

**FCC 47 CFR PART 15 SUBPART C AND ANSI C63.10:2013  
TEST REPORT**

**For**

**300Mbps Wireless N VDSL2 Modem Router**

**Model: DL4422U**

**Trade Name: netis**

**Issued for**

**NETIS SYSTEMS CO., LTD**

**4F & 5F, R&D Building, Oriental Cyberport, High-Tech Industrial Park,  
Nanshan, Shenzhen, China**

**Issued by**

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## Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	05/26/2017	Initial Issue	All Page 116	Dola Hsieh

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# 1. TEST REPORT CERTIFICATION

**Applicant** : NETIS SYSTEMS CO., LTD  
**Address** : 4F & 5F, R&D Building, Oriental Cyberport, High-Tech Industrial Park, Nanshan, Shenzhen, China  
**Equipment Under Test** : 300Mbps Wireless N VDSL2 Modem Router  
**Model** : DL4422U  
**Trade Name** : netis  
**Tested Date** : November 30, 2016 ~ May 12, 2017

APPLICABLE STANDARD	
Standard	Test Result
FCC Part 15 Subpart C AND ANSI C63.10:2013	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

**Approved by:**



Sb. Lu  
Sr. Engineer

**Reviewed by:**



Gundan Lin  
Sr. Engineer

## 2. EUT DESCRIPTION

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router
<b>Model Number</b>	DL4422U
<b>Identify Number</b>	T161130D14
<b>Received Date</b>	November 30, 2016
<b>Frequency Range</b>	IEEE 802.11b/g, 802.11gn HT20 Mode: 2412MHz ~ 2462MHz IEEE 802.11gn HT40 Mode: 2422MHz ~ 2452MHz
<b>Transmit Power</b>	IEEE 802.11b Mode: 18.16 dBm (0.0655 W) IEEE 802.11g Mode: 25.57 dBm (0.3606 W) IEEE 802.11gn HT20 MCS0 Mode: 27.75 dBm (0.5957 W) IEEE 802.11gn HT40 MCS0 Mode: 25.84 dBm (0.3837 W)
<b>Channel Spacing</b>	5MHz
<b>Channel Number</b>	IEEE 802.11b/g, 802.11gn HT20 Mode: 11 Channels IEEE 802.11gn HT40 Mode: 7 Channels
<b>Transmit Data Rate</b>	IEEE 802.11b Mode: up to 11 Mbps IEEE 802.11g Mode: up to 54 Mbps IEEE 802.11gn HT20 Mode (800ns GI): up to 130.00 Mbps IEEE 802.11gn HT20 Mode (400ns GI): up to 144.40 Mbps IEEE 802.11gn HT40 Mode (800ns GI): up to 270.00 Mbps IEEE 802.11gn HT40 Mode (400ns GI): up to 300.00 Mbps
<b>Type of Modulation</b>	IEEE 802.11b Mode: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g Mode: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11gn HT20/40 Mode: OFDM (64QAM, 16QAM, QPSK, BPSK)
<b>Antenna Type</b>	Dipole Antenna x 2 , Ant. 1 (Chain 0), Antenna Gain: 5.26 dBi Ant. 2 (Chain 1), Antenna Gain: 5.26 dBi
<b>Power Rating</b>	12Vdc
<b>Test Voltage</b>	120Vac, 60Hz
<b>DC Power Cable Type</b>	Non-shielded cable, 1.2m x 3 (Non-detachable)
<b>I/O Port</b>	RJ-11 Port x 1, RJ-45 Port x 1, USB Port x 1, Power Port x 1

**Power Adapter:**

No.	Manufacturer	Model No.	Power Input	Power Output
1	DongGuan Tenpao Power Co., LTD	NT12V1AUL	100-240Vac, 0.3A, 50/60Hz	12Vdc, 1A
2	ShenZhen TOPOW Electronics Co., Ltd	NTT101120100UL	100-240Vac, 0.5A, 50/60Hz	12Vdc, 1A
3	ShenZhen TOPOW Electronics Co., Ltd	NTT101120050UL	100-240Vac, 0.3A, 50/60Hz	12Vdc, 500mA

**Remark:**

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. For more details, please refer to the User's manual of the EUT.
3. This submittal(s) (test report) is intended for FCC ID: T58DL4422UR filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

### 3. DESCRIPTION OF TEST MODES

The EUT (300Mbps Wireless N VDSL2 Modem Router) is an 802.11b/g/n transceiver.

For IEEE 802.11b/g Mode (1TX / 1RX) : Ant. 1 Chain 0 transmit/receive.

For IEEE 802.11gn HT20/HT40 Mode (2TX / 2RX) :

Ant. 1 / Chain 0 & Ant. 2 / Chain 1 transmit/receive.

**Conducted Emission / Radiated Emission Test (Below 1 GHz)**

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test mode
1	TX Mode / Power Adapter 1
2	TX Mode / Power Adapter 2
3	TX Mode / Power Adapter 3

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test mode		
Emission	Radiated Emission	Mode 1 ~ 3
	Conducted Emission	Mode 1 ~ 3

**Remark:** Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.

**Conducted / Radiated Emission Test (Above 1 GHz)**

**IEEE 802.11b/g, 802.11gn HT20 Mode:**

The EUT had been tested under operating condition.

There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b Mode: 1Mbps data rate (worst case) was chosen for full testing.

IEEE 802.11g Mode: 6Mbps data rate (worst case) was chosen for full testing.

IEEE 802.11gn HT20 MCS0 Mode: 6.5Mbps data rate (worst case) was chosen for full testing.

**IEEE 802.11gn HT40 Mode:**

The EUT had been tested under operating condition.

There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

IEEE 802.11gn HT40 MCS0 Mode: 13.5Mbps data rate (worst case) was chosen for full testing.

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

## 4. TEST METHODOLOGY

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

## 5. FACILITIES AND ACCREDITATION

### 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at No.989-1, Wenshan Rd., Shangshan Village, Qionglin Township, Hsinchu County 30741, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.10:2013 and CISPR 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

### 5.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>Taiwan</b>	TAF
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The measuring facility of laboratories has been authorized or registered by the following approval agencies.

<b>Canada</b>	INDUSTRY CANADA
<b>Japan</b>	VCCI
<b>Taiwan</b>	BSMI
<b>USA</b>	FCC MRA

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsrf.com>

**Remark:** FCC Designation Number TW1027.



### 5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 30 to 1000 MHz	+/- 3.97
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 1 to 18GHz	+/- 3.58
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 18 to 26 GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 26 to 40 GHz	+/- 3.81
Conducted Emission (Mains Terminals), 9kHz to 30MHz	+/- 2.48

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

Consistent with industry standard (e.g. CISPR 22, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than  $U_{CISPR}$  which is 3.6dB and 5.2dB respectively. CCS values (called  $U_{Lab}$  in CISPR 16-4-2) is less than  $U_{CISPR}$  as shown in the table above. Therefore, MU need not be considered for compliance.

## 6. SETUP OF EQUIPMENT UNDER TEST

### SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.
1	Notebook PC	TOSHIBA	PORTEGE R30-A	1E101235H

No.	Signal Cable Description
1	Non-shielded RJ-45 cable, 12m x 1

### SETUP DIAGRAM FOR TESTS

EUT & peripherals setup diagram is shown in appendix setup photos.

### EUT OPERATING CONDITION

1. EUT & peripherals setup diagram is shown in appendix setup photos.

2. TX mode:

- ⇒ **Data Rate:** 1Mbps Bandwidth 20 (IEEE 802.11b Mode)
- 6Mbps Bandwidth 20 (IEEE 802.11g Mode)
- 6.5Mbps Bandwidth 20 (IEEE 802.11gn HT20 MCS0 Mode)
- 13.5Mbps Bandwidth 40 (IEEE 802.11gn HT40 MCS0 Mode)

⇒ **Power control**

Mode	Channel	Frequency (MHz)	Chain	Power Set
IEEE 802.11b	Low	2412	0	35
	Middle	2437	0	38
	High	2462	0	41
IEEE 802.11g	Low	2412	0	51
	Middle	2437	0	63
	High	2462	0	50
IEEE 802.11gn HT20 MCS0	Low	2412	0/1	51/52
	Middle	2437	0/1	56/56
	High	2462	0/1	43/42
IEEE 802.11gn HT40 MCS0	Low	2422	0/1	47/47
	Middle	2437	0/1	46/46
	High	2452	0/1	45/45

3. All of the functions are under run.

4. Start test.

## 7. FCC PART 15.247 REQUIREMENTS

### 7.1 DUTY CYCLE CORRECTION FACTOR

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/13
<b>Test Mode</b>	TX Mode	<b>Temp. &amp; Humidity</b>	25°C, 50%

<b>Mode</b>	<b>TX on (ms)</b>	<b>TX on + off (ms)</b>	<b>Duty Cycle (%)</b>	<b>Duty Factor (dB)</b>	<b>1/T Minimum VBW (kHz)</b>
IEEE 802.11b	12.420	12.540	99.04%	0.04	0.010
IEEE 802.11g	2.065	2.161	95.56%	0.20	0.484
IEEE 802.11gn HT20	1.921	2.098	91.56%	0.38	0.521
IEEE 802.11gn HT40	0.920	1.092	84.25%	0.74	1.087

## 7.2 6dB BANDWIDTH

### LIMITS

§ 15.247(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

### TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/15/2017
Test S/W	N/A			

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

### TEST SETUP



### TEST PROCEDURE

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

**TEST RESULTS**

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Crystal Wu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/19
<b>Test Mode</b>	TX Mode	<b>Temp. &amp; Humidity</b>	22°C, 63%

**IEEE 802.11b Mode**

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (kHz)	Result
		Chain 0			
Low	2412	10.03		500	PASS
Middle	2437	9.56		500	PASS
High	2462	9.54		500	PASS

**IEEE 802.11g Mode**

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (kHz)	Result
		Chain 0			
Low	2412	16.33		500	PASS
Middle	2437	16.34		500	PASS
High	2462	16.34		500	PASS

**IEEE 802.11gn HT20 MCS0 Mode (2TX)**

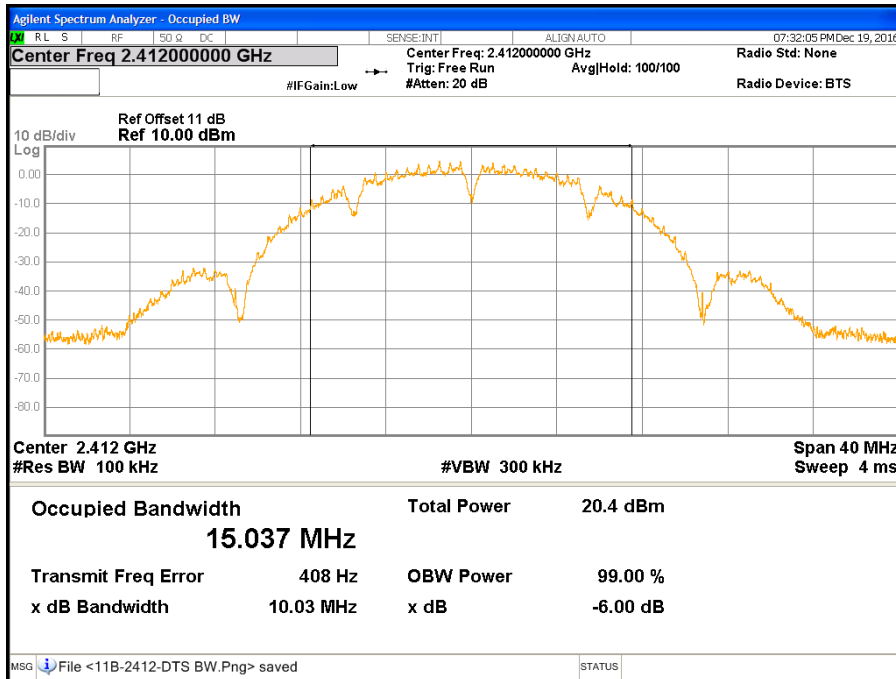
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (kHz)	Result
		Chain 0	Chain 1		
Low	2412	17.57	17.28	500	PASS
Middle	2437	17.53	17.59	500	PASS
High	2462	17.57	17.61	500	PASS

**IEEE 802.11gn HT40 MCS0 Mode (2TX)**

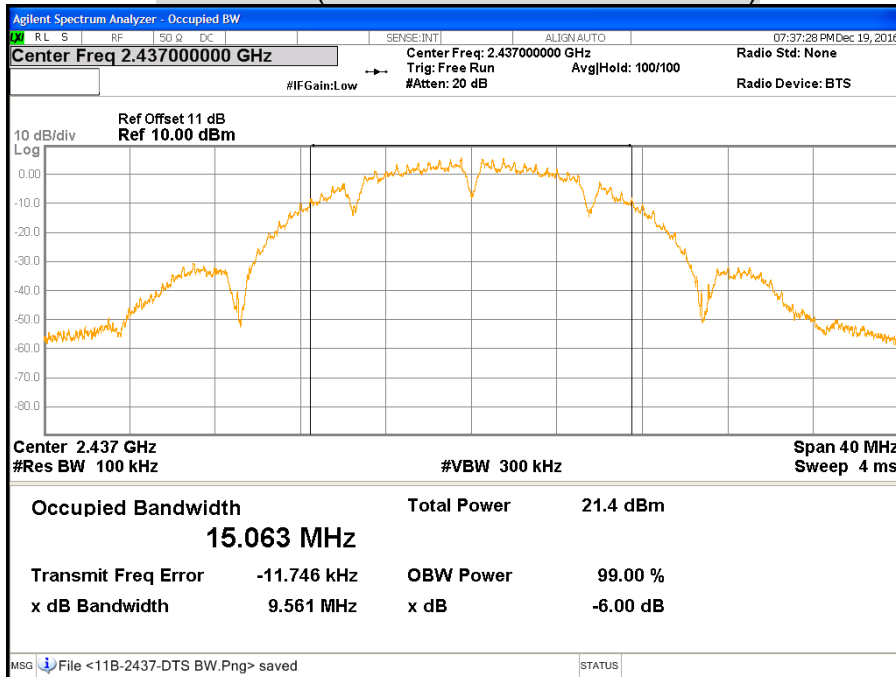
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (kHz)	Result
		Chain 0	Chain 1		
Low	2422	35.70	35.12	500	PASS
Middle	2437	35.72	35.35	500	PASS
High	2452	35.52	35.53	500	PASS

**6dB BANDWIDTH**

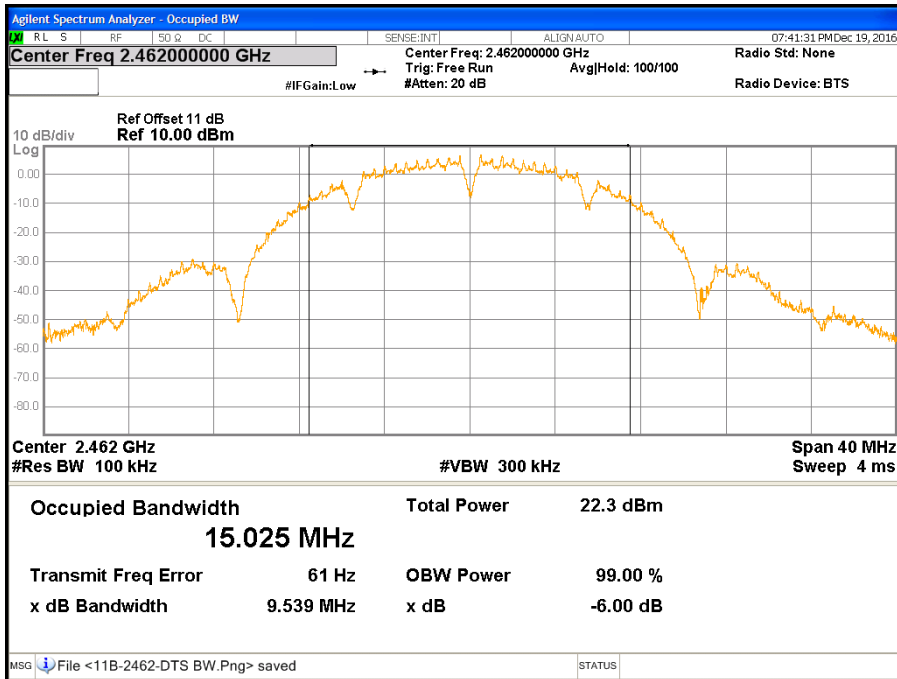
**CH Low (IEEE 802.11b Mode / Chain 0)**



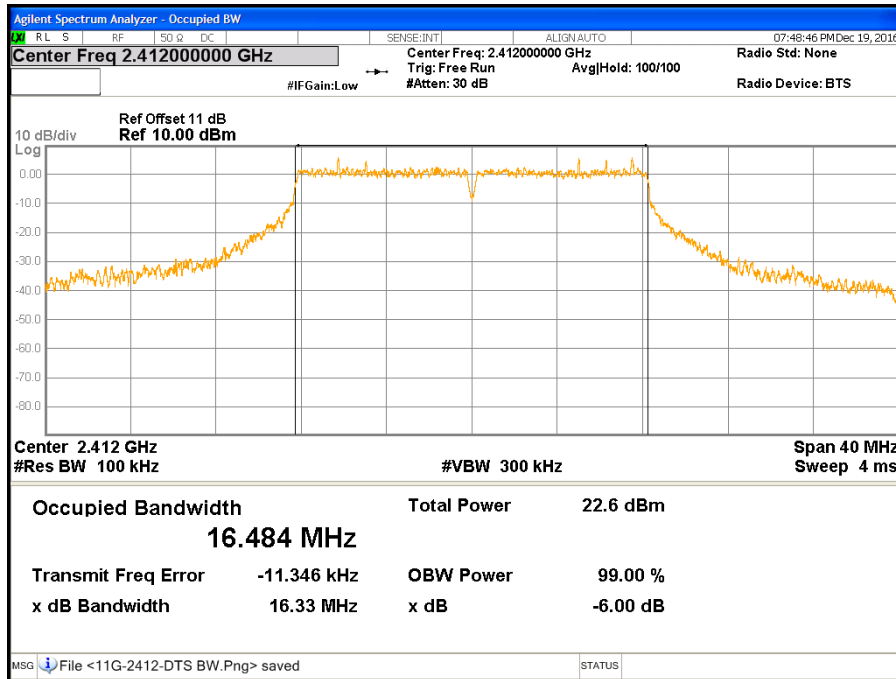
**CH Middle (IEEE 802.11b Mode / Chain 0)**



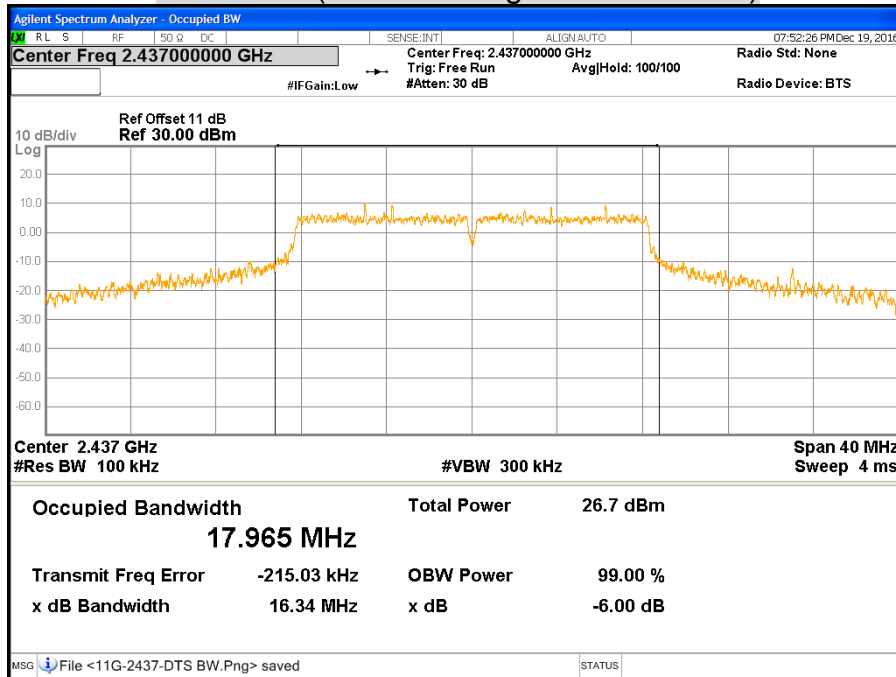
**CH High (IEEE 802.11b Mode / Chain 0)**



**CH Low (IEEE 802.11g Mode / Chain 0)**

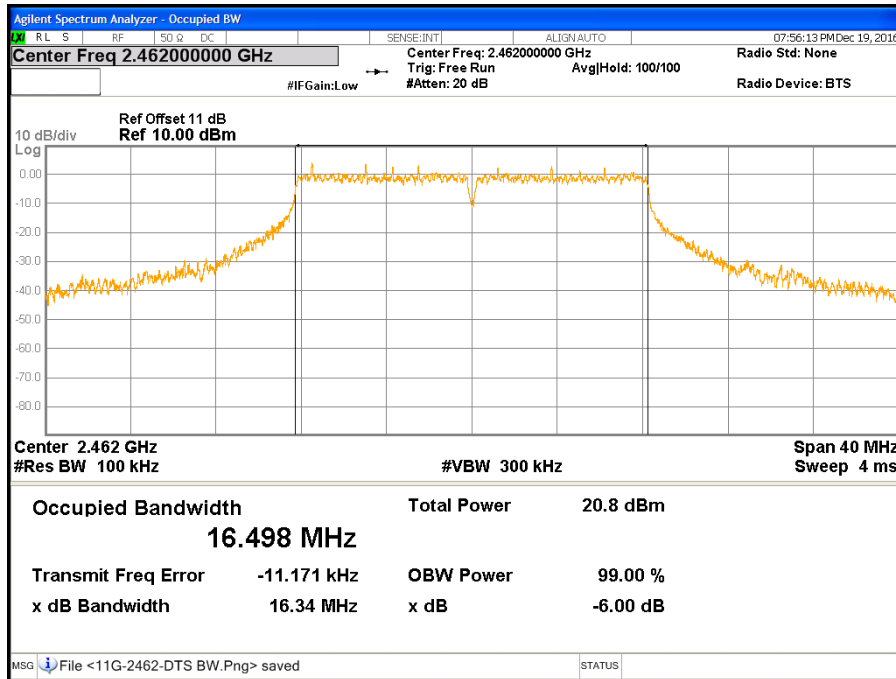


**CH Middle (IEEE 802.11g Mode / Chain 0)**

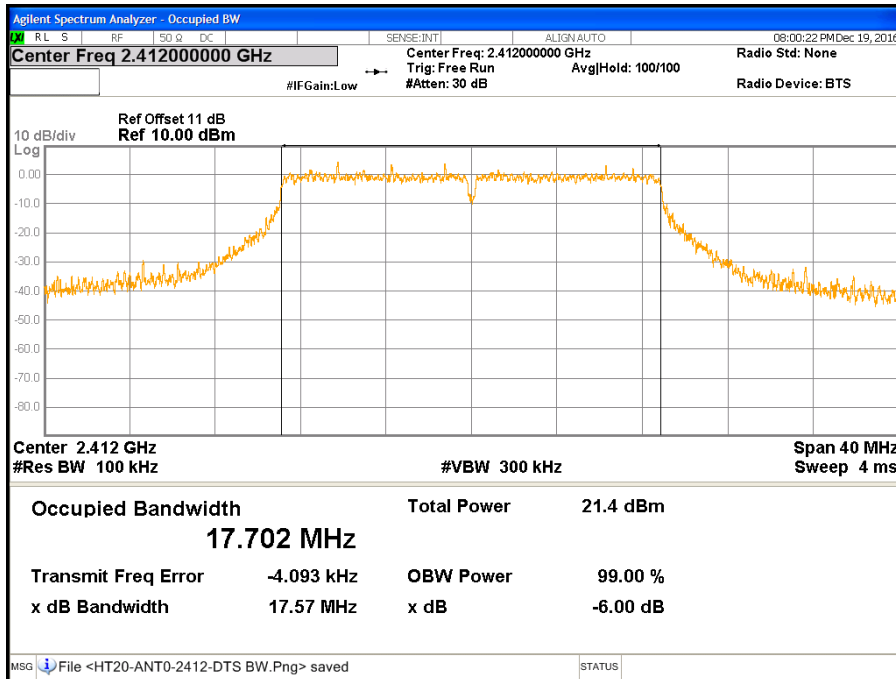




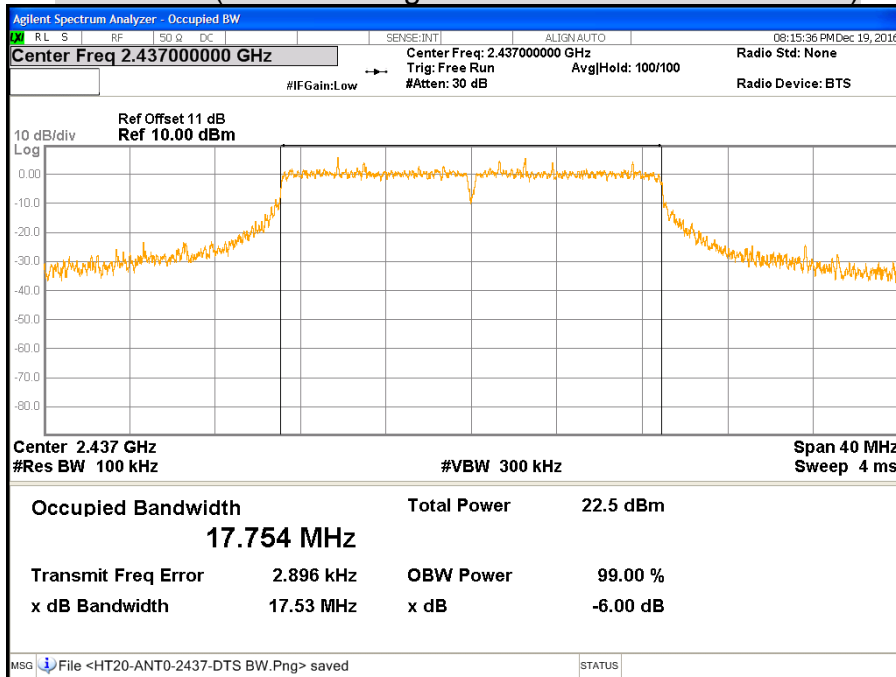
**CH High (IEEE 802.11g Mode / Chain 0)**



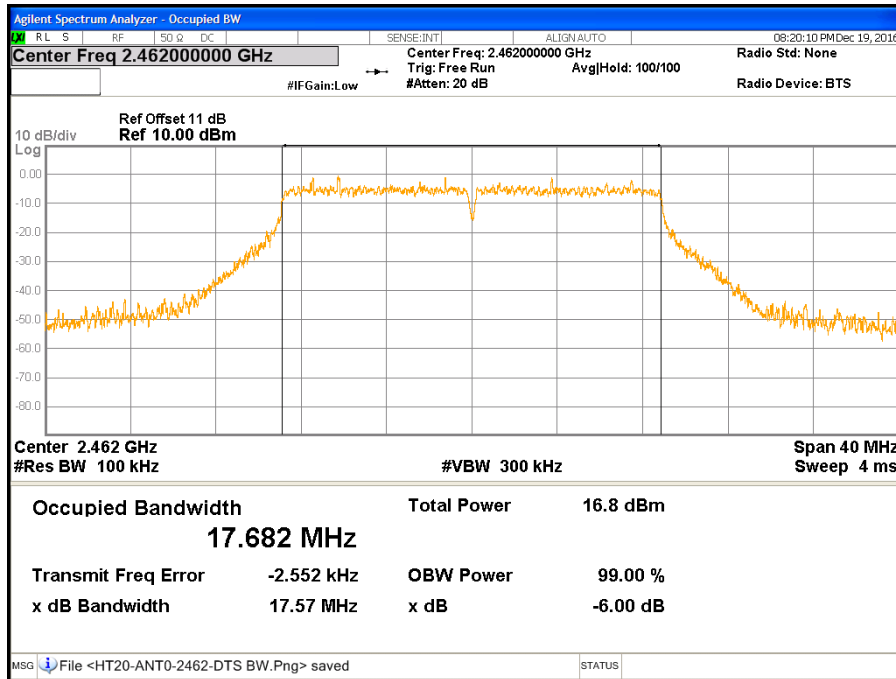
**CH Low (IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**



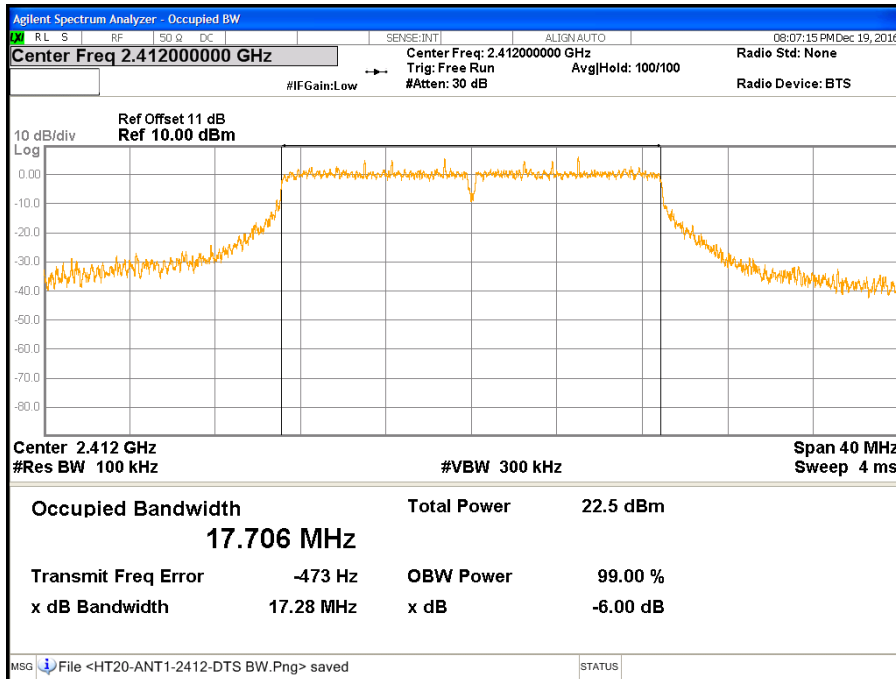
**CH Middle (IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**



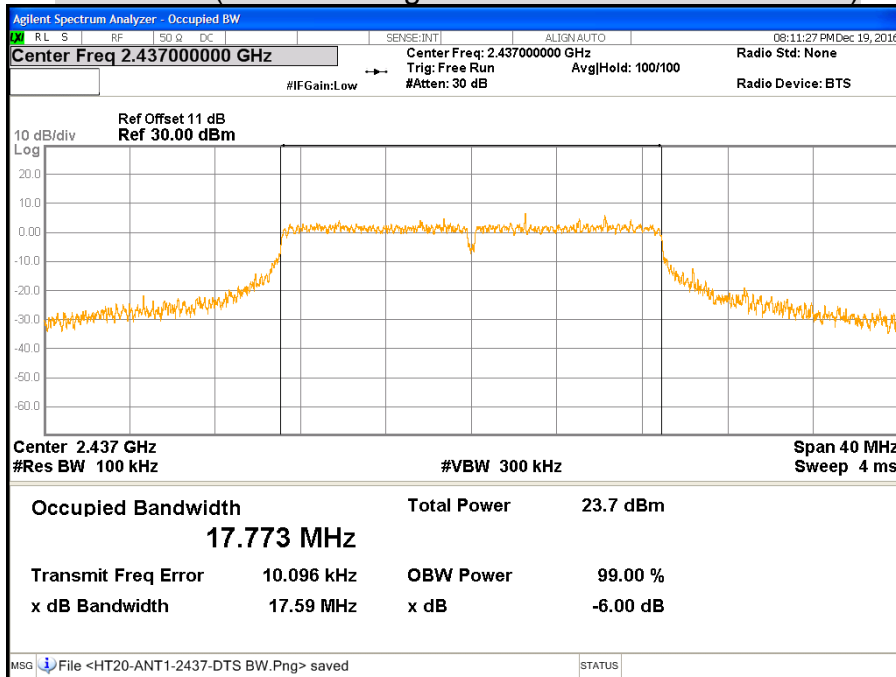
**CH High (IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**



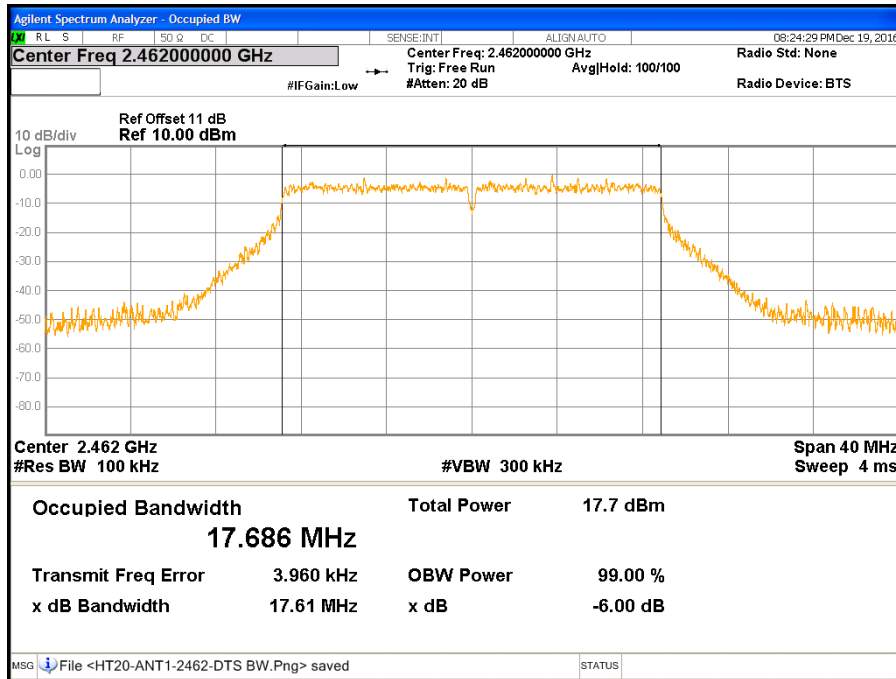
**CH Low (IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



