



CTC Laboratories, Inc.

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TEST REPORT

Report No.: **CTC2024198601**

FCC ID.....: **2AQ5R-HM-5P**

Applicant.....: **Shenzhen KTC Commercial Display Technology Co.,LTD.**

Address.....: No.4023,Northern Wuhe Road,Bantian Street, Longgang District,Shenzhen City,Guangdong Province,P.R.

Manufacturer.....: Shenzhen Bluesource Electronics Technology Co., Ltd

Address.....: Building 5A1103, Huaqiang IdeaPark, Guangming District, Shenzhen, China

Product Name.....: **Speakerphone**

Trade Mark.....: /

Model/Type reference.....: HM-5P

Listed Model(s): /

Standard.....: **FCC CFR Title 47 Part 15 Subpart C Section 15.247**

Date of receipt of test sample...: Aug. 16, 2024

Date of testing.....: Aug. 16, 2024 ~ Sep. 25, 2024

Date of issue.....: Sep. 25, 2024

Result.....: **PASS**

Compiled by:

(Printed name+signature) Lucy Lan

Supervised by:

(Printed name+signature) Eric Zhang

Approved by:

(Printed name+signature) Totti Zhao

Testing Laboratory Name.....: **CTC Laboratories, Inc.**

Address.....: Room 101 Building B, No. 7, Lanqing 1st Road, Luhua Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China

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1. 7TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version

Revised No.	Report No.	Date of issue	Description
01	CTC2024198601	Sep. 25, 2024	Original



1.3. Test Description

FCC Part 15 Subpart C (15.247)			
Test Item	Standard Section	Result	Test Engineer
	FCC		
Antenna Requirement	15.203	Pass	Alicia Liu
Conducted Emission	15.207	Pass	Cecilia Hu
Conducted Band Edge and Spurious Emissions	15.247(d)	Pass	Alicia Liu
Radiated Band Edge and Spurious Emissions	15.205&15.209&15.247(d)	Pass	Alicia Liu
6dB Bandwidth	15.247(a)(2)	Pass	Alicia Liu
Conducted Max Output Power	15.247(b)(3)	Pass	Alicia Liu
Power Spectral Density	15.247(e)	Pass	Alicia Liu
Transmitter Radiated Spurious	15.209&15.247(d)	Pass	Alicia Liu

Note: The measurement uncertainty is not included in the test result.



1.4. Test Facility

CTC Laboratories, Inc.

Add: Room 101 of Building B, Room 107, 108, 207, 208 of Building A, No. 7, Lanqing 1st Road, Luhua Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 951311, Aug 26, 2017.

1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.





Test Items	Measurement Uncertainty	Notes
RF output power	± 1.24 dB	(1)
Power Spectral Density	± 1.88 dB	(1)
Duty Cycle	± 0.566 dB	(1)
Tx-sequence	± 0.566 dB	(1)
Tx-gap	± 0.566 dB	(1)
Medium Utilization (MU) factor	± 0.566 dB	(1)
Dwell time	$\pm 0.028\%$	(1)
Minimum Frequency Occupation	$\pm 0.028\%$	(1)
Hopping Sequence	$\pm 1.9\%$	(1)
Hopping Frequency Separation	$\pm 1.9\%$	(1)
Occupied Channel Bandwidth	$\pm 0.0196\%$	(1)
Transmitter unwanted emissions in the out-of-band domain	± 1.328 dB	(1)
Transmitter unwanted emissions in the spurious domain	30MHz~1GHz: ± 0.746 dB 1GHz~12.75GHz: ± 1.328 dB	(1)
Receiver spurious emissions	30MHz~1GHz: ± 0.746 dB 1GHz~12.75GHz: ± 1.328 dB	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	21°C ~ 27°C
Relative Humidity:	40% ~ 60%
Air Pressure:	101kPa



2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Shenzhen KTC Commercial Display Technology Co.,LTD.
Address:	No.4023,Northern Wuhe Road,Bantian Street, Longgang District,Shenzhen City,Guangdong Province,P.R.
Manufacturer:	Shenzhen Bluesource Electronics Technology Co., Ltd
Address:	Building 5A1103, Huaqiang IdeaPark, Guangming District, Shenzhen, China

2.2. General Description of EUT

Product Name:	Speakerphone
Trade Mark:	/
Model/Type reference:	HM-5P
Listed Model(s):	/
Model Difference:	/
Power supply:	DC 5V 1A
Hardware version:	/
Software version:	/
BT 5.0/ BLE	
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	40
Channel separation:	2MHz
Data rate:	1Mbps, 2Mbps
Antenna type:	PCB Antenna
Antenna gain:	1.72dBi

Note: The EUT contains two Bluetooth modules with the same PCB, layout and electrical circuit. At the same power level, the power of module 2 is higher than that of module 1, so module 2 is selected for all tests. So, this report only records the test data of one module (Bluetooth modules 2).



2.3. Accessory Equipment information

Equipment Information			
Name	Model	S/N	Manufacturer
Notebook	ThinkBook 14 G3 ACL	/	Lenovo
USB TO TTL	/	/	/
Adapter	A1443	---	Apple
Cable Information			
Name	Shielded Type	Ferrite Core	Length
USB Cable	Without	Without	1M
Test Software Information			
Name	/	/	/
FCC assist	1.0.2.2	/	/



2.4. Operation state

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BT BLE, 40 channels are provided to the EUT. Channels 00/19/39 were selected for testing. Operation Frequency List:

Channel	Frequency (MHz)
00	2402
01	2404
:	:
18	2438
19	2440
20	2442
:	:
38	2478
39	2480

Note: The display in grey were the channel selected for testing.

Test mode

For RF test items:
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.



2.5. Measurement Instruments List

RF Test System - SRD					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	Keysight	N9020A	MY52091402	Aug. 21, 2025
2	USB Wideband Power Sensor	Keysight	U2021XA	MY55130004	Mar. 21 2025
3	USB Wideband Power Sensor	Keysight	U2021XA	MY55130006	Mar. 21 2025
4	Test Software	Tonscend	JS1120-3	V3.3.38	/

Radiated emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9163	01026	Dec. 18, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Sep. 25, 2025
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 12, 2024
4	Broadband Amplifier	SCHWARZBECK	BBV9743B	259	Dec. 12, 2024
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 12, 2024
6	3m chamber 3	YIHENG	EE106	/	Aug. 28, 2026
7	Test Software	FARA	EZ-EMC	FA-03A2	/

Conducted emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Dec. 12, 2024
2	LISN	R&S	ENV216	101113	Dec. 12, 2024
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 12, 2024
4	ISN CAT6	Schwarzbeck	NTFM 8158	CAT6-8158-0046	Dec. 12, 2024
5	ISN CAT5	Schwarzbeck	NTFM 8158	CAT5-8158-0046	Dec. 12, 2024
6	Test Software	R&S	EMC32	6.10.10	/

Note:1. The Cal. Interval was one year.

2. The cable loss has calculated in test result which connection between each test instruments.

3. TEST ITEM AND RESULTS

3.1. Conducted Emission

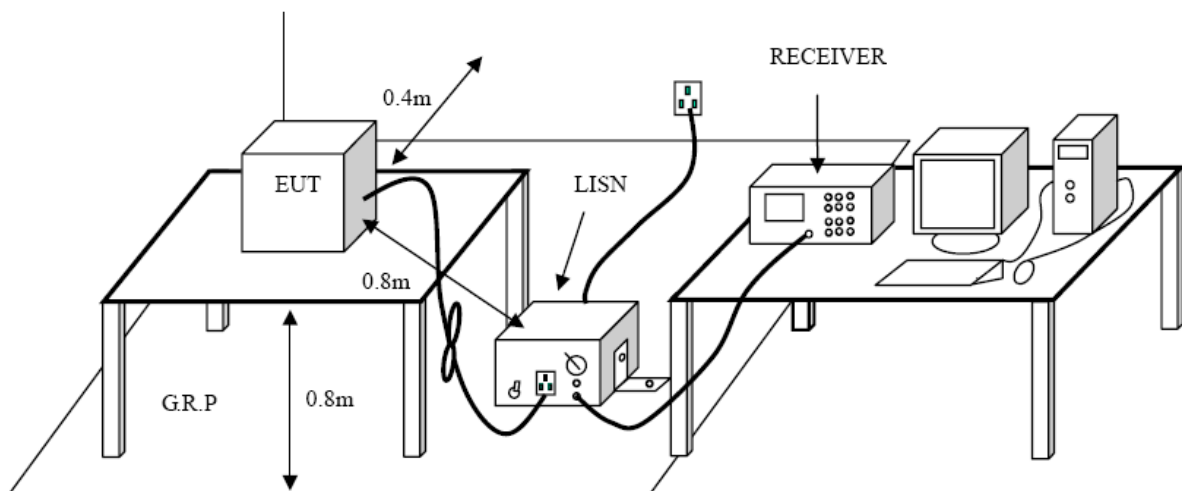
Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Configuration

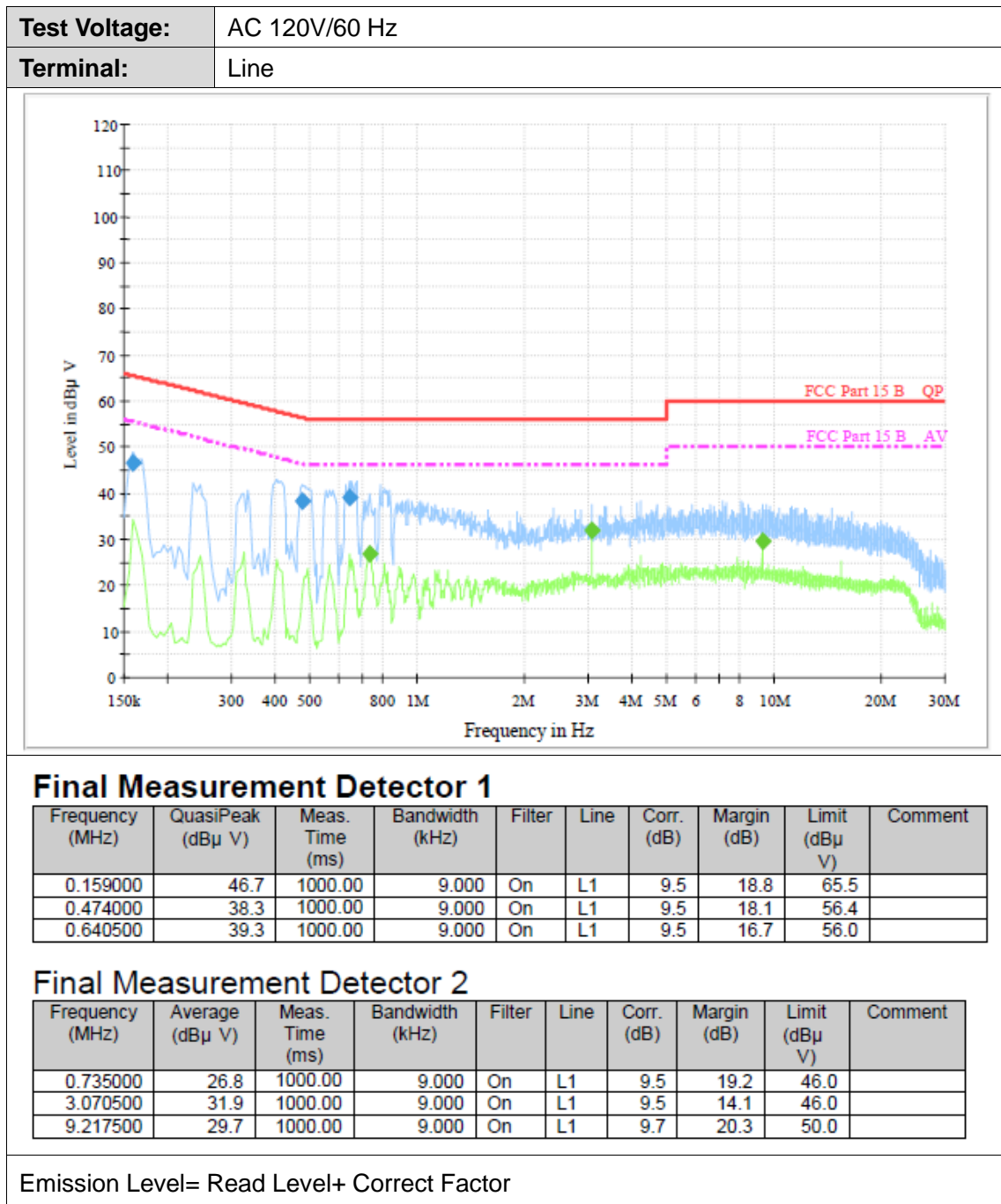


Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

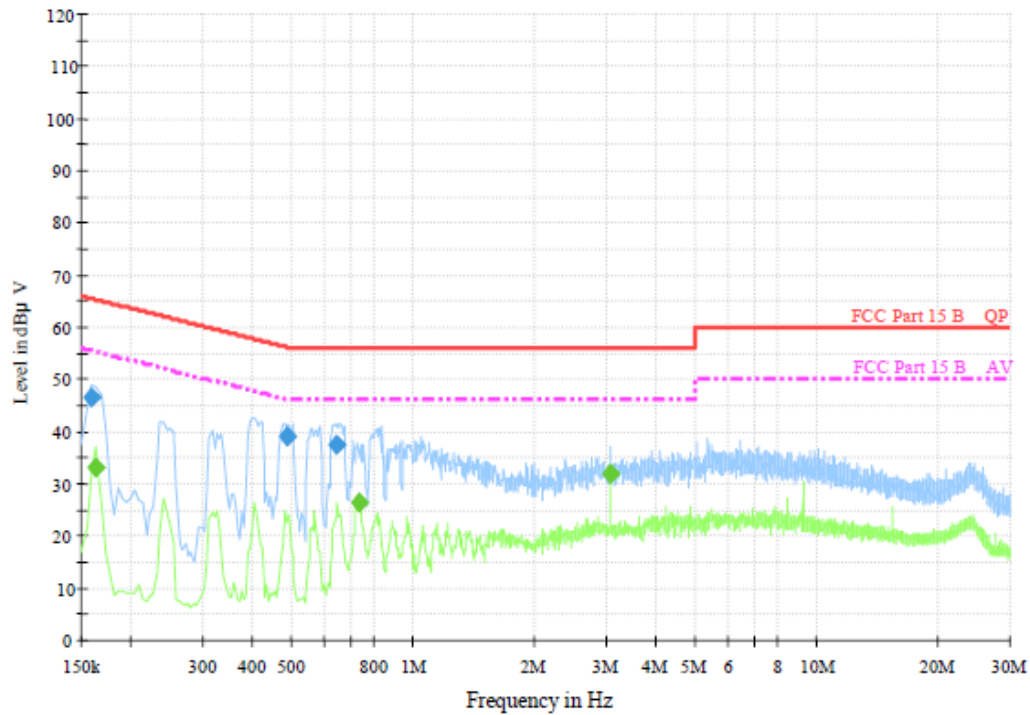
**Test Mode:**

Please refer to the clause 2.4.

