FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

HD Wireless N Pan/Tilt Network Camera

Model: DCS-5222L

Trade Name: D-Link

Issued to

D-Link Corporation
17595 Mt. Herrmann, Fountain Valley, California 92708, United States

Issued by

Compliance Certification Services Inc.
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
http://www.ccsrf.com
service@ccsrf.com

Testing Laboratory
1309

Note: *This report shall not be reproduced except in full, without the written approval of Compliance Certification Services Inc. This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, A2LA, NIST or any government agencies. The test results in the report only apply to the tested sample.*

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		November 26, 2013		Initial Issue	All	Landy Huang

TABLE OF CONTENTS

1 TEST RESULT CERTIFICATION

Applicant:	**D-Link Corporation** 17595 Mt. Herrmann, Fountain Valley, California 92708, United States
Manufacturer:	**APPRO Technology Inc.** 13F, No. 66, Zhongzheng Rd., Xinzhuang Dist., New Taipei City, Taiwan.
Equipment Under Test:	HD Wireless N Pan/Tilt Network Camera
Trade Name:	D-Link
Model:	DCS-5222L
Date of Test:	November 12 ~ 22, 2013

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

We hereby certify that:

Compliance Certification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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

Approved by:

Stan Lin
Section Manager

Reviewed by:

Angel Hu
Section Manager

2 EUT DESCRIPTION

Product	HD Wireless N Pan/Tilt Network Camera		
Trade Name	D-Link		
Model Number	DCS-5222L		
Model Discrepancy	N/A		
EUT Power Rating	5VDC, 2.5A		
Received Date	November 4, 2013		
Power Adapter	D-Link	**Model**	AMS3-0502500FU
Power Adapter Power Rating	I/P: 100-240VAC, 50/60HZ, 0.5A O/P: 5VDC, 2.5A		
RF Module Manufacturer	Realtek	**Model**	RTL8188EUS
Frequency Range	IEEE 802.11b/g/ IEEE 802.11n HT20: 2412~2462MHz IEEE 802.11n HT40: 2422~2452MHz		
Transmit Power	IEEE 802.11b mode: 19.36 dBm (0.0863W) IEEE 802.11g mode: 22.73 dBm (0.1875W) IEEE 802.11n HT20 mode: 21.91 dBm (0.1552W) IEEE 802.11n HT40 mode: 21.57 dBm (0.1435W)		
Modulation Technique & Transmit Data Rate	IEEE 802.11b mode: DSSS (11, 5.5, 2, 1 Mbps) IEEE 802.11g mode: OFDM (54, 48, 36, 24, 18, 12, 11 , 9, 6 Mbps) IEEE 802.11n HT20 mode: OFDM (130, 117, 104, 78, 65, 58.5, 52, 39, 26, 19.5, 13, 6.5 Mbps) IEEE 802.11n HT40 mode: OFDM (270, 243, 216, 162, 135, 121.5, 108, 81, 54, 40.5, 27, 13.5 Mbps)		
Number of Channels	IEEE 802.11b/g mode: 11 Channels IEEE 802.11n HT20 mode: 11 Channels IEEE 802.11n HT40 mode: 7 Channels		
Antenna Specification	Dipole Antenna / Gain: 2.7 dBi		

Remark:

1. The sample selected for test was production product and was provided by manufacturer.

*2. This submittal(s) (test report) is intended for FCC ID: **KA2CS5222LB1** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*

3. This report is compliance with the 558074 D01 DTS Meas Guidance v03r01 Requirement.

3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4: 2009 and FCC CFR 47 Part 15.207, 15.209, 15.247.

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

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 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 0.8 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 Section 13.1.4.1 of ANSI C63.4.

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: DCS-5222L) had been tested under operating condition.

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

The worst case data rate is determined as the data rate with highest output power.

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, which worst case was in Data Link mode and receiving radiated spurious emission above 1GHz, which worst case was in CH Mid mode only.

Data Link Mode: Setup the EUT as setup photo of Below 1GHz / Powerline Conducted Emissions. Turn on the power of support equipment and link to EUT.

IEEE 802.11b mode:

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

IEEE 802.11g mode:

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

IEEE 802.11n HT20 mode:

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

IEEE 802.11n HT40 mode:

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

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

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250064	01/13/2014
Spectrum Analyzer	Agilent	N9010A	MY52220817	02/22/2014
Power meter	Anritsu	ML2495A	1033009	09/29/2014
Power Sensor	Anritsu	MA2411B	0917221	09/29/2014

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250064	01/13/2014
Pre-Amplifier	HP	8447D	2944A06530	04/23/2014
Pre-Amplifier	EMEC	EM01M26G	060570	07/25/2014
Pre-Amplifier	MITEQ	AMF-6F-26040 0-40-8P	985646	08/08/2014
Pre-Amplifier	Agilent	8449B	3008A01738	04/23/2014
EMI Test Receiver	SCHAFFNER	SCR 3501	430	03/24/2014
Loop Antenna	EMCO	6502	2356	06/12/2014
Bilog Antenna	TESEQ	CBL 6112D	35378	09/11/2014
Horn Antenna	EMCO	3115	00022250	08/04/2014
Horn Antenna	EMCO	3116	00026370	01/07/2014
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Test S/W	EZ-EMC			

NOTE: *1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.*
2. N.C.R = No Calibration Request.

Powerline Conducted Emissions Test Site #4				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCI	100782	06/14/2014
LISN	R&S	ENV216	100066	09/01/2014
LISN	R&S	ENV 4200	830326/016	05/30/2014
ISN	FCC	FCC-TLISN-T2-02	20587	08/01/2014
ISN	TESEQ	ISN-T8	30843	08/16/2014
Current Probe	FCC	F-35	506	07/19/2014
ISN	TESEQ	ISN ST08	27907	09/30/2014
Test S/W	EZ-EMC			

NOTE: *1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.*
2. N.C.R = No Calibration Request.

4.3 MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Powerline Conducted Emission	±0.9203
3M Semi Anechoic Chamber / 30MHz ~ 200MHz	±3.5921
3M Semi Anechoic Chamber / 200MHz ~ 1GHz	±3.5657
3M Semi Anechoic Chamber / 1 ~ 8GHz	±2.5873
3M Semi Anechoic Chamber / 8 ~ 18GHz	±2.6646
3M Semi Anechoic Chamber / 18 ~ 26GHz	±2.9617
3M Semi Anechoic Chamber / 26 ~ 40GHz	±3.4250

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. 163-1, Jhongsheng Rd., Sindien District, Taipei City 23151, Taiwan
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☐ No 11, Wugong 6th Rd, Wugu District, 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
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

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

5.2 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, IC 2324G-2 for 3M Semi Anechoic Chamber B.

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	ACCREDITED TESTING CERT #0824.01
USA	FCC MRA	3 meter Open Area Test Sites to perform FCC Part 15/18 measurements	TW1026
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	VCCI R-2882/2541/2798/725/1868 C-402/747/912 T-1930/1646
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	ilac-MRA TAF Testing Laboratory 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS-Gen Issue 3	Canada IC 2324C-5

** 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

For Radiated Emissions(Below 1GHz) and Powerline Conducted Emission							
No.	**Device Type**	**Model**	**Series No.**	**FCC ID**	**Brand**	**Data Cable**	**Power Cord**
1	Multimedia Headset	ClearChat	N/A	FCC DoC	Logitech	Unshielded, 2.0m	N/A
2	Notebook PC (Remote)	TP00013A	LR-9XH2K	FCC DoC	LENOVO	LAN Cable: Unshielded, 10m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
3	Alarm Sensor	N/A	N/A	N/A	N/A	DIO Cable: Unshielded, 1.5m	N/A

For Radiated Emissions(Above 1GHz) and Conducted Emission							
No.	**Device Type**	**Model**	**Series No.**	**FCC ID**	**Brand**	**Data Cable**	**Power Cord**
1	Notebook PC	TP00013A	LR-9XH2K	FCC DoC	LENOVO	USB Cable: Unshielded, 0.3m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

Remark: *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

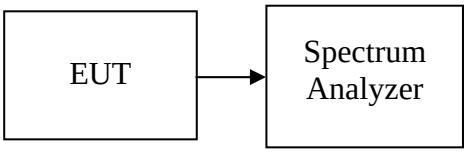
7 FCC PART 15 REQUIREMENTS

7.1 6DB BANDWIDTH

LIMIT

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

Test Configuration



TEST PROCEDURE

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 = 100kHz, VBW = 300kHz, Sweep = auto, Span = 30MHz (IEEE 802.11b, IEEE 802.11g, IEEE 802.11n HT20) or Span = 50MHz (IEEE 802.11n HT40).
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

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	10.10	>500	PASS
Mid	2437	10.10		PASS
High	2462	10.10		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.65	>500	PASS
Mid	2437	16.65		PASS
High	2462	16.65		PASS

Test mode: IEEE 802.11n HT20 mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.80	>500	PASS
Mid	2437	17.85		PASS
High	2462	17.85		PASS

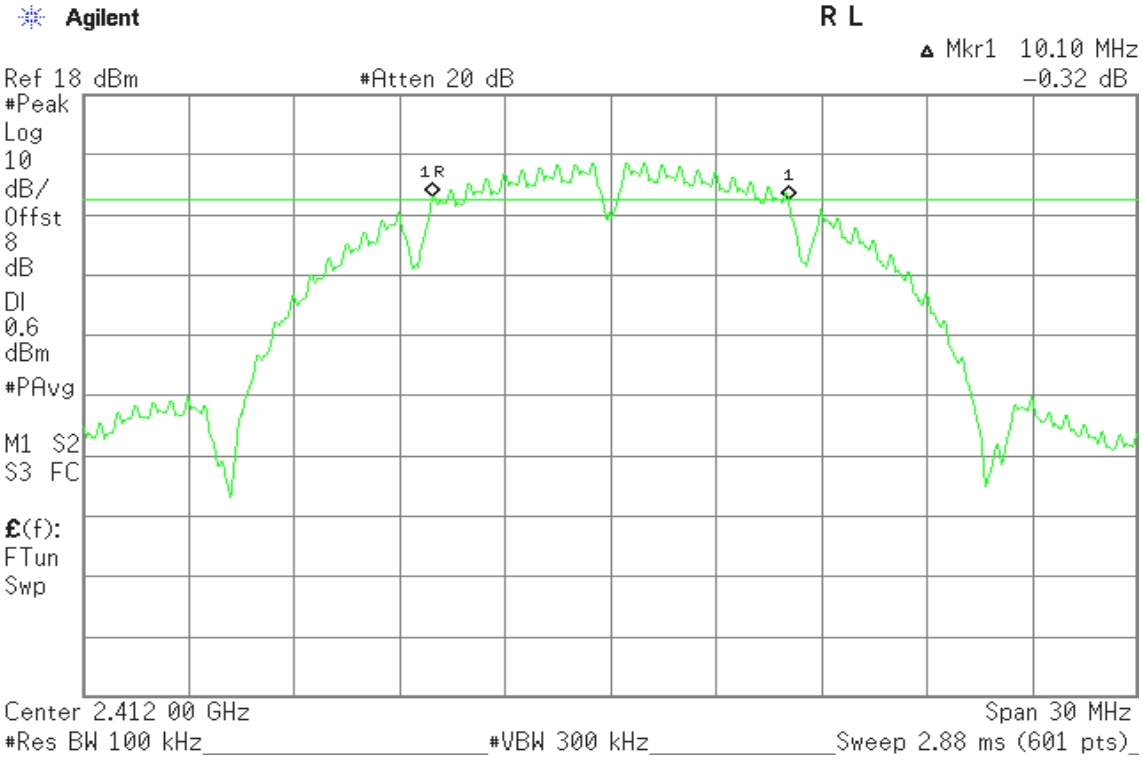
Test mode: IEEE 802.11n HT40 mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	36.50	>500	PASS
Mid	2437	36.50		PASS
High	2452	36.50		PASS

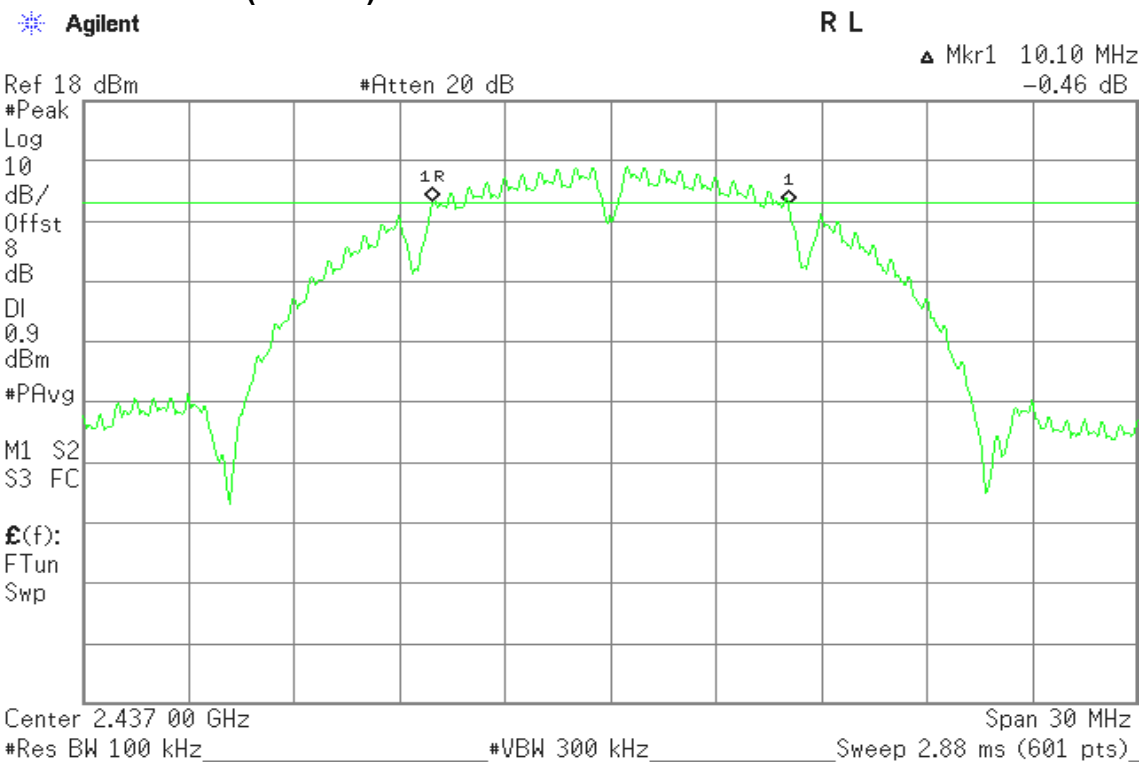
Test Plot

IEEE 802.11b mode

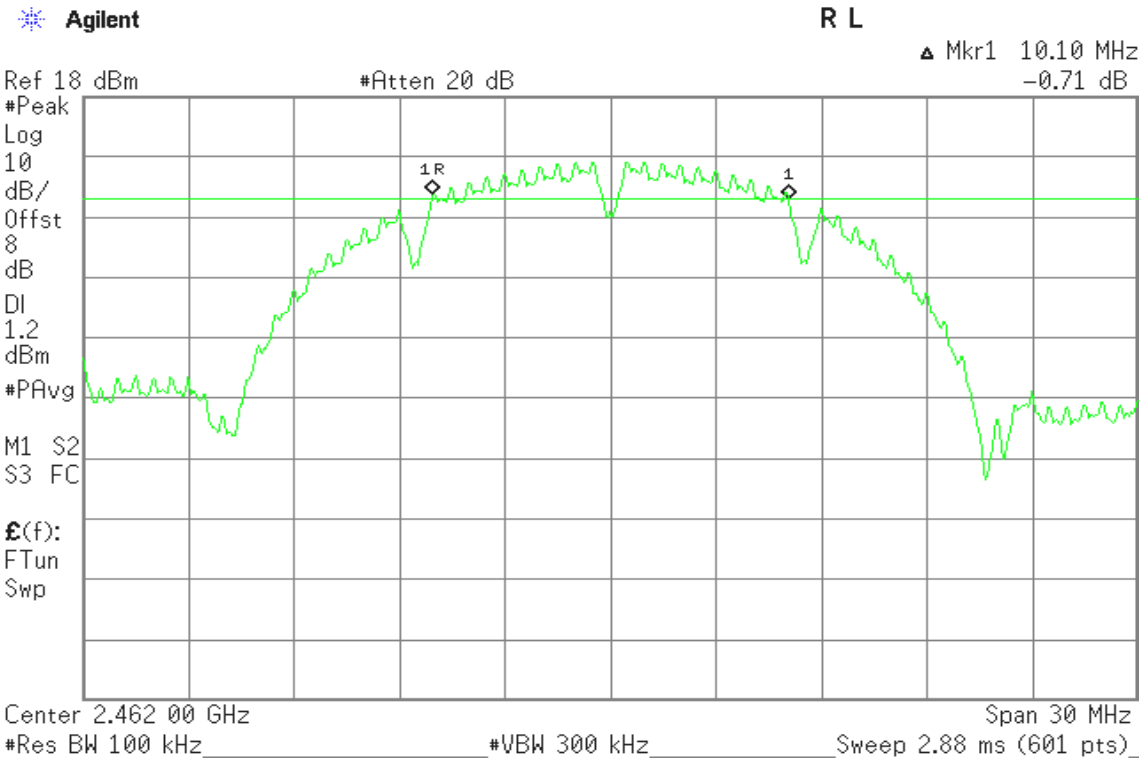
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

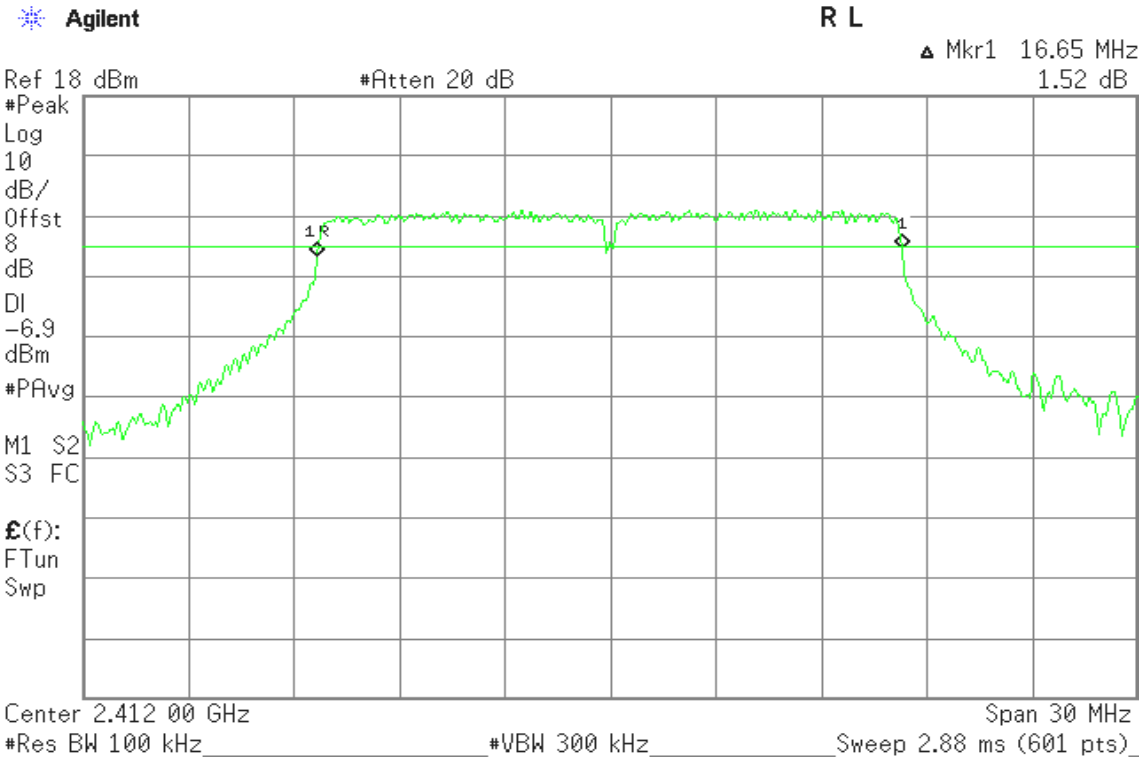


6dB Bandwidth (CH High)

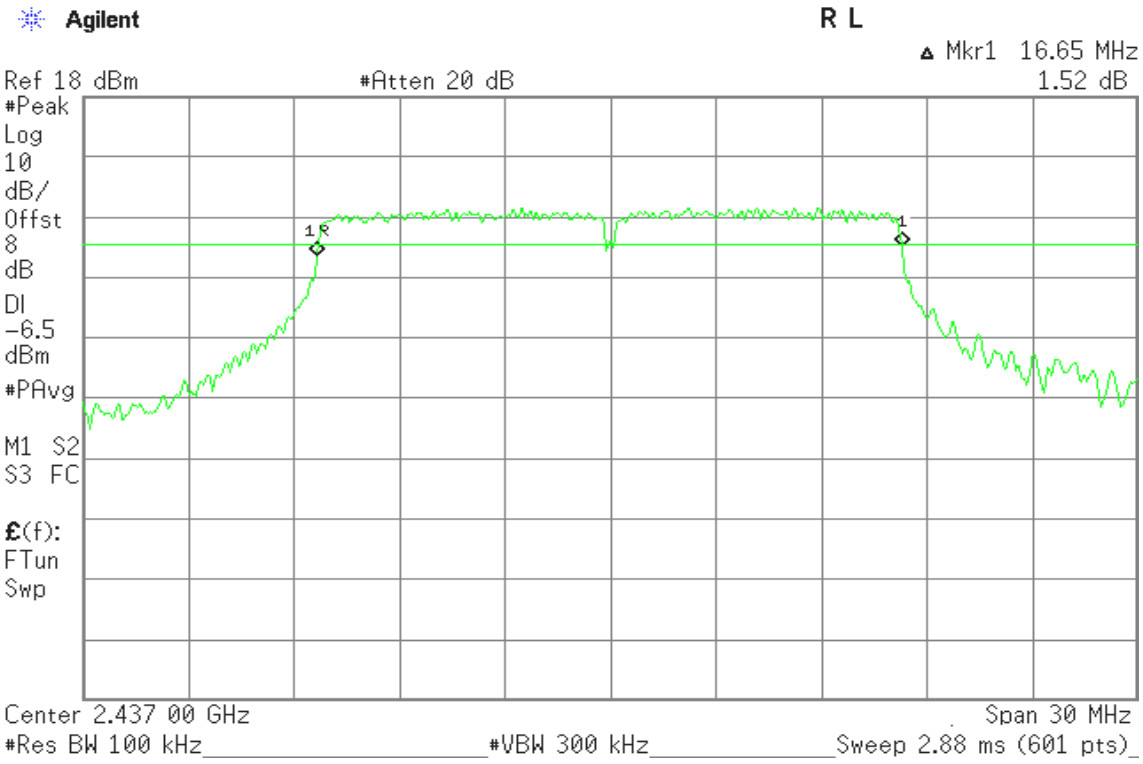


IEEE 802.11g mode

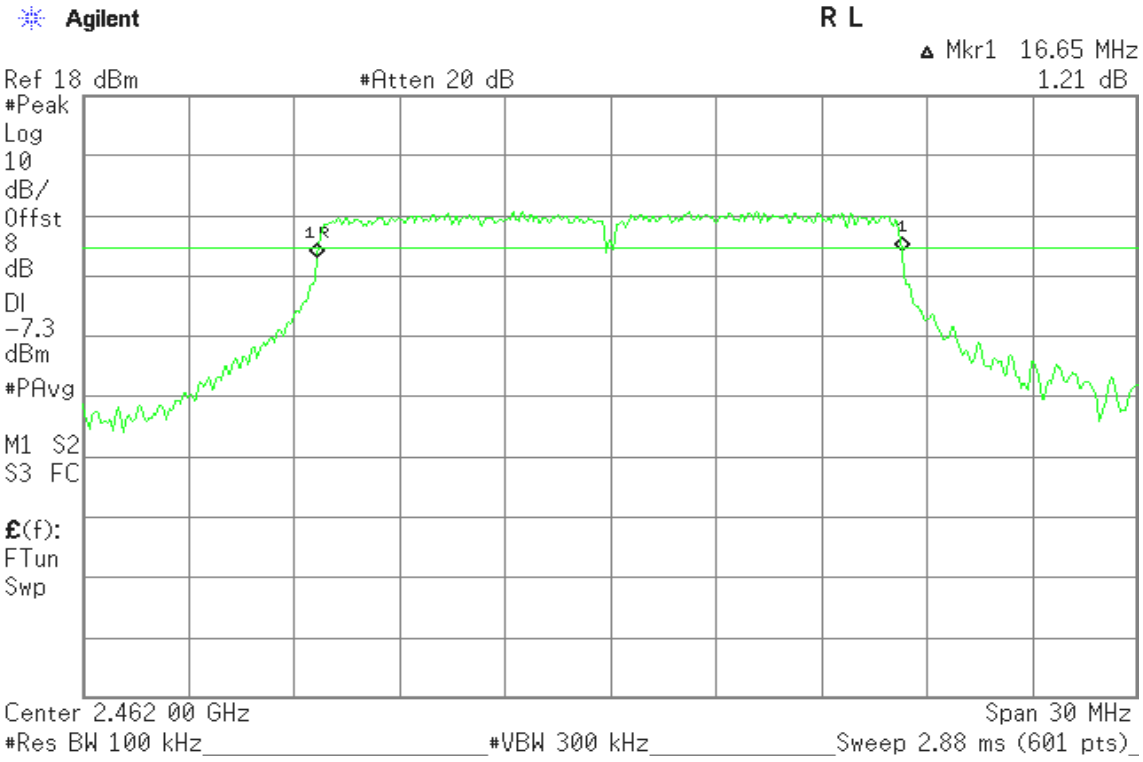
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

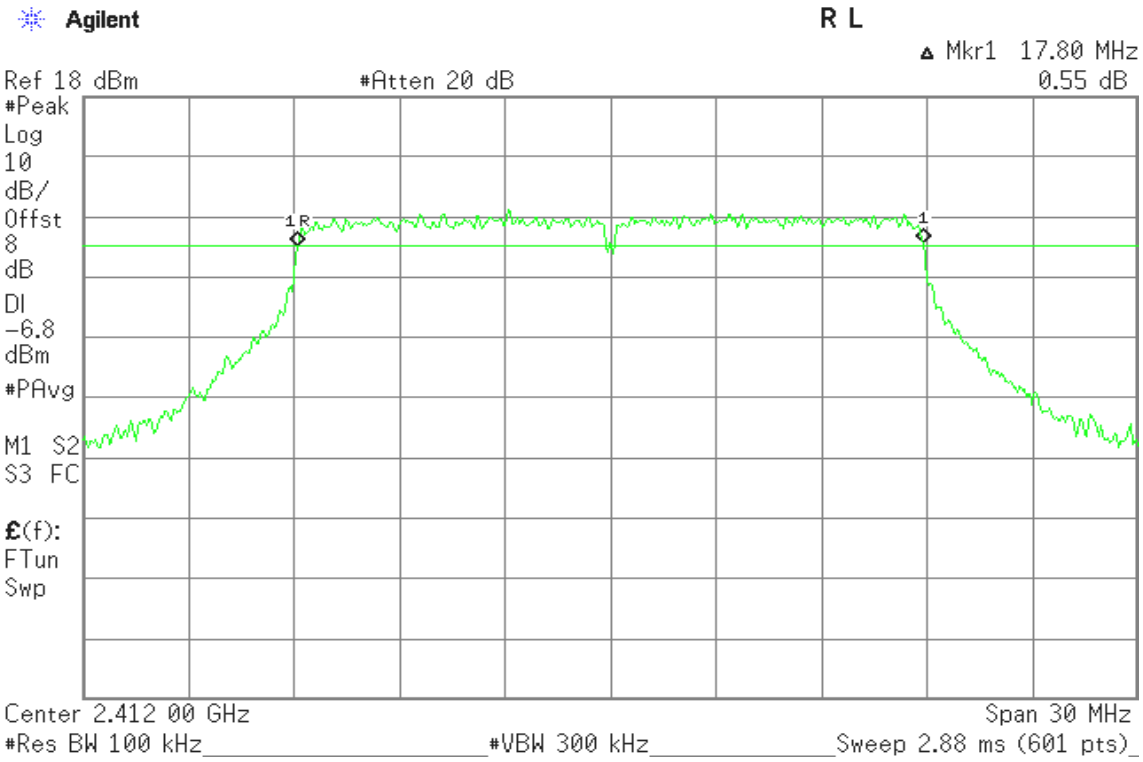


6dB 6dB Bandwidth (CH High)

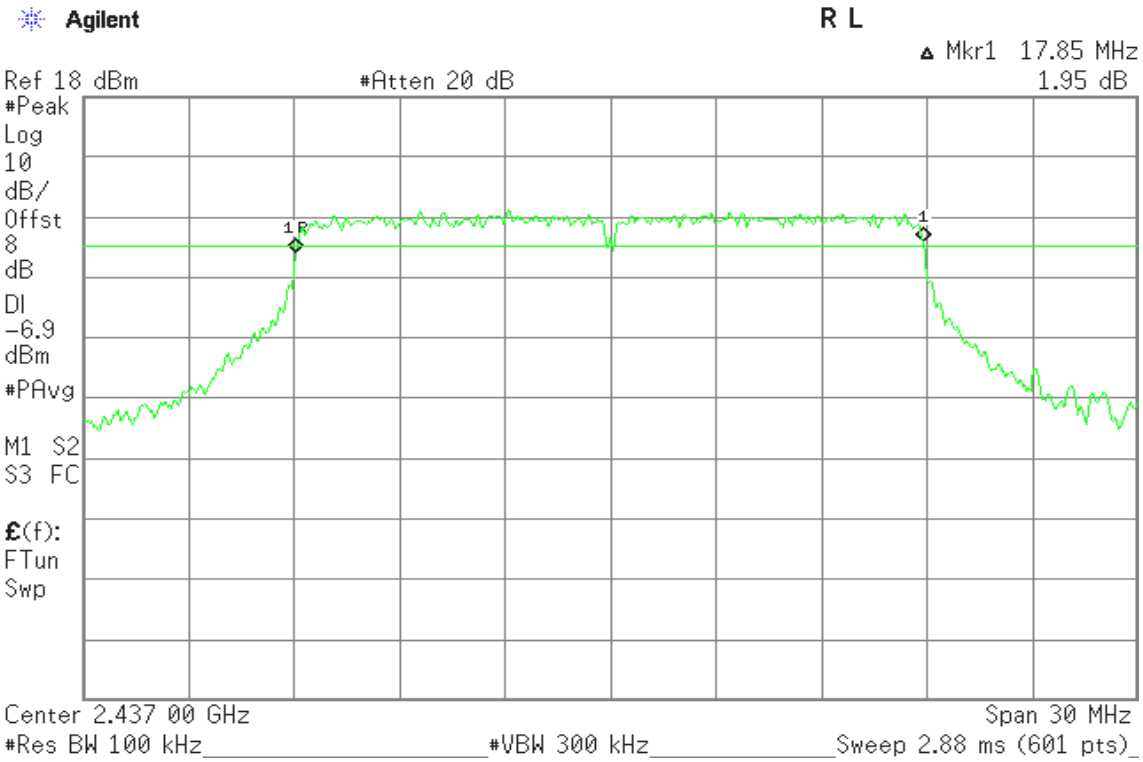


IEEE 802.11n HT20 mode

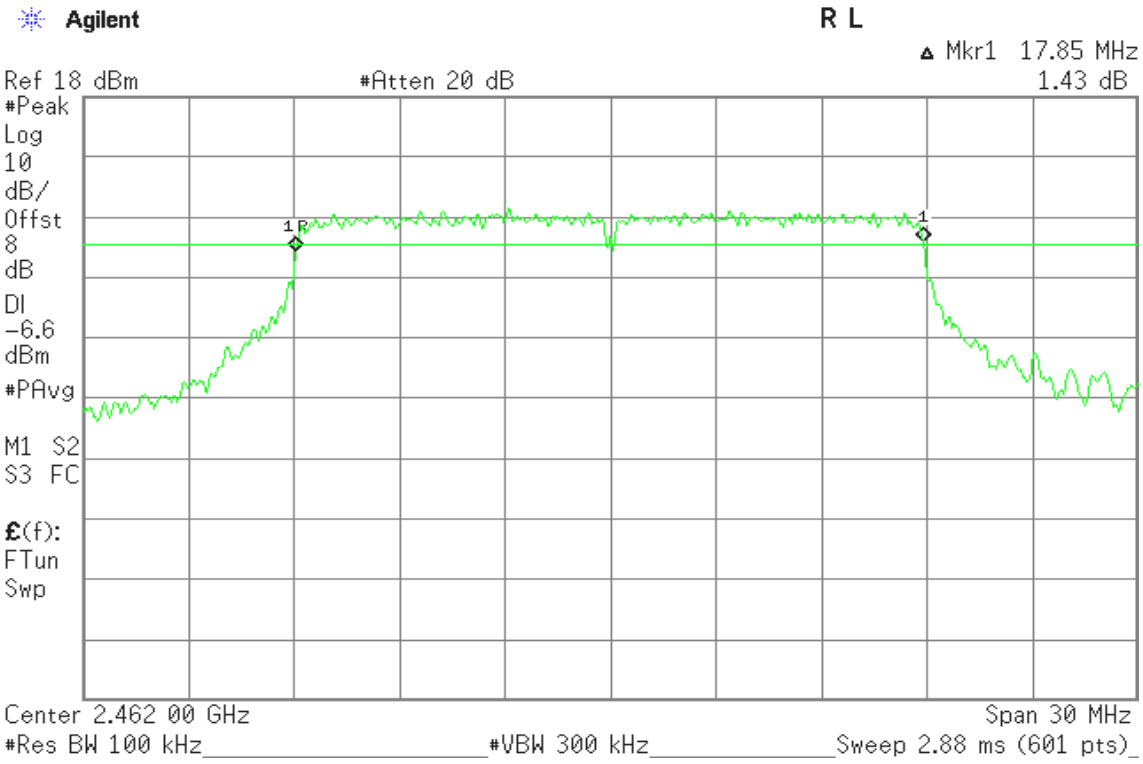
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