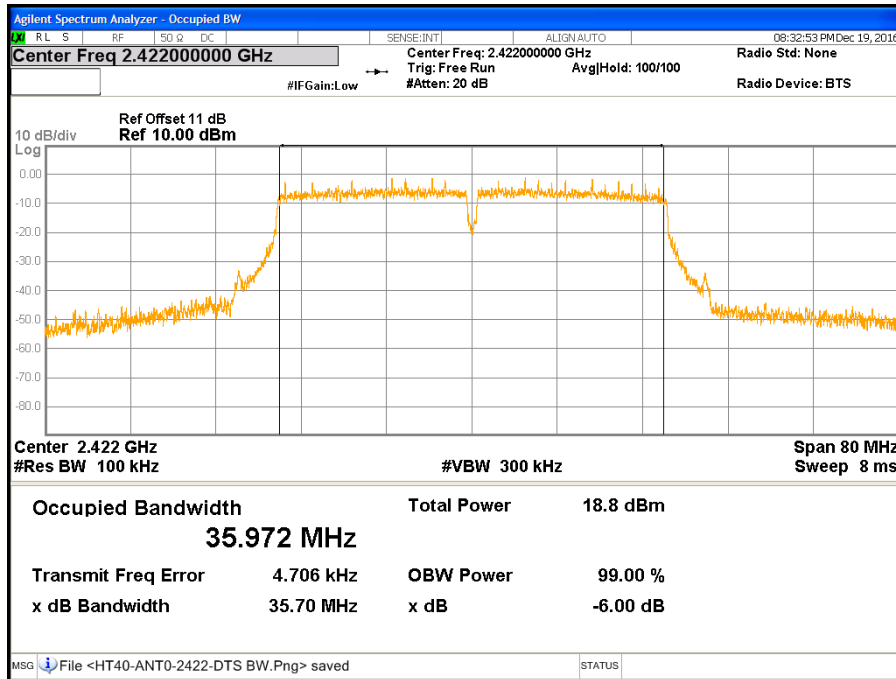
**CH Middle (IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



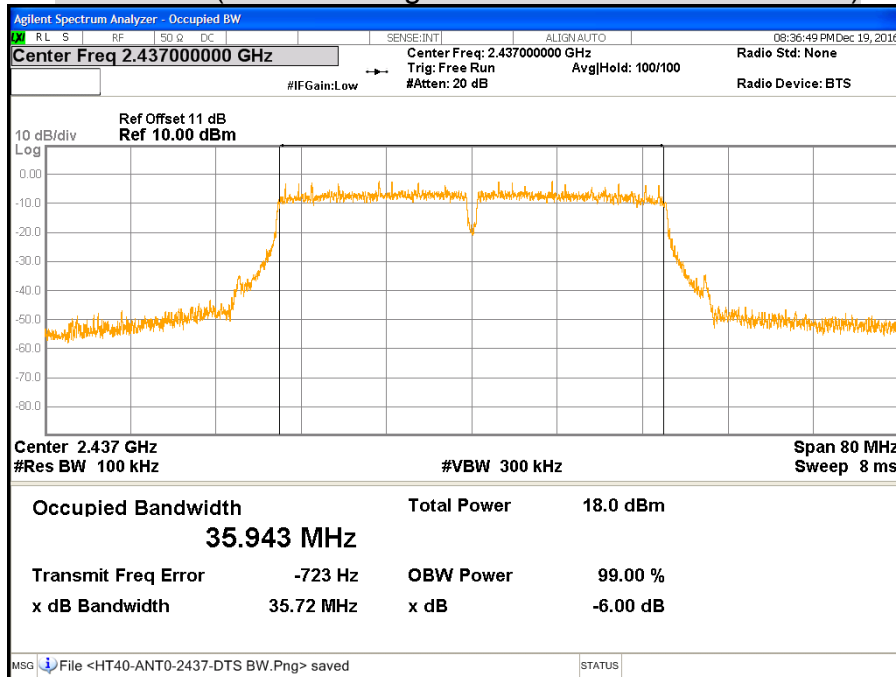
**CH High (IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



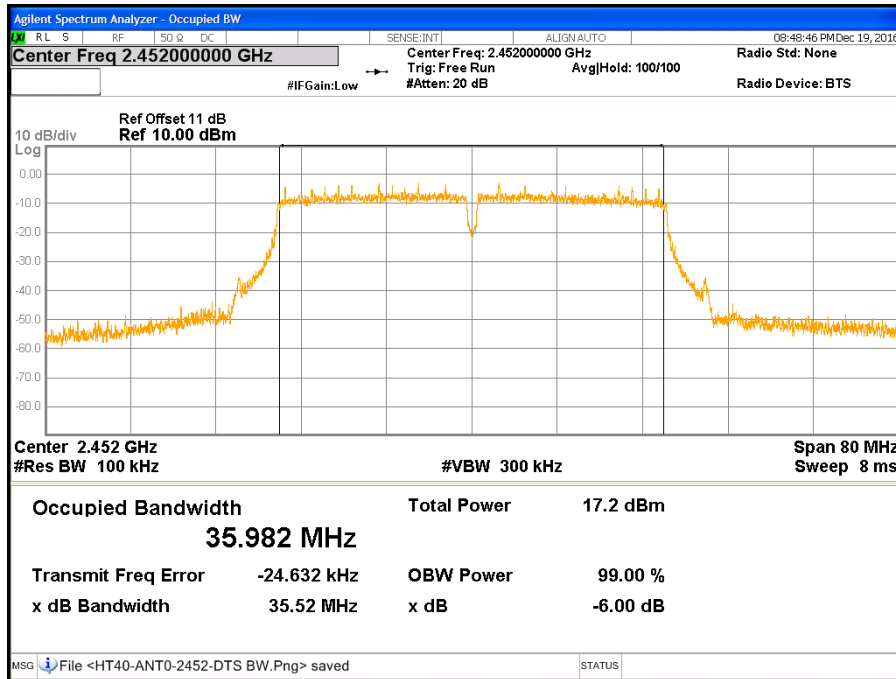
**CH Low (IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**



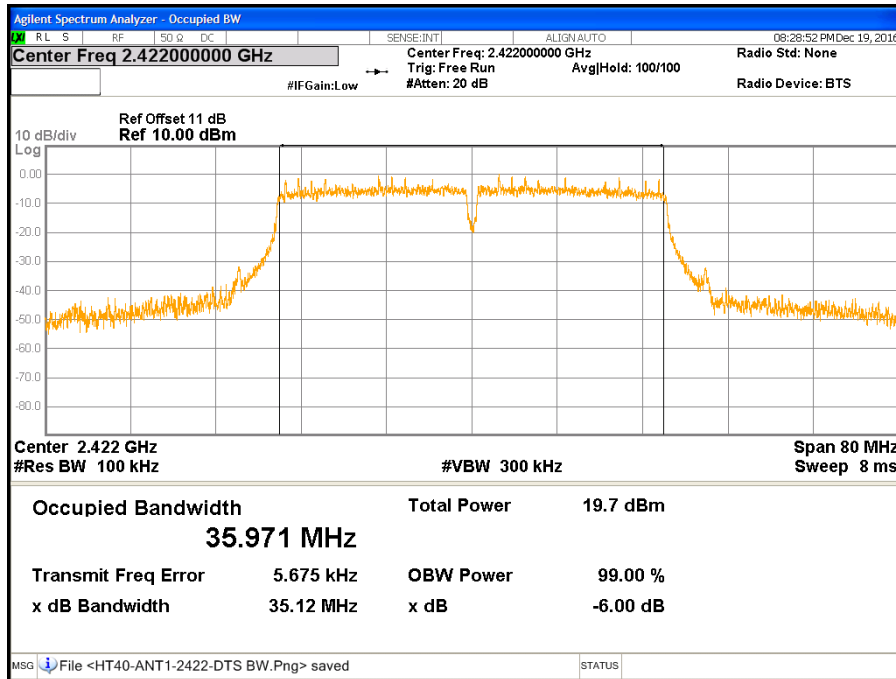
**CH Middle (IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**



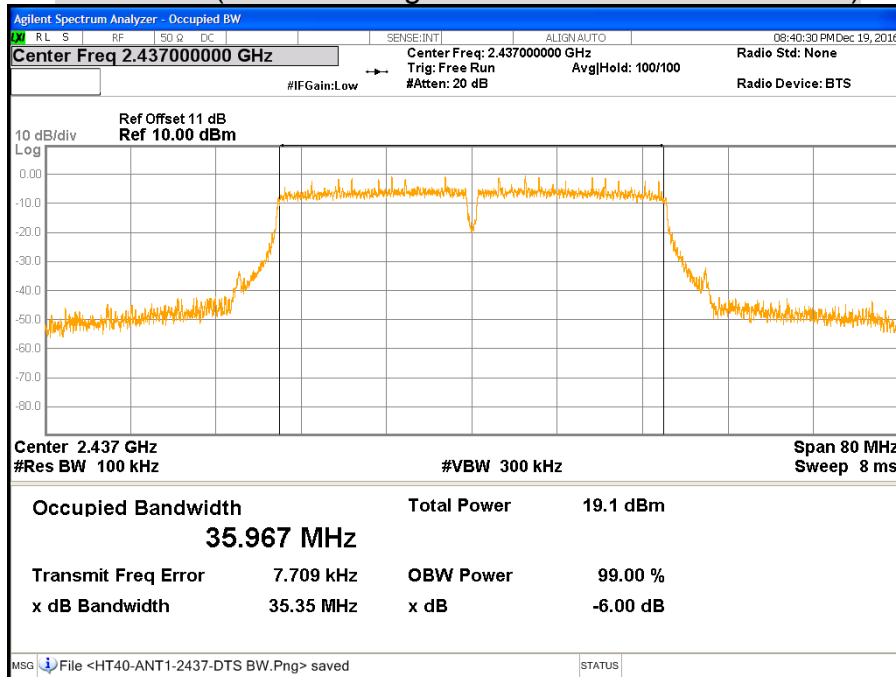
**CH High (IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**



**CH Low (IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**

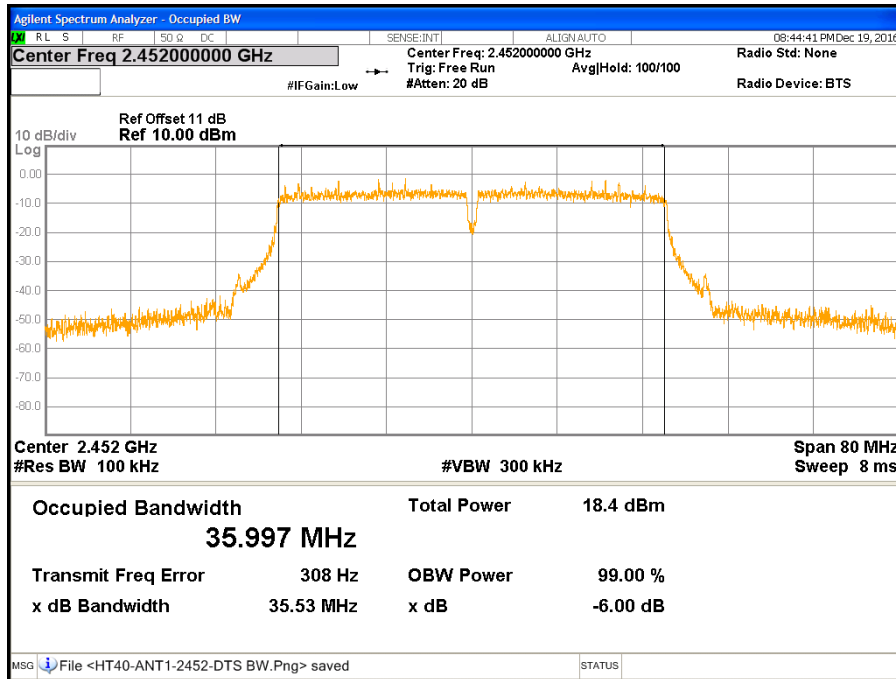


**CH Middle (IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**





**CH High (IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**



### 7.3 MAXIMUM PEAK OUTPUT POWER

#### LIMITS

§ 15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following:

§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 watt.

§ 15.247(b) (4) Except as shown in paragraphs (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (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.

§ KDB 662911:

If all antennas have the same gain,  $G_{ANT}$ , Directional gain =  $G_{ANT}$  + Array Gain, where Array Gain is as follows.

Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$  ;

Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq 40$  MHz for any  $N_{ANT}$  ;

Array Gain =  $5 \log(N_{ANT}/N_{SS})$  dB or 3 dB, whichever is less for 20-MHz channel widths with  $N_{ANT} \geq 5$ .

If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream:

Directional gain may be calculated by using the formulas applicable to equal gain antennas with  $G_{ANT}$  set equal to the gain of the antenna having the highest gain; or,

$$DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

#### TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2495A	1149001	12/05/2017
Power Sensor	Anritsu	MA2411B	1126148	12/05/2017
Test S/W	N/A			

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

**TEST SETUP**



**TEST PROCEDURE**

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

**TEST RESULTS**

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Crystal Wu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/19
<b>Test Mode</b>	TX Mode	<b>Temp. &amp; Humidity</b>	22°C, 63%

**IEEE 802.11b Mode**

Channel	Channel Frequency (MHz)	Maximum Peak Output Power				Result
		Chain 0		Limit		
		(dBm)	(W)	(dBm)	(W)	
Low	2412	16.75	0.0473	30	1.000	PASS
Middle	2437	17.41	0.0551	30	1.000	PASS
High	2462	18.16	0.0655	30	1.000	PASS

**Remark:**

1. At final test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.
3. The maximum antenna gain is 5.26 dBi which is less than 6dBi, the limit should be 30 dBm.

**IEEE 802.11g Mode**

Channel	Channel Frequency (MHz)	Maximum Peak Output Power				Result
		Chain 0		Limit		
		(dBm)	(W)	(dBm)	(W)	
Low	2412	25.10	0.3236	30	1.000	PASS
Middle	2437	25.57	0.3606	30	1.000	PASS
High	2462	23.40	0.2188	30	1.000	PASS

**Remark:**

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.
3. The maximum antenna gain is 5.26 dBi which is less than 6dBi, the limit should be 30 dBm.

**IEEE 802.11gn HT20 MCS0 Mode (2TX)**

Channel	Channel Frequency (MHz)	Maximum Peak Output Power						Result
		Chain 0	Chain 1	Total		Limit		
		(dBm)	(dBm)	(dBm)	(W)	(dBm)	(W)	
Low	2412	24.11	24.86	27.51	0.5636	30	1.000	PASS
Middle	2437	24.28	25.15	27.75	0.5957	30	1.000	PASS
High	2462	20.37	20.76	23.58	0.2280	30	1.000	PASS

**Remark:**

1. At final test to get the worst-case emission at 6.5Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.
3. Total peak power = Chain 0 + Chain 1.
4. The maximum antenna gain is 5.26 dBi which is less than 6dBi, the limit should be 30 dBm.

**IEEE 802.11gn HT40 MCS0 Mode (2TX)**

Channel	Channel Frequency (MHz)	Maximum Peak Output Power						Result
		Chain 0	Chain 1	Total		Limit		
		(dBm)	(dBm)	(dBm)	(W)	(dBm)	(W)	
Low	2422	21.46	22.12	24.82	0.3034	30	1.000	PASS
Middle	2437	21.39	21.94	24.68	0.2938	30	1.000	PASS
High	2452	20.28	24.43	25.84	0.3837	30	1.000	PASS

**Remark:**

1. At final test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.
3. Total peak power = Chain 0 + Chain 1.
4. The maximum antenna gain is 5.26 dBi which is less than 6dBi, the limit should be 30 dBm.

## 7.4 AVERAGE POWER

### LIMITS

None: For reporting purposes only.

### TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2495A	1149001	12/05/2017
Power Sensor	Anritsu	MA2411B	1126148	12/05/2017
Test S/W	N/A			

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

### TEST SETUP



### TEST PROCEDURE

The transmitter output is connected to the power meter. The power meter is set to the average power detection.

**TEST RESULTS**

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Crystal Wu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/19
<b>Test Mode</b>	TX Mode	<b>Temp. &amp; Humidity</b>	22°C, 63%

**IEEE 802.11b Mode**

Channel	Channel Frequency (MHz)	Average Power (dBm)
		Chain 0
Low	2412	14.53
Middle	2437	15.25
High	2462	16.03

**Remark:**

1. At final test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

**IEEE 802.11g Mode**

Channel	Channel Frequency (MHz)	Average Power (dBm)
		Chain 0
Low	2412	17.33
Middle	2437	21.27
High	2462	15.46

**Remark:**

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

**IEEE 802.11gn HT20 MCS0 Mode**

Channel	Channel Frequency (MHz)	Average Power (dBm)	
		Chain 0	Chain 1
Low	2412	16.07	17.17
Middle	2437	17.43	18.53
High	2462	11.36	12.38

**Remark:**

1. At final test to get the worst-case emission at 6.5Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

**IEEE 802.11gn HT40 MCS0 Mode**

Channel	Channel Frequency (MHz)	Average Power (dBm)	
		Chain 0	Chain 1
Low	2422	13.60	13.84
Middle	2437	12.65	13.64
High	2452	11.85	13.59

**Remark:**

1. At final test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.



## 7.5 POWER SPECTRAL DENSITY

### LIMITS

§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

§ KDB 662911:

If all antennas have the same gain,  $G_{ANT}$ , Directional gain =  $G_{ANT}$  + Array Gain, where Array Gain is as follows.

Array Gain =  $10 \log(N_{ANT}/N_{SS})$  dB.

If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream:

Directional gain may be calculated by using the formulas applicable to equal gain antennas with  $G_{ANT}$  set equal to the gain of the antenna having the highest gain; or,

$$DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

### TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/15/2017
Test S/W	N/A			

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

### TEST SETUP



## **TEST PROCEDURE**

1. The transmitter output was connected to the spectrum analyzer.
2. Set analyzer center frequency to DTS channel center frequency.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
5. Set the VBW  $\geq 3 \times \text{RBW}$ .
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level within the RBW.
11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

**TEST RESULTS**

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Crystal Wu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/19
<b>Test Mode</b>	TX Mode	<b>Temp. &amp; Humidity</b>	22°C, 63%

**IEEE 802.11b Mode**

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)		Result
		Chain 0	Limit	
Low	2412	-1.85	8	PASS
Middle	2437	-0.79	8	PASS
High	2462	0.07	8	PASS

**Remark:**

1. At final test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.
3. The maximum antenna gain is 5.26 dBi which is less than 6dBi, the limit should be 8 dBm.

**IEEE 802.11g Mode**

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)		Result
		Chain 0	Limit	
Low	2412	-4.64	8	PASS
Middle	2437	-0.58	8	PASS
High	2462	-4.88	8	PASS

**Remark:**

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.
3. The maximum antenna gain is 5.26 dBi which is less than 6dBi, the limit should be 8 dBm.

**IEEE 802.11gn HT20 MCS0 Mode**

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)				Result
		Chain 0	Chain 1	Total	Limit	
Low	2412	-5.11	-4.20	-1.62	5.73	PASS
Middle	2437	-4.45	-3.07	-0.70	5.73	PASS
High	2462	-9.07	-9.00	-6.02	5.73	PASS

**Remark:**

1. At final test to get the worst-case emission at 6.5Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.
3. Total power spectral density = Chain 0 + Chain 1.
4. The directional gain is 8.27 dBi which is more than 6dBi, the limit should be 5.73 dBm.

**IEEE 802.11gn HT40 MCS0 Mode**

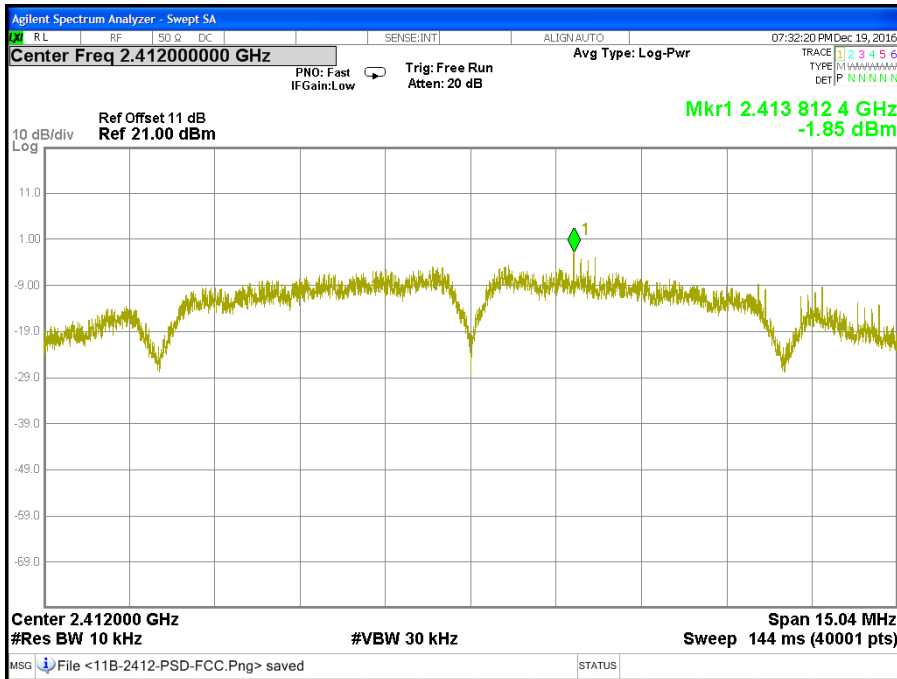
Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)				Result
		Chain 0	Chain 1	Total	Limit	
Low	2422	-10.29	-9.21	-6.70	5.73	PASS
Middle	2437	-11.16	-9.90	-7.47	5.73	PASS
High	2452	-11.75	-10.44	-8.04	5.73	PASS

**Remark:**

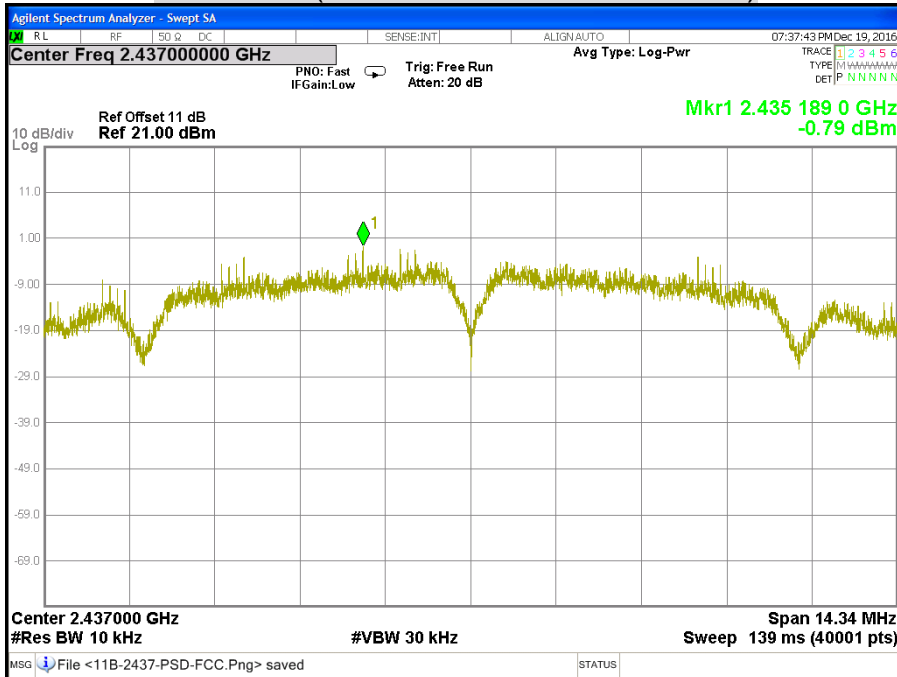
1. At final test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.
3. Total power spectral density = Chain 0 + Chain 1.
4. The directional gain is 8.27 dBi which is more than 6dBi, the limit should be 5.73 dBm.

### POWER SPECTRAL DENSITY

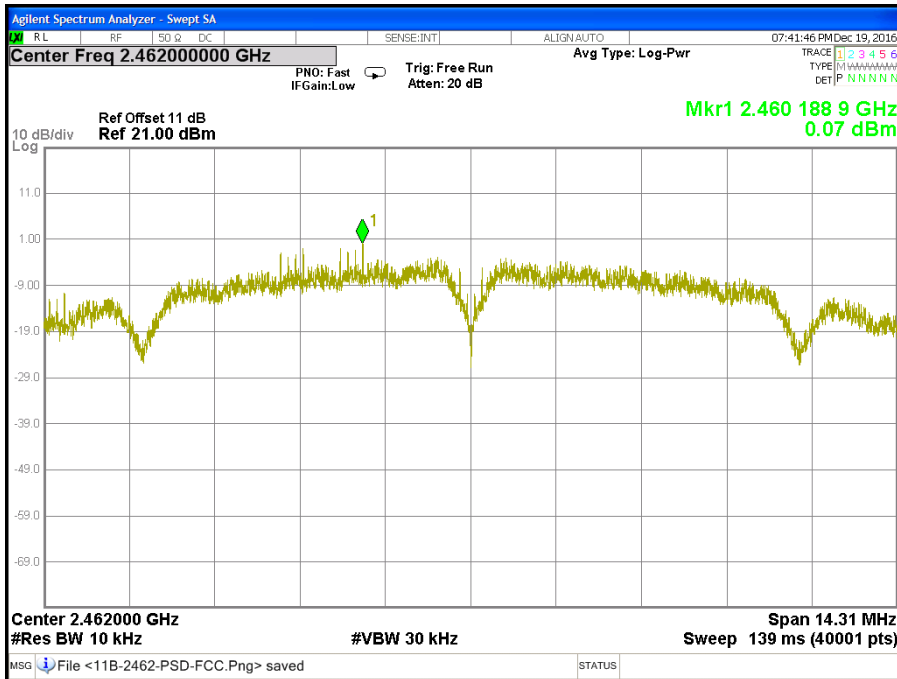
#### CH Low (IEEE 802.11b Mode / Chain 0)



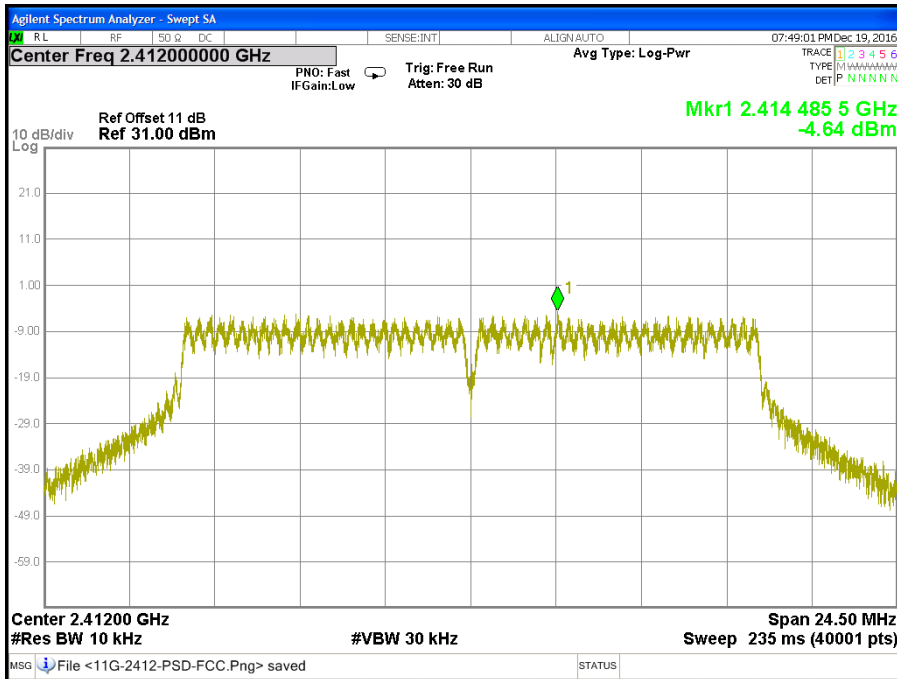
#### CH Middle (IEEE 802.11b Mode / Chain 0)



**CH High (IEEE 802.11b Mode / Chain 0)**



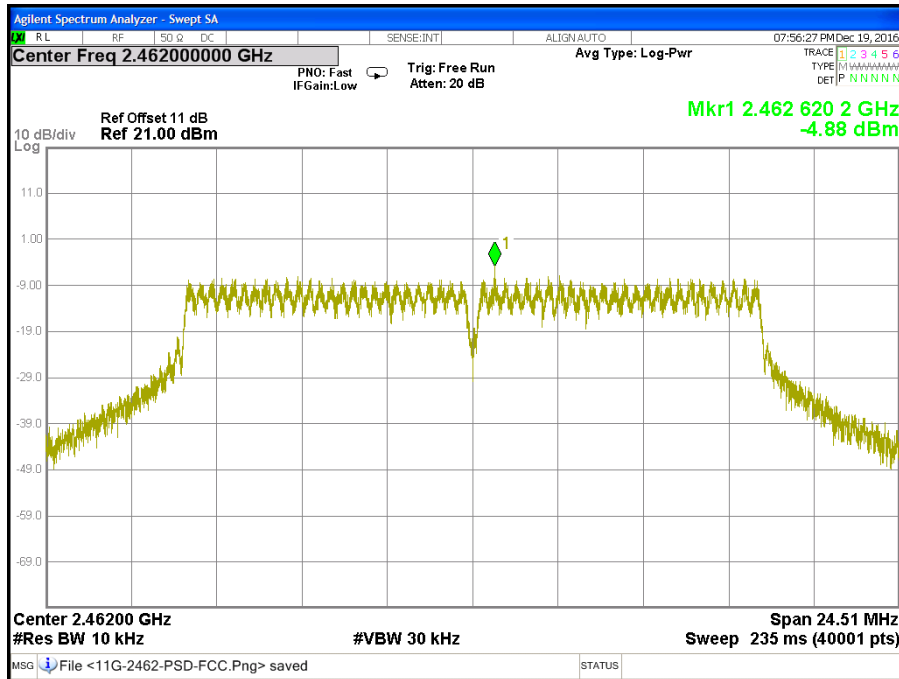
CH Low (IEEE 802.11g Mode / Chain 0)



CH Middle (IEEE 802.11g Mode / Chain 0)

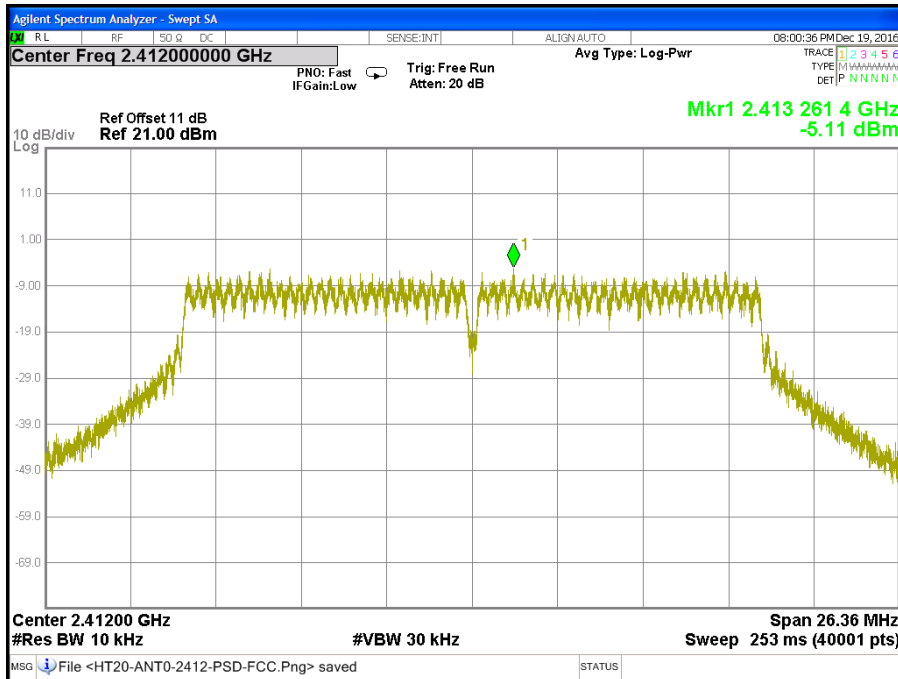


**CH High (IEEE 802.11g Mode / Chain 0)**





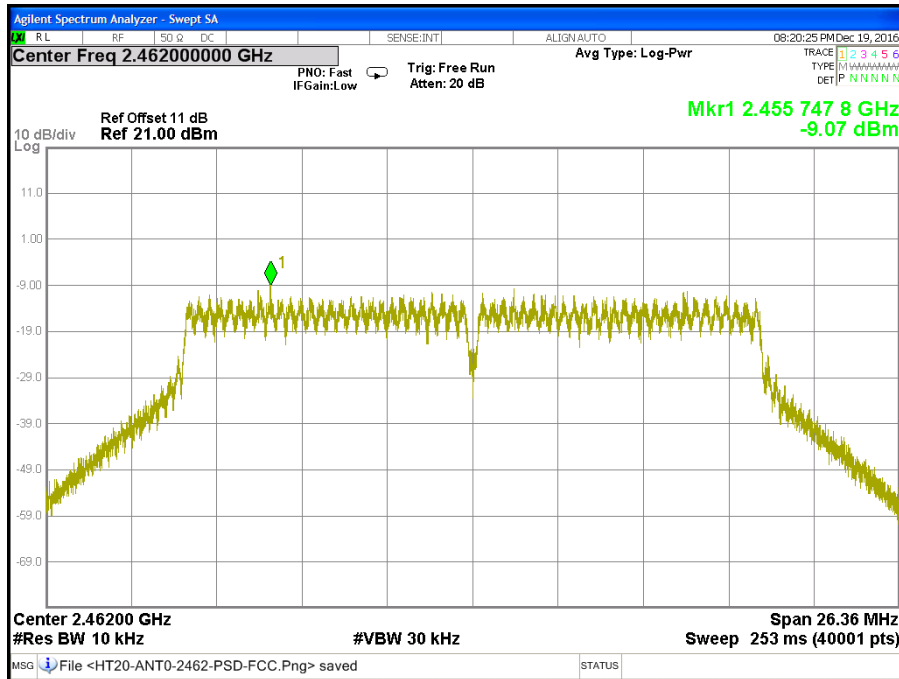
**CH Low (IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**



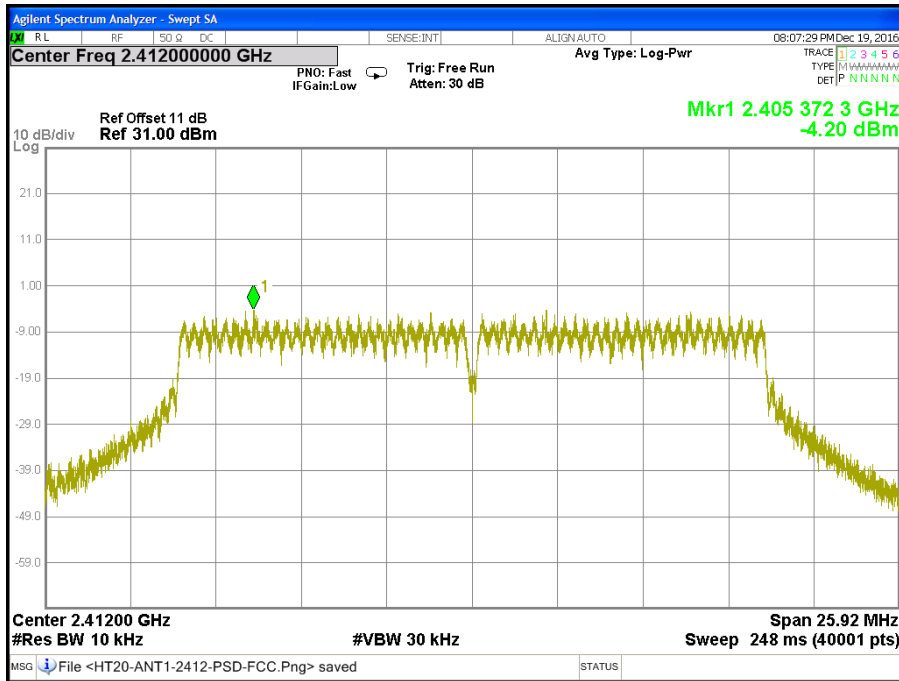
**CH Middle (IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**



