REPORT No.: SZ16040061W03

FCC RF TEST REPORT

APPLICANT	:	Haier Telecom (Qingdao) Co., Ltd.
PRODUCT NAME	:	SmartPhone
MODEL NAME	:	HM-G109-W/G11
TRADE NAME	:	Haier
BRAND NAME	:	Haier
FCC ID	:	SG7201603G11
STANDARD(S)	:	47 CFR Part 15 Subpart C
ISSUE DATE	:	2016-05-06

SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

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DIRECTORY

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Change History		
Issue	Date	Reason for change
1.0	2016-05-06	First edition

TEST REPORT DECLARATION

Applicant	Haier Telecom (Qingdao) Co., Ltd.
Applicant Address	No.1,Haier Road,Hi-tech Zone,Qingdao,P.R.China
Manufacturer Address	Haier Telecom (Qingdao) Co., Ltd.
Manufacturer	No.1,Haier Road,Hi-tech Zone,Qingdao,P.R.China
Product Name	SmartPhone
Model Name	HM-G109-W/G11
Brand Name	Haier
HW Version	H01
SW Version	G11-H01-S001-MX
Test Standards	47 CFR Part 15 Subpart C
Test Date	2016-04-18 to 2016-04-29
Test Result	PASS

Tested by : Zou Jian

Zou Jian

Reviewed by : Qiu Xiaojun

Qiu Xiaojun

Approved by : Peng Hua

Peng Huarui

1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	Haier Telecom (Qingdao) Co., Ltd.
Address	No.1,Haier Road,Hi-tech Zone,Qingdao,P.R.China

1.2 Equipment under Test (EUT) Description

Brand Name:	Haier
Trade Name:	Haier
Model Name:	HM-G109-W/G11
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:	1.52 dBi

NOTE:

1. The EUT is a SmartPhone, it contains WIFI Module operating at 2.4GHz ISM; it supports 802.11b, 802.11g, 802.11n and they are all tested in this report.

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).

2. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.
3. 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	H01	G11-H01-S001-MX

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)	Maximum Output Power	Apr 22, 2016	**PASS**
3	15.247(a)	Bandwidth	Apr 21, 2016	**PASS**
4	15.247(d)	Conducted Spurious Emission and Band Edge	Apr 21, 2016	**PASS**
5	15.247(d)	Restricted Frequency Bands	Apr 21, 2016	**PASS**
6	15.207	Conducted Emission	Apr 21, 2016	**PASS**
7	15.209 ,15.247(d)	Radiated Emission	Apr 21, 2016	**PASS**
8	15.247(e)	Power spectral density (PSD)	Apr 21, 2016	**PASS**

The tests 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

A.1 Maximum conducted Peak Power

According to KDB 558074 D01 v03r05 9.1.2 PKPM1 Peak power meter method for Peak Power test.

The maximum peak conducted output power measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

A.2 Maximum conducted Average output power

According to KDB 558074 D01 v03r05 9.2.3.1 Measurement using an RF average power meter for Average Power test. Measurements performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

1) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.

3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

a) If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as described in KDB 558074 D01 v03r05 Section 6.0.

b) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

c) Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement result.

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.

2.2.3.1 802.11b Test Mode

Channel	Frequency (MHz)	Measured Peak Output Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	13.81	0.024	30	1	PASS
6	2437	14.46	0.028			PASS
11	2462	15.15	0.033			PASS

Channel	Frequency (MHz)	Power Meter Value (dBm)	10log (1/x)	Measured Average Output Power		Limit		Verdict
				dBm	W	dBm	W	
1	2412	10.45	0.02	10.47	0.0111	30	1	PASS
6	2437	10.95		10.97	0.0125			PASS
11	2462	11.82		11.84	0.0153			PASS

2.2.3.2 802.11g Test mode

Channel	Frequency (MHz)	Measured Peak Output Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	16.77	0.048	30	1	PASS
6	2437	17.34	0.054			PASS
11	2462	17.52	0.056			PASS

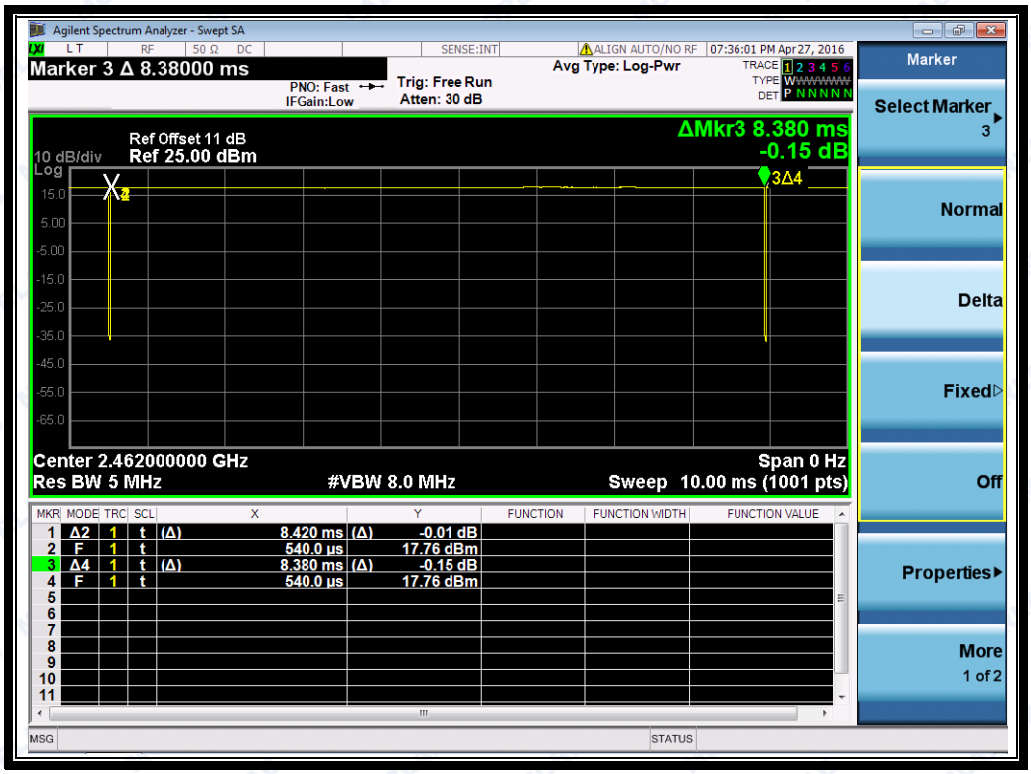
Channel	Frequency (MHz)	Power Meter Value	10log (1/x)	Measured Average Output Power		Limit		Verdict
				dBm	W	dBm	W	
1	2412	8.46	0.14	8.60	0.0072	30	1	PASS
6	2437	8.92		9.06	0.0081			PASS
11	2462	9.64		9.78	0.0095			PASS

2.2.3.3 802.11n-20MHz Test mode

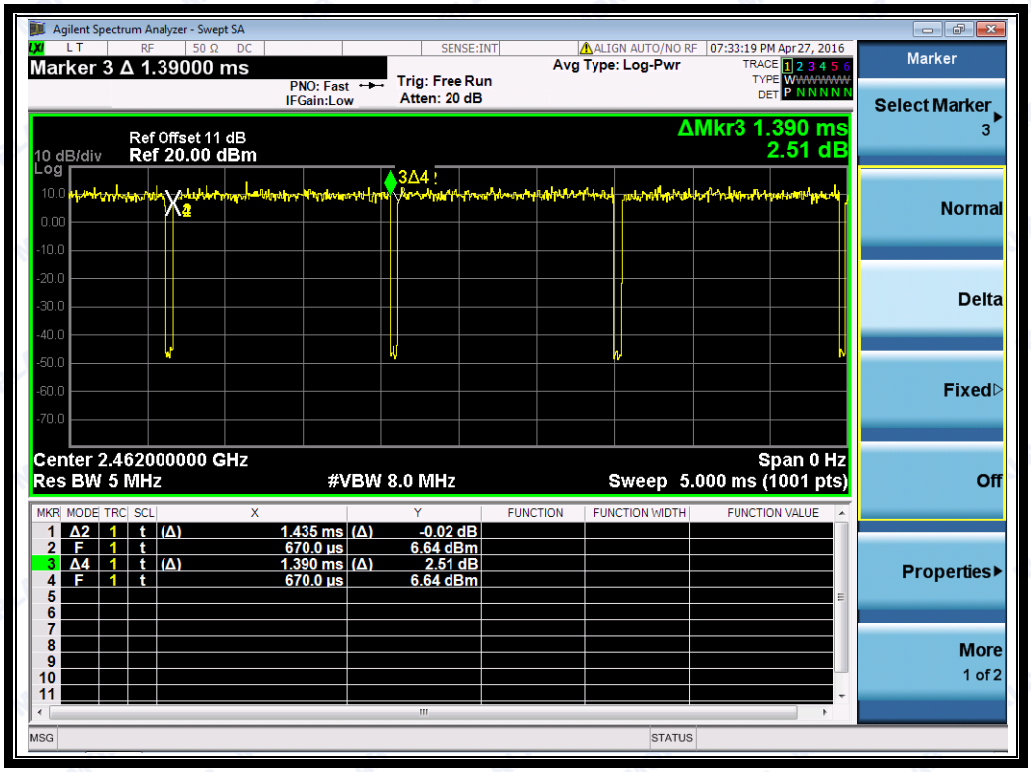
Channel	Frequency (MHz)	Measured Peak Output Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	13.88	0.024	30	1	PASS
6	2437	14.33	0.027			PASS
11	2462	14.74	0.030			PASS

Channel	Frequency (MHz)	Power Meter Value	10log (1/x)	Measured Average Output Power		Limit		Verdict
				dBm	W	dBm	W	
1	2412	4.23	0.12	4.35	0.0027	30	1	PASS
6	2437	4.79		4.91	0.0031			PASS
11	2462	5.49		5.61	0.0036			PASS

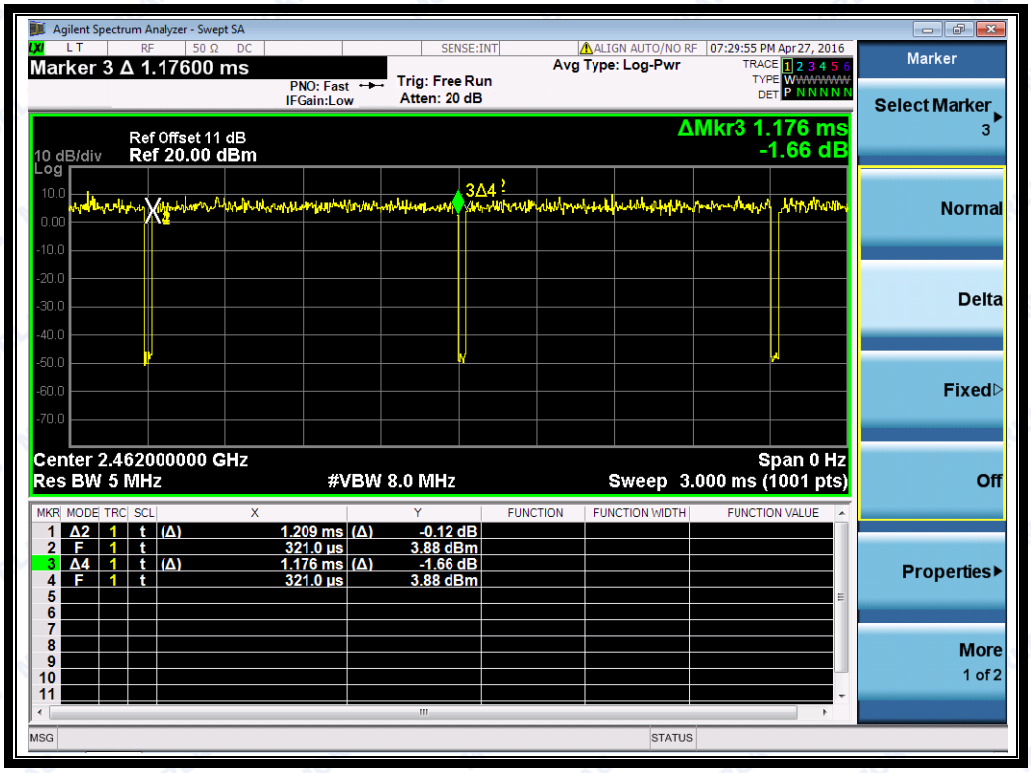
2.2.3.4 Test Plots



(Duty Cycle @ 802.11b)



(Duty Cycle @ 802.11g)



(Duty Cycle @ 802.11n20)

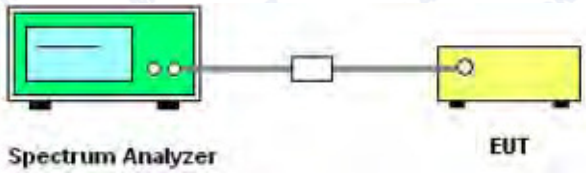
2.3 Bandwidth

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

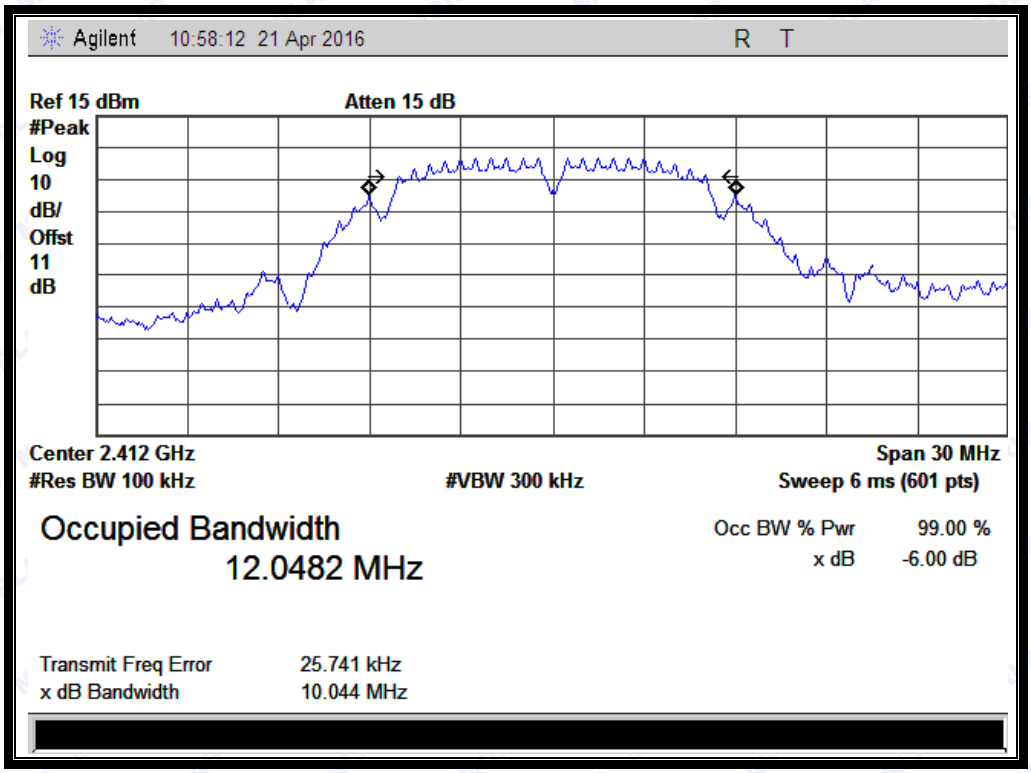
The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the Module.

2.3.3.1 802.11b Test mode

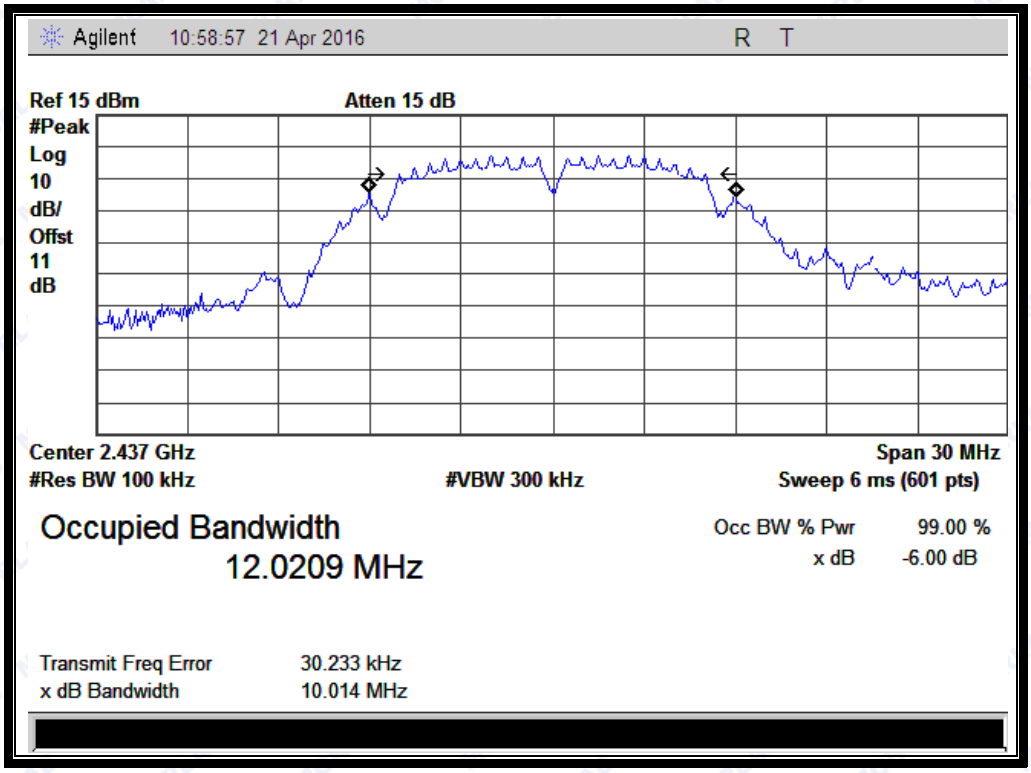
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	10.044	≥500	PASS
6	2437	10.014	≥500	PASS
11	2462	9.589	≥500	PASS

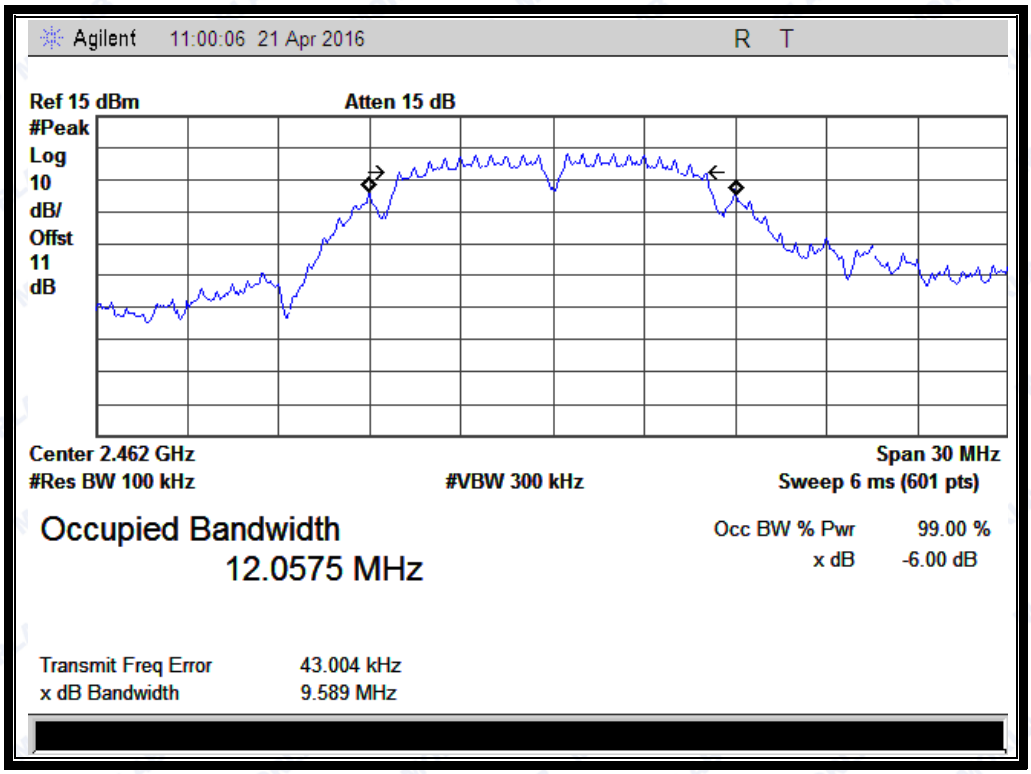
B. Test Plots



(Channel 1: 2412MHz @ 802.11b)