Test Results



Test Voltage:	AC 120V/60 Hz
Terminal:	Neutral



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBu V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBu V)	Comment
0.159000	46.7	1000.00	9.000	On	N	9.5	18.8	65.5	
0.487500	39.0	1000.00	9.000	On	N	9.4	17.2	56.2	
0.645000	37.5	1000.00	9.000	On	N	9.4	18.5	56.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBu V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBu V)	Comment
0.163500	33.1	1000.00	9.000	On	N	9.5	22.2	55.3	
0.735000	26.3	1000.00	9.000	On	N	9.4	19.7	46.0	
3.070500	32.0	1000.00	9.000	On	N	9.4	14.0	46.0	

Emission Level= Read Level+ Correct Factor

3.2. Radiated Emission

Limit

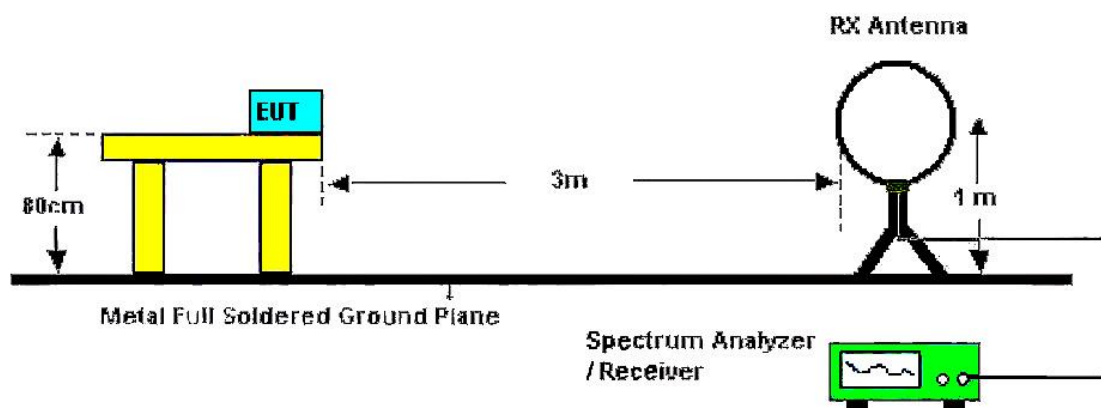
FCC CFR Title 47 Part 15 Subpart C Section 15.209

Frequency	Limit (dBuV/m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

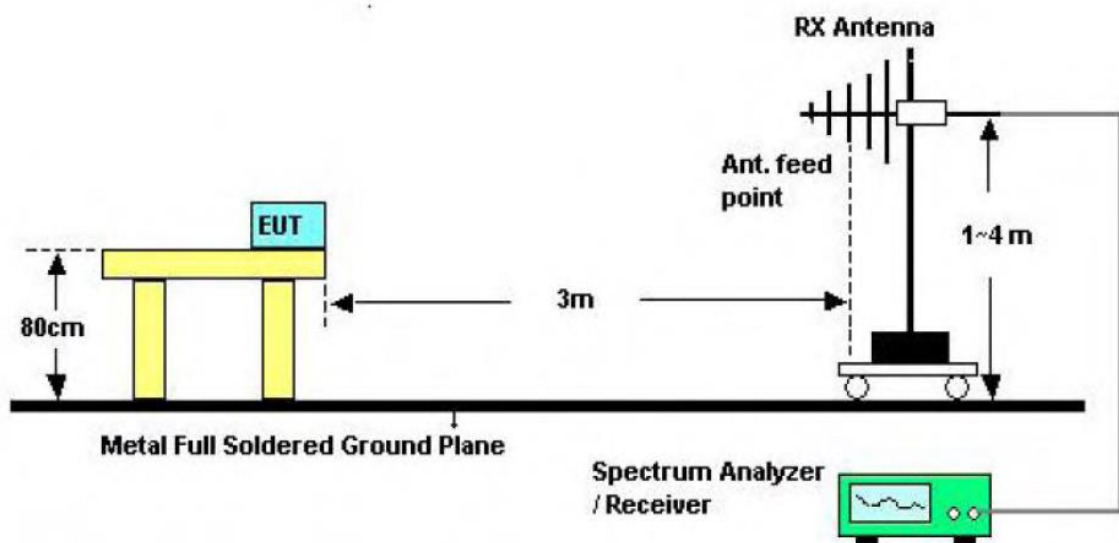
Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

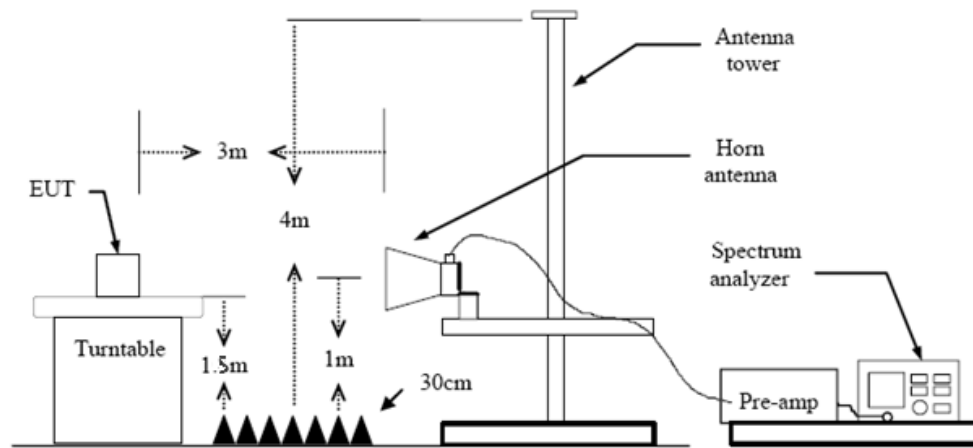
Test Configuration



Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013
 2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
 5. Set to the maximum power setting and enable the EUT transmit continuously.
 6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW \geq 1/T Peak detector for Average value.
- Note 1: For the 1/T& Duty Cycle please refer to clause 3.8 Duty Cycle.

Test Mode

Please refer to the clause 2.4.

Test Result

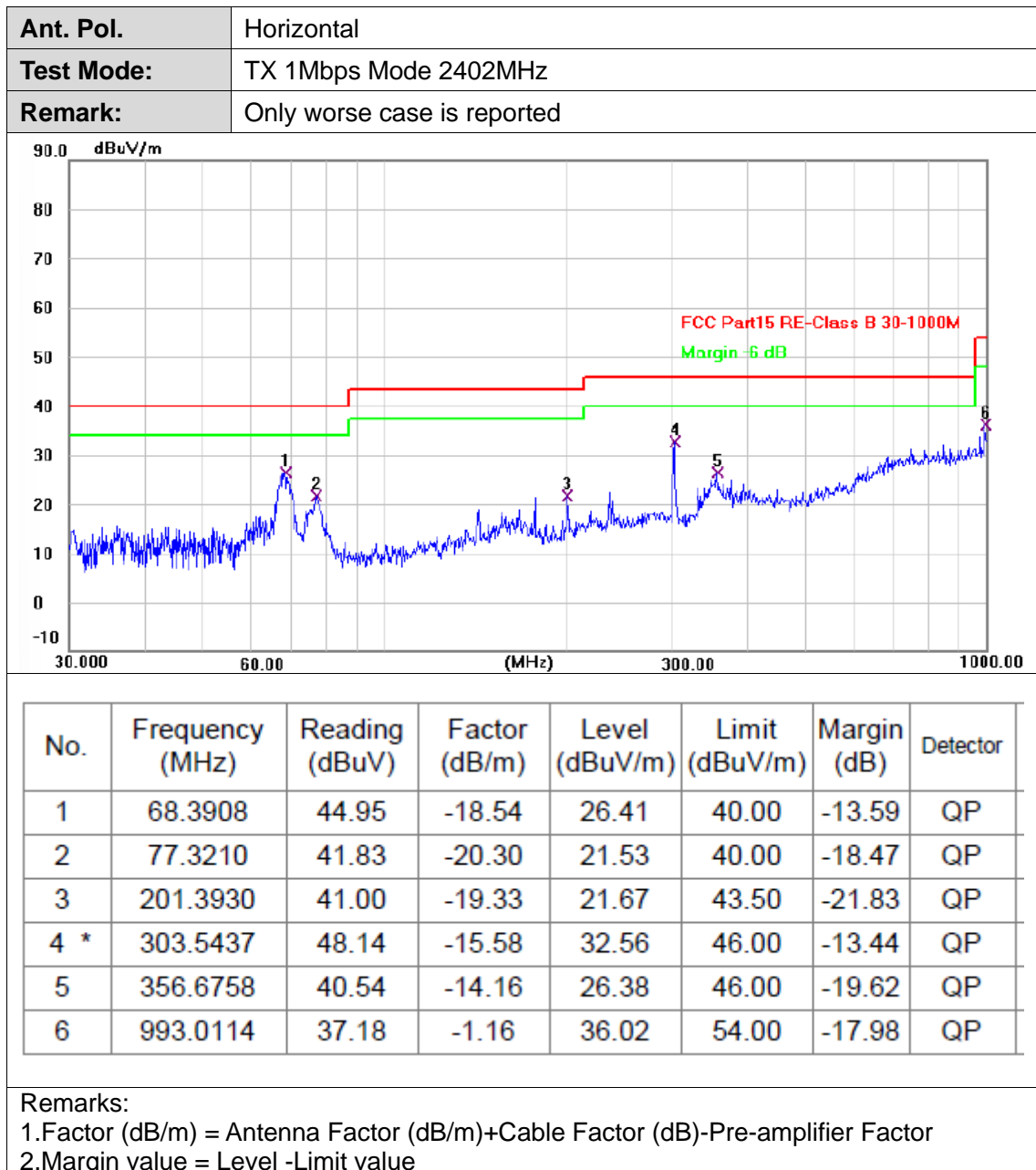
9 KHz~30 MHz

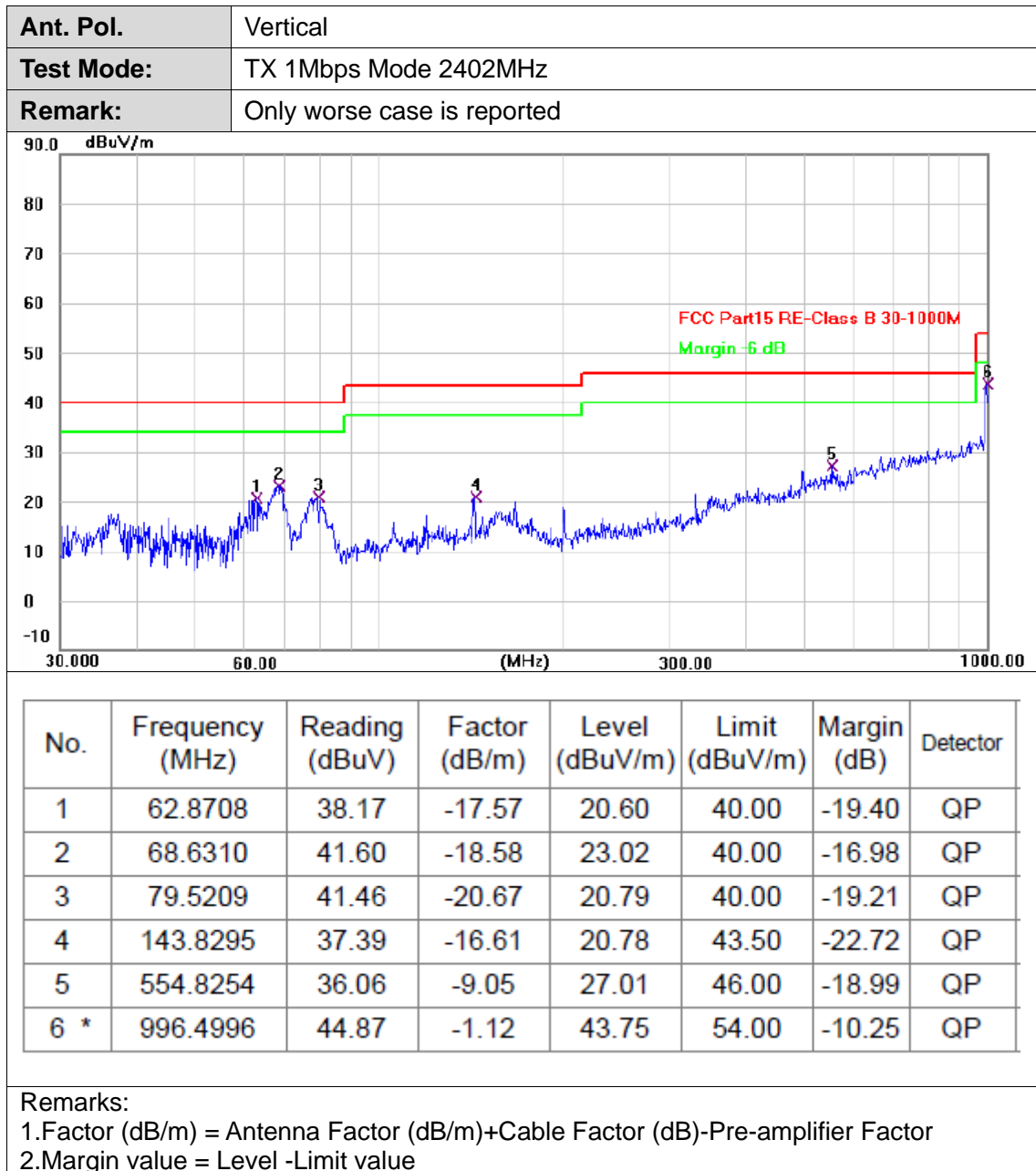
From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



30MHz-1GHz







Above 1GHz (Bluetooth modules 1 Test Results)

Ant. Pol.	Horizontal						
Test Mode:	TX BLE 1Mbps Mode 2402MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	4803.538	38.08	2.00	40.08	74.00	-33.92	peak
2 *	4804.055	27.41	2.00	29.41	54.00	-24.59	AVG
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical						
Test Mode:	TX BLE 1Mbps Mode 2402MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	4803.606	38.59	2.00	40.59	74.00	-33.41	peak
2 *	4804.169	27.08	2.00	29.08	54.00	-24.92	AVG
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 1Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4880.101	27.49	2.09	29.58	54.00	-24.42	AVG
2	4880.347	40.25	2.09	42.34	74.00	-31.66	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical						
Test Mode:	TX BLE 1Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4879.171	27.34	2.09	29.43	54.00	-24.57	AVG
2	4880.341	39.42	2.09	41.51	74.00	-32.49	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 1Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4959.070	27.58	2.21	29.79	54.00	-24.21	AVG
2	4959.517	39.33	2.21	41.54	74.00	-32.46	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical						
Test Mode:	TX BLE 1Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4959.721	27.52	2.21	29.73	54.00	-24.27	AVG
2	4960.117	41.23	2.21	43.44	74.00	-30.56	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 2Mbps Mode 2402MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4804.035	27.48	2.00	29.48	54.00	-24.52	AVG
2	4804.235	38.17	2.00	40.17	74.00	-33.83	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical
Test Mode:	TX BLE 2Mbps Mode 2402MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	4803.799	38.85	2.00	40.85	74.00	-33.15	peak
2 *	4803.973	27.27	2.00	29.27	54.00	-24.73	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



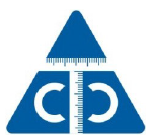
Ant. Pol.	Horizontal						
Test Mode:	TX BLE 2Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4881.203	27.18	2.09	29.27	54.00	-24.73	AVG
2	4882.529	39.32	2.09	41.41	74.00	-32.59	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical						
Test Mode:	TX BLE 2Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4879.972	27.16	2.09	29.25	54.00	-24.75	AVG
2	4880.199	39.71	2.09	41.80	74.00	-32.20	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 2Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4959.196	27.68	2.21	29.89	54.00	-24.11	AVG
2	4960.120	39.16	2.21	41.37	74.00	-32.63	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical						
Test Mode:	TX BLE 2Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4959.325	27.51	2.21	29.72	54.00	-24.28	AVG
2	4960.650	39.90	2.21	42.11	74.00	-31.89	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Above 1GHz (Bluetooth modules 2 Test Results)

