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TEST REPORT

Report No.: **CTC20231460E02**

FCC ID.....: **2ATHM-CAW23A301**

Applicant.....: **AIR-U Co., Ltd.**

Address.....: Yamaki 2nd BLDG, 8F, 3-4-2, Nishishinbashi, Minato-ku, Tokyo, Japan

Manufacturer.....: AIR-U Co., Ltd.

Address.....: Yamaki 2nd BLDG, 8F, 3-4-2, Nishishinbashi, Minato-ku, Tokyo, Japan

Product Name.....: **4G Wireless Data Terminal**

Trade Mark.....: CLOUD AiR-WiFi

Model/Type reference.....: CAW23A301

Listed Model(s): /

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

Date of receipt of test sample...: Jul. 03, 2023

Date of testing.....: Jul. 04, 2023 ~ Jul. 25, 2023

Date of issue.....: Aug. 03, 2023

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

Compiled by:

(Printed name+signature)

Terry Su

Supervised by:

(Printed name+signature)

Eric Zhang

Approved by:

(Printed name+signature)

Totti Zhao

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

Address.....: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

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1. TEST 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.

[RSS 247 Issue 2](#): Standard Specifications for Frequency Hopping Systems (FHSs) and Digital Transmission Systems (DTSS) Operating in the Bands 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.	Date of issue	Description
01	Aug. 03, 2023	Original



1.3. Test Description

FCC Part 15 Subpart C (15.247) / RSS 247 Issue 2				
Test Item	Standard Section		Result	Test Engineer
	FCC	IC		
Antenna Requirement	15.203	/	Pass	Alicia Liu
Conducted Emission	15.207	RSS-Gen 8.8	Pass	Eva Feng
Radiated Band Edge and Spurious Emissions	15.205&15.209&15.247(d)	RSS 247 5.5	Pass	Alicia Liu
Conducted Band Edge and Spurious Emissions	15.247(d)	RSS 247 5.5	Pass	Alicia Liu
6dB Bandwidth	15.247(a)(2)	RSS 247 5.2 (a)	Pass	Alicia Liu
Conducted Max Output Power	15.247(b)(3)	RSS 247 5.4 (d)	Pass	Alicia Liu
Power Spectral Density	15.247(e)	RSS 247 5.2 (b)	Pass	Alicia Liu
Transmitter Radiated Spurious	15.209&15.247(d)	RSS 247 5.5&RSS-Gen 8.9	Pass	Alicia Liu

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



1.4. Test Facility

CTC Laboratories, Inc.

Add: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, 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
DTS Bandwidth	$\pm 0.0196\%$	(1)
Maximum Conducted Output Power	± 0.686 dB	(1)
Maximum Power Spectral Density Level	± 0.743 dB	(1)
Band-edge Compliance	± 1.328 dB	(1)
Unwanted Emissions In Non-restricted Freq Bands	9kHz-1GHz: ± 0.746 dB 1GHz-26GHz: ± 1.328 dB	(1)
Conducted Emissions 9kHz~30MHz	± 3.08 dB	(1)
Radiated Emissions 30~1000MHz	± 4.51 dB	(1)
Radiated Emissions 1~18GHz	± 5.84 dB	(1)
Radiated Emissions 18~40GHz	± 6.12 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:	AIR-U Co., Ltd.
Address:	Yamaki 2nd BLDG, 8F, 3-4-2, Nishishinbashi, Minato-ku, Tokyo, Japan
Manufacturer:	AIR-U Co., Ltd.
Address:	Yamaki 2nd BLDG, 8F, 3-4-2, Nishishinbashi, Minato-ku, Tokyo, Japan
Factory:	Shenzhen uCloudlink Network Technology Co., Ltd.
Address:	3rd Floor, A part of Building 1, Shenzhen Software Industry Base, Nanshan District Xuefu Road, 518057 Shenzhen City, Guangdong, China



2.2. General Description of EUT

Product Name:	4G Wireless Data Terminal
Trade Mark:	CLOUD AiR-WiFi
Model/Type reference:	CAW23A301
Listed Model(s):	/
Power supply:	5Vdc/2A from USB Cable 3.85Vdc from 3900mAh Li-ion Battery
Hardware version:	G40_MB_VB
Software version:	K5_TSV3.2.000.002.230703
WIFI 802.11b/ g/ n(HT20)/ n(HT40)	
Modulation:	802.11b: DSSS(CCK, DQPSK, DBPSK) 802.11g/n: OFDM(BPSK, QPSK, 16QAM, 64QAM)
Operation frequency:	802.11b/g/n(HT20): 2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz
Channel number:	802.11b/g/n(HT20): 11channels 802.11n(HT40): 7channels
Channel separation:	5MHz
Antenna type:	Internal Antenna
Antenna gain:	0.76dBi Max



2.3. Accessory Equipment information

Equipment Information			
Name	Model	S/N	Manufacturer
Notebook	ThinkBook 14G3 ACL	MP246QDR	Lenovo
AC/DC Adapter	A2167	/	Apple
Cable Information			
Name	Shielded Type	Ferrite Core	Length
Type-C Cable	With	Without	1M
Test Software Information			
Name	Versions	/	/
QRCT4.exe	V4.0.00172.0	/	/



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.

Operation Frequency List:

Channel	Frequency (MHz)
01	2412
02	2417
03	2422
04	2427
05	2432
06	2437
07	2442
08	2447
09	2452
10	2457
11	2462

Note: CH 01~CH 11 for 802.11b/g/n(HT20), CH 03~CH 09 for 802.11n(HT40)

Data Rated

Preliminary tests were performed in different data rate, and found which the below bit rate is worst case mode, so only show data which it is a worst case mode.

Mode	Data rate (worst mode)
802.11b	1Mbps
802.11g	6Mbps
802.11n(HT20)	HT-MCS0
802.11n(HT40)	HT-MCS0

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 WLAN AP 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

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	MXA Signal Analyzer	Keysight	N9020A	MY46471737	Dec. 16, 2023
2	Spectrum Analyzer	R&S	FSU26	100105	Dec. 16, 2023
3	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 14, 2024
4	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 16, 2023
5	PSG Analog Signal Generator	Agilent	E8257D	MY46521908	Dec. 16, 2023
6	Power Sensor	Keysight	U2021XA	MY55130004	Mar. 14, 2024
7	Power Sensor	Keysight	U2021XA	MY55130006	Mar. 14, 2024
8	Wideband Radio Communication Tester	R&S	CMW500	102414	Dec. 16, 2023
9	High and low temperature box	ESPEC	MT3035	/	Mar. 24, 2024
10	JS1120 RF Test system	TONSCEND	v2.6	/	/

Radiated emission(3m chamber 2)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Dec. 07, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 07, 2024
3	Loop Antenna	LAPLAC	RF300	9138	Dec. 16, 2023
4	Spectrum Analyzer	R&S	FSU26	100105	Dec. 16, 2023
5	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 14, 2024
6	Pre-Amplifier	SONOMA	310	186194	Dec. 16, 2023
7	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 16, 2023
8	Test Receiver	R&S	ESC17	100967	Dec. 16, 2023
9	3m chamber 2	Frankonia	EE025	/	Oct. 23, 2024

Radiated emission(3m chamber 3)					
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	Dec. 01, 2024
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 16, 2023
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 16, 2023
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 16, 2023
6	Pre-Amplifier	R&S	SCU-26	10033	Dec. 16, 2023
7	Pre-Amplifier	R&S	SCU-40	10030	Dec. 16, 2023
8	Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-497	Dec. 16, 2023
9	3m chamber 3	YIHENG	EE106	/	Sep. 09, 2023



Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Dec. 16, 2023
2	LISN	R&S	ENV216	101113	Dec. 16, 2023
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 16, 2023

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

2. The Cal. Interval was three year of the chamber

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

3. TEST ITEM AND RESULTS

3.1. Conducted Emission

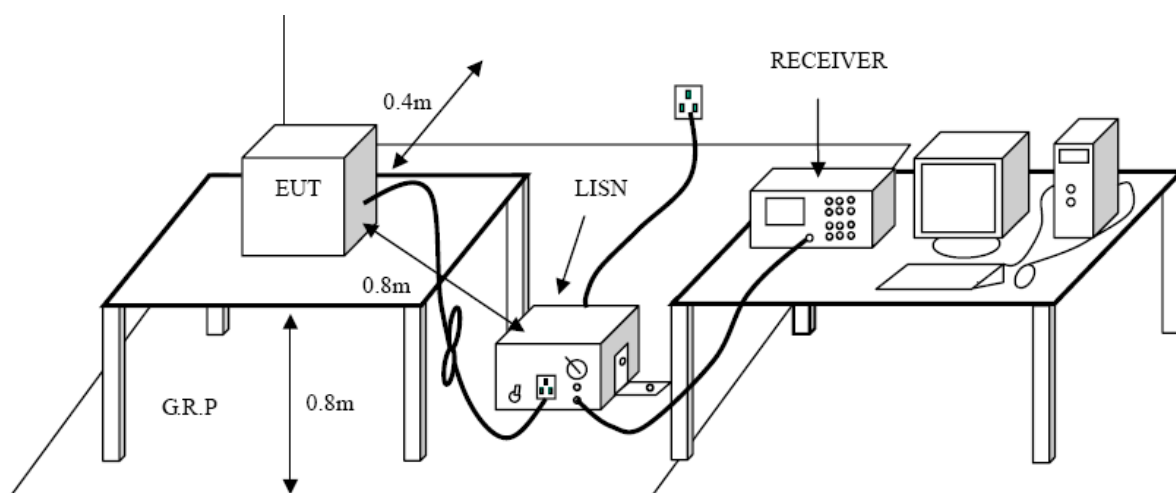
Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.207/ RSS - Gen 8.8:

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

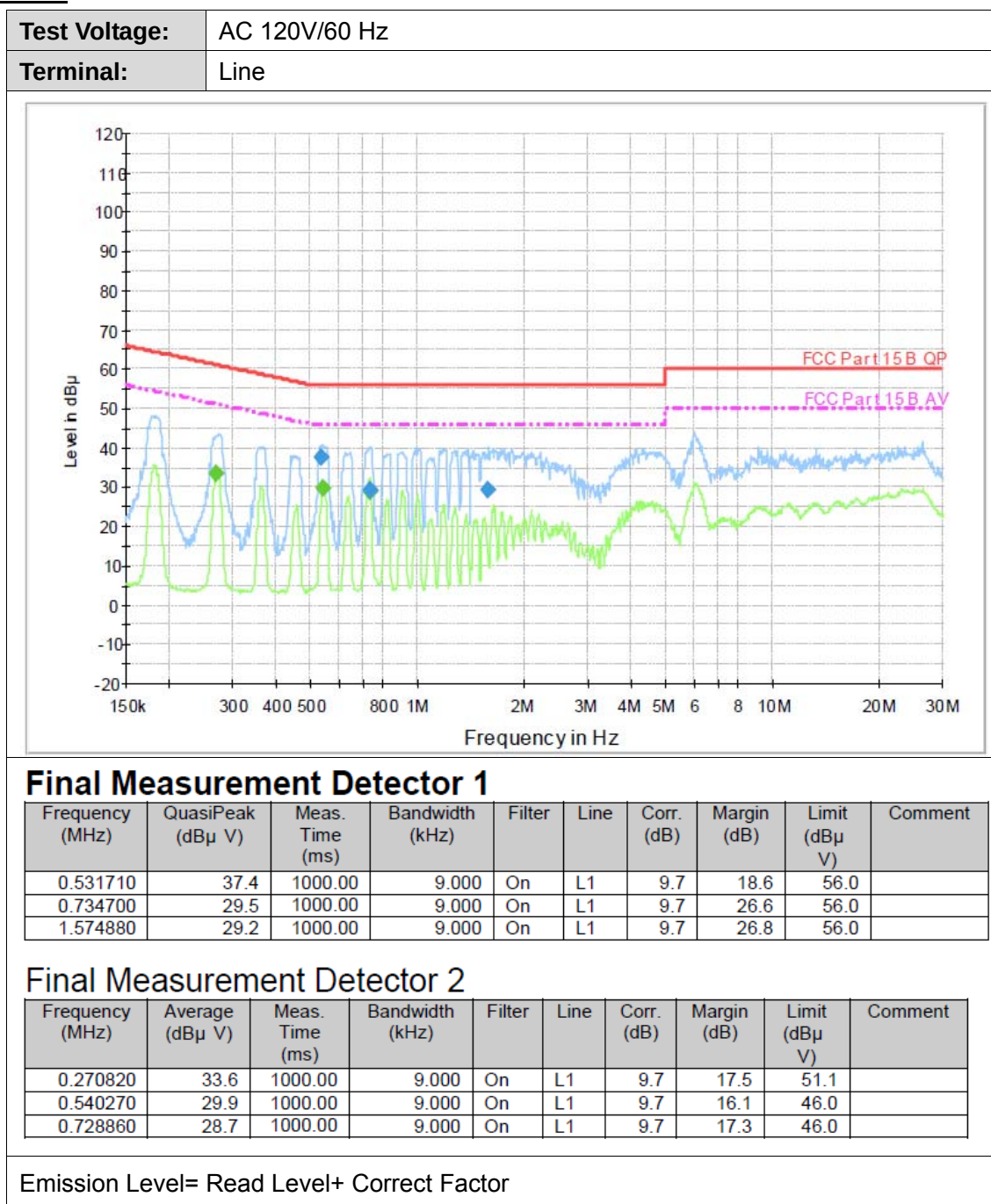


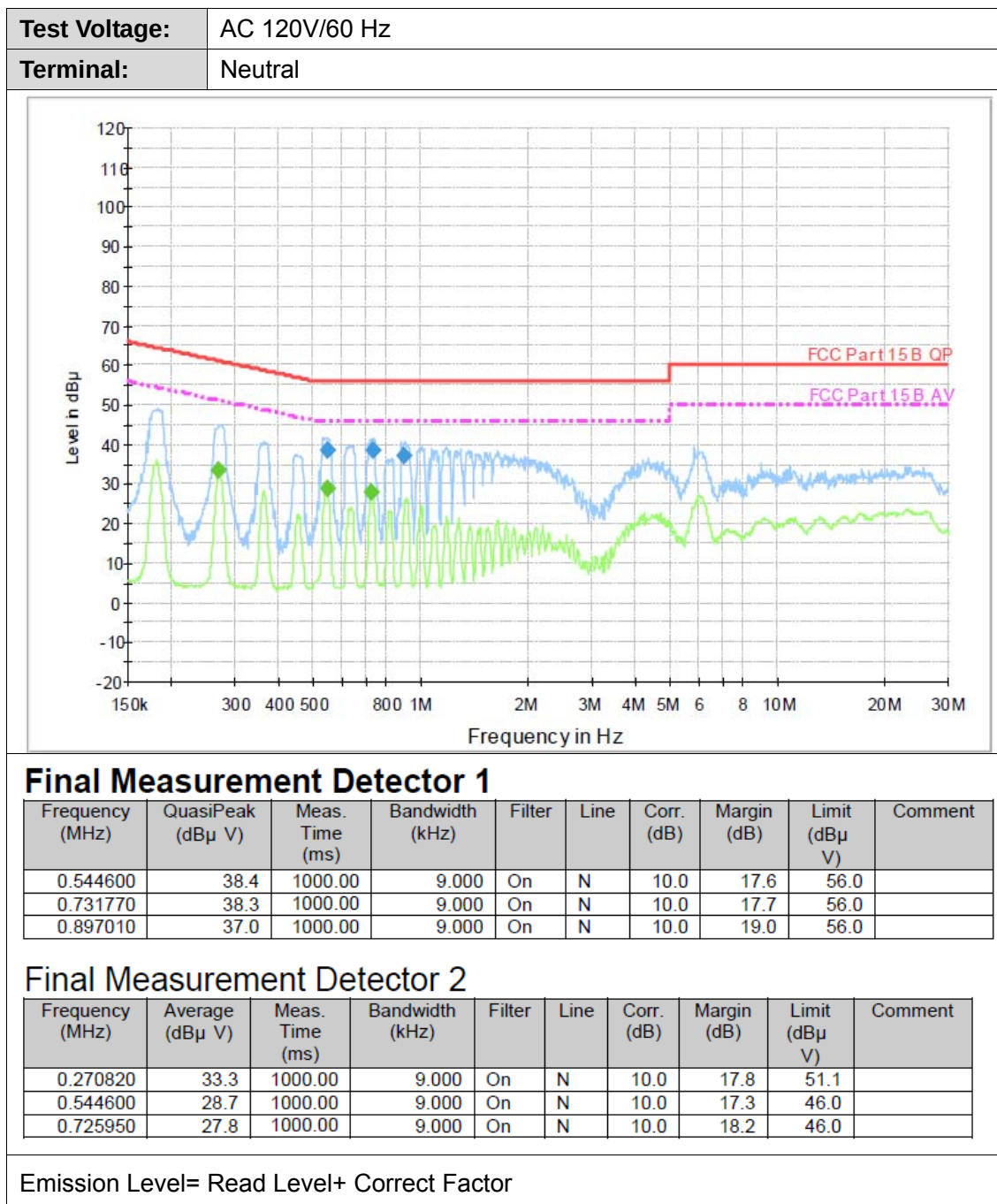
Test Procedure

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



3.2. Radiated Emission

Limit

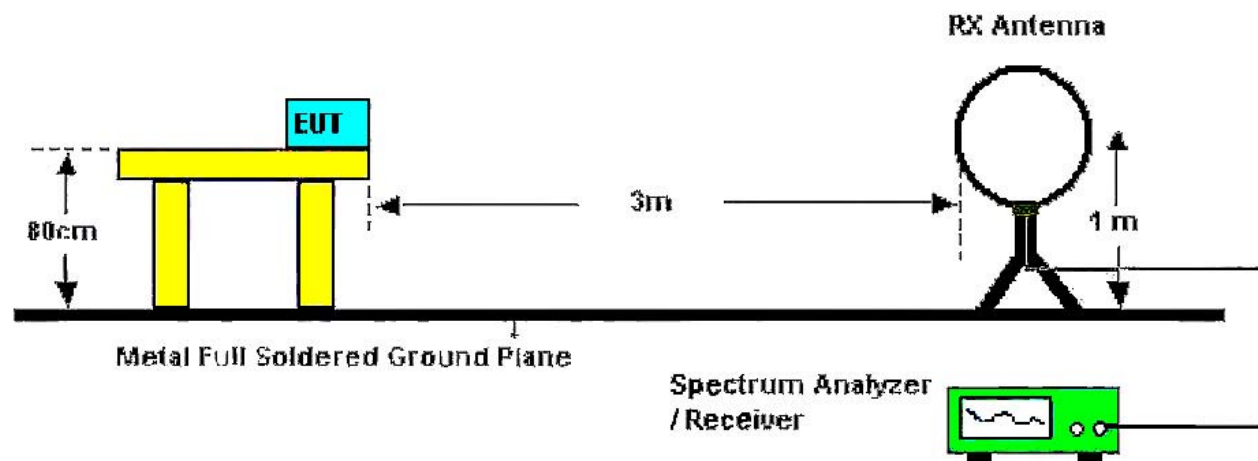
FCC CFR Title 47 Part 15 Subpart C Section 15.209/ RSS – Gen 8.9:

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

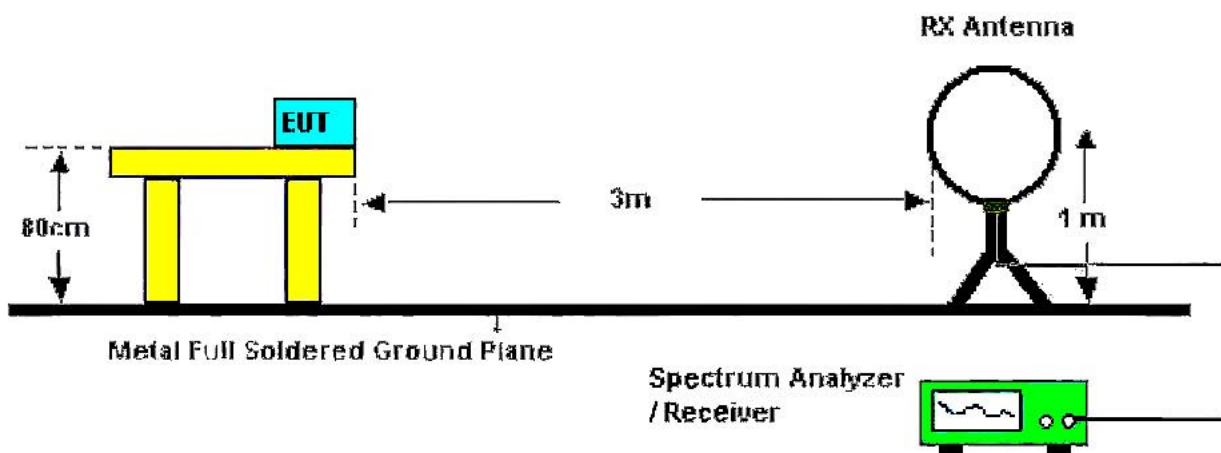
Note:

- (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

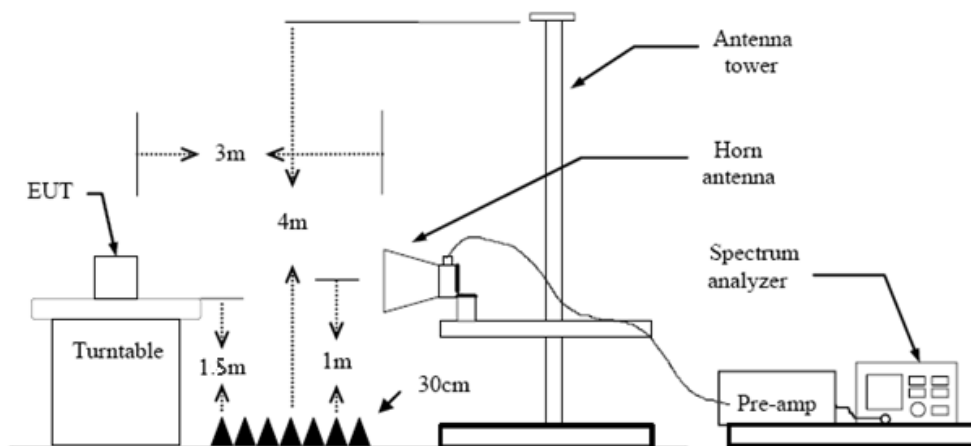
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Above 1GHz Test Setup

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 30 MHz:
9kHz – 150kHz, RBW=200Hz, VBW $\geq$ RBW, Sweep=auto, Detector function=peak, Trace=max hold;
150kHz – 30MHz, RBW=9kHz, VBW $\geq$ RBW, 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) 30 MHz - 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.
 - (4) 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

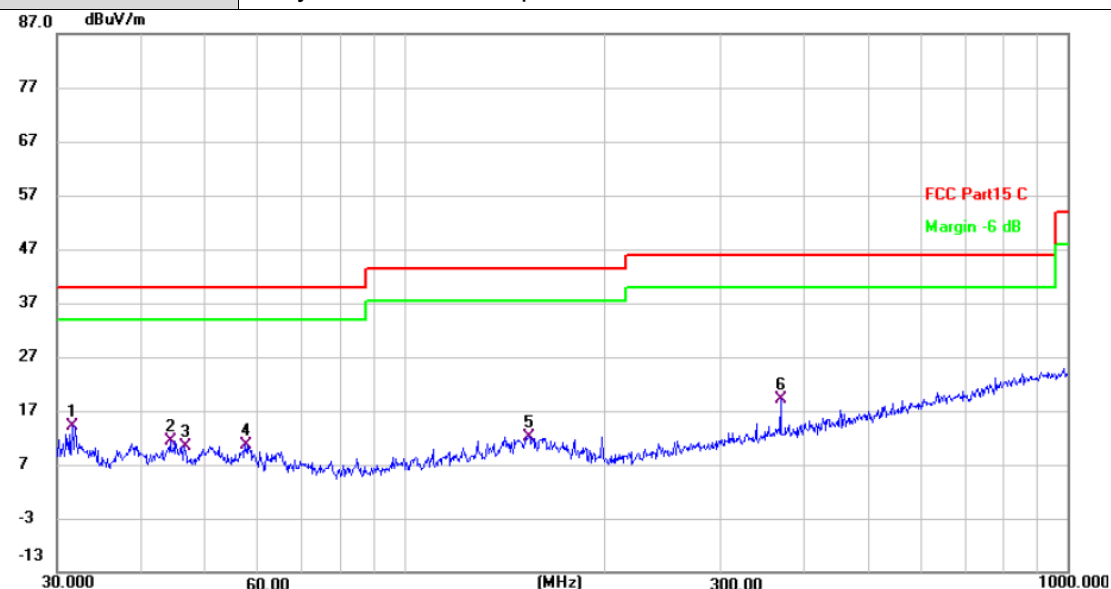
From 9 KHz to 30 MHz: Conclusion: PASS

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

Ant. Pol.	Horizontal
Test Mode:	802.11b Mode 2412MHz
Remark:	Only worse case is reported



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	31.6201	32.39	-18.18	14.21	40.00	-25.79	QP
2	44.4307	29.11	-17.69	11.42	40.00	-28.58	QP
3	46.6663	28.17	-17.75	10.42	40.00	-29.58	QP
4	57.5939	29.01	-18.41	10.60	40.00	-29.40	QP
5	154.2785	28.89	-16.64	12.25	43.50	-31.25	QP
6	369.4047	34.74	-15.53	19.21	46.00	-26.79	QP

