REPORT No.: SZ16050107W07

FCC RF TEST REPORT

APPLICANT	:	SHENZHEN ANTOP TECHNOLOGY., LTD.
PRODUCT NAME	:	Router Antenna
MODEL NAME	:	MV-9818/4G
TRADE NAME	:	N.A
BRAND NAME	:	N.A
FCC ID	:	2AG6P09819
STANDARD(S)	:	47 CFR Part 15 Subpart C
ISSUE DATE	:	2016-08-12

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DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	2016-08-12	First edition

TEST REPORT DECLARATION

Applicant	SHENZHEN ANTOP TECHNOLOGY., LTD.
Applicant Address	301, No. 1 Workshop, Longqiaohua Industrial Zone, Luotian Forest Farm, Songgang Street, Baoan District, 518100 Shenzhen City, Guang Dong Province, People's, Republic Of China
Manufacturer Address	SHENZHEN ANTOP TECHNOLOGY., LTD.
Manufacturer	301, No. 1 Workshop, Longqiaohua Industrial Zone, Luotian Forest Farm, Songgang Street, Baoan District, 518100 Shenzhen City, Guang Dong Province, People's, Republic Of China
Product Name	Router Antenna
Model Name	MV-9818/4G
Brand Name	N.A
HW Version	V1.0
SW Version	V1.0
Test Standards	47 CFR Part 15 Subpart C
Test Date	2016-05-30 to 2016-06-15
Test Result	PASS

Tested by : Yuan Ling

Reviewed by : Qiu Xiaojun

Approved by : Peng Huarui

1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	SHENZHEN ANTOP TECHNOLOGY., LTD.
Address	301, No. 1 Workshop, Longqiaohua Industrial Zone, Luotian Forest Farm, Songgang Street, Baoan District, 518100 Shenzhen City, Guang Dong Province, People's, Republic Of China

1.2 Equipment under Test (EUT) Description

Brand Name:	N.A
Trade Name:	N.A
Model Name:	MV-9818/4G
Frequency Range:	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz 802.11n-40MHz: 2.422GHz - 2.452GHz
Channel Number:	802.11b/g/n-20MHz: 11 802.11n-40MHz: 7
Modulation Type:	DSSS, OFDM
Antenna Type:	Dedicated Antenna
Antenna Gain:	Ant1: 5.0dBi; Ant2: 5.0dBi$_{Note2}$
Directional Gain:	8.01dBi

NOTE:

1. The EUT is a Router Antenna, 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.

For 802.11b/g/n-20MHz (2.4GHz band), the frequencies allocated is F (MHz) =2412+5*(n-1) (1<=n<=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 (MHz) =2412+5*(n-1) (3<=n<=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).

2. The EUT has 2 antennas, only the 802.11n HT20/HT40 of the EUT operates in MIMO Antenna mode (antenna1 and antenna2). And the test data of the 802.11n HT20/HT40 were tested by MIMO mode.

Operation mode / TX mode	1TX	2TX
802.11b	ANT1 or ANT2	
802.11g	ANT1 or ANT2	
802.11n(20MHz)		ANT1 & ANT2
802.11n(40MHz)		ANT1 & ANT2

According to KDB 662911 D01, the directional gain = $G_{ANT}+10\log(N_{ANT})$ dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

3. The EUT operated in a continuous transmission mode and the duty cycle not less than 98% for all test item.
4. The EUT connected to the serial port of the computer with a serial communication cable, and then use the dedicated software to control the EUT into the test mode.
5. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.
6. The antenna connector of EUT is designed with permanent attachment and no consideration of replacement.

1.2.1 Identification of all used EUTs

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
A01	V1.0	V1.0

1.3 Test Standards and Results

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

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

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

No.	Section	Description	Test Date	Result
1	15.203	Antenna Requirement	N.A	**PASS**
2	15.247(b)	Peak Output Power	May 30, 2016	**PASS**
3	15.247(a)	Bandwidth	May 30, 2016	**PASS**
4	15.247(d)	Conducted Spurious Emission and Band Edge	May 30, 2016	**PASS**
5	15.247(d)	Restricted Frequency Bands	Jun 15, 2016	**PASS**
6	15.207	Conducted Emission	N.A	**N.A** Note
7	15.209 ,15.247(d)	Radiated Emission	Jun 15, 2016	**PASS**
8	15.247(e)	Power spectral density (PSD)	May 30, 2016	**PASS**
Note: Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.				

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

1.3.1 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 exceed1 Watt.

2.2.2 Test Description

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

A. Test procedure

The measured output power was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for Peak Output Power test on the spectrum analyzer：

a) Set analyzer center frequency to channel center frequency.

b)Set the RBW to1MHz

c) Set VBW to 3MHz

d) Set span to 3MHz

e) Sweep time to auto couple.

f) Detector = peak.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use peak marker function to determine the peak amplitude level.

B. Test Setup:

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

C. Equipments List:

Please reference ANNEX A(1.5).

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 Antenna 1 802.11b Test Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	20.18	0.1042	30	1	PASS
6	2437	20.24	0.1057			PASS
11	2462	20.81	0.1205			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	16.81	0.0480	30	1	PASS
6	2437	16.91	0.0491			PASS
11	2462	17.36	0.0545			PASS

2.2.3.2 Antenna 2 802.11b Test Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	19.20	0.0832	30	1	PASS
6	2437	18.92	0.0780			PASS
11	2462	19.32	0.0855			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	15.77	0.0378	30	1	PASS
6	2437	15.32	0.0340			PASS
11	2462	15.69	0.0371			PASS

2.2.3.3 Antenna 1 802.11g Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	24.75	0.2985	30	1	PASS
6	2437	24.74	0.2979			PASS
11	2462	25.93	0.3917			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.82	0.0605	30	1	PASS
6	2437	18.05	0.0638			PASS
11	2462	18.16	0.0655			PASS

2.2.3.4 Antenna 2 802.11g Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	24.09	0.2564	30	1	PASS
6	2437	24.11	0.2576			PASS
11	2462	23.97	0.2495			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.21	0.0526	30	1	PASS
6	2437	16.99	0.0500			PASS
11	2462	17.42	0.0552			PASS

2.2.3.5 Antenna 1 802.11n-20MHz Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	24.92	0.3105	30	1	PASS
6	2437	24.55	0.2851			PASS
11	2462	23.89	0.2449			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.54	0.0568	30	1	PASS
6	2437	17.23	0.0528			PASS
11	2462	17.12	0.0515			PASS

2.2.3.6 Antenna 2 802.11n-20MHz Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	23.95	0.2483	30	1	PASS
6	2437	23.84	0.2421			PASS
11	2462	24.13	0.2588			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	16.74	0.0472	30	1	PASS
6	2437	16.48	0.0445			PASS
11	2462	16.89	0.0489			PASS

2.2.3.7 ANT1+ANT2 802.11n-20MHz Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	27.47	0.5588	27.99 Note	0.63	PASS
6	2437	27.22	0.5272			PASS
11	2462	27.02	0.5037			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	20.17	0.1040	27.99 Note	0.63	PASS
6	2437	19.88	0.0973			PASS
11	2462	20.02	0.1004			PASS

2.2.3.8 Antenna 1 802.11n-40MHz Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	23.62	0.2301	30	1	PASS
6	2437	23.81	0.2404			PASS
9	2452	23.75	0.2371			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	16.52	0.0449	30	1	PASS
6	2437	16.79	0.0478			PASS
9	2452	16.46	0.0443			PASS

2.2.3.9 Antenna 2 802.11n-40MHz Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	22.88	0.1941	30	1	PASS
6	2437	22.37	0.1726			PASS
9	2452	22.86	0.1932			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	15.76	0.0377	30	1	PASS
6	2437	15.64	0.0366			PASS
9	2452	15.73	0.0374			PASS

2.2.3.10 ANT1+ANT2 802.11n-40MHz Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	26.28	0.4242	27.99_{Note}	0.63	PASS
6	2437	26.16	0.4130			PASS
9	2452	26.34	0.4303			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	19.17	0.0825	27.99 Note	0.63	PASS
6	2437	19.26	0.0844			PASS
9	2452	19.12	0.0817			PASS

Note:

1. Each antenna port was measured individually, and the aggregated power was summed mathematically.

Remark:

The MIMO test requirement, RF conducted output power shall measure each transmitter chain. And after obtain each individual transmitter chain power, then sum the output power by using the following formula;

((dBm/Chain 1)/10^Log)+ (dBm/Chain 2)/10^Log))+ (dBm/Chain N)/10^Log))= Combined peak output power in mW.

2. According to KDB 558074 D01 v03r03, for those cases where the rule specifies that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6 dBi, the applicable output power limit shall be calculated as follows:

$$P_{Out} = P_{Limit} - (G_{Tx} - 6)$$

Where:

P_{Out} is the maximum conducted output power in dBm,

P_{Limit} is the output power limit in dBm,

G_{Tx} is the maximum transmitting antenna directional gain in dBi

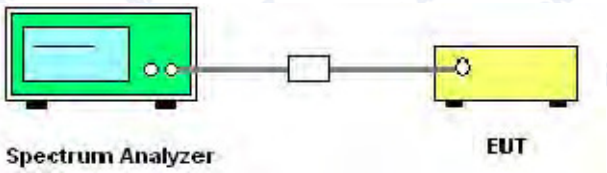
2.3 Bandwidth

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 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:

Please reference ANNEX A(1.5).

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.

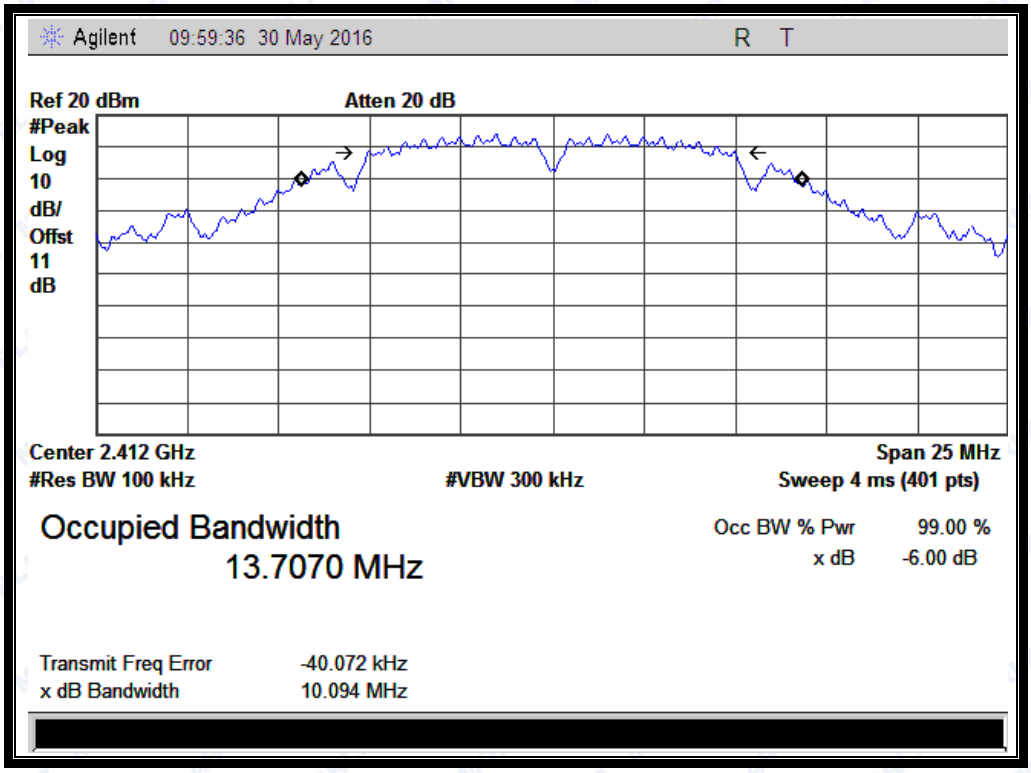
2.3.3.1 802.11b Test mode

Antenna 1:

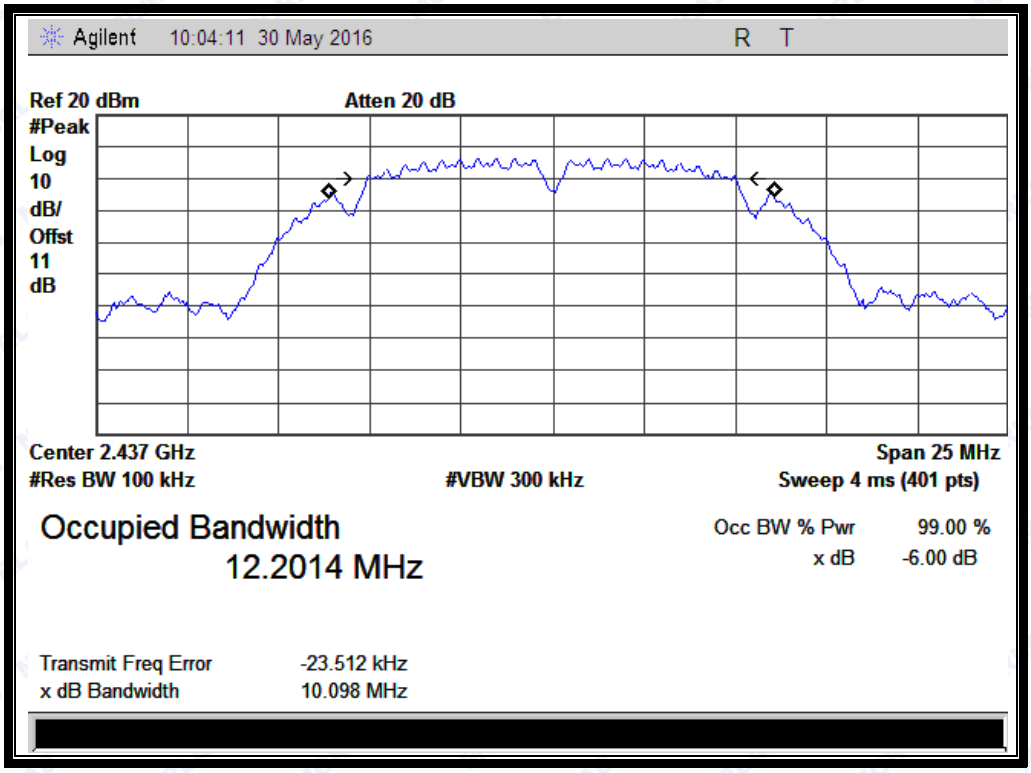
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	10.094	≥500	PASS
6	2437	10.098	≥500	PASS
11	2462	10.072	≥500	PASS

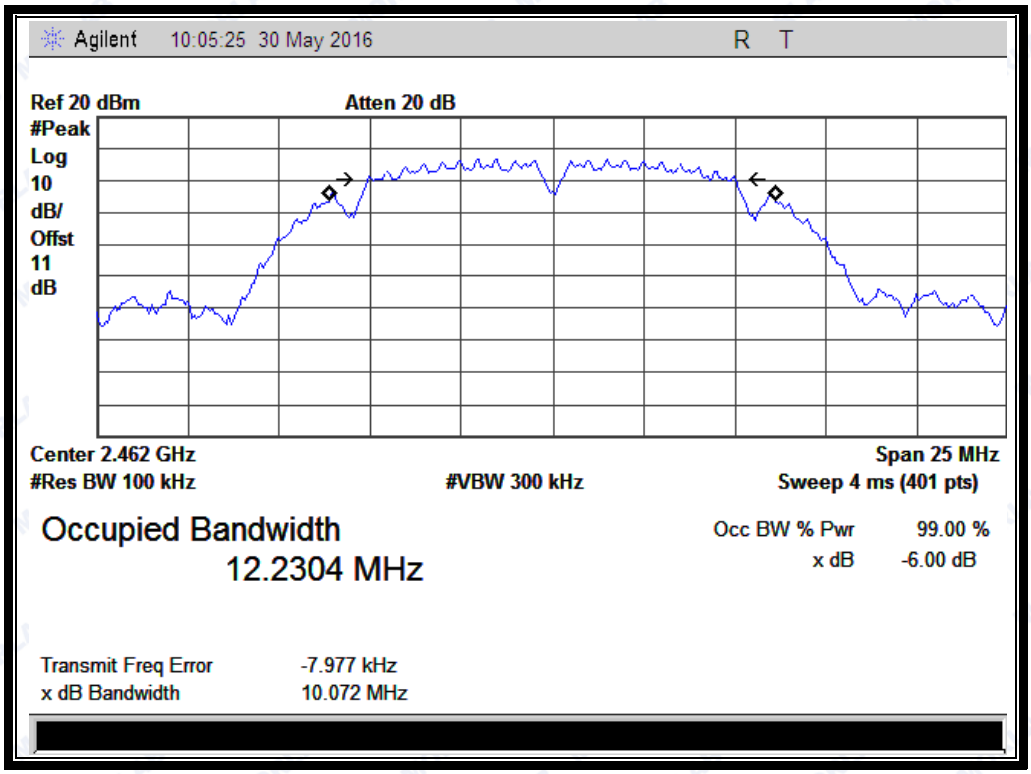
B. Test Plots:



(Channel 1: 2412MHz @ 802.11b)



(Channel 6: 2437 MHz @ 802.11b)



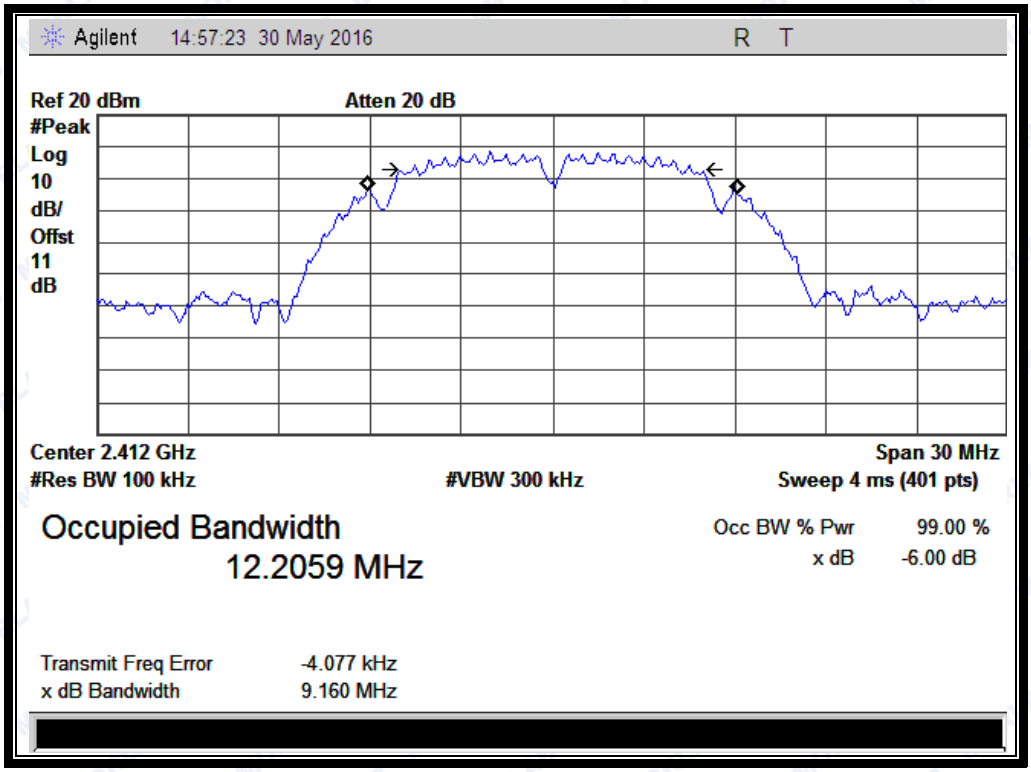
(Channel 11: 2462MHz @ 802.11b)

Antenna 2:

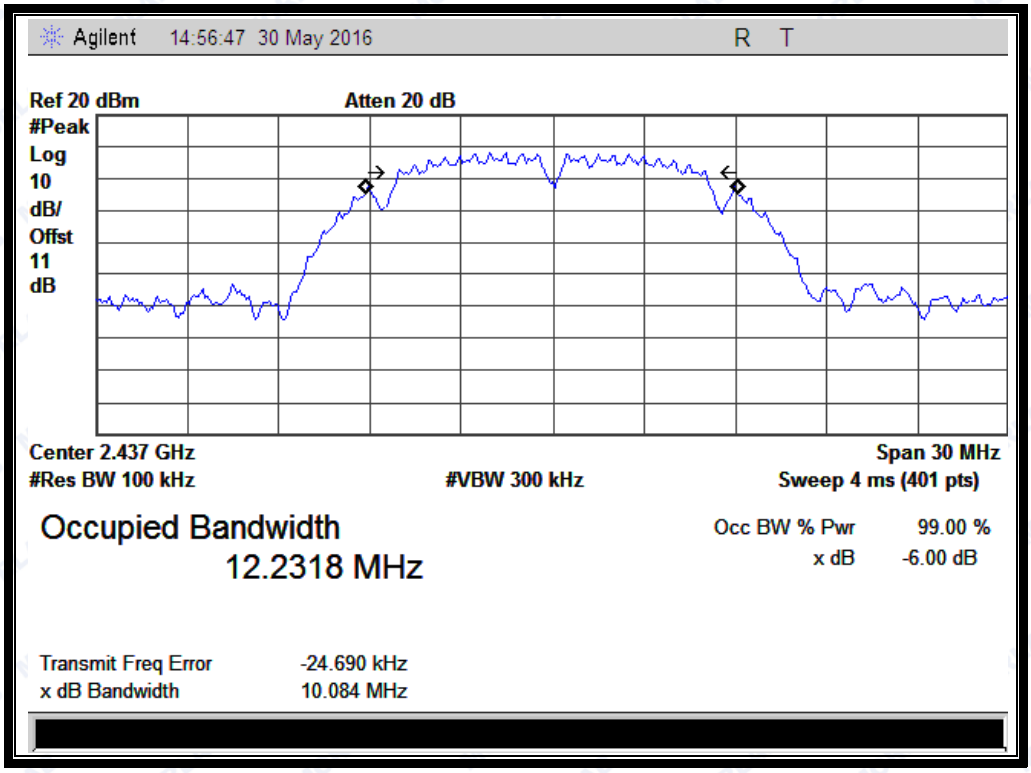
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.160	≥500	PASS
6	2437	10.084	≥500	PASS
11	2462	9.601	≥500	PASS

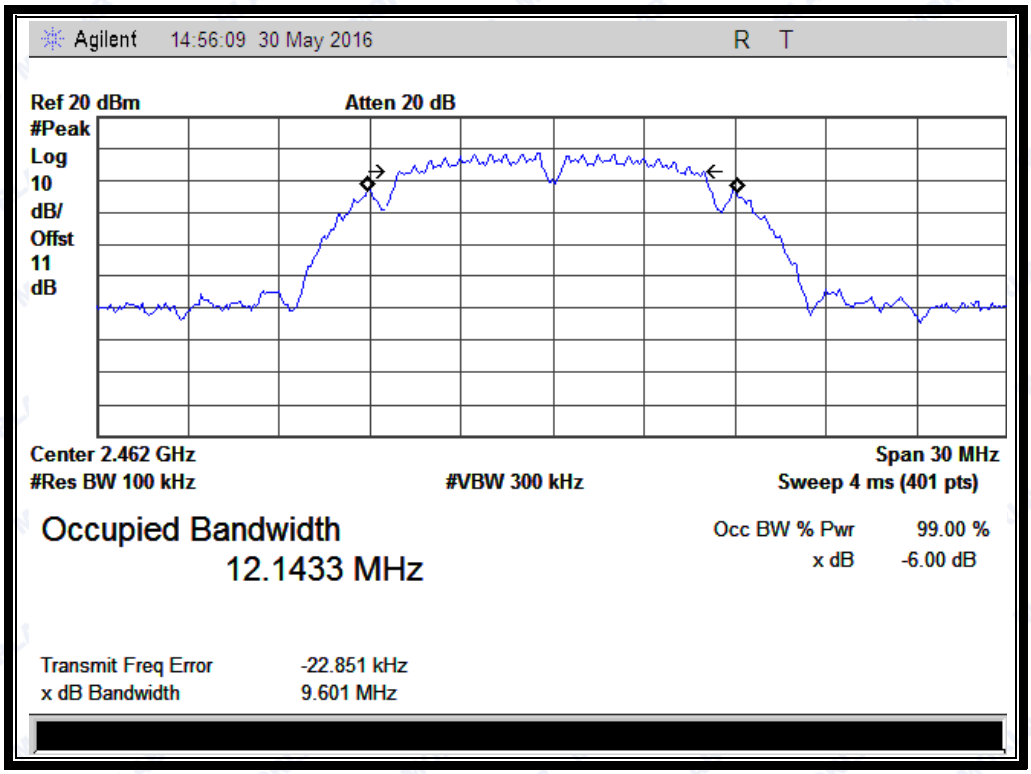
B. Test Plots:



(Channel 1: 2412MHz @ 802.11b)



(Channel 6: 2437 MHz @ 802.11b)



(Channel 11: 2462MHz @ 802.11b)

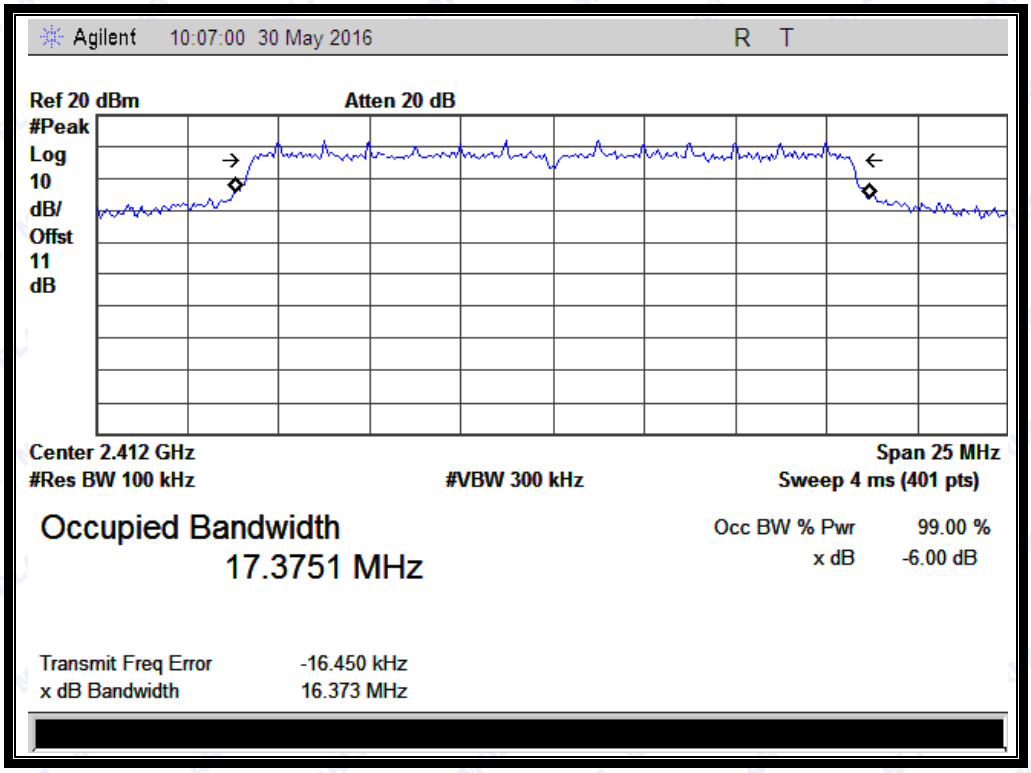
2.3.3.2 802.11g Test mode

Antenna 1:

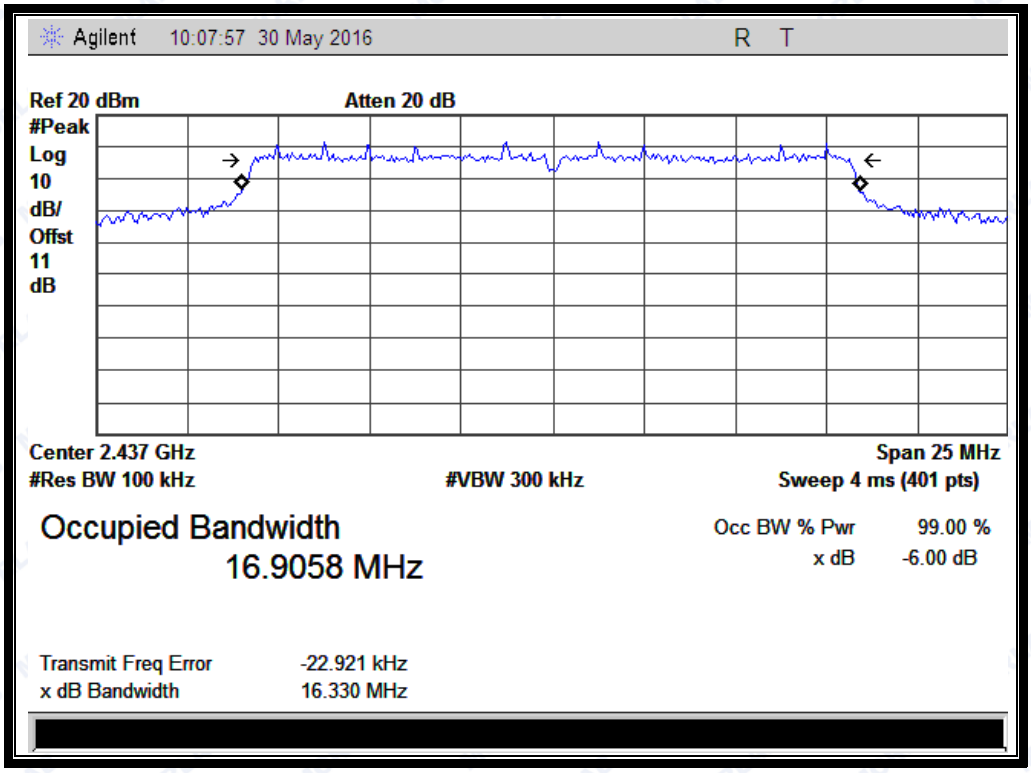
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.373	≥500	PASS
6	2437	16.330	≥500	PASS
11	2462	16.388	≥500	PASS

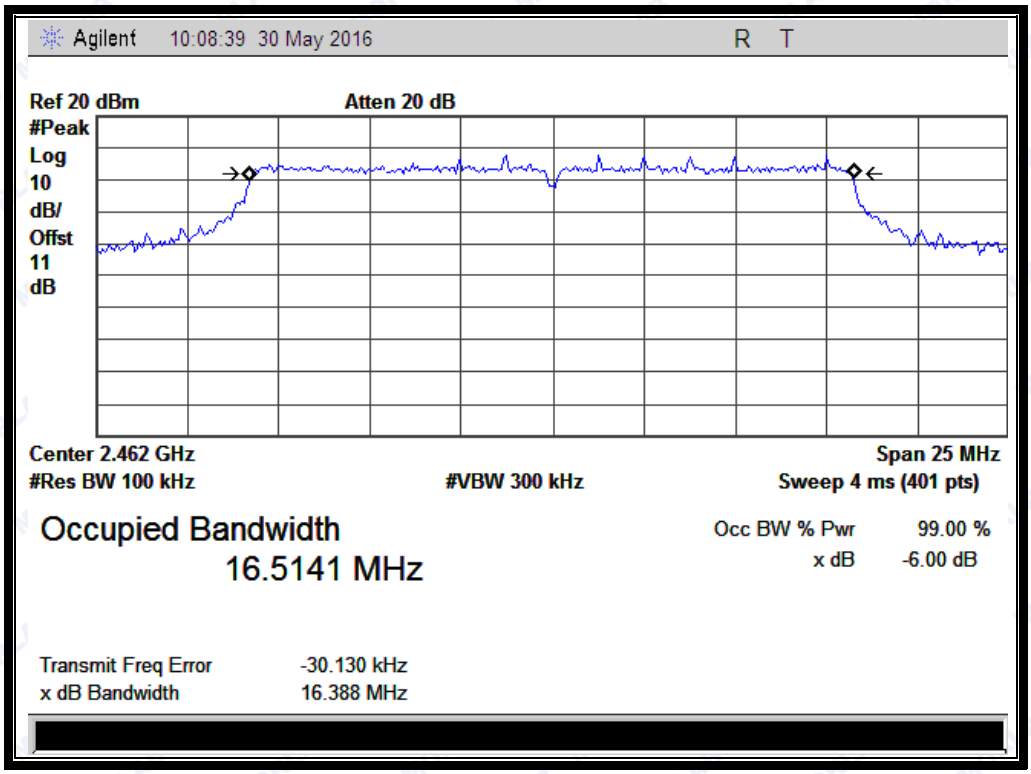
B. Test Plots:



(Channel 1: 2412MHz @ 802.11g)



(Channel 6: 2437MHz @ 802.11g)



