FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

WLAN + BT Combo Module

Model: WCBN4511R

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.,
New Taipei City 24891, Taiwan. (R.O.C.)
http://www.ccsrf.com
service@ccsrf.com
Issued Date: July 19, 2016

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		July 19, 2016		Initial Issue	ALL	Doris Chu
01		August 24, 2016		1. Added Product SW/HW version, Radio SW/HW version, Test SW Version. 2. Added the worst case power setting parameter. 3. Added 99% bandwidth. 4. Modify peak power spectral density to added duty cycle and duty factor.	P.5, P.9, P.15 ~ P.33, P.92	Doris Chu

TABLE OF CONTENTS

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: WLAN + BT Combo Module

Model Number: WCBN4511R

Trade Name: LITE-ON

Date of Test: June 21 ~ July 15, 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:

Miller Lee
Manager
Compliance Certification Services Inc.

Tested by:

Dennis Li
Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

<table>
<tr><td>Product</td><td>WLAN + BT Combo Module</td></tr>
<tr><td>Model Number</td><td>WCBN4511R</td></tr>
<tr><td>Trade Name</td><td>LITE-ON</td></tr>
<tr><td>Model Discrepancy</td><td>N/A</td></tr>
<tr><td>Received Date</td><td>June 8, 2016</td></tr>
<tr><td>Power supply</td><td>Powered from host device.</td></tr>
<tr><td>Frequency Range</td><td>2412 ~ 2462 MHz</td></tr>
<tr><td>Transmit Power</td><td>
<table>
<tr><th>Mode</th><th>Frequency Range</th><th>Output Power (dBm)</th><th>Output Power (W)</th></tr>
<tr><td>IEEE 802.11b</td><td>2412 - 2462</td><td>22.67</td><td>0.1849</td></tr>
<tr><td>IEEE 802.11g</td><td>2412 - 2462</td><td>25.18</td><td>0.3296</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>2412 - 2462</td><td>24.98</td><td>0.3148</td></tr>
<tr><td>IEEE 802.11n HT 40 MHz</td><td>2422 - 2452</td><td>22.94</td><td>0.1968</td></tr>
</table>
</td></tr>
<tr><td>Number of Channels</td><td>IEEE 802.11b/g mode: 11 Channels
IEEE 802.11n HT 20 MHz mode: 11 Channels
IEEE 802.11n HT 40 MHz mode: 7 Channels</td></tr>
<tr><td>Antenna Specification</td><td>LITE-ON / WCBN4511R
PIFA Antenna
ANT-L: Gain: 2.54dBi
ANT-R: Gain: 0.93dBi</td></tr>
<tr><td>Product SW/HW version</td><td>V02/V02</td></tr>
<tr><td>Radio SW version</td><td>V02/V02</td></tr>
<tr><td>Radio HW version</td><td>V1.0.3.19</td></tr>
</table>

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-WCBN4511R** filing to comply with FCC Part 15C, Section 15.207, 15.209.*

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, KDB 558074 D01 DTS Meas Guidance v03r05

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: WCBN4511R) had been tested under operating condition.

The EUT is a 2x2 configuration spatial MIMO (2Tx & 2Rx) without beam forming function that operate in double TX chains and double RX chains. The 2x2 configuration is implemented with two outside TX & RX chains (Chain 0 and 1).

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

After verification, all tests carried out are 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 and receiving radiated spurious emission above 1GHz, which worst case was in CH Mid 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 MHz 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 axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (Y axis) and the worst case was recorded.

3.6 THE WORST CASE POWER SETTING PARAMETER

IEEE 802.11b mode

Channel	Frequency (MHz)	RF power setting in TEST SW (Chin 0)	RF power setting in TEST SW (Chin 1)
Low	2412	20	20
Mid	2437	21	21
High	2462	22	22

IEEE 802.11g mode

Channel	Frequency (MHz)	RF power setting in TEST SW (Chin 0)	RF power setting in TEST SW (Chin 1)
Low	2412	18	18
Mid	2437	25	25
High	2462	1A	1A

IEEE 802.11n HT 20 MHz mode

Channel	Frequency (MHz)	RF power setting in TEST SW (Chin 0)	RF power setting in TEST SW (Chin 1)
Low	2412	17	17
Mid	2437	25	25
High	2462	19	19

IEEE 802.11n HT 40 MHz mode

Channel	Frequency (MHz)	RF power setting in TEST SW (Chin 0)	RF power setting in TEST SW (Chin 1)
Low	2422	13	13
Mid	2437	1A	1A
High	2452	13	13

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 and Loop Antenna is scheduled for calibration once three years.*

Conducted Emissions Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
DC Power Supplies	GW Instek	SPS-3610	GPE880163	01/19/2016	01/18/2017
Power Meter	Anritsu	ML2495A	1012009	07/04/2016	07/03/2017
Power Sensor	Anritsu	MA2411B	917072	07/04/2016	07/03/2017
Signal Analyzer	R&S	FSV 40	101073	07/20/2015	07/19/2016
Spectrum Analyzer	Agilent	E4446A	US42510268	02/15/2016	02/14/2017
Thermostatic/Hrgrosatic Chamber	TAICHY	MHG-150LF	930619	10/08/2015	10/07/2016
Vector Signal Generator	R&S	SMU 200A	102239	03/10/2016	03/09/2017
AC Power Source	EXTECH	6205	1140845	N.C.R	N.C.R

Wugu 966 Chamber A					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	08/06/2015	08/05/2016
EMI Test Receiver	R&S	ESCI	100064	05/31/2016	05/30/2017
Horn Antenna	EMCO	3117	55165	02/24/2016	02/23/2017
Horn Antenna	EMCO	3116	26370	01/15/2016	01/14/2017
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	01/12/2016	01/11/2017
K Type Cable	Huber+Suhner	SUCOFLEX 102	22470/2	01/12/2016	01/11/2017
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	01/14/2016	01/13/2017
Pre-Amplifier	EMCI	EMC 012635	980151	06/23/2016	06/22/2017
Pre-Amplifier	EMCI	EM330	N/A	06/08/2016	06/07/2017
Spectrum Analyzer	Agilent	E4446A	US42510252	12/08/2015	12/07/2016
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	EZ-EMC (CCS-3A1RE)				

Conducted Emission Room # B					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
EMI Test Receiver	R&S	ESCI	101073	09/09/2015	09/08/2016
LISN	SCHWARZBECK	NSLK 8127	8127-541	11/23/2015	11/22/2016
LISN	R&S	ENV216	101054	05/11/2016	05/10/2017
Capacitive Voltage Probe	FCC	F-CVP-1	100185	03/09/2016	03/08/2017
Test S/W	CCS-3A1-CE				

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.2575
3M Semi Anechoic Chamber / 30M~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.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ 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 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 0824-01 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC 2324G-1 for 3M Semi Anechoic Chamber A, 2324G-2 for 3M Semi Anechoic Chamber B.

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	FCC MRA: TW1039
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	TAF Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	Canada 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	Equipment	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	Notebook PC	ASUS	M5200AE	5BN0AG019631	PD9WM3B2100	N/A	AC I/P: Unshielded, 1.8m with a core DC O/P: Unshielded, 1.8m

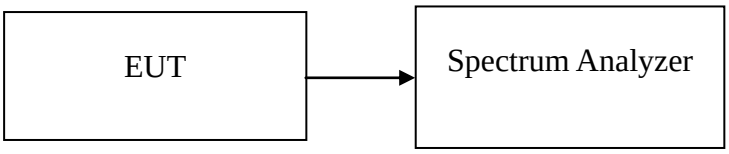
Remark:

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 99% BANDWIDTH

Test Configuration



TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold.

Test Data

IEEE 802.11b mode / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.1997
Mid	2437	12.1562
High	2462	12.1562

IEEE 802.11b mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.2865
Mid	2437	12.3733
High	2462	12.3733

IEEE 802.11g mode/ Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4109
Mid	2437	16.5412
High	2462	16.4978

IEEE 802.11g mode/ Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4978
Mid	2437	16.6280
High	2462	16.4544

IEEE 802.11n HT 20 MHz mode / Chain 0

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.5832
Mid	2437	17.5832
High	2462	17.5832

IEEE 802.11n HT 20 MHz mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.5832
Mid	2437	17.7134
High	2462	17.5397

IEEE 802.11n HT 40 MHz mode / Chain 0

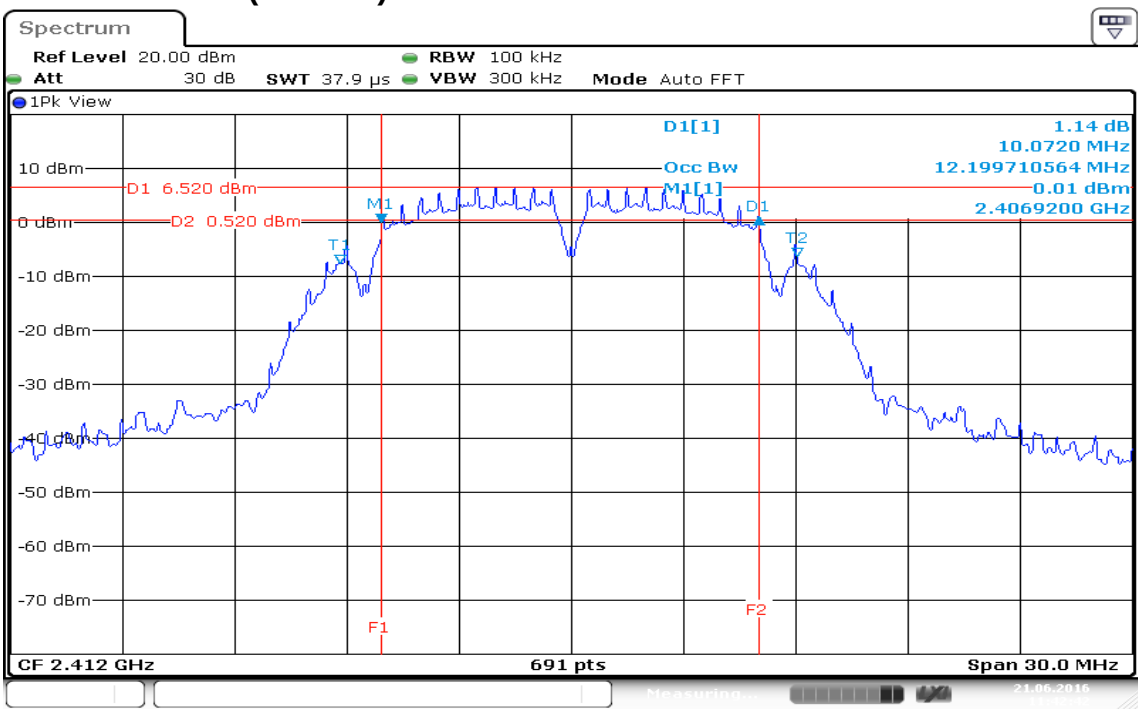
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	35.7742
Mid	2437	35.8900
High	2452	36.0057

IEEE 802.11n HT 40 MHz mode / Chain 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2422	35.7742
Mid	2437	35.8900
High	2452	35.8900

Test Plot

IEEE 802.11b mode/ Chain 0
99% Bandwidth (CH Low)



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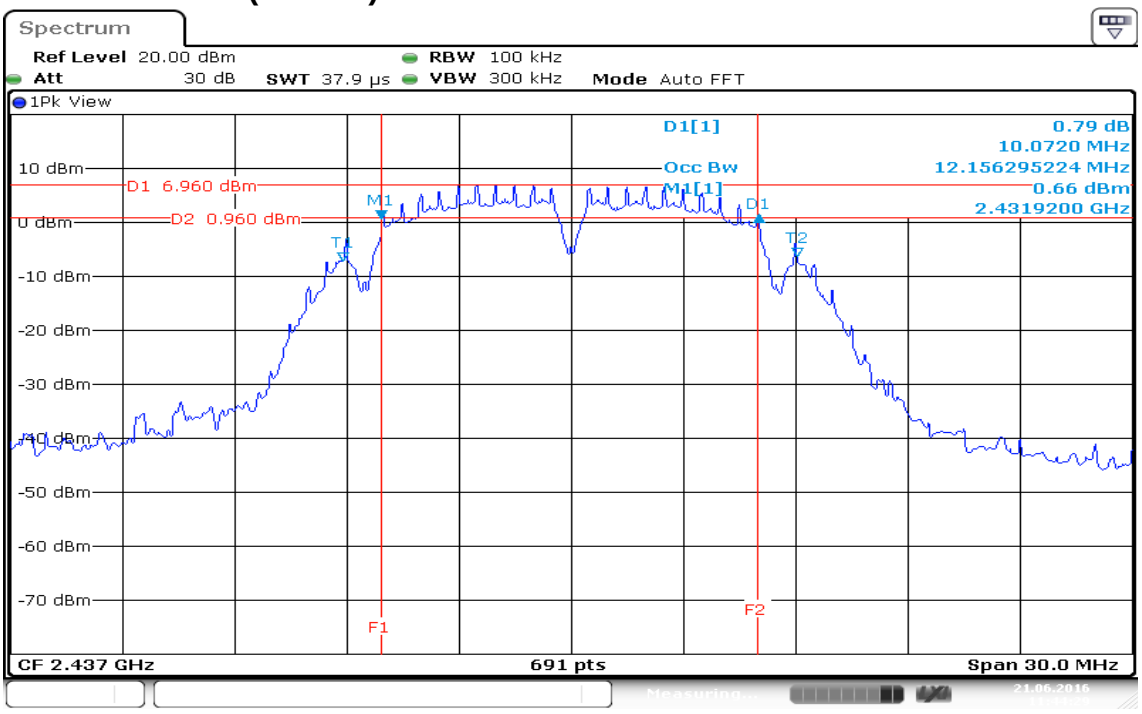
99% Bandwidth (CH Mid)



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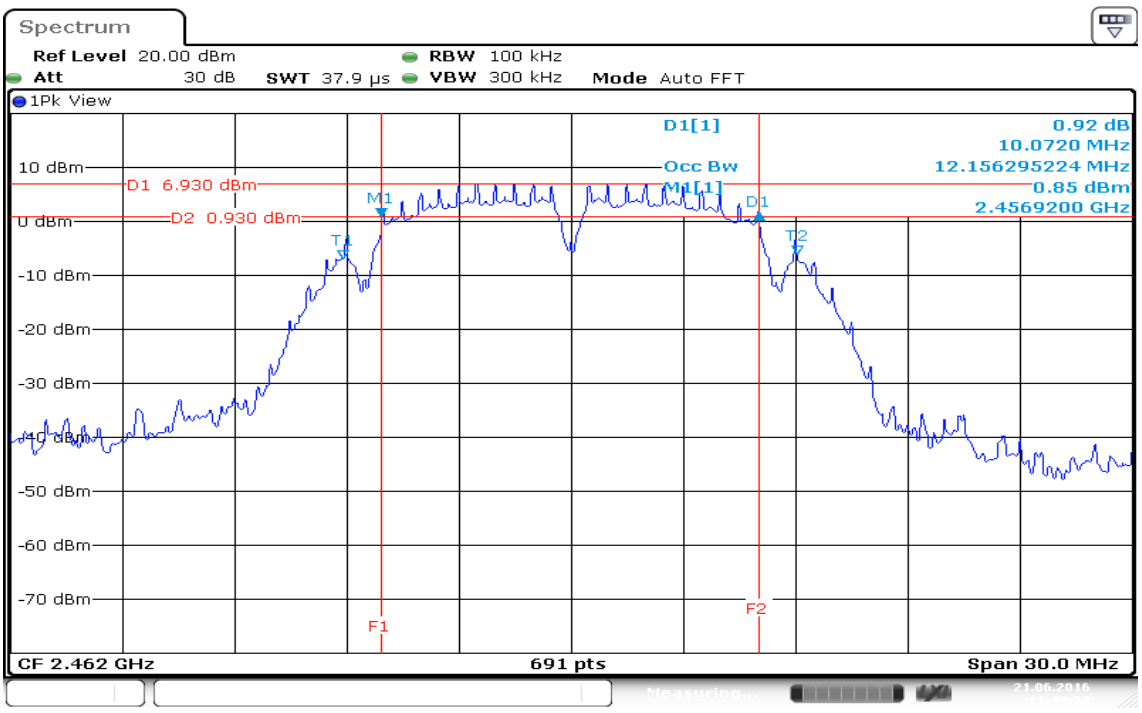
99% Bandwidth (CH High)



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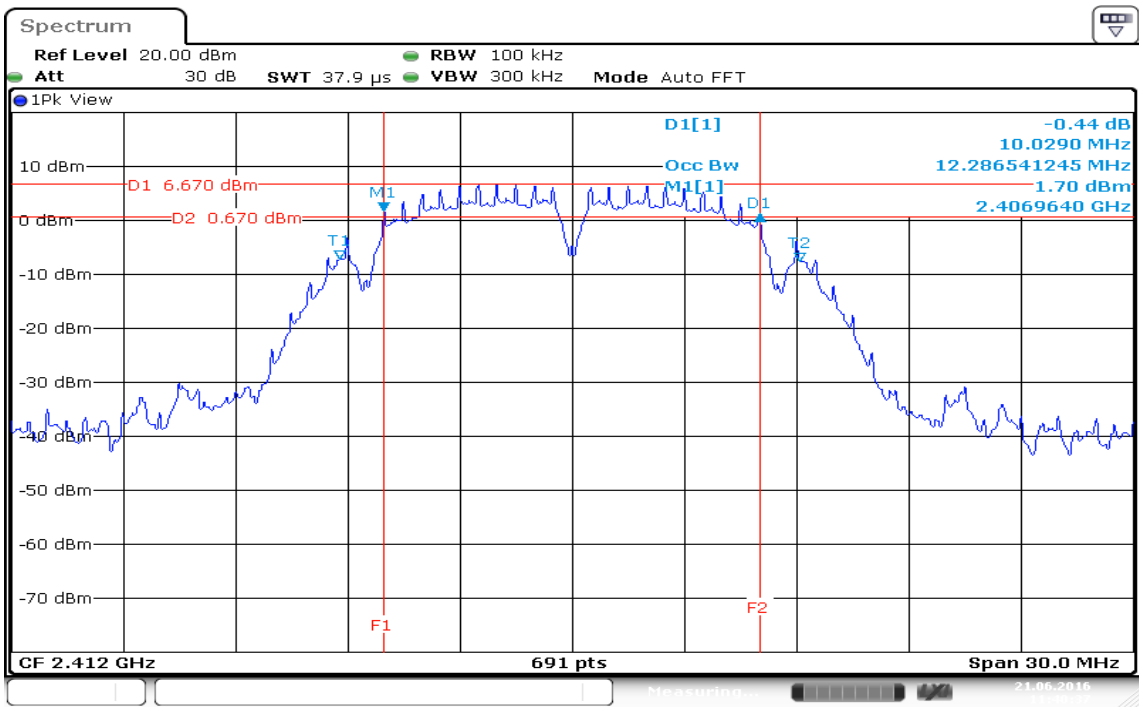
IEEE 802.11b mode/ Chain 1

99% Bandwidth (CH Low)



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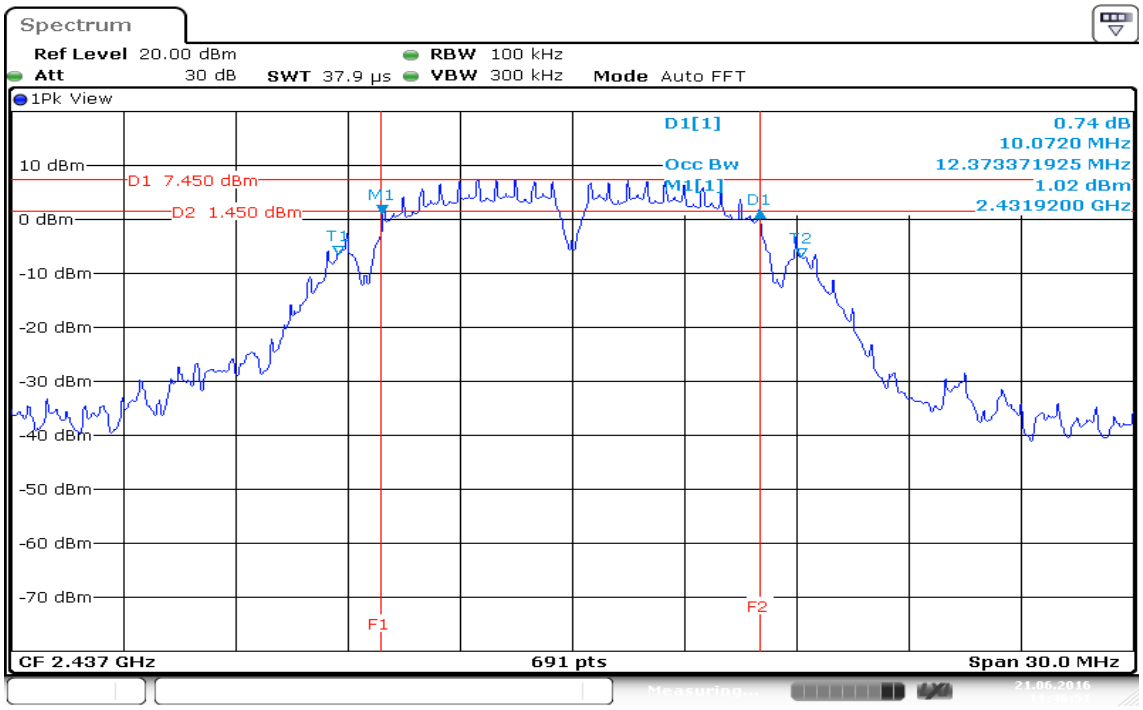
99% Bandwidth (CH Mid)



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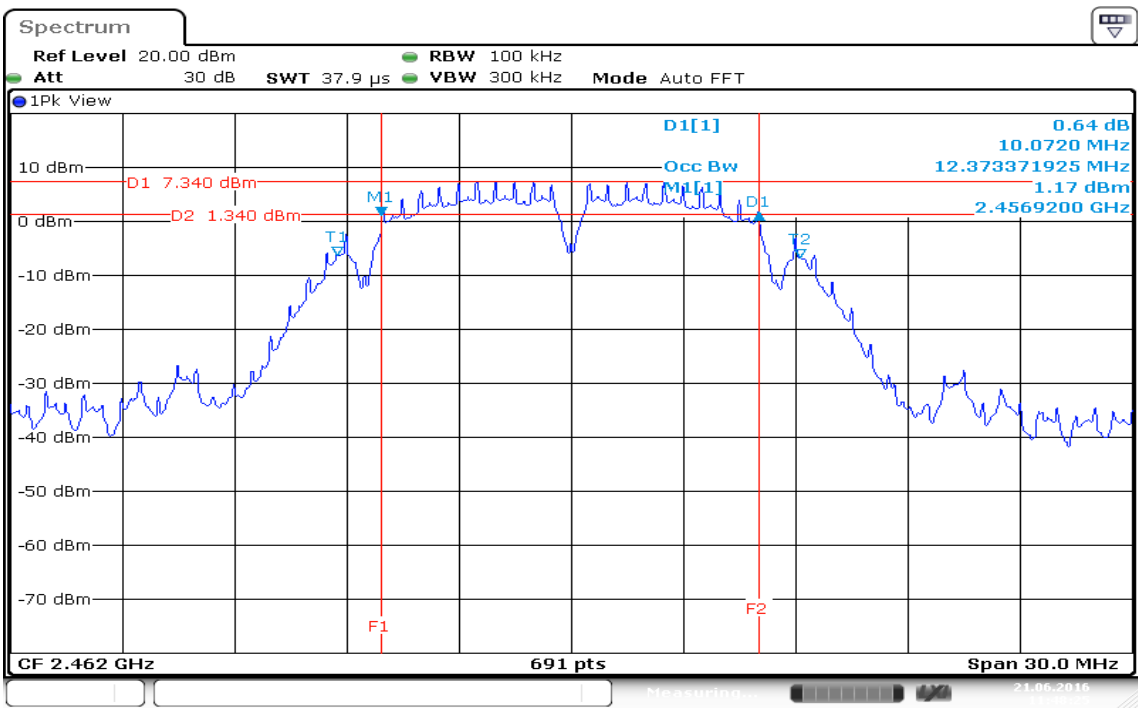

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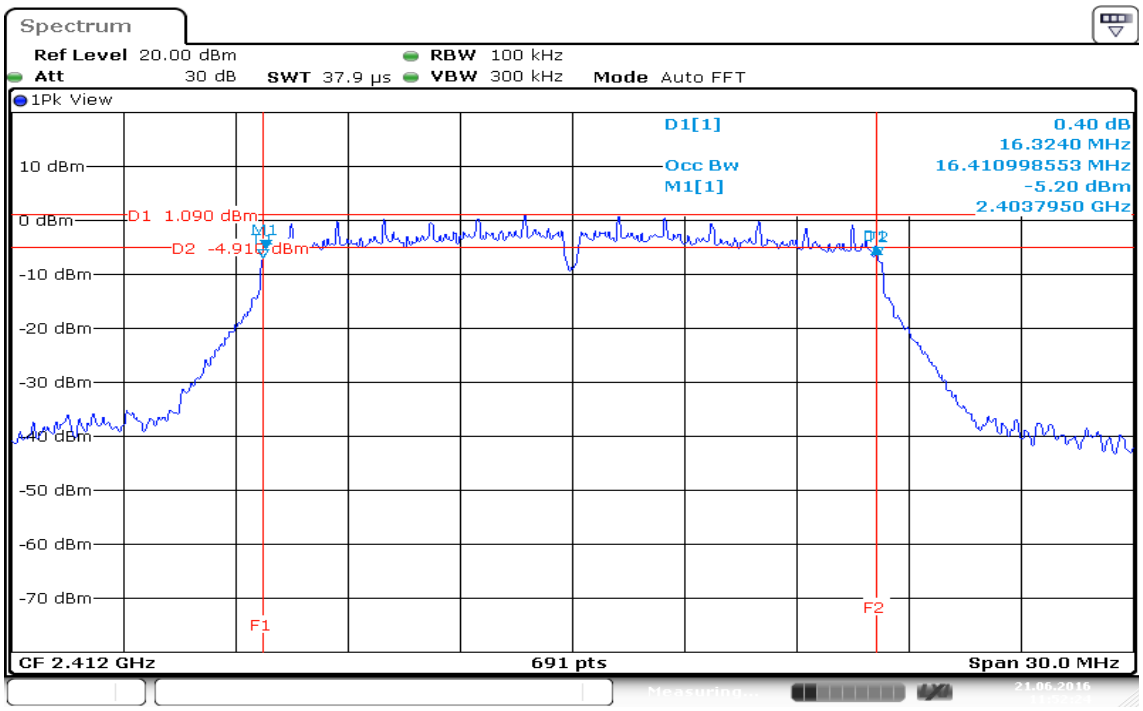
IEEE 802.11g mode / Chain 0

99% Bandwidth (CH Low)



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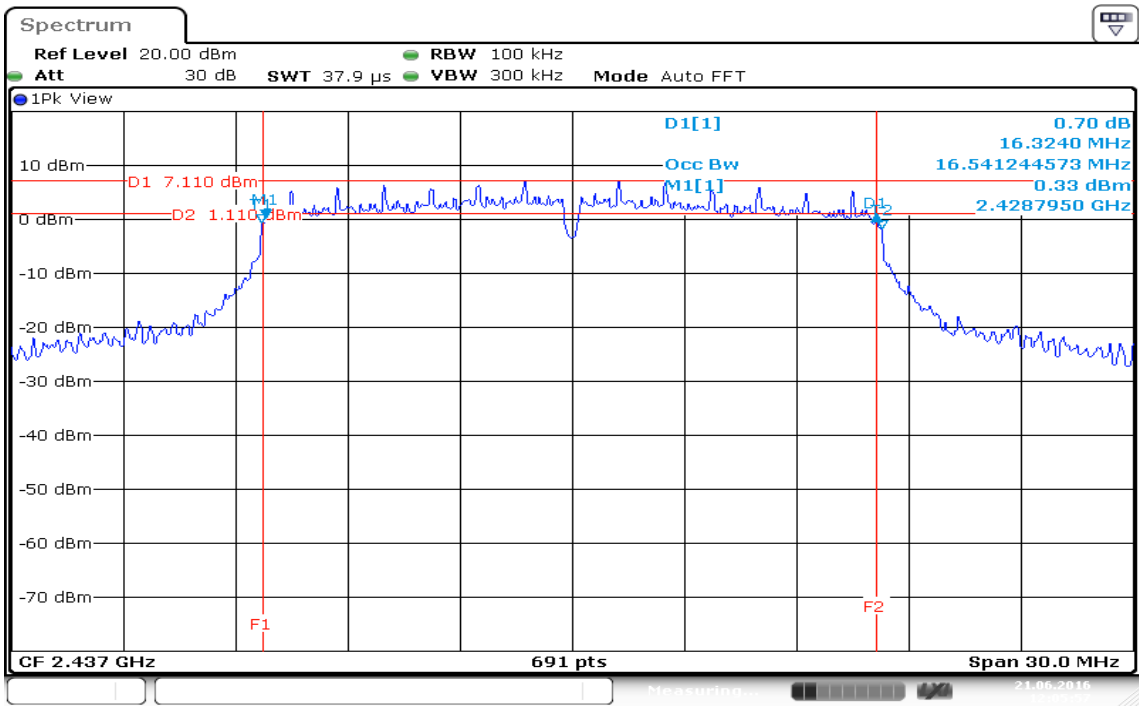

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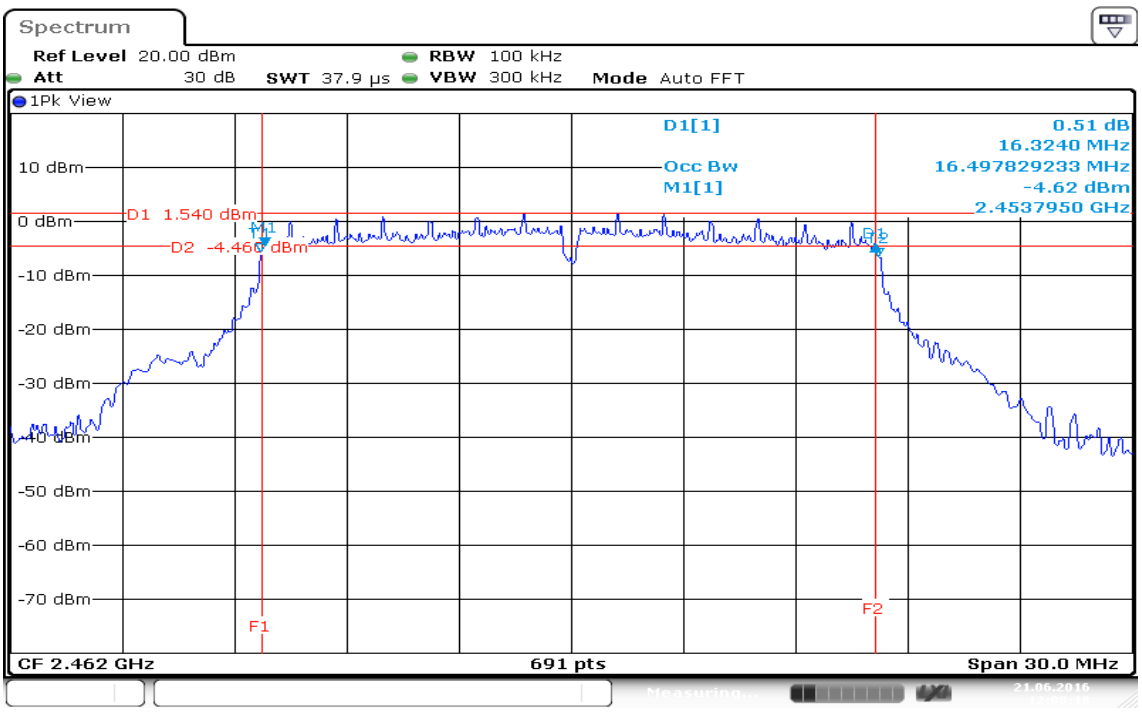
99% Bandwidth (CH High)



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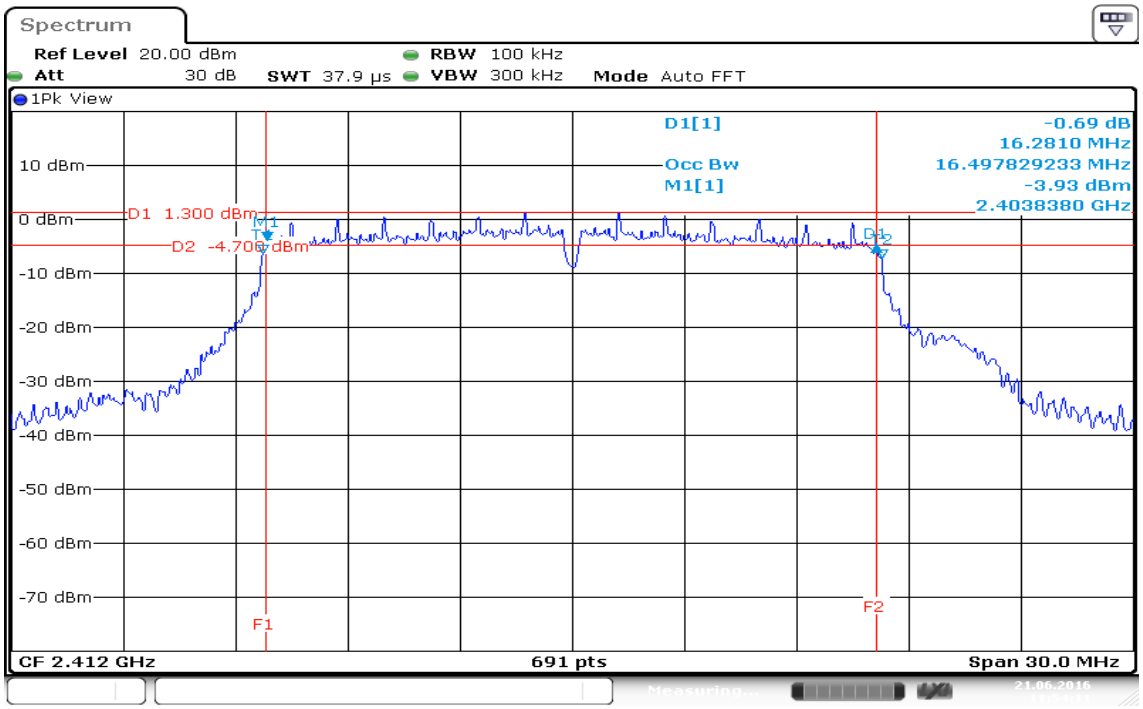
IEEE 802.11g mode / Chain 1

99% Bandwidth (CH Low)



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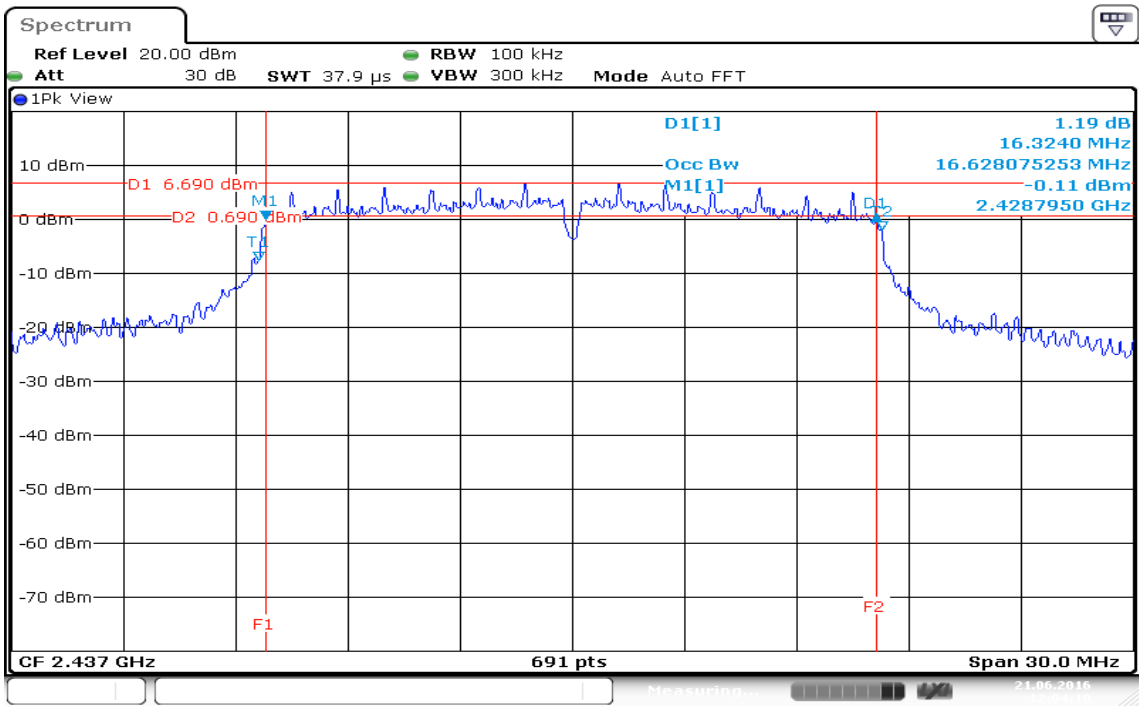
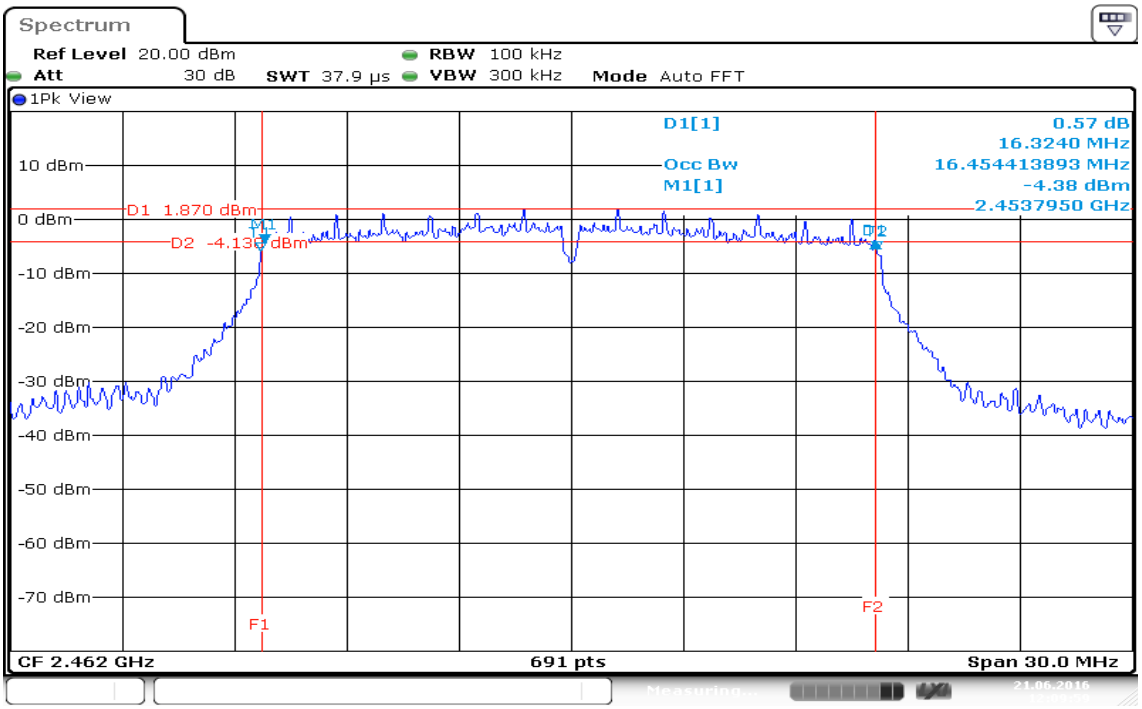
99% Bandwidth (CH Mid)



Date: 21.JUN.2016 12:04:11

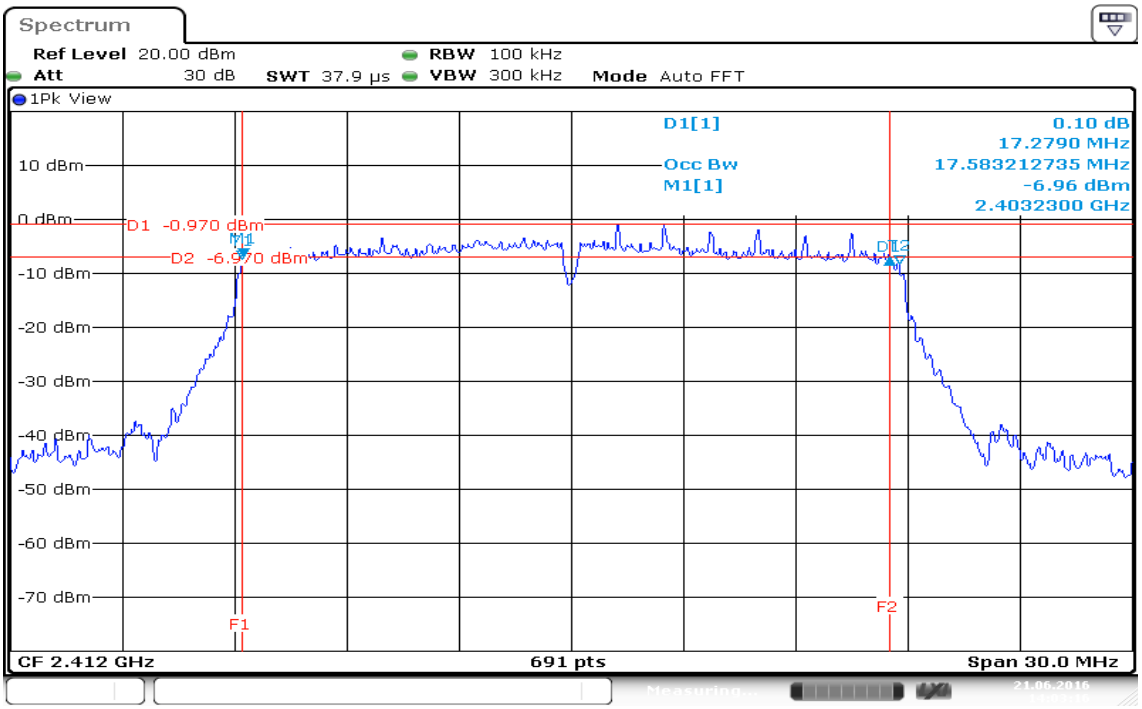
99% Bandwidth (CH High)



Date: 21.JUN.2016 12:09:59

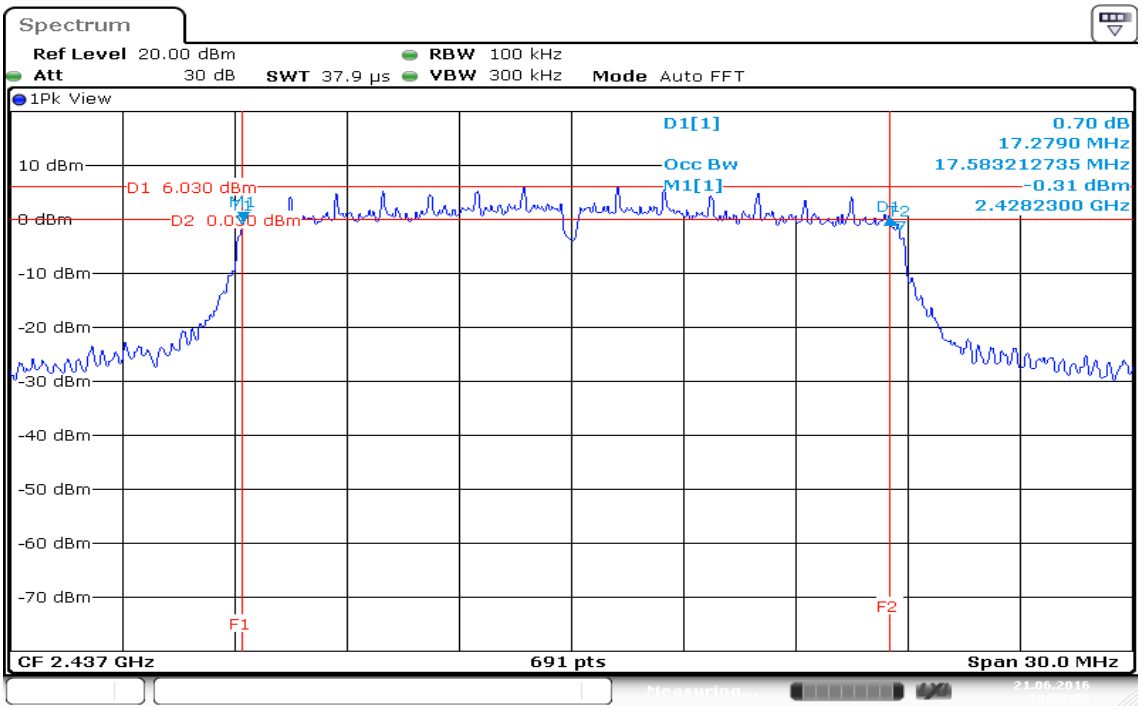
IEEE 802.11n HT 20 MHz mode/ Chain 0

99% Bandwidth (CH Low)



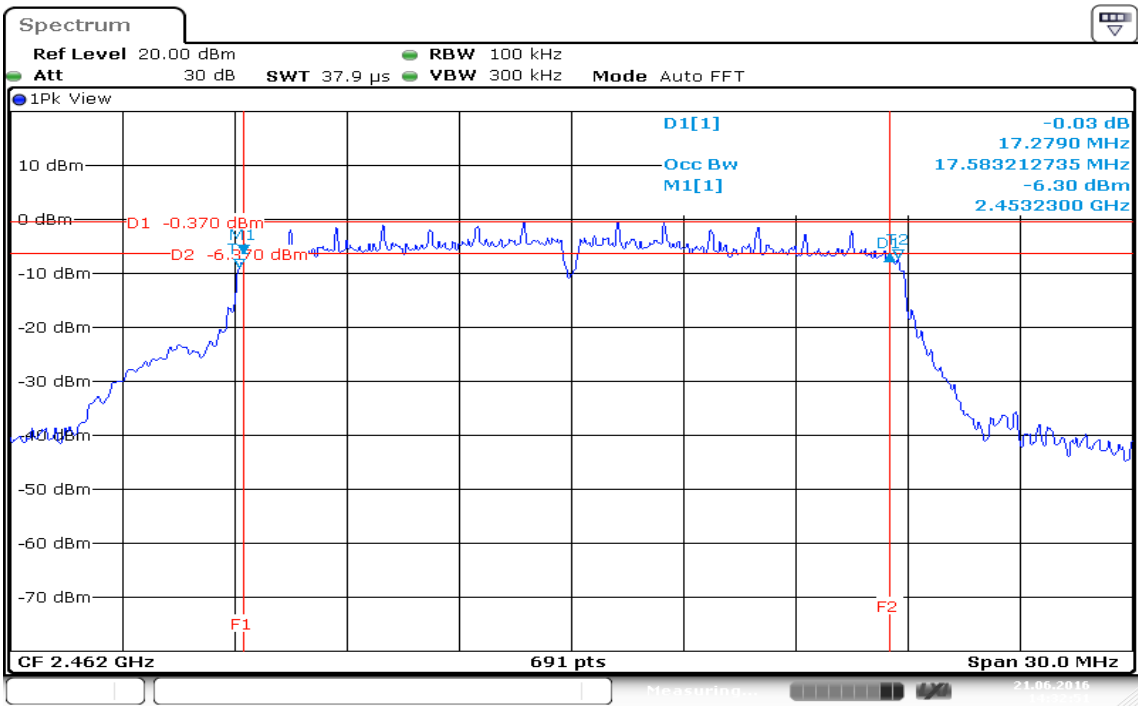
Date: 21.JUN.2016 14:03:16

99% Bandwidth (CH Mid)



Date: 21.JUN.2016 14:27:07

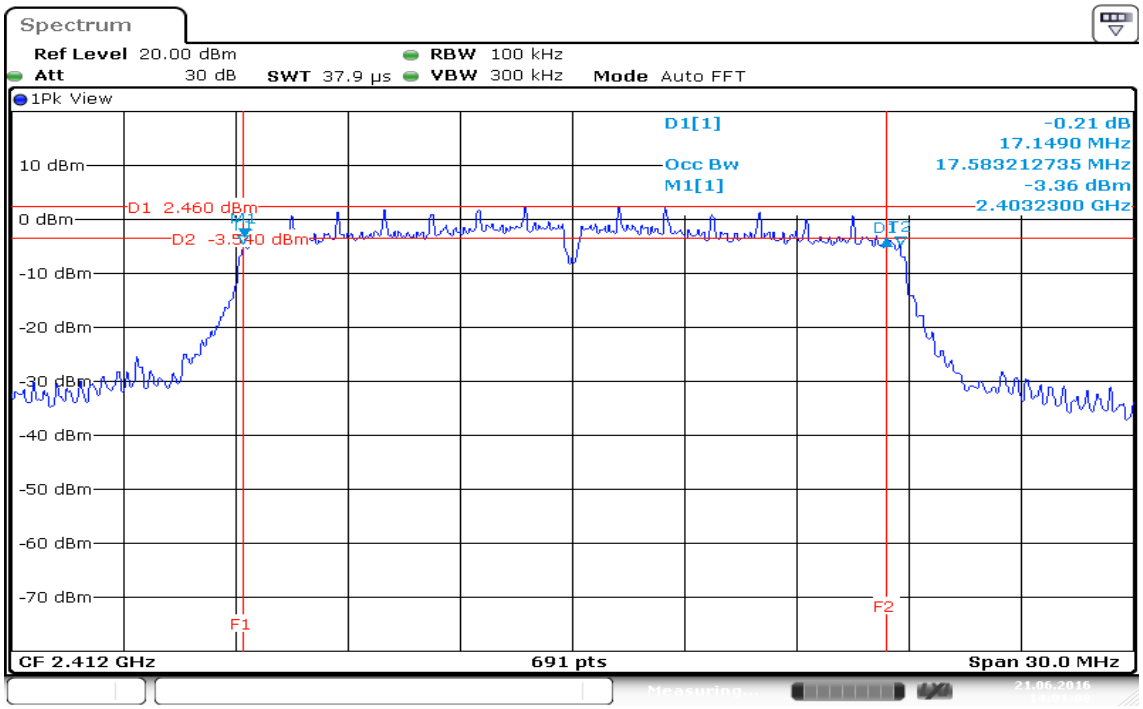
99% Bandwidth (CH High)



