

Test Report

Verified code: 197507

Report No.: E20240129370001-7

Customer: Lumi United Technology Co., Ltd

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

Sample Name: Aqara Smart Lock U200

Sample Model: EL-D02D

Receive Sample Date: Feb.01,2024

Test Date: Feb.02,2024 ~ Feb.29,2024

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

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GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-04-01

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20240129370001-7	Original Issue	2024-03-12

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1. TEST RESULT SUMMARY

Technical Requirements		
47 CFR, FCC Part 15 Subpart C 15.247 ANSI C63.10-2020 KDB 558074 D01 15.247 measurement guidance v05r02		
Limit / Severity	Item	Result
§15.203	Antenna Requirement	Pass
§15.207(a)	Conducted Emission	N/A
§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:

1)The antenna is PIFA antenna. The max gain of antenna is 0.82dBi.which accordance 15.203.is considered sufficient to comply with the provisions of this section.

2)N/A is not applied. The prototype is DC battery powered.

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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: Aqara Smart Lock U200

Model No.: EL-D02D

Adding Model: EL-D02E

Models Difference: The model NO. EL-D02D & EL-D02E have the same technical construction including circuit diagram, PCB LAYOUT, hardware version and software version identical, except the model name and powered are different due to the sales area .

Product Name	Model No.	Powered	Sales Area
Aqara Smart Lock U200	EL-D02D	Dry Battery+ Lithium battery	Sales entities
	EL-D02E	Lithium battery	Sales on line

Trade Name: Aqara

FCC ID: 2AKIT-ELD02

Power supply: 4 LR6 AA 1.5V Batteries(Dry Battery, DC 6V) or 7.4V battery(Lithium battery)

Frequency Band: 2402MHz-2480MHz

Transmit Power: GFSK for 1Mbps:7.73dBm
GFSK for 2Mbps:7.73dBm

Modulation type: GFSK for 1Mbps
GFSK for 2Mbps

Channel space: 2MHz

Antenna Specification: PIFA antenna with 0.82dBi gain (Max.)

Temperature Range: -15 ℃ ~ 66 ℃

Hardware Version: V2.1

Software Version: V0019

Sample No: E20240129370001-0007 , E20240129370001-0009

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 tests were performed on the EL-D02D model.

2.4 CHANNELLIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
*00	2402	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	*19	2440	29	2460	*39	2480

* is the test frequency

2.5 TEST OPERATION MODE

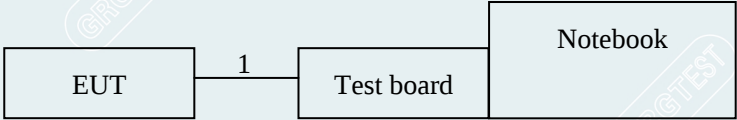
Mode No.	Description of the modes
1	Bluetooth (BLE) fixed frequency transmitting

2.6 LOCAL SUPPORTIVE

Name of equipment	Manufacturer	Model	Serial number	Note
Notebook	DELL	Latitude3300	2C6CFW2	/
Test board	/	/	/	/

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

2.7 CONFIGURATION OF SYSTEM UNDER TEST



Test software:

Software version	Test level
QCOM_V1.0	2402MHz: 80 2440MHz: 80 2480MHz: 80

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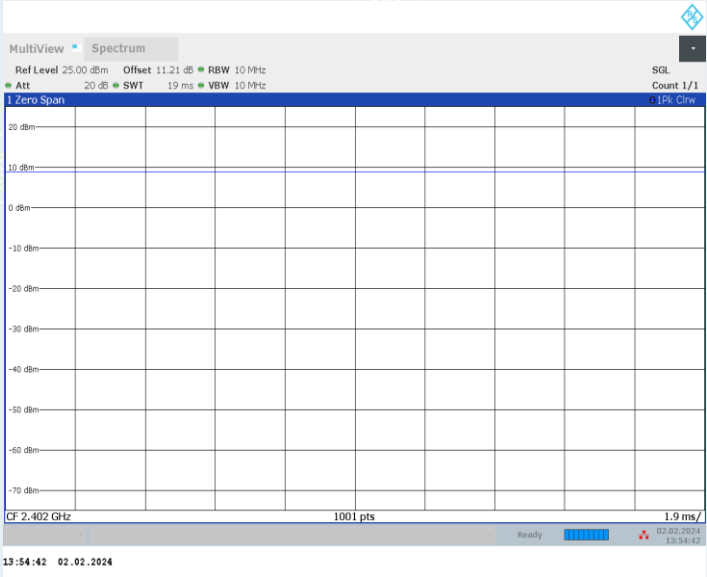
2.8 DUTY CYCLE

Environment: 23.1℃/68%RH/101.0kPa
Tested By: Huang Tianmei

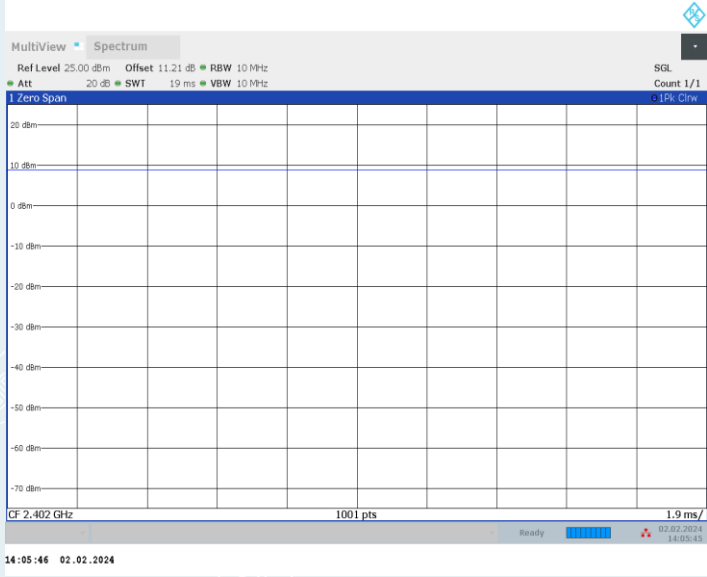
Voltage: DC 6V
Date: 2024-02-02

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	DC [%]	T [s]
BLE_1M	Ant1	2402	19.00	19.00	100.00	/
BLE_2M	Ant1	2402	19.00	19.00	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.

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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.

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Copies of granted accreditation certificates are available for downloading from our web site,
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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	X	9kHz~30MHz	4.4dB ¹⁾
	Y	9kHz~30MHz	4.4dB ¹⁾
	Z	9kHz~30MHz	4.4dB ¹⁾
	Horizontal	30MHz~200MHz	4.6dB ¹⁾
		200MHz~1000MHz	4.8dB ¹⁾
		1GHz~18GHz	5.0dB ¹⁾
		18GHz~26.5GHz	5.2dB ¹⁾
	Vertical	30MHz~200MHz	4.7dB ¹⁾
		200MHz~1000MHz	4.7dB ¹⁾
		1GHz~18GHz	5.1dB ¹⁾
		18GHz~26.5GHz	5.4dB ¹⁾

Measurement	Uncertainty
RF frequency	6.0×10 ⁻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:
¹⁾ 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
Radiated Spurious Emission&Restricted bands of operation				
Test S/W	EZ	CCS-03A1		
Loop Antenna	Schwarzbeck	FMZB 1513-60	1513-60-56	2024-07-15
Bi-log Antenna	Schwarzbeck	VULB9160	VULB9160-3402	2024-10-06
Horn Antenna	Schwarzbeck	BBHA 9120D	02143	2024-09-23
Test Receiver	R&S	ESR26	101758	2024-09-22
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-497	2024-09-18
Amplifier	SHIRONG ELECTRONIC	DLNA-30M1G-G40	20200928001	2025-01-30
Amplifier	Tonscend	TAP01018048	AP20E8060075	2024-04-11
Amplifier	Tonscend	TAP184050	AP20E806071	2024-04-16
Amplifier	SHIRONG ELECTRONIC	DLNA-1G18G-G40	20200928005	2024-08-17
Test S/W	Tonscend	JS32-RE/5.0.0		
6dB Bandwidth&Conducted band edges and Spurious Emission&Power Spectral Density				
Spectrum Analyzer	R&S	FSW43	102072	2024-07-09
Automatic power test unit	TONSCEND	JS0806-2	21B8060365	2024-11-07
BT/WIFI System	Tonscend	JS1120-3		
Maximum peak output power				
Pulse power sensor	Anristu	MA2411B	1126150	2025-01-11
Power meter	Anristu	ML2495A	1204003	2025-01-11

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

a) 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.

b) 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.

c) 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.

d) 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:

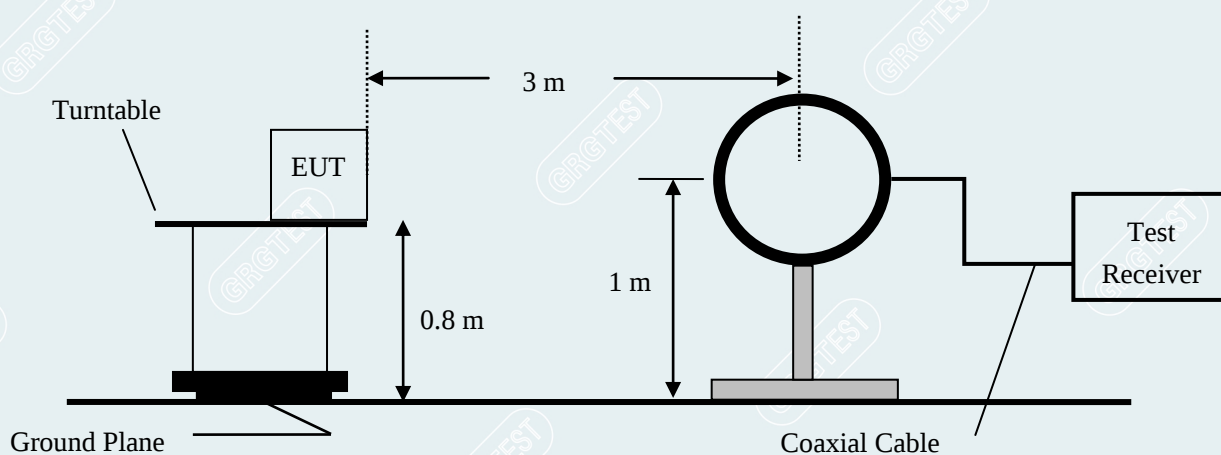
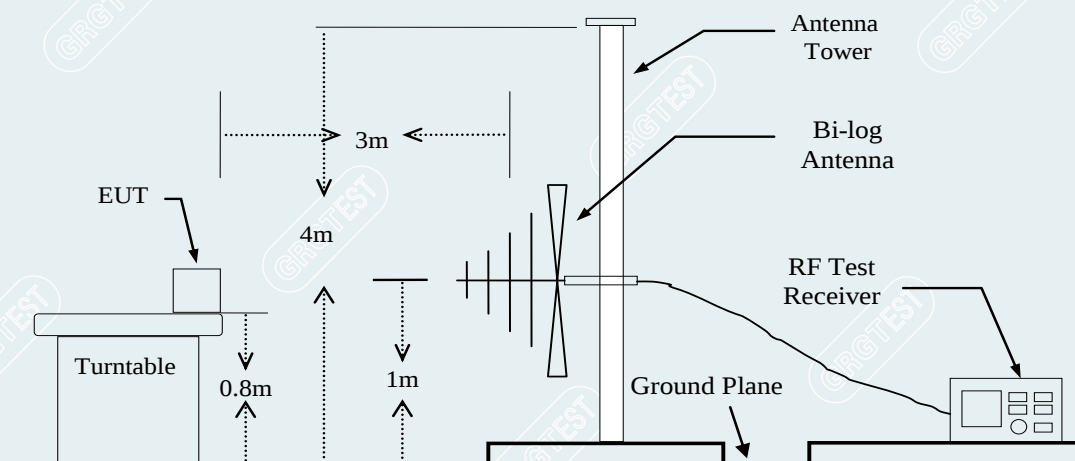
- The turntable rotates from 0 °to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

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:

- (1).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).
- (2).The frequency from 30MHz to 1GHz, Set RBW=120kHz, VBW=300kHz, (for QP Detector).
- (3).The frequency above 1GHz, for Peak detector: Set RBW=1MHz,VBW=3MHz.
- (4). 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**

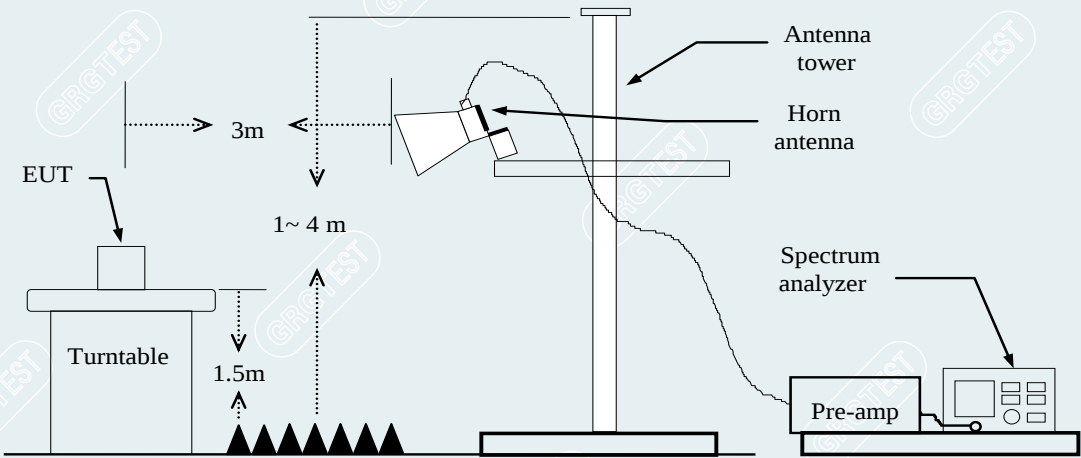


Figure 3. 1GHz to 18GHz radiated emissions test configuration

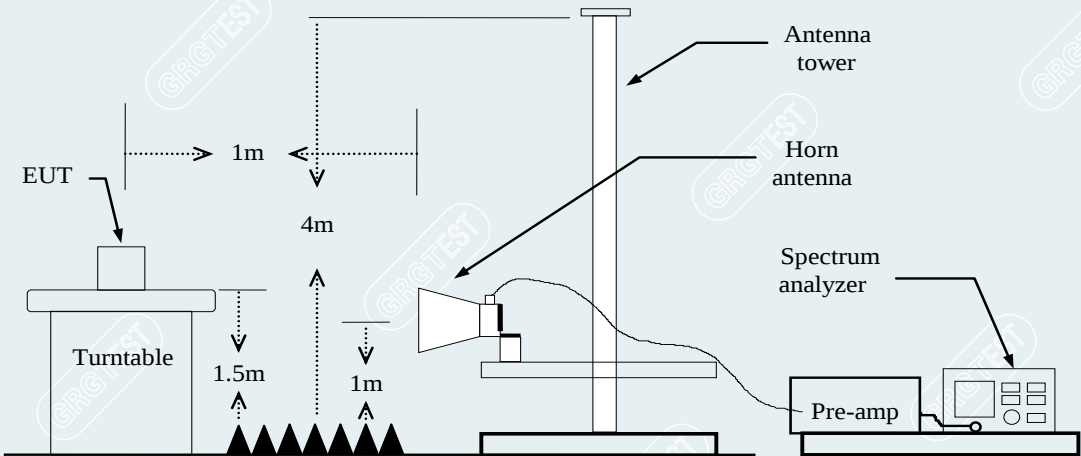


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

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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

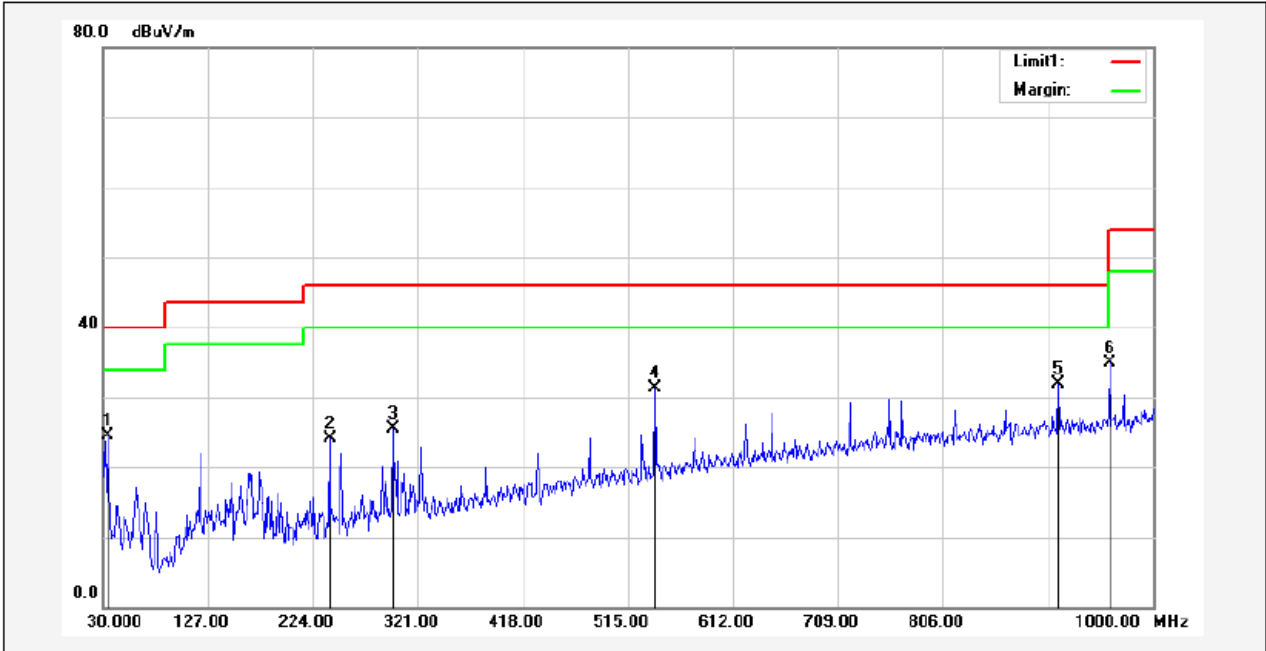
6.5 TEST RESULTS

Below 1GHz

Power supply: 7.4V battery

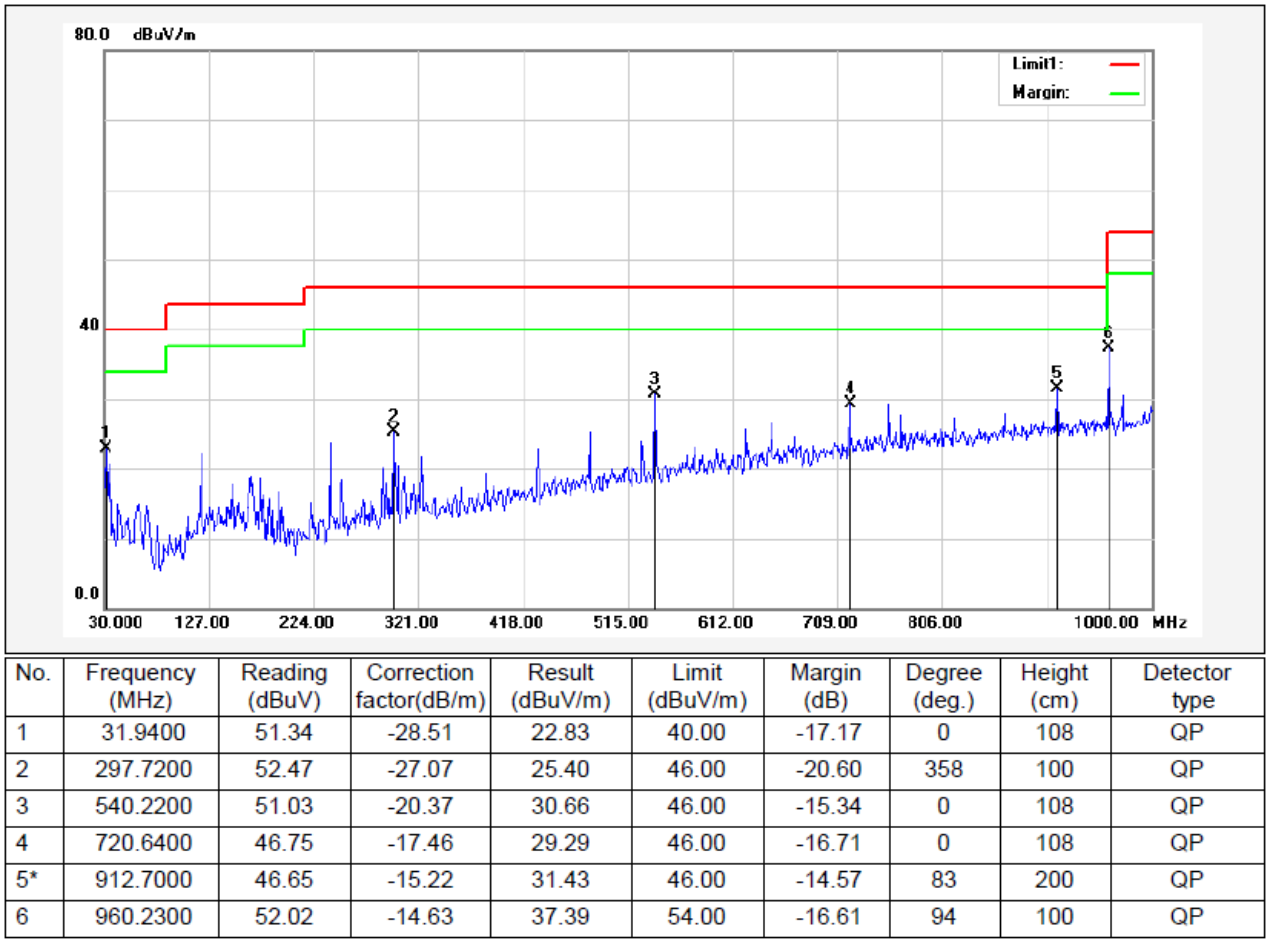
Note: Pre-scan all modes , only the worst case(TX_BLE_2M_2480MHz) is recorded, in this report.

