

FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

802.11n, 2.4G 1T1R Wireless LAN USB Module

Model: WN4639R

Trade Name: LITE-ON

Issued to

Lite-On Technology Corp.
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist.,
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Issued Date: January 14, 2016



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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	January 14, 2016	Initial Issue	ALL	Kelly Cheng
01	January 27, 2016	1. Added Loop Antenna	P.9	Kelly Cheng

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1. TEST RESULT CERTIFICATION

Applicant: Lite-On Technology Corp.
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585,
Taiwan, R.O.C

Equipment Under Test: 802.11n, 2.4G 1T1R Wireless LAN USB Module

Trade Name: LITE-ON

Model: WN4639R

Date of Test: January 11~13, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Reviewed by:



Miller Lee
Manager
Compliance Certification Services Inc.

Angel Cheng
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	802.11n, 2.4G 1T1R Wireless LAN USB Module
Trade Name	LITE-ON
Model Number	WN4639R
Model Discrepancy	All the specification and layout are identical except they come with different model numbers for marketing purposes.
Received Date	October 12, 2015
Power Rating	Powered from host device
Frequency Range	2412 ~ 2462 MHz
Transmit Power	IEEE 802.11b mode: 26.13 dBm IEEE 802.11g mode: 25.86 dBm IEEE 802.11n HT 20 mode: 26.15 dBm IEEE 802.11n HT 40 mode: 25.97dBm
Modulation Technique	IEEE 802.11b mode: DSSS IEEE 802.11g mode: OFDM IEEE 802.11n HT 20 mode: OFDM IEEE 802.11n HT 40 mode: OFDM
Number of Channels	IEEE 802.11b/g mode: 11 Channels IEEE 802.11n HT 20 mode: 11 Channels IEEE 802.11n HT 40 mode: 7 Channels
Antenna Specification	For TX PIFA Antenna / Walsin RFMTA400530IMAB701 / 3.11 dBi For RX PIFA Antenna / HONGLIN 290-20031 / 2.2 dBi

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **PPQ-WN4639R** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.247, KDB558074.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

According to the requirements in ANSI C63.10: 2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013.

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5 DESCRIPTION OF TEST MODES

The EUT (model: SMC-86) had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

IEEE 802.11b mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE 802.11g mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT 20 MHz mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT 40 mode:

Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13.5Mbps data rate were chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z mode), lie-down position (X, Y mode). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year.

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	12/07/2016
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	10/07/2016
AC Power Source	EXTECH	6205	1140845	N.C.R
DC Power Supply	ABM	8301HD	D011531	N.C.R
Power Meter	Anritsu	ML2495A	1012009	07/07/2016
Power Sensor	Anritsu	MA2411A	0917072	07/07/2016
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101073	07/19/2016

Wugu 966 Chamber A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510268	01/25/2016
EMI Test Receiver	R&S	ESCI	100064	06/03/2016
Bilog Antenna	Sunol Sciences	JB3	A030105	08/05/2016
Horn Antenna	EMCO	3117	00055165	01/26/2016
Horn Antenna	EMCO	3116	26370	12/24/2016
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Pre-Amplifier	MITEQ	1652-3000	1490939	08/09/2016
Pre-Amplifier	EMC	EMC 012635	980151	06/04/2016
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	12/24/2016
Coaxial Cable	Huber+Suhner	102	29212/2	12/24/2016
Coaxial Cable	Huber+Suhner	102	29406/2	12/24/2016
Loop Antenna	COM-POWER	AL-130	121051	01/26/2016
Test S/W	EZ-EMC (CCS-3A1RE)			

Conducted Emission Room # B				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	101073	09/08/2016
LISN	R&S	ENV216	101054	06/06/2016
LISN	SCHWARZBECK	NSLK 8127	8127-541	11/22/2016
Capacitive Voltage Probe	FCC	F-CVP-1	100185	03/12/2016

Test S/W	CCS-3A1-CE
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4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.2575
3M Semi Anechoic Chamber / <200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

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

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

- ☐ No.139, Wugong Rd., Wugu Dist., New Taipei City 24891, Taiwan (R.O.C.)
Tel: 886-2-2298-4086 / Fax: 886-2-2298-1470
- ☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045
- ☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2013 and CISPR Publication 22.

5.2 EQUIPMENT




Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, ridged waveguide, horn and/or Loop. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1309) to perform FCC Part 15 measurements	 FCC MRA: TW1309
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	Notebook PC	IBM	7663 (T61)	L3E9812	N/A	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

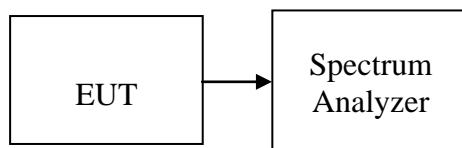
7. FCC PART 15.247 REQUIREMENTS

7.1 6DB BANDWIDTH

LIMIT

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. Set the RBW=100kHz the emission bandwidth, VBW $\geq 3 \times$ RBW, Detector = Peak, Trace mode = max hold, Sweep = auto couple. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
2412	10.0290	>500	PASS
2437	10.0290		PASS
2462	10.0290		PASS

Test mode: IEEE 802.11g mode

Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
2412	16.4110	>500	PASS
2437	16.4110		PASS
2462	16.4110		PASS

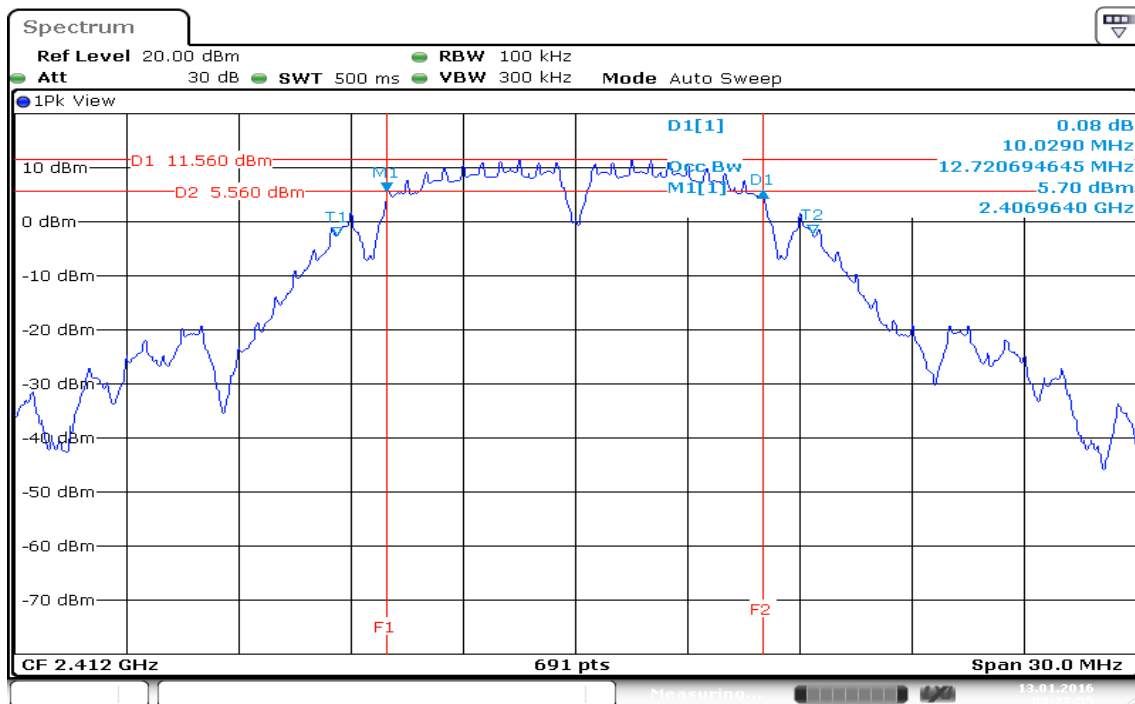
Test mode: IEEE 802.11n HT 20 MHz mode

Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
2412	17.3230	>500	PASS
2437	17.4960		PASS
2462	17.4960		PASS

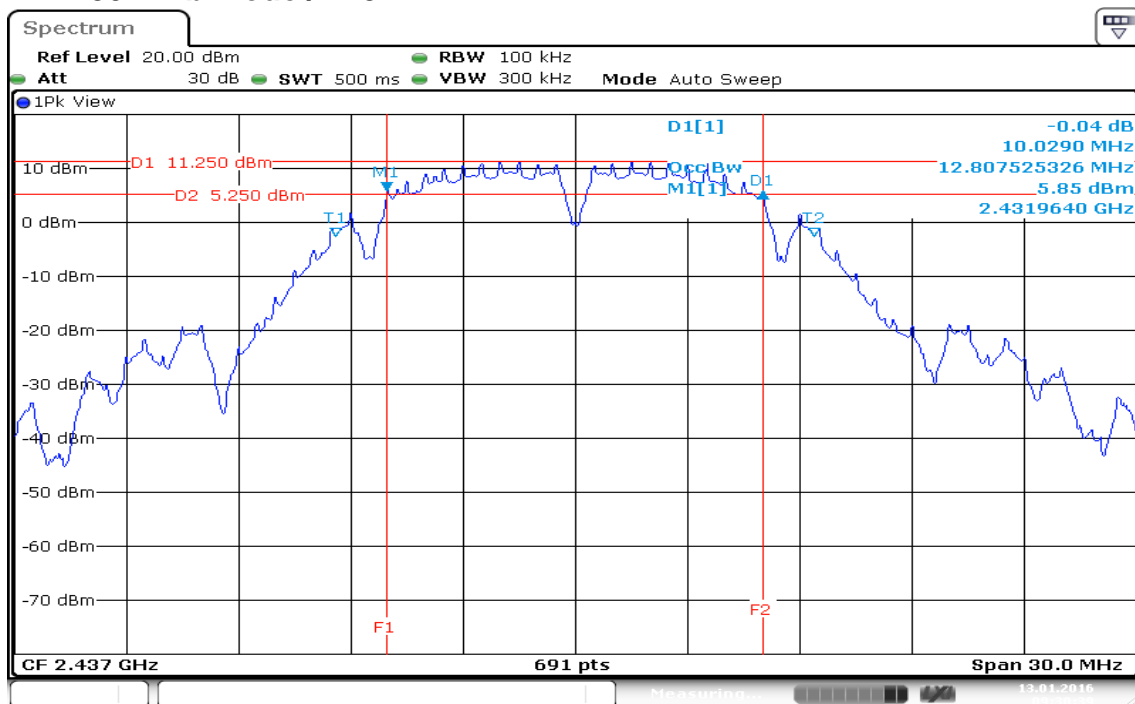
Test mode: IEEE 802.11n HT 40 MHz mode

Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
2422	36.120	>500	PASS
2437	36.240		PASS
2452	36.240		PASS

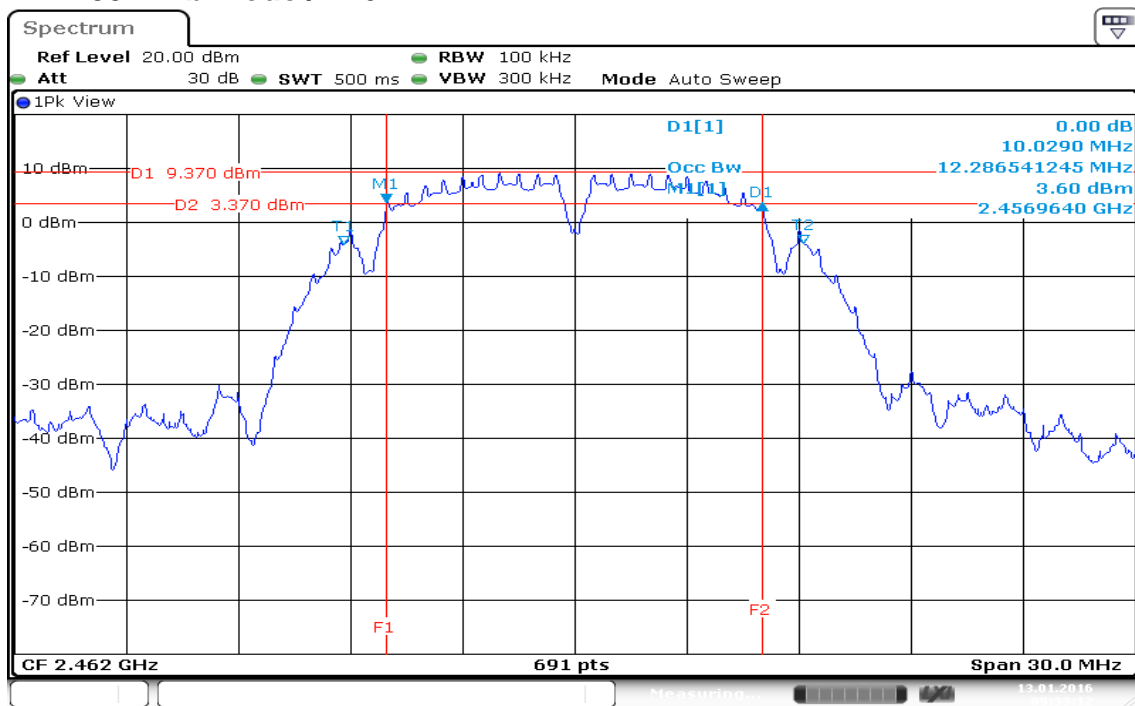
IEEE 802.11b mode / 2412 MHz



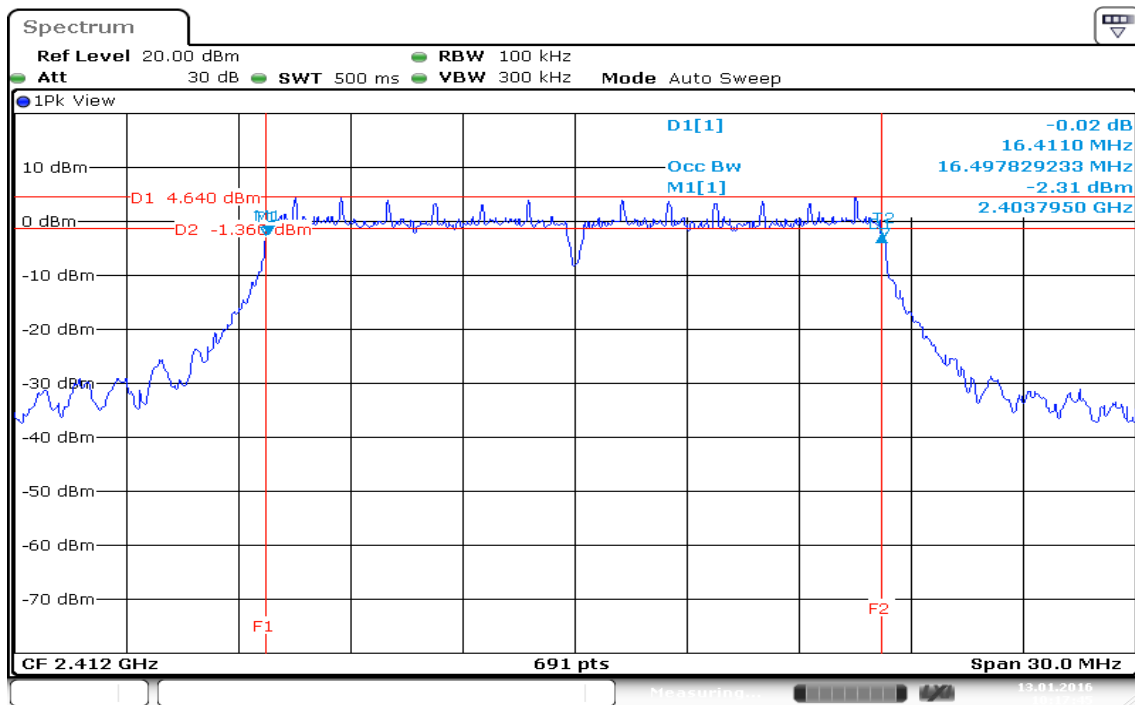
IEEE 802.11b mode / 2437 MHz



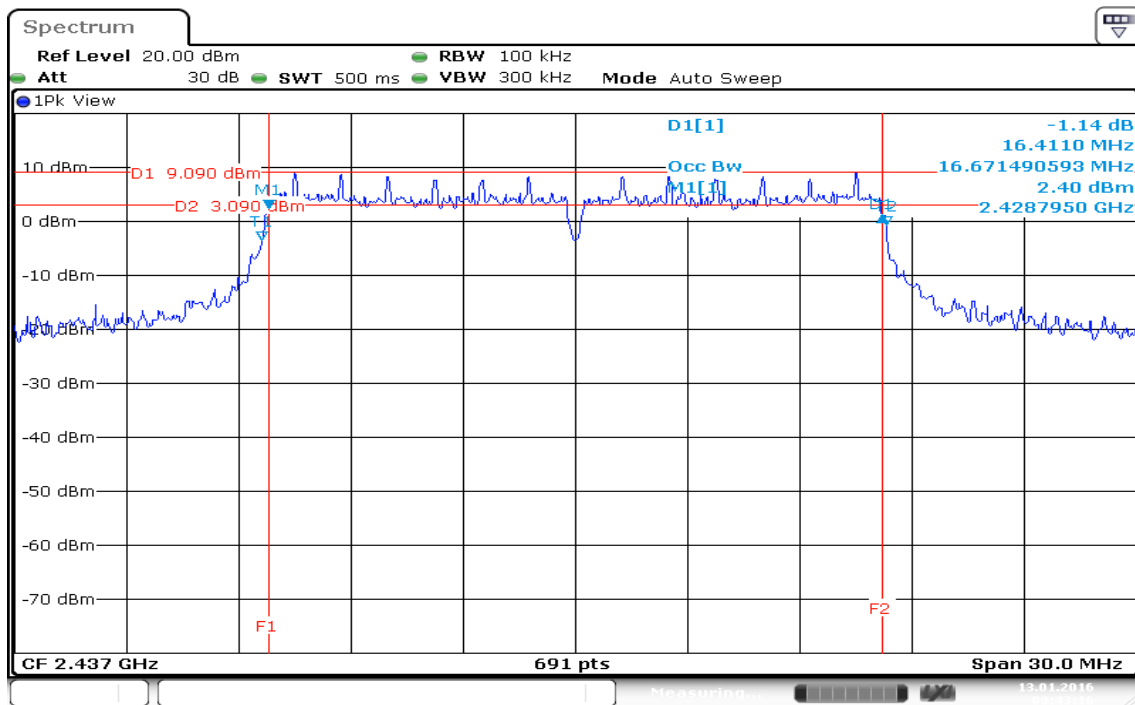
IEEE 802.11b mode / 2462 MHz



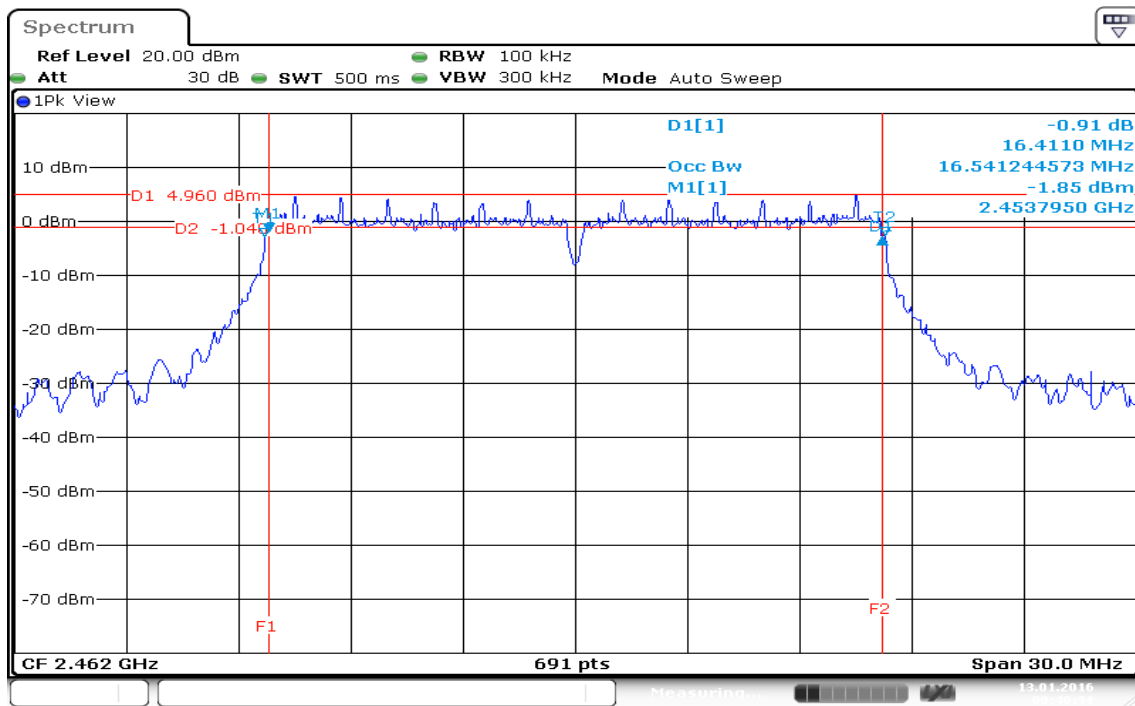
IEEE 802.11g mode / 2412 MHz



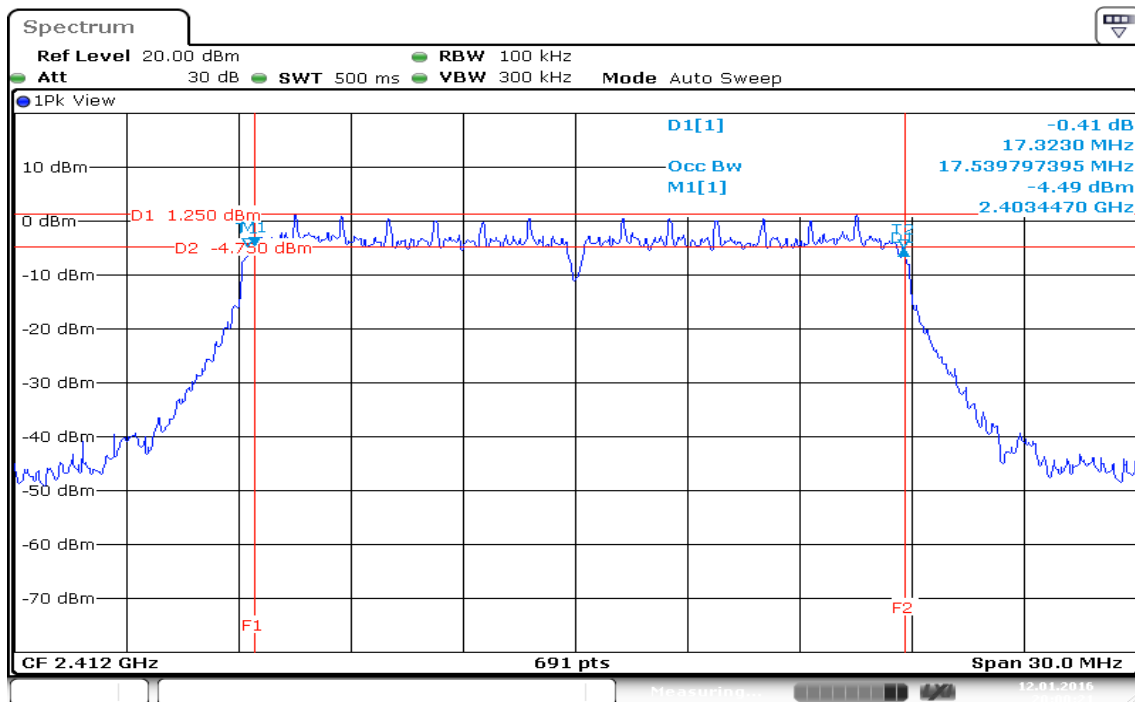
IEEE 802.11g mode / 2437 MHz



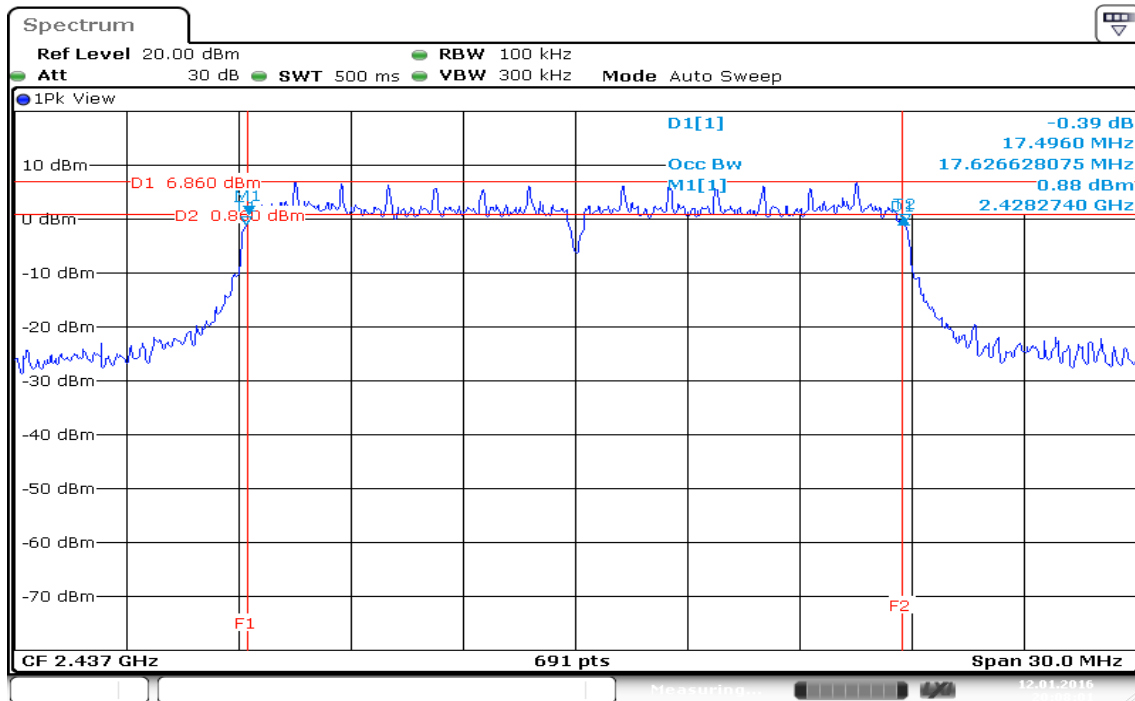
IEEE 802.11g mode / 2462 MHz



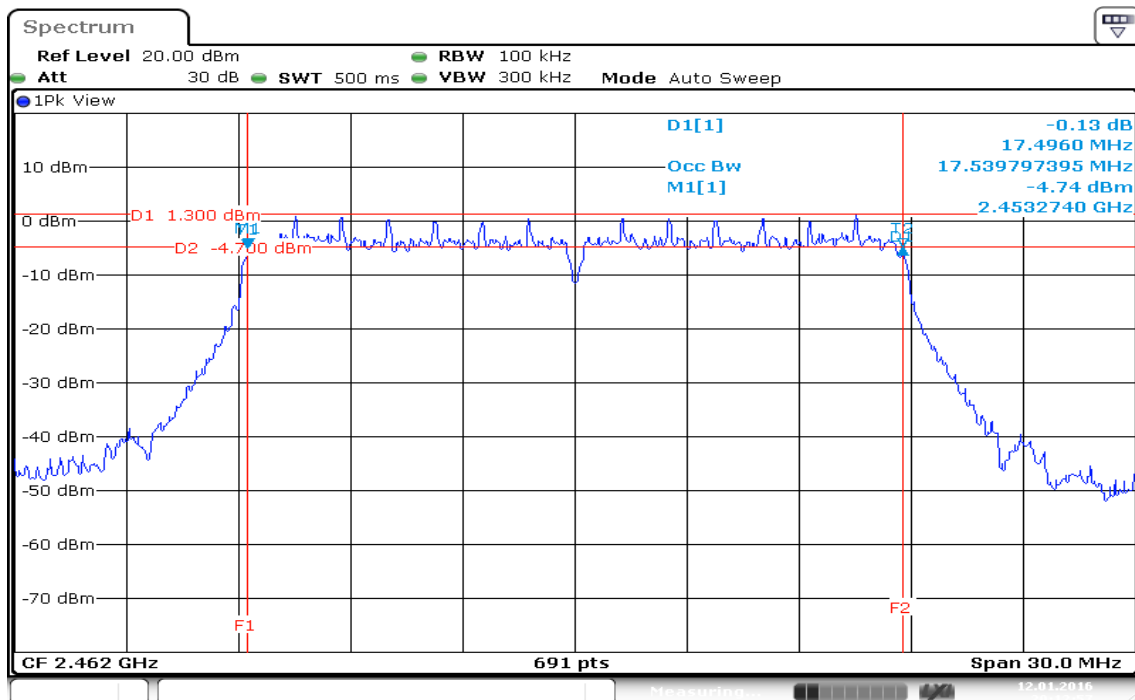
IEEE 802.11n HT 20 MHz mode / 2412 MHz



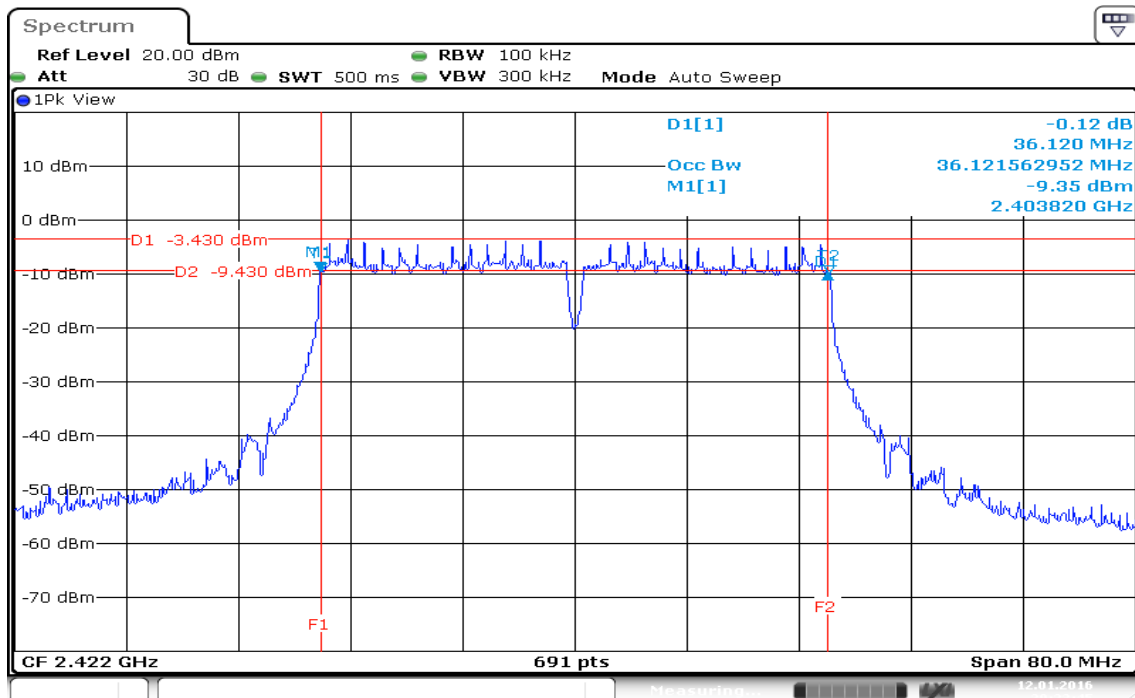
IEEE 802.11n HT 20 MHz mode / 2437 MHz



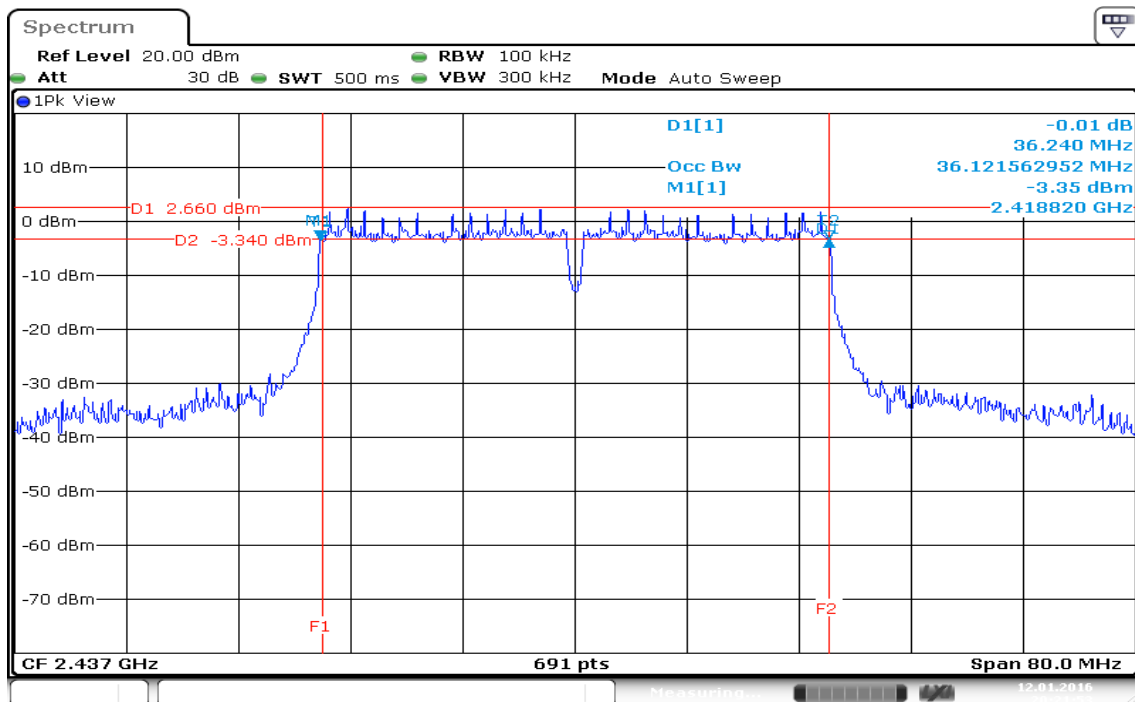
IEEE 802.11n HT 20 MHz mode / 2462 MHz



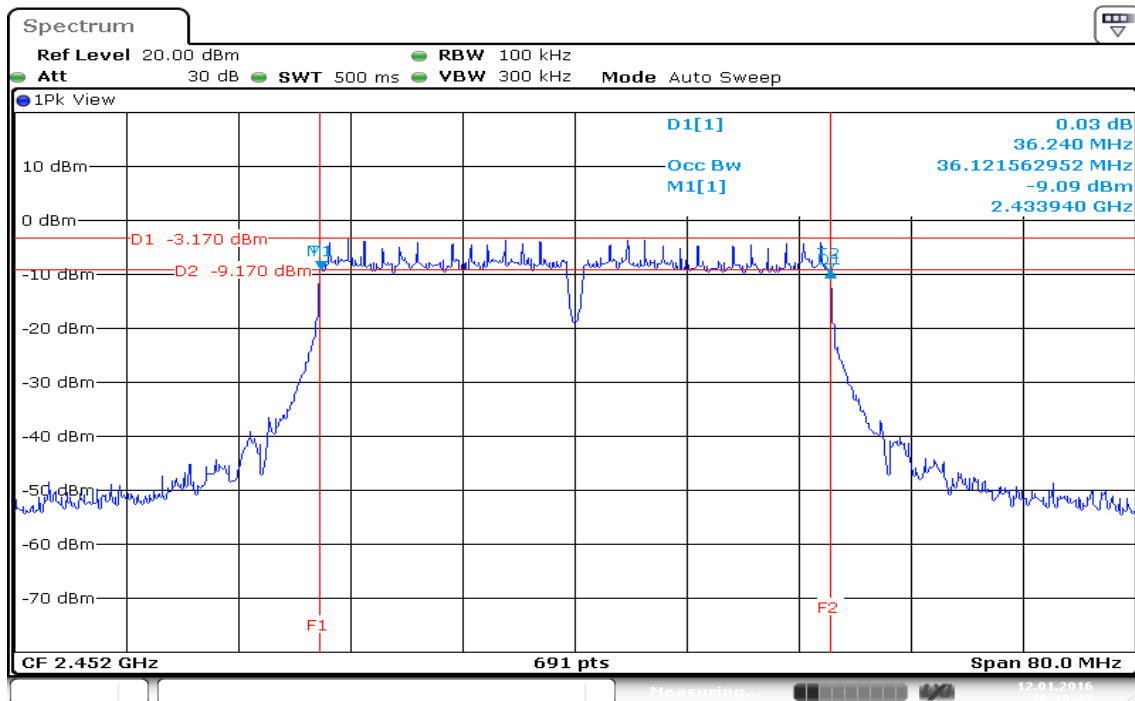
IEEE 802.11n HT 40 mode / 2422MHz



IEEE 802.11n HT 40 mode / 2437MHz



IEEE 802.11n HT 40 mode / 2452MHz



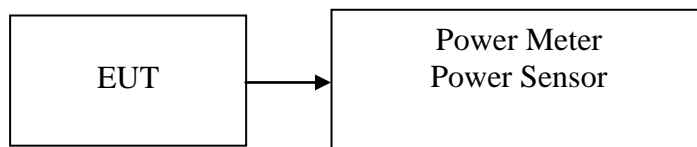
7.2 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
2412	*26.13	0.4102	1.00	PASS
2437	26.08	0.4055		PASS
2462	24.81	0.3027		PASS

