REPORT No.: SZ15080165W03

FCC RF TEST REPORT

APPLICANT	:	Solnik S.A.
PRODUCT NAME	:	TBW9612C8
MODEL NAME	:	HY2-2169NE
TRADE NAME	:	N.A
BRAND NAME	:	HYUNDAI
FCC ID	:	2AFRUHY22169NE
STANDARD(S)	:	47 CFR Part 15 Subpart C
ISSUE DATE	:	2015-10-12

SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

MORLAB GROUP
FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Http://www.morlab.com
Fax: 86-755-36698525 E-mail: service@morlab.cn

DIRECTORY

TEST REPORT DECLARATION 4

1. TECHNICAL INFORMATION 5

1.1 APPLICANT INFORMATION 5
1.2 EQUIPMENT UNDER TEST (EUT) DESCRIPTION 5
1.2.1 IDENTIFICATION OF ALL USED EUTS 5
1.3 TEST STANDARDS AND RESULTS 6
1.3.1 TEST ENVIRONMENT CONDITIONS 6

2. 47 CFR PART 15C REQUIREMENTS 7

2.1 ANTENNA REQUIREMENT 7
2.1.1 APPLICABLE STANDARD 7
2.1.2 RESULT: COMPLIANT 7
2.2 PEAK OUTPUT POWER 7
2.2.1 REQUIREMENT 7
2.2.2 TEST DESCRIPTION 7
2.2.3 TEST RESULT 8
2.3 BANDWIDTH 9
2.3.1 REQUIREMENT 9
2.3.2 TEST DESCRIPTION 9
2.3.3 TEST RESULT 9
2.4 CONDUCTED SPURIOUS EMISSIONS AND BAND EDGE 16
2.4.1 REQUIREMENT 16
2.4.2 TEST DESCRIPTION 16
2.4.3 TEST RESULT 16
2.5 POWER SPECTRAL DENSITY (PSD) 26
2.5.1 REQUIREMENT 26
2.5.2 TEST DESCRIPTION 26
2.5.3 TEST RESULT 27
2.6 RESTRICTED FREQUENCY BANDS 33
2.6.1 REQUIREMENT 33
2.6.2 TEST DESCRIPTION 33
2.6.3 TEST RESULT 34

2.7 CONDUCTED EMISSION 42
2.7.1 REQUIREMENT 42
2.7.2 TEST DESCRIPTION 42
2.7.3 TEST RESULT 43
2.8 RADIATED EMISSION 45
2.8.1 REQUIREMENT 45
2.8.2 TEST DESCRIPTION 46
2.8.3 TEST RESULT 48
2.9 RF EXPOSURE EVALUATION 58
2.9.1 REQUIREMENT 58
2.9.2 RESULT 58

ANNEX A GENERAL INFORMATION 59

Change History		
Issue	Date	Reason for change
1.0	2015-10-12	First edition

TEST REPORT DECLARATION

Applicant	Solnik S.A.
Applicant Address	Dr Emilio Ravignani 1724 - C.A.B.A. - República Argentina
Manufacturer	Beijing Benywave Wireless Communication Co. Ltd.,
Manufacturer Address	No 55, Jiachuang second road, Zhongguancun science Park OPTO—Mechatronics Industrial Park, Tongzhou District, Beijing, China 101111
Product Name	TBW9612C8
Model Name	HY2-2169N
Brand Name	HYUNDAI
HW Version	TBW9612_P2_001
SW Version	961221_9716_VXXX
Test Standards	47 CFR Part 15 Subpart C
Test Date	2015-8-20 to 2015-9-20
Test Result	PASS

Tested by : Zou Jian

Zou Jian(Test Engineer)

Reviewed by : Qiu Xiaojun

Qiu Xiaojun(RF Manager)

Approved by : Zeng Dexin

Zeng Dexin(Chief Engineer)

1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	Solnik S.A.
Address:	Dr Emilio Ravignani 1724 - C.A.B.A. - República Argentina

1.2 Equipment under Test (EUT) Description

Brand Name:	HYUNDAI
Trade Name:	N.A
Model Name:	HY2-2169NE
Frequency Range:	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz
Channel Number:	802.11b/g/n-20MHz: 11
Modulation Type:	DSSS, OFDM
Antenna Type:	PIFA Antenna
Antenna Gain:	1.1dBi

NOTE:

The EUT is a TBW9612C8, 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 a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

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	TBW9612_P2_001	961221_9716_VXXX

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 (10-1-13 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	Aug 28, 2015	PASS
3	15.247(a)	Bandwidth	Aug 28, 2015	PASS
4	15.247(d)	Conducted Spurious Emission and Band Edge	Aug 28, 2015	PASS
5	15.247(d)	Restricted Frequency Bands	Sep 16, 2015	PASS
6	15.207	Conducted Emission	Aug 17, 2015	PASS
7	15.209 ,15.247(d)	Radiated Emission	Sep 16, 2015	PASS
8	15.247(e)	Power spectral density (PSD)	Aug 28,2015	PASS
9	15.247(i), 1.1307&2.1093	RF exposure evaluation	N.A	PASS

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10: 2013 and ANSI C63.4: 2009.

These RF tests were performed according to the method of measurements prescribed in KDB558074 D01 v03r03 (09/06/2015).

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

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 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.

B. Equipments List:

Please reference ANNEX A(1.4).

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	7.03	0.005047	30	1	PASS
6	2437	6.17	0.004140			PASS
11	2462	6.23	0.004198			PASS

2.2.3.2 802.11g Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	5.26	0.003357	30	1	PASS
6	2437	5.12	0.003251			PASS
11	2462	4.33	0.002710			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	2.15	0.001641	30	1	PASS
6	2437	1.12	0.001294			PASS
11	2462	1.11	0.001291			PASS

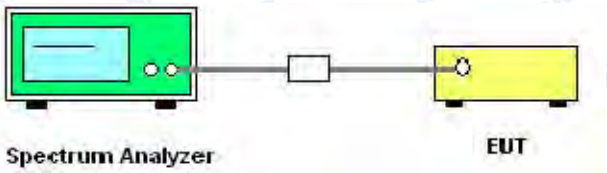
2.3 Bandwidth

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 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(1.4).

2.3.3 Test Result

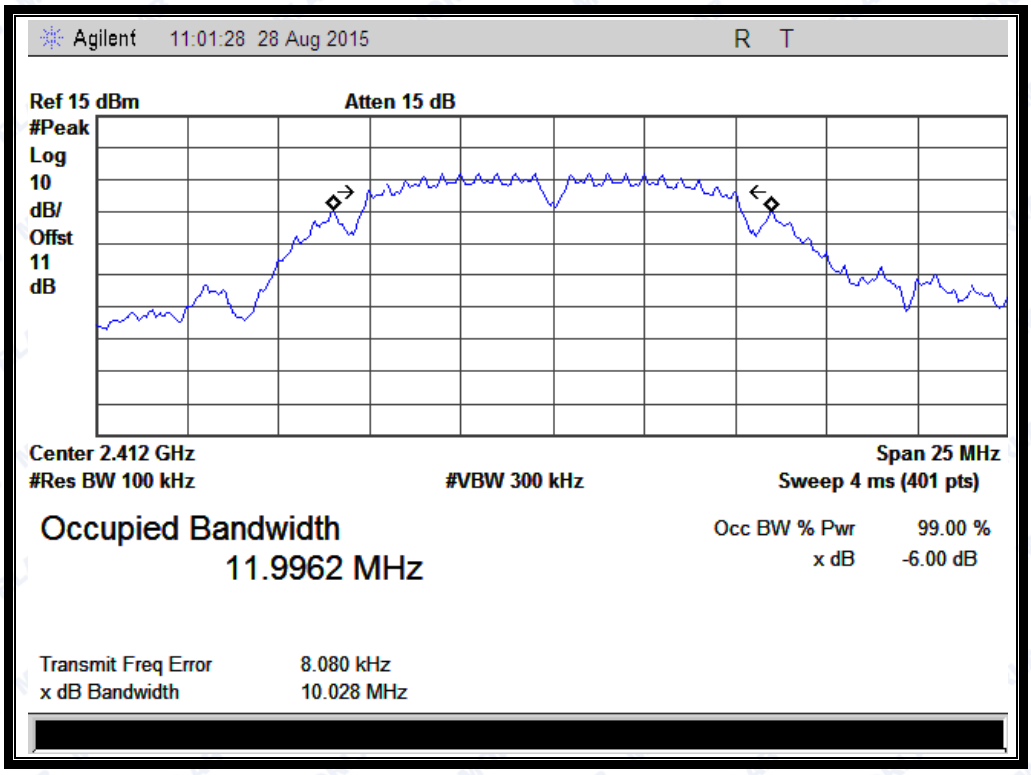
The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the Module.

2.3.3.1 802.11b Test mode

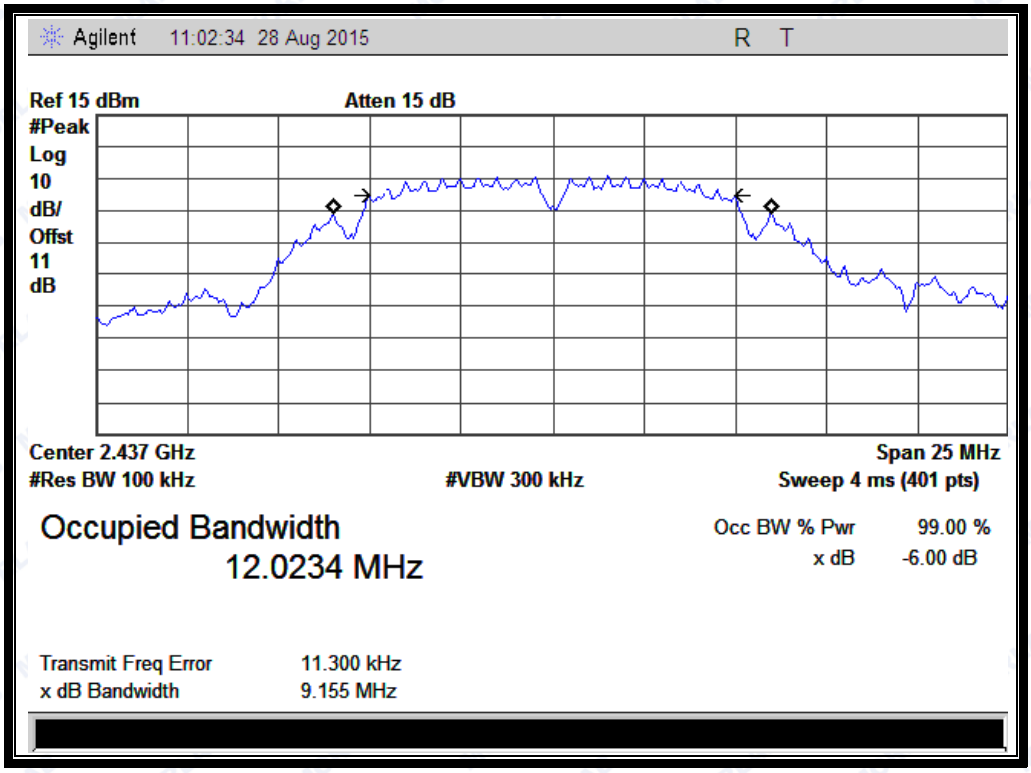
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	10.028	≥500	PASS
6	2437	9.155	≥500	PASS
11	2462	9.595	≥500	PASS

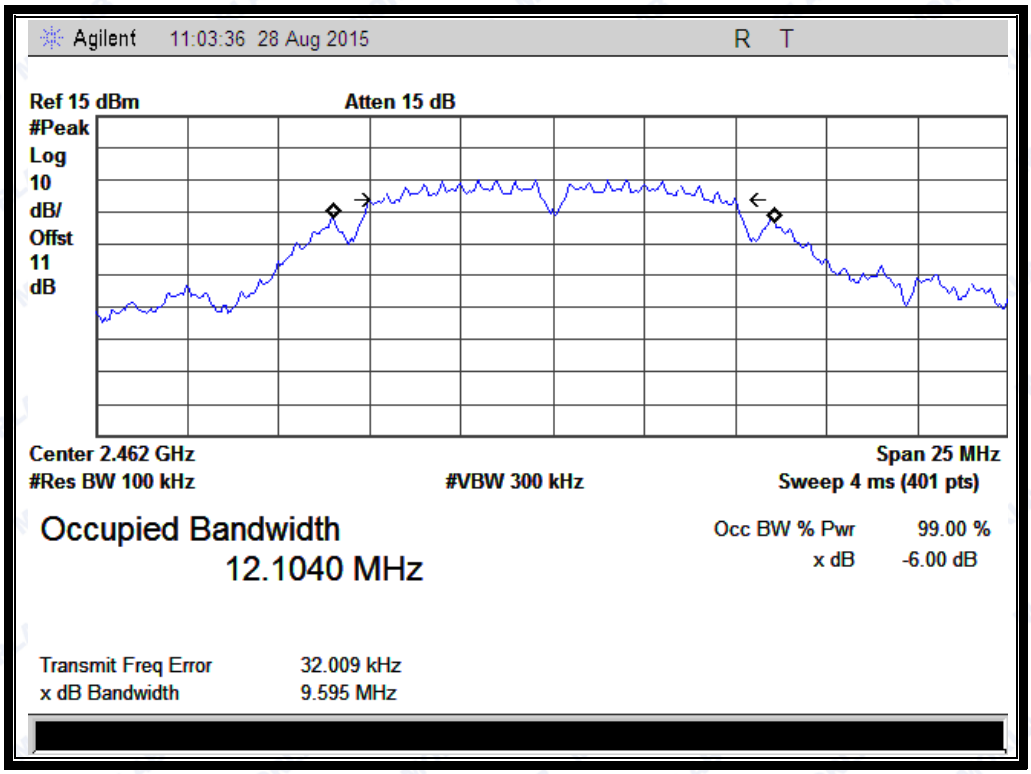
B. Test Plots



(Channel 1: 2412MHz @ 802.11b)



(Channel 6: 2437 MHz @ 802.11b)



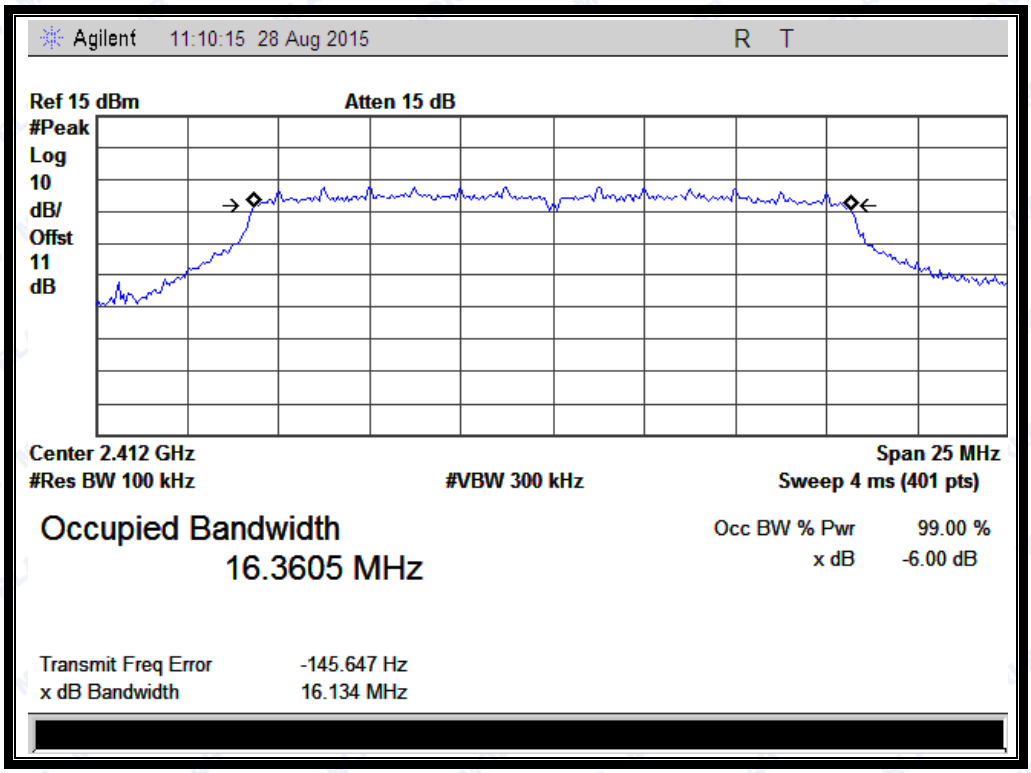
(Channel 11: 2462MHz @ 802.11b)

2.3.3.2 802.11g Test mode

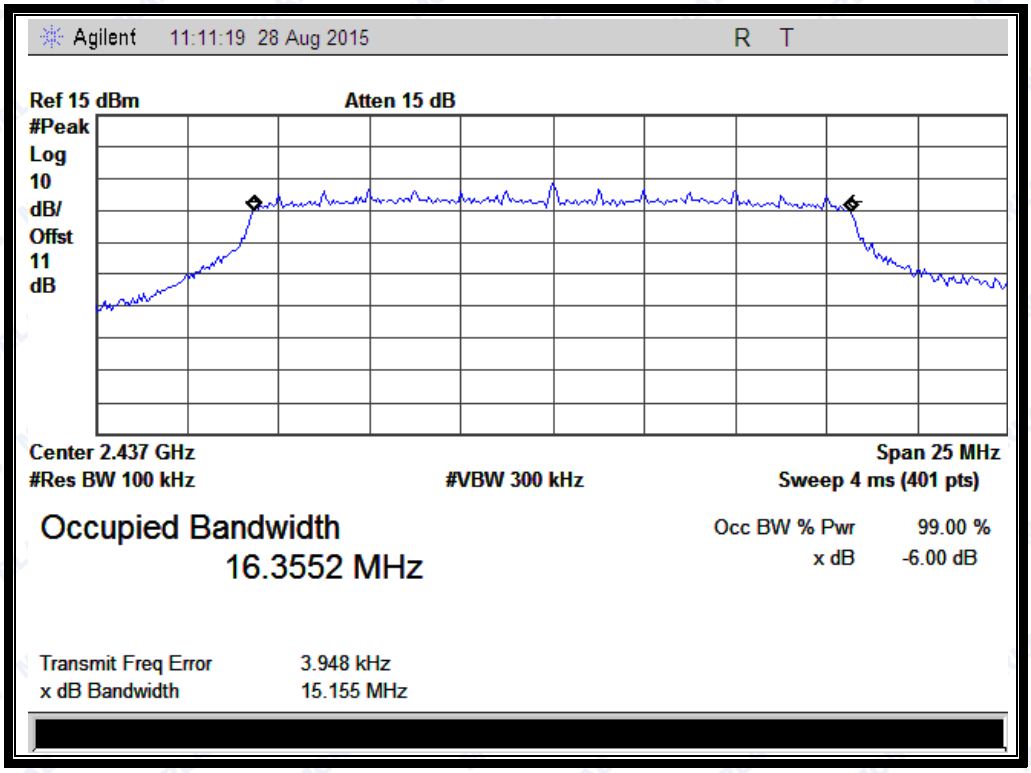
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.134	≥500	PASS
6	2437	15.155	≥500	PASS
11	2462	16.153	≥500	PASS