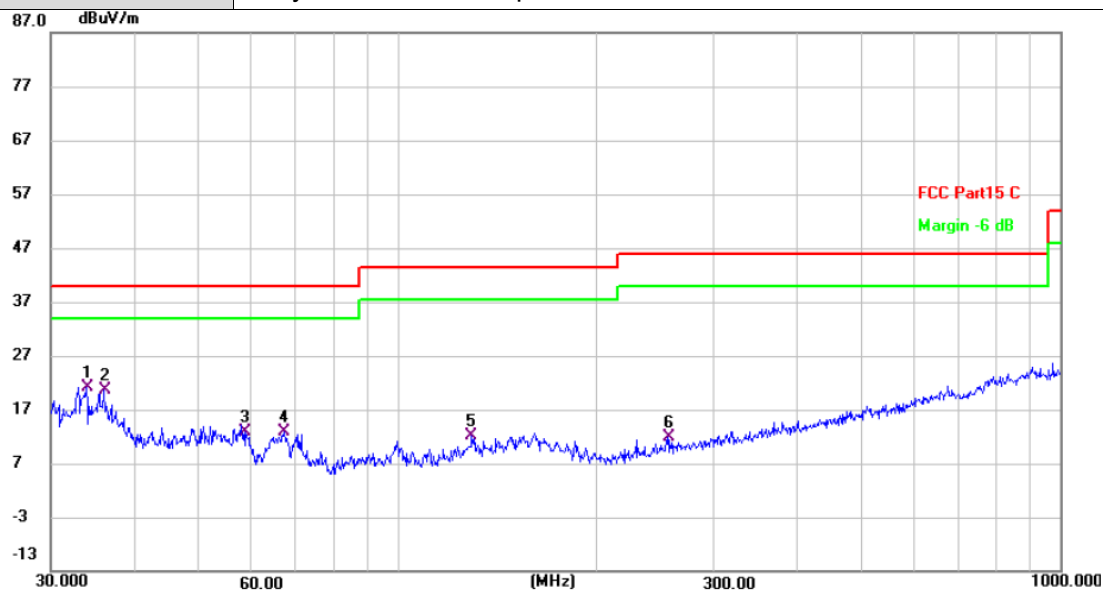
Remarks:

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:	802.11b Mode 2412MHz
Remark:	Only worse case is reported



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	33.9174	39.31	-18.10	21.21	40.00	-18.79	QP
2	36.1272	38.60	-17.90	20.70	40.00	-19.30	QP
3	59.0251	31.37	-18.51	12.86	40.00	-27.14	QP
4	67.4382	32.77	-20.00	12.77	40.00	-27.23	QP
5	129.4677	30.58	-18.54	12.04	43.50	-31.46	QP
6	255.8025	30.40	-18.43	11.97	46.00	-34.03	QP

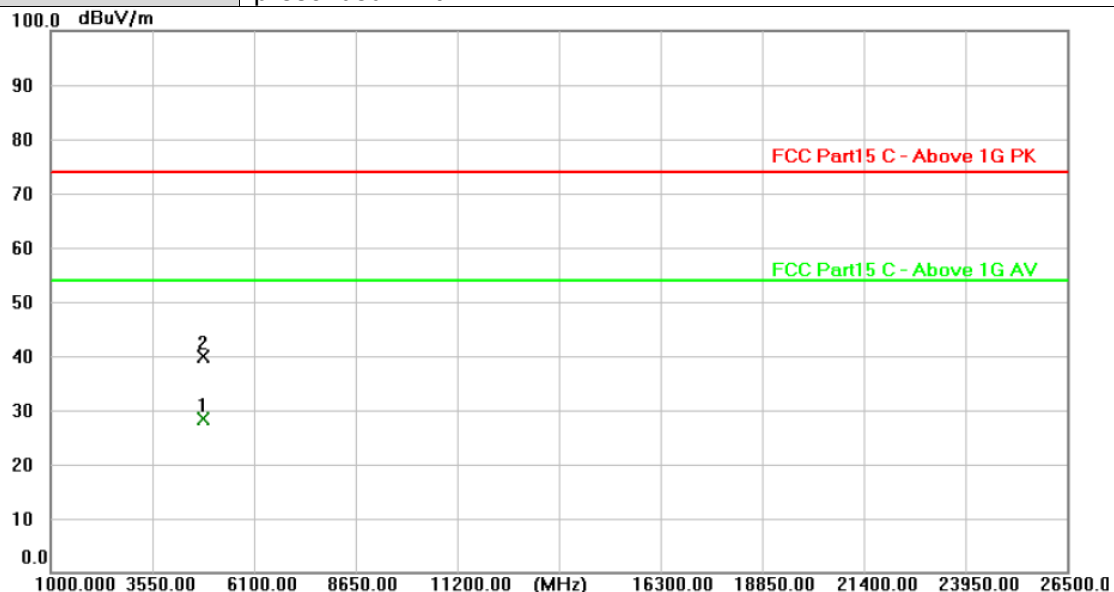
Remarks:

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value



Adobe 1GHz

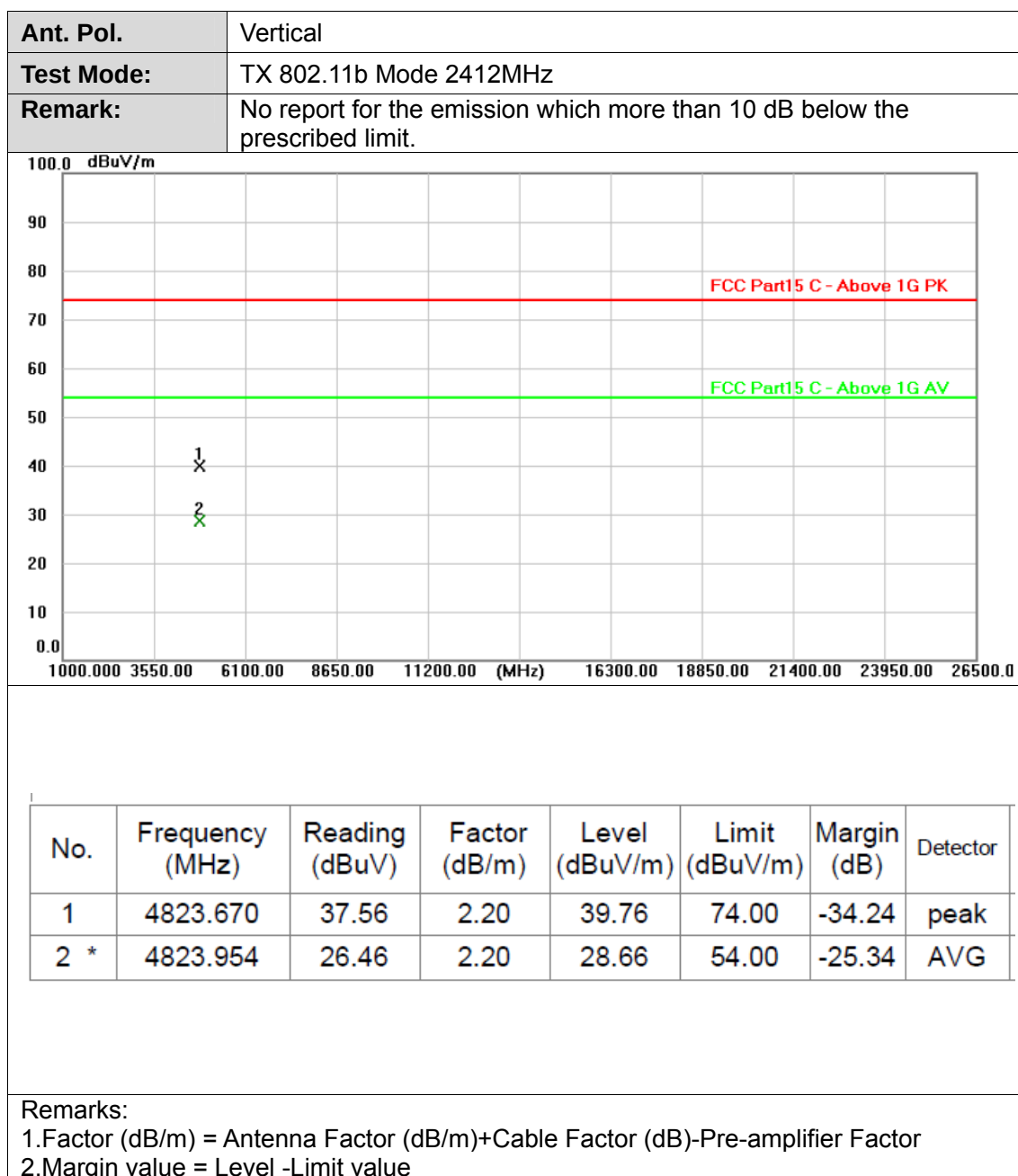
Ant. Pol.	Horizontal
Test Mode:	TX 802.11b Mode 2412MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4824.022	26.21	2.20	28.41	54.00	-25.59	AVG
2	4824.420	37.77	2.20	39.97	74.00	-34.03	peak

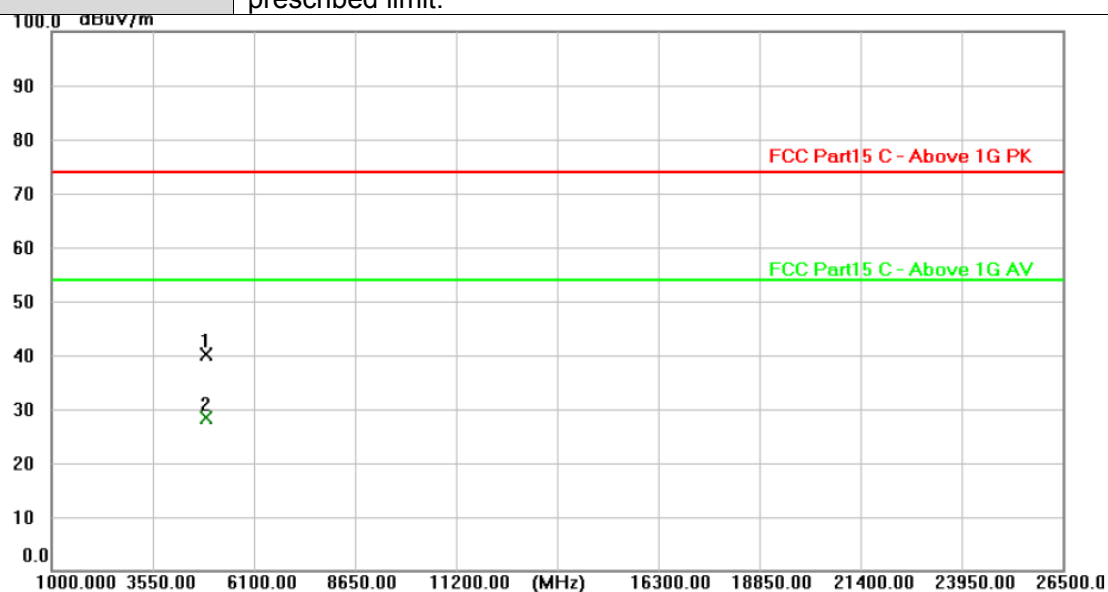
Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value





Ant. Pol.	Horizontal
Test Mode:	TX 802.11b Mode 2437MHz
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	4873.673	37.87	2.30	40.17	74.00	-33.83	peak
2 *	4874.599	26.03	2.30	28.33	54.00	-25.67	AVG

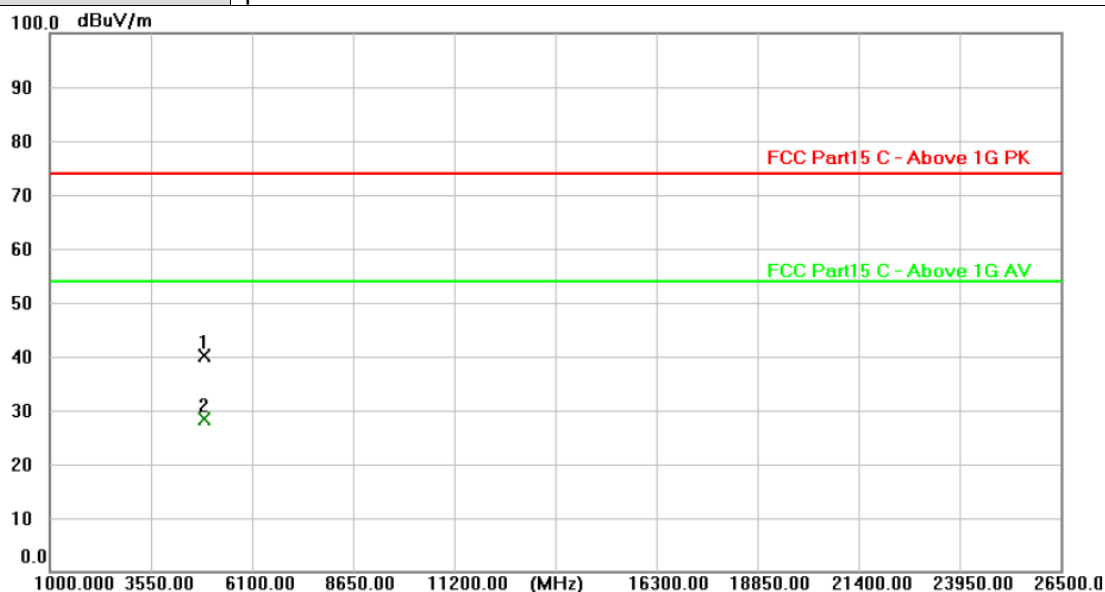
Remarks:

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

2.Margin value = Level -Limit value



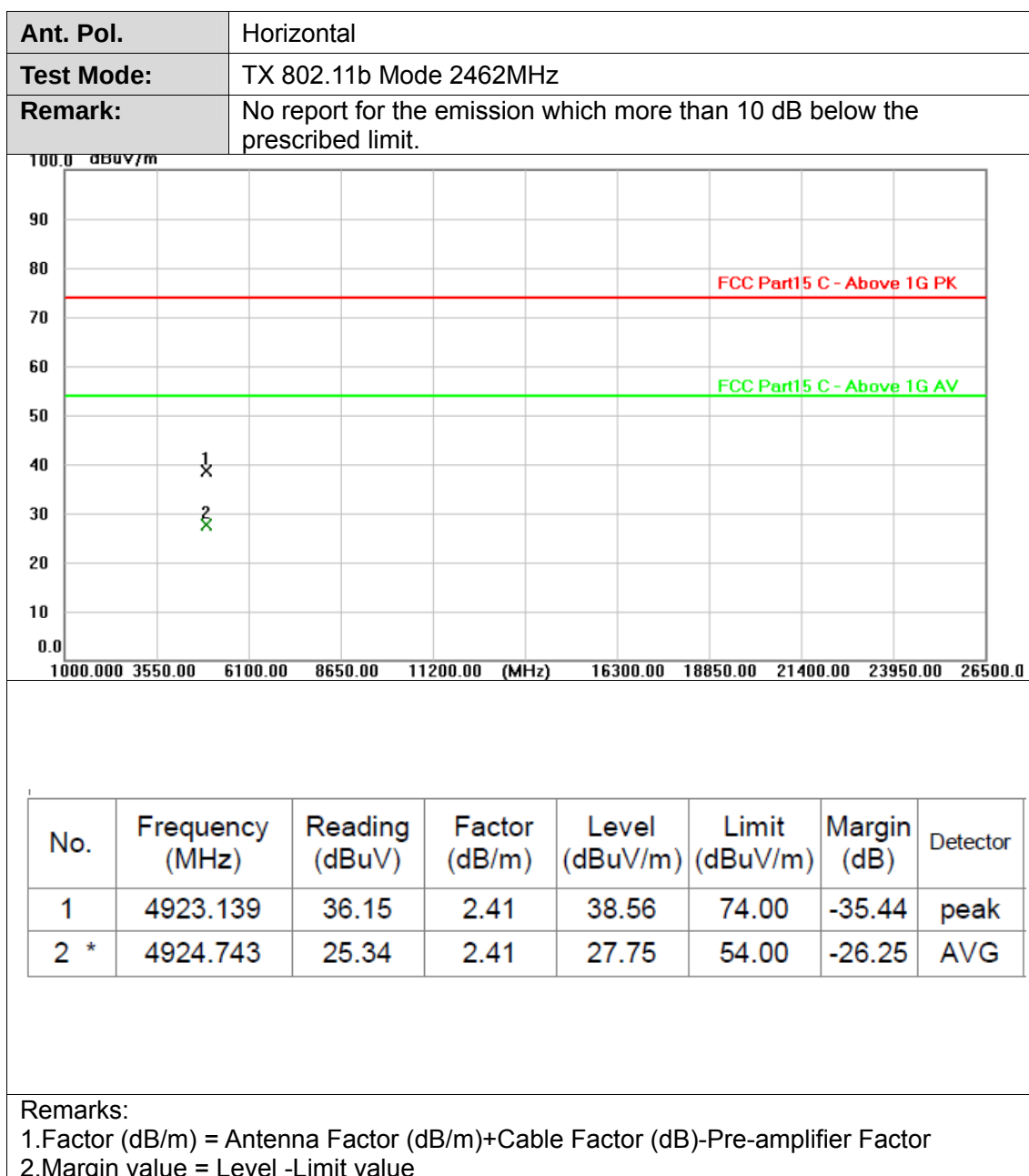
Ant. Pol.	Vertical
Test Mode:	TX 802.11b Mode 2437MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4874.128	37.83	2.30	40.13	74.00	-33.87	peak
2 *	4874.323	25.97	2.30	28.27	54.00	-25.73	AVG

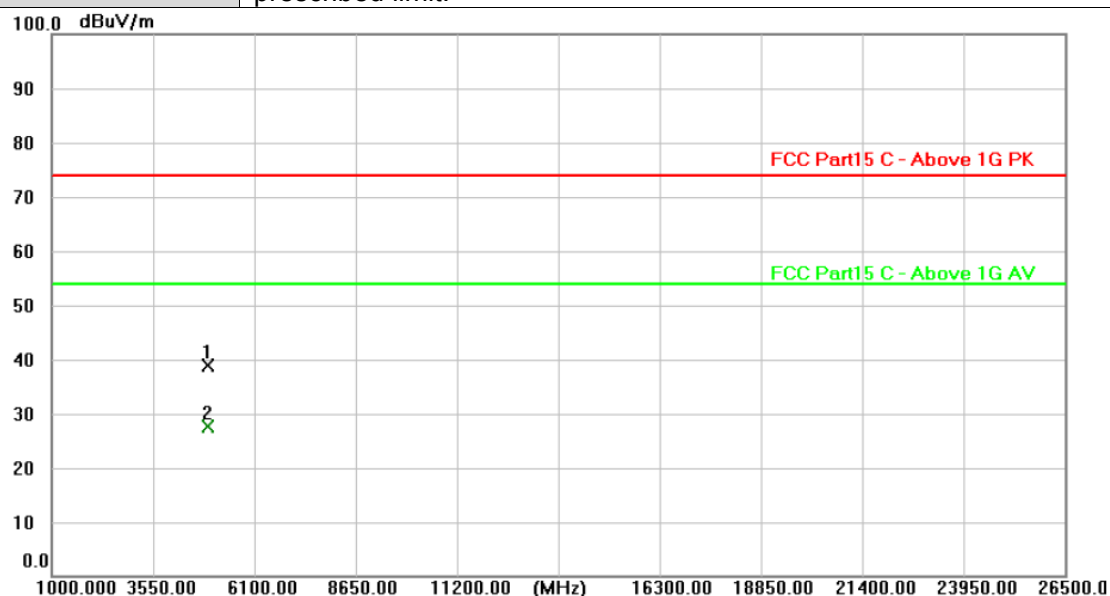
Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value





Ant. Pol.	Vertical
Test Mode:	TX 802.11b Mode 2462MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



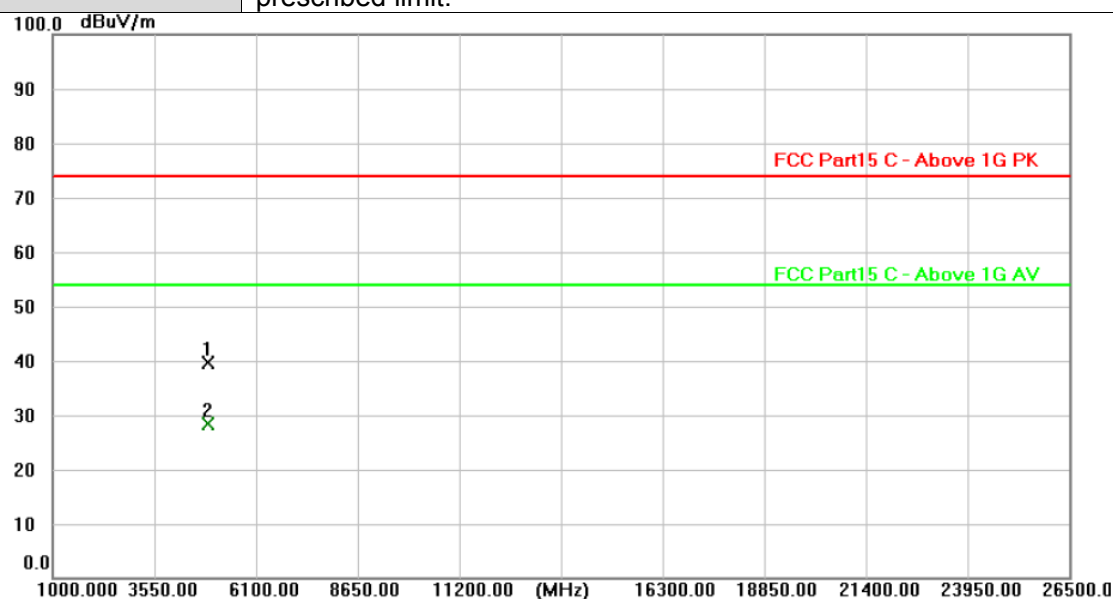
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4923.581	36.39	2.41	38.80	74.00	-35.20	peak
2 *	4924.205	25.26	2.41	27.67	54.00	-26.33	AVG

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX 802.11g Mode 2412MHz
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	4873.436	37.35	2.30	39.65	74.00	-34.35	peak
2 *	4873.879	26.04	2.30	28.34	54.00	-25.66	AVG

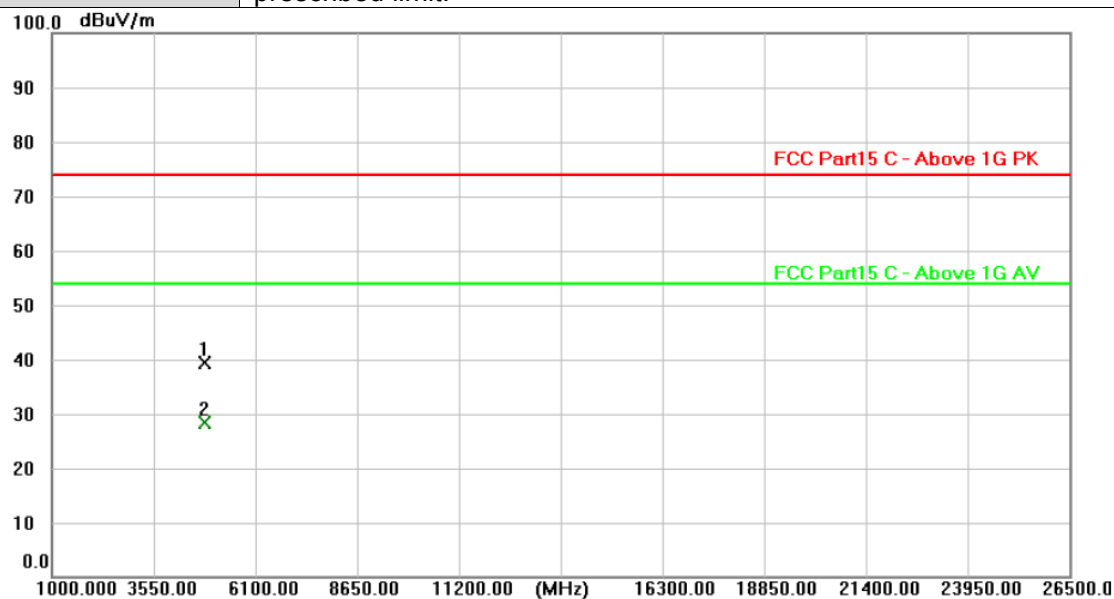
Remarks:

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 802.11g Mode 2412MHz
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	4823.788	37.10	2.20	39.30	74.00	-34.70	peak
2 *	4823.793	26.14	2.20	28.34	54.00	-25.66	AVG

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



Ant. Pol.	Horizontal						
Test Mode:	TX 802.11g Mode 2437MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

100.0 dBuV/m

100.0
90
80
70
60
50
40
30
20
10
0.0

1000.000 3550.00 6100.00 8650.00 11200.00 (MHz) 16300.00 18850.00 21400.00 23950.00 26500.0