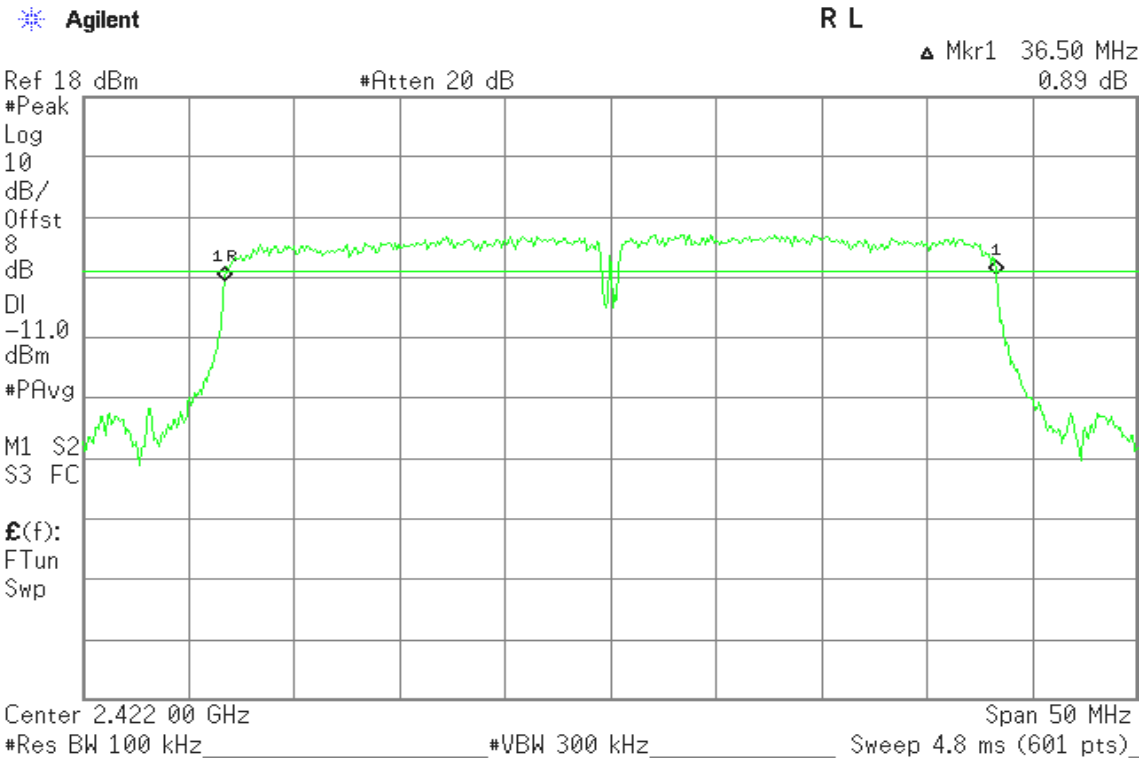


6dB Bandwidth (CH High)

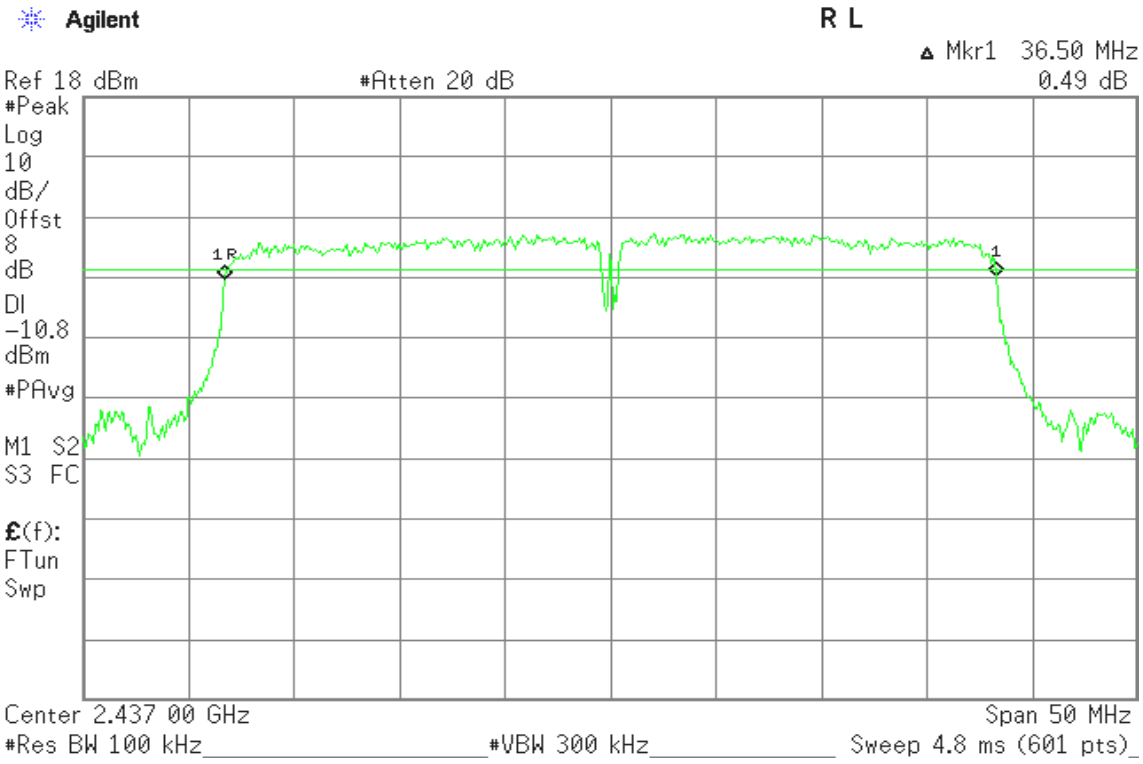


IEEE 802.11n HT40 mode

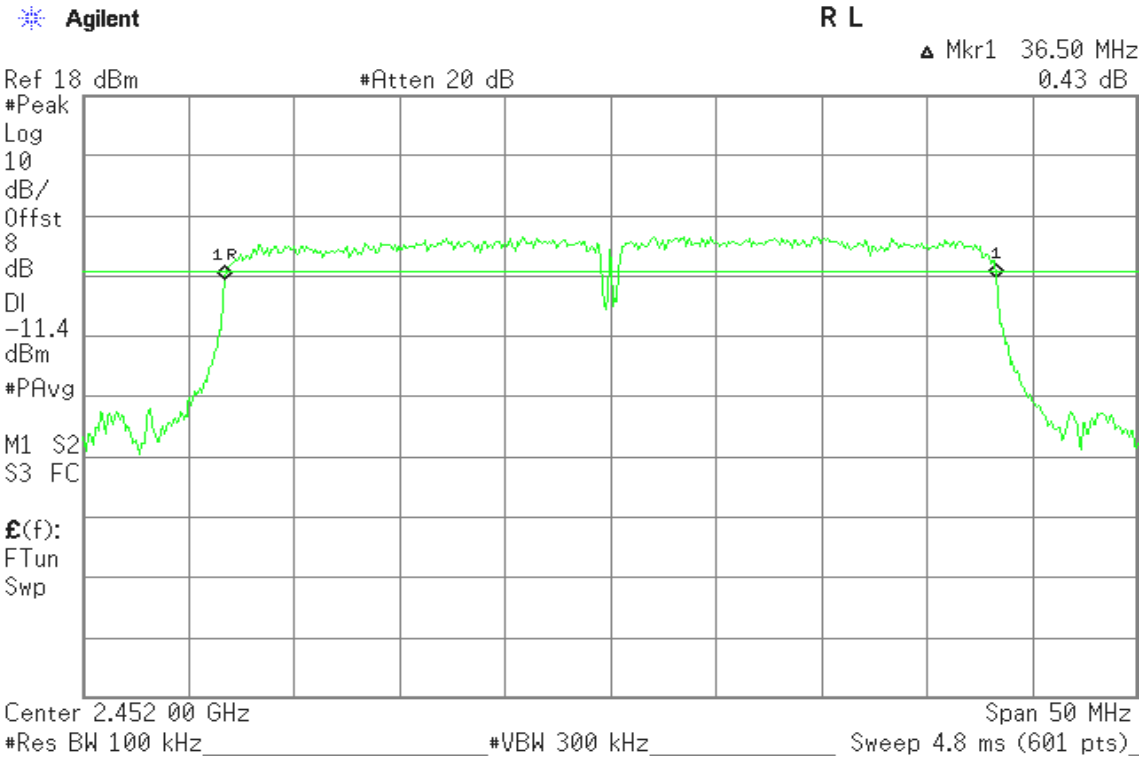
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



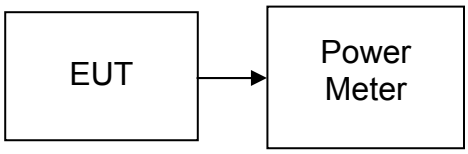
7.2 PEAK POWER

LIMIT

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

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

Test Configuration



TEST PROCEDURE

Per KDB 558074 v03r01

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)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2412	19.01	0.0796	1	PASS
Mid	2437	19.18	0.0828		PASS
High	2462	19.36	0.0863		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2412	22.73	0.1875	1	PASS
Mid	2437	22.27	0.1687		PASS
High	2462	21.29	0.1346		PASS

Test mode: IEEE 802.11n HT20 mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2412	21.91	0.1552	1	PASS
Mid	2437	21.61	0.1449		PASS
High	2462	21.21	0.1321		PASS

Test mode: IEEE 802.11n HT40 mode

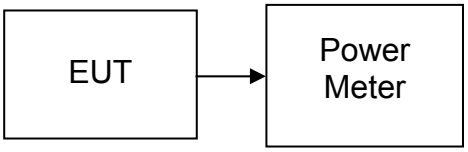
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2422	21.57	0.1435	1	PASS
Mid	2437	21.31	0.1352		PASS
High	2452	20.60	0.1148		PASS

7.3 AVERAGE POWER

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

Per KDB 558074 v03r01

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)	Output Power (dBm)	Output Power (W)
Low	2412	16.49	0.0446
Mid	2437	16.69	0.0467
High	2462	16.96	0.0497

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	13.38	0.0218
Mid	2437	13.61	0.0230
High	2462	12.89	0.0195

Test mode: IEEE 802.11n HT20 mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2412	12.79	0.0190
Mid	2437	13.15	0.0207
High	2462	13.36	0.0217

Test mode: IEEE 802.11n HT40 mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2422	12.23	0.0167
Mid	2437	12.34	0.0171
High	2452	11.70	0.0148

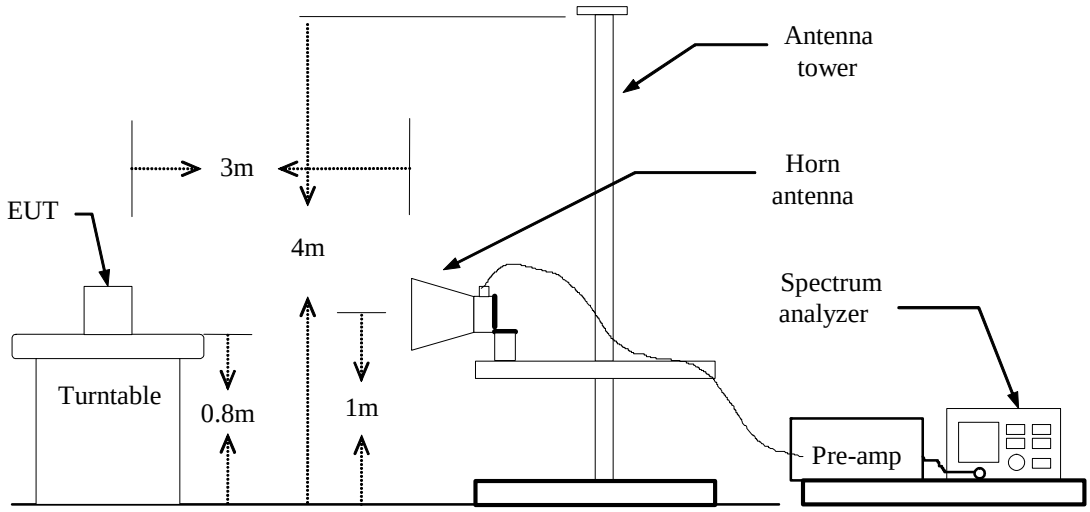
7.4 BAND EDGES MEASUREMENT

LIMIT

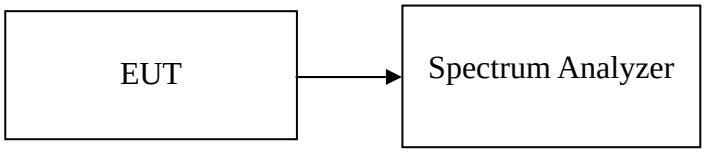
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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



For Conducted



TEST PROCEDURE

For Radiated

1. The EUT is placed on a turntable, which is 0.8m 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 / VBW=300Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

For Conducted

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

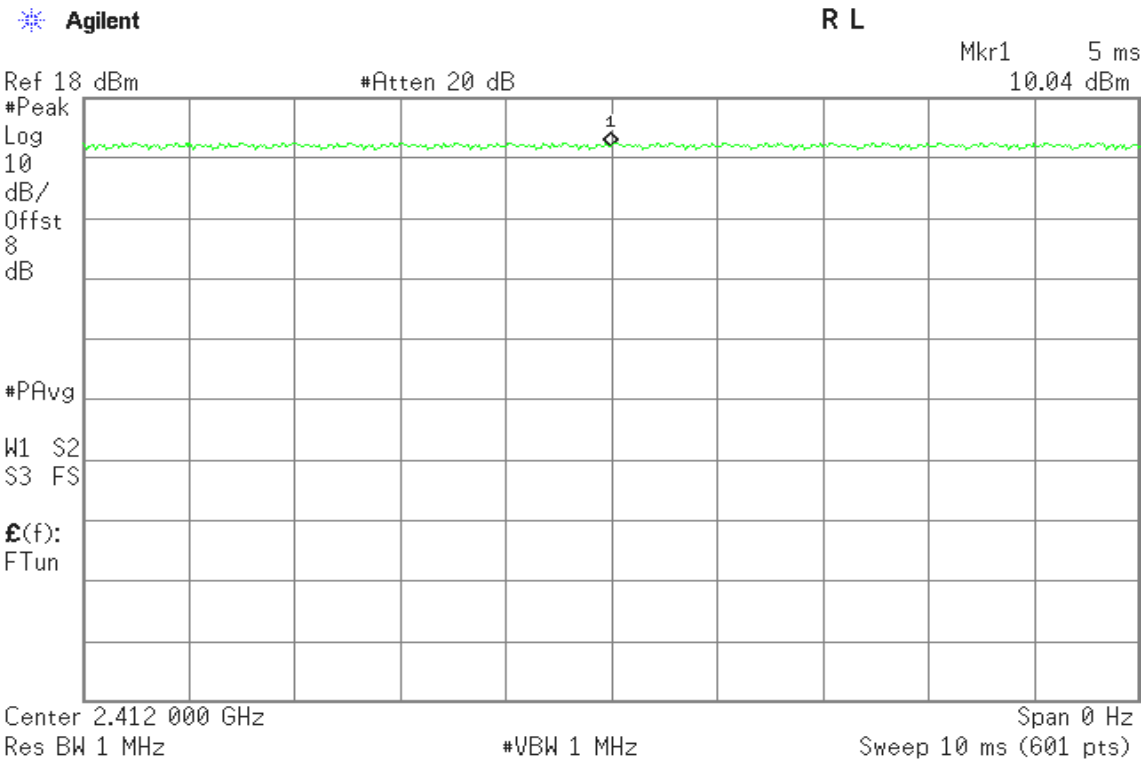
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

TEST RESULTS

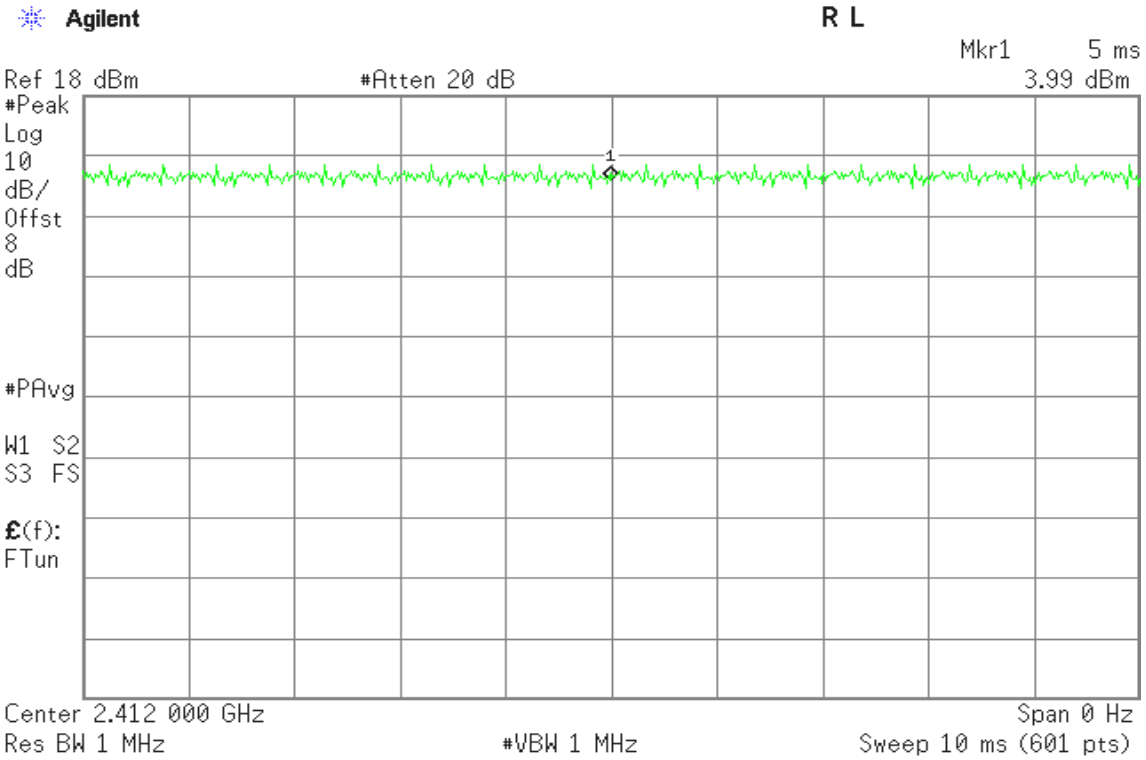
Refer to attach spectrum analyzer data chart.

DUTY CYCLE

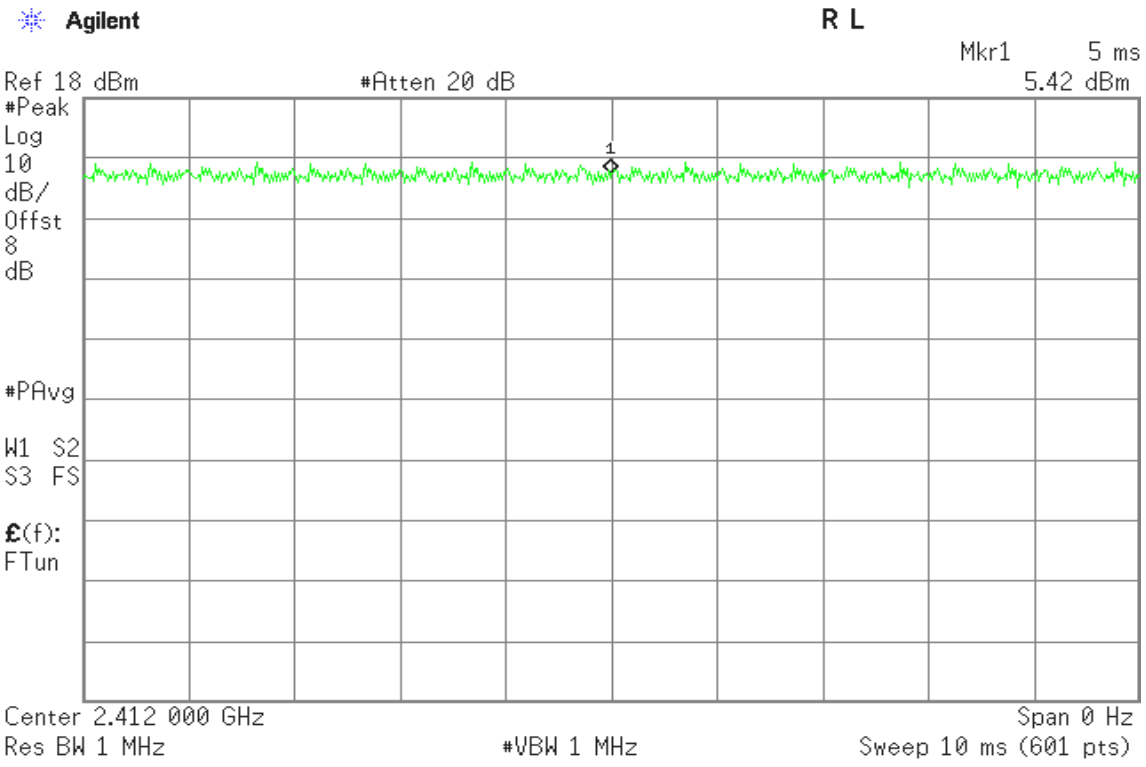
IEEE 802.11b mode



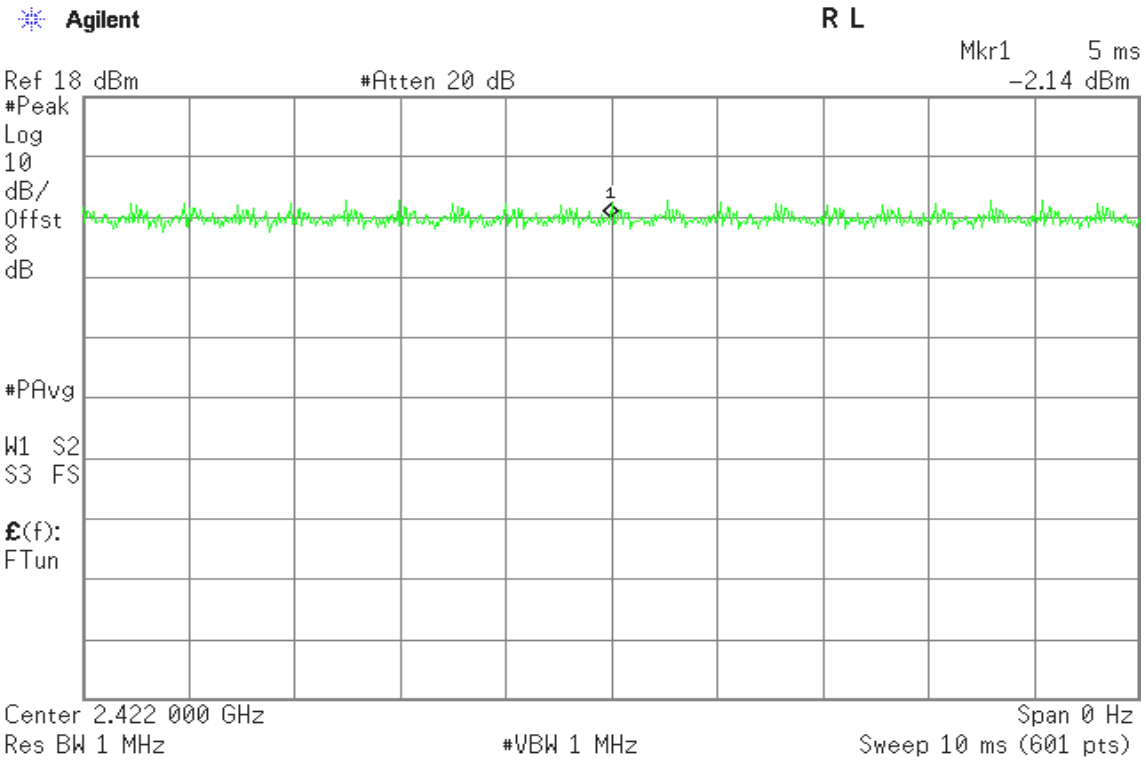
IEEE 802.11g mode



IEEE 802.11n HT20 mode



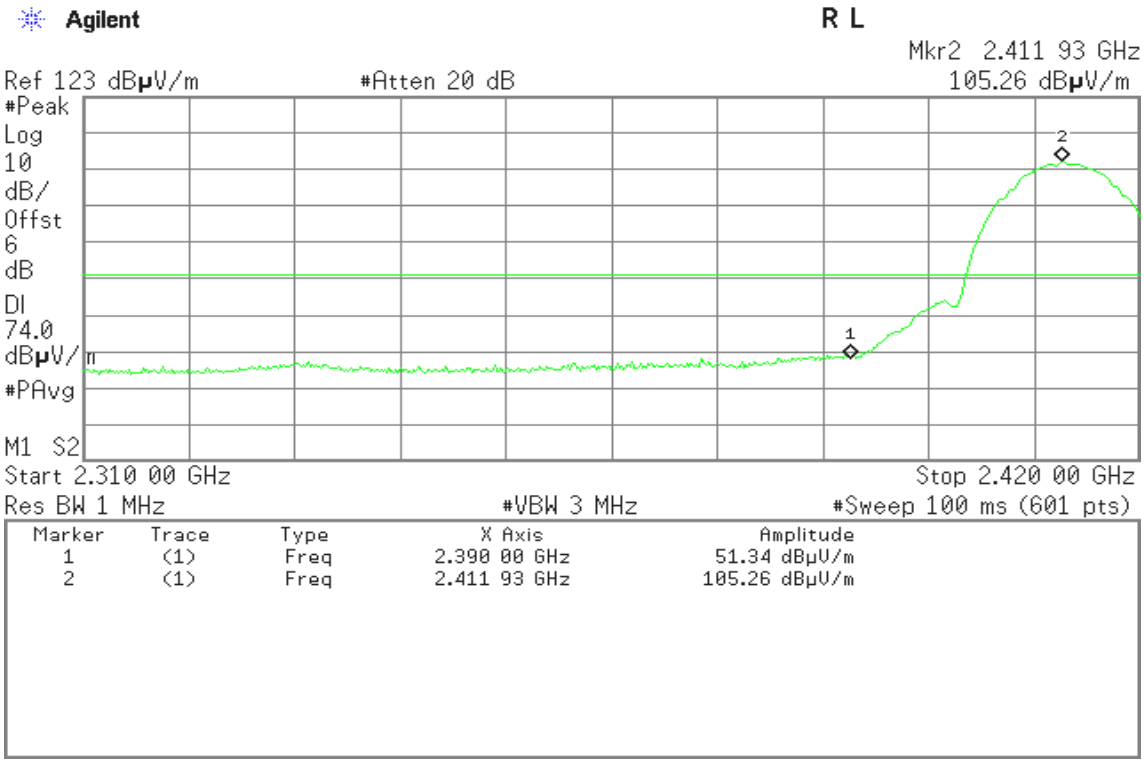
IEEE 802.11n HT40 mode



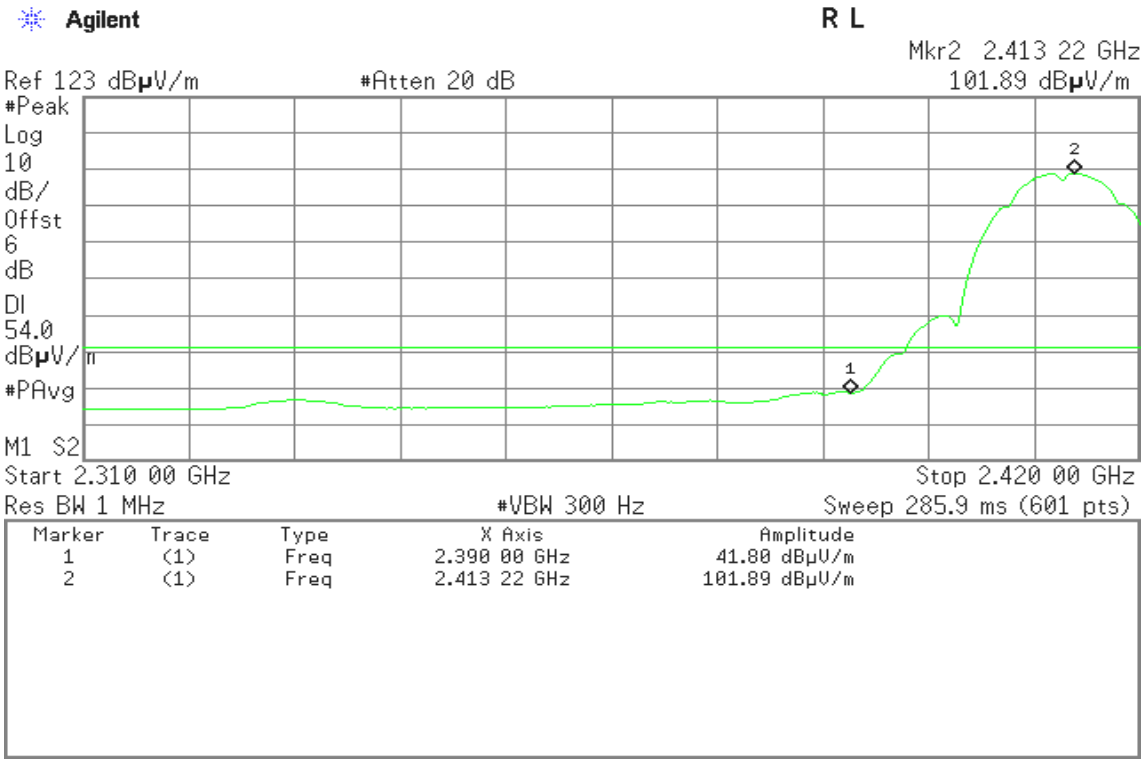
TEST DATA

Band Edges (IEEE 802.11b mode / CH Low)

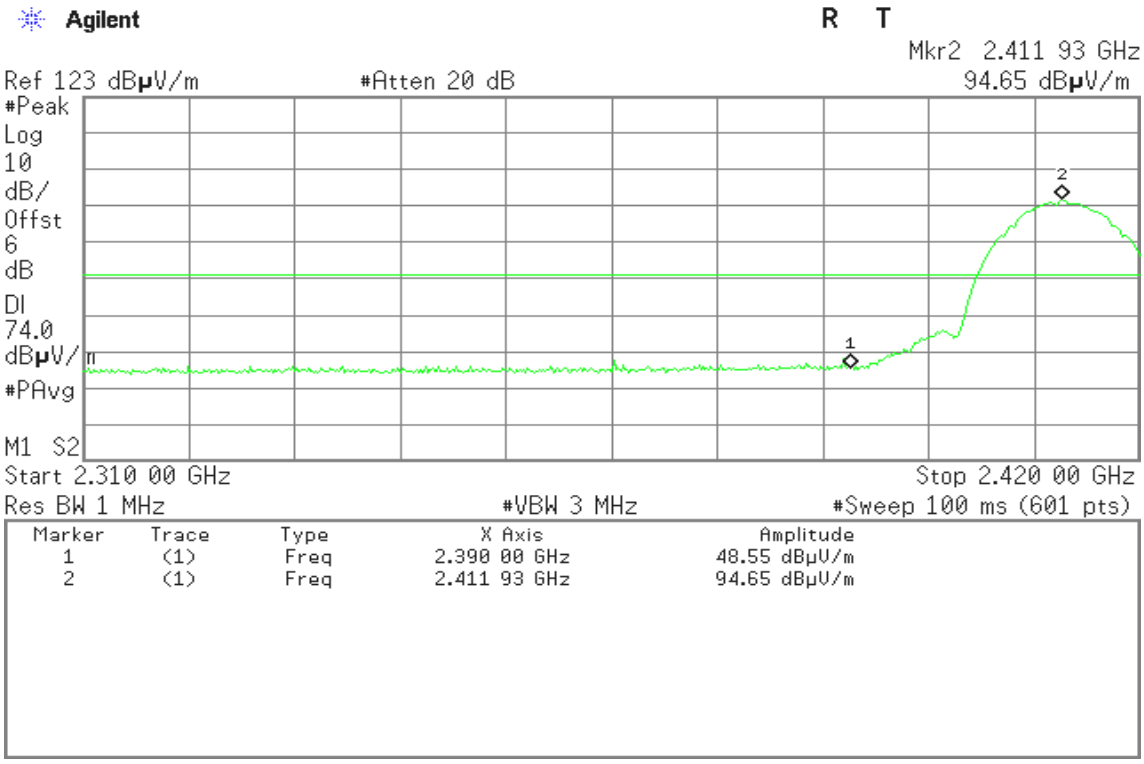
Detector mode: Peak Polarity: Vertical



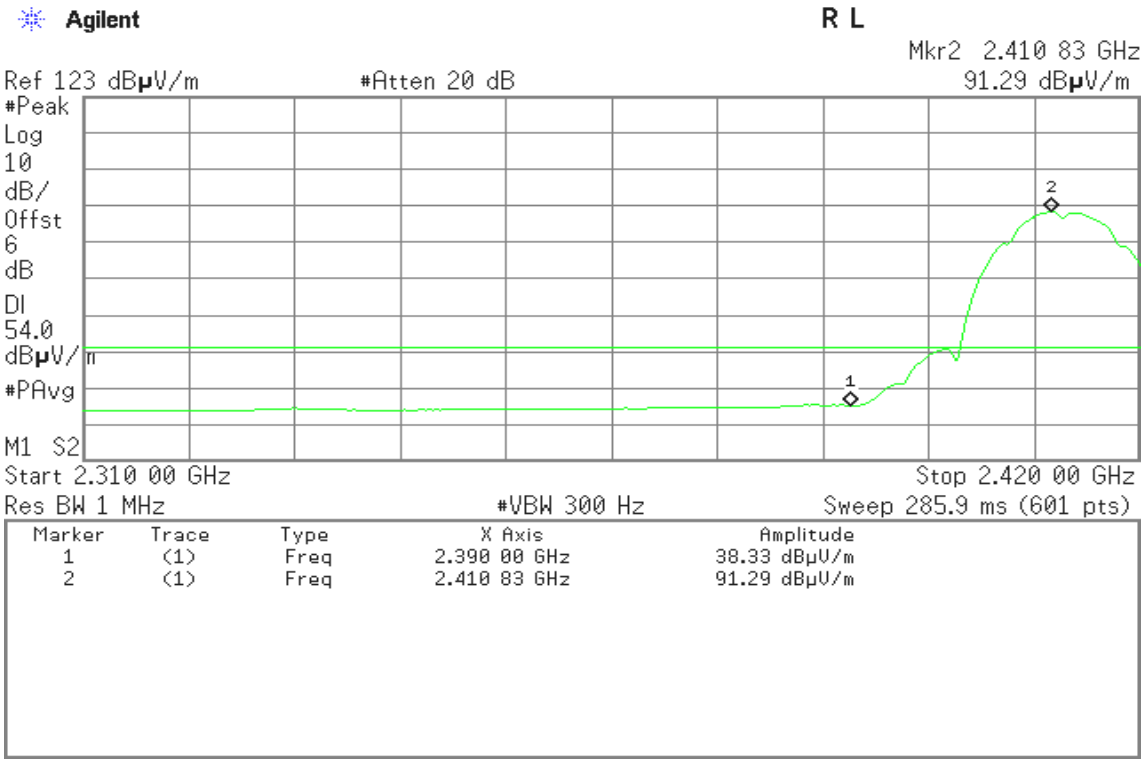
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