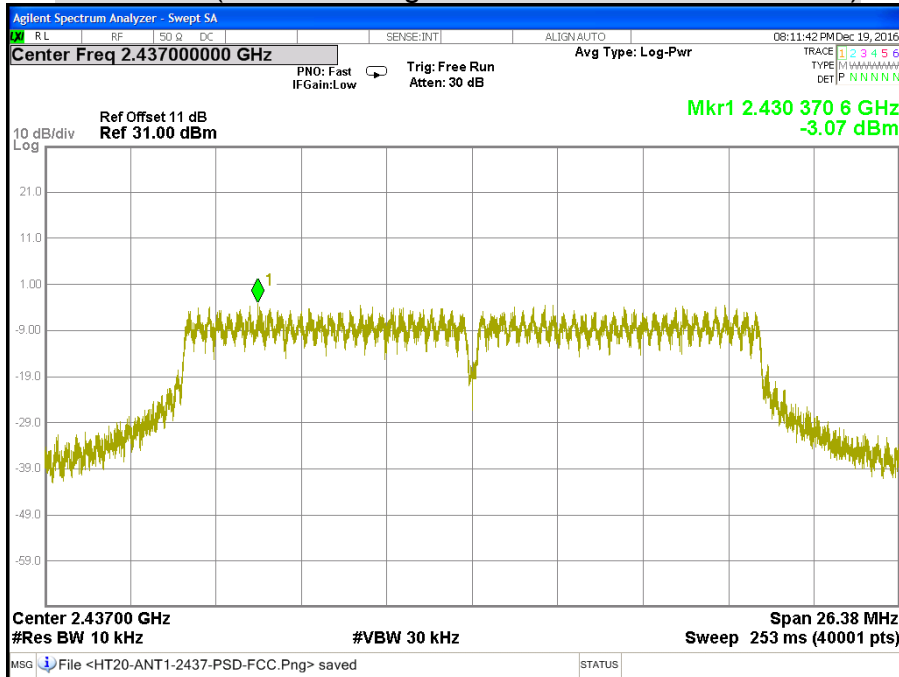
CH High (IEEE 802.11gn HT20 MCS0 Mode / Chain 0)



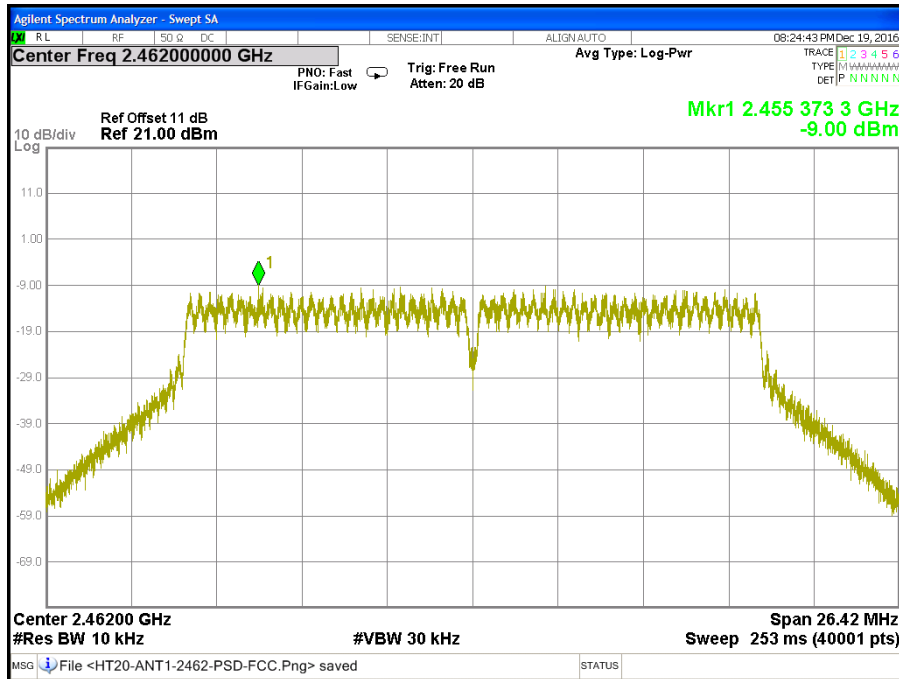
**CH Low (IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



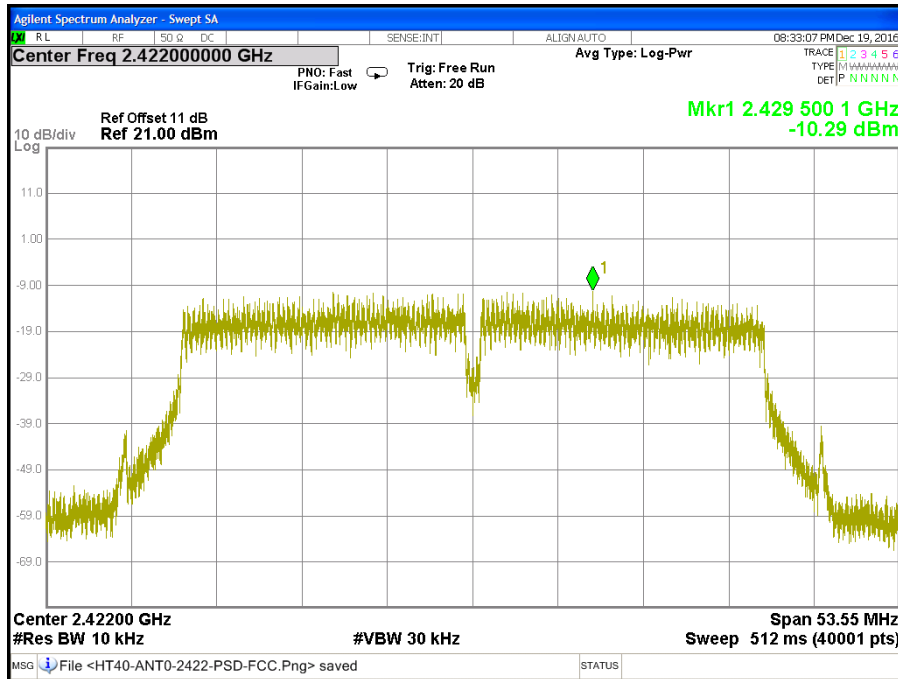
**CH Middle (IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



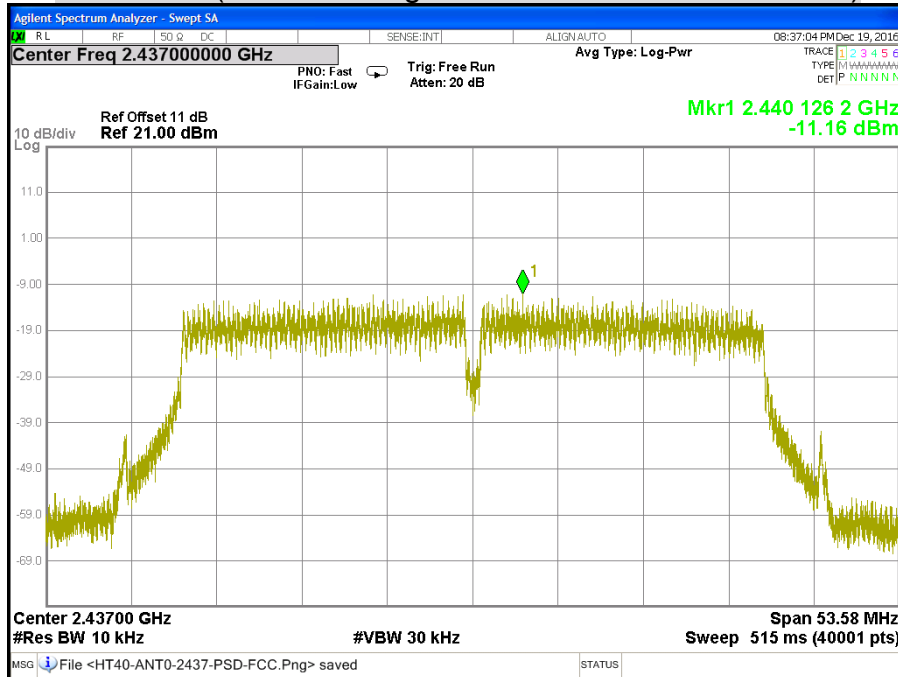
CH High (IEEE 802.11gn HT20 MCS0 Mode / Chain 1)



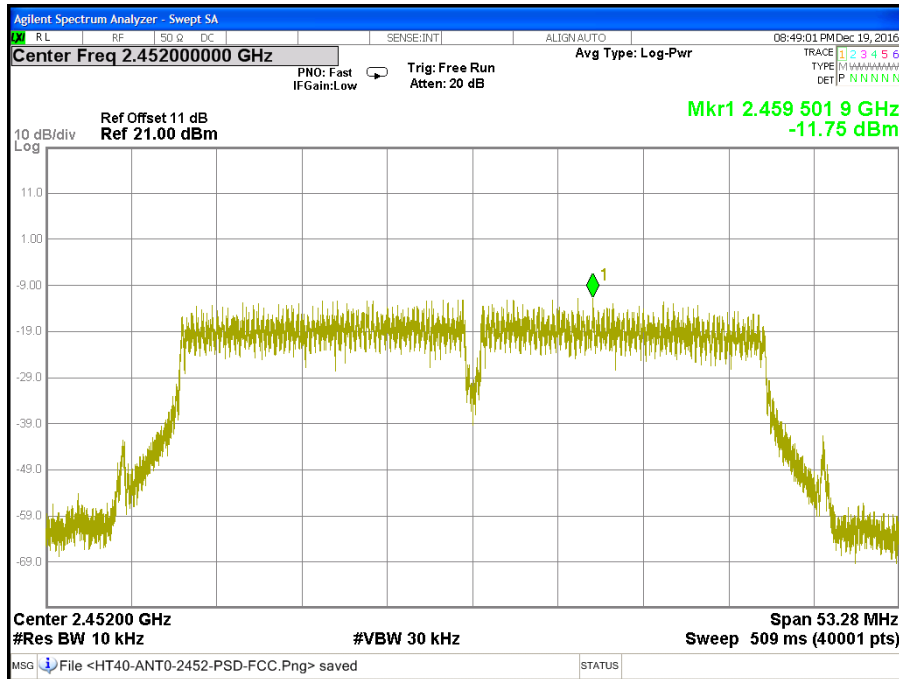
CH Low (IEEE 802.11gn HT40 MCS0 Mode / Chain 0)



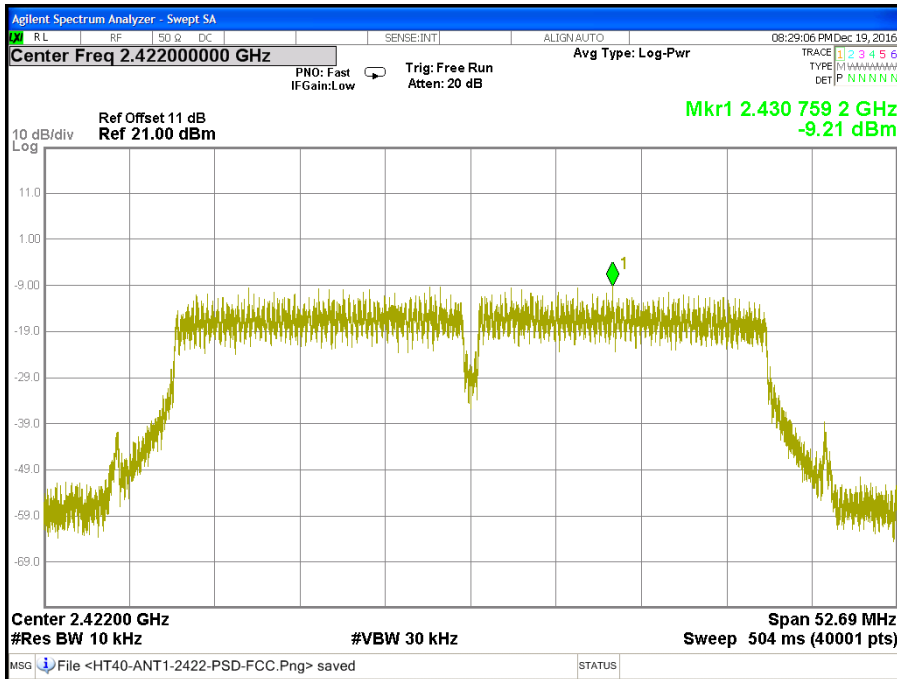
CH Middle (IEEE 802.11gn HT40 MCS0 Mode / Chain 0)



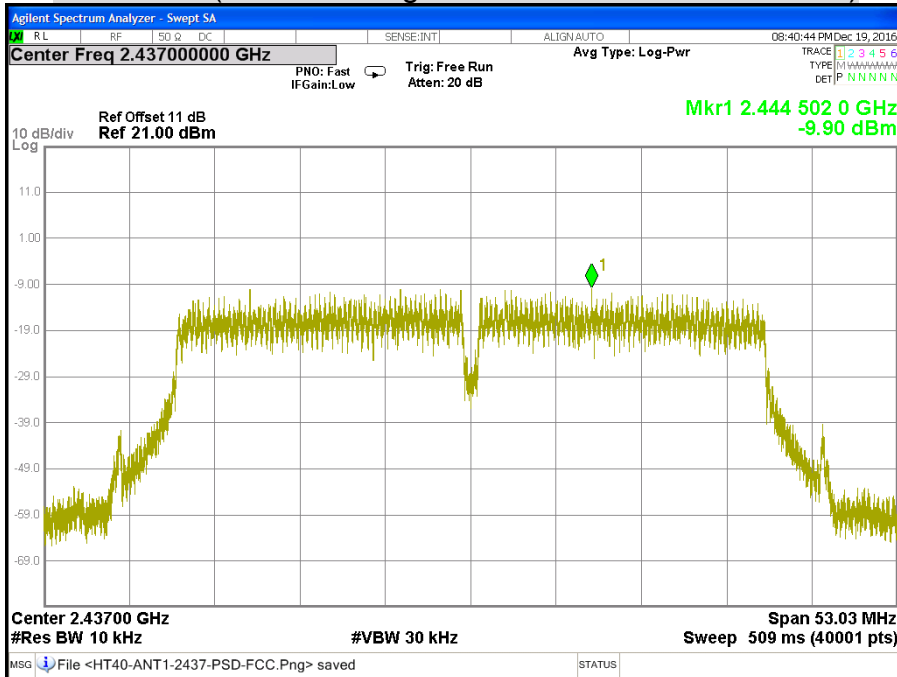
**CH High (IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**



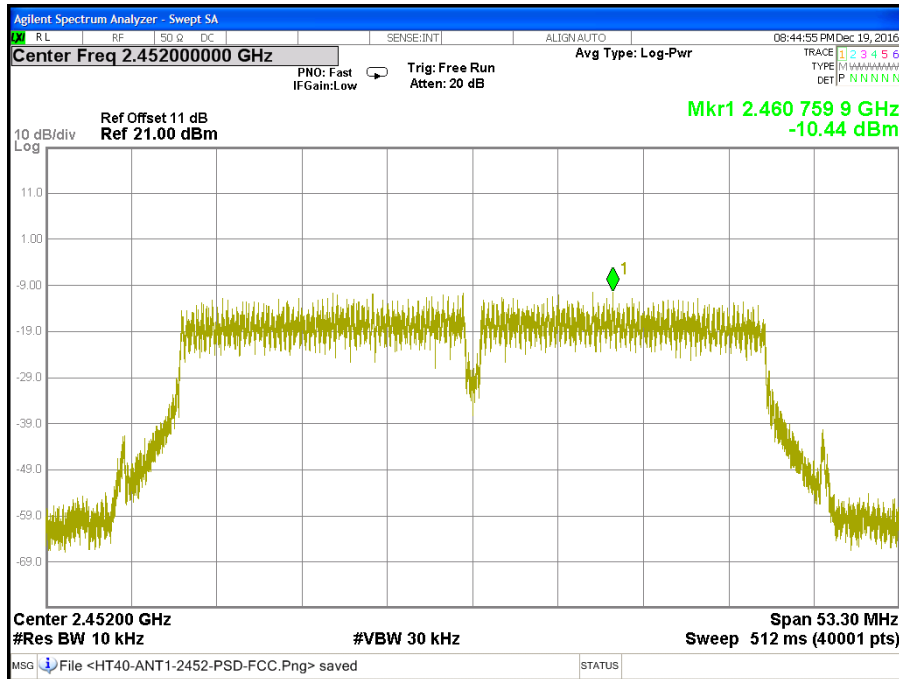
CH Low (IEEE 802.11gn HT40 MCS0 Mode / Chain 1)



CH Middle (IEEE 802.11gn HT40 MCS0 Mode / Chain 1)



**CH High (IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**





## 7.6 CONDUCTED SPURIOUS EMISSION

### LIMITS

§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the and that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. 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 § 15.205(c)).

### TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/15/2017
Test S/W	N/A			

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

### TEST SETUP



### TEST PROCEDURE

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

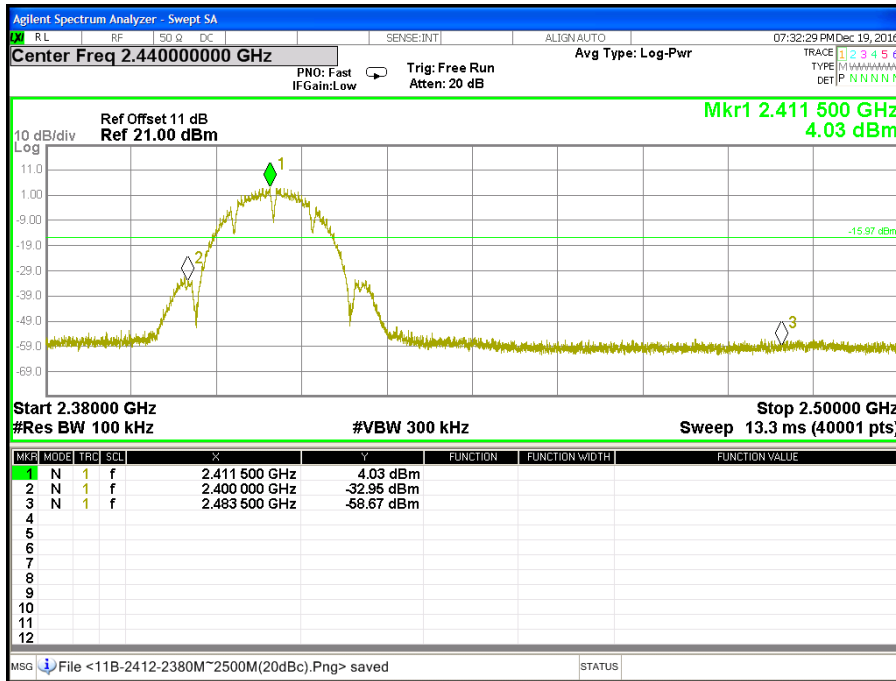
The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

### TEST RESULTS

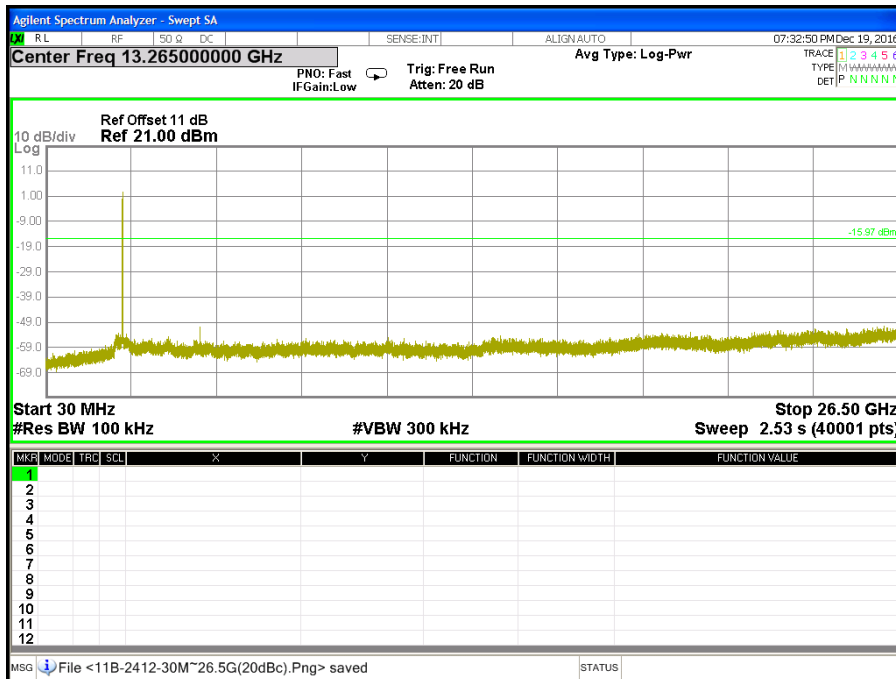
<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Crystal Wu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/19
<b>Test Mode</b>	TX Mode	<b>Temp. &amp; Humidity</b>	22°C, 63%

**OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT**

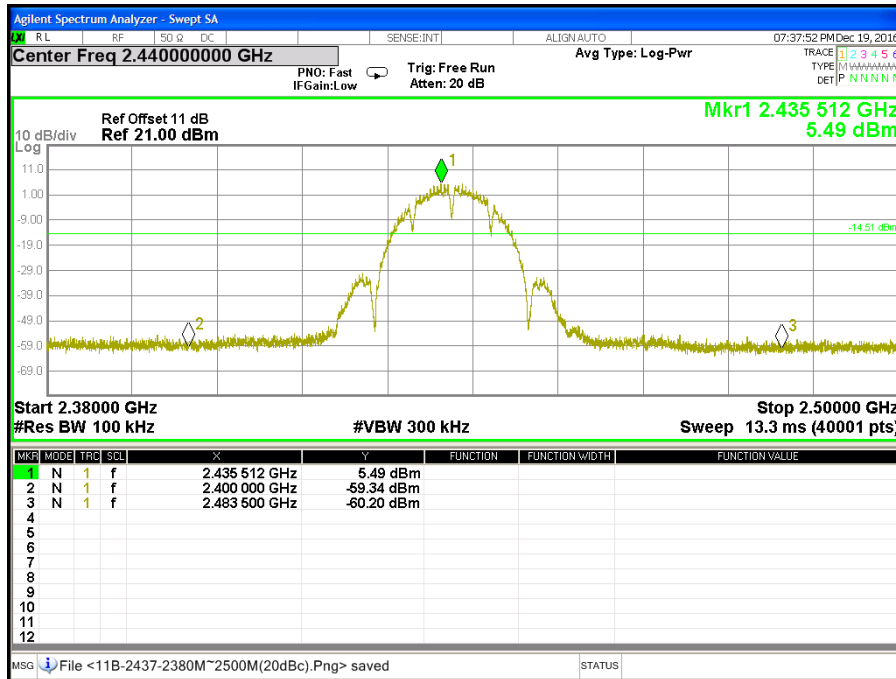
CH Low (2.38GHz ~ 2.5GHz / IEEE 802.11b Mode / Chain 0)



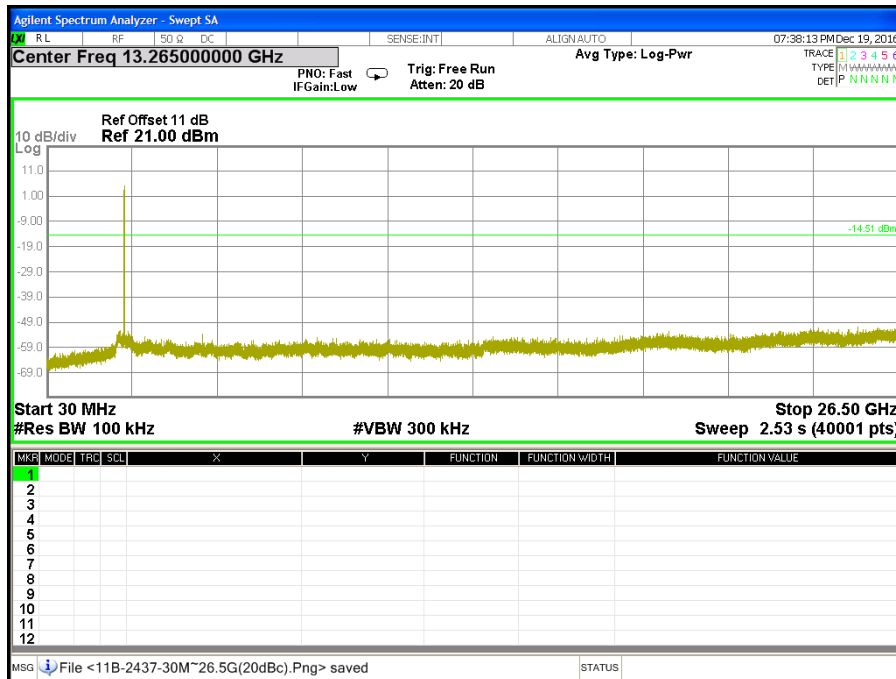
CH Low (30MHz ~ 26.5GHz / IEEE 802.11b Mode / Chain 0)



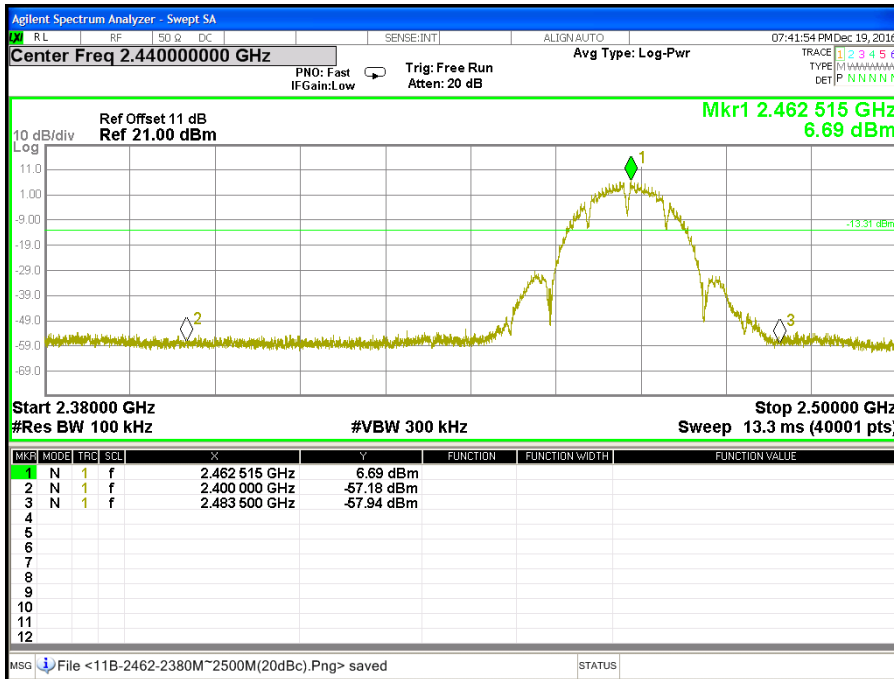
**CH Middle (2.38GHz ~ 2.5GHz / IEEE 802.11b Mode / Chain 0)**



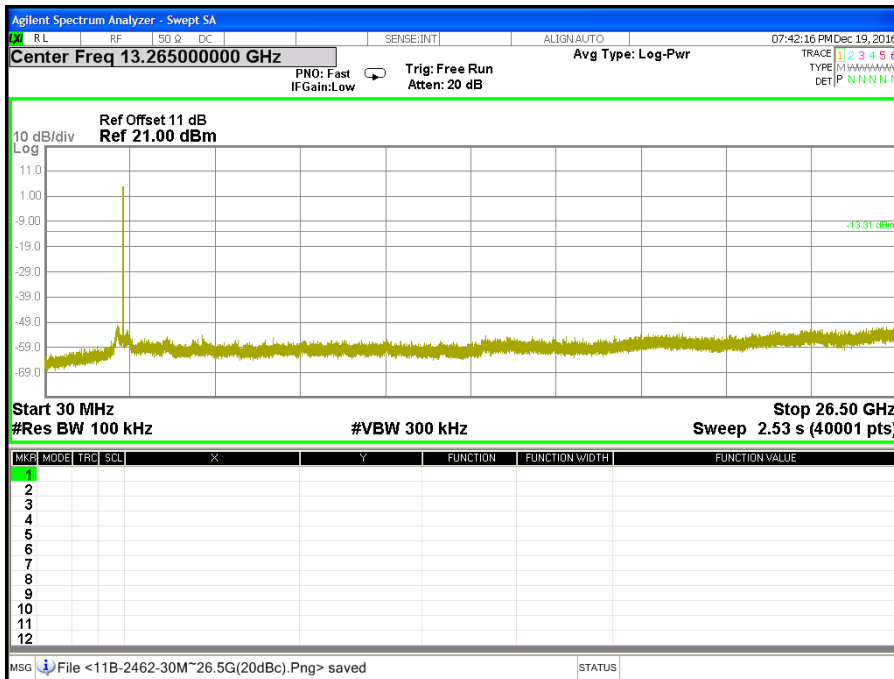
**CH Middle (30MHz ~ 26.5GHz / IEEE 802.11b Mode / Chain 0)**



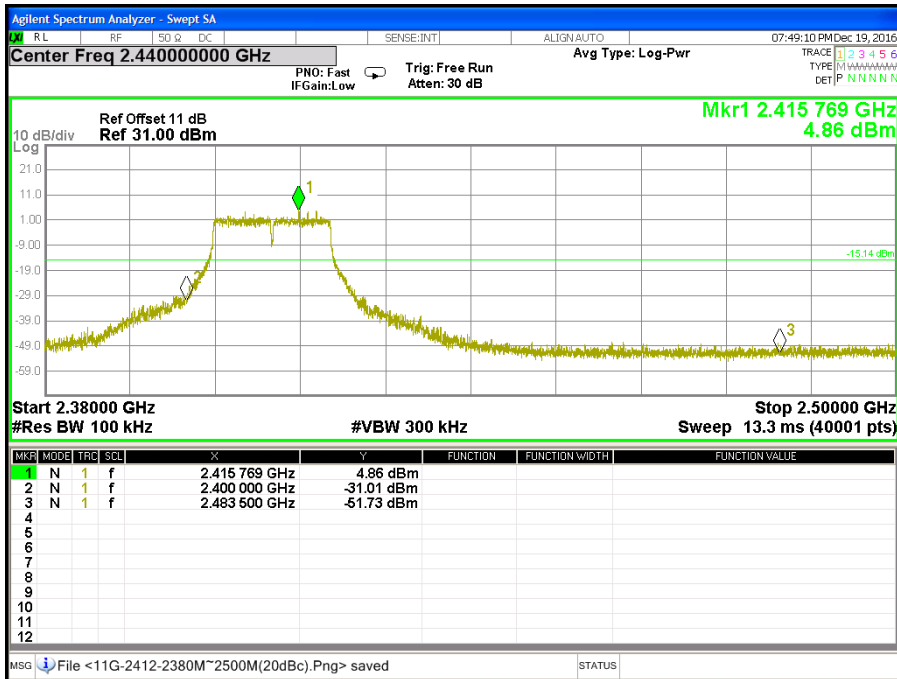
**CH High (2.38GHz ~ 2.5GHz / IEEE 802.11b Mode / Chain 0)**



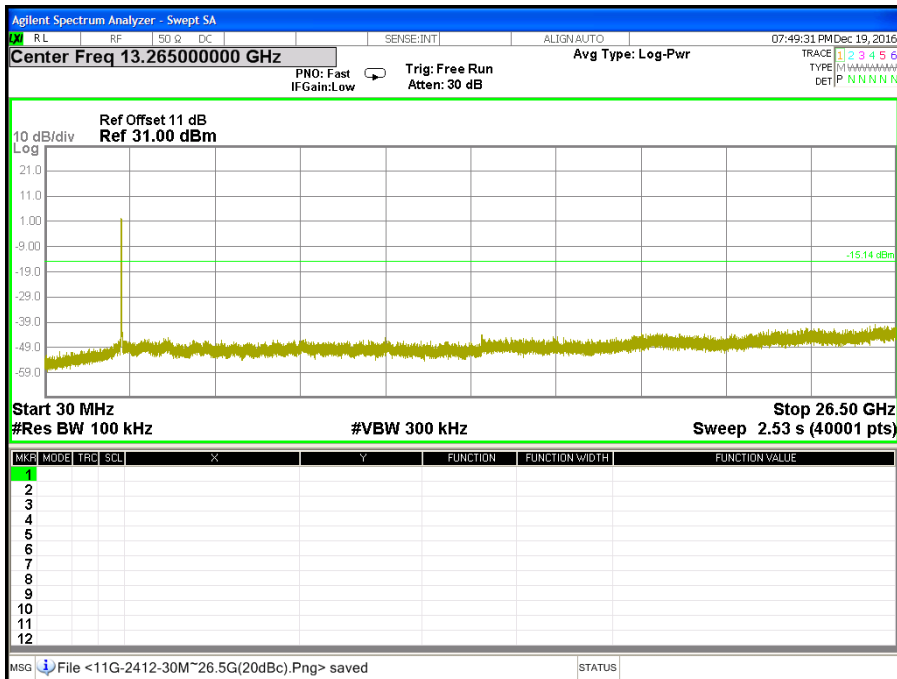
**CH High (30MHz ~ 26.5GHz / IEEE 802.11b Mode / Chain 0)**



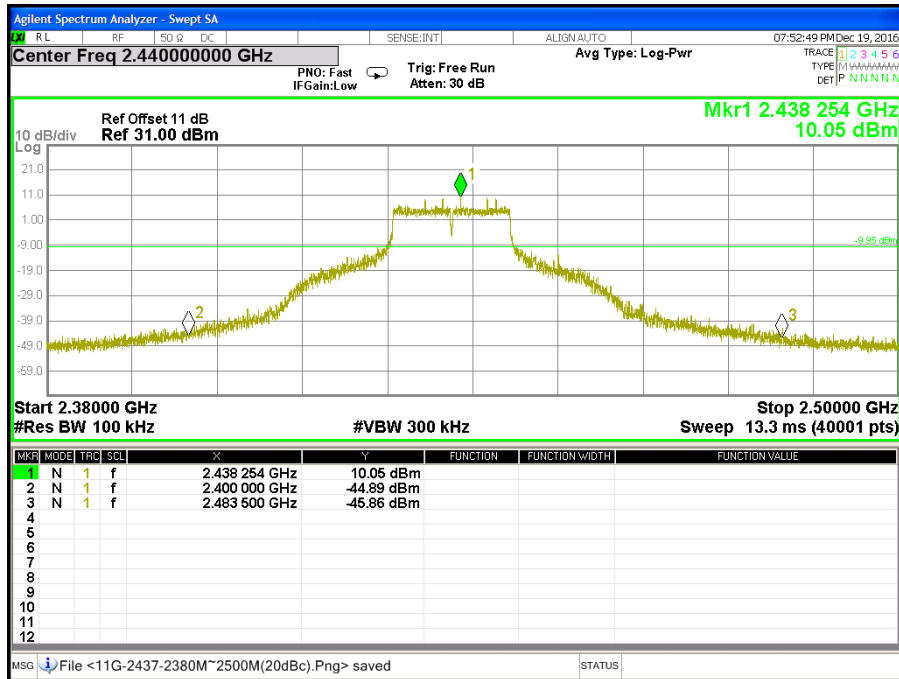
**CH Low (2.38GHz ~ 2.5GHz / IEEE 802.11g Mode / Chain 0)**