(Channel 6: 2437 MHz @ 802.11b)



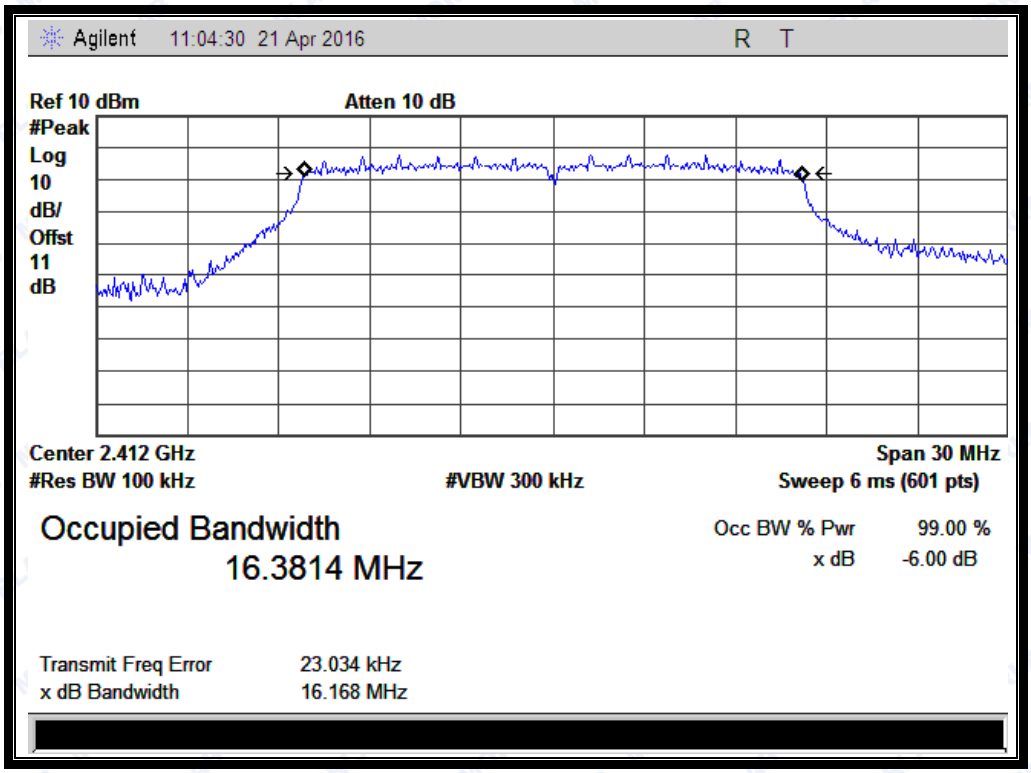
(Channel 11: 2462MHz @ 802.11b)

2.3.3.2 802.11g Test mode

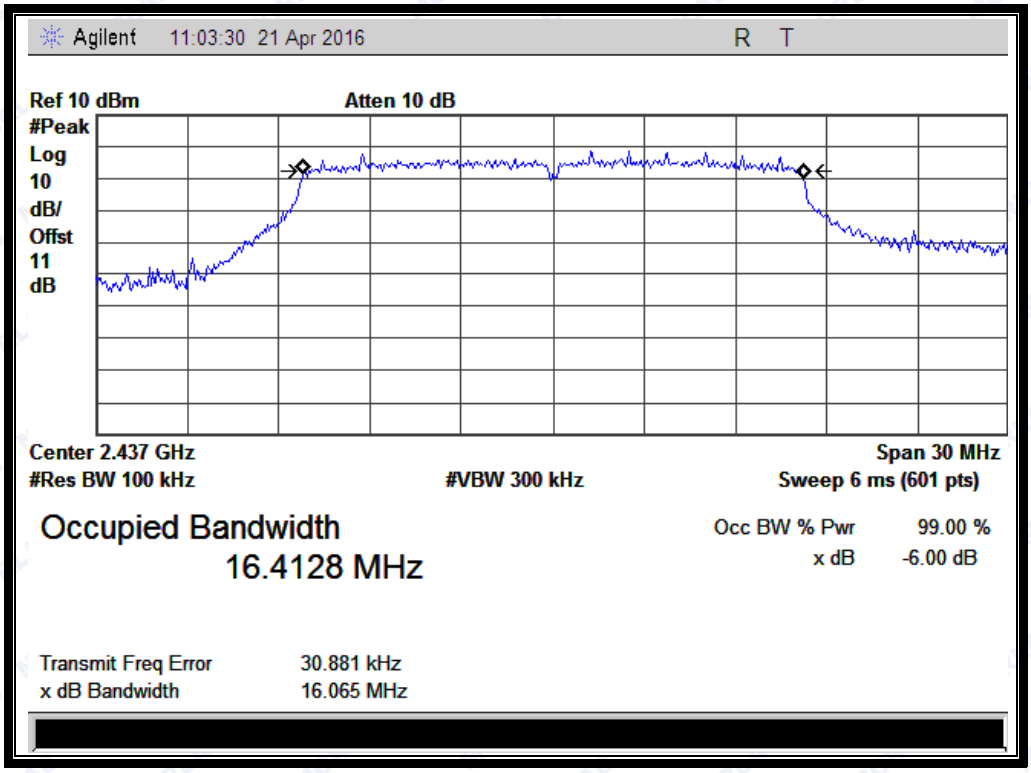
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.168	≥500	PASS
6	2437	16.065	≥500	PASS
11	2462	15.971	≥500	PASS

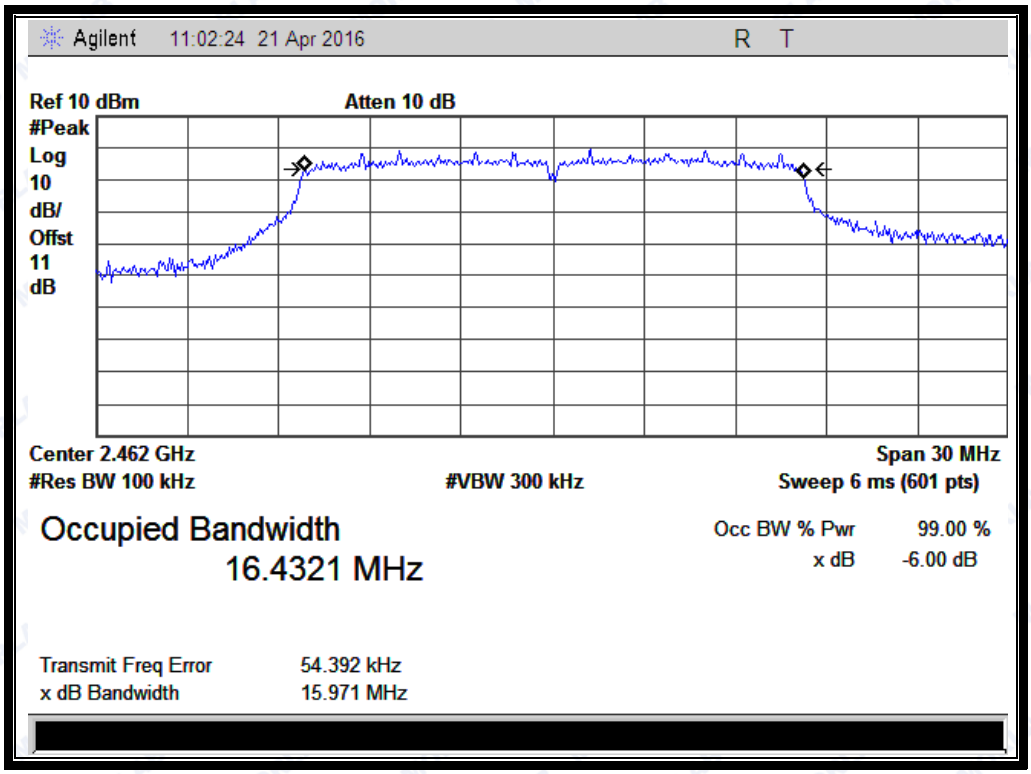
B. Test Plots:



(Channel 1: 2412MHz @ 802.11g)



(Channel 6: 2437MHz @ 802.11g)



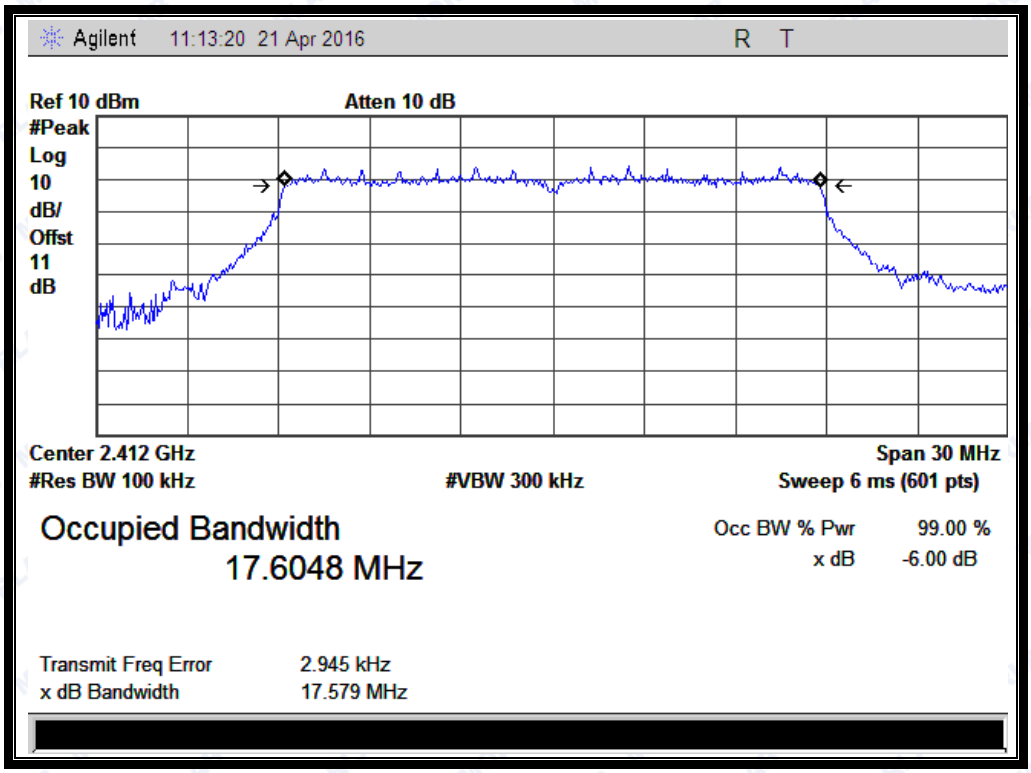
(Channel 11: 2462MHz @ 802.11g)

2.3.3.3 802.11n-20 Test mode

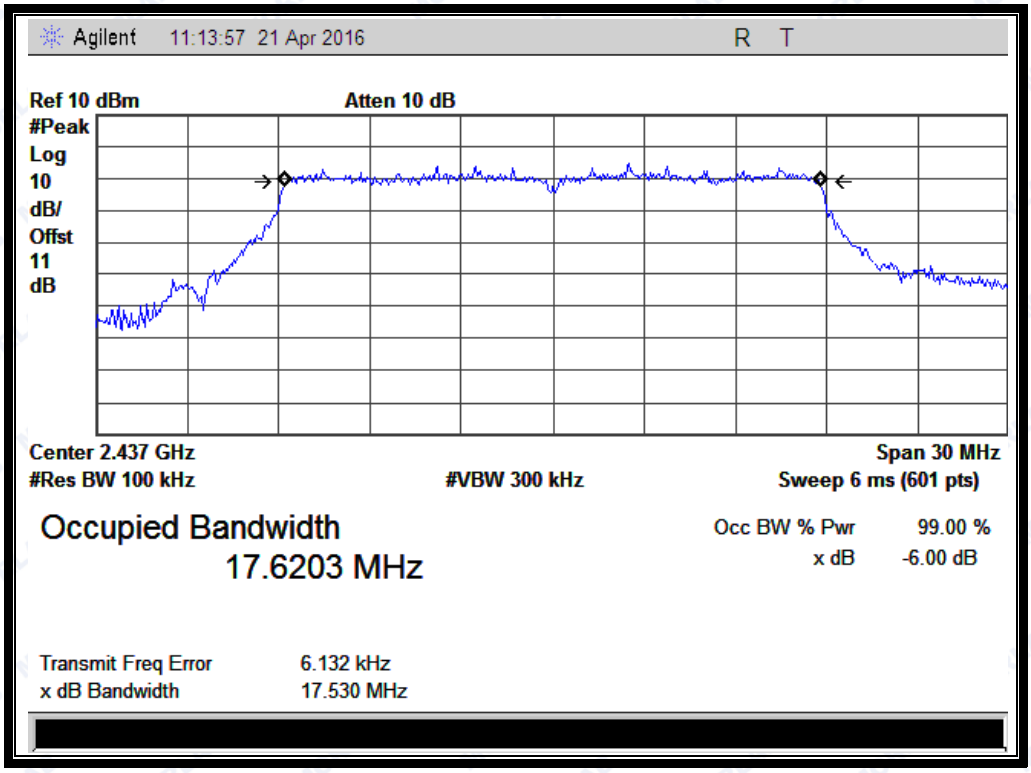
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.579	≥500	PASS
6	2437	17.530	≥500	PASS
11	2462	17.577	≥500	PASS

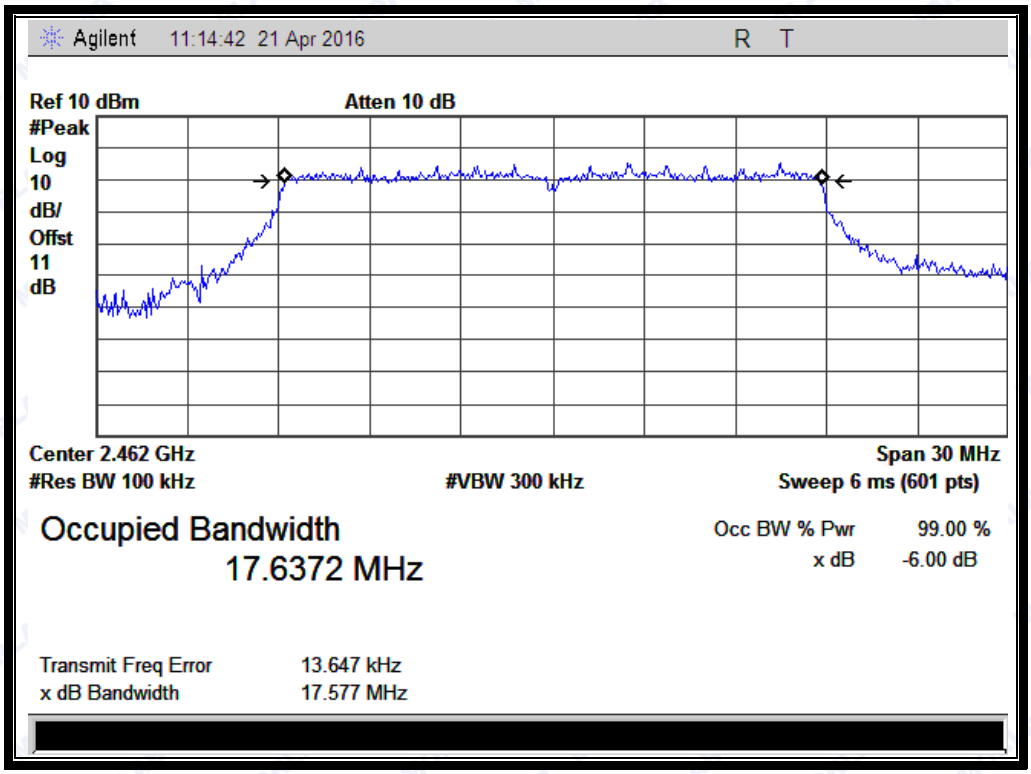
B. Test Plots:



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



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



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

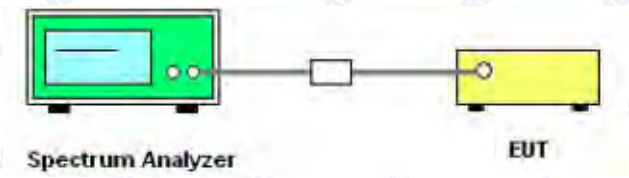
2.4 Conducted Spurious Emissions and Band Edge

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(1.5).

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.