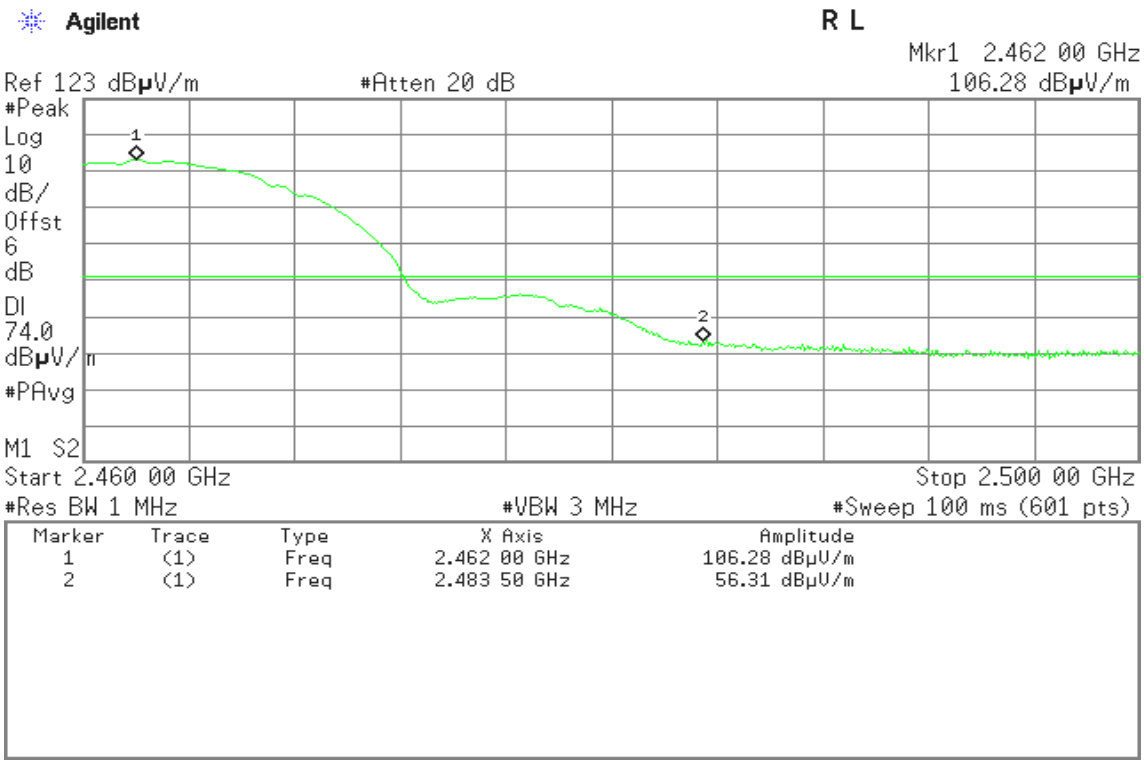


Detector mode: Average **Polarity: Horizontal**

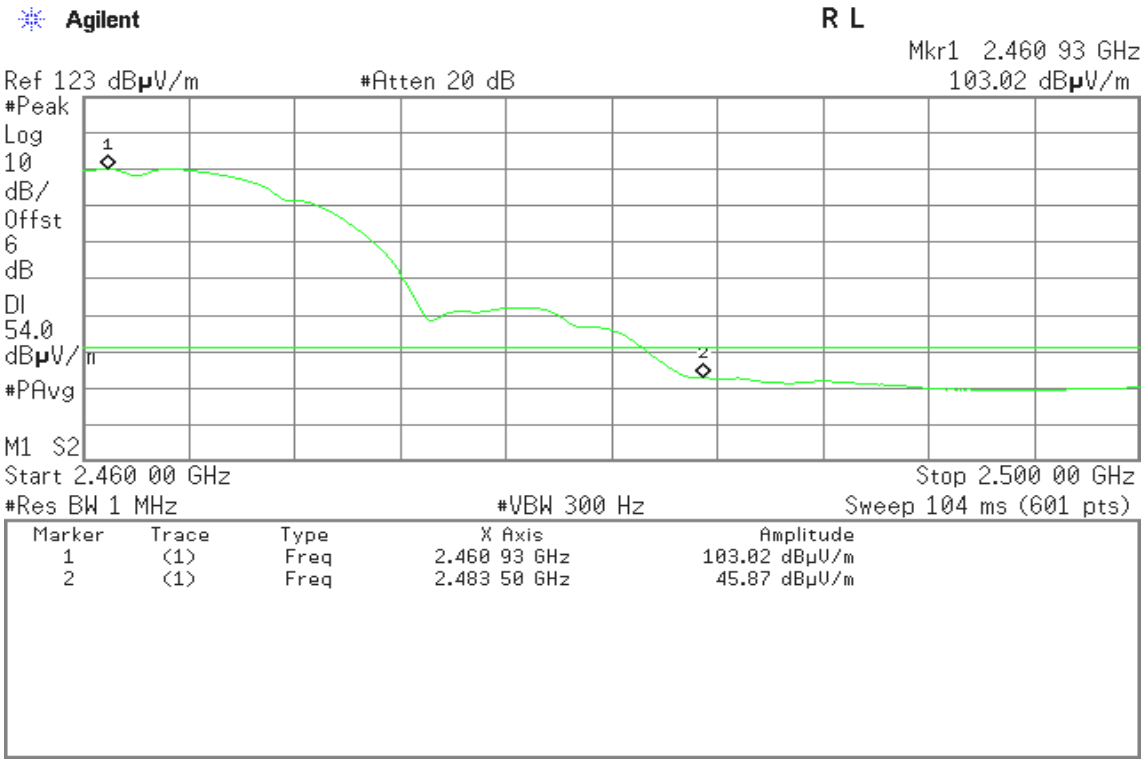


Band Edges (IEEE 802.11b mode / CH High)

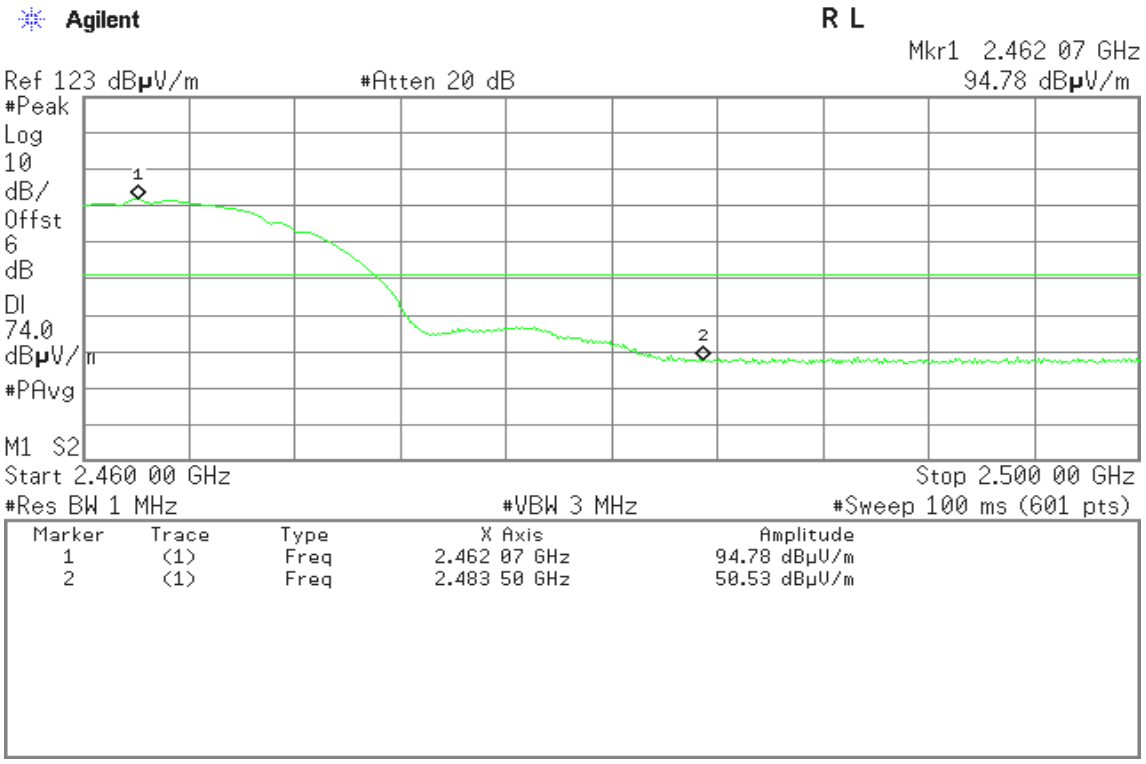
Detector mode: Peak Polarity: Vertical



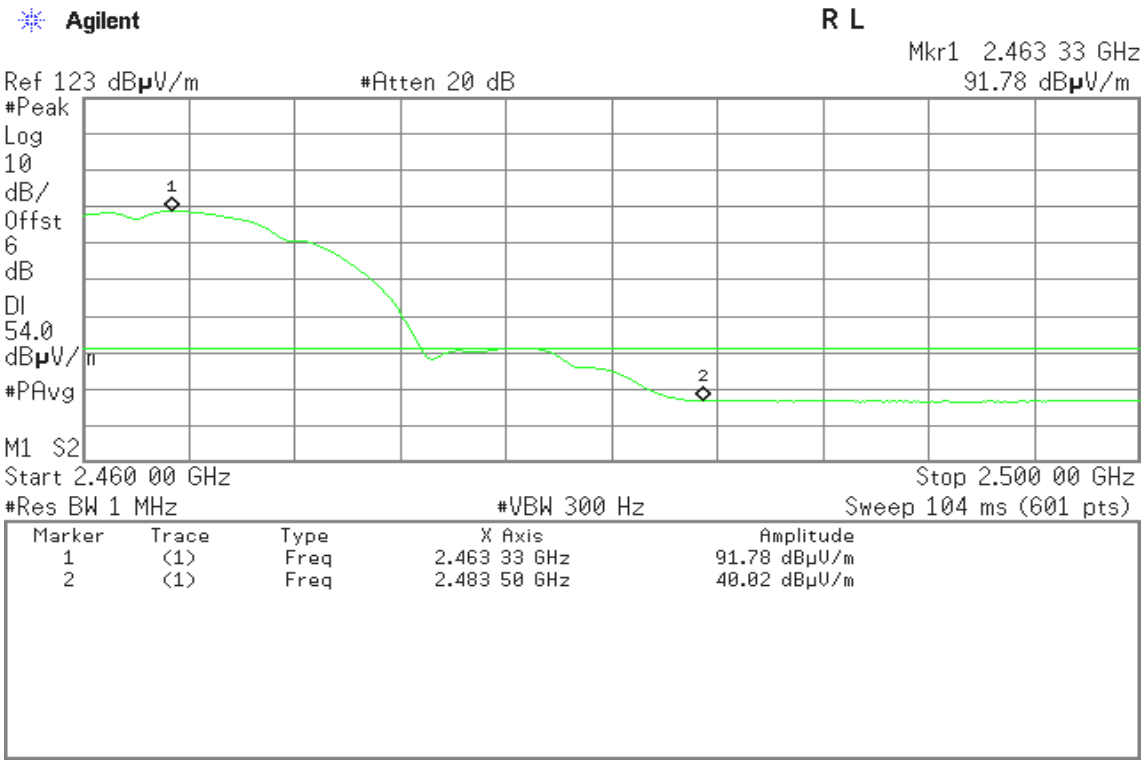
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

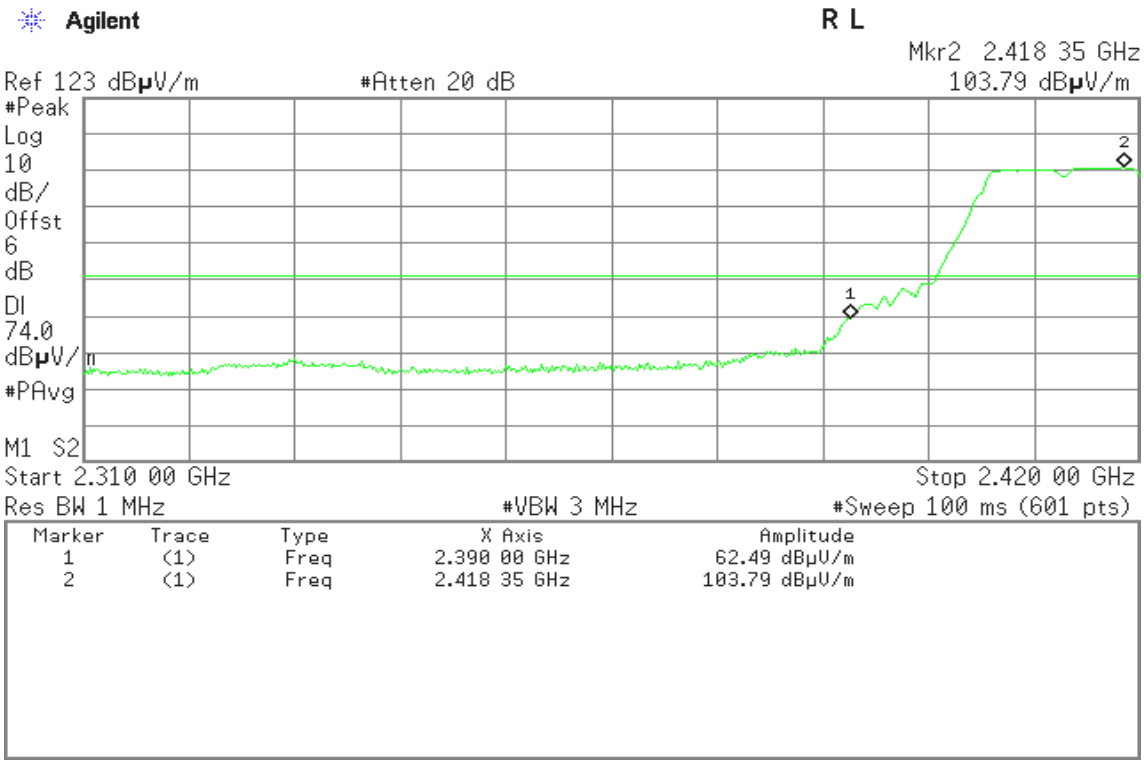


Detector mode: Average **Polarity: Horizontal**

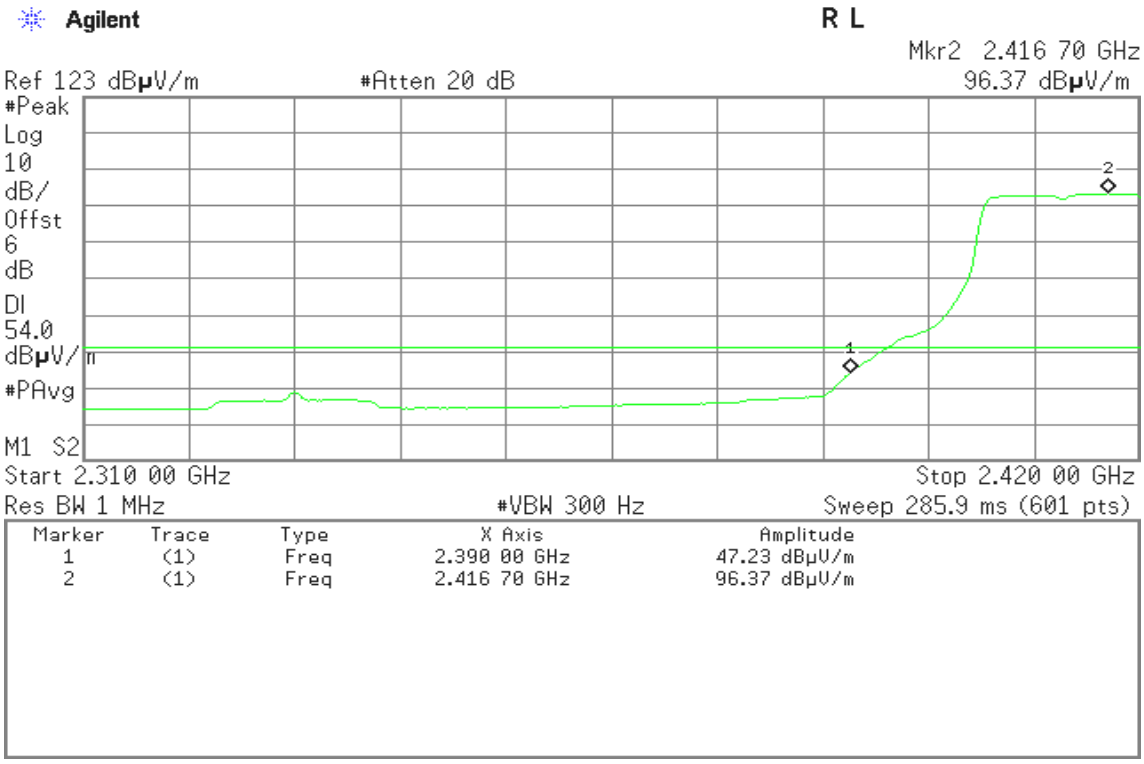


Band Edges (IEEE 802.11g mode / CH Low)

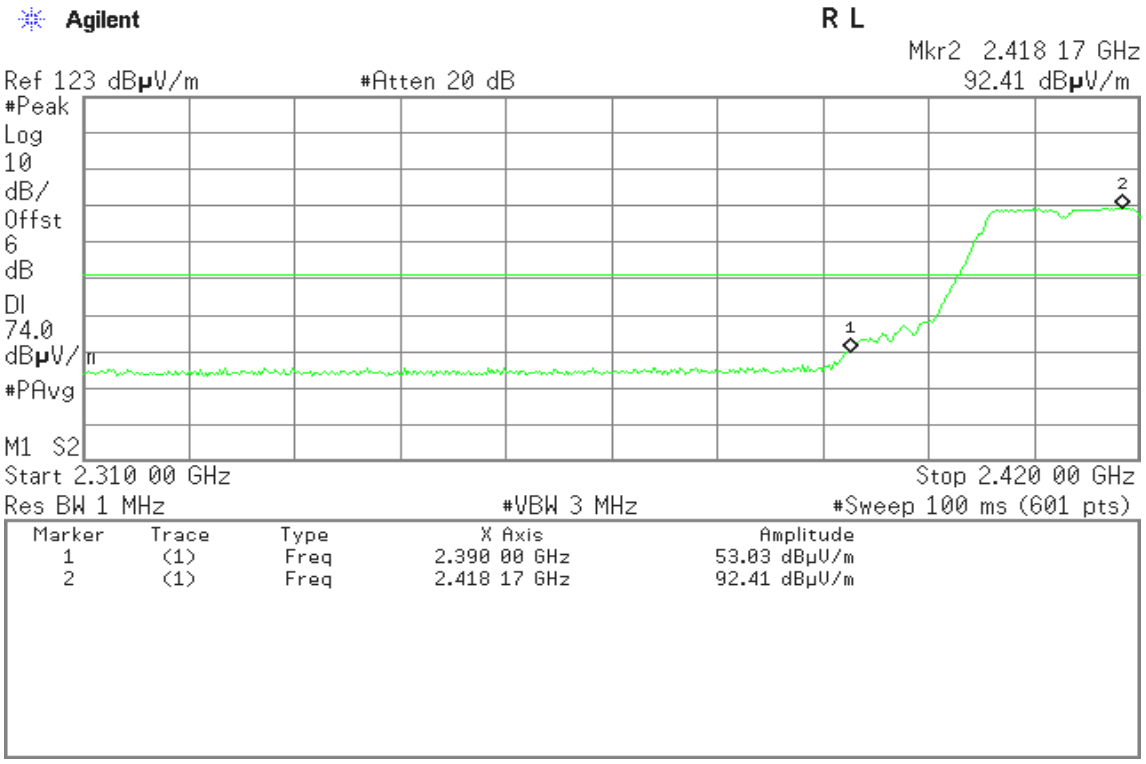
Detector mode: Peak Polarity: Vertical



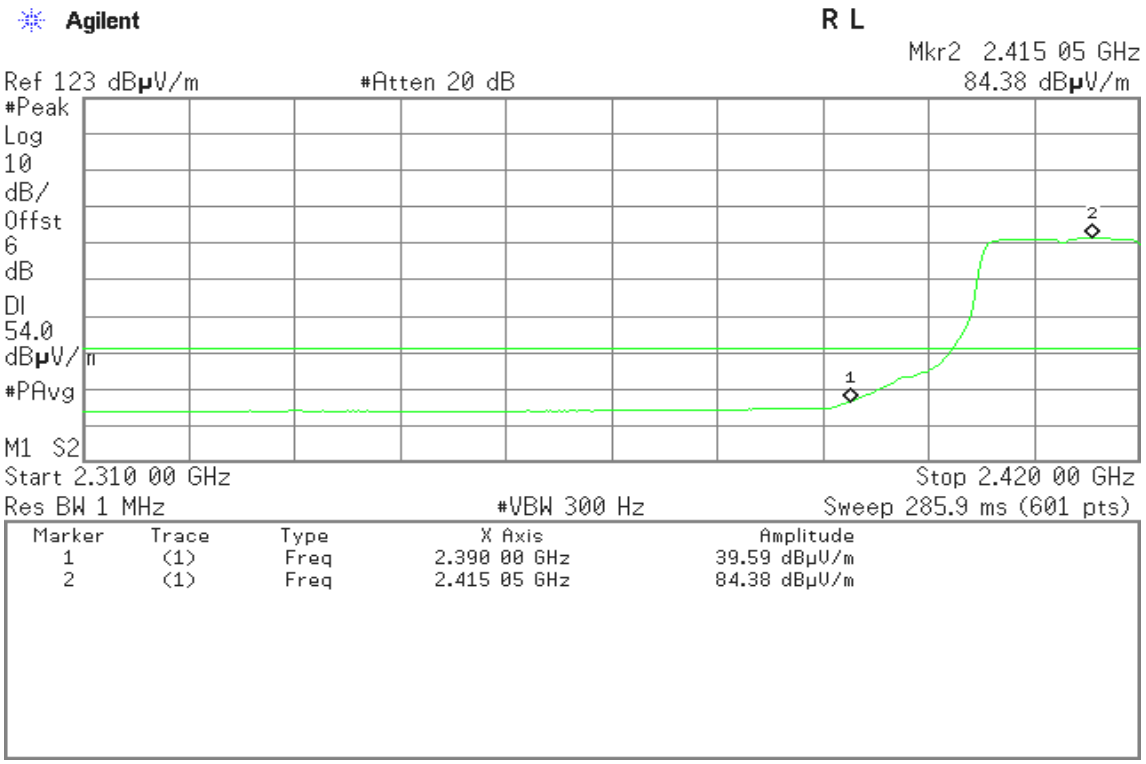
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

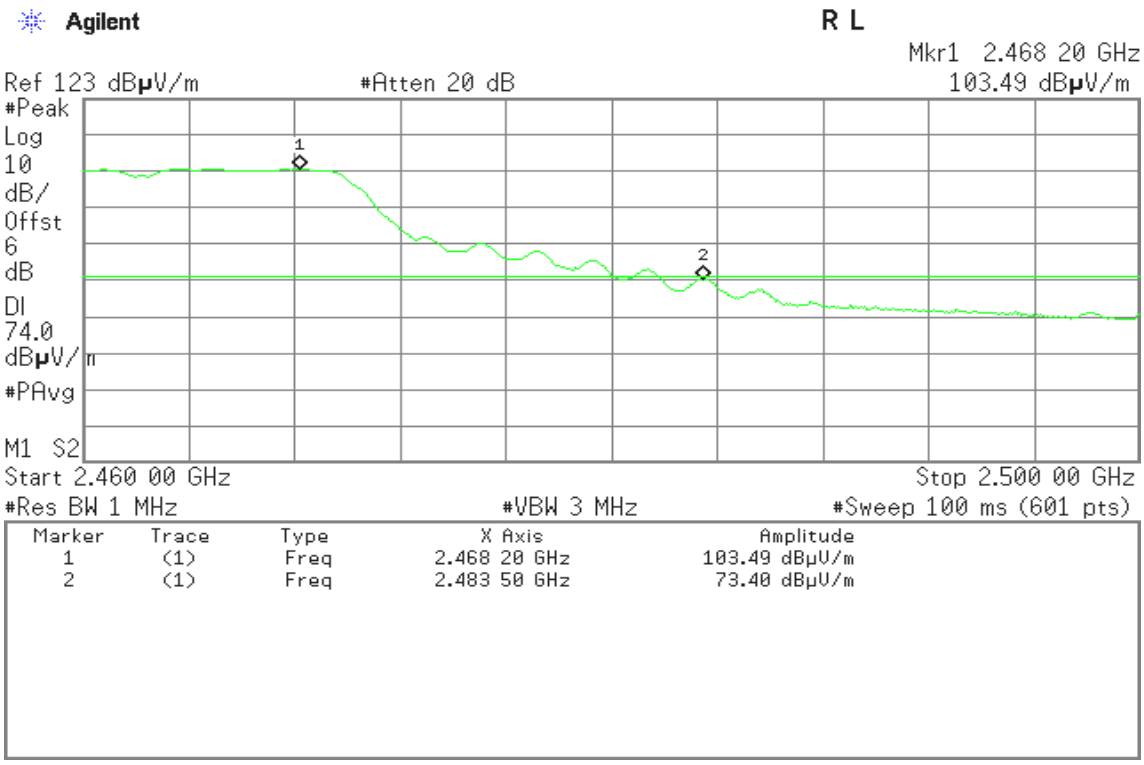


Detector mode: Average **Polarity: Horizontal**

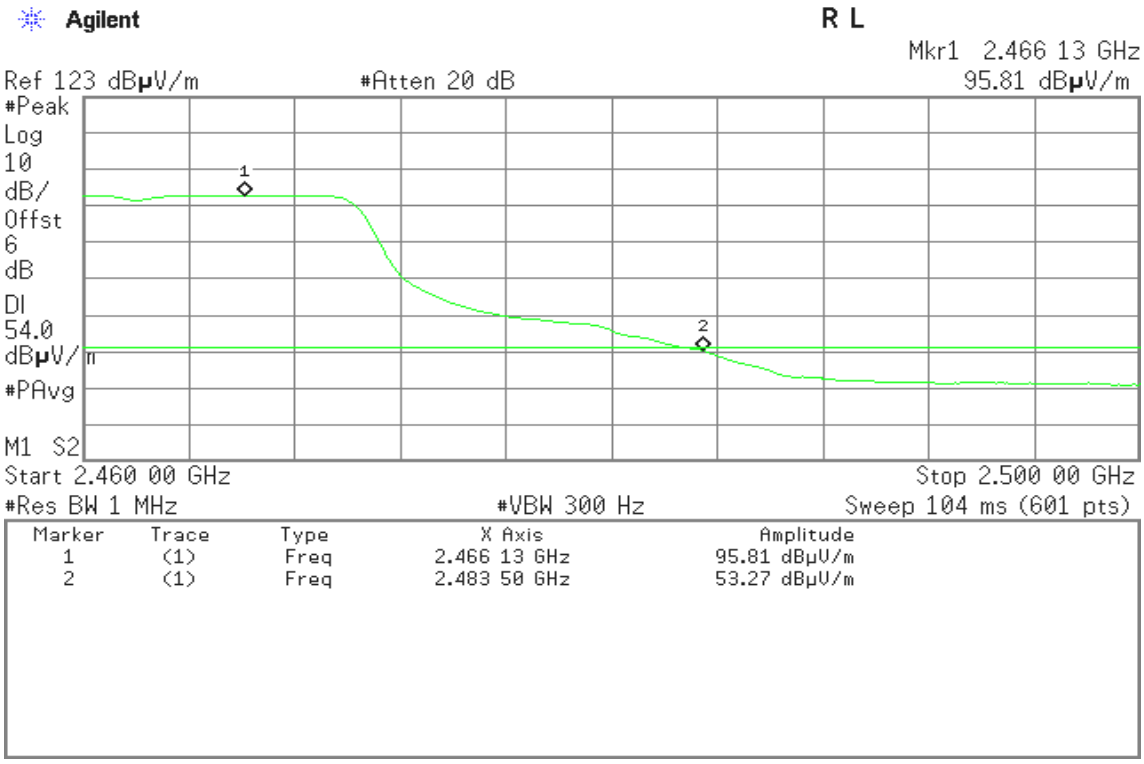


Band Edges (IEEE 802.11g mode / CH High)

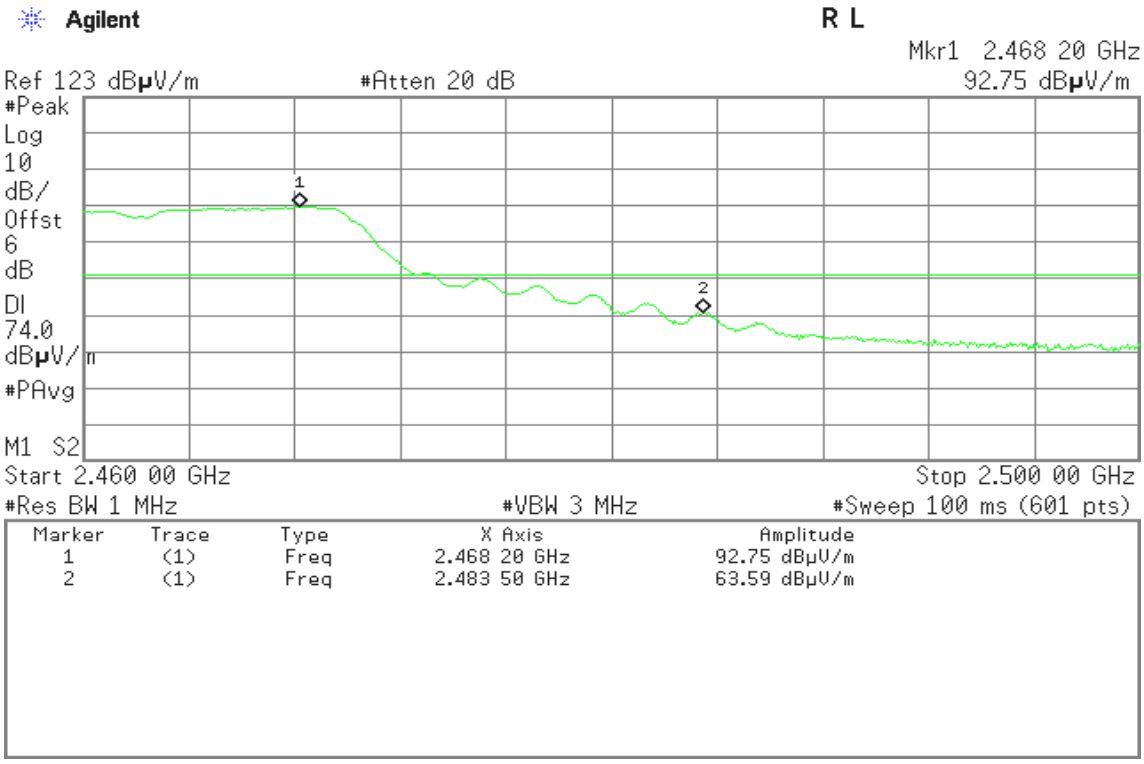
Detector mode: Peak Polarity: Vertical



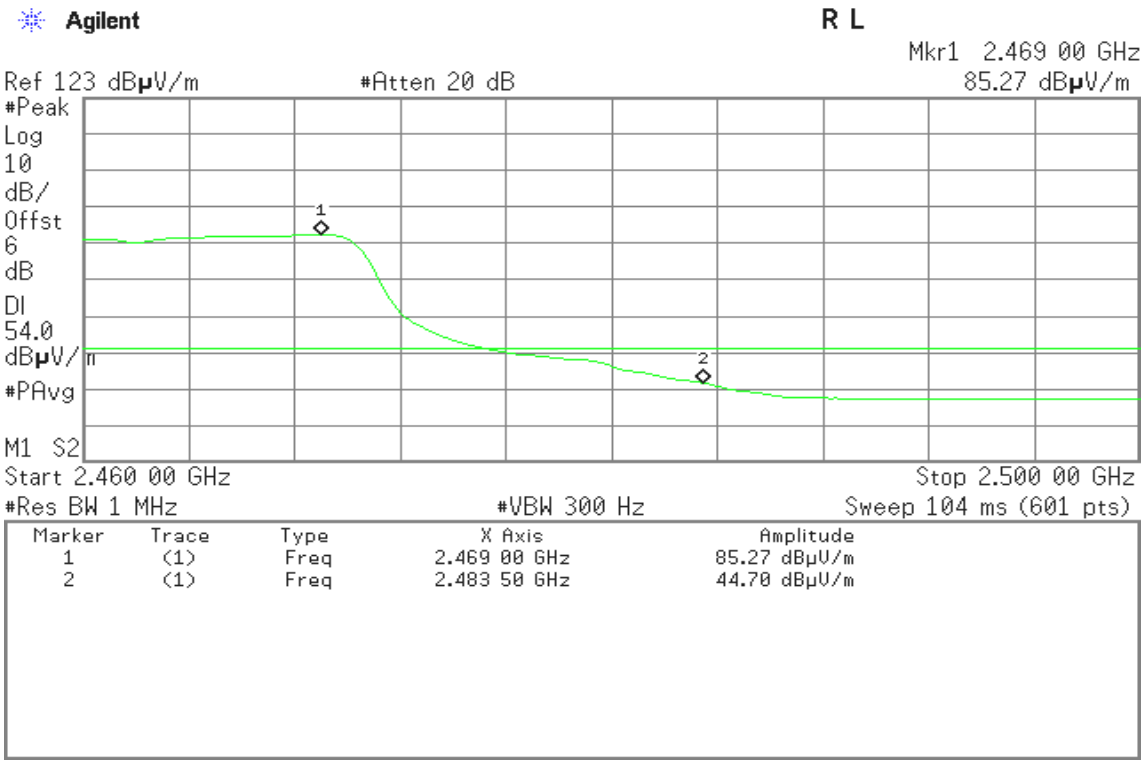
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