Test mode: IEEE 802.11g mode

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
2412	25.68	0.3698	1.00	PASS
2437	*25.86	0.3855		PASS
2462	25.66	0.3681		PASS

Test mode: IEEE 802.11n HT 20 MHz mode

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
2412	26.08	0.4055	1.00	PASS
2437	*26.15	0.4121		PASS
2462	25.98	0.3963		PASS

Test mode: IEEE 802.11n HT 40 MHz mode

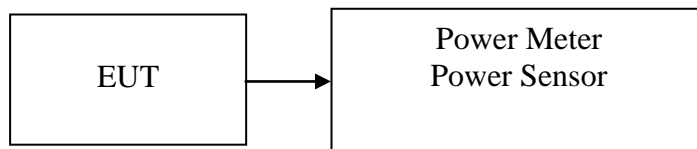
Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
2422	25.72	0.3733	1.00	PASS
2437	*25.97	0.3954		PASS
2452	25.73	0.3741		PASS

7.3 AVERAGE POWER

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the avg power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Frequency (MHz)	Output Power (dBm)	Output Power (W)
2412	24.89	0.3083
2437	24.94	0.3119
2462	21.44	0.1393

Test mode: IEEE 802.11g mode

Frequency (MHz)	Output Power (dBm)	Output Power (W)
2412	16.99	0.0500
2437	21.11	0.1291
2462	17.74	0.0594

Test mode: IEEE 802.11n HT 20 MHz mode

Frequency (MHz)	Output Power (dBm)	Output Power (W)
2412	23.99	0.2506
2437	24.75	0.2985
2462	23.30	0.2138

Test mode: IEEE 802.11n HT 40 MHz mode

Frequency (MHz)	Output Power (dBm)	Output Power (W)
2422	21.10	0.1288
2437	24.14	0.2594
2452	20.84	0.1213

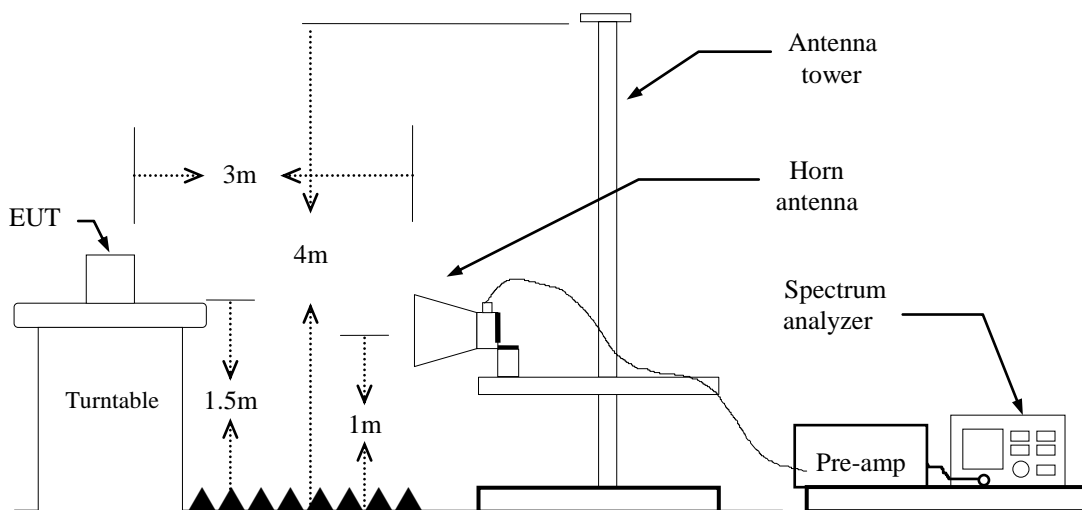
7.4 BAND EDGES MEASUREMENT

LIMIT

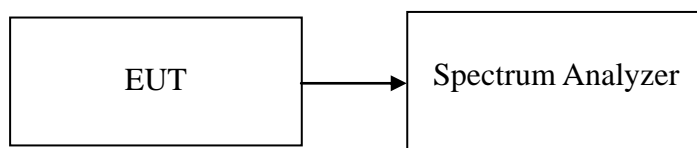
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test Configuration

For Radiated



For Conducted



TEST PROCEDURE

For Radiated

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz,
if duty cycle $\geq 98\%$, VBW=10Hz.
if duty cycle $< 98\%$ VBW=1/T.
IEEE 802.11b mode: $\geq 98\%$, VBW=10Hz
IEEE 802.11g mode: = 89%, VBW=680Hz
IEEE 802.11n HT 20 MHz mode: = 90%, VBW=750Hz
IEEE 802.11n HT 40 MHz mode: = 82%, VBW=1.5KHz
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

For Un-restricted Band Emissions

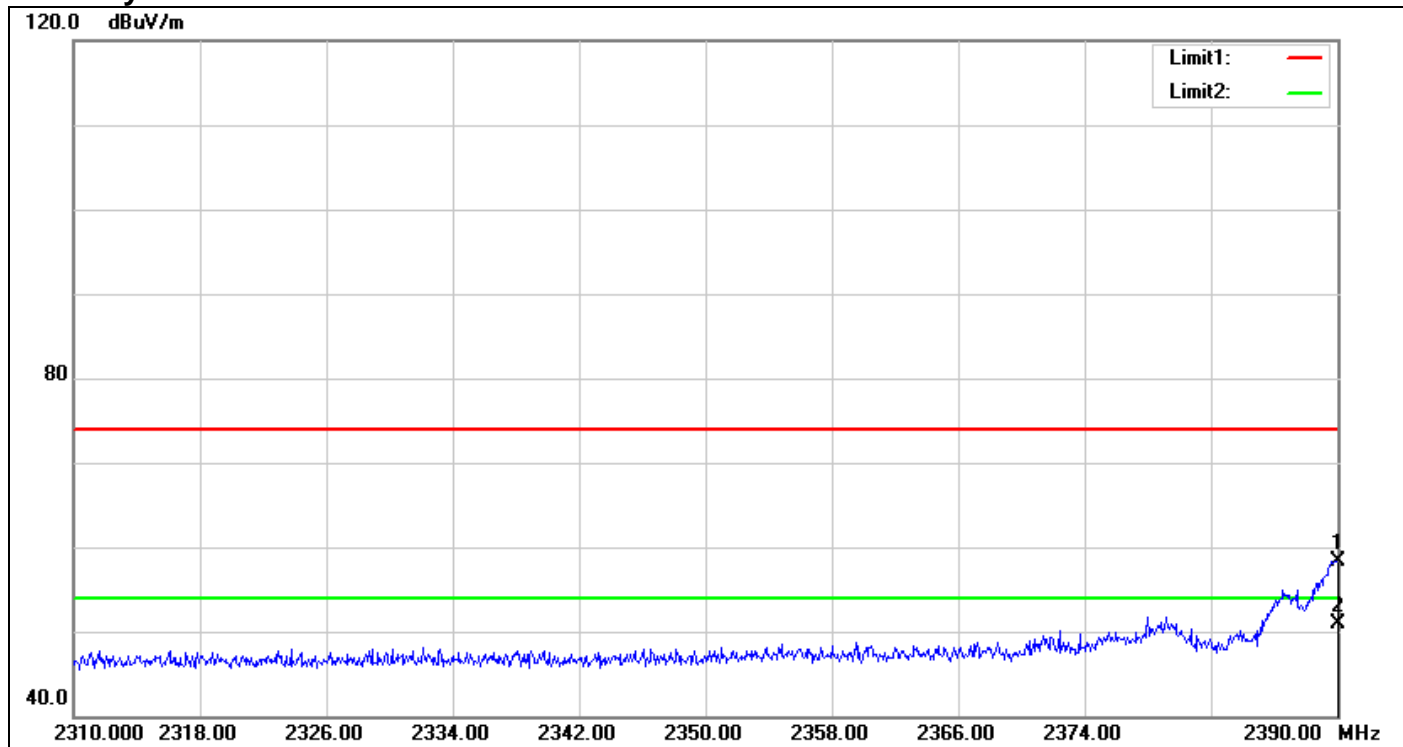
The peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

TEST RESULTS

Refer to attach spectrum analyzer data chart.

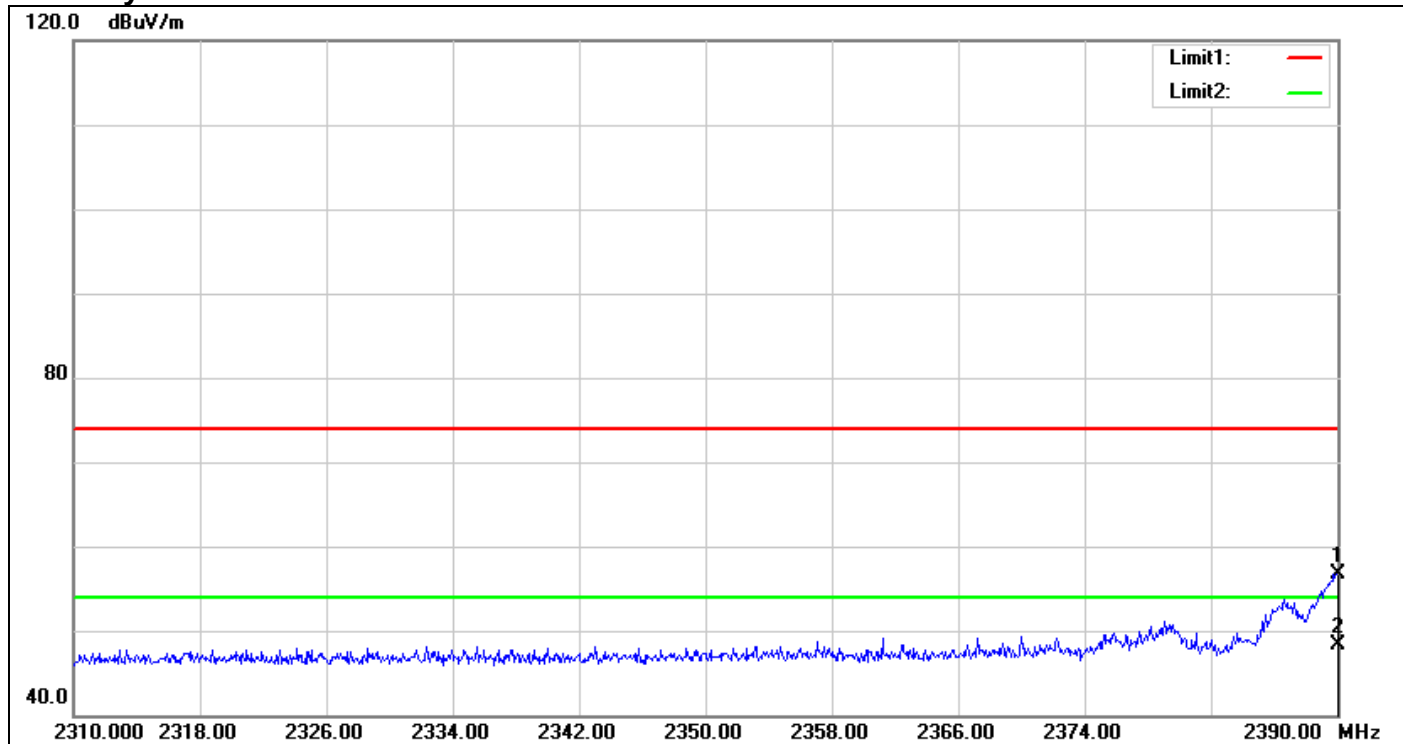
Band Edges (IEEE 802.11b mode / 2412 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2390.000	60.84	-2.49	58.35	74.00	-15.65	150	357	peak
2	2390.000	53.40	-2.49	50.91	54.00	-3.09	150	357	AVG

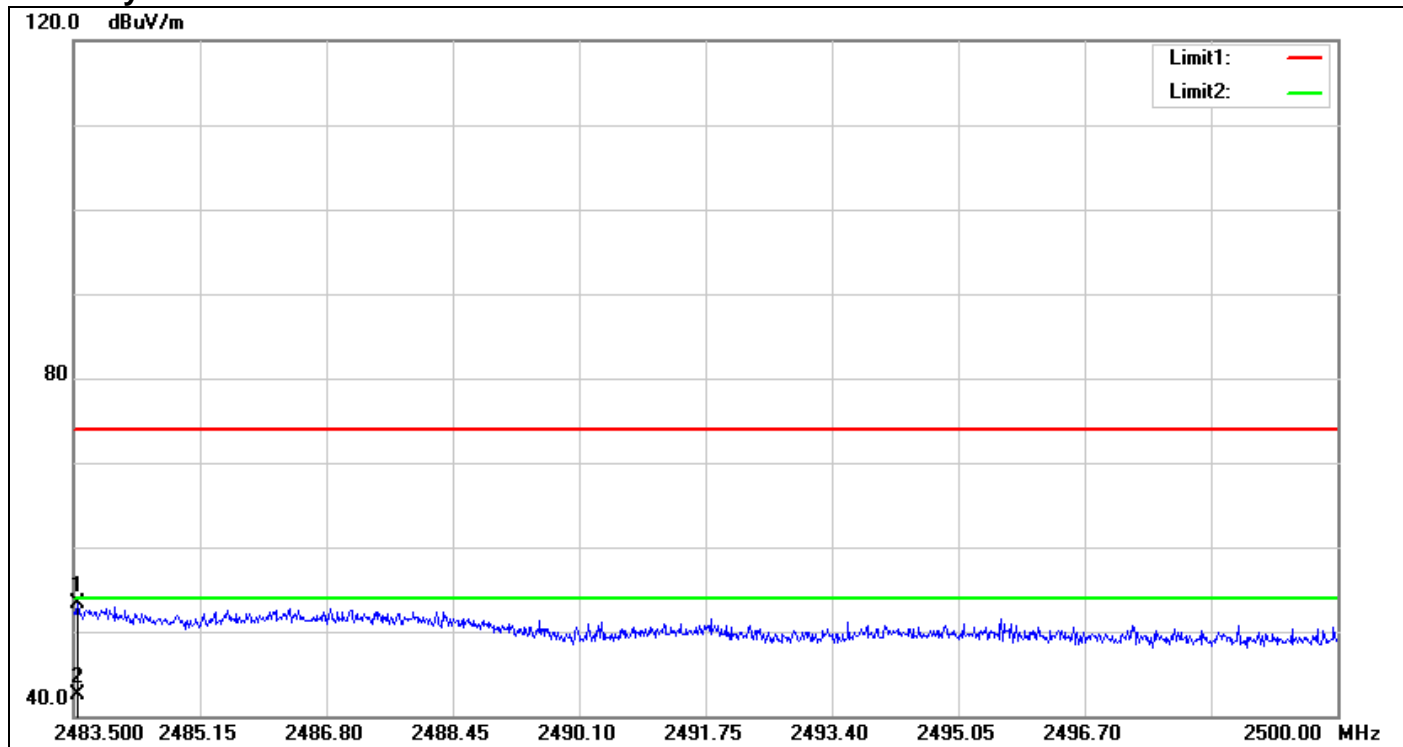
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2390.000	59.28	-2.49	56.79	74.00	-17.21	150	305	peak
2	2390.000	50.69	-2.49	48.20	54.00	-5.80	150	305	AVG

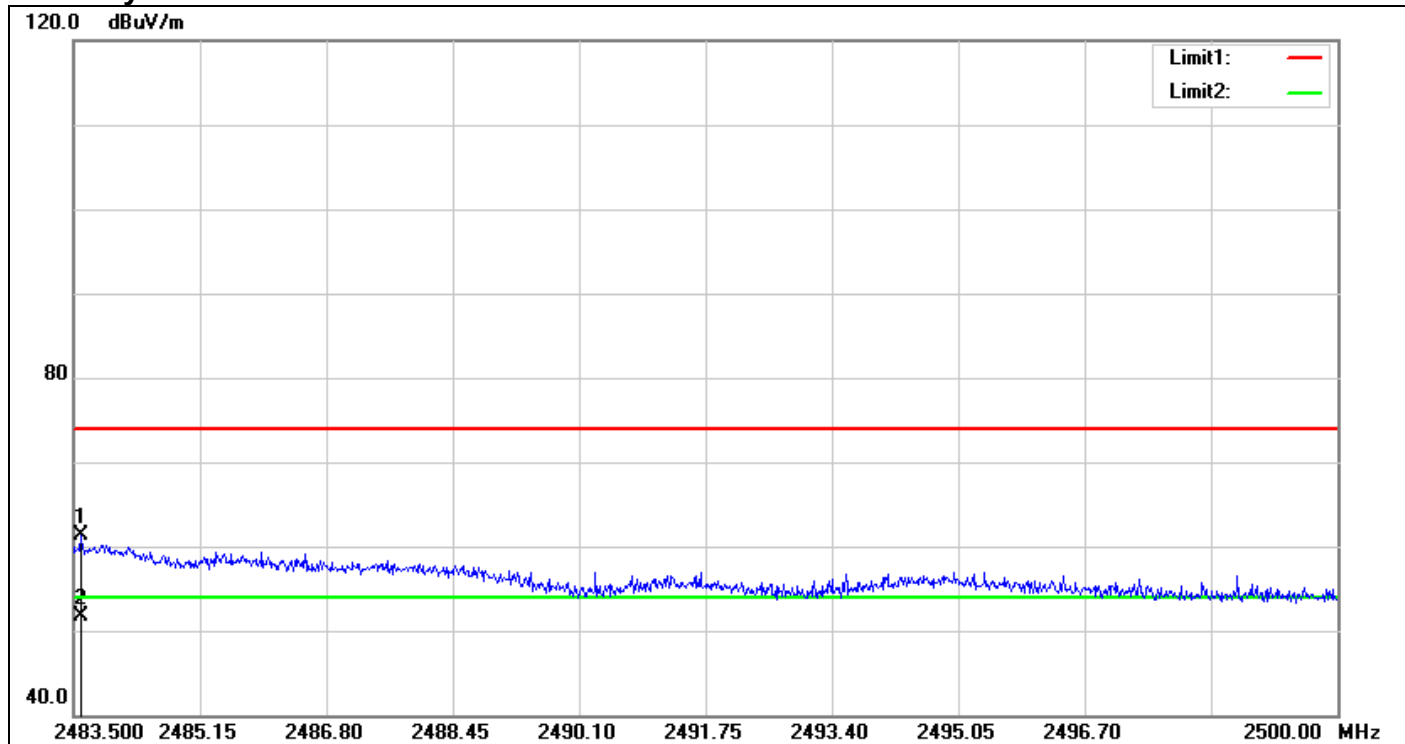
Band Edges (IEEE 802.11b mode / 2462 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2483.550	55.20	-1.99	53.21	74.00	-20.79	150	43	peak
2	2483.550	44.54	-1.99	42.55	54.00	-11.45	150	43	AVG

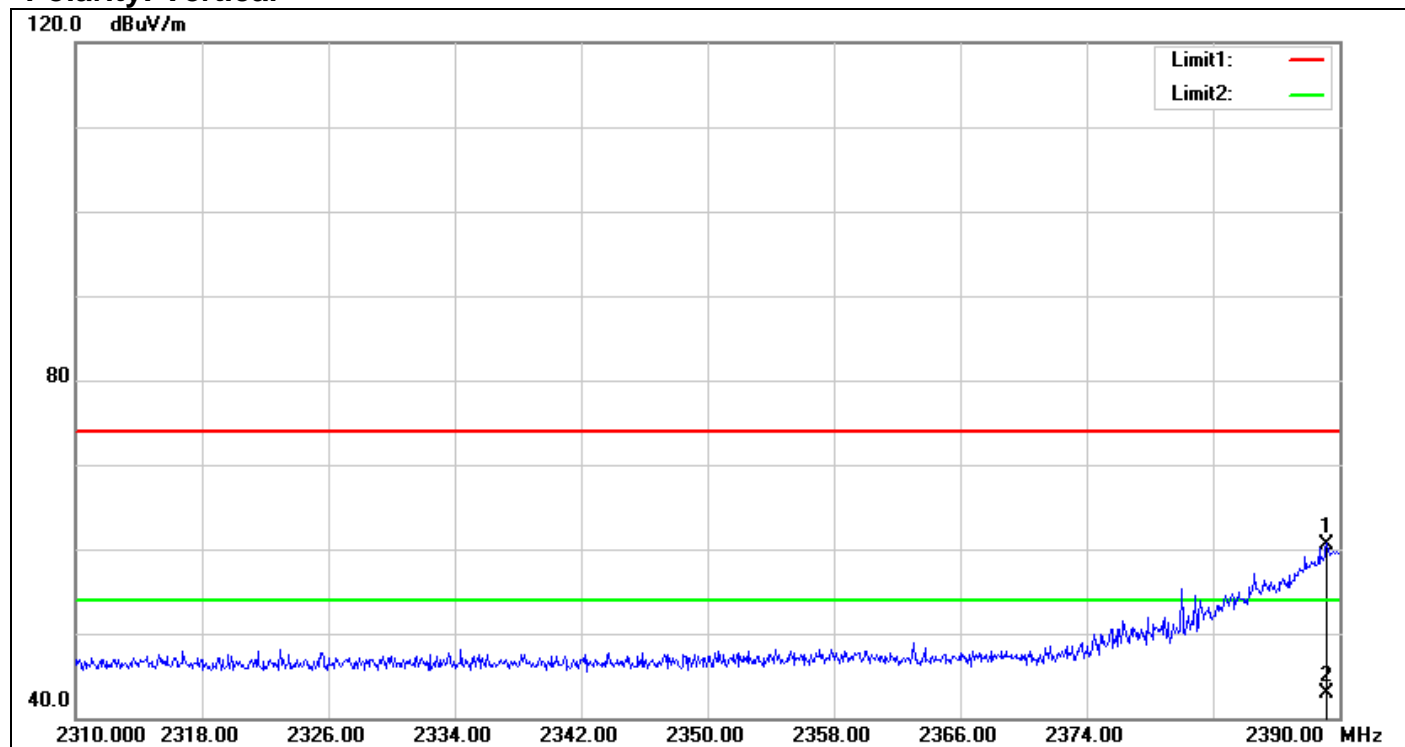
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2483.599	63.23	-1.99	61.24	74.00	-12.76	150	202	peak
2	2483.599	53.65	-1.99	51.66	54.00	-2.34	150	202	AVG

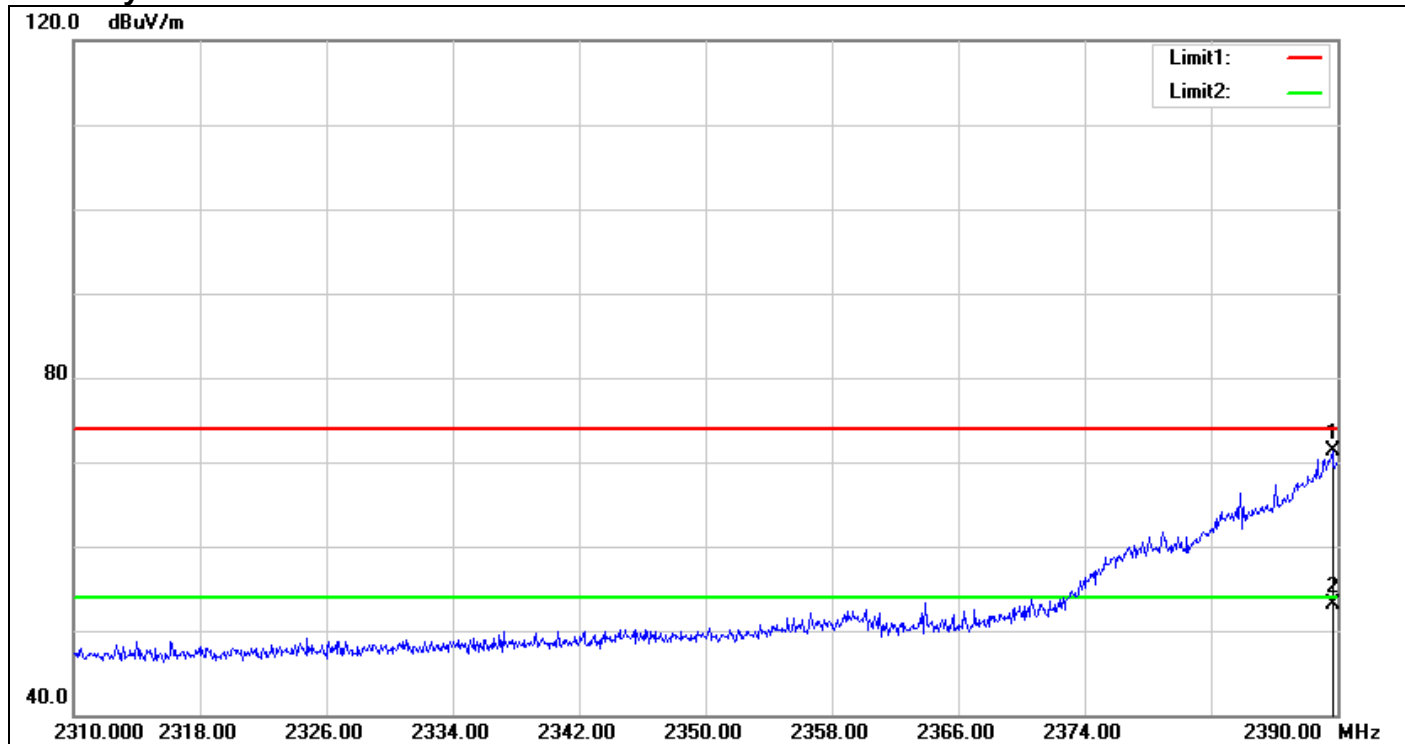
Band Edges (IEEE 802.11g mode / 2412 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2389.200	63.10	-2.50	60.60	74.00	-13.40	150	87	peak
2	2389.200	45.33	-2.50	42.83	54.00	-11.17	150	87	AVG

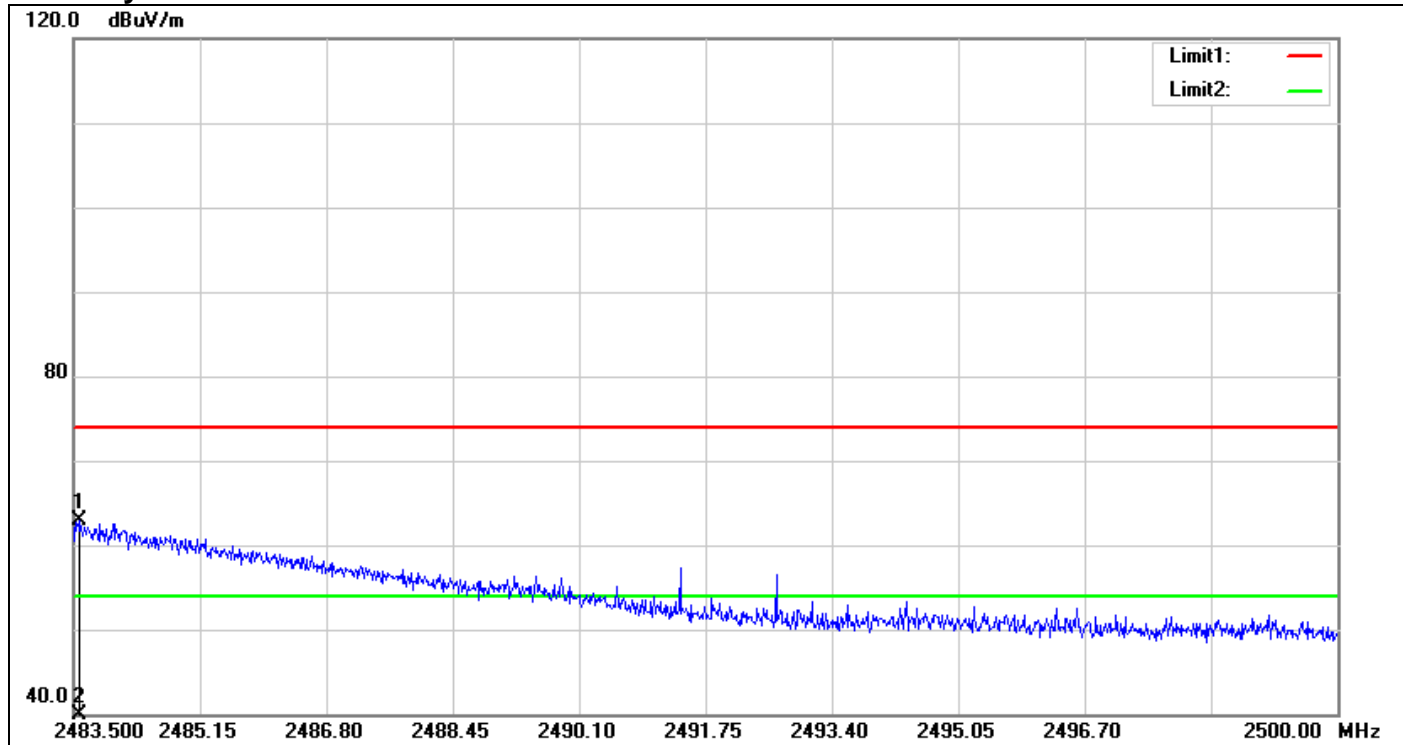
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2389.680	73.87	-2.49	71.38	74.00	-2.62	150	308	peak
2	2389.680	55.61	-2.49	53.12	54.00	-0.88	150	308	AVG