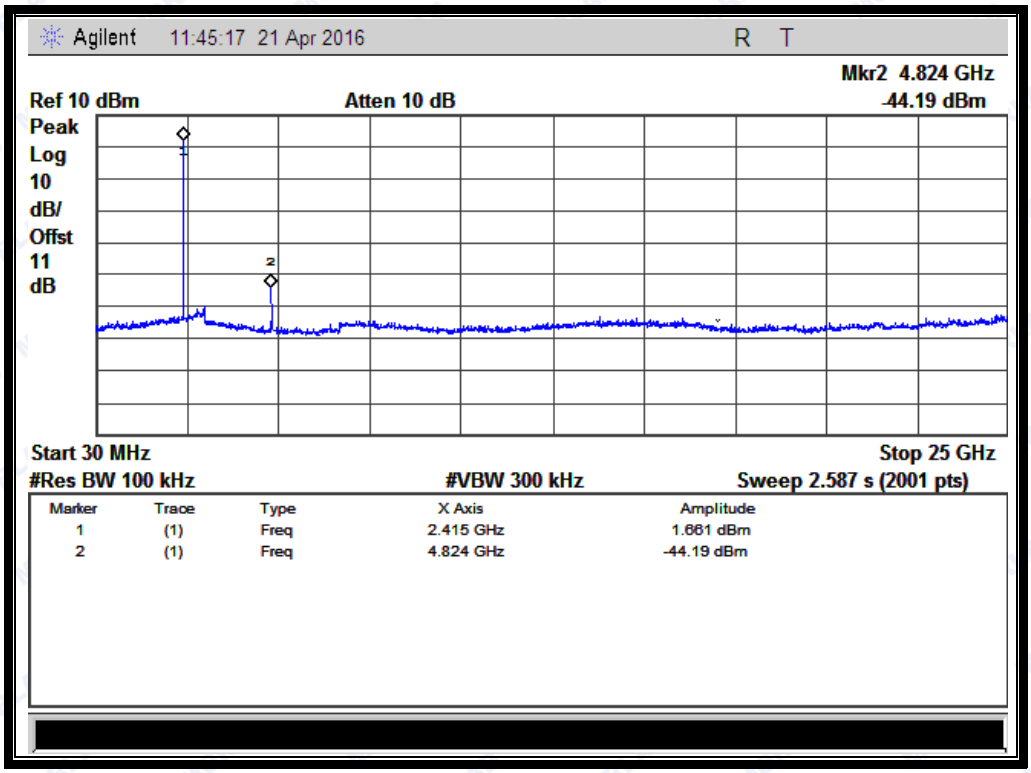
2.4.3.1 802.11b Test mode

A. Test Verdict:

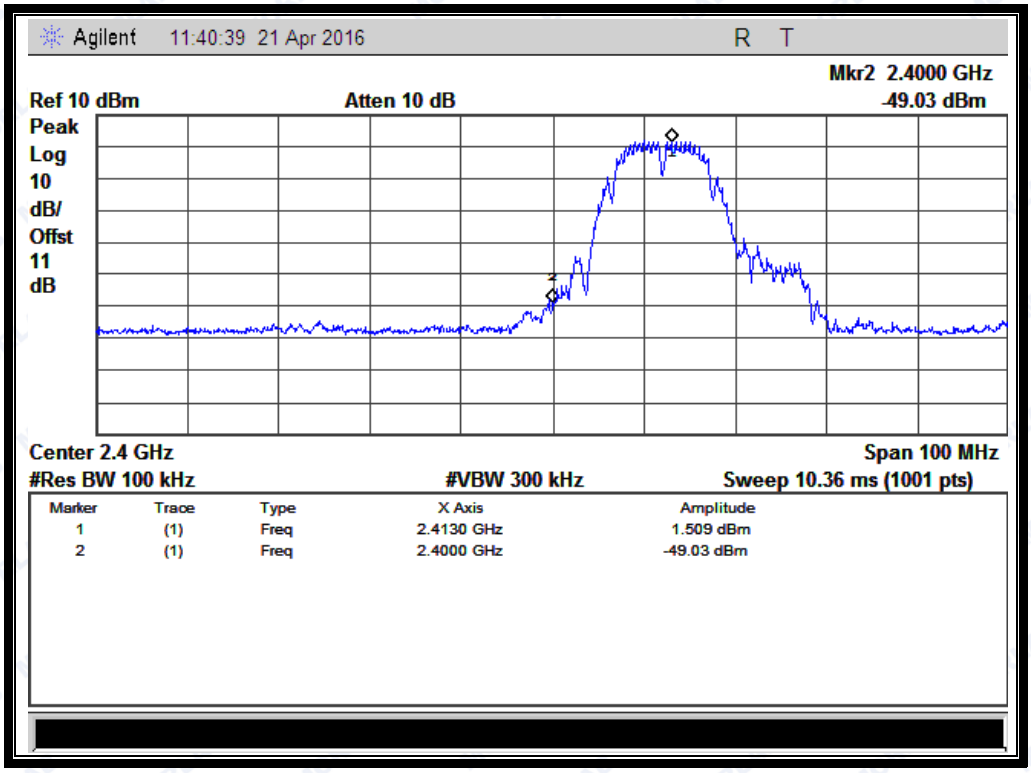
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-44.19	1.66	-18.34	PASS
6	2437	-43.78	1.71	-18.29	PASS
11	2462	-43.52	2.03	-17.97	PASS

B. Test Plots:

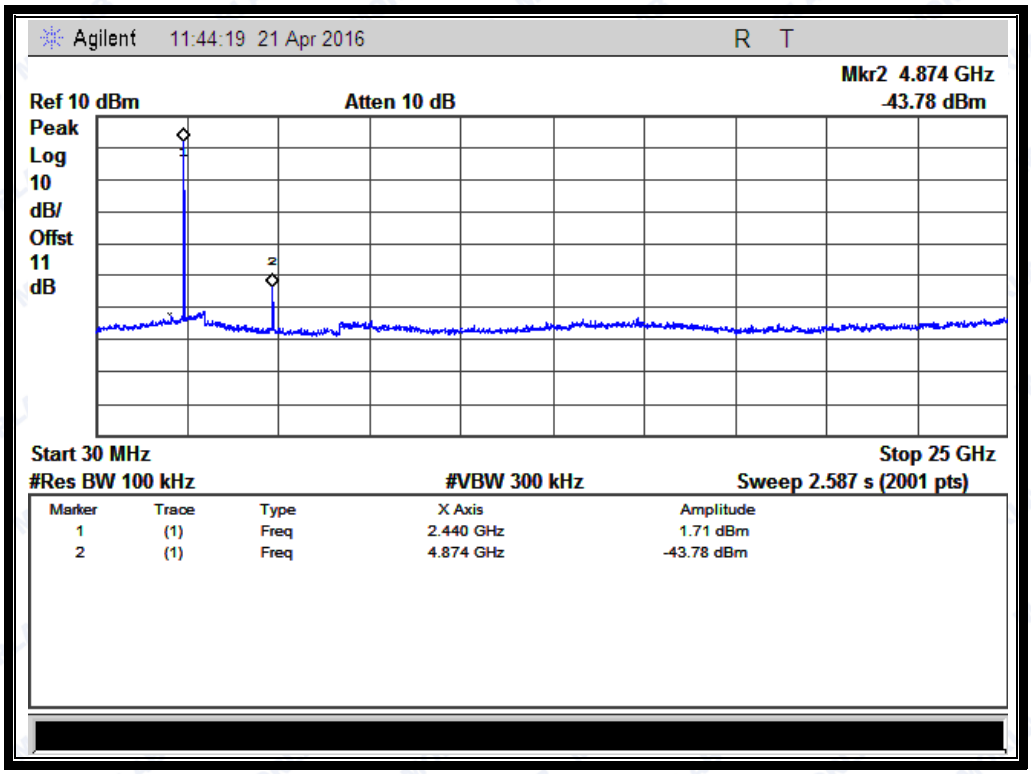
Note: the power of the Module transmitting frequency should be ignored.



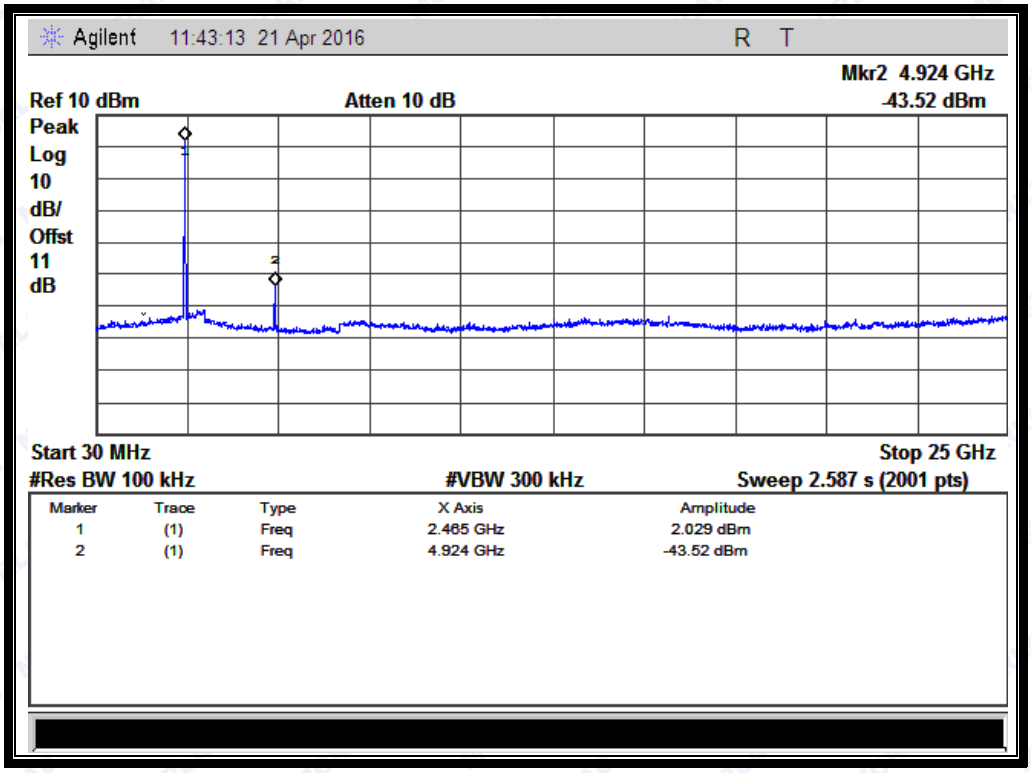
(Channel = 1, 30MHz to 25GHz)



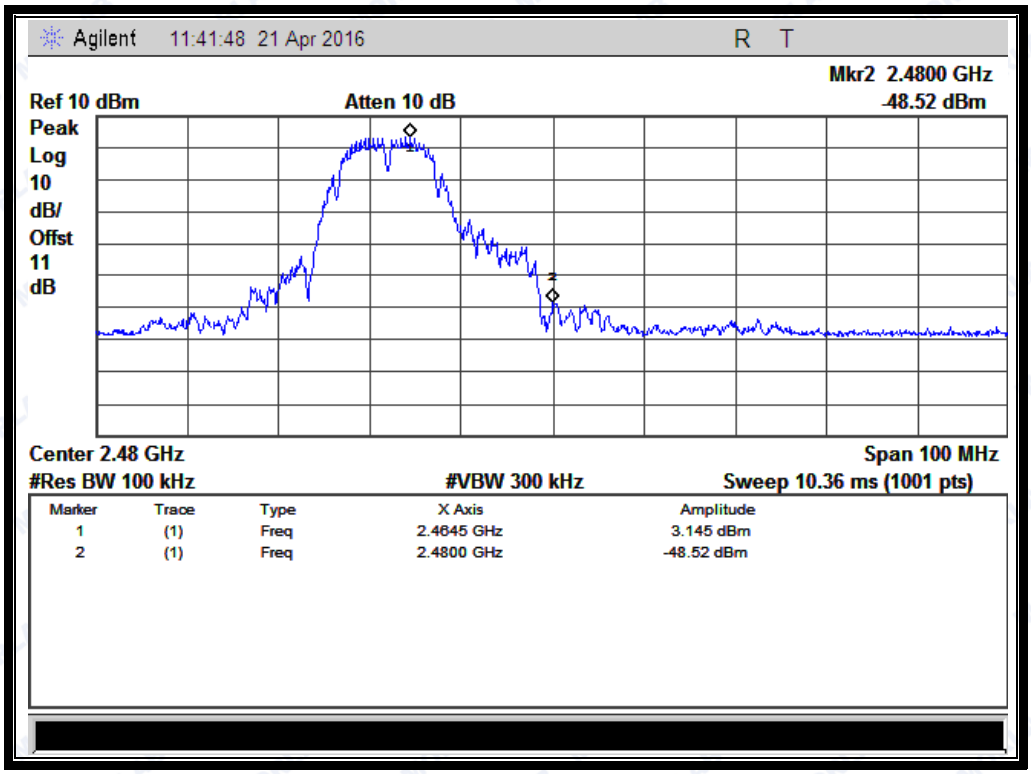
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

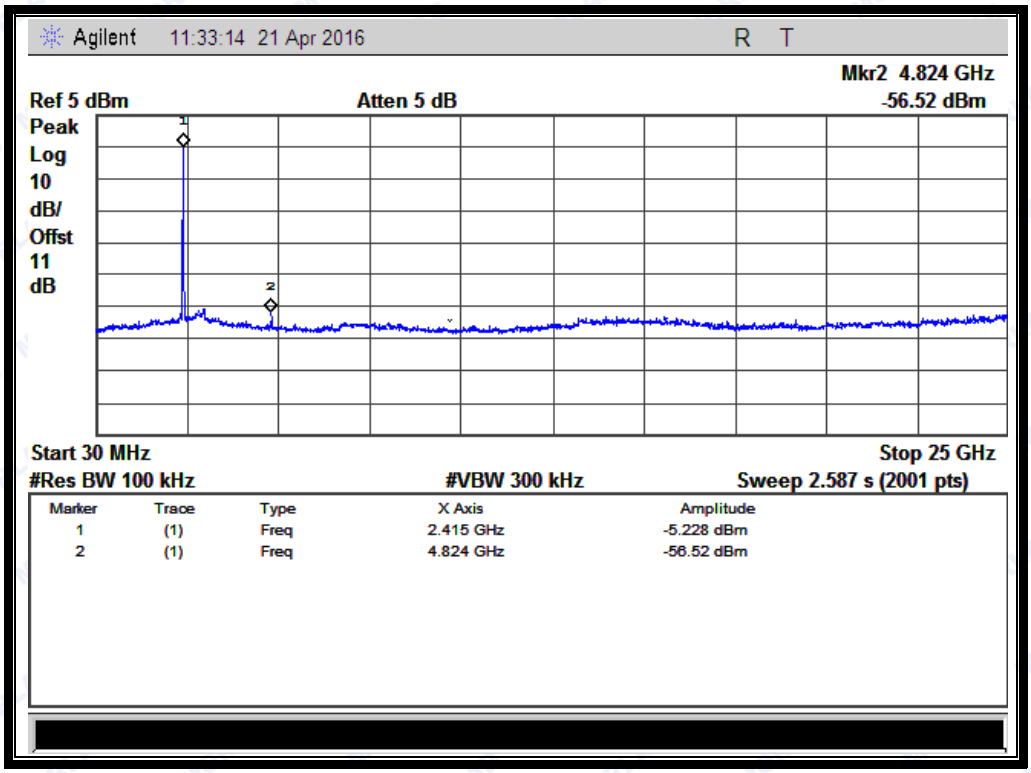
2.4.3.2 802.11g Test mode

A. Test Verdict:

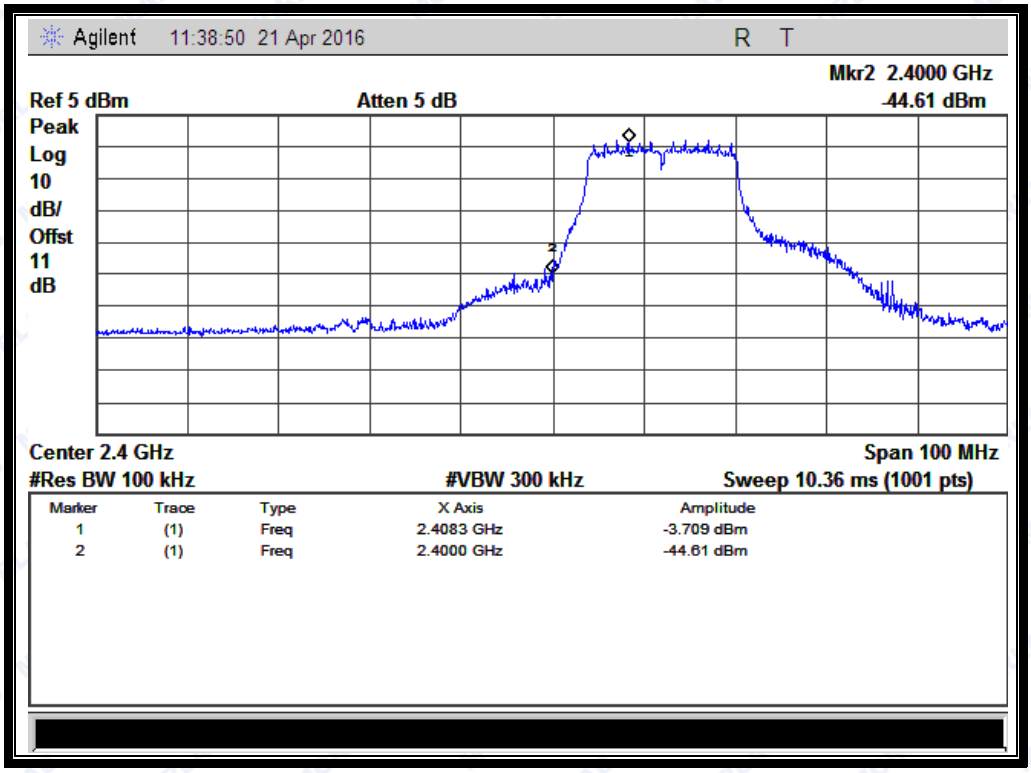
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-56.52	-5.23	-25.23	PASS
6	2437	-56.55	-3.89	-23.89	PASS
11	2462	-57.46	-2.43	-22.43	PASS

B. Test Plots:

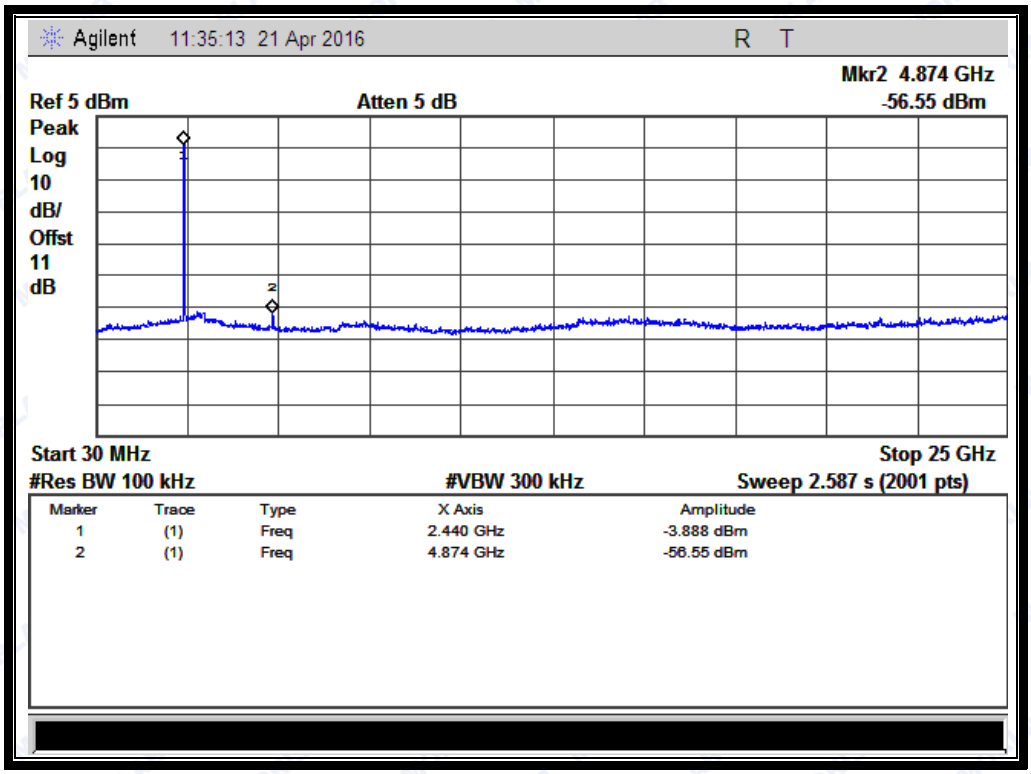
Note: the power of the Module transmitting frequency should be ignored.



