

# FCC PART 15C TEST REPORT



Issued to

**SGP Technologies S.A.**

For

**Smartphone**

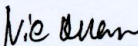
Model Name: BP1  
Trade Name: N/A  
Brand Name: blackphone  
FCC ID: 2ACDKBP1  
Standard: 47 CFR Part 15 Subpart C  
Test date: 2014-06-24 to 2014-07-23  
Issue date: 2014-07-23

by

**Shenzhen Morlab Communications Technology Co., Ltd.**

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ShenZhen, GuangDong Province, P. R. China 518101

Tested by



Nie Quan  
(Test Engineer)

Date 2014.7.23

Approved by

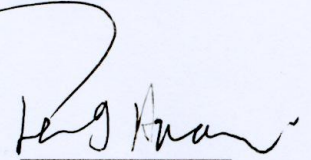


Zeng Dexin  
(Chief Engineer)

Date

2014.7.23

Reviewed by



Peng Huarui  
(Dept. Manager)

Date

2014.7.23

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Change History		
Issue	Date	Reason for change
1.0	July 23, 2014	First Edition

## 1. General Information

### 1.1. EUT Description

<b>EUT Type</b> ..... :	Smartphone
<b>Serial No.</b> .....	(n.a, marked #1 by test site)
<b>Hardware Version</b> ..... :	1.0
<b>Software Version</b> ..... :	V07
<b>Applicant</b> ..... :	SGP Technologies S.A. Rue du 31 Decembre, 47, Geneva, Switzerland.
<b>Manufacturer</b> .....	Tinno Mobile Technology Corp. 4/F.,H-3 Building,OCT Eastern Industrial Park. NO.1 XiangShan East Road.,Nan Shan District,Shenzhen,P.R.China.
<b>Frequency Range</b> ..... :	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz 802.11n-40MHz: 2.422GHz - 2.452GHz
<b>Channel Number</b> .....	802.11b/g/n-20MHz: 11 802.11n-40MHz: 7
<b>Modulation Type</b> ..... :	DSSS, OFDM
<b>Antenna Type</b> .....	PIFA Antenna
<b>Antenna Gain</b> ..... :	0.5dBi

**Note :**

1. The EUT is a Smartphone, it contains WIFI Module operating at 2.4GHz ISM; it supports 802.11b, 802.11g, 802.11n and they are all tested in this report.
2. For 802.11b/g/n-20MHz (2.4GHz band), the frequencies allocated is  $F \text{ (MHz)} = 2412 + 5 \times (n-1)$  ( $1 \leq n \leq 11$ ). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2412MHz), 6 (2437MHz) and 11 (2462MHz).  
For 802.11n-40MHz, the frequencies allocated is  $F \text{ (MHz)} = 2412 + 5 \times (n-1)$  ( $3 \leq n \leq 9$ ). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 3 (2422MHz), 6 (2437MHz) and 9 (2452MHz).
3. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.
4. The antenna connector of EUT is designed with permanent attachment and no consideration of replacement.



## 1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Wi-Fi, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-13 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.203	Antenna Requirement	<u>PASS</u>
2	15.247(b)	Peak Output Power	<u>PASS</u>
3	15.247(a)	Bandwidth	<u>PASS</u>
4	15.247(d)	Conducted Spurious Emission and Band Edge	<u>PASS</u>
5	15.247(d)	Restricted Frequency Bands	<u>PASS</u>
6	15.207	Conducted Emission	<u>PASS</u>
7	15.209 , 15.247(d)	Radiated Emission	<u>PASS</u>
8	15.247(e)	Power spectral density (PSD)	<u>PASS</u>
9	15.247(i), 1.1307 & 2.1093	RF exposure evaluation	<u>PASS</u>

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.4 2009.

These RF tests were performed according to the method of measurements prescribed in KDB558074 D01 v03r01 (04/09/2013).

## 1.3. Facilities and Accreditations

### 1.3.1. Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2009, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

### 1.3.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

## 2. 47 CFR Part 15C Requirements

### 2.1. Antenna requirement

#### 2.1.1. Applicable Standard

According to FCC 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.

#### 2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

### 2.2. Peak Output Power

#### 2.2.1. Requirement

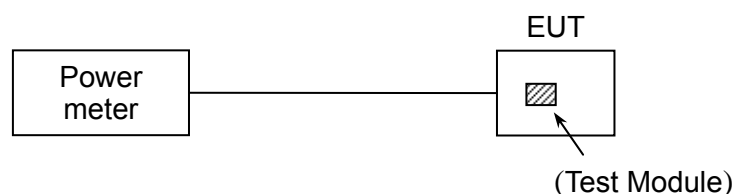
According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

#### 2.2.2. Test Description

KDB 558074 Section 9.1.3 was used in order to prove compliance.

The measured output power was calculated by the reading of the Power Meter and calibration.

#### A. Test Setup:



The EUT (Equipment under the test) which is powered by the Battery is coupled to the Power Meter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading, all test result in power meter.



**B. Equipments List:**

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
USB Wideband Power Sensor	Agilent	U2021XA	MY52280010	2014.02.26	2015.02.25

**2.2.3. Test Result**

The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

**2.2.3.1. 802.11b Test Mode**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	16.04	0.040179	30	1	PASS
6	2437	17.12	0.051523			PASS
11	2462	18.20	0.066069			PASS

**2.2.3.2. 802.11g Test mode**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	19.73	0.093972	30	1	PASS
6	2437	20.23	0.105439			PASS
11	2462	20.34	0.108143			PASS

**2.2.3.3. 802.11n-20MHz Test mode**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	18.22	0.066374	30	1	PASS
6	2437	18.40	0.069183			PASS
11	2462	18.57	0.071945			PASS

**2.2.3.4. 802.11n-40MHz Test mode**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	23.25	0.211349	30	1	PASS
6	2437	23.66	0.232274			PASS
9	2452	23.79	0.239332			PASS

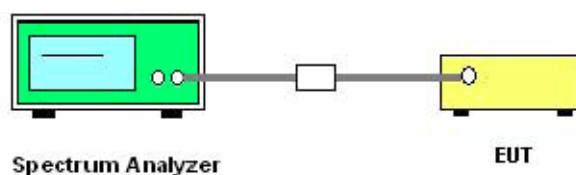
## 2.3. Bandwidth

### 2.3.1. Requirement

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

### 2.3.2. Test Description

#### A. Test Set:



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

KDB 558074 Section 8.1 Option 1 was used in order to prove compliance.

#### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E7405A	US44210471	2014.02.26	2015.02.25
EXA Signal Analyzer	Agilent	N9010A	MY51440152	2014.02.26	2015.02.25

### 2.3.3. Test Result

The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the Module.

### 2.3.3.1. 802.11b Test mode

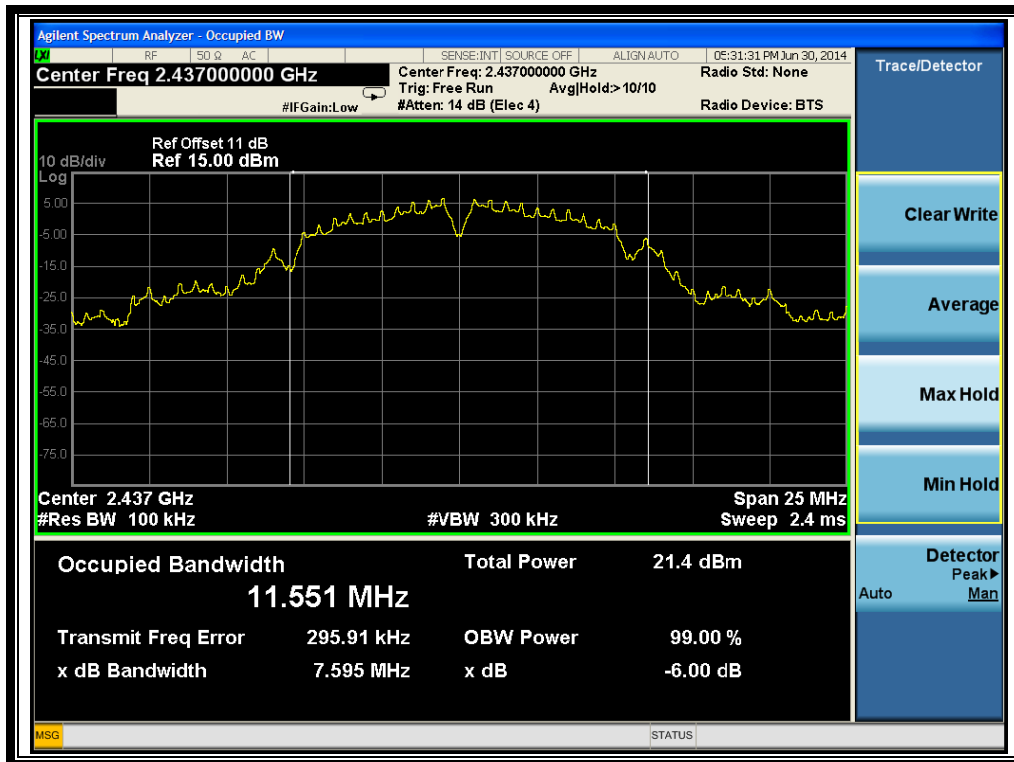
#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	7.077	≥500	PASS
6	2437	7.595	≥500	PASS
11	2462	7.571	≥500	PASS

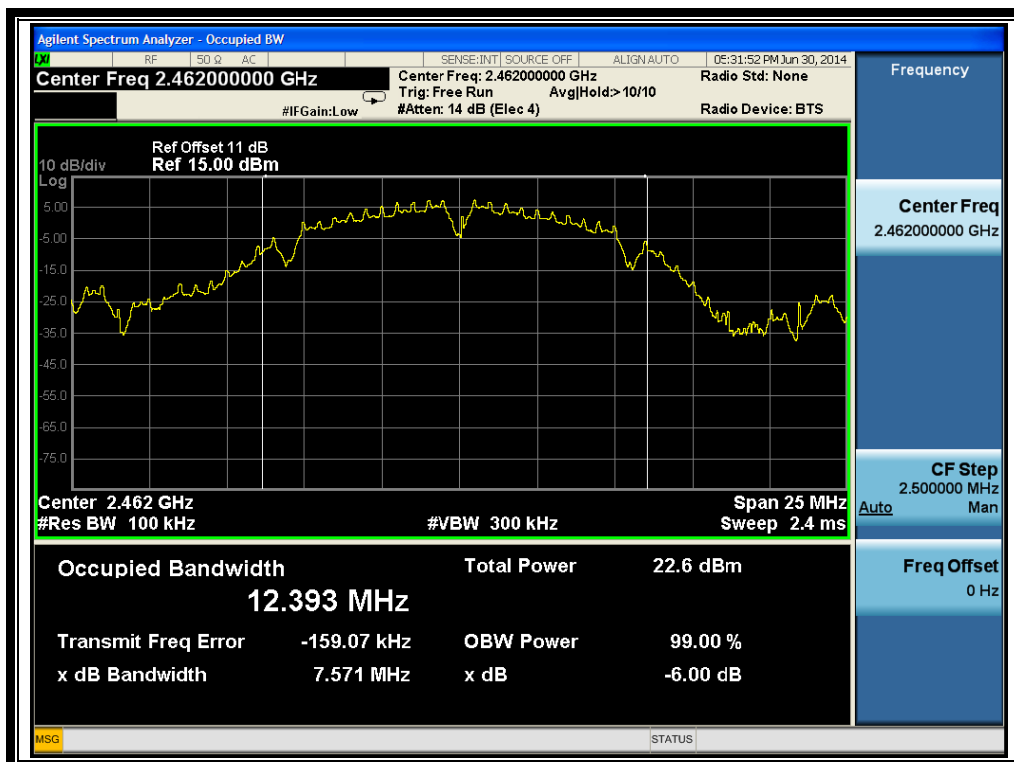
#### B. Test Plots



(Channel 1: 2412MHz @ 802.11b)



(Channel 6: 2437 MHz @ 802.11b)



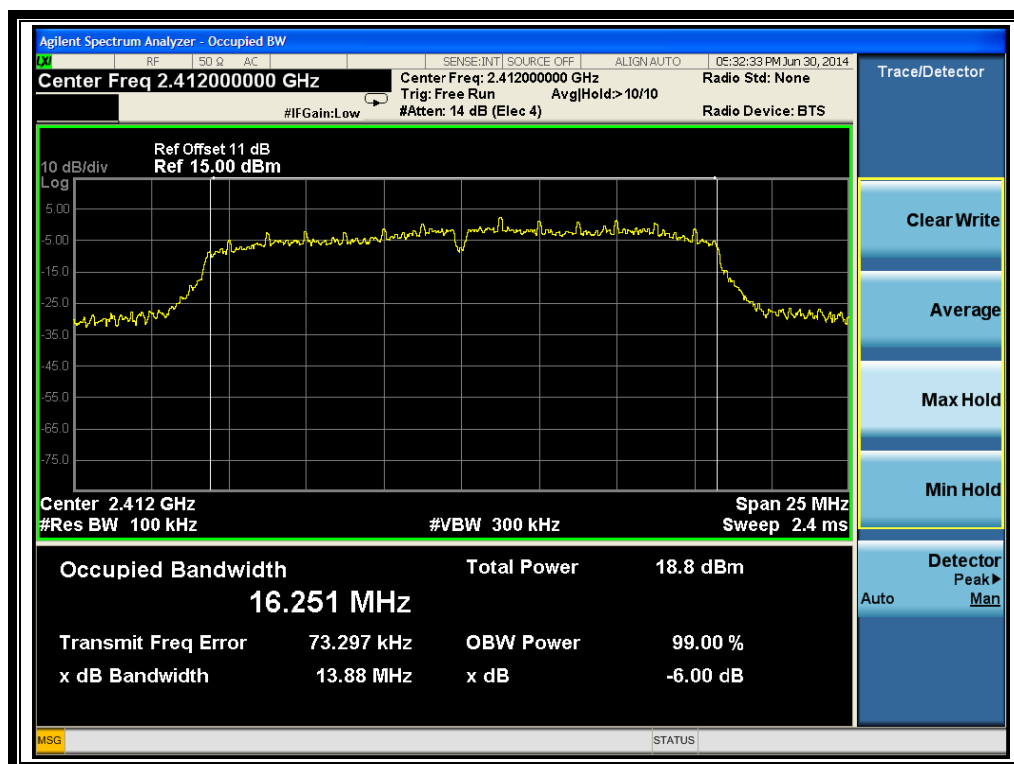
(Channel 11: 2462MHz @ 802.11b)

### 2.3.3.2. 802.11g Test mode

#### A. Test Verdict:

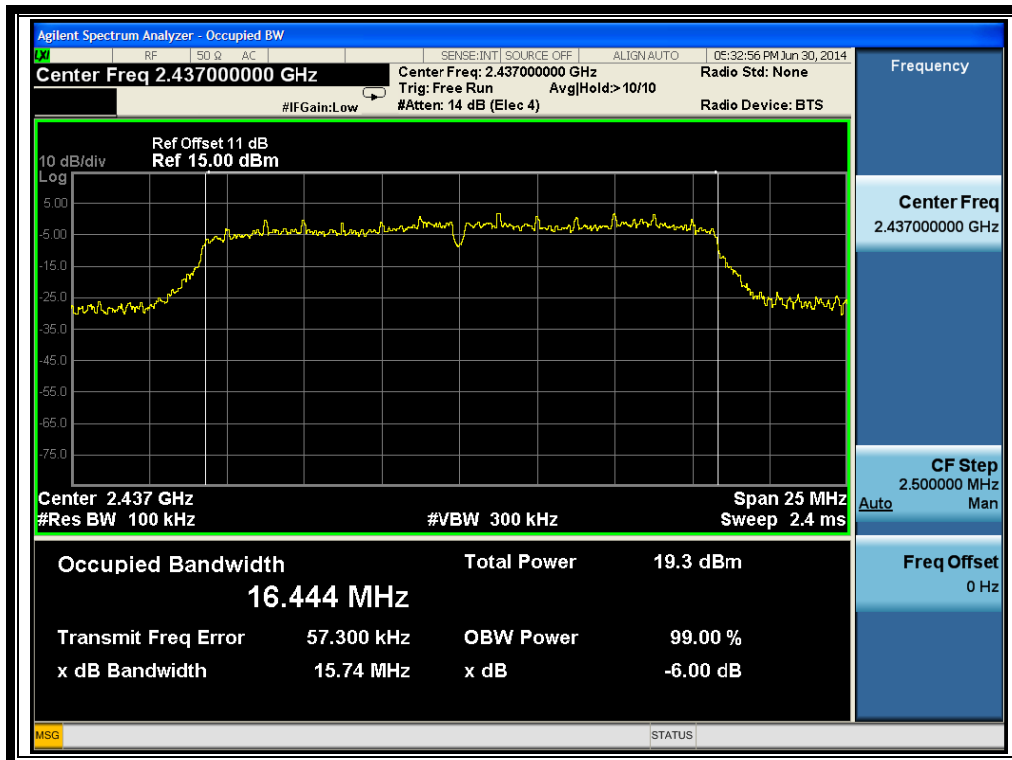
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	13.88	≥500	PASS
6	2437	15.74	≥500	PASS
11	2462	15.75	≥500	PASS

#### B. Test Plots:

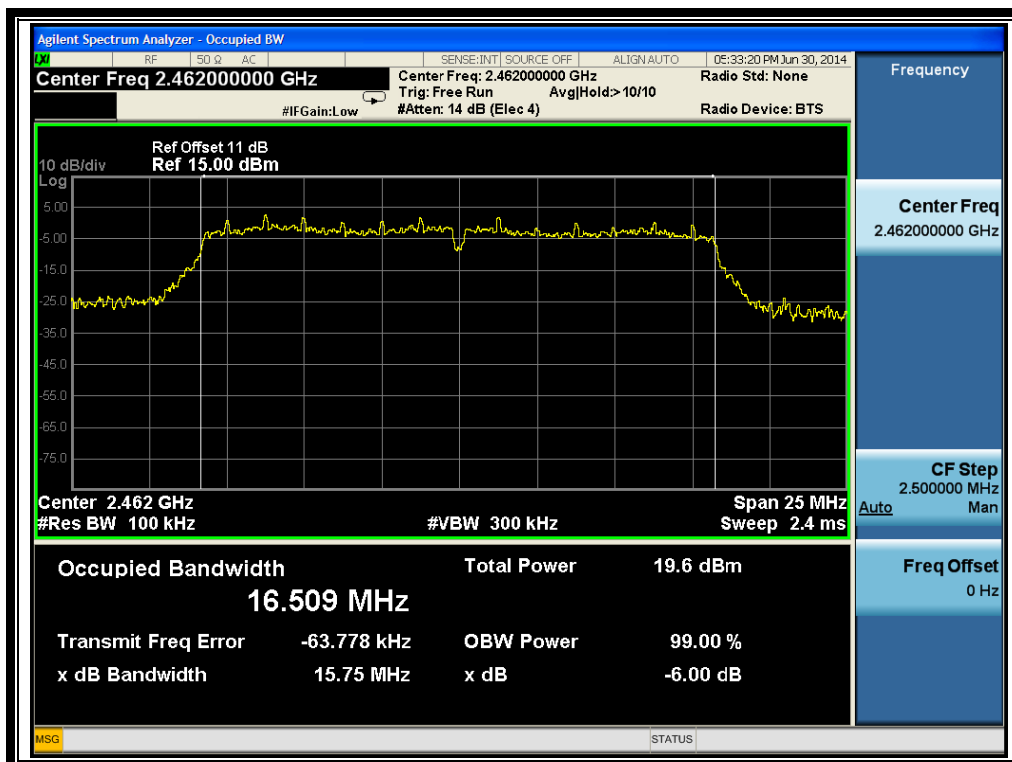


(Channel 1: 2412MHz @ 802.11g)





(Channel 6: 2437MHz @ 802.11g)



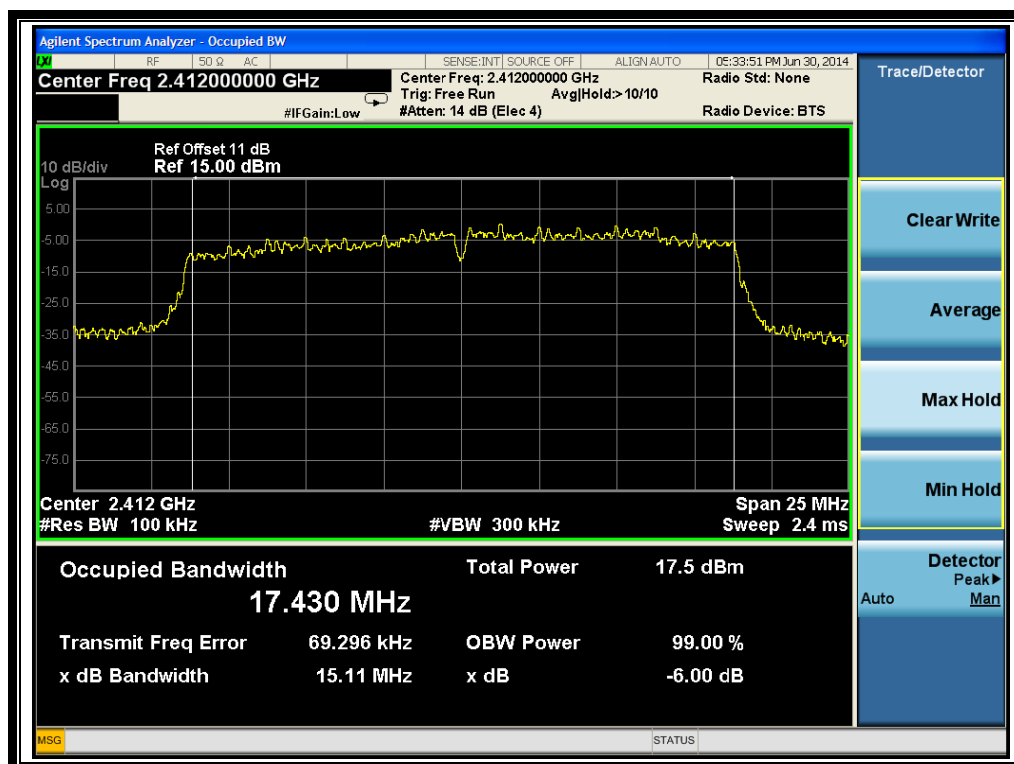
(Channel 11: 2462MHz @ 802.11g)

### 2.3.3.3. 802.11n-20 Test mode

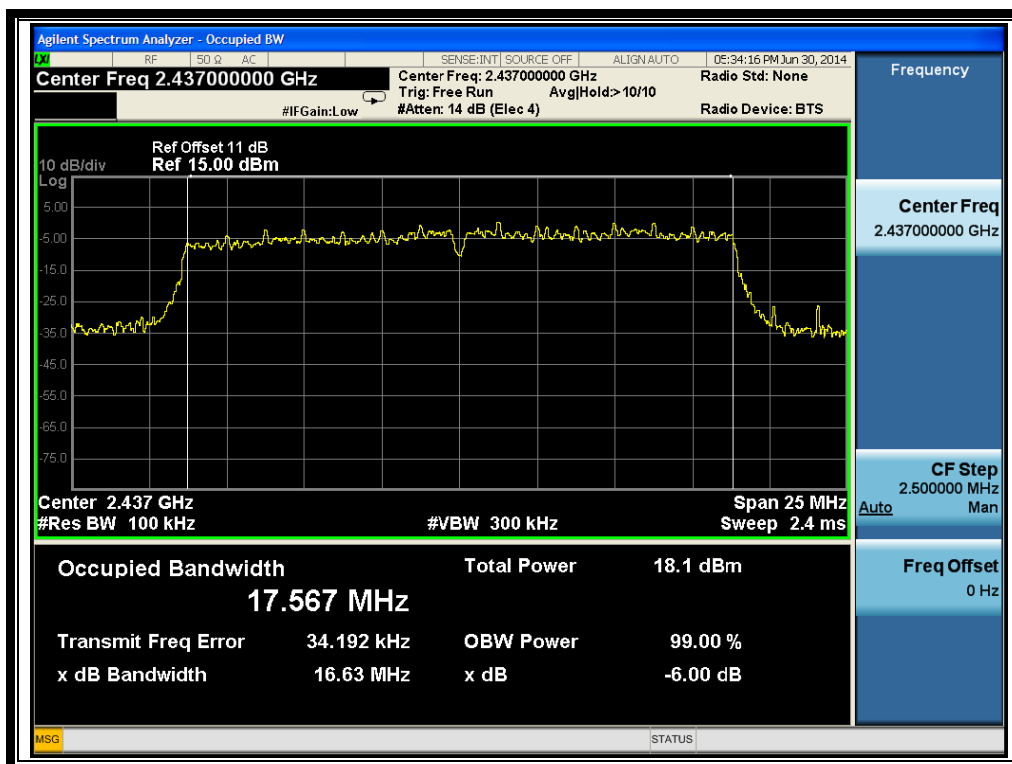
#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	15.11	≥500	PASS
6	2437	16.63	≥500	PASS
11	2462	17.66	≥500	PASS

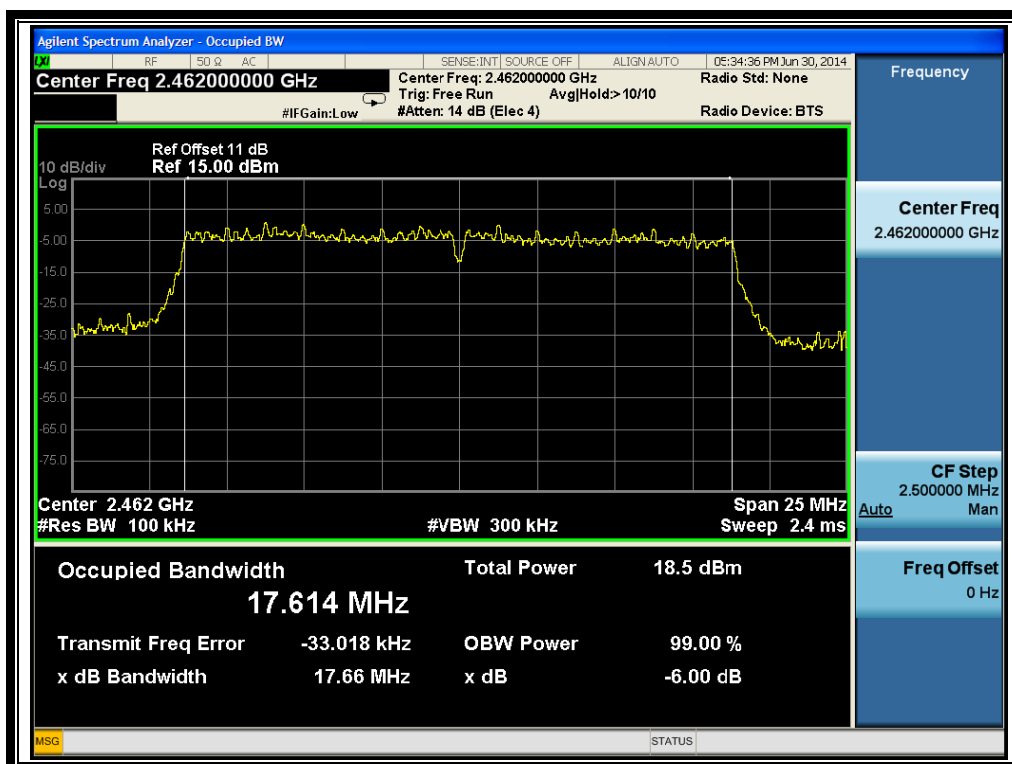
#### B. Test Plots:



(Channel 1: 2412MHz @ 802.11n-20)



(Channel 6: 2437MHz @ 802.11n-20)



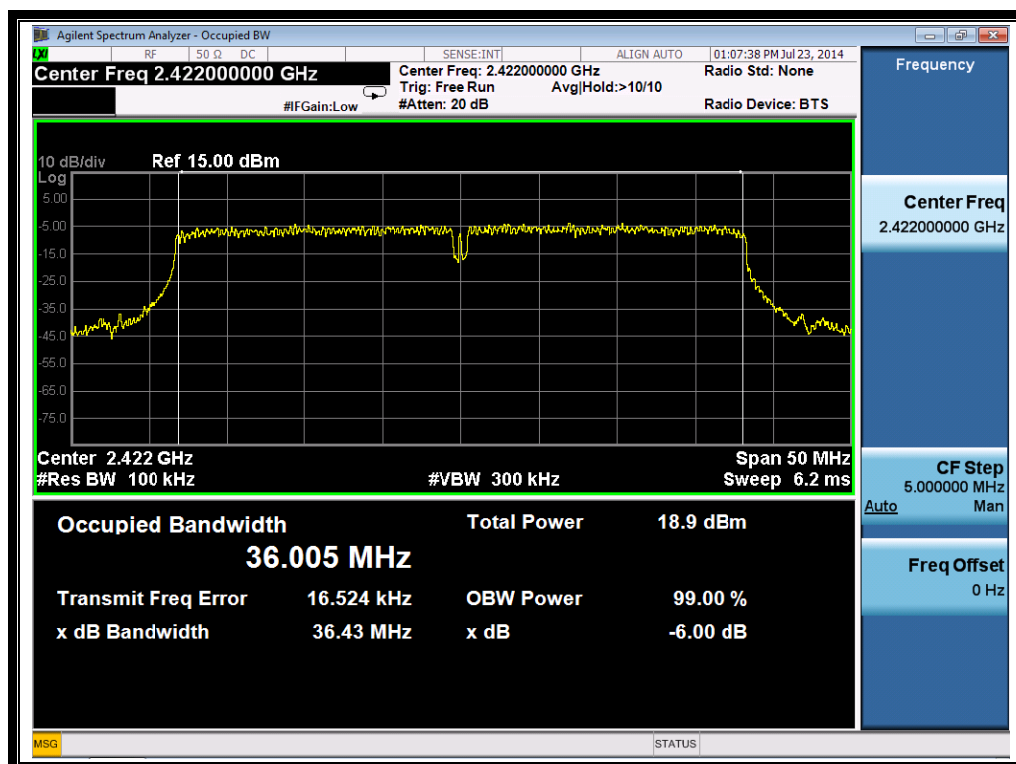
(Channel 11: 2462MHz @ 802.11n-20)

### 2.3.3.4. 802.11n-40 Test mode

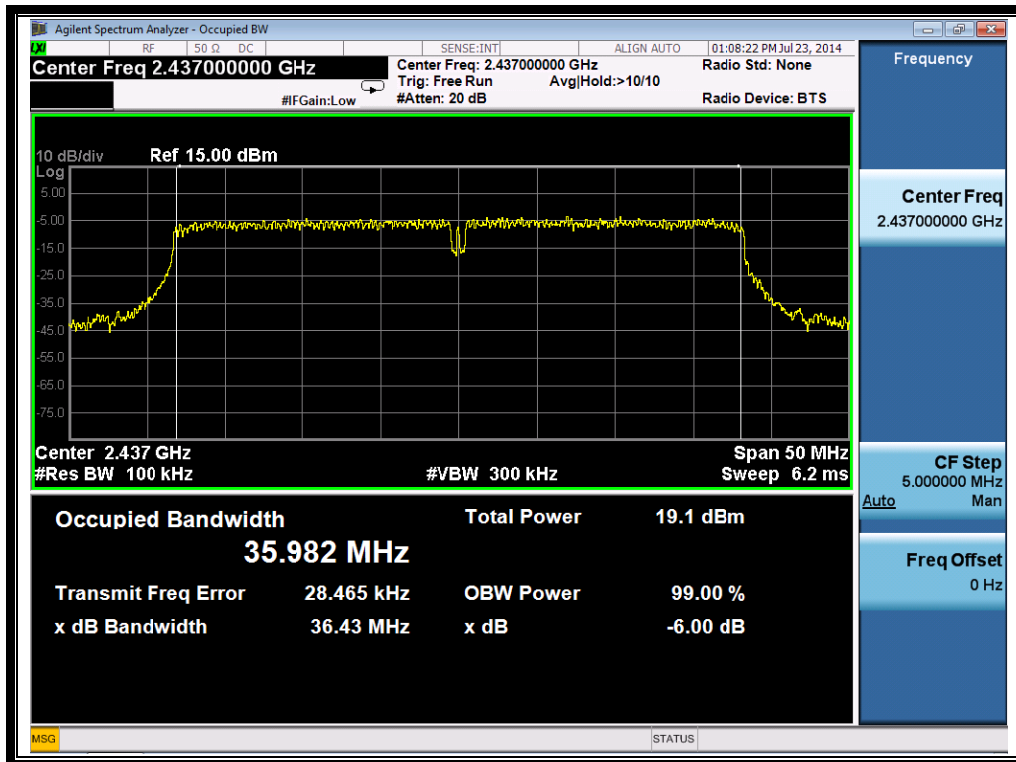
#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	36.43	≥500	PASS
6	2437	36.43	≥500	PASS
9	2452	36.42	≥500	PASS

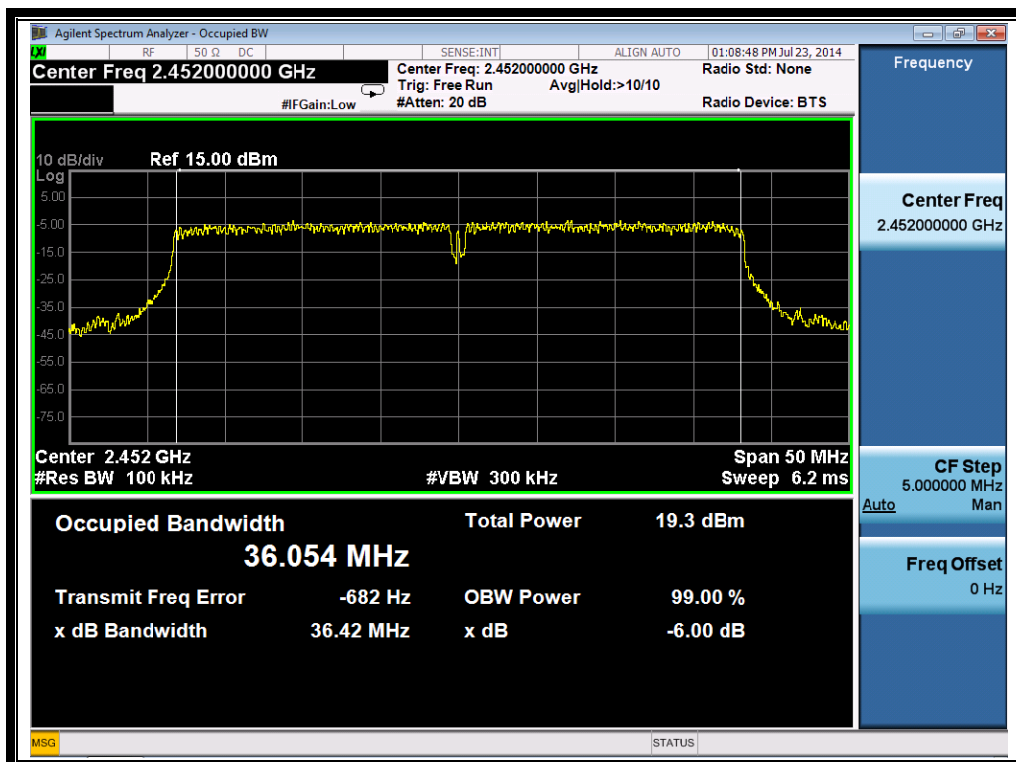
#### B. Test Plots:



(Channel 3: 2422MHz @ 802.11n-40)



(Channel 6: 2437MHz @ 802.11n-40)



(Channel 9: 2452MHz @ 802.11n-40)

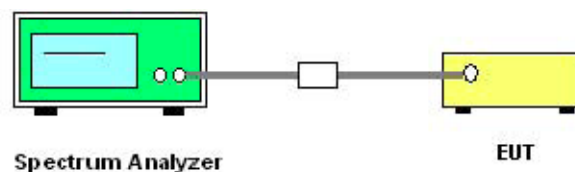
## 2.4. Conducted Spurious Emissions and Band Edge

### 2.4.1. Requirement

According to FCC section 15.247(c), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 2.4.2. Test Description

#### A. Test Set:



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

KDB 558074 Section 11.0 was used in order to prove compliance.

#### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E7405A	US44210471	2014.02.26	2015.02.25
EXA Signal Analyzer	Agilent	N9010A	MY51440152	2014.02.26	2015.02.25

### 2.4.3. Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.



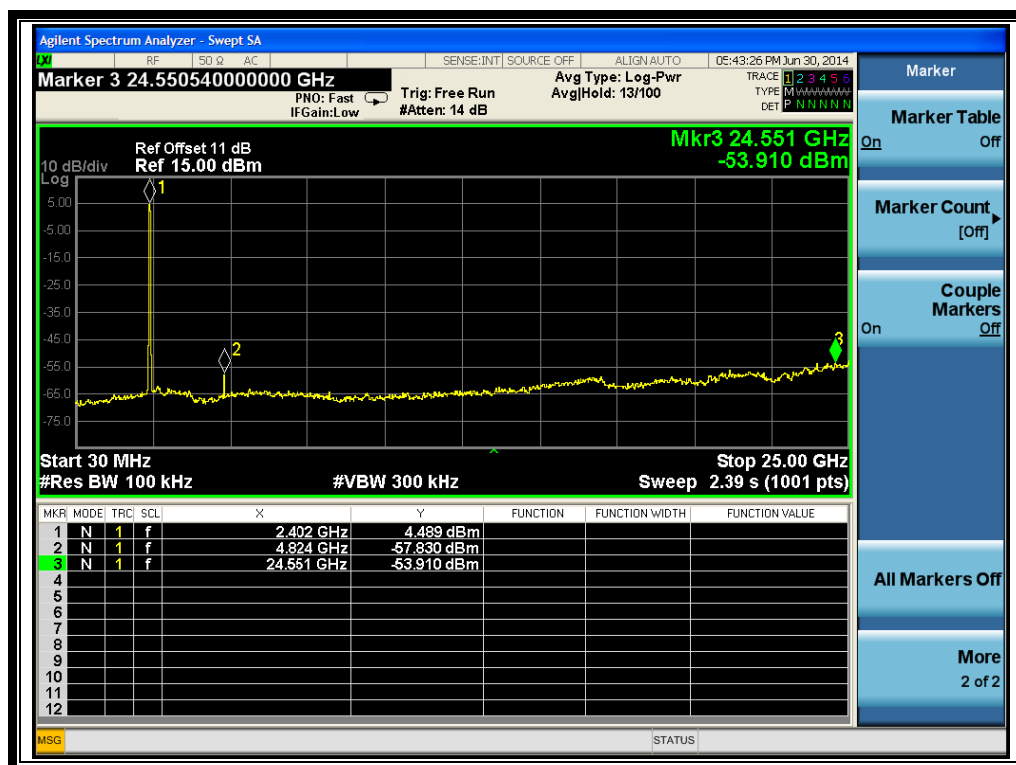
### 2.4.3.1. 802.11b Test mode

#### A. Test Verdict:

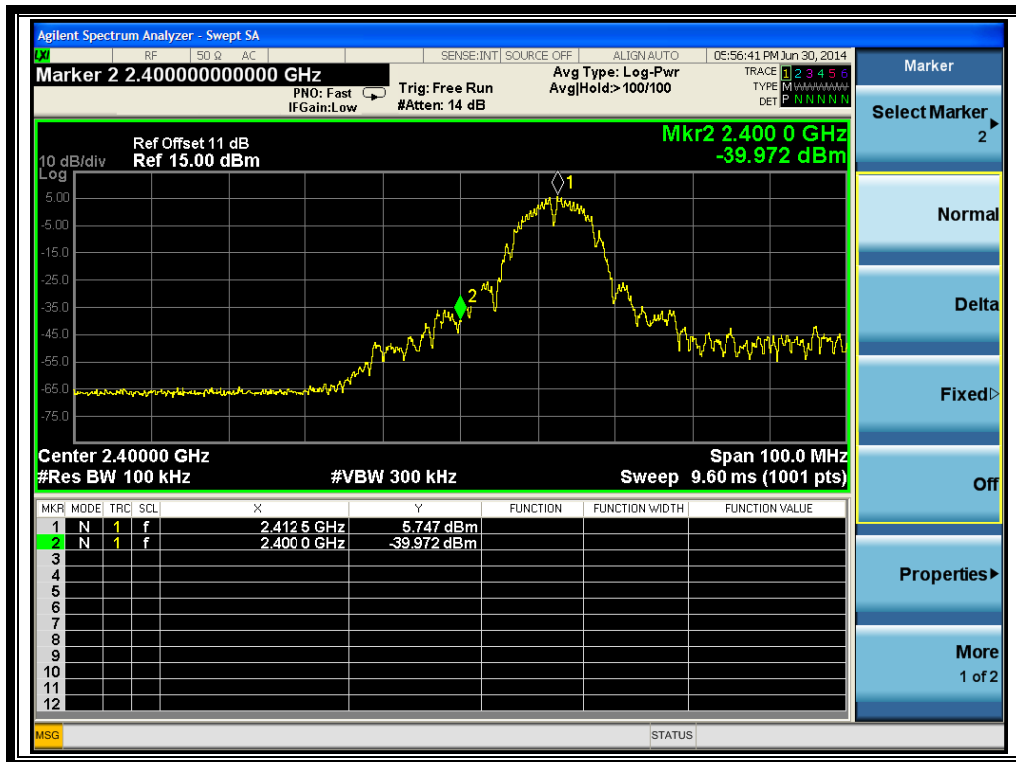
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-53.91	4.489	-15.5	PASS
6	2437	-53.112	6.003	-14.0	PASS
11	2462	-53.518	5.361	-14.6	PASS

#### B. Test Plots:

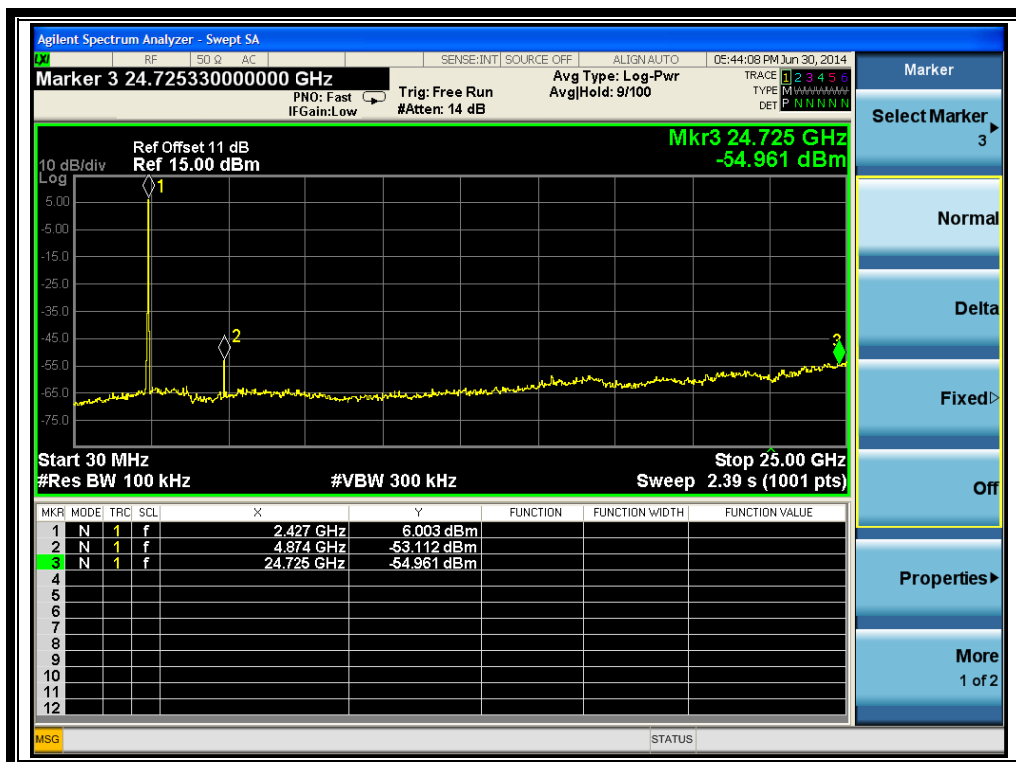
**Note:** the power of the Module transmitting frequency should be ignored.



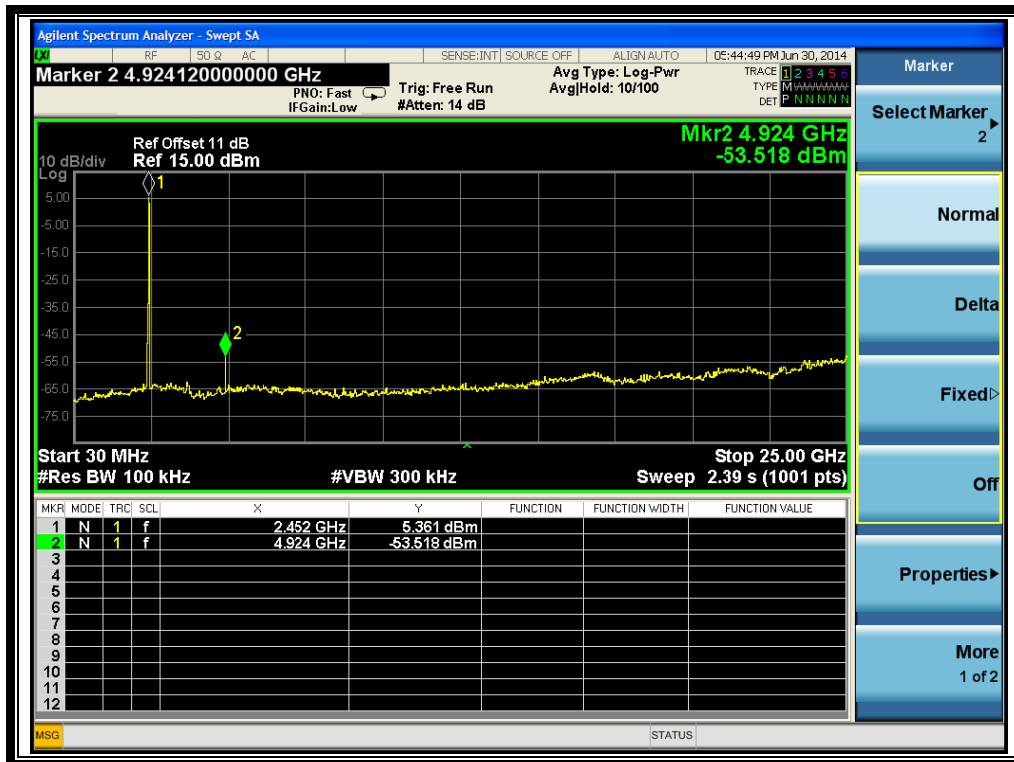
(Channel = 1, 30MHz to 25GHz)



(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

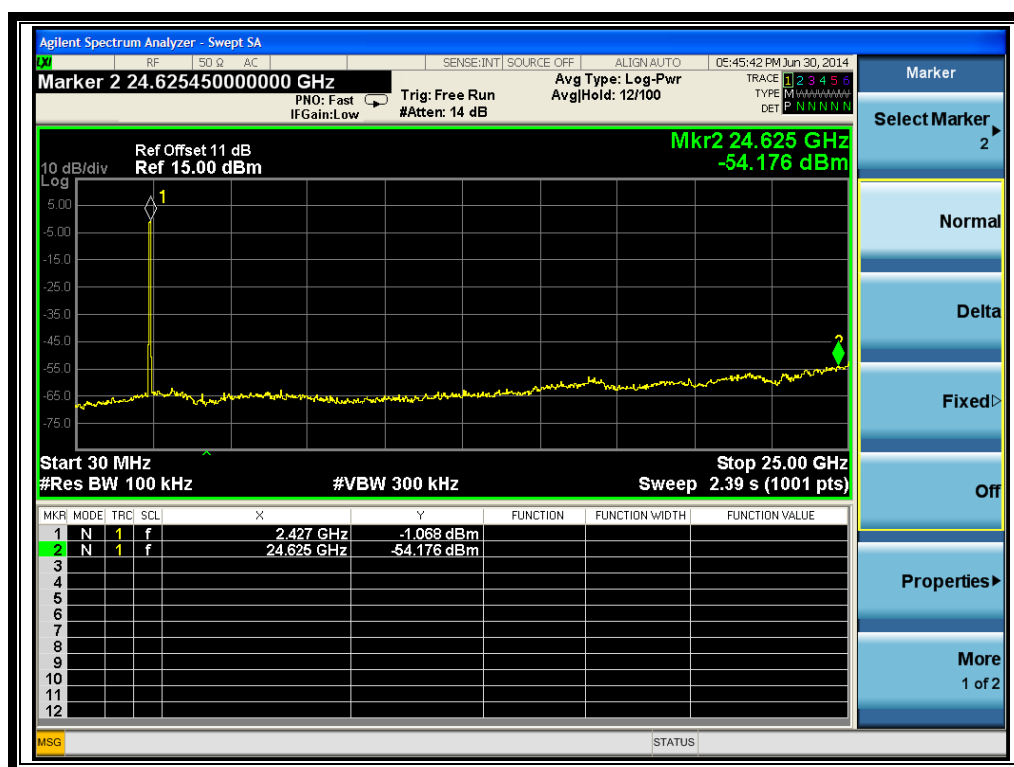
### 2.4.3.2. 802.11g Test mode

#### A. Test Verdict:

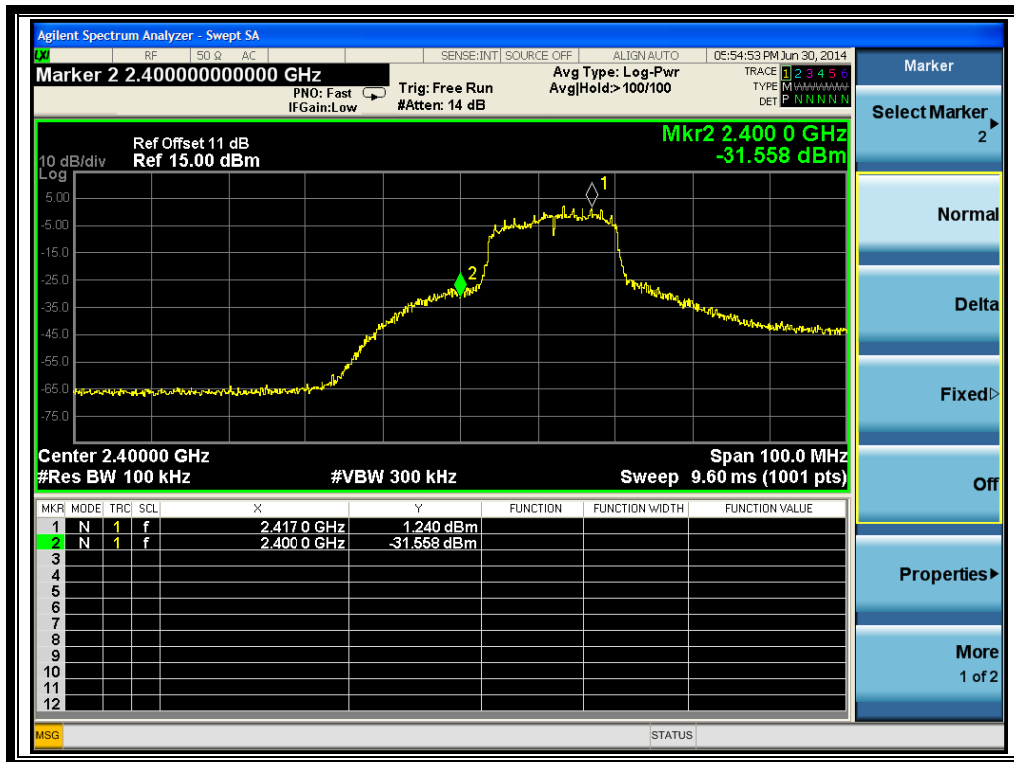
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-54.176	-1.068	-21.1	PASS
6	2437	-54.488	-1.537	-21.5	PASS
11	2462	-54.012	-1.261	-21.3	PASS

#### B. Test Plots:

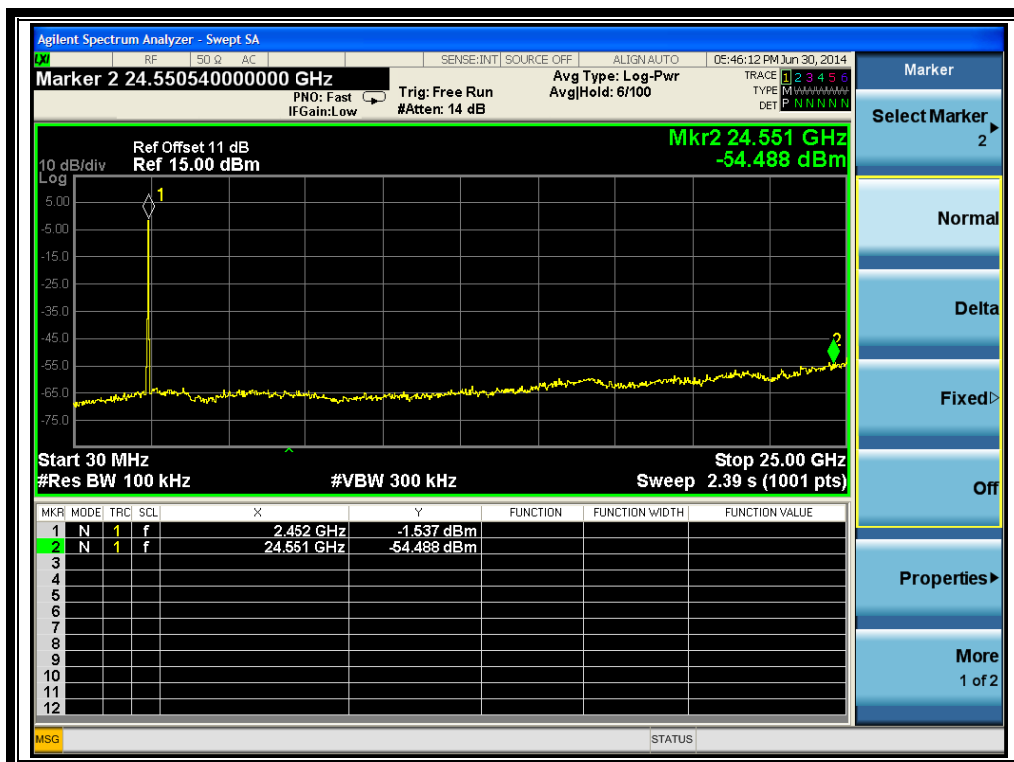
**Note:** the power of the Module transmitting frequency should be ignored.



