



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**IPC**

**Model: AR-V5403FLAT-LTE**

**Trade Name: Acrosser**

*Issued to*

**Acrosser Technology Co., LTD.  
10F., No. 12, Lane 609, Sec. 5, Chongsin Rd., Sanchong Dist.,  
New Taipei City 241, Taiwan, R.O.C.**

*Issued by*

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**Issued Date: September 29, 2012**



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**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 29, 2012	Initial Issue	ALL	Eunice Shen



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## 1. TEST RESULT CERTIFICATION

**Applicant:** Acrosser Technology Co., LTD.  
10F., No. 12, Lane 609, Sec. 5, Chongsin Rd., Sanchong Dist.,  
New Taipei City 241, Taiwan, R.O.C.

**Equipment Under Test:** IPC

**Trade Name:** Acrosser

**Model:** AR-V5403FLAT-LTE

**Date of Test:** September 22 ~ 27, 2012

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 C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

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

*Approved by:*

*Reviewed by:*

Miller Lee  
Section Manager  
Compliance Certification Services Inc.

Gina Lo  
Section Manager  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product</b>	IPC
<b>Trade Name</b>	Acrosser
<b>Model Number</b>	AR-V5403FLAT-LTE
<b>Model Discrepancy</b>	N/A
<b>Received Date</b>	September 20, 2012
<b>Power Rating</b>	Powered by DC 30V
<b>Frequency Range</b>	2412 ~ 2462 MHz
<b>Transmit Power</b>	IEEE 802.11b mode: 17.91 dBm IEEE 802.11g mode: 17.60 dBm IEEE 802.11n HT 20 MHz mode: 17.57 dBm IEEE 802.11n HT 40 MHz mode: 16.88 dBm
<b>Modulation Technique</b>	IEEE 802.11b mode: DSSS (1, 2, 5.5 and 11 Mbps) IEEE 802.11g mode: OFDM (6, 9, 12, 18, 24, 36, 48 and 54 Mbps) IEEE 802.11n HT 20 MHz mode: OFDM (6.5, 13, 19.5, 26, 39, 52, 58.5, 65.0Mbps) IEEE 802.11n HT 40 MHz mode: OFDM (13.5, 27, 40.5, 54, 81, 108, 121.5, 135Mbps)
<b>Number of Channels</b>	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
<b>Antenna Specification</b>	Monopole Antenna / Gain: 5dBi

**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: **ZJD-ARV5403FLLTE** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 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
<sup>1</sup> 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	( <sup>2</sup> )
13.36 - 13.41	322 - 335.4		

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> 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: AR-V5403FLAT-LTE) had been tested under operating condition.

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

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

#### **IEEE 802.11b mode:**

Channel Low (2412MHz), Channel Mid (2442MHz) and Channel High (2462MHz) with 1Mbps data rate were chosen for full testing.

#### **IEEE 802.11g mode:**

Channel Low (2412MHz), Channel Mid (2442MHz) 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 (2442MHz) 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 (2442MHz) 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

**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 Due
Spectrum Analyzer	Agilent	E4446A	MY43360131	03/16/2013
Power Meter	Anritsu	ML2495A	1012009	04/26/2013
Power Sensor	Anritsu	MA2411B	0917072	04/26/2013

Wugu 966 Chamber A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	11/02/2012
EMI Test Receiver	R&S	ESCI	100064	02/16/2013
Pre-Amplifier	Mini-Circuits	ZFL-1000LN	SF350700823	01/12/2013
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/19/2012
Bilog Antenna	Sunol Sciences	JB3	A030105	10/03/2012
Horn Antenna	EMCO	3117	00055165	01/11/2013
Horn Antenna	EMCO	3116	00026370	10/12/2012
Loop Antenna	EMCO	6502	8905/2356	06/10/2013
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Site NSA	CCS	N/A	N/A	12/25/2012
Test S/W	EZ-EMC (CCS-3A1RE)			



### 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	N/A
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, Wu-Gong 6th Rd., Wugu Industrial Park, New Taipei City 248, 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 C63.4 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, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.




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

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

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



### 5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: 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	 Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

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



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

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

### 6.2 SUPPORT EQUIPMENT

No	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	LCD Monitor	DELL	3008WFP	CN-0XK290-7161 8-846-169L	FCC DoC	Unshielded, 1.8m	Shielded, 1.8m
2	USB Mouse	DELL	MO56UO	408031121	FCC DoC	Shielded, 1.8m	N/A

**Remark:**

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



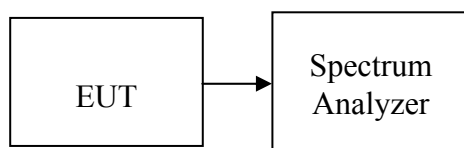
## 7. FCC PART 15.247 REQUIREMENTS

### 7.1 6DB BANDWIDTH

#### **LIMIT**

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

#### **Test Configuration**



#### **TEST PROCEDURE**

The transmitter output is connected to the spectrum analyzer. Set the RBW = 1% of the emission bandwidth, VBW  $\geq 3 \times$  RBW, Detector = Peak, Trace mode = max hold, Sweep = auto couple. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

#### **TEST RESULTS**

*No non-compliance noted*

**Test Data****Test mode: IEEE 802.11b mode**

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	12.17	>500	PASS
Mid	2442	12.13		PASS
High	2462	12.13		PASS

**Test mode: IEEE 802.11g mode**

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.47	>500	PASS
Mid	2442	16.43		PASS
High	2462	16.43		PASS

**Test mode: IEEE 802.11n HT 20 MHz mode**

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.23	>500	PASS
Mid	2442	17.90		PASS
High	2462	16.47		PASS

**Test mode: IEEE 802.11n HT 40 MHz mode**

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
Low	2422	35.53	>500	PASS
Mid	2442	35.67		PASS
High	2452	36.33		PASS



## IEEE 802.11b mode

## 6dB Bandwidth (CH Low)

Agilent

R T

▲ Mkr2 12.17 MHz  
-0.57 dB

Ref 20 dBm

Atten 20 dB

#Peak

Log

10

dB/

Offst

13.7

dB

DI

-2.5

dBm

LgAv

V1 S2

Center 2.412 00 GHz

Span 20 MHz

#Res BW 160 kHz

#VBW 470 kHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.412 97 GHz	3.55 dBm
2R	(1)	Freq	2.405 90 GHz	-3.05 dBm
2Δ	(1)	Freq	12.17 MHz	-0.57 dB

## 6dB Bandwidth (CH Mid)

Agilent

R T

▲ Mkr2 12.13 MHz  
0.09 dB

Ref 20 dBm

Atten 20 dB

#Peak

Log

10

dB/

Offst

13.7

dB

DI

-1.0

dBm

LgAv

V1 S2

Center 2.442 00 GHz

Span 20 MHz

#Res BW 160 kHz

#VBW 470 kHz

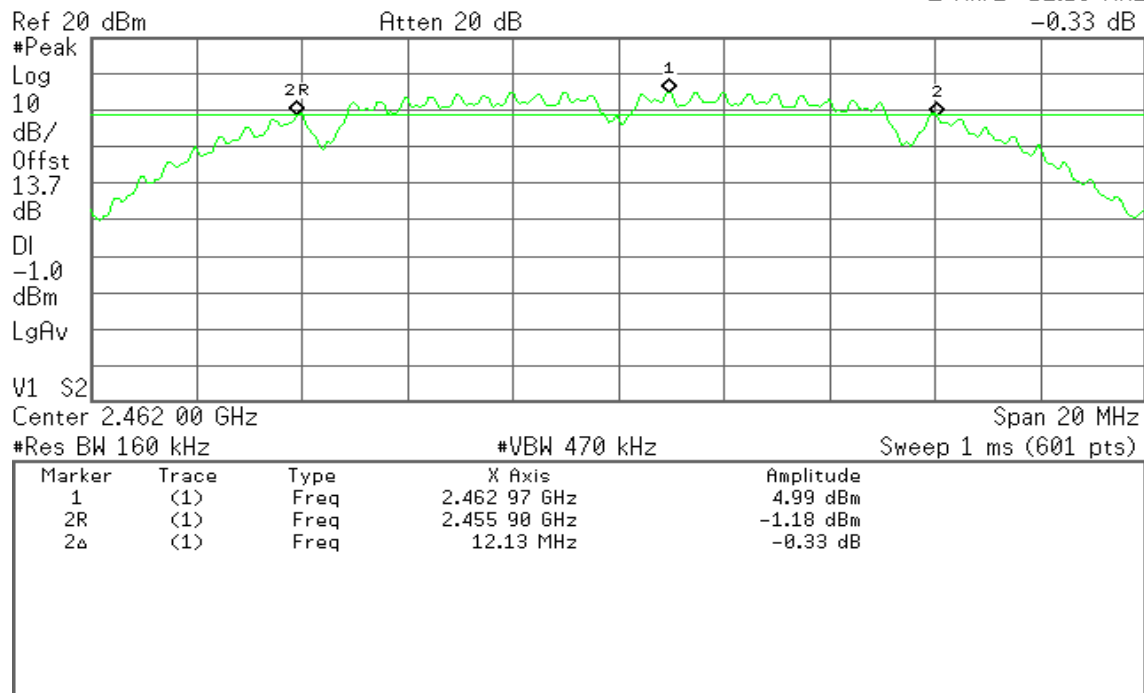
Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.440 97 GHz	4.99 dBm
2R	(1)	Freq	2.435 90 GHz	-1.75 dBm
2Δ	(1)	Freq	12.13 MHz	0.09 dB

**6dB Bandwidth (CH High)**

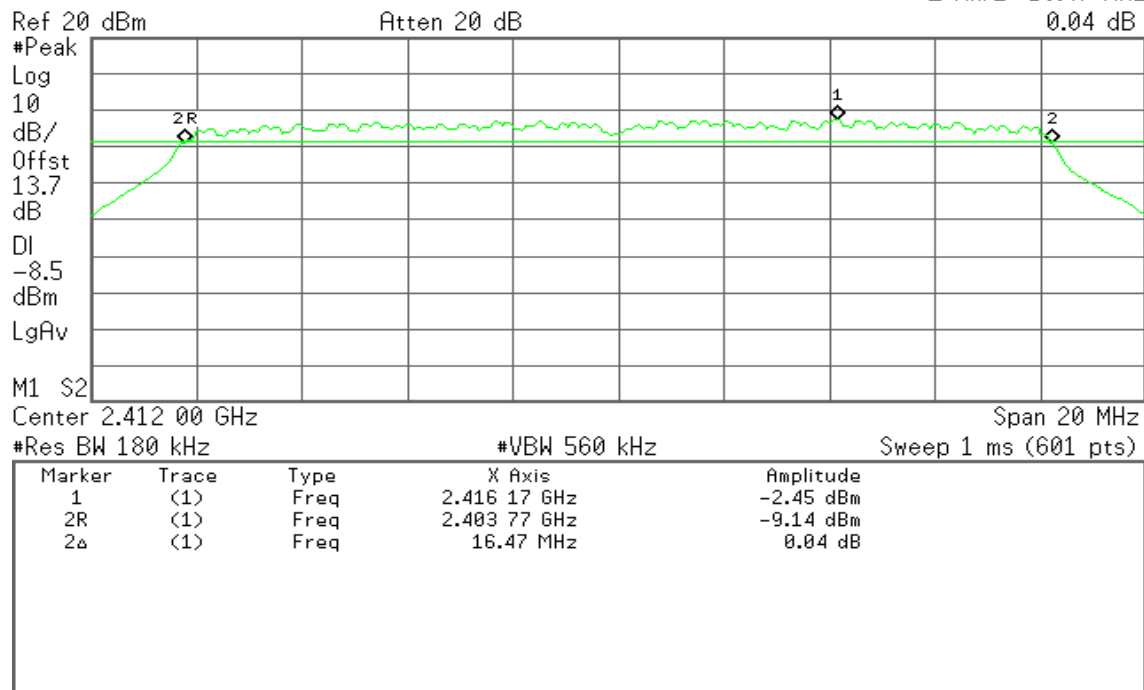
Agilent

R T

▲ Mkr2 12.13 MHz  
-0.33 dB**IEEE 802.11g mode****6dB Bandwidth (CH Low)**

Agilent

R T

▲ Mkr2 16.47 MHz  
0.04 dB

**6dB Bandwidth (CH Mid)**

Agilent

R T

▲ Mkr2 16.43 MHz

0.04 dB

Ref 20 dBm

Atten 20 dB

#Peak

Log

10

dB/

Offst

13.7

dB

DI

-6.9

dBm

LgAv

V1 S2

Center 2.442 00 GHz

Span 20 MHz

#Res BW 180 kHz

#VBW 560 kHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.446 13 GHz	-0.90 dBm
2R	(1)	Freq	2.433 77 GHz	-7.49 dBm
2Δ	(1)	Freq	16.43 MHz	0.04 dB

**6dB Bandwidth (CH High)**

Agilent

R T

▲ Mkr2 16.43 MHz

-0.15 dB

Ref 20 dBm

Atten 20 dB

#Peak

Log

10

dB/

Offst

13.7

dB

DI

-7.0

dBm

LgAv

V1 S2

Center 2.462 00 GHz

Span 20 MHz

#Res BW 180 kHz

#VBW 560 kHz

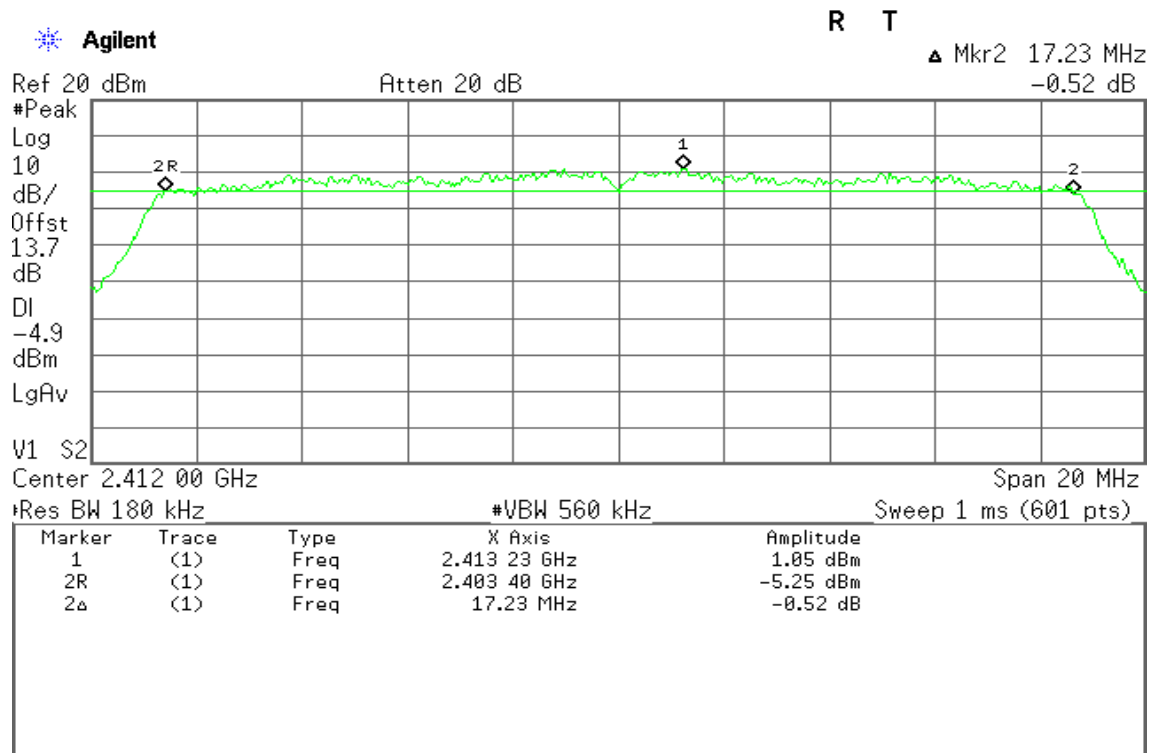
Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.466 13 GHz	-0.99 dBm
2R	(1)	Freq	2.453 77 GHz	-7.66 dBm
2Δ	(1)	Freq	16.43 MHz	-0.15 dB

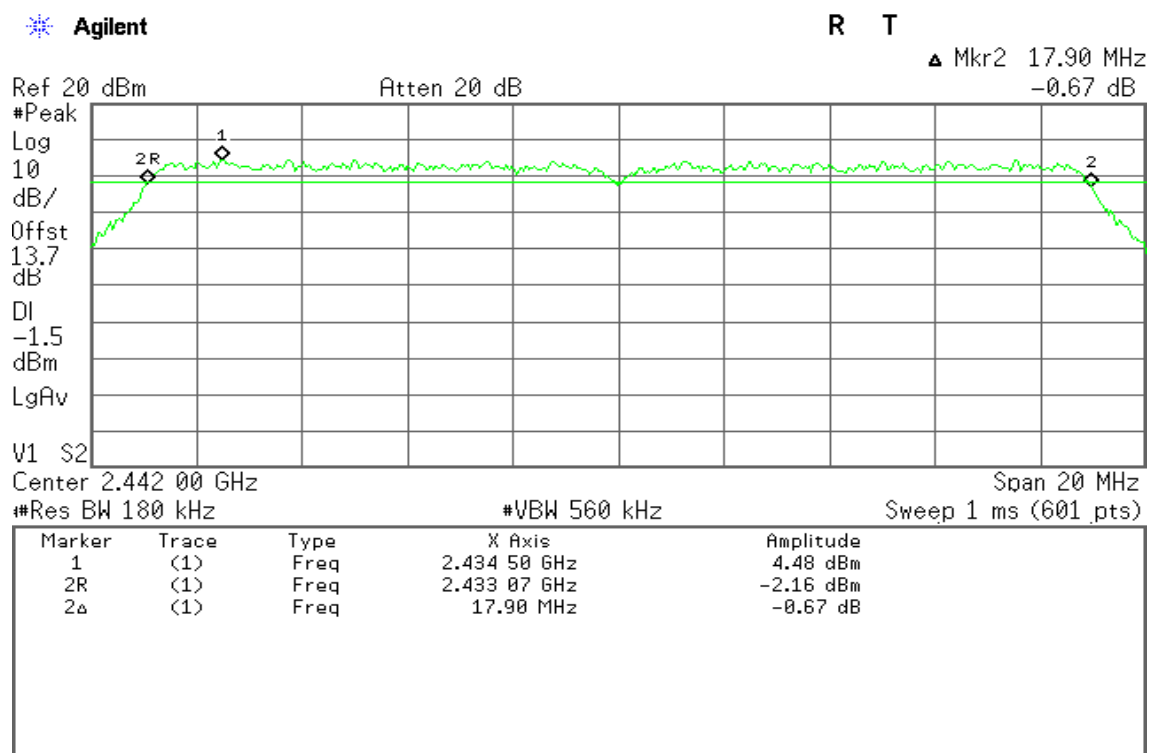


## IEEE 802.11n HT 20 MHz mode

## 6dB Bandwidth (CH Low)



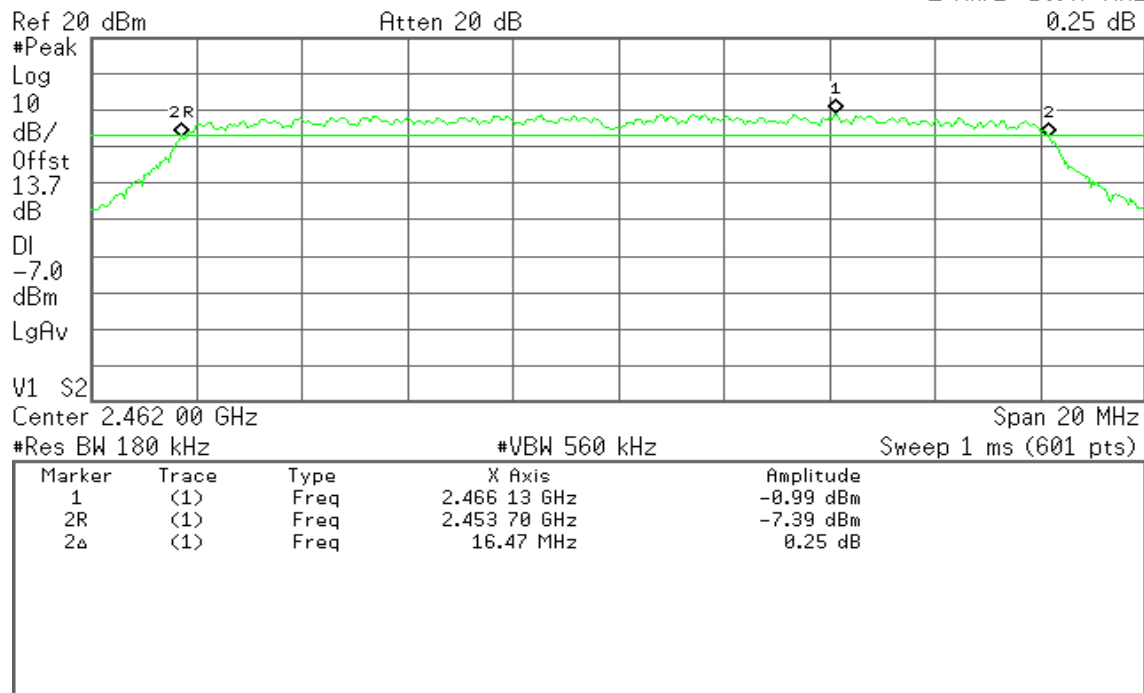
## 6dB Bandwidth (CH Mid)



**6dB Bandwidth (CH High)**

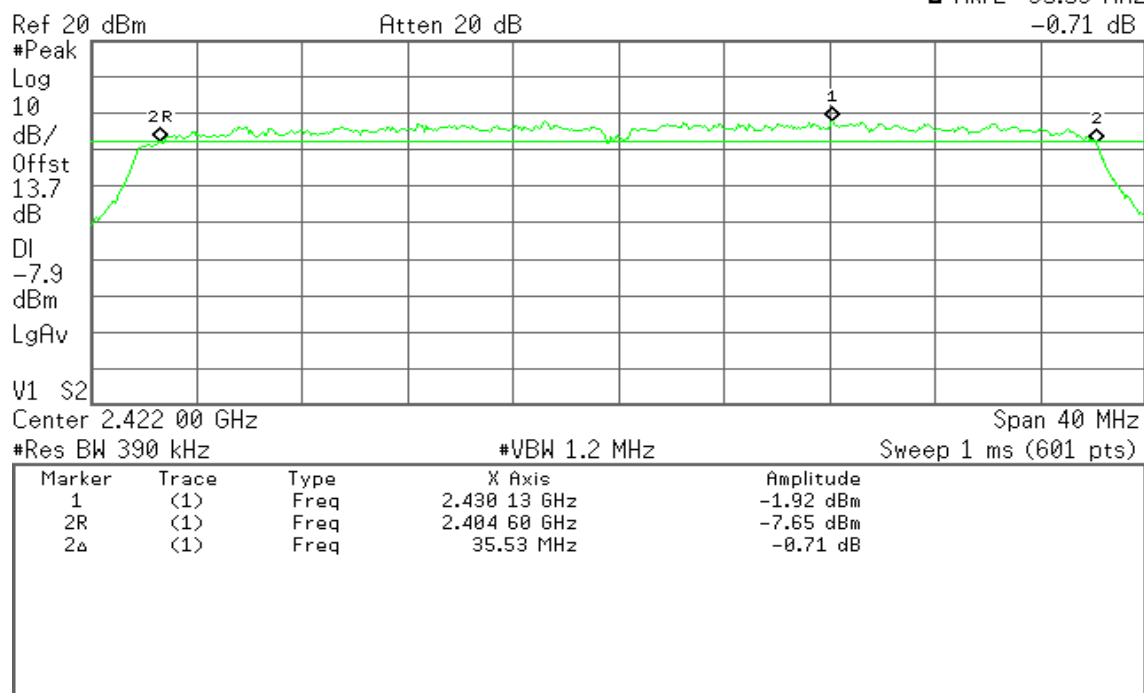
Agilent

R T

▲ Mkr2 16.47 MHz  
0.25 dB**IEEE 802.11n HT 40 MHz mode****6dB Bandwidth (CH Low)**

Agilent

R T

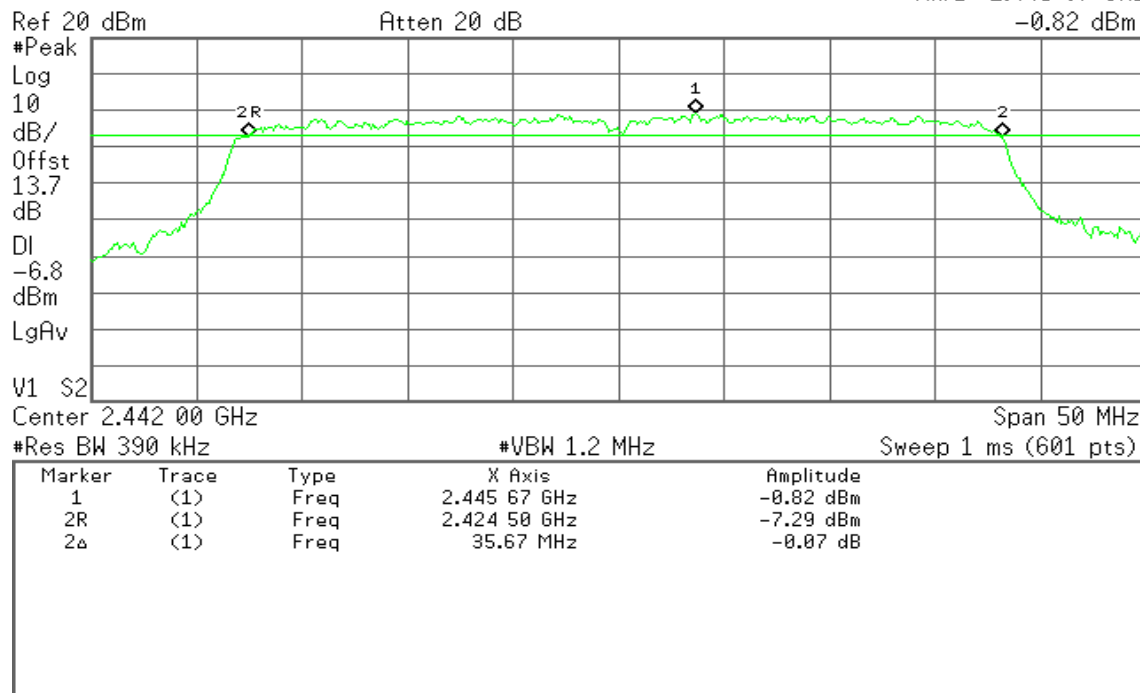
▲ Mkr2 35.53 MHz  
-0.71 dB



## 6dB Bandwidth (CH Mid)

Agilent

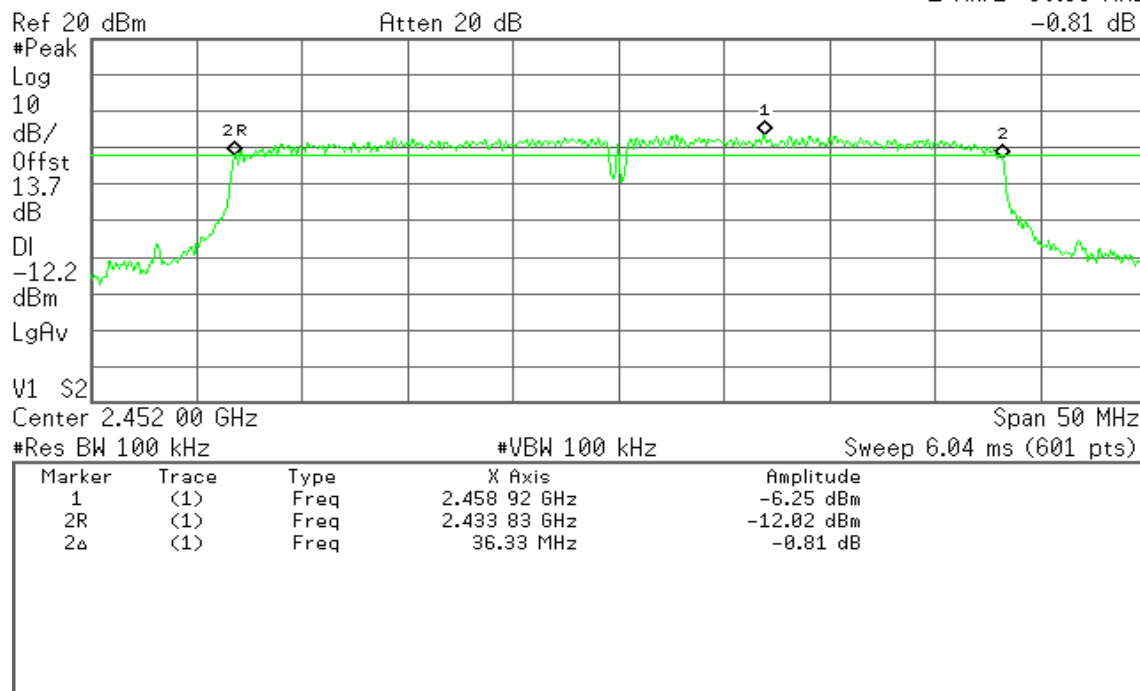
R T

Mkr1 2.445 67 GHz  
-0.82 dBm

## 6dB Bandwidth (CH High)

Agilent

R T

Mkr2 36.33 MHz  
-0.81 dB



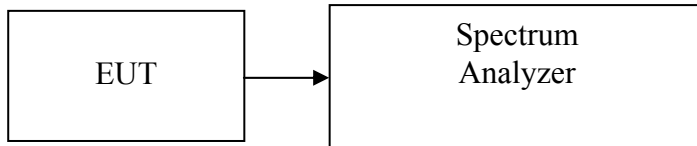
## 7.2 PEAK POWER

### LIMIT

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

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

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. Set the RBW = 1MHz, VBW = 3MHz, Detector = Peak, Trace mode = max hold, Allow trace to fully stabilize. Sweep = auto couple. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges record the max reading. Repeat the above procedure until the measurements for all frequencies are completed.