EUT Name:	Aqara Smart Lock U200	Test Mode:	Mode 1
Model:	EL-D02D	Sample No:	E20240129370001-0009
Power supply:	DC 7.4V	Environmental Conditions:	24.2℃/49%RH/101.0kPa
Test Engineer:	Zhang Zishan	Test Date:	2024-02-29
Frequency	2480MHz(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	33.8800	52.98	-28.50	24.48	40.00	-15.52	177	200	QP
2	239.5200	53.04	-29.00	24.04	46.00	-21.96	313	200	QP
3	297.7200	52.55	-27.07	25.48	46.00	-20.52	203	100	QP
4	540.2200	51.69	-20.37	31.32	46.00	-14.68	124	200	QP
5*	912.7000	47.09	-15.22	31.87	46.00	-14.13	9	100	QP
6	960.2300	49.53	-14.63	34.90	54.00	-19.10	200	200	QP

EUT Name:	Aqara Smart Lock U200	Test Mode:	Mode 1
Model:	EL-D02D	Sample No:	E20240129370001-0009
Power supply:	DC 7.4V	Environmental Conditions:	24.2°C/49%RH/101.0kPa
Test Engineer:	Zhang Zishan	Test Date:	2024-02-29
Frequency	2480MHz(TX/ BLE_2M)	Polarity:	Vertical



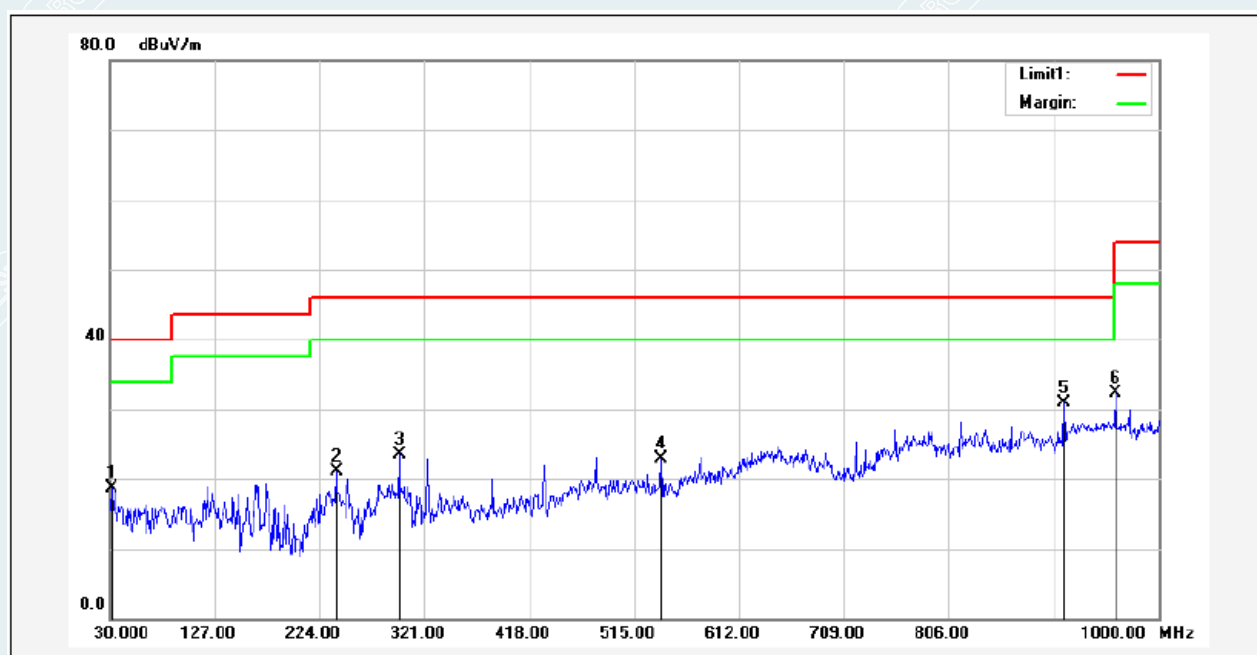
Remark:

- 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.

Power supply: 4 LR6 AA 1.5V Batteries

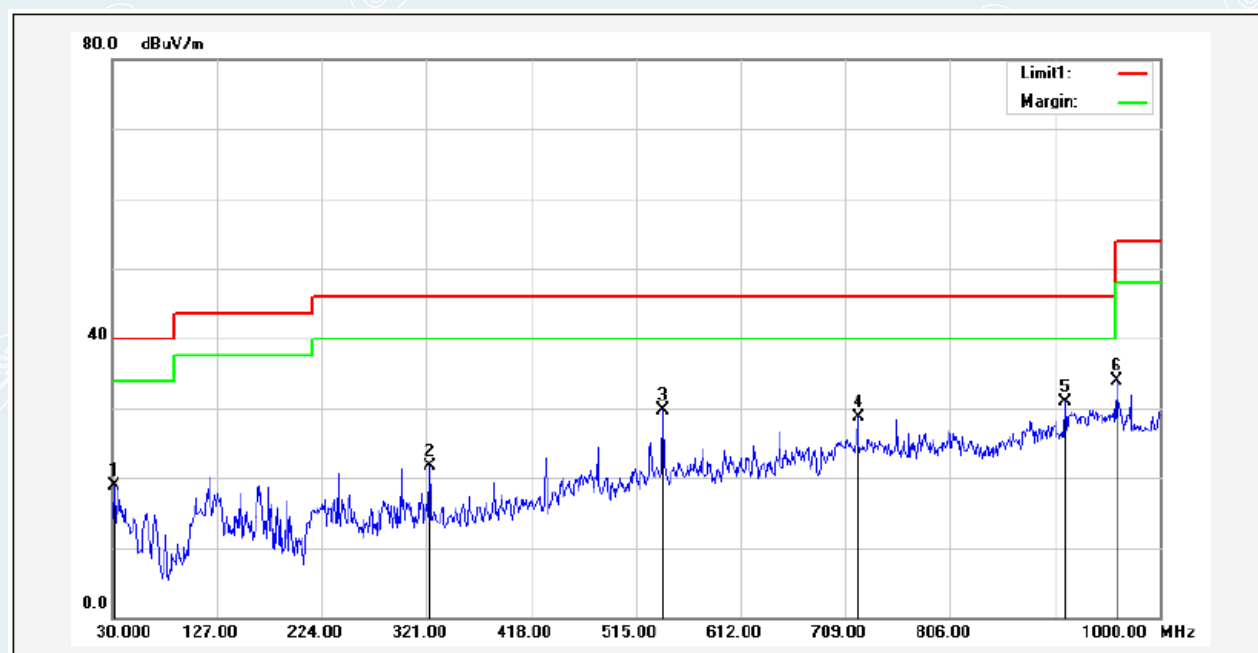
Note: Pre-scan all modes , only the worst case(TX_BLE_2M_2480MHz) is recorded, in this report.

EUT Name:	Aqara Smart Lock U200	Test Mode:	Mode 1
Model:	EL-D02D	Sample No:	E20240129370001-0009
Power supply:	DC 6V	Environmental Conditions:	24.2°C/49%RH/101.0kPa
Test Engineer:	Zhang Zishan	Test Date:	2024-02-29
Frequency	2480MHz(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	31.9400	47.30	-28.51	18.79	40.00	-21.21	172	200	QP
2	239.5200	50.04	-29.00	21.04	46.00	-24.96	313	200	QP
3	297.7200	50.55	-27.07	23.48	46.00	-22.52	203	100	QP
4	540.2200	43.19	-20.37	22.82	46.00	-23.18	120	200	QP
5*	912.7000	46.09	-15.22	30.87	46.00	-15.13	200	200	QP
6	960.2300	47.03	-14.63	32.40	54.00	-21.60	9	100	QP

EUT Name:	Aqara Smart Lock U200	Test Mode:	Mode 1
Model:	EL-D02D	Sample No:	E20240129370001-0009
Power supply:	DC 6V	Environmental Conditions:	24.2°C/49%RH/101.0kPa
Test Engineer:	Zhang Zishan	Test Date:	2024-02-29
Frequency	2480MHz(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	31.9400	47.34	-28.51	18.83	40.00	-21.17	2	105	QP
2	323.9100	48.02	-26.26	21.76	46.00	-24.24	360	100	QP
3	540.2200	50.03	-20.37	29.66	46.00	-16.34	0	105	QP
4	720.6400	46.25	-17.46	28.79	46.00	-17.21	85	200	QP
5*	912.7000	46.15	-15.22	30.93	46.00	-15.07	75	100	QP
6	960.2300	48.52	-14.63	33.89	54.00	-20.11	88	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.

Pre-scan all modes, the worst power supply is 7.4V battery. In the two power supply modes(4 LR6 AA 1.5V Batteries and 7.4V battery), only the worst power supply mode is recorded in this report.

Mode: TX/ BLE_1M
Lowest Frequency (2402MHz)
Environment: 24.2°C/49%RH/101.0kPa
Tested By:Zhang Zishan

Model:EL-D02D
Voltage: DC 7.4V
Date: 2024-02-29

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1198.8000	53.65	44.66	-8.99	74.00	29.34	100	34	Horizontal
2	1818.4000	51.42	45.90	-5.52	74.00	28.10	100	20	Horizontal
3	2917.2000	48.05	46.93	-1.12	74.00	27.07	200	113	Horizontal
4	4804.5000	56.50	49.37	-7.13	74.00	24.63	200	180	Horizontal
5	5983.5000	48.82	45.22	-3.60	74.00	28.78	100	231	Horizontal
6	12171.0000	36.40	49.97	13.57	74.00	24.03	200	194	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	4804.0135	-7.13	53.62	46.49	54.00	7.51	179	174.9	Horizontal
2	12171.0000	13.57	30.34	43.91	54.00	10.09	200	194	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	1199.4000	51.91	42.91	-9.00	74.00	31.09	100	360	Vertical
2	1819.6000	51.48	46.20	-5.28	74.00	27.80	100	222	Vertical
3	2800.0000	47.86	46.55	-1.31	74.00	27.45	200	128	Vertical
4	4803.0000	57.00	49.84	-7.16	74.00	24.16	100	191	Vertical
5	5329.5000	49.26	43.71	-5.55	74.00	30.29	100	218	Vertical
6	18000.0000	37.91	51.38	13.47	74.00	22.62	200	177	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	-7.16	54.54	47.38	54.00	6.62	130	235.7	Vertical
2	18000.0000	13.47	30.42	43.89	54.00	10.11	200	177	Vertical

Mode: TX/ BLE_1M
Middle Frequency (2440MHz)
Environment: 24.2°C/49%RH/101.0kPa
Tested By:Zhang Zishan

Model:EL-D02D
Voltage: DC 7.4V
Date: 2024-02-29

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1165.8000	50.63	41.57	-9.06	74.00	32.43	100	32	Horizontal
2	1739.2000	54.42	47.57	-6.85	74.00	26.43	100	20	Horizontal
3	2908.6000	47.87	46.74	-1.13	74.00	27.26	200	291	Horizontal
4	3988.5000	53.65	43.27	-10.38	74.00	30.73	100	111	Horizontal
5	4879.5000	57.36	50.47	-6.89	74.00	23.53	200	179	Horizontal
6	13185.0000	36.47	50.15	13.68	74.00	23.85	100	340	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	4880.0645	-6.89	54.84	47.95	54.00	6.05	179	184.4	Horizontal
2	13185.0000	13.68	30.18	43.86	54.00	10.14	100	340	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	1197.6000	53.61	44.56	-9.05	74.00	29.44	200	34	Vertical
2	1896.6000	48.34	44.98	-3.36	74.00	29.02	200	249	Vertical
3	2908.0000	49.69	48.08	-1.61	74.00	25.92	100	35	Vertical
4	3592.5000	57.32	44.58	-12.74	74.00	29.42	100	339	Vertical
5	4879.5000	54.78	47.47	-7.31	74.00	26.53	100	258	Vertical
6	17991.0000	37.23	50.71	13.48	74.00	23.29	200	246	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	2896.0900	-1.61	45.78	44.17	54.00	9.83	121	34	Vertical
2	17991.0000	13.48	30.25	43.73	54.00	10.27	200	246	Vertical

Mode: TX/ BLE_1M
Highest Frequency (2480MHz)
Environment: 24.2°C/49%RH/101.0kPa
Tested By:Zhang Zishan

Model:EL-D02D
Voltage: DC 7.4V
Date: 2024-02-29

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1194.4000	51.59	42.59	-9.00	74.00	31.41	100	74	Horizontal
2	1747.6000	51.98	45.22	-6.76	74.00	28.78	100	344	Horizontal
3	2927.2000	48.18	47.08	-1.10	74.00	26.92	100	61	Horizontal
4	3990.0000	51.68	41.31	-10.37	74.00	32.69	100	70	Horizontal
5	4959.0000	56.24	49.90	-6.34	74.00	24.10	200	192	Horizontal
6	12141.0000	36.70	50.75	14.05	74.00	23.25	200	44	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	4960.0050	-6.34	51.31	44.97	54.00	9.03	171	199.2	Horizontal
2	12141.0000	14.05	30.25	44.30	54.00	9.70	200	44	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	1196.8000	54.51	45.44	-9.07	74.00	28.56	100	211	Vertical
2	1893.8000	50.57	47.14	-3.43	74.00	26.86	100	266	Vertical
3	3597.0000	56.37	43.61	-12.76	74.00	30.39	100	339	Vertical
4	4959.0000	54.03	47.32	-6.71	74.00	26.68	100	272	Vertical
5	6571.5000	46.53	45.48	-1.05	74.00	28.52	200	342	Vertical
6	14152.5000	36.78	50.56	13.78	74.00	23.44	200	97	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	14142.2575	13.78	30.12	43.90	54.00	10.10	104	119.2	Vertical

Mode: TX/ BLE_2M
Lowest Frequency (2402MHz)
Environment: 24.2°C/49%RH/101.0kPa
Tested By:Zhang Zishan

Model:EL-D02D
Voltage: DC 7.4V
Date: 2024-02-29

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1194.0000	51.26	42.26	-9.00	74.00	31.74	100	34	Horizontal
2	1900.2000	48.94	45.26	-3.68	74.00	28.74	100	292	Horizontal
3	2117.2000	52.59	48.47	-4.12	74.00	25.53	100	250	Horizontal
4	2916.6000	48.73	47.61	-1.12	74.00	26.39	200	103	Horizontal
5	4803.0000	56.34	49.20	-7.14	74.00	24.80	200	177	Horizontal
6	12937.5000	36.94	50.66	13.72	74.00	23.34	200	54	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	2111.6240	-4.12	46.44	42.32	54.00	11.68	100	267.9	Horizontal
2	4803.9730	-7.14	50.13	42.99	54.00	11.01	180	179.7	Horizontal
3	12937.5000	13.72	31.21	44.93	54.00	9.07	200	54	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	1198.2000	52.67	43.63	-9.04	74.00	30.37	200	316	Vertical
2	1806.4000	50.73	45.10	-5.63	74.00	28.90	100	316	Vertical
3	2000.0000	51.44	46.26	-5.18	74.00	27.74	100	20	Vertical
4	2822.8000	49.00	47.73	-1.27	74.00	26.27	100	235	Vertical
5	4804.5000	56.38	49.22	-7.16	74.00	24.78	100	191	Vertical
6	18000.0000	37.88	51.35	13.47	74.00	22.65	100	341	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	4804.0135	-7.16	50.08	42.92	54.00	11.08	155	235.7	Vertical
2	18000.0000	13.47	31.25	44.72	54.00	9.28	100	341	Vertical

Mode: TX/ BLE_2M
Middle Frequency (2440MHz)
Environment: 24.2°C/49%RH/101.0kPa
Tested By:Zhang Zishan

Model:EL-D02D
Voltage: DC 7.4V
Date: 2024-02-29

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1194.4000	49.56	40.56	-9.00	74.00	33.44	100	32	Horizontal
2	1328.8000	50.30	41.86	-8.44	74.00	32.14	100	19	Horizontal
3	1838.6000	49.74	44.63	-5.11	74.00	29.37	100	167	Horizontal
4	2924.0000	47.80	46.69	-1.11	74.00	27.31	200	222	Horizontal
5	4881.0000	56.70	49.81	-6.89	74.00	24.19	200	175	Horizontal
6	12858.0000	36.86	50.67	13.81	74.00	23.33	100	338	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	4880.0110	-6.89	50.69	43.80	54.00	10.20	182	182.1	Horizontal
2	12858.0000	13.81	30.14	43.95	54.00	10.05	100	338	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	1512.0000	50.20	42.89	-7.31	74.00	31.11	100	61	Vertical
2	1911.6000	48.39	44.81	-3.58	74.00	29.19	200	154	Vertical
3	2921.2000	48.30	46.78	-1.52	74.00	27.22	100	224	Vertical
4	4878.0000	54.72	47.40	-7.32	74.00	26.60	100	243	Vertical
5	6852.0000	44.73	44.88	0.15	74.00	29.12	100	55	Vertical
6	17947.5000	37.23	50.74	13.51	74.00	23.26	200	218	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	17947.5000	13.51	30.14	43.65	54.00	10.35	200	218	Vertical

Mode: TX/ BLE_2M
Highest Frequency (2480MHz)
Environment: 24.2°C/49%RH/101.0kPa
Tested By:Zhang Zishan

Model:EL-D02D
Voltage: DC 7.4V
Date: 2024-02-29

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1194.4000	51.73	42.73	-9.00	74.00	31.27	100	340	Horizontal
2	1665.0000	53.01	45.52	-7.49	74.00	28.48	100	71	Horizontal
3	3993.0000	53.87	43.51	-10.36	74.00	30.49	200	358	Horizontal
4	4959.0000	56.32	49.98	-6.34	74.00	24.02	200	183	Horizontal
5	6718.5000	45.32	44.61	-0.71	74.00	29.39	200	88	Horizontal
6	12163.5000	36.59	50.38	13.79	74.00	23.62	100	139	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	4960.0050	-6.34	49.39	43.05	54.00	10.95	200	185.5	Horizontal
2	12163.5000	13.79	30.51	44.30	54.00	9.70	100	139	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	1166.2000	53.38	43.51	-9.87	74.00	30.49	200	2	Vertical
2	1665.6000	51.80	43.53	-8.27	74.00	30.47	100	340	Vertical
3	1824.2000	50.43	45.27	-5.16	74.00	28.73	200	150	Vertical
4	4959.0000	55.19	48.48	-6.71	74.00	25.52	100	274	Vertical
5	7984.5000	44.10	47.66	3.56	74.00	26.34	100	301	Vertical
6	17995.5000	37.70	51.17	13.47	74.00	22.83	200	265	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	-6.71	45.55	38.84	54.00	15.16	121	282	Vertical
2	17995.5000	13.47	30.21	43.68	54.00	10.32	200	265	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.

