

FCC TEST REPORT  
for  
Digience Co., Ltd.

Necon Camera  
Model No.: DNC-P100, DNC-P200,  
DNC-P300, DNC-P400, DNC-P500

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Report Number : R011505103I  
Date of Test : May 06~ 29, 2015  
Date of Report : Jun. 03, 2015

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## TEST REPORT

Applicant : Digience Co., Ltd.  
Manufacturer : Digience Co., Ltd.  
EUT : Necon Camera  
Model No. : DNC-P100, DNC-P200, DNC-P300, DNC-P400, DNC-P500  
Serial No. : N.A.  
Trade Mark :   
Rating : DC 5V, 2A

Measurement Procedure Used:  
FCC Part15 Subpart C 2014, Paragraph 15.247

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : May 06~ 29, 2015



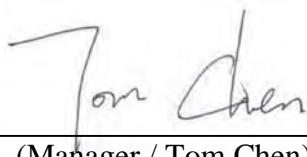
Prepared by :

(Tested Engineer / Kebo Zhang)



Reviewer :

(Project Manager / Amy Ding)



Approved & Authorized Signer :

(Manager / Tom Chen)

## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

EUT	: Necon Camera
Model Number	: DNC-P100, DNC-P200, DNC-P300, DNC-P400, DNC-P500 (Note: All samples are the same except the model number and colour, so we prepare “DNC-P100” for test only.)
Test Power Supply	: AC 120V, 60Hz for adapter
Adapter	: Model: CW0502000 Input: AC 100-240V, 50/60Hz, 0.4A MAX Output: DC 5V, 2000mA
RF Transmission Frequency	: 2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20)) 2422MHz~2452MHz ( 802.11n(HT40))
Channels	: 11 For (802.11b/802.11g/802.11n(HT20)) 7 For (802.11n(HT40))
Modulation	802.11b CCK 802.11g OFDM 802.11n MCS
Antenna Gain:	: 2dBi
Applicant Address	: Digience Co., Ltd. : 204 Building for Growth, GERI, #17 Cheomdangieop-1ro, Sandong-myeon, Gumi-si, Gyeongbuk, Korea
Manufacturer Address	: Digience Co., Ltd. : 204 Building for Growth, GERI, #17 Cheomdangieop-1ro, Sandong-myeon, Gumi-si, Gyeongbuk, Korea
Factory Address	: Apexis Electronic(Hongkong) Limited (China) : F5, NO.53, Dalangshan, Wanfeng, Shajing, Shenzhen, China
Date of receipt	: May 06, 2015
Date of Test	: May 06~ 29, 2015

## 1.2. Auxiliary Equipment Used during Test

PC	: Manufacturer: DELL M/N: OPTIPLEX 380 S/N: 1J63X2X CE , FCC: DOC
MONITOR	: Manufacturer: DELL M/N: E170Sc S/N: CN-00V539-64180-055-0UPS CE , FCC: DOC
KEYBOARD	: Manufacturer: DELL M/N: SK-8115 S/N: CN-0DJ313-71616-06C-02XN CE , FCC: DOC Cable: 1m, unshielded
MOUSE	: Manufacturer: DELL M/N: M-UARDEL7 S/N: N/A CE , FCC: DOC Cable: 1m, unshielded
Printer	: Manufacturer:Brother M/N: MFC-3360C S/N: N/A CE, FCC:DOC
Power Line	: Non-Shielded, 1.5m
VGA Cable	: Non-Shielded, 1.5m

### 1.3. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### **CNAS - LAB Code: L3503**

Shenzhen Anbotek Compliance Laboratory Limited., Laboratory has been assessed and in compliance with CNAS/CL01: 2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

#### **FCC-Registration No.: 752021**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 10, 2013.

#### **IC-Registration No.: 8058A-1**

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, February 22, 2013.

#### **Test Location**

All Emissions tests were performed at Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

### 1.4. Measurement Uncertainty

Radiation Uncertainty : Ur = 4.1 dB (Horizontal)  
Ur = 4.3 dB (Vertical)

Conduction Uncertainty : Uc = 3.4dB

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC Part 15, Paragraph 15.247.

### 2.1. Summary of Test Results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.107, 15.207	Conducted Emission Test	PASS	Complies
FCC Part 15, Paragraph 15.247(b)(1)	Maximum Output Power	PASS	Complies
FCC Part 15, Paragraph 15.247(a)(2)	6dB Bandwidth	PASS	Complies
FCC Part 15, Paragraph 15.247(c)	100kHz Bandwidth of Frequency Band Edges	PASS	Complies
FCC Part 15, Paragraph 15.209(a)(f)	Spurious Emission	PASS	Complies
FCC Part 15, Paragraph 15.247(a)(1)	Frequency Separation	-	N/A
FCC Part 15, Paragraph 15.247(a)(1)(iii)	Number of Hopping Frequency	-	N/A
FCC Part 15, Paragraph 15.247(a)(1)(iii)	Time of Occupancy	-	N/A
FCC Part 15, Paragraph 15.247(c)	Peak Power Density	PASS	Complies

### 2.2. Description of Test Modes

The EUT has been tested under operating condition.

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

IEEE802.11b: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 1 Mbps lowest data rate (worst case) are chosen for the final testing.

IEEE802.11g: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 6 Mbps lowest data rate (the worst case) are chosen for the final testing.

IEEE802.11n (HT20): Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with MCS 0 Mbps lowest data rate (the worst case) are chosen for the final testing.

IEEE802.11n (HT40): Channel 3(2422MHz), Channel 6(2437MHz) and Channel 9(2452MHz) with MCS 0 Mbps lowest data rate (the worst case) are chosen for the final testing.

## 2.3. List of channels:

✓ - available

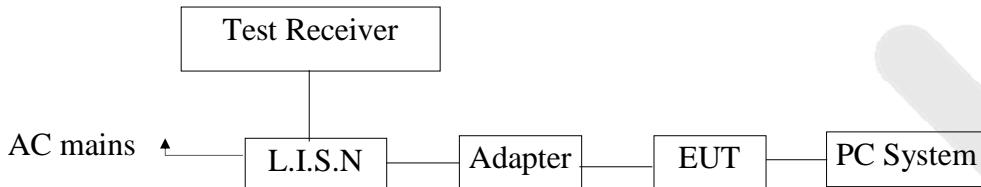
X - tested

Number	Frequency(MHz)		802.11 b/g/n (HT20)	802.11 b/g/n (HT40)
1	2412	✓	X	
2	2417	✓		
3	2422	✓		X
4	2427	✓		
5	2432	✓		
6	2437	✓	X	X
7	2442	✓		
8	2447	✓		
9	2452	✓		X
10	2457	✓		
11	2462	✓	X	

### 3. Conducted Emission Test

#### 3.1. Block Diagram of Test Setup

##### 3.1.1. Block diagram of connection between the EUT and simulators



#### 3.2. Power Line Conducted Emission Measurement Limits (15.207)

Frequency MHz	Limits dB( $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: 1. \*Decreasing linearly with logarithm of frequency.  
2. The lower limit shall apply at the transition frequencies.

#### 3.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

#### 3.4. Operating Condition of EUT

- 3.4.1. Setup the EUT and simulator as shown as Section 3.1.
- 3.4.2. Turn on the power of all equipment.
- 3.4.3. Let the EUT work in test mode (On) and measure it.

### 3.5. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

The test results are reported on Section 3.6.

### 3.6. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	100055	Apr. 17, 2015	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Apr. 17, 2015	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Apr. 17, 2015	1 Year

### 3.7. Power Line Conducted Emission Measurement Results

**PASS.**

The frequency range from 150KHz to 30 MHz is investigated.

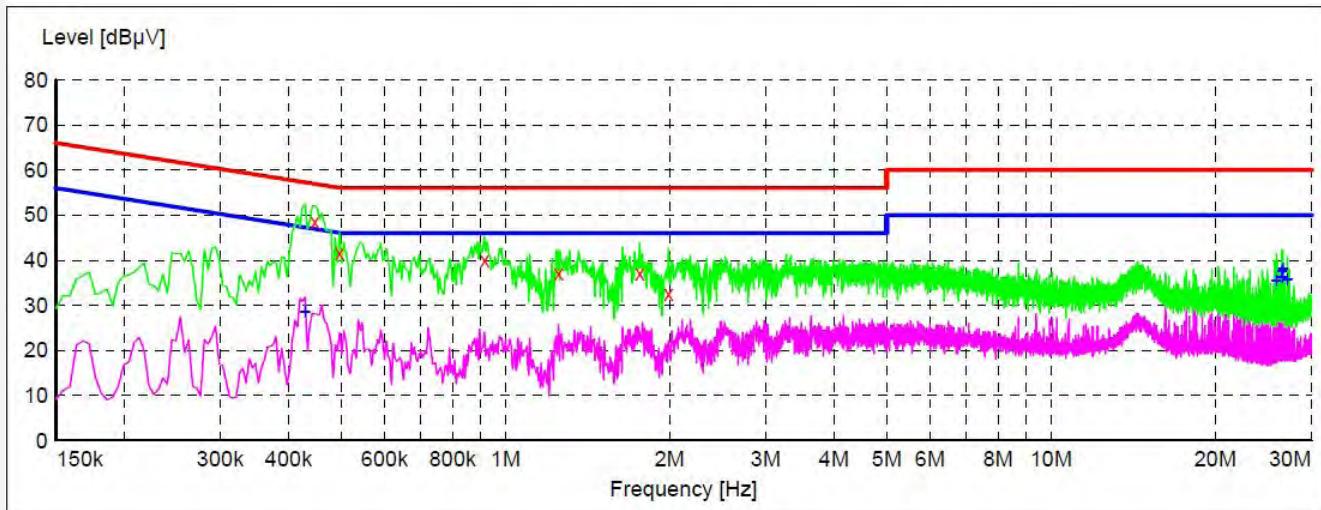
Please refer the following pages.

**CONDUCTED EMISSION TEST DATA**

Test Site: 1# Shielded Room  
 Operating Condition: On  
 Test Specification: AC 120V, 60Hz for adapter  
 Comment: Live Line  
 Tem.:25°C Hum.:50%

**SCAN TABLE: "Voltage (150K~30M) FIN"**

Short Description: 150K-30M Disturbance Voltages



Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.447000	48.40	20.1	57	8.5	QP	L1	GND
0.496500	41.60	20.1	56	14.5	QP	L1	GND
0.915000	40.00	20.1	56	16.0	QP	L1	GND
1.252000	37.20	20.2	56	18.8	QP	L1	GND
1.760500	37.00	20.3	56	19.0	QP	L1	GND
1.990000	32.70	20.3	56	23.3	QP	L1	GND

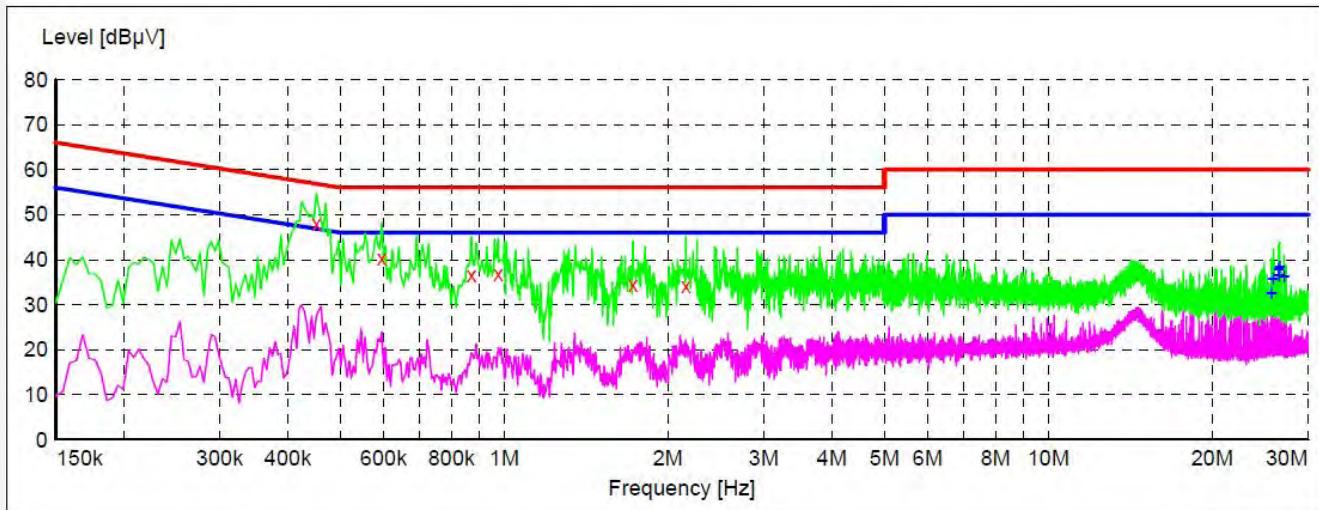
Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.429000	28.60	20.1	47	18.7	AV	L1	GND
25.876000	35.60	20.9	50	14.4	AV	L1	GND
26.488000	37.70	20.9	50	12.3	AV	L1	GND
26.546500	36.30	20.9	50	13.7	AV	L1	GND
26.609500	38.20	20.9	50	11.8	AV	L1	GND
27.158500	35.80	20.9	50	14.2	AV	L1	GND

**CONDUCTED EMISSION TEST DATA**

Test Site: 1# Shielded Room  
 Operating Condition: On  
 Test Specification: AC 120V, 60Hz for adapter  
 Comment: Neutral Line  
 Tem.:25°C Hum.:50%

**SCAN TABLE: "Voltage (150K~30M) FIN"**

Short Description: 150K-30M Disturbance Voltages

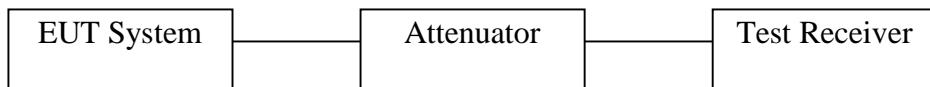


Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.451500	48.00	20.1	57	8.8	QP	N	GND
0.595500	40.30	20.1	56	15.7	QP	N	GND
0.870000	36.60	20.1	56	19.4	QP	N	GND
0.973500	36.80	20.2	56	19.2	QP	N	GND
1.724500	34.40	20.3	56	21.6	QP	N	GND
2.156500	34.20	20.3	56	21.8	QP	N	GND

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
25.696000	32.70	20.9	50	17.3	AV	N	GND
25.876000	35.80	20.9	50	14.2	AV	N	GND
26.488000	38.00	20.9	50	12.0	AV	N	GND
26.546500	36.60	20.9	50	13.4	AV	N	GND
26.609500	38.50	20.9	50	11.5	AV	N	GND
27.158500	36.20	20.9	50	13.8	AV	N	GND

## 4. FCC Part 15.247 Requirements for DS-SS & OFDM Modulation

### 4.1 Test Setup



### 4.2 6dB Bandwidth

#### a. Limit

For the direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

#### b. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:  
 $RBW = 100\text{kHz}$ ,  $VBW \geq 3 * RBW = 300\text{kHz}$ ,  
Detector= Peak  
Trace mode= Max hold.  
Sweep- auto couple.
4. Mark the peak frequency and  $-6\text{dB}$  (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### 20dB Bandwidth:

#### C63.10

#### Occupied Bandwidth (OBW=20dB Bandwidth)

1. Set  $RBW = 1\% \sim 5\% OBW$
2. Set the  $VBW \geq 3 * RBW$
3. Set the span range between 2 times and 5 times of the OBW
4. Sweep Time= Auto  
Detector= Peak  
Trace= Max hold
5. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce the worst case (i.e. the widest) bandwidth. Unless otherwise specified for an unlicensed wireless device, measure the bandwidth at the  $-20\text{dB}$  levels with respect to the reference level.

**c. Test Setup See 4.1****d. Test Equipment**

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Apr. 17, 2015	1 Year
2.	Preamplifier	Instruments corporation	EMC011830	980100	Apr. 17, 2015	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 17, 2015	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Apr. 20, 2015	1 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 20, 2015	1 Year
6.	Pre-amplifier	SONOMA	310N	186860	Apr. 17, 2015	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

**e. Test Results**

Pass.

## f. Test Data

### 6dB Bandwidth

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Results
Low	2412	11.76		Pass
Mid	2437	11.72	>500	Pass
High	2462	11.76		Pass

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Results
Low	2412	16.48		Pass
Mid	2437	16.48	>500	Pass
High	2462	16.48		Pass

Test mode: IEEE 802.11n (HT20)

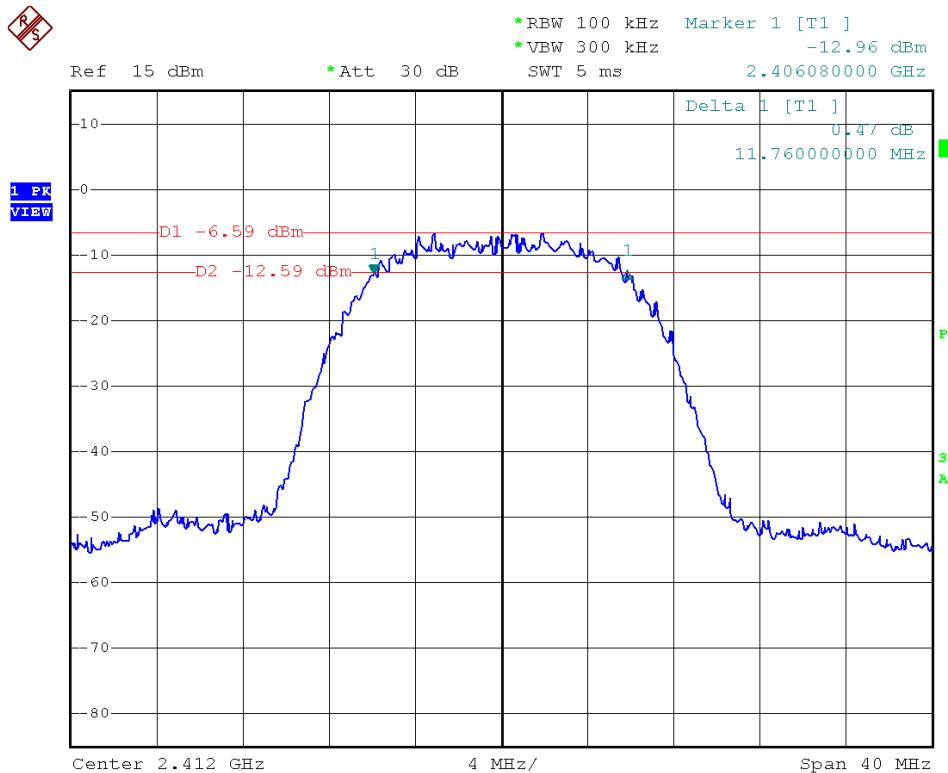
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Results
Low	2412	17.68		Pass
Mid	2437	17.68	>500	Pass
High	2462	17.68		Pass

Test mode: IEEE 802.11n (HT40)

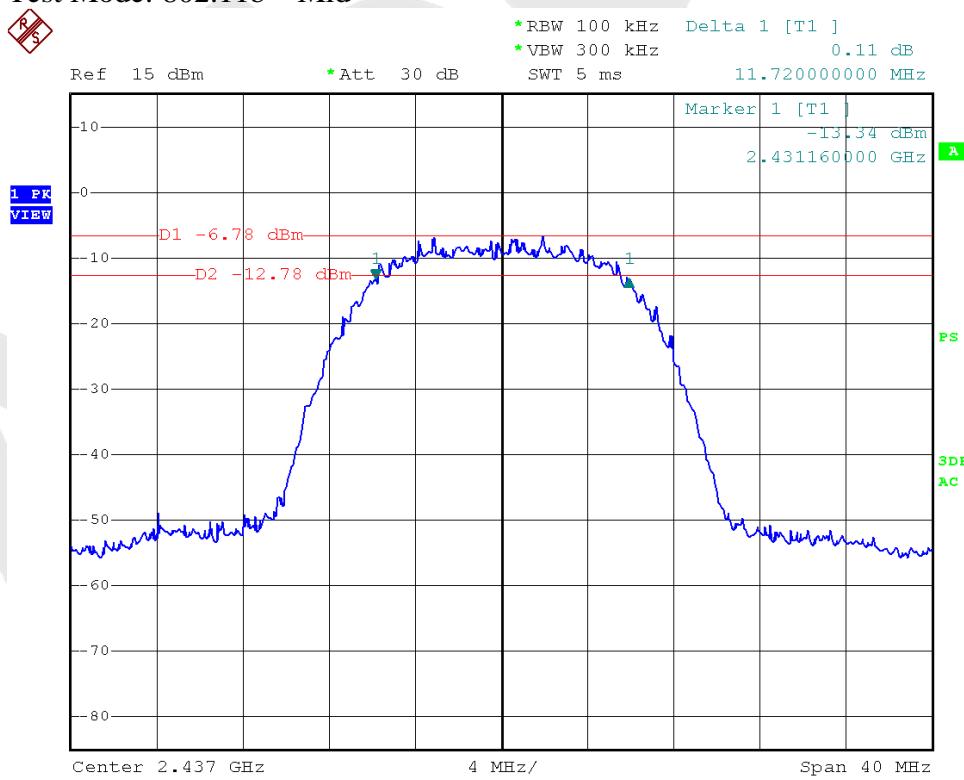
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Results
Low	2422	36.48		Pass
Mid	2437	36.48	>500	Pass
High	2452	36.48		Pass

Test Plots See the following page.

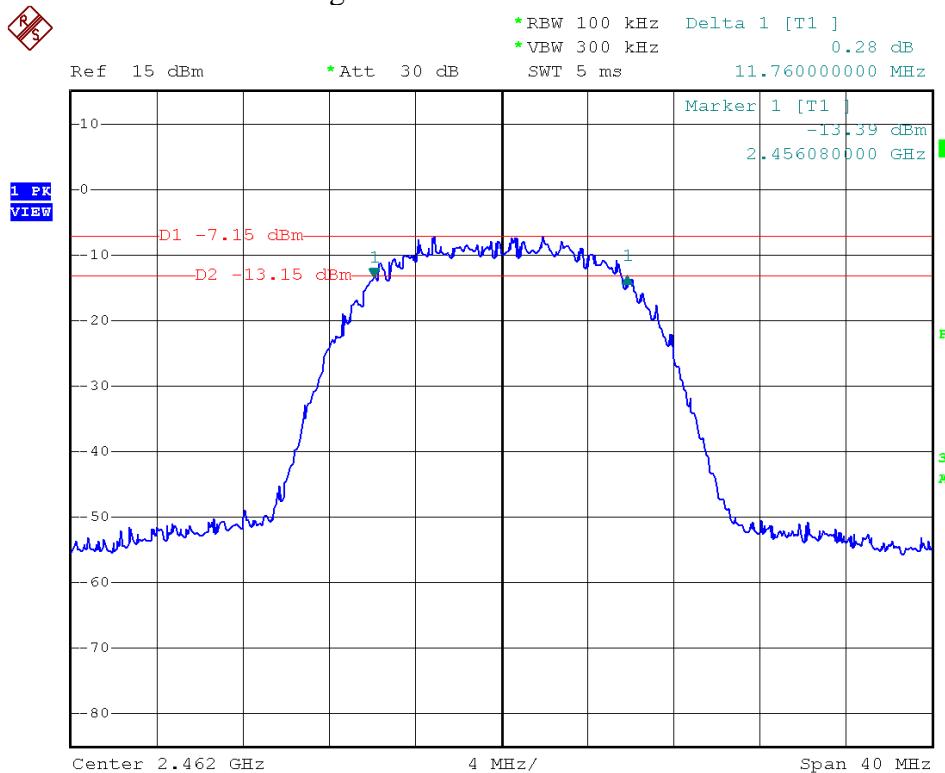
Test Mode: 802.11b---Low



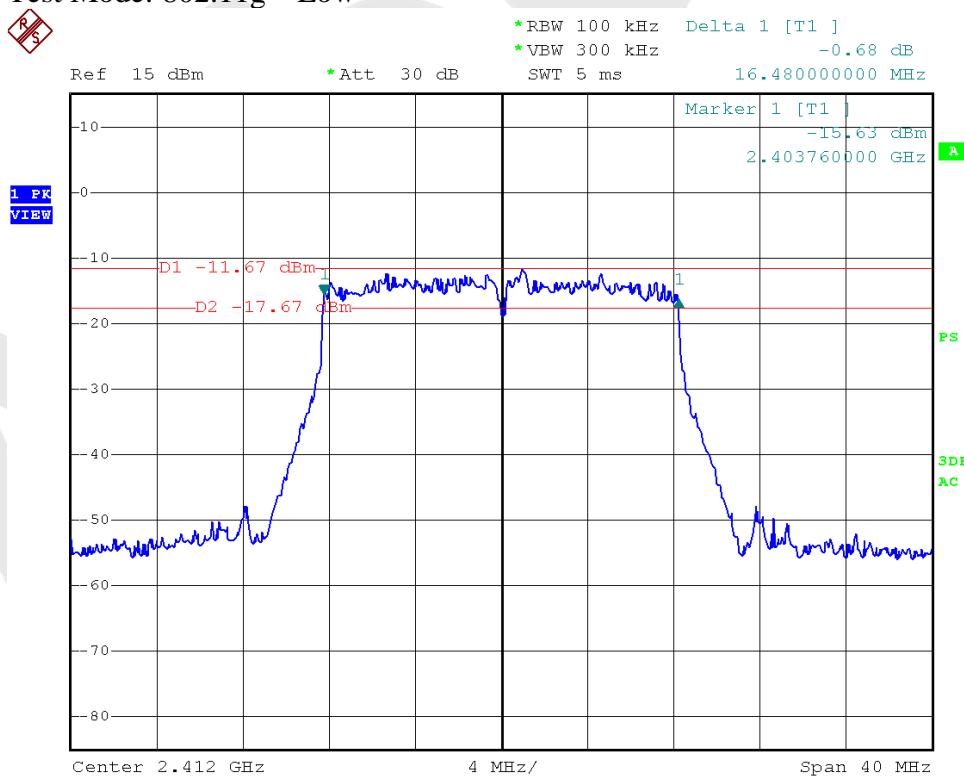
Test Mode: 802.11b---Mid



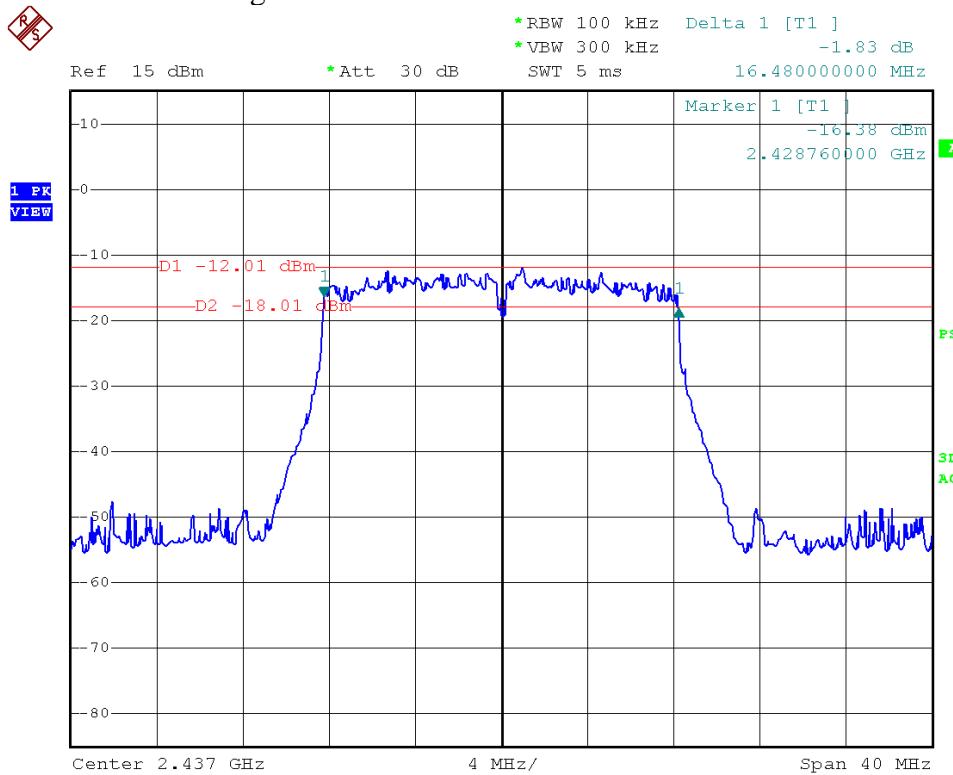
Test Mode: 802.11b---High



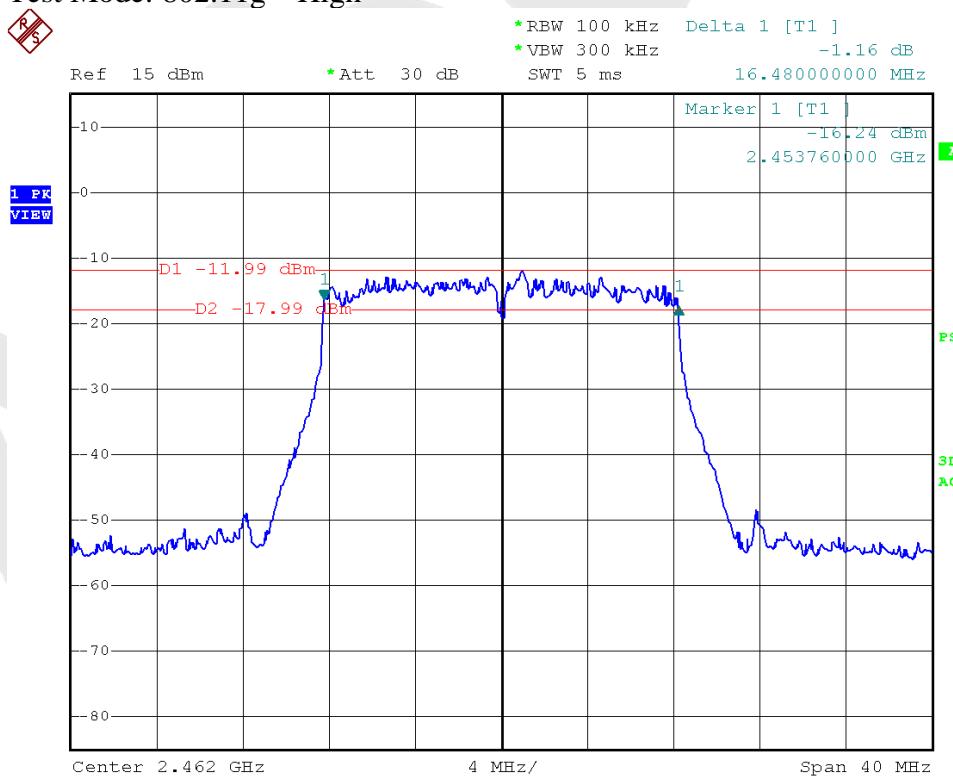
Test Mode: 802.11g---Low



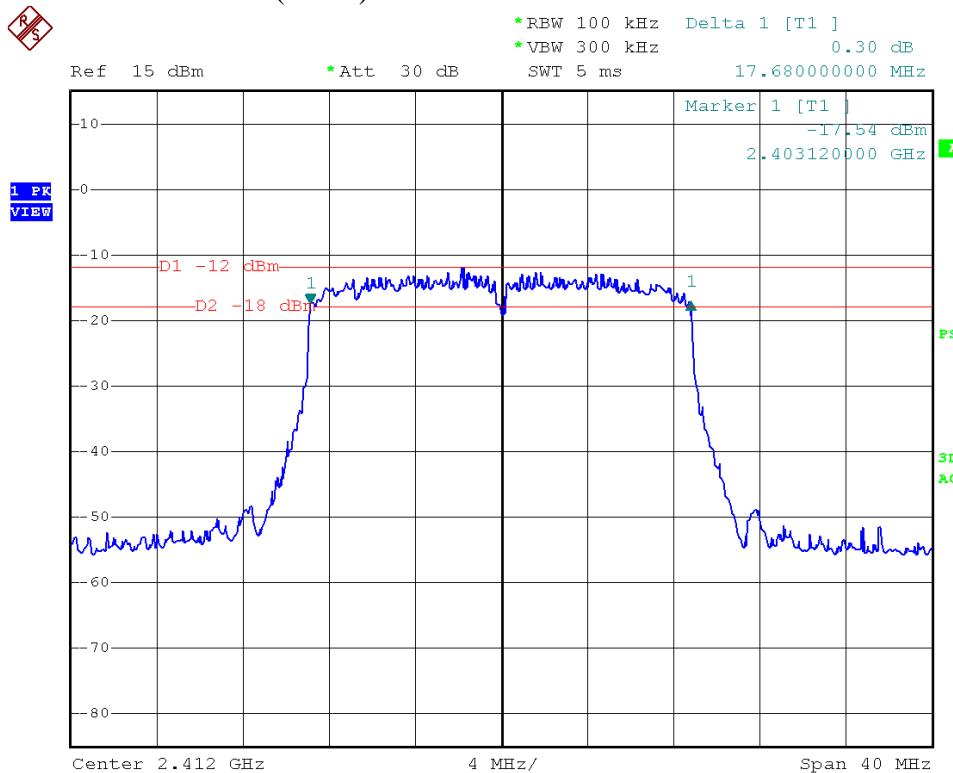
Test Mode: 802.11g---Mid



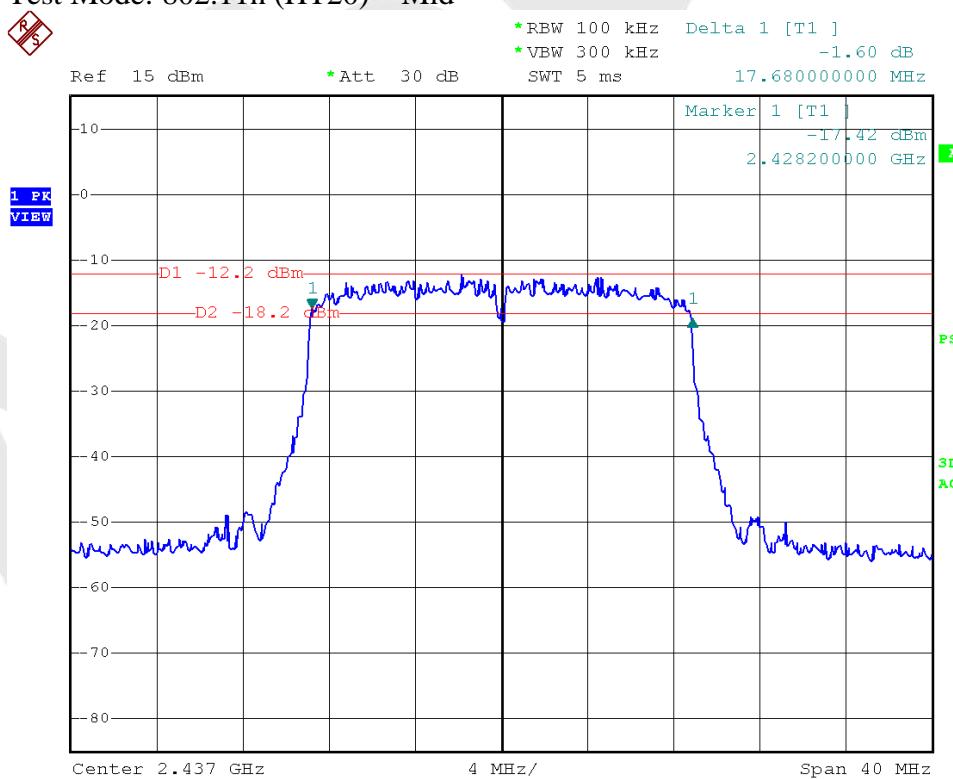
Test Mode: 802.11g---High



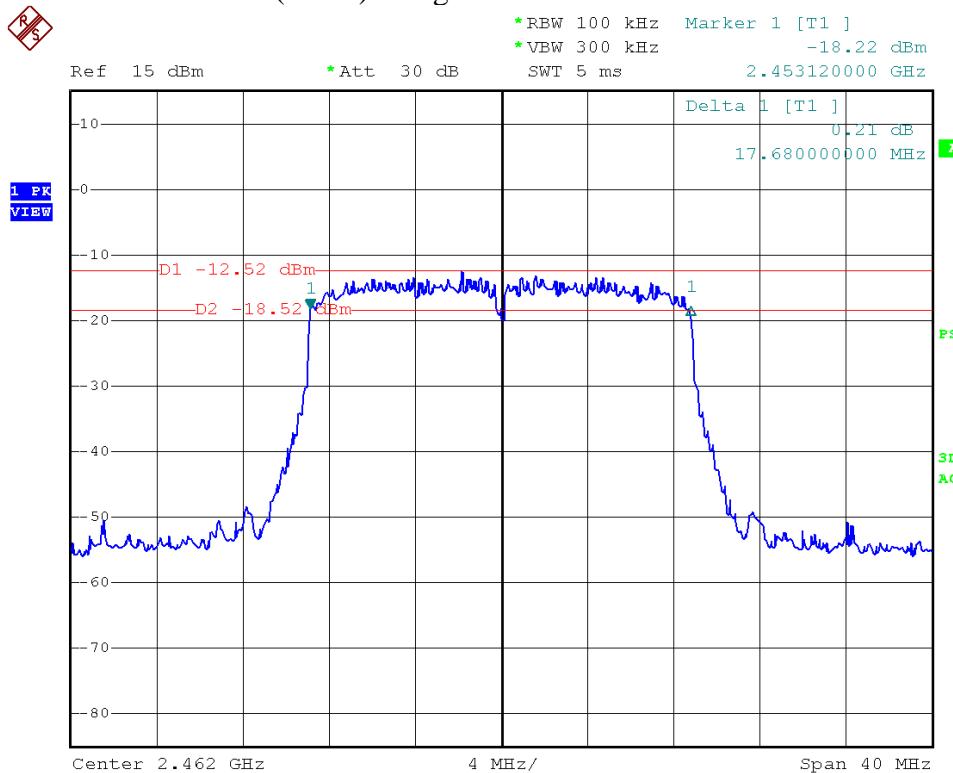
Test Mode: 802.11n (HT20)---Low



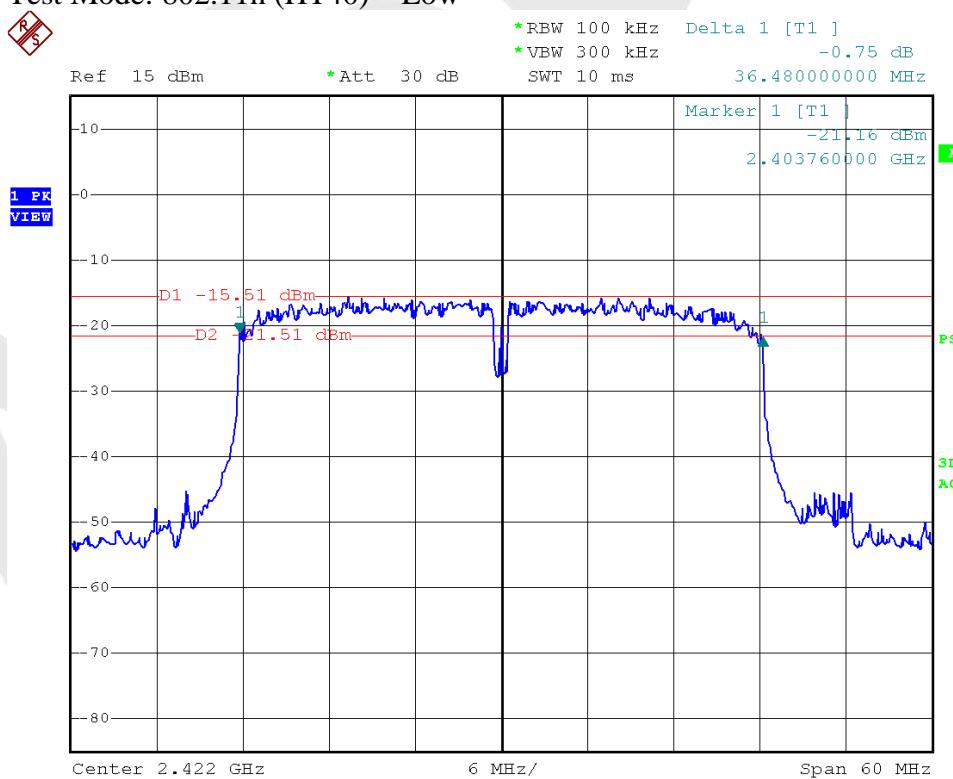
Test Mode: 802.11n (HT20)---Mid



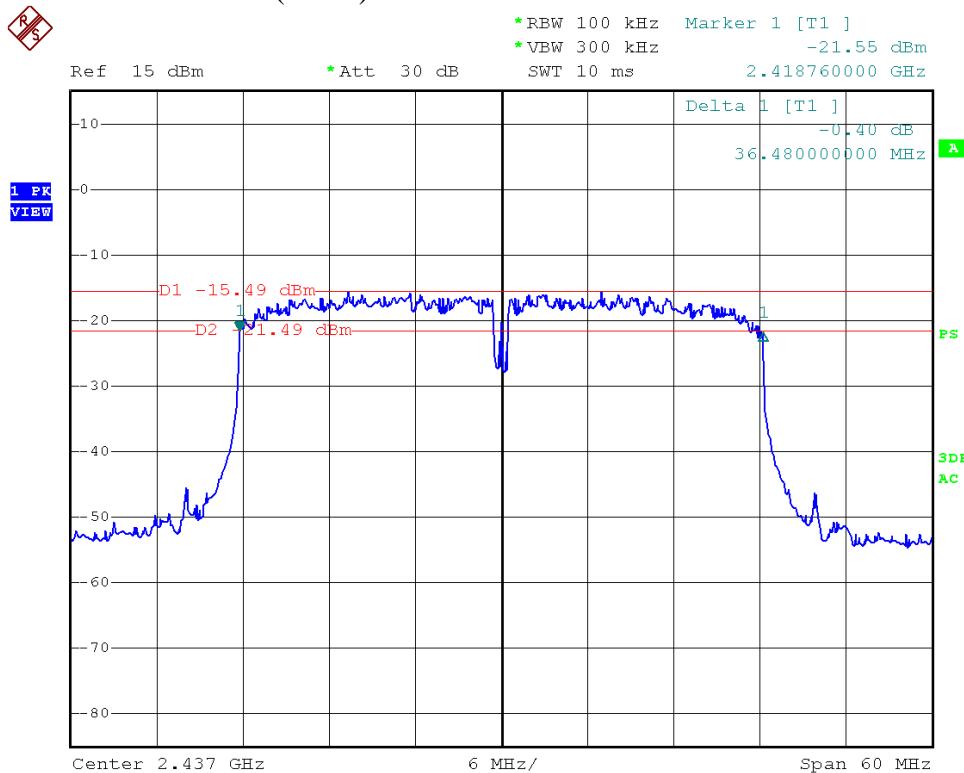
Test Mode: 802.11n (HT20)---High



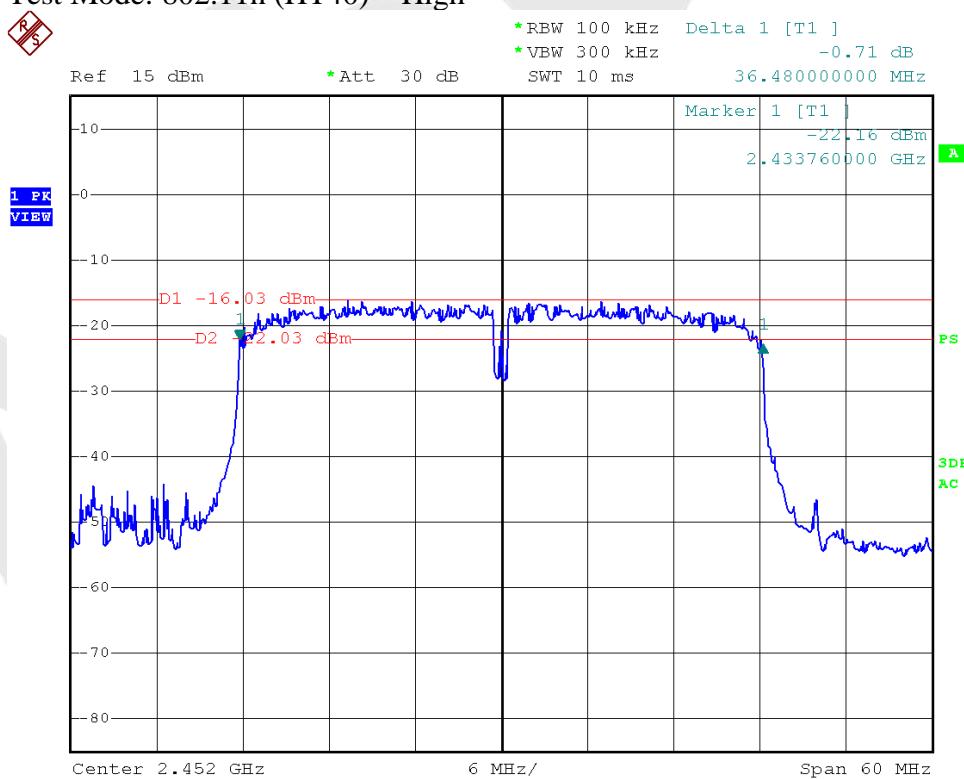
Test Mode: 802.11n (HT40)---Low



Test Mode: 802.11n (HT40)---Mid



Test Mode: 802.11n (HT40)---High



**20dB Bandwidth**

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (MHz)	Results
Low	2412	19.04	Pass
Mid	2437	19.04	Pass
High	2462	19.04	Pass