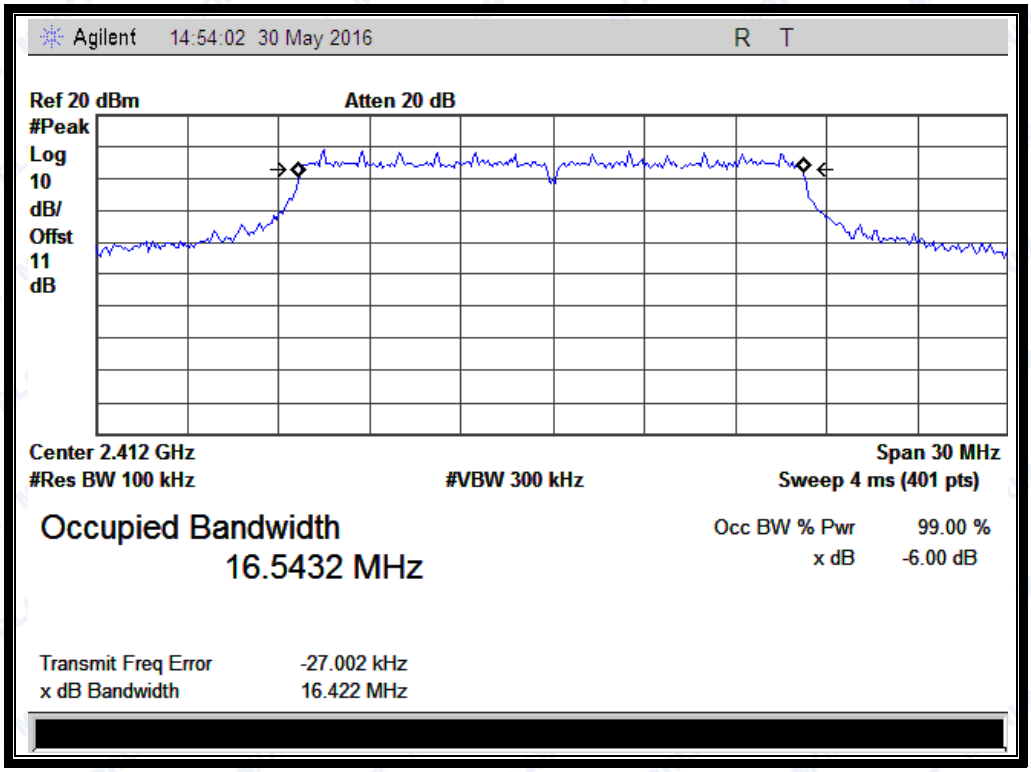
(Channel 11: 2462MHz @ 802.11g)

Antenna 2:

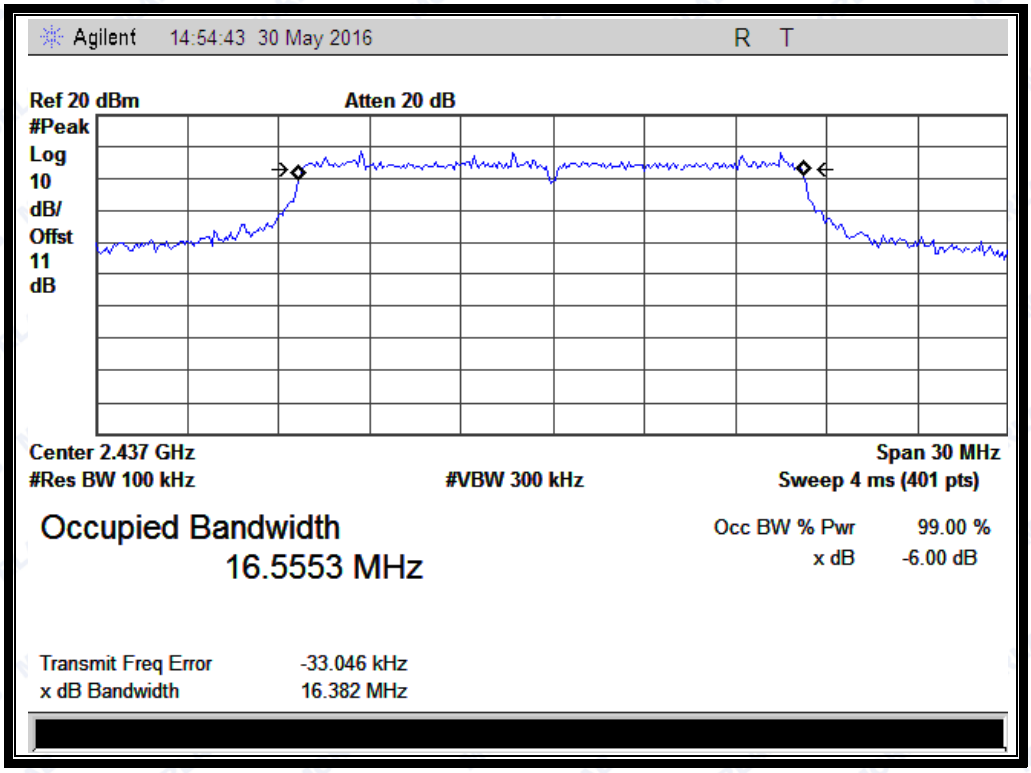
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.422	≥500	PASS
6	2437	16.382	≥500	PASS
11	2462	16.449	≥500	PASS

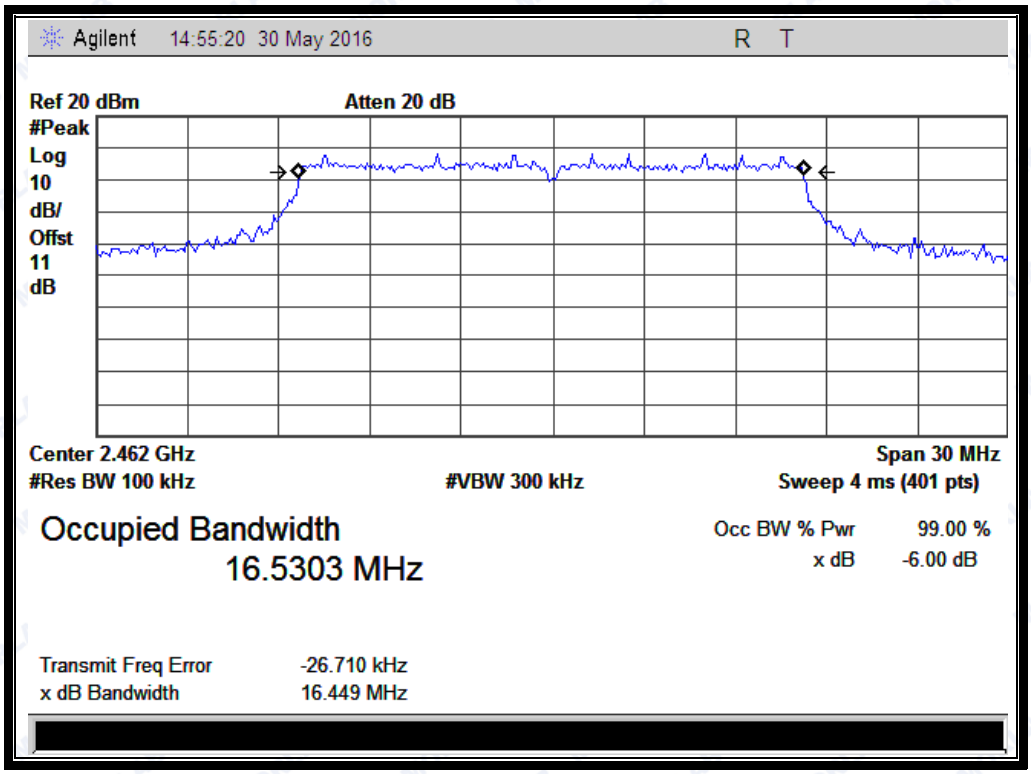
B. Test Plots:



(Channel 1: 2412MHz @ 802.11g)



(Channel 6: 2437MHz @ 802.11g)



(Channel 11: 2462MHz @ 802.11g)

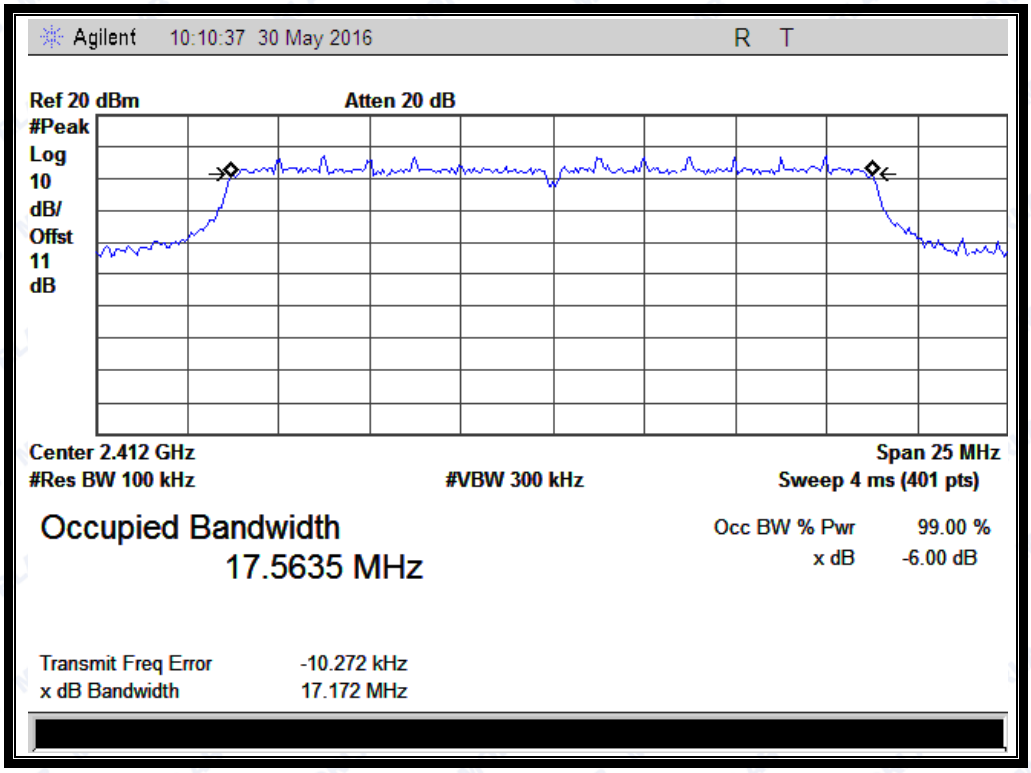
2.3.3.3 802.11n-20 Test mode

Antenna 1:

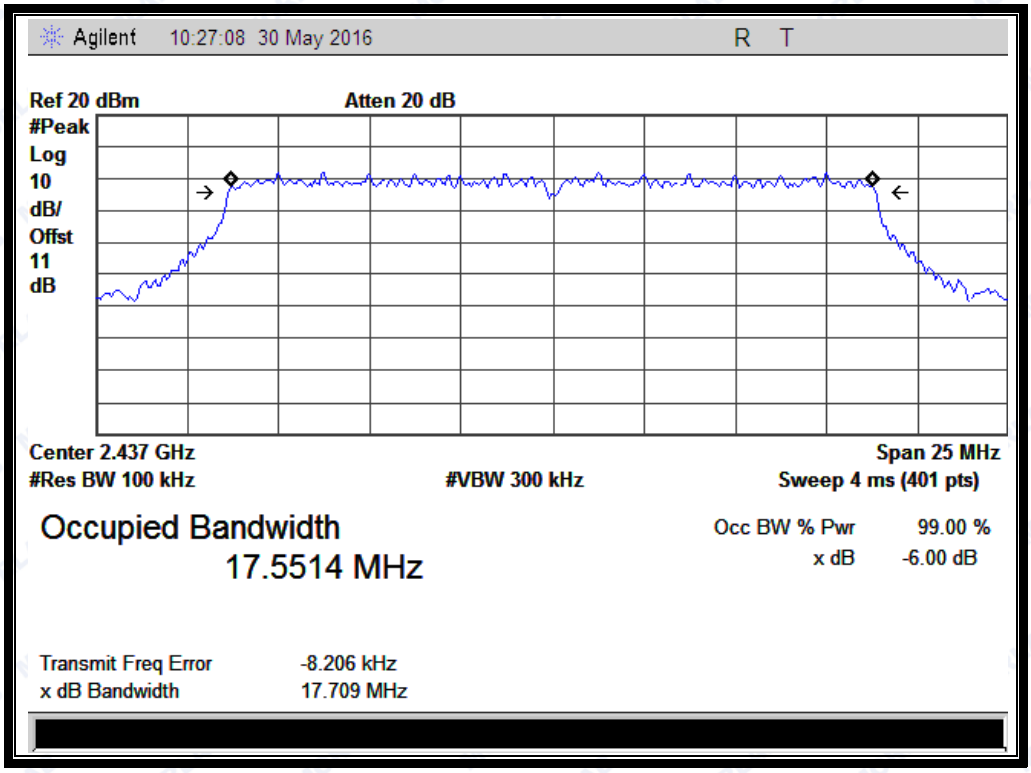
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.172	≥500	PASS
6	2437	17.709	≥500	PASS
11	2462	17.695	≥500	PASS

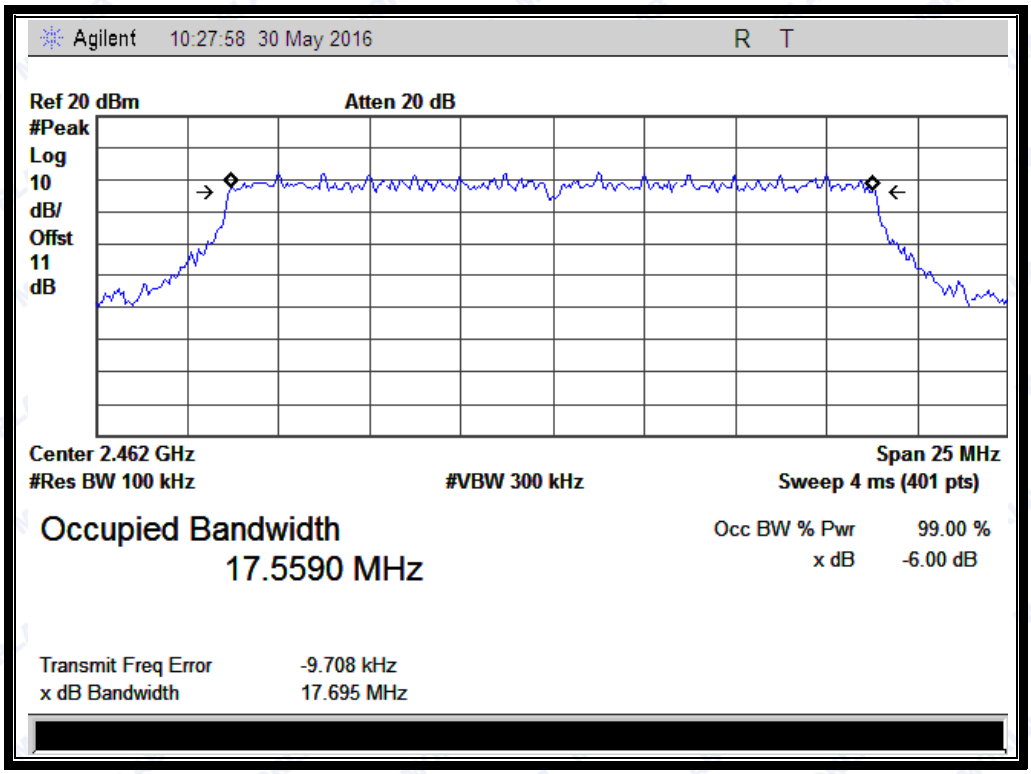
B. Test Plots:



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



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



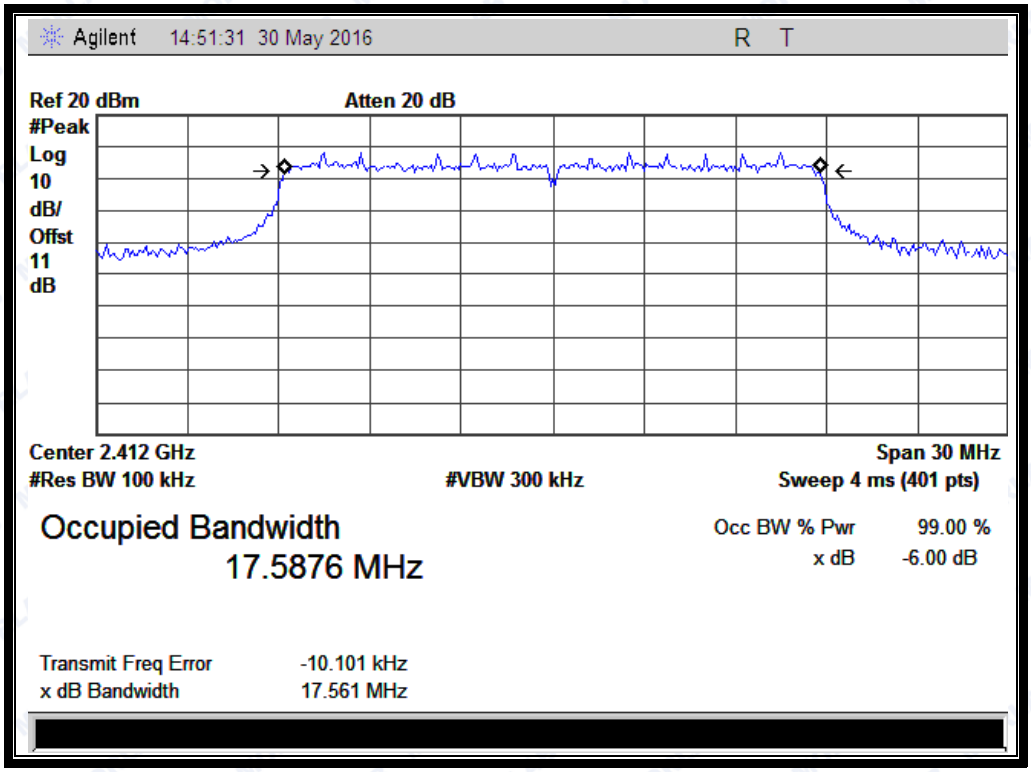
(Channel 11: 2462MHz @ 802.11n-20)

Antenna 2:

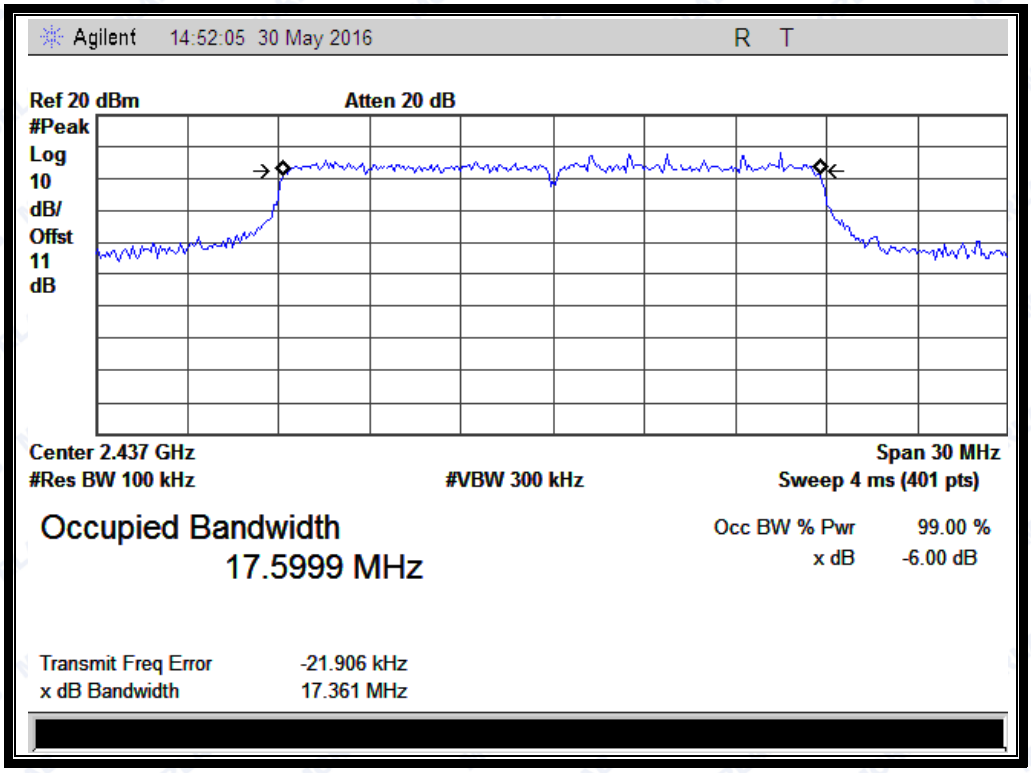
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.561	≥500	PASS
6	2437	17.361	≥500	PASS
11	2462	17.185	≥500	PASS

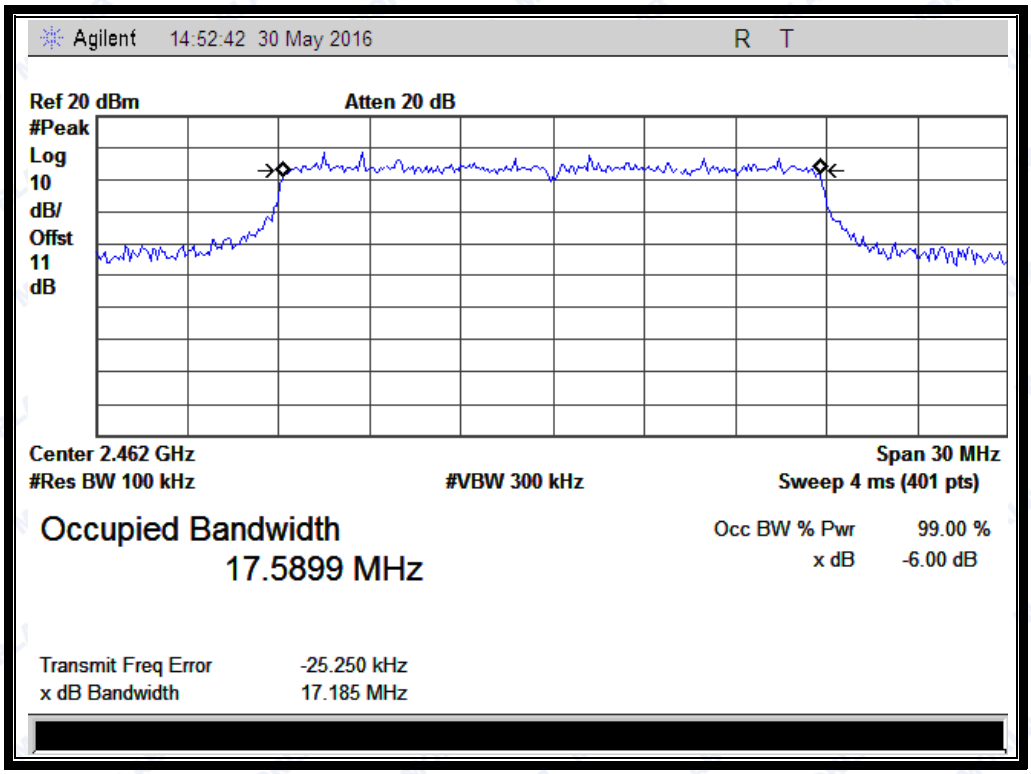
B. Test Plots:



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



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



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

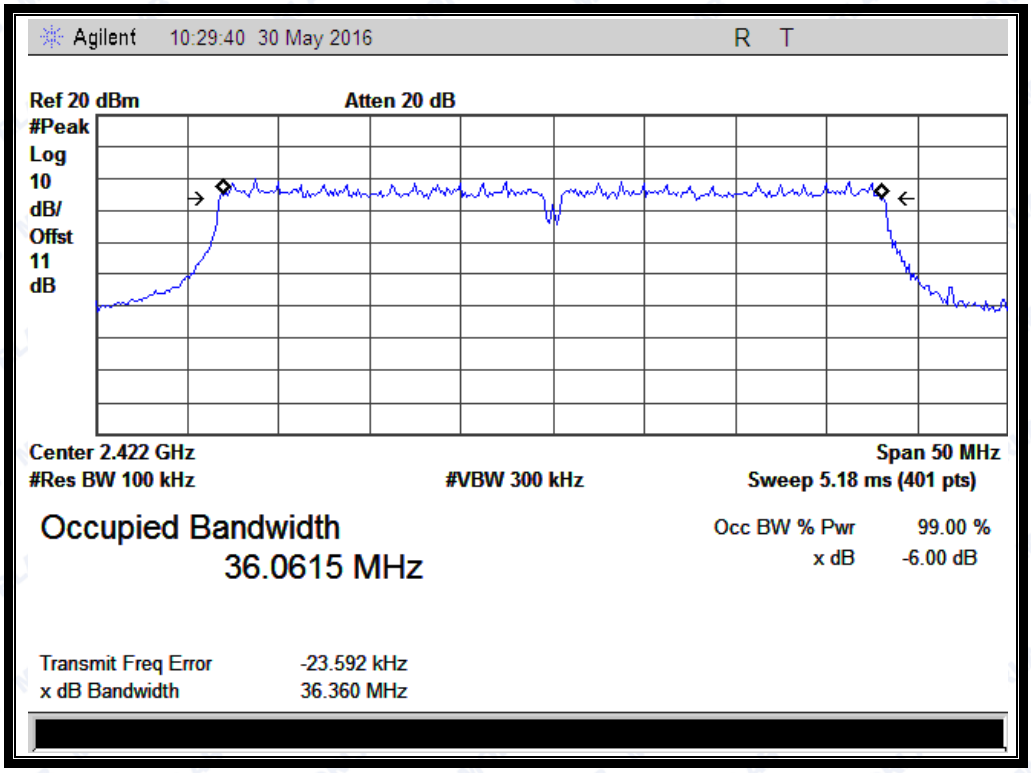
2.3.3.4 802.11n-40 Test mode

Antenna 1:

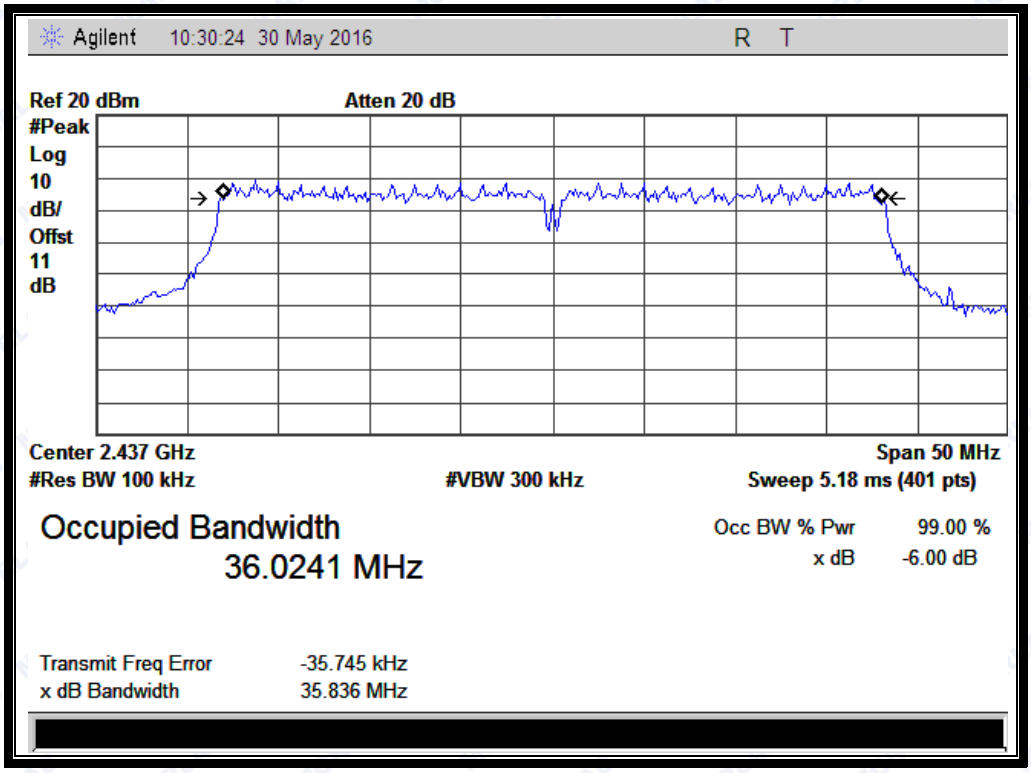
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	36.360	≥500	PASS
6	2437	35.836	≥500	PASS
9	2452	36.339	≥500	PASS

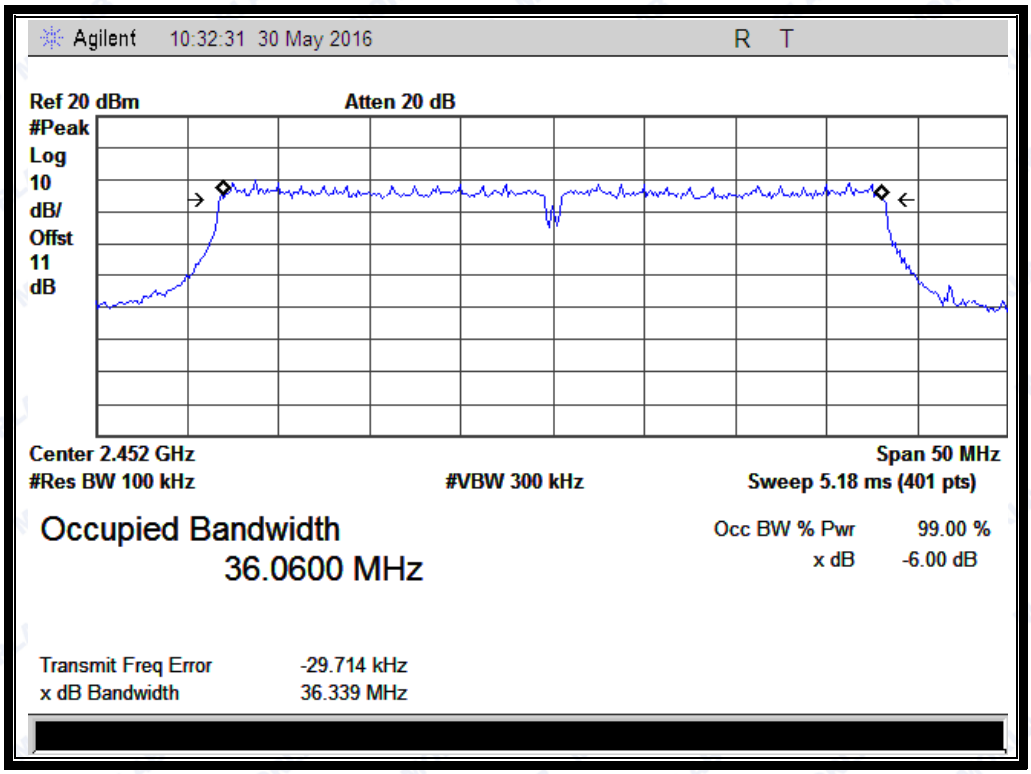
B. Test Plots:



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



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



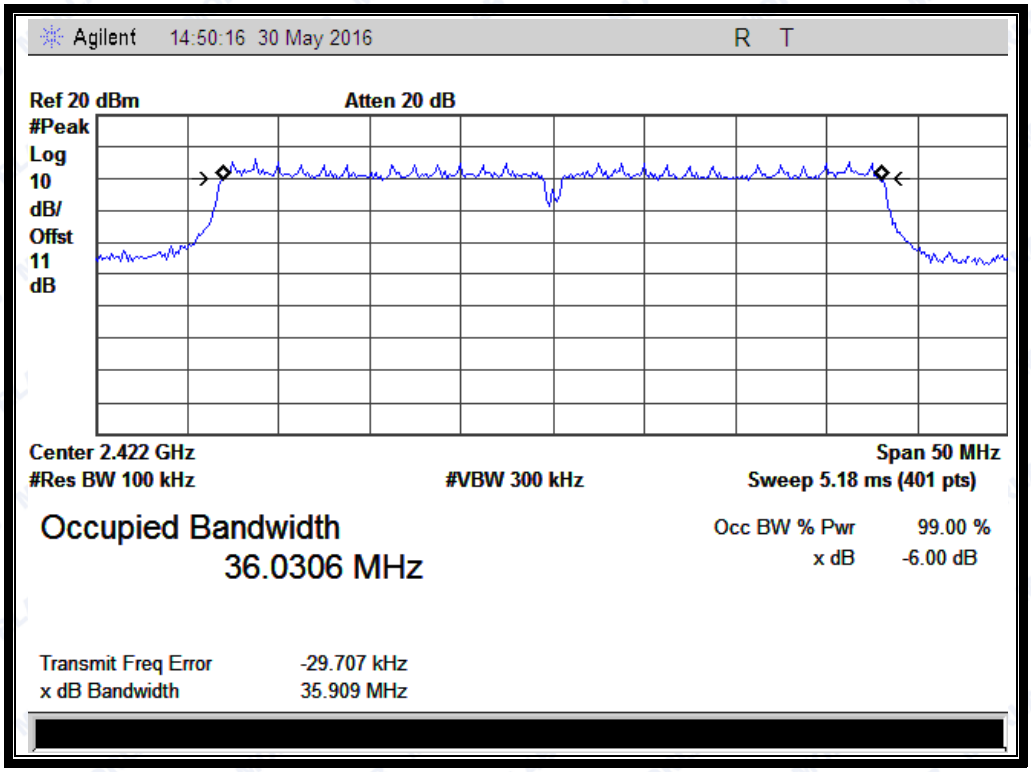
(Channel 9: 2452MHz @ 802.11n-40)