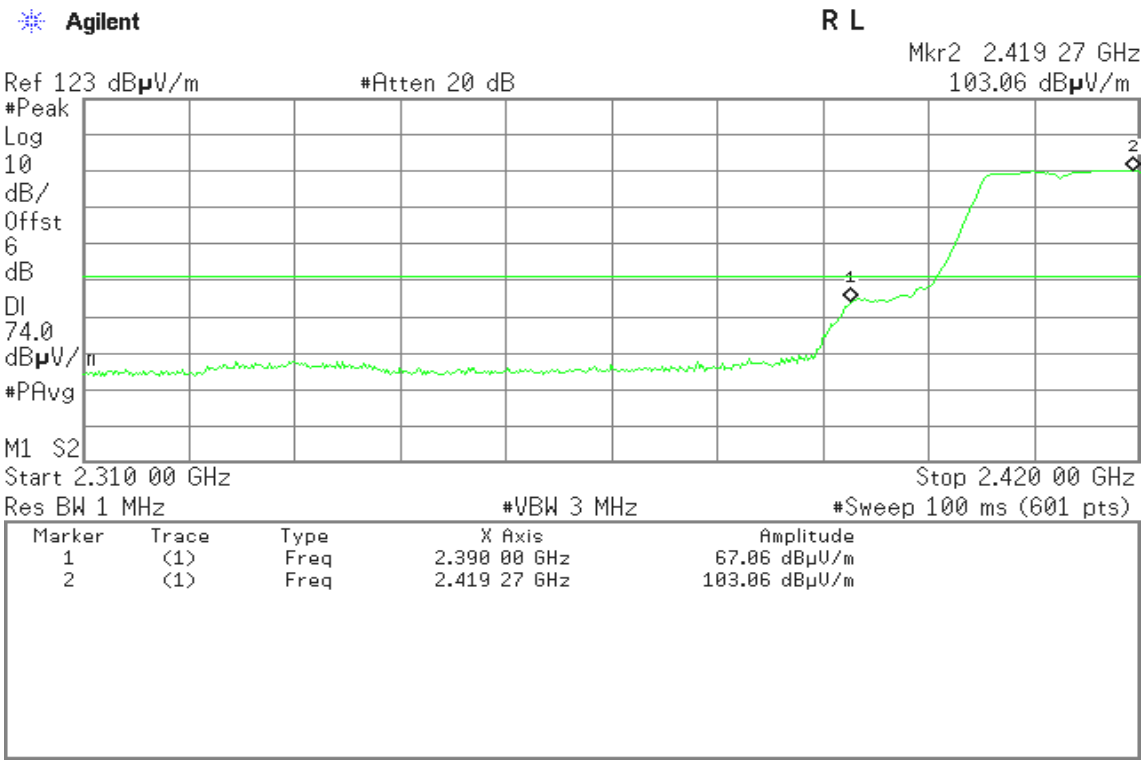


Detector mode: Average Polarity: Horizontal

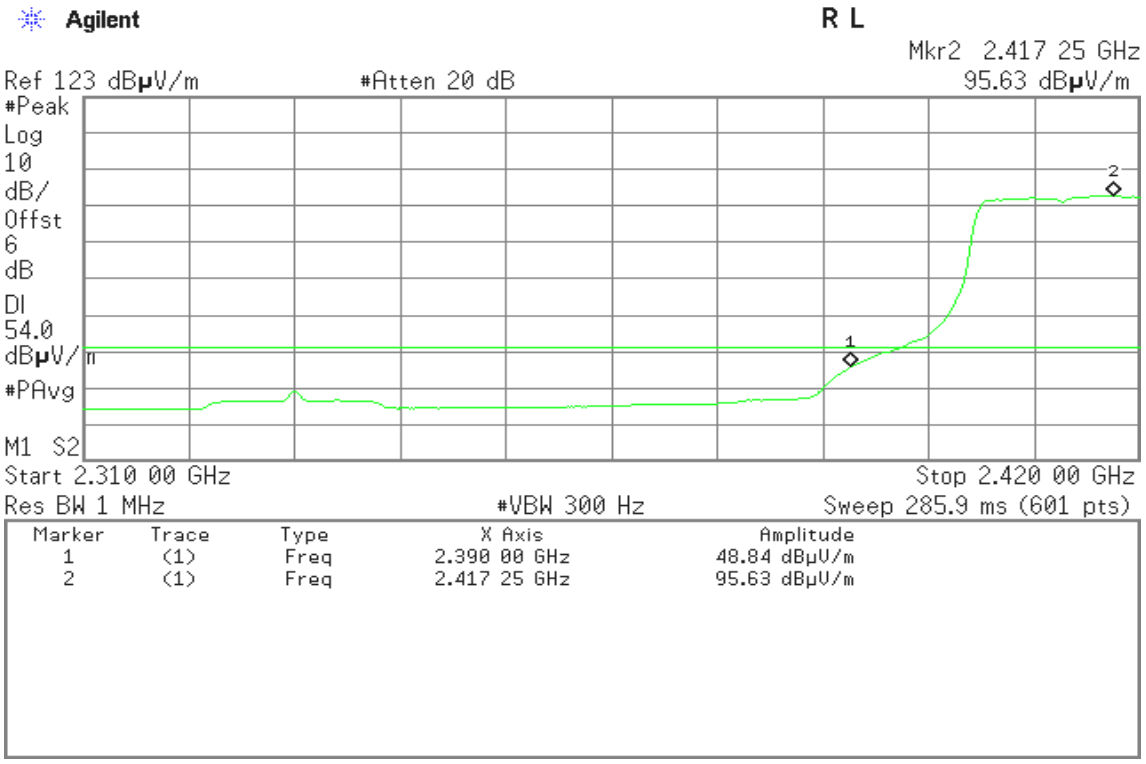


Band Edges (IEEE 802.11n HT20 mode / CH Low)

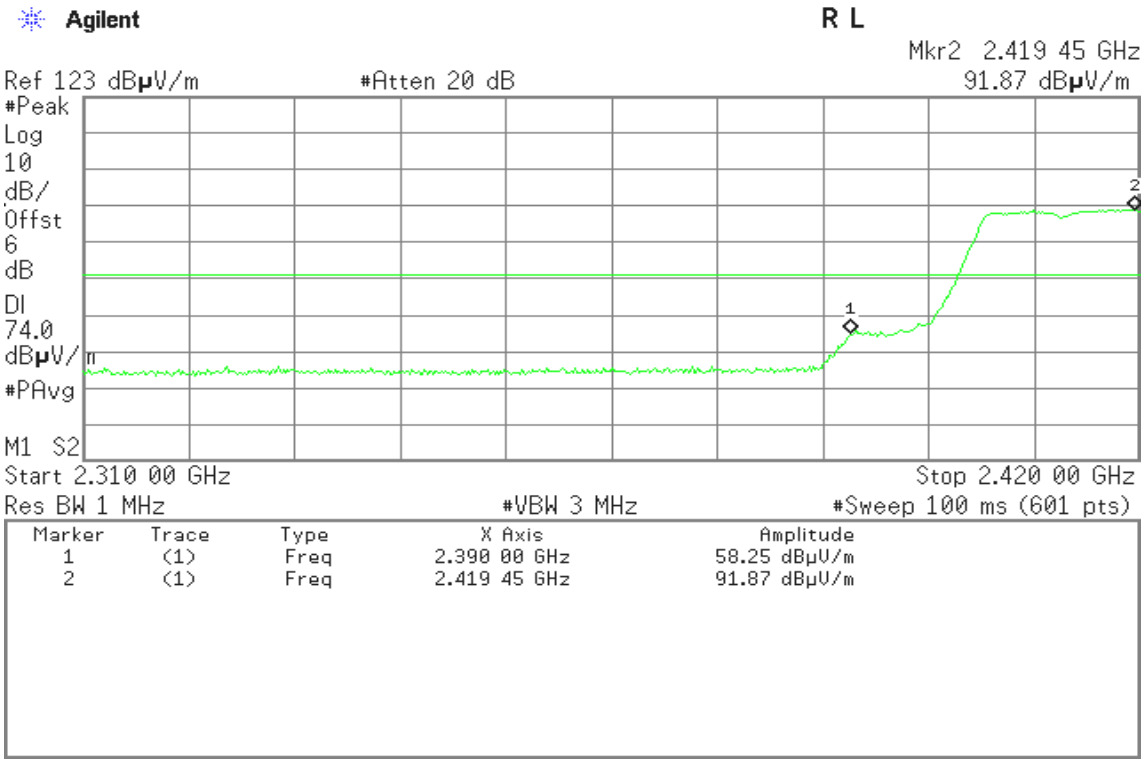
Detector mode: Peak Polarity: Vertical



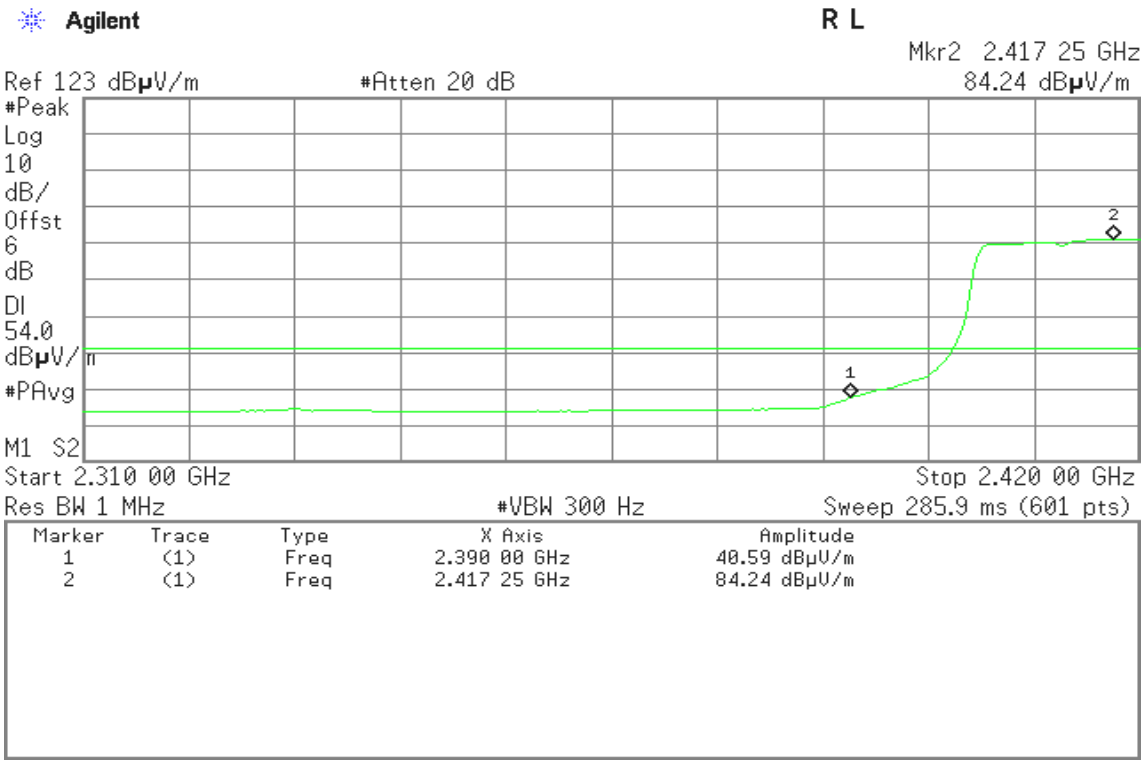
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

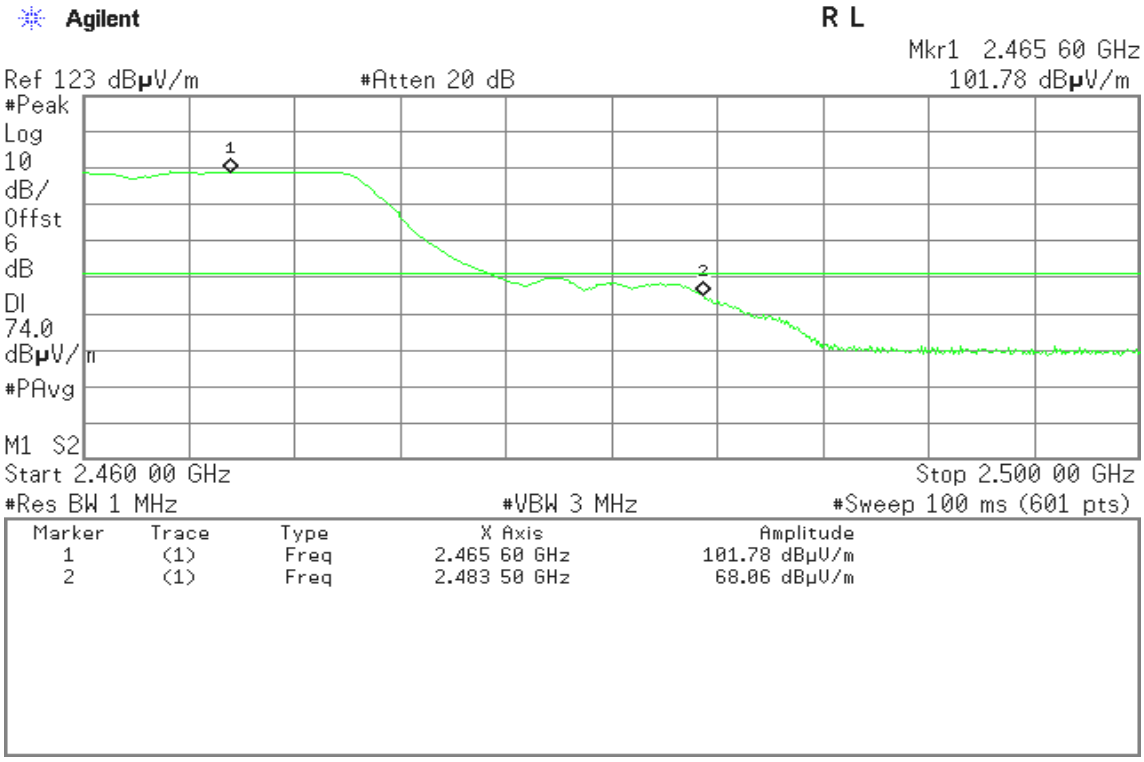


Detector mode: Average **Polarity: Horizontal**

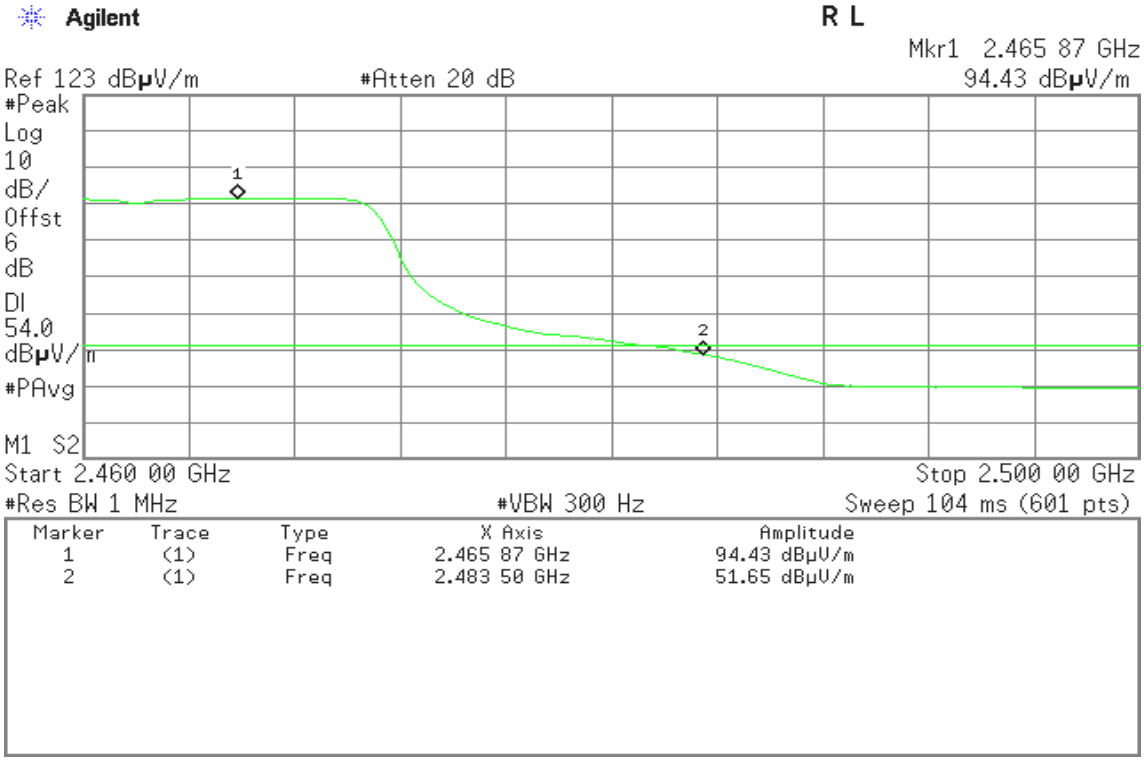


Band Edges (IEEE 802.11n HT20 mode / CH High)

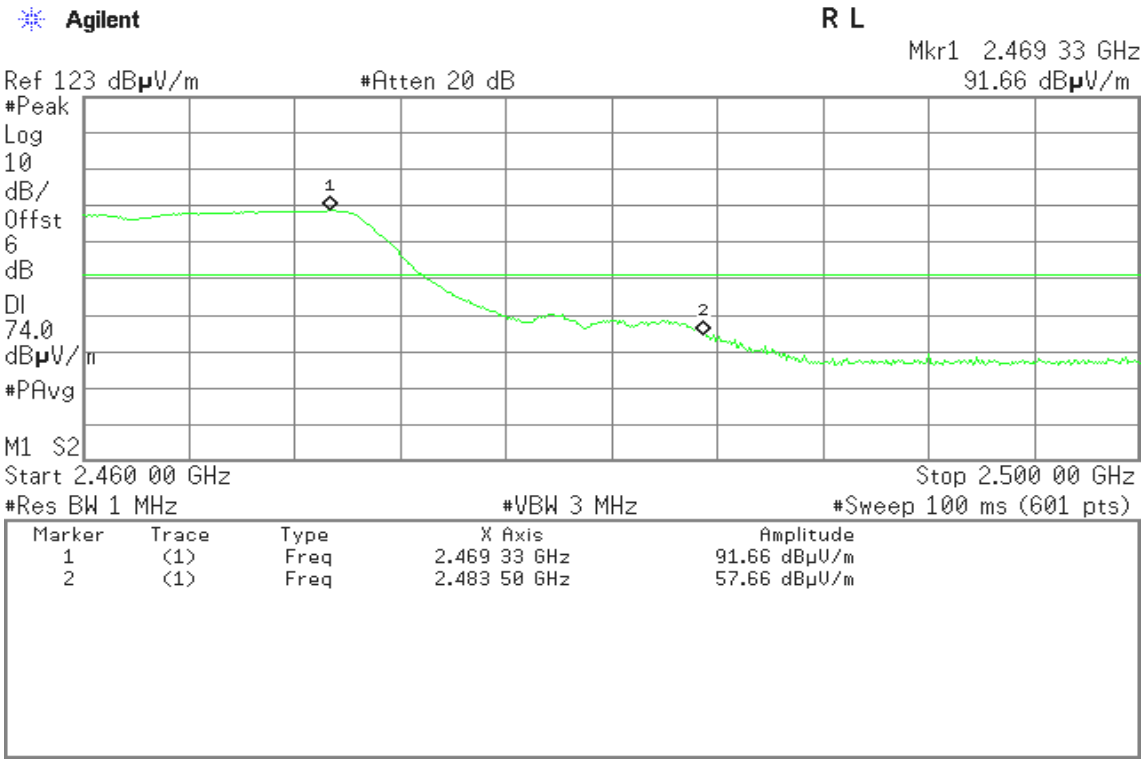
Detector mode: Peak Polarity: Vertical



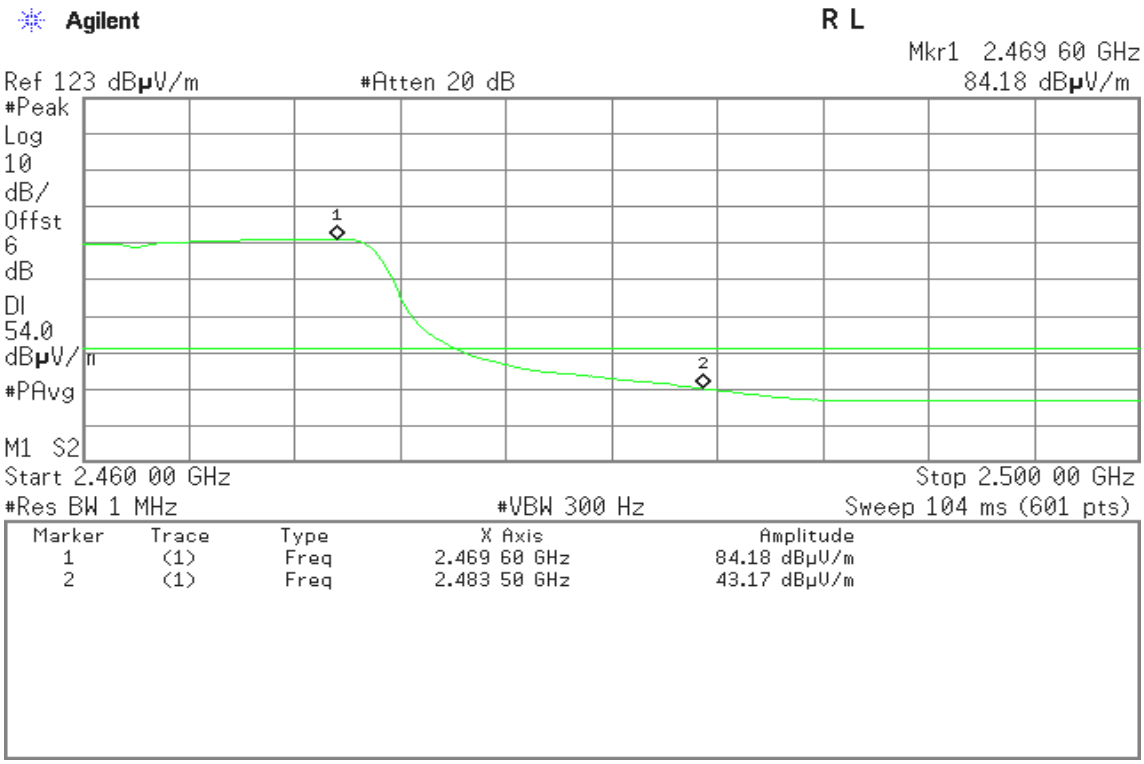
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

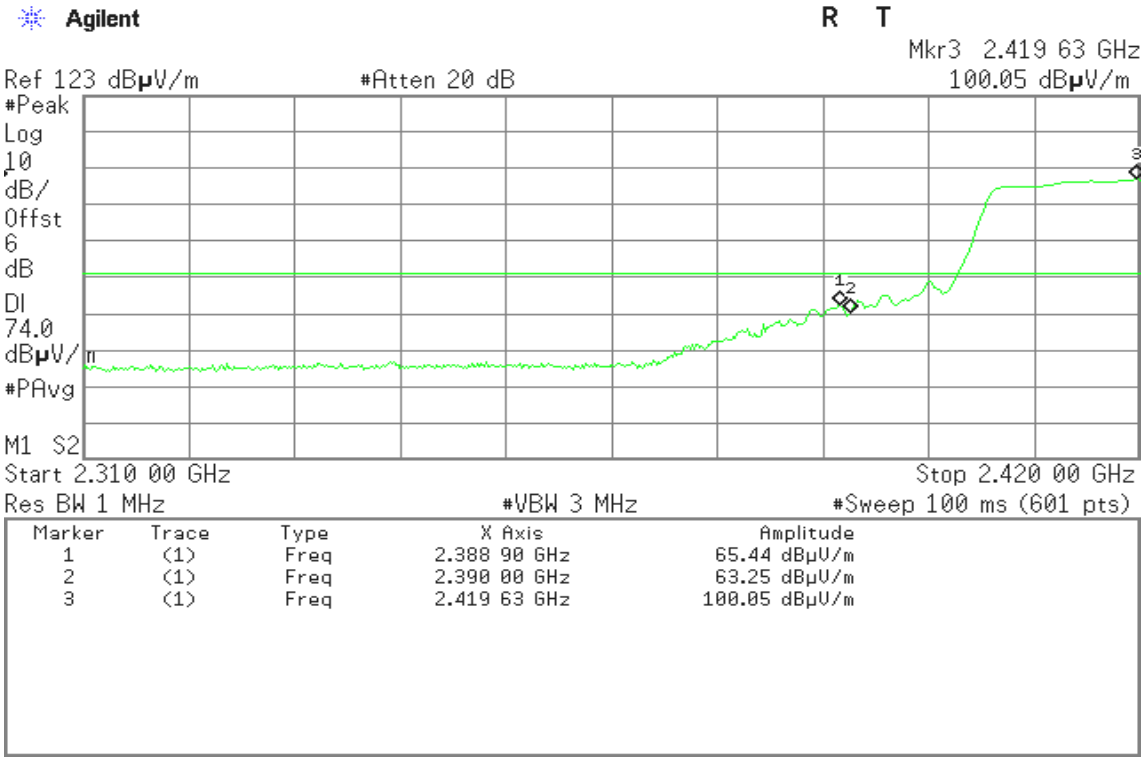


Detector mode: Average **Polarity: Horizontal**

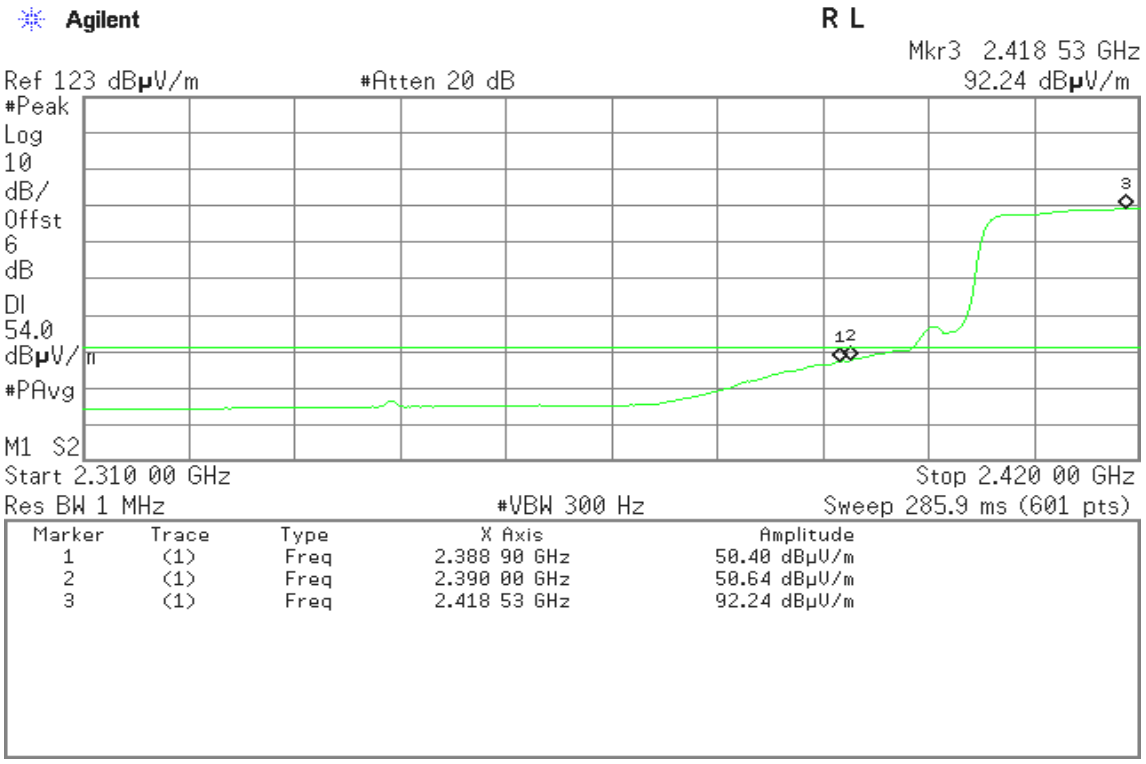


Band Edges (IEEE 802.11n HT40 mode / CH Low)

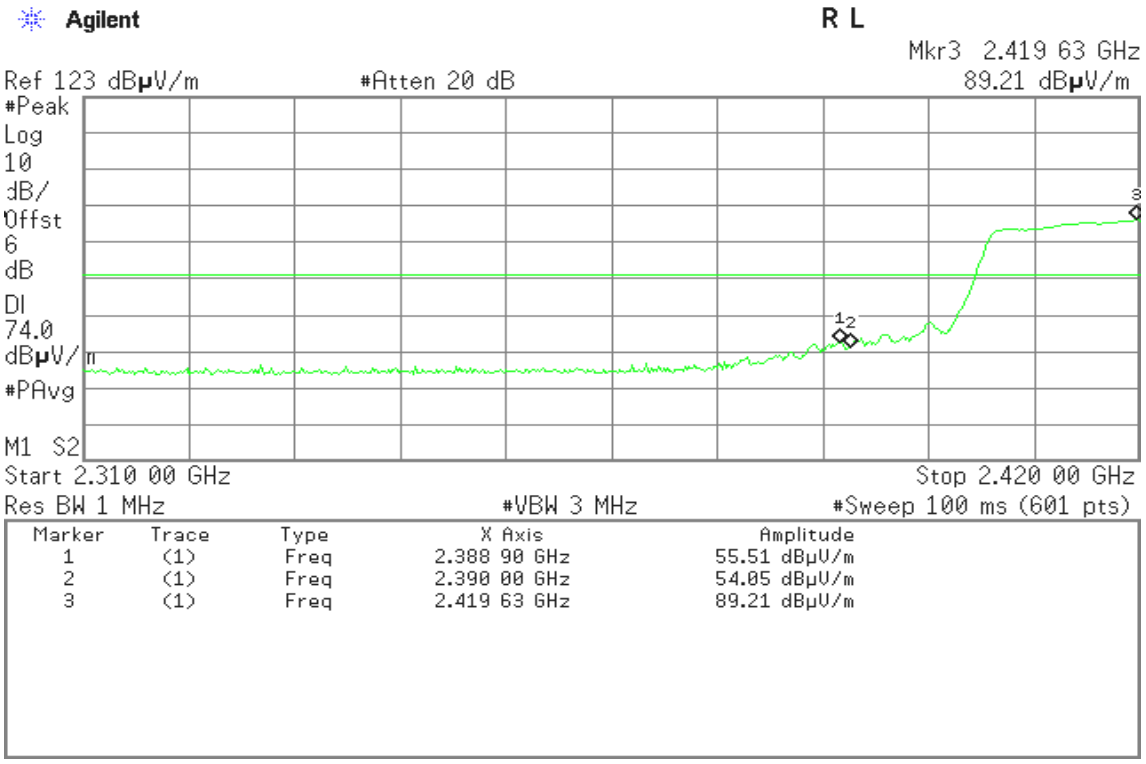
Detector mode: Peak Polarity: Vertical



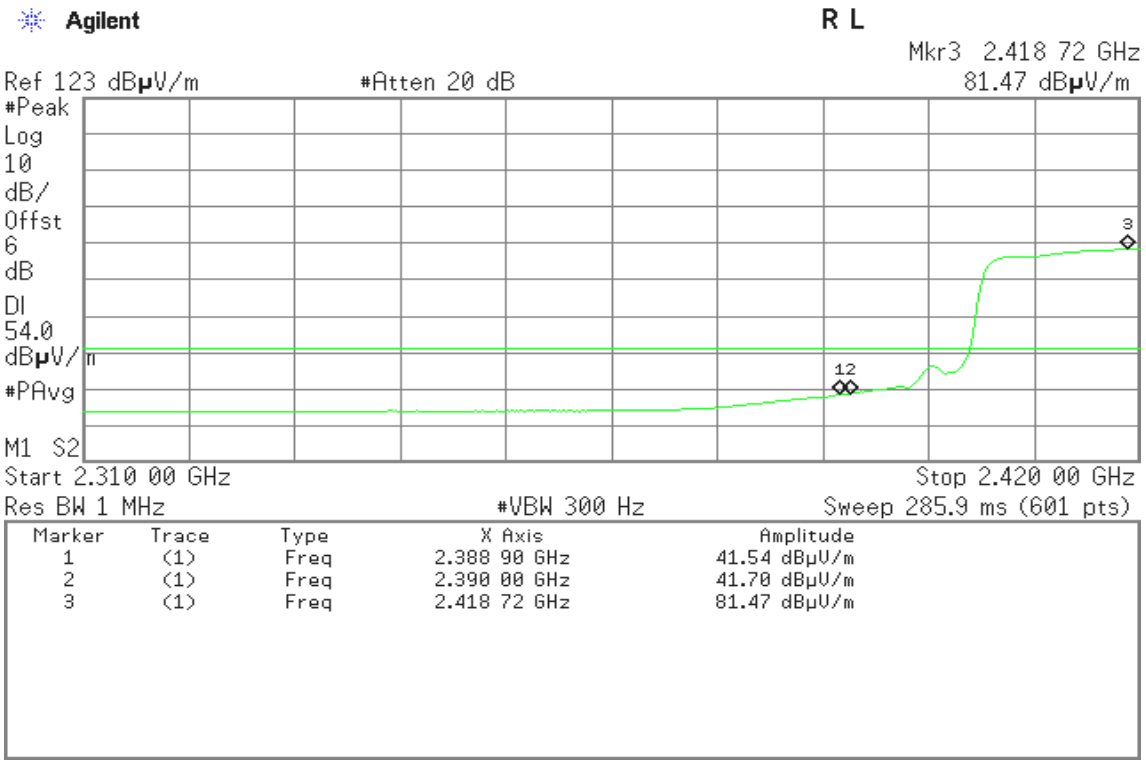
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