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (MHz)	Results
Low	2412	22.48	Pass
Mid	2437	22.16	Pass
High	2462	22.48	Pass

Test mode: IEEE 802.11n (HT20)

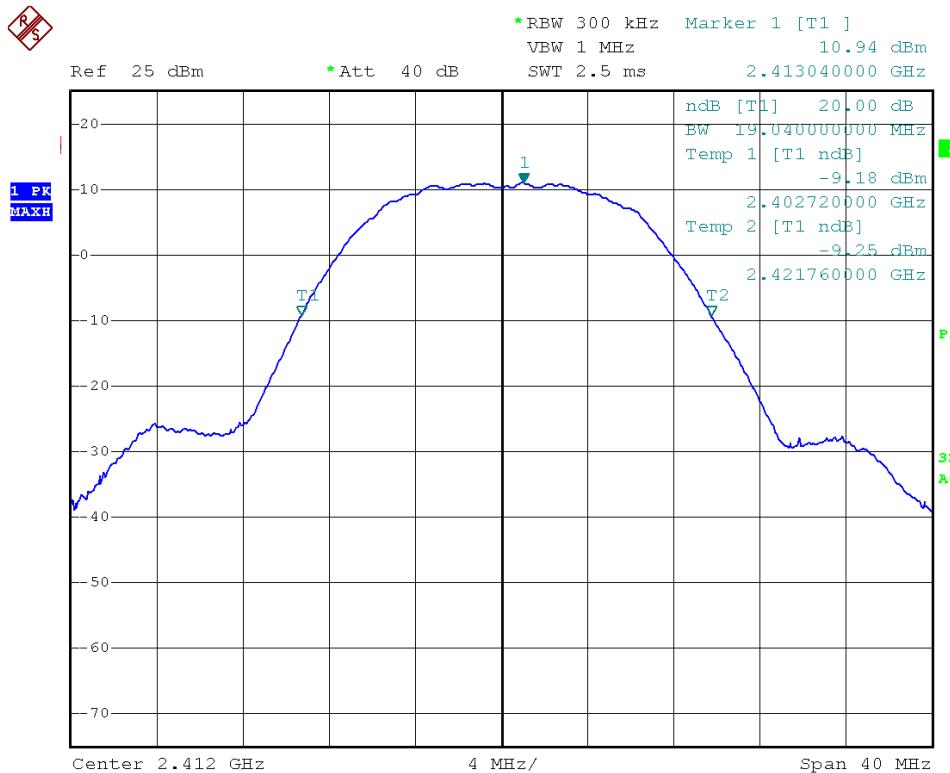
Channel	Frequency (MHz)	Bandwidth (MHz)	Results
Low	2412	23.20	Pass
Mid	2437	23.28	Pass
High	2462	23.20	Pass

Test mode: IEEE 802.11n (HT40)

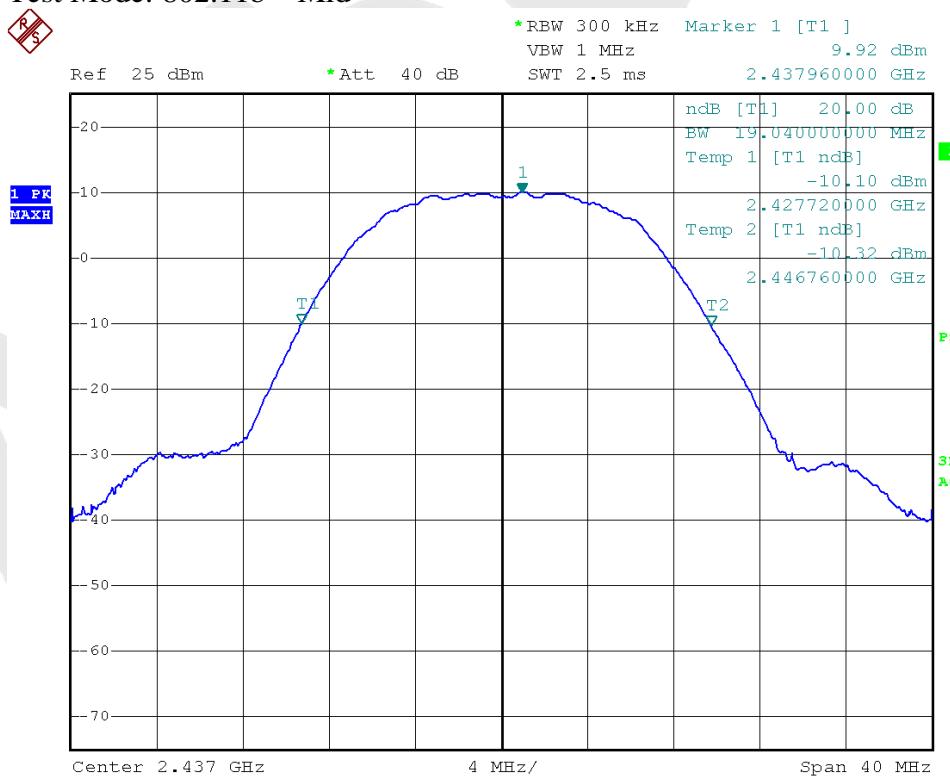
Channel	Frequency (MHz)	Bandwidth (MHz)	Results
Low	2422	42.40	Pass
Mid	2437	42.40	Pass
High	2452	42.08	Pass

Test Plots See the following page.

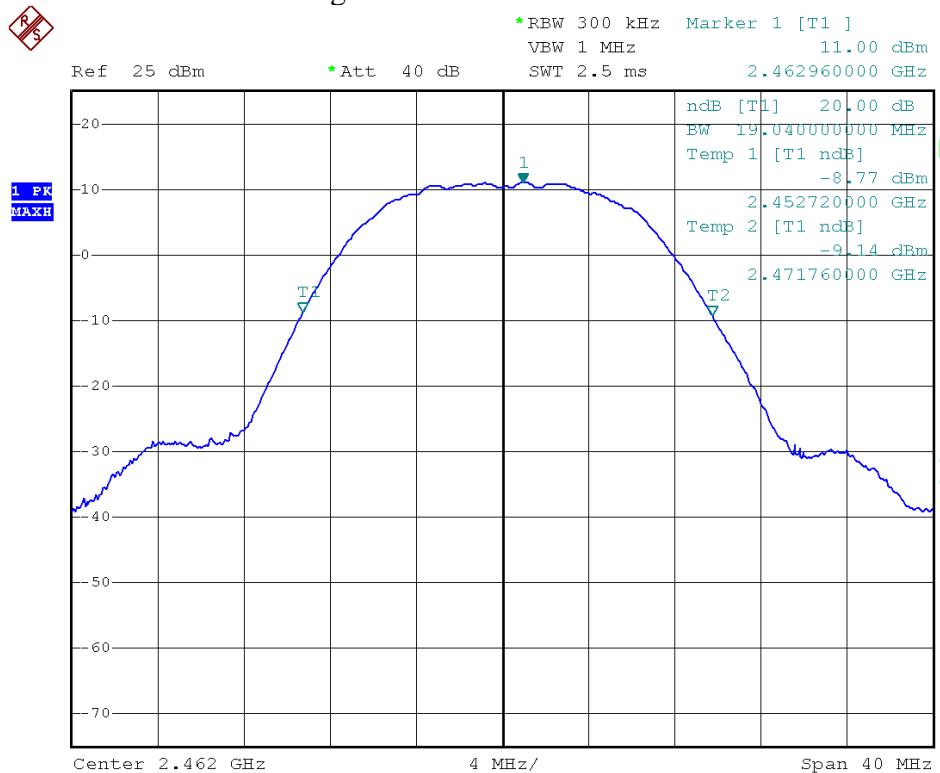
Test Mode: 802.11b---Low



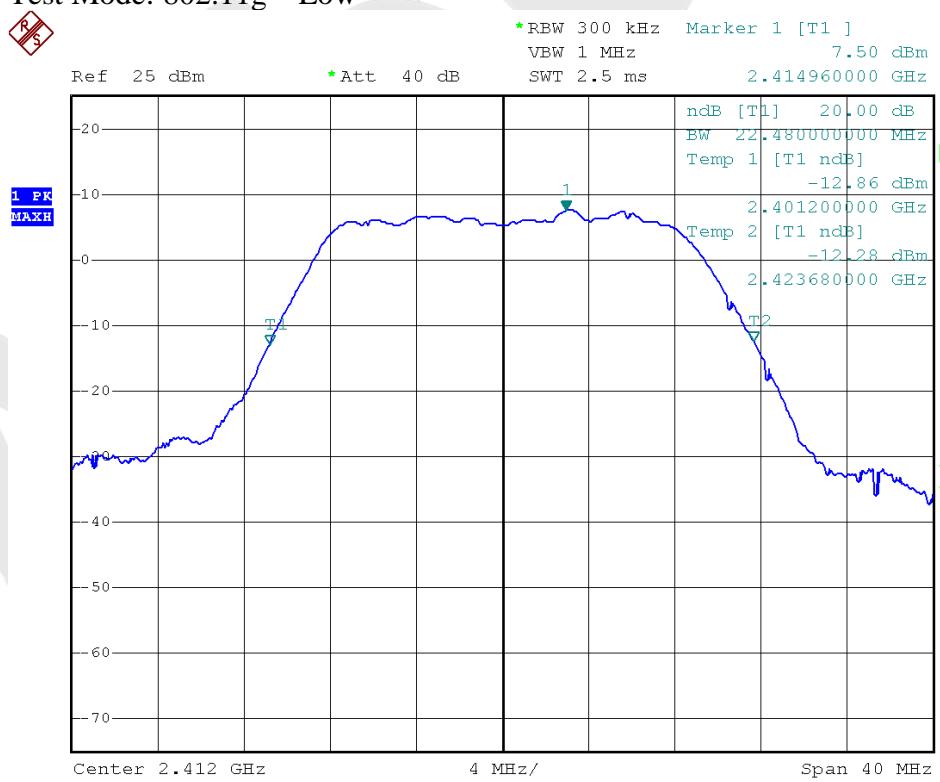
Test Mode: 802.11b---Mid



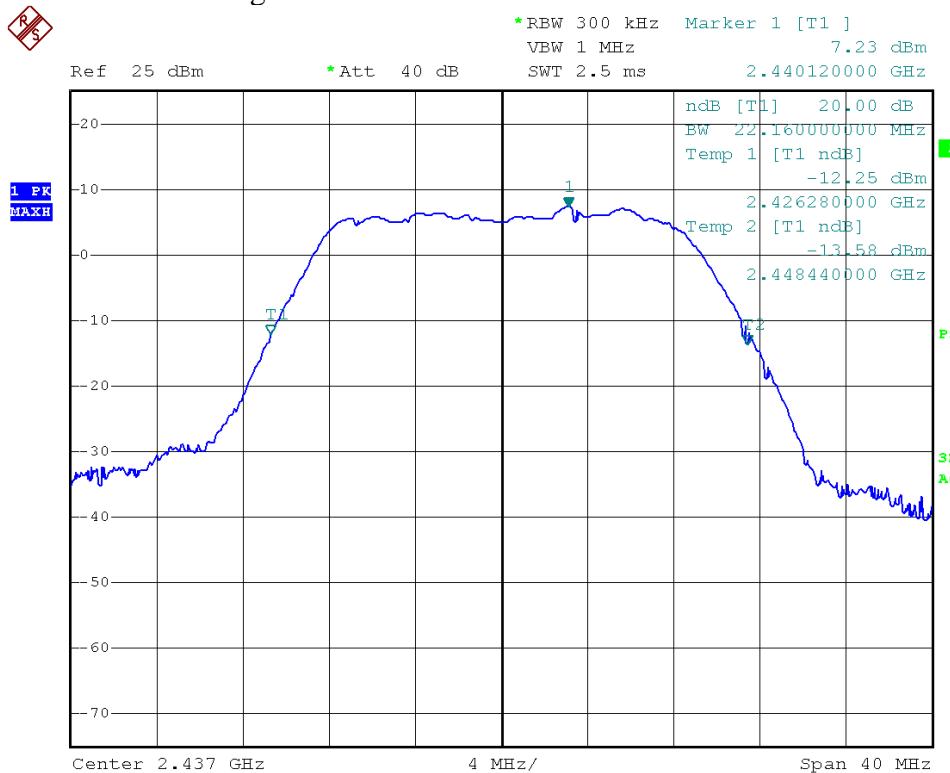
Test Mode: 802.11b---High



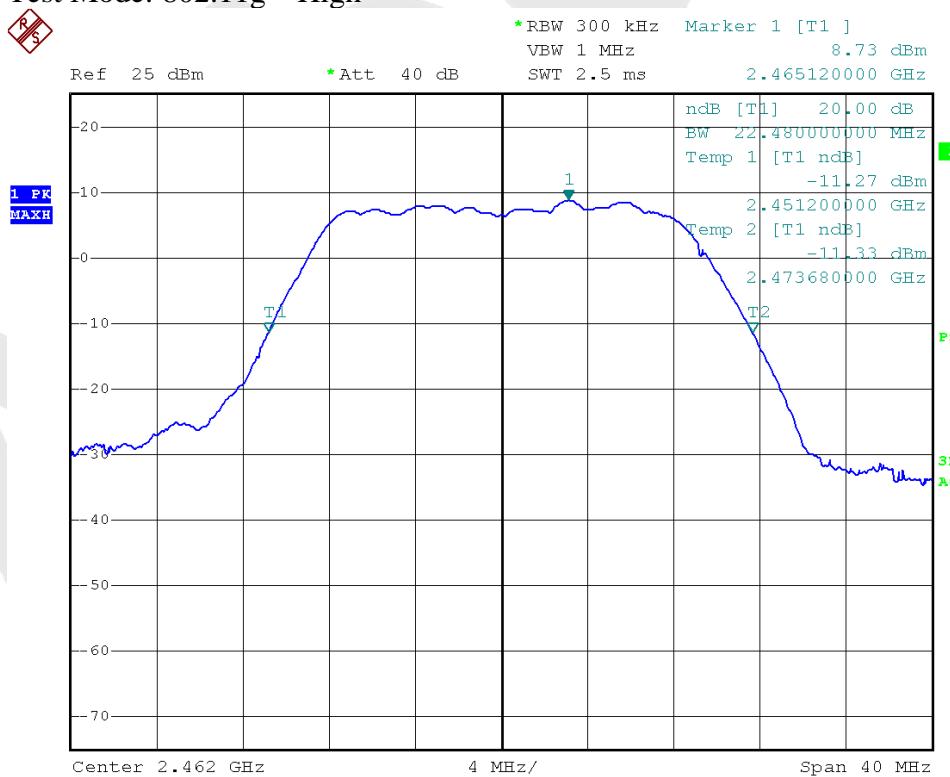
Test Mode: 802.11g---Low



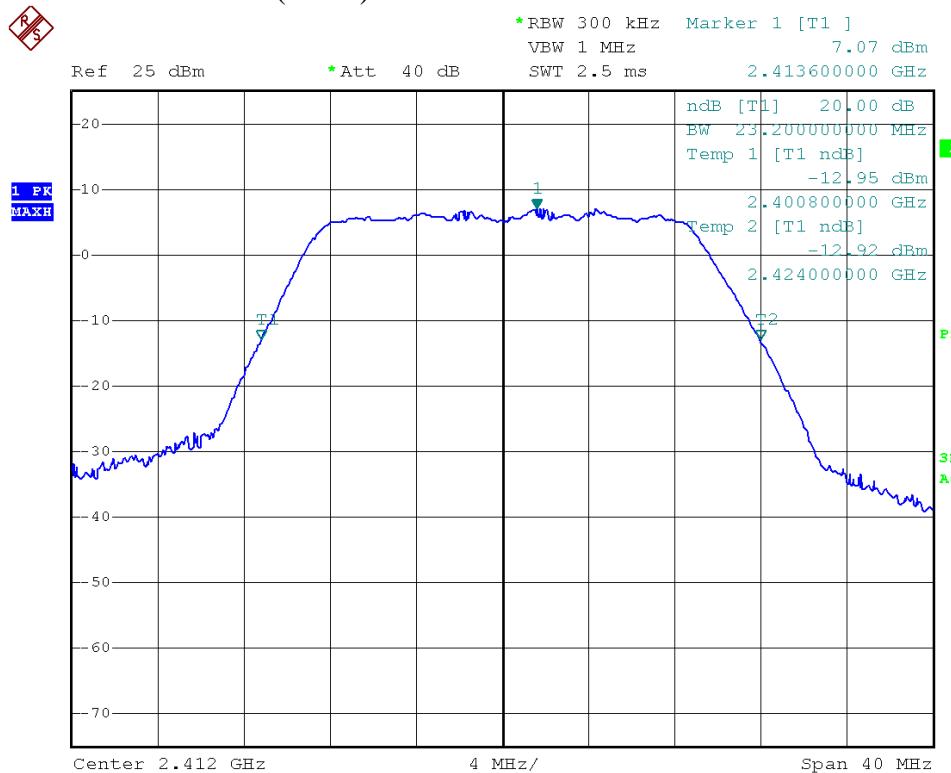
Test Mode: 802.11g---Mid



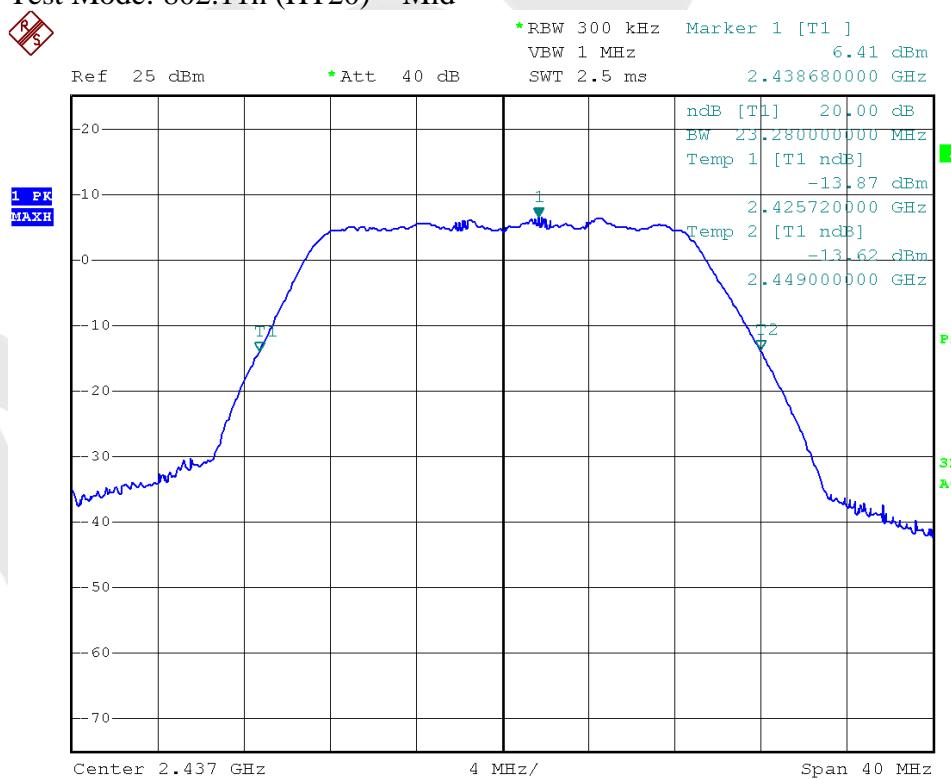
Test Mode: 802.11g---High



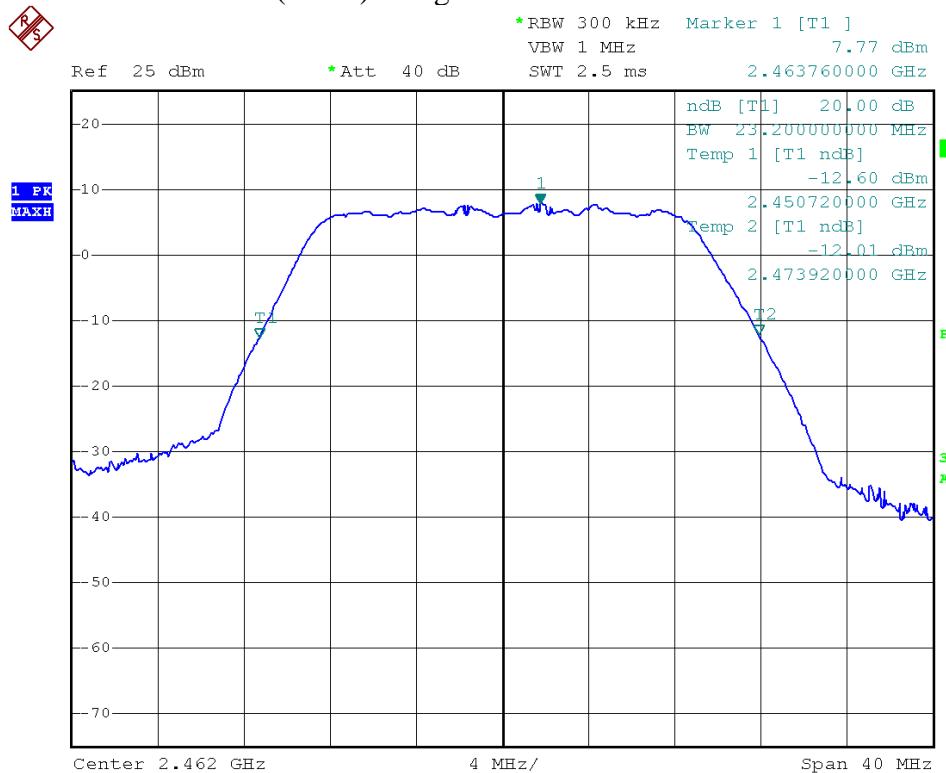
Test Mode: 802.11n (HT20)---Low



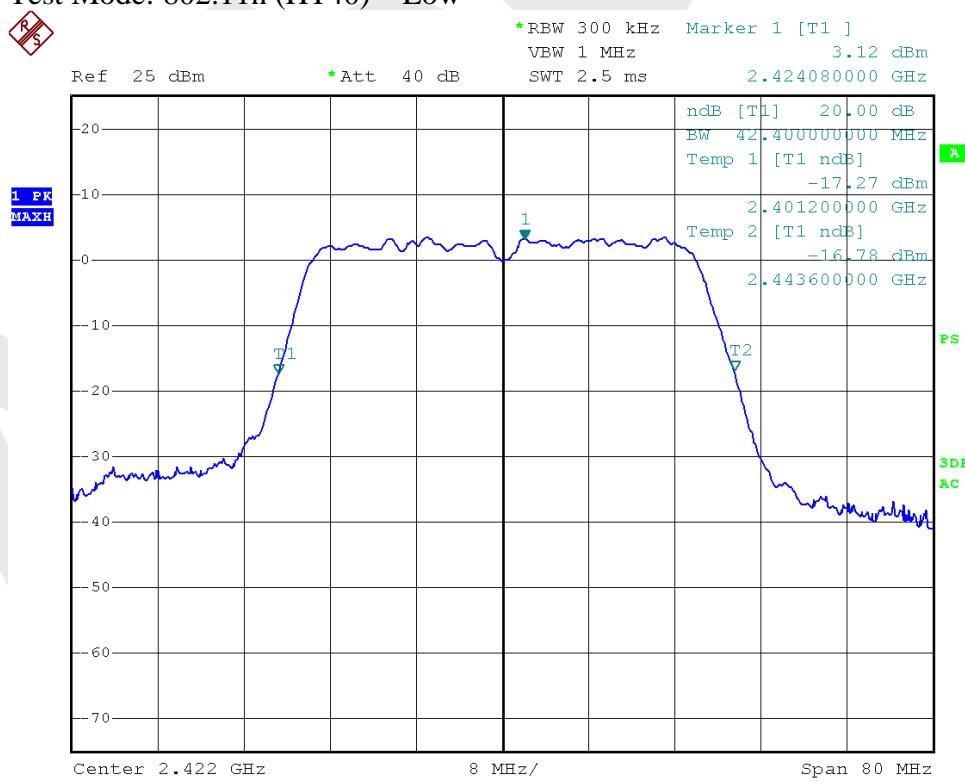
Test Mode: 802.11n (HT20)---Mid



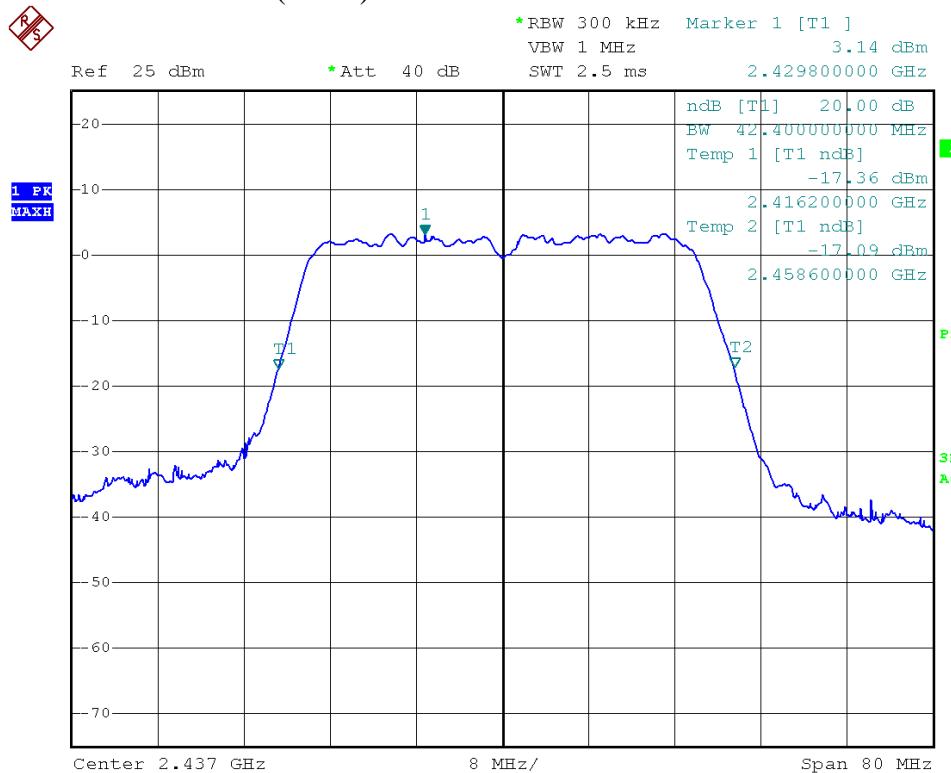
Test Mode: 802.11n (HT20)---High



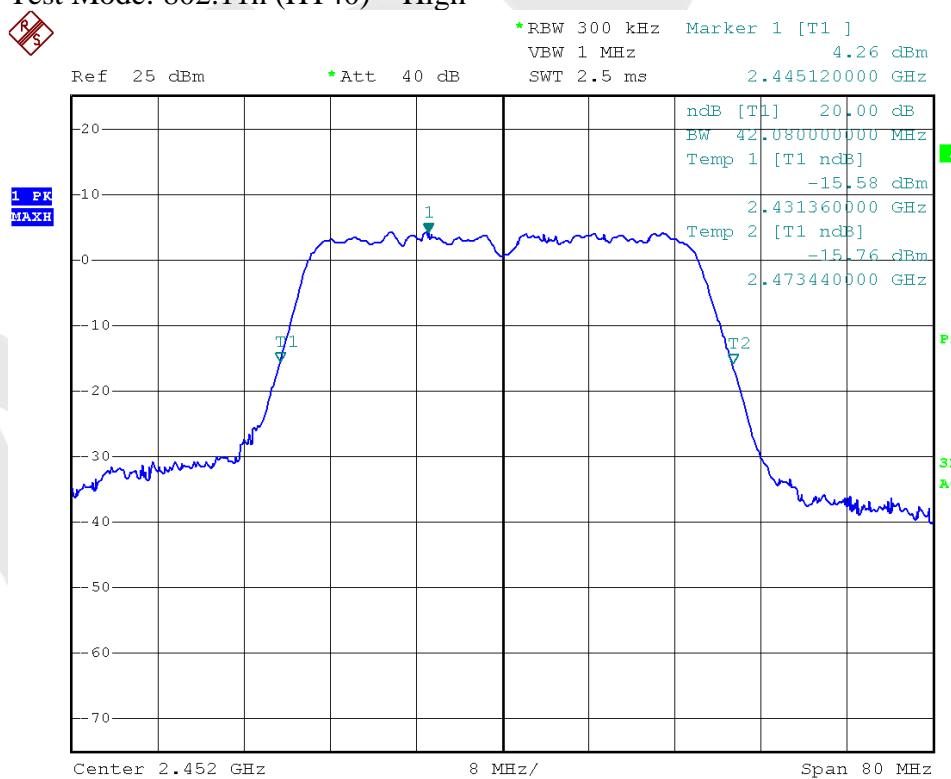
Test Mode: 802.11n (HT40)---Low



Test Mode: 802.11n (HT40)---Mid



Test Mode: 802.11n (HT40)---High



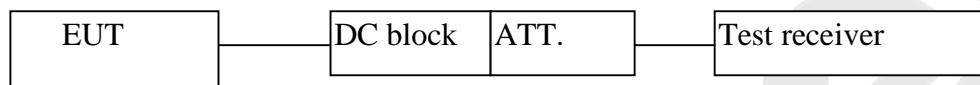
### 4.3. Maximum Output Power Test

#### a. Limit

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

1. For systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 watt (30dBm).
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antenna 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) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### b. Configuration of Measurement



#### c. Data Rates

IEEE802.11b: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 1 Mbps data rate (worst case) are chosen for the final testing.

IEEE802.11g: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 6 Mbps data rate (the worst case) are chosen for the final testing.

IEEE802.11n (HT20: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with 6.5Mbps data rate (the worst case) are chosen for the final testing.

IEEE802.11n (HT40: Channel 3(2422MHz), Channel 6(2437MHz) and Channel 9(2452MHz) with 13.5Mbps data rate (the worst case) are chosen for the final testing.

#### d. Test Procedure

This test was according the kDB 558074 9.2.2:

1. Set span to at least 1.5 times the OBW.
2. Set the RBW =1~5% of the OBW, not to exceed 1MHz.
3. Set VBW $\geqslant$ 3\*RBW.
4. Detector = Average.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

#### e. Test Equipment

Same as the equipment listed in 4.2.

#### f. Test Results

Pass.

### g. Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Maximum transmit power	Limit		Result
		(dBm)	(dBm)	(watts)	
Low	2412	11.99	30	1	Pass
Mid	2437	11.63			Pass
High	2462	11.12			Pass

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Maximum transmit power	Limit		Result
		(dBm)	(dBm)	(watts)	
Low	2412	10.11	30	1	Pass
Mid	2437	9.90			Pass
High	2462	9.47			Pass

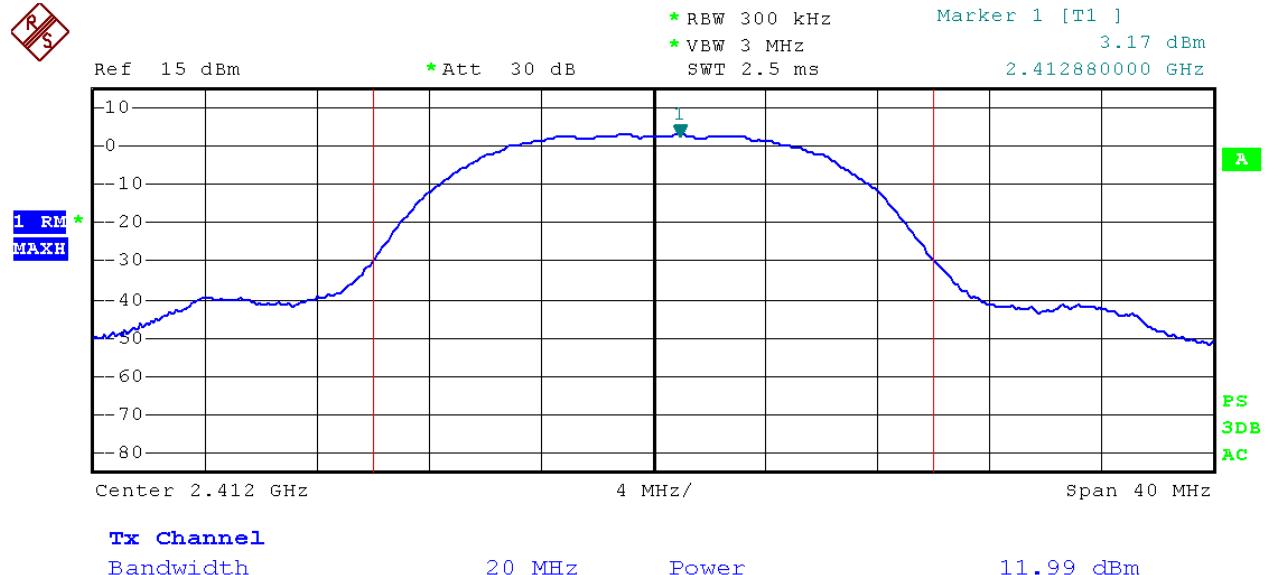
Test mode: IEEE 802.11n (HT20)

Channel	Frequency (MHz)	Maximum transmit power	Limit		Result
		(dBm)	(dBm)	(watts)	
Low	2412	9.88	30	1	Pass
Mid	2437	9.57			Pass
High	2462	9.04			Pass

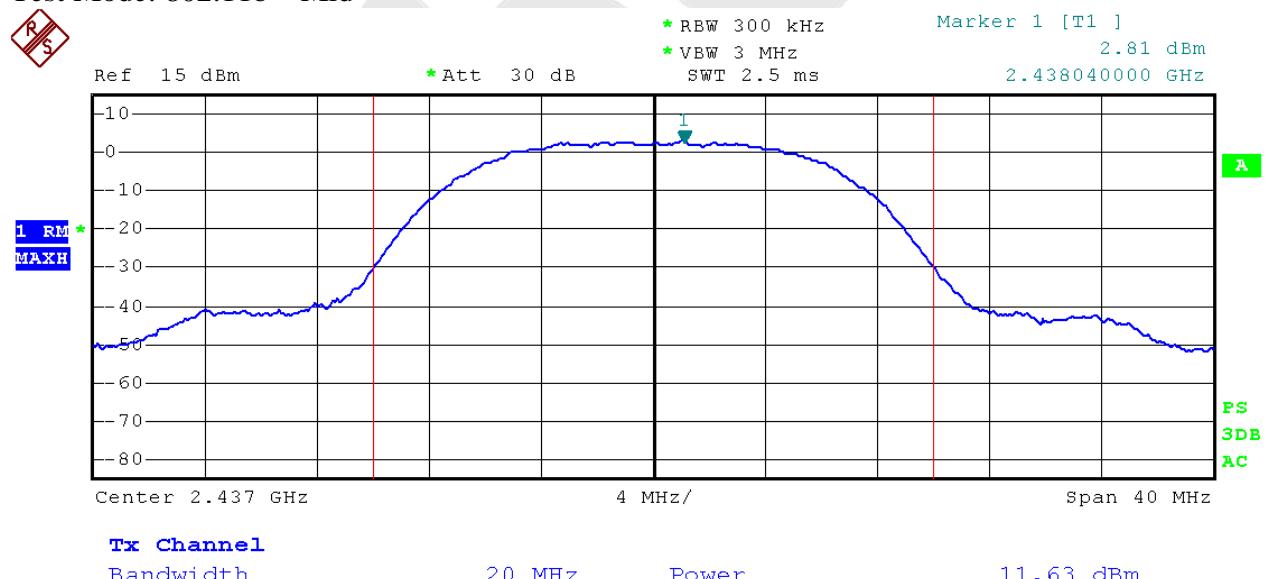
Test mode: IEEE 802.11n (HT40)

Channel	Frequency (MHz)	Maximum transmit power	Limit		Result
		(dBm)	(dBm)	(watts)	
Low	2422	9.39	30	1	Pass
Mid	2437	9.37			Pass
High	2452	8.96			Pass

