

Test Report

Verified code: 726539

Report No.: E20240725192701-3

Customer: Lumi United Technology Co., Ltd

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

Sample Name: Voice Mate H1

Sample Model: AT-R01E

Receive Sample Date: Aug.05,2024

Test Date: Aug.09,2024 ~ Aug.26,2024

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

Test Result: Pass

Prepared by: Wen Wenwen
Wen Wenwen

Reviewed by: Wu Haoting
Wu Haoting

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GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-09-06

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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.....	9
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	37
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 66

APPENDIX B. PHOTOGRAPH OF THE EUT 66

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20240725192701-3	Original Issue	2024-09-02

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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 Internal antenna. The max gain of antenna is 1.0dBi.which accordance 15.203.is considered sufficient to comply with the provisions of this section.

2)N/A is not applied. The EUT 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

Product Name: Voice Mate H1
Product Model: AT-R01E
Trade Name: Aqara
Additional Model: AT-R01D
Model difference descriptions: They have the same software and hardware constructions including circuit diagram, PCB layout and electrical parts, except Model name and packaging are different, as they would distribute in different regions to satisfy subdividing market demands.
Power Supply: 3.0V DC supplied by button cell
Battery Specification: CR2450 3.0V DC
FCC ID: 2AKIT-ATR01
Frequency Band: 2402MHz-2480MHz
Transmit Power: GFSK for 1Mbps: 7.61dBm
GFSK for 2Mbps: 7.60dBm
Modulation type: GFSK for 1Mbps
GFSK for 2Mbps
Channel space: 2MHz
Antenna Type: Internal antenna
Antenna Gain: 1.0dBi (Max.)
Temperature Range: 0 °C ~ 50 °C
Hardware Version: V1.0
Software Version: V1.0.0.1
Sample No: E20240725192701-0001, E20240725192701-0002
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:

The EUT have two colors, the one is white, the other is black, they have the same software and hardware constructions including circuit diagram, PCB layout and electrical parts, except color is different. All tests were performed on the AT-R01E 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

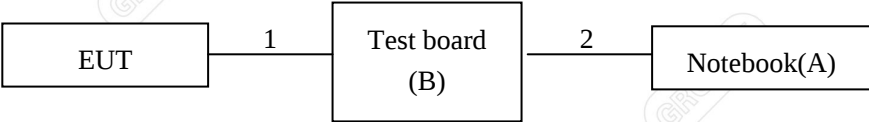
2.6 LOCAL SUPPORTIVE

No.	Name of Equipment	Manufacturer	Model	Serial Number
A	Notebook	DELL	Latitude3300	2C6CFW2
B	Test board	/	/	/

No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	Serial cable	1	No	0	0.2m
2	USB cable	1	No	0	0.5m

Note: The notebook is just used to produce fixed frequency transmitting.

2.7 CONFIGURATION OF SYSTEM UNDER TEST



Test software:

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

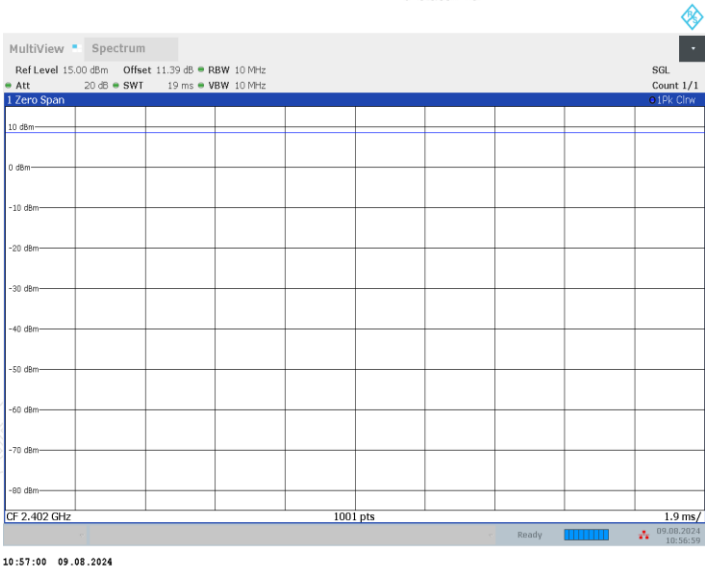
2.8 DUTY CYCLE

Environment: 25.3℃/59%RH/101.0kPa
Tested By: Qin tingting

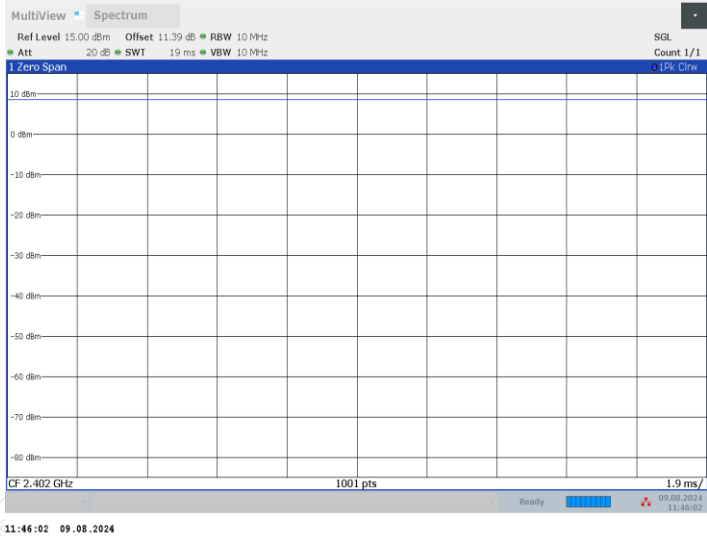
Voltage: DC 3V
Date: 2024-08-09

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



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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
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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.

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>

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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				
Loop Antenna	Schwarzbeck	FMZB 1513-60	1513-60-56	2025-05-07
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	2025-03-01
Amplifier	Tonscend	TAP184050	AP20E806071	2025-03-01
Amplifier	SHIRONG ELECTRONIC	DLNA-1G18G-G40	20200928005	2025-07-19
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	2025-06-14
Automatic power test unit	TONSCEND	JS0806-2	21B8060365	2024-12-28
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: 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 EUT is power by battery.
- 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 EUT is power by battery.

--- 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 EUT is power by battery.

--- 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 EUT is power by battery.
- The measurement distance is 1 meter.
- The EUT was set into operation.

Pre measurement:

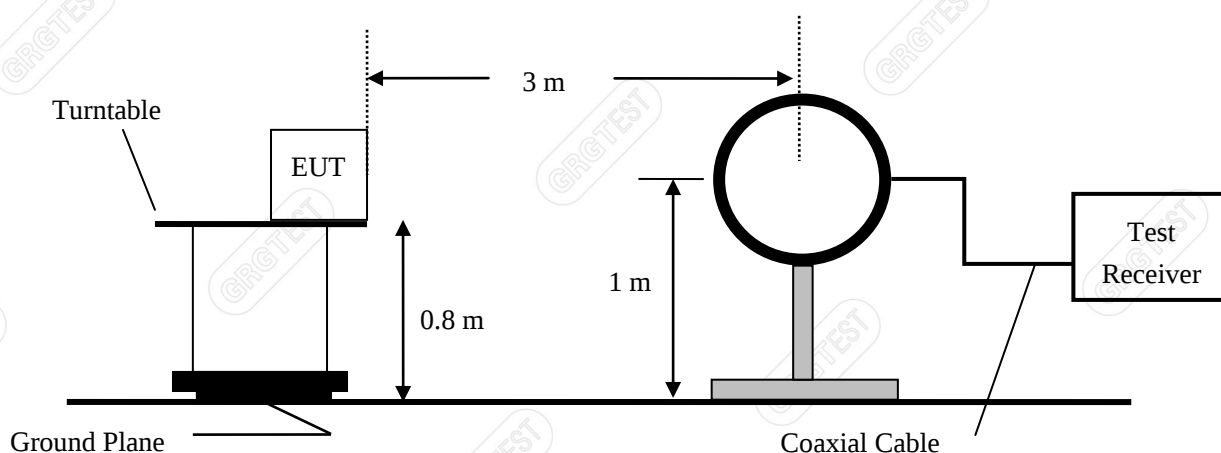
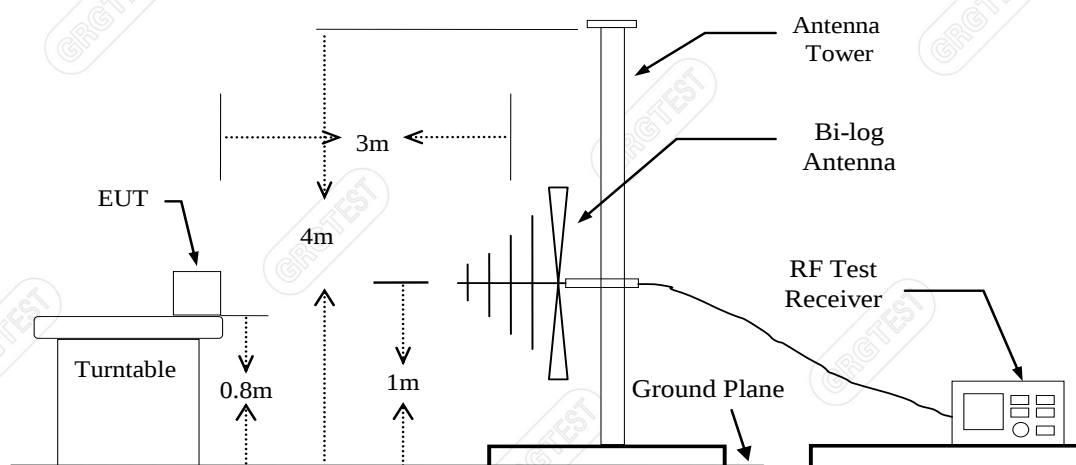
- The turntable rotates from 0 °to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

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**

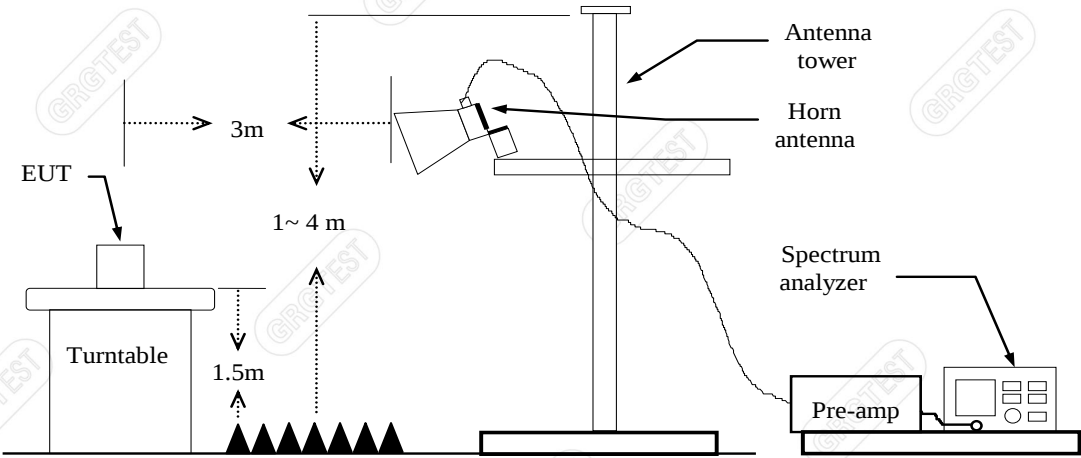


Figure 3. 1GHz to 18GHz radiated emissions test configuration

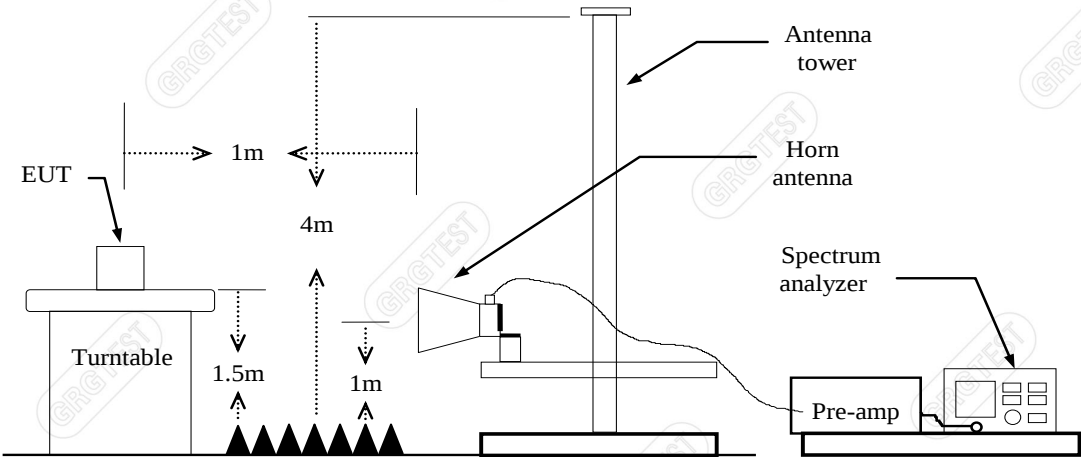


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

6.4 DATA SAMPLE

30MHz to 1GHz

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity	Verdict
xxx	86.5096	67.55	33.83	-33.72	40.00	6.17	QP	200	118	Horizontal	PASS

Frequency (MHz)

= Emission frequency in MHz

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Factor (dB)

= Antenna factor + Cable loss – Amplifier gain

Level (dBuV/m)

= Reading (dBuV) + Factor (dB)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Limit (dBuV/m) - Level (dBuV/m)

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
xxx	xxxx	78.01	55.30	-22.71	74.00	18.70	100	50	Horizontal
xxx	xxxx	66.37	43.66	-22.71	54.00	10.34	100	50	Horizontal

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
xxx	xxx	62.46	45.31	35.77	-17.15	74	38.23	100	19	Horizontal

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

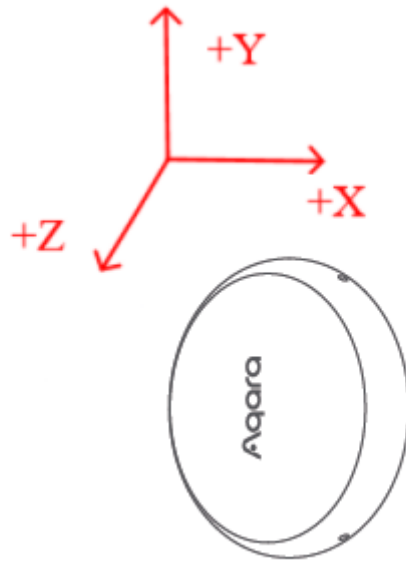
= Peak Reading

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.