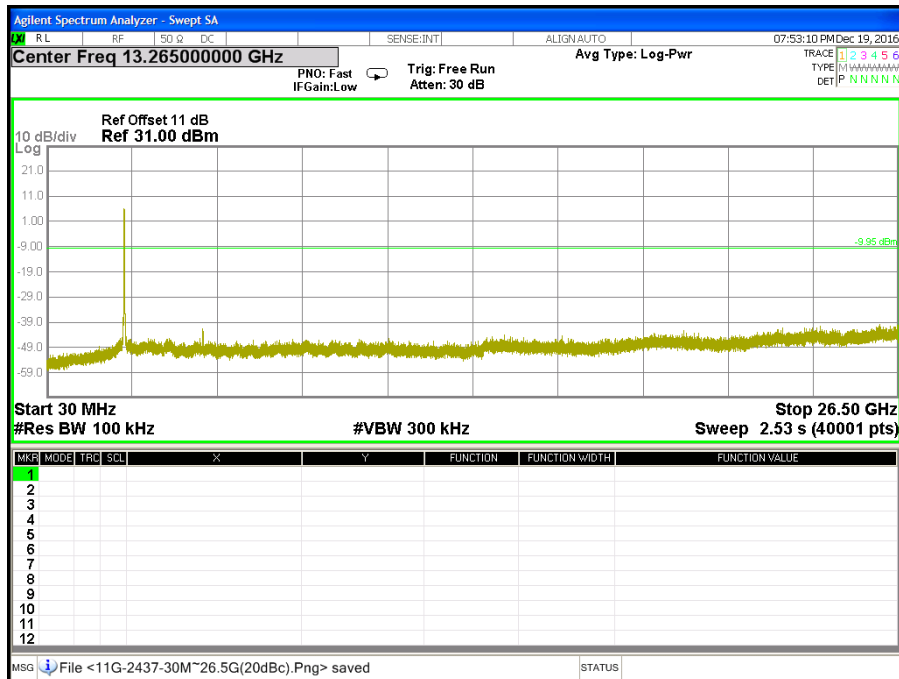
**CH Low (30MHz ~ 26.5GHz / IEEE 802.11g Mode / Chain 0)**



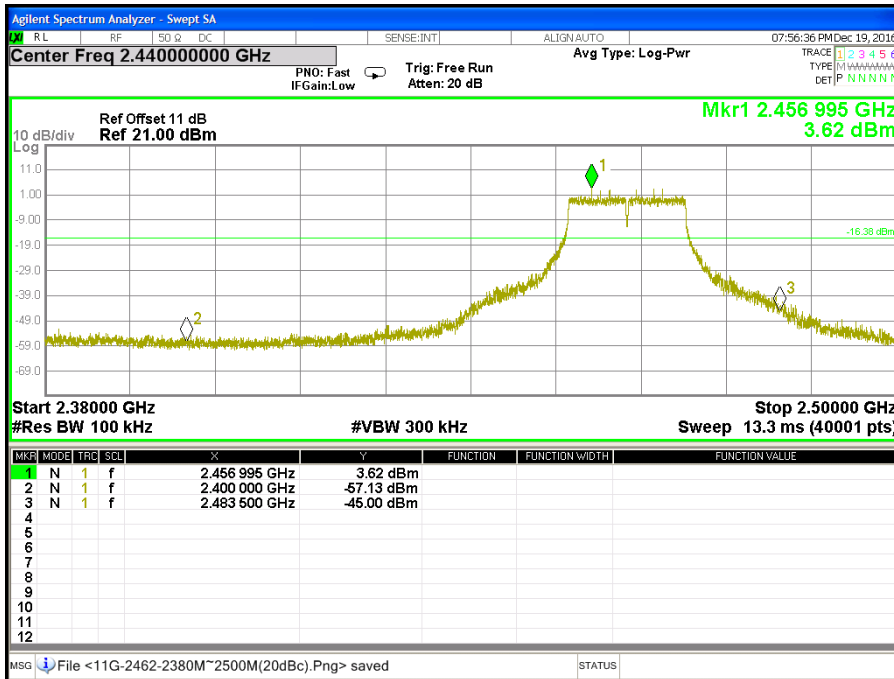
**CH Middle (2.38GHz ~ 2.5GHz / IEEE 802.11g Mode / Chain 0)**



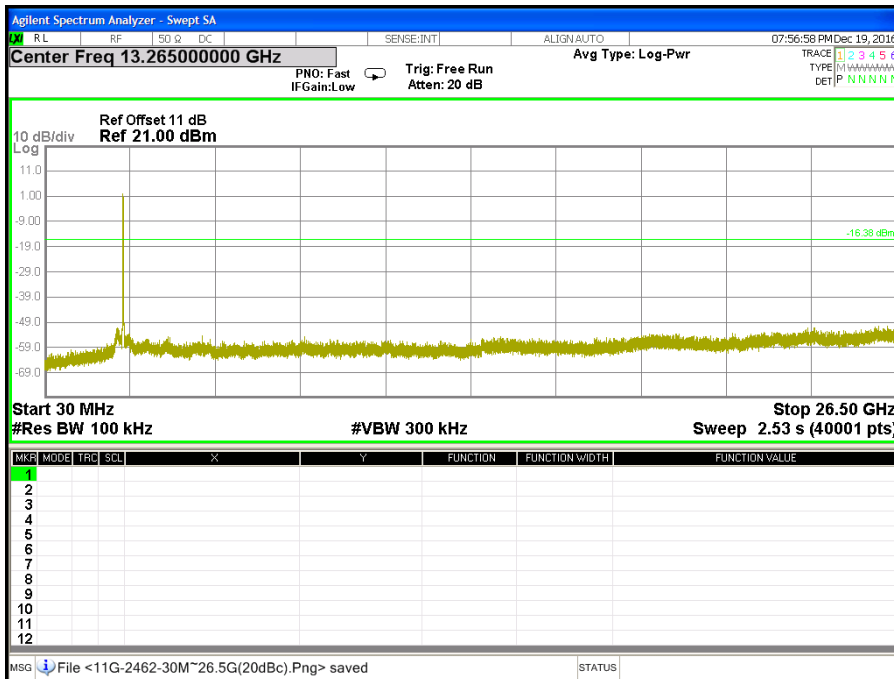
**CH Middle (30MHz ~ 26.5GHz / IEEE 802.11g Mode / Chain 0)**



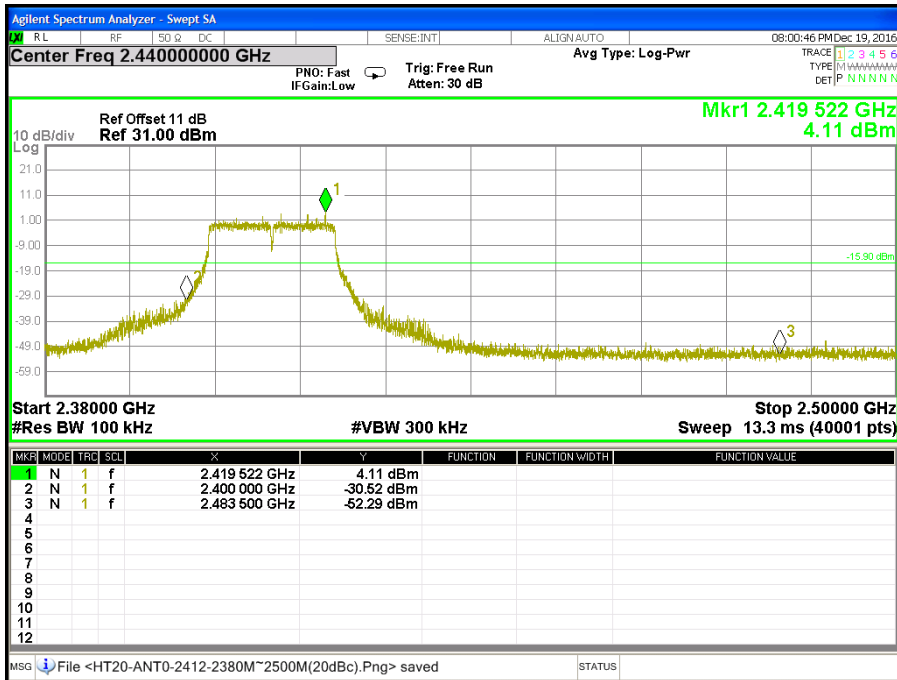
**CH High (2.38GHz ~ 2.5GHz / IEEE 802.11g Mode / Chain 0)**



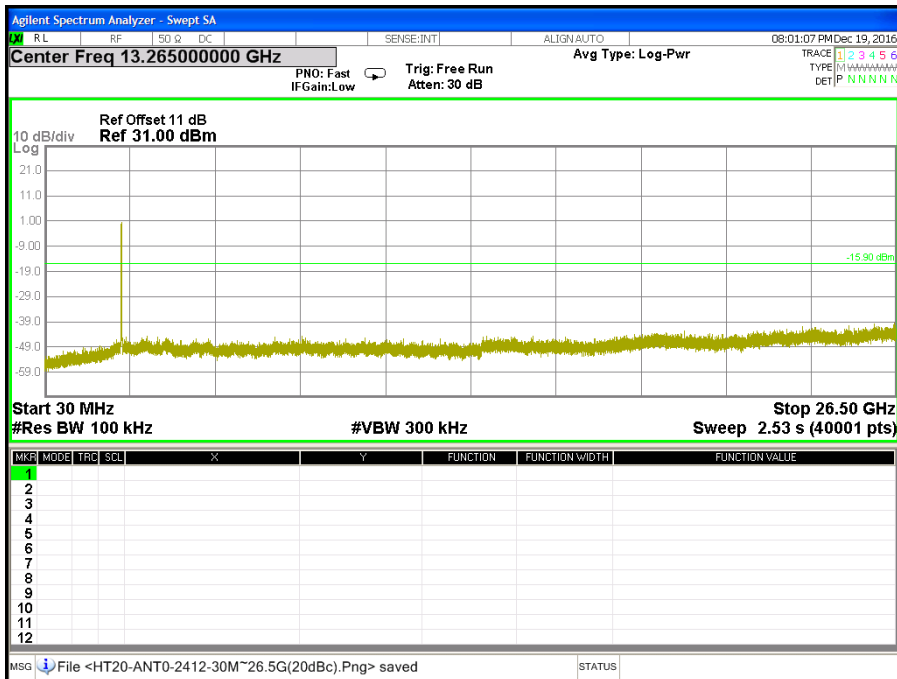
**CH High (30MHz ~ 26.5GHz / IEEE 802.11g Mode / Chain 0)**



**CH Low (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**

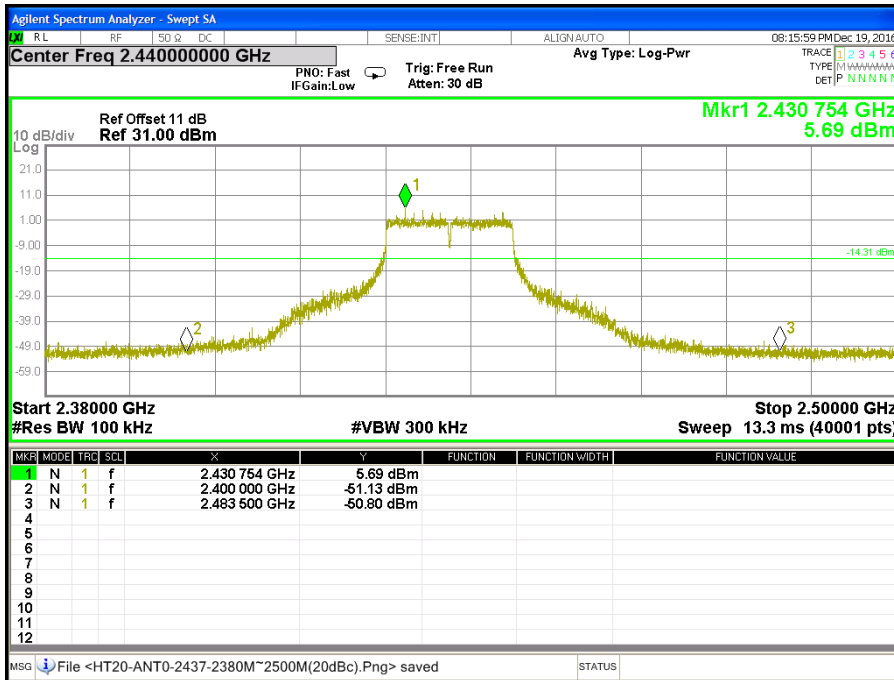


**CH Low (30MHz ~ 26.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**

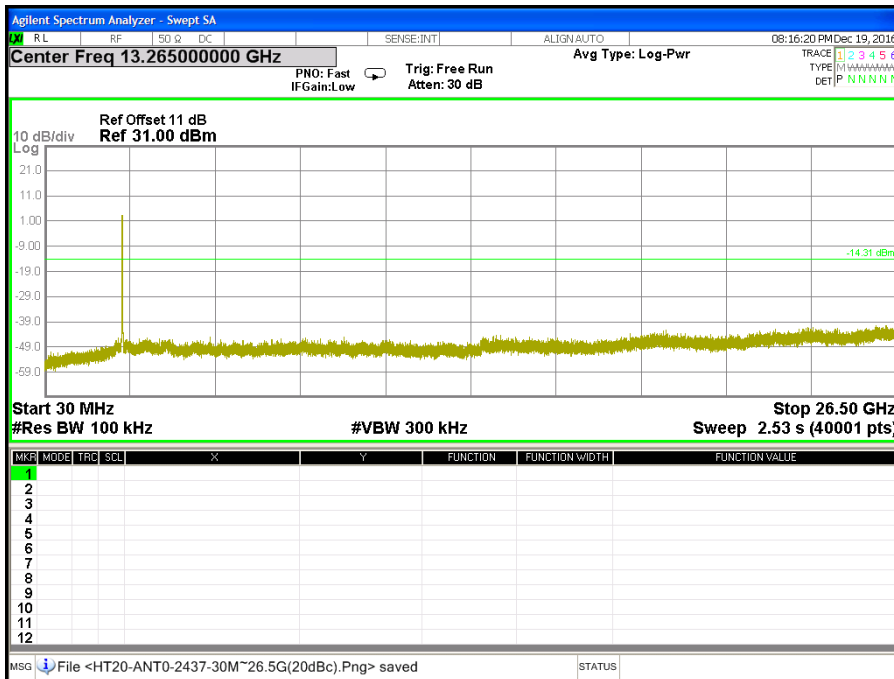




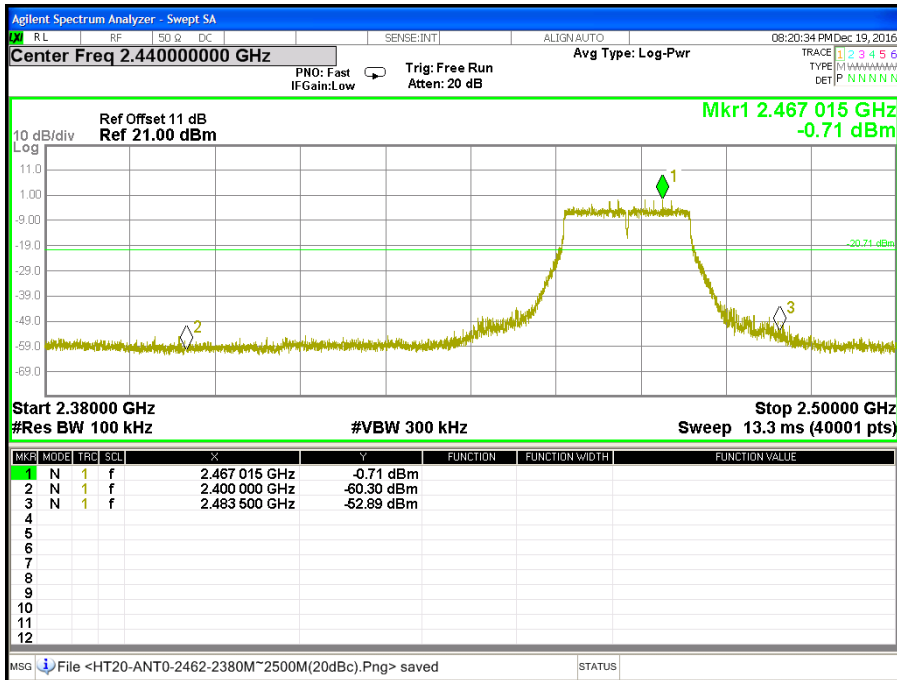
CH Middle (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 0)



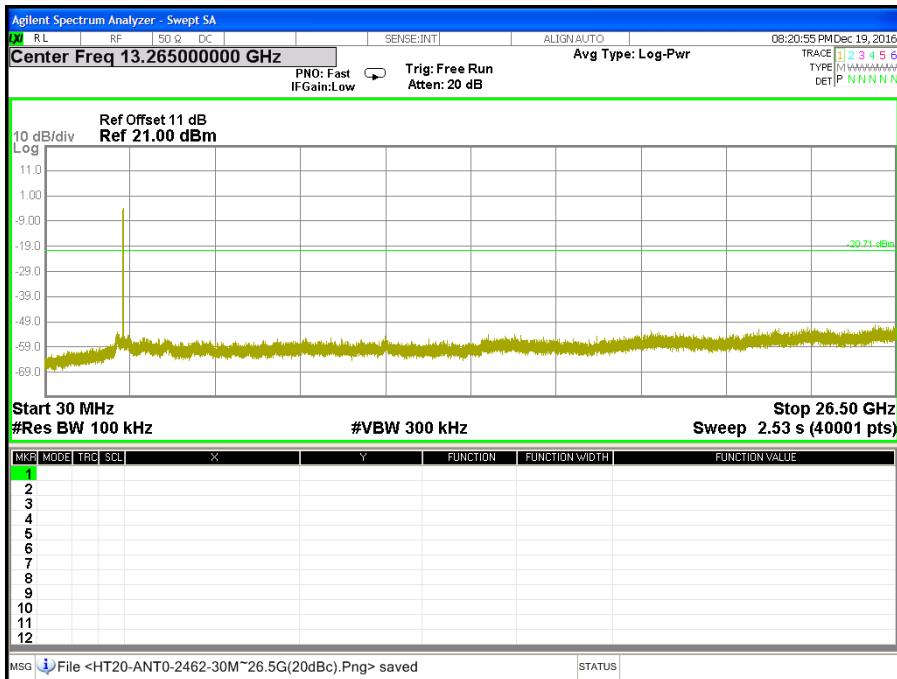
CH Middle (30MHz ~ 26.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 0)



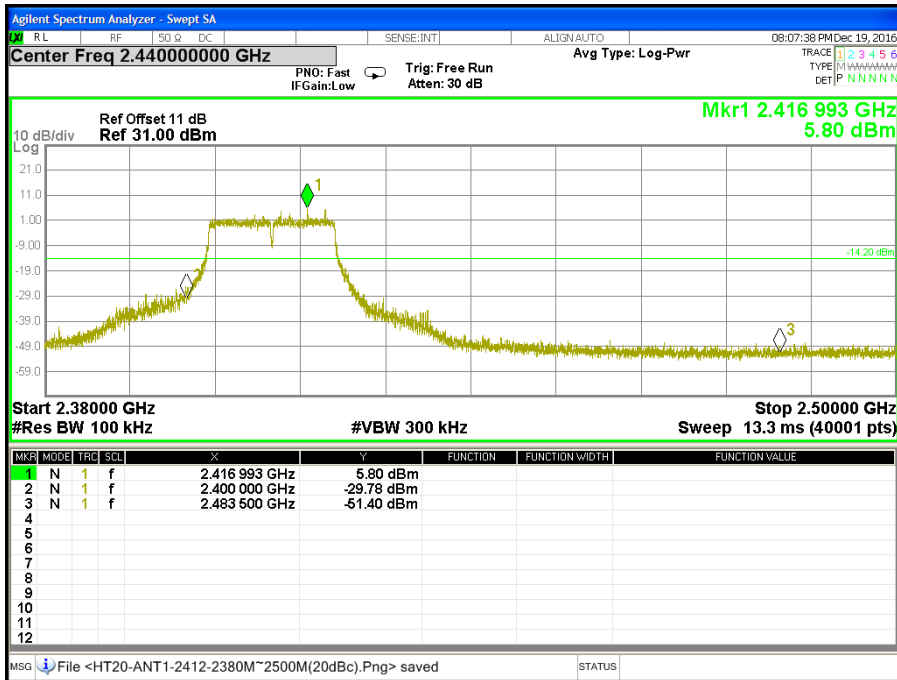
**CH High (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**



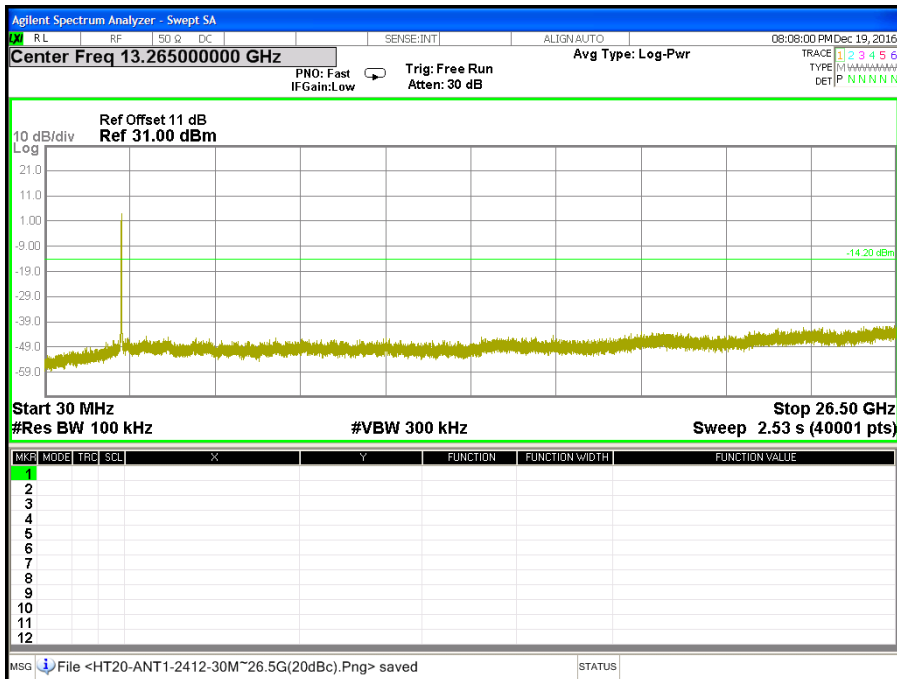
**CH High (30MHz ~ 26.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 0)**



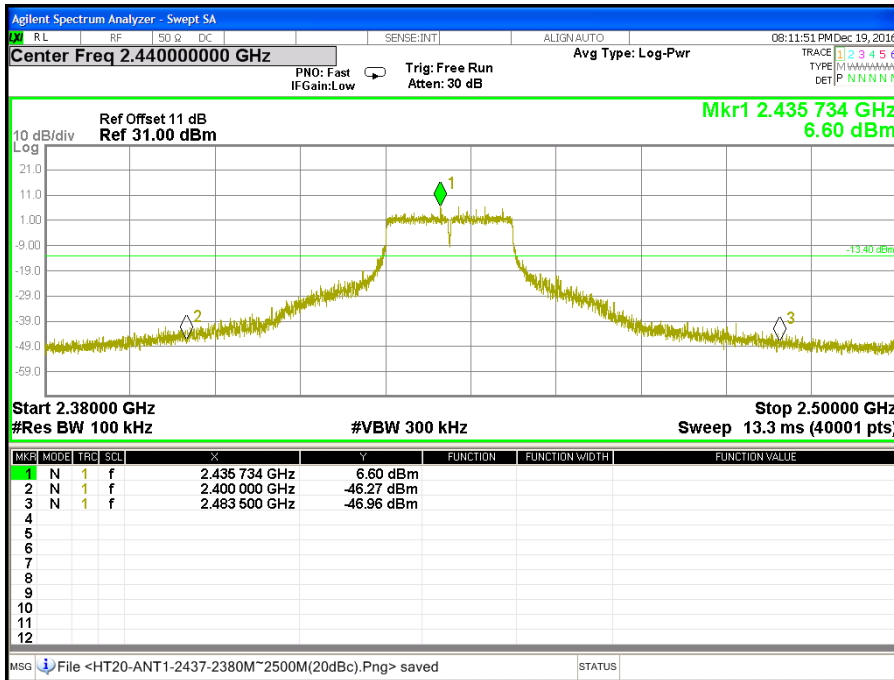
**CH Low (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



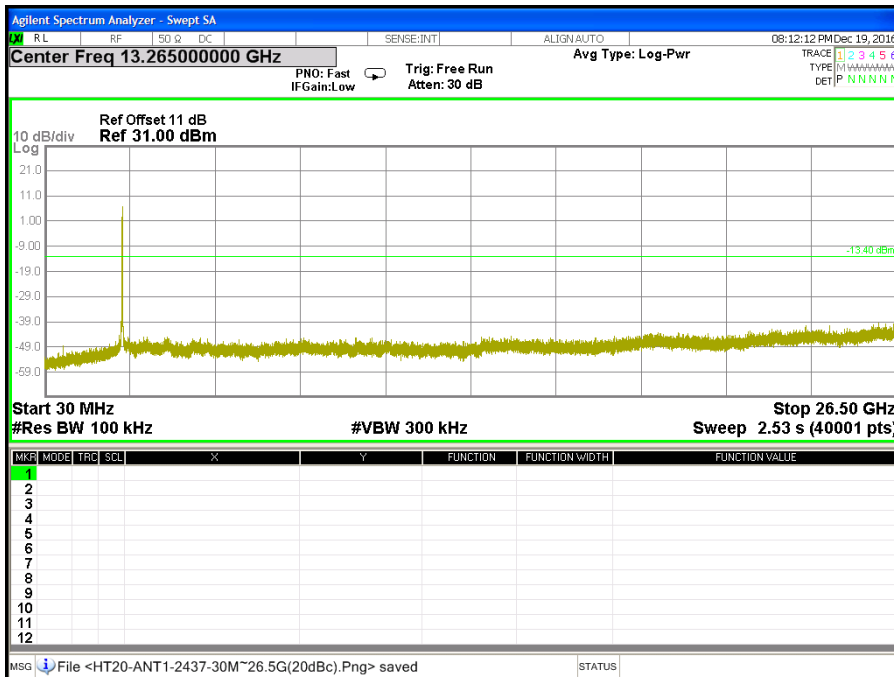
**CH Low (30MHz ~ 26.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



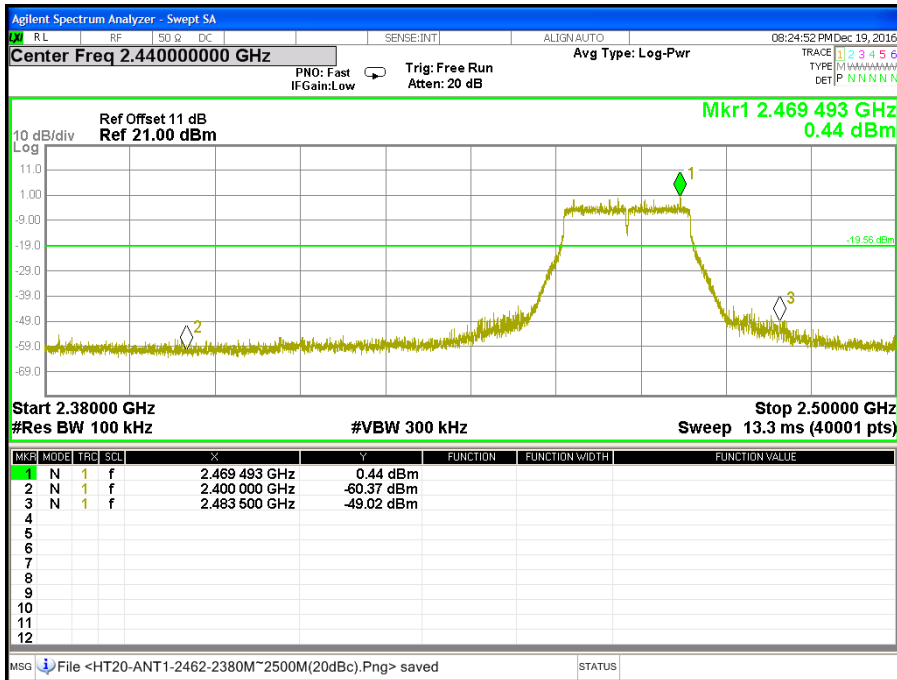
CH Middle (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 1)



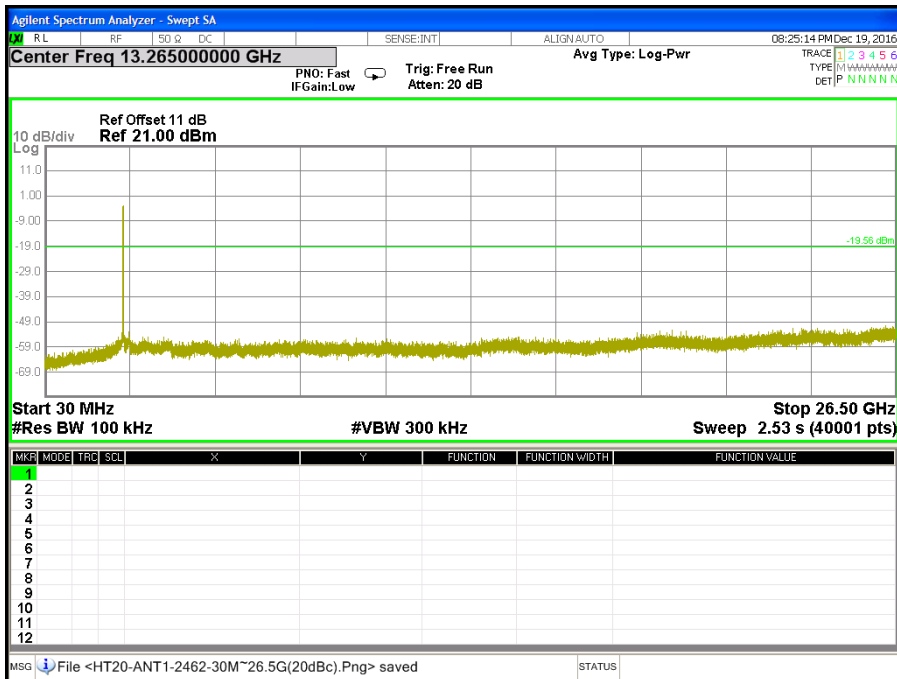
CH Middle (30MHz ~ 26.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 1)



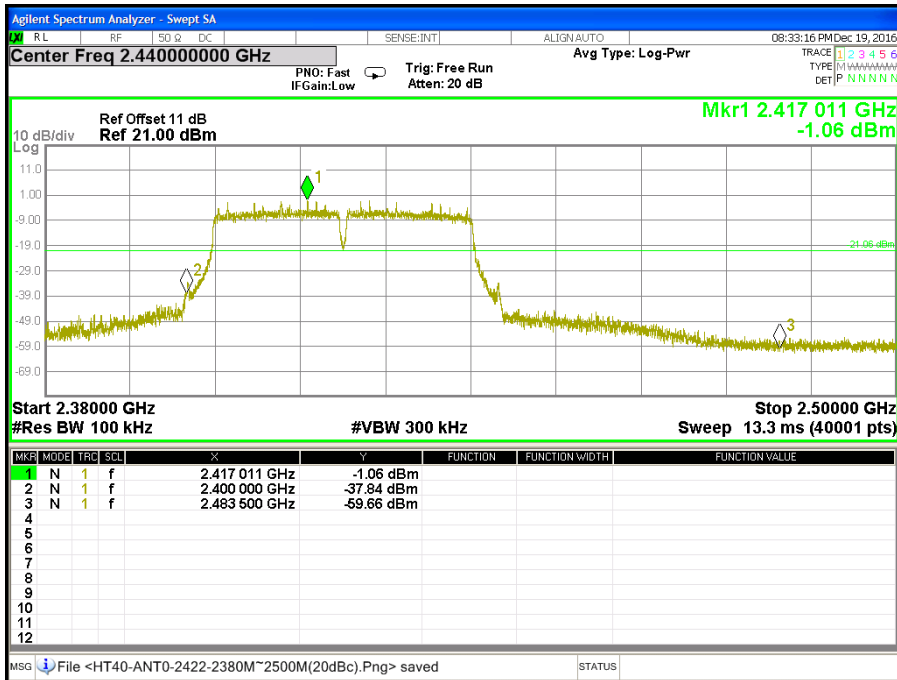
**CH High (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



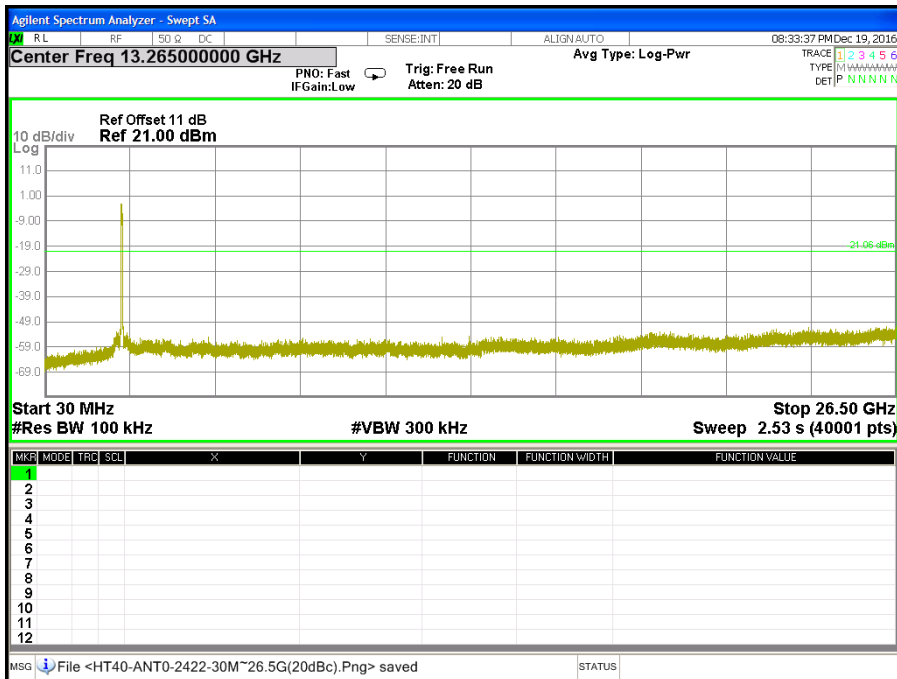
**CH High (30MHz ~ 26.5GHz / IEEE 802.11gn HT20 MCS0 Mode / Chain 1)**