Ant. Pol.	Horizontal						
Test Mode:	TX BLE 1Mbps Mode 2402MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	4803.740	39.86	2.00	41.86	74.00	-32.14	peak
2 *	4804.025	28.91	2.00	30.91	54.00	-23.09	AVG
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical
Test Mode:	TX BLE 1Mbps Mode 2402MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 1Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4879.763	28.49	2.09	30.58	54.00	-23.42	AVG
2	4880.377	39.13	2.09	41.22	74.00	-32.78	peak

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol.	Vertical						
Test Mode:	TX BLE 1Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4880.335	-6.19	36.71	30.52	54.00	-23.48	AVG
2	4880.499	5.70	36.71	42.41	74.00	-31.59	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 1Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

Ant. Pol.	Vertical						
Test Mode:	TX BLE 1Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	4960.005	5.28	36.88	42.16	74.00	-31.84	peak
2 *	4960.173	-6.50	36.88	30.38	54.00	-23.62	AVG
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 2Mbps Mode 2402MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	4803.697	39.87	2.00	41.87	74.00	-32.13	peak
2 *	4803.961	28.94	2.00	30.94	54.00	-23.06	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

Ant. Pol.	Vertical						
Test Mode:	TX BLE 2Mbps Mode 2402MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4804.076	-5.97	36.56	30.59	54.00	-23.41	AVG
2	4804.232	5.44	36.56	42.00	74.00	-32.00	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 2Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4879.933	28.45	2.09	30.54	54.00	-23.46	AVG
2	4880.398	40.34	2.09	42.43	74.00	-31.57	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical						
Test Mode:	TX BLE 2Mbps Mode 2440MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4880.216	-6.16	36.71	30.55	54.00	-23.45	AVG
2	4880.452	5.32	36.71	42.03	74.00	-31.97	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							



Ant. Pol.	Horizontal						
Test Mode:	TX BLE 2Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4960.220	28.16	2.21	30.37	54.00	-23.63	AVG
2	4960.260	39.05	2.21	41.26	74.00	-32.74	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

Ant. Pol.	Vertical						
Test Mode:	TX BLE 2Mbps Mode 2480MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	4959.807	-6.57	36.88	30.31	54.00	-23.69	AVG
2	4960.046	4.63	36.88	41.51	74.00	-32.49	peak
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value							

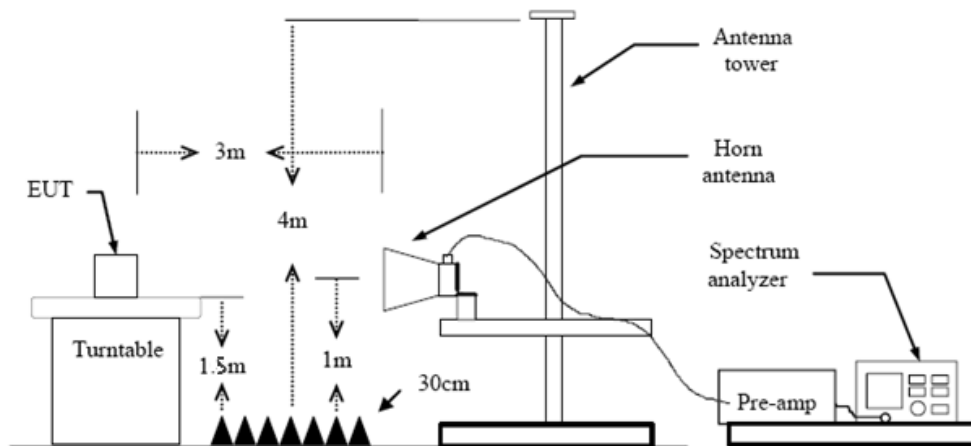
3.3. Band Edge Emissions (Radiated)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

Restricted Frequency Band (MHz)	(dBuV/m)(at 3m)	
	Peak	Average
2310 ~ 2390	74	54
2483.5 ~ 2500	74	54

Test Configuration



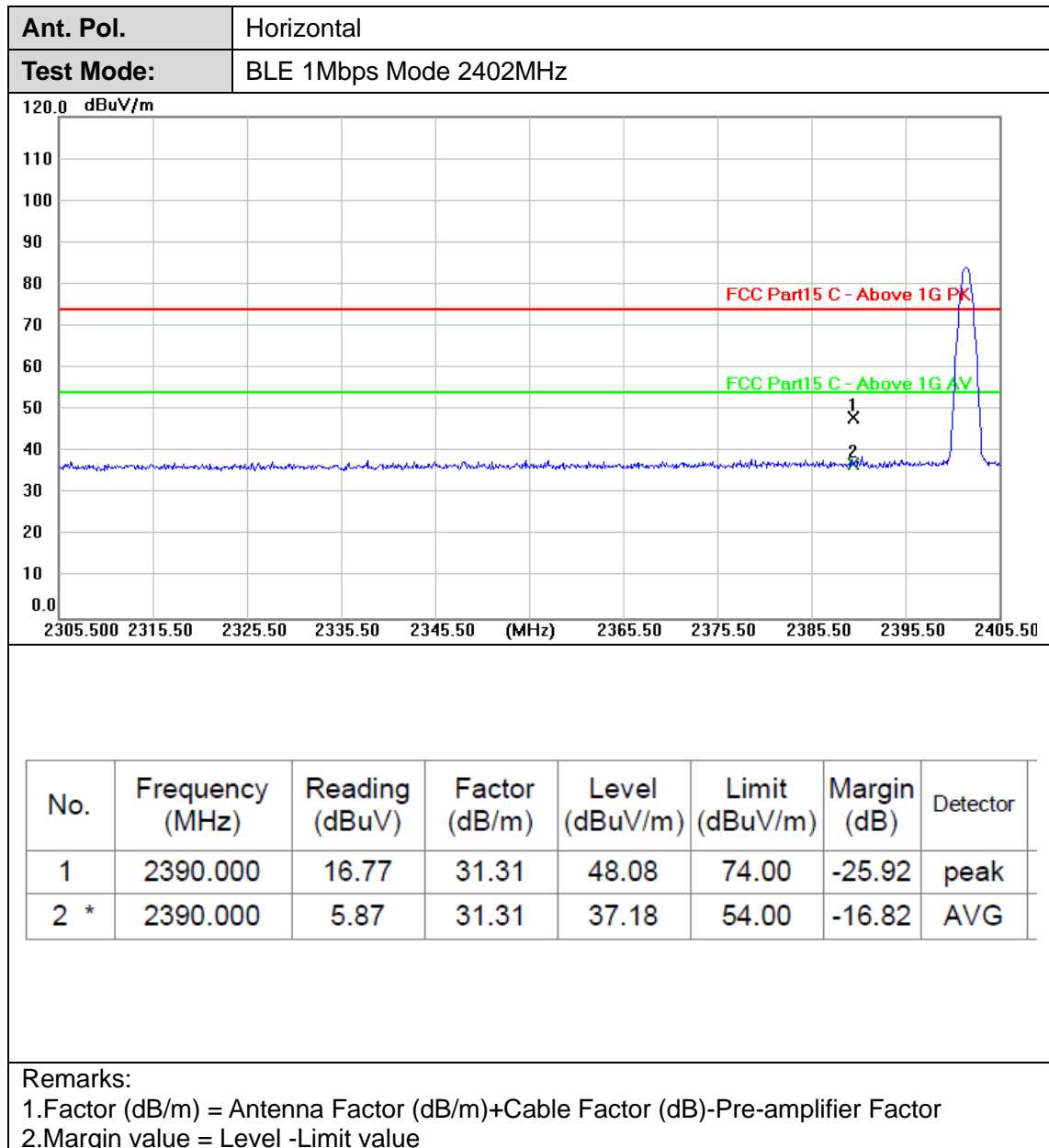
Test Procedure

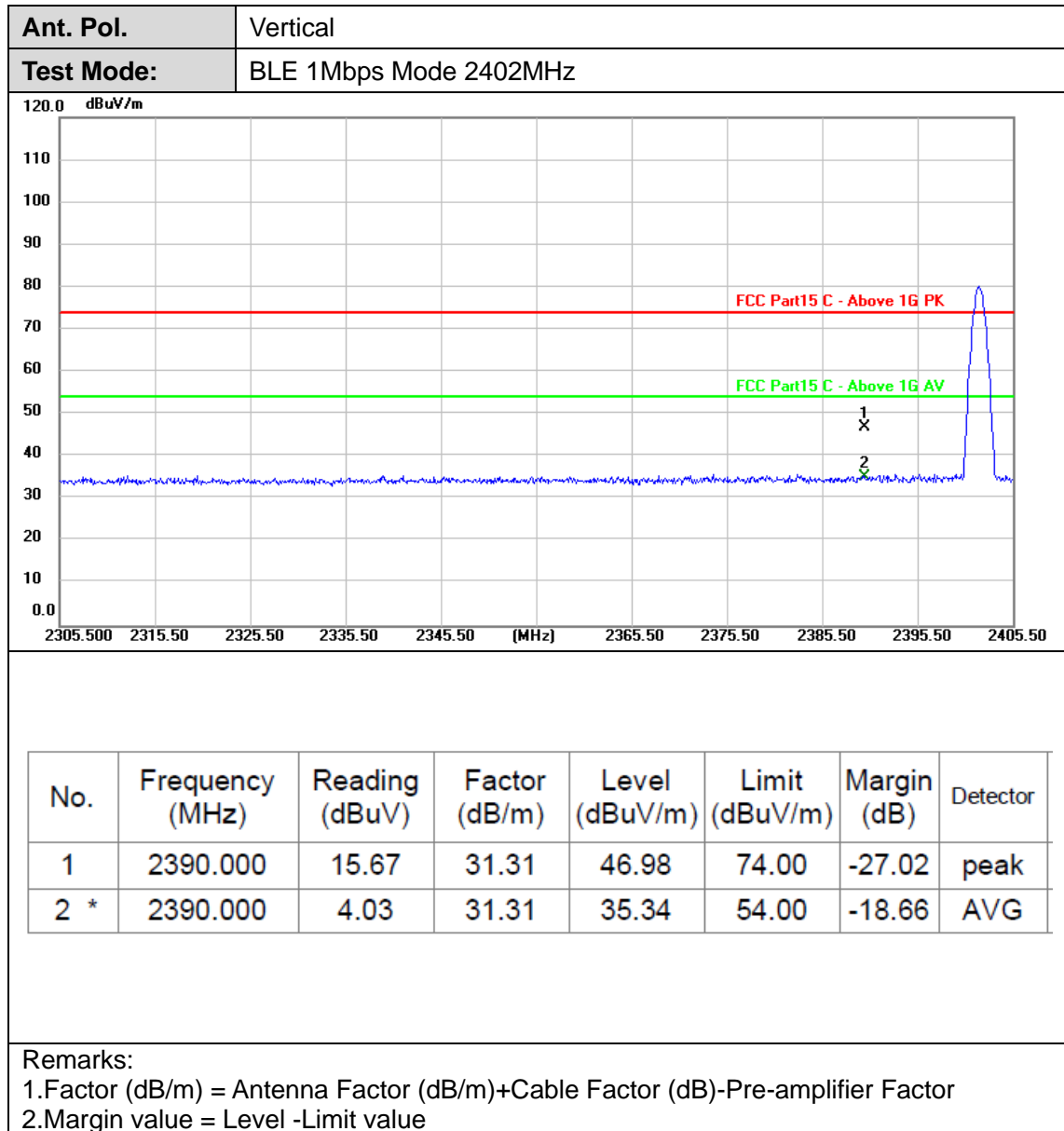
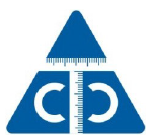
1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

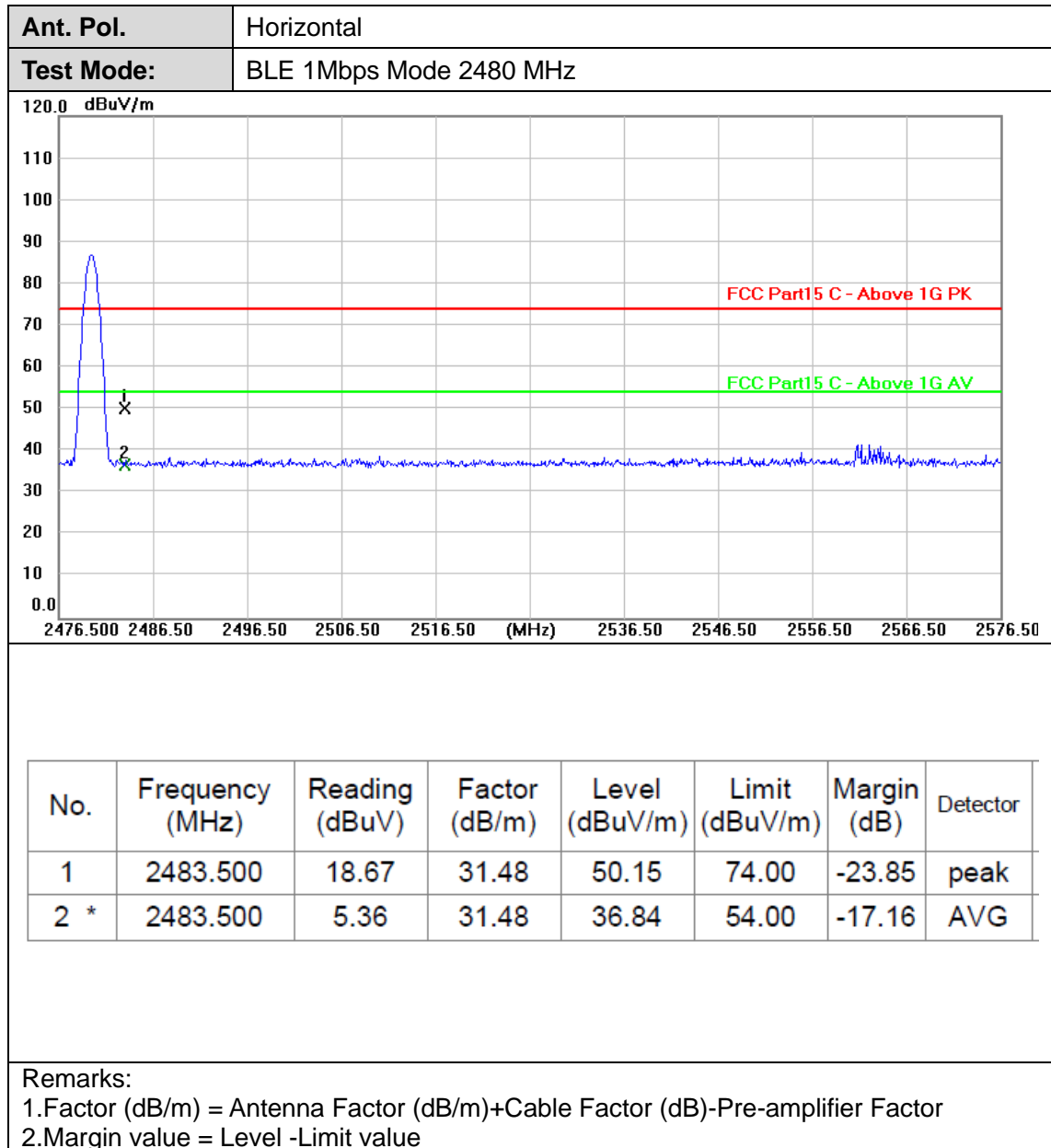
Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.8 Duty Cycle.

