

Test Report

Verified code: 218493

Report No.: E20221124437601-5-G1

Customer: Lumi United Technology Co., Ltd

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

Sample Name: Presence Sensor FP2

Sample Model: PS-S02E

Receive Sample Date: Nov.28,2022

Test Date: Nov.29,2022 ~ Dec.20,2022

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

Test Result: Pass

Prepared by: Chen Xiaolong

Reviewed by: Jiang Tao

Approved by: Zhao Zetian

GUANGZHOU GRG METROLOGY & TEST CO., LTD

Issued Date: 2023-02-27

GUANGZHOU GRG METROLOGY & TEST CO., LTD.

Address: No.163, Pingyun Road, West of Huangpu Avenue, Guangzhou, Guangdong, China

Tel: (+86) 400-602-0999 FAX: (+86) 020-38698685 Web: <http://www.grgtest.com>



Statement

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

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

TABLE OF CONTENTS

1.	TEST RESULT SUMMARY	6
2.	GENERAL DESCRIPTION OF EUT.....	7
2.1	APPLICANT	7
2.2	MANUFACTURER.....	7
2.3	BASIC DESCRIPTION OF EQUIPMENT UNDER TEST	7
2.4	CHANNELIST	8
2.5	TEST OPERATION MODE	8
2.6	LOCAL SUPPORTIVE	8
2.7	CONFIGURATION OF SYSTEM UNDER TEST	9
2.8	DUTY CYCLE.....	10
3.	LABORATORY AND ACCREDITATIONS	11
3.1	LABORATORY	11
3.2	ACCREDITATIONS	11
4.	MEASUREMENT UNCERTAINTY	12
5.	LIST OF USED TEST EQUIPMENT AT GRGT	13
6.	CONDUCTED EMISSION MEASUREMENT	14
6.1	LIMITS.....	14
6.2	TEST PROCEDURES	14
6.3	TEST SETUP	15
6.4	DATA SAMPLE	15
6.5	TEST RESULTS	16
7.	RADIATED SPURIOUS EMISSIONS	20
7.1	LIMITS.....	20
7.2	TEST PROCEDURES	20
7.3	TEST SETUP	23
7.4	DATA SAMPLE	25
7.5	TEST RESULTS	26
8.	6dB BANDWIDTH.....	38
8.1	LIMITS.....	38
8.2	TEST PROCEDURES	38
8.3	TEST SETUP	38
8.4	TEST RESULTS	38
9.	MAXIMUM PEAK OUTPUT POWER	41
9.1	LIMITS.....	41
9.2	TEST PROCEDURES	41
9.3	TEST SETUP	41
9.4	TEST RESULTS	41
10.	POWER SPECTRAL DENSITY	42
10.1	LIMITS.....	42
10.2	TEST PROCEDURES	42
10.3	TEST SETUP	42

10.4 TEST RESULTS 42

11. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS 45

11.1 LIMITS..... 45

11.2 TEST PROCEDURES 45

11.3 TEST SETUP 45

11.4 TEST RESULTS 46

12. RESTRICTED BANDS OF OPERATION..... 53

12.1 LIMITS..... 53

12.2 TEST PROCEDURES 54

12.3 TEST SETUP 54

12.4 TEST RESULTS 55

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM 60

APPENDIX B. PHOTOGRAPH OF THE EUT 60

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

REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20221124437601-5	Original Issue	2022-12-15
2.0	E20221124437601-5-G1	Update	2023-02-27

Note:

This report E20221124437601-5-G1 is the modification of report E20221124437601-5. On the basis of the original report, update the home page customer and address, and the original report E20221124437601-5 is invalid.

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

1. TEST RESULT SUMMARY

Technical Requirements		
FCC 47 CFR Part 15 Subpart C 15.247 ANSI C63.10-2013 KDB 558074 D01 15.247 measurement guidance v05r02		
Limit / Severity	Item	Result
§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 FPC antenna. The max gain of antenna is 1dBi, which accordance 15.203, is considered sufficient to comply with the provisions of this section.

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

2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name: Lumi United Technology Co., Ltd

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

2.2 MANUFACTURER

Name: Lumi United Technology Co., Ltd

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

2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Presence Sensor FP2

Model No.: PS-S02E

Adding Model: PS-S02D

Models Difference: That EUT (Presence Sensor FP2) Model Numbers PS-S02E and PS-S02D have the same technical construction including circuit diagram PCB layout, hardware version and software version identical, except sales area, packaging and accessories are different.

Trade Name: Aqara

FCC ID: 2AKIT-PS-S02

Power supply: DC 5V /1A

Frequency Band: 2402MHz-2480MHz

Transmit Power: GFSK for 1Mbps:6.21dBm

Modulation type: GFSK for 1Mbps

Channel space: 2MHz

Antenna Specification: FPC antenna with 1dBi gain (Max.)

Temperature Range: -10°C~ +40°C

Hardware Version: X2

Software Version: 1.0.0_0004.0004

Sample No: E20221124437601-0007, E20221124437601-0008

Note: /

2.4 CHANNELLIST

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

* is the test frequency

2.5 TEST OPERATION MODE

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

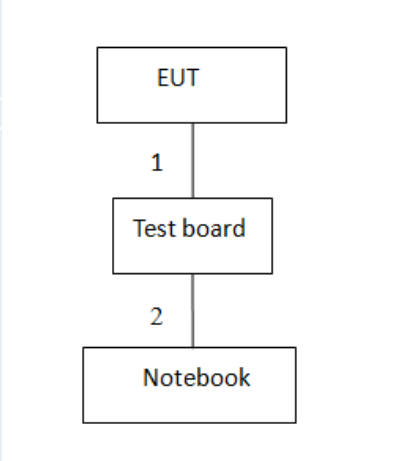
2.6 LOCAL SUPPORTIVE

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

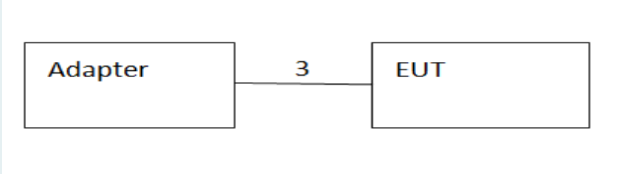
No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	DC cable	1	No	0	0.3m
2	USB cable	1	No	0	1.0m
3	USB cable	1	No	0	2.0m
4	DC cable	1	No	0	1.2m

2.7 CONFIGURATION OF SYSTEM UNDER TEST

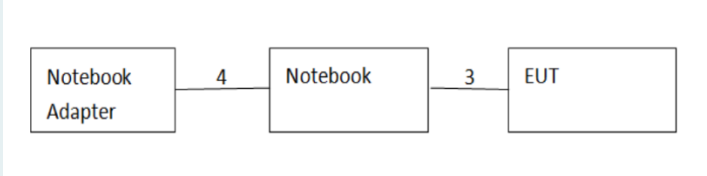
For Radiated Spurious Emission, 6dB Bandwidth, Maximum Peak Output Power, Power Spectral Density, Conducted band edges and Spurious Emission, Restricted bands of operation



For Conducted Emissions adapter power supply



For Conducted Emissions notebook power supply



Test software:

Software version	Test level
EspRFTestTool_v2.8_Manual	8

2.8 DUTY CYCLE

Environment: 23.6°C/51%RH/101.0kPa

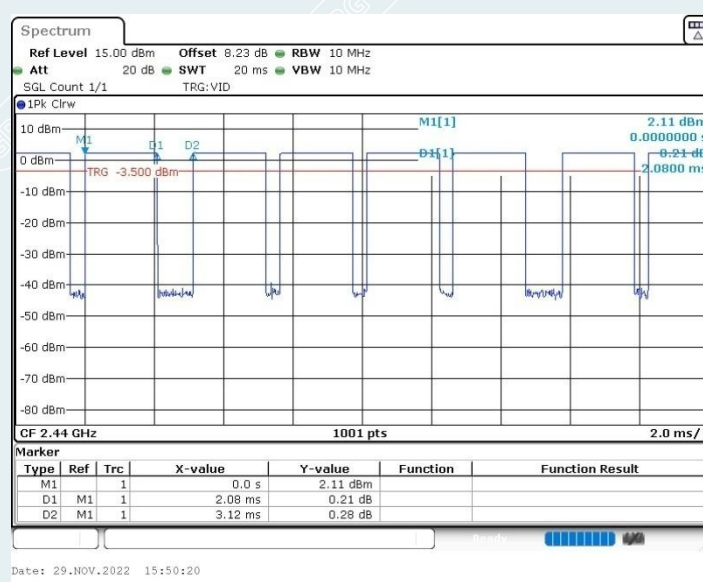
Tested By: Qin Tingting

Voltage: DC 5V

Date: 2022-11-29

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	DC [%]	T [s]
BLE_1M	Ant1	2440	2.08	3.12	66.67	0.00208

BLE_1M_2440MHz



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

3. LABORATORY AND ACCREDITATIONS

3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

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

P.C.: 518110

Tel : 0755-61180008

Fax: 0755-61180008

3.2 ACCREDITATIONS

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

USA A2LA(Certificate #2861.01)

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

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

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

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

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

4. MEASUREMENT UNCERTAINTY

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

Measurement		Frequency	Uncertainty
Radiated Emission	Horizontal	9kHz~30MHz	5.1dB ¹⁾
		30MHz~200MHz	4.5dB ¹⁾
		200MHz~1000MHz	4.4dB ¹⁾
		1GHz~18GHz	5.6dB ¹⁾
		18GHz~26.5GHz	3.7dB ¹⁾
	Vertical	9kHz~30MHz	5.1dB ¹⁾
		30MHz~200MHz	4.4dB ¹⁾
		200MHz~1000MHz	4.5dB ¹⁾
		1GHz~18GHz	5.6dB ¹⁾
		18GHz~26.5GHz	3.7dB ¹⁾
Conduction Emission		150kHz~30MHz	3.4dB ¹⁾

Measurement	Uncertainty
RF frequency	6.0×10^{-6}
RF power conducted	0.8dB
Power spectral density conducted	0.8dB
Occupied channel bandwidth	0.4dB
Unwanted emission, conducted	0.7dB
Humidity	6%
Temperature	2°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
Conducted Emissions				
EMI TEST RECEIVER	R&S	ESCI	100783	2023-08-28
LISN(EUT)	R&S	ENV216	101543	2023-09-13
Test S/W	EZ	CCS-3A1-CE		
Radiated Spurious Emission&Restricted bands of operation				
Test S/W	EZ	CCS-03A1		
Test Receiver	R&S	ESR7	102444	2023-09-02
Preamplifier	EMEC	EM330	I00426	2023-03-05
Bi-log Antenna	Schwarzbeck	CBL6143A	26039	2024-10-23
Loop Antenna	TESEQ	HLA6121	52599	2023-04-02
Spectrum Analyzer	KEYSIGHT	N9010A	MY52221469	2023-06-29
Horn Antenna	Schwarzbeck	BBHA9120D	02143	2023-10-15
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170-497	2023-10-14
Amplifier	Tonscend	TAP01018048	AP20E8060075	2023-05-05
Amplifier	Tonscend	TAP184050	AP20E806071	2023-05-05
Amplifier	SHIRONG ELECTRONIC	DLNA-1G18G-G40	20200928005	2023-05-08
Test S/W	Tonscend	JS36-RE/2.5.1.5		
6dB Bandwidth&Conducted band edges and Spurious Emission&Power Spectral Density				
Spectrum Analyzer	R&S	FSV30	1321.3008K30-104381-rH	2023-11-17
BT/WIFI System	Tonscend	JS0806		
Maximum Peak Output Power				
Pulse power sensor	Anritsu	MA2411B	1126150	2023-03-01
Power meter	Anritsu	ML2495A	1204003	2023-02-28

Note: The calibration cycle of the above instruments is 12 months except for the Bi-log Antenna which is 24 months.

6. CONDUCTED EMISSION MEASUREMENT

6.1 LIMITS

Frequency range	Limits (dB μ V)	
	Quasi-peak	Average
150kHz~0.5MHz	66~56	56~46
0.5MHz~5MHz	56	46
5MHz~30MHz	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 150kHz to 0.5MHz.

6.2 TEST PROCEDURES

Procedure of Preliminary Test

Test procedures follow ANSI C63.10:2013.

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.

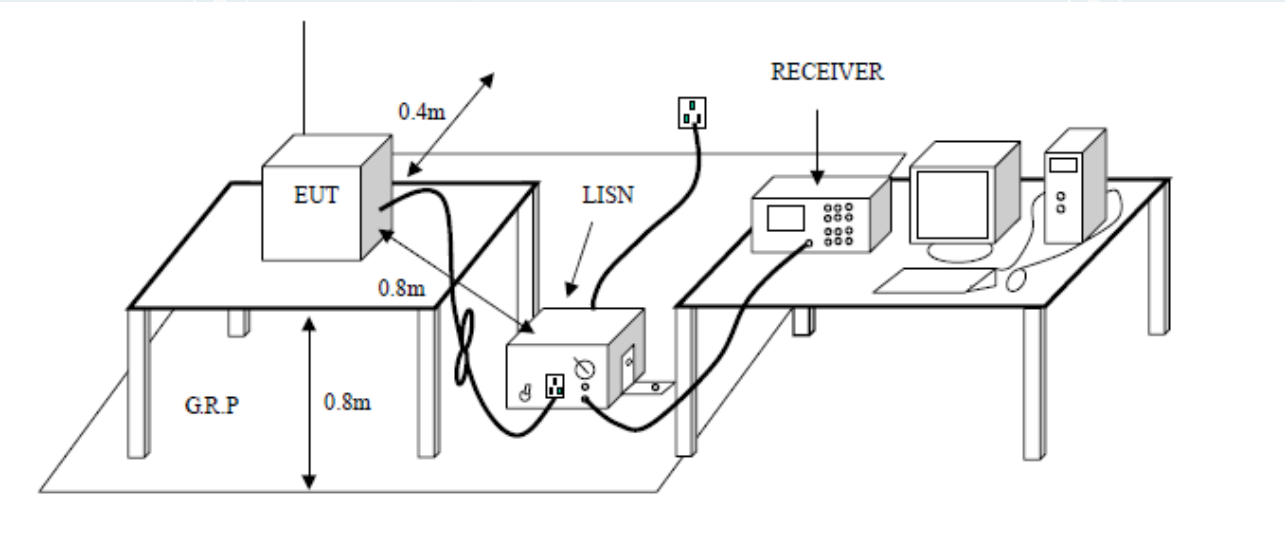
– I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

The test mode(s) described in Item 2.5 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.5 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)

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

6.5 TEST RESULTS

For notebook power supply:

EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.1°C/46%RH/101.0kPa	Test Mode	BLE 1M 2480MHz
Tested By	Huang Xinlong	Line	L
Tested Date	2022-12-06	Test Voltage	AC 120V/ 60Hz