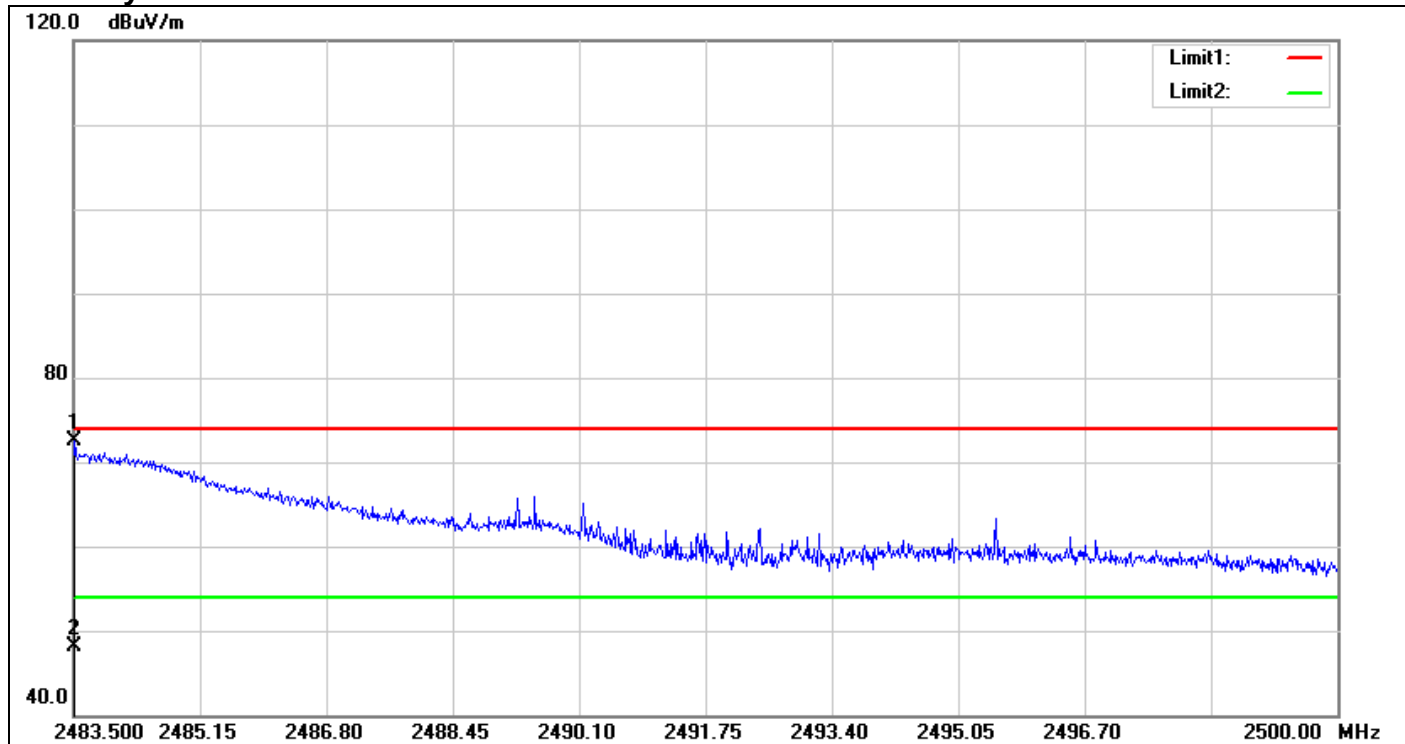
Band Edges (IEEE 802.11g mode / 2462 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2483.566	64.80	-1.99	62.81	74.00	-11.19	150	330	peak
2	2483.566	41.36	-1.99	39.37	54.00	-14.63	150	330	AVG

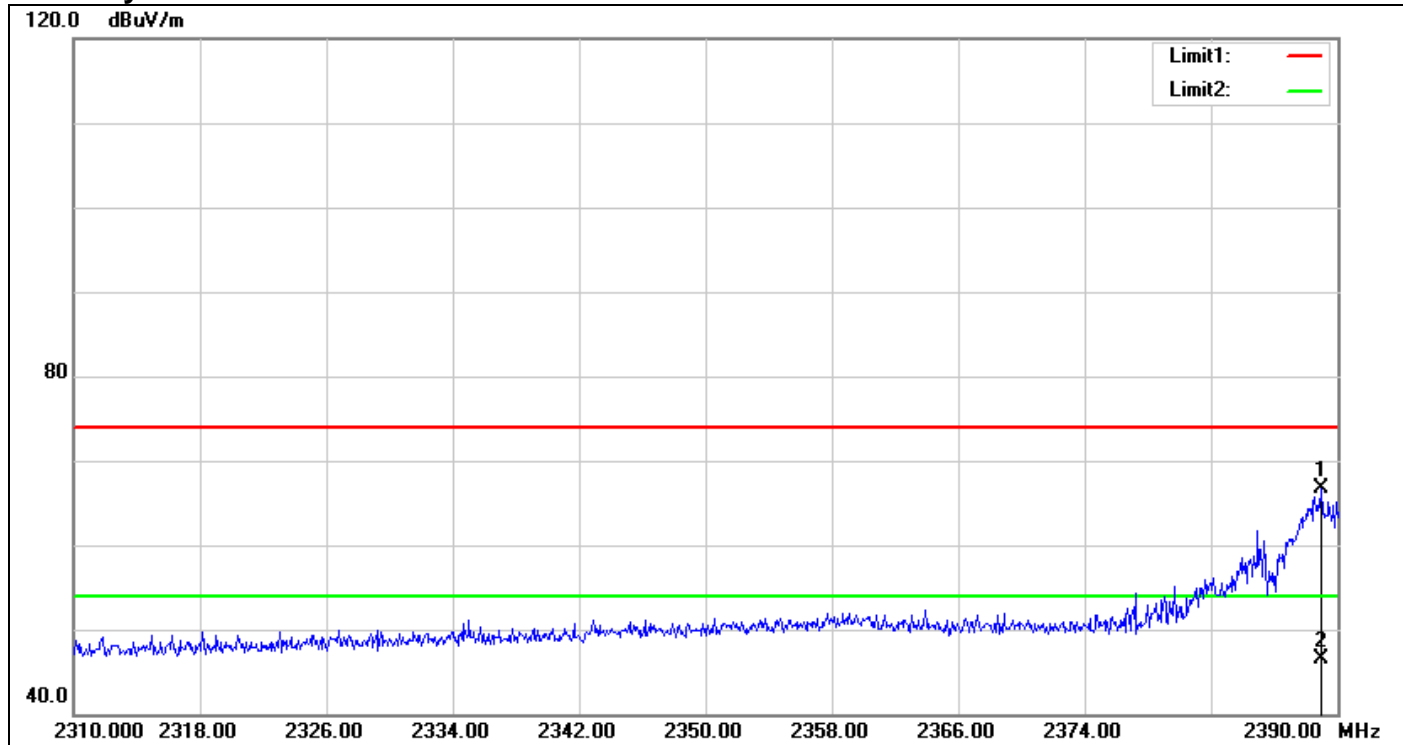
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2483.517	74.47	-1.99	72.48	74.00	-1.52	150	0	peak
2	2483.517	50.11	-1.99	48.12	54.00	-5.88	150	0	AVG

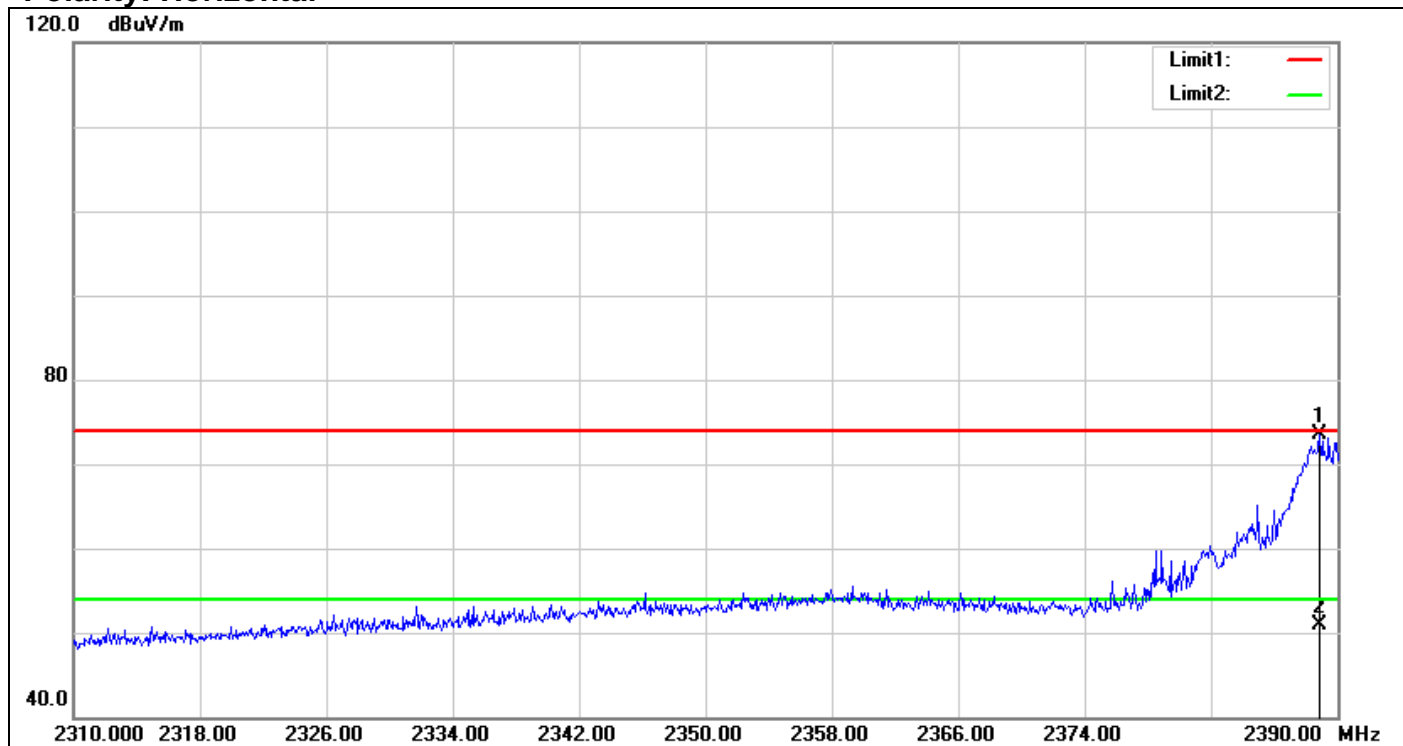
Band Edges (IEEE 802.11n HT 20 MHz mode / 2412 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2388.960	69.30	-2.50	66.80	74.00	-7.20	150	265	peak
2	2388.960	48.92	-2.50	46.42	54.00	-7.58	150	265	AVG

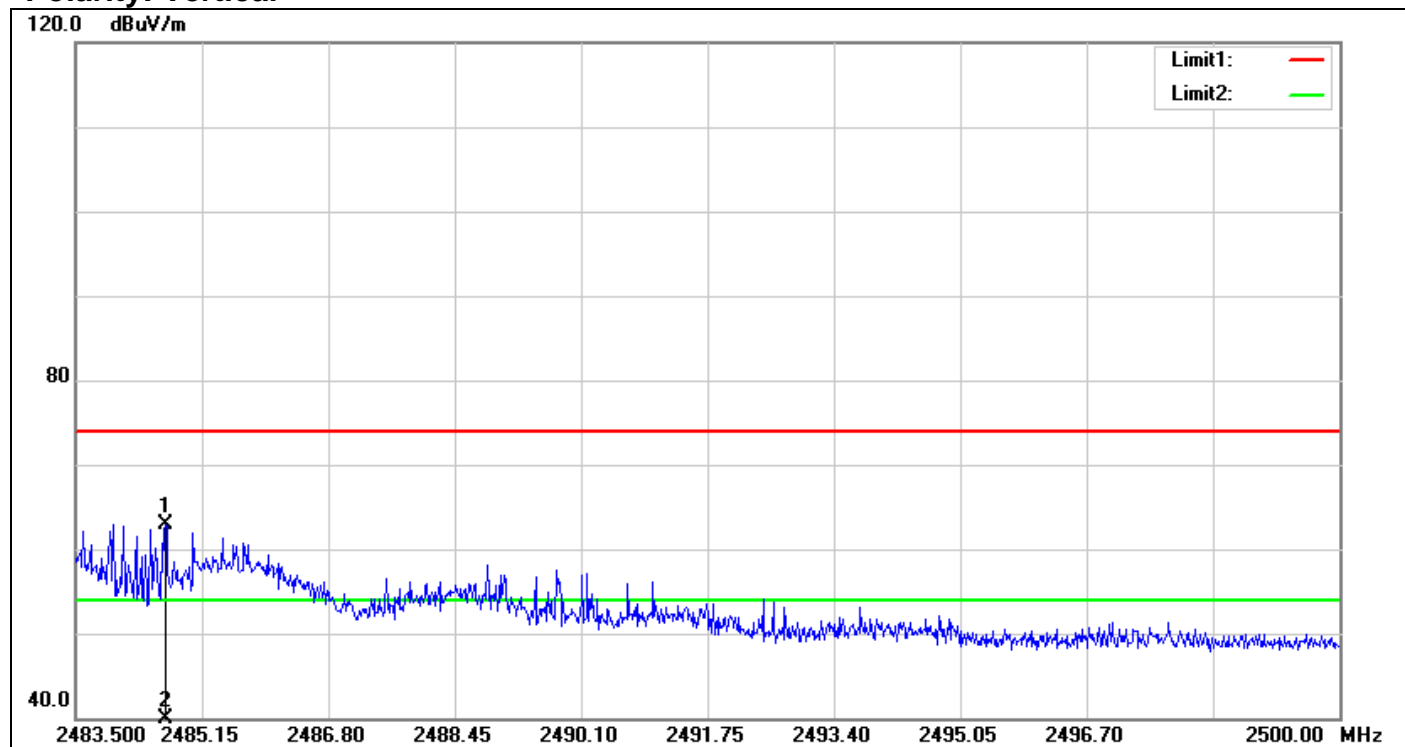
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2388.880	76.05	-2.50	73.55	74.00	-0.45	150	242	peak
2	2388.880	53.47	-2.50	50.97	54.00	-3.03	150	242	AVG

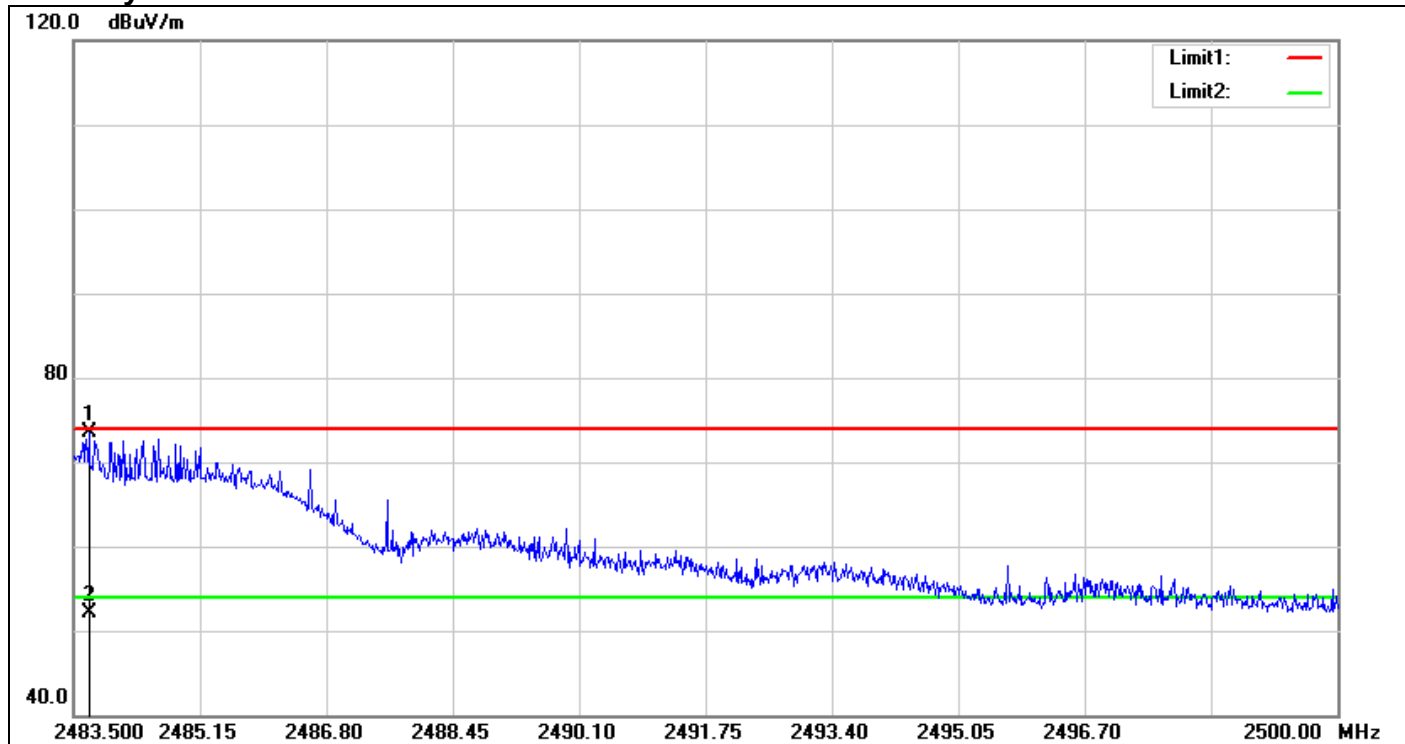
Band Edges (IEEE 802.11n HT 20 MHz mode / 2462 MHz)

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2484.671	64.81	-1.98	62.83	74.00	-11.17	150	67	peak
2	2484.671	39.17	-1.98	37.19	54.00	-16.81	150	67	AVG

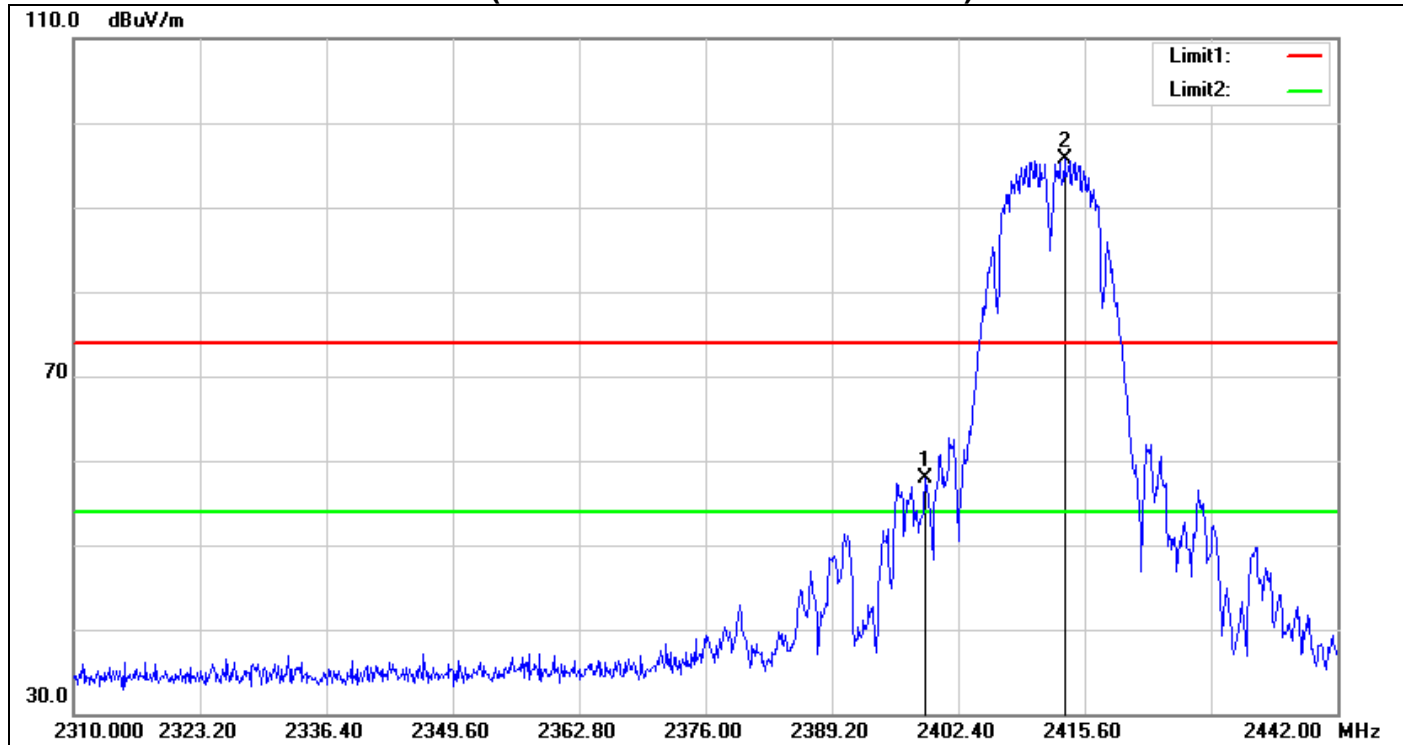
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2483.698	75.39	-1.99	73.40	74.00	-0.60	150	183	peak
2	2483.698	54.12	-1.99	52.13	54.00	-1.87	150	183	AVG

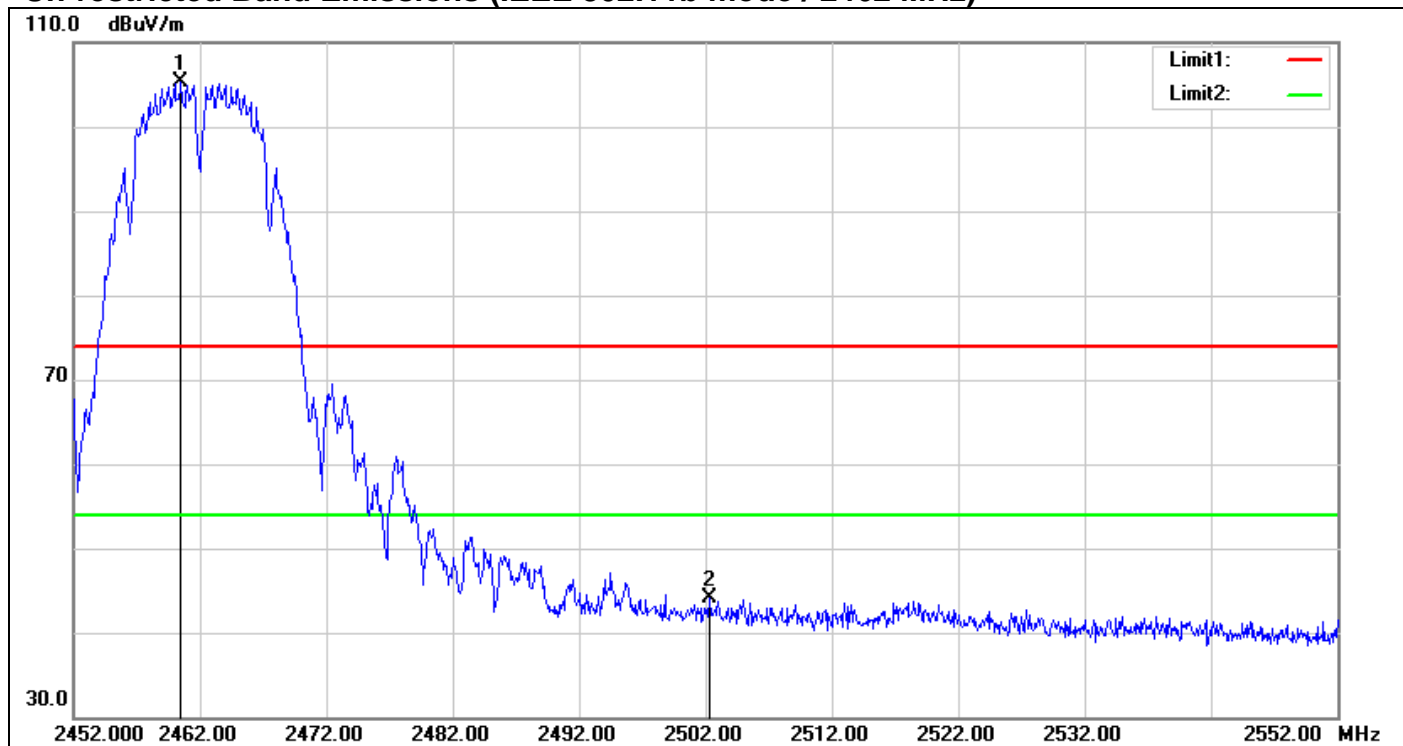
Test Plot

Un-restricted Band Emissions (IEEE 802.11b mode / 2412 MHz)



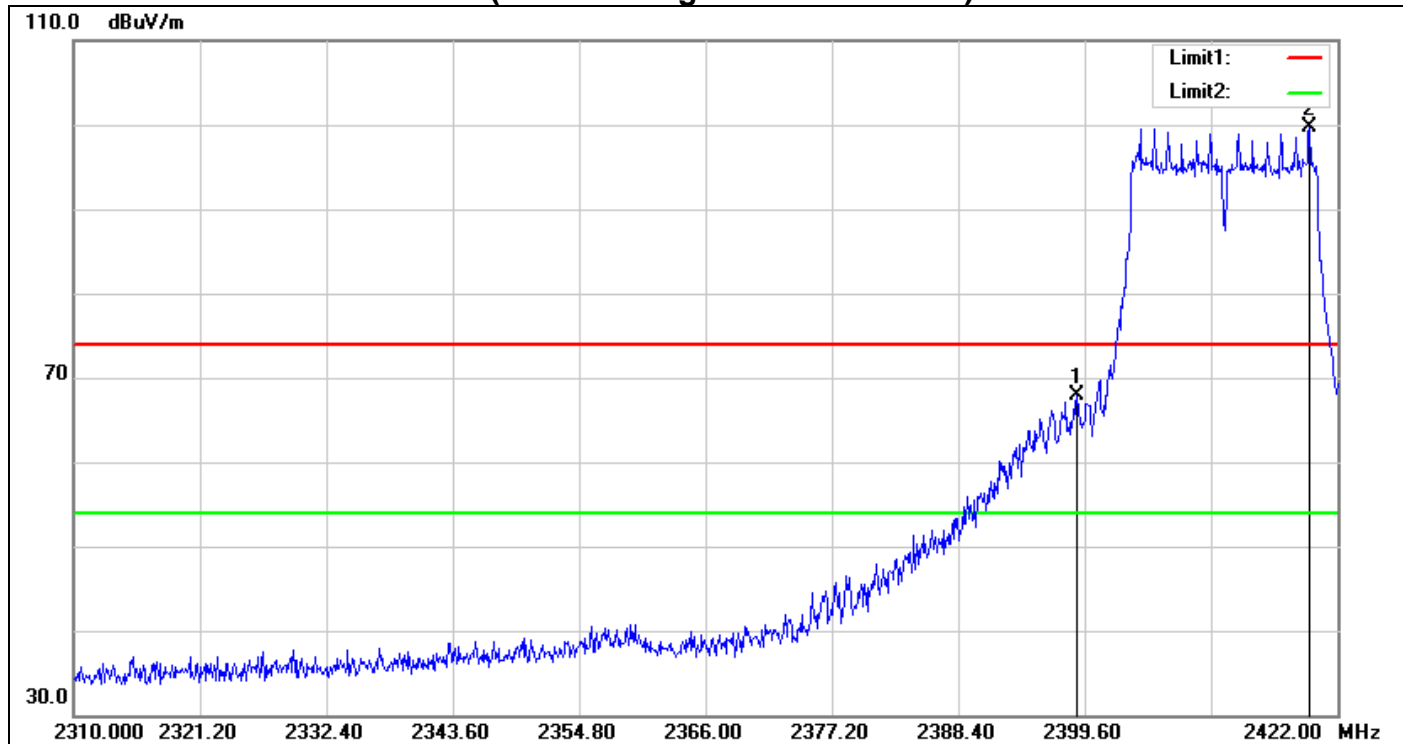
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2398.968	60.28	-2.42	57.86	74.00	-16.14	150	305	peak
2	2413.488	98.07	-2.40	95.67	74.00	21.67	150	305	peak

Un-restricted Band Emissions (IEEE 802.11b mode / 2462 MHz)



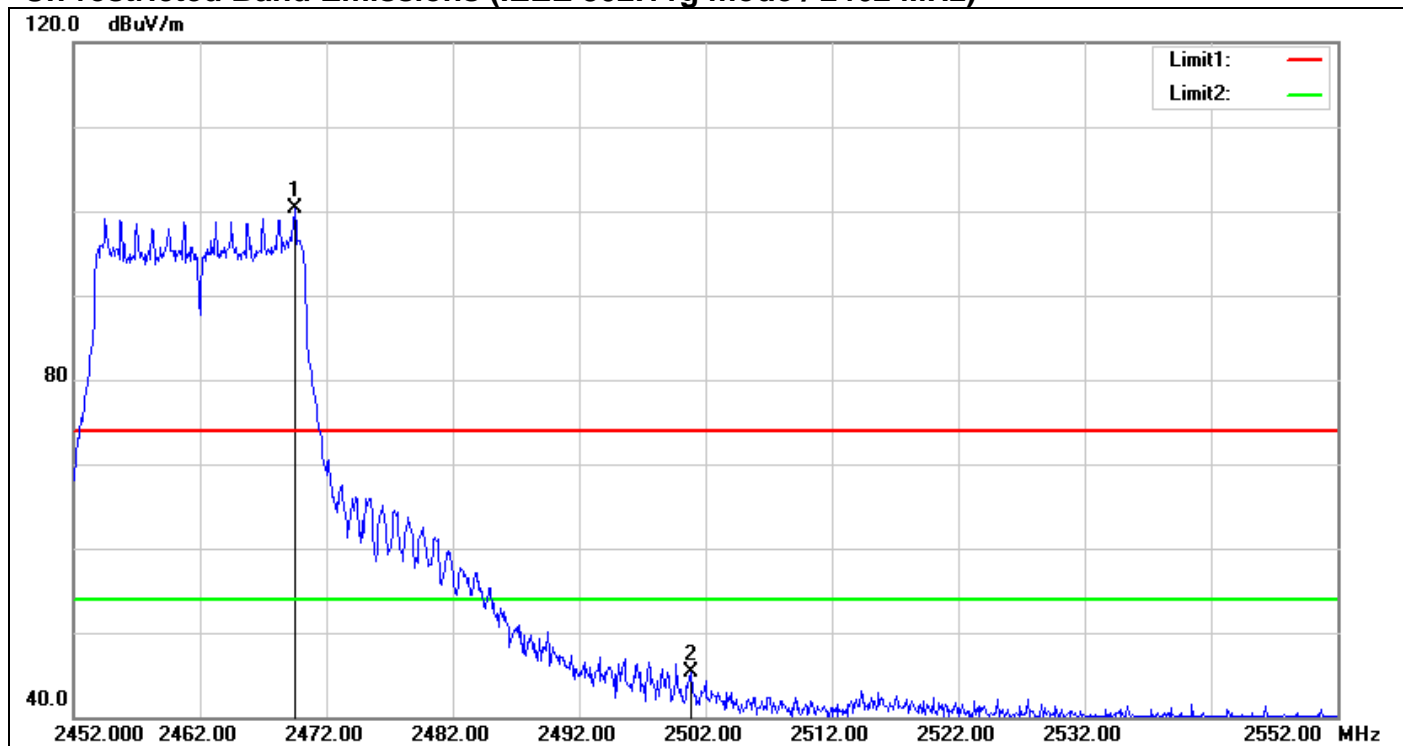
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2460.500	107.32	-2.10	105.22	74.00	31.22	150	202	peak
2	2502.300	45.94	-1.85	44.09	74.00	-29.91	150	202	peak

Un-restricted Band Emissions (IEEE 802.11g mode / 2412 MHz)



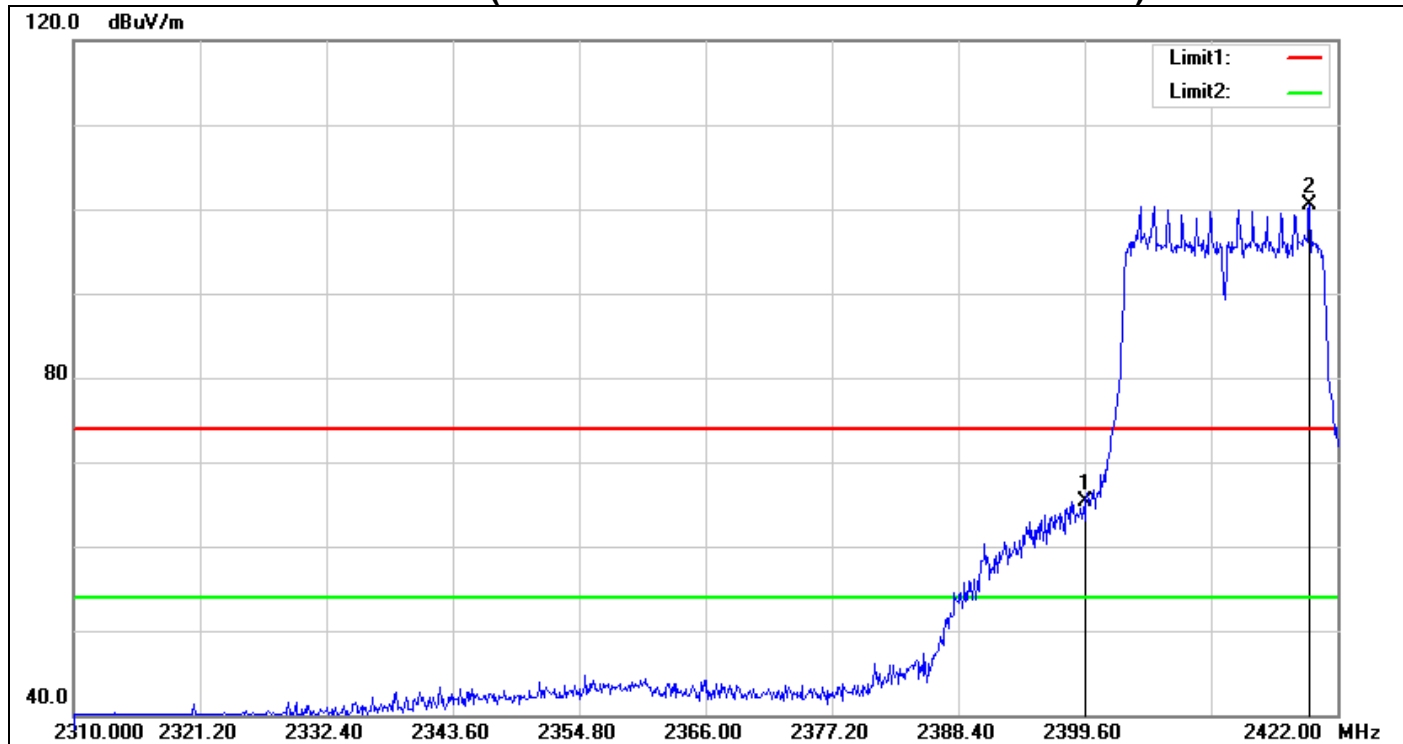
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2398.928	70.24	-2.42	67.82	74.00	-6.18	150	178	peak
2	2419.536	101.99	-2.36	99.63	74.00	25.63	150	73	peak