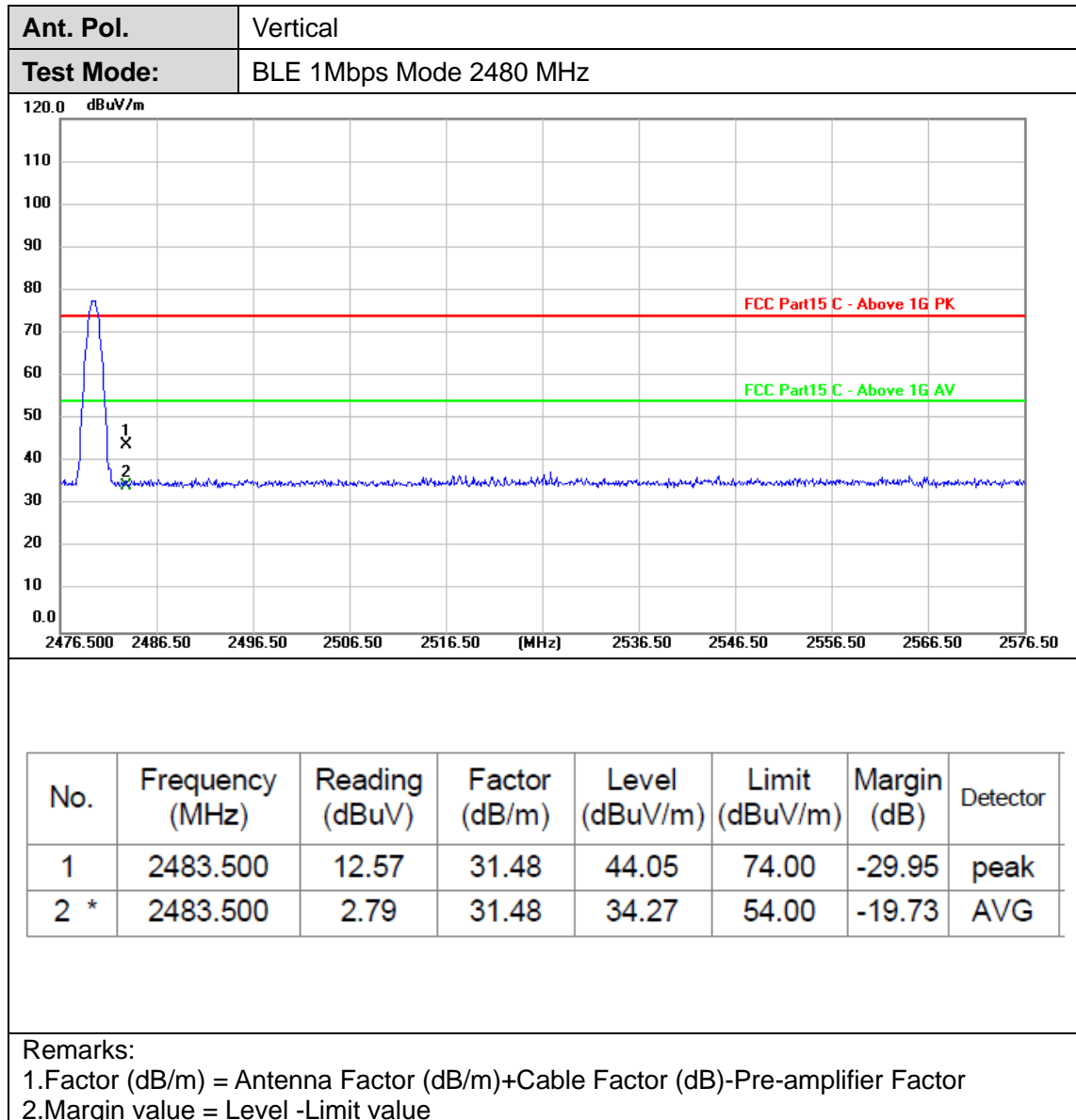
Test Mode

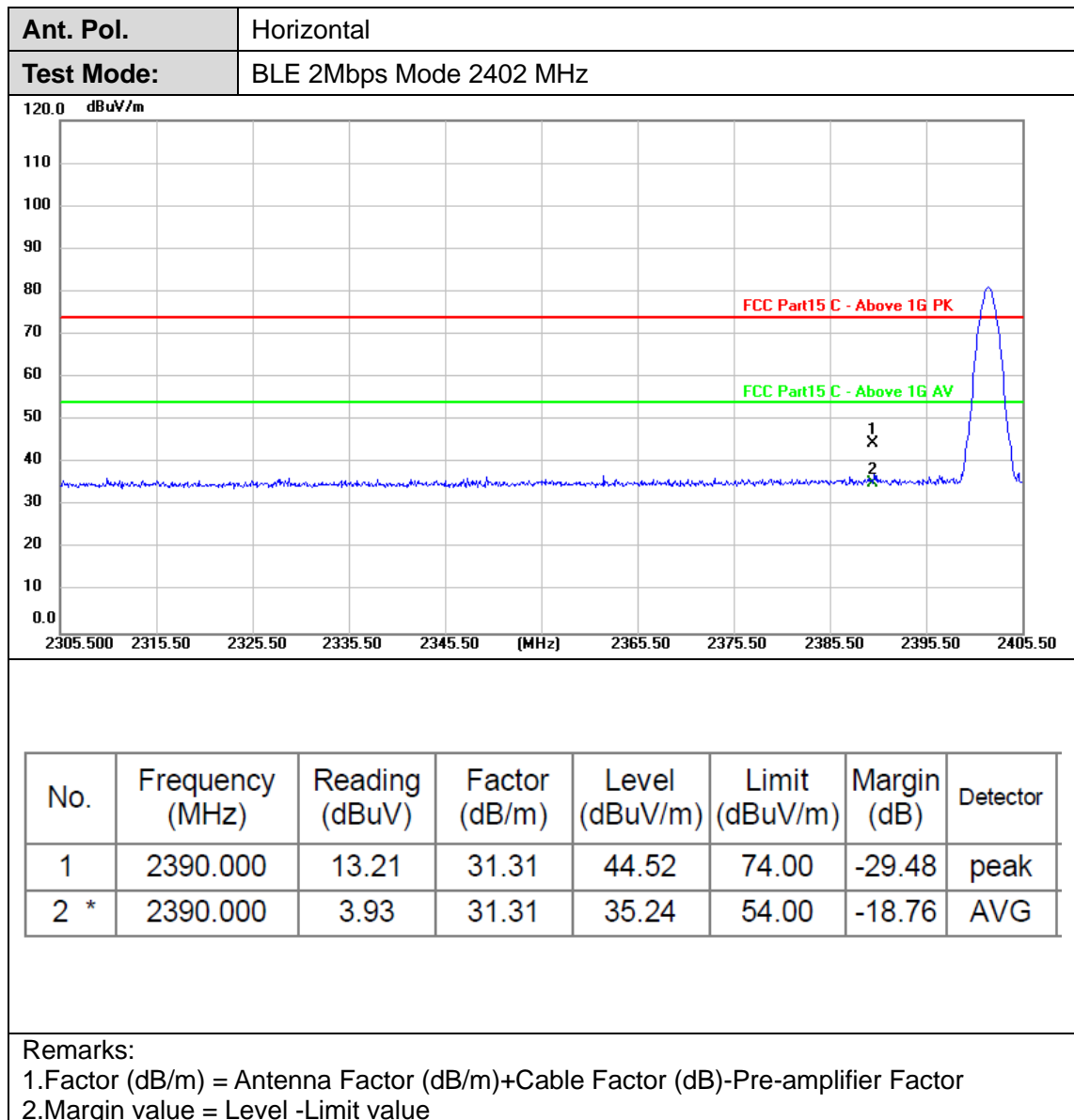
Please refer to the clause 2.4.