Date: 21.JUN.2016 14:32:51

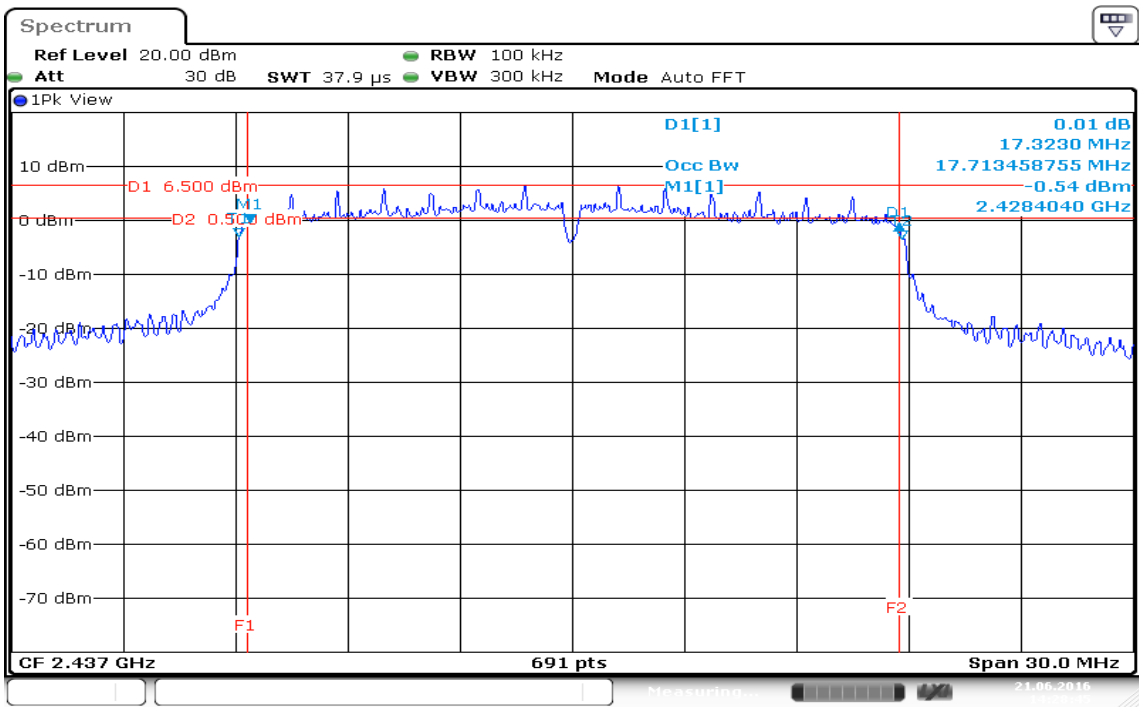
IEEE 802.11n HT 20 MHz mode / Chain 1

99% Bandwidth (CH Low)



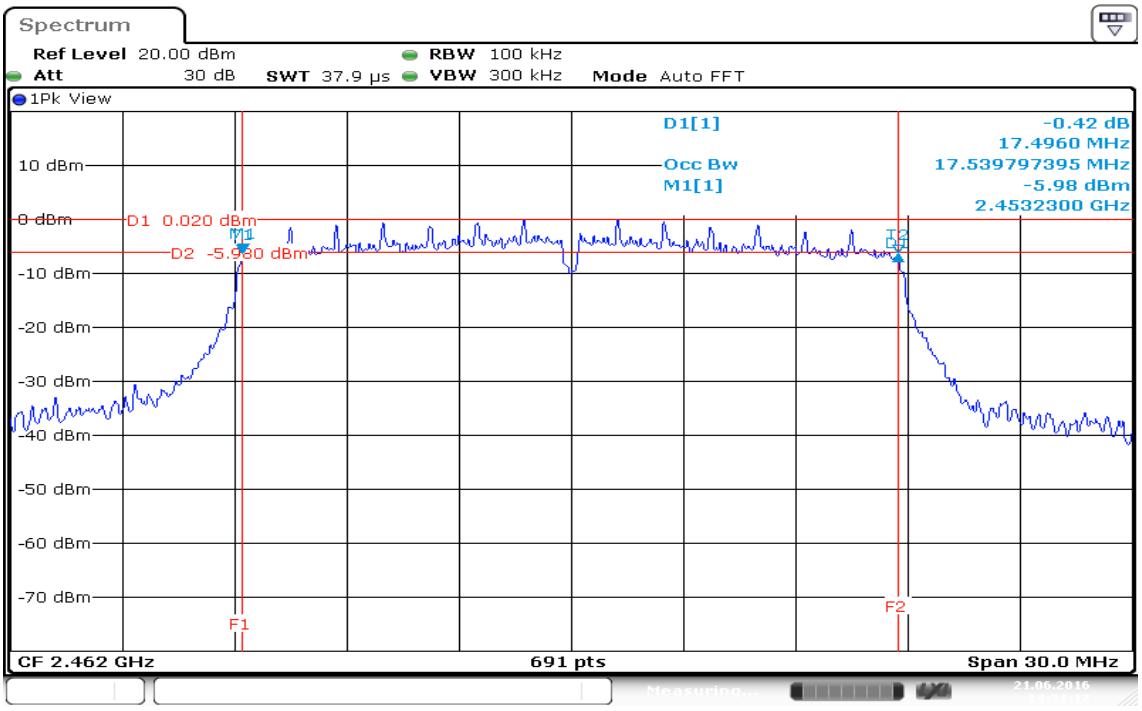
Date: 21.JUN.2016 14:01:08

99% Bandwidth (CH Mid)



Date: 21.JUN.2016 14:28:46

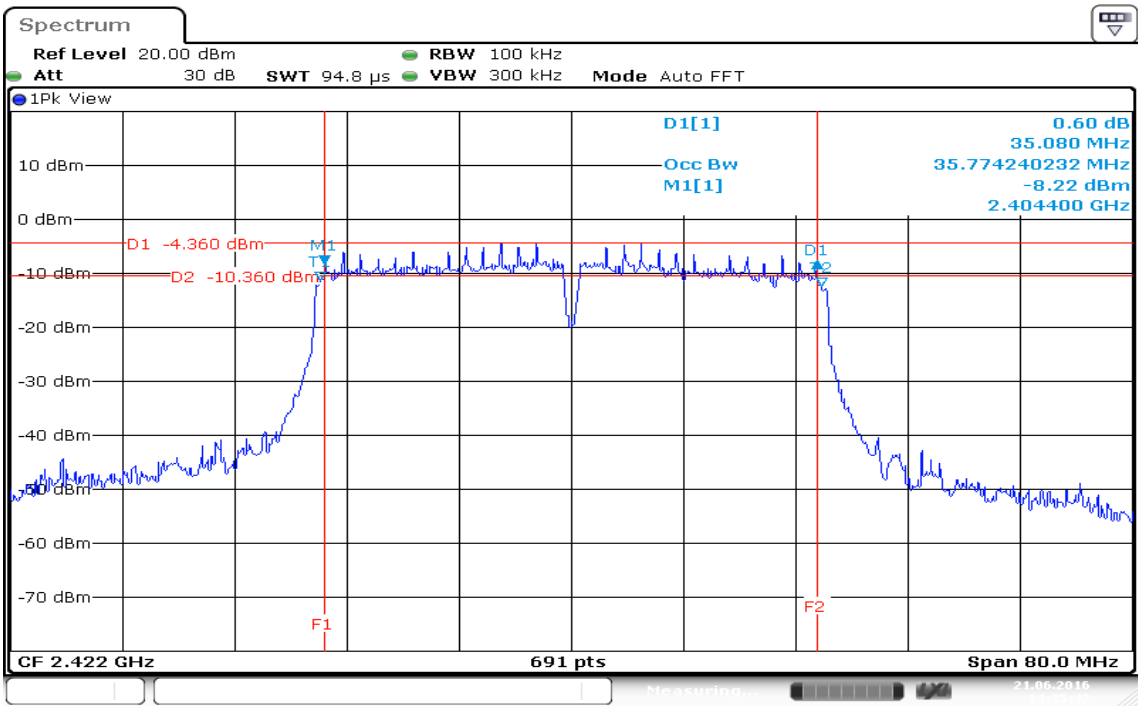
99% Bandwidth (CH High)



Date: 21.JUN.2016 14:31:13

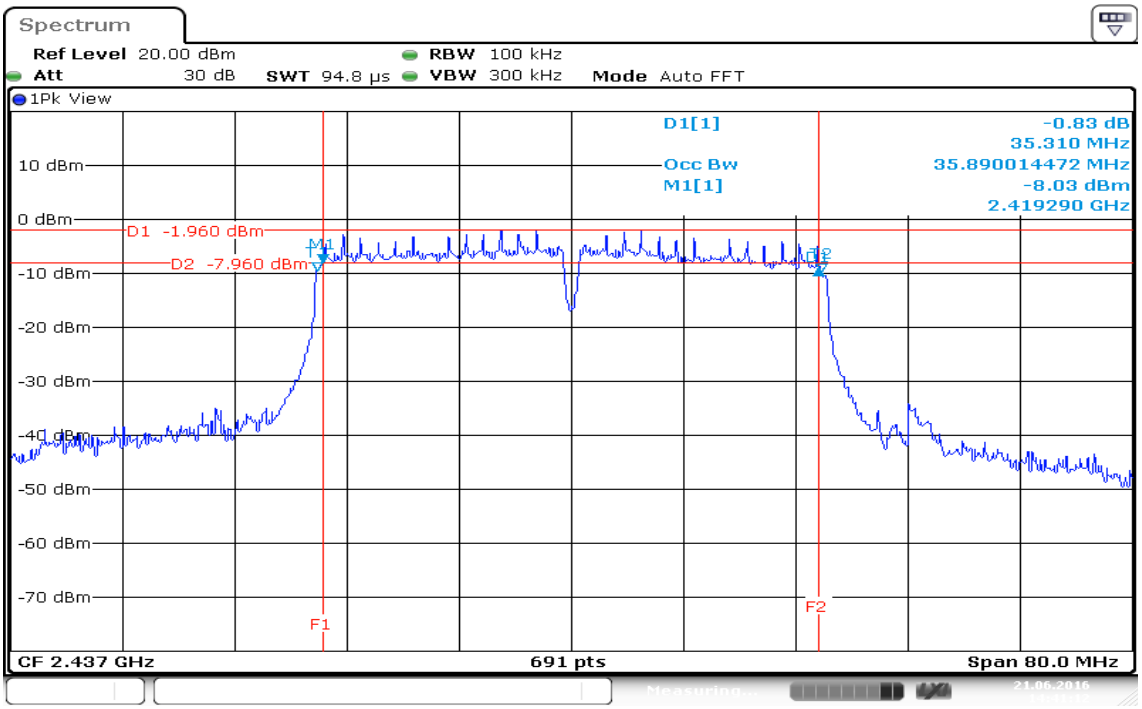
IEEE 802.11n HT 40 MHz mode/ Chain 0

99% Bandwidth (CH Low)



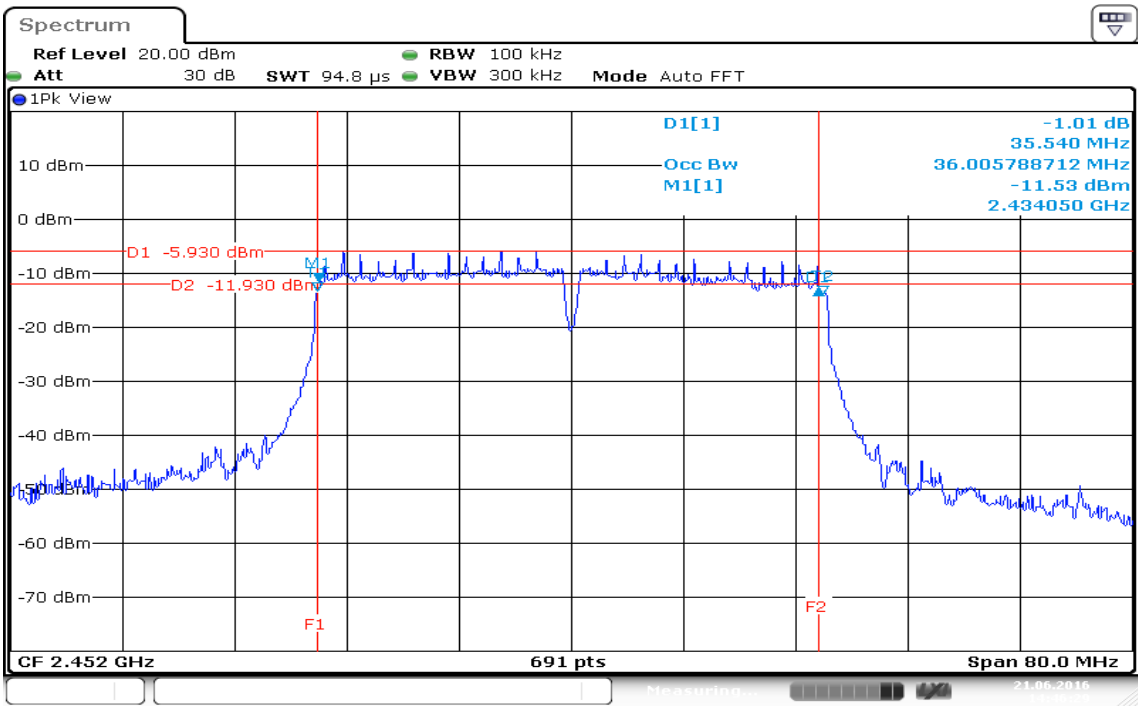
Date: 21.JUN.2016 14:35:42

99% Bandwidth (CH Mid)



Date: 21.JUN.2016 14:41:12

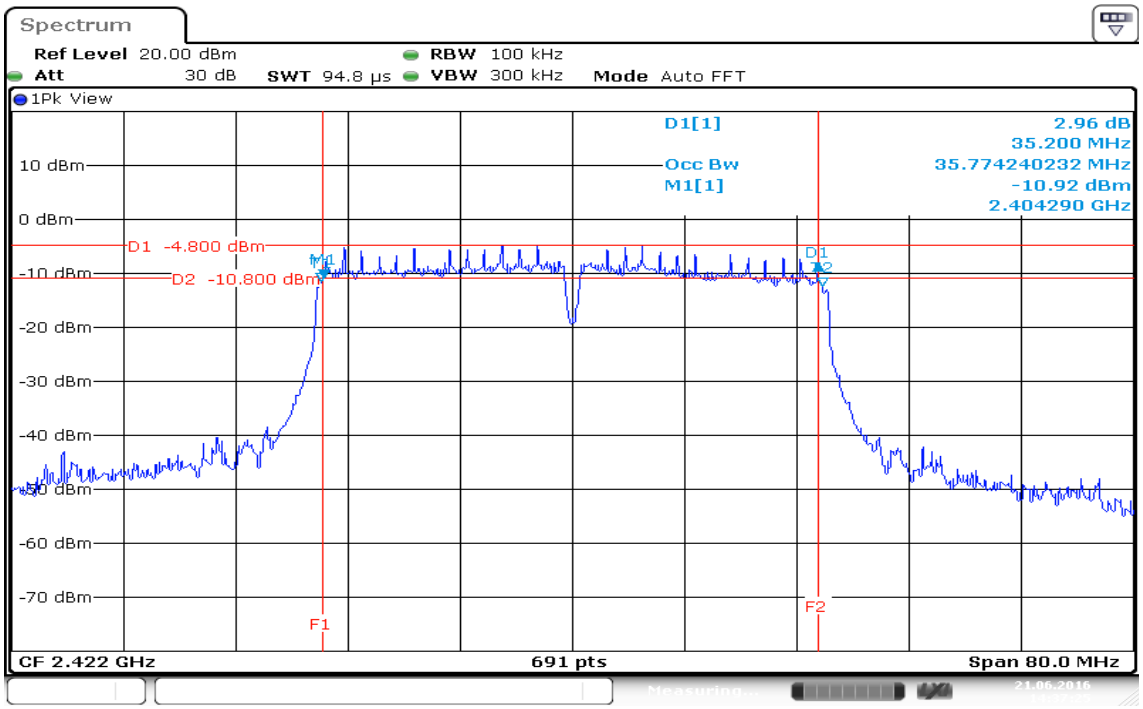
99% Bandwidth (CH High)



Date: 21.JUN.2016 14:46:29

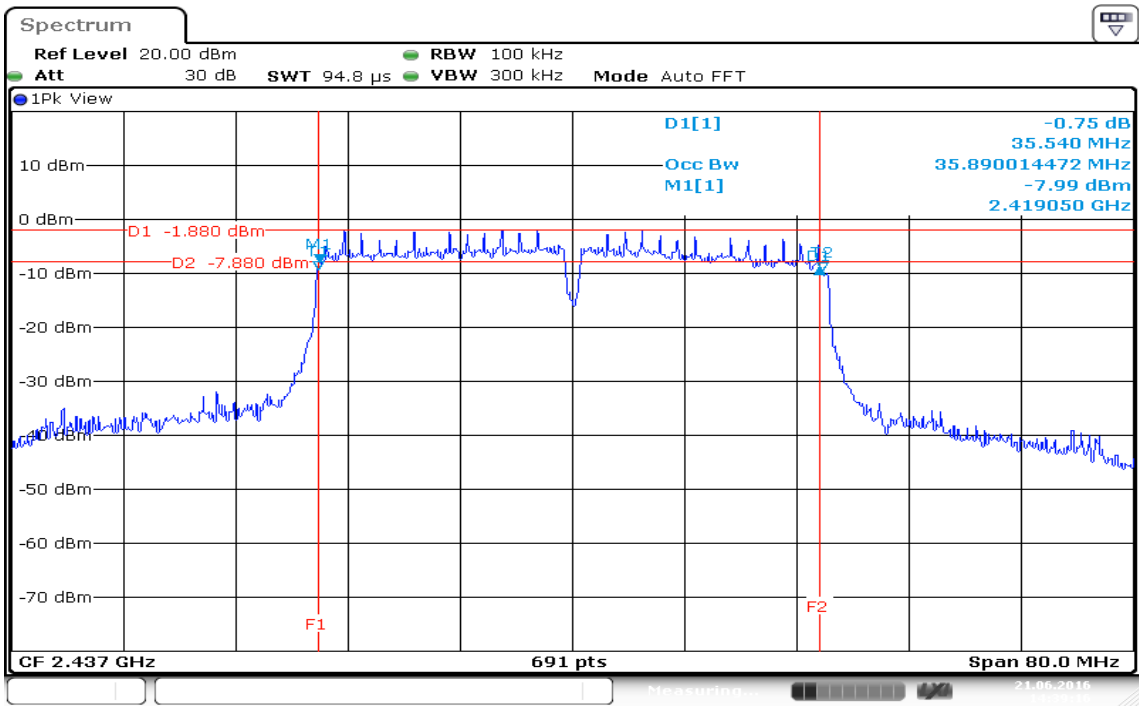
IEEE 802.11n HT 40 MHz mode / Chain 1

99% Bandwidth (CH Low)



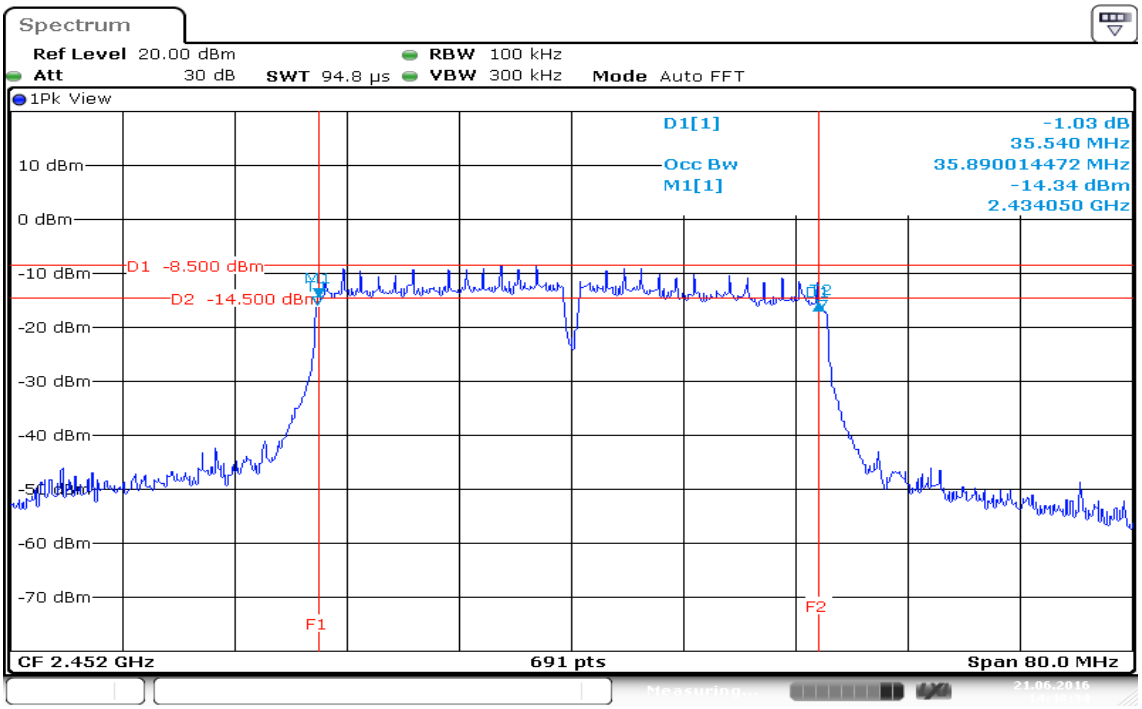
Date: 21.JUN.2016 14:37:26

99% Bandwidth (CH Mid)



Date: 21.JUN.2016 14:39:16

99% Bandwidth (CH High)



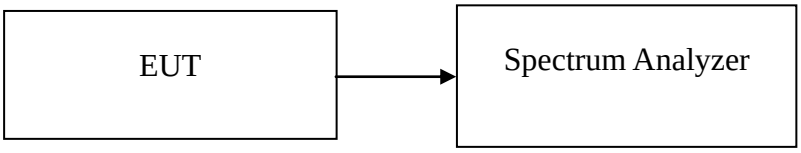
Date: 21.JUN.2016 14:48:34

7.2 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

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW= 300kHz, Span = 50 MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

No non-compliance noted

Test Data

IEEE 802.11b mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	10.0720	>500	PASS
Mid	2437	10.0720		PASS
High	2462	10.0720		PASS

IEEE 802.11b mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	10.0290	>500	PASS
Mid	2437	10.0720		PASS
High	2462	10.0720		PASS

IEEE 802.11g mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.3240	>500	PASS
Mid	2437	16.3240		PASS
High	2462	16.3240		PASS

IEEE 802.11g mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.2810	>500	PASS
Mid	2437	16.3240		PASS
High	2462	16.3240		PASS

IEEE 802.11n HT 20 MHz mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.2790	>500	PASS
Mid	2437	17.2790		PASS
High	2462	17.2790		PASS

IEEE 802.11n HT 20 MHz mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.1490	>500	PASS
Mid	2437	17.3230		PASS
High	2462	17.4960		PASS

IEEE 802.11n HT 40 MHz mode / Chain 0

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	35.0800	>500	PASS
Mid	2437	35.3100		PASS
High	2452	35.5400		PASS

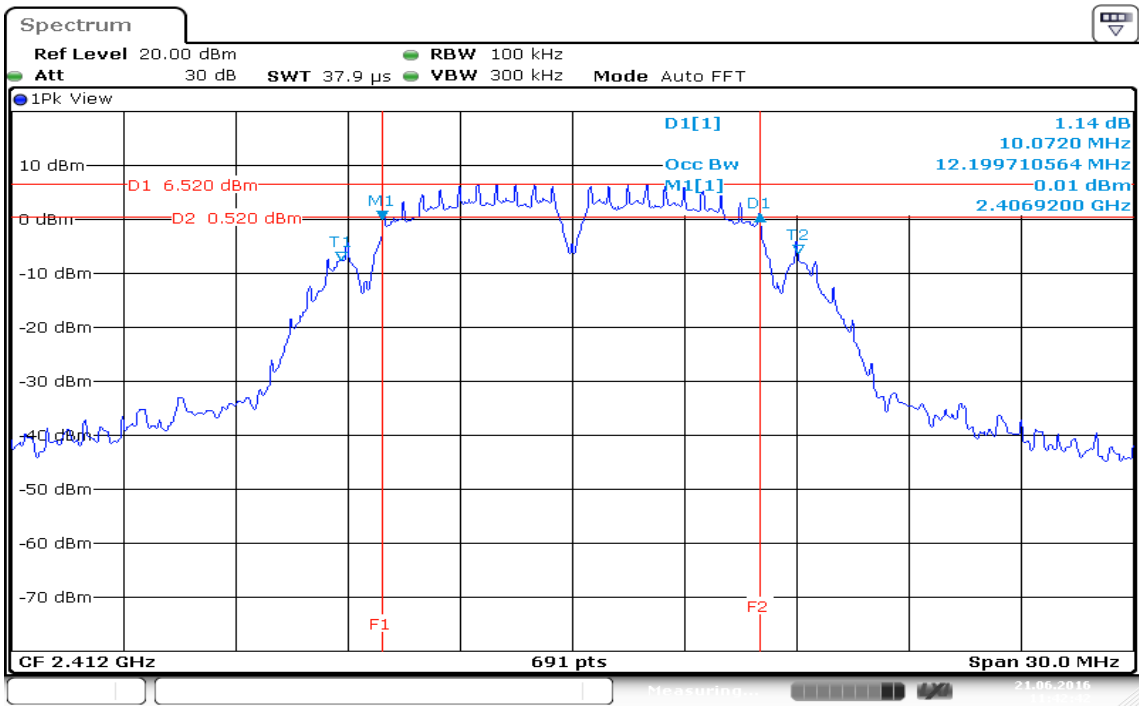
IEEE 802.11n HT 40 MHz mode / Chain 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	35.2000	>500	PASS
Mid	2437	35.5400		PASS
High	2452	35.5400		PASS

Test Plot

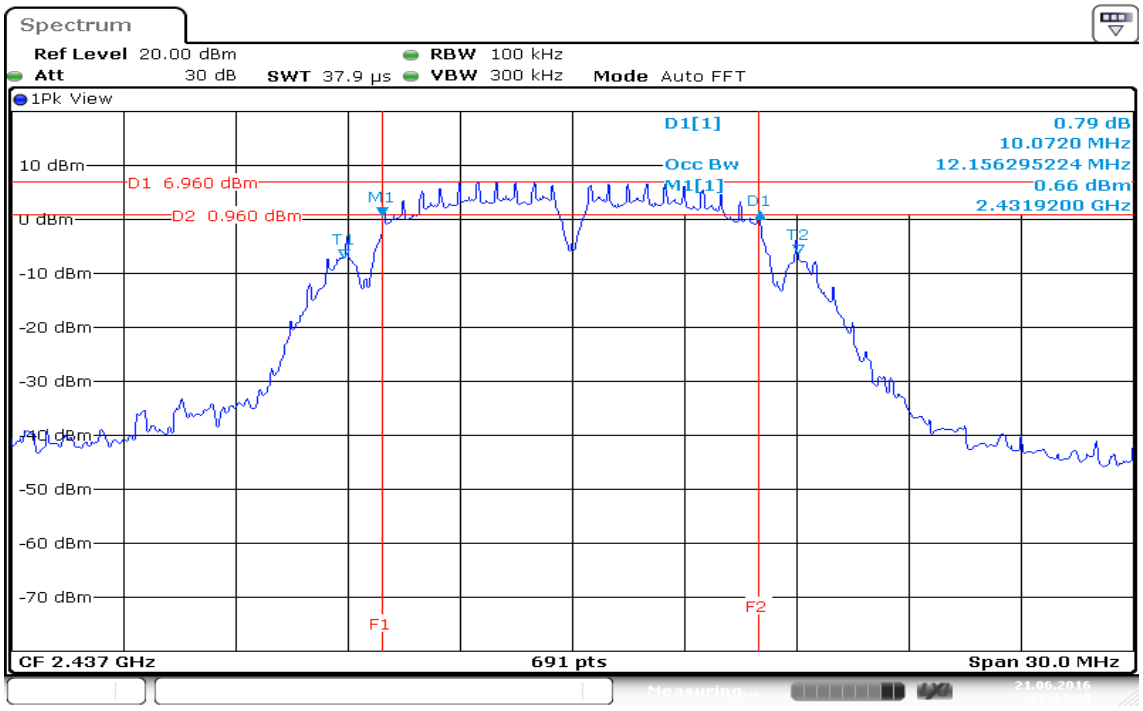
IEEE 802.11b mode/ Chain 0

6dB Bandwidth (CH Low)



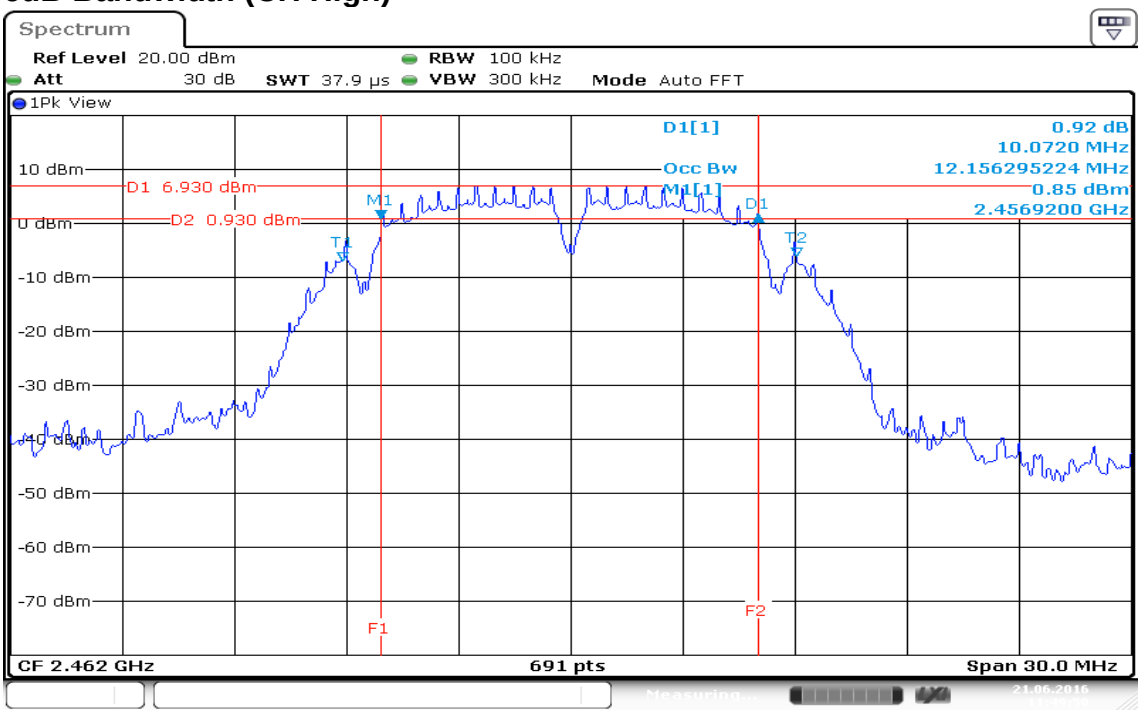
Date: 21.JUN.2016 11:42:43

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 11:44:30

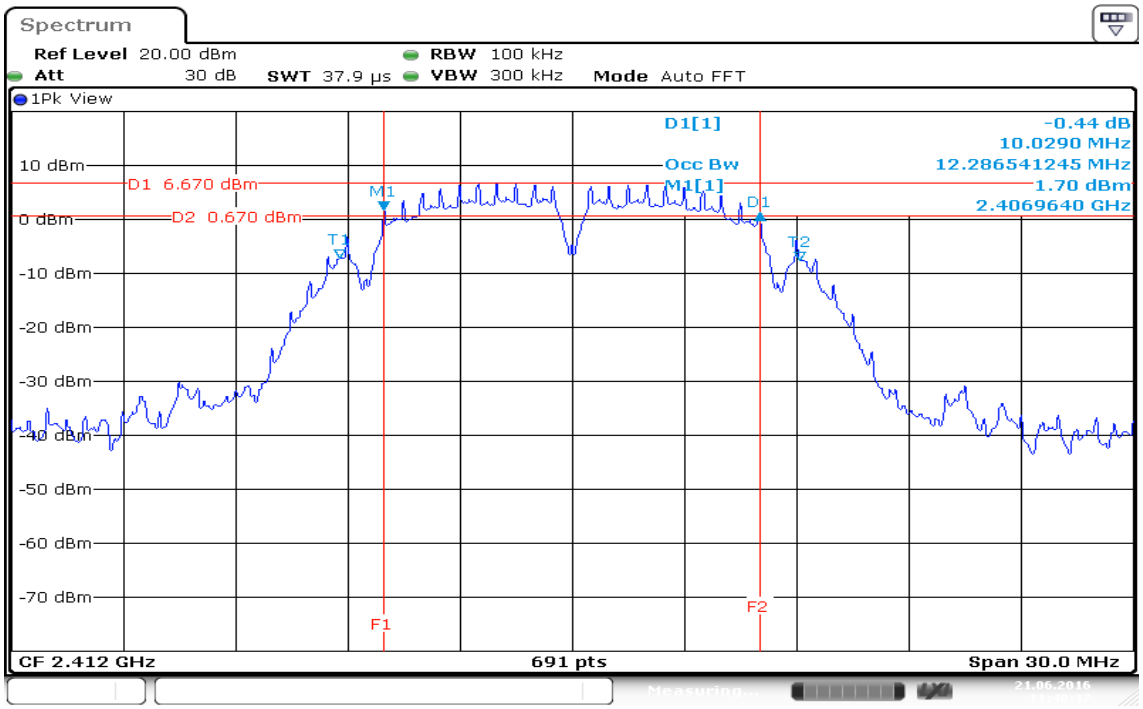
6dB Bandwidth (CH High)



Date: 21.JUN.2016 11:49:50

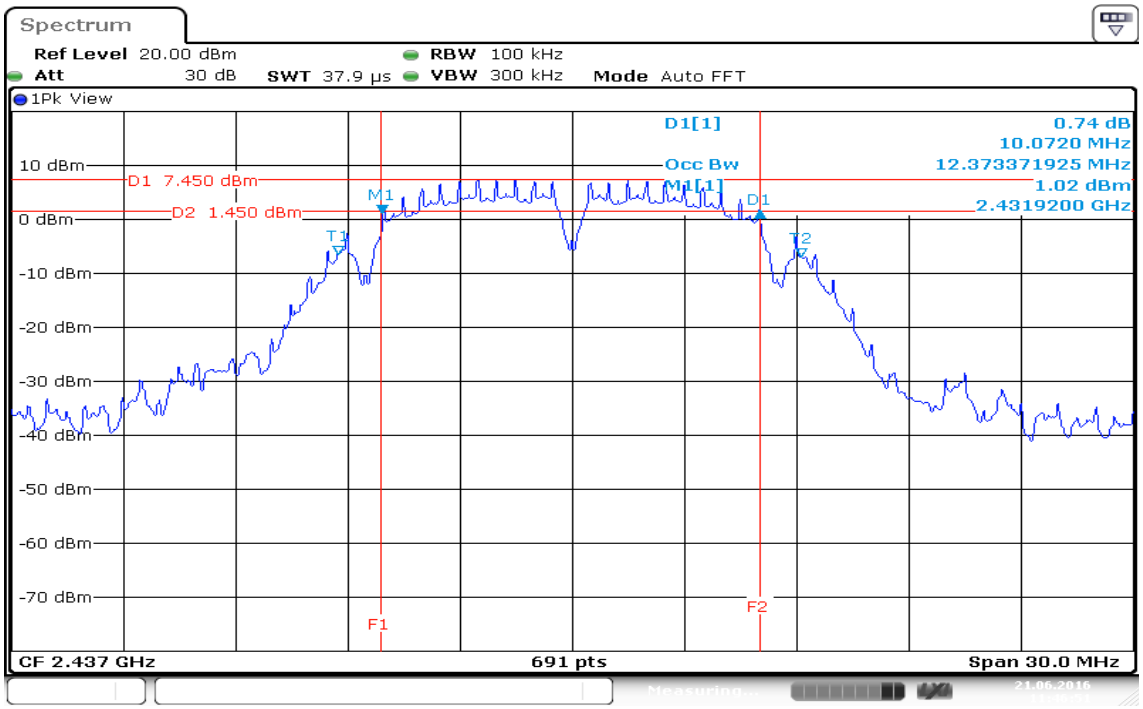
IEEE 802.11b mode/ Chain 1

6dB Bandwidth (CH Low)



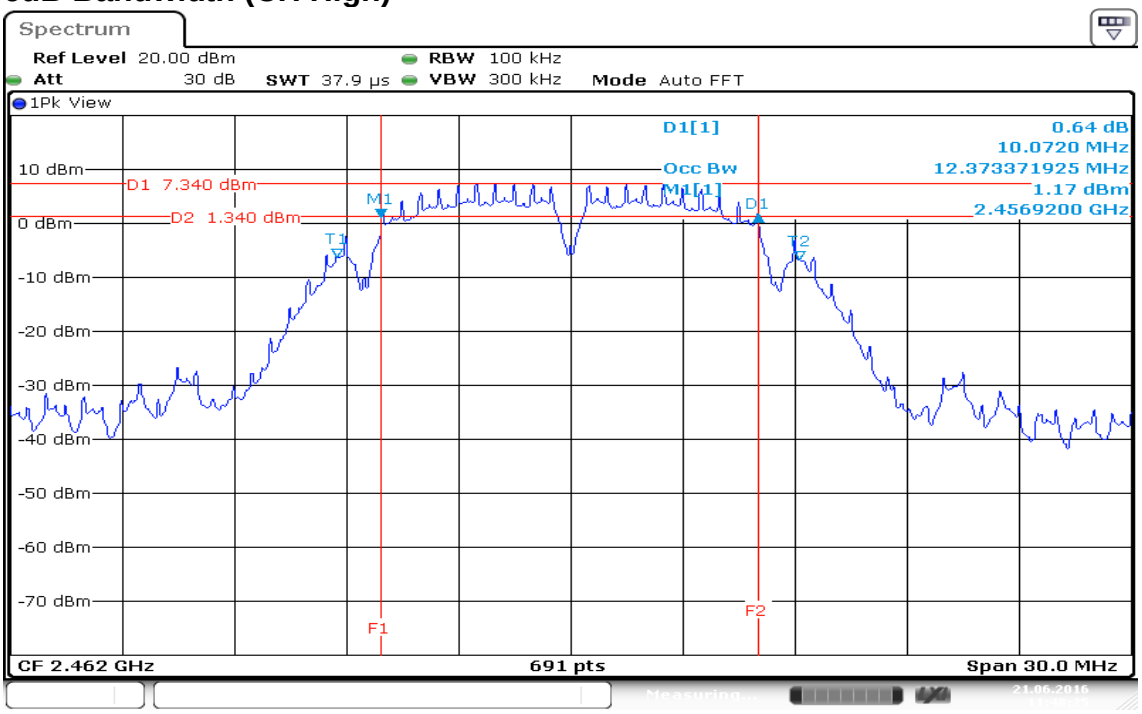
Date: 21.JUN.2016 11:40:38

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 11:46:51

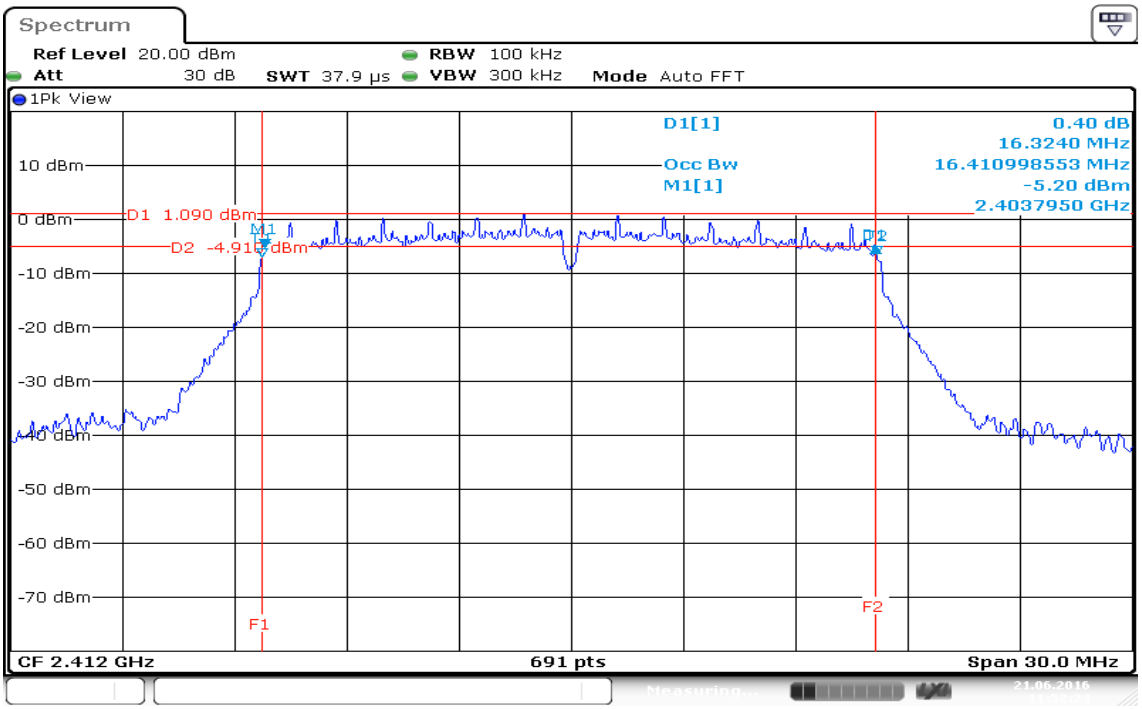
6dB Bandwidth (CH High)



Date: 21.JUN.2016 11:48:26

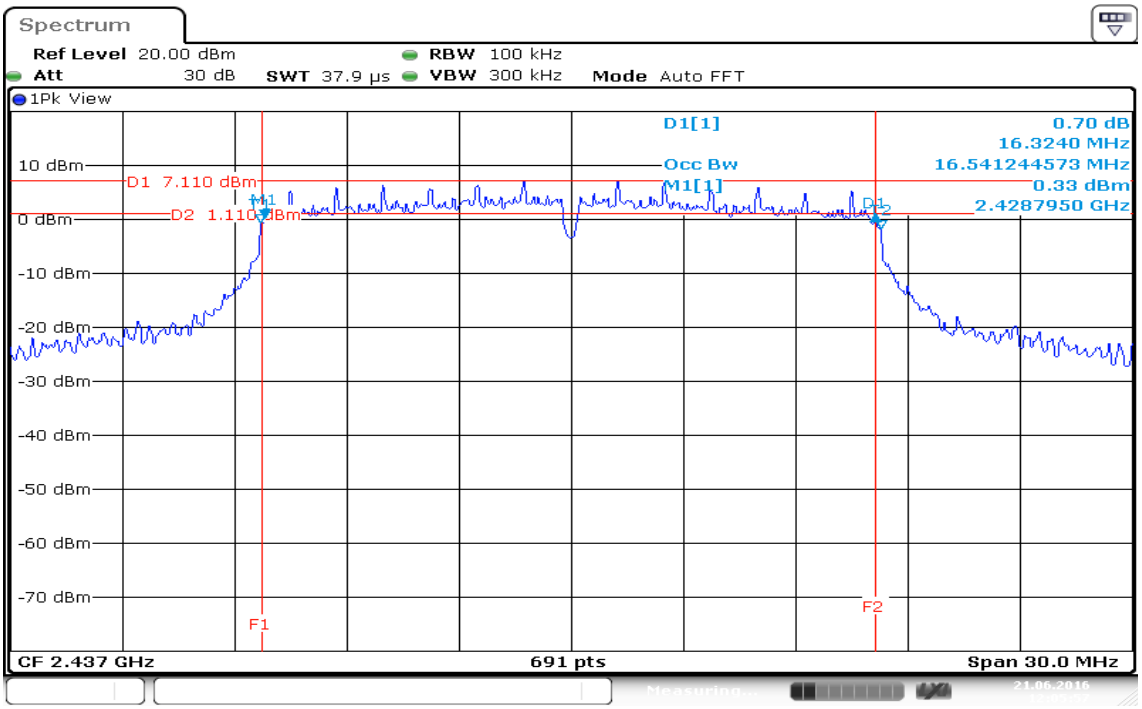
IEEE 802.11g mode / Chain 0

6dB Bandwidth (CH Low)



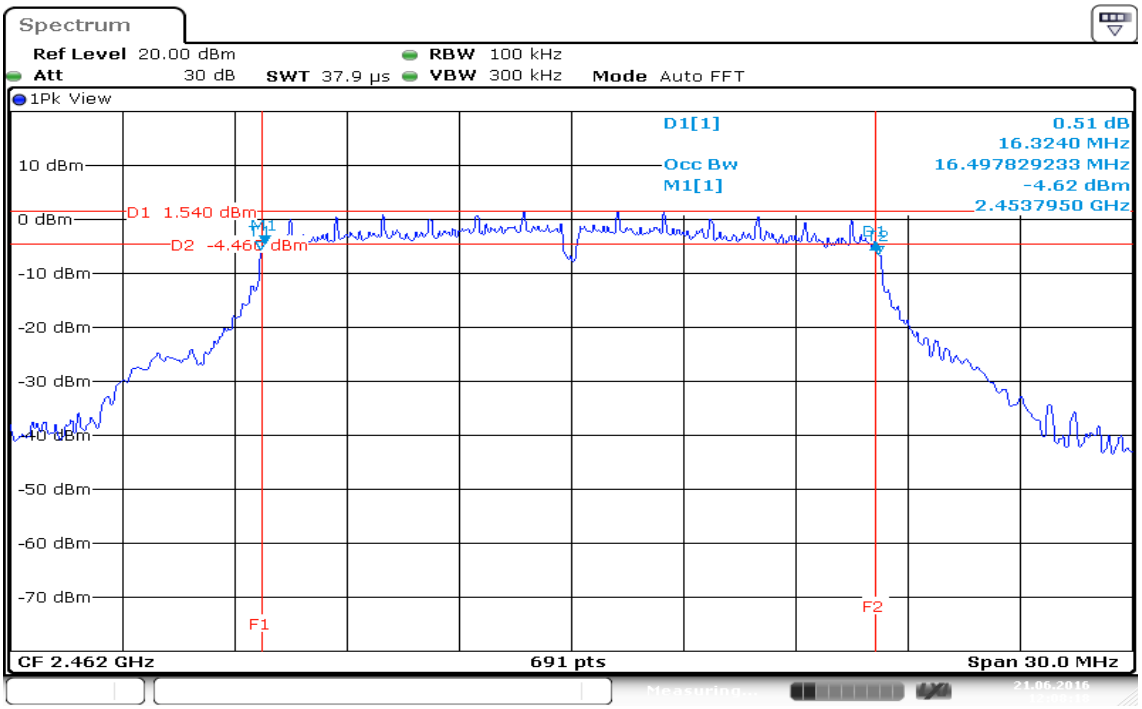
Date: 21.JUN.2016 11:52:25

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 12:05:58

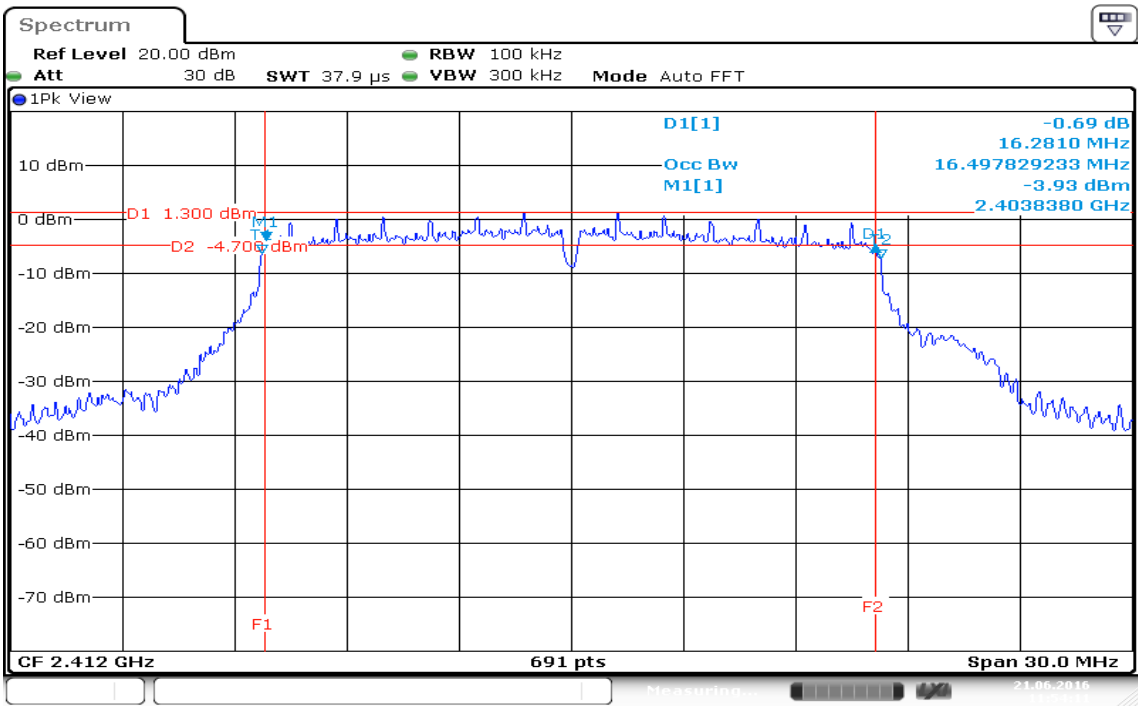
6dB Bandwidth (CH High)