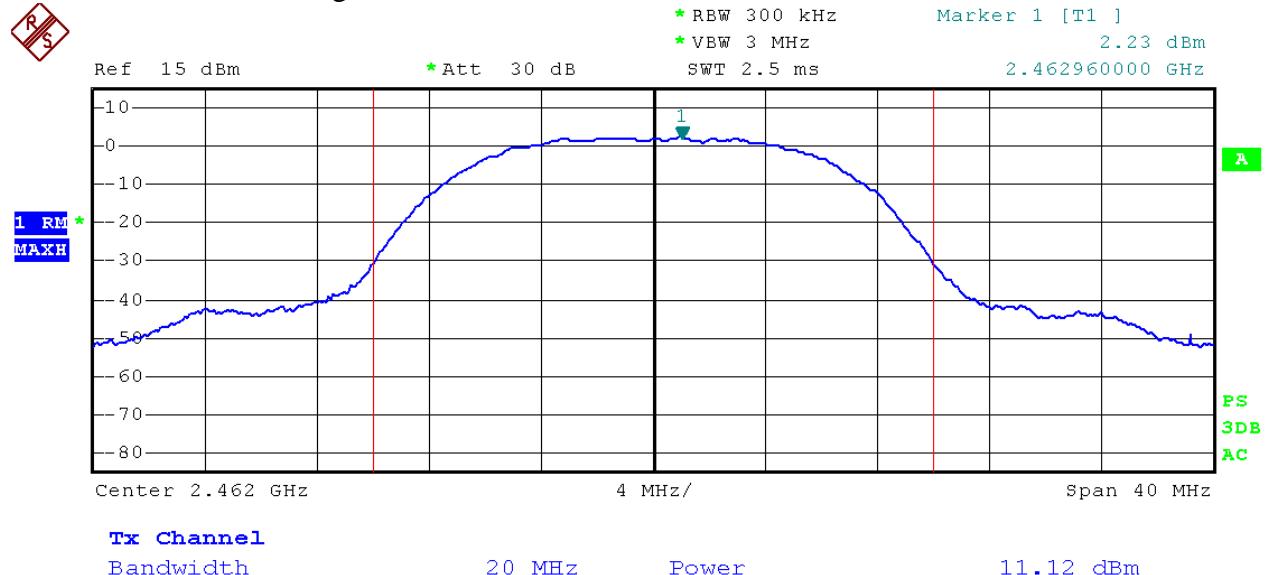
Test Mode: 802.11b--Low



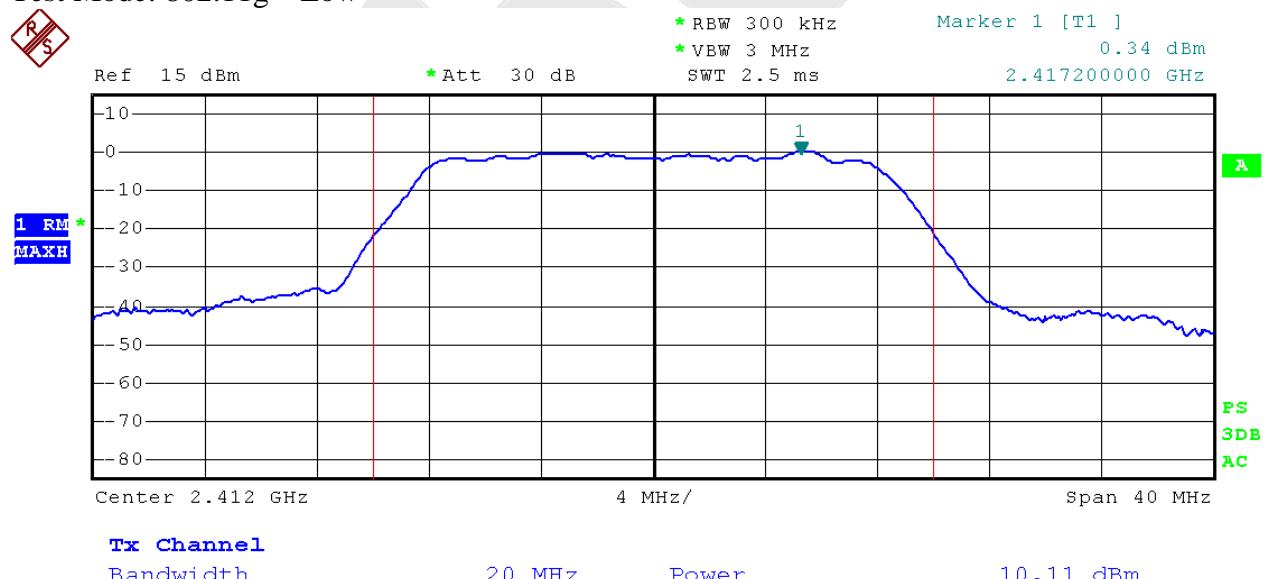
Test Mode: 802.11b--Mid



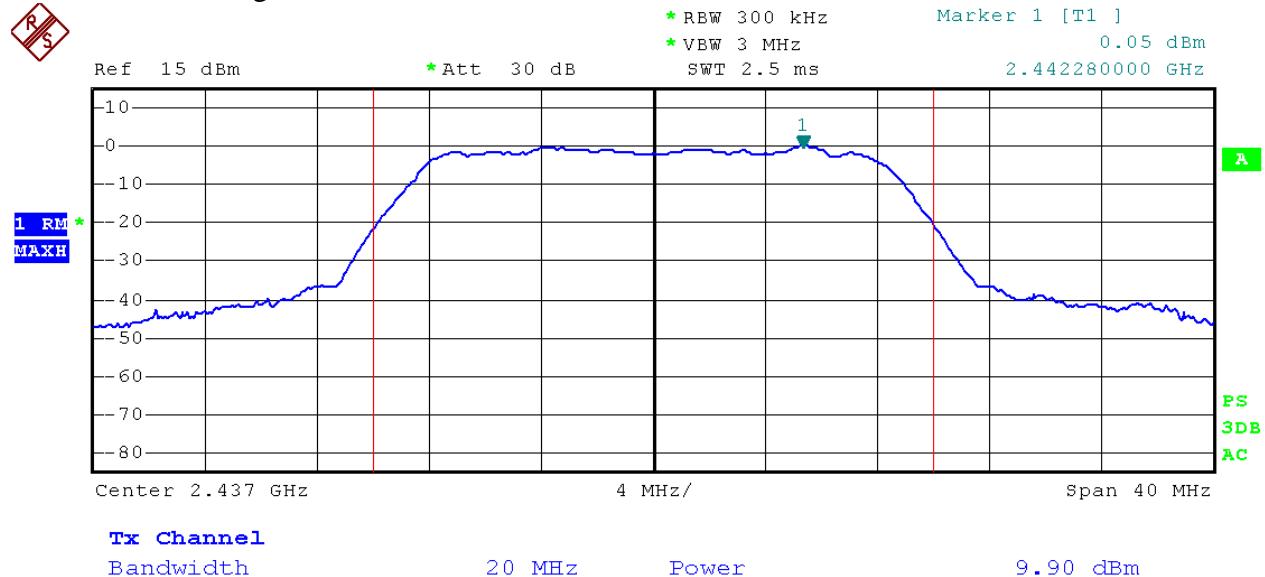
Test Mode: 802.11b---High



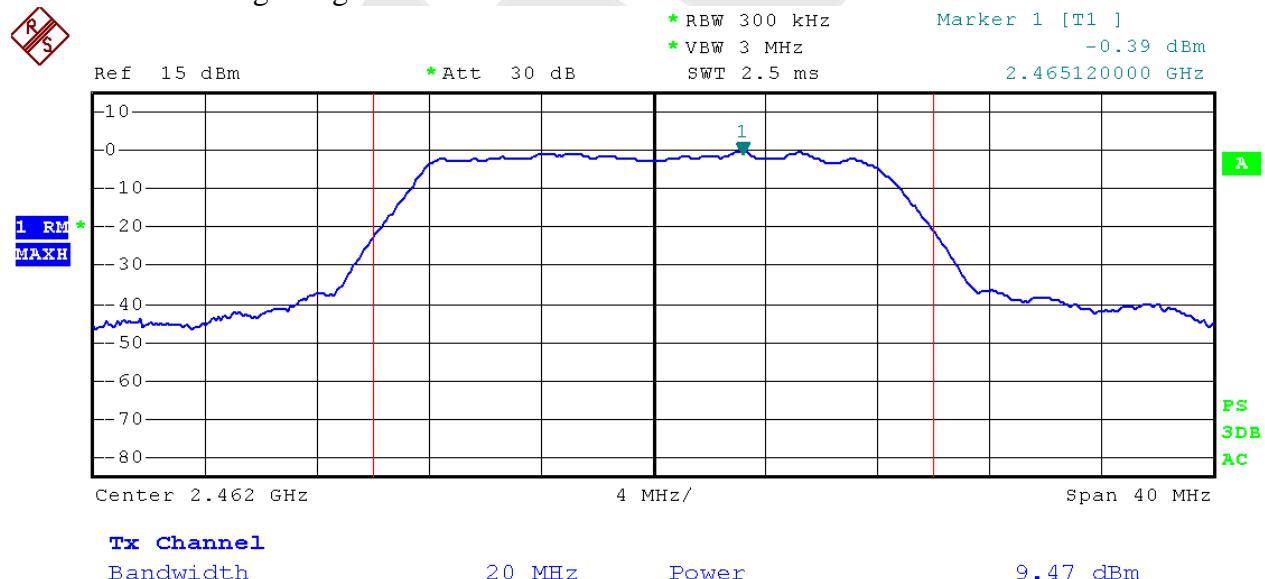
Test Mode: 802.11g---Low



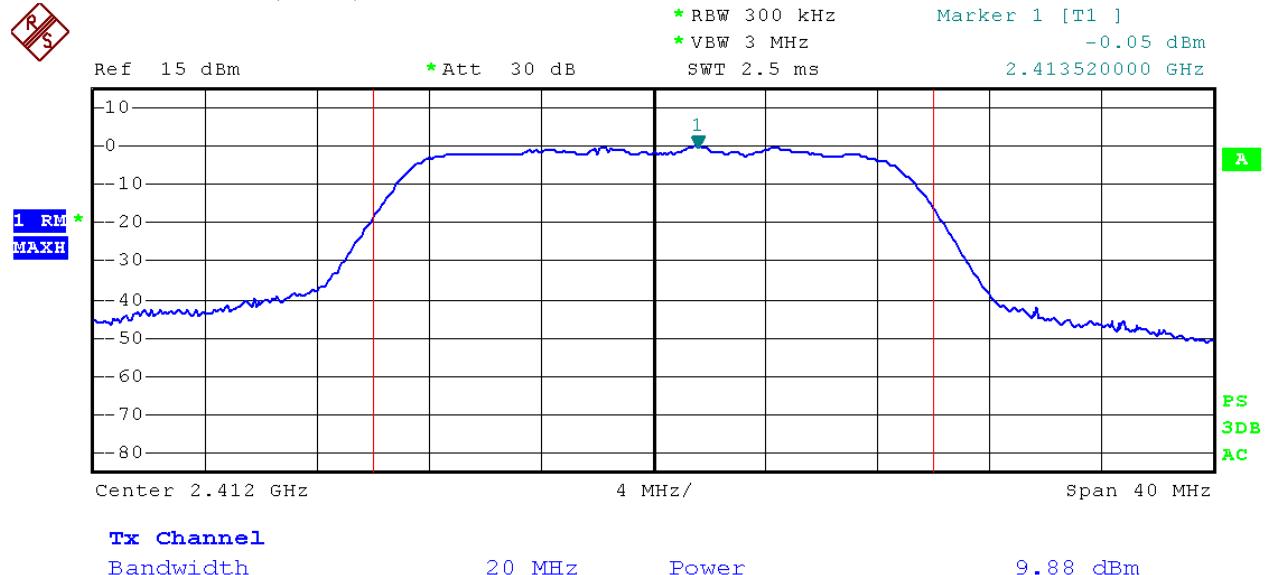
Test Mode: 802.11g---Mid



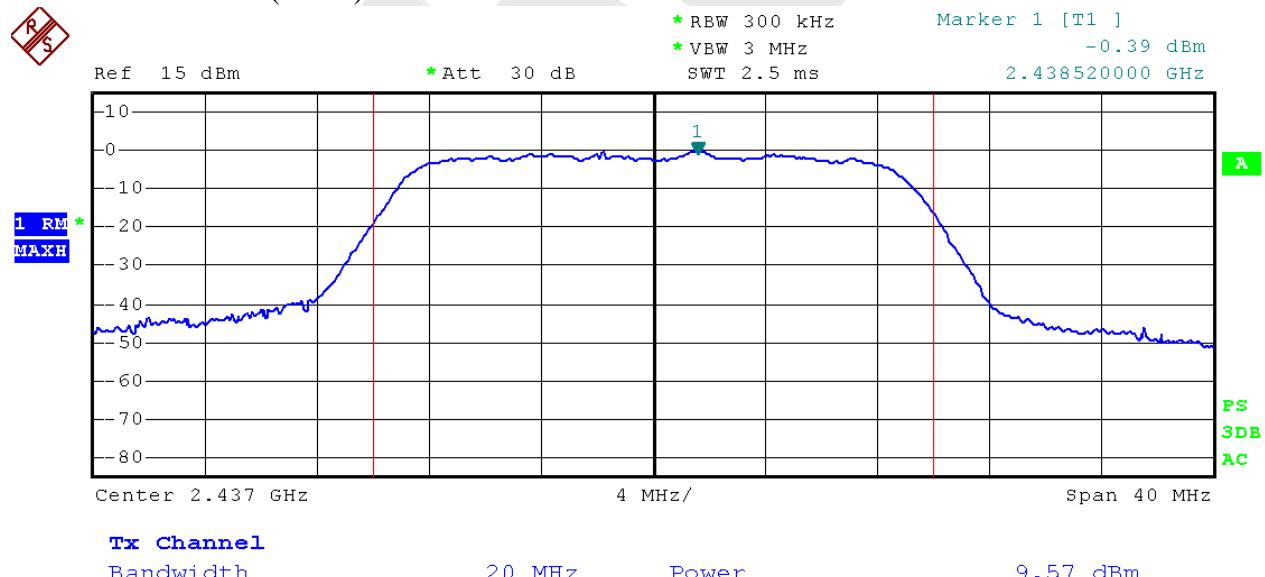
Test Mode: 802.11g---High



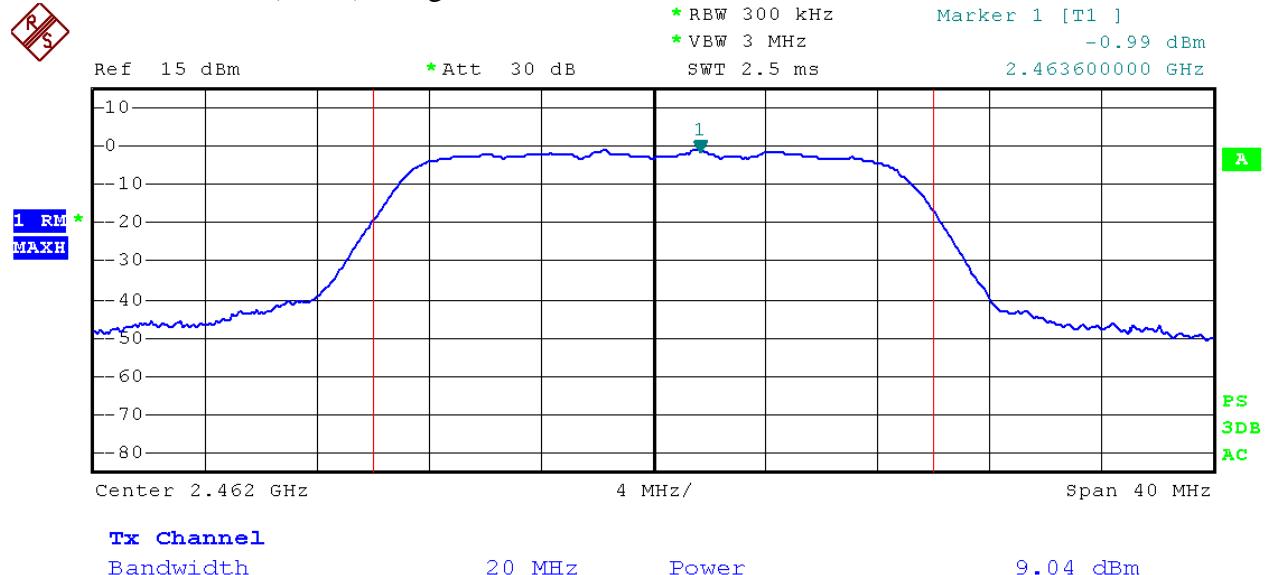
Test Mode: 802.11n(HT20)---Low



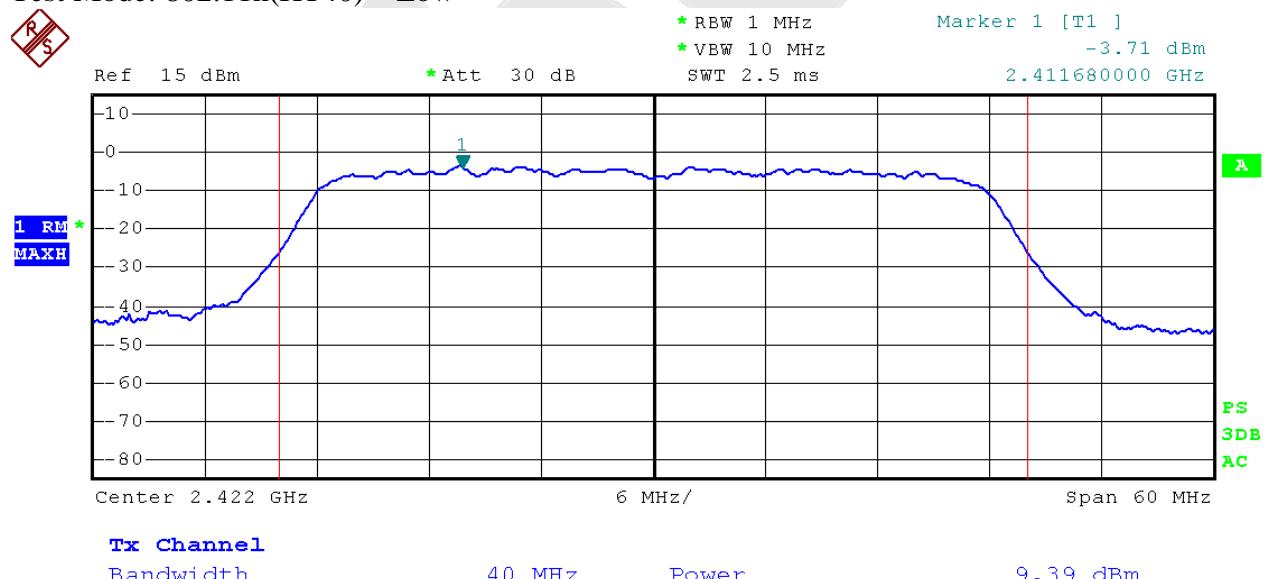
Test Mode: 802.11n(HT20)---Mid



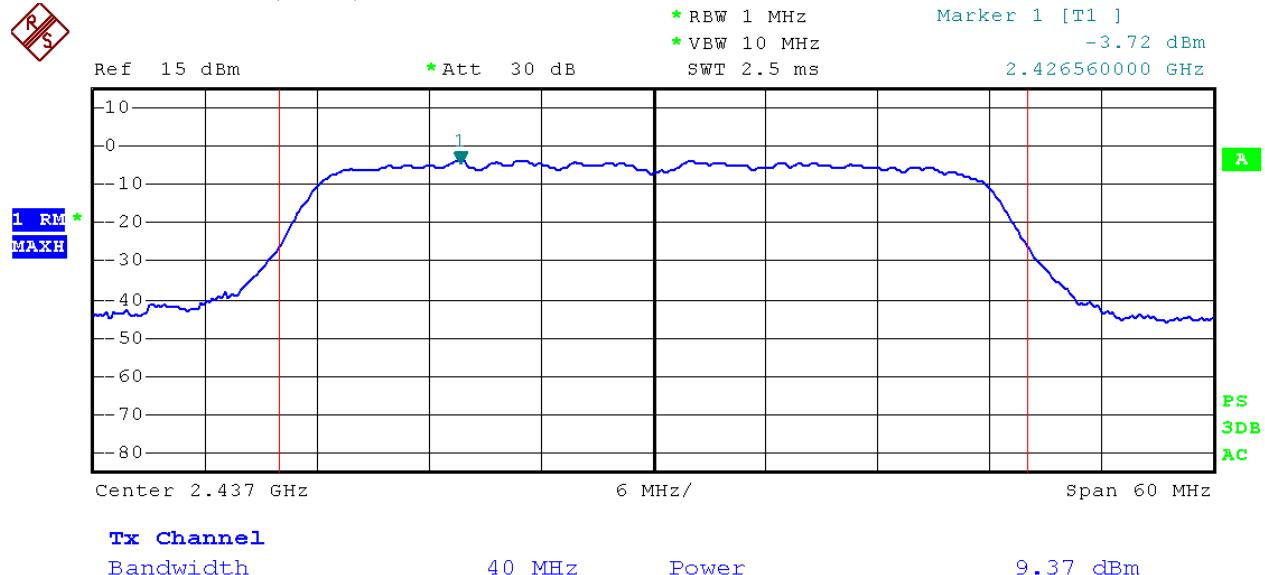
Test Mode: 802.11n(HT20)---High



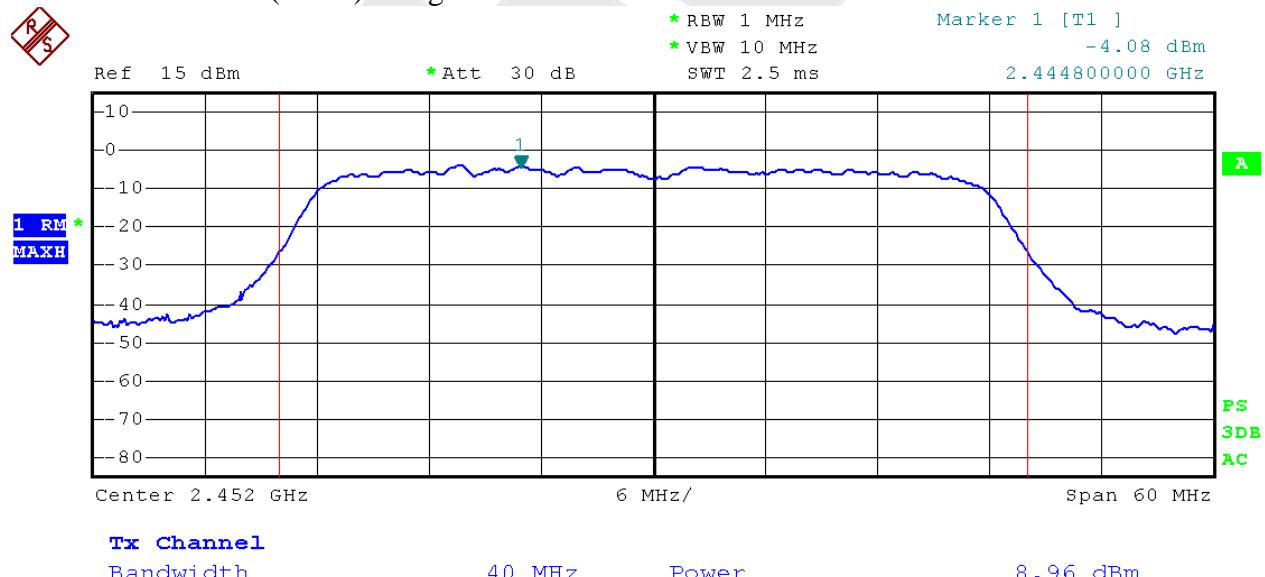
Test Mode: 802.11n(HT40)---Low



Test Mode: 802.11n(HT40)---Mid



Test Mode: 802.11n(HT40)---High



#### 4.4. Band Edges Measurement

##### a. Limit

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

##### b. Test Procedure

###### 1. Conducted Method:

- 1) Set RBW=100KHz, VBW=300KHz
- 2) Detector=peak
- 3) Sweep time= auto
- 4) Trace mode=max hold.

###### 2. Radiated Method:

1) For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane. The EUT is tested in 9\*6\*6 Chamber.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane. The EUT is tested in 9\*6\*6 Chamber.

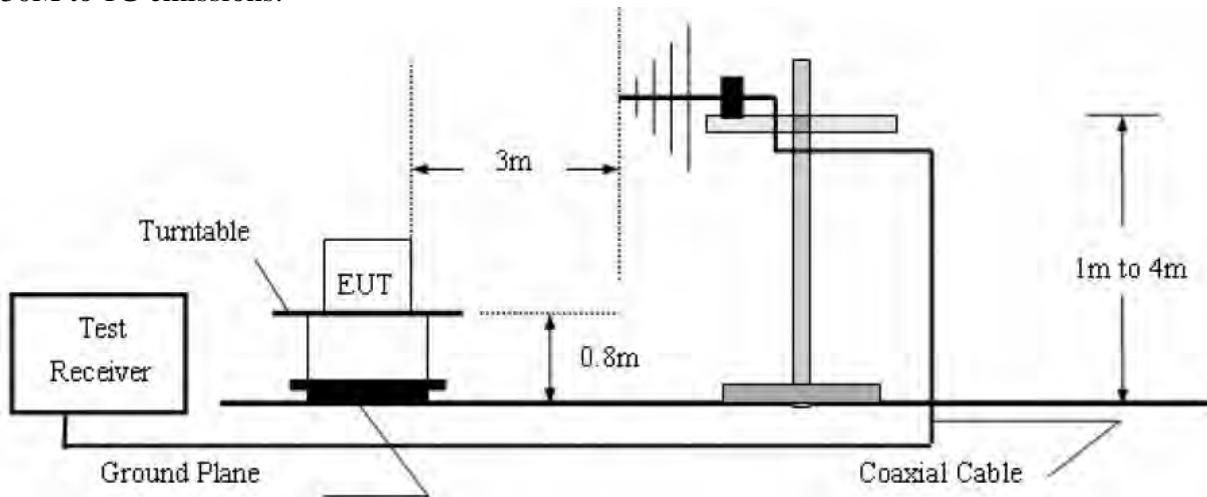
2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

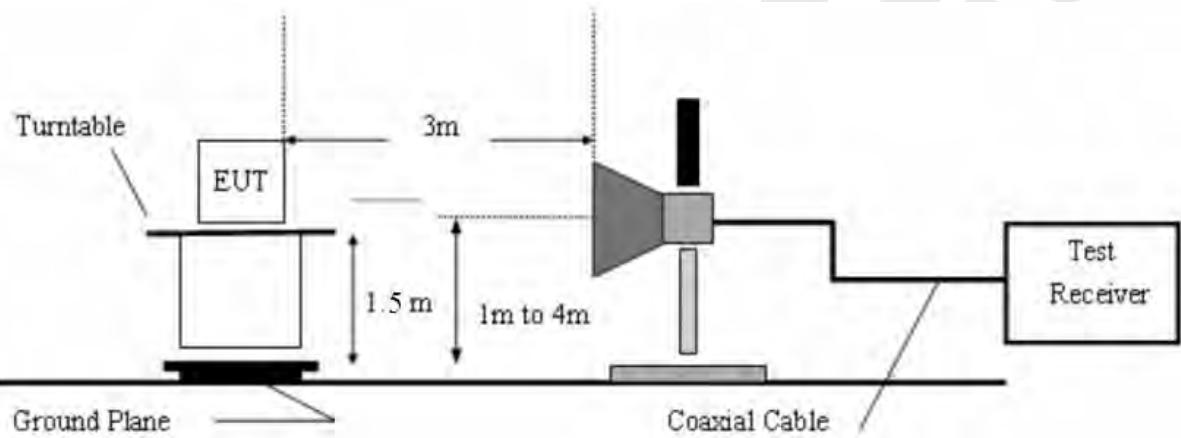
4) Peak detector: RBW=1MHz, VBW=3MHz, SWT=AUTO  
Average detector: RBW=1MHz, VBW=10Hz, SWT=AUTO  
The EUT is tested in 9\*6\*6 Chamber.

5) Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

30M to 1G emissions:



1G to 40G emissions:



**c. Test Equipment**

Same as the equipment listed in 4.2.

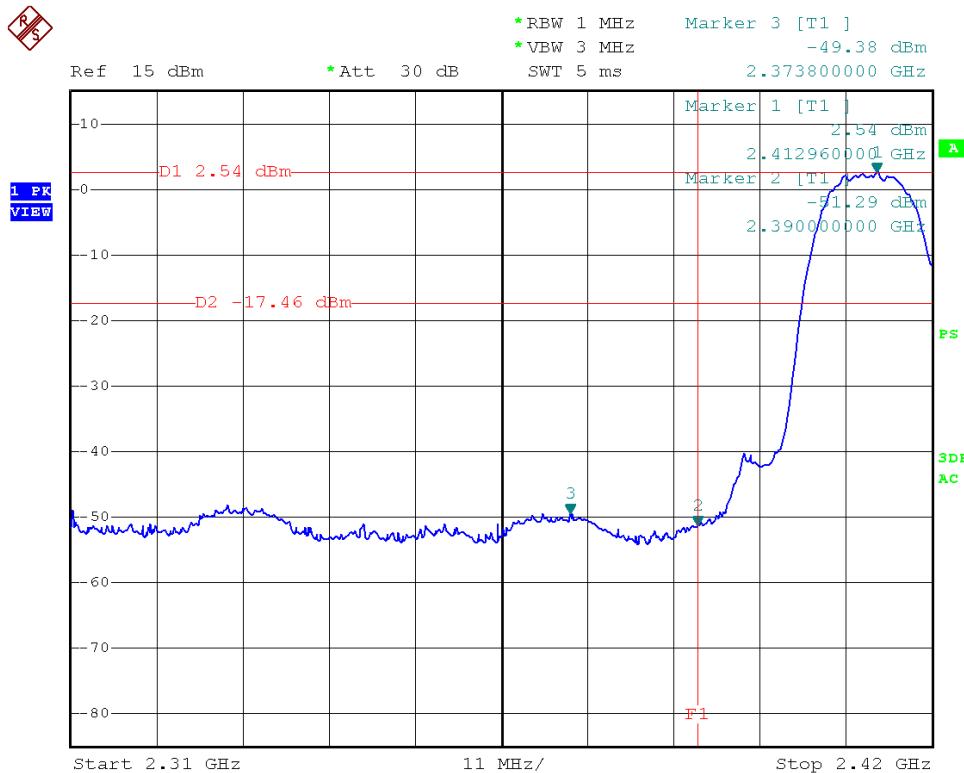
**d. Test Results**

Pass.

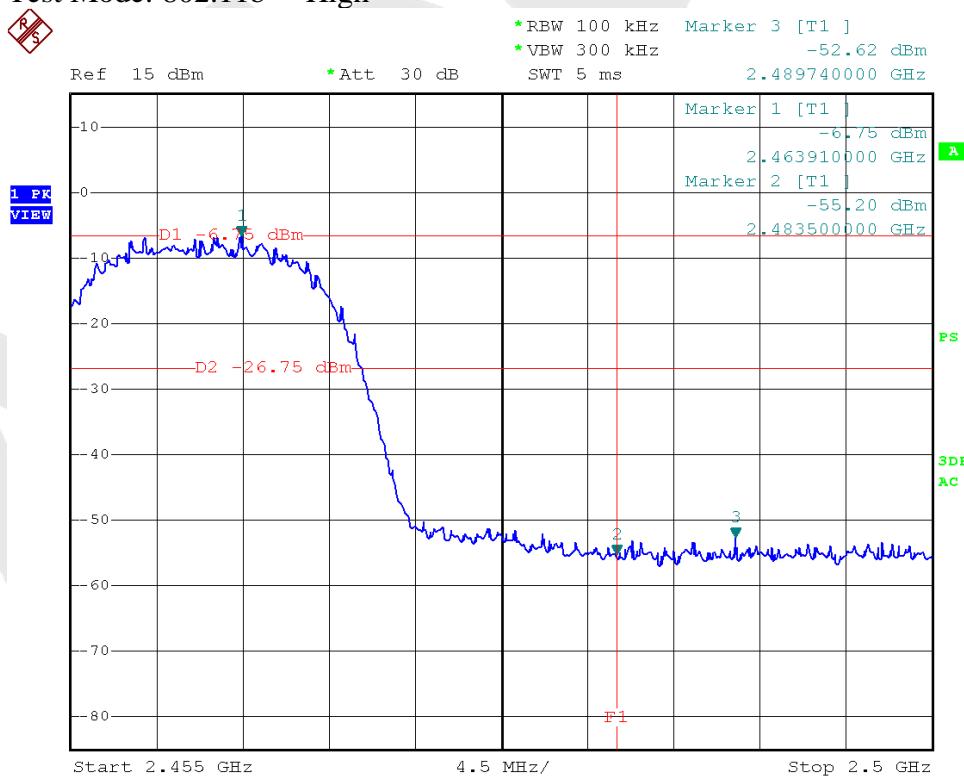
**e. Test Plots**

See the following page.

