

# Test Report

Verified code: 917139

Report No.: E20240724756701-1

Customer: Shenzhen H&T Intelligent Product Co., Ltd.  
Address: 1004, 10/F, Building D, Shenzhen Academy of Aerospace Technology, No. 6  
Technology South 10th Rd., Hi-Tech Park, South Zone, Nanshan, Shenzhen City,  
Guangdong Province, P. R. China  
Sample Name: Presence Sensor S1  
Sample Model: PS-SP1  
Receive Sample Date: Jul.25,2024  
Test Date: Aug.01,2024 ~ Oct.23,2024  
Reference Document: 47 CFR, FCC Part 15 Subpart C  
RADIO FREQUENCY DEVICES:Subpart C—Intentional Radiators  
Test Result: Pass

Prepared by: Wen Wenwen      Reviewed by: Wu Haoting      Approved by: Xiao Liang  
Wen Wenwen      Wu Haoting      Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-11-05

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**REPORT ISSUED HISTORY**

Report Version	Report No.	Description	Compile Date
1.0	E20240724756701-1	Original Issue	2024-10-25

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## 1. TEST RESULT SUMMARY

<b>Technical Requirements</b>		
47 CFR, FCC Part 15 Subpart C 15.247 ANSI C63.10-2020 KDB 558074 D01 15.247 measurement guidance v05r02		
<b>Limit / Severity</b>	<b>Item</b>	<b>Result</b>
§15.203	Antenna Requirement	Pass
§15.207(a)	Conducted Emission	Pass
§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: The antenna is Internal FPC antenna. The max gain of antenna is 3.24dBi, which accordance 15.203 is considered sufficient to comply with the provisions of this section.

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## 2. GENERAL DESCRIPTION OF EUT

### 2.1 APPLICANT

Name: Shenzhen H&T Intelligent Product Co., Ltd.  
Address: 1004,10/F, Building D, Shenzhen Academy of Aerospace Technology, No. 6  
Technology South 10th Rd., Hi-Tech Park, South Zone, Nanshan, Shenzhen City,  
Guangdong Province, P. R. China

### 2.2 MANUFACTURER

Name: Shenzhen H&T Intelligent Product Co., Ltd.  
Address: 1004,10/F, Building D, Shenzhen Academy of Aerospace Technology, No. 6  
Technology South 10th Rd., Hi-Tech Park, South Zone, Nanshan, Shenzhen City,  
Guangdong Province, P. R. China

### 2.3 FACTORY

Name: Shenzhen H&T Intelligent Product Co., Ltd.  
Address: 1004,10/F, Building D, Shenzhen Academy of Aerospace Technology, No. 6  
Technology South 10th Rd., Hi-Tech Park, South Zone, Nanshan, Shenzhen City,  
Guangdong Province, P. R. China

### 2.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Product Name: Presence Sensor S1  
Product Model: PS-SP1  
Trade Name: /  
Power Supply: DC 5V by USB port  
FCC ID: 2BHYS888888888  
Frequency Band: 2402MHz-2480MHz  
Maximum output Power: 2.08dBm  
Modulation type: GFSK for 1Mbps  
Channel space: 2MHz  
Antenna Type: Internal FPC antenna  
Antenna Gain: 3.24dBi (Max.)  
Temperature Range: -10 °C ~ +40 °C  
Hardware Version: V01  
Software Version: 0.0.3.2  
Sample No: E20240724756701-0001, E20240724756701-0002

## Note:

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.

## 2.5 CHANNELLIST

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

\* is the test frequency

## 2.6 TEST OPERATION MODE

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

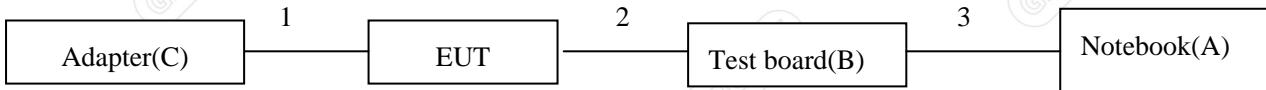
## 2.7 LOCAL SUPPORTIVE

No.	Name of Equipment	Manufacturer	Model	Serial Number
A	Notebook	DELL	Latitude3400	8RZFJW2
B	Test board	/	/	/
C	Adapter	Hua wei	HW-050450C01 CA36YTJBR03003	/

No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	USB cable	1	Yes	0	1.0m
2	Serial cable	1	No	0	0.5m
3	USB cable	1	No	0	1.0m

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

## 2.8 CONFIGURATION OF SYSTEM UNDER TEST



### Test software:

Software version	Test level
ESP32	2402MHz: 4
	2440MHz: 4
	2480MHz: 4

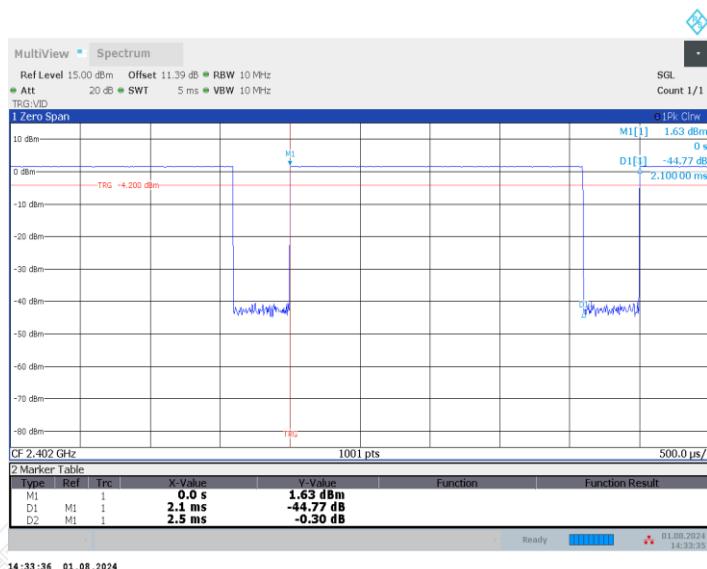
## 2.9 DUTY CYCLE

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

Voltage: DC 5V  
Date: 2024-08-01

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	DC [%]	T [s]
BLE_1M	Ant1	2402	2.10	2.50	84.00	0.0021

### BLE\_1M \_2402MHz



### 3. LABORATORY AND ACCREDITATIONS

#### 3.1 LABORATORY

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

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

P.C.: 518110

Tel : 0755-61180008

Fax: 0755-61180008

#### 3.2 ACCREDITATIONS

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

**USA** A2LA(Certificate #2861.01)

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

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

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

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

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

Note:

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

## 5. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
<b>Radiated Spurious Emission &amp; Restricted bands of operation</b>				
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	2025-09-07
Test Receiver	R&S	ESR26	101758	2025-09-10
Spectrum Analyzer	R&S	FSW43	102072	2025-07-19
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		
<b>6dB Bandwidth &amp; Conducted band edges and Spurious Emission &amp; Power Spectral Density</b>				
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		
<b>Maximum peak output power</b>				
Pulse power sensor	Anristu	MA2411B	1126150	2025-01-11
Power meter	Anristu	ML2495A	1204003	2025-01-11
<b>Conducted Emissions</b>				
EZ-EMC	EZ	CCS-3A1-CE	/	/
EMI Receiver	R&S	ESCI	100783	2025-07-19
LISN(EUT)	R&S	ENV216	101543	2025-07-10

Note: The calibration cycle of the above instruments is 12 months.

## 6. CONDUCTED EMISSION MEASUREMENT

### 6.1 LIMITS

Frequency range	Limits (dB $\mu$ V)	
	Quasi-peak	Average
150kHz ~ 0.5MHz	66~56	56~46
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50

NOTE: (1) The lower limit shall apply at the transition frequencies.

(2) The limit decreases in line with the logarithm of the frequency in the range of 150 kHz to 0.5MHz.

### 6.2 TEST PROCEDURES

#### Procedure of Preliminary Test

For measurement of the disturbance voltage the equipment under test (EUT) is connected to the power supply mains and any other extended network via one or more artificial network(s). An EUT, whether intended to be grounded or not, and which is to be used on a table is configured as follows:

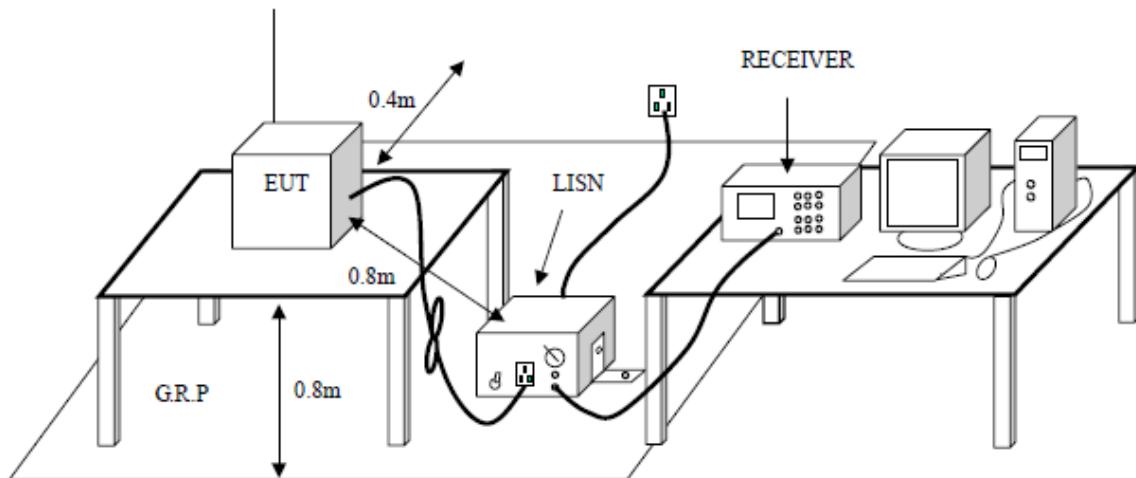
- Either the bottom or the rear of the EUT shall be at a controlled distance of 40 cm from a reference ground plane. This ground plane is normally the wall or floor of a shielded room. It may also be a grounded metal plane of at least 2 m by 2 m. This is physically accomplished as follows:
  - 1) place the EUT on a table of non-conducting material which is at least 80 cm high. Place the EUT so that it is 40 cm from the wall of the shielded room, or
  - 2) place the EUT on a table of non-conducting material which is 40 cm high so that the bottom of the EUT is 40 cm above the ground plane;
- All other conductive surfaces of the EUT shall be at least 80 cm from the reference ground plane;
- The EUT are placed on the floor that one side of the housings is 40 cm from the vertical reference ground plane and other metallic parts;
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between the ground plane and the table.
- I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.
- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

The test mode(s) described in Item 2.6 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.6 producing the highest emission level. The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

#### Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

### 6.3 TEST SETUP



### 6.4 DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

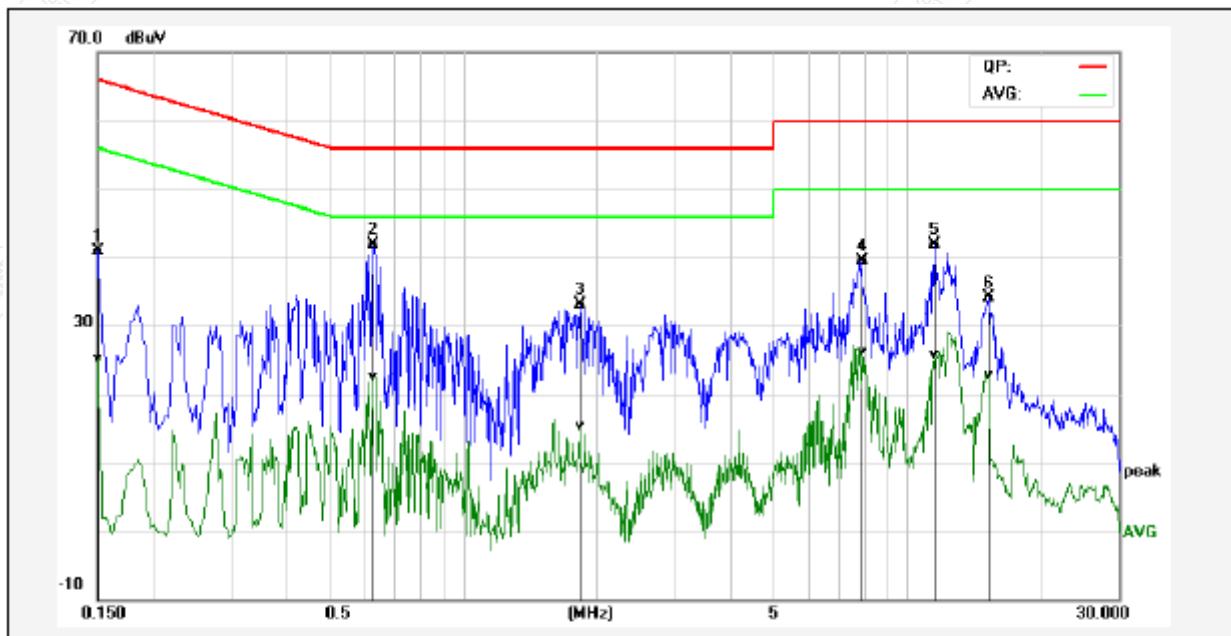
Factor = Insertion loss of LISN + Cable Loss  
 Result = Quasi-peak Reading/ Average Reading + Factor  
 Limit = Limit stated in standard  
 Margin = Result (dBuV) – Limit (dBuV)

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## 6.5 TEST RESULTS

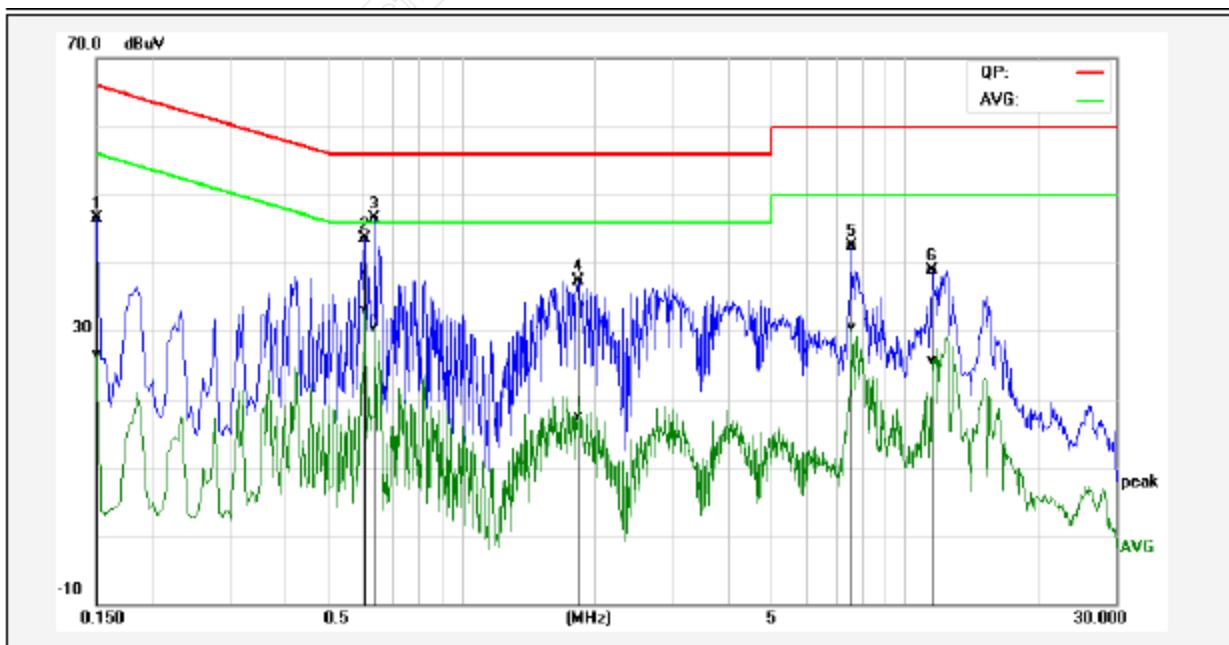
All models were pretested and only the worst modes and channels were recorded in this report. (BLE 2440MHz).

<b>Environmental Conditions</b>	24.6 °C/60% RH	<b>Test Voltage</b>	AC 120V/60Hz
<b>Tested By</b>	Wen wenwen	<b>Line</b>	L
<b>Tested Date</b>	2024-09-27	/	/



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1500	40.92	25.03	0.00	40.92	25.03	65.99	56.00	-25.07	-30.97	Pass
2*	0.6300	41.83	22.59	0.00	41.83	22.59	56.00	46.00	-14.17	-23.41	Pass
3	1.8300	33.08	15.31	0.00	33.08	15.31	56.00	46.00	-22.92	-30.69	Pass
4	7.9060	39.49	26.05	0.00	39.49	26.05	60.00	50.00	-20.51	-23.95	Pass
5	11.5420	41.84	25.79	0.00	41.84	25.79	60.00	50.00	-18.16	-24.21	Pass
6	15.2580	34.02	22.61	0.00	34.02	22.61	60.00	50.00	-25.98	-27.39	Pass

<b>Environmental Conditions</b>	24.6°C/60%RH	<b>Test Voltage</b>	AC 120V/60Hz
<b>Tested By</b>	Wen wenwen	<b>Line</b>	N
<b>Tested Date</b>	2024-09-27	/	/



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1500	46.48	26.55	0.00	46.48	26.55	65.99	56.00	-19.51	-29.45	Pass
2	0.6060	43.56	33.05	0.00	43.56	33.05	56.00	46.00	-12.44	-12.95	Pass
3*	0.6380	46.53	30.60	0.00	46.53	30.60	56.00	46.00	-9.47	-15.40	Pass
4	1.8460	37.40	17.54	0.00	37.40	17.54	56.00	46.00	-18.60	-28.46	Pass
5	7.5820	42.43	30.44	0.00	42.43	30.44	60.00	50.00	-17.57	-19.56	Pass
6	11.5380	38.98	25.78	0.00	38.98	25.78	60.00	50.00	-21.02	-24.22	Pass

## 7. RADIATED SPURIOUS EMISSIONS

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

#### 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 $\mu$ V/m).  
The Avg Limit=54+20\*log(3/1)=63.54 (dB $\mu$ V/m).

### 7.2 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 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 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 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 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:**

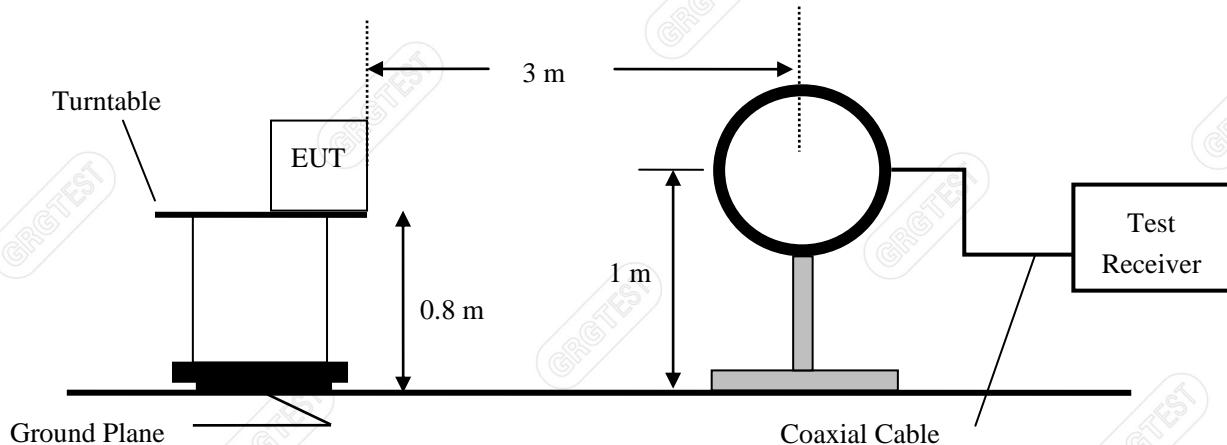
- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter. This procedure is repeated 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:**

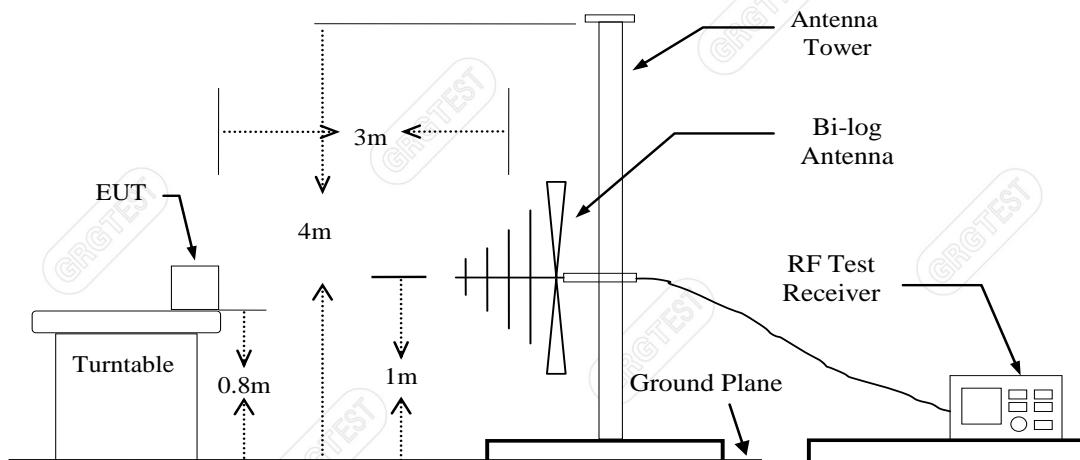
- (1).The frequency from 9kHz to 150kHz, Set RBW=300Hz(for Peak&AVG), VBW=300Hz(for Peak&AVG). The frequency from 150kHz to 30MHz, Set RBW=9kHz, VBW=9kHz, (for QP Detector).
- (2).The frequency from 30MHz to 1GHz, Set RBW=120kHz, VBW=300kHz, (for QP Detector).
- (3).The frequency above 1GHz, for Peak 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 2.9.