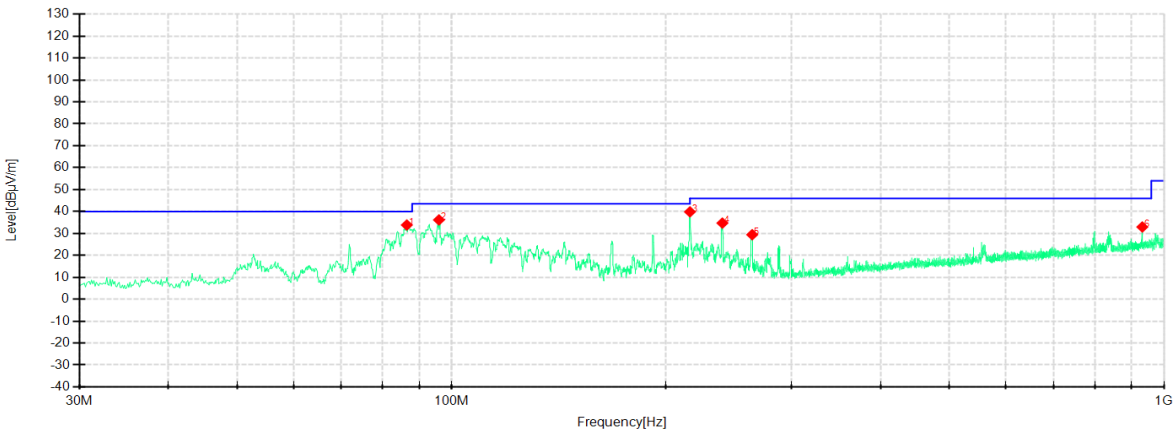


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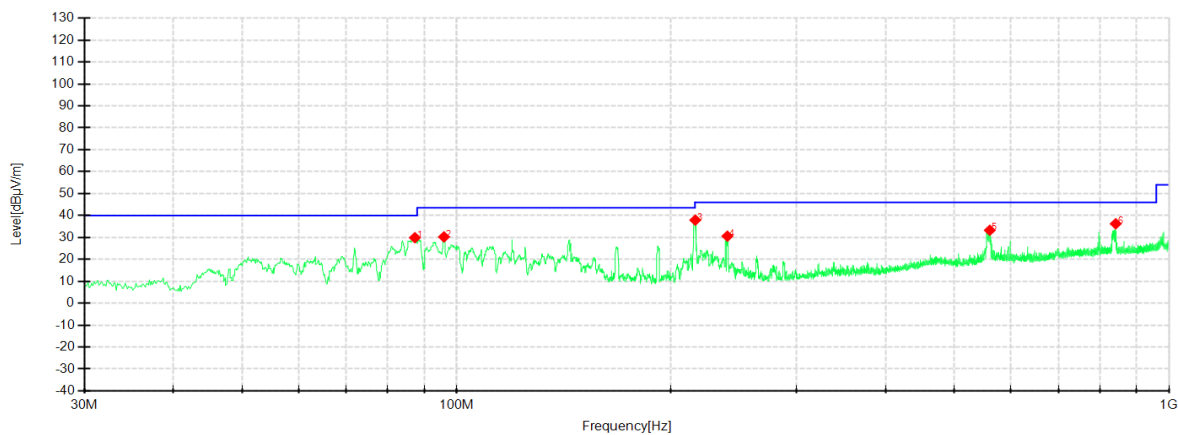
Below 1GHz

Note: Pre-scan all modes , only the worst case(TX_BLE_1M_2440MHz) is recorded, in this report.

Model:	AT-R01E	Frequency:	2440MHz(TX_BLE_1M)
Power supply:	DC 3V	Environmental Conditions:	23.5℃/65%RH/101.0kPa
Test Engineer:	Wen wenwen	Test Date:	2024-08-17



NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity	Verdict
1	86.5096	67.55	33.83	-33.72	40.00	6.17	QP	200	118	Horizontal	PASS
2	95.9682	68.84	36.17	-32.67	43.50	7.33	QP	200	118	Horizontal	PASS
3	216.0208	71.01	39.85	-31.16	46.00	6.15	QP	100	341	Horizontal	PASS
4	239.9100	64.35	34.71	-29.64	46.00	11.29	QP	100	341	Horizontal	PASS
5	264.1630	58.40	29.41	-28.99	46.00	16.59	QP	100	341	Horizontal	PASS
6	932.3340	47.76	32.93	-14.83	46.00	13.07	QP	200	55	Horizontal	PASS



NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity	Verdict
1	87.3584	63.59	29.87	-33.72	40.00	10.13	QP	200	0	Vertical	PASS
2	95.9682	62.90	30.23	-32.67	43.50	13.27	QP	100	110	Vertical	PASS
3	216.2633	69.05	37.90	-31.15	46.00	8.10	QP	100	225	Vertical	PASS
4	239.9100	60.21	30.57	-29.64	46.00	15.43	QP	100	250	Vertical	PASS
5	560.2925	53.36	33.26	-20.10	46.00	12.74	QP	100	199	Vertical	PASS
6	841.7490	52.38	36.22	-16.16	46.00	9.78	QP	100	210	Vertical	PASS

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: 24.3°C/64%RH/101.0kPa
Tested By: Wen wenwen

/
Voltage: DC 3V
Date: 2024-08-24

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1119.0000	57.25	47.30	-9.95	74.00	26.70	100	312	Horizontal
2	2579.2000	49.40	46.76	-2.64	74.00	27.24	200	144	Horizontal
3	3445.5000	52.69	39.70	-12.99	74.00	34.30	100	34	Horizontal
4	4803.0000	64.59	57.45	-7.14	74.00	16.55	100	21	Horizontal
5	6678.0000	44.71	43.91	-0.80	74.00	30.09	200	261	Horizontal
6	13915.5000	38.96	51.80	12.84	74.00	22.20	200	181	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	4803.9730	-7.14	58.74	51.60	54.00	2.40	100	340.1	Horizontal
2	13915.5000	12.84	28.26	41.10	54.00	12.90	200	181	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	2532.0000	49.63	47.93	-1.70	74.00	26.07	100	273	Vertical
2	4803.0000	64.29	57.24	-7.05	74.00	16.76	200	22	Vertical
3	6187.5000	50.25	47.41	-2.84	74.00	26.59	100	74	Vertical
4	6384.0000	51.48	49.03	-2.45	74.00	24.97	100	254	Vertical
5	7965.0000	44.50	47.96	3.46	74.00	26.04	100	20	Vertical
6	15003.0000	39.74	52.39	12.65	74.00	21.61	100	140	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	-7.05	58.33	51.28	54.00	2.72	148	61.8	Vertical
2	6374.6690	-2.45	37.11	34.66	54.00	19.34	120	281.3	Vertical
3	15003.0000	12.65	28.97	41.62	54.00	12.38	100	140	Vertical

Mode: TX/ BLE_1M
Middle Frequency (2440MHz)
Environment: 24.3°C/64%RH/101.0kPa
Tested By: Wen wenwen

Voltage: DC 3V
Date: 2024-08-24

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1120.8000	56.01	46.09	-9.92	74.00	27.91	100	299	Horizontal
2	1195.4000	55.06	46.12	-8.94	74.00	27.88	100	299	Horizontal
3	2000.4000	49.50	45.62	-3.88	74.00	28.38	200	49	Horizontal
4	4879.5000	60.24	53.25	-6.99	74.00	20.75	200	218	Horizontal
5	6862.5000	44.50	44.39	-0.11	74.00	29.61	100	86	Horizontal
6	14157.0000	38.80	52.13	13.33	74.00	21.87	100	232	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	-6.99	55.84	48.85	54.00	5.15	200	240.1	Horizontal
2	14157.0000	13.33	27.71	41.04	54.00	12.96	100	232	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	1199.2000	54.39	44.89	-9.50	74.00	29.11	200	229	Vertical
2	1864.6000	49.59	45.06	-4.53	74.00	28.94	100	275	Vertical
3	4879.5000	60.93	54.00	-6.93	74.00	20.00	100	139	Vertical
4	6375.0000	55.96	53.29	-2.67	74.00	20.71	100	300	Vertical
5	7966.5000	43.41	46.84	3.43	74.00	27.16	100	300	Vertical
6	15690.0000	42.17	52.30	10.13	74.00	21.70	100	100	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	-6.93	56.43	49.50	54.00	4.50	100	121.1	Vertical
2	6381.0890	-2.67	39.10	36.43	54.00	17.57	127	276.5	Vertical
3	15690.0000	10.13	31.28	41.41	54.00	12.59	100	100	Vertical

Mode: TX/ BLE_1M
Highest Frequency (2480MHz)
Environment: 24.3°C/64%RH/101.0kPa
Tested By: Wen wenwen

Voltage: DC 3V
Date: 2024-08-24

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1117.2000	56.87	46.88	-9.99	74.00	27.12	100	312	Horizontal
2	1199.6000	55.08	46.19	-8.89	74.00	27.81	100	60	Horizontal
3	3271.5000	57.42	44.48	-12.94	74.00	29.52	100	75	Horizontal
4	4960.5000	58.13	51.57	-6.56	74.00	22.43	200	230	Horizontal
5	7936.5000	43.30	46.85	3.55	74.00	27.15	200	18	Horizontal
6	15709.5000	42.68	52.64	9.96	74.00	21.36	200	350	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	4959.9975	-6.56	54.88	48.32	54.00	5.68	200	212.8	Horizontal
2	15709.5000	9.96	31.41	41.37	54.00	12.63	200	350	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	1115.6000	53.49	43.64	-9.85	74.00	30.36	200	301	Vertical
2	1994.8000	50.87	46.97	-3.90	74.00	27.03	200	339	Vertical
3	3196.5000	61.35	48.13	-13.22	74.00	25.87	100	310	Vertical
4	4959.0000	58.98	52.64	-6.34	74.00	21.36	100	138	Vertical
5	6393.0000	51.44	49.22	-2.22	74.00	24.78	100	283	Vertical
6	14604.0000	40.30	52.84	12.54	74.00	21.16	200	191	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	3199.4145	-13.22	43.85	30.63	54.00	23.37	119	287.2	Vertical
2	4960.0050	-6.34	53.46	47.12	54.00	6.88	100	119.4	Vertical
3	6387.3560	-2.22	38.35	36.13	54.00	17.87	101	259	Vertical
4	14604.0000	12.54	27.96	40.50	54.00	13.50	200	191	Vertical

Mode: TX/ BLE_2M
Lowest Frequency (2402MHz)
Environment: 24.3°C/64%RH/101.0kPa
Tested By: Wen wenwen

Voltage: DC 3V
Date: 2024-08-24

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1113.0000	56.69	46.62	-10.07	74.00	27.38	100	315	Horizontal
2	2467.4000	46.89	46.21	-0.68	74.00	27.79	200	275	Horizontal
3	4804.5000	61.89	54.75	-7.14	74.00	19.25	100	21	Horizontal
4	6855.0000	44.38	44.32	-0.06	74.00	29.68	100	85	Horizontal
5	7936.5000	42.73	46.28	3.55	74.00	27.72	200	235	Horizontal
6	14149.5000	39.55	53.00	13.45	74.00	21.00	200	114	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	4803.9435	-7.14	55.95	48.81	54.00	5.19	150	0	Horizontal
2	14149.5000	13.45	27.93	41.38	54.00	12.62	200	114	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	1997.0000	51.85	47.96	-3.89	74.00	26.04	200	0	Vertical
2	4258.5000	53.18	43.85	-9.33	74.00	30.15	100	128	Vertical
3	4803.0000	62.14	55.09	-7.05	74.00	18.91	100	142	Vertical
4	6381.0000	51.51	48.99	-2.52	74.00	25.01	100	273	Vertical
5	7206.0000	42.19	43.39	1.20	74.00	30.61	100	75	Vertical
6	13273.5000	39.69	52.99	13.30	74.00	21.01	200	22	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	-7.05	55.70	48.65	54.00	5.35	101	149.1	Vertical
2	6381.0000	-2.52	46.37	43.85	54.00	10.15	100	273	Vertical
3	13273.5000	13.30	28.37	41.67	54.00	12.33	200	22	Vertical

Mode: TX/ BLE_2M
Middle Frequency (2440MHz)
Environment: 24.3°C/64%RH/101.0kPa
Tested By: Wen wenwen

Voltage: DC 3V
Date: 2024-08-24

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	56.73	46.76	-9.97	74.00	27.24	100	312	Horizontal
2	2501.0000	47.55	47.13	-0.42	74.00	26.87	200	22	Horizontal
3	4878.0000	59.55	52.55	-7.00	74.00	21.45	200	235	Horizontal
4	7195.5000	43.91	45.02	1.11	74.00	28.98	200	248	Horizontal
5	7926.0000	42.94	46.22	3.28	74.00	27.78	200	168	Horizontal
6	15759.0000	43.22	52.81	9.59	74.00	21.19	200	114	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	4879.9770	-7.00	52.48	45.48	54.00	8.52	199	251.8	Horizontal
2	15759.0000	9.59	30.18	39.77	54.00	14.23	200	114	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	1990.0000	50.36	46.44	-3.92	74.00	27.56	100	271	Vertical
2	3208.5000	55.56	42.54	-13.02	74.00	31.46	100	314	Vertical
3	4255.5000	52.29	42.96	-9.33	74.00	31.04	100	103	Vertical
4	4878.0000	61.34	54.39	-6.95	74.00	19.61	100	140	Vertical
5	6387.0000	52.20	49.84	-2.36	74.00	24.16	100	301	Vertical
6	15231.0000	40.98	52.69	11.71	74.00	21.31	100	288	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	4879.7650	-6.95	51.82	44.87	54.00	9.13	100	123.2	Vertical
2	6387.0000	-2.36	39.51	37.15	54.00	16.85	100	301	Vertical
3	15231.0000	11.71	29.33	41.04	54.00	12.96	100	288	Vertical

Mode: TX/ BLE_2M

Highest Frequency (2480MHz)

Environment: 24.3°C/64%RH/101.0kPa

Tested By: Wen wenwen

Voltage: DC 3V

Date: 2024-08-24

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1114.8000	56.54	46.51	-10.03	74.00	27.49	100	313	Horizontal
2	2504.8000	47.42	46.81	-0.61	74.00	27.19	200	232	Horizontal
3	4264.5000	49.81	39.99	-9.82	74.00	34.01	100	87	Horizontal
4	4960.5000	57.91	51.35	-6.56	74.00	22.65	200	220	Horizontal
5	7084.5000	44.61	45.26	0.65	74.00	28.74	100	326	Horizontal
6	15771.0000	43.40	52.98	9.58	74.00	21.02	200	61	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	4959.9255	-6.56	51.13	44.57	54.00	9.43	148	238.8	Horizontal
2	15771.0000	9.58	31.92	41.50	54.00	12.50	200	61	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	1998.4000	51.80	47.92	-3.88	74.00	26.08	200	360	Vertical
2	2588.4000	50.27	47.94	-2.33	74.00	26.06	100	259	Vertical
3	4252.5000	52.44	43.12	-9.32	74.00	30.88	100	101	Vertical
4	4960.5000	58.69	52.35	-6.34	74.00	21.65	100	148	Vertical
5	6381.0000	53.72	51.20	-2.52	74.00	22.80	100	101	Vertical
6	15694.5000	42.95	53.09	10.14	74.00	20.91	100	87	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	4959.9975	-6.34	49.31	42.97	54.00	11.03	100	165.3	Vertical
2	6387.9260	-2.52	40.59	38.07	54.00	15.93	100	74.6	Vertical
3	15694.5000	10.14	31.69	41.83	54.00	12.17	100	87	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, only the worst case(TX/BLE_1M_2402MHz) in the worst power supply is recorded in this report.