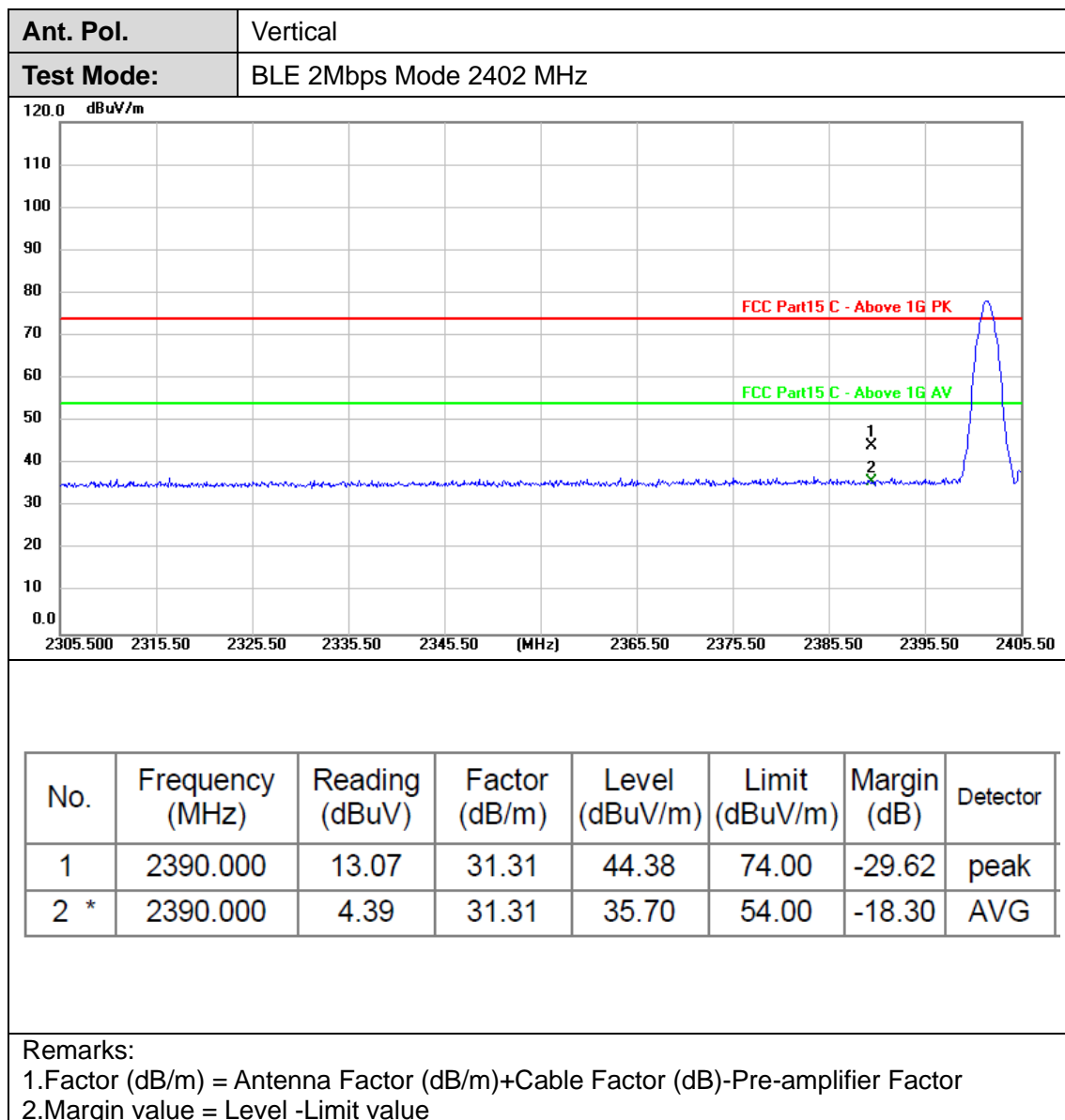
**Bluetooth modules 1 Test Results**

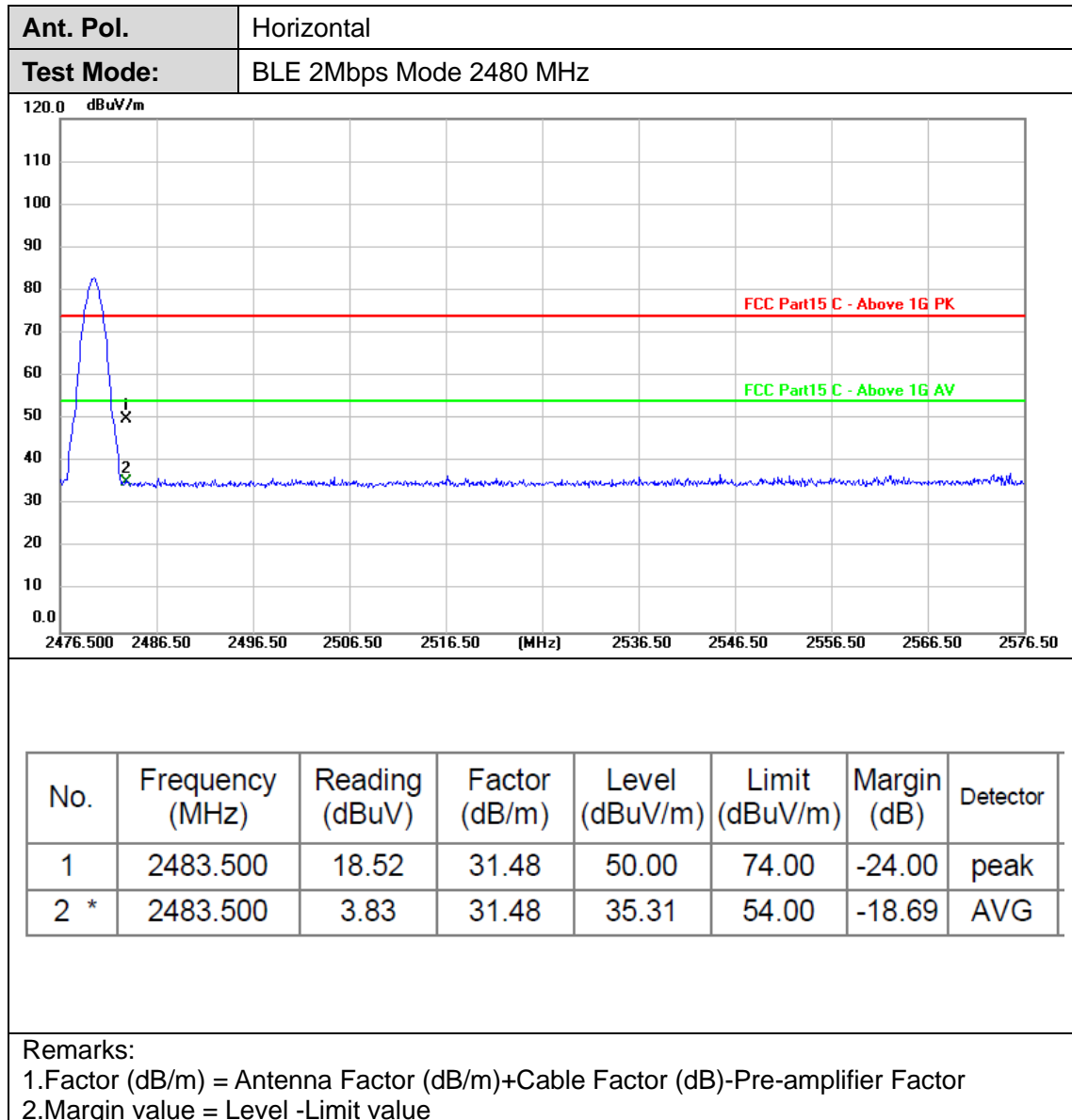


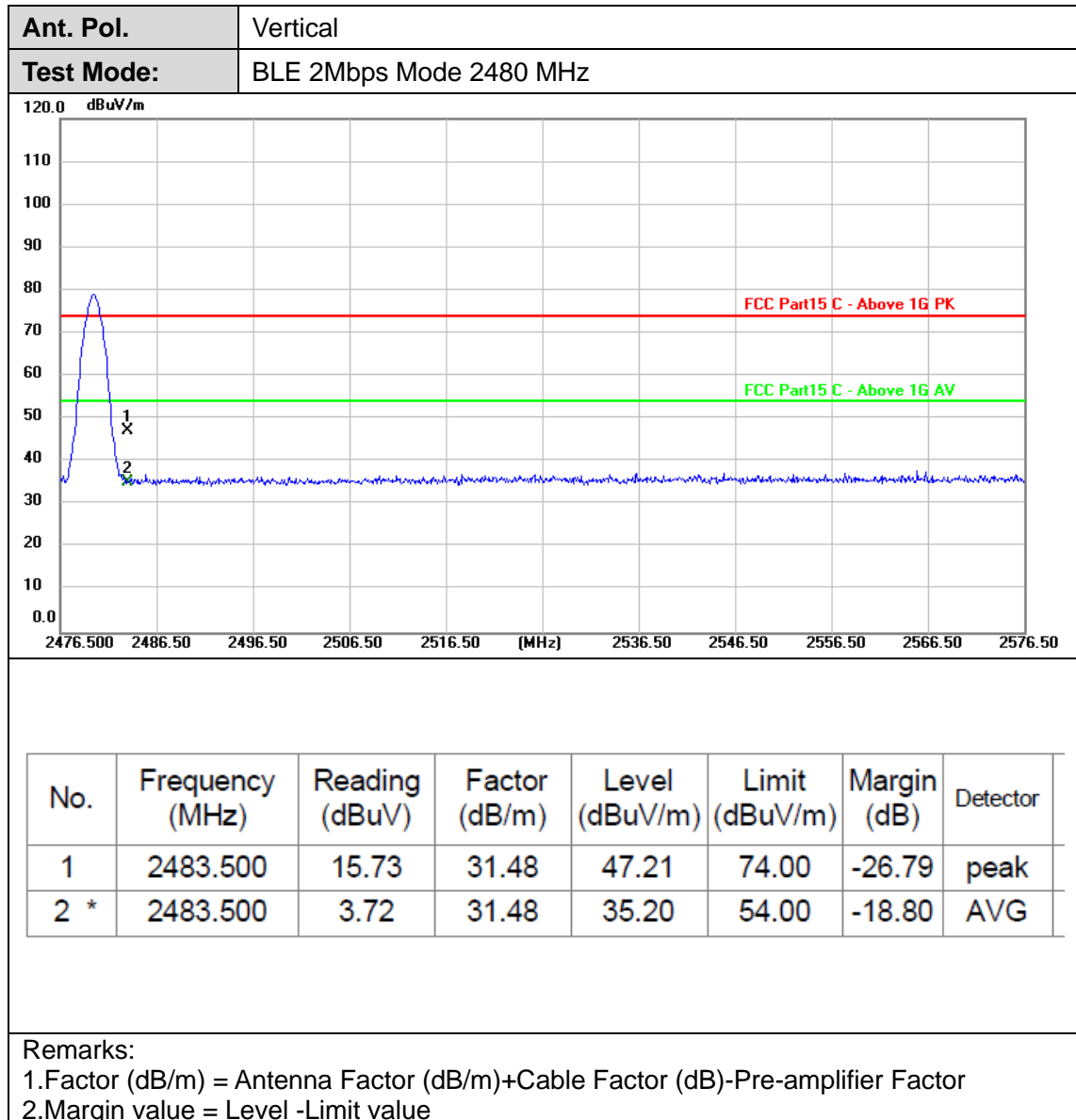


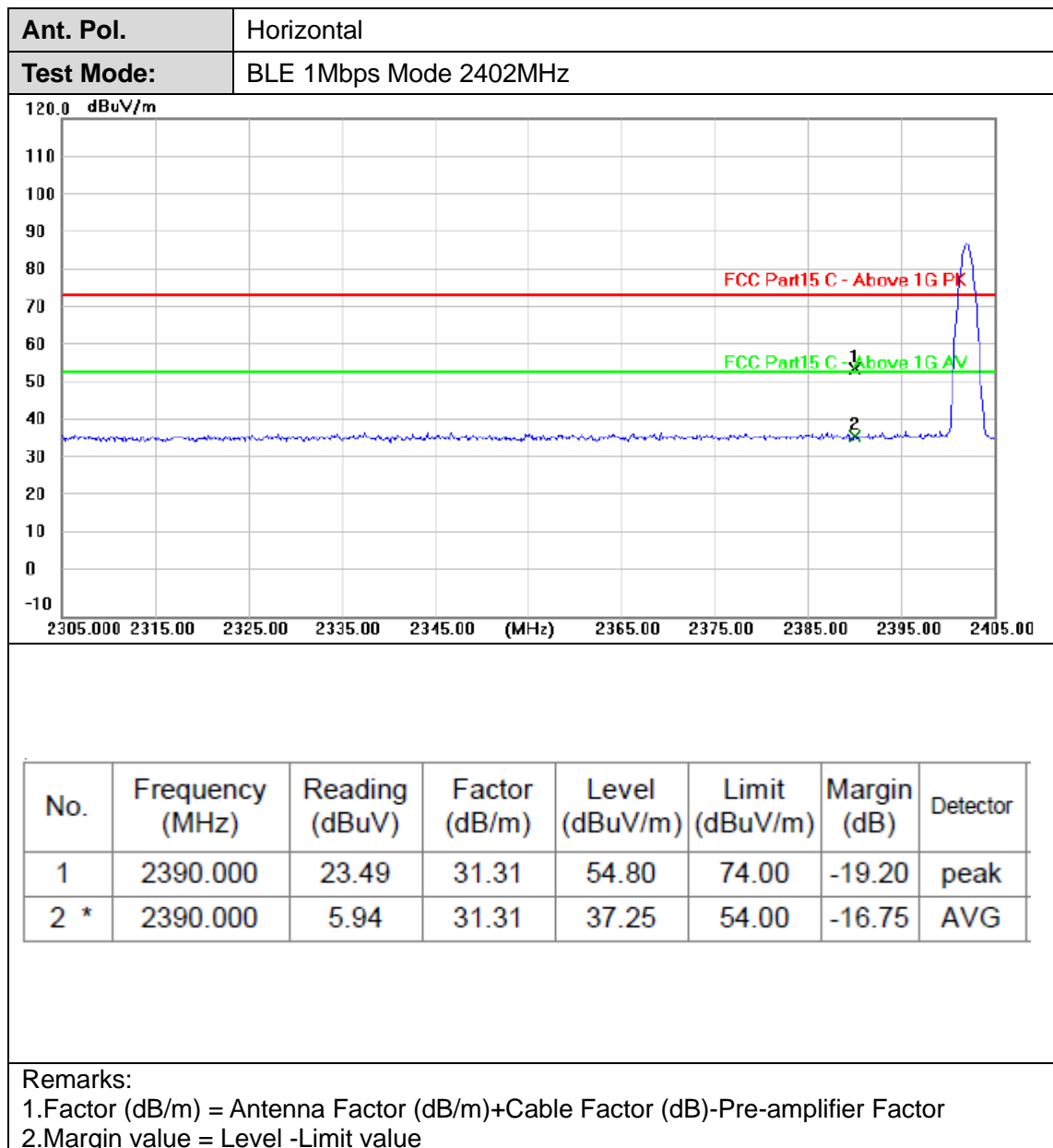


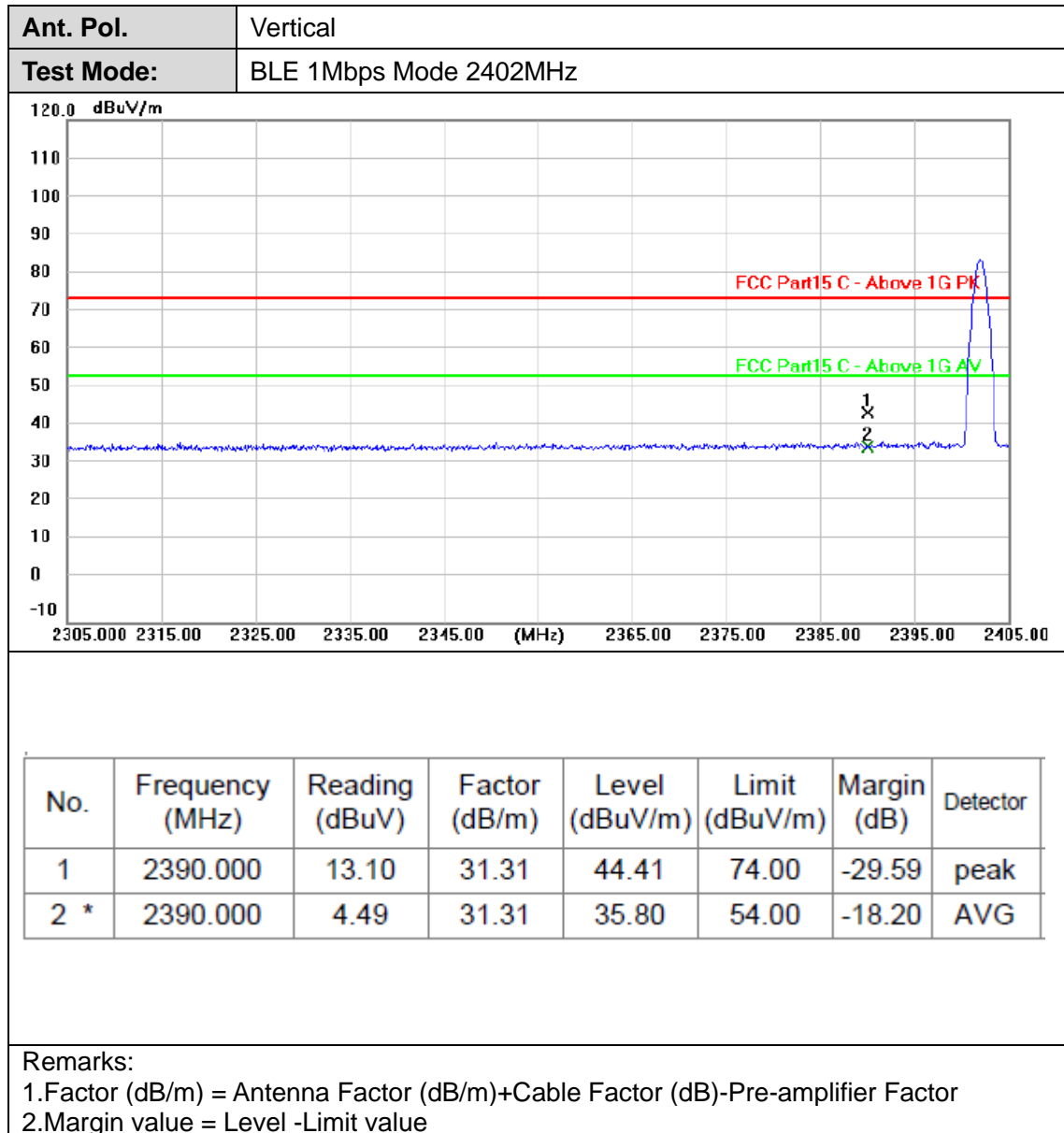
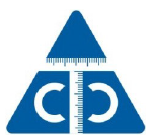