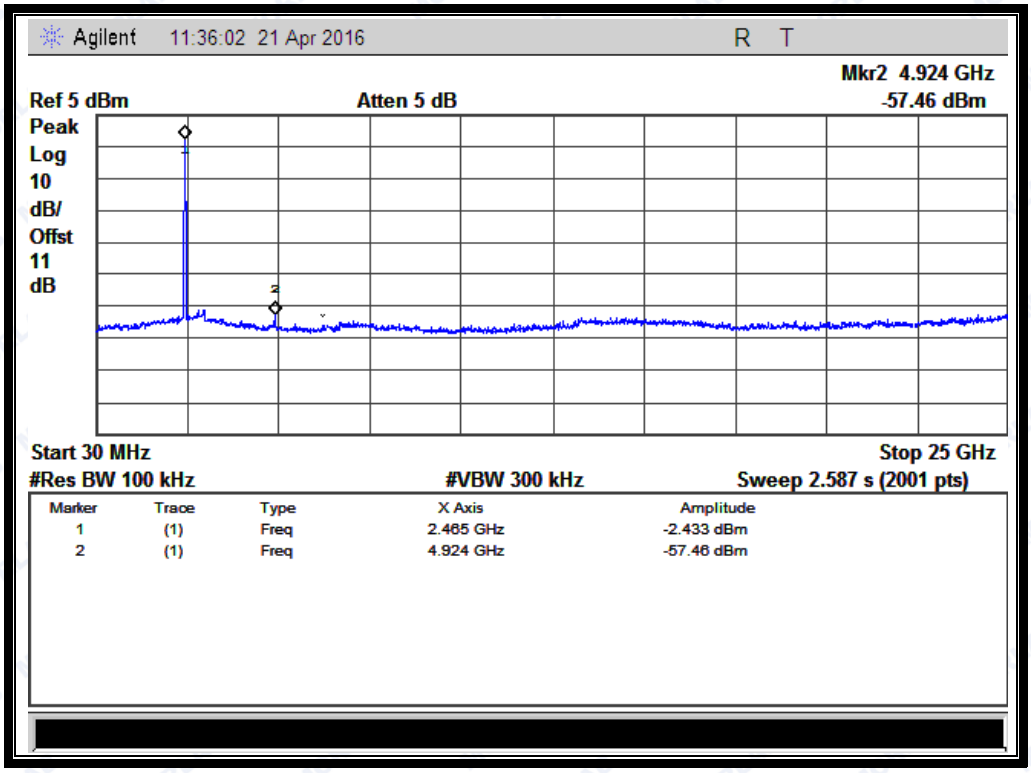
(Channel = 1, 30MHz to 25GHz)



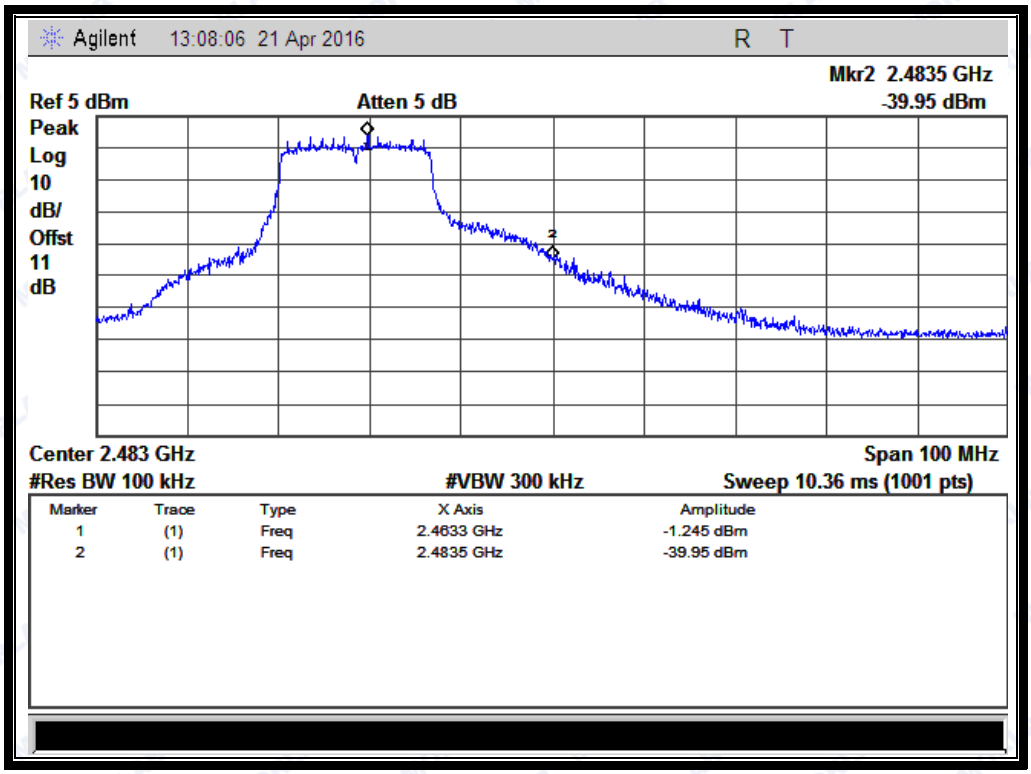
(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

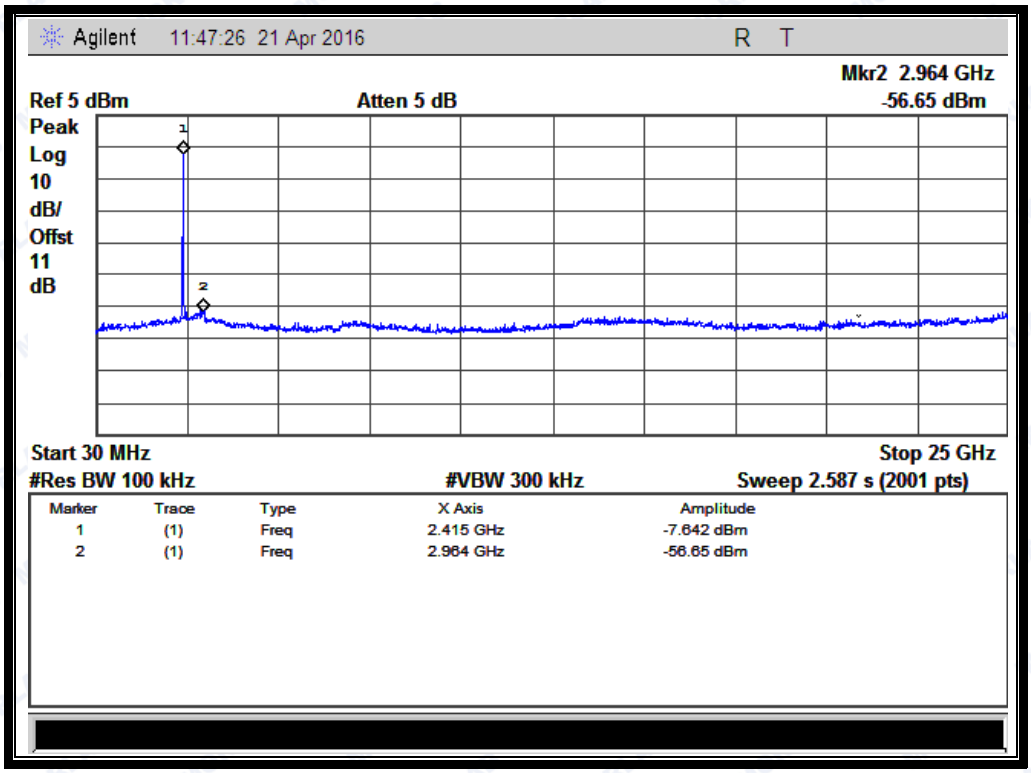
2.4.3.3 802.11n -20MHz Test mode

A. Test Verdict:

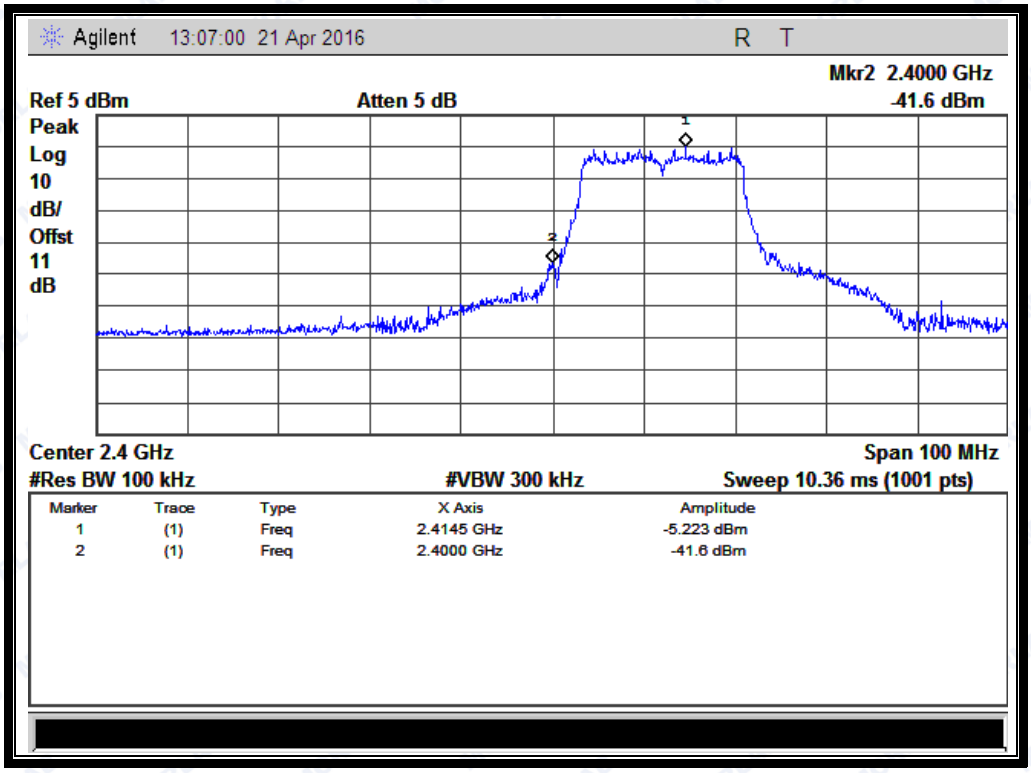
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-56.65	-7.64	-27.64	PASS
6	2437	-59.65	-8.24	-28.24	PASS
11	2462	-56.18	-5.95	-25.95	PASS

B. Test Plots:

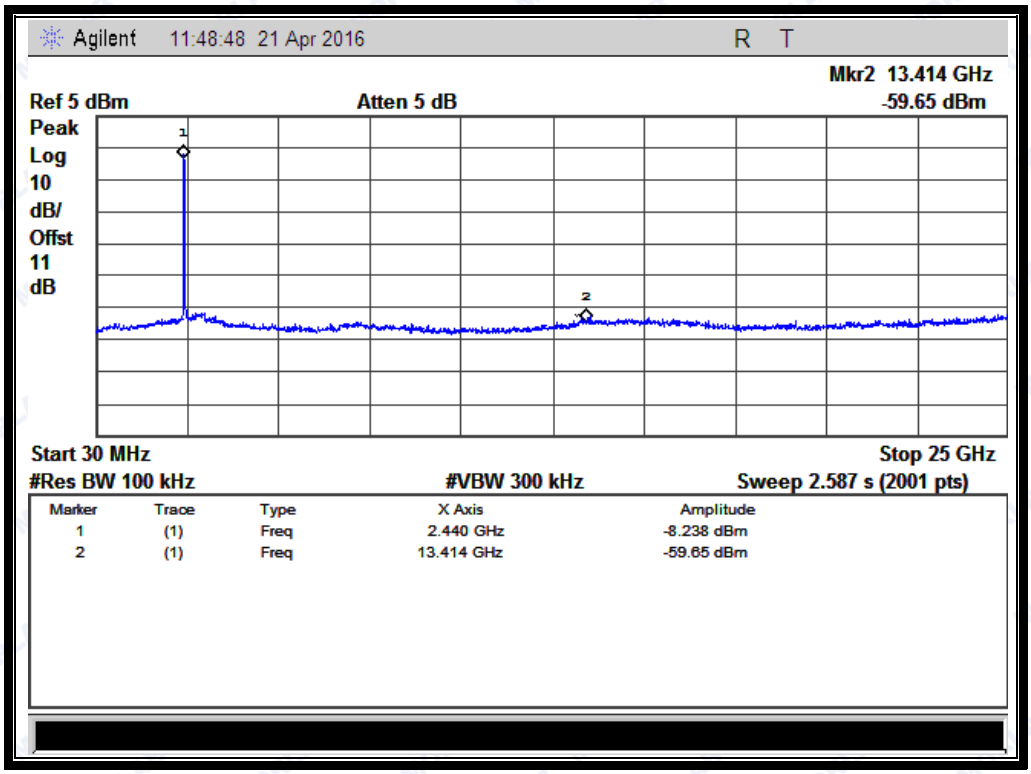
Note: the power of the Module transmitting frequency should be ignored.



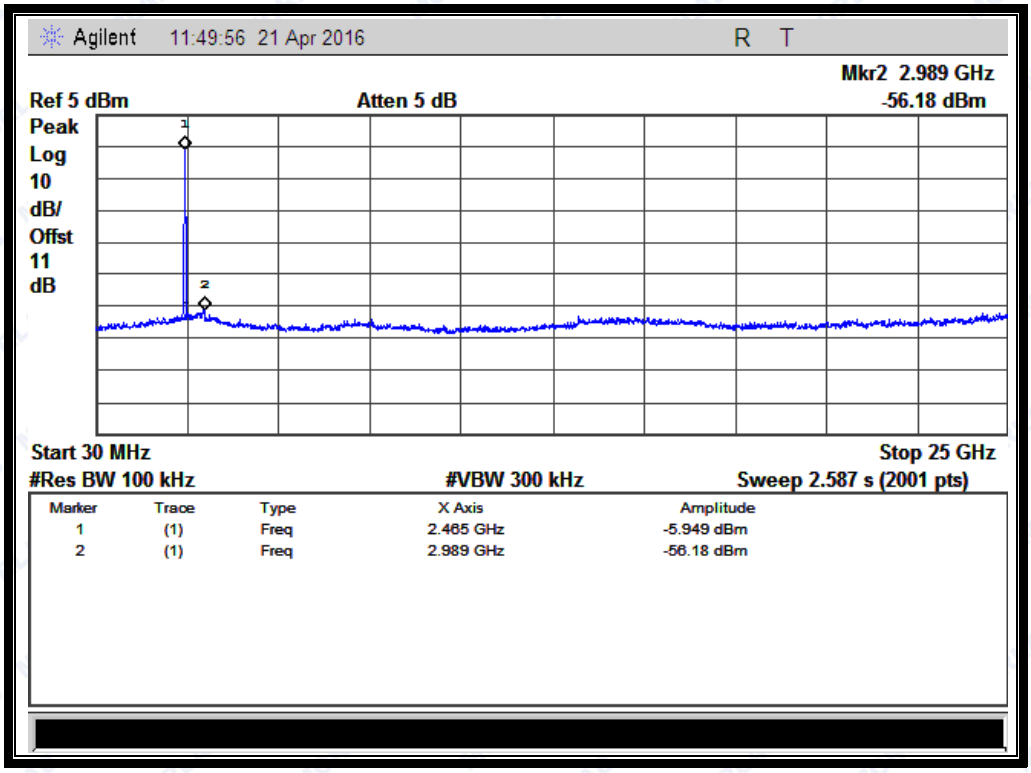
(Channel = 1, 30MHz to 25GHz)



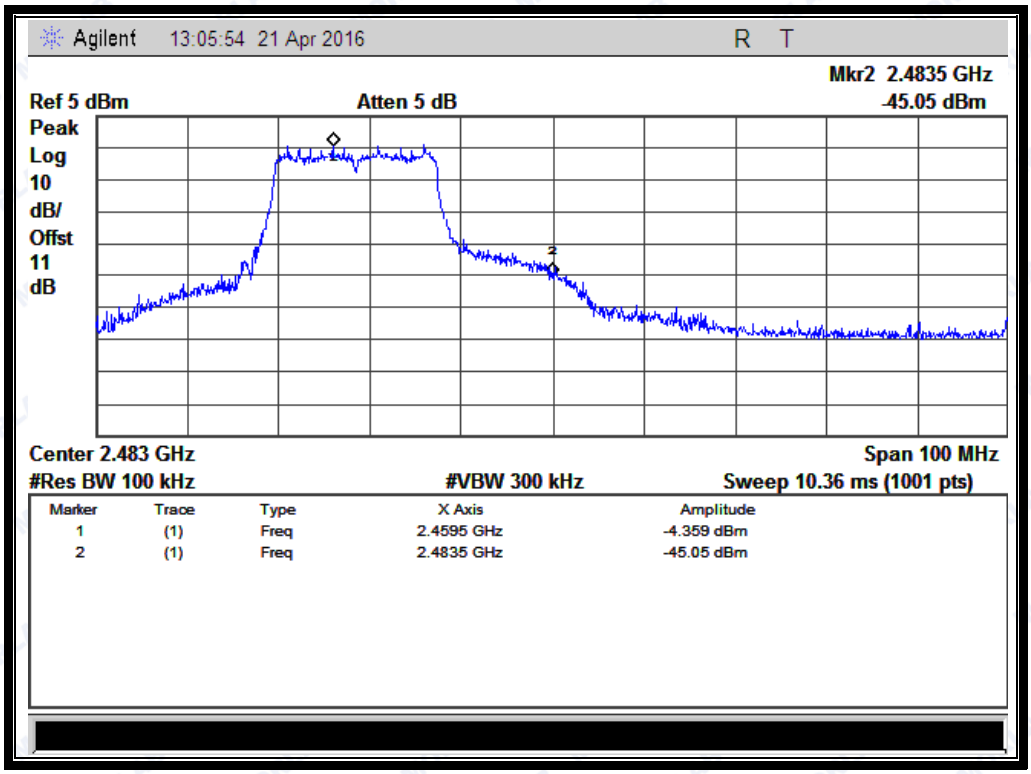
(Band Edge @ Channel = 1)



(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.

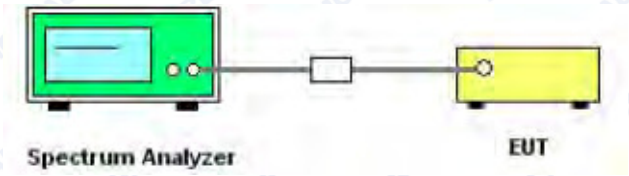
2.5.2 Test Description

A. Test 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 30MHz
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).