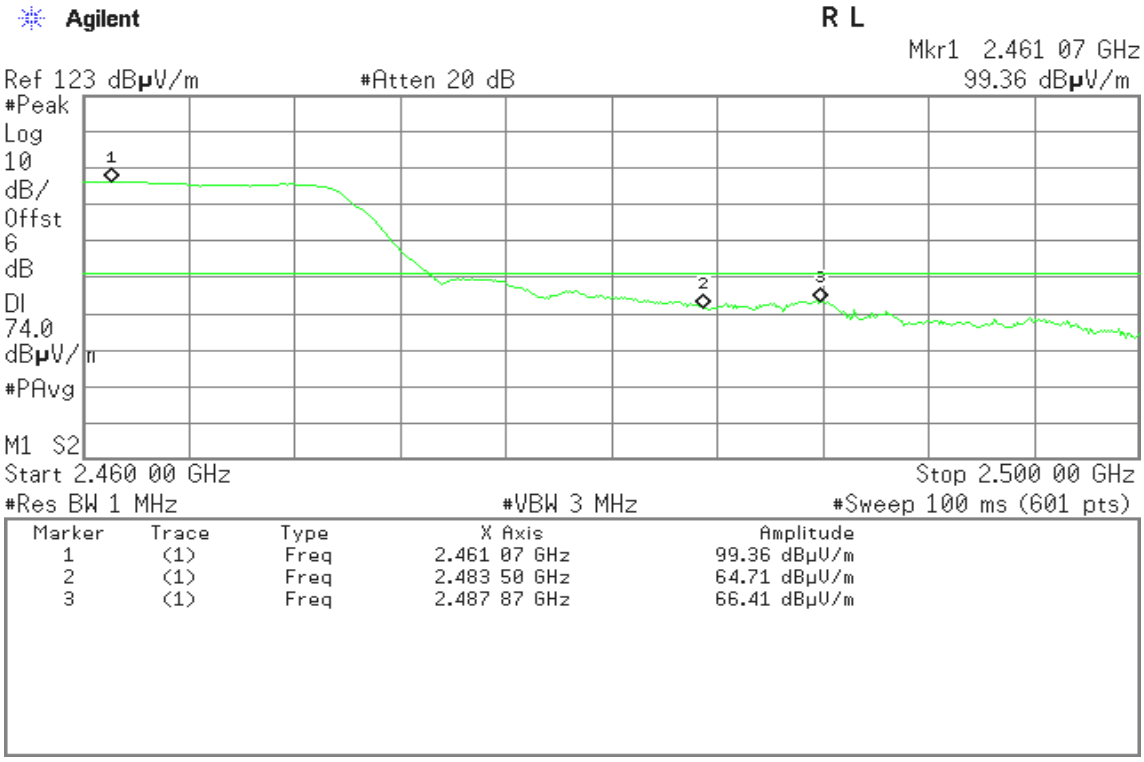


Detector mode: Average Polarity: Horizontal

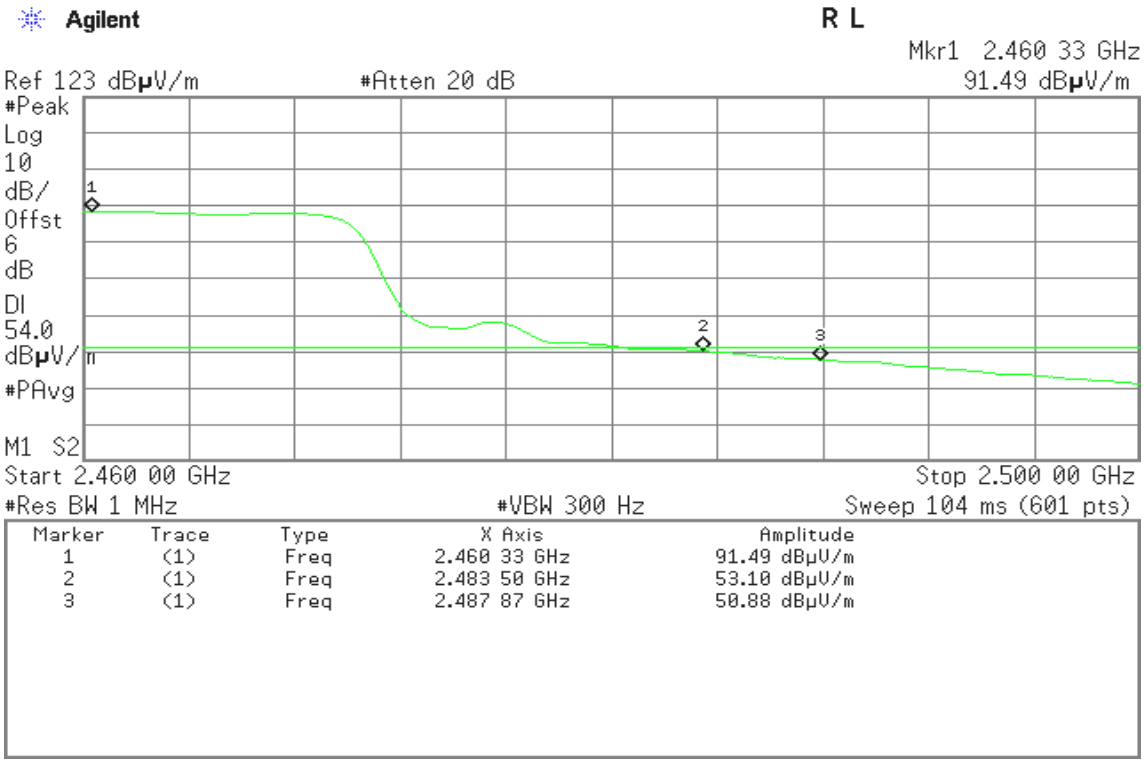


Band Edges (IEEE 802.11n HT40 mode / CH High)

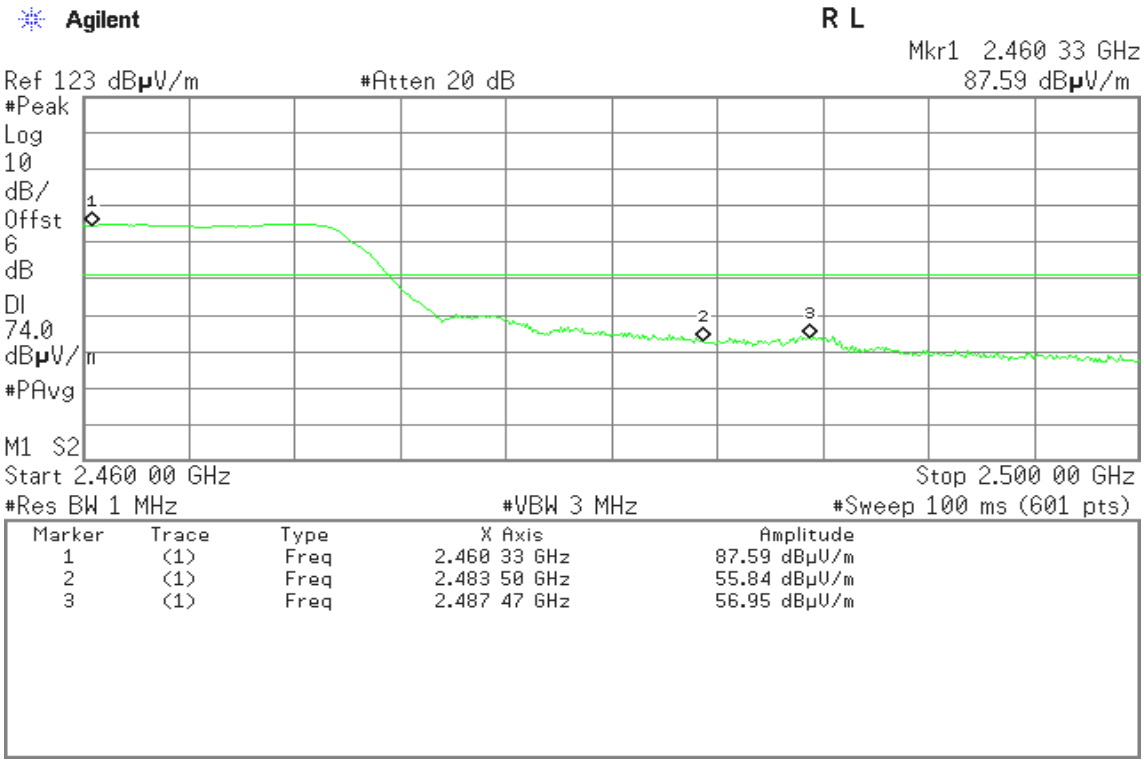
Detector mode: Peak Polarity: Vertical



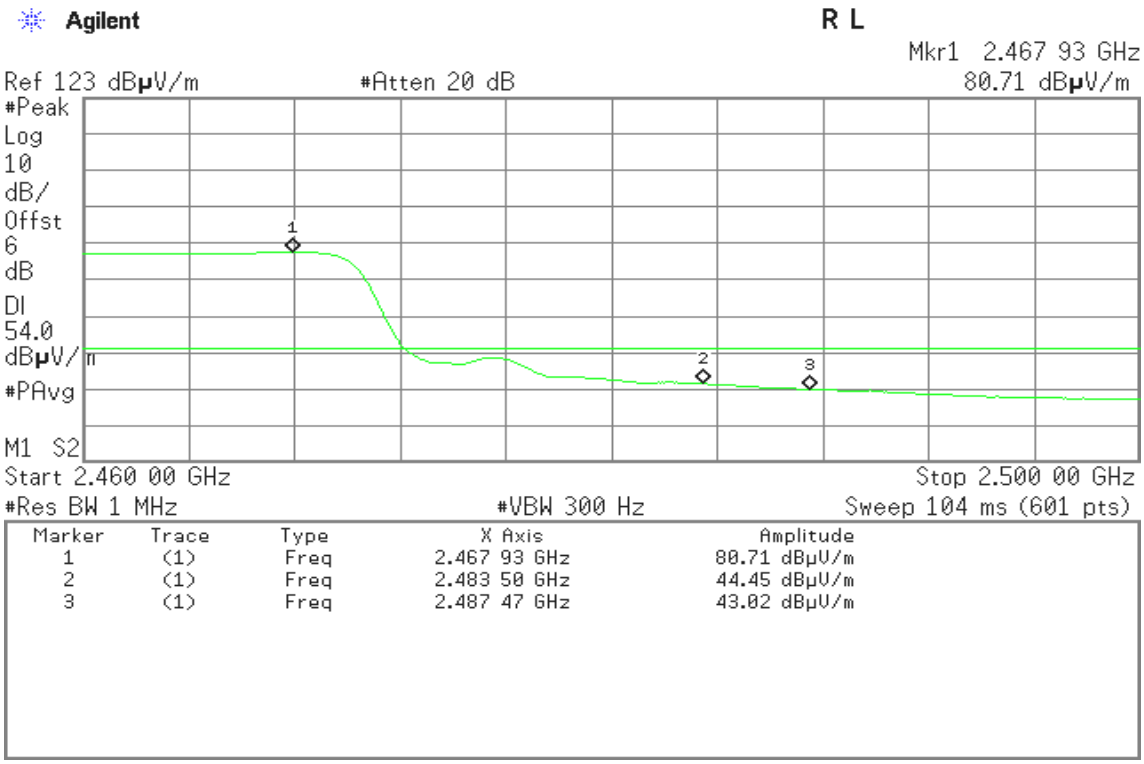
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**

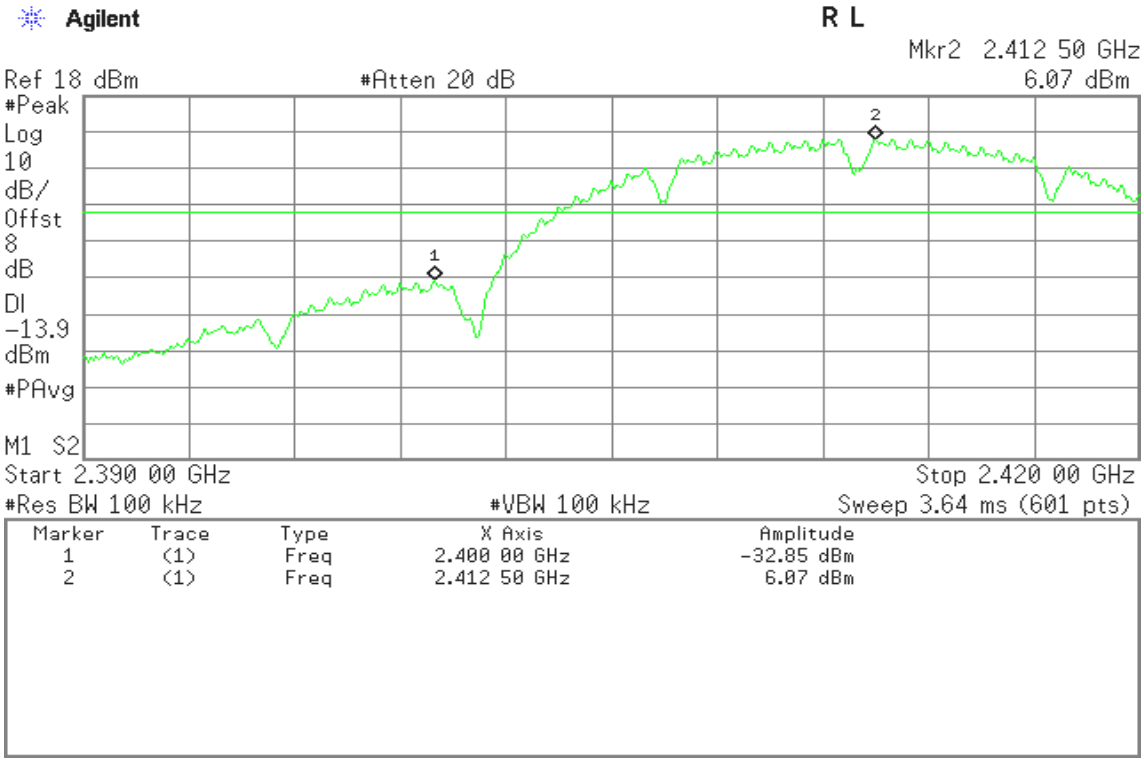


Detector mode: Average **Polarity: Horizontal**

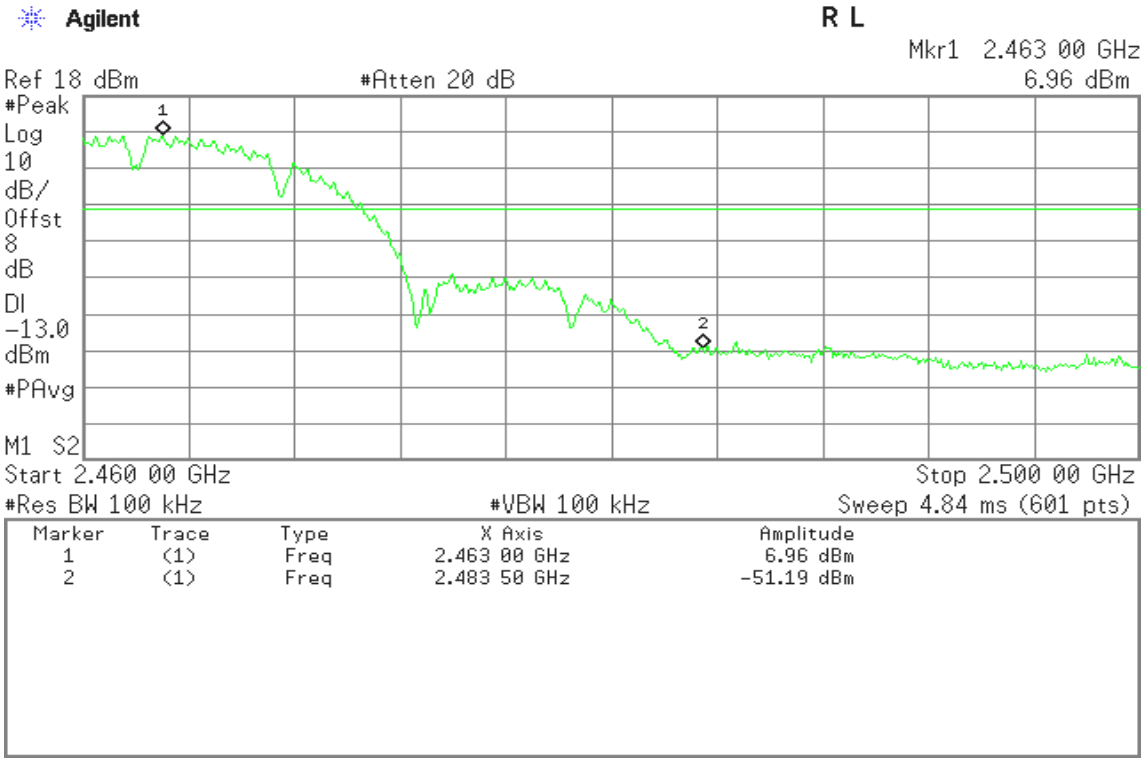


Test Plot

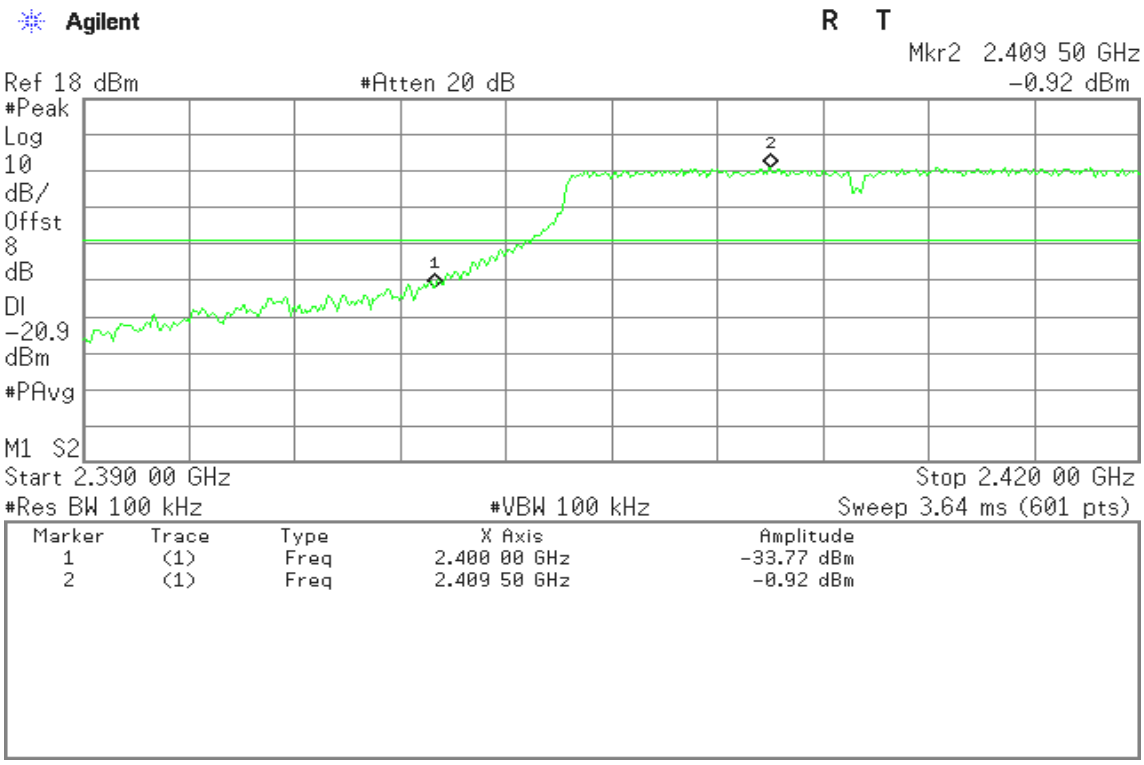
Conducted Band Edges (IEEE 802.11b mode / CH Low)



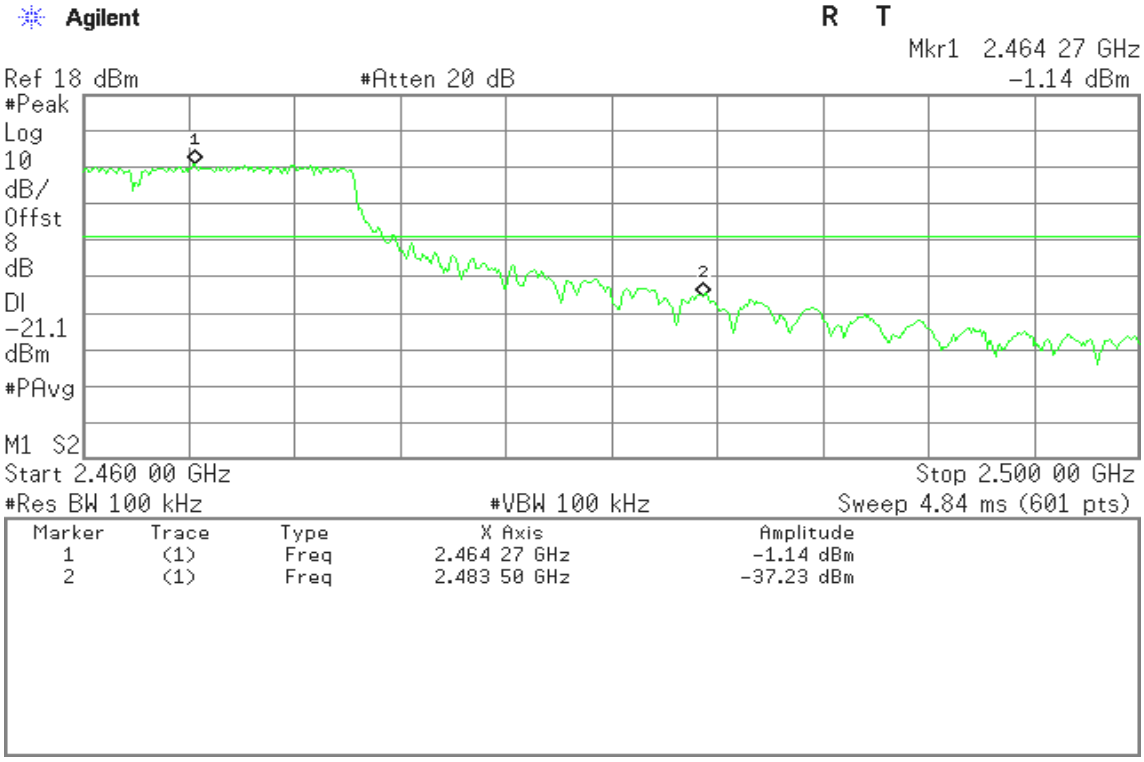
Conducted Band Edges (IEEE 802.11b mode / CH High)



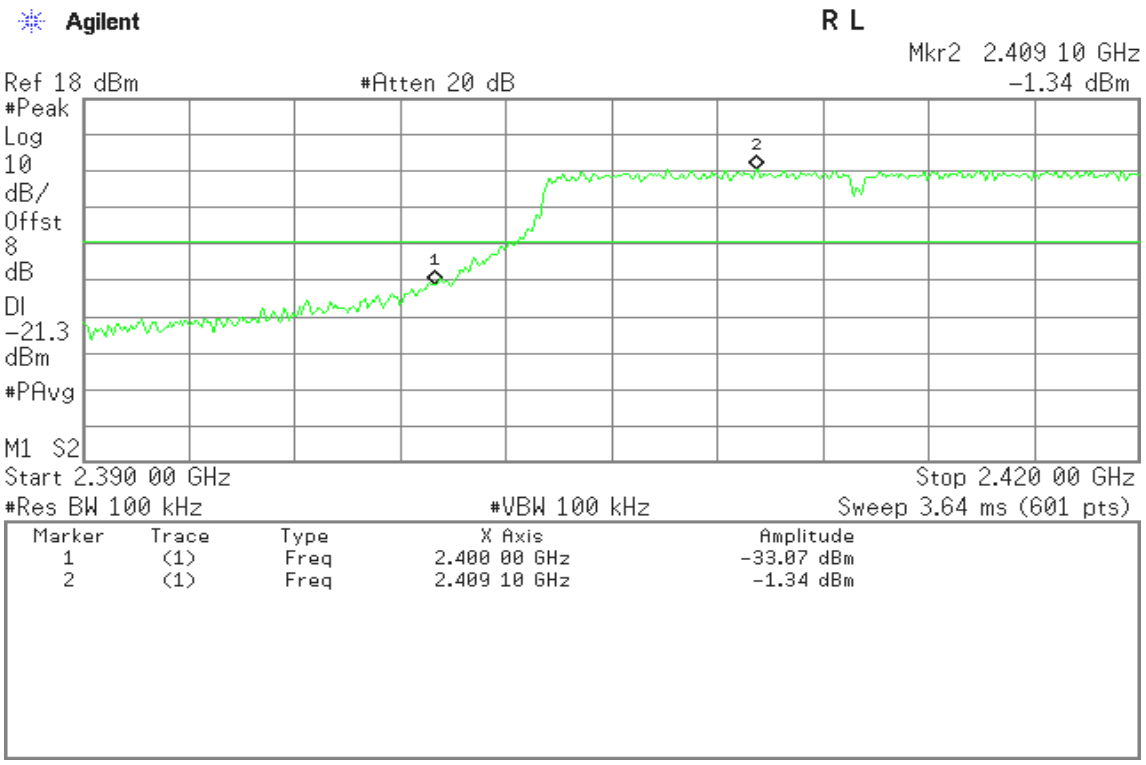
Conducted Band Edges (IEEE 802.11g mode / CH Low)



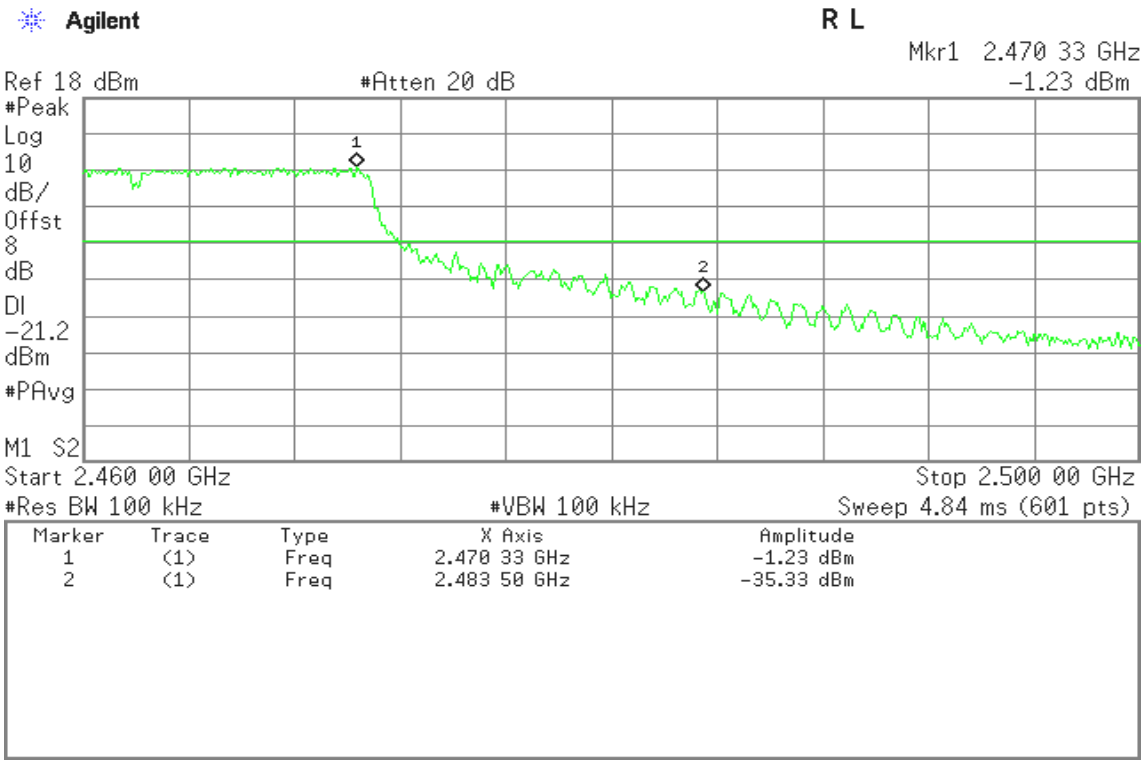
Conducted Band Edges (IEEE 802.11g mode / CH High)



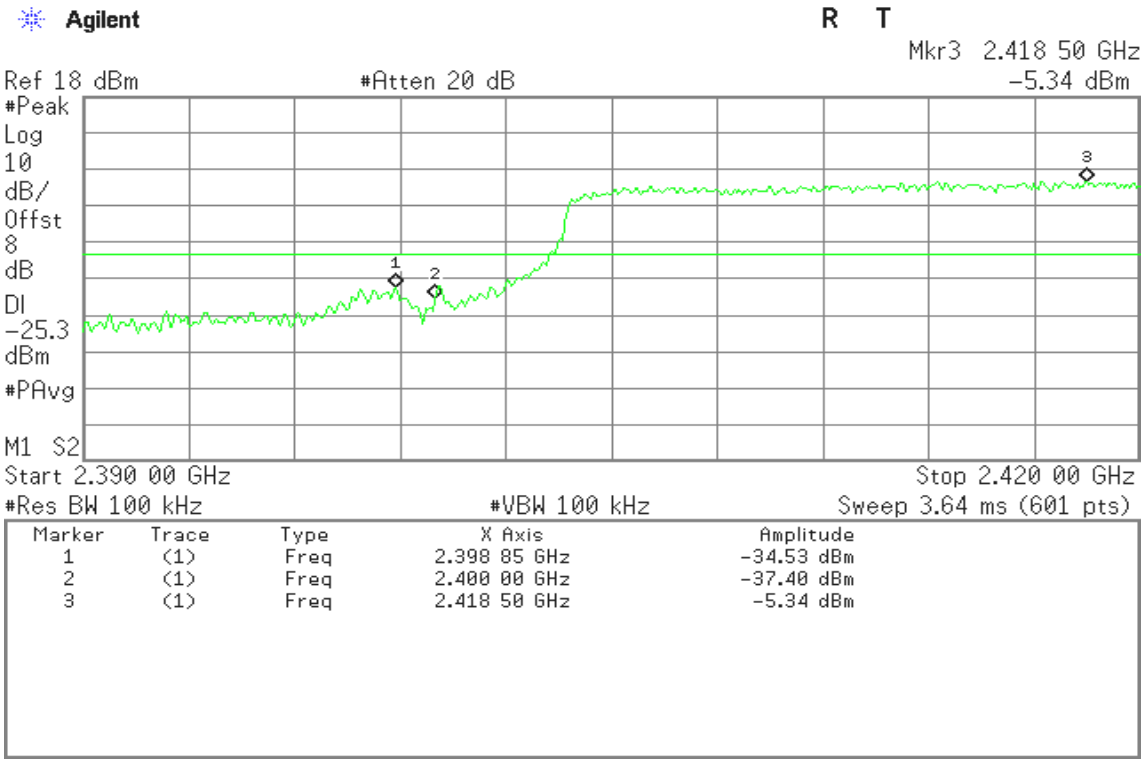
Conducted Band Edges (IEEE 802.11n HT20 mode / CH Low)



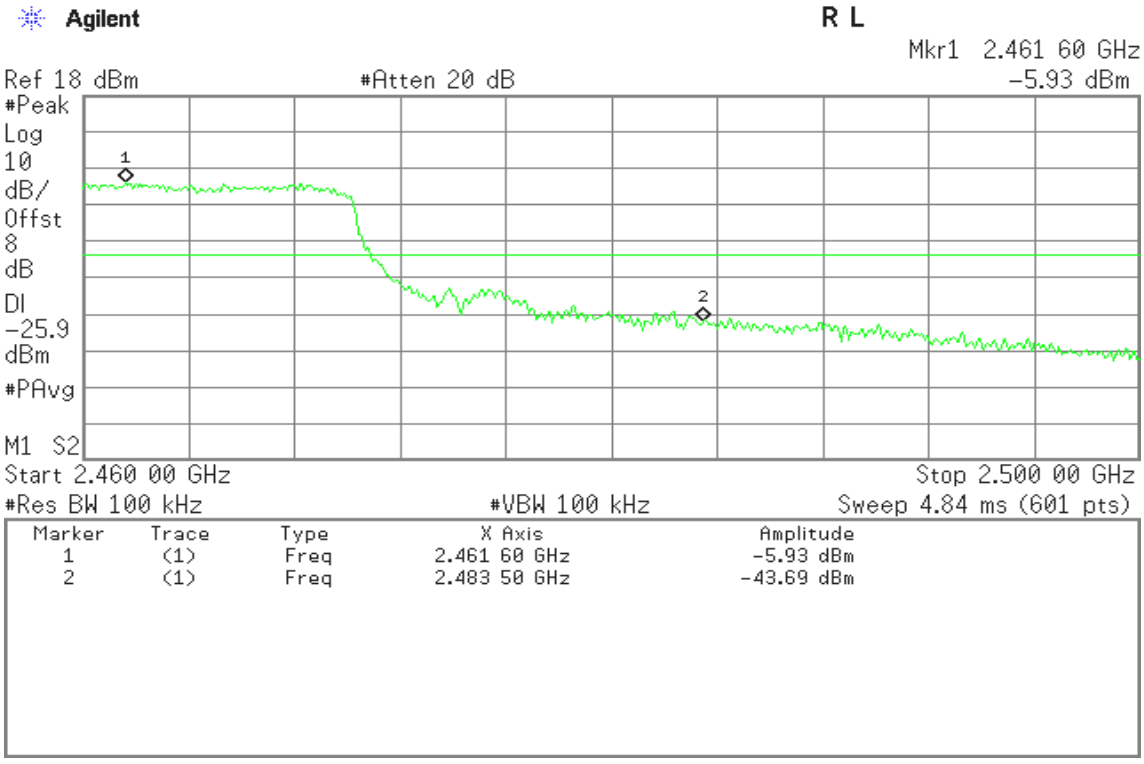
Conducted Band Edges (IEEE 802.11n HT20 mode / CH High)



Conducted Band Edges (IEEE 802.11n HT40 mode / CH Low)



Conducted Band Edges (IEEE 802.11n HT40 mode / CH High)

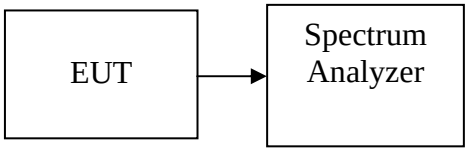


7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

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

Test Configuration



TEST PROCEDURE

Per KDB 558074 v03r01

This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW ≥ 3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level.
If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-11.09	8.00	PASS
Mid	2437	-10.70		PASS
High	2462	-10.30		PASS