FCC Part15 C - Above 1G PK

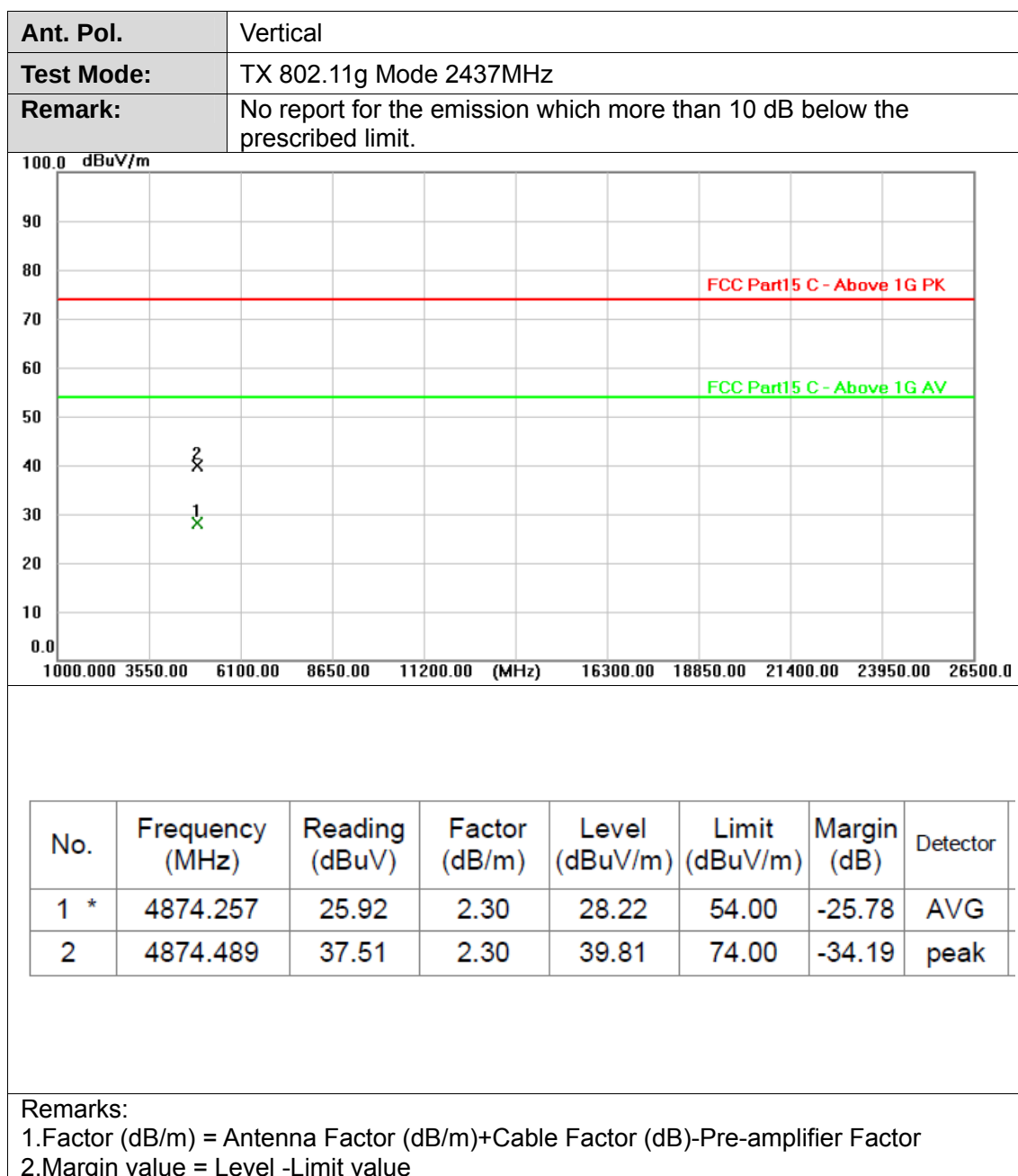
FCC Part15 C - Above 1G AV

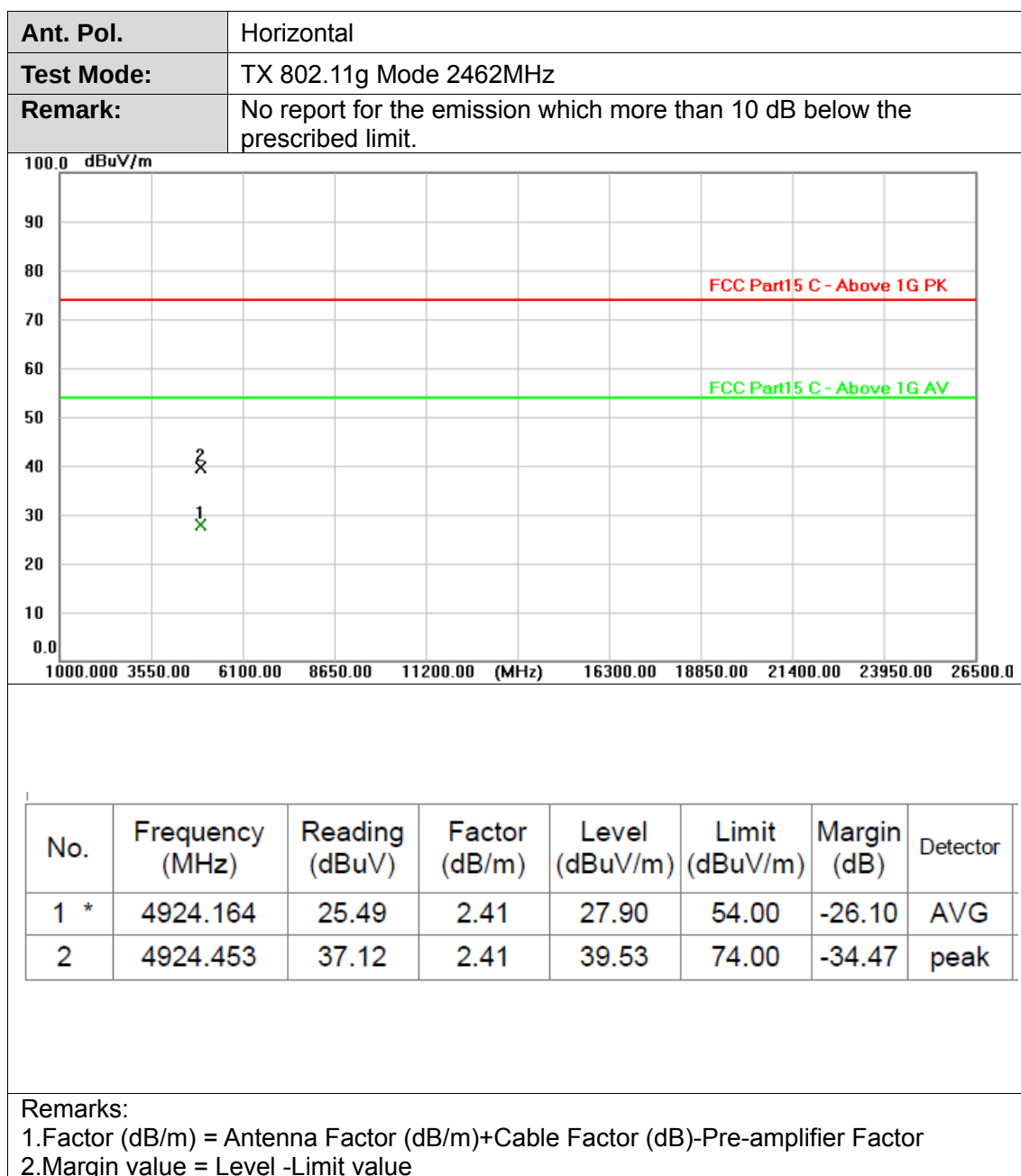
1 x

2 x

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4873.125	37.56	2.30	39.86	74.00	-34.14	peak
2 *	4874.458	25.90	2.30	28.20	54.00	-25.80	AVG

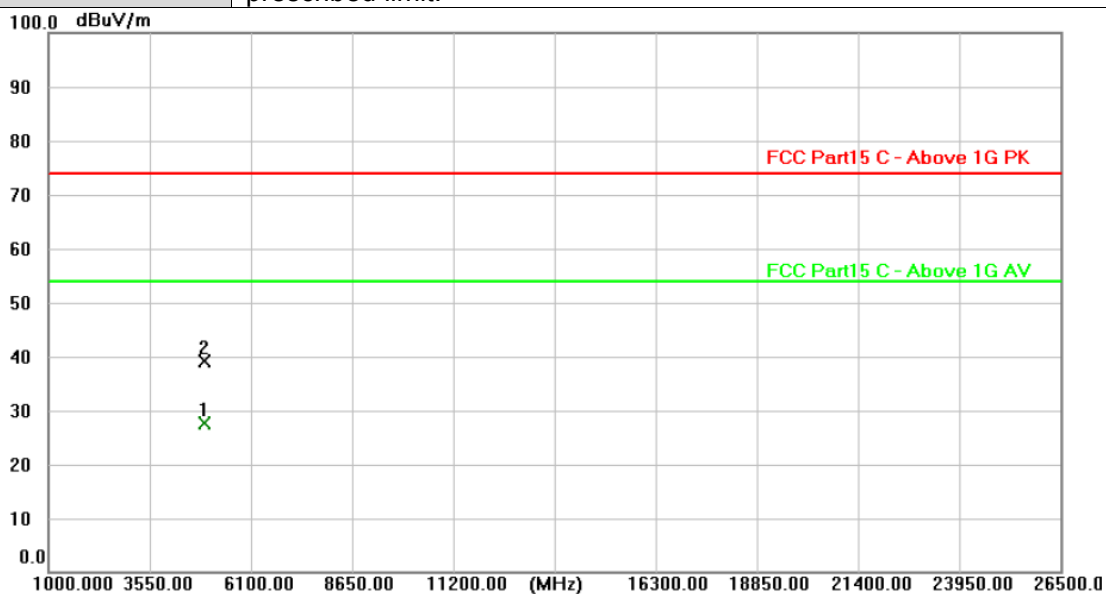
Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value







Ant. Pol.	Vertical
Test Mode:	TX 802.11g Mode 2462MHz
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 *	4924.017	25.27	2.41	27.68	54.00	-26.32	AVG
2	4924.143	36.72	2.41	39.13	74.00	-34.87	peak

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX 802.11n(HT20) Mode 2412MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.

100.0 dBuV/m

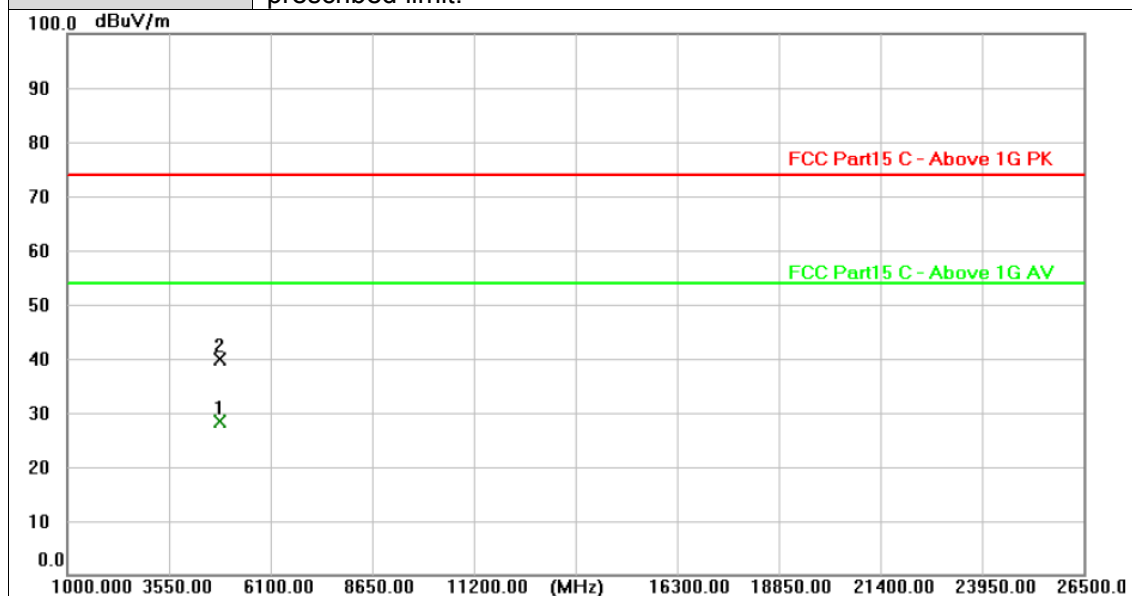
1000.000 3550.00 6100.00 8650.00 11200.00 (MHz) 16300.00 18850.00 21400.00 23950.00 26500.0

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4823.634	26.08	2.20	28.28	54.00	-25.72	AVG
2	4824.398	36.75	2.20	38.95	74.00	-35.05	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 802.11n(HT20) Mode 2412MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



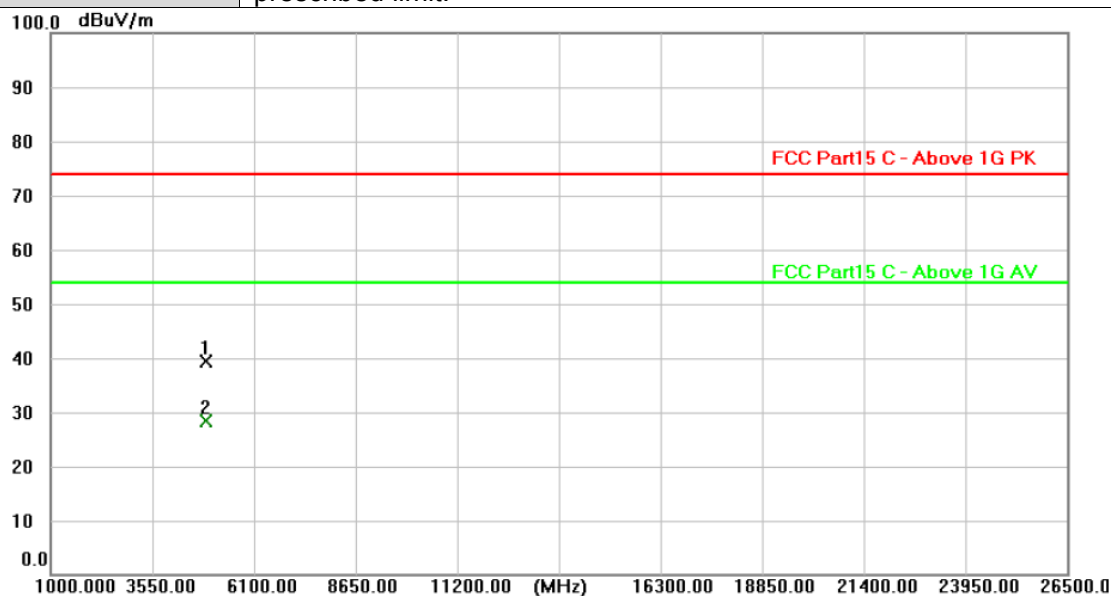
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4823.554	26.25	2.20	28.45	54.00	-25.55	AVG
2	4824.427	37.67	2.20	39.87	74.00	-34.13	peak

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX 802.11n(HT20) Mode 2437MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



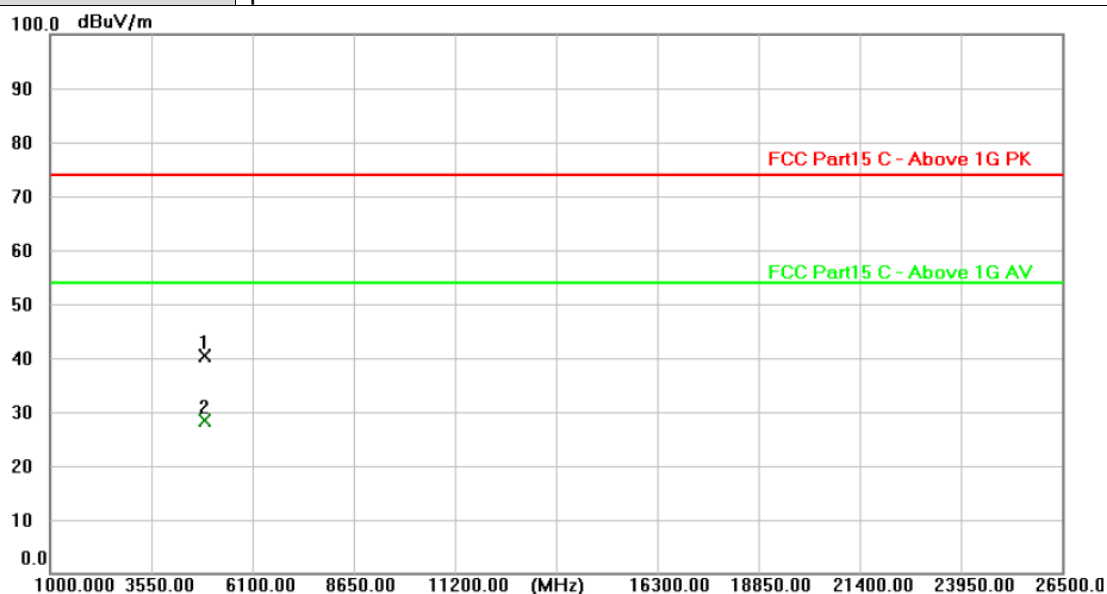
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4873.989	37.11	2.30	39.41	74.00	-34.59	peak
2 *	4874.481	26.11	2.30	28.41	54.00	-25.59	AVG

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



Ant. Pol.	Vertical
Test Mode:	TX 802.11n(HT20) Mode 2437MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.

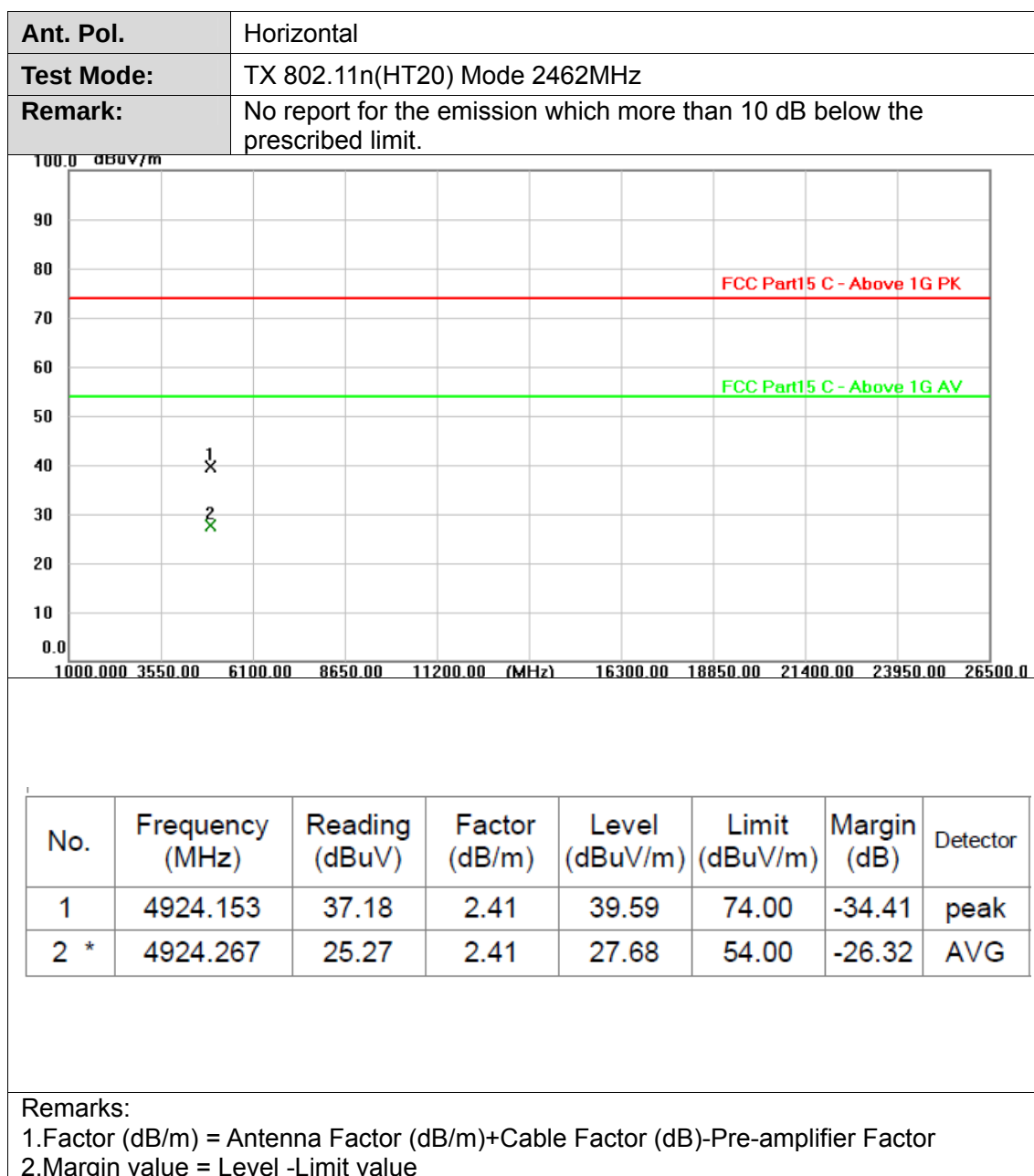


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4873.816	38.08	2.30	40.38	74.00	-33.62	peak
2 *	4874.500	26.03	2.30	28.33	54.00	-25.67	AVG

Remarks:

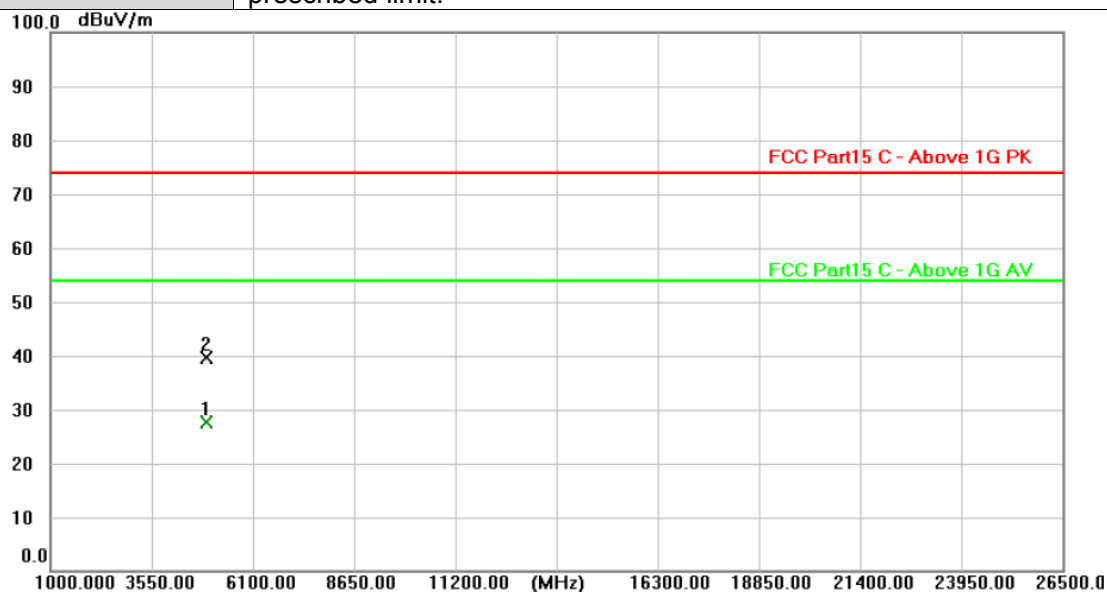
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value





Ant. Pol.	Vertical
Test Mode:	TX 802.11n(HT20) Mode 2462MHz
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 *	4923.920	25.30	2.41	27.71	54.00	-26.29	AVG
2	4924.292	37.29	2.41	39.70	74.00	-34.30	peak

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



Ant. Pol.	Horizontal						
Test Mode:	TX 802.11n(HT40) Mode 2422MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