Antenna 2:

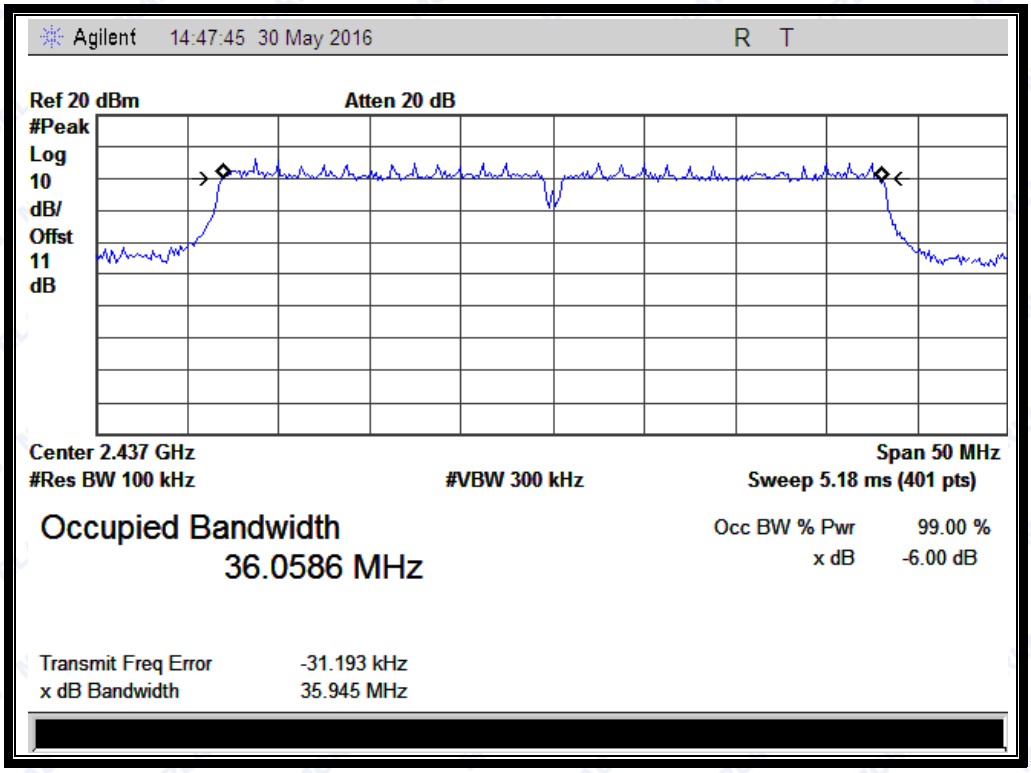
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	35.909	≥500	PASS
6	2437	35.945	≥500	PASS
9	2452	35.613	≥500	PASS

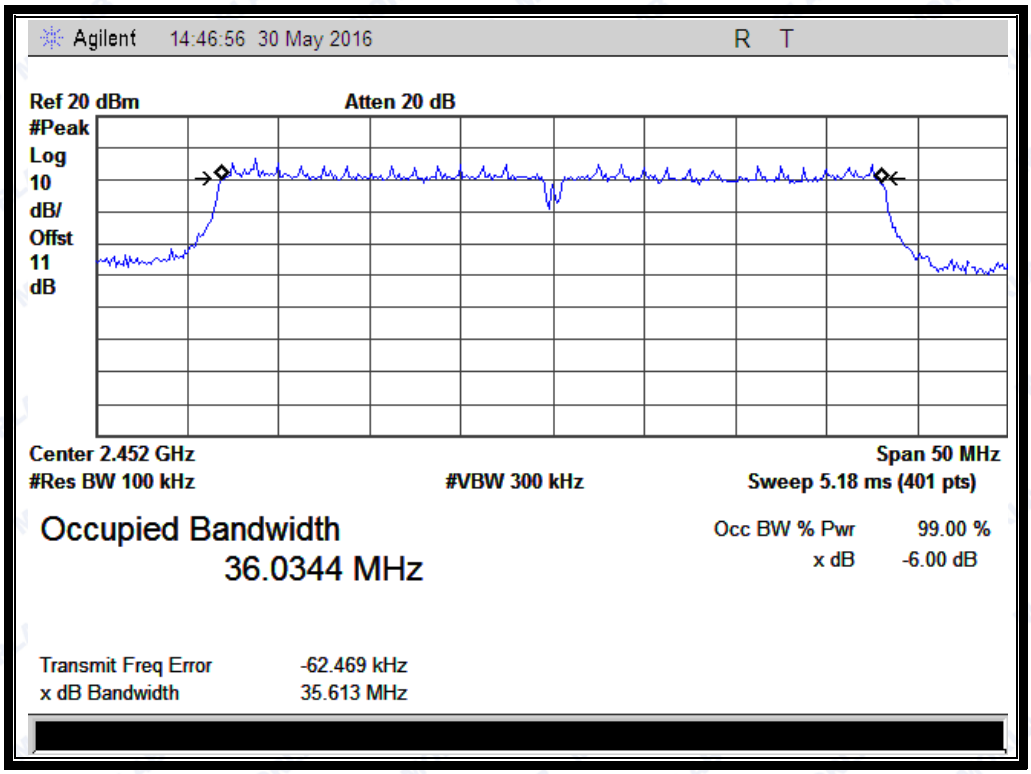
B. Test Plots:



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



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



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

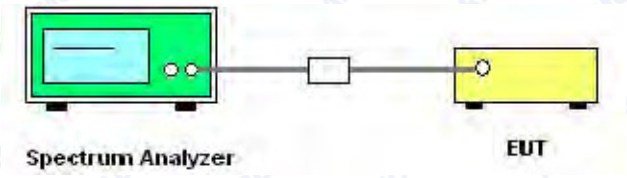
2.4 Conducted Spurious Emissions and Band Edge

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 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:

Please reference ANNEX A(1.5).

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.

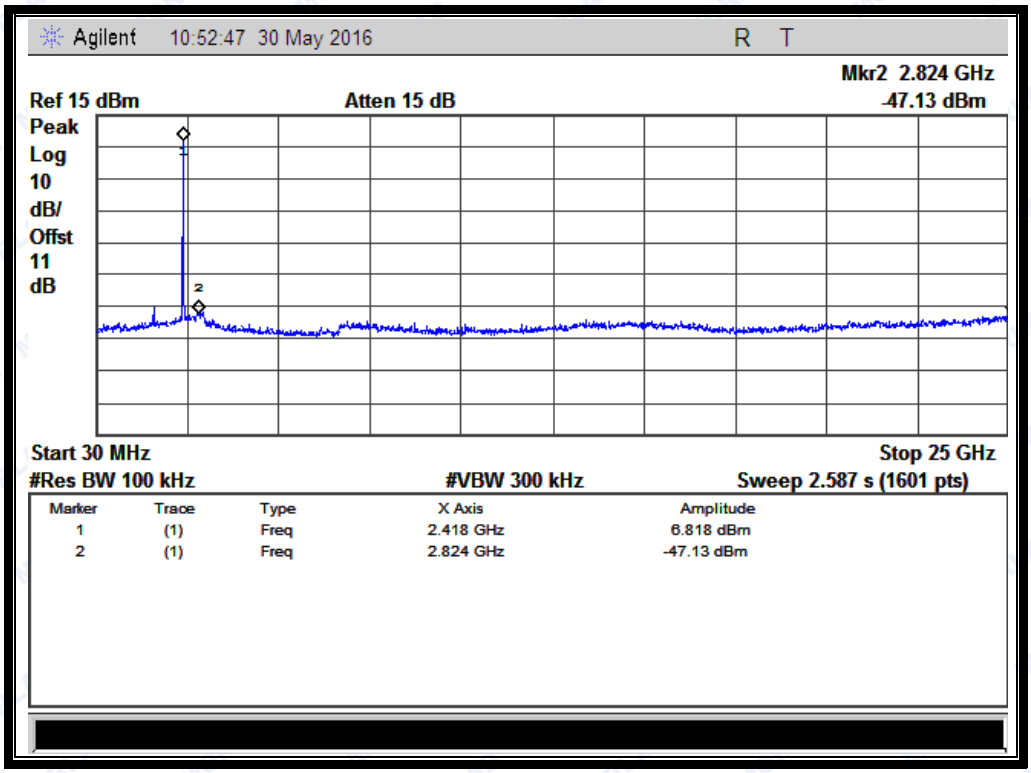
2.4.3.1 802.11b SISO Test mode

A. Test Verdict:

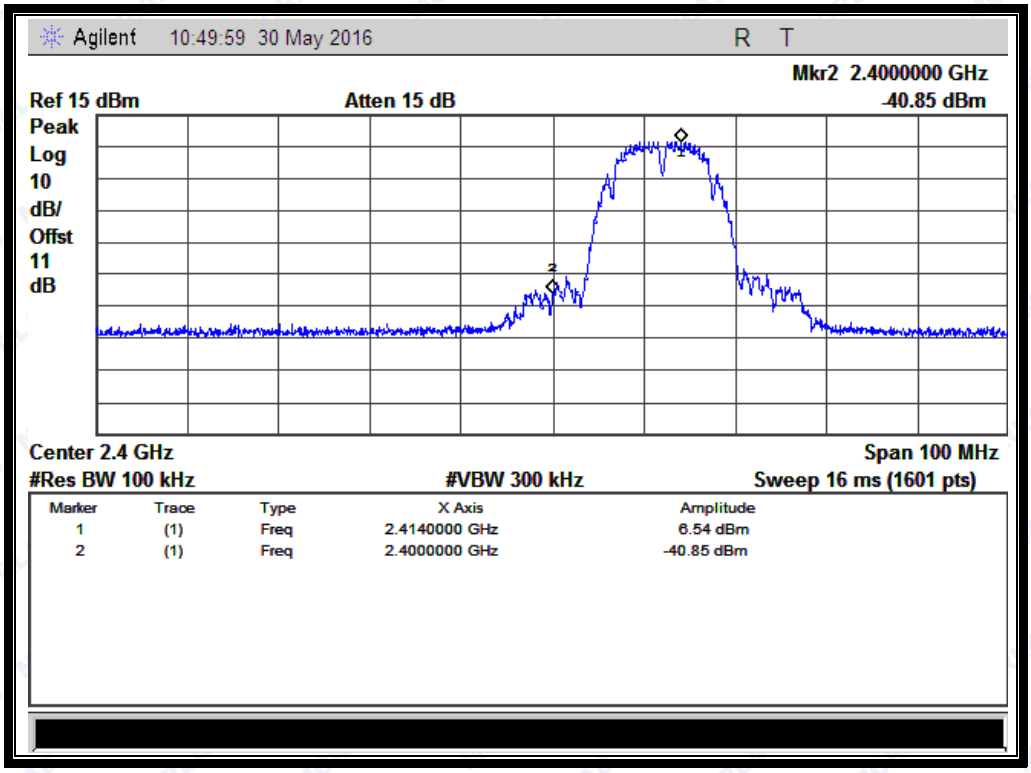
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-47.13	6.82	-13.18	PASS
6	2437	-47.42	4.92	-15.08	PASS
11	2462	-47.05	6.72	-13.28	PASS

B. Test Plots:

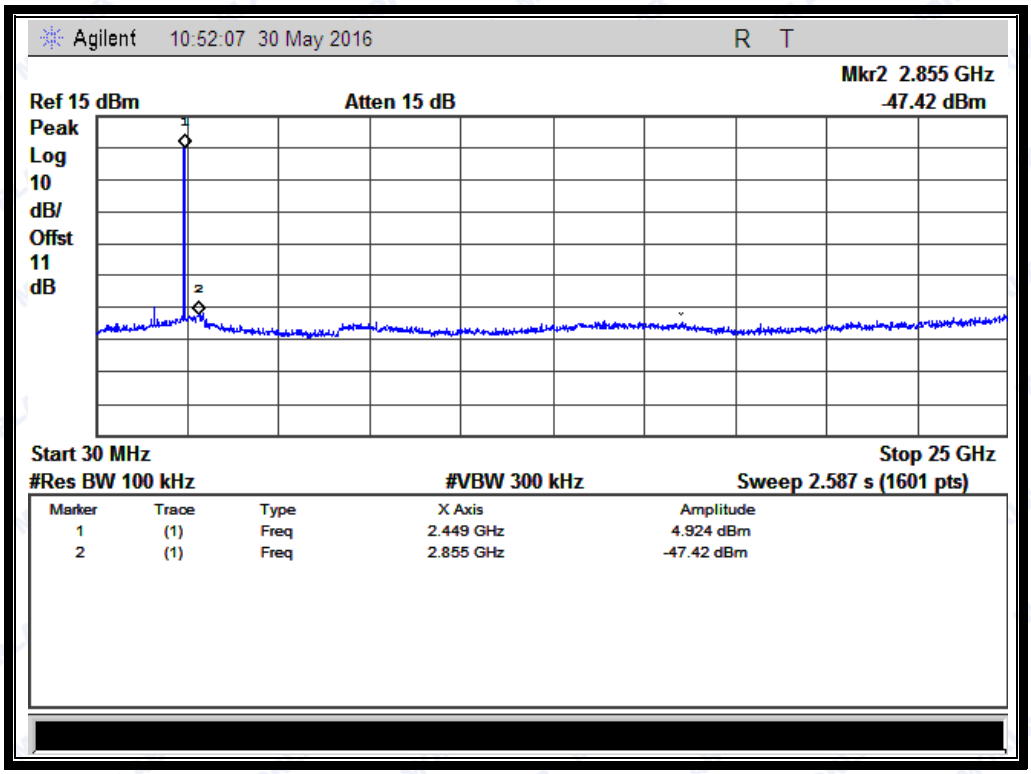
Note: the power of the Module transmitting frequency should be ignored.



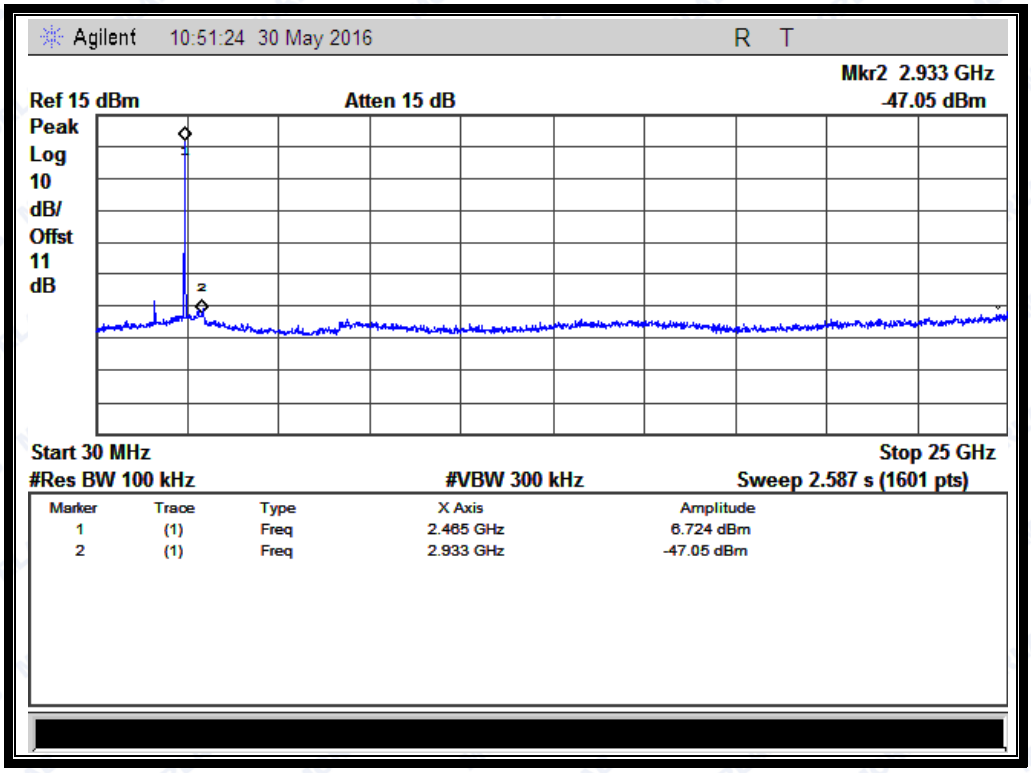
(Channel = 1, 30MHz to 25GHz)



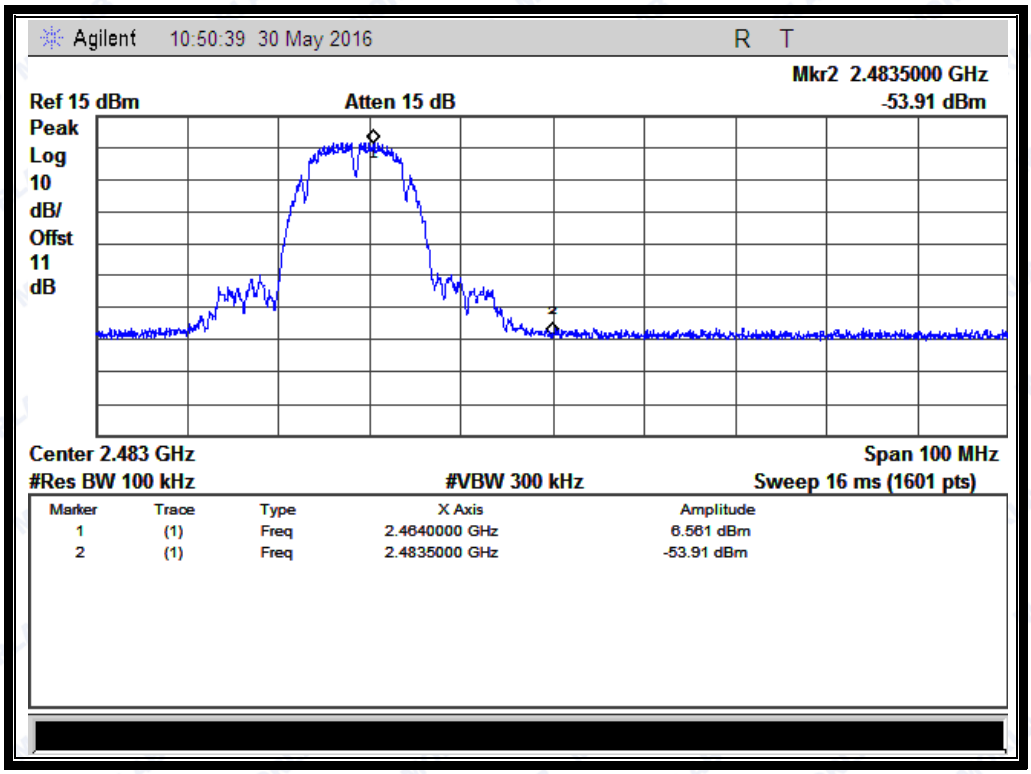
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

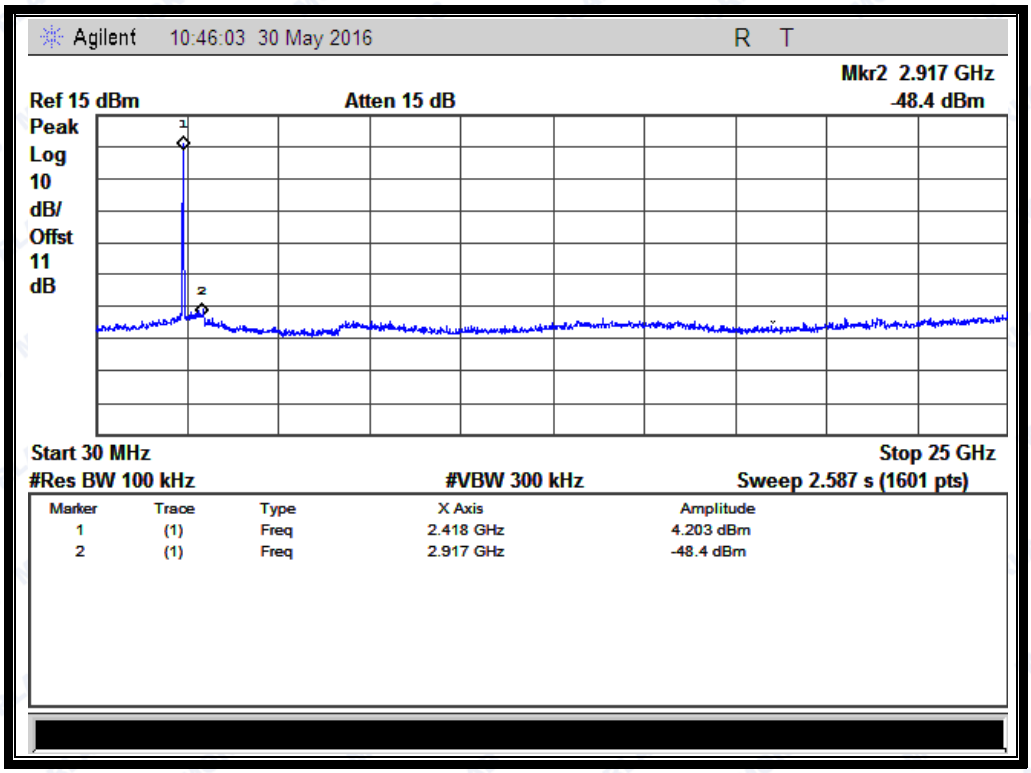
2.4.3.2 802.11g SISO Test mode

A. Test Verdict:

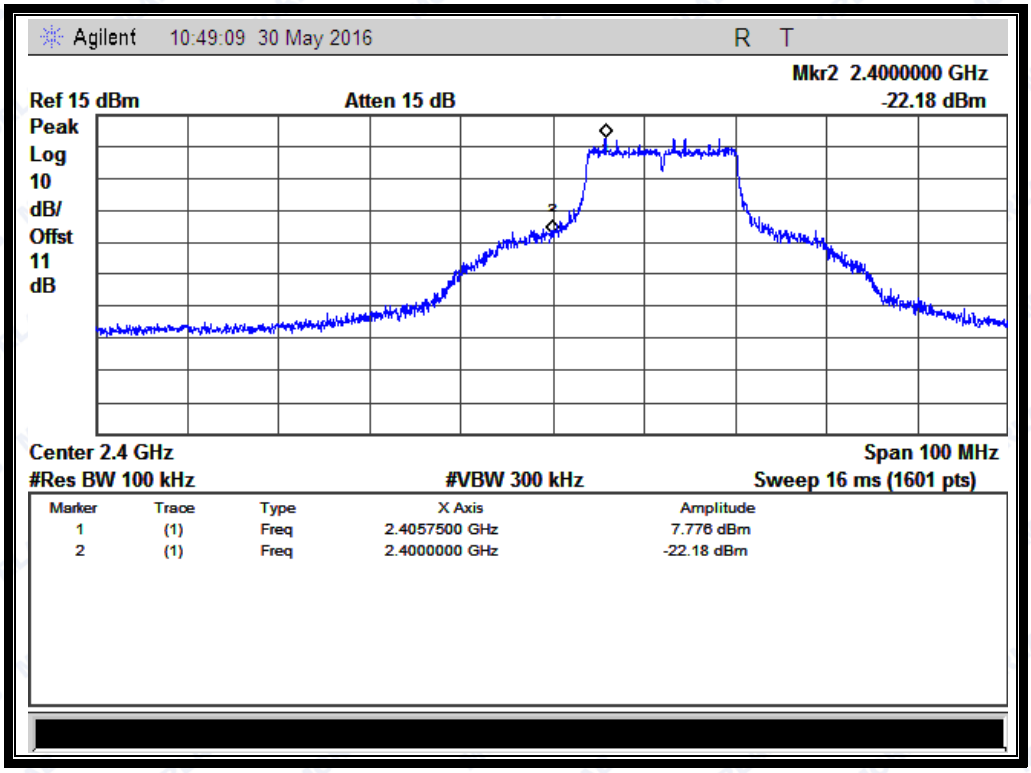
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-48.40	4.20	-15.80	PASS
6	2437	-47.86	4.30	-15.70	PASS
11	2462	-46.92	4.31	-15.69	PASS

B. Test Plots:

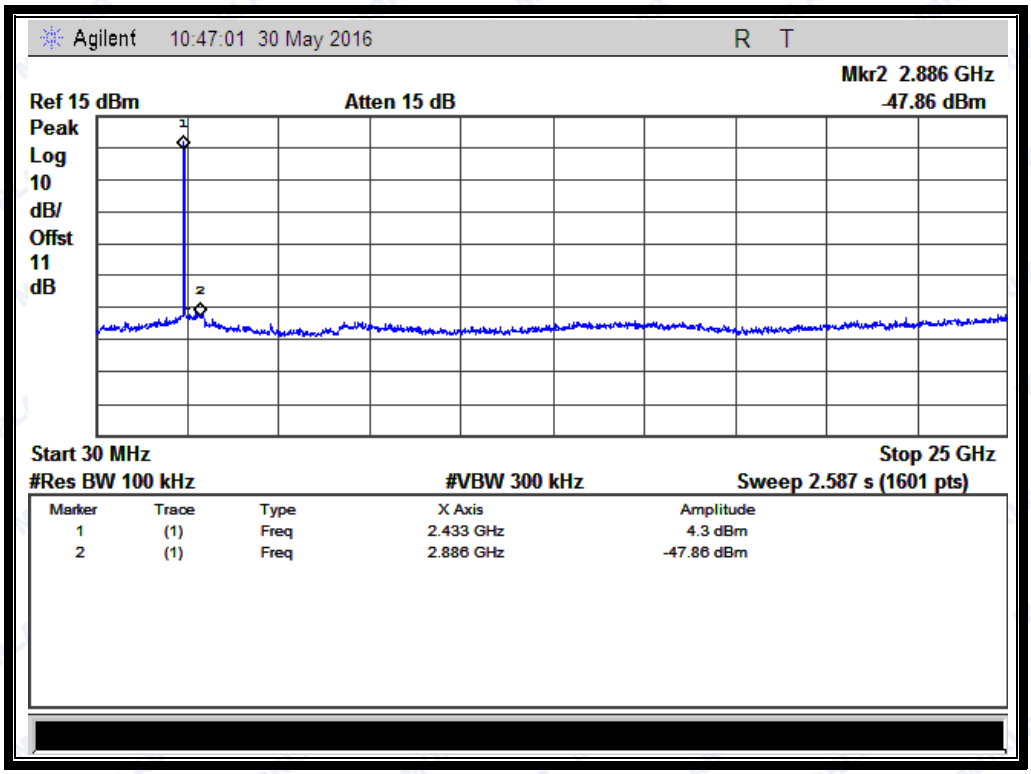
Note: the power of the Module transmitting frequency should be ignored.



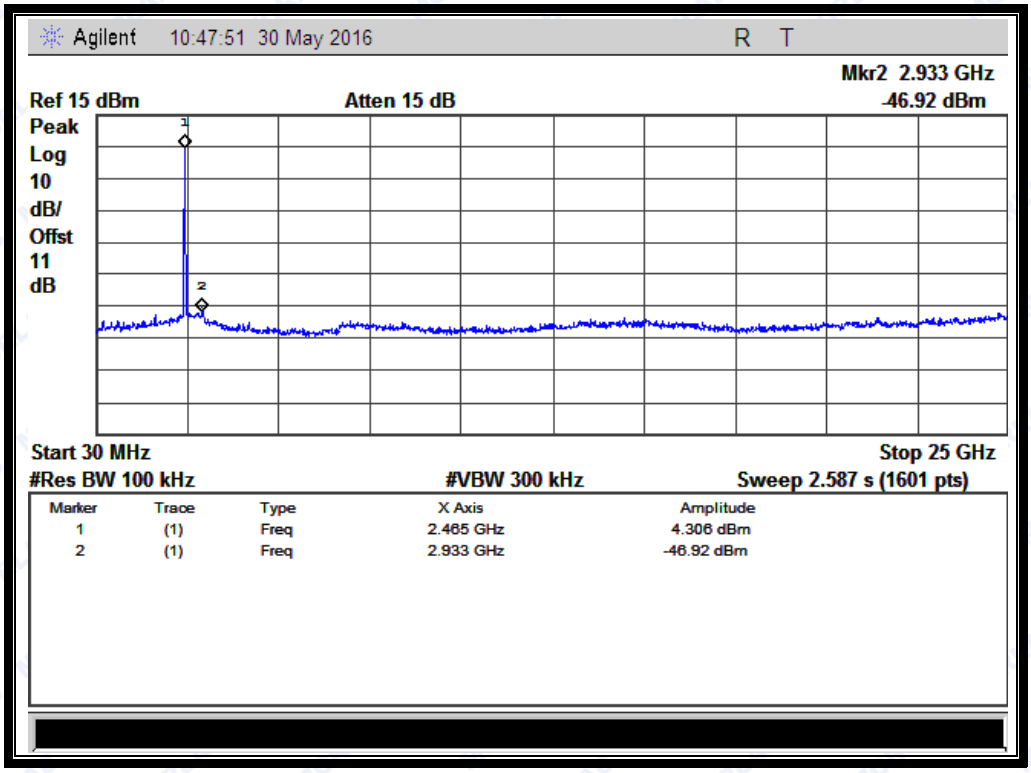
(Channel = 1, 30MHz to 25GHz)



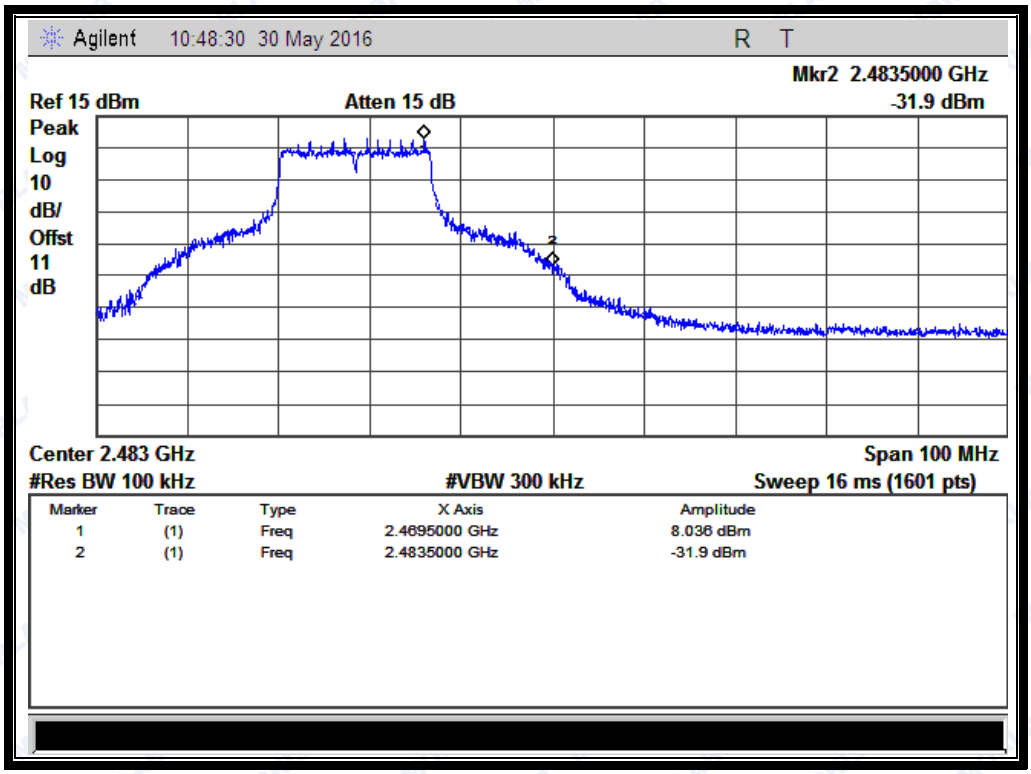
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