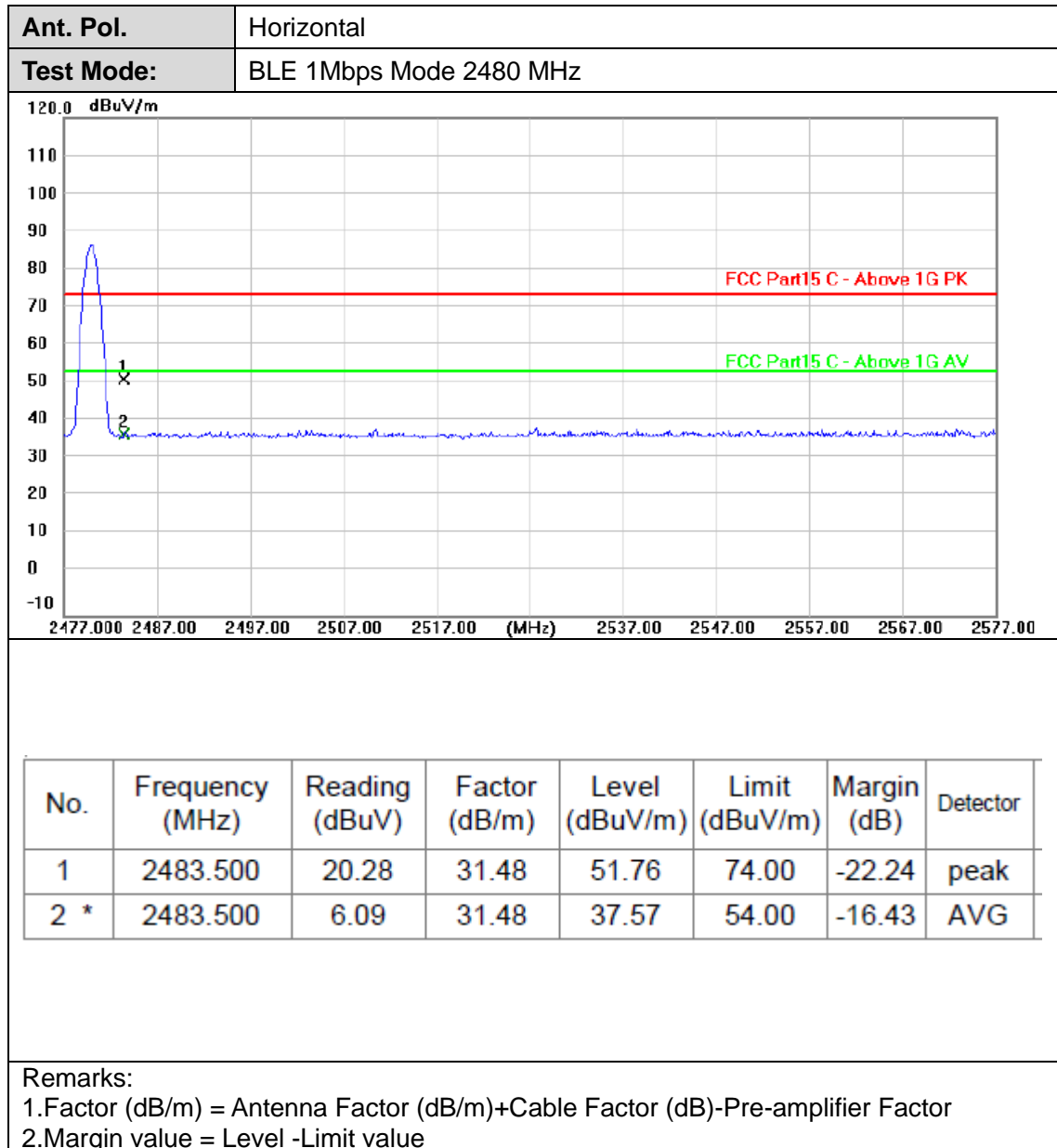


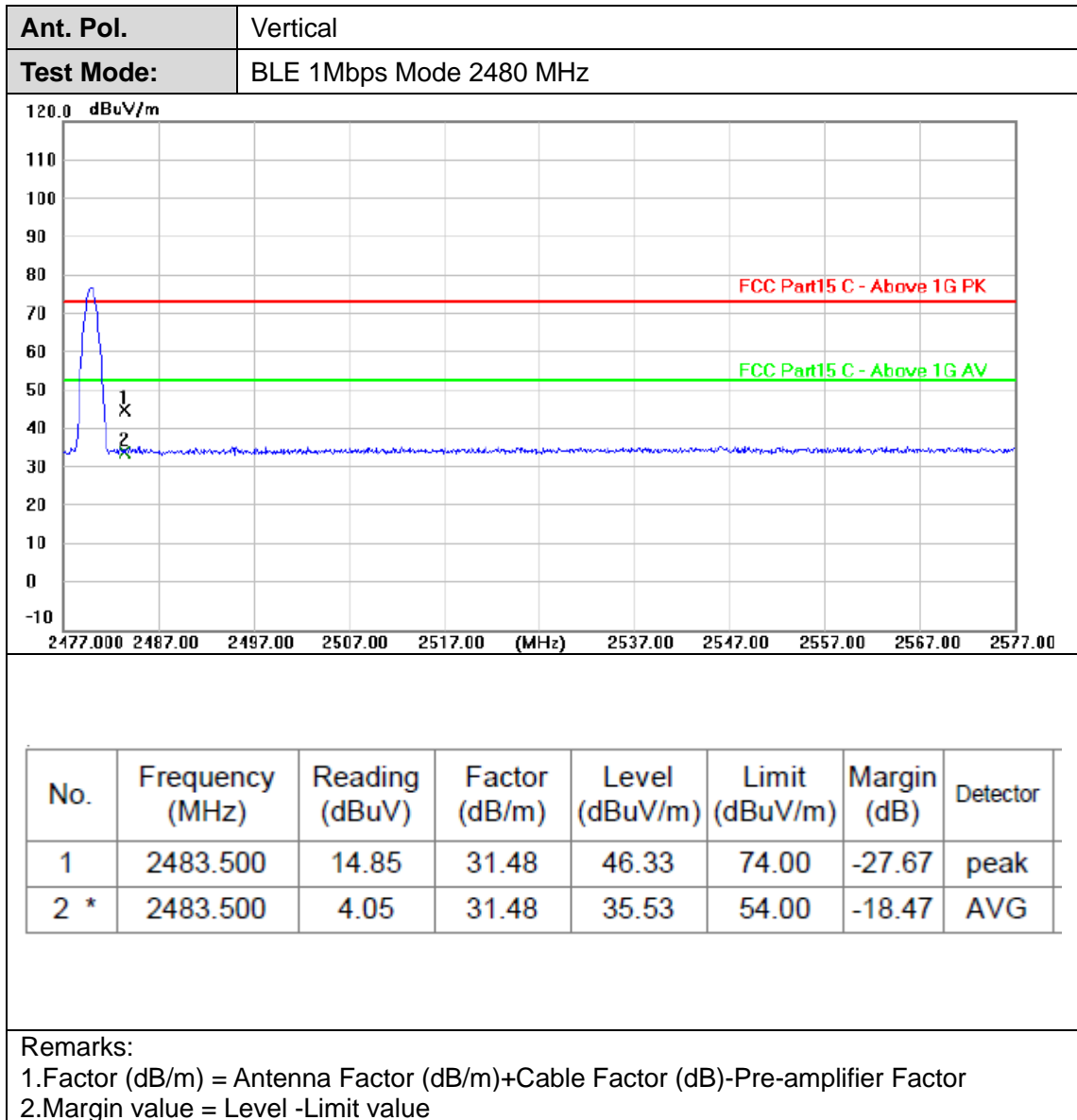


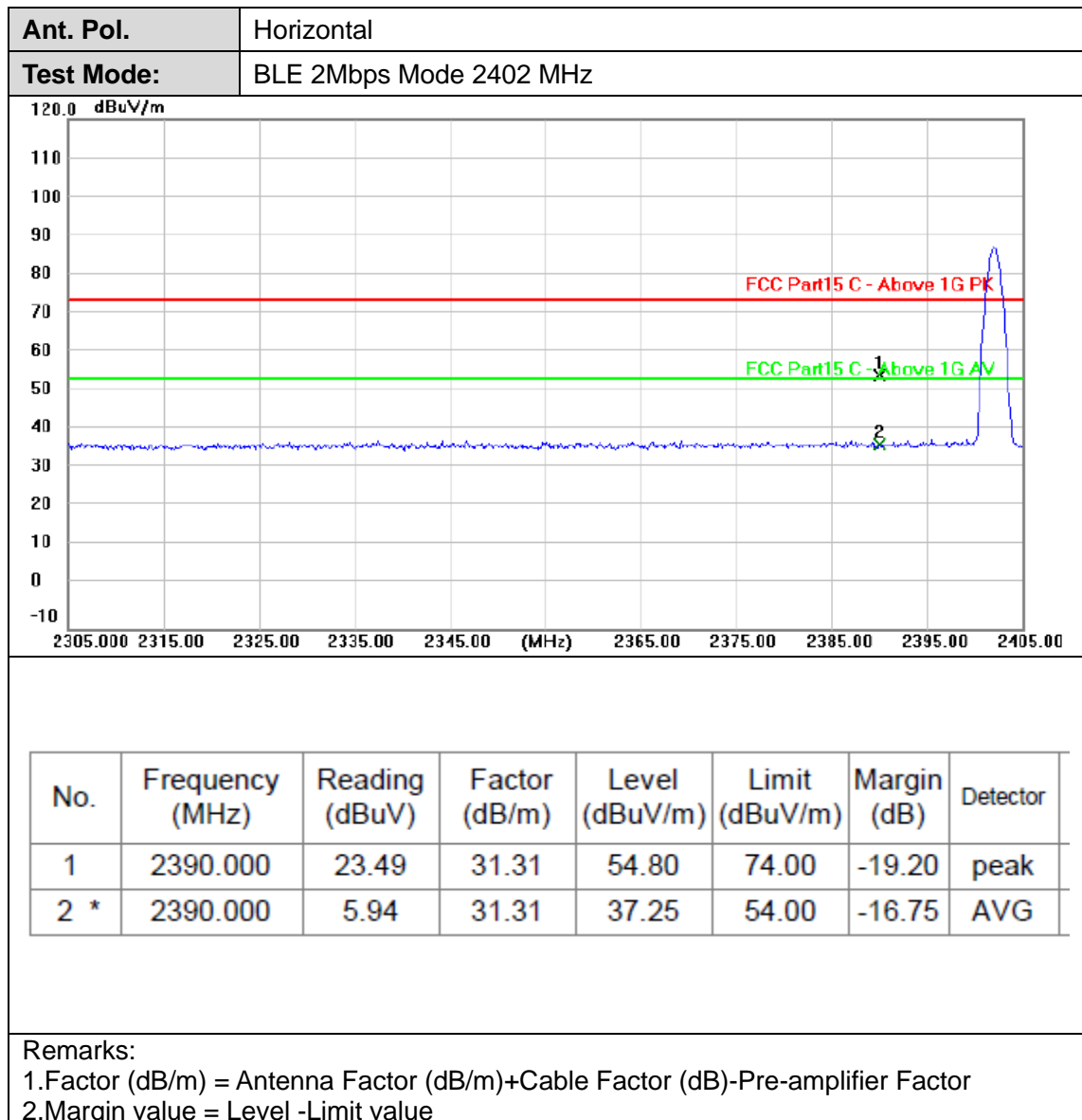


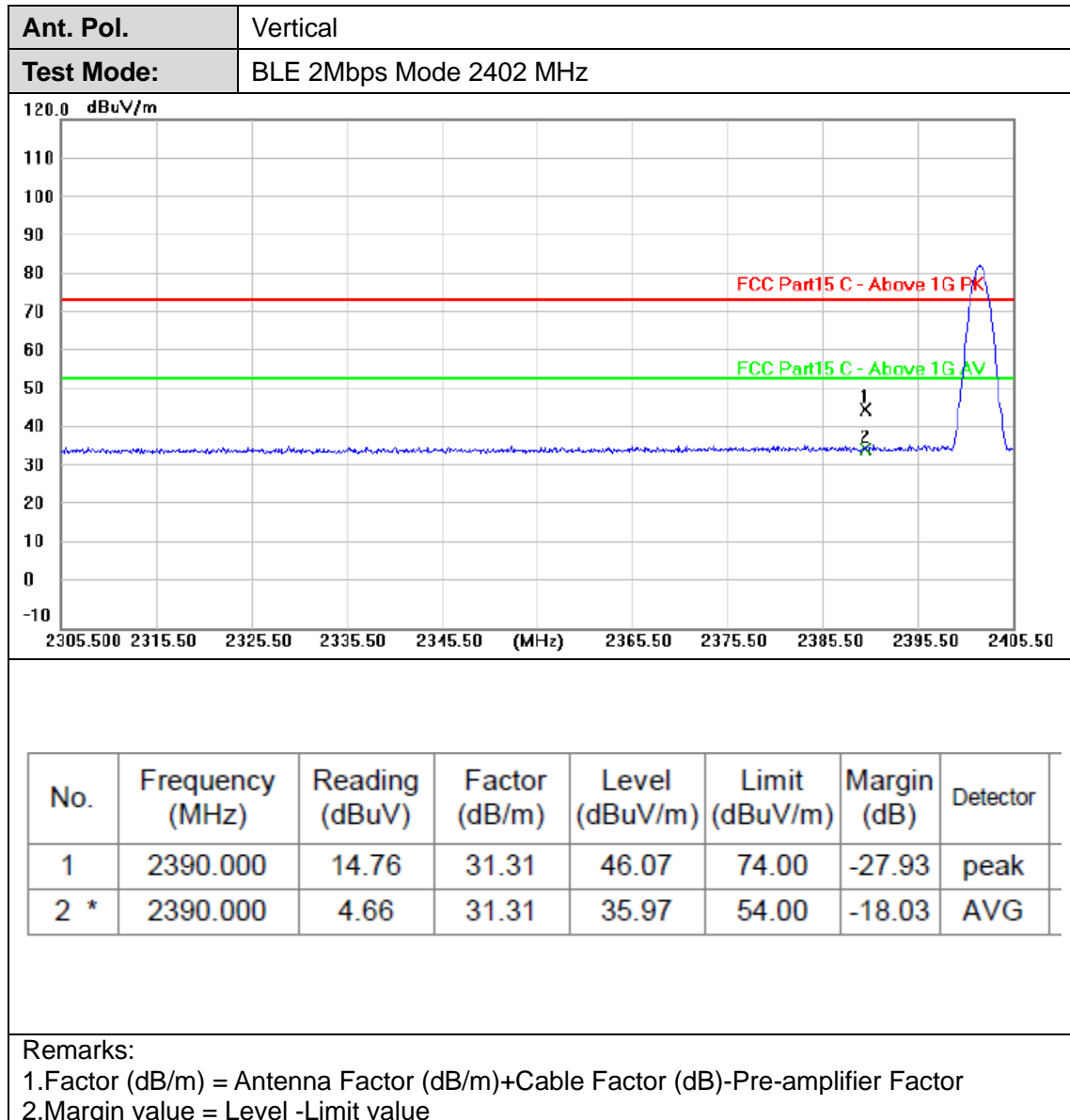
**Bluetooth modules 2 Test Results**

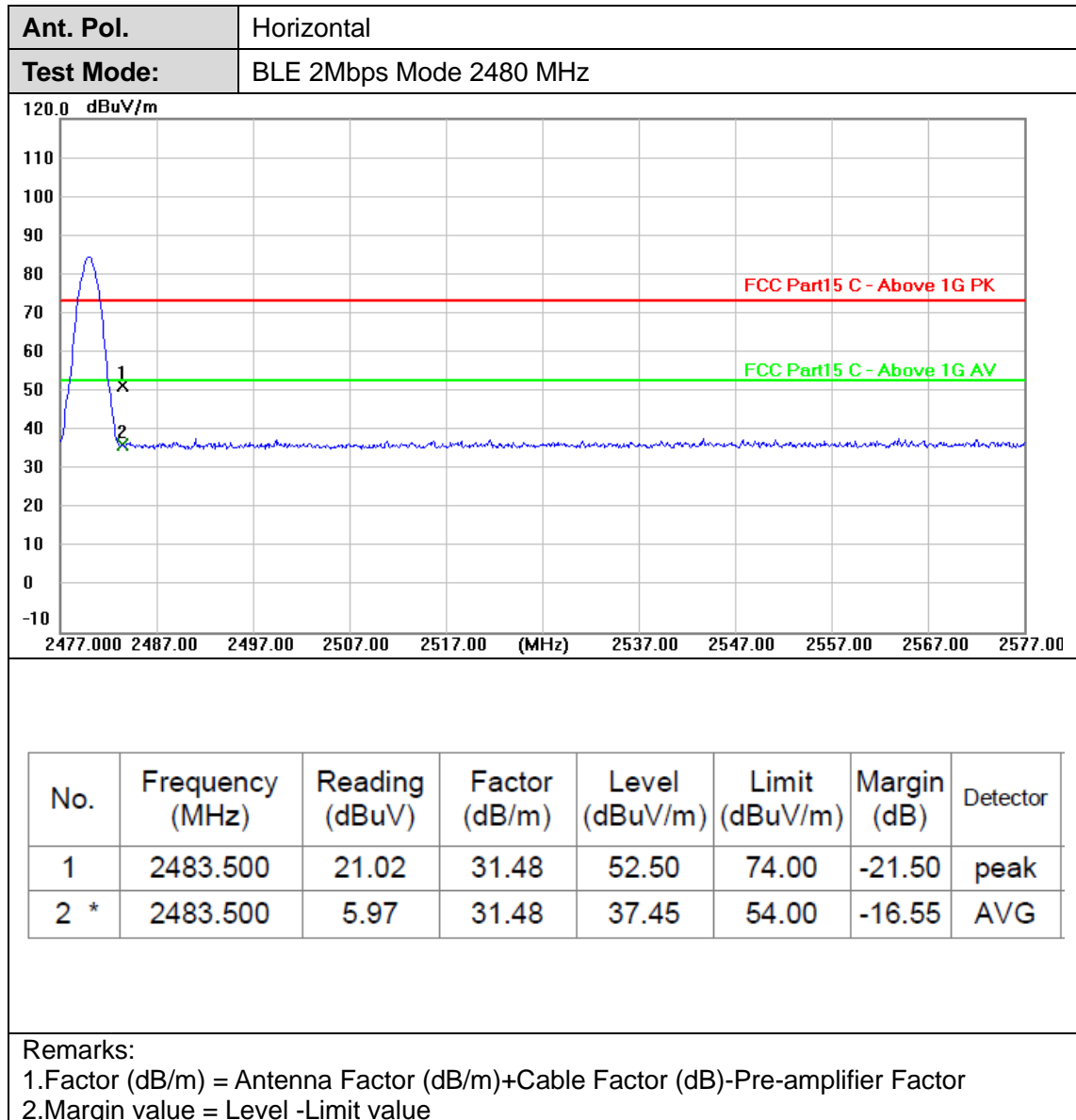


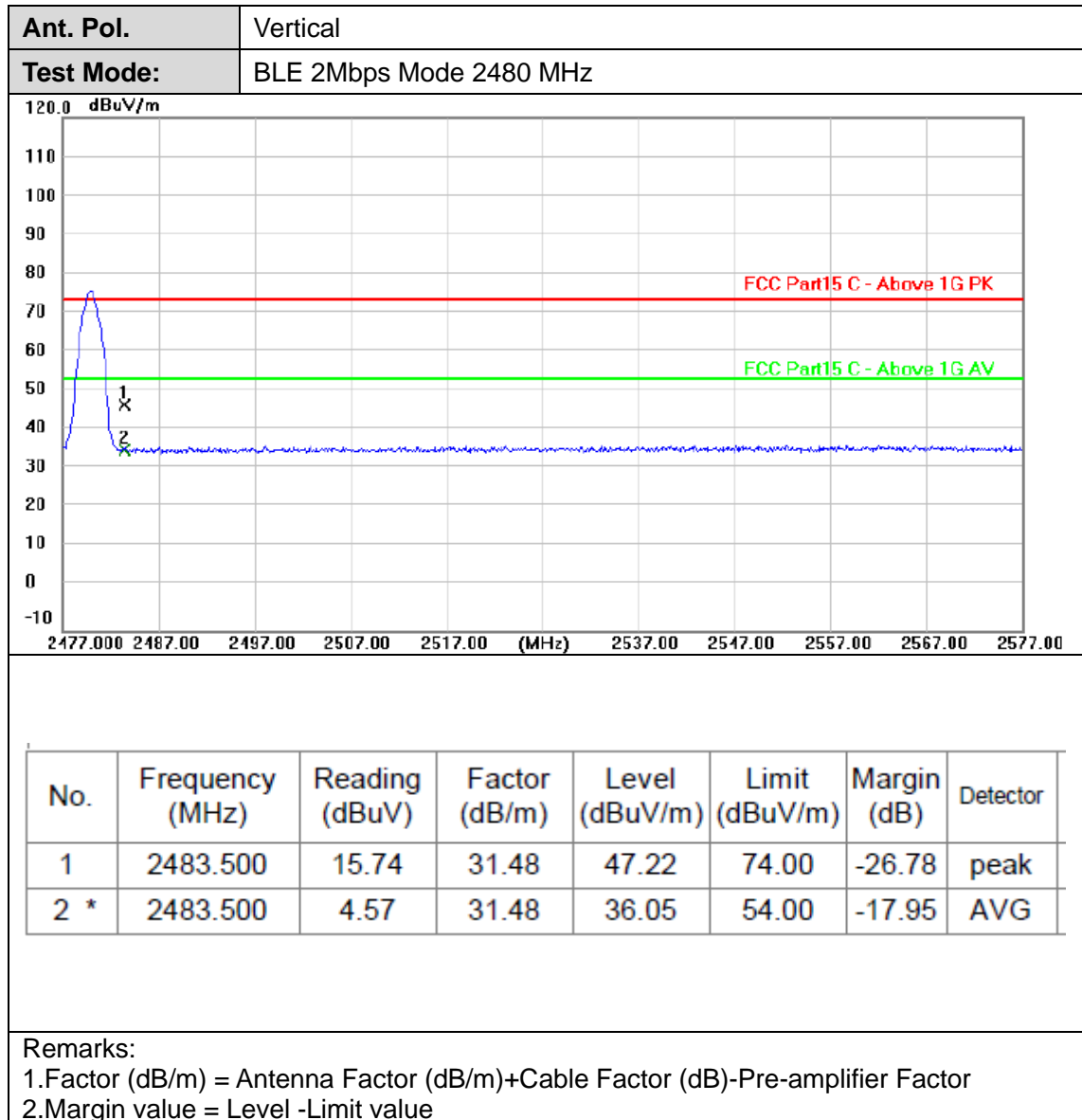












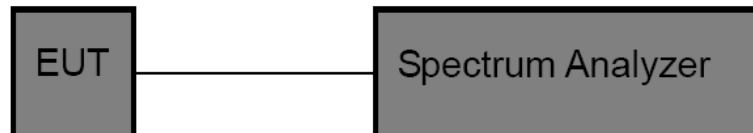


3.4. Band edge and Spurious Emissions (Conducted)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

Test Configuration



Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator, 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. Use the following spectrum analyzer settings:
RBW = 100 kHz, VBW ≥ RBW, scan up through 10th harmonic.
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

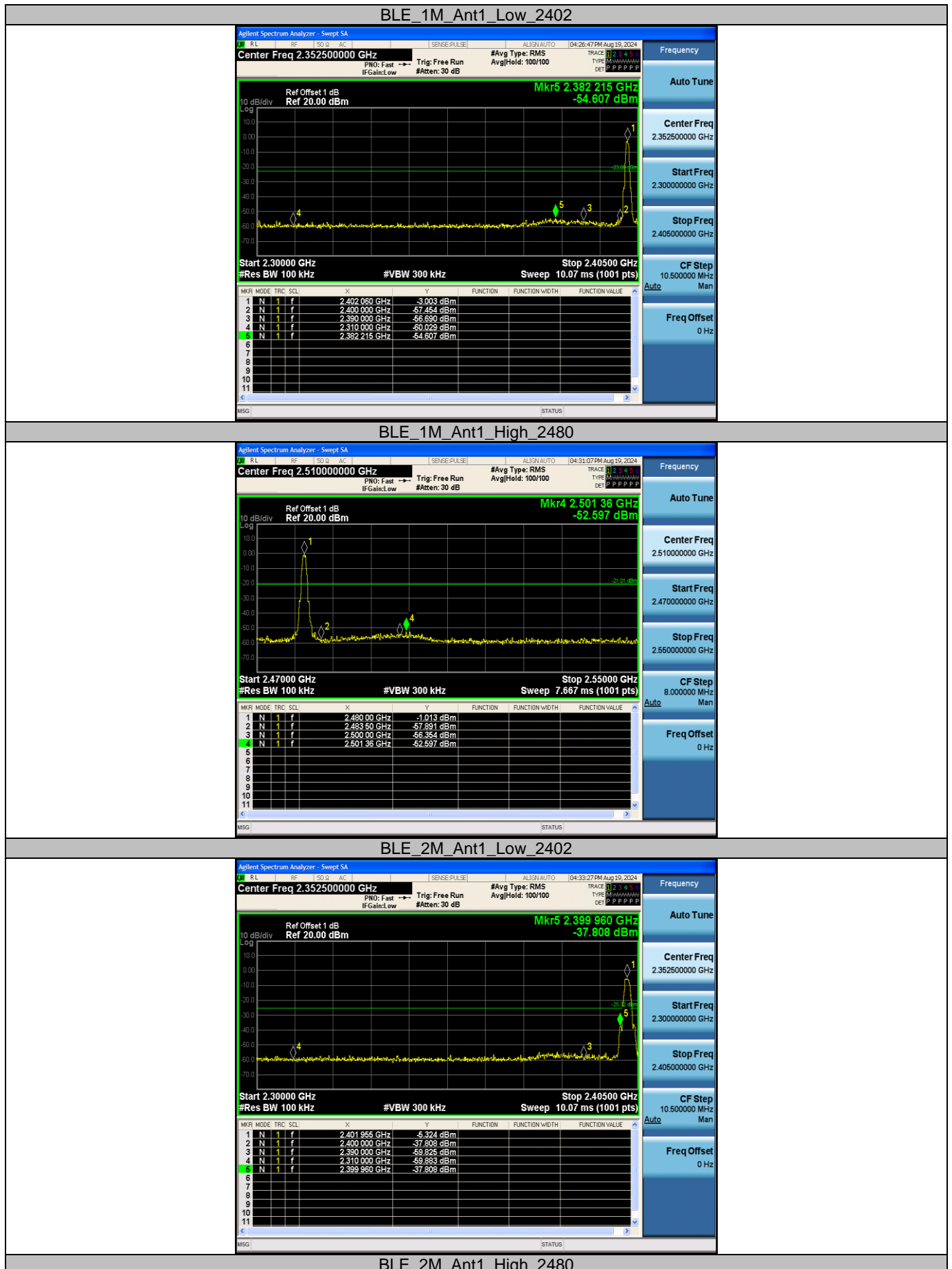
Test Mode

Please refer to the clause 2.4.

Test Results

(1) Band edge Conducted Test

TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-3.00	-54.61	≤-23	PASS
		High	2480	-1.01	-52.6	≤-21.01	PASS
BLE_2M	Ant1	Low	2402	-5.32	-37.81	≤-25.32	PASS