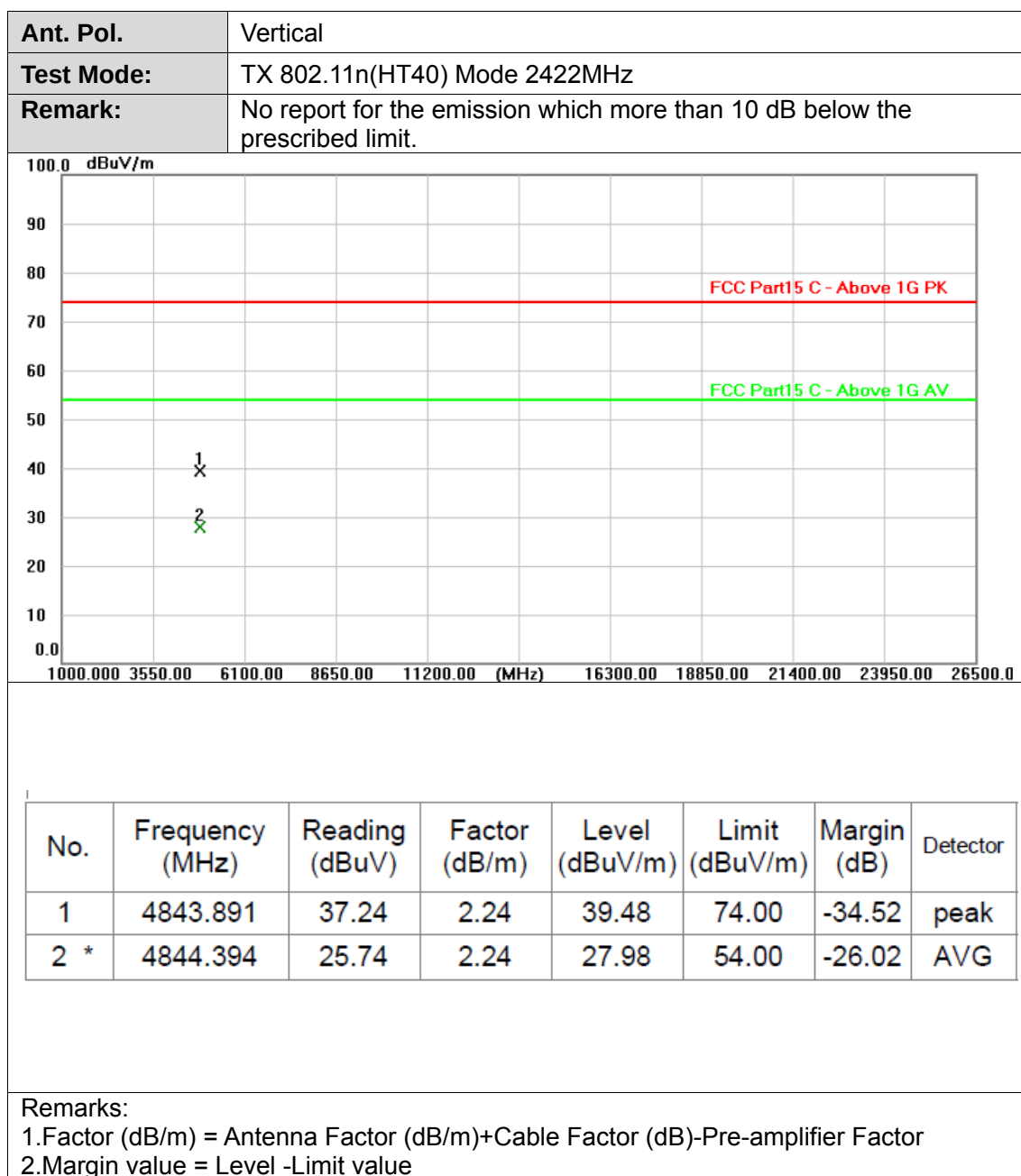
100.0 dBuV/m

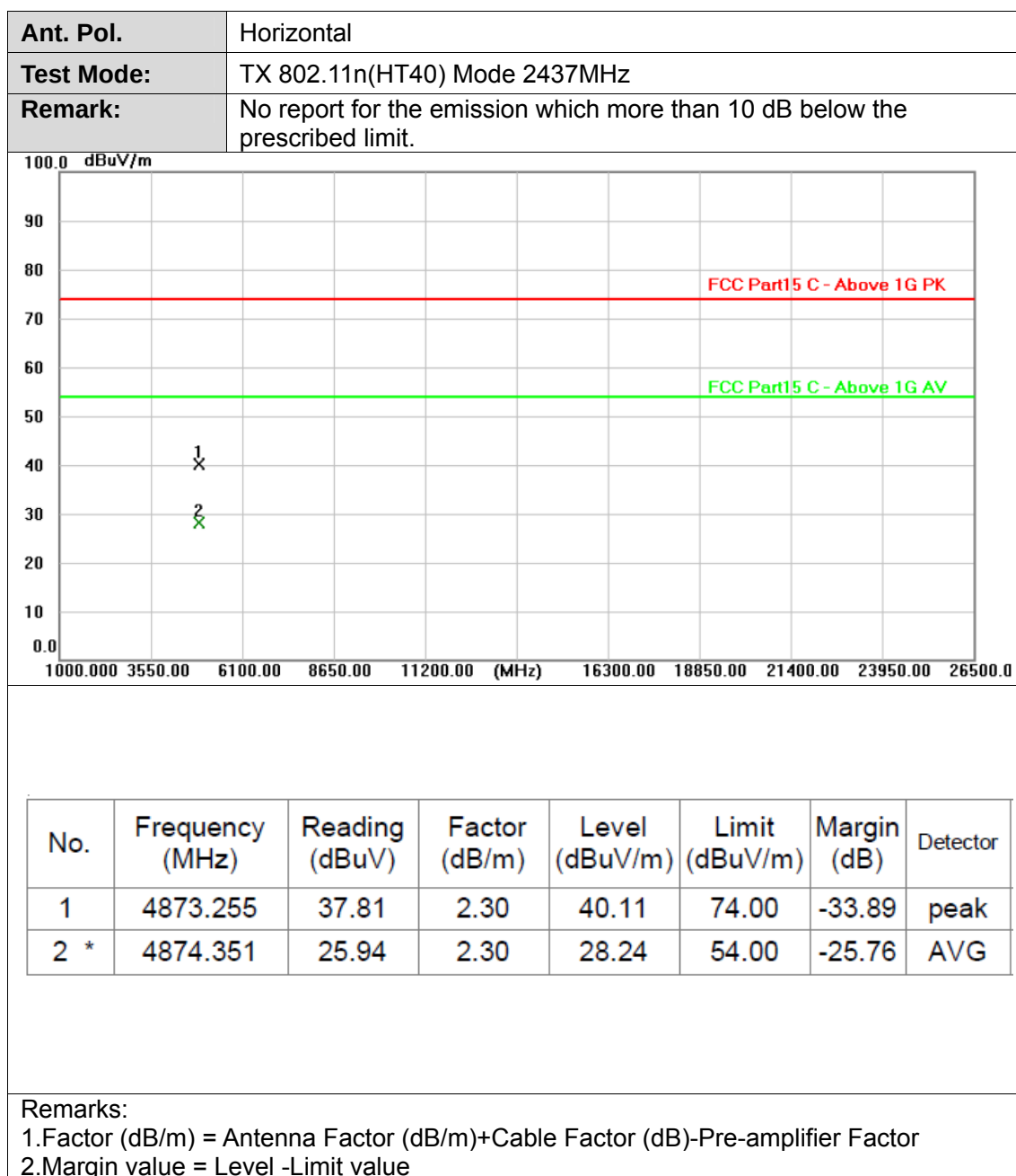
1000.000 3550.00 6100.00 8650.00 11200.00 13800.00 16300.00 18850.00 21400.00 23950.00 26500.0

(MHz)

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4843.474	26.09	2.24	28.33	54.00	-25.67	AVG
2	4843.749	37.27	2.24	39.51	74.00	-34.49	peak

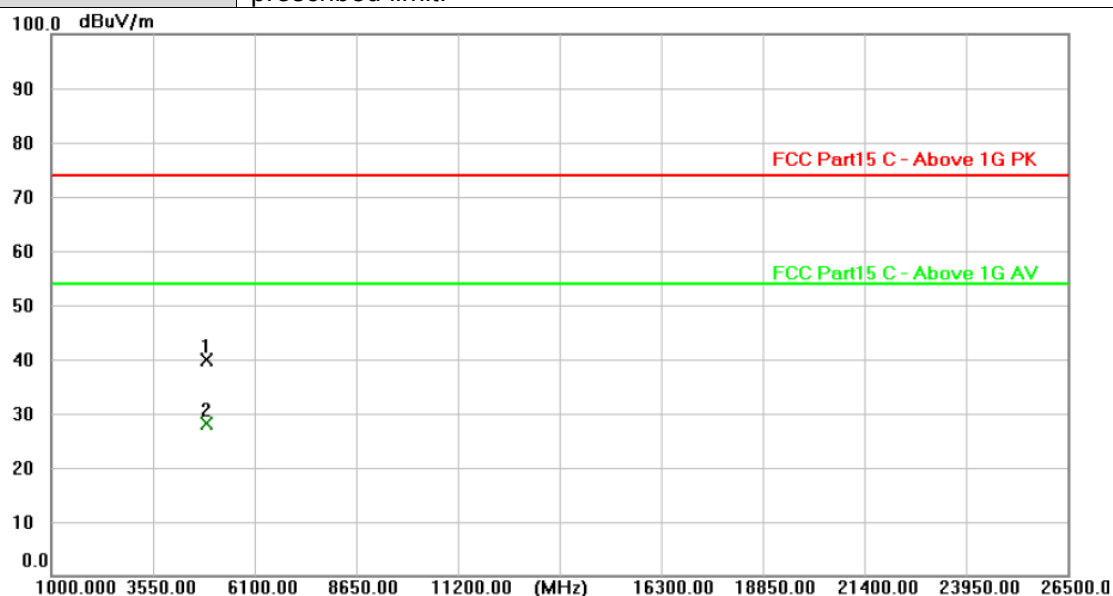
Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value







Ant. Pol.	Vertical
Test Mode:	TX 802.11n(HT40) Mode 2437MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



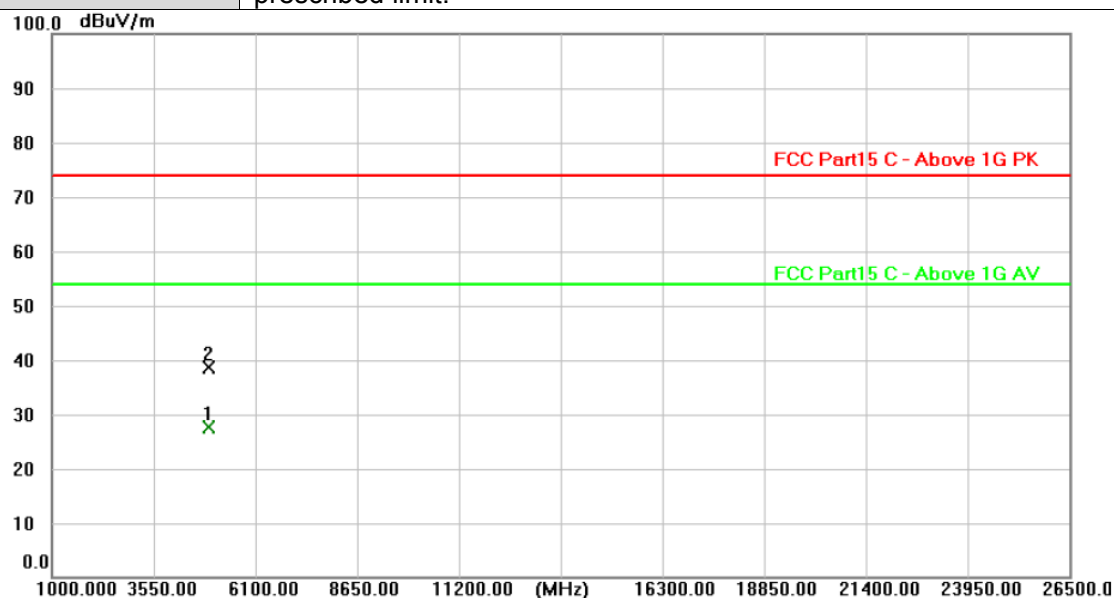
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4873.872	37.57	2.30	39.87	74.00	-34.13	peak
2 *	4874.051	25.95	2.30	28.25	54.00	-25.75	AVG

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



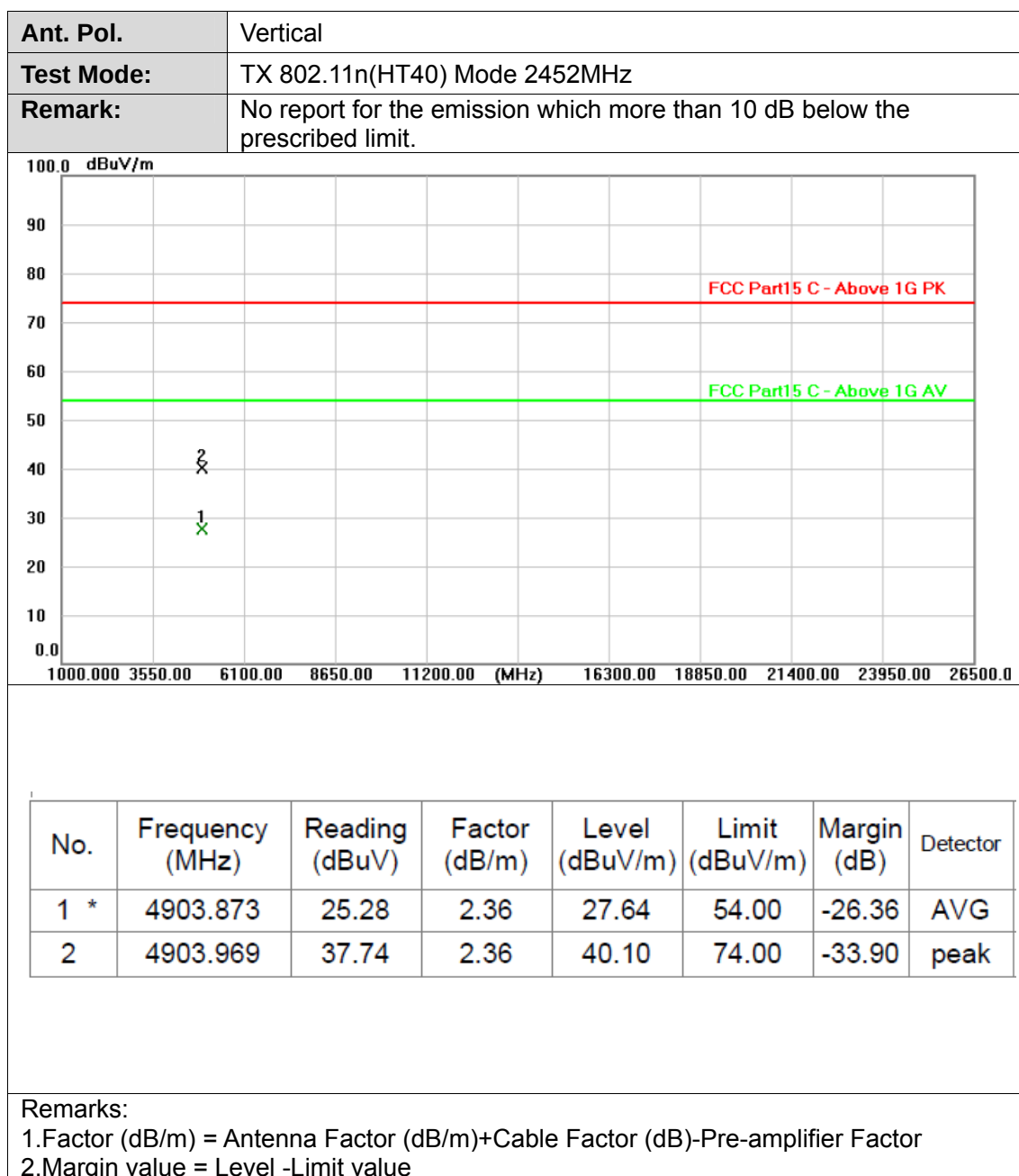
Ant. Pol.	Horizontal
Test Mode:	TX 802.11n(HT40) Mode 2452MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	4903.263	25.25	2.36	27.61	54.00	-26.39	AVG
2	4903.491	36.32	2.36	38.68	74.00	-35.32	peak

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value



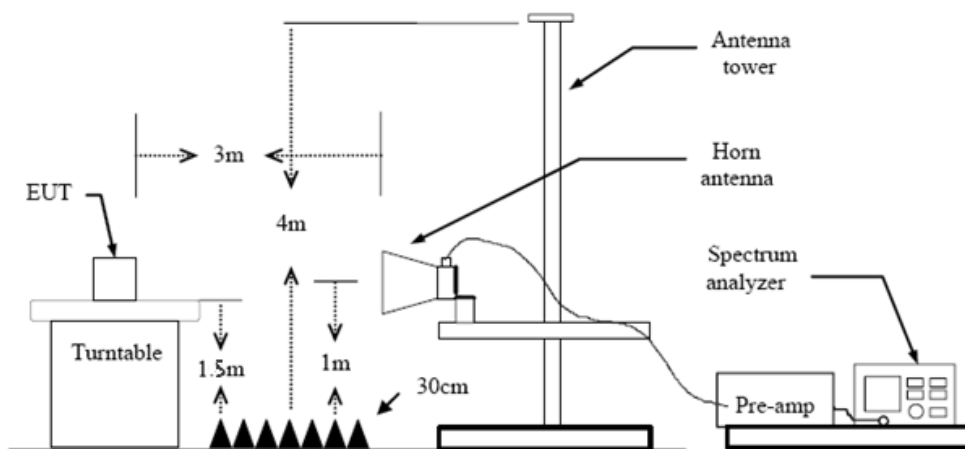
3.3. Band Edge Emissions (Radiated)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d)/ RSS 247 5.5:

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.

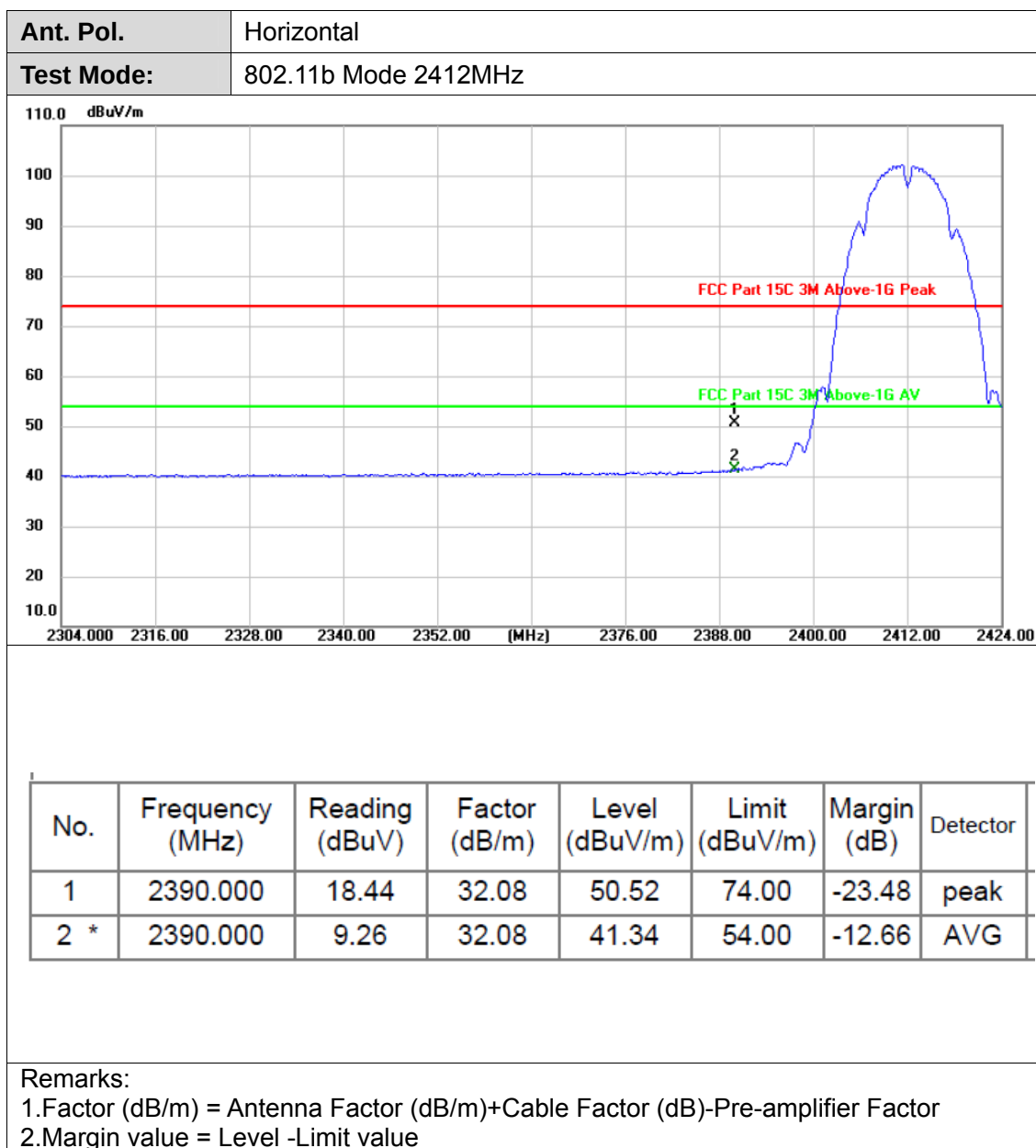
Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 3.7 Duty Cycle.

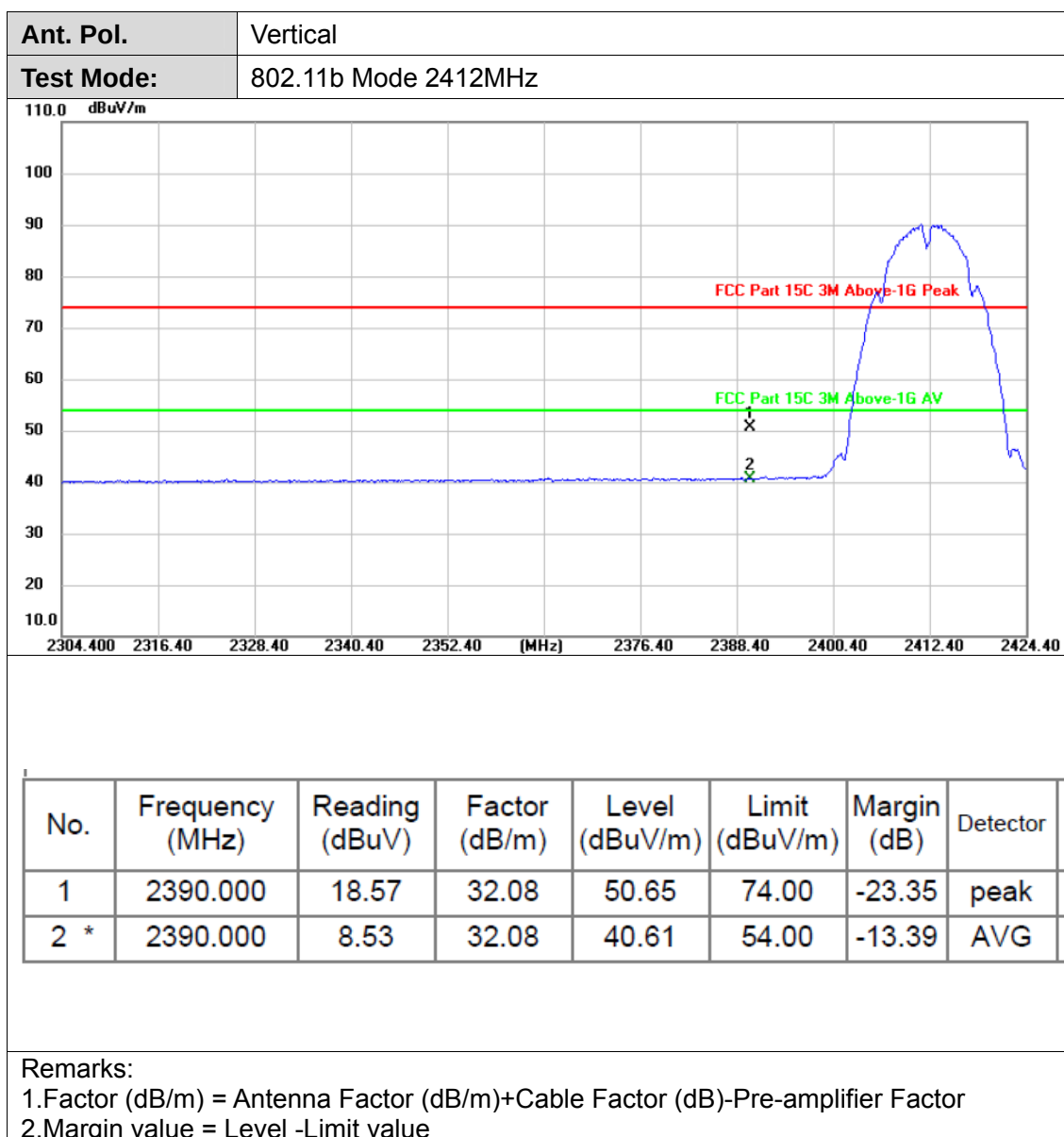
2: Duty Cycle> 98%, VBW=10Hz.