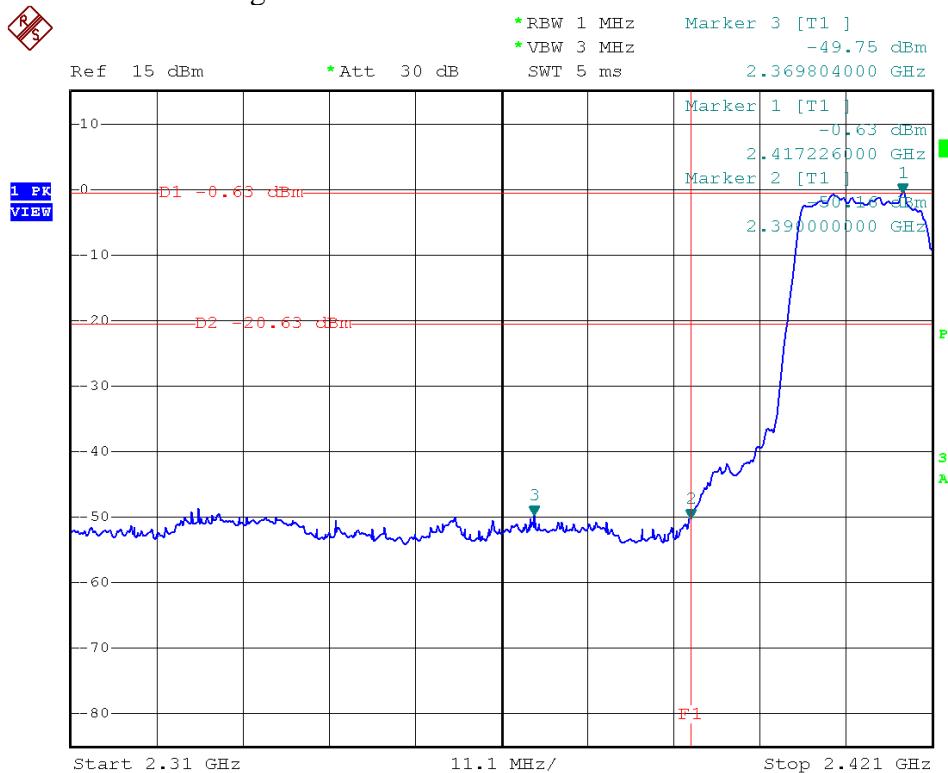
Test Mode: 802.11b ---Low



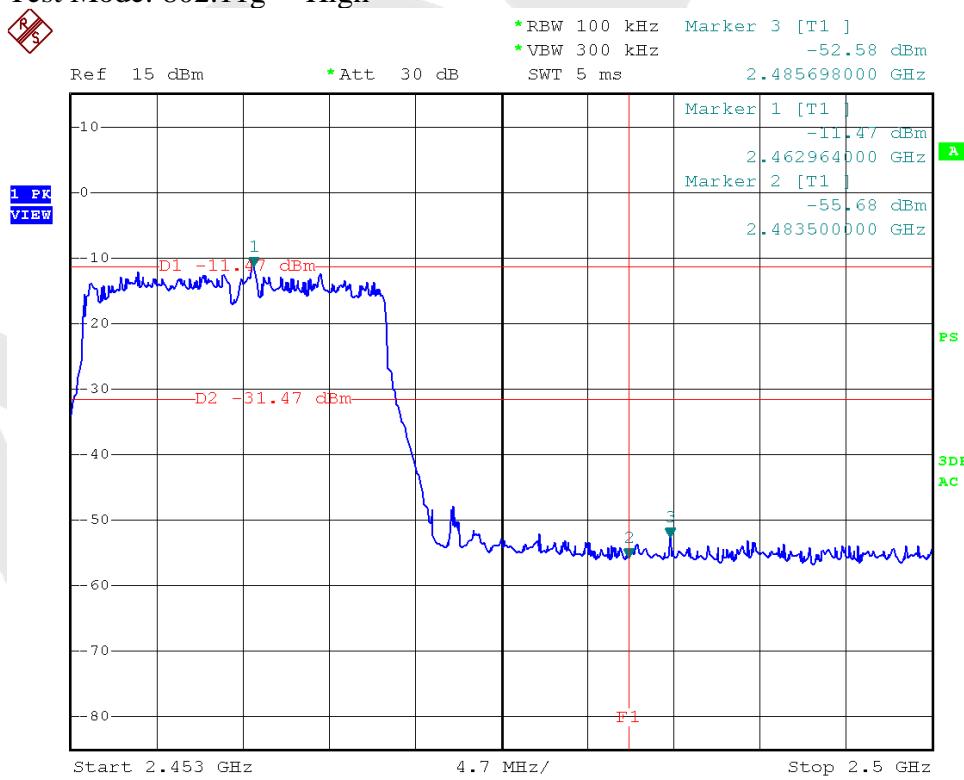
Test Mode: 802.11b ---High



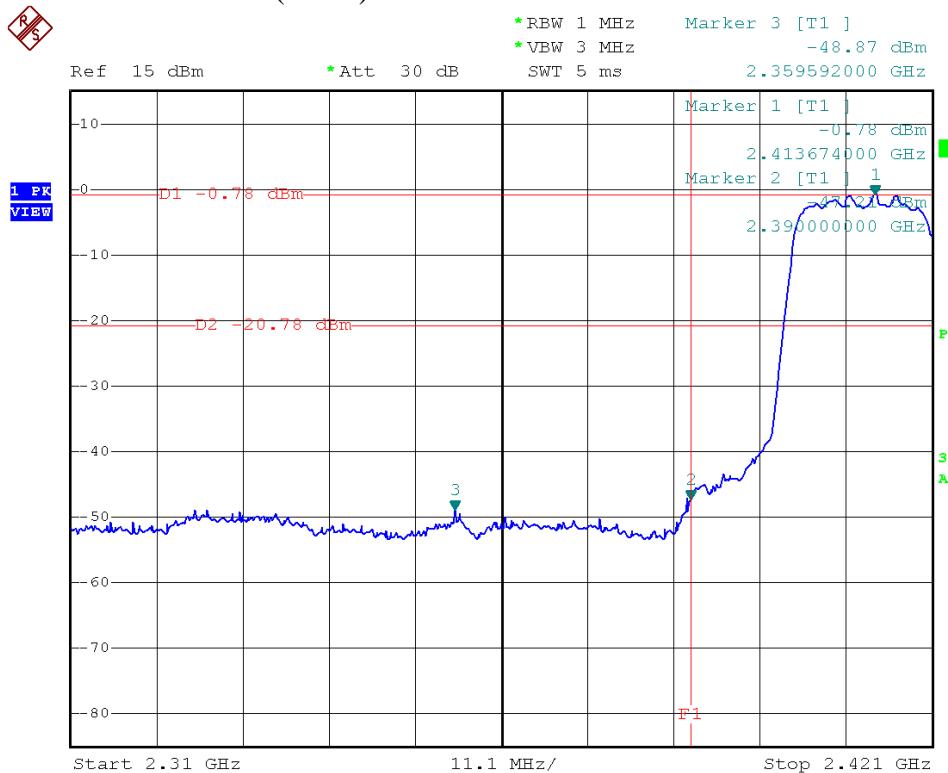
Test Mode: 802.11g ---Low



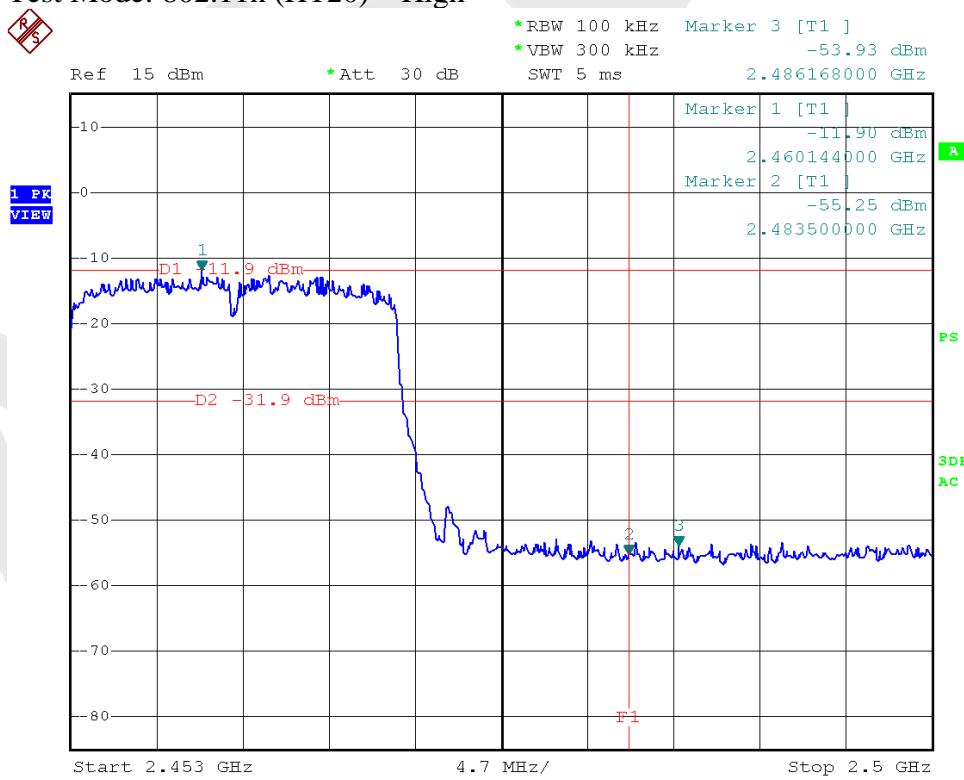
Test Mode: 802.11g ---High



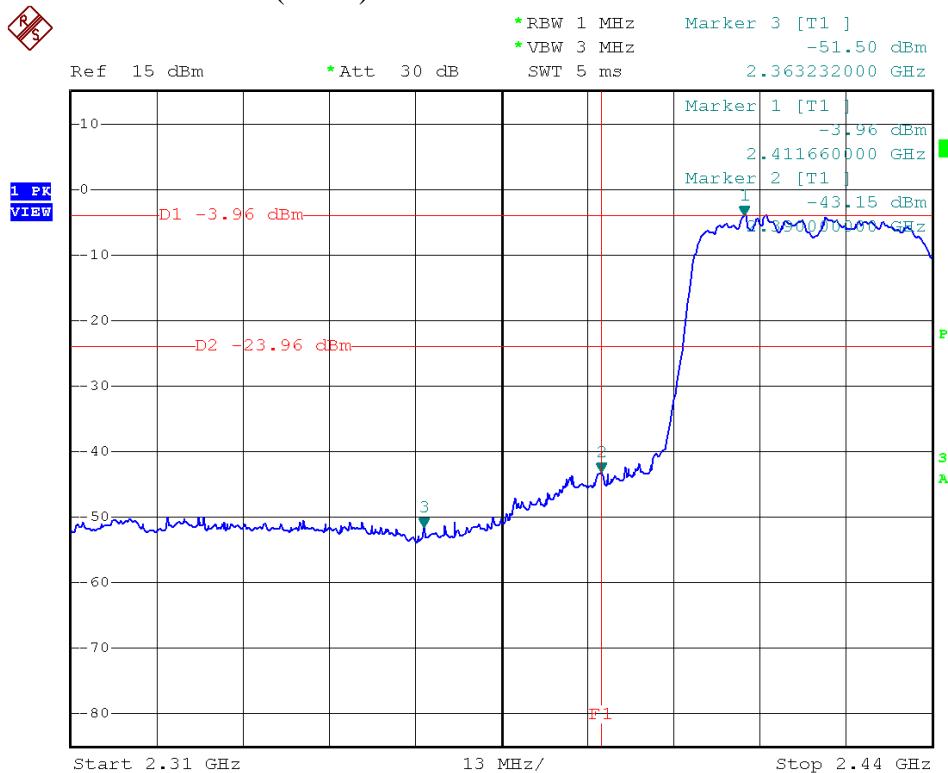
Test Mode: 802.11n (HT20) ---Low



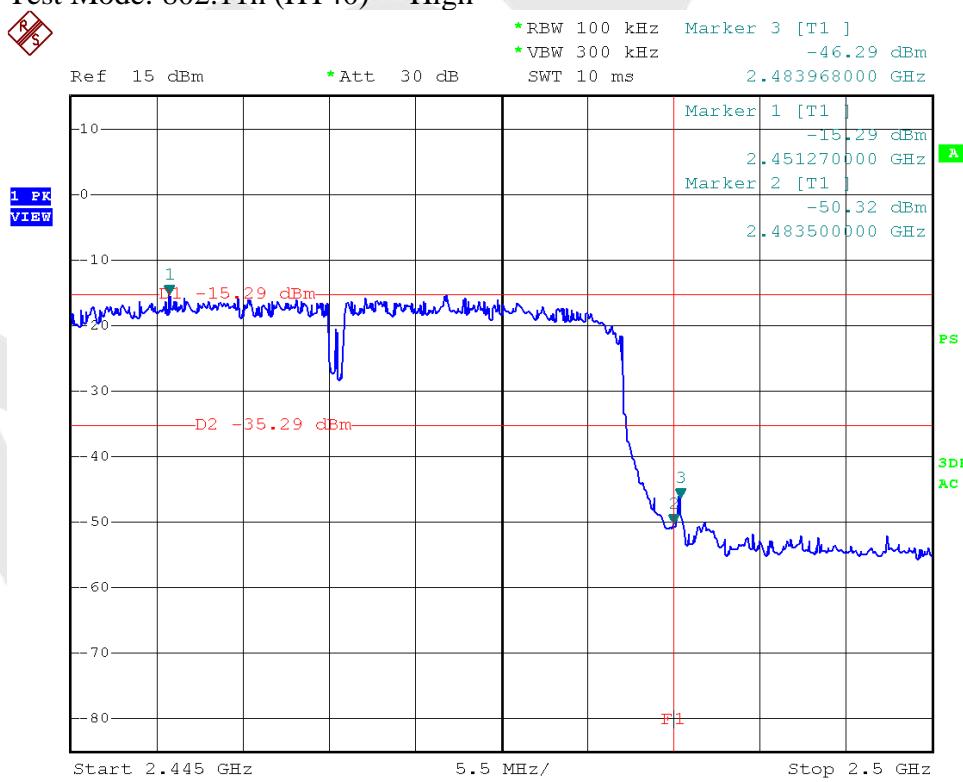
Test Mode: 802.11n (HT20)---High



Test Mode: 802.11n (HT40) ---Low



Test Mode: 802.11n (HT40) ---High



Test Mode: 802.11b

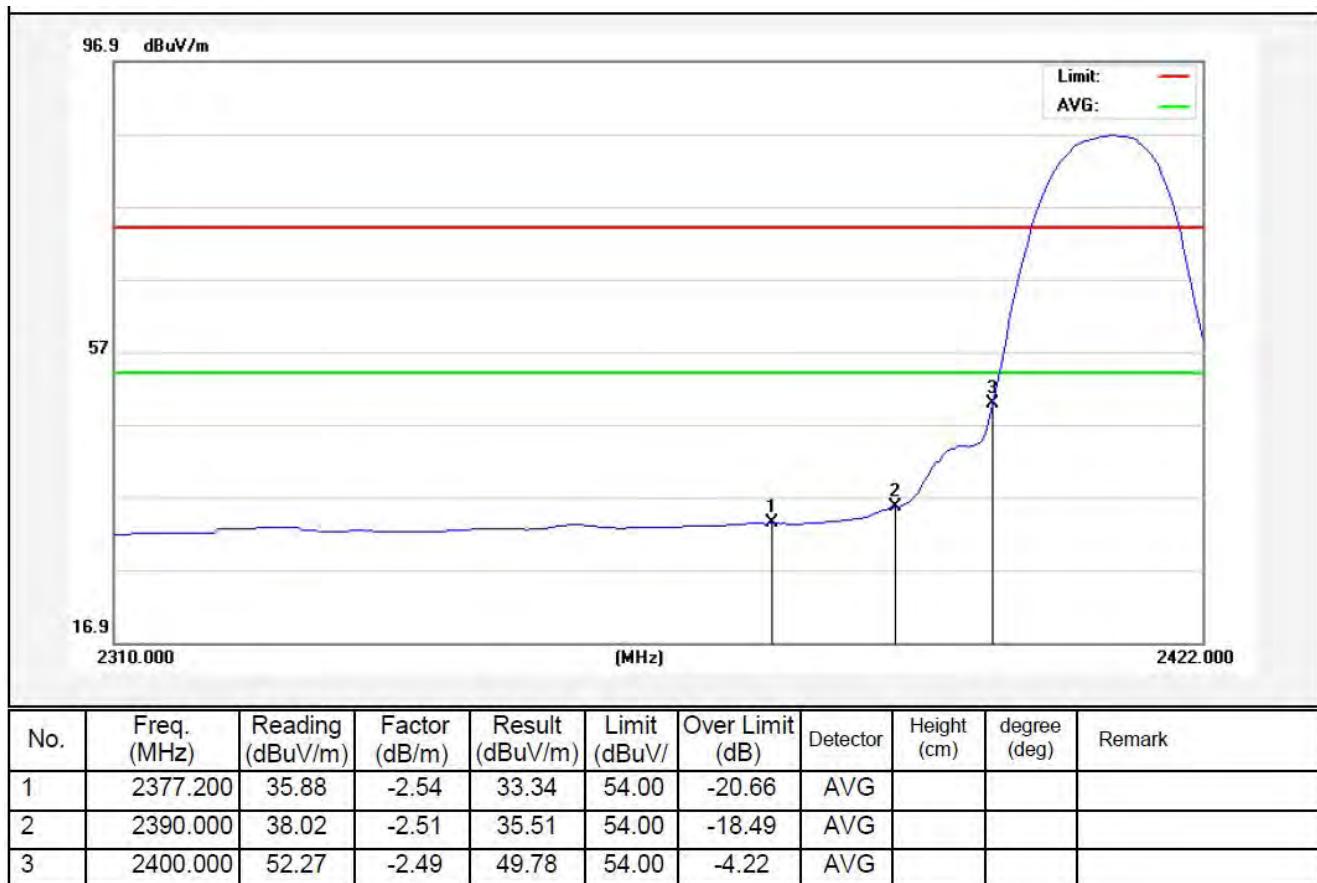
2412MHz

Horizontal-PEAK:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	2349.760	45.37	-2.60	42.77	74.00	-31.23	peak			
2	2390.000	46.82	-2.51	44.31	74.00	-29.69	peak			
3	2400.000	57.49	-2.49	55.00	74.00	-19.00	peak			

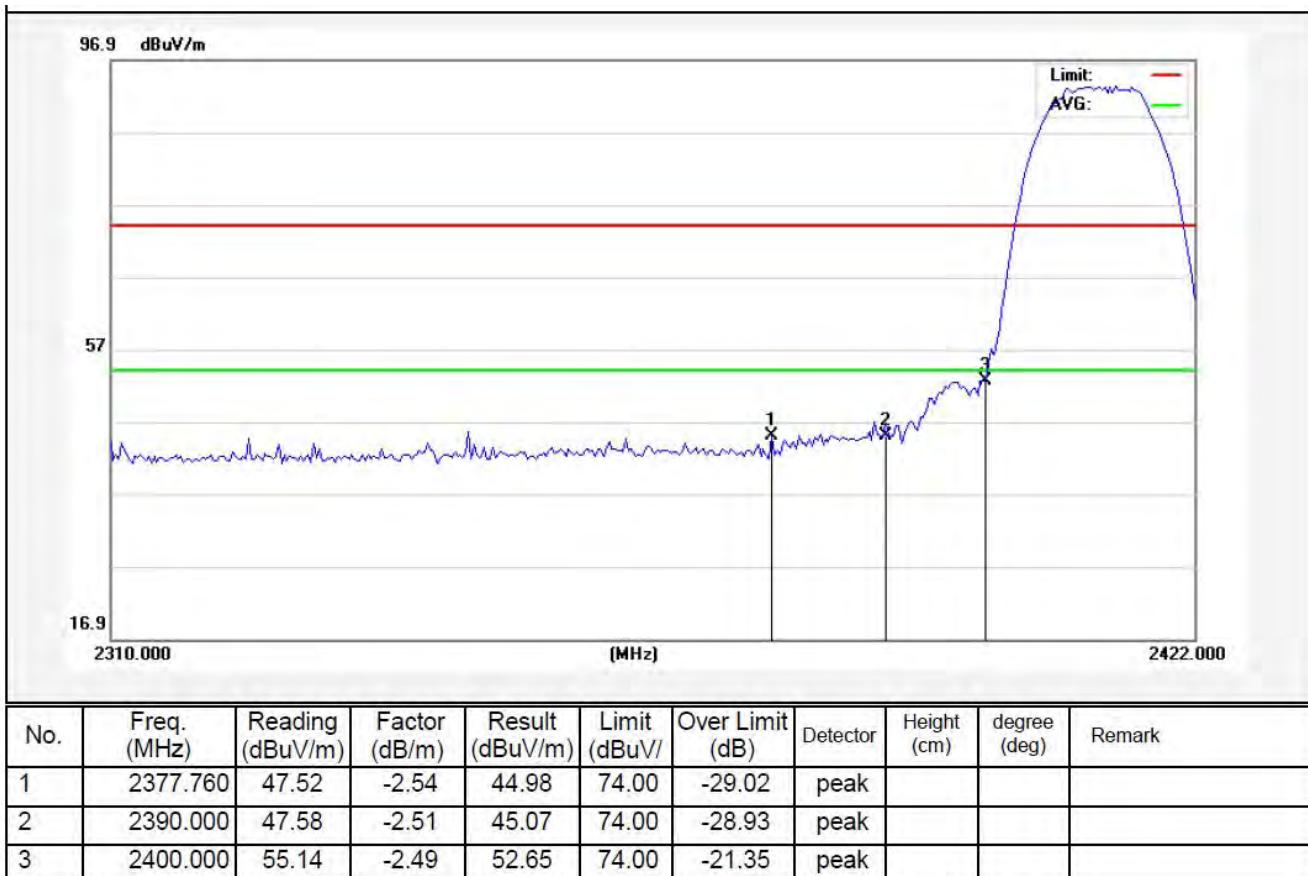
Horizontal-AV:



Test Mode: 802.11b

2412MHz

Vertical-PEAK:



Vertical-AV:

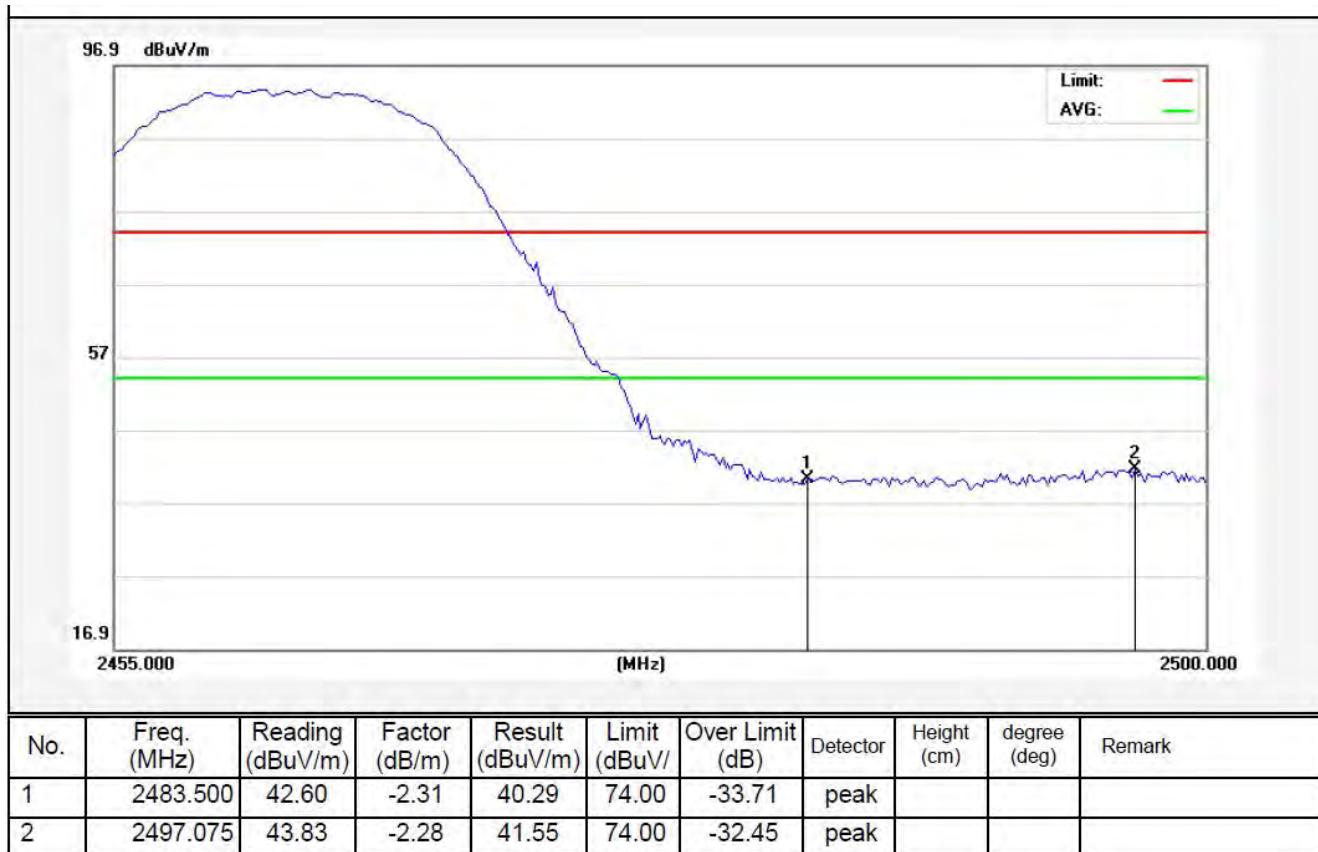


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	2373.000	36.42	-2.55	33.87	54.00	-20.13	AVG			
2	2390.000	38.67	-2.51	36.16	54.00	-17.84	AVG			
3	2400.000	53.11	-2.49	50.62	54.00	-3.38	AVG			

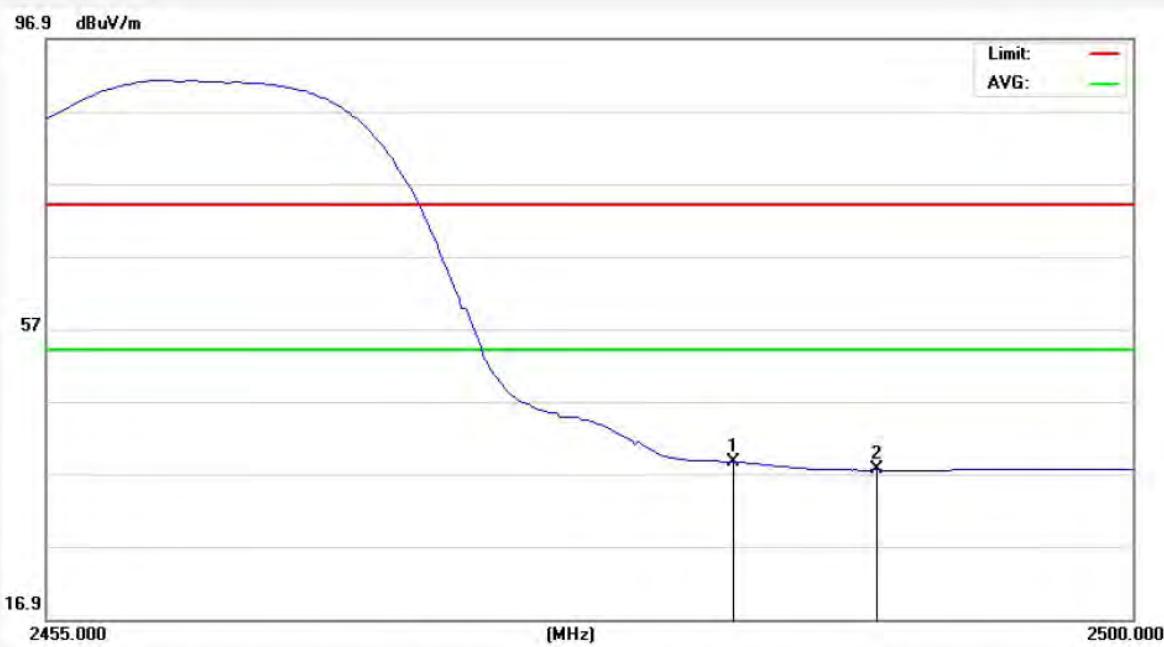
Test Mode: 802.11b

2462MHz

Horizontal-PEAK:



Horizontal-AV:

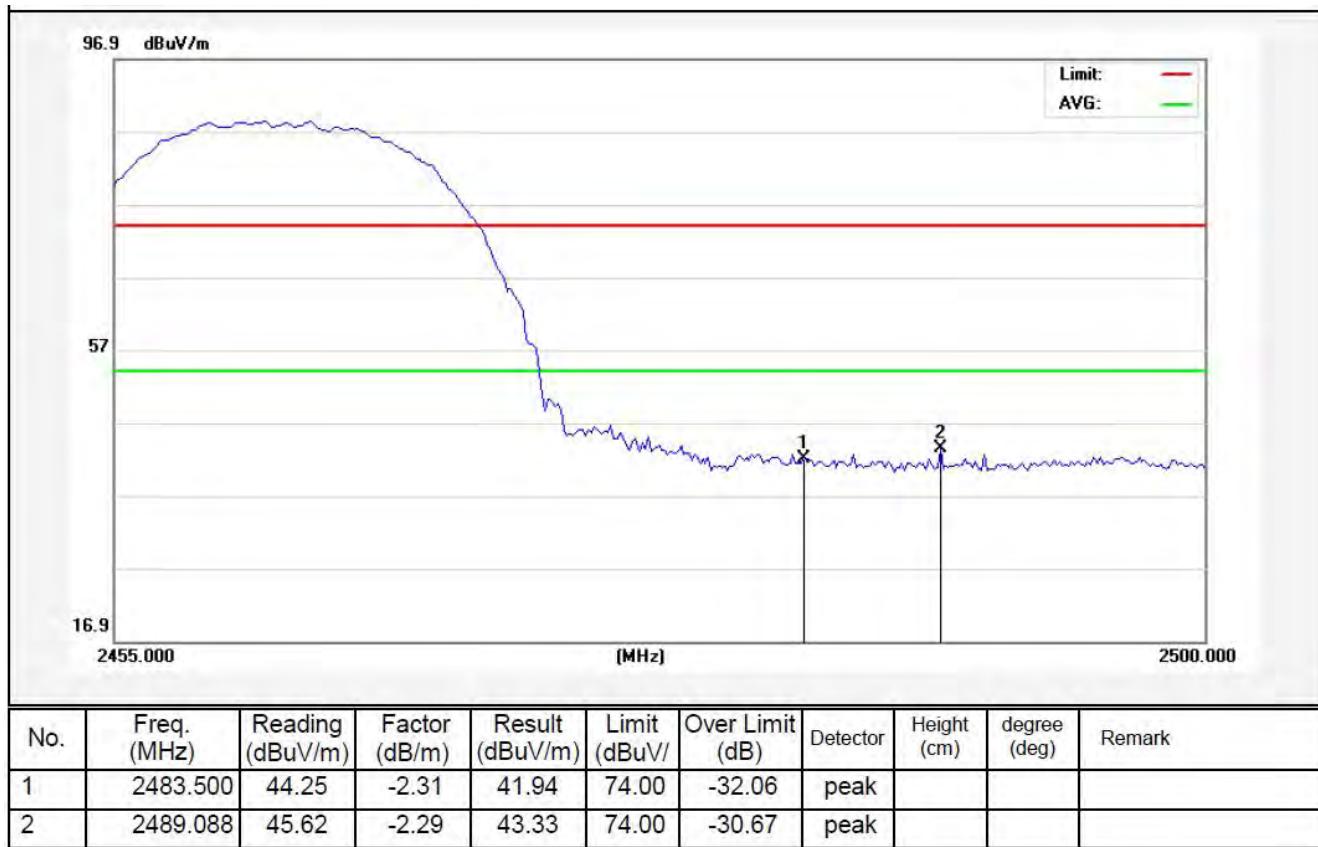


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	2483.500	40.89	-2.31	38.58	54.00	-15.42	AVG			
2	2489.425	39.80	-2.29	37.51	54.00	-16.49	AVG			

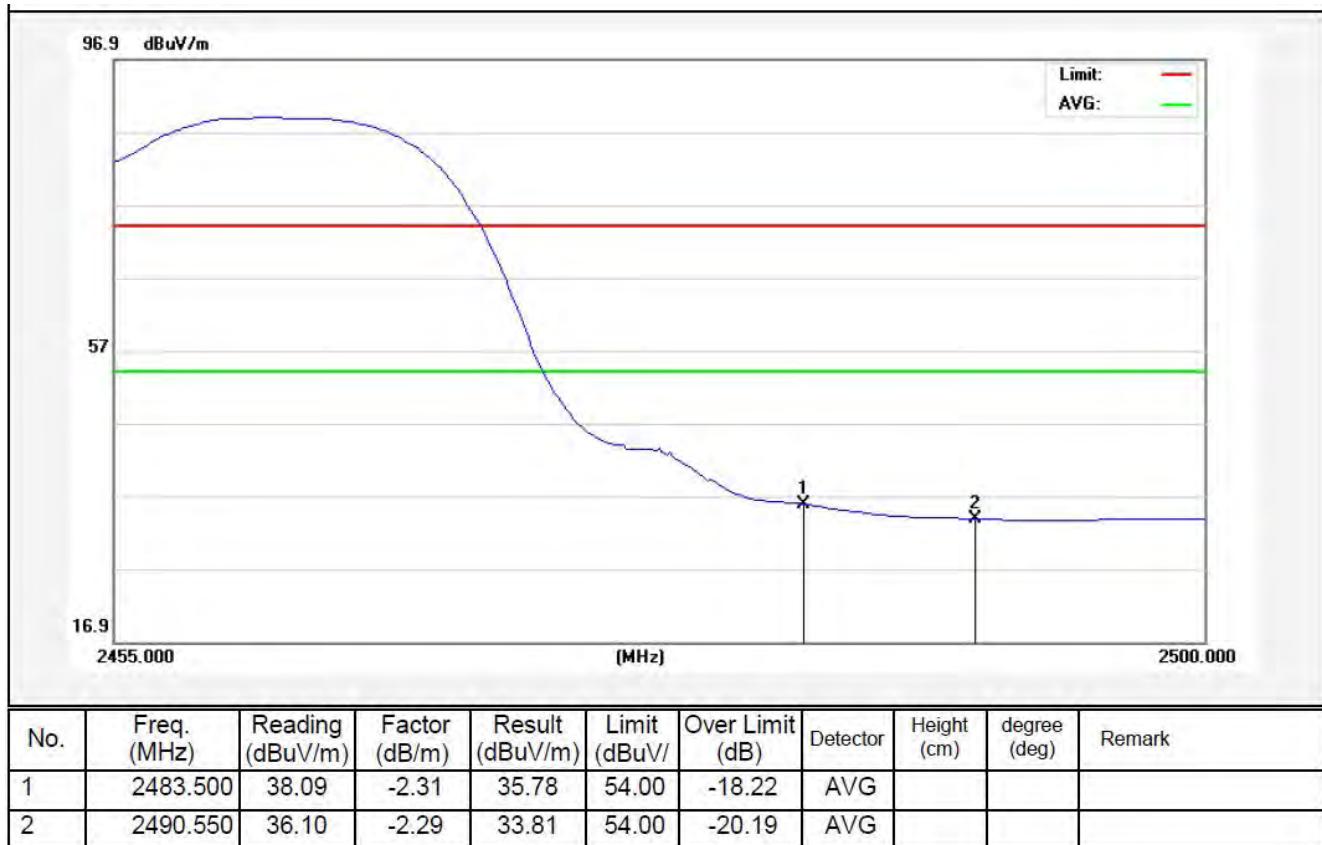
Test Mode: 802.11b

2462MHz

Vertical-PEAK:



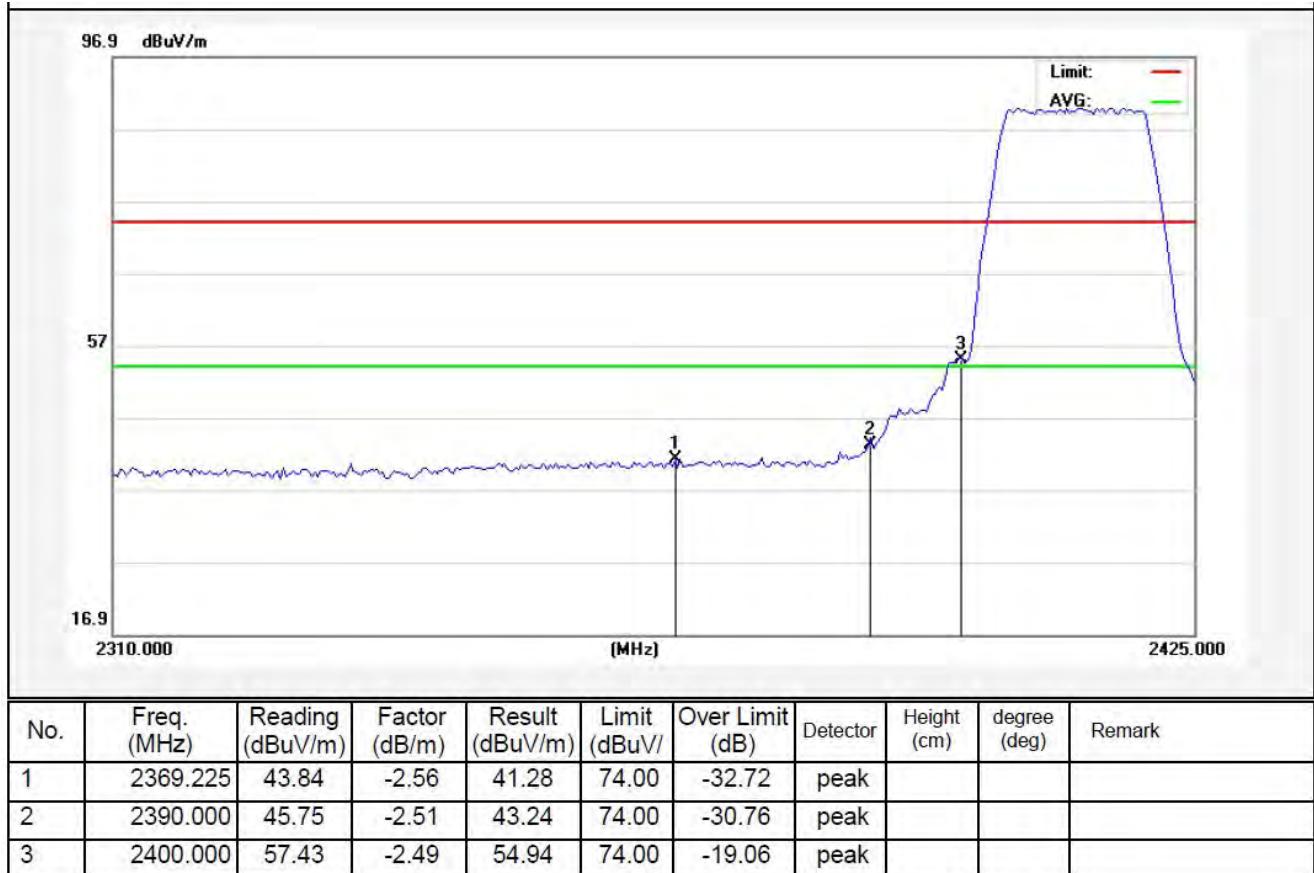
Vertical-AV:



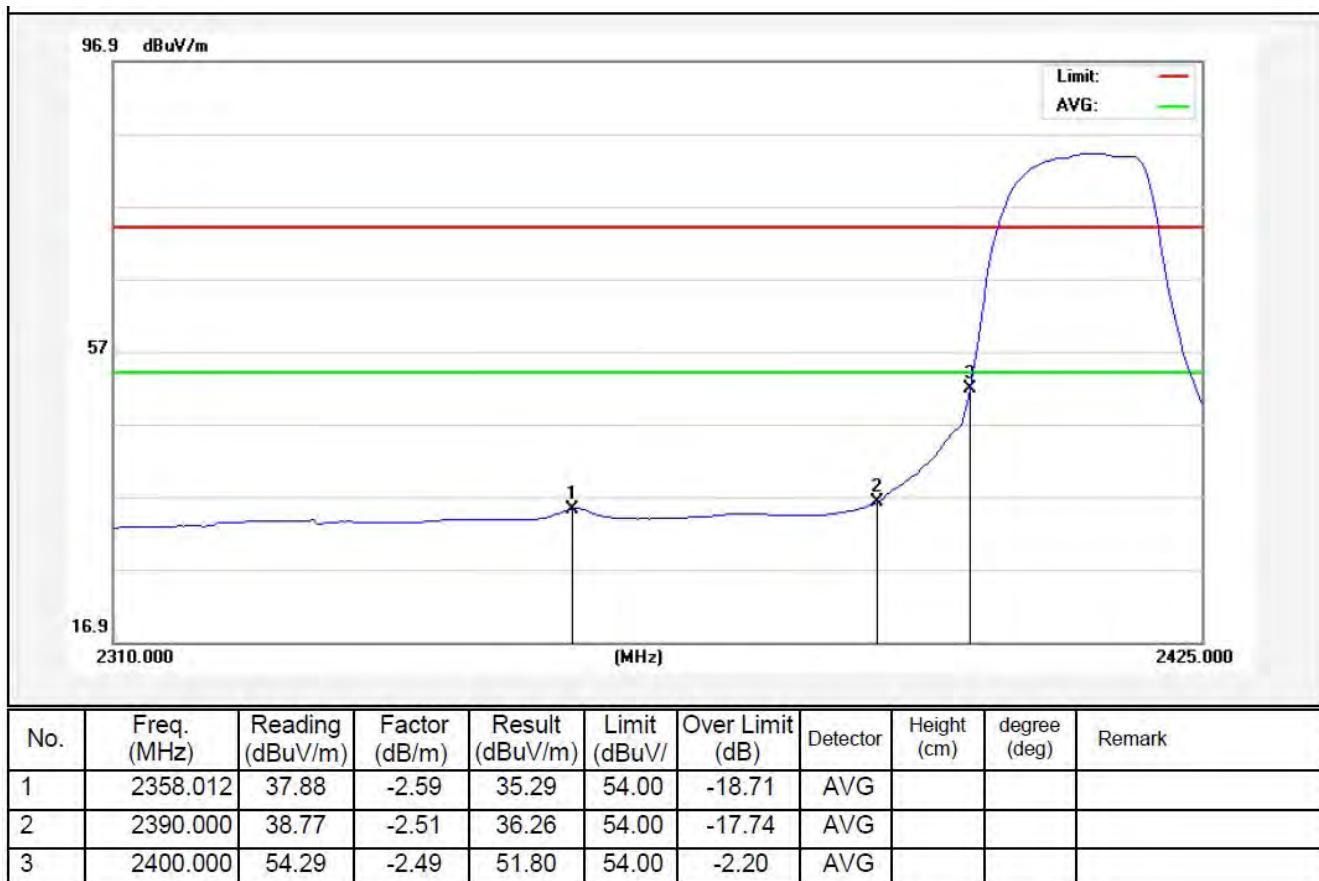
Test Mode: 802.11g

2412MHz

Horizontal-PEAK:



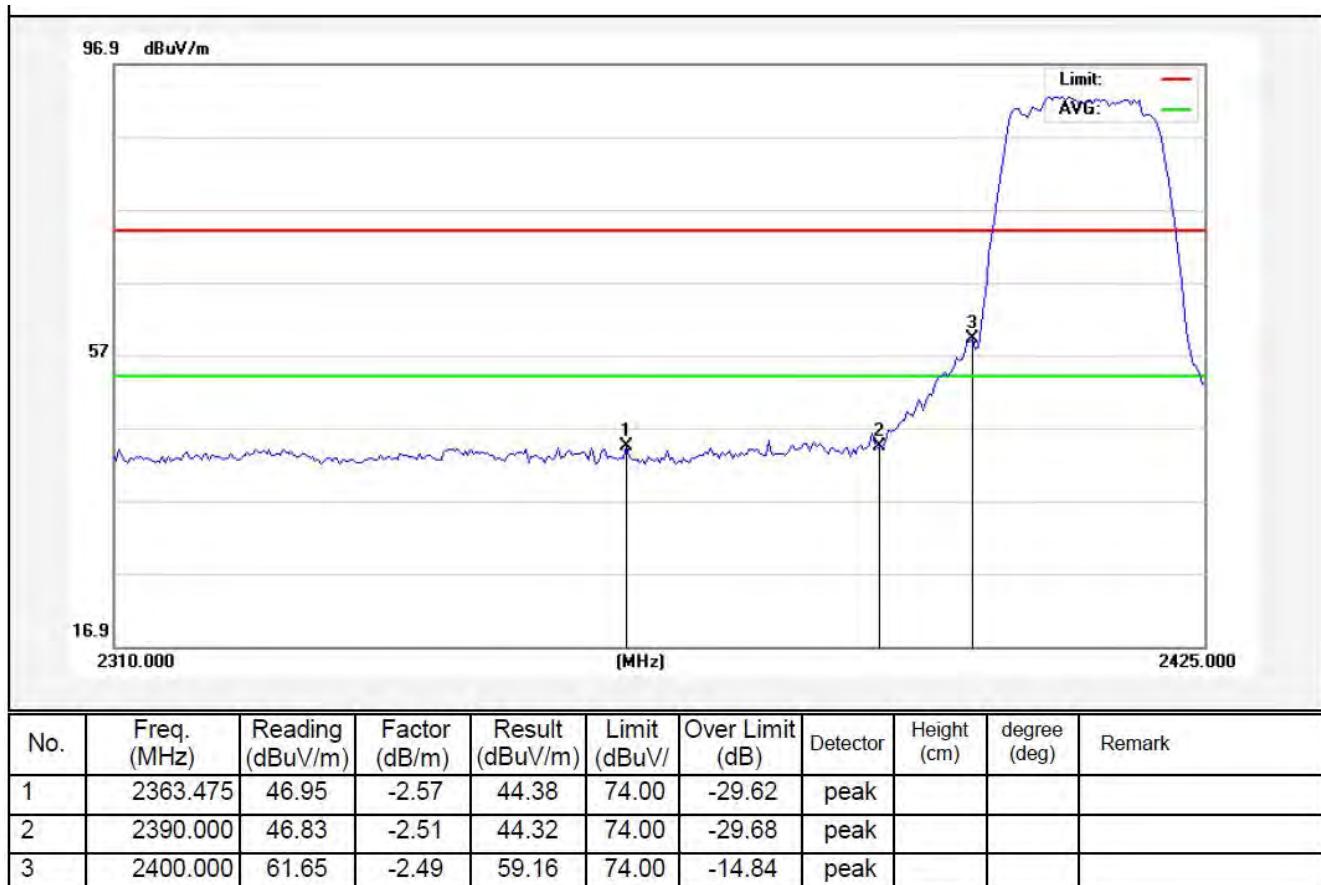
Horizontal-AV:



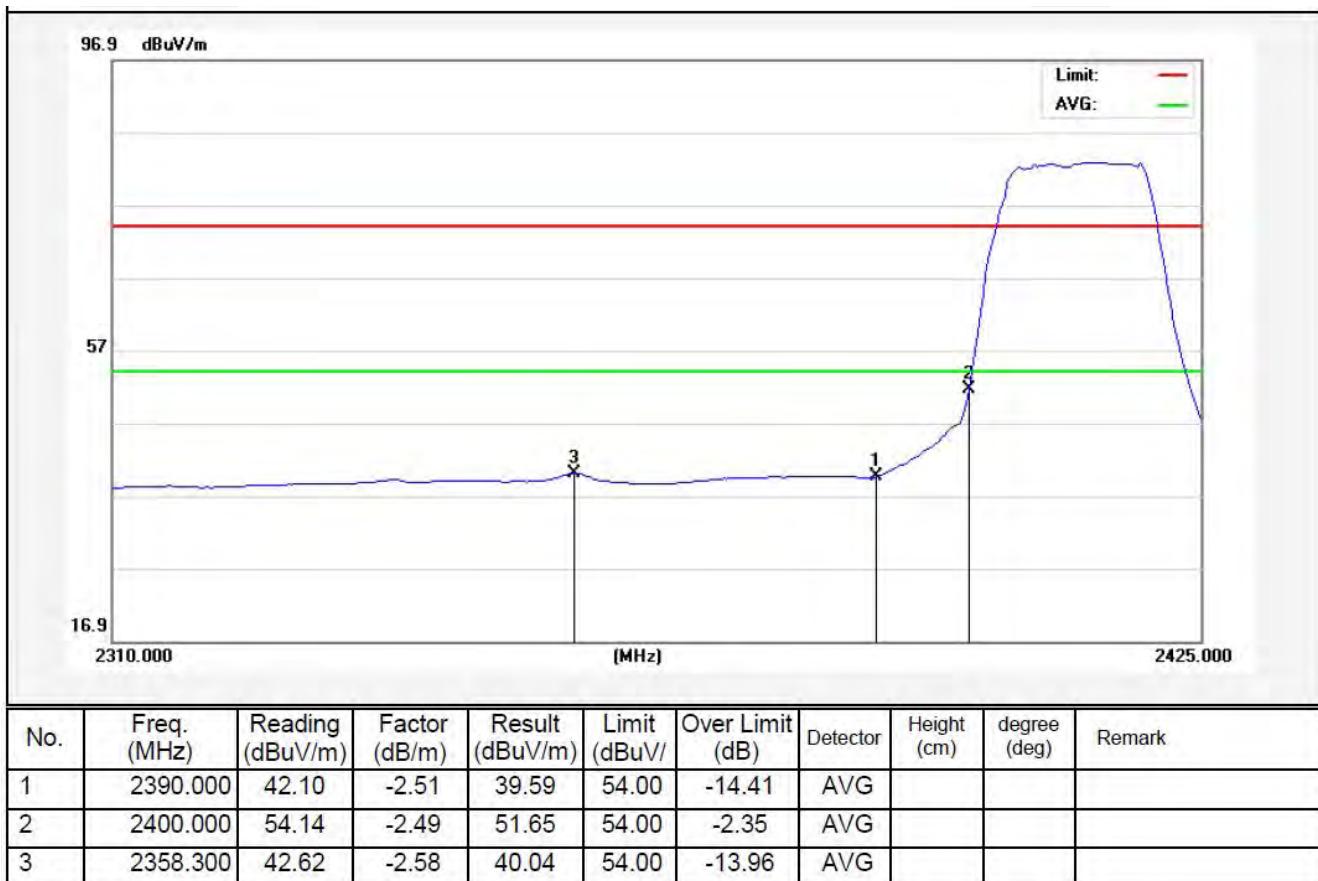
Test Mode: 802.11g

2412MHz

Vertical-PEAK:



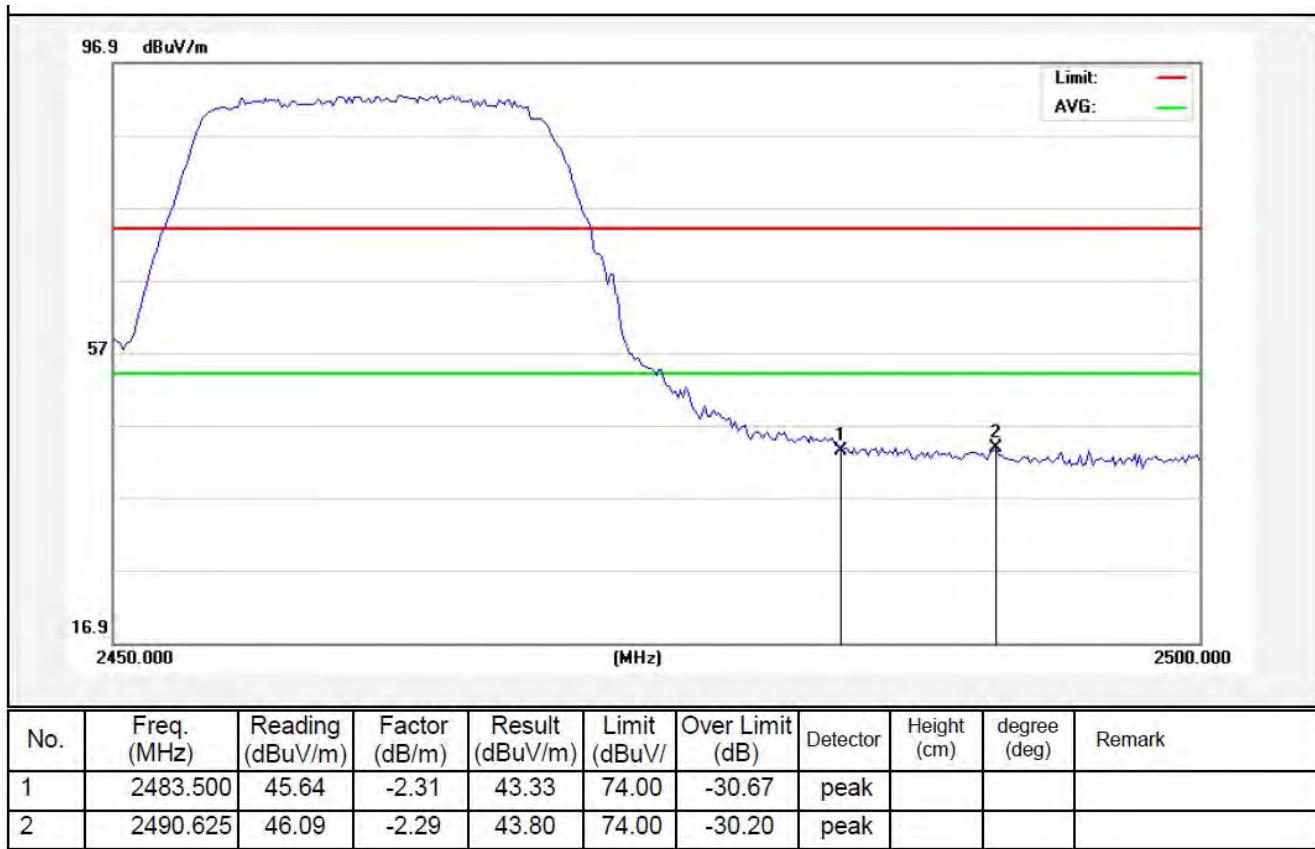
Vertical-AV:



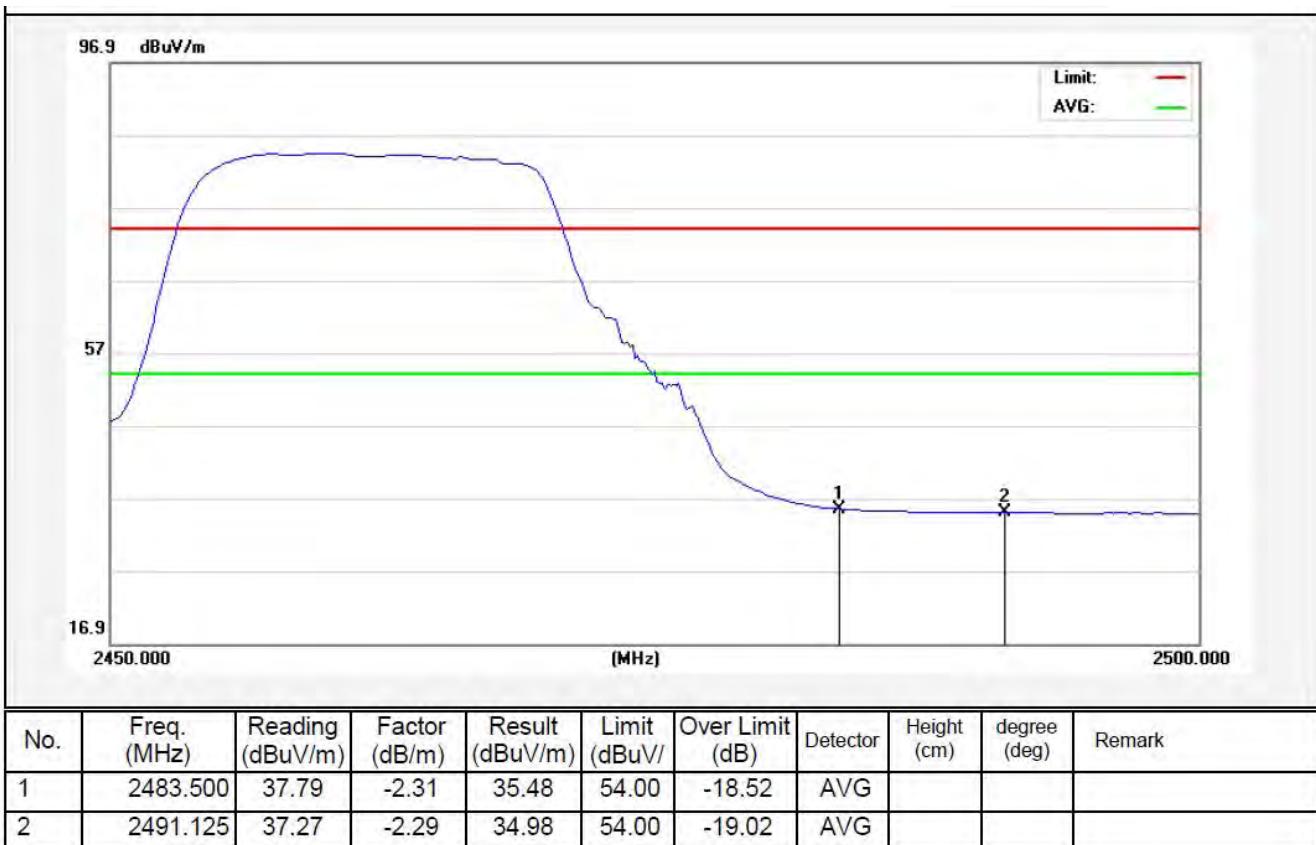
Test Mode: 802.11g

2462MHz

Horizontal-PEAK:



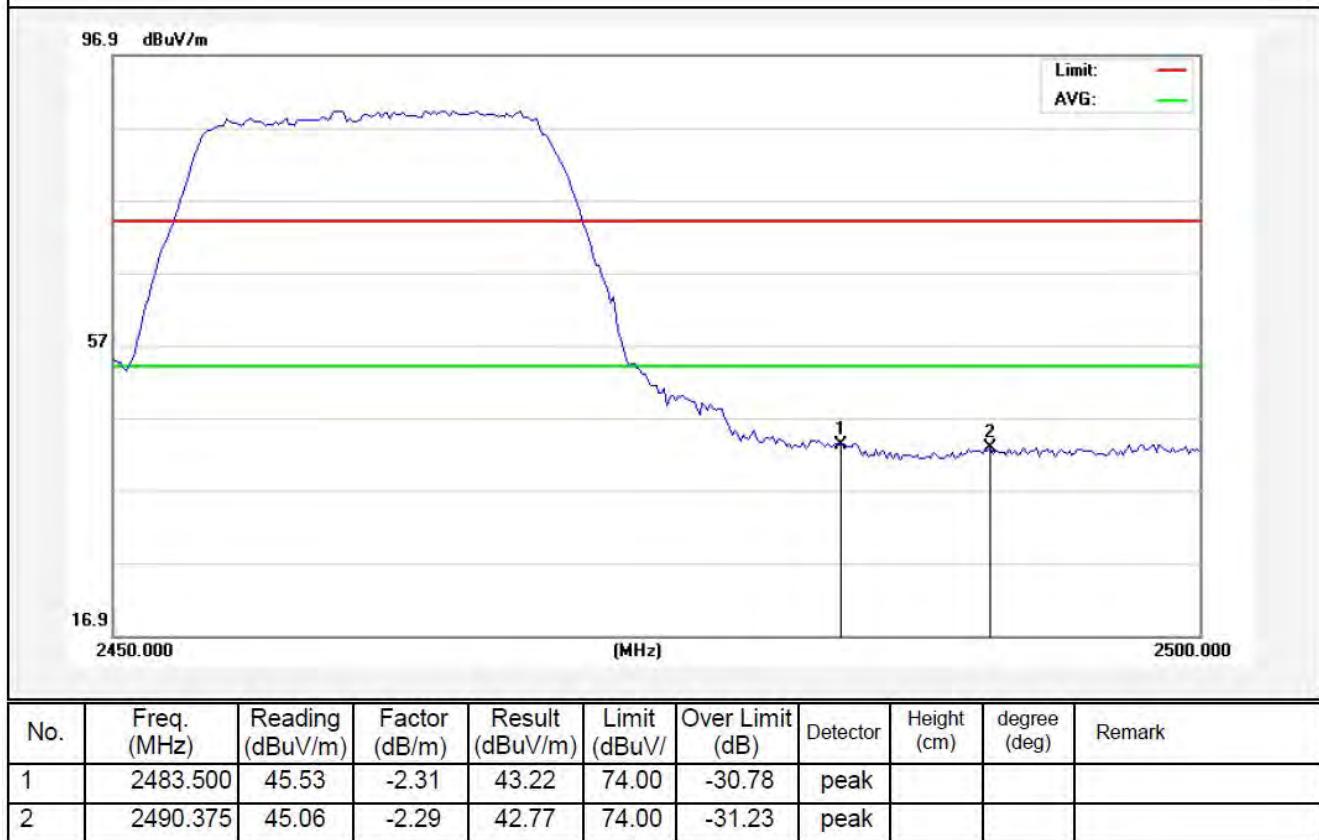
Horizontal-AV:



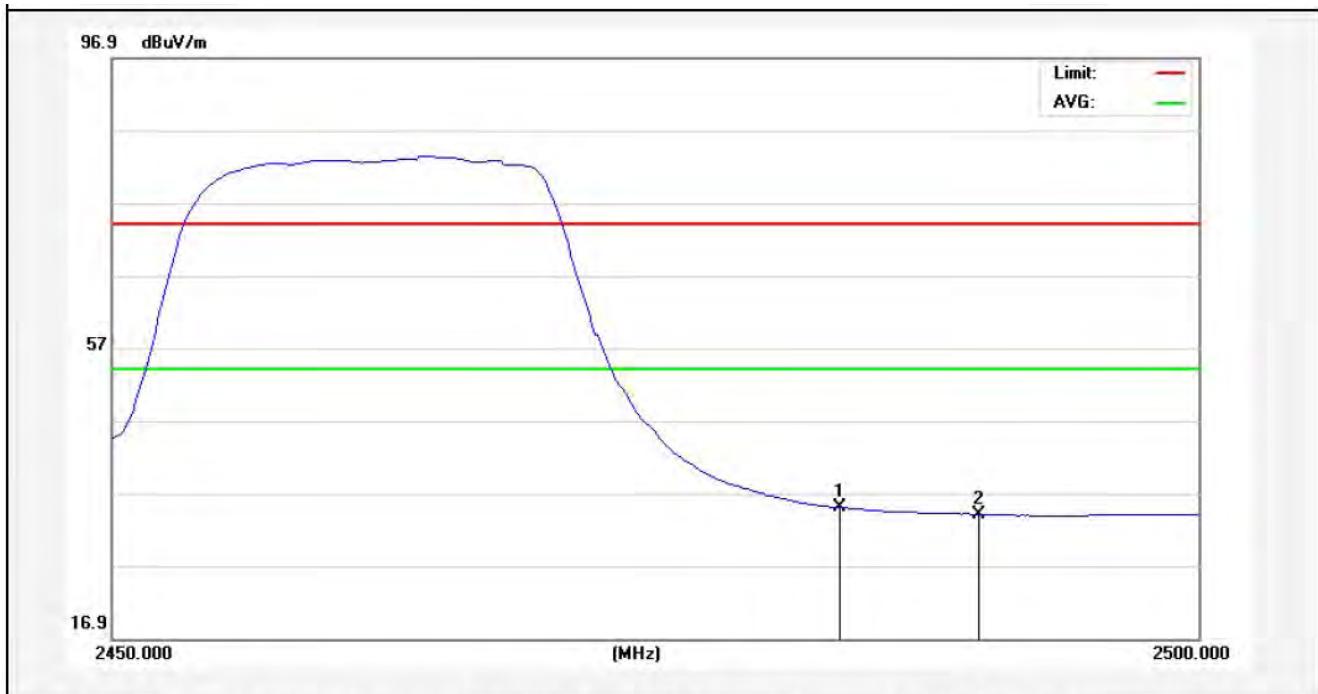
Test Mode: 802.11g

2462MHz

Vertical-PEAK:



Vertical-AV:

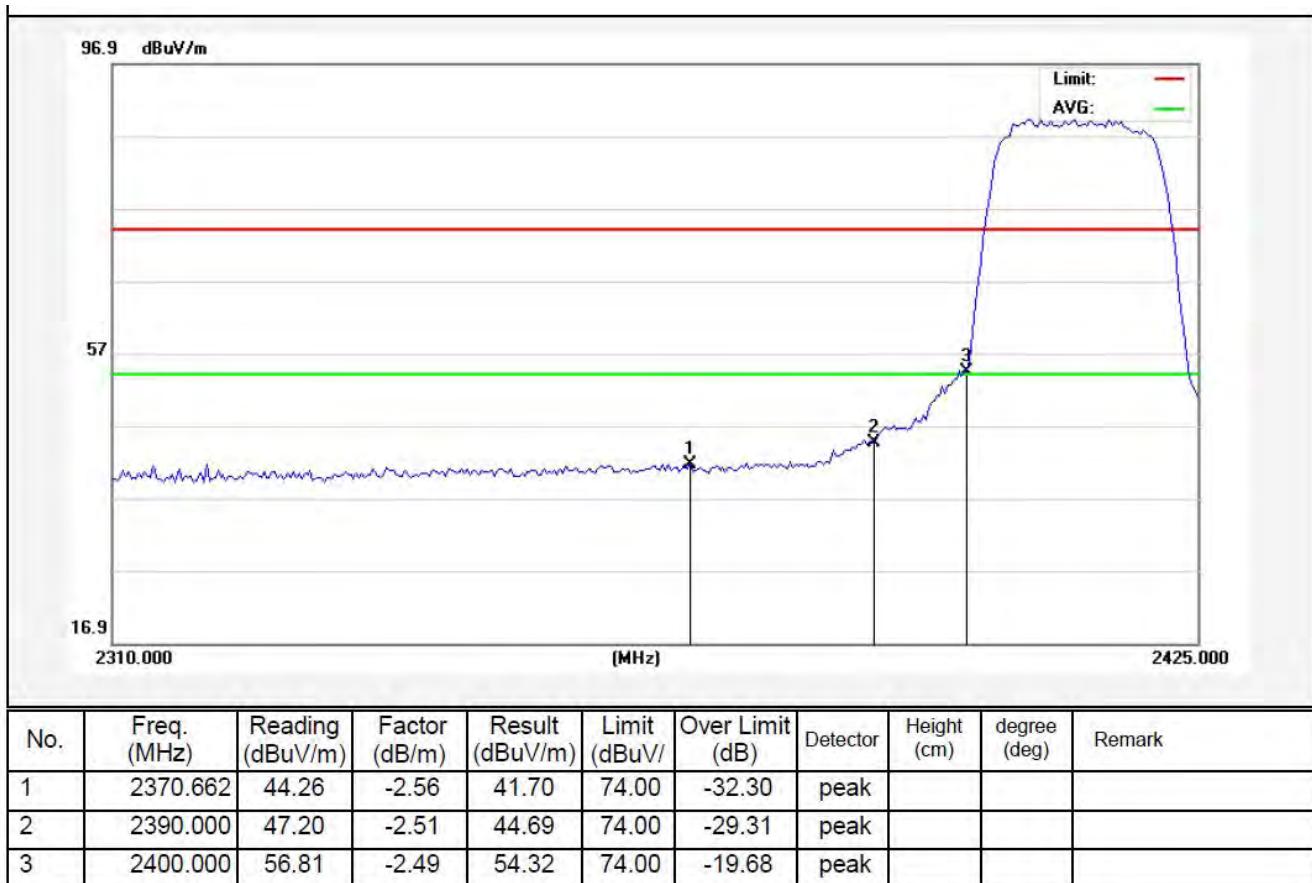


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	2483.500	37.29	-2.31	34.98	54.00	-19.02	AVG			
2	2489.875	36.34	-2.29	34.05	54.00	-19.95	AVG			

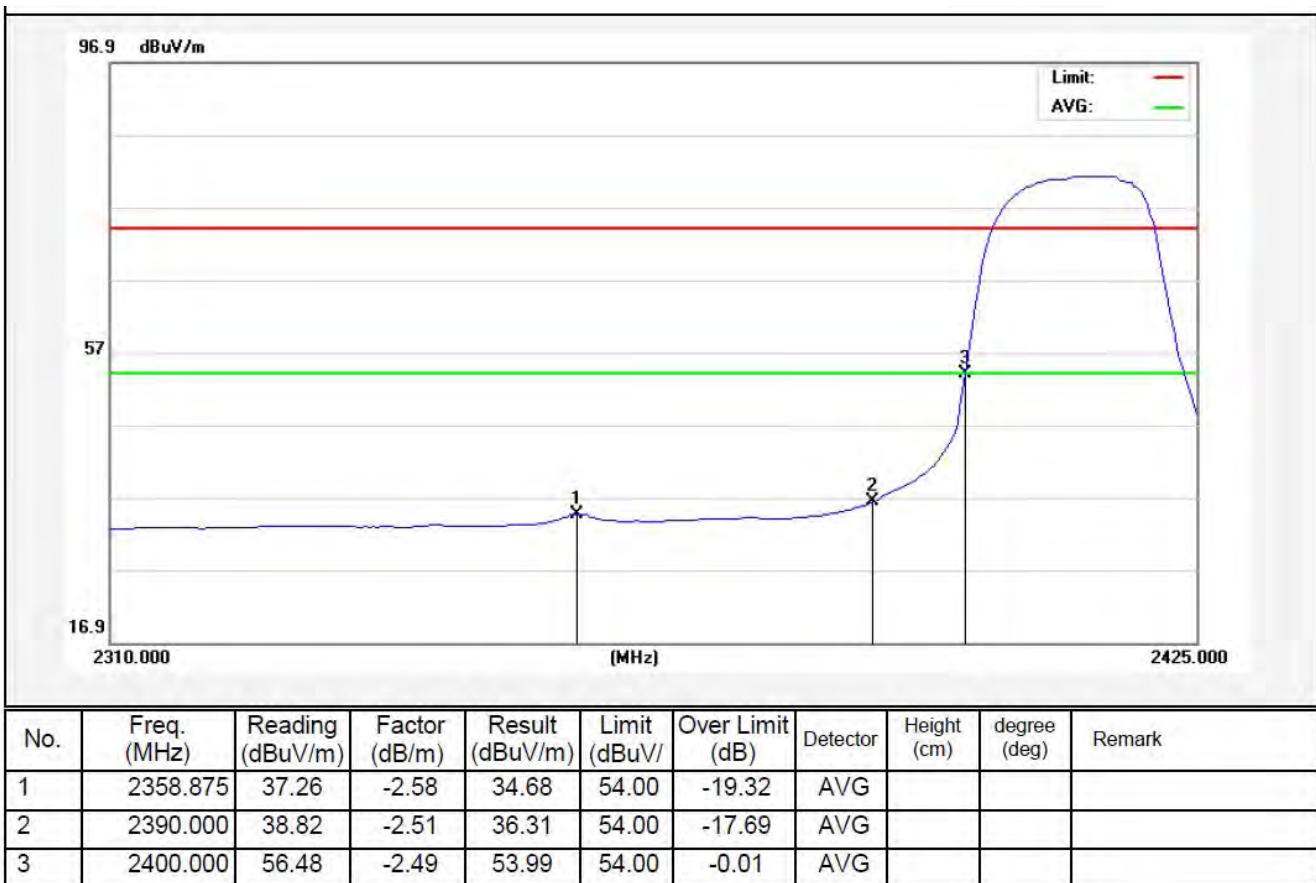
Test Mode: 802.11n (HT20)

2412MHz

Horizontal-PEAK:



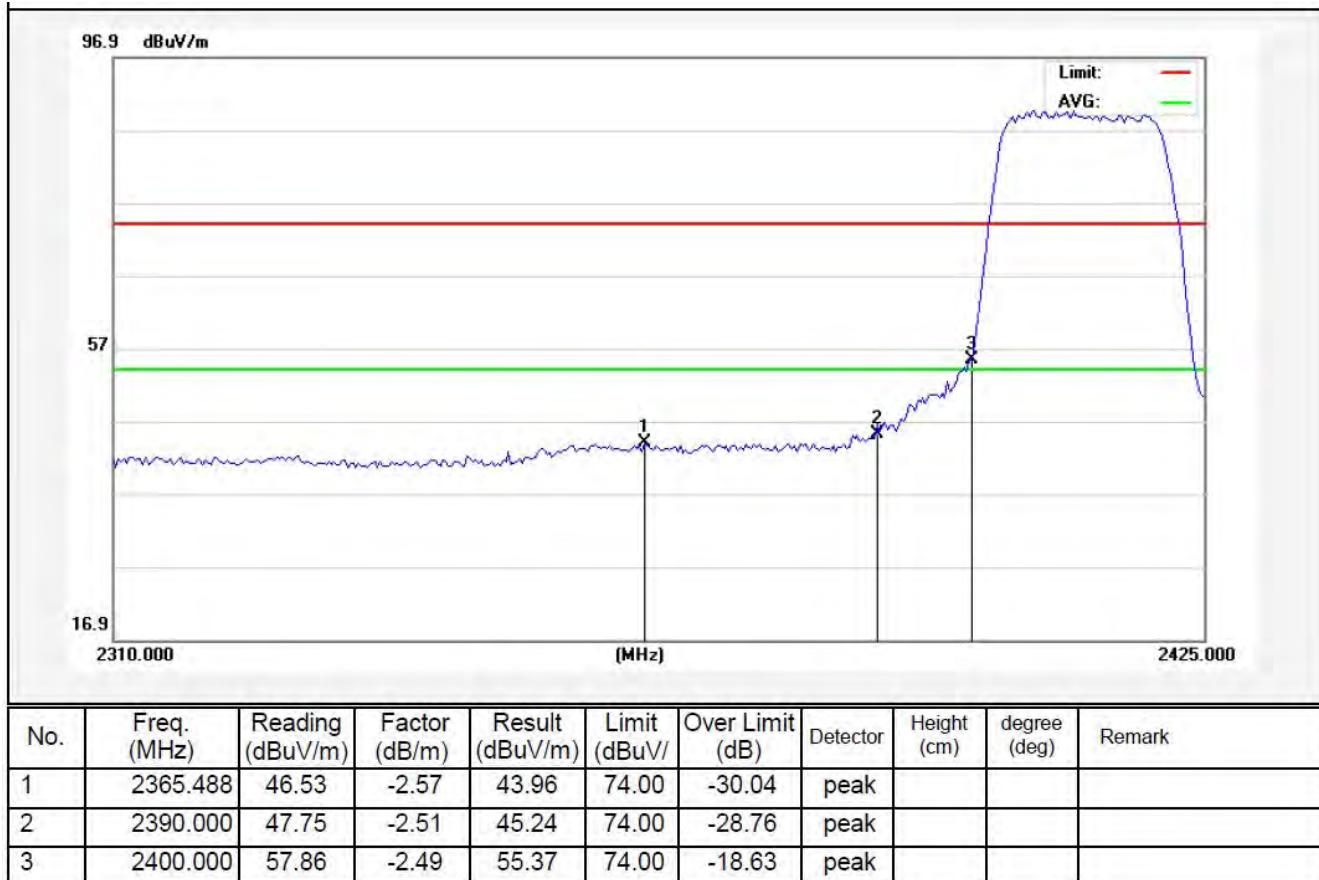
Horizontal-AV:



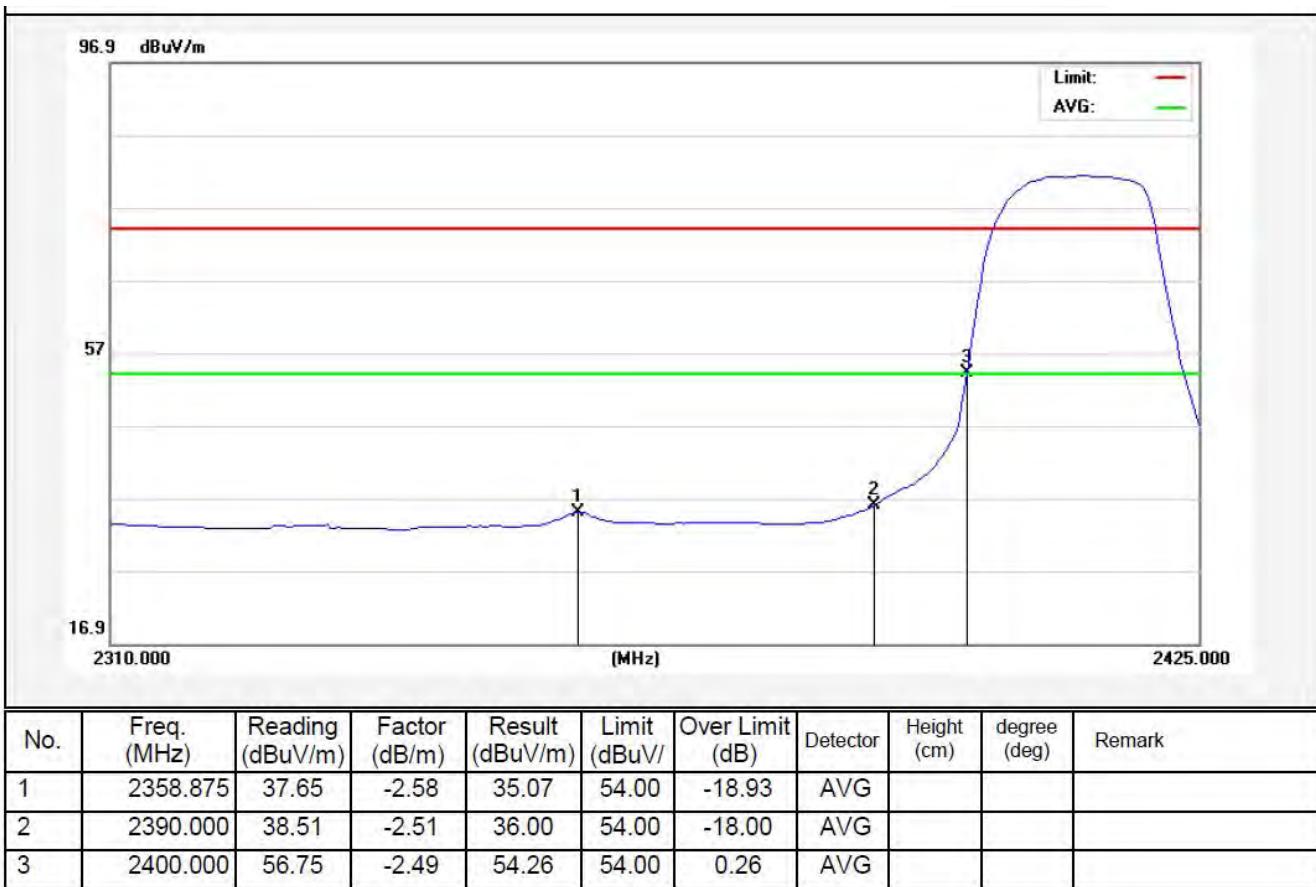
Test Mode: 802.11n (HT20)

2412MHz

Vertical-PEAK:



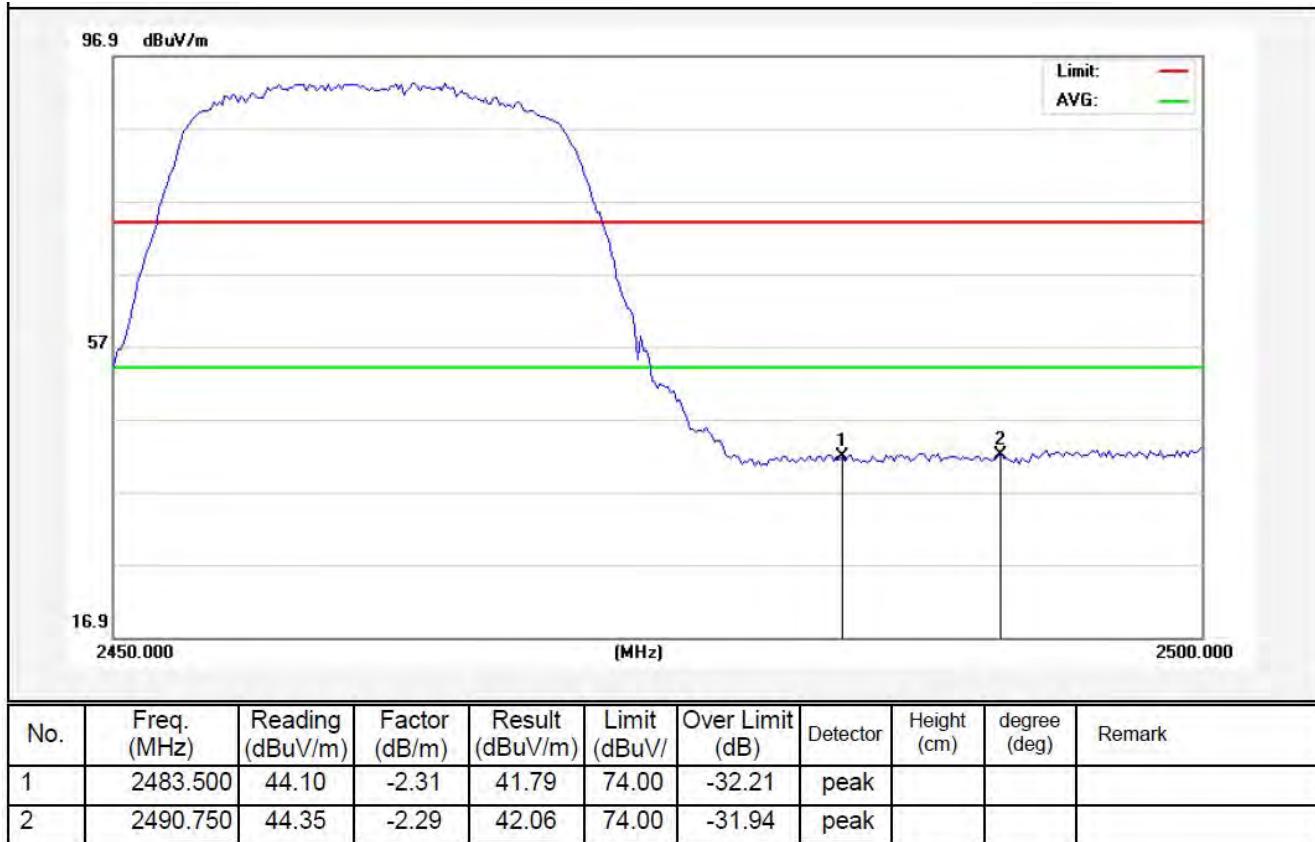
Vertical-AV:



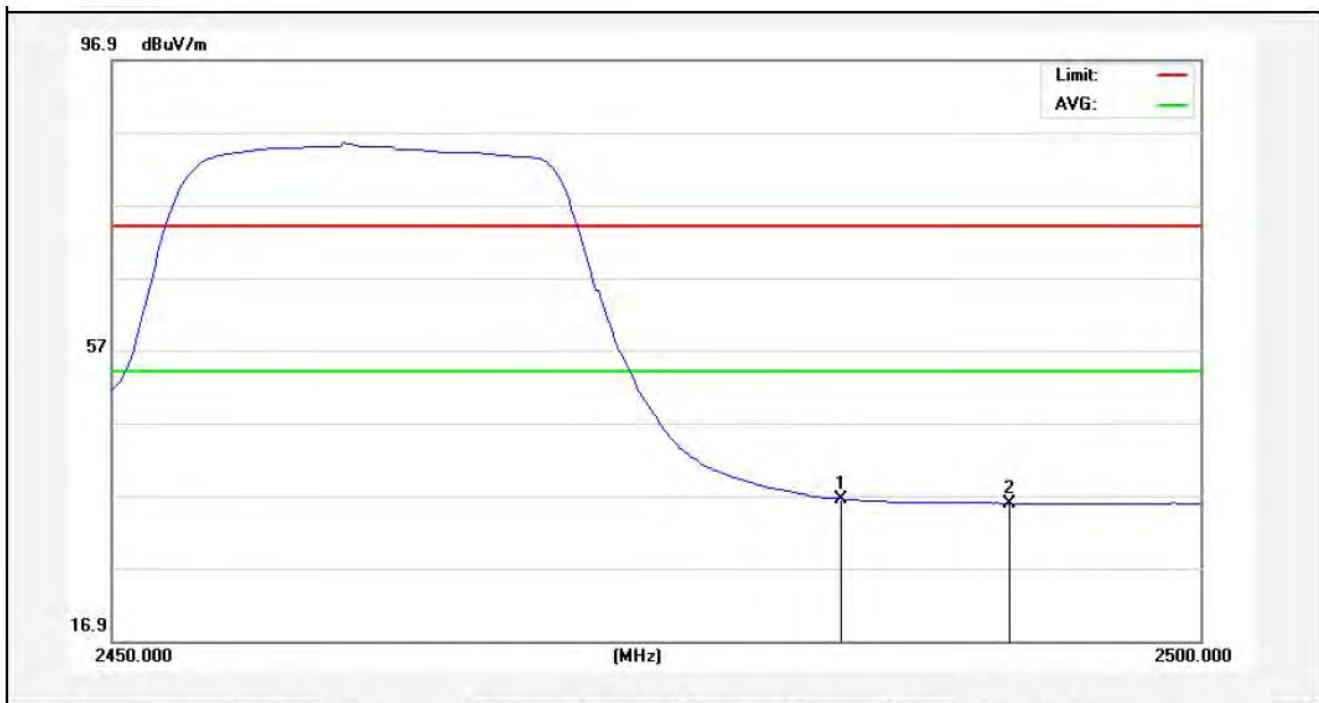
Test Mode: 802.11n (HT20)

2462MHz

Horizontal-PEAK:



Horizontal-AV:

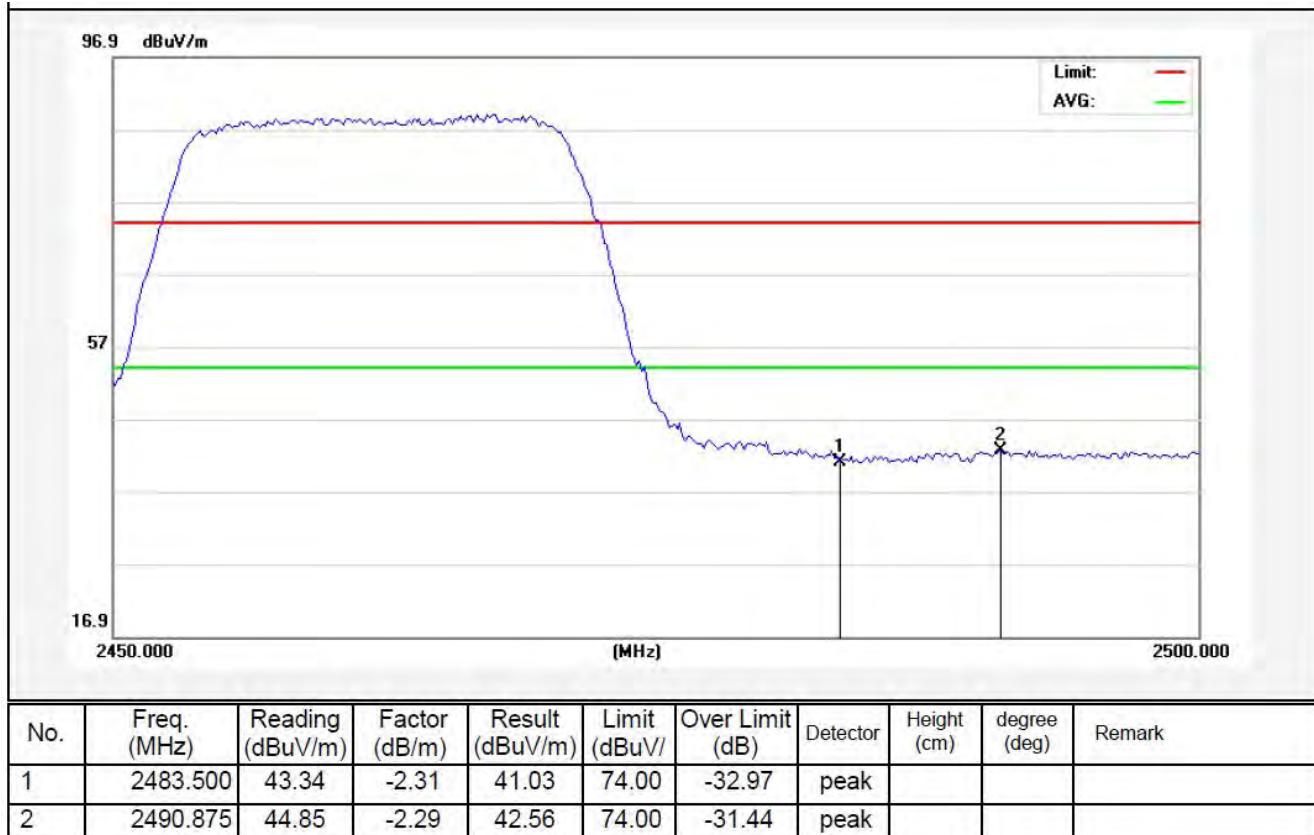


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	2483.500	38.81	-2.31	36.50	54.00	-17.50	AVG			
2	2491.250	38.15	-2.29	35.86	54.00	-18.14	AVG			