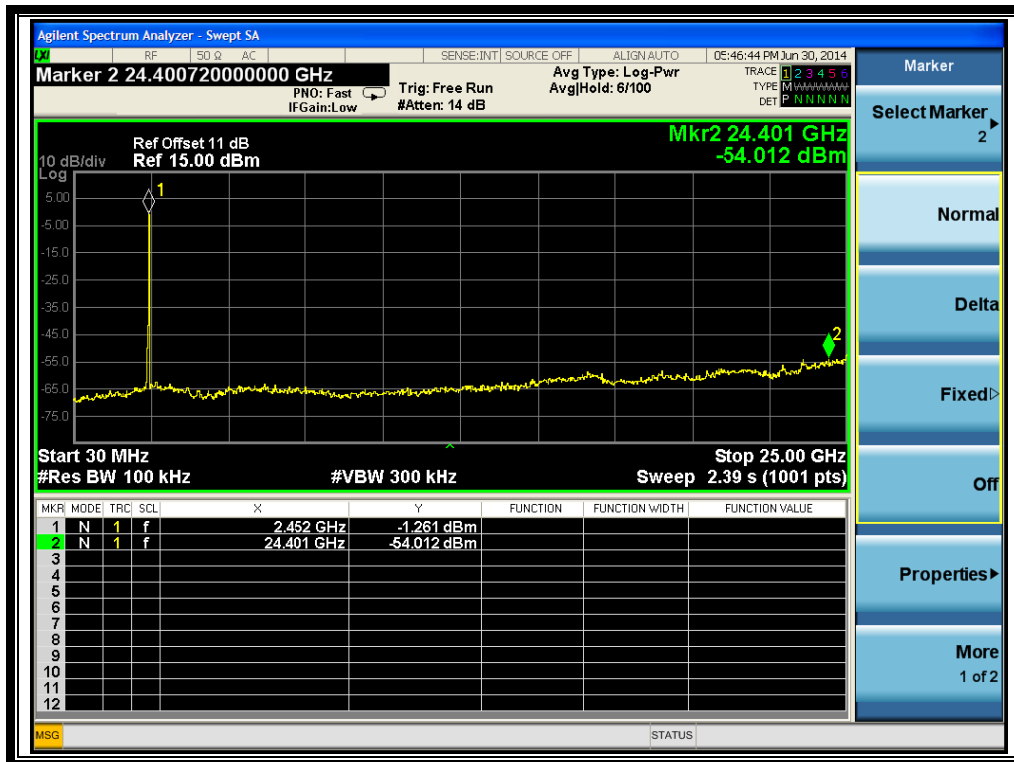
(Channel = 1, 30MHz to 25GHz)



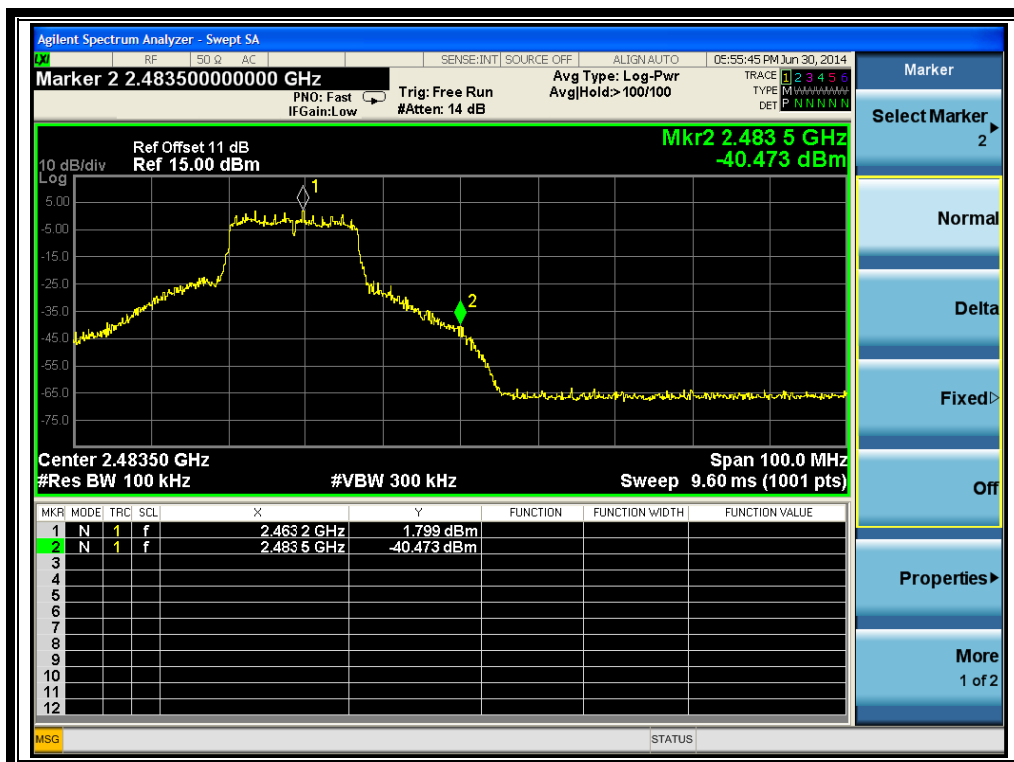
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)



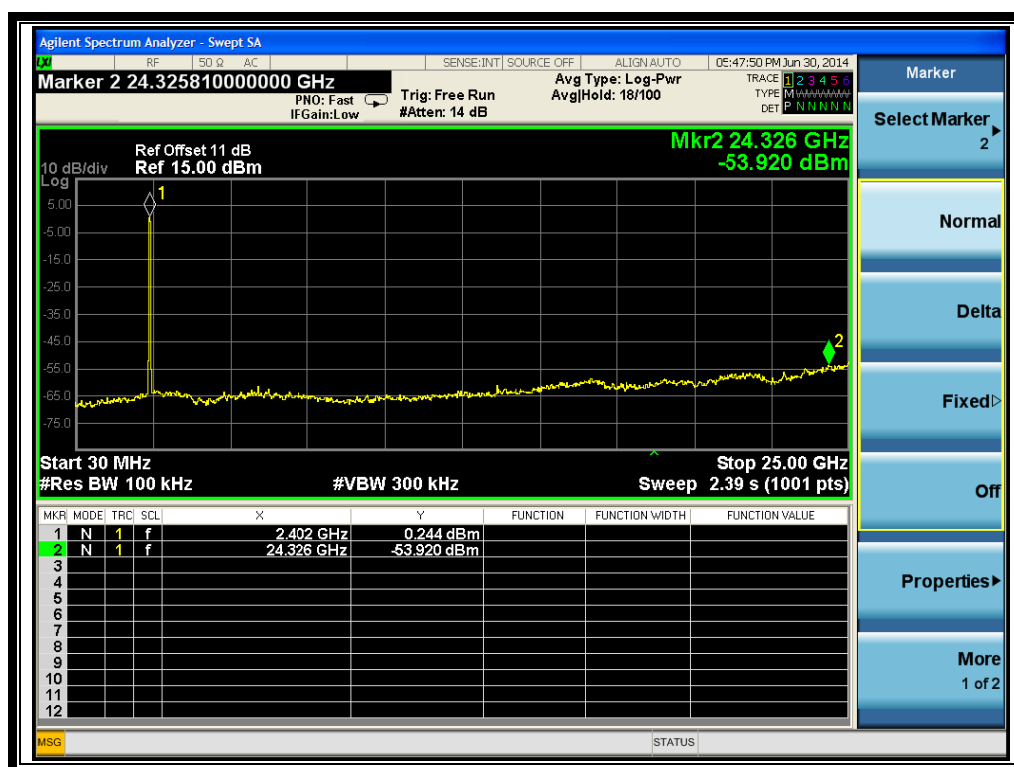
### 2.4.3.3. 802.11n -20MHz Test mode

#### A. Test Verdict:

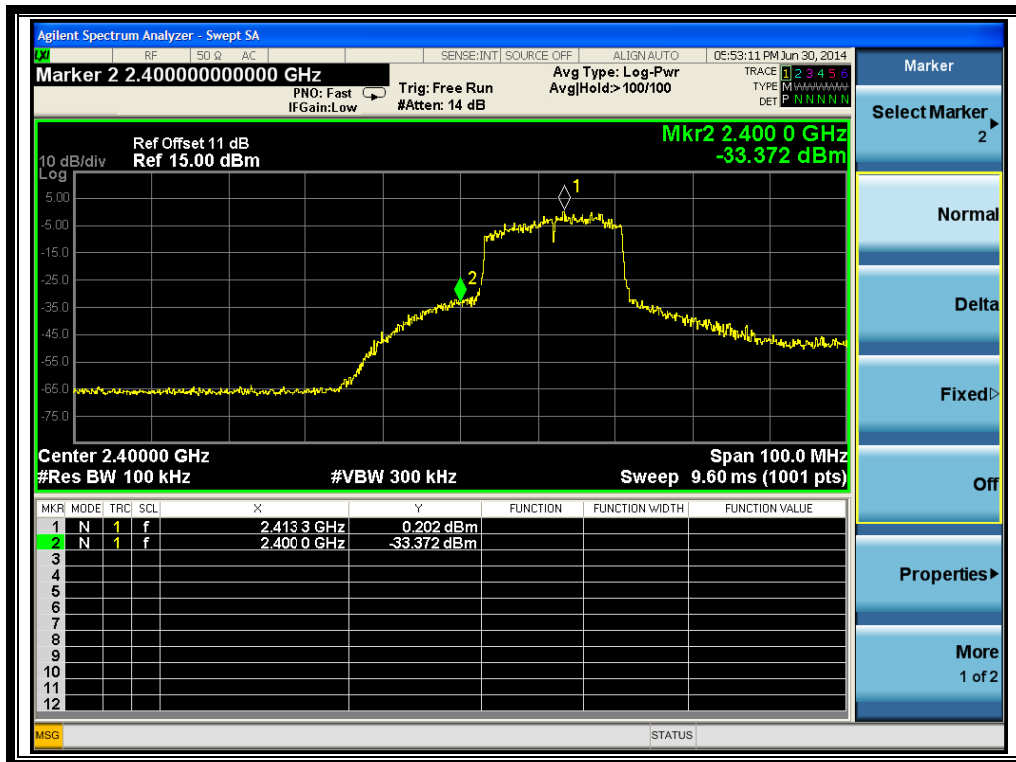
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-53.920	0.244	-19.8	PASS
6	2437	-53.914	-1.193	-21.2	PASS
11	2462	-55.032	-2.672	-22.7	PASS

#### B. Test Plots:

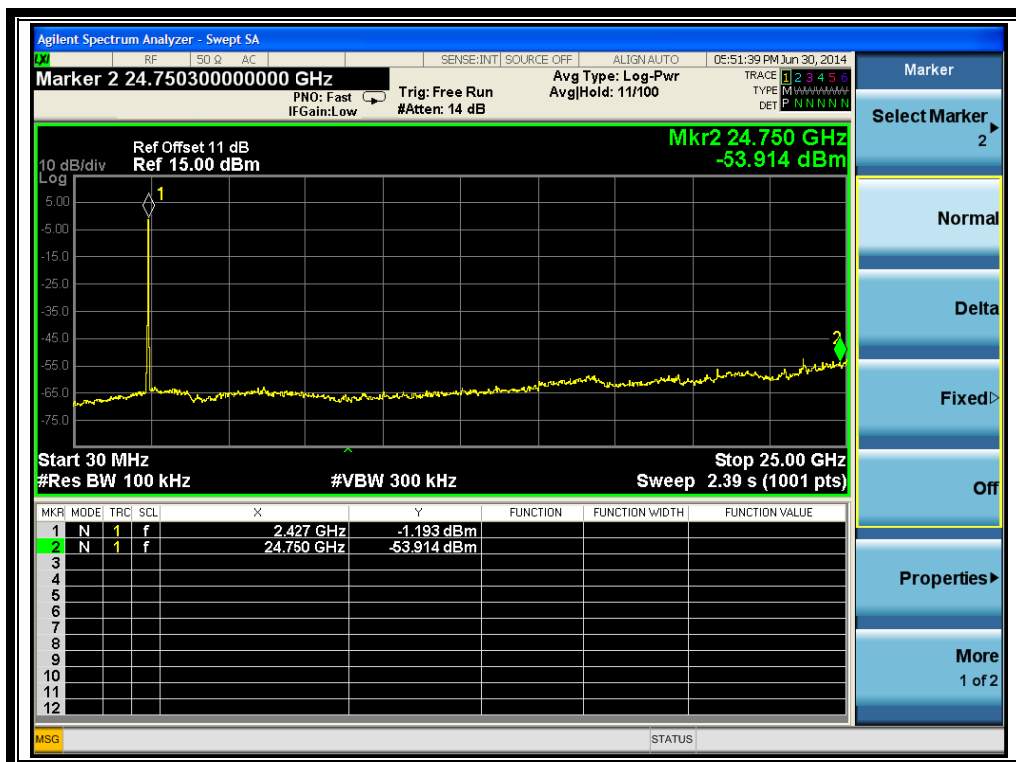
**Note:** the power of the Module transmitting frequency should be ignored.



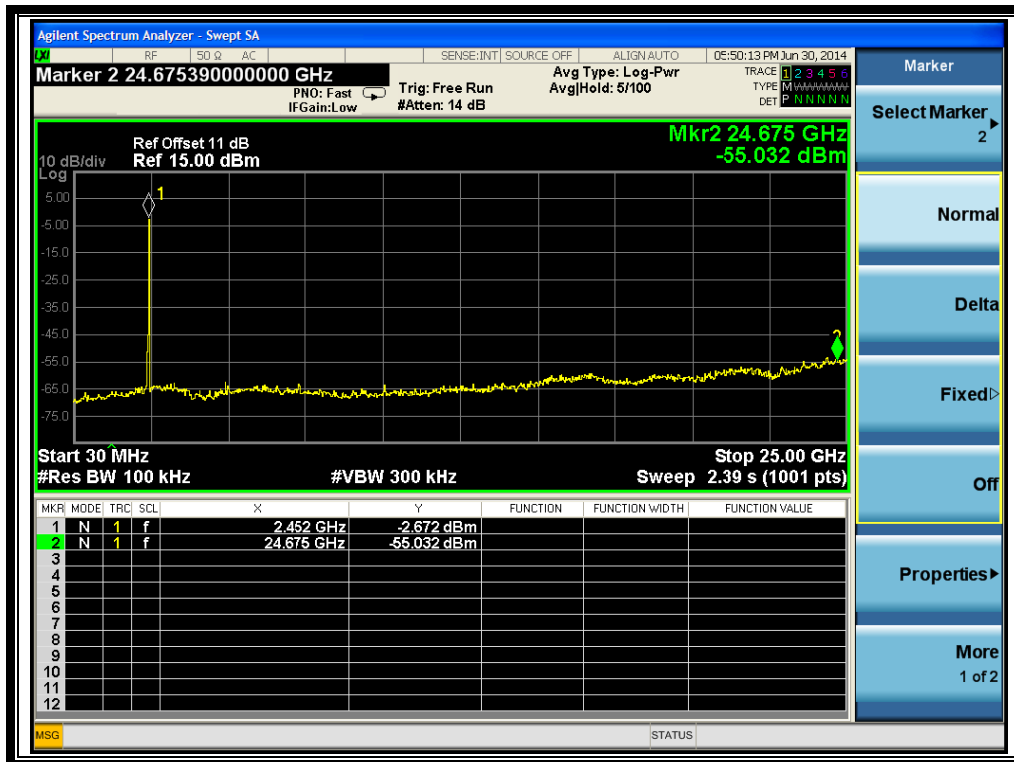
(Channel = 1, 30MHz to 25GHz)



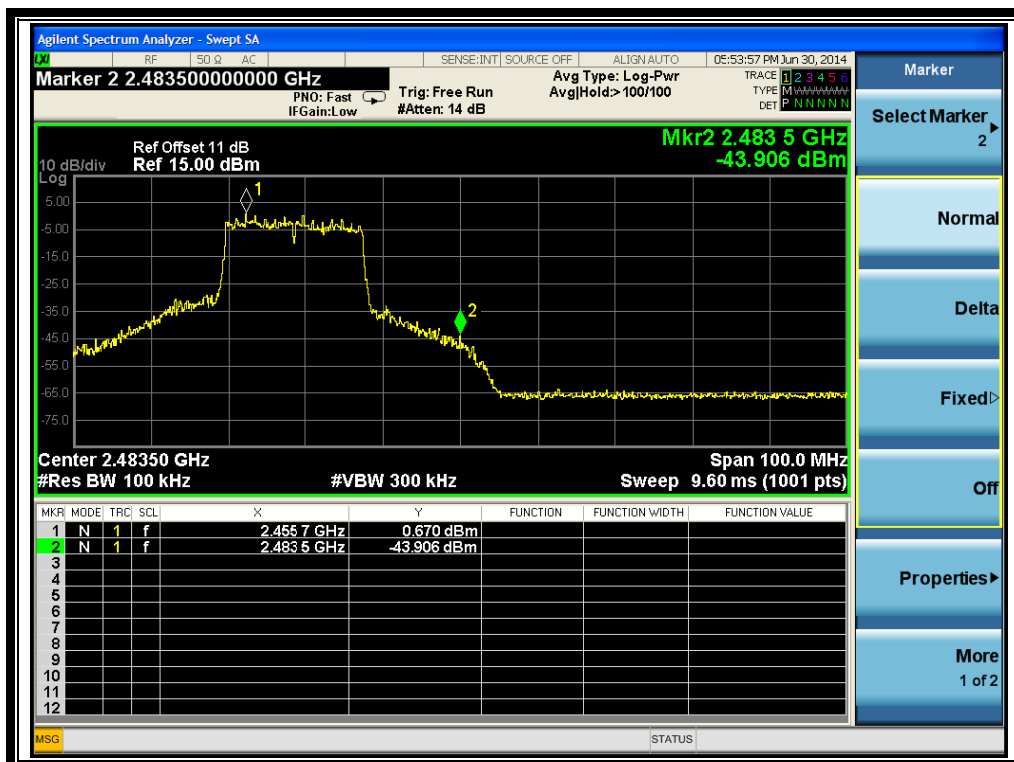
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

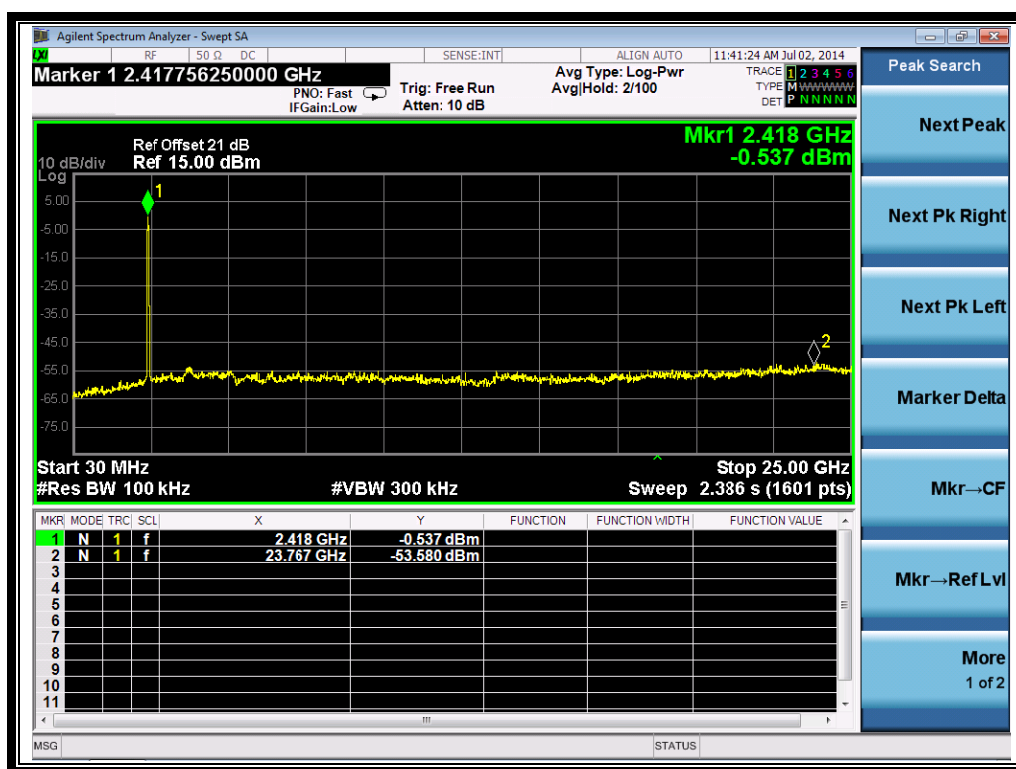
#### 2.4.3.4. 802.11n -40MHz Test mode

##### A. Test Verdict:

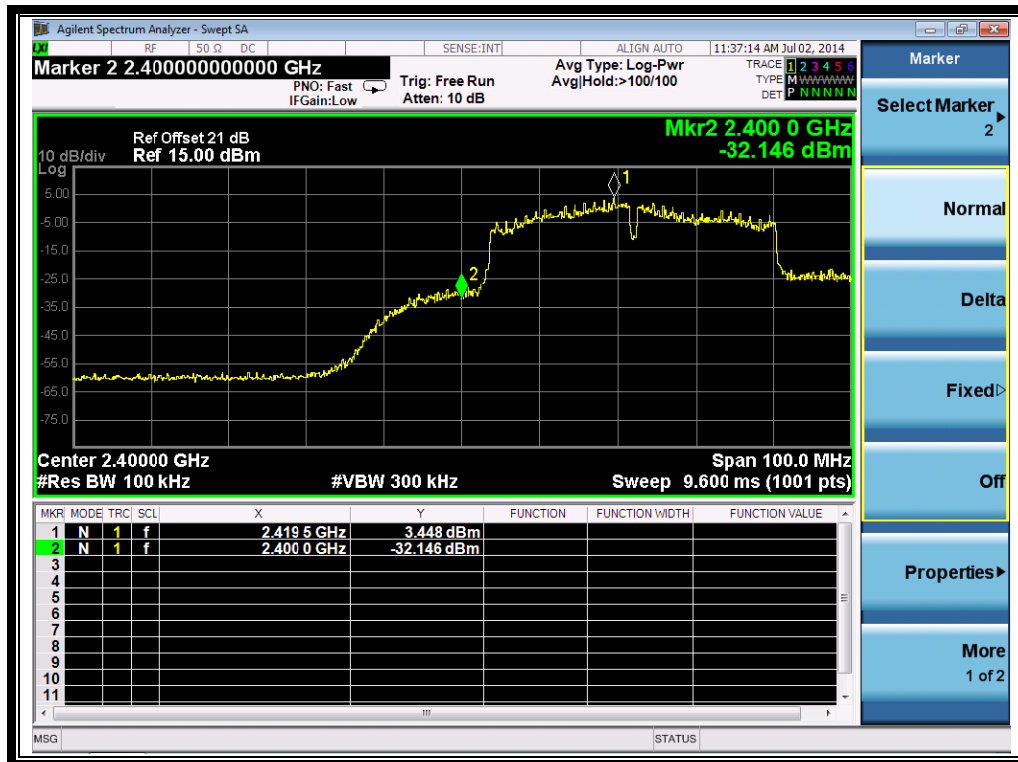
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-53.580	-0.537	-20.5	PASS
6	2437	-52.473	1.483	-18.5	PASS
9	2452	-53.639	0.910	-19.1	PASS

##### B. Test Plots:

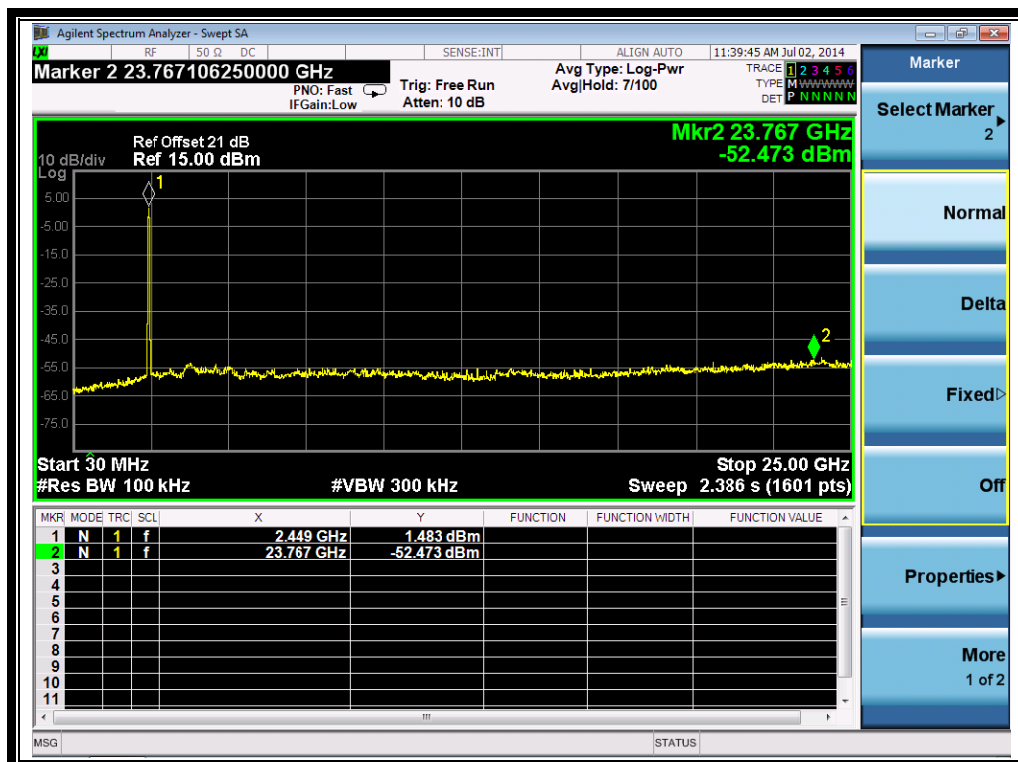
**Note:** the power of the Module transmitting frequency should be ignored.