Date: 21.JUN.2016 12:08:19

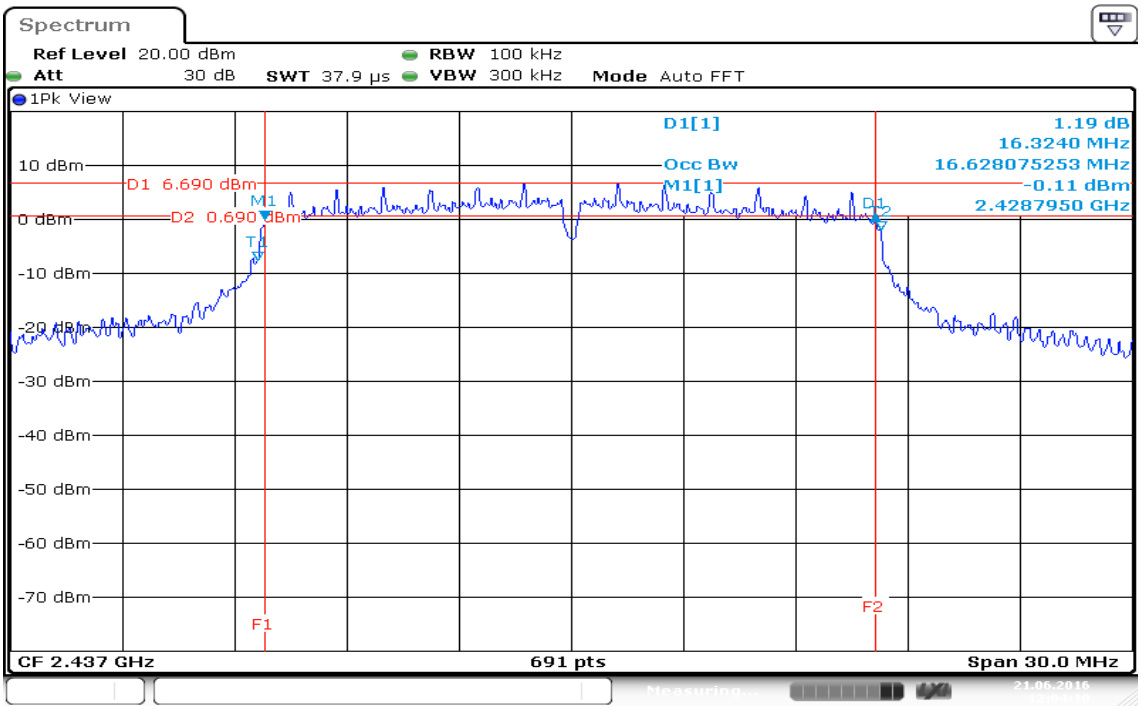
IEEE 802.11g mode / Chain 1

6dB Bandwidth (CH Low)



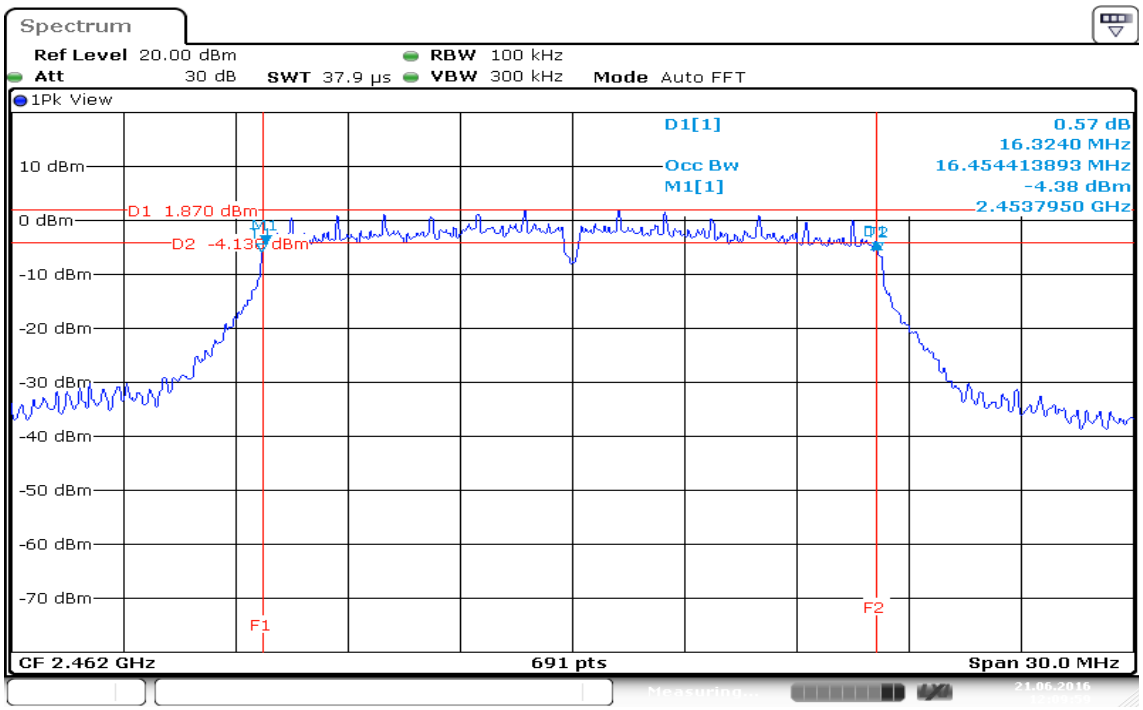
Date: 21.JUN.2016 11:54:11

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 12:04:11

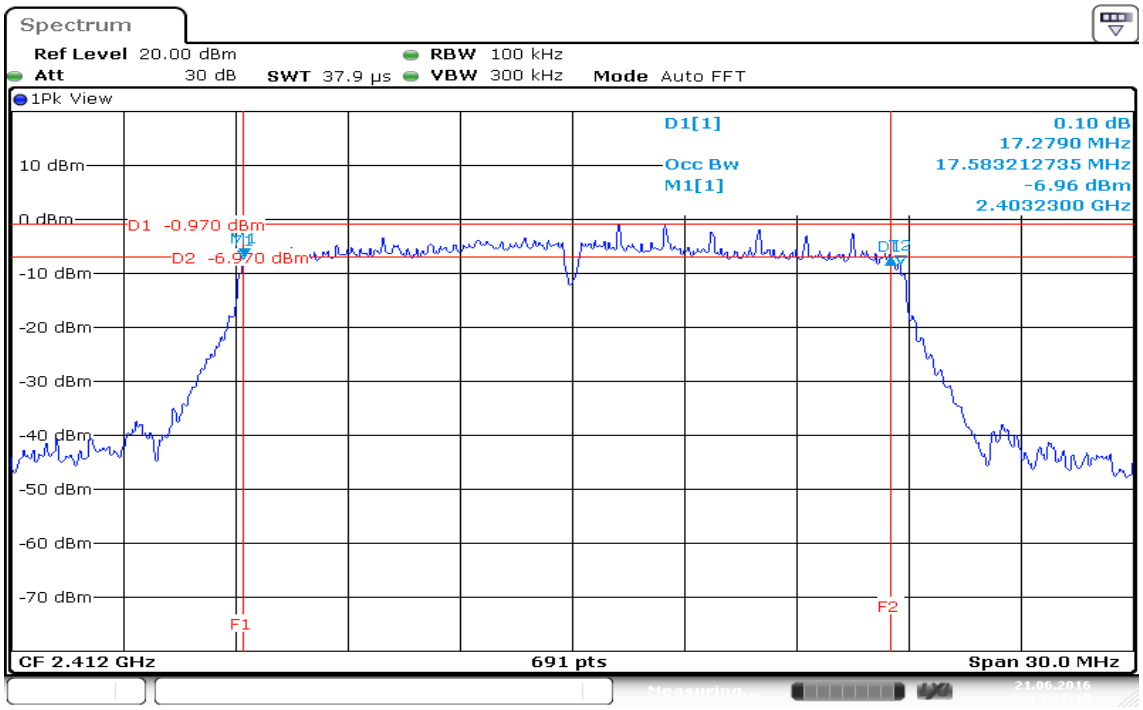
6dB Bandwidth (CH High)



Date: 21.JUN.2016 12:09:59

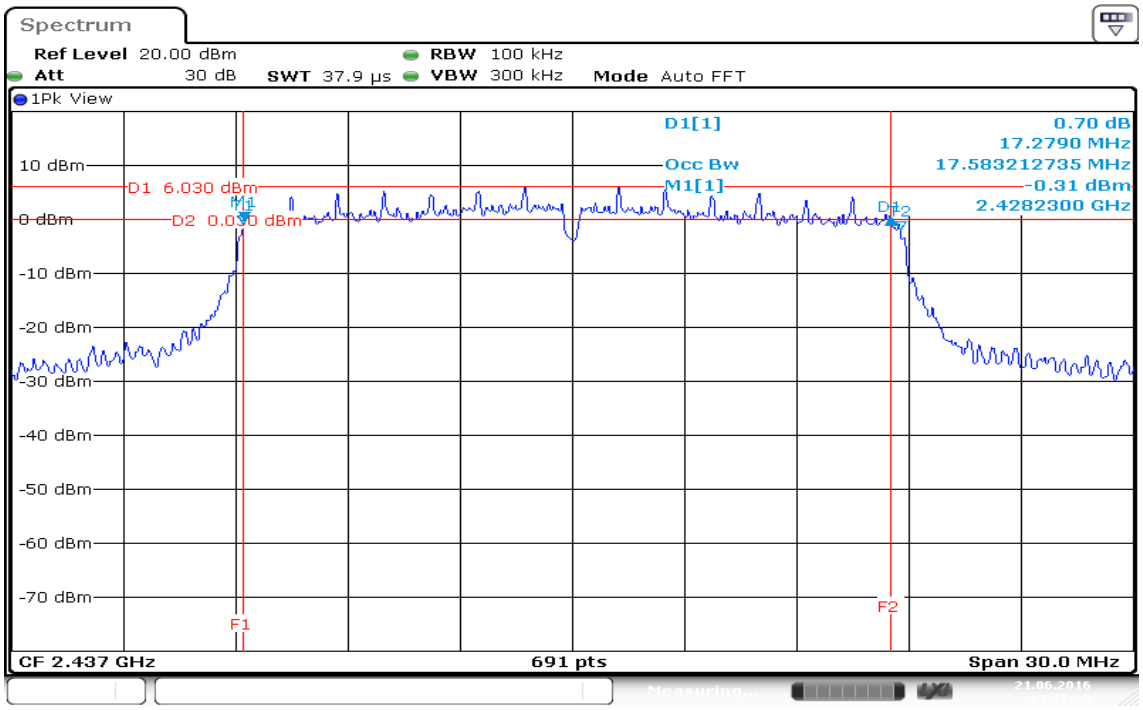
IEEE 802.11n HT 20 MHz mode / Chain 0

6dB Bandwidth (CH Low)



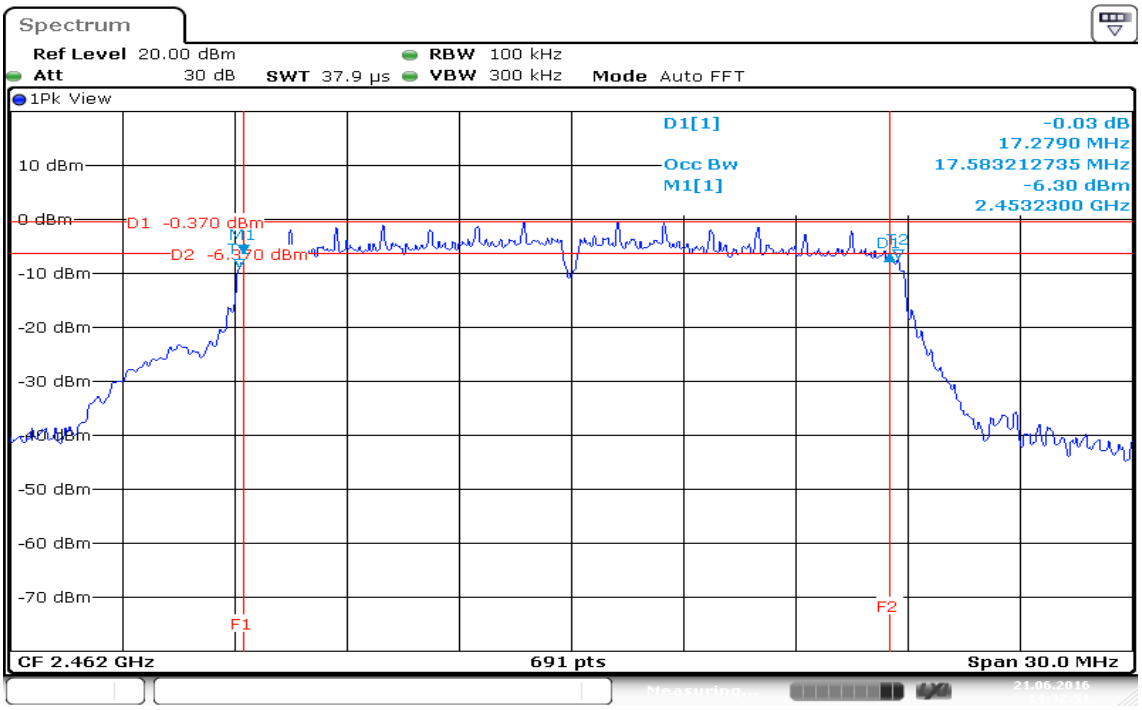
Date: 21.JUN.2016 14:03:16

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 14:27:07

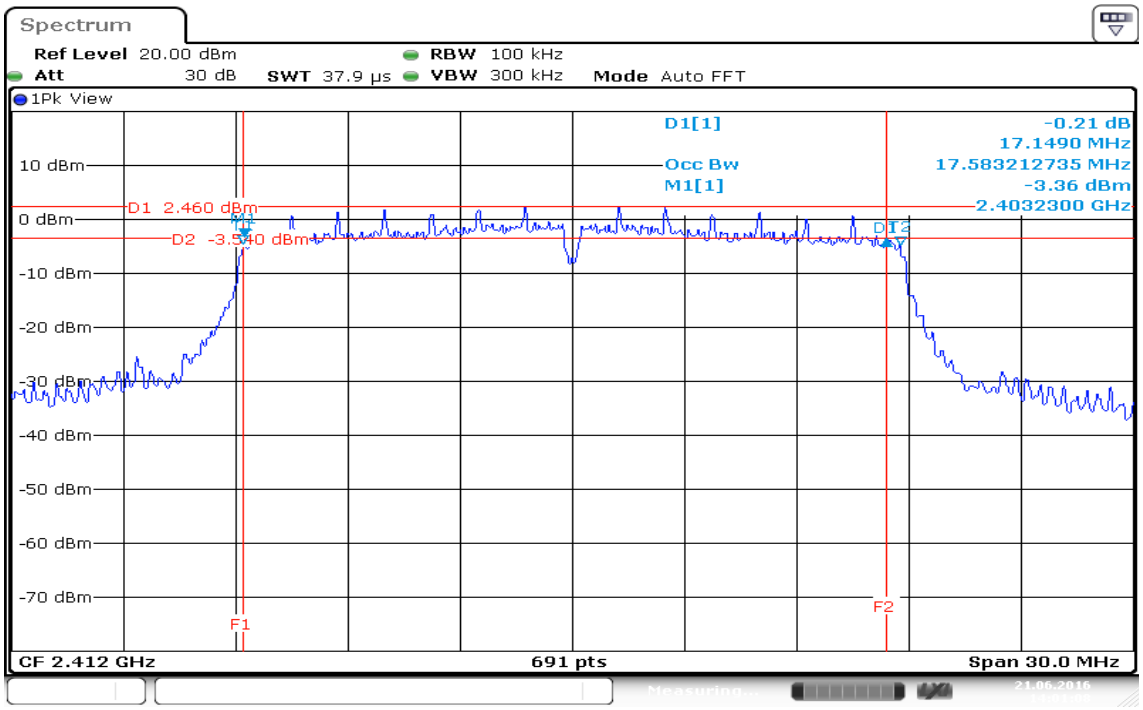
6dB Bandwidth (CH High)



Date: 21.JUN.2016 14:32:51

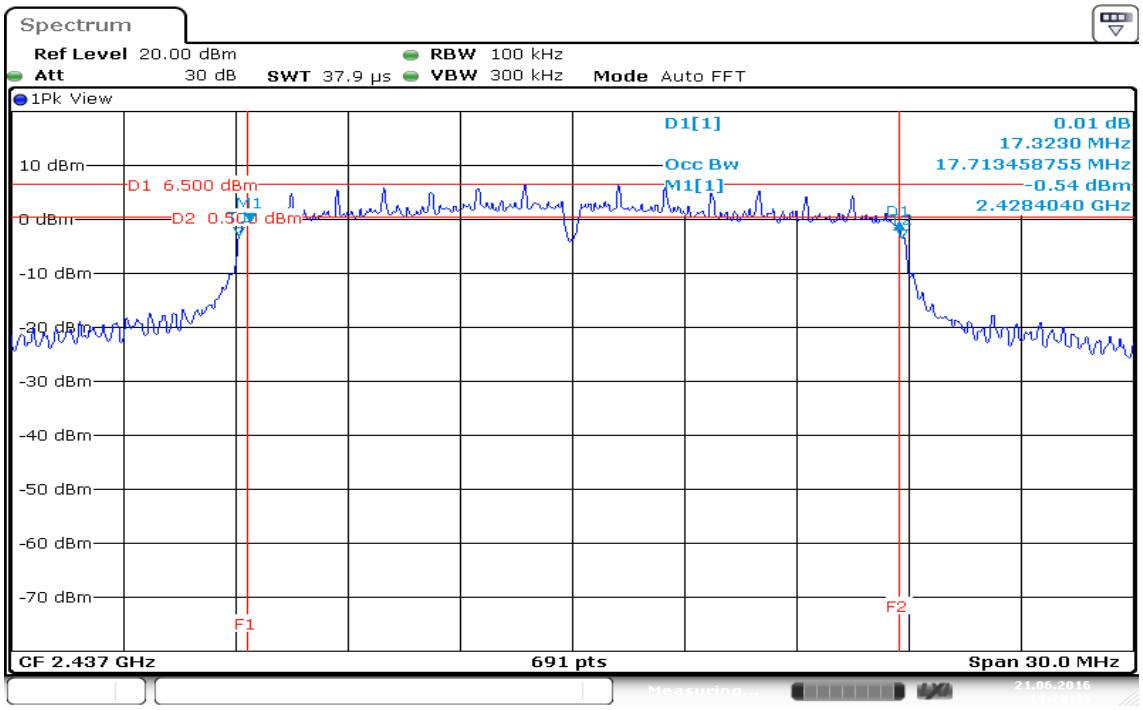
IEEE 802.11n HT 20 MHz mode / Chain 1

6dB Bandwidth (CH Low)



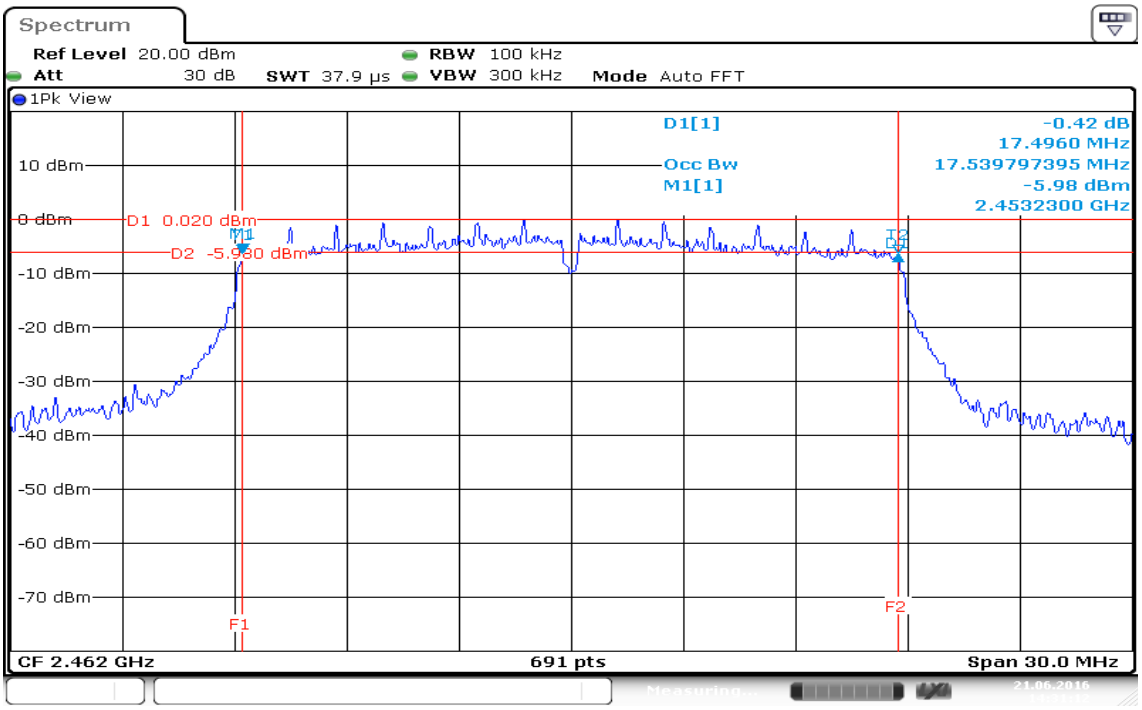
Date: 21.JUN.2016 14:01:08

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 14:28:46

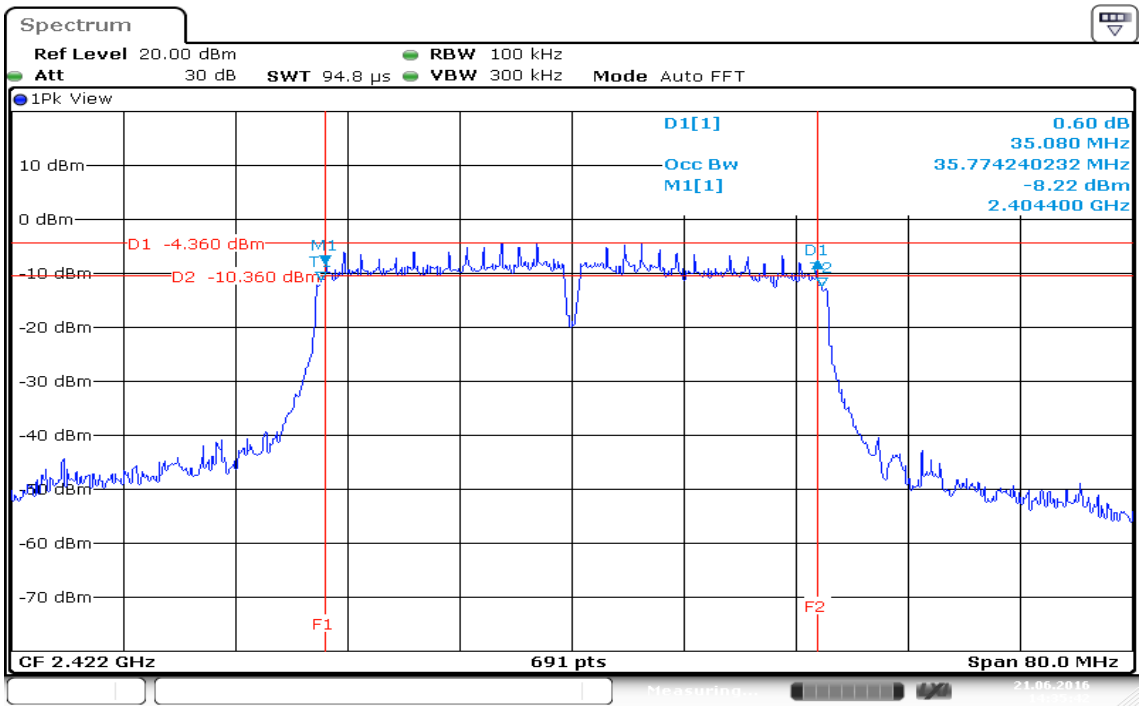
6dB Bandwidth (CH High)



Date: 21.JUN.2016 14:31:13

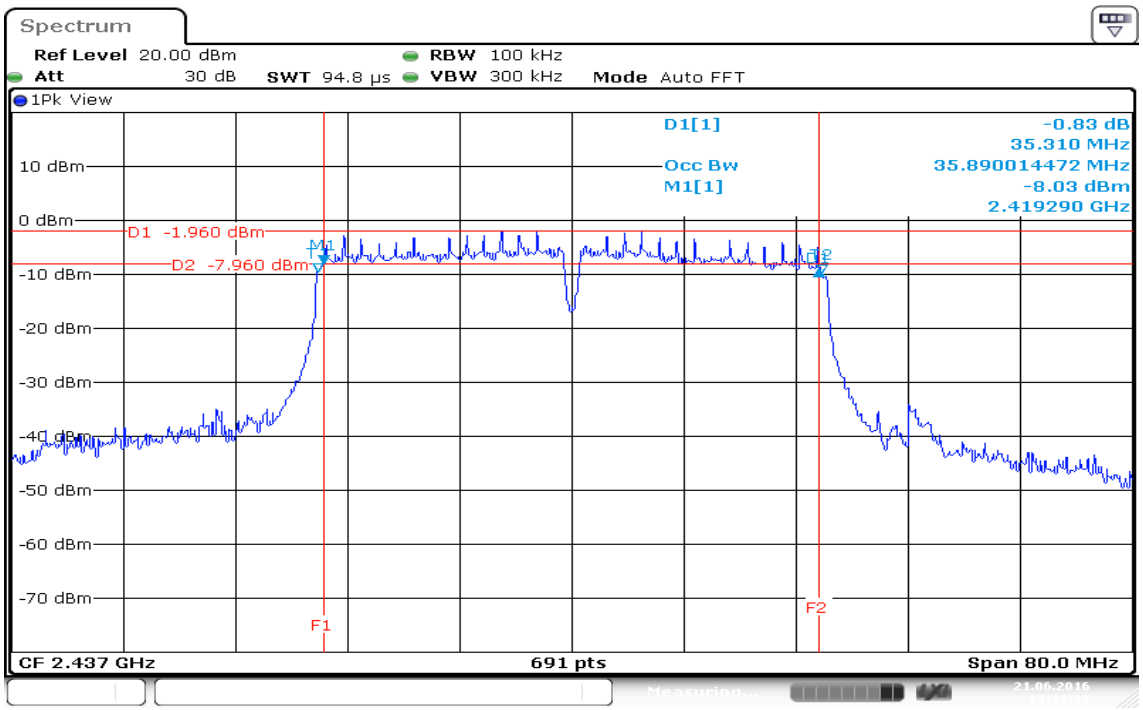
IEEE 802.11n HT 40 MHz mode / Chain 0

6dB Bandwidth (CH Low)



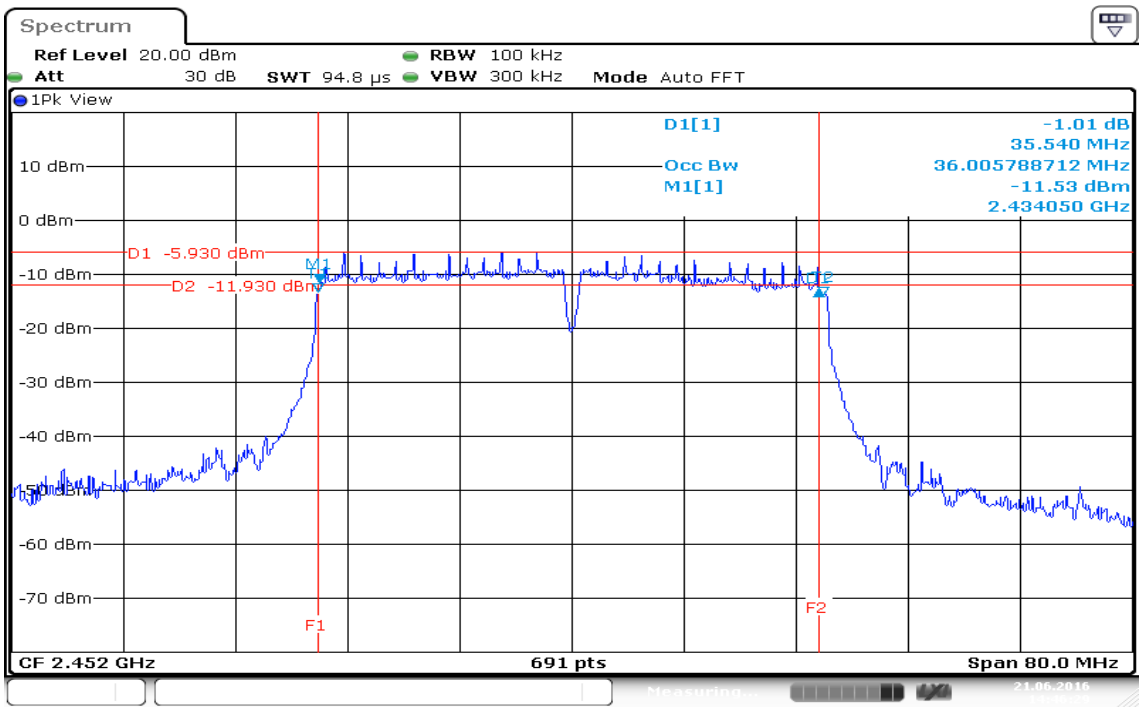
Date: 21.JUN.2016 14:35:42

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 14:41:12

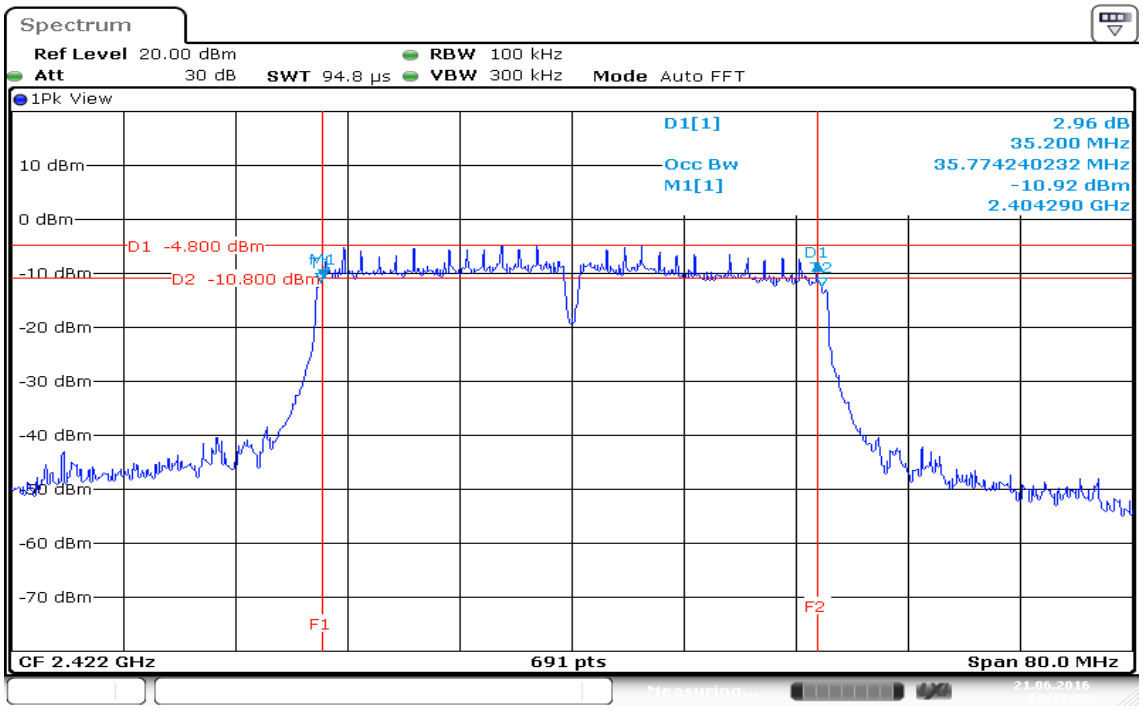
6dB Bandwidth (CH High)



Date: 21.JUN.2016 14:46:29

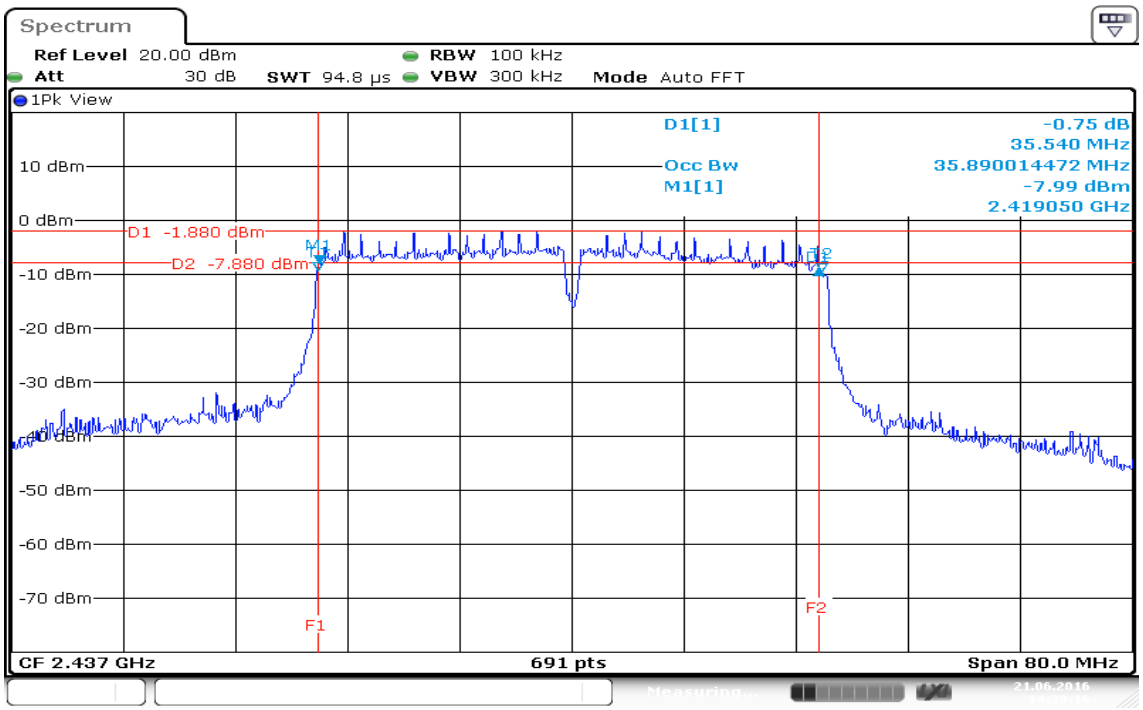
IEEE 802.11n HT 40 MHz mode / Chain 1

6dB Bandwidth (CH Low)



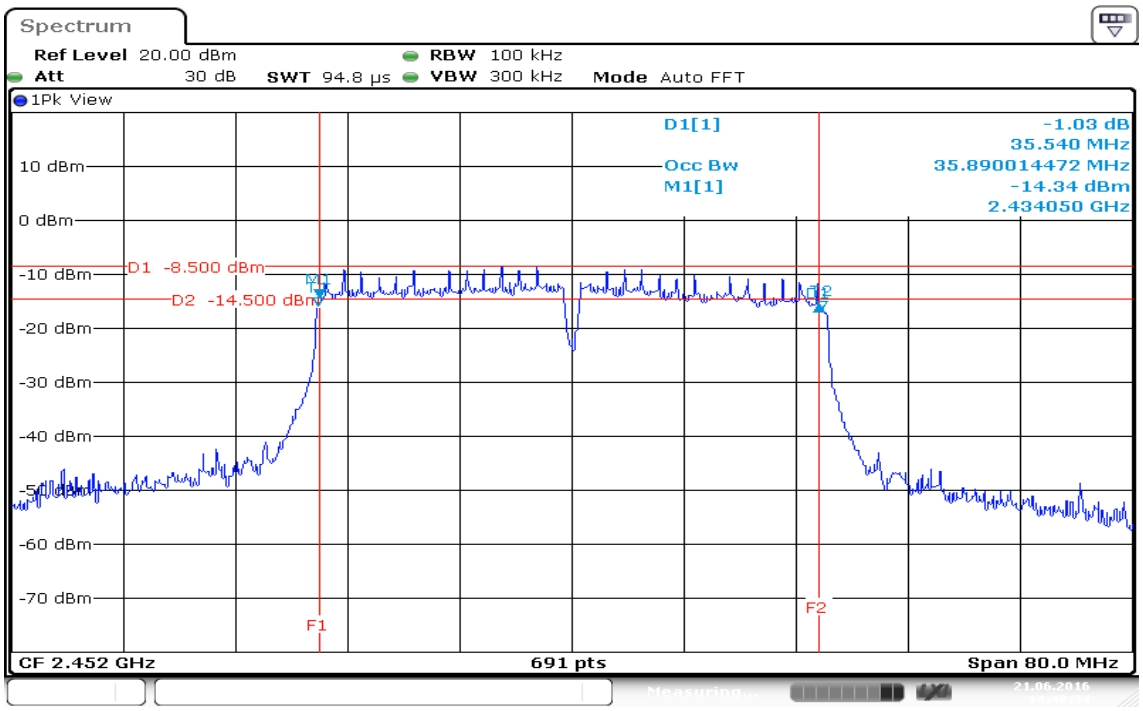
Date: 21.JUN.2016 14:37:26

6dB Bandwidth (CH Mid)



Date: 21.JUN.2016 14:39:16

6dB Bandwidth (CH High)



Date: 21.JUN.2016 14:48:34

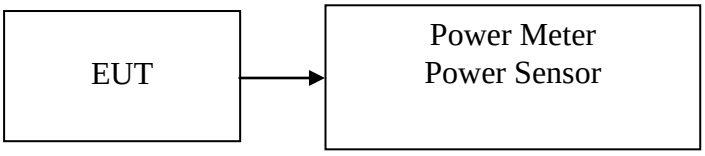
7.3 PEAK POWER

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

IEEE 802.11b mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2412	18.24	18.83	21.56	0.1432	30	PASS
Mid	2437	18.87	19.09	21.99	0.1581		PASS
High	2462	19.26	20.02	***22.67**	0.1849		PASS

IEEE 802.11g mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2412	20.25	19.97	23.12	0.2051	30	PASS
Mid	2437	21.85	22.46	***25.18**	0.3296		PASS
High	2462	21.12	20.58	23.87	0.2438		PASS

IEEE 802.11n HT 20 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2412	18.53	19.32	21.95	0.1567	30	PASS
Mid	2437	21.64	22.27	***24.98**	0.3148		PASS
High	2462	19.31	19.82	22.58	0.1811		PASS

IEEE 802.11n HT 40 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)	Limit (dBm)	Result
Low	2422	17.56	18.03	20.81	0.1205	30	PASS
Mid	2437	19.73	20.13	***22.94**	0.1968		PASS
High	2452	17.65	17.39	20.53	0.1130		PASS

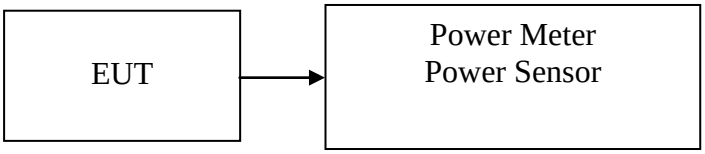
Remark:
1. Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000)+ Chain 1 (10^(Output Power /10)/1000)

7.4 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 peak power detection.

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	2412	15.12	15.75	18.46	0.0701
Mid	2437	15.51	15.92	18.73	0.0746
High	2462	15.83	16.26	19.06	0.0805

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	2412	10.74	11.37	14.08	0.0256
Mid	2437	16.34	16.74	19.55	0.0902
High	2462	11.66	11.59	14.64	0.0291

Test mode: IEEE 802.11n HT 20 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	2412	9.27	9.87	12.59	0.0182
Mid	2437	15.62	16.05	18.85	0.0767
High	2462	9.87	10.23	13.06	0.0202

Test mode: IEEE 802.11n HT 40 MHz mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	2422	7.39	7.65	10.53	0.0113
Mid	2437	10.28	10.74	13.53	0.0225
High	2452	7.11	7.29	10.21	0.0105

Remark: *Total Output Power (w) = Chain 0 (10^(Output Power /10)/1000) + Chain 1 (10^(Output Power /10)/1000)*

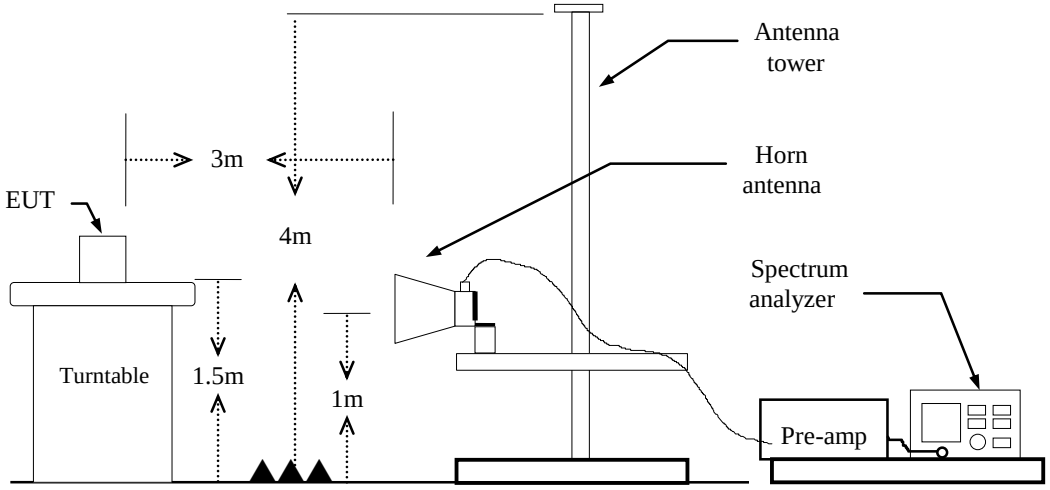
7.5 BAND EDGES MEASUREMENT

LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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



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≧98%, VBW=10Hz.
   if duty cycle<98% VBW=1/T.
   IEEE 802.11b mode: =98%, VBW=300Hz
   IEEE 802.11g mode: =90%, VBW=600Hz
   IEEE 802.11n HT 20 MHz mode: =88%, VBW=750Hz
   IEEE 802.11n HT 40 MHz mode: =79%, VBW=1.5kHz
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.
6. Result = Spectrum Reading + cable loss(spectrum to Amp) - Amp Gain + Cable loss(Amp to receive Ant)+ Receive Ant

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.

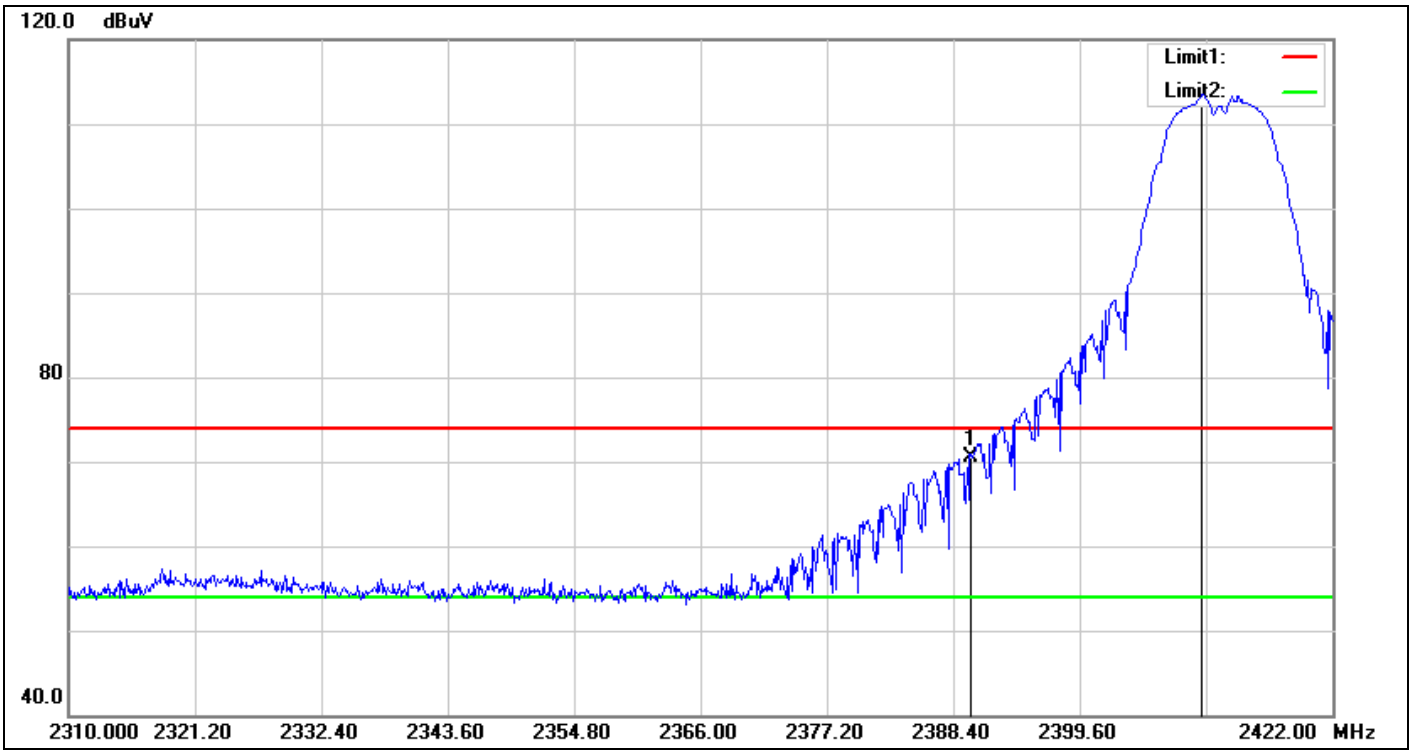
TEST RESULTS

Refer to attach spectrum analyzer data chart.