Un-restricted Band Emissions (IEEE 802.11g mode / 2462 MHz)



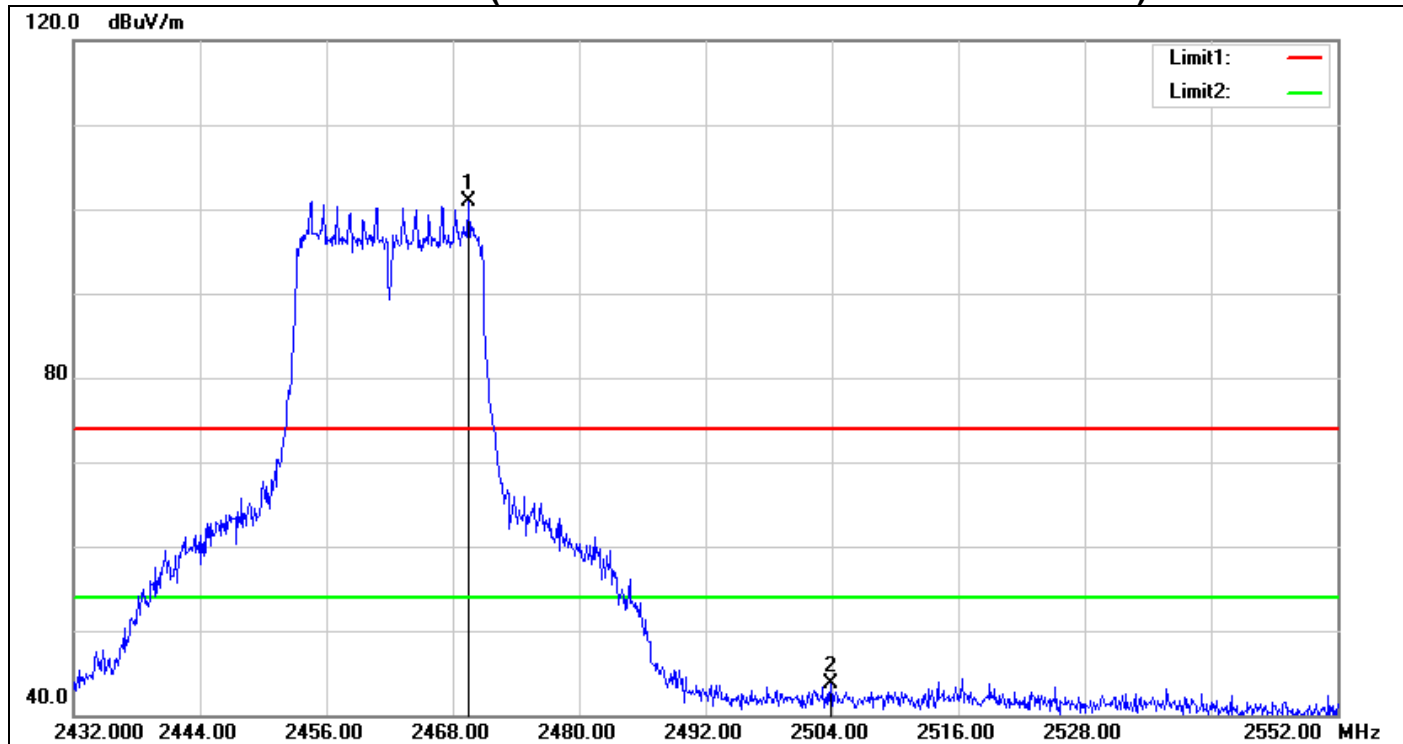
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2469.500	102.42	-2.07	100.35	74.00	26.35	150	286	peak
2	2500.900	47.15	-1.86	45.29	74.00	-28.71	150	336	peak

Un-restricted Band Emissions (IEEE 802.11n HT 20 MHz mode / 2412 MHz)



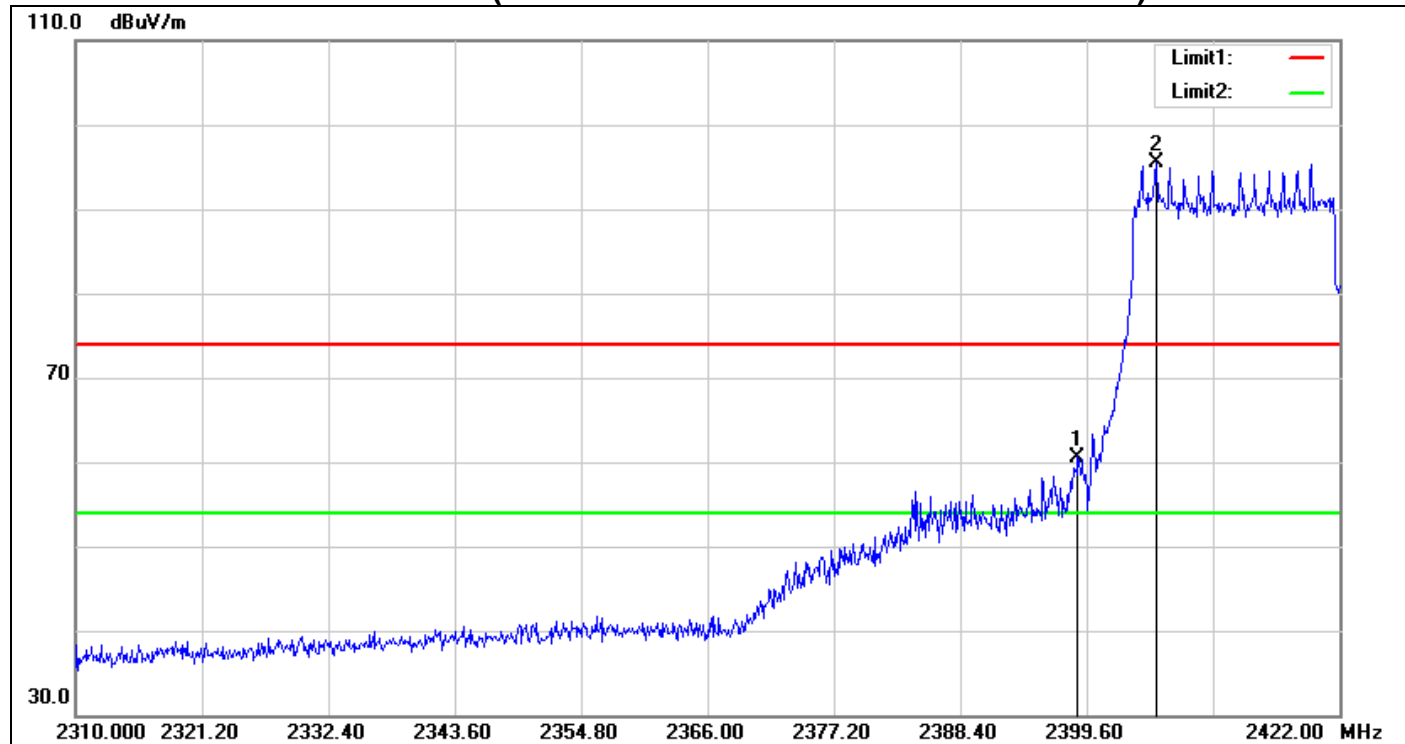
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2399.712	67.74	-2.41	65.33	74.00	-8.67	150	30	peak
2	2419.536	102.92	-2.36	100.56	74.00	26.56	150	211	peak

Un-restricted Band Emissions (IEEE 802.11n HT 20 MHz mode / 2462 MHz)



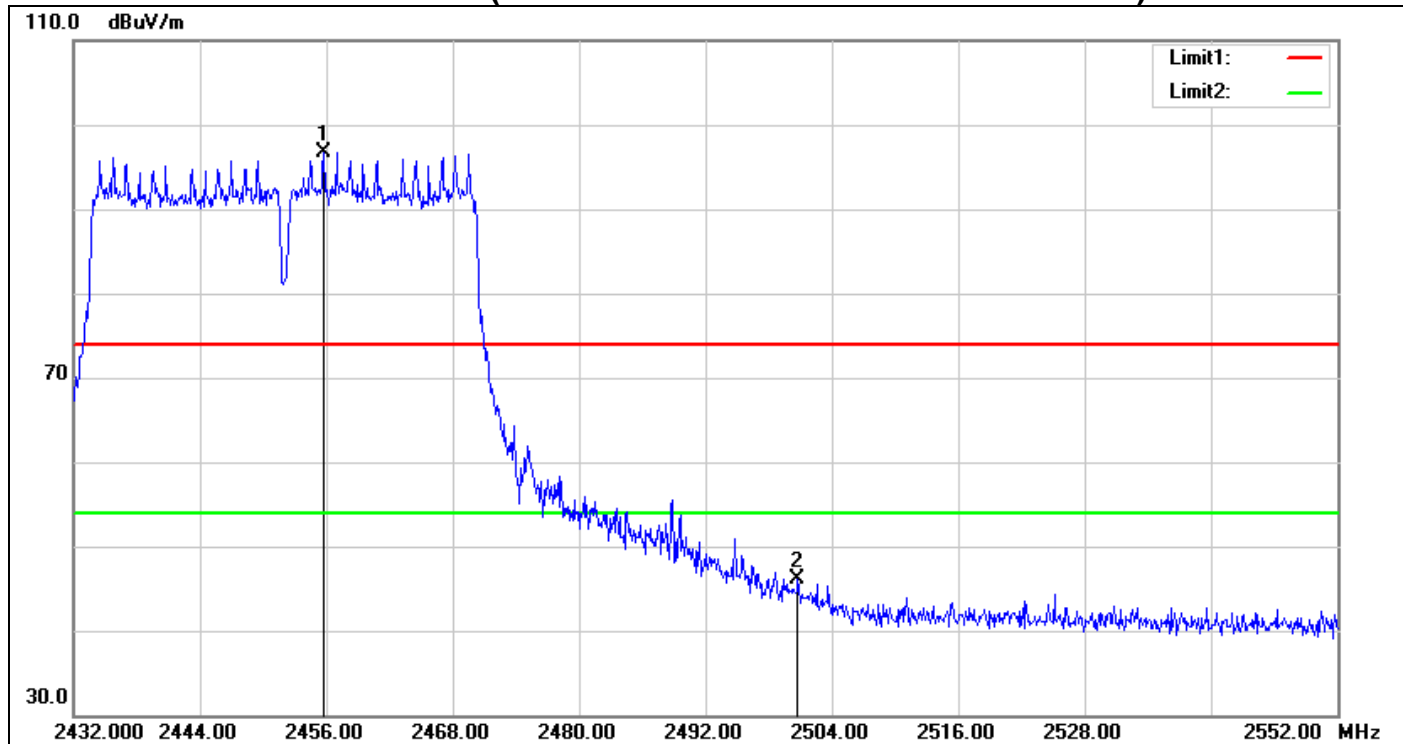
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2469.440	102.97	-2.07	100.90	74.00	26.90	150	231	peak
2	2503.880	45.47	-1.85	43.62	74.00	-30.38	150	231	peak

Un-restricted Band Emissions (IEEE 802.11n HT 40 MHz mode / 2422 MHz)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2398.816	63.02	-2.42	60.60	74.00	-13.40	150	174	peak
2	2405.760	98.00	-2.42	95.58	74.00	21.58	150	202	peak

Un-restricted Band Emissions (IEEE 802.11n HT 40 MHz mode / 2452 MHz)



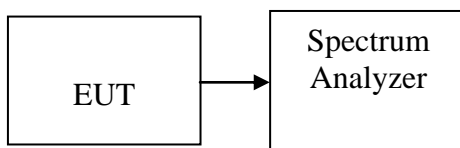
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2455.760	98.81	-2.12	96.69	74.00	22.69	150	287	peak
2	2500.760	47.87	-1.86	46.01	74.00	-27.99	150	132	peak

7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

1. According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. Set the RBW = 3 kHz, VBW = 10 kHz, span to 1.5 times the DTS bandwidth, Detector = peak, Trace mode = max hold, Sweep = auto couple. Use the peak marker function to determine the maximum amplitude level within the RBW.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
2412	-19.33	8.00	PASS
2437	-20.00		PASS
2462	-20.51		PASS

Test mode: IEEE 802.11g mode

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
2412	-11.18	8.00	PASS
2437	-5.01		PASS
2462	-10.15		PASS

Test mode: IEEE 802.11n HT 20 MHz mode

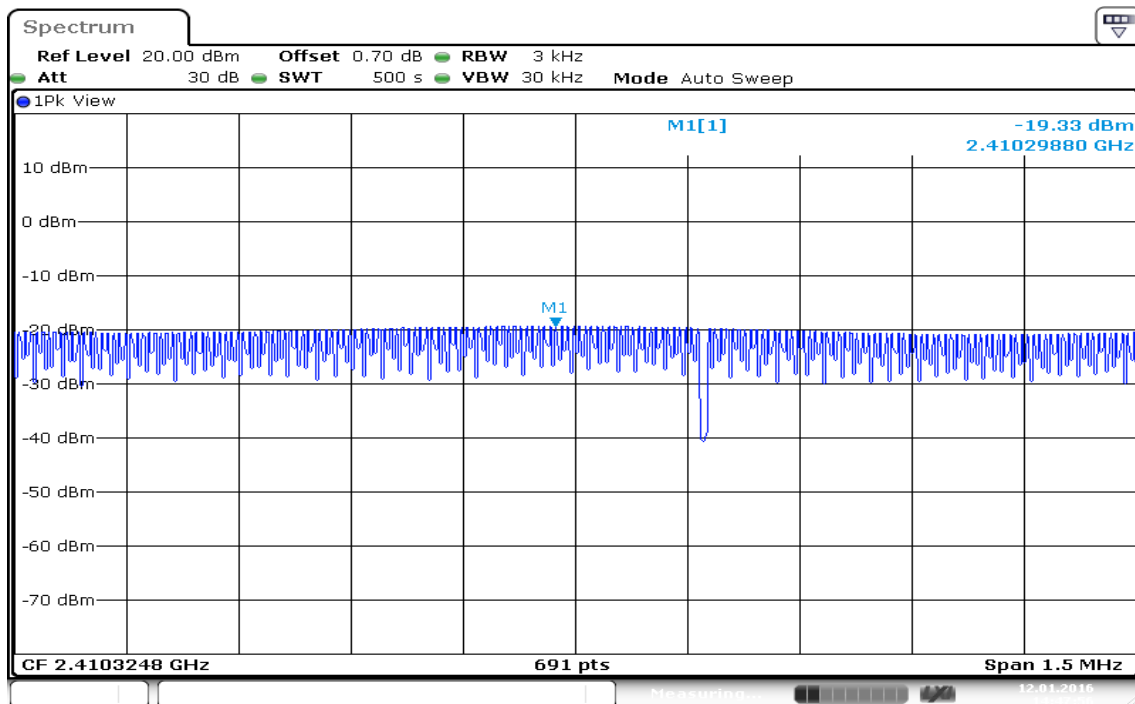
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
2412	-13.48	8.00	PASS
2437	-7.84		PASS
2462	-11.96		PASS

Test mode: IEEE 802.11n HT 40 MHz mode

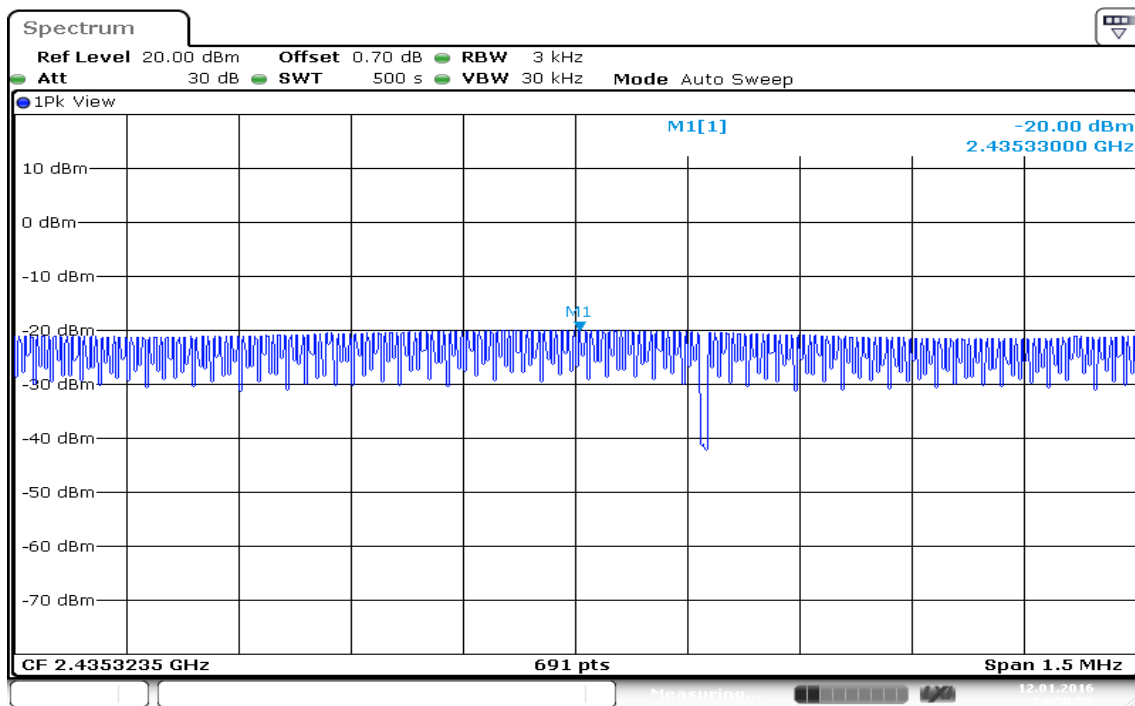
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
2422	-16.93	8.00	PASS
2437	-11.61		PASS
2452	-16.70		PASS

Test Plot

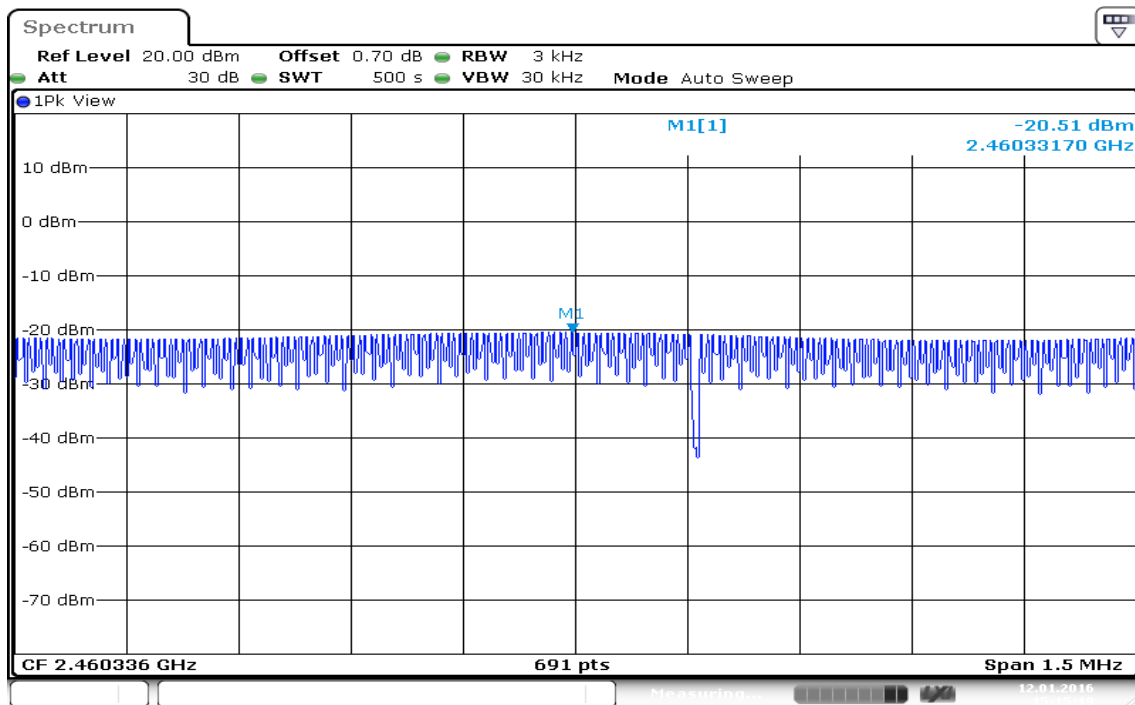
IEEE 802.11b mode / 2412 MHz



IEEE 802.11b mode / 2437 MHz

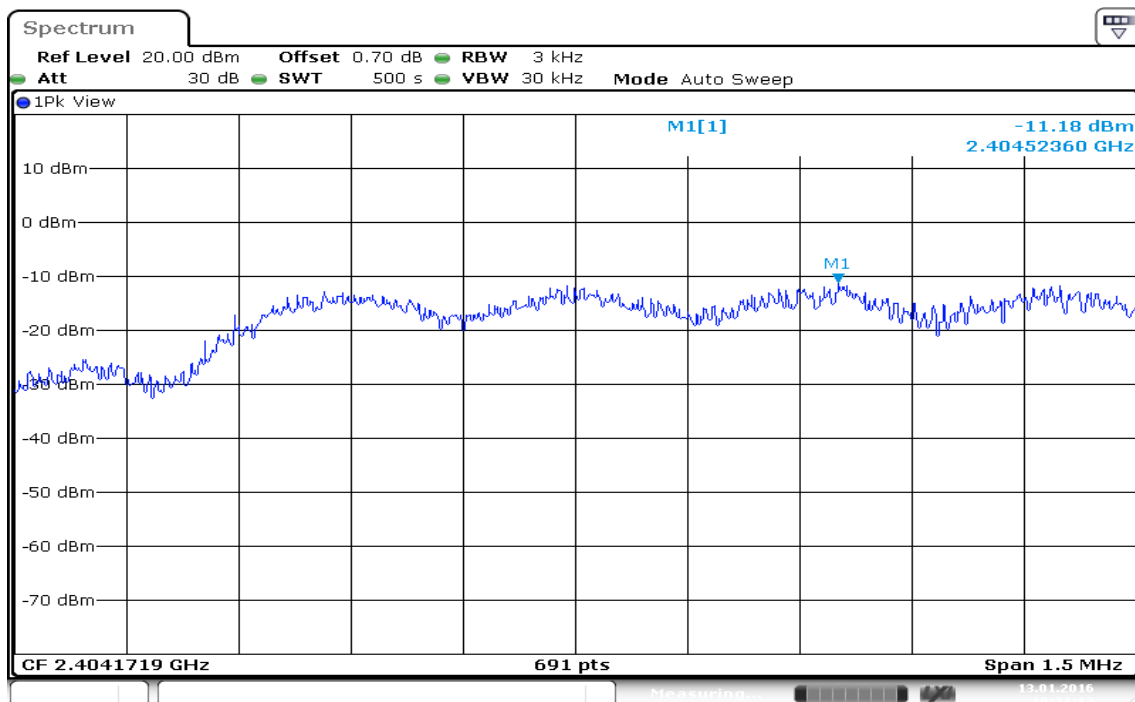


IEEE 802.11b mode / 2462 MHz



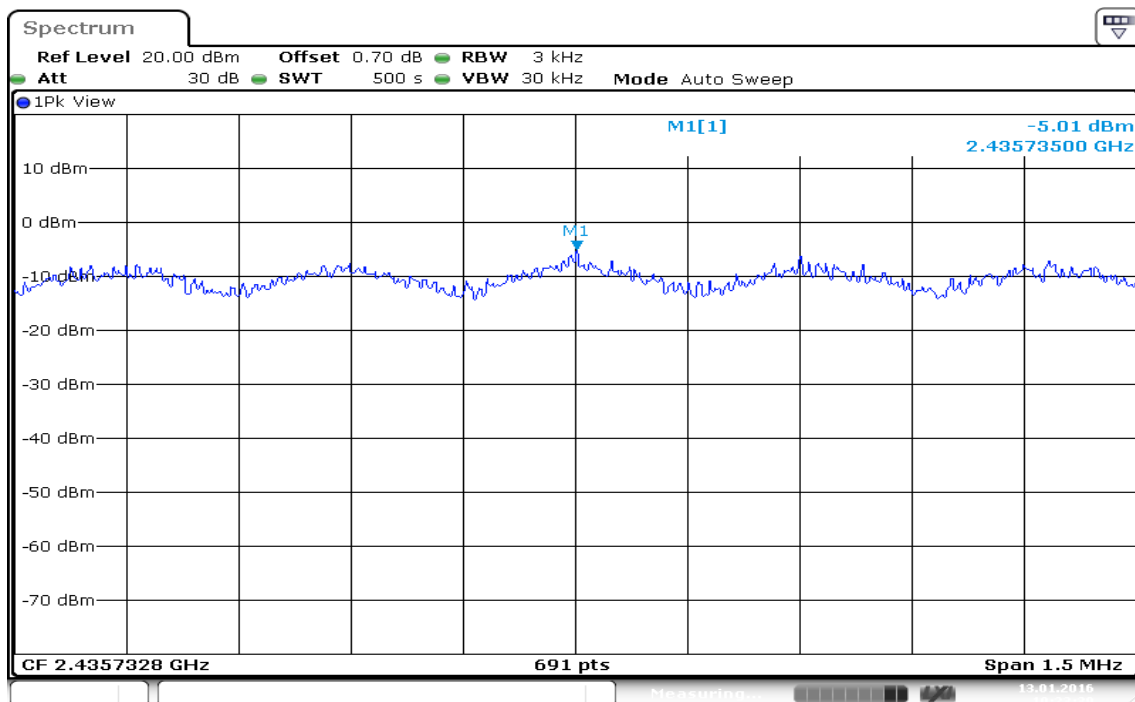
Date: 12.JAN.2016 15:15:19

IEEE 802.11g mode / 2412 MHz



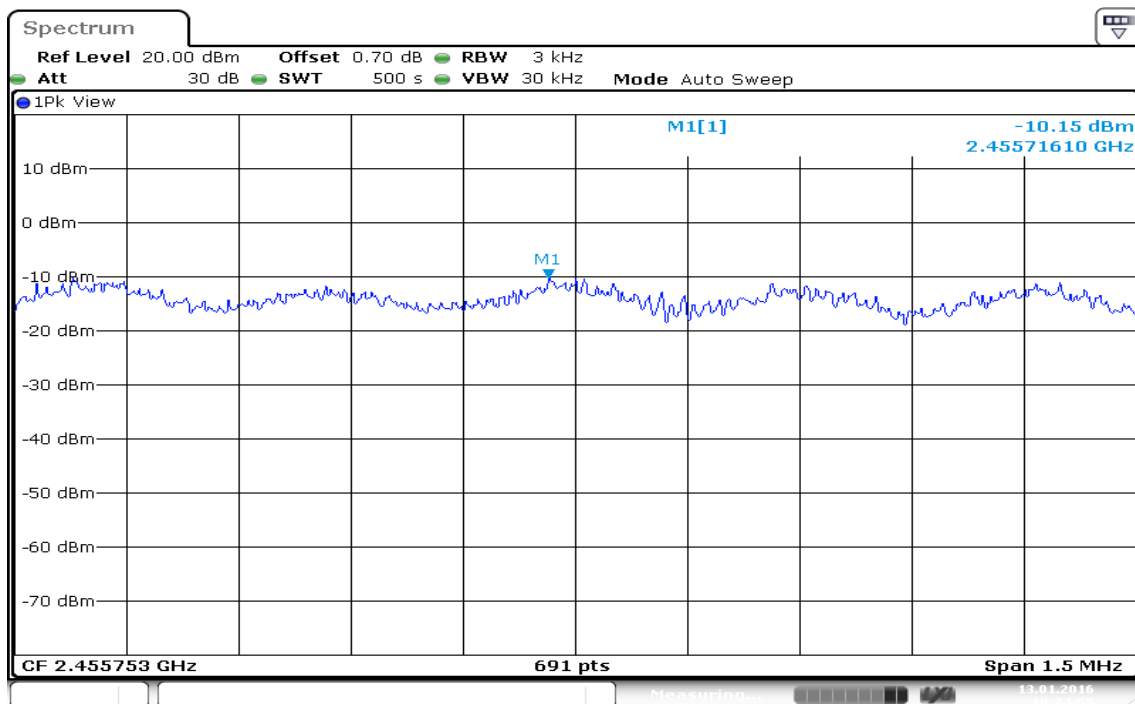
Date: 13.JAN.2016 10:21:13

IEEE 802.11g mode / 2437 MHz



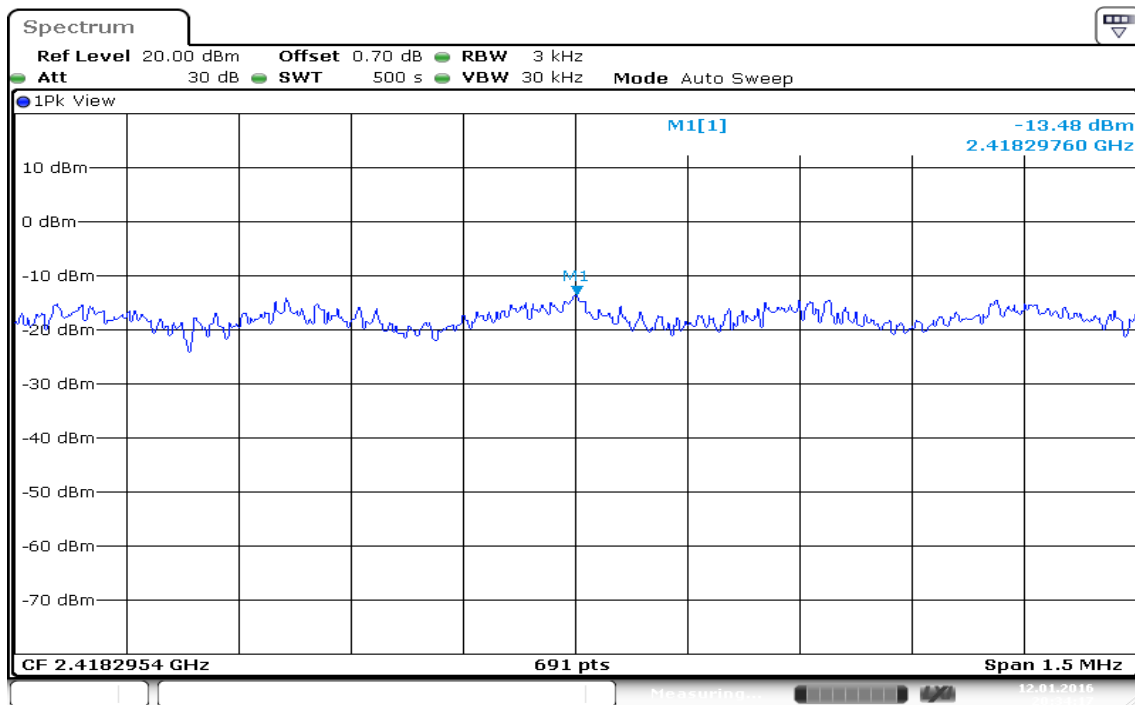
Date: 13.JAN.2016 10:23:40

IEEE 802.11g mode / 2462 MHz



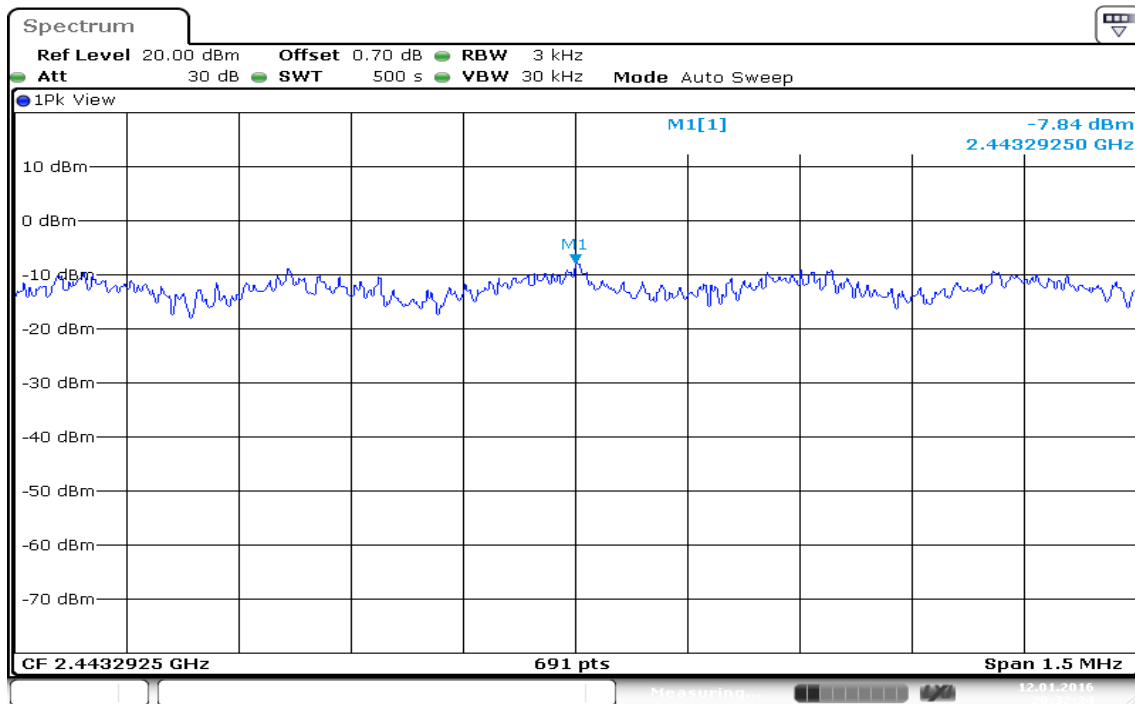
Date: 13.JAN.2016 10:24:56

IEEE 802.11n HT 20 MHz mode / 2412 MHz



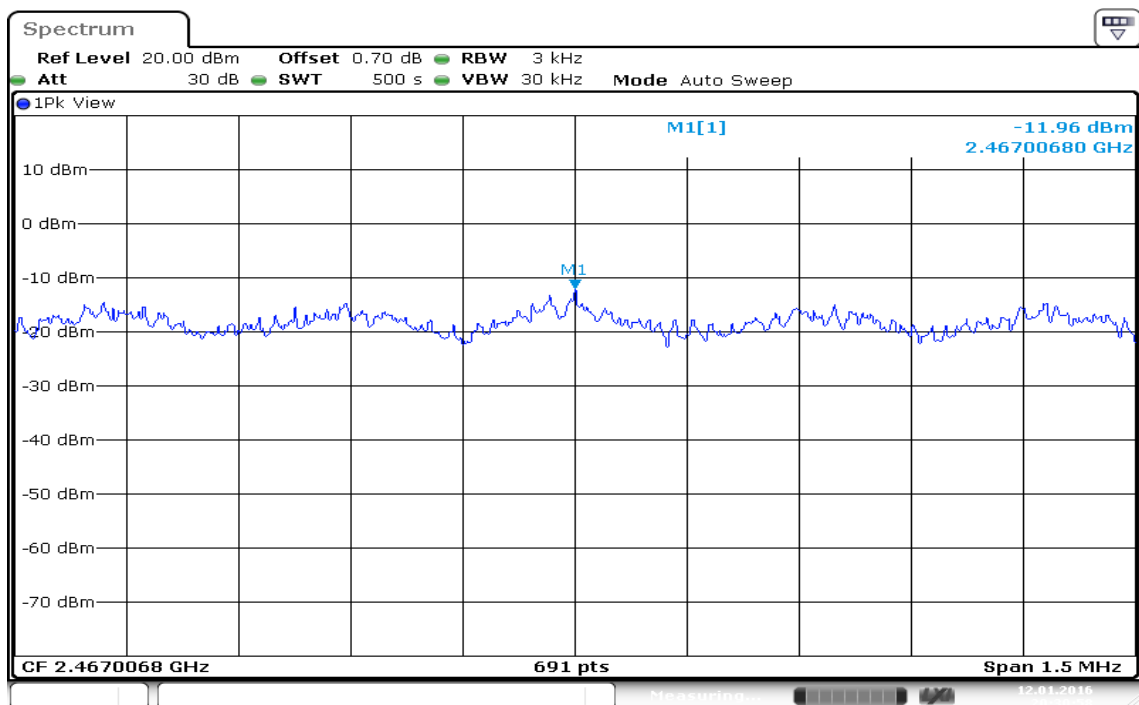
Date: 12.JAN.2016 20:34:17

IEEE 802.11n HT 20 MHz mode / 2437 MHz



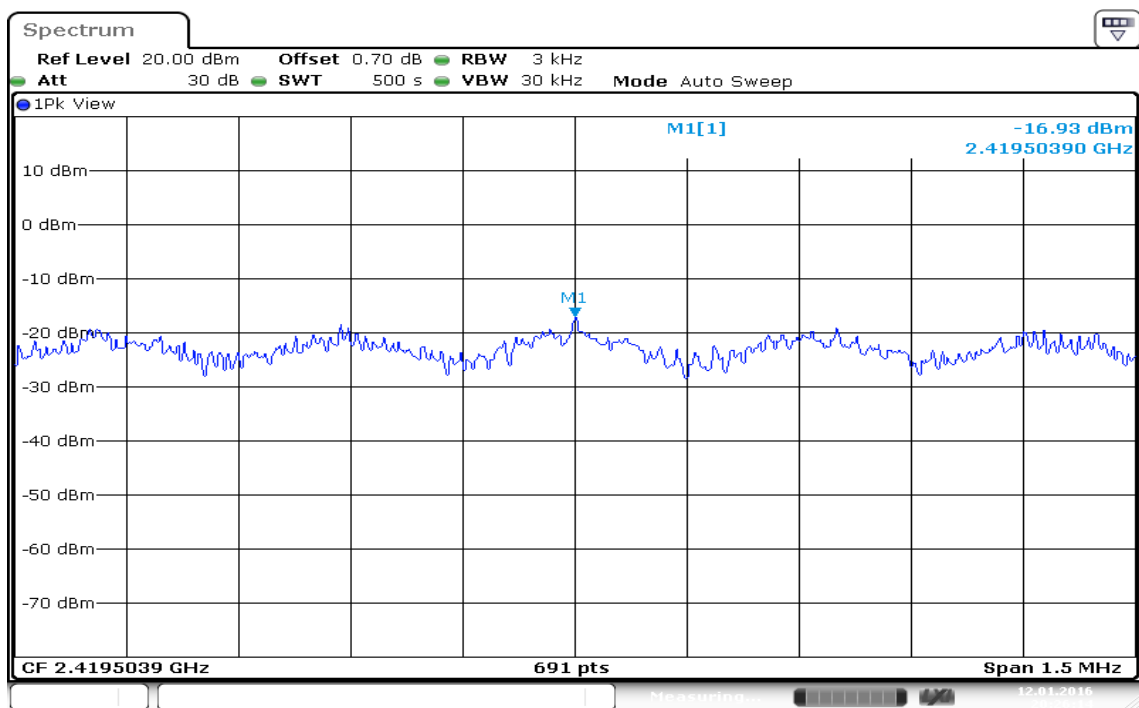
Date: 12.JAN.2016 20:32:24

IEEE 802.11n HT 20 MHz mode / 2462 MHz



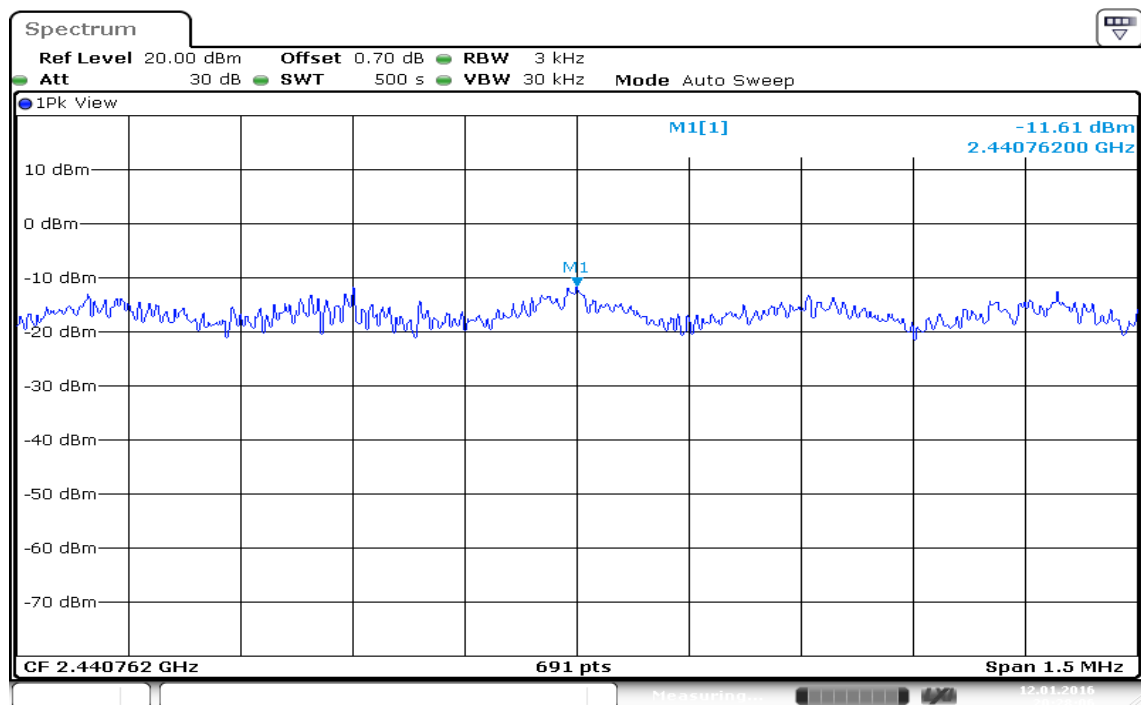
Date: 12.JAN.2016 20:30:58

IEEE 802.11n HT 40 mode / 2422MHz



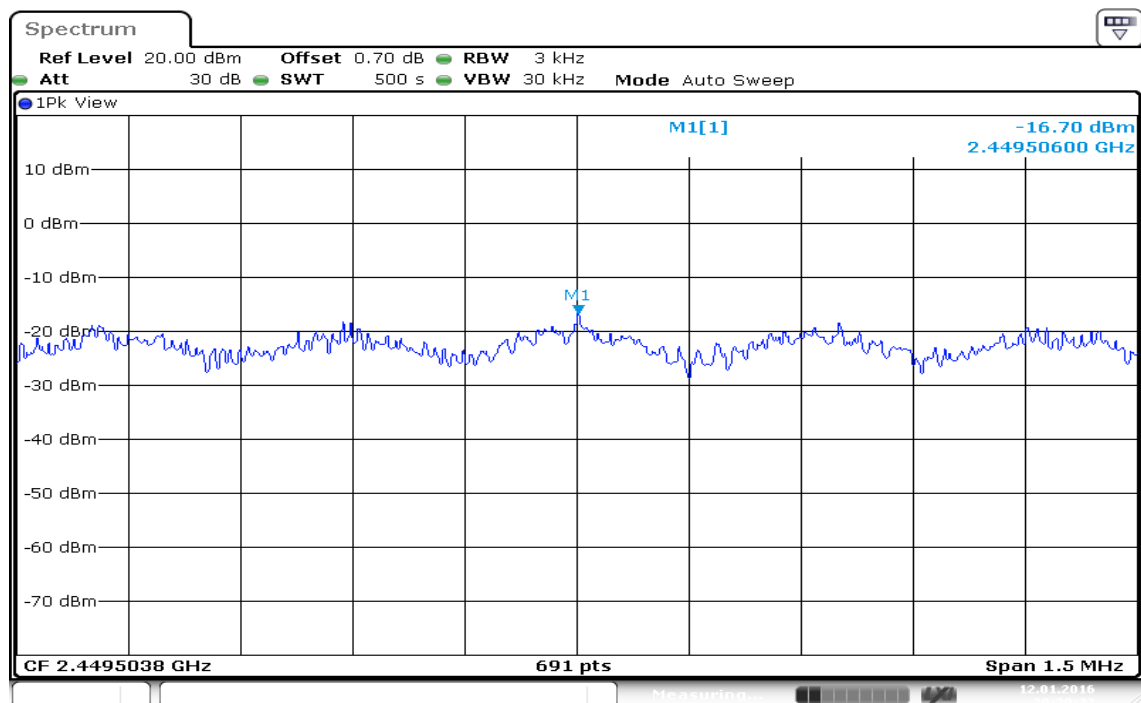
Date: 12.JAN.2016 20:26:14

IEEE 802.11n HT 40 mode / 2437MHz



Date: 12.JAN.2016 20:28:06

IEEE 802.11n HT 40 mode / 2452MHz



Date: 12.JAN.2016 20:29:32

7.6 RADIATED EMISSIONS

LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

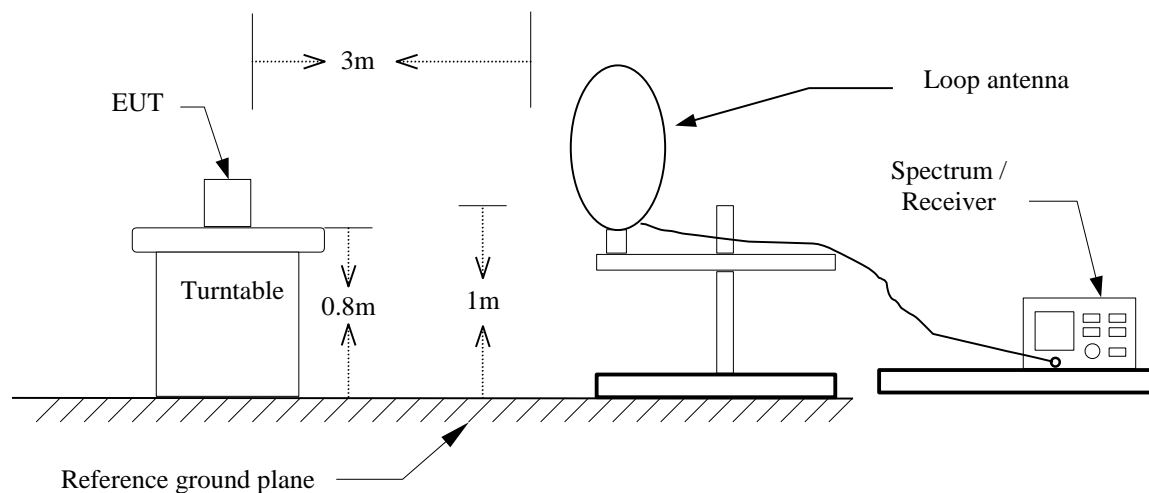
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

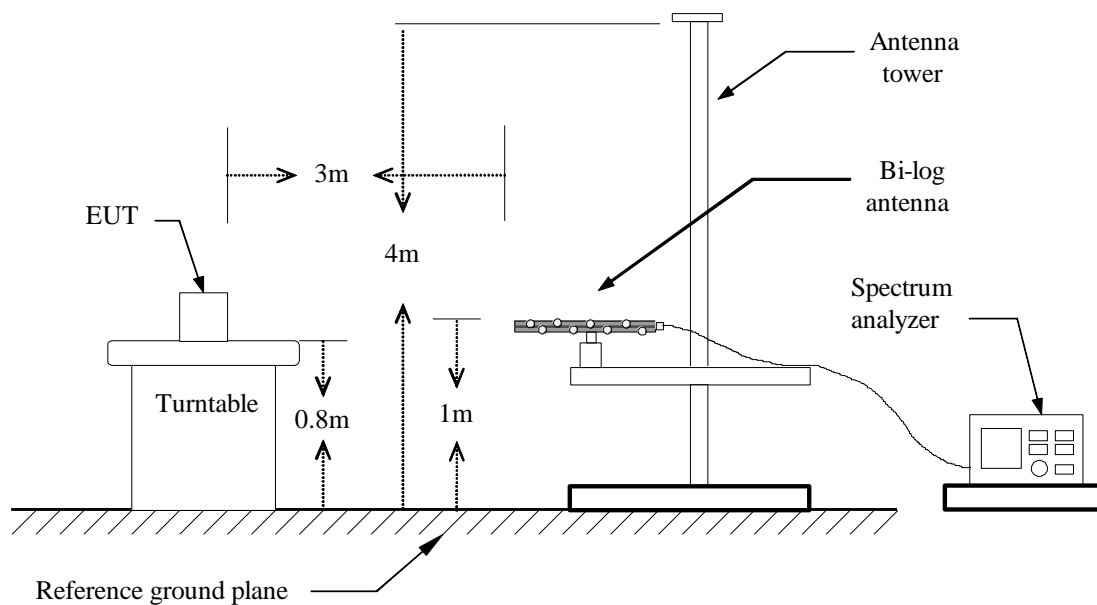
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
0.009 - 0.490	2400/F(kHz) +80	20LOG((2400/F(kHz))+80)
0.490 - 1.705	24000/F(kHz) +40	20LOG((24000/F(kHz))+40)
1.705 – 30.0	30	69.54
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

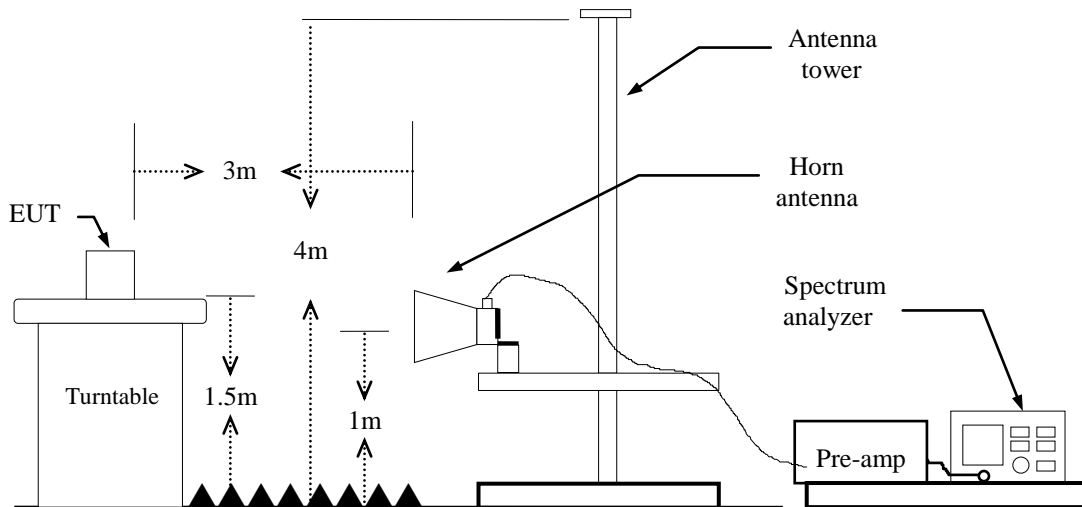
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m high and below 1 GHz is 0.8m high above ground plane
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz,
if duty cycle $\geq 98\%$, VBW=10Hz.

if duty cycle $< 98\%$ VBW=1/T.

IEEE 802.11b mode: $\geq 98\%$, VBW=10Hz

IEEE 802.11g mode: = 89%, VBW=680Hz

IEEE 802.11n HT 20 MHz mode: = 90%, VBW=750Hz

IEEE 802.11n HT 40 MHz mode: = 82%, VBW=1.5KHz

7. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

Below 1GHz

Operation Mode: Normal Link

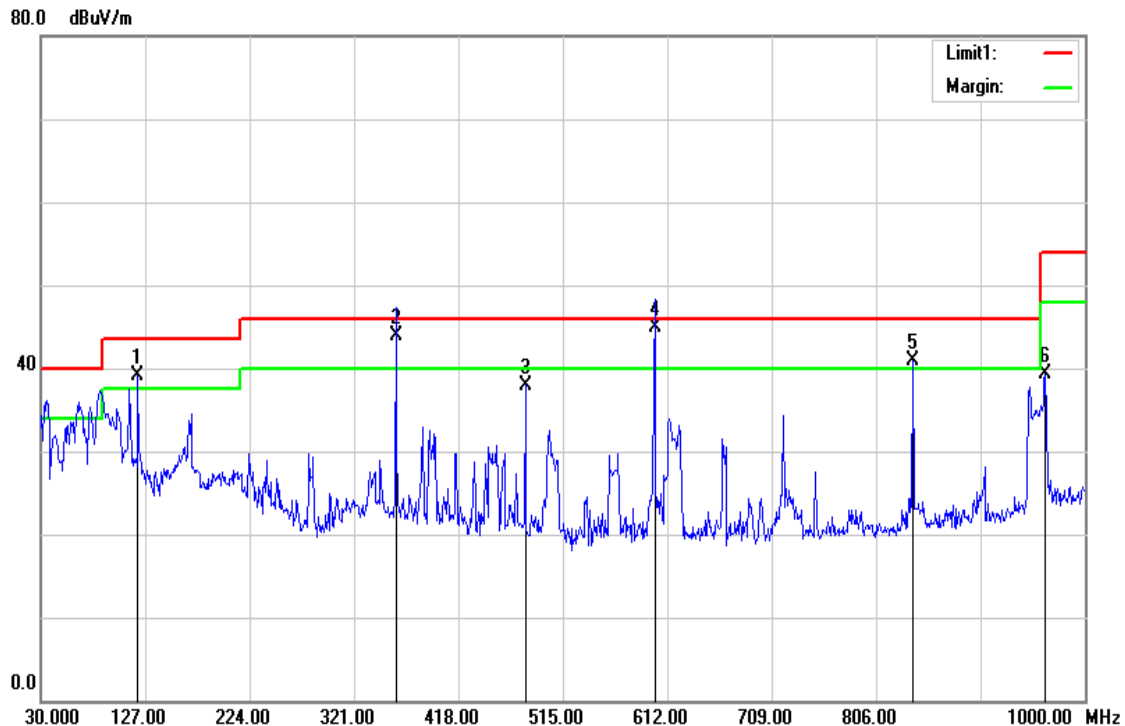
Test Date: January 13 , 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
120.2100	54.58	-15.50	39.08	43.50	-4.42	peak
359.8000	56.62	-12.66	43.96	46.00	-2.04	QP
480.0800	47.62	-9.62	38.00	46.00	-8.00	peak
600.3600	52.61	-7.75	44.86	46.00	-1.14	QP
839.9500	44.80	-3.92	40.88	46.00	-5.12	peak
963.1400	41.52	-2.18	39.34	54.00	-14.66	peak

Remark:

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. $\text{Margin (dB)} = \text{Result (dBuV/m)} - \text{Limit (dBuV/m)}$.

Operation Mode: Normal Link

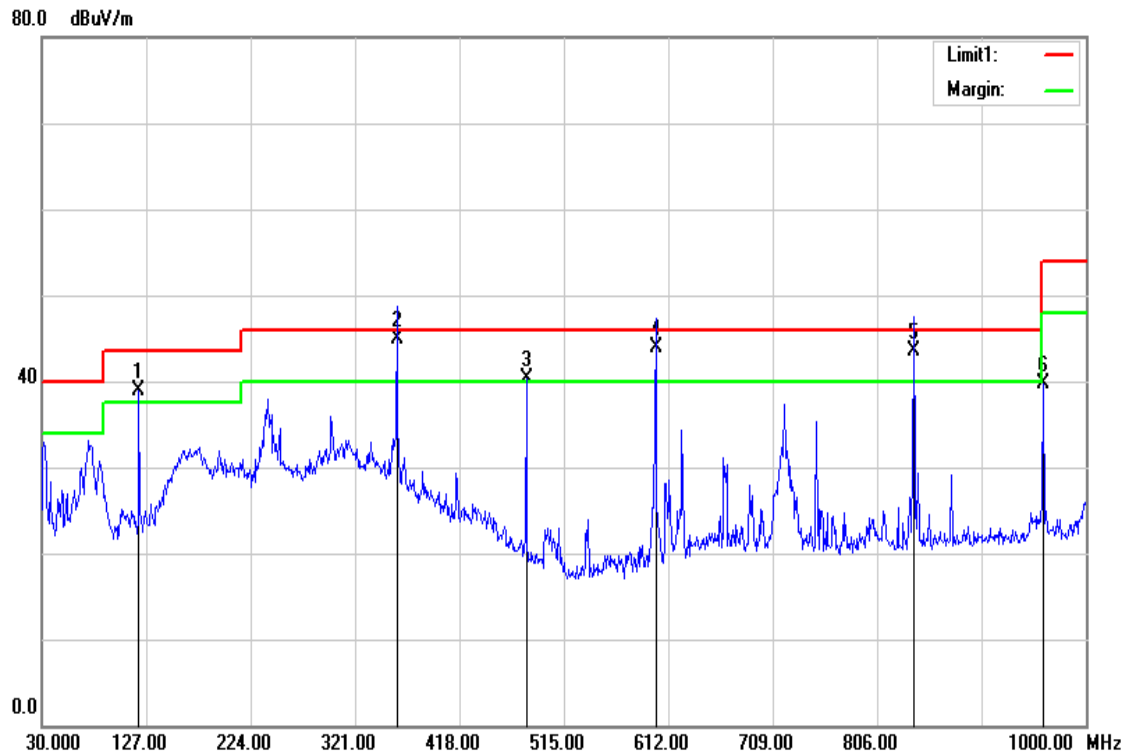
Test Date: January 13 , 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Hor.



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
120.2100	54.43	-15.50	38.93	43.50	-4.57	peak
359.8000	57.48	-12.66	44.82	46.00	-1.18	QP
480.0800	49.89	-9.62	40.27	46.00	-5.73	peak
600.3600	51.70	-7.75	43.95	46.00	-2.05	QP
839.9500	47.48	-3.92	43.56	46.00	-2.44	QP
960.2300	41.84	-2.23	39.61	54.00	-14.39	peak

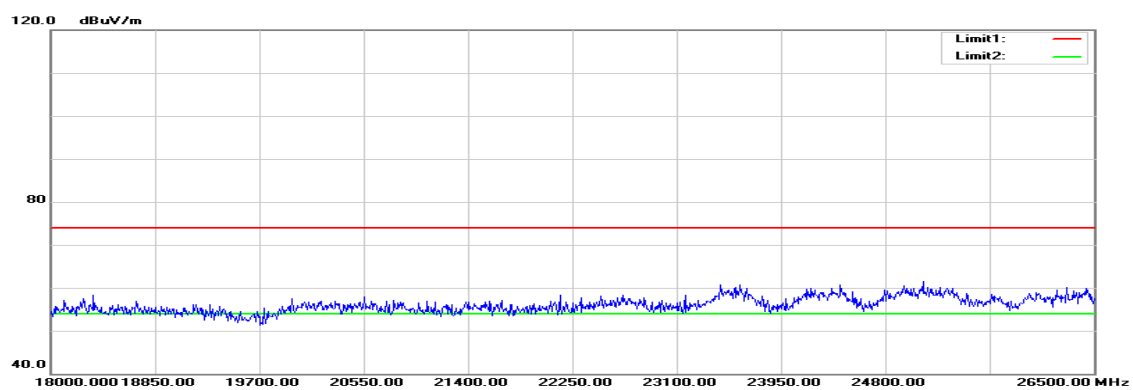
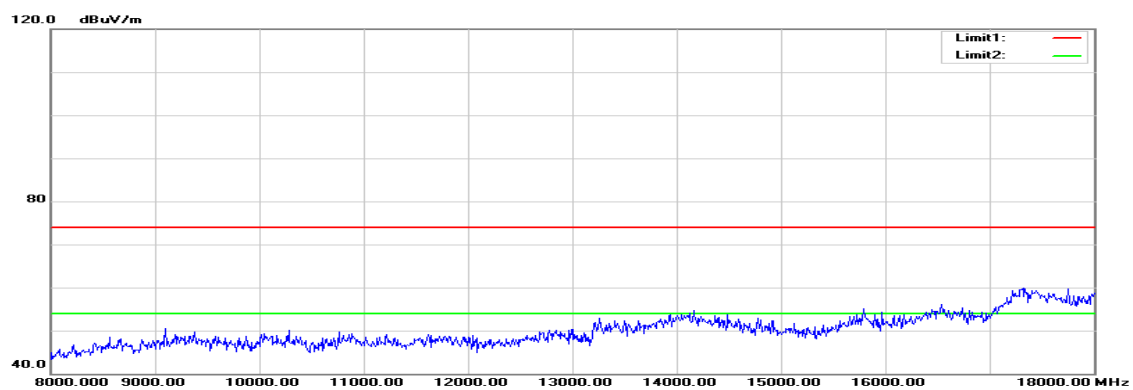
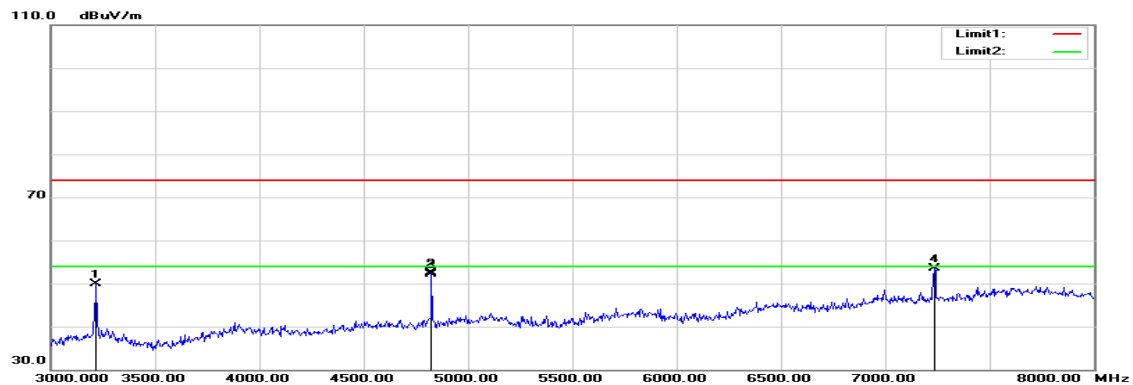
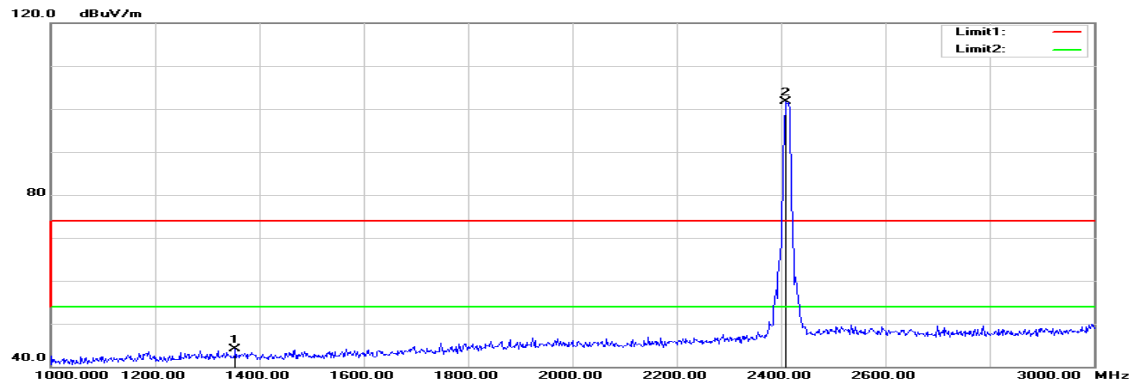
Remark:

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

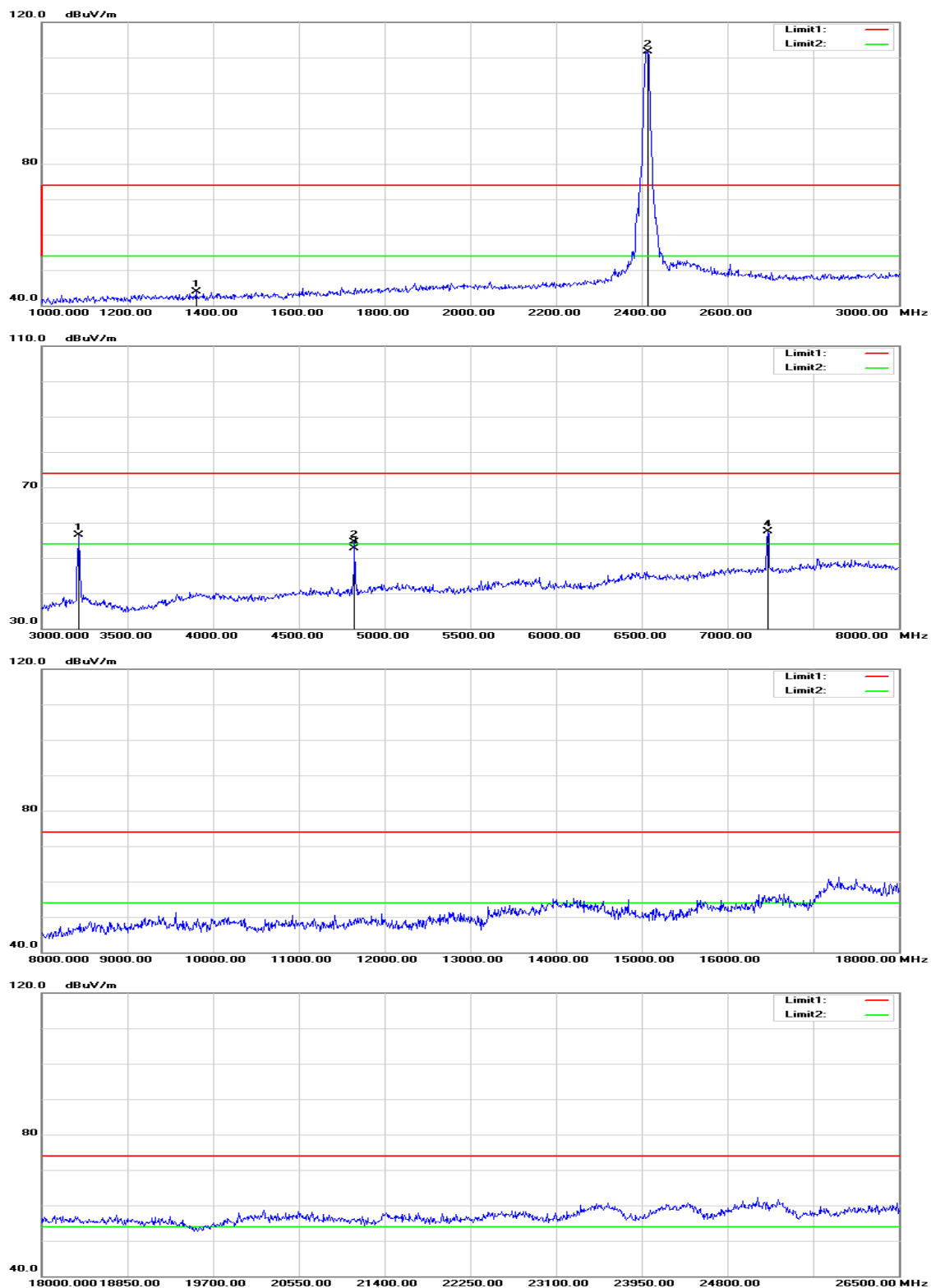
Above 1 GHz

TX / IEEE 802.11b / CH Low

Polarity: Vertical



Polarity: Horizontal



Above 1 GHz**Operation Mode:** TX / IEEE 802.11b / 2412 MHz**Test Date:** January 11, 2016**Temperature:** 27°C**Tested by:** Jason Lu**Humidity:** 53% RH**Polarity:** Ver. / Hor.