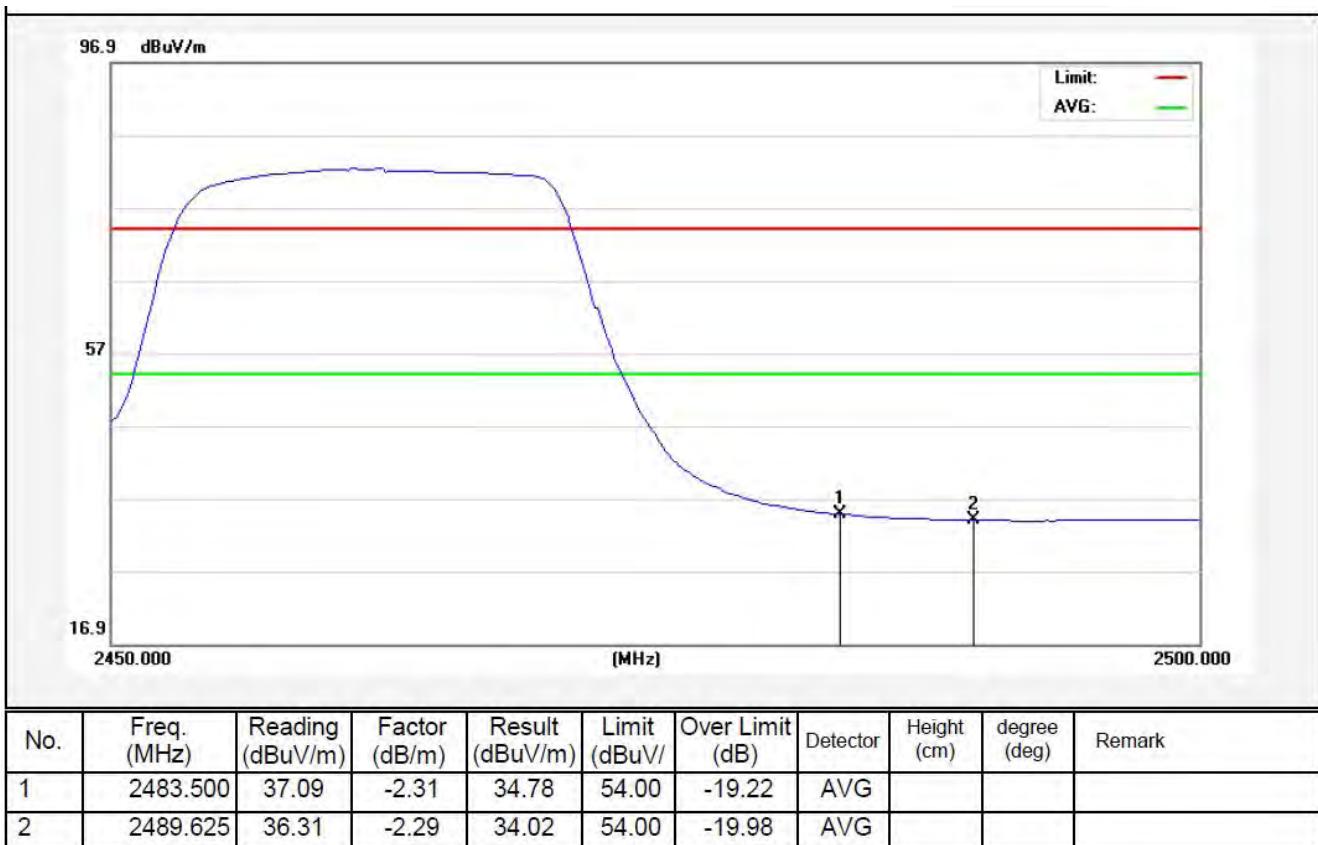
Test Mode: 802.11n (HT20)

2462MHz

Vertical-PEAK:



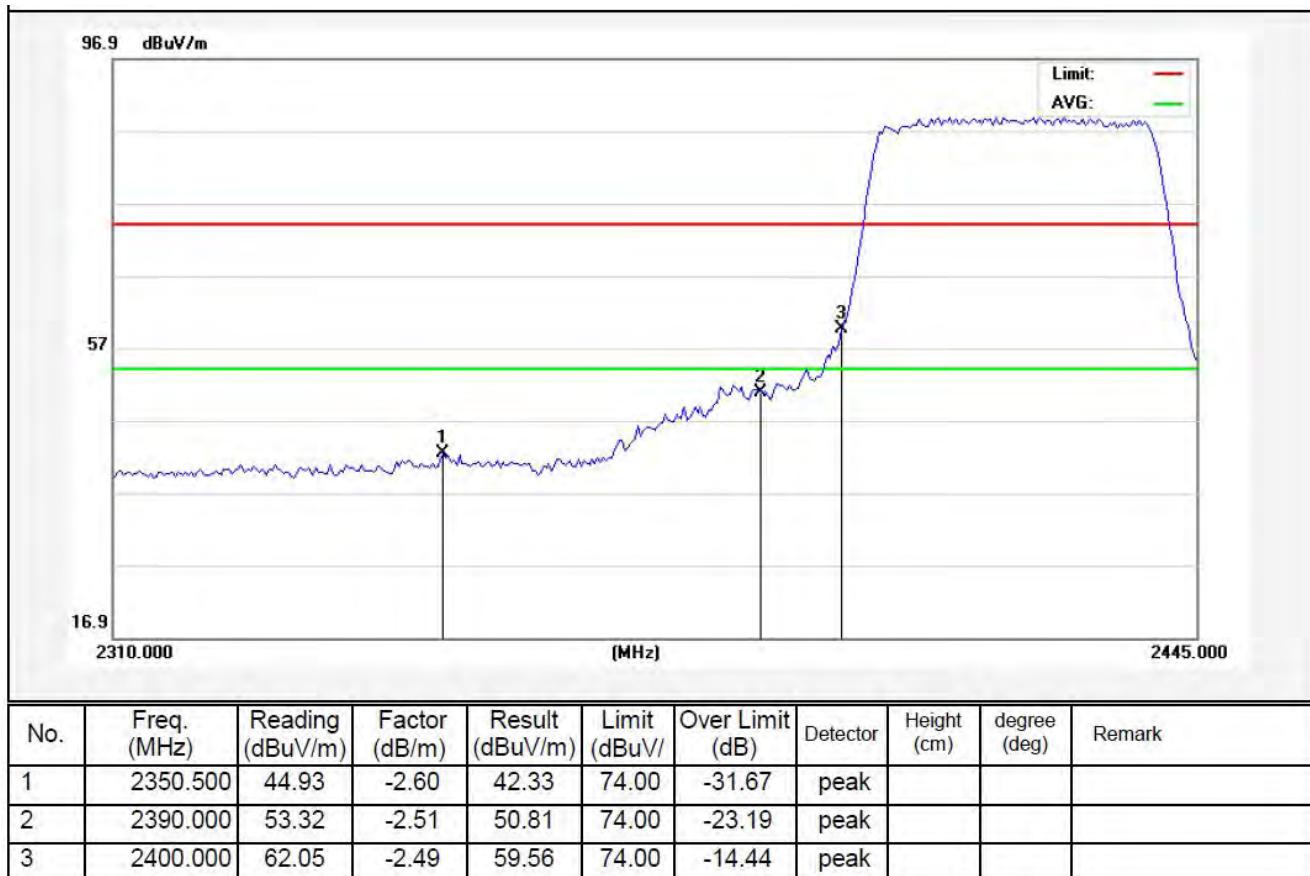
Vertical-AV:



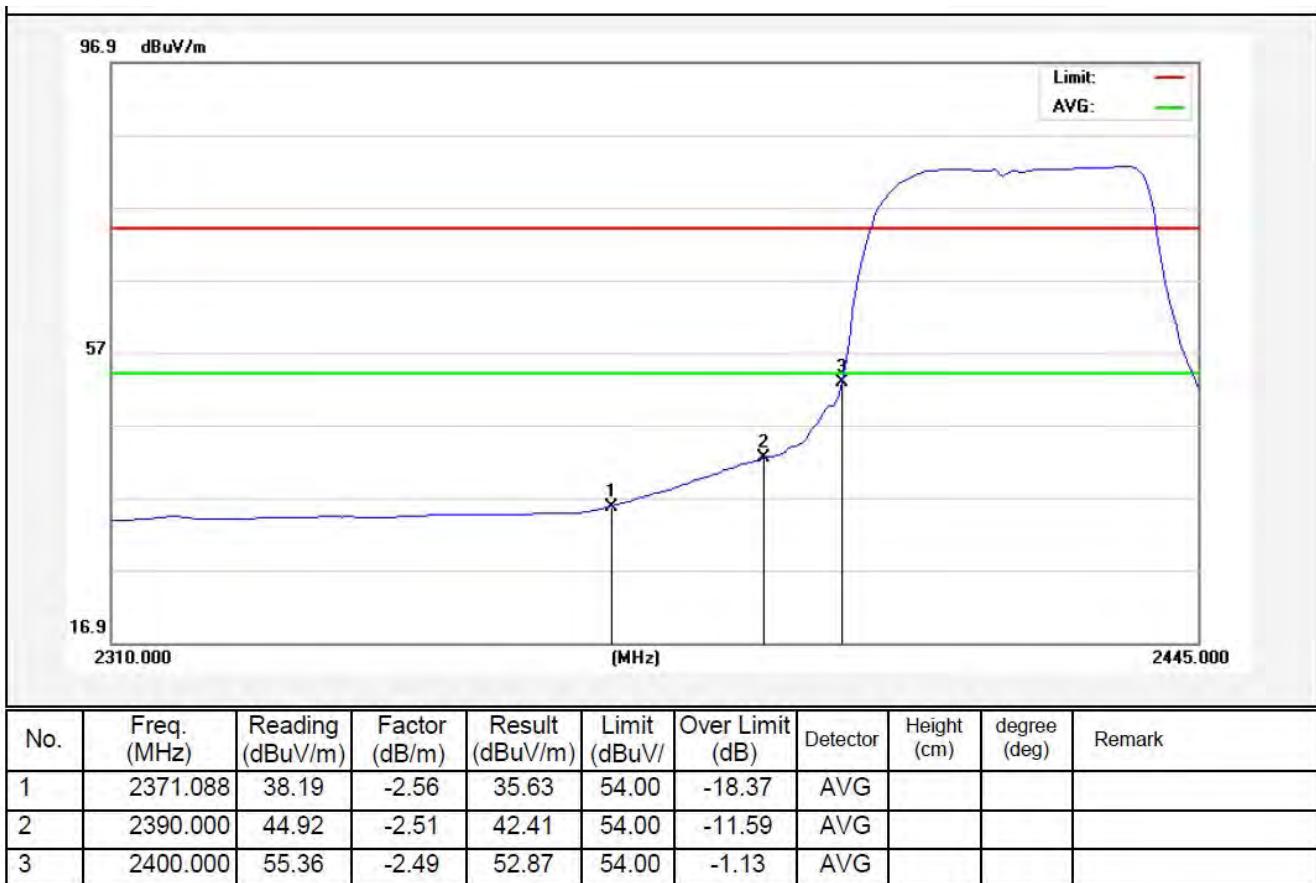
Test Mode: 802.11n (HT40)

2422MHz

Horizontal-PEAK:



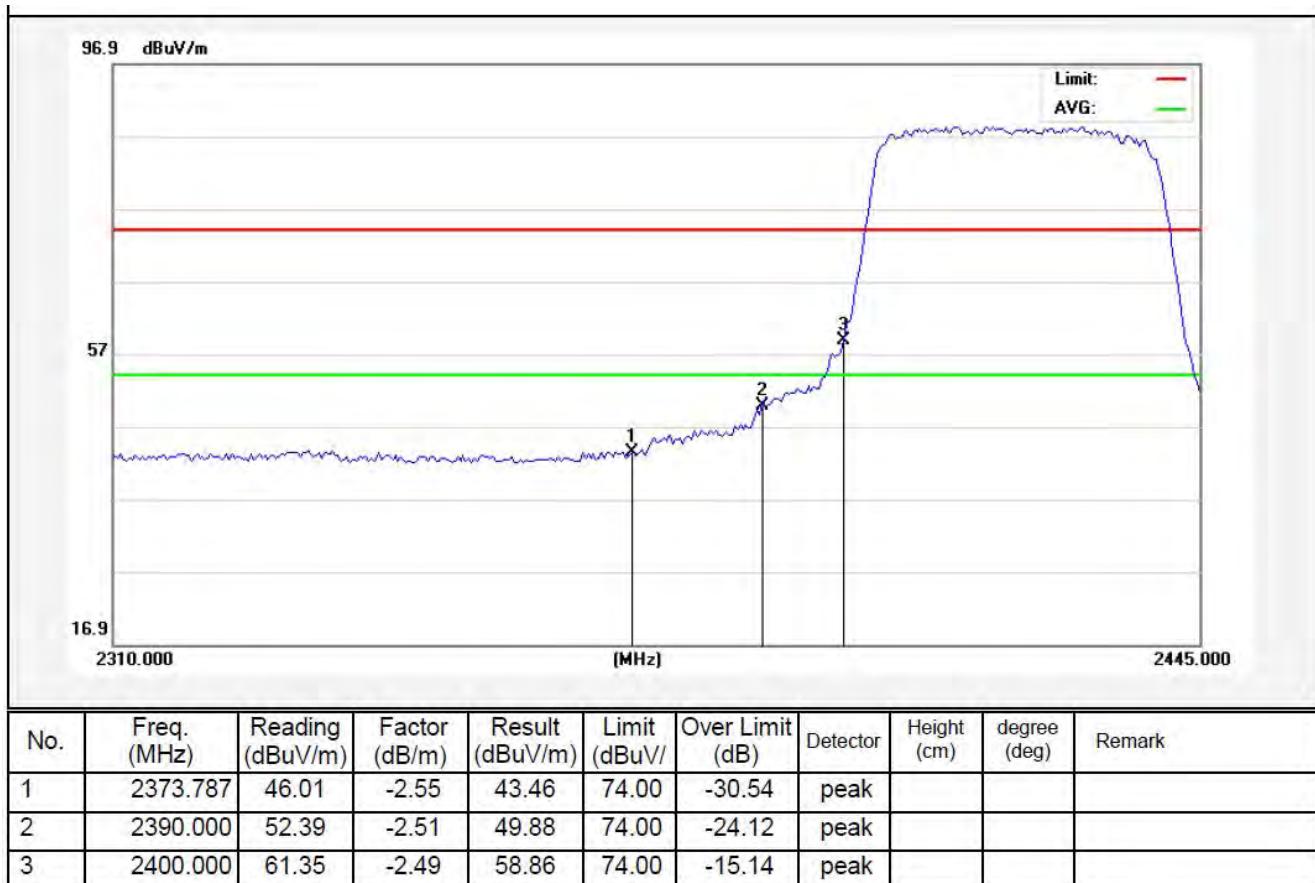
Horizontal-AV:



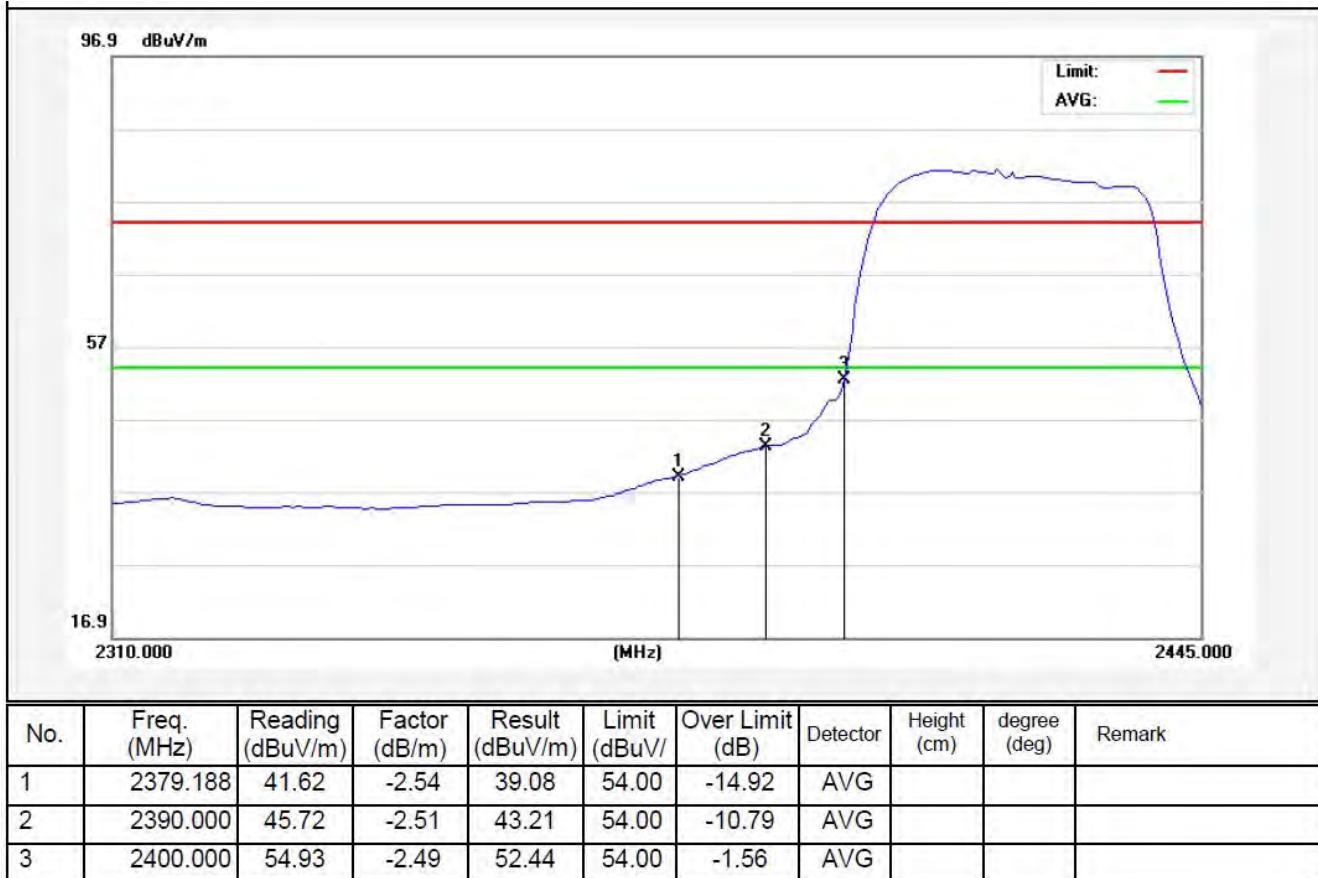
Test Mode: 802.11n (HT40)

2422MHz

Vertical-PEAK:



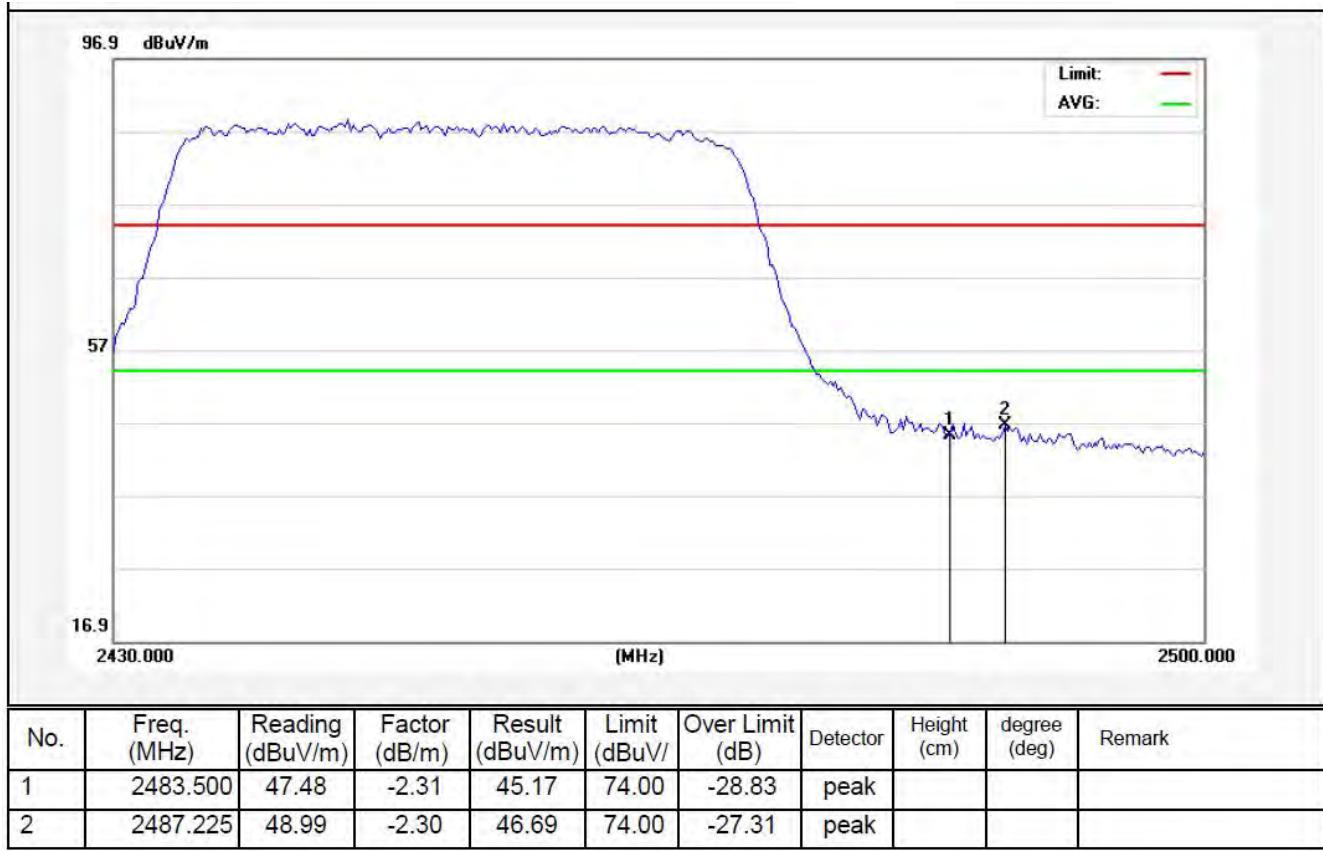
Vertical-AV:



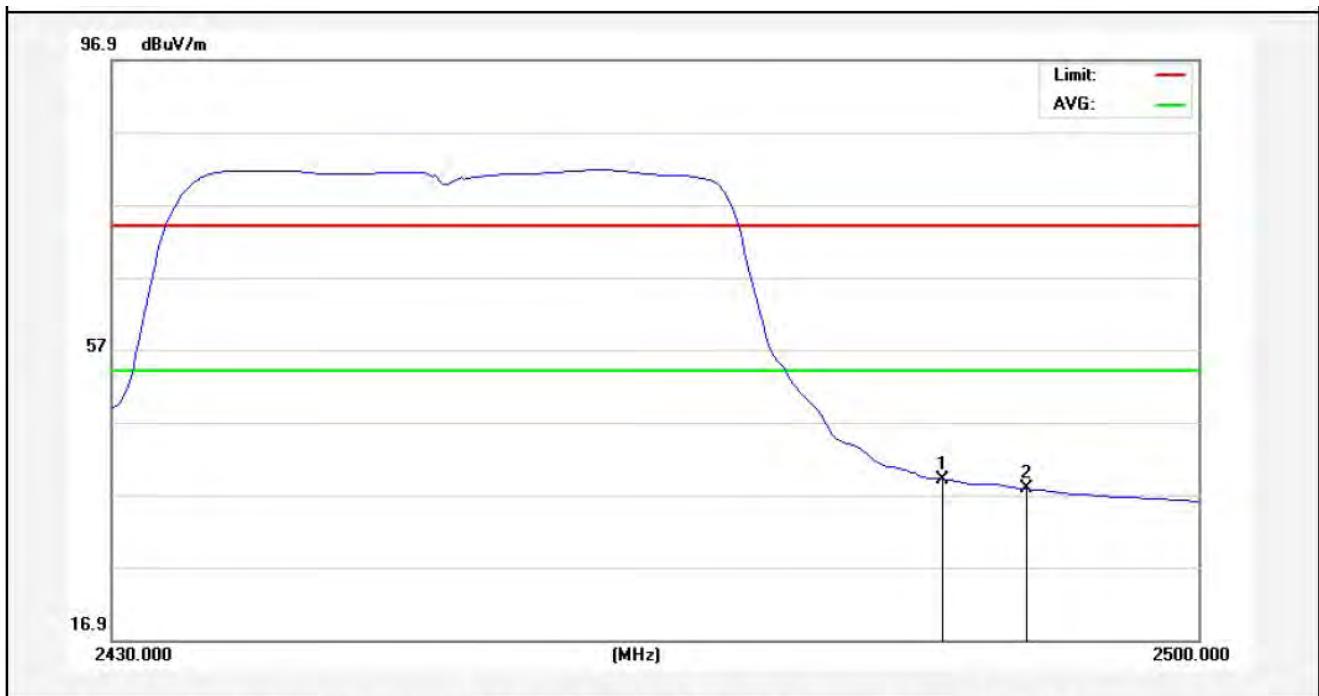
Test Mode: 802.11n (HT40)

2452MHz

Horizontal-PEAK:



Horizontal-AV:

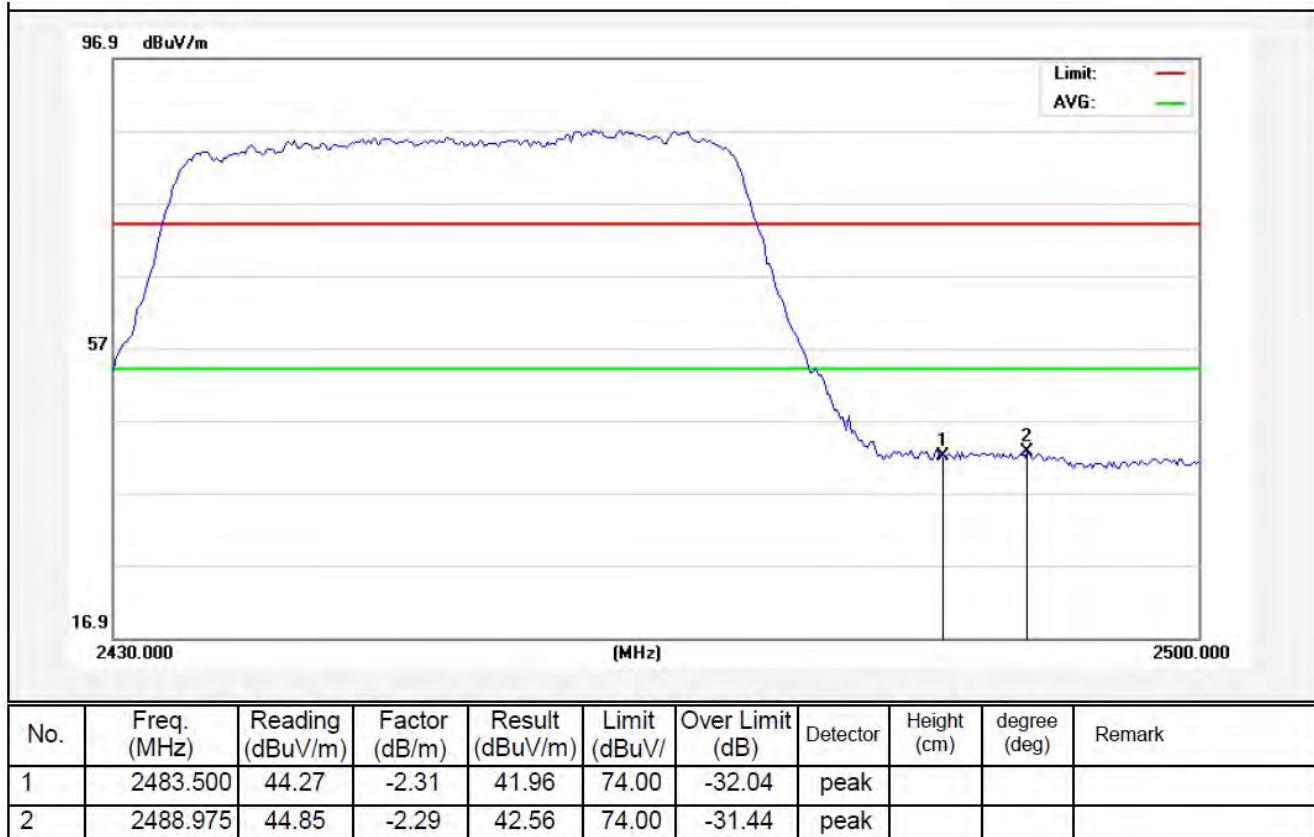


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	2483.500	41.40	-2.31	39.09	54.00	-14.91	AVG			
2	2488.975	40.01	-2.29	37.72	54.00	-16.28	AVG			

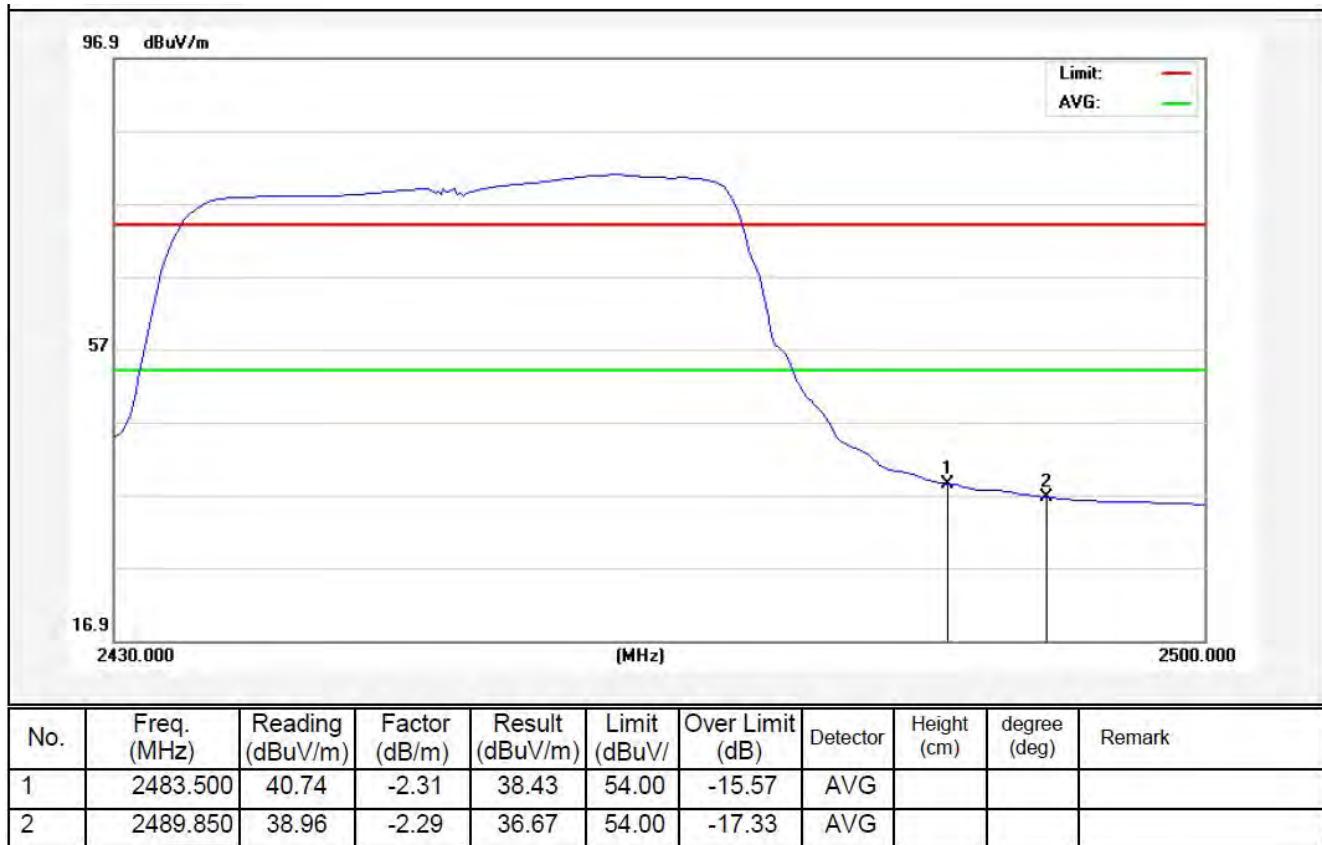
Test Mode: 802.11n (HT40)

2452MHz

Vertical-PEAK:



Vertical-AV:



## 4.5. Peak Power Spectral Density

### a. Limit

1. For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.
2. The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

### b. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5 times DTS BW, Sweep=500s
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

### c. Test Equipment

Same as the equipment listed in 4.2.

### d. Test Setup

See 4.1

### e. Test Results

Pass

### f. Test Data

Please refer to the following data.

### g. Test Plot

See the following pages

**Test mode: IEEE 802.11b**

Channel	Frequency (MHz)	PPSD (dBm/3KHz)	$\Sigma$ PPSD (dBm/3KHz)	Limit (dBm)	Result
Low	2412	-17.52	-		Pass
Mid	2437	-18.47	-	8.00	Pass
High	2462	-19.35	-		Pass

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	PPSD (dBm)	$\Sigma$ PPSD (dBm)	Limit (dBm)	Result
Low	2412	-21.10	-		Pass
Mid	2437	-21.92	-	8.00	Pass
High	2462	-22.72	-		Pass

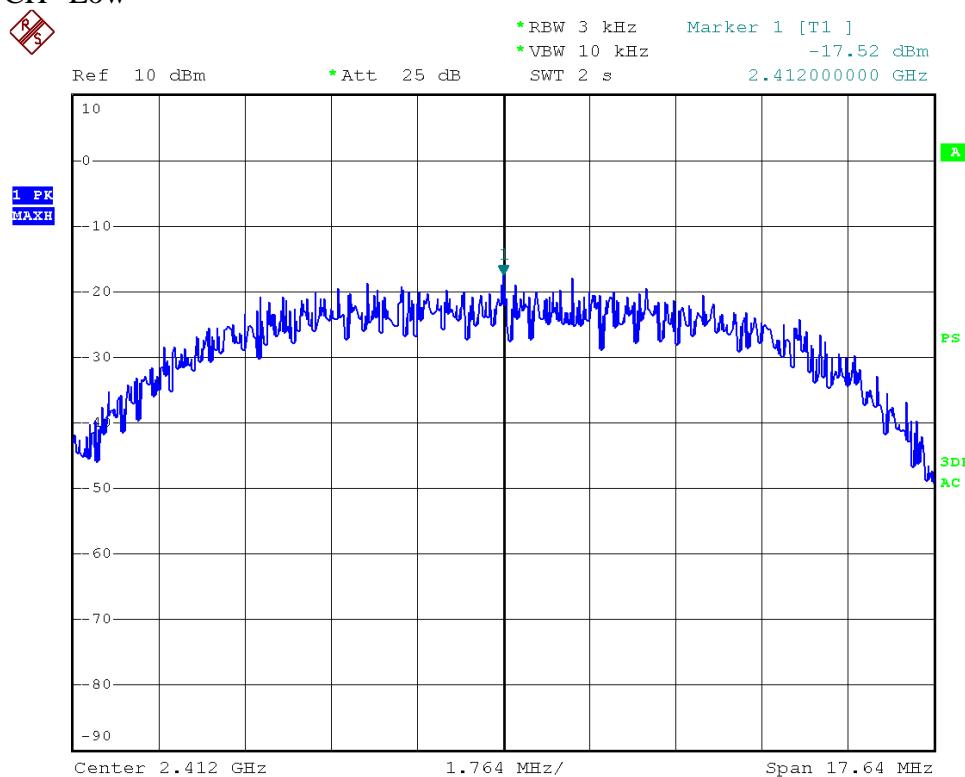
**Test mode: IEEE 802.11n (HT20)**

Channel	Frequency (MHz)	PPSD (dBm/3KHz)	$\Sigma$ PPSD (dBm/3KHz)	Limit (dBm)	Result
Low	2412	-20.46	-		Pass
Mid	2437	-22.12	-	8.00	Pass
High	2462	-23.05	-		Pass

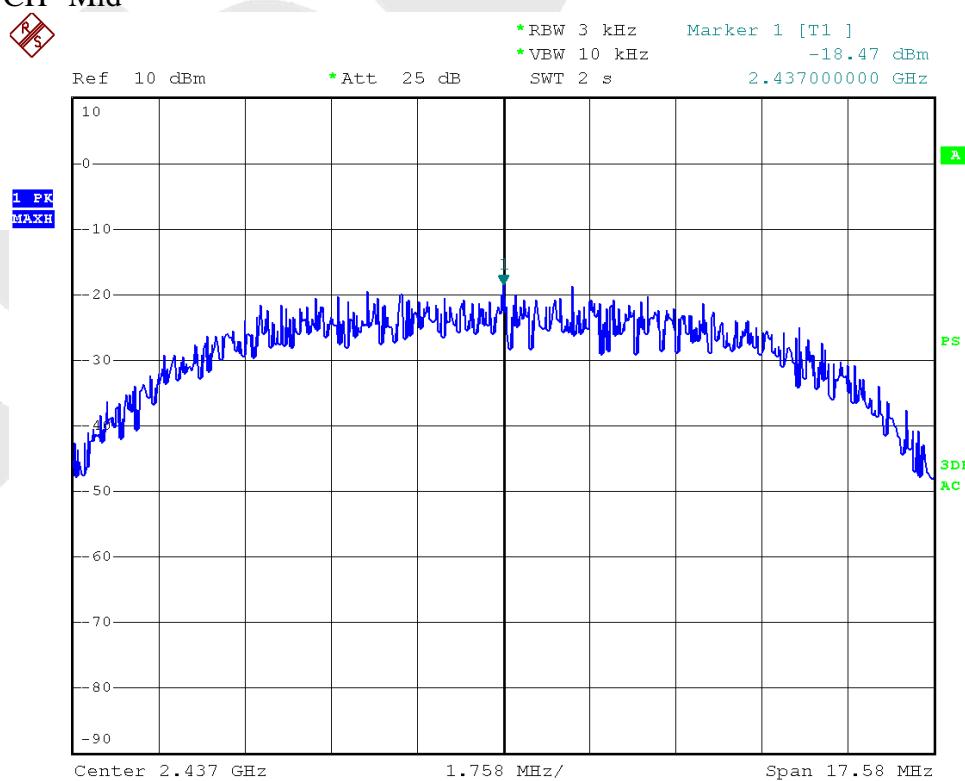
**Test mode: IEEE 802.11n (HT40)**

Channel	Frequency (MHz)	PPSD (dBm/3KHz)	$\Sigma$ PPSD (dBm/3KHz)	Limit (dBm)	Result
Low	2422	-21.07	-		Pass
Mid	2437	-21.81	-	8.00	Pass
High	2452	-22.68	-		Pass