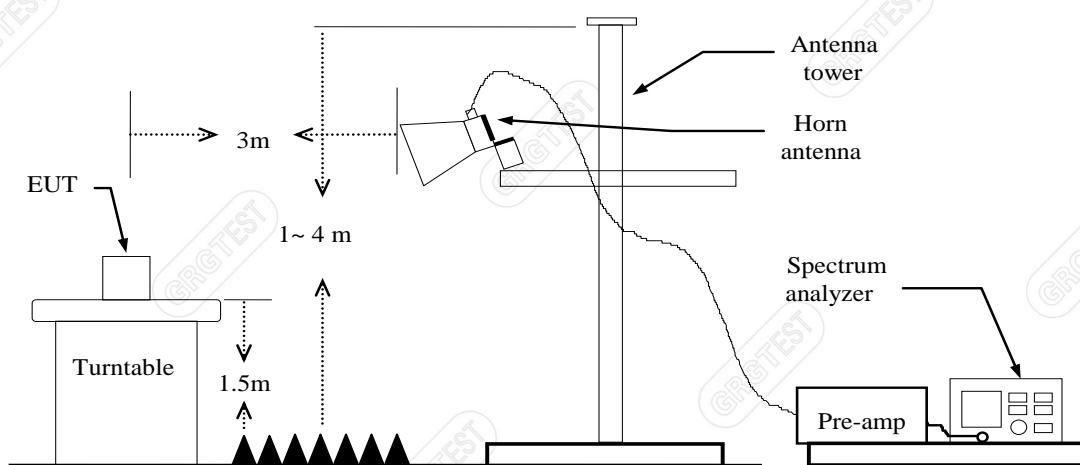
### 7.3 TEST SETUP



**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**

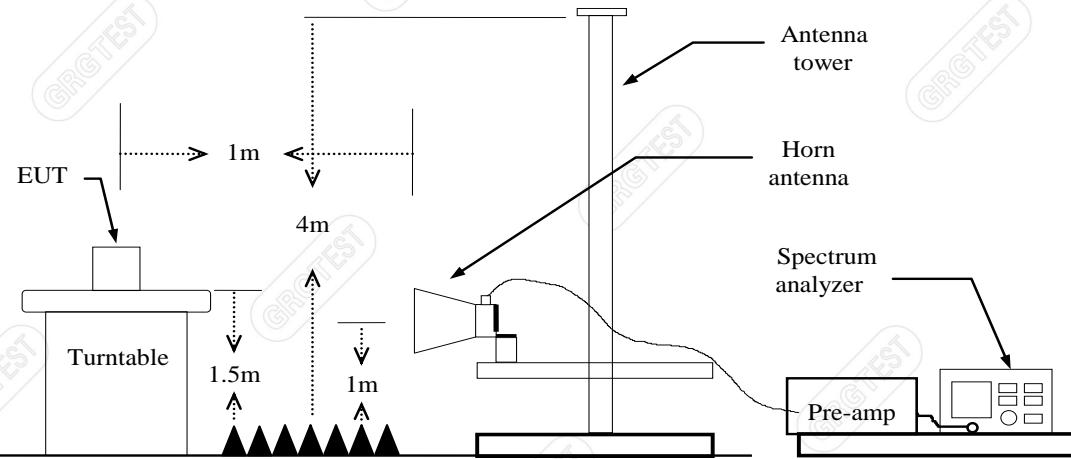


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

#### 7.4 DATA SAMPLE

##### 30MHz to 1GHz

NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/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 (dB $\mu$ V) = Uncorrected Analyzer / Receiver reading

Factor (dB) = Antenna factor + Cable loss – Amplifier gain

Level (dB $\mu$ V/m) = Reading (dB $\mu$ V) + Factor (dB)

Limit (dB $\mu$ V/m) = Limit stated in standard

Margin (dB) = Limit (dB $\mu$ V/m) - Level (dB $\mu$ V/m)

QP = Quasi-peak Reading

##### 1GHz-18GHz

No.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/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 [dB $\mu$ V/m]	Level for 1m [dB $\mu$ V/m]	Level for 3m [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/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

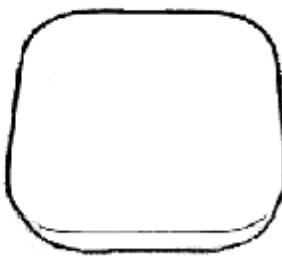
Reading (dB $\mu$ V/m) = Uncorrected Analyzer / Receiver reading

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

## 7.5 TEST RESULTS

The test are under the EUT typical placement for ceiling mounted the EUT can rotate 90 °, 180 °, 270 °etc. lying flat, standing on the table, etc. Only the worst case EUT lying flat results recorded in the report.

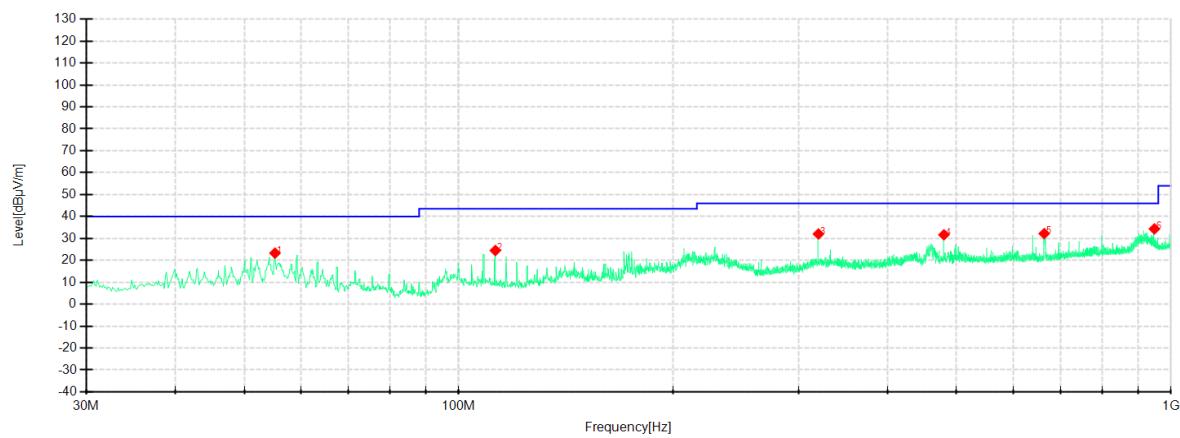


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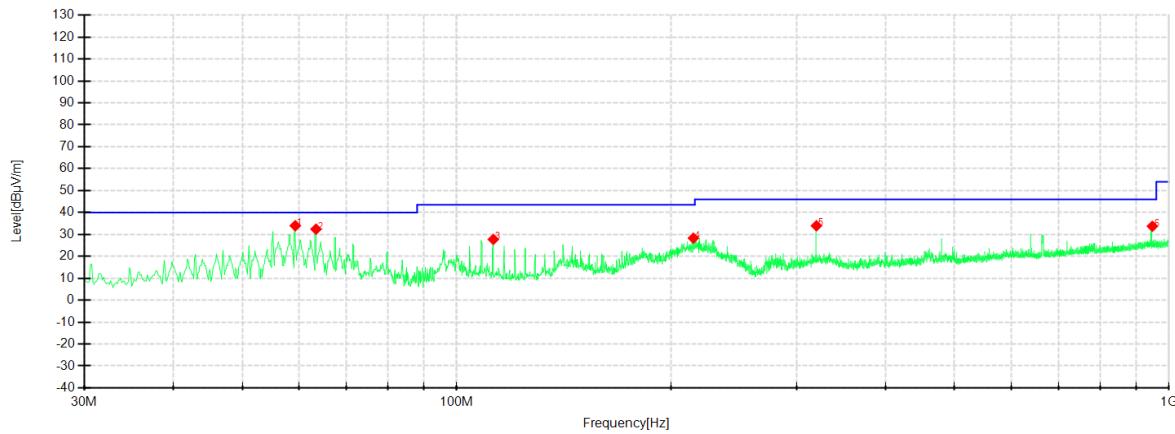
**Below 1GHz**

Note: Pre-scan all modes , only the worst case(TX\_BLE\_1M\_2402MHz) is recorded in this report.

Power supply:	DC 5V	Environmental Conditions:	24.3 °C/64%RH/101.0kPa
Test Engineer:	Qin tingting	Test Date:	2024-08-24



NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity	Verdict
1	55.2232	52.48	23.29	-29.19	40.00	17.21	QP	100	240	Horizontal	PASS
2	112.5816	54.96	24.50	-30.46	43.50	19.50	QP	200	325	Horizontal	PASS
3	319.9450	58.89	32.03	-26.86	46.00	14.47	QP	100	342	Horizontal	PASS
4	480.0150	53.45	31.66	-21.79	46.00	14.84	QP	100	298	Horizontal	PASS
5	663.7317	50.76	32.21	-18.55	46.00	14.29	QP	100	314	Horizontal	PASS
6	947.7347	49.06	34.34	-14.72	46.00	12.16	QP	100	94	Horizontal	PASS



NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity	Verdict
1	59.3462	63.43	33.96	-29.47	40.00	6.04	QP	200	138	Vertical	PASS
2	63.4692	62.44	32.40	-30.04	40.00	7.60	QP	100	280	Vertical	PASS
3	112.5816	58.21	27.75	-30.46	43.50	15.75	QP	100	340	Vertical	PASS
4	214.9294	59.52	28.30	-31.22	43.50	15.20	QP	100	294	Vertical	PASS
5	319.9450	60.81	33.95	-26.86	46.00	12.05	QP	100	0	Vertical	PASS
6	947.6135	48.45	33.73	-14.72	46.00	12.27	QP	100	325	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: 25.1 °C/52%RH/101.0kPa