### 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)	Result
Low	2412	16.53	0.0450	1.00	PASS
Mid	2442	17.91	0.0618		PASS
High	2462	17.73	0.0593		PASS

**Test mode: IEEE 802.11g mode**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	16.10	0.0407	1.00	PASS
Mid	2442	17.60	0.0575		PASS
High	2462	17.60	0.0575		PASS

**Test mode: IEEE 802.11n HT 20 MHz mode**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	15.96	0.0394	1.00	PASS
Mid	2442	17.51	0.0564		PASS
High	2462	17.57	0.0571		PASS

**Test mode: IEEE 802.11n HT 40 MHz mode**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2422	15.46	0.0352	1.00	PASS
Mid	2442	16.64	0.0443		PASS
High	2452	16.88	0.0488		PASS

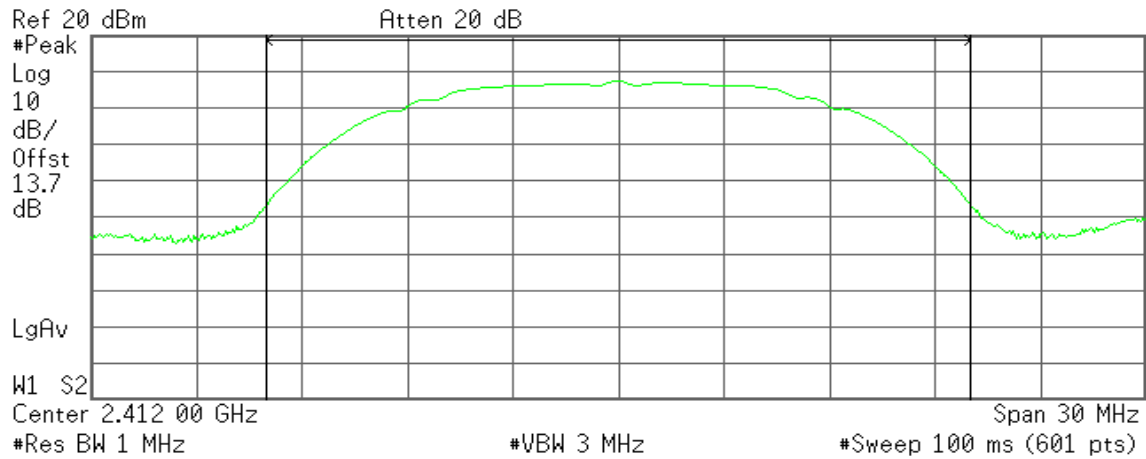


## IEEE 802.11b mode

### Peak power (CH Low)

Agilent

R T



Channel Power

16.53 dBm /20.0000 MHz

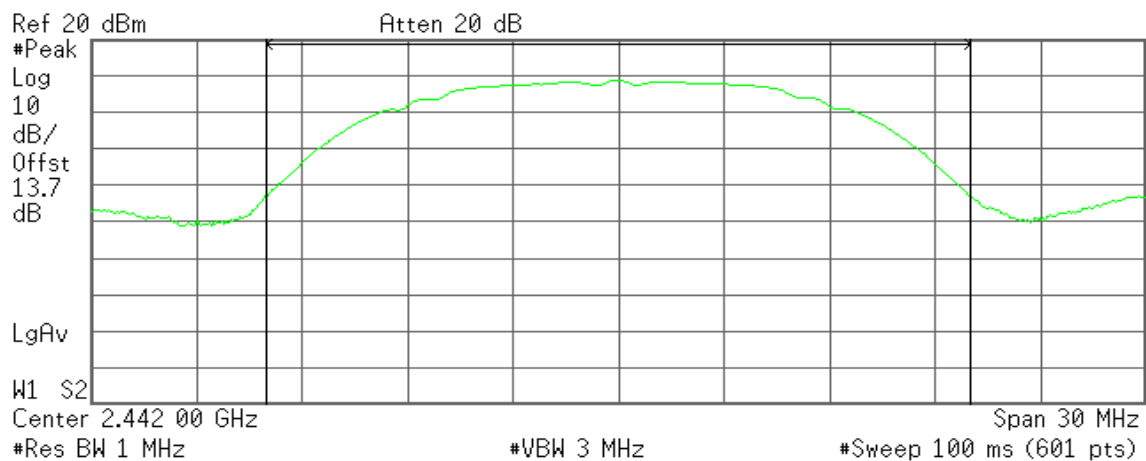
Power Spectral Density

-56.48 dBm/Hz

### Peak power (CH Mid)

Agilent

R T



Channel Power

17.91 dBm /20.0000 MHz

Power Spectral Density

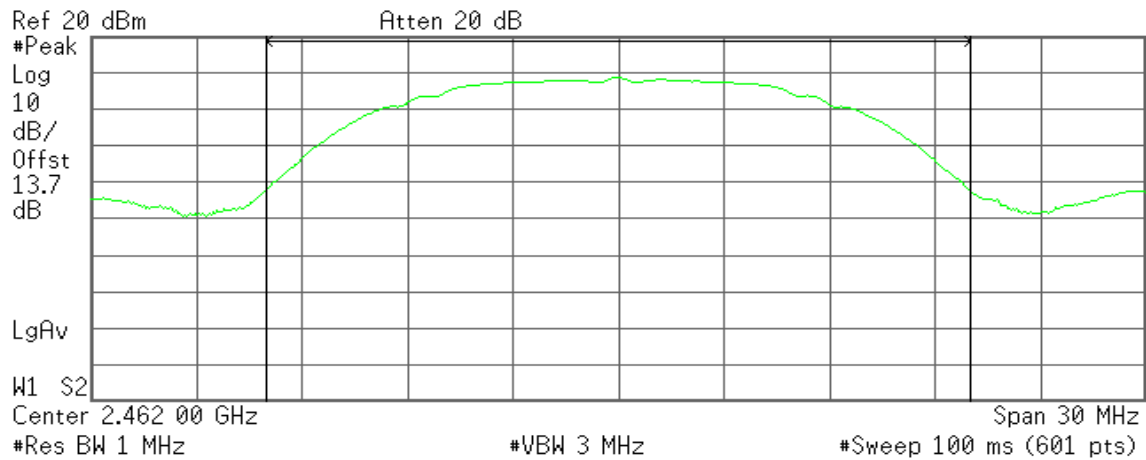
-55.10 dBm/Hz



### Peak power (CH High)

Agilent

R T



Channel Power

17.73 dBm /20.0000 MHz

Power Spectral Density

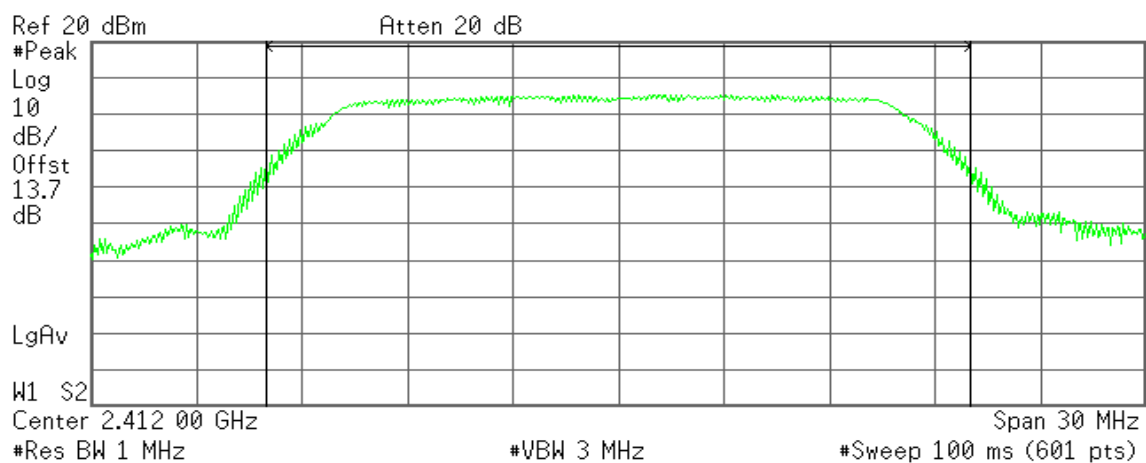
-55.28 dBm/Hz

### IEEE 802.11g mode

#### Peak power (CH Low)

Agilent

R T



Channel Power

16.10 dBm /20.0000 MHz

Power Spectral Density

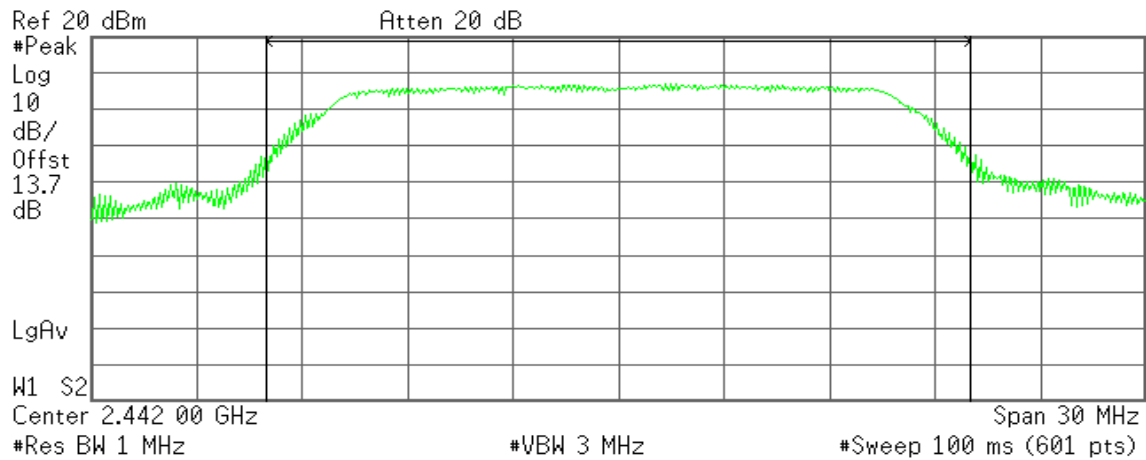
-56.91 dBm/Hz



### Peak power (CH Mid)

Agilent

R T



Channel Power

17.60 dBm /20.0000 MHz

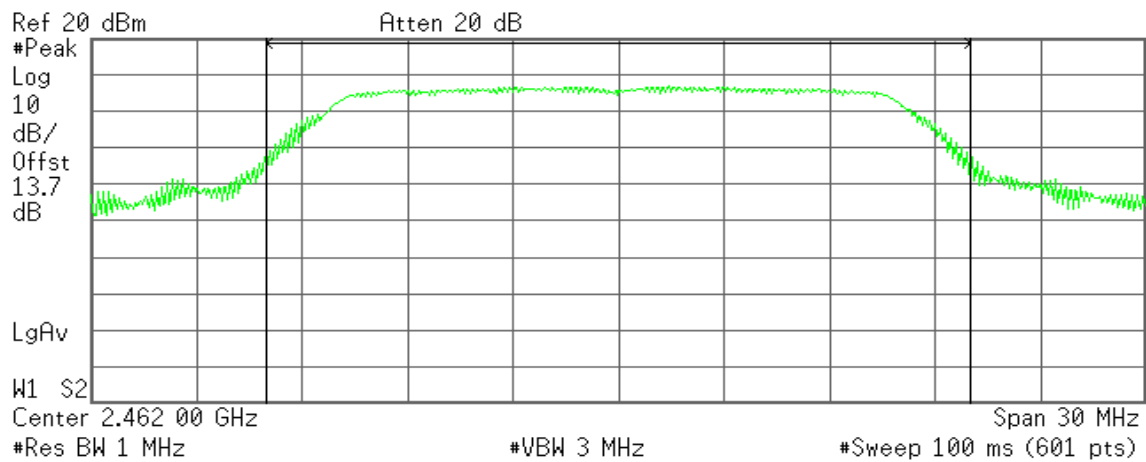
Power Spectral Density

-55.41 dBm/Hz

### Peak power (CH High)

Agilent

R T



Channel Power

17.60 dBm /20.0000 MHz

Power Spectral Density

-55.41 dBm/Hz

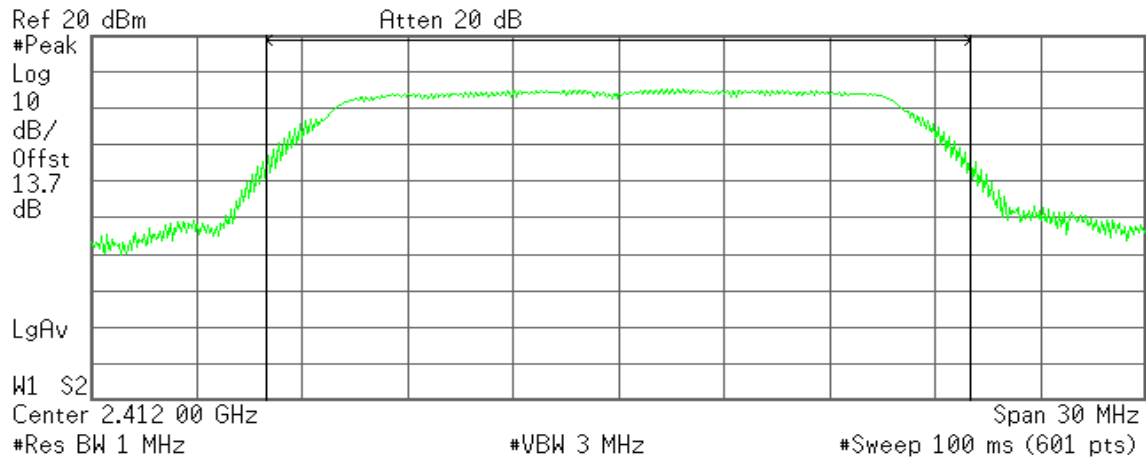


## IEEE 802.11n HT20 MHz mode

### Peak power (CH Low)

Agilent

R T



Channel Power

15.96 dBm /20.0000 MHz

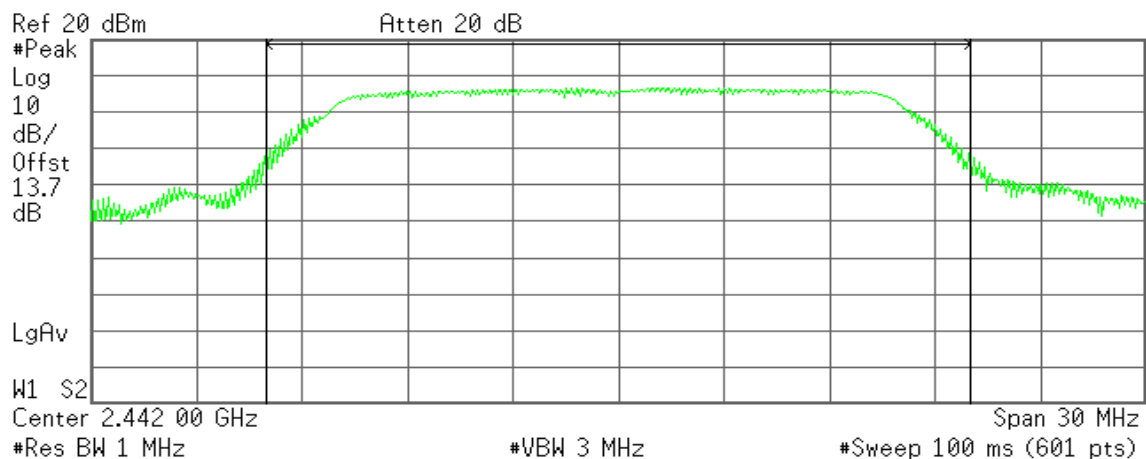
Power Spectral Density

-57.05 dBm/Hz

### Peak power (CH Mid)

Agilent

R T



Channel Power

17.51 dBm /20.0000 MHz

Power Spectral Density

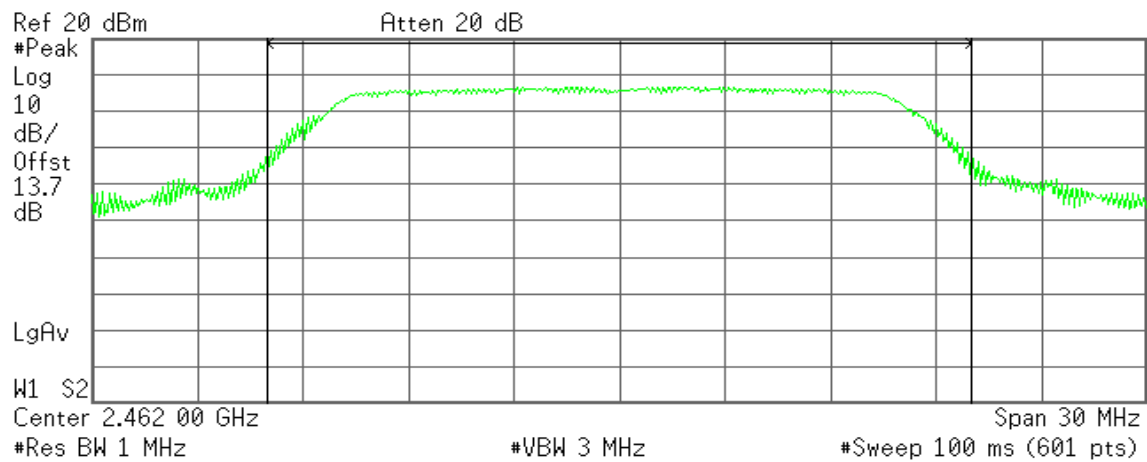
-55.50 dBm/Hz



### Peak power (CH High)

Agilent

R T



Channel Power

17.57 dBm /20.0000 MHz

Power Spectral Density

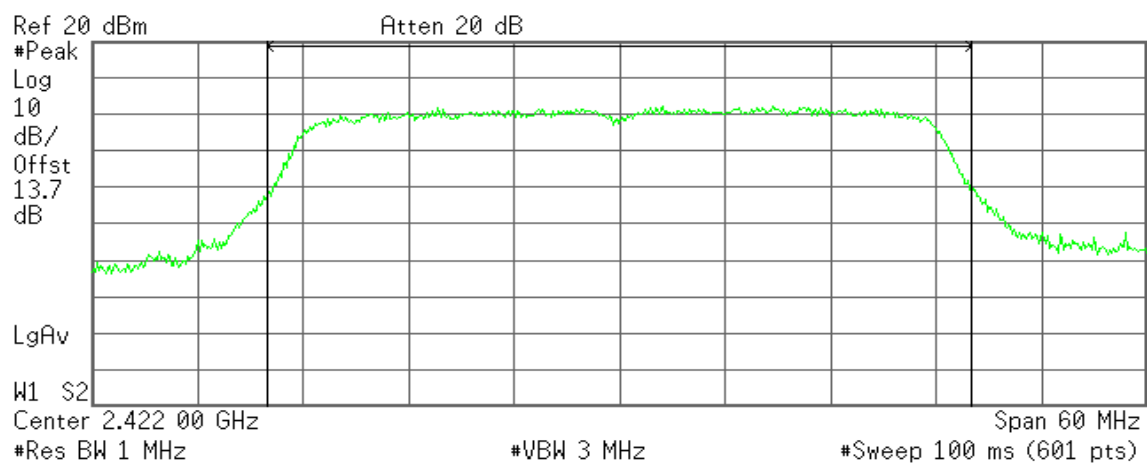
-55.44 dBm/Hz

### IEEE 802.11n HT40 MHz mode

#### Peak power (CH Low)

Agilent

R T



Channel Power

15.46 dBm /40.0000 MHz

Power Spectral Density

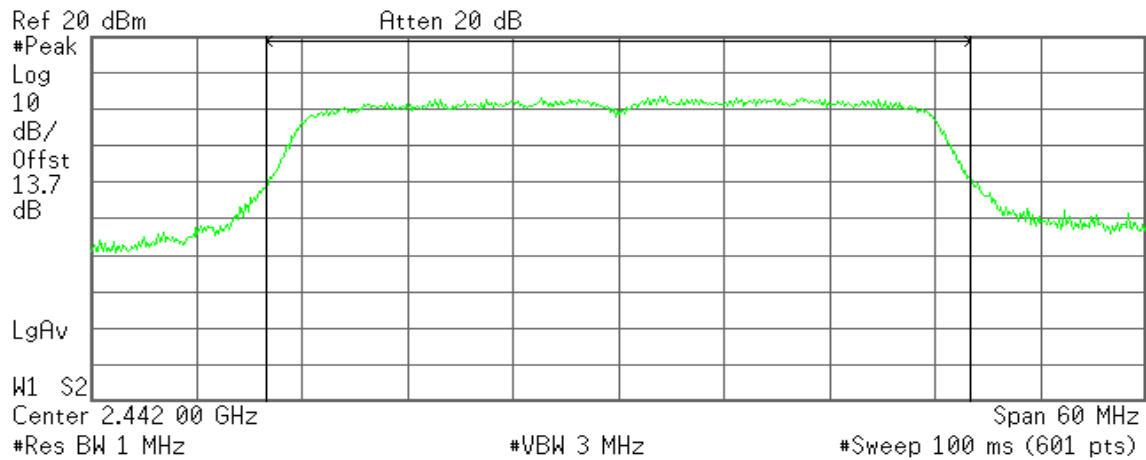
-60.56 dBm/Hz



### Peak power (CH Mid)

Agilent

R T



Channel Power

16.64 dBm /40.0000 MHz

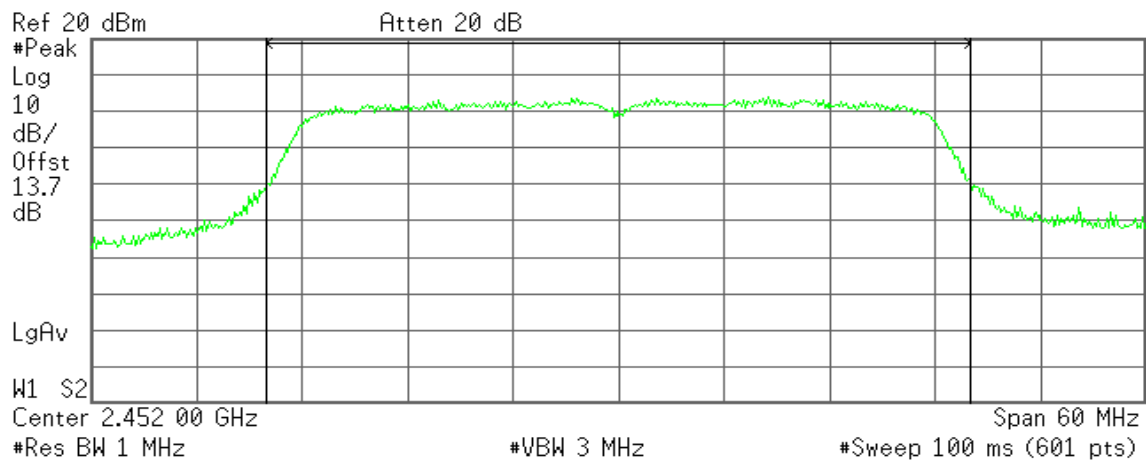
Power Spectral Density

-59.38 dBm/Hz

### Peak power (CH High)

Agilent

R T



Channel Power

16.88 dBm /40.0000 MHz

Power Spectral Density

-59.14 dBm/Hz



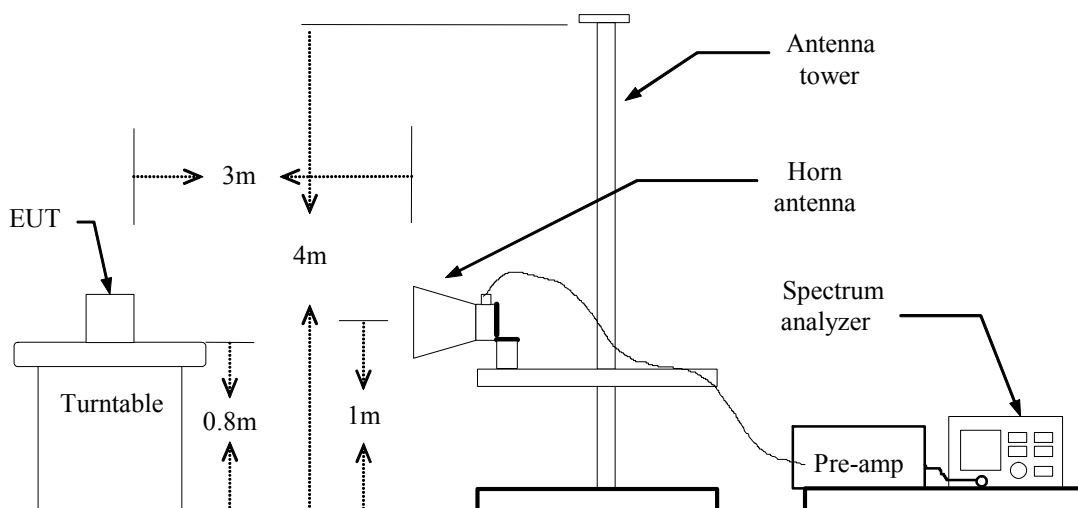
## 7.3 BAND EDGES MEASUREMENT

### LIMIT

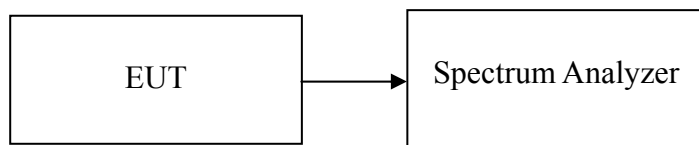
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains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