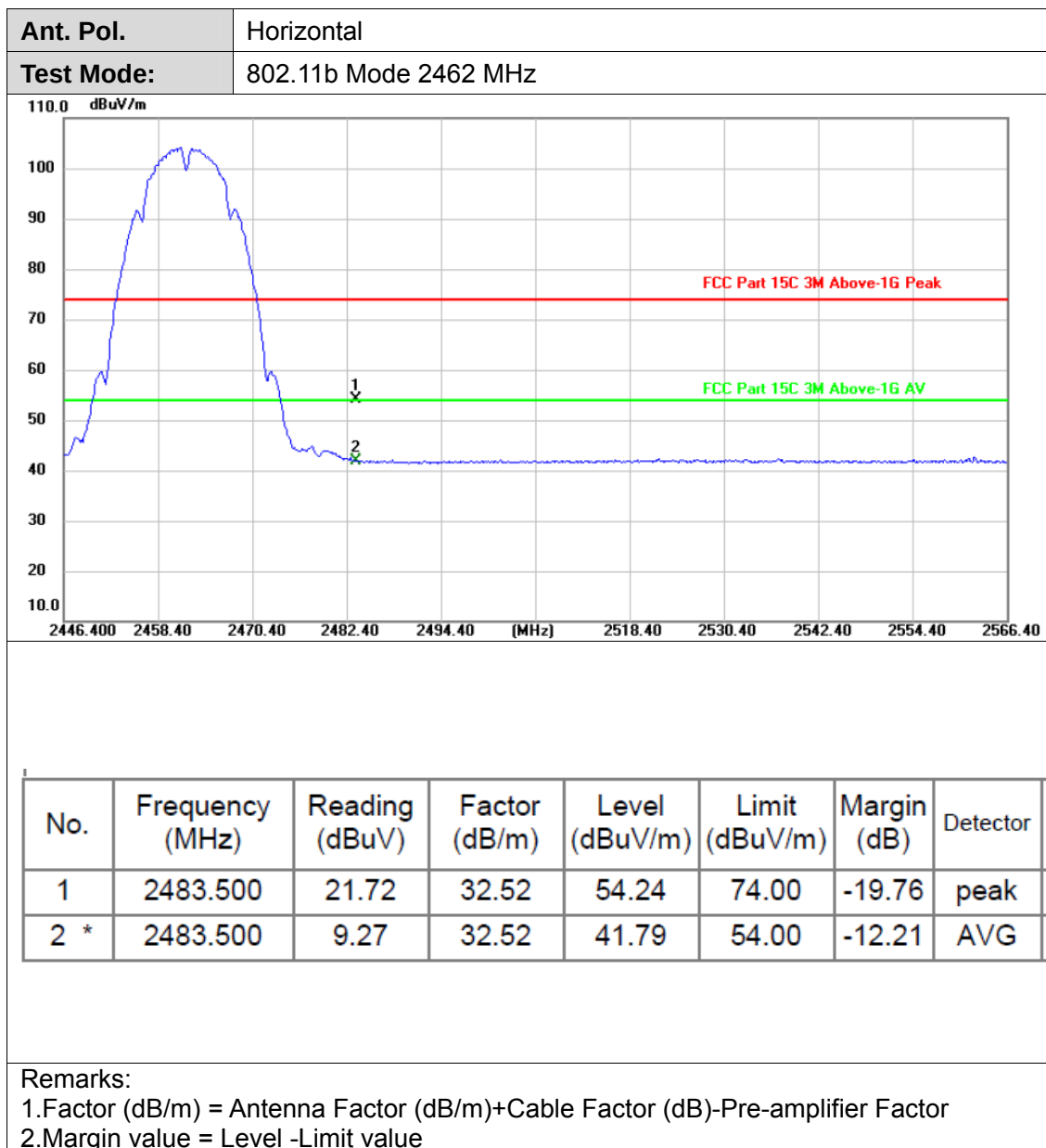
Test Mode

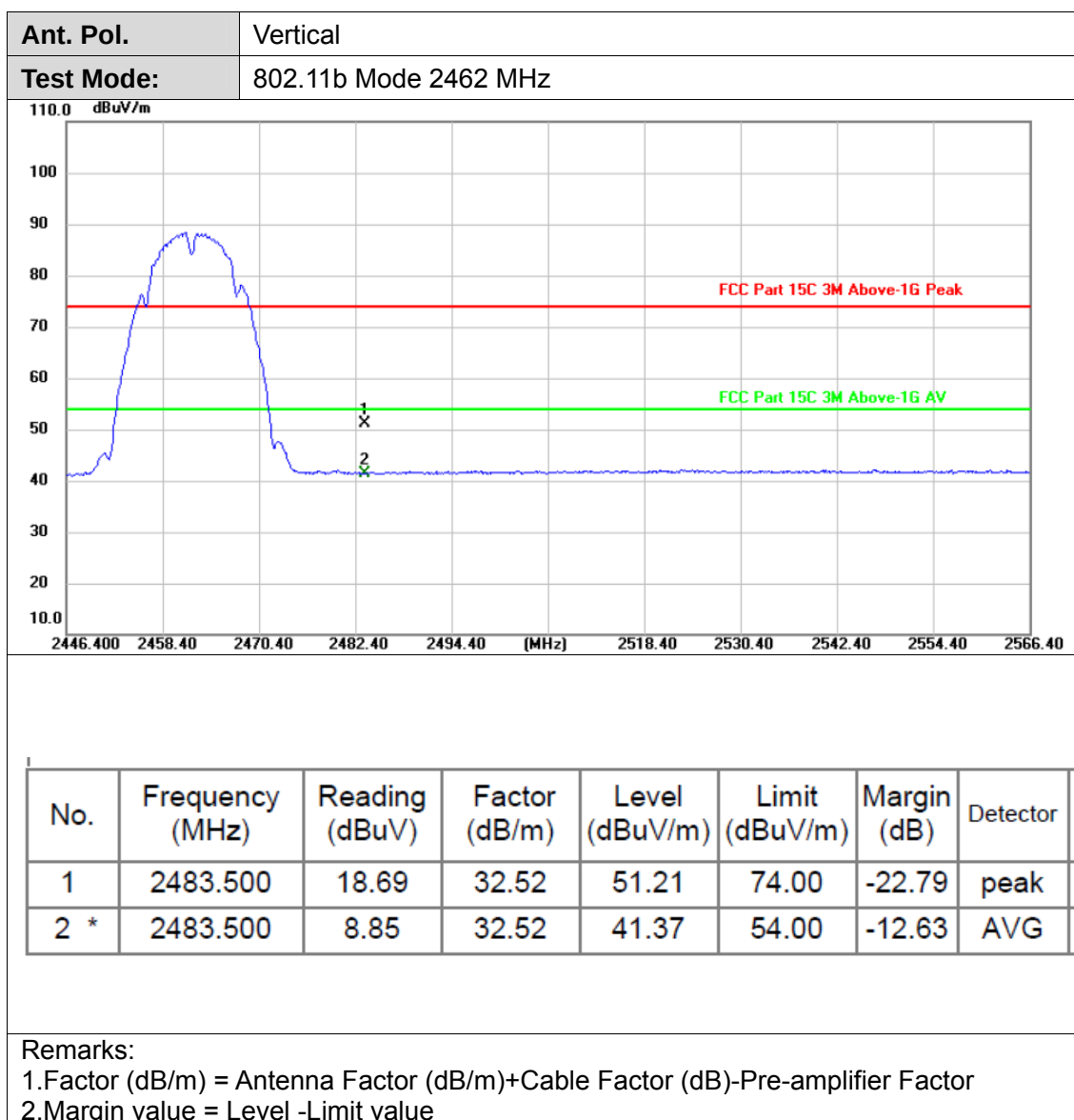
Please refer to the clause 2.4.