Band Edges

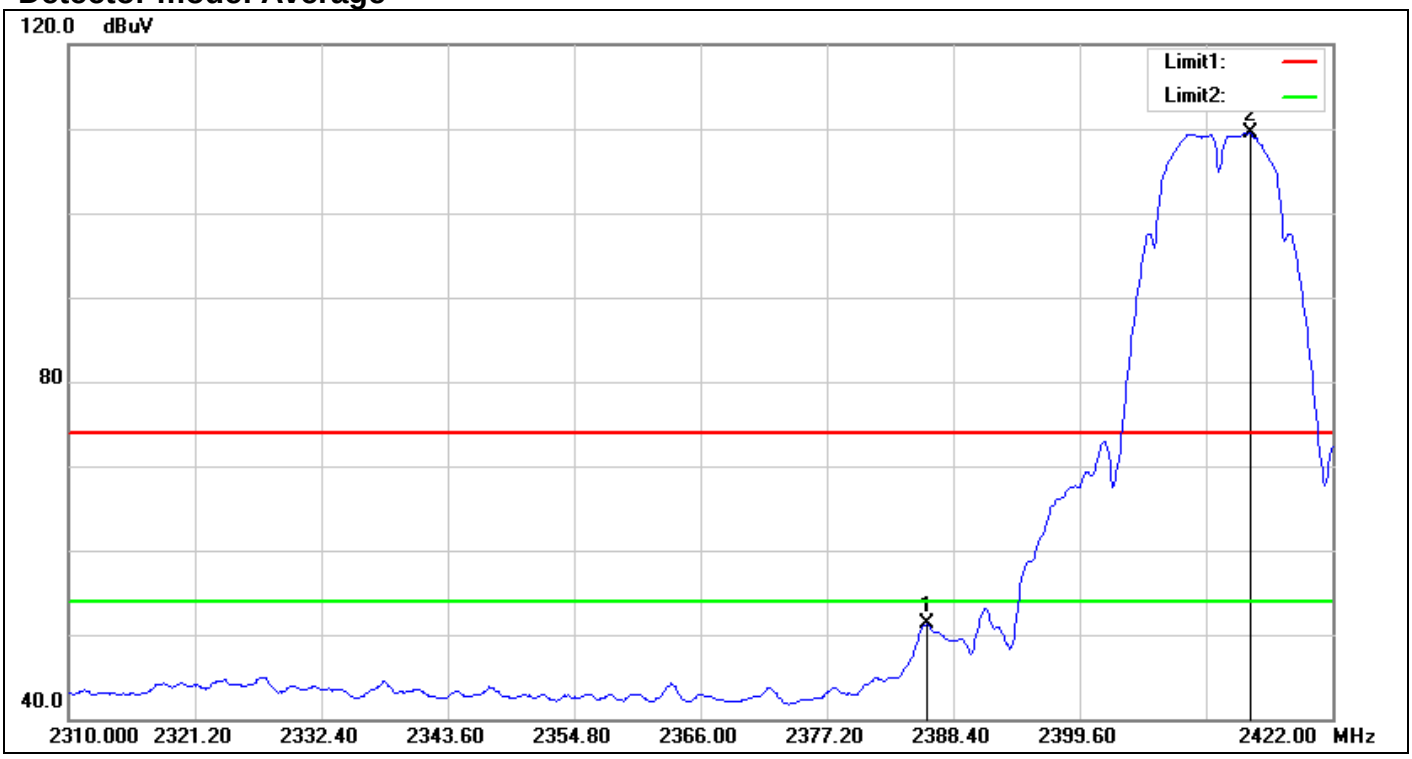
IEEE 802.11b Mode / CH Low

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2390.000	72.98	-2.49	70.49	74.00	-3.51	peak
2	2410.464	115.95	-2.43	113.52	-	-	peak

Detector mode: Average

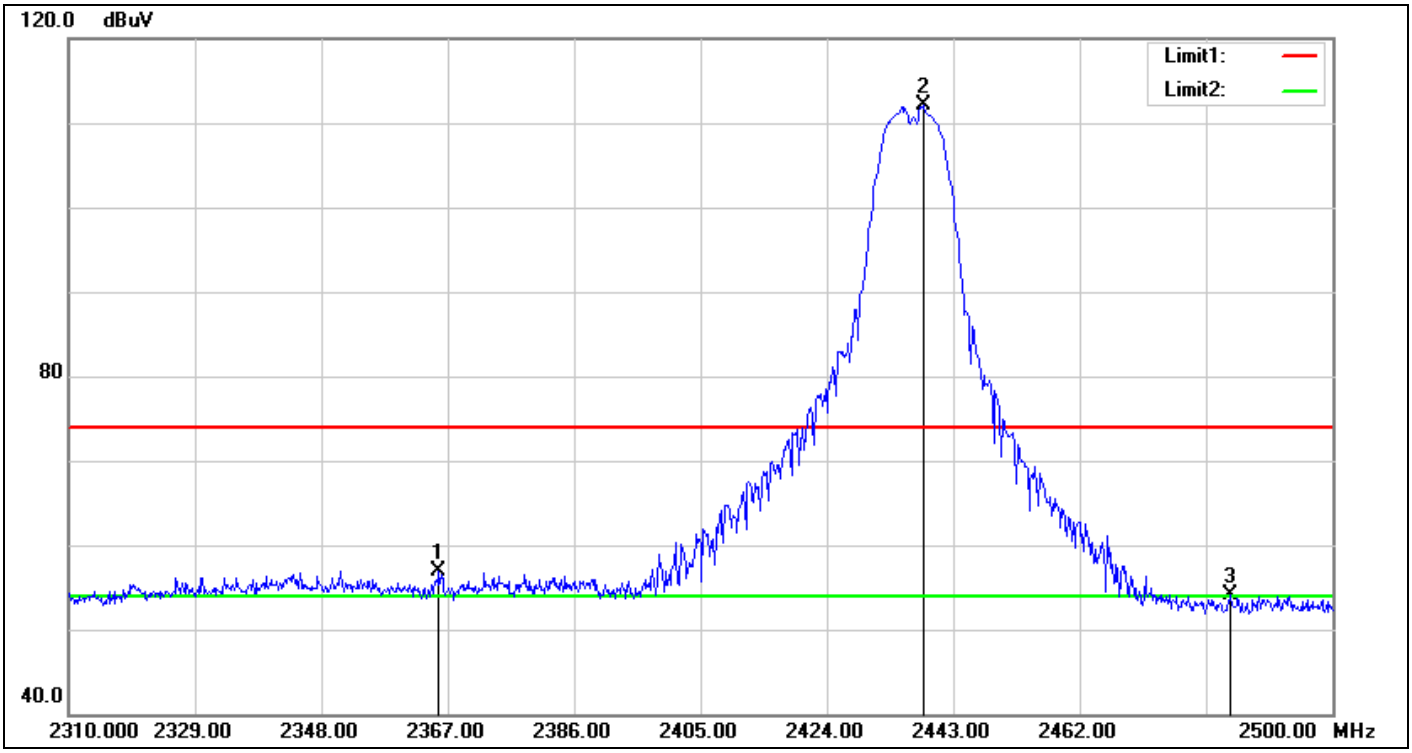


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2386.048	53.77	-2.53	51.24	54.00	-2.76	AVG
2	2414.720	111.86	-2.40	109.46	-	-	AVG

Band Edges

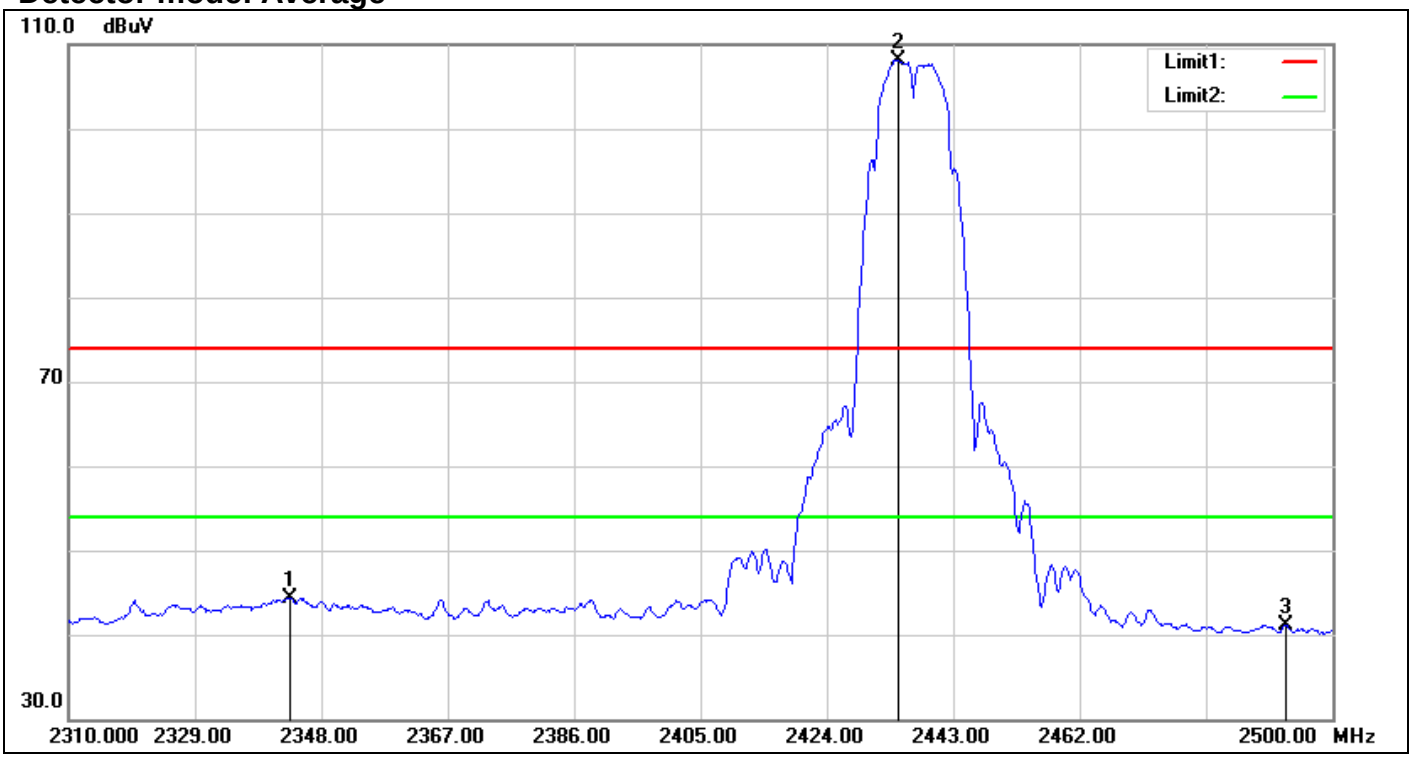
IEEE 802.11b Mode / CH Mid

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2365.670	59.56	-2.72	56.84	74.00	-17.16	peak
2	2438.440	114.23	-2.22	112.01	-	-	peak
3	2484.610	56.12	-1.98	54.14	74.00	-19.86	peak

Detector mode: Average

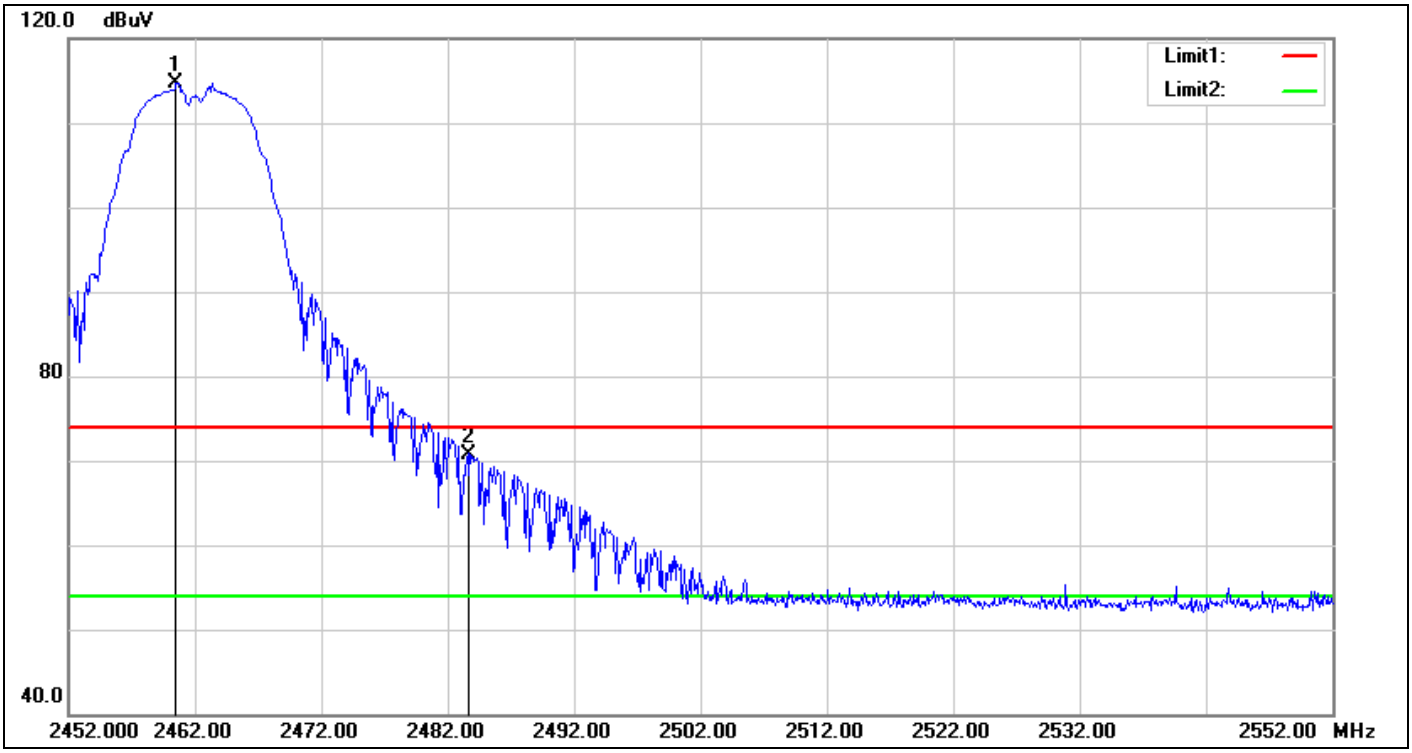


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2343.250	47.30	-2.91	44.39	54.00	-9.61	AVG
2	2434.640	110.42	-2.25	108.17	-	-	AVG
3	2492.970	42.98	-1.91	41.07	54.00	-12.93	AVG

Band Edges

IEEE 802.11b Mode / CH High

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2460.500	116.85	-2.10	114.75	-	-	peak
2	2483.600	72.79	-1.99	70.80	74.00	-3.20	peak

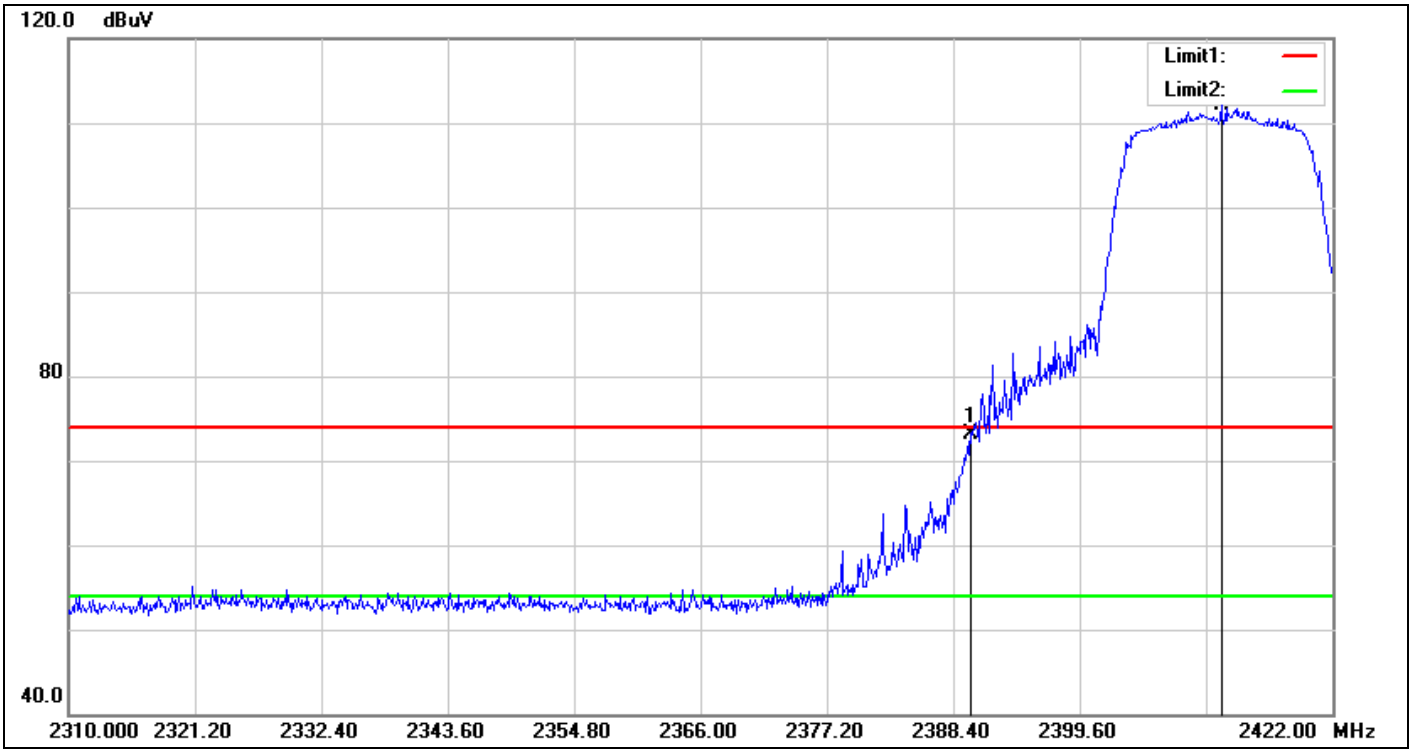
Detector mode: Average

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2459.700	113.12	-2.10	111.02	-	-	AVG
2	2486.900	53.19	-1.96	51.23	54.00	-2.77	AVG

Band Edges

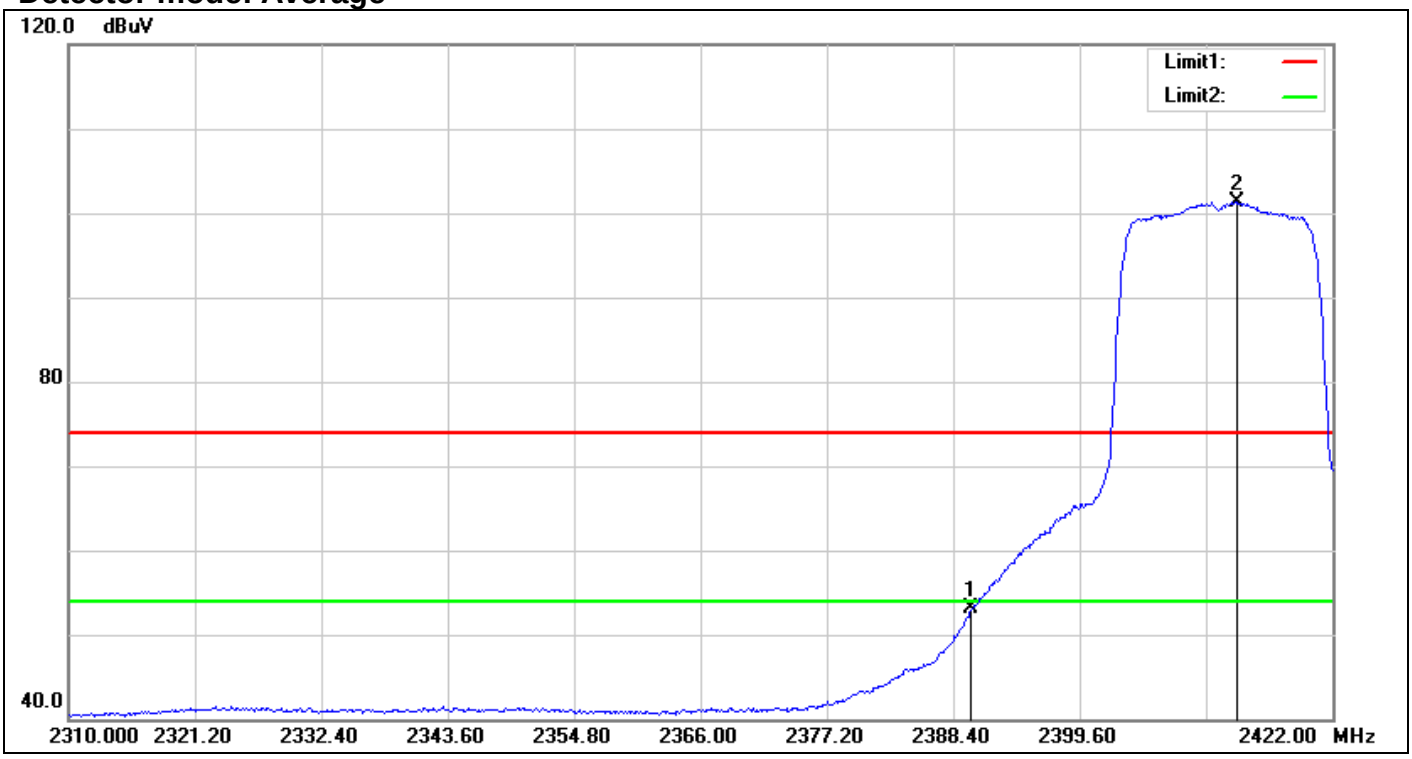
IEEE 802.11g Mode / CH Low

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2390.000	75.58	-2.49	73.09	74.00	-0.91	peak
2	2412.144	114.52	-2.41	112.11	-	-	peak

Detector mode: Average

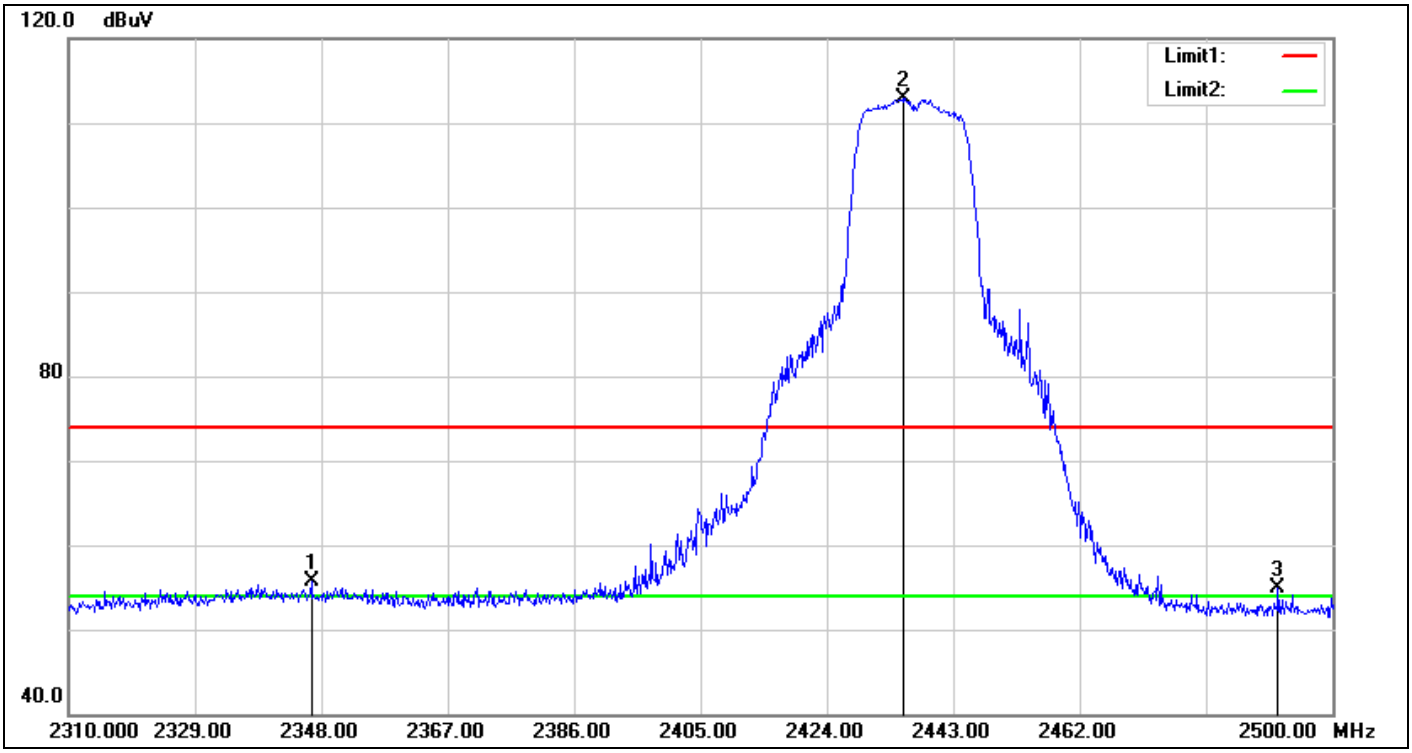


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2390.000	55.62	-2.49	53.13	54.00	-0.87	AVG
2	2413.488	103.66	-2.40	101.26	-	-	AVG

Band Edges

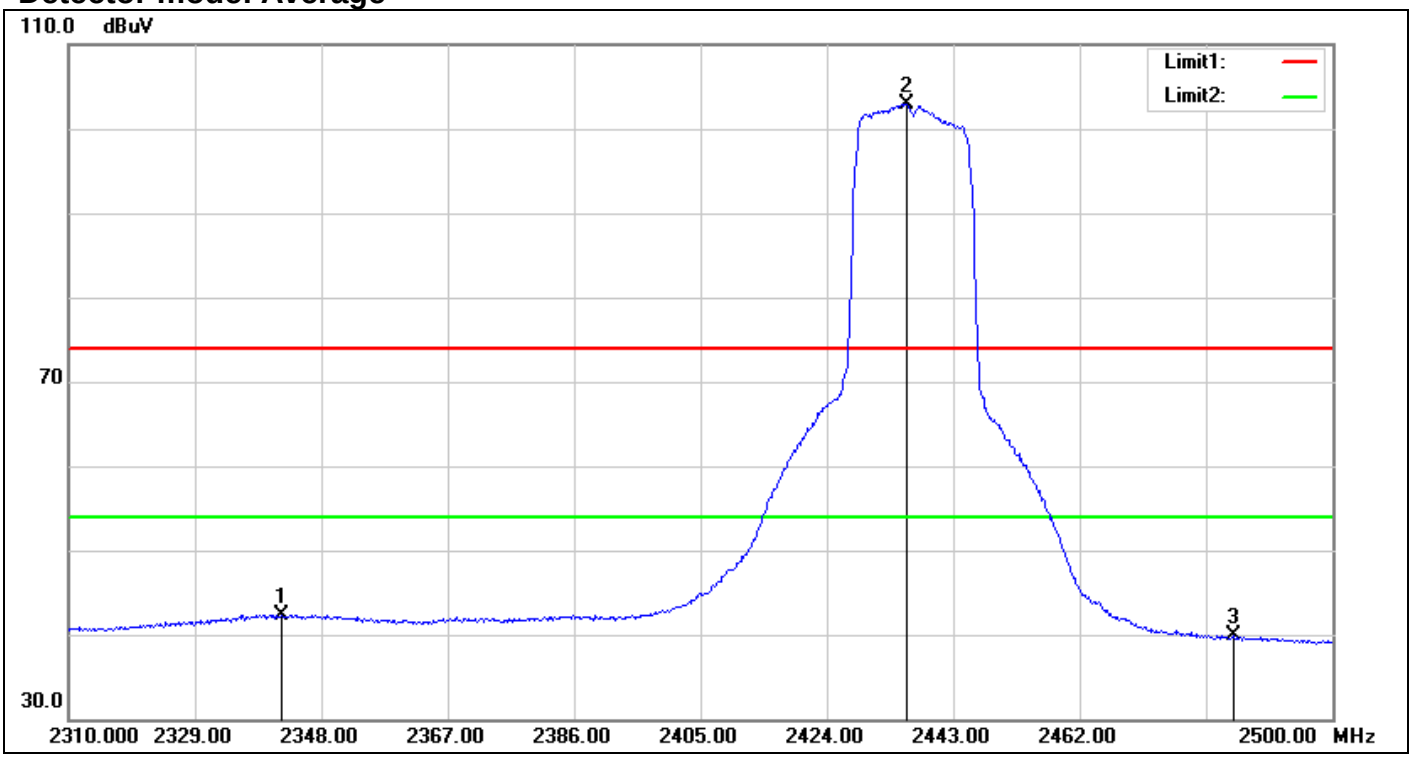
IEEE 802.11g Mode / CH Mid

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2346.480	58.58	-2.86	55.72	74.00	-18.28	peak
2	2435.400	115.17	-2.25	112.92	-	-	peak
3	2491.830	56.81	-1.92	54.89	74.00	-19.11	peak

Detector mode: Average

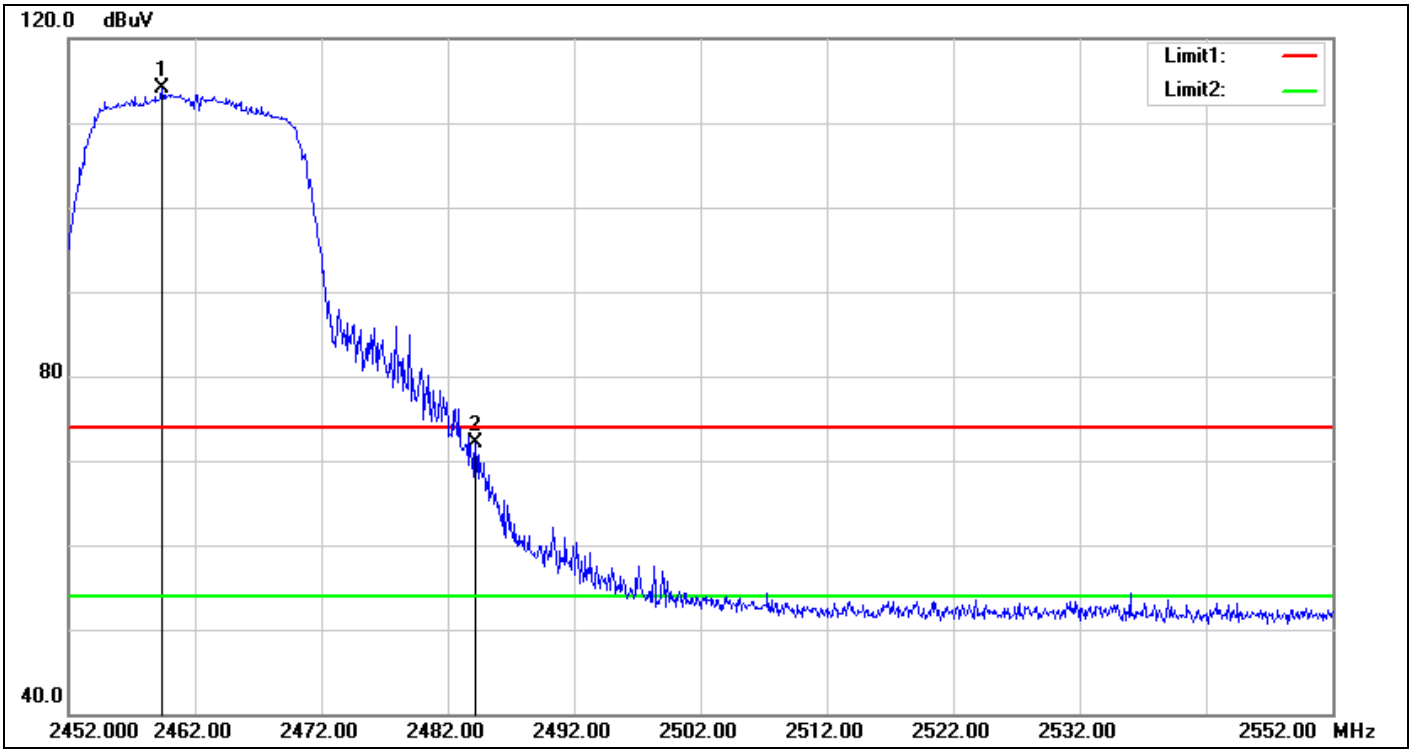


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2342.110	45.30	-2.93	42.37	54.00	-11.63	AVG
2	2435.970	105.17	-2.24	102.93	-	-	AVG
3	2485.180	41.80	-1.98	39.82	54.00	-14.18	AVG

Band Edges

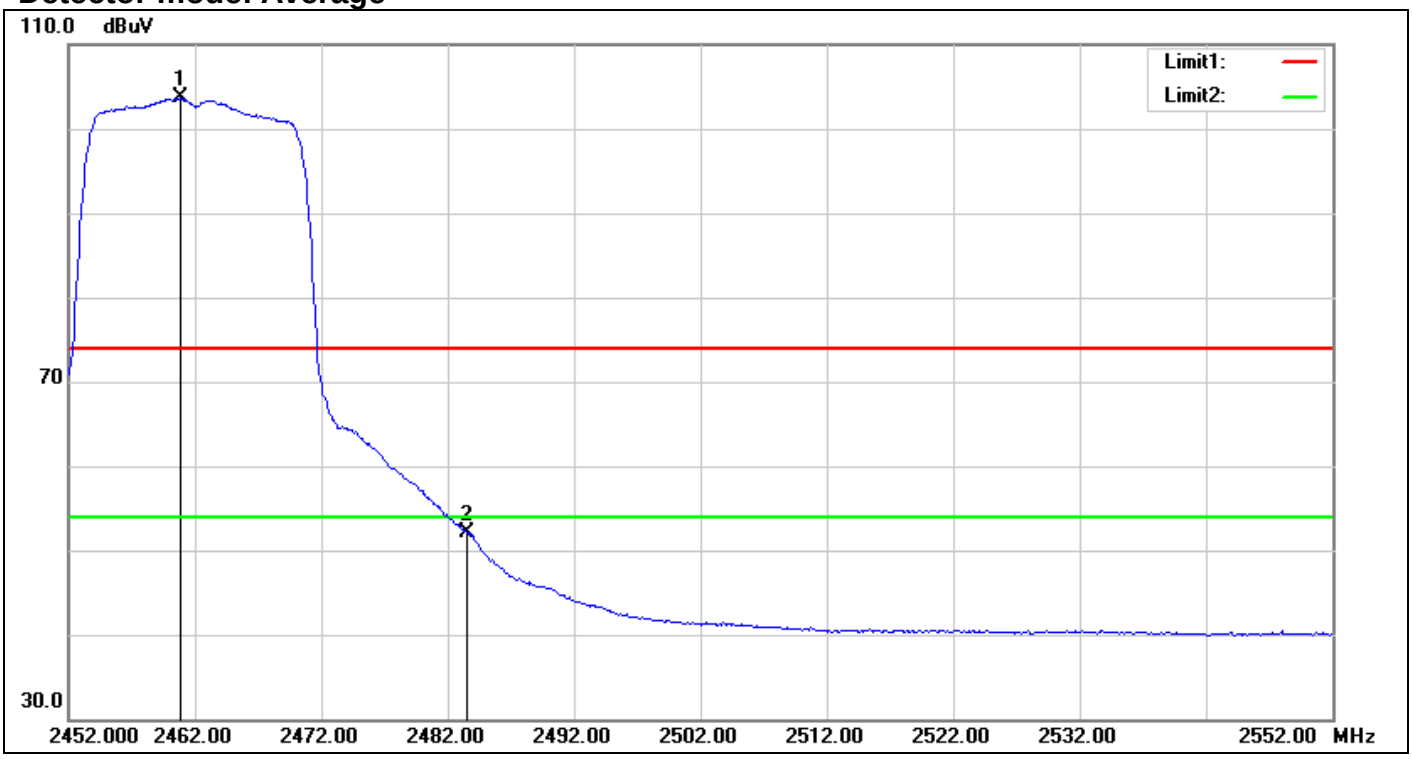
IEEE 802.11g Mode / CH High

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2459.400	116.14	-2.11	114.03	-	-	peak
2	2484.200	74.01	-1.99	72.02	74.00	-1.98	peak

Detector mode: Average

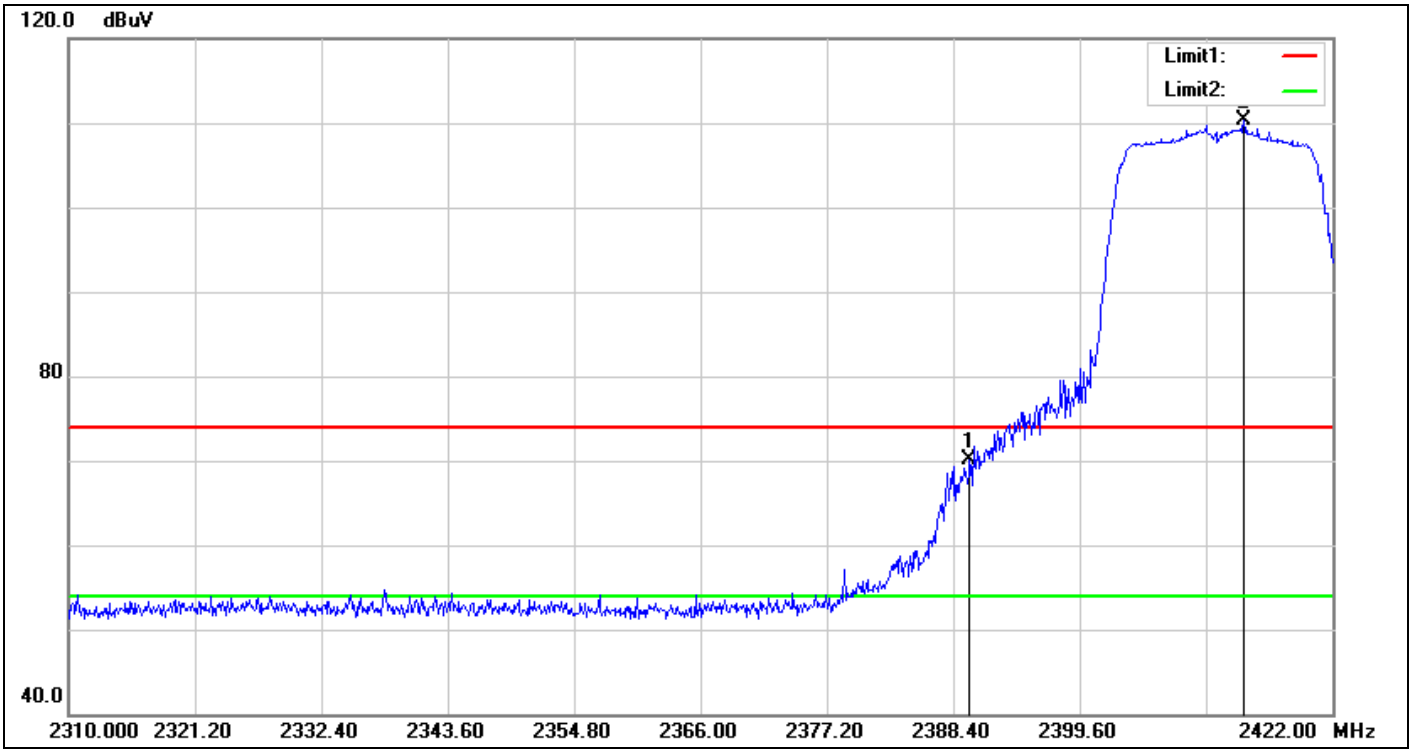


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2460.900	105.79	-2.10	103.69	-	-	AVG
2	2483.500	54.11	-1.99	52.12	54.00	-1.88	AVG

Band Edges

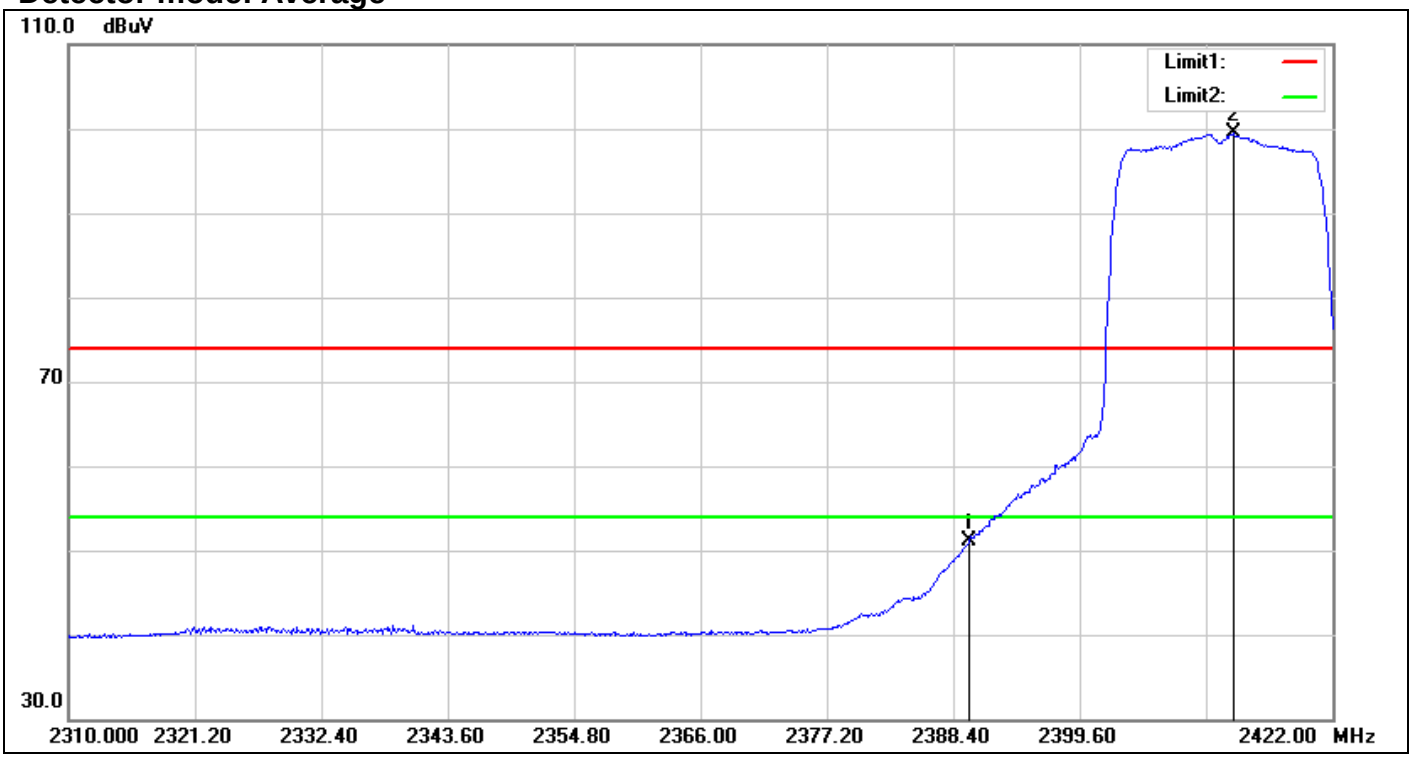
IEEE 802.11n HT 20 MHz Channel Mode / CH Low

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2389.856	72.54	-2.49	70.05	74.00	-3.95	peak
2	2414.160	112.73	-2.40	110.33	-	-	peak

Detector mode: Average

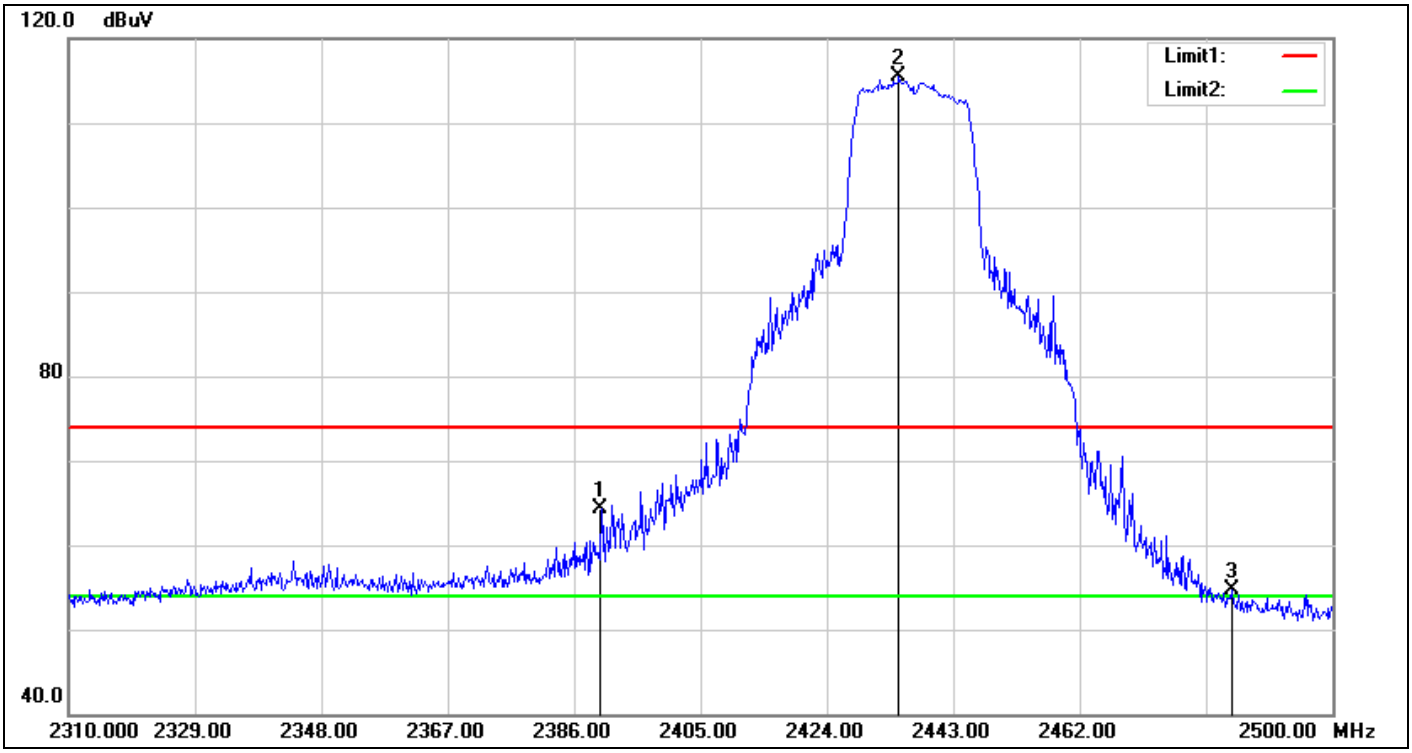


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2389.856	53.63	-2.49	51.14	54.00	-2.86	AVG
2	2413.264	101.92	-2.41	99.51	-	-	AVG

Band Edges

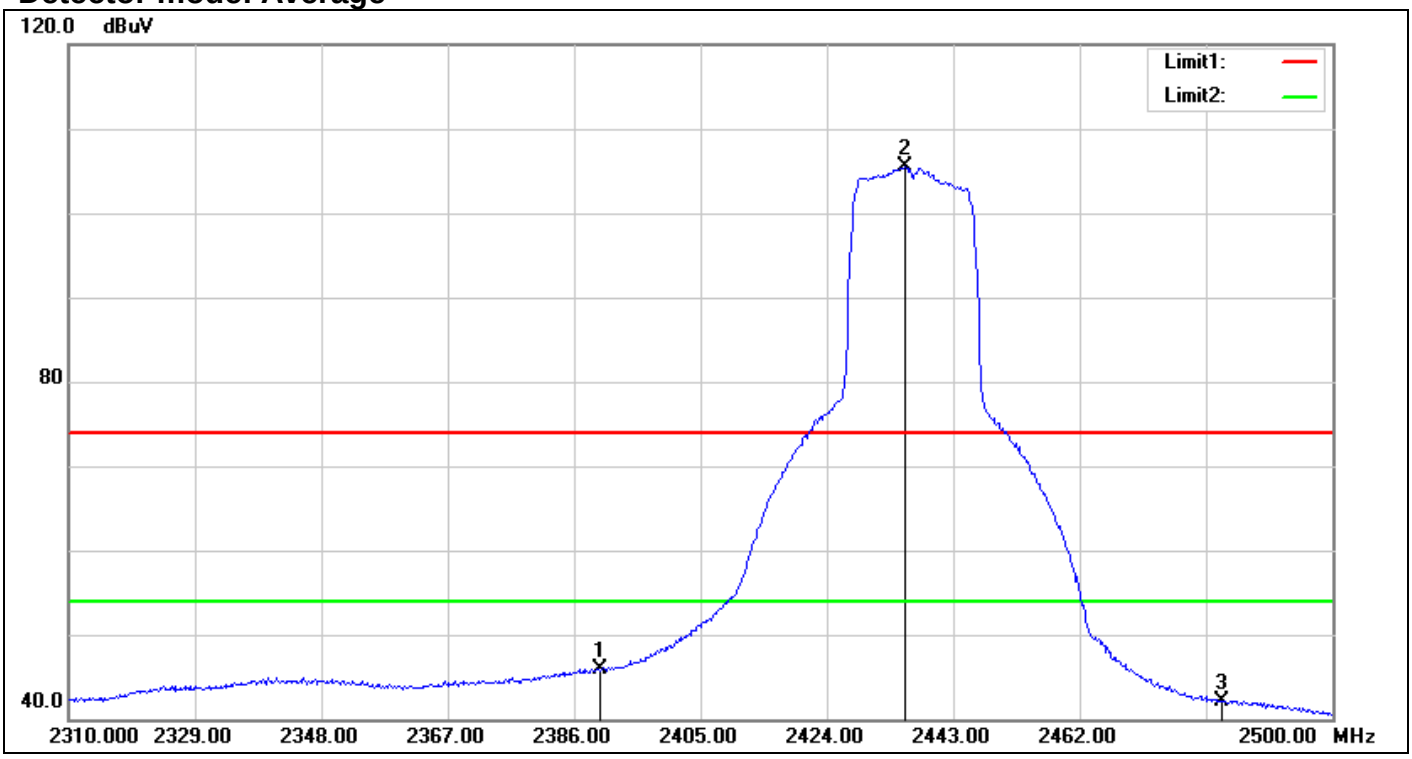
IEEE 802.11n HT 20 MHz Channel Mode / CH Mid

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2390.000	66.82	-2.49	64.33	74.00	-9.67	peak
2	2434.830	117.72	-2.25	115.47	-	-	peak
3	2484.800	56.70	-1.98	54.72	74.00	-19.28	peak

Detector mode: Average

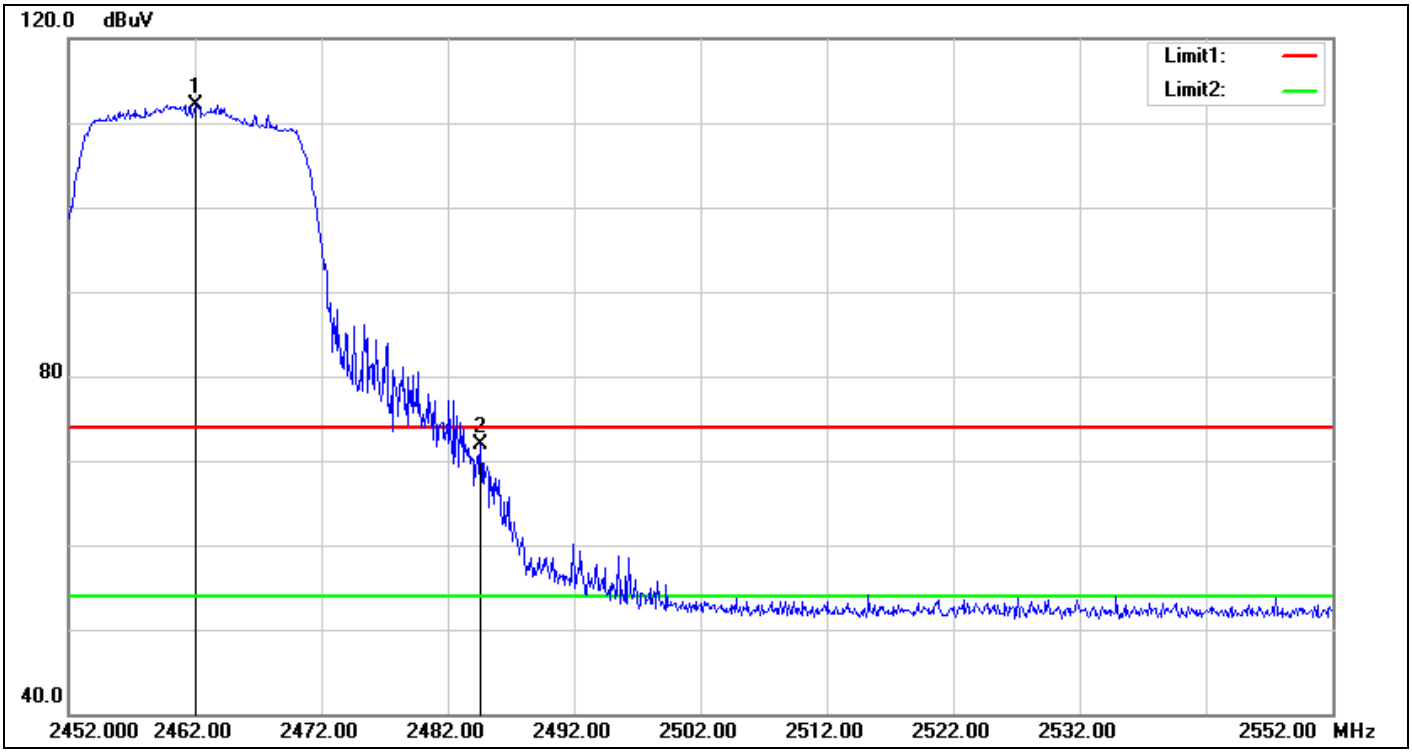


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2390.000	48.46	-2.49	45.97	54.00	-8.03	AVG
2	2435.780	107.71	-2.24	105.47	-	-	AVG
3	2483.500	44.03	-1.99	42.04	54.00	-11.96	AVG

Band Edges

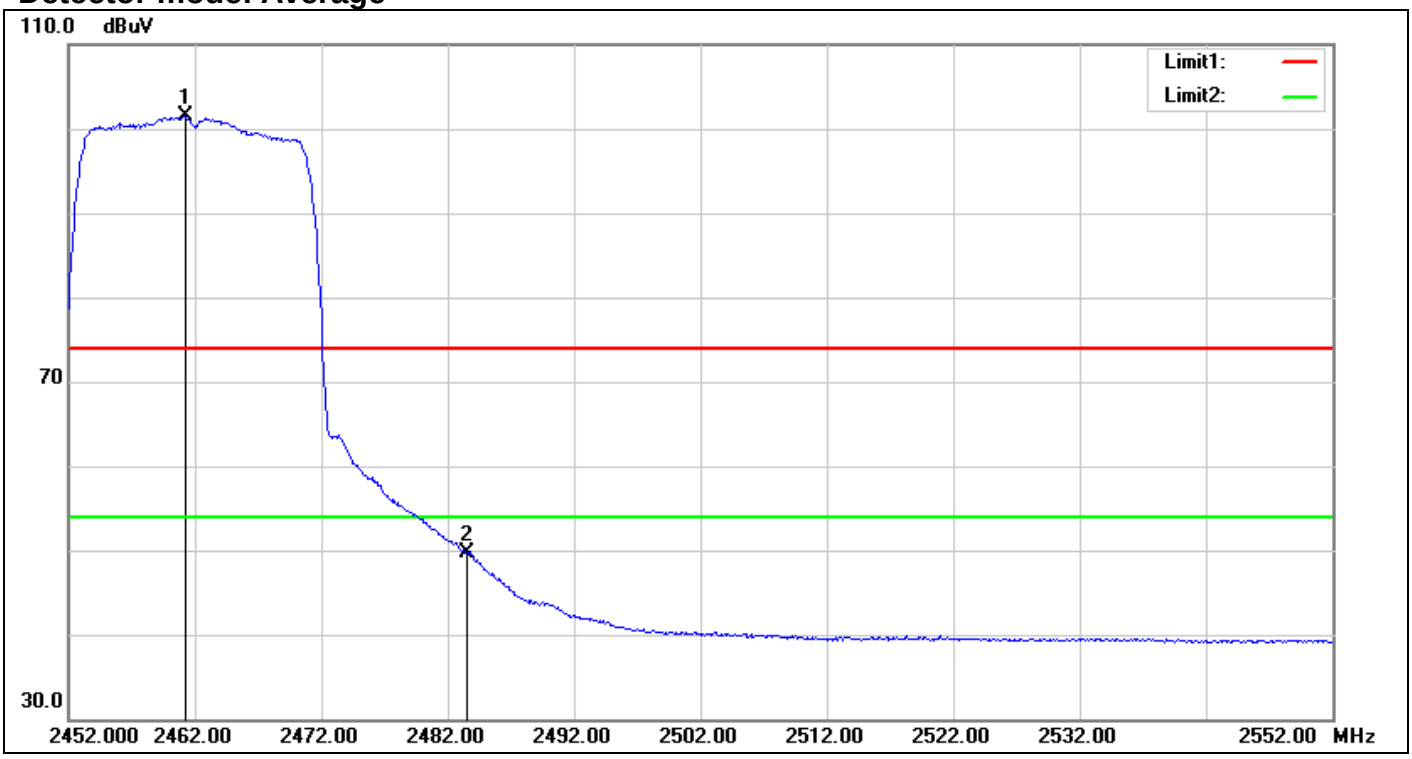
IEEE 802.11n HT 20 MHz Channel Mode / CH High