### Test Configuration

#### For Radiated



#### For Conducted





## **TEST PROCEDURE**

### **For Radiated**

1. The EUT is placed on a turntable, which is 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=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

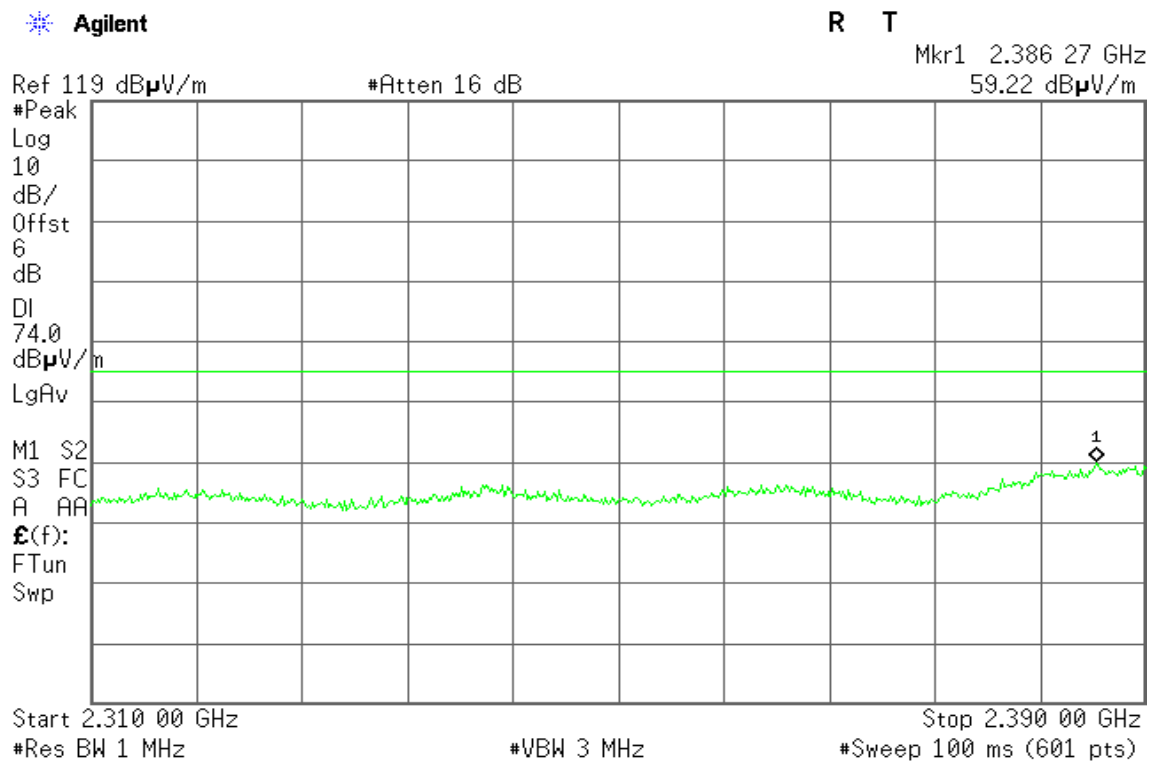
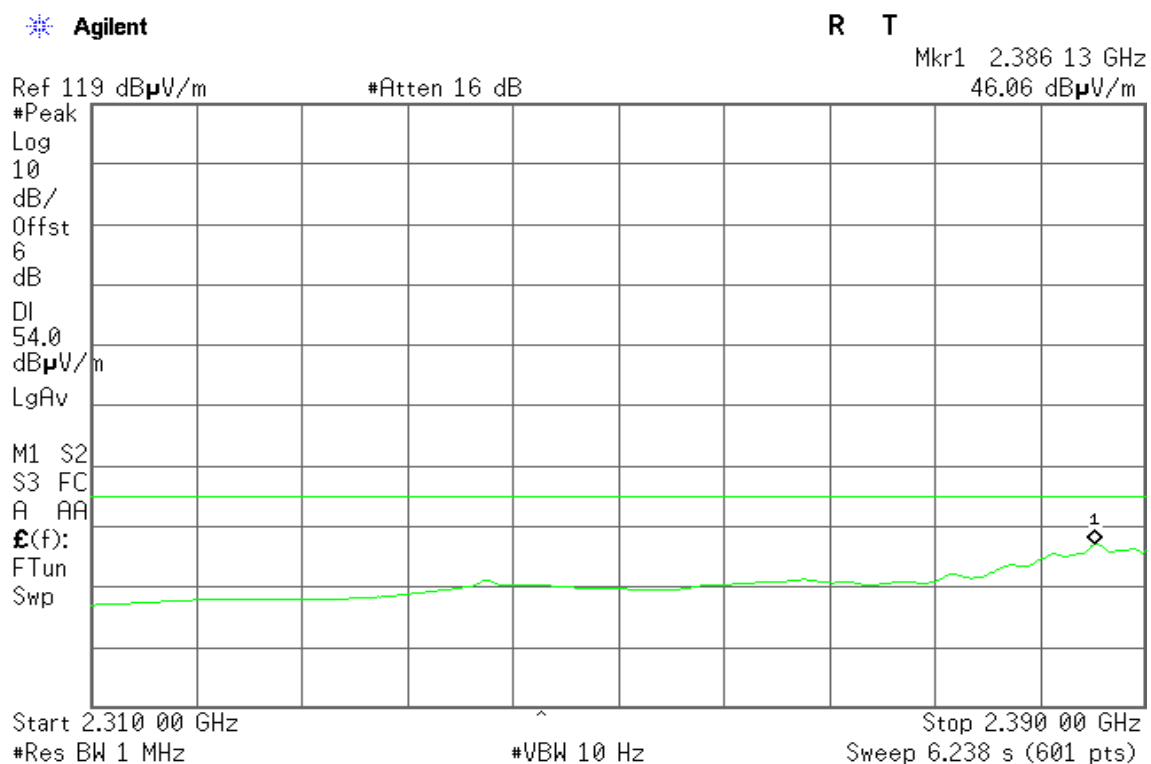
### **For Conducted**

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.

**Band Edges (IEEE 802.11b mode / CH Low)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**



Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.389 60 GHz

55.39 dB $\mu$ V/m

Ref 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

$\mathcal{E}(f)$ :

FTun

Swp

Start 2.310 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

Stop 2.390 00 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 00 GHz

41.68 dB $\mu$ V/m

Ref 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

$\mathcal{E}(f)$ :

FTun

Swp

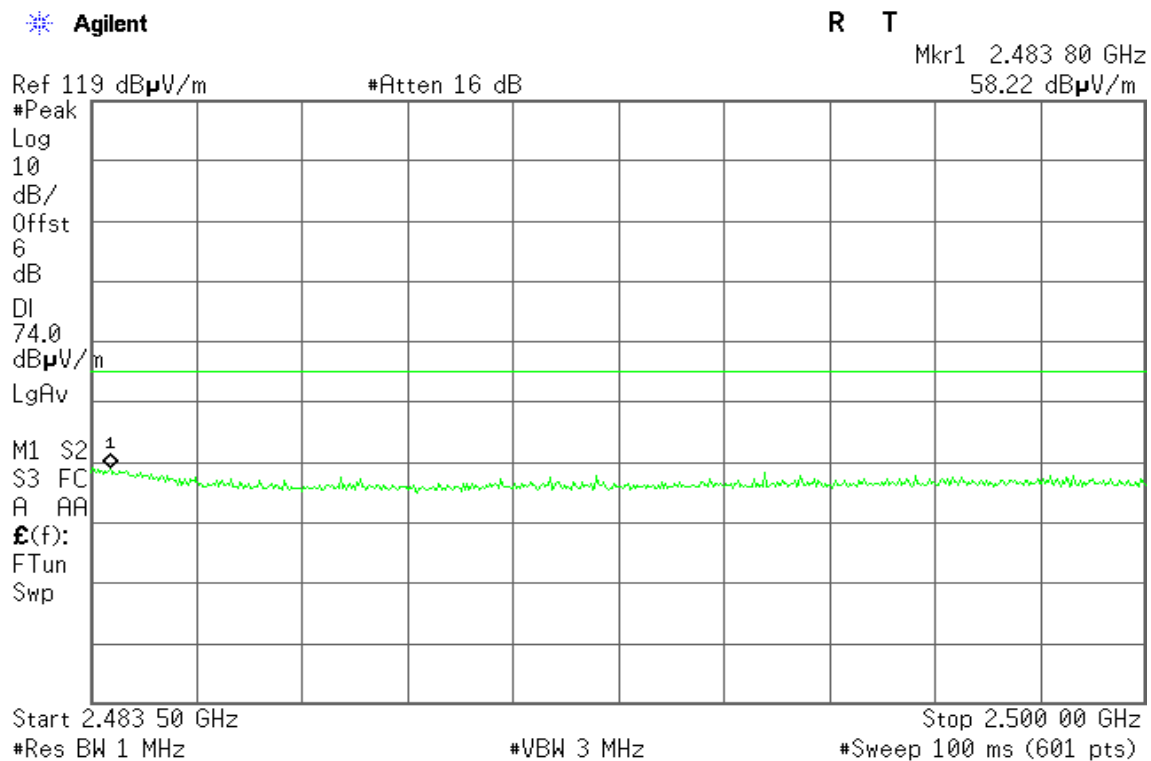
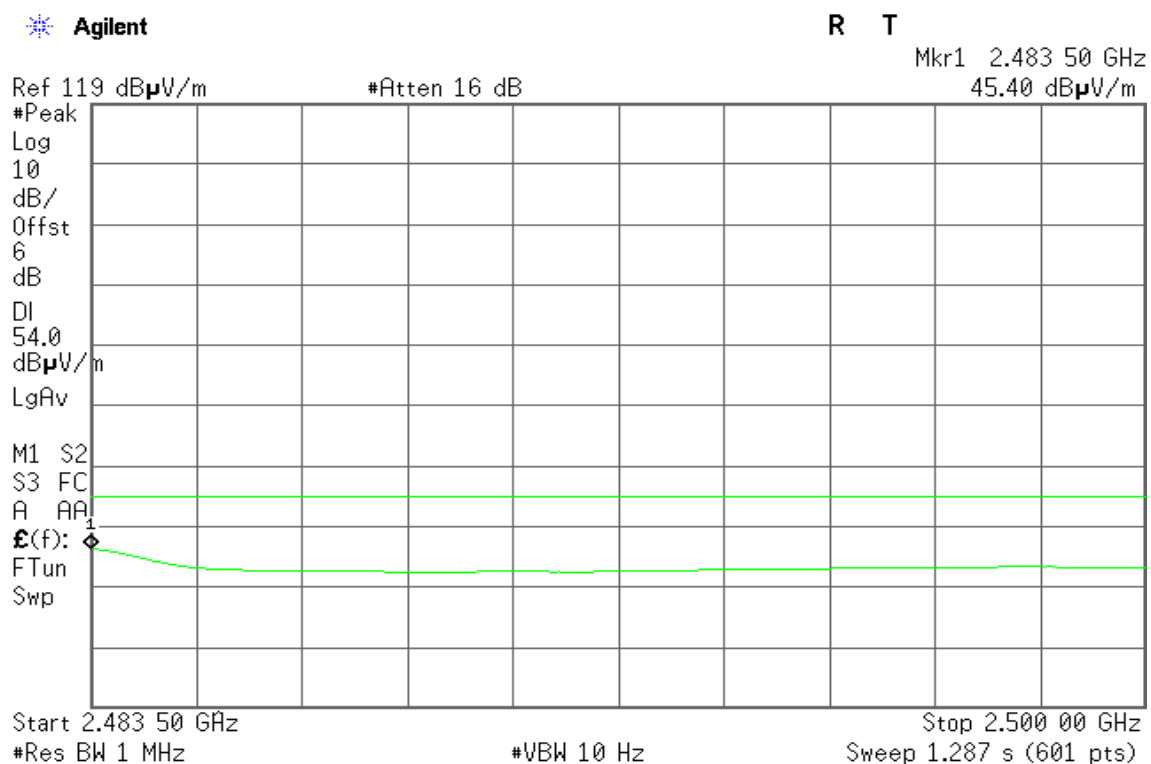
Start 2.310 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.390 00 GHz

Sweep 6.238 s (601 pts)

**Band Edges (IEEE 802.11b mode / CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**



Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.485 56 GHz

53.06 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.483 50 GHz

#Res BW 1 MHz

#VBW 3 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.496 18 GHz

38.93 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.483 50 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

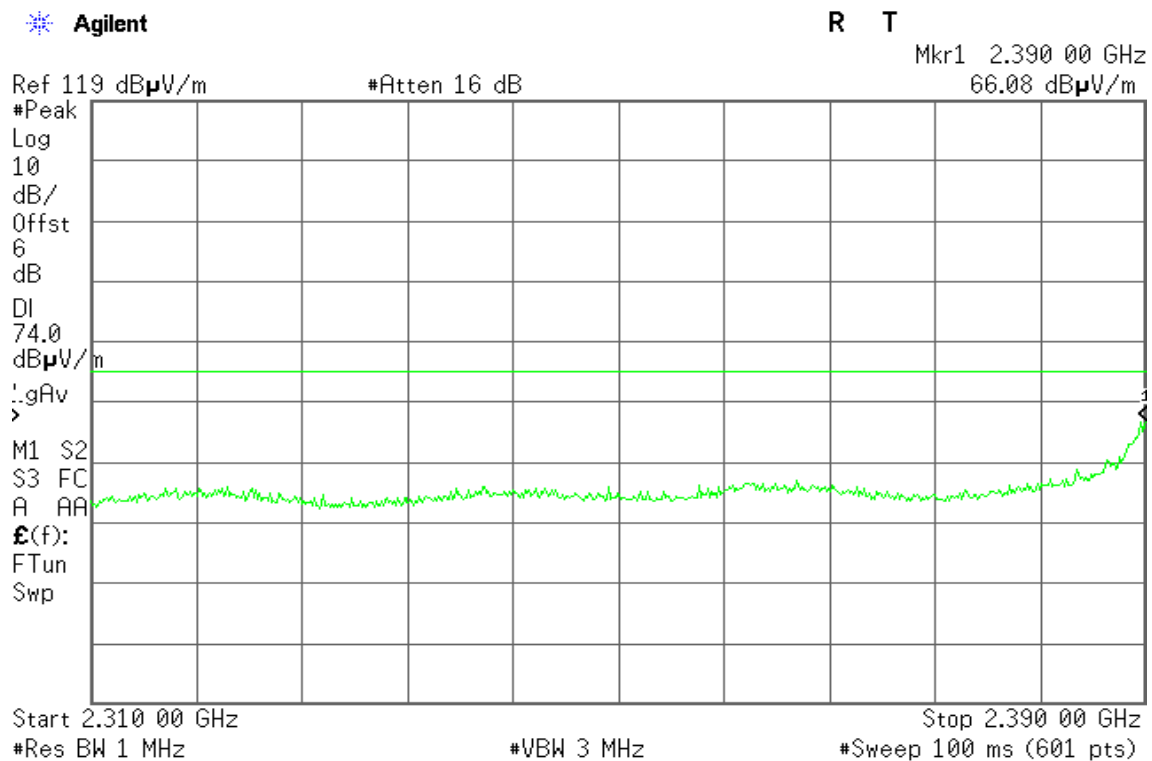
Sweep 1.287 s (601 pts)



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

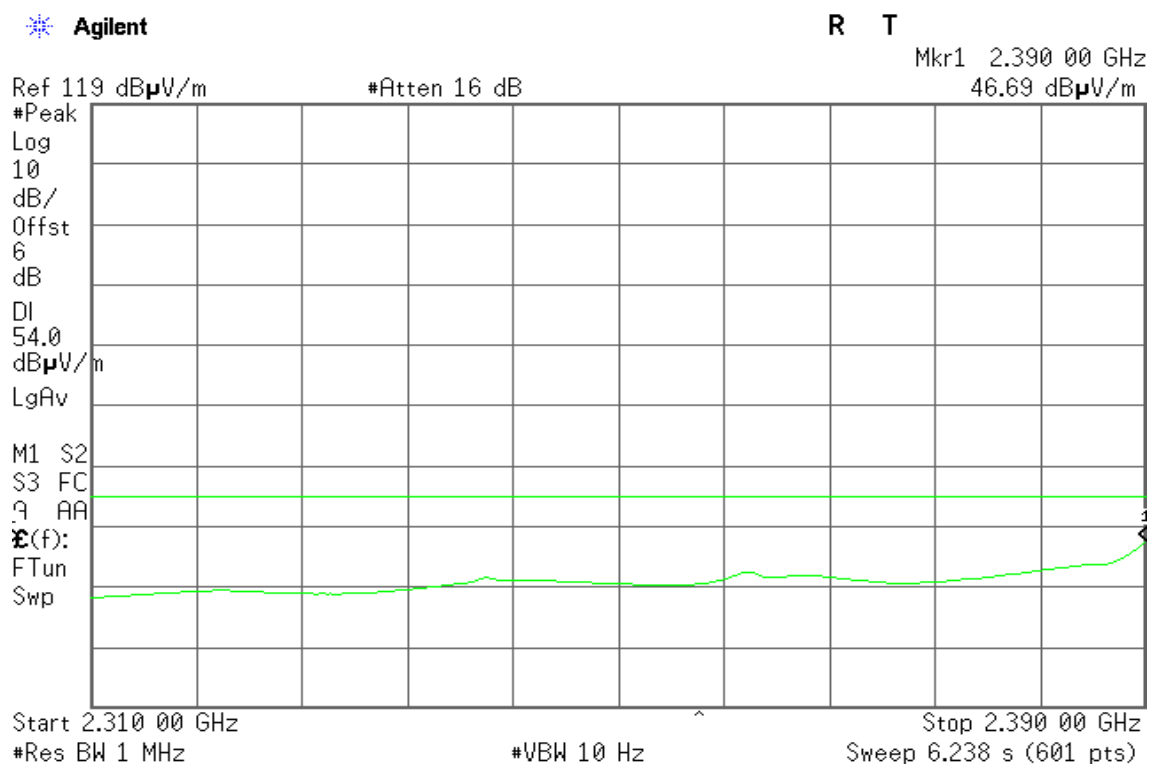
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical





Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.388 80 GHz

52.23 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.310 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

Stop 2.390 00 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 00 GHz

38.30 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

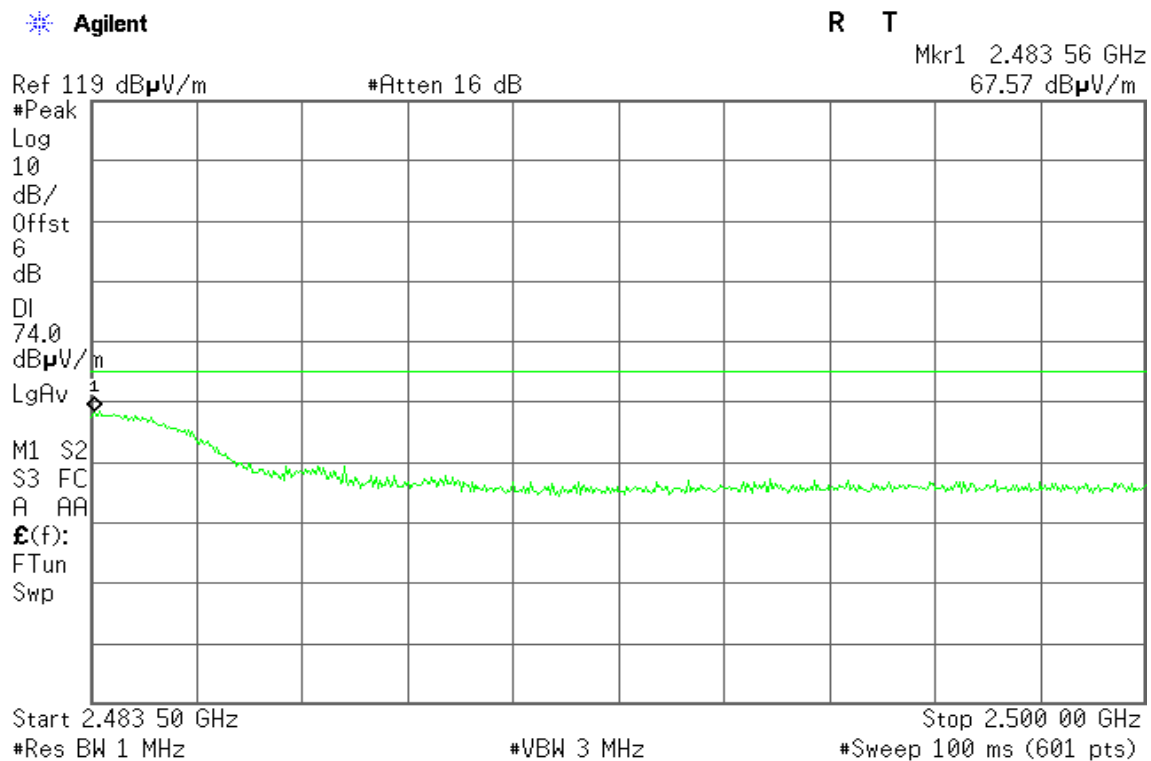
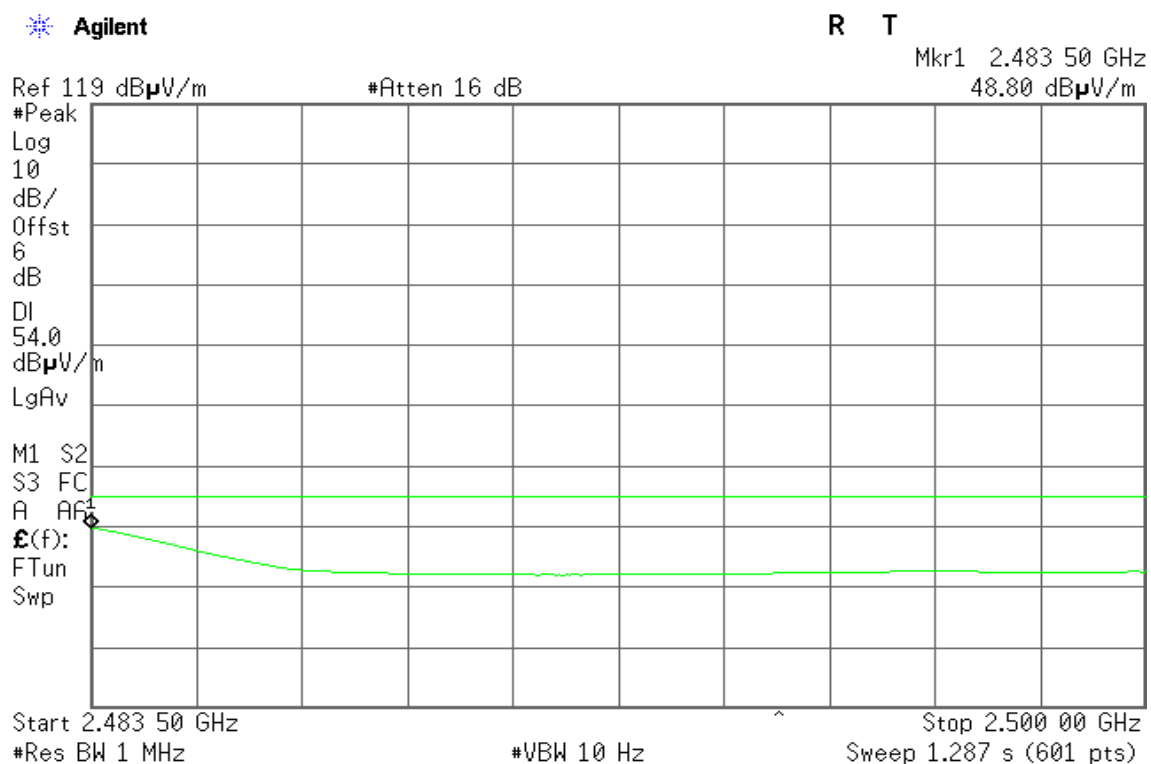
Start 2.310 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.390 00 GHz