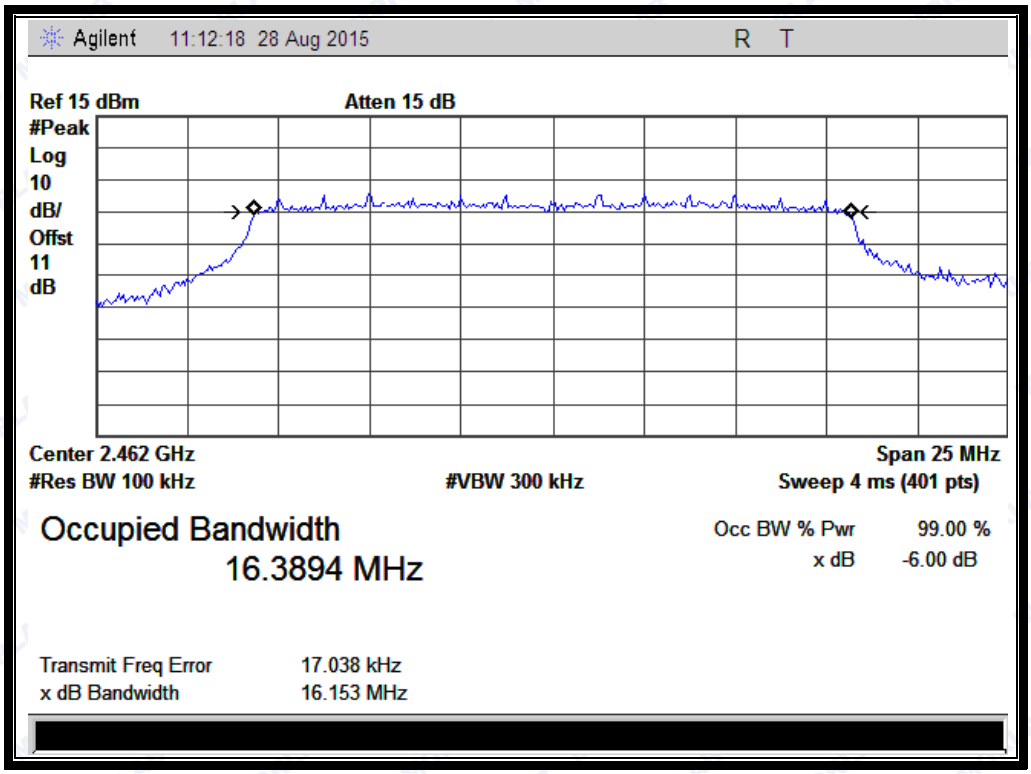
B. Test Plots:



(Channel 1: 2412MHz @ 802.11g)



(Channel 6: 2437MHz @ 802.11g)



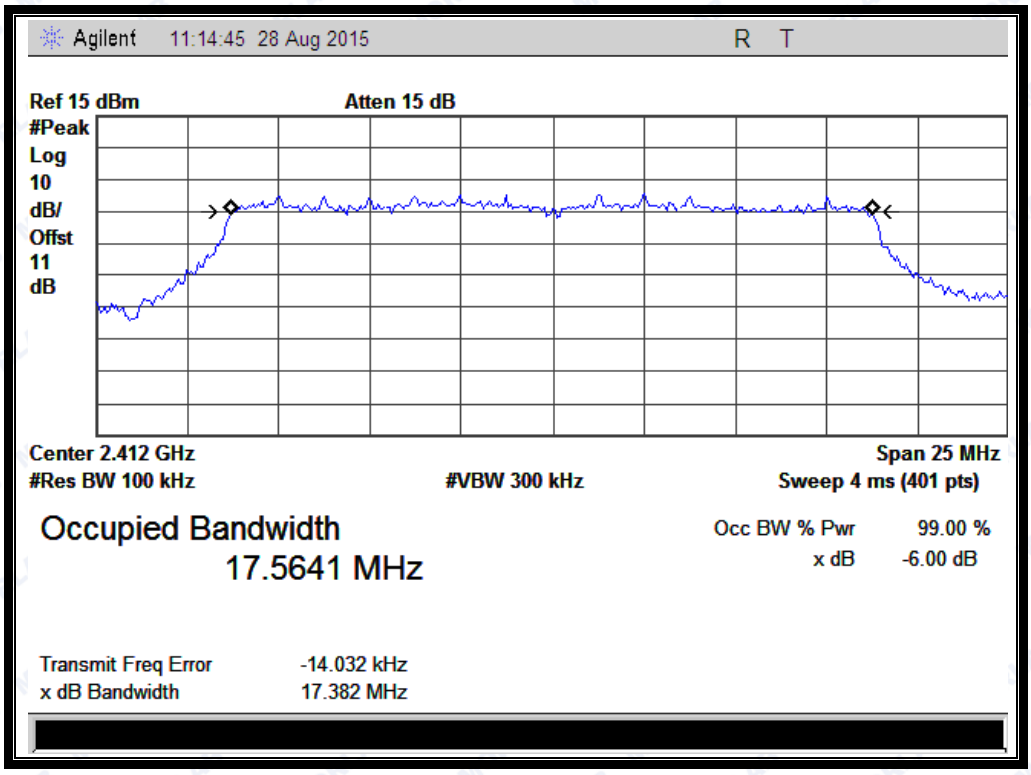
(Channel 11: 2462MHz @ 802.11g)

2.3.3.3 802.11n-20 Test mode

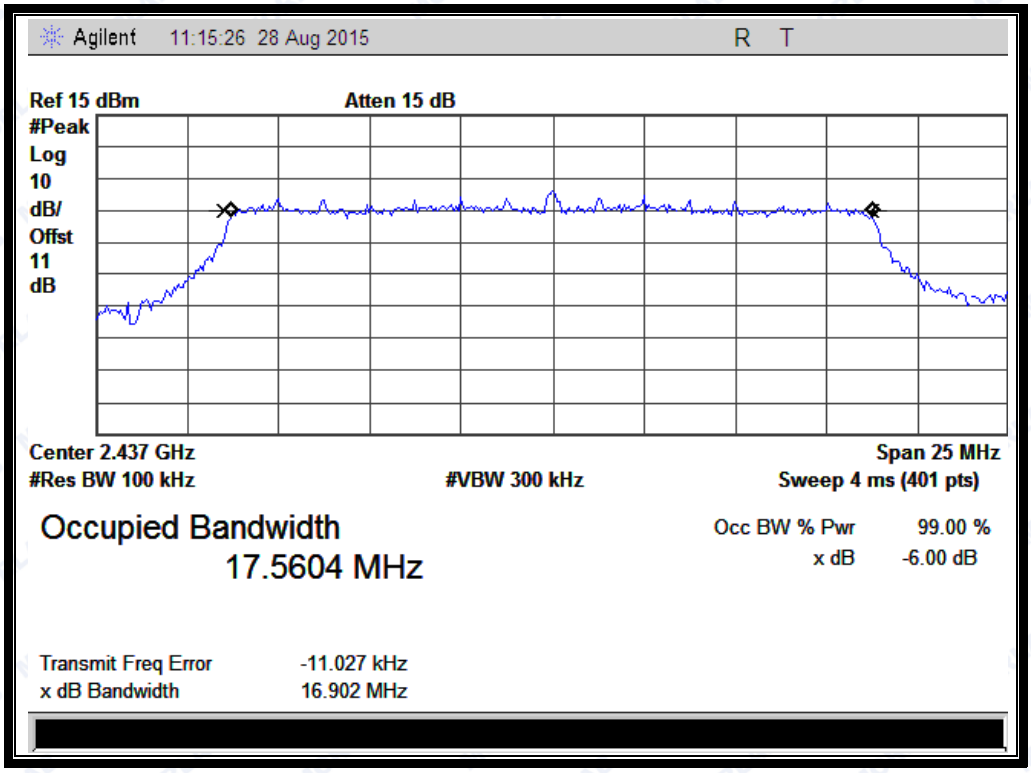
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.382	≥500	PASS
6	2437	16.902	≥500	PASS
11	2462	17.296	≥500	PASS

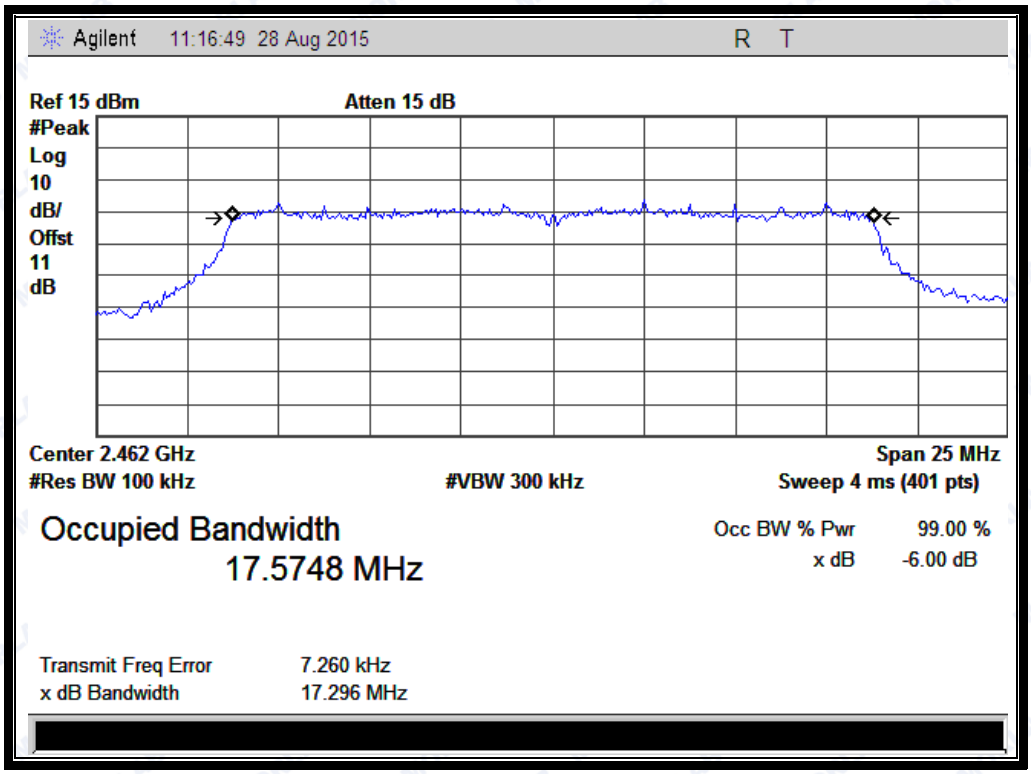
B. Test Plots:



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



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



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

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(1.4).

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.

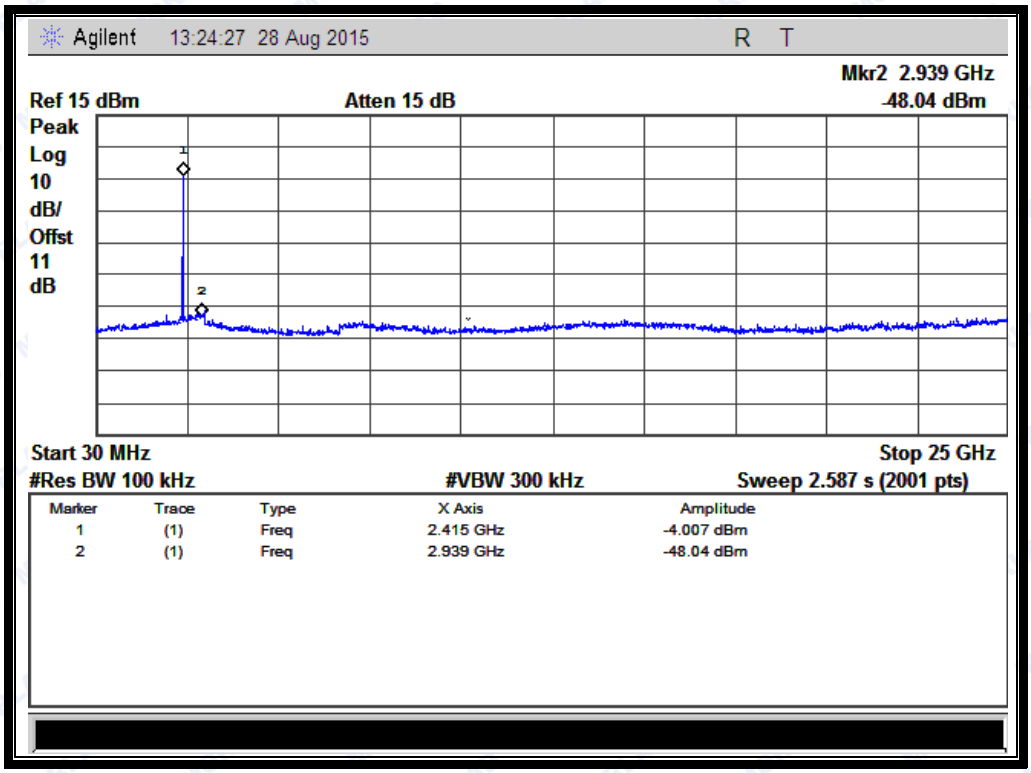
2.4.3.1 802.11b Test mode

A. Test Verdict:

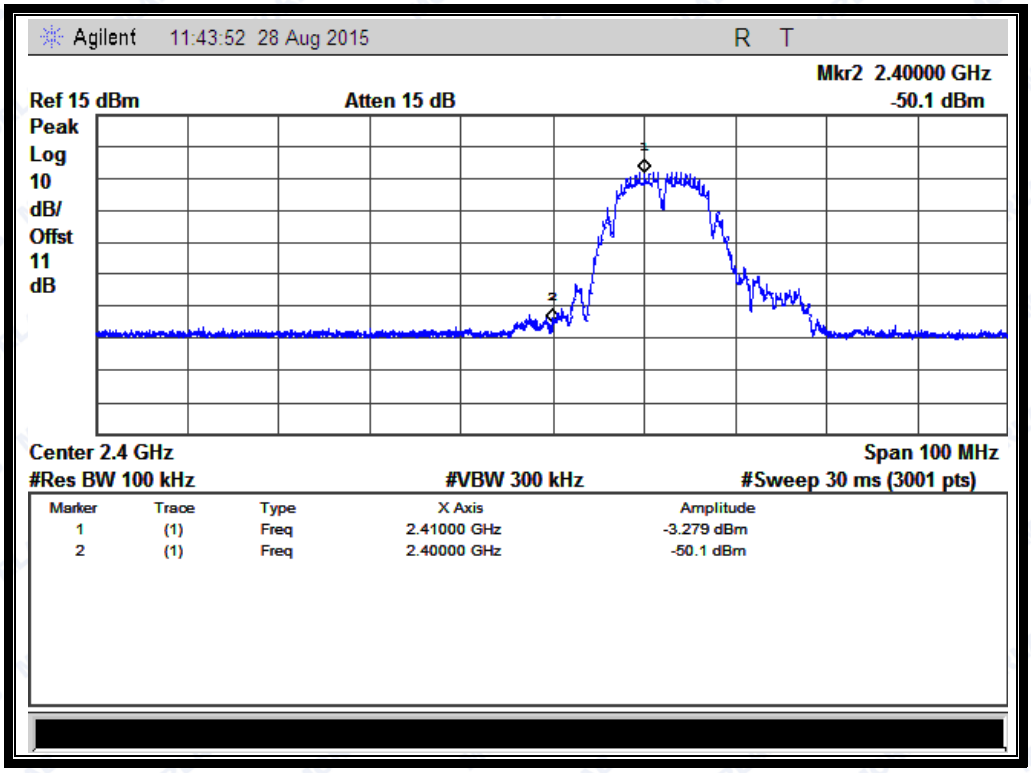
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-48.04	-4.007	-24.007	PASS
6	2437	-48.15	-5.047	-25.047	PASS
11	2462	-48.43	-5.777	-25.777	PASS

B. Test Plots:

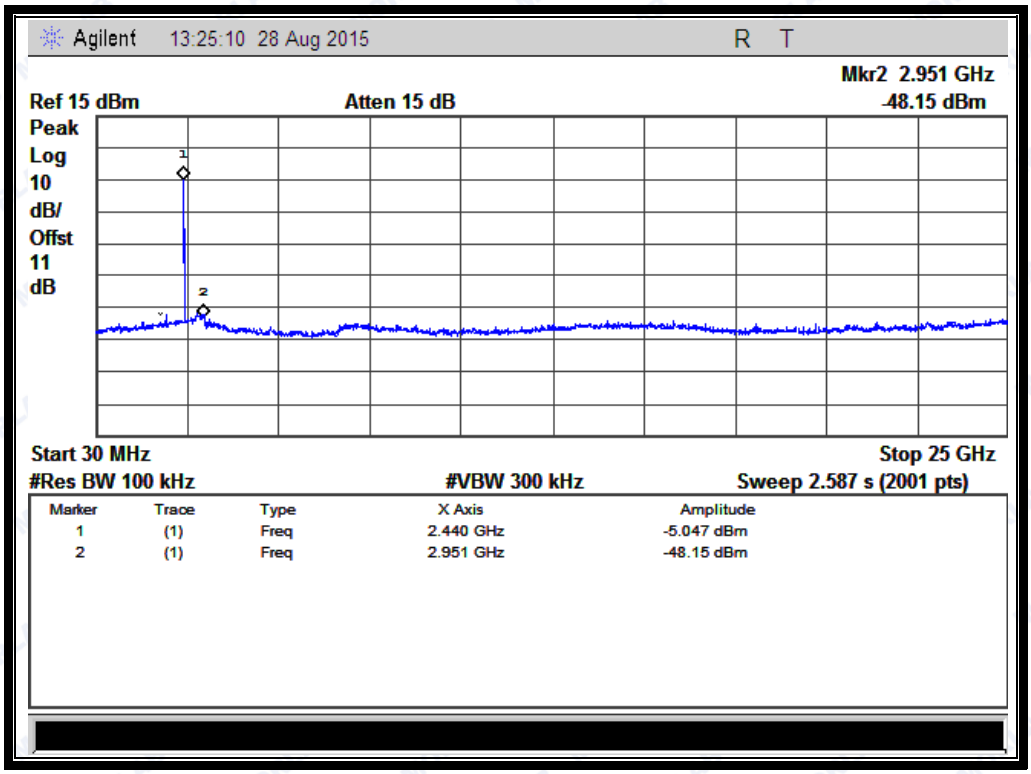
Note: the power of the Module transmitting frequency should be ignored.