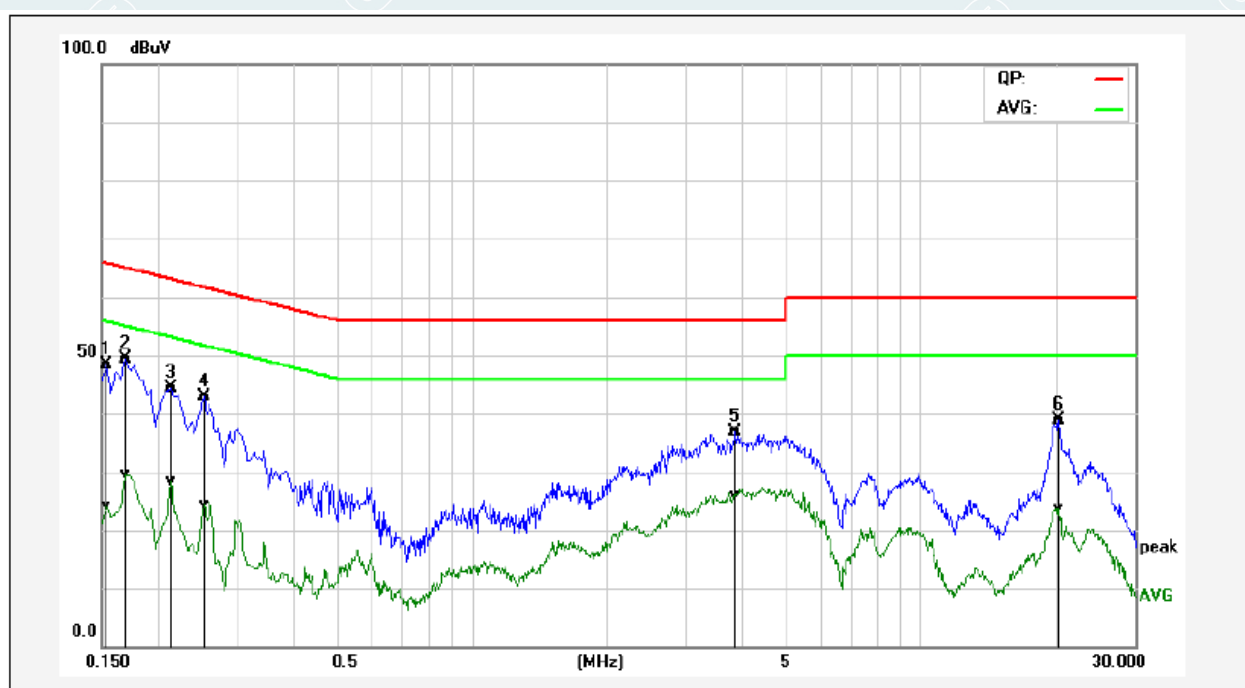


No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1539	37.83	15.77	9.61	47.44	25.38	65.78	55.79	-18.34	-30.41	Pass
2*	0.1700	38.28	18.39	9.61	47.89	28.00	64.96	54.96	-17.07	-26.96	Pass
3	0.1940	35.64	13.43	9.61	45.25	23.04	63.86	53.86	-18.61	-30.82	Pass
4	0.2180	34.48	19.26	9.61	44.09	28.87	62.89	52.89	-18.80	-24.02	Pass
5	3.4740	28.38	17.23	9.67	38.05	26.90	56.00	46.00	-17.95	-19.10	Pass
6	19.9740	30.90	16.58	9.93	40.83	26.51	60.00	50.00	-19.17	-23.49	Pass

REMARKS: L = Live Line

Pre-scan all mode and recorded the worst case results in this report (TX- High Channel(1Mbps))

EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.1°C/46%RH/101.0kPa	Test Mode	BLE 1M 2480MHz
Tested By	Huang Xinlong	Line	N
Tested Date	2022-12-06	Test Voltage	AC 120V/ 60Hz



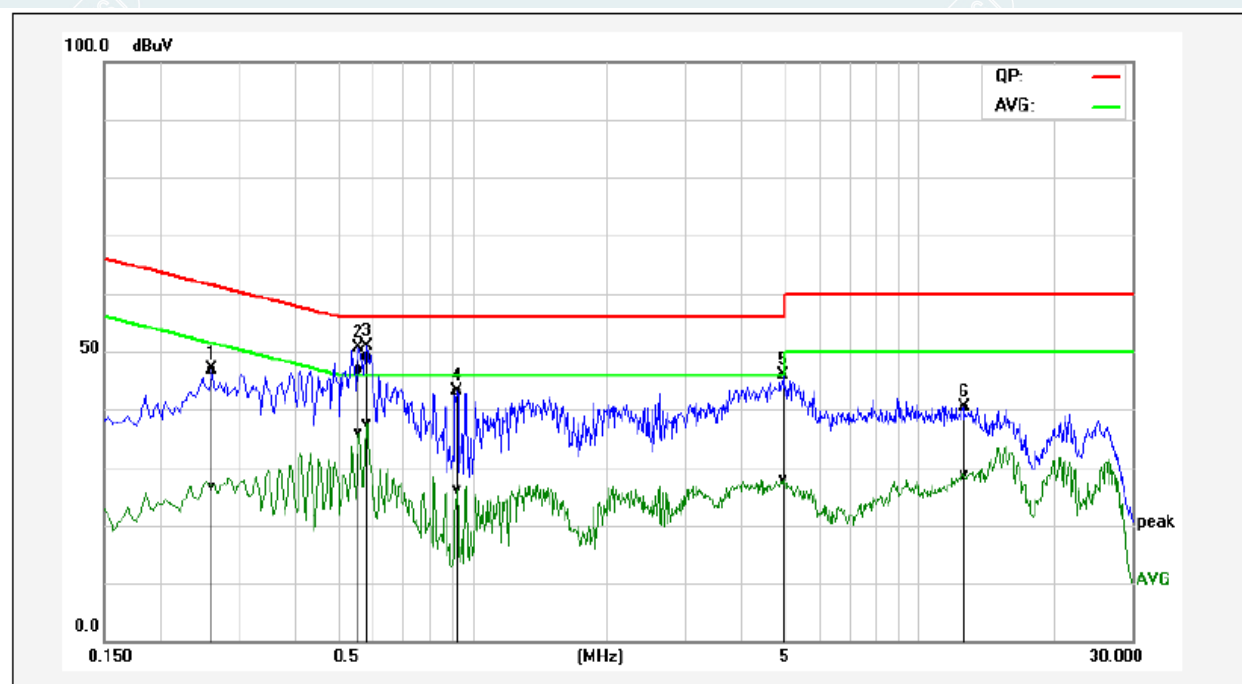
No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1539	38.70	14.57	9.60	48.30	24.17	65.78	55.79	-17.48	-31.62	Pass
2*	0.1700	39.67	19.92	9.60	49.27	29.52	64.96	54.96	-15.69	-25.44	Pass
3	0.2140	34.73	18.85	9.60	44.33	28.45	63.04	53.05	-18.71	-24.60	Pass
4	0.2540	33.27	14.84	9.60	42.87	24.44	61.62	51.63	-18.75	-27.19	Pass
5	3.8620	27.09	16.18	9.68	36.77	25.86	56.00	46.00	-19.23	-20.14	Pass
6	20.3380	28.79	13.55	9.97	38.76	23.52	60.00	50.00	-21.24	-26.48	Pass

REMARKS: N = Neutral Line.

Pre-scan all mode and recorded the worst case results in this report (TX-High Channel(1Mbps))

For adapter power supply:

EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.1°C/46%RH/101.0kPa	Test Mode	BLE 1M 2480MHz
Tested By	Huang Xinlong	Line	L
Tested Date	2022-12-06	Test Voltage	AC 120V/ 60Hz

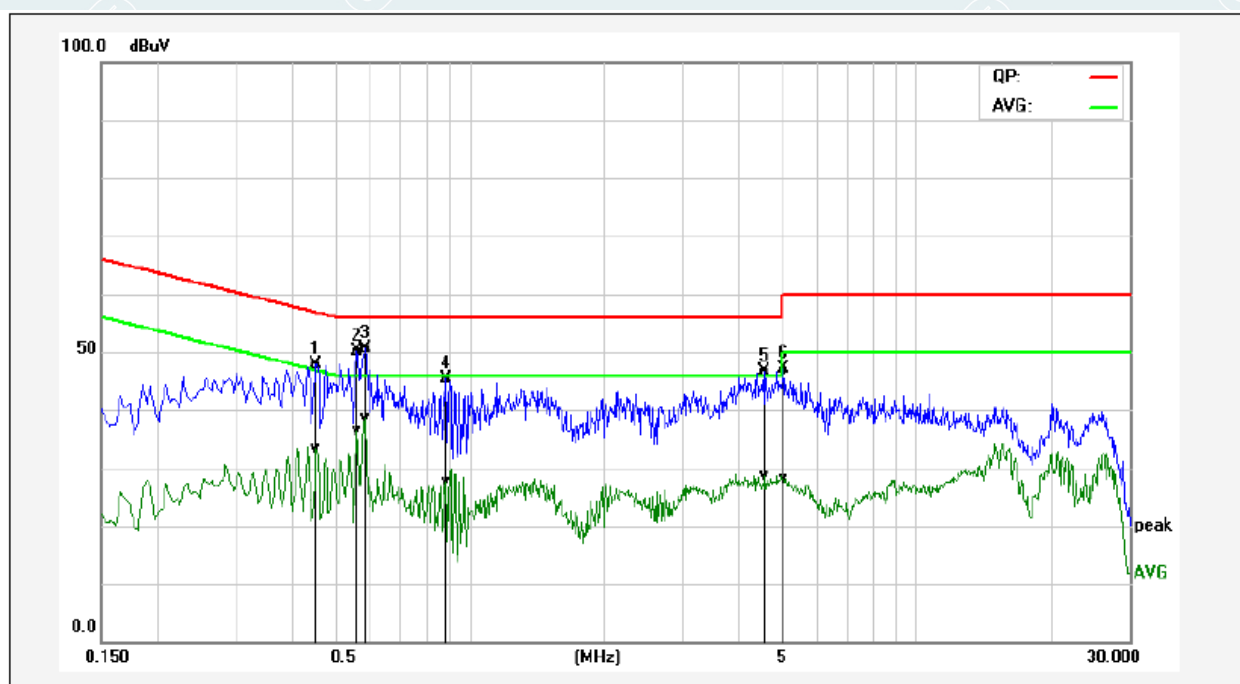


No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.2620	37.24	17.11	9.60	46.84	26.71	61.36	51.37	-14.52	-24.66	Pass
2	0.5580	37.40	26.30	9.60	47.00	35.90	56.00	46.00	-9.00	-10.10	Pass
3*	0.5820	39.60	27.92	9.60	49.20	37.52	56.00	46.00	-6.80	-8.48	Pass
4	0.9260	33.54	16.40	9.63	43.17	26.03	56.00	46.00	-12.83	-19.97	Pass
5	4.9940	36.29	18.14	9.70	45.99	27.84	56.00	46.00	-10.01	-18.16	Pass
6	12.6420	30.43	18.75	9.83	40.26	28.58	60.00	50.00	-19.74	-21.42	Pass

REMARKS: L = Live Line

Pre-scan all mode and recorded the worst case results in this report (TX- High Channel(1Mbps))

EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.1°C/46%RH/101.0kPa	Test Mode	BLE 1M 2480MHz
Tested By	Huang Xinlong	Line	N
Tested Date	2022-12-06	Test Voltage	AC 120V/ 60Hz



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	0.4540	38.38	23.75	9.61	47.99	33.36	56.80	46.80	-8.81	-13.44	Pass
2	0.5620	40.59	26.67	9.61	50.20	36.28	56.00	46.00	-5.80	-9.72	Pass
3*	0.5860	40.91	29.10	9.61	50.52	38.71	56.00	46.00	-5.48	-7.29	Pass
4	0.8860	35.70	18.11	9.63	45.33	27.74	56.00	46.00	-10.67	-18.26	Pass
5	4.5780	36.99	19.01	9.70	46.69	28.71	56.00	46.00	-9.31	-17.29	Pass
6	5.0460	37.30	18.31	9.70	47.00	28.01	60.00	50.00	-13.00	-21.99	Pass

REMARKS: N = Neutral Line.

Pre-scan all mode and recorded the worst case results in this report (TX- High Channel(1Mbps))

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($\mu\text{V/m}$)	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 $\mu\text{V/m}$).

7.2 TEST PROCEDURES

1) Sequence of testing 9kHz to 30MHz

Setup:

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

Pre measurement:

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

Final measurement:

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

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

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

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

2) Sequence of testing 30MHz to 1GHz

Setup:

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

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

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

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

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

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

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

--- The antenna is polarized vertical and horizontal.

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

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

Final measurement:

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

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

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

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

3) Sequence of testing 1GHz to 18GHz

Setup:

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

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

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

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

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

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

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

Final measurement:

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

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

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

Pre measurement:

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

Final measurement:

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

the pre measurement with marked maximum final measurements and the limit will be stored.

NOTE:

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

7.3 TEST SETUP

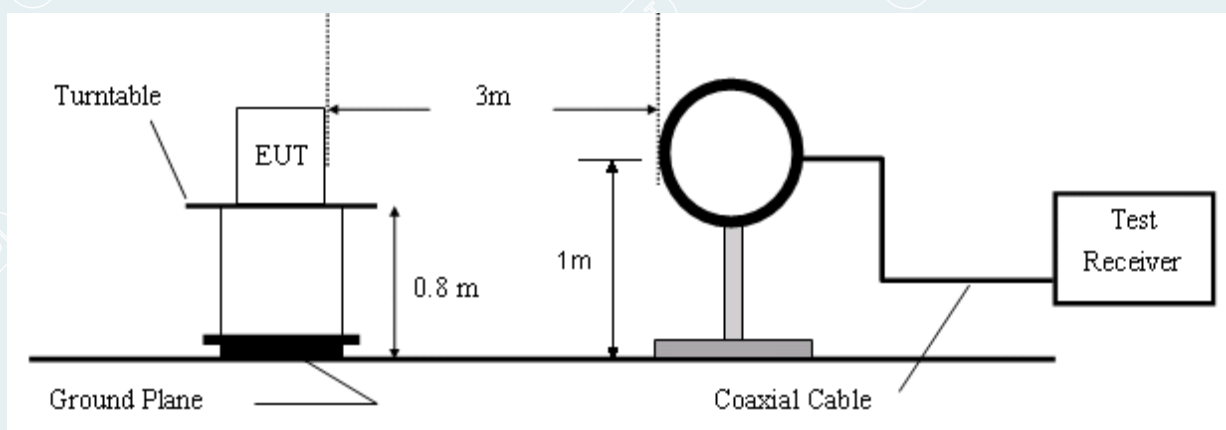


Figure 1. 9kHz to 30MHz radiated emissions test configuration

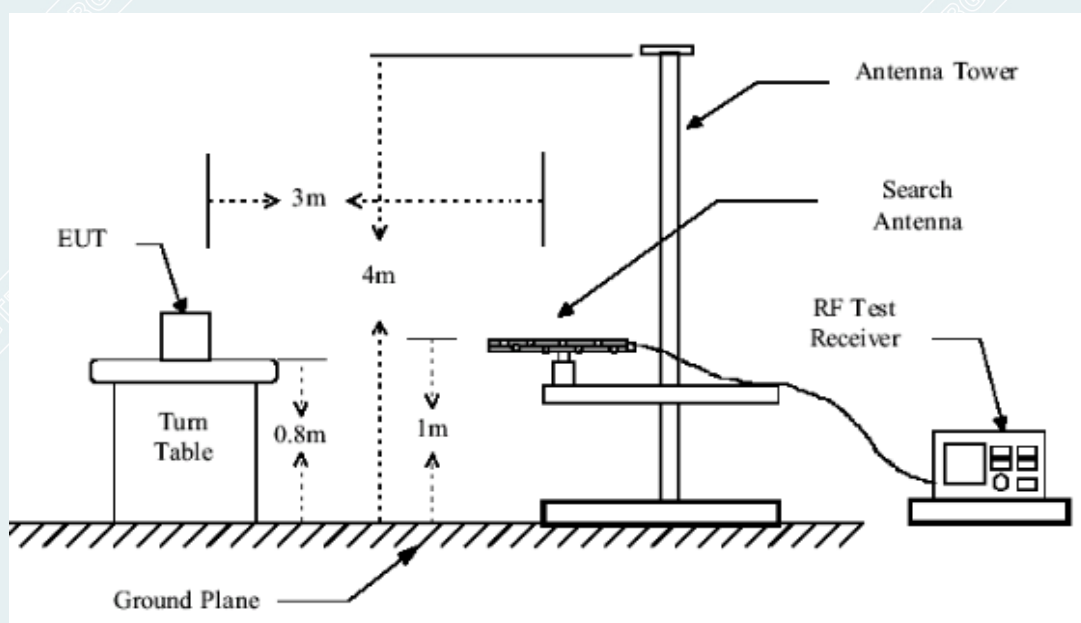


Figure 2. 30MHz to 1GHz radiated emissions test configuration

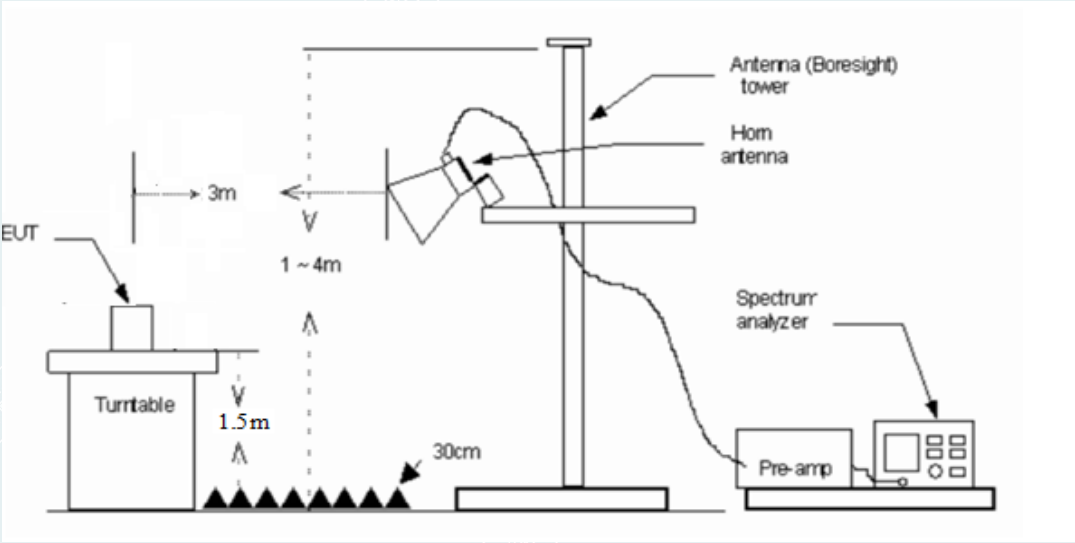


Figure 3. 1GHz to 18GHz radiated emissions test configuration

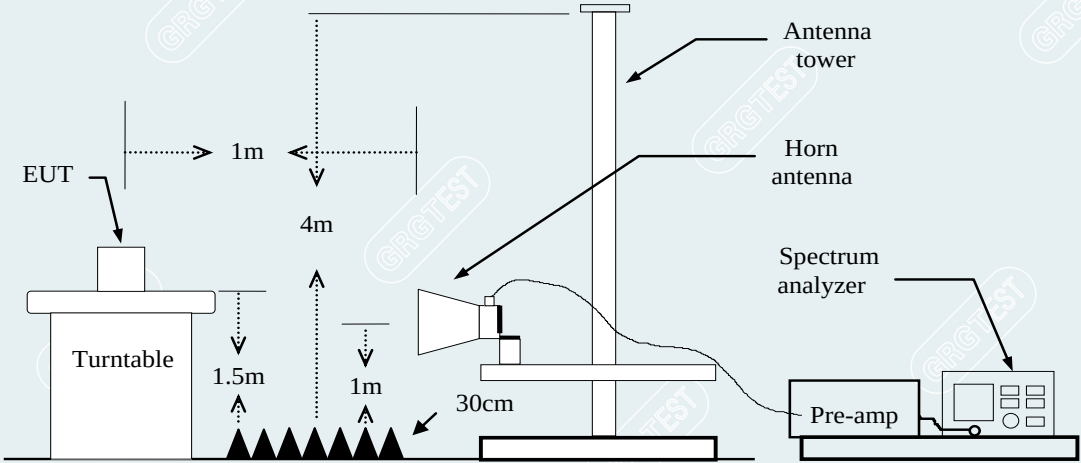


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

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

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	37.06	-15.48	21.58	40.00	-18.42	QP	Vertical

1GHz to 18GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	65.45	-11.12	54.33	74.00	-19.67	Peak	Vertical
xxx	xxx	63.00	-11.12	51.88	54.00	-2.12	AVG	Vertical

Above 18GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	68.86	57.66	-11.20	83.54	25.88	peak	Vertical
xxx	xxx	68.89	-11.20	57.69	63.54	5.85	AVG	Vertical

Frequency (MHz)

= Emission frequency in MHz

Ant.Pol. (H/V)

= Antenna polarization

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m)

= Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m)

= Reading (dBuV) + Correction Factor (dB/m)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Remark Result (dBuV/m) – Limit (dBuV/m)

Peak

= Peak Reading

QP

= Quasi-peak Reading

AVG

= Average Reading

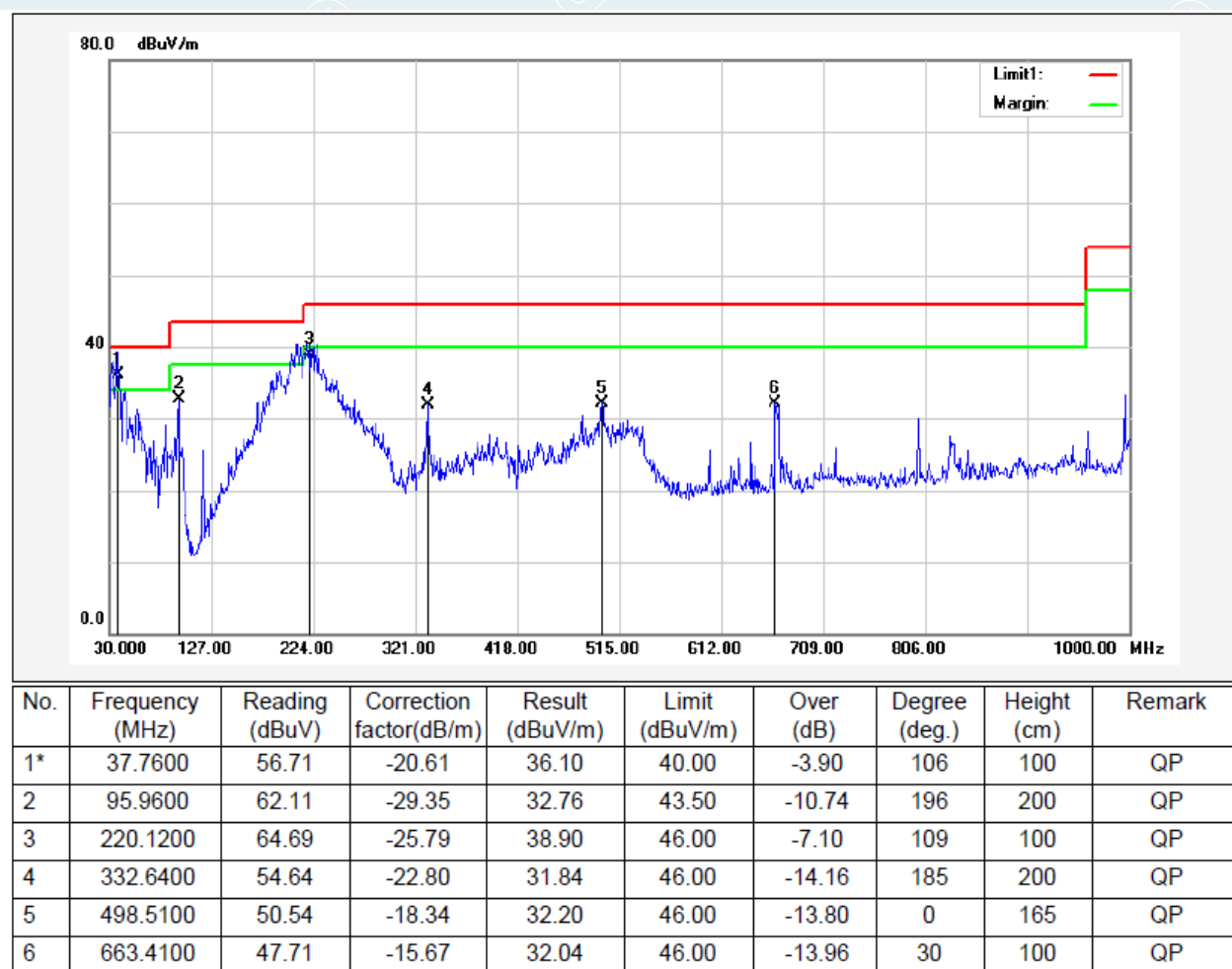
----- The following blanks -----

7.5 TEST RESULTS

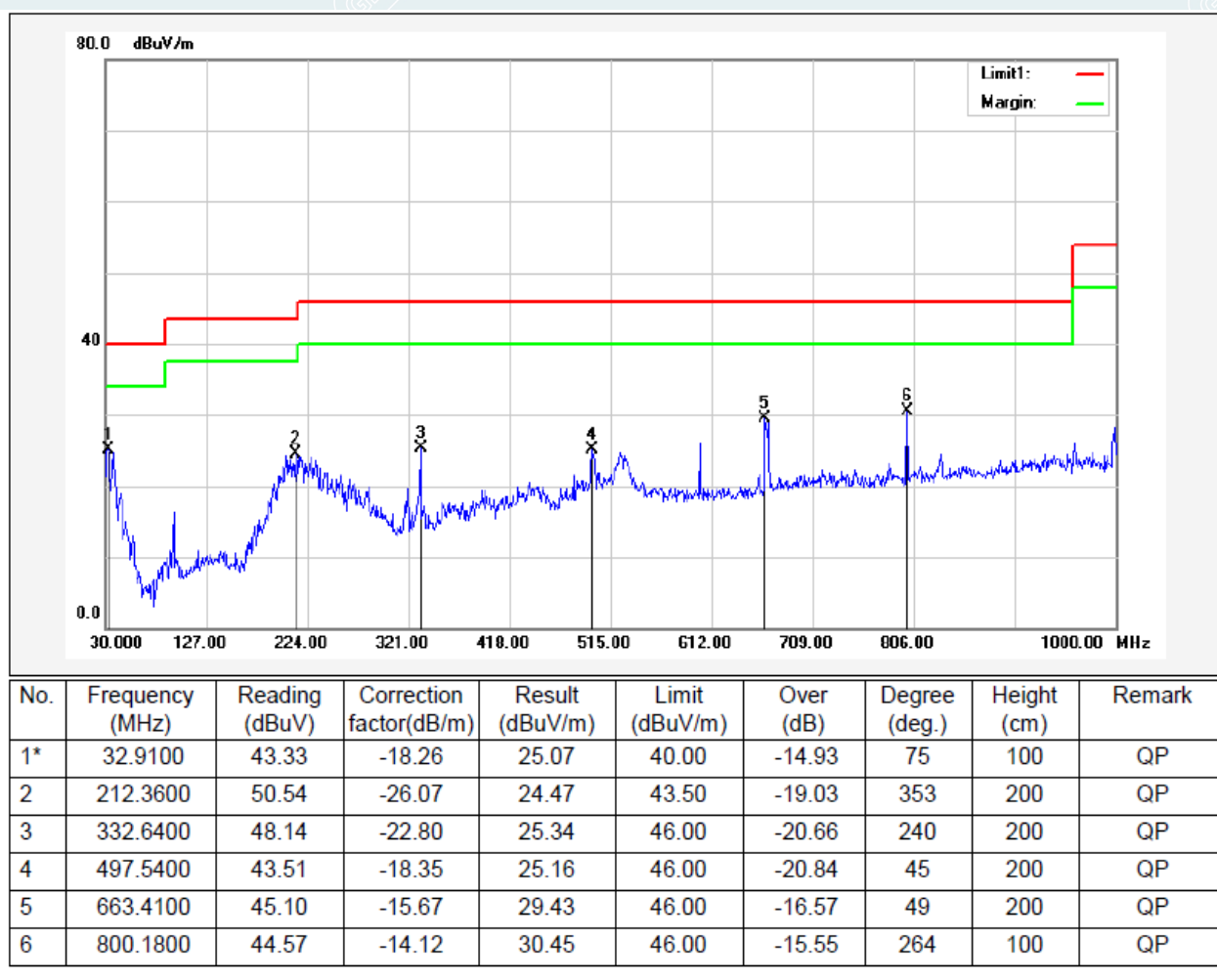
According to the user manual, the EUT has two typical installation modes,namely side installation and suction top installation.The two modes have been tested and verified,the worst configuration is the suction top installation mode,which is recorded in this report.