Sweep 6.238 s (601 pts)

**Band Edges (IEEE 802.11g mode / CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**



Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.485 29 GHz  
55.34 dB $\mu$ V/m

Ref 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

$\mathcal{E}(f)$ :

FTun

Swp

Start 2.483 50 GHz

#Res BW 1 MHz

#VBW 3 MHz

Stop 2.500 00 GHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
39.68 dB $\mu$ V/m

Ref 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

$\mathcal{E}(f)$ :

FTun

Swp

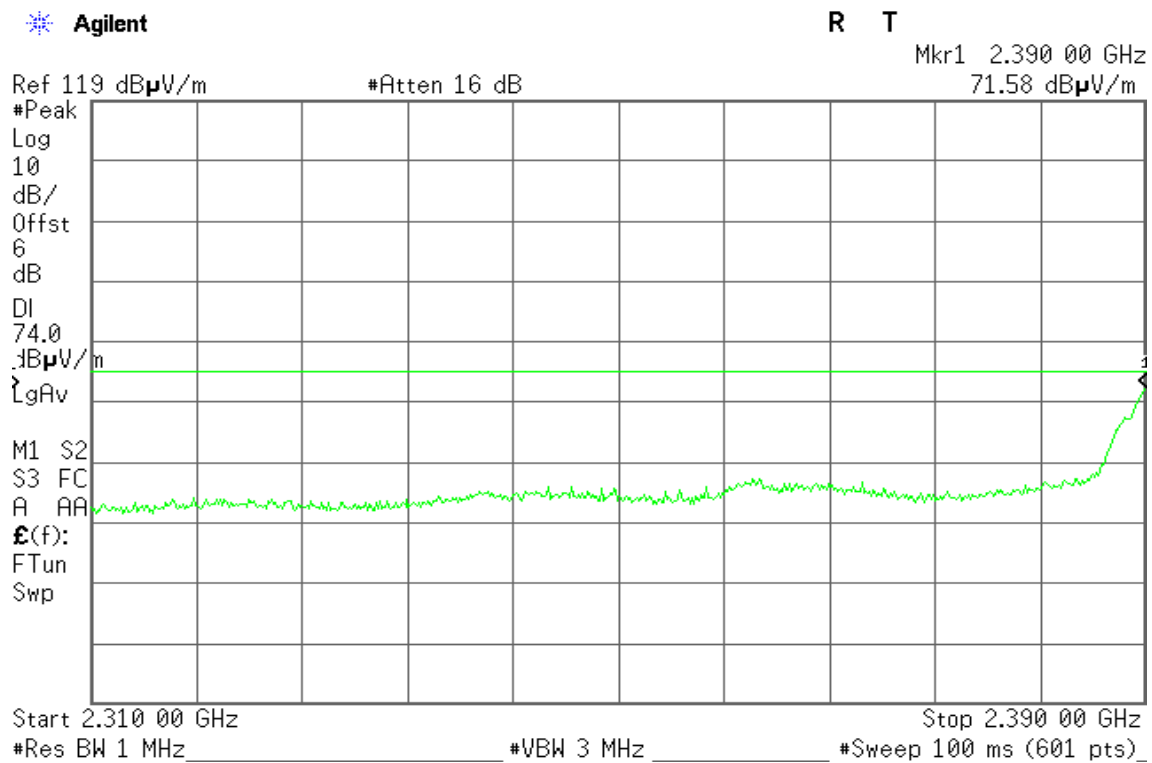
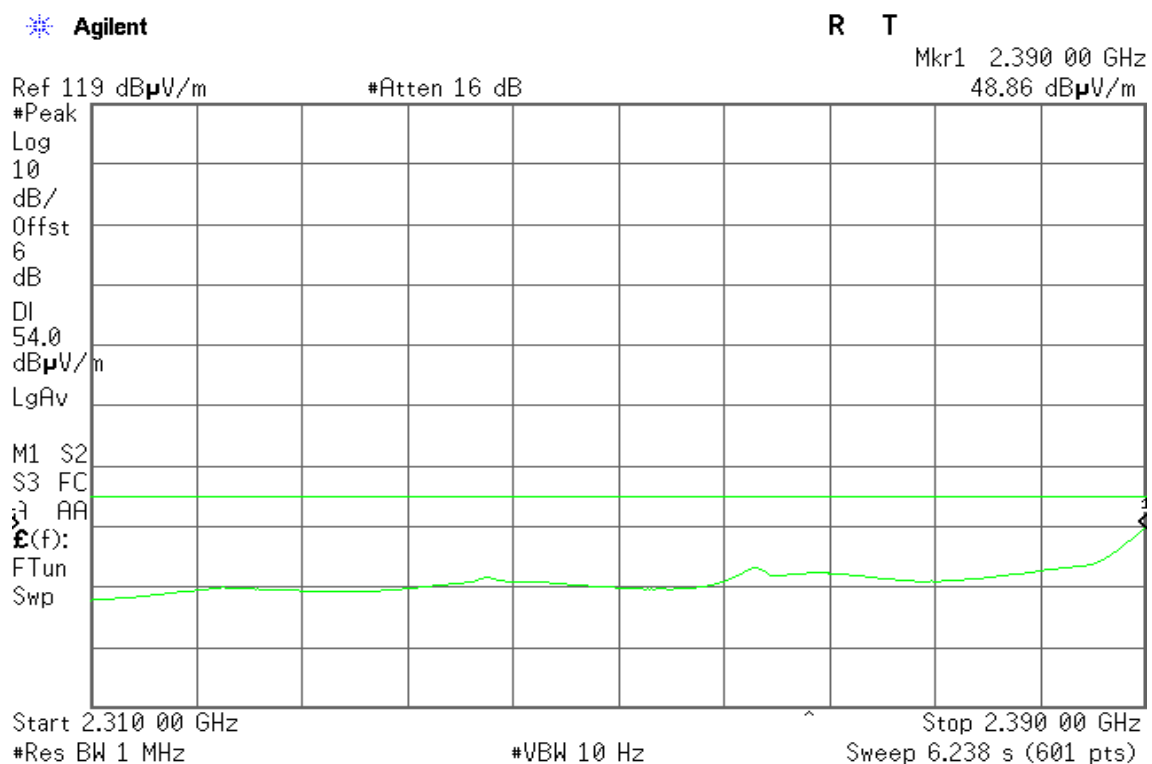
Start 2.483 50 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 1.287 s (601 pts)

**Band Edges (IEEE 802.11n HT 20 MHz mode / CH Low)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**



Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 00 GHz

56.43 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.310 00 GHz

Stop 2.390 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 00 GHz

39.16 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

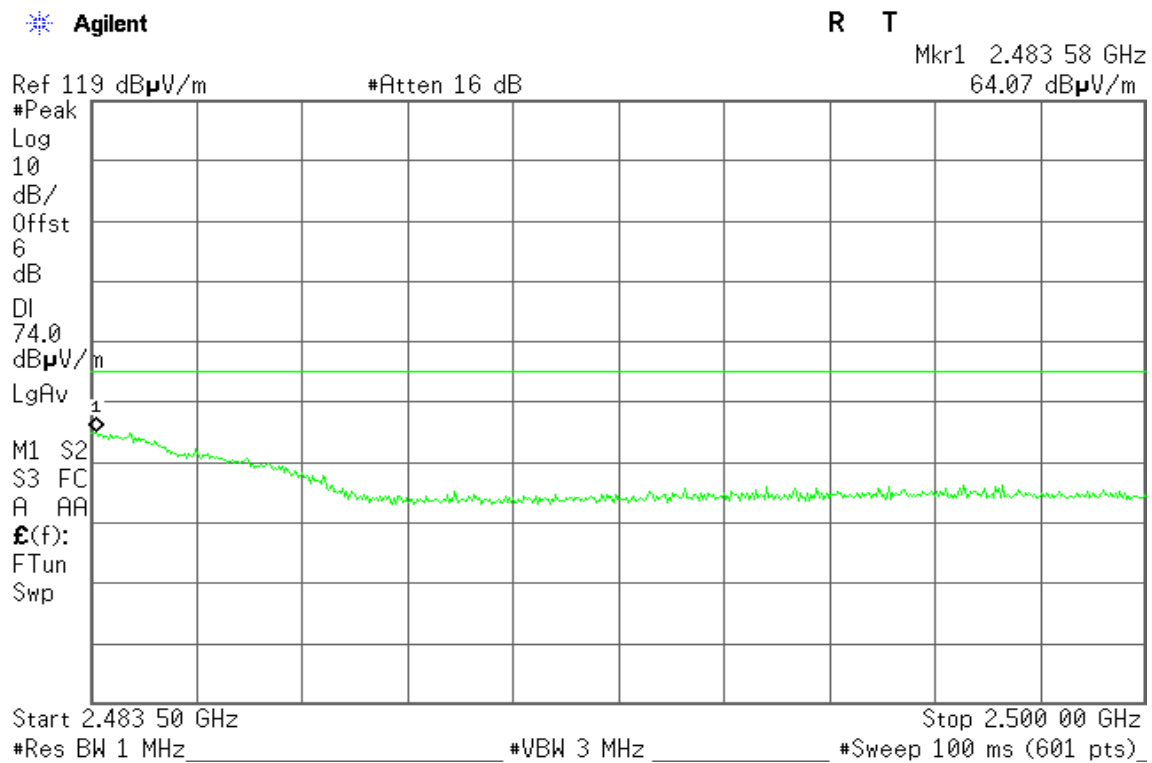
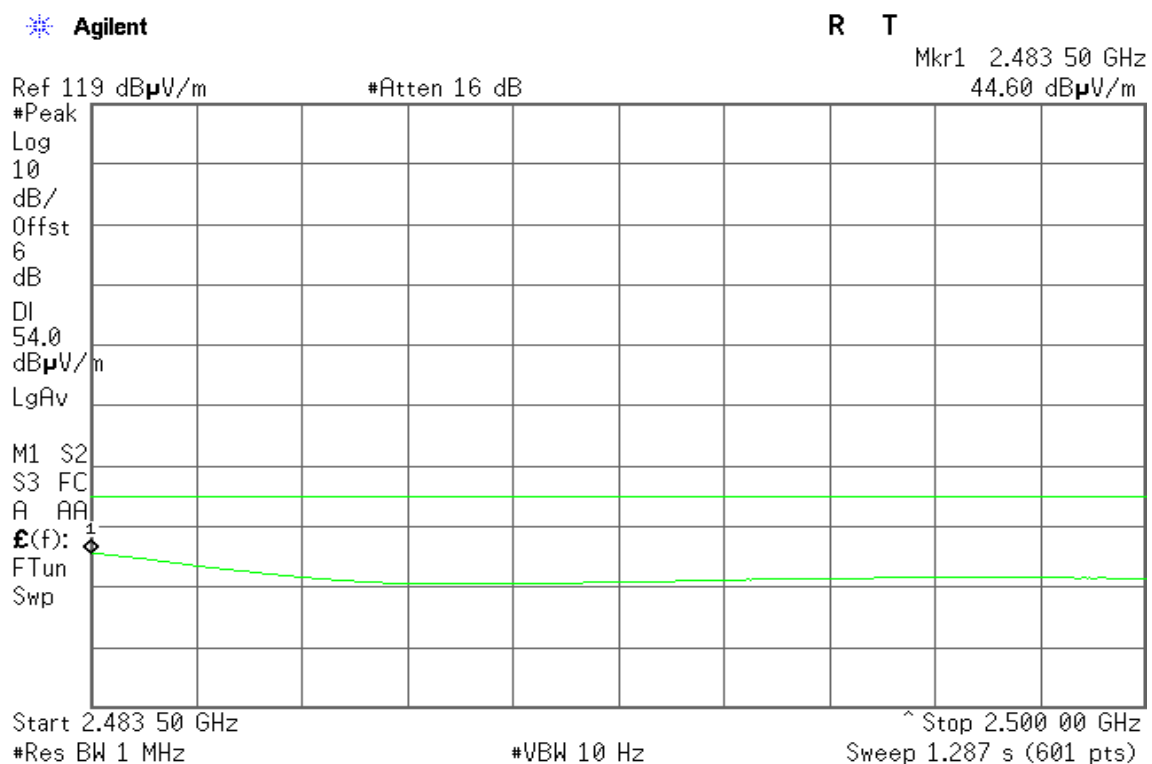
Start 2.310 00 GHz

Stop 2.390 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 6.238 s (601 pts)

**Band Edges (IEEE 802.11n HT 20 MHz mode / CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**



Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.486 22 GHz

53.42 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

Start 2.483 50 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz

38.07 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

E(f):

FTun

Swp

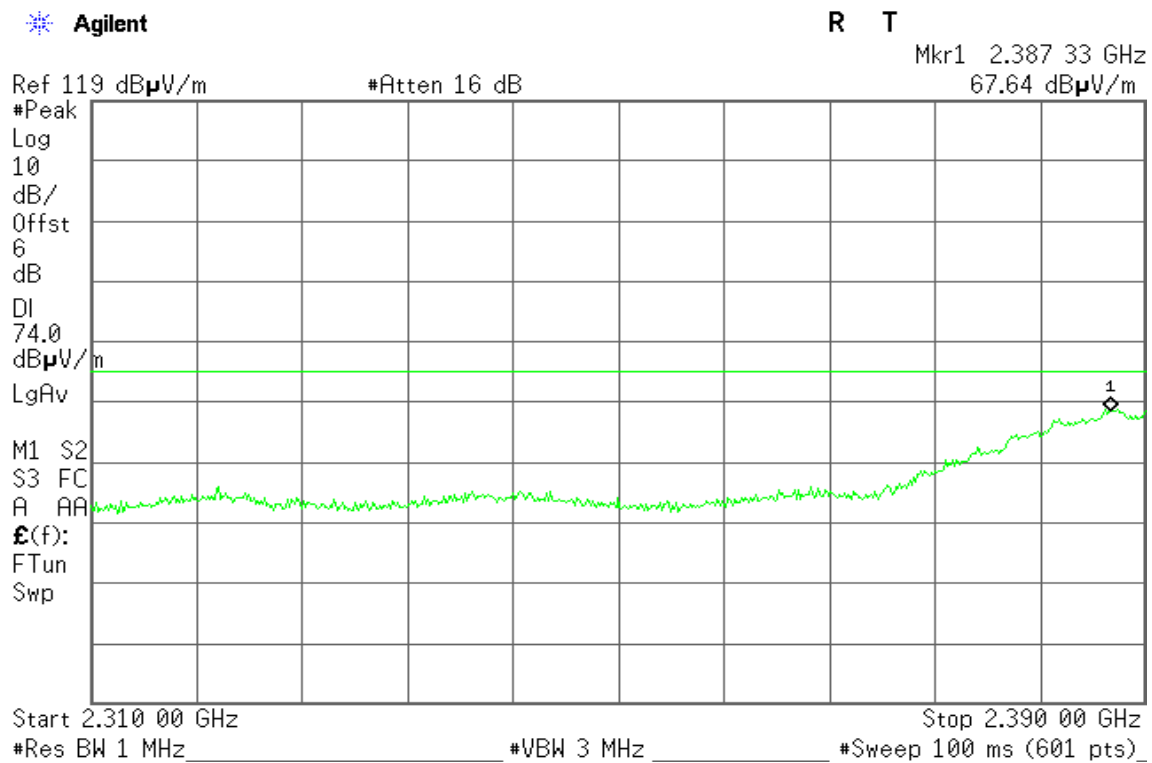
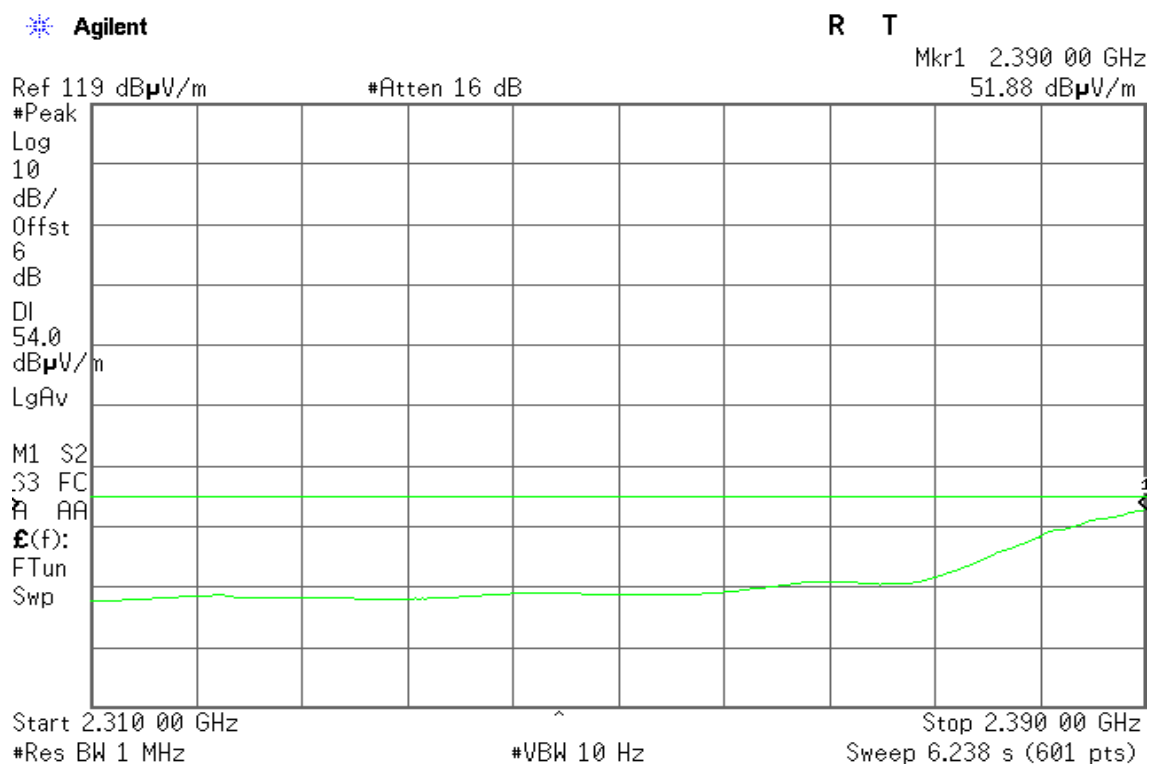
Start 2.483 50 GHz

^ Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 1.287 s (601 pts)

**Band Edges (IEEE 802.11n HT 40 MHz mode / CH Low)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**



Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.387 87 GHz

55.59 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

 $\mathcal{E}(f)$ :

FTun

Swp

Start 2.310 00 GHz

Stop 2.390 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.389 47 GHz

41.28 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

 $\mathcal{E}(f)$ :

FTun

Swp

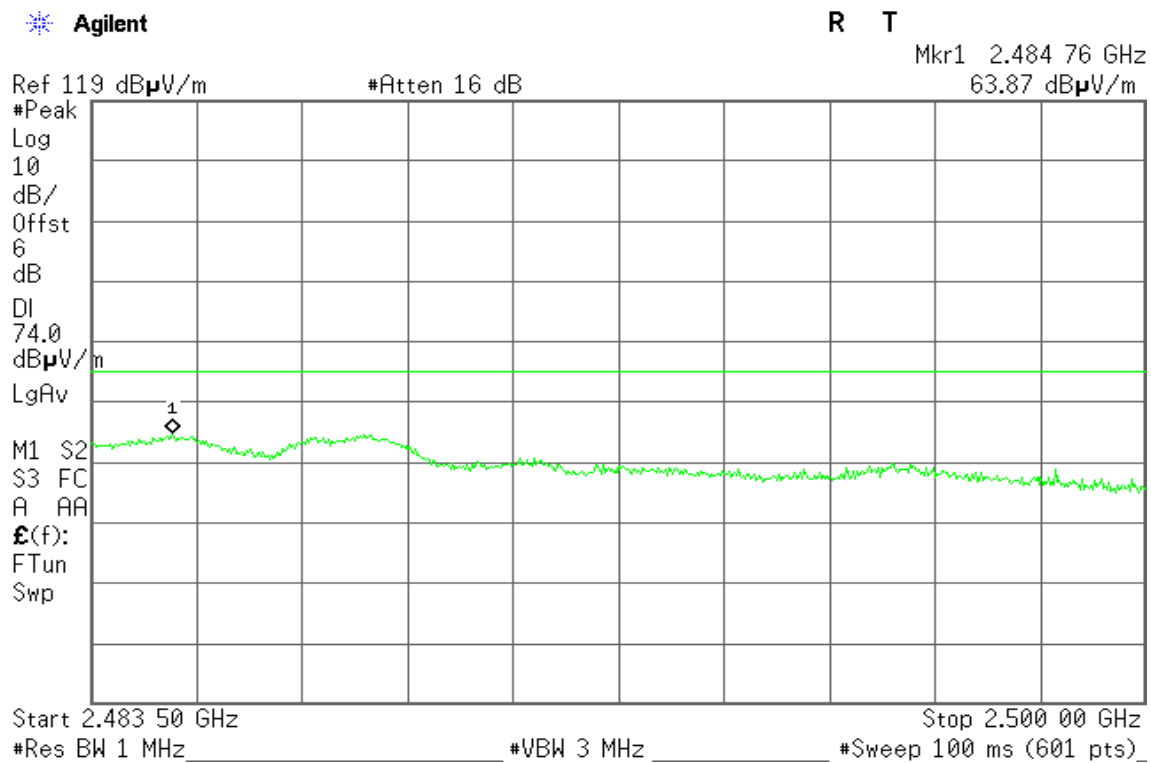
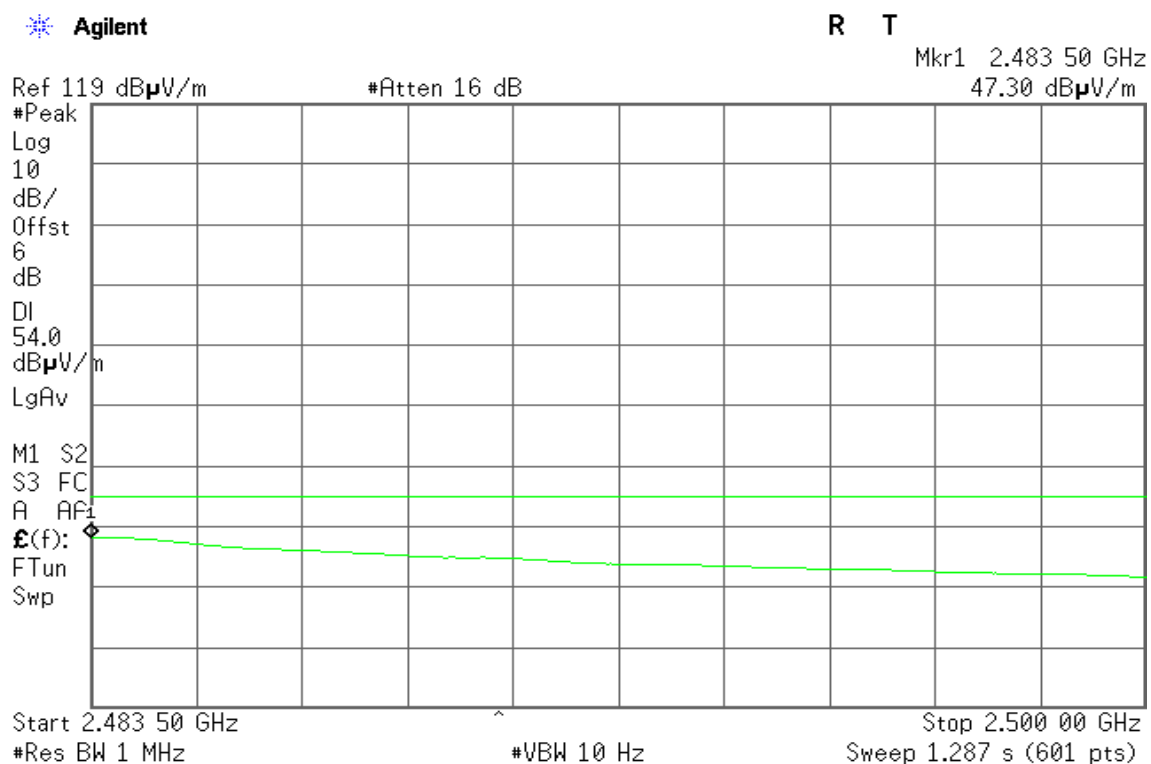
Start 2.310 00 GHz

Stop 2.390 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 6.238 s (601 pts)

**Band Edges (IEEE 802.11n HT 40 MHz mode / CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**



Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.484 79 GHz

55.05 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

 $\mathcal{E}(f)$ :

FTun

Swp

Start 2.483 50 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

#Sweep 100 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 75 GHz

39.14 dB $\mu$ V/mRef 119 dB $\mu$ V/m

#Atten 16 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

LgAv

M1 S2

S3 FC

A AA

 $\mathcal{E}(f)$ :