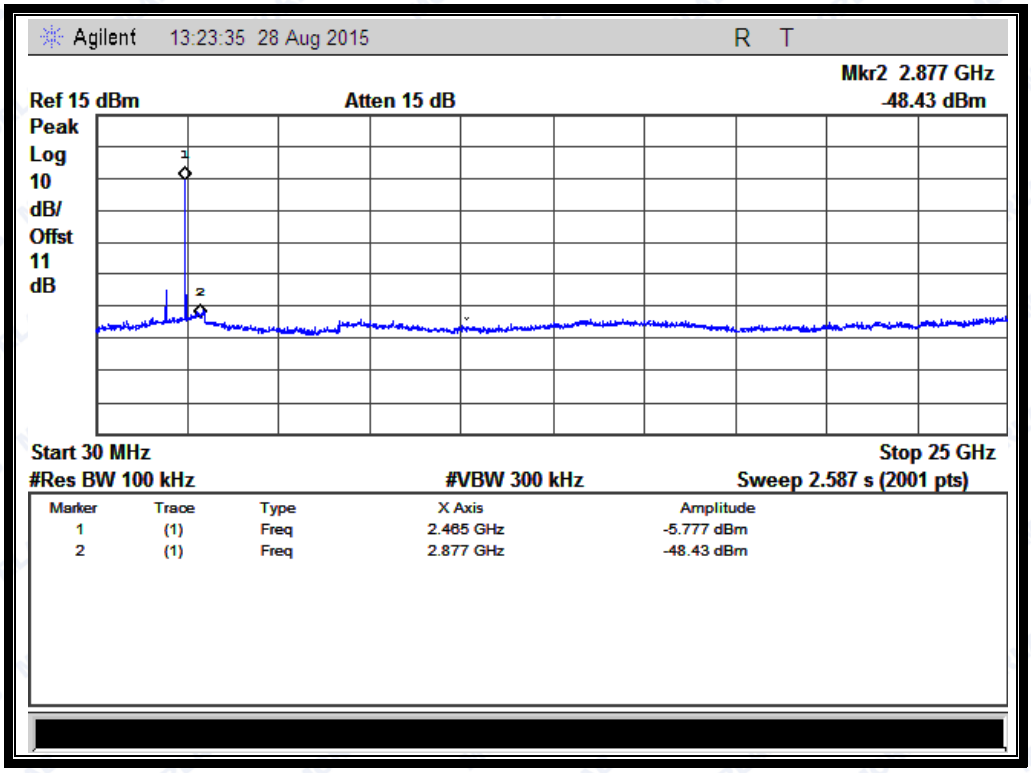
(Channel = 1, 30MHz to 25GHz)



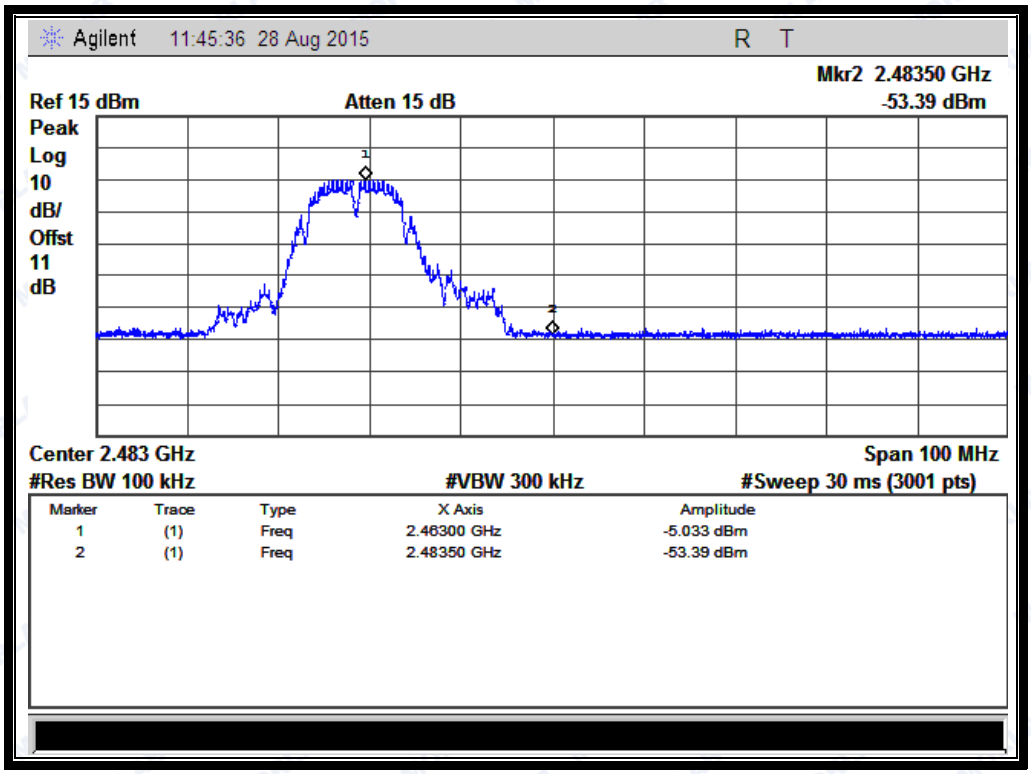
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

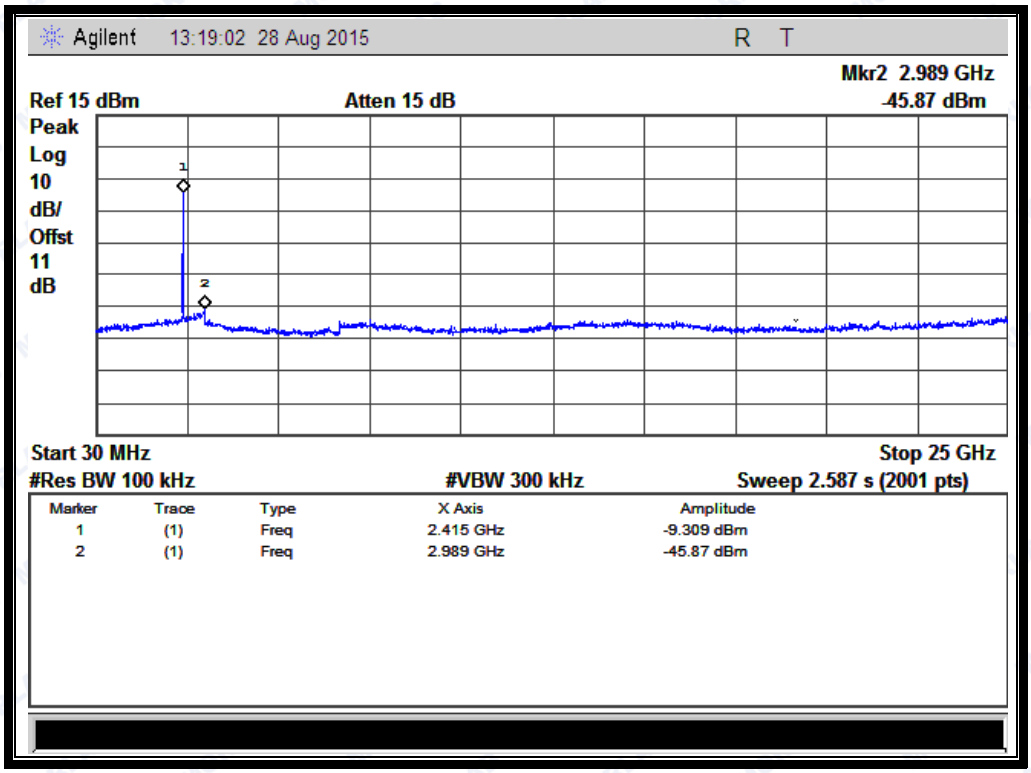
2.4.3.2 802.11g Test mode

A. Test Verdict:

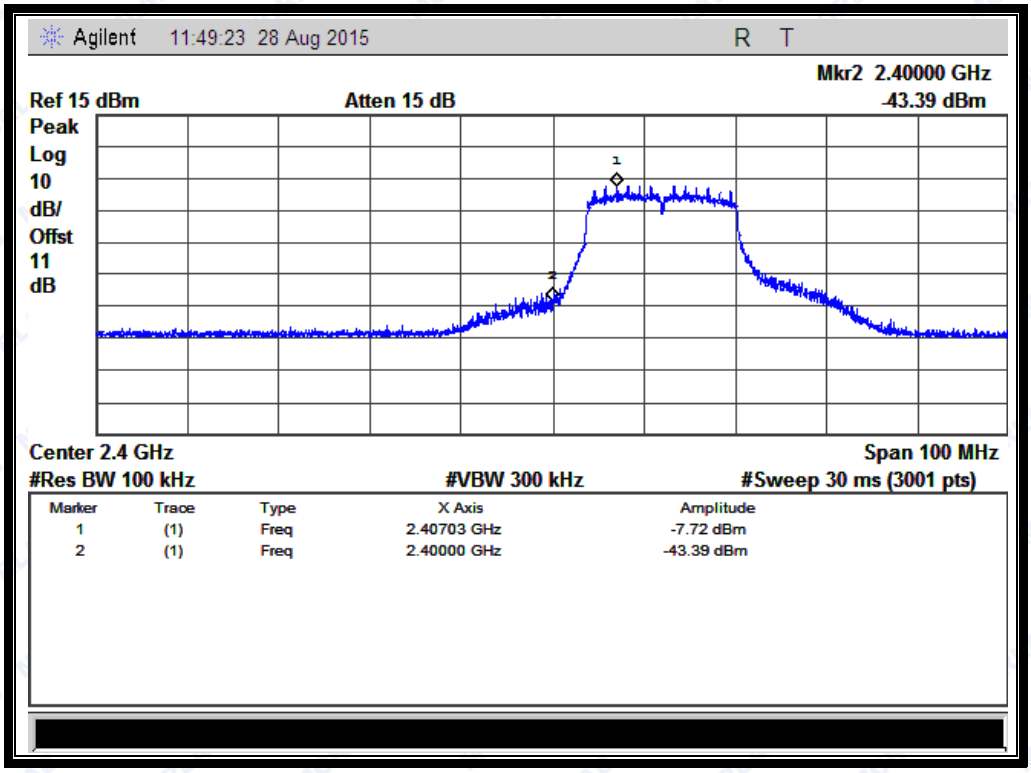
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-45.87	-9.309	-29.309	PASS
6	2437	-46.42	-11.44	-31.44	PASS
11	2462	-48.43	-6.048	-26.048	PASS

B. Test Plots:

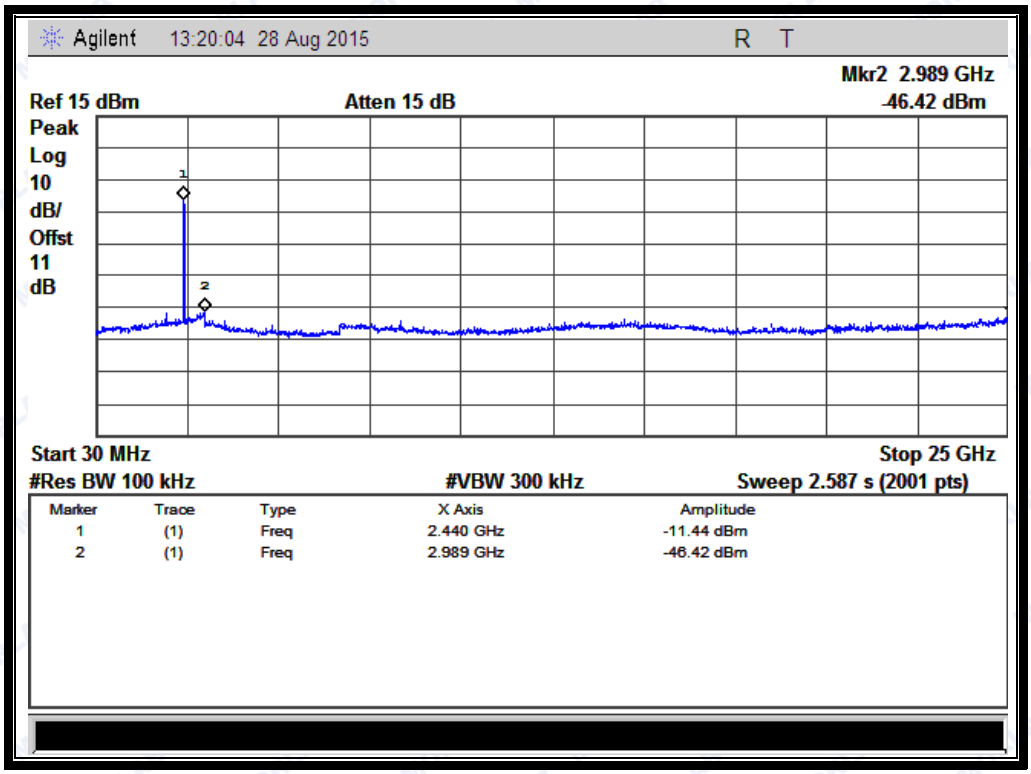
Note: the power of the Module transmitting frequency should be ignored.



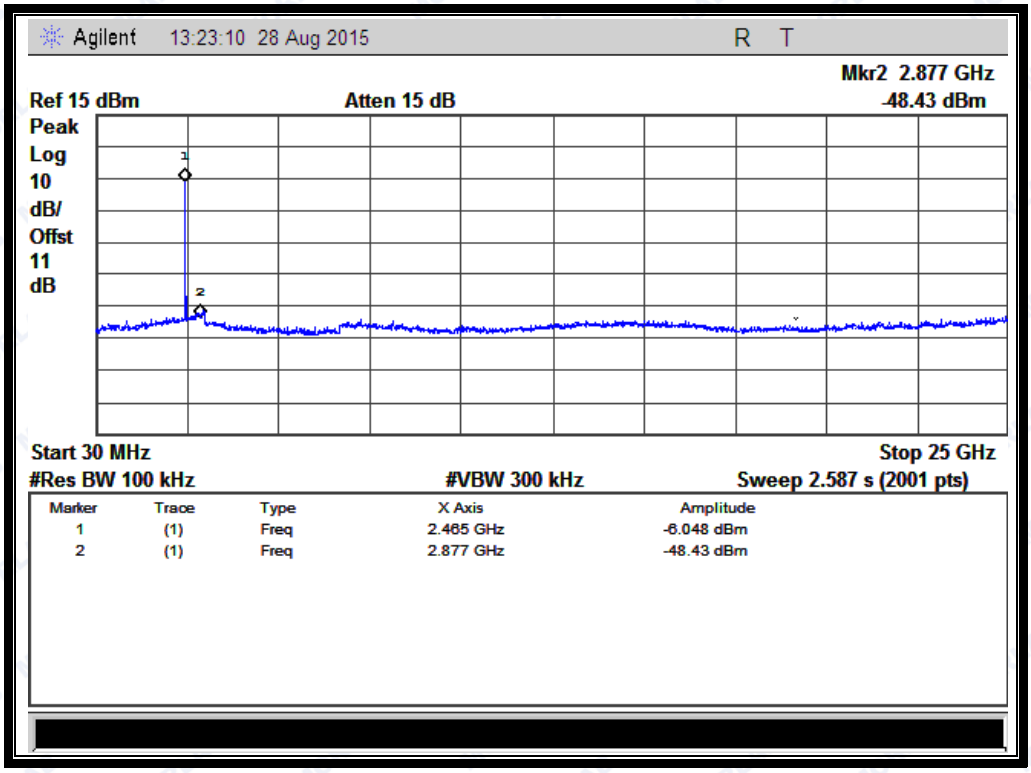
(Channel = 1, 30MHz to 25GHz)



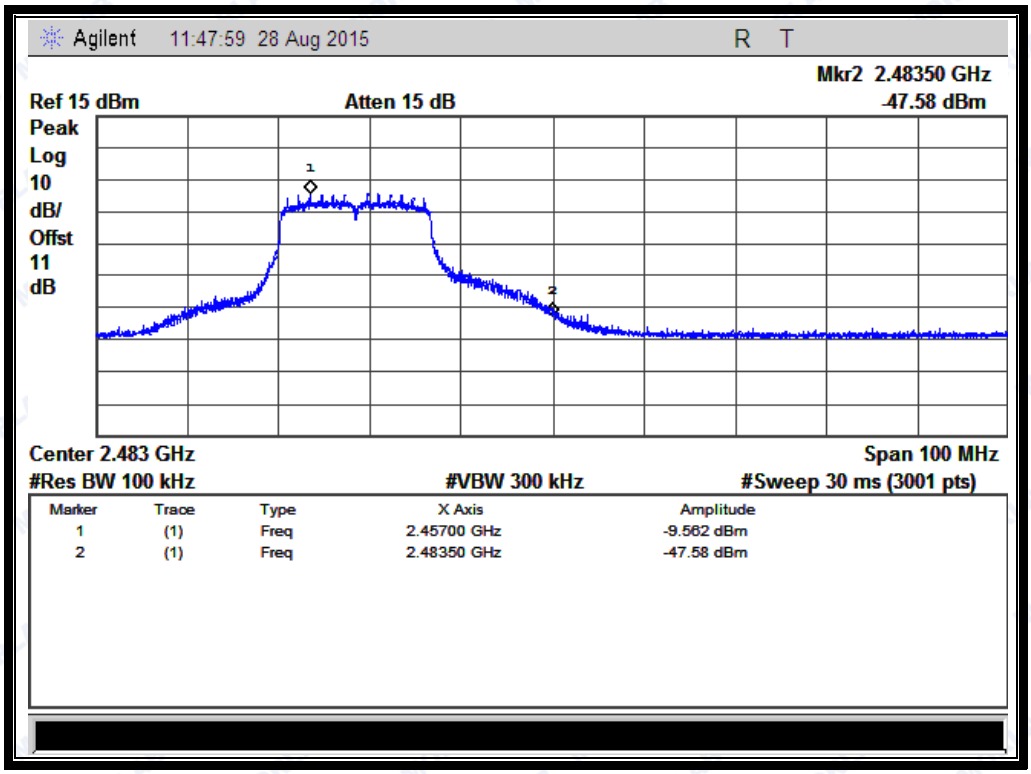
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

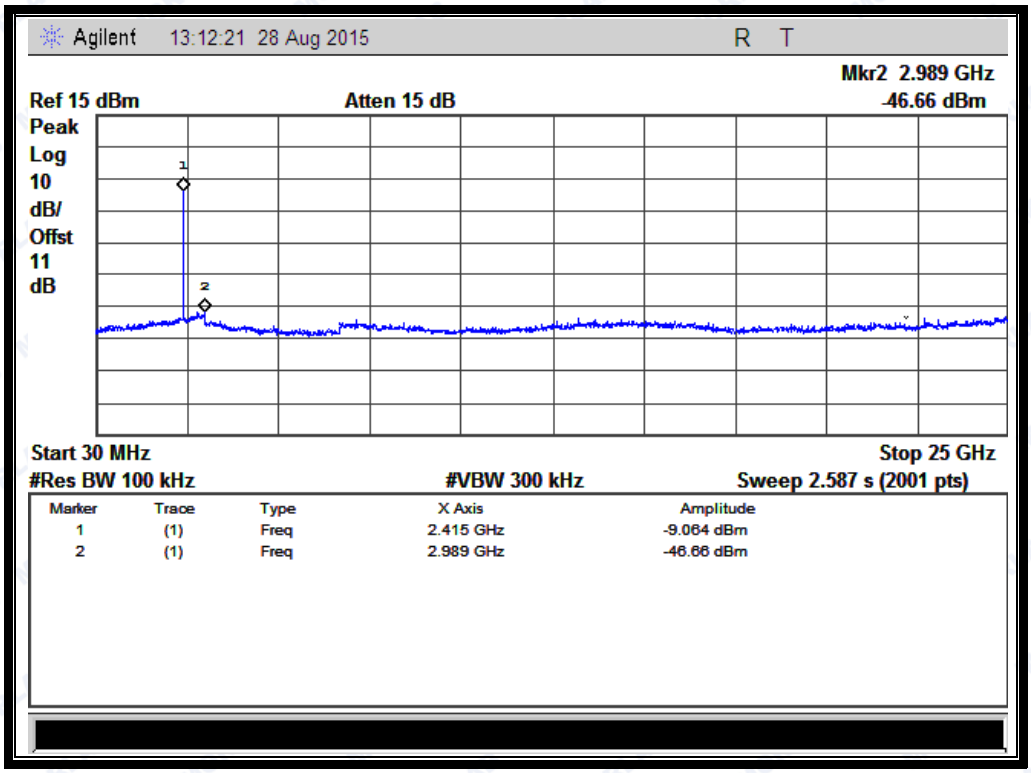
2.4.3.3 802.11n -20MHz Test mode

A. Test Verdict:

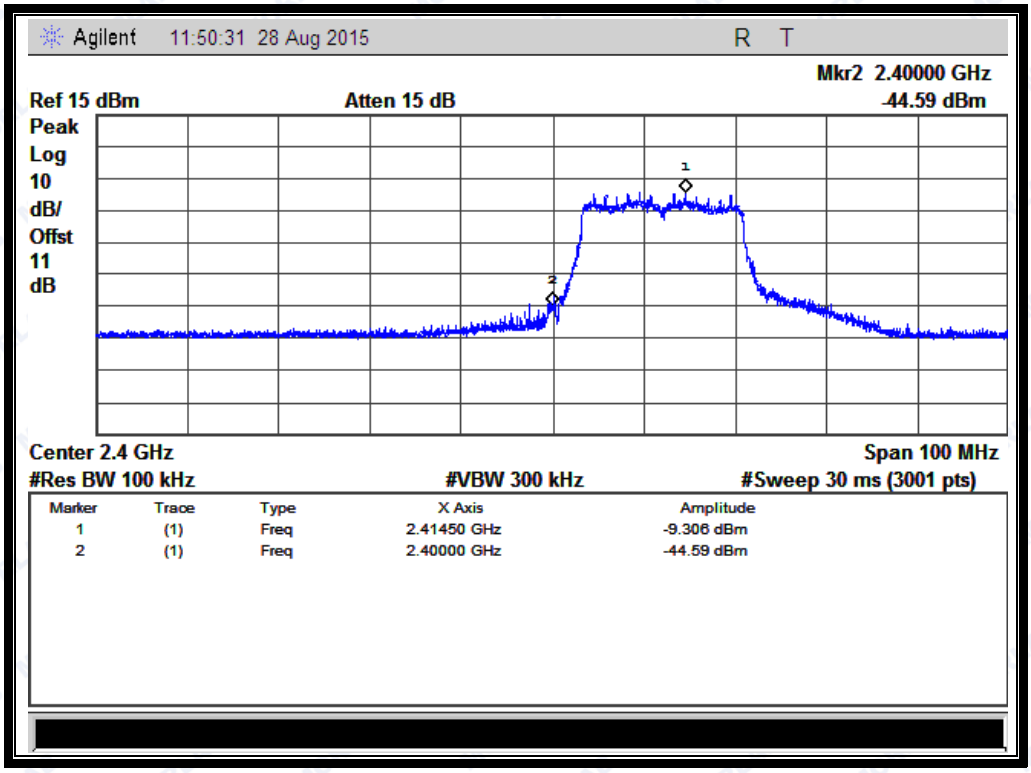
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-46.66	-9.064	-29.064	PASS
6	2437	-48.18	-12.86	-32.86	PASS
11	2462	-47.04	-14.68	-34.68	PASS