Below 1GHz

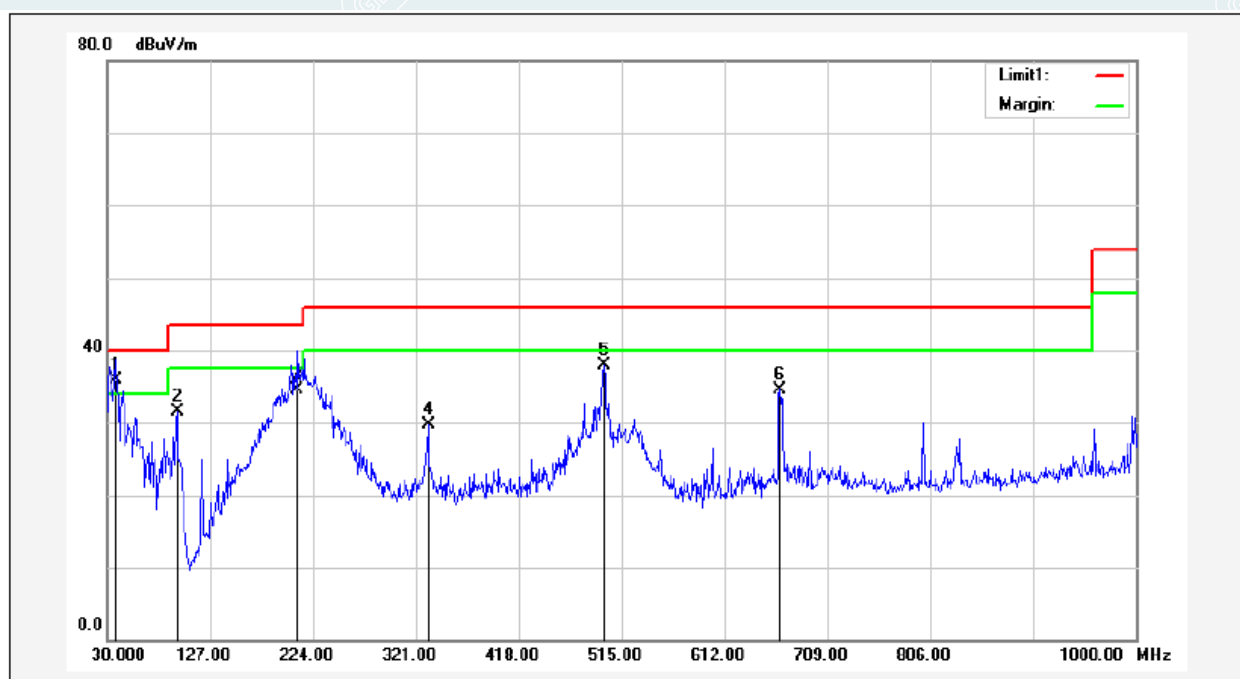
EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.7°C/41%RH/101.0kPa	Test Voltage	DC 5V
Test Mode	TX/ BLE_1M (2402MHz)	Polarity	Vertical
Tested By	Huang Xinlong	Tested Date	2022-12-02



EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.7°C/41%RH/101.0kPa	Test Voltage	DC 5V
Test Mode	TX/ BLE_1M (2402MHz)	Polarity	Horizontal
Tested By	Huang Xinlong	Tested Date	2022-12-02

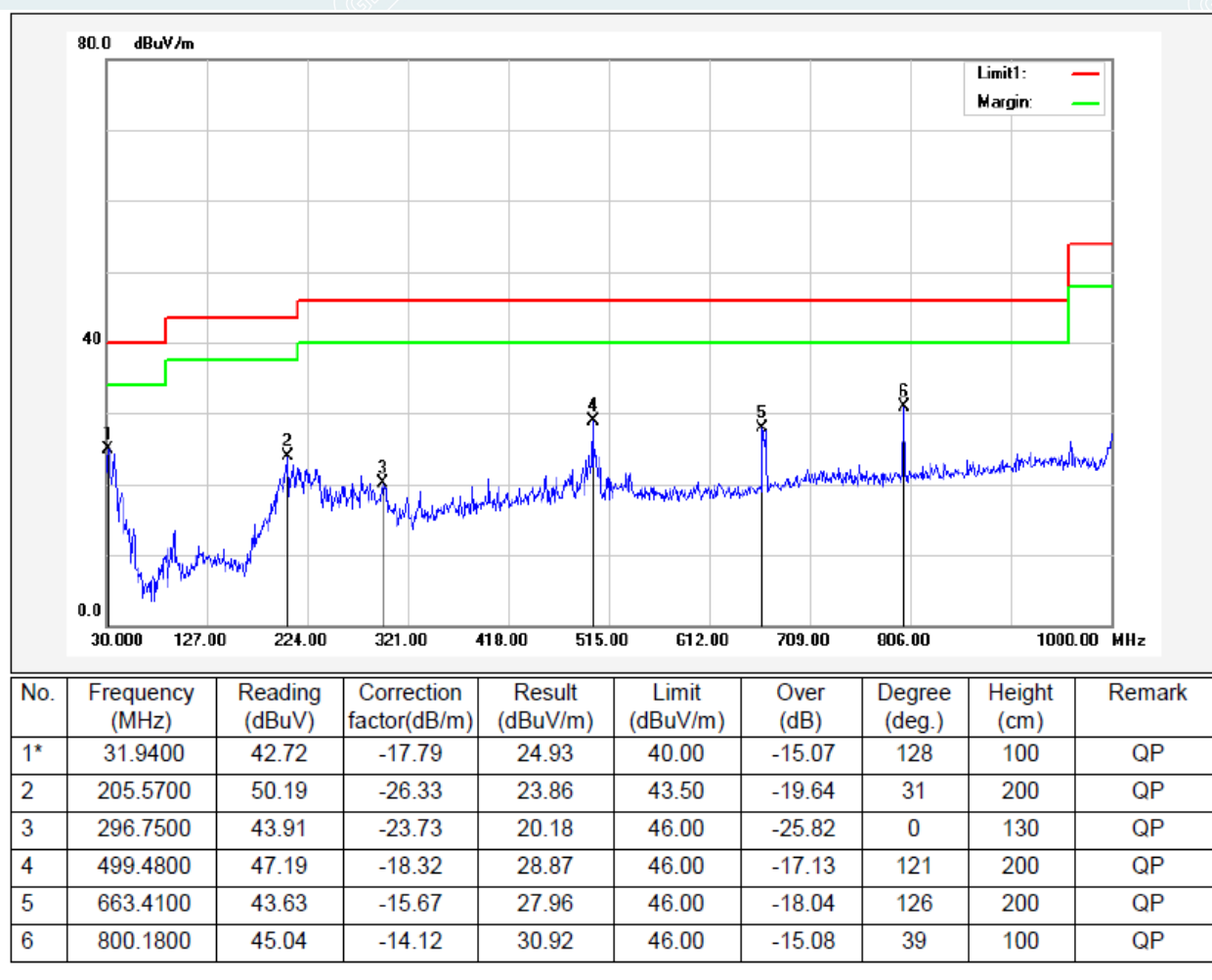


EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.7°C/41%RH/101.0kPa	Test Voltage	DC 5V
Test Mode	TX/ BLE_1M (2440MHz)	Polarity	Vertical
Tested By	Huang Xinlong	Tested Date	2022-12-02

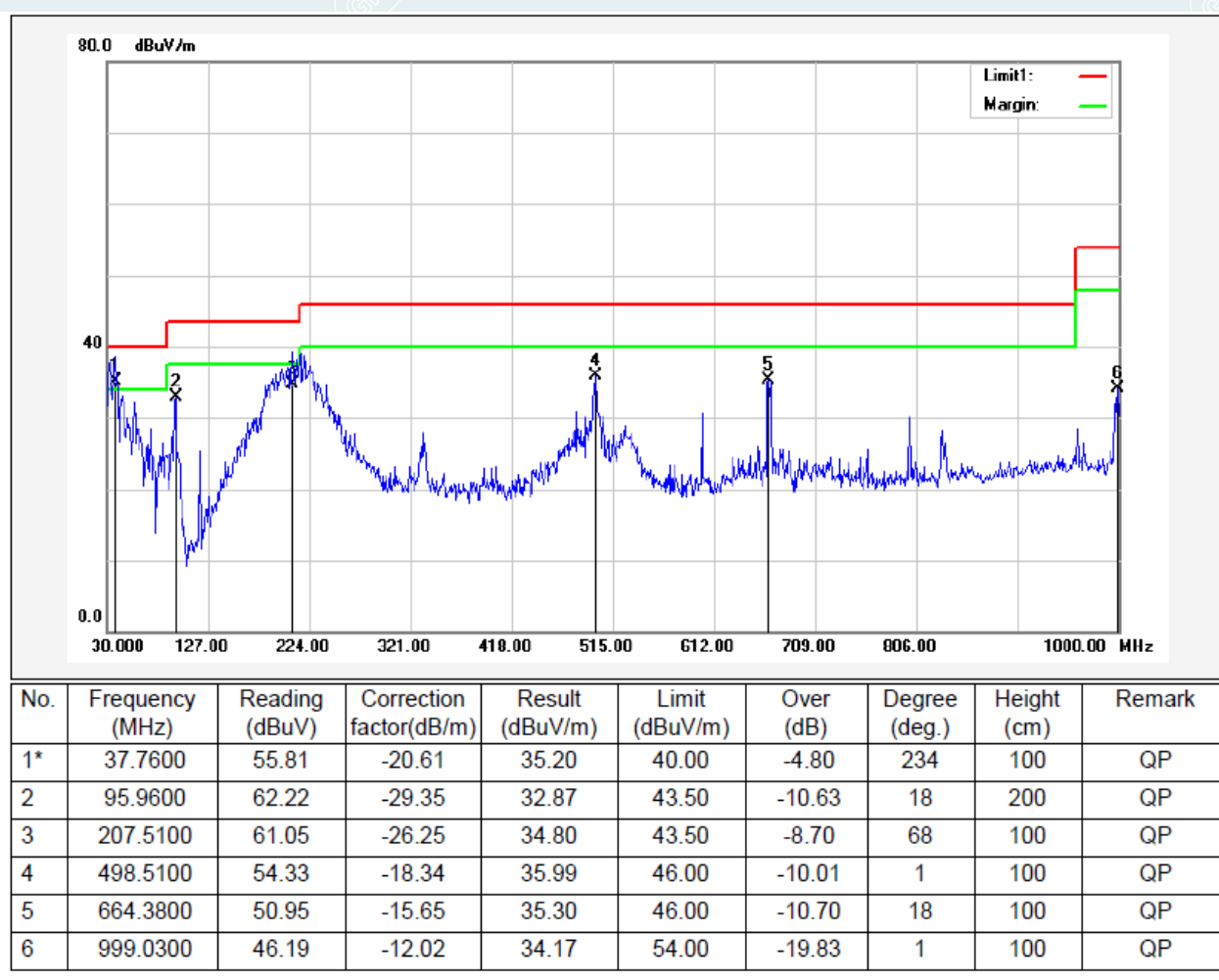


No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over (dB)	Degree (deg.)	Height (cm)	Remark
1*	37.7600	56.61	-20.61	36.00	40.00	-4.00	0	102	QP
2	95.9600	60.82	-29.35	31.47	43.50	-12.03	0	197	QP
3	209.4500	60.78	-26.18	34.60	43.50	-8.90	52	100	QP
4	332.6400	52.52	-22.80	29.72	46.00	-16.28	87	100	QP
5	498.5100	56.26	-18.34	37.92	46.00	-8.08	13	100	QP
6	664.3800	50.25	-15.65	34.60	46.00	-11.40	22	100	QP

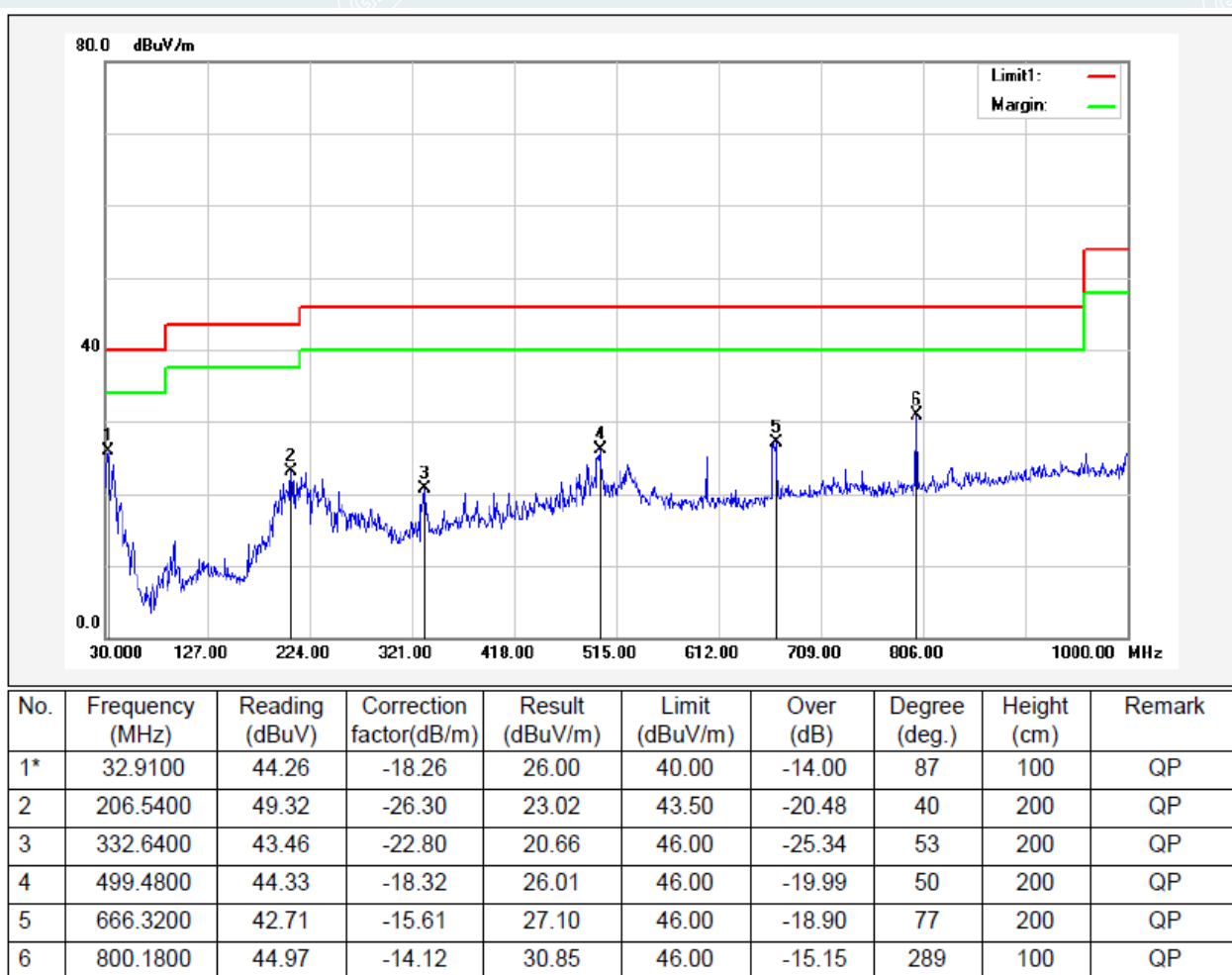
EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.7°C/41%RH/101.0kPa	Test Voltage	DC 5V
Test Mode	TX/ BLE_1M (2440MHz)	Polarity	Horizontal
Tested By	Huang Xinlong	Tested Date	2022-12-02



EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.7°C/41%RH/101.0kPa	Test Voltage	DC 5V
Test Mode	TX/ BLE_1M (2480MHz)	Polarity	Vertical
Tested By	Huang Xinlong	Tested Date	2022-12-02



EUT Name	Presence Sensor FP2	Model	PS-S02E
Environmental Conditions	23.7°C/41%RH/101.0kPa	Test Voltage	DC 5V
Test Mode	TX/ BLE_1M (2480MHz)	Polarity	Horizontal
Tested By	Huang Xinlong	Tested Date	2022-12-02

**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: 20.3°C/49%RH/101.0kPa

Tested By:Zhang Zishan

Voltage: DC 5V

Date: 2022-11-30

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1161.2702	65.76	41.06	-24.70	74.00	32.94	100	162	Horizontal
2	1666.0833	64.82	41.73	-23.09	74.00	32.27	100	240	Horizontal
3	1996.1245	65.55	44.38	-21.17	74.00	29.62	100	258	Horizontal
4	3281.2852	59.91	43.10	-16.81	74.00	30.90	100	120	Horizontal
5	3990.1238	58.90	43.53	-15.37	74.00	30.47	100	179	Horizontal
6	17634.3293	46.90	55.36	8.46	74.00	18.64	200	118	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	17634.3293	8.46	37.78	46.24	54.00	7.76	200	118	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1196.0245	66.42	41.48	-24.94	74.00	32.52	200	16	Vertical
2	1831.3539	68.72	45.79	-22.93	74.00	28.21	100	143	Vertical
3	2329.6662	61.02	42.48	-18.54	74.00	31.52	100	192	Vertical
4	3202.5253	63.56	47.20	-16.36	74.00	26.80	100	81	Vertical
5	4659.5824	56.51	43.26	-13.25	74.00	30.74	100	207	Vertical
6	17975.622	45.43	58.02	12.59	74.00	15.98	100	40	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	17975.622	12.59	34.15	46.74	54.00	7.26	100	40	Vertical