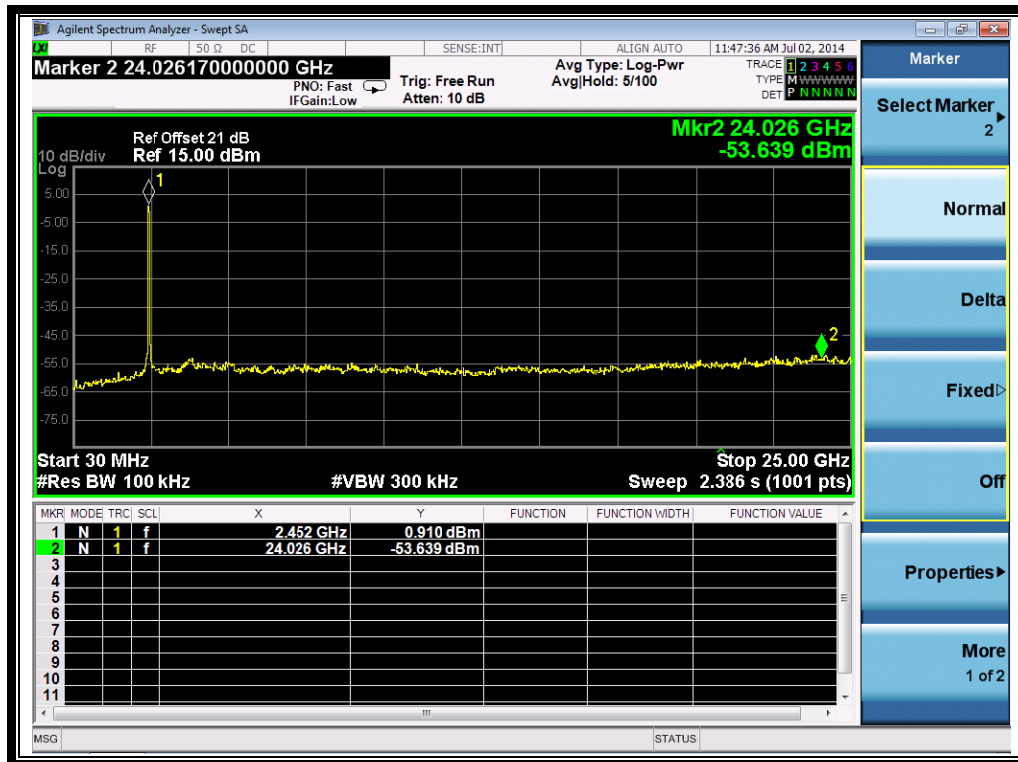
(Channel = 3, 30MHz to 25GHz)



(Band Edge @ Channel = 3)



(Channel = 6, 30MHz to 25GHz)



(Channel = 9, 30MHz to 25GHz)



(Band Edge @ Channel = 9)



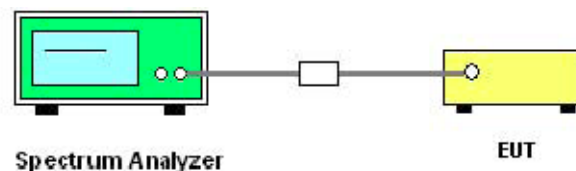
## 2.5. Power spectral density (PSD)

### 2.5.1. Requirement

According to FCC section 15.247(e), the same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used.

### 2.5.2. Test Description

#### A. Test Set:



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

KDB 558074 Section 10.2 was used in order to prove compliance.

#### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E7405A	US44210471	2014.02.26	2015.02.25
EXA Signal Analyzer	Agilent	N9010A	MY51440152	2014.02.26	2015.02.25

### 2.5.3. Test Result

#### 2.5.3.1. 802.11b Test mode

## A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-7.560	8	PASS
6	2437	-7.137	8	PASS
11	2462	-7.382	8	PASS
Measurement uncertainty: $\pm 1.3$ dB				

## B. Test Plots:



(Channel = 1 @ 802.11b)



(Channel = 6 @ 802.11b)



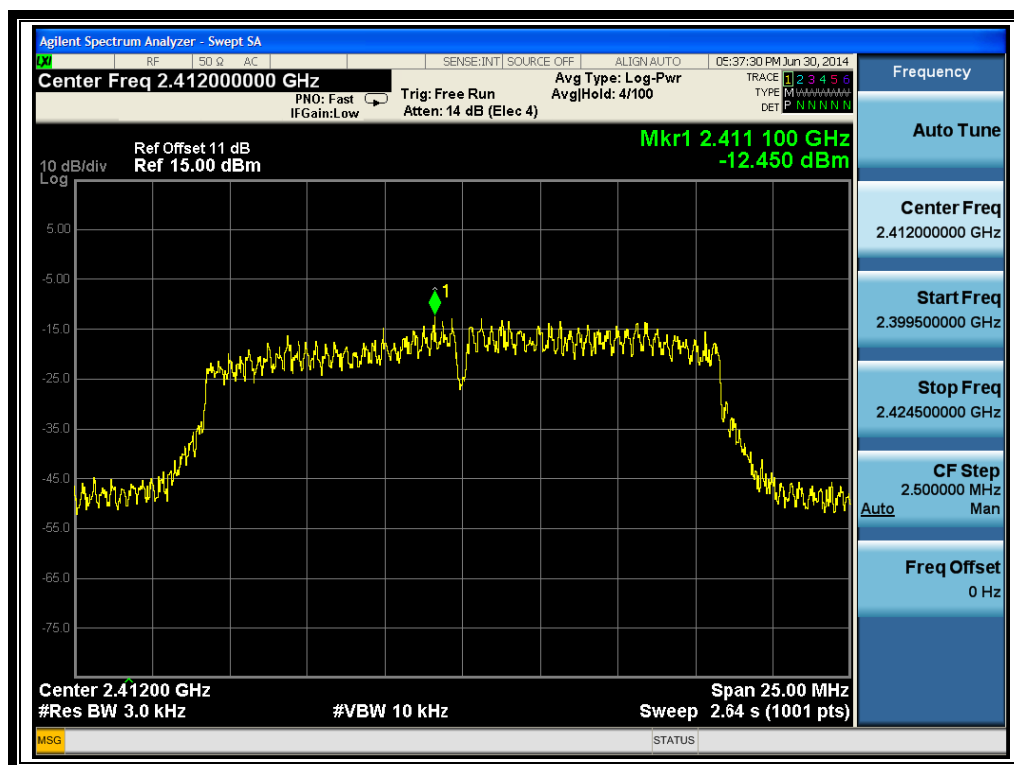
(Channel = 11 @ 802.11b)

### 2.5.3.2. 802.11g Test mode

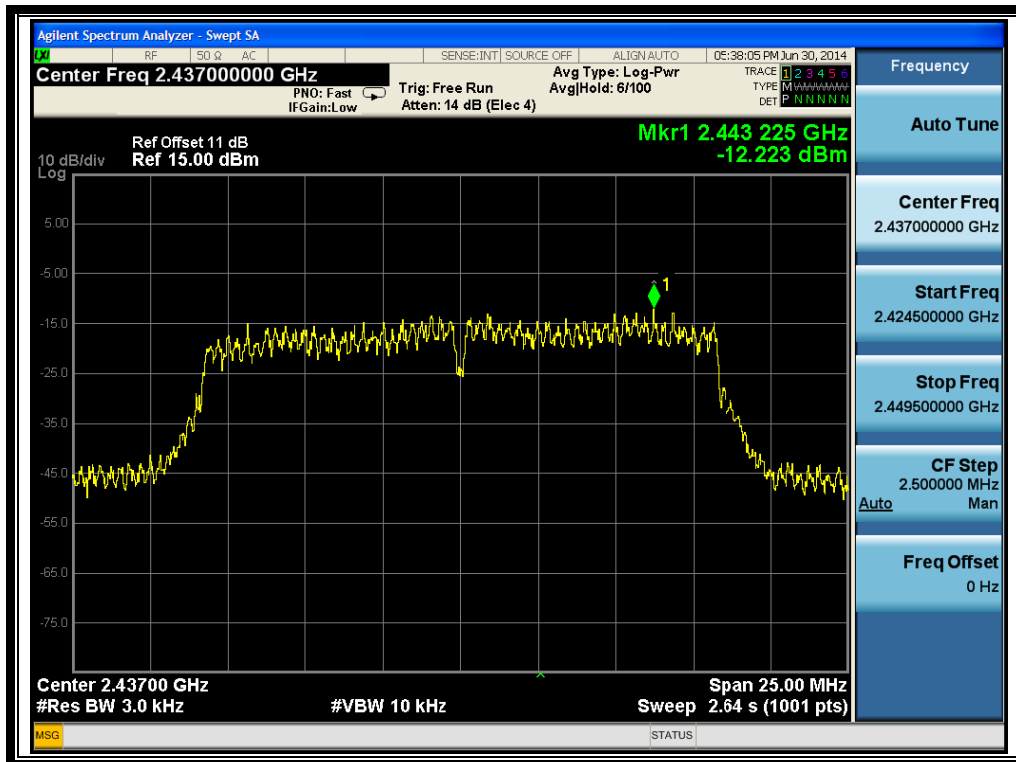
#### A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-12.450	8	PASS
6	2437	-12.223	8	PASS
11	2462	-11.443	8	PASS
Measurement uncertainty: $\pm 1.3$ dB				

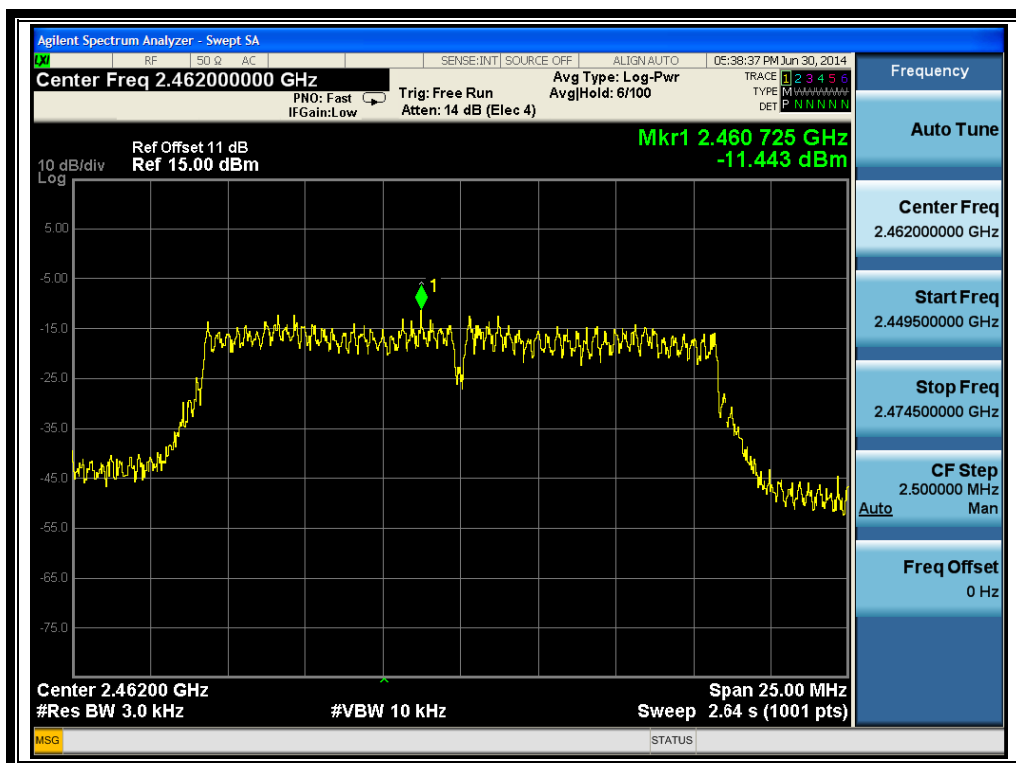
#### B. Test Plots:



(Channel = 1 @ 802.11g)



(Channel = 6 @ 802.11g)



(Channel = 11 @ 802.11g)

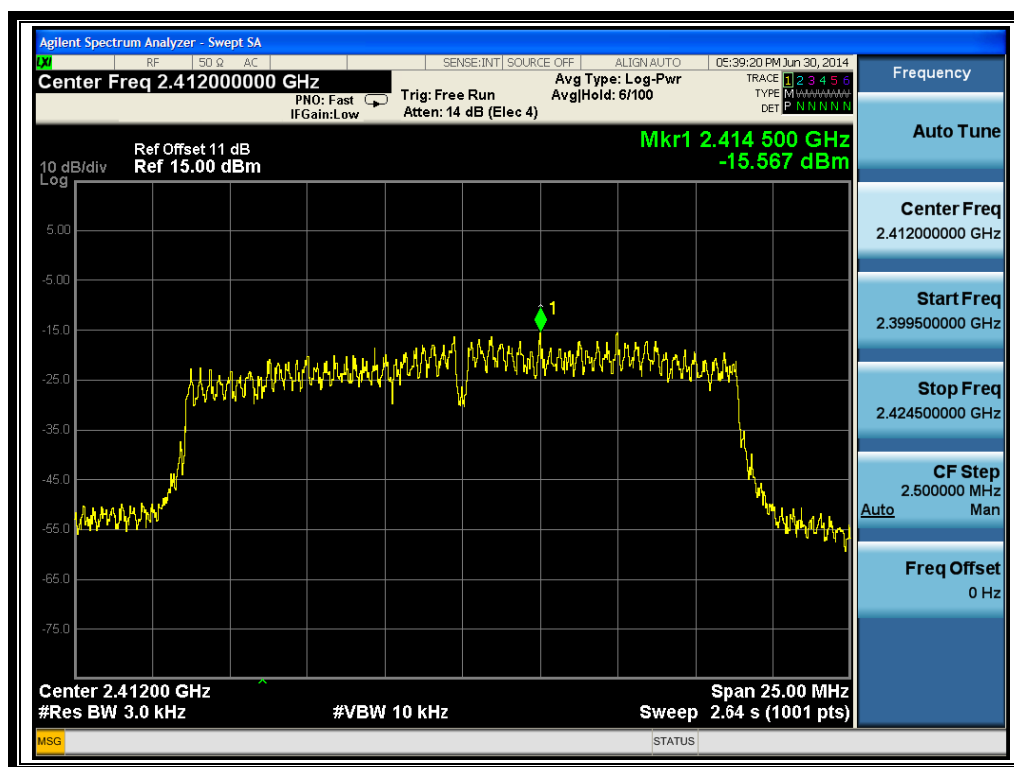
### 2.5.3.3. 802.11n-20MHz Test mode

#### A. Test Verdict:

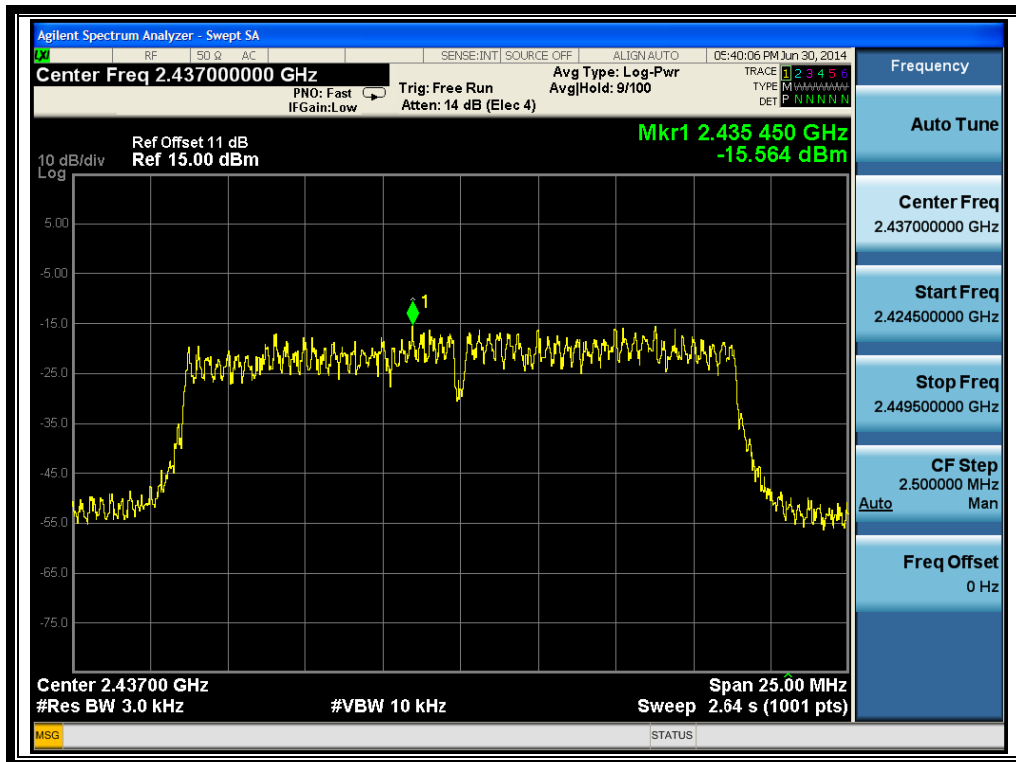
Spectral power density (dBm/3kHz)				
Chann el	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-15.567	8	PASS
6	2437	-15.564	8	PASS
11	2462	-16.275	8	PASS

Measurement uncertainty:  $\pm 1.3$ dB

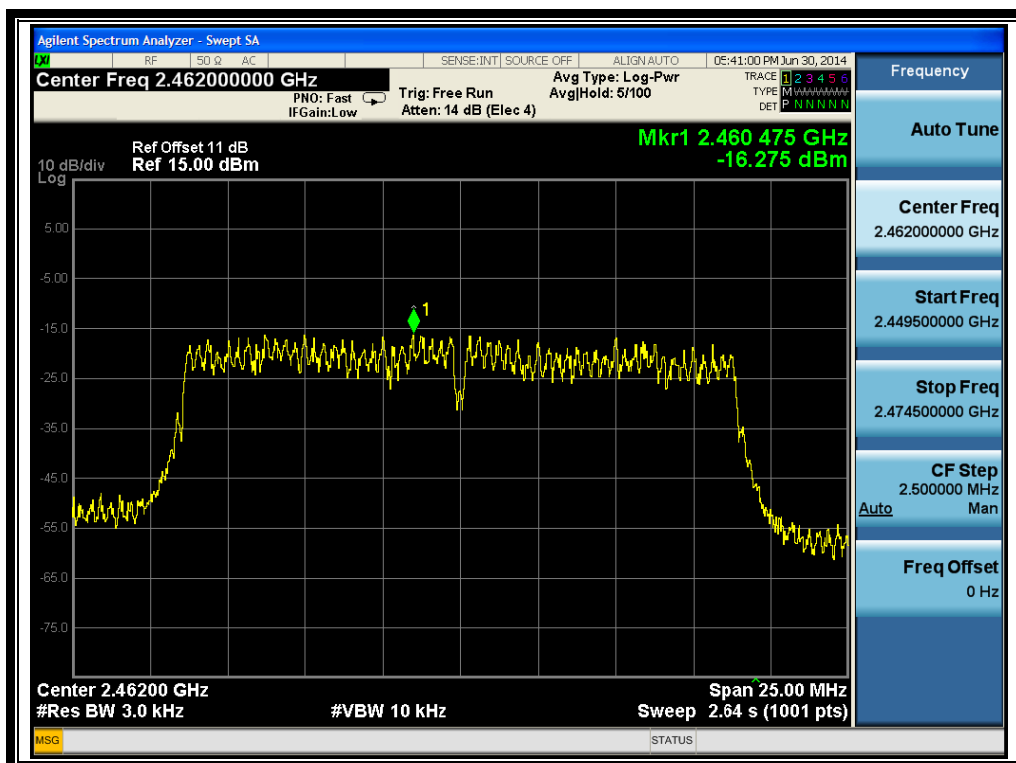
#### B. Test Plots:



(Channel = 1 @ 802.11n-20MHz)



(Channel = 6 @ 802.11n-20MHz)



(Channel = 11 @ 802.11n-20MHz)

#### 2.5.3.4. 802.11n-40MHz Test mode

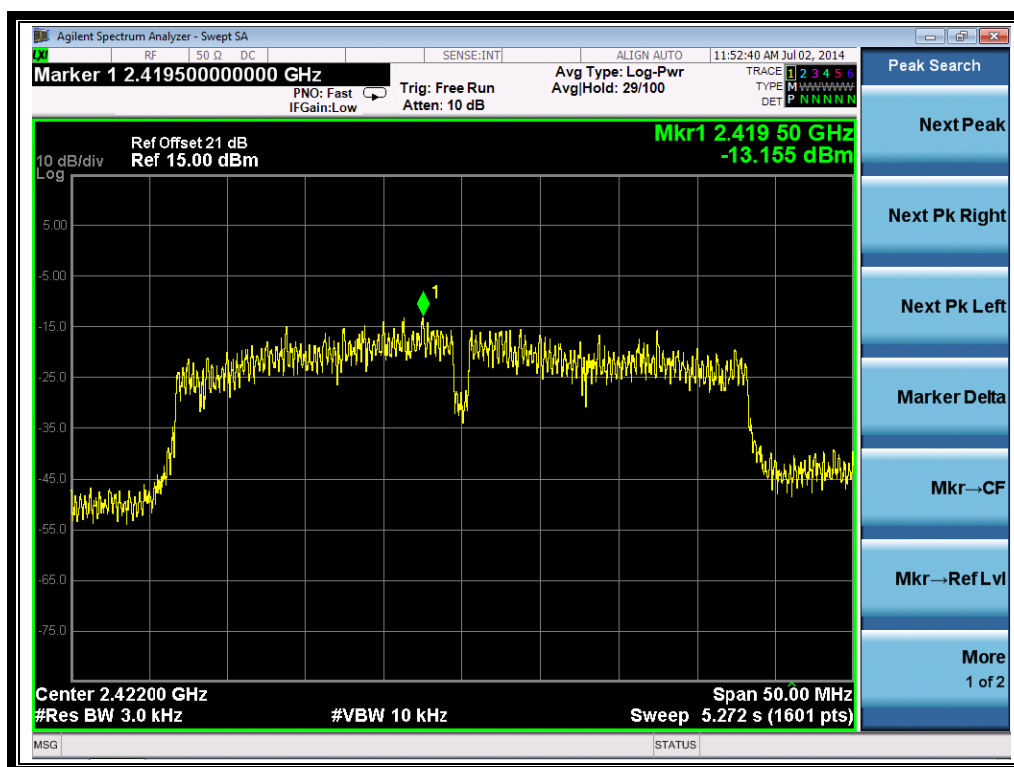
### A. Test Verdict:

Spectral power density (dBm/3kHz)				
Chann el	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-13.155	8	PASS
6	2437	-13.049	8	PASS
9	2452	-11.348	8	PASS

Measurement uncertainty:  $\pm 1.3$ dB

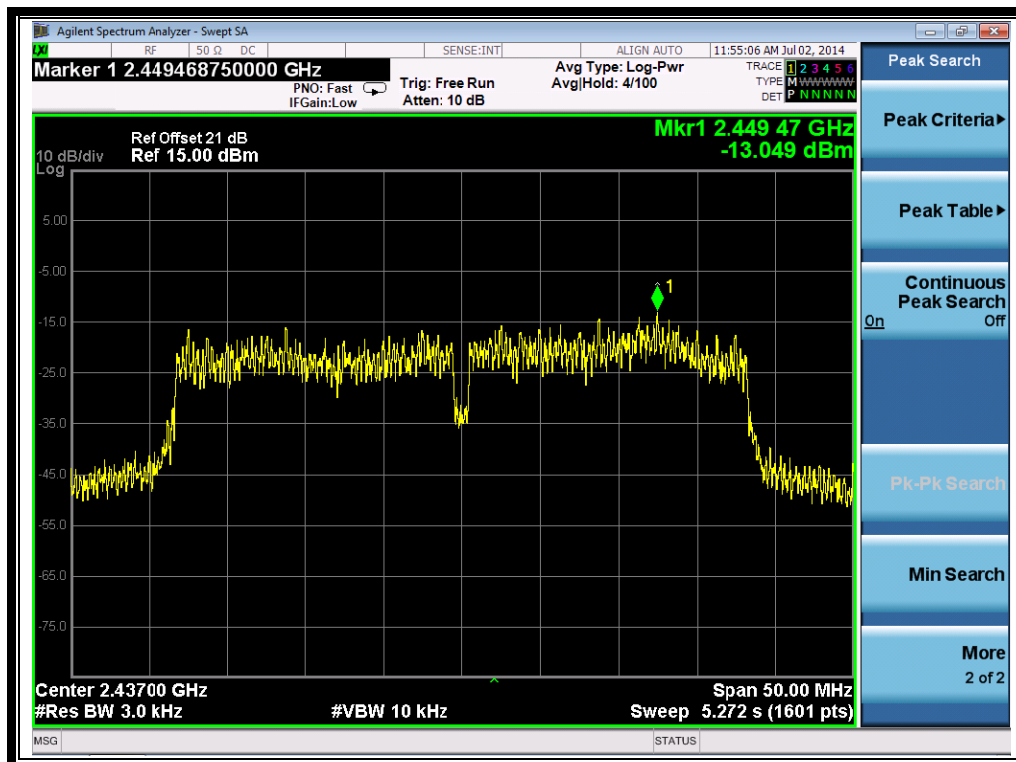
Measurement uncertainty:  $\pm 1.3\text{dB}$ 

### B. Test Plots:

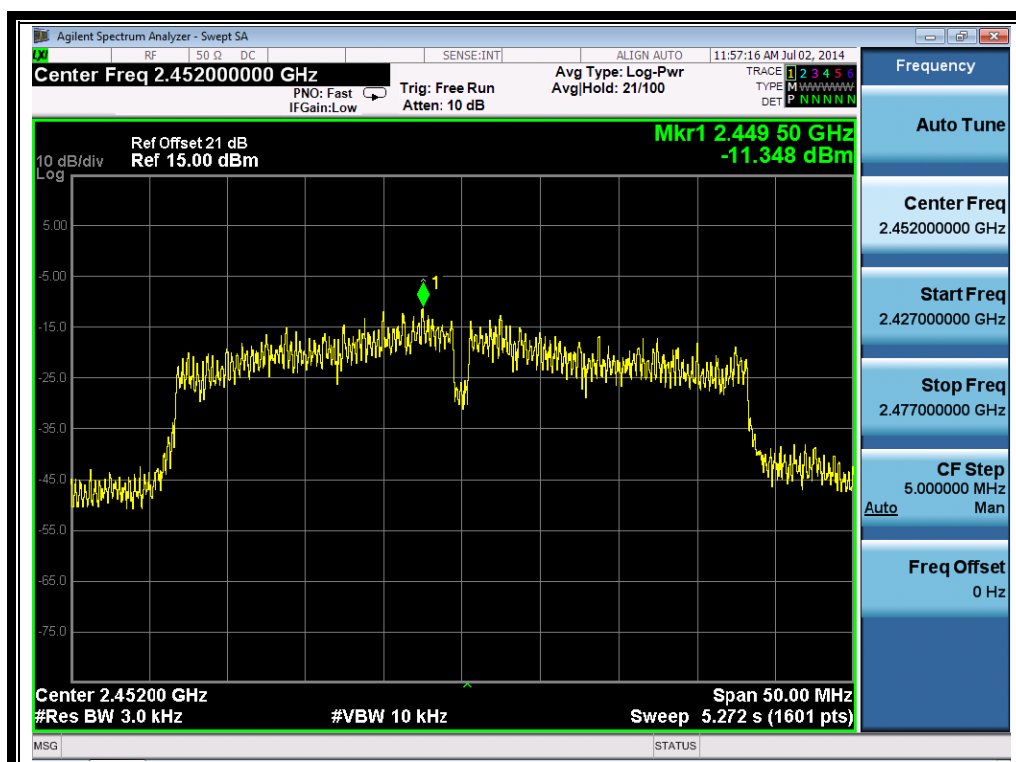


(Channel = 3 @ 802.11n-40MHz)





(Channel = 6 @ 802.11n-40MHz)



(Channel = 9 @ 802.11n-40MHz)

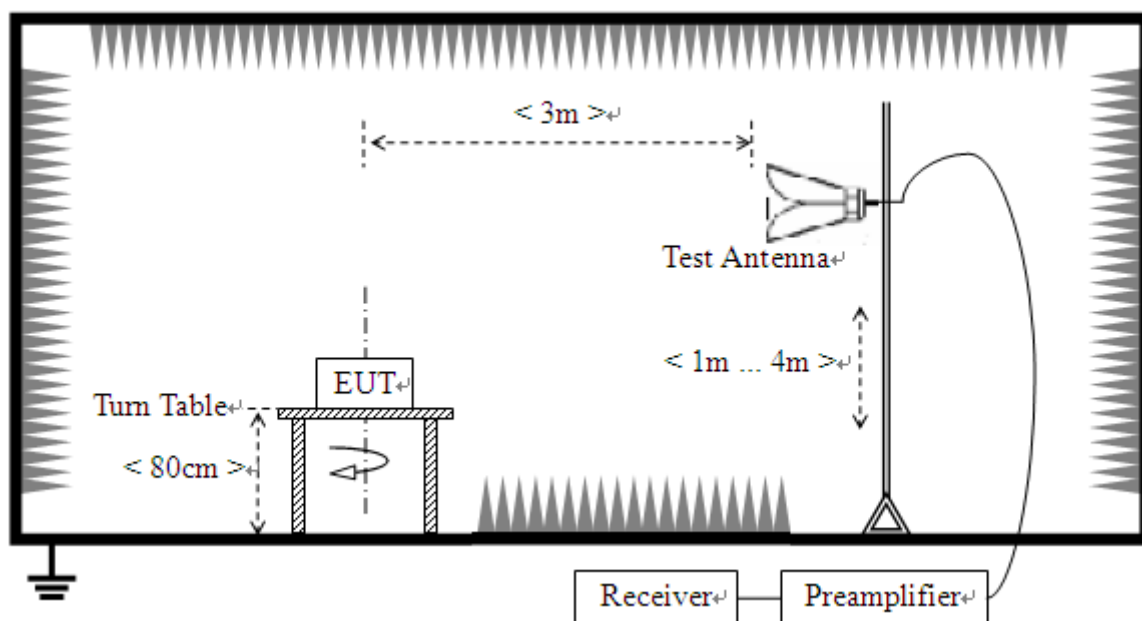
## 2.6. Restricted Frequency Bands

### 2.6.1. Requirement

According to FCC section 15.247(d), in any 100kHz 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 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).