B. Test Plots:

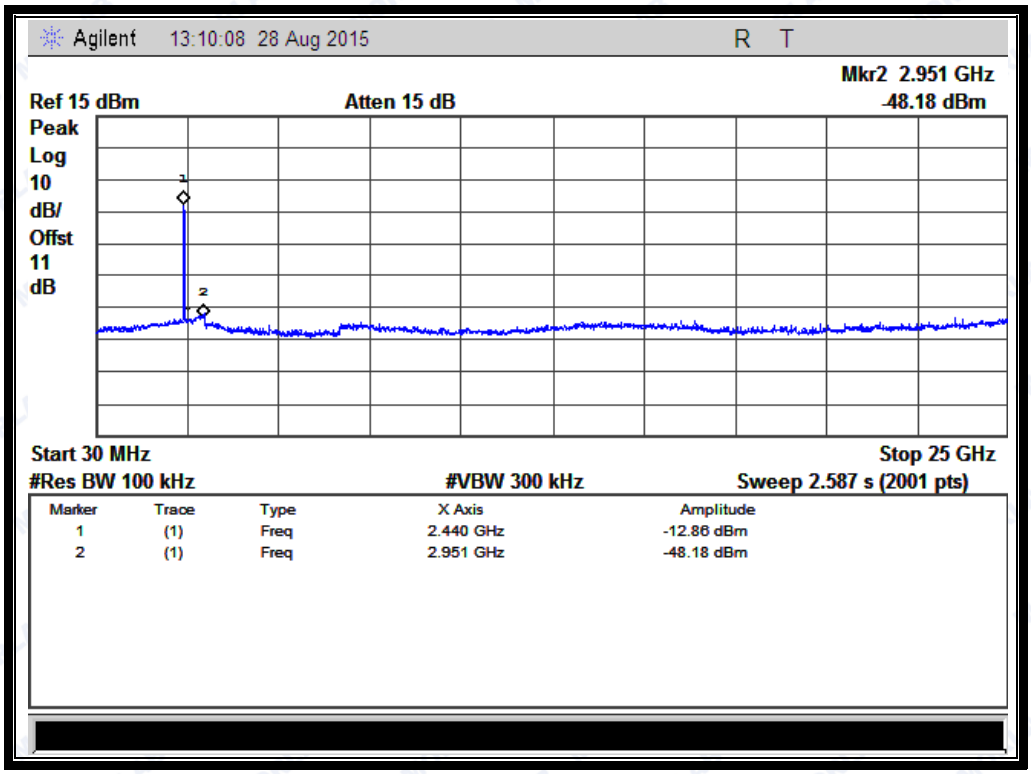
Note: the power of the Module transmitting frequency should be ignored.



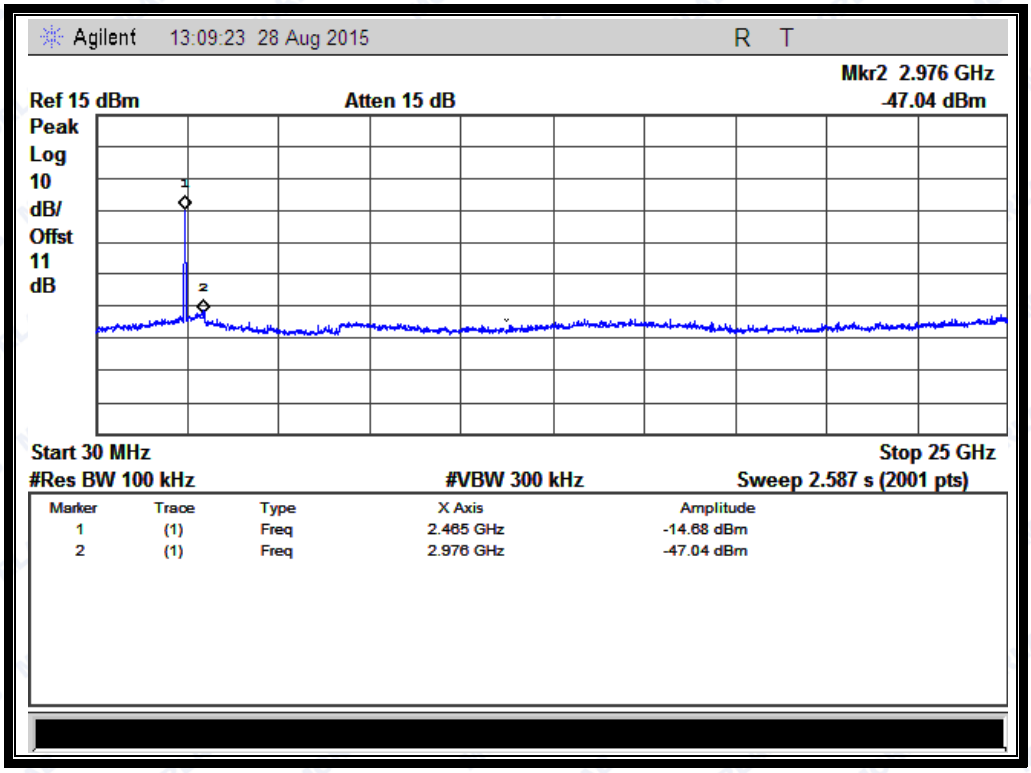
(Channel = 1, 30MHz to 25GHz)



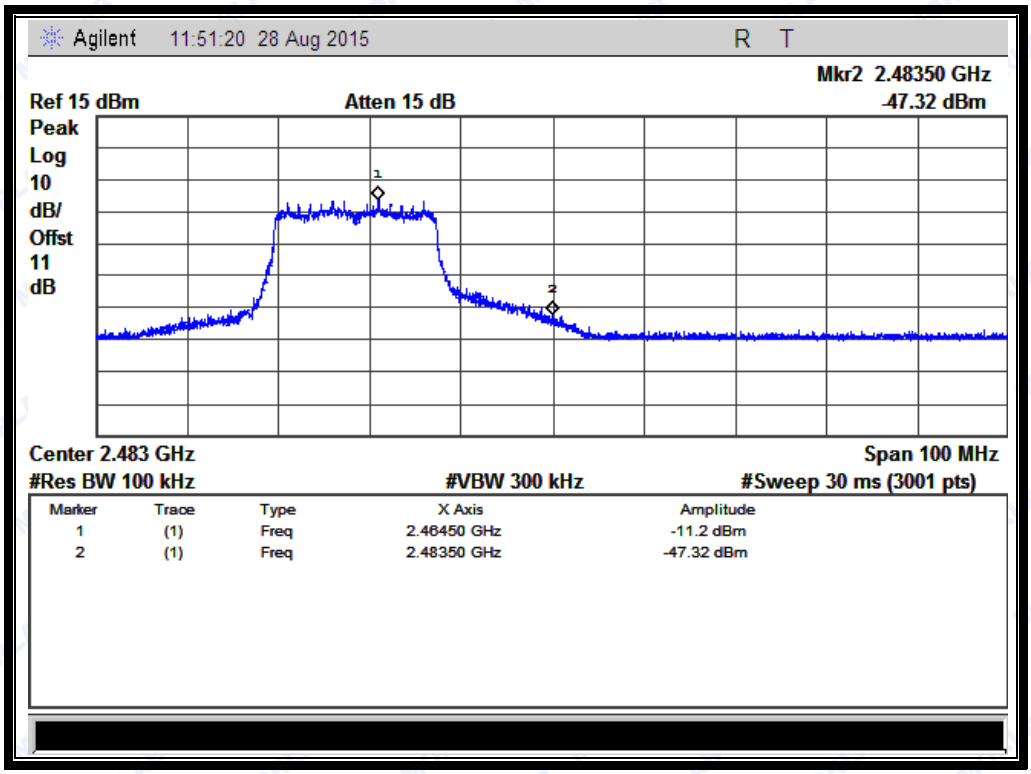
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

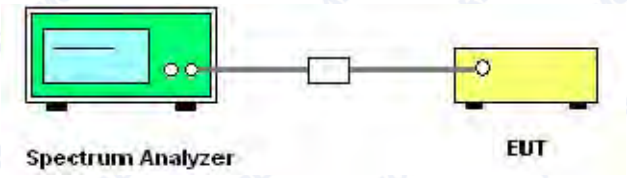
2.5 Power spectral density (PSD)

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 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.

B. Equipments List:

Please reference ANNEX A(1.4).

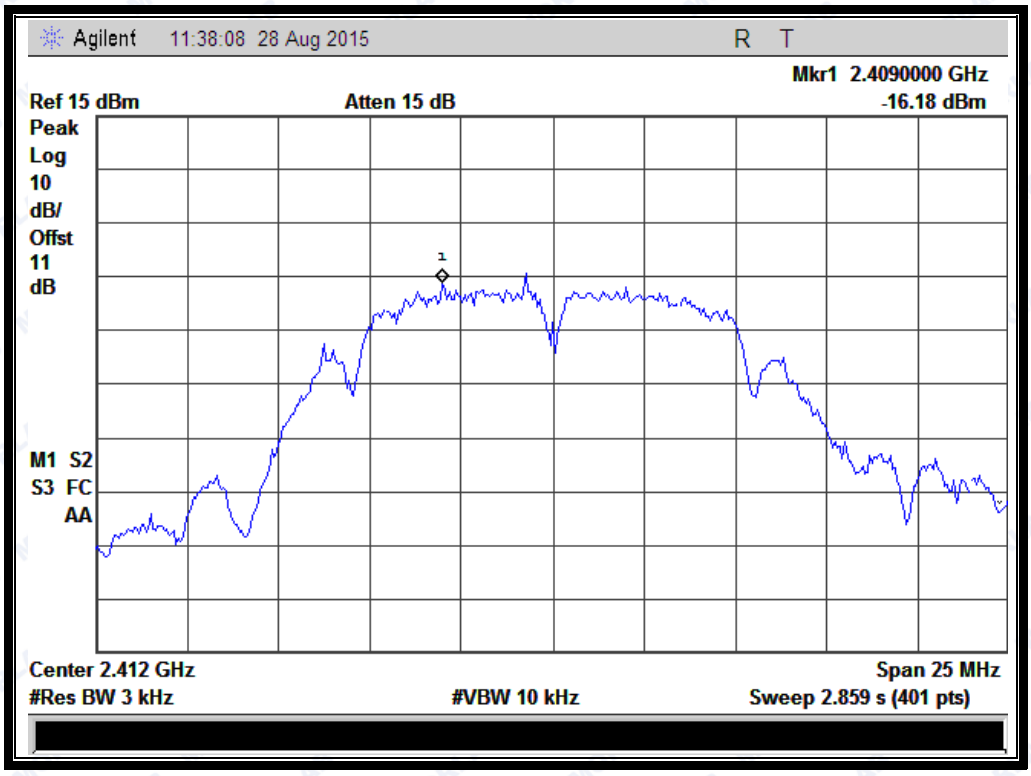
2.5.3 Test Result

2.5.3.1 802.11b Test mode

A. Test Verdict:

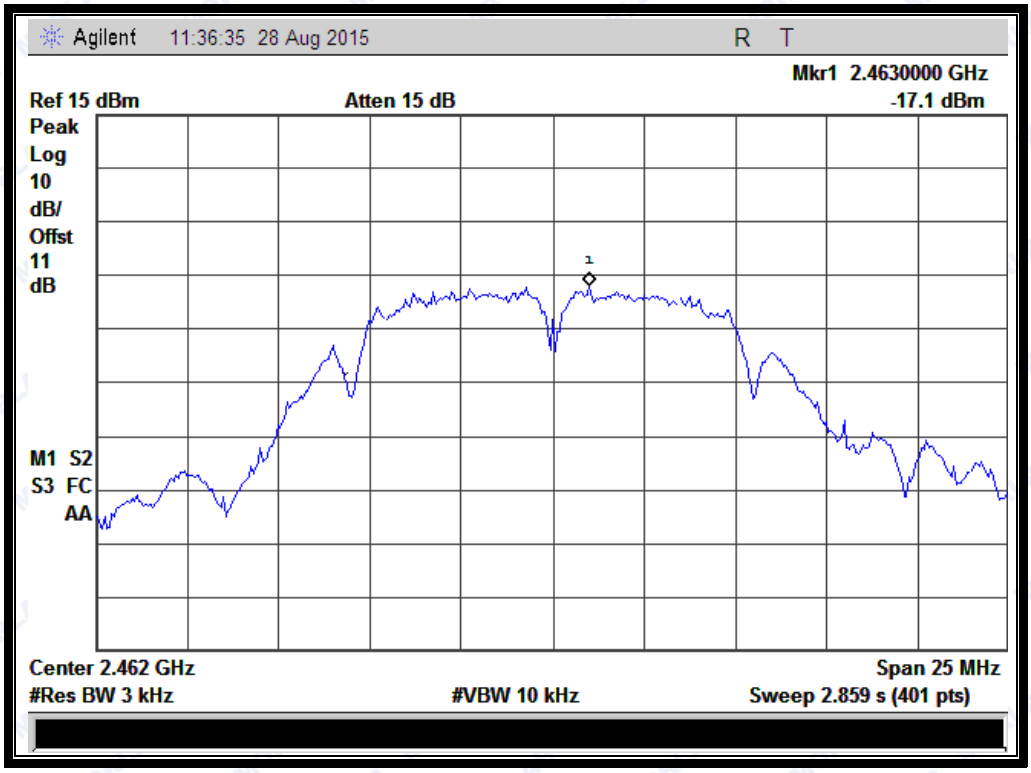
Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-16.18	8	PASS
6	2437	-18.14	8	PASS
11	2462	-17.1	8	PASS
Measurement uncertainty: ±1.3dB				

B. Test Plots:



(Channel = 1 @ 802.11b)

(Channel = 6 @ 802.11b)



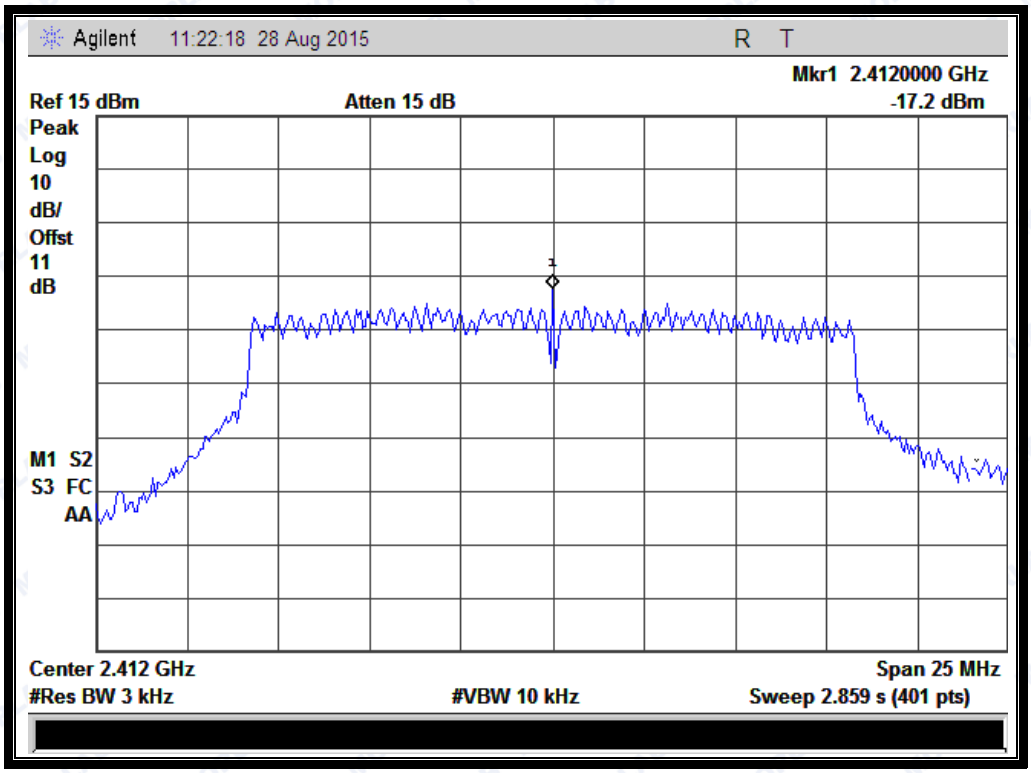
(Channel = 11 @ 802.11b)