Mode: TX/ BLE_1M
 Middle Frequency (2440MHz)
 Environment: 20.3°C/49%RH/101.0kPa
 Tested By:Zhang Zishan

Voltage: DC 5V
 Date: 2022-11-30

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1196.0245	65.27	41.26	-24.01	74.00	32.74	200	134	Horizontal
2	1664.333	67.13	44.03	-23.10	74.00	29.97	100	250	Horizontal
3	1992.8741	66.00	44.82	-21.18	74.00	29.18	100	270	Horizontal
4	3253.1566	58.89	42.80	-16.09	74.00	31.20	100	111	Horizontal
5	3980.7476	57.84	42.50	-15.34	74.00	31.50	100	43	Horizontal
6	17998.1248	44.82	55.37	10.55	74.00	18.63	100	131	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	17998.1248	10.55	35.47	46.02	54.00	7.98	100	131	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	1161.7702	65.74	41.55	-24.19	74.00	32.45	100	220	Vertical
2	1832.104	65.99	43.04	-22.95	74.00	30.96	100	171	Vertical
3	2329.6662	61.23	42.69	-18.54	74.00	31.31	100	171	Vertical
4	3253.1566	61.42	45.38	-16.04	74.00	28.62	100	325	Vertical
5	4653.9567	59.10	45.79	-13.31	74.00	28.21	100	21	Vertical
6	17994.3743	44.68	57.88	13.20	74.00	16.12	100	285	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	17994.3743	13.20	34.12	47.32	54.00	6.68	100	285	Vertical

Mode: TX/ BLE_1M

Highest Frequency (2480MHz)

Environment: 20.3°C/49%RH/101.0kPa

Tested By:Zhang Zishan

Voltage: DC 5V

Date: 2022-11-30

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1194.2743	67.54	43.50	-24.04	74.00	30.50	100	191	Horizontal
2	1665.0831	63.83	40.73	-23.10	74.00	33.27	100	35	Horizontal
3	1999.625	61.20	40.03	-21.17	74.00	33.97	100	83	Horizontal
4	2654.2068	65.08	46.63	-18.45	74.00	27.37	100	326	Horizontal
5	3305.6632	60.24	42.99	-17.25	74.00	31.01	100	246	Horizontal
6	17842.4803	45.22	55.19	9.97	74.00	18.81	200	179	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBμV/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	17842.4803	9.97	36.10	46.07	54.00	7.93	200	179	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	1161.2702	68.60	44.42	-24.18	74.00	29.58	100	200	Vertical
2	2991.749	59.65	43.18	-16.47	74.00	30.82	100	192	Vertical
3	3305.6632	62.18	45.80	-16.38	74.00	28.20	200	120	Vertical
4	3990.1238	60.83	45.76	-15.07	74.00	28.24	200	316	Vertical
5	4653.9567	58.20	44.89	-13.31	74.00	29.11	100	20	Vertical
6	17971.8715	45.50	57.96	12.46	74.00	16.04	200	71	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	17971.8715	12.46	35.18	47.64	54.00	6.36	200	71	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.

Mode: TX/ BLE_1M

Lowest Frequency (2402MHz)

Environment: 20.3°C/49%RH/101.0kPa

Tested By: Zhang Zishan

Voltage: DC 5V

Date: 2022-12-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	19999.625	55.45	44.39	-11.06	83.54	39.15	150	32	Horizontal
2	20355.775	53.41	42.74	-10.67	83.54	40.80	150	343	Horizontal
3	20655.4	56.20	45.83	-10.37	83.54	37.71	150	235	Horizontal
4	20870.45	55.96	45.78	-10.18	83.54	37.76	150	313	Horizontal
5	21337.525	57.49	47.53	-9.96	83.54	36.01	150	110	Horizontal
6	25647.875	48.34	40.74	-7.60	83.54	42.80	150	171	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	18478.55	52.57	40.42	-12.15	83.54	43.12	150	312	Vertical
2	20652.85	56.64	46.43	-10.21	83.54	37.11	150	235	Vertical
3	21359.2	56.31	46.47	-9.84	83.54	37.07	150	297	Vertical
4	23142.075	50.10	41.48	-8.62	83.54	42.06	150	94	Vertical
5	24071.125	49.08	40.80	-8.28	83.54	42.74	150	171	Vertical
6	26188.9	49.20	41.69	-7.51	83.54	41.85	150	329	Vertical

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

Mode: TX/ BLE_1M
Middle Frequency (2440MHz)
Environment: 20.3°C/49%RH/101.0kPa
Tested By: Zhang Zishan

Voltage: DC 5V
Date: 2022-12-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18155.125	54.02	41.58	-12.44	83.54	41.96	150	46	Horizontal
2	19999.625	55.69	44.63	-11.06	83.54	38.91	150	46	Horizontal
3	20355.775	54.92	44.25	-10.67	83.54	39.29	150	31	Horizontal
4	20650.725	54.71	44.34	-10.37	83.54	39.20	150	234	Horizontal
5	21366.85	56.97	47.03	-9.94	83.54	36.51	150	234	Horizontal
6	25120.875	48.00	40.83	-7.17	83.54	42.71	150	46	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	19009.8	53.16	41.37	-11.79	83.54	42.17	150	315	Vertical
2	19999.2	55.65	44.69	-10.96	83.54	38.85	150	299	Vertical
3	20332.825	55.48	44.87	-10.61	83.54	38.67	150	236	Vertical
4	20654.125	54.70	44.49	-10.21	83.54	39.05	150	299	Vertical
5	21333.275	57.61	47.75	-9.86	83.54	35.79	150	220	Vertical
6	23885.825	49.53	41.10	-8.43	83.54	42.44	150	328	Vertical

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

Mode: TX/ BLE_1M

Highest Frequency (2480MHz)

Environment: 20.3°C/49%RH/101.0kPa

Tested By: Zhang Zishan

Voltage: DC 5V

Date: 2022-12-05

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18351.05	53.24	40.93	-12.31	83.54	42.61	150	32	Horizontal
2	19999.625	54.57	43.51	-11.06	83.54	40.03	150	16	Horizontal
3	20355.35	54.35	43.68	-10.67	83.54	39.86	150	297	Horizontal
4	20588.25	55.53	45.11	-10.42	83.54	38.43	150	344	Horizontal
5	20881.5	55.93	45.75	-10.18	83.54	37.79	150	32	Horizontal
6	21351.55	57.32	47.37	-9.95	83.54	36.17	150	219	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	18337.025	52.96	40.68	-12.28	83.54	42.86	150	266	Vertical
2	19999.625	55.12	44.16	-10.96	83.54	39.38	150	156	Vertical
3	20649.025	57.27	47.06	-10.21	83.54	36.48	150	234	Vertical
4	21333.7	56.15	46.29	-9.86	83.54	37.25	150	188	Vertical
5	25361.425	47.85	40.67	-7.18	83.54	42.87	150	234	Vertical
6	26438.8	48.26	41.25	-7.01	83.54	42.29	150	204	Vertical

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

8. 6dB BANDWIDTH

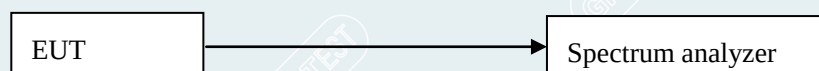
8.1 LIMITS

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

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

8.3 TEST SETUP



8.4 TEST RESULTS

Environment: 25.3°C/56%RH/101.0kPa
Tested By: Qin Tingting

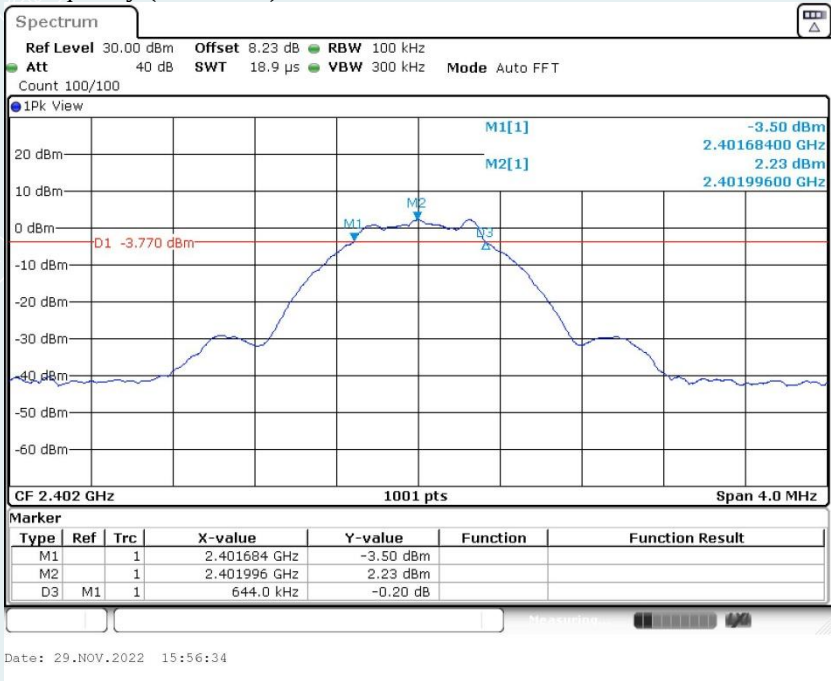
Voltage: DC 5V
Date: 2022-11-29

BLE_1M

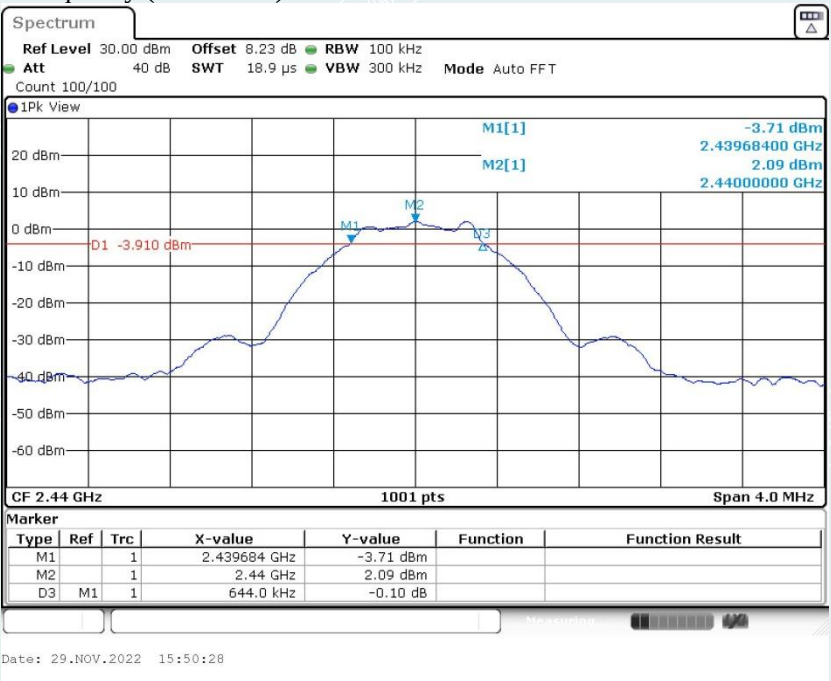
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	644	≥ 500	PASS
Middle	2440	644		PASS
Highest	2480	644		PASS

BLE_1M

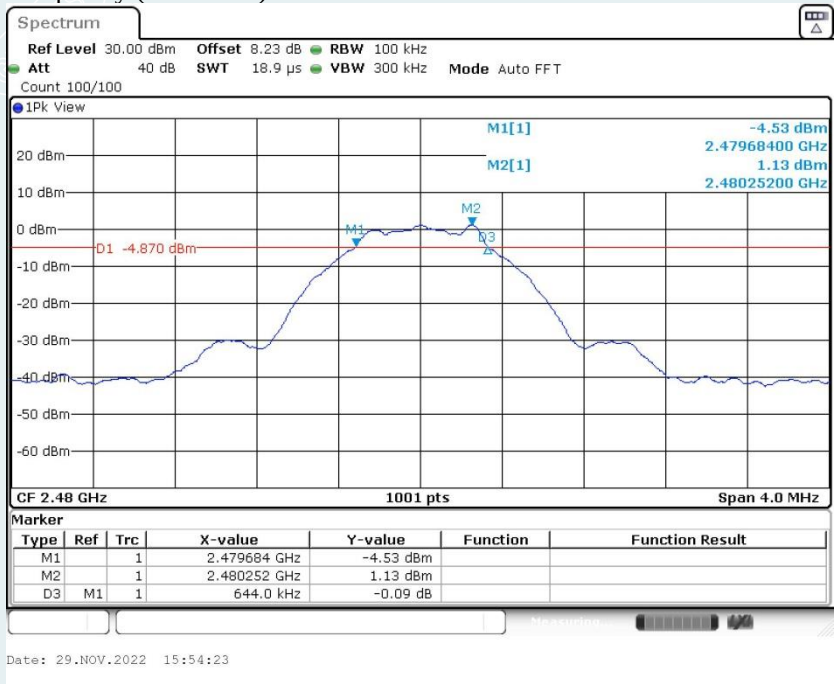
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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

9. MAXIMUM PEAK OUTPUT POWER

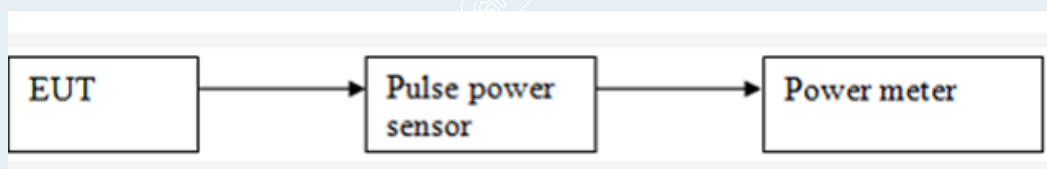
9.1 LIMITS

The maximum Peak output power measurement is 1W

9.2 TEST PROCEDURES

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

9.3 TEST SETUP



9.4 TEST RESULTS

Environment: 25.3°C/56%RH/101.0kPa
Tested By: Qin Tingting

Voltage: DC 5V
Date: 2022-11-29

BLE_1M

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/Average	Result
Lowest	2402	6.21	1W (30dBm)	Peak	Pass
Middle	2440	5.82			Pass
Highest	2480	5.47			Pass