Test mode: IEEE 802.11g mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-11.03	8.00	PASS
Mid	2437	-10.19		PASS
High	2462	-9.60		PASS

Test mode: IEEE 802.11n HT20 mode

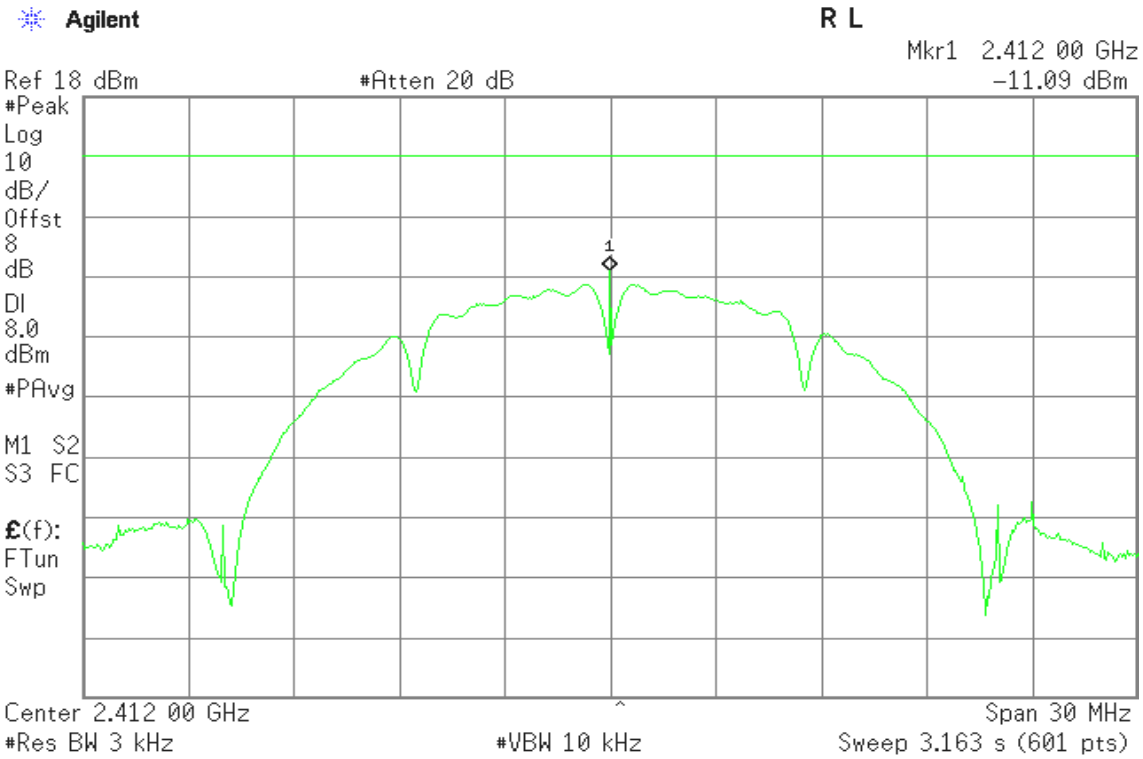
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2412	-10.92	8.00	PASS
Mid	2437	-10.13		PASS
High	2462	-9.41		PASS

Test mode: IEEE 802.11n HT40 mode

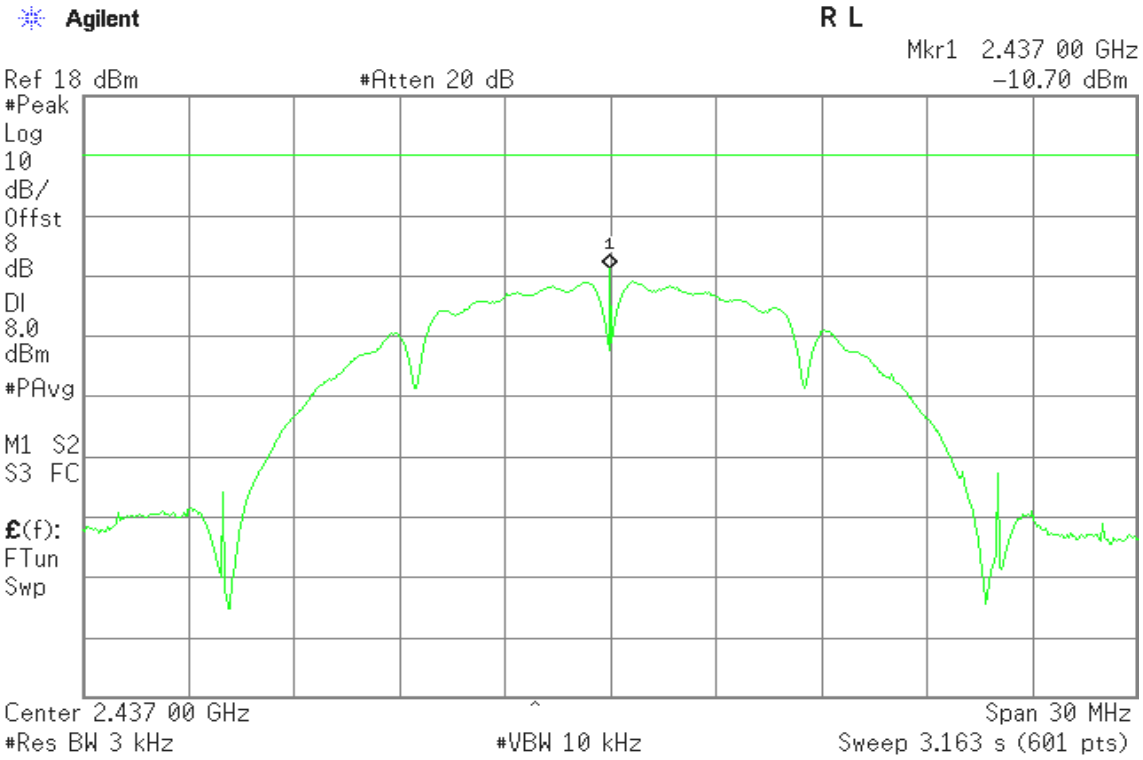
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2422	-10.76	8.00	PASS
Mid	2437	-10.27		PASS
High	2452	-9.83		PASS

Test Plot

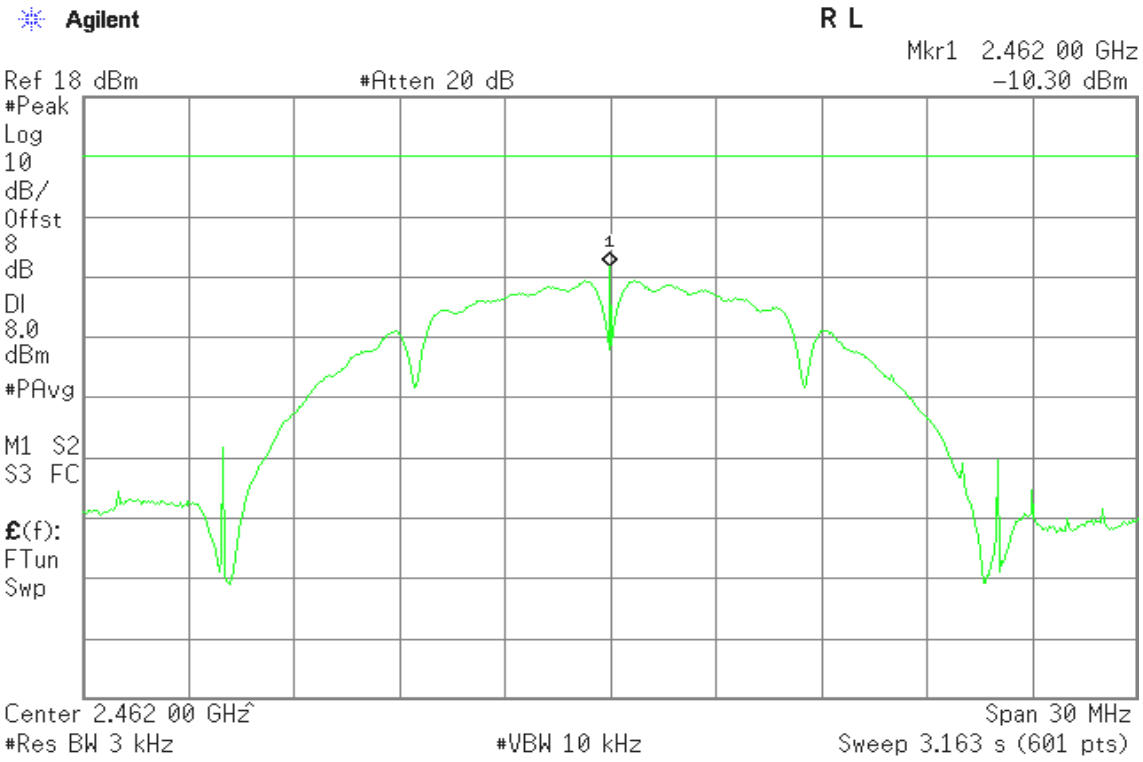
IEEE 802.11b mode
PPSD (CH Low)



PPSD (CH Mid)

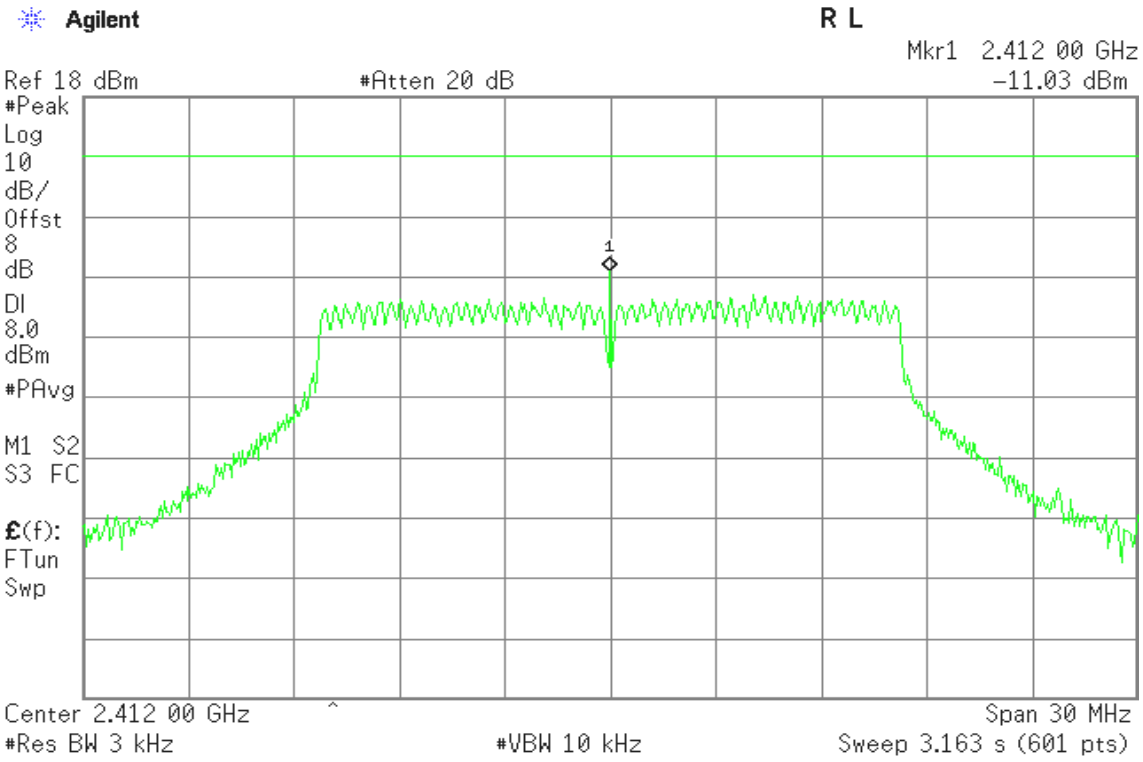


PPSD (CH High)

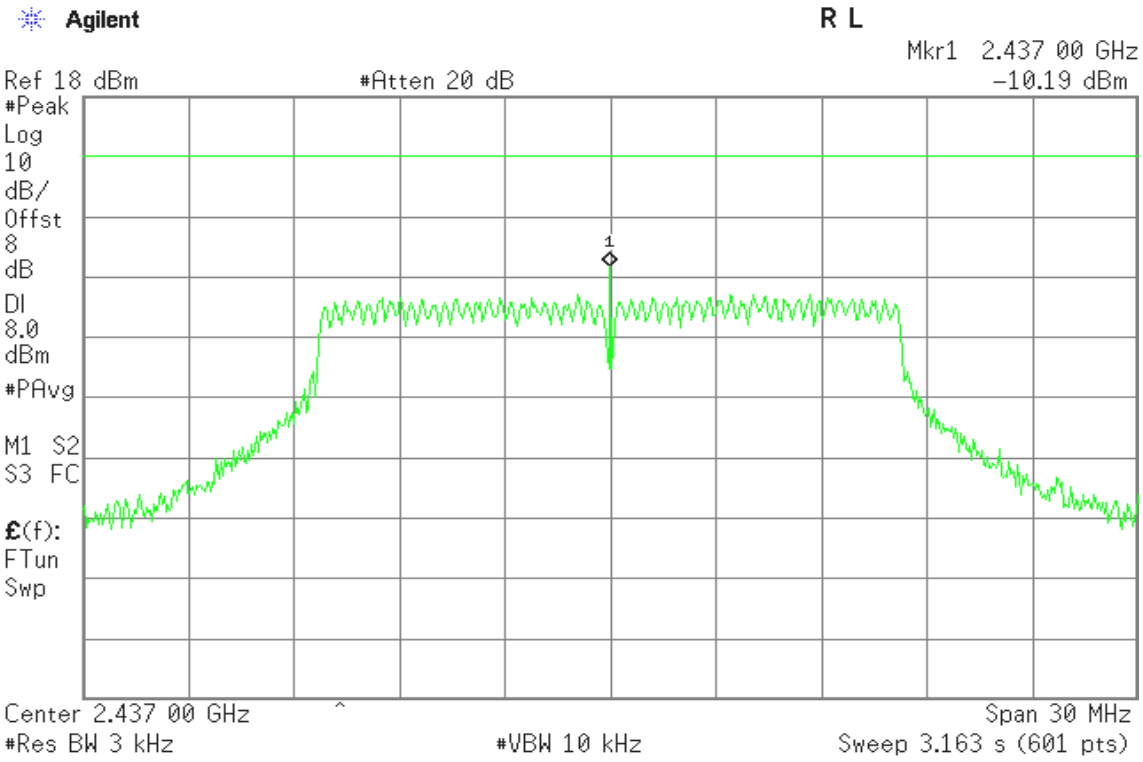


IEEE 802.11g mode

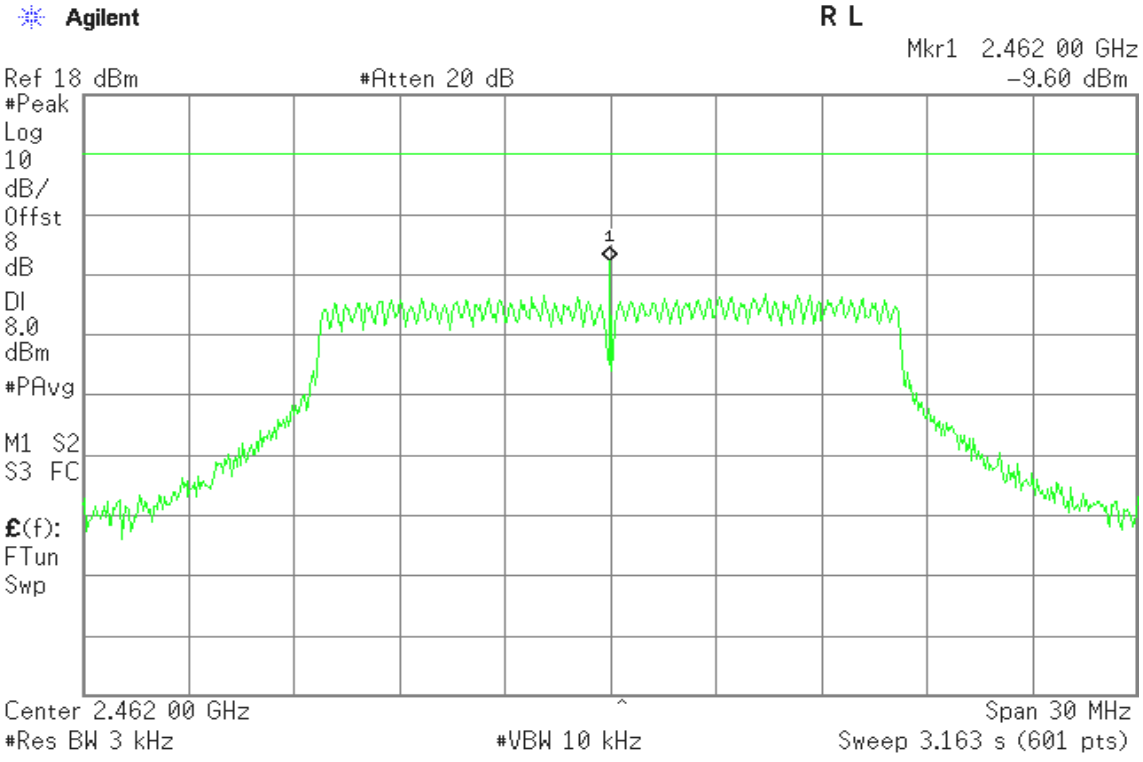
PPSD (CH Low)



PPSD (CH Mid)

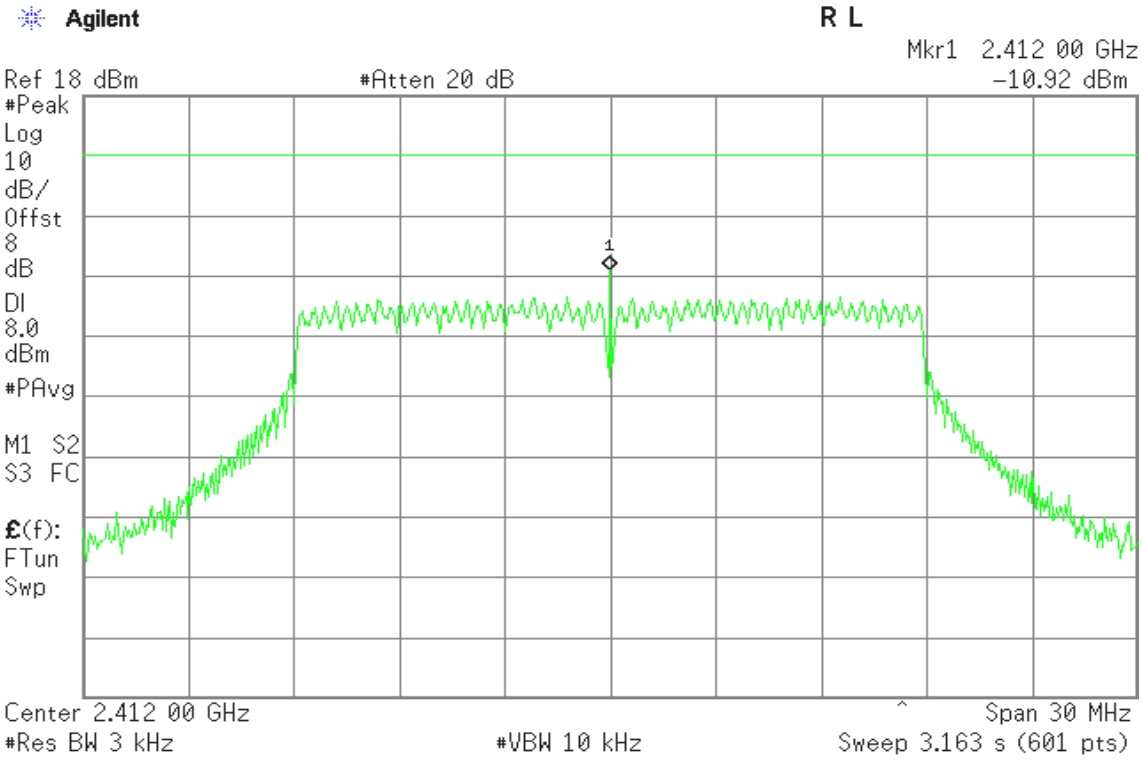


PPSD (CH High)

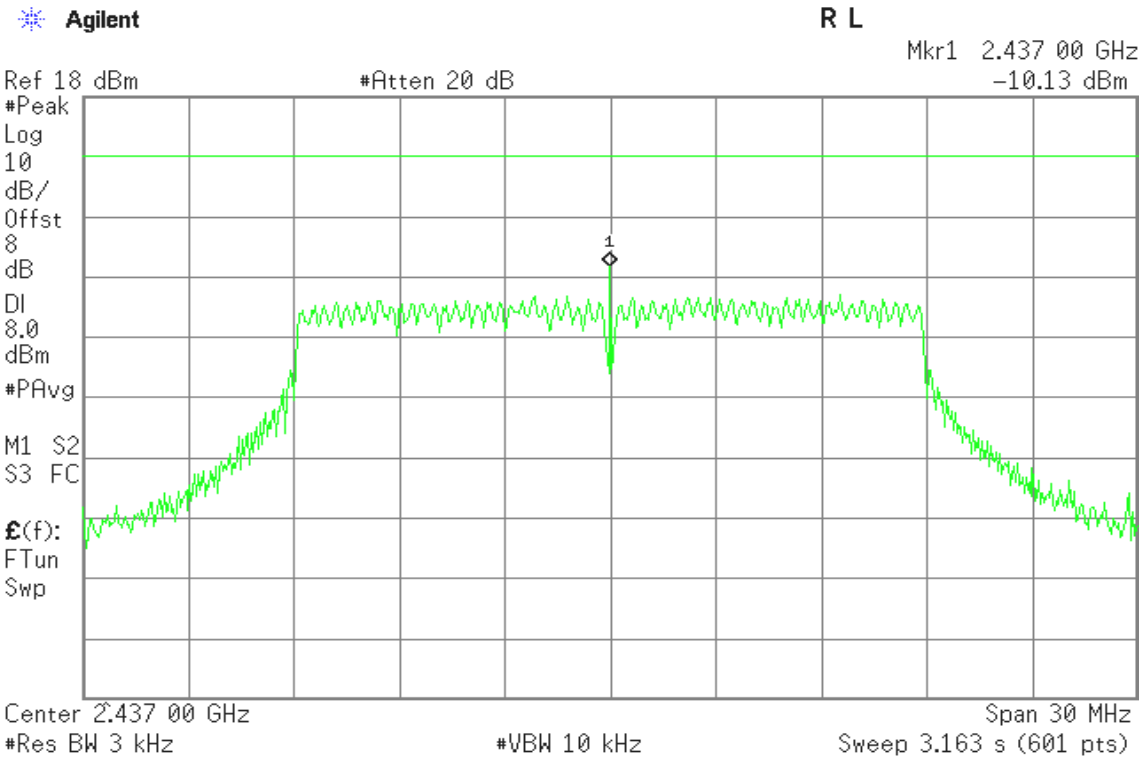


IEEE 802.11n HT20 mode

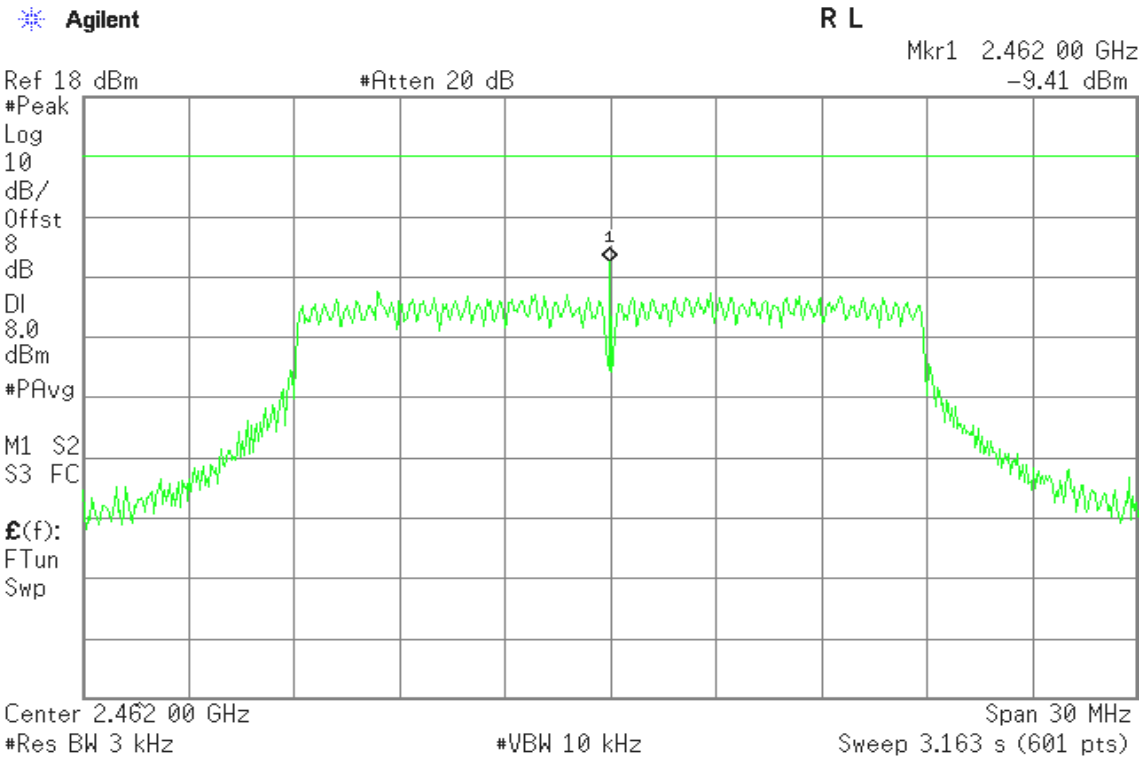
PPSD (CH Low)



PPSD (CH Mid)



PPSD (CH High)

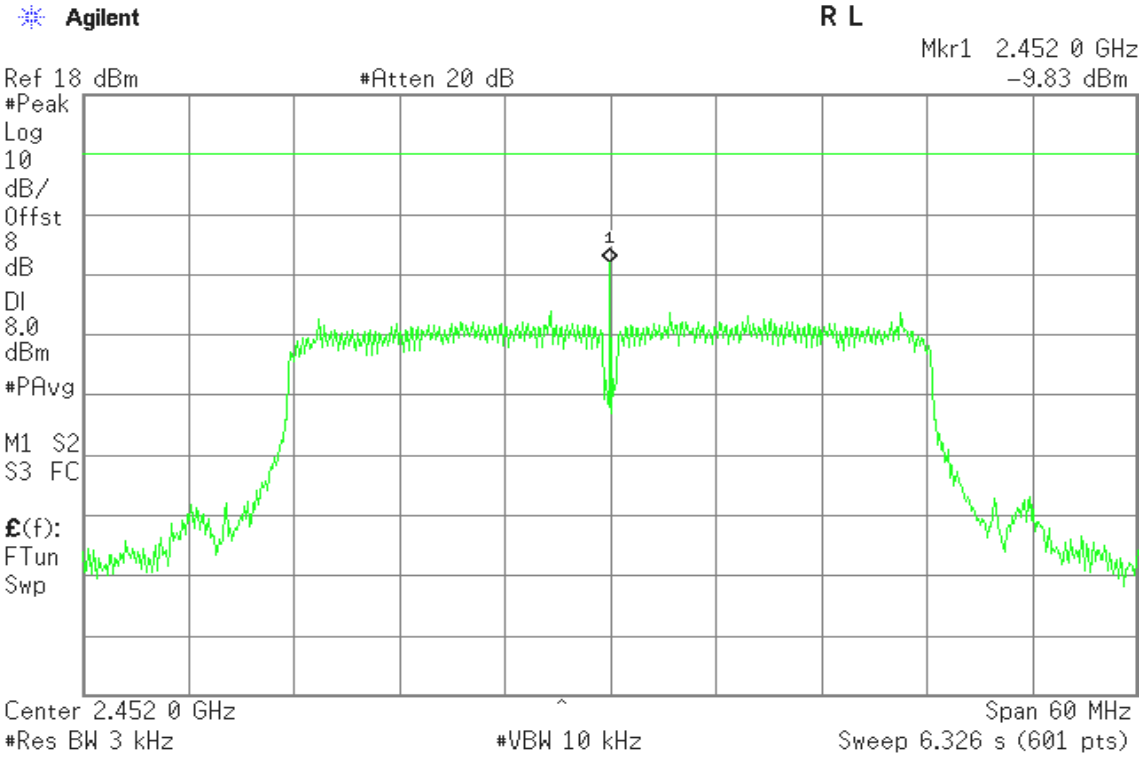


IEEE 802.11n HT40 mode

PPSD (CH Low)

PPSD (CH Mid)

PPSD (CH High)



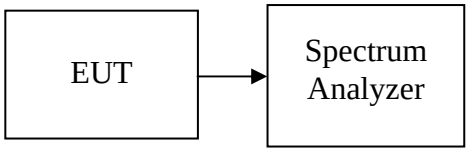
7.6 SPURIOUS EMISSIONS

7.6.1 Conducted 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



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

Measurements are made over the 30MHz to 26GHz range for IEEE 802.11b/g, 30MHz to 40GHz range for IEEE 802.11a with the transmitter set to the lowest, middle, and highest channels.