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2462.100	114.29	-2.10	112.19	-	-	peak
2	2484.600	73.91	-1.98	71.93	74.00	-2.07	peak

Detector mode: Average

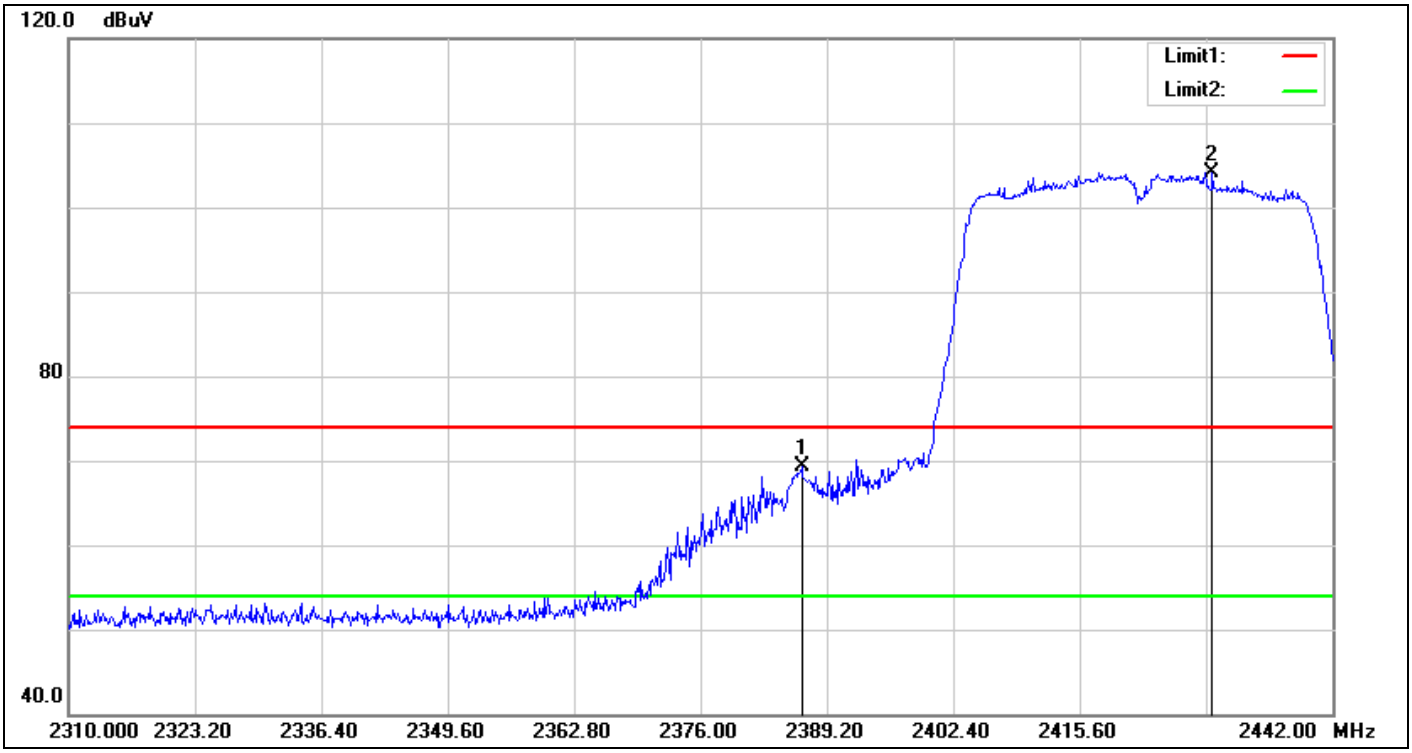


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2461.200	103.61	-2.10	101.51	-	-	AVG
2	2483.500	51.62	-1.99	49.63	54.00	-4.37	AVG

Band Edges

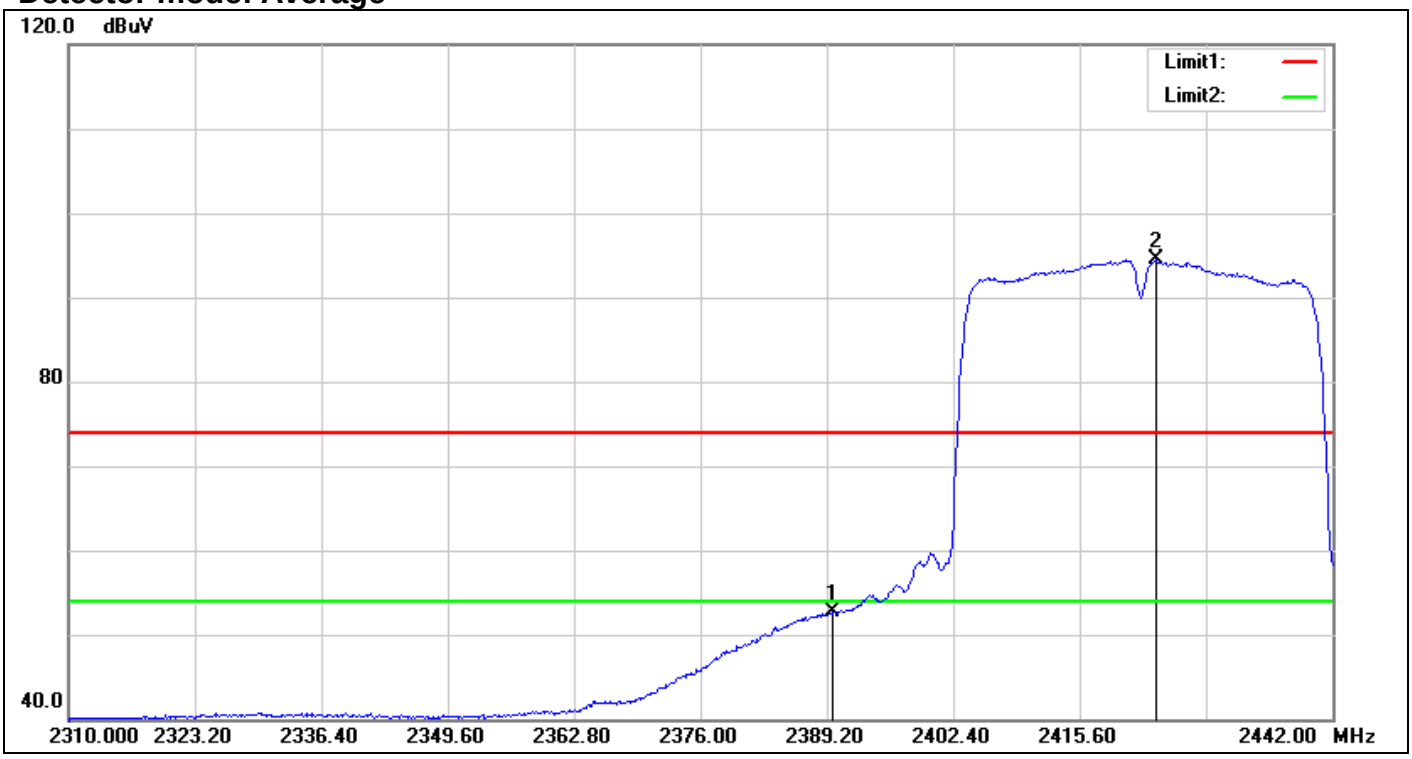
IEEE 802.11n HT 40 MHz Channel Mode / CH Low

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2386.560	71.77	-2.52	69.25	74.00	-4.75	peak
2	2429.460	106.34	-2.29	104.05	-	-	peak

Detector mode: Average

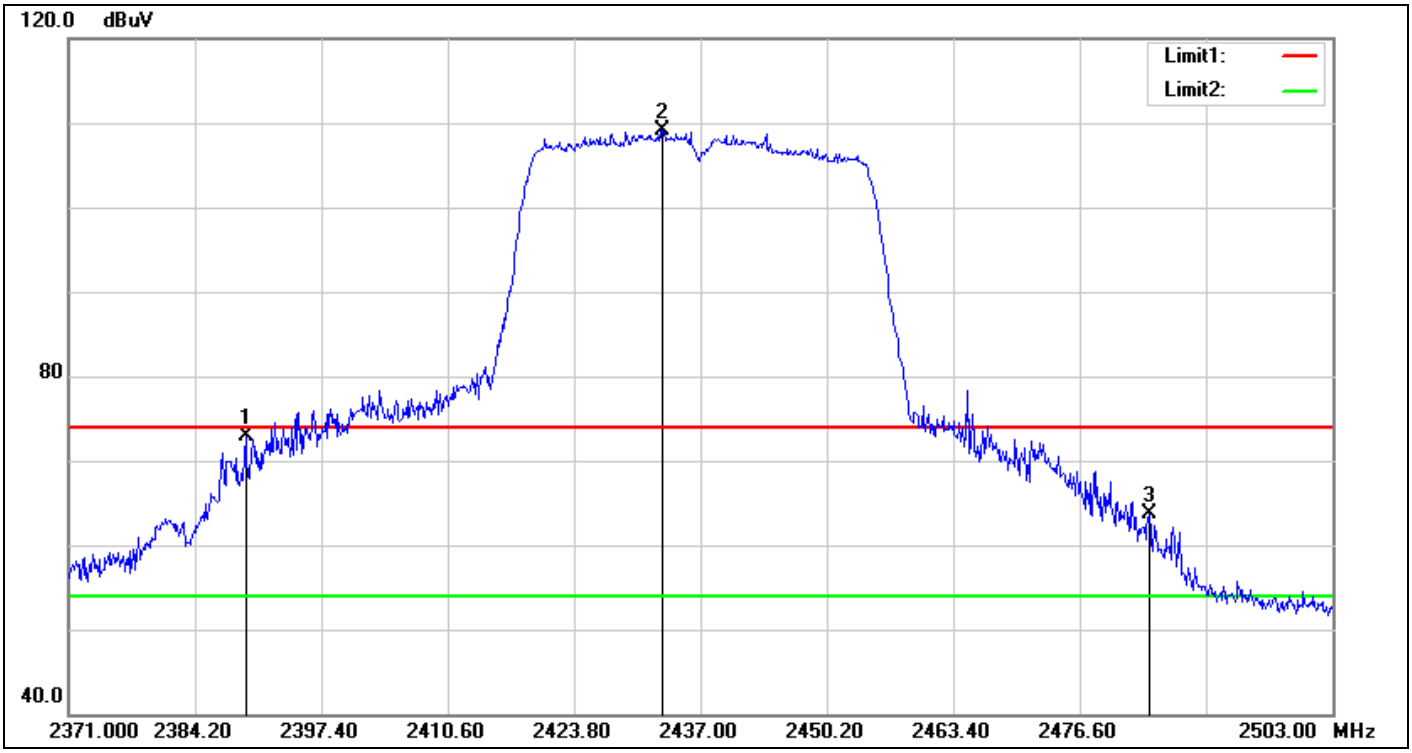


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2389.728	55.12	-2.49	52.63	54.00	-1.37	AVG
2	2423.520	96.75	-2.33	94.42	-	-	AVG

Band Edges

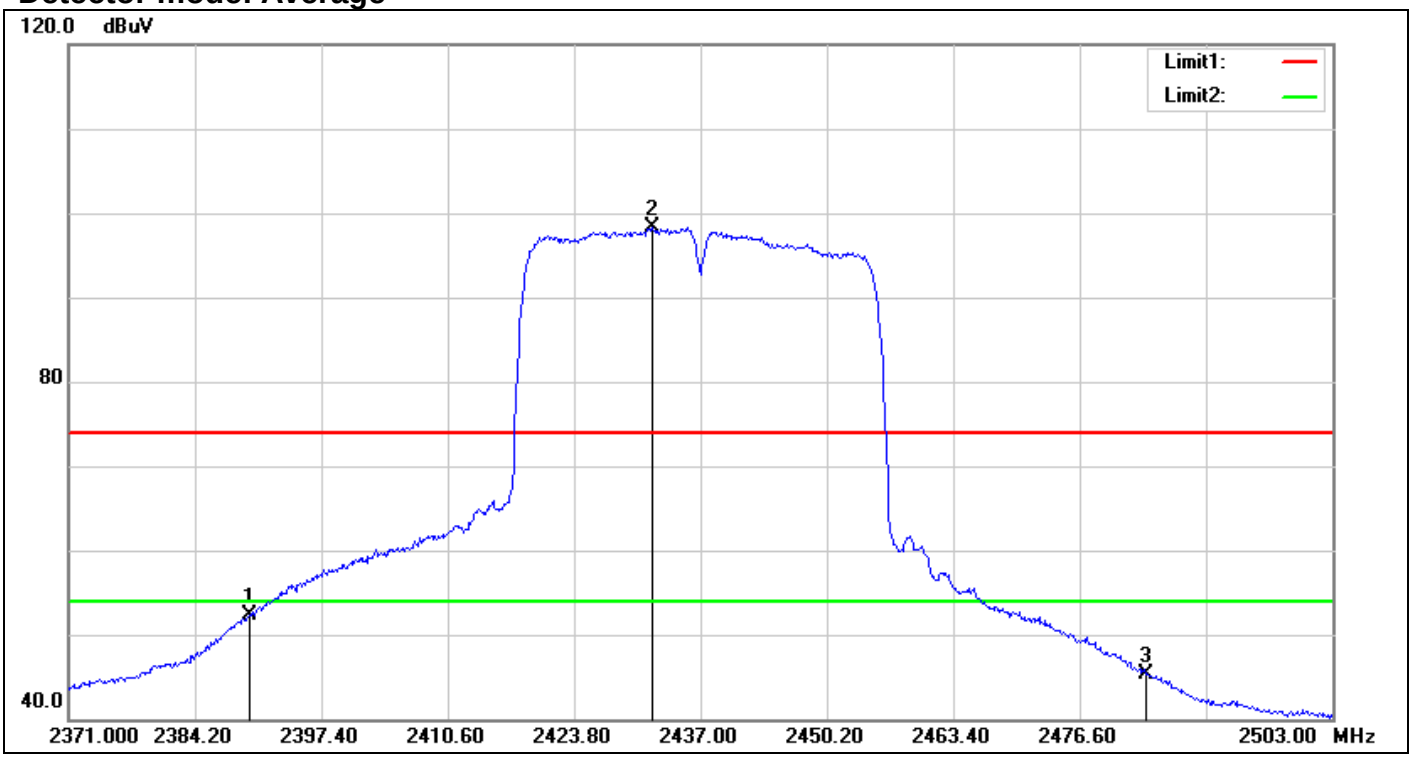
IEEE 802.11n HT 40 MHz Channel Mode / CH Mid

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2389.480	75.30	-2.49	72.81	74.00	-1.19	peak
2	2433.040	111.31	-2.26	109.05	-	-	peak
3	2483.860	65.62	-1.99	63.63	74.00	-10.37	peak

Detector mode: Average

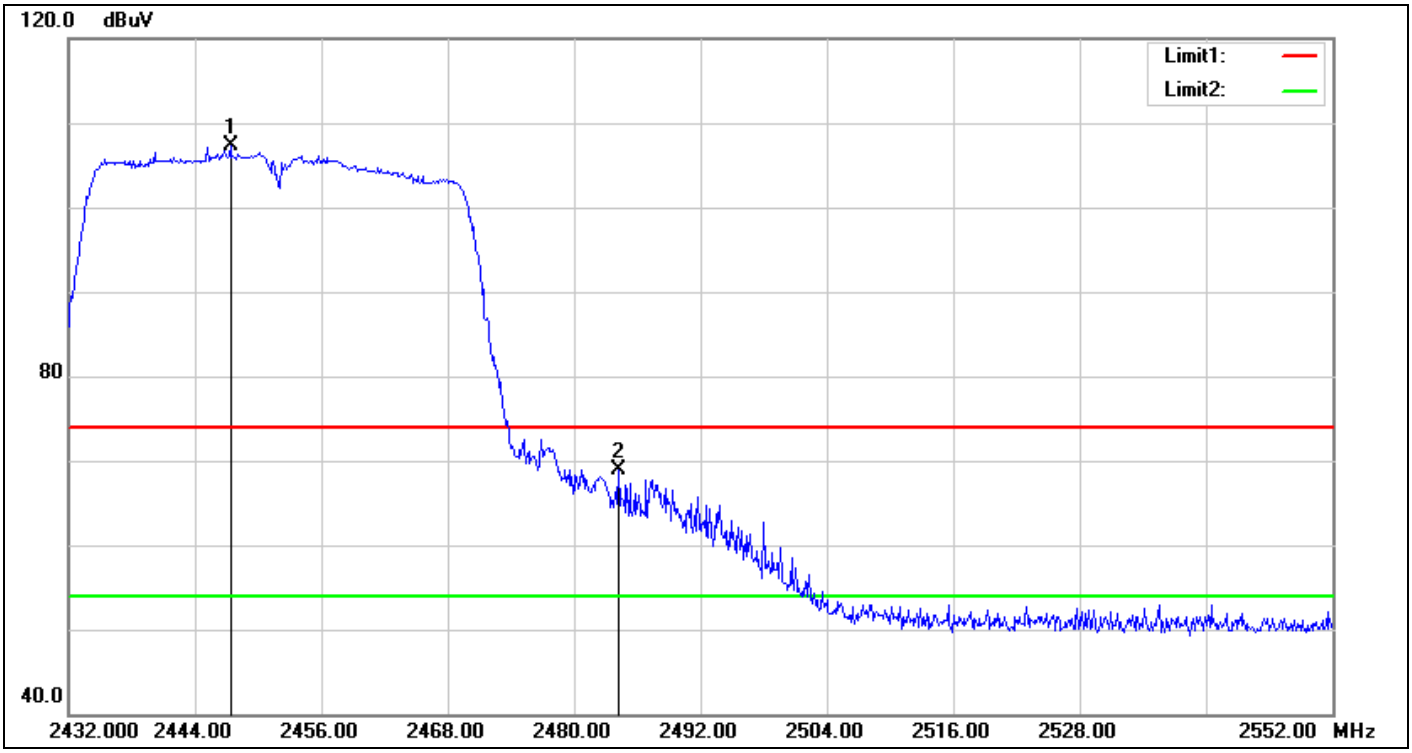


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2389.876	54.85	-2.49	52.36	54.00	-1.64	AVG
2	2431.984	100.64	-2.27	98.37	-	-	AVG
3	2483.500	47.20	-1.99	45.21	54.00	-8.79	AVG

Band Edges

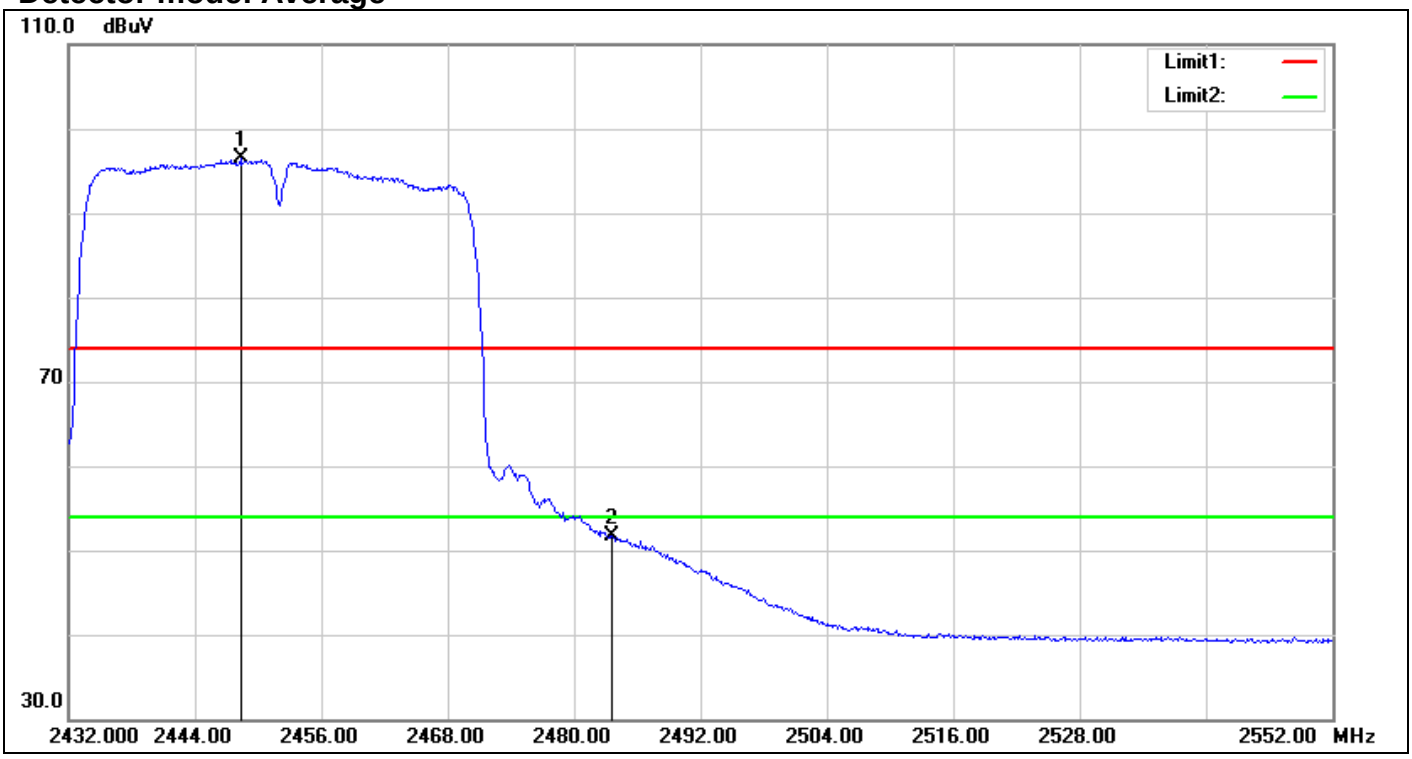
IEEE 802.11n HT 40 MHz Channel Mode / CH High

Detector mode: Peak



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2447.360	109.39	-2.16	107.23	-	-	peak
2	2484.200	70.80	-1.99	68.81	74.00	-5.19	peak

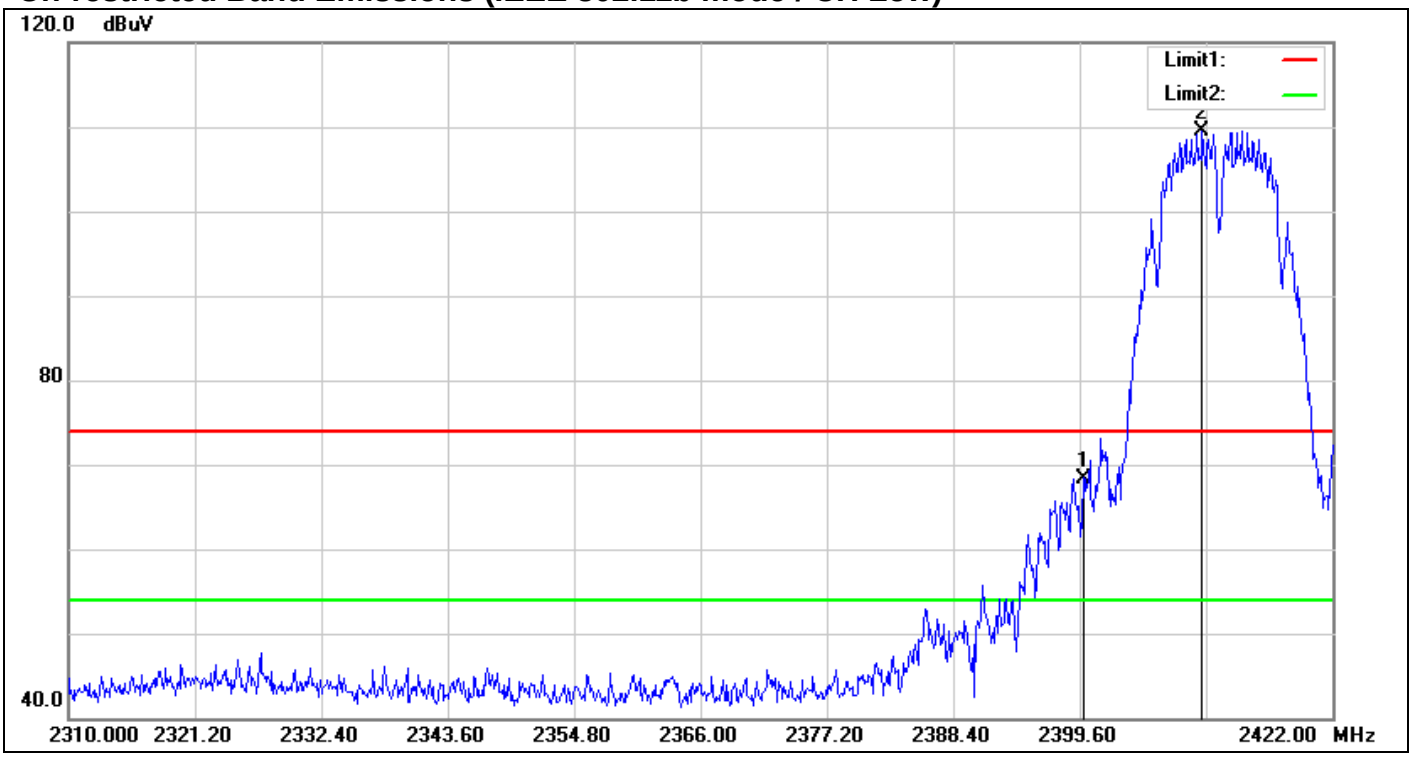
Detector mode: Average



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	2448.320	98.64	-2.15	96.49	-	-	AVG
2	2483.600	53.67	-1.99	51.68	54.00	-2.32	AVG

Test Plot

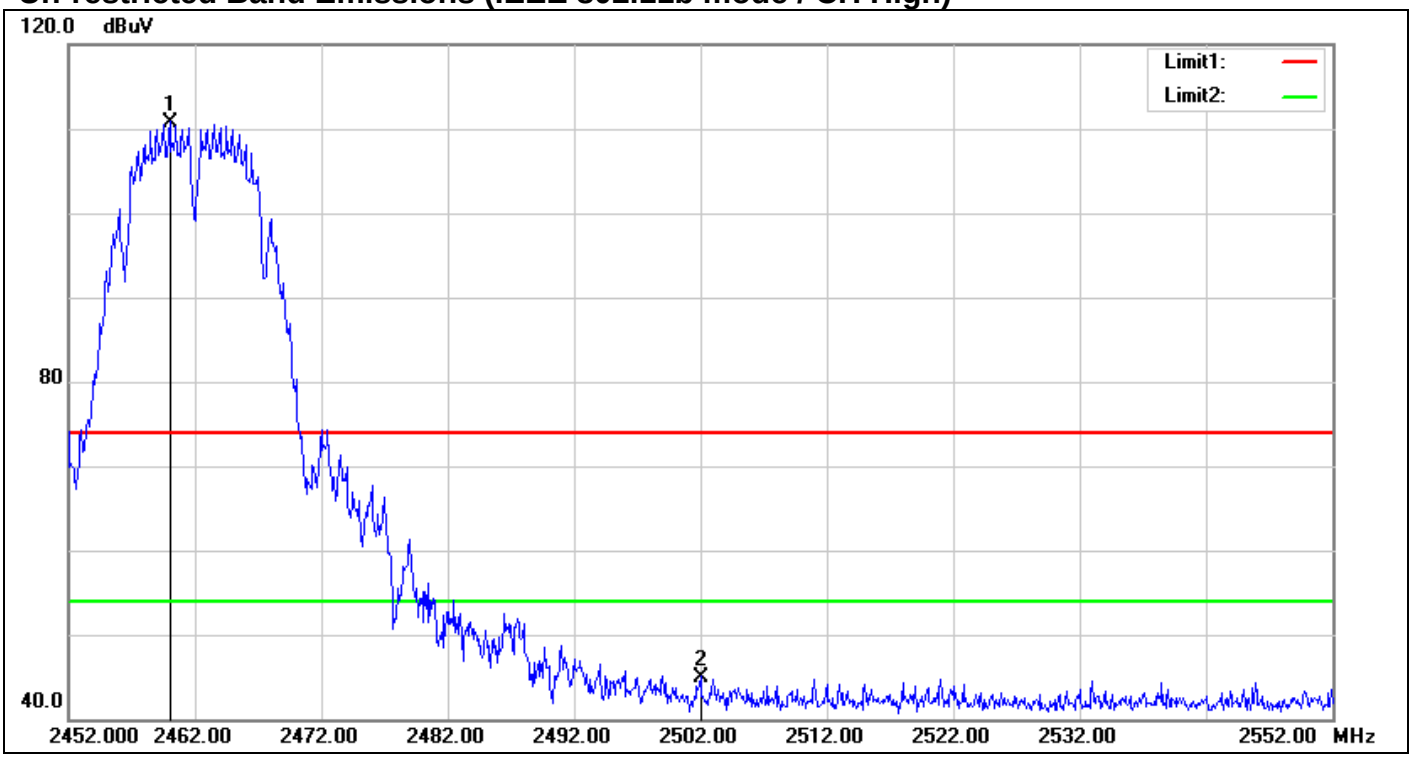
Un-restricted Band Emissions (IEEE 802.11b mode / CH Low)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2400.000	70.64	-2.41	68.23	peak
2	2410.464	111.90	-2.43	109.47	peak

Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

Un-restricted Band Emissions (IEEE 802.11b mode / CH High)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2460.000	112.90	-2.10	110.80	peak
2	2502.000	46.85	-1.85	45.00	peak

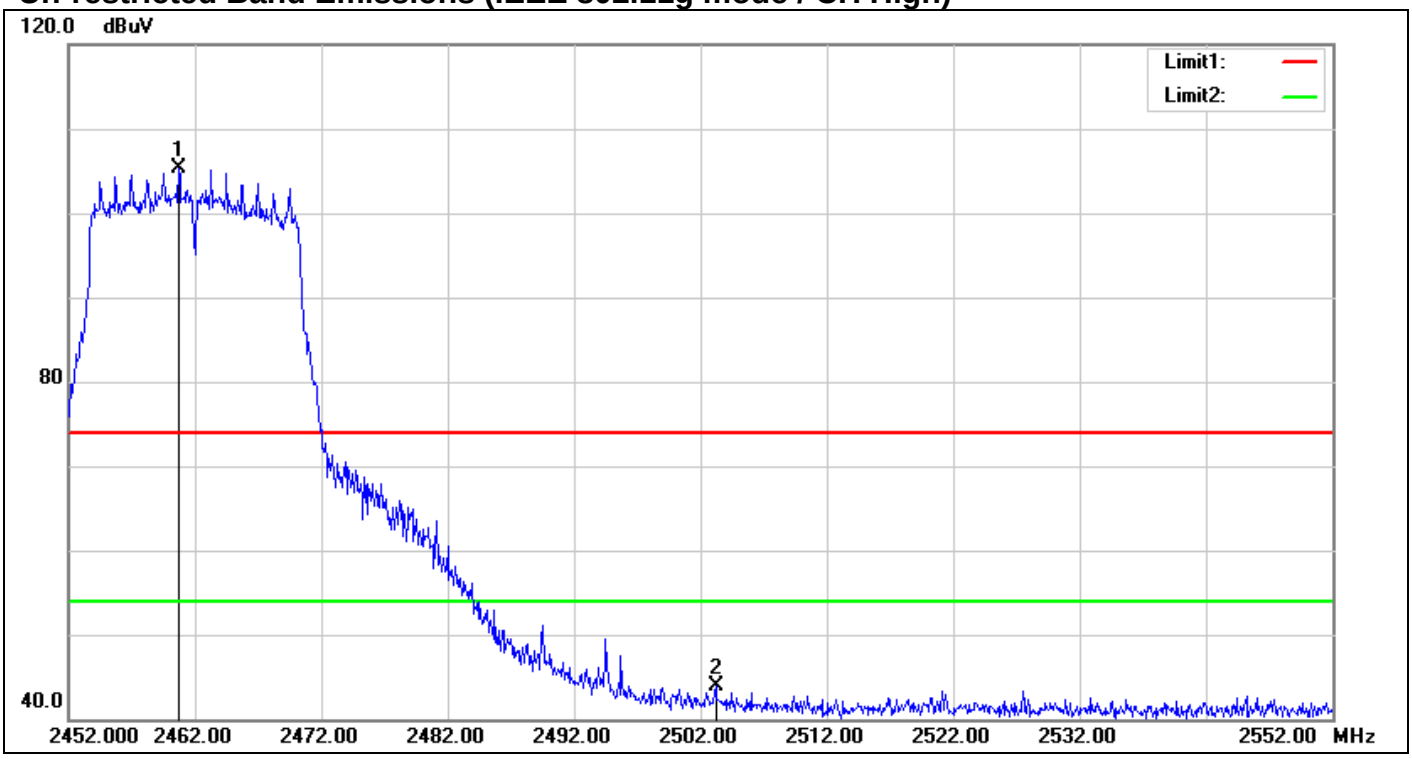
Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

Un-restricted Band Emissions (IEEE 802.11g mode / CH Low)

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2399.488	72.65	-2.41	70.24	peak
2	2413.264	105.42	-2.41	103.01	peak

Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

Un-restricted Band Emissions (IEEE 802.11g mode / CH High)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2460.700	107.45	-2.10	105.35	peak
2	2503.200	45.71	-1.85	43.86	peak

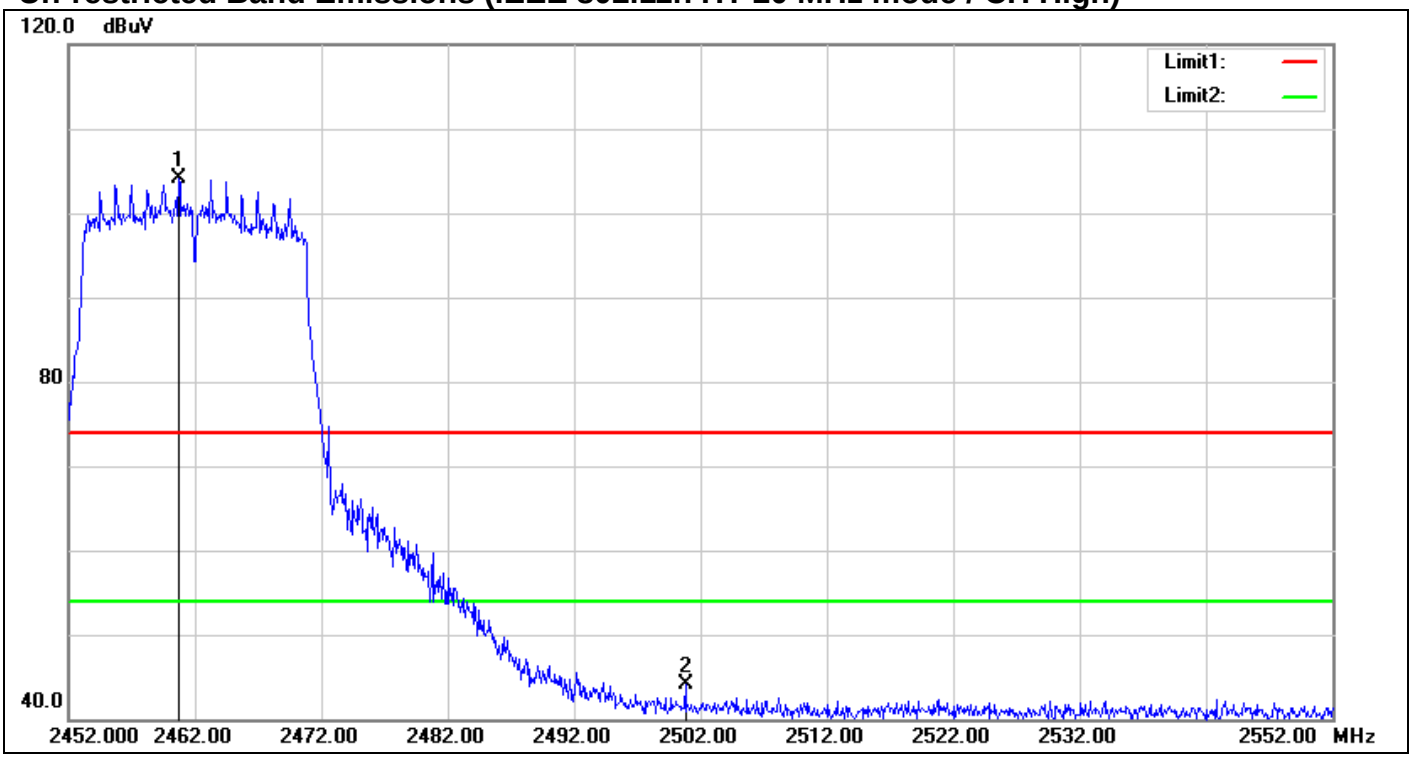
Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

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

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2399.488	68.44	-2.41	66.03	peak
2	2413.264	103.96	-2.41	101.55	peak

Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

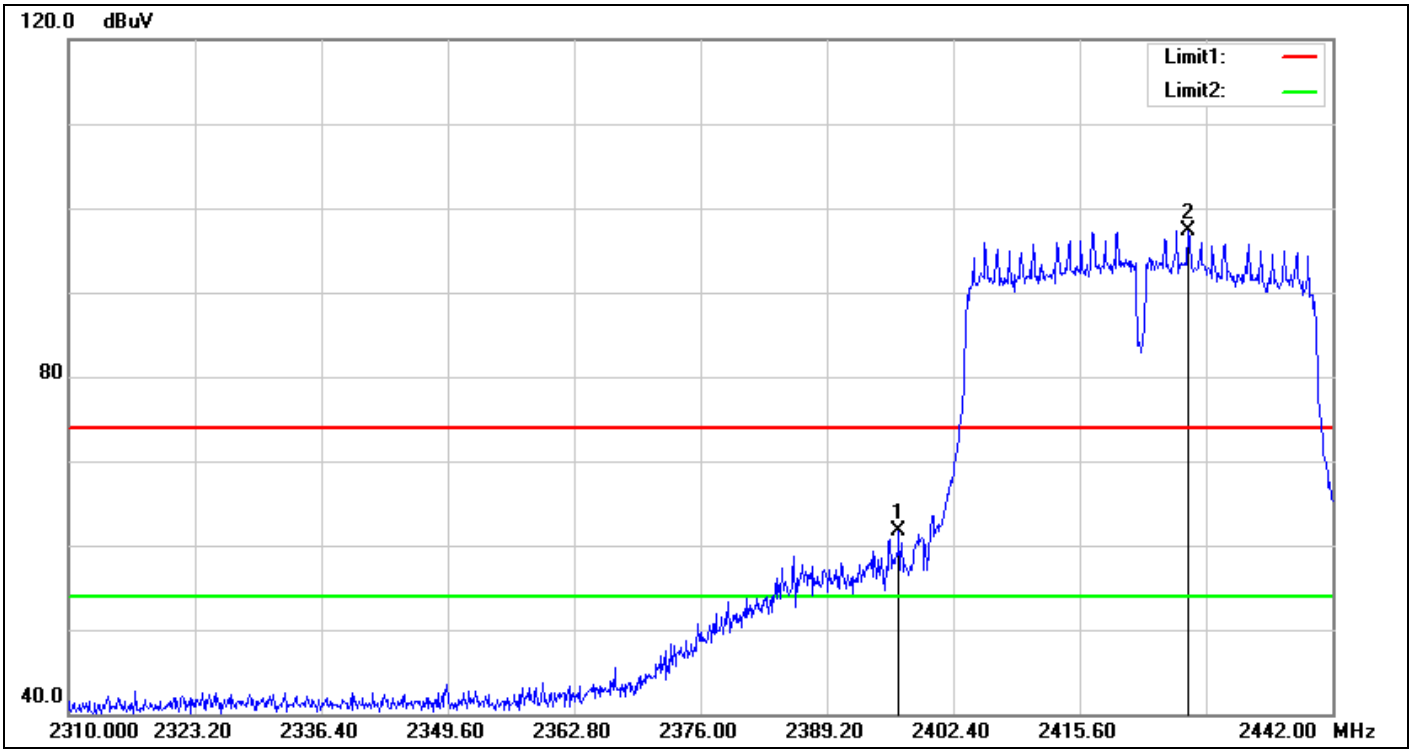
Un-restricted Band Emissions (IEEE 802.11n HT 20 MHz mode / CH High)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2460.700	106.14	-2.10	104.04	peak
2	2500.800	45.88	-1.86	44.02	peak

Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

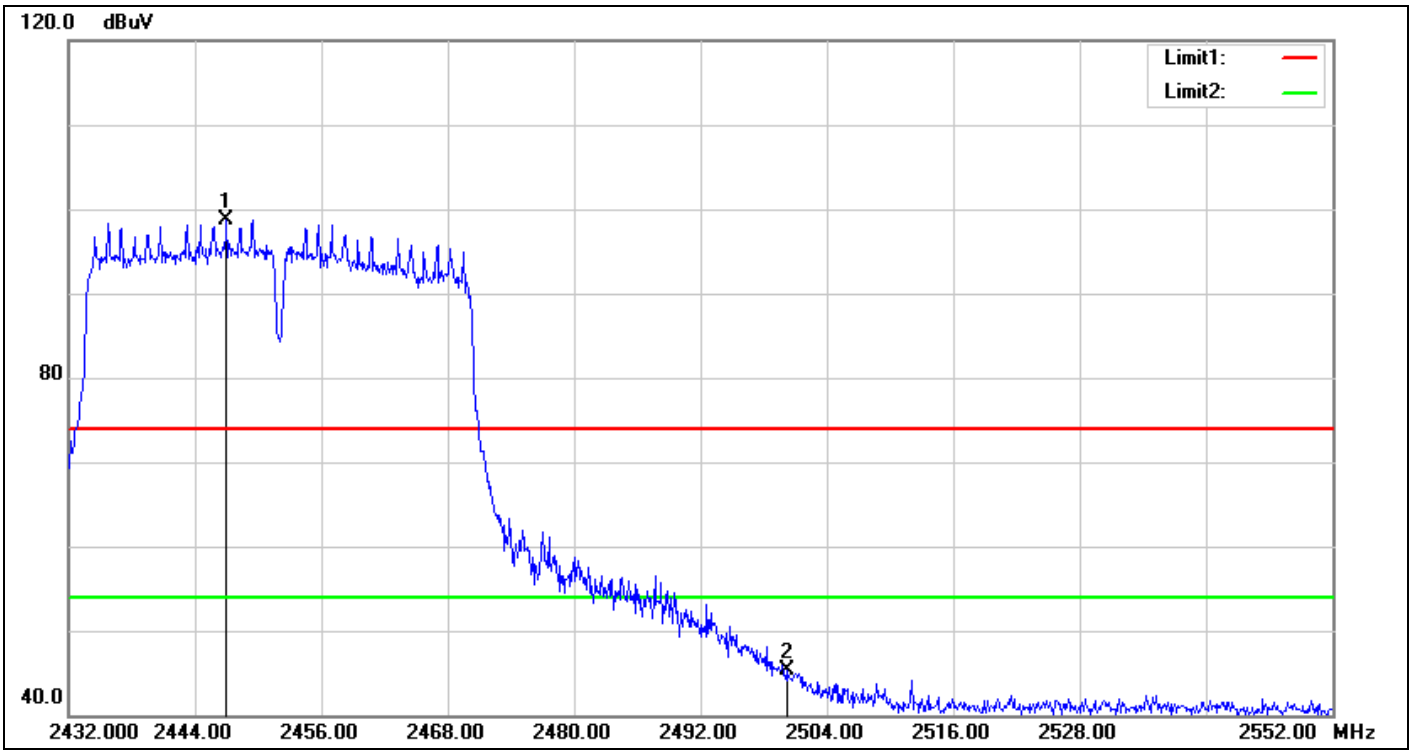
Un-restricted Band Emissions (IEEE 802.11n HT 40 MHz mode / CH Low)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2396.724	64.12	-2.44	61.68	peak
2	2426.952	99.64	-2.31	97.33	peak

Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

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



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Remark
1	2447.000	100.95	-2.16	98.79	peak
2	2500.160	47.14	-1.86	45.28	peak

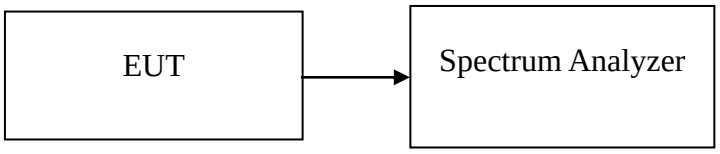
Note: Spurious emission levels that exceed the level of 20 dB below the applicable limit.