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

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

10.3 TEST SETUP



10.4 TEST RESULTS

Environment: 25.3°C/56%RH/101.0kPa
 Tested By: Qin Tingting

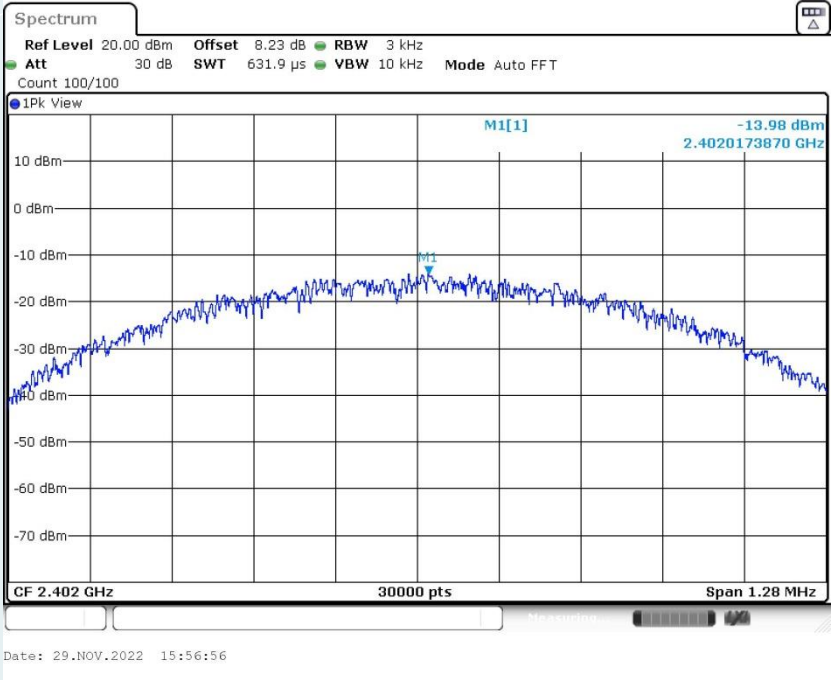
Voltage: DC 5V
 Date: 2022-11-29

BLE_1M

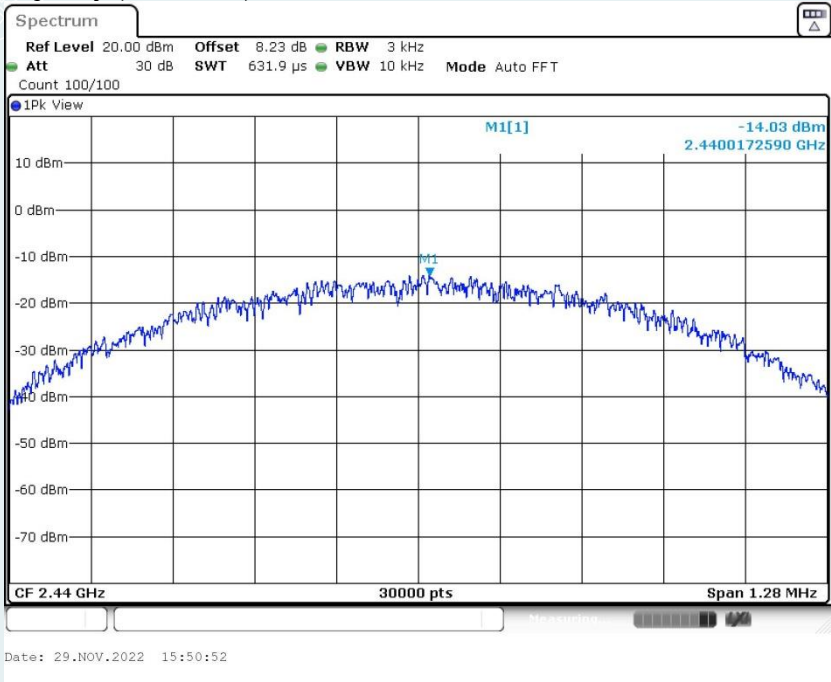
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-13.98	8.00	PASS
Middle	2440	-14.03		PASS
Highest	2480	-14.63		PASS

BLE_1M

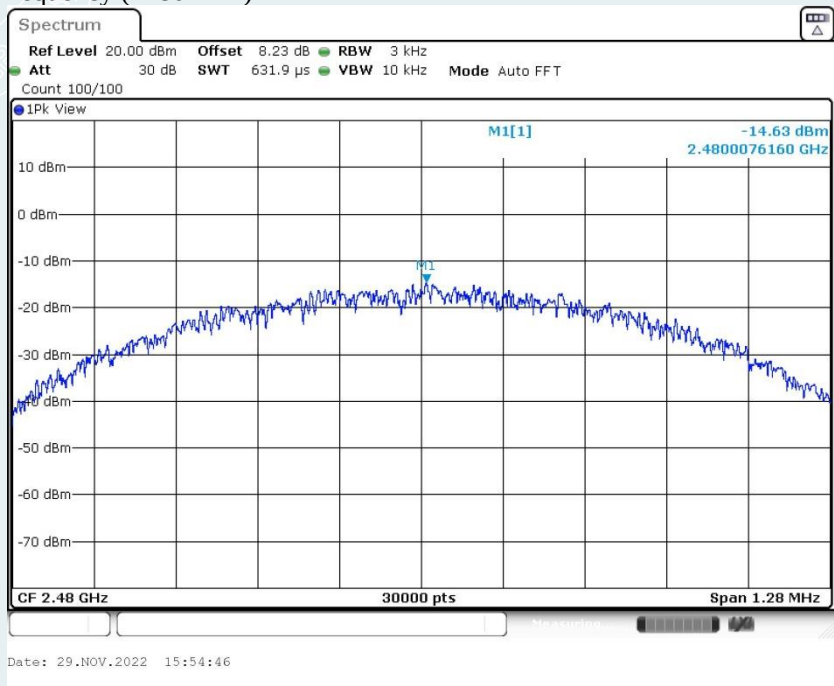
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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

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.

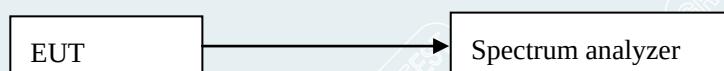
11.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 15.247 Measurement Guidance v05r02.

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

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

11.3 TEST SETUP



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

11.4 TEST RESULTS

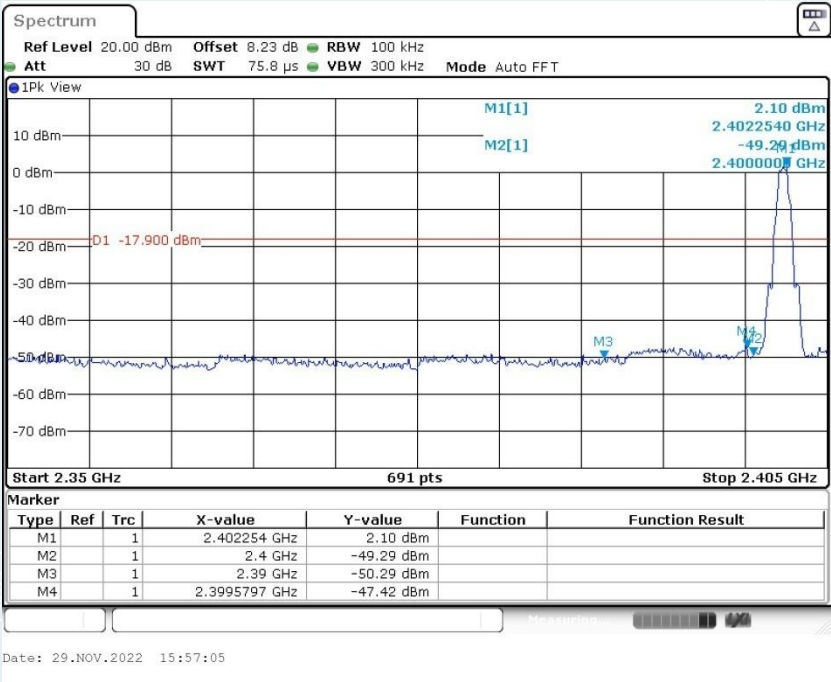
Environment: 25.3°C/56%RH/101.0kPa
Tested By: Qin Tingting

Voltage: DC 5V
Date: 2022-11-29

Band edge measurements

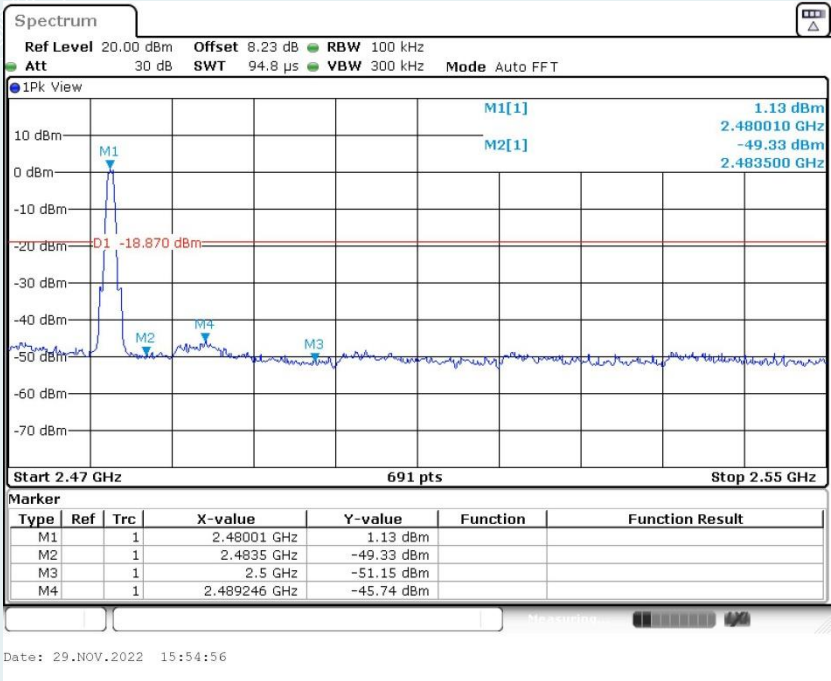
BLE_1M

Lowest Frequency (2402MHz)
2.35GHz-2.405GHz



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

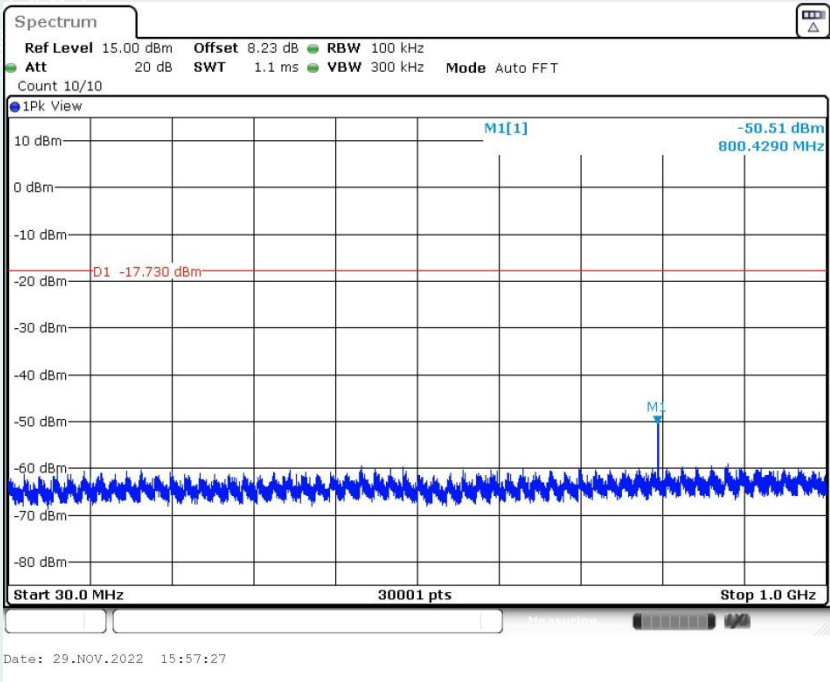
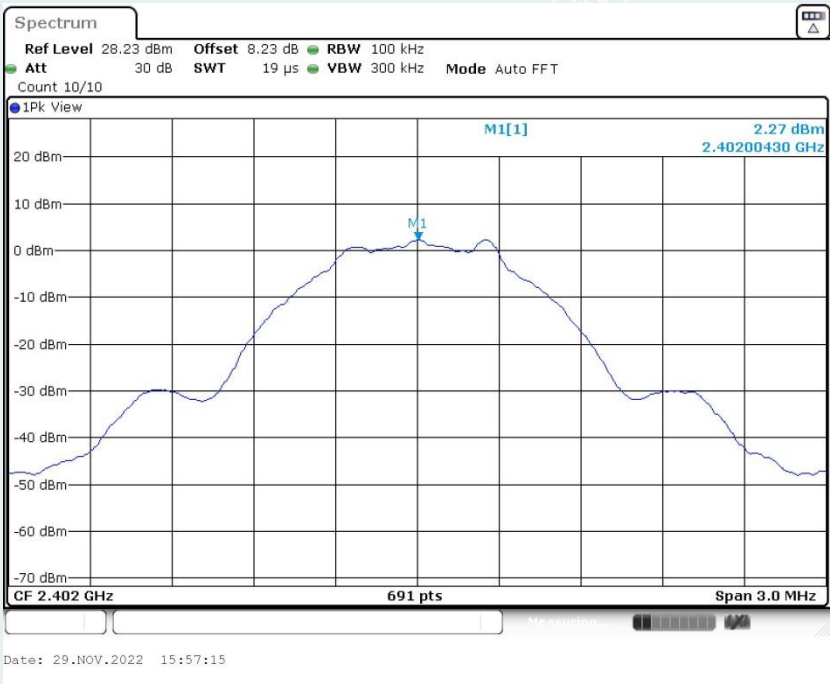
Highest Frequency (2480MHz)
2.47GHz-2.55GHz