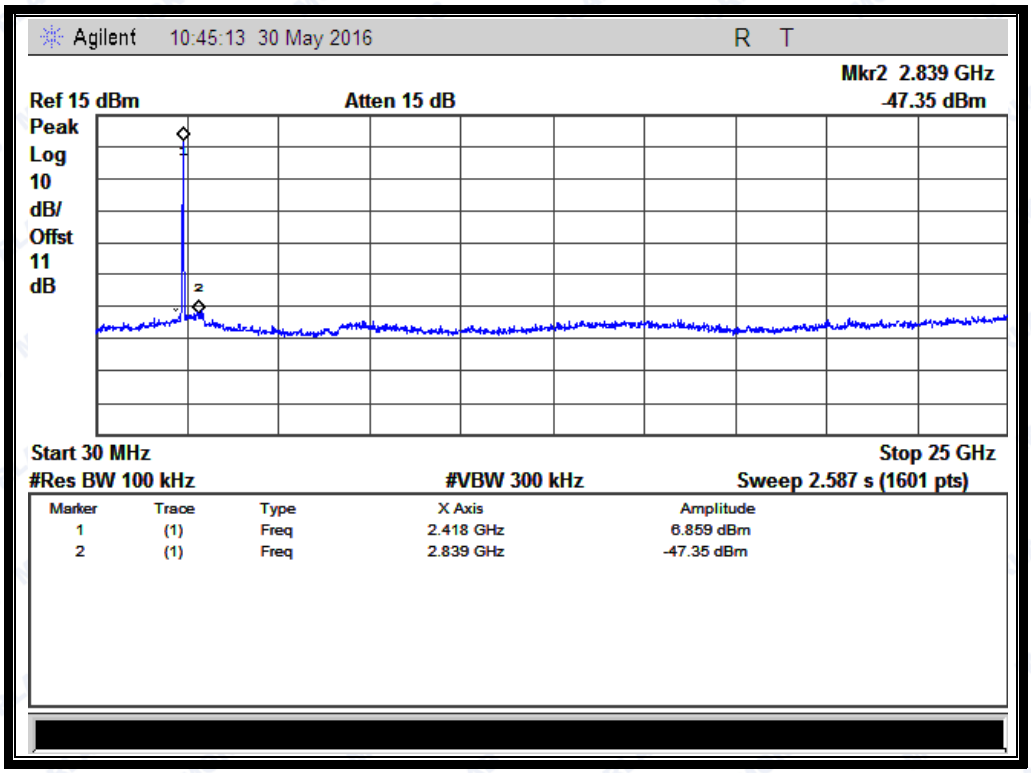
2.4.3.3 802.11n -20MHz MIMO Test mode

A. Test Verdict:

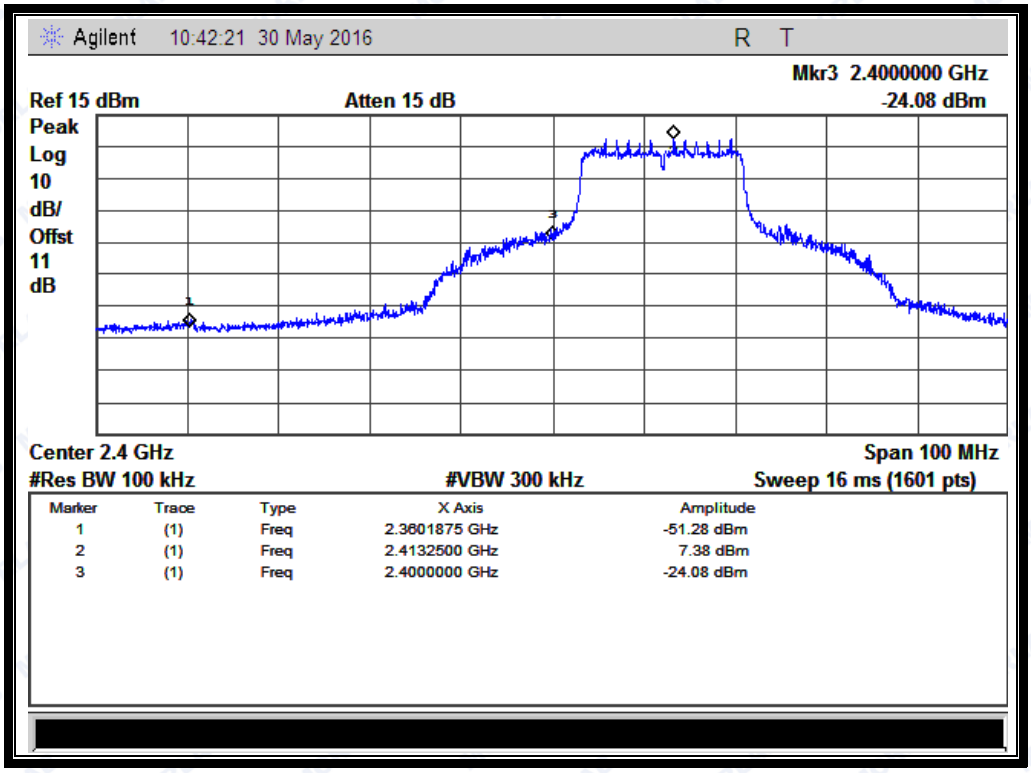
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-47.35	6.86	-13.14	PASS
6	2437	-48.47	6.76	-13.24	PASS
11	2462	-47.42	3.67	-16.33	PASS

B. Test Plots:

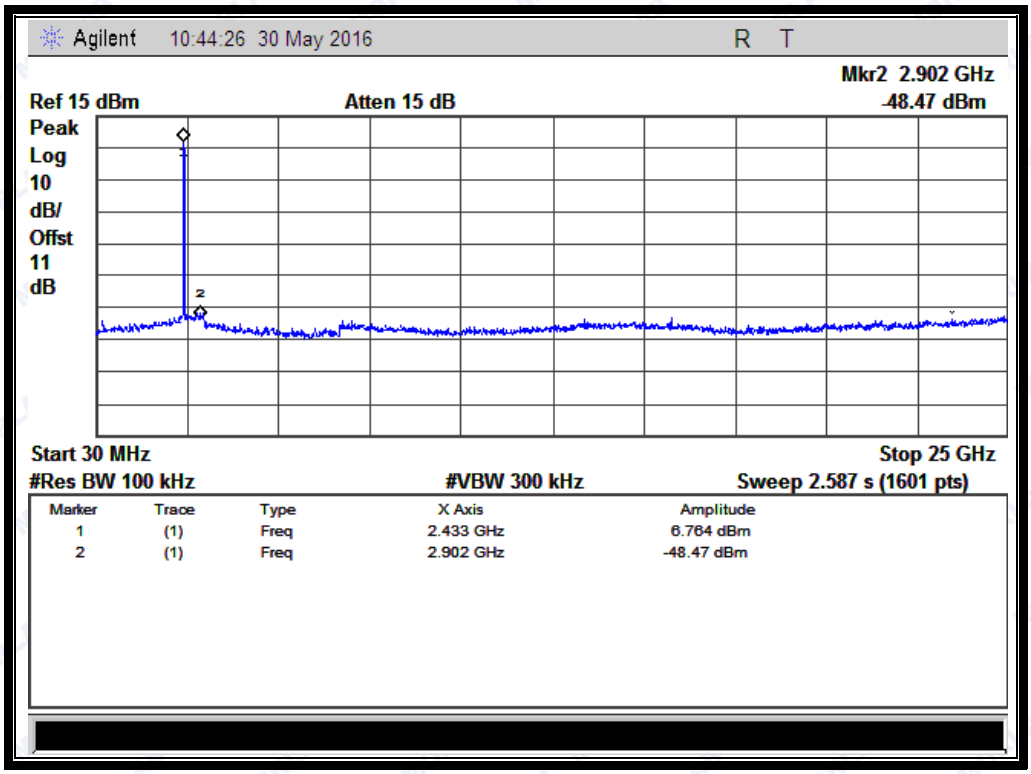
Note: the power of the Module transmitting frequency should be ignored.



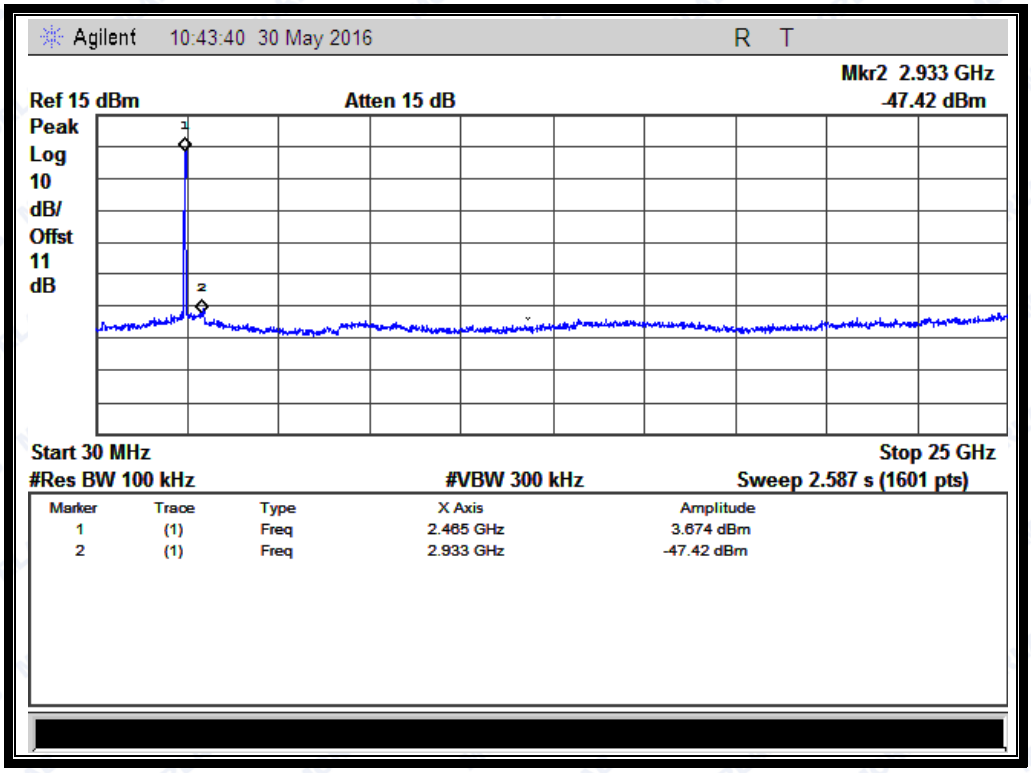
(Channel = 1, 30MHz to 25GHz)



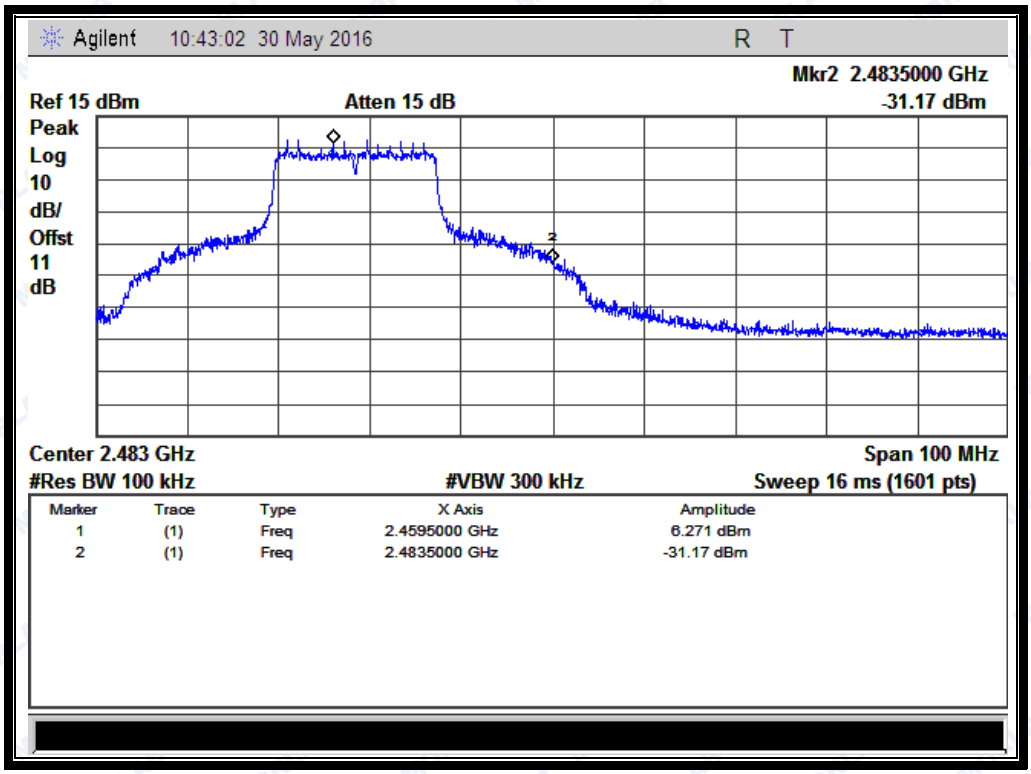
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

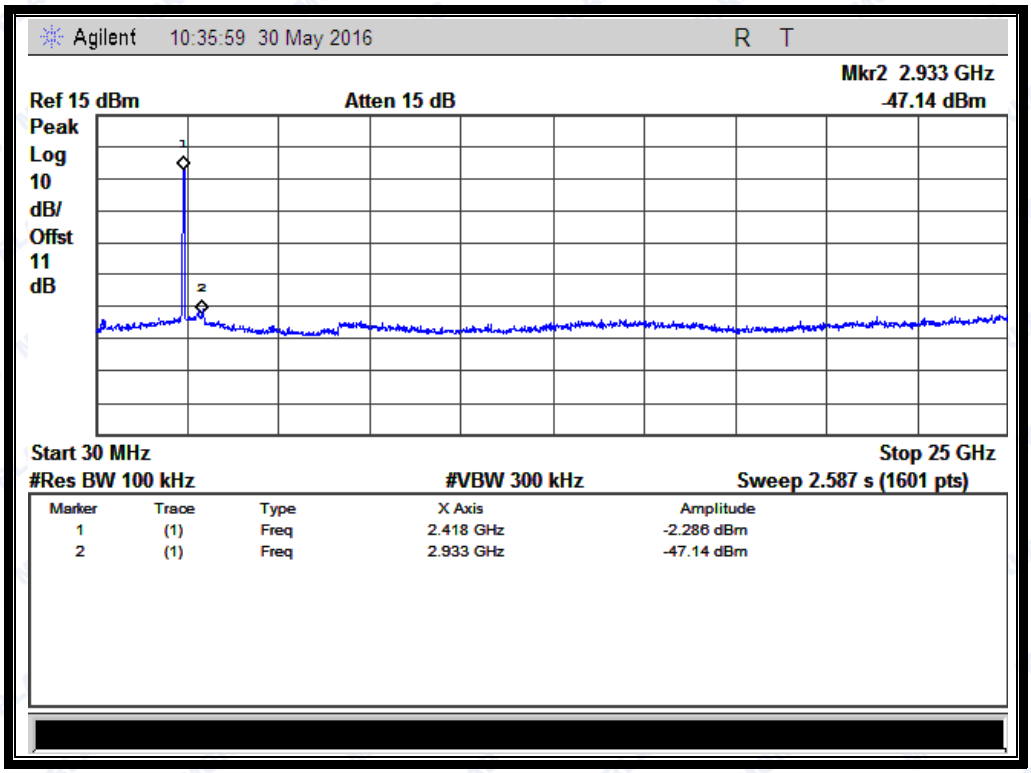
2.4.3.4 802.11n -40MHz MIMO Test mode

A. Test Verdict:

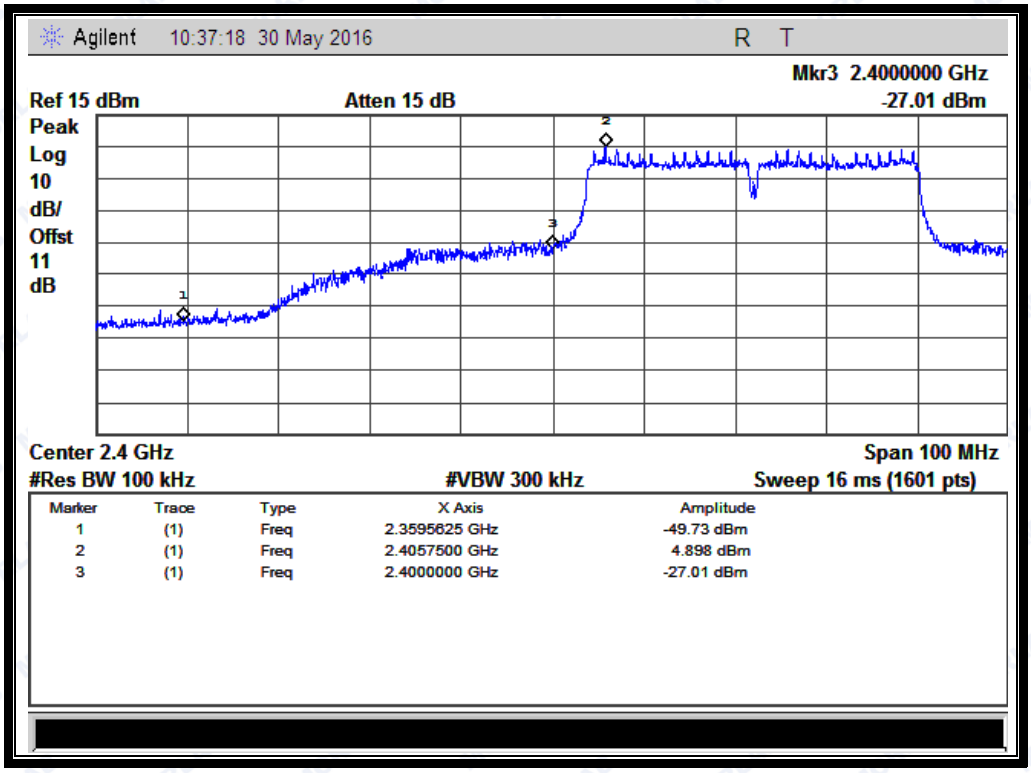
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-47.14	-2.29	-22.29	PASS
6	2437	-46.78	-0.41	-20.41	PASS
9	2452	-40.95	-0.43	-20.43	PASS

B. Test Plots:

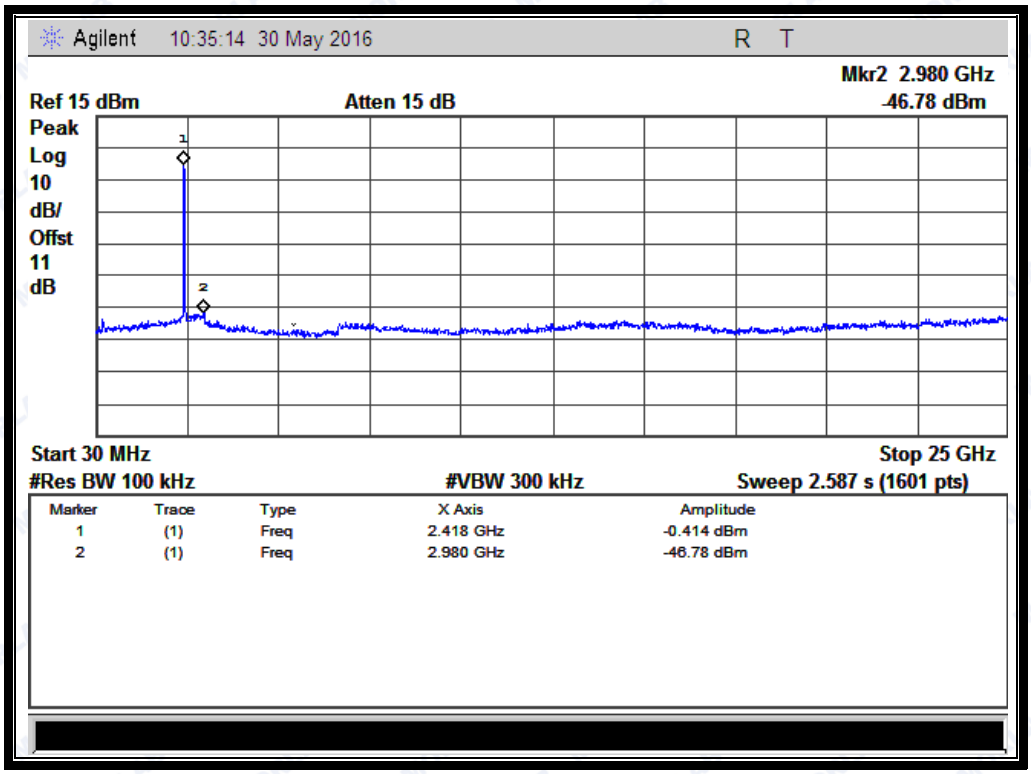
Note: the power of the Module transmitting frequency should be ignored.



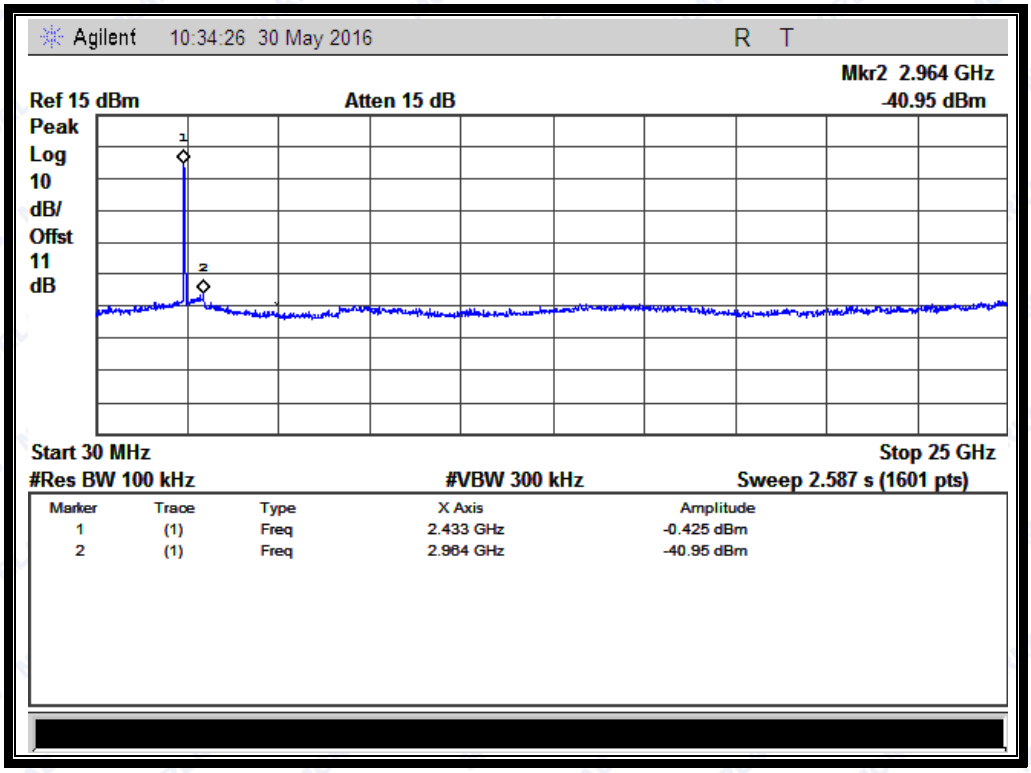
(Channel = 3, 30MHz to 25GHz)



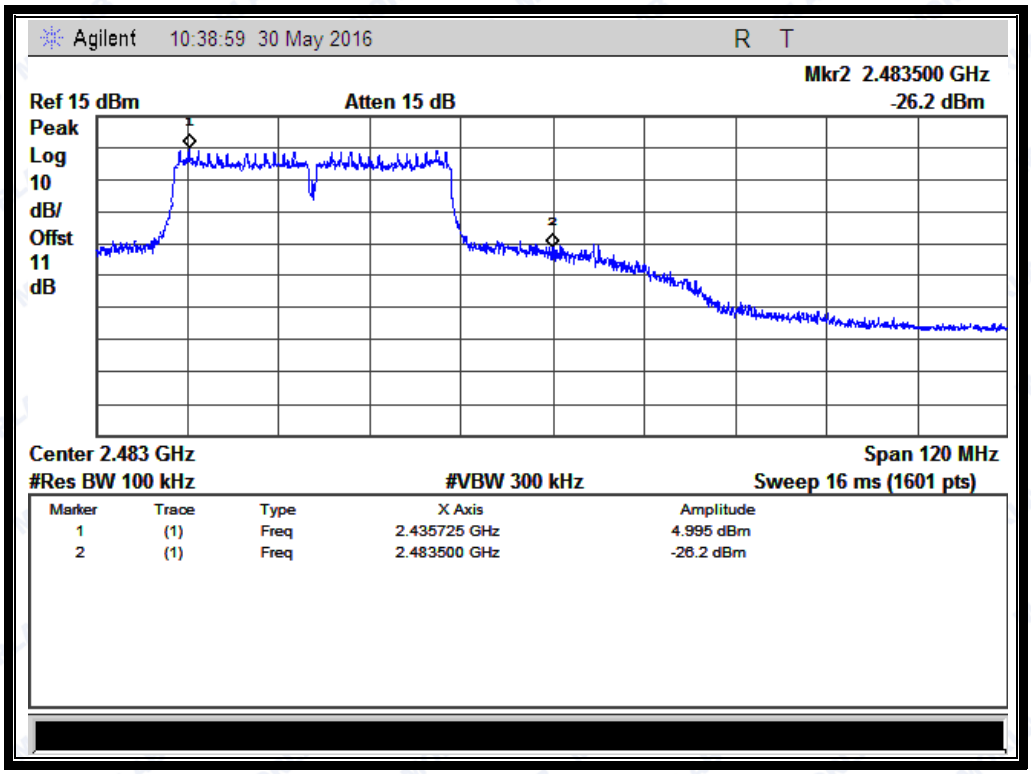
(Band Edge @ Channel = 3)



(Channel = 6, 30MHz to 25GHz)



(Channel = 9, 30MHz to 25GHz)



(Band Edge @ Channel = 9)

2.5 Power spectral density (PSD)

2.5.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

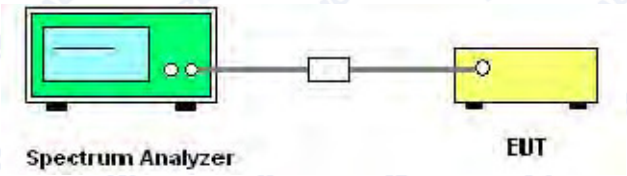
2.5.2 Test Description

A. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:

a) Set analyzer center frequency to channel center frequency.
b) Set the span to 3MHz
c) Set the RBW to 3 kHz
d) Set the VBW to 10KHz
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.

B. Test Set:



The EUT 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.

C. Equipments List:

Please reference ANNEX A(1.5).

2.5.3 Test Result

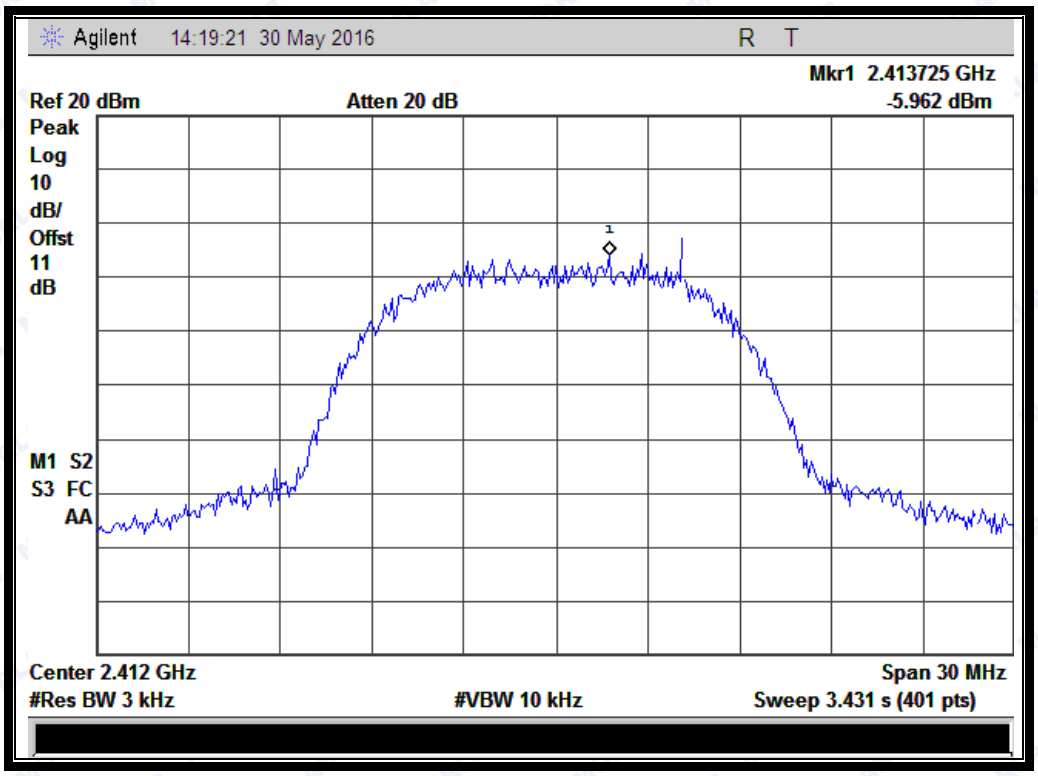
2.5.3.1 802.11b Test mode

Antenna 1:

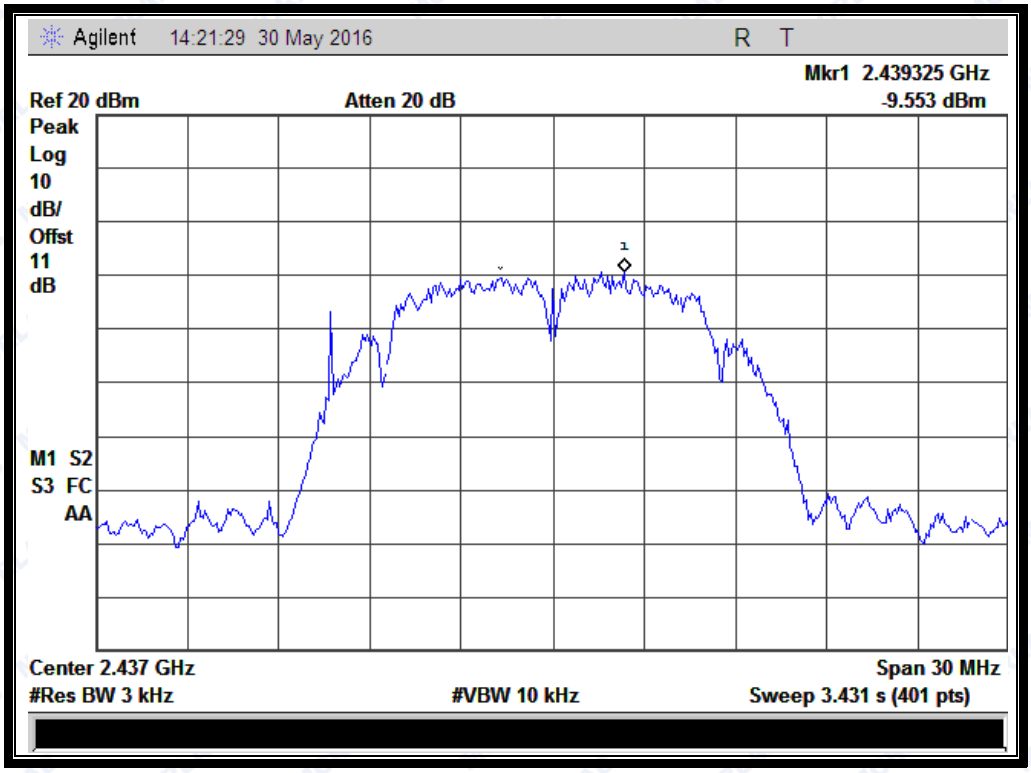
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-5.96	8	PASS
6	2437	-9.55	8	PASS
11	2462	-9.78	8	PASS
Measurement uncertainty: ±1.3dB				