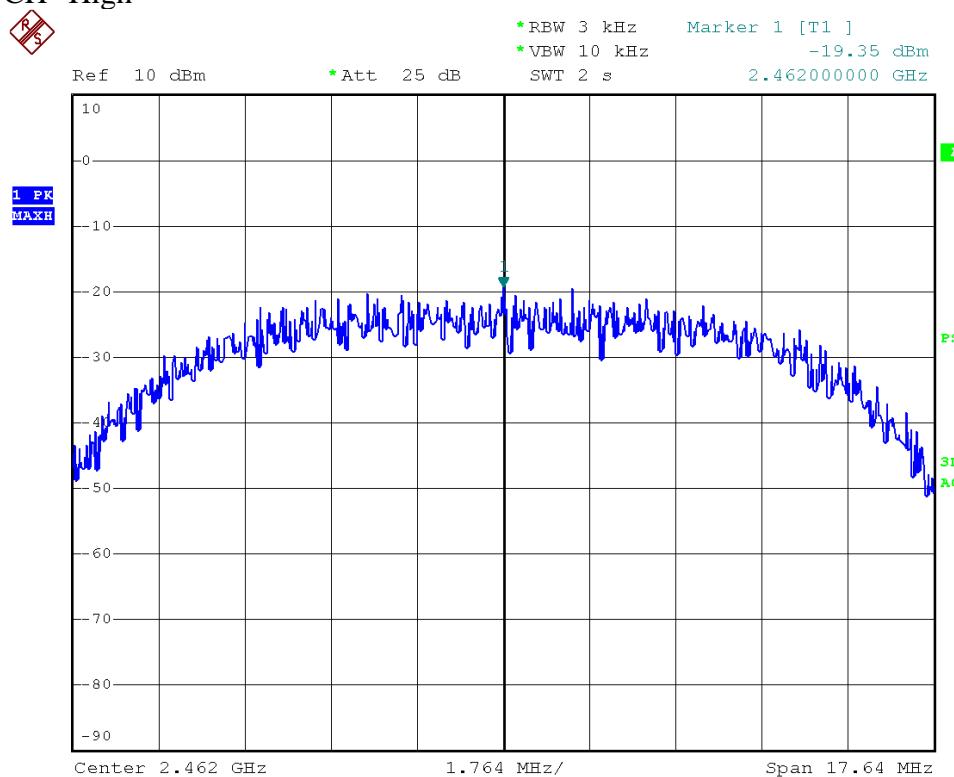
802.11 b CH--Low



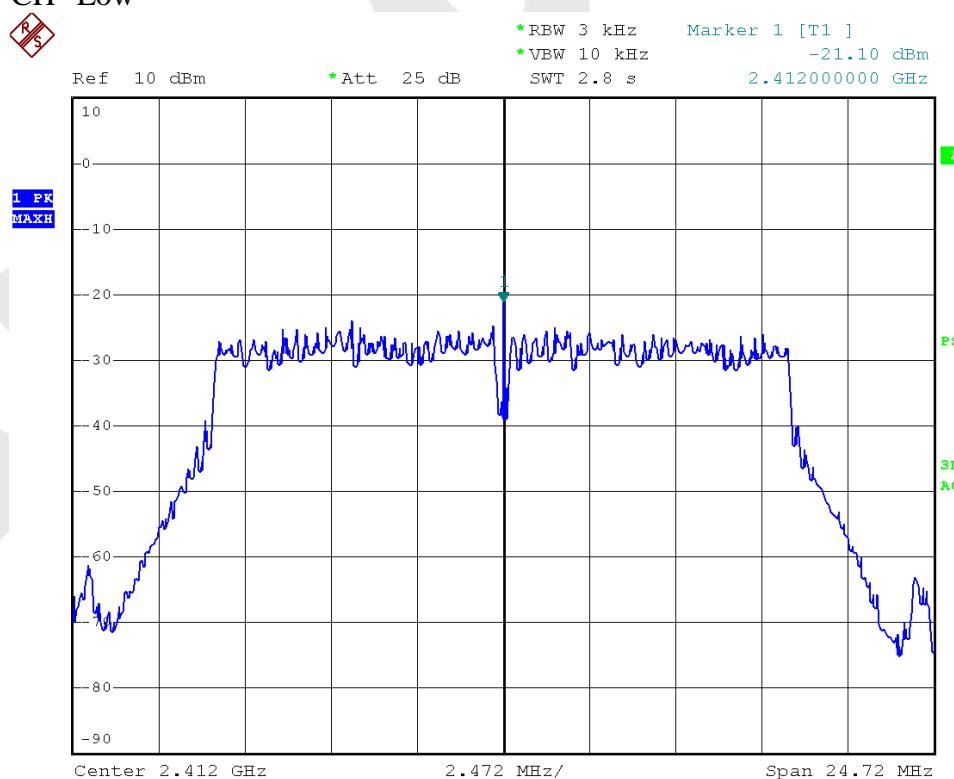
802.11 b CH--Mid



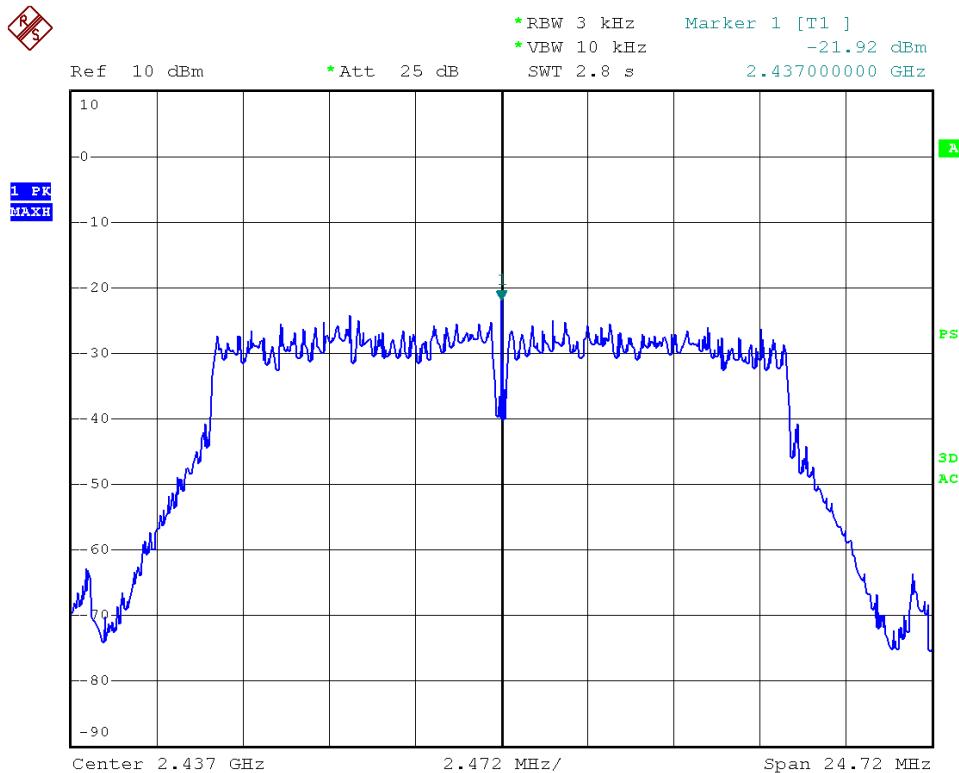
802.11 b CH--High



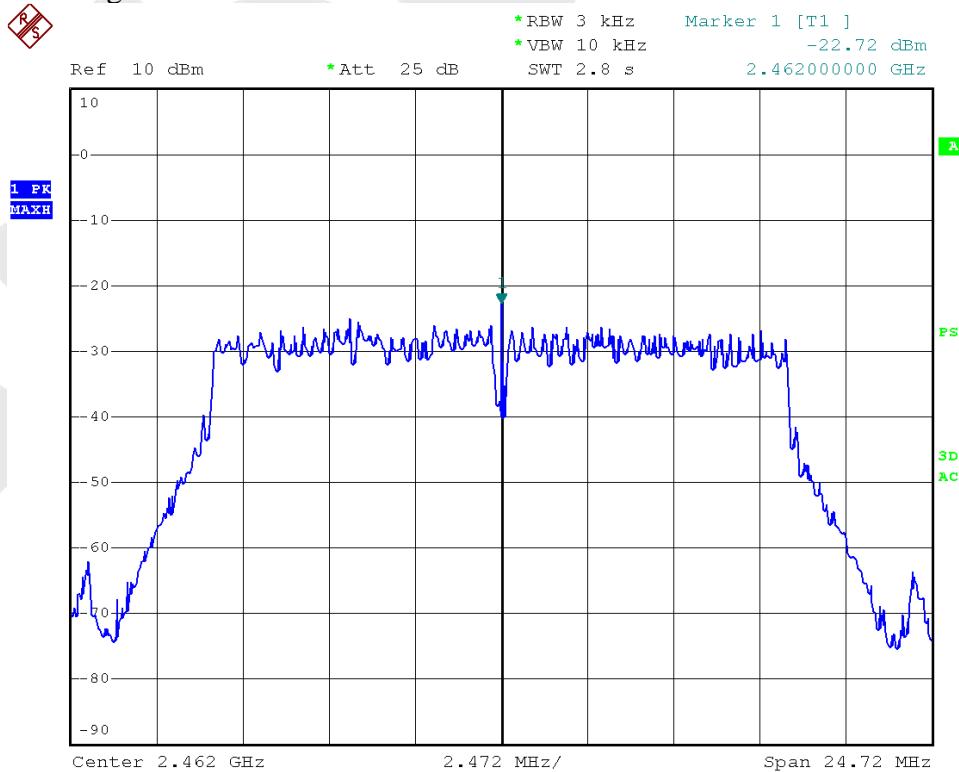
802.11g CH--Low



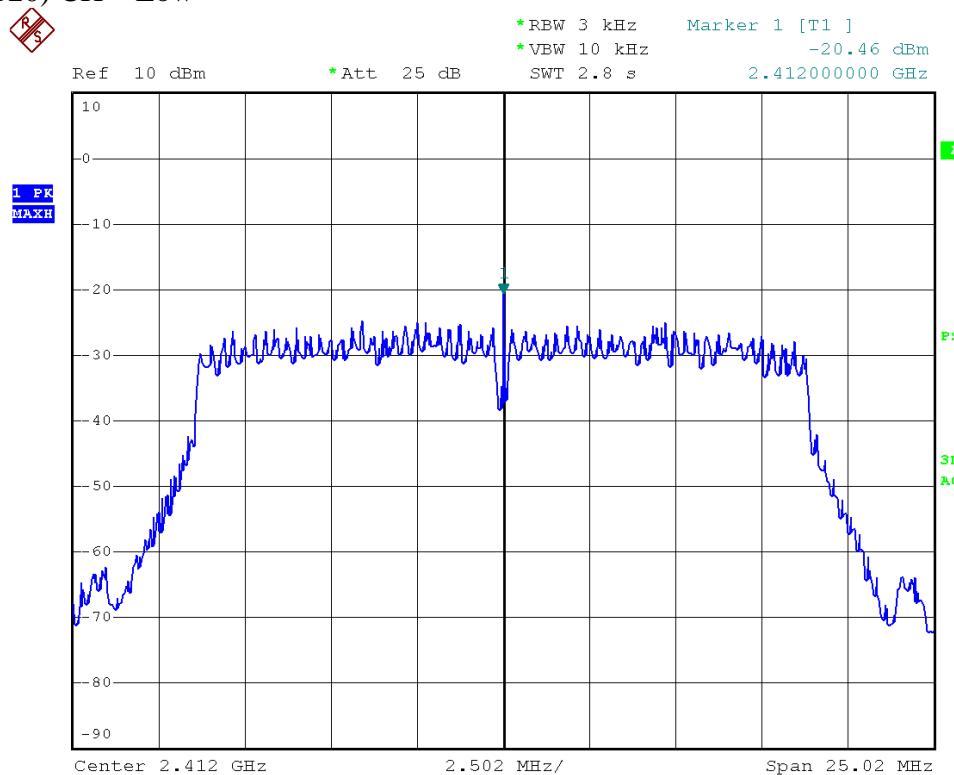
802.11g CH--Mid



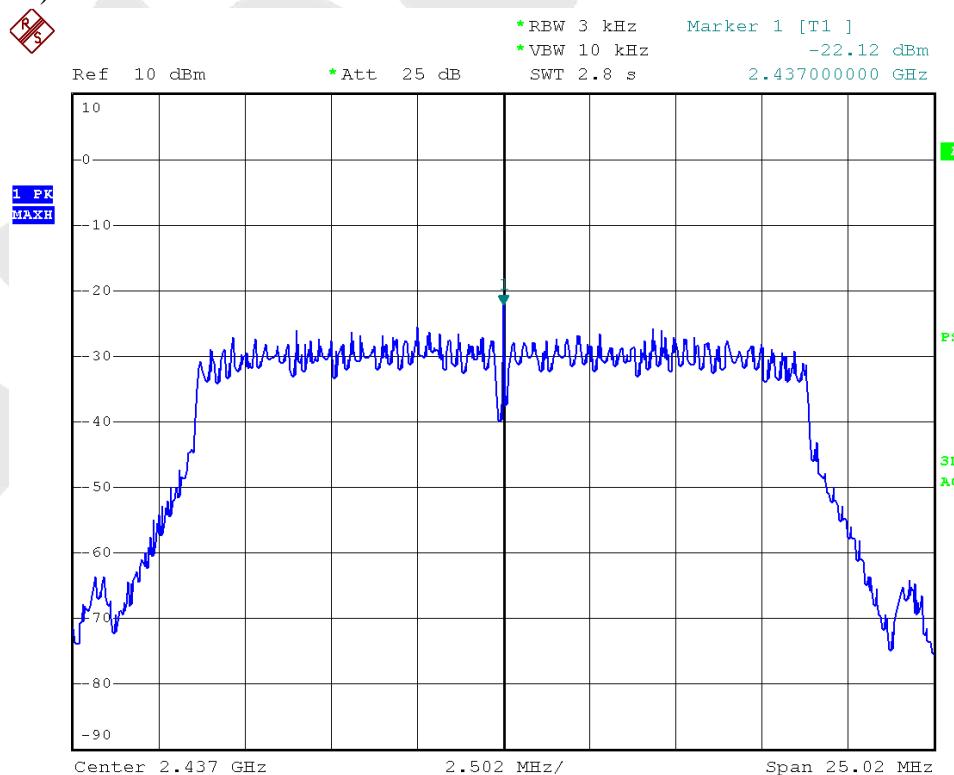
802.11g CH--High



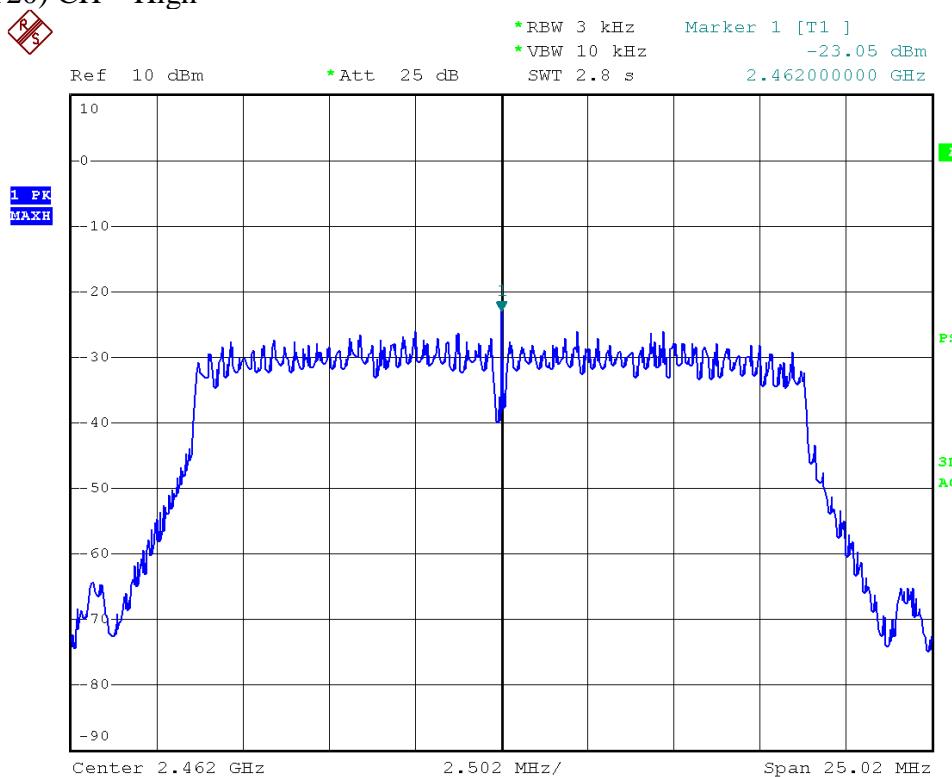
802.11n (HT20) CH—Low



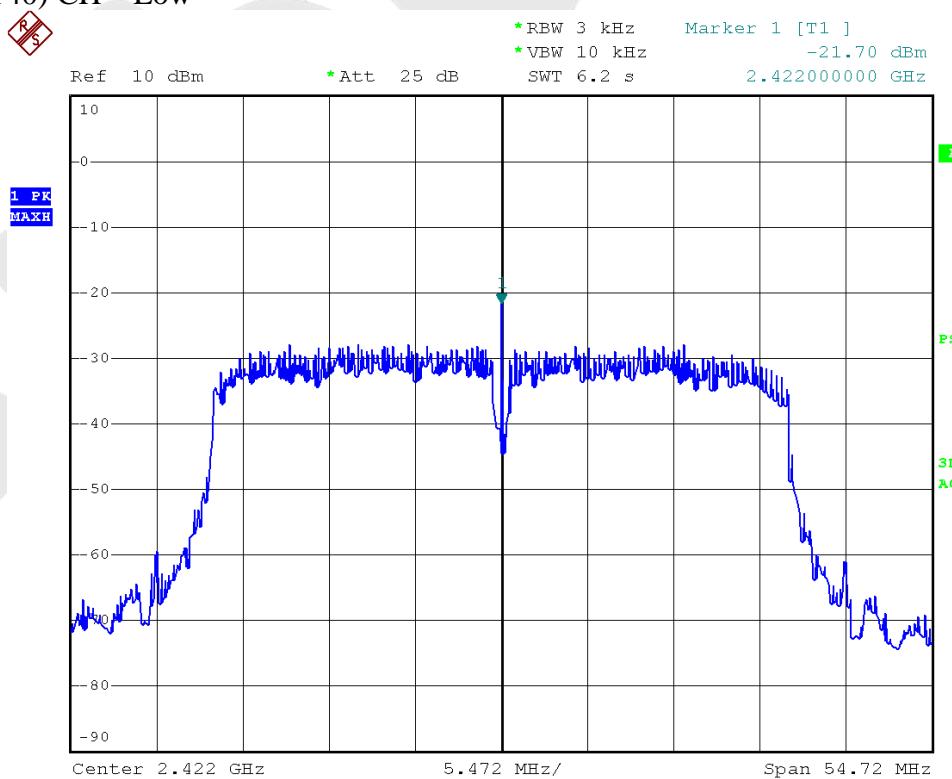
802.11n (HT20) CH—Mid



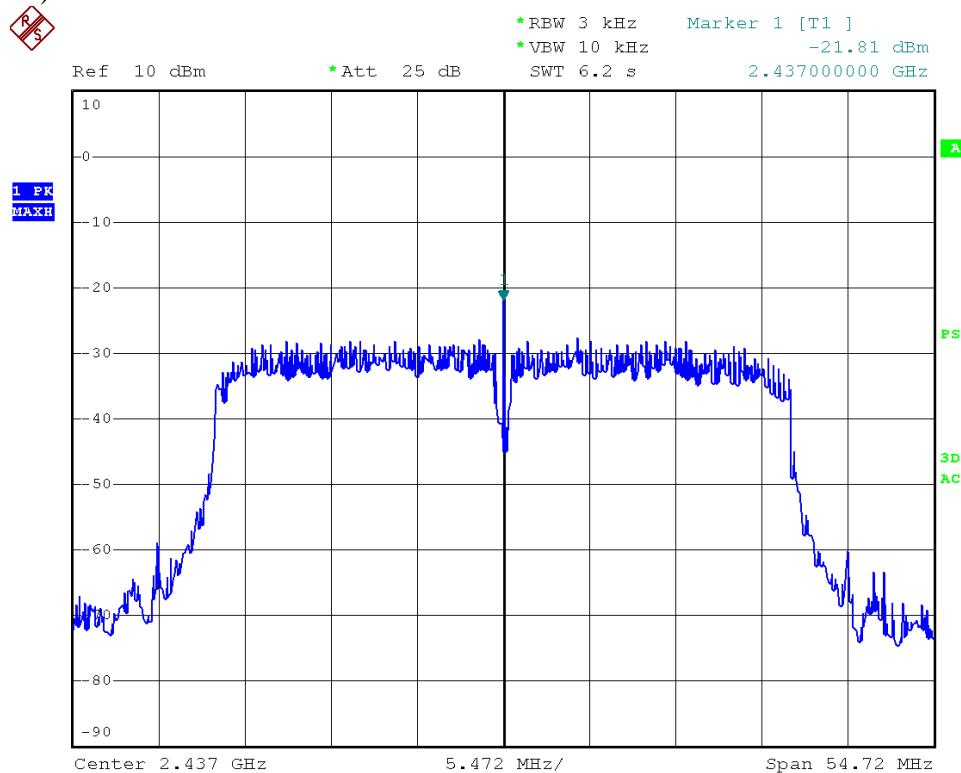
802.11n (HT20) CH—High



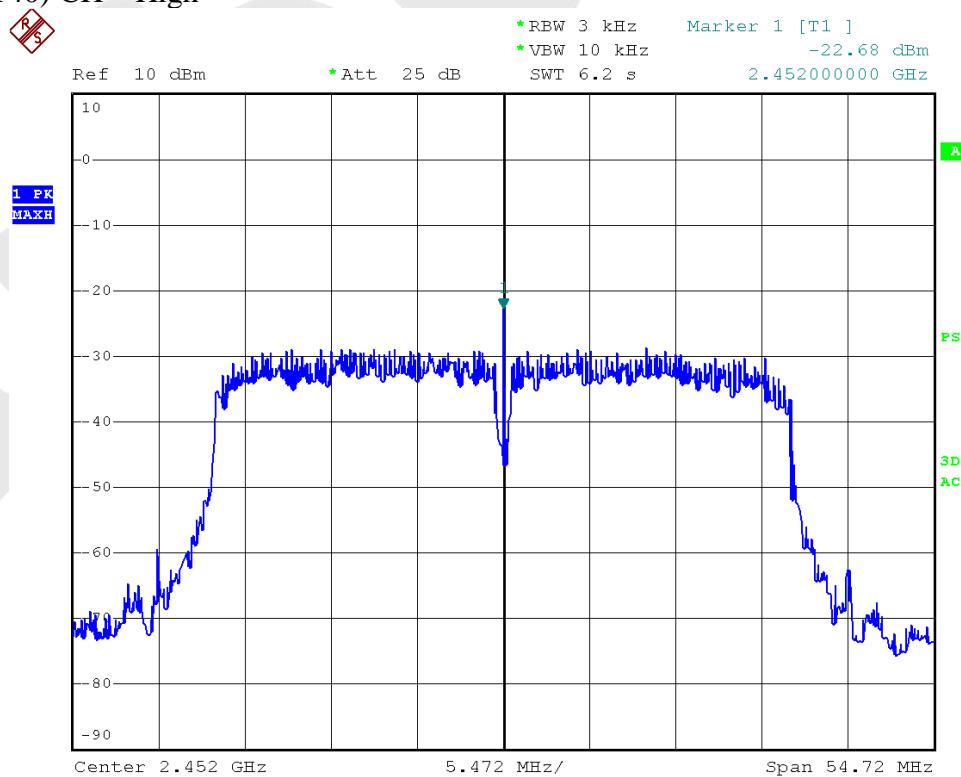
802.11n (HT40) CH—Low



## 802.11n (HT40) CH—Mid



## 802.11n (HT40) CH—High



## 4.6. Radiated Emissions

### 4.6.1.1. Test Limits (< 30 MHZ)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30

### 4.6.1.2. Test Limits ( $\geq 30$ MHZ)

FIELD STRENGTH of Fundamental: @3M	FIELD STRENGTH of Harmonics	S15.209 30 - 88 MHz	40 dB $\mu$ V/m
902-928 MHZ		88 - 216 MHz	43.5
2.4-2.4835 GHz		216 - 960 MHz	46
94 dB $\mu$ V/m @3m	54 dB $\mu$ V/m @3m	ABOVE 960 MHz	54dB $\mu$ V/m

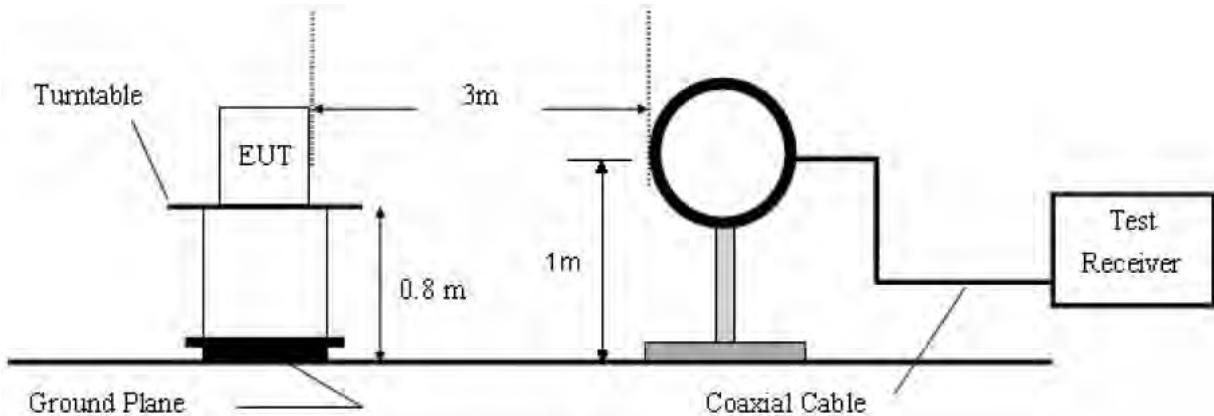
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### Test Equipment

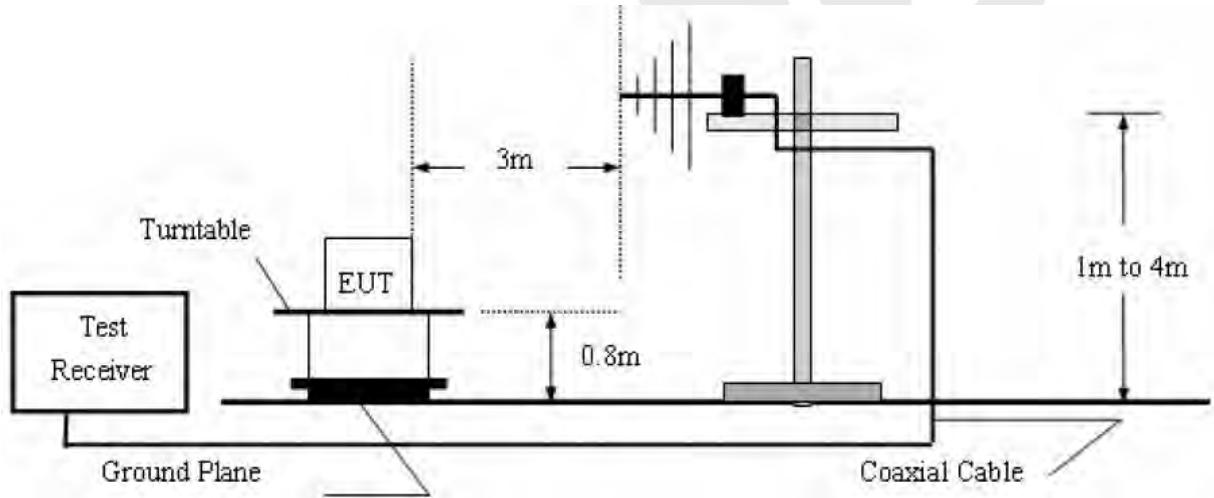
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Apr. 17, 2015	1 Year
2.	Preamplifier	Instruments corporation	EMC011830	980100	Apr. 17, 2015	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 17, 2015	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Apr. 20, 2015	1 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 20, 2015	1 Year
6.	Pre-amplifier	SONOMA	310N	186860	Apr. 17, 2015	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

#### 4.6.2. Test Configuration:

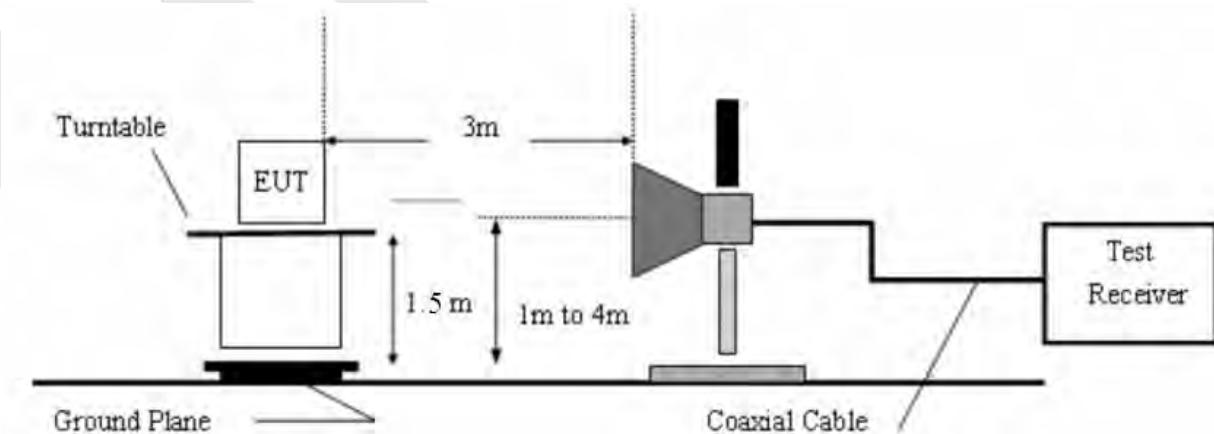
##### 4.6.2.1. 9k to 30MHz emissions:



##### 4.6.2.2. 30M to 1G emissions:



##### 4.6.2.3. 1G to 40G emissions:



#### 4.6.3. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

Measurements are made on 9KHz to 30MHz and 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

All readings from 30MHz to 1GHz are quasi-peak values with a resolution bandwidth of 120kHz. All reading are above 1GHz, peak & average values with a resolution bandwidth of 1MHz.

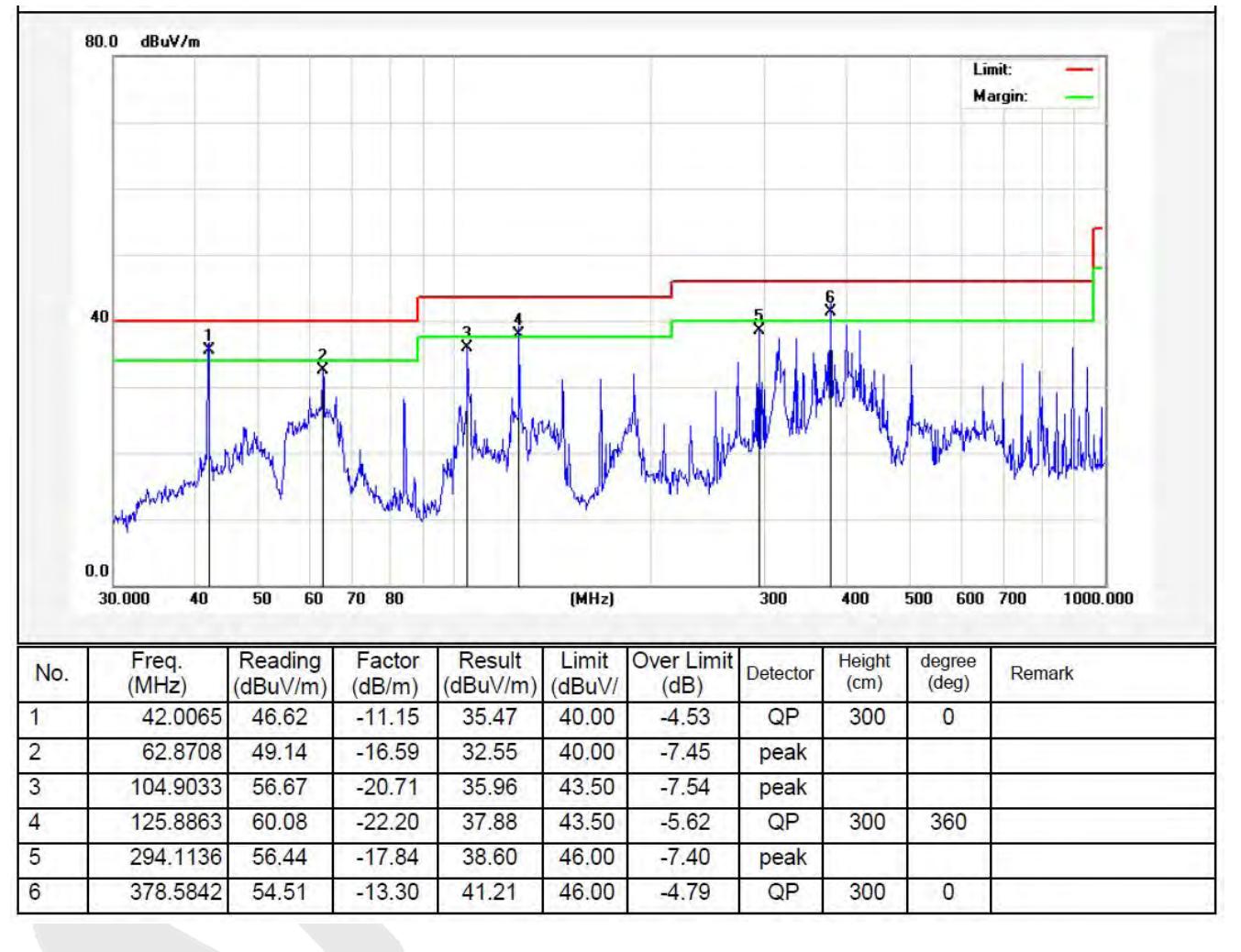
The EUT is tested in 9\*6\*6 Chamber.

The test results are listed in Section 4.6.4.

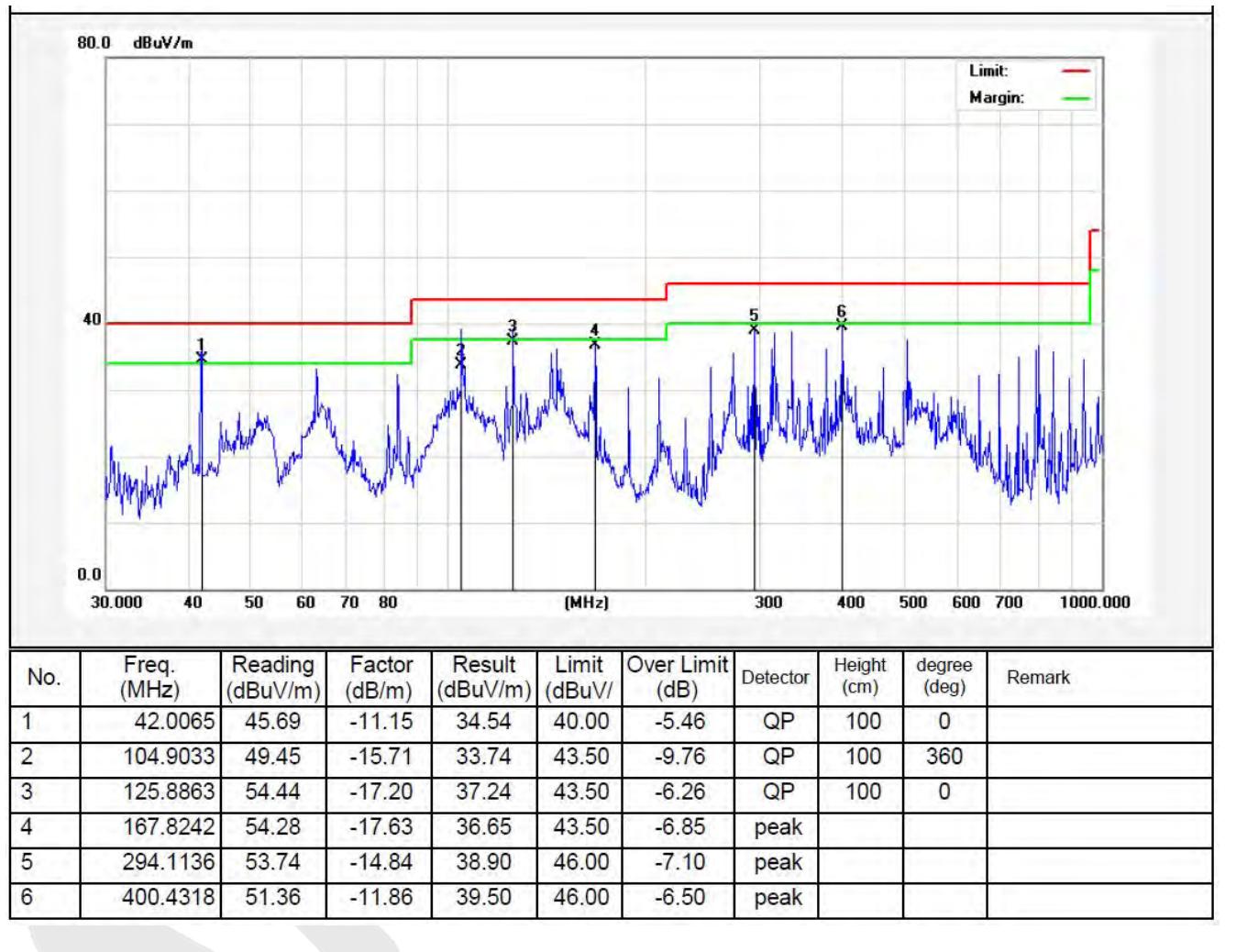
#### 4.6.4. Test Results

Please refer to the following pages.

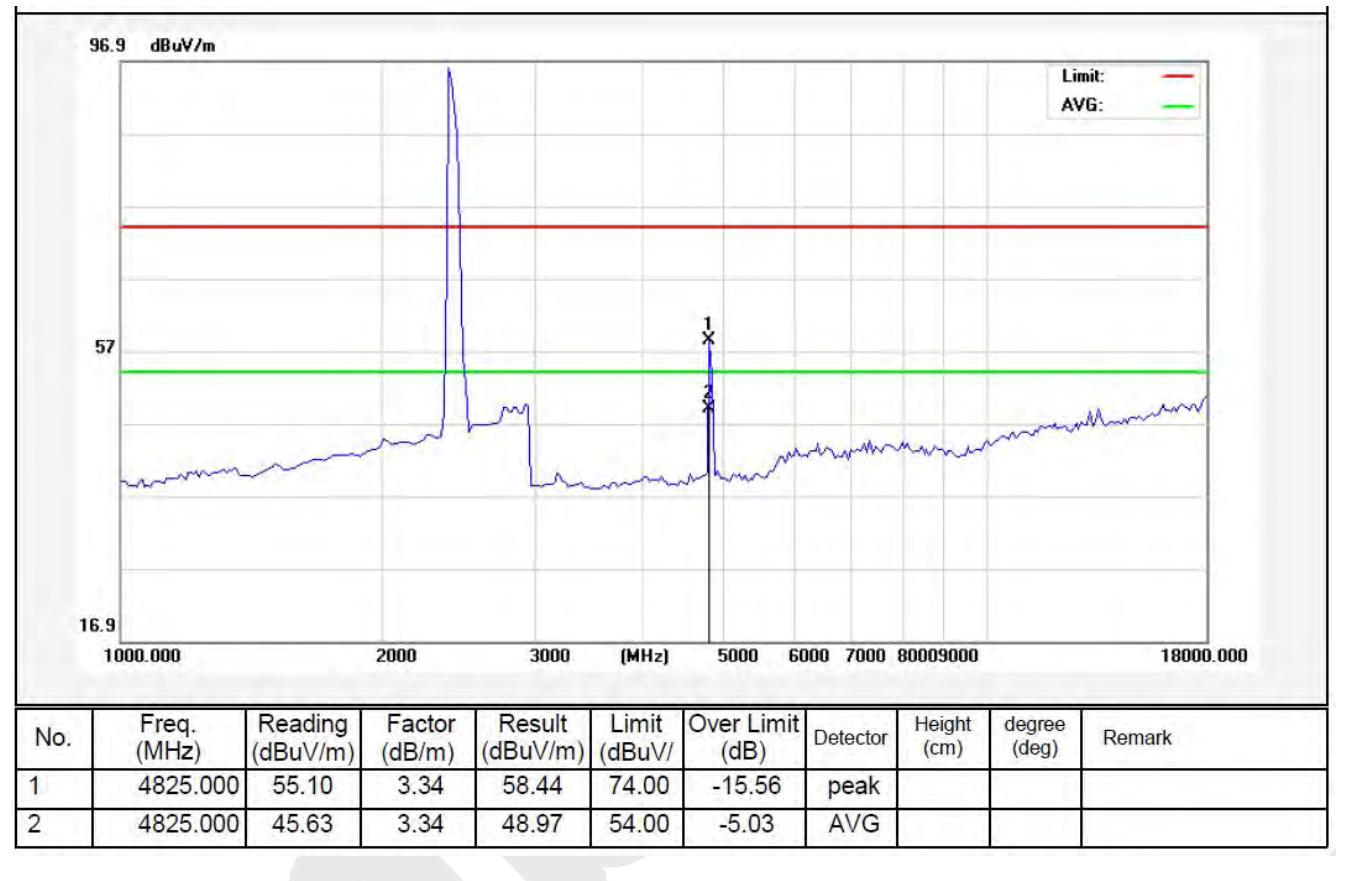
Job No.:	011505103I	Polarization:	Horizontal
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Test Mode:	On	Distance:	3m



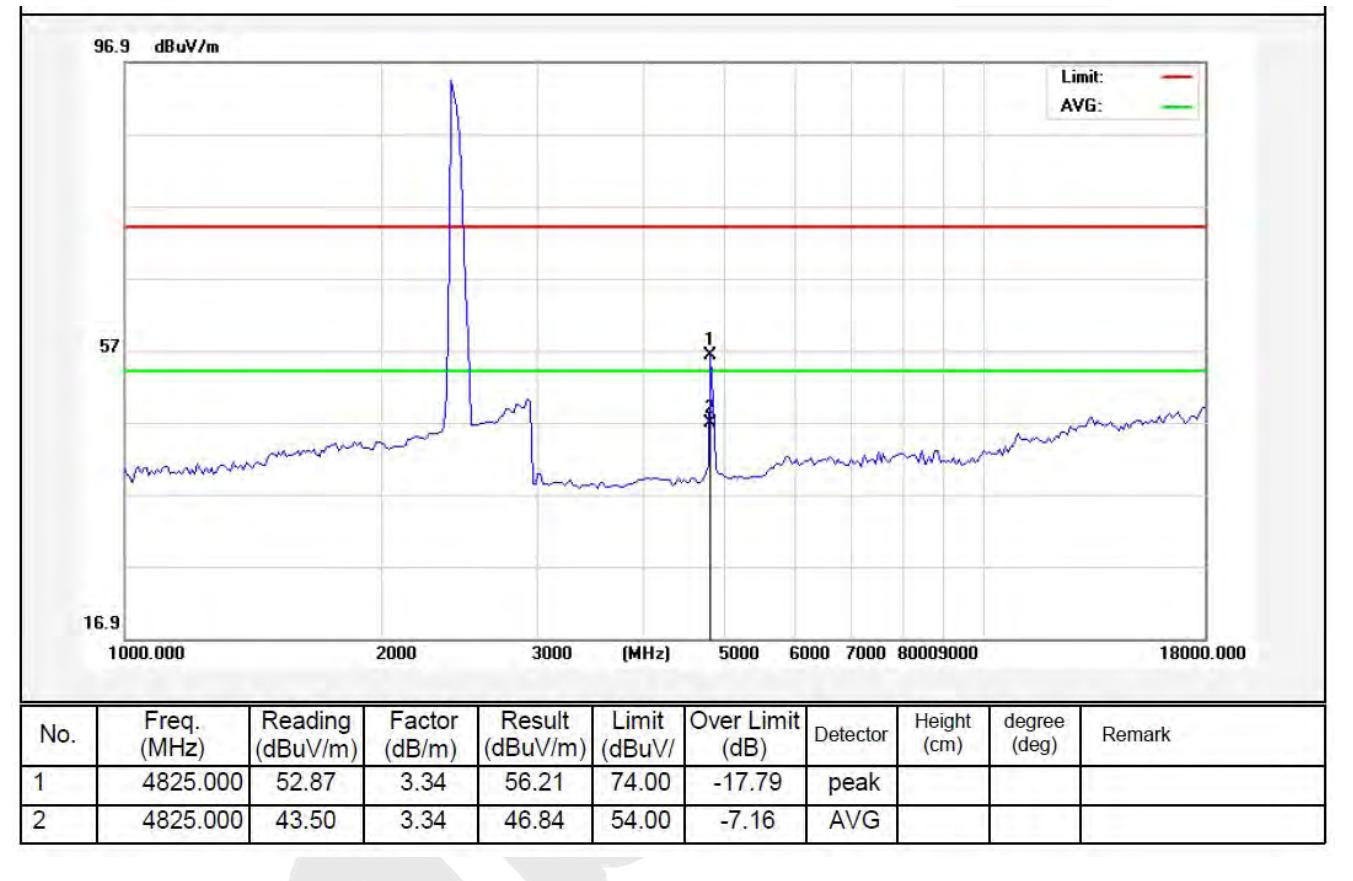
Job No.:	011505103I	Polarization:	Vertical
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Test Mode:	On	Distance:	3m