2.5.3.2 802.11g Test mode

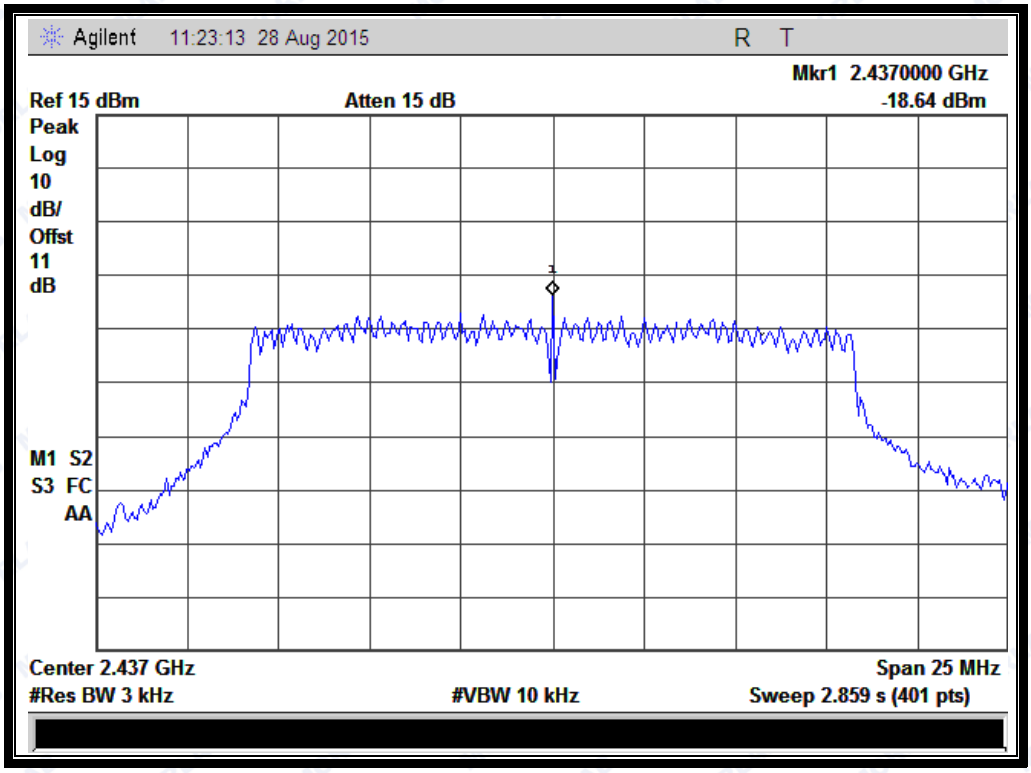
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-17.2	8	PASS
6	2437	-18.64	8	PASS
11	2462	-19.19	8	PASS
Measurement uncertainty: ±1.3dB				

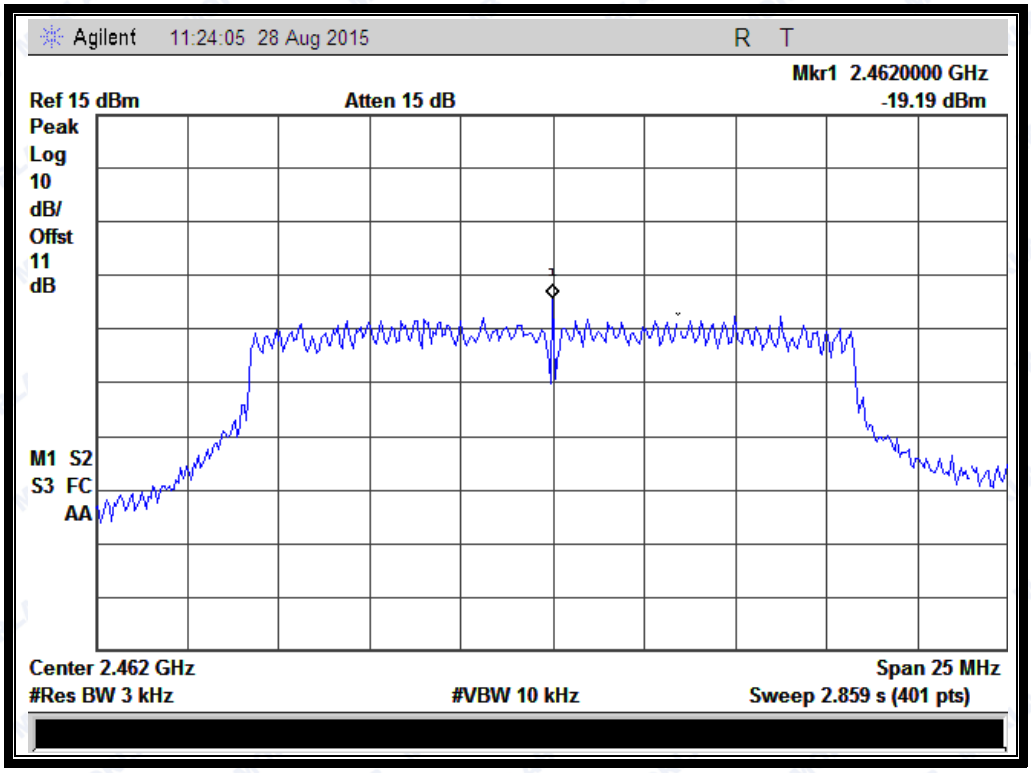
B. Test Plots:



(Channel = 1 @ 802.11g)



(Channel = 6 @ 802.11g)



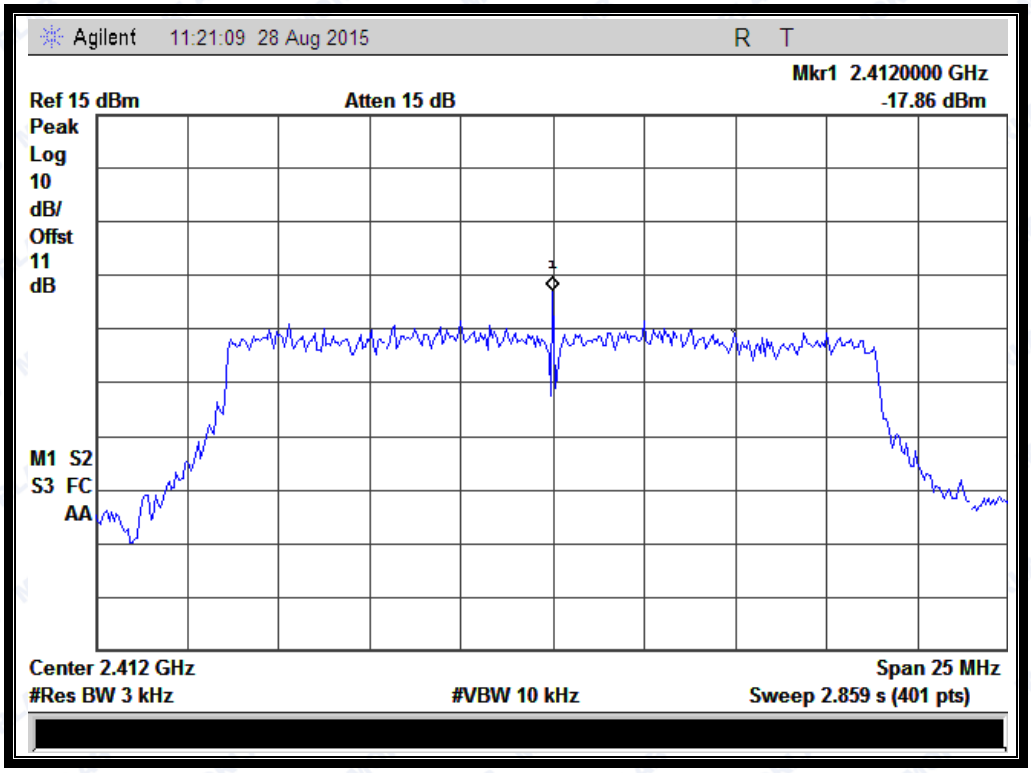
(Channel = 11 @ 802.11g)

2.5.3.3 802.11n-20MHz Test mode

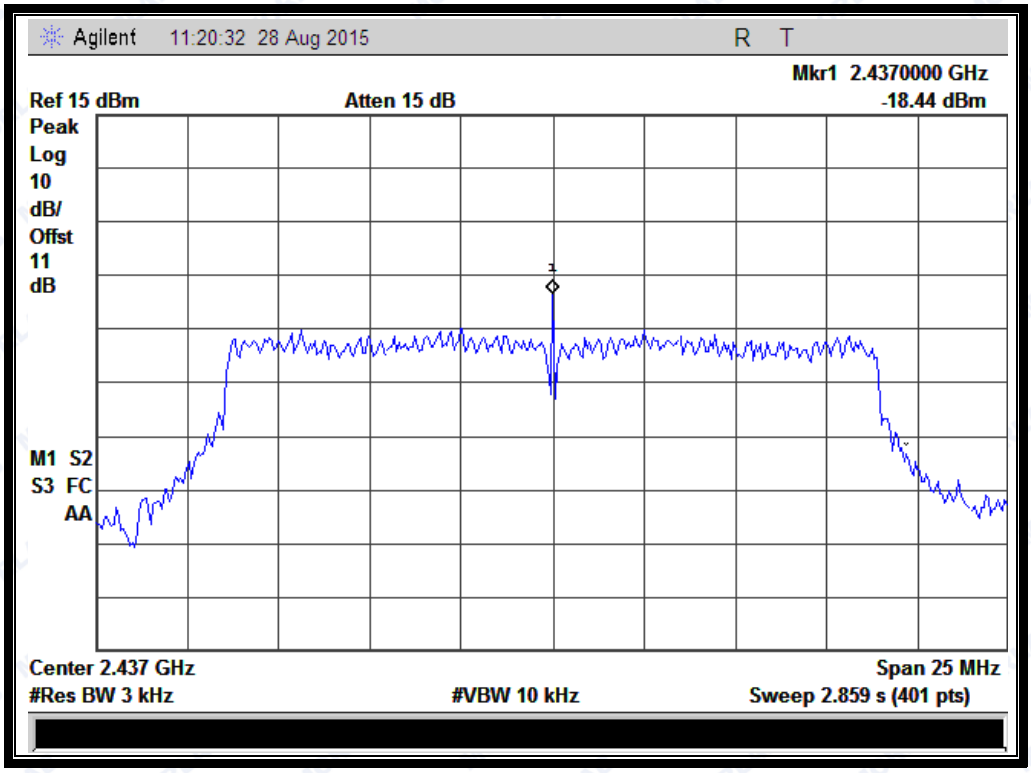
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-17.86	8	PASS
6	2437	-18.44	8	PASS
11	2462	-19.32	8	PASS
Measurement uncertainty: ±1.3dB				

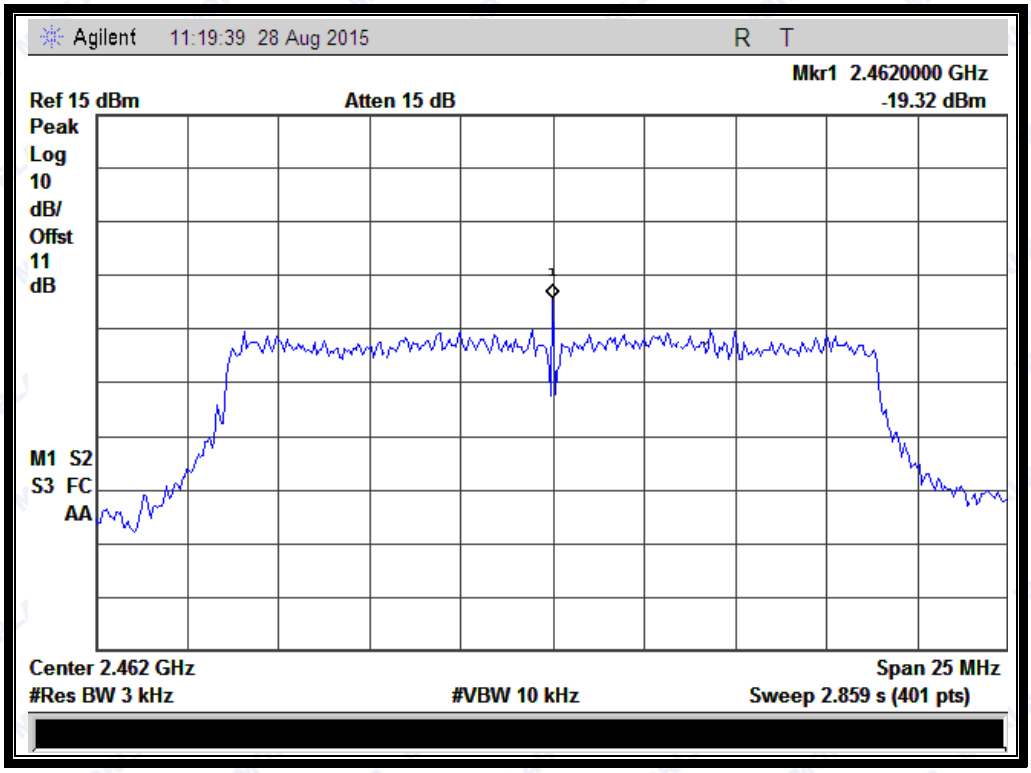
B. Test Plots:



(Channel = 1 @ 802.11n-20MHz)



(Channel = 6 @ 802.11n-20MHz)



(Channel = 11 @ 802.11n-20MHz)

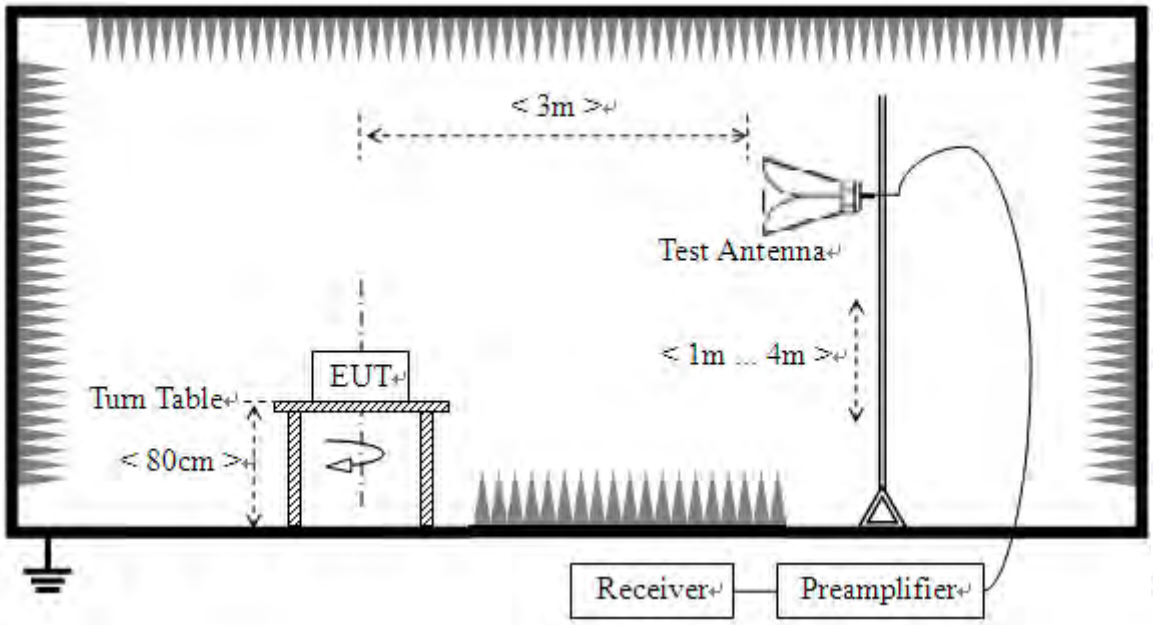
2.6 Restricted Frequency Bands

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(1.4).

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.

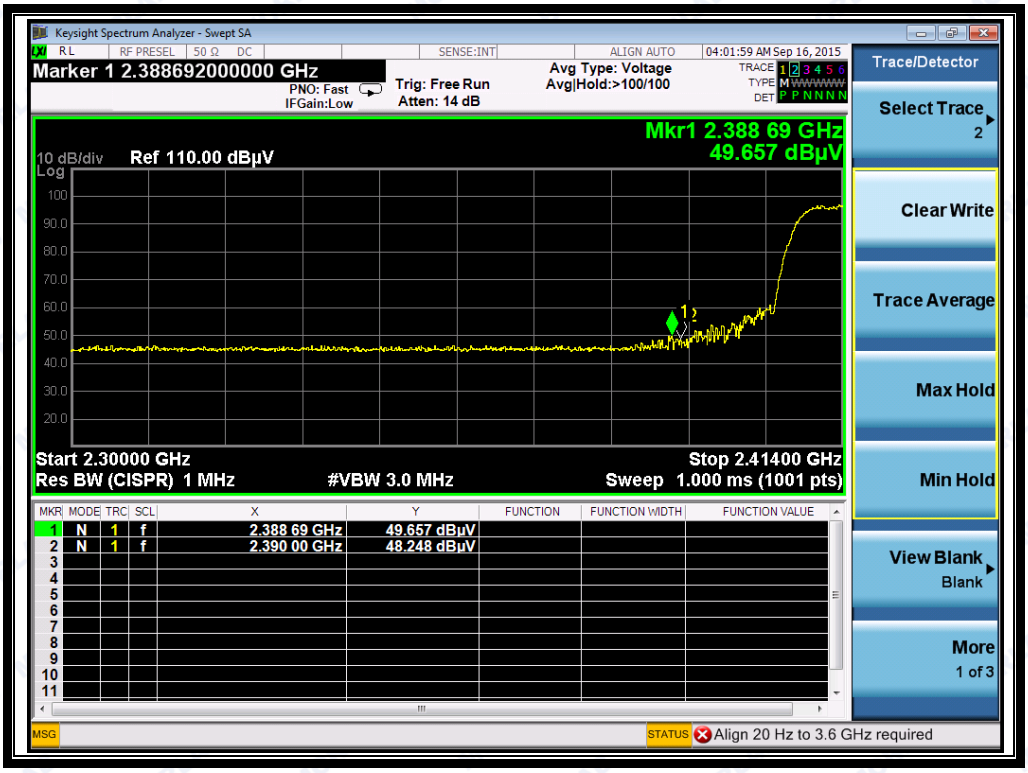
2.6.3.1 802.11b Test mode

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

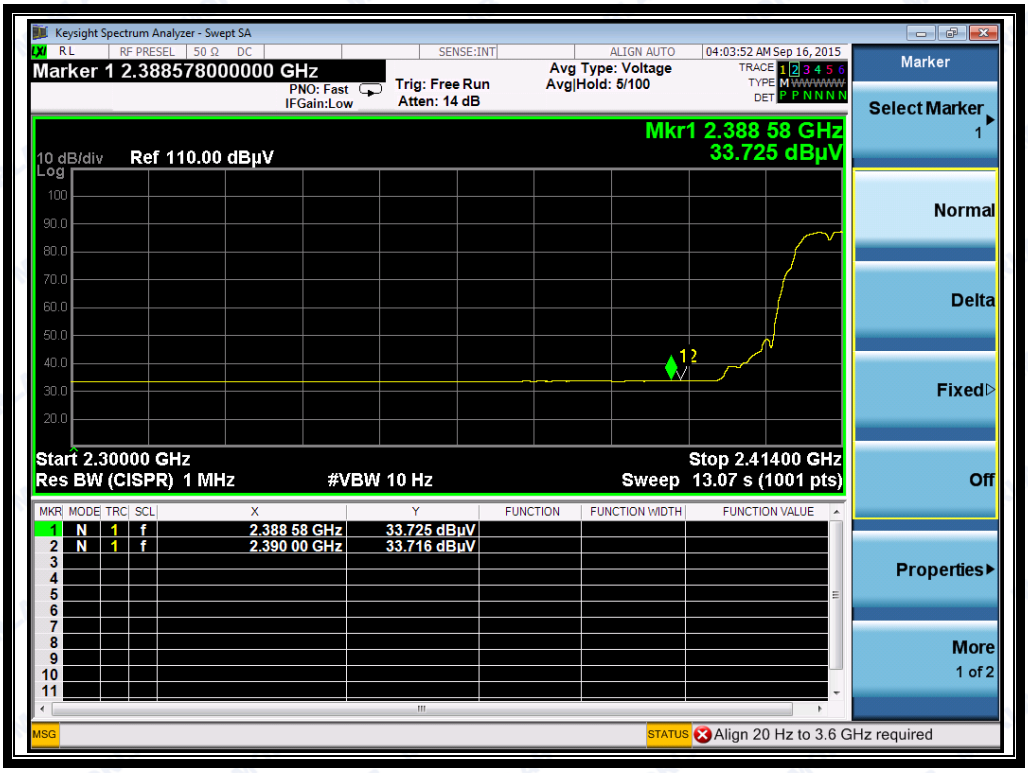
A. Test Verdict:

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	2388.69	PK	49.66	-33.63	32.56	48.59	74	Pass
1	2388.58	AV	33.73	-33.63	32.56	32.66	54	Pass
11	2484.72	PK	54.83	-33.18	32.5	54.15	74	Pass
11	2483.85	AV	37.70	-33.18	32.5	37.02	54	Pass

B. Test Plots:

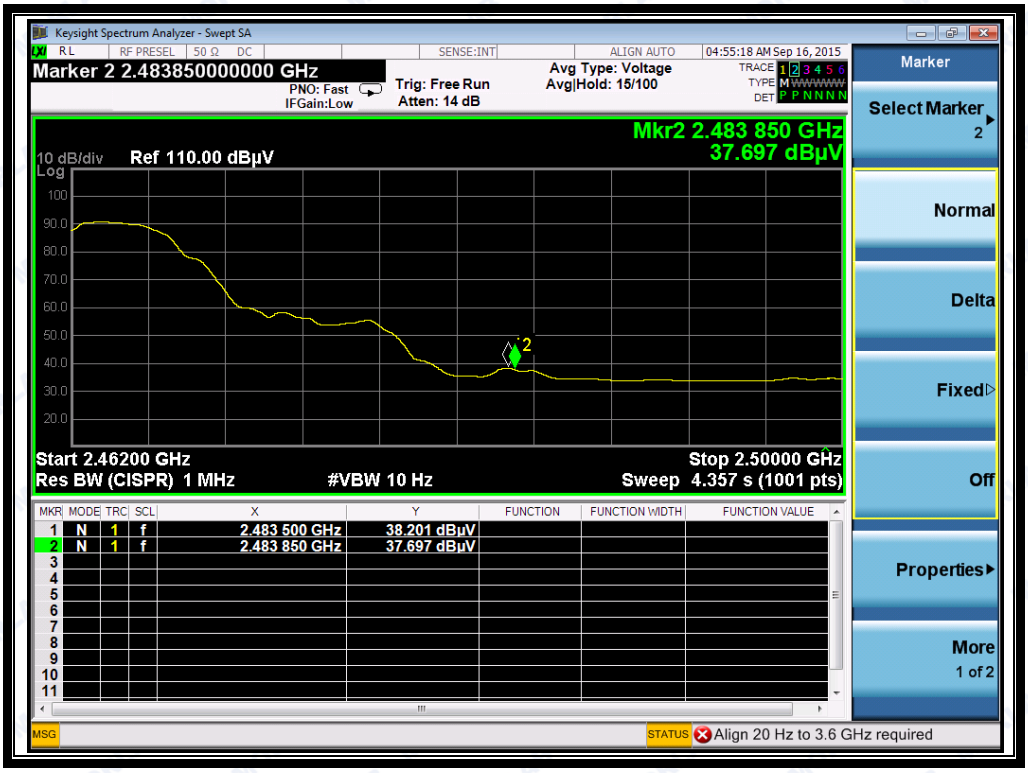


(Plot A1: Channel = 1 PEAK @ 802.11b)



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

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



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

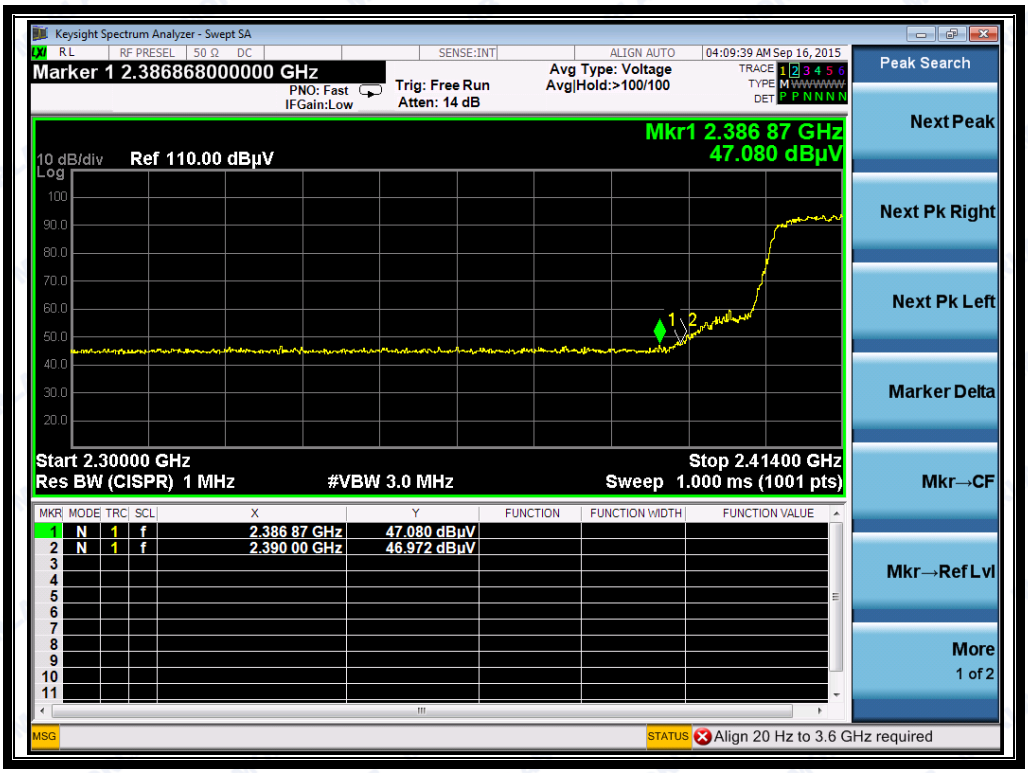
2.6.3.2 802.11g Test mode

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

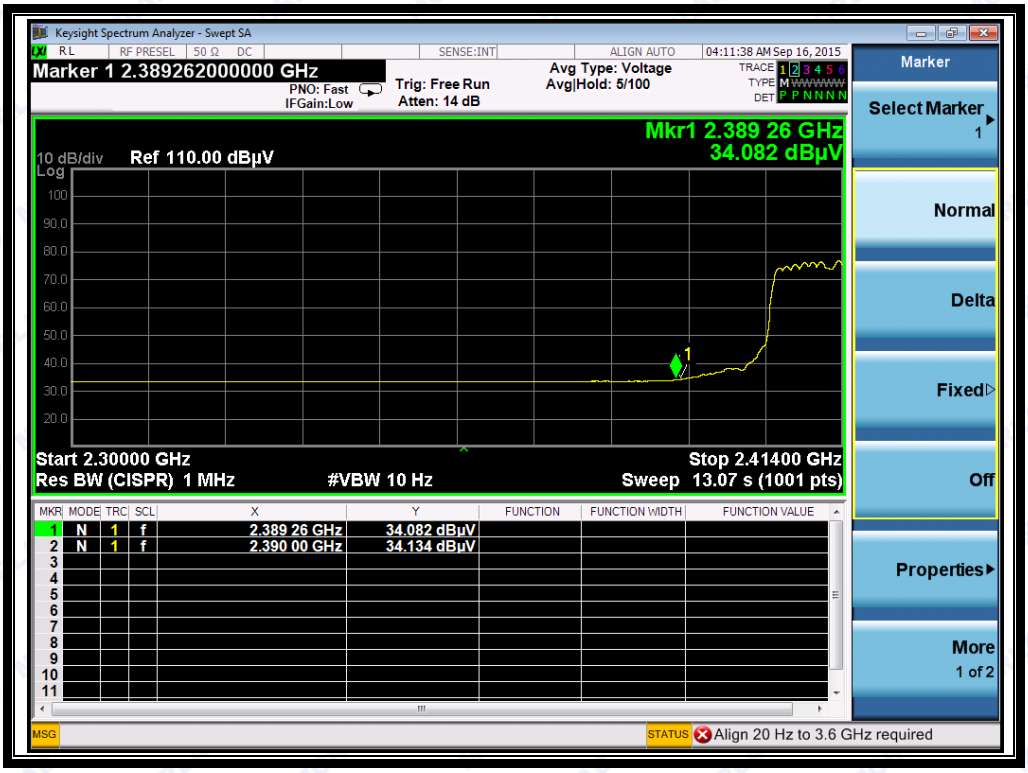
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
1	2386.87	PK	47.08	-33.63	32.56	46.01	74	Pass
1	2389.26	AV	34.08	-33.63	32.56	33.01	54	Pass
11	2483.93	PK	61.35	-33.18	32.5	60.67	74	Pass
11	2483.74	AV	41.67	-33.18	32.5	40.99	54	Pass

B. Test Plots:

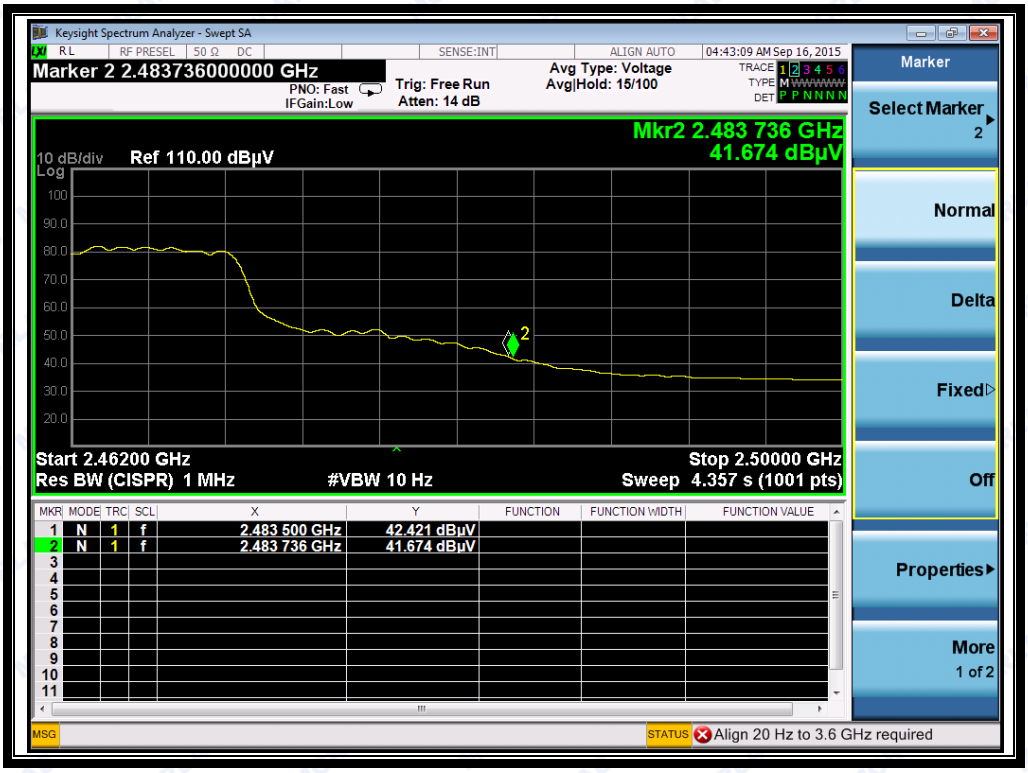


(Plot C1: Channel = 1 PEAK @ 802.11g)



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

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



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

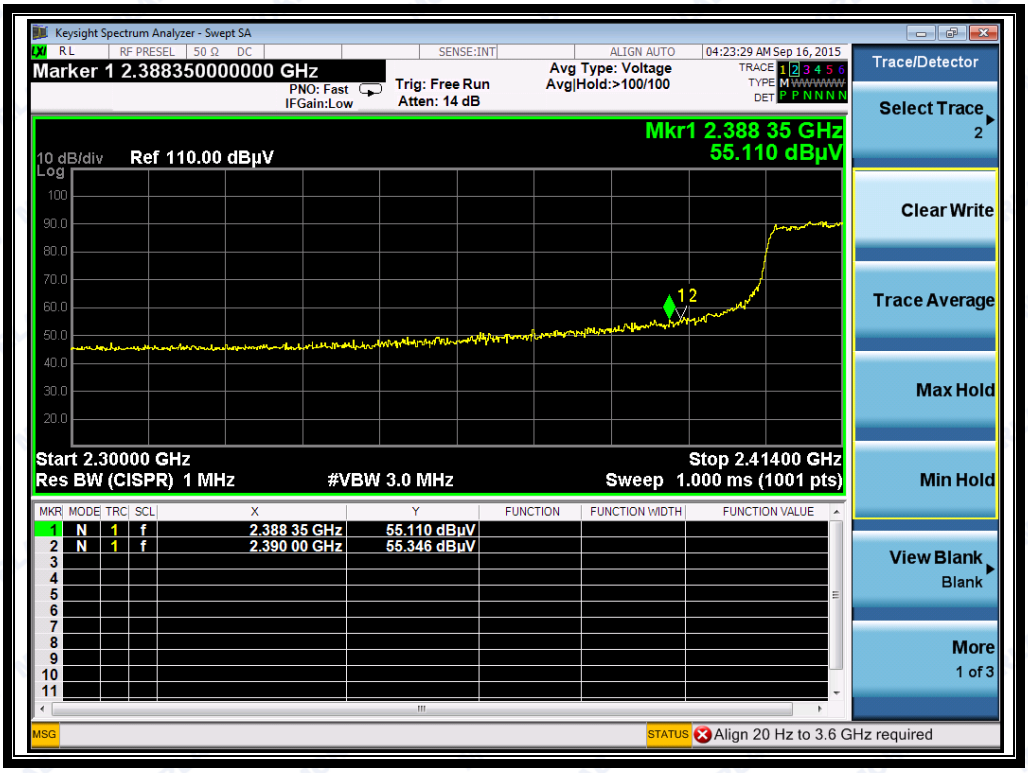
2.6.3.3 802.11n-20MHz Test mode

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

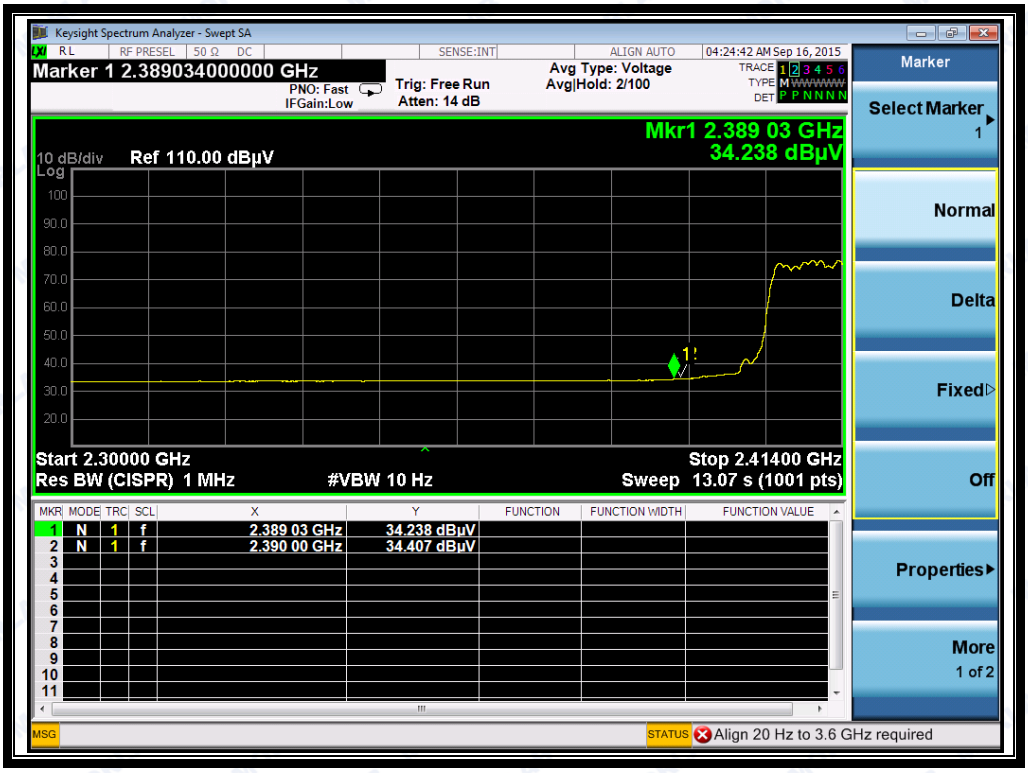
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
1	2388.35	PK	55.11	-33.63	32.56	54.04	74	Pass
1	2389.03	AV	34.24	-33.63	32.56	33.17	54	Pass
11	2484.19	PK	63.08	-33.18	32.5	32.40	74	Pass
11	2483.77	AV	38.74	-33.18	32.5	38.06	54	Pass

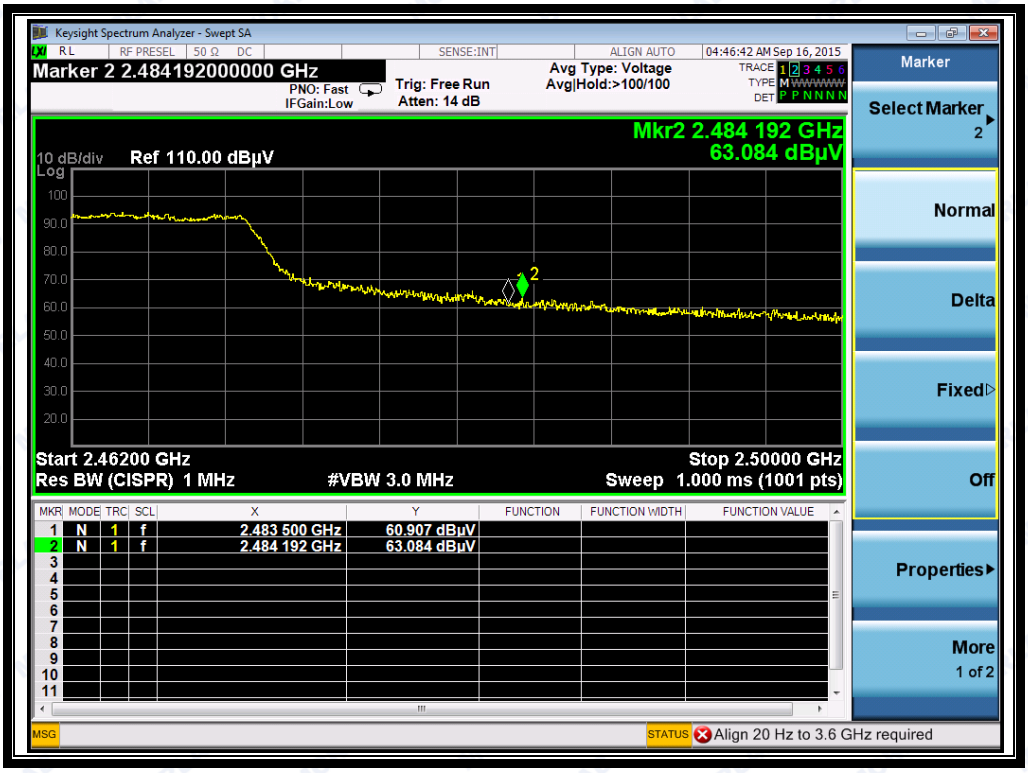
B. Test Plots:



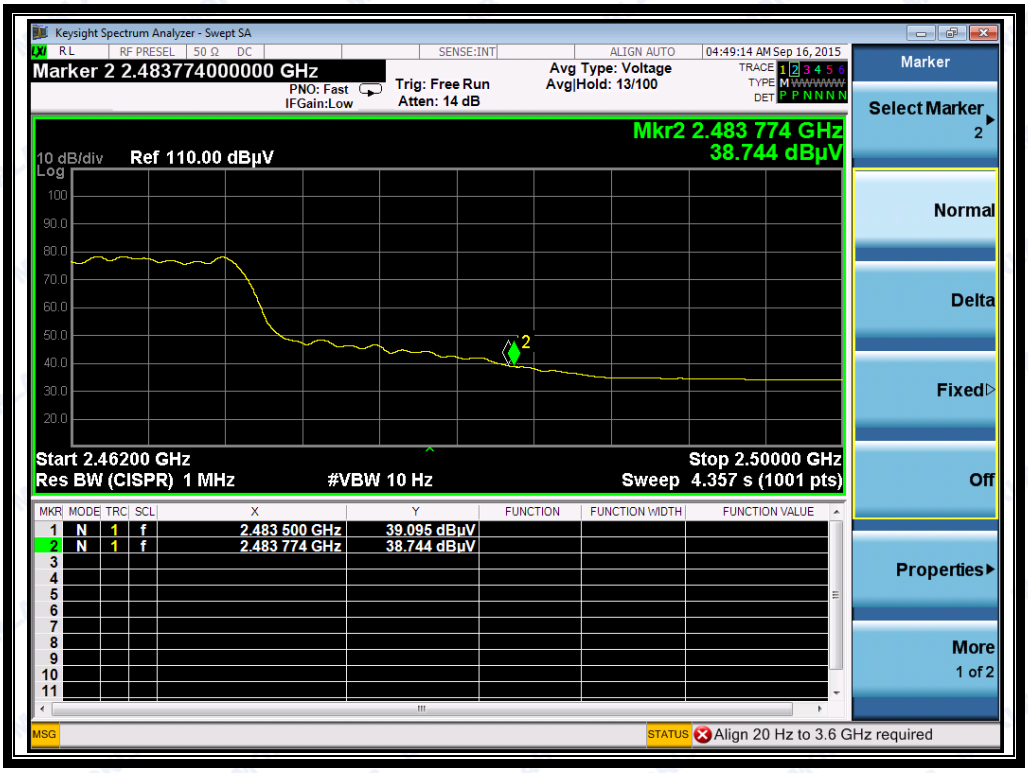
(Plot E1: Channel = 1 PEAK @ 802.11n-20)



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



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



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

2.7 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

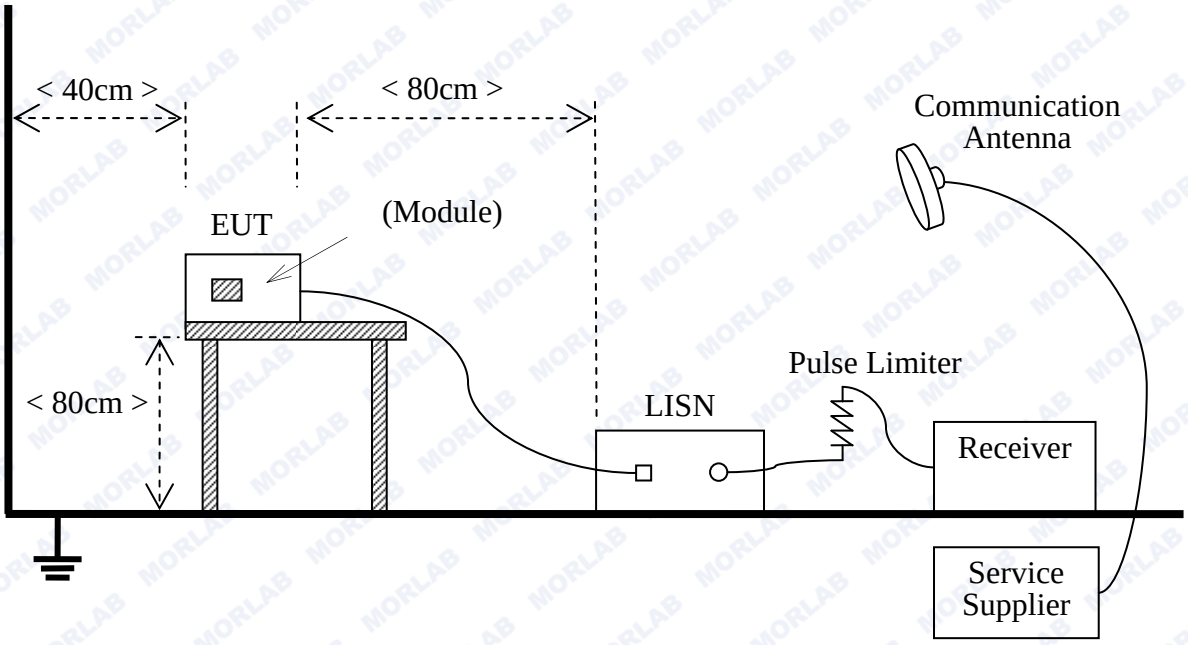
NOTE:

(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 C63.4:2009

B. Equipments List:

Please reference ANNEX A(1.4).

2.7.3 Test Result

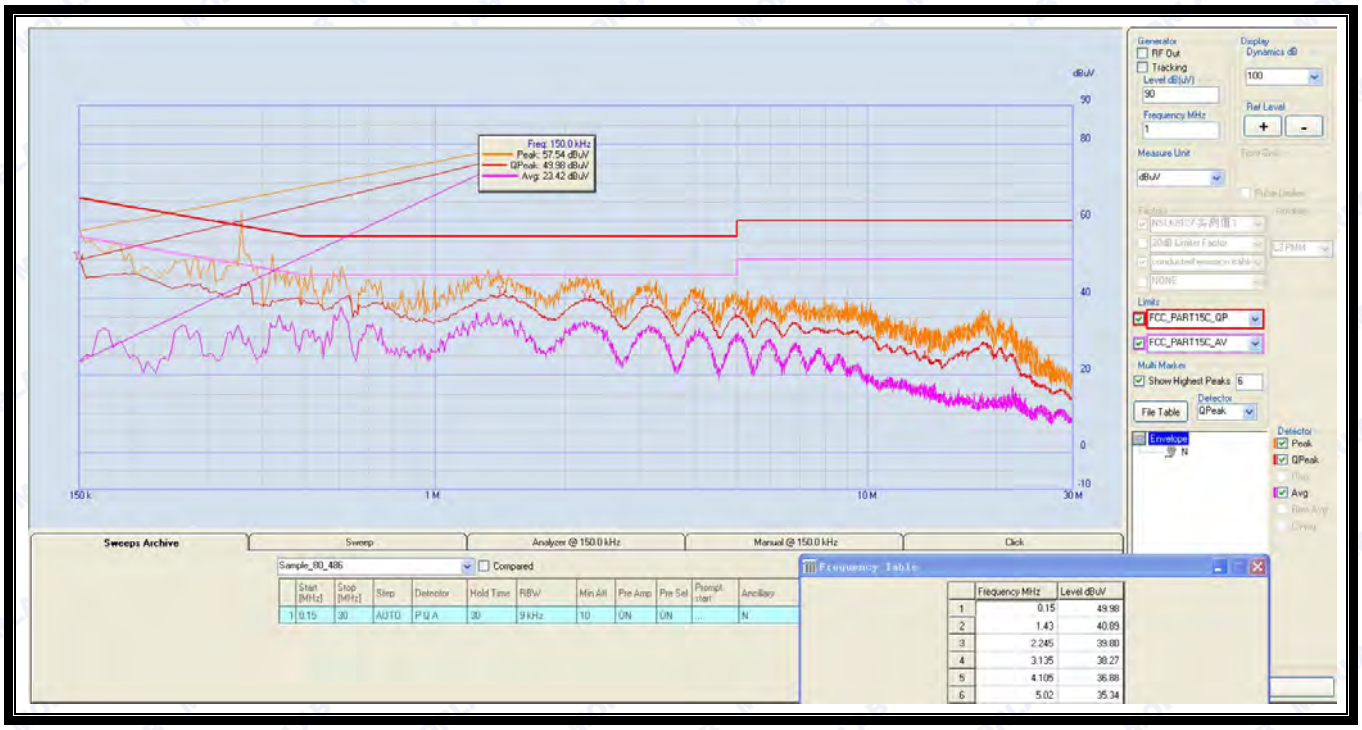
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT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

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

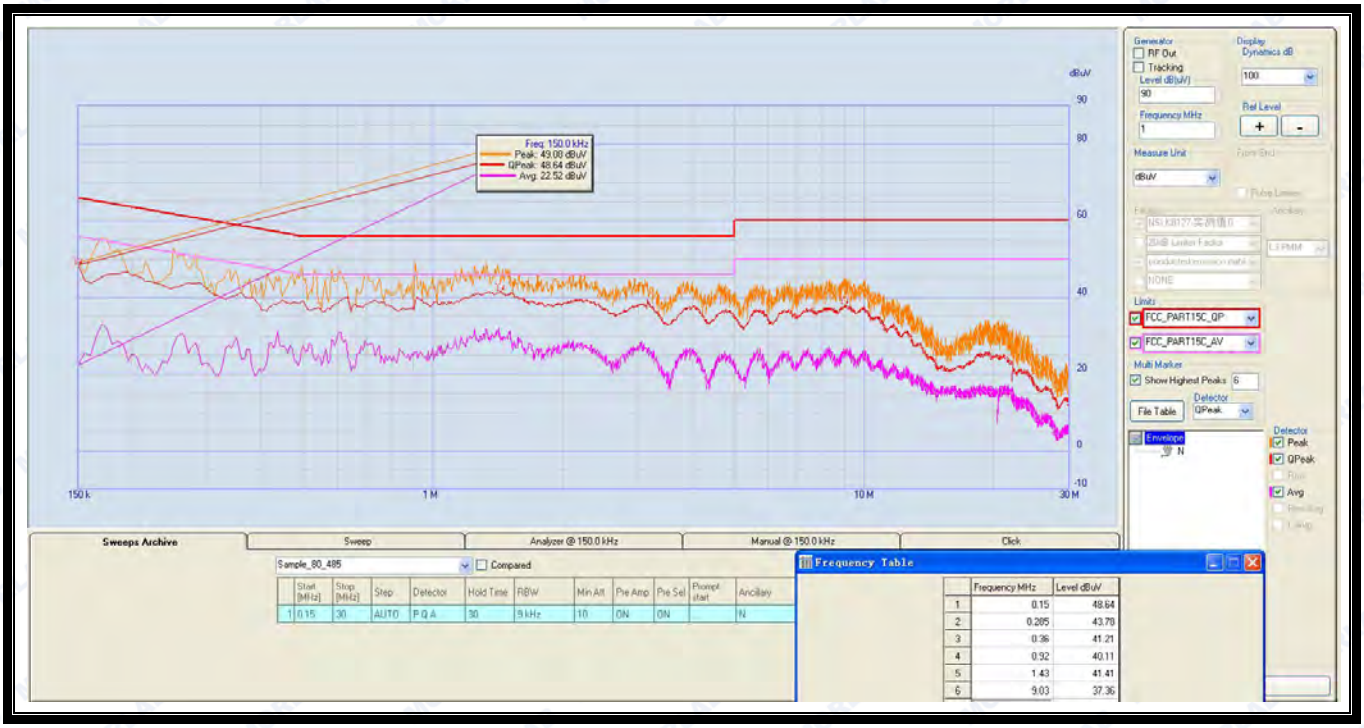
A. Test setup:

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 (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.

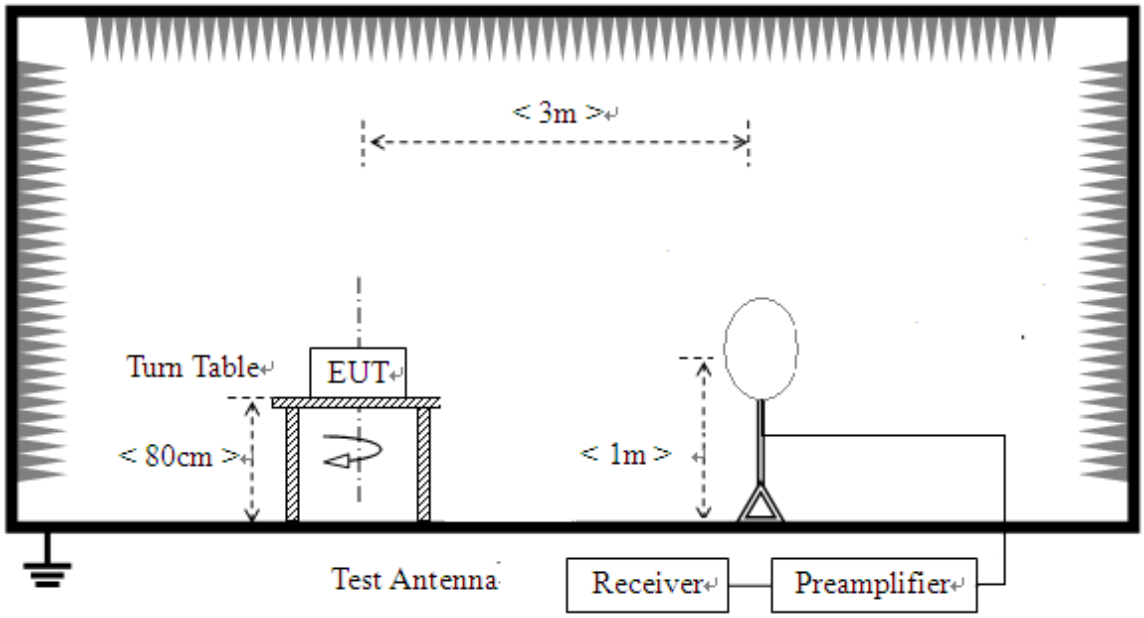
For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

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)

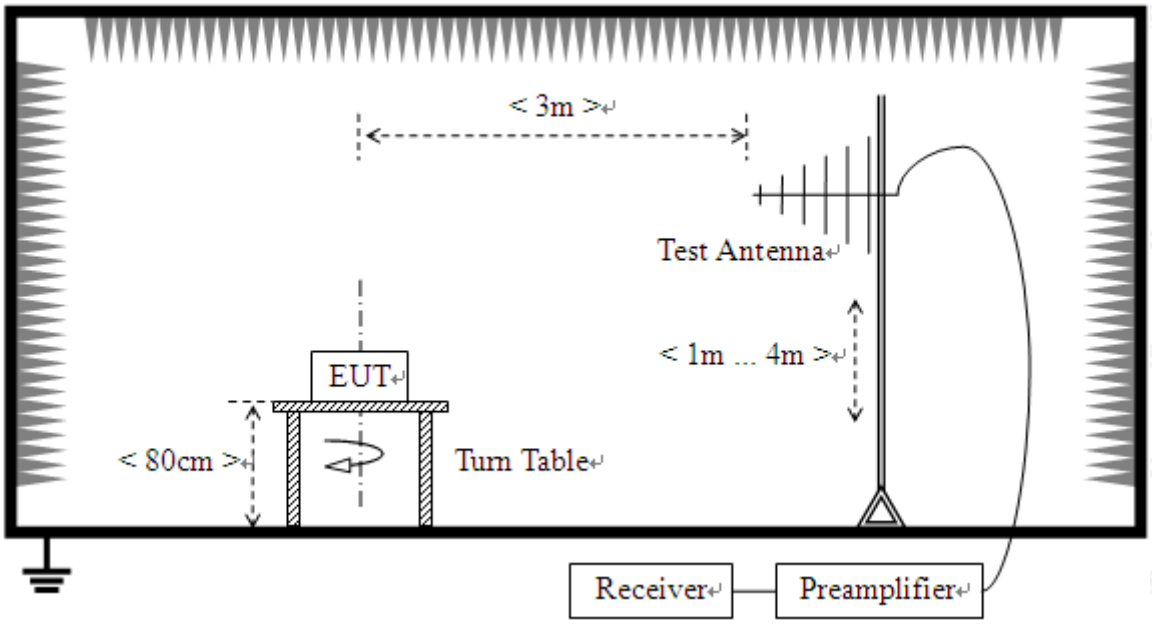
2.8.2 Test Description

A. Test Setup:

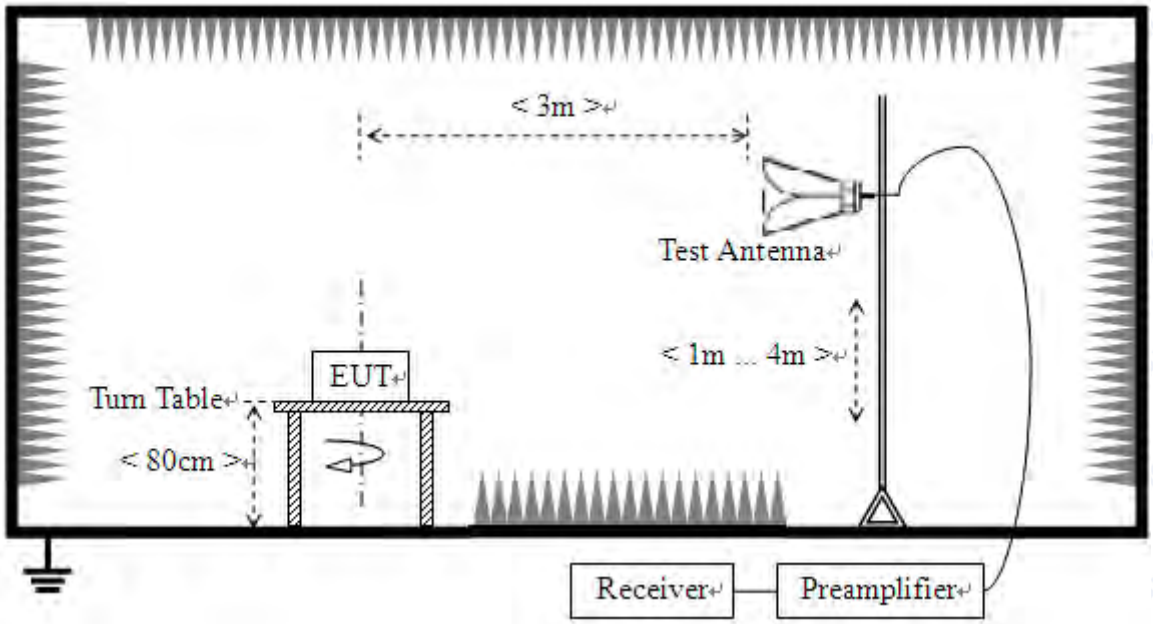
1) For radiated emissions from 9kHz to 30MHz



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 C63.4 (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 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(1.4).

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:

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

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.

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.