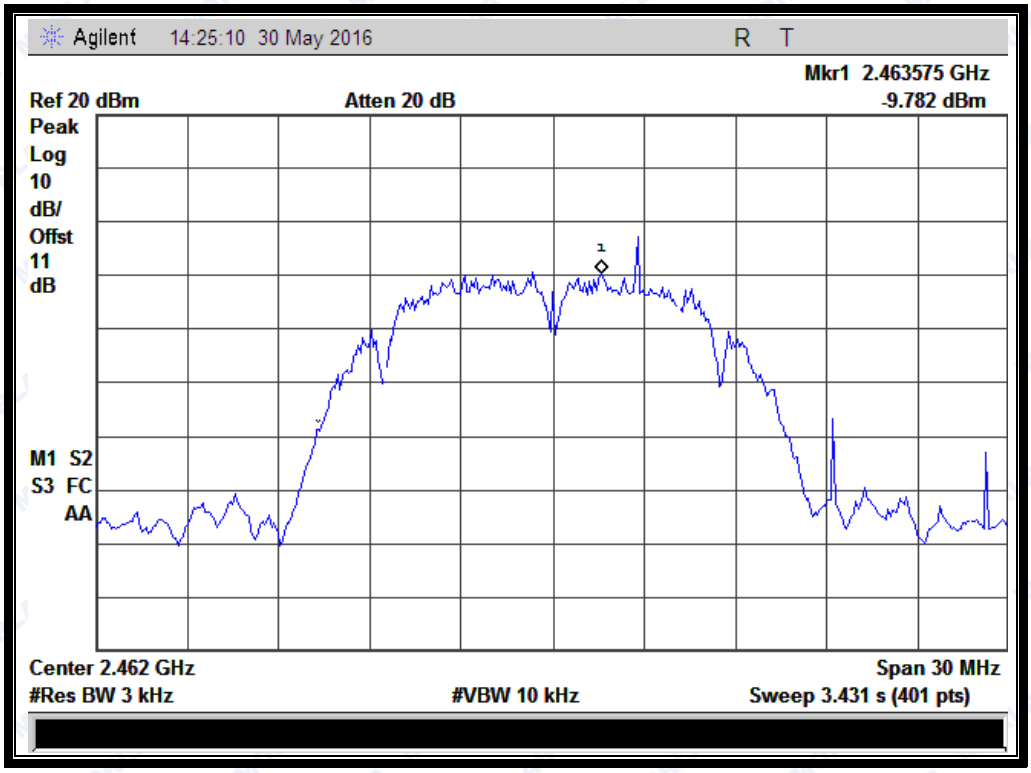
B. Test Plots:



(Channel = 1 @ 802.11b)



(Channel = 6 @ 802.11b)



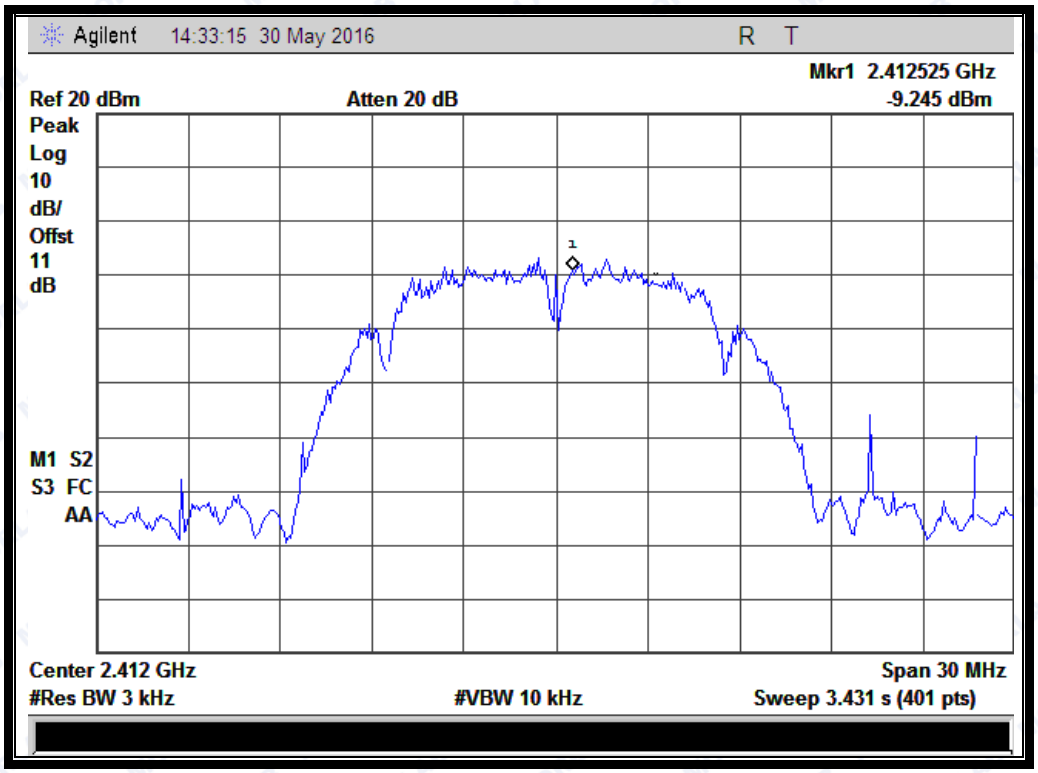
(Channel = 11 @ 802.11b)

Antenna 2:

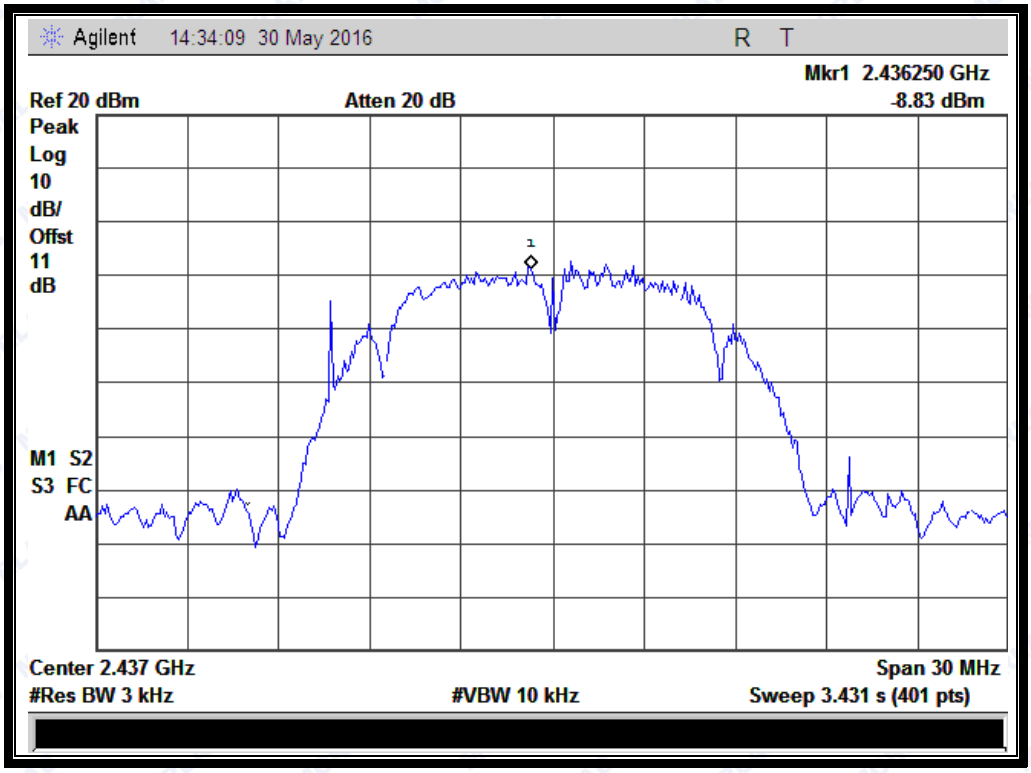
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-9.25	8	PASS
6	2437	-8.83	8	PASS
11	2462	-6.80	8	PASS
Measurement uncertainty: ±1.3dB				

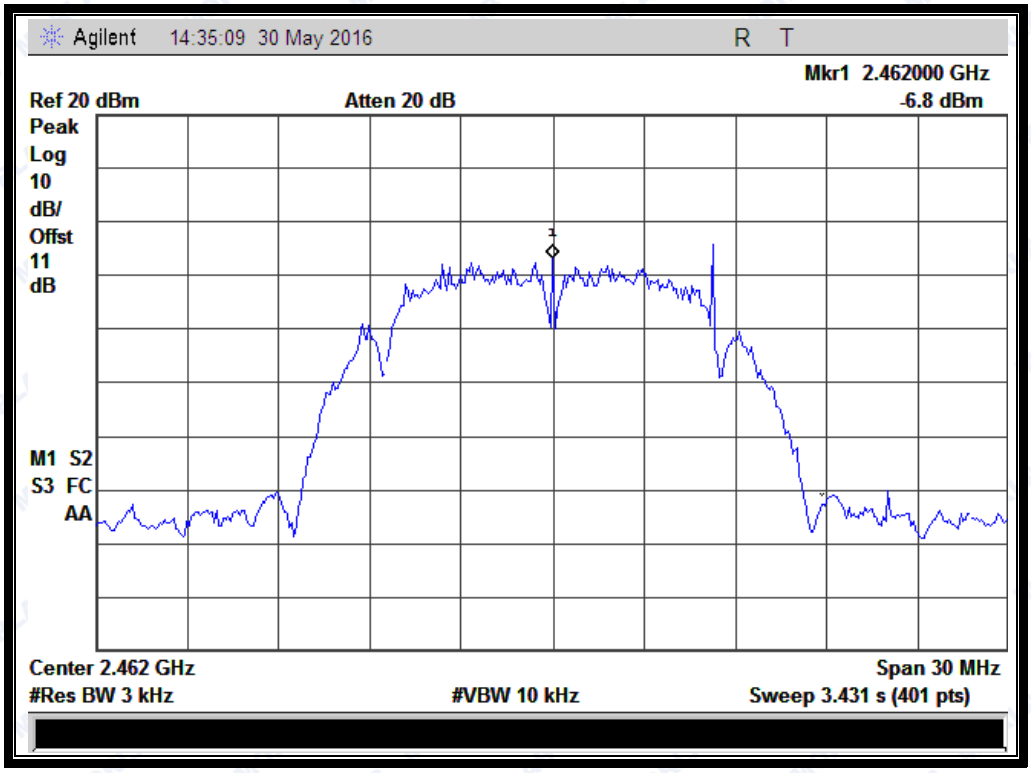
B. Test Plots:



(Channel = 1 @ 802.11b)



(Channel = 6 @ 802.11b)



(Channel = 11 @ 802.11b)

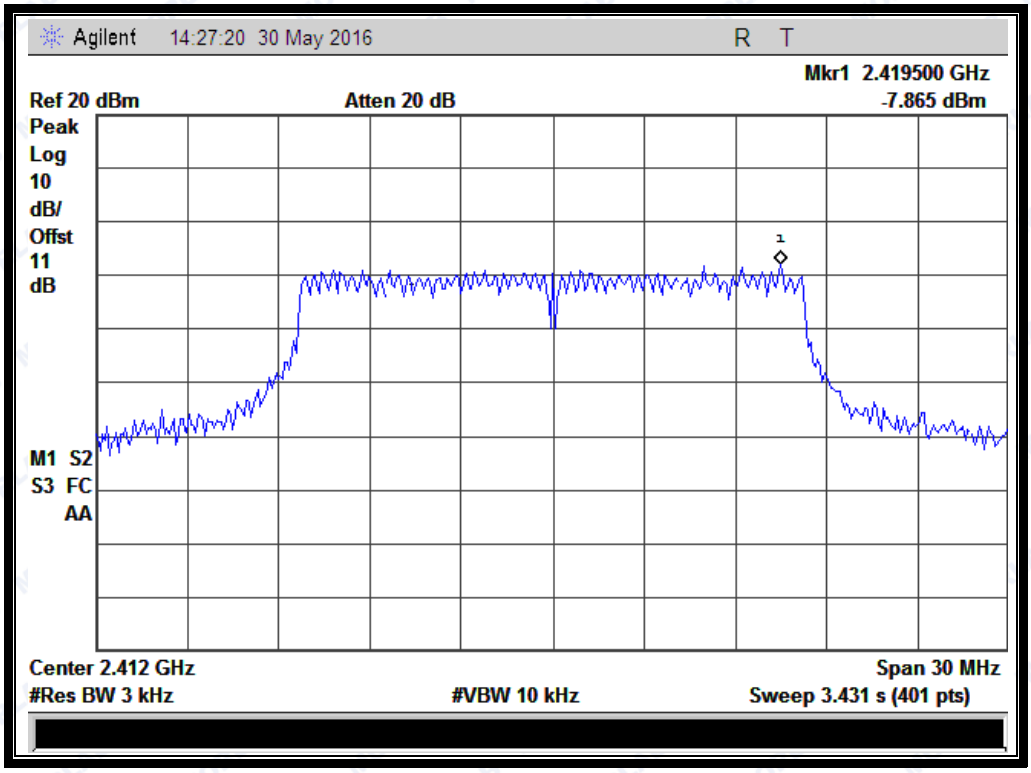
2.5.3.2 802.11g Test mode

Antenna 1:

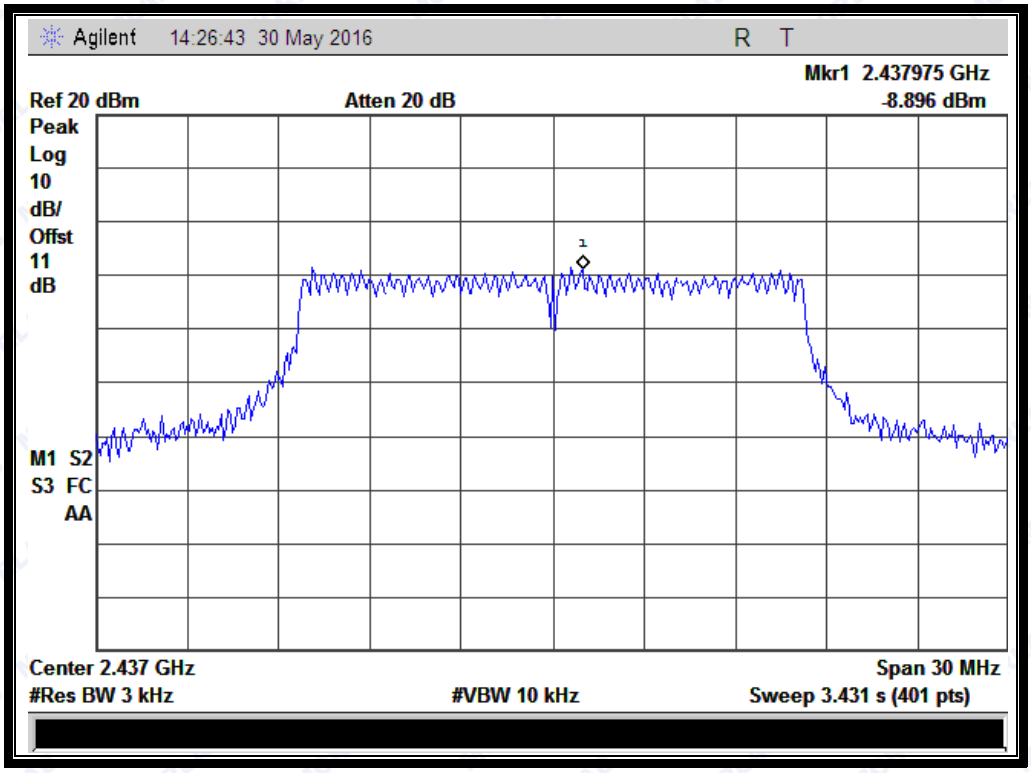
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-7.87	8	PASS
6	2437	-8.90	8	PASS
11	2462	-8.80	8	PASS
Measurement uncertainty: ±1.3dB				

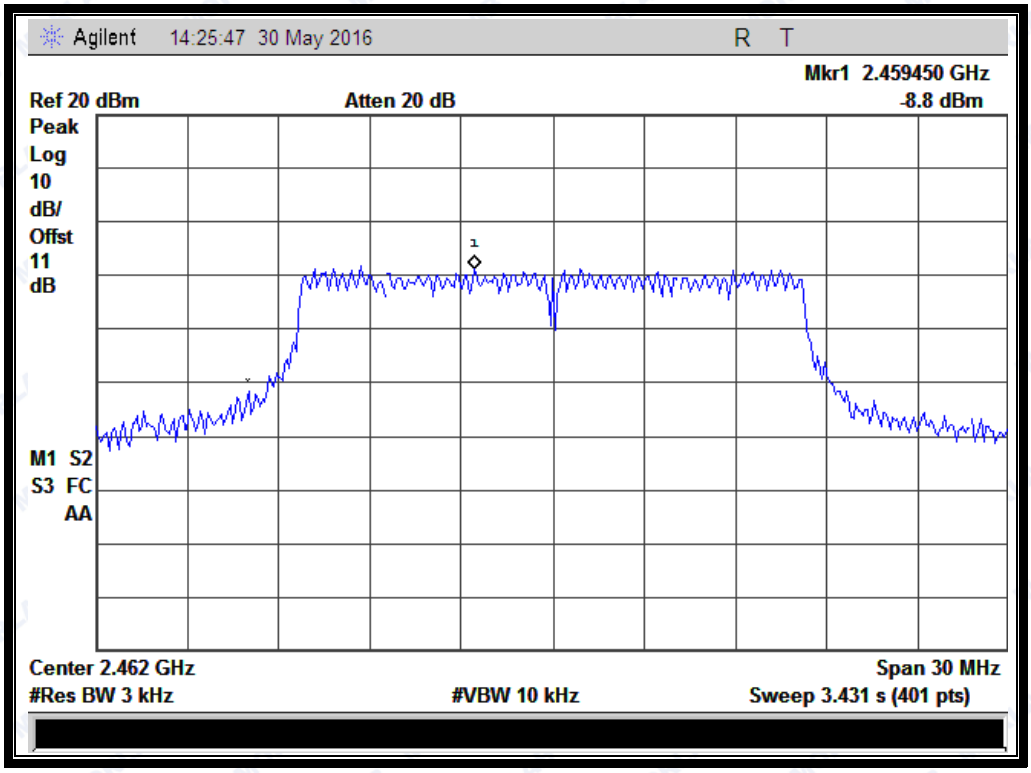
B. Test Plots:



(Channel = 1 @ 802.11g)



(Channel = 6 @ 802.11g)



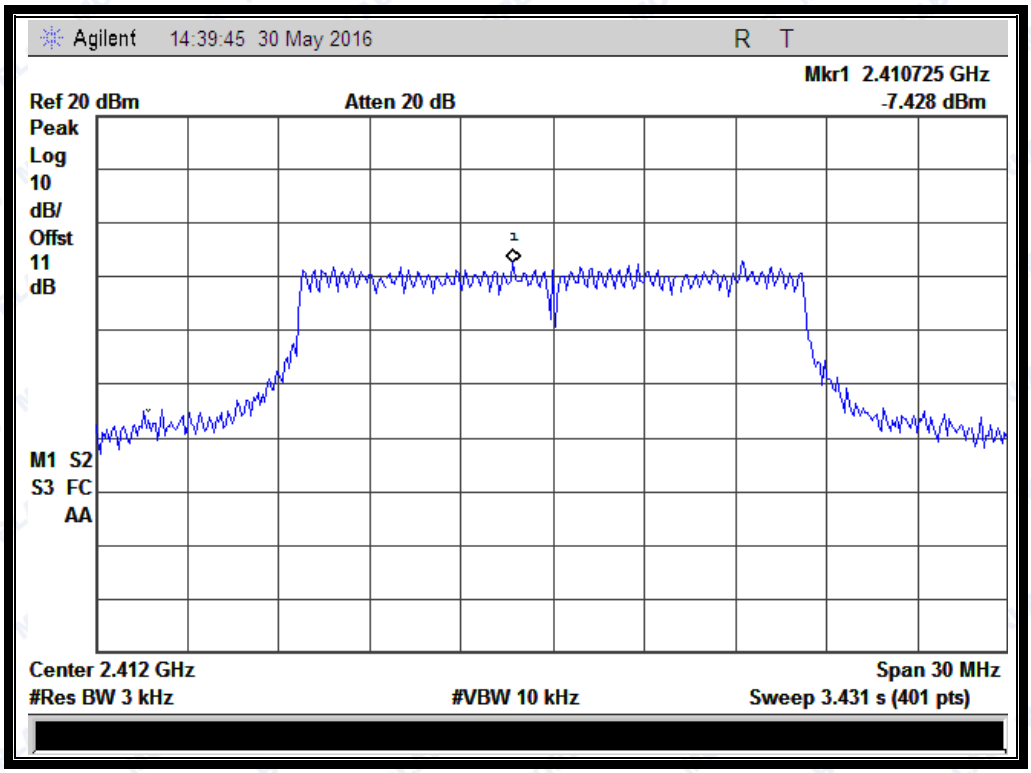
(Channel = 11 @ 802.11g)

Antenna 2:

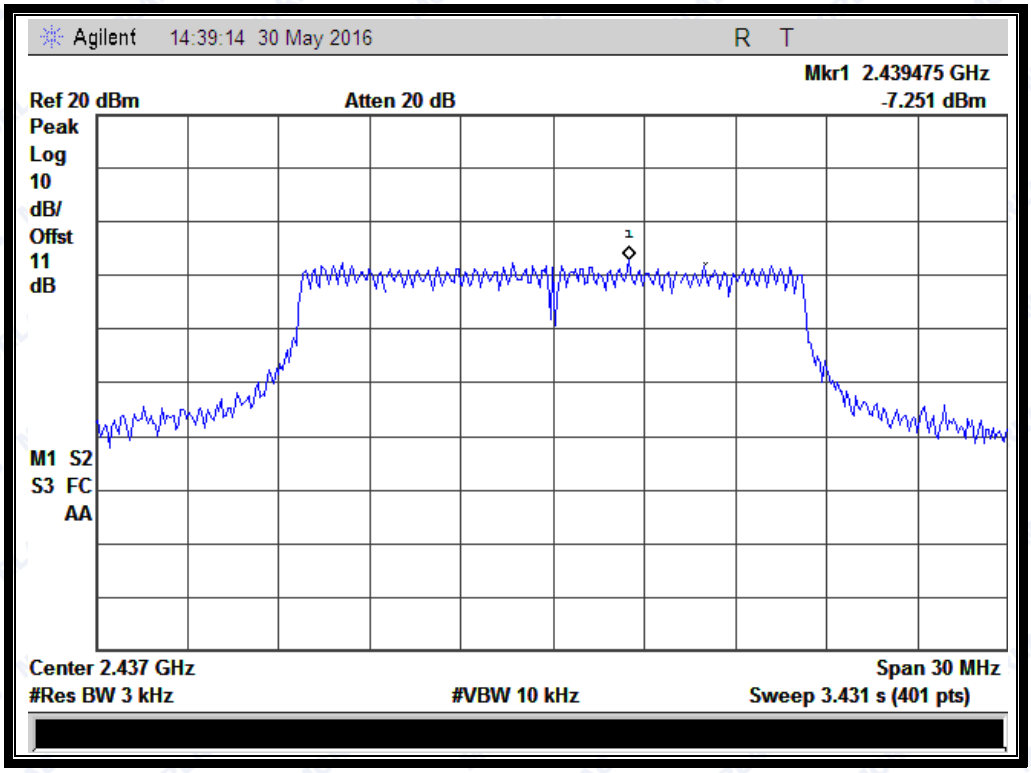
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-7.43	8	PASS
6	2437	-7.25	8	PASS
11	2462	-4.74	8	PASS
Measurement uncertainty: ±1.3dB				

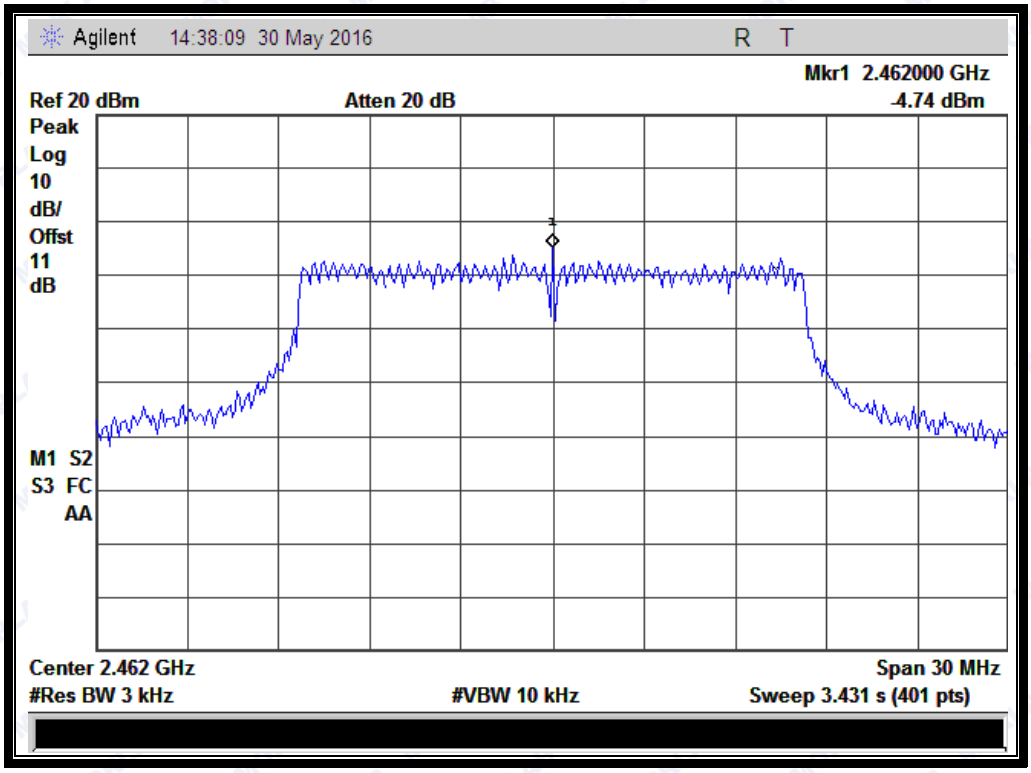
B. Test Plots:



(Channel = 1 @ 802.11g)



(Channel = 6 @ 802.11g)



(Channel = 11 @ 802.11g)

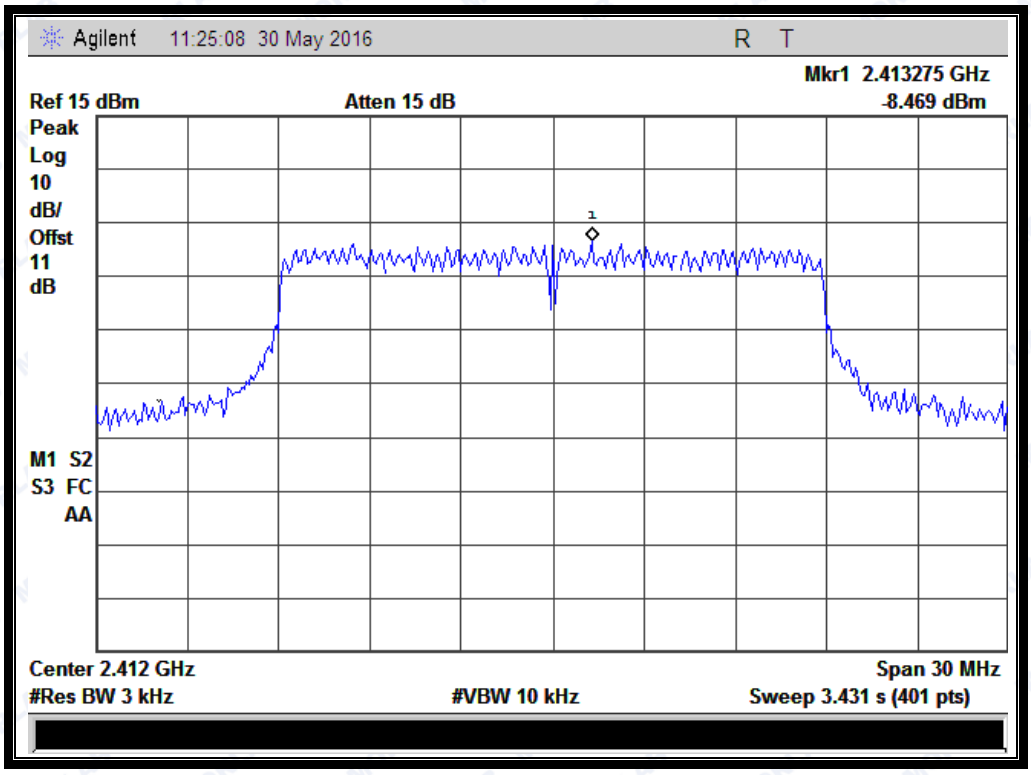
2.5.3.3 802.11n-20MHz Test mode

Antenna 1:

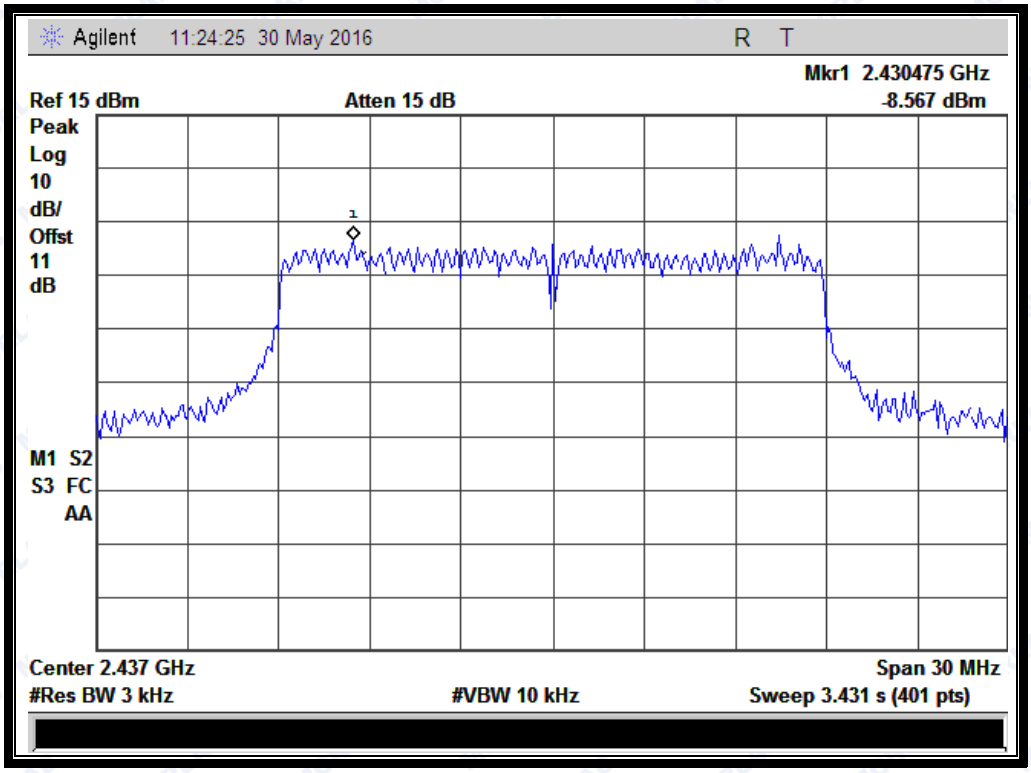
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-8.47	8	PASS
6	2437	-8.57	8	PASS
11	2462	-8.23	8	PASS
Measurement uncertainty: ±1.3dB				

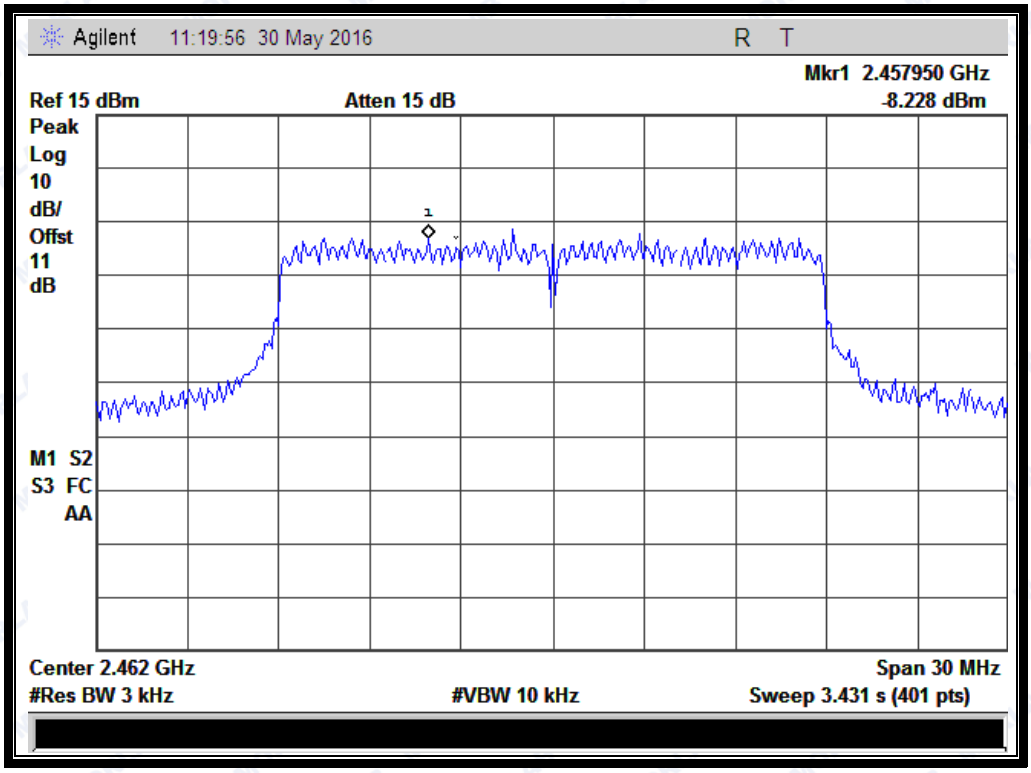
B. Test Plots:



(Channel = 1 @ 802.11n-20MHz)



(Channel = 6 @ 802.11n-20MHz)



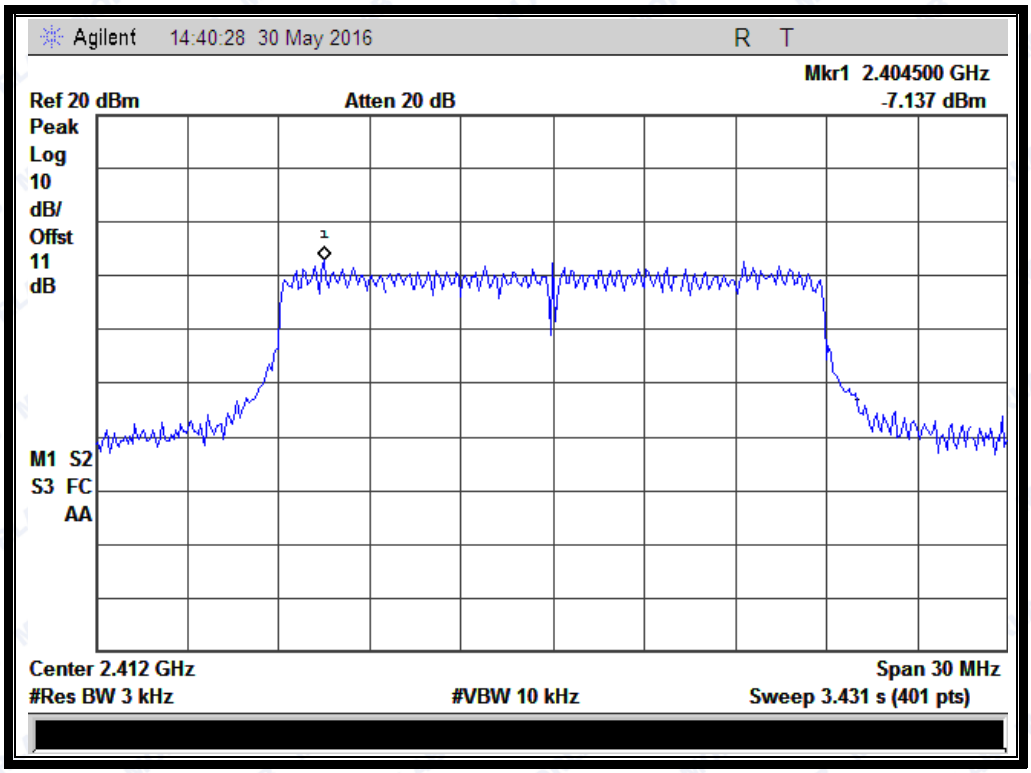
(Channel = 11 @ 802.11n-20MHz)

Antenna 2:

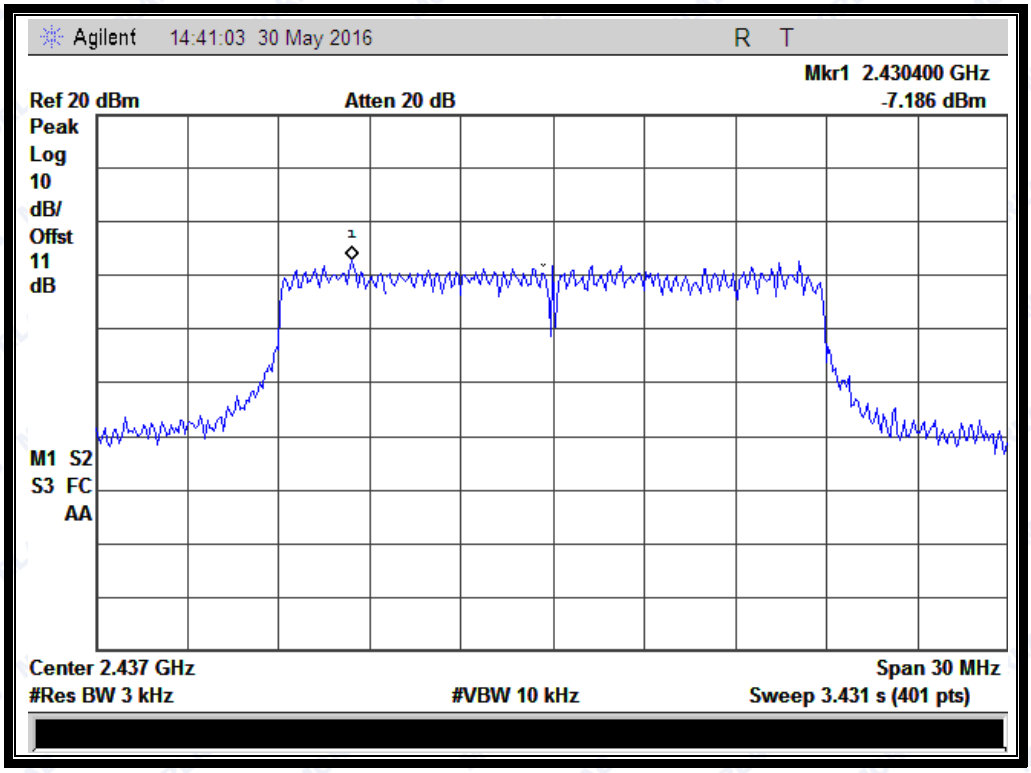
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-7.14	8	PASS
6	2437	-7.19	8	PASS
11	2462	-4.79	8	PASS
Measurement uncertainty: ±1.3dB				

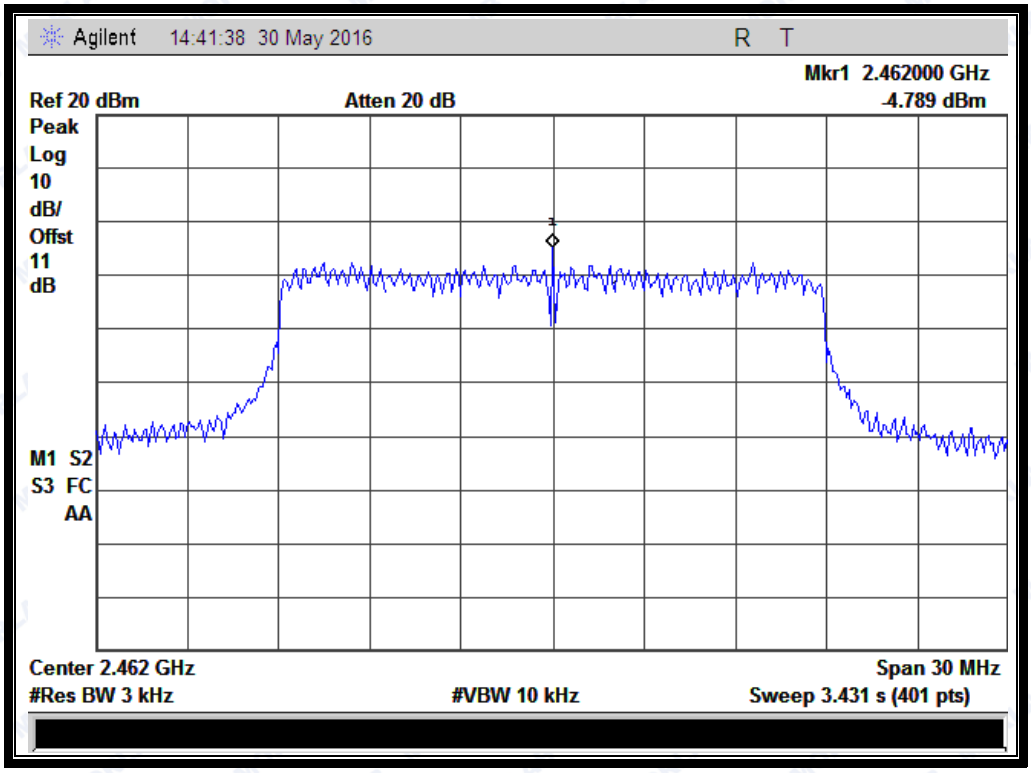
B. Test Plots:



(Channel = 1 @ 802.11n-20MHz)



(Channel = 6 @ 802.11n-20MHz)



(Channel = 11 @ 802.11n-20MHz)

Antenna 1 + Antenna 2

D. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-4.74	5.99_{Note}	PASS
6	2437	-4.82		PASS
9	2452	-3.17		PASS
Measurement uncertainty: ±1.3dB				

Note: According to KDB 558074 D01 c03r03, for those cases where the rule specifies that the Spectral power density be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6 dBi, the applicable Spectral power density limit shall be calculated as follows:

$$P_{Out} = P_{Limit} - (G_{Tx} - 6)$$

Where:

P_{Out} is the maximum Spectral power density in dBm/3KHz,

P_{Limit} is the Spectral power density limit in dBm/3KHz,

G_{Tx} is the maximum transmitting antenna directional gain in dBi.

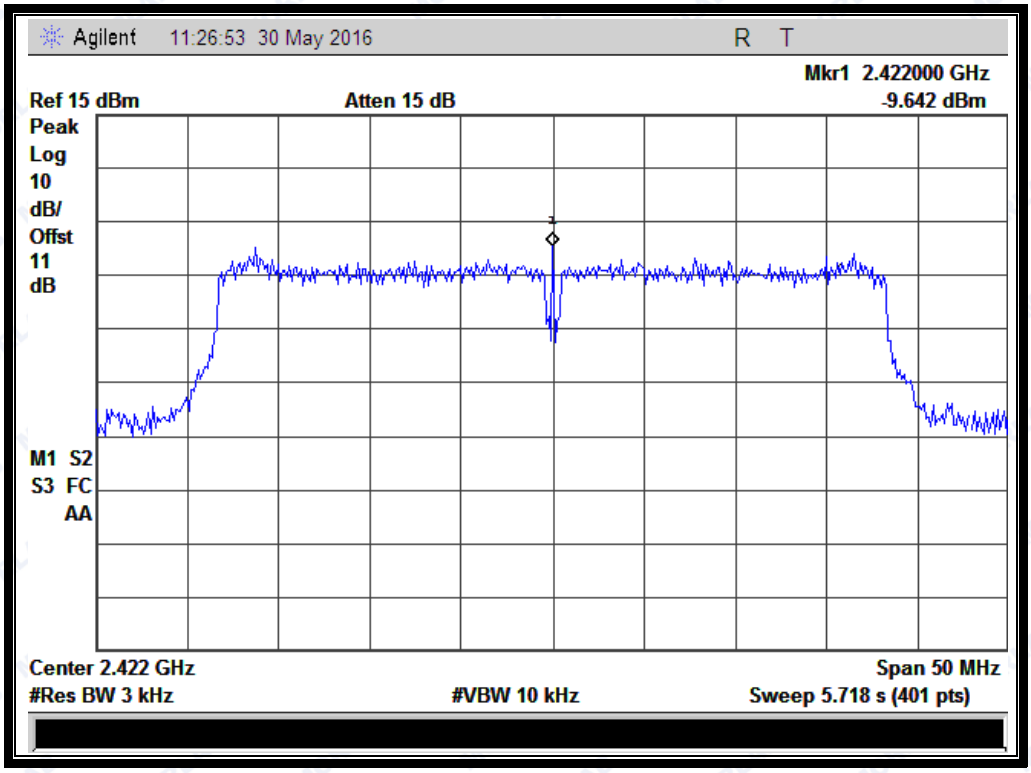
2.5.3.4 802.11n-40MHz Test mode

Antenna 1:

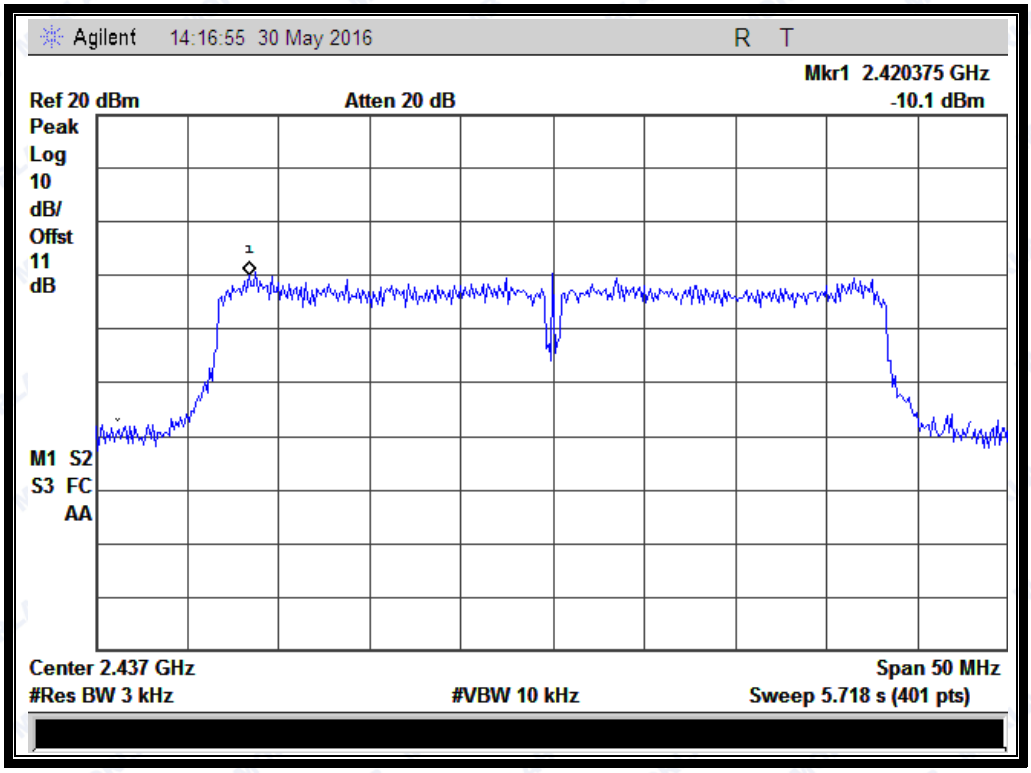
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-9.64	8	PASS
6	2437	-10.10	8	PASS
9	2452	-10.01	8	PASS
Measurement uncertainty: ±1.3dB				

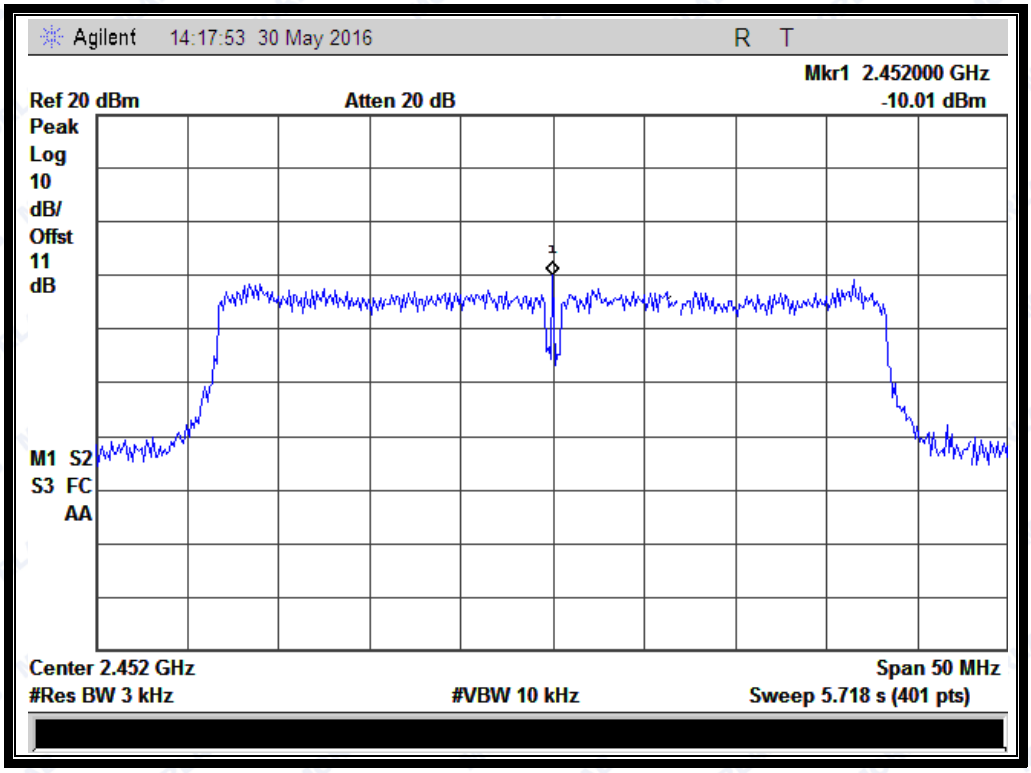
B. Test Plots:



(Channel = 3 @ 802.11n-40MHz)



(Channel = 6 @ 802.11n-40MHz)



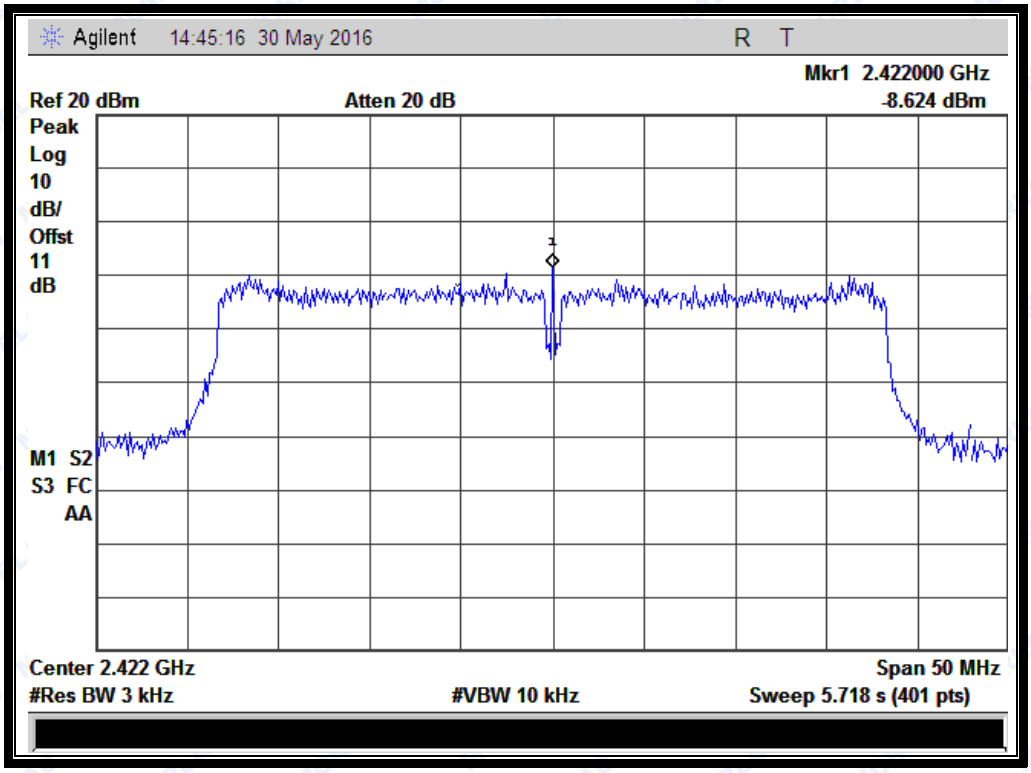
(Channel = 9 @ 802.11n-40MHz)

Antenna 2:

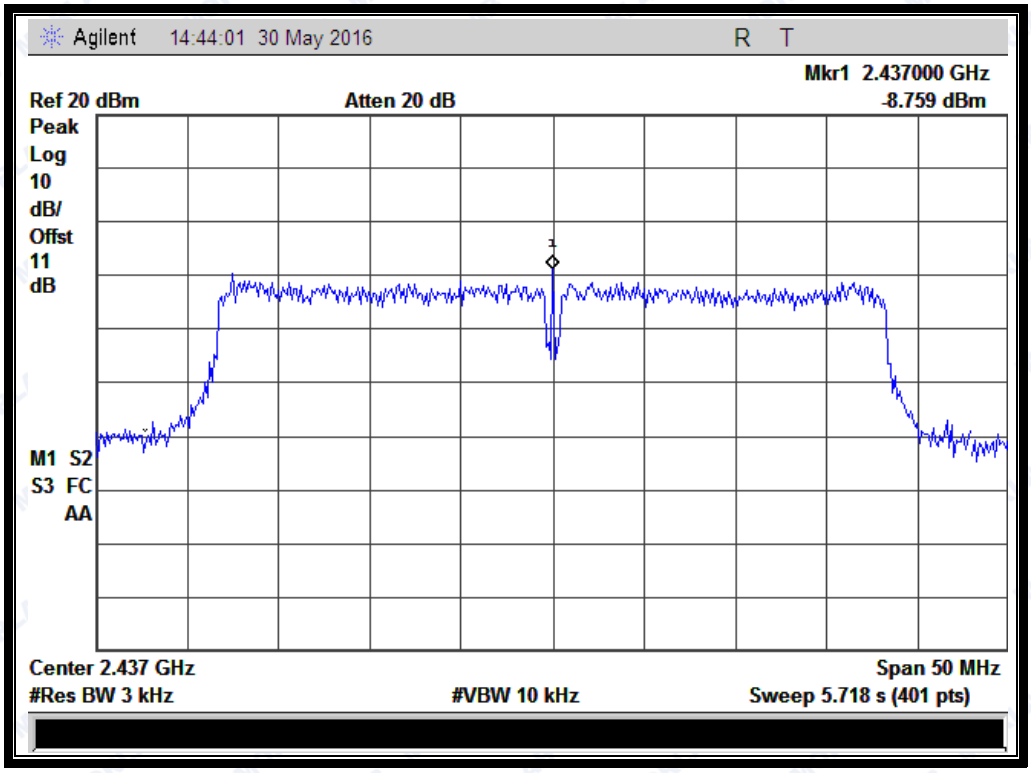
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-8.62	8	PASS
6	2437	-8.76	8	PASS
9	2452	-3.67	8	PASS
Measurement uncertainty: ±1.3dB				

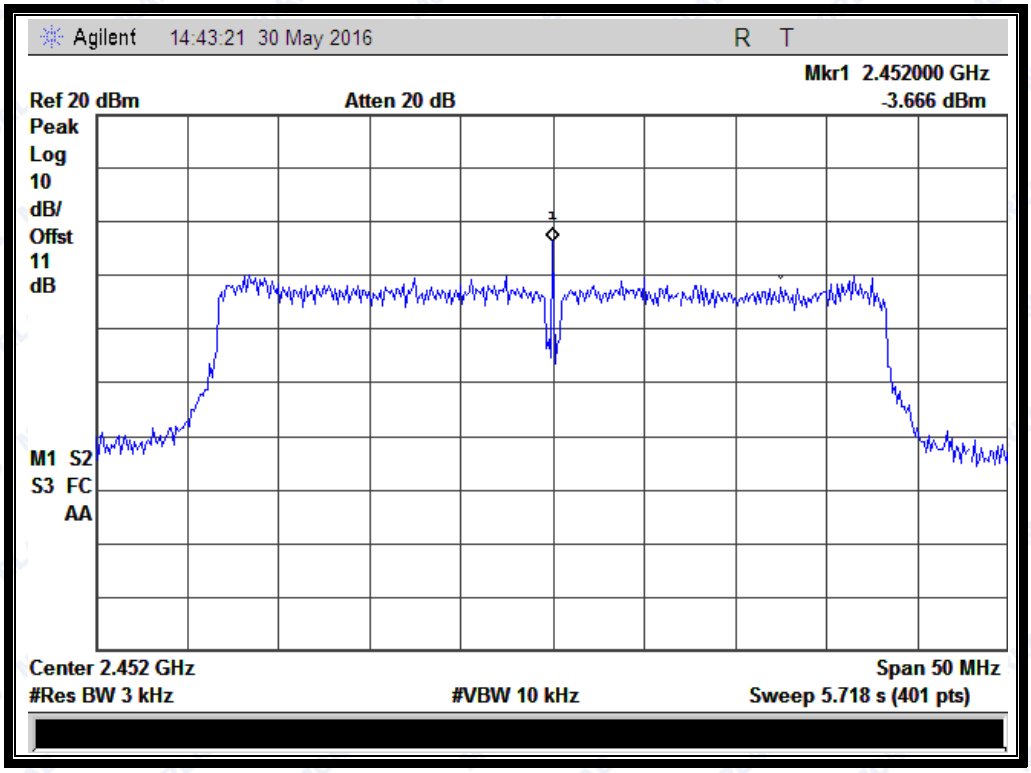
B. Test Plots:



(Channel = 3 @ 802.11n-40MHz)



(Channel = 6 @ 802.11n-40MHz)



(Channel = 9 @ 802.11n-40MHz)

Antenna 1 + Antenna 2

A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-6.09	5.99_{Note}	PASS
6	2437	-6.37		PASS
9	2452	-2.76		PASS
Measurement uncertainty: ±1.3dB				

Note: According to KDB 558074 D01 c03r03, for those cases where the rule specifies that the Spectral power density be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6 dBi, the applicable Spectral power density limit shall be calculated as follows:

$P_{Out} = P_{Limit} – (G_{Tx} – 6)$

Where:

P_{Out} is the maximum Spectral power density in dBm/3KHz,

P_{Limit} is the Spectral power density limit in dBm/3KHz,

G_{Tx} is the maximum transmitting antenna directional gain in dBi.

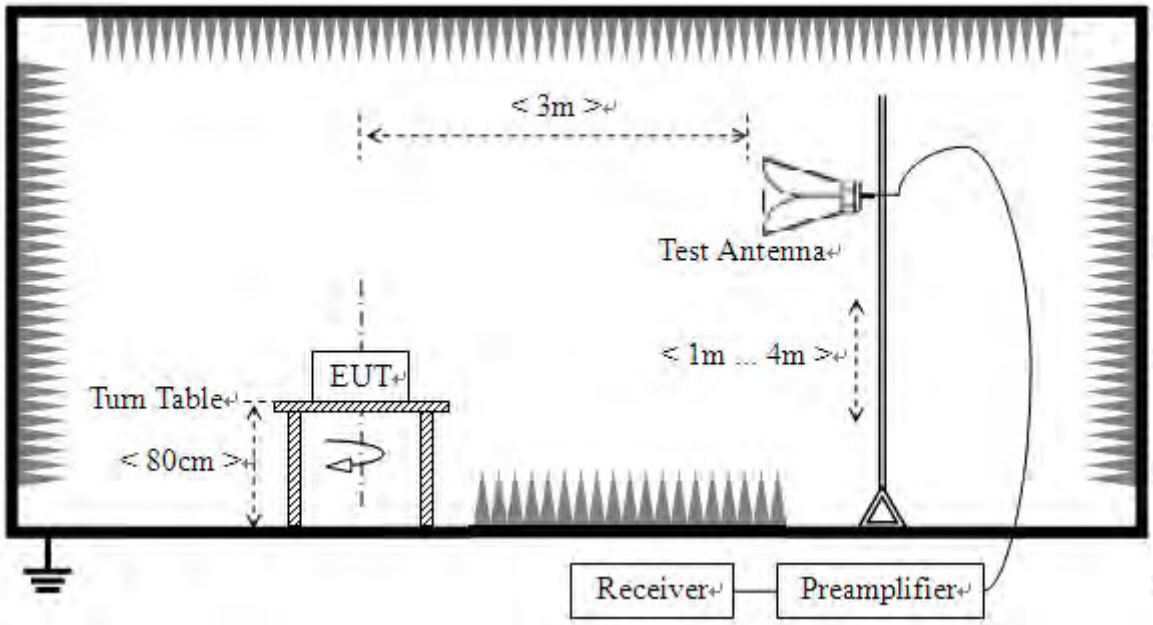
2.6 Restricted Frequency Bands

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:

Please reference ANNEX A(1.5).

2.6.3 Test Result

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

The measurement results are obtained as below:
$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{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.

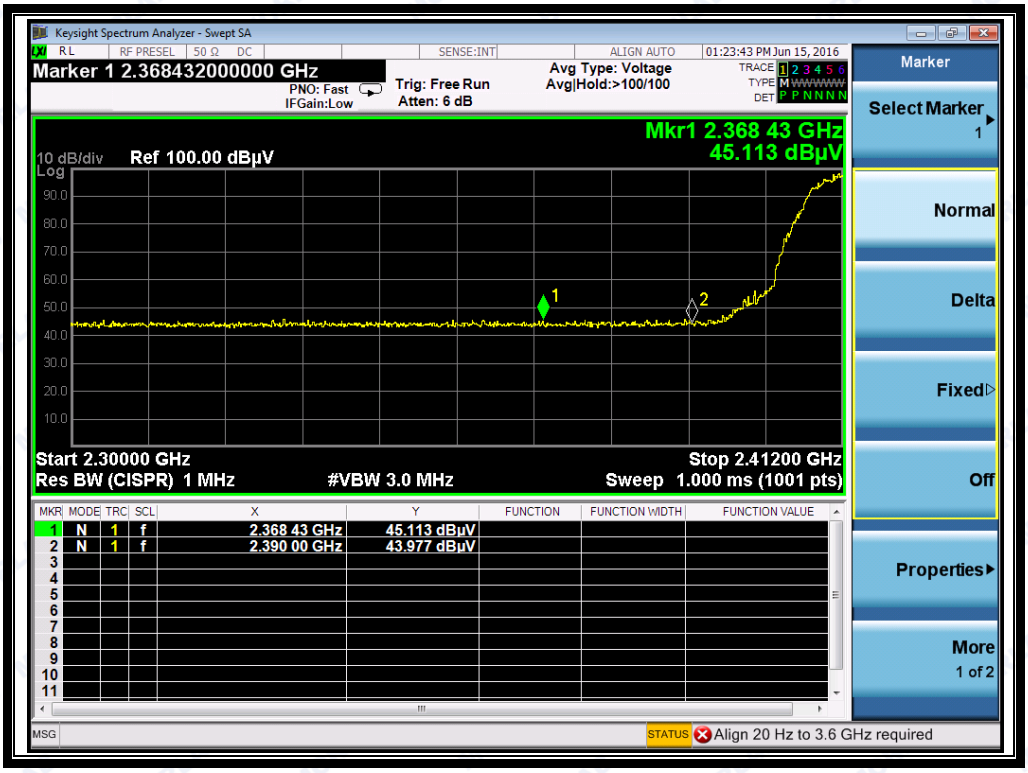
2.6.3.1 802.11b SISO Test mode

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

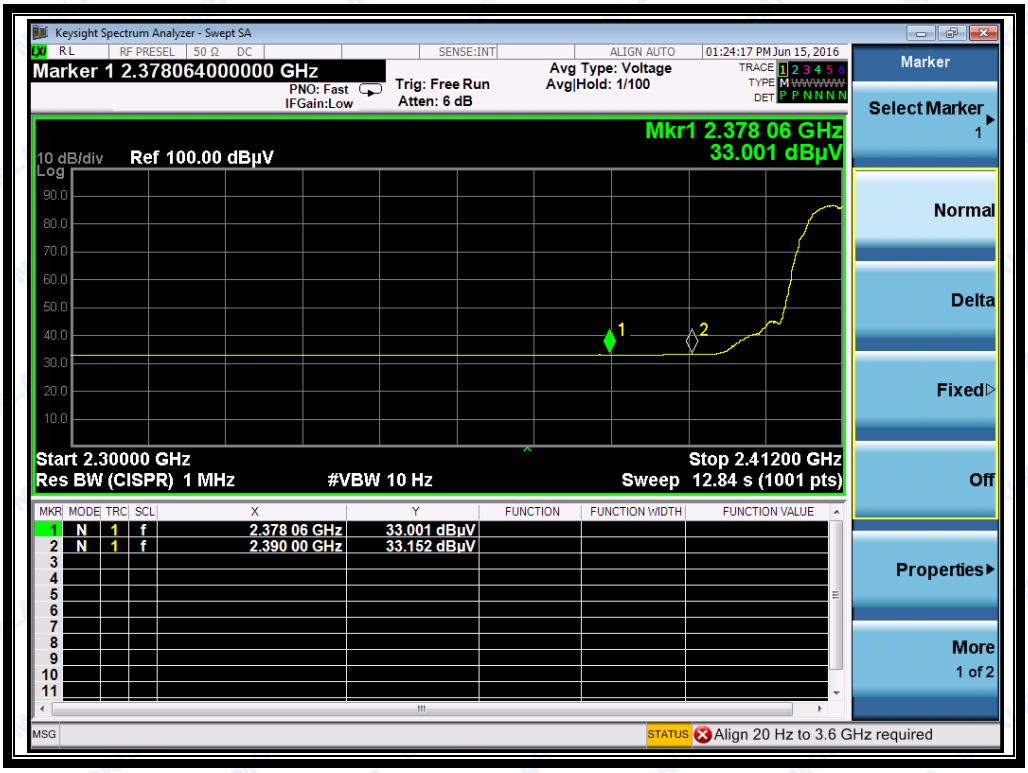
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
1	2368.43	PK	45.11	-33.63	32.56	44.04	74	Pass
1	2378.06	AV	33.00	-33.63	32.56	31.93	54	Pass
11	2487.01	PK	46.12	-33.18	32.5	45.44	74	Pass
11	2485.42	AV	33.06	-33.18	32.5	32.38	54	Pass

B. Test Plots:

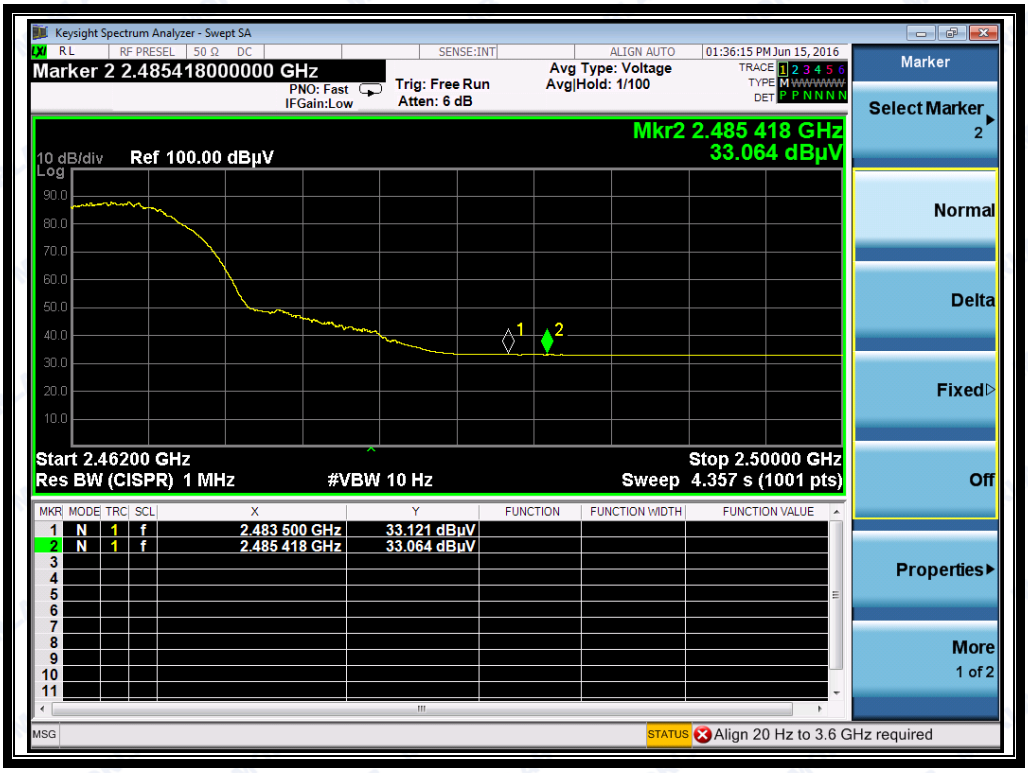


(Plot A1: Channel = 1 PEAK @ 802.11b)



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

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



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

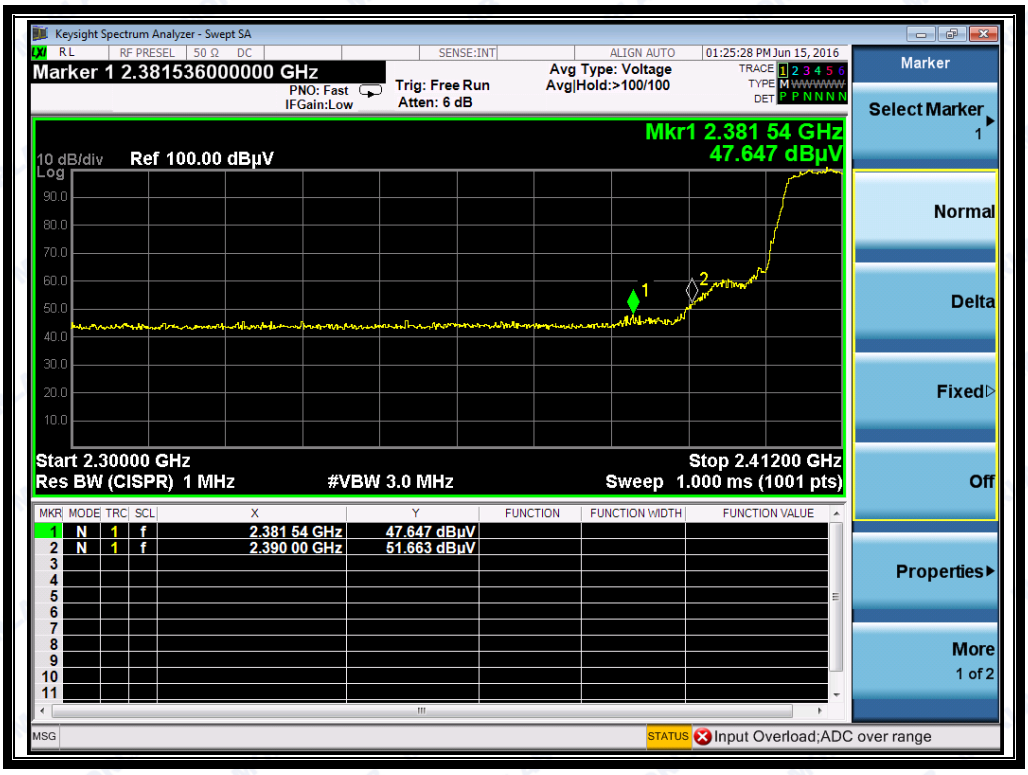
2.6.3.2 802.11g SISO Test mode

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

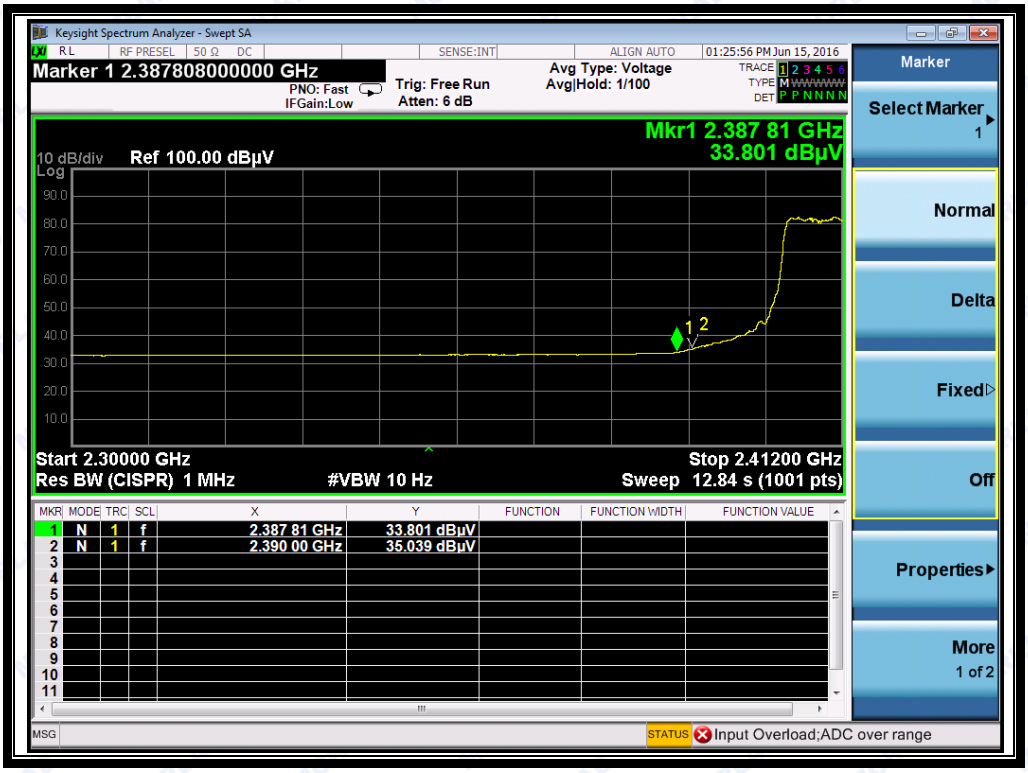
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
1	2381.54	PK	47.65	-33.63	32.56	46.58	74	Pass
1	2387.81	AV	33.80	-33.63	32.56	32.73	54	Pass
11	2484.16	PK	57.98	-33.18	32.5	57.3	74	Pass
11	2484.24	AV	36.49	-33.18	32.5	35.81	54	Pass

B. Test Plots:

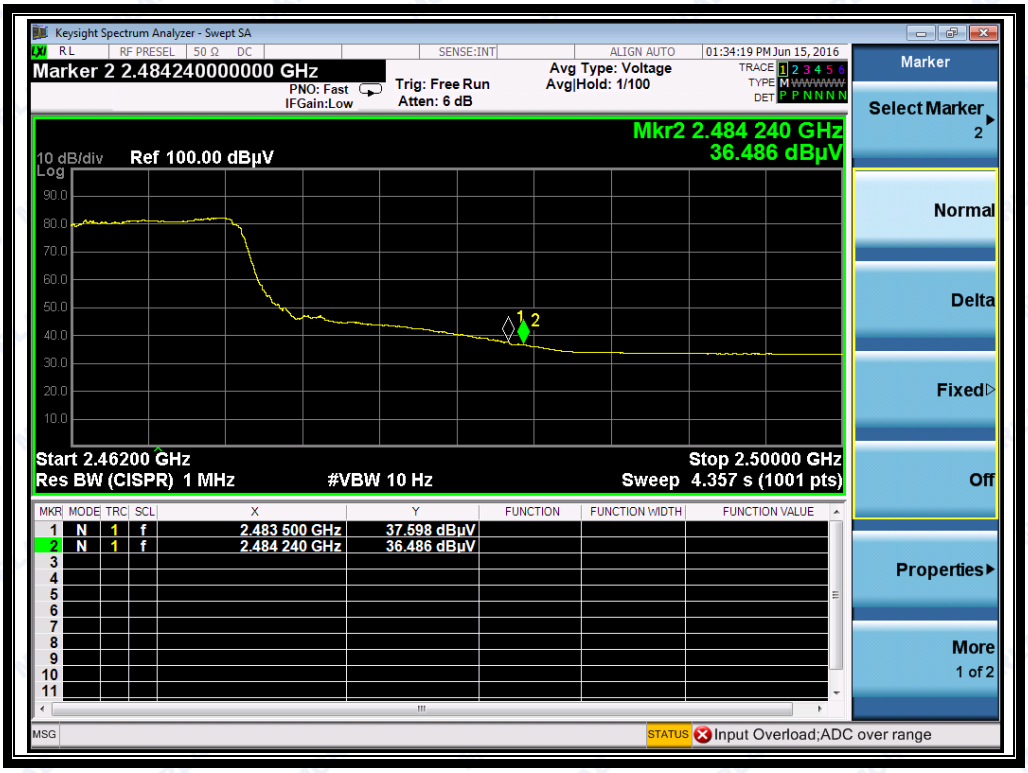


(Plot C1: Channel = 1 PEAK @ 802.11g)



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

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



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

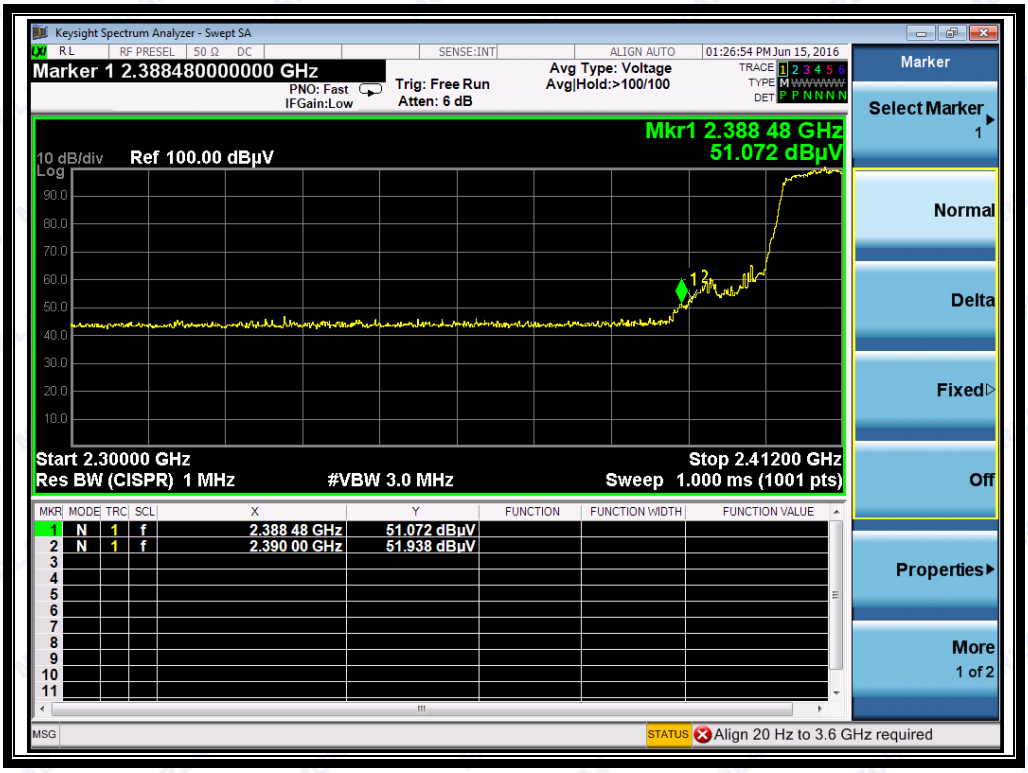
2.6.3.3 802.11n-20MHz MIMO Test mode

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

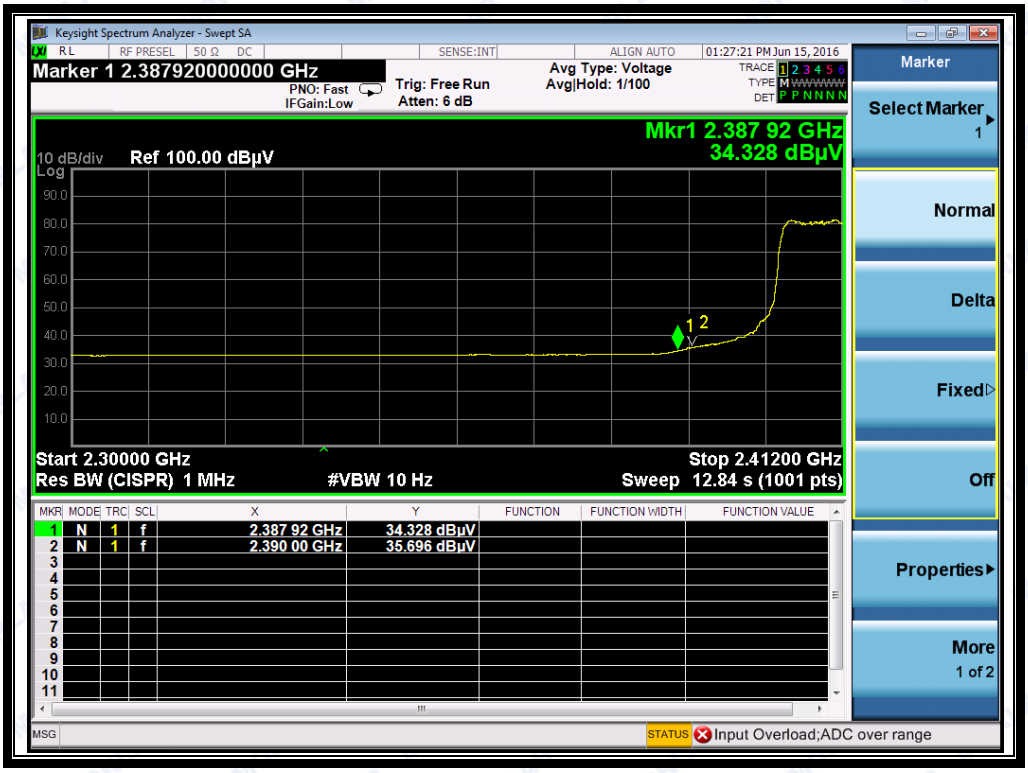
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
1	2388.48	PK	51.07	-33.63	32.56	50.00	74	Pass
1	2387.92	AV	34.33	-33.63	32.56	33.26	54	Pass
11	2486.14	PK	62.83	-33.18	32.5	62.15	74	Pass
11	2484.54	AV	37.93	-33.18	32.5	37.25	54	Pass

B. Test Plots:

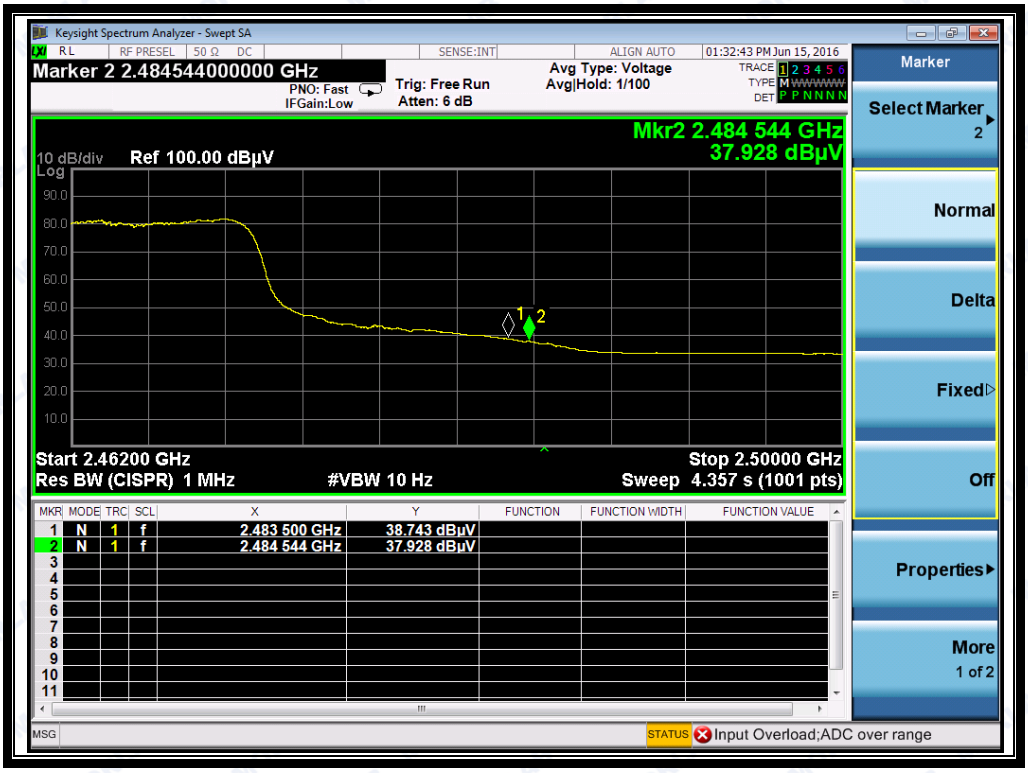


(Plot E1: Channel = 1 PEAK @ 802.11n-20)



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

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



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

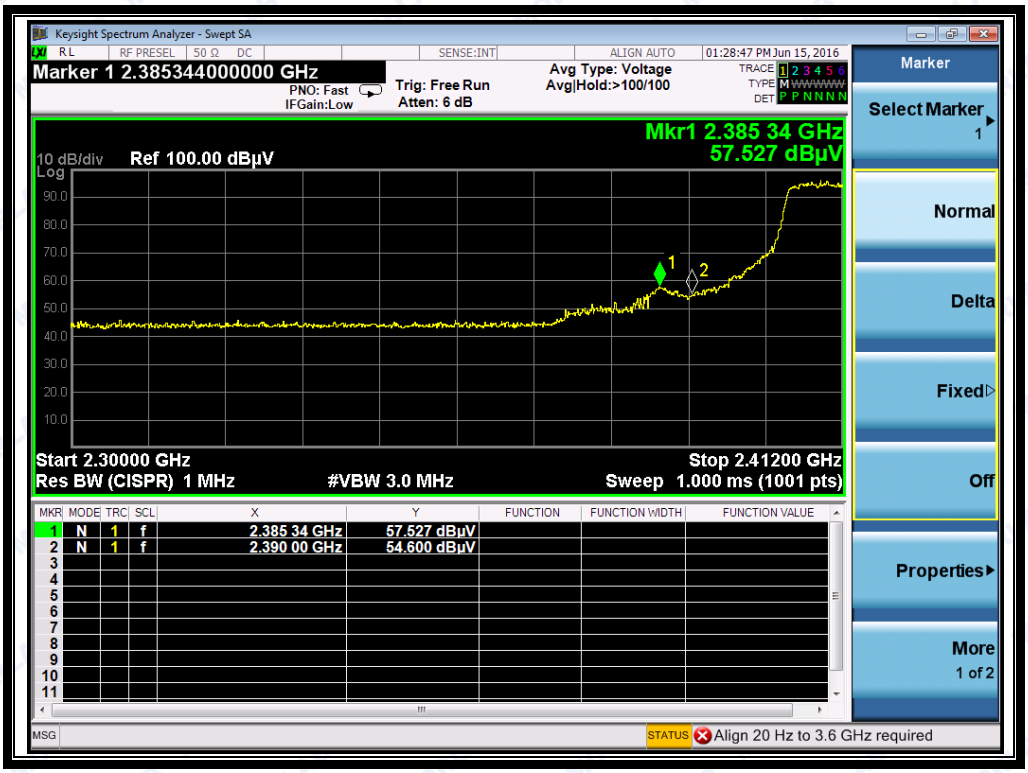
2.6.3.4 802.11n-40MHz MIMO Test mode

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

A. Test Verdict:

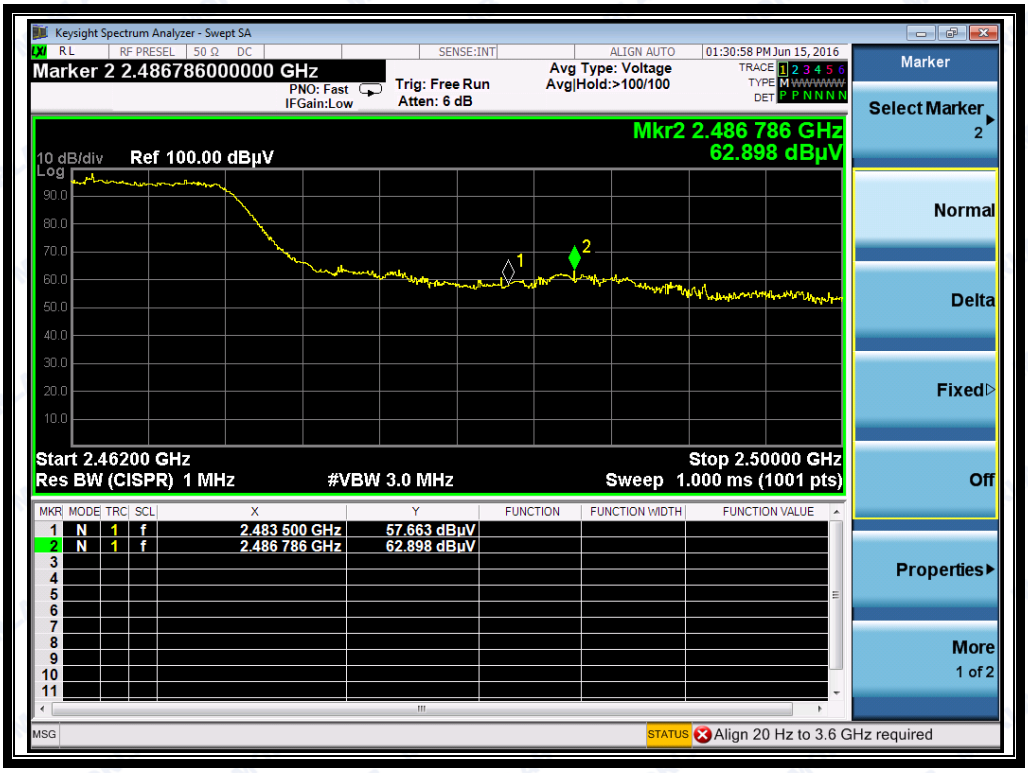
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
3	2385.34	PK	57.53	-33.63	32.56	56.46	74	Pass
3	2384.56	AV	37.65	-33.63	32.56	36.58	54	Pass
9	2486.79	PK	62.90	-33.18	32.5	62.22	74	Pass
9	2485.95	AV	39.28	-33.18	32.5	38.60	54	Pass

C. Test Plots:

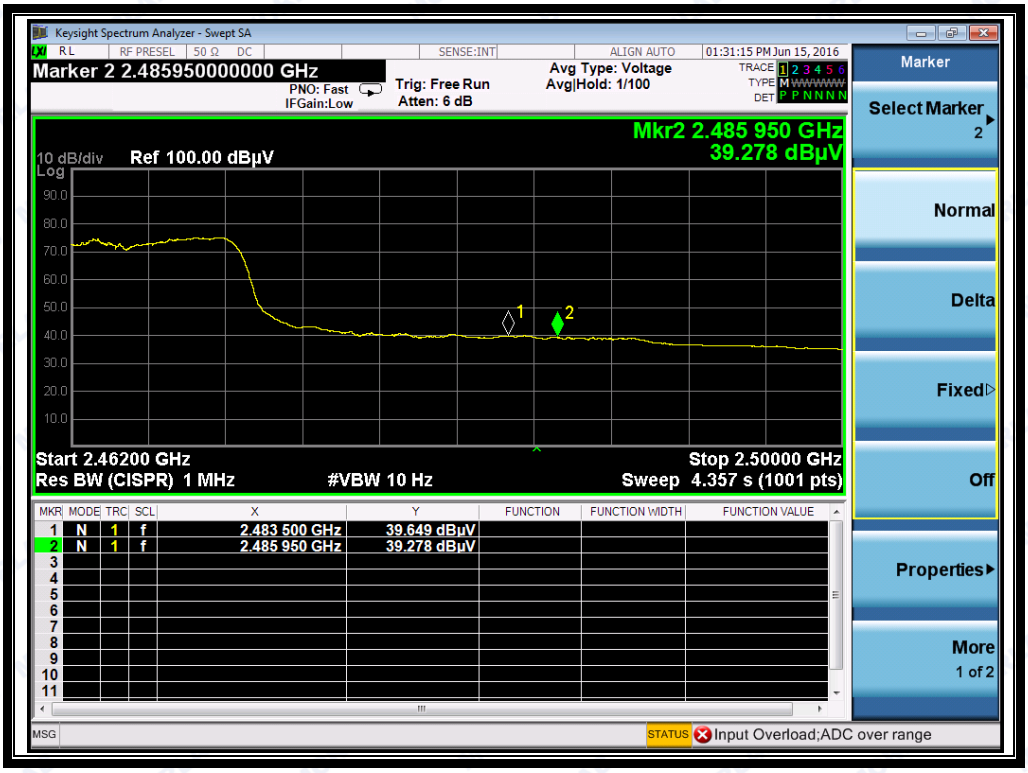


(Plot E1: Channel = 3 PEAK @ 802.11n-40)

(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

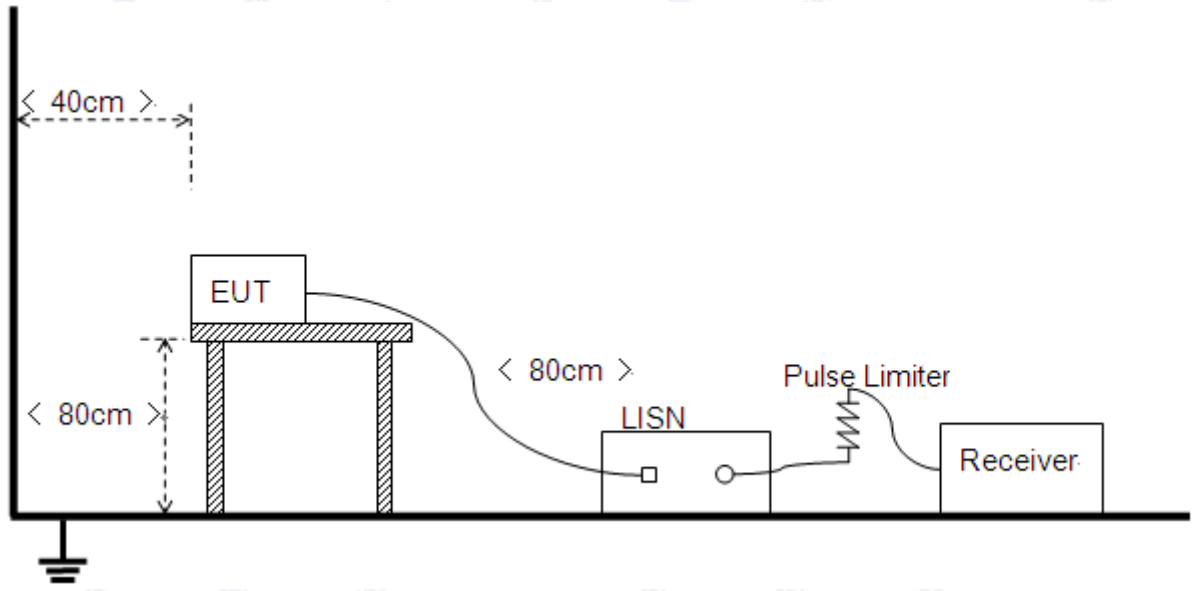
NOTE:

(a) The lower limit shall apply at the band edges.

(b) 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 C63.10 2013.

B. Equipments List:

Please reference ANNEX A(1.5).

2.1.1 Test Result

Note: Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

A. Test setup:

N.A

B. Test Plots:

N.A

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 (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

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.