Mode: TX/ BLE_1M

Lowest Frequency (2402MHz)

Environment: 26.5°C/65%RH/101.0kPa

Tested By: Wen wenwen

Voltage: DC 3V

Date: 2024-08-26

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	18854.25	62.46	45.31	35.77	-17.15	74	38.23	100	19	Horizontal
2	19671.95	63.5	46.73	37.19	-16.77	74	36.81	120	19	Horizontal
3	21472.25	61.97	46.13	36.59	-15.84	74	37.41	100	241	Horizontal
4	22832.675	62.92	48.16	38.62	-14.76	74	35.38	130	178	Horizontal
5	23919.4	64.44	50.06	40.52	-14.38	74	33.48	100	116	Horizontal
6	26401.825	64.31	50.37	40.83	-13.94	74	33.17	100	306	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	18955.4	62.75	45.67	36.13	-17.08	74	37.87	110	89	Vertical
2	19806.25	62.38	45.49	35.95	-16.89	74	38.05	100	314	Vertical
3	22032.4	62.96	47.14	37.6	-15.82	74	36.4	100	220	Vertical
4	23744.725	64.85	50.26	40.72	-14.59	74	33.28	120	282	Vertical
5	24938.975	64.41	50.47	40.93	-13.94	74	33.07	100	282	Vertical
6	25843.375	64.42	50.14	40.6	-14.28	74	33.4	100	21	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

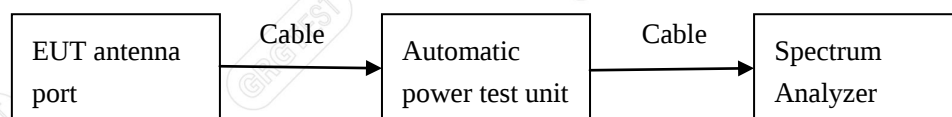
7.1 LIMITS

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



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7.4 TEST RESULTS

Environment: 25.3°C/59%RH/101.0kPa
Tested By: Qin tingting

Voltage: DC 3V
Date: 2024-08-09

BLE_1M

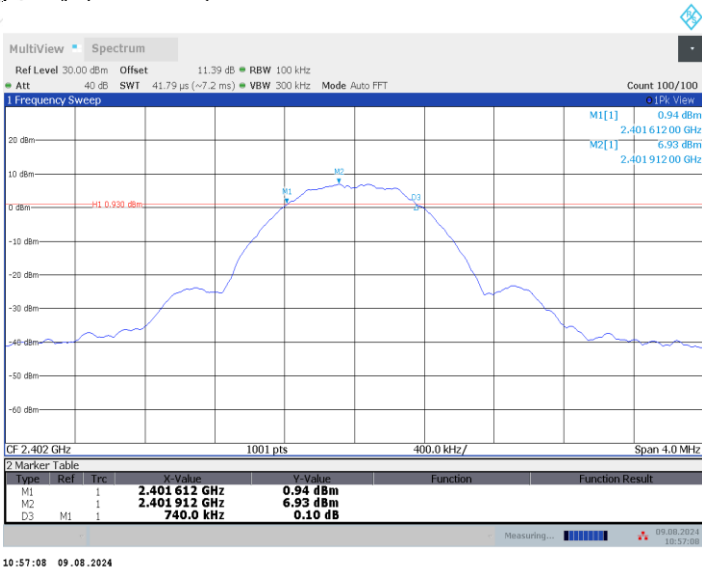
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	740	≥500	PASS
Middle	2440	736		PASS
Highest	2480	748		PASS

BLE_2M

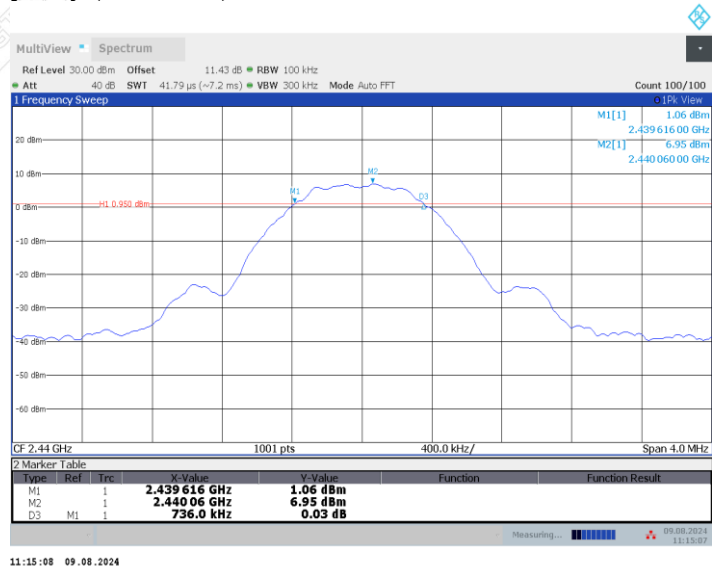
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	1348	≥500	PASS
Middle	2440	1352		PASS
Highest	2480	1348		PASS

BLE_1M

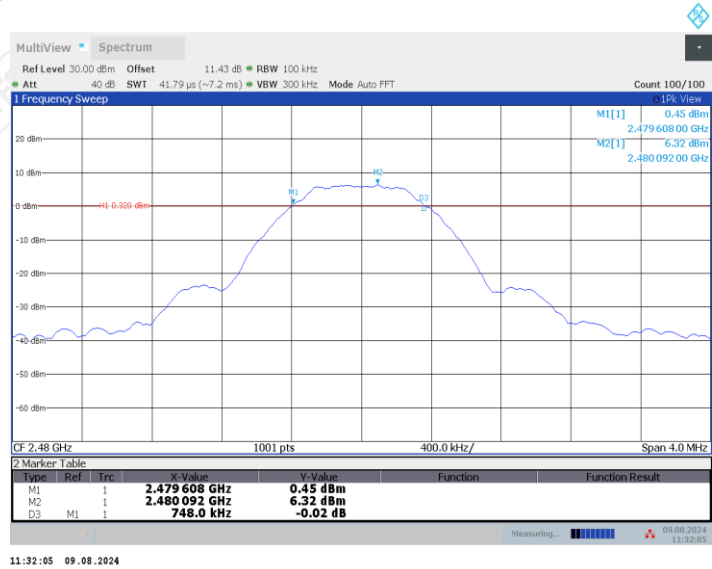
Lowest Frequency (2402MHz)



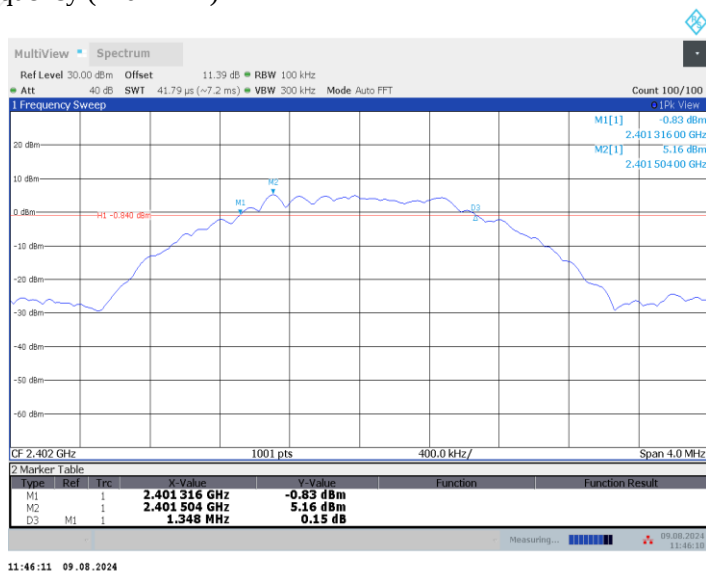
Middle Frequency (2440 MHz)



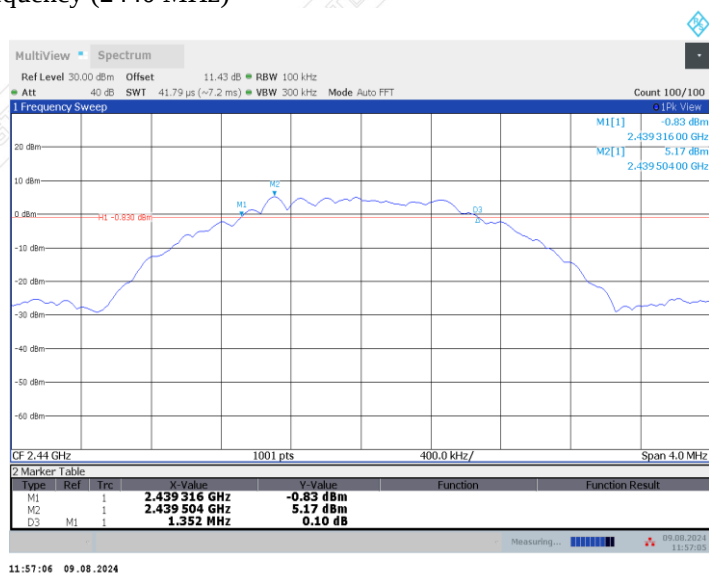
Highest Frequency (2480MHz)



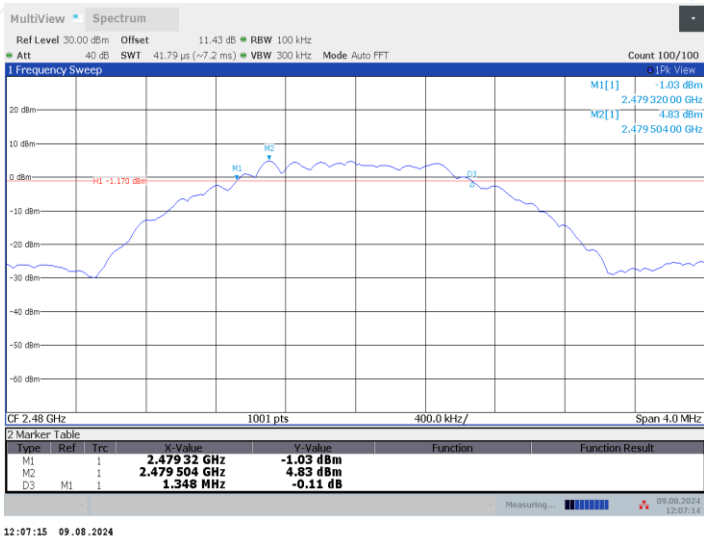
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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8. MAXIMUM PEAK OUTPUT POWER

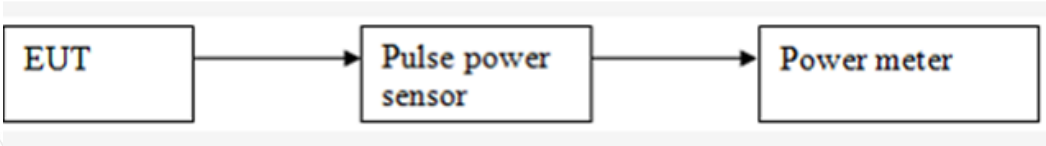
8.1 LIMITS

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: 25.3°C/59%RH/101.0kPa
Tested By: Qin tingting

Voltage: DC 3V
Date: 2024-08-22

BLE_1M

Channel	Frequency (MHz)	Maximum Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	7.61	1W (30dBm)	Peak	Pass
Middle	2440	7.45			Pass
Highest	2480	7.32			Pass

BLE_2M

Channel	Frequency (MHz)	Maximum Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	7.60	1W (30dBm)	Peak	Pass
Middle	2440	7.45			Pass
Highest	2480	7.32			Pass

9. POWER SPECTRAL DENSITY

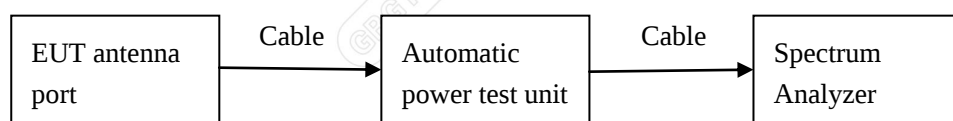
9.1 LIMITS

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: 25.3°C/59%RH/101.0kPa
Tested By: Qin tingting

Voltage: DC 3V
Date: 2024-08-22

BLE_1M

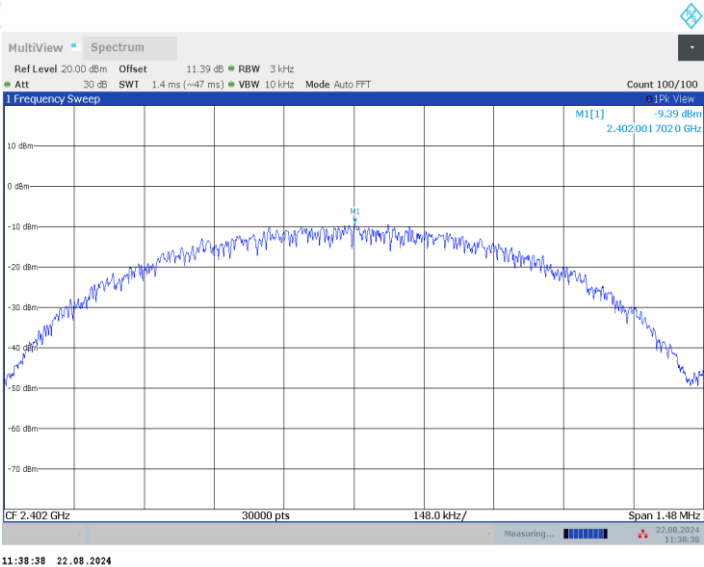
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-9.39	8.00	PASS
Middle	2440	-9.40		PASS
Highest	2480	-9.69		PASS

BLE_2M

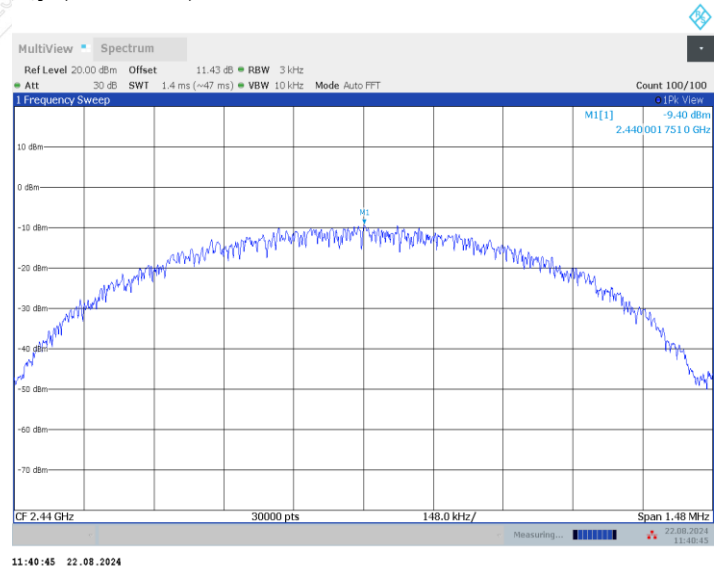
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-10.19	8.00	PASS
Middle	2440	-10.23		PASS
Highest	2480	-10.53		PASS

