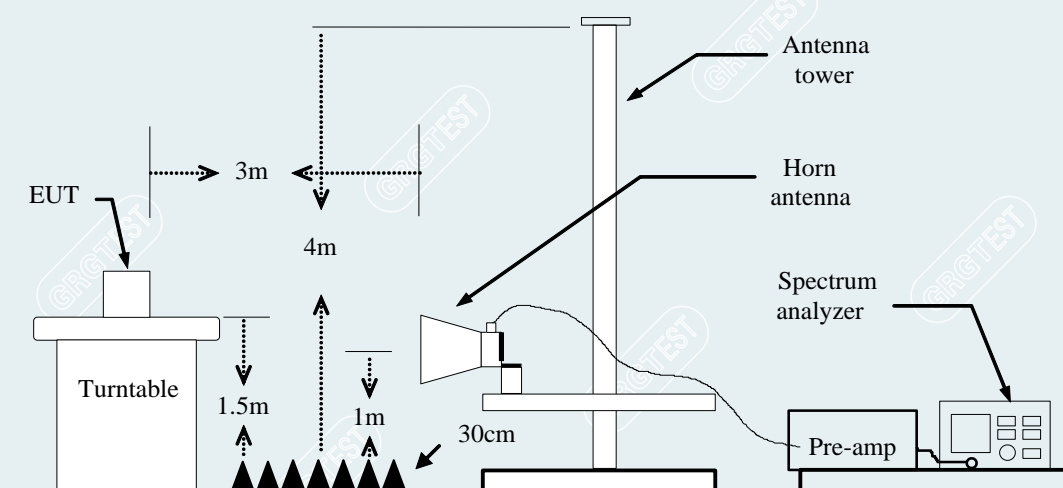
## 11.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 15.247 Meas Guidance v05r02.

- 1) The EUT is placed on a turntable, which is 1.5m above the ground plane.
- 2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- 4) Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - a) PEAK: RBW=1MHz / VBW=1MHz / Sweep=AUTO.
  - b) AVERAGE: RBW=1MHz / VBW=1/T / Sweep=AUTO.

If the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set  $VBW \leq RBW/100$  (i.e., 10kHz) but not less than 10 Hz. If the EUT duty cycle is  $< 98\%$ , set  $VBW \geq 1/T$ , Where T is defined in section 2.8.
- 5) Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

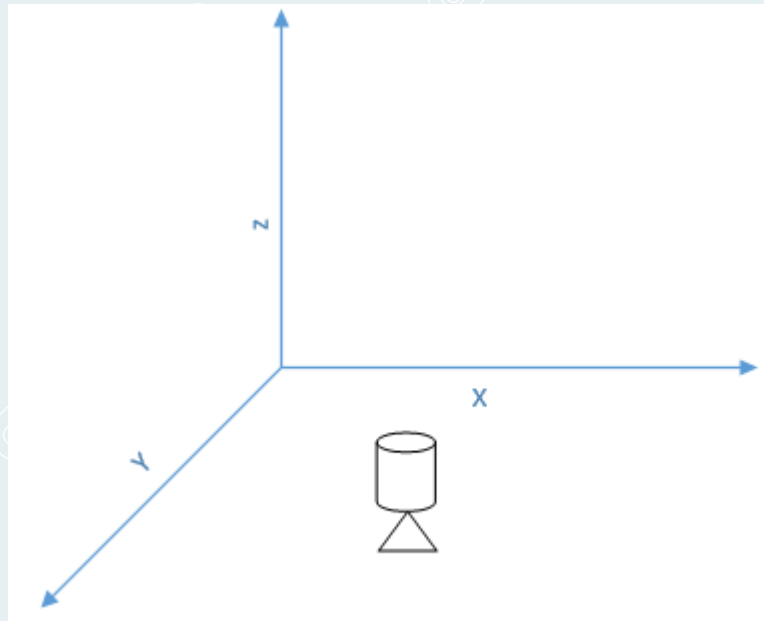
## 11.3 TEST SETUP



----- The following blanks -----

#### 11.4 TEST RESULTS

The test are under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the Z position. So the data shown the Z position only.

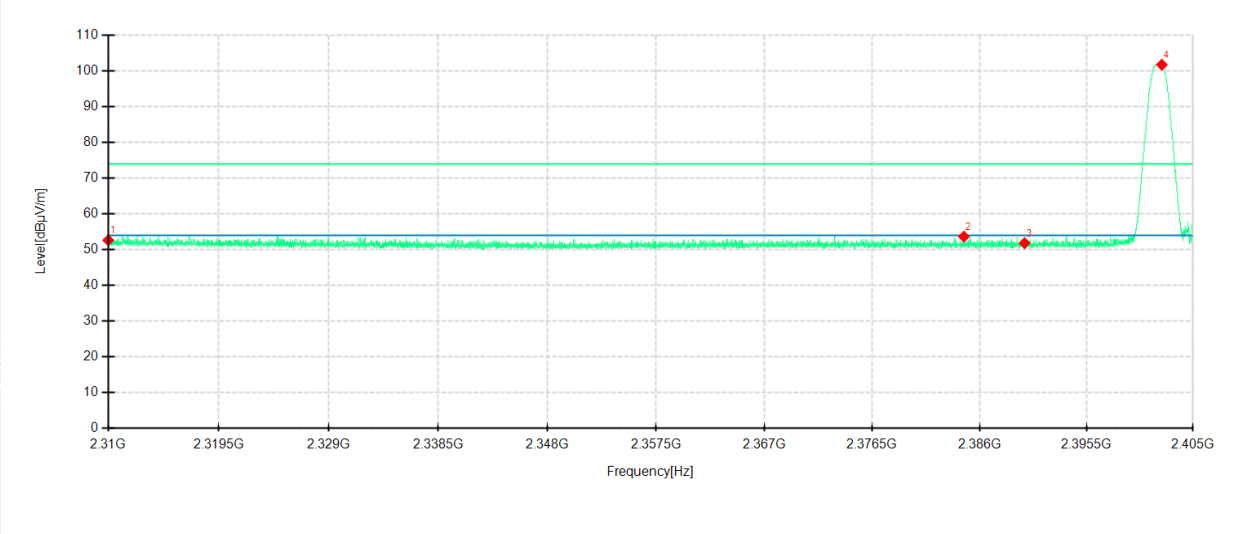


----- The following blanks -----

Equipment:	Motion and Light Sensor P2	Test Date	2023-09-05
Model No.:	ML-S03D	Test Engineer:	Zhang Zishan
Test Voltage:	DC 3V	Environmental Conditions	25.8℃/53%RH/101.0kPa

BLE 1M  
Lowest Frequency  
Frequency 2402MHz  
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical