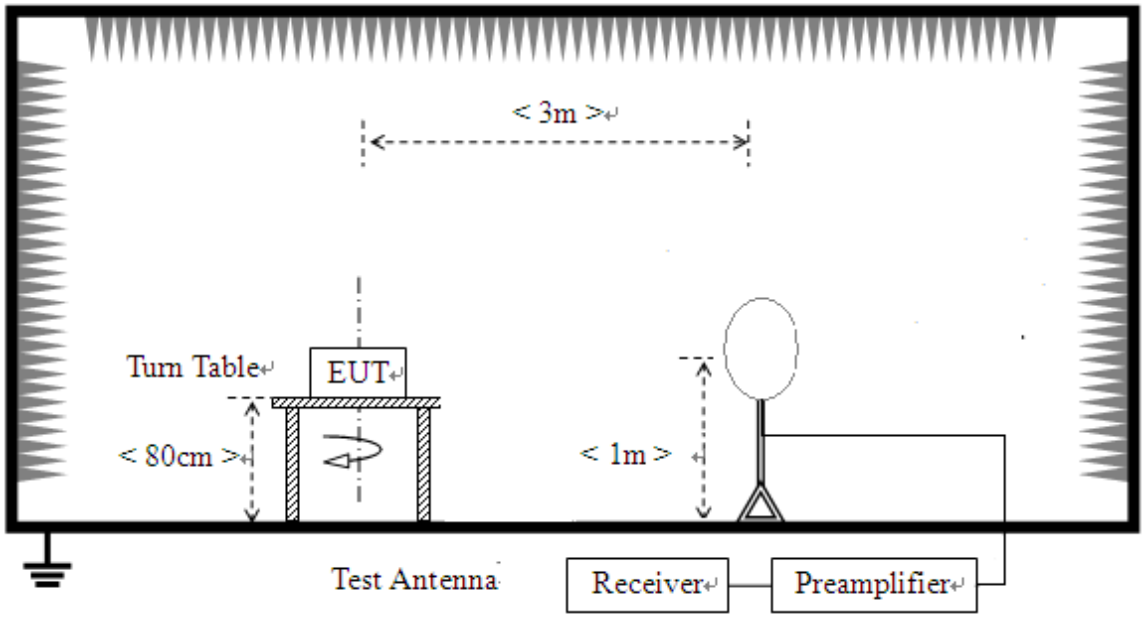
For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

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)

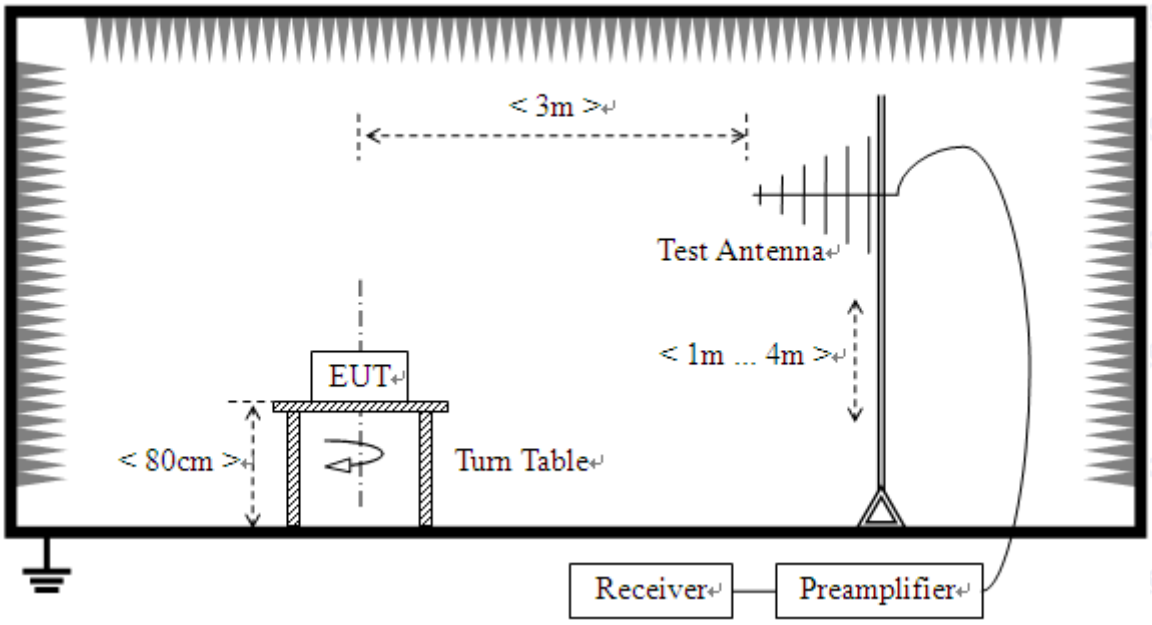
2.8.2 Test Description

A. Test Setup:

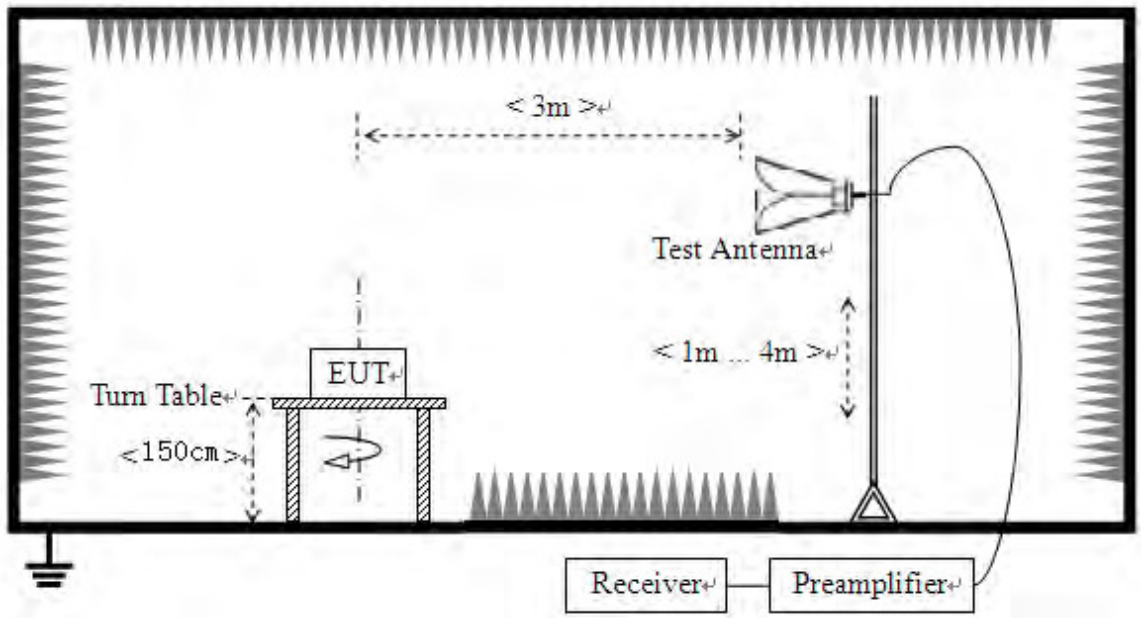
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



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 C63.10 (2013). For radiated emissions below or equal to 1GHz,The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

The EUT 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:

(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 1GHz) and Horn Test Antenna (above 1GHz) 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:

Please reference ANNEX A(1.5).

2.8.3 Test Result

According to ANSI C63.10, 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:

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

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

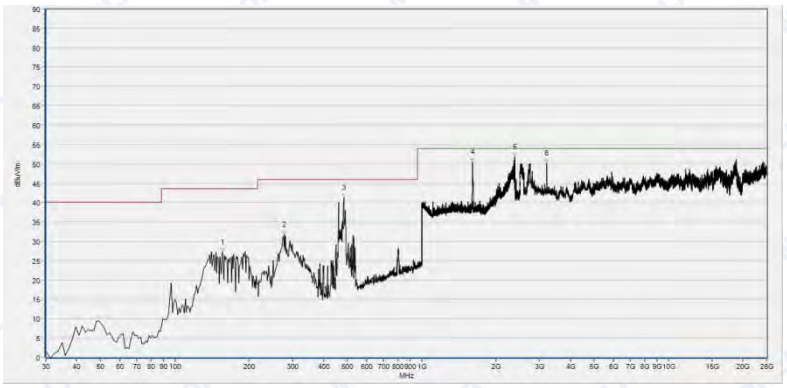
During the test, the total correction Factor A_T and A_{Factor} were built in test software.

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 SISO Test mode

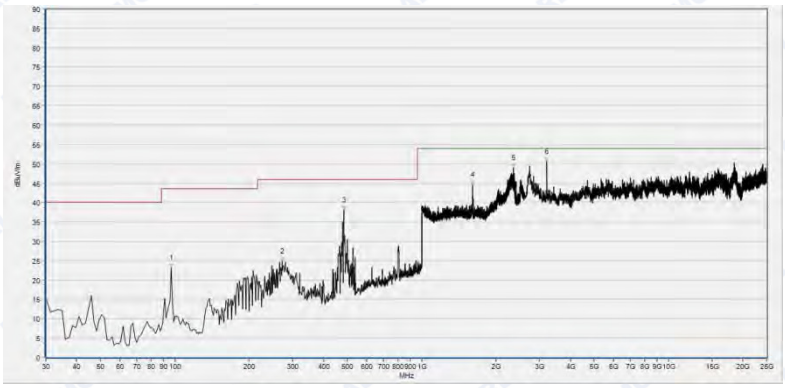
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
156.258	27.09	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
277.660	31.75	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
482.829	41.28	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1607.603	50.40	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2381.673	51.72	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3215.094	54.10	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

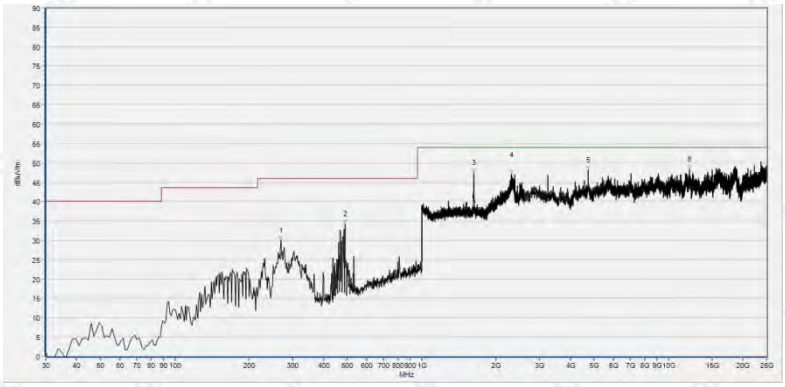
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
96.771	23.17	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
271.589	24.74	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
482.829	38.11	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1607.603	44.66	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2348.379	48.89	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
3215.094	54.64	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



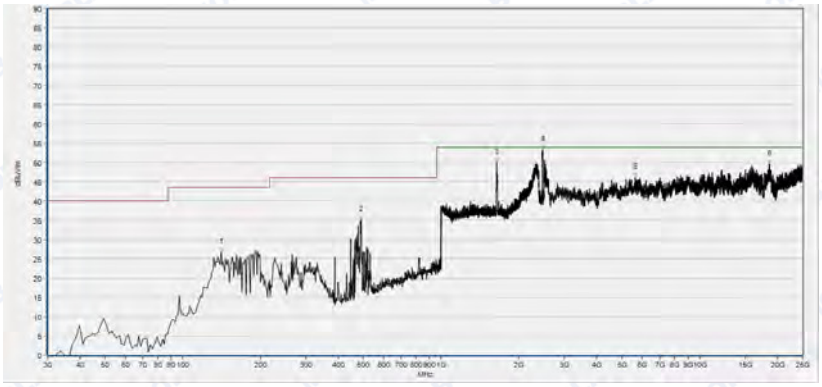
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
269.161	29.93	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
488.899	34.24	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1624.250	47.37	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2315.726	47.11	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4714.130	48.08	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12140.062	48.19	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
96.771	25.39	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
267.947	26.45	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
482.829	41.21	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1624.250	51.75	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
3247.681	50.23	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
9003.492	48.24	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

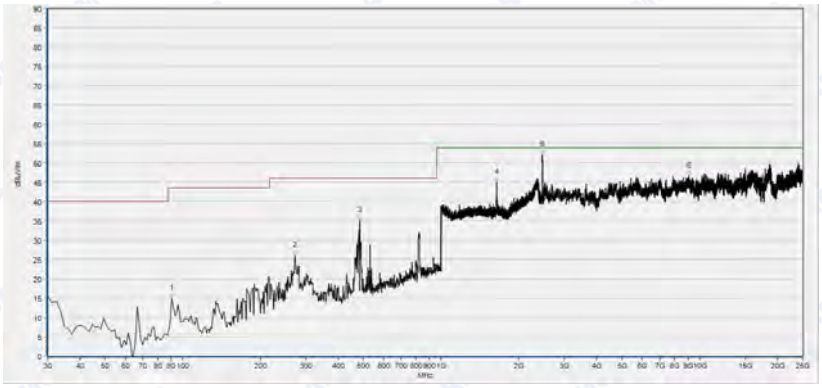
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
140.476	26.83	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
490.113	35.20	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1640.896	49.96	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2466.827	53.38	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5618.440	46.19	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18584.288	49.61	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



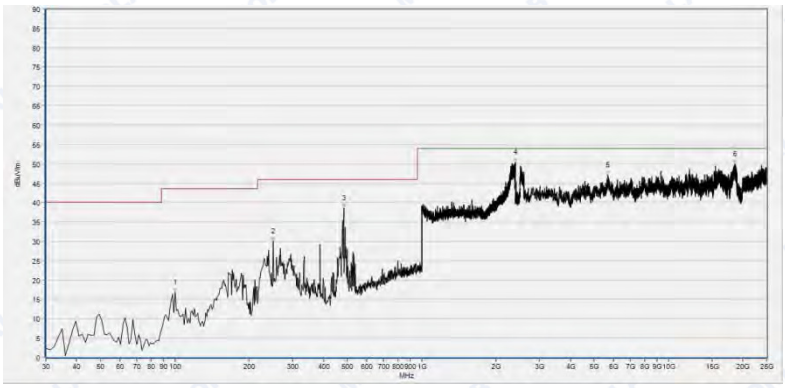
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
90.701	14.95	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
271.589	26.09	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
484.043	35.20	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1641.537	45.04	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2461.705	54.17	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
9084.961	46.68	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

2.8.3.2 802.11g SISO Test mode

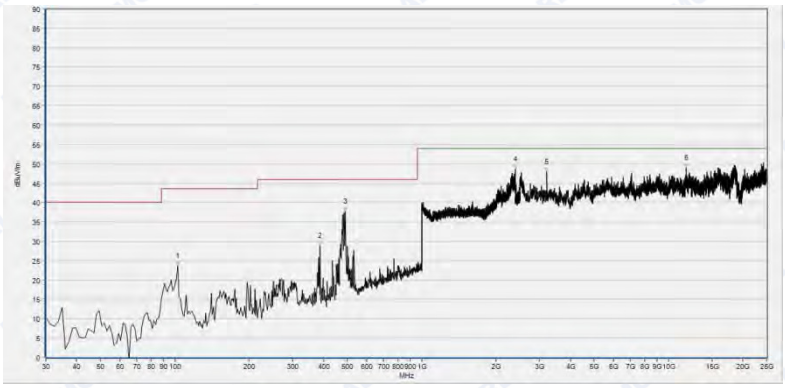
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
100.413	16.78	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
249.737	29.92	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
482.829	38.59	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2391.277	50.39	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5679.542	47.02	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18616.876	49.96	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



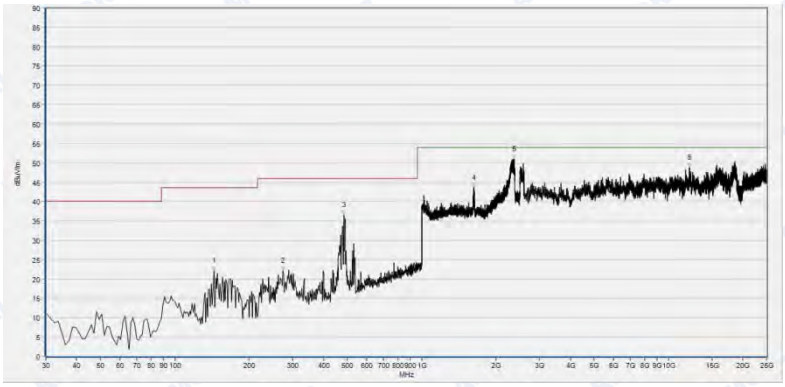
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
102.841	23.59	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
386.921	28.78	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
491.327	37.76	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2389.996	48.53	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
3215.094	47.86	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
11777.523	48.89	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6

Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
101.627	13.65	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
182.966	25.41	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
482.829	43.20	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2516.126	47.71	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
6783.452	47.02	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18543.553	50.45	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

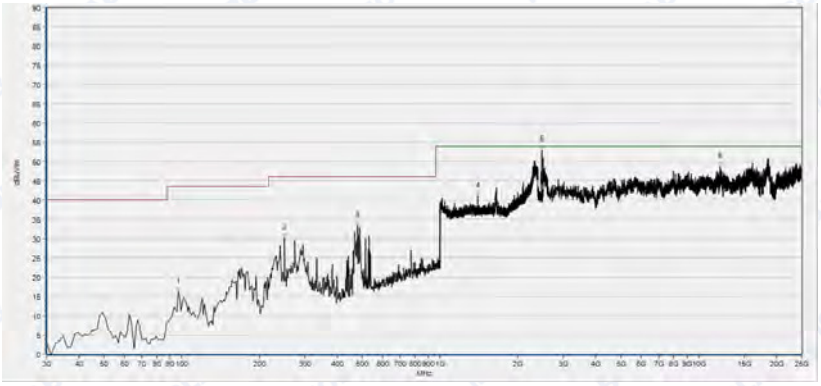
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
144.118	22.10	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
274.018	22.14	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
482.829	36.50	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1624.890	43.55	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2366.947	50.96	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12148.209	48.71	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

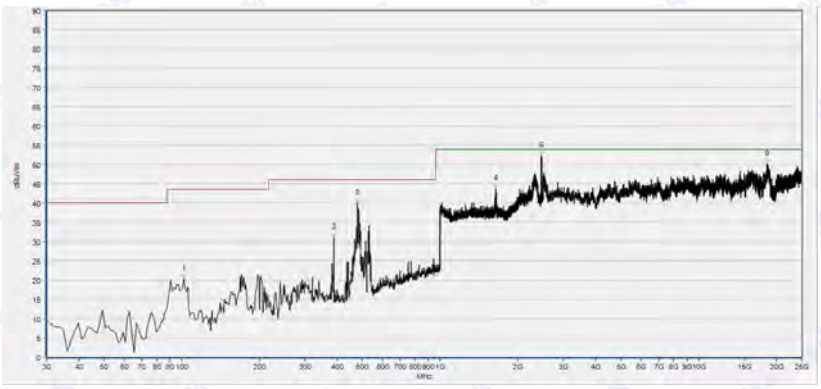
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
96.771	16.32	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
249.737	30.15	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
477.972	33.39	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1400.160	41.05	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2469.388	53.12	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12144.135	48.67	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



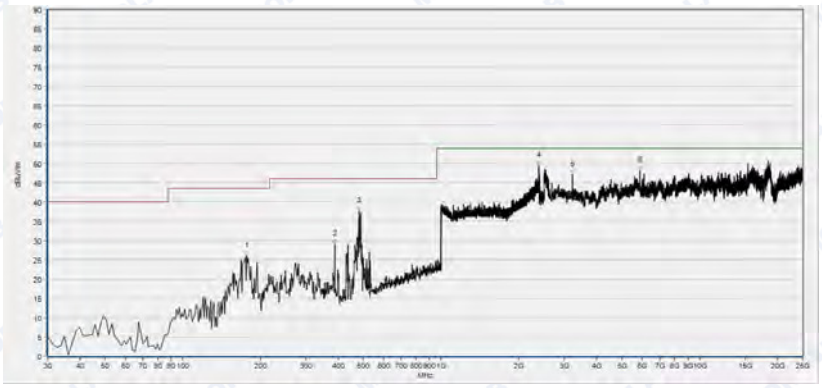
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
101.627	20.41	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
386.921	31.11	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
477.972	40.02	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1642.177	43.75	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2461.705	52.30	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
18413.202	50.21	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

2.8.3.3 802.11n-20MHz MIMO Test mode

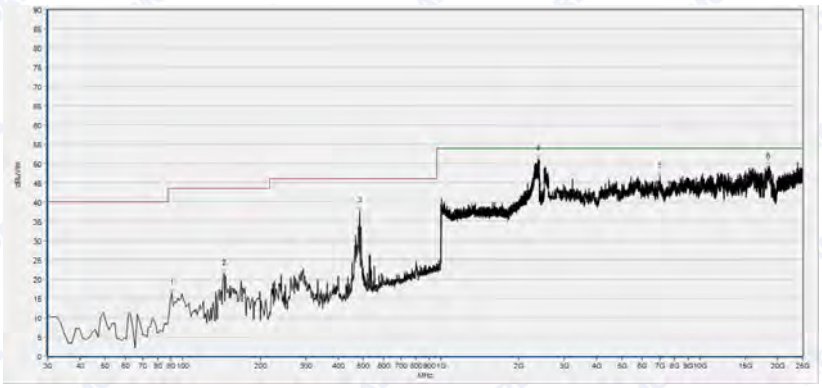
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
176.896	26.12	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
386.921	29.19	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.615	37.71	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2390.636	49.54	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3215.094	47.23	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5858.774	48.27	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

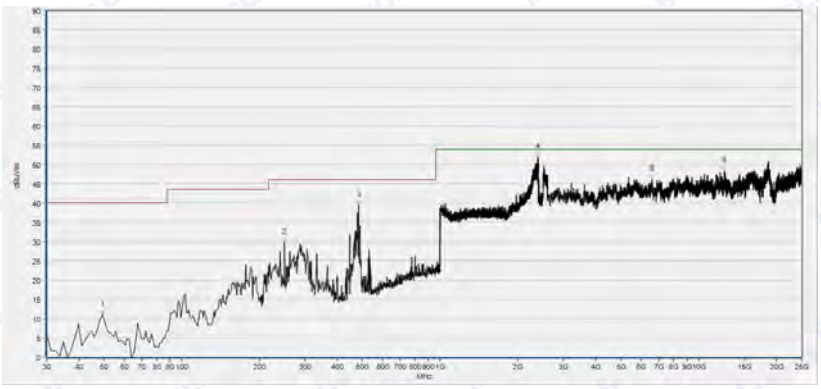
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
90.701	16.51	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
144.118	21.43	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
484.043	37.76	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2375.270	51.20	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7003.419	46.87	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
18384.688	49.10	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

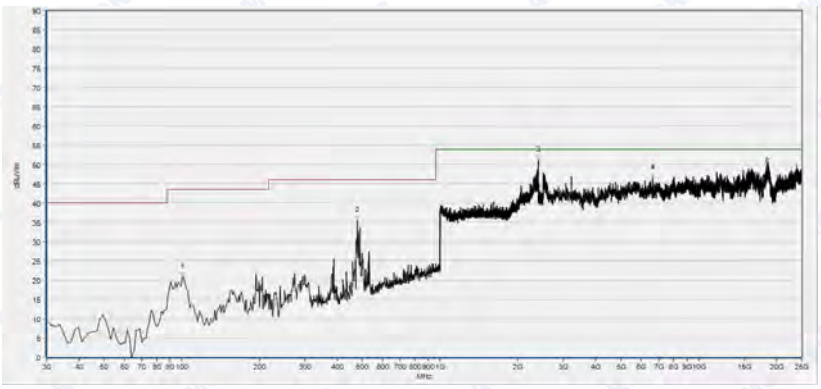
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.424	11.03	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
249.737	29.76	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
482.829	39.51	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2390.636	52.02	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
6583.852	46.17	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12567.776	48.36	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

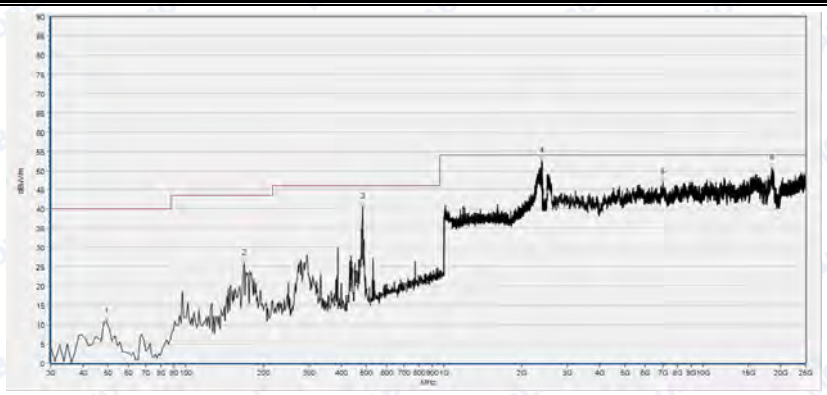
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
100.413	20.90	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
477.972	35.47	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2392.557	51.26	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
6636.807	46.61	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18372.468	48.09	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

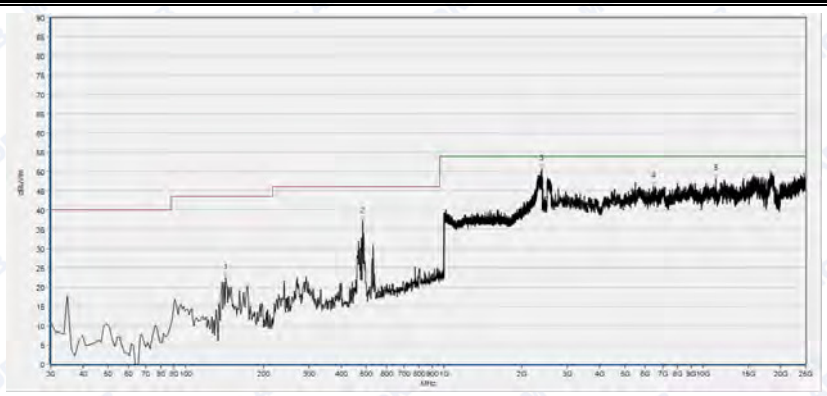
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.424	10.65	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
168.398	26.02	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
482.829	40.67	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2388.715	52.61	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7040.080	47.04	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18474.304	50.60	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



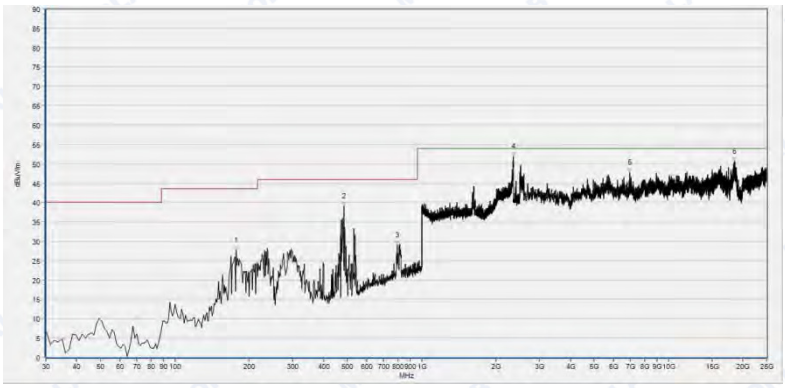
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
142.904	22.46	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
484.043	37.06	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2388.715	50.78	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
6457.574	46.33	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
11284.634	48.15	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

2.8.3.4 802.11n-40MHz MIMO Test mode

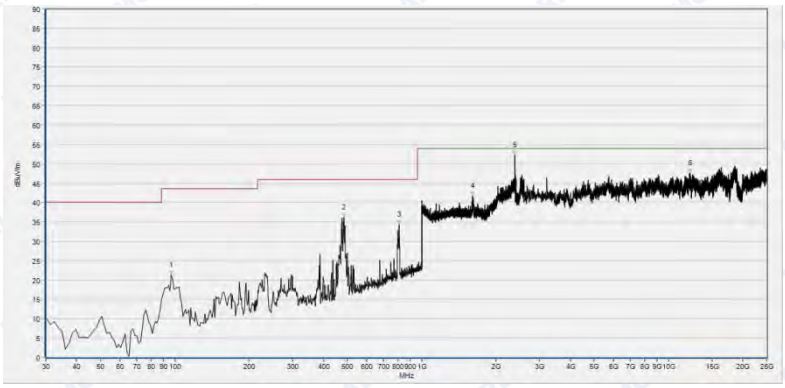
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 3



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
176.896	27.59	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
484.043	38.97	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
796.045	29.06	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2346.459	51.97	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
6962.684	47.84	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18421.349	50.62	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

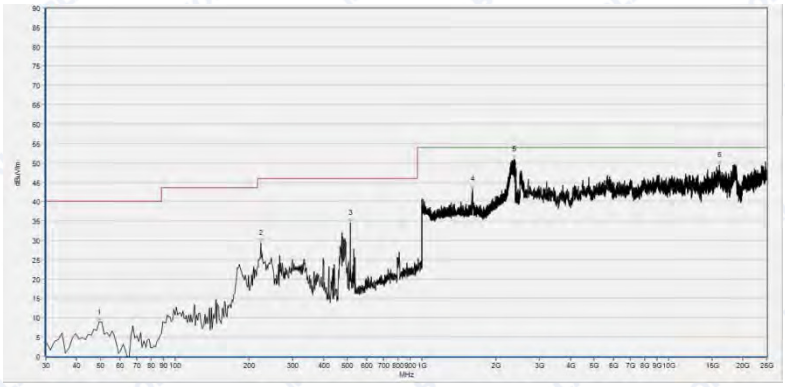
(Plot A.2: Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
96.771	21.33	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
484.043	36.18	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
809.399	34.36	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1602.481	41.79	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2388.715	52.36	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12197.090	47.54	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

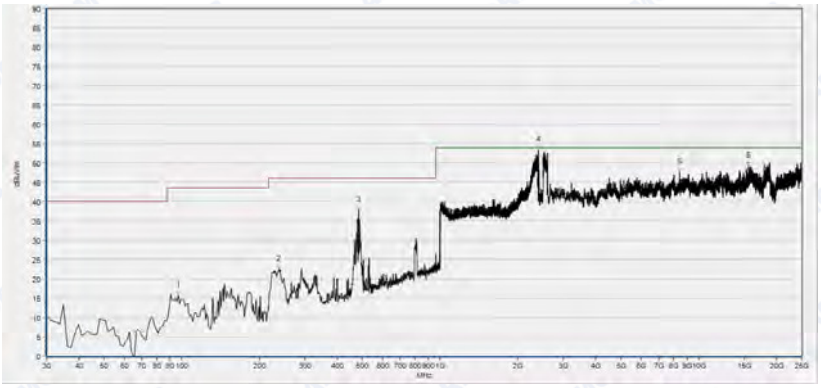
(Plot A.3: Antenna Vertical, 30MHz to 25GHz)

Plots for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.424	8.91	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
223.029	29.30	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
513.179	34.45	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1608.243	43.32	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2361.184	50.94	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16030.224	49.44	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

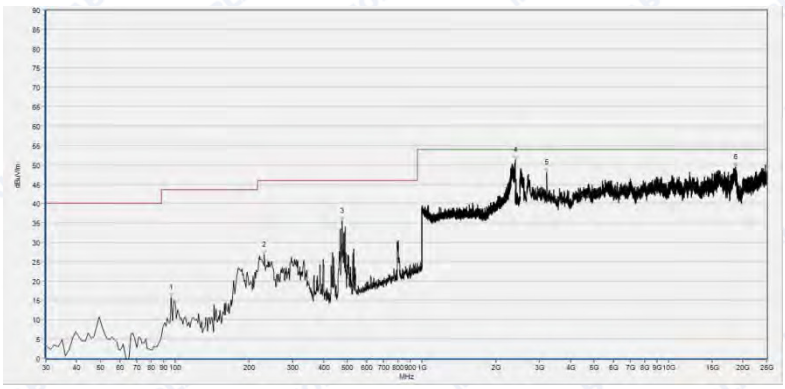
(Plot B.2: Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
96.771	15.78	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
237.597	22.46	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
482.829	37.89	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2391.917	53.45	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
8457.647	47.67	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15606.583	49.21	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

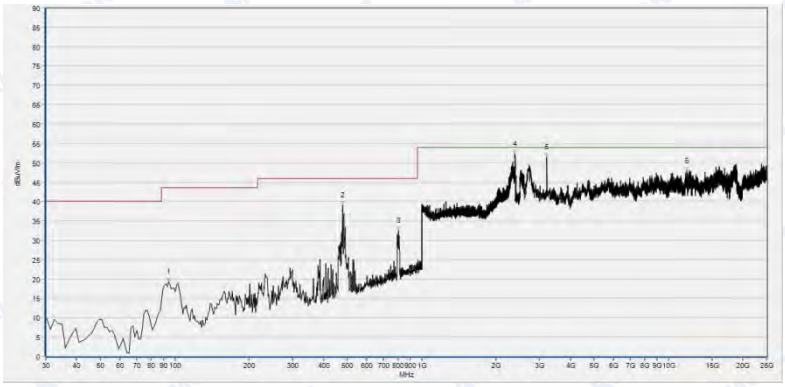
(Plot B.3: Antenna Vertical, 30MHz to 25GHz)

Plots for Channel = 9



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
96.771	15.70	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
230.313	26.82	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
476.758	35.49	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2390.636	51.35	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3215.094	52.16	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18669.831	49.45	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
94.343	19.19	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
477.972	39.05	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
805.757	32.56	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2388.715	52.30	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
3215.094	51.46	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
11875.286	48.01	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

ANNEX A GENERAL INFORMATION

1.1 Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

1.2 Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

1.3 Facilities and Accreditations

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.

1.4 Maximum measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Measurements	**Frequency**	**Uncertainty**
Conducted emissions	9KHz~30MHz	2.44dB
Radiated emissions	30MHz~200MHz	2.93
	200MHz~1000MHz	2.95
	1GHz~18GHz	2.26
	18GHz~40GHz	1.94

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

1.5 Test Equipments Utilized

1.5.1 Conducted Test Equipments

Conducted Test Equipment						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal. Due**
1	Spectrum Analyzer	MY45101810	E4407B	Agilent	2016.03.02	2017.03.01
2	USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2016.03.02	2017.03.01
3	EXA Signal Analzyer	MY53470838	N9010A	Agilent	2015.08.26	2016.08.25
4	RF cable	CB01	RF01	Morlab	N/A	N/A
5	Attenuator	(n.a.)	10dB	Resnet	N/A	N/A
6	SMA connector Note	CN01	RF03	HUBER-SUHNER	N/A	N/A
Note: The SMA antenna connector is soldered on the PCB board in order to perform conducted tests and this SMA antenna connector is listed in the equipment list.						

1.5.2 Radiated Test Equipments

Radiated Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal.Due Date**
1	System Simulator	GB45360846	8960-E5515C	Agilent	2016.03.02	2017.03.01
2	Receiver	MY54130016	N9038A	Agilent	2016.03.02	2017.03.01
3	Test Antenna - Bi-Log	N/A	VULB9163	Schwarzbeck	2016.03.02	2017.03.01
4	Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2016.03.02	2017.03.01
5	Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2016.03.02	2017.03.01
6	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2016.03.02	2017.03.01
7	Coaxial cable(N male)	CB02	EMC02	Morlab	N/A	N/A
8	Coaxial cable(N male)	CB03	EMC03	Morlab	N/A	N/A
9	1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde&Schwarz	2016.03.02	2017.03.01
10	18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde&Schwarz	2016.03.02	2017.03.01

1.5.3 Climate Chamber

Climate Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Climate Chamber	2004012	HL4003T	Yinhe	2016.03.02	2017.03.01

1.5.4 Vibration Table

Vibration Table						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Vibration Table	N/A	ACT2000-S015L	CMI-COM	2016.03.02	2017.03.01

1.5.5 Anechoic Chamber

Anechoic Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Anechoic Chamber	N/A	9m*6m*6m	Changning	2016.03.02	2017.03.01

1.5.6 Auxiliary Test Equipment

Auxiliary Test Equipment						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Computer	N.A	PU500C	Asus	N.A	N.A

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