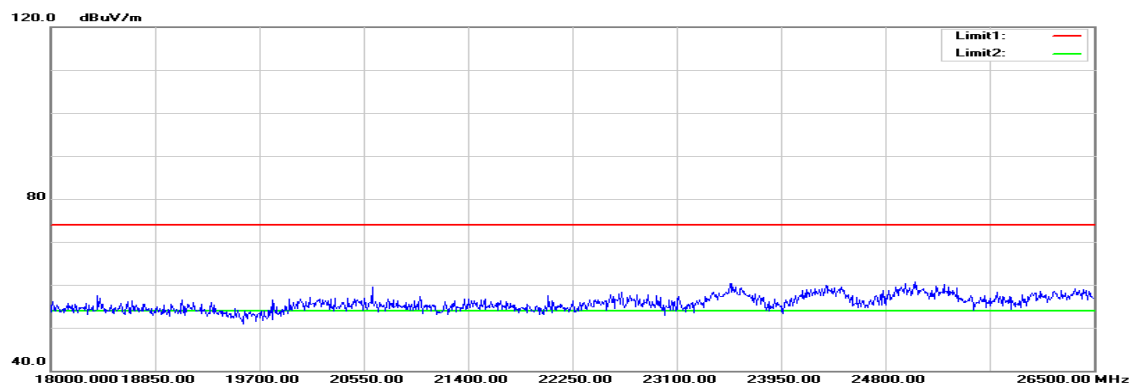
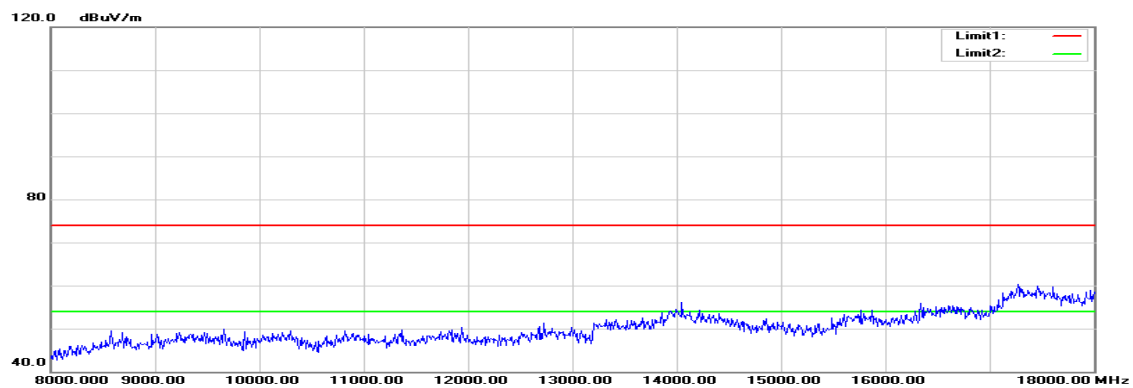
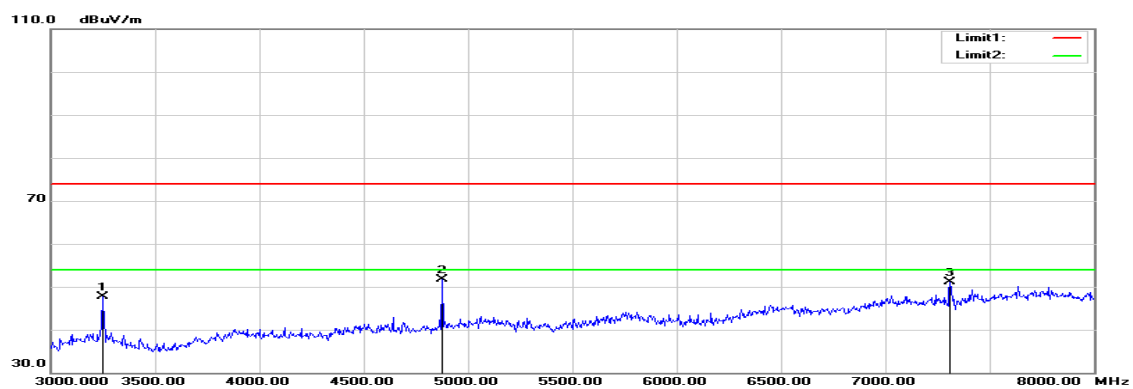
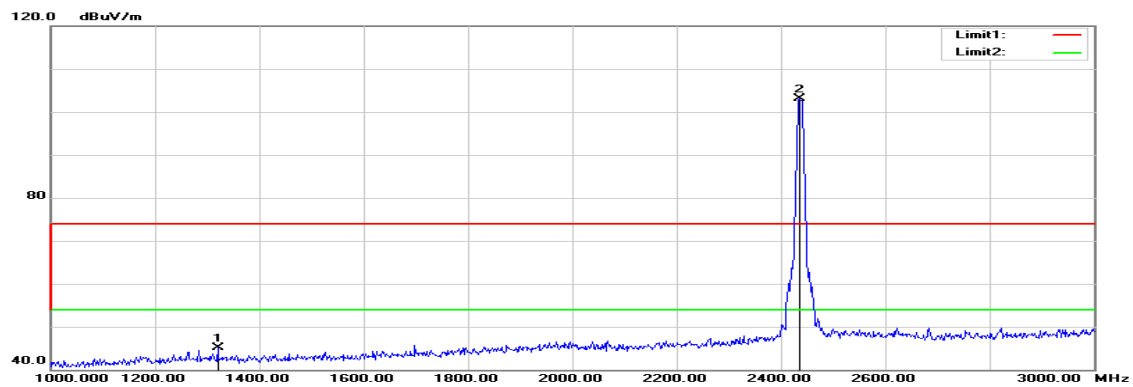
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1354.000	50.86	-6.70	44.16	74.00	-29.84	peak	V
3215.000	50.04	-0.09	49.95	74.00	-24.05	peak	V
4825.000	47.50	5.10	52.60	74.00	-21.40	peak	V
4825.000	47.07	5.10	52.17	54.00	-1.83	AVG	V
7235.000	40.84	12.71	53.55	74.00	-20.45	peak	V
N/A							
1360.000	50.49	-6.68	43.81	74.00	-30.19	peak	H
3215.000	56.55	-0.09	56.46	74.00	-17.54	peak	H
4825.000	49.37	5.10	54.47	74.00	-19.53	peak	H
4825.000	47.65	5.10	52.75	54.00	-1.25	AVG	H
7235.000	44.70	12.71	57.41	74.00	-16.59	peak	H
N/A							

Remark:

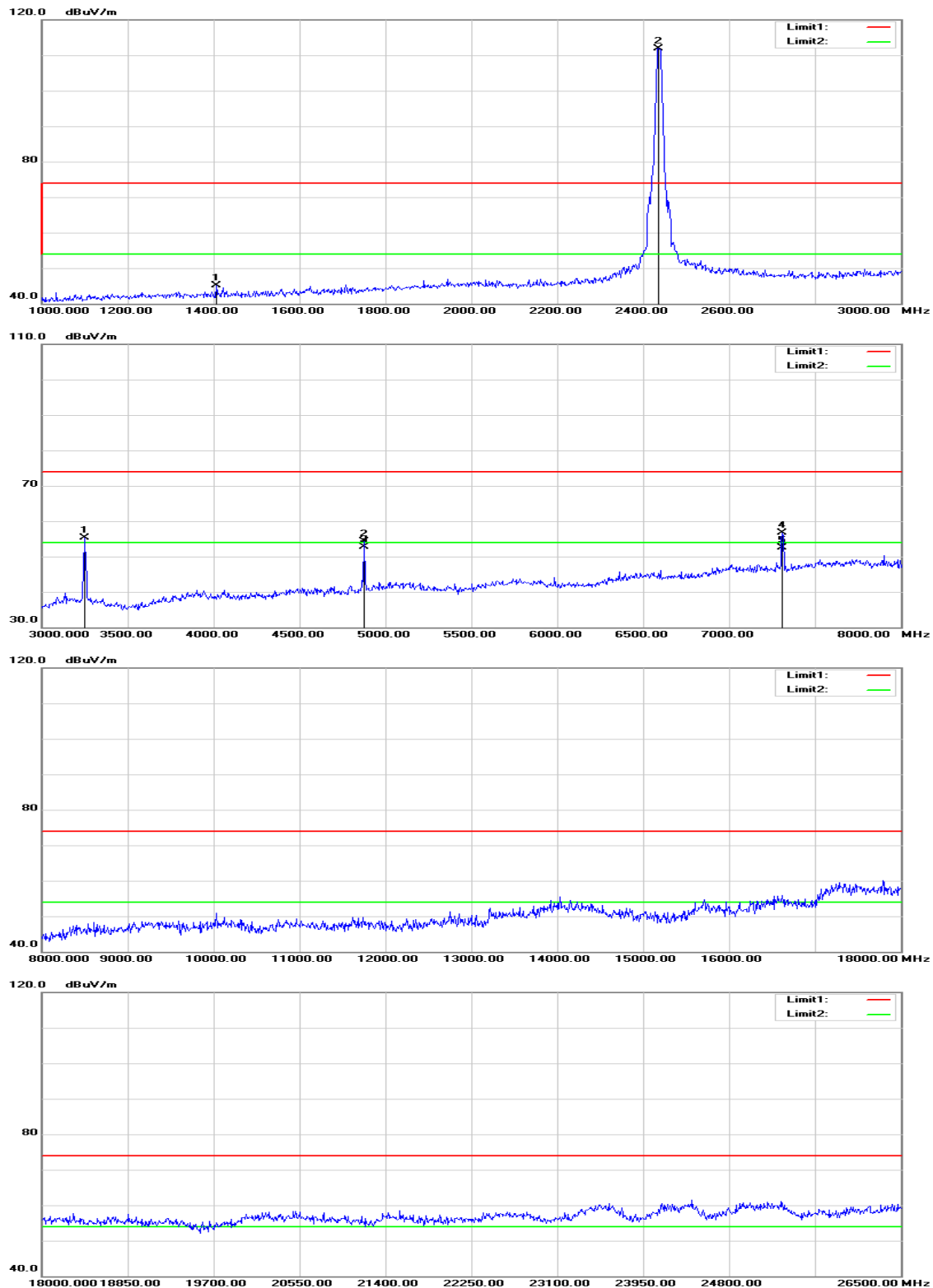
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

TX / IEEE 802.11b / CH Mid

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11b / 2437 MHz

Test Date: January 11, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

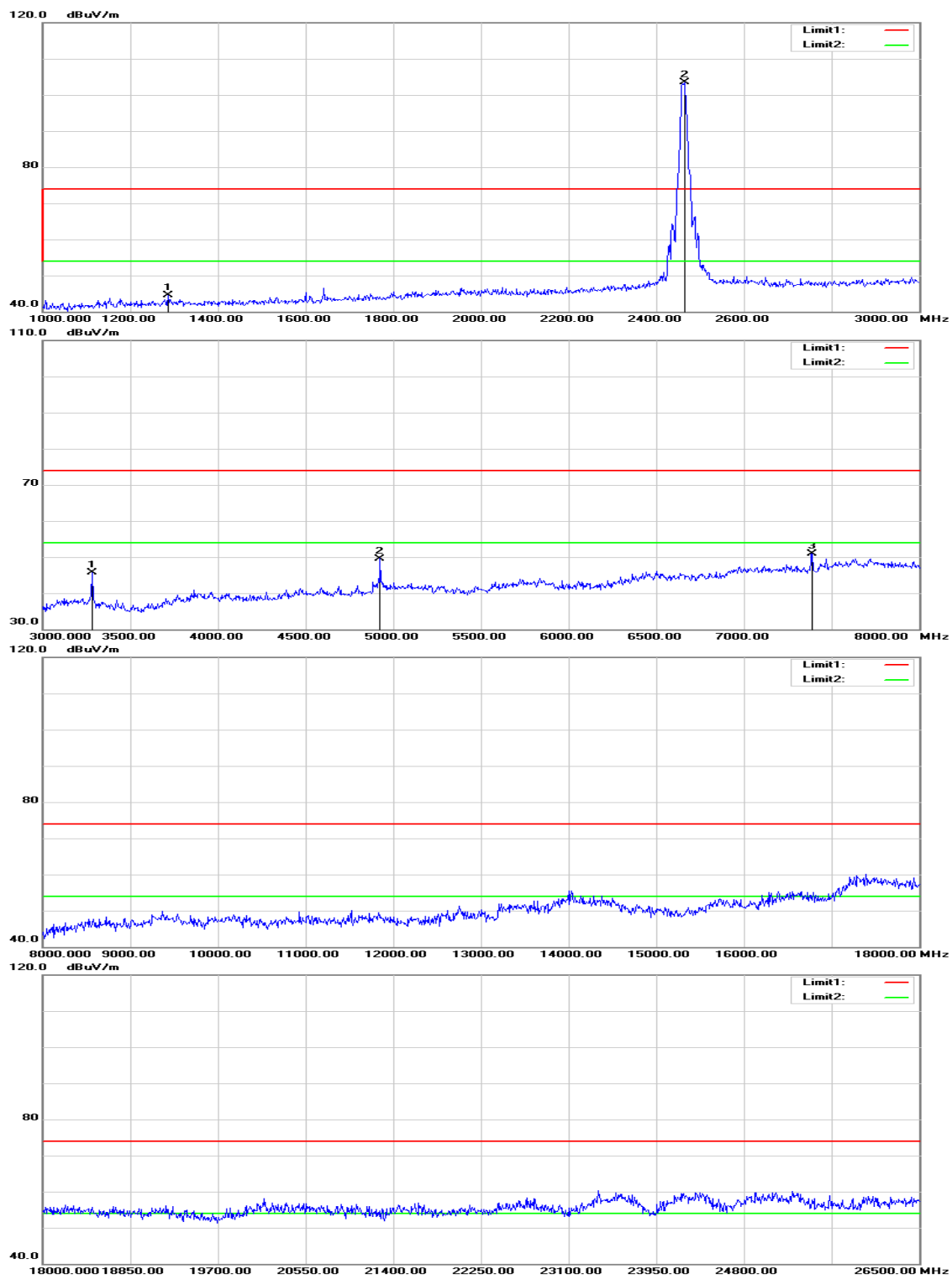
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1320.000	51.83	-6.82	45.01	74.00	-28.99	peak	V
3250.000	47.67	-0.01	47.66	74.00	-26.34	peak	V
4875.000	46.46	5.24	51.70	74.00	-22.30	peak	V
7310.000	38.10	12.94	51.04	74.00	-22.96	peak	V
N/A							
1406.000	51.66	-6.52	45.14	74.00	-28.86	peak	H
3250.000	55.39	-0.01	55.38	74.00	-18.62	peak	H
4875.000	49.07	5.24	54.31	74.00	-19.69	peak	H
4875.000	47.49	5.24	52.73	54.00	-1.27	AVG	H
7310.000	43.69	12.94	56.63	74.00	-17.37	peak	H
7310.000	39.48	12.94	52.42	54.00	-1.58	AVG	H

Remark:

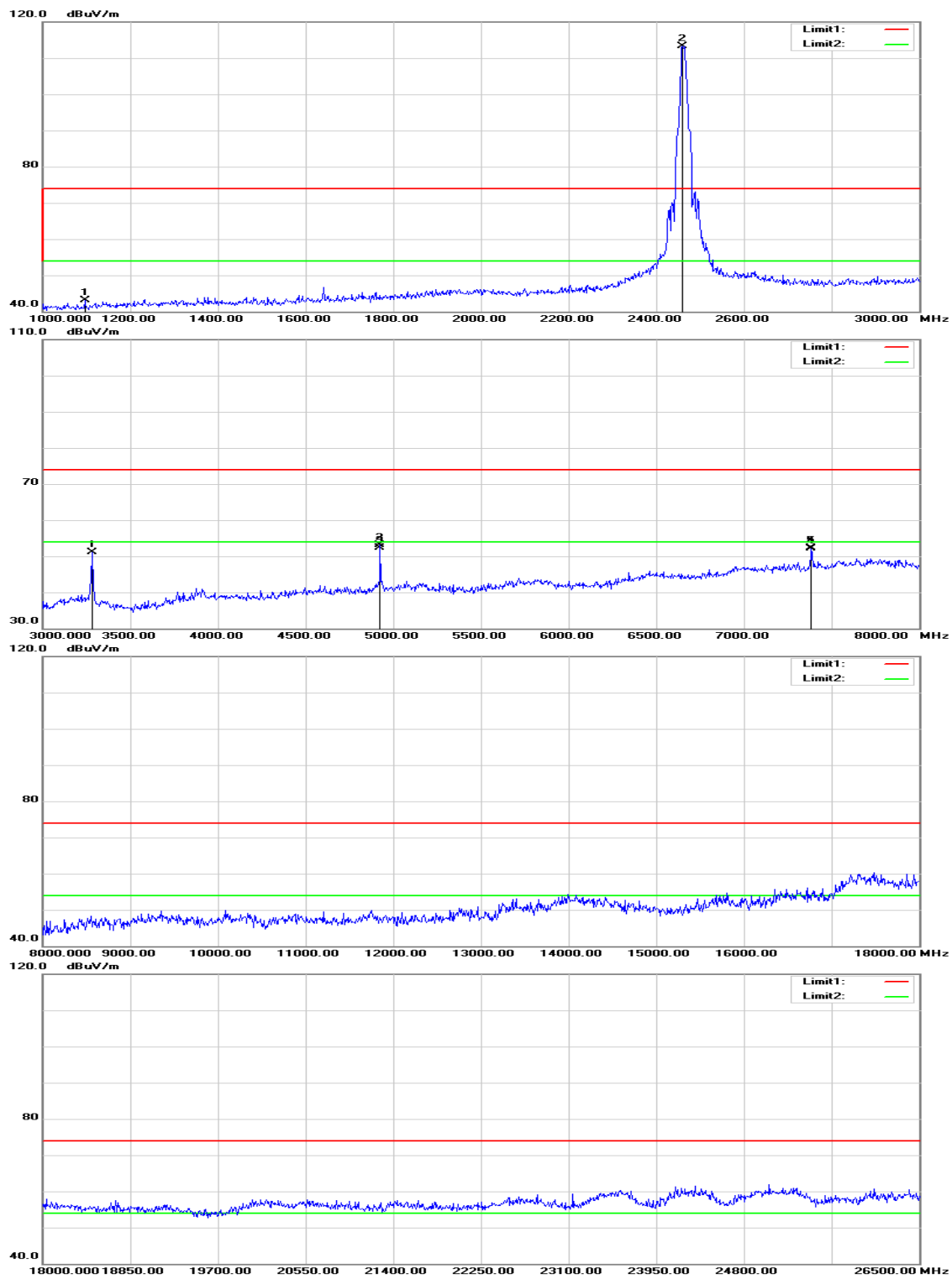
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

TX / IEEE 802.11b / CH High

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11b / 2462 MHz

Test Date: January 11, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

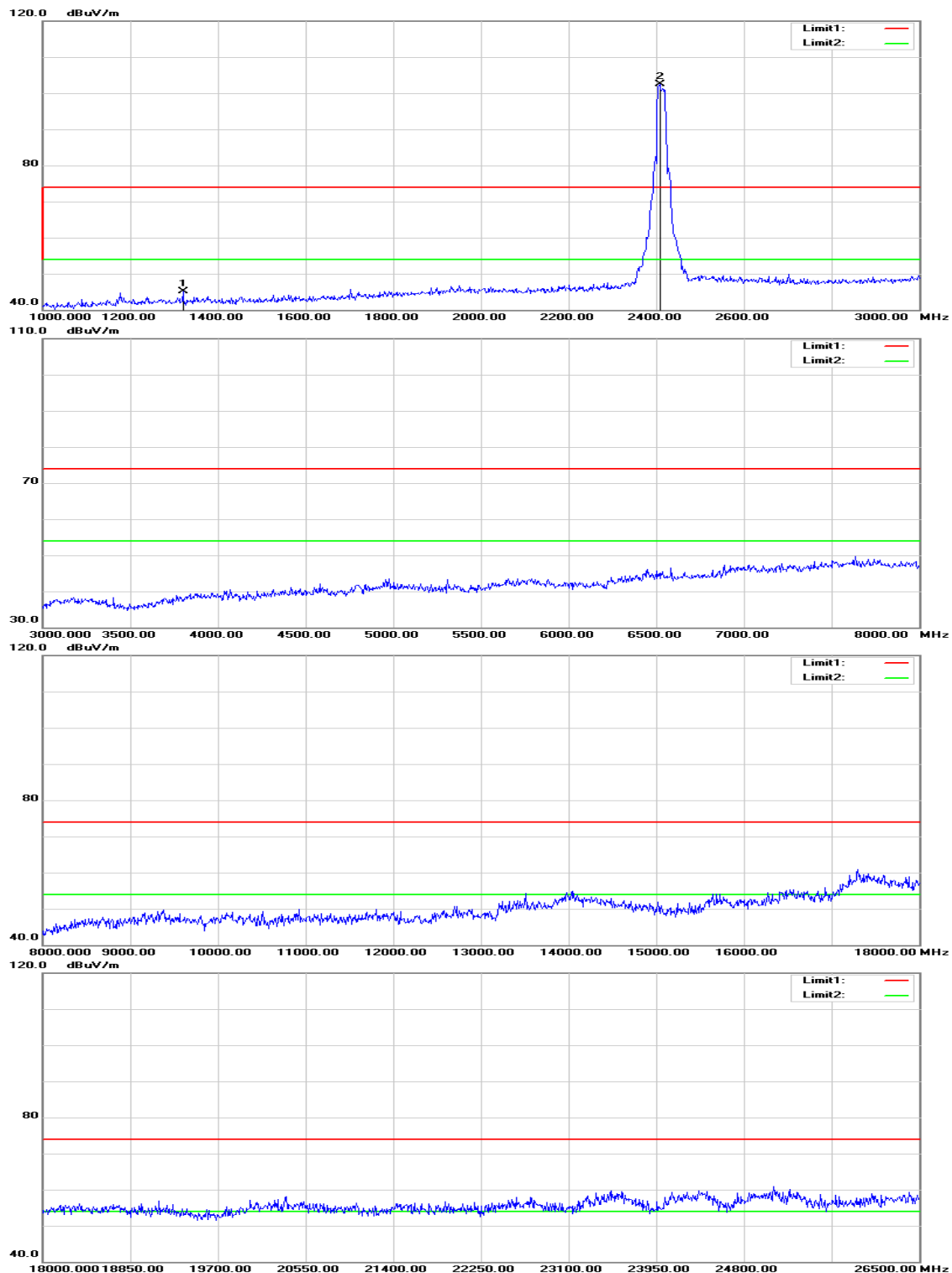
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1286.000	51.38	-6.94	44.44	74.00	-29.56	peak	V
3285.000	45.65	0.07	45.72	74.00	-28.28	peak	V
4925.000	44.23	5.37	49.60	74.00	-24.40	peak	V
7390.000	37.74	13.18	50.92	74.00	-23.08	peak	V
N/A							
1096.000	50.76	-7.60	43.16	74.00	-30.84	peak	H
3285.000	51.05	0.07	51.12	74.00	-22.88	peak	H
4925.000	47.78	5.37	53.15	74.00	-20.85	peak	H
4925.000	46.86	5.37	52.23	54.00	-1.77	AVG	H
7385.000	38.99	13.16	52.15	74.00	-21.85	peak	H
7385.000	39.06	13.16	52.22	54.00	-1.78	AVG	H

Remark:

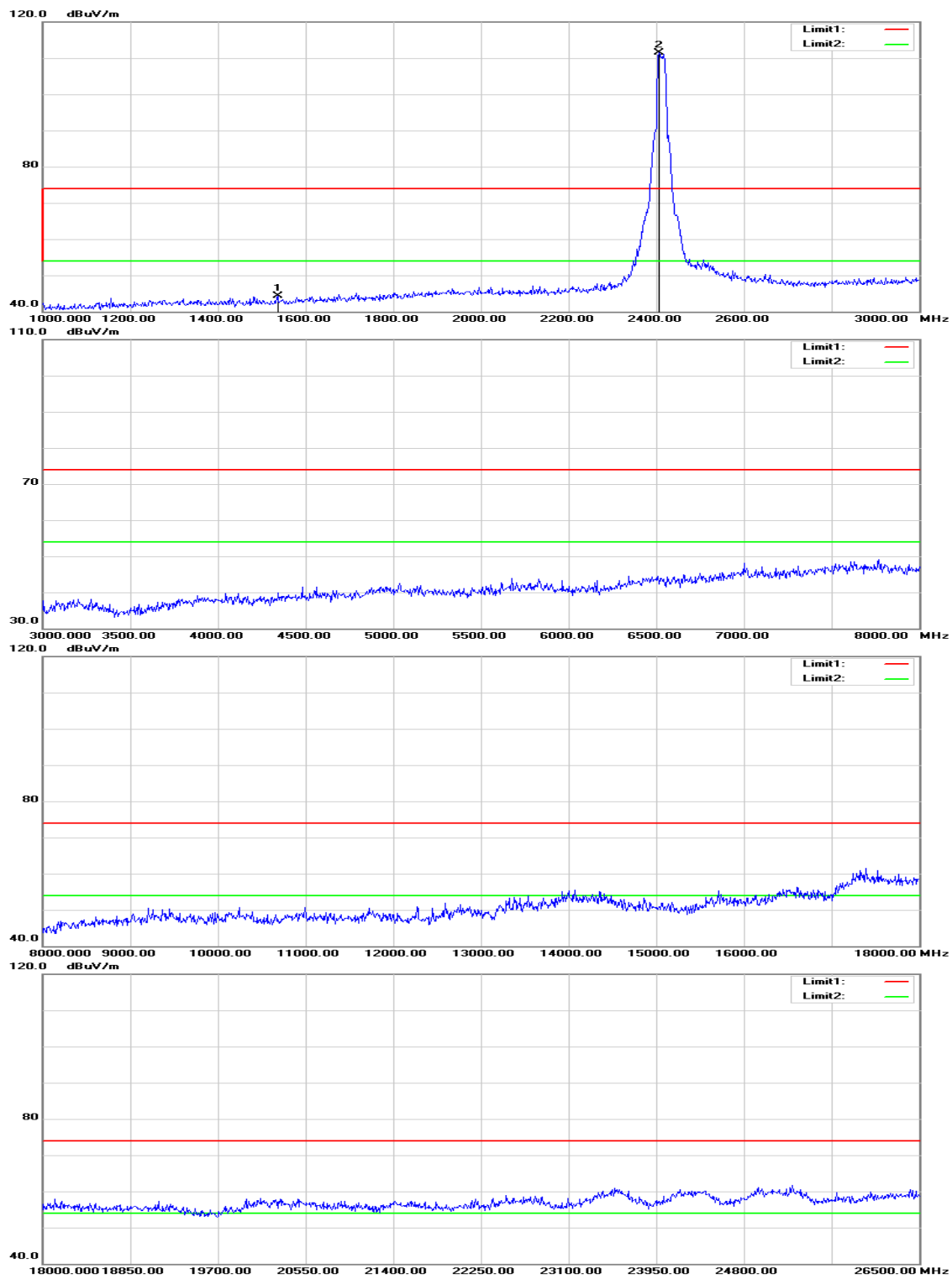
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

TX / IEEE 802.11g / CH Low

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11g / 2412 MHz

Test Date: January 11, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

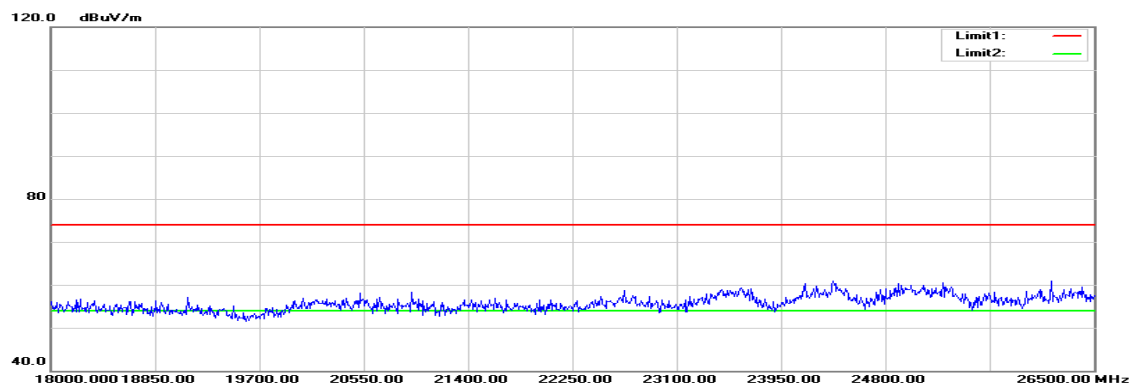
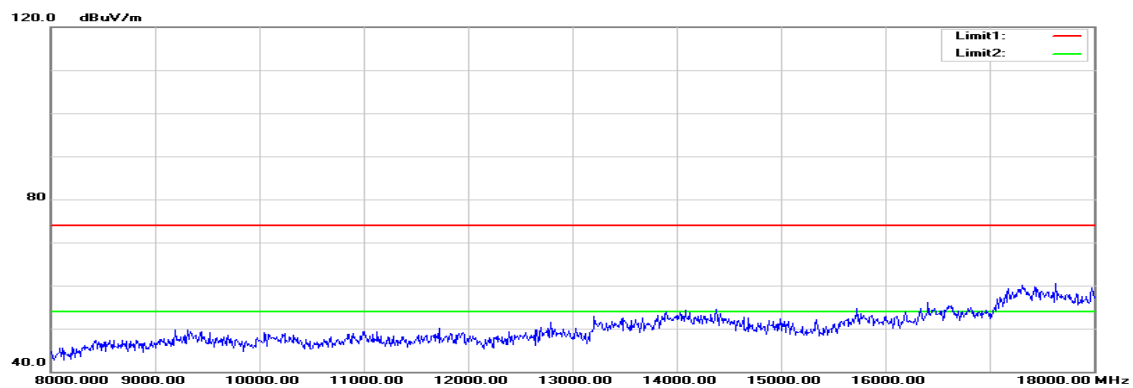
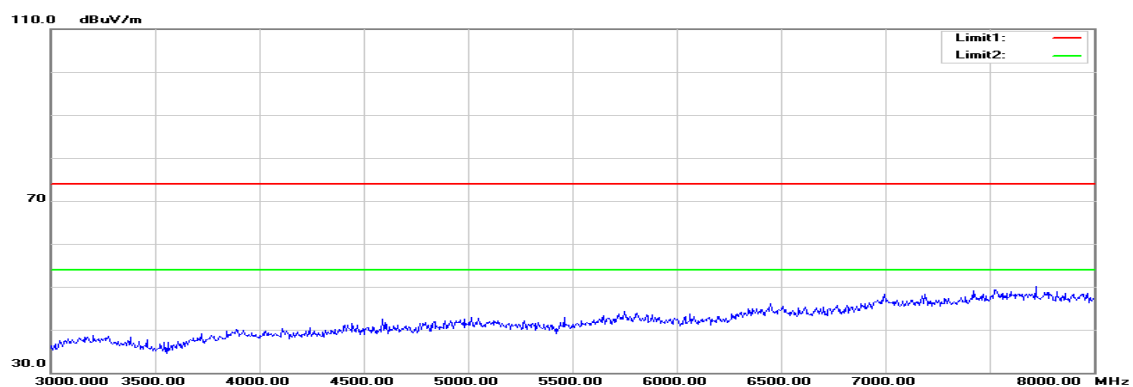
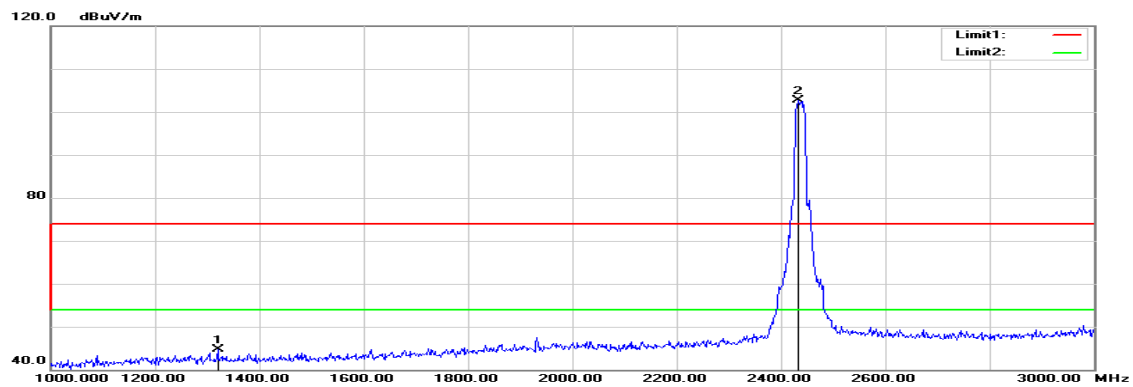
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1320.000	51.84	-6.82	45.02	74.00	-28.98	peak	V
N/A							
1536.000	50.30	-6.00	44.30	74.00	-29.70	peak	H
N/A							

Remark:

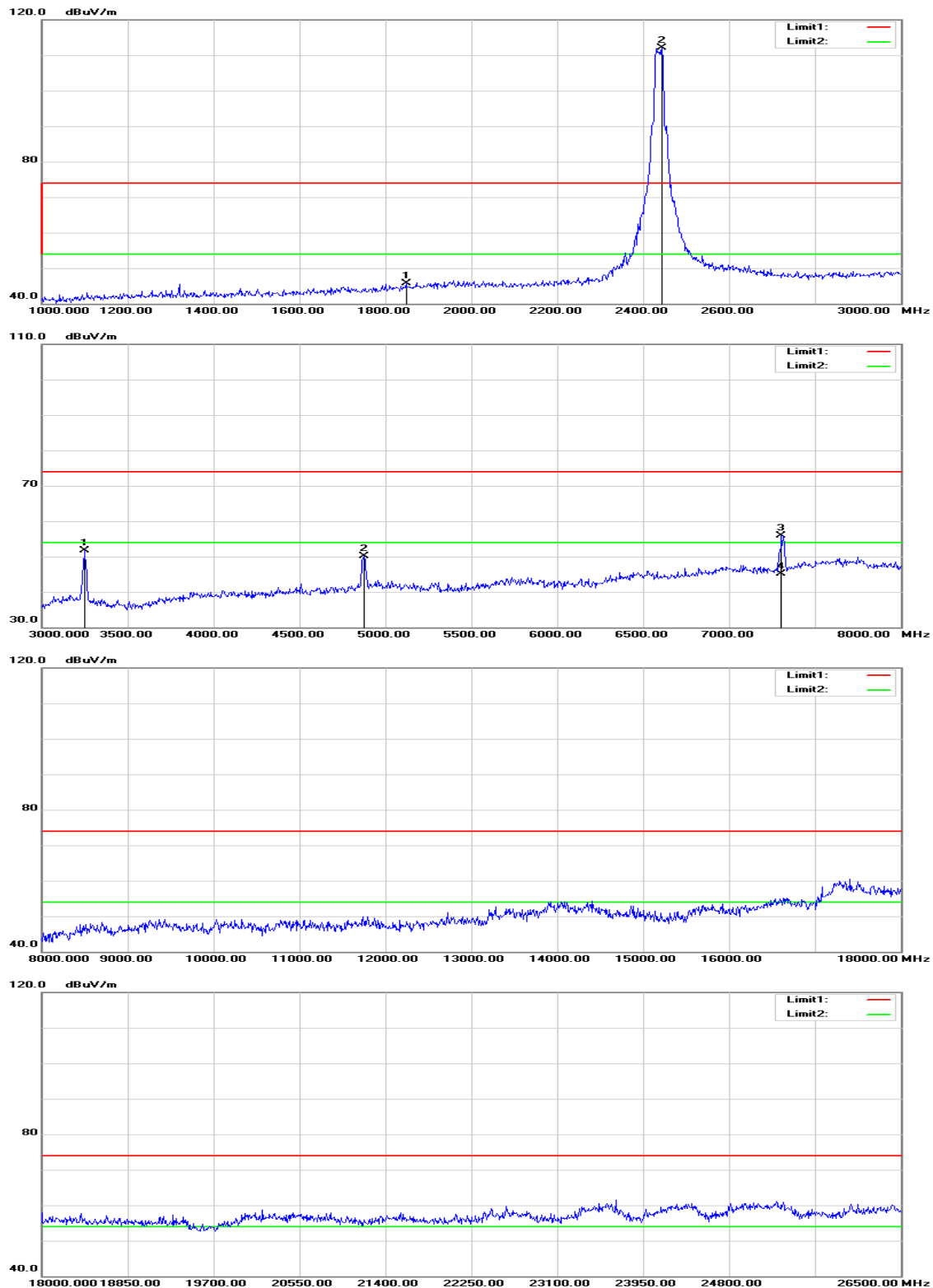
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

TX / IEEE 802.11g / CH Mid

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11g / 2437 MHz

Test Date: January 11, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

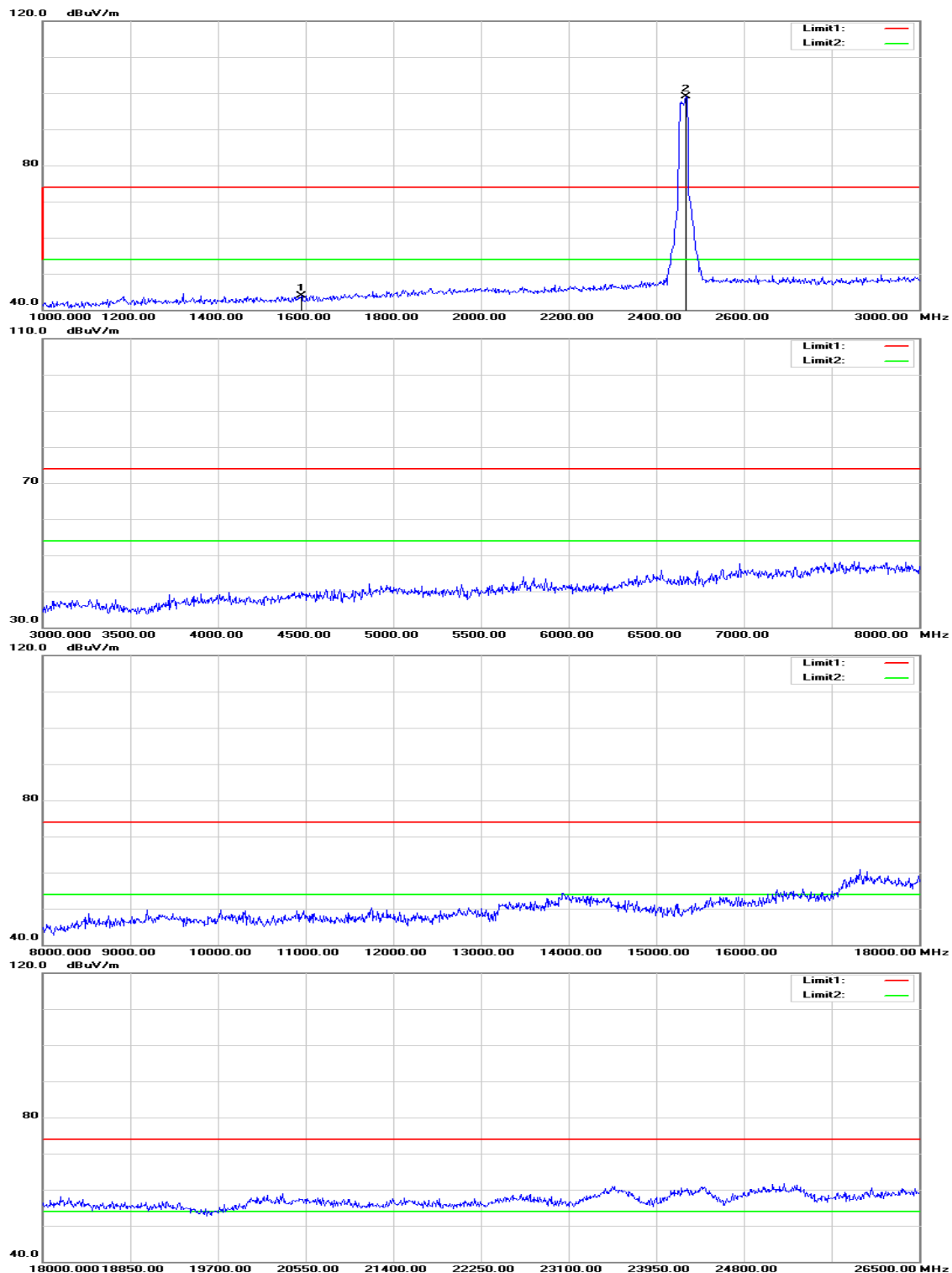
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1320.000	51.54	-6.82	44.72	74.00	-29.28	peak	V
N/A							
1848.000	50.19	-4.39	45.80	74.00	-28.20	peak	H
3250.000	51.79	-0.01	51.78	74.00	-22.22	peak	H
4875.000	44.92	5.24	50.16	74.00	-23.84	peak	H
7305.000	43.00	12.92	55.92	74.00	-18.08	peak	H
7305.000	32.22	12.92	45.14	54.00	-8.86	AVG	H
N/A							

Remark:

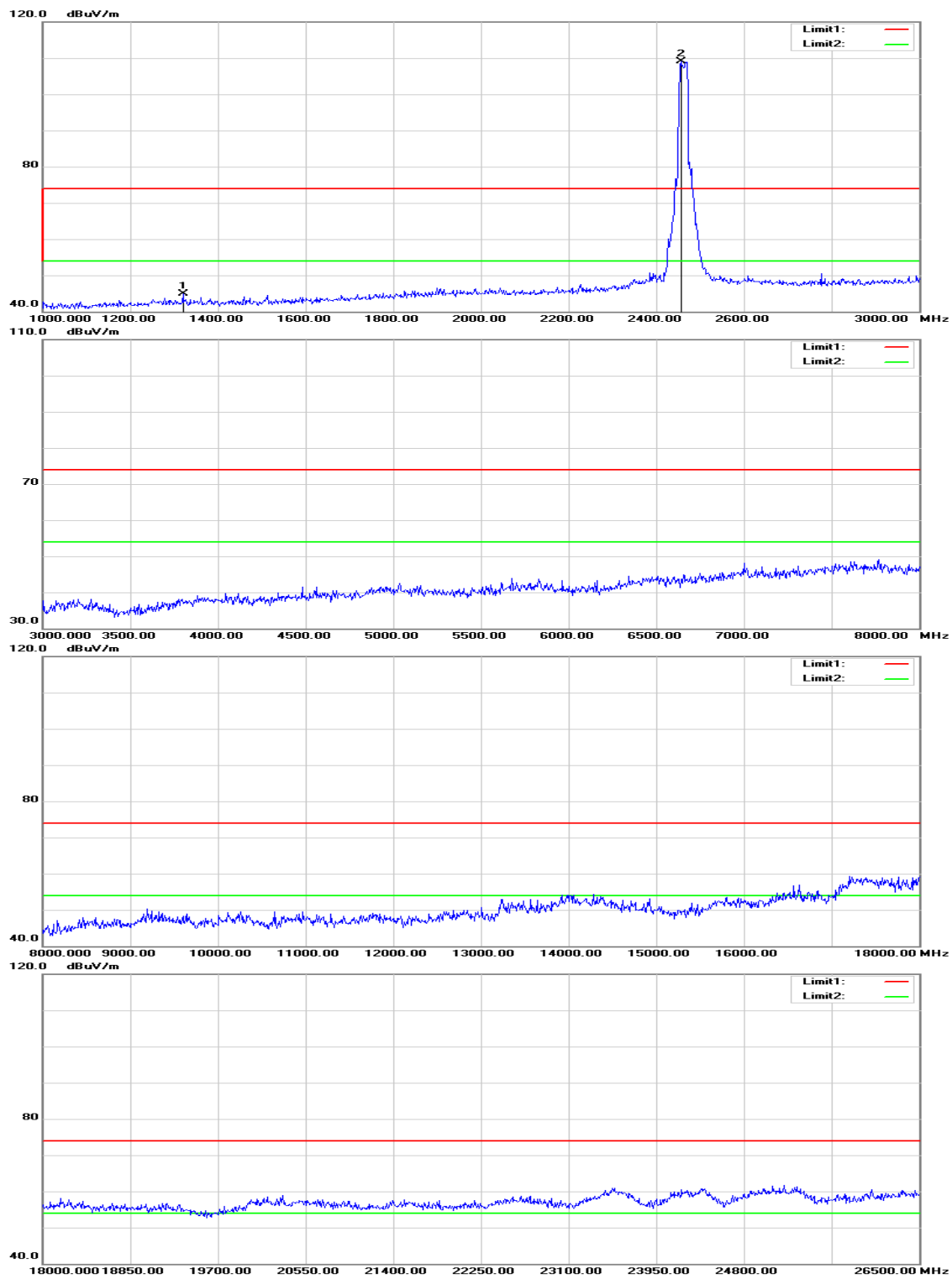
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

TX / IEEE 802.11g / CH High

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11g / 2462 MHz

Test Date: January 11, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

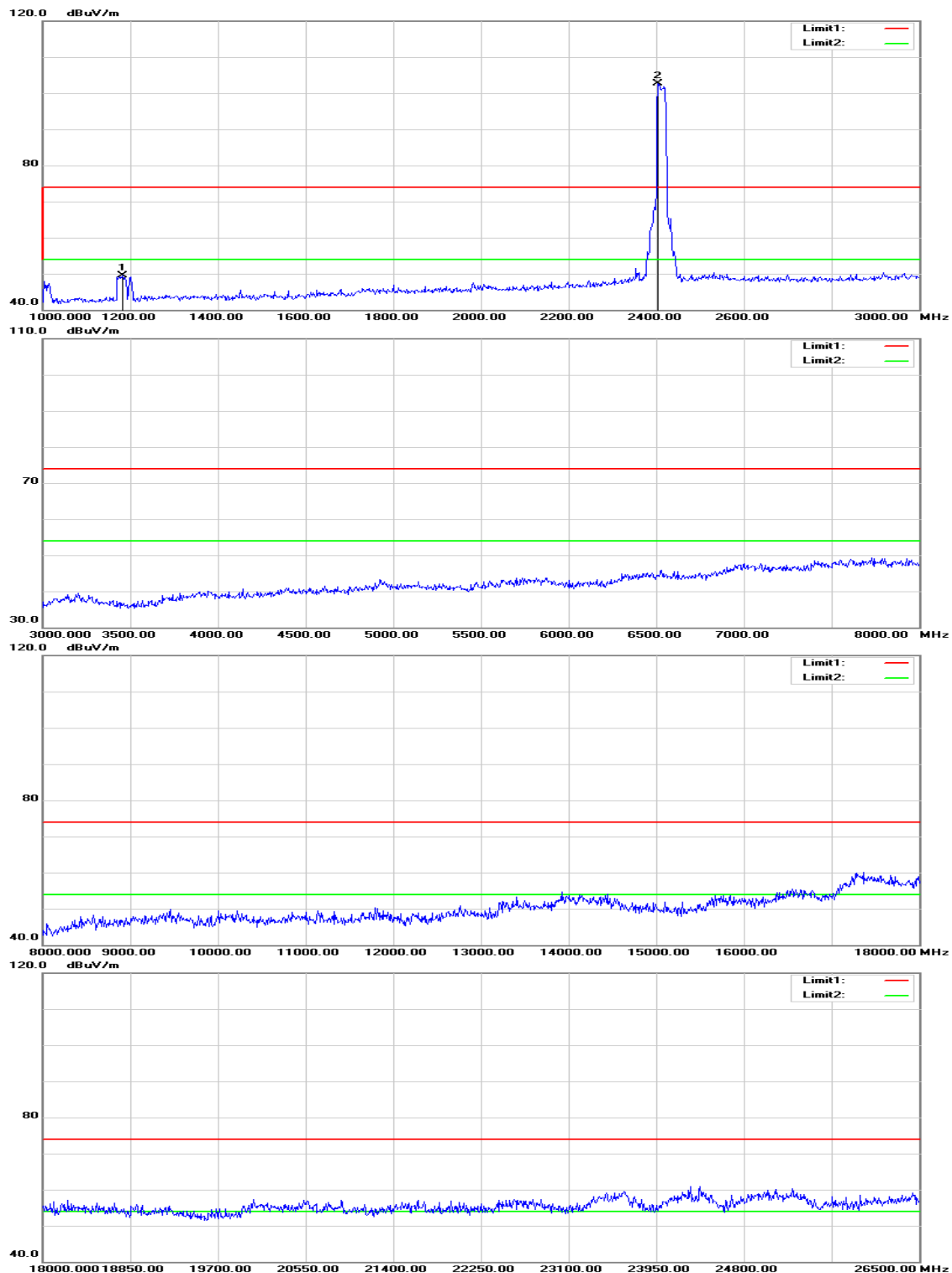
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1590.000	49.60	-5.72	43.88	74.00	-30.12	peak	V
N/A							
1320.000	51.67	-6.82	44.85	74.00	-29.15	peak	H
N/A							

Remark:

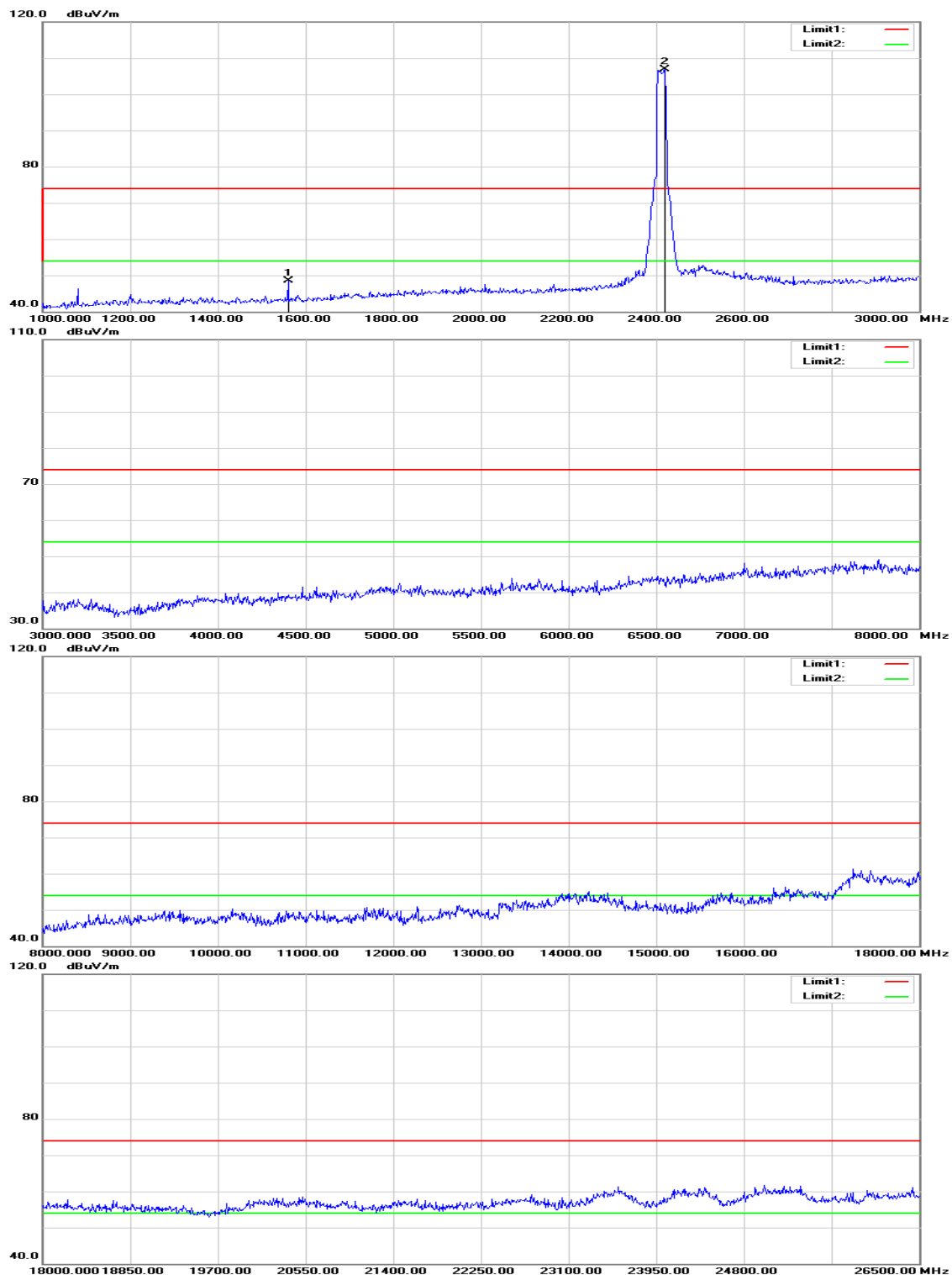
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

TX / IEEE 802.11n HT 20 MHz mode / CH Low

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 20 MHz mode /
2412 MHz

Test Date: January 12, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

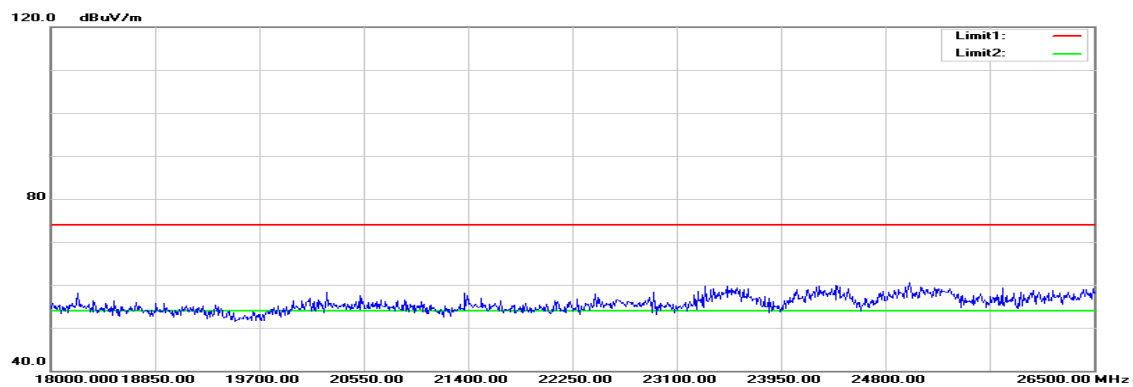
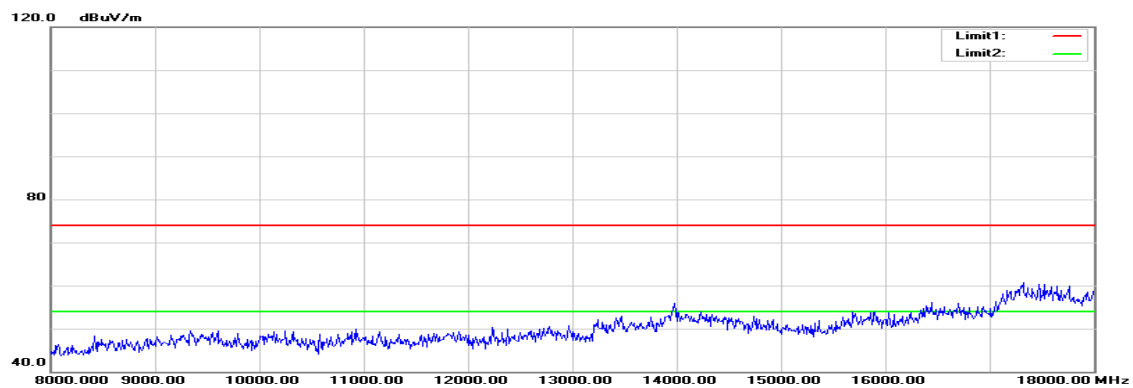
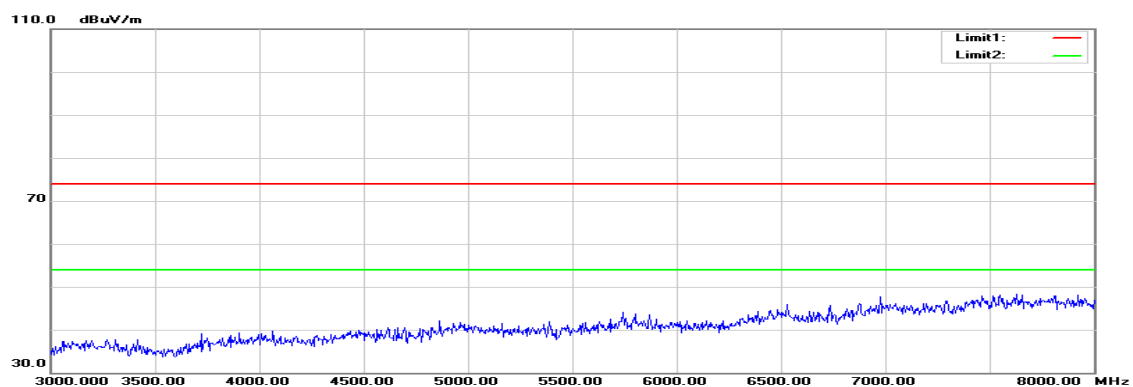
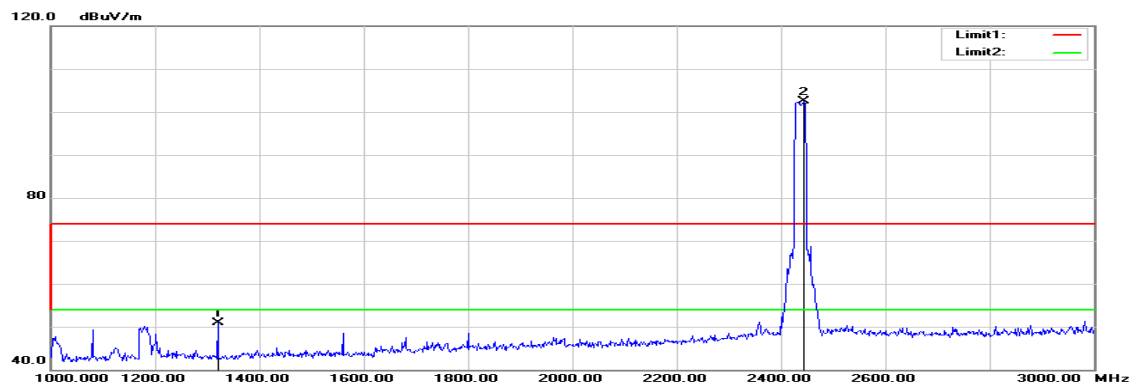
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1182.000	56.87	-7.30	49.57	74.00	-24.43	peak	V
N/A							
1560.000	54.38	-5.88	48.50	74.00	-25.50	peak	H
N/A							

Remark:

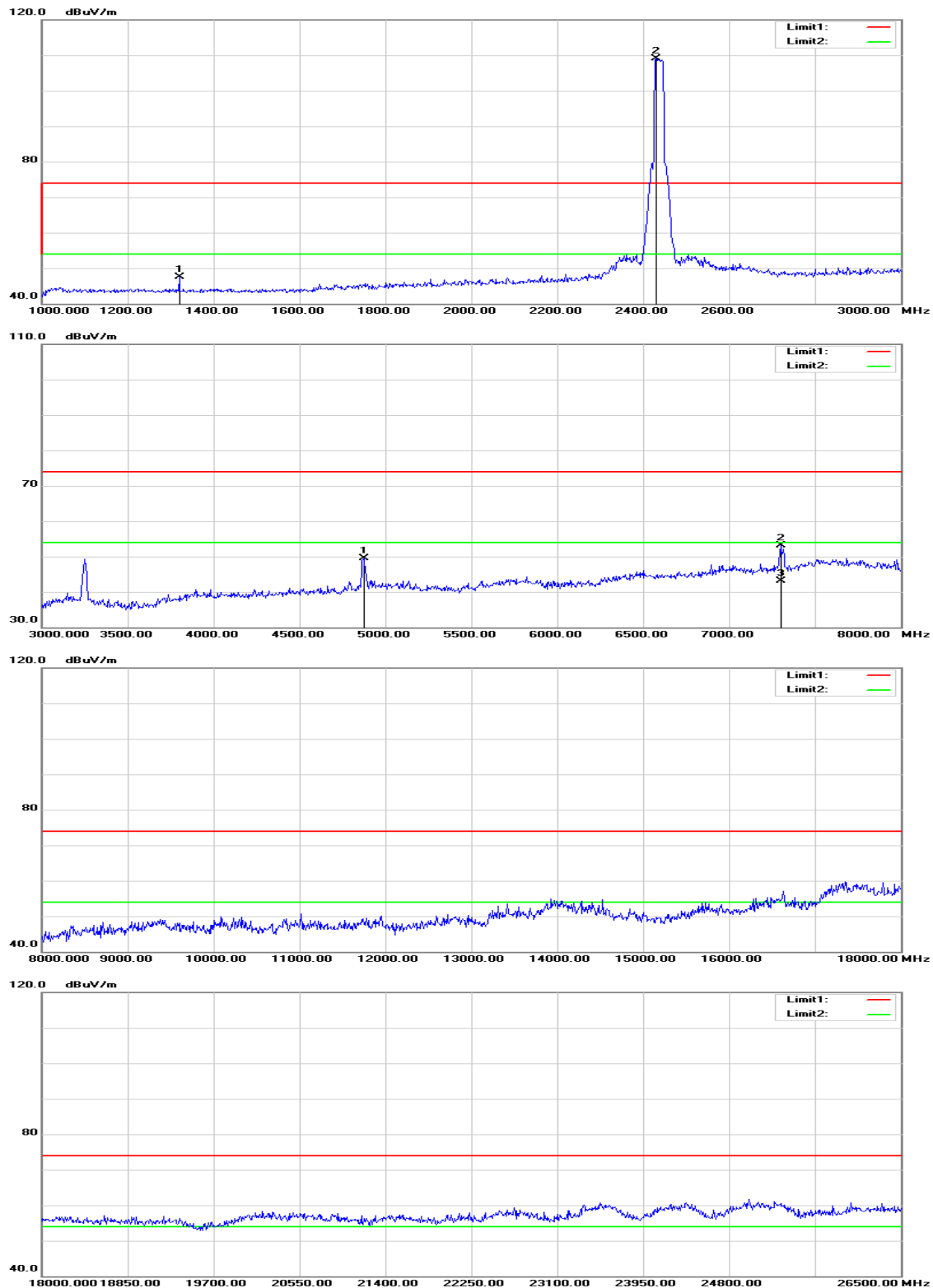
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

TX / IEEE 802.11n HT 20 MHz mode / CH Mid

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 20 MHz mode /
2437 MHz

Test Date: January 12, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

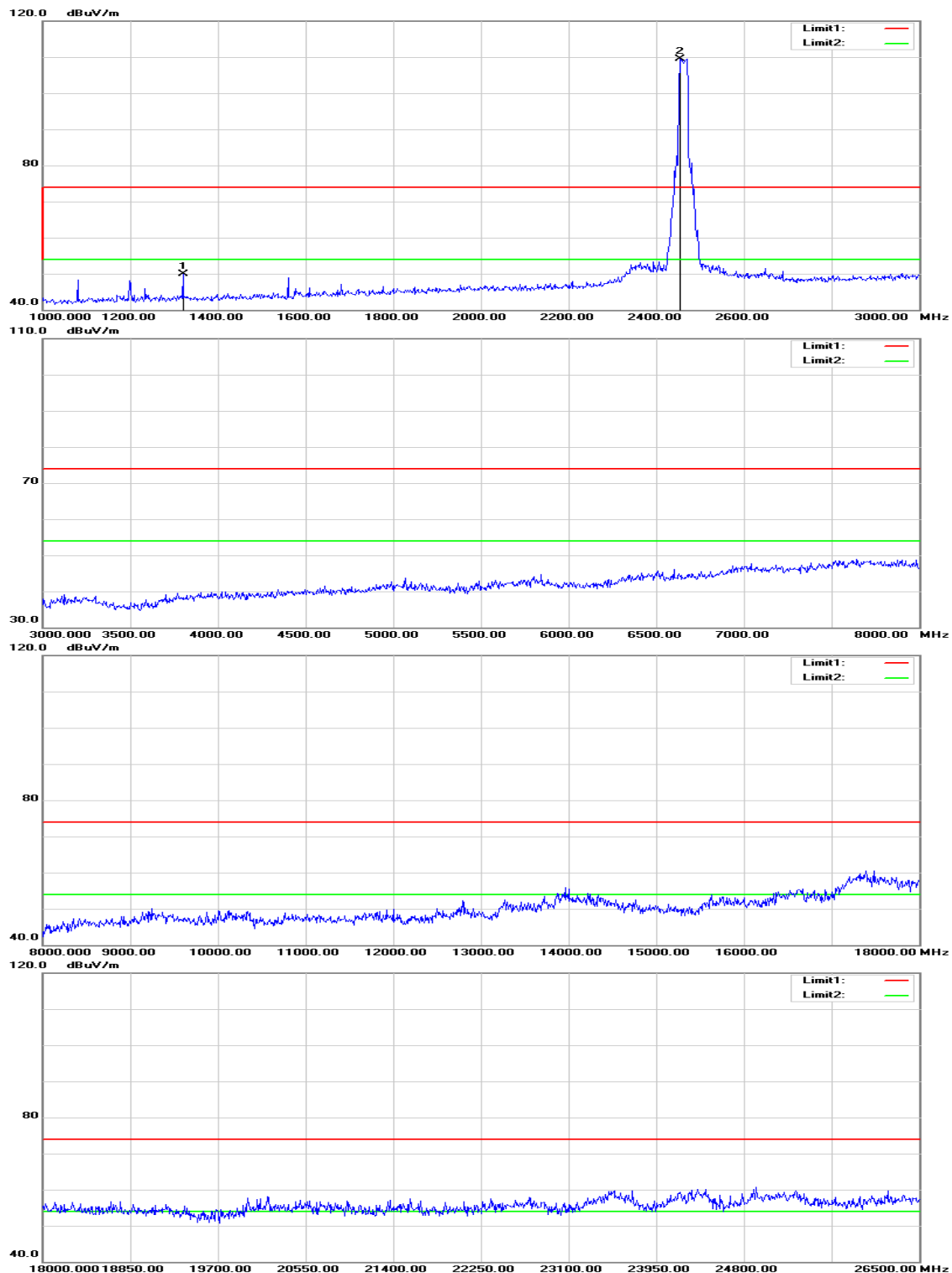
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1320.000	57.64	-6.82	50.82	74.00	-23.18	peak	V
N/A							
1320.000	54.25	-6.82	47.43	74.00	-26.57	peak	H
4875.000	44.23	5.24	49.47	74.00	-24.53	peak	H
7300.000	40.25	12.91	53.16	74.00	-20.84	peak	H
7300.000	30.13	12.91	43.04	54.00	-10.96	AVG	H
N/A							

Remark:

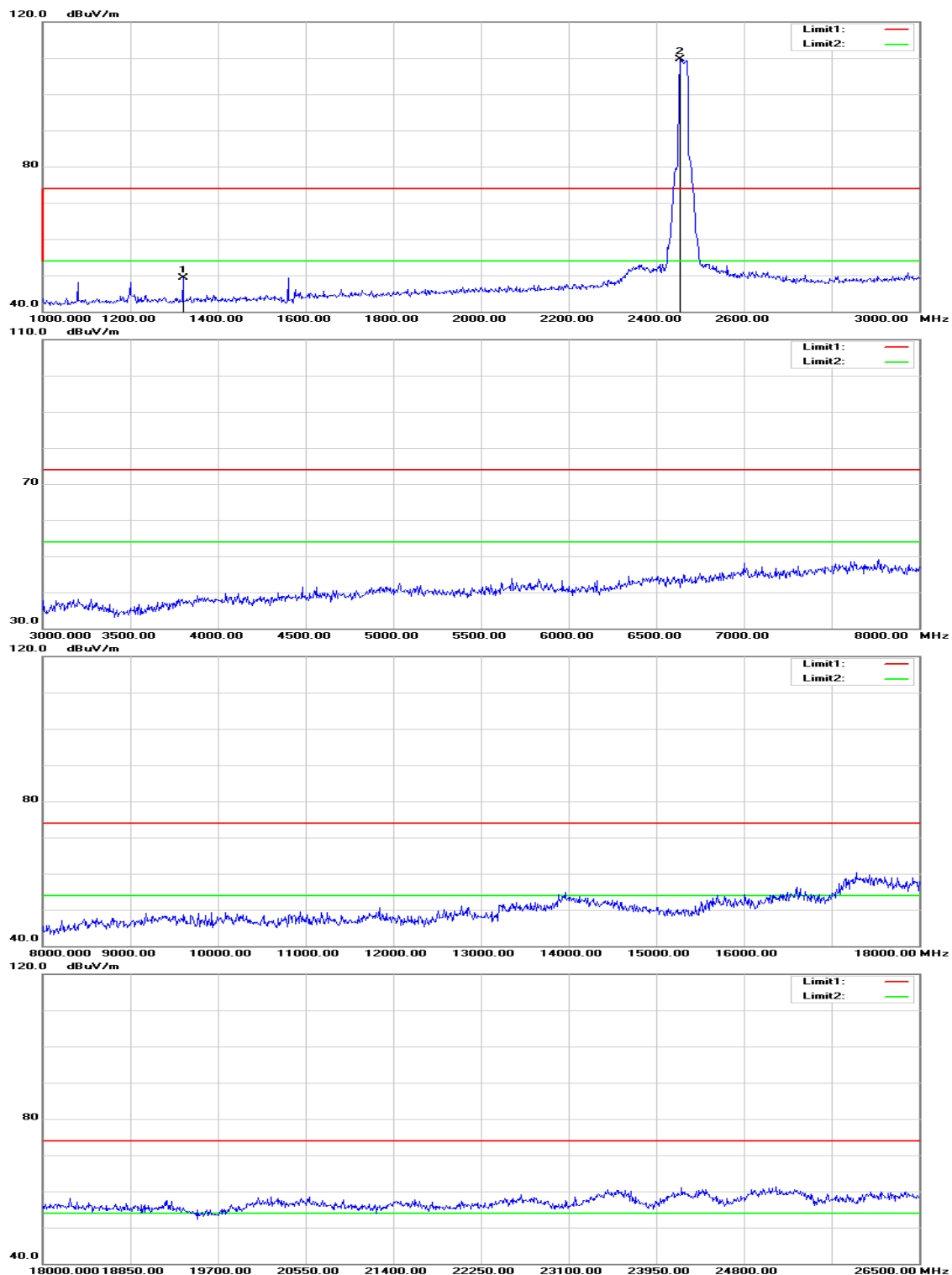
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

TX / IEEE 802.11n HT 20 MHz mode / CH High

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 20 MHz mode /
2462 MHz

Test Date: January 12, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

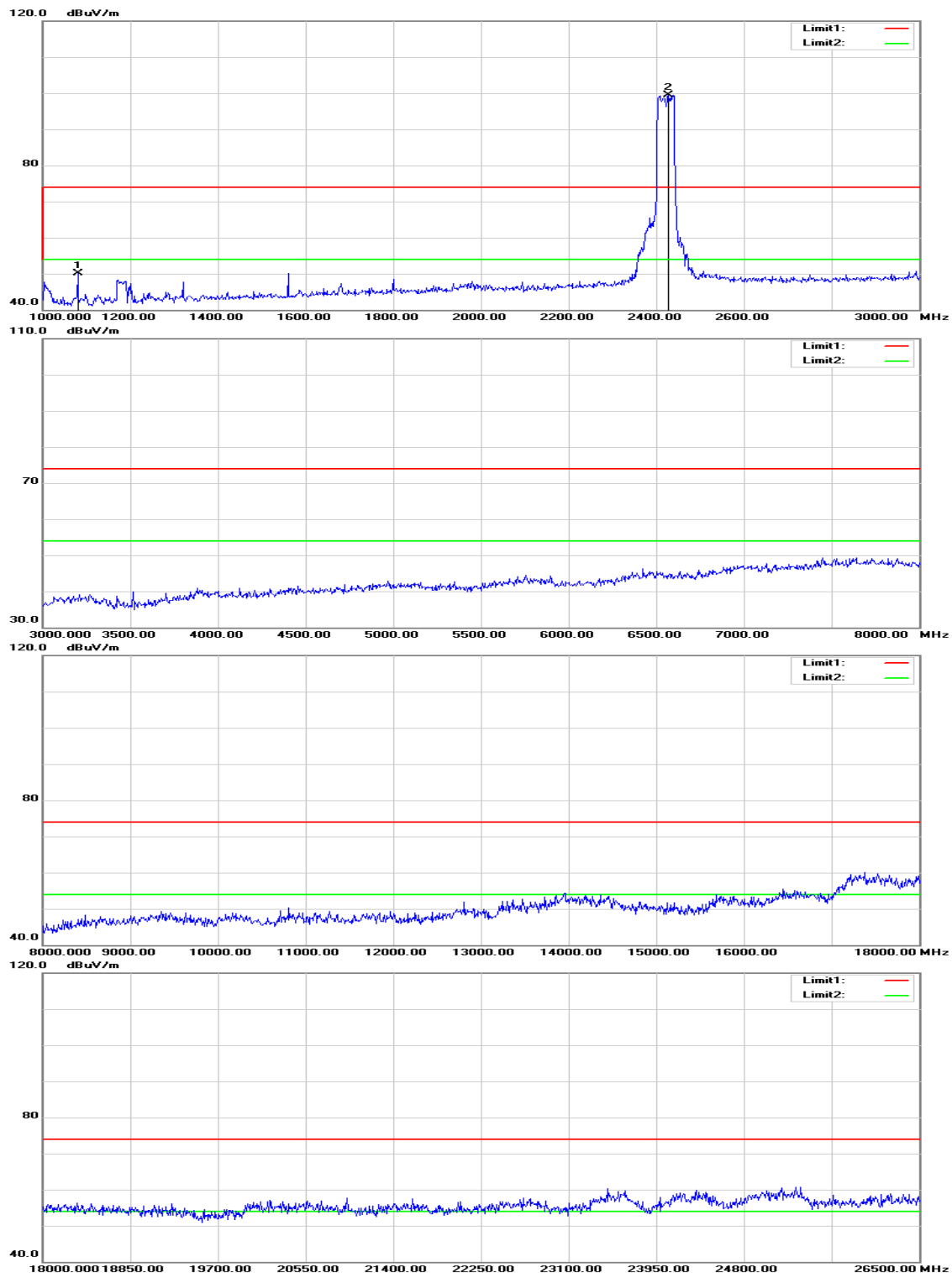
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1320.000	56.63	-6.82	49.81	74.00	-24.19	peak	V
N/A							
1320.000	56.15	-6.82	49.33	74.00	-24.67	peak	H
N/A							

Remark:

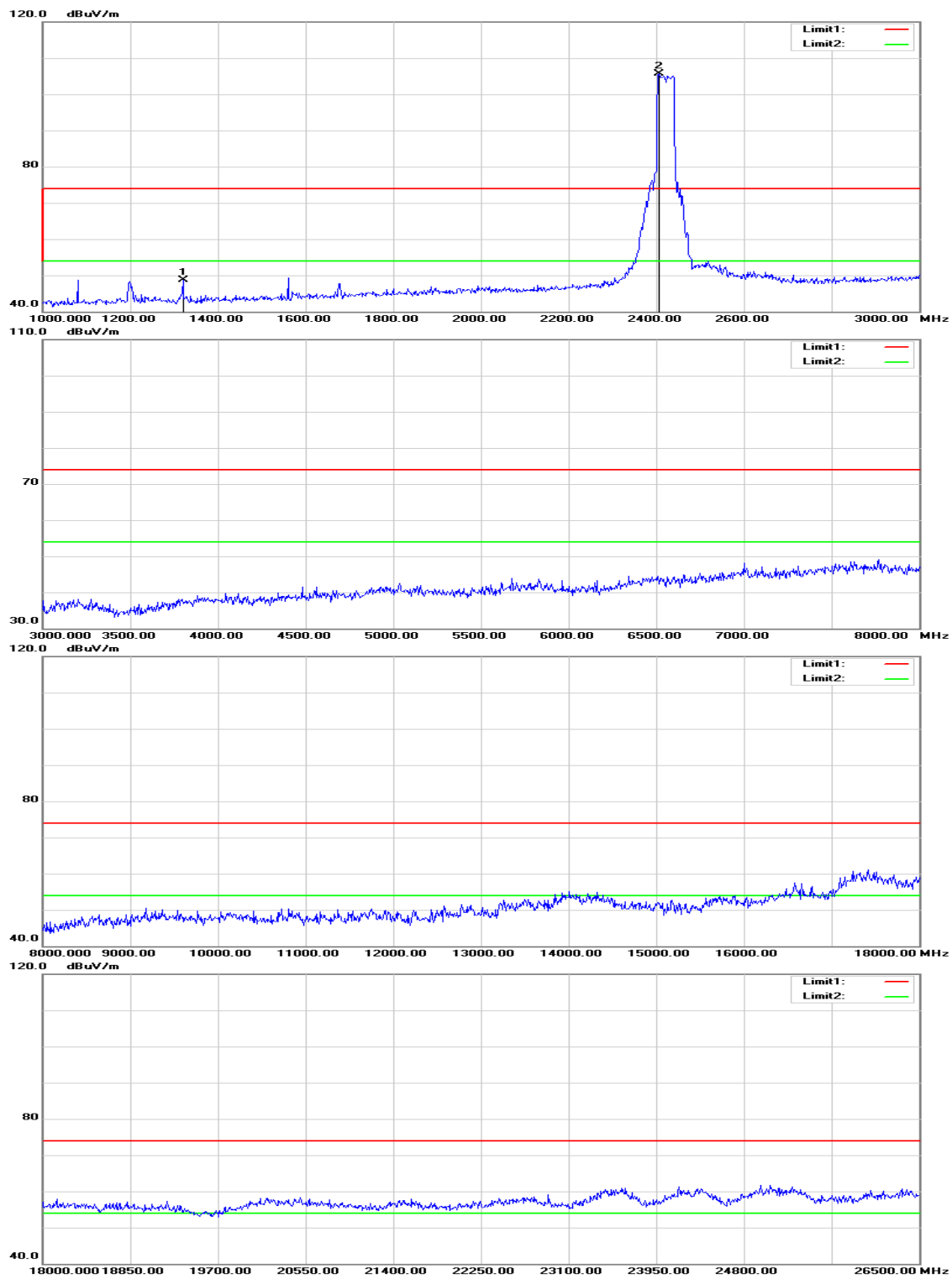
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

TX / IEEE 802.11n HT 40 MHz mode / CH Low

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 40 mode
/ CH Low

Test Date: January 12, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

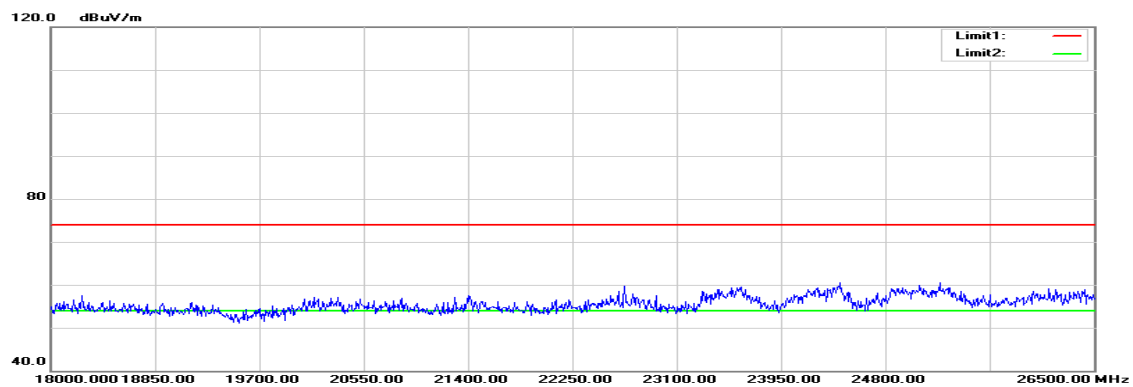
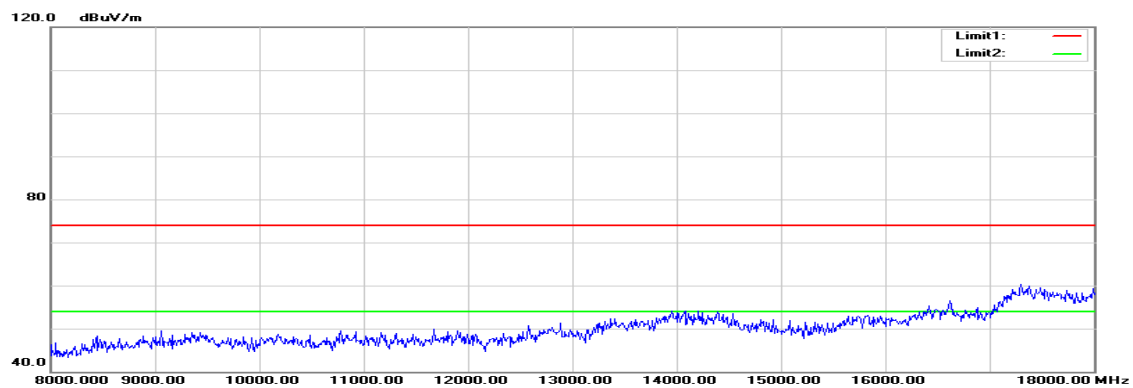
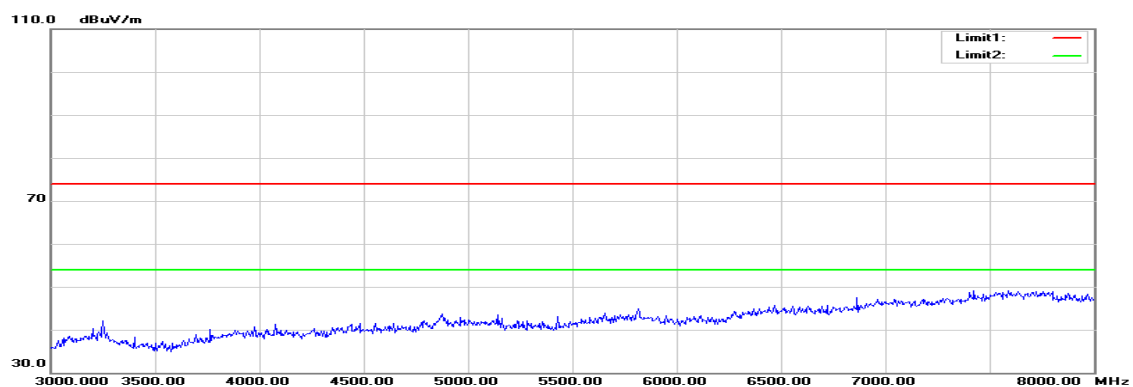
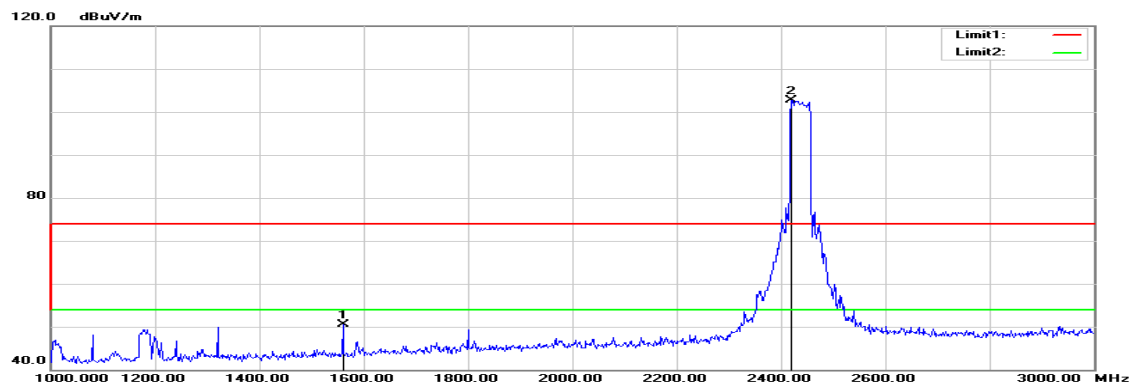
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1080.000	57.72	-7.66	50.06	74.00	-23.94	peak	V
N/A							
1320.000	55.54	-6.82	48.72	74.00	-25.28	peak	H
N/A							

Remark:

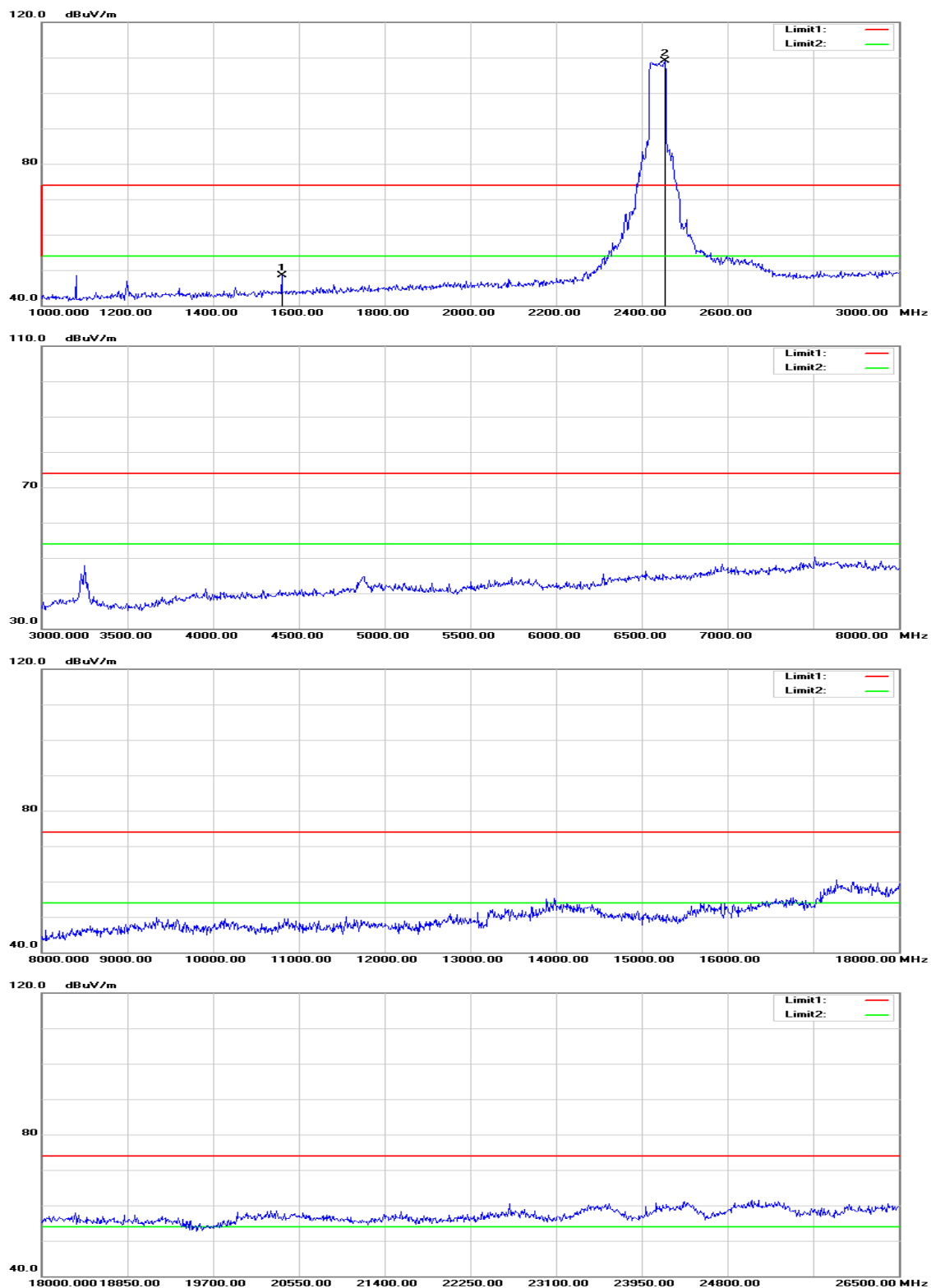
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

TX / IEEE 802.11n HT 40 MHz mode / CH Mid

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 40 mode
/ CH Mid

Test Date: January 12, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

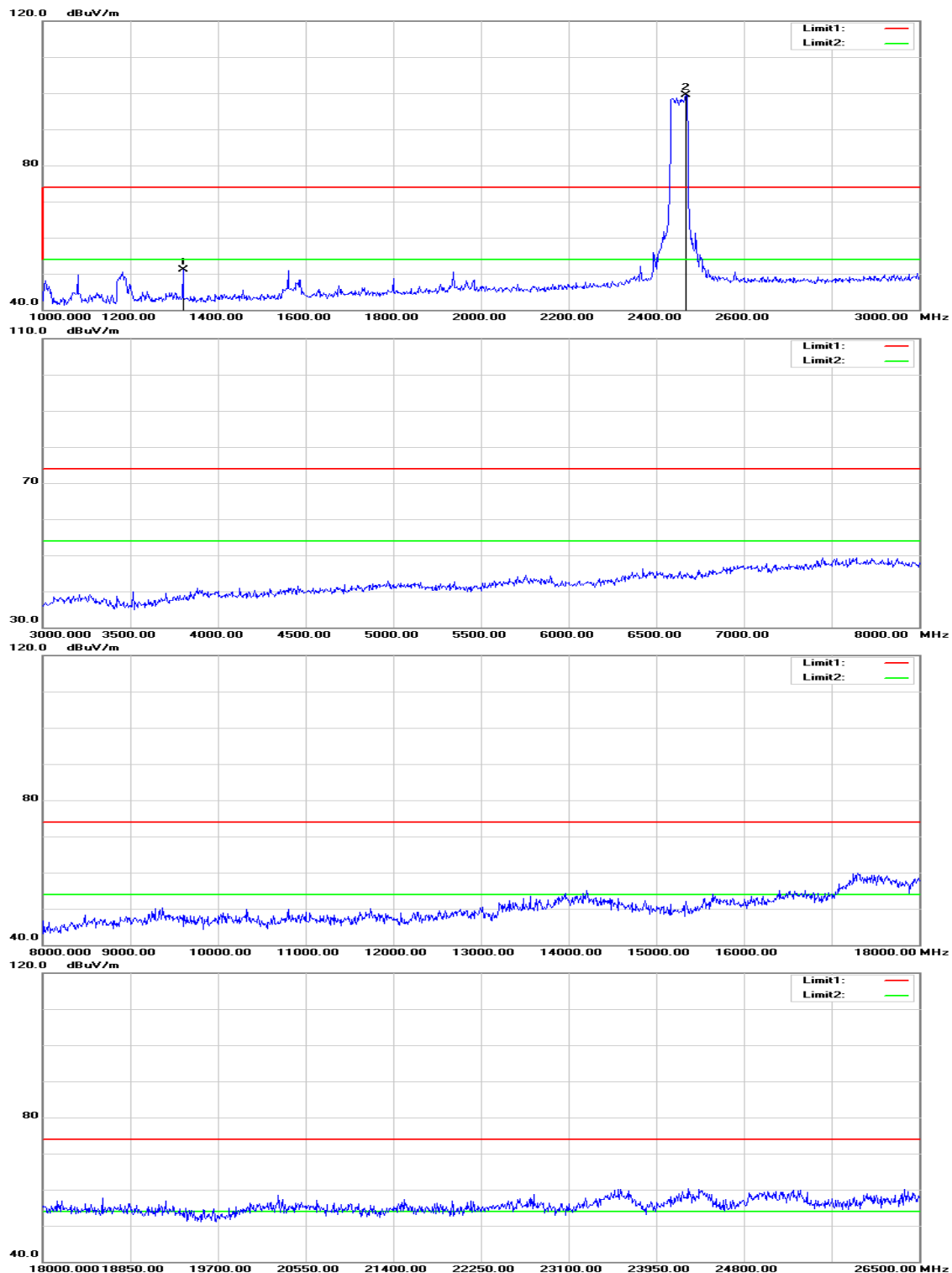
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1560.000	56.44	-5.88	50.56	74.00	-23.44	peak	V
N/A							
1560.000	54.44	-5.88	48.56	74.00	-25.44	peak	H
N/A							

Remark:

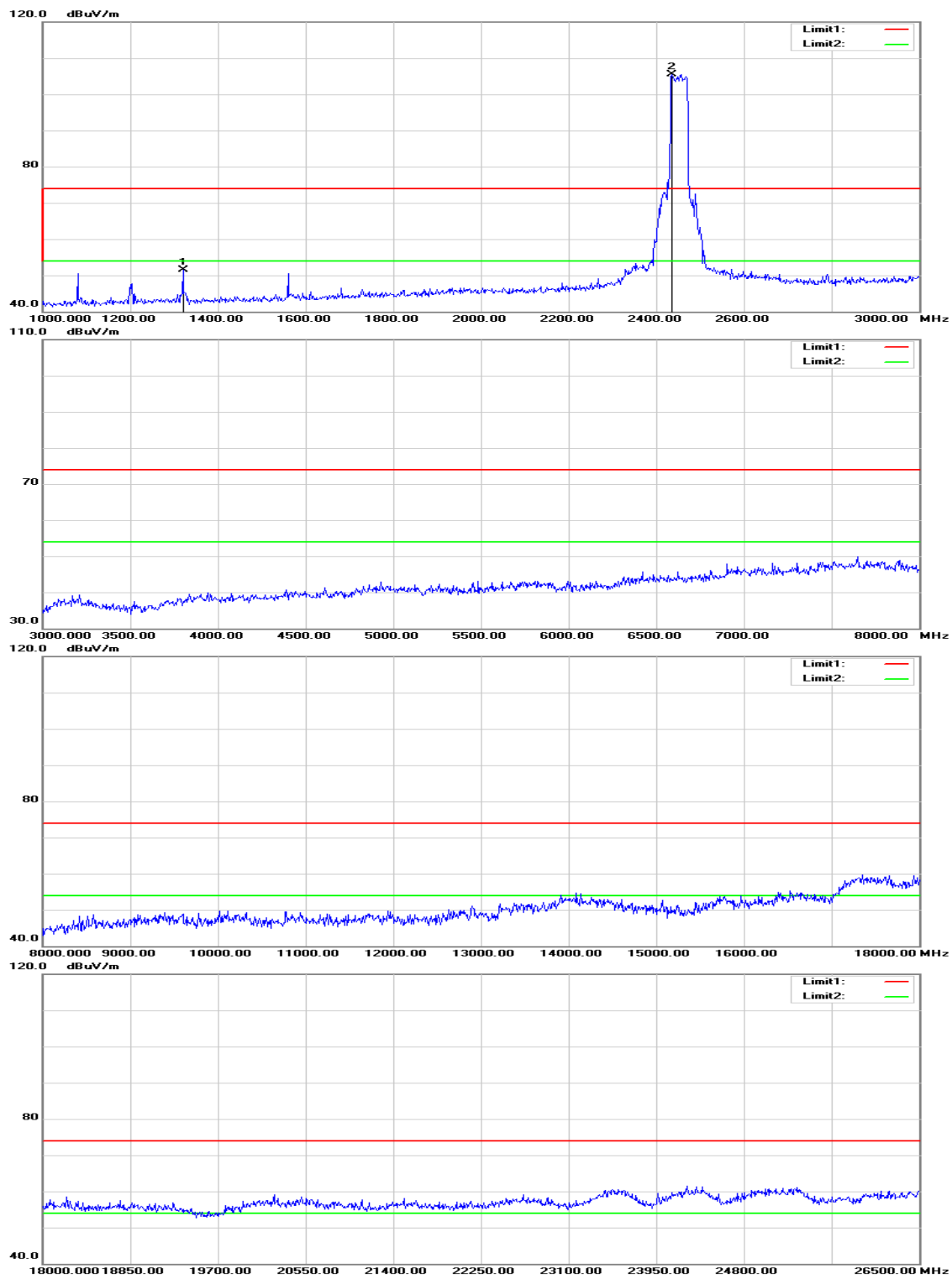
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

TX / IEEE 802.11n HT 40 MHz mode / CH High

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 40 mode
/ CH High

Test Date: January 12, 2016

Temperature: 27°C

Tested by: Jason Lu

Humidity: 53% RH

Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
1320.000	57.87	-6.82	51.05	74.00	-22.95	peak	V
N/A							
1320.000	58.41	-6.82	51.59	74.00	-22.41	peak	H
N/A							

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

7.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

* Decreases with the logarithm of the frequency.

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

Operation Mode: Normal Link **Test Date:** January 12, 2016
Temperature: 24°C **Tested by:** Jason Lu
Humidity: 56% RH

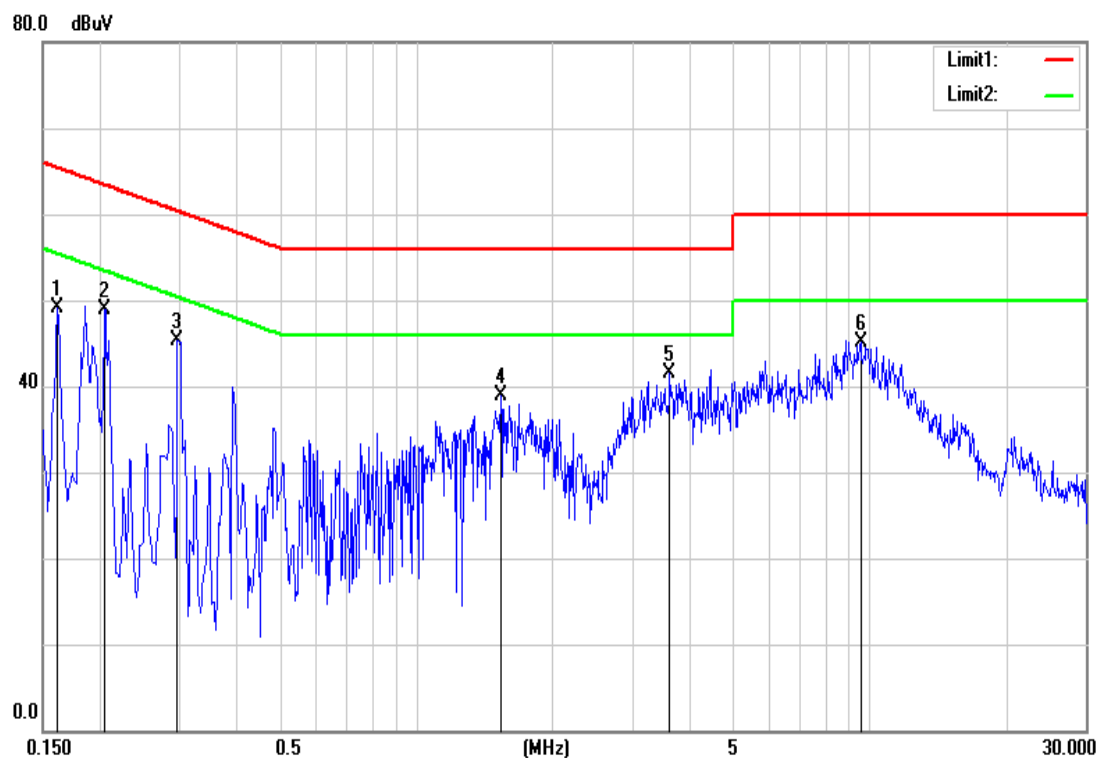
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m)	AV Result (dBuV/m)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1620	39.39	39.39	9.69	49.08	49.08	65.36	55.36	-16.28	-6.28	L1
0.2060	39.29	39.29	9.68	48.97	48.97	63.36	53.37	-14.39	-4.40	L1
0.2980	35.60	35.60	9.68	45.28	45.28	60.30	50.30	-15.02	-5.02	L1
1.5420	28.77	28.77	10.11	38.88	38.88	56.00	46.00	-17.12	-7.12	L1
3.6340	31.67	31.67	9.81	41.48	41.48	56.00	46.00	-14.52	-4.52	L1
9.6020	35.08	35.08	9.94	45.02	45.02	60.00	50.00	-14.98	-4.98	L1
0.1660	35.96	35.96	9.64	45.60	45.60	65.16	55.16	-19.56	-9.56	L2
0.2020	39.74	39.74	9.64	49.38	49.38	63.53	53.53	-14.15	-4.15	L2
0.3060	35.56	35.56	9.65	45.21	45.21	60.08	50.08	-14.87	-4.87	L2
1.6340	27.75	27.75	10.00	37.75	37.75	56.00	46.00	-18.25	-8.25	L2
8.7700	35.15	35.15	9.89	45.04	45.04	60.00	50.00	-14.96	-4.96	L2
9.4260	20.39	20.39	9.91	30.30	30.30	60.00	50.00	-29.70	-19.70	L2

Remark:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10 kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9 kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)