BLE_1M

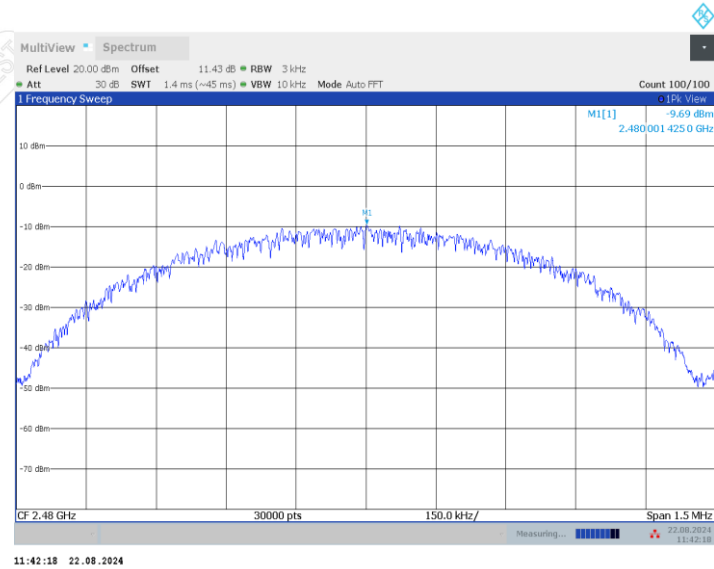
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)

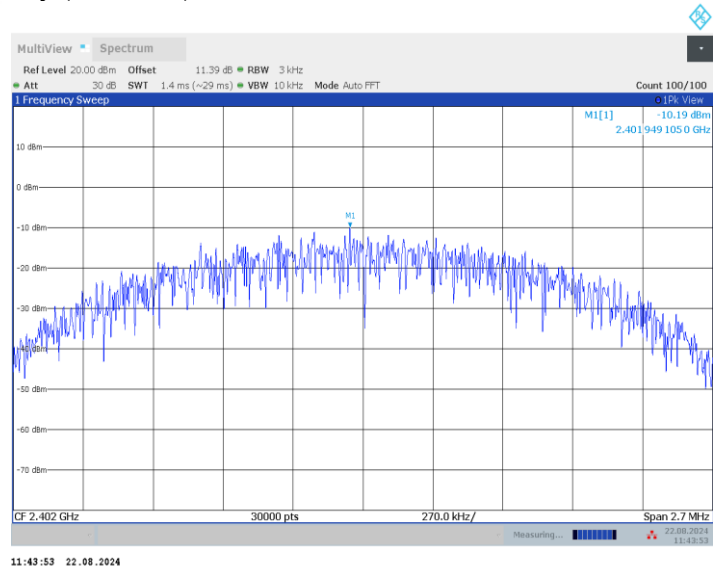


Highest Frequency (2480MHz)

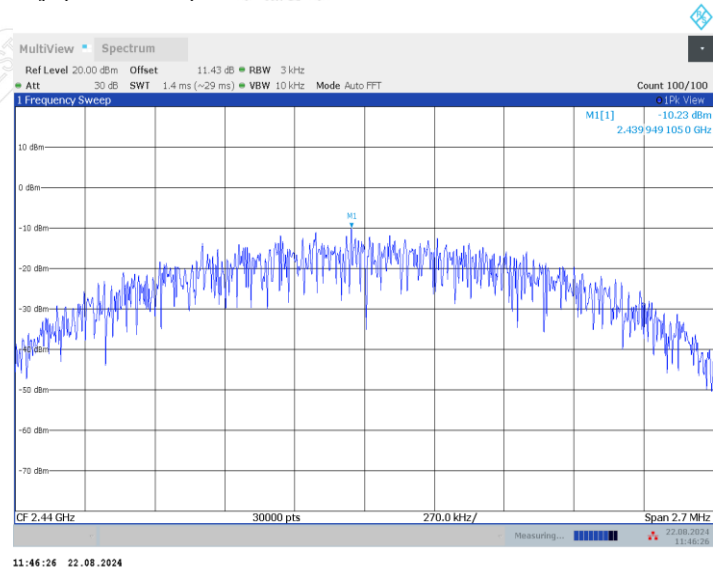


BLE_2M

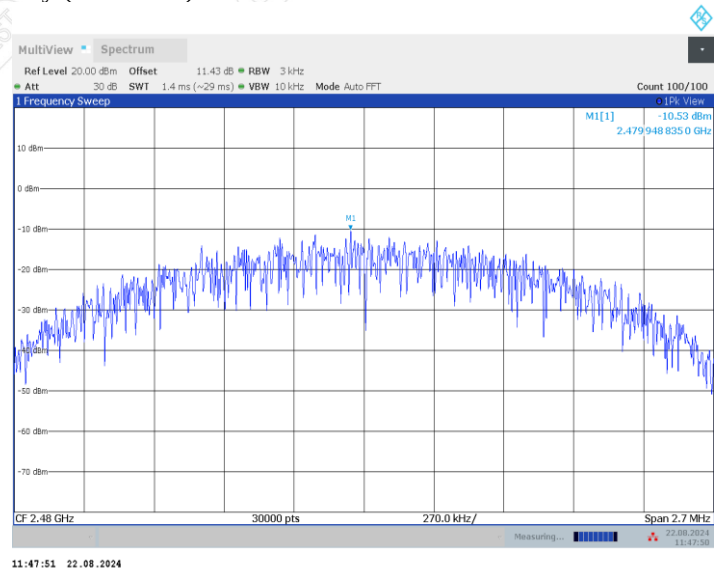
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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10. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS

10.1 LIMITS

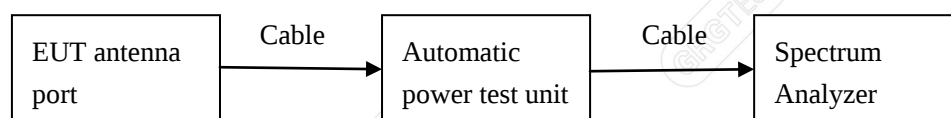
In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the 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

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: 25.3°C/59%RH/101.0kPa
Tested By: Qin tingting

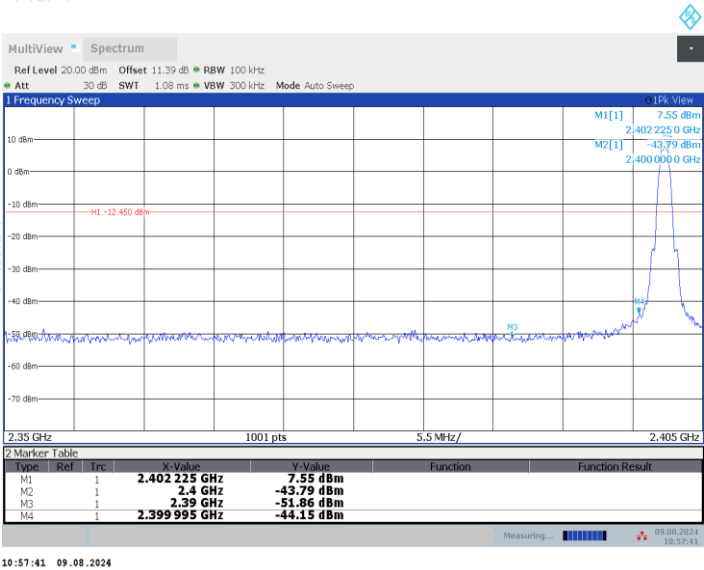
Voltage: DC 3V
Date: 2024-08-09

Band edge measurements

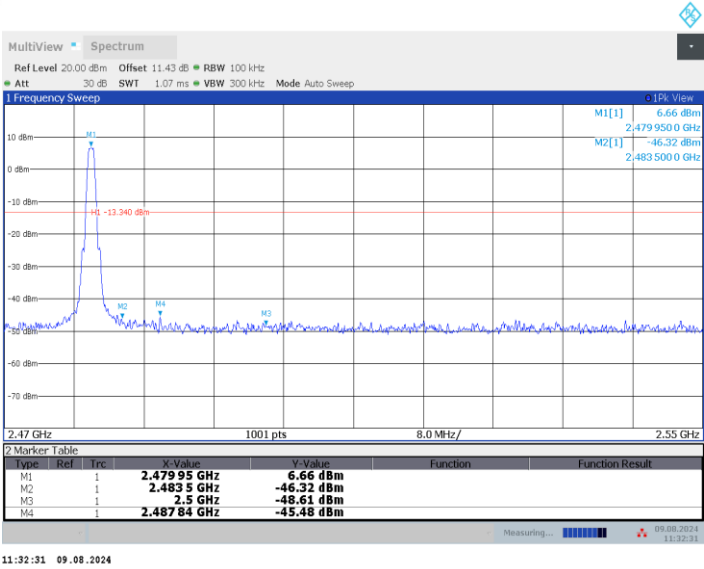
TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	7.55	-44.15	≤-12.45	PASS
		High	2480	6.66	-45.48	≤-13.34	PASS
BLE_2M	Ant1	Low	2402	5.31	-26.3	≤-14.69	PASS
		High	2480	4.94	-45.56	≤-15.06	PASS

BLE_1M

Lowest Frequency (2402MHz)
2.35GHz-2.405GHz

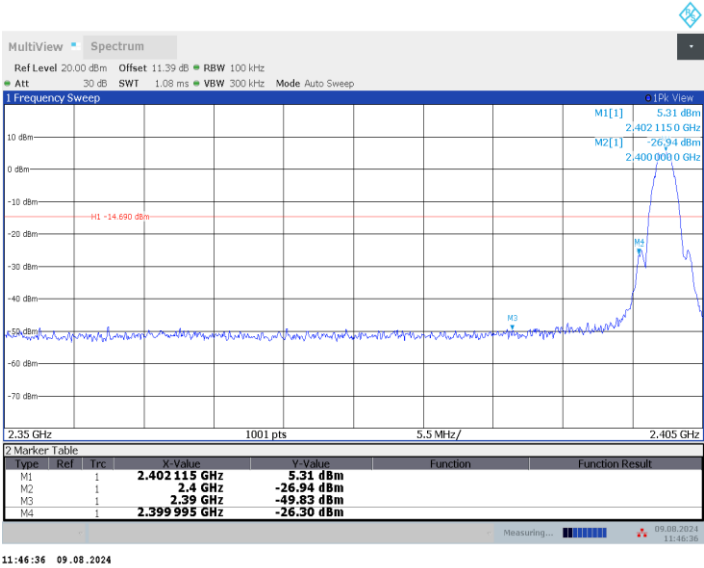


Highest Frequency (2480MHz)
2.47GHz-2.55GHz

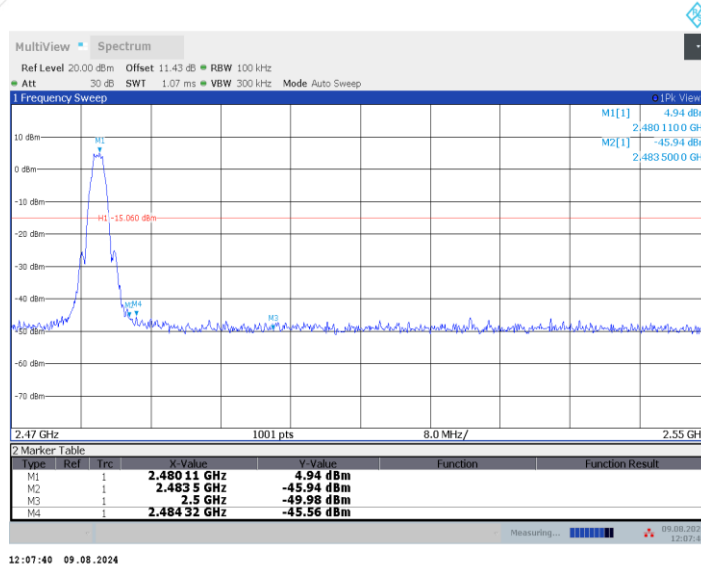


BLE_2M

Lowest Frequency (2402MHz)
2.35GHz-2.405GHz



Highest Frequency (2480MHz)
2.47GHz-2.55GHz

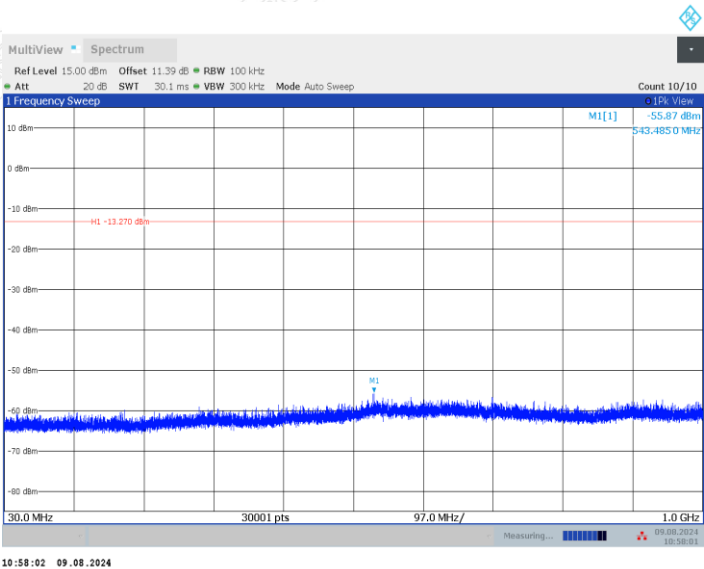
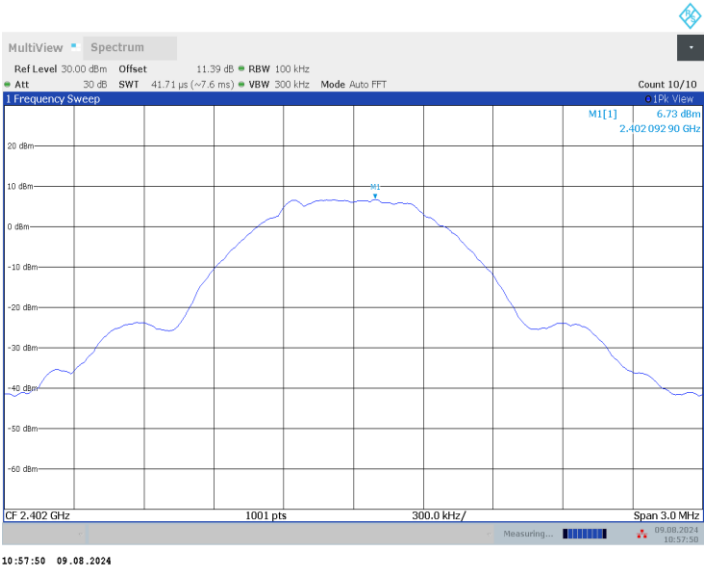