Note: Pre-scan all modes, the worst power supply is 7.4V battery. In the two power supply modes(4 LR6 AA 1.5V Batteries and 7.4V battery), only the worst case(TX/ BLE_2M_2480MHz) in the worst power supply is recorded, in this report.

Mode: TX/ BLE_2M

Lowest Frequency (2480MHz)

Environment: 27.5°C/57%RH/101.0kPa

Tested By: Zhang Zishan

Model:EL-D02D

Voltage: DC 7.4V

Date: 2024-03-08

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	18386.7500	47.45	29.67	20.13	-17.78	74	53.87	100	309	Horizontal
2	19895.9250	47.00	30.42	20.88	-16.58	74	53.12	100	175	Horizontal
3	21280.5750	44.99	29.14	19.6	-15.85	74	54.40	200	102	Horizontal
4	22130.1500	44.18	28.53	18.99	-15.65	74	55.01	200	332	Horizontal
5	23993.3500	45.54	31.30	21.76	-14.24	74	52.24	100	344	Horizontal
6	25463.4250	46.95	32.75	23.21	-14.20	74	50.79	150	175	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	18221.8500	48.17	30.06	20.52	-18.11	74	53.48	200	197	Vertical
2	19889.1250	47.10	30.26	20.72	-16.84	74	53.28	200	210	Vertical
3	21242.7500	44.66	28.61	19.07	-16.05	74	54.93	100	320	Vertical
4	22952.1000	45.45	30.63	21.09	-14.82	74	52.91	100	111	Vertical
5	24494.8500	45.52	31.29	21.75	-14.23	74	52.25	250	197	Vertical
6	25684.0000	45.49	31.34	21.8	-14.15	74	52.20	150	37	Vertical

Remark:

- 1 Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2 Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.
- 3 Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- 4 Above 18G test distance is 1m, so the Level for 3m= Level for 1m + 20*log(1/3)

7. 6dB BANDWIDTH

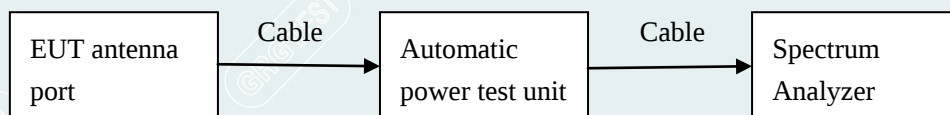
7.1 LIMITS

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

- Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the Automatic power measuring unit.
- 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.
- Repeat above procedures until all frequencies measured were complete.

7.3 TEST SETUP



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

7.4 TEST RESULTS

Environment: 23.1℃/68%RH/101.0kPa
Tested By: Huang Tianmei

Voltage: DC 6V
Date: 2024-02-02

BLE_1M

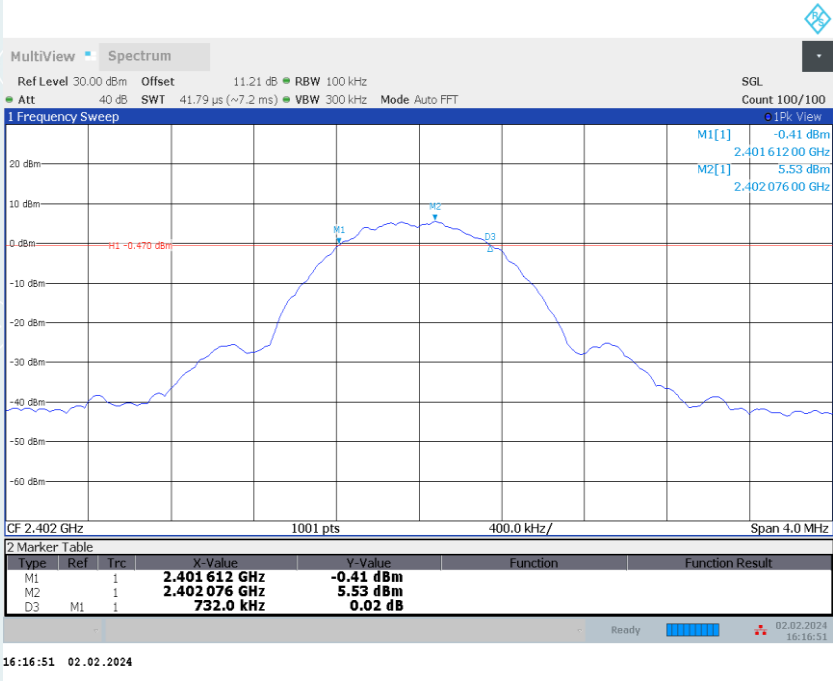
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	732	≥500	PASS
Middle	2440	716		PASS
Highest	2480	740		PASS

BLE_2M

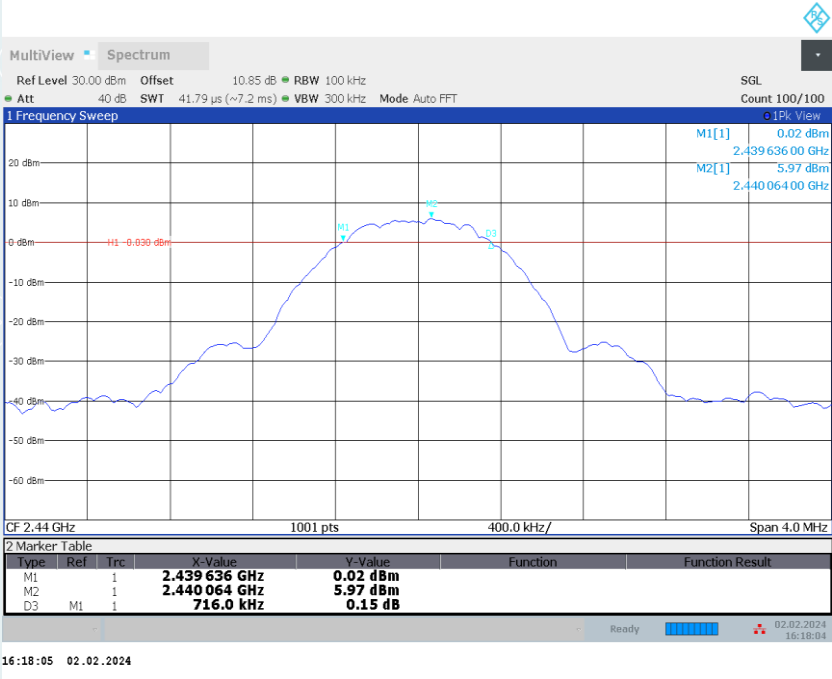
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	1300	≥500	PASS
Middle	2440	1356		PASS
Highest	2480	1364		PASS

BLE_1M

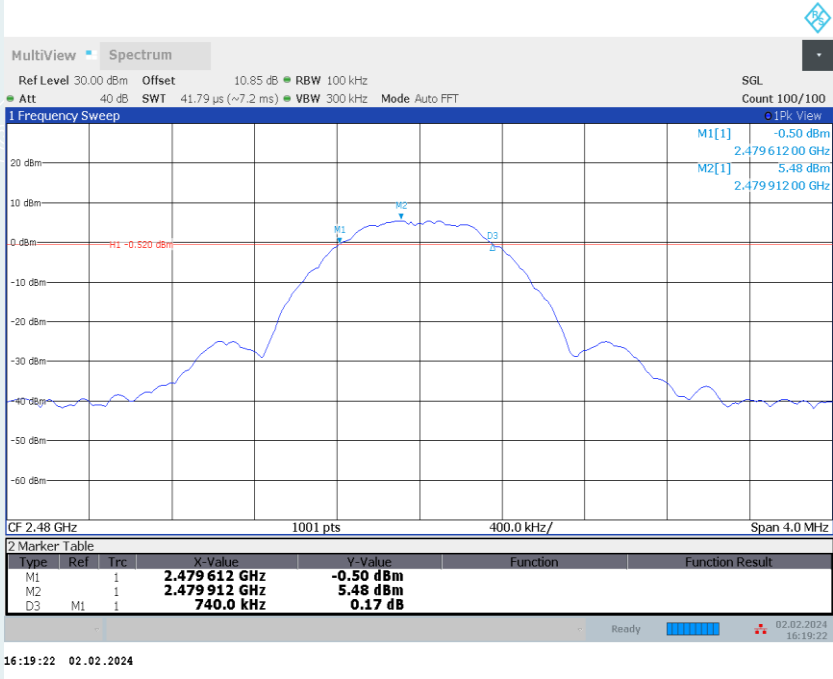
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)

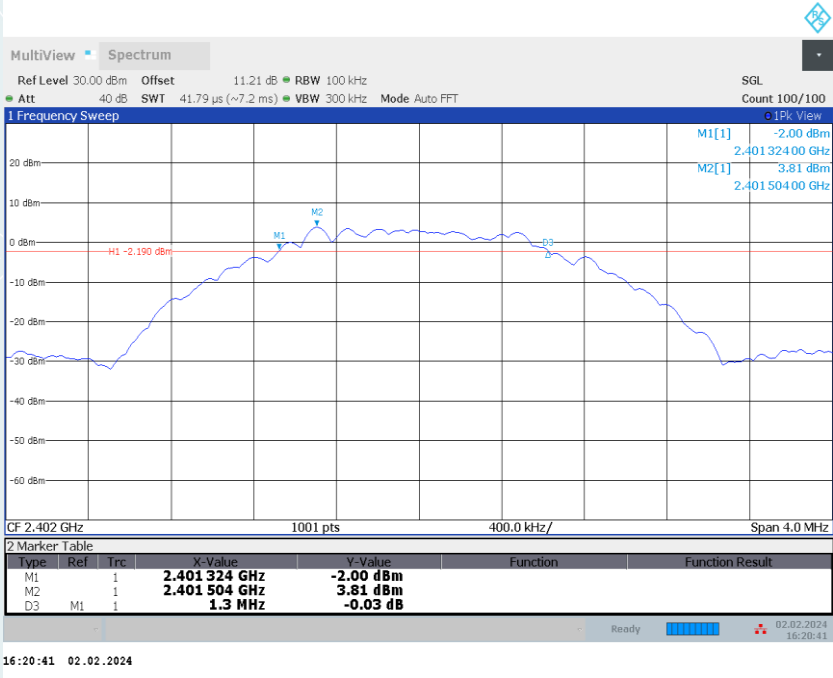


Highest Frequency (2480MHz)

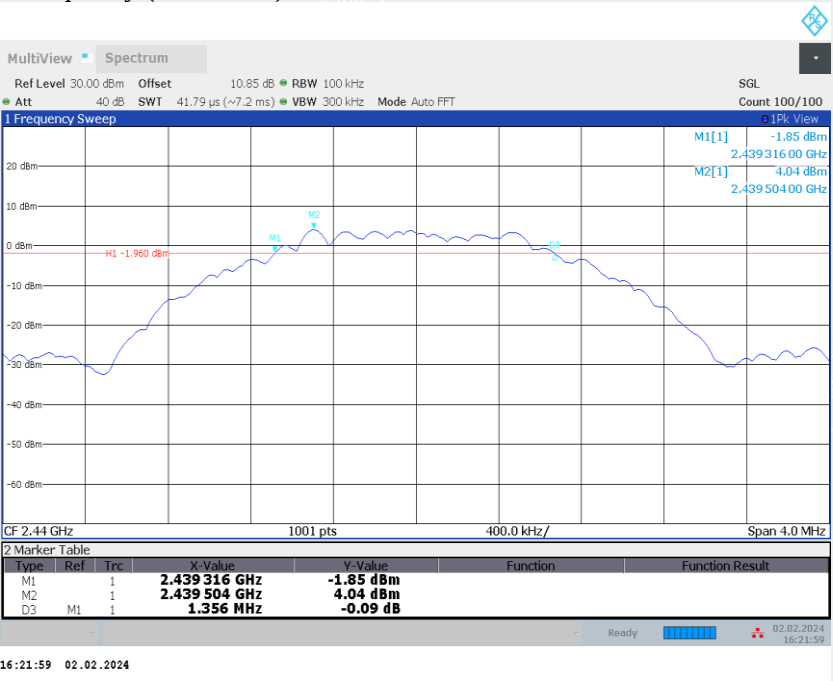


BLE_2M

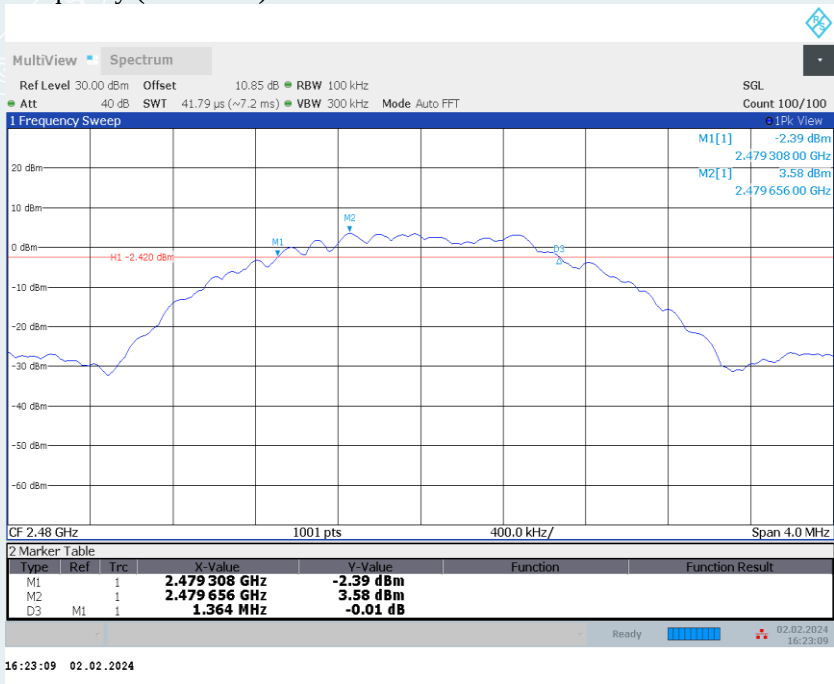
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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8. MAXIMUM PEAK OUTPUT POWER

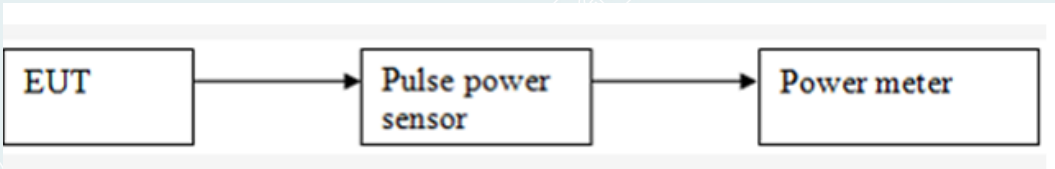
8.1 LIMITS

The maximum Peak output power measurement is 1W

8.2 TEST PROCEDURES

- a) 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.
- b) Set to the maximum power setting and enable the EUT transmit continuously.
- c) Measure the conducted output power and record the results in the test report.

8.3 TEST SETUP



8.4 TEST RESULTS

Environment: 23.1°C/68%RH/101.0kPa
Tested By: Huang Tianmei

Voltage: DC 6V
Date: 2024-02-02

BLE_1M

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	7.66	1W (30dBm)	Peak	Pass
Middle	2440	7.66			Pass
Highest	2480	7.73			Pass

BLE_2M

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	7.65	1W (30dBm)	Peak	Pass
Middle	2440	7.65			Pass
Highest	2480	7.73			Pass

9. POWER SPECTRAL DENSITY

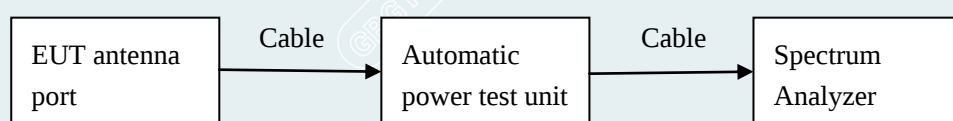
9.1 LIMITS

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

- a) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- b) 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.
- c) The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:
 - a) Set analyzer center frequency to DTS channel center frequency.
 - b) Set the span to at least 1.5 times the DTS bandwidth.
 - c) Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - d) Set the VBW $\geq [3 \times \text{RBW}]$.
 - e) Detector = peak
 - f) Sweep time = auto couple.
 - g) Trace mode = max hold.
 - h) Allow trace to fully stabilize.
 - i) Use the peak marker function to determine the maximum amplitude level within the RBW.
 - j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
- d) Repeat above procedures until all frequencies measured were complete.