Tested By: Qin tingting

/ Voltage: DC 5V

Date: 2024-10-23

Suspected Data List									
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1718.0000	65.31	58.09	-7.22	74.00	15.91	200	1	Horizontal
2	1891.6000	55.04	51.23	-3.81	74.00	22.77	200	301	Horizontal
3	2660.0000	51.36	49.23	-2.13	74.00	24.77	100	105	Horizontal
4	3202.5000	62.88	49.71	-13.17	74.00	24.29	100	322	Horizontal
5	7200.0000	53.59	54.69	1.10	74.00	19.31	200	297	Horizontal
6	15000.0000	39.93	51.77	11.84	74.00	22.23	200	21	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dB $\mu$ V/m]	AV Value [dB $\mu$ V/m]	AV Limit [dB $\mu$ V/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1725.2600	-7.22	46.66	39.44	54.00	14.56	200	43.5	Horizontal
2	1890.9160	-3.81	42.43	38.62	54.00	15.38	200	279.1	Horizontal
3	2662.1560	-2.13	39.13	37.00	54.00	17.00	183	104.9	Horizontal
4	3202.6855	-13.17	59.90	46.73	54.00	7.27	100	175.8	Horizontal
5	7199.7900	1.10	46.64	47.74	54.00	6.26	200	274	Horizontal
6	14999.5700	11.84	35.68	47.52	54.00	6.48	200	336.7	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1329.2000	59.53	51.44	-8.09	74.00	22.56	200	23	Vertical
2	1665.4000	58.75	50.74	-8.01	74.00	23.26	200	50	Vertical
3	1892.4000	53.74	49.88	-3.86	74.00	24.12	200	194	Vertical
4	3202.5000	65.21	52.06	-13.15	74.00	21.94	100	315	Vertical
5	7200.0000	56.52	57.72	1.20	74.00	16.28	200	348	Vertical
6	15000.0000	42.14	54.78	12.64	74.00	19.22	200	34	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dB $\mu$ V/m]	AV Value [dB $\mu$ V/m]	AV Limit [dB $\mu$ V/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1327.7380	-8.09	47.68	39.59	54.00	14.41	127	21	Vertical
2	1664.7970	-8.01	46.05	38.04	54.00	15.96	200	28.6	Vertical
3	1897.7680	-3.86	41.50	37.64	54.00	16.36	181	171.3	Vertical
4	3202.6855	-13.15	64.67	51.52	54.00	2.48	102	308.2	Vertical
5	7199.7900	1.20	50.48	51.68	54.00	2.32	200	339.4	Vertical
6	14999.5700	12.64	32.13	44.77	54.00	9.23	200	133.1	Vertical

Mode: TX/ BLE\_1M

Middle Frequency (2440MHz)

Environment: 25.1 °C/52%RH/101.0kPa

Tested By: Qin tingting

Voltage: DC 5V

Date: 2024-10-23

Suspected Data List									
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1939.2000	47.77	43.95	-3.82	74.00	30.05	100	177	Horizontal
2	2502.2000	47.52	47.04	-0.48	74.00	26.96	200	148	Horizontal
3	3252.0000	58.82	46.28	-12.54	74.00	23.72	100	210	Horizontal
4	6207.0000	47.76	44.73	-3.03	74.00	29.27	200	24	Horizontal
5	7200.0000	52.80	53.90	1.10	74.00	20.10	200	117	Horizontal
6	17652.0000	39.33	46.88	7.55	74.00	27.12	200	104	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dB $\mu$ V/m]	AV Value [dB $\mu$ V/m]	AV Limit [dB $\mu$ V/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	7199.7900	1.10	47.97	49.07	54.00	4.93	200	162	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1914.4000	47.78	43.98	-3.80	74.00	30.02	100	257	Vertical
2	2500.4000	47.84	47.45	-0.39	74.00	26.55	200	322	Vertical
3	3252.0000	59.05	46.92	-12.13	74.00	24.08	100	143	Vertical
4	4933.5000	49.27	42.77	-6.50	74.00	31.23	200	249	Vertical
5	7200.0000	56.39	57.59	1.20	74.00	16.41	100	53	Vertical
6	13572.0000	33.77	46.61	12.84	74.00	27.39	100	143	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dB $\mu$ V/m]	AV Value [dB $\mu$ V/m]	AV Limit [dB $\mu$ V/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	7199.7900	1.20	51.22	52.42	54.00	1.58	100	31.1	Vertical

Mode: TX/ BLE\_1M

Highest Frequency (2480MHz)

Environment: 25.1°C/52%RH/101.0kPa

Tested By: Qin tingting

Voltage: DC 5V

Date: 2024-10-23

Suspected Data List									
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1724.6000	64.75	57.58	-7.17	74.00	16.42	200	12	Horizontal
2	2523.4000	50.85	49.32	-1.53	74.00	24.68	100	102	Horizontal
3	2658.0000	51.41	49.27	-2.14	74.00	24.73	100	62	Horizontal
4	3306.0000	59.94	46.46	-13.48	74.00	27.54	100	22	Horizontal
5	7200.0000	53.59	54.69	1.10	74.00	19.31	200	62	Horizontal
6	15000.0000	39.84	51.68	11.84	74.00	22.32	200	101	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dB $\mu$ V/m]	AV Value [dB $\mu$ V/m]	AV Limit [dB $\mu$ V/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1724.6000	-7.17	53.12	45.95	54.00	8.05	200	12	Horizontal
2	2523.4000	-1.53	46.52	44.99	54.00	9.01	100	102	Horizontal
3	2658.0000	-2.14	43.85	41.71	54.00	12.29	100	62	Horizontal
4	3306.0000	-13.48	47.34	33.86	54.00	20.14	100	22	Horizontal
5	7199.7900	1.10	48.01	49.11	54.00	4.89	200	85	Horizontal
6	15000.0000	11.84	35.62	47.46	54.00	6.54	200	101	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1727.8000	65.80	58.72	-7.08	74.00	15.28	100	260	Vertical
2	2519.8000	53.23	52.04	-1.19	74.00	21.96	100	74	Vertical
3	2998.6000	54.84	54.49	-0.35	74.00	19.51	200	117	Vertical
4	3306.0000	60.61	47.76	-12.85	74.00	26.24	100	74	Vertical
5	7200.0000	56.49	57.69	1.20	74.00	16.31	200	350	Vertical
6	15000.0000	42.13	54.77	12.64	74.00	19.23	200	36	Vertical

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dB $\mu$ V/m]	AV Value [dB $\mu$ V/m]	AV Limit [dB $\mu$ V/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1727.8000	-7.08	52.67	45.59	54.00	8.41	100	260	Vertical
2	2519.8000	-1.19	50.12	48.93	54.00	5.07	100	74	Vertical
3	2998.6000	-0.35	48.74	48.39	54.00	5.61	200	117	Vertical
4	3306.0000	-12.85	47.13	34.28	54.00	19.72	100	74	Vertical
5	7199.7900	1.20	50.43	51.63	54.00	2.37	200	336.5	Vertical
6	15000.0000	12.64	36.2	48.84	54.00	5.16	200	36	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.

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**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\_2440MHz) in the worst power supply is recorded in this report.

Environment: 24.2°C/60%RH/101.0kPa

Tested By: Qin tingting

Voltage: DC 5V

Date: 2024-08-27

Suspected Data List										
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level for 1m [dB $\mu$ V/m]	Level for 3m [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18648.55	48.45	32.32	22.78	-16.13	74	51.22	100	276	Horizontal
2	19752.275	47.71	31.89	22.35	-15.82	74	51.65	100	230	Horizontal
3	21113.55	47.43	32.4	22.86	-15.03	74	51.14	100	230	Horizontal
4	22657.575	47.09	32.45	22.91	-14.64	74	51.09	100	144	Horizontal
5	23921.525	47.12	33.17	23.63	-13.95	74	50.37	100	254	Horizontal
6	25789.825	46.67	32.69	23.15	-13.98	74	50.85	100	164	Horizontal

Suspected Data List										
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Level for 1m [dB $\mu$ V/m]	Level for 3m [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	19032.75	48.31	32.59	23.05	-15.72	74	50.95	100	35	Vertical
2	19794.775	48.03	32.67	23.13	-15.36	74	50.87	100	320	Vertical
3	21191.325	47.28	32.68	23.14	-14.60	74	50.86	100	300	Vertical
4	22748.1	46.71	32.9	23.36	-13.81	74	50.64	100	340	Vertical
5	23647.825	47.62	33.97	24.43	-13.65	74	49.57	100	148	Vertical
6	25975.55	47.46	34.14	24.6	-13.32	74	49.40	100	217	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)

## 8. 6dB BANDWIDTH

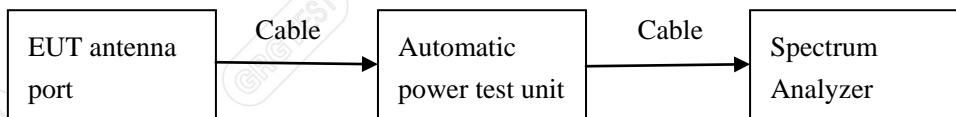
### 8.1 LIMITS

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.

### 8.2 TEST PROCEDURES

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

### 8.3 TEST SETUP



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## 8.4 TEST RESULTS

Environment: 25.3 °C/59%RH/101.0kPa

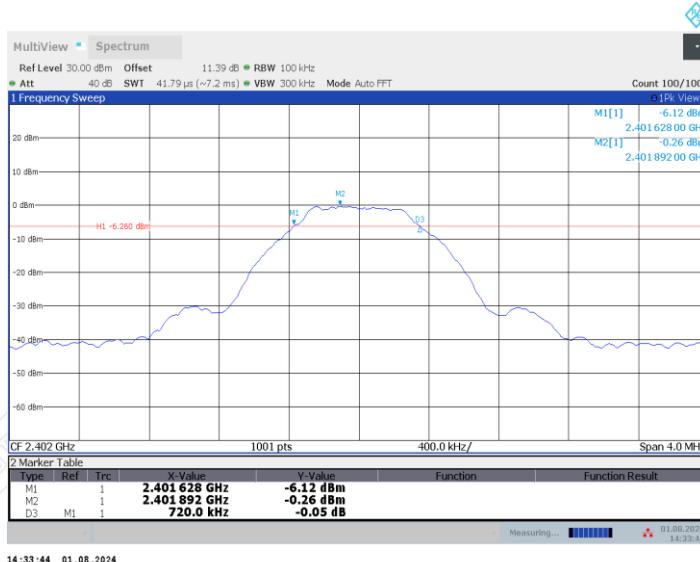
Tested By: Qin tingting

Voltage: DC 5V

Date: 2024-08-01

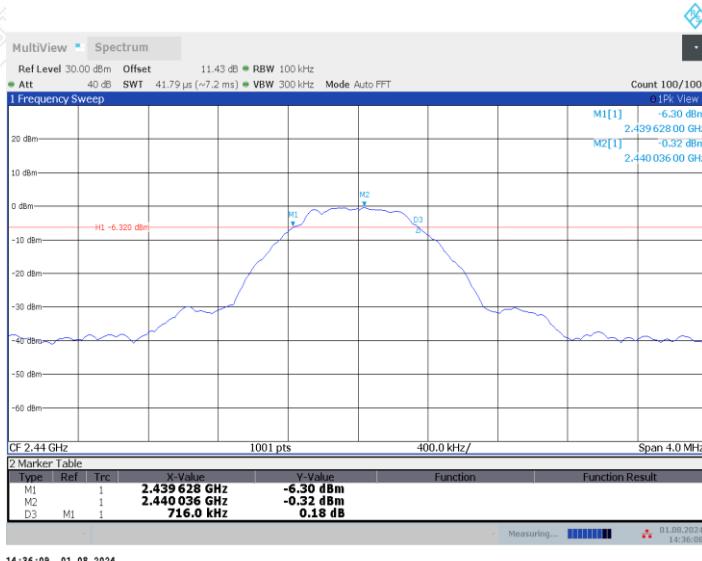
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	720.0	≥500	PASS
Middle	2440	716.0		PASS
Highest	2480	720.0		PASS

Lowest Frequency (2402MHz)