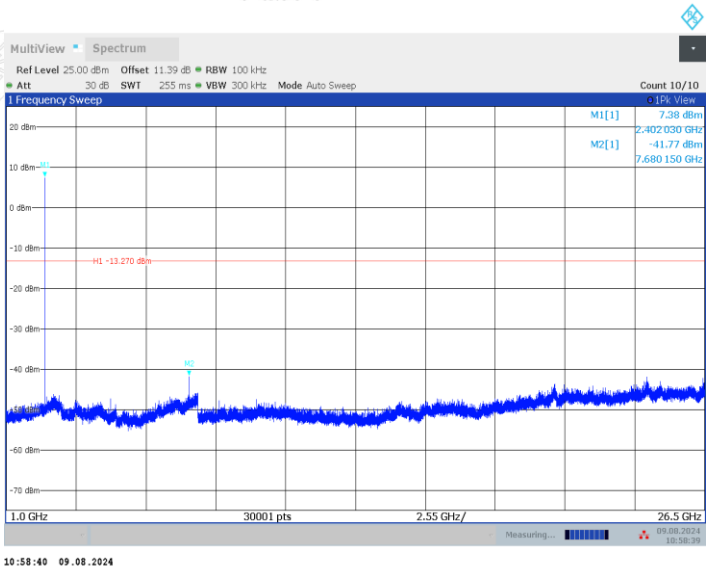
Conducted Spurious Emission

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	6.73	6.73	---	PASS
			30~1000	6.73	-55.87	≤-13.27	PASS
			1000~26500	6.73	-41.77	≤-13.27	PASS
		2440	Reference	6.61	6.61	---	PASS
			30~1000	6.61	-56.36	≤-13.39	PASS
			1000~26500	6.61	-42.6	≤-13.39	PASS
		2480	Reference	6.35	6.35	---	PASS
			30~1000	6.35	-56.85	≤-13.65	PASS
			1000~26500	6.35	-42.53	≤-13.65	PASS
BLE_2M	Ant1	2402	Reference	5.21	5.21	---	PASS
			30~1000	5.21	-56.98	≤-14.79	PASS
			1000~26500	5.21	-42.42	≤-14.79	PASS
		2440	Reference	5.18	5.18	---	PASS
			30~1000	5.18	-56.65	≤-14.82	PASS
			1000~26500	5.18	-42.37	≤-14.82	PASS
		2480	Reference	4.87	4.87	---	PASS
			30~1000	4.87	-56.48	≤-15.13	PASS
			1000~26500	4.87	-42.55	≤-15.13	PASS

BLE_1M

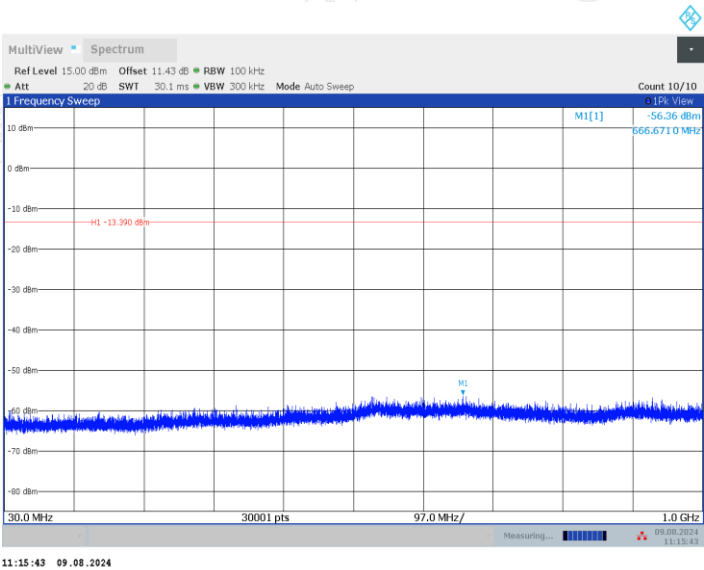
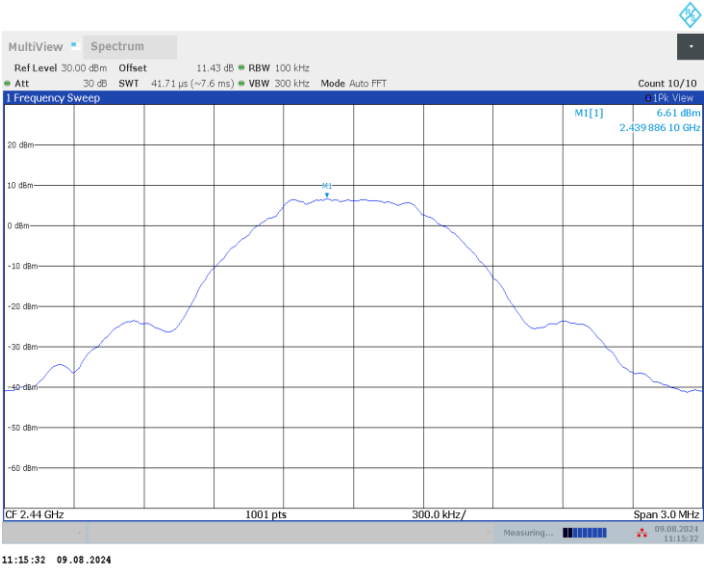
Lowest Frequency (2402MHz)

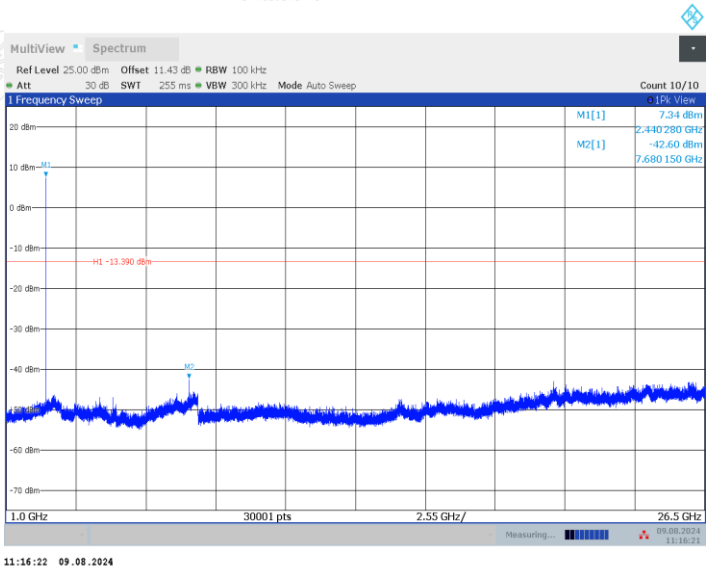




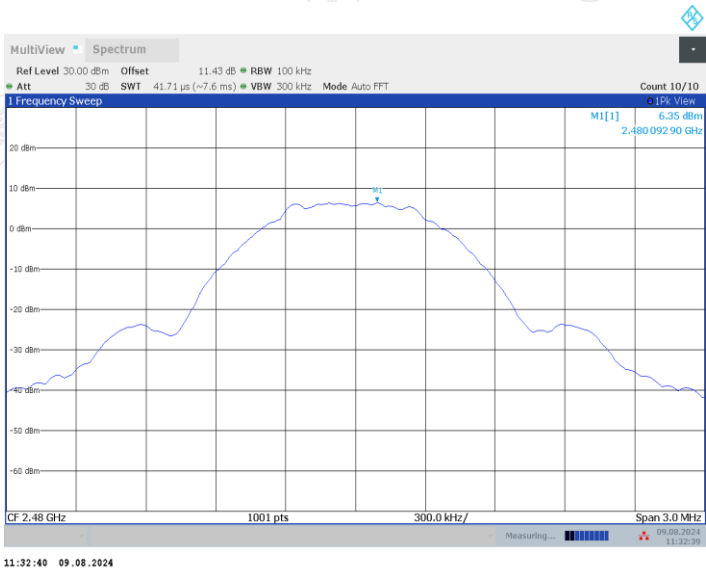
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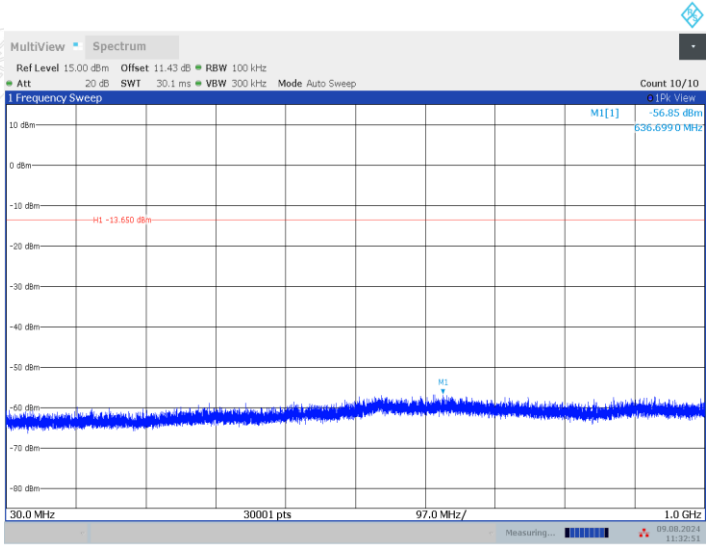
Middle Frequency (2440MHz)



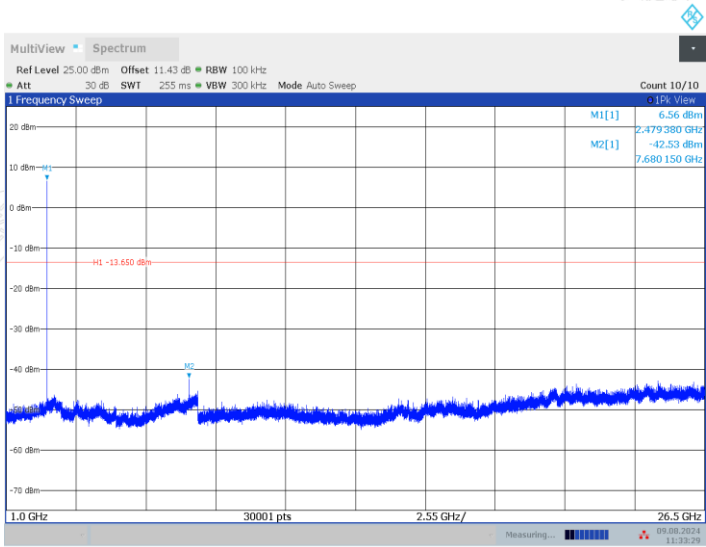


Highest Frequency (2480MHz)





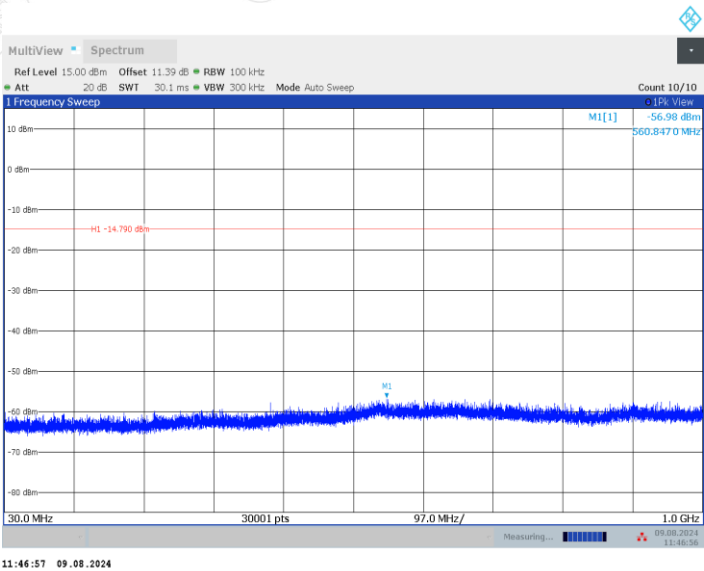
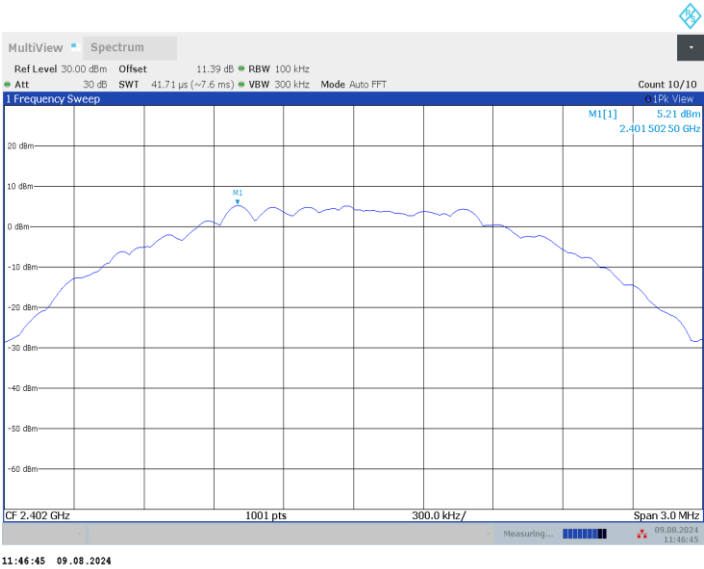
11:32:51 09.08.2024