7.6 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

1. Place the EUT on the table and set it in transmitting mode.
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3 kHz, VBW = 30 kHz, Span = 300 kHz, Sweep time = 100 s
3. Record the max reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

No non-compliance noted

Test Data

IEEE 802.11b mode

Duty Cycle = 98.37% Duty Factor = 0.07

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-5.56	-5.84	-2.62	8.00	PASS
Mid	2437	-5.24	-5.97	-2.51		PASS
High	2462	-5.66	-5.09	-2.28		PASS

IEEE 802.11g mode

Duty Cycle = 89.47% Duty Factor =0.48

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-11.28	-10.77	-7.52	8.00	PASS
Mid	2437	-4.74	-5.49	-1.61		PASS
High	2462	-11.03	-10.64	-7.34		PASS

IEEE 802.11n HT 20 MHz mode

Duty Cycle = 88.79% Duty Factor =0.52

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-12.88	-11.81	-8.79	8.00	PASS
Mid	2437	-5.14	-5.96	-2.00		PASS
High	2462	-12.45	-12.76	-9.08		PASS

IEEE 802.11n HT 40 MHz mode

Duty Cycle = 79.98% Duty Factor =0.97

Channel	Frequency (MHz)	Chain 0 PPSD (dBm)	Chain 1 PPSD (dBm)	PPSD (dBm)	Limit (dBm)	Result
Low	2422	-18.64	-18.41	-14.54	8.00	PASS
Mid	2437	-14.83	-14.93	-10.90		PASS
High	2452	-18.41	-21.13	-15.58		PASS

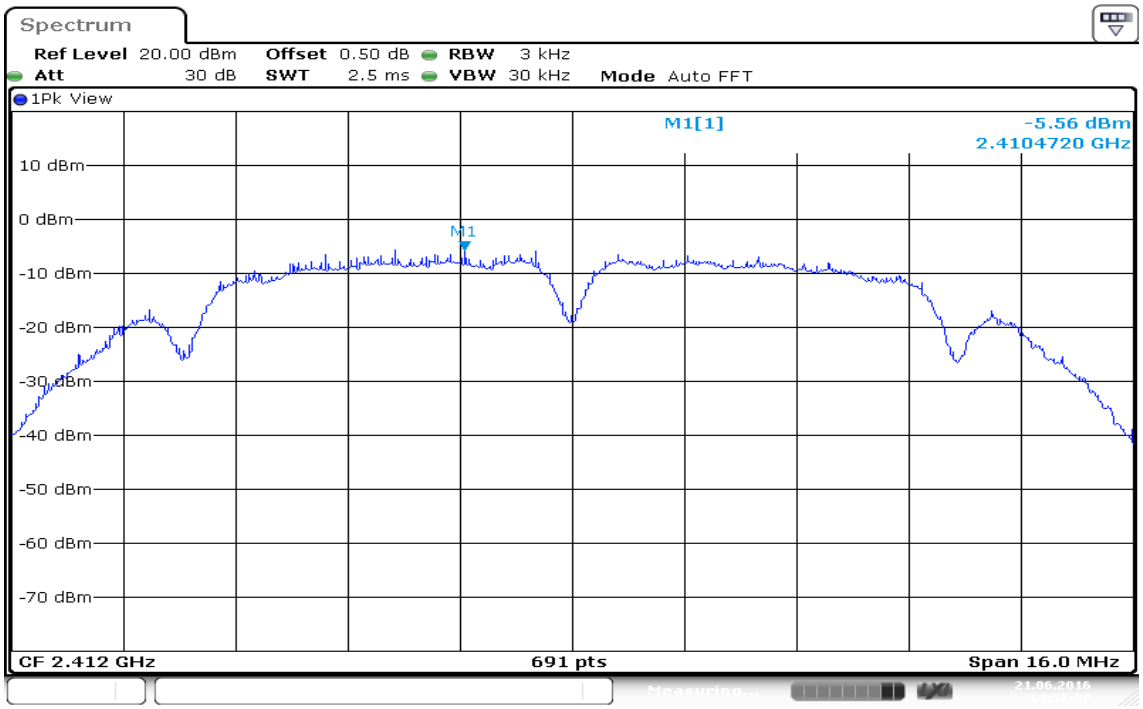
Remark:

*1. Total PPSD (dBm) = 10*LOG(10^(Chain 0 PPSD / 10)+10^(Chain 1 PPSD /10))*

Test Plot

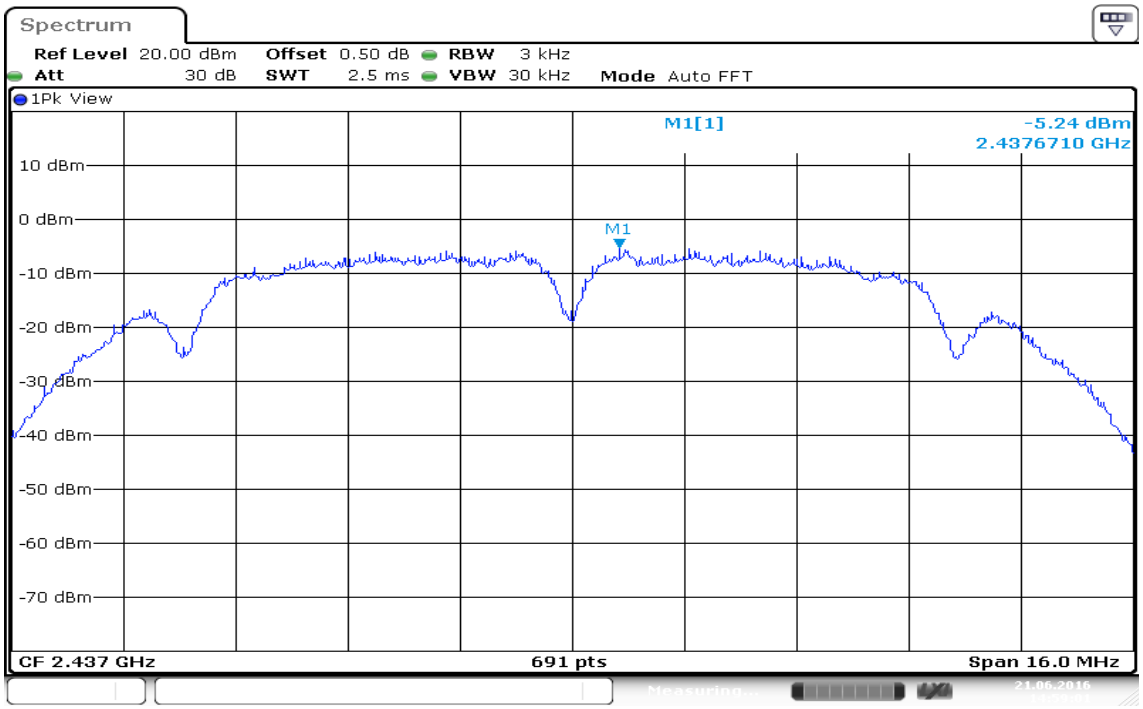
IEEE 802.11b mode / Chain 0

PPSD (CH Low)



Date: 21.JUN.2016 14:57:57

PPSD (CH Mid)



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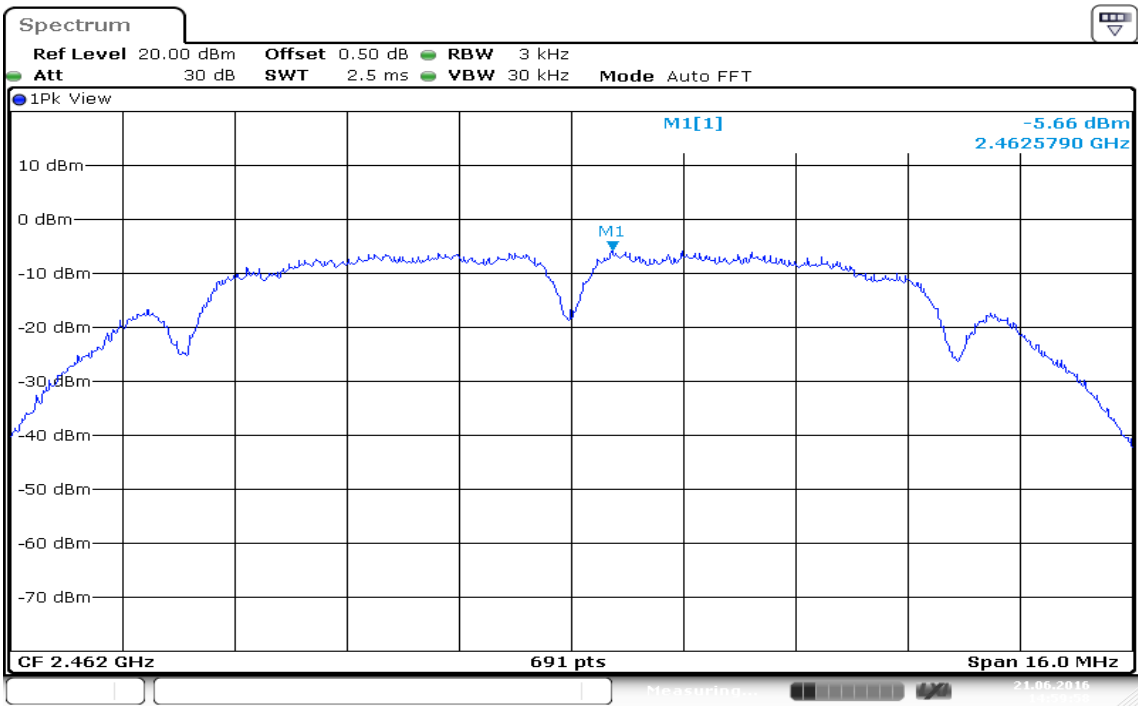
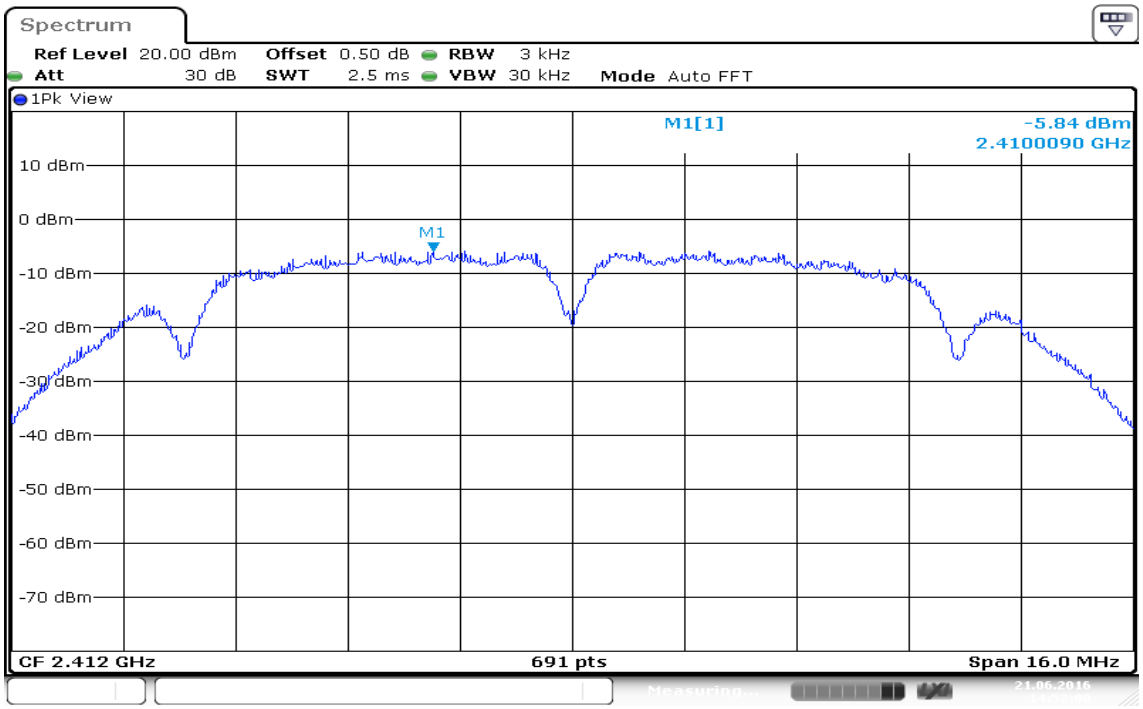
PPSD (CH High)



Date: 21.JUN.2016 14:59:59

IEEE 802.11b mode / Chain 1

PPSD (CH Low)



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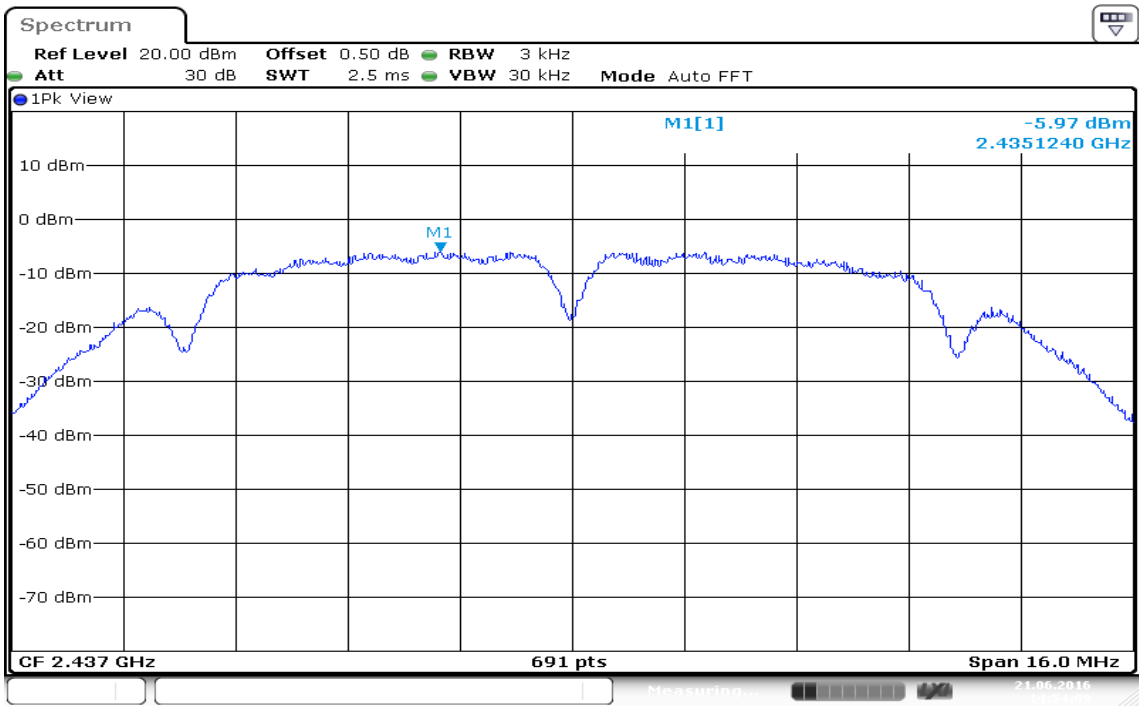
PPSD (CH Mid)



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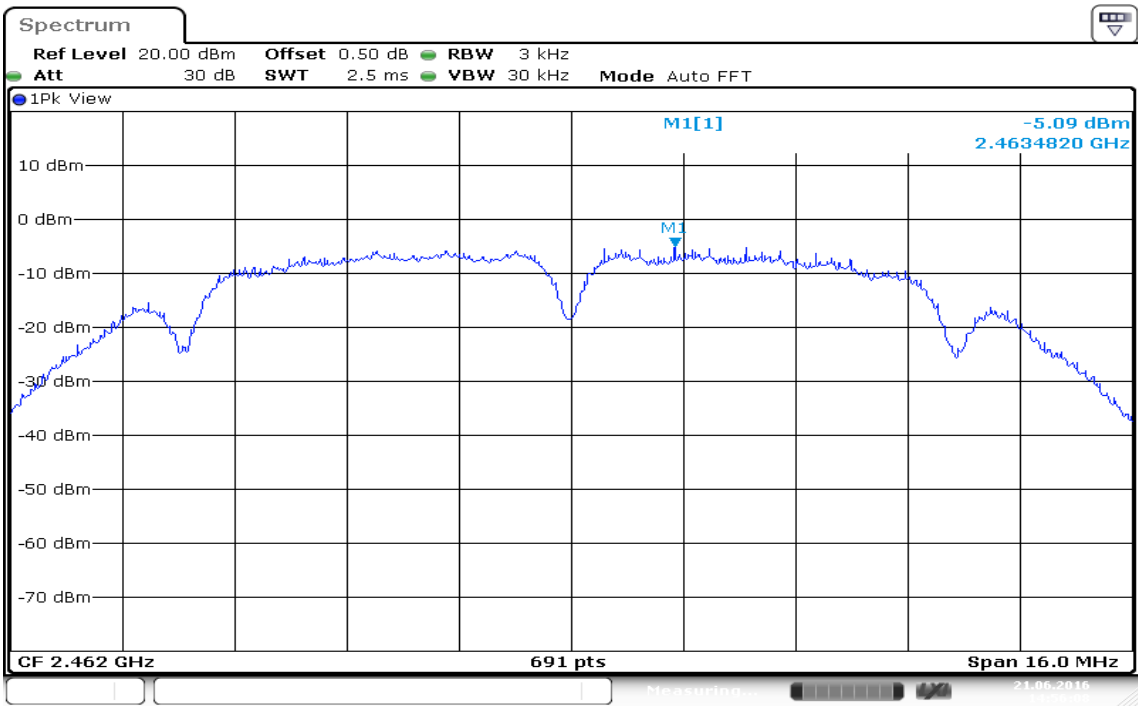
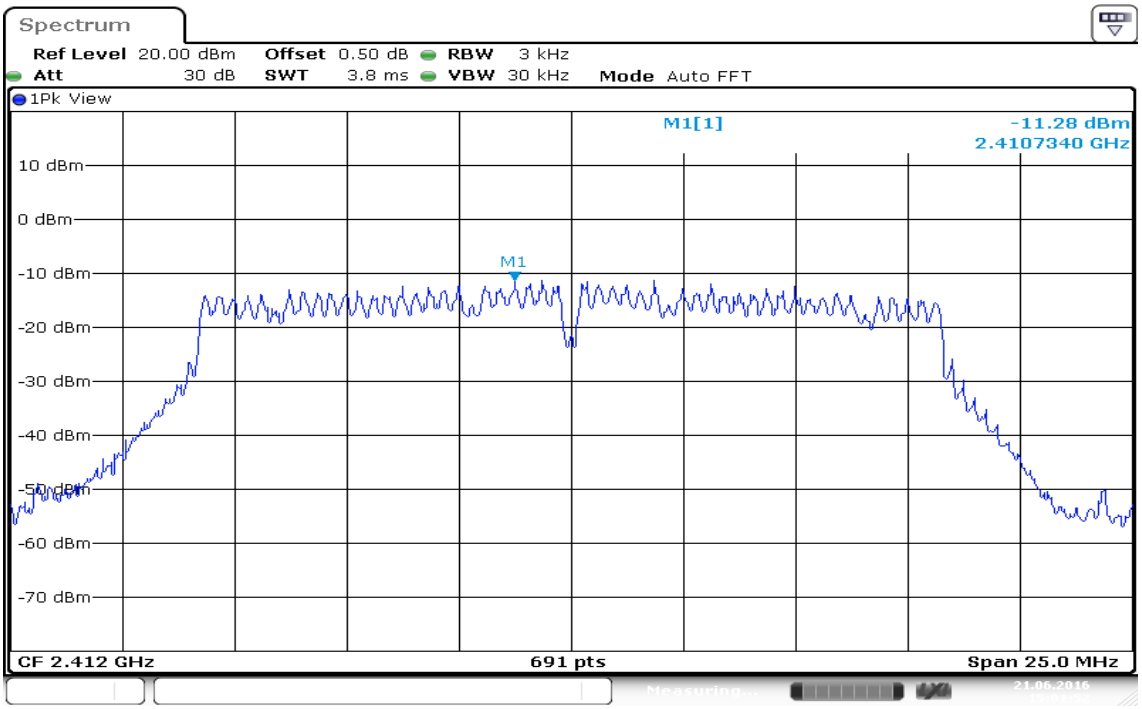
PPSD (CH High)



Date: 21.JUN.2016 14:56:08

IEEE 802.11g mode / Chain 0

PPSD (CH Low)



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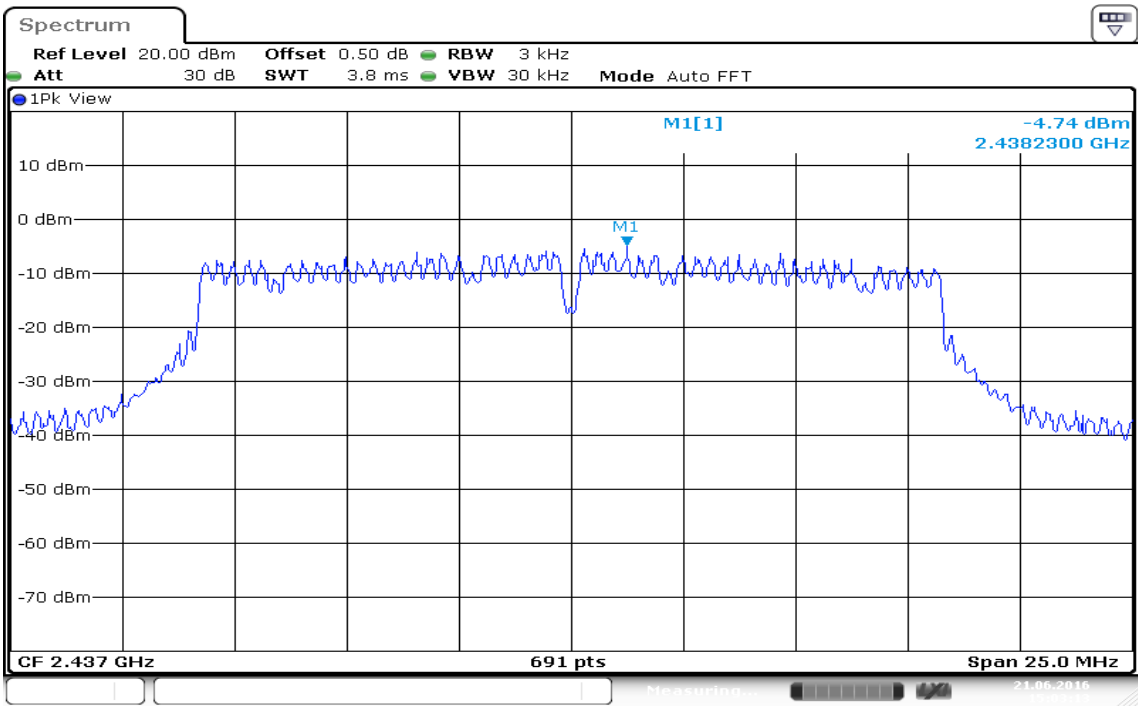
PPSD (CH Mid)



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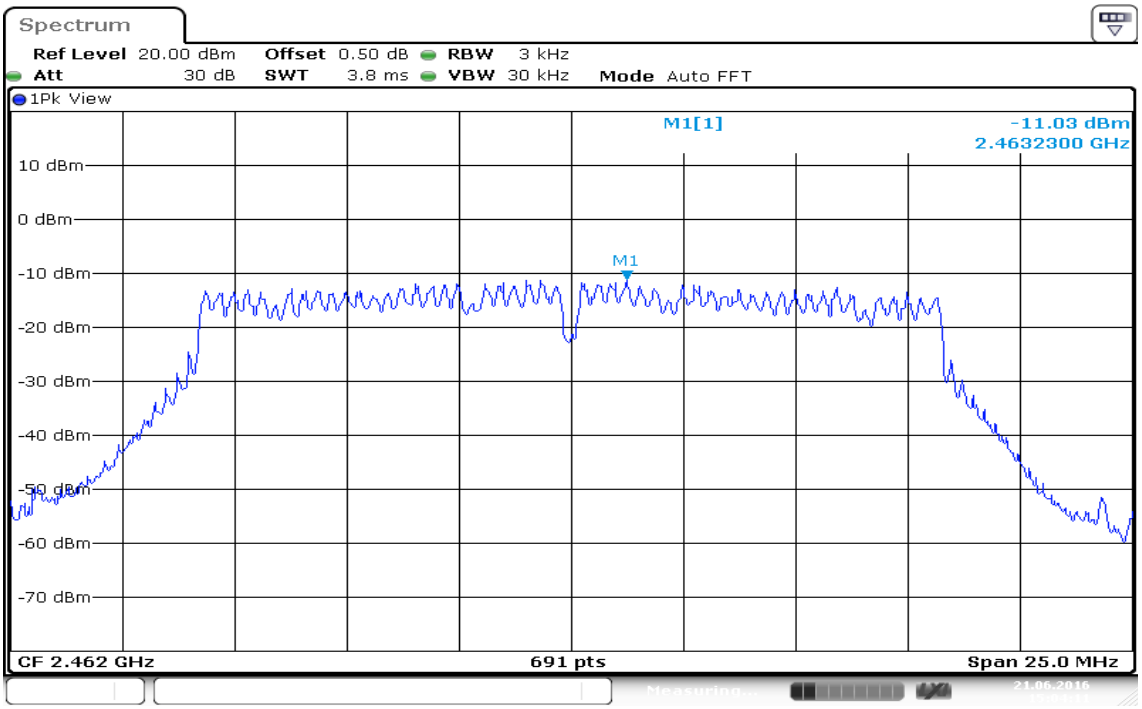
PPSD (CH High)



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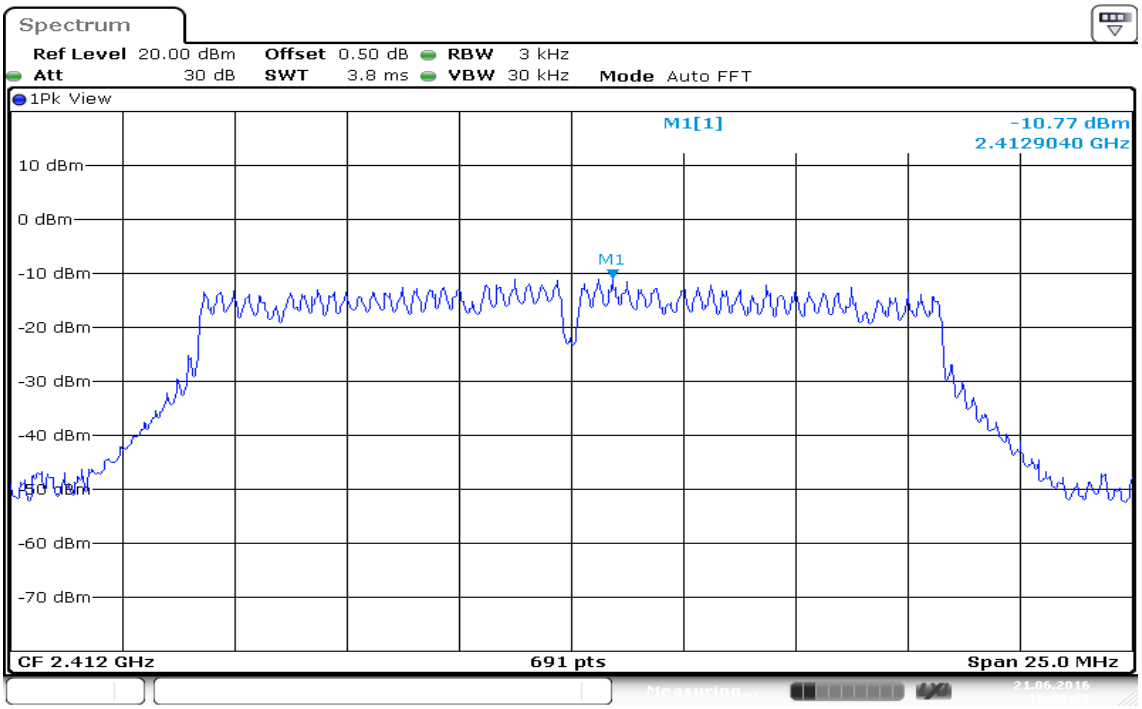
IEEE 802.11g mode / Chain 1

PPSD (CH Low)



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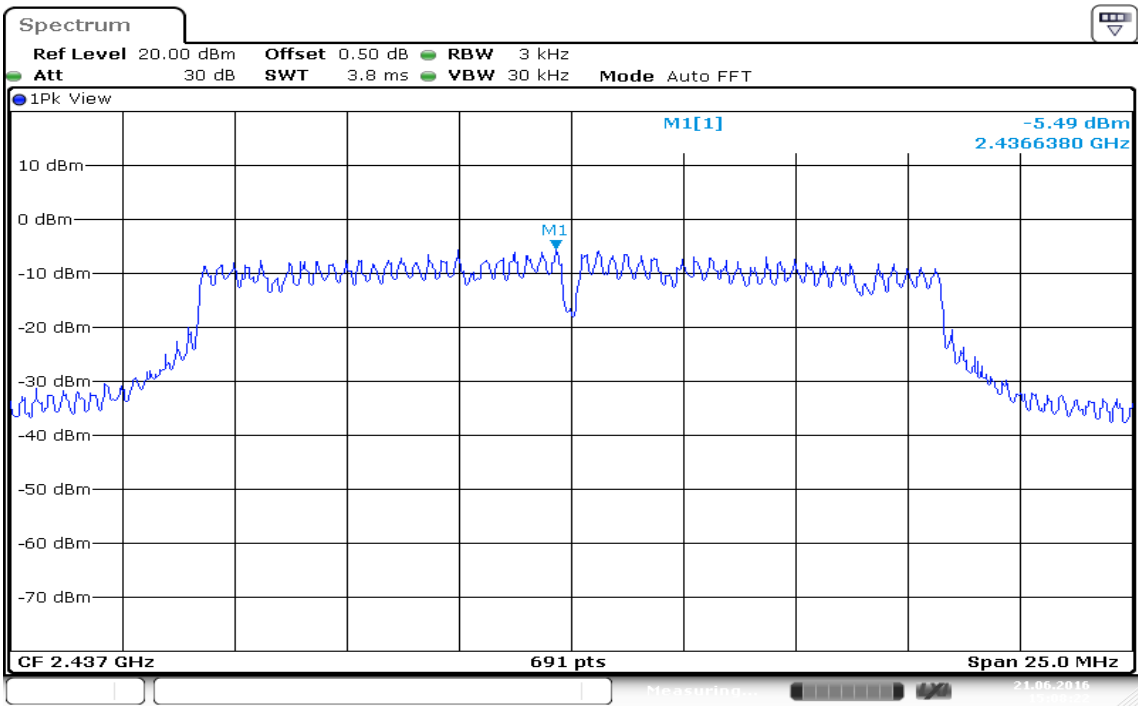
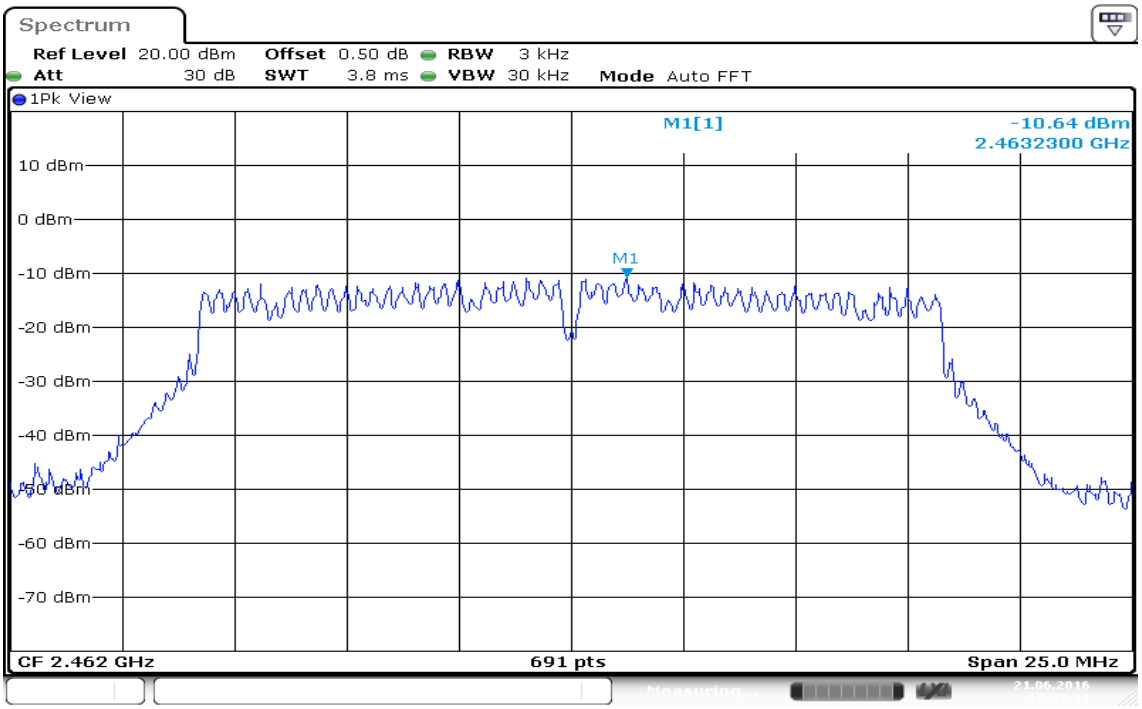
PPSD (CH Mid)



Date: 21.JUN.2016 15:08:22

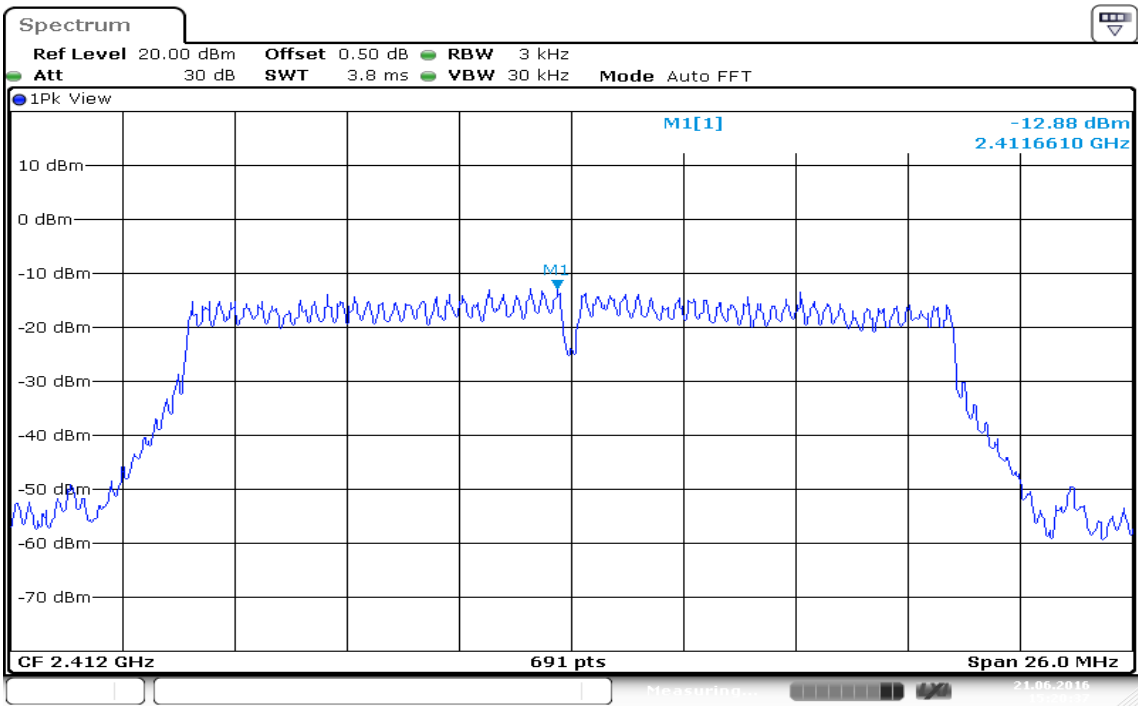
PPSD (CH High)



Date: 21.JUN.2016 15:07:11

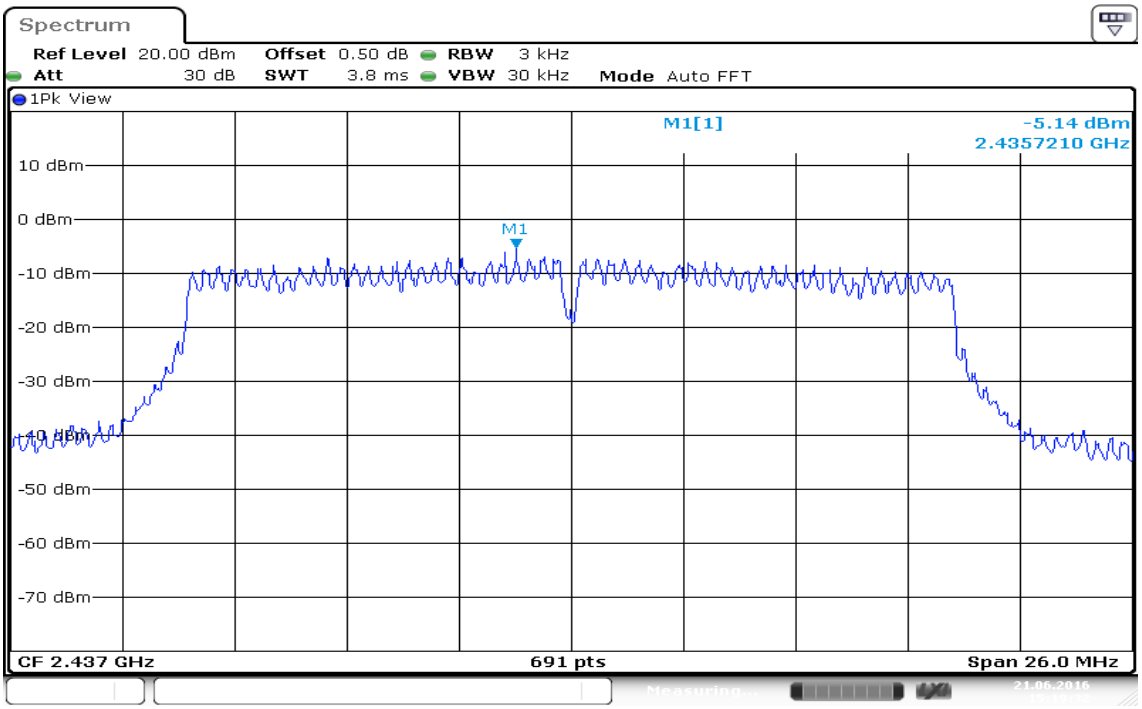
IEEE 802.11n HT 20 MHz mode / Chain 0

PPSD (CH Low)



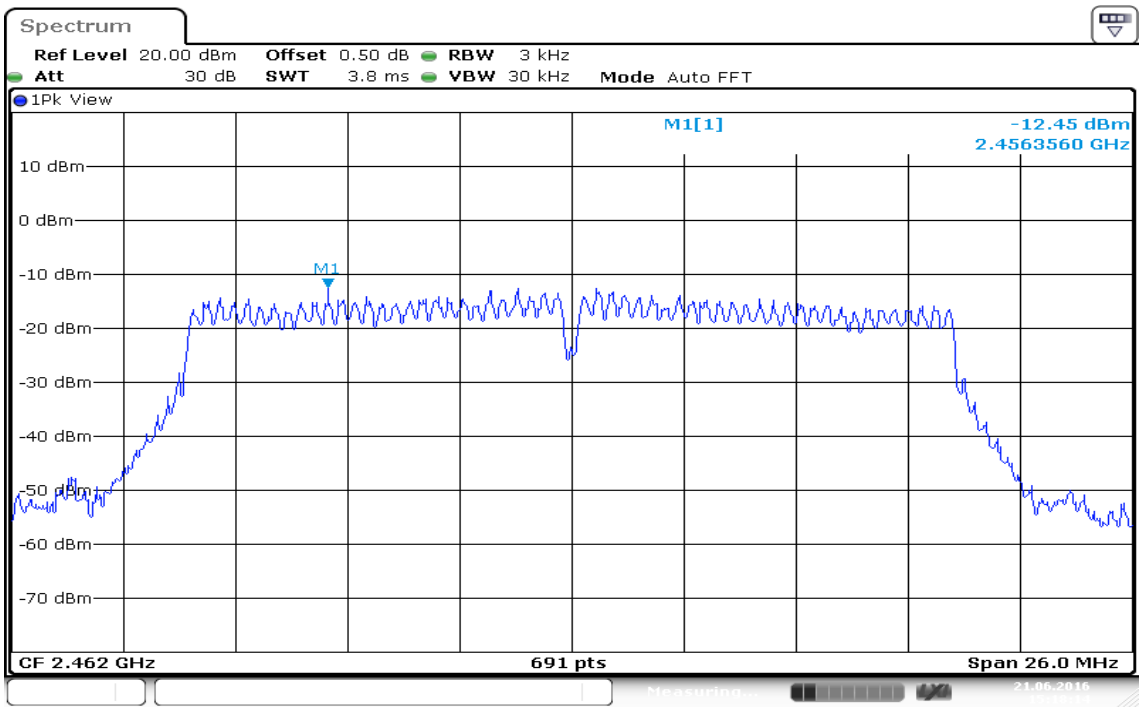
Date: 21.JUN.2016 15:20:38

PPSD (CH Mid)



Date: 21.JUN.2016 15:19:33

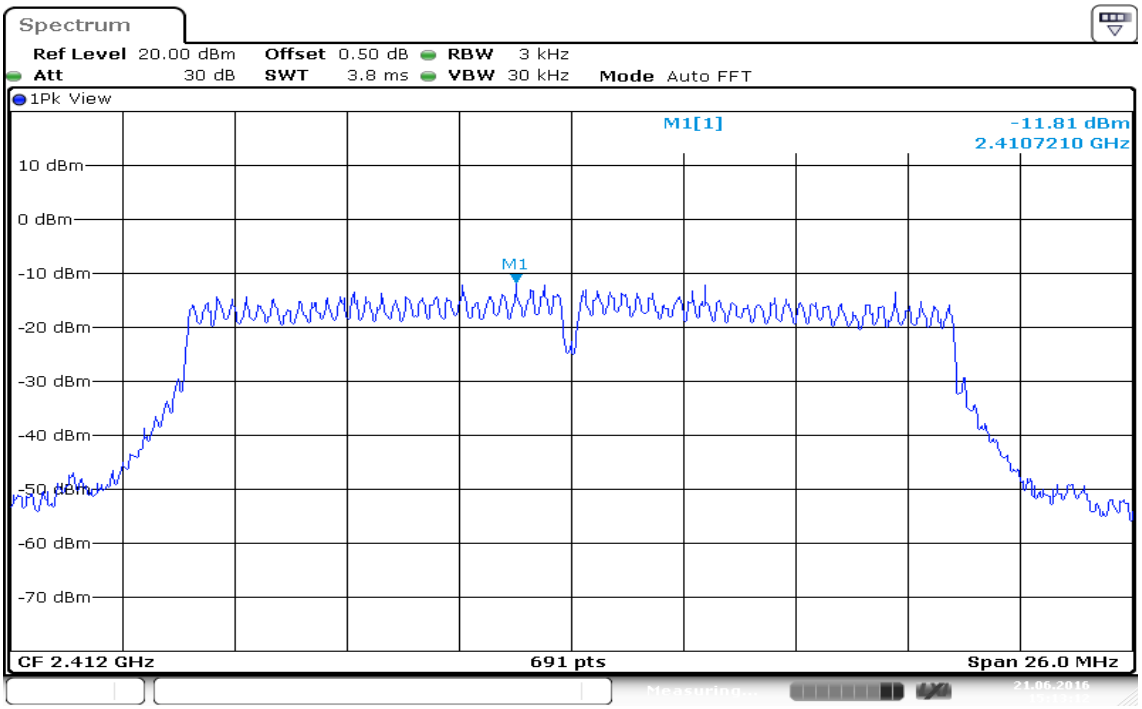
PPSD (CH High)



Date: 21.JUN.2016 15:18:14

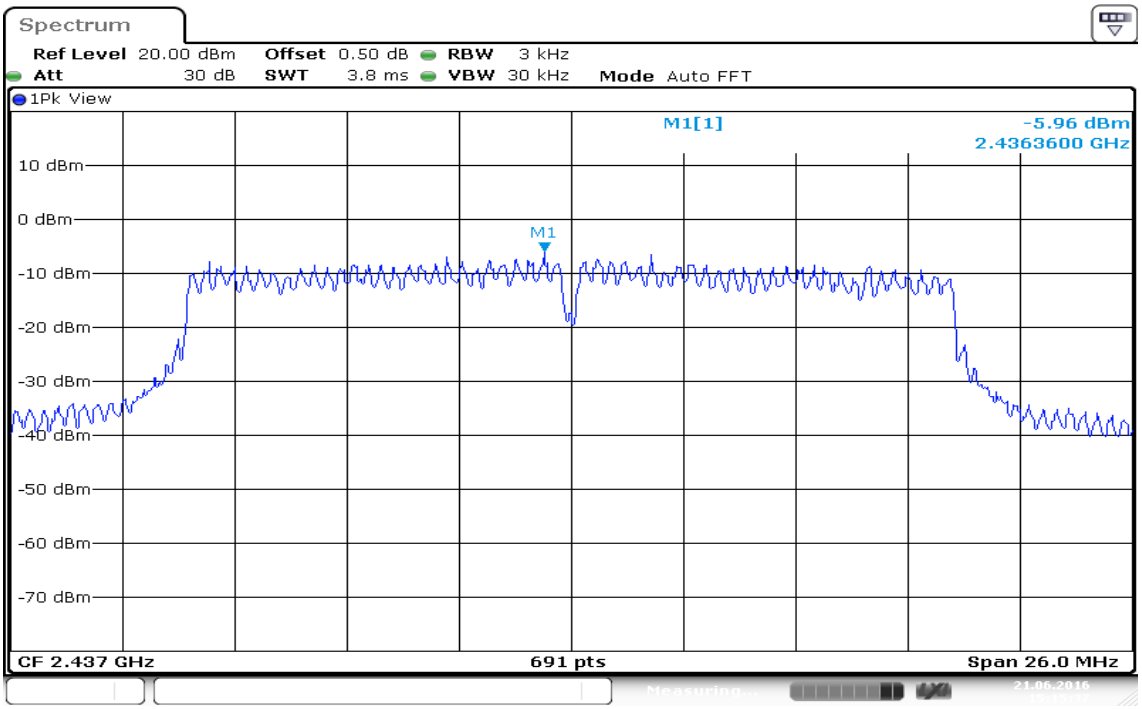
IEEE 802.11n HT 20 MHz mode / Chain 1

PPSD (CH Low)



Date: 21.JUN.2016 15:13:13

PPSD (CH Mid)



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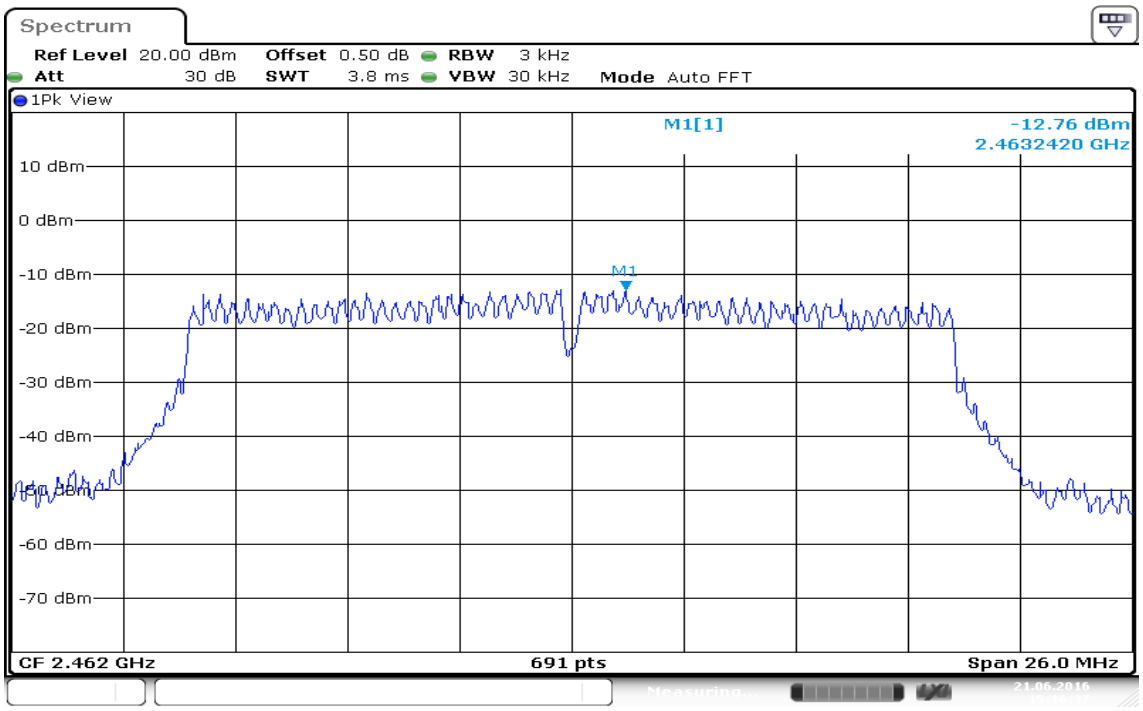
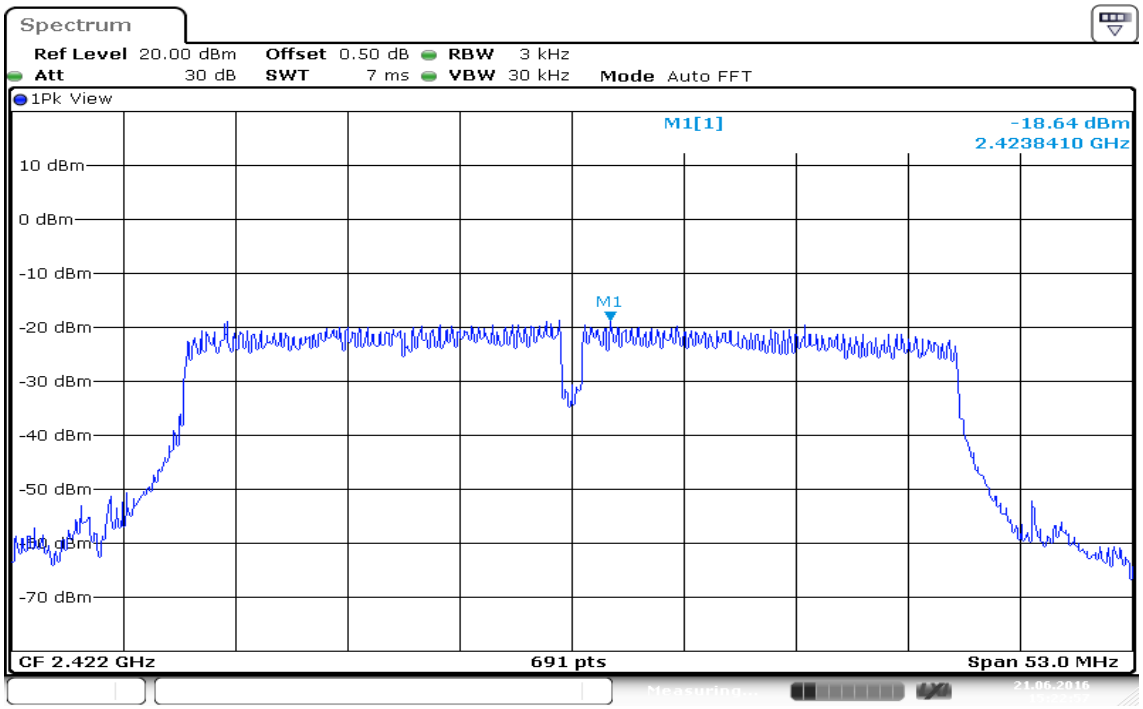
PPSD (CH High)



Date: 21.JUN.2016 15:16:38

IEEE 802.11n HT 40 MHz mode / Chain 0

PPSD (CH Low)



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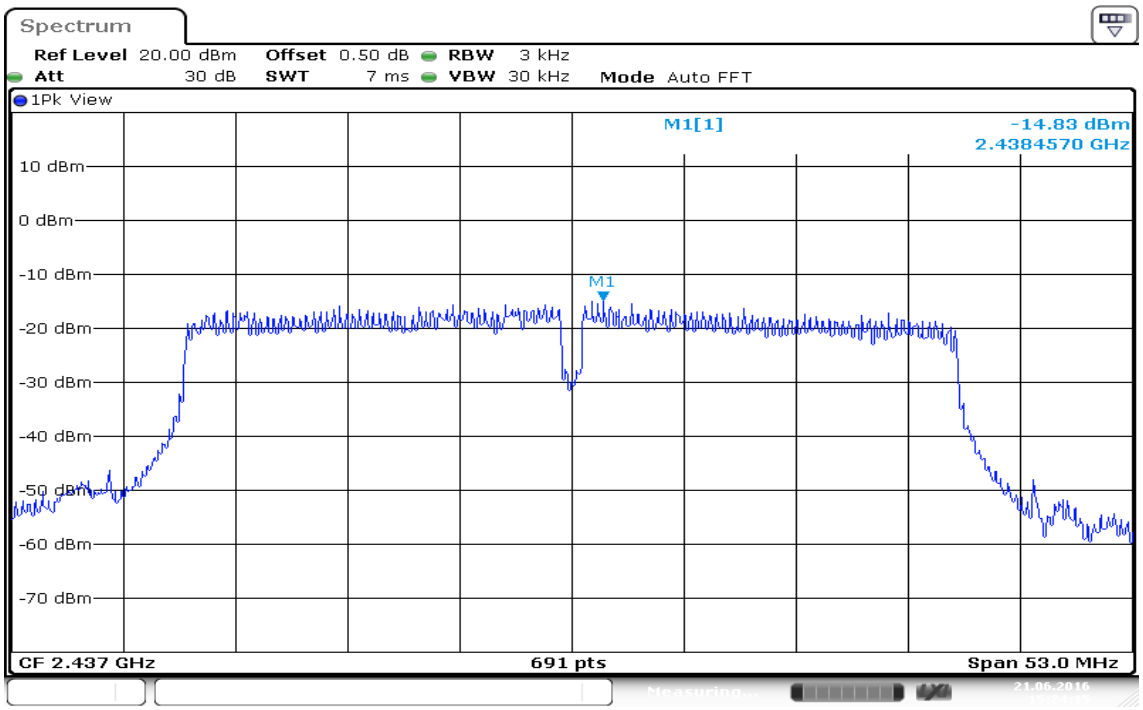
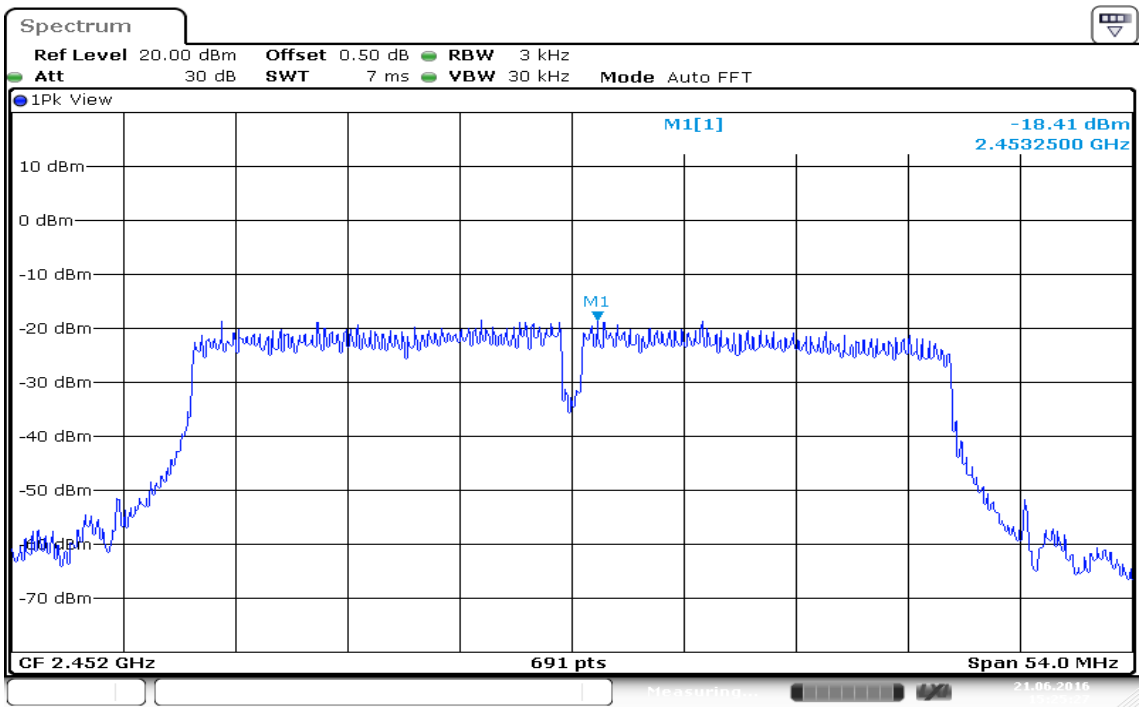
PPSD (CH Mid)