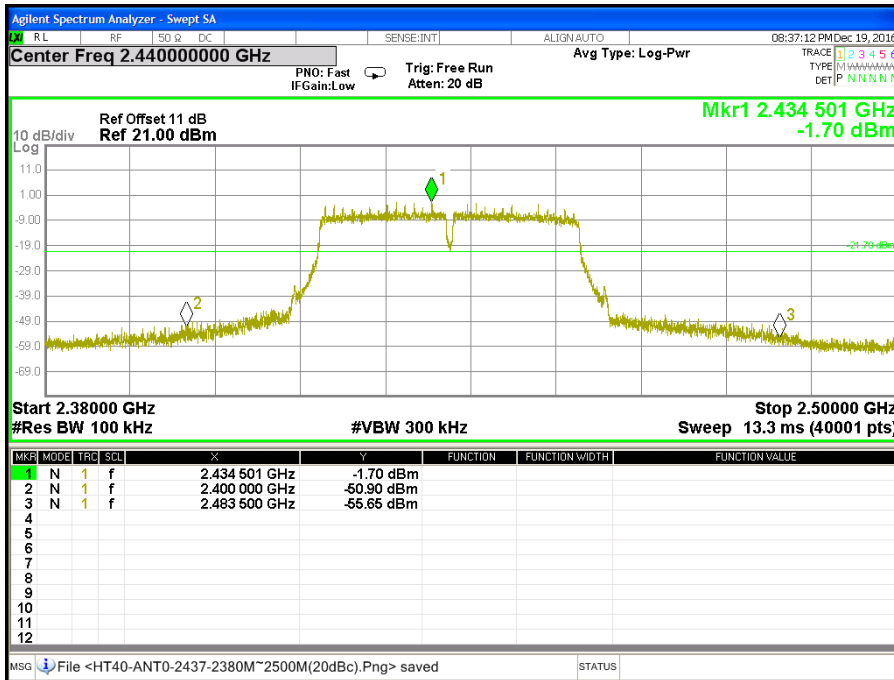
**CH Low (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**



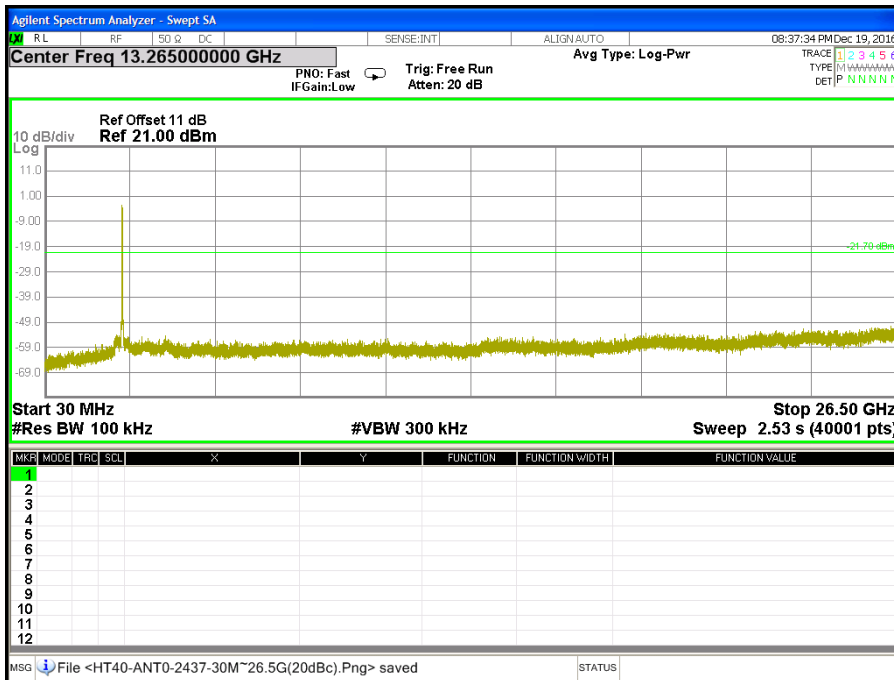
**CH Low (30MHz ~ 26.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**



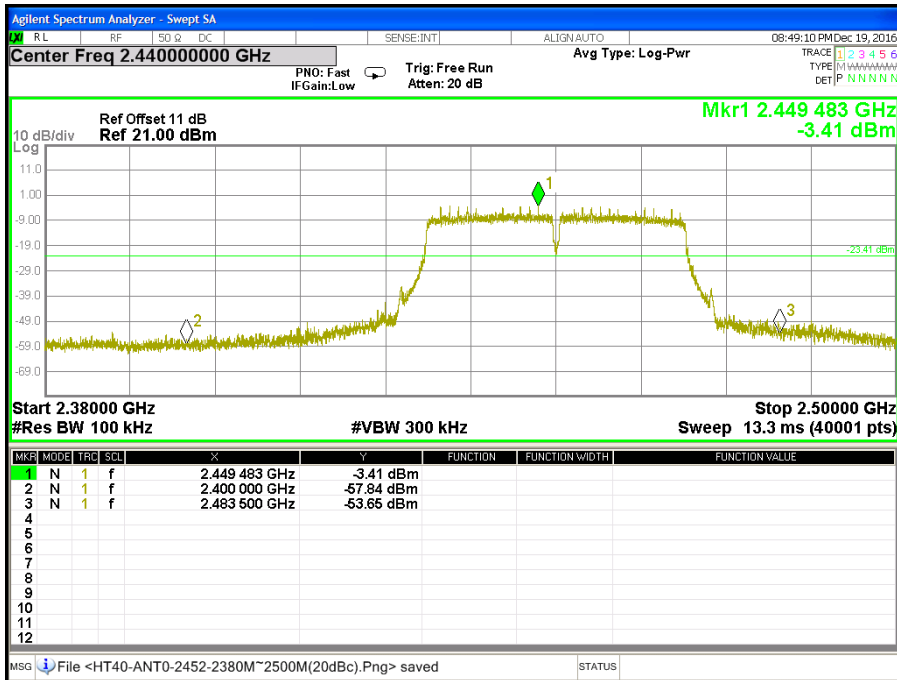
CH Middle (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 0)



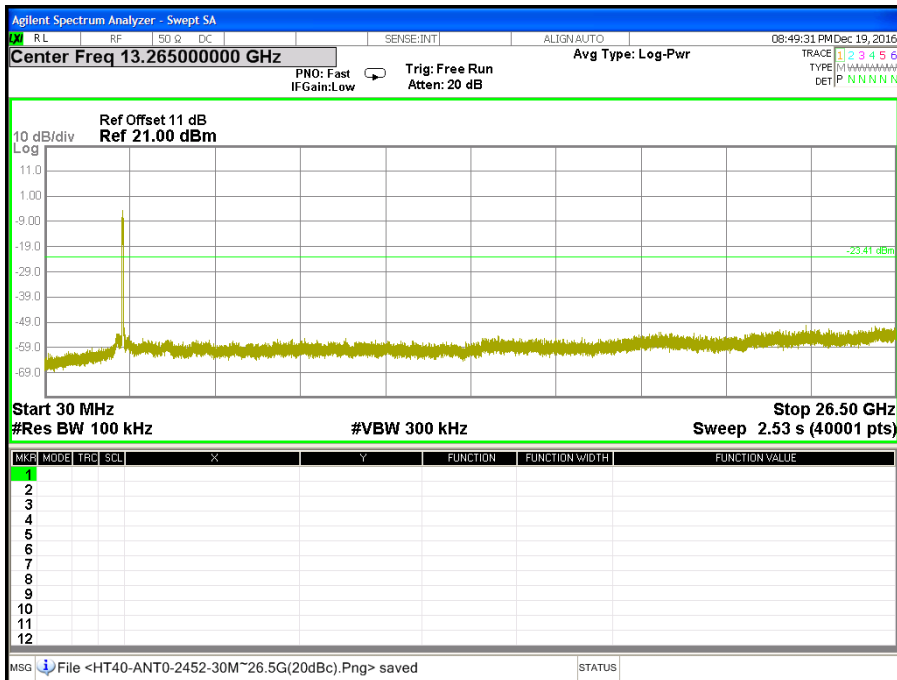
CH Middle (30MHz ~ 26.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 0)



**CH High (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**

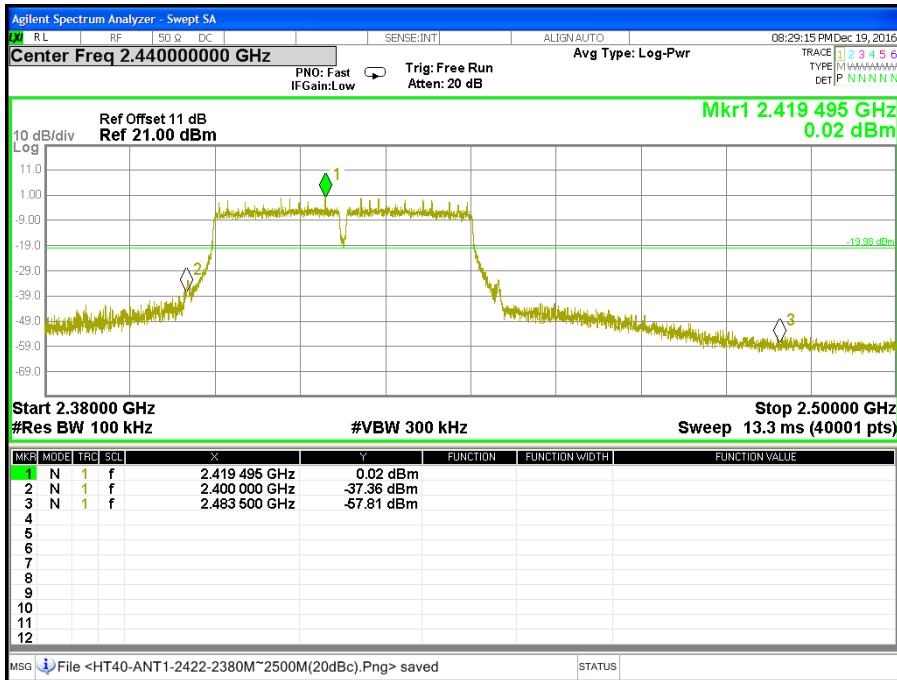


**CH High (30MHz ~ 26.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 0)**

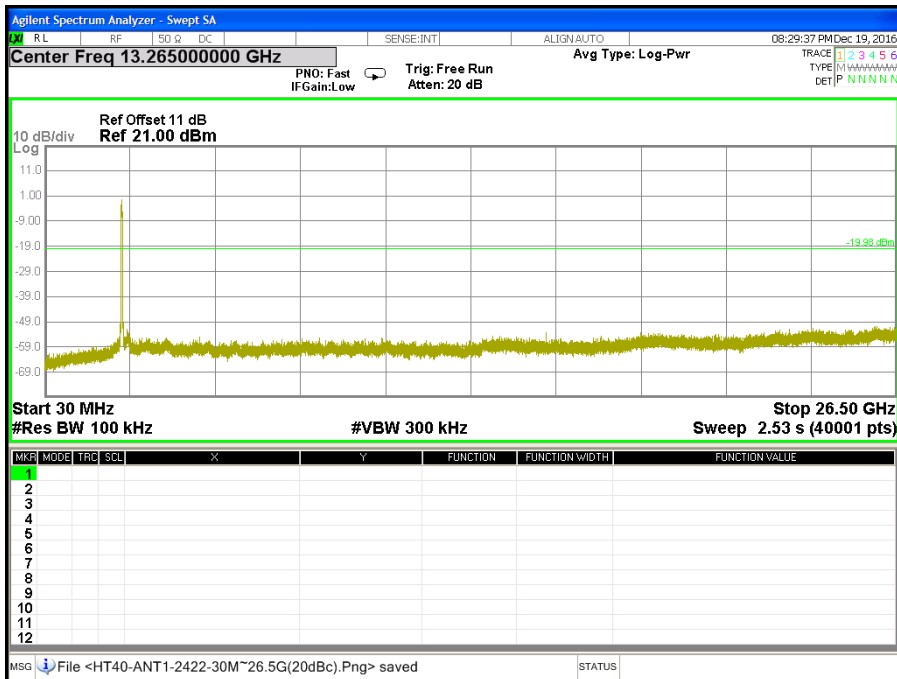




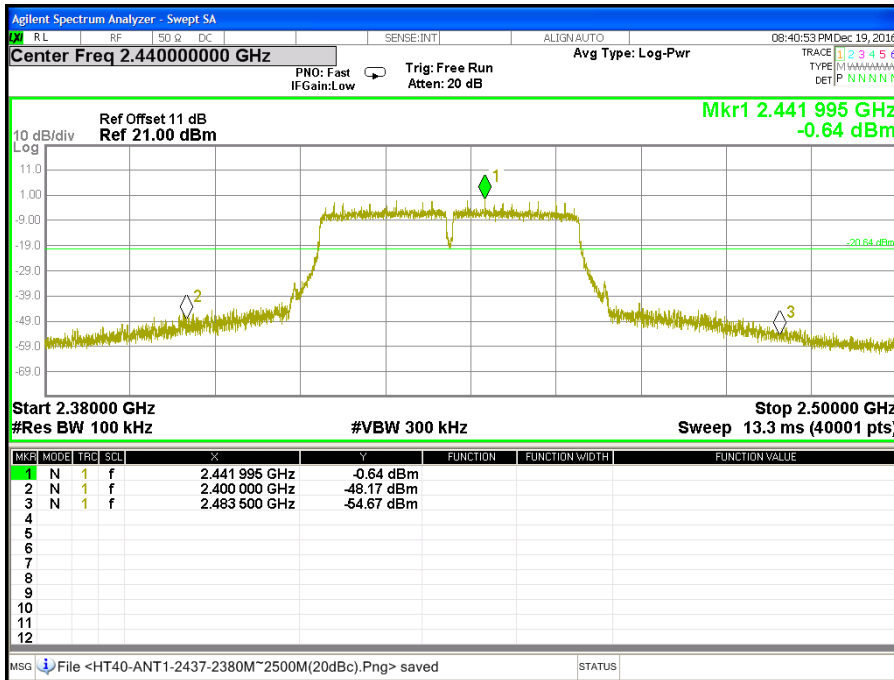
**CH Low (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**



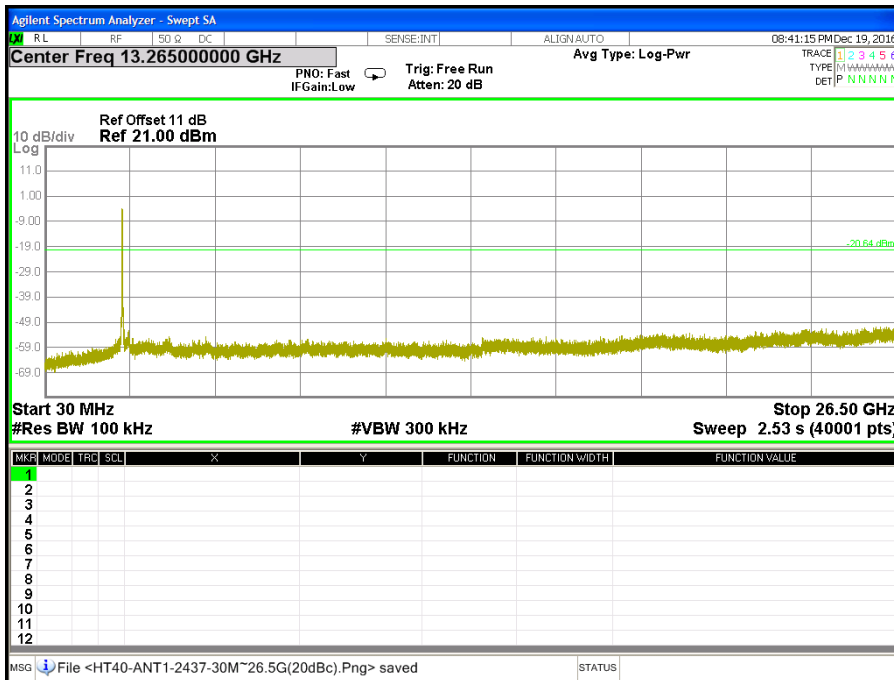
**CH Low (30MHz ~ 26.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**



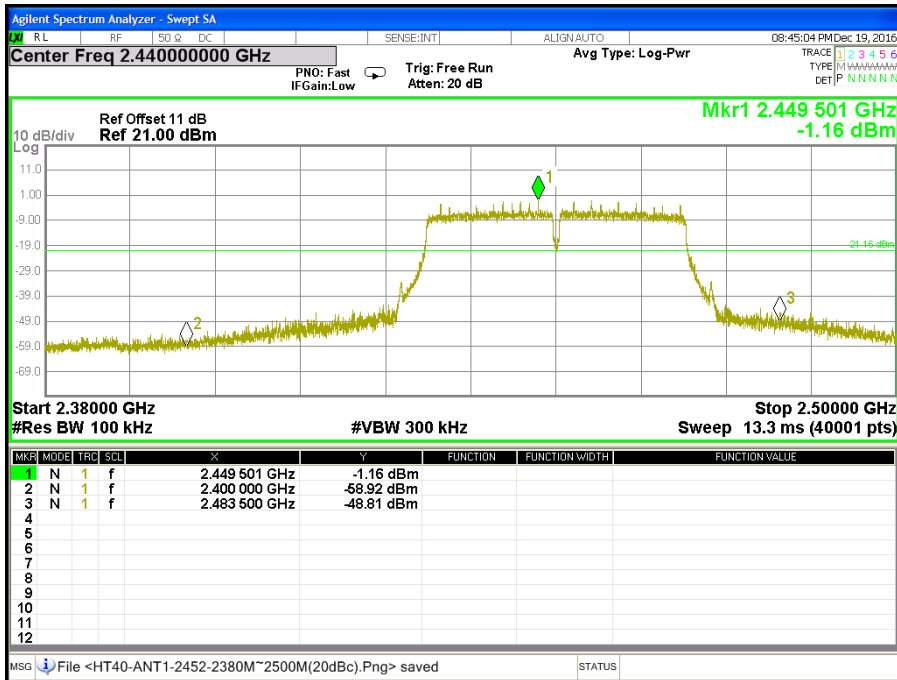
CH Middle (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chian 1)



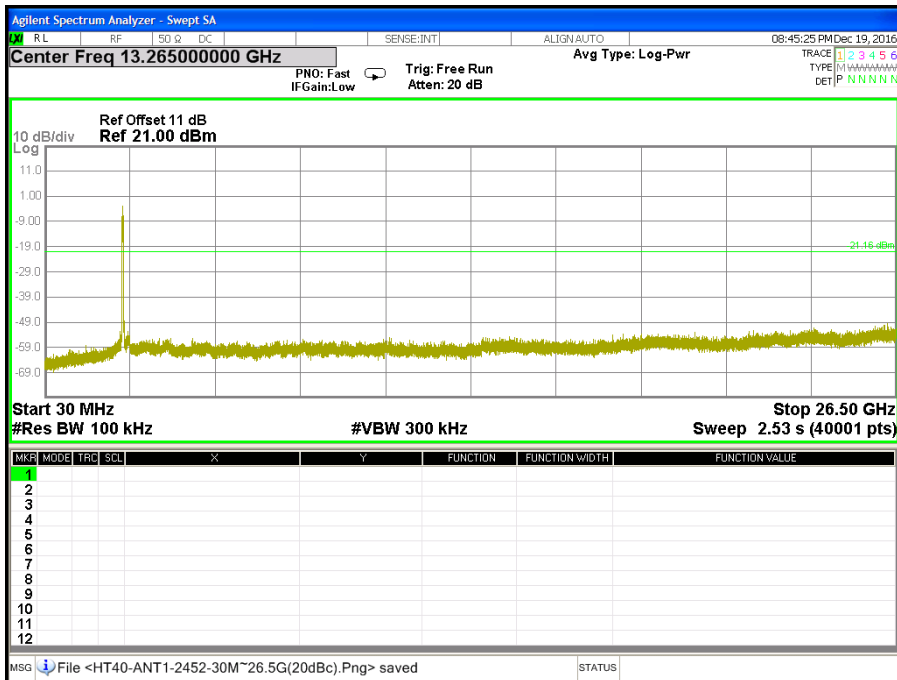
CH Middle (30MHz ~ 26.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chian 1)



**CH High (2.38GHz ~ 2.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**



**CH High (30MHz ~ 26.5GHz / IEEE 802.11gn HT40 MCS0 Mode / Chain 1)**



## 7.7 RADIATED EMISSION

### LIMITS

- (1) According to § 15.205 (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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

**Remark:**

1. <sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2. <sup>2</sup> Above 38.6

- (2) According to § 15.205 (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) 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 (microvolts/meter)	Measurement Distance (meters)
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.

- (4) According to § 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

**TEST EQUIPMENT**

**Radiated Emission / 966Chamber\_B**

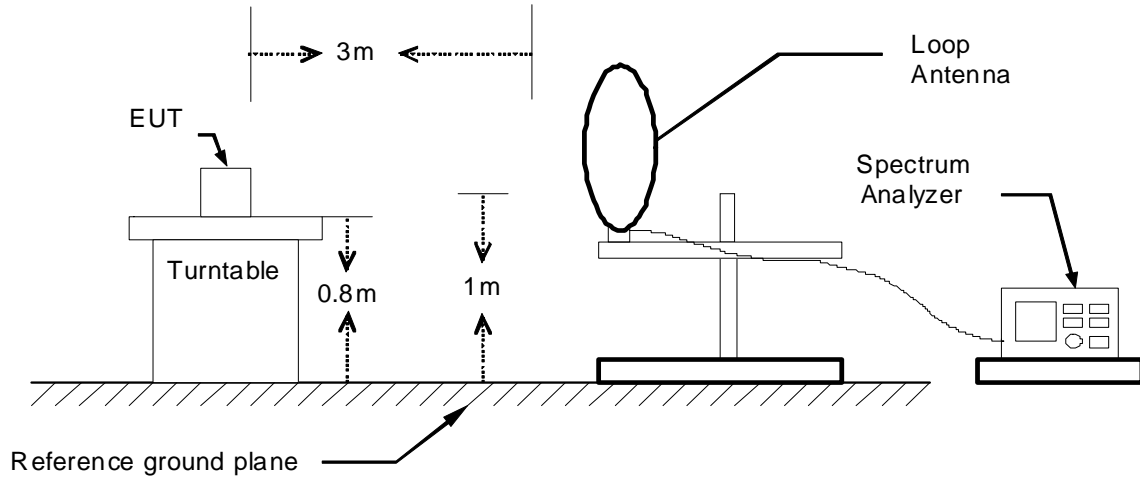
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY46180323	03/16/2018
EMI Test Receiver	Rohde & Schwarz	ESCI	100221	04/26/2017
Bi-log Antenna	TESEQ	CBL 6112D	35403	07/02/2017
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-778	07/14/2017
Double-Ridged Waveguide Horn	ETS-LINDGREN	3117	00078733	11/16/2017
Horn Antenna	COM-POWER	AH-840	03077	12/01/2017
Pre-Amplifier	Agilent	8447D	2944A10052	07/12/2017
Pre-Amplifier	Agilent	8449B	3008A01916	07/12/2017
LOOP Antenna	COM-POWER	AL-130	121060	05/23/2017
Test S/W	E3.815206a			

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

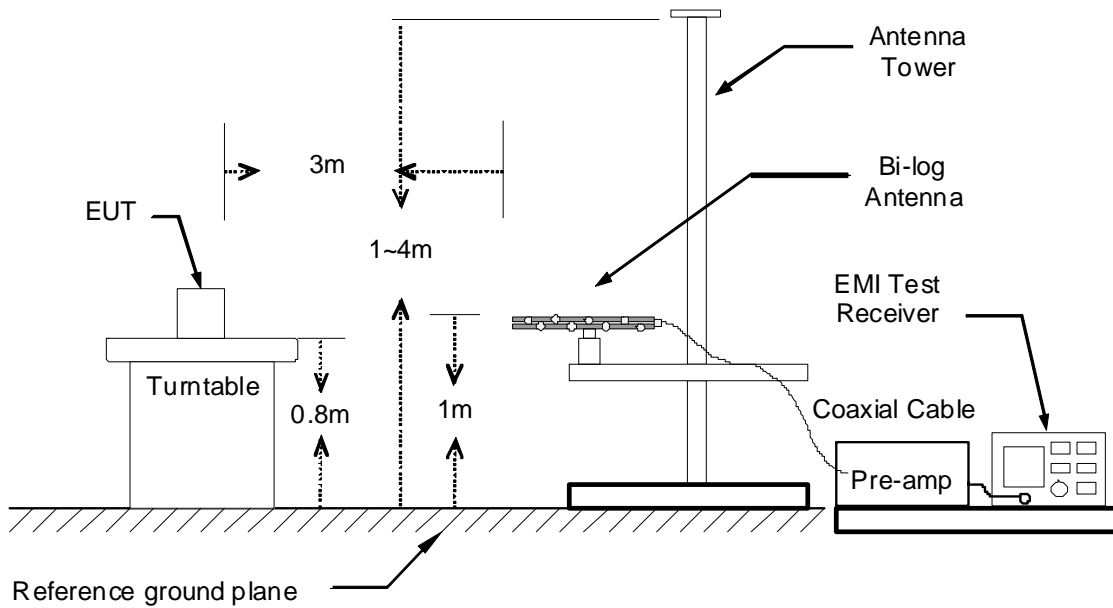
**TEST SETUP**

The diagram below shows the test setup that is utilized to make the measurements for emission below 1GHz.

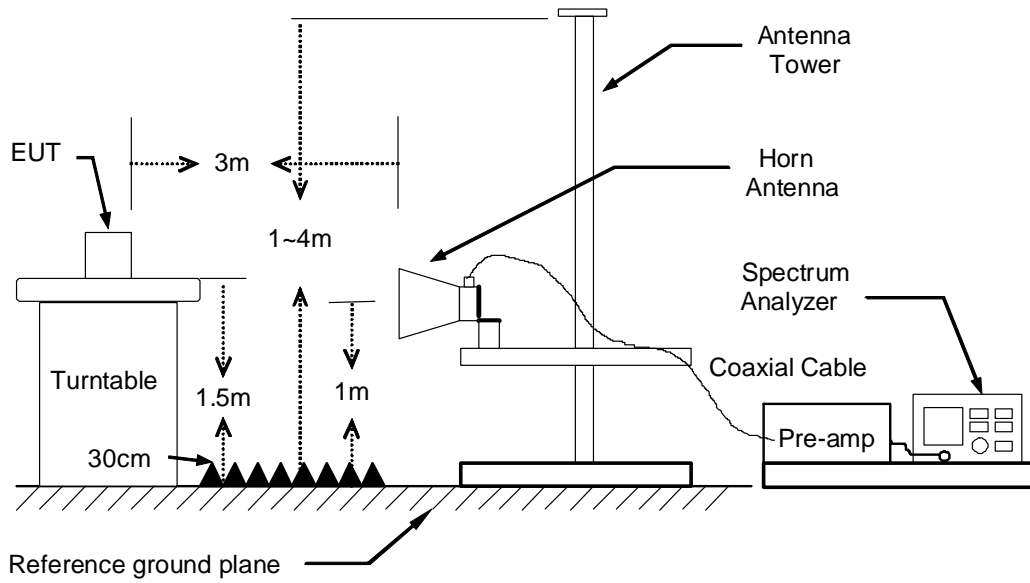
**9kHz ~ 30MHz**



**30MHz ~ 1GHz**



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



## **TEST PROCEDURE**

1. The EUT was placed on the top of a rotating table 0.8 and 1.5 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
2. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

### **Remark:**

1. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.*
2. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.*
3. *The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.*



**TEST RESULTS**

**Below 1 GHz (9kHz ~ 30MHz)**

No emission found between lowest internal used/generated frequency to 30MHz.

**Below 1 GHz (30MHz ~ 1GHz)**

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2017/01/10
<b>Test Mode</b>	Mode 1	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
125.06	41.69	-10.75	30.94	43.50	-12.56	235	200	Peak
224.97	52.95	-12.20	40.75	46.00	-5.25	215	100	Peak
250.19	48.62	-9.27	39.35	46.00	-6.65	211	100	Peak
337.49	45.75	-7.63	38.12	46.00	-7.88	287	200	Peak
400.54	44.99	-6.19	38.80	46.00	-7.20	275	100	Peak
750.71	40.22	-1.95	38.27	46.00	-7.73	261	100	Peak
787.57	40.98	-1.38	39.60	46.00	-6.40	290	200	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
41.64	46.61	-11.46	35.15	40.00	-4.85	360	100	Peak
106.63	48.53	-11.34	37.19	43.50	-6.31	192	100	Peak
250.19	48.08	-9.27	38.81	46.00	-7.19	311	100	Peak
337.49	48.21	-7.63	40.58	46.00	-5.42	252	100	Peak
350.10	44.52	-7.23	37.29	46.00	-8.71	146	100	Peak
400.54	44.35	-6.19	38.16	46.00	-7.84	174	100	Peak
750.71	36.61	-1.95	34.66	46.00	-11.34	194	100	Peak

**Remark:**

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB)
3. Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)
4. Margin (dB) = Remark result (dBuV/m) - Quasi-peak limit (dBuV/m).

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Waternil Guan
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2017/05/11
<b>Test Mode</b>	Mode 2	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
106.63	52.05	-11.34	40.71	43.50	-2.79	98	200	Peak
187.14	47.36	-13.28	34.08	43.50	-9.42	254	200	Peak
250.19	49.11	-9.27	39.84	46.00	-6.16	115	200	Peak
262.80	48.19	-8.19	40.00	46.00	-6.00	220	100	Peak
337.49	50.37	-7.63	42.74	46.00	-3.26	287	100	Peak
350.10	48.90	-7.23	41.67	46.00	-4.33	185	100	Peak
750.71	43.93	-1.95	41.98	46.00	-4.02	234	100	Peak
787.57	40.67	-1.38	39.29	46.00	-6.71	268	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
42.61	47.10	-11.97	35.13	40.00	-4.87	115	100	Peak
54.25	49.08	-16.51	32.57	40.00	-7.43	353	100	Peak
106.63	49.33	-11.34	37.99	43.50	-5.51	289	100	Peak
149.31	45.51	-12.17	33.34	43.50	-10.16	360	100	Peak
262.80	42.90	-8.19	34.71	46.00	-11.29	10	200	Peak
337.49	47.71	-7.63	40.08	46.00	-5.92	269	100	Peak
412.18	39.62	-5.69	33.93	46.00	-12.07	306	100	Peak
750.71	38.40	-1.95	36.45	46.00	-9.55	173	100	Peak

**Remark:**

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB)
3. Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)
4. Margin (dB) = Remark result (dBuV/m) - Quasi-peak limit (dBuV/m).

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Waternil Guan
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2017/05/11
<b>Test Mode</b>	Mode 3	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
106.63	51.45	-11.34	40.11	43.50	-3.39	72	200	Peak
149.31	45.79	-12.17	33.62	43.50	-9.88	314	200	Peak
250.19	50.98	-9.27	41.71	46.00	-4.29	127	100	Peak
274.44	46.00	-8.60	37.40	46.00	-8.60	167	100	Peak
281.23	46.47	-8.65	37.82	46.00	-8.18	163	100	Peak
350.10	47.67	-7.23	40.44	46.00	-5.56	184	100	Peak
355.92	43.30	-7.05	36.25	46.00	-9.75	199	100	Peak
750.71	40.58	-1.95	38.63	46.00	-7.37	244	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
30.97	38.60	-5.88	32.72	40.00	-7.28	76	100	Peak
42.61	46.85	-11.97	34.88	40.00	-5.12	9	100	Peak
53.28	48.01	-16.25	31.76	40.00	-8.24	229	100	Peak
97.90	47.25	-12.62	34.63	43.50	-8.87	1	100	Peak
106.63	50.96	-11.34	39.62	43.50	-3.88	291	100	Peak
149.31	47.85	-12.17	35.68	43.50	-7.82	0	100	Peak
250.19	45.38	-9.27	36.11	46.00	-9.89	216	200	Peak
350.10	42.31	-7.23	35.08	46.00	-10.92	25	200	Peak

**Remark:**

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB)
3. Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)
4. Margin (dB) = Remark result (dBuV/m) - Quasi-peak limit (dBuV/m).