9.3 TEST SETUP



9.4 TEST RESULTS

Environment: 23.1℃/68%RH/101.0kPa
Tested By: Huang Tianmei

Voltage: DC 6V
Date: 2024-02-02

BLE_1M

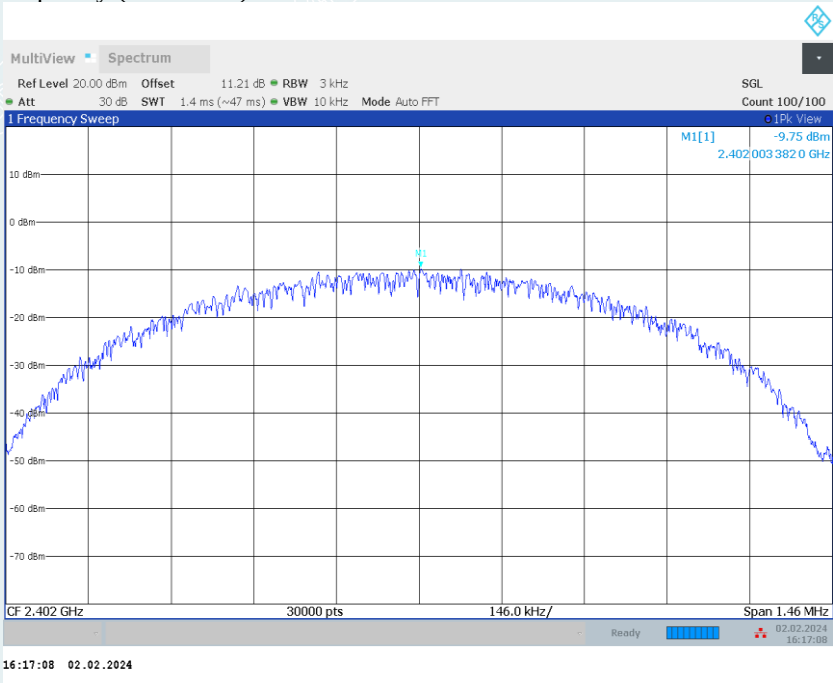
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-9.75	8.00	PASS
Middle	2440	-9.38		PASS
Highest	2480	-9.55		PASS

BLE_2M

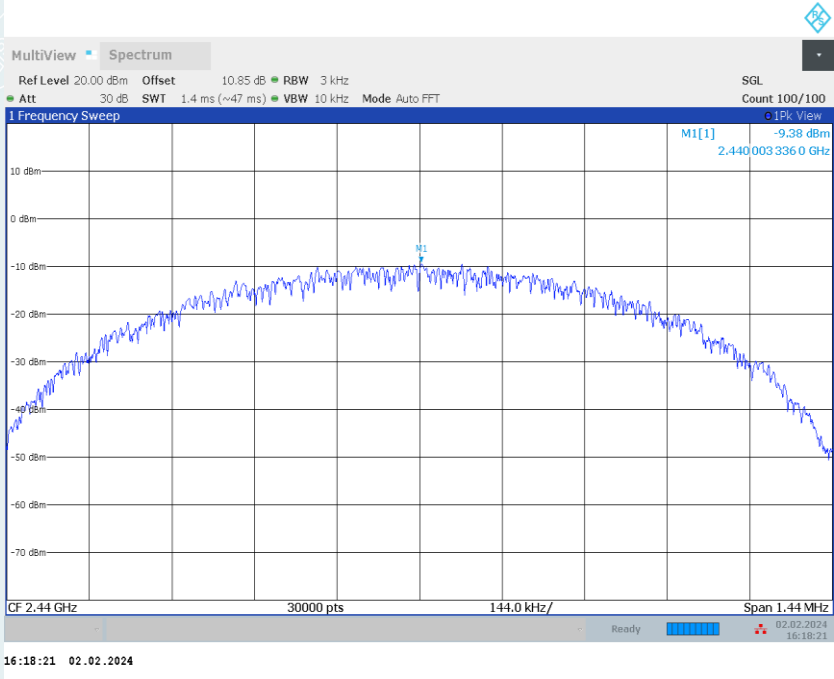
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-10.54	8.00	PASS
Middle	2440	-10.22		PASS
Highest	2480	-10.40		PASS

BLE_1M

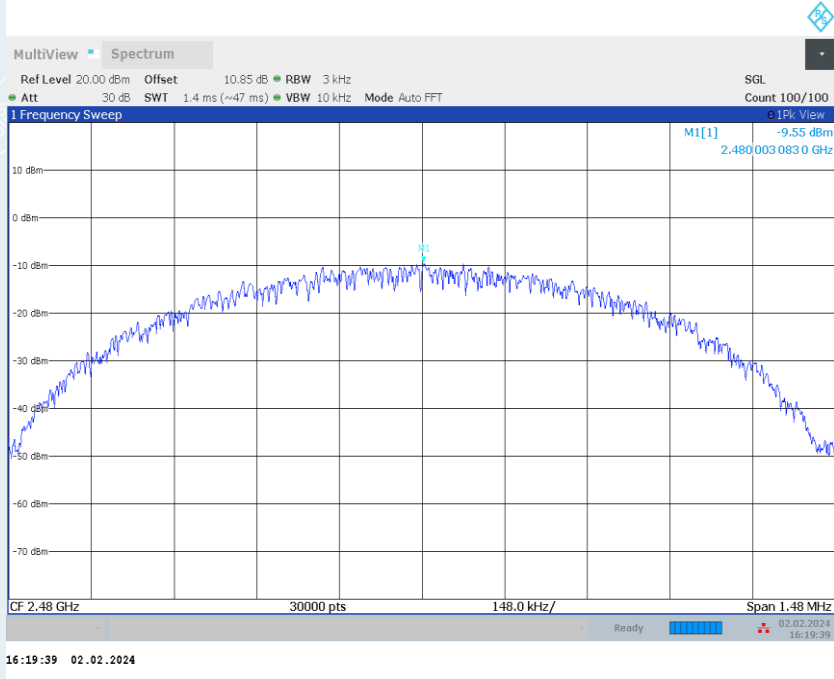
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)

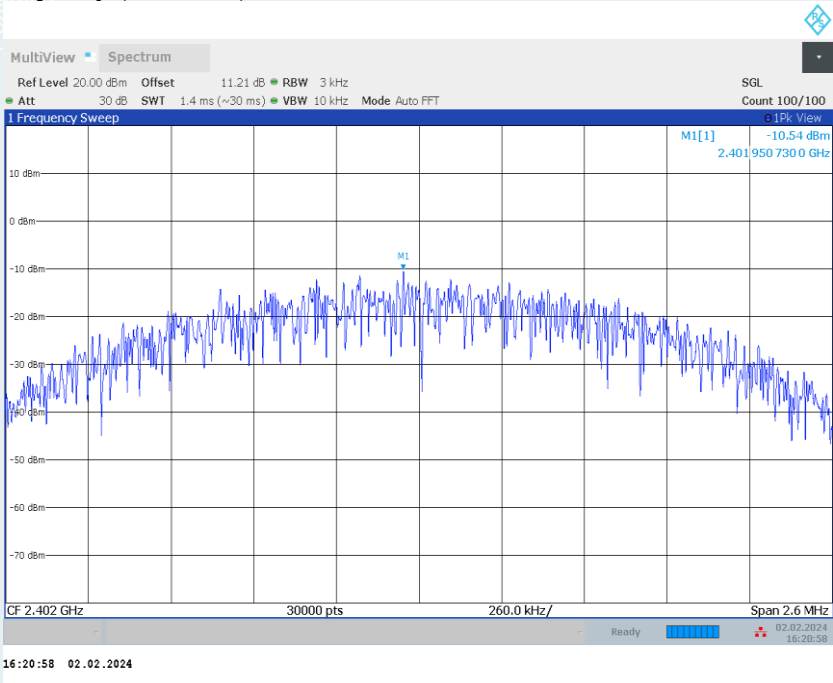


Highest Frequency (2480MHz)

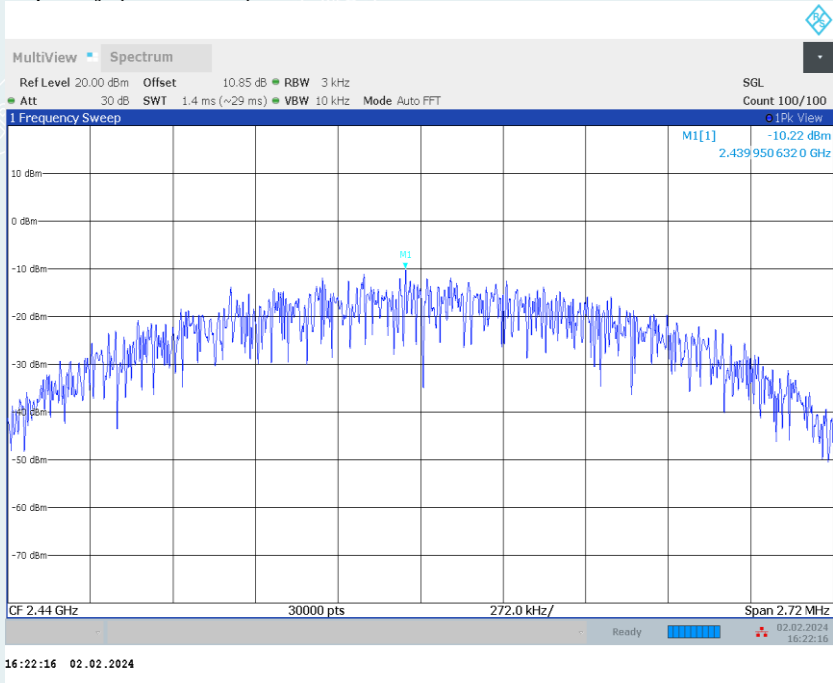


BLE_2M

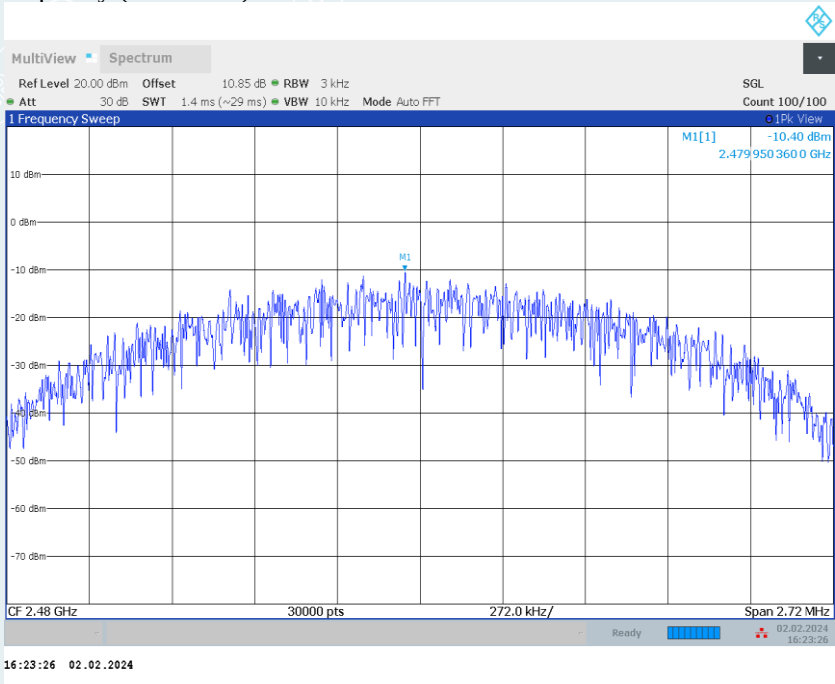
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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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.

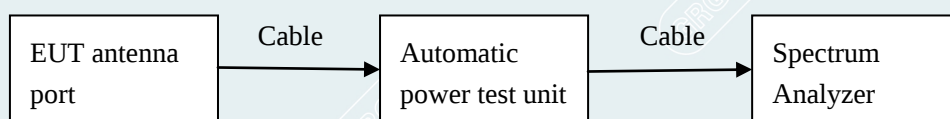
10.2 TEST PROCEDURES

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.

- Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.
- Set the spectrum analyzer: RBW =100kHz; VBW =300kHz, Frequency range = 30MHz to 26.5GHz; Sweep = auto; Detector Function = Peak. Trace = Max, hold.
- Measure and record the results in the test report.
- 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: 23.1°C/68%RH/101.0kPa
Tested By: Huang Tianmei

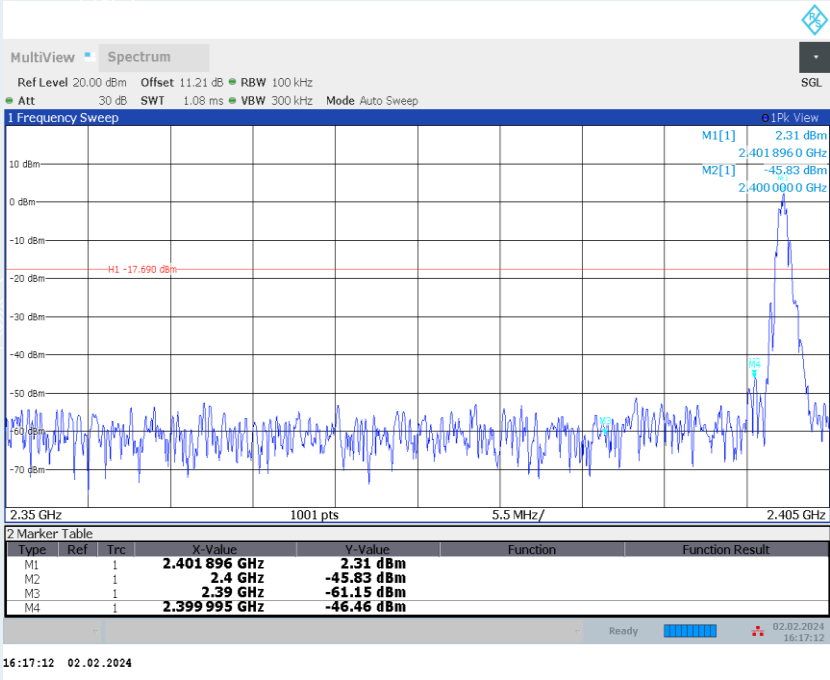
Voltage: DC 6V
Date: 2024-02-02

Band edge measurements

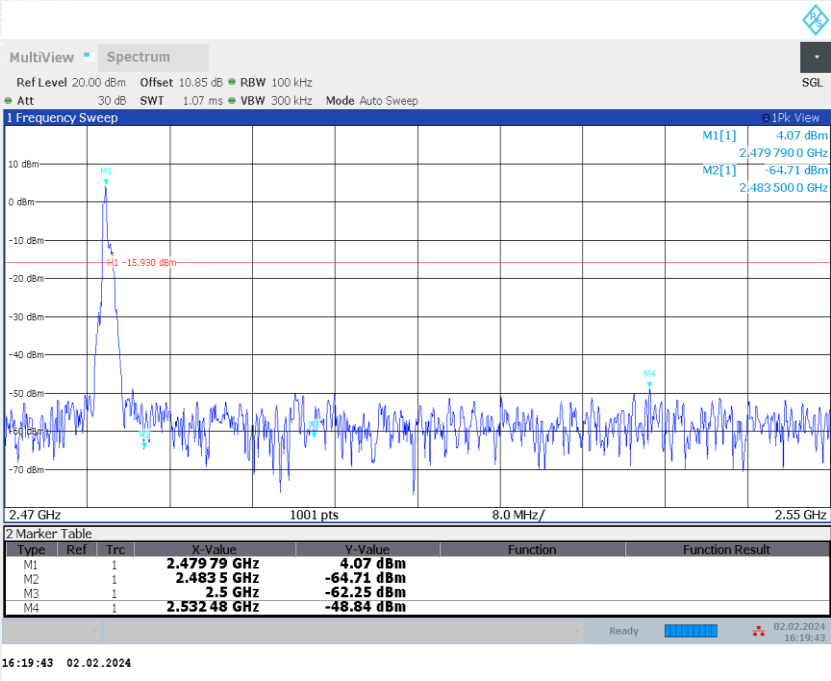
TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	2.31	-46.46	≤-17.69	PASS
		High	2480	4.07	-48.84	≤-15.93	PASS
BLE_2M	Ant1	Low	2402	2.42	-33.14	≤-17.58	PASS
		High	2480	-0.54	-49.01	≤-20.54	PASS

BLE_1M

Lowest Frequency (2402MHz)
2.35GHz-2.405GHz

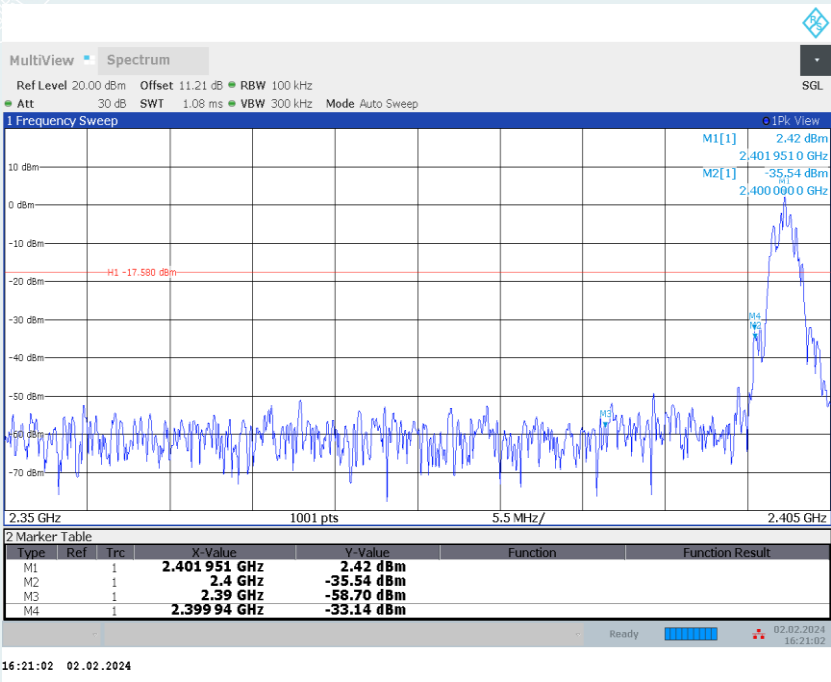


Highest Frequency (2480MHz)
2.47GHz-2.55GHz

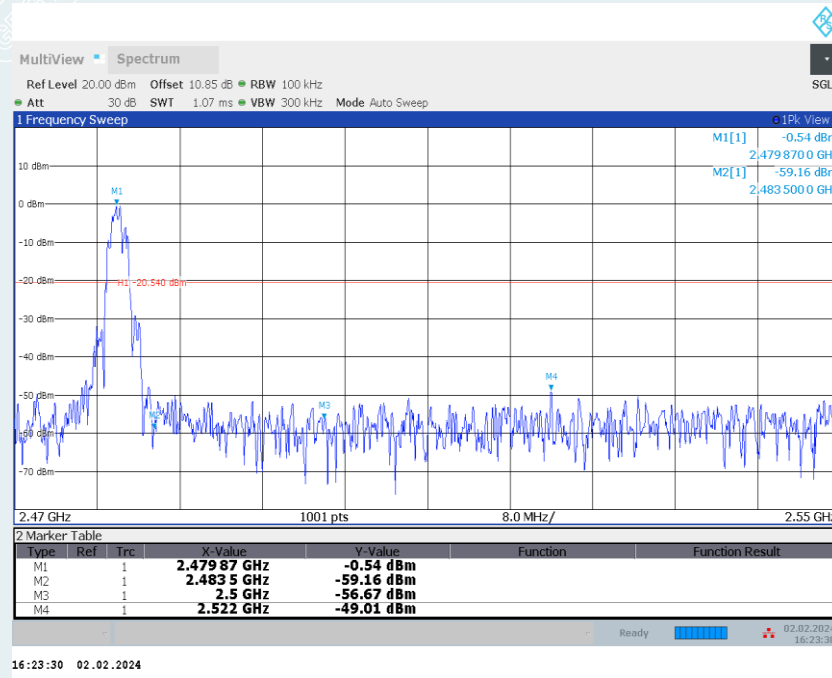


BLE_2M

Lowest Frequency (2402MHz)
2.35GHz-2.405GHz



Highest Frequency (2480MHz)
2.47GHz-2.55GHz

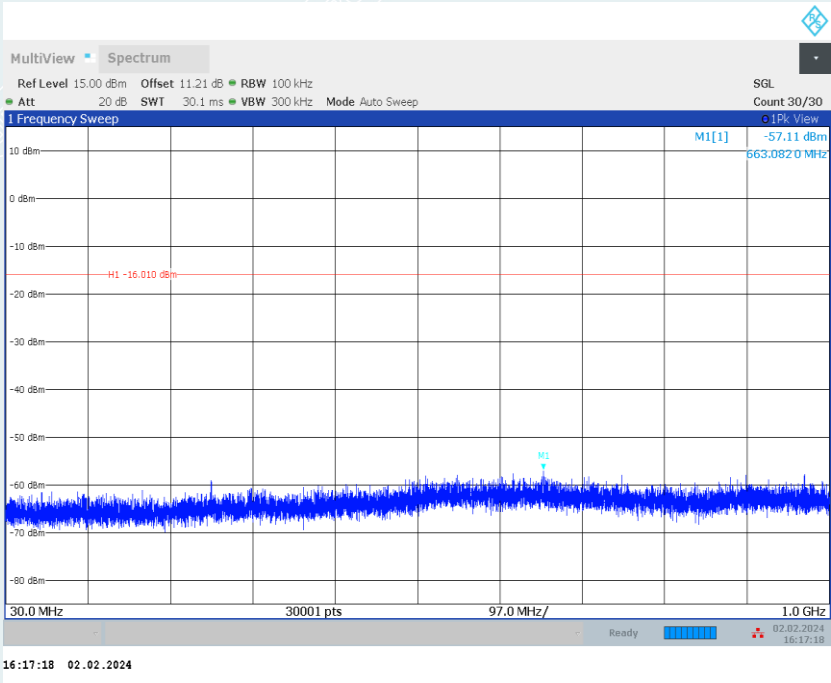
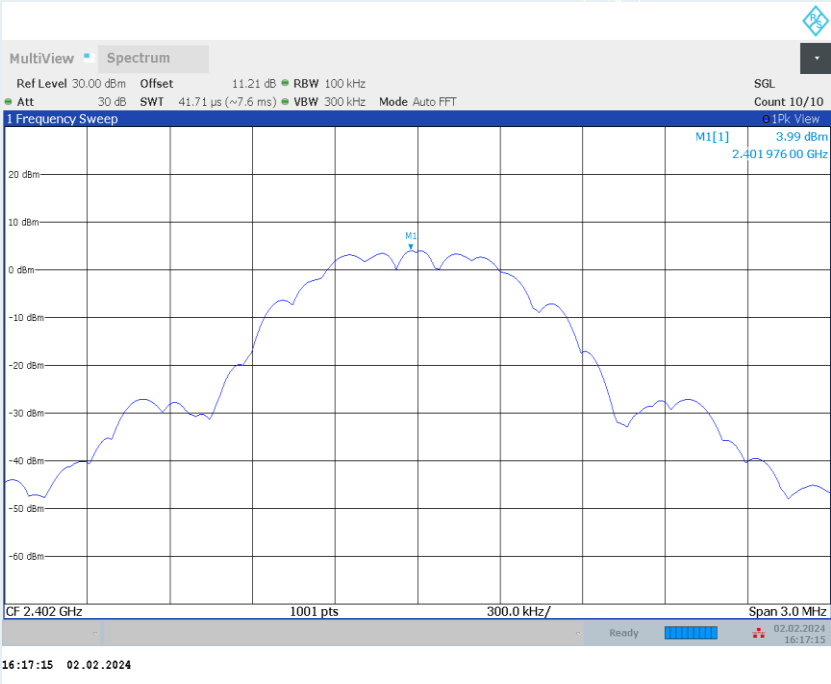