Date: 21.JUN.2016 15:24:15

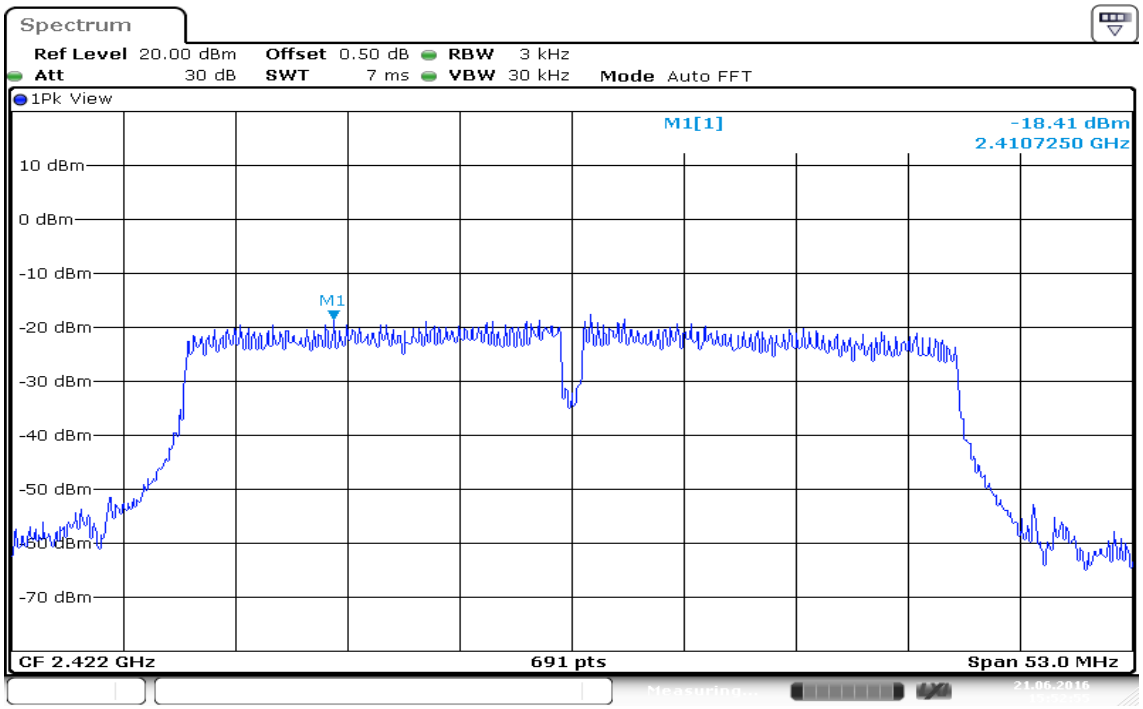
PPSD (CH High)



Date: 21.JUN.2016 15:25:28

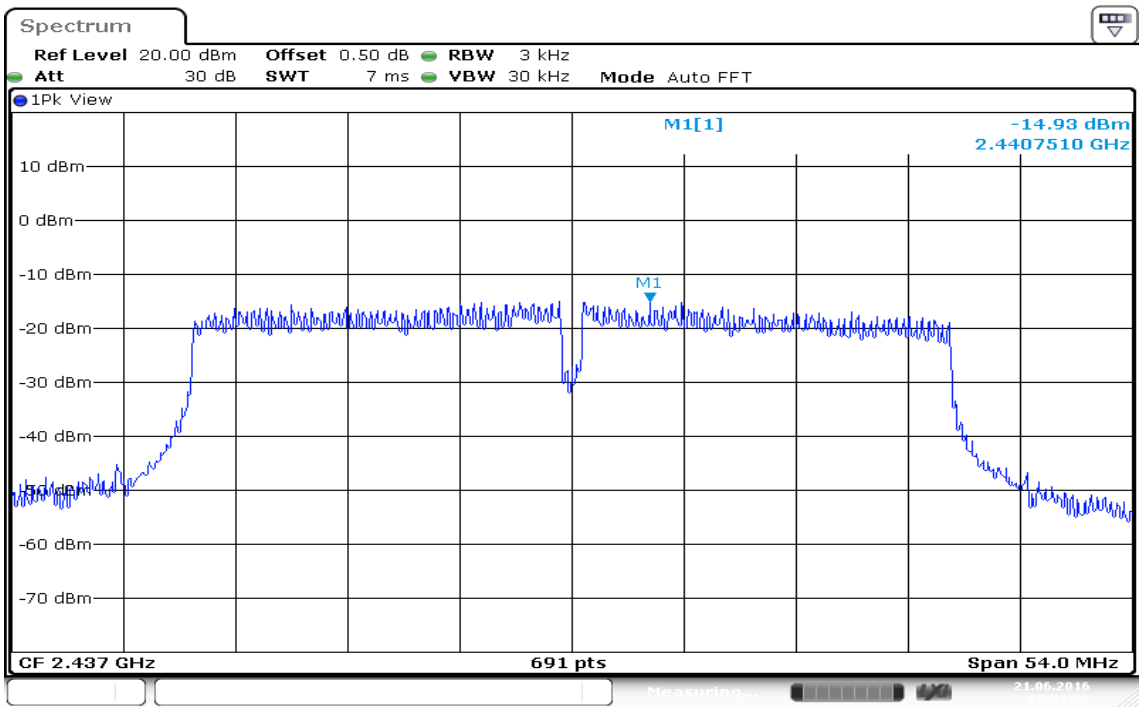
IEEE 802.11n HT 40 MHz mode / Chain 1

PPSD (CH Low)



Date: 21.JUN.2016 15:52:55

PPSD (CH Mid)



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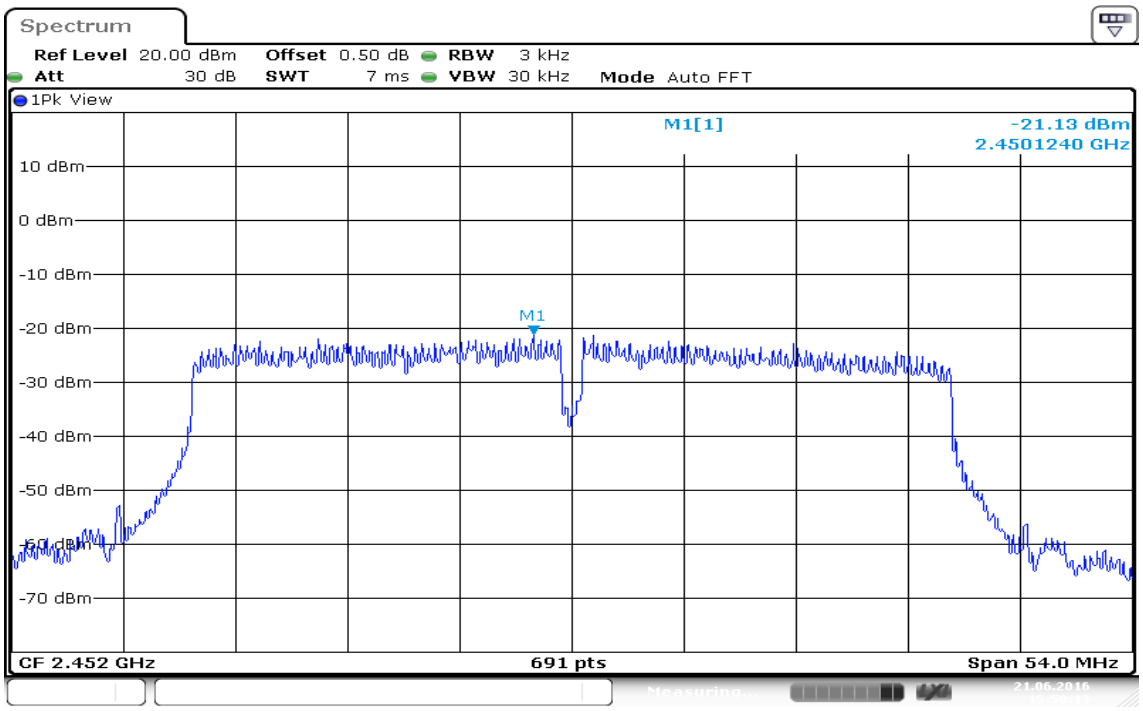
PPSD (CH High)



Date: 21.JUN.2016 15:50:13

7.7 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

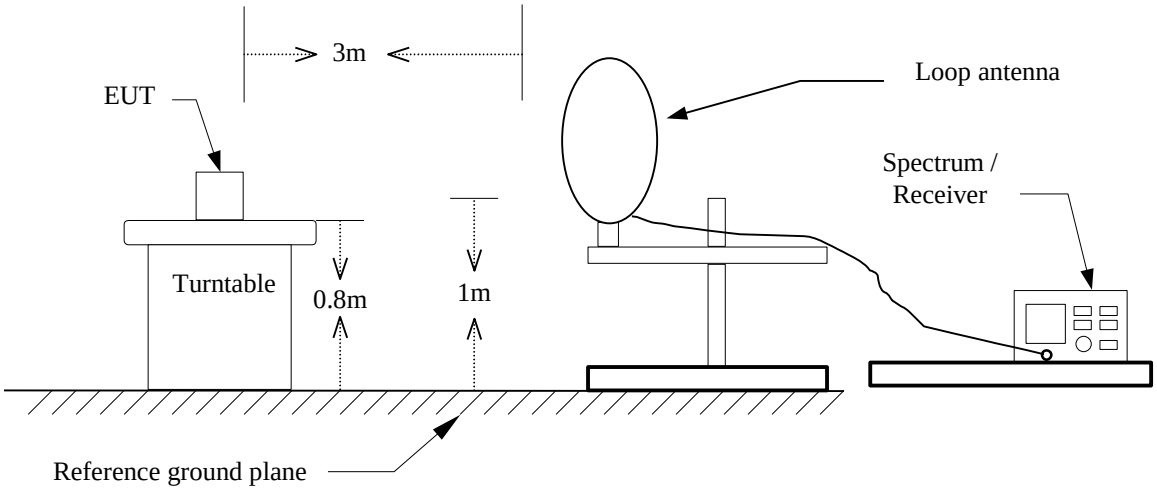
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

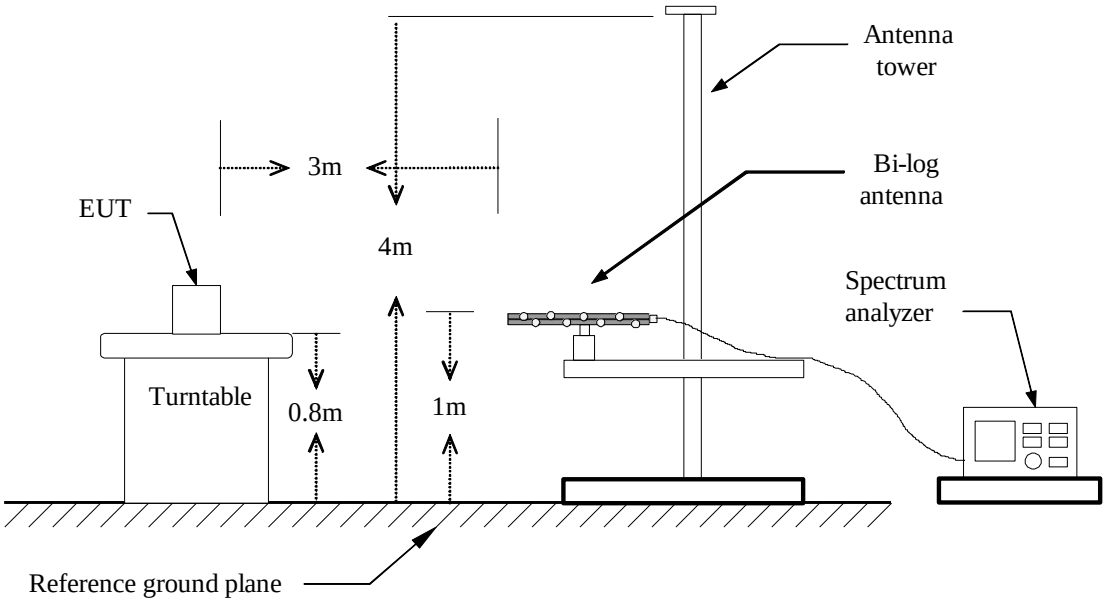
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
0.009 - 0.490	2400/F(kHz) +80	20LOG((2400/F(kHz))+80)
0.490 - 1.705	24000/F(kHz) +40	20LOG((24000/F(kHz))+40)
1.705 – 30.0	30	69.54
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

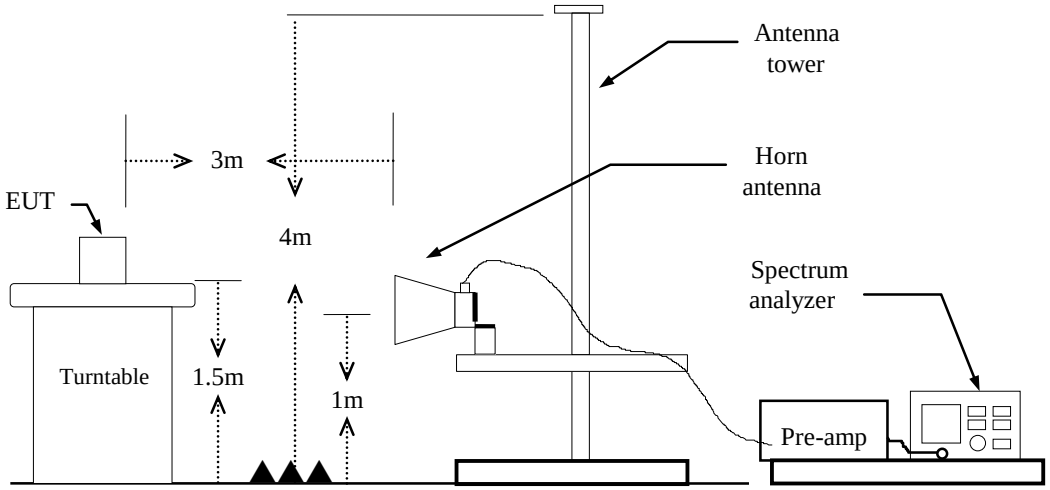
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz


Antenna
tower
Horn
antenna
Spectrum
analyzer
3m
EUT
4m
Turntable
1.5m
1m
Pre-amp

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=1MHz / VBW=3MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz,
   if duty cycle≧98%, VBW=10Hz.
   if duty cycle<98% VBW=1/T.
   IEEE 802.11b mode: =98%, VBW=300Hz
   IEEE 802.11g mode: =90%, VBW=600Hz
   IEEE 802.11n HT 20 MHz mode: =88%, VBW=750Hz
   IEEE 802.11n HT 40 MHz mode: =79%, VBW=1.5kHz

7. Repeat above procedures until the measurements for all frequencies are complete.
8. Result = Spectrum Reading + cable loss(spectrum to Amp) - Amp Gain + Cable loss(Amp to receive Ant)+ Receive Ant

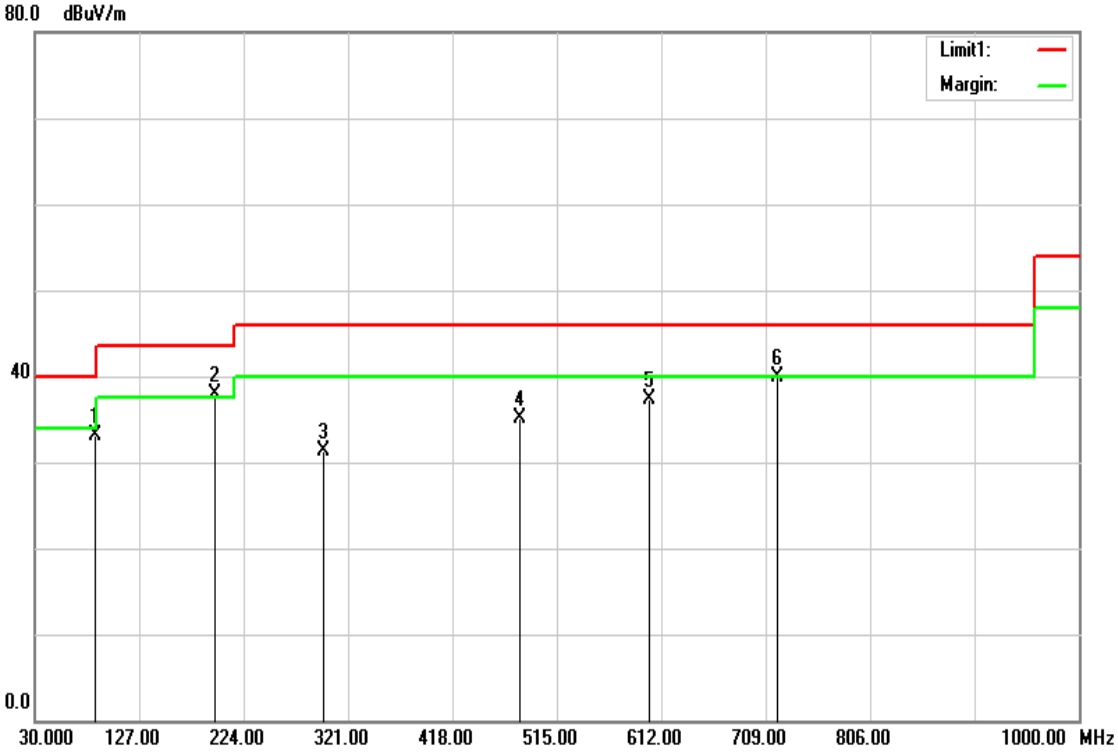
Note: We checked every harmonics frequencies from Fundamental frequencies with reduced VBW, and we mark a point to prove pass or not if we find any emission. For this case, there are no emissions hidden in the noise floor.

Below 1GHz

Operation Mode: Normal Link **Test Date:** July 15, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver.



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
86.2600	54.58	-21.41	33.17	40.00	-6.83	peak	V
196.8400	53.64	-15.83	37.81	43.50	-5.69	peak	V
298.6900	45.58	-14.26	31.32	46.00	-14.68	peak	V
480.0800	44.63	-9.62	35.01	46.00	-10.99	peak	V
600.3600	45.03	-7.75	37.28	46.00	-8.72	peak	V
719.6700	45.61	-5.62	39.99	46.00	-6.01	peak	V

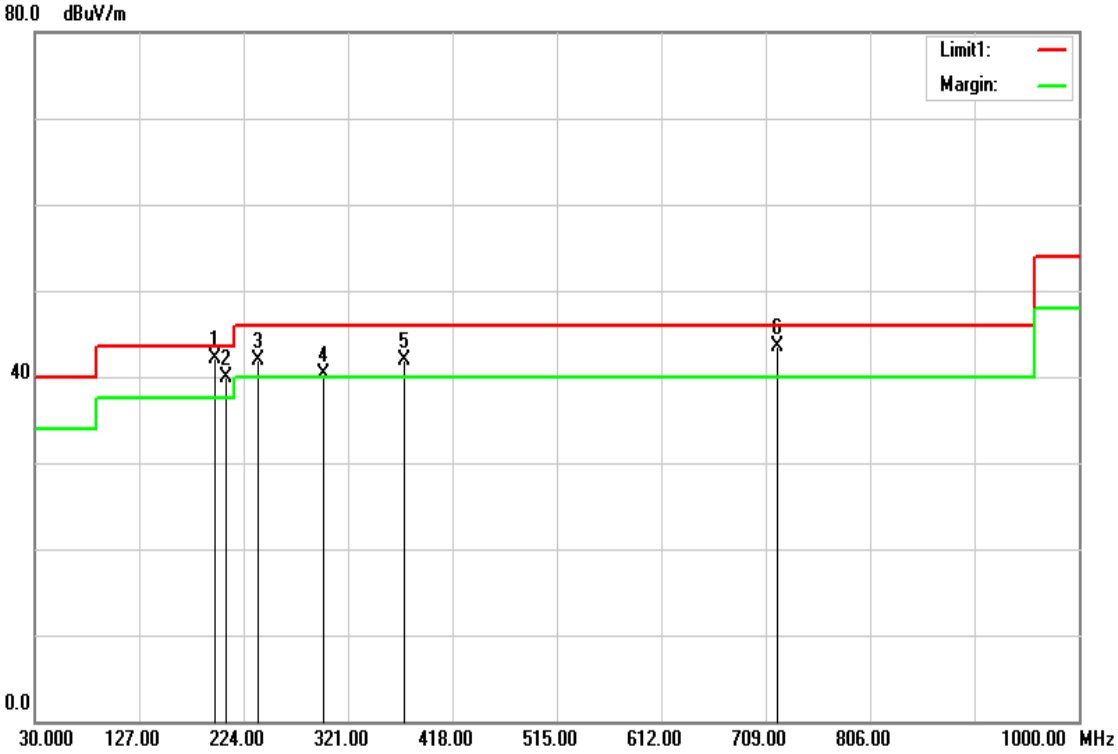
Remark:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
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) = Result (dBuV/m) – Limit (dBuV/m).*

Operation Mode: Normal Link **Test Date:** July 15, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Hor.



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
196.8400	57.88	-15.83	42.05	43.50	-1.45	QP	H
207.5100	55.99	-16.08	39.91	43.50	-3.59	QP	H
237.5800	58.42	-16.56	41.86	46.00	-4.14	QP	H
298.6900	54.49	-14.26	40.23	46.00	-5.77	peak	H
373.3800	54.29	-12.33	41.96	46.00	-4.04	peak	H
719.6700	49.08	-5.62	43.46	46.00	-2.54	QP	H

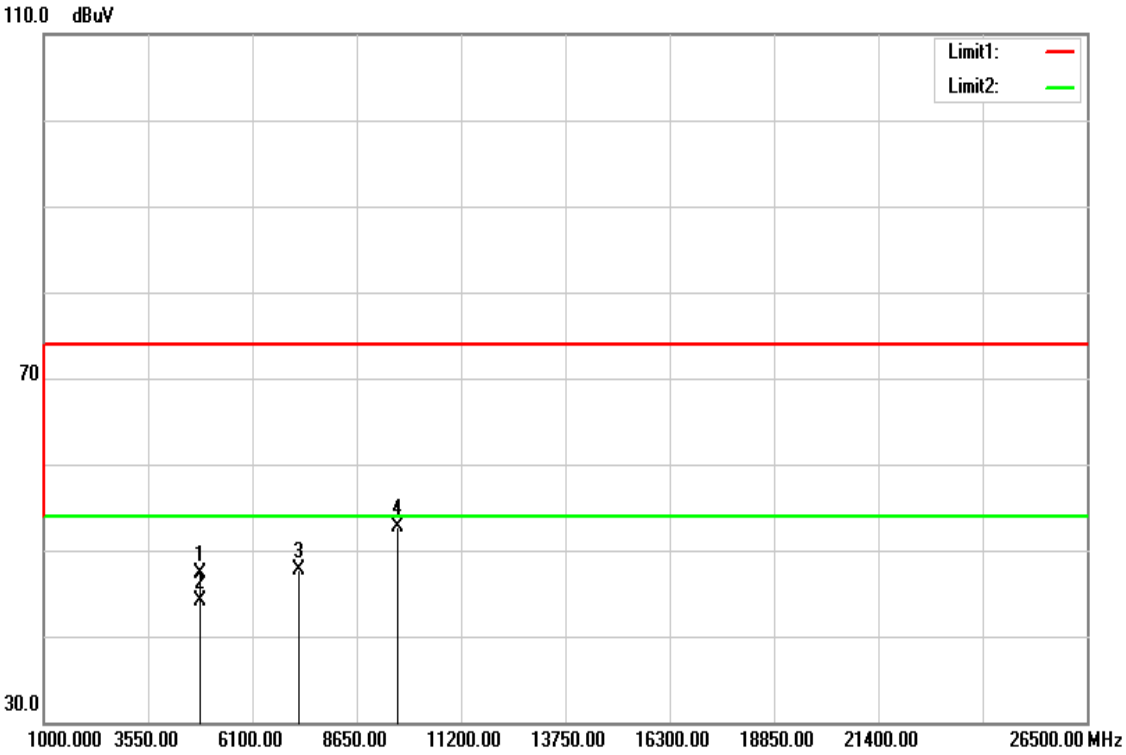
Remark:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
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) = Result (dBuV/m) – Limit (dBuV/m).*

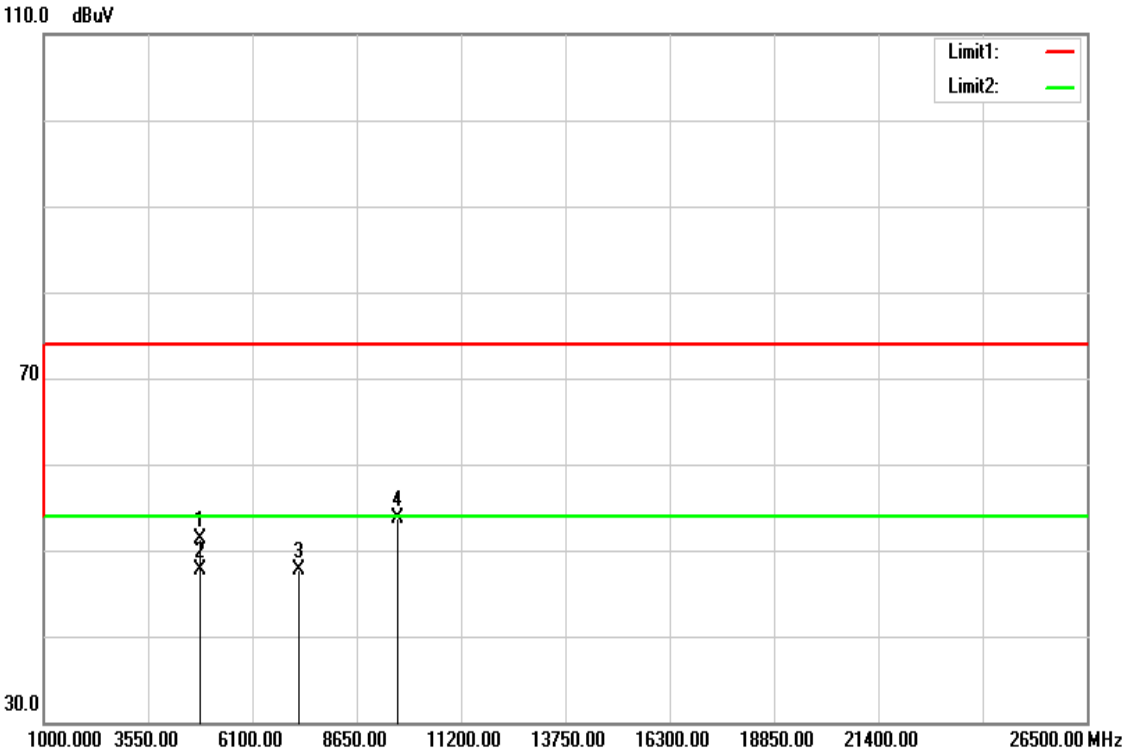
Above 1 GHz

TX / IEEE 802.11b / CH Low

Polarity: Vertical



Polarity: Horizontal



Above 1 GHz

Operation Mode: TX / IEEE 802.11b / CH Low **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

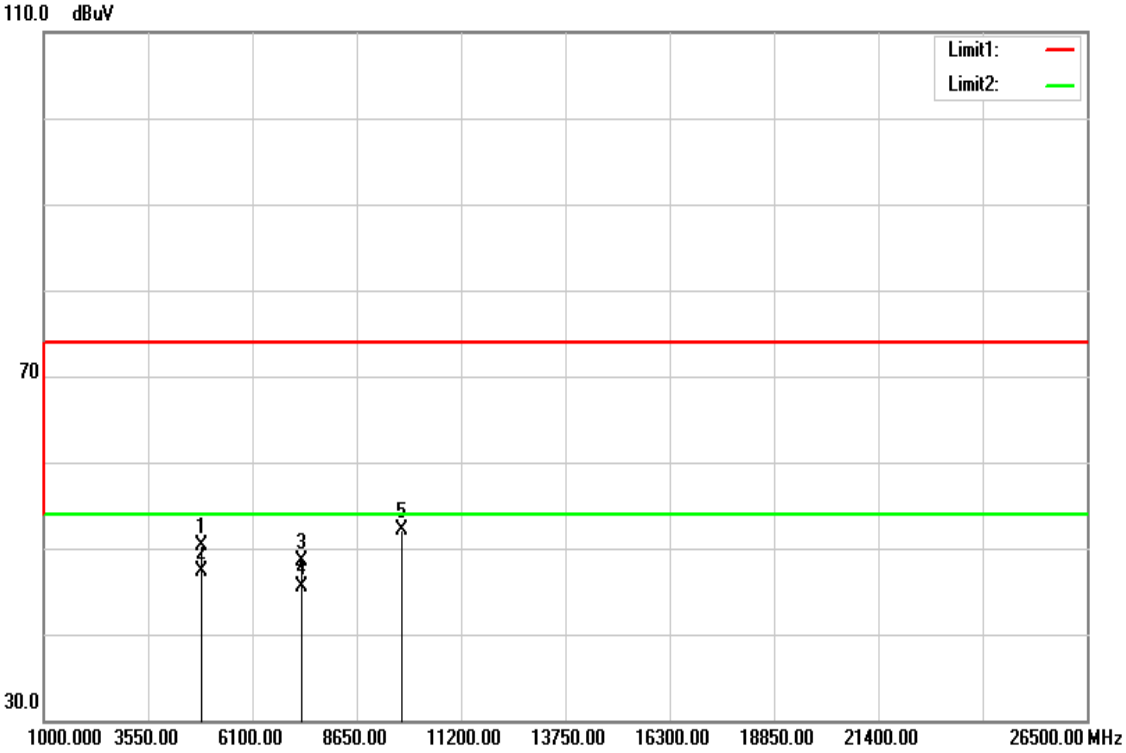
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4824.000	43.35	4.01	47.36	74.00	-26.64	peak	V
4824.000	40.11	4.01	44.12	54.00	-9.88	AVG	V
7236.000	37.06	10.64	47.70	74.00	-26.30	peak	V
9648.000	38.56	14.22	52.78	74.00	-21.22	peak	V
N/A							
4824.000	47.35	4.01	51.36	74.00	-22.64	peak	H
4824.000	43.70	4.01	47.71	54.00	-6.29	AVG	H
7236.000	36.97	10.64	47.61	74.00	-26.39	peak	H
9648.000	39.50	14.22	53.72	74.00	-20.28	peak	H
N/A							

Remark:

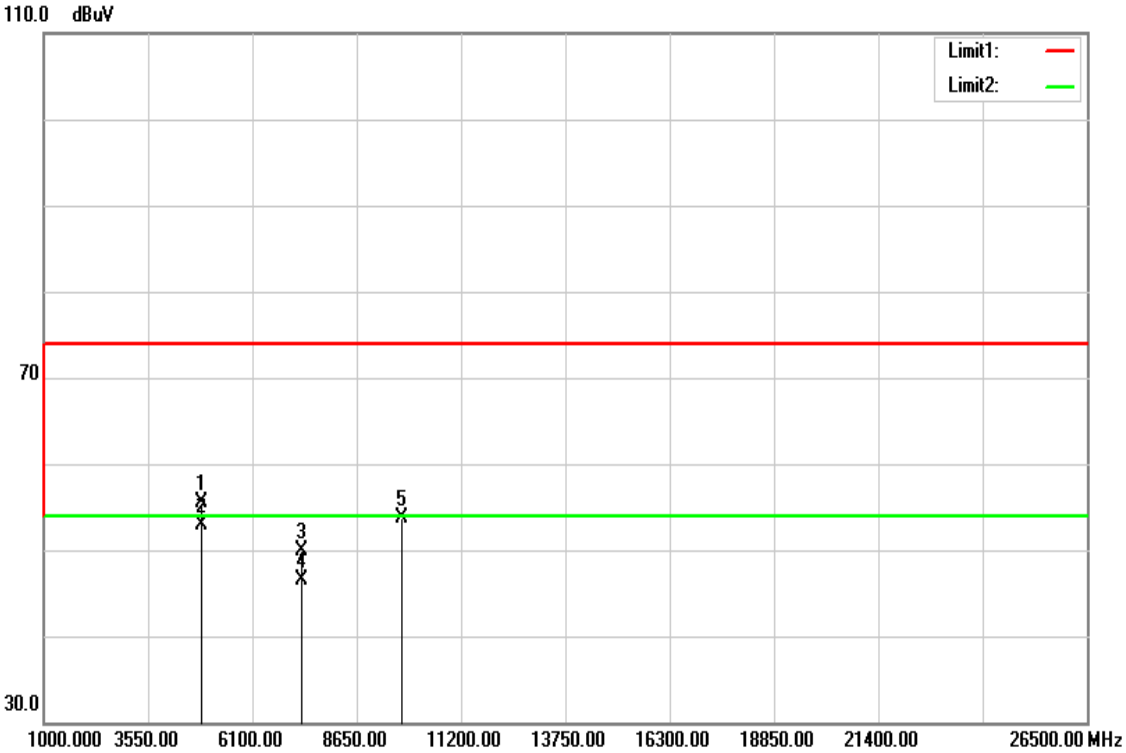
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

TX / IEEE 802.11b / CH Mid

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11b / CH Mid **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

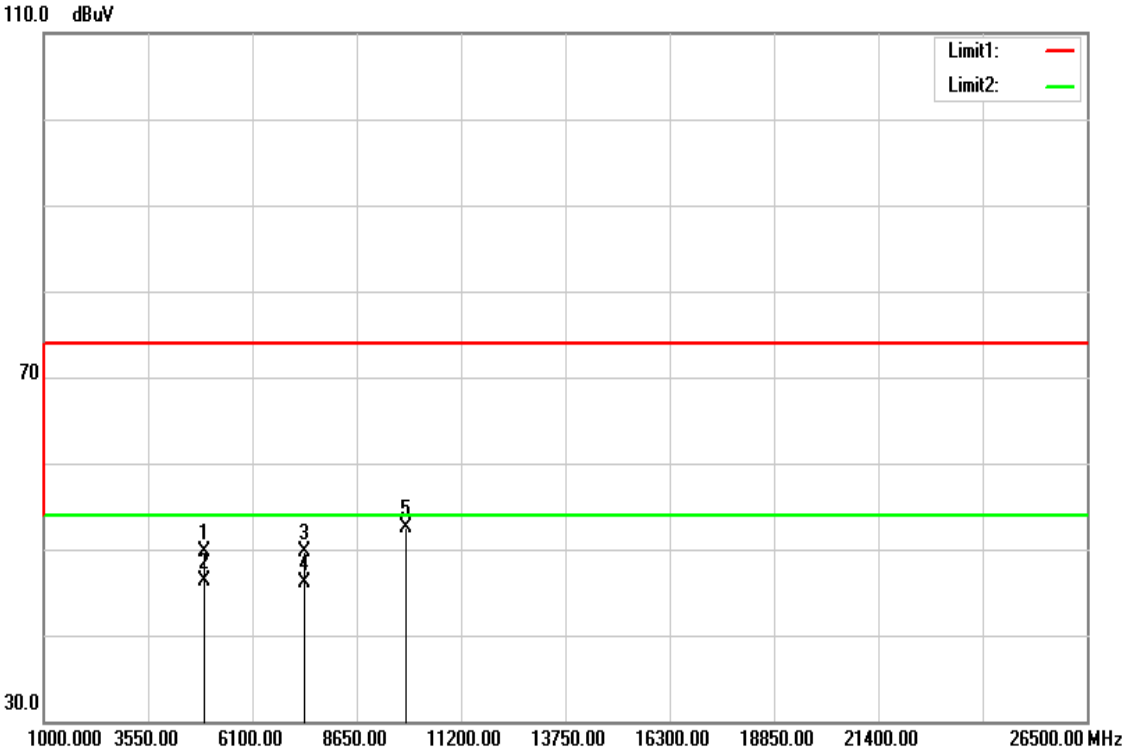
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4874.000	46.38	3.92	50.30	74.00	-23.70	peak	V
4874.000	43.39	3.92	47.31	54.00	-6.69	AVG	V
7311.000	37.86	10.71	48.57	74.00	-25.43	peak	V
7311.000	34.80	10.71	45.51	54.00	-8.49	AVG	V
9748.000	37.67	14.41	52.08	74.00	-21.92	peak	V
N/A							
4874.000	51.54	3.92	55.46	74.00	-18.54	peak	H
4874.000	49.05	3.92	52.97	54.00	-1.03	AVG	H
7311.000	39.19	10.71	49.90	74.00	-24.10	peak	H
7311.000	35.83	10.71	46.54	54.00	-7.46	AVG	H
9748.000	39.39	14.41	53.80	74.00	-20.20	peak	H
N/A							

Remark:

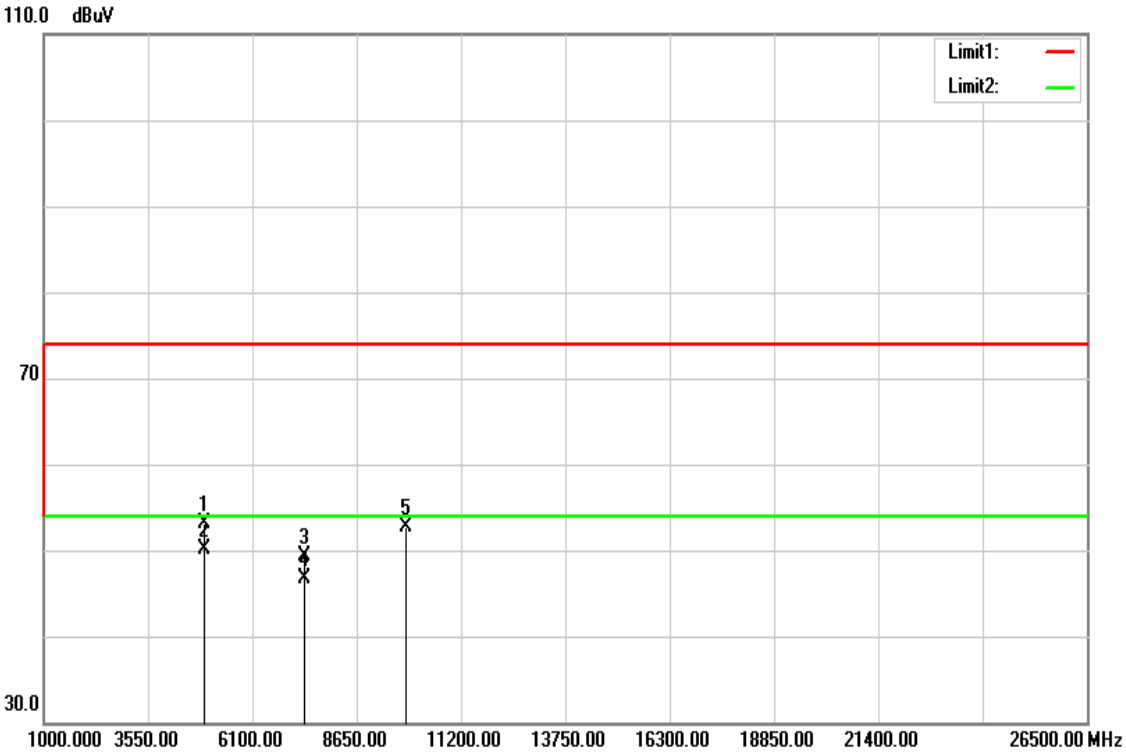
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 802.11b / CH High

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11b / CH High **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

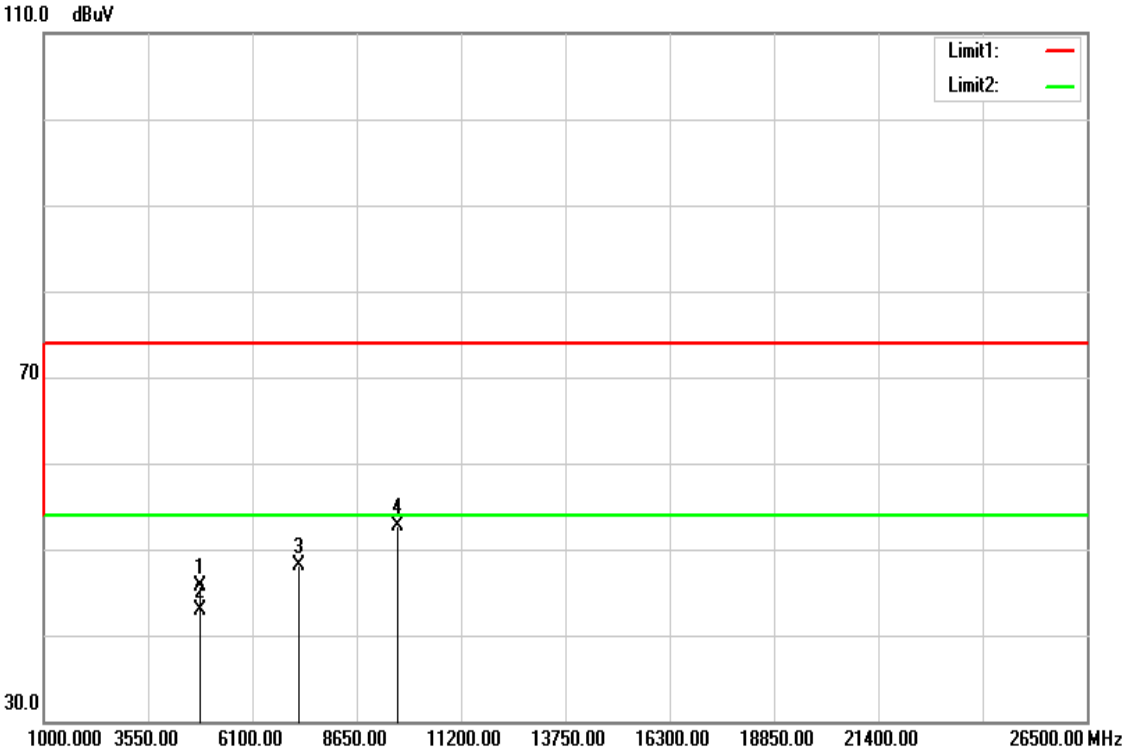
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4924.000	45.87	3.90	49.77	74.00	-24.23	peak	V
4924.000	42.41	3.90	46.31	54.00	-7.69	AVG	V
7386.000	38.89	10.79	49.68	74.00	-24.32	peak	V
7386.000	35.32	10.79	46.11	54.00	-7.89	AVG	V
9848.000	37.95	14.60	52.55	74.00	-21.45	peak	V
N/A							
4924.000	49.18	3.90	53.08	74.00	-20.92	peak	H
4924.000	46.26	3.90	50.16	54.00	-3.84	AVG	H
7386.000	38.54	10.79	49.33	74.00	-24.67	peak	H
7386.000	35.98	10.79	46.77	54.00	-7.23	AVG	H
9848.000	38.16	14.60	52.76	74.00	-21.24	peak	H
N/A							

Remark:

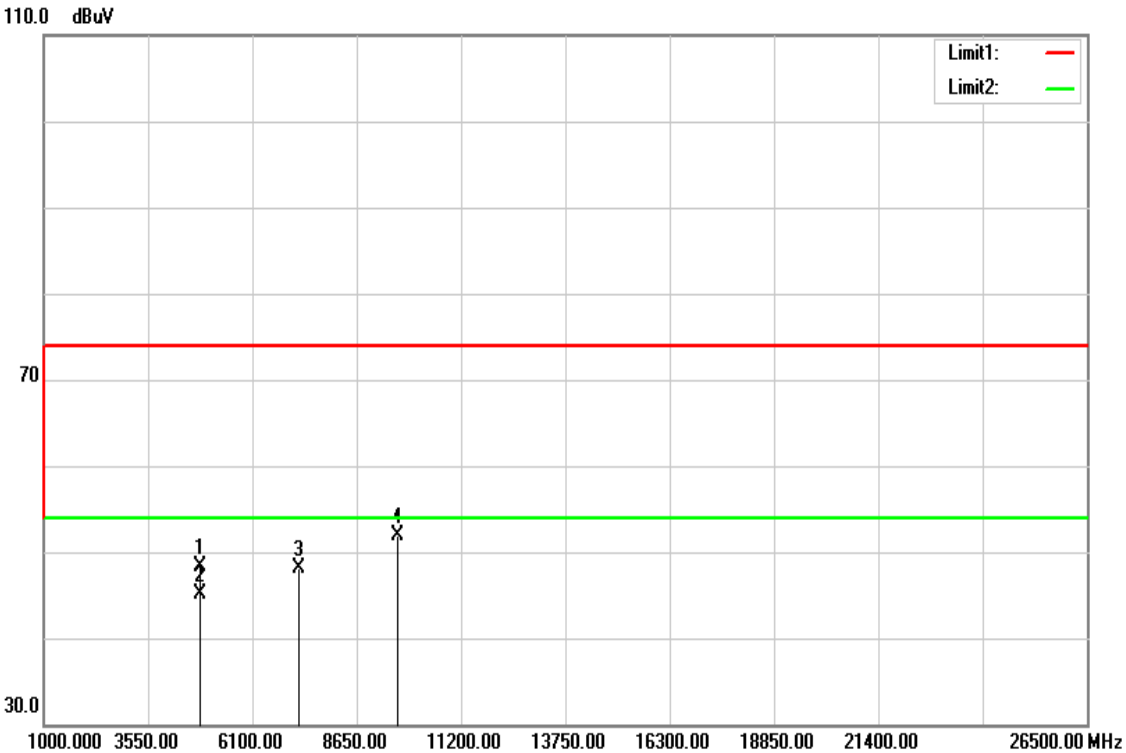
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 Low

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11g / CH Low **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

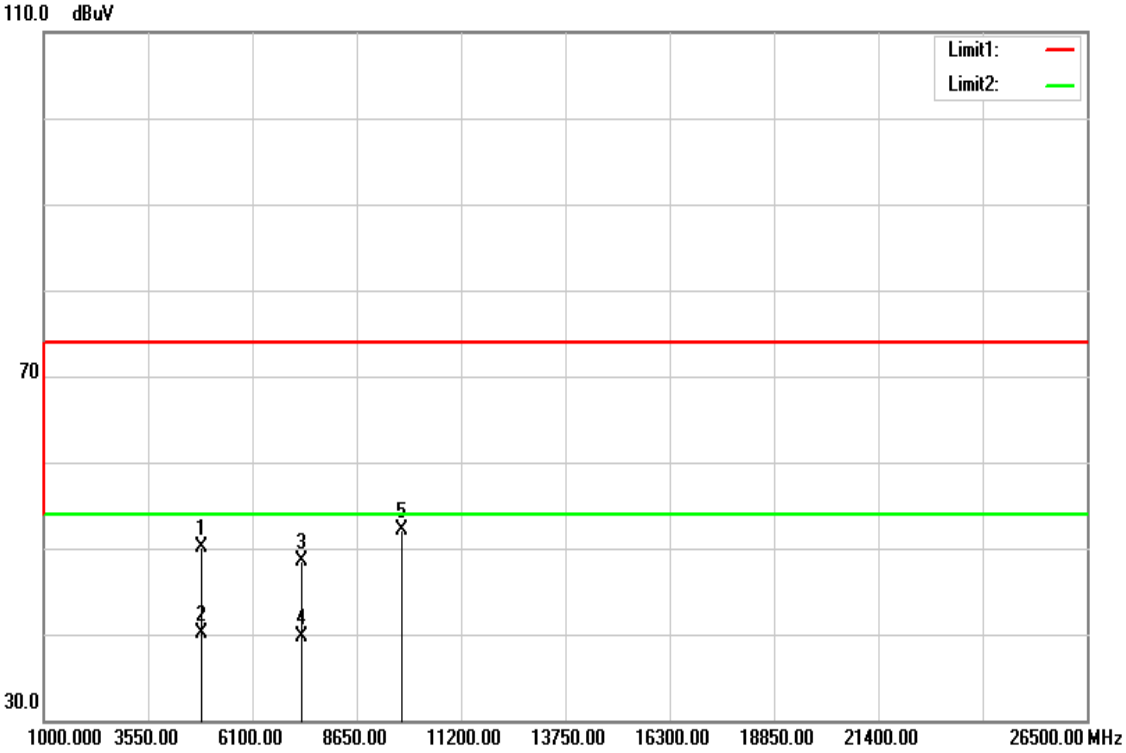
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4824.000	41.73	4.01	45.74	74.00	-28.26	peak	V
4824.000	38.98	4.01	42.99	54.00	-11.01	AVG	V
7236.000	37.45	10.64	48.09	74.00	-25.91	peak	V
9648.000	38.56	14.22	52.78	74.00	-21.22	peak	V
N/A							
4824.000	44.29	4.01	48.30	74.00	-25.70	peak	H
4824.000	41.10	4.01	45.11	54.00	-8.89	AVG	H
7236.000	37.46	10.64	48.10	74.00	-25.90	peak	H
9648.000	37.62	14.22	51.84	74.00	-22.16	peak	H
N/A							

Remark:

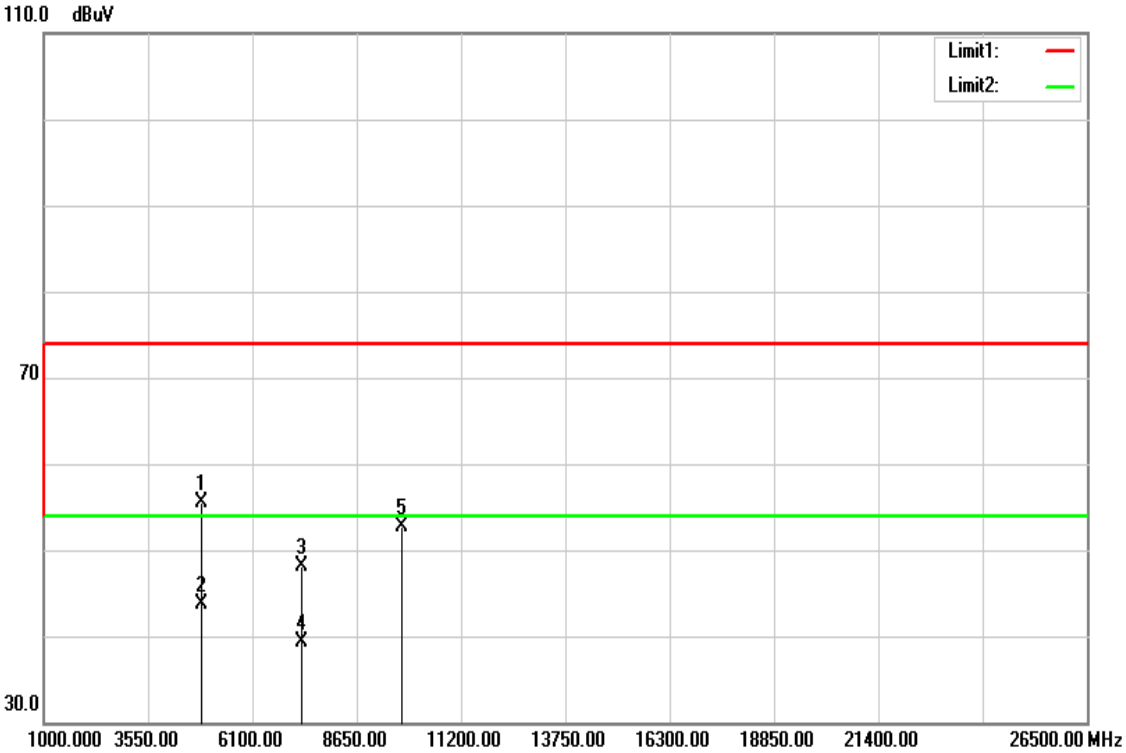
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 / CH Mid **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

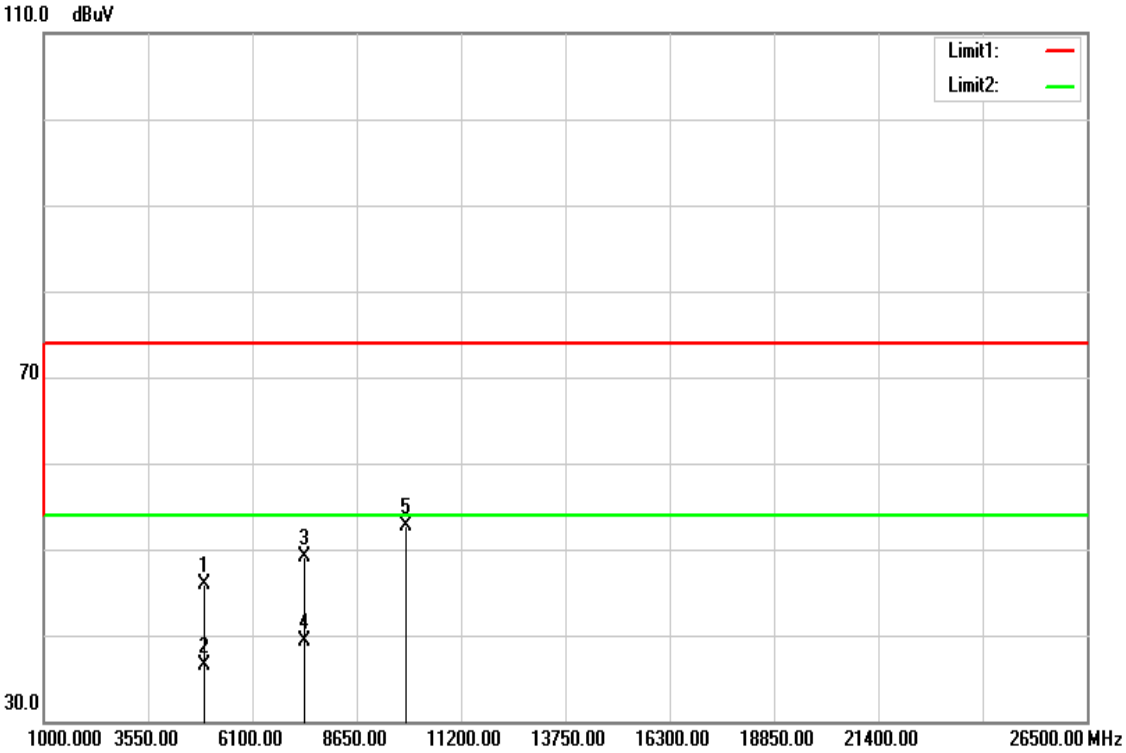
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4874.000	46.15	3.92	50.07	74.00	-23.93	peak	V
4874.000	36.23	3.92	40.15	54.00	-13.85	AVG	V
7311.000	37.89	10.71	48.60	74.00	-25.40	peak	V
7311.000	28.94	10.71	39.65	54.00	-14.35	AVG	V
9748.000	37.61	14.41	52.02	74.00	-21.98	peak	V
N/A							
4874.000	51.54	3.92	55.46	74.00	-18.54	peak	H
4874.000	39.71	3.92	43.63	54.00	-10.37	AVG	H
7311.000	37.32	10.71	48.03	74.00	-25.97	peak	H
7311.000	28.50	10.71	39.21	54.00	-14.79	AVG	H
9748.000	38.27	14.41	52.68	74.00	-21.32	peak	H
N/A							

Remark:

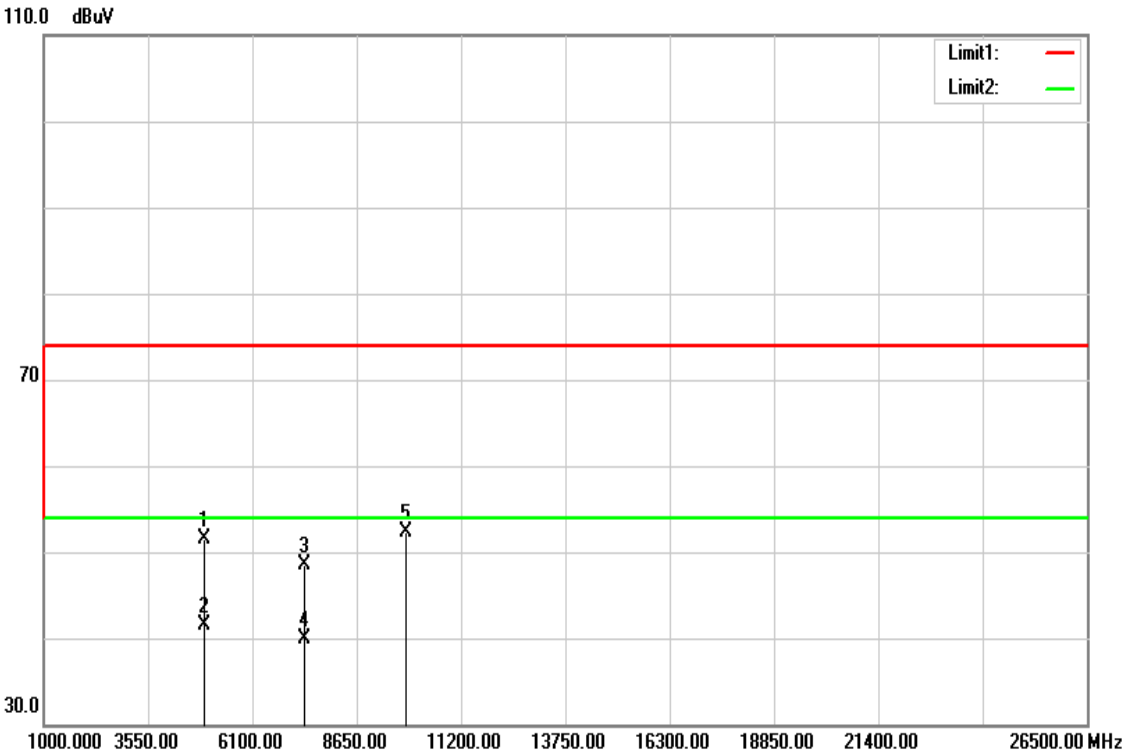
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 High

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11g / CH High **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

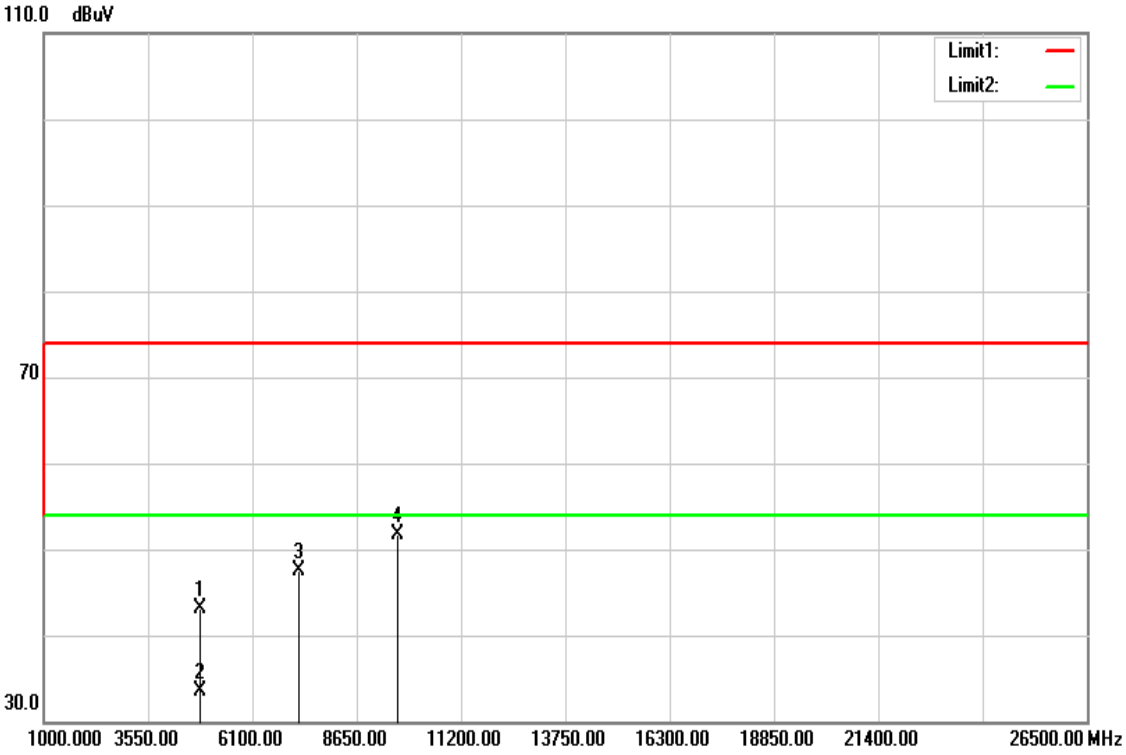
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4924.000	41.98	3.90	45.88	74.00	-28.12	peak	V
4924.000	32.56	3.90	36.46	54.00	-17.54	AVG	V
7386.000	38.26	10.79	49.05	74.00	-24.95	peak	V
7386.000	28.53	10.79	39.32	54.00	-14.68	AVG	V
9848.000	38.12	14.60	52.72	74.00	-21.28	peak	V
N/A							
4924.000	47.53	3.90	51.43	74.00	-22.57	peak	H
4924.000	37.68	3.90	41.58	54.00	-12.42	AVG	H
7386.000	37.80	10.79	48.59	74.00	-25.41	peak	H
7386.000	29.08	10.79	39.87	54.00	-14.13	AVG	H
9848.000	37.73	14.60	52.33	74.00	-21.67	peak	H
N/A							

Remark:

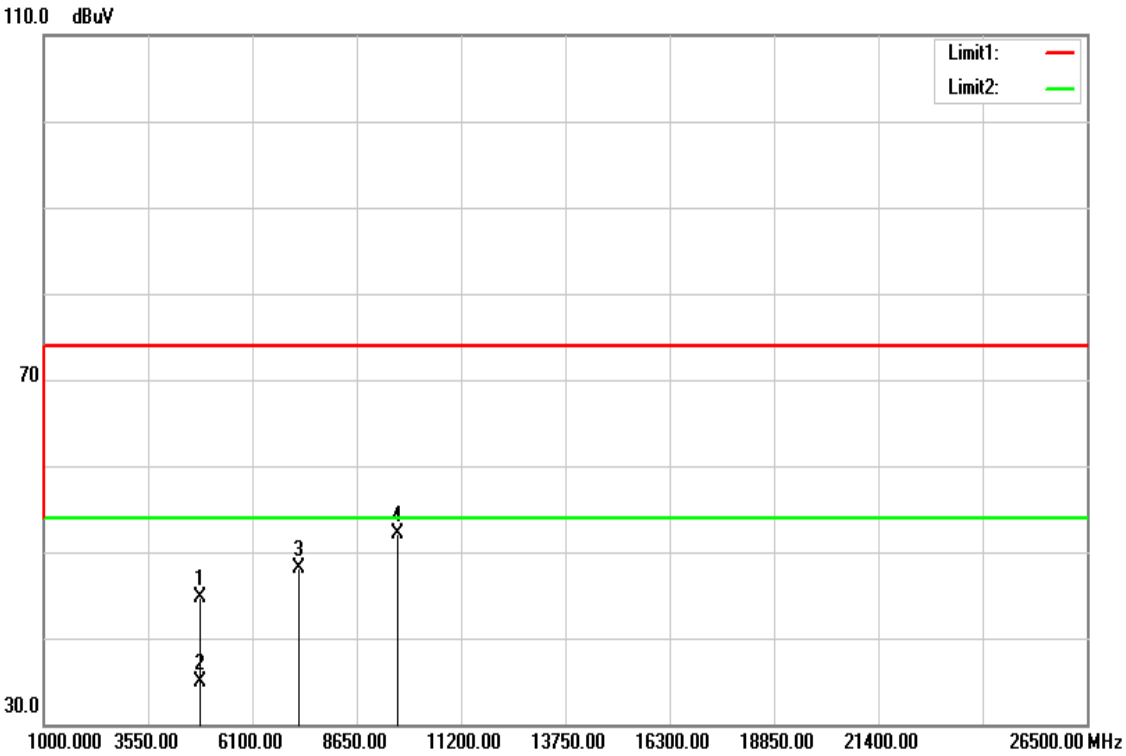
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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. *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 / CH Low **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

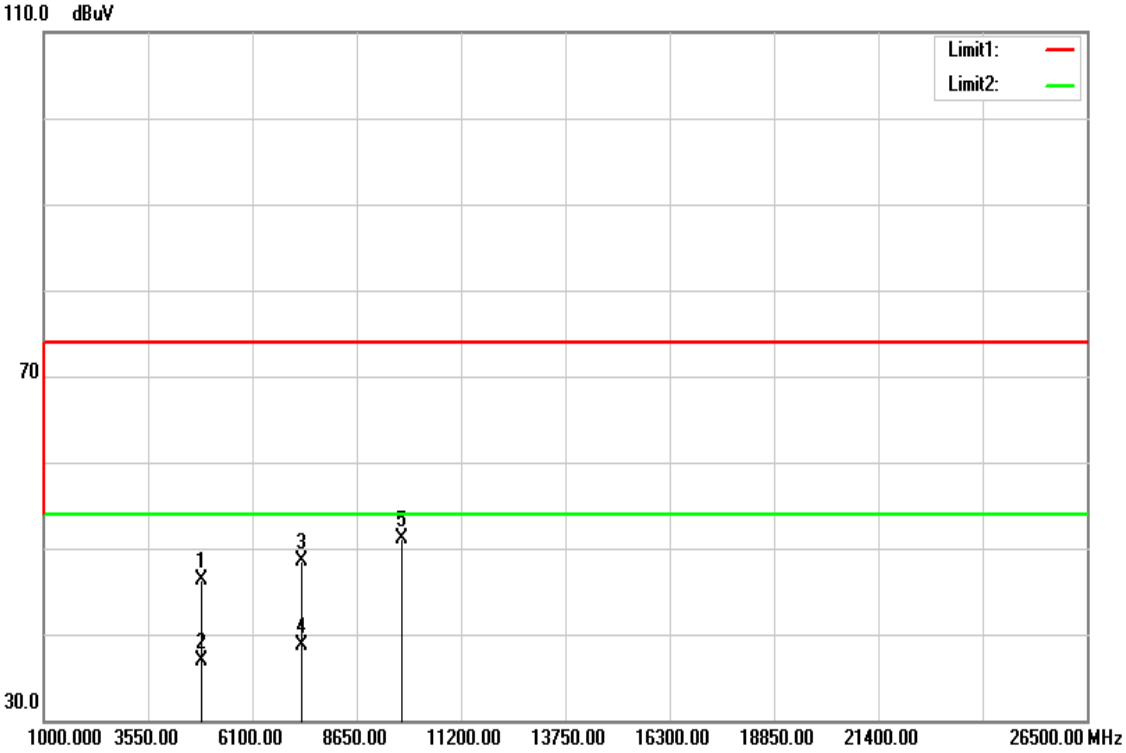
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4824.000	39.16	4.01	43.17	74.00	-30.83	peak	V
4824.000	29.55	4.01	33.56	54.00	-20.44	AVG	V
7236.000	36.92	10.64	47.56	74.00	-26.44	peak	V
9648.000	37.41	14.22	51.63	74.00	-22.37	peak	V
N/A							
4824.000	40.79	4.01	44.80	74.00	-29.20	peak	H
4824.000	30.84	4.01	34.85	54.00	-19.15	AVG	H
7236.000	37.55	10.64	48.19	74.00	-25.81	peak	H
9648.000	37.86	14.22	52.08	74.00	-21.92	peak	H
N/A							

Remark:

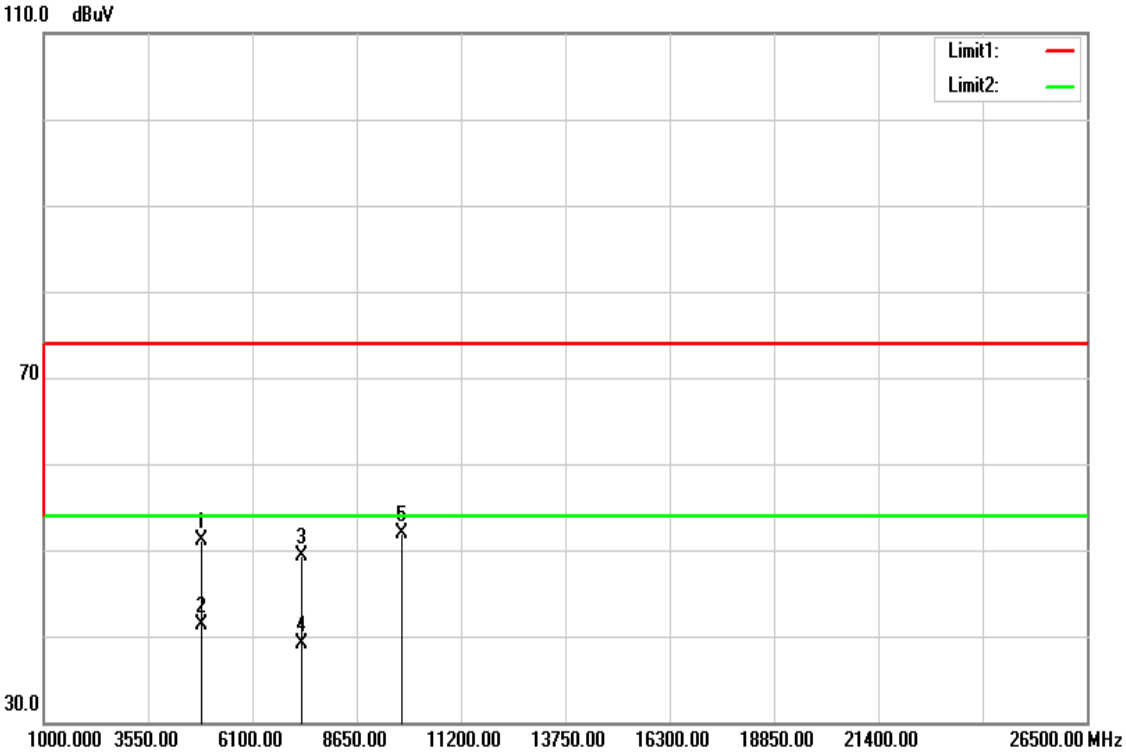
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 Mid

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 20 MHz mode / CH Mid **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

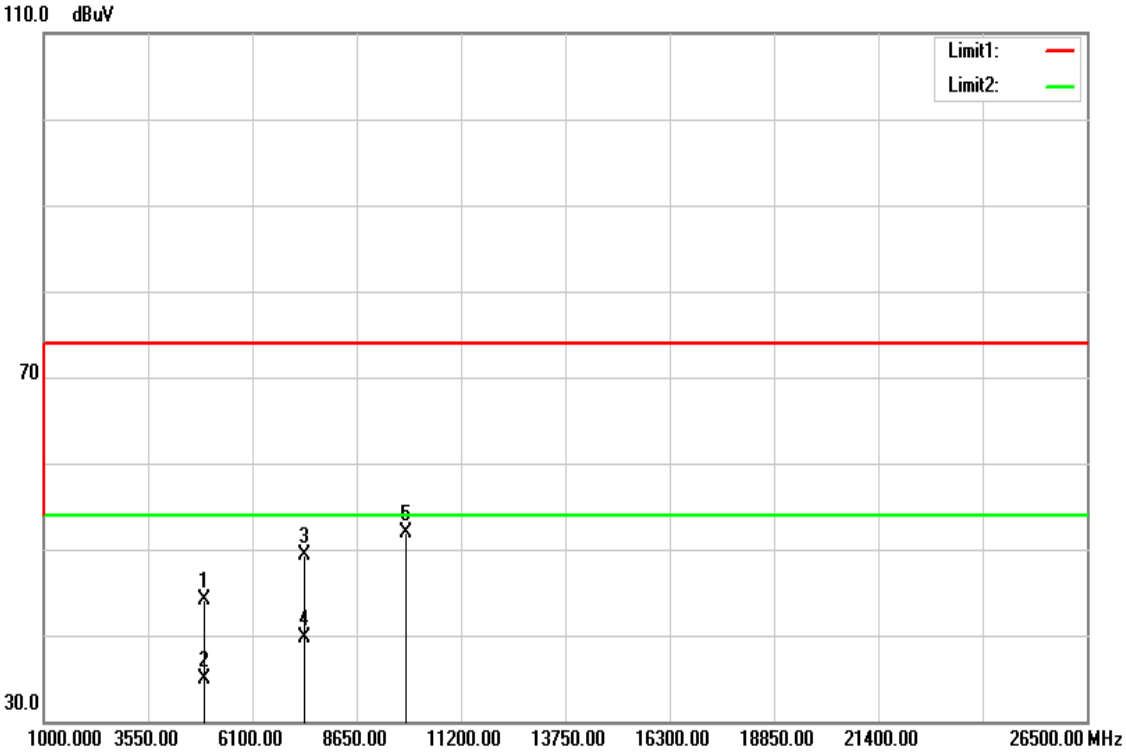
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4874.000	42.47	3.92	46.39	74.00	-27.61	peak	V
4874.000	33.06	3.92	36.98	54.00	-17.02	AVG	V
7311.000	37.86	10.71	48.57	74.00	-25.43	peak	V
7311.000	28.08	10.71	38.79	54.00	-15.21	AVG	V
9748.000	36.64	14.41	51.05	74.00	-22.95	peak	V
N/A							
4874.000	47.11	3.92	51.03	74.00	-22.97	peak	H
4874.000	37.40	3.92	41.32	54.00	-12.68	AVG	H
7311.000	38.52	10.71	49.23	74.00	-24.77	peak	H
7311.000	28.44	10.71	39.15	54.00	-14.85	AVG	H
9748.000	37.49	14.41	51.90	74.00	-22.10	peak	H
N/A							

Remark:

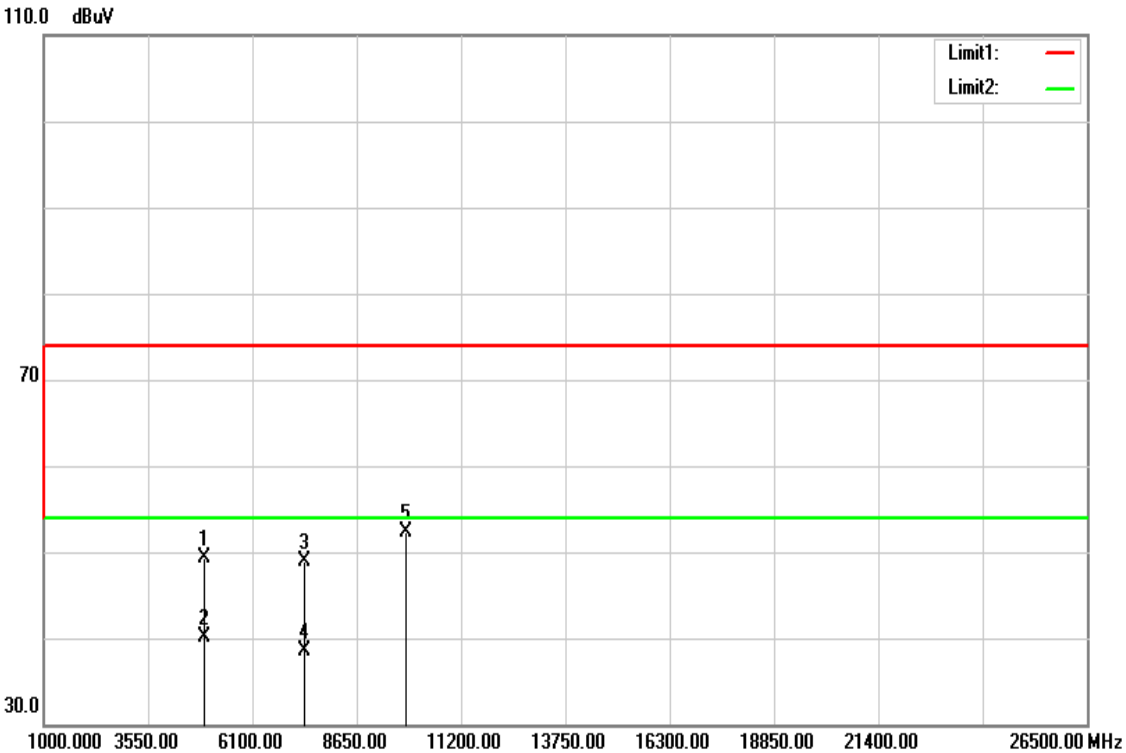
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 High

Polarity: Vertical



Polarity: Horizontal



Operation Mode:	TX / IEEE 802.11n HT 20 MHz mode / CH High	**Test Date:**	June 22, 2016
Temperature:	27°C	**Tested by:**	Dennis Li
Humidity:	53% RH	**Polarity:**	Ver. / Hor.

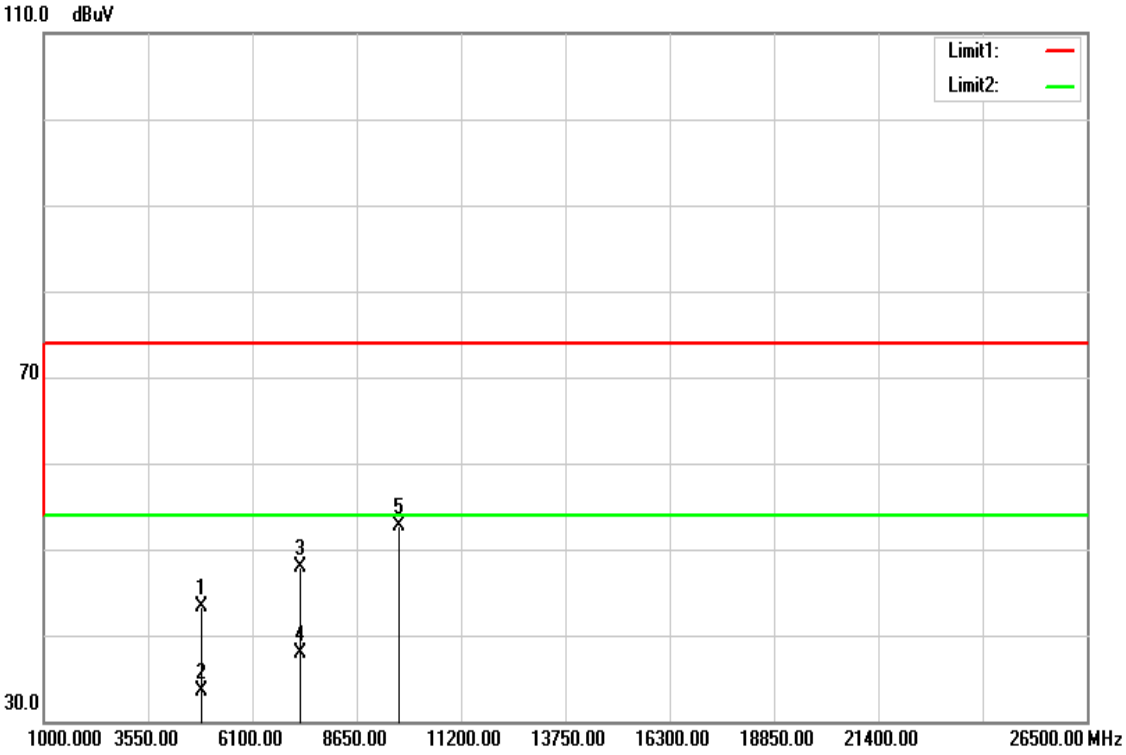
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4924.000	40.18	3.90	44.08	74.00	-29.92	peak	V
4924.000	31.06	3.90	34.96	54.00	-19.04	AVG	V
7386.000	38.53	10.79	49.32	74.00	-24.68	peak	V
7386.000	28.99	10.79	39.78	54.00	-14.22	AVG	V
9848.000	37.37	14.60	51.97	74.00	-22.03	peak	V
N/A							
4924.000	45.36	3.90	49.26	74.00	-24.74	peak	H
4924.000	36.22	3.90	40.12	54.00	-13.88	AVG	H
7386.000	38.04	10.79	48.83	74.00	-25.17	peak	H
7386.000	27.66	10.79	38.45	54.00	-15.55	AVG	H
9848.000	37.75	14.60	52.35	74.00	-21.65	peak	H
N/A							

Remark:

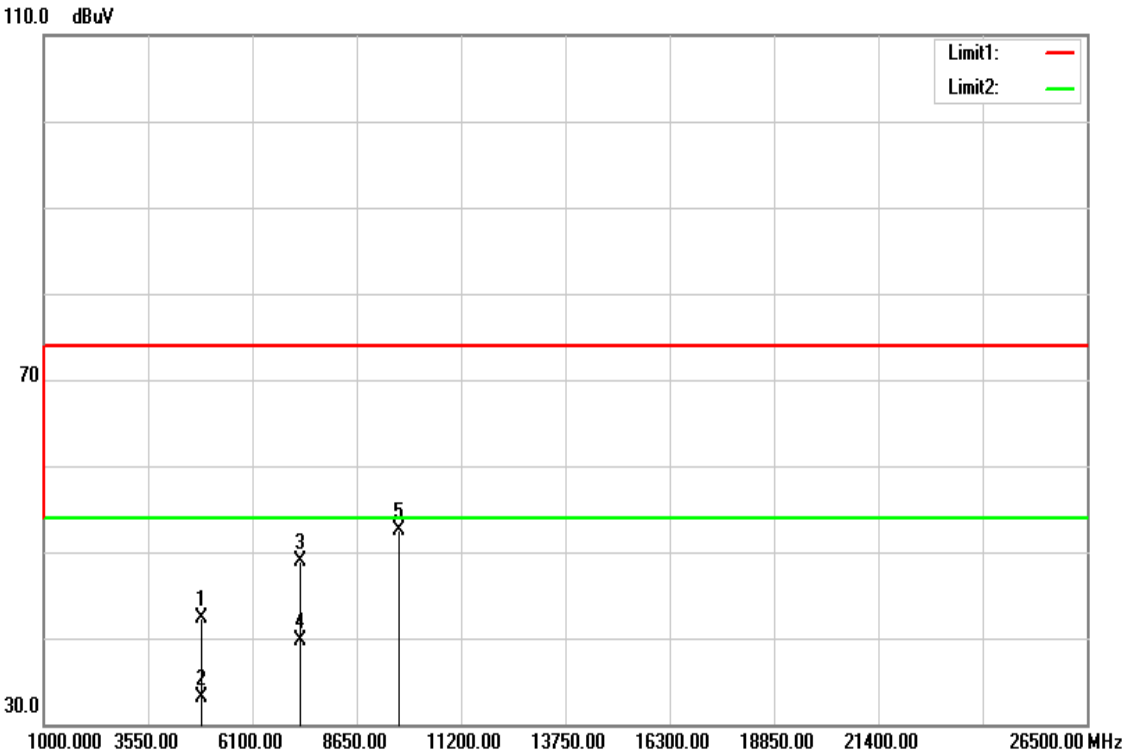
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 40 MHz mode / CH Low

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 40 MHz mode / CH Low **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

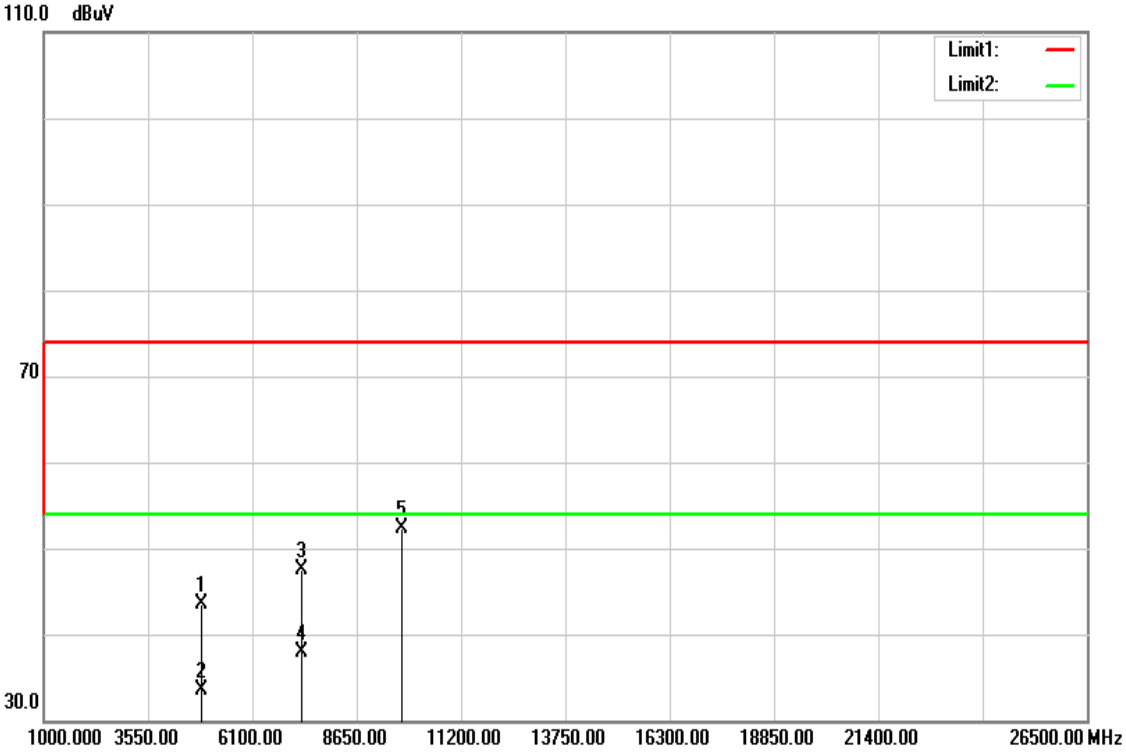
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4844.000	39.23	3.98	43.21	74.00	-30.79	peak	V
4844.000	29.47	3.98	33.45	54.00	-20.55	AVG	V
7266.000	37.29	10.67	47.96	74.00	-26.04	peak	V
7266.000	27.27	10.67	37.94	54.00	-16.06	AVG	V
9688.000	38.32	14.30	52.62	74.00	-21.38	peak	V
N/A							
4844.000	38.26	3.98	42.24	74.00	-31.76	peak	H
4844.000	29.17	3.98	33.15	54.00	-20.85	AVG	H
7266.000	38.20	10.67	48.87	74.00	-25.13	peak	H
7266.000	28.98	10.67	39.65	54.00	-14.35	AVG	H
9688.000	38.15	14.30	52.45	74.00	-21.55	peak	H
N/A							

Remark:

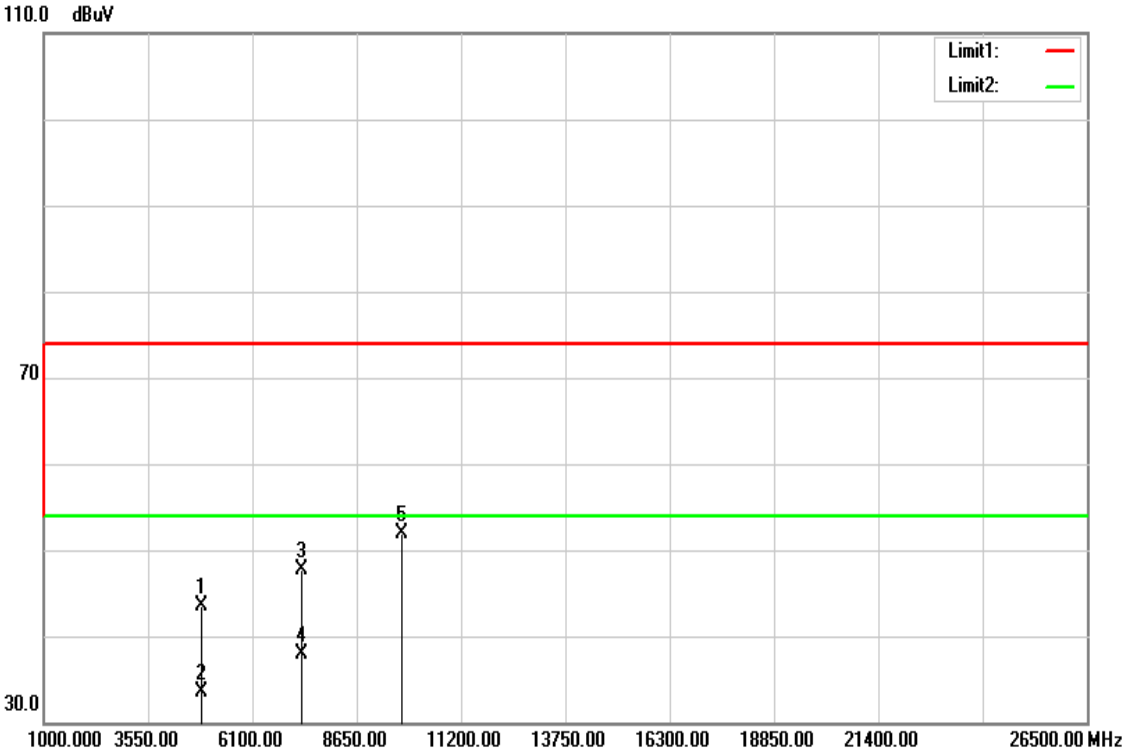
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 40 MHz mode / CH Mid

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 40 MHz mode / CH Mid **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

Humidity: 53% RH **Polarity:** Ver. / Hor.

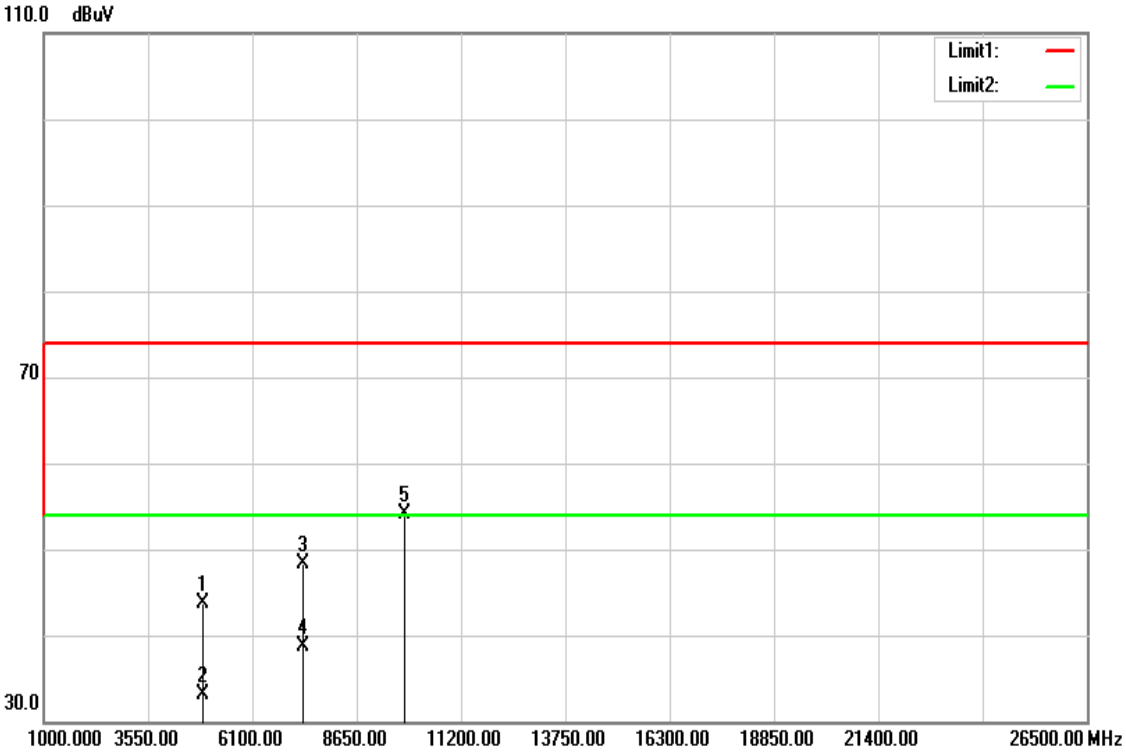
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant. Pol. (H/V)
4874.000	39.49	3.92	43.41	74.00	-30.59	peak	V
4874.000	29.64	3.92	33.56	54.00	-20.44	AVG	V
7311.000	36.83	10.71	47.54	74.00	-26.46	peak	V
7311.000	27.13	10.71	37.84	54.00	-16.16	AVG	V
9748.000	37.93	14.41	52.34	74.00	-21.66	peak	V
N/A							
4874.000	39.53	3.92	43.45	74.00	-30.55	peak	H
4874.000	29.54	3.92	33.46	54.00	-20.54	AVG	H
7311.000	37.04	10.71	47.75	74.00	-26.25	peak	H
7311.000	27.27	10.71	37.98	54.00	-16.02	AVG	H
9748.000	37.44	14.41	51.85	74.00	-22.15	peak	H
N/A							

Remark:

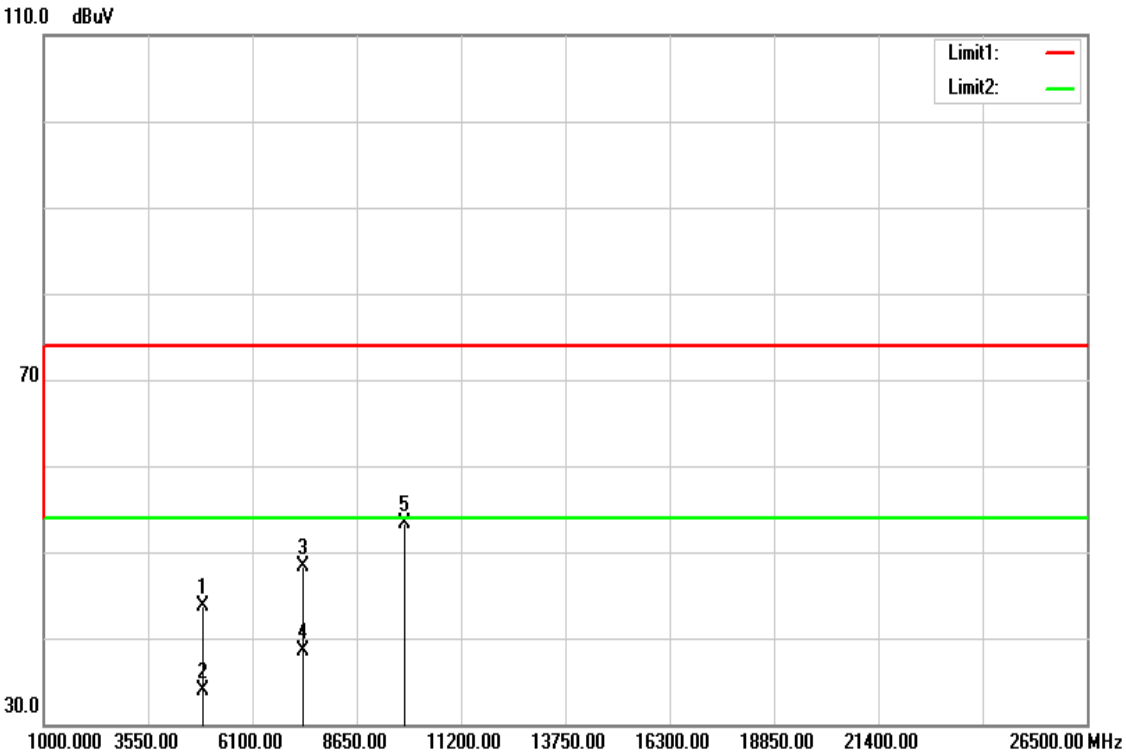
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average 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 40 MHz mode / CH High

Polarity: Vertical



Polarity: Horizontal



Operation Mode: TX / IEEE 802.11n HT 40 MHz mode / CH High **Test Date:** June 22, 2016

Temperature: 27°C **Tested by:** Dennis Li

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)
4904.000	39.75	3.88	43.63	74.00	-30.37	peak	V
4904.000	29.26	3.88	33.14	54.00	-20.86	AVG	V
7356.000	37.58	10.76	48.34	74.00	-25.66	peak	V
7356.000	27.86	10.76	38.62	54.00	-15.38	AVG	V
9808.000	39.65	14.53	54.18	74.00	-19.82	peak	V
N/A							
4904.000	39.80	3.88	43.68	74.00	-30.32	peak	H
4904.000	30.10	3.88	33.98	54.00	-20.02	AVG	H
7356.000	37.57	10.76	48.33	74.00	-25.67	peak	H
7356.000	27.76	10.76	38.52	54.00	-15.48	AVG	H
9808.000	38.75	14.53	53.28	74.00	-20.72	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).*

7.8 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 μH/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 (dBμV)	
	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 II 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:**	July 6, 2016
Temperature:	24°C	**Tested by:**	Dennis Li
Humidity:	50% RH		

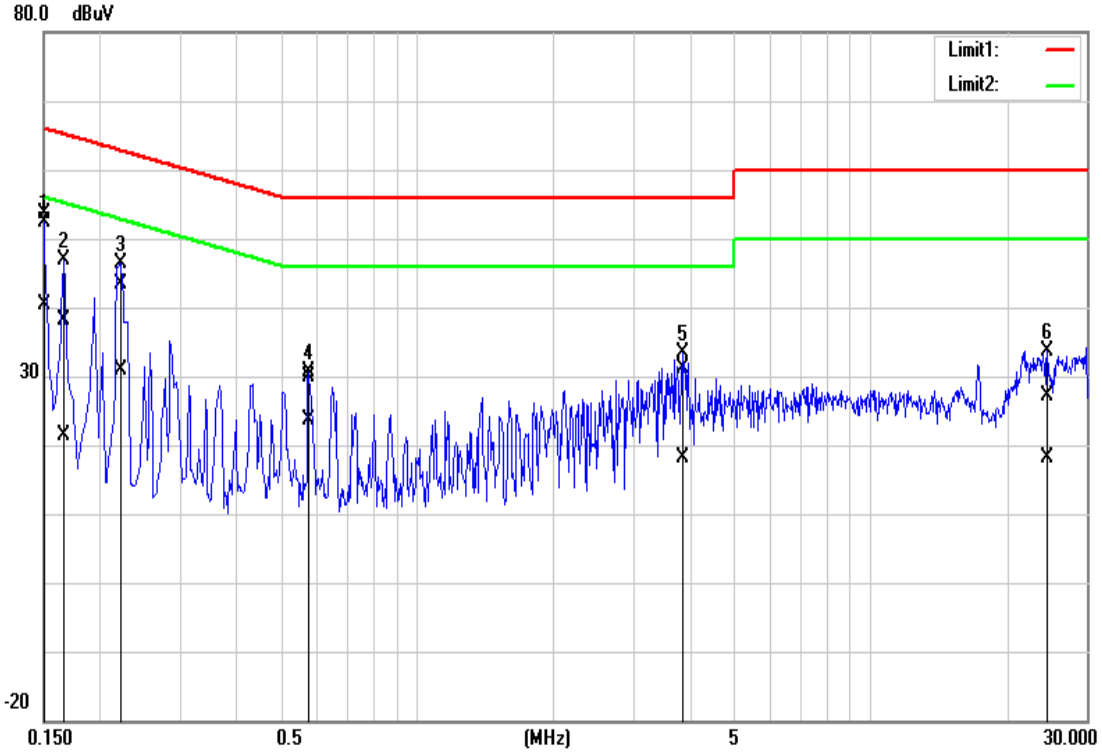
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m)	AV Result (dBuV/m)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1500	43.90	30.72	9.71	53.61	40.43	66.00	56.00	-12.39	-15.57	L1
0.1660	28.46	11.57	9.71	38.17	21.28	65.16	55.16	-26.99	-33.88	L1
0.2220	33.57	21.20	9.70	43.27	30.90	62.74	52.74	-19.47	-21.84	L1
0.5780	20.18	13.94	9.70	29.88	23.64	56.00	46.00	-26.12	-22.36	L1
3.8780	21.39	8.34	9.74	31.13	18.08	56.00	46.00	-24.87	-27.92	L1
24.5540	17.31	8.34	9.83	27.14	18.17	60.00	50.00	-32.86	-31.83	L1
0.1700	27.84	9.88	9.78	37.62	19.66	64.96	54.96	-27.34	-35.30	L2
0.2220	33.94	22.10	9.77	43.71	31.87	62.74	52.74	-19.03	-20.87	L2
0.3700	22.19	13.24	9.76	31.95	23.00	58.50	48.50	-26.55	-25.50	L2
0.6580	20.91	15.78	9.76	30.67	25.54	56.00	46.00	-25.33	-20.46	L2
3.6620	16.40	2.97	9.82	26.22	12.79	56.00	46.00	-29.78	-33.21	L2
29.9220	19.39	11.12	10.38	29.77	21.50	60.00	50.00	-30.23	-28.50	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)