**Above 1 GHz**

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/13
<b>Test Mode</b>	IEEE 802.11b Mode / TX / CH Low	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2222.00	47.90	-3.31	44.59	54.00	-9.41	7	200	Average
2222.00	56.19	-3.31	52.88	74.00	-21.12	7	200	Peak
2488.00	48.80	-2.24	46.56	54.00	-7.44	1	100	Average
2488.00	57.57	-2.24	55.33	74.00	-18.67	1	100	Peak
4824.00	48.10	5.24	53.34	54.00	-0.66	218	200	Average
4824.00	49.05	5.24	54.29	74.00	-19.71	218	200	Peak
5640.00	37.17	7.10	44.27	74.00	-29.73	189	200	Peak
6960.00	36.62	12.16	48.78	74.00	-25.22	29	100	Peak
9336.00	35.54	14.10	49.64	74.00	-24.36	173	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2236.00	54.04	-3.26	50.78	74.00	-23.22	262	100	Peak
2968.00	50.23	-0.84	49.39	74.00	-24.61	140	200	Peak
4824.00	41.38	5.24	46.62	74.00	-27.38	333	100	Peak
5001.00	39.25	5.70	44.95	74.00	-29.05	212	200	Peak
7032.00	37.01	12.26	49.27	74.00	-24.73	110	100	Peak
9336.00	35.77	14.10	49.87	74.00	-24.13	250	100	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)  
 Remark AVG = Result(AV) – Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11b Mode / TX / CH Middle	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	47.90	-2.63	45.27	54.00	-8.73	356	200	Average
2390.00	56.74	-2.63	54.11	74.00	-19.89	356	200	Peak
2490.00	53.80	-2.23	51.57	54.00	-2.43	312	100	Average
2490.00	60.99	-2.23	58.76	74.00	-15.24	312	100	Peak
4875.00	47.79	5.38	53.17	54.00	-0.83	220	200	Average
4875.00	49.37	5.38	54.75	74.00	-19.25	220	200	Peak
5544.00	36.71	6.92	43.63	74.00	-30.37	359	200	Peak
7176.00	36.51	12.35	48.86	74.00	-25.14	0	200	Peak
9264.00	36.05	14.02	50.07	74.00	-23.93	70	200	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2312.00	47.50	-2.95	44.55	54.00	-9.45	281	100	Average
2312.00	56.20	-2.95	53.25	74.00	-20.75	281	100	Peak
2488.00	52.33	-2.24	50.09	74.00	-23.91	353	200	Peak
4875.00	41.31	5.38	46.69	74.00	-27.31	318	100	Peak
5283.00	37.14	6.34	43.48	74.00	-30.52	205	100	Peak
7308.00	37.83	12.44	50.27	74.00	-23.73	250	100	Peak
9228.00	36.22	13.97	50.19	74.00	-23.81	265	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result - Limit  
 Remark Peak = Result(PK) - Limit(PK)  
 Remark AVG = Result(AV) - Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/13
<b>Test Mode</b>	IEEE 802.11b Mode / TX / CH High	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2304.00	48.20	-2.98	45.22	54.00	-8.78	358	200	Average
2304.00	56.30	-2.98	53.32	74.00	-20.68	358	200	Peak
2948.00	49.56	-0.90	48.66	74.00	-25.34	247	200	Peak
4923.00	48.00	5.50	53.50	54.00	-0.50	220	200	Average
4923.00	48.74	5.50	54.24	74.00	-19.76	220	200	Peak
5679.00	36.76	7.18	43.94	74.00	-30.06	193	200	Peak
7380.00	36.85	12.48	49.33	74.00	-24.67	240	200	Peak
9288.00	36.21	14.04	50.25	74.00	-23.75	285	200	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2336.00	54.84	-2.85	51.99	74.00	-22.01	243	100	Peak
2964.00	50.05	-0.85	49.20	74.00	-24.80	47	200	Peak
4923.00	41.22	5.50	46.72	74.00	-27.28	232	100	Peak
5466.00	38.04	6.75	44.79	74.00	-29.21	351	100	Peak
7380.00	38.18	12.48	50.66	74.00	-23.34	298	100	Peak
9360.00	35.84	14.13	49.97	74.00	-24.03	293	100	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)  
 Remark AVG = Result(AV) – Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11g Mode / TX / CH Low	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2218.00	54.93	-3.33	51.60	74.00	-22.40	359	200	Peak
2572.00	45.30	-1.98	43.32	54.00	-10.68	338	100	Average
2572.00	55.18	-1.98	53.20	74.00	-20.80	338	100	Peak
4821.00	39.10	5.23	44.33	54.00	-9.67	220	200	Average
4821.00	48.06	5.23	53.29	74.00	-20.71	220	200	Peak
5751.00	37.06	7.32	44.38	74.00	-29.62	120	100	Peak
7236.00	30.10	12.39	42.49	54.00	-11.51	250	100	Average
7236.00	42.12	12.39	54.51	74.00	-19.49	250	100	Peak
9228.00	36.18	13.97	50.15	74.00	-23.85	124	200	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2214.00	52.72	-3.35	49.37	74.00	-24.63	280	200	Peak
2840.00	51.50	-1.21	50.29	74.00	-23.71	235	200	Peak
4821.00	40.81	5.23	46.04	74.00	-27.96	252	200	Peak
5757.00	37.13	7.33	44.46	74.00	-29.54	44	100	Peak
7236.00	31.80	12.39	44.19	54.00	-9.81	248	100	Average
7236.00	44.37	12.39	56.76	74.00	-17.24	248	100	Peak
9492.00	36.19	14.28	50.47	74.00	-23.53	257	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result - Limit  
 Remark Peak = Result(PK) - Limit(PK)  
 Remark AVG = Result(AV) - Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11g Mode / TX / CH Middle	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	50.00	-2.63	47.37	54.00	-6.63	10	100	Average
2390.00	62.97	-2.63	60.34	74.00	-13.66	10	100	Peak
2484.00	54.30	-2.25	52.05	54.00	-1.95	345	100	Average
2484.00	66.40	-2.25	64.15	74.00	-9.85	345	100	Peak
4875.00	44.59	5.38	49.97	54.00	-4.03	220	200	Average
4875.00	53.66	5.38	59.04	74.00	-14.96	220	200	Peak
5631.00	37.67	7.08	44.75	74.00	-29.25	35	200	Peak
7308.00	35.40	12.44	47.84	54.00	-6.16	311	200	Average
7308.00	44.40	12.44	56.84	74.00	-17.16	311	200	Peak
12192.00	30.00	19.64	49.64	54.00	-4.36	10	100	Average
12192.00	43.38	19.64	63.02	74.00	-10.98	10	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	45.70	-2.63	43.07	54.00	-10.93	71	100	Average
2390.00	58.91	-2.63	56.28	74.00	-17.72	71	100	Peak
2484.00	44.20	-2.25	41.95	54.00	-12.05	280	200	Average
2484.00	59.01	-2.25	56.76	74.00	-17.24	280	200	Peak
4872.00	46.74	5.37	52.11	74.00	-21.89	244	200	Peak
5844.00	36.77	7.50	44.27	74.00	-29.73	198	100	Peak
7308.00	40.50	12.44	52.94	54.00	-1.06	239	100	Average
7308.00	49.92	12.44	62.36	74.00	-11.64	239	100	Peak
12180.00	30.20	19.62	49.82	54.00	-4.18	261	200	Average
12180.00	42.03	19.62	61.65	74.00	-12.35	261	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)  
 Remark AVG = Result(AV) – Limit(AV)



<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11g Mode / TX / CH High	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2280.00	54.14	-3.08	51.06	74.00	-22.94	4	200	Peak
2942.00	49.76	-0.92	48.84	74.00	-25.16	286	200	Peak
4926.00	43.61	5.51	49.12	74.00	-24.88	224	200	Peak
5454.00	36.83	6.73	43.56	74.00	-30.44	229	200	Peak
7380.00	38.12	12.48	50.60	74.00	-23.40	339	100	Peak
9312.00	35.50	14.07	49.57	74.00	-24.43	280	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2272.00	52.65	-3.11	49.54	74.00	-24.46	261	100	Peak
2982.00	49.69	-0.80	48.89	74.00	-25.11	223	100	Peak
4926.00	38.77	5.51	44.28	74.00	-29.72	284	200	Peak
5499.00	37.11	6.83	43.94	74.00	-30.06	292	100	Peak
7380.00	33.20	12.48	45.68	54.00	-8.32	284	100	Average
7380.00	43.89	12.48	56.37	74.00	-17.63	284	100	Peak
9360.00	36.78	14.13	50.91	74.00	-23.09	284	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)  
 Remark AVG = Result(AV) – Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11gn HT20 MCS0 Mode / TX / CH Low	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2194.00	54.88	-3.43	51.45	74.00	-22.55	156	100	Peak
2540.00	47.30	-2.07	45.23	54.00	-8.77	353	200	Average
2540.00	59.24	-2.07	57.17	74.00	-16.83	353	200	Peak
4824.00	40.10	5.24	45.34	54.00	-8.66	224	200	Average
4824.00	49.40	5.24	54.64	74.00	-19.36	224	200	Peak
5664.00	36.78	7.15	43.93	74.00	-30.07	213	200	Peak
7236.00	37.90	12.39	50.29	74.00	-23.71	243	200	Peak
9300.00	36.03	14.06	50.09	74.00	-23.91	56	200	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2240.00	52.88	-3.24	49.64	74.00	-24.36	348	200	Peak
2540.00	51.78	-2.07	49.71	74.00	-24.29	278	200	Peak
4824.00	38.40	5.24	43.64	54.00	-10.36	283	100	Average
4824.00	48.41	5.24	53.65	74.00	-20.35	283	100	Peak
5580.00	37.17	6.99	44.16	74.00	-29.84	2	100	Peak
7236.00	31.10	12.39	43.49	54.00	-10.51	260	100	Average
7236.00	40.94	12.39	53.33	74.00	-20.67	260	100	Peak
9540.00	36.53	14.36	50.89	74.00	-23.11	0	100	Peak

**Remark:**

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Average test would be performed if the peak result were greater than the average limit.
- 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.
- Result = Reading + Correction Factor  
 Margin = Result - Limit  
 Remark Peak = Result(PK) - Limit(PK)  
 Remark AVG = Result(AV) - Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11gn HT20 MCS0 Mode / TX / CH Middle	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	52.70	-2.63	50.07	54.00	-3.93	351	100	Average
2390.00	64.92	-2.63	62.29	74.00	-11.71	351	100	Peak
2484.00	55.10	-2.25	52.85	54.00	-1.15	360	150	Average
2484.00	67.25	-2.25	65.00	74.00	-9.00	360	100	Peak
4866.00	47.10	5.35	52.45	54.00	-1.55	295	155	Average
4866.00	57.91	5.35	63.26	74.00	-10.74	295	100	Peak
5574.00	37.92	6.97	44.89	74.00	-29.11	293	100	Peak
7320.00	32.80	12.44	45.24	54.00	-8.76	214	100	Average
7320.00	42.28	12.44	54.72	74.00	-19.28	214	100	Peak
9324.00	35.71	14.09	49.80	74.00	-24.20	291	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	53.82	-2.63	51.19	74.00	-22.81	288	200	Peak
2484.00	53.43	-2.25	51.18	74.00	-22.82	252	200	Peak
4866.00	45.50	5.35	50.85	54.00	-3.15	264	200	Average
4866.00	55.71	5.35	61.06	74.00	-12.94	264	200	Peak
5328.00	36.88	6.44	43.32	74.00	-30.68	232	200	Peak
7308.00	35.40	12.44	47.84	54.00	-6.16	291	100	Average
7308.00	45.08	12.44	57.52	74.00	-16.48	291	100	Peak
12180.00	27.20	19.62	46.82	54.00	-7.18	255	200	Average
12180.00	38.24	19.62	57.86	74.00	-16.14	255	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)  
 Remark AVG = Result(AV) – Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11gn HT20 MCS0 Mode / TX / CH High	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	54.14	-2.63	51.51	74.00	-22.49	360	200	Peak
2920.00	50.81	-0.98	49.83	74.00	-24.17	23	100	Peak
4932.00	44.45	5.52	49.97	74.00	-24.03	215	200	Peak
5949.00	37.45	7.70	45.15	74.00	-28.85	354	200	Peak
7008.00	36.64	12.25	48.89	74.00	-25.11	109	200	Peak
9240.00	36.37	13.99	50.36	74.00	-23.64	145	200	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2378.00	51.63	-2.68	48.95	74.00	-25.05	308	100	Peak
2986.00	49.25	-0.79	48.46	74.00	-25.54	116	100	Peak
4923.00	42.78	5.50	48.28	74.00	-25.72	260	200	Peak
5787.00	37.66	7.39	45.05	74.00	-28.95	141	100	Peak
7392.00	36.99	12.49	49.48	74.00	-24.52	254	100	Peak
9192.00	35.67	13.93	49.60	74.00	-24.40	31	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result - Limit  
 Remark Peak = Result(PK) - Limit(PK)  
 Remark AVG = Result(AV) - Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11gn HT40 MCS0 Mode / TX / CH Low	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2220.00	53.21	-3.32	49.89	74.00	-24.11	17	200	Peak
2484.00	52.30	-2.25	50.05	54.00	-3.95	179	200	Average
2484.00	59.41	-2.25	57.16	74.00	-16.84	179	200	Peak
4851.00	43.32	5.31	48.63	74.00	-25.37	215	200	Peak
5679.00	36.88	7.18	44.06	74.00	-29.94	226	200	Peak
7092.00	36.16	12.30	48.46	74.00	-25.54	141	100	Peak
9264.00	35.45	14.02	49.47	74.00	-24.53	123	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2282.00	51.53	-3.07	48.46	74.00	-25.54	64	100	Peak
2596.00	50.65	-1.91	48.74	74.00	-25.26	80	200	Peak
4857.00	43.85	5.33	49.18	74.00	-24.82	270	200	Peak
5766.00	37.06	7.35	44.41	74.00	-29.59	292	200	Peak
6948.00	37.13	12.13	49.26	74.00	-24.74	14	200	Peak
9408.00	35.61	14.18	49.79	74.00	-24.21	190	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)  
 Remark AVG = Result(AV) – Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11gn HT40 MCS0 Mode / TX / CH Middle	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	48.30	-2.63	45.67	54.00	-8.33	352	200	Average
2390.00	60.18	-2.63	57.55	74.00	-16.45	352	200	Peak
2484.00	54.30	-2.25	52.05	54.00	-1.95	0	130	Average
2484.00	61.68	-2.25	59.43	74.00	-14.57	0	100	Peak
4872.00	47.06	5.37	52.43	74.00	-21.57	220	200	Peak
5910.00	36.71	7.63	44.34	74.00	-29.66	233	200	Peak
6924.00	36.80	12.08	48.88	74.00	-25.12	311	100	Peak
9336.00	36.22	14.10	50.32	74.00	-23.68	79	100	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	43.50	-2.63	40.87	54.00	-13.13	249	100	Average
2390.00	55.51	-2.63	52.88	74.00	-21.12	249	100	Peak
2484.00	51.58	-2.25	49.33	74.00	-24.67	276	200	Peak
4854.00	44.56	5.32	49.88	74.00	-24.12	281	200	Peak
5730.00	37.33	7.28	44.61	74.00	-29.39	337	200	Peak
6936.00	37.32	12.11	49.43	74.00	-24.57	61	200	Peak
9384.00	35.28	14.16	49.44	74.00	-24.56	165	200	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result - Limit  
 Remark Peak = Result(PK) - Limit(PK)  
 Remark AVG = Result(AV) - Limit(AV)

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/14
<b>Test Mode</b>	IEEE 802.11gn HT40 MCS0 Mode / TX / CH High	<b>Temp. &amp; Humidity</b>	25°C, 50%

**966Chamber\_B at 3Meter / Horizontal**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2390.00	43.70	-2.63	41.07	54.00	-12.93	179	200	Average
2390.00	55.60	-2.63	52.97	74.00	-21.03	179	200	Peak
2950.00	49.48	-0.89	48.59	74.00	-25.41	301	200	Peak
4905.00	45.91	5.45	51.36	74.00	-22.64	214	200	Peak
5802.00	37.03	7.42	44.45	74.00	-29.55	94	200	Peak
7032.00	36.92	12.26	49.18	74.00	-24.82	347	100	Peak
9588.00	36.63	14.44	51.07	74.00	-22.93	0	200	Peak

**966Chamber\_B at 3Meter / Vertical**

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2338.00	51.50	-2.84	48.66	74.00	-25.34	234	100	Peak
2986.00	49.38	-0.79	48.59	74.00	-25.41	290	200	Peak
4908.00	43.73	5.46	49.19	74.00	-24.81	278	200	Peak
5655.00	38.23	7.13	45.36	74.00	-28.64	186	200	Peak
7032.00	37.47	12.26	49.73	74.00	-24.27	115	200	Peak
9168.00	36.94	13.90	50.84	74.00	-23.16	180	100	Peak

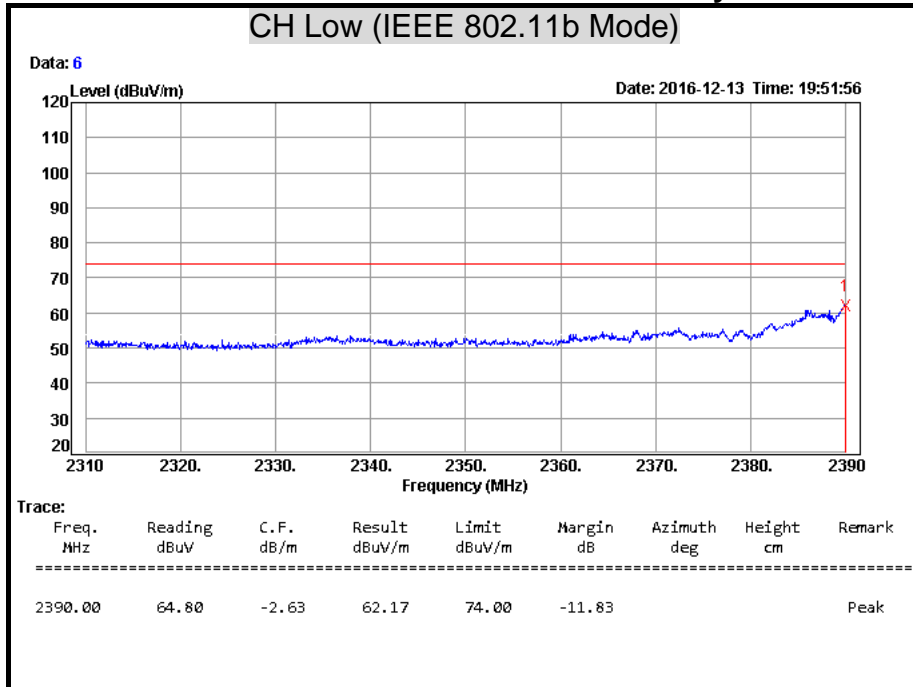
**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. 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.
4. Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)  
 Remark AVG = Result(AV) – Limit(AV)

**Restricted Band Edges**

**Detector Mode: Peak**

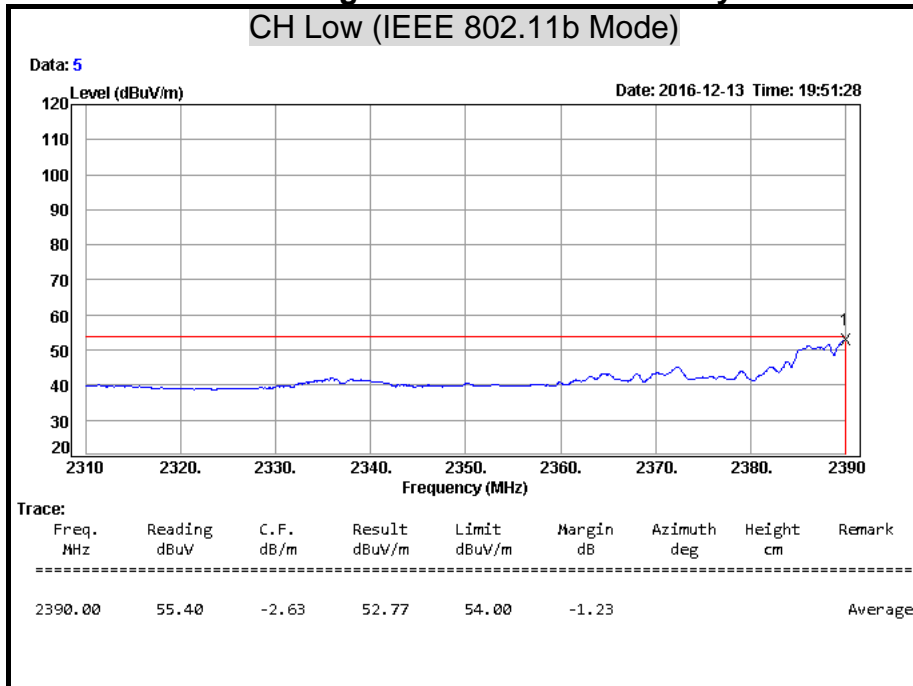
**Polarity: Horizontal**



**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)

**Detector Mode: Average**

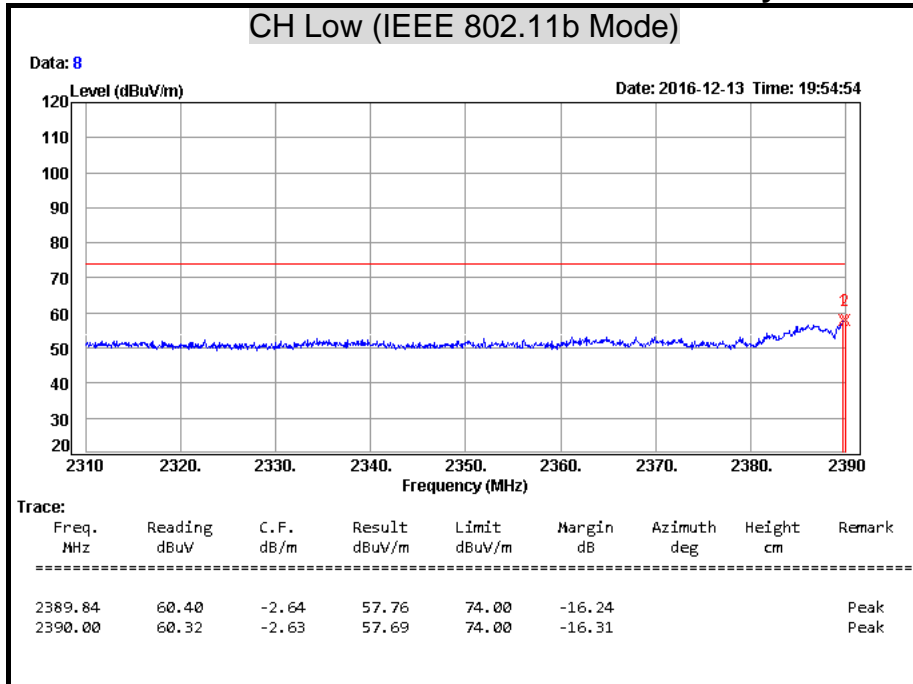
**Polarity: Horizontal**



**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark AVG = Result(AV) – Limit(AV)

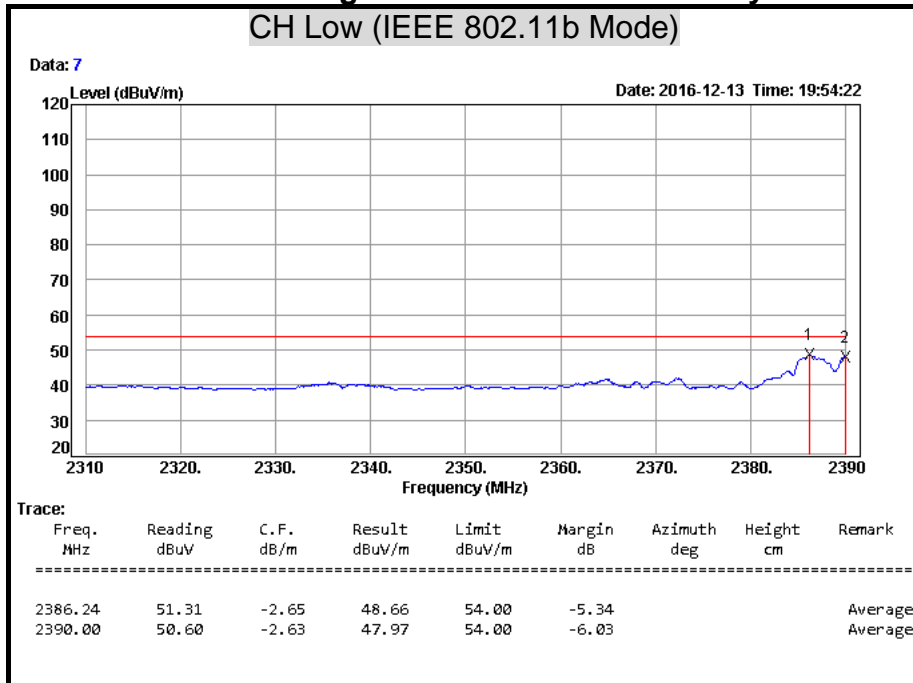


**Detector Mode: Peak** **Polarity: Vertical**



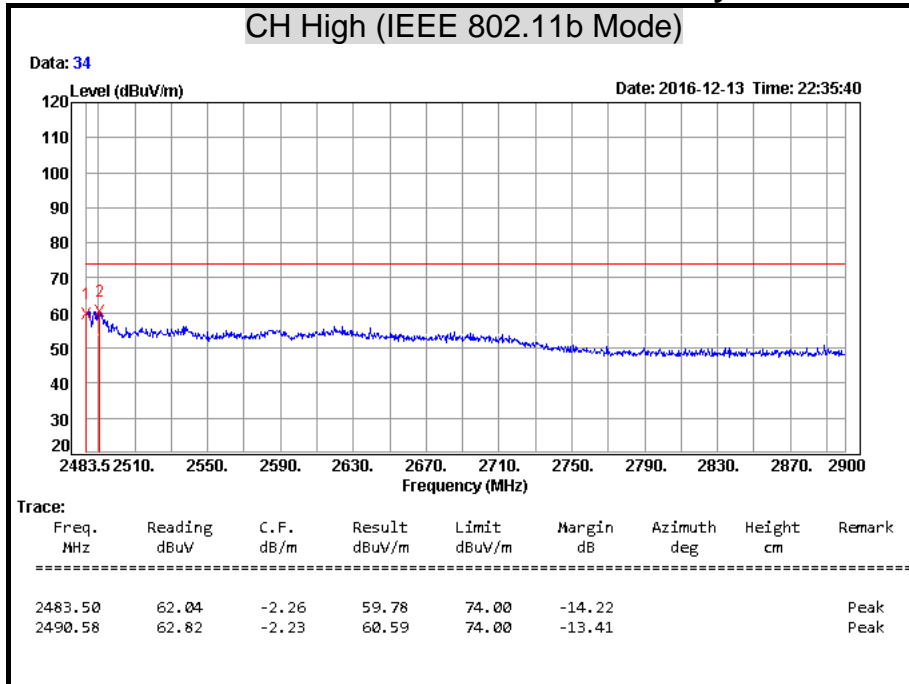
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

**Detector Mode: Average** **Polarity: Vertical**



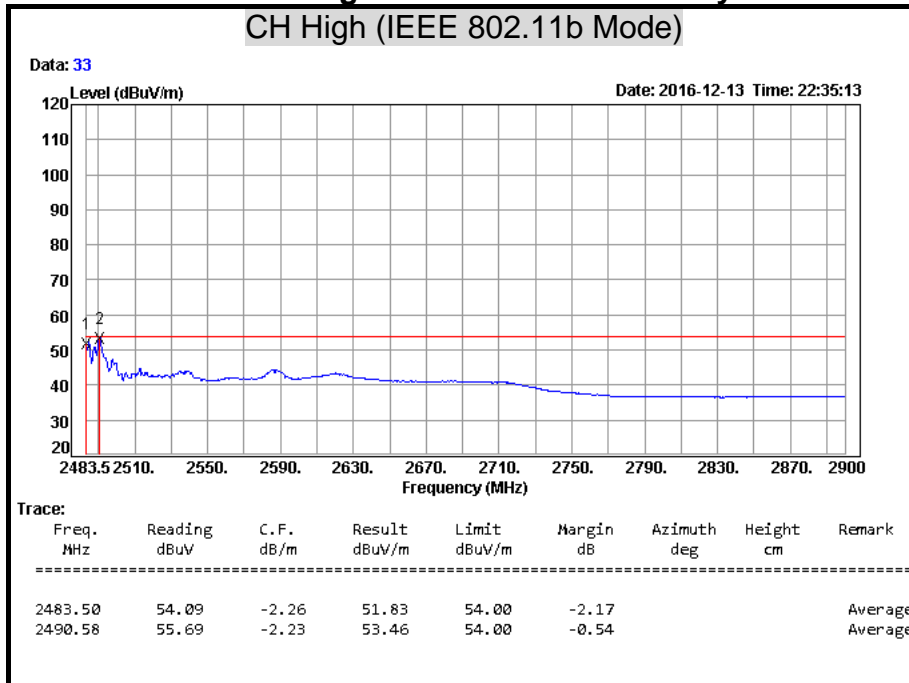
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak** **Polarity: Horizontal**



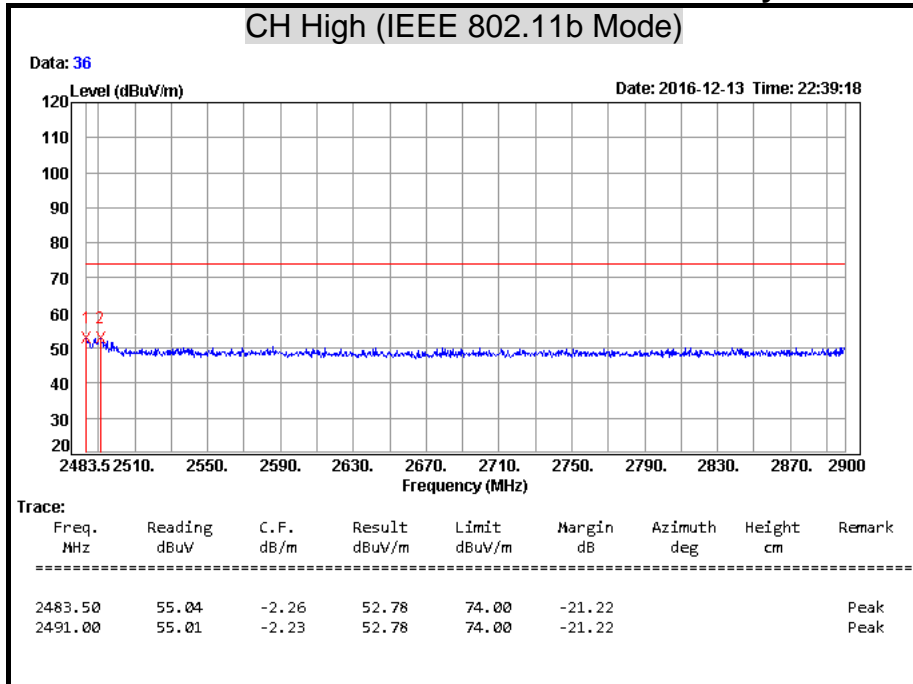
**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)

**Detector Mode: Average** **Polarity: Horizontal**



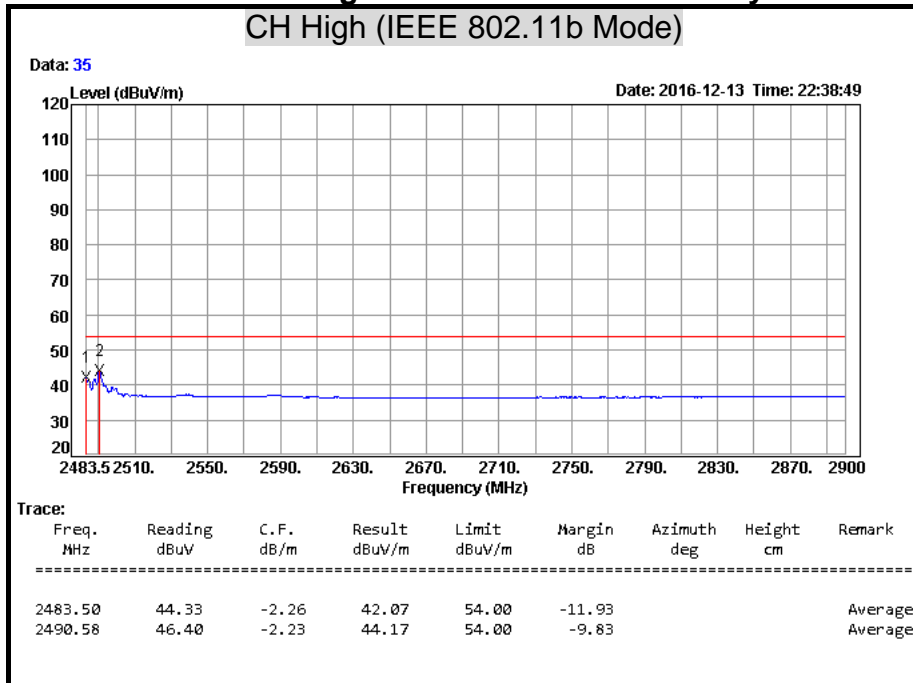
**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark AVG = Result(AV) – Limit(AV)

**Detector Mode: Peak** **Polarity: Vertical**



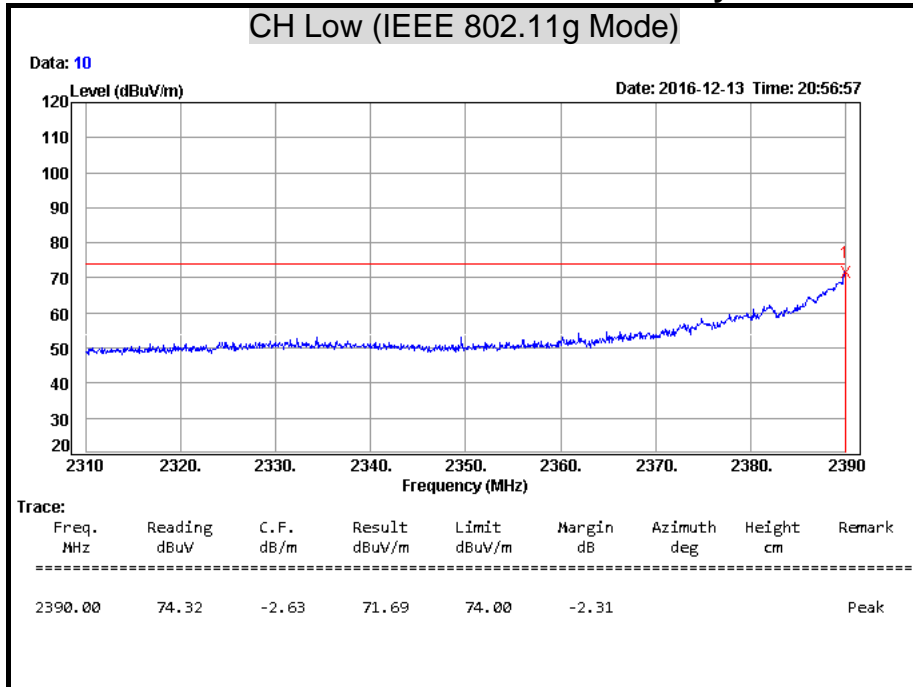
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

**Detector Mode: Average** **Polarity: Vertical**



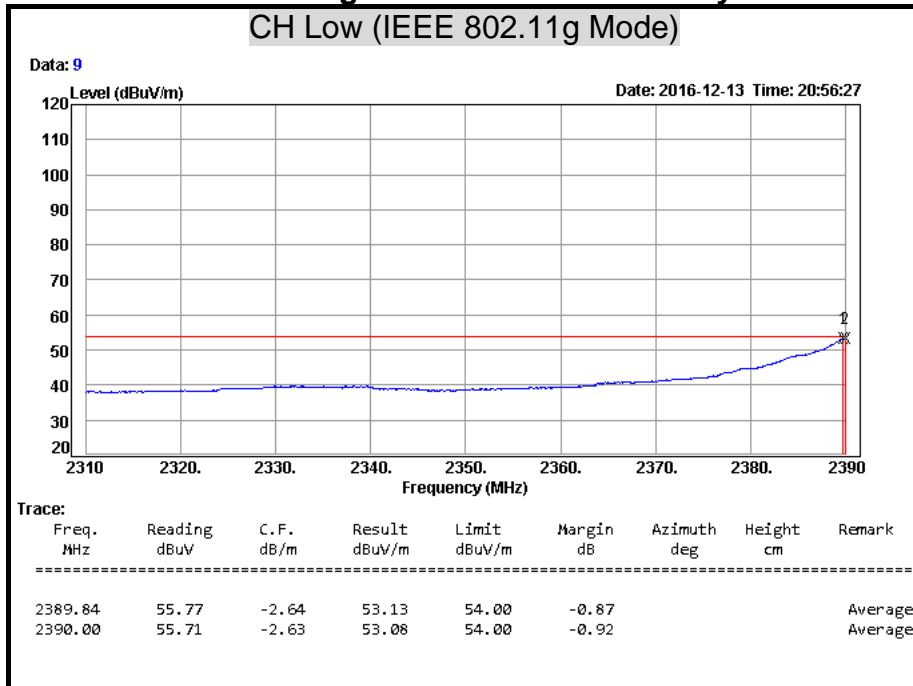
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak** **Polarity: Horizontal**