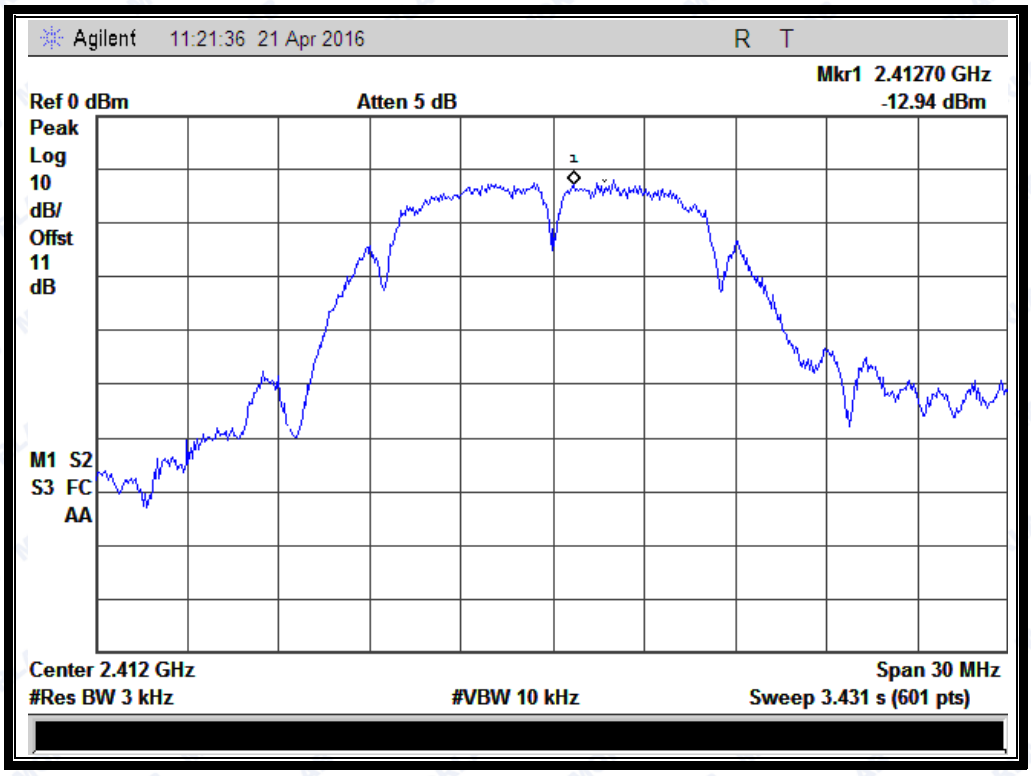
2.5.3 Test Result

2.5.3.1 802.11b Test mode

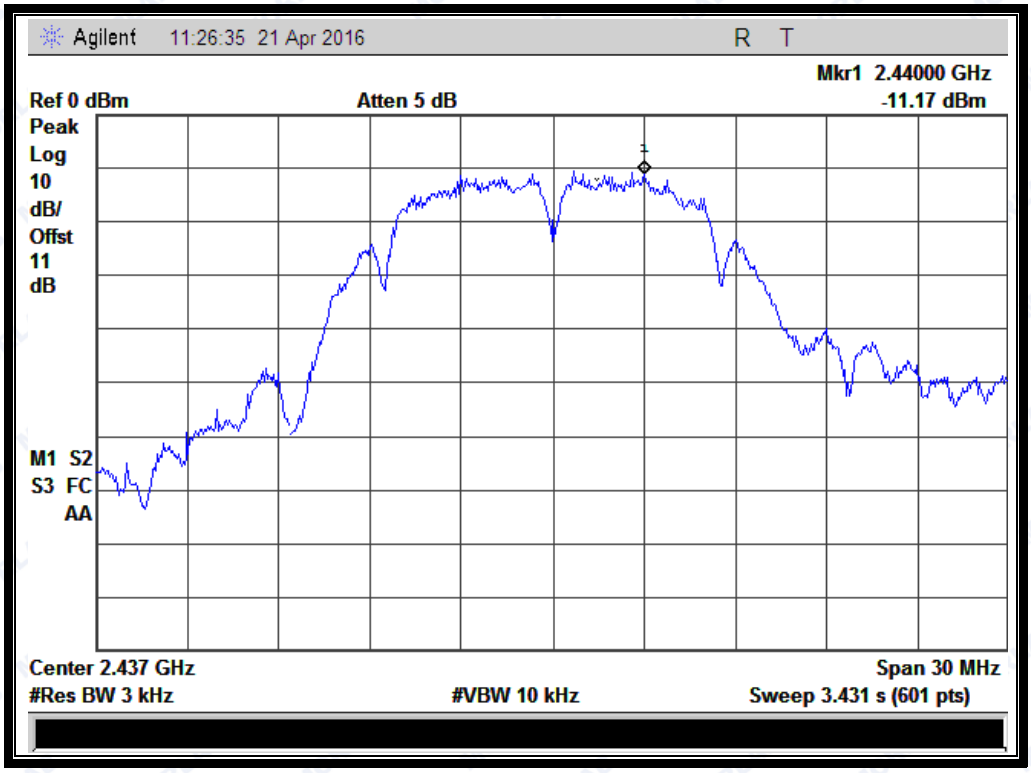
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-12.94	8	PASS
6	2437	-11.17	8	PASS
11	2462	-9.12	8	PASS
Measurement uncertainty: ±1.3dB				

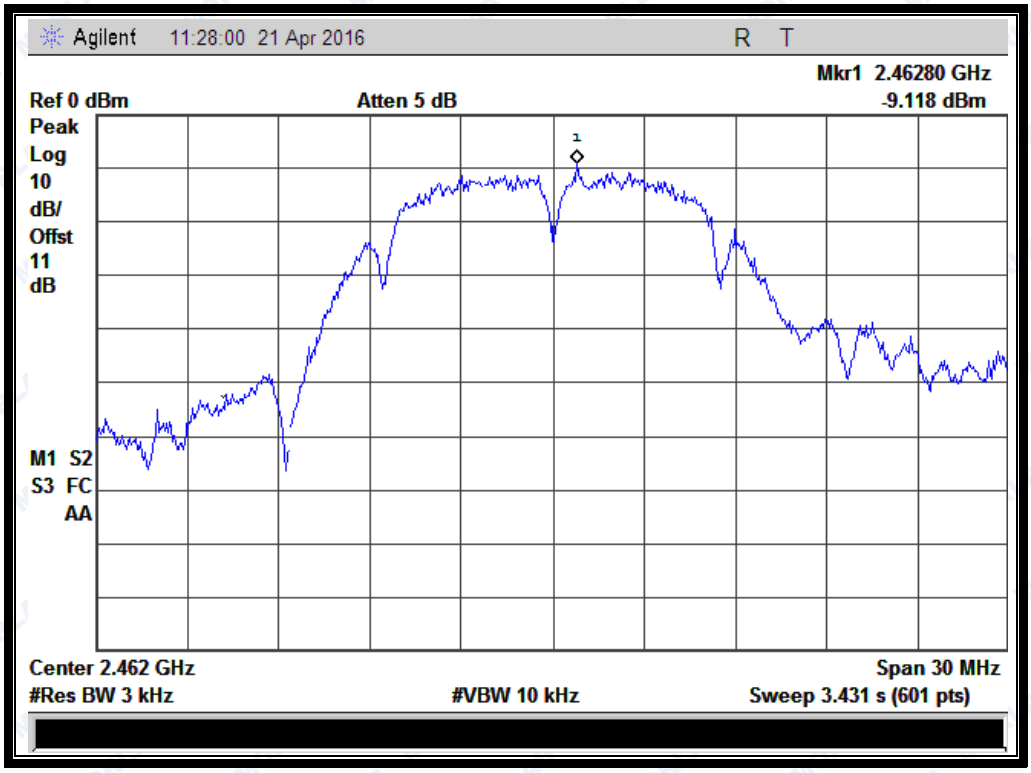
B. Test Plots:



(Channel = 1 @ 802.11b)



(Channel = 6 @ 802.11b)



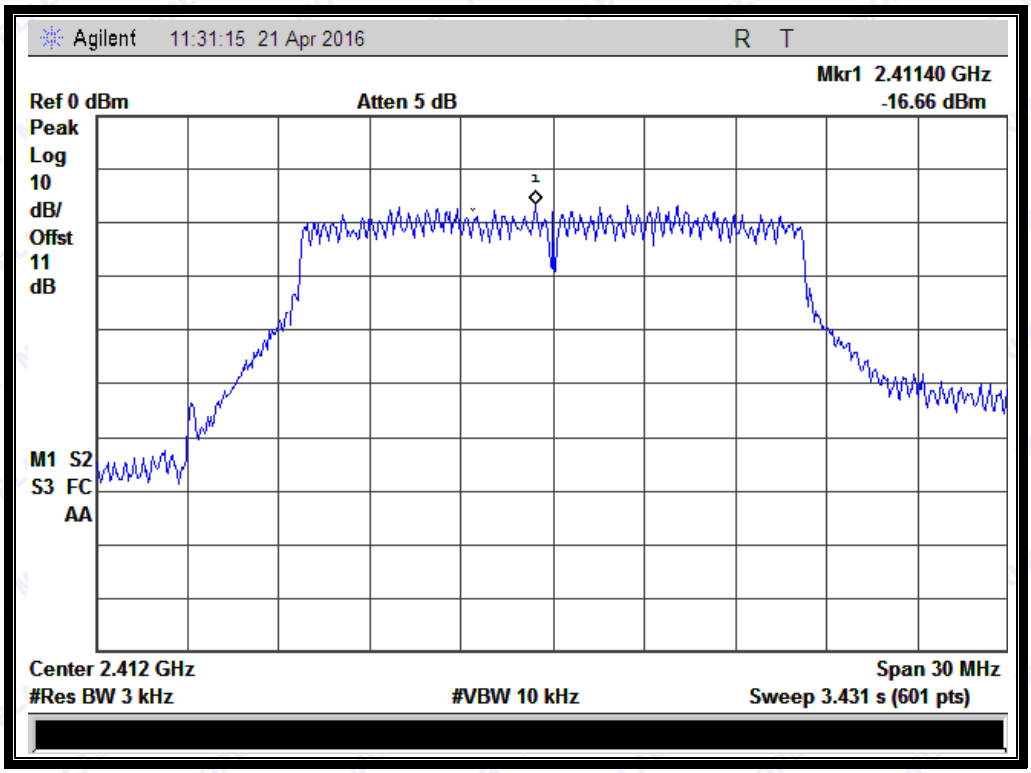
(Channel = 11 @ 802.11b)

2.5.3.2 802.11g Test mode

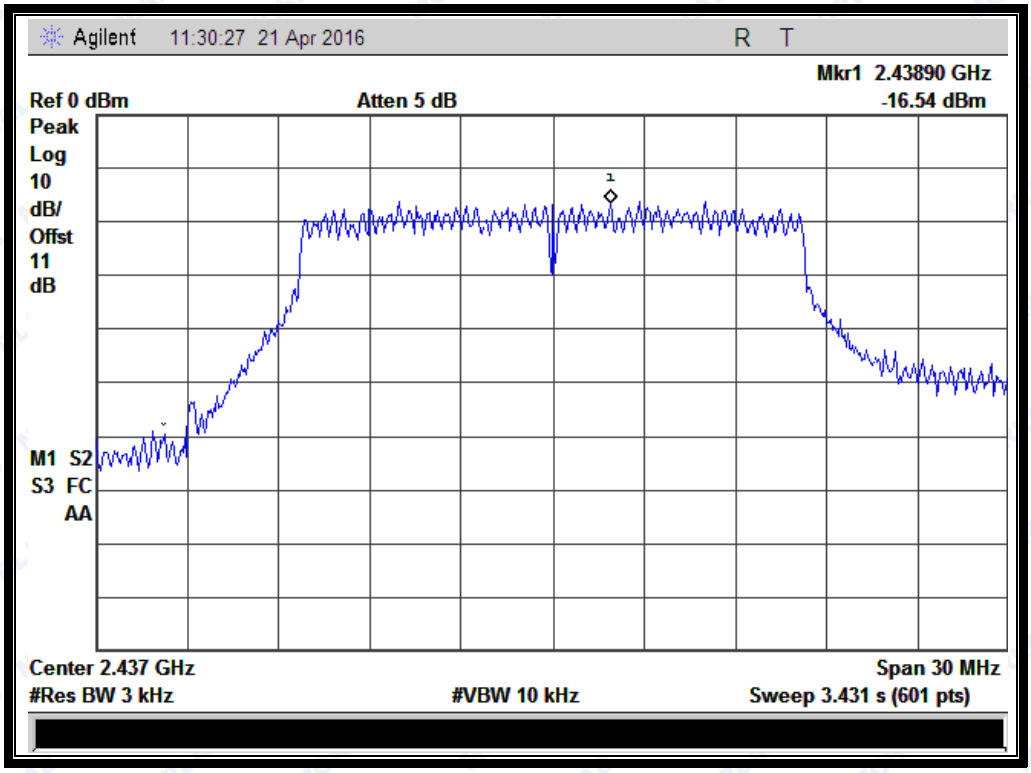
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-16.66	8	PASS
6	2437	-16.54	8	PASS
11	2462	-14.98	8	PASS
Measurement uncertainty: ±1.3dB				

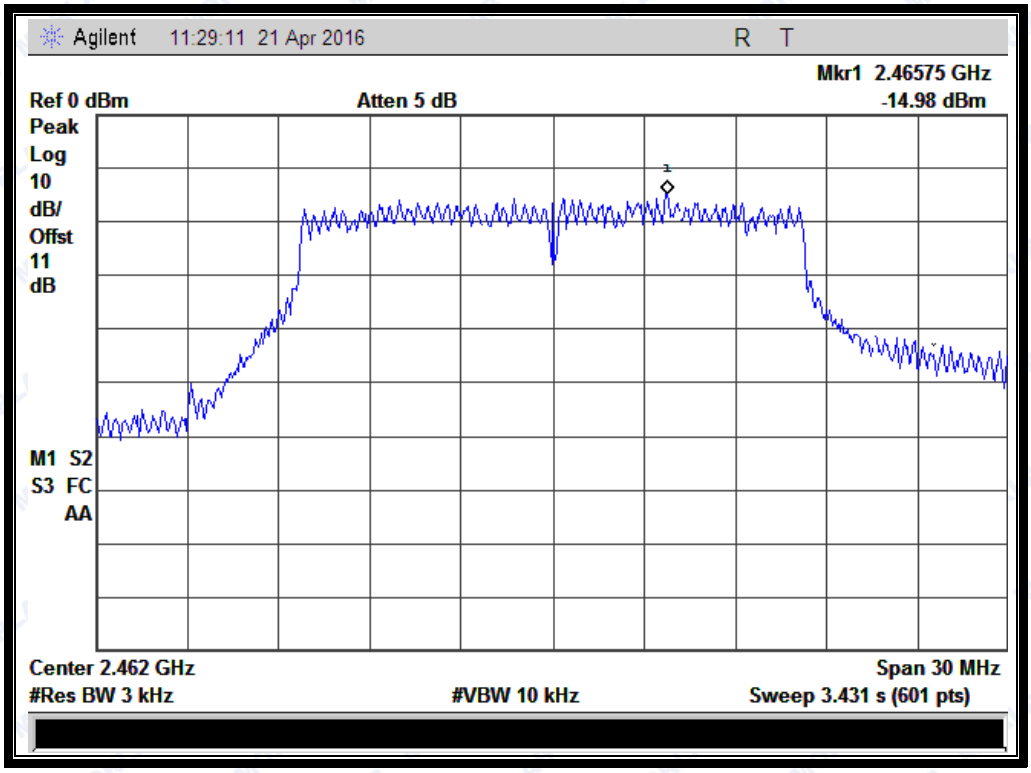
B. Test Plots:



(Channel = 1 @ 802.11g)



(Channel = 6 @ 802.11g)



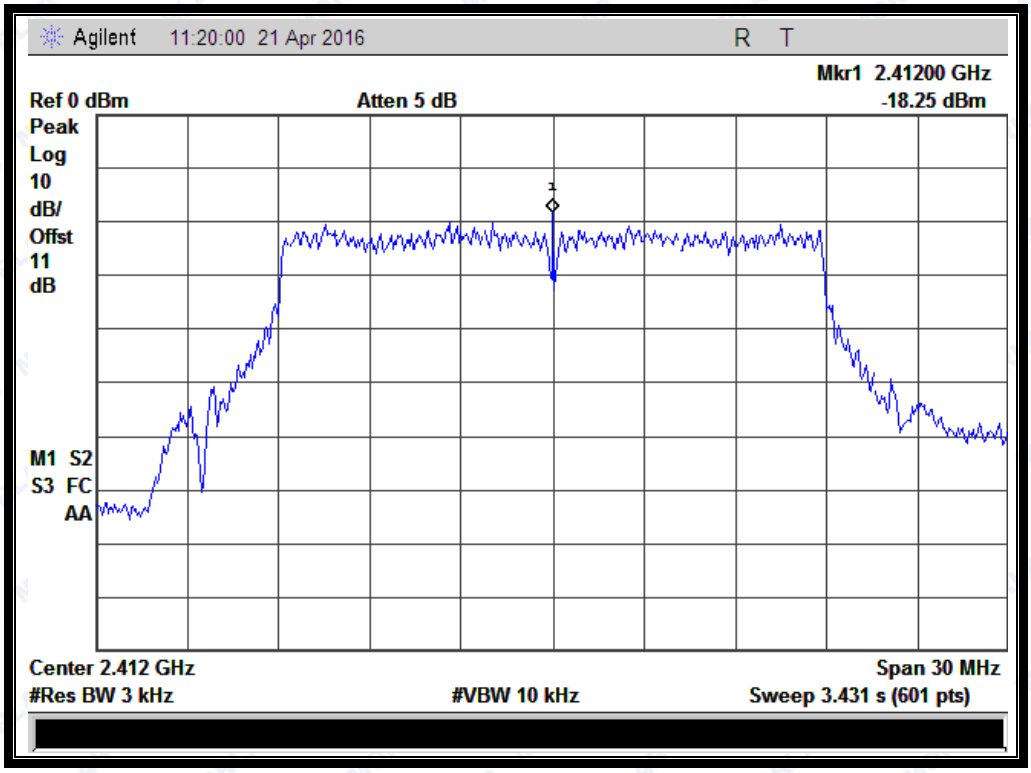
(Channel = 11 @ 802.11g)

2.5.3.3 802.11n-20MHz Test mode

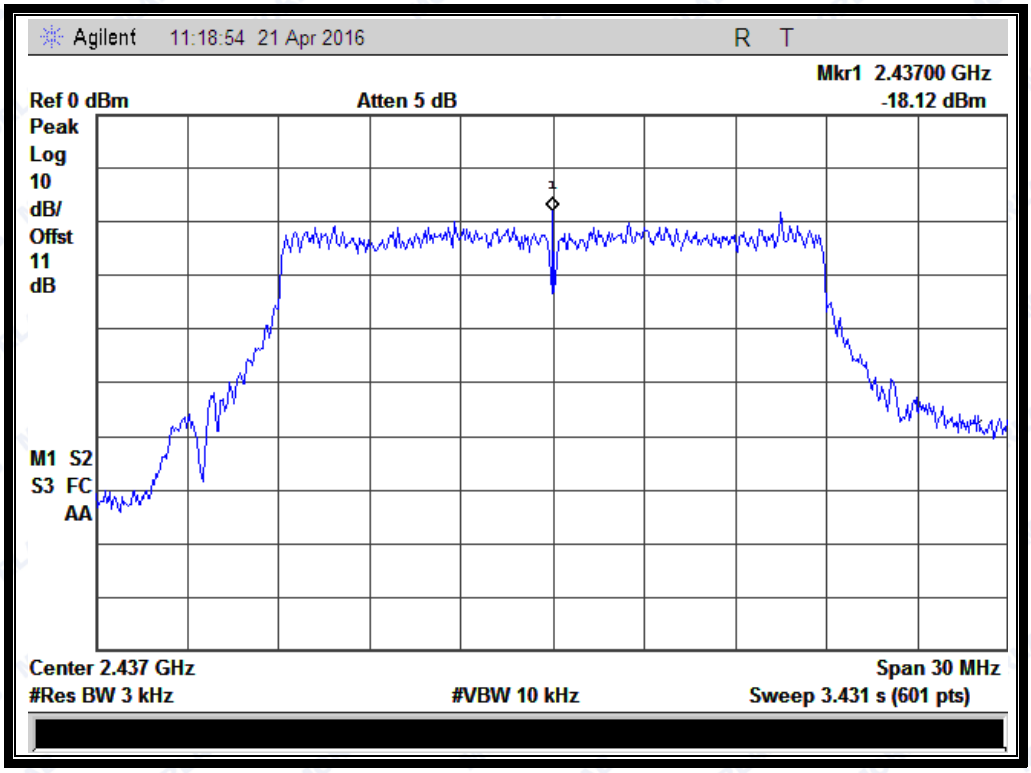
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-18.25	8	PASS
6	2437	-18.12	8	PASS
11	2462	-17.36	8	PASS
Measurement uncertainty: ±1.3dB				