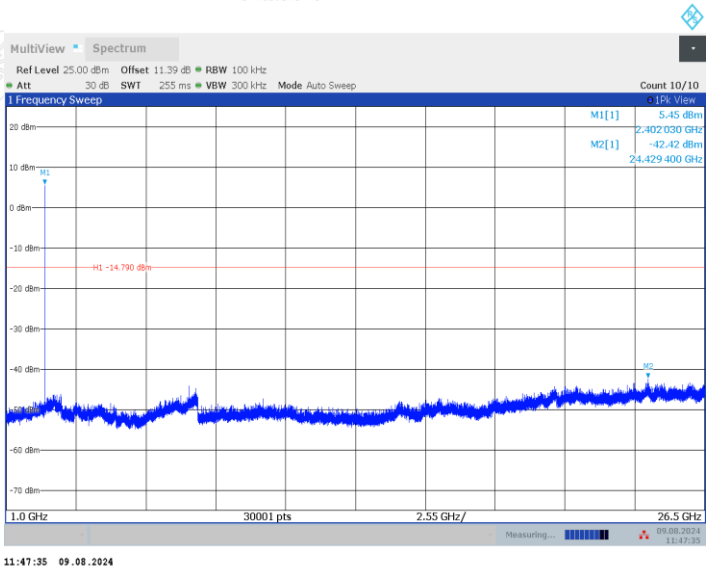


11:33:30 09.08.2024

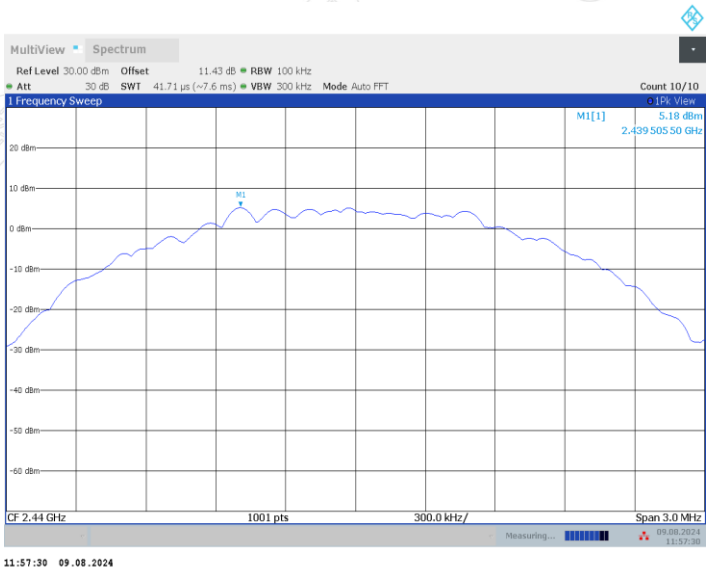
BLE_2M

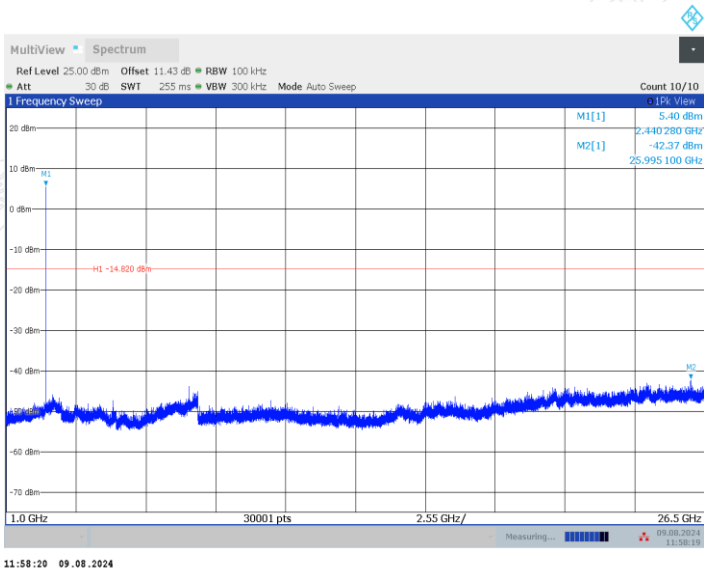
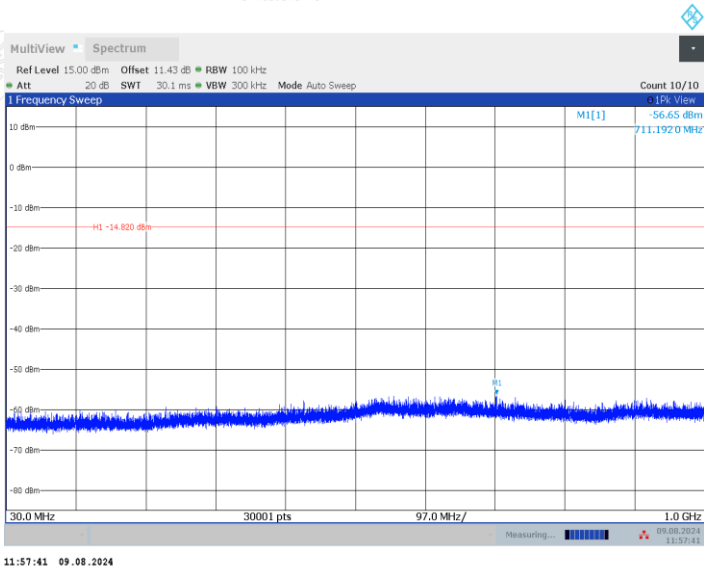
Lowest Frequency (2402MHz)



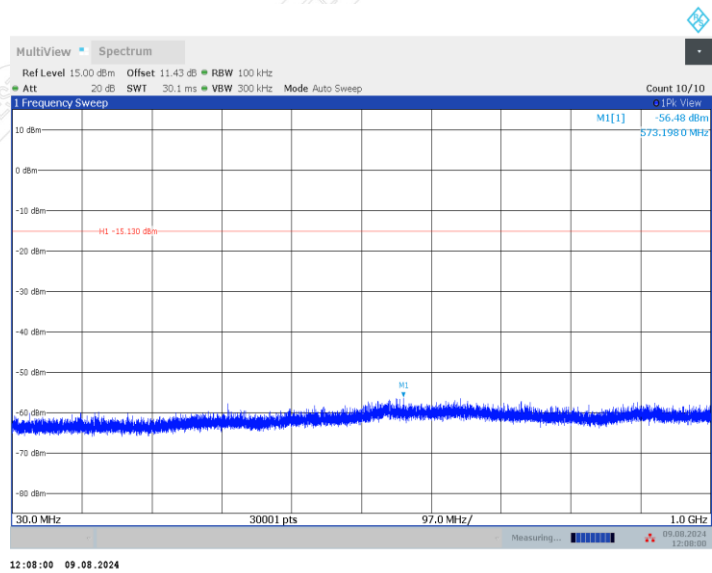
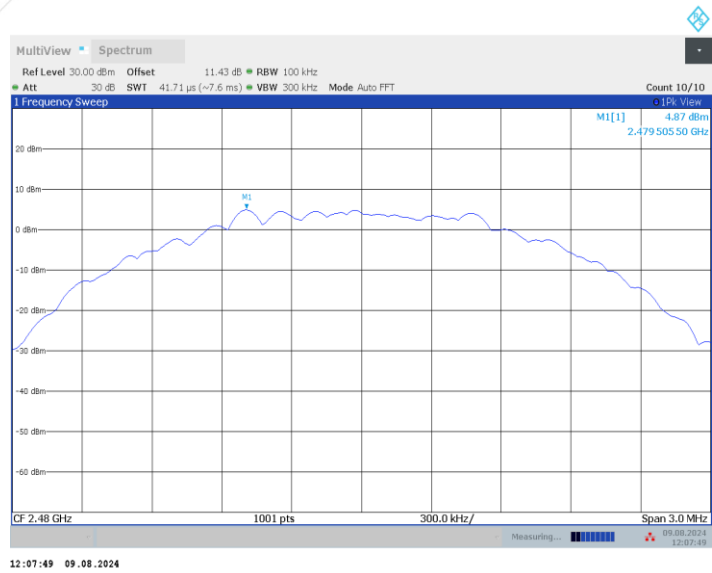


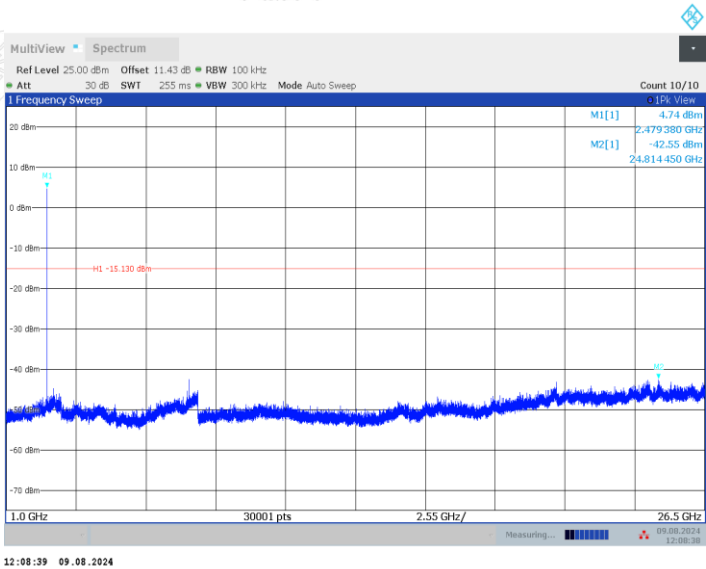
Middle Frequency (2440MHz)





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			

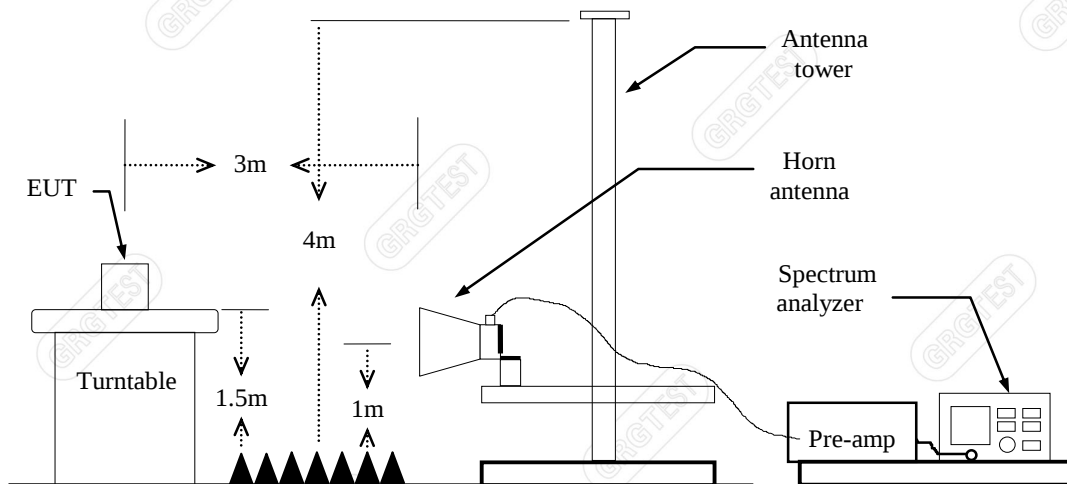
Frequency (MHz)	Quasi-peak($\mu\text{V}/\text{m}$)	Measurement distance(m)	Quasi-peak(dB $\mu\text{V}/\text{m}$)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

11.2 TEST PROCEDURES

- a) The EUT is placed on a turntable, which is 1.5m above the ground plane.
- b) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- c) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- d) 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.

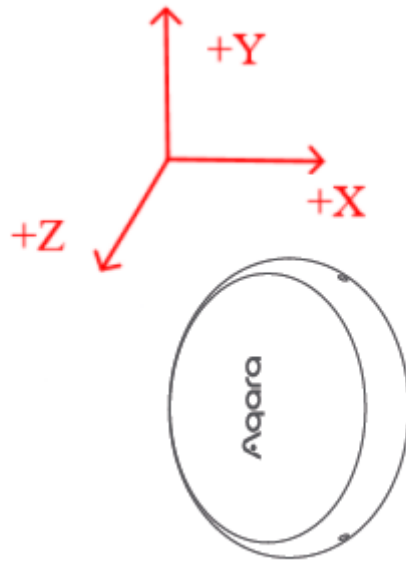
If the EUT is configured to transmit with duty cycle $\geq 98\%$, set $VBW \leq RBW/100$ (i.e., 10kHz) but not less than 10 Hz. If the EUT duty cycle is $< 98\%$, set $VBW \geq 1/T$, Where T is defined in section 2.8.
- e) Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

11.3 TEST SETUP



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.

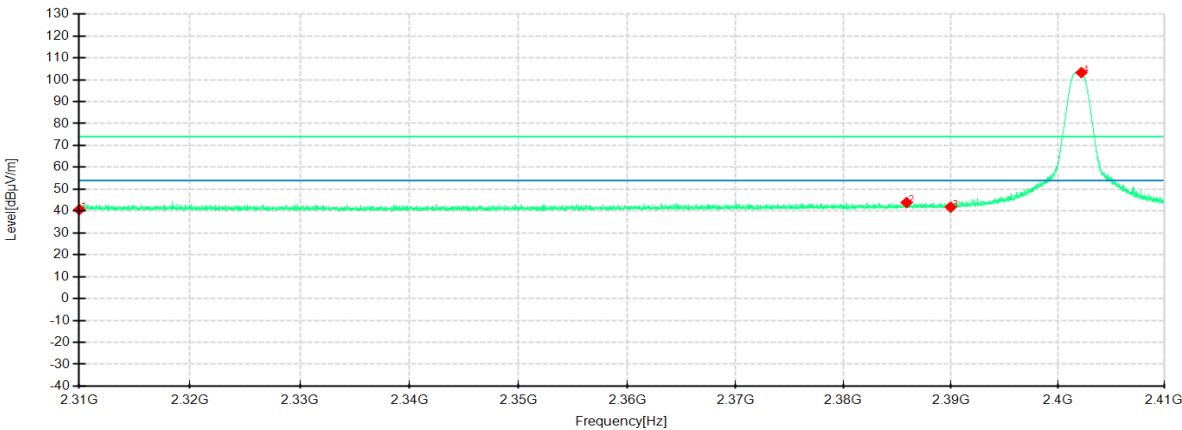


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Test Voltage:	DC 3V	Test Engineer:	Wen wenwen
Test Date	2024-08-15	Environmental Conditions	24.9℃/64%RH/101.0kPa

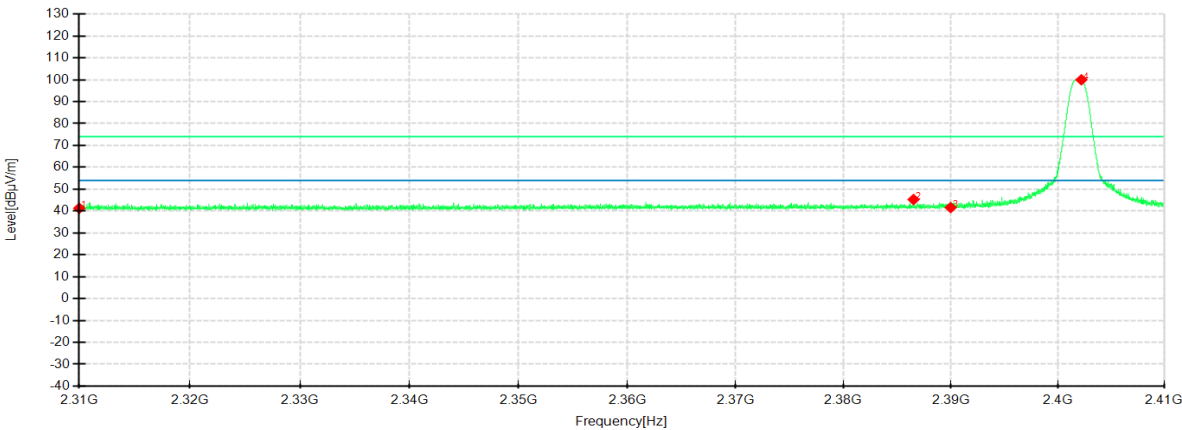
BLE 1M
Lowest Frequency
Frequency 2402MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