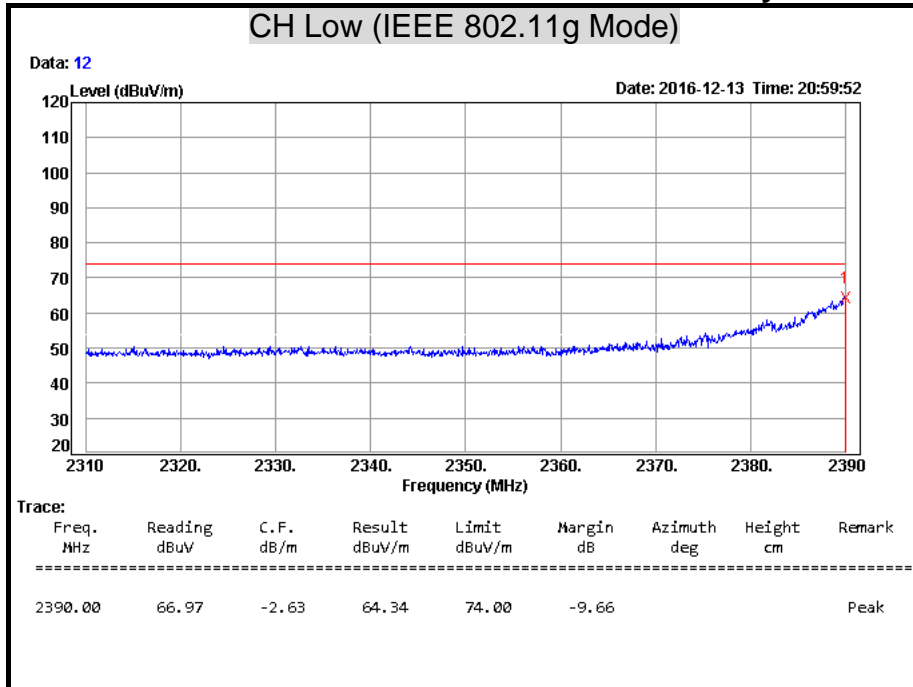
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

**Detector Mode: Average** **Polarity: Horizontal**



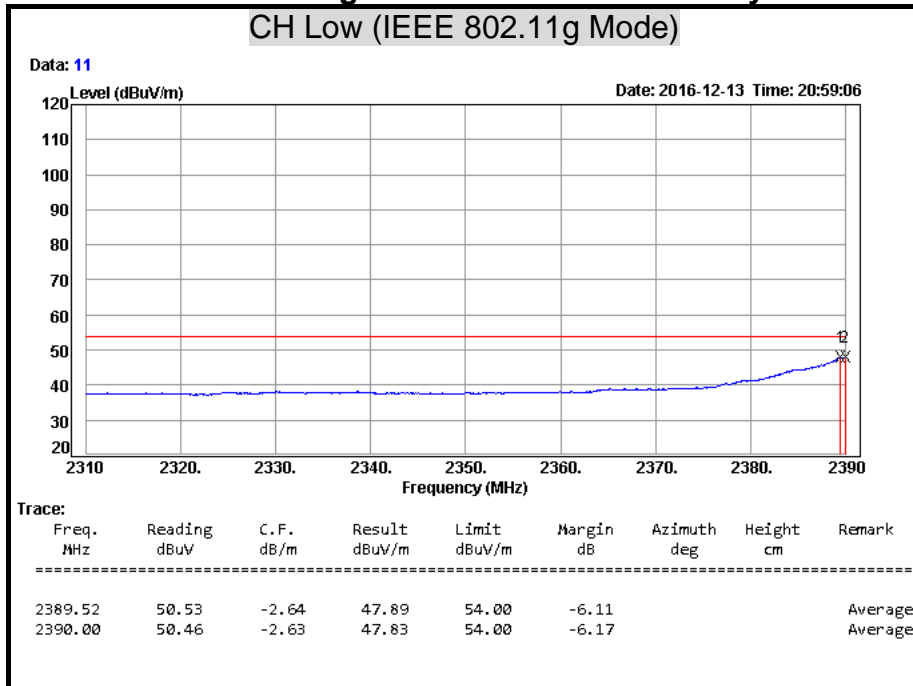
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak** **Polarity: Vertical**



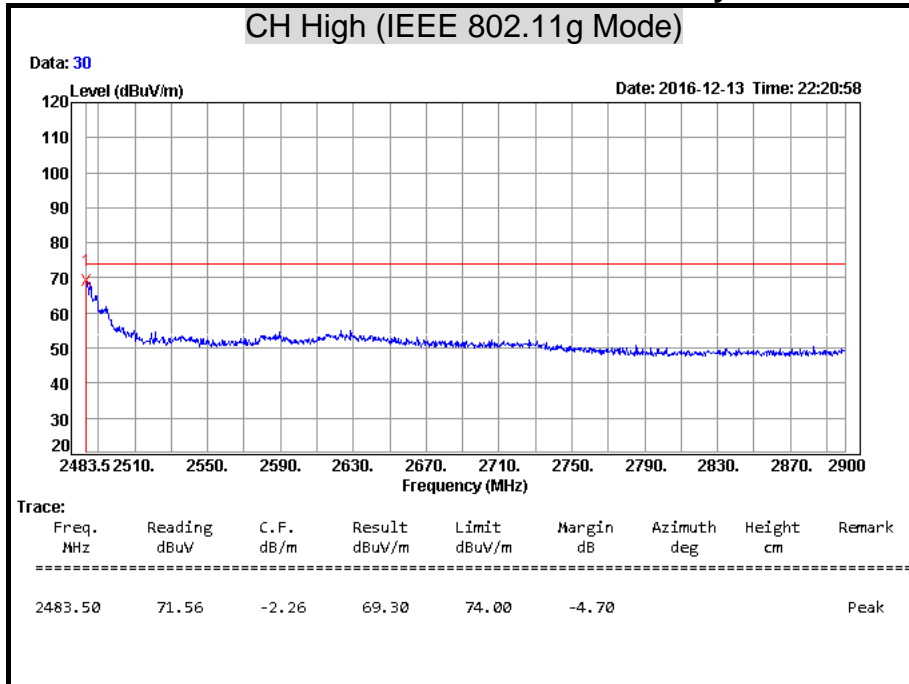
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

**Detector Mode: Average** **Polarity: Vertical**



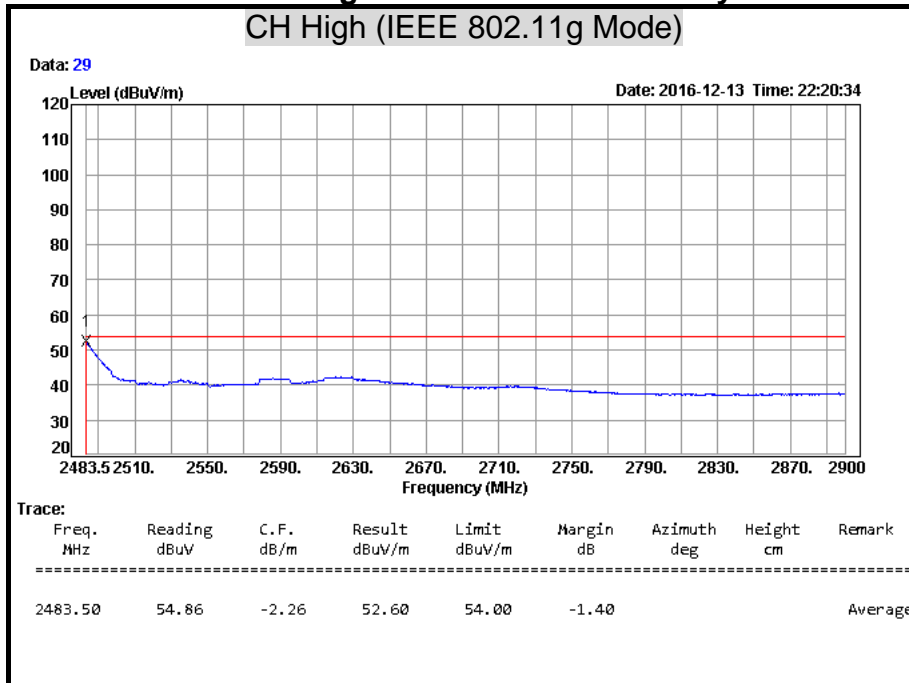
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak** **Polarity: Horizontal**



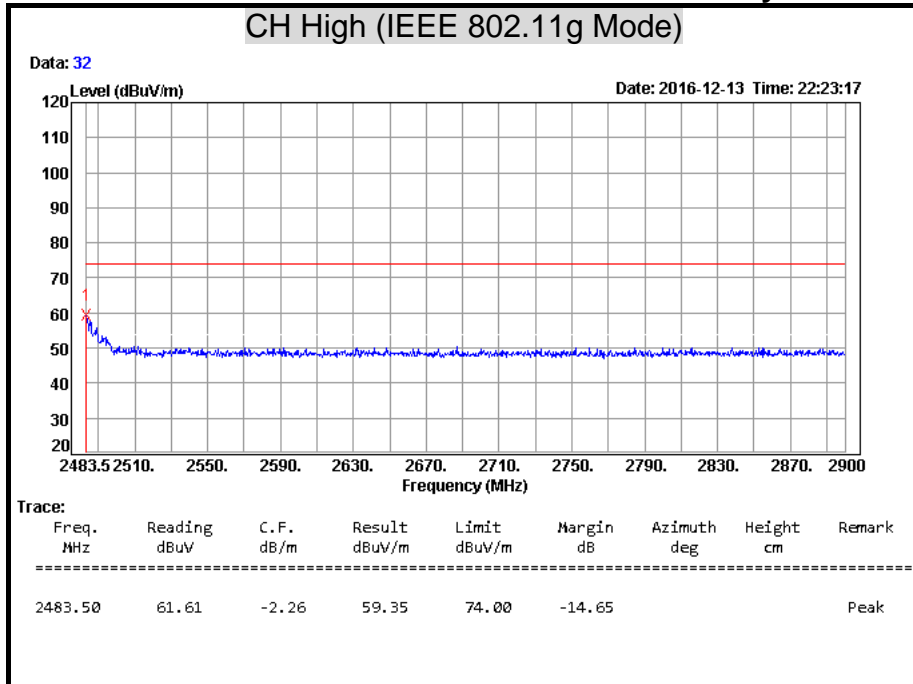
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

**Detector Mode: Average** **Polarity: Horizontal**



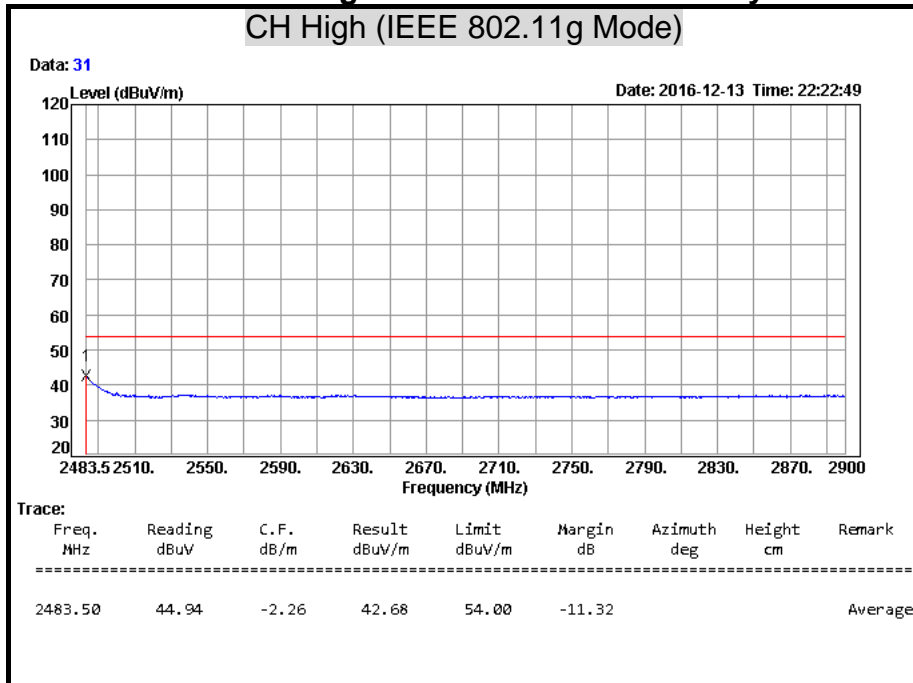
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

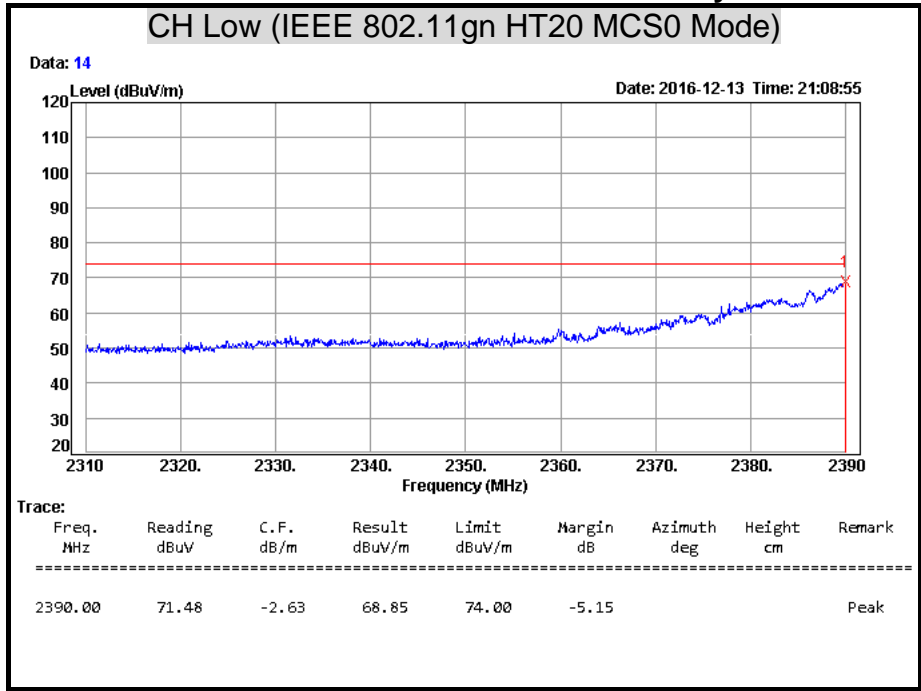
**Detector Mode: Average** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak**

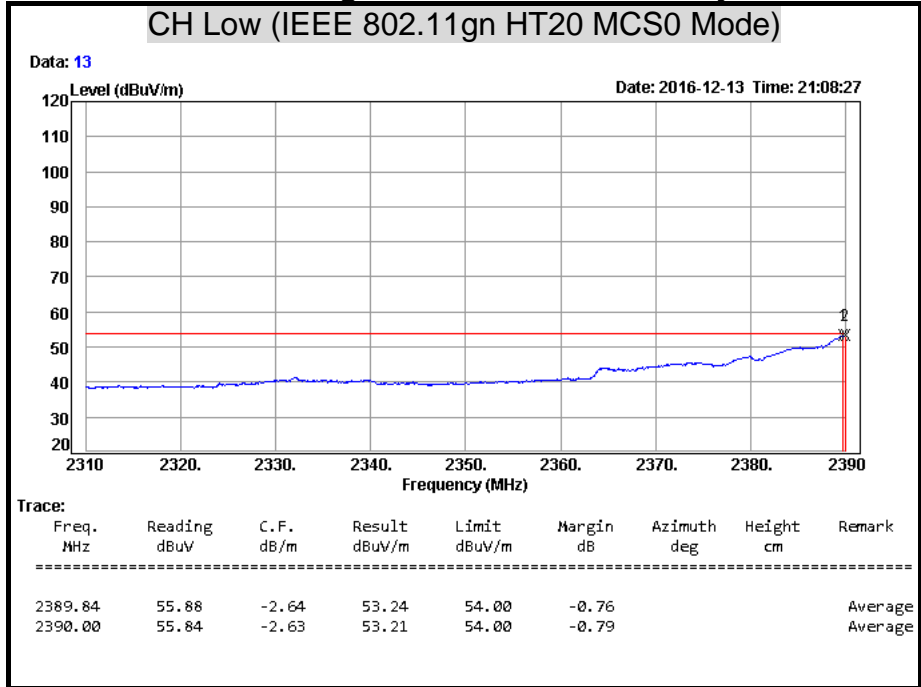
**Polarity: Horizontal**



**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)

**Detector Mode: Average**

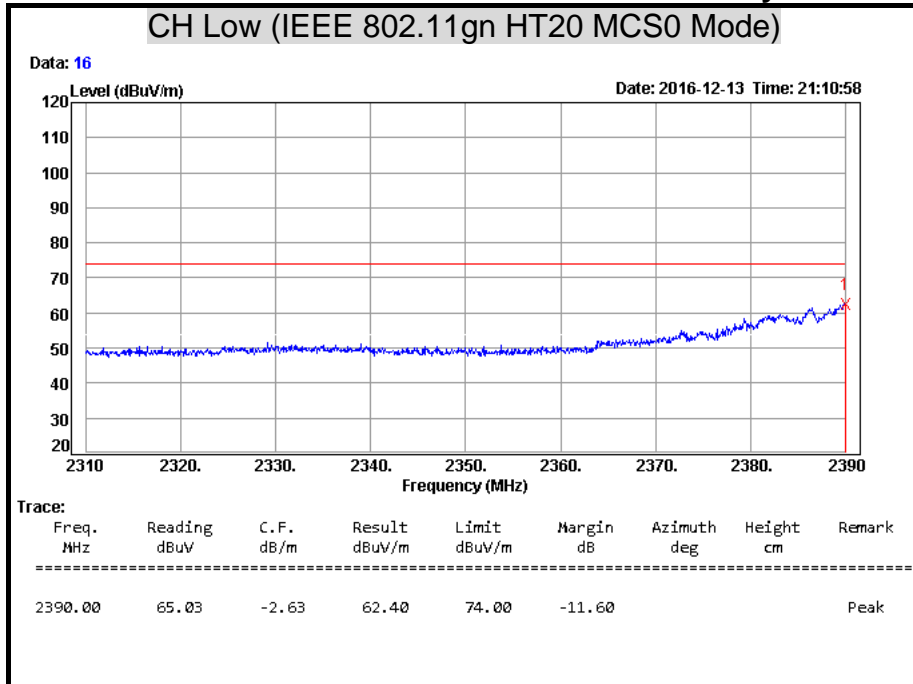
**Polarity: Horizontal**



**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark AVG = Result(AV) – Limit(AV)

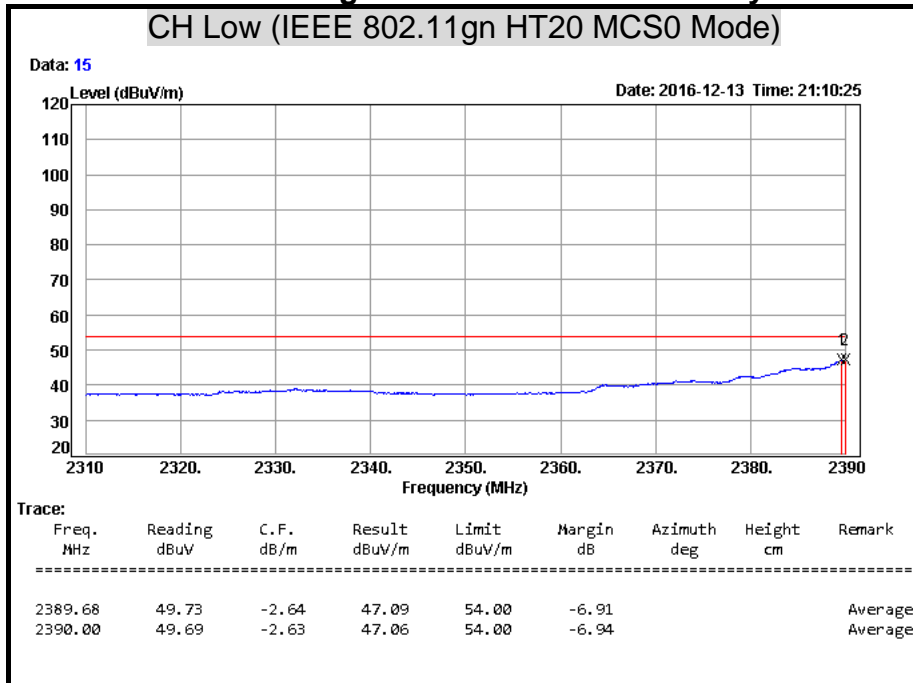


**Detector Mode: Peak** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

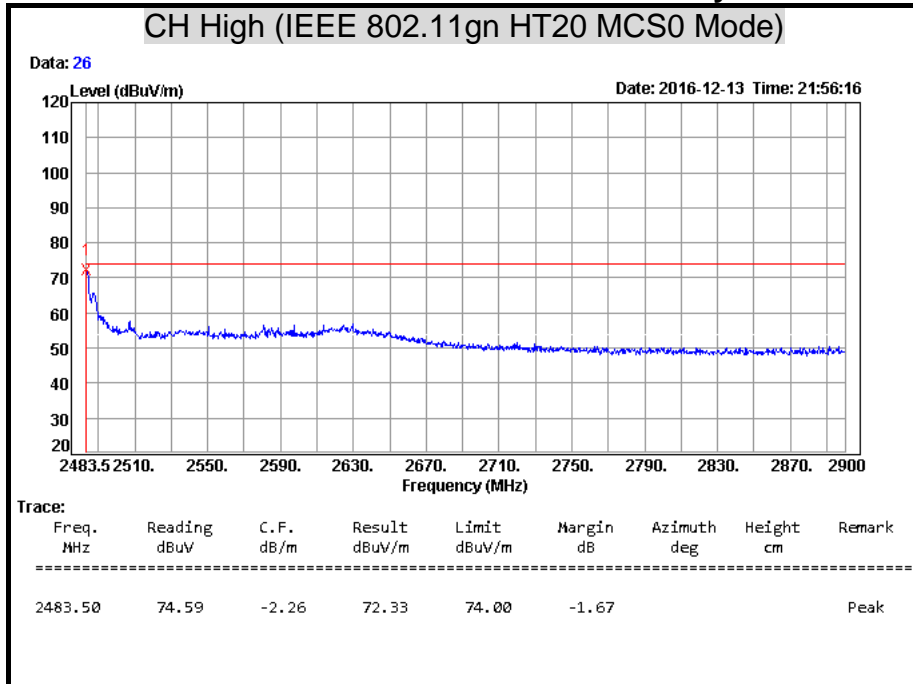
**Detector Mode: Average** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak**

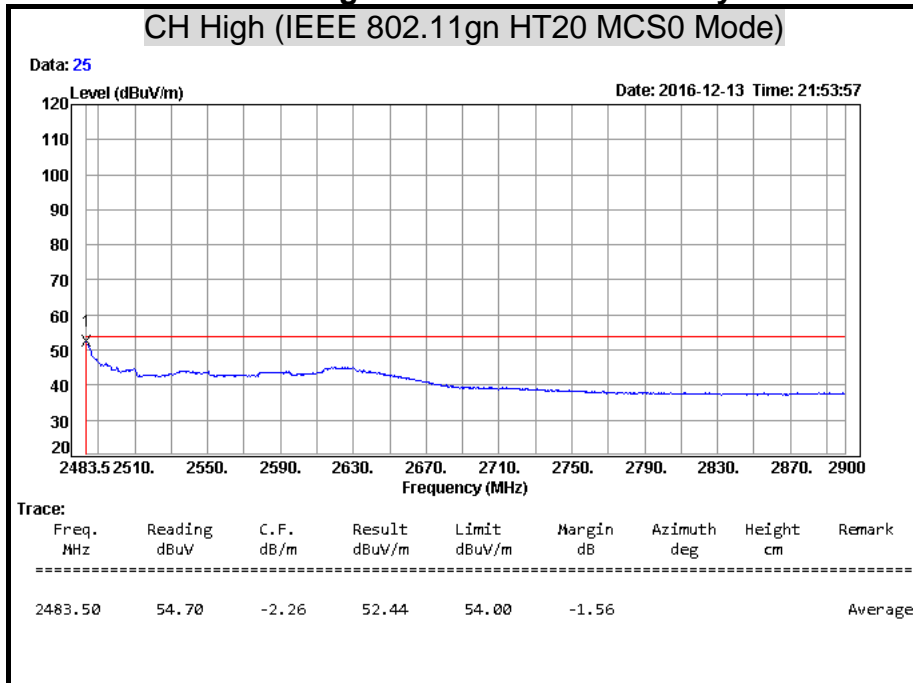
**Polarity: Horizontal**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 Remark Peak =  $Result(PK) - Limit(PK)$

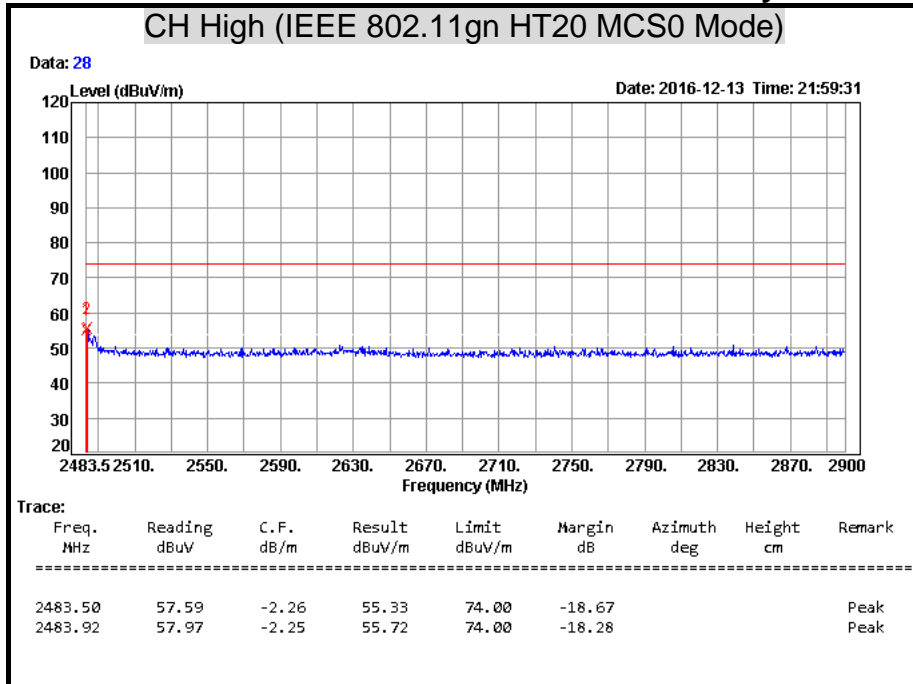
**Detector Mode: Average**

**Polarity: Horizontal**



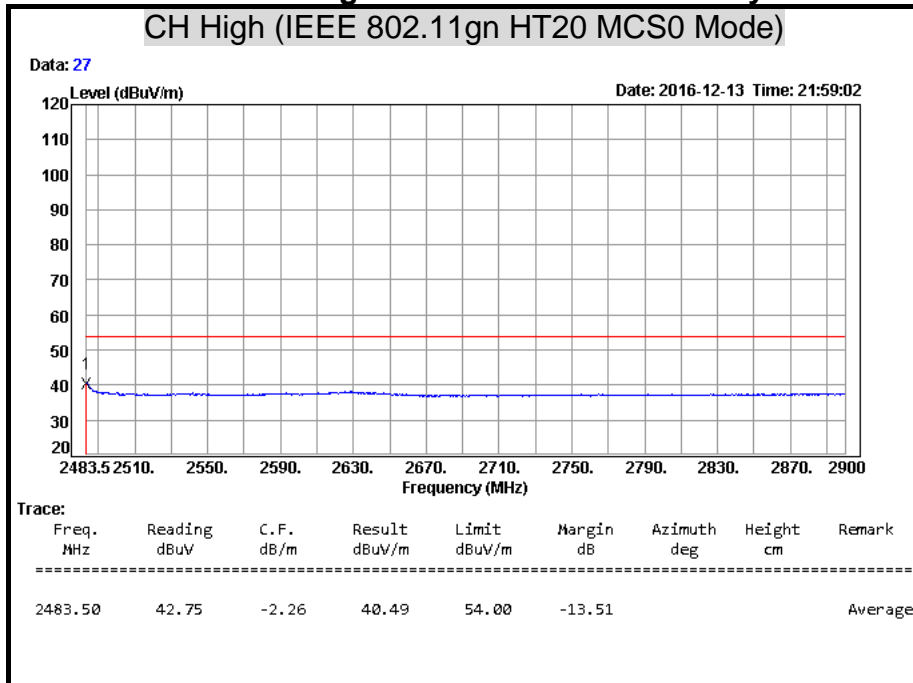
**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 Remark AVG =  $Result(AV) - Limit(AV)$

**Detector Mode: Peak** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

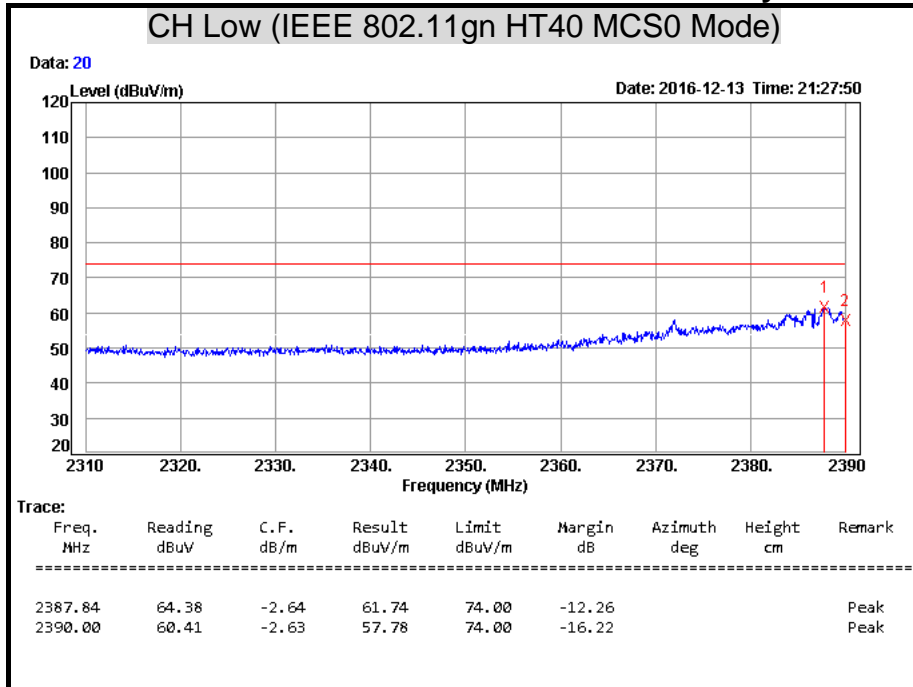
**Detector Mode: Average** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

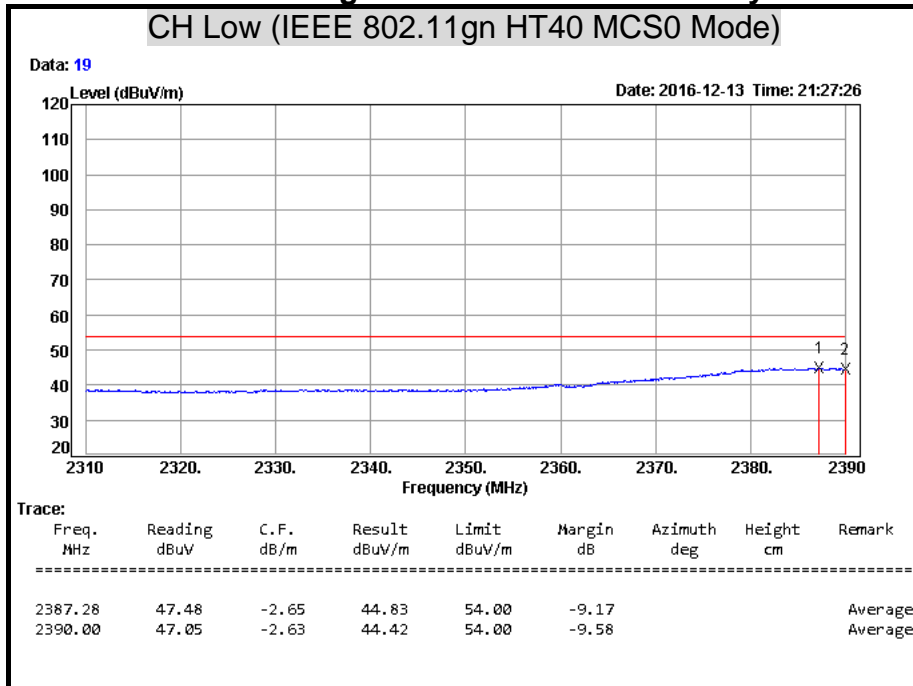


**Detector Mode: Peak** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ Peak = Result(PK) - Limit(PK)$

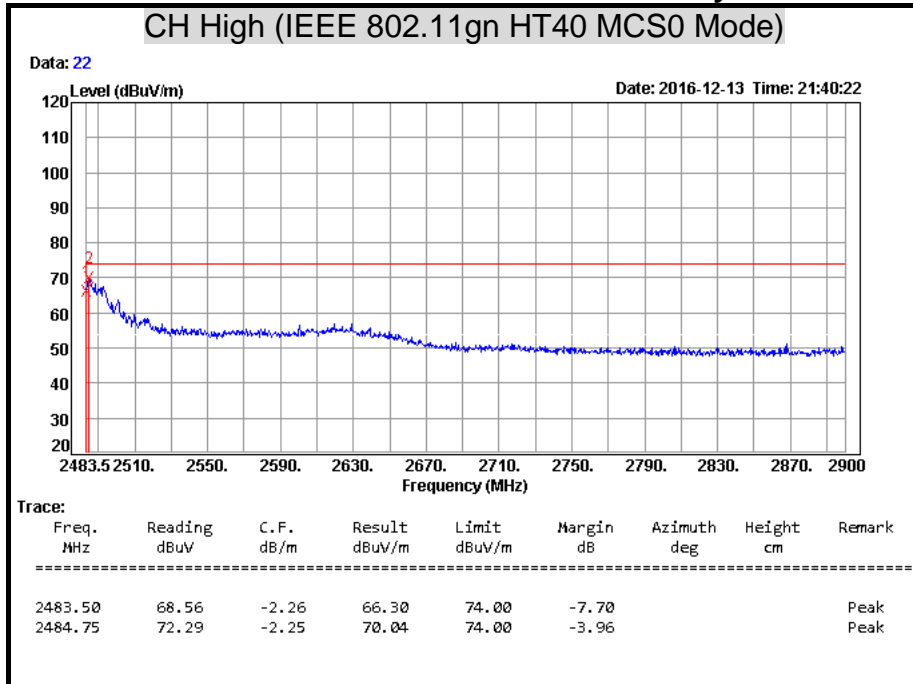
**Detector Mode: Average** **Polarity: Vertical**



**Remark:**  $Result = Reading + Correction\ Factor$   
 $Margin = Result - Limit$   
 $Remark\ AVG = Result(AV) - Limit(AV)$