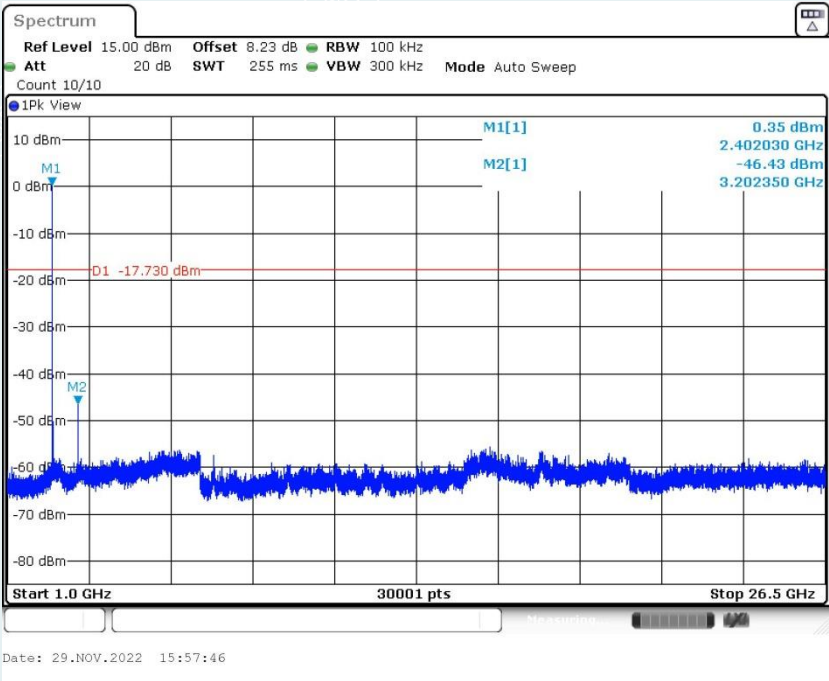


----- The following blanks -----

Conducted Spurious Emission
BLE_1M

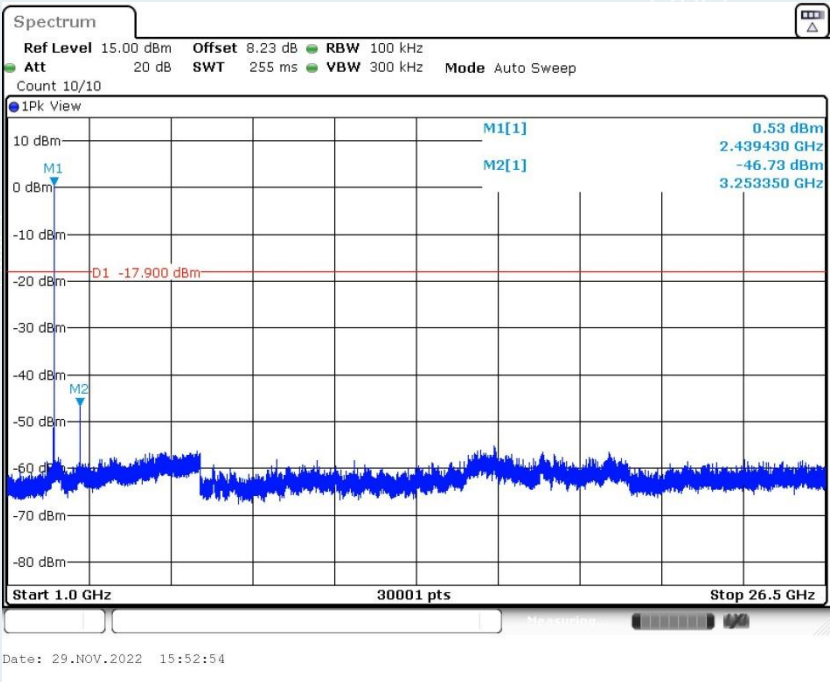
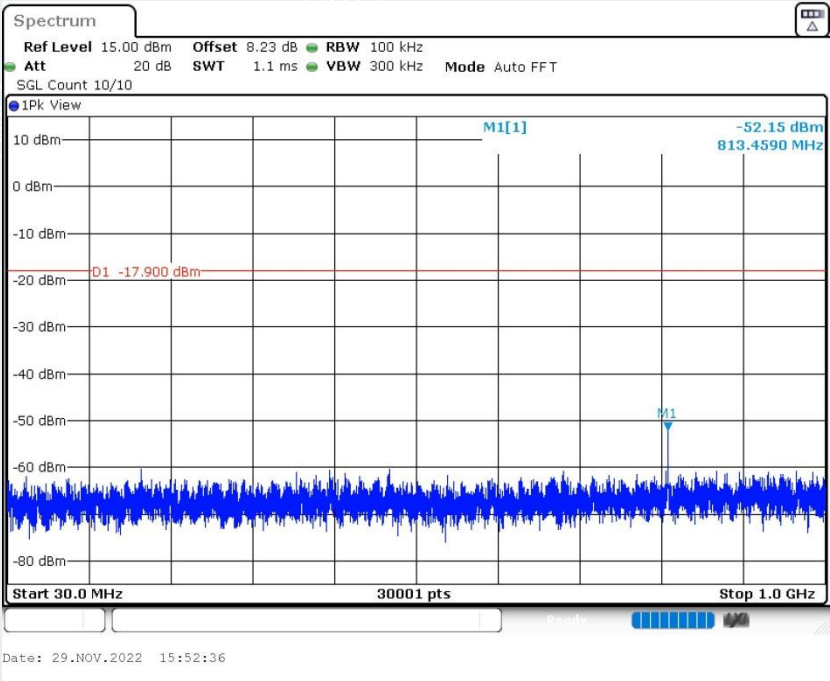
Lowest Frequency (2402MHz)



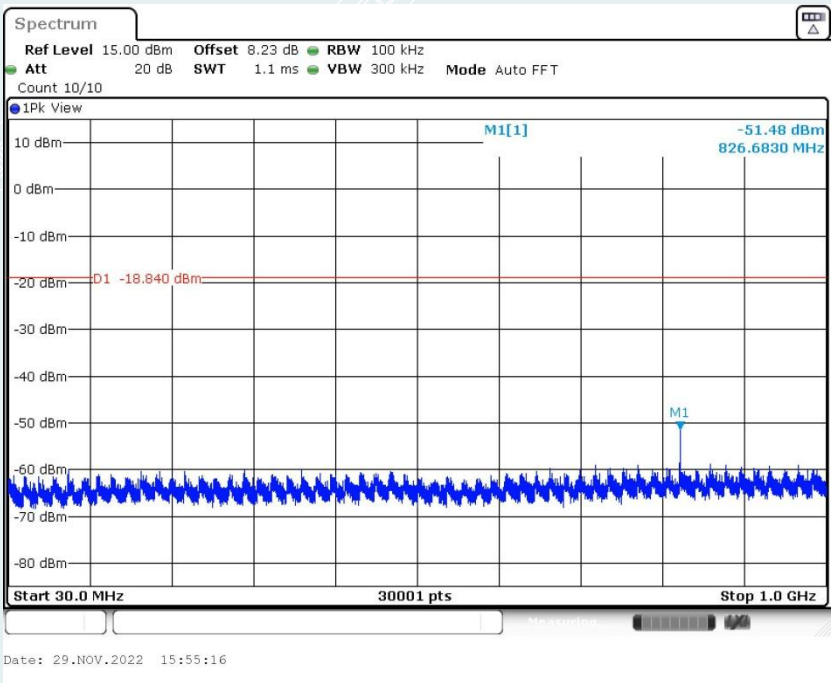


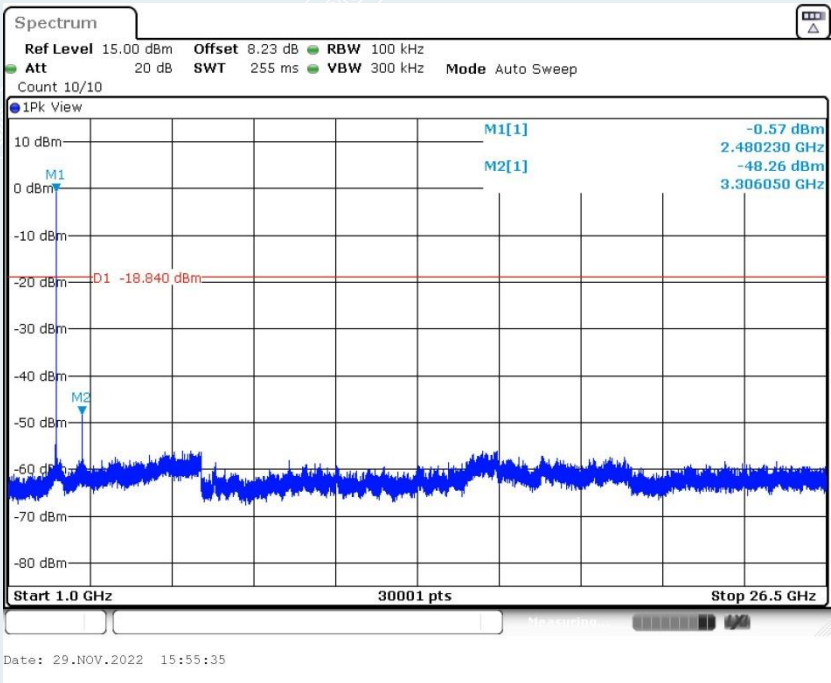
Middle Frequency (2440MHz)





Highest Frequency (2480MHz)





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

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
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

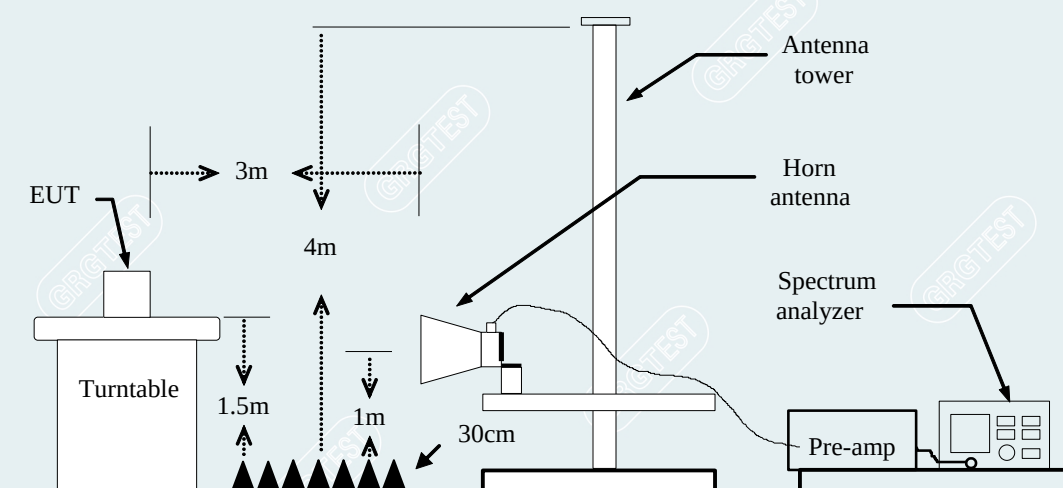
12.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 15.247 Meas Guidance v05r02.

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

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

12.3 TEST SETUP



12.4 TEST RESULTS

According to the user manual, the EUT has two typical installation modes,namely side installation and suction top installation.The two modes have been tested and verified,the worst configuration is the suction top installation mode,which is recorded in this report.

Equipment:	Presence Sensor FP2	Test Date	2022-12-02
Model No.:	PS-S02E	Test Engineer:	Zhang Zishan
Test Voltage:	DC 5V	Environmental Conditions	24.2℃/53%RH/101.0kPa

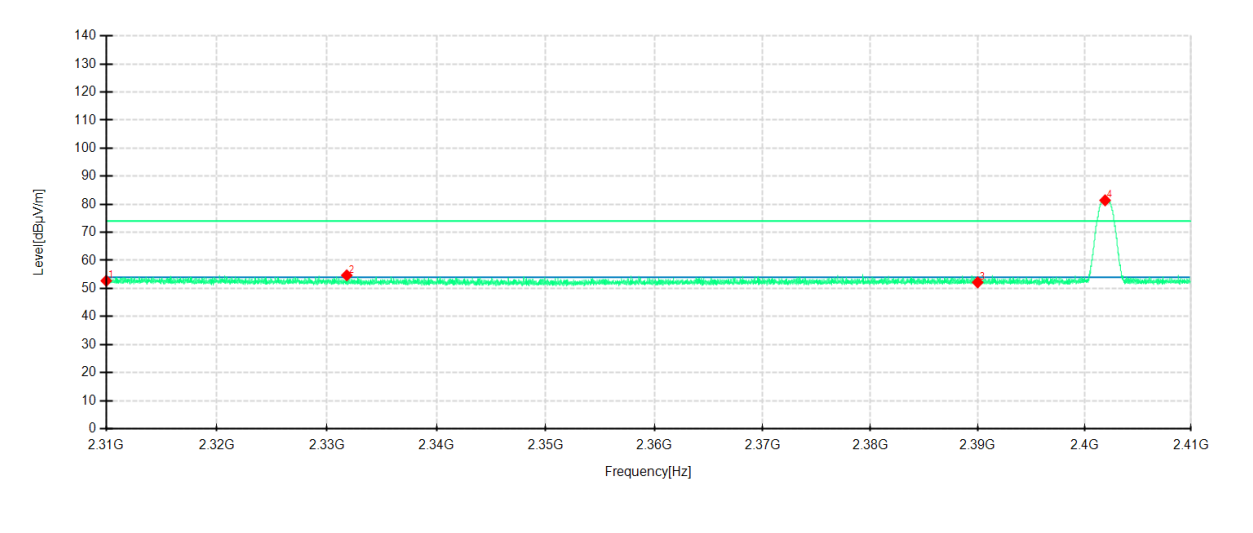
BLE 1M

Lowest Frequency

Frequency 2402MHz

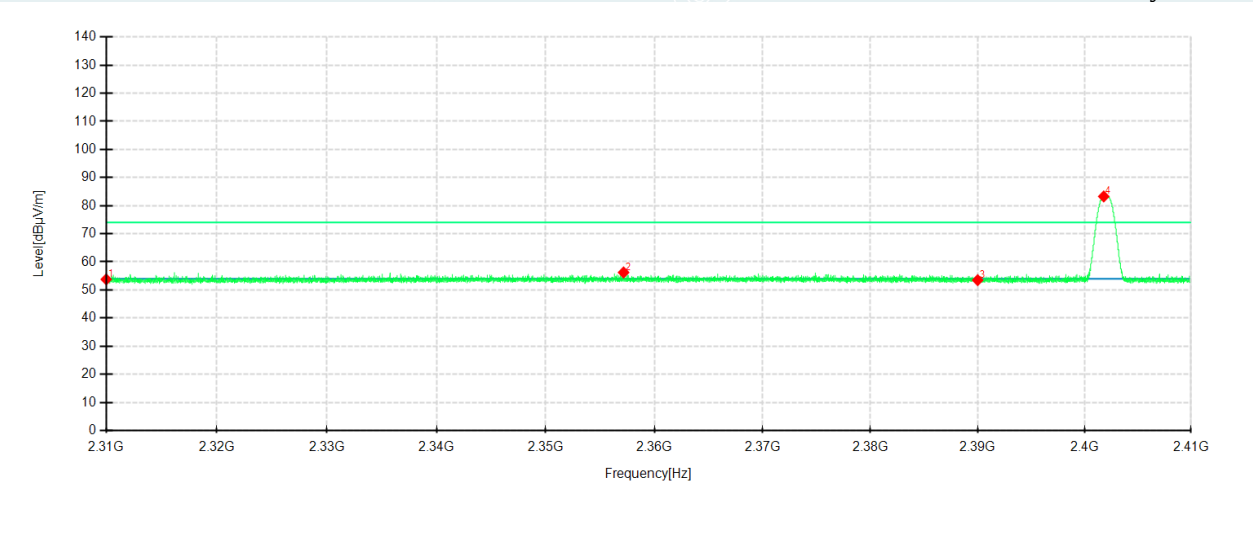
Detector mode: Peak

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	43.38	52.73	9.35	74.00	21.27	200	172	Horizontal	/
2	2331.8122	45.76	54.66	8.90	74.00	19.34	100	44	Horizontal	/
3	2390	43.23	52.16	8.93	74.00	21.84	200	325	Horizontal	/
4	2401.9292	72.37	81.41	9.04	74.00	-7.41	200	234	Horizontal	No limit
1	2310	43.84	53.77	9.93	74.00	20.23	100	184	Vertical	/
2	2357.1647	46.04	56.23	10.19	74.00	17.77	100	174	Vertical	/
3	2390	43.43	53.50	10.07	74.00	20.50	200	46	Vertical	/
4	2401.7992	73.29	83.28	9.99	74.00	-9.28	100	174	Vertical	No limit