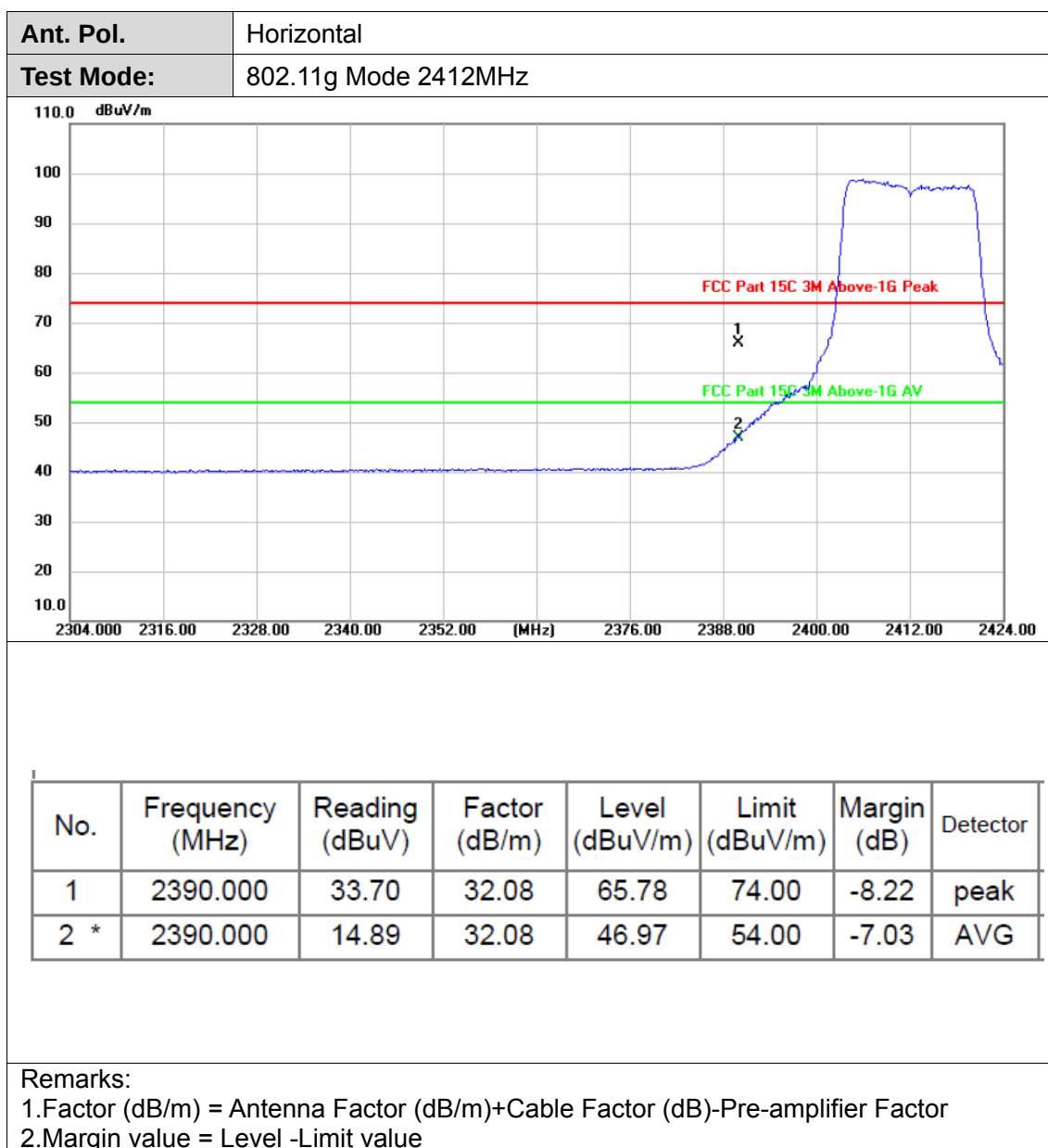
Test Results

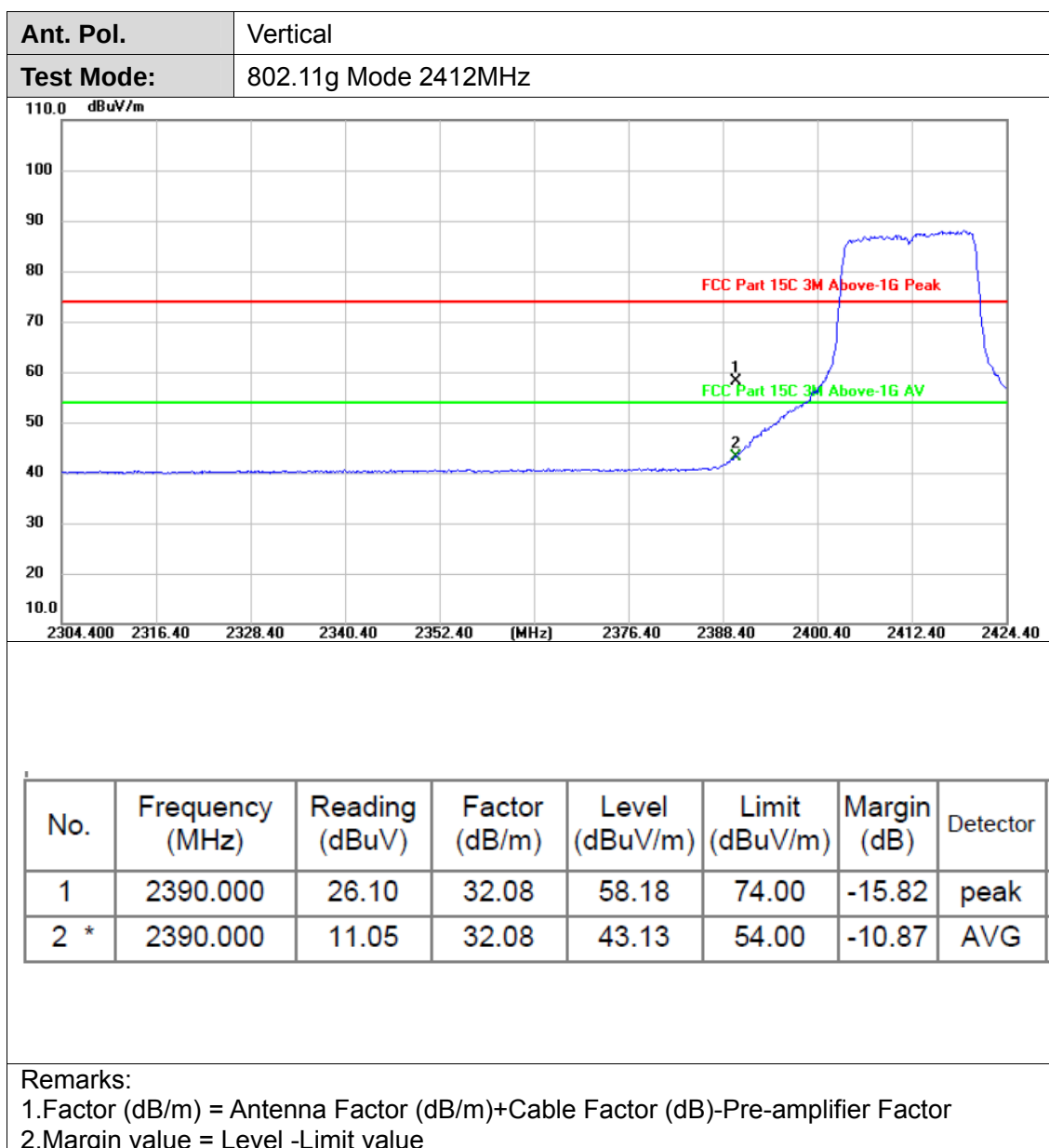


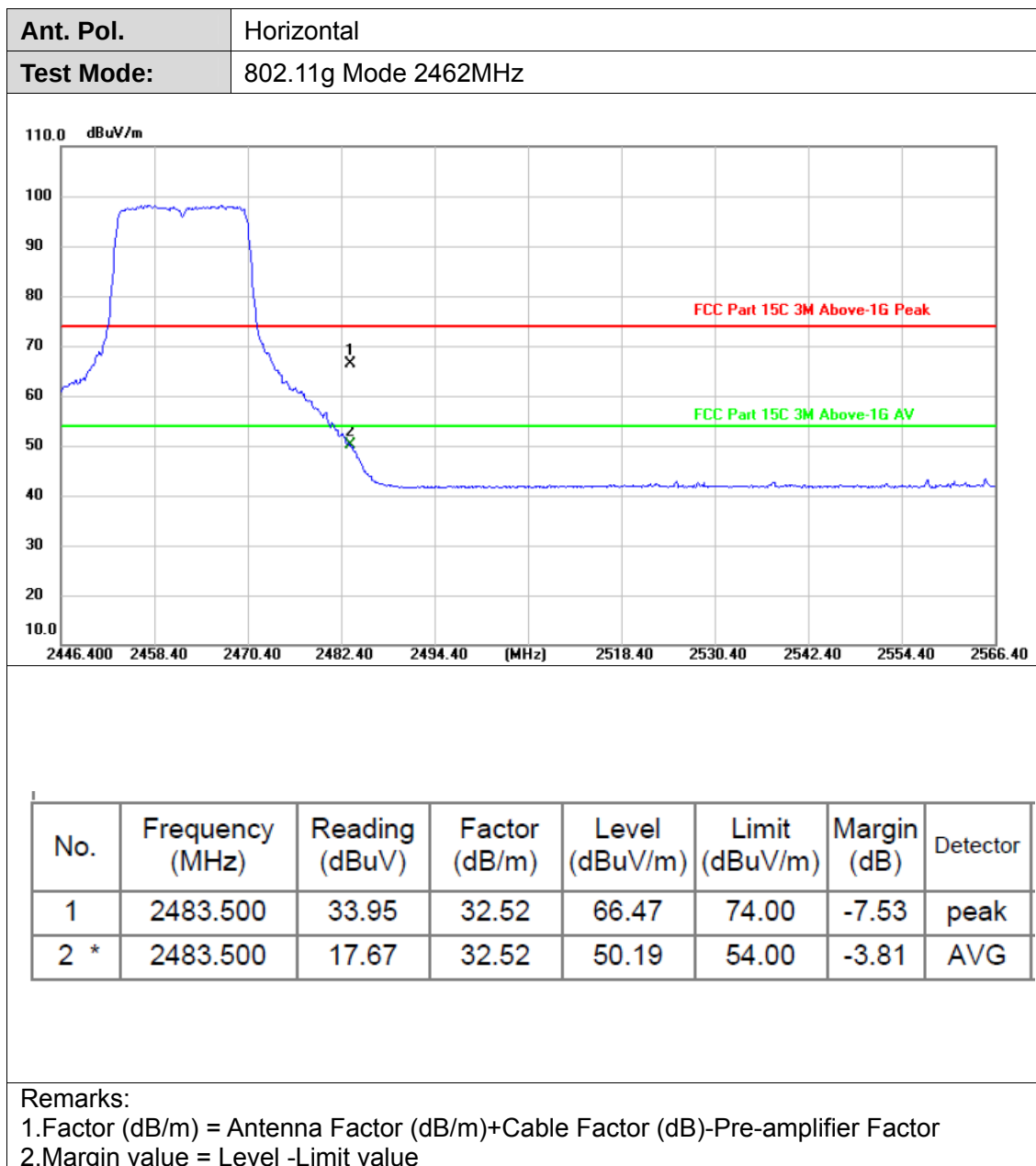


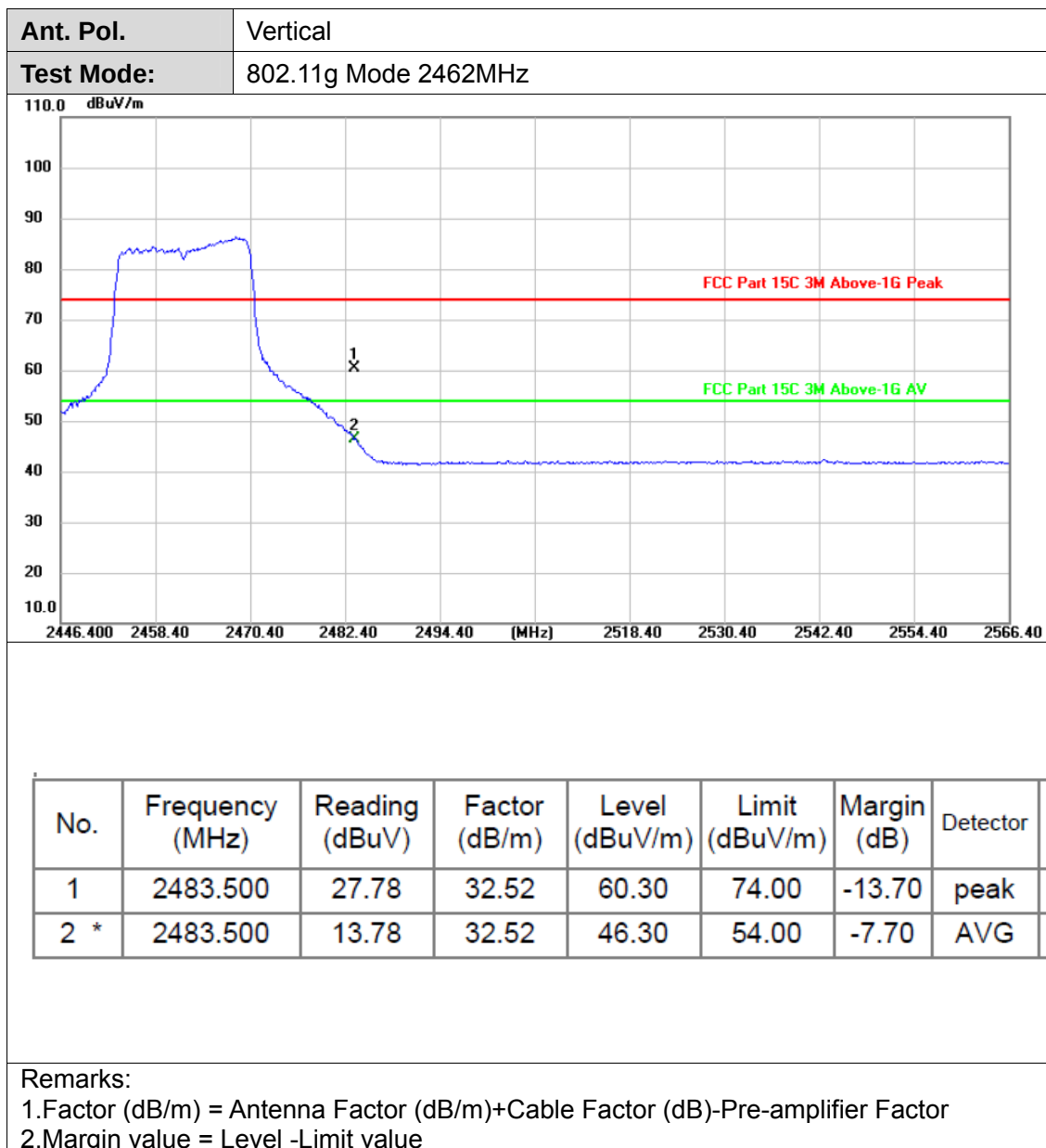


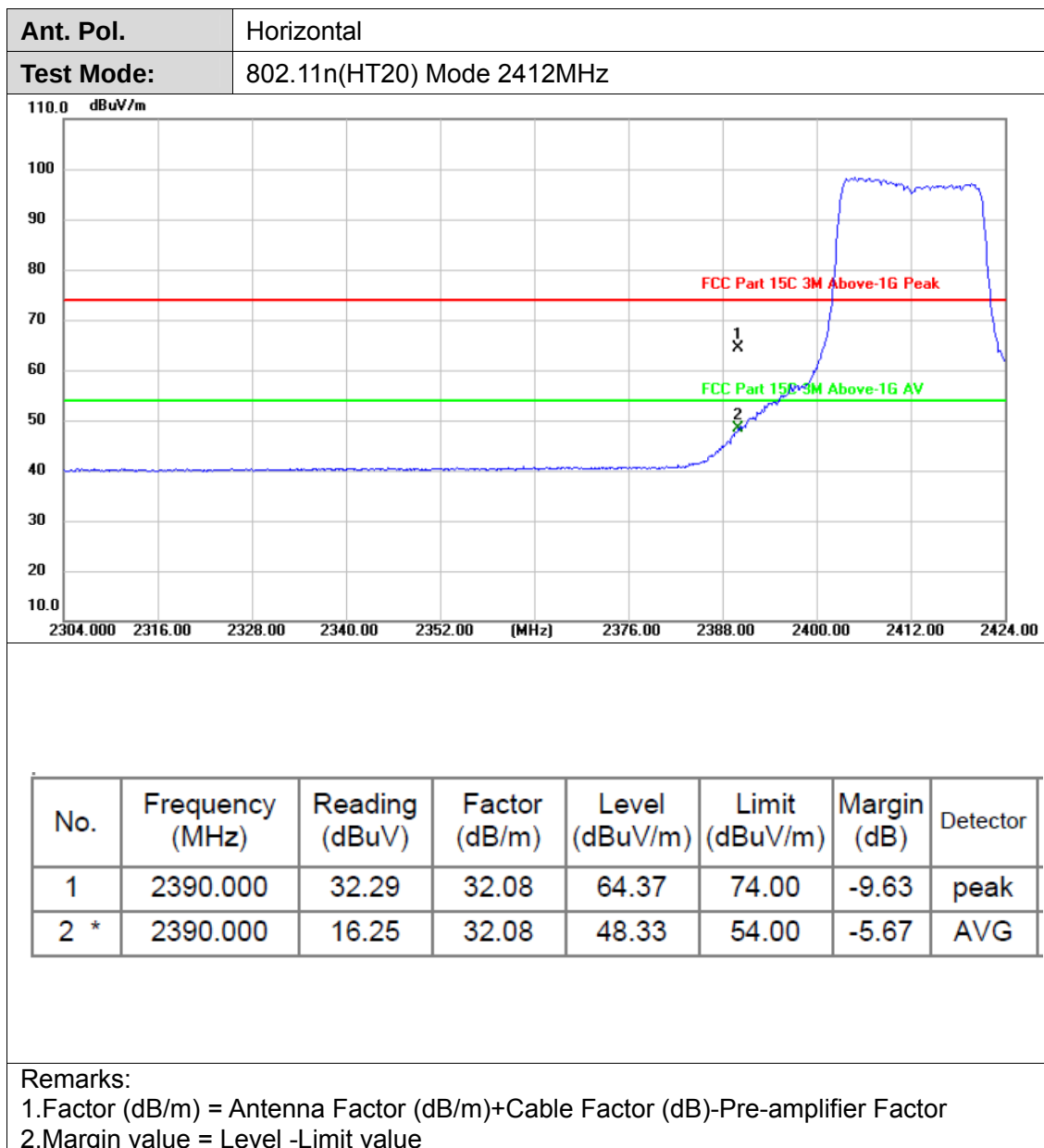


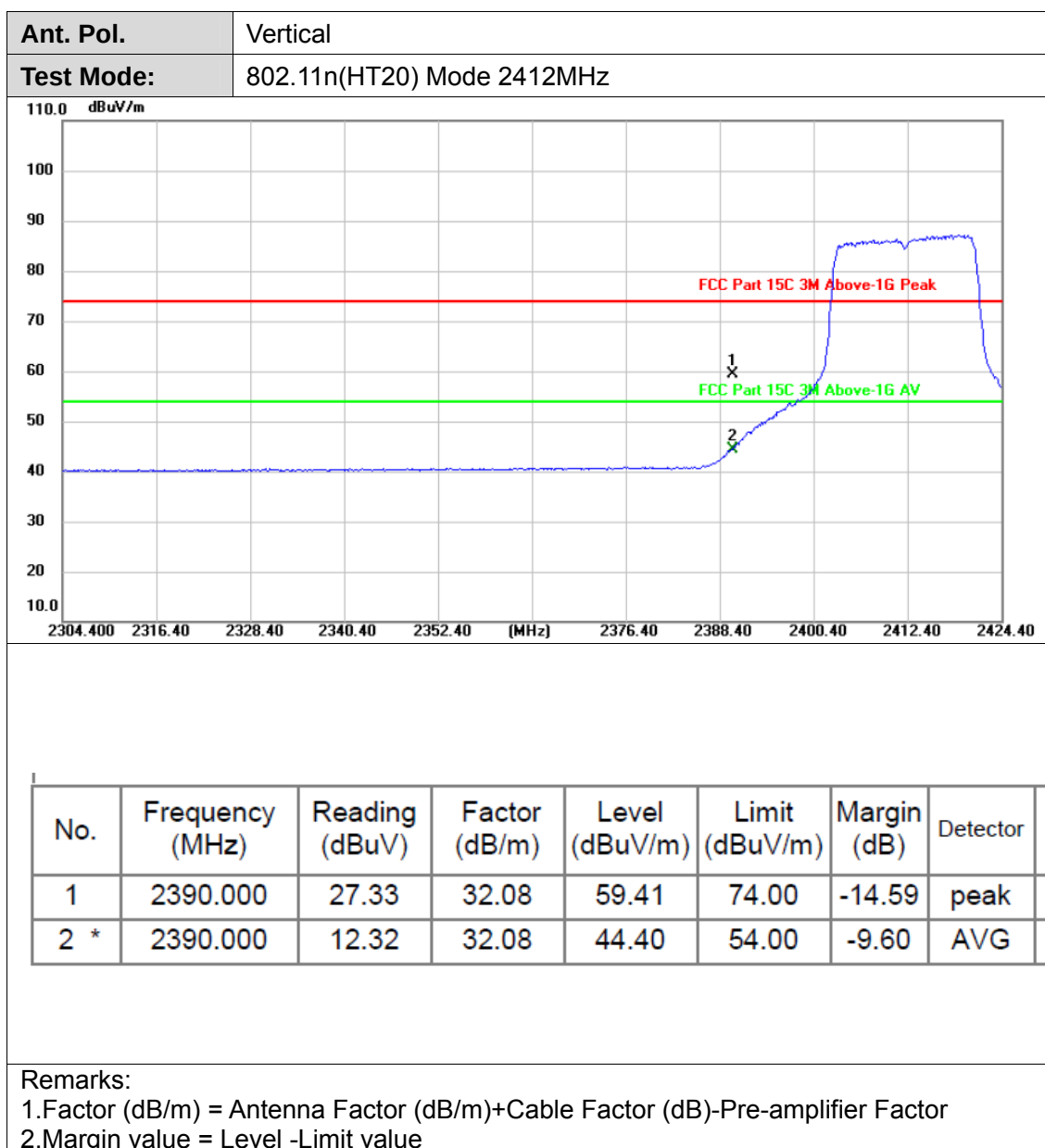


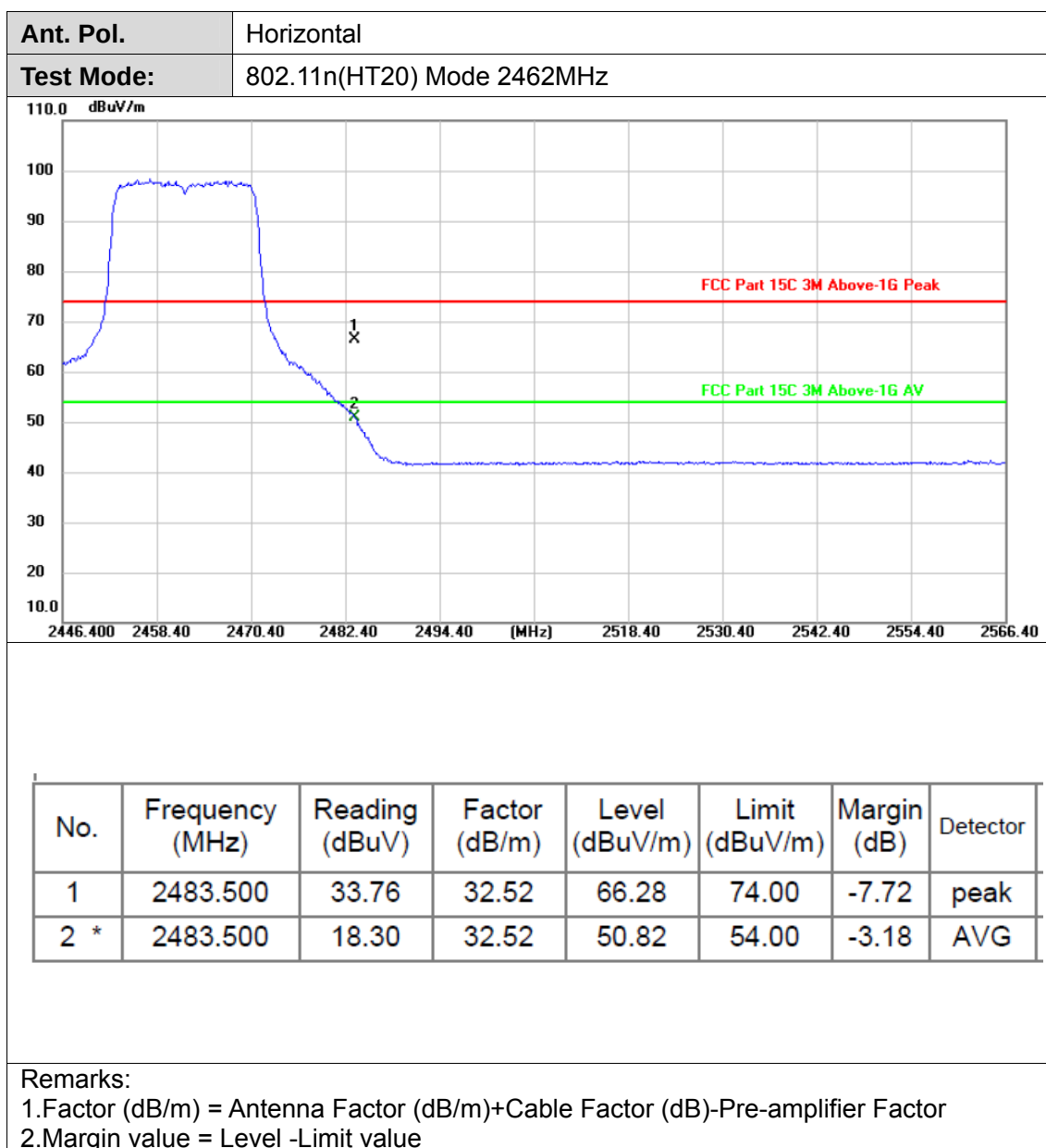


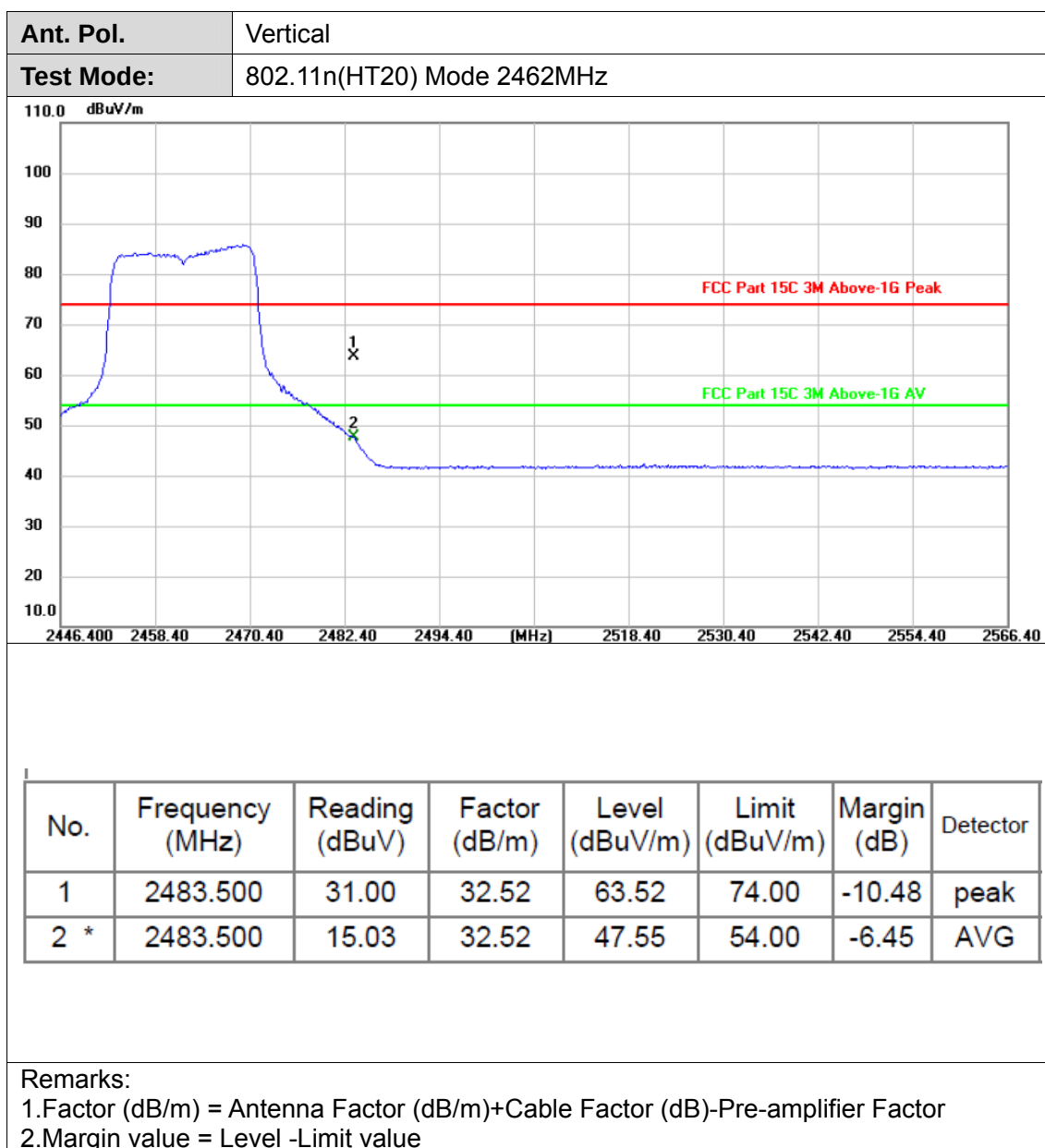


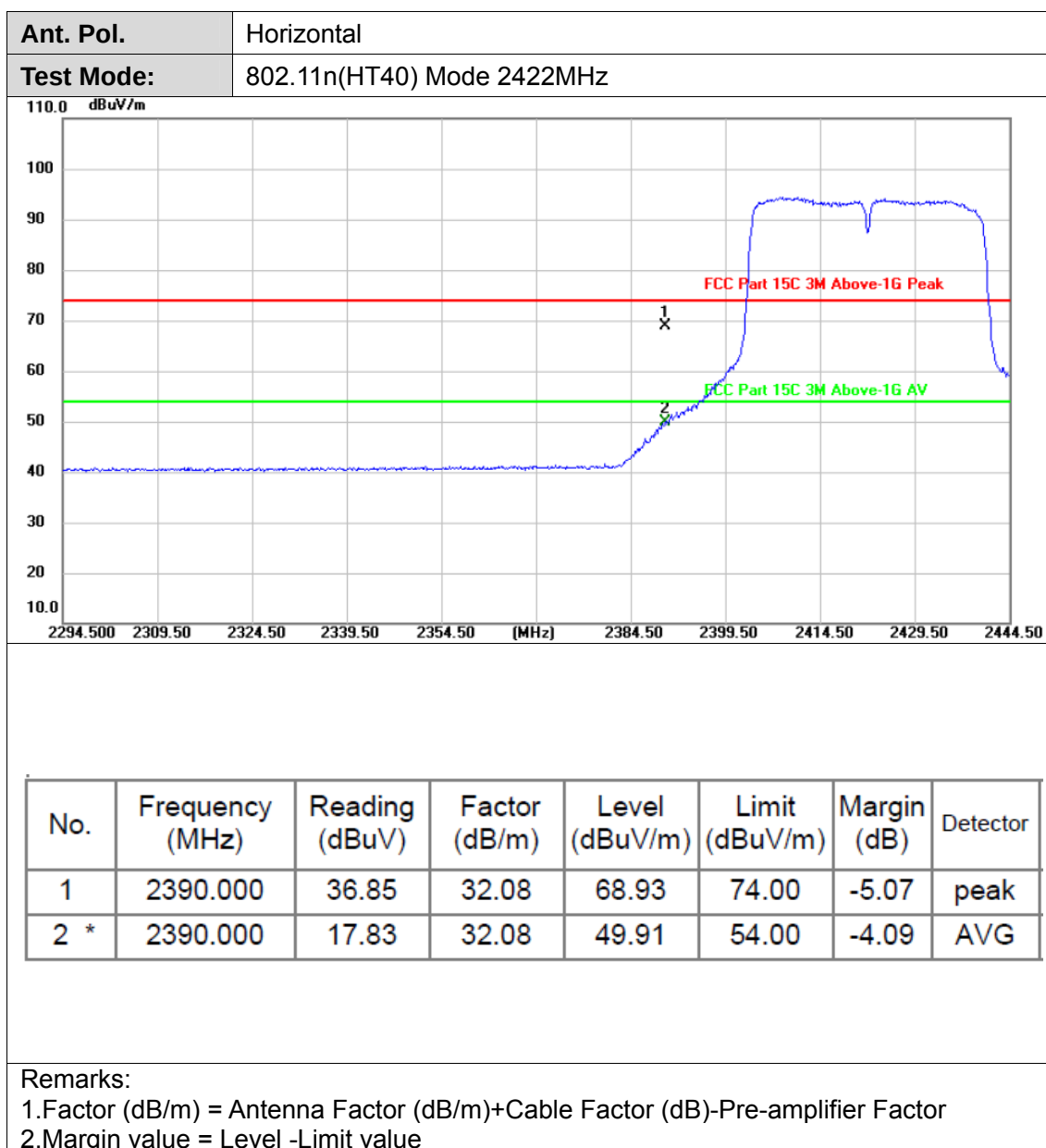


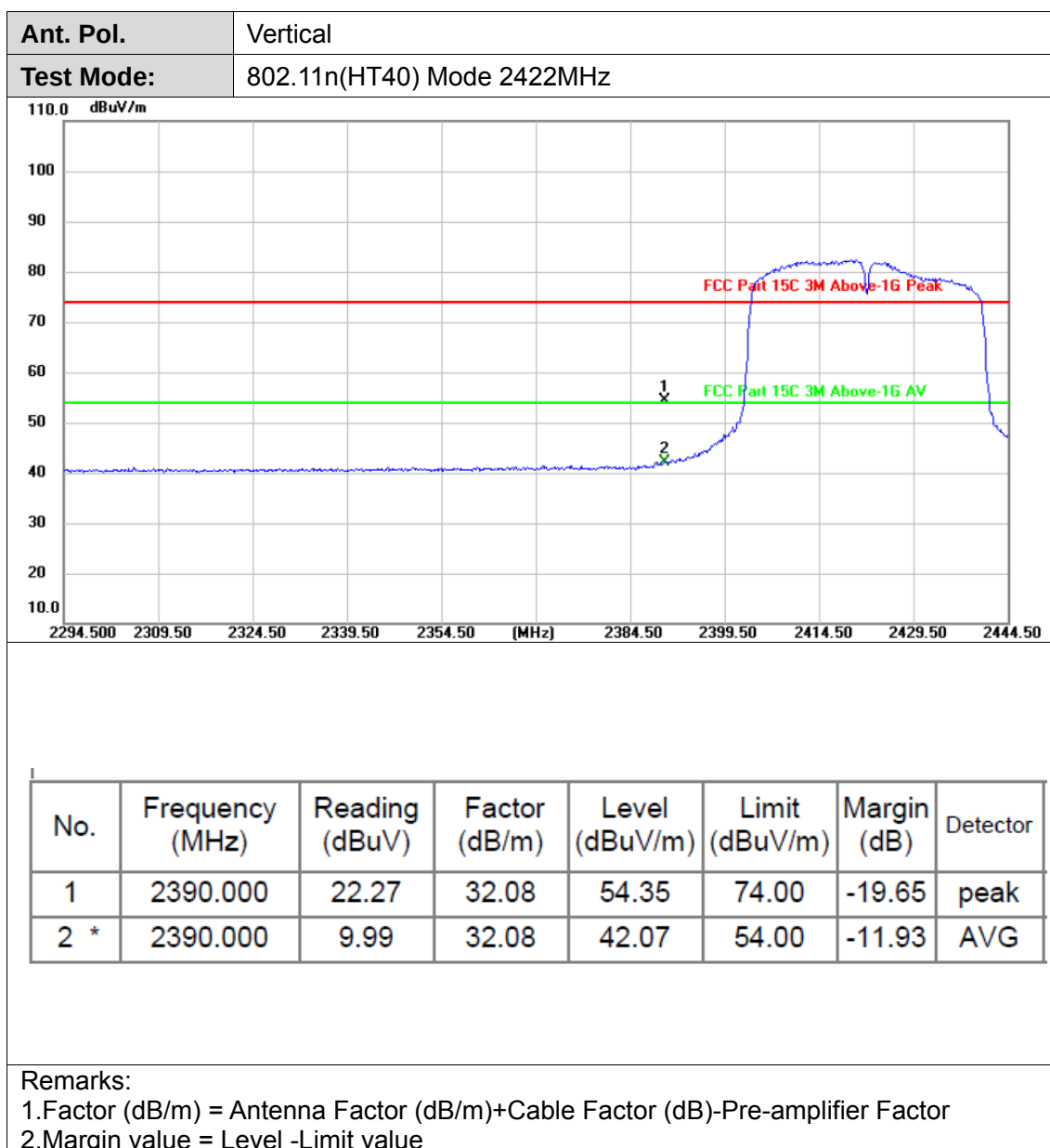


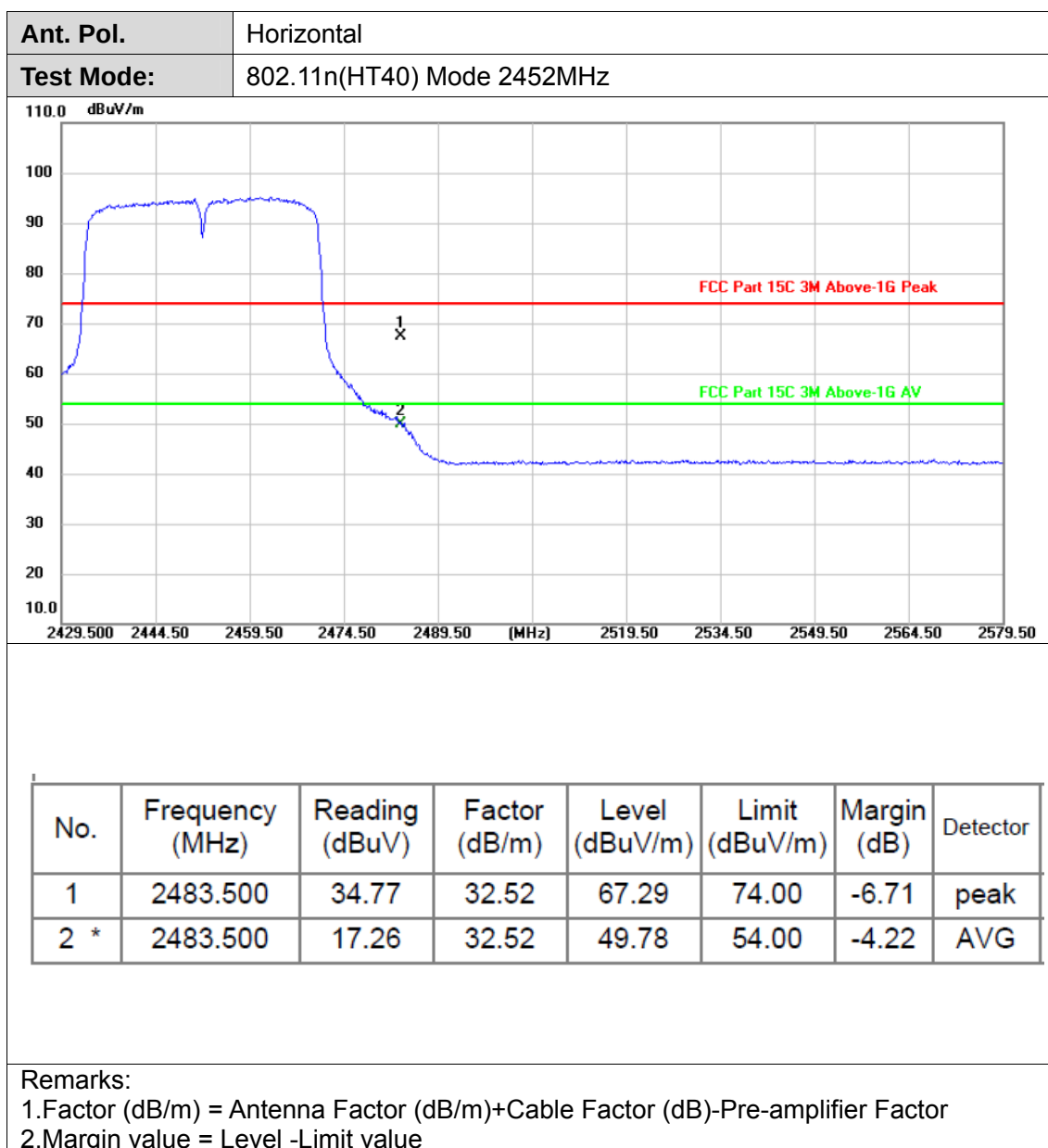


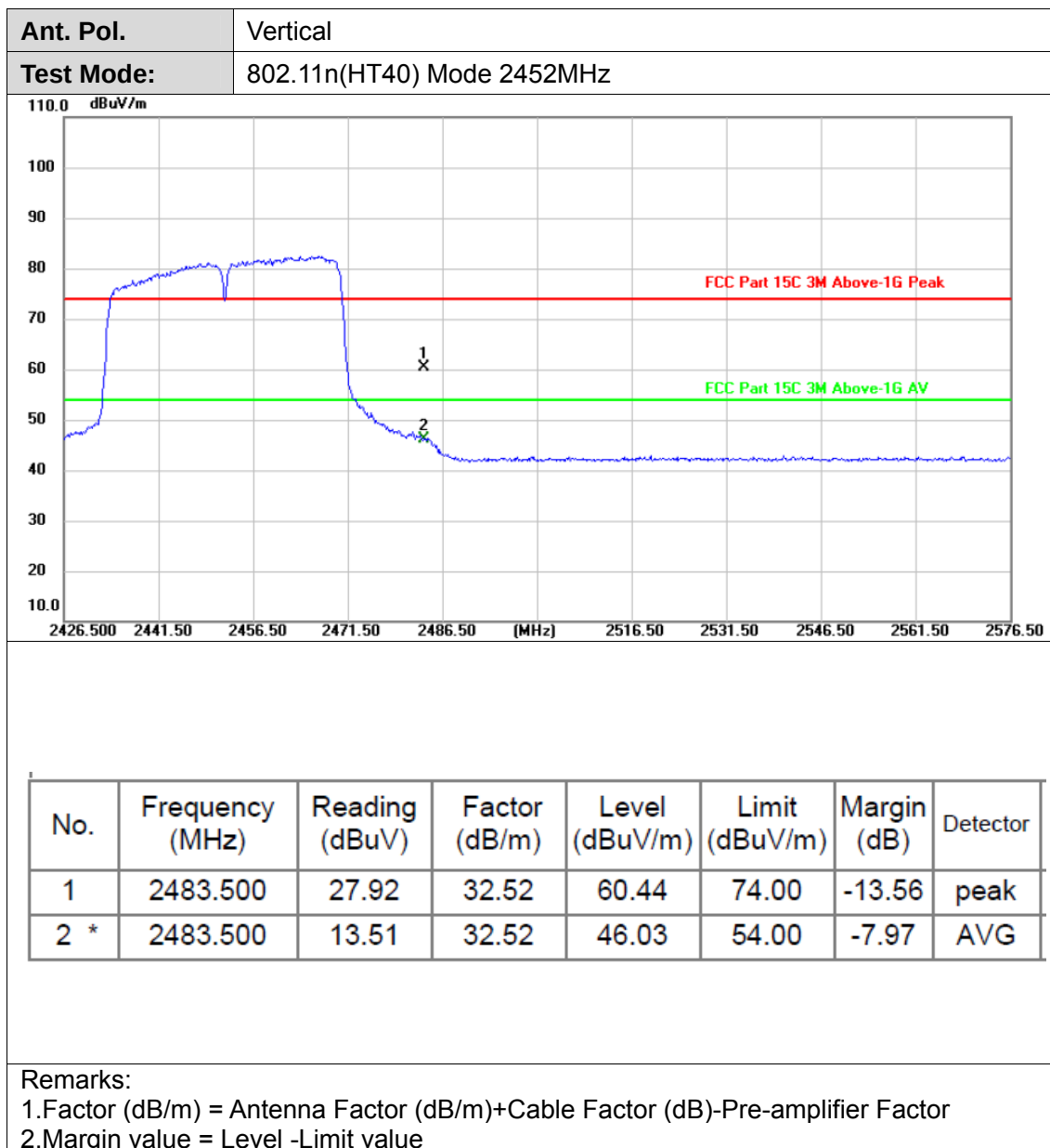












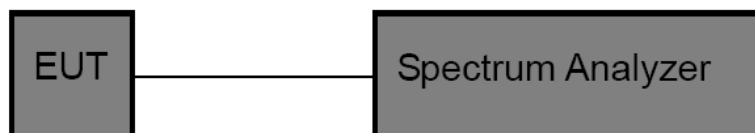


3.4. Band edge and Spurious Emissions (Conducted)

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 $\geq$ 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.