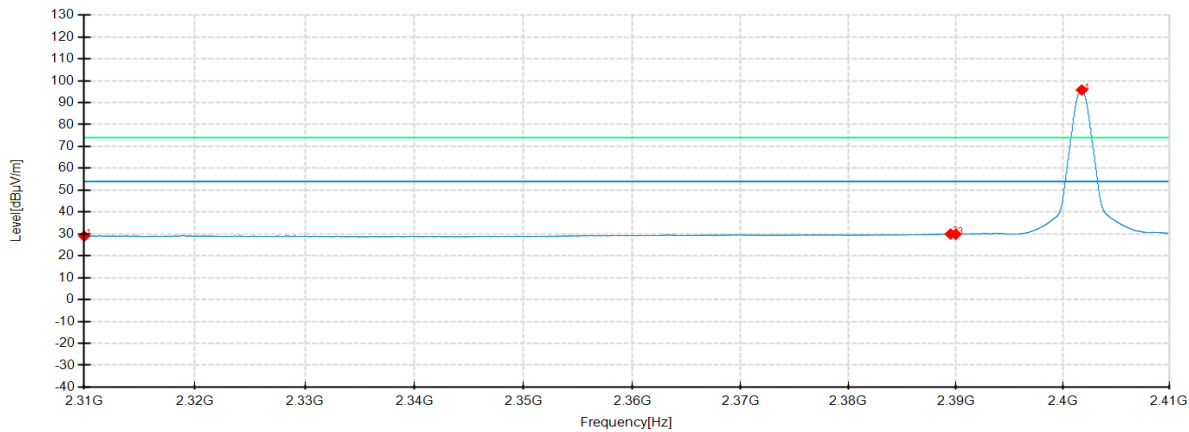
No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	46.10	40.62	-5.48	74.00	33.38	100	84	Horizontal	/
2	2385.8875	49.34	43.90	-5.44	74.00	30.10	100	0	Horizontal	/
3	2390.0000	47.17	41.78	-5.39	74.00	32.22	200	19	Horizontal	/
4	2402.2375	108.50	103.27	-5.23	74.00	-29.27	100	161	Horizontal	No limit
1	2310.0000	46.61	41.29	-5.32	74.00	32.71	200	251	Vertical	/
2	2386.5375	50.74	45.27	-5.47	74.00	28.73	100	21	Vertical	/
3	2390.0000	47.07	41.60	-5.47	74.00	32.40	100	360	Vertical	/
4	2402.2375	105.45	99.99	-5.46	74.00	-25.99	100	147	Vertical	No limit

Lowest Frequency

Frequency 2402MHz

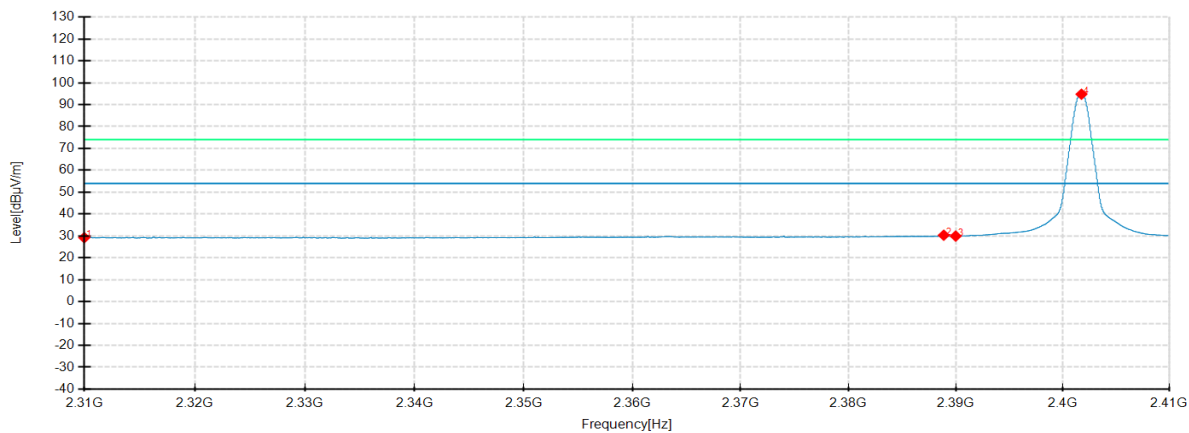
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

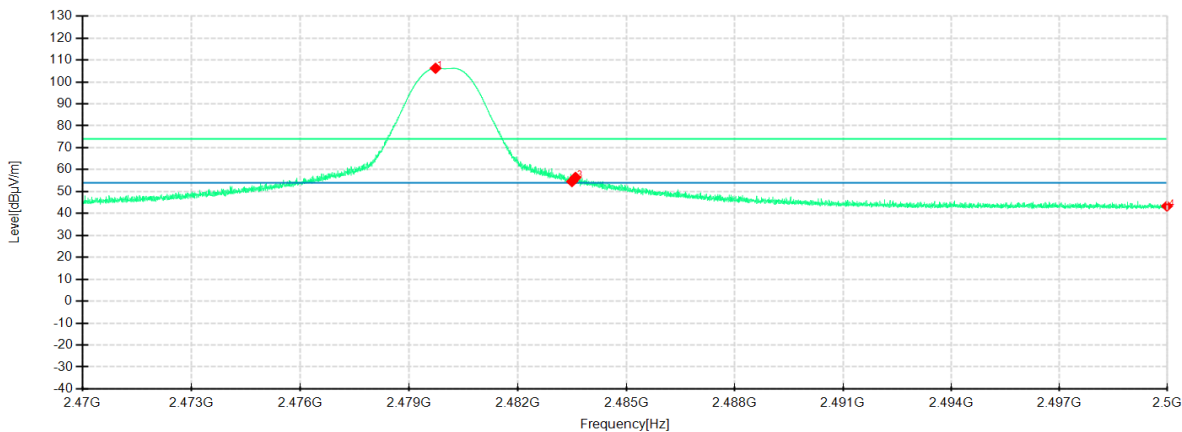
Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	34.47	28.99	-5.48	54.00	25.01	100	342	Horizontal	/
2	2389.5250	35.34	29.94	-5.40	54.00	24.06	200	287	Horizontal	/
3	2390.0000	35.26	29.87	-5.39	54.00	24.13	200	287	Horizontal	/
4	2401.8000	101.01	95.77	-5.24	54.00	-41.77	100	25	Horizontal	No limit
1	2310.0000	34.52	29.20	-5.32	54.00	24.80	100	21	Vertical	/
2	2388.8875	35.81	30.34	-5.47	54.00	23.66	100	282	Vertical	/
3	2390.0000	35.41	29.94	-5.47	54.00	24.06	100	21	Vertical	/
4	2401.7750	100.24	94.77	-5.47	54.00	-40.77	100	21	Vertical	No limit

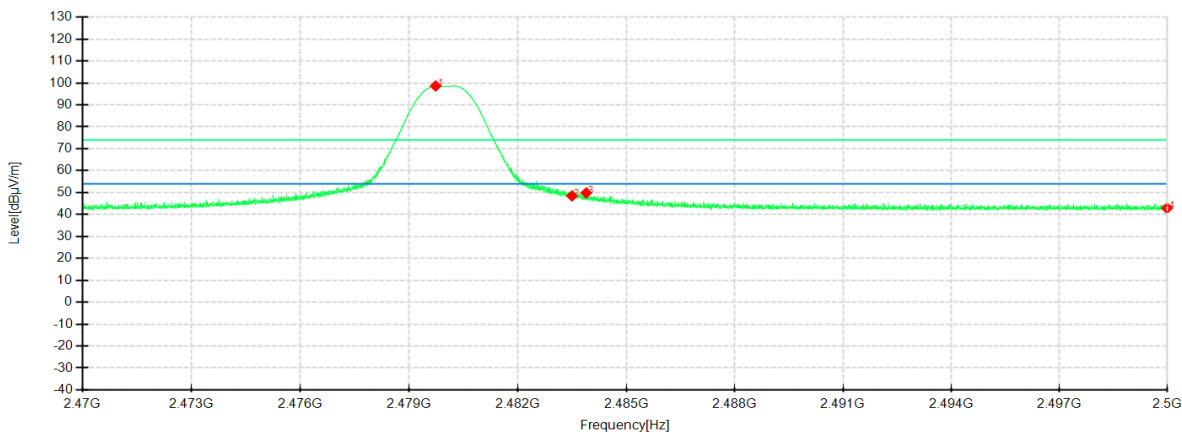
Highest Frequency
Frequency 2480MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



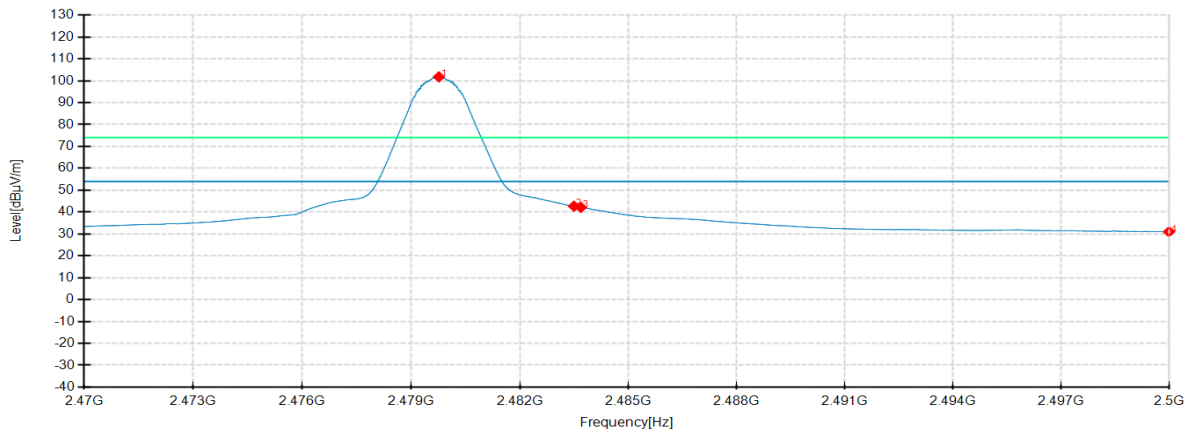
No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.7313	111.04	106.23	-4.81	74.00	-32.23	100	200	Horizontal	No limit
2	2483.5000	59.40	54.57	-4.83	74.00	19.43	100	200	Horizontal	/
3	2483.5975	61.28	56.44	-4.84	74.00	17.56	100	200	Horizontal	/
4	2500.0000	48.36	43.37	-4.99	74.00	30.63	200	200	Horizontal	/
1	2479.7350	103.70	98.61	-5.09	74.00	-24.61	200	110	Vertical	No limit
2	2483.5000	53.54	48.47	-5.07	74.00	25.53	200	110	Vertical	/
3	2483.8938	54.91	49.85	-5.06	74.00	24.15	200	124	Vertical	/
4	2500.0000	47.86	42.87	-4.99	74.00	31.13	200	328	Vertical	/

Highest Frequency

Frequency 2480MHz

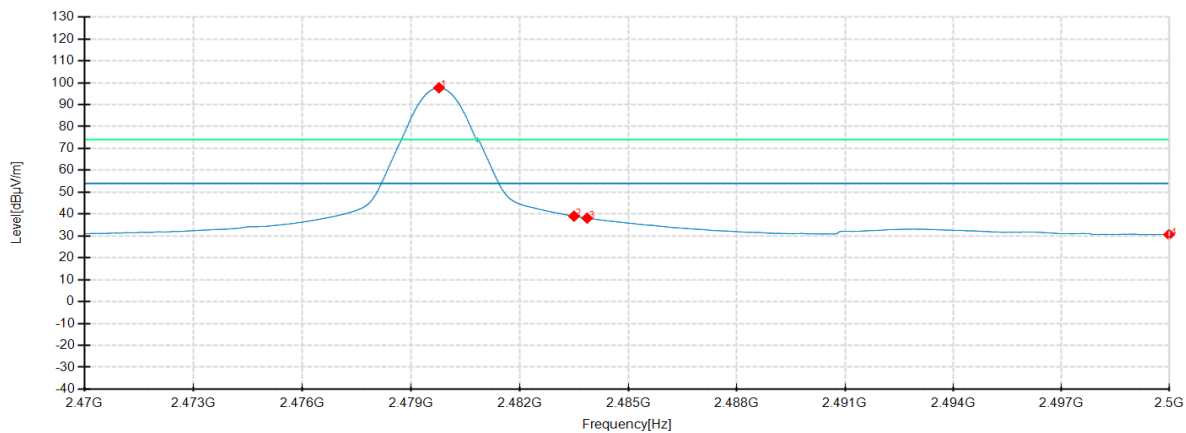
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

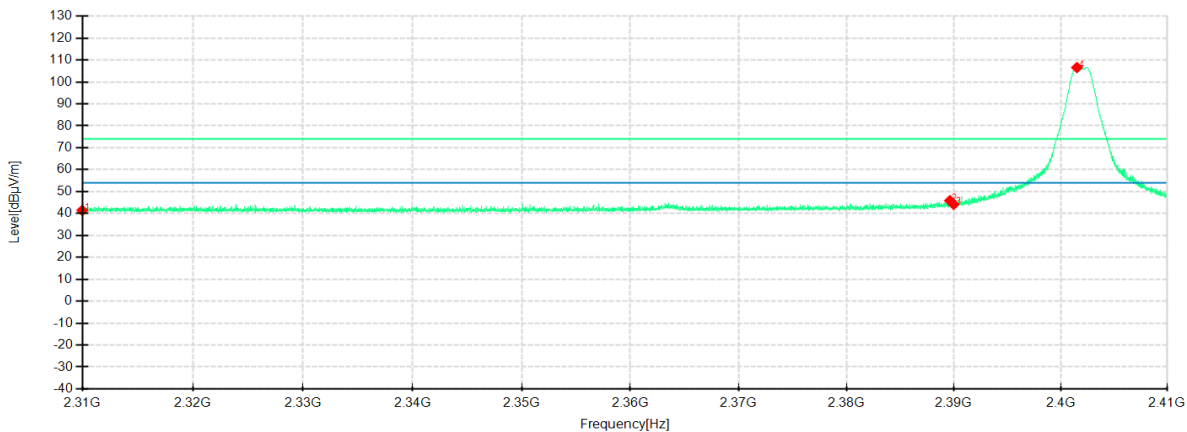
Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.7688	106.57	101.76	-4.81	54.00	-47.76	100	227	Horizontal	No limit
2	2483.5000	47.51	42.68	-4.83	54.00	11.32	100	214	Horizontal	/
3	2483.6913	46.99	42.15	-4.84	54.00	11.85	100	202	Horizontal	/
4	2500.0000	35.96	30.97	-4.99	54.00	23.03	100	152	Horizontal	/
1	2479.7725	102.77	97.68	-5.09	54.00	-43.68	200	112	Vertical	No limit
2	2483.5000	44.11	39.04	-5.07	54.00	14.96	200	338	Vertical	/
3	2483.8638	43.20	38.14	-5.06	54.00	15.86	200	338	Vertical	/
4	2500.0000	35.60	30.61	-4.99	54.00	23.39	100	212	Vertical	/