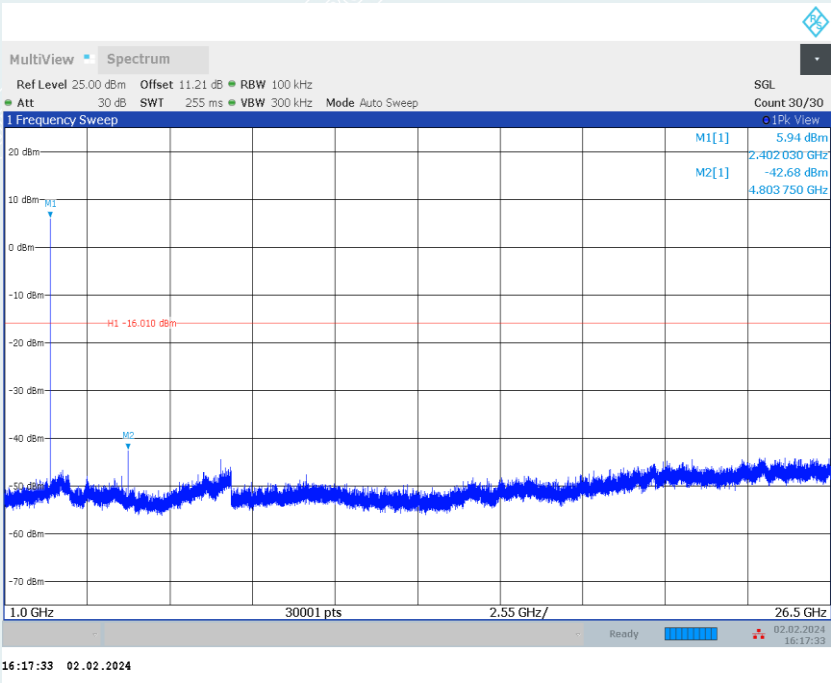
Conducted Spurious Emission

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	3.99	3.99	---	PASS
			30~1000	3.99	-57.11	≤-16.01	PASS
			1000~26500	3.99	-42.68	≤-16.01	PASS
		2440	Reference	5.62	5.62	---	PASS
			30~1000	5.62	-57.8	≤-14.38	PASS
			1000~26500	5.62	-43.4	≤-14.38	PASS
		2480	Reference	5.14	5.14	---	PASS
			30~1000	5.14	-57.39	≤-14.86	PASS
			1000~26500	5.14	-44.1	≤-14.86	PASS
BLE_2M	Ant1	2402	Reference	3.48	3.48	---	PASS
			30~1000	3.48	-58.01	≤-16.52	PASS
			1000~26500	3.48	-43.77	≤-16.52	PASS
		2440	Reference	3.59	3.59	---	PASS
			30~1000	3.59	-57.67	≤-16.41	PASS
			1000~26500	3.59	-44.18	≤-16.41	PASS
		2480	Reference	2.82	2.82	---	PASS
			30~1000	2.82	-57.54	≤-17.18	PASS
			1000~26500	2.82	-43.58	≤-17.18	PASS

BLE_1M

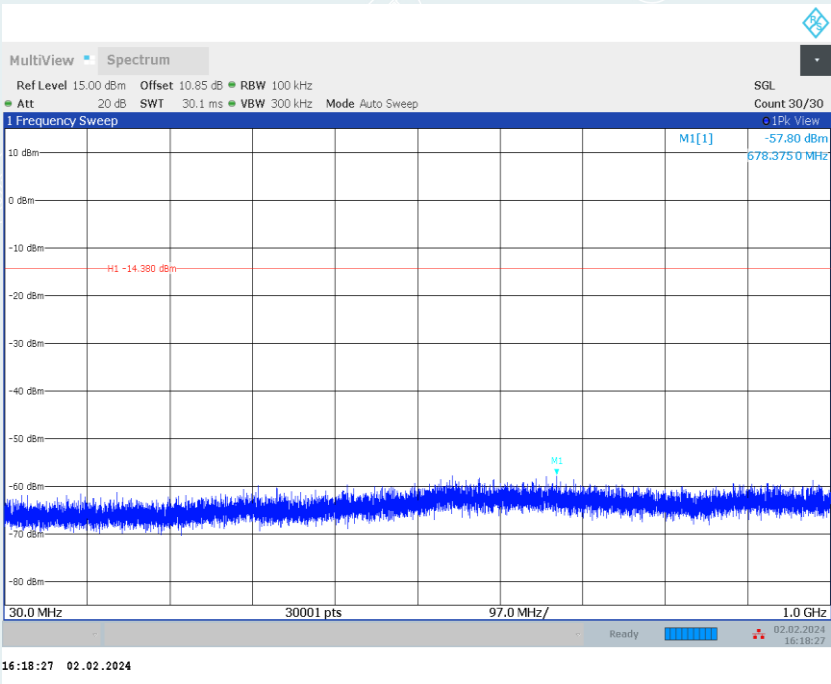
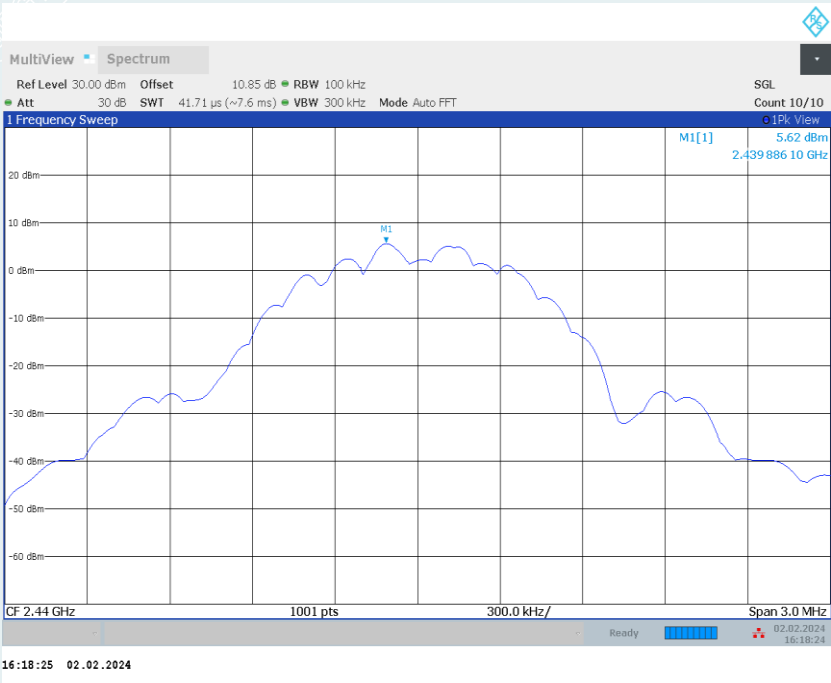
Lowest Frequency (2402MHz)

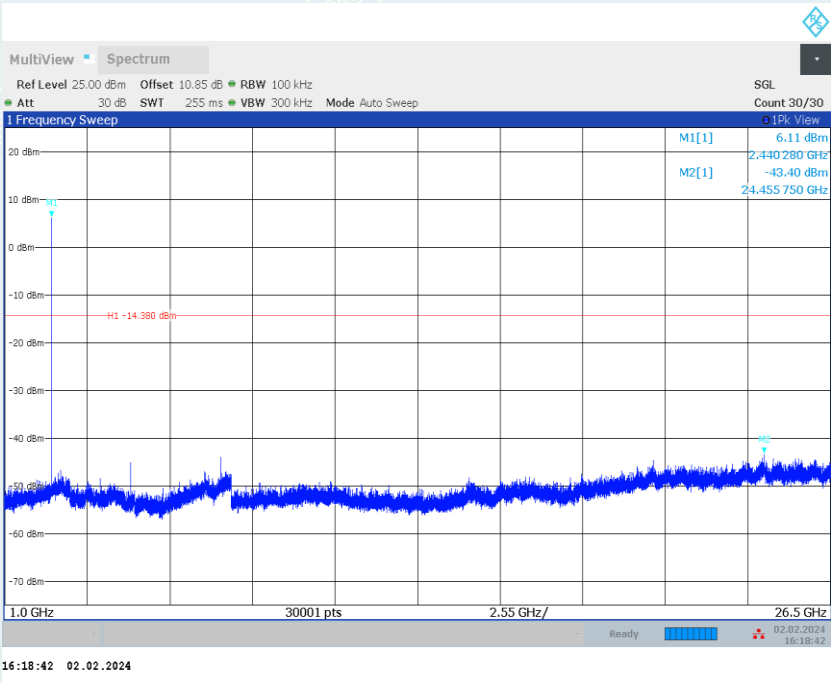




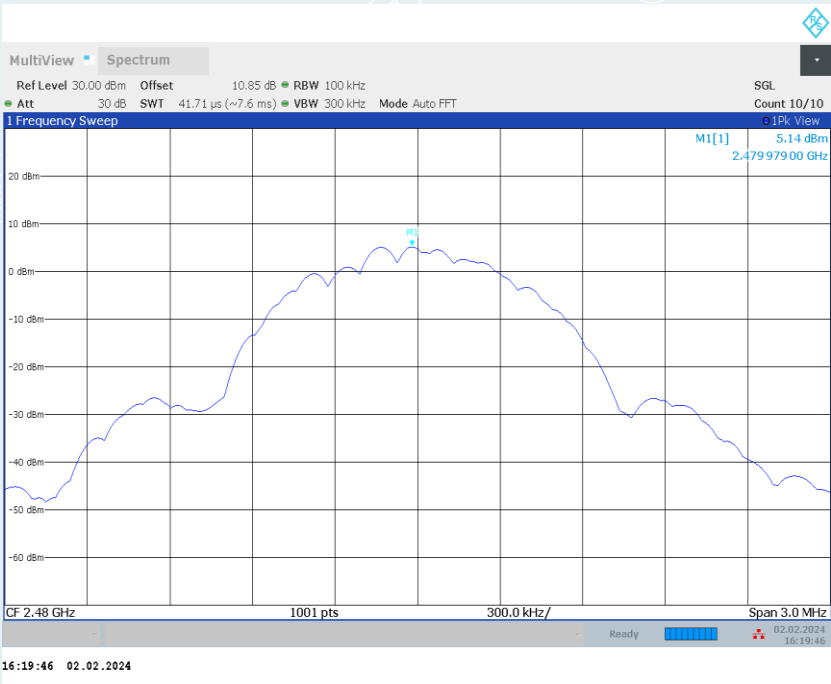
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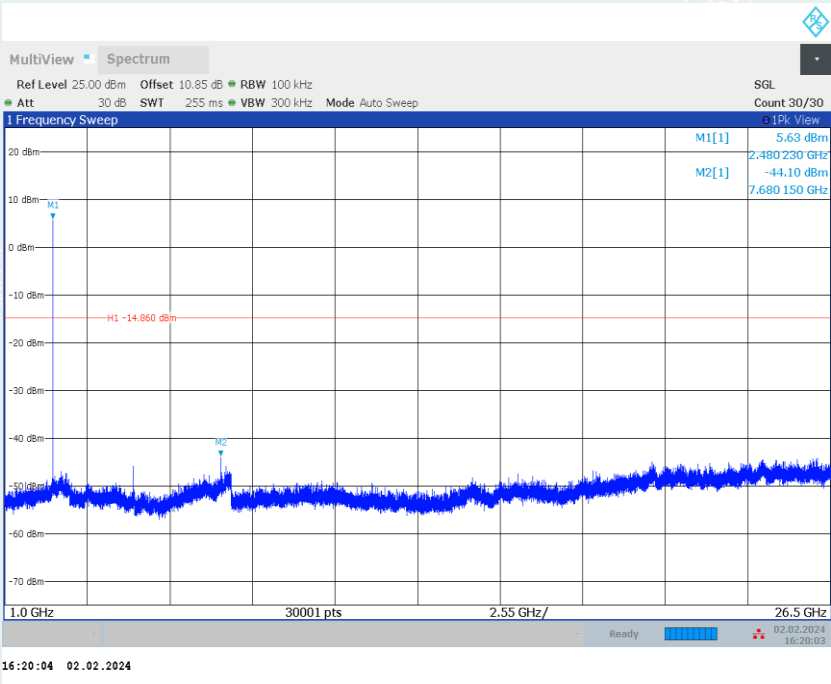
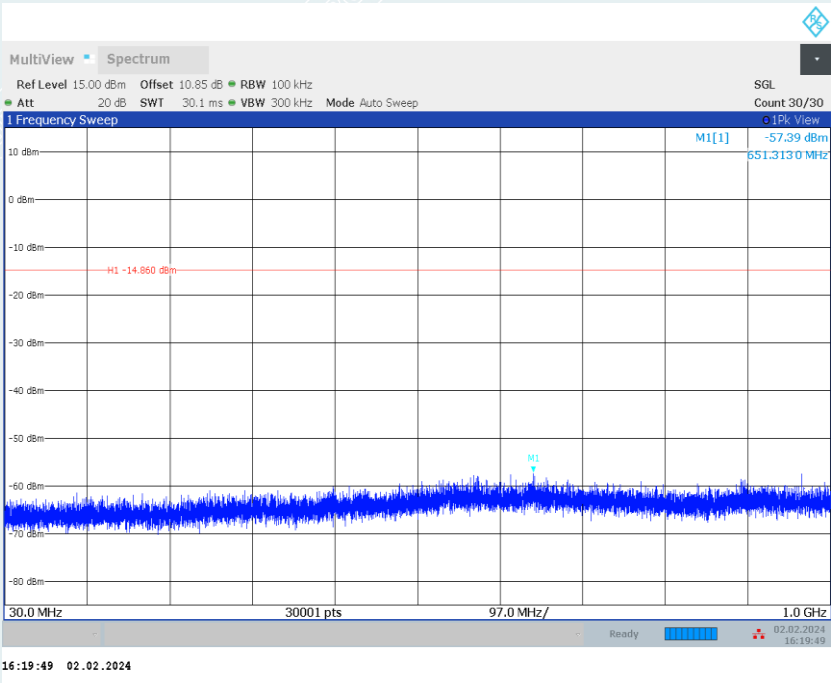
Middle Frequency (2440MHz)





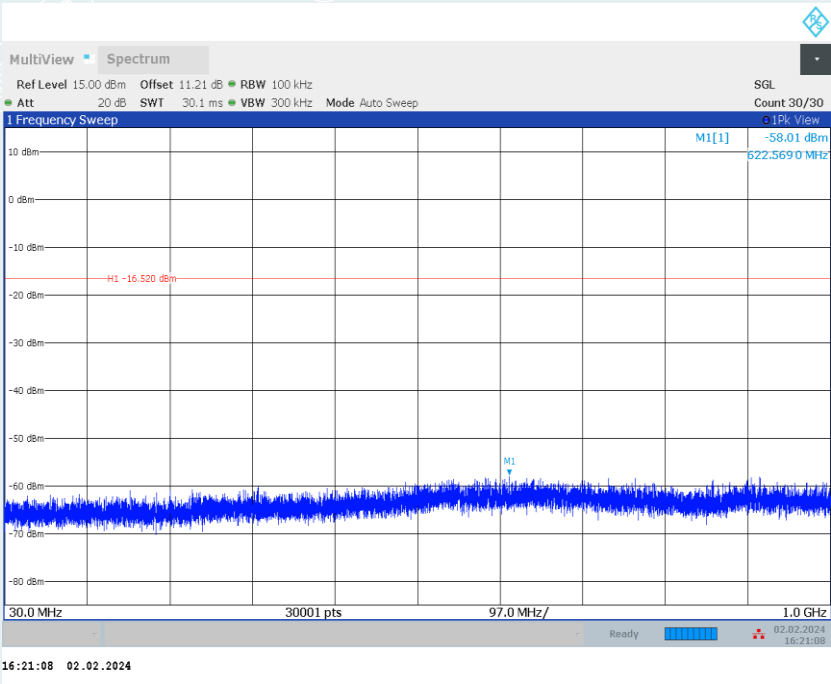
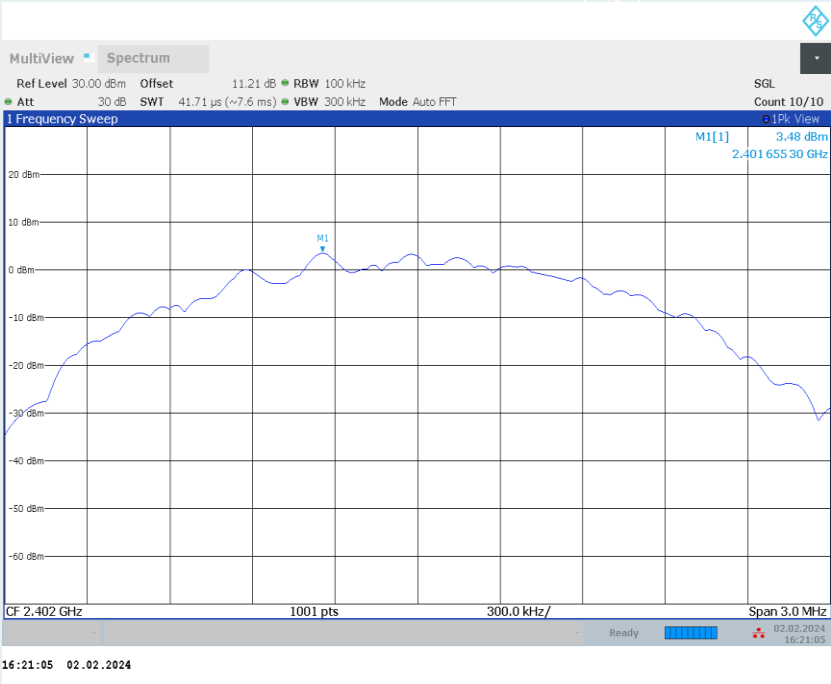
Highest Frequency (2480MHz)