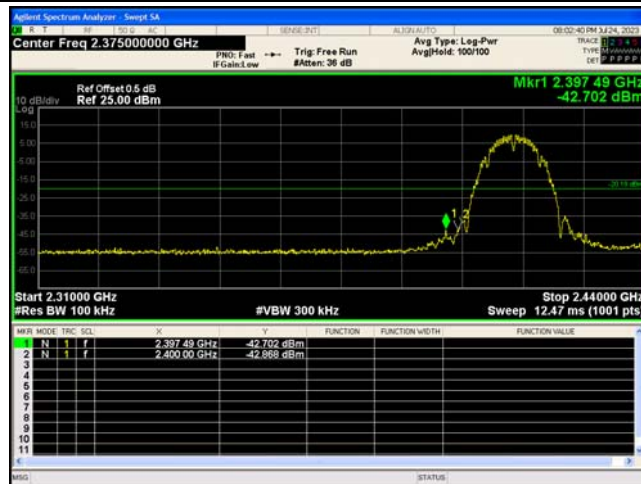
Test Results

**(1) Band edge Conducted Test**

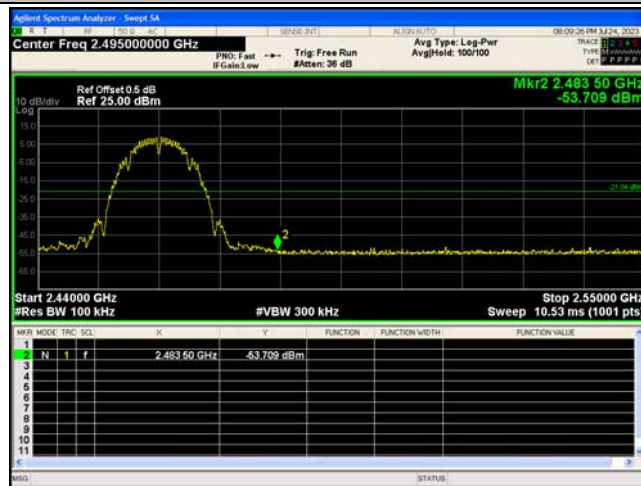
Test Mode	Test Frequency	Ref Level[dBm]	Result[dBm]	Limit[dBm]	Verdict
802.11b	2412	9.73	-41.82	<=-10.27	PASS
	2462	9.05	-56.57	<=-10.95	PASS
802.11g	2412	6.51	-25.81	<=-13.49	PASS
	2462	7.02	-38.05	<=-12.98	PASS
802.11n(HT20)	2412	6.28	-26.33	<=-13.72	PASS
	2462	6.93	-34.98	<=-13.07	PASS
802.11n(HT40)	2422	2.63	-31.39	<=-17.38	PASS
	2452	2.99	-36.73	<=-17.01	PASS



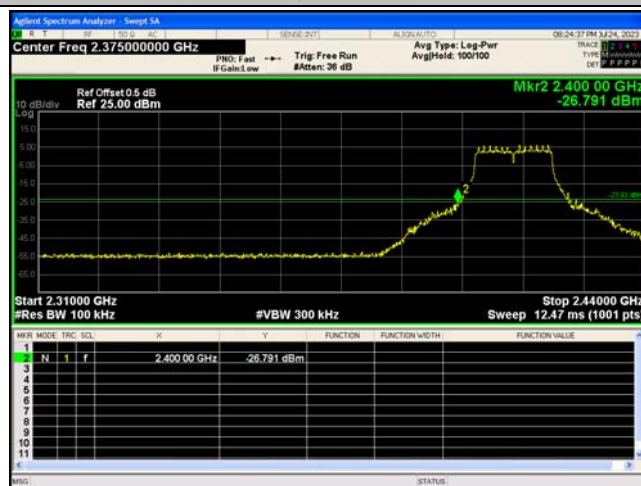
802.11b_Low_2412



802.11b_High_2462



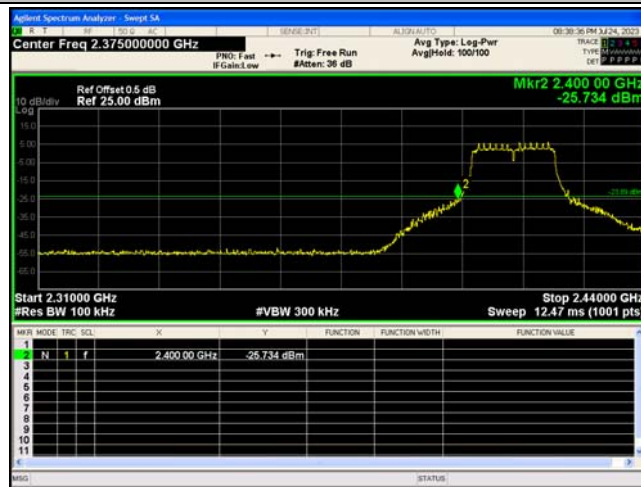
802.11g_Low_2412



802.11g_High_2462



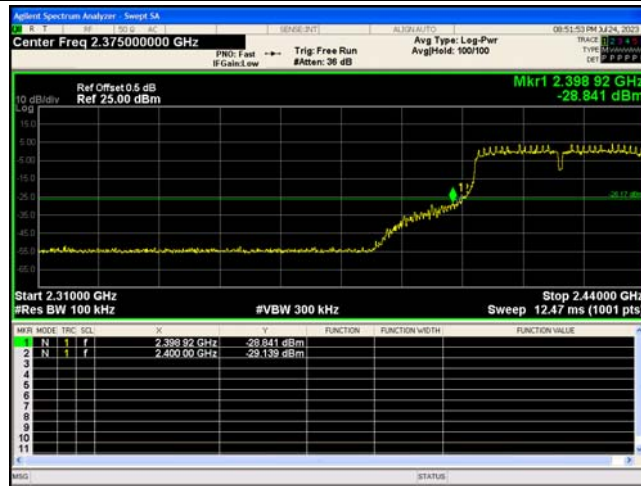
802.11n(HT20)_Low_2412



802.11n(HT20)_High_2462



802.11n(HT40)_Low_2422



802.11n(HT40)_High_2452





(2) Conducted Spurious Emissions Test

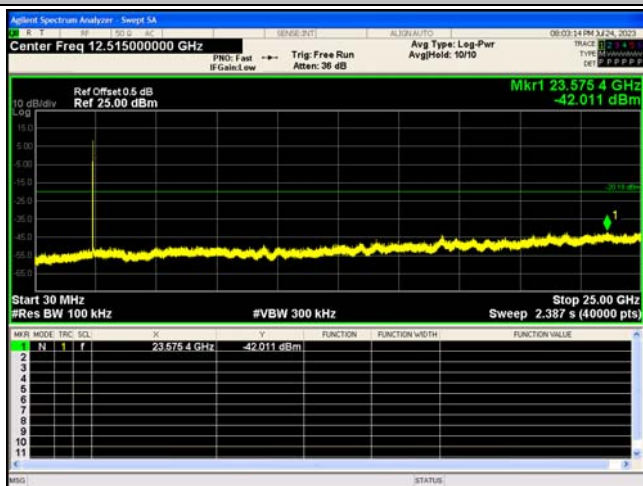
Test Mode	Test Frequency	Freq Range [Mhz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
802.11b	2412	Reference	9.817	---	---	PASS
		30~25000	9.817	-42.011	≤ -20.18	PASS
	2437	Reference	8.787	---	---	PASS
		30~25000	8.787	-42.065	≤ -21.21	PASS
	2462	Reference	8.961	---	---	PASS
		30~25000	8.961	-40.568	≤ -21.04	PASS
802.11g	2412	Reference	6.065	---	---	PASS
		30~25000	6.065	-41.357	≤ -23.93	PASS
	2437	Reference	6.458	---	---	PASS
		30~25000	6.458	-42.408	≤ -23.54	PASS
	2462	Reference	6.792	---	---	PASS
		30~25000	6.792	-41.898	≤ -23.21	PASS
802.11n(HT20)	2412	Reference	6.108	---	---	PASS
		30~25000	6.108	-40.886	≤ -23.89	PASS
	2437	Reference	6.567	---	---	PASS
		30~25000	6.567	-41.263	≤ -23.43	PASS
	2462	Reference	6.921	---	---	PASS
		30~25000	6.921	-41.939	≤ -23.08	PASS
802.11n(HT40)	2422	Reference	3.833	---	---	PASS
		30~25000	3.833	-42.040	≤ -26.17	PASS
	2437	Reference	4.137	---	---	PASS
		30~25000	4.137	-41.264	≤ -25.86	PASS
	2452	Reference	4.428	---	---	PASS
		30~25000	4.428	-41.388	≤ -25.57	PASS



802.11b_2412_0~Reference



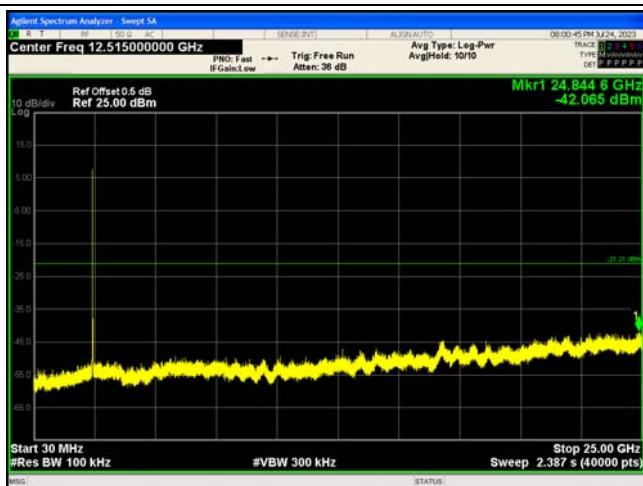
802.11b_2412_30~25000



802.11b_2437_0~Reference



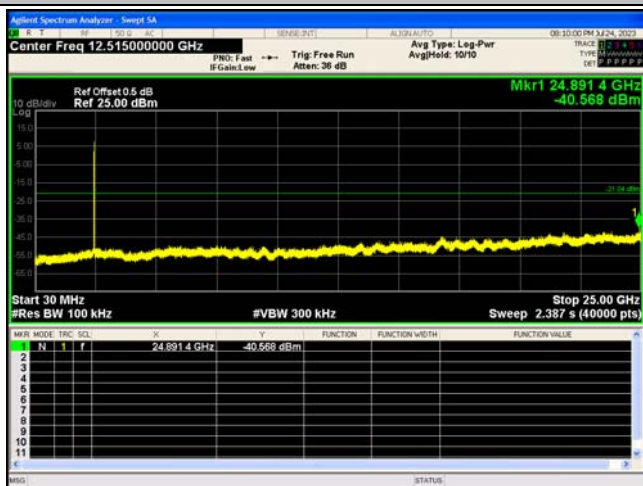
802.11b_2437_30~25000



802.11b_2462_0~Reference



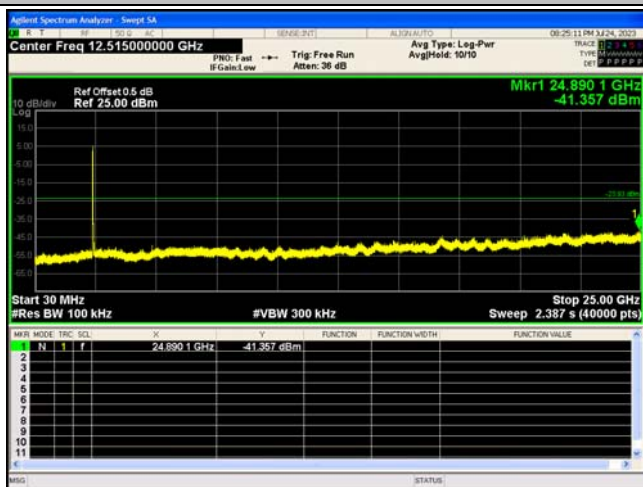
802.11b_2462_30~25000



802.11g_2412_0~Reference



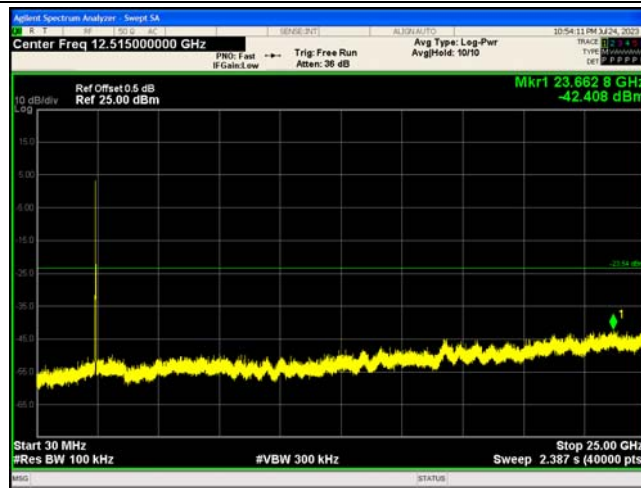
802.11g_2412_30~25000



802.11g_2437_0~Reference



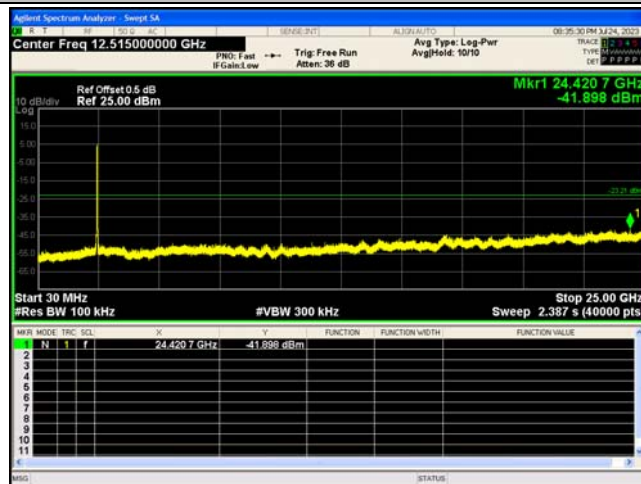
802.11g_2437_30~25000



802.11g_2462_0~Reference



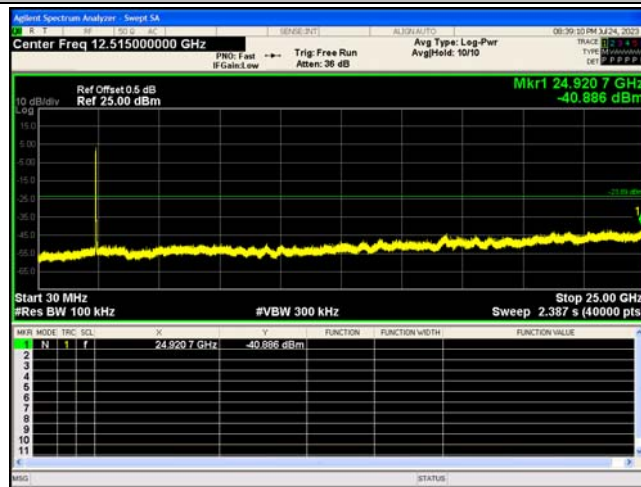
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802.11n(HT20)_2412_0~Reference



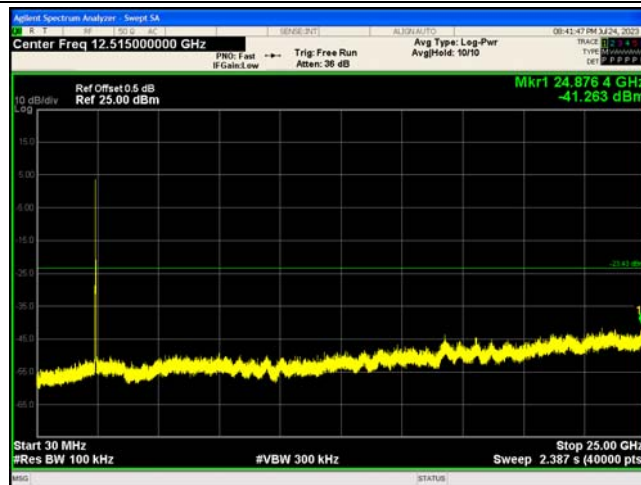
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802.11n(HT20)_2437_0~Reference



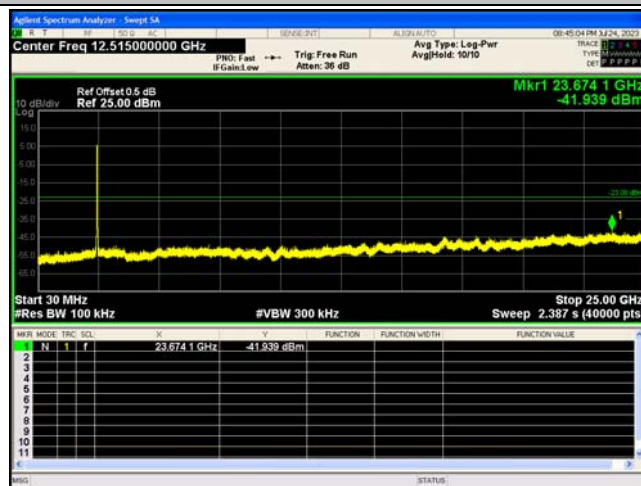
802.11n(HT20)_2437_30~25000



802.11n(HT20)_2462_0~Reference



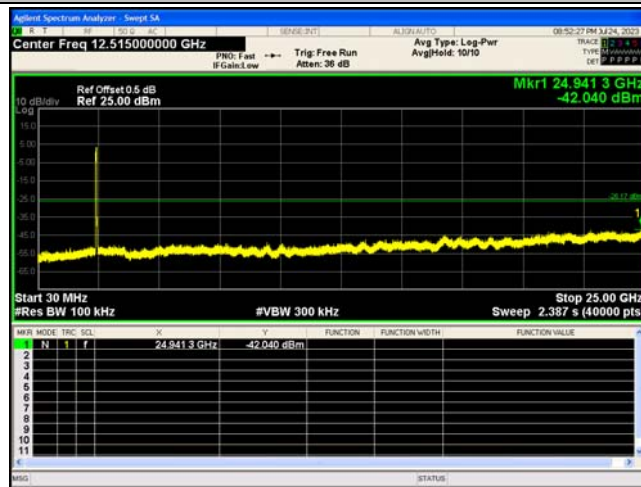
802.11n(HT20)_2462_30~25000



802.11n(HT40)_2422_0~Reference



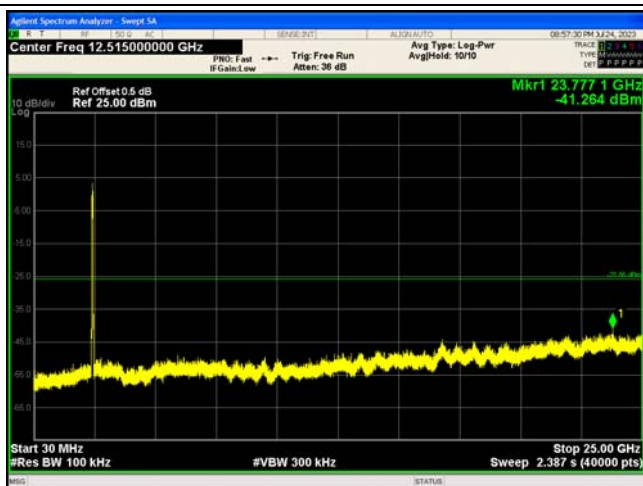
802.11n(HT40)_2422_30~25000



802.11n(HT40)_2437_0~Reference



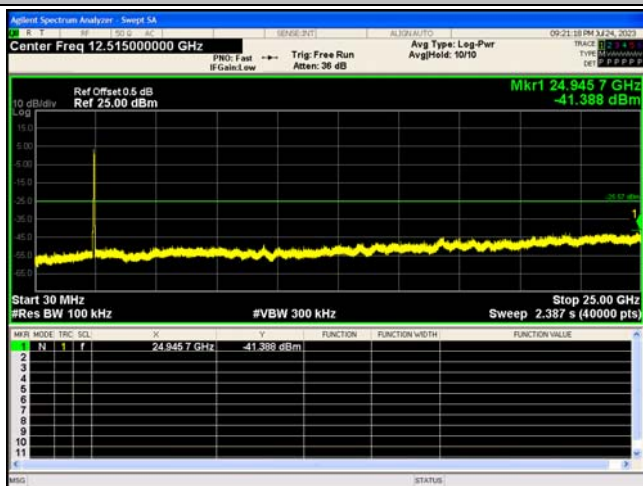
802.11n(HT40)_2437_30~25000



802.11n(HT40) 2452 0~Reference



802.11n(HT40) 2452 30~25000





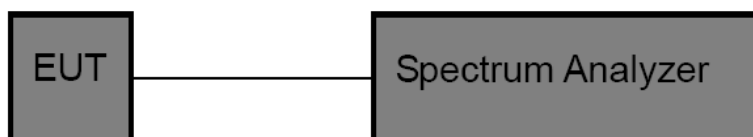
3.5. DTS Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2)/ RSS-247 5.2 a:

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.

NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

Test Mode

Please refer to the clause 2.4.

**Test Results**

Test Mode	Channel	DTS BW [MHz]	Limit [MHz]	Verdict
802.11b	2412	8.543	≥ 0.5	PASS
	2437	9.000	≥ 0.5	PASS
	2462	8.081	≥ 0.5	PASS
802.11g	2412	16.36	≥ 0.5	PASS
	2437	16.37	≥ 0.5	PASS
	2462	16.33	≥ 0.5	PASS
802.11n(HT20)	2412	17.56	≥ 0.5	PASS
	2437	17.61	≥ 0.5	PASS
	2462	17.57	≥ 0.5	PASS
802.11n(HT40)	2422	35.15	≥ 0.5	PASS
	2437	35.14	≥ 0.5	PASS
	2452	35.13	≥ 0.5	PASS