### 2.6.2. Test Description

#### A. Test Setup



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

KDB 558074 Section 12.1 was used in order to prove compliance.

#### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2014.02.26	2015.02.25
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05.12	2015.02.25
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120D-963	2014.02.26	2015.02.25

### 2.6.3. Test Result

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V/m]} = U_R + A_T + A_{\text{Factor}} \text{ [dB]}; A_T = L_{\text{Cable loss}} \text{ [dB]} - G_{\text{preamp}} \text{ [dB]}$$

$A_T$ : Total correction Factor except Antenna

$U_R$ : Receiver Reading

$G_{\text{preamp}}$ : Preamplifier Gain

$A_{\text{Factor}}$ : Antenna Factor at 3m

**Note:** Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

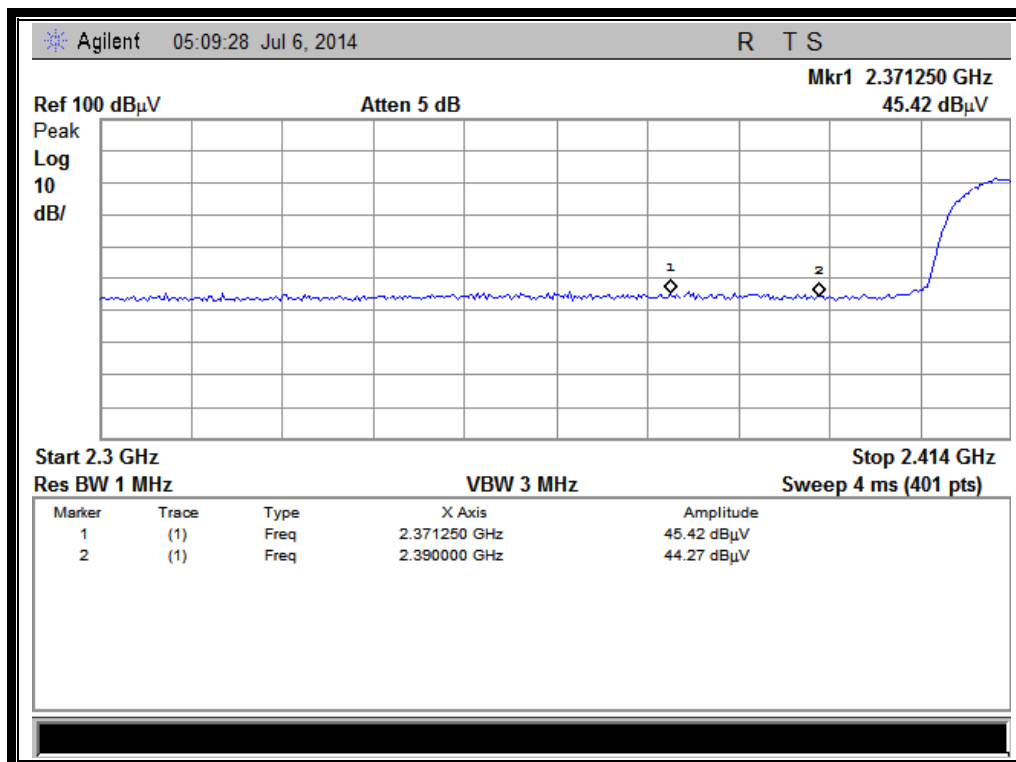
#### 2.6.3.1. 802.11b Test mode

The lowest and highest channels are tested to verify the band edge emissions.

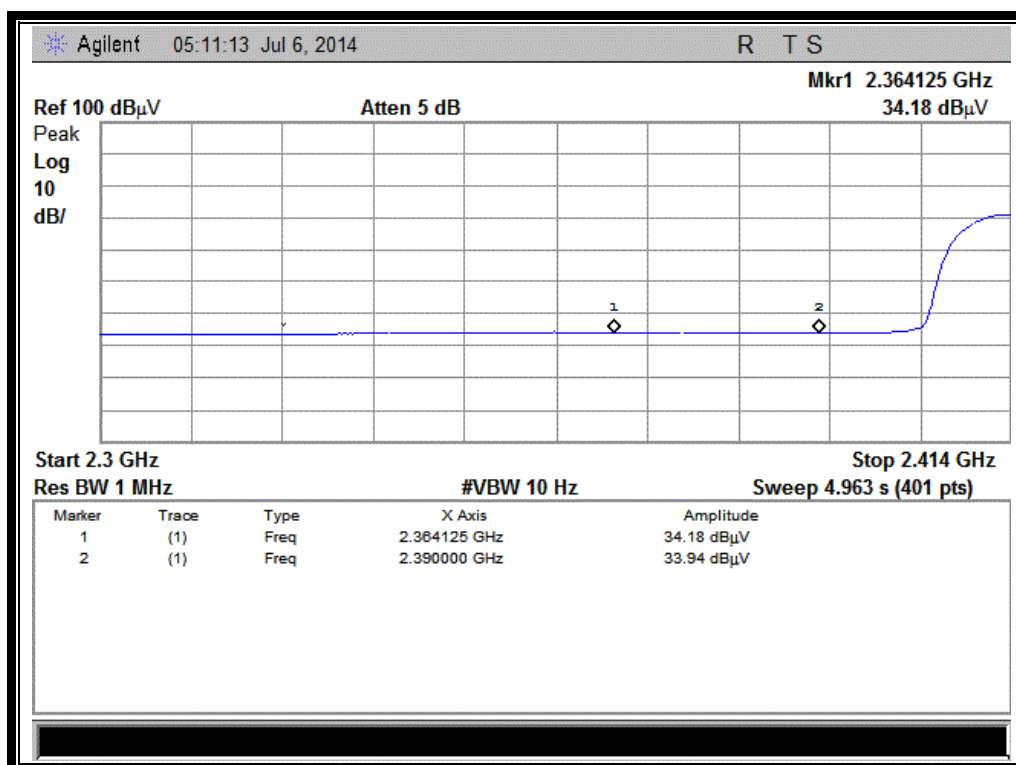
##### A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2371.25	PK	45.42	-30.93	32.56	47.05	74	Pass
1	2364.13	AV	34.18	-30.93	32.56	35.81	54	Pass
11	2486.80	PK	46.23	-29.05	32.50	49.68	74	Pass
11	2487.84	AV	33.75	-29.05	32.50	37.20	54	Pass

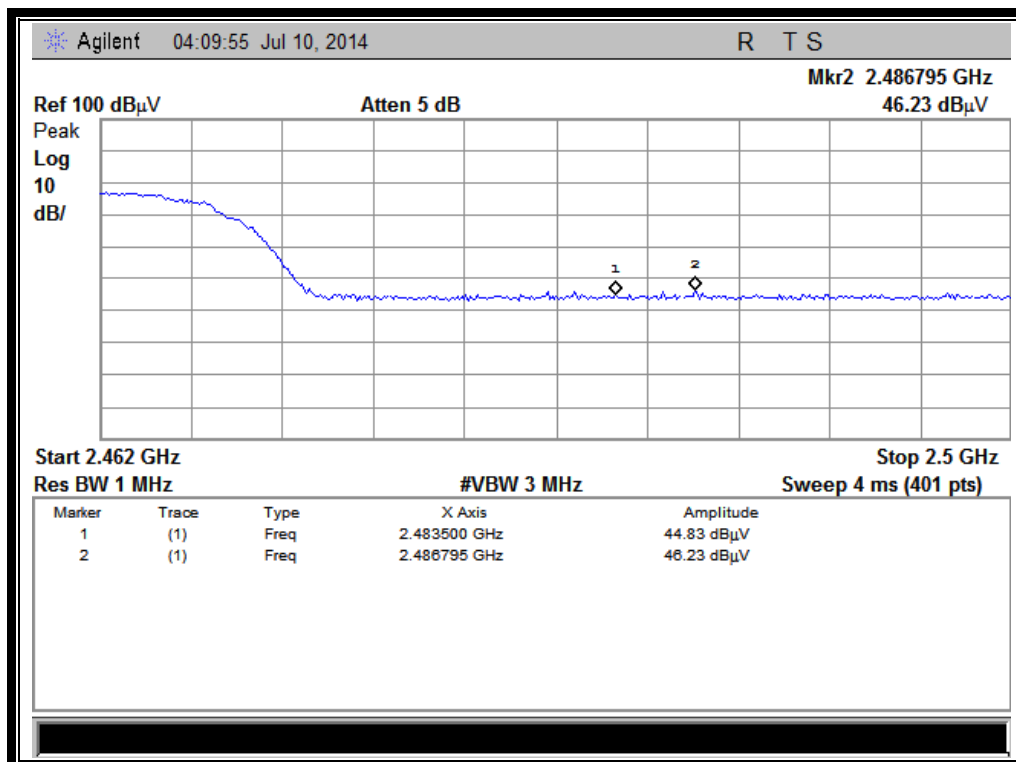
##### B. Test Plots:



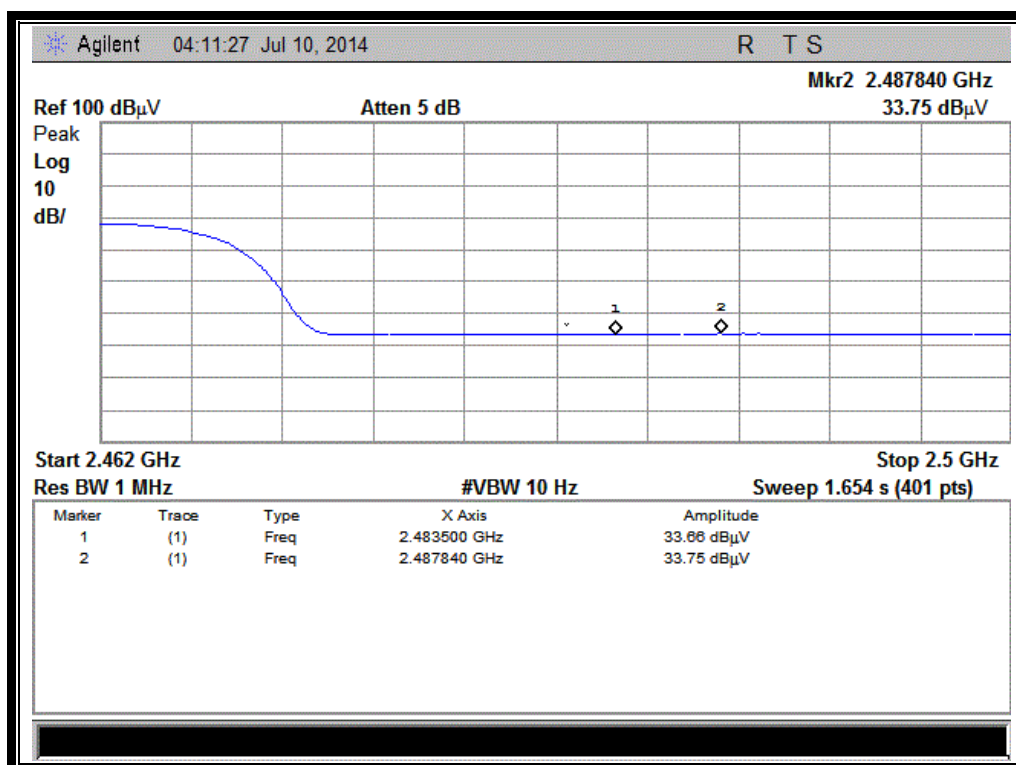
(Plot A1: Channel = 1 PEAK @ 802.11b)



(Plot A2: Channel = 1 AVG @ 802.11b)



(Plot B1: Channel = 11 PEAK @ 802.11b)



(Plot B2: Channel = 11 AVG @ 802.11b)

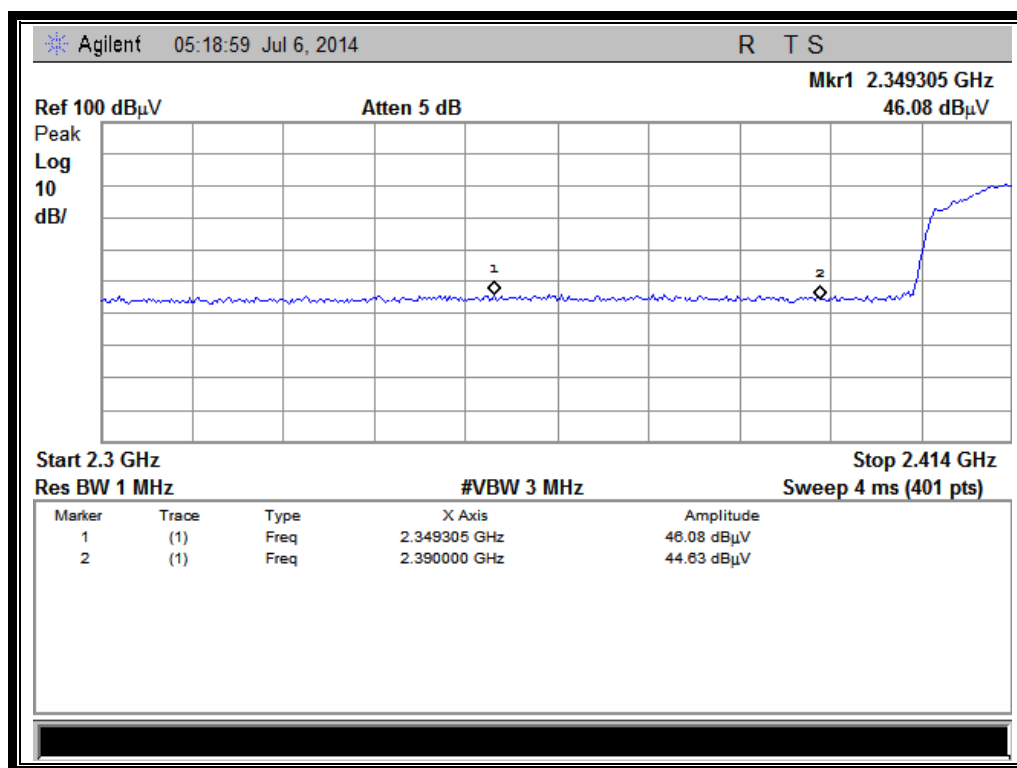
### 2.6.3.2. 802.11g Test mode

The lowest and highest channels are tested to verify the band edge emissions.

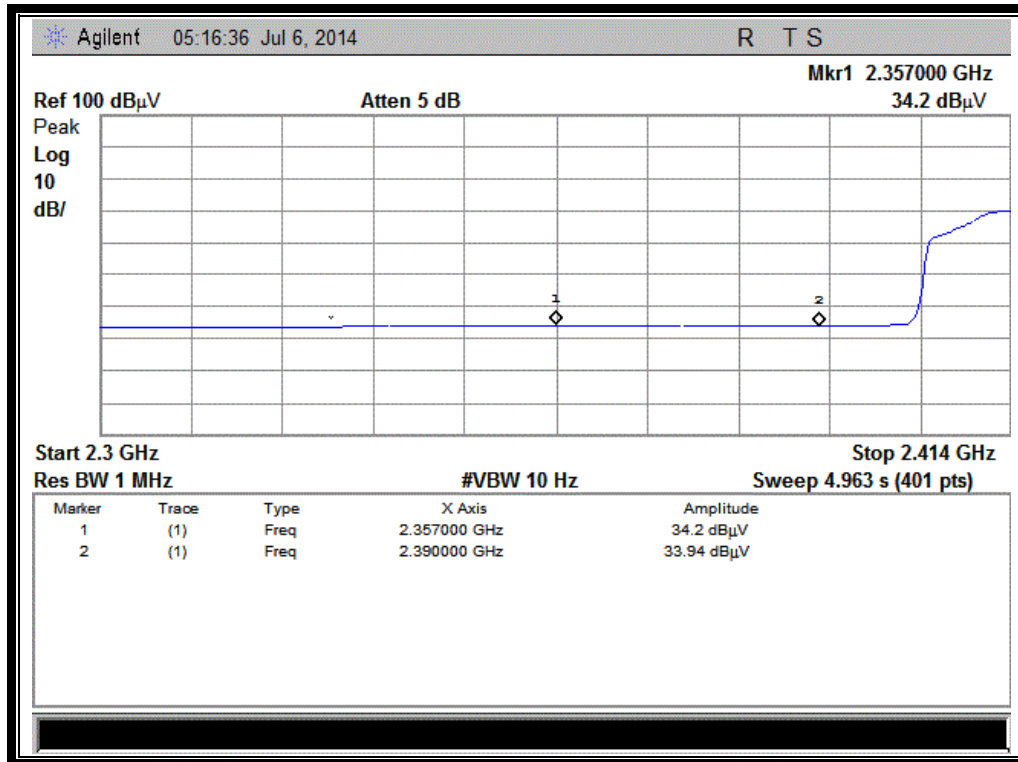
#### A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2349.31	PK	46.08	-30.93	32.56	47.71	74	Pass
1	2357.70	AV	34.20	-30.93	32.56	35.83	54	Pass
11	2484.33	PK	45.37	-29.05	32.50	46.94	74	Pass
11	2488.60	AV	33.69	-29.05	32.50	37.14	54	Pass

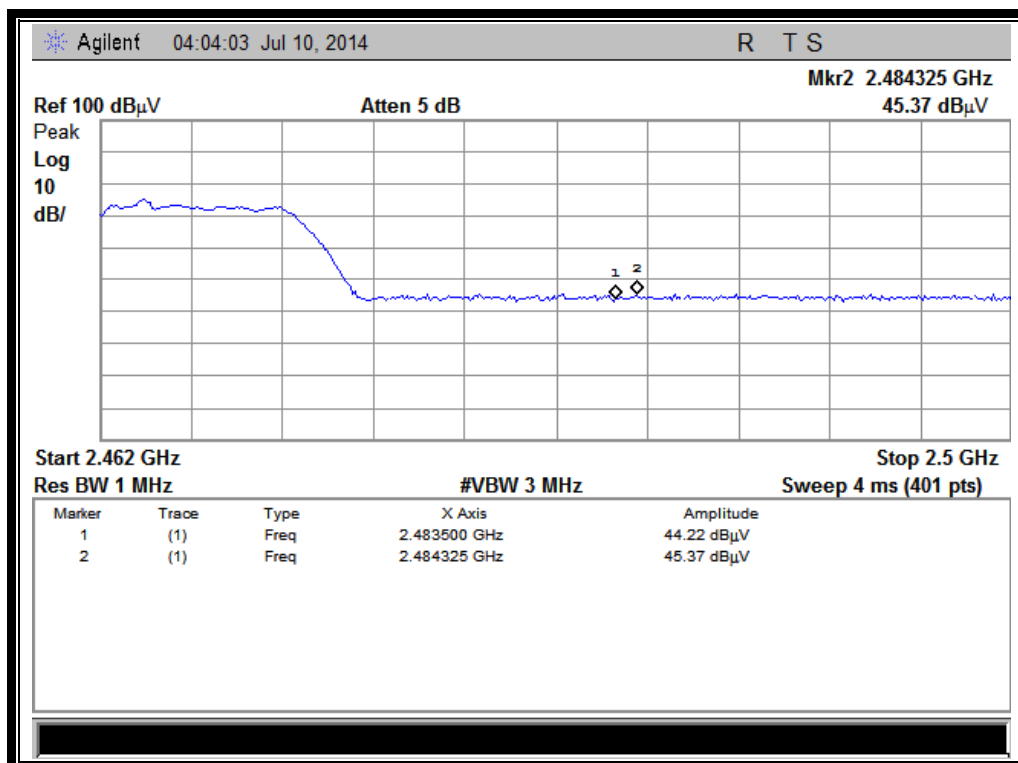
#### B. Test Plots:



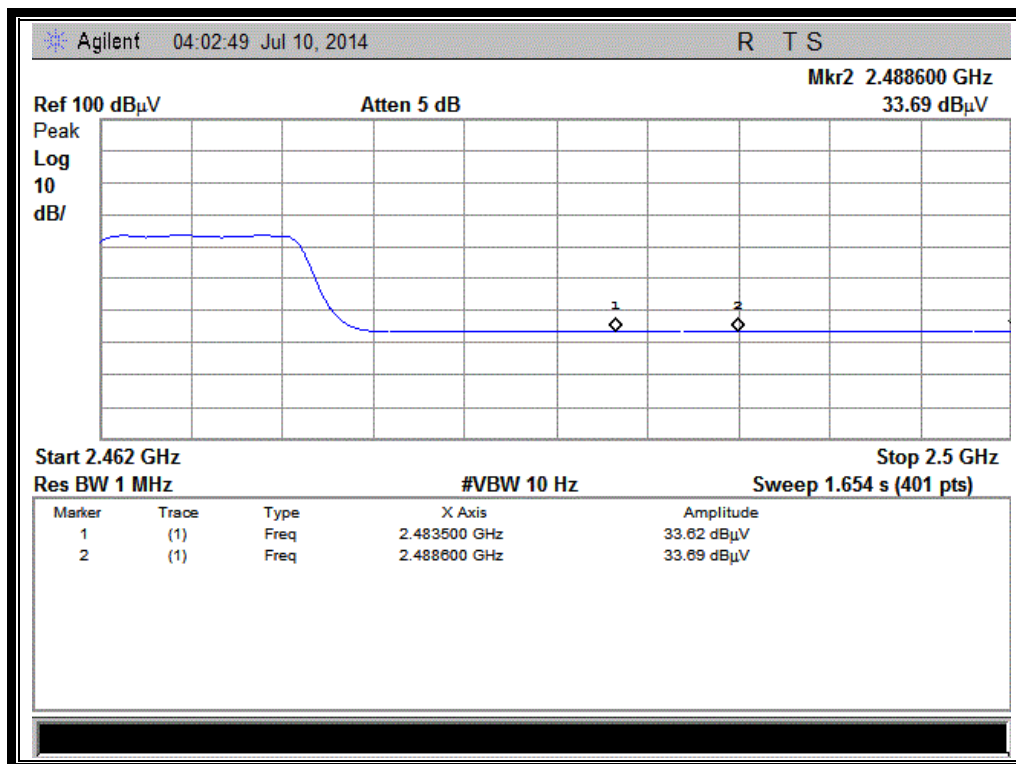
(Plot C1: Channel = 1 PEAK @ 802.11g)



(Plot C2: Channel = 1 AVG @ 802.11g)



(Plot D1: Channel = 11 PEAK @ 802.11g)



(Plot D2: Channel = 11 AVG @ 802.11g)

### 2.6.3.3. 802.11n-20MHz Test mode

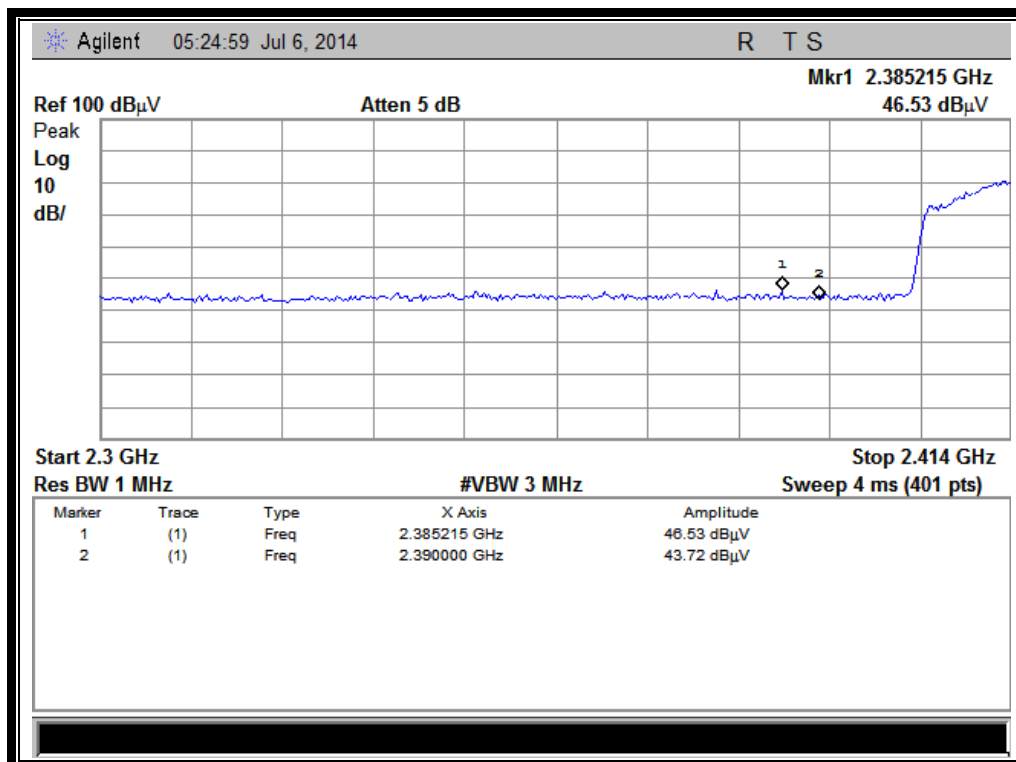
The lowest and highest channels are tested to verify the band edge emissions.