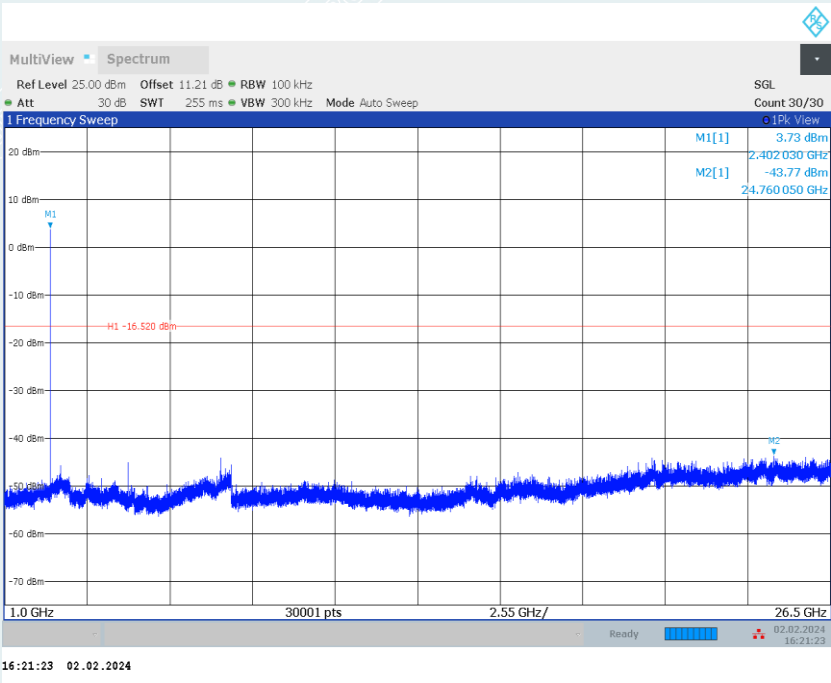




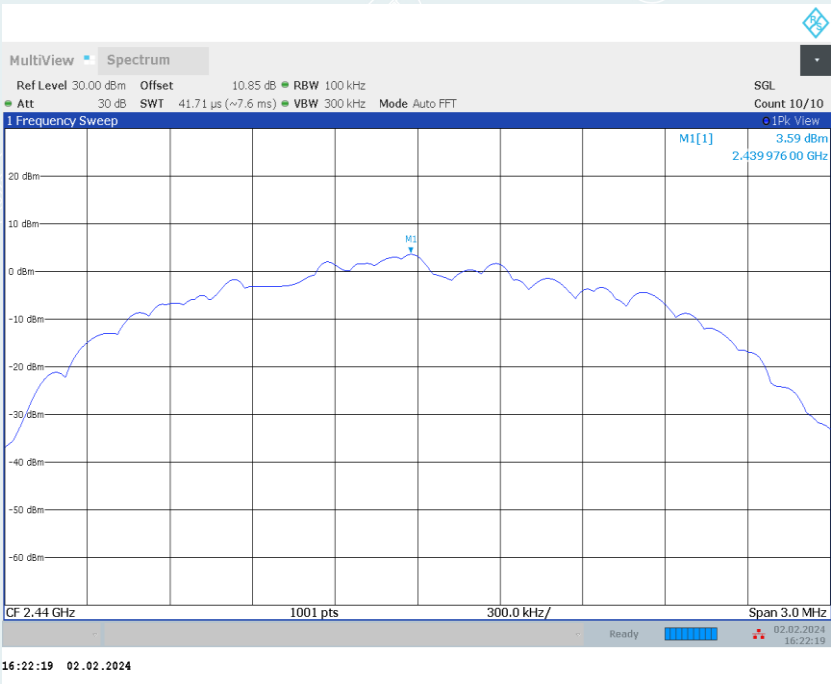
BLE_2M

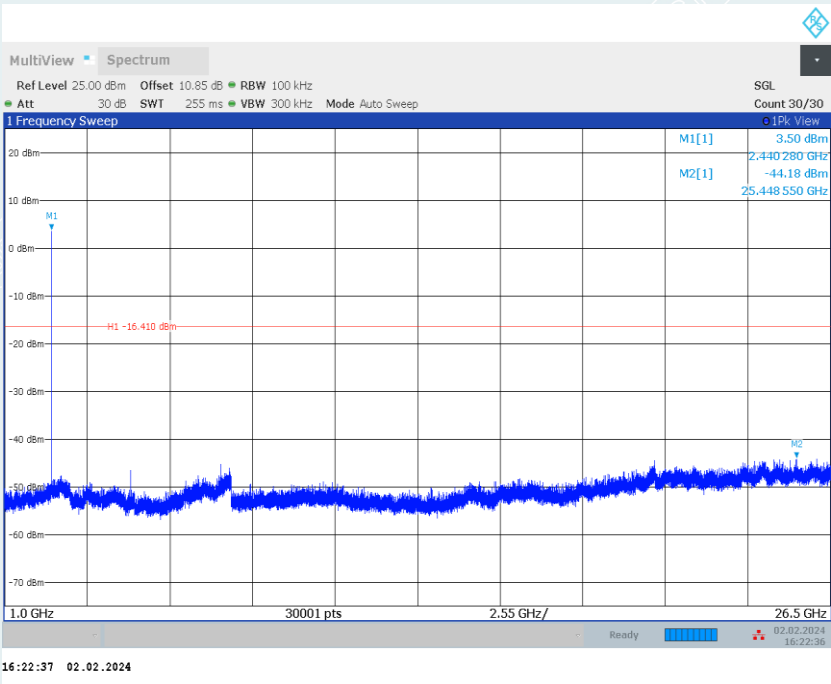
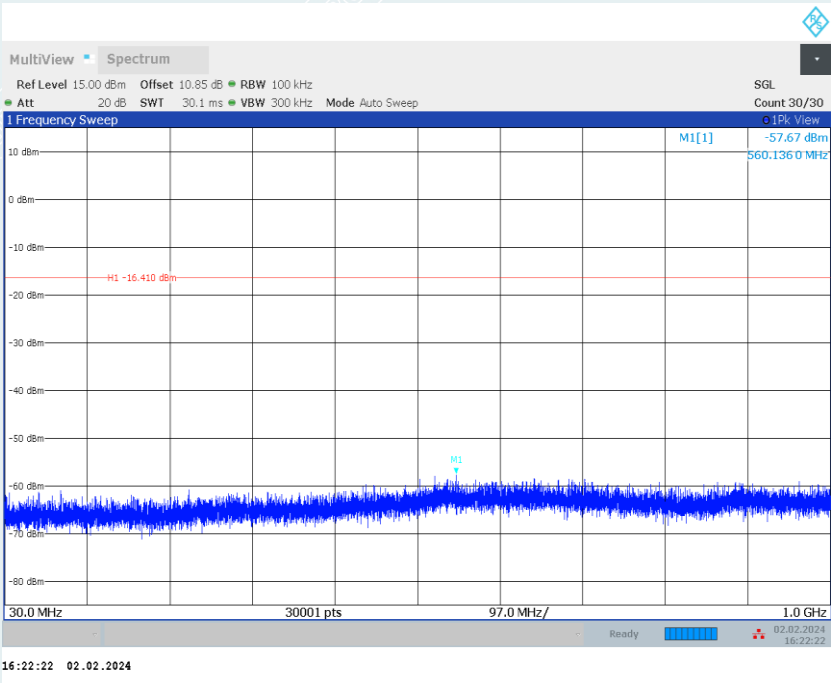
Lowest Frequency (2402MHz)



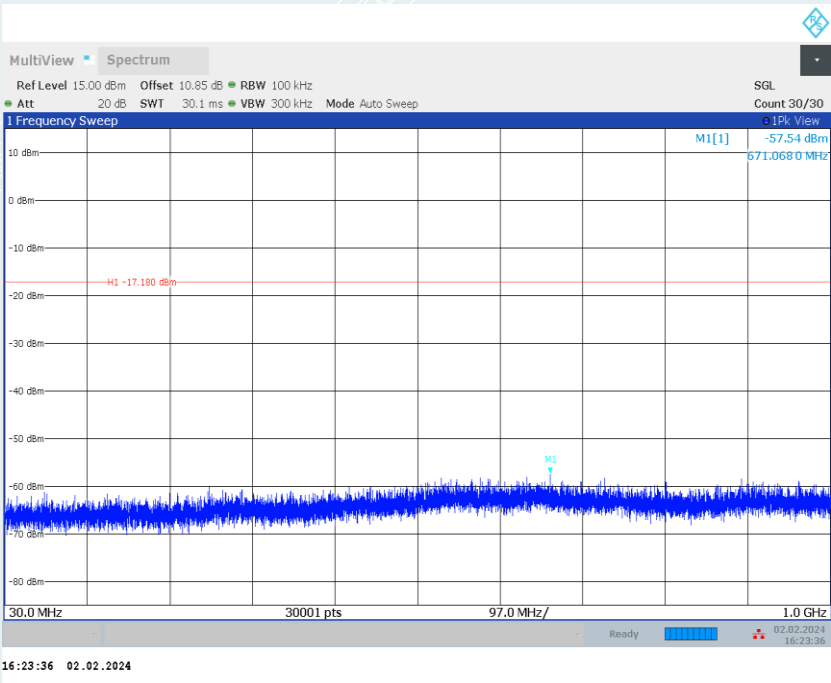
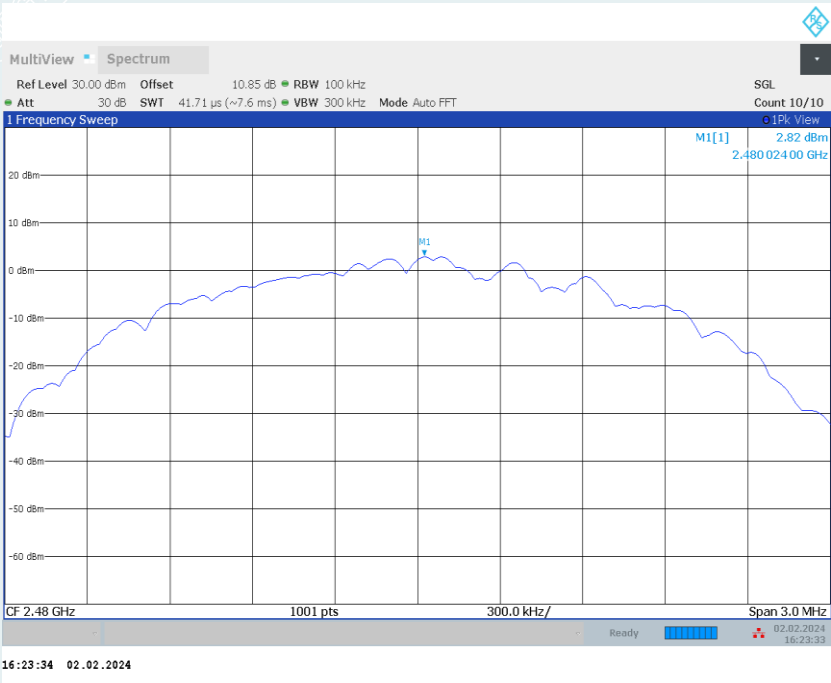


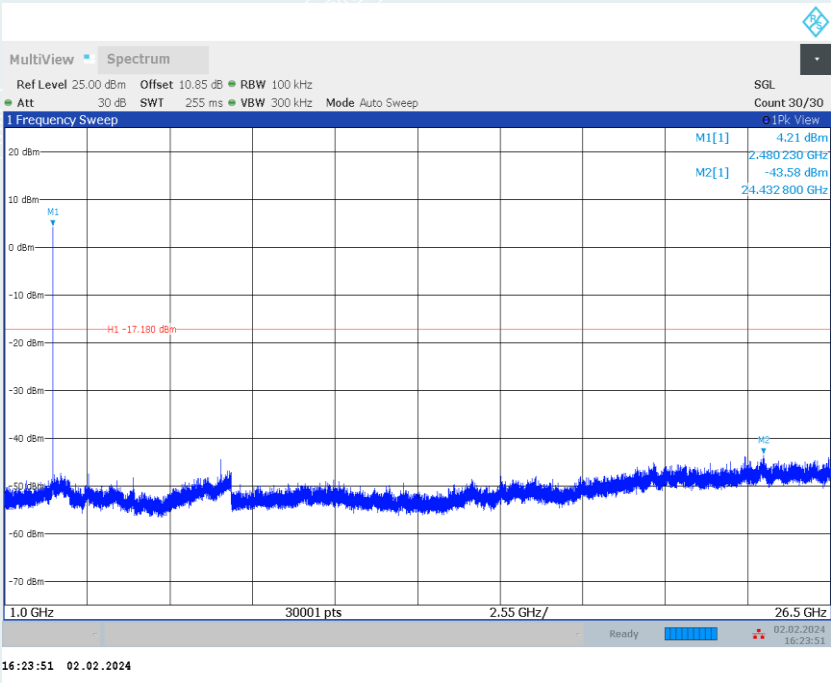
Middle Frequency (2440MHz)





Highest Frequency (2480MHz)





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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
¹ 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(μ V/m)	Measurement distance(m)	Quasi-peak(dB μ 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

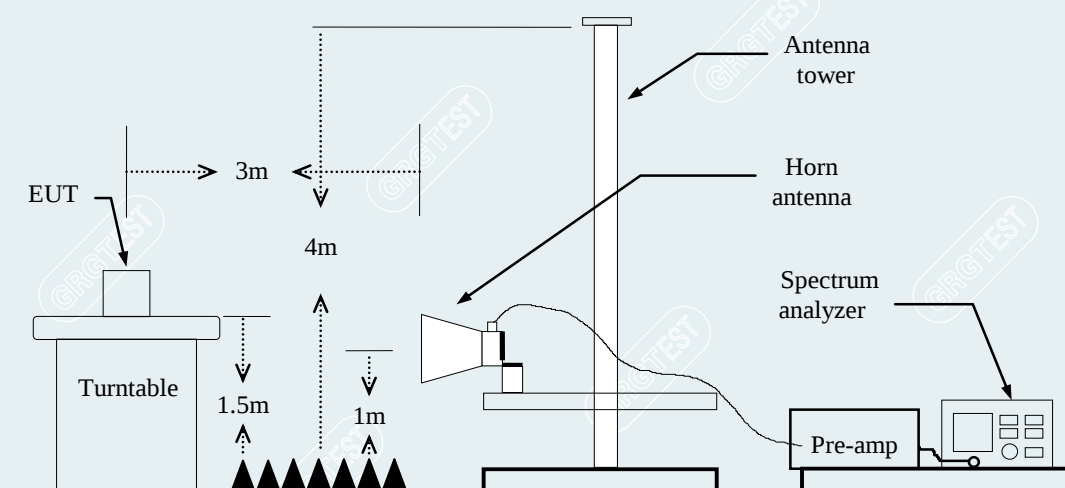
11.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 15.247 Meas Guidance v05r02.

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

11.3 TEST SETUP



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

11.4 TEST RESULTS

Pre-scan all modes, the worst power supply is 7.4V battery, in the two power supply modes(4 LR6 AA 1.5V Batteries and 7.4V battery), only the worst power supply mode is recorded in this report.

Equipment:	Aqara Smart Lock U200	Test Date	2024-02-29
Model No.:	EL-D02D	Test Engineer:	Zhang Zishan
Test Voltage:	DC 7.4V	Environmental Conditions	24.2℃/49%RH/101.0kPa

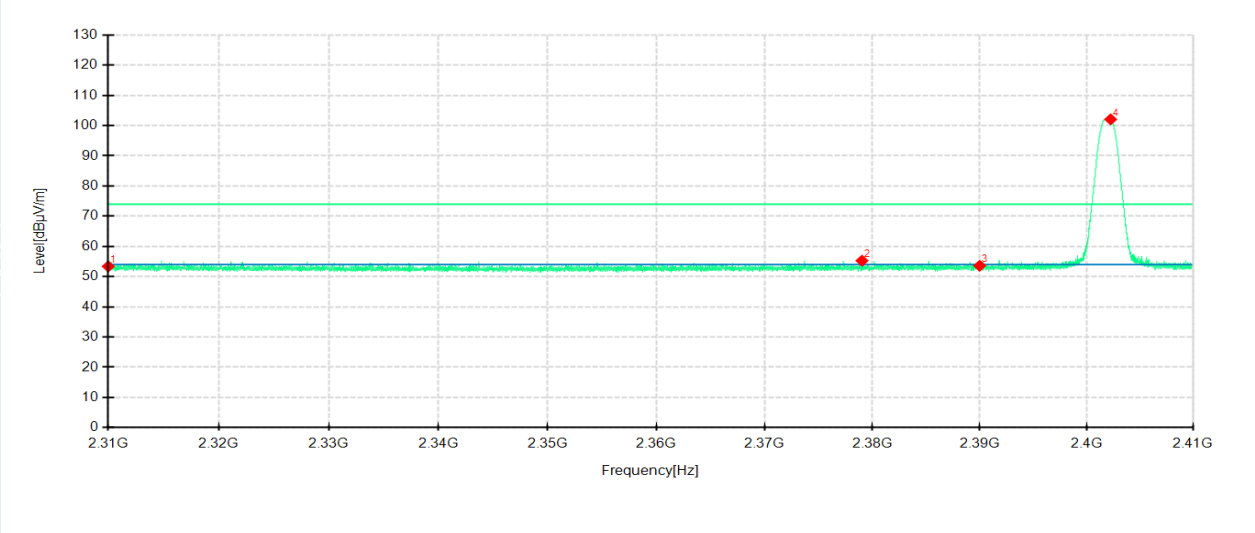
BLE 1M

Lowest Frequency

Frequency 2402MHz

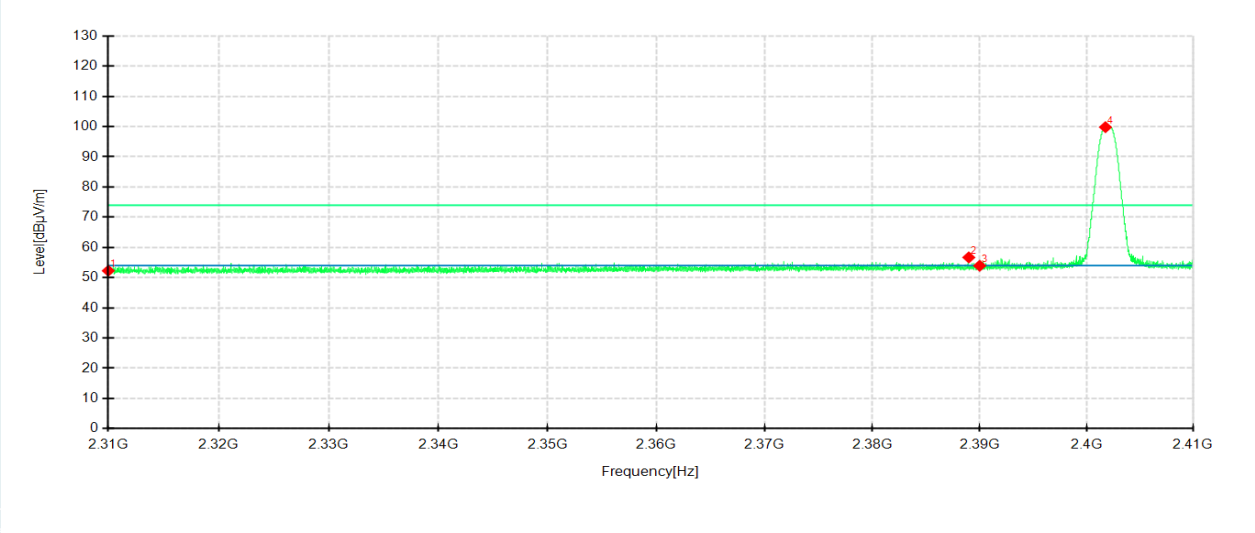
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	58.35	53.39	-4.96	74.00	20.61	100	200	Horizontal	/
2	2379.0375	61.07	55.28	-5.79	74.00	18.72	200	340	Horizontal	/
3	2390.0000	59.44	53.61	-5.83	74.00	20.39	100	330	Horizontal	/
4	2402.2625	107.92	102.06	-5.86	74.00	-28.06	100	162	Horizontal	No limit
1	2310.0000	57.95	52.29	-5.66	74.00	21.71	100	5	Vertical	/
2	2388.9875	62.10	56.69	-5.41	74.00	17.31	200	19	Vertical	/
3	2390.0000	59.35	53.94	-5.41	74.00	20.06	200	46	Vertical	/
4	2401.7750	105.18	99.81	-5.37	74.00	-25.81	200	238	Vertical	No limit