FTun

Swp

Start 2.483 50 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

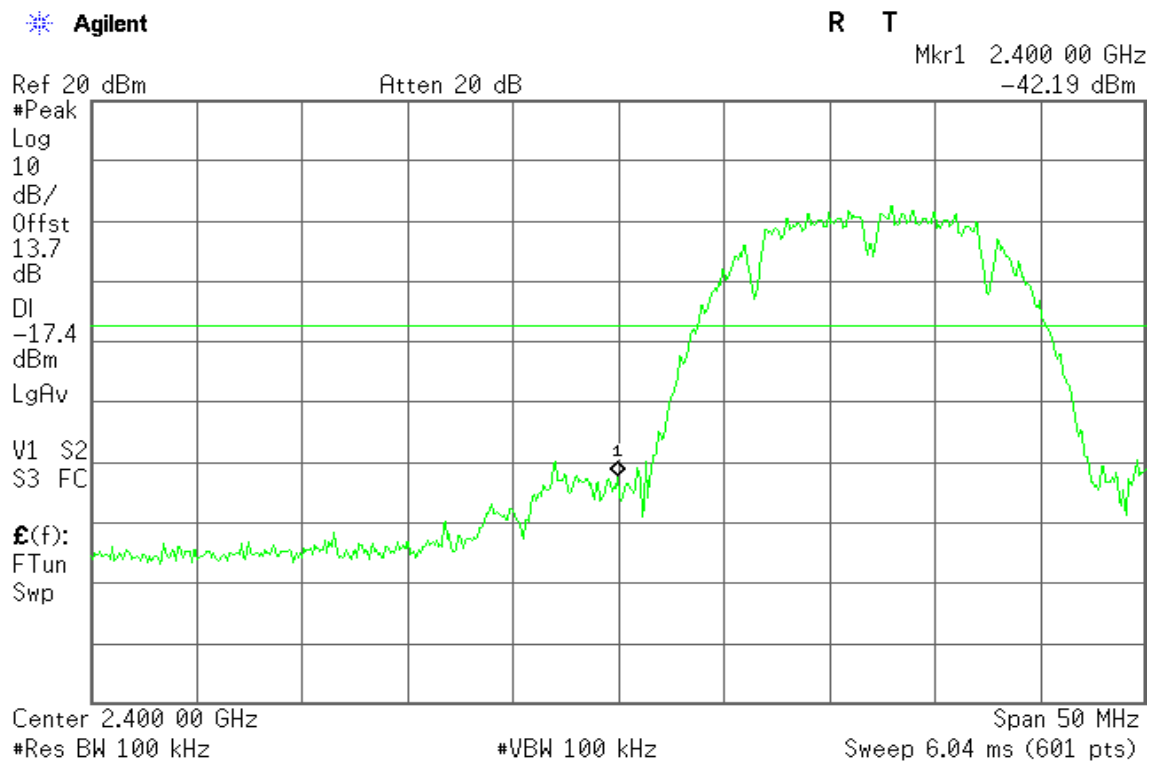
#VBW 10 Hz

Sweep 1.287 s (601 pts)

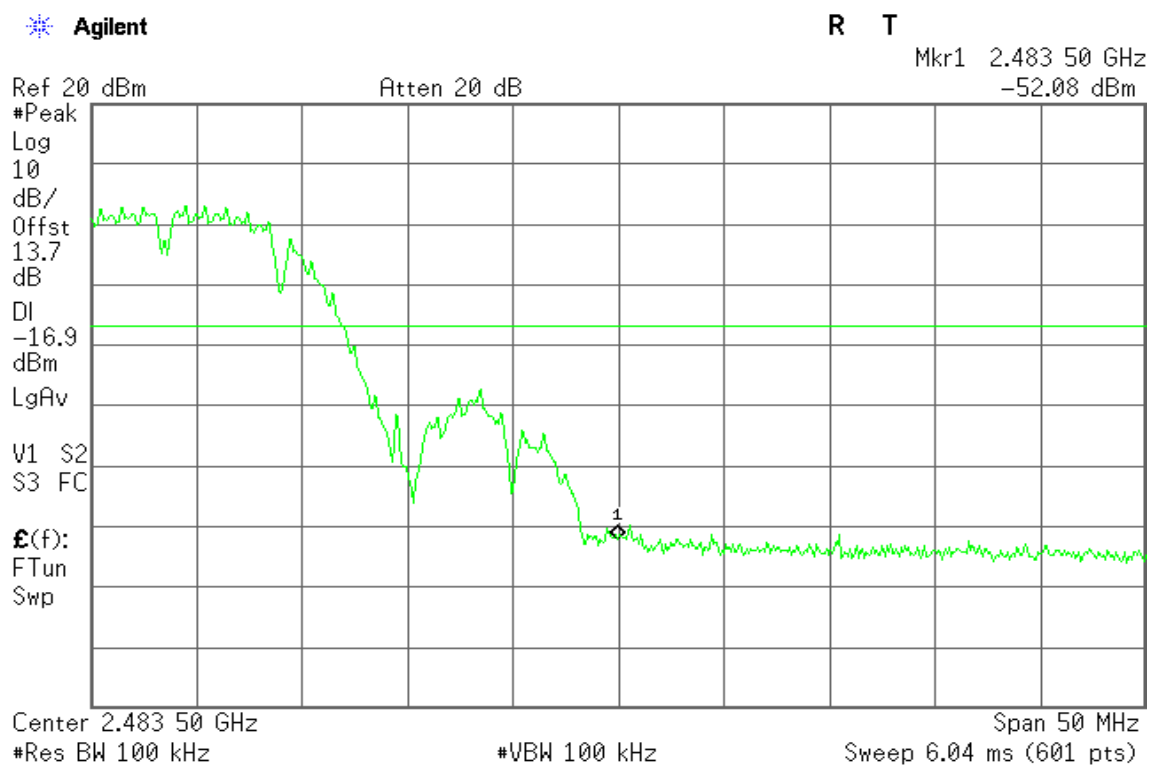


## Test Plot

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

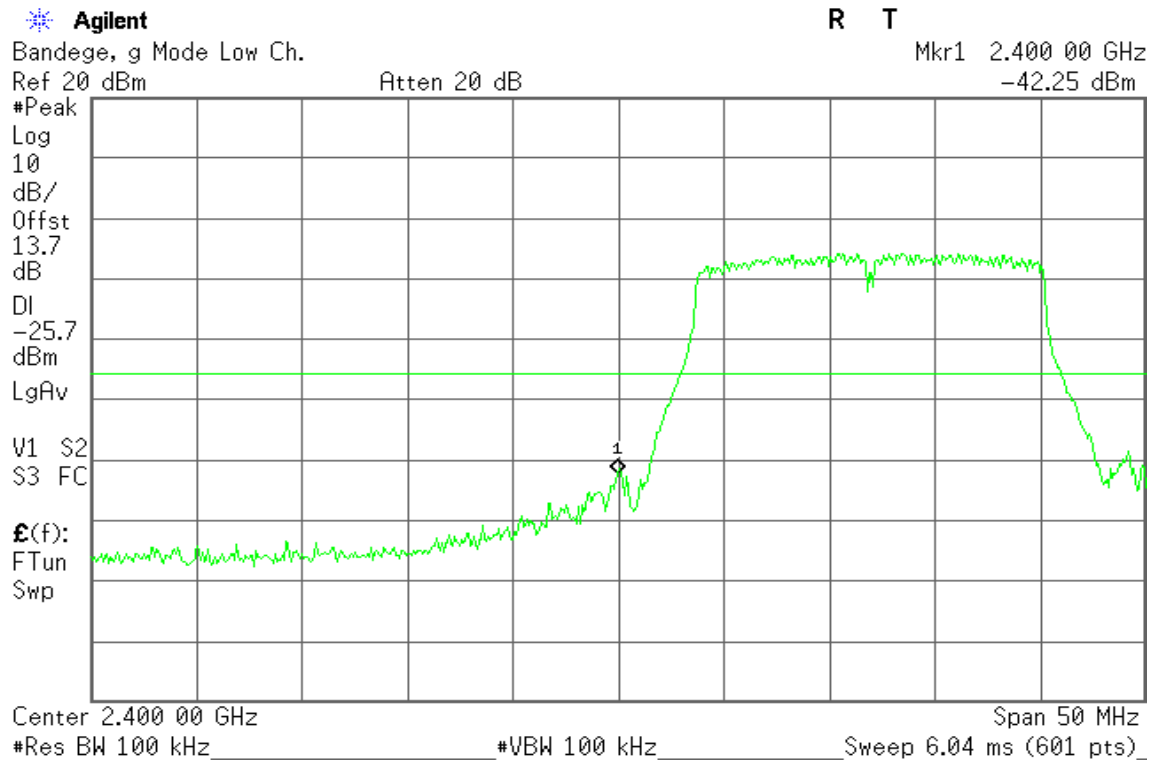


### Conducted Band Edges (IEEE 802.11b mode / CH High)

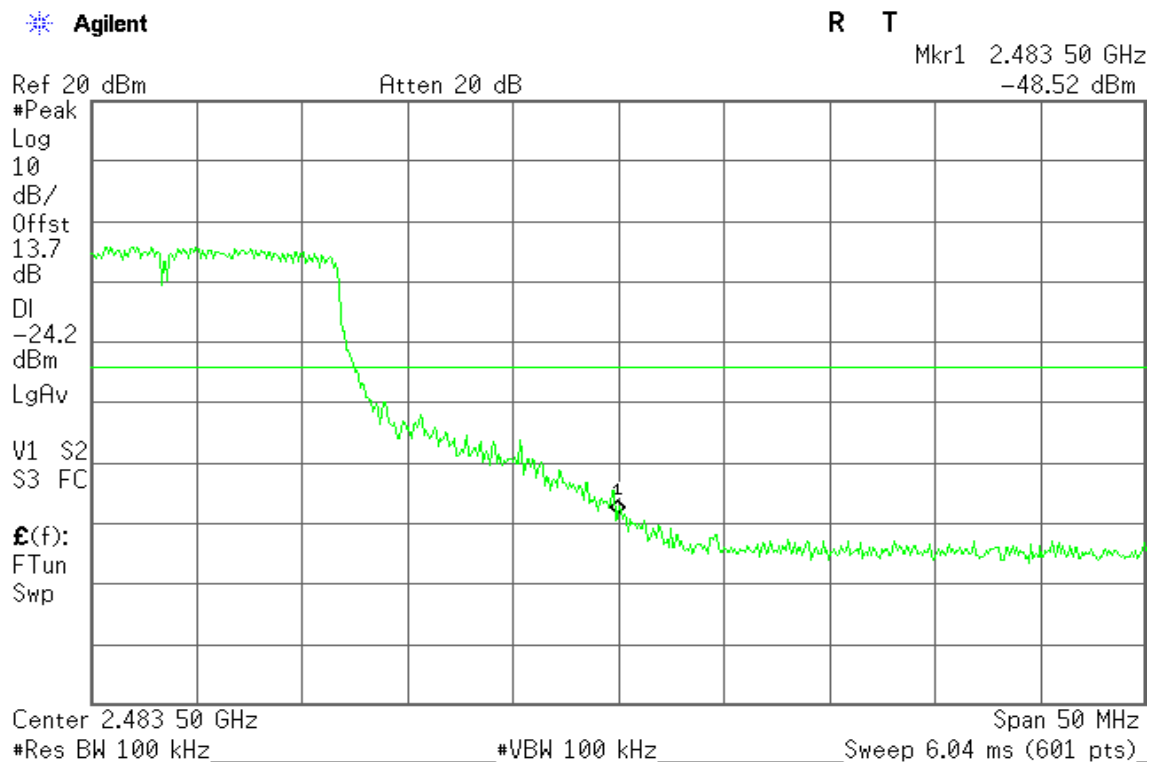




### Conducted Band Edges (IEEE 802.11g mode / CH Low)

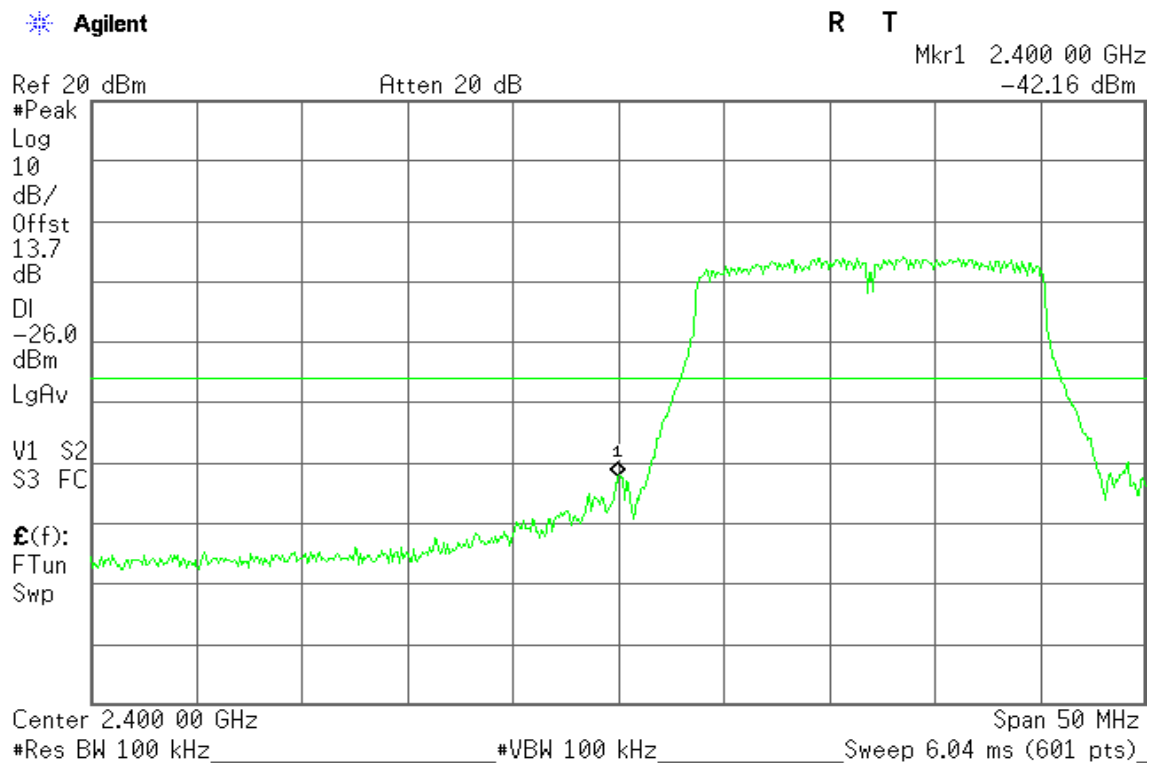


### Conducted Band Edges (IEEE 802.11g mode / CH High)

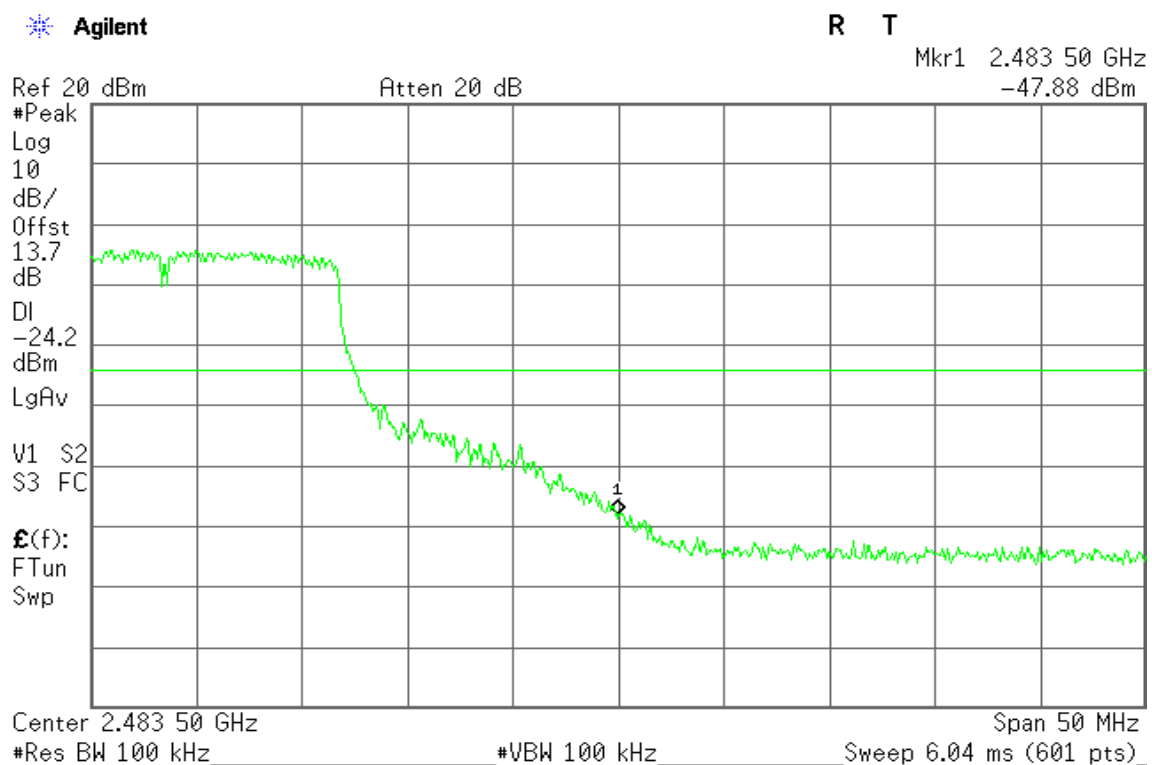




### Conducted Band Edges (IEEE 802.11n HT 20 MHz mode / CH Low)

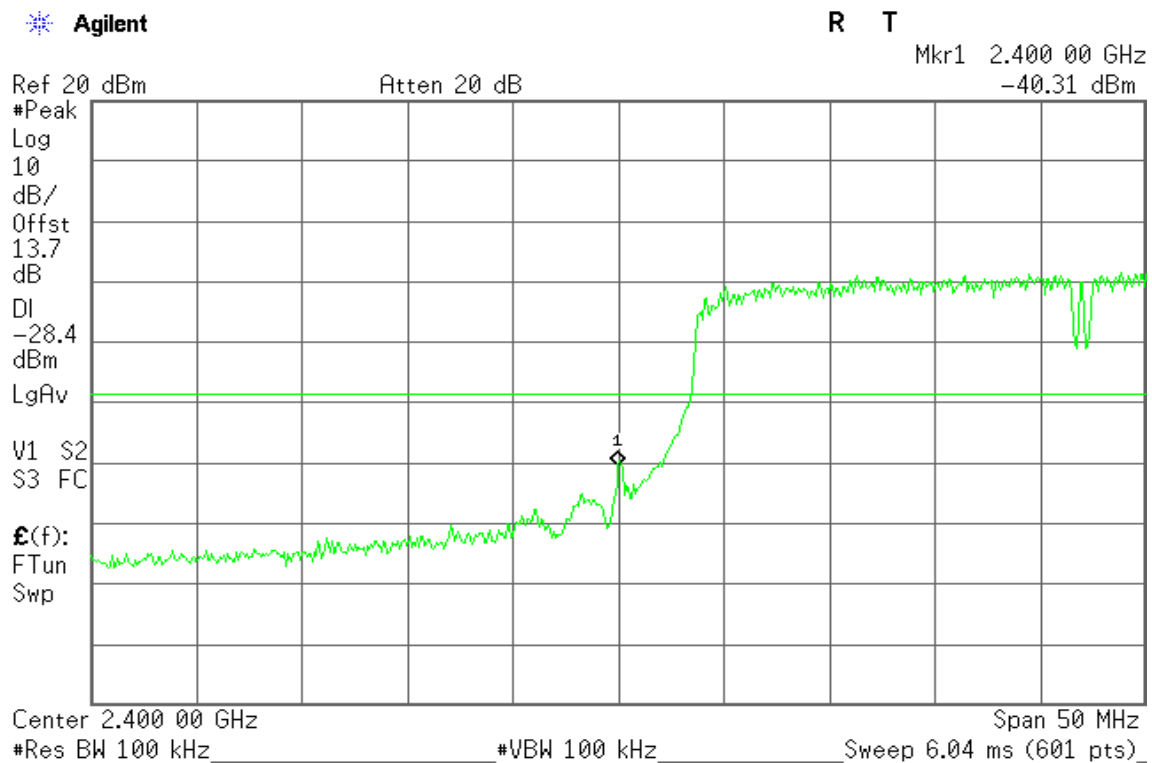


### Conducted Band Edges (IEEE 802.11n HT 20 MHz mode / CH High)

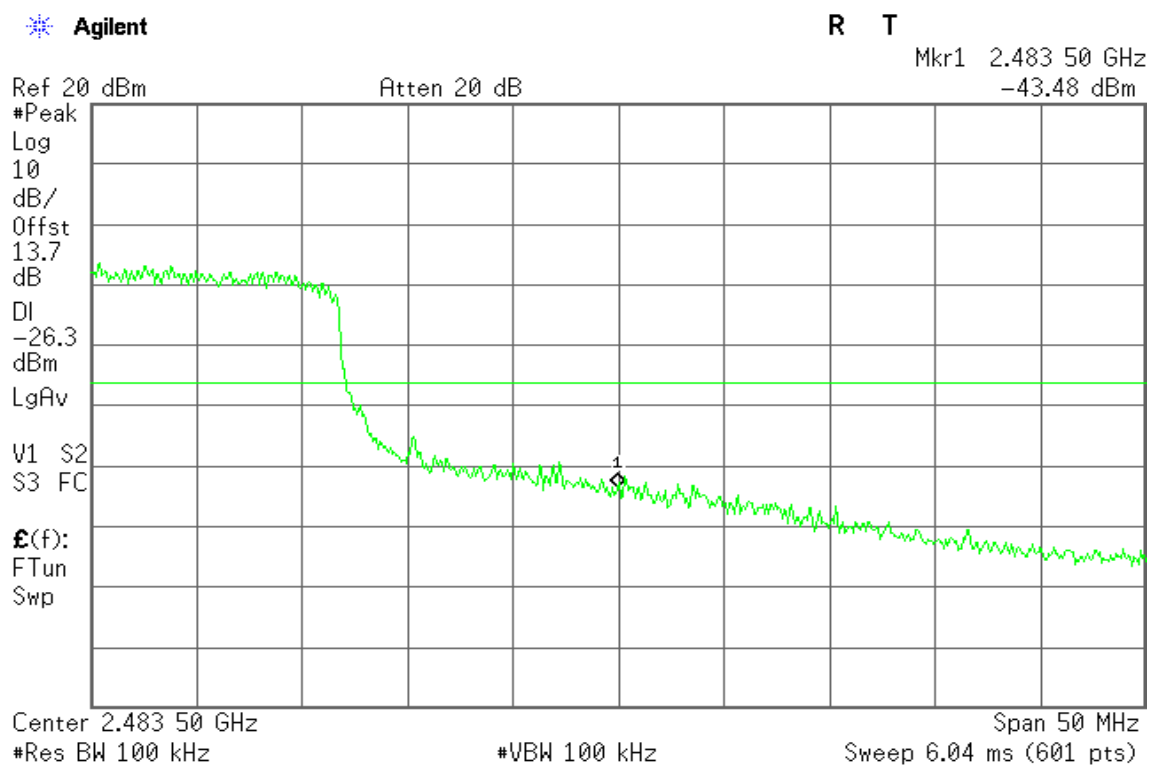




### Conducted Band Edges (IEEE 802.11n HT 40 MHz mode / CH Low)



### Conducted Band Edges (IEEE 802.11n HT 40 MHz mode / CH High)



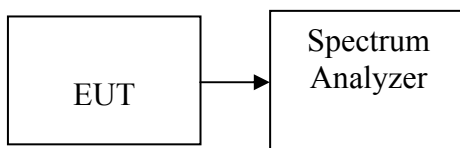


## 7.4 PEAK POWER SPECTRAL DENSITY

### LIMIT

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

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. Set the RBW = 100 kHz, VBW  $\geq$  300 kHz, span 5-30% greater than EBW, Detector = peak, Trace mode = max hold, Sweep = auto couple. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where  $BWCF = 10\log(3\text{ kHz}/100\text{ kHz} = -15.2\text{ dB})$ . Record the maximum reading. Repeat the above procedure until the measurements for all frequencies are completed.