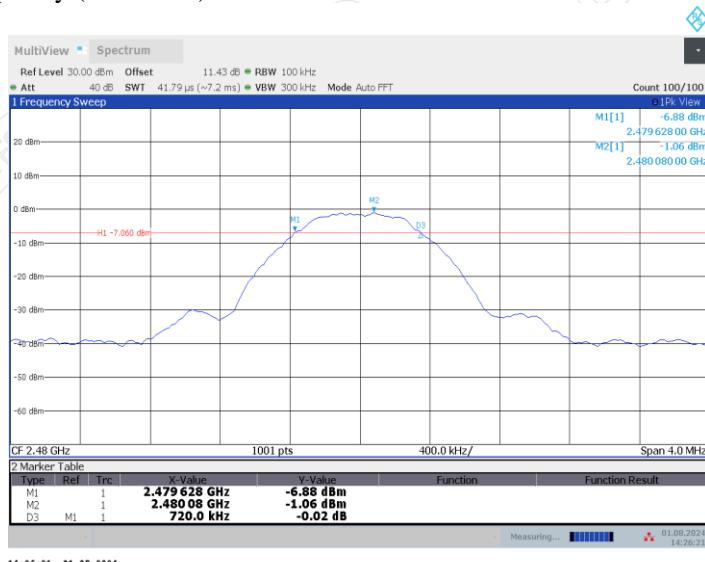


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## Middle Frequency (2440 MHz)



## Highest Frequency (2480MHz)



## 9. MAXIMUM PEAK OUTPUT POWER

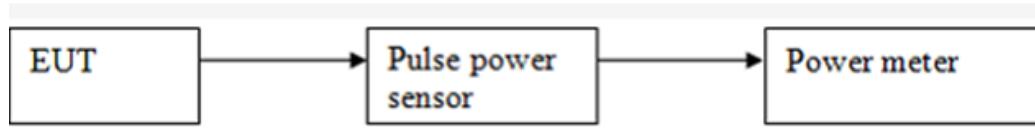
### 9.1 LIMITS

The maximum Peak output power measurement is 1W

### 9.2 TEST PROCEDURES

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

### 9.3 TEST SETUP



### 9.4 TEST RESULTS

Environment: 25.3 °C/59%RH/101.0kPa

Voltage: DC 5V

Tested By: Qin tingting

Date: 2024-08-01

Channel	Frequency (MHz)	Maximum Power (dBm)	Limit	Peak/Average	Result
Lowest	2402	1.55	1W (30dBm)	Peak	Pass
Middle	2440	2.08			Pass
Highest	2480	1.35			Pass

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## 10. POWER SPECTRAL DENSITY

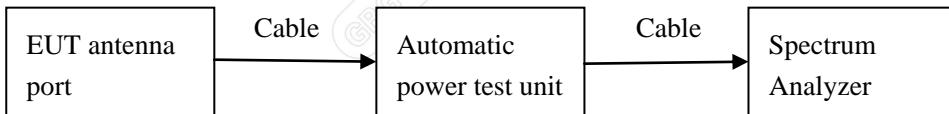
### 10.1 LIMITS

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.

### 10.2 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.

### 10.3 TEST SETUP



## 10.4 TEST RESULTS

Environment: 25.3 °C/59%RH/101.0kPa

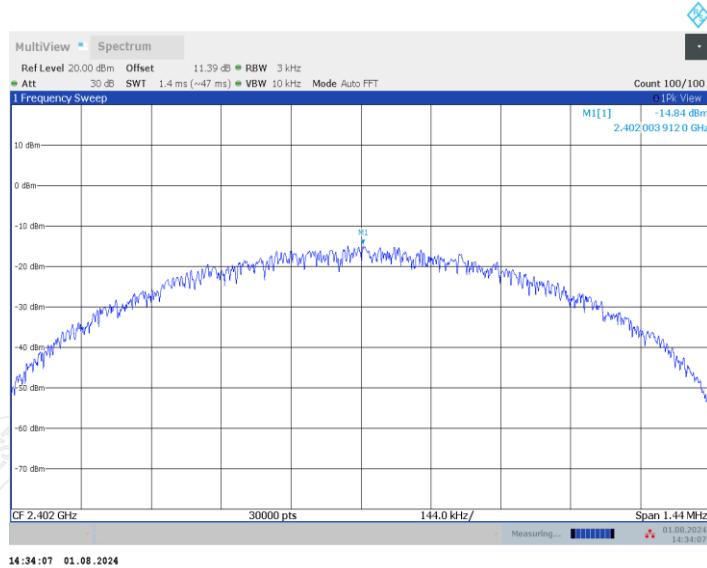
Tested By: Qin tingting

Voltage: DC 5V

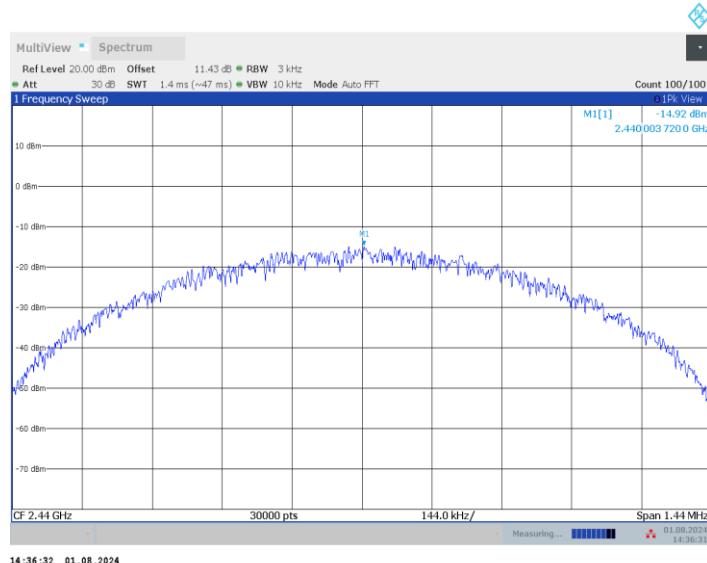
Date: 2024-08-01

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-14.84	8.00	PASS
Middle	2440	-14.92		PASS
Highest	2480	-15.67		PASS

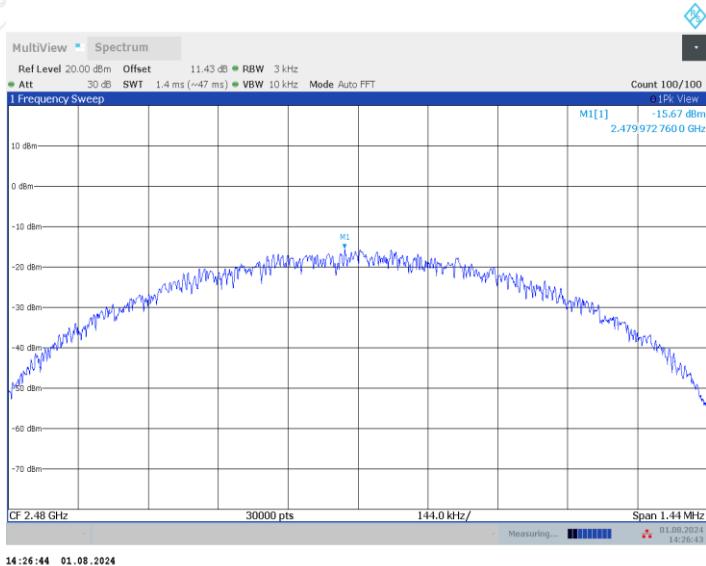
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



## Highest Frequency (2480MHz)



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## 11. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS

### 11.1 LIMITS

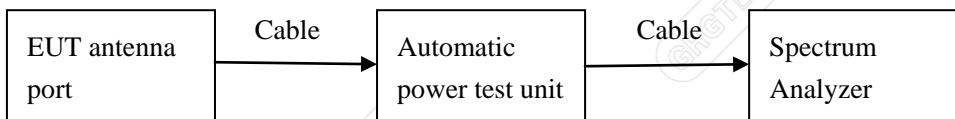
In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the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

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

### 10.3 TEST SETUP



## 10.4 TEST RESULTS

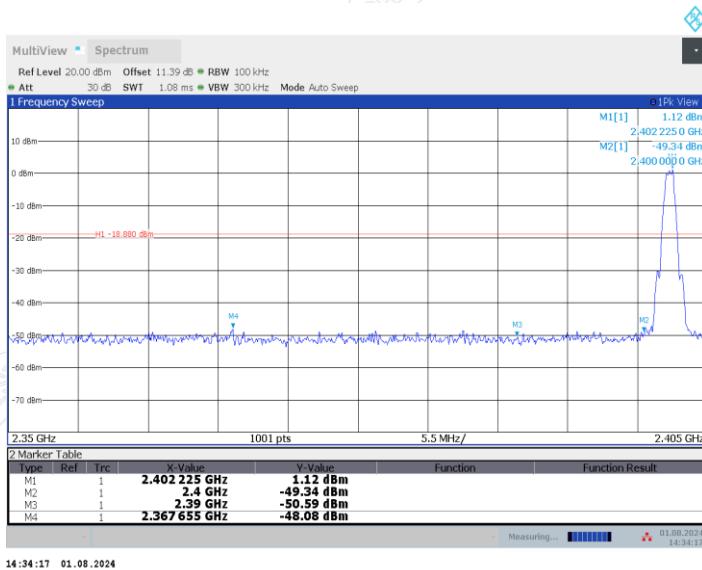
Environment: 25.3°C/59%RH/101.0kPa  
Tested By: Qin tingting

Voltage: DC 5V  
Date: 2024-08-01

### Band edge measurements

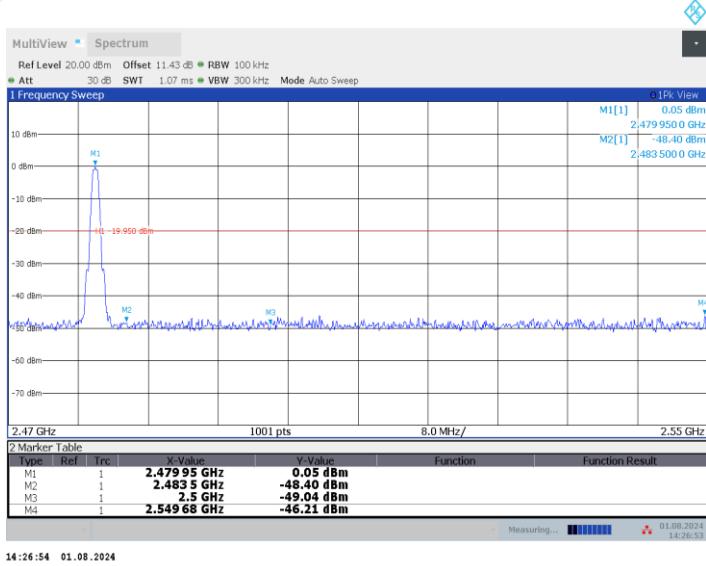
TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	1.12	-48.08	≤-18.88	PASS
		High	2480	0.05	-46.21	≤-19.95	PASS