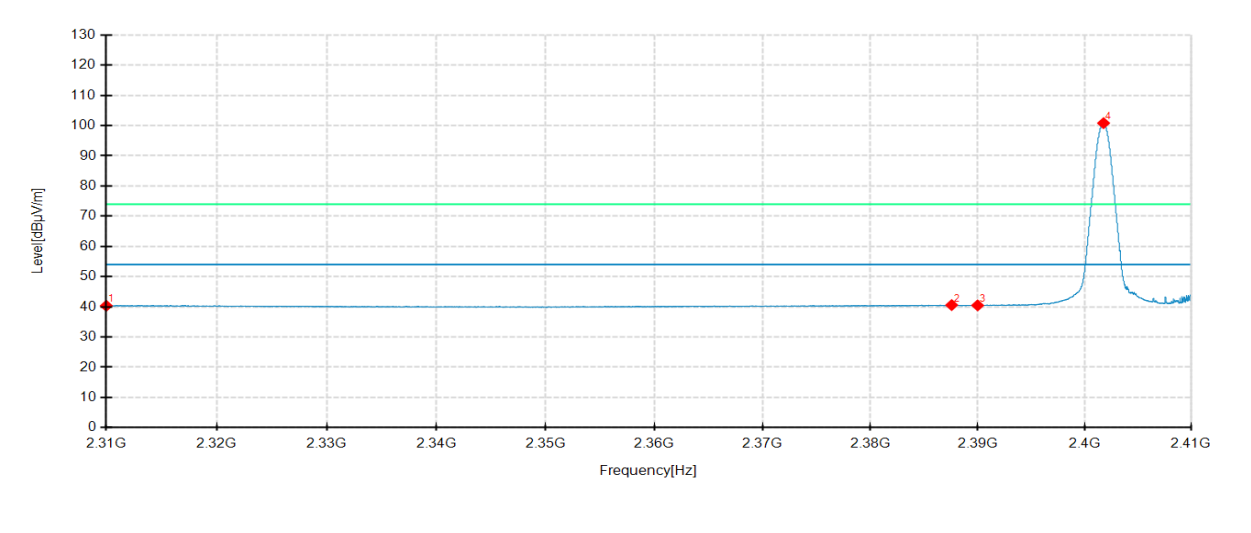
----- The following blanks -----

Lowest Frequency

Frequency 2402MHz

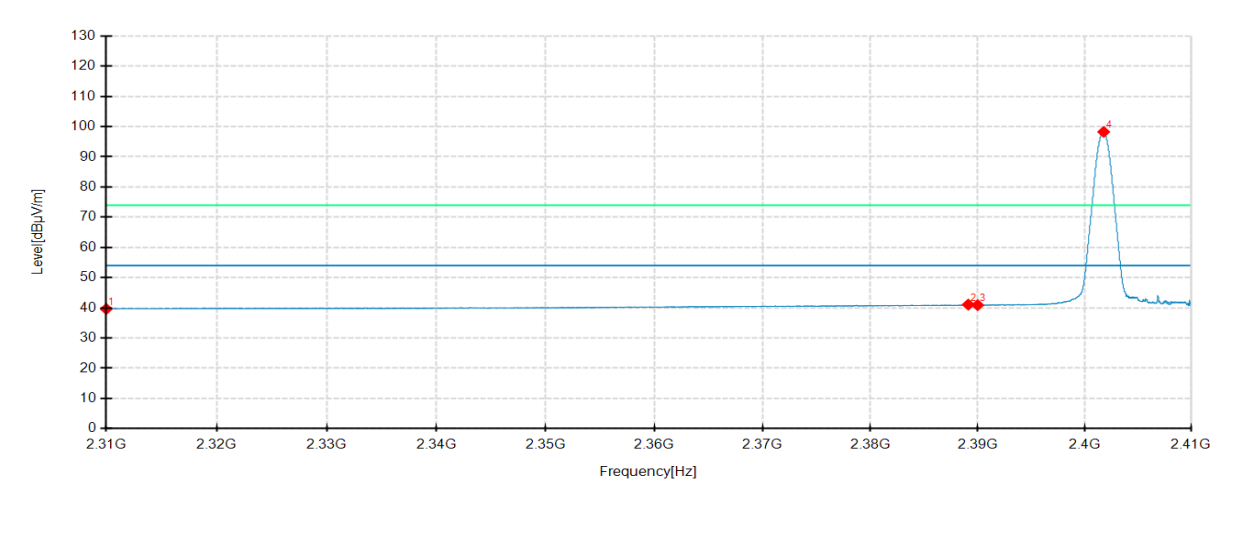
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

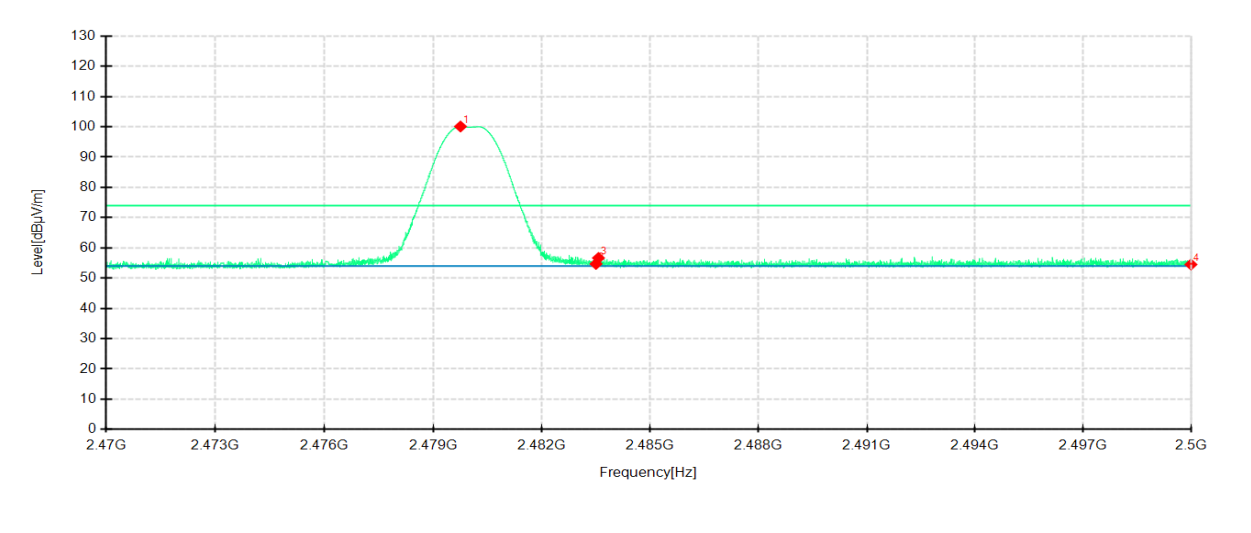
Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBμV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	45.31	40.35	-4.96	54.00	13.65	200	0	Horizontal	/
2	2387.5750	46.40	40.58	-5.82	54.00	13.42	100	317	Horizontal	/
3	2390.0000	46.31	40.48	-5.83	54.00	13.52	100	278	Horizontal	/
4	2401.7875	106.68	100.82	-5.86	54.00	-46.82	100	136	Horizontal	No limit
1	2310.0000	45.28	39.62	-5.66	54.00	14.38	200	292	Vertical	/
2	2389.1250	46.49	41.08	-5.41	54.00	12.92	200	21	Vertical	/
3	2390.0000	46.32	40.91	-5.41	54.00	13.09	100	339	Vertical	/
4	2401.8000	103.61	98.25	-5.36	54.00	-44.25	200	253	Vertical	No limit

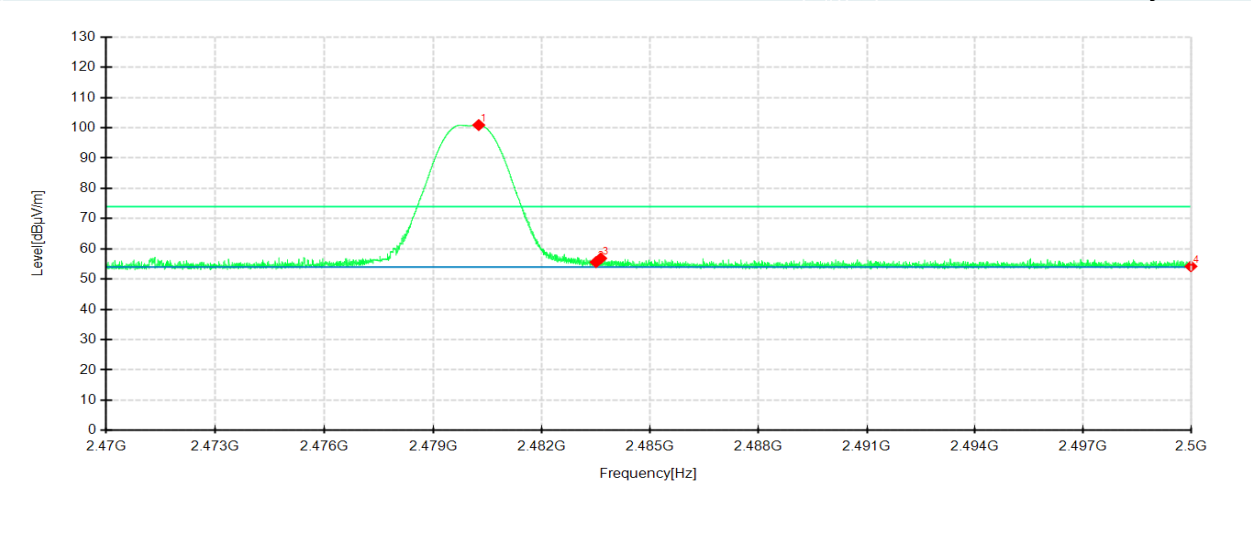
Highest Frequency
Frequency 2480MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



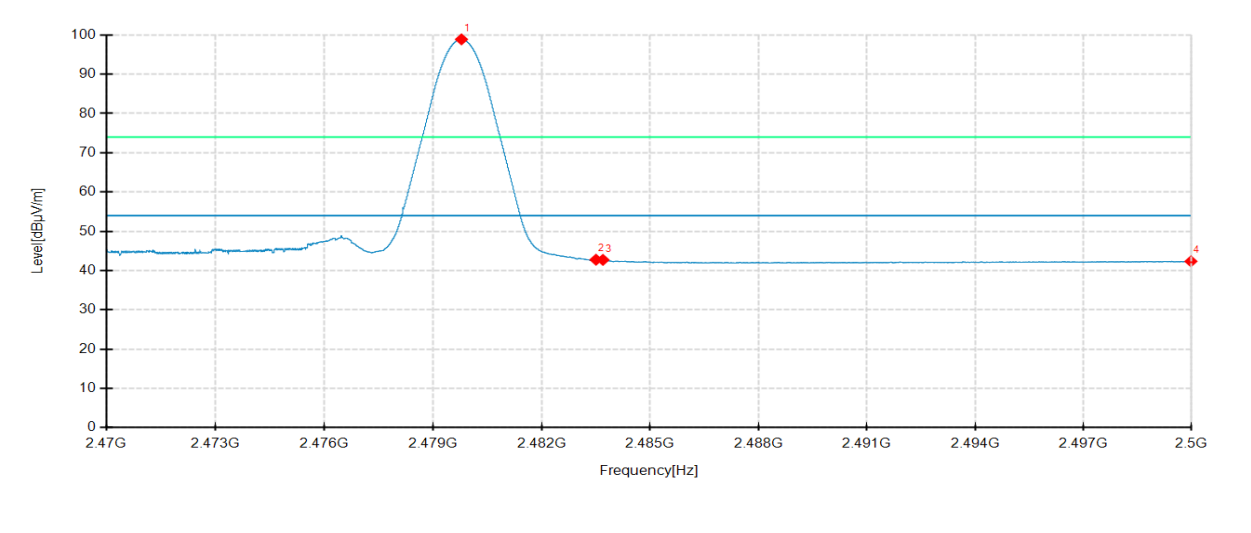
No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.7575	105.28	100.11	-5.17	74.00	-26.11	100	126	Horizontal	No limit
2	2483.5000	59.80	54.70	-5.10	74.00	19.30	200	158	Horizontal	/
3	2483.5675	61.77	56.67	-5.10	74.00	17.33	100	153	Horizontal	/
4	2500.0000	59.31	54.52	-4.79	74.00	19.48	100	334	Horizontal	/
1	2480.2600	105.97	100.92	-5.05	74.00	-26.92	100	238	Vertical	No limit
2	2483.5000	60.65	55.62	-5.03	74.00	18.38	200	255	Vertical	/
3	2483.6313	61.90	56.87	-5.03	74.00	17.13	200	228	Vertical	/
4	2500.0000	59.21	54.22	-4.99	74.00	19.78	100	211	Vertical	/

Highest Frequency

Frequency 2480MHz

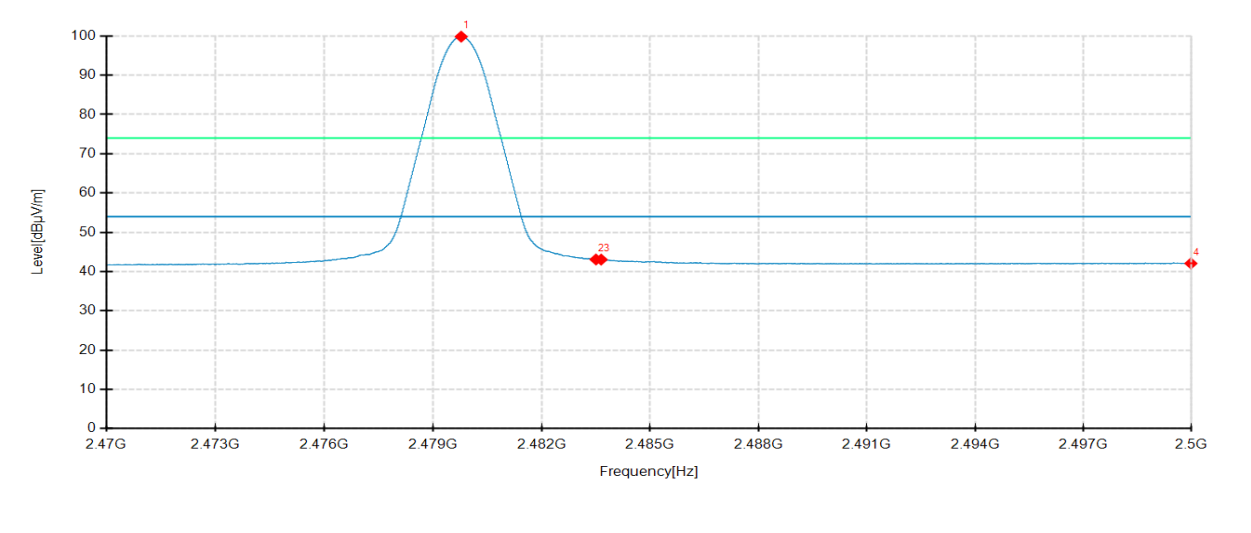
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

Polarity: Vertical



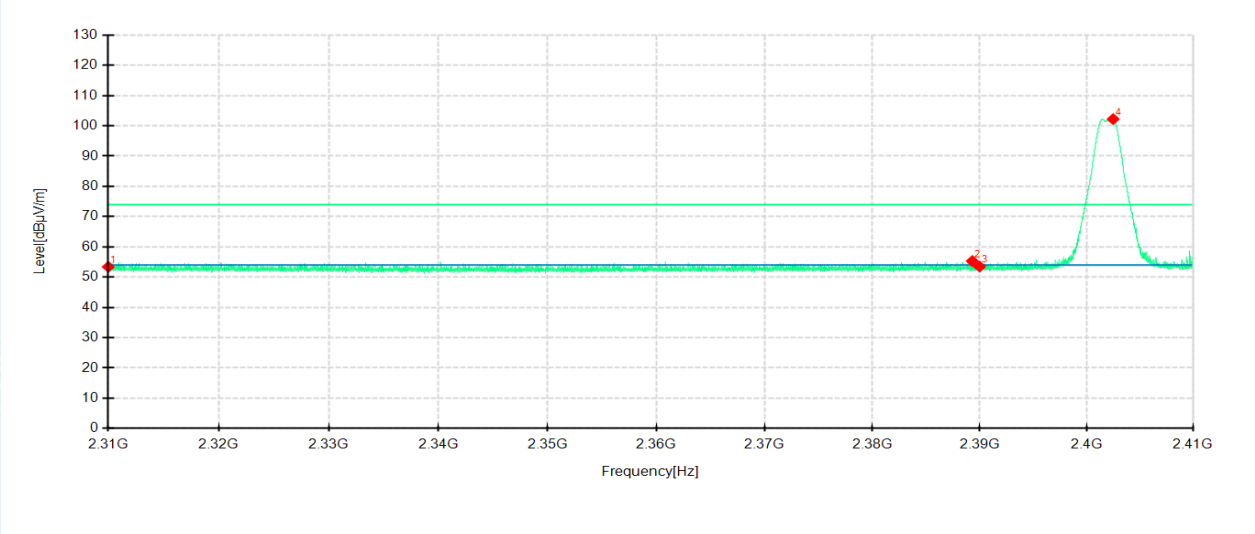
No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBμV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.7838	104.06	98.89	-5.17	54.00	-44.89	100	124	Horizontal	No limit
2	2483.5000	47.87	42.77	-5.10	54.00	11.23	100	124	Horizontal	/
3	2483.6913	47.83	42.74	-5.09	54.00	11.26	100	278	Horizontal	/
4	2500.0000	47.15	42.36	-4.79	54.00	11.64	100	19	Horizontal	/
1	2479.7763	104.88	99.83	-5.05	54.00	-45.83	100	236	Vertical	No limit
2	2483.5000	48.11	43.08	-5.03	54.00	10.92	100	236	Vertical	/
3	2483.6425	48.09	43.06	-5.03	54.00	10.94	100	236	Vertical	/
4	2500.0000	47.07	42.08	-4.99	54.00	11.92	200	73	Vertical	/

Remark: Max field strength in 3m distance. No any other emission which falls in restricted bands can be detected and be reported.