		High	2480	-0.48	-51.32	≤-20.48	PASS



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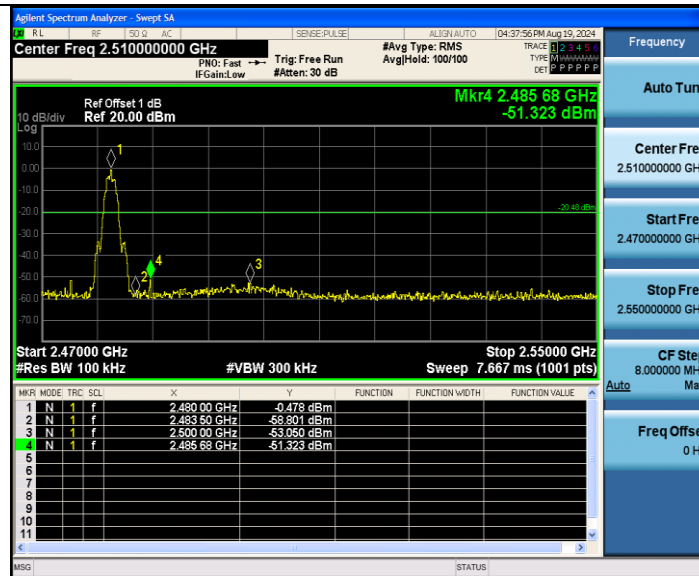
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(2) Conducted Spurious Emissions Test

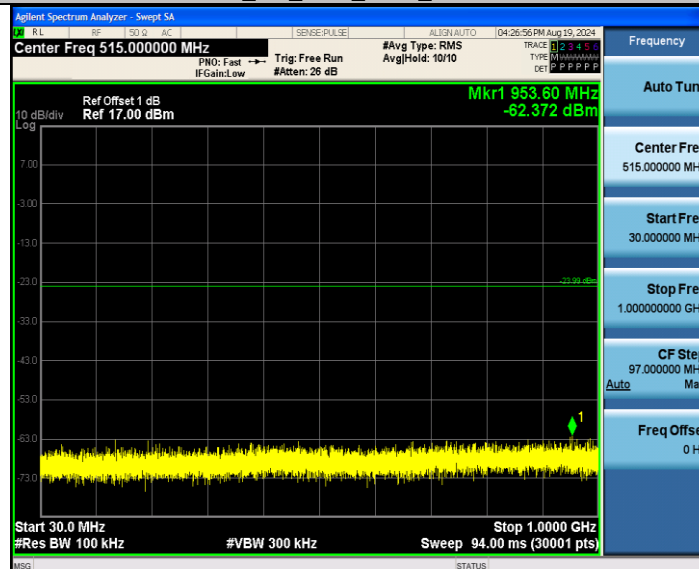
TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-3.99	-3.99	---	PASS
			30~1000	-3.99	-62.37	≤ -23.99	PASS
			1000~26500	-3.99	-46.51	≤ -23.99	PASS
		2440	Reference	-1.39	-1.39	---	PASS
			30~1000	-1.39	-61.83	≤ -21.39	PASS
			1000~26500	-1.39	-44.48	≤ -21.39	PASS
		2480	Reference	-1.96	-1.96	---	PASS
			30~1000	-1.96	-62.54	≤ -21.96	PASS
			1000~26500	-1.96	-43.11	≤ -21.96	PASS
BLE_2M	Ant1	2402	Reference	-2.34	-2.34	---	PASS
			30~1000	-2.34	-61.86	≤ -22.34	PASS
			1000~26500	-2.34	-47.08	≤ -22.34	PASS
		2440	Reference	-1.84	-1.84	---	PASS
			30~1000	-1.84	-62.46	≤ -21.84	PASS
			1000~26500	-1.84	-44.24	≤ -21.84	PASS
		2480	Reference	-3.99	-3.99	---	PASS
			30~1000	-3.99	-62.32	≤ -23.99	PASS
			1000~26500	-3.99	-42.96	≤ -23.99	PASS