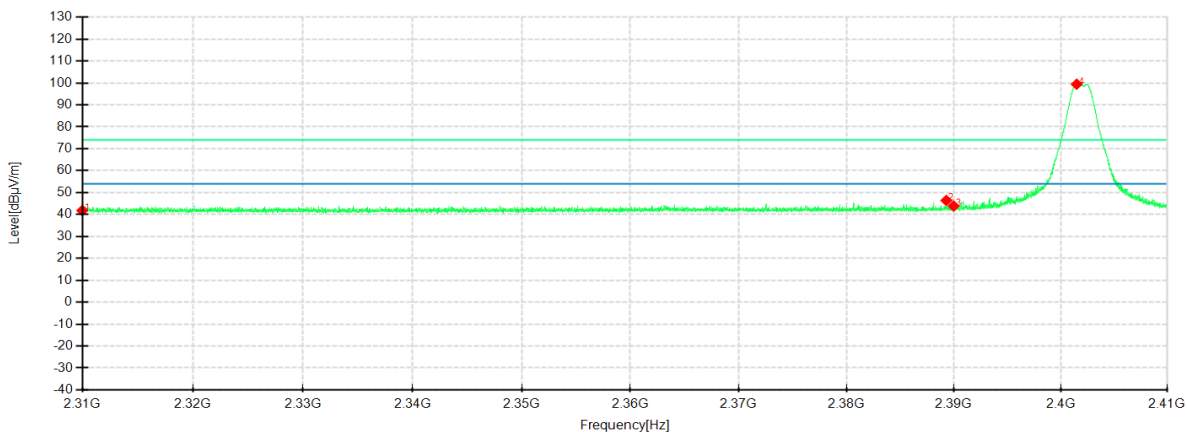
BLE 2M
Lowest Frequency
Frequency 2402MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



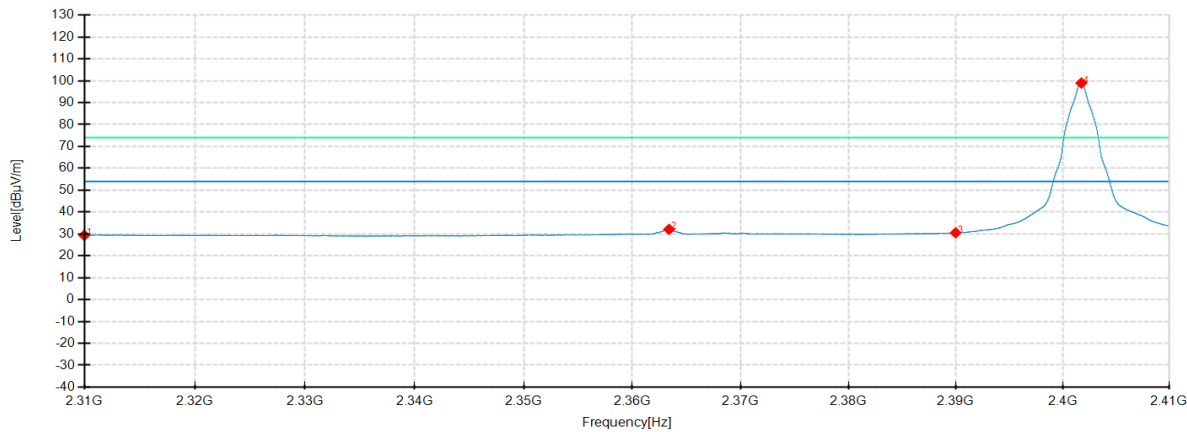
No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	46.90	41.42	-5.48	74.00	32.58	100	262	Horizontal	/
2	2389.6500	51.27	45.88	-5.39	74.00	28.12	100	198	Horizontal	/
3	2390.0000	49.58	44.19	-5.39	74.00	29.81	100	224	Horizontal	/
4	2401.5375	111.82	106.57	-5.25	74.00	-32.57	100	185	Horizontal	No limit
1	2310.0000	47.13	41.81	-5.32	74.00	32.19	200	84	Vertical	/
2	2389.3125	51.87	46.40	-5.47	74.00	27.60	100	110	Vertical	/
3	2390.0000	49.34	43.87	-5.47	74.00	30.13	200	263	Vertical	/
4	2401.5125	104.88	99.41	-5.47	74.00	-25.41	200	123	Vertical	No limit

Lowest Frequency

Frequency 2402MHz

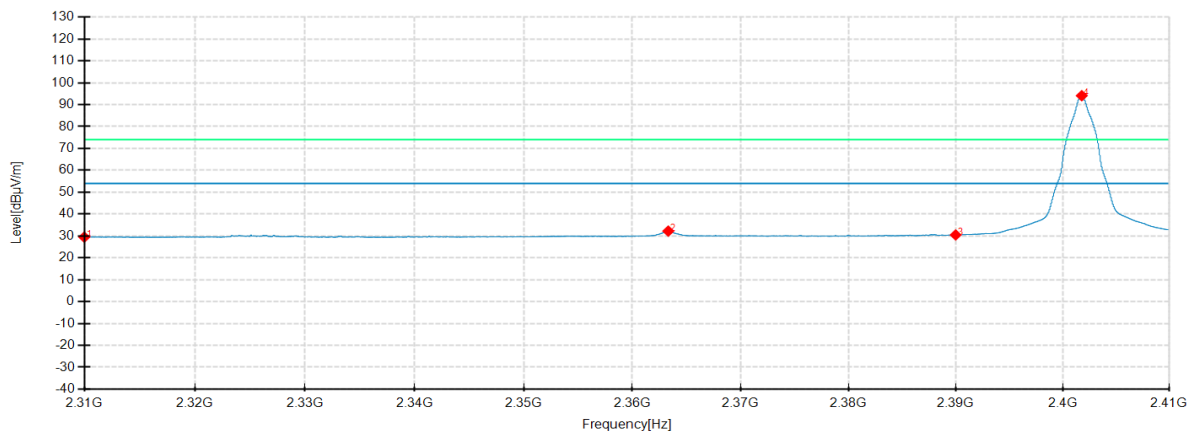
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

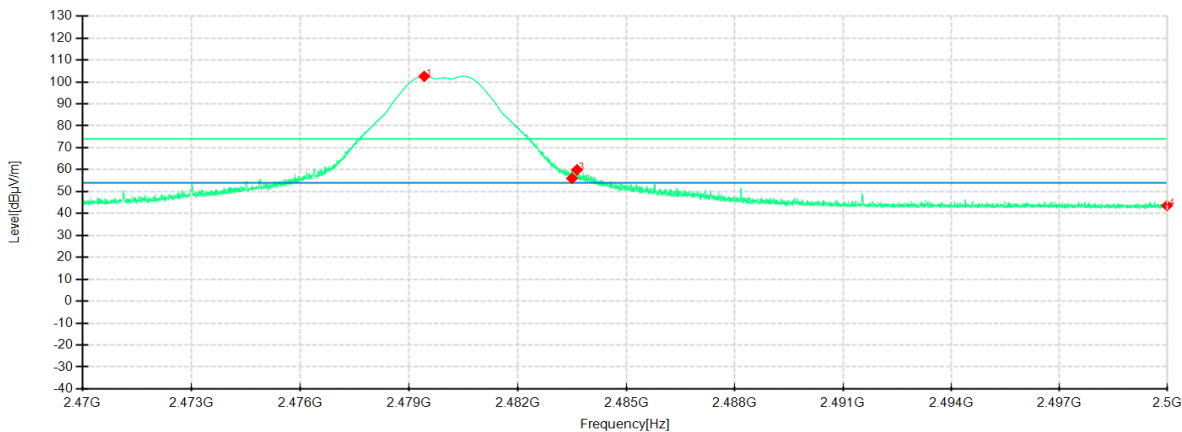
Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	34.86	29.38	-5.48	54.00	24.62	100	0	Horizontal	/
2	2363.3875	37.82	32.11	-5.71	54.00	21.89	100	176	Horizontal	/
3	2390.0000	35.89	30.50	-5.39	54.00	23.50	100	75	Horizontal	/
4	2401.7625	104.19	98.94	-5.25	54.00	-44.94	100	25	Horizontal	No limit
1	2310.0000	34.79	29.47	-5.32	54.00	24.53	100	21	Vertical	/
2	2363.3125	37.69	32.22	-5.47	54.00	21.78	200	339	Vertical	/
3	2390.0000	35.94	30.47	-5.47	54.00	23.53	100	21	Vertical	/
4	2401.8000	99.55	94.09	-5.46	54.00	-40.09	200	339	Vertical	No limit

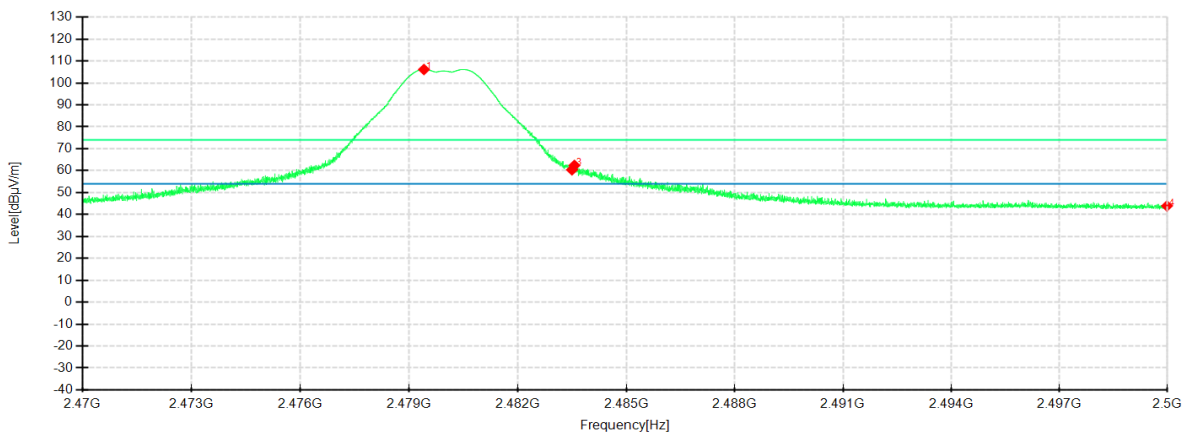
Highest Frequency
Frequency 2480MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

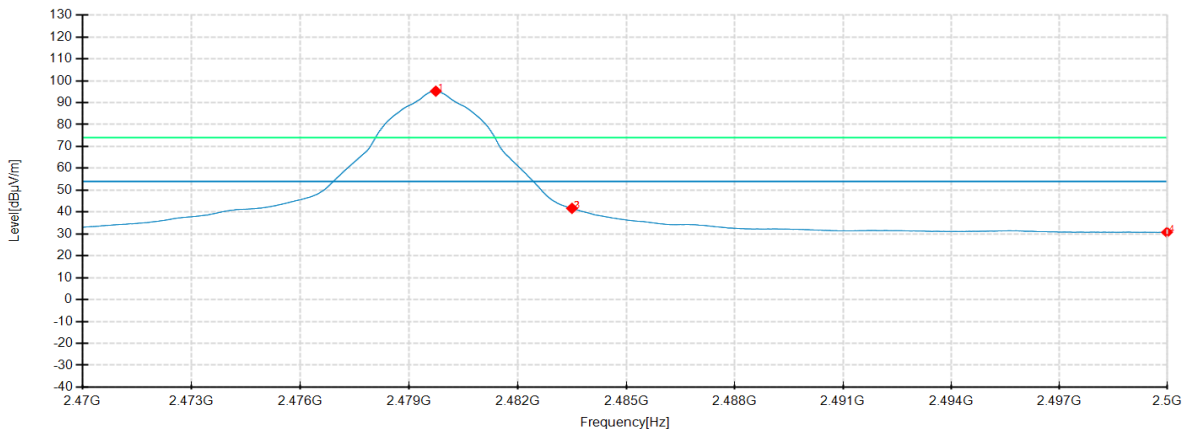
Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.4200	107.35	102.55	-4.80	74.00	-28.55	100	234	Horizontal	No limit
2	2483.5000	60.87	56.04	-4.83	74.00	17.96	100	234	Horizontal	/
3	2483.6388	64.77	59.93	-4.84	74.00	14.07	100	234	Horizontal	/
4	2500.0000	48.61	43.62	-4.99	74.00	30.38	200	339	Horizontal	/
1	2479.4125	111.21	106.12	-5.09	74.00	-32.12	100	311	Vertical	No limit
2	2483.5000	65.44	60.37	-5.07	74.00	13.63	100	298	Vertical	/
3	2483.5675	67.47	62.40	-5.07	74.00	11.60	100	311	Vertical	/
4	2500.0000	48.90	43.91	-4.99	74.00	30.09	200	37	Vertical	/

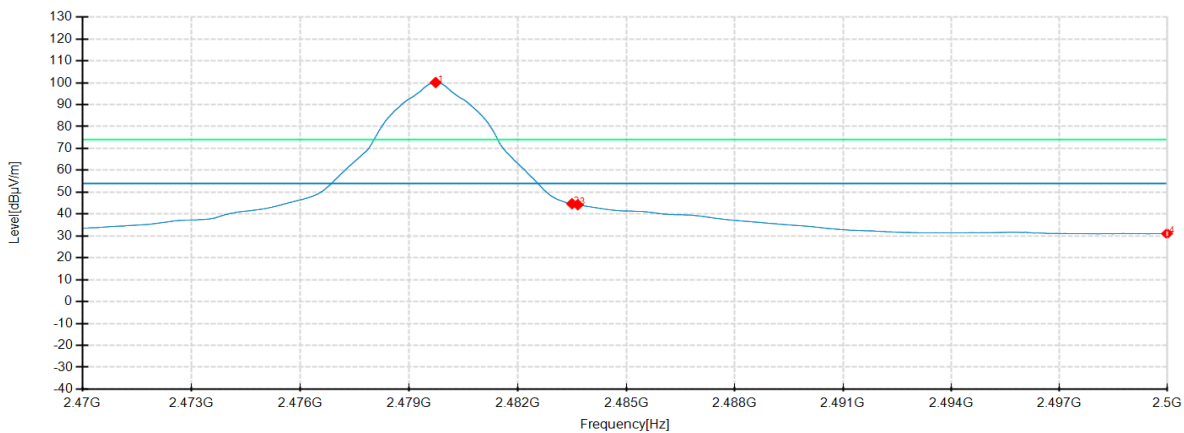
Highest Frequency
Frequency 2480MHz
Detector mode: Average

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	2479.7388	100.04	95.23	-4.81	54.00	-41.23	200	225	Horizontal	No limit
2	2483.5000	46.52	41.69	-4.83	54.00	12.31	200	87	Horizontal	/
3	2483.5225	46.47	41.63	-4.84	54.00	12.37	200	87	Horizontal	/
4	2500.0000	35.74	30.75	-4.99	54.00	23.25	100	97	Horizontal	/
1	2479.7350	105.20	100.11	-5.09	54.00	-46.11	100	339	Vertical	No limit
2	2483.5000	49.79	44.72	-5.07	54.00	9.28	100	326	Vertical	/
3	2483.6613	49.34	44.27	-5.07	54.00	9.73	100	326	Vertical	/
4	2500.0000	36.05	31.06	-4.99	54.00	22.94	100	260	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 E20240725192701-test setup photo-FCC+IC.

APPENDIX B. PHOTOGRAPH OF THE EUT

Please refer to the attached document E20240725192701-EUT photo.

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