Equipment:	Aqara Smart Lock U200 Kit	Test Date	2024-02-29
Model No.:	EL-D02D	Test Engineer:	Zhang Zishan
Test Voltage:	DC 7.4V	Environmental Conditions	24.2℃/49%RH/101.0kPa

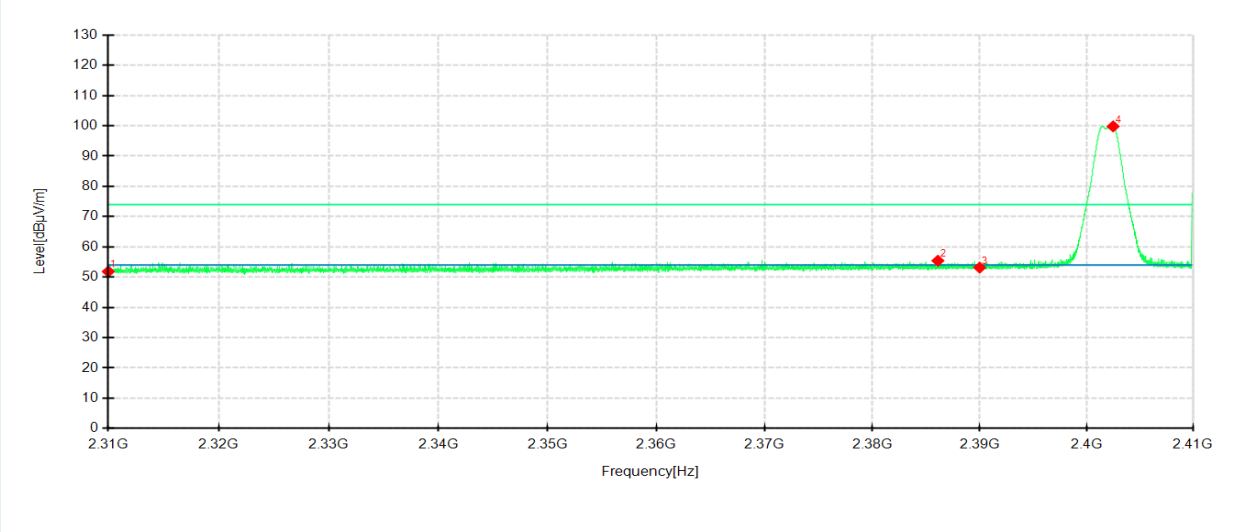
BLE 2M
Lowest Frequency
Frequency 2402MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	58.36	53.40	-4.96	74.00	20.60	100	100	Horizontal	/
2	2389.3125	61.15	55.32	-5.83	74.00	18.68	200	314	Horizontal	/
3	2390.0000	59.34	53.51	-5.83	74.00	20.49	200	4	Horizontal	/
4	2402.5000	108.09	102.23	-5.86	74.00	-28.23	100	164	Horizontal	No limit
1	2310.0000	57.51	51.85	-5.66	74.00	22.15	100	187	Vertical	/
2	2386.1000	60.87	55.44	-5.43	74.00	18.56	200	267	Vertical	/
3	2390.0000	58.56	53.15	-5.41	74.00	20.85	100	236	Vertical	/
4	2402.5000	105.17	99.82	-5.35	74.00	-25.82	200	240	Vertical	No limit

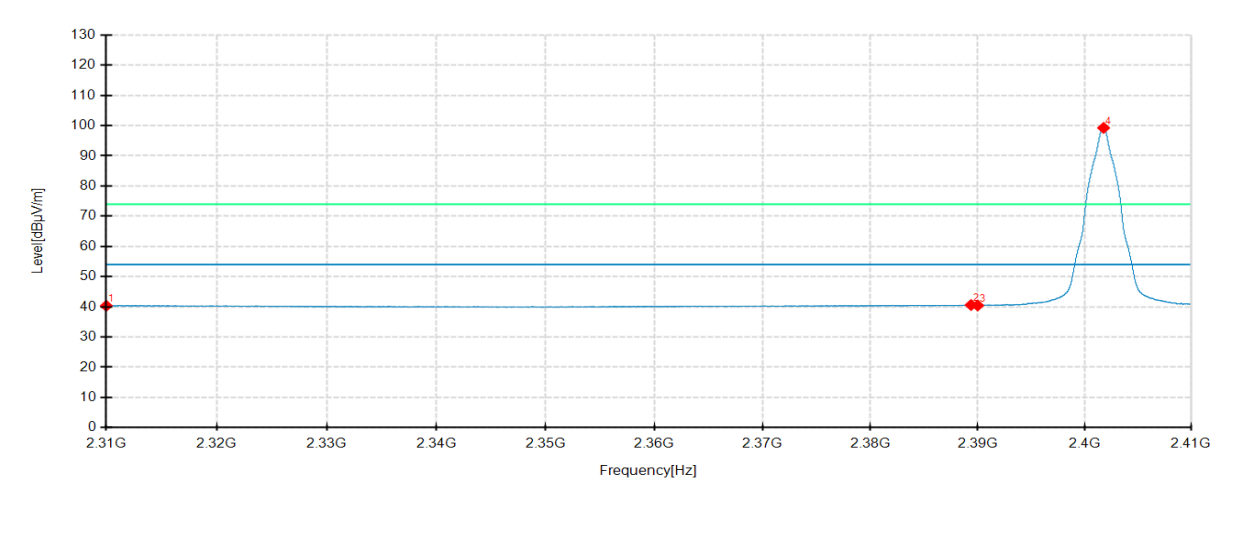
----- The following blanks -----

Lowest Frequency

Frequency 2402MHz

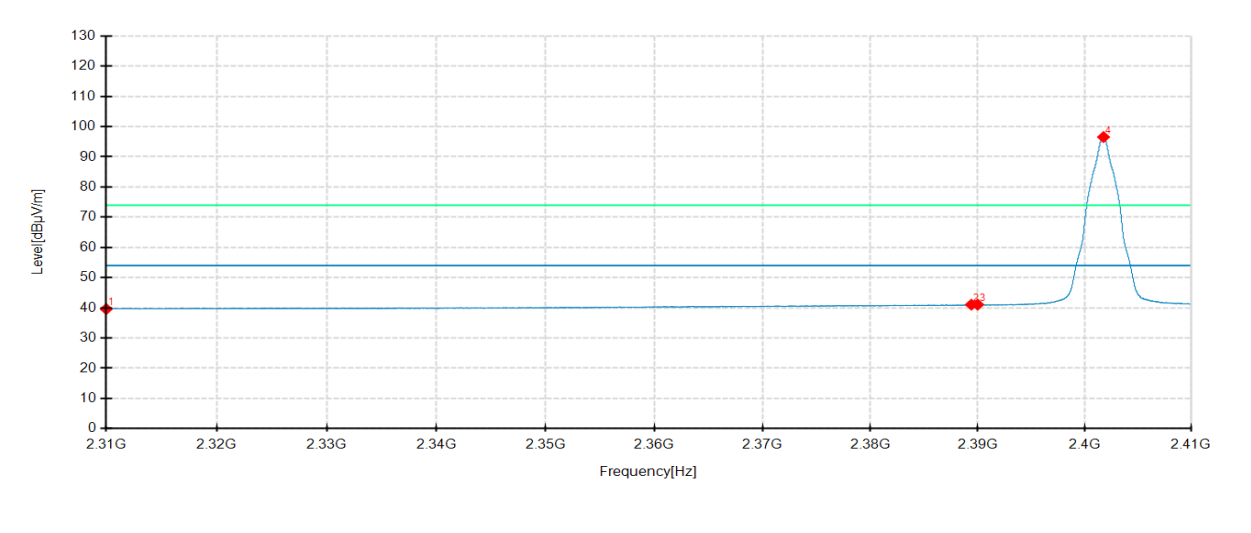
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

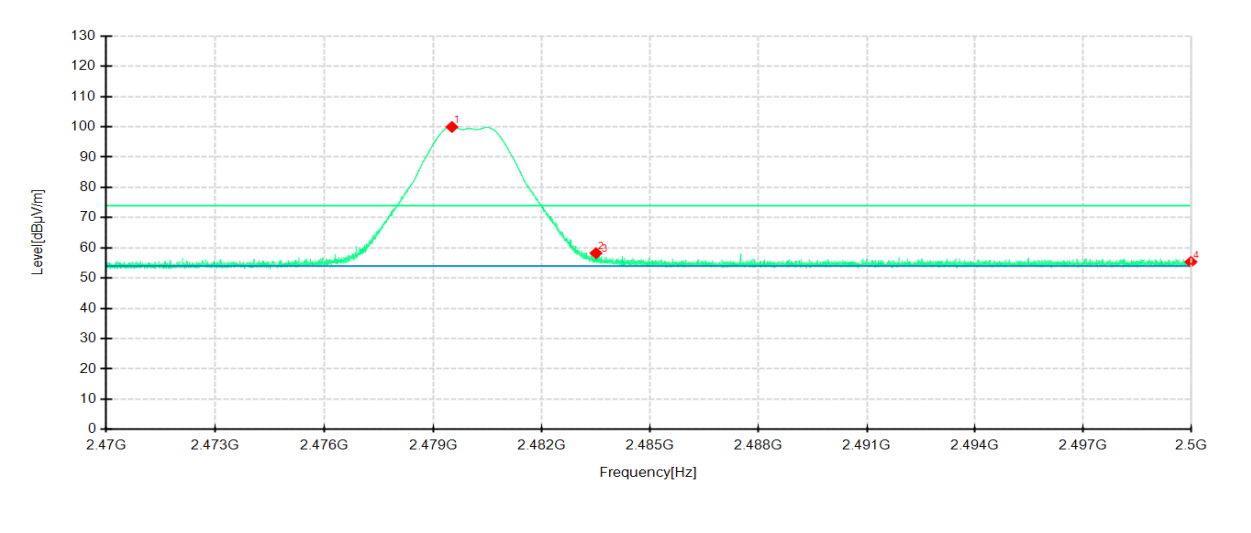
Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBμV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	45.31	40.35	-4.96	54.00	13.65	100	330	Horizontal	/
2	2389.3875	46.44	40.61	-5.83	54.00	13.39	100	125	Horizontal	/
3	2390.0000	46.28	40.45	-5.83	54.00	13.55	200	275	Horizontal	/
4	2401.7875	105.10	99.24	-5.86	54.00	-45.24	100	138	Horizontal	No limit
1	2310.0000	45.26	39.60	-5.66	54.00	14.40	100	224	Vertical	/
2	2389.4125	46.46	41.05	-5.41	54.00	12.95	100	300	Vertical	/
3	2390.0000	46.49	41.08	-5.41	54.00	12.92	100	300	Vertical	/
4	2401.7875	101.90	96.54	-5.36	54.00	-42.54	200	255	Vertical	No limit

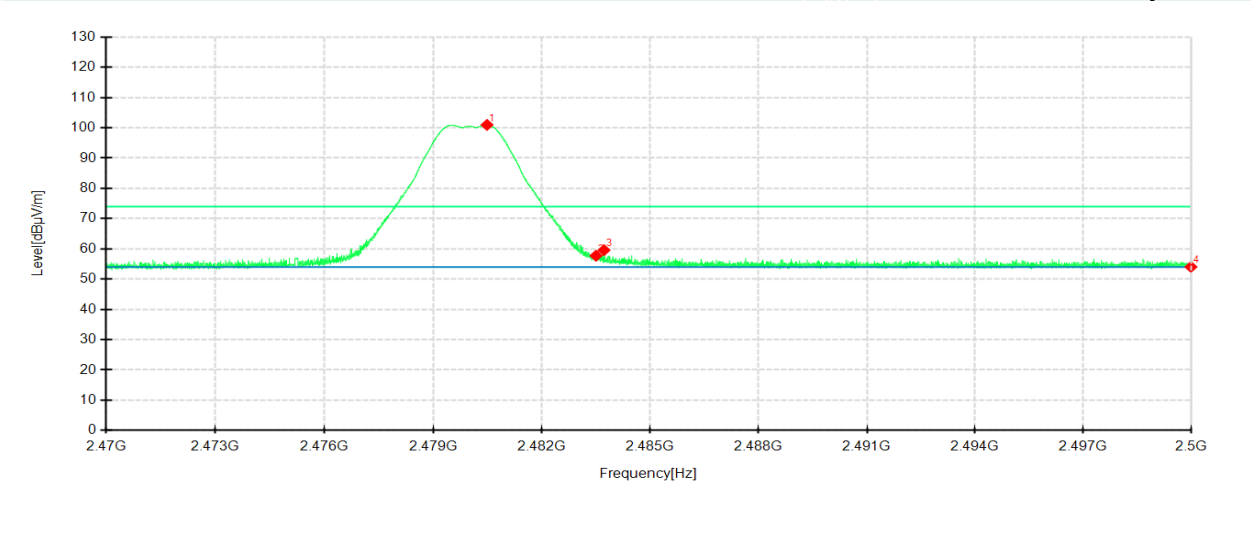
Highest Frequency
Frequency 2480MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



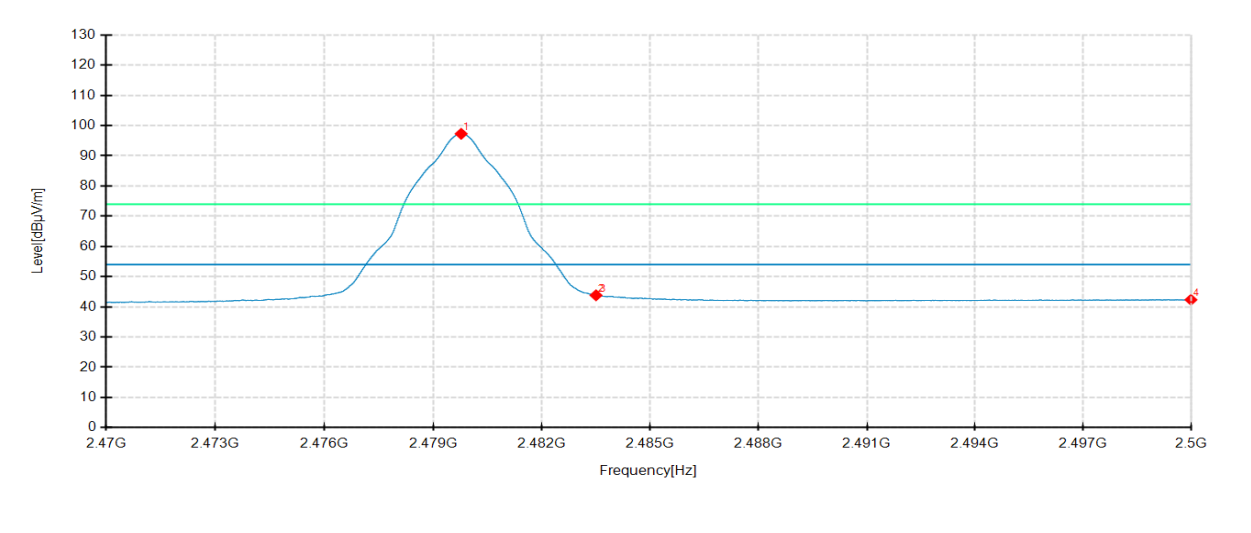
No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.5213	105.13	99.95	-5.18	74.00	-25.95	100	120	Horizontal	No limit
2	2483.5000	63.35	58.25	-5.10	74.00	15.75	100	146	Horizontal	/
3	2483.6013	62.50	57.40	-5.10	74.00	16.60	100	83	Horizontal	/
4	2500.0000	60.16	55.37	-4.79	74.00	18.63	200	202	Horizontal	/
1	2480.4888	106.02	100.97	-5.05	74.00	-26.97	100	240	Vertical	No limit
2	2483.5000	62.78	57.75	-5.03	74.00	16.25	100	240	Vertical	/
3	2483.7213	64.61	59.58	-5.03	74.00	14.42	100	253	Vertical	/
4	2500.0000	59.04	54.05	-4.99	74.00	19.95	100	240	Vertical	/

Highest Frequency

Frequency 2480MHz

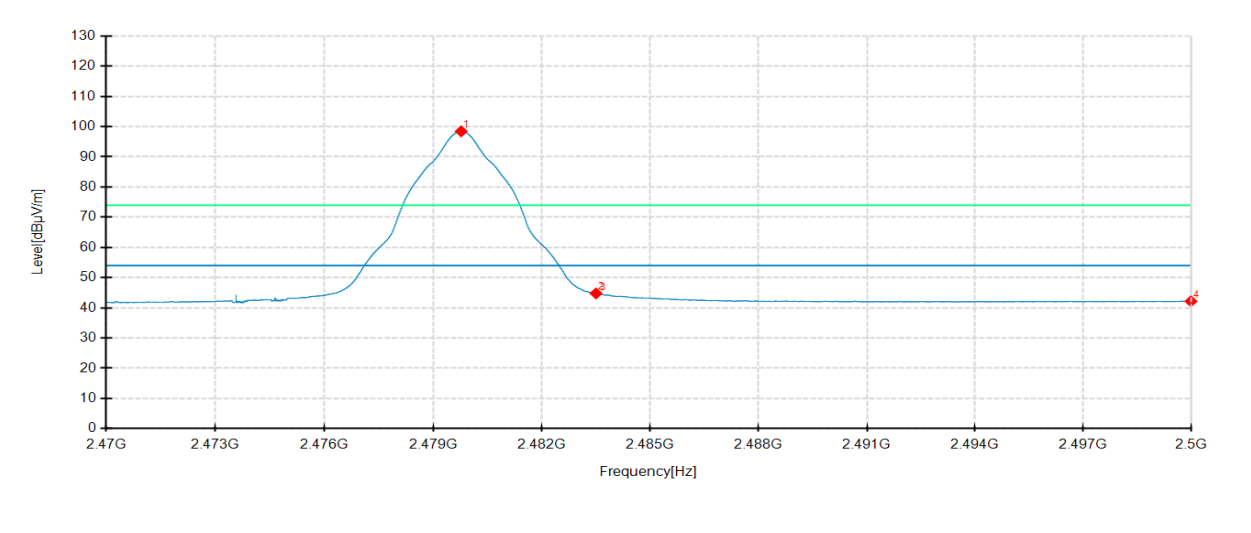
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBμV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.7763	102.44	97.27	-5.17	54.00	-43.27	100	132	Horizontal	No limit
2	2483.5000	48.92	43.82	-5.10	54.00	10.18	100	274	Horizontal	/
3	2483.5563	48.94	43.84	-5.10	54.00	10.16	100	132	Horizontal	/
4	2500.0000	47.13	42.34	-4.79	54.00	11.66	100	339	Horizontal	/
1	2479.7763	103.47	98.42	-5.05	54.00	-44.42	100	250	Vertical	No limit
2	2483.5000	49.80	44.77	-5.03	54.00	9.23	100	250	Vertical	/
3	2483.5413	49.74	44.71	-5.03	54.00	9.29	100	250	Vertical	/
4	2500.0000	47.15	42.16	-4.99	54.00	11.84	200	247	Vertical	/

Remark: Max field strength in 3m distance. No any other emission which falls in restricted bands can be detected and be reported.

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM

Please refer to the attached document E20240129370001-26 FCC ISED-Test Photo.

APPENDIX B. PHOTOGRAPH OF THE EUT

Please refer to the attached document E20240129370001-27 EUT photo.

----- End of Report -----