#### A. Test Verdict:

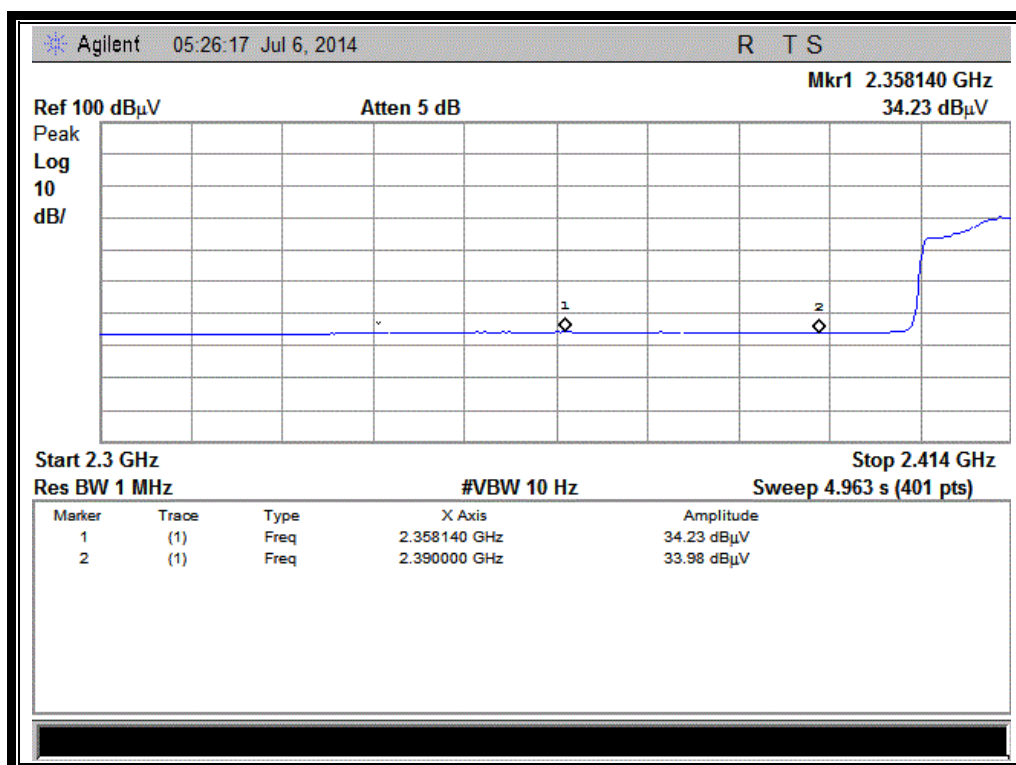
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2385.22	PK	46.53	-30.93	32.56	48.16	74	Pass
1	2458.14	AV	34.23	-30.93	32.56	35.86	54	Pass
11	2480.96	PK	45.81	-29.05	32.50	49.26	74	Pass
11	2358.14	AV	34.23	-29.05	32.50	37.68	54	Pass

#### B. Test Plots:

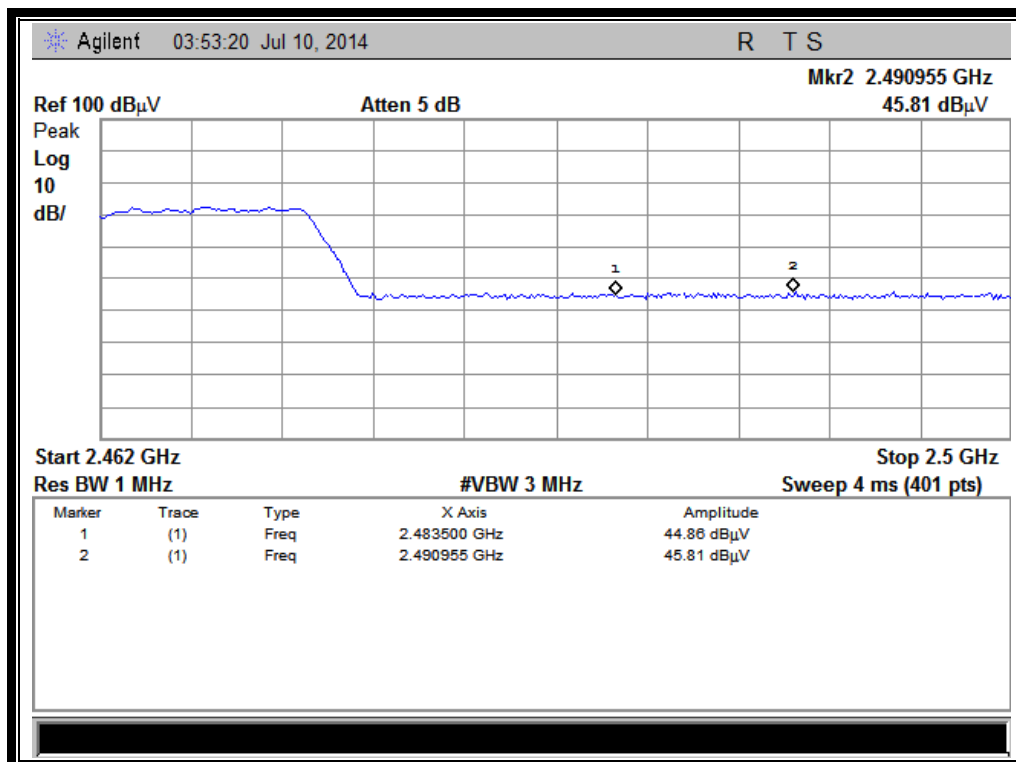




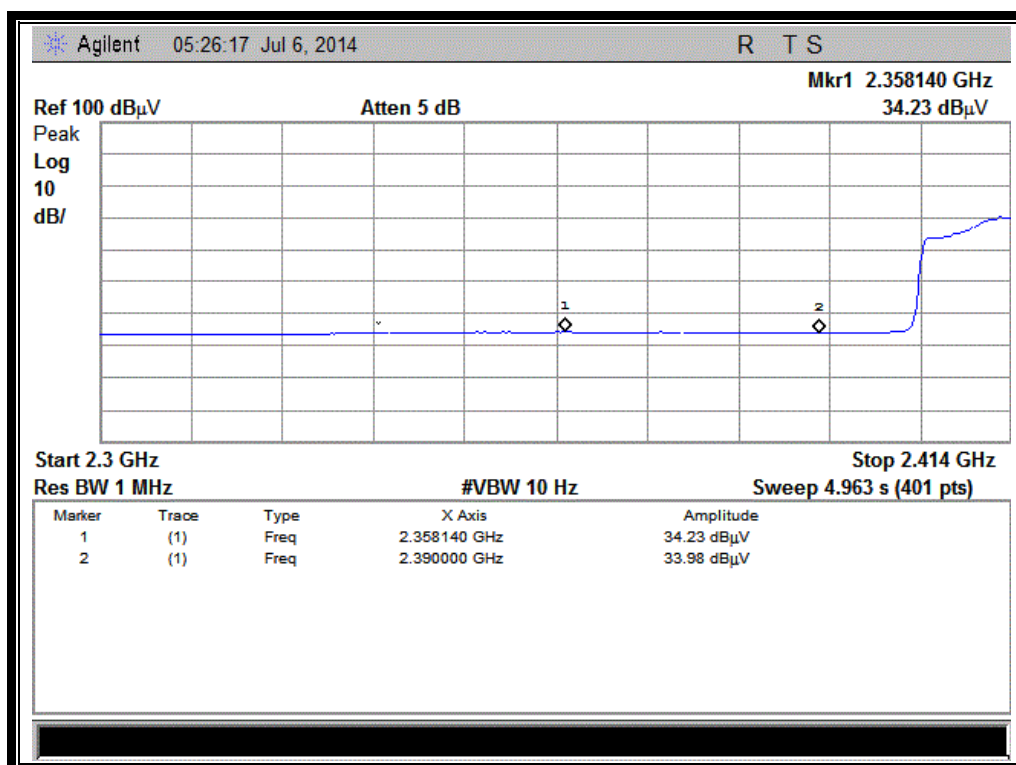
(Plot E1: Channel = 1 PEAK @ 802.11n-20)



(Plot E2: Channel = 1 AVG @ 802.11n-20)



(Plot F1: Channel = 11 PEAK @ 802.11n-20)



(Plot F2: Channel = 11 AVG @ 802.11n-20)

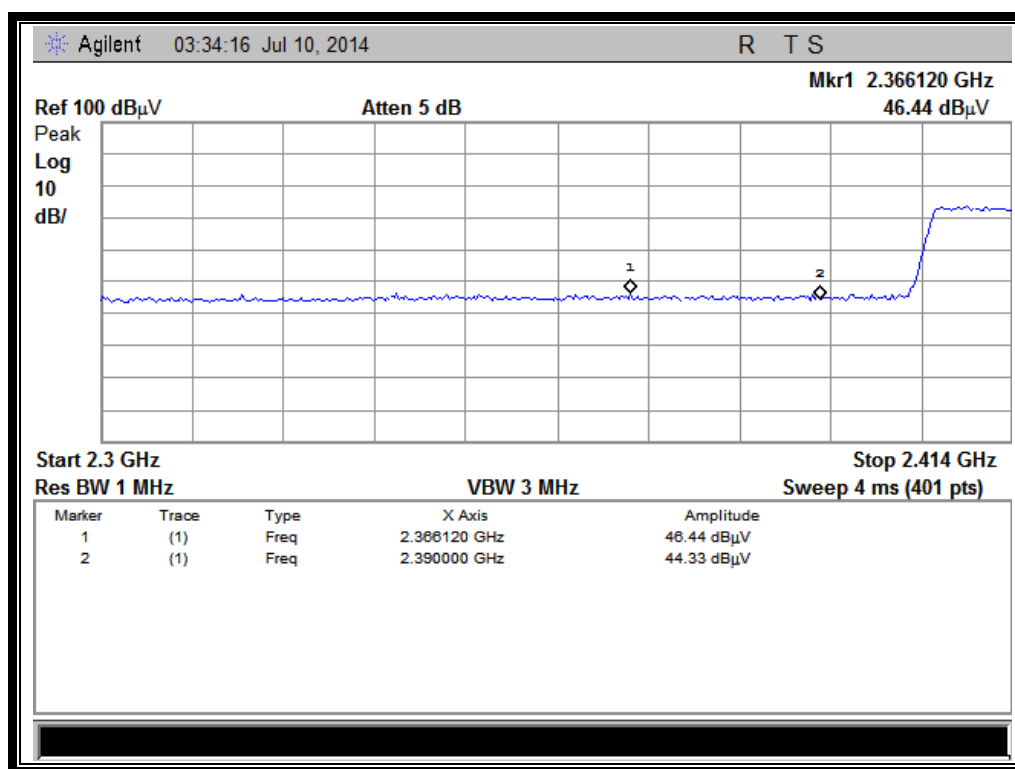
### 2.6.3.4. 802.11n-40MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

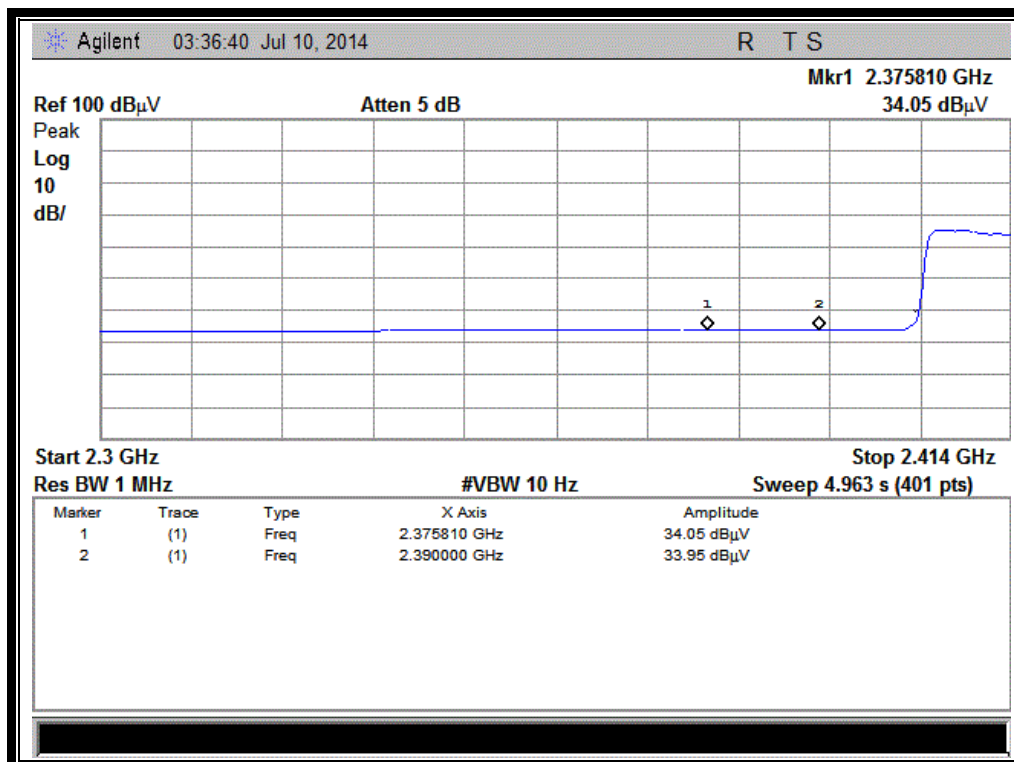
#### A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
3	2366.12	PK	46.44	-30.93	32.56	48.07	74	Pass
3	2375.81	AV	34.05	-30.93	32.56	35.68	54	Pass
9	2487.25	PK	46.08	-29.05	32.50	49.53	74	Pass
9	2484.12	AV	33.69	-29.05	32.50	37.14	54	Pass

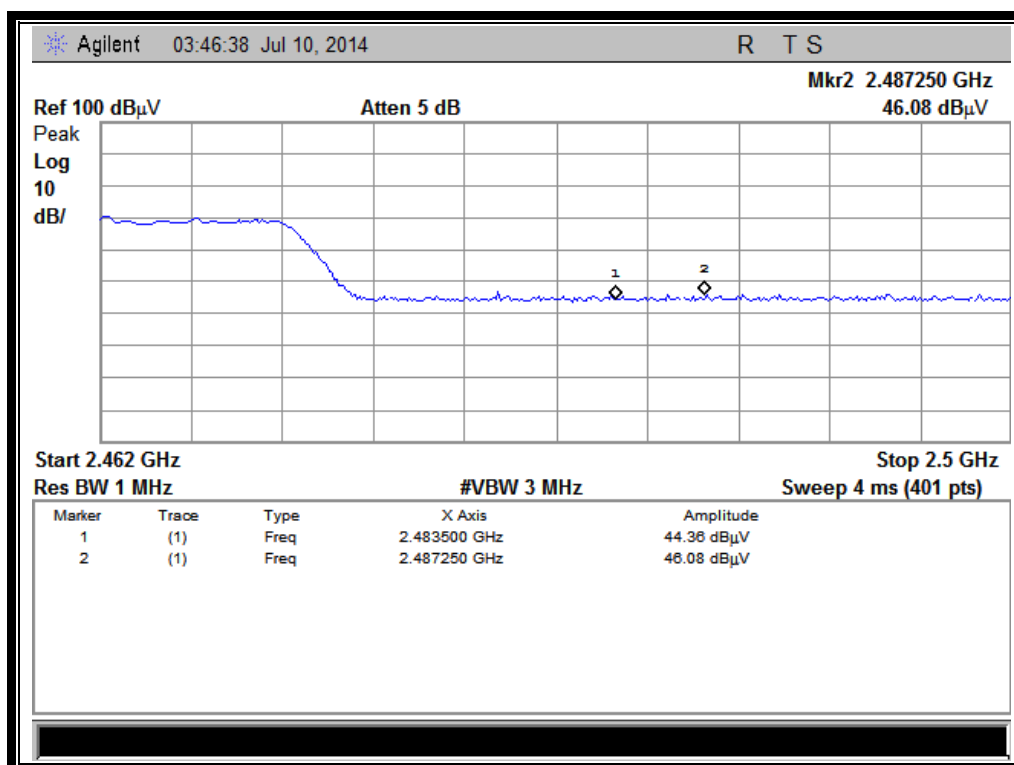
#### B. Test Plots:



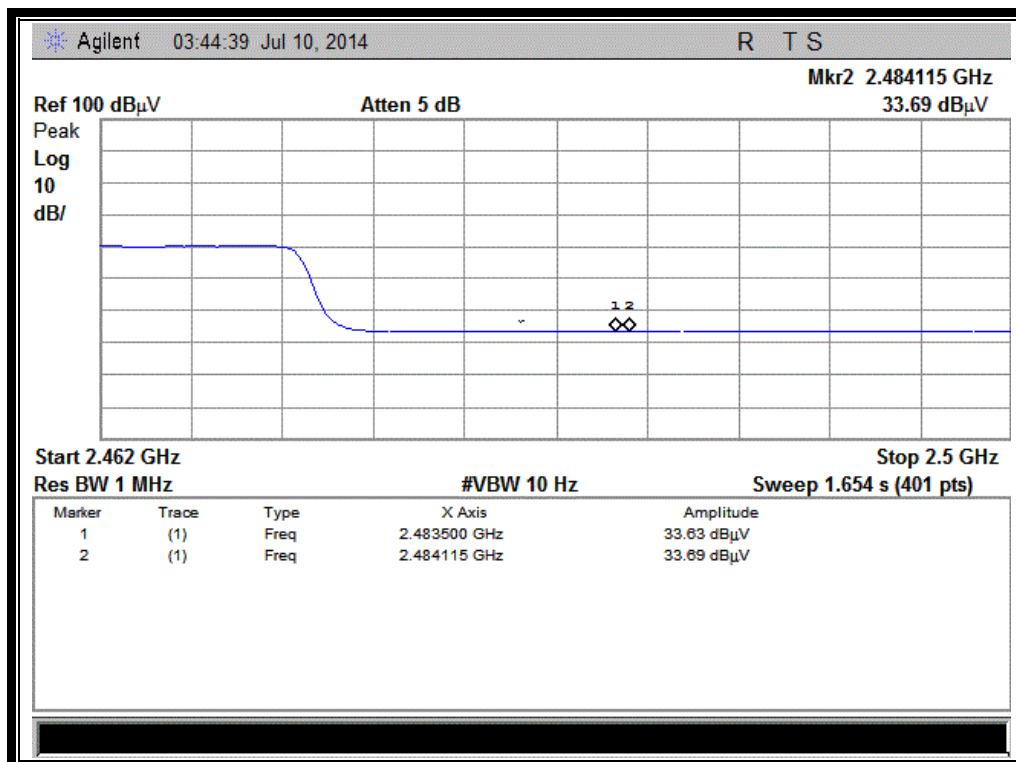
(Plot E1: Channel = 3 PEAK @ 802.11n-40)



(Plot E2: Channel = 3 AVG @ 802.11n-40)



(Plot F1: Channel = 9 PEAK @ 802.11n-40)



(Plot F2: Channel = 9 AVG @ 802.11n-40)

## 2.7. Conducted Emission

### 2.7.1. Requirement

According to FCC section 15.207, 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

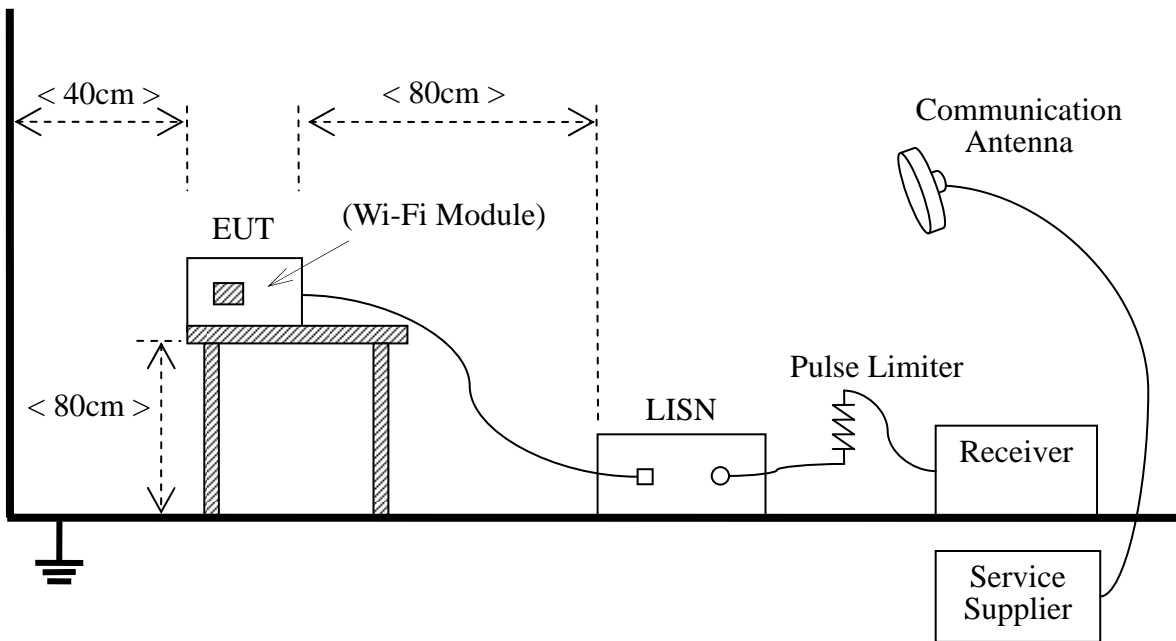
Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

#### NOTE:

- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

### 2.7.2. Test Description

#### A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

The EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply.

## B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2014.02.26	2015.02.25
LISN	Schwarzbeck	NSLK 8127	812744	2014.02.26	2015.02.25
Service Supplier	R&S	CMU200	100448	2014.02.26	2015.02.25
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)	(n.a.)

## 2.7.3. Test Result

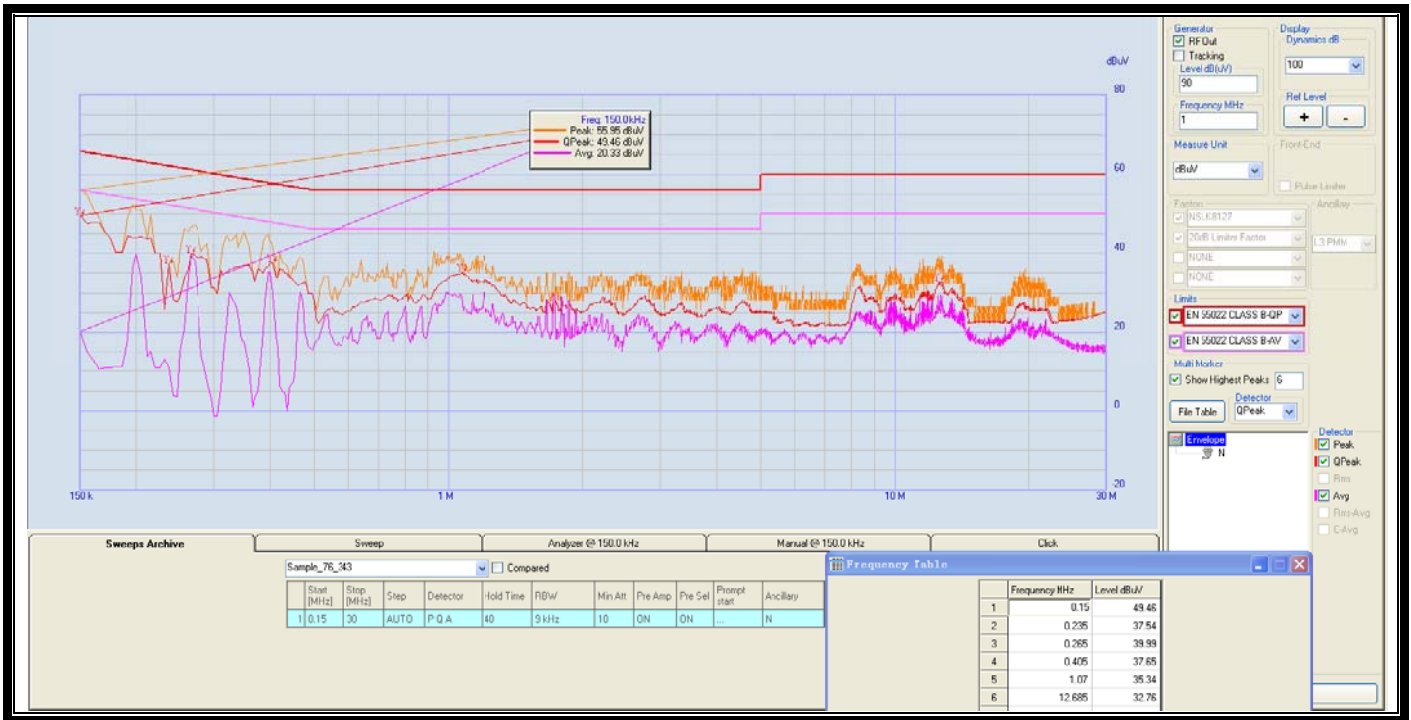
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: All test modes are performed, only the worst case is recorded in this report.