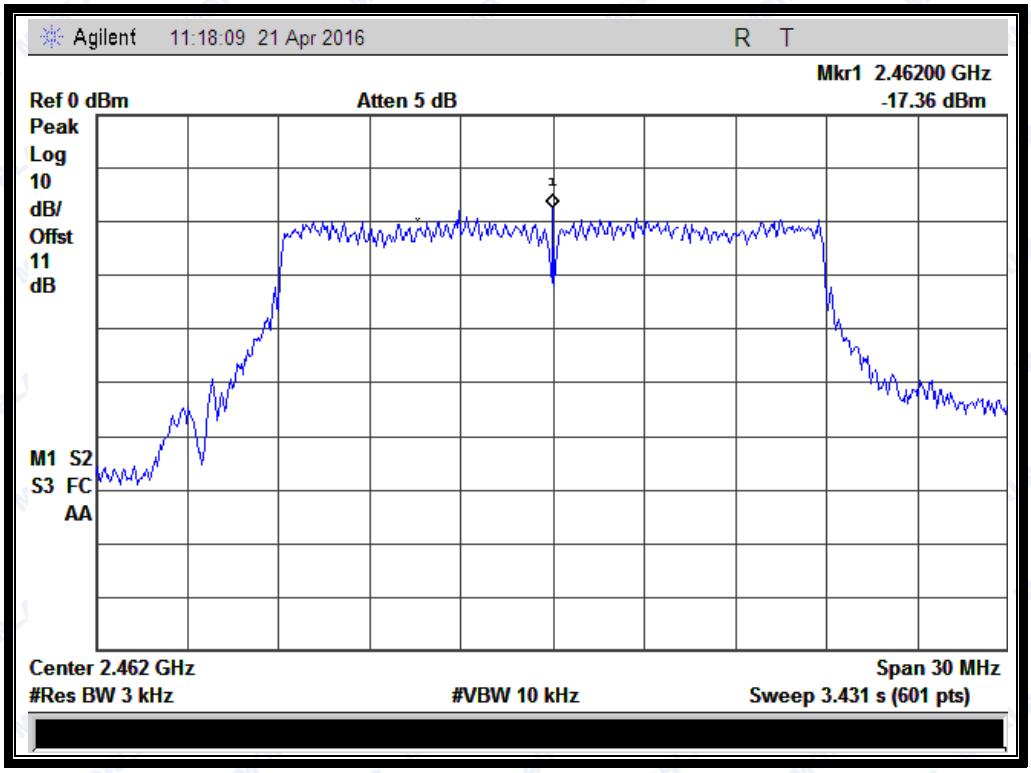
B. Test Plots:



(Channel = 1 @ 802.11n-20MHz)



(Channel = 6 @ 802.11n-20MHz)



(Channel = 11 @ 802.11n-20MHz)

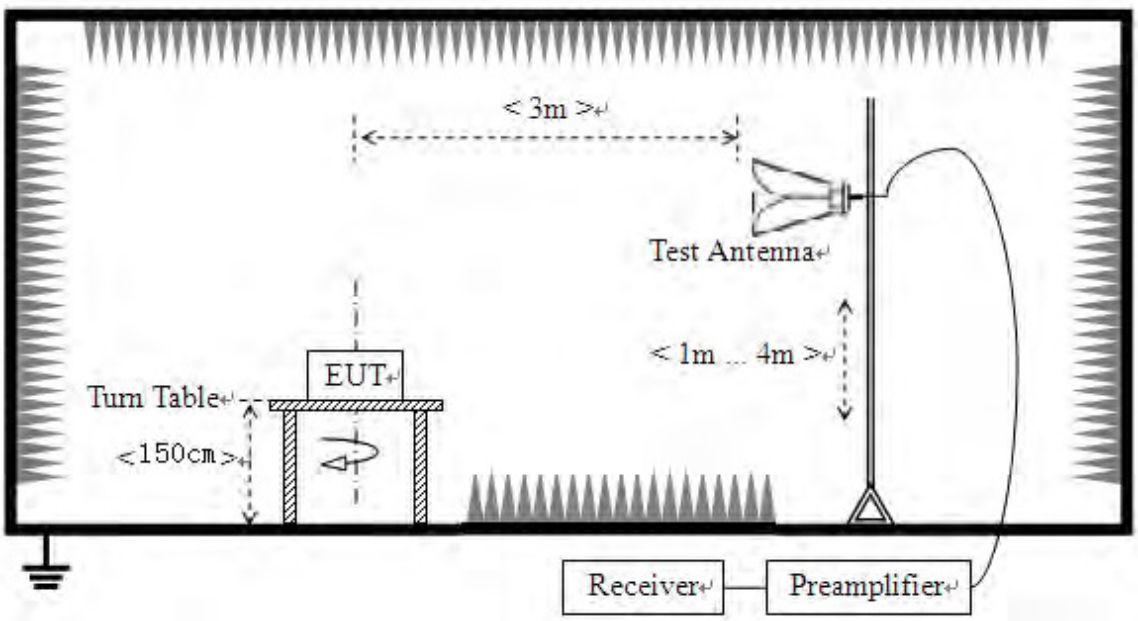
2.6 Restricted Frequency Bands

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(1.5).

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 [dBμV/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.

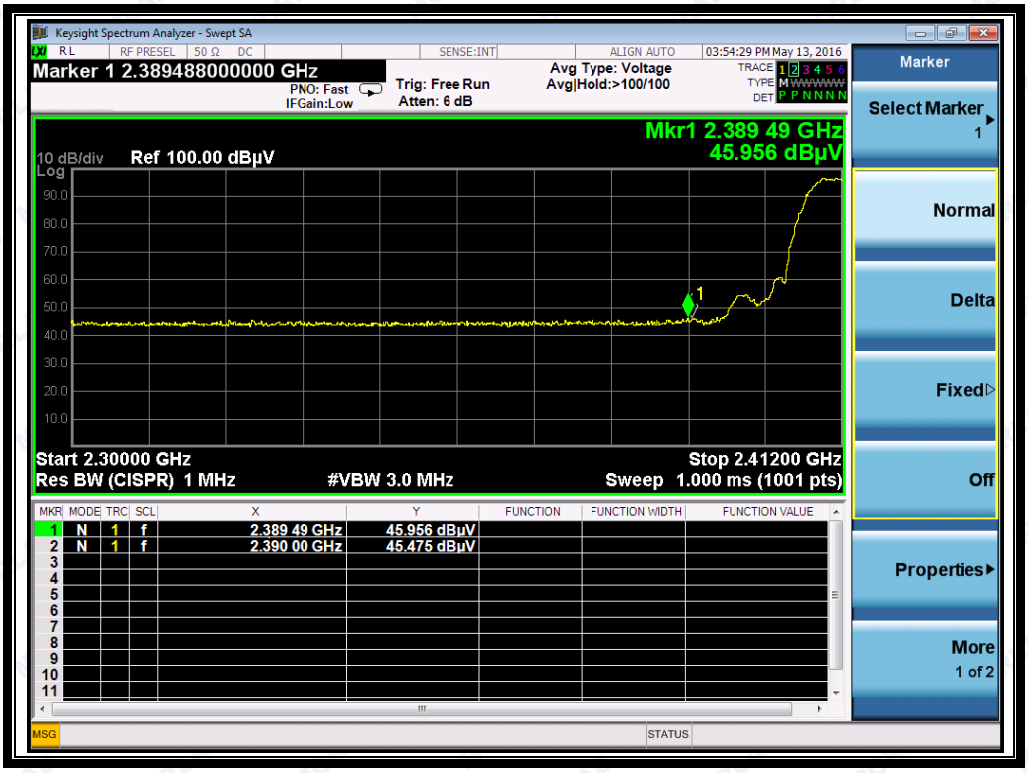
2.6.3.1 802.11b Test mode

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

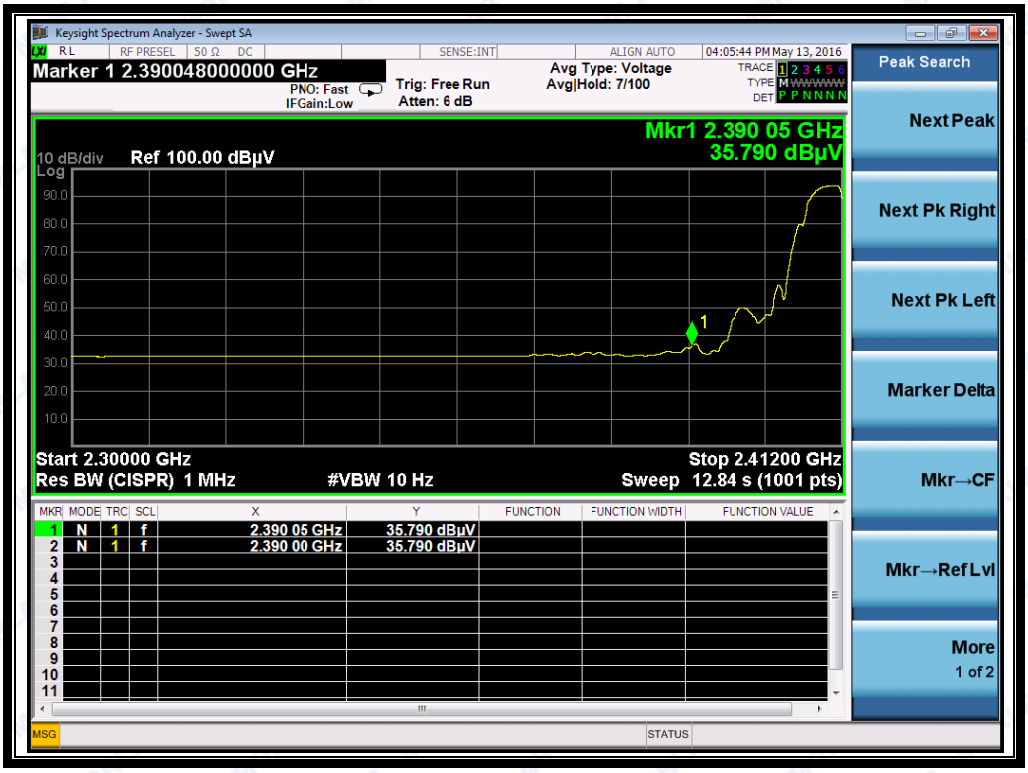
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
1	2389.49	PK	45.96	-33.63	32.56	44.89	74	Pass
1	2390.05	AV	35.79	-33.63	32.56	34.72	54	Pass
11	2483.55	PK	48.01	-33.18	32.5	47.33	74	Pass
11	2483.51	AV	39.78	-33.18	32.5	39.10	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)

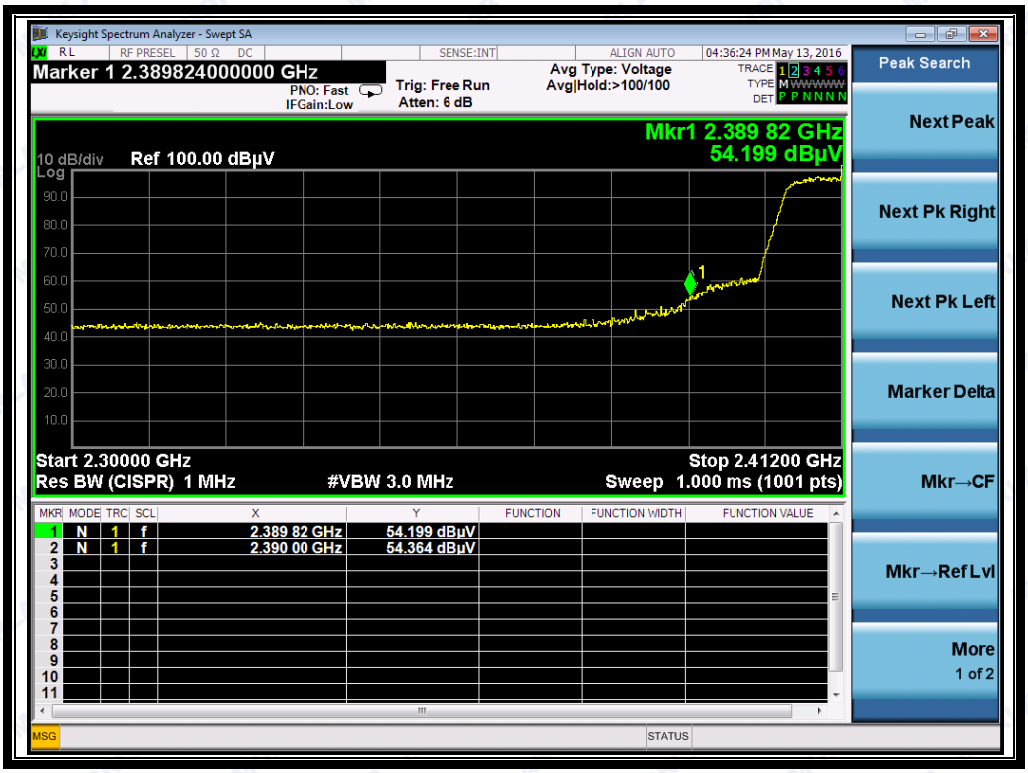
2.6.3.2 802.11g Test mode

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

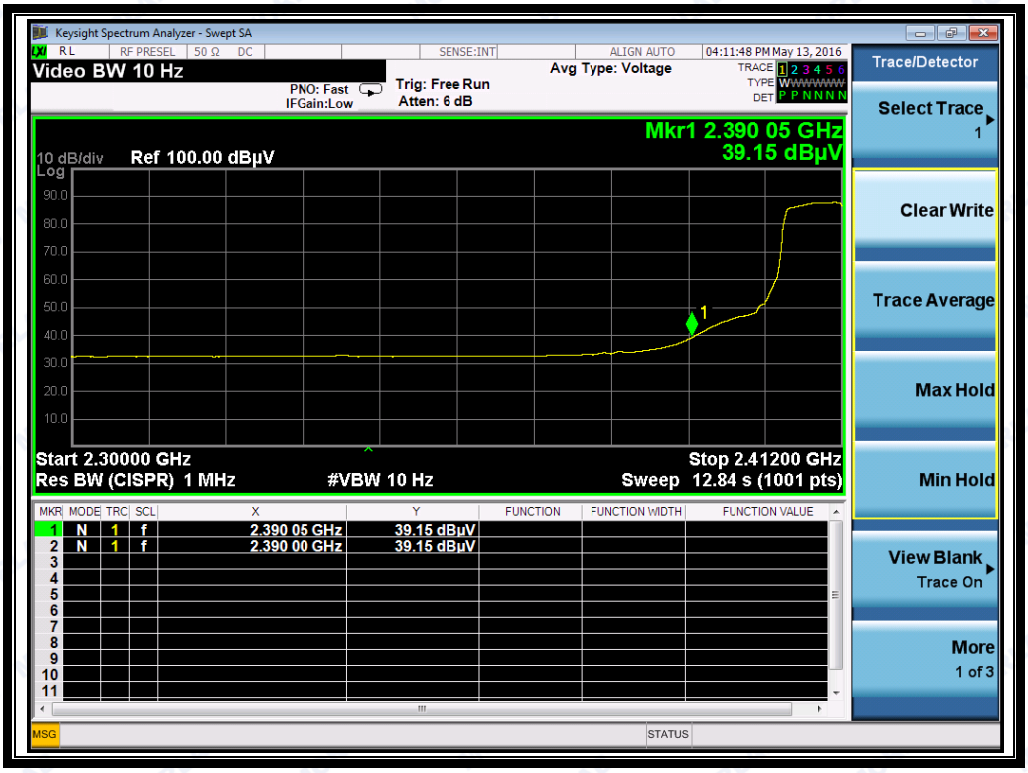
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
1	2389.82	PK	54.20	-33.63	32.56	53.13	74	Pass
1	2390.05	AV	39.15	-33.63	32.56	38.08	54	Pass
11	2483.70	PK	67.62	-33.18	32.5	66.94	74	Pass
11	2483.55	AV	49.39	-33.18	32.5	48.71	54	Pass

B. Test Plots:

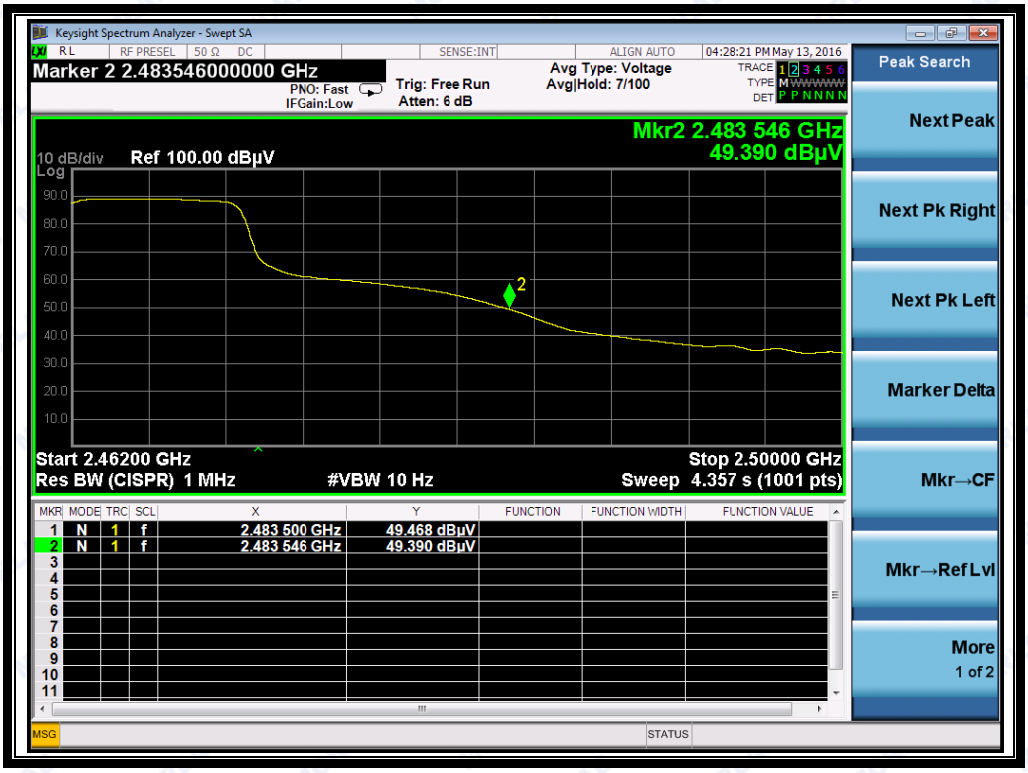


(Plot C1: Channel = 1 PEAK @ 802.11g)