**TEST RESULTS***No non-compliance noted***Test Data****Test mode: IEEE 802.11b mode**

Channel	Frequency (MHz)	100kHz PPSD (dBm)	3kHz PPSD (dBm)	Limit (dBm)	Result
Low	2412	2.51	-12.69	8	PASS
Mid	2442	4.03	-11.17		PASS
High	2462	3.94	-11.26		PASS

**Test mode: IEEE 802.11g mode**

Channel	Frequency (MHz)	100kHz PPSD (dBm)	3kHz PPSD (dBm)	Limit (dBm)	Result
Low	2412	-4.89	-20.09	8	PASS
Mid	2442	-3.73	-18.93		PASS
High	2462	-3.52	-18.72		PASS

**Test mode: IEEE 802.11n HT 20 MHz mode**

Channel	Frequency (MHz)	100kHz PPSD (dBm)	3kHz PPSD (dBm)	Limit (dBm)	Result
Low	2412	-5.48	-20.68	8	PASS
Mid	2442	-3.72	-18.92		PASS
High	2462	-3.63	-18.83		PASS

**Test mode: IEEE 802.11n HT 40 MHz mode**

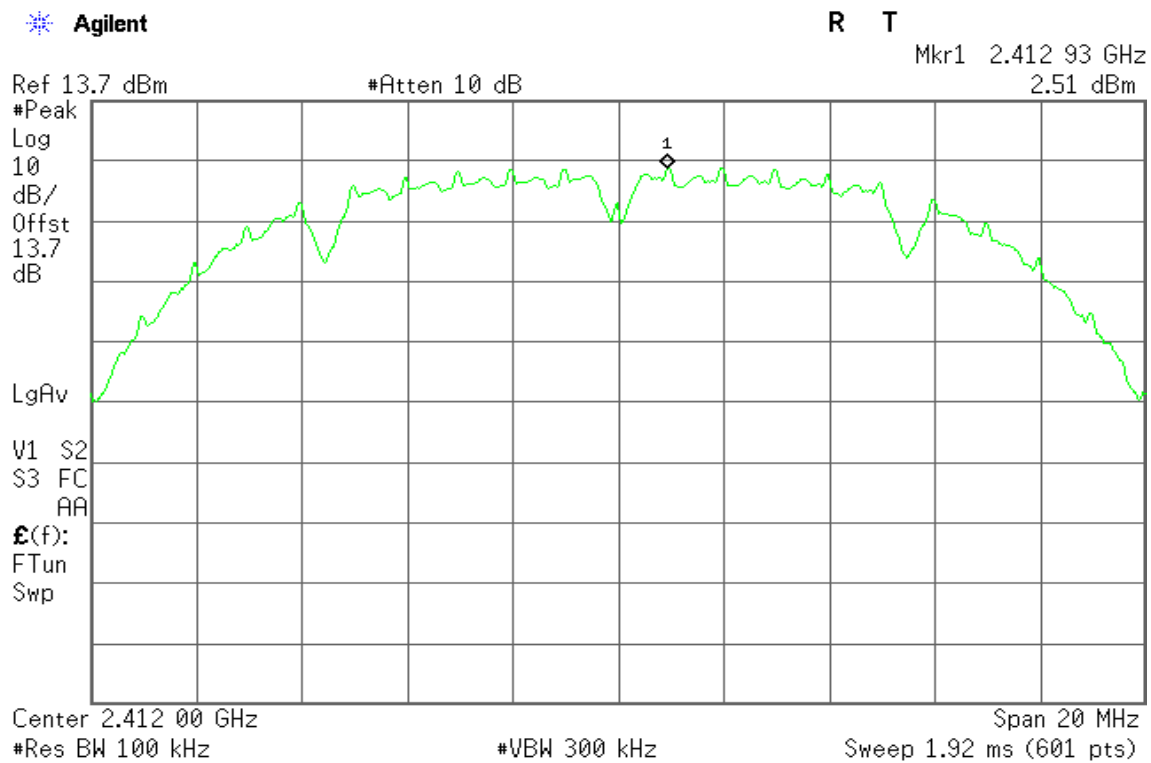
Channel	Frequency (MHz)	100kHz PPSD (dBm)	3kHz PPSD (dBm)	Limit (dBm)	Result
Low	2412	-7.3	-22.50	8	PASS
Mid	2442	-5.89	-21.09		PASS
High	2462	-5.96	-21.16		PASS



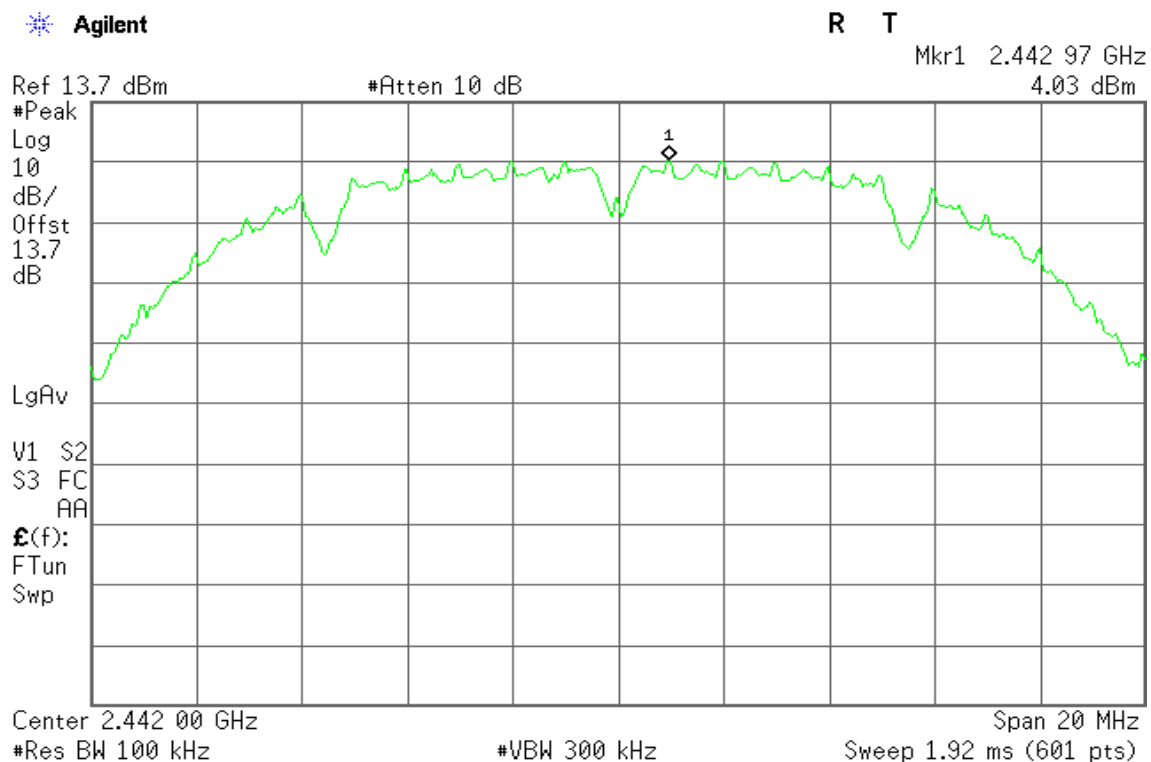
## Test Plot

### IEEE 802.11b mode

### PPSD (CH Low)

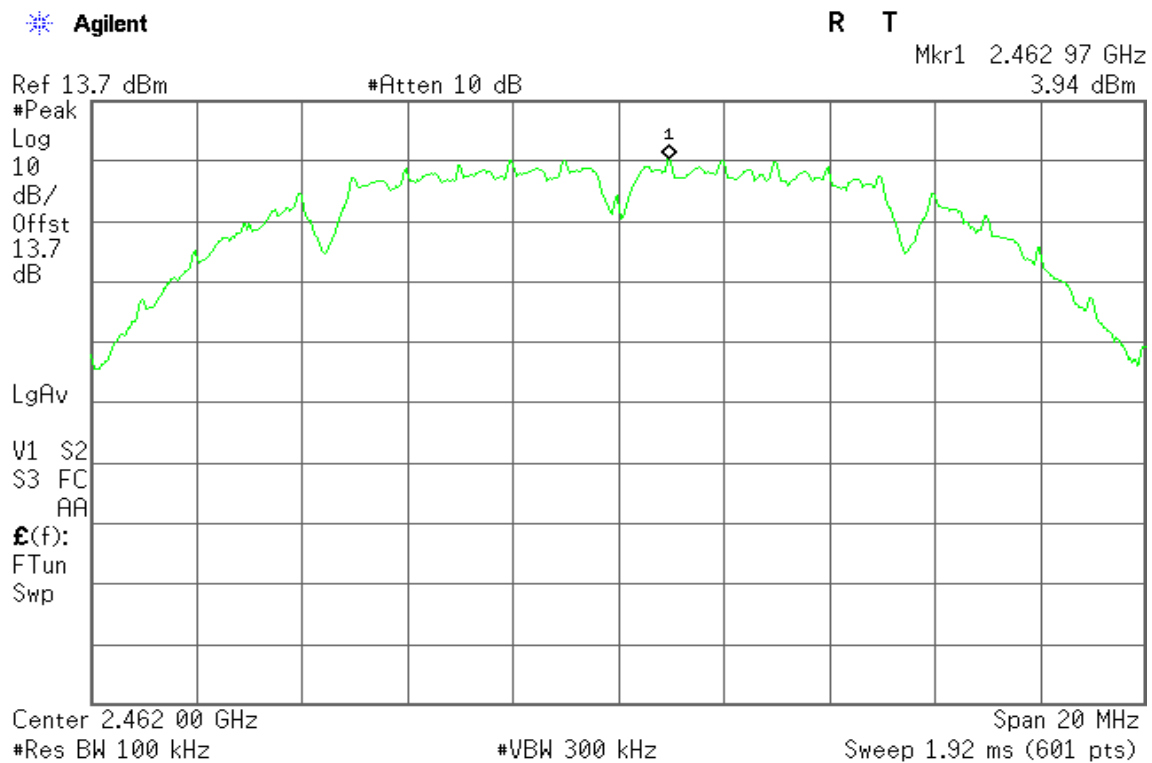


### PPSD (CH Mid)



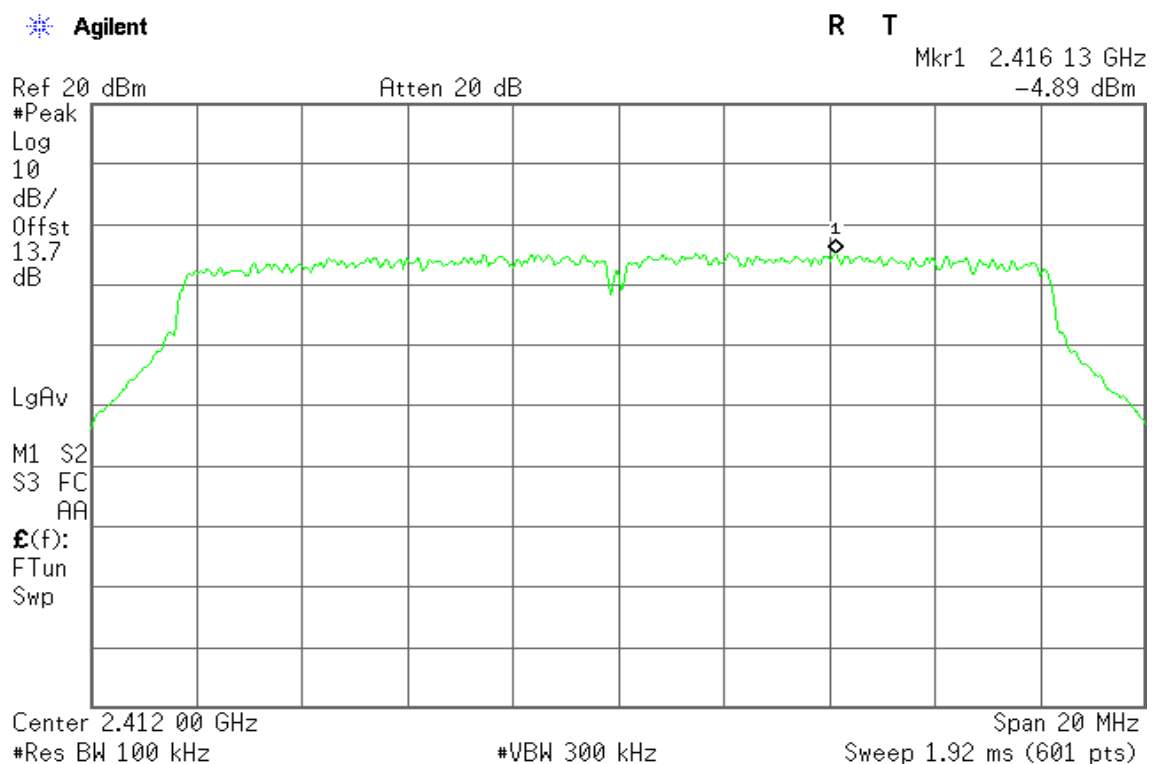


## PPSD (CH High)



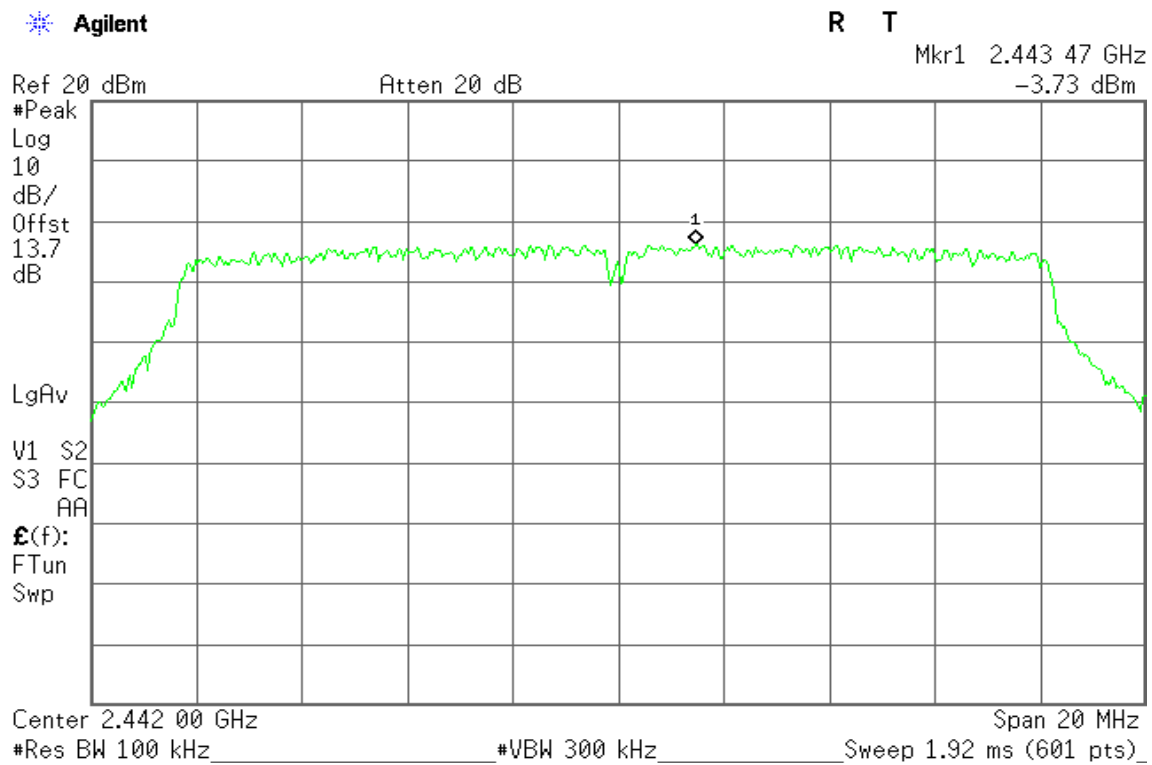
## IEEE 802.11g mode

### PPSD (CH Low)

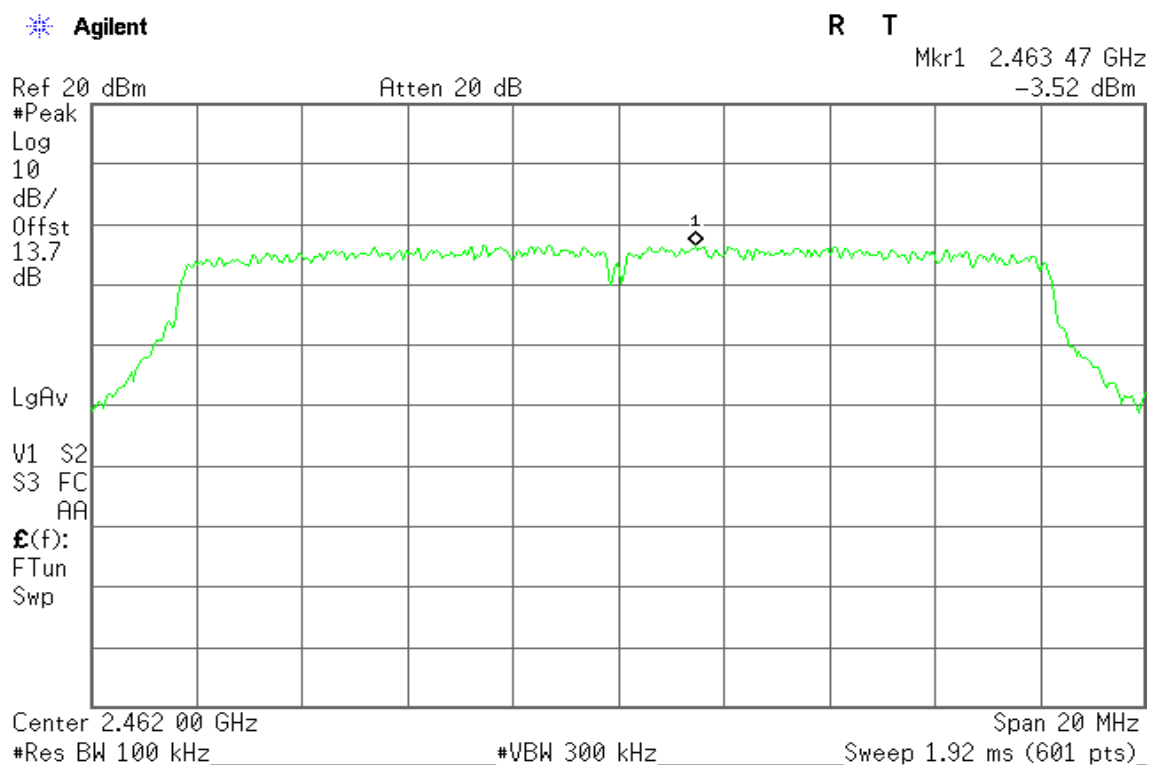




## PPSD (CH Mid)



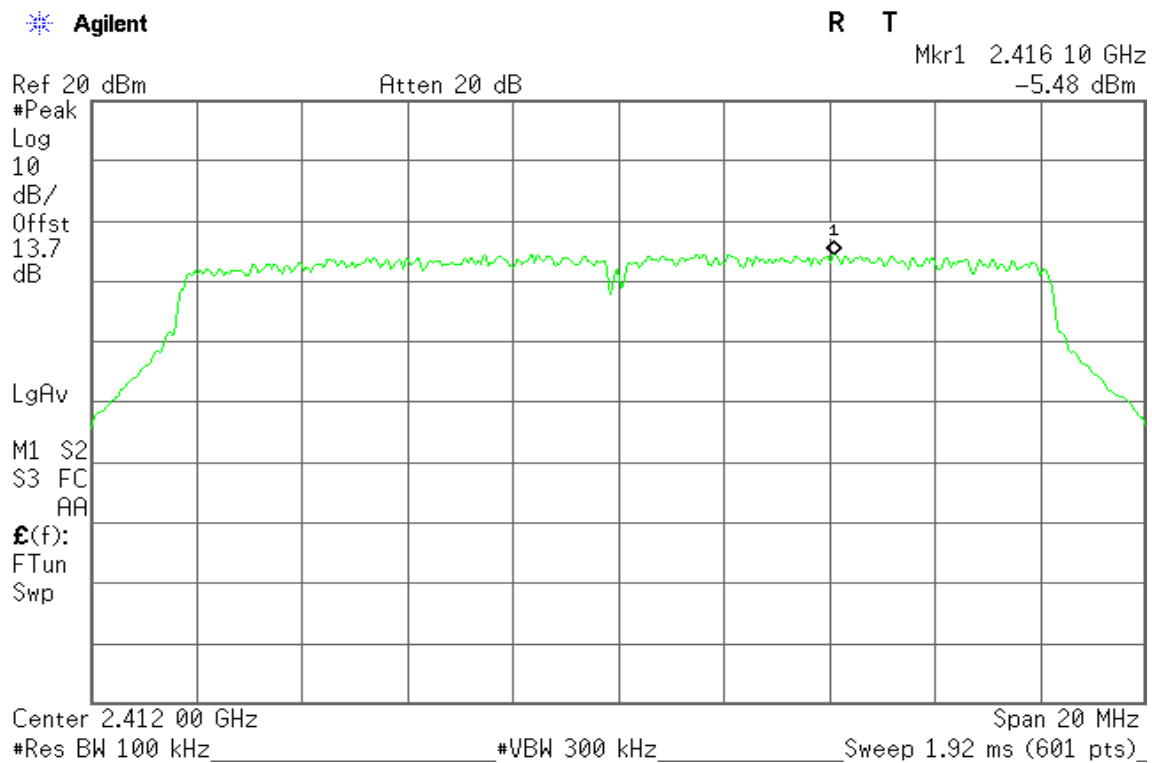
## PPSD (CH High)