Lowest Frequency (2402MHz)  
2.35GHz-2.405GHz



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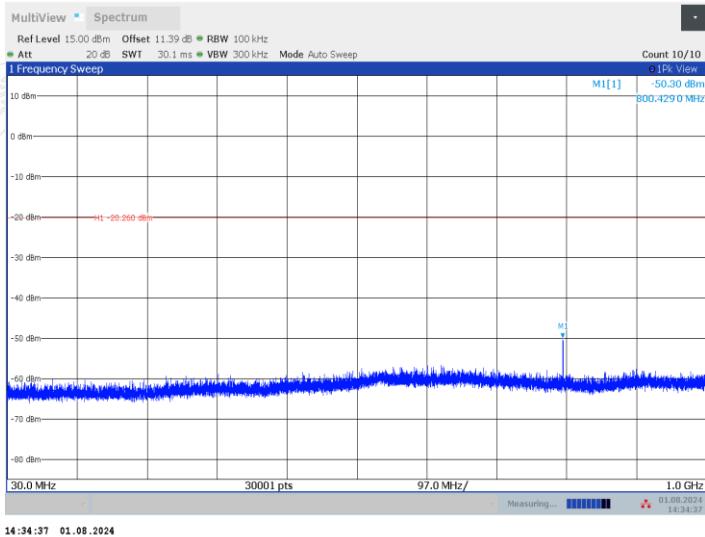
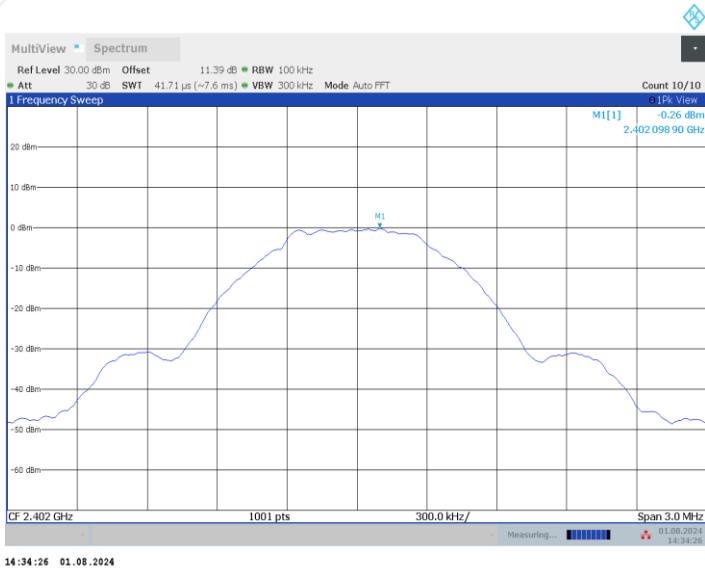
Highest Frequency (2480MHz)  
2.47GHz-2.55GHz

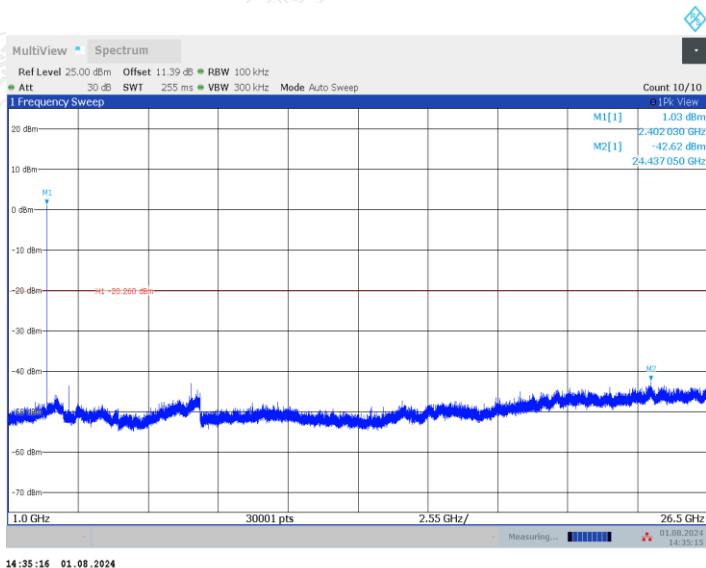


### Conducted Spurious Emission

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-0.26	-0.26	---	PASS
			30~1000	-0.26	-50.3	≤-20.26	PASS
			1000~26500	-0.26	-42.62	≤-20.26	PASS
		2440	Reference	-0.45	-0.45	---	PASS
			30~1000	-0.45	-49.83	≤-20.45	PASS
			1000~26500	-0.45	-42.41	≤-20.45	PASS
		2480	Reference	-1.21	-1.21	---	PASS
			30~1000	-1.21	-49.99	≤-21.21	PASS
			1000~26500	-1.21	-42.65	≤-21.21	PASS

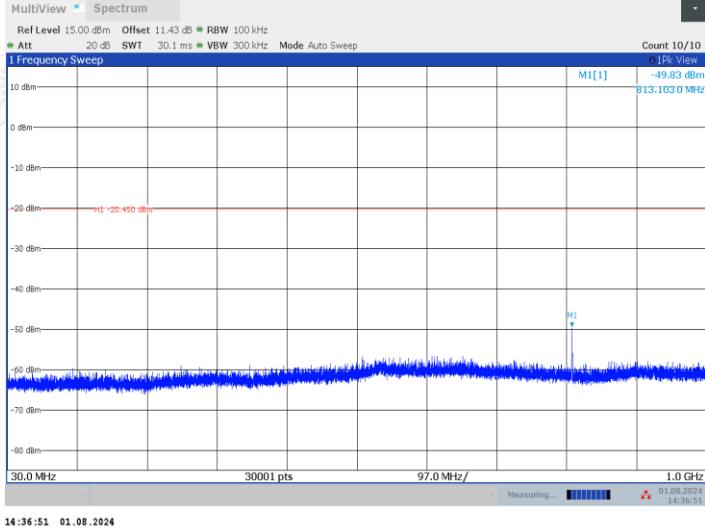
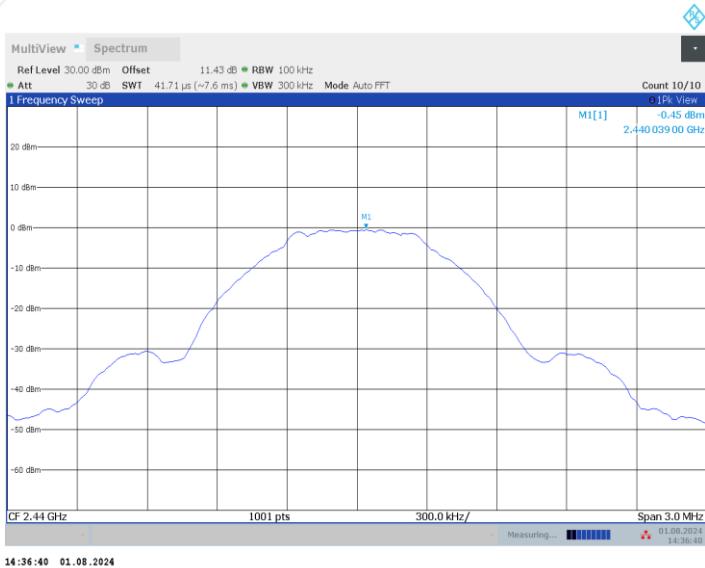
## Lowest Frequency (2402MHz)

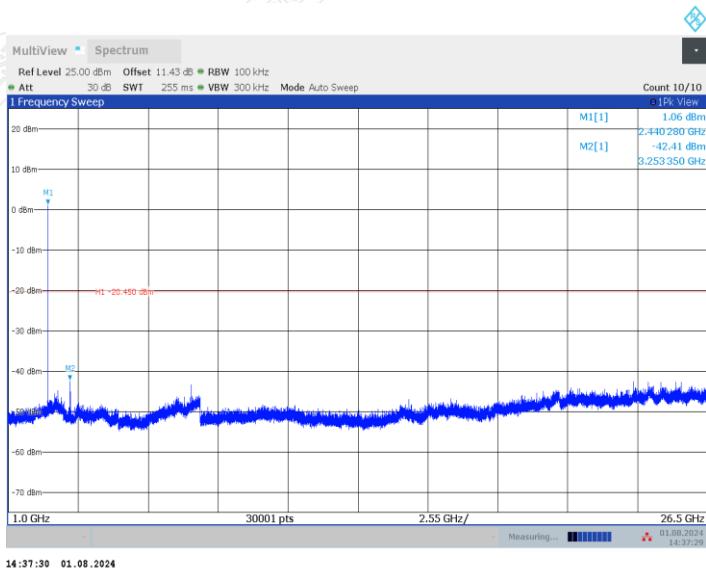




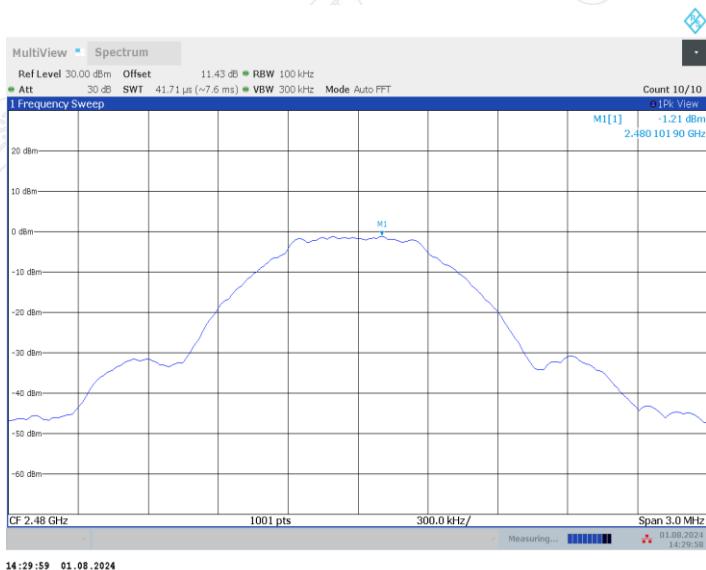
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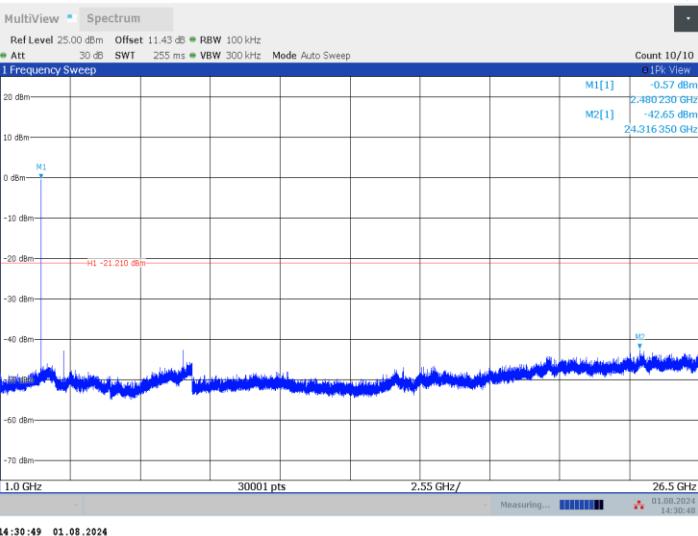
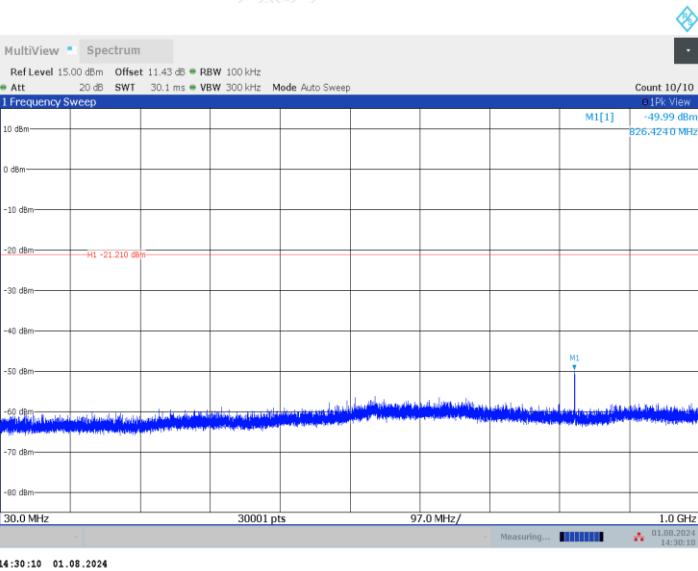
## Middle Frequency (2440MHz)