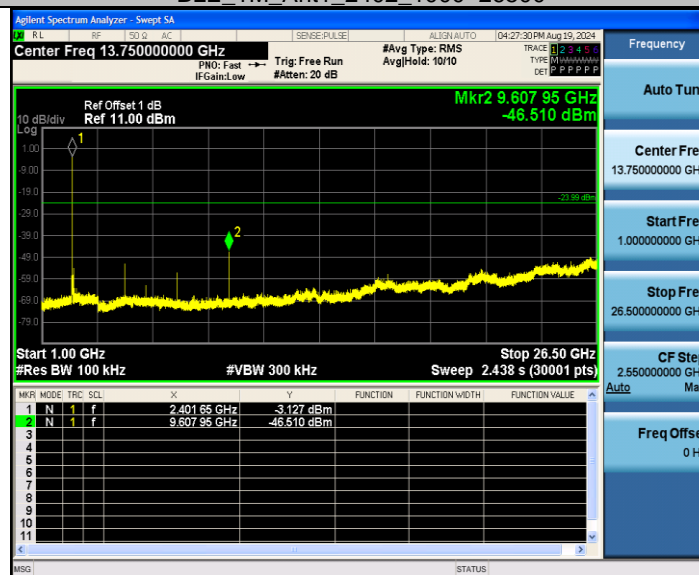
BLE_1M_Ant1_2402_0~Reference



BLE_1M_Ant1_2402_30~1000



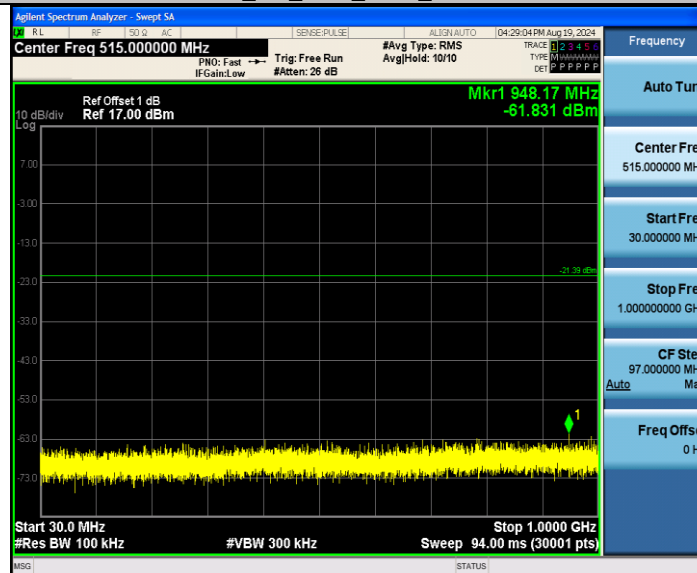
BLE_1M_Ant1_2402_1000~26500



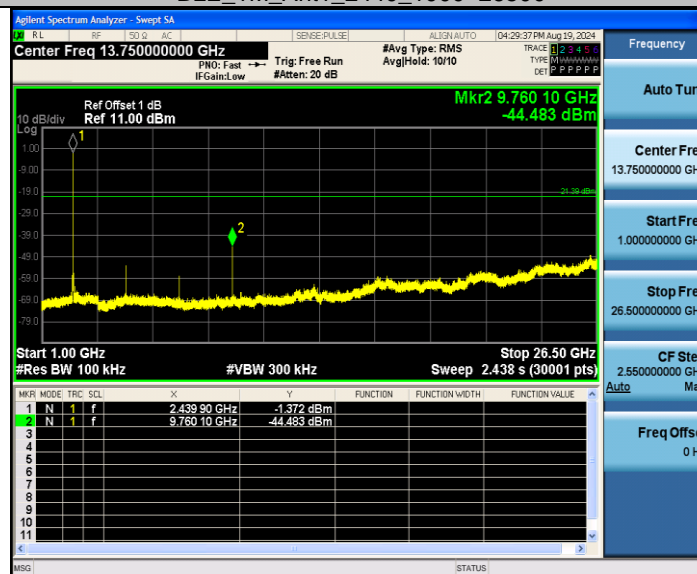
BLE_1M_Ant1_2440_0~Reference



BLE_1M_Ant1_2440_30~1000



BLE_1M_Ant1_2440_1000~26500



BLE_1M_Ant1_2480_0~Reference

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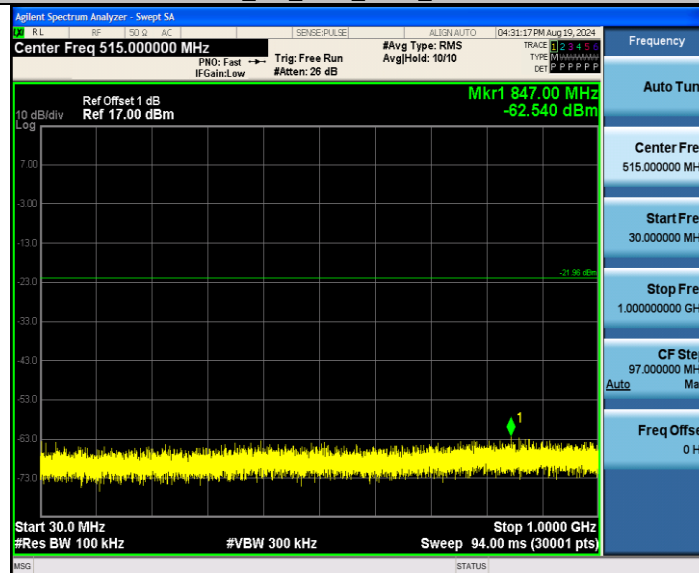
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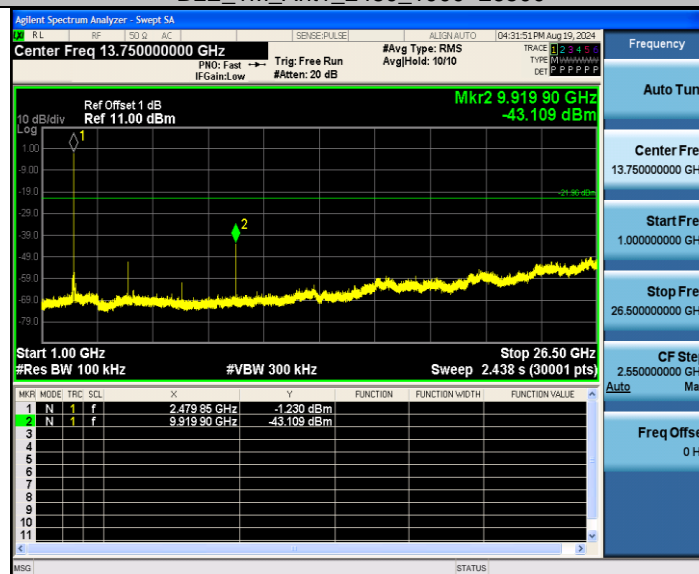
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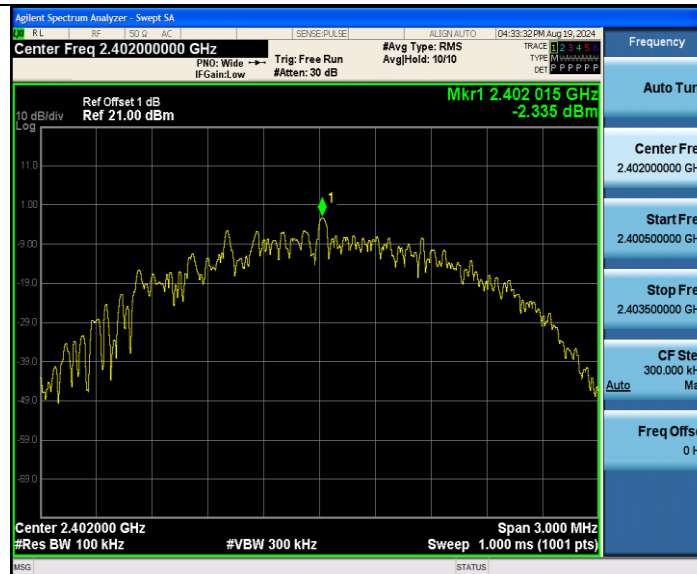
BLE_1M_Ant1_2480_30~1000



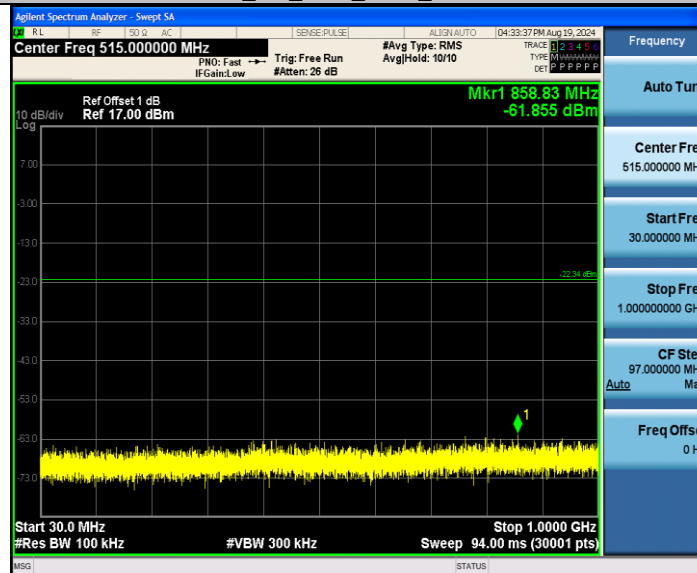
BLE_1M_Ant1_2480_1000~26500



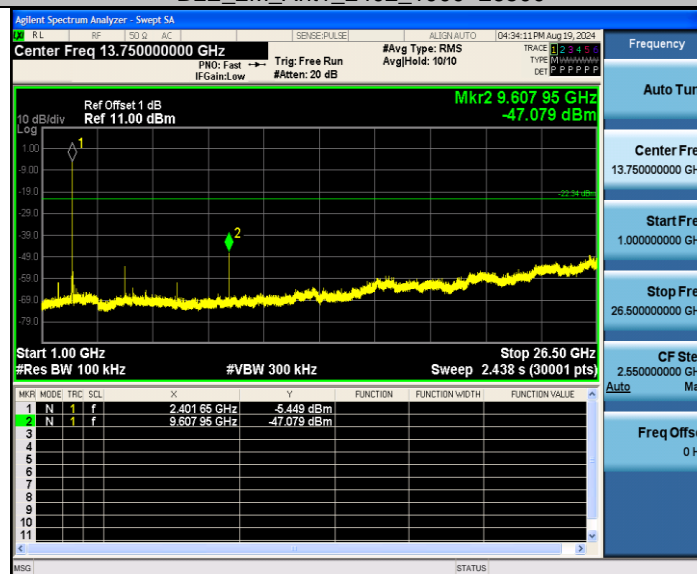
BLE_2M_Ant1_2402_0~Reference



BLE_2M_Ant1_2402_30~1000



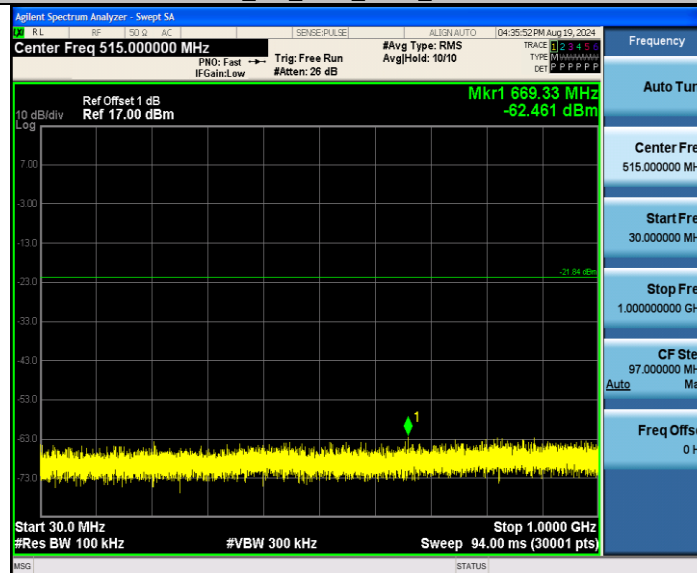
BLE_2M_Ant1_2402_1000~26500



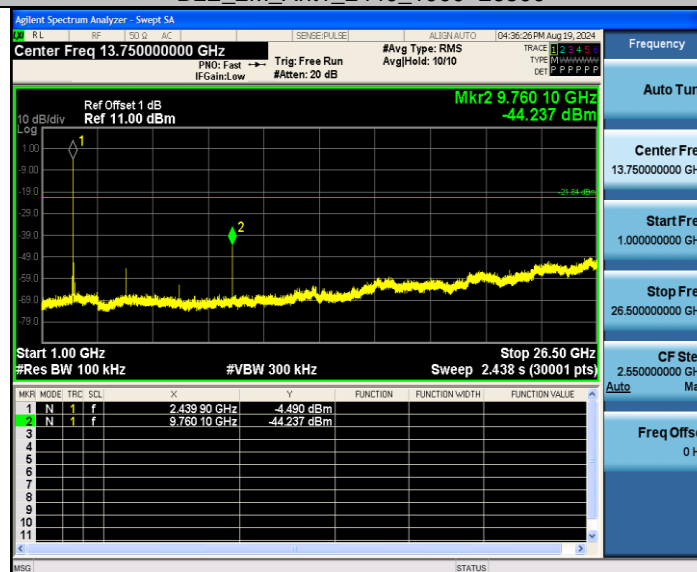
BLE_2M_Ant1_2440_0~Reference



BLE_2M_Ant1_2440_30~1000



BLE_2M_Ant1_2440_1000~26500



BLE_2M_Ant1_2480_0~Reference

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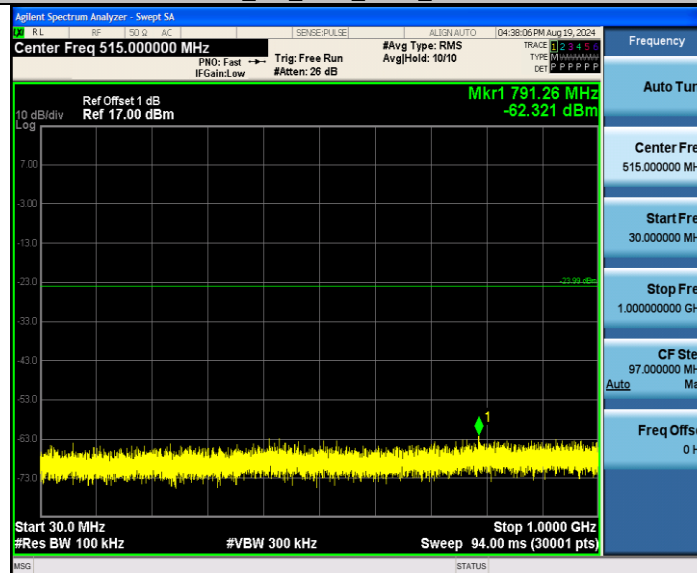
Fax: (86)755-27521011

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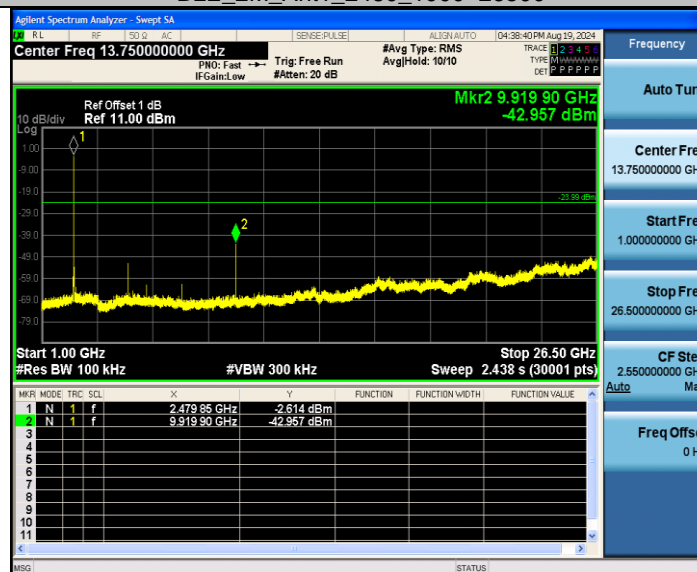
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BLE_2M_Ant1_2480_30~1000



BLE_2M_Ant1_2480_1000~26500





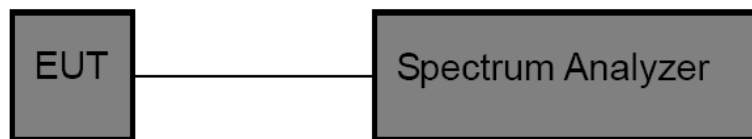
3.5. DTS Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):

Test Item	Limit	Frequency Range(MHz)
DTS Bandwidth	≥ 500 KHz (6dB bandwidth)	2400~2483.5

Test Configuration



Test Procedure

5. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
 6. DTS Spectrum Setting:
 - (1) Set RBW = 100 kHz.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.
- OCB Spectrum Setting:
- (1) Set RBW = 1% ~ 5% occupied bandwidth.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

Test Mode

Please refer to the clause 2.4.

**Test Results****DTS Bandwidth Test Results**

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.704	2401.668	2402.372	0.5	PASS
		2440	0.684	2439.660	2440.344	0.5	PASS
		2480	0.696	2479.648	2480.344	0.5	PASS
BLE_2M	Ant1	2402	1.356	2401.324	2402.680	0.5	PASS
		2440	1.316	2439.336	2440.652	0.5	PASS
		2480	1.316	2479.328	2480.644	0.5	PASS

Occupied Channel Bandwidth Test Results

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0402	2401.4938	2402.5340	---	---
		2440	1.0249	2439.4963	2440.5212	---	---
		2480	1.0366	2479.4914	2480.5280	---	---
BLE_2M	Ant1	2402	2.0510	2400.9937	2403.0447	---	---
		2440	2.0595	2438.9900	2441.0495	---	---
		2480	2.0582	2478.9992	2481.0574	---	---

DTS Bandwidth Test Graphs

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BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



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