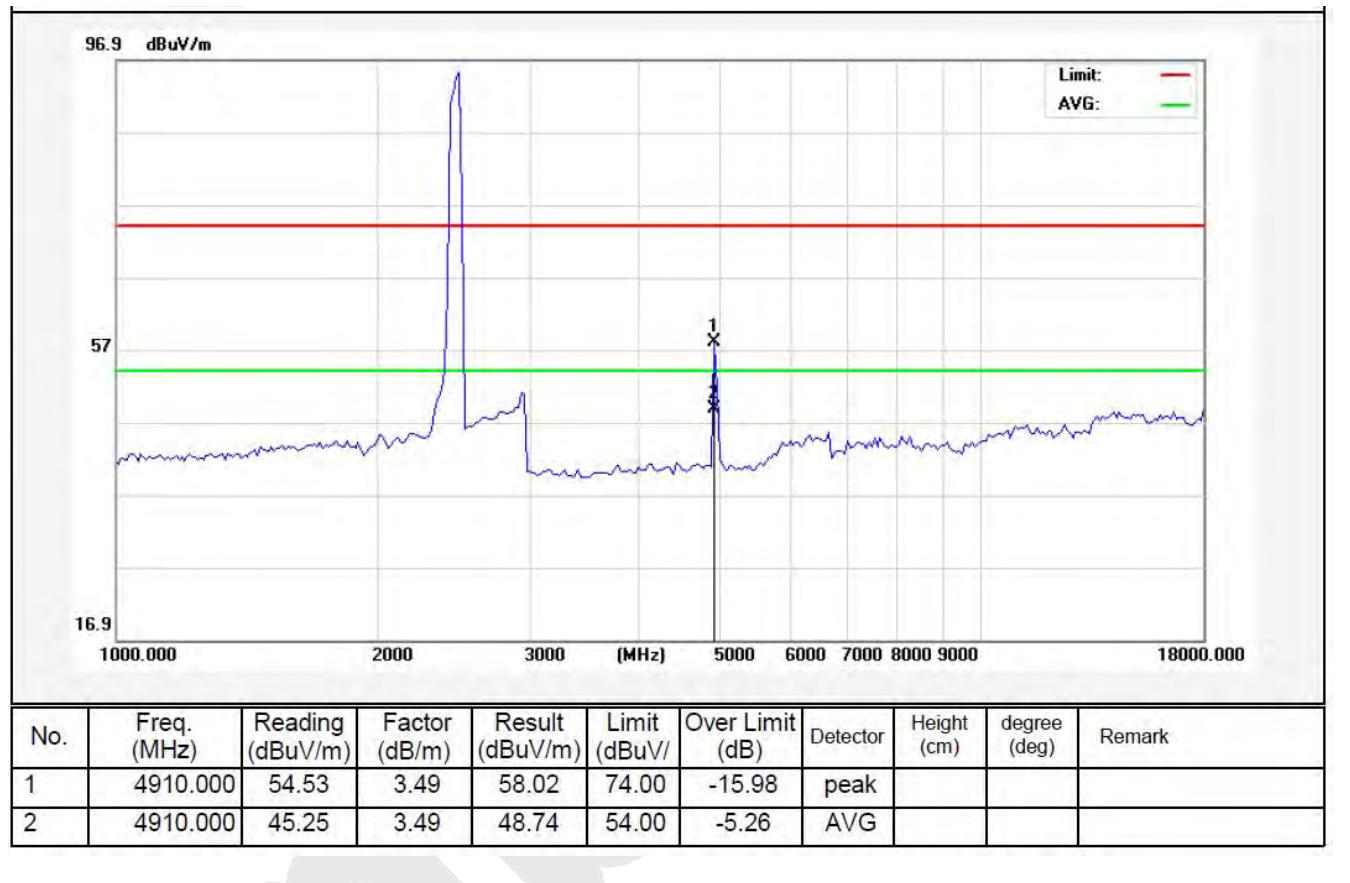
Job No.:	011505103I	Polarization:	Horizontal
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	802.11b(2412MHz)	Distance:	3m



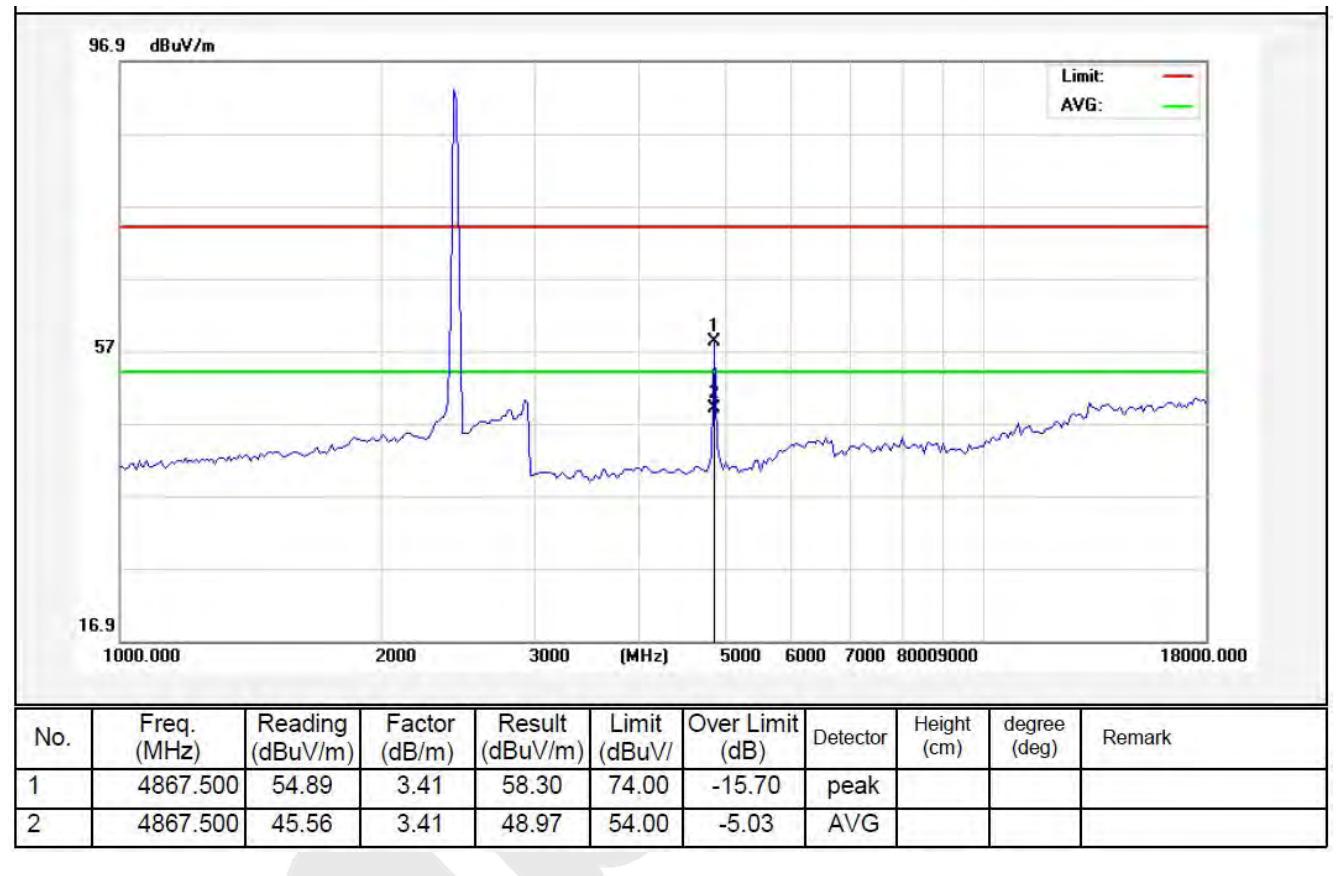
Job No.:	011505103I	Polarization:	Vertical
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	802.11b(2412MHz)	Distance:	3m



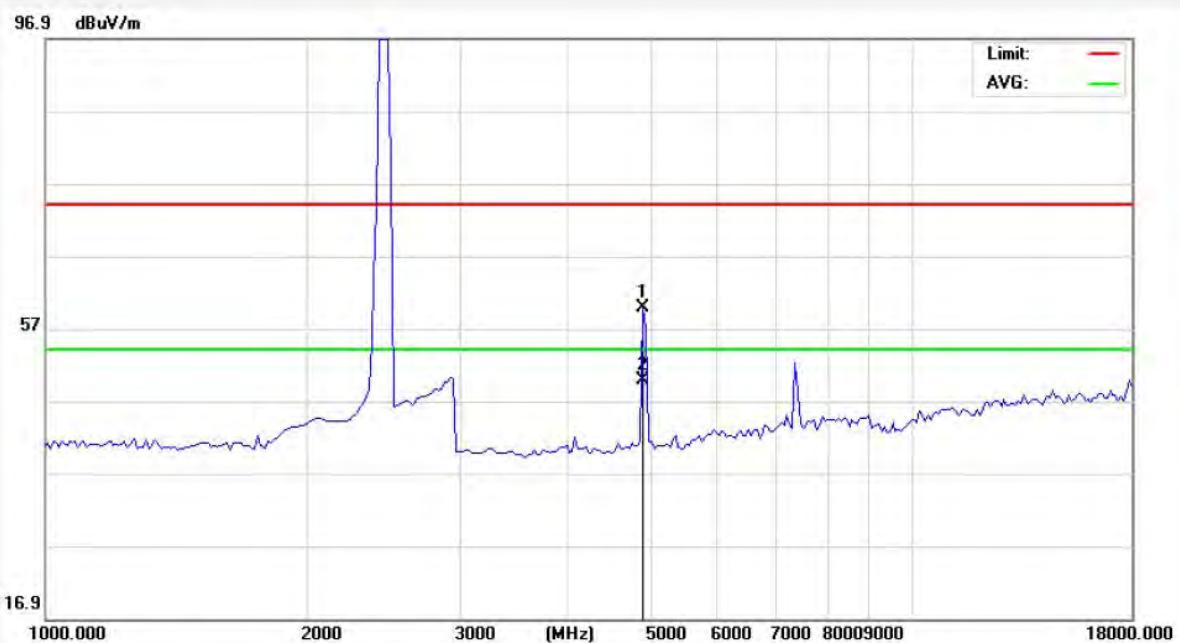
Job No.:	011505103I	Polarization:	Horizontal
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	802.11b(2437MHz)	Distance:	3m



Job No.:	011505103I	Polarization:	Vertical
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	802.11b(2437MHz)	Distance:	3m

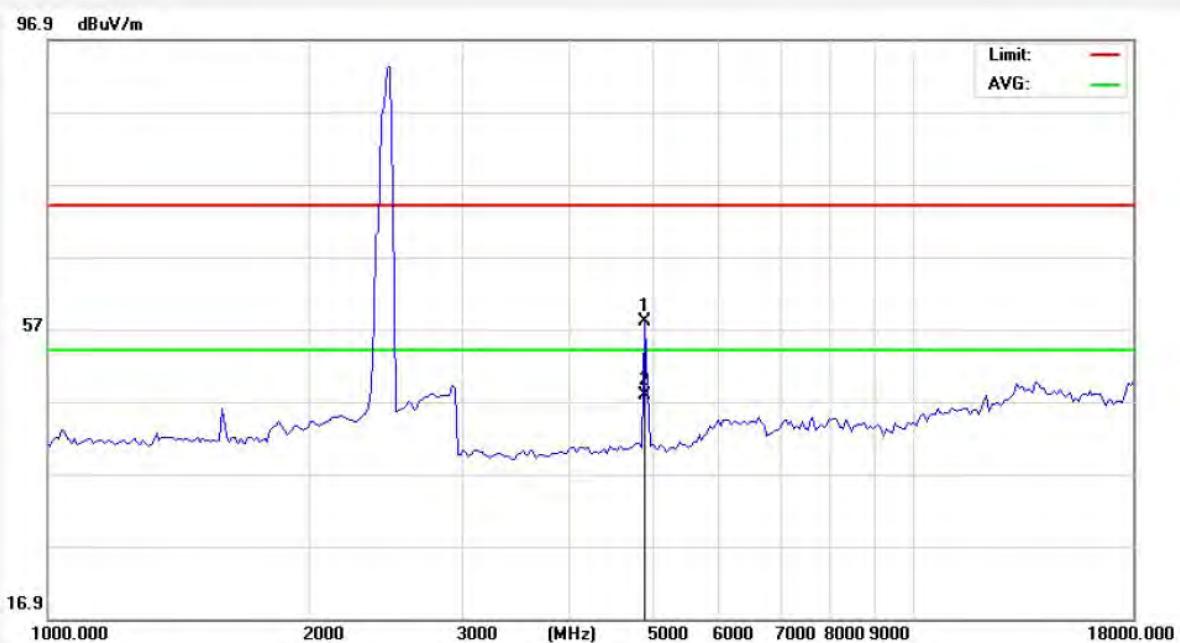


Job No.:	011505103I	Polarization:	Horizontal
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	802.11b(2462MHz)	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4910.000	56.37	3.49	59.86	74.00	-14.14	peak			
2	4910.000	46.25	3.49	49.74	54.00	-4.26	AVG			

Job No.:	011505103I	Polarization:	Vertical
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	802.11b(2462MHz)	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4902.300	54.46	3.48	57.94	74.00	-16.06	peak			
2	4902.300	44.36	3.48	47.84	54.00	-6.16	AVG			

## 5. ANTENNA APPLICATION

### 5.1. Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

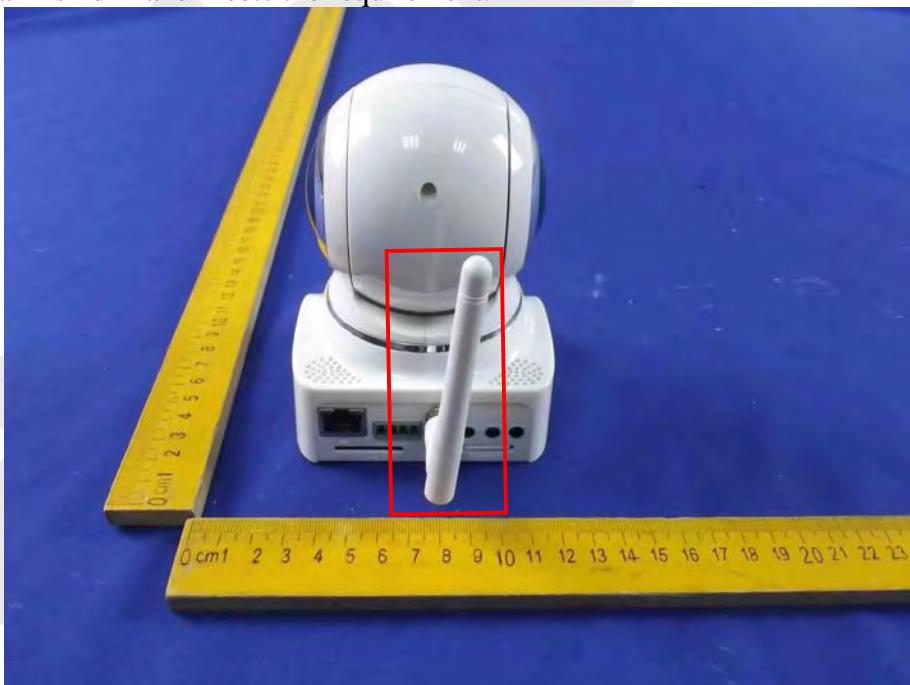
### 5.2. Result

The EUT's antenna used a external antenna which is permanently attached.

The antenna connector type is SMA Male, which is a right hand threads, the antenna is tailor-made, so it can't be changed easily.

The other side is snap-in type, which connected to the WIFI module, and can't be loosen easy, and only in full force can pull it out.

The antenna's gain is 2dBi and meets the requirement.



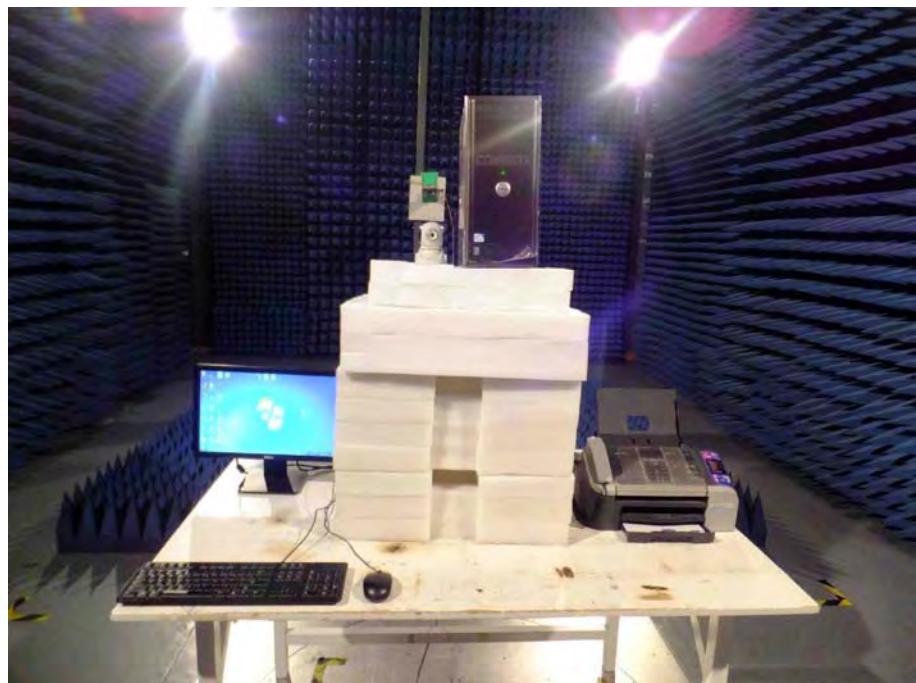
## 6. PHOTOGRAPH

### 6.1. Photo of Conducted Emission Measurement



### 6.2. Photo of Radiation Emission Test





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## APPENDIX I (EXTERNAL PHOTOS)

Figure 1  
The EUT-Overall View



Figure 2  
The EUT-Top View



Figure 3  
The EUT-Bottom View

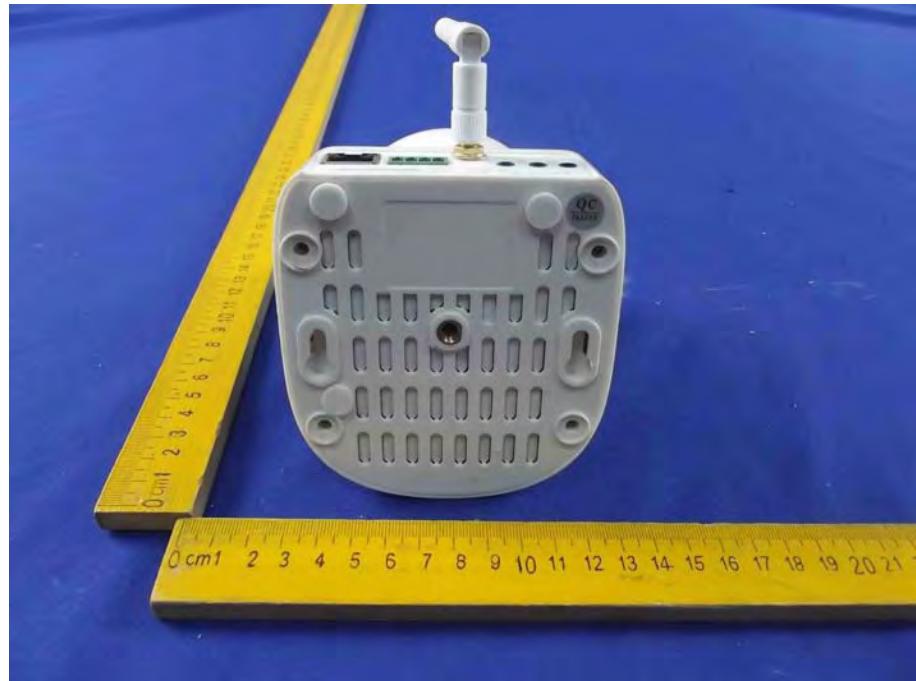


Figure 4  
The EUT-Front View



Figure 5  
The EUT-Back View



Figure 6  
The EUT-Right View



Figure 7  
The EUT-Left View



## APPENDIX II (INTERNAL PHOTOS)

Figure 8  
The EUT-Inside View

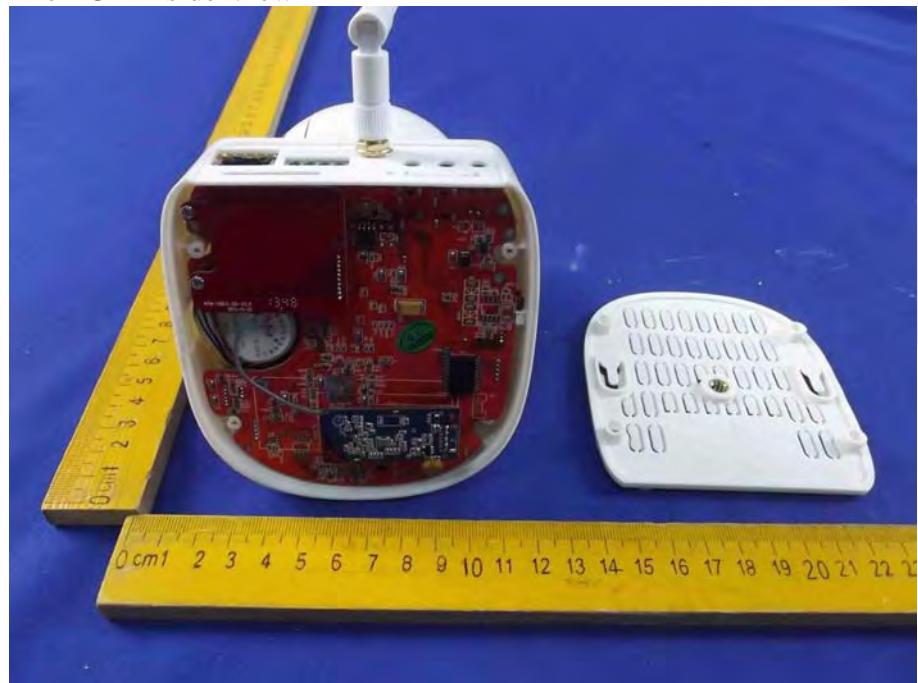


Figure 9  
The EUT-Inside View

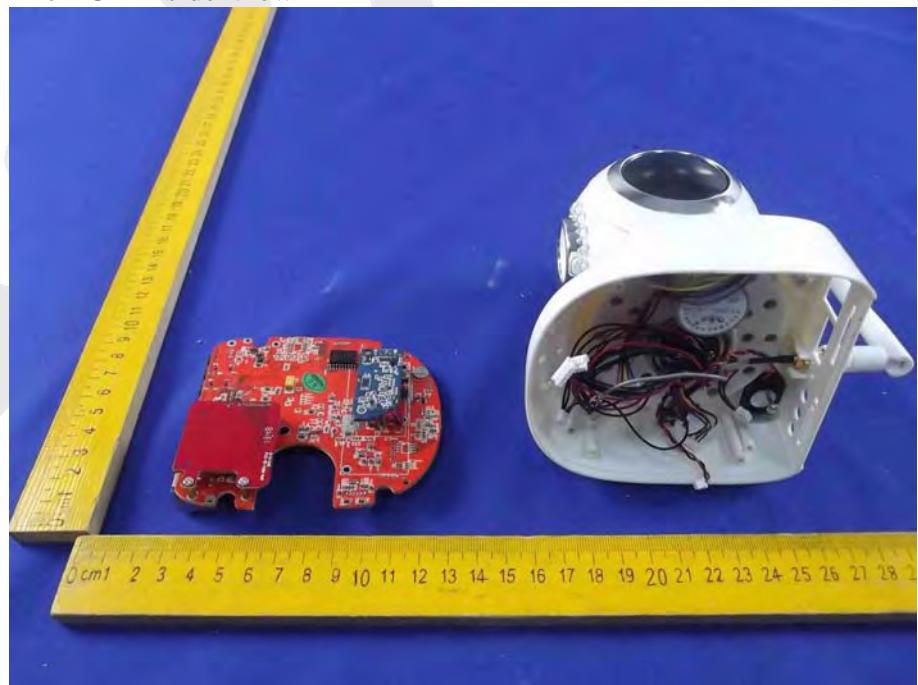


Figure 10  
PCB of the EUT-Front View



Figure 11  
PCB of the EUT-Front View

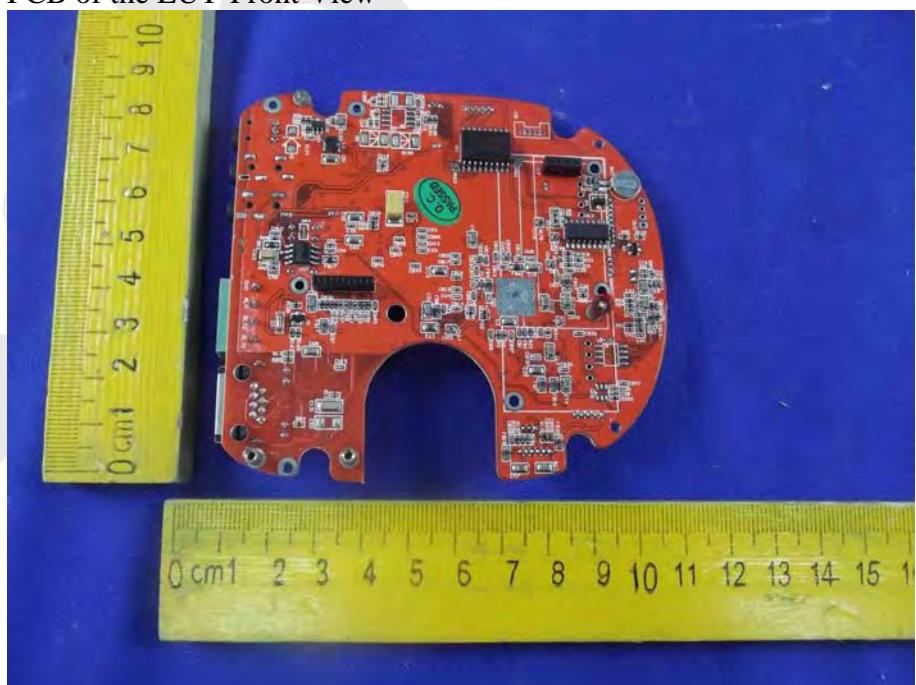


Figure 12  
PCB of the EUT-Back View

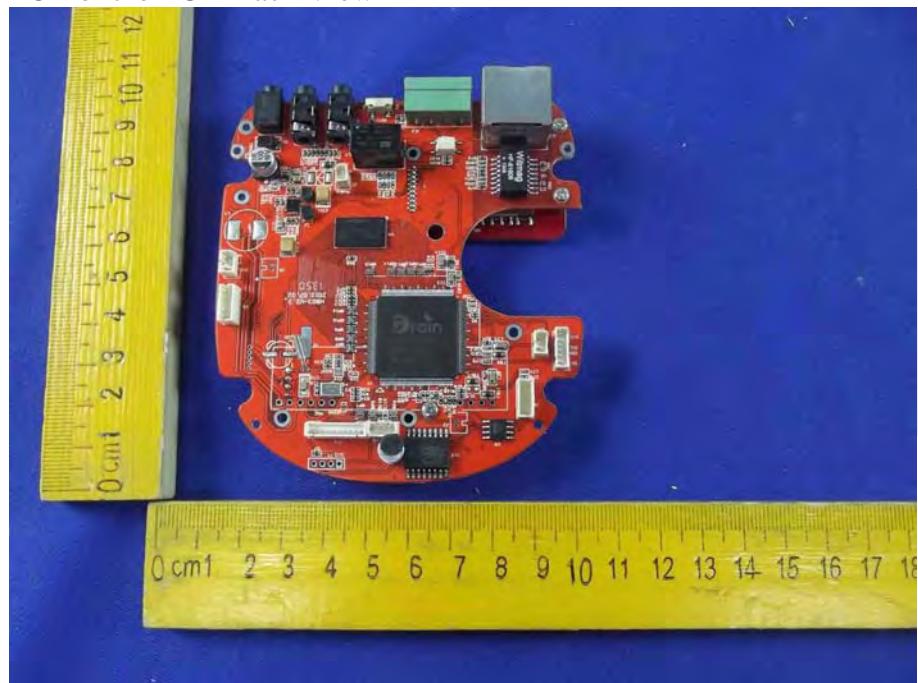


Figure 13  
PCB of the EUT-Front View

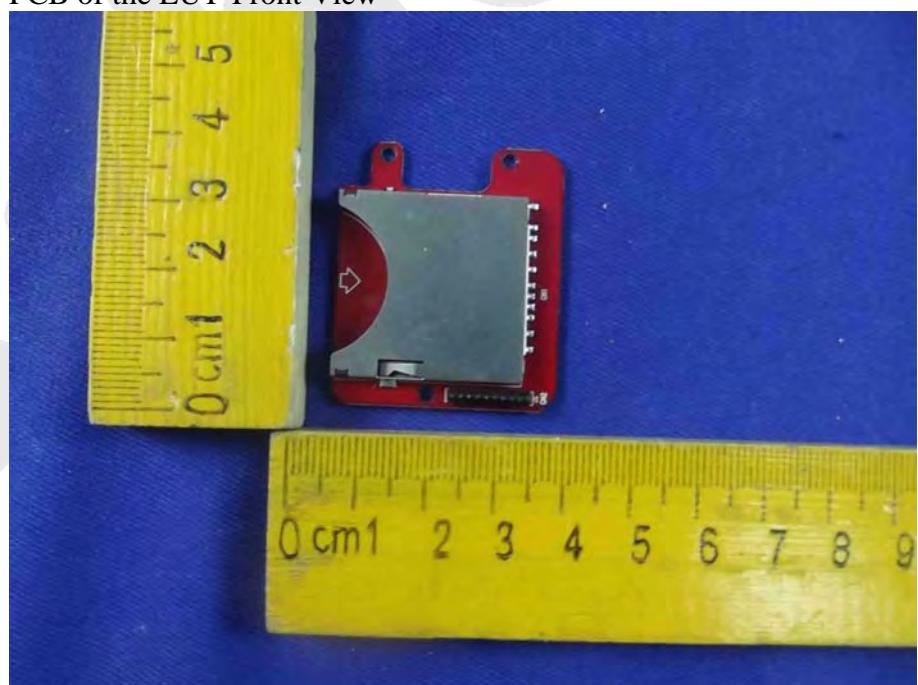


Figure 14  
PCB of the EUT-Back View

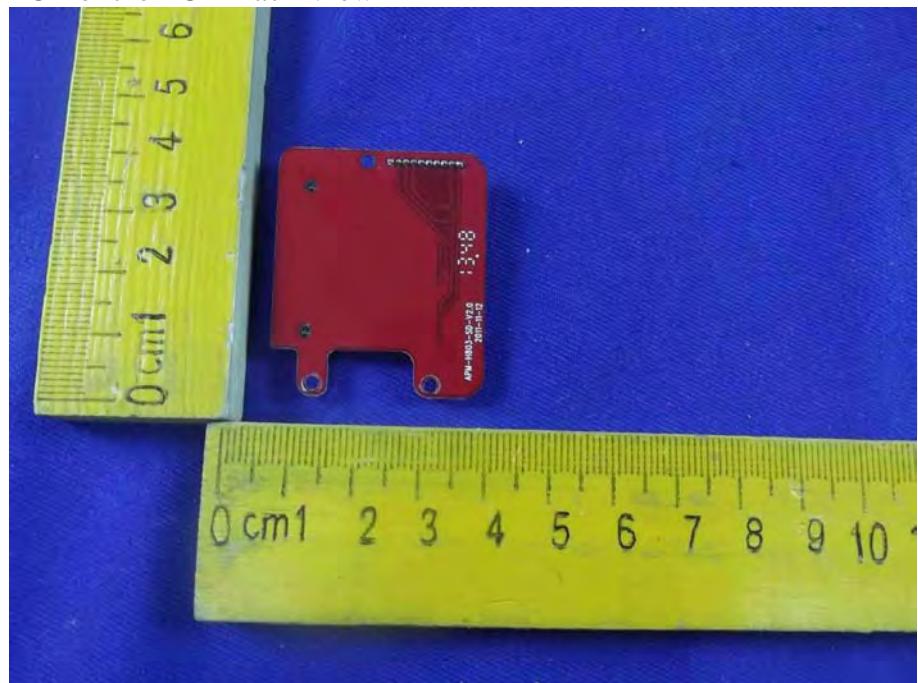


Figure 15  
PCB of the EUT-Front View

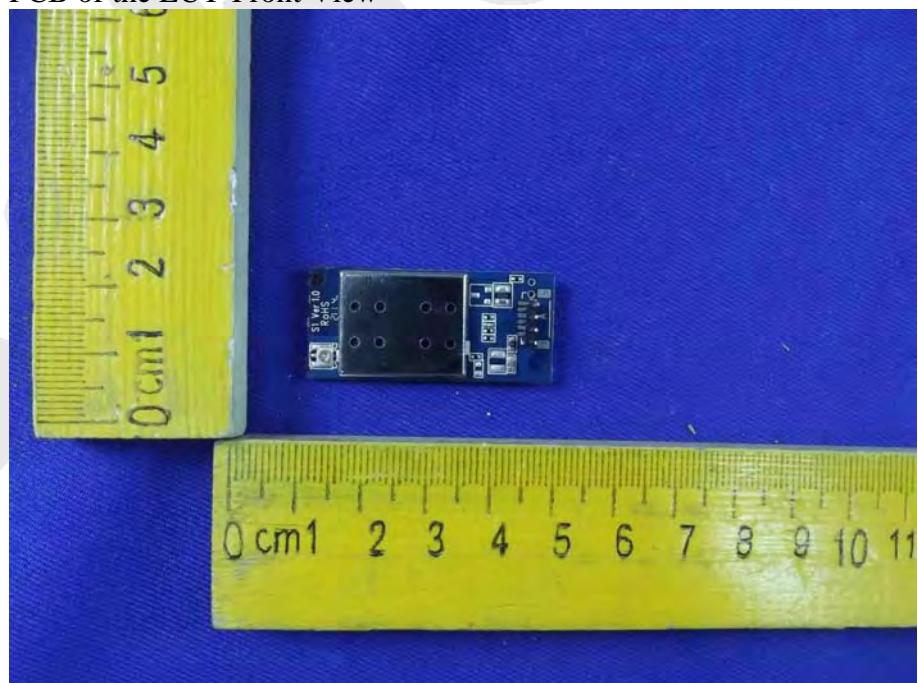


Figure 16  
PCB of the EUT-Back View

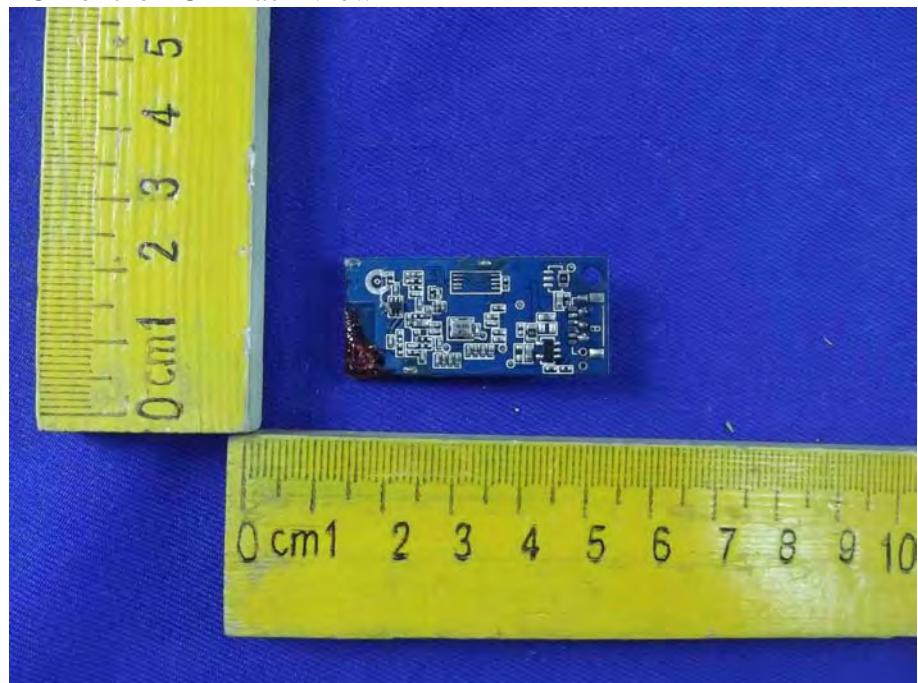


Figure 17  
PCB of the EUT-Front View

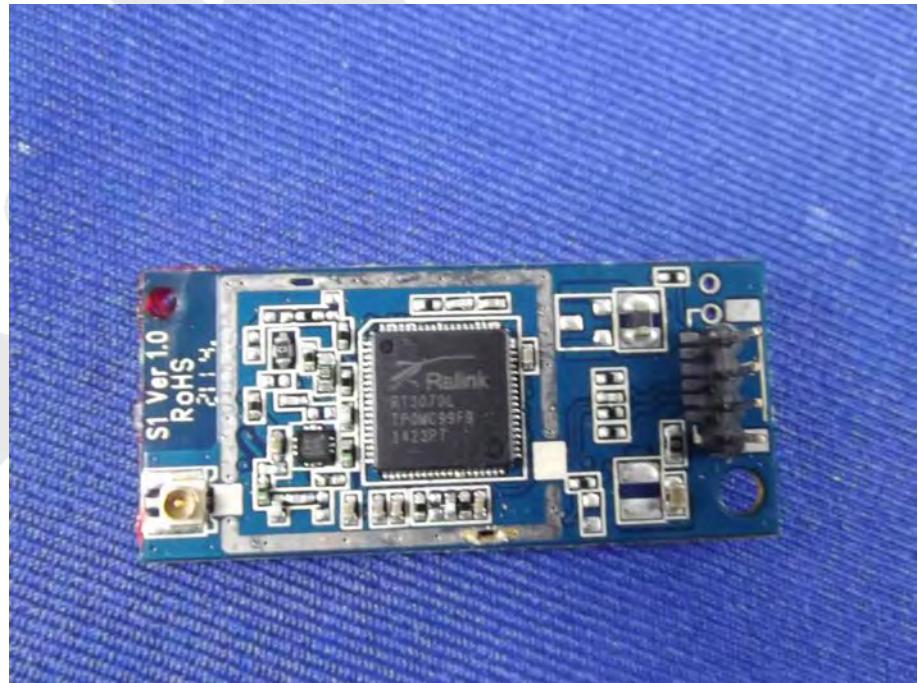
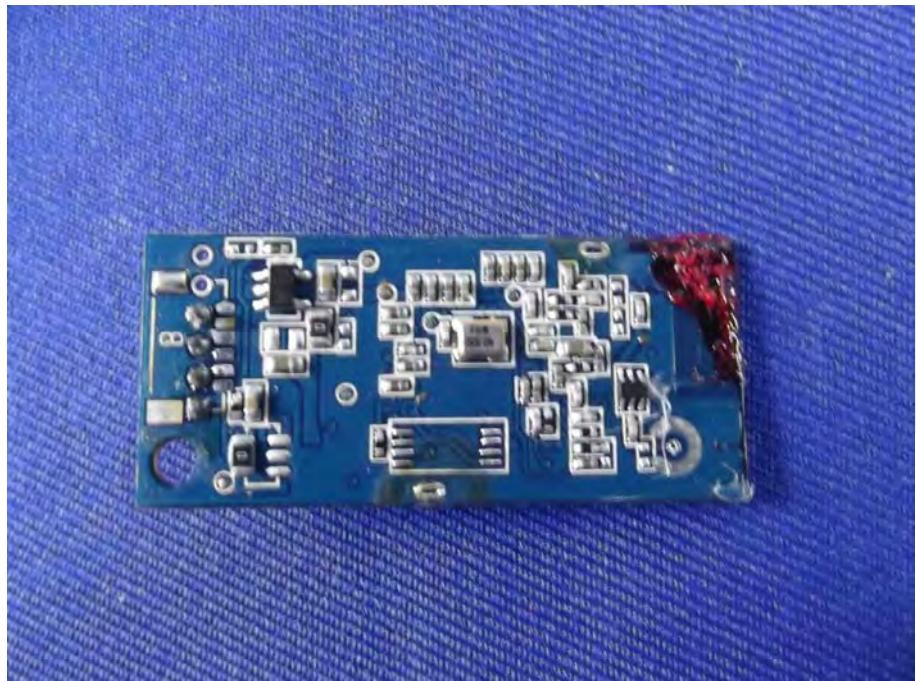


Figure 18  
PCB of the EUT-Back View



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