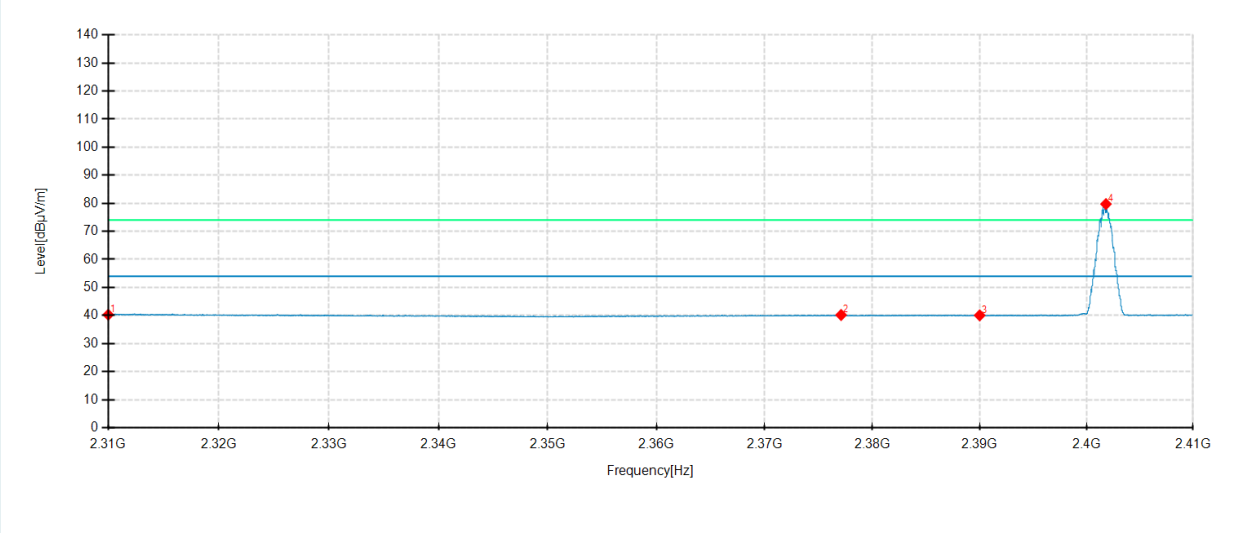
----- The following blanks -----

Lowest Frequency

Frequency 2402MHz

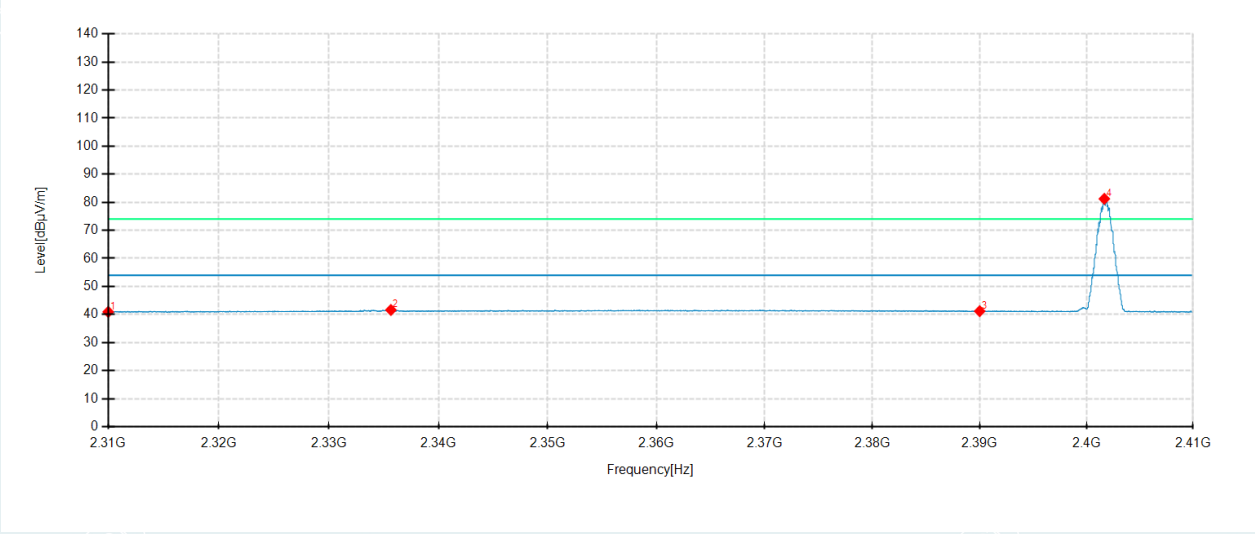
Detector mode: Average

Polarity: Horizontal



Detector mode: Average

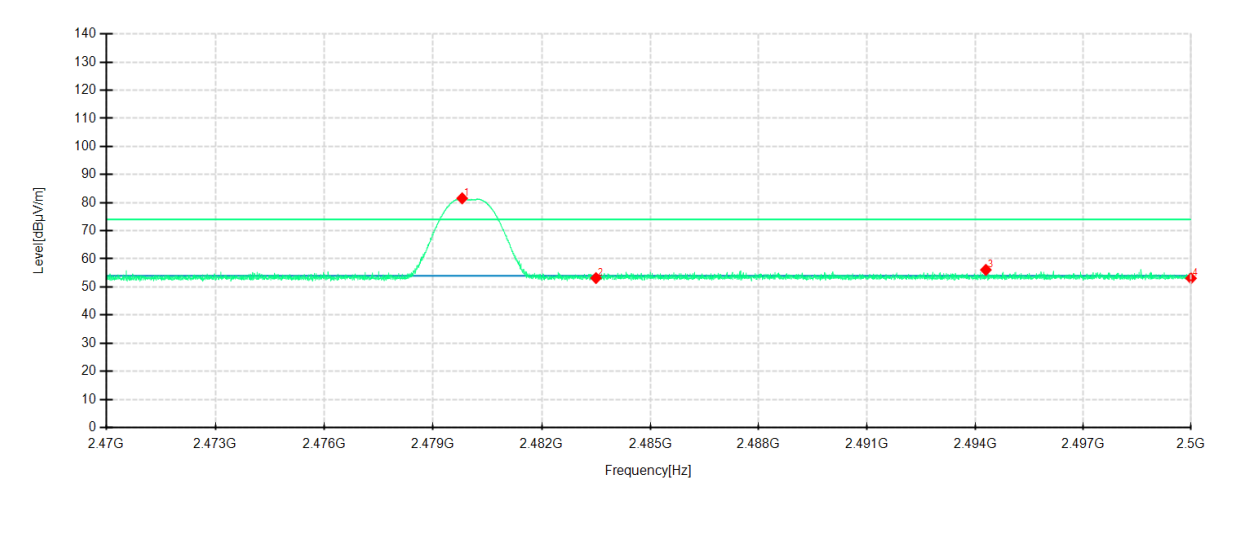
Polarity: Vertical



No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBμV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310	30.91	40.26	9.35	54.00	13.74	200	274	Horizontal	/
2	2377.0967	31.38	40.18	8.80	54.00	13.82	200	172	Horizontal	/
3	2390	31.11	40.04	8.93	54.00	13.96	100	188	Horizontal	/
4	2401.8192	70.70	79.73	9.03	54.00	-25.73	200	232	Horizontal	No limit
1	2310	30.99	40.92	9.93	54.00	13.08	100	284	Vertical	/
2	2335.6526	31.49	41.60	10.11	54.00	12.40	100	244	Vertical	/
3	2390	31.12	41.19	10.07	54.00	12.81	100	345	Vertical	/
4	2401.6692	71.23	81.23	10.00	54.00	-27.23	100	173	Vertical	No limit

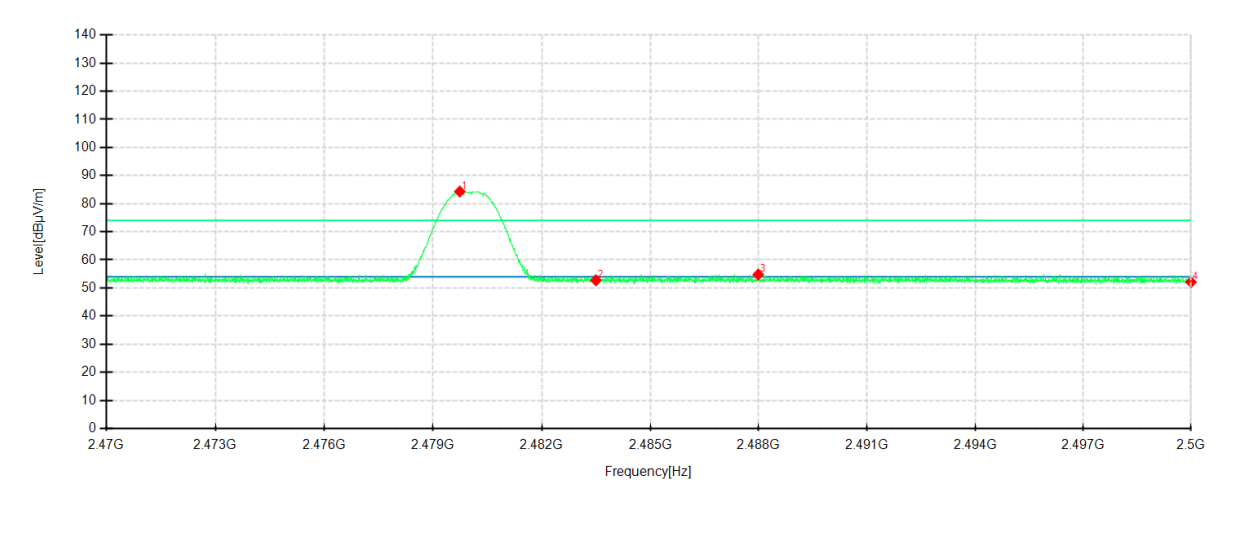
Highest Frequency
Frequency 2480MHz
Detector mode: Peak

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



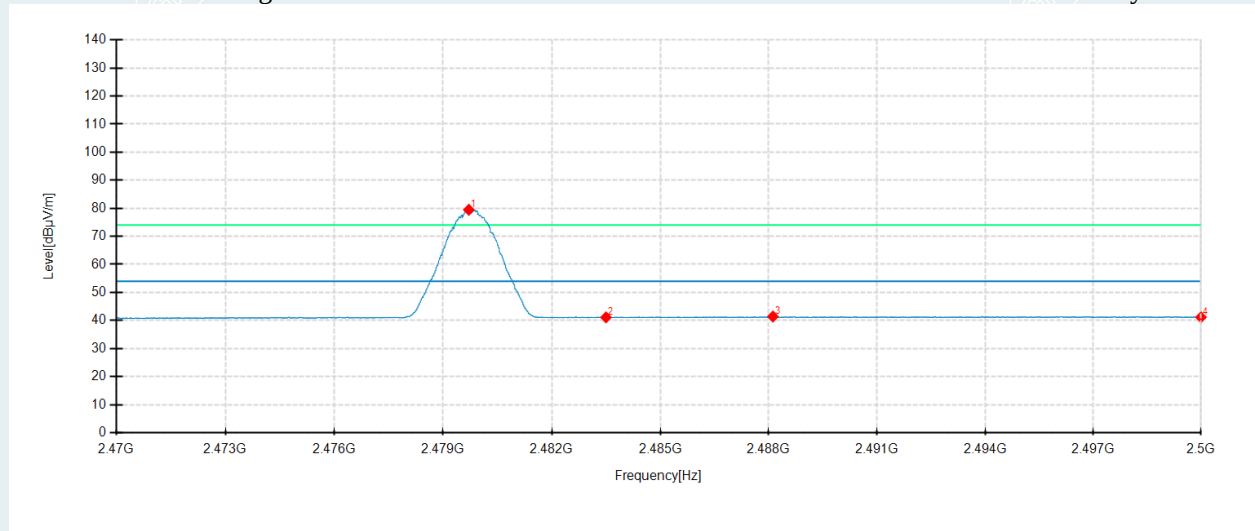
No.	Frequency MHz	Reading dBμV/m	Level dBμV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.803	71.69	81.54	9.85	74.00	-7.54	100	65	Horizontal	No limit
2	2483.5	43.23	53.15	9.92	74.00	20.85	100	188	Horizontal	/
3	2494.2994	45.93	56.07	10.14	74.00	17.93	200	335	Horizontal	/
4	2500	42.84	53.09	10.25	74.00	20.91	200	172	Horizontal	/
1	2479.738	75.05	84.31	9.26	74.00	-10.31	100	172	Vertical	No limit
2	2483.5	43.45	52.73	9.28	74.00	21.27	200	76	Vertical	/
3	2487.9888	45.49	54.79	9.30	74.00	19.21	200	188	Vertical	/
4	2500	42.75	52.10	9.35	74.00	21.90	100	172	Vertical	/

Highest Frequency

Frequency 2480MHz

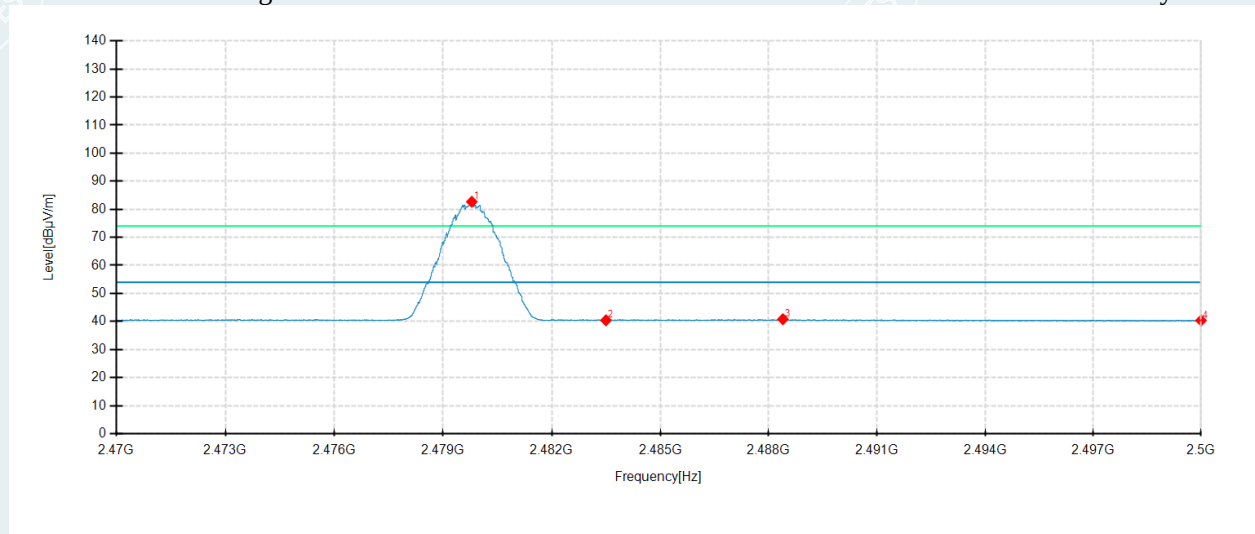
Detector mode: Average

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	2479.713	69.62	79.46	9.84	54.00	-25.46	100	66	Horizontal	No limit
2	2483.5	31.19	41.11	9.92	54.00	12.89	100	188	Horizontal	/
3	2488.1188	31.40	41.41	10.01	54.00	12.59	100	188	Horizontal	/
4	2500	30.91	41.16	10.25	54.00	12.84	200	214	Horizontal	/
1	2479.793	73.42	82.69	9.27	54.00	-28.69	100	172	Vertical	No limit
2	2483.5	31.14	40.42	9.28	54.00	13.58	200	188	Vertical	/
3	2488.3938	31.51	40.81	9.30	54.00	13.19	100	172	Vertical	/
4	2500	31.02	40.37	9.35	54.00	13.63	200	188	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 E20221124437601-10-Test Photo.

APPENDIX B. PHOTOGRAPH OF THE EUT

Please refer to the attached document E20221124437601-11-EUT Photo.

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