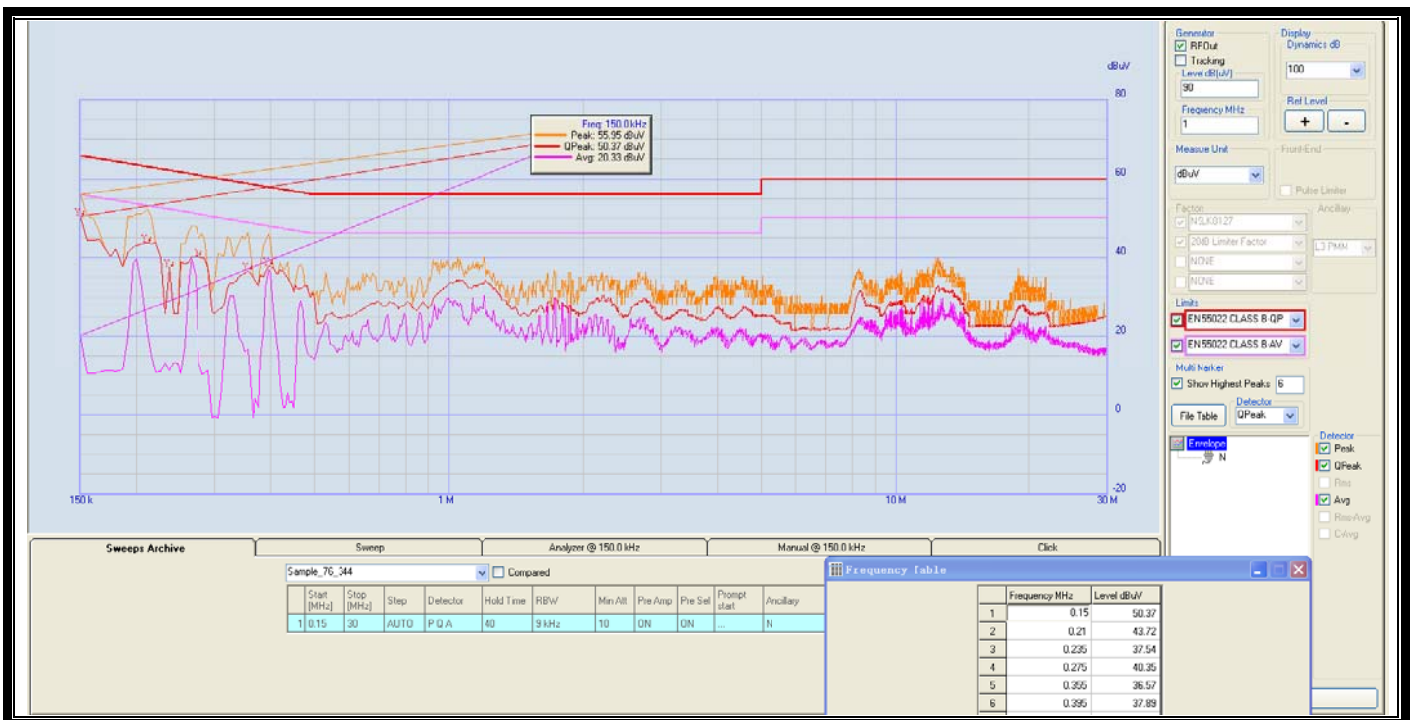
## A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

## B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)

## 2.8. Radiated Emission

### 2.8.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 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 ( $\mu\text{V}/\text{m}$ )	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

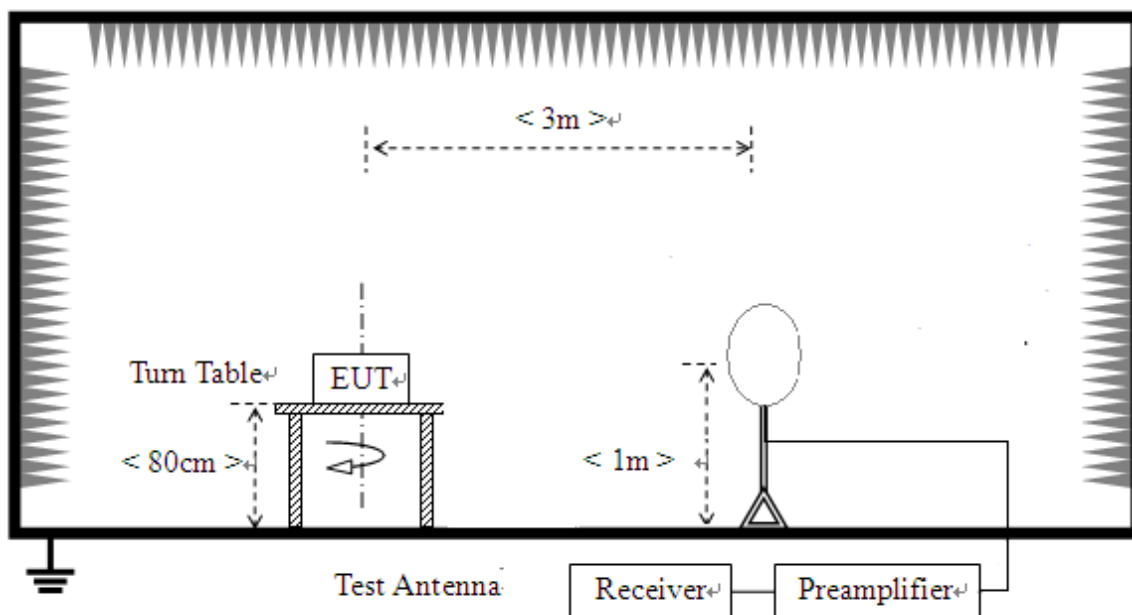
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

### 2.8.2. Test Description

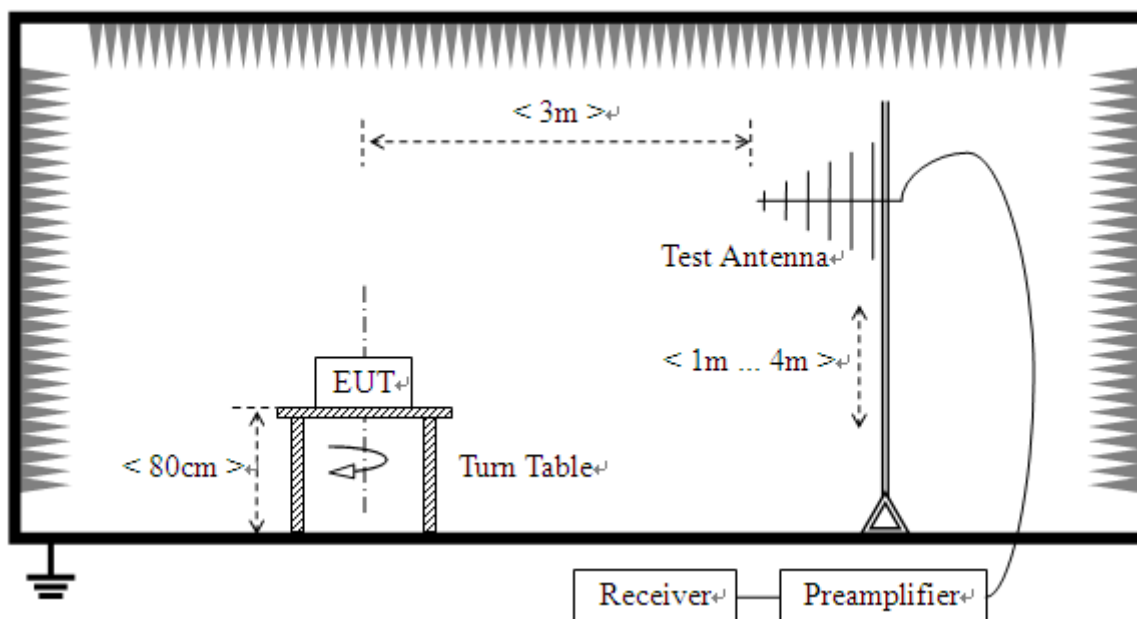
#### A. Test Setup:

- 1) For radiated emissions from 9kHz to 30MHz

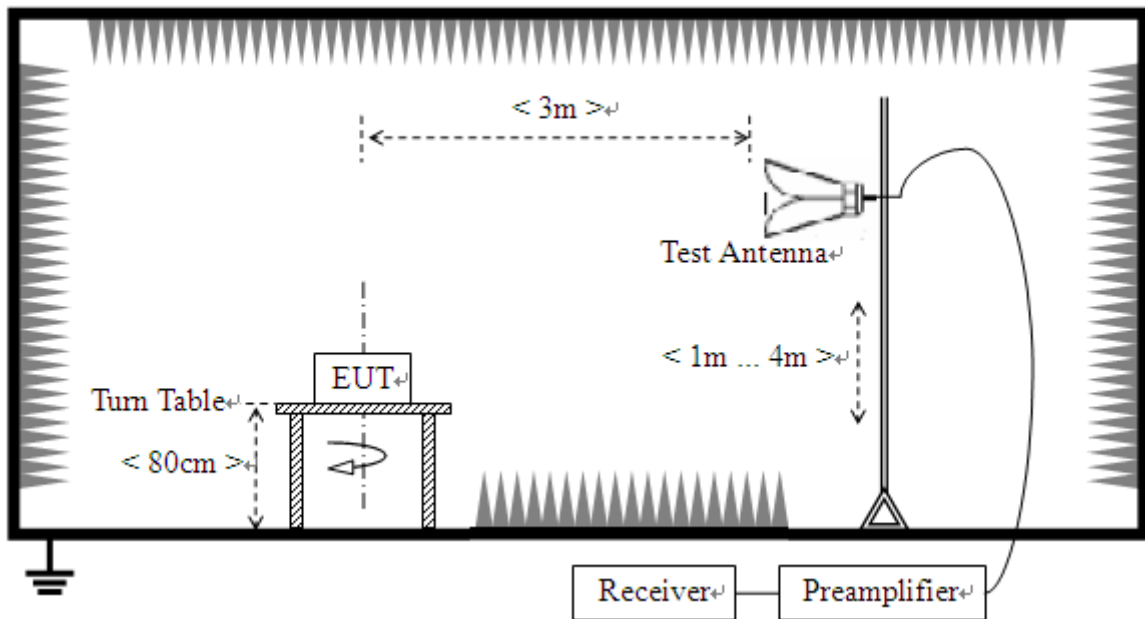




2) For radiated emissions from 30MHz to 1GHz



## 3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The EUT of the EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the EUT is activated and controlled by the Wireless Router via a Common Antenna, and is set to operate under hopping-on test mode.

For the Test Antenna:

- (a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- (b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 2GHz) and Horn Test Antenna (above 2GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

**B. Equipments List:**

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2014.02.26	2015.02.25
EXA Signal Analyzer	Agilent	N9010A	MY51440152	2014.02.26	2015.02.25
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05.12	2015.02.25
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2014.02.26	2015.02.25
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120D-963	2014.02.26	2015.02.25
Test Antenna - Horn	Schwarzbeck	BBHA9170	9170-872	2014.02.26	2015.02.25
Test Antenna - Horn	R&S	HL050S7	71688	2014.02.26	2015.02.25
Test Antenna -Loop	Schwarzbeck	FMZB 1519	1519-022	2014.02.26	2015.02.25

**2.8.3. Test Result**

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$$E [\text{dB}\mu\text{V/m}] = U_R + A_T + A_{\text{Factor}} [\text{dB}]; A_T = L_{\text{Cable loss}} [\text{dB}] - G_{\text{preamp}} [\text{dB}]$$

$A_T$ : Total correction Factor except Antenna

$U_R$ : Receiver Reading

$G_{\text{preamp}}$ : Preamplifier Gain

$A_{\text{Factor}}$ : Antenna Factor at 3m

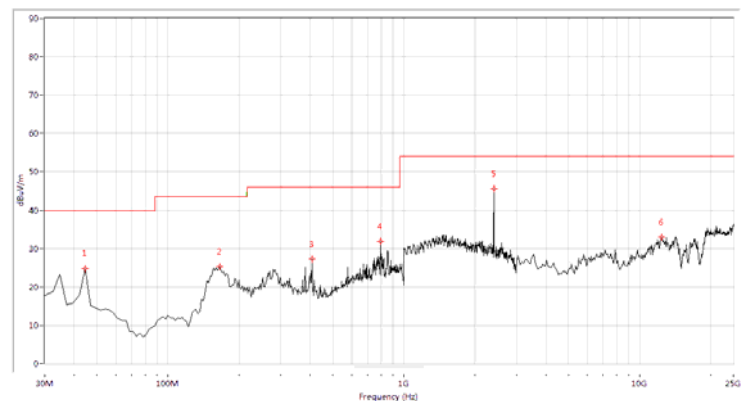
During the test, the total correction Factor  $A_T$  and  $A_{\text{Factor}}$  were built in test software.

**Note:** All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

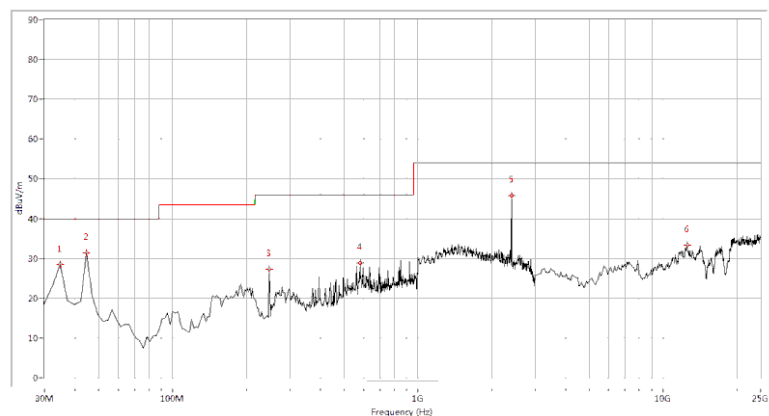
**2.8.3.1. 802.11b Test mode****A. Test Plots for the Whole Measurement Frequency Range:**

# Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	24.76	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
165.461	25.29	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
407.357	27.26	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	31.93	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2412.000	45.56	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
12381.546	33.00	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

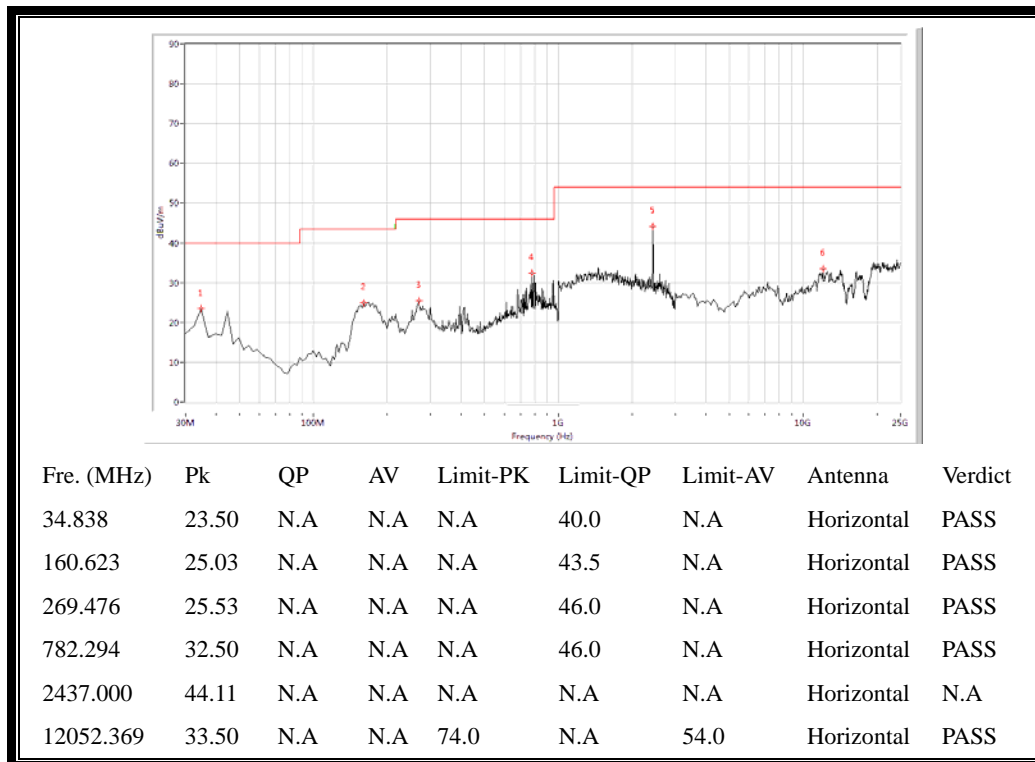
(Antenna Horizontal, 30MHz to 25GHz)



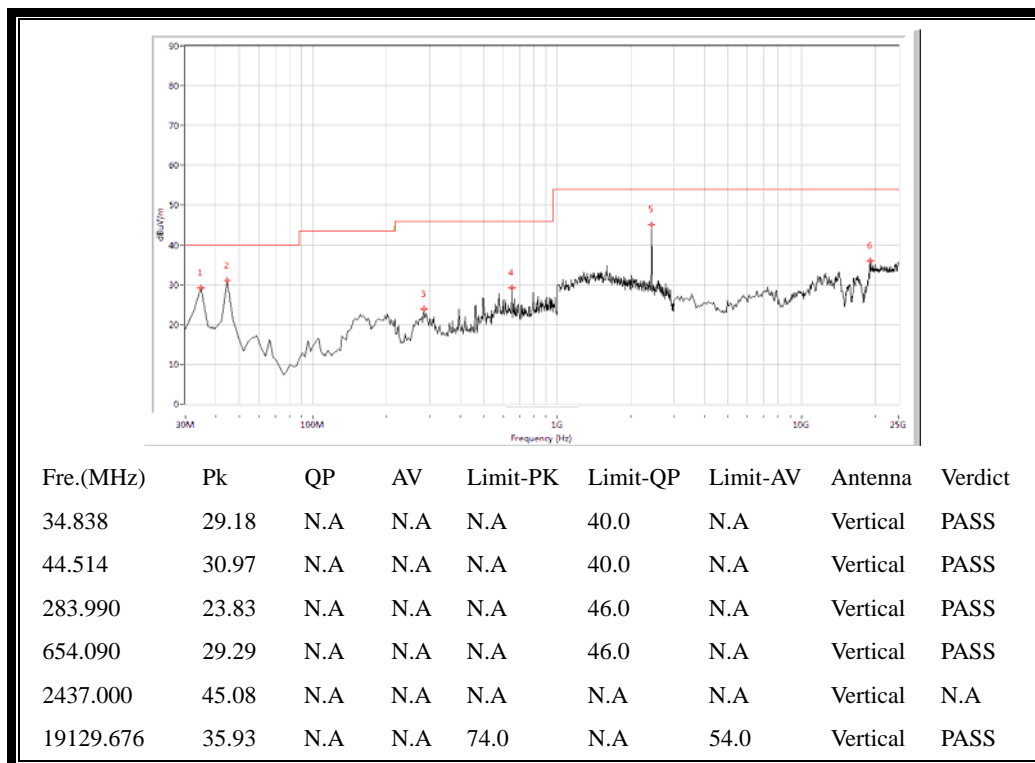
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	28.52	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
44.514	31.38	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
247.706	27.28	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
581.521	28.81	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2412.000	45.72	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
12546.135	33.30	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

### Plot for Channel = 6

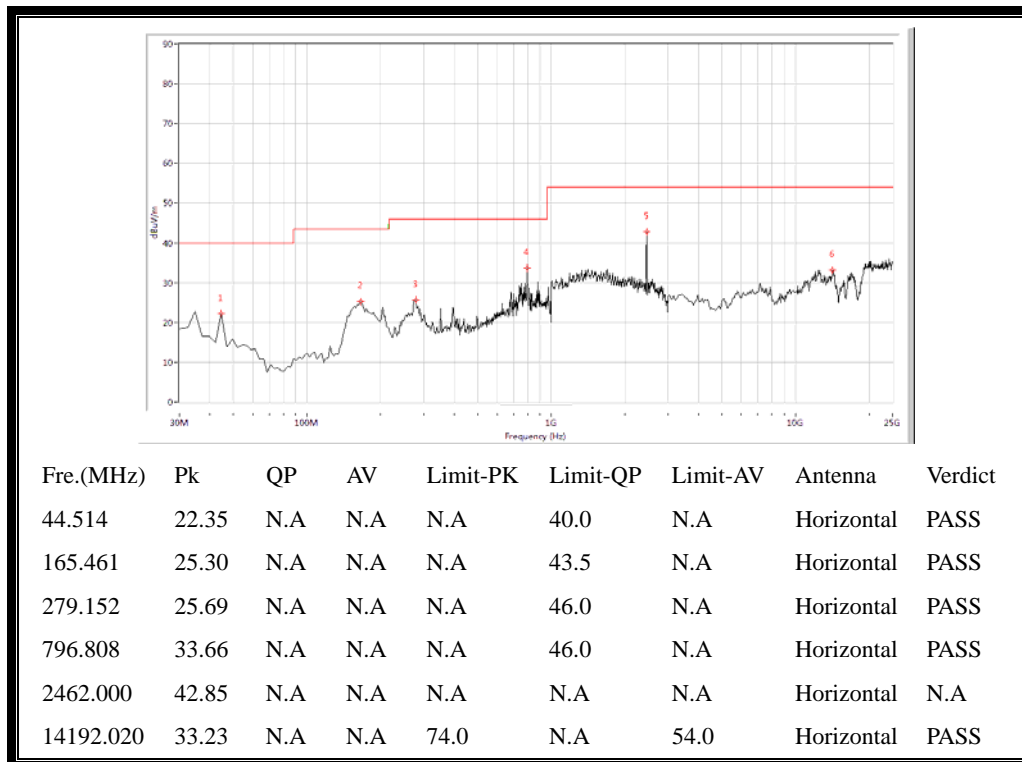


(Antenna Horizontal, 30MHz to 25GHz)

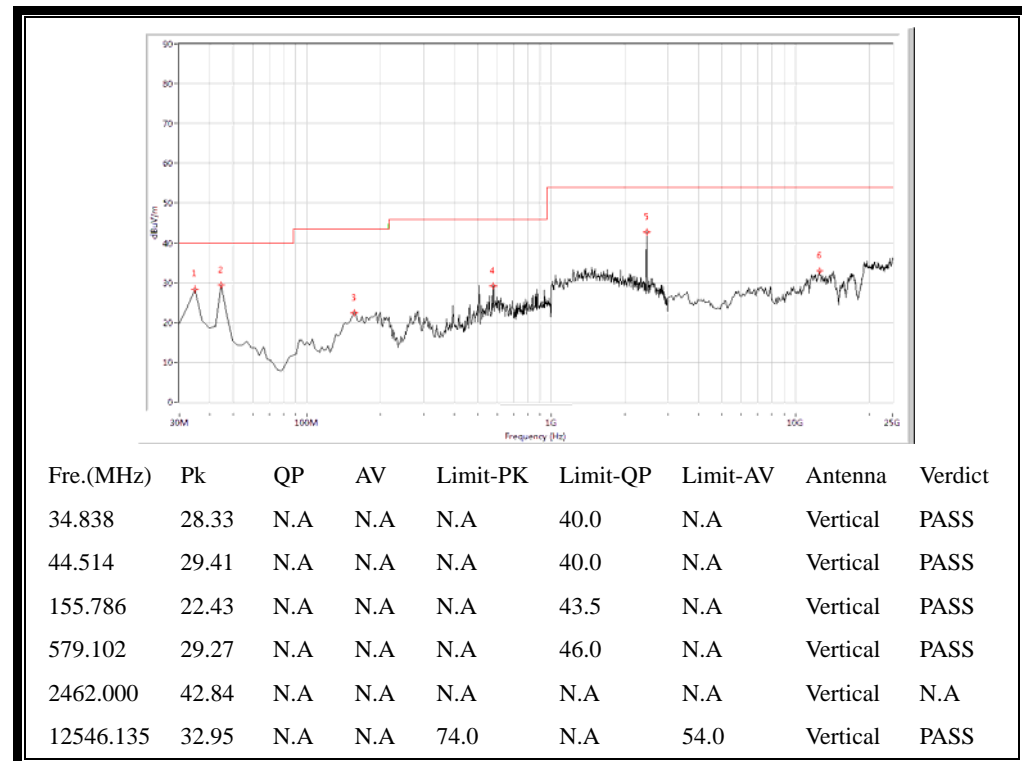


(Antenna Vertical, 30MHz to 25GHz)

### Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)

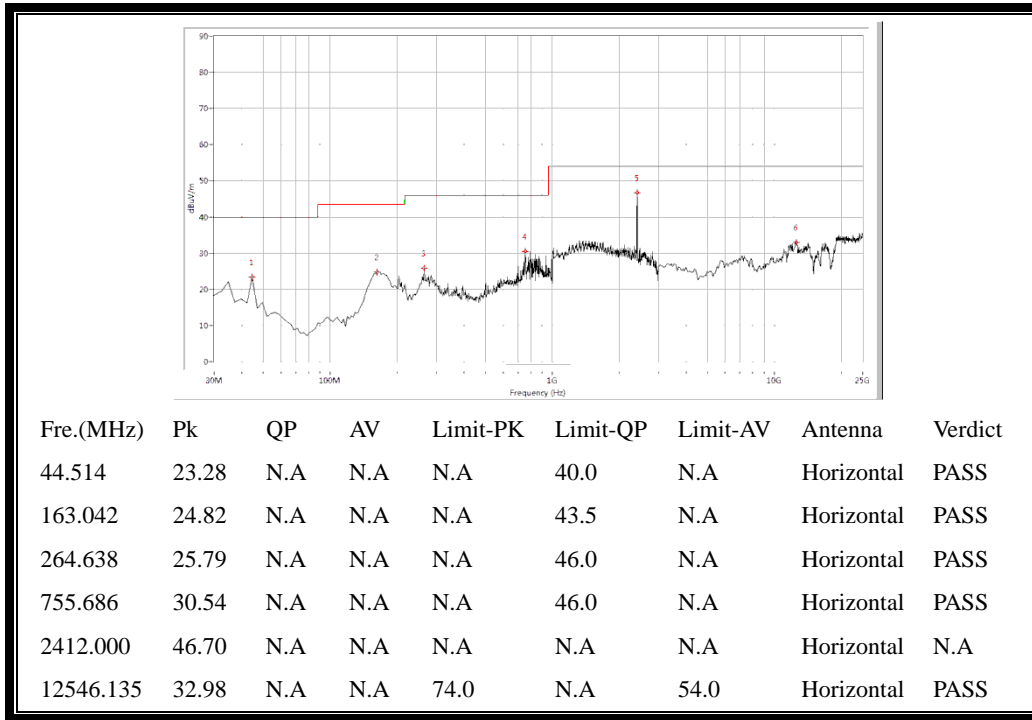


(Antenna Vertical, 30MHz to 25GHz)

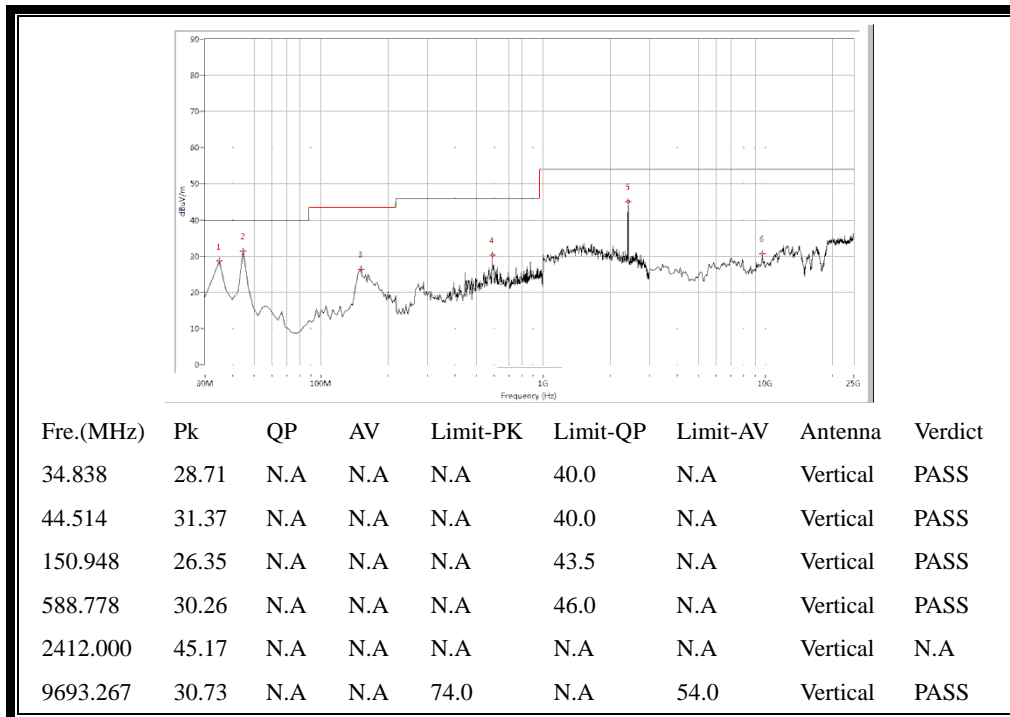
### 2.8.3.2. 802.11g Test mode

#### A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1

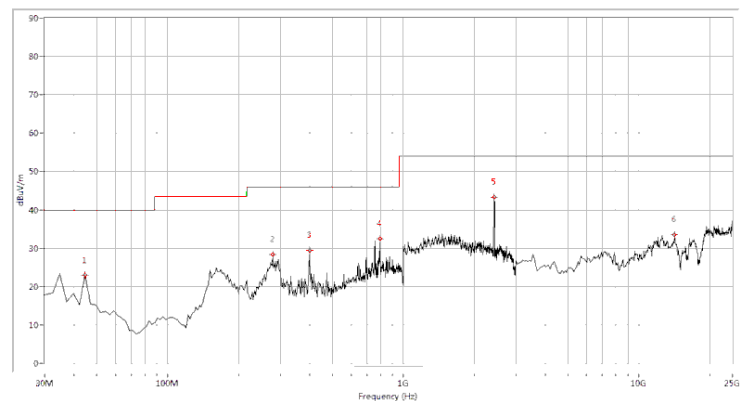


(Antenna Horizontal, 30MHz to 25GHz)



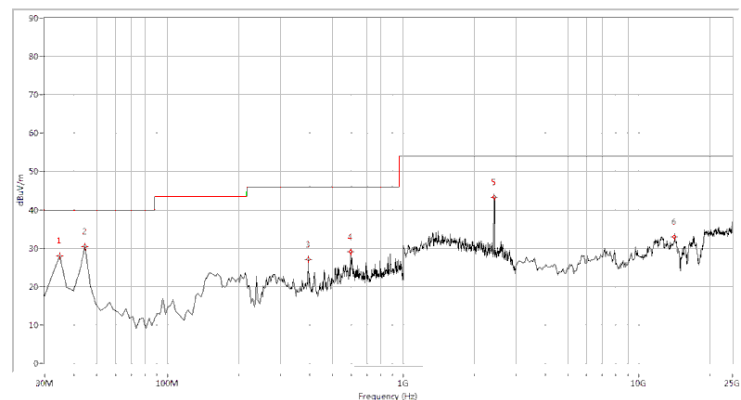
(Antenna Vertical, 30MHz to 25GHz)

# Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	22.98	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
279.152	28.33	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
400.100	29.39	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	32.51	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2437.000	43.25	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	33.59	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

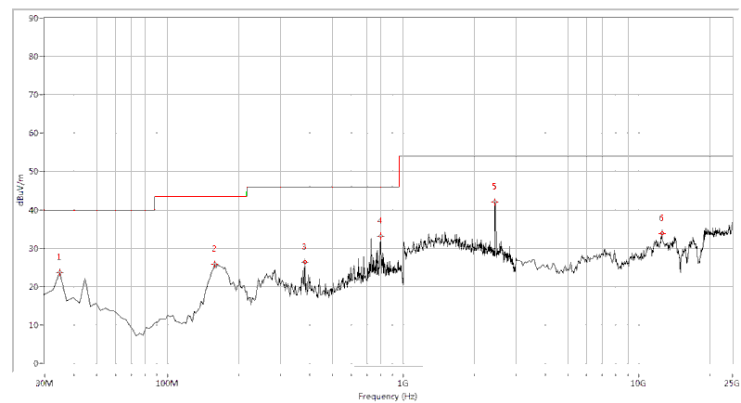


Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	27.92	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
44.514	30.49	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
395.262	27.12	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
596.035	29.01	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2437.000	43.37	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14192.020	32.91	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

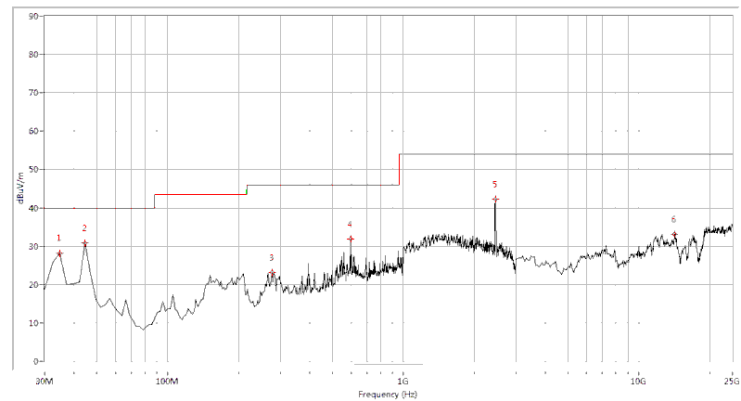


### Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	23.65	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
158.204	25.89	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
383.167	26.37	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
804.065	33.14	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2462.000	42.13	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
12546.135	33.91	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



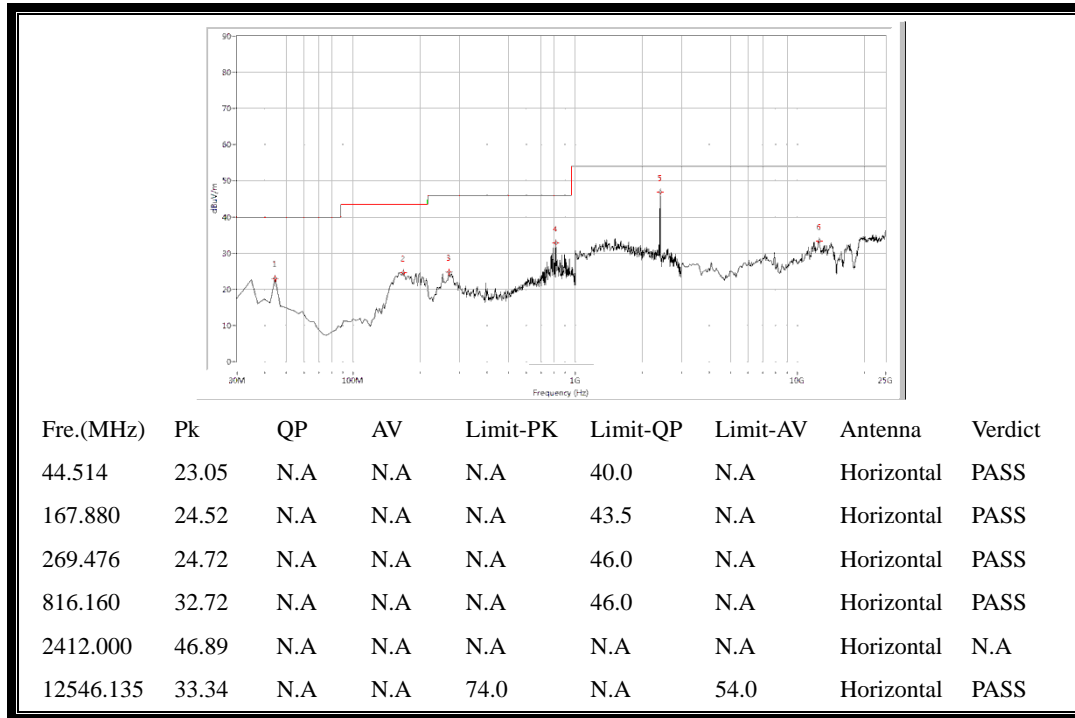
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	28.17	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
44.514	30.85	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
276.733	23.20	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
596.035	31.87	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2462.000	42.16	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14137.157	33.11	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

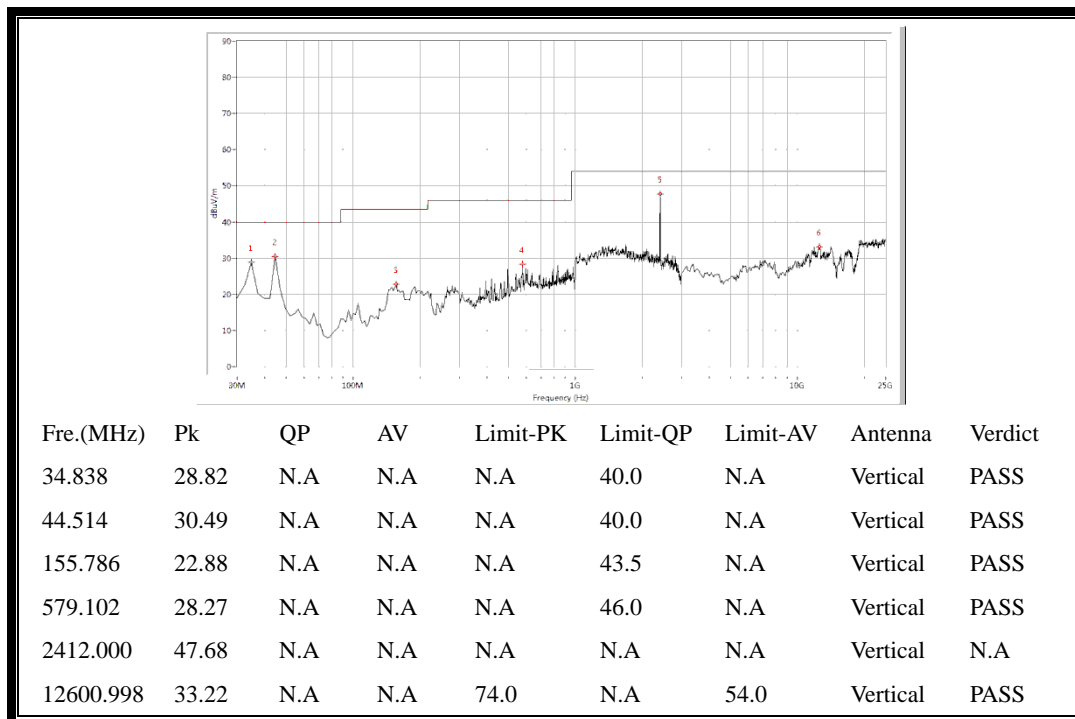
### 2.8.3.3. 802.11n-20MHz Test mode

#### A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1

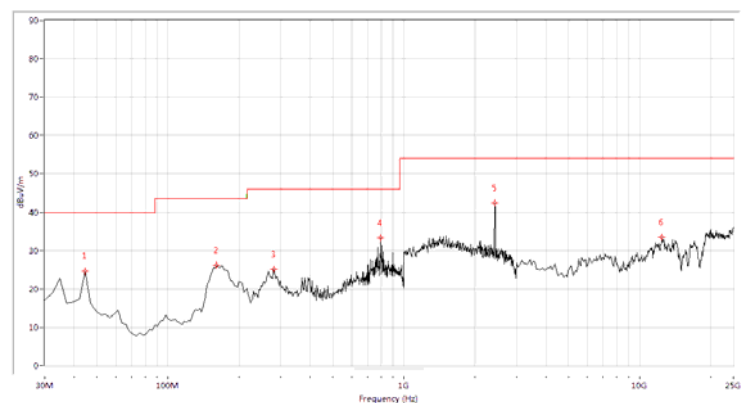


(Antenna Horizontal, 30MHz to 25GHz)



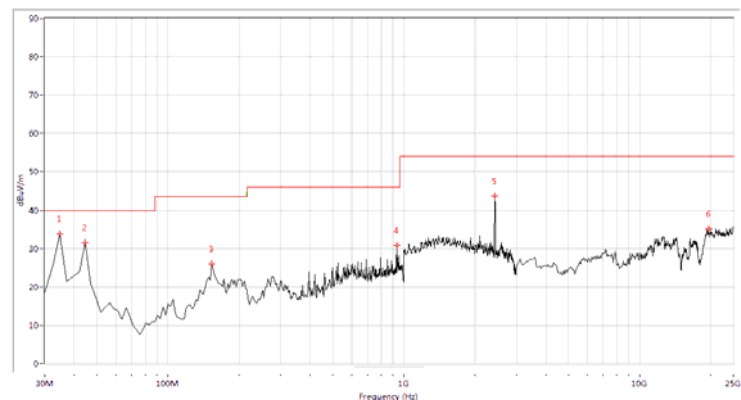
(Antenna Vertical, 30MHz to 25GHz)

# Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	24.61	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
160.623	26.16	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
281.571	25.10	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
799.227	33.25	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2437.000	42.47	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
12436.409	33.48	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

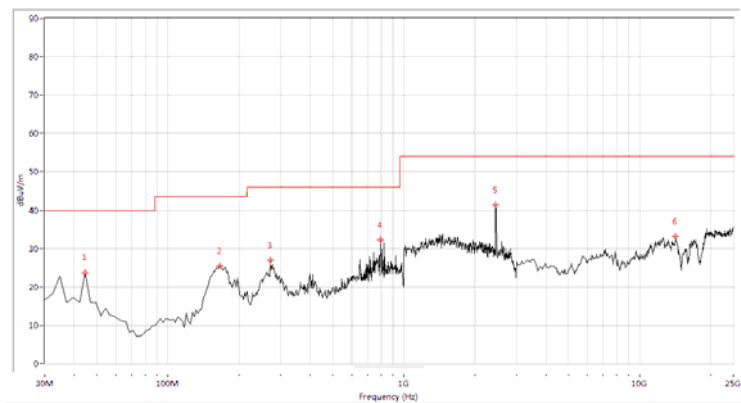
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	33.84	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
44.514	31.61	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
153.367	26.02	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
932.269	30.88	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2437.000	43.70	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
19678.304	35.13	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

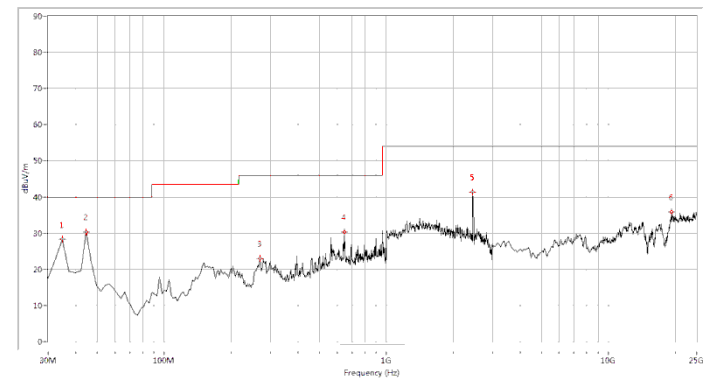
(Antenna Vertical, 30MHz to 25GHz)

### Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	23.61	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
165.461	25.55	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
271.895	26.92	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	32.17	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2462.000	41.39	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	33.24	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



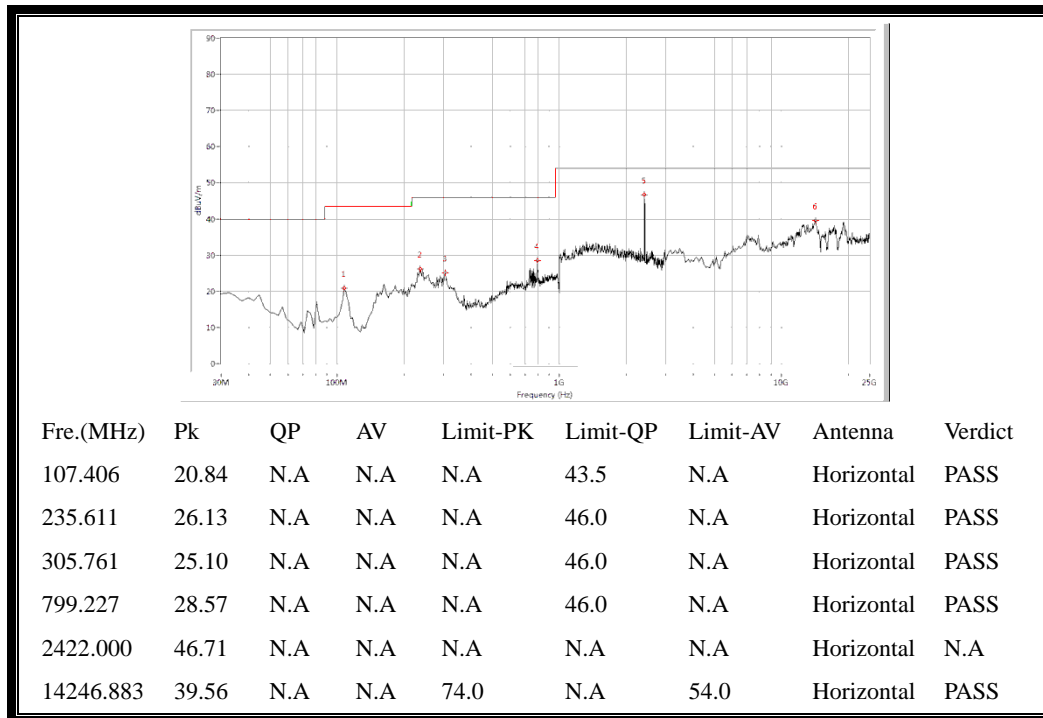
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	28.27	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
44.514	30.34	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
269.476	22.97	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
649.252	30.26	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2462.000	41.27	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
19239.401	35.75	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

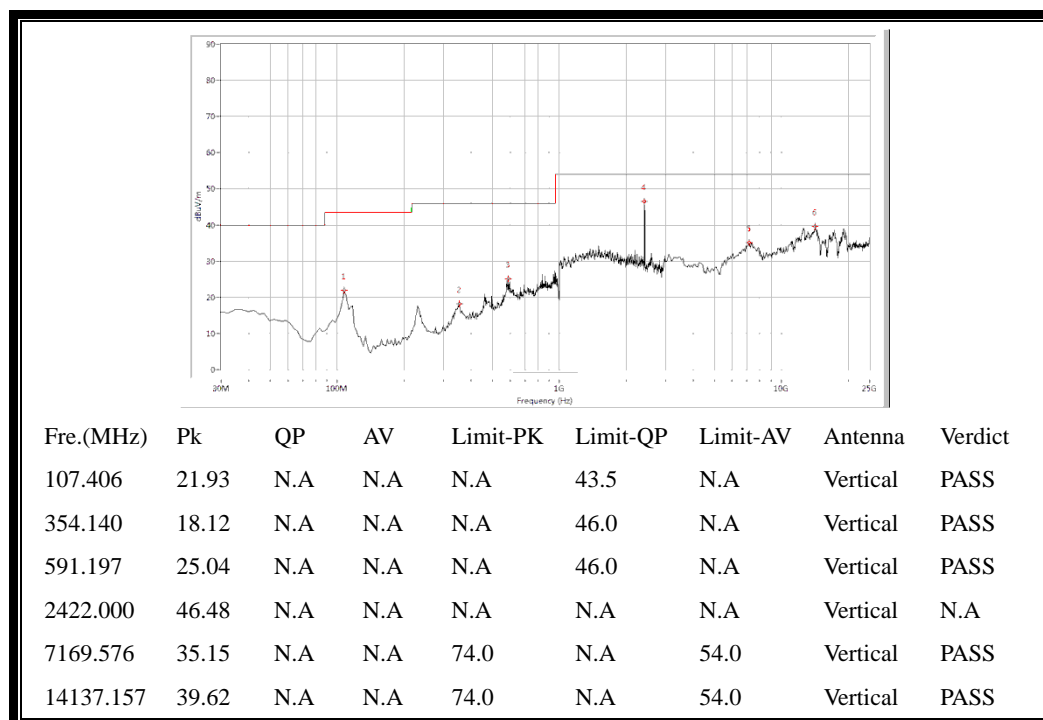
### 2.8.3.4. 802.11n-40MHz Test mode

#### A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 3

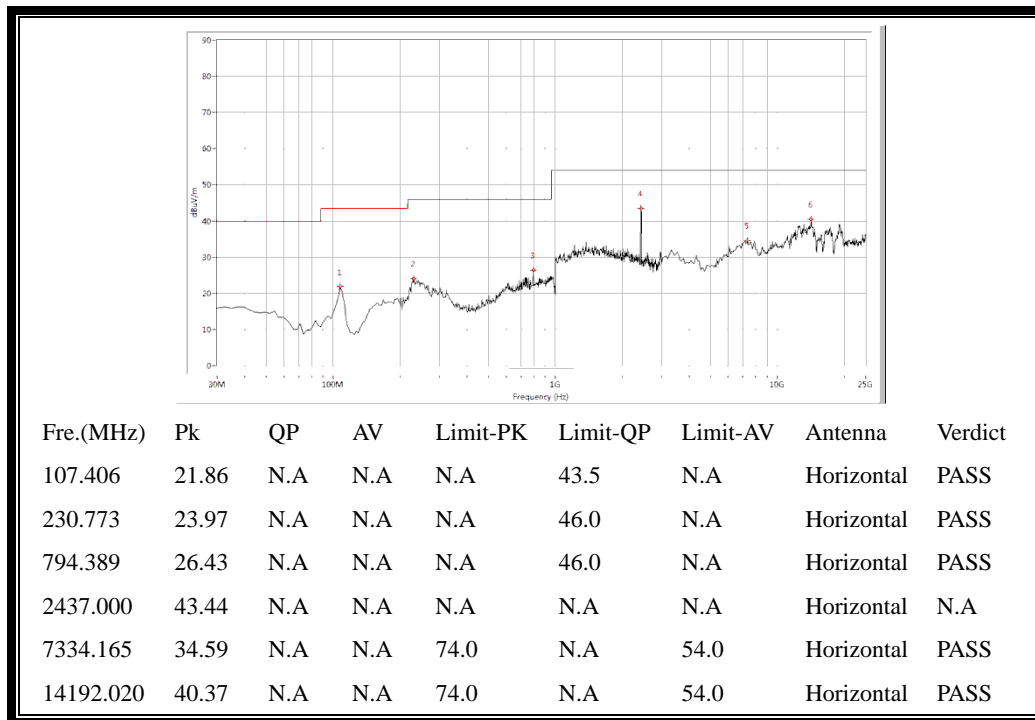


(Plot A.2: Antenna Horizontal, 30MHz to 25GHz)

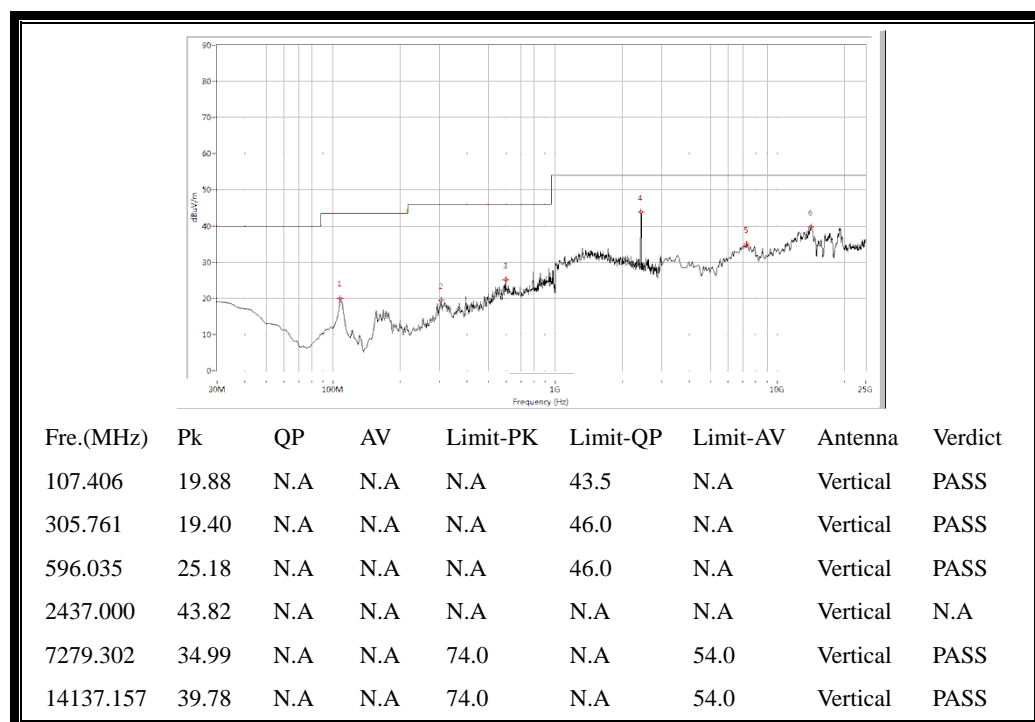


(Plot A.3: Antenna Vertical, 30MHz to 25GHz)

# Plots for Channel = 6

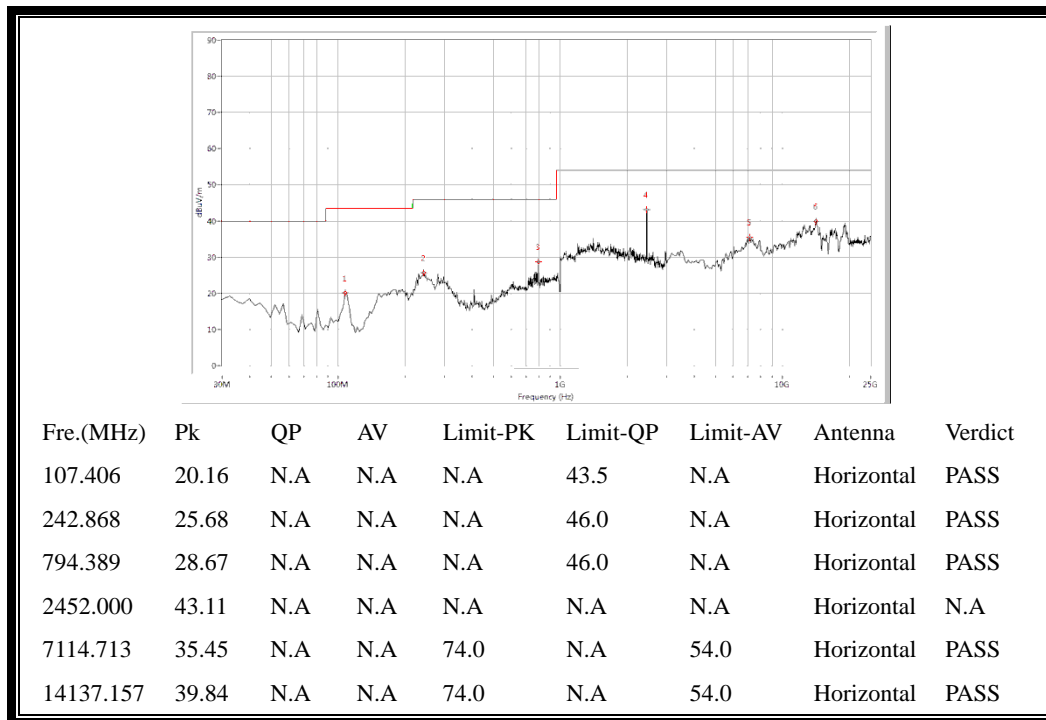


(Plot B.2: Antenna Horizontal, 30MHz to 25GHz)

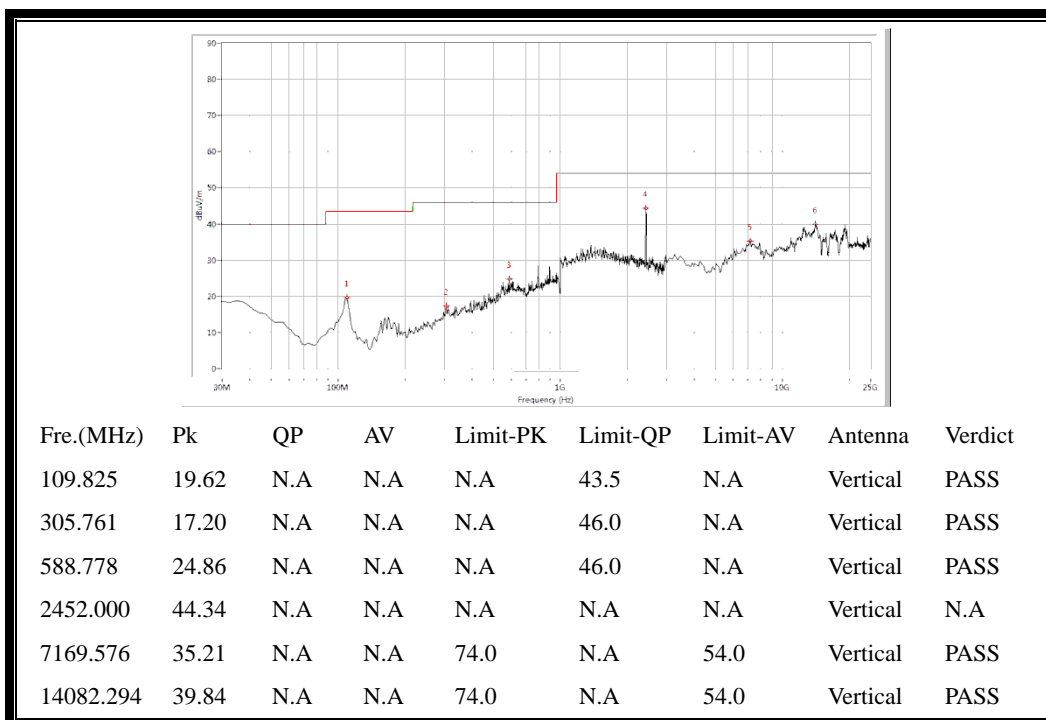


(Plot B.3: Antenna Vertical, 30MHz to 25GHz)

# Plots for Channel = 9



(Plot C.2: Antenna Horizontal, 30MHz to 25GHz)



(Plot C.3: Antenna Vertical, 30MHz to 25GHz)

## **2.9. RF exposure evaluation**

### **2.9.1. Requirement**

According to § 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of Commission's guideline.

### **2.9.2. Result**

Please refer to SAR report.

**\*\* END OF REPORT \*\***