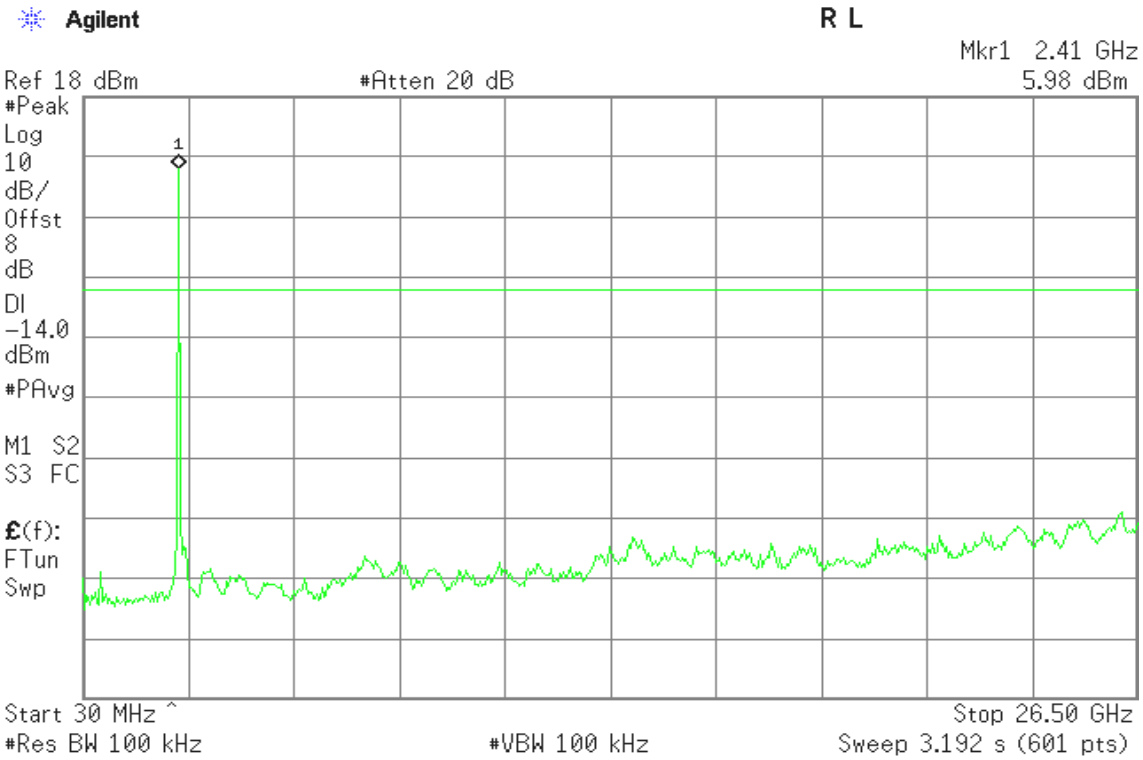
TEST RESULTS

No non-compliance noted

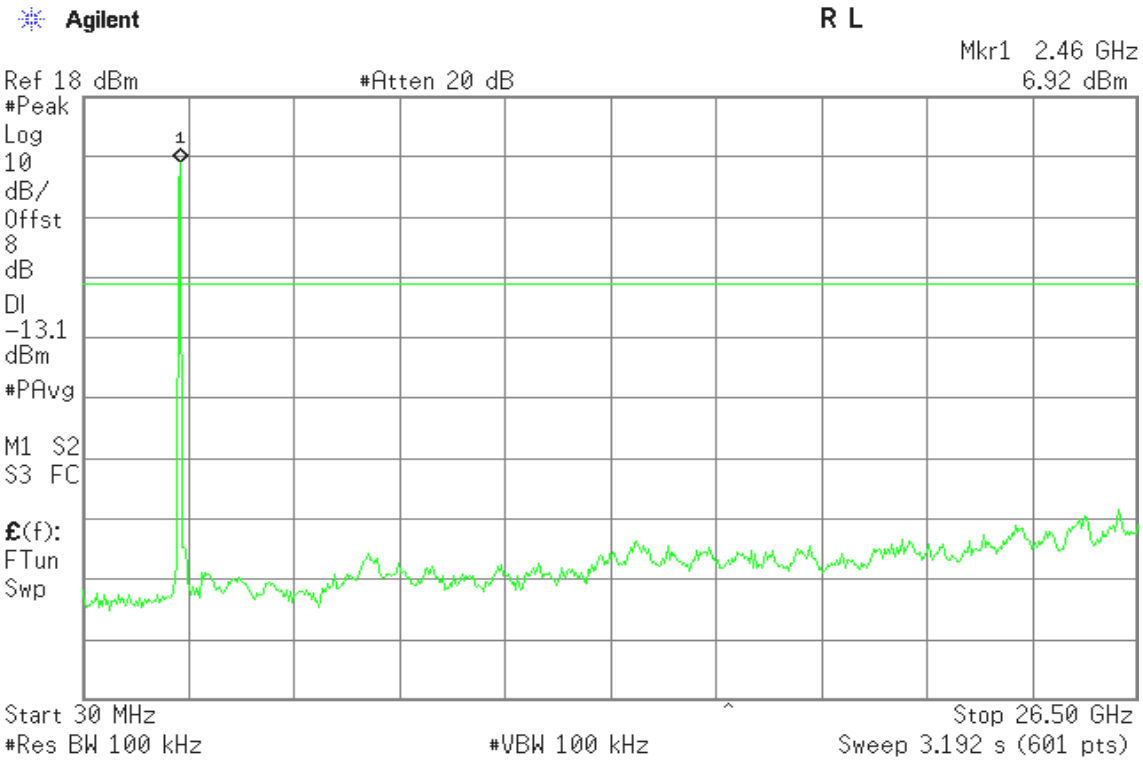
Test Plot

IEEE 802.11b mode

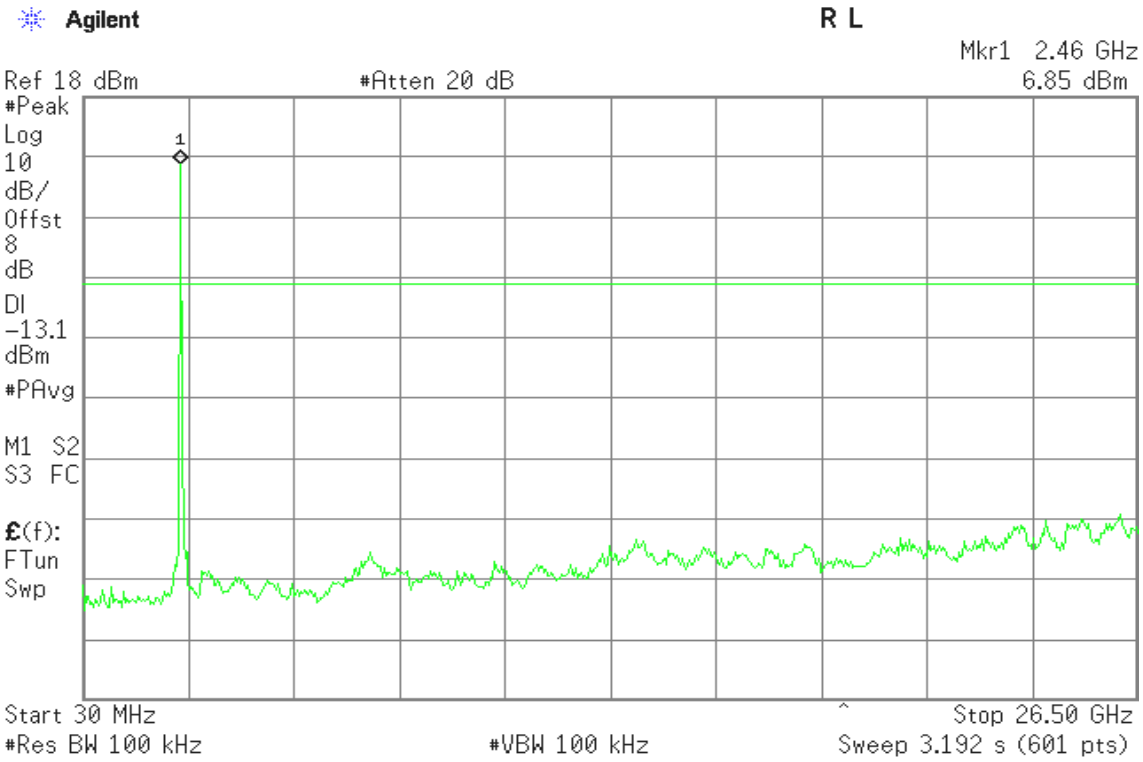
CH Low



CH Mid

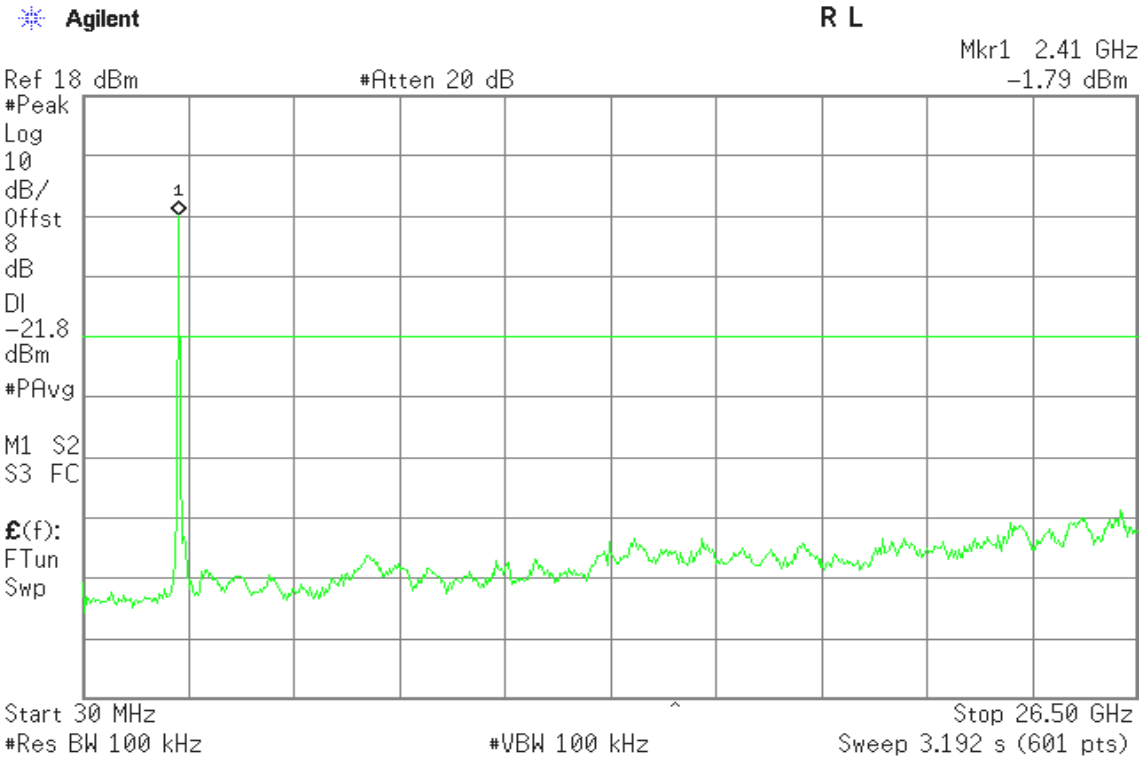


CH High

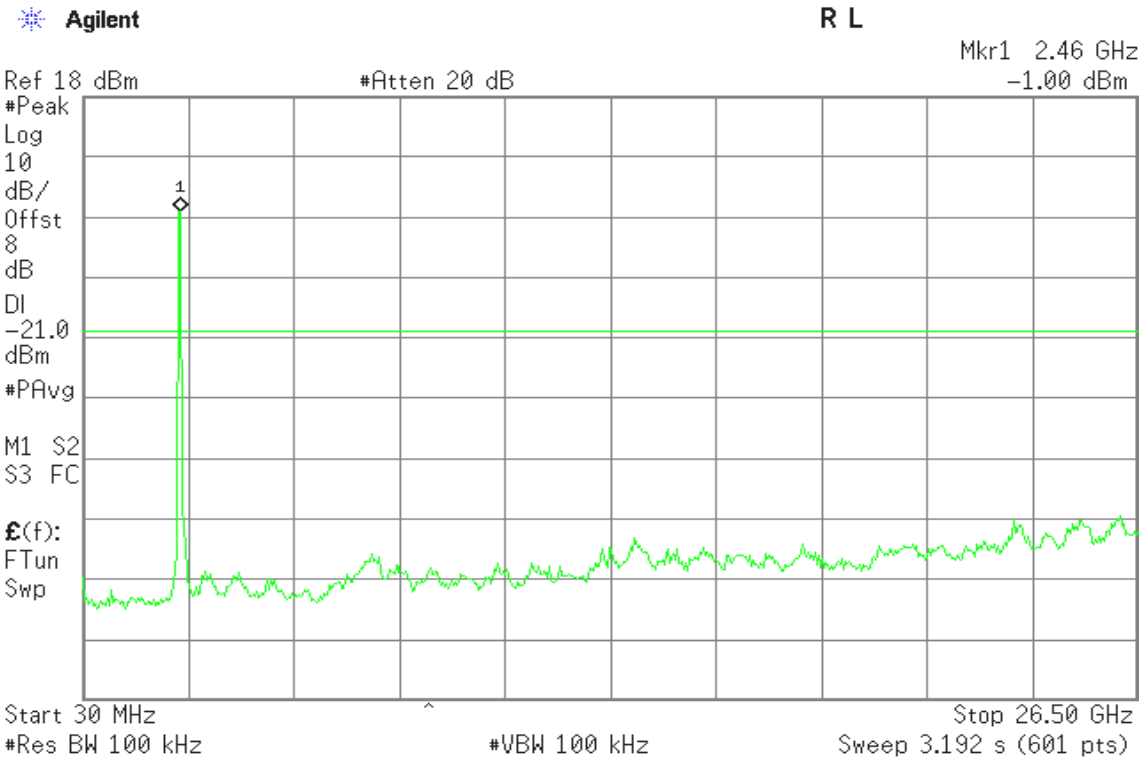


IEEE 802.11g mode

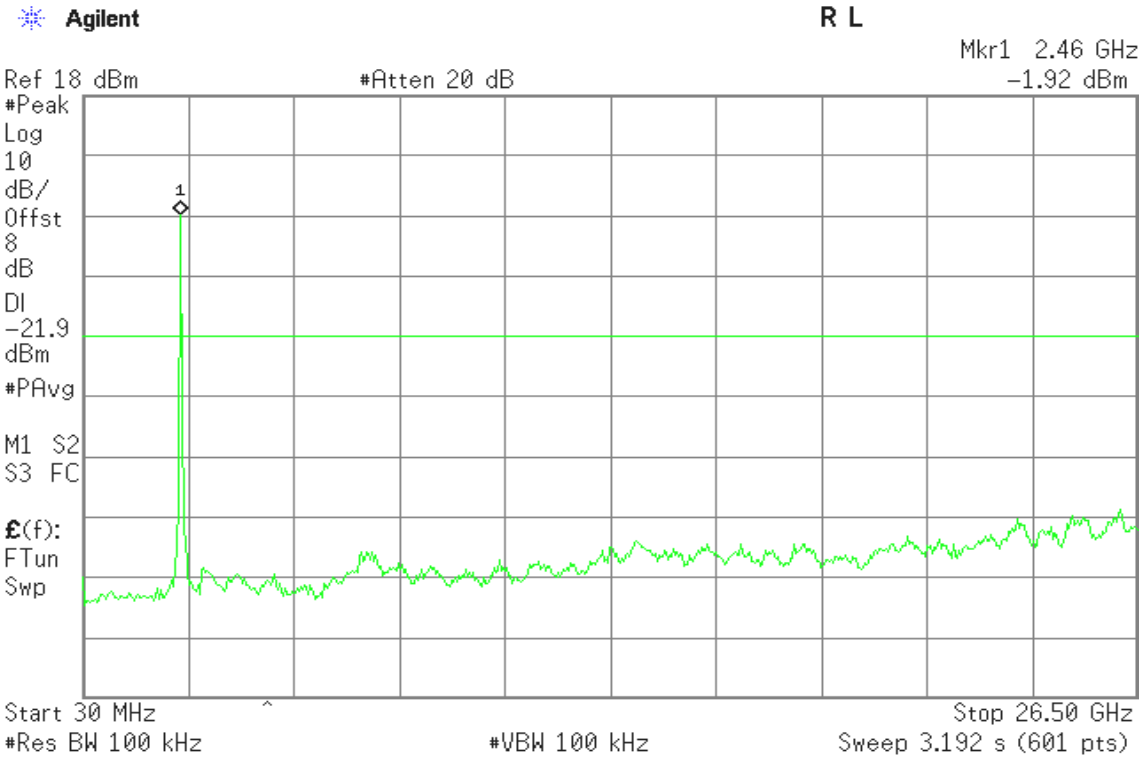
CH Low



CH Mid

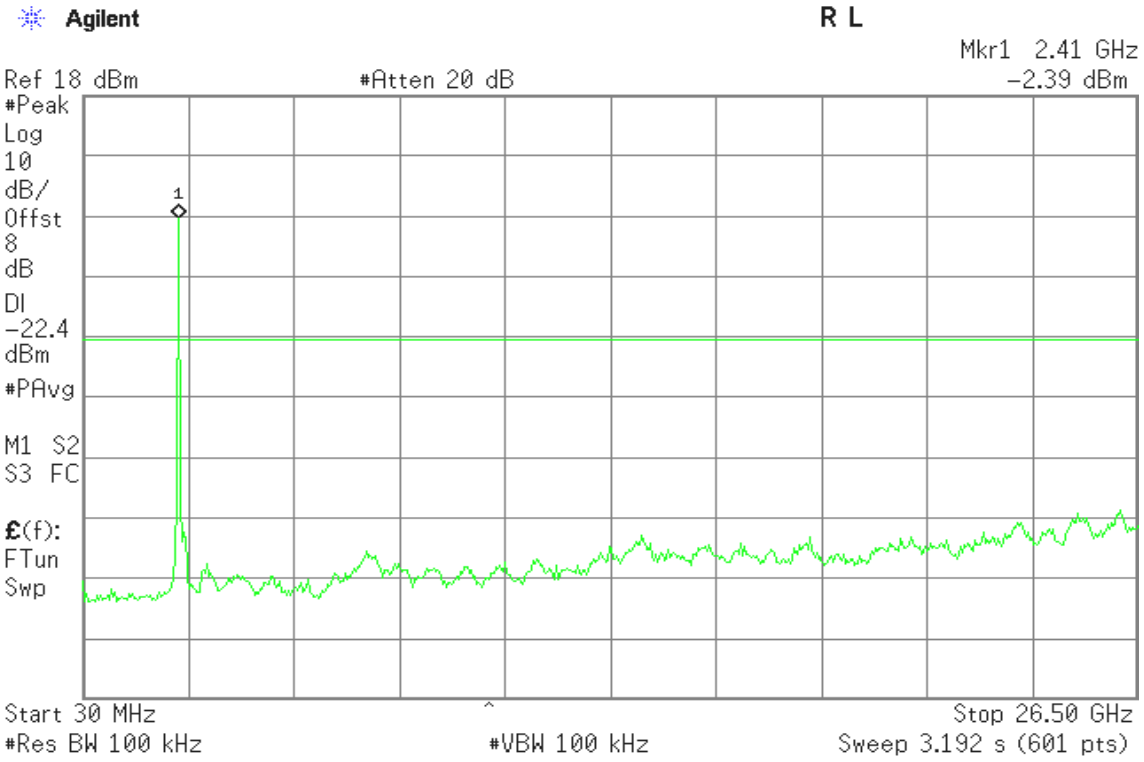


CH High

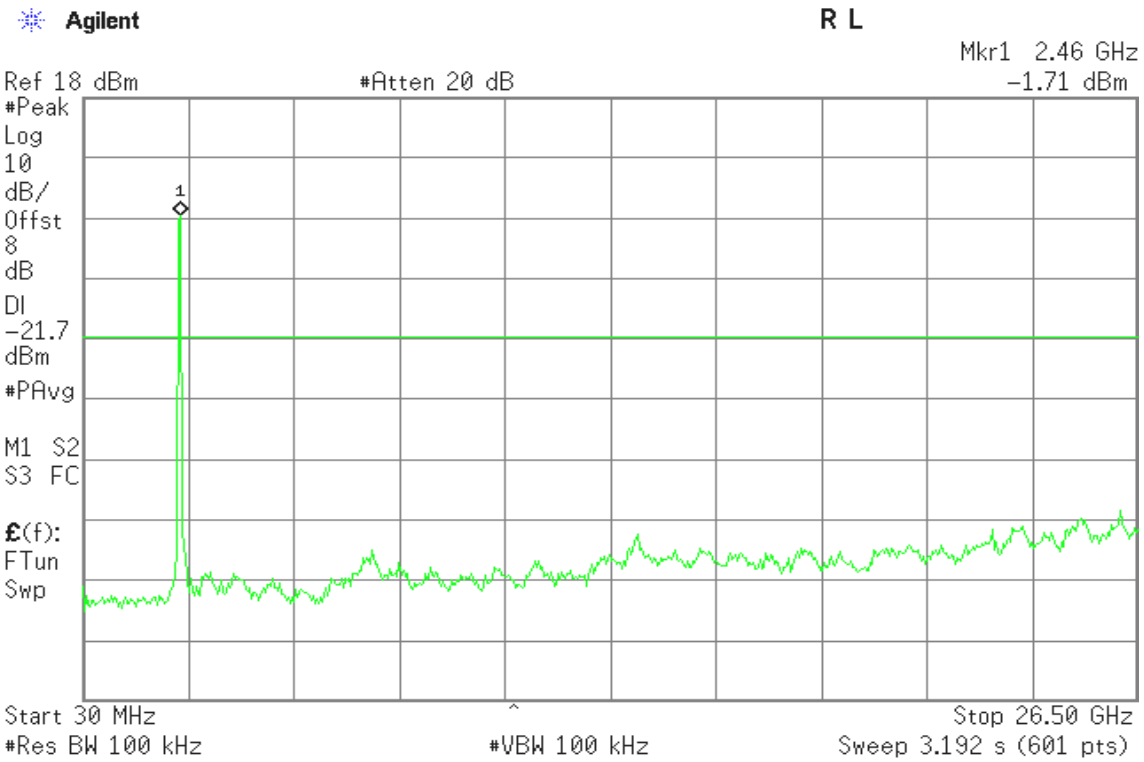


IEEE 802.11n HT20 mode

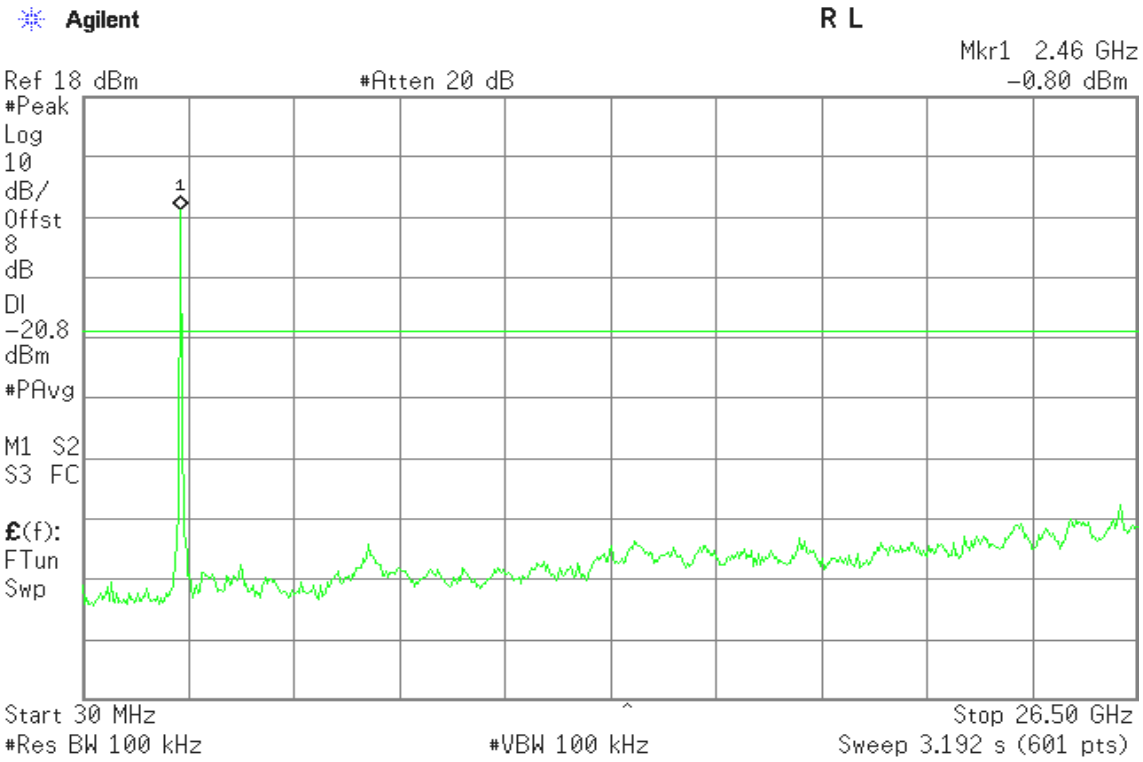
CH Low



CH Mid

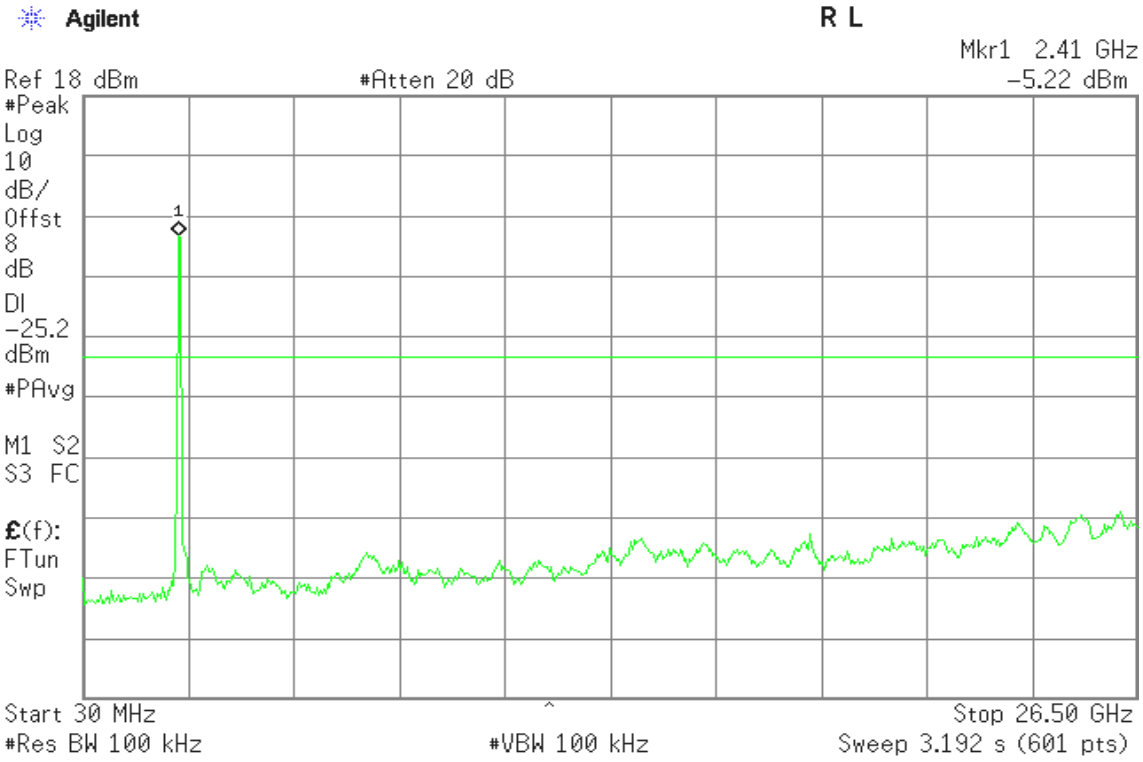


CH High

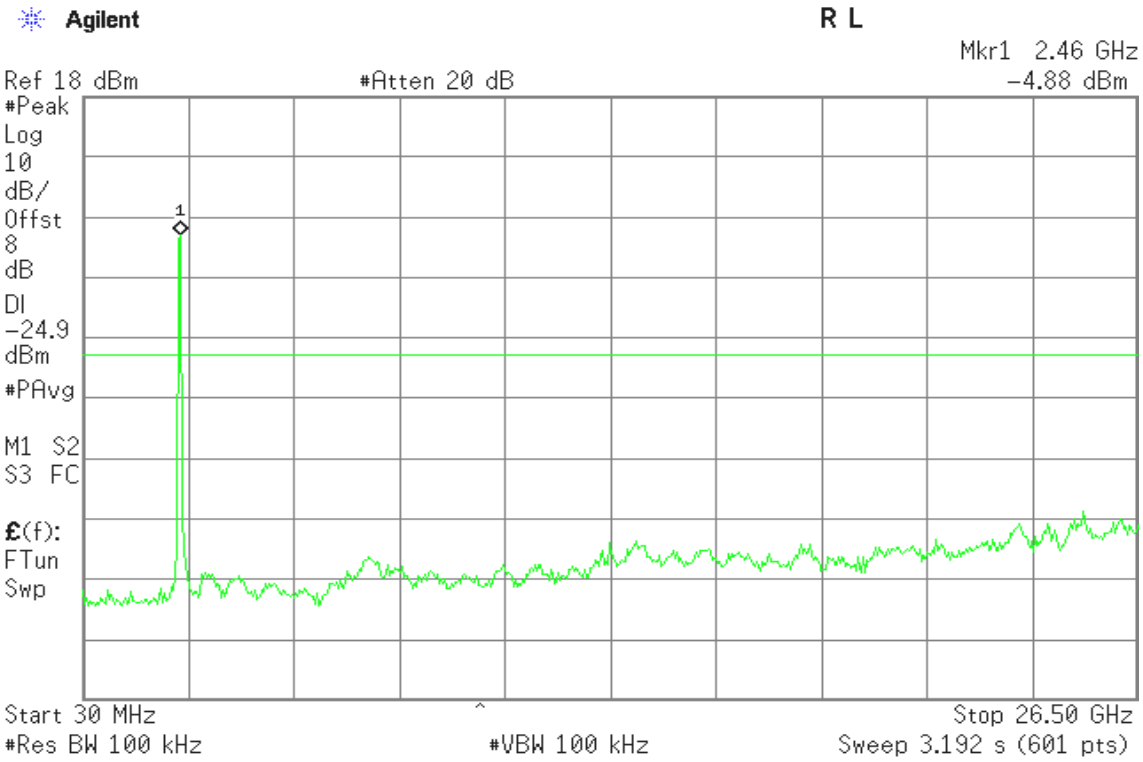


IEEE 802.11n HT40 mode

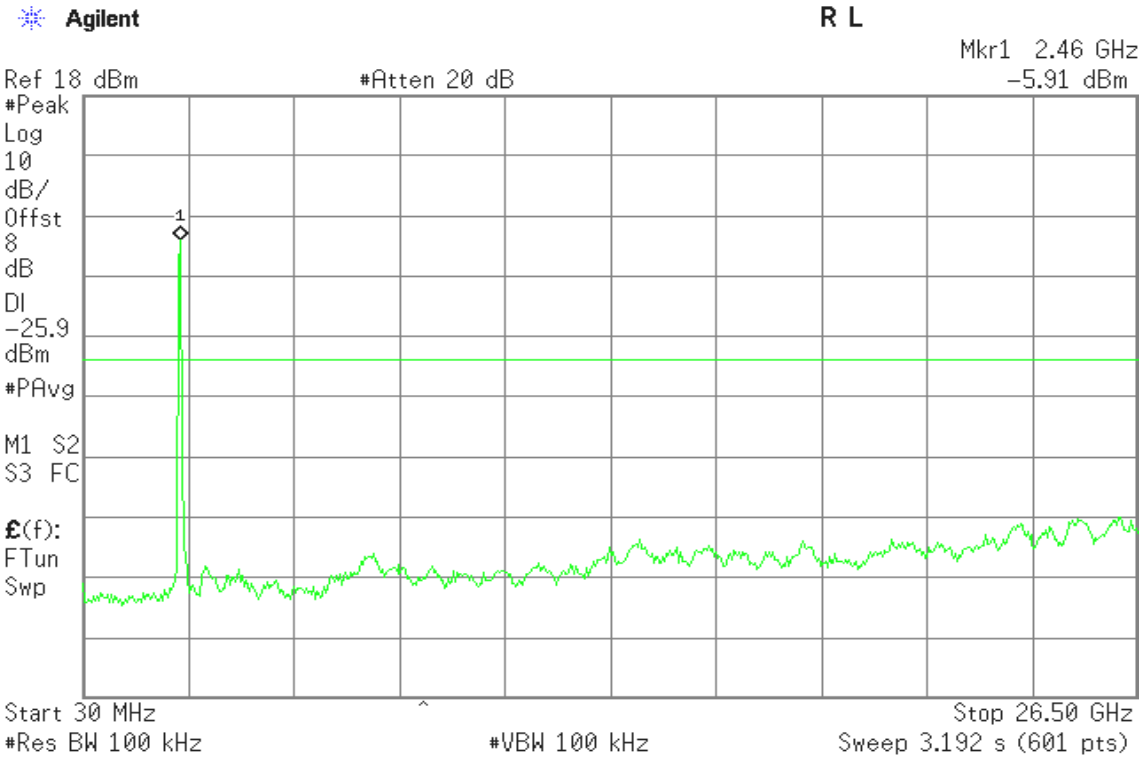
CH Low



CH Mid



CH High



7.6.2 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

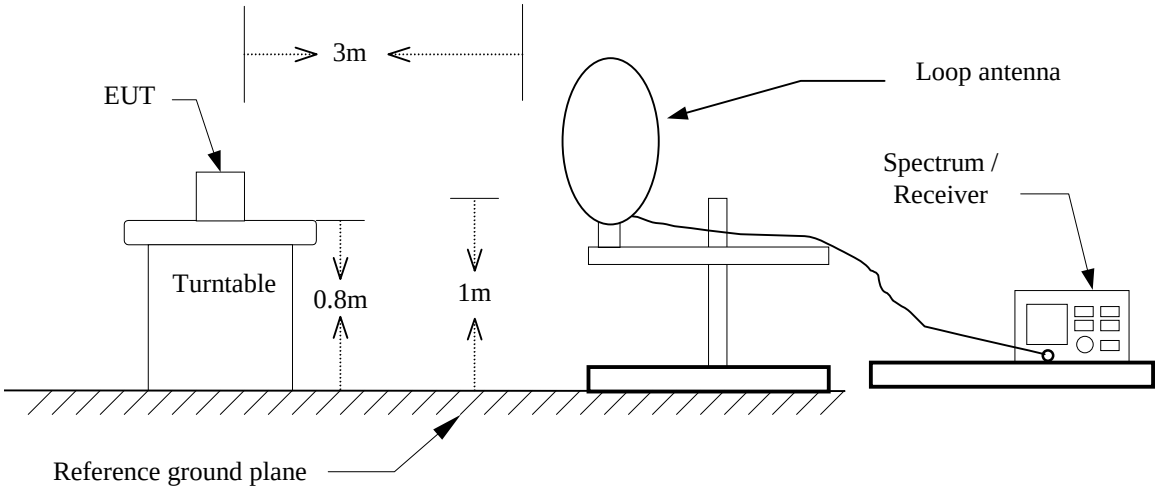
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

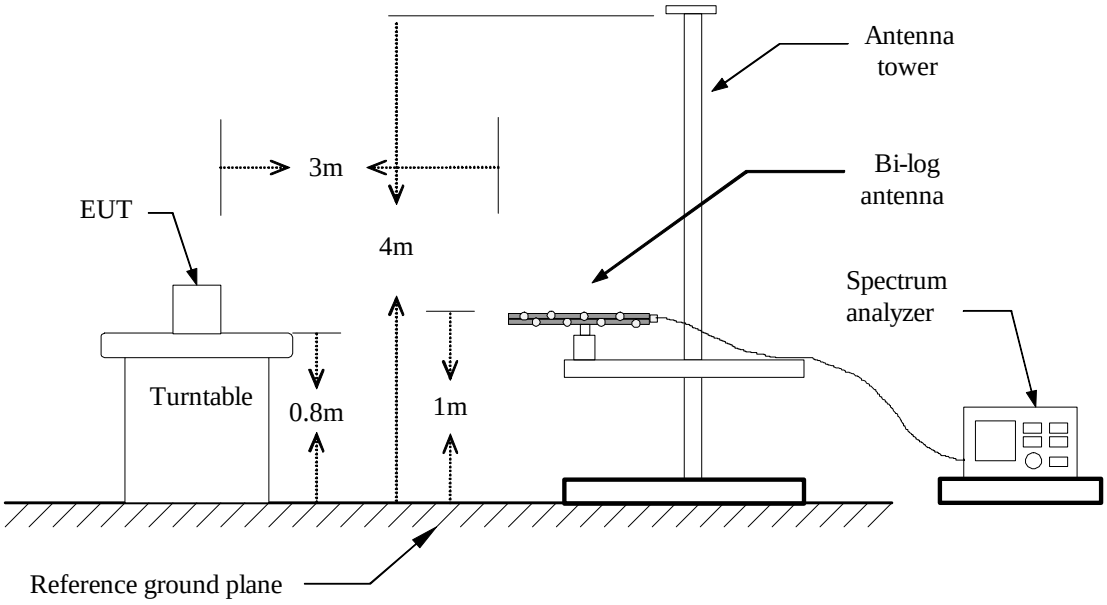
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
0.009 - 0.490	2400/F(kHz) +80	20LOG((2400/F(kHz))+80)
0.490 - 1.705	24000/F(kHz) +40	20LOG((24000/F(kHz))+40)
1.705 – 30.0	30	69.54
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

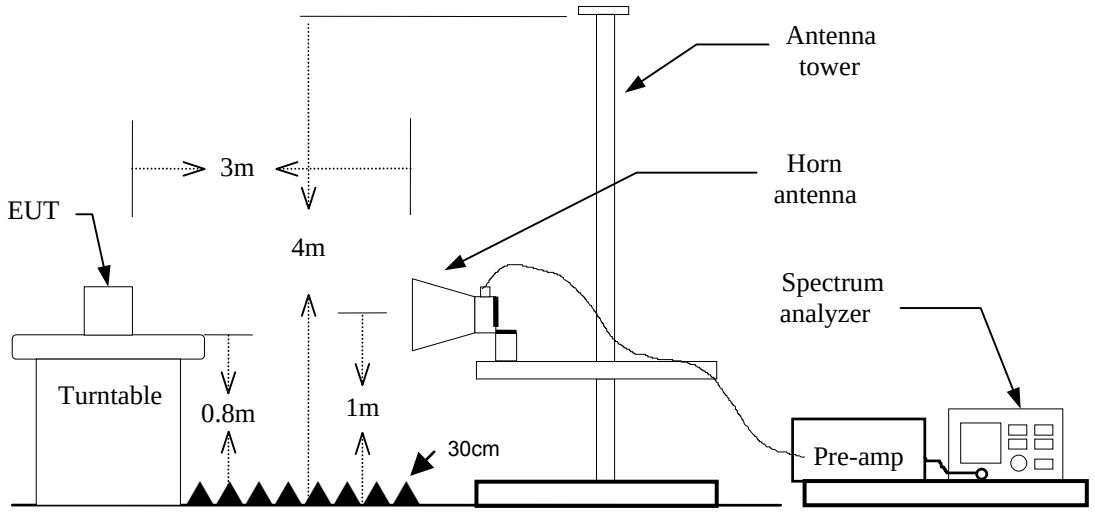
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m 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 30MHz