**Detector Mode: Peak**

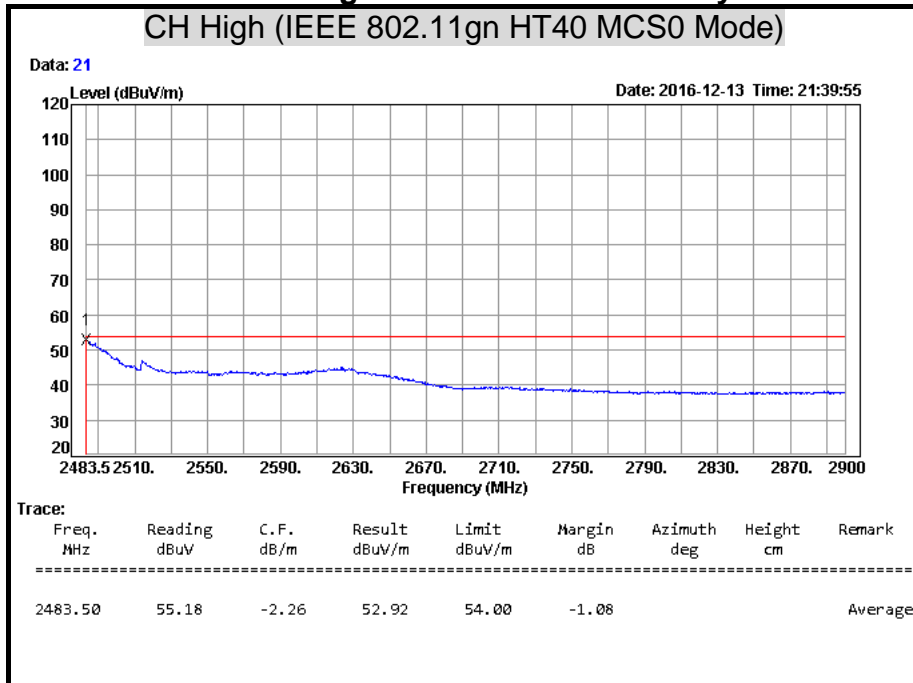
**Polarity: Horizontal**



**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)

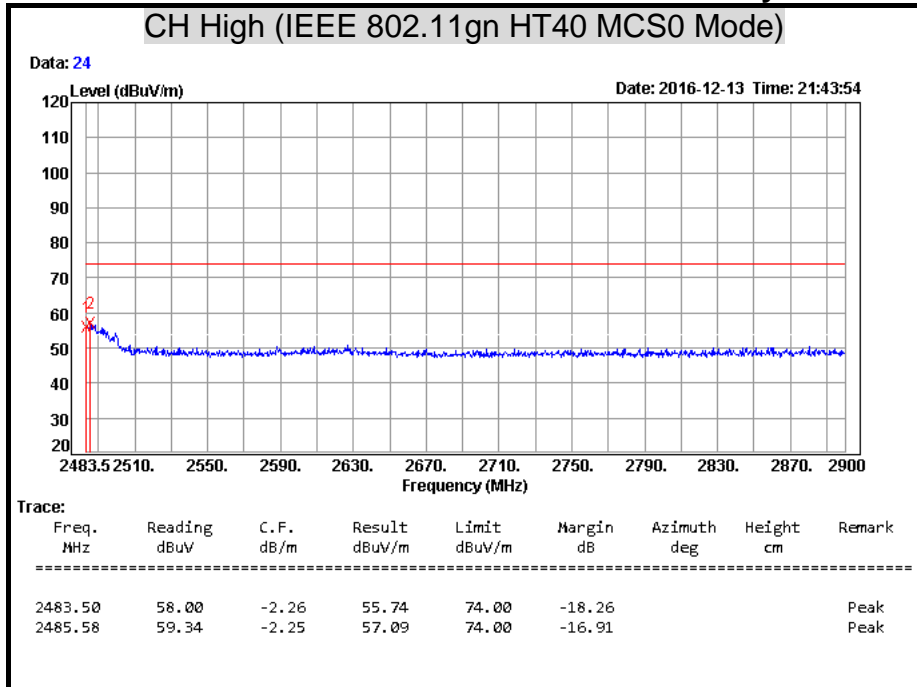
**Detector Mode: Average**

**Polarity: Horizontal**



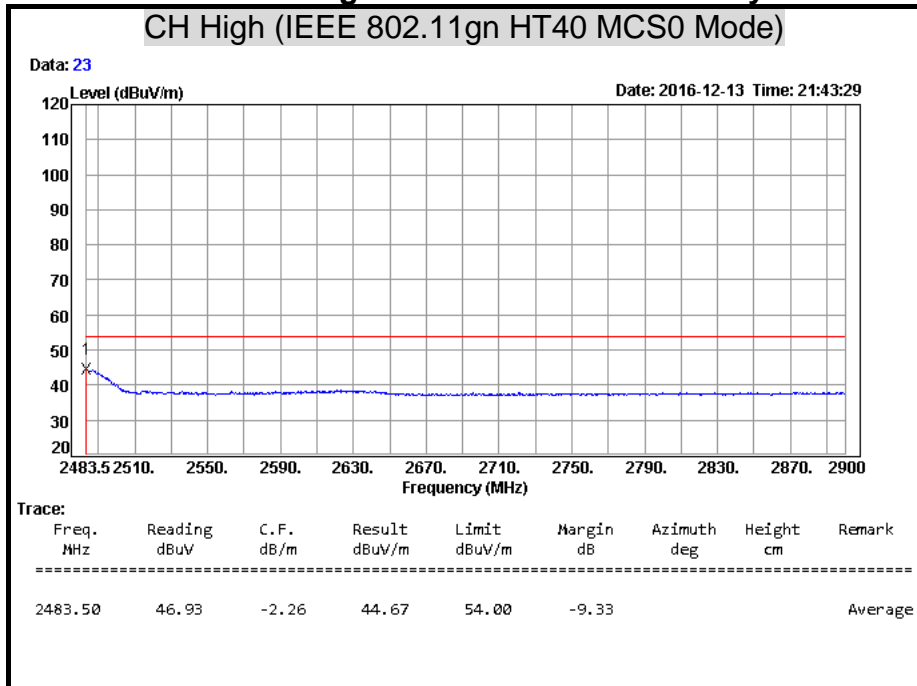
**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark AVG = Result(AV) – Limit(AV)

**Detector Mode: Peak** **Polarity: Vertical**



**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark Peak = Result(PK) – Limit(PK)

**Detector Mode: Average** **Polarity: Vertical**



**Remark:** Result = Reading + Correction Factor  
 Margin = Result – Limit  
 Remark AVG = Result(AV) – Limit(AV)

## 7.8 CONDUCTED EMISSION

### LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) 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)	Conducted Limit (dBµv)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5.00	56	46
5.00 - 30.0	60	50

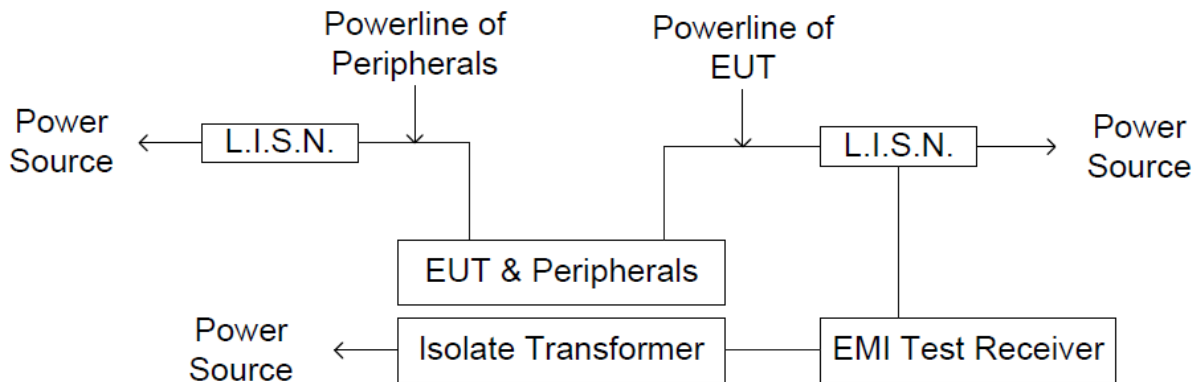
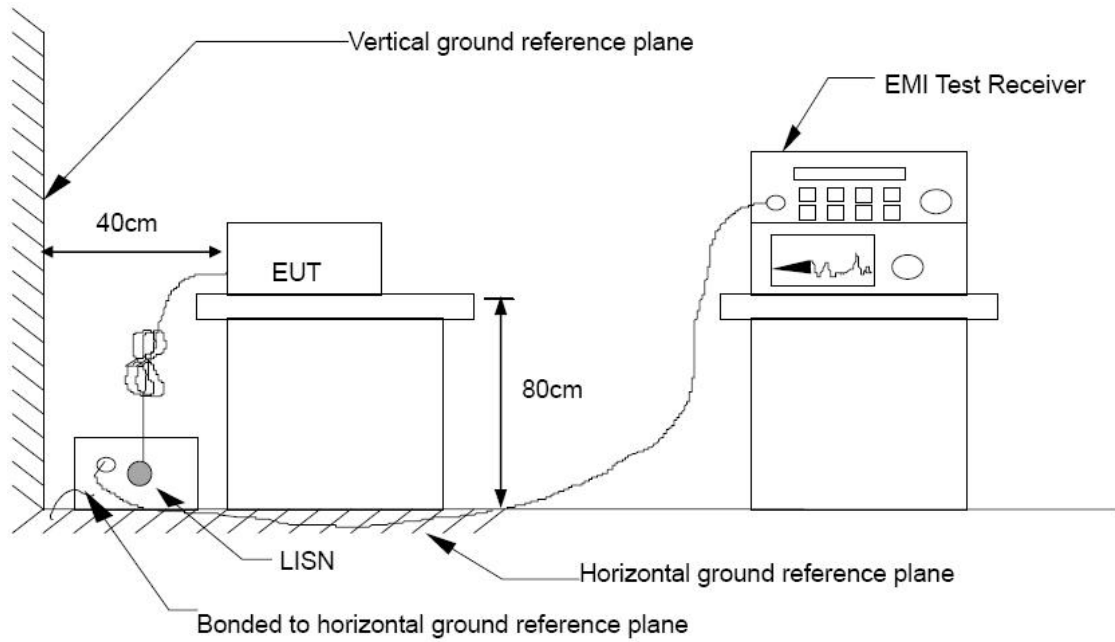
### TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N	Schwarzbeck	NSLK 8127	8127465	07/28/2017
L.I.S.N	Schwarzbeck	NSLK 8127	8127473	03/12/2018
EMI Test Receiver	Rohde & Schwarz	ESHS 30	838550/003	10/25/2017
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100111	06/27/2017
Test S/W	E3.815206a			

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



**TEST SETUP**



## **TEST PROCEDURE**

The basic test procedure was in accordance with ANSI C63.10:2013.

The test procedure is performed in a 4m × 3m × 2.4m (L×W×H) shielded room.

The EUT along with its peripherals were placed on a 1.0m (W) × 1.5m (L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.

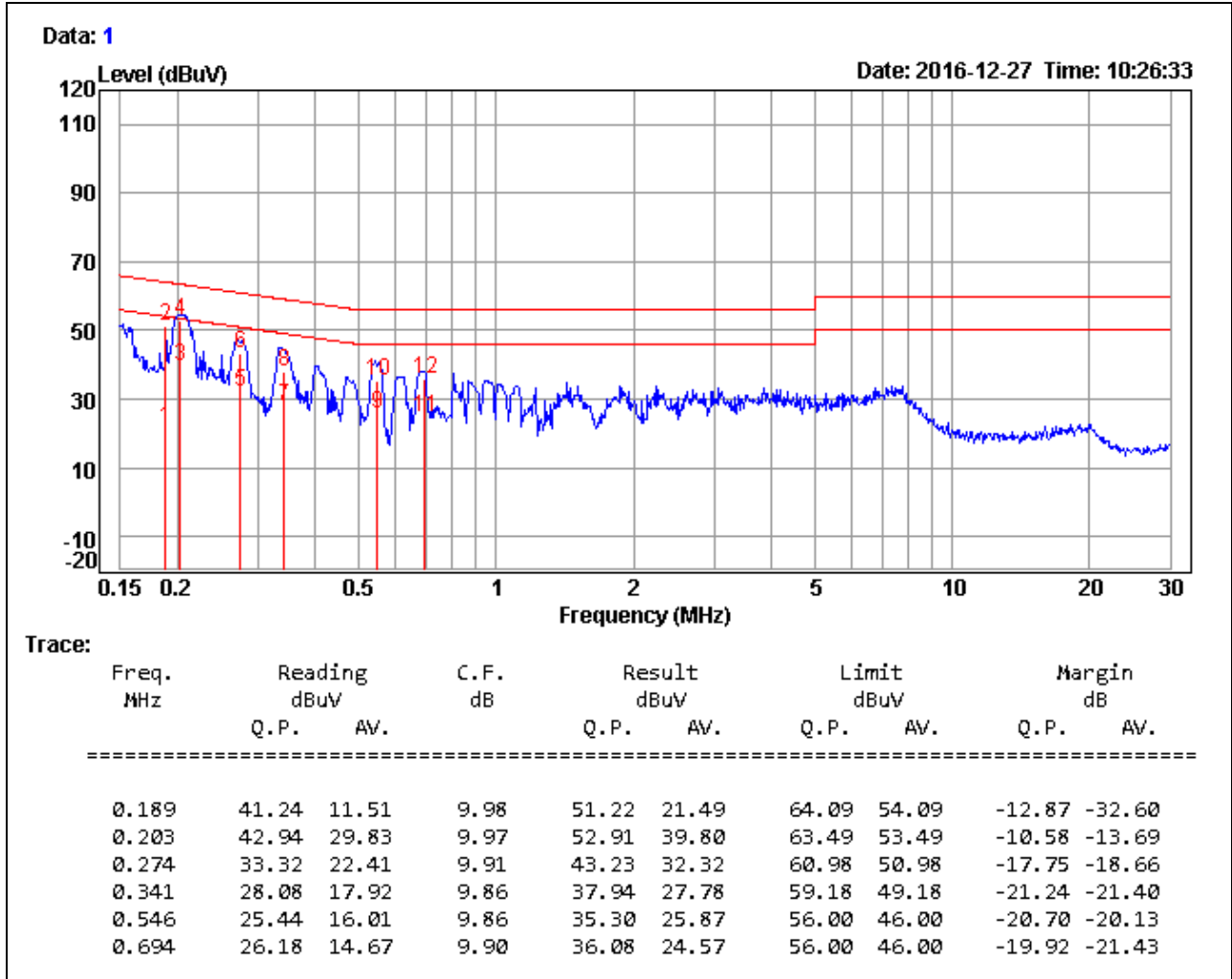
The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.

The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN is 0.8 m. Where a mains flexible cord was provided by the manufacturer shall be 1 m long, or if in excess of 1 m, the excess cable was folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

**TEST RESULTS**

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Allen Liu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/27
<b>Test Mode</b>	Mode 1	<b>Temp. &amp; Humidity</b>	19.9°C, 74%

**LINE**

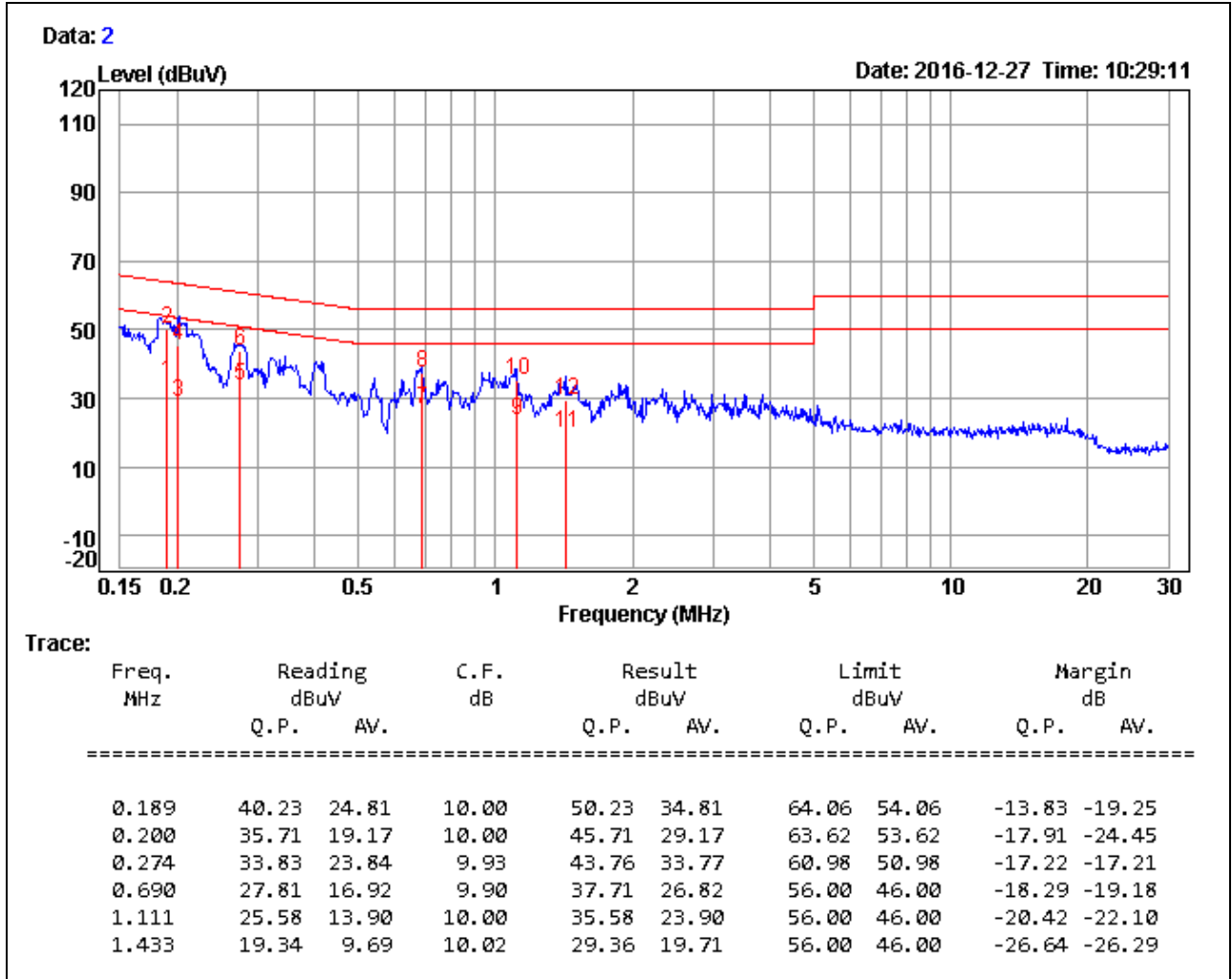


**Remark:**

1. Correction Factor = Insertion loss + Cable loss
2. Result level = Reading Value + Correction factor
3. Margin value = Result level – Limit value

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Allen Liu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2016/12/27
<b>Test Mode</b>	Mode 1	<b>Temp. &amp; Humidity</b>	19.9°C, 74%

**NEUTRAL**

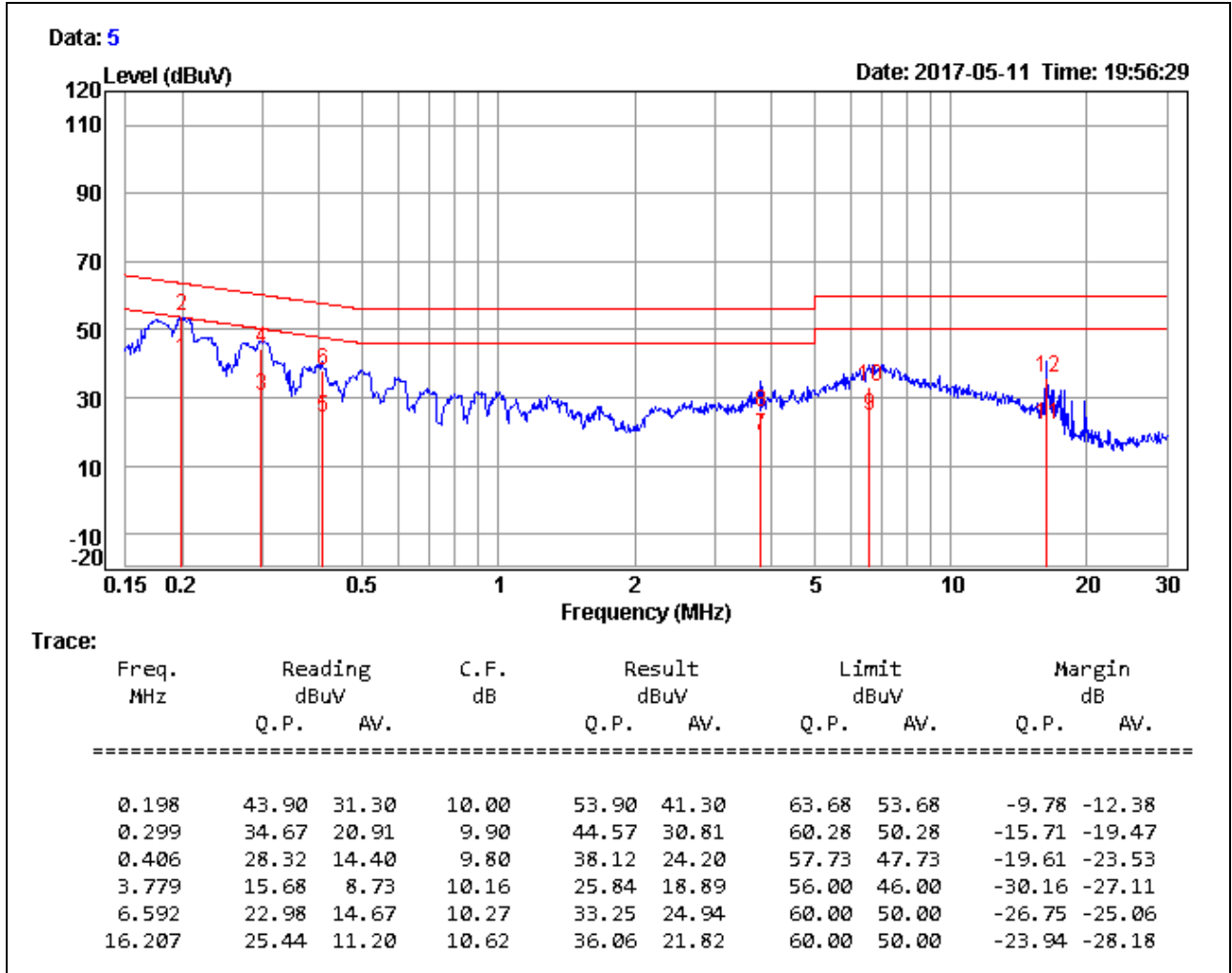


**Remark:**

1. Correction Factor = Insertion loss + Cable loss
2. Result level = Reading Value + Correction factor
3. Margin value = Result level – Limit value

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2017/05/11
<b>Test Mode</b>	Mode 2	<b>Temp. &amp; Humidity</b>	19.9°C, 74%

**LINE**

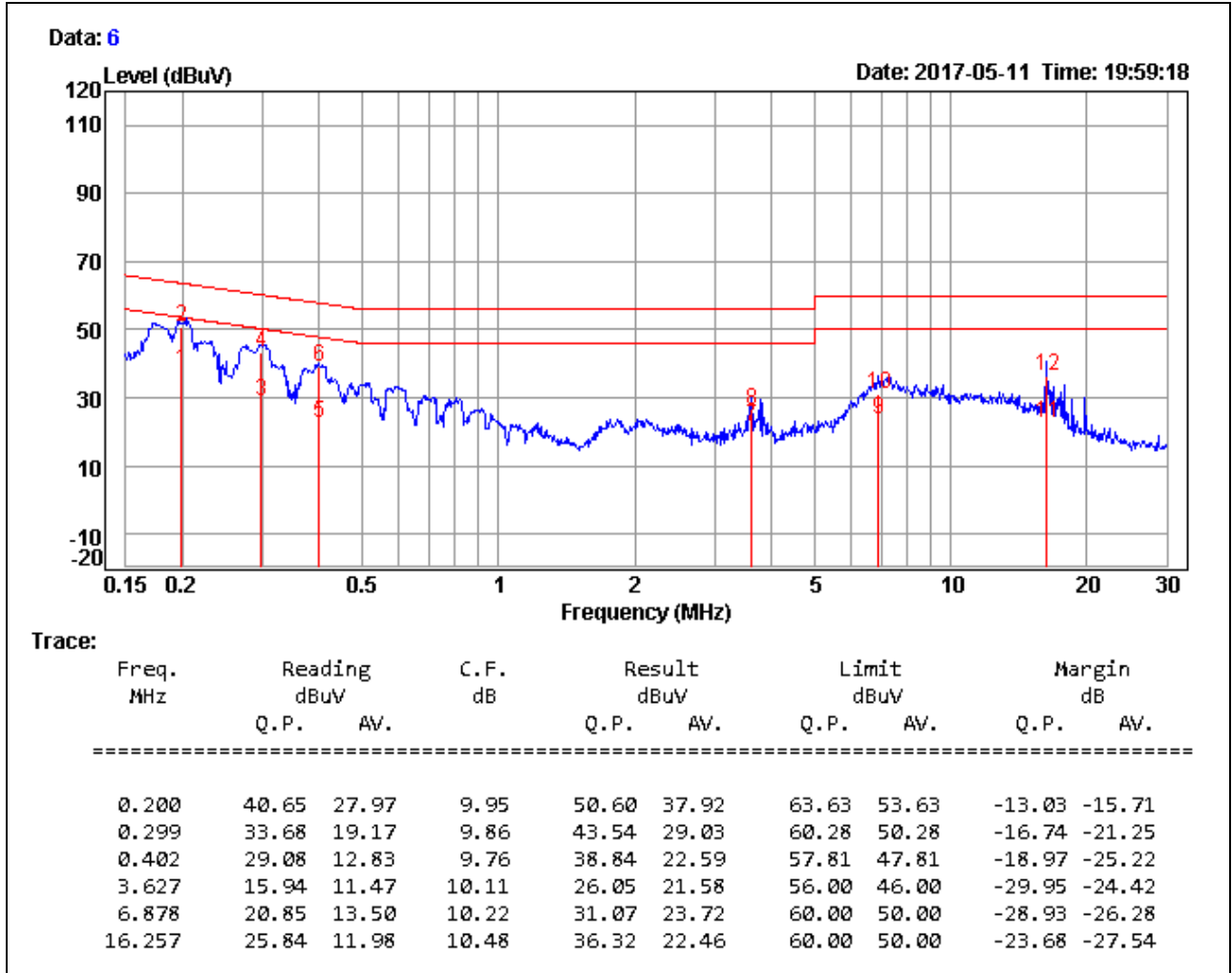


**Remark:**

1. Correction Factor = Insertion loss + Cable loss
2. Result level = Reading Value + Correction factor
3. Margin value = Result level – Limit value

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2017/05/11
<b>Test Mode</b>	Mode 2	<b>Temp. &amp; Humidity</b>	19.9°C, 74%

**NEUTRAL**

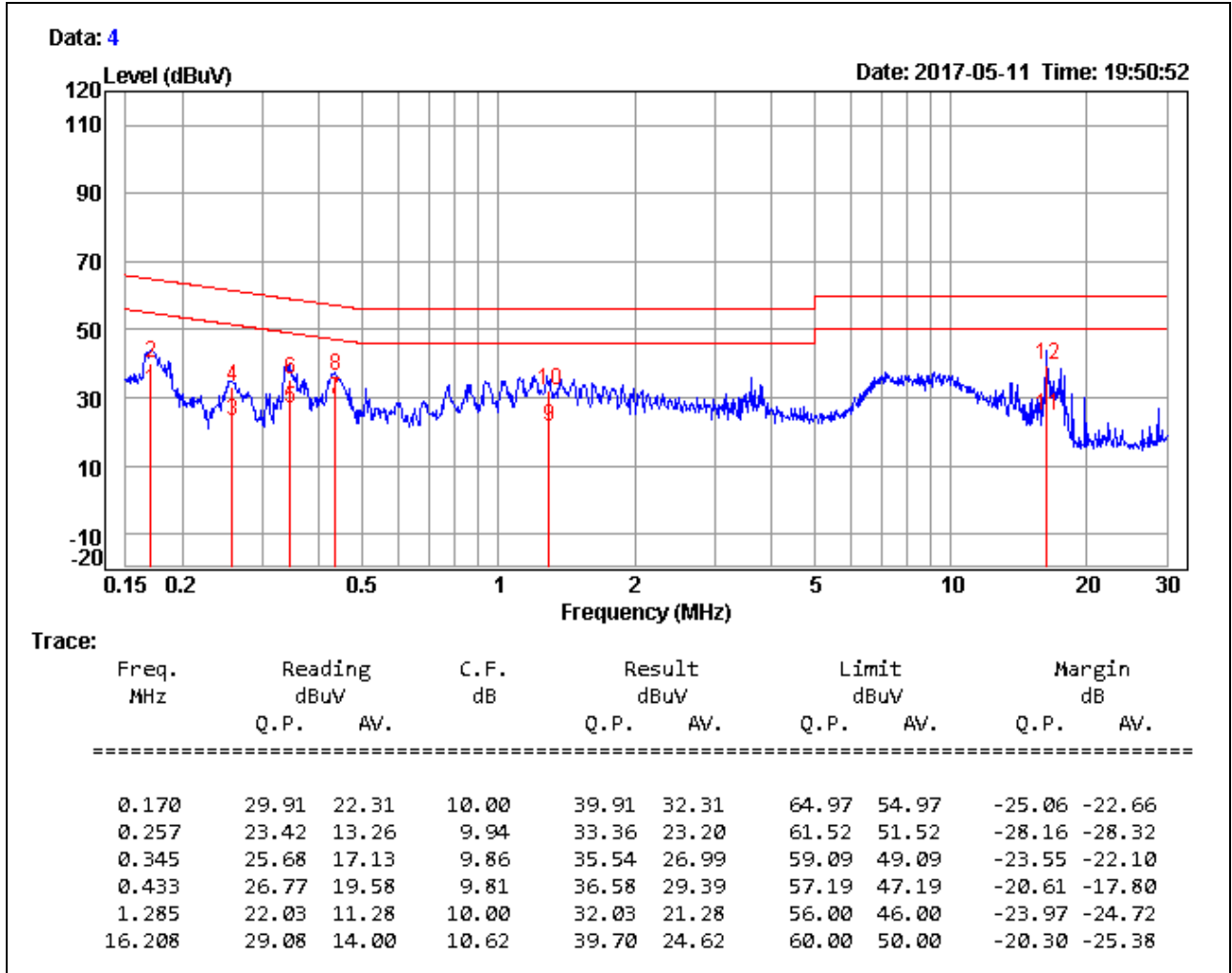


**Remark:**

1. Correction Factor = Insertion loss + Cable loss
2. Result level = Reading Value + Correction factor
3. Margin value = Result level – Limit value

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2017/05/11
<b>Test Mode</b>	Mode 3	<b>Temp. &amp; Humidity</b>	19.9°C, 74%

**LINE**

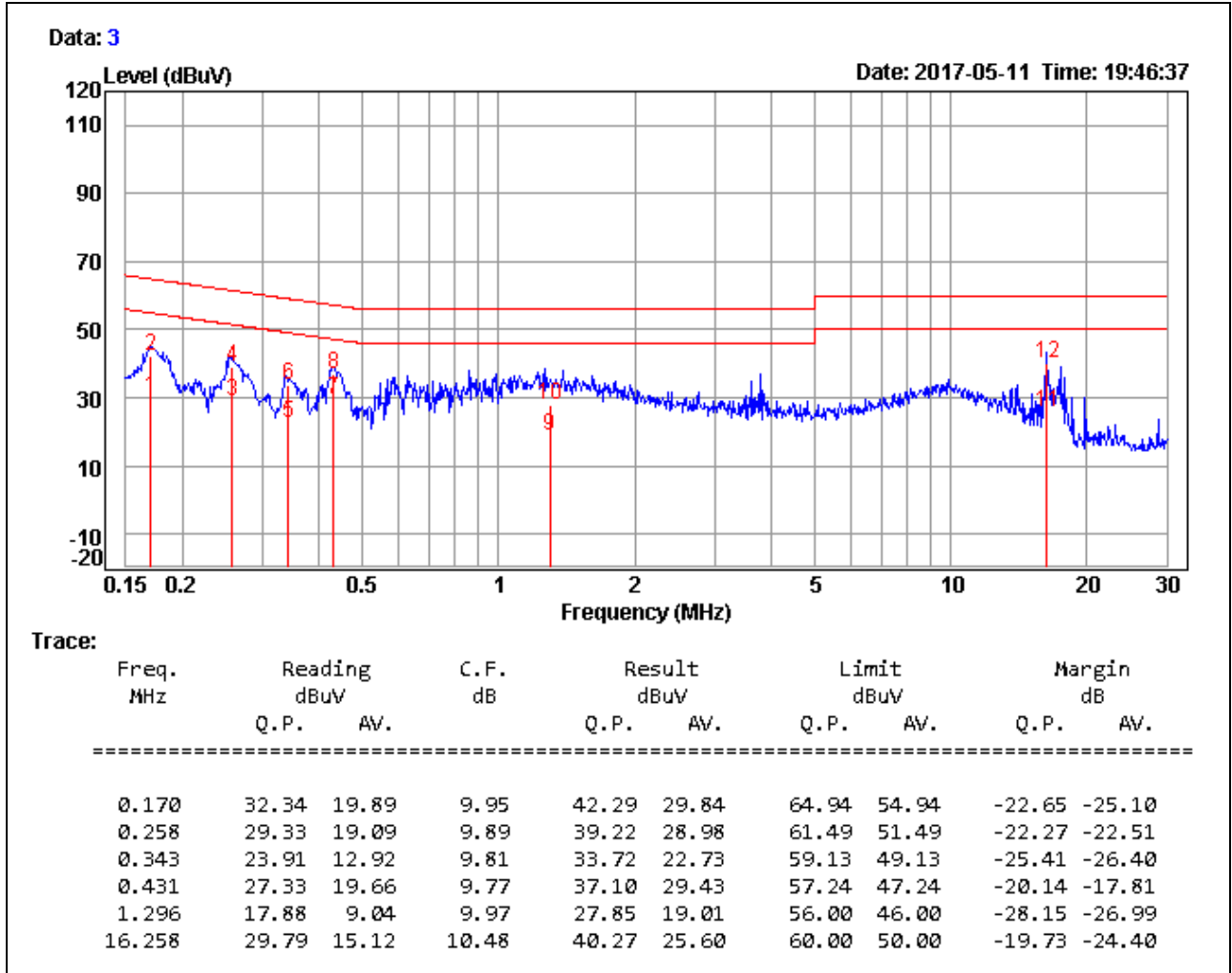


**Remark:**

1. Correction Factor = Insertion loss + Cable loss
2. Result level = Reading Value + Correction factor
3. Margin value = Result level – Limit value

<b>Product Name</b>	300Mbps Wireless N VDSL2 Modem Router	<b>Test By</b>	Rex Chiu
<b>Test Model</b>	DL4422U	<b>Test Date</b>	2017/05/11
<b>Test Mode</b>	Mode 3	<b>Temp. &amp; Humidity</b>	19.9°C, 74%

**NEUTRAL**



**Remark:**

1. Correction Factor = Insertion loss + Cable loss
2. Result level = Reading Value + Correction factor
3. Margin value = Result level – Limit value