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

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



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

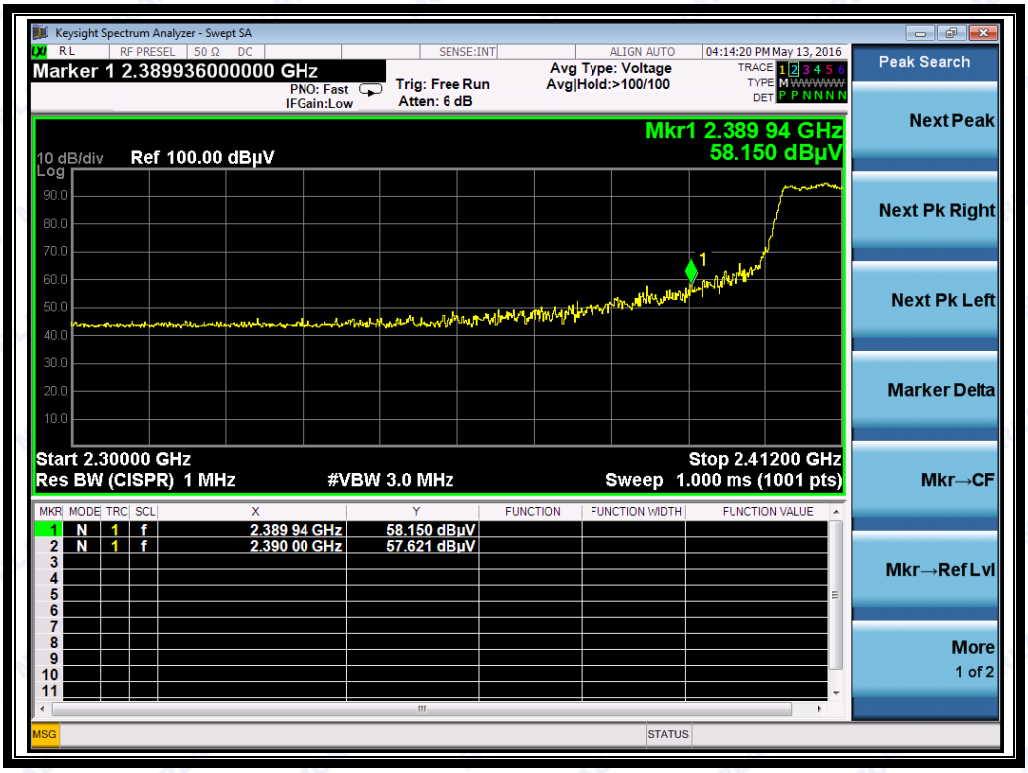
2.6.3.3 802.11n-20MHz Test mode

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

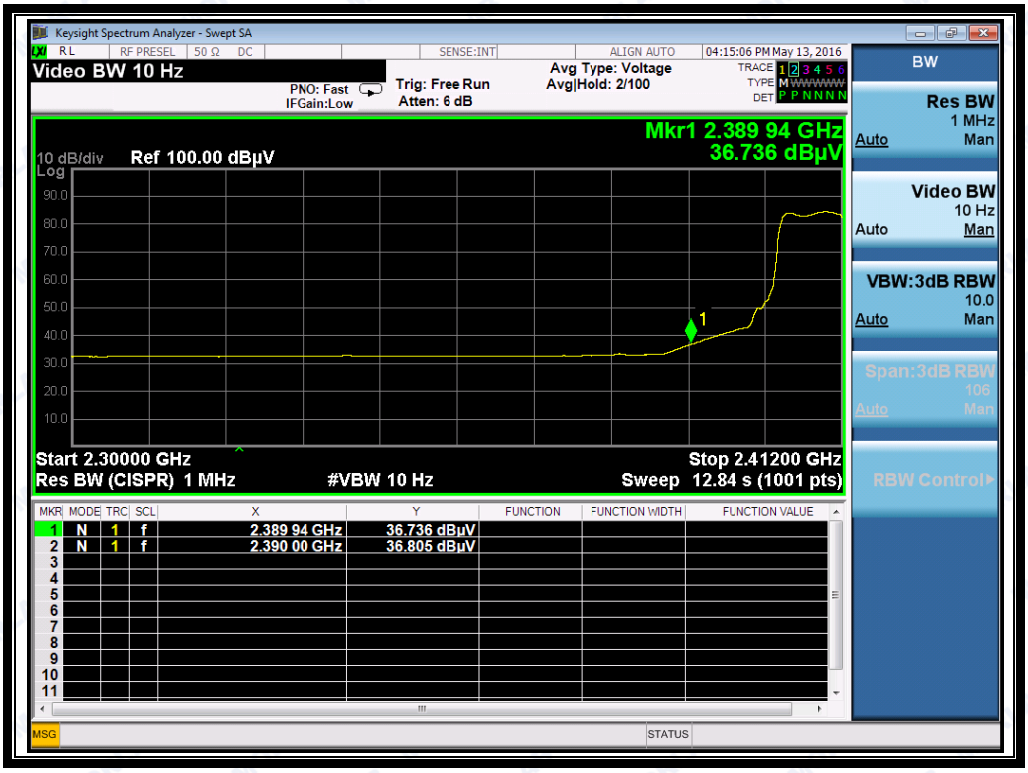
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
1	2389.94	PK	58.15	-33.63	32.56	57.08	74	Pass
1	2389.94	AV	36.74	-33.63	32.56	35.67	54	Pass
11	2483.77	PK	61.67	-33.18	32.5	60.99	74	Pass
11	2483.51	AV	44.70	-33.18	32.5	44.02	54	Pass

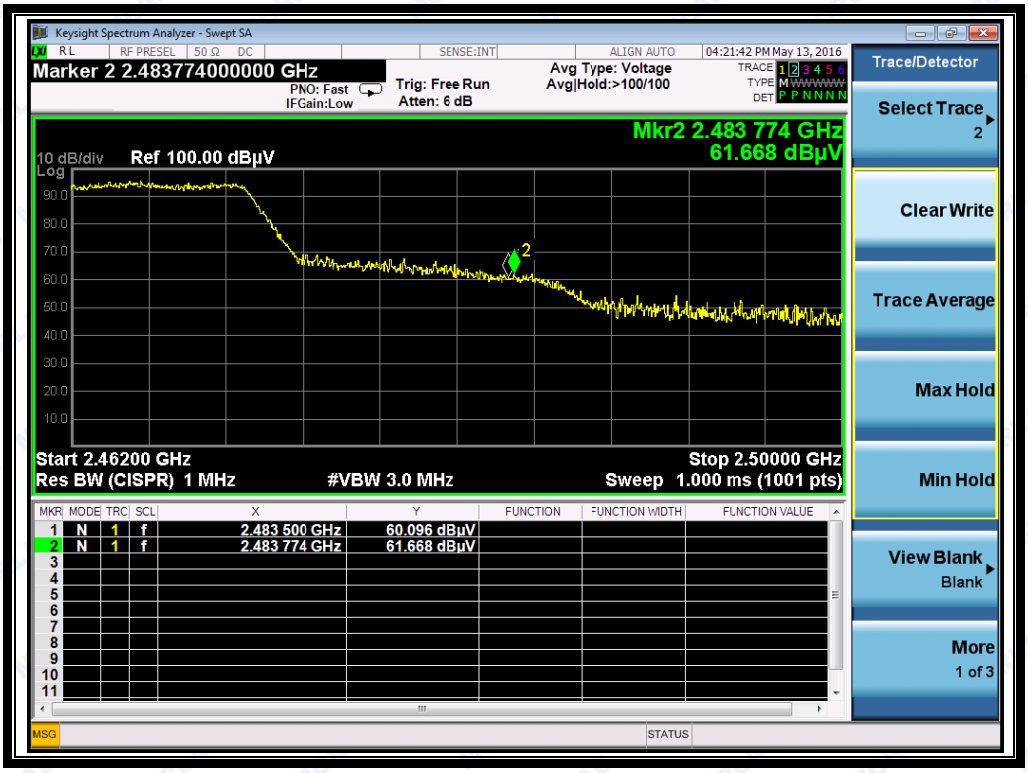
B. Test Plots:



(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

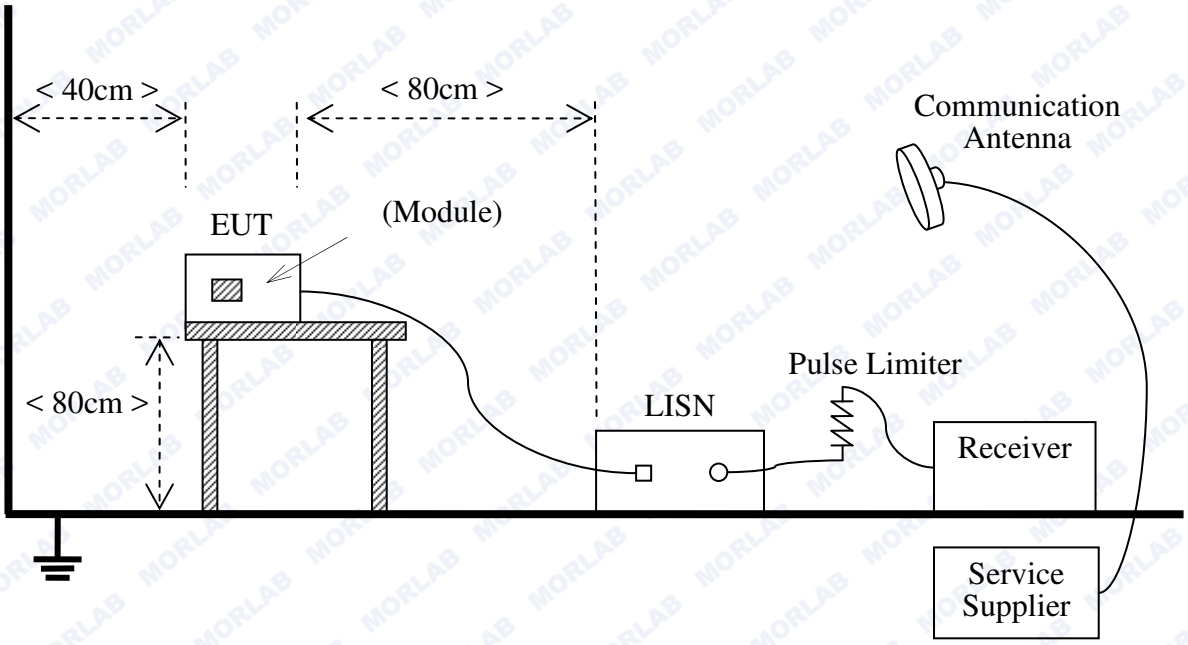
NOTE:

(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(1.5).

2.7.3 Test Result

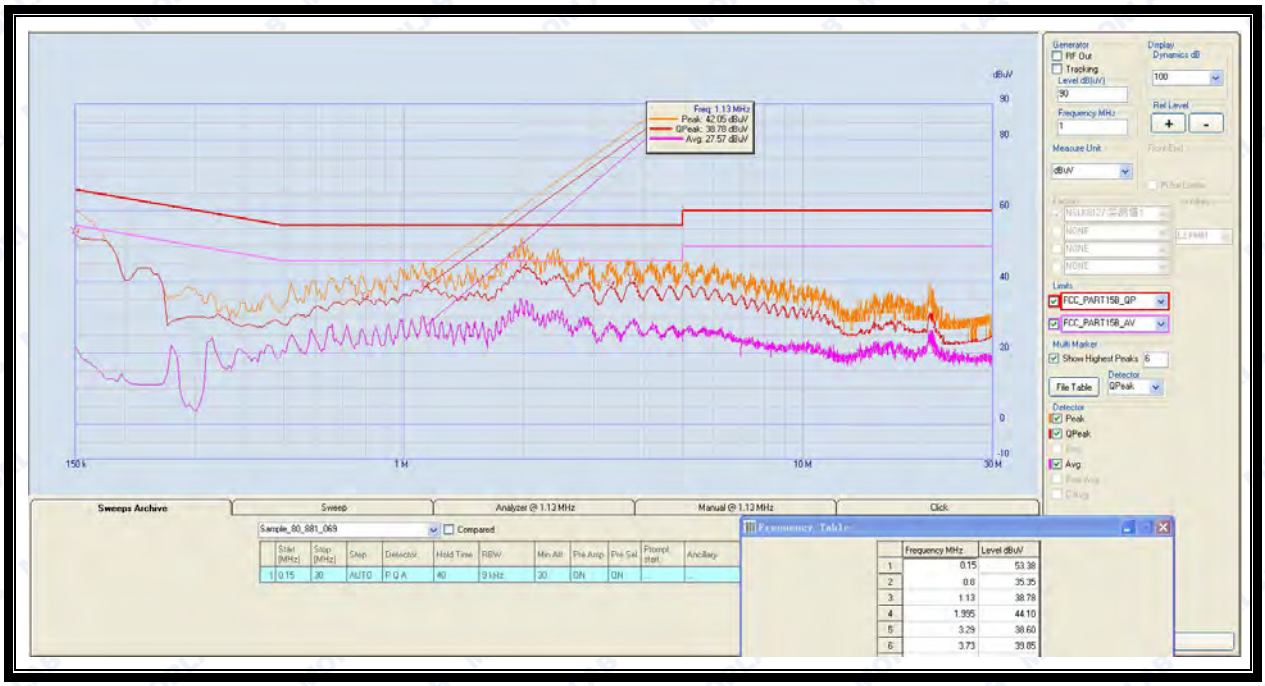
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT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

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

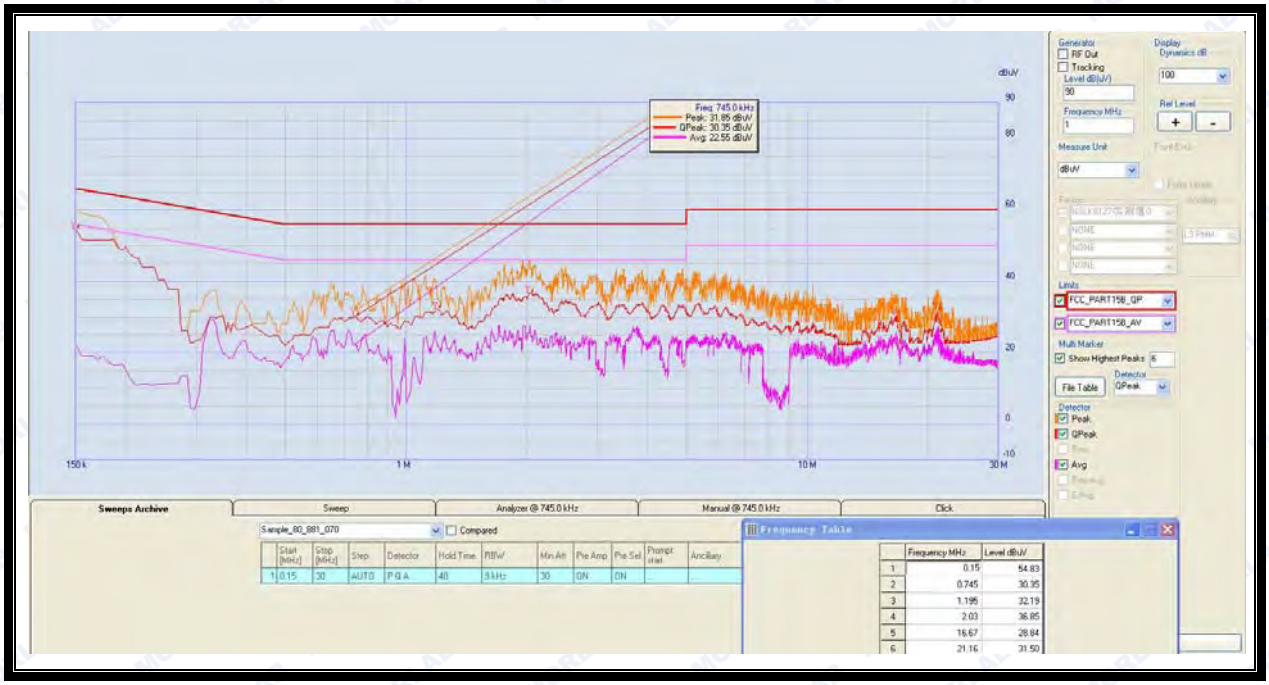
A. Test setup:

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.

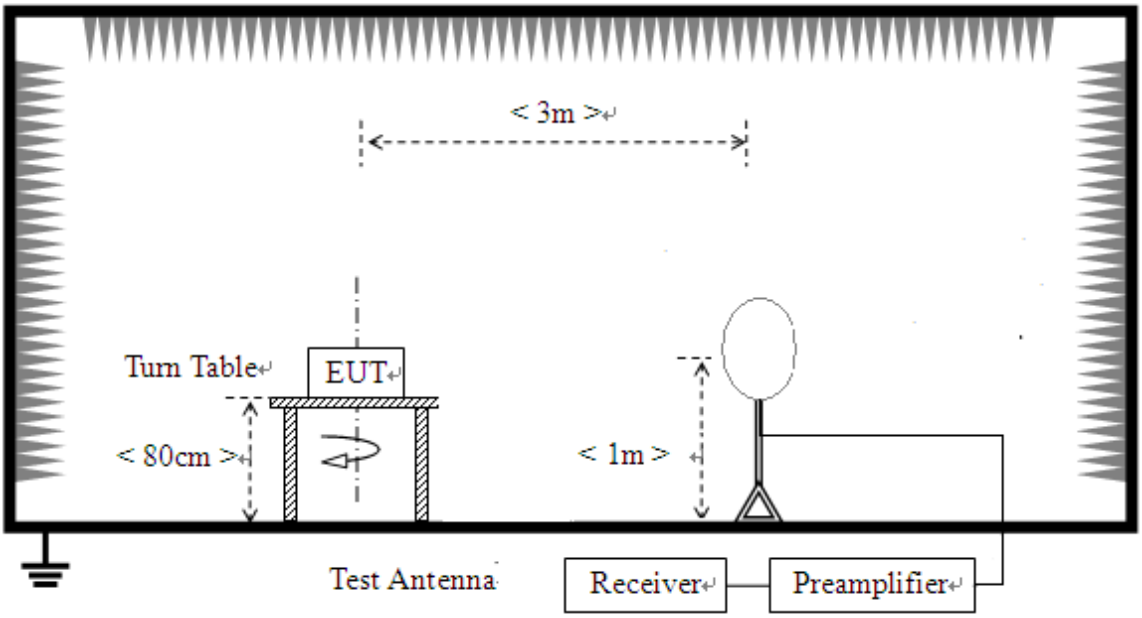
For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

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)

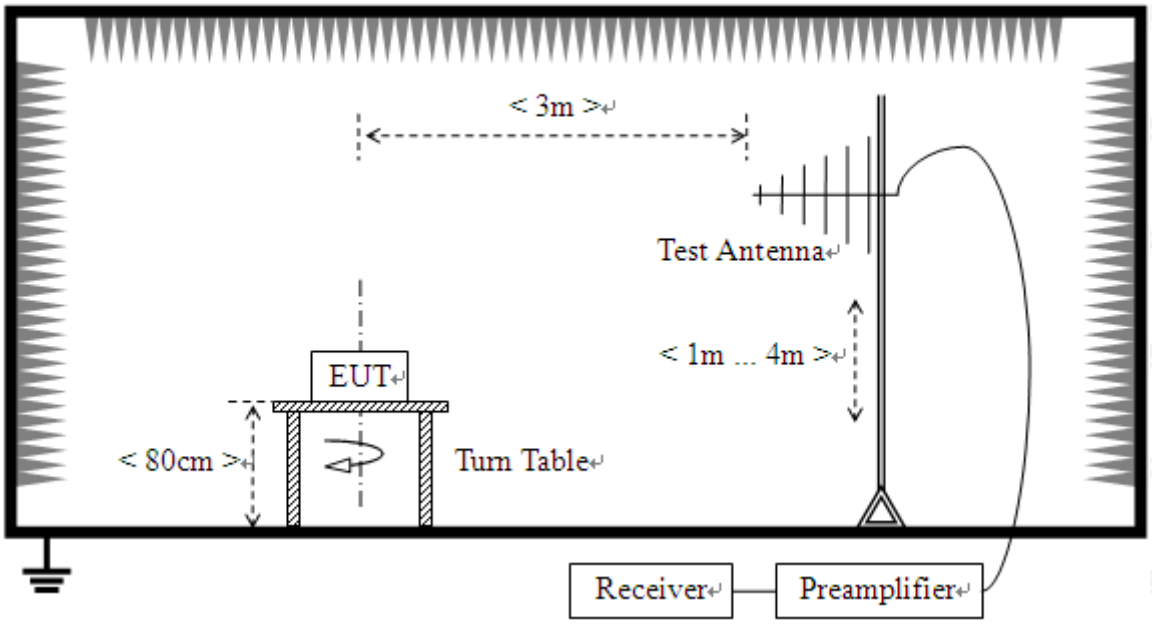
2.8.2 Test Description

A. Test Setup:

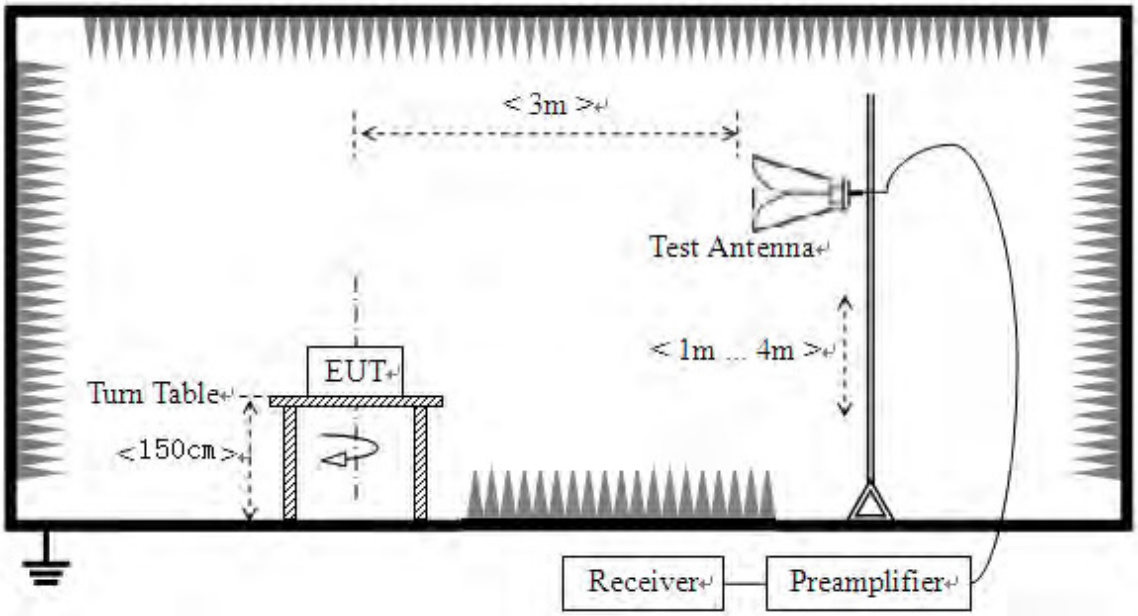
1) For radiated emissions from 9kHz to 30MHz



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 C63.10 (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(1.4).