DTS Bandwidth

802.11b_2412



802.11b_2437

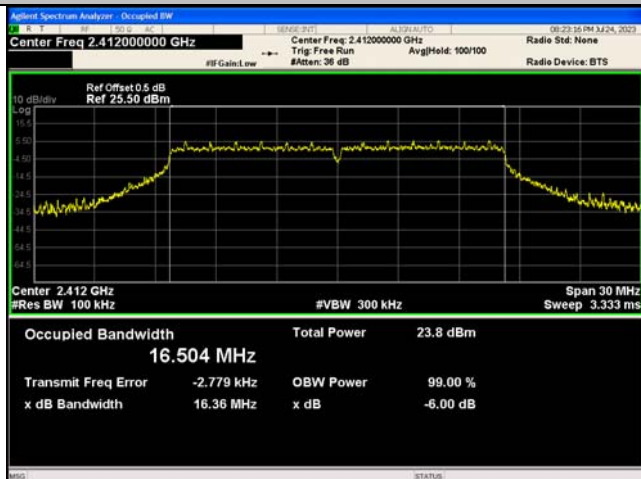


802.11b_2462

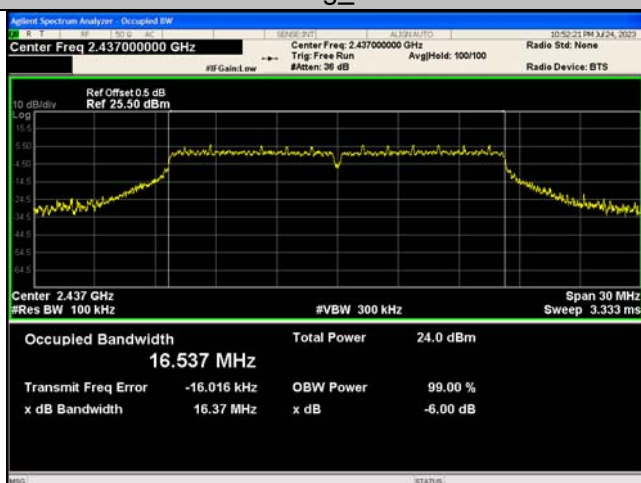




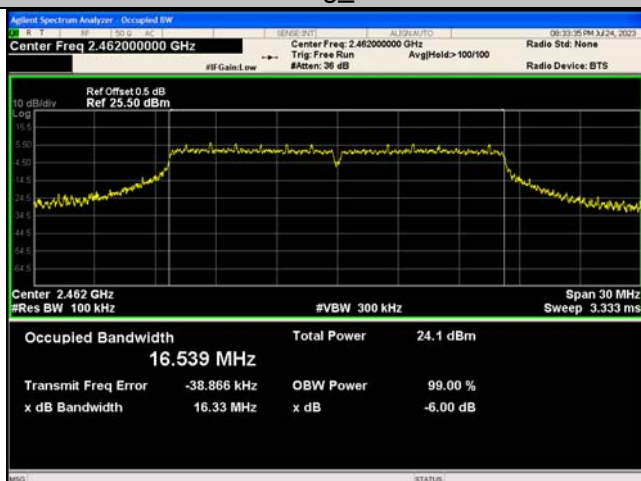
802.11g_2412



802.11g_2437

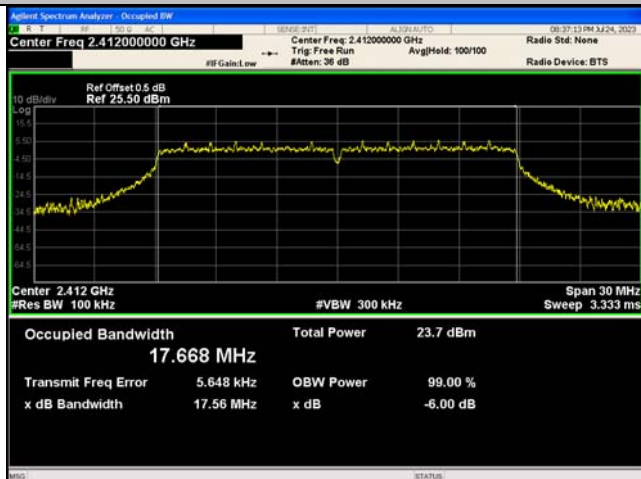


802.11g_2462

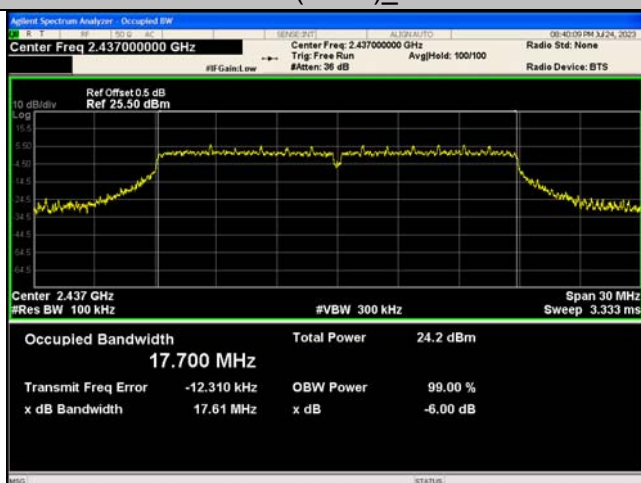




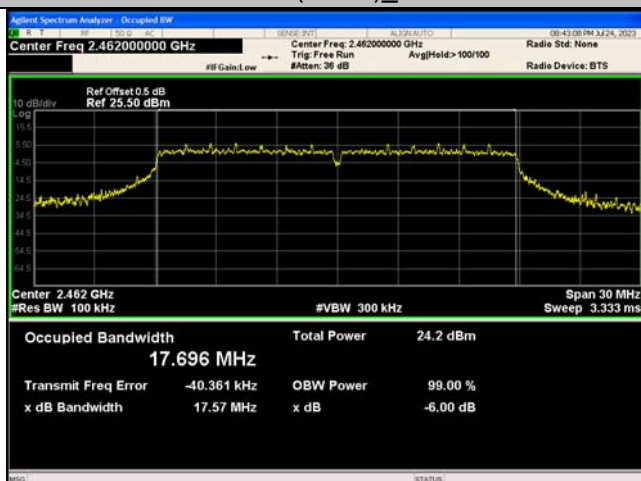
802.11n(HT20)_2412



802.11n(HT20)_2437



802.11n(HT20)_2462

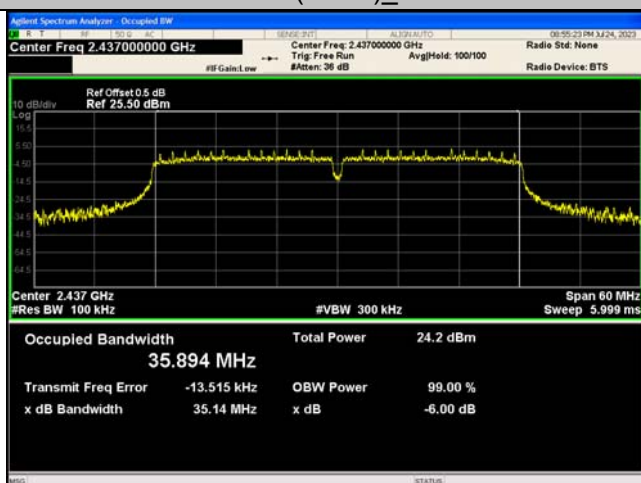




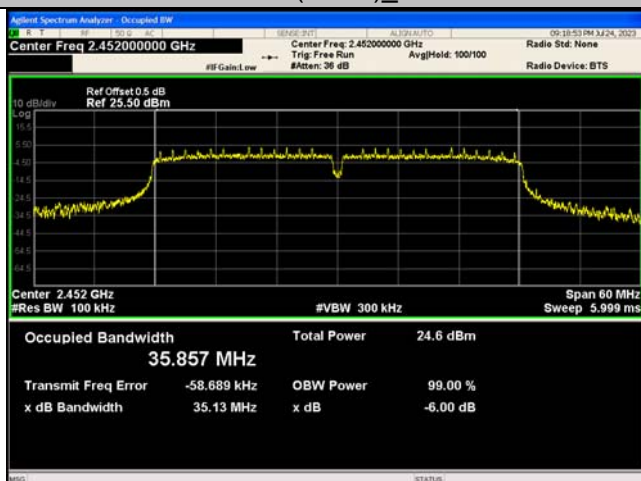
802.11n(HT40)_2422



802.11n(HT40)_2437



802.11n(HT40)_2452





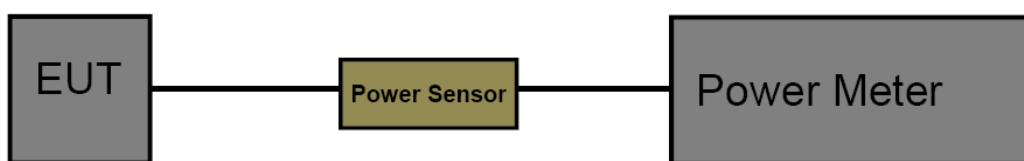
3.6. Conducted Output Power

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3)/ RSS-247 5.4:

Section	Test Item	Limit	Frequency Range(MHz)
CFR 47 FCC 15.247(b)(3)	Maximum conducted output power	1 Watt or 30dBm	2400~2483.5
ISED RSS-247 5.4 d	EIRP	4 Watt or 36dBm	2400~2483.5

Test Configuration



Test Procedure

1. The maximum conducted output power may be measured using a broadband Peak RF power meter.
2. Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor.
3. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.
4. Record the measurement data.

Test Mode

Please refer to the clause 2.3

Test Result





Test Mode	Channel	Avg Result [dBm]	Limit [dBm]	Verdict
802.11b	2412	18.46	<=30	PASS
	2437	18.19	<=30	PASS
	2462	18.30	<=30	PASS
802.11g	2412	16.83	<=30	PASS
	2437	16.86	<=30	PASS
	2462	16.10	<=30	PASS
802.11n(HT20)	2412	16.32	<=30	PASS
	2437	16.81	<=30	PASS
	2462	16.01	<=30	PASS
802.11n(HT40)	2422	16.45	<=30	PASS
	2437	16.71	<=30	PASS
	2452	16.64	<=30	PASS

Note: Test results increased RF cable loss by 0.5dB.



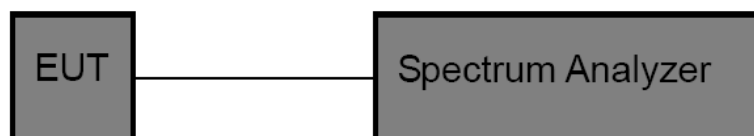
3.7. Power Spectral Density

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e)/ RSS-247 5.2 b:

Test Item	Limit	Frequency Range(MHz)
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
3. Spectrum Setting:
Set analyzer center frequency to DTS channel center frequency.
Set the span to 1.5 times the DTS bandwidth.
Set the RBW to: 3 kHz
Set the VBW to: 10 kHz
Detector: PK
Sweep time: Auto
Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

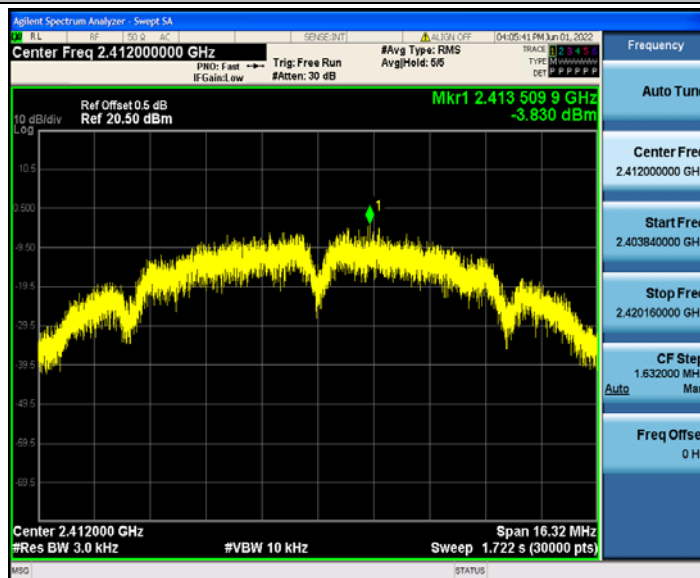
Please refer to the clause 2.3

**Test Result**

Test Mode	Channel	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
802.11b	2412	-3.83	<=8	PASS
	2437	-4.64	<=8	PASS
	2462	-4.58	<=8	PASS
802.11g	2412	-7.97	<=8	PASS
	2437	-6.50	<=8	PASS
	2462	-7.95	<=8	PASS
802.11n(HT20)	2412	-8.06	<=8	PASS
	2437	-7.54	<=8	PASS
	2462	-7.79	<=8	PASS
802.11n(HT40)	2422	-11.79	<=8	PASS
	2437	-12.14	<=8	PASS
	2452	-11.71	<=8	PASS



802.11b_2412



802.11b_2437



802.11b_2462



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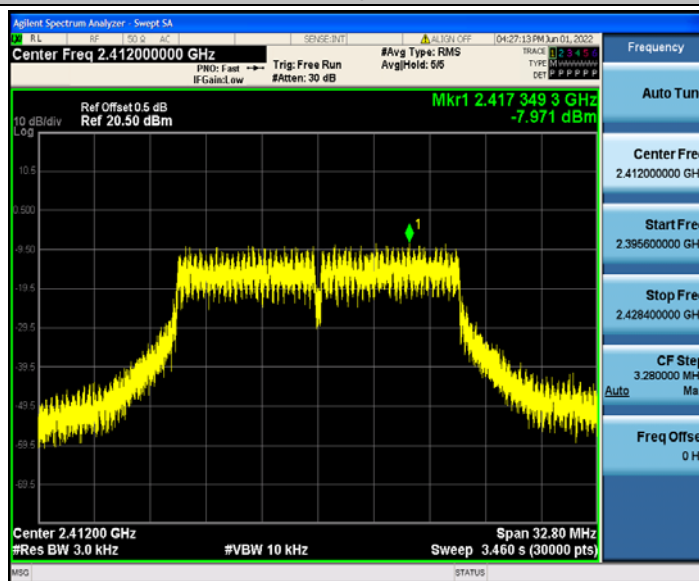
Fax: (86)755-27521011

Http://www.sz-ctc.org.cn

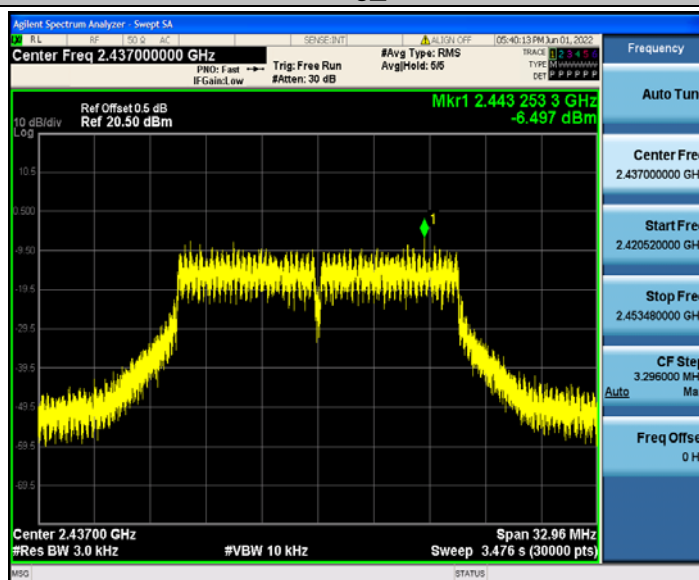
For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China: yz.cnca.cn



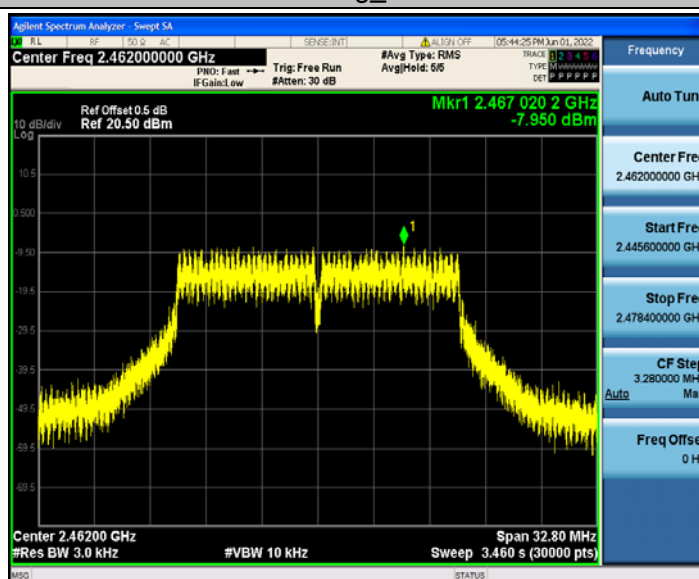
802.11g_2412



802.11g_2437



802.11g_2462



802.11n(HT20)_2412

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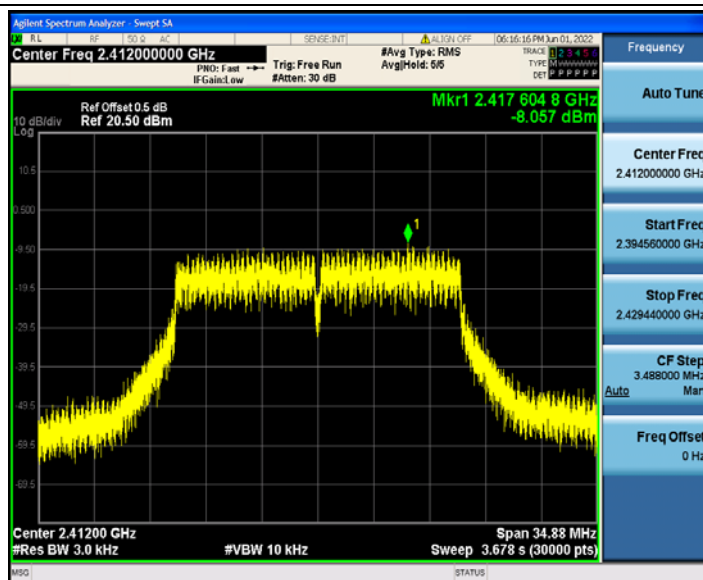
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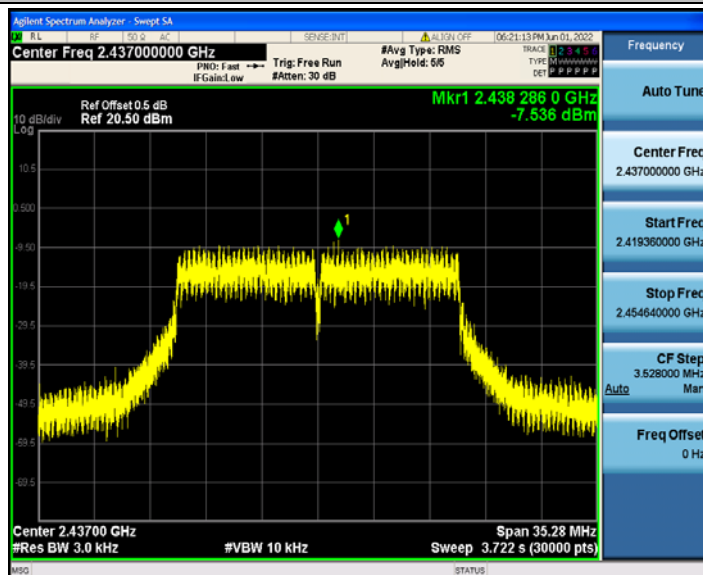
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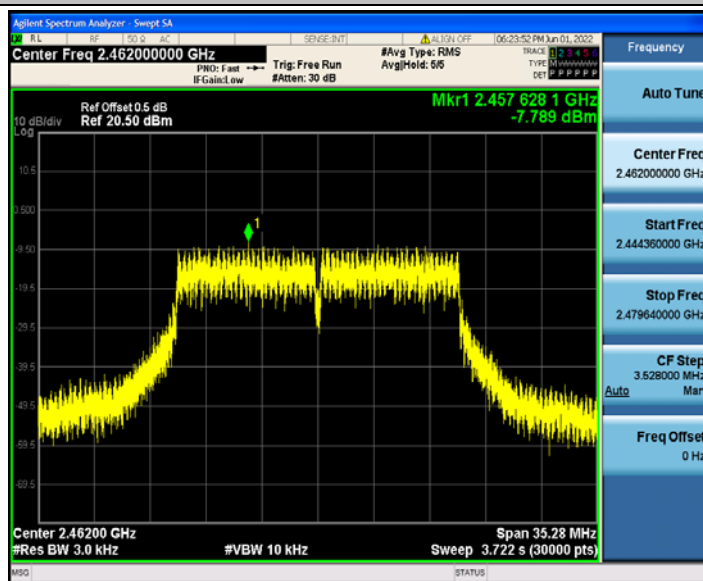
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802.11n(HT20)_2437



802.11n(HT20)_2462



802.11n(HT40)_2422

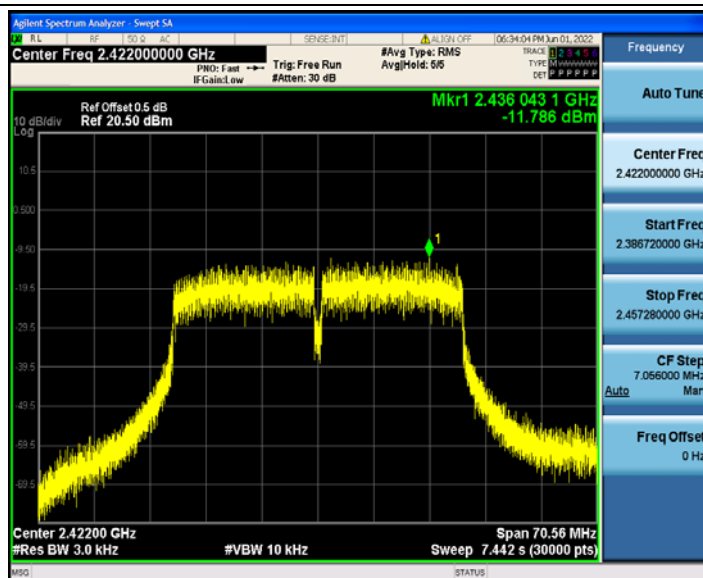
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Tel.: (86)755-27521059

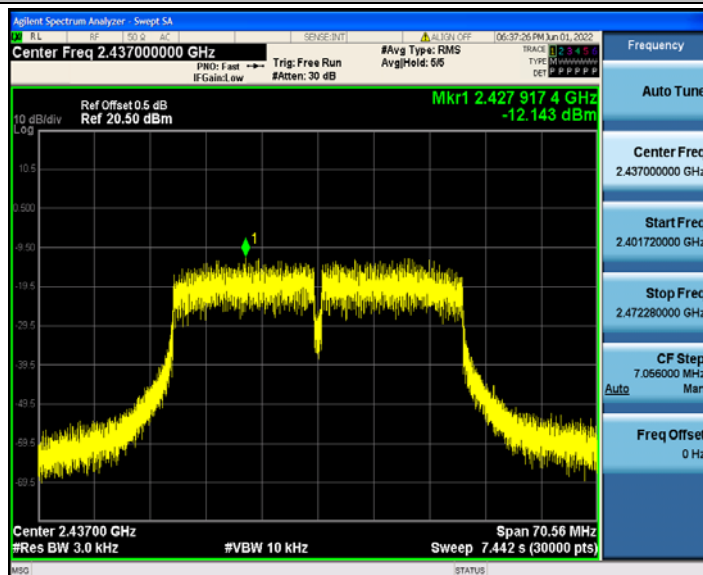
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Http://www.sz-ctc.org.cn

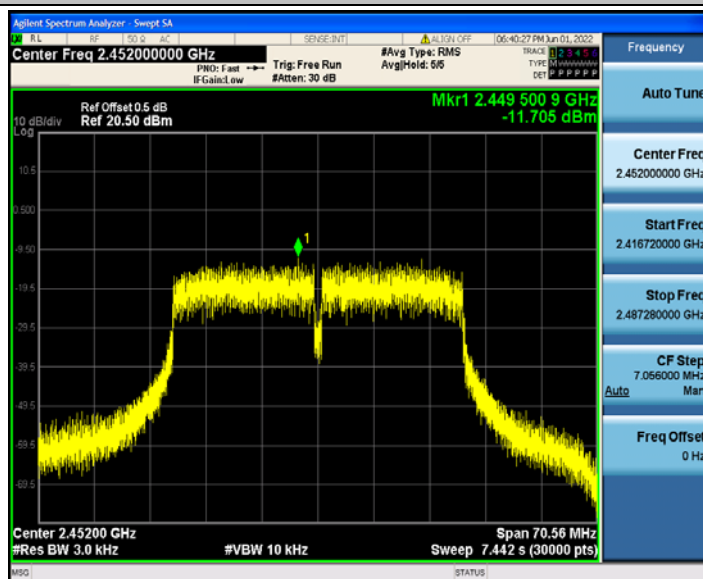
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802.11n(HT40)_2437



802.11n(HT40)_2452



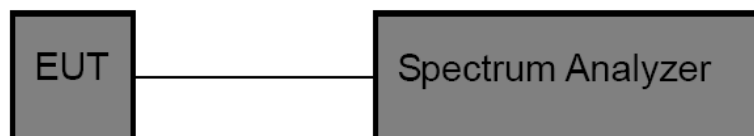


3.8. Duty Cycle

Limit

None, for report purposes only.

Test Configuration



Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
3. Spectrum Setting:
Set analyzer center frequency to DTS channel center frequency.
Set the span to 0Hz
Set the RBW to 10MHz
Set the VBW to 10MHz
Detector: peak
Sweep time: auto
Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

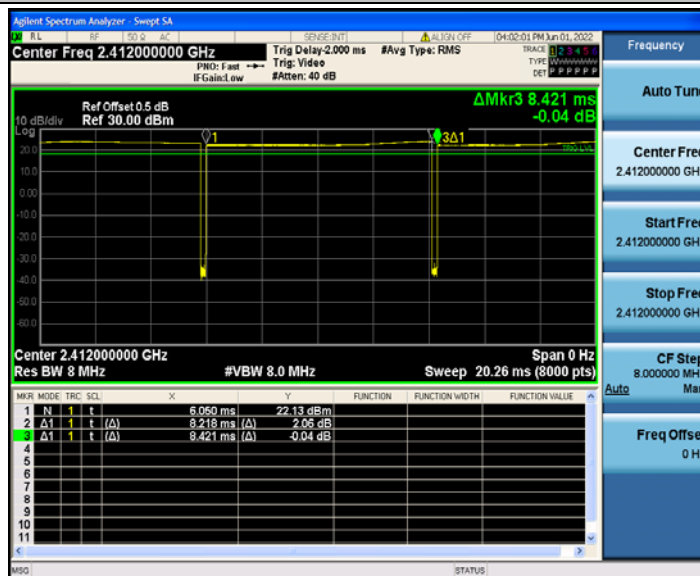
Please refer to the clause 2.3

Test Result

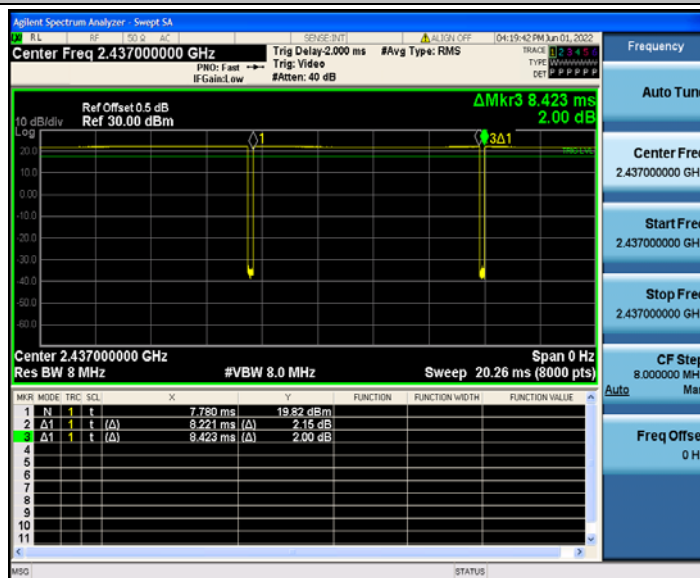
Test Mode	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
802.11b	2412	8.22	8.42	97.62	0.122	1
	2437	8.22	8.42	97.62	0.122	1
	2462	8.22	8.42	97.62	0.122	1
802.11g	2412	1.36	1.56	87.18	0.735	1
	2437	1.36	1.56	87.18	0.735	1
	2462	1.36	1.56	87.18	0.735	1
802.11n(HT20)	2412	1.27	1.47	86.39	0.787	1
	2437	1.27	1.47	86.39	0.787	1
	2462	1.27	1.47	86.39	0.787	1
802.11n(HT40)	2422	0.63	0.83	75.90	1.587	2
	2437	0.63	0.84	75.00	1.587	2
	2452	0.63	0.83	75.90	1.587	2



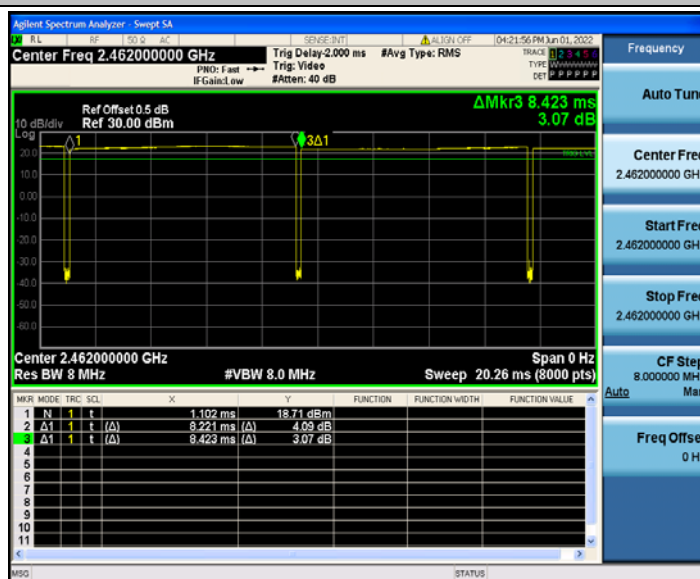
802.11b_2412



802.11b_2437



802.11b_2462



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