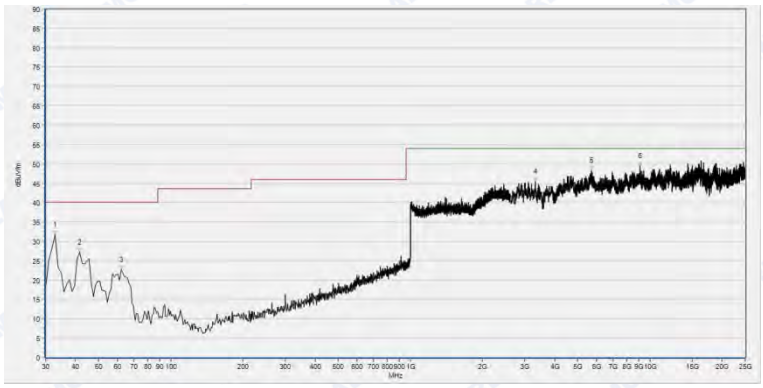
2.8.3.1 802.11b Test mode

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
31.940	21.65	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
49.400	20.33	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
182.290	18.48	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
2795.526	46.34	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5626.587	48.55	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
8991.271	49.90	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

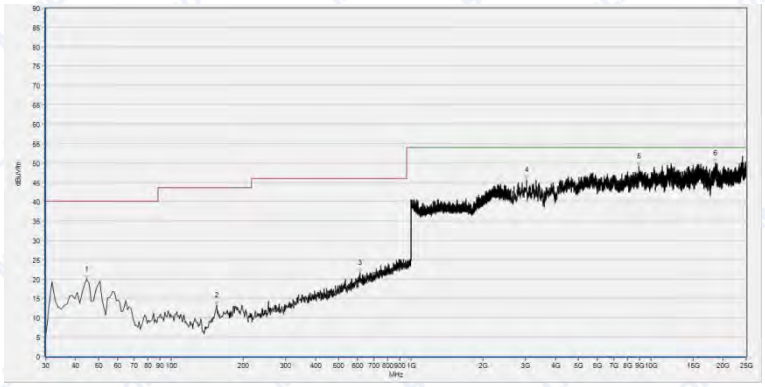
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.910	31.72	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
41.640	27.10	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.010	22.55	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
3329.151	45.39	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5695.836	48.34	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
9101.255	49.52	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

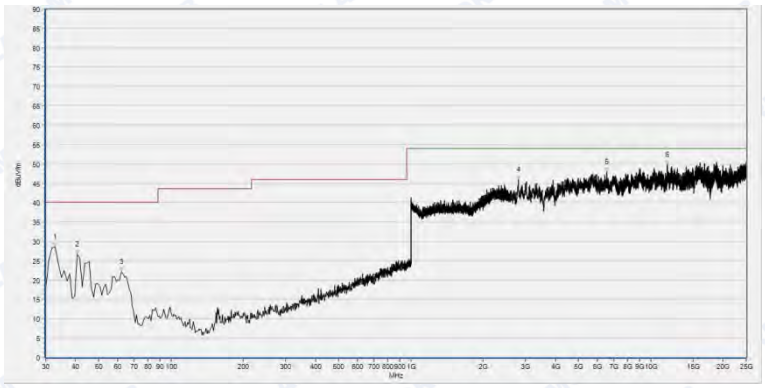
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	19.89	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
155.130	13.21	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
612.970	21.66	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
3031.788	45.66	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
8934.243	49.04	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18588.362	49.96	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

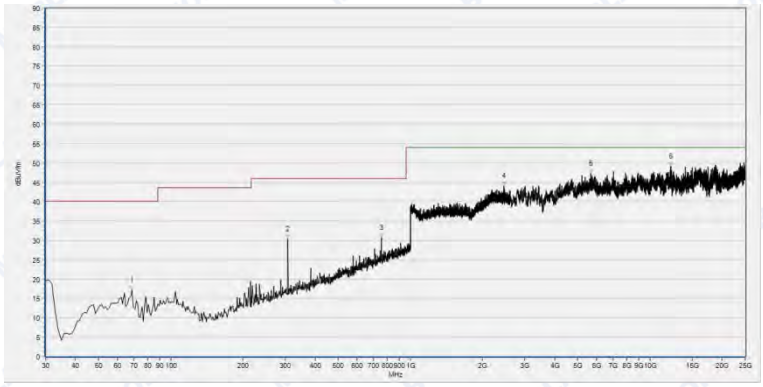
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.910	28.53	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
40.670	26.59	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.010	22.19	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
2803.673	46.00	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
6551.264	48.00	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
11740.862	49.71	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

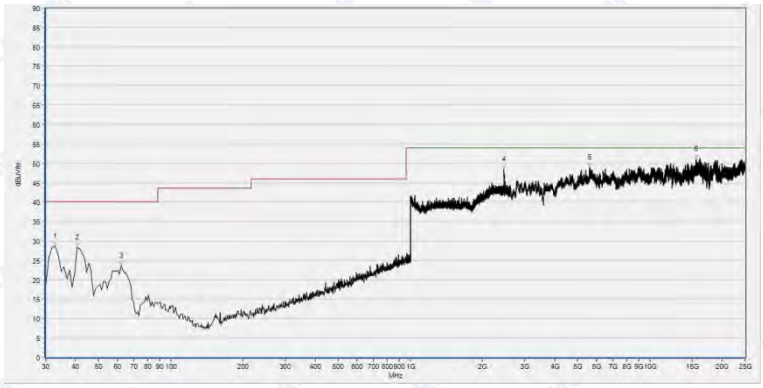
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	20.09	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
179.380	18.30	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
723.550	24.10	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2461.705	48.92	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7056.374	48.32	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16763.448	50.70	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



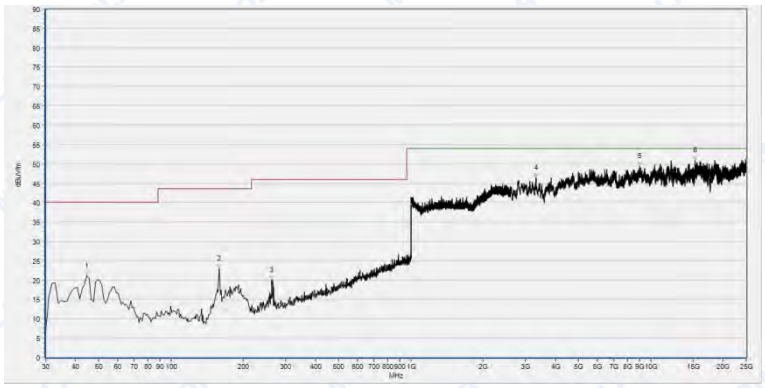
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.910	28.70	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
40.670	28.29	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.010	23.65	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
2461.705	48.51	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5598.072	48.86	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15618.803	51.08	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

2.8.3.2 802.11g Test mode

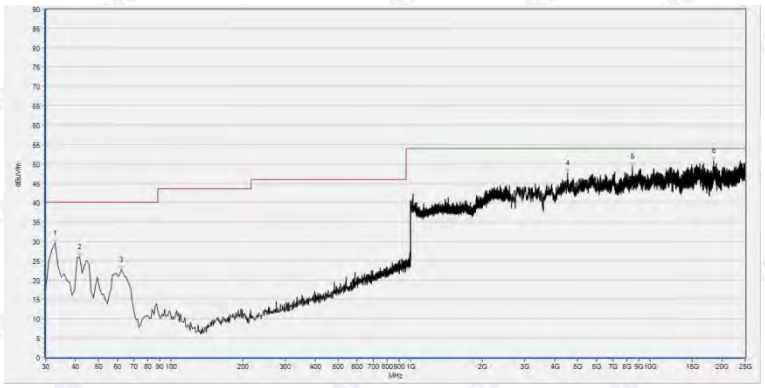
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	21.20	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
159.010	23.03	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
262.800	19.92	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
3325.077	46.49	N.A	N.A	74.0	N.A	74.0	Horizontal	PASS
8954.610	49.41	N.A	N.A	74.0	N.A	74.0	Horizontal	PASS
15341.808	50.98	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

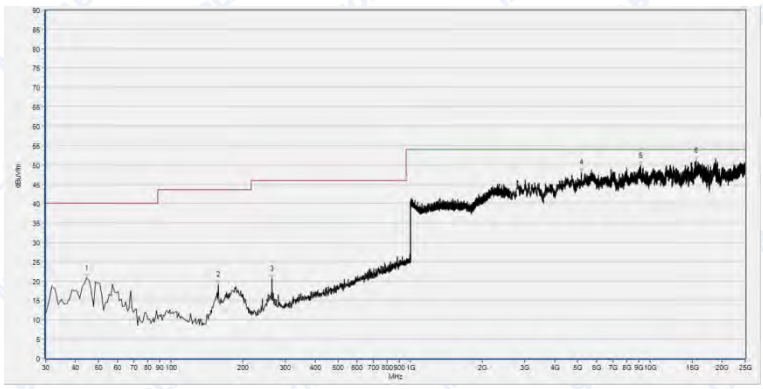
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.910	29.42	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
41.640	26.03	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.010	22.69	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
4538.971	47.60	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
8465.794	49.20	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
18413.202	50.82	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

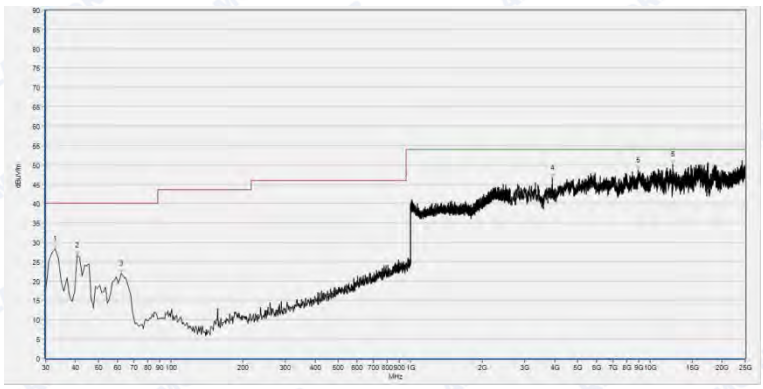
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	20.76	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
158.040	19.06	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
264.740	20.61	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
5178.505	48.06	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
9133.843	49.71	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15618.803	51.11	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

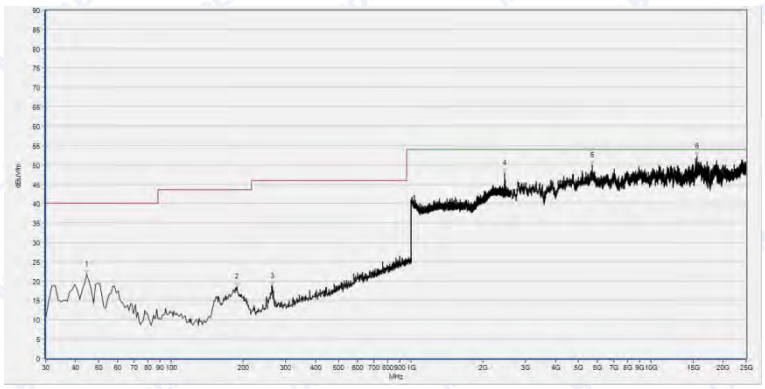
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.910	28.27	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
40.670	26.63	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.010	21.94	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
3911.657	46.58	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
8946.463	48.52	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12482.233	50.16	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

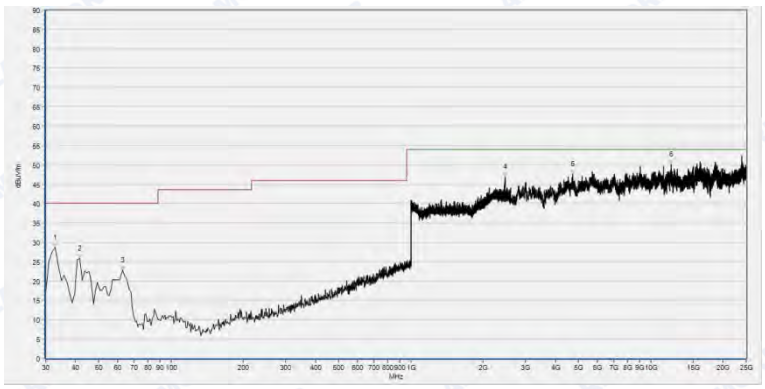
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	21.74	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
188.110	18.59	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
264.740	18.85	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2462.345	47.90	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5699.909	49.92	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15622.877	52.25	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
32.910	28.69	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
41.640	25.76	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.980	22.79	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
2462.467	46.85	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
4730.424	47.57	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12188.943	50.16	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

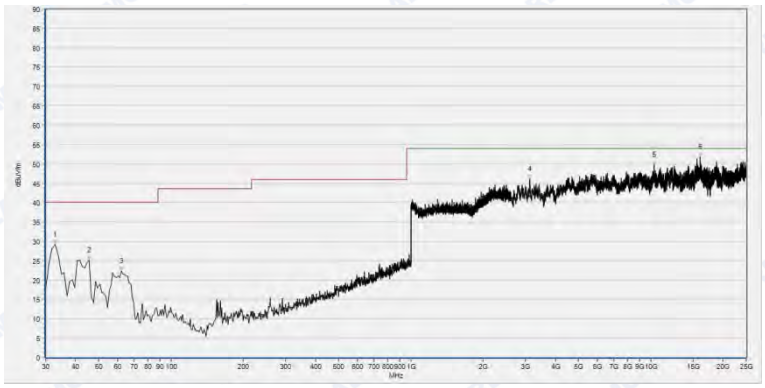
2.8.3.3 802.11n-20MHz Test mode

A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1

Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
31.940	21.48	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
44.550	21.04	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
157.070	23.91	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
2791.453	46.07	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5410.693	48.42	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11728.642	50.98	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

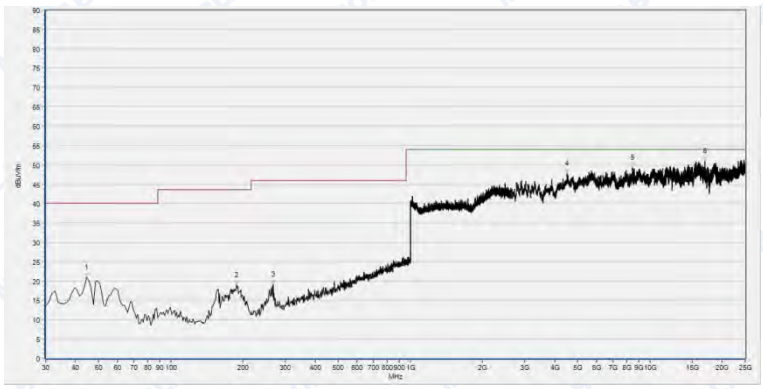
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.910	29.18	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
45.520	25.06	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.010	22.27	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
3133.624	46.02	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
10311.075	49.79	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
16046.518	51.80	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

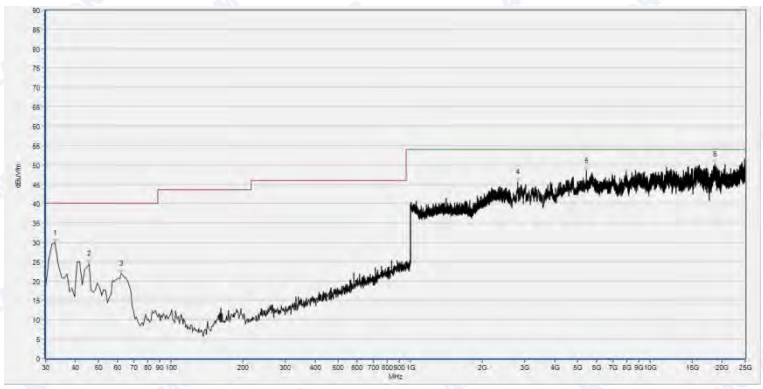
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	21.00	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
188.110	18.95	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
267.650	19.08	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
4510.456	47.69	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
8433.206	49.35	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16942.680	50.91	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

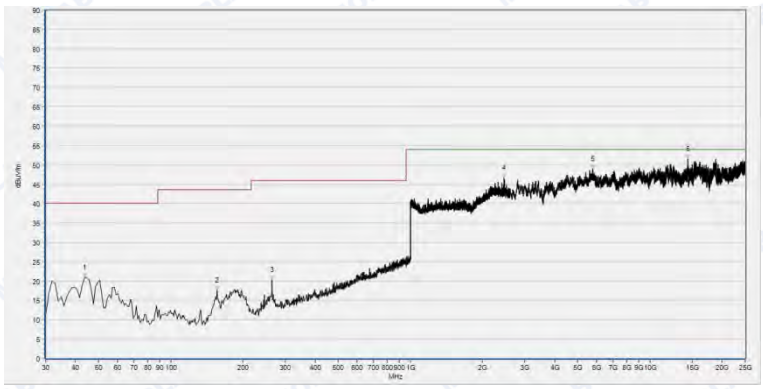
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.910	29.87	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
45.520	24.53	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.010	21.96	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
2803.673	45.58	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5435.134	48.44	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
18718.712	50.12	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

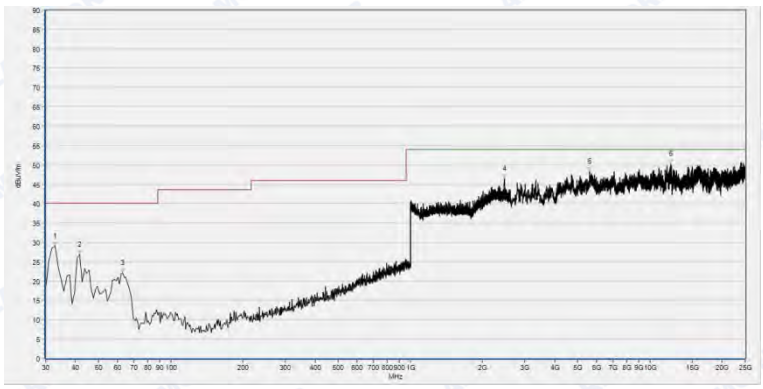
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
43.580	20.87	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
156.100	17.65	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
264.740	20.22	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2462.345	46.64	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5756.938	49.02	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
14441.571	51.48	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
32.910	28.97	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
41.640	26.81	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
62.980	22.17	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
2462.345	46.49	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5593.999	48.26	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12197.090	50.31	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(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 lever in excess of Commission's guideline.

2.9.2 Result

Please refer to SAR report.

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: 2013, ANSI C63.4: 2009 and CISPR Publication 22; the FCC registration number is 695796.

1.4 Test Equipments Utilized

1.4.1 Conducted Test Equipments

Conducted Test Equipment						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal. Due**
1	Spectrum Analyzer	MY45101810	E4407B	Agilent	2015.02.26	2016.02.25
2	Power Splitter	NW521	1506A	Weinschel	2015.02.26	2016.02.25
3	Attenuator 1	(n.a.)	10dB	Resnet	2015.02.26	2016.02.25
4	Attenuator 2	(n.a.)	3dB	Resnet	2015.02.26	2016.02.25
5	USB Wideband Power Sensor	MY52280010	U2021XA	Agilent	2015.02.26	2016.02.25
6	EXA Signal Analzyer	MY51440152	N9010A	Agilent	2015.02.26	2016.02.25
7	RF cable	CB01	RF01	Morlab	N/A	N/A
8	Coaxial cable	CB02	RF02	Morlab	N/A	N/A
9	SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.4.2 Conducted Emission Test Equipments

Conducted Emission Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal. Due**
1	Receiver	US44210471	E7405A	Agilent	2015.02.26	2016.02.25
2	LISN	812744	NSLK 8127	Schwarzbeck	2015.02.26	2016.02.25
3	Service Supplier	100448	CMU200	R&S	2015.02.26	2016.02.25
4	Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2015.02.26	2016.02.25
5	Coaxial cable(BNC)	CB01	EMC01	Morlab	N/A	N/A

1.4.3 Radiated Test Equipments

Radiated Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal.Due Date**
1	System Simulator	100448	CMU200	R&S	2015.02.26	2016.02.25
2	Receiver	US44210471	E7405A	Agilent	2015.02.26	2016.02.25
3	Test Antenna - Bi-Log	9163-274	9m*6m*6m	Albatross	2015.02.26	2016.02.25
4	Test Antenna - Horn	9120D-963	VULB 9163	Schwarzbeck	2015.02.26	2016.02.25
5	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2015.02.26	2016.02.25
6	Test Antenna - Loop	1519-022	HL050S7	R&S	2015.02.26	2016.02.25
7	Reject Filter	(n.a.)	BRM50702	Micro-Tronics	2015.02.26	2016.02.25
8	Coaxial cable (N male)	CB02	EMC02	Morlab	N/A	N/A
9	Coaxial cable (N male)	CB03	EMC03	Morlab	N/A	N/A

1.4.4 Climate Chamber

Climate Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Climate Chamber	2004012	HL4003T	Yinhe	2015.02.26	2016.02.25

1.4.5 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	2015.02.26	2016.02.25

1.4.6 Anechoic Chamber

Anechoic Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Anechoic Chamber	N/A	9m*6m*6m	Albatross	2015.02.26	2016.02.25

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