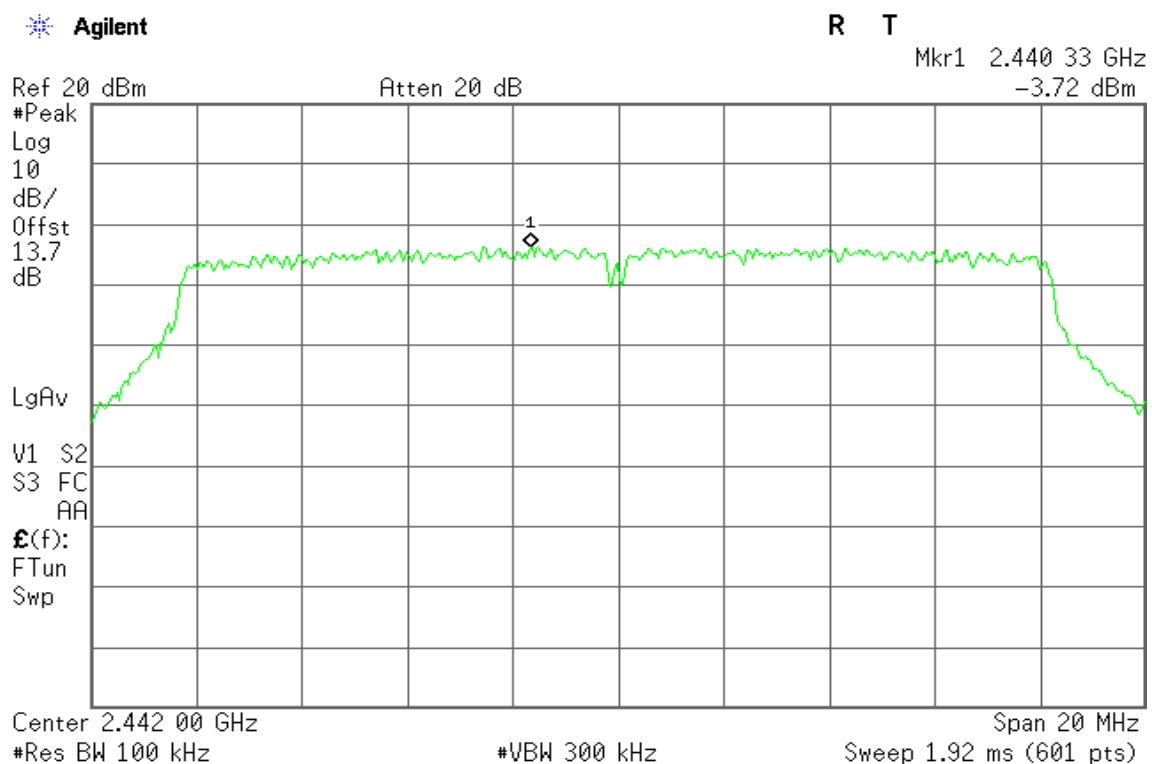


## IEEE 802.11n HT 20 MHz mode

### PPSD (CH Low)

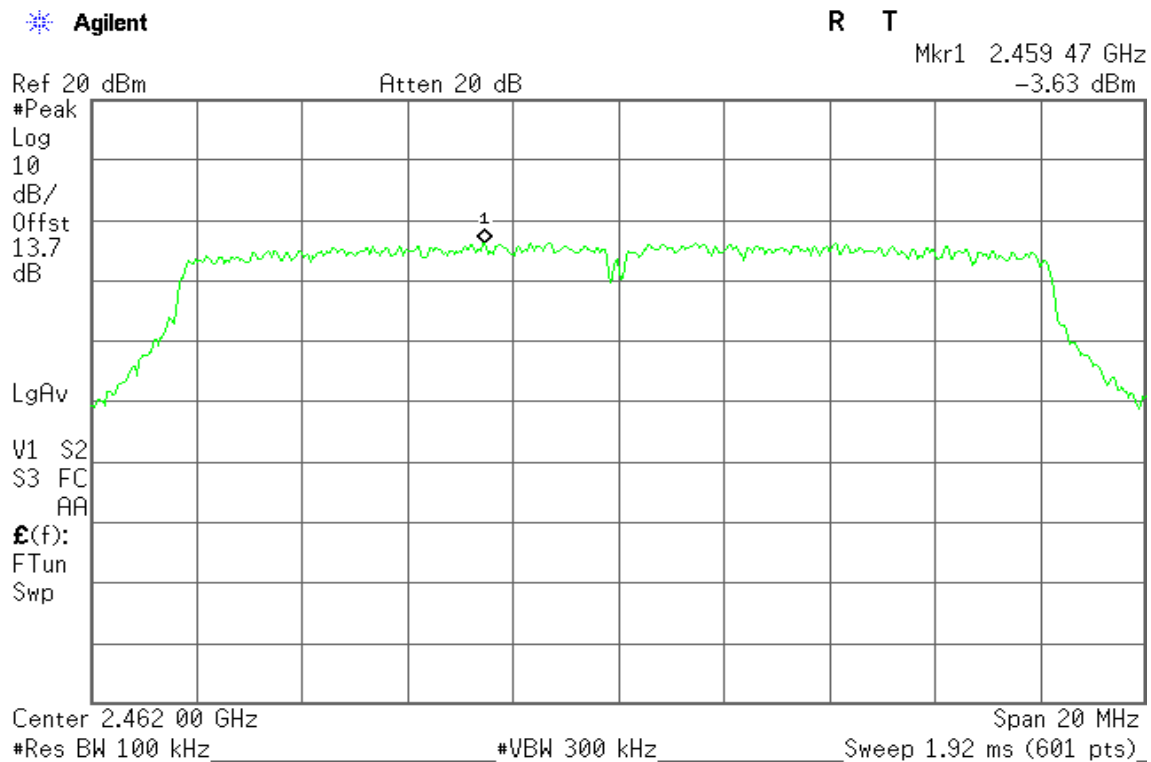


### PPSD (CH Mid)



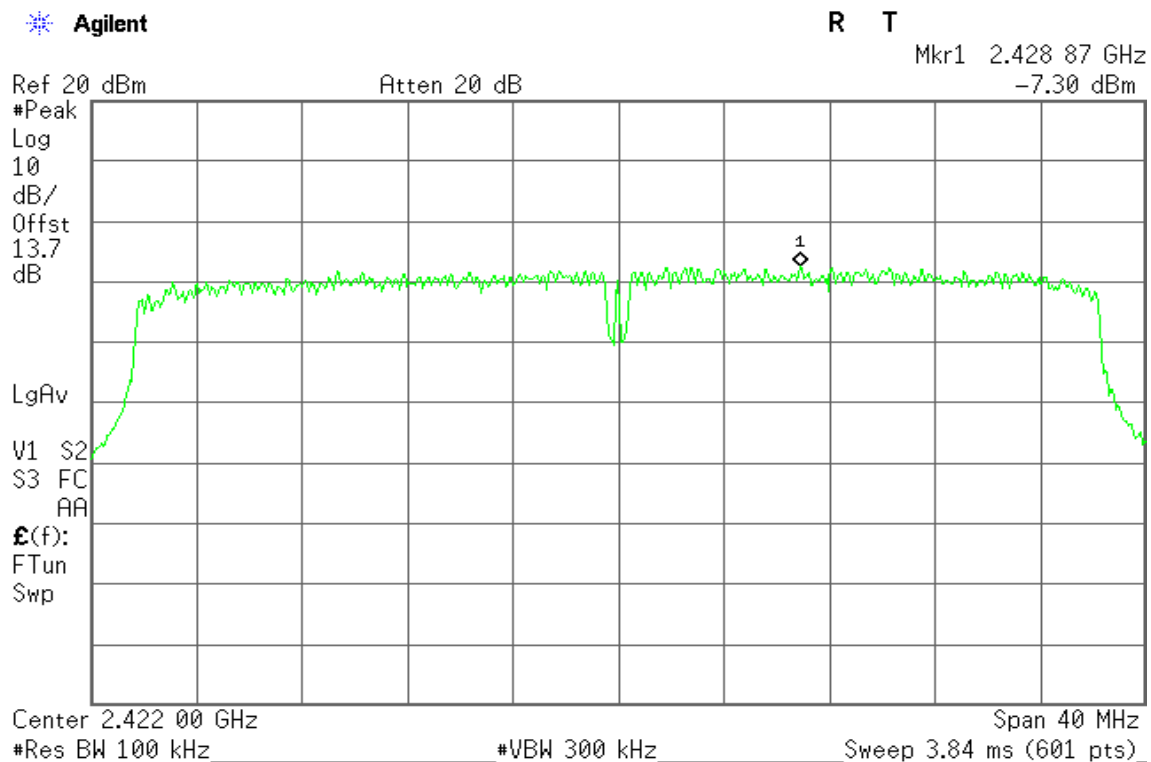


## PPSD (CH High)



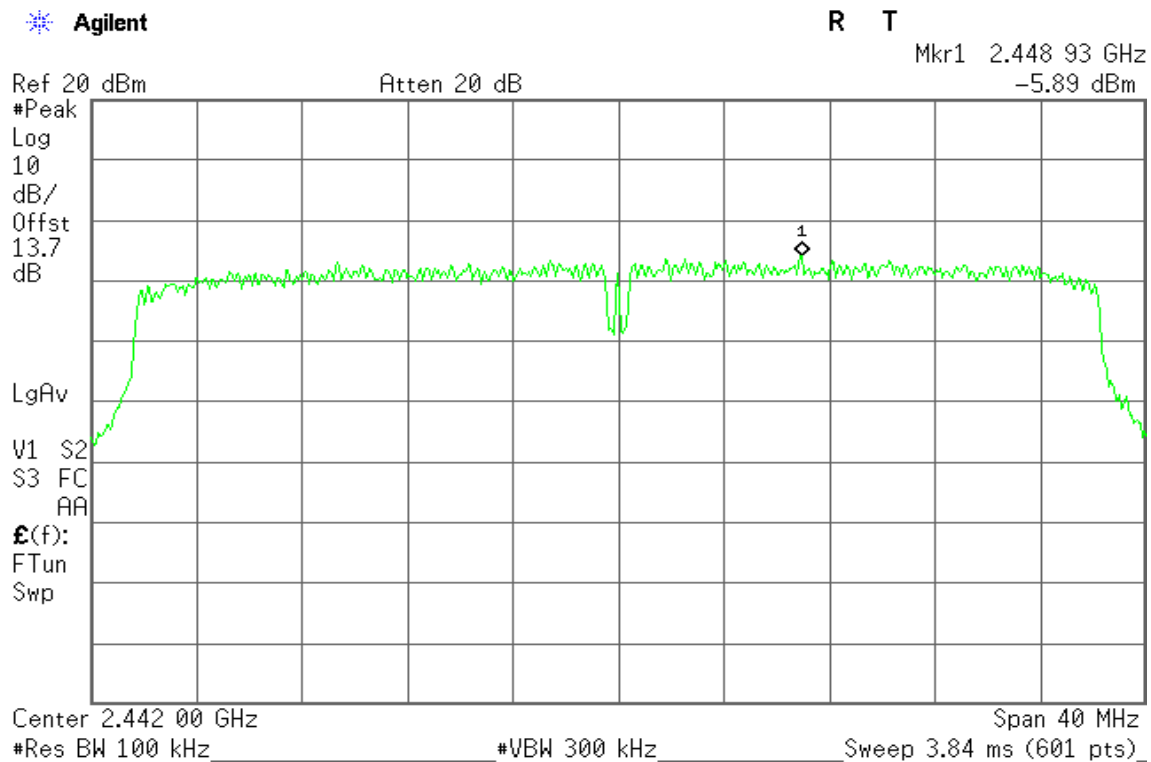
## IEEE 802.11n HT 40 MHz mode

### PPSD (CH Low)

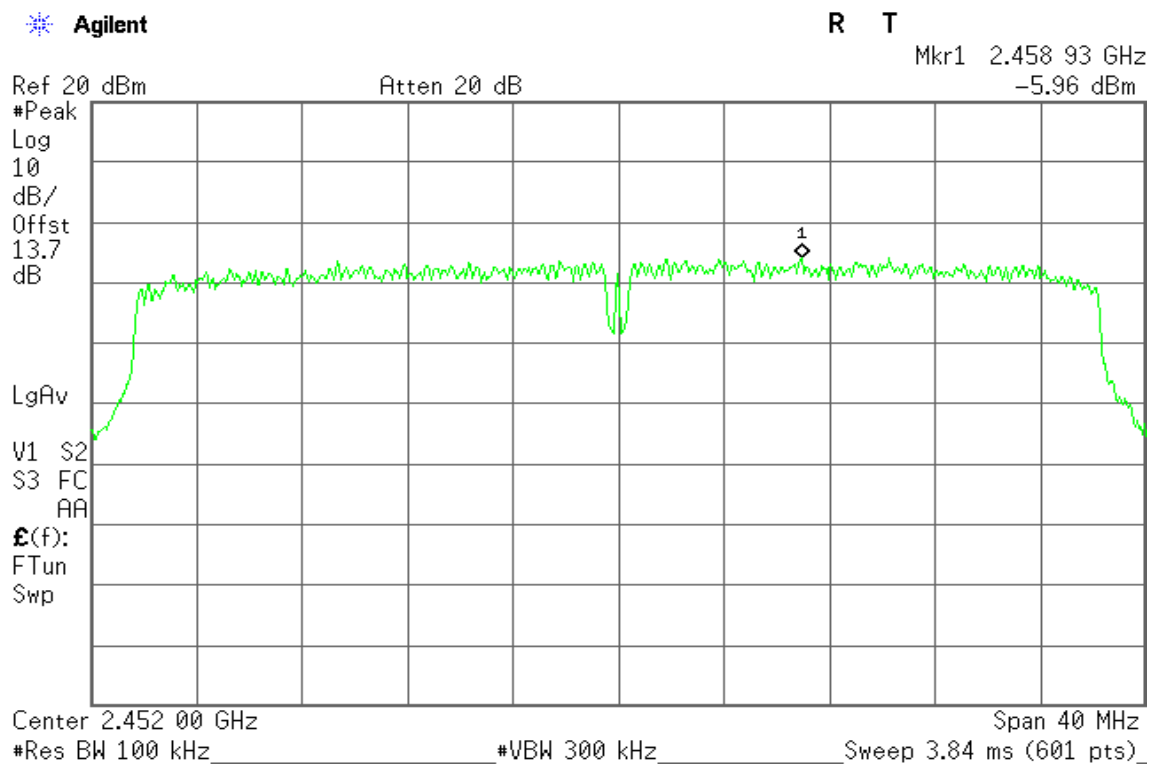




## PPSD (CH Mid)



## PPSD (CH High)





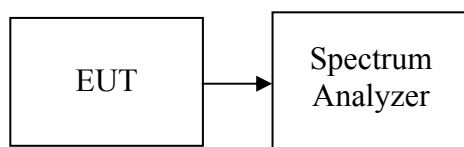
## 7.5 SPURIOUS EMISSIONS

### 7.5.1 Conducted Measurement

#### **LIMIT**

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

#### **Test Configuration**



#### **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 100 kHz.

Measurements are made over the 13GHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