   RBW=10kHz / VBW=30kHz / Sweep=AUTO

   30 ~ 1000MHz:

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

   Above 1GHz:

   a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

   b) AVERAGE: RBW=1MHz / VBW=300Hz / Sweep=AUTO

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

DATA SAMPLE

Below 1 GHz

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol. (H/V)	Remark
x.xx	43.20	-20.71	22.49	40.00	-17.51	V	QP

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m) = Antenna factor – Amplifier gain + Cable loss
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
Q.P. = Quasi-Peak

Above 1 GHz

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
x.xx	45.25	6.91	52.16	74.00	-21.84	H	peak
x.xx	32.33	6.91	39.24	54.00	-14.76	H	AVG

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)

Below 1 GHz

Operation Mode:	Data Link	**Test Date:**	2013/11/22
Temperature:	26°C	**Tested by:**	Louis Shen
Humidity:	56% RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol. (H/V)	Remark
50.3700	43.25	-18.81	24.44	40.00	-15.56	V	QP
154.1600	39.57	-16.00	23.57	43.50	-19.93	V	QP
215.2700	36.74	-15.92	20.82	43.50	-22.68	V	QP
224.9700	38.01	-15.54	22.47	46.00	-23.53	V	QP
736.1600	29.03	-6.05	22.98	46.00	-23.02	V	QP
945.6800	28.77	-3.05	25.72	46.00	-20.28	V	QP
32.9099	30.26	-9.68	20.58	40.00	-19.42	H	QP
74.6200	39.58	-20.52	19.06	40.00	-20.94	H	QP
154.1600	38.15	-16.00	22.15	43.50	-21.35	H	QP
224.9700	36.81	-15.54	21.27	46.00	-24.73	H	QP
333.6100	34.41	-11.29	23.12	46.00	-22.88	H	QP
727.4299	29.46	-6.21	23.25	46.00	-22.75	H	QP

Remark:

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

Above 1 GHz

Operation Mode: TX / IEEE 802.11b mode / CH Low **Test Date:** 2013/11/19

Temperature: 26℃ **Tested by:** Louis Shen

Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1570.000	53.85	-4.93	48.92	74.00	-25.08	V	peak
1987.610	53.66	-1.50	52.16	74.00	-21.84	V	peak
1987.610	39.84	-1.50	38.34	54.00	-15.66	V	AVG
2505.550	55.67	-1.00	54.67	74.00	-19.33	V	peak
2505.550	41.00	-1.00	40.00	54.00	-14.00	V	AVG
3610.000	35.76	2.88	38.64	74.00	-35.36	V	peak
4825.000	39.95	2.68	42.63	74.00	-31.37	V	peak
6295.000	33.52	6.93	40.45	74.00	-33.55	V	peak
1398.000	54.02	-6.95	47.07	74.00	-26.93	H	peak
2092.000	53.81	-3.99	49.82	74.00	-24.18	H	peak
2780.000	53.02	-2.66	50.36	74.00	-23.64	H	peak
4825.000	36.54	5.88	42.42	74.00	-31.58	H	peak
5570.000	33.98	9.10	43.08	74.00	-30.92	H	peak
7200.000	34.35	10.49	44.84	74.00	-29.16	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11b mode / CH Mid **Test Date:** 2013/11/19

Temperature: 26℃ **Tested by:** Louis Shen

Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1738.000	56.48	-5.48	51.00	74.00	-23.00	V	peak
1954.000	52.72	-2.03	50.69	74.00	-23.31	V	peak
2676.000	53.54	-1.64	51.90	74.00	-22.10	V	peak
2676.000	41.83	-1.64	40.19	54.00	-13.81	V	AVG
3835.000	35.71	2.91	38.62	74.00	-35.38	V	peak
4875.000	41.04	3.81	44.85	74.00	-29.15	V	peak
7155.000	33.60	9.83	43.43	74.00	-30.57	V	peak
1716.000	56.13	-7.49	48.64	74.00	-25.36	H	peak
2150.000	53.89	-3.67	50.22	74.00	-23.78	H	peak
2868.000	52.75	-1.97	50.78	74.00	-23.22	H	peak
4345.000	34.55	7.33	41.88	74.00	-32.12	H	peak
5965.000	34.91	8.97	43.88	74.00	-30.12	H	peak
7560.000	34.88	10.71	45.59	74.00	-28.41	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11b mode / CH High **Test Date:** 2013/11/19

Temperature: 26℃ **Tested by:** Louis Shen

Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1624.000	53.74	-4.99	48.75	74.00	-25.25	V	peak
1976.000	53.44	-1.68	51.76	74.00	-22.24	V	peak
1976.000	39.94	-1.68	38.26	54.00	-15.74	V	AVG
2868.000	52.94	-1.12	51.82	74.00	-22.18	V	peak
2868.000	41.31	-1.12	40.19	54.00	-13.81	V	AVG
3600.000	36.28	2.93	39.21	74.00	-34.79	V	peak
4925.000	43.24	4.61	47.85	74.00	-26.15	V	peak
7560.000	34.22	11.76	45.98	74.00	-28.02	V	peak
1598.000	53.65	-4.80	48.85	74.00	-25.15	H	peak
1996.000	52.93	-1.36	51.57	74.00	-22.43	H	peak
1996.000	39.89	-1.36	38.53	54.00	-15.47	H	AVG
2632.000	53.91	-1.95	51.96	74.00	-22.04	H	peak
2632.000	41.06	-1.95	39.11	54.00	-14.89	H	AVG
4270.000	34.50	7.16	41.66	74.00	-32.34	H	peak
4925.000	40.02	7.26	47.28	74.00	-26.72	H	peak
6910.000	34.77	9.64	44.41	74.00	-29.59	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11g mode / CH Low **Test Date:** 2013/11/19
Temperature: 26℃ **Tested by:** Louis Shen
Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1576.000	54.20	-4.90	49.30	74.00	-24.70	V	peak
2022.000	53.21	-1.80	51.41	74.00	-22.59	V	peak
2022.000	39.86	-1.80	38.06	54.00	-15.94	V	AVG
2864.000	52.70	-1.18	51.52	74.00	-22.48	V	peak
2864.000	41.06	-1.18	39.88	54.00	-14.12	V	AVG
3725.000	35.35	2.78	38.13	74.00	-35.87	V	peak
5030.000	35.16	5.04	40.20	74.00	-33.80	V	peak
7590.000	33.11	11.87	44.98	74.00	-29.02	V	peak
1424.000	54.27	-7.40	46.87	74.00	-27.13	H	peak
2138.000	53.20	-3.70	49.50	74.00	-24.50	H	peak
2736.000	53.44	-3.05	50.39	74.00	-23.61	H	peak
4250.000	34.45	6.82	41.27	74.00	-32.73	H	peak
6055.000	33.68	8.75	42.43	74.00	-31.57	H	peak
7255.000	33.15	11.22	44.37	74.00	-29.63	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11g mode / CH Mid **Test Date:** 2013/11/19
Temperature: 26℃ **Tested by:** Louis Shen
Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1648.000	54.19	-5.20	48.99	74.00	-25.01	V	peak
1996.000	52.70	-1.36	51.34	74.00	-22.66	V	peak
1996.000	39.85	-1.36	38.49	54.00	-15.51	V	AVG
2918.000	52.38	-0.77	51.61	74.00	-22.39	V	peak
2918.000	41.06	-0.77	40.29	54.00	-13.71	V	AVG
3820.000	35.79	3.24	39.03	74.00	-34.97	V	peak
4875.000	38.73	3.81	42.54	74.00	-31.46	V	peak
7415.000	32.84	11.34	44.18	74.00	-29.82	V	peak
1398.000	53.44	-6.95	46.49	74.00	-27.51	H	peak
2126.000	54.18	-3.72	50.46	74.00	-23.54	H	peak
2990.000	52.77	-0.77	52.00	74.00	-22.00	H	peak
2990.000	41.30	-0.77	40.53	54.00	-13.47	H	AVG
4875.000	35.58	6.73	42.31	74.00	-31.69	H	peak
5900.000	33.75	9.22	42.97	74.00	-31.03	H	peak
7235.000	33.80	10.96	44.76	74.00	-29.24	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11g mode / CH High **Test Date:** 2013/11/19
Temperature: 26℃ **Tested by:** Louis Shen
Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1634.000	54.40	-5.08	49.32	74.00	-24.68	V	peak
1966.000	53.56	-1.84	51.72	74.00	-22.28	V	peak
1966.000	39.79	-1.84	37.95	54.00	-16.05	V	AVG
2898.000	52.66	-0.69	51.97	74.00	-22.03	V	peak
2898.000	41.01	-0.69	40.32	54.00	-13.68	V	AVG
3660.000	36.50	2.65	39.15	74.00	-34.85	V	peak
4925.000	39.25	4.61	43.86	74.00	-30.14	V	peak
7555.000	34.43	11.74	46.17	74.00	-27.83	V	peak
1368.000	54.94	-7.72	47.22	74.00	-26.78	H	peak
2188.000	53.89	-3.59	50.30	74.00	-23.70	H	peak
2902.000	52.92	-1.71	51.21	74.00	-22.79	H	peak
2902.000	41.02	-1.71	39.31	54.00	-14.69	H	AVG
4285.000	34.74	7.41	42.15	74.00	-31.85	H	peak
4925.000	38.63	7.26	45.89	74.00	-28.11	H	peak
7290.000	33.15	11.69	44.84	74.00	-29.16	H	peak

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.*
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).*

Operation Mode:	TX / IEEE 802.11n HT20 mode / CH Low	**Test Date:**	2013/11/19
Temperature:	26℃	**Tested by:**	Louis Shen
Humidity:	56%RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1596.000	54.90	-4.81	50.09	74.00	-23.91	V	peak
2014.000	53.78	-1.62	52.16	74.00	-21.84	V	peak
2014.000	39.86	-1.62	38.24	54.00	-15.76	V	AVG
2704.000	53.91	-1.50	52.41	74.00	-21.59	V	peak
2704.000	41.04	-1.50	39.54	54.00	-14.46	V	AVG
3945.000	35.96	2.37	38.33	74.00	-35.67	V	peak
5370.000	33.80	6.04	39.84	74.00	-34.16	V	peak
7575.000	33.68	11.82	45.50	74.00	-28.50	V	peak
1396.000	54.19	-7.00	47.19	74.00	-26.81	H	peak
2184.000	53.26	-3.60	49.66	74.00	-24.34	H	peak
2846.000	53.03	-2.13	50.90	74.00	-23.10	H	peak
4300.000	34.70	7.66	42.36	74.00	-31.64	H	peak
5475.000	33.82	8.74	42.56	74.00	-31.44	H	peak
7275.000	33.24	11.49	44.73	74.00	-29.27	H	peak

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.*
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).*

Operation Mode:	TX / IEEE 802.11n HT20 mode / CH Mid	**Test Date:**	2013/11/19
Temperature:	26℃	**Tested by:**	Louis Shen
Humidity:	56%RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1618.000	53.77	-4.94	48.83	74.00	-25.17	V	peak
2218.000	54.58	-1.37	53.21	74.00	-20.79	V	peak
2218.000	39.87	-1.37	38.50	54.00	-15.50	V	AVG
2708.000	53.47	-1.52	51.95	74.00	-22.05	V	peak
2708.000	41.06	-1.52	39.54	54.00	-14.46	V	AVG
3590.000	35.20	2.86	38.06	74.00	-35.94	V	peak
4875.000	35.92	3.81	39.73	74.00	-34.27	V	peak
7615.000	33.78	11.74	45.52	74.00	-28.48	V	peak
1438.000	54.90	-7.70	47.20	74.00	-26.80	H	peak
2156.000	53.97	-3.66	50.31	74.00	-23.69	H	peak
2866.000	53.78	-1.98	51.80	74.00	-22.20	H	peak
2866.000	41.07	-1.98	39.09	54.00	-14.91	H	AVG
4285.000	34.31	7.41	41.72	74.00	-32.28	H	peak
5595.000	33.86	9.18	43.04	74.00	-30.96	H	peak
7170.000	34.19	10.45	44.64	74.00	-29.36	H	peak

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.*
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).*

Operation Mode:	TX / IEEE 802.11n HT20 mode / CH High	**Test Date:**	2013/11/19
Temperature:	26℃	**Tested by:**	Louis Shen
Humidity:	56%RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1514.000	54.92	-5.19	49.73	74.00	-24.27	V	peak
1986.000	53.59	-1.52	52.07	74.00	-21.93	V	peak
1986.000	39.87	-1.52	38.35	54.00	-15.65	V	AVG
2920.000	53.54	-0.79	52.75	74.00	-21.25	V	peak
2920.000	41.05	-0.79	40.26	54.00	-13.74	V	AVG
3800.000	34.62	3.69	38.31	74.00	-35.69	V	peak
4925.000	36.70	4.61	41.31	74.00	-32.69	V	peak
7520.000	32.85	11.61	44.46	74.00	-29.54	V	peak
1422.000	54.27	-7.36	46.91	74.00	-27.09	H	peak
2170.000	53.82	-3.63	50.19	74.00	-23.81	H	peak
2746.000	54.06	-2.96	51.10	74.00	-22.90	H	peak
2746.000	41.02	-2.96	38.06	54.00	-15.94	H	AVG
4305.000	34.95	7.62	42.57	74.00	-31.43	H	peak
4920.000	35.10	7.24	42.34	74.00	-31.66	H	peak
7290.000	32.39	11.69	44.08	74.00	-29.92	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11n HT40 mode / CH Low **Test Date:** 2013/11/19

Temperature: 26℃ **Tested by:** Louis Shen

Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1544.000	54.10	-5.05	49.05	74.00	-24.95	V	peak
2034.000	54.67	-2.07	52.60	74.00	-21.40	V	peak
2034.000	39.85	-2.07	37.78	54.00	-16.22	V	AVG
2860.000	53.18	-1.24	51.94	74.00	-22.06	V	peak
2860.000	41.00	-1.24	39.76	54.00	-14.24	V	AVG
3605.000	35.78	2.91	38.69	74.00	-35.31	V	peak
5465.000	33.57	6.29	39.86	74.00	-34.14	V	peak
7585.000	33.07	11.85	44.92	74.00	-29.08	V	peak
1404.000	53.41	-6.98	46.43	74.00	-27.57	H	peak
2128.000	53.68	-3.72	49.96	74.00	-24.04	H	peak
2520.000	54.50	-3.72	50.78	74.00	-23.22	H	peak
4305.000	34.10	7.62	41.72	74.00	-32.28	H	peak
5470.000	33.74	8.72	42.46	74.00	-31.54	H	peak
7280.000	33.31	11.55	44.86	74.00	-29.14	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11n HT40 mode / CH Mid **Test Date:** 2013/11/19

Temperature: 26℃ **Tested by:** Louis Shen

Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1530.000	53.91	-5.12	48.79	74.00	-25.21	V	peak
2006.000	53.29	-1.44	51.85	74.00	-22.15	V	peak
2006.000	39.90	-1.44	38.46	54.00	-15.54	V	AVG
2694.000	53.74	-1.51	52.23	74.00	-21.77	V	peak
2694.000	41.02	-1.51	39.51	54.00	-14.49	V	AVG
3995.000	34.68	3.39	38.07	74.00	-35.93	V	peak
5455.000	33.98	6.30	40.28	74.00	-33.72	V	peak
7645.000	34.35	11.39	45.74	74.00	-28.26	V	peak
1402.000	53.83	-6.94	46.89	74.00	-27.11	H	peak
2166.000	54.08	-3.63	50.45	74.00	-23.55	H	peak
2762.000	53.44	-2.82	50.62	74.00	-23.38	H	peak
4385.000	34.36	7.03	41.39	74.00	-32.61	H	peak
5580.000	33.85	9.13	42.98	74.00	-31.02	H	peak
7290.000	33.87	11.69	45.56	74.00	-28.44	H	peak

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.*
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).*

Operation Mode: TX / IEEE 802.11n HT40 mode / CH High **Test Date:** 2013/11/19

Temperature: 26℃ **Tested by:** Louis Shen

Humidity: 56%RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1398.000	54.00	-6.95	47.05	74.00	-26.95	V	peak
2126.000	53.56	-3.72	49.84	74.00	-24.16	V	peak
2740.000	54.33	-3.01	51.32	74.00	-22.68	V	peak
2740.000	41.06	-3.01	38.05	54.00	-15.95	V	AVG
3770.000	35.34	3.32	38.66	74.00	-35.34	V	peak
5710.000	34.50	5.86	40.36	74.00	-33.64	V	peak
7525.000	33.59	11.63	45.22	74.00	-28.78	V	peak
1406.000	54.52	-7.03	47.49	74.00	-26.51	H	peak
2120.000	53.97	-3.74	50.23	74.00	-23.77	H	peak
2914.000	53.47	-1.58	51.89	74.00	-22.11	H	peak
2914.000	41.08	-1.58	39.50	54.00	-14.50	H	AVG
4310.000	34.42	7.59	42.01	74.00	-31.99	H	peak
6015.000	33.59	8.81	42.40	74.00	-31.60	H	peak
7405.000	34.06	11.29	45.35	74.00	-28.65	H	peak

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.*
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).*

7.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 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 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

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

TEST RESULTS

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

Test Data

Operation Mode:	Data Link	**Test Date:**	2013/11/12
Temperature:	25℃	**Tested by:**	Tony Tsai
Humidity:	57% RH		

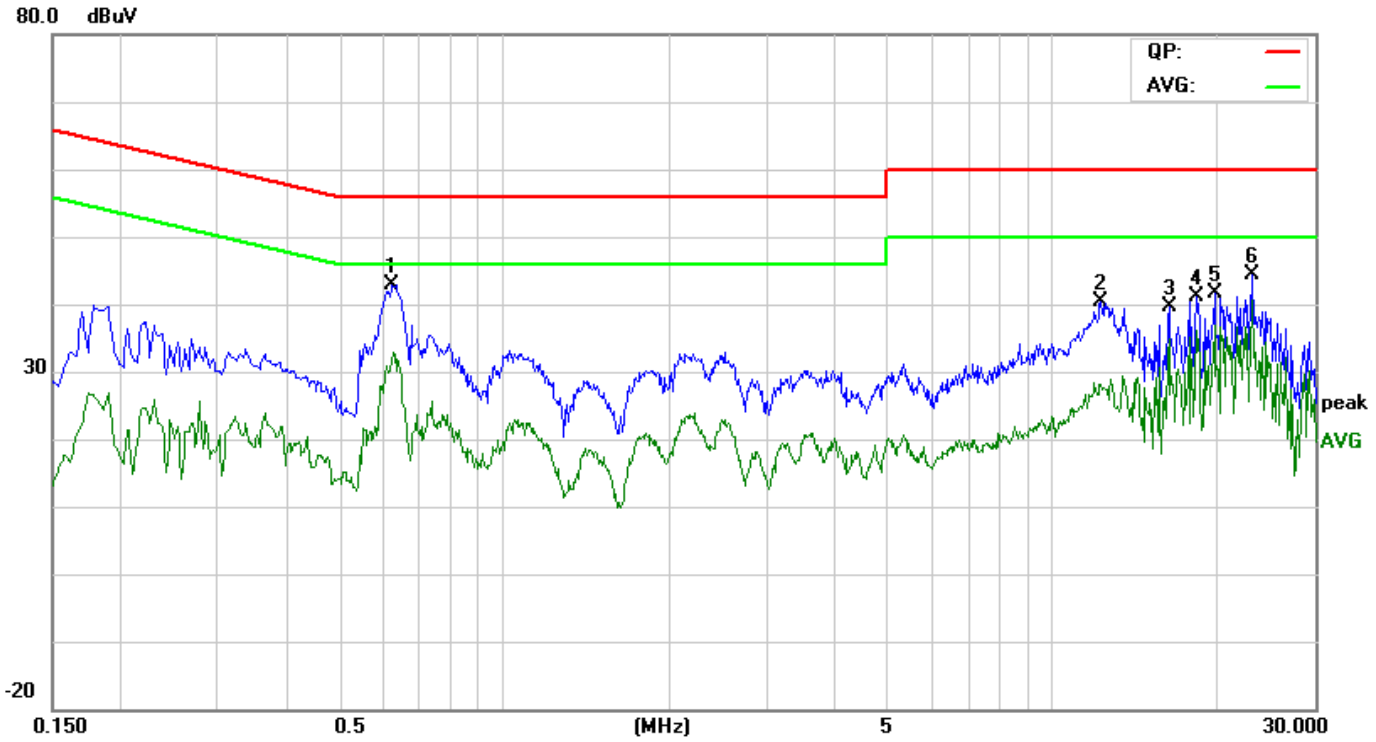
Freq. (MHz)	QP Reading	AV Reading	Corr. factor	QP Result	AV Result	QP Limit	AV Limit	QP Margin	AV Margin	Note
0.6260	33.23	22.00	9.64	42.87	31.64	56.00	46.00	-13.13	-14.36	L1
12.1980	30.27	18.05	9.98	40.25	28.03	60.00	50.00	-19.75	-21.97	L1
16.2300	29.65	24.87	10.02	39.67	34.89	60.00	50.00	-20.33	-15.11	L1
18.2460	31.01	26.20	10.03	41.04	36.23	60.00	50.00	-18.96	-13.77	L1
19.7099	31.56	26.89	10.04	41.60	36.93	60.00	50.00	-18.40	-13.07	L1
23.1299	34.38	30.49	10.08	44.46	40.57	60.00	50.00	-15.54	-9.43	L1
0.6300	30.17	17.24	9.66	39.83	26.90	56.00	46.00	-16.17	-19.10	L2
16.2300	28.59	23.53	10.13	38.72	33.66	60.00	50.00	-21.28	-16.34	L2
18.2460	29.53	25.32	10.16	39.69	35.48	60.00	50.00	-20.31	-14.52	L2
19.7099	30.30	25.86	10.19	40.49	36.05	60.00	50.00	-19.51	-13.95	L2
21.6660	30.17	26.14	10.22	40.39	36.36	60.00	50.00	-19.61	-13.64	L2
23.1299	32.69	29.61	10.26	42.95	39.87	60.00	50.00	-17.05	-10.13	L2

Remark:

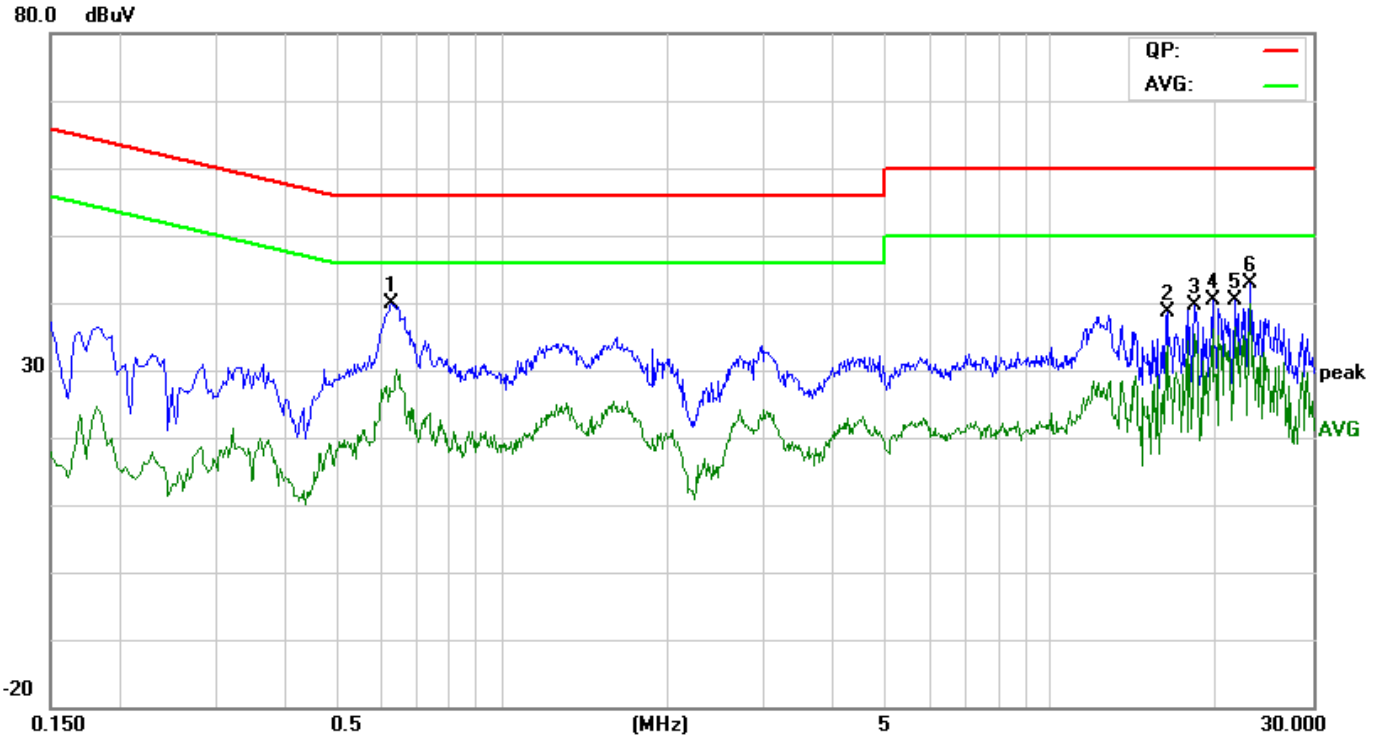
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between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

Test Plots

Conducted emissions (Line 1)

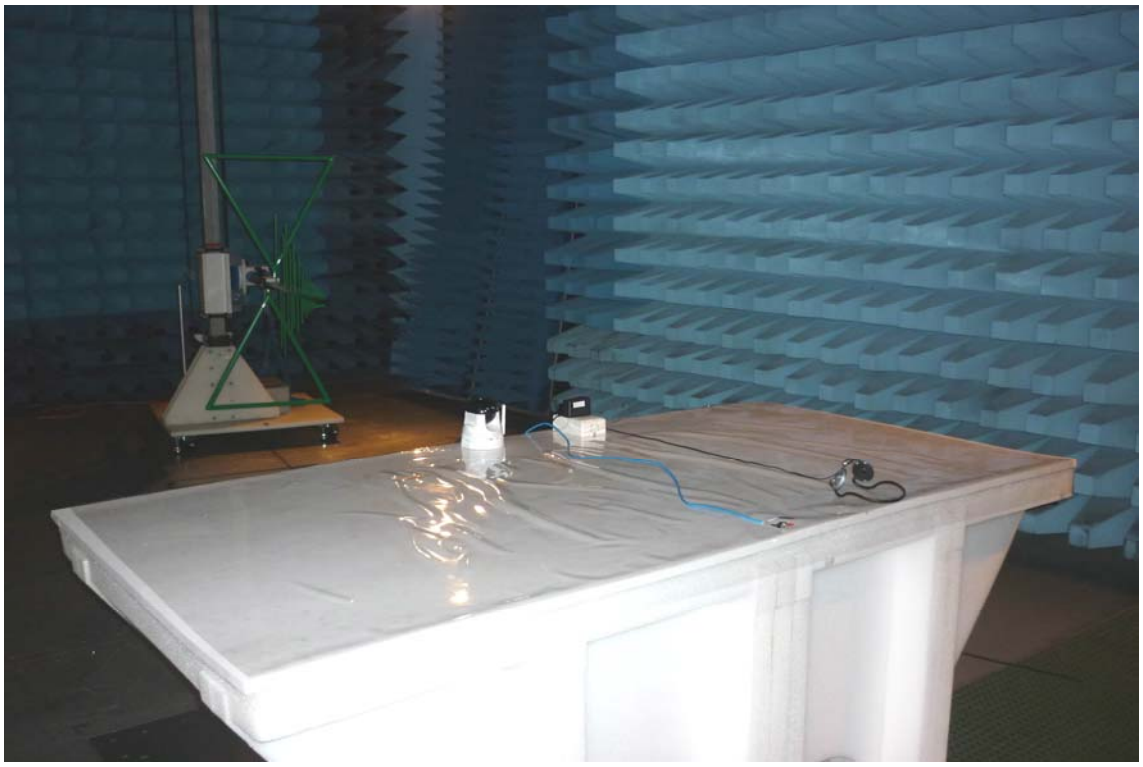


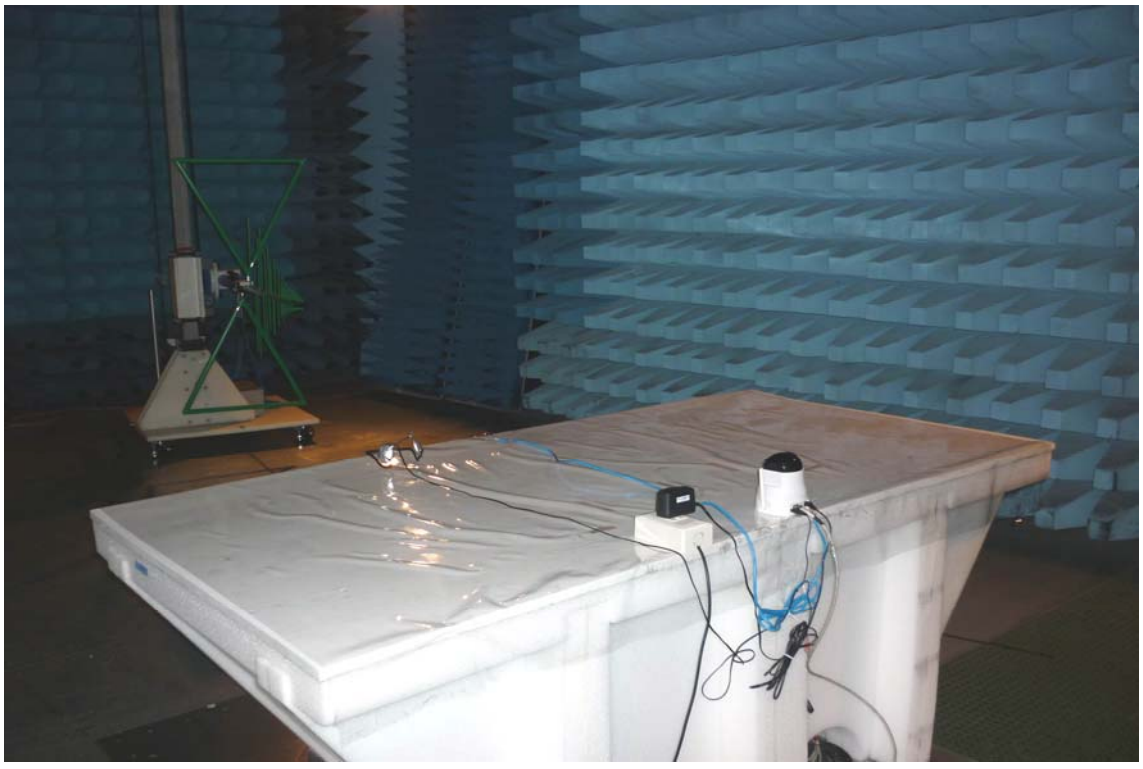
Conducted emissions (Line 2)



8 APPENDIX I
PHOTOGRAPHS OF TEST SETUP

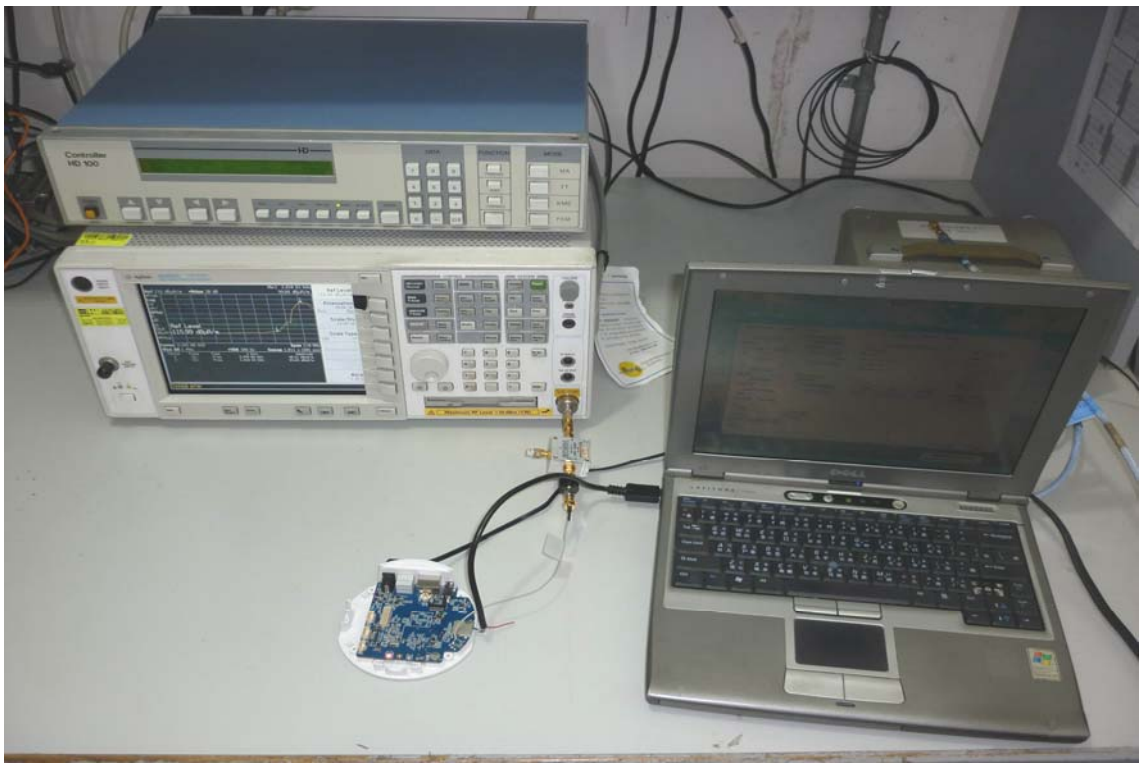
Radiated Emissions Setup Photos
Below 1GHz





Above 1GHz

Conducted Emissions Setup Photo



Powerline Conducted Emissions Setup Photos

9 APPENDIX II: PHOTOGRAPHS OF EUT

Refer to T131104J01 Photographs.