### Highest Frequency (2480MHz)





## 12. RESTRICTED BANDS OF OPERATION

### 12.1 LIMITS

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

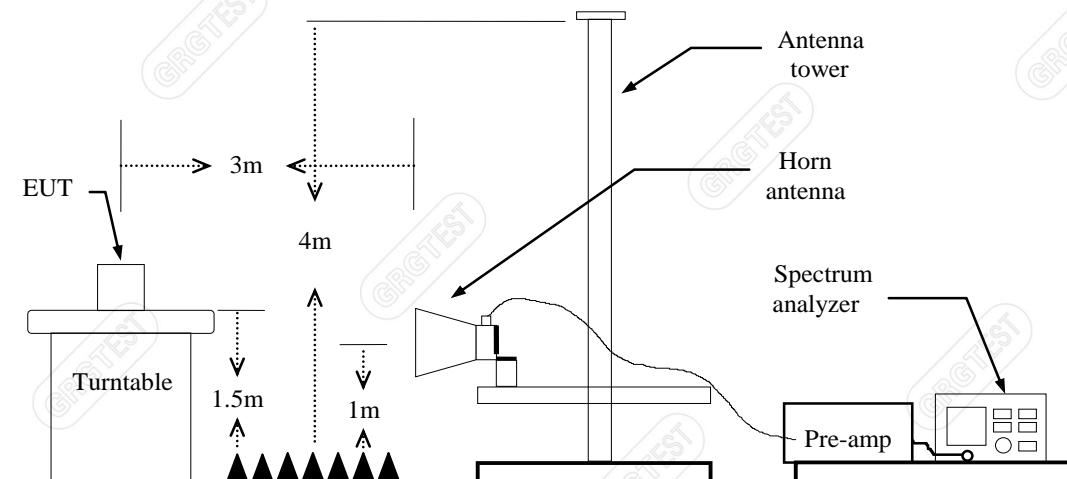
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2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

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

## 11.2 TEST PROCEDURES

- 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  $\text{VBW} \leq \text{RBW}/100$  (i.e., 10kHz) but not less than 10 Hz. If the EUT duty cycle is  $< 98\%$ , set  $\text{VBW} \geq 1/T$ , Where T is defined in section 2.9.
- Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

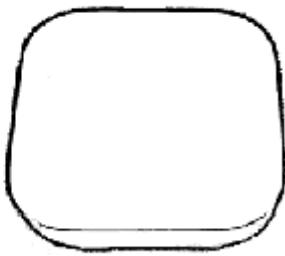
## 11.3 TEST SETUP



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## 11.4 TEST RESULTS

The test are under the EUT typical placement for ceiling mounted the EUT can rotate 90 °, 180 °, 270 ° etc. lying flat, standing on the table, etc. Only the worst case EUT lying flat results recorded in the report.



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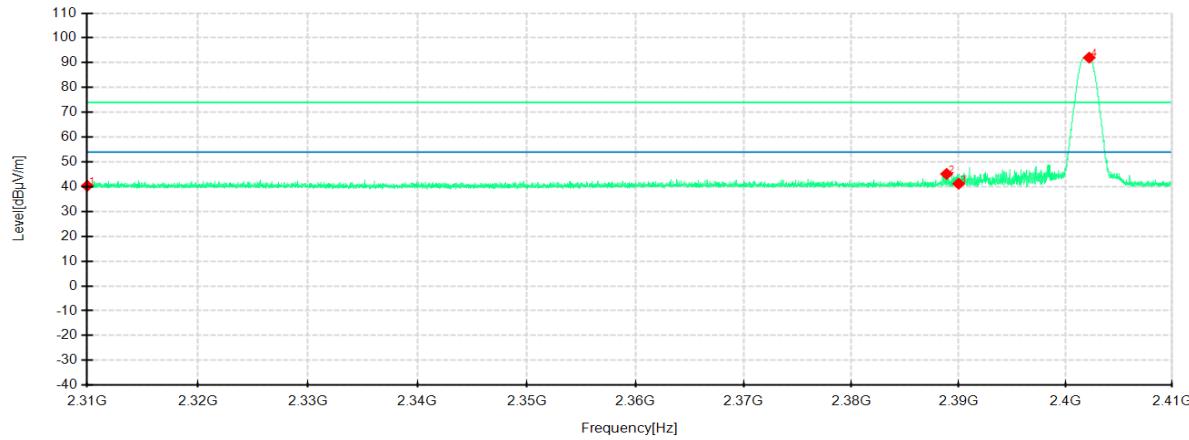
Test Voltage:	DC 5V	Test Engineer:	Qin tingting
Test Date	2024-08-02	Environmental Conditions	24.7°C/65%RH/101.0kPa

**Lowest Frequency**

Frequency 2402MHz

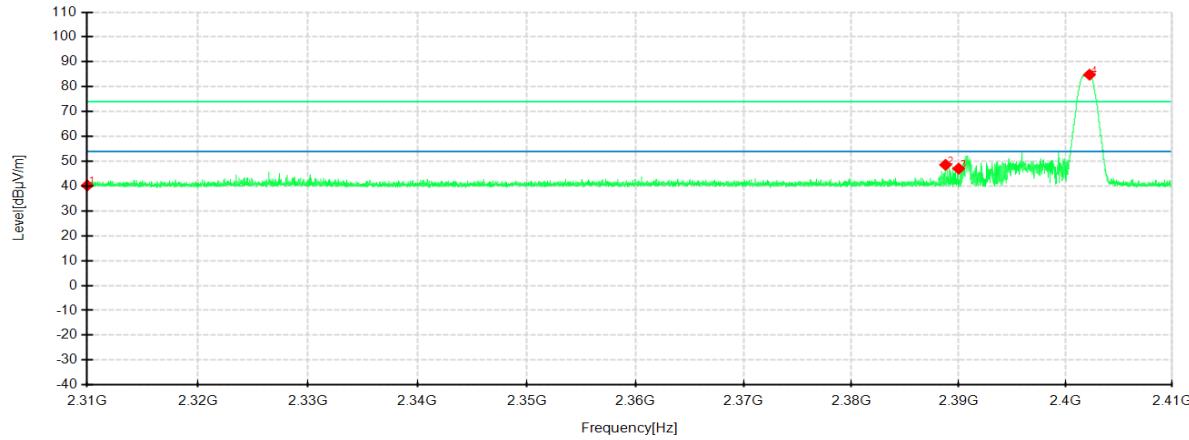
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

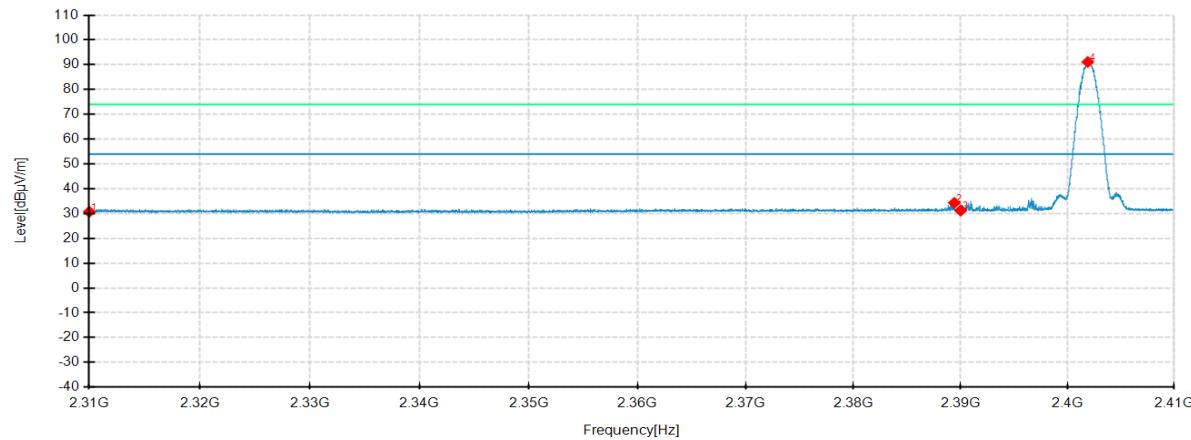
Polarity: Vertical



No.	Frequency MHz	Reading dB $\mu$ V/m	Level dB $\mu$ V/m	Factor dB	Limit dB $\mu$ V/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	45.85	40.37	-5.48	74.00	33.63	200	50	Horizontal	/
2	2388.8750	50.55	45.15	-5.40	74.00	28.85	200	289	Horizontal	/
3	2390.0000	46.61	41.22	-5.39	74.00	32.78	200	77	Horizontal	/
4	2402.2250	97.28	92.05	-5.23	74.00	-18.05	100	312	Horizontal	No limit
1	2310.0000	45.58	40.26	-5.32	74.00	33.74	200	257	Vertical	/
2	2388.7750	54.03	48.56	-5.47	74.00	25.44	100	221	Vertical	/
3	2390.0000	52.51	47.04	-5.47	74.00	26.96	200	219	Vertical	/
4	2402.2500	90.31	84.85	-5.46	74.00	-10.85	200	21	Vertical	No limit