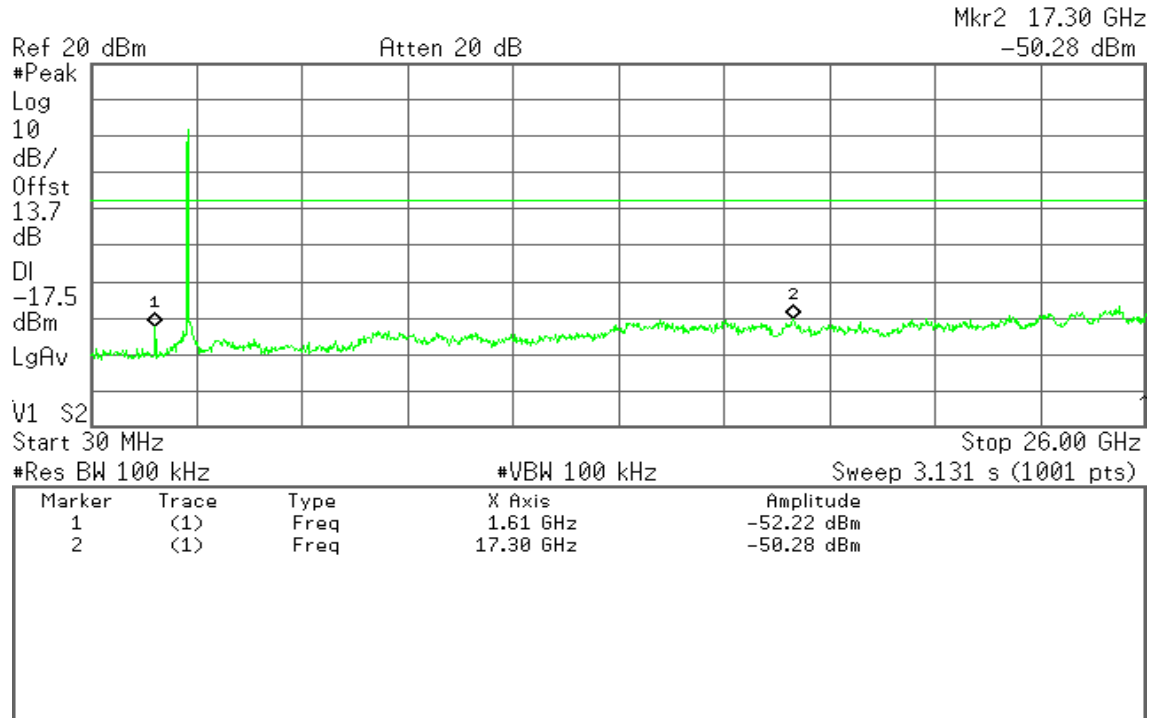
#### **TEST RESULTS**

*No non-compliance noted.*

**Test Plot****IEEE 802.11b mode****CH Low**

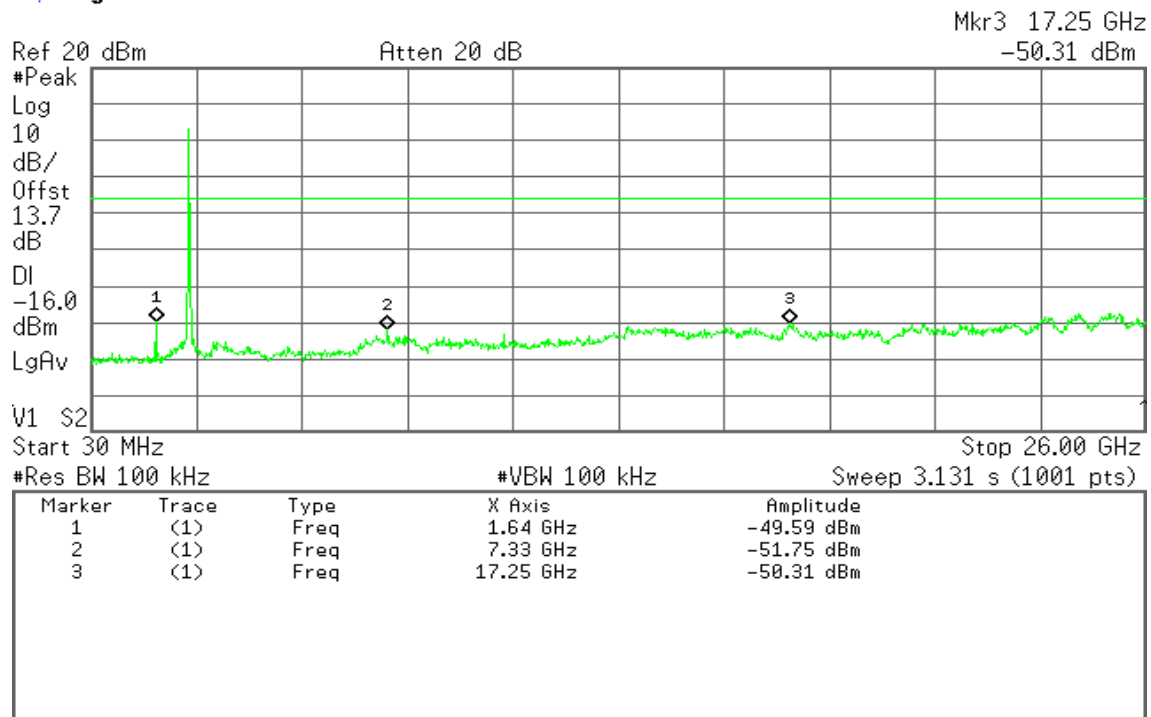
Agilent

R T

**CH Mid**

Agilent

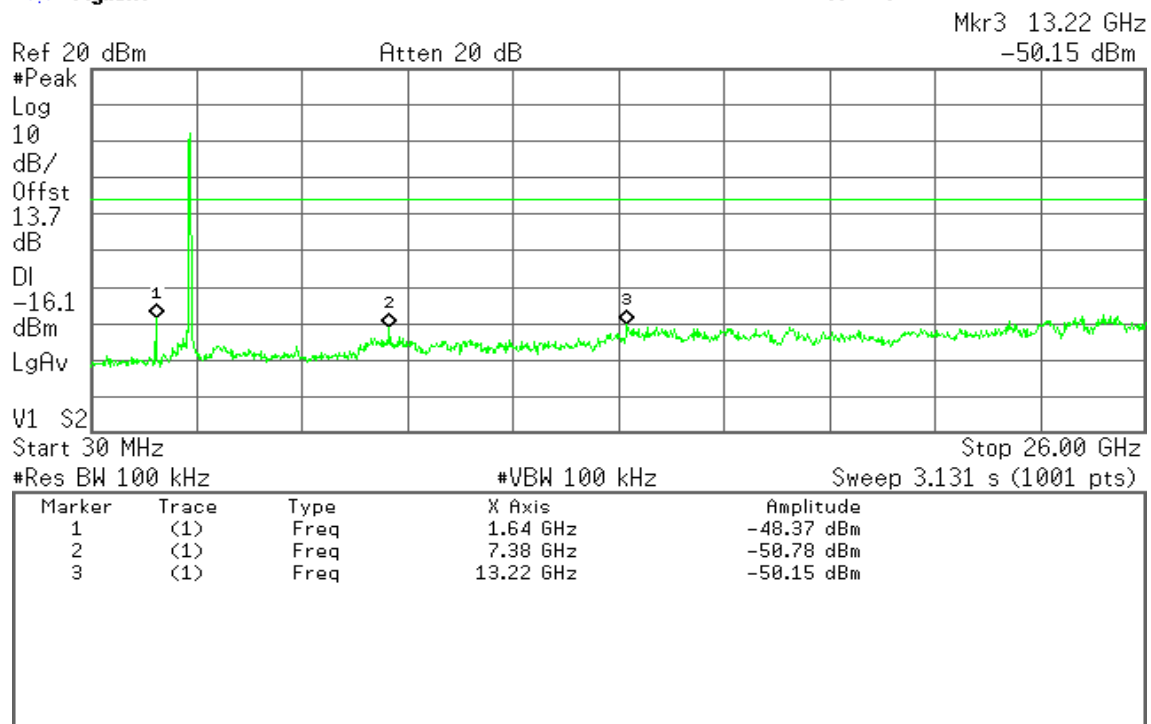
R T



**CH High**

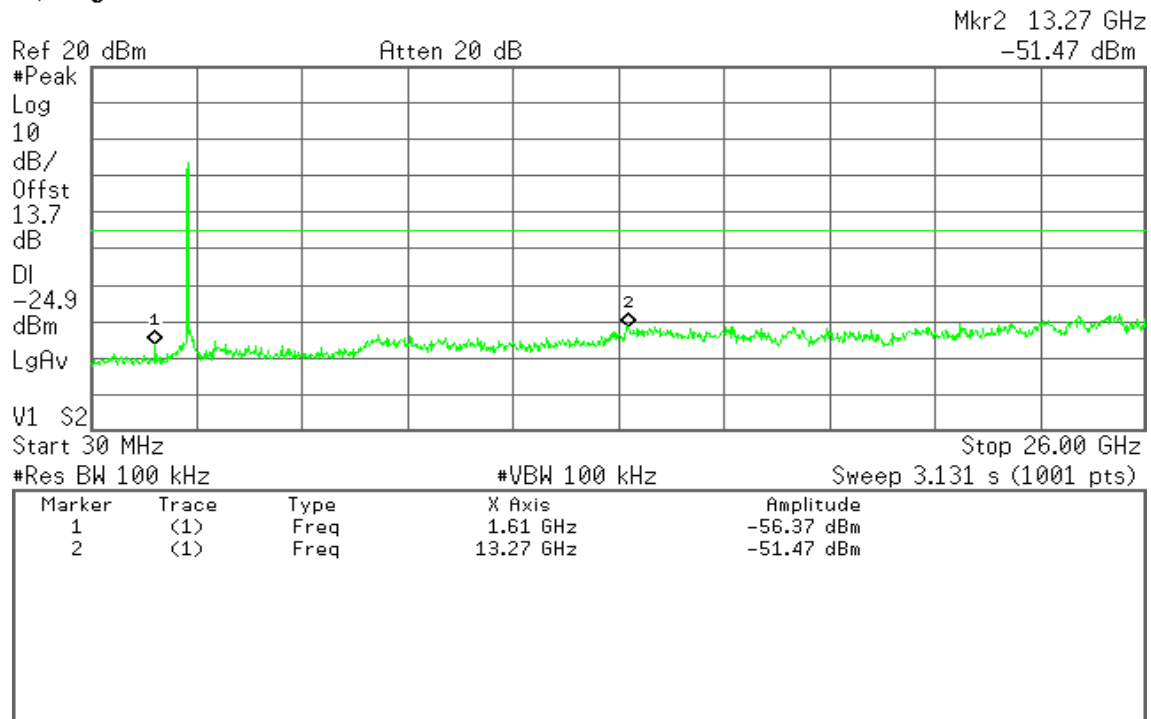
\* Agilent

R T

**IEEE 802.11g mode****CH Low**

\* Agilent

R T

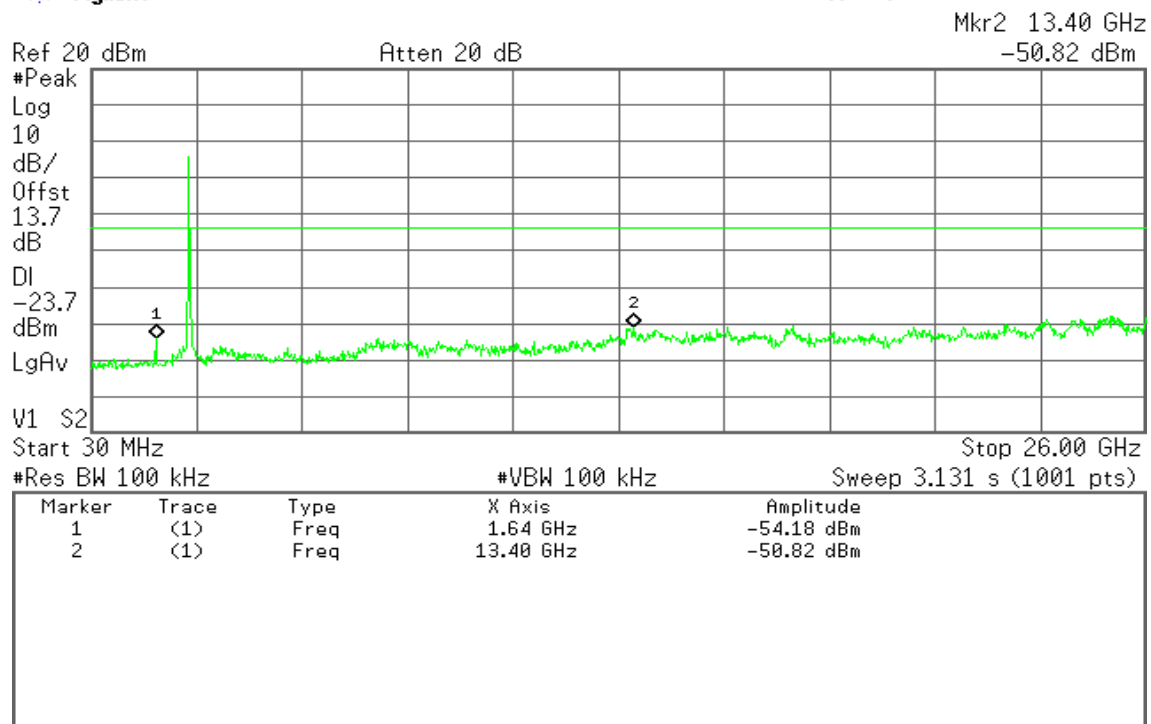




## CH Mid

Agilent

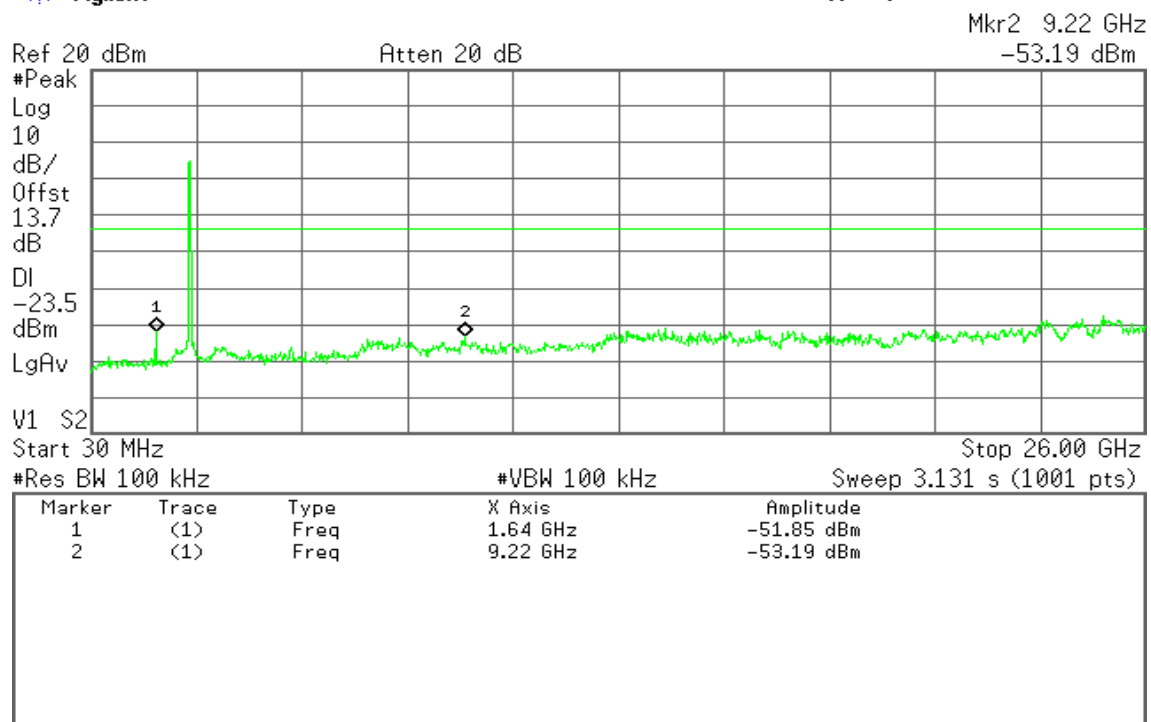
R T



## CH High

Agilent

R T



**IEEE 802.11n HT 20 MHz mode****CH Low**

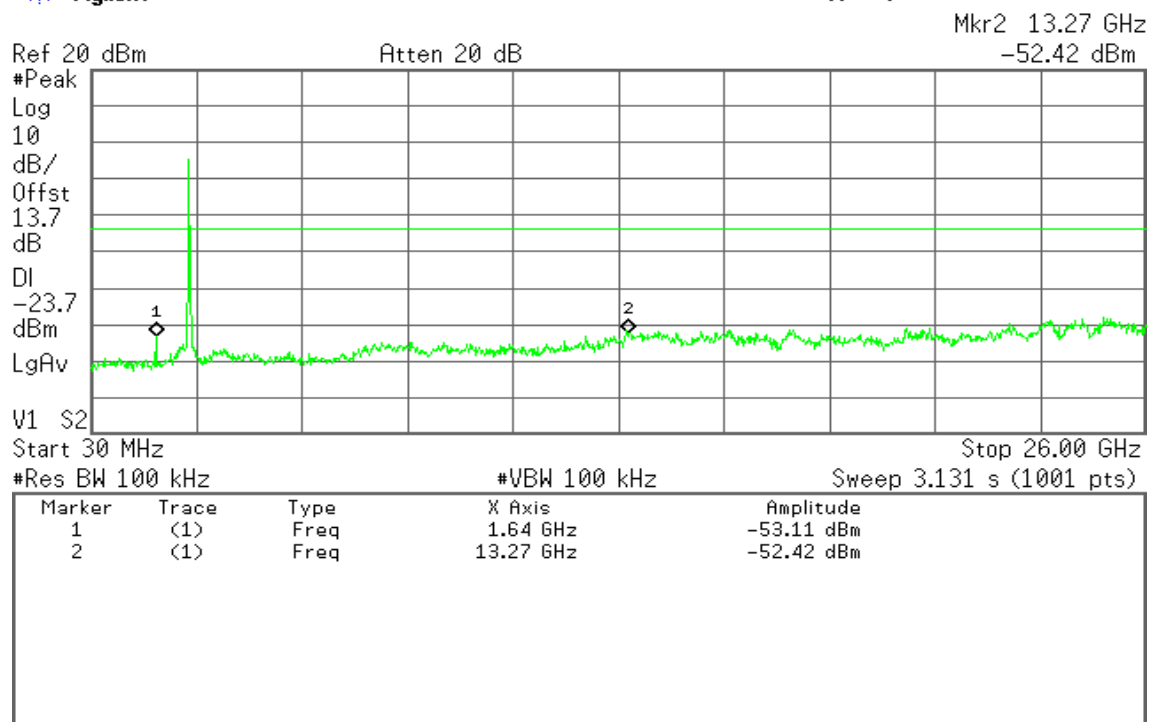
\* Agilent

R T

**CH Mid**

\* Agilent

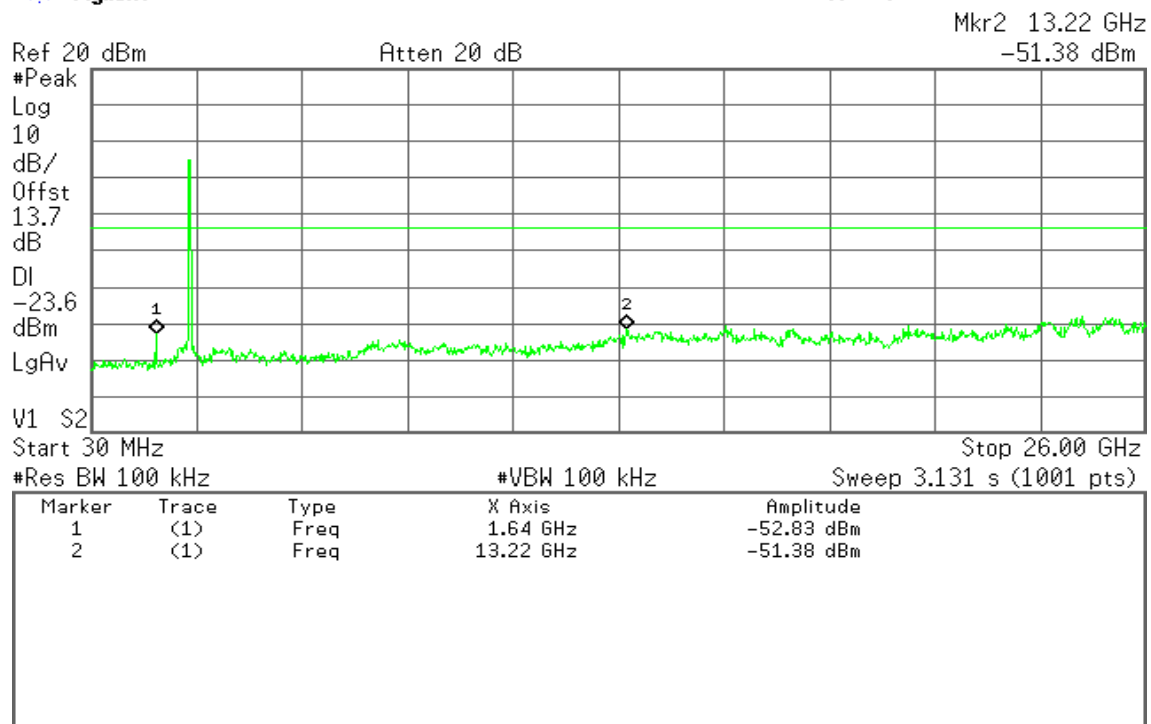
R T



**CH High**

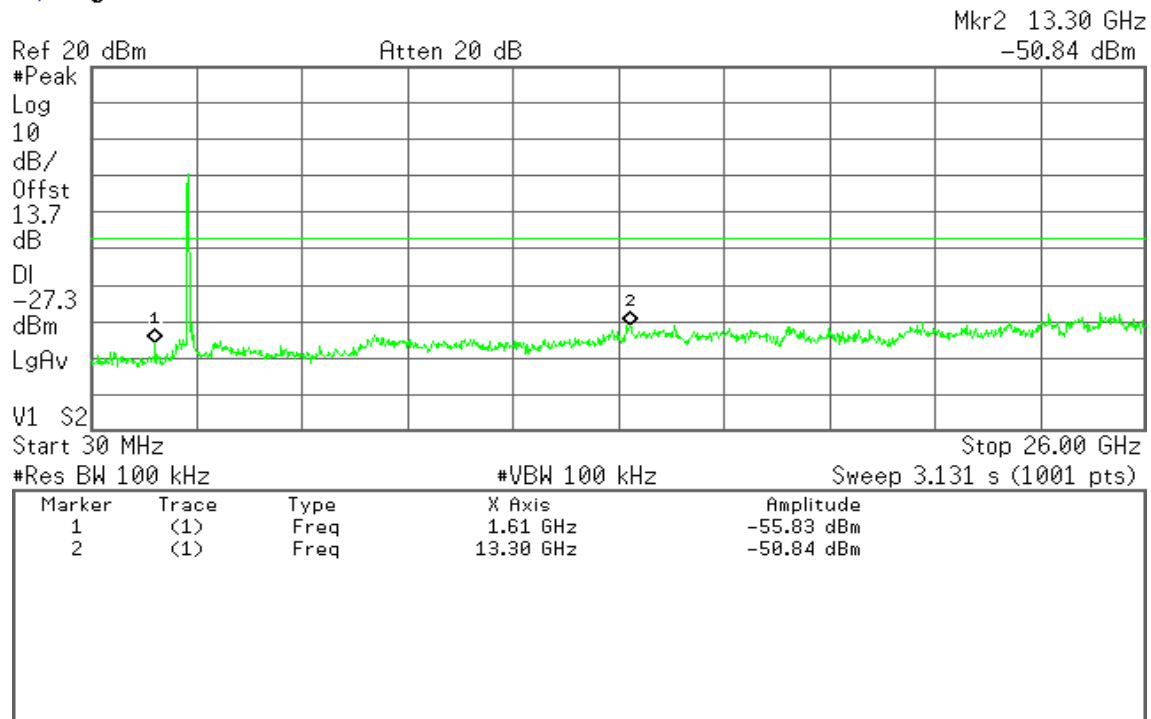
Agilent

R T

**IEEE 802.11n HT 40 MHz mode****CH Low**

Agilent

R T

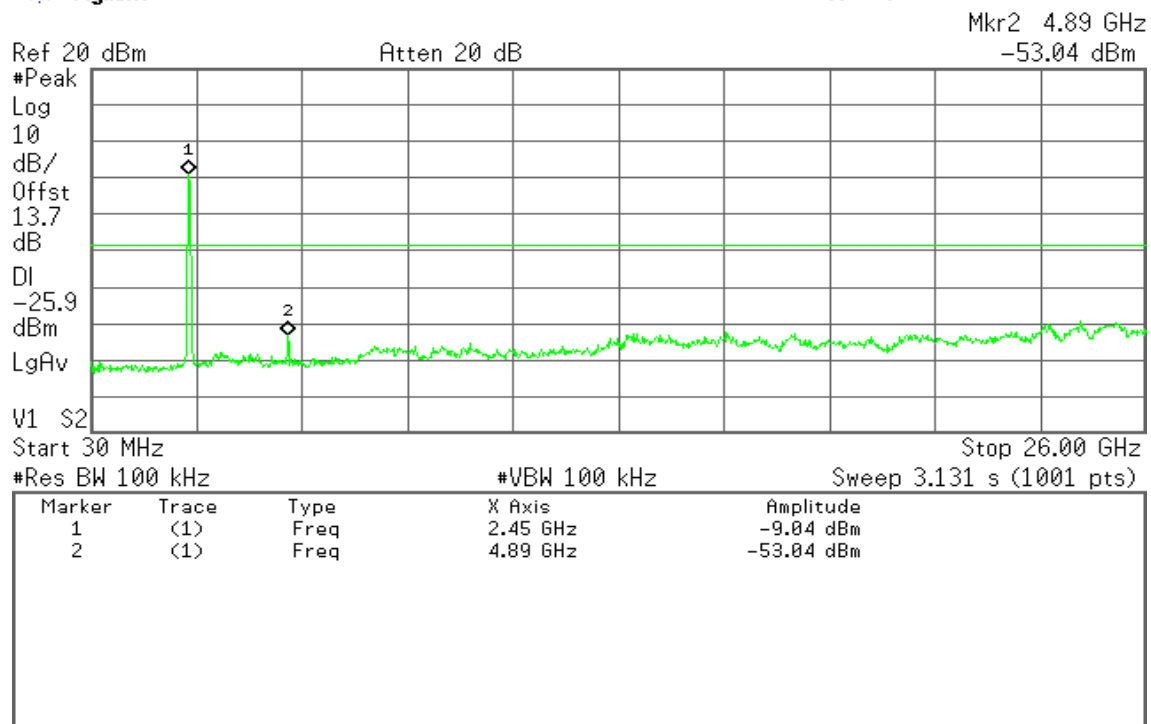




## CH Mid

Agilent

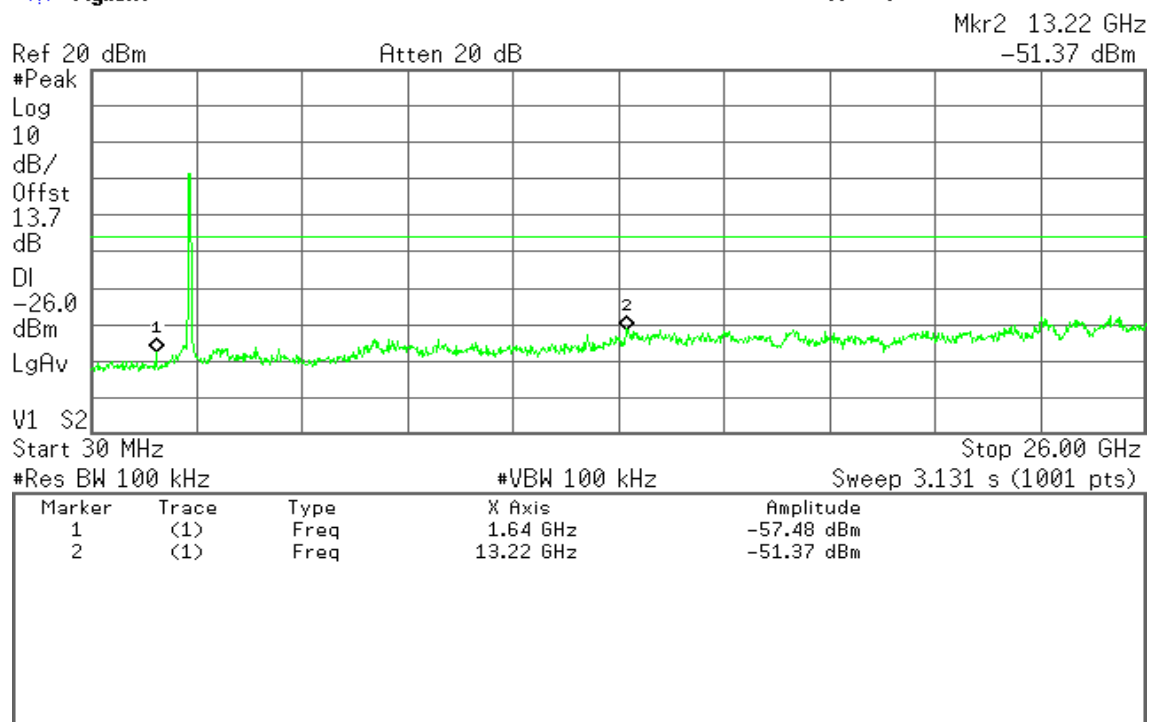
R T



## CH High

Agilent

R T





## 7.6 RADIATED EMISSIONS

### LIMIT

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

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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.

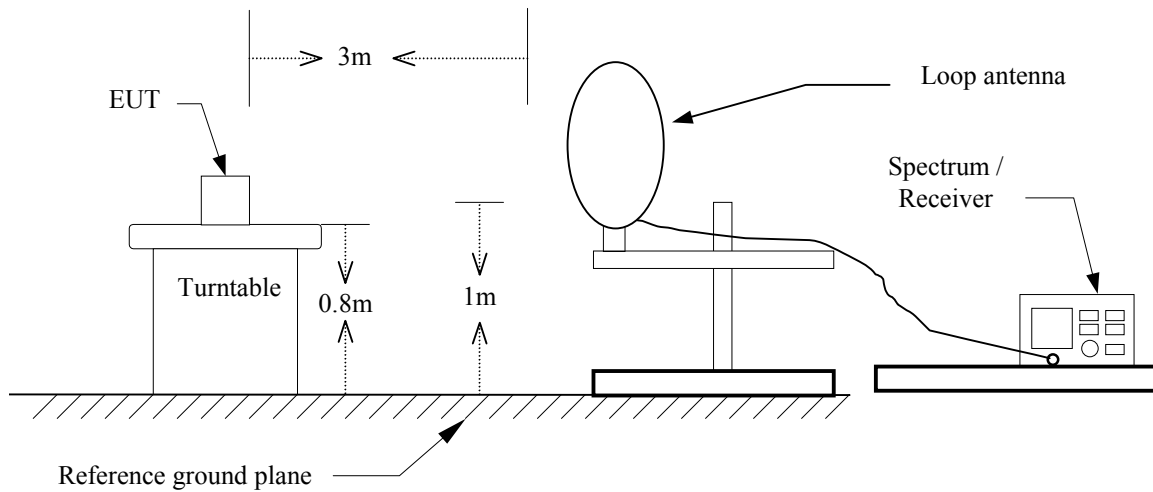
2. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

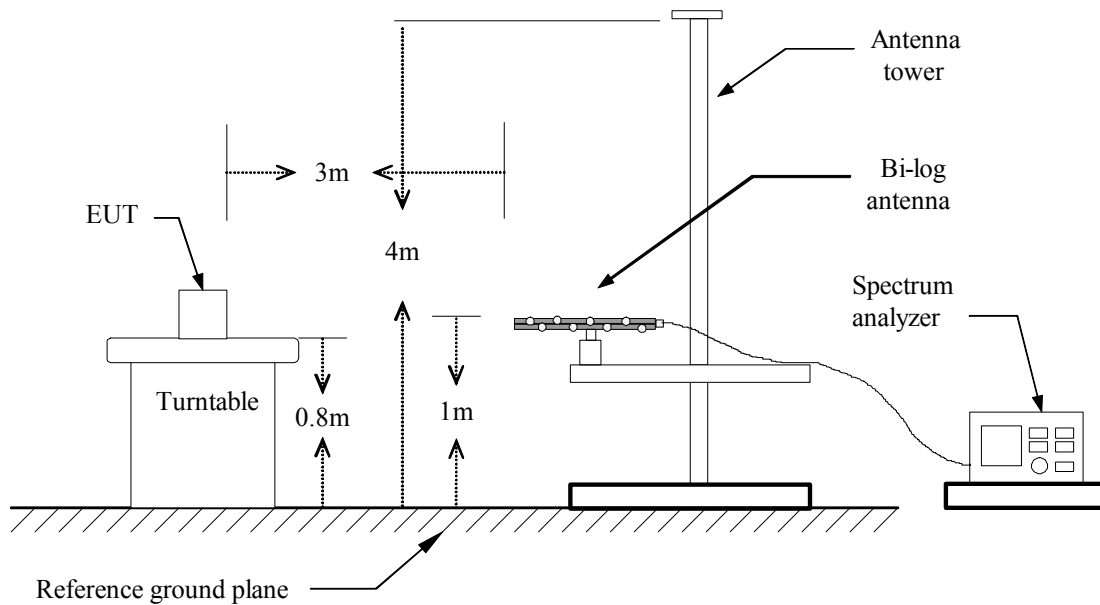


## Test Configuration

9kHz ~ 30MHz

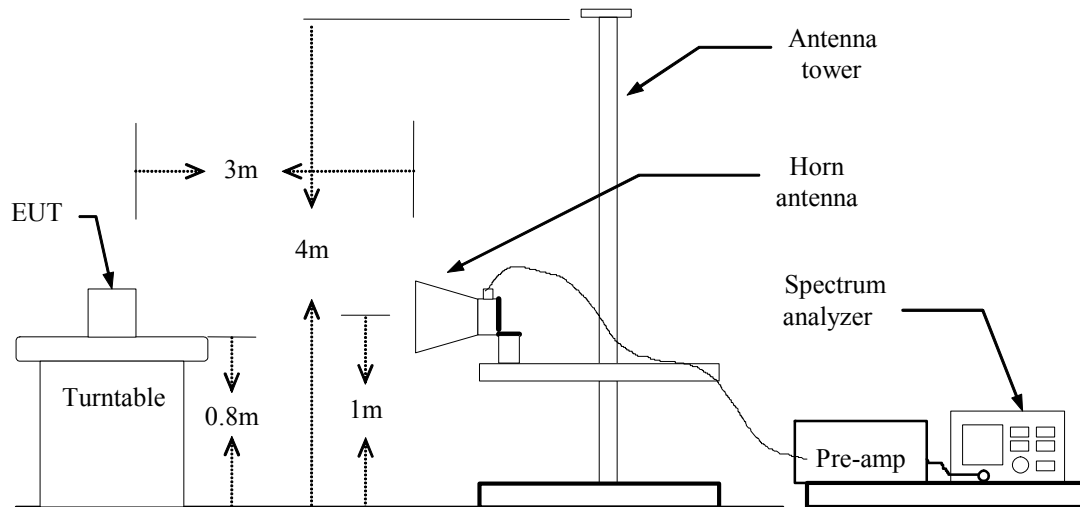


30MHz ~ 1GHz





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 1GHz:  
RBW=100kHz / VBW=300kHz / Sweep=AUTO  
Above 1GHz:  
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO  
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

**TEST RESULTS****Below 1GHz**

**Operation Mode:** Normal Link      **Test Date:** September 27, 2012  
**Temperature:** 27°C      **Tested by:** Shawn Wu  
**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)
33.2333	44.95	-7.29	37.66	40.00	-2.34	QP	V
46.1667	51.64	-16.17	35.47	40.00	-4.53	QP	V
62.3333	22.13	-18.75	3.38	40.00	-36.62	QP	V
86.5833	55.33	-18.35	36.98	40.00	-3.02	QP	V
133.4667	48.39	-12.62	35.77	43.50	-7.73	peak	V
666.9667	45.69	-5.95	39.74	46.00	-6.26	peak	V
88.2000	58.51	-18.39	40.12	43.50	-3.38	QP	H
136.7000	51.10	-12.66	38.44	43.50	-5.06	QP	H
157.7167	50.63	-13.18	37.45	43.50	-6.05	QP	H
248.2500	52.64	-13.13	39.51	46.00	-6.49	peak	H
712.2333	42.91	-5.43	37.48	46.00	-8.52	peak	H
767.2000	40.38	-4.61	35.77	46.00	-10.23	peak	H

**Remark:**

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

**Above 1 GHz**

**Operation Mode:** TX / IEEE 802.11b / CH Low    **Test Date:** September 22, 2012  
**Temperature:** 27°C    **Tested by:** Shawn Wu  
**Humidity:** 53 % RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1113.333	63.22	-10.31	52.91	74.00	-21.09	peak	V
1113.333	46.88	-10.31	36.57	54.00	-17.43	AVG	V
2363.333	60.86	-6.76	54.10	74.00	-19.90	peak	V
2363.333	48.75	-6.76	41.99	54.00	-12.01	AVG	V
7233.333	42.82	9.28	52.10	74.00	-21.90	peak	V
7233.333	38.78	9.28	48.06	54.00	-5.94	AVG	V
1116.667	63.78	-10.32	53.46	74.00	-20.54	peak	H
1116.667	44.77	-10.32	34.45	54.00	-19.55	AVG	H
N/A							

**Remark:**

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



**Operation Mode:** TX / IEEE 802.11b / CH Mid    **Test Date:** September 22, 2012  
**Temperature:** 27°C    **Tested by:** Shawn Wu  
**Humidity:** 53 % RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1120.000	64.84	-10.32	54.52	74.00	-19.48	peak	V
1120.000	48.18	-10.32	37.86	54.00	-16.14	AVG	V
2360.000	60.69	-6.77	53.92	74.00	-20.08	peak	V
2360.000	48.30	-6.77	41.53	54.00	-12.47	AVG	V
N/A							
1113.333	61.53	-10.31	51.22	74.00	-22.78	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).



**Operation Mode:** TX / IEEE 802.11b / CH High **Test Date:** September 22, 2012  
**Temperature:** 27°C **Tested by:** Shawn Wu  
**Humidity:** 53 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1120.000	63.51	-10.32	53.19	74.00	-20.81	peak	V
1120.000	45.30	-10.32	34.98	54.00	-19.02	AVG	V
2293.333	61.17	-6.97	54.20	74.00	-19.80	peak	V
2293.333	49.12	-6.97	42.15	54.00	-11.85	AVG	V
2340.000	60.77	-6.84	53.93	74.00	-20.07	peak	V
2340.000	51.34	-6.84	44.50	54.00	-9.50	AVG	V
1120.000	62.35	-10.32	52.03	74.00	-21.97	peak	H
1120.000	44.00	-10.32	33.68	54.00	-20.32	AVG	H
1716.667	64.22	-9.30	54.92	74.00	-19.08	peak	H
1716.667	45.09	-9.30	35.79	54.00	-18.21	AVG	H
1740.000	60.82	-9.12	51.70	74.00	-22.30	peak	
N/A							

**Remark:**

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



**Operation Mode:** TX / IEEE 802.11g / CH Low    **Test Date:** September 22, 2012  
**Temperature:** 27°C    **Tested by:** Shawn Wu  
**Humidity:** 53 % RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1120.000	62.50	-10.32	52.18	74.00	-21.82	peak	V
1120.000	42.70	-10.32	32.38	54.00	-21.62	AVG	V
2196.667	59.33	-7.02	52.31	74.00	-21.69	peak	V
2196.667	42.89	-7.02	35.87	54.00	-18.13	AVG	V
2340.000	61.21	-6.84	54.37	74.00	-19.63	peak	V
2340.000	49.53	-6.84	42.69	54.00	-11.31	AVG	V
1113.333	63.34	-10.31	53.03	74.00	-20.97	peak	H
1113.333	42.72	-10.31	32.41	54.00	-21.59	AVG	H
N/A							

**Remark:**

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



**Operation Mode:** TX / IEEE 802.11g / CH Mid    **Test Date:** September 22, 2012  
**Temperature:** 27°C    **Tested by:** Shawn Wu  
**Humidity:** 53 % RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1113.333	62.25	-10.31	51.94	74.00	-22.06	peak	V
2313.333	60.24	-6.93	53.31	74.00	-20.69	peak	V
2313.333	40.28	-6.93	33.35	54.00	-20.65	AVG	V
N/A							
1123.333	60.31	-10.33	49.98	74.00	-24.02	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).



**Operation Mode:** TX / IEEE 802.11g / CH High **Test Date:** September 22, 2012  
**Temperature:** 27°C **Tested by:** Shawn Wu  
**Humidity:** 53 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1110.000	62.43	-10.30	52.13	74.00	-21.87	peak	V
1110.000	42.28	-10.30	31.98	54.00	-22.02	AVG	V
2360.000	60.13	-6.77	53.36	74.00	-20.64	peak	V
2360.000	39.64	-6.77	32.87	54.00	-21.13	AVG	V
N/A							
1113.333	62.63	-10.31	52.32	74.00	-21.68	peak	H
1113.333	42.83	-10.31	32.52	54.00	-21.48	AVG	H
N/A							

**Remark:**

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



**Operation Mode:** TX / IEEE 802.11n HT 20 MHz mode  
/ CH Low

**Test Date:** September 22, 2012

**Temperature:** 27°C

**Tested by:** Shawn Wu

**Humidity:** 53 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1116.667	62.38	-10.32	52.06	74.00	-21.94	peak	V
1116.667	45.90	-10.32	35.58	54.00	-18.42	AVG	V
2360.000	61.59	-6.77	54.82	74.00	-19.18	peak	V
2360.000	46.51	-6.77	39.74	54.00	-14.26	AVG	V
N/A							
1120.000	58.85	-10.32	48.53	74.00	-25.47	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).



**Operation Mode:** TX / IEEE 802.11n HT 20 MHz mode  
/ CH Mid

**Test Date:** September 22, 2012

**Temperature:** 27°C

**Tested by:** Shawn Wu

**Humidity:** 53 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1120.000	61.72	-10.32	51.40	74.00	-22.60	peak	V
2390.000	60.44	-6.67	53.77	74.00	-20.23	peak	V
2390.000	45.33	-6.67	38.66	54.00	-15.34	AVG	V
N/A							
2000.000	57.20	-7.12	50.08	74.00	-23.92	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).



**Operation Mode:** TX / IEEE 802.11n HT 20 MHz mode  
/ CH High

**Test Date:** September 22, 2012

**Temperature:** 27°C

**Tested by:** Shawn Wu

**Humidity:** 53 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1103.333	60.40	-10.29	50.11	74.00	-23.89	peak	V
2383.333	59.88	-6.70	53.18	74.00	-20.82	peak	V
2383.333	44.98	-6.70	38.28	54.00	-15.72	AVG	V
N/A							
2180.000	56.88	-7.03	49.85	74.00	-24.15	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).



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

**Test Date:** September 22, 2012

**Temperature:** 27°C

**Tested by:** Shawn Wu

**Humidity:** 53 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1116.667	62.44	-10.32	52.12	74.00	-21.88	peak	V
1116.667	42.73	-10.32	32.41	54.00	-21.59	AVG	V
2336.667	60.93	-6.85	54.08	74.00	-19.92	peak	V
2336.667	44.96	-6.85	38.11	54.00	-15.89	AVG	V
N/A							
2580.000	58.04	-6.49	51.55	74.00	-22.45	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).



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

**Test Date:** September 22, 2012

**Temperature:** 27°C

**Tested by:** Shawn Wu

**Humidity:** 53 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
2366.667	60.34	-6.75	53.59	74.00	-20.41	peak	V
2366.667	44.19	-6.75	37.44	54.00	-16.56	AVG	V
N/A							
2000.000	57.79	-7.12	50.67	74.00	-23.33	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).



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

**Test Date:** September 22, 2012

**Temperature:** 27°C

**Tested by:** Shawn Wu

**Humidity:** 53 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polarization (V/H)
1106.667	62.20	-10.30	51.90	74.00	-22.10	peak	V
2363.333	60.64	-6.76	53.88	74.00	-20.12	peak	V
2363.333	45.13	-6.76	38.37	54.00	-15.63	AVG	V
N/A							
1923.333	58.11	-7.71	50.40	74.00	-23.60	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).



## 7.7 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  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

\* Decreases with the logarithm of the frequency.

### **Test Configuration**

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

### **TEST PROCEDURE**

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

### **TEST RESULTS**

*Not applicable, because EUT not connect to AC Main Source direct.*