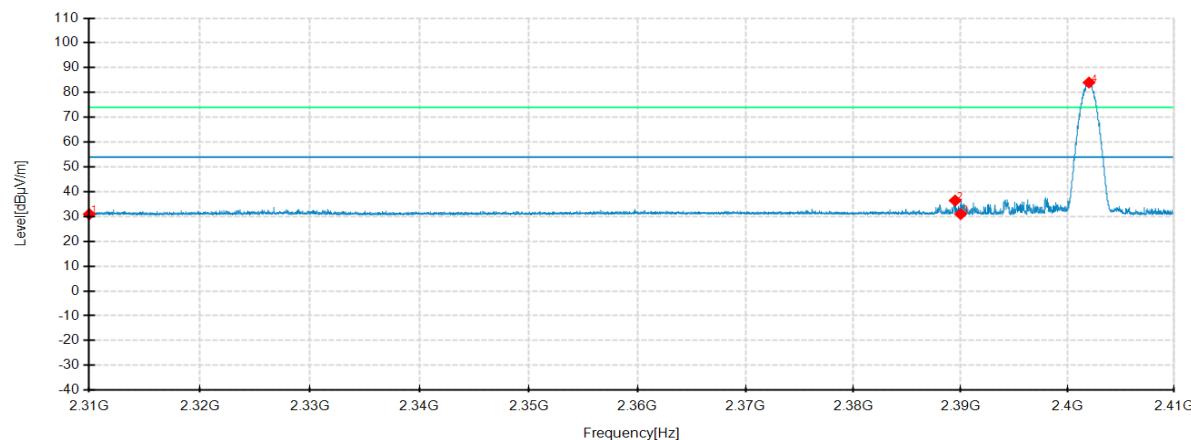
**Lowest Frequency**  
Frequency 2402MHz  
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

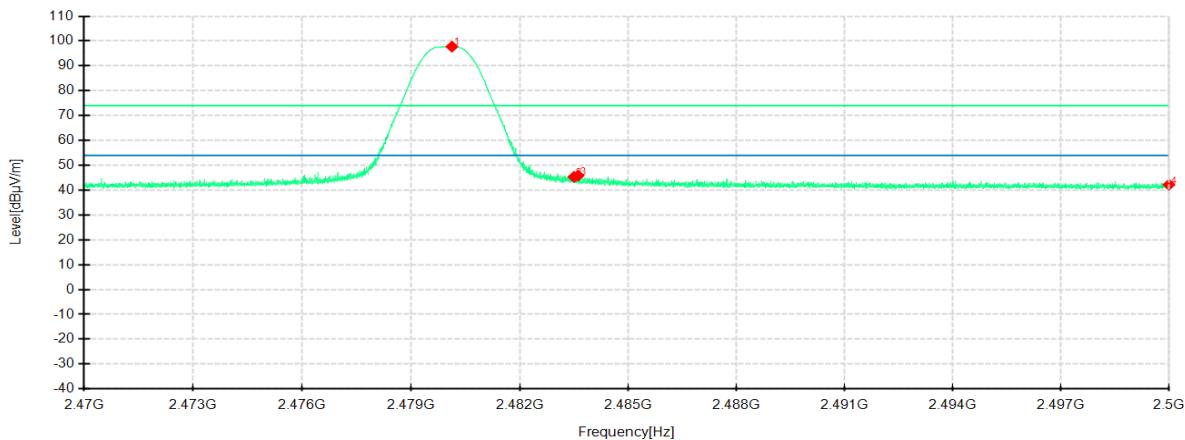
Polarity: Vertical



No.	Frequency MHz	Reading dB $\mu$ V/m	Level dB $\mu$ V/m	Factor dB	Limit dB $\mu$ V/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	36.18	30.70	-5.48	54.00	23.30	100	81	Horizontal	/
2	2389.4125	39.73	34.33	-5.40	54.00	19.67	200	307	Horizontal	/
3	2390.0000	36.59	31.20	-5.39	54.00	22.80	200	201	Horizontal	/
4	2401.9000	96.34	91.10	-5.24	54.00	-37.10	100	315	Horizontal	No limit
1	2310.0000	36.27	30.95	-5.32	54.00	23.05	100	288	Vertical	/
2	2389.4875	41.91	36.44	-5.47	54.00	17.56	100	209	Vertical	/
3	2390.0000	36.45	30.98	-5.47	54.00	23.02	200	194	Vertical	/
4	2402.0125	89.47	84.01	-5.46	54.00	-30.01	200	20	Vertical	No limit

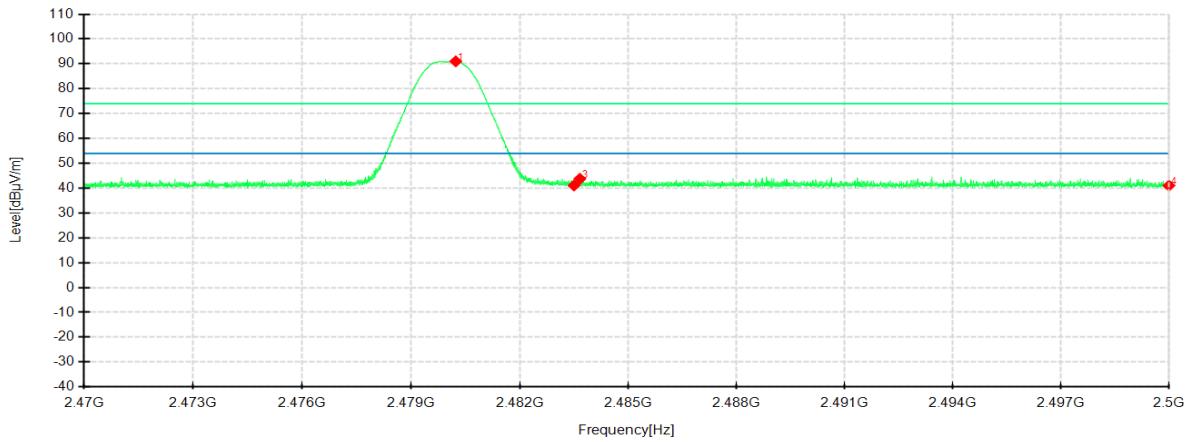
**Highest Frequency**  
Frequency 2480MHz  
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



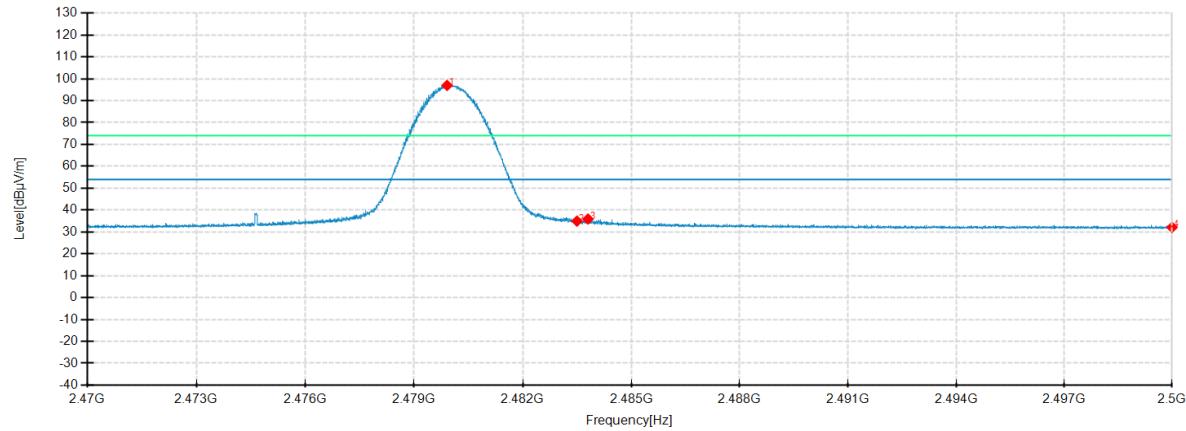
No.	Frequency MHz	Reading dB $\mu$ V/m	Level dB $\mu$ V/m	Factor dB	Limit dB $\mu$ V/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2480.1288	102.56	97.75	-4.81	74.00	-23.75	100	320	Horizontal	No limit
2	2483.5000	50.16	45.33	-4.83	74.00	28.67	100	48	Horizontal	/
3	2483.6125	50.71	45.87	-4.84	74.00	28.13	100	203	Horizontal	/
4	2500.0000	47.17	42.18	-4.99	74.00	31.82	100	20	Horizontal	/
1	2480.2338	96.10	91.01	-5.09	74.00	-17.01	200	39	Vertical	No limit
2	2483.5000	46.12	41.05	-5.07	74.00	32.95	200	50	Vertical	/
3	2483.6613	48.82	43.75	-5.07	74.00	30.25	200	12	Vertical	/
4	2500.0000	45.98	40.99	-4.99	74.00	33.01	200	261	Vertical	/

**Highest Frequency**

Frequency 2480MHz

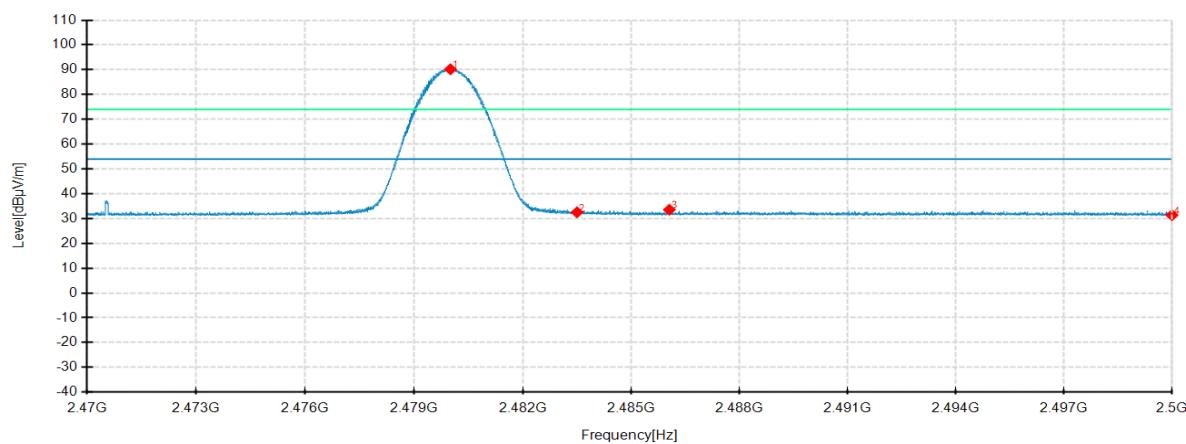
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

Polarity: Vertical



No.	Frequency MHz	Reading dB $\mu$ V/m	Level dB $\mu$ V/m	Factor dB	Limit dB $\mu$ V/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.9113	101.77	96.96	-4.81	54.00	-42.96	100	322	Horizontal	No limit
2	2483.5000	39.78	34.95	-4.83	54.00	19.05	100	322	Horizontal	/
3	2483.8038	40.75	35.91	-4.84	54.00	18.09	100	322	Horizontal	/
4	2500.0000	37.09	32.10	-4.99	54.00	21.90	100	322	Horizontal	/
1	2480.0050	95.26	90.17	-5.09	54.00	-36.17	200	25	Vertical	No limit
2	2483.5000	37.60	32.53	-5.07	54.00	21.47	200	234	Vertical	/
3	2486.0538	38.62	33.56	-5.06	54.00	20.44	200	326	Vertical	/
4	2500.0000	36.33	31.34	-4.99	54.00	22.66	200	116	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 E20240724756701-test setup photo-FCC+IC.

## **APPENDIX B. PHOTOGRAPH OF THE EUT**

Please refer to the attached document E20240724756701-EUT photo.

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