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 [dBμV/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

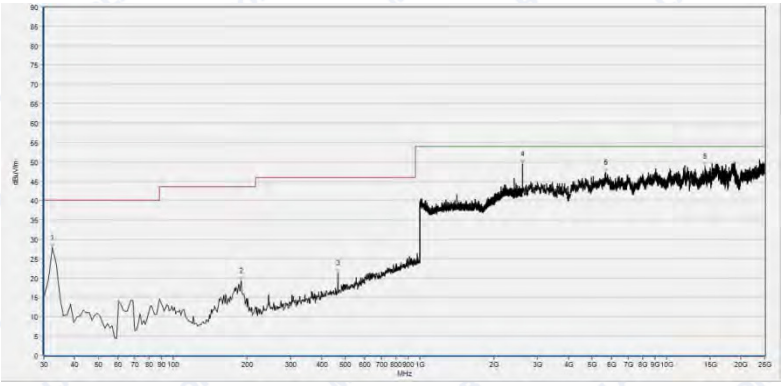
During the test, the total correction Factor A_T and A_{Factor} were built in test software.

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 Test mode

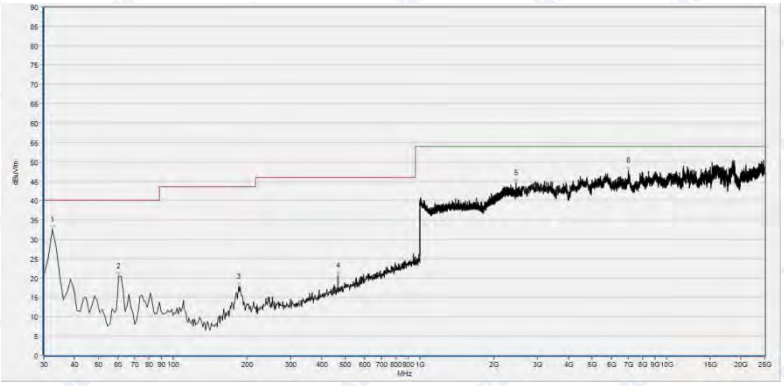
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	27.77	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
189.036	19.30	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
465.832	21.34	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2612.220	49.44	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5675.468	47.31	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
14351.955	48.72	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

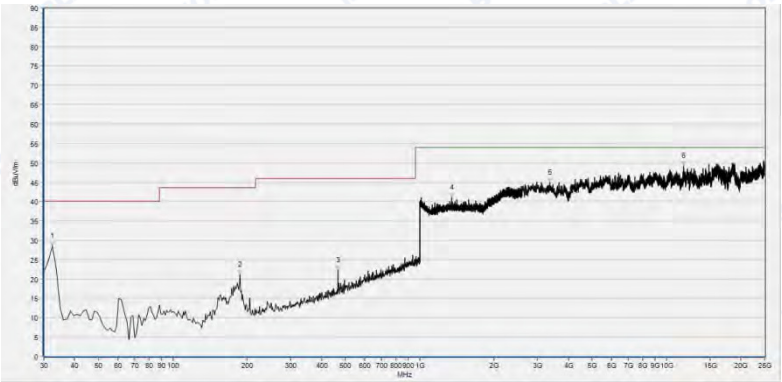
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	32.51	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
60.350	20.42	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
184.180	17.78	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
465.832	20.59	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2449.540	44.51	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7023.786	47.76	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

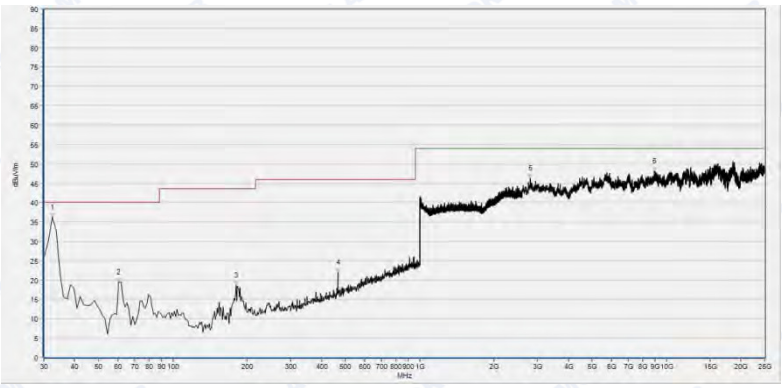
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	28.48	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
186.608	21.08	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
465.832	22.35	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1347.019	41.02	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3361.738	44.90	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11732.715	49.30	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

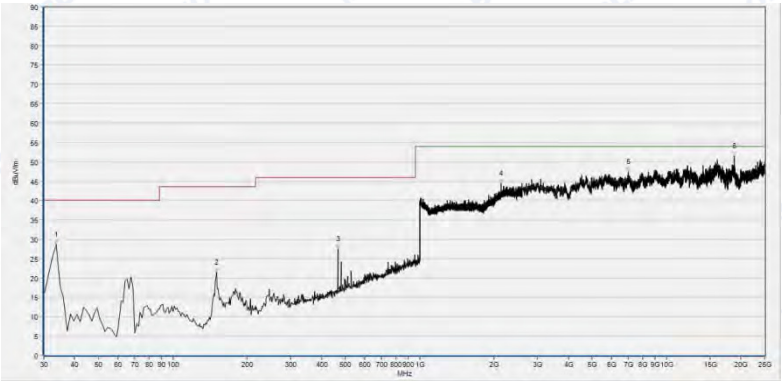
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	36.12	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
60.350	19.45	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
180.538	18.67	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
465.832	21.88	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2799.600	46.18	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
8934.243	48.06	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

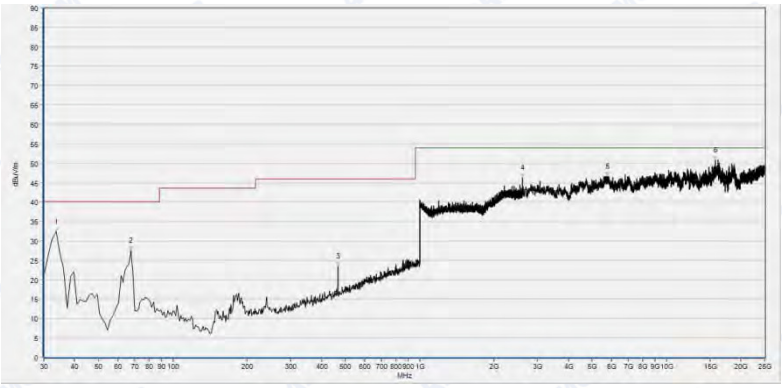
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	28.61	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
150.188	21.48	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
465.832	27.52	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2133.253	44.49	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7011.566	47.36	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18792.035	51.48	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



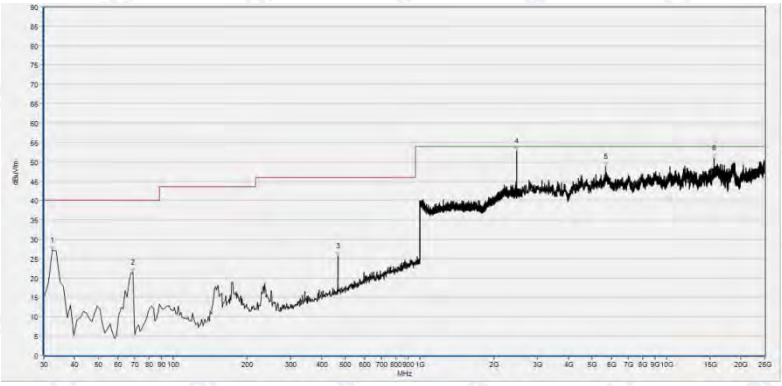
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	32.36	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
67.635	27.42	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
465.832	23.43	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2608.147	46.21	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5765.085	46.64	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15757.301	50.79	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

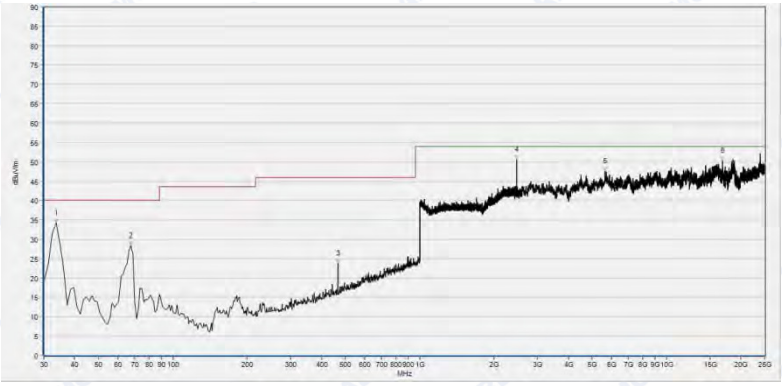
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	27.08	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
68.849	21.50	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
465.832	25.68	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2465.546	52.85	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5655.101	48.75	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15594.363	50.88	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

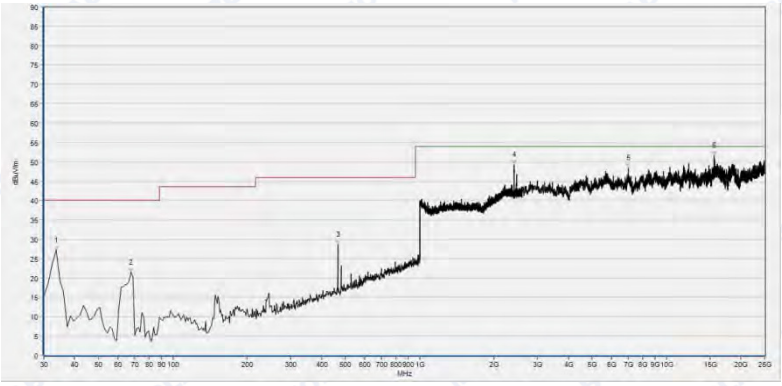
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	34.21	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
67.635	28.33	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
465.832	23.83	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2465.546	50.58	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5630.660	47.59	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
16820.476	50.28	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

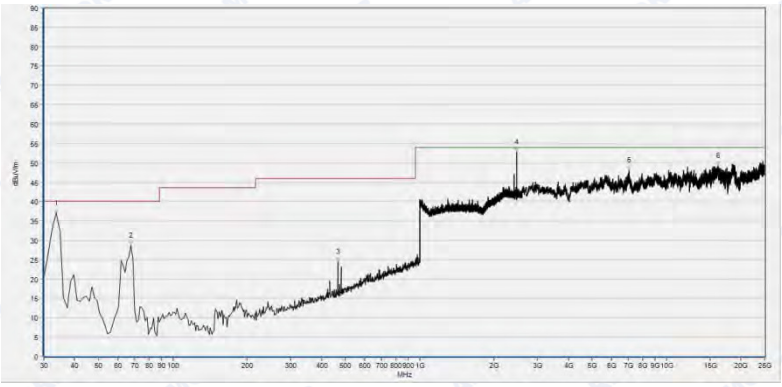
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	27.11	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
67.635	21.48	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
465.832	28.72	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2410.484	49.32	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7015.639	48.43	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15590.289	51.61	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

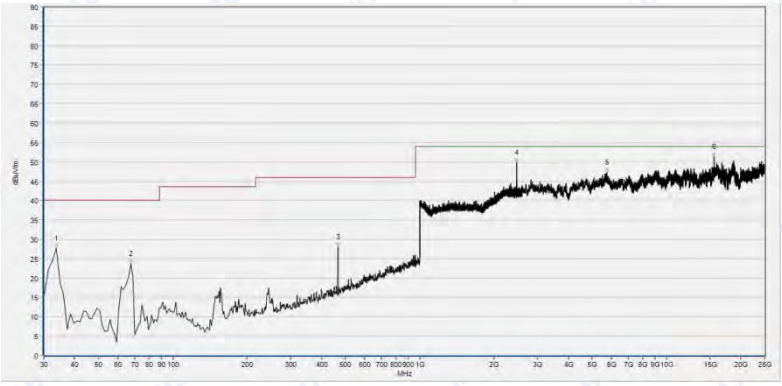
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	36.97	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
67.635	28.63	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
465.832	24.50	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2465.546	52.77	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7052.300	48.04	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

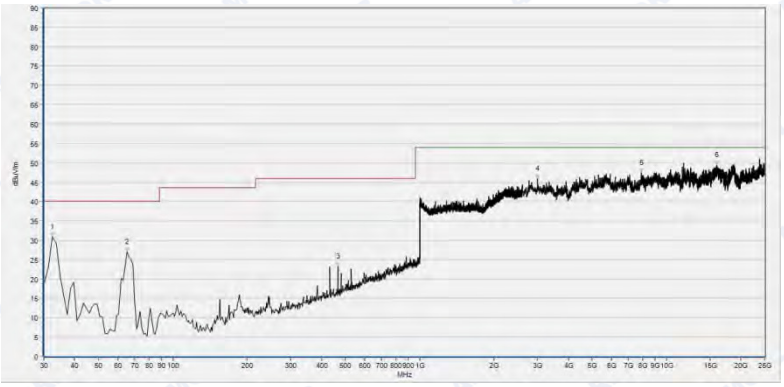
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	27.65	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
67.635	23.67	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
465.832	27.91	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2466.186	49.83	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5724.350	47.31	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15598.436	51.24	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



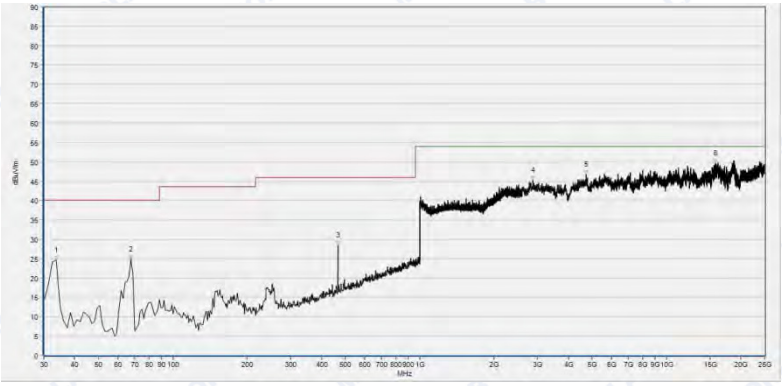
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	30.89	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
65.207	26.94	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
465.832	23.24	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
3007.347	45.94	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7883.288	47.40	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15965.048	49.45	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

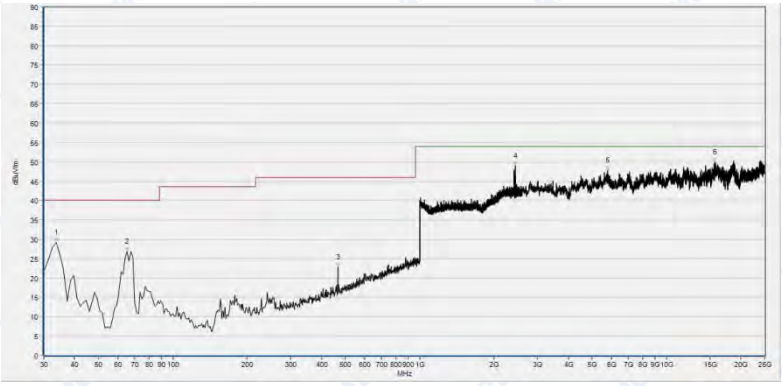
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	24.60	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
67.635	24.74	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
465.832	28.56	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2872.922	45.30	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4726.350	46.80	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15781.742	49.54	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

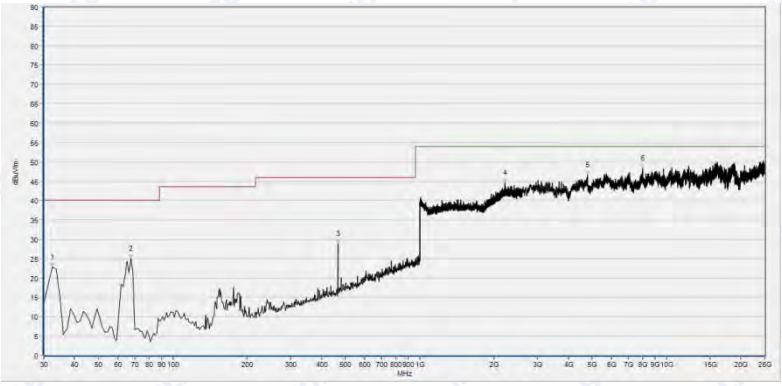
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
33.642	29.11	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
65.207	26.77	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
465.832	22.74	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2442.497	48.86	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5756.938	47.78	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15659.538	49.99	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

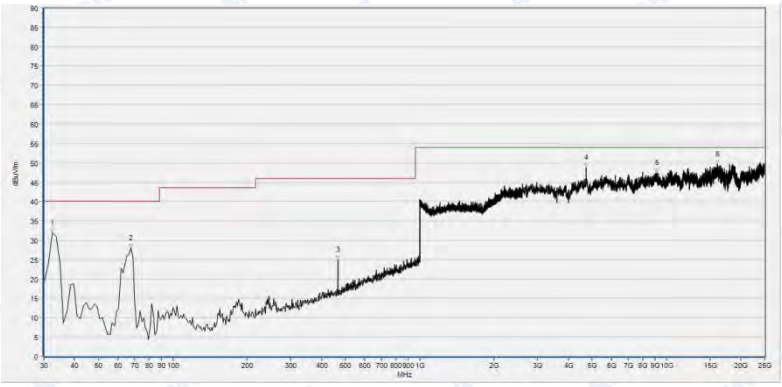
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	22.71	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
67.635	24.96	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
465.832	28.84	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2212.645	44.61	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4775.232	46.63	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7981.051	48.29	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

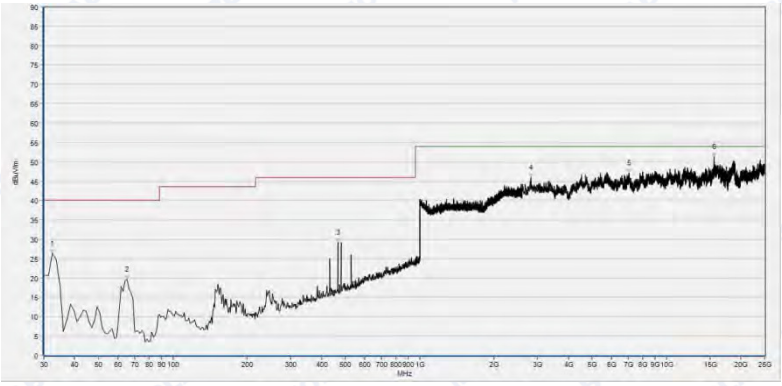
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	31.77	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
67.635	28.04	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
465.832	25.01	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
4718.203	48.77	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
9170.504	47.43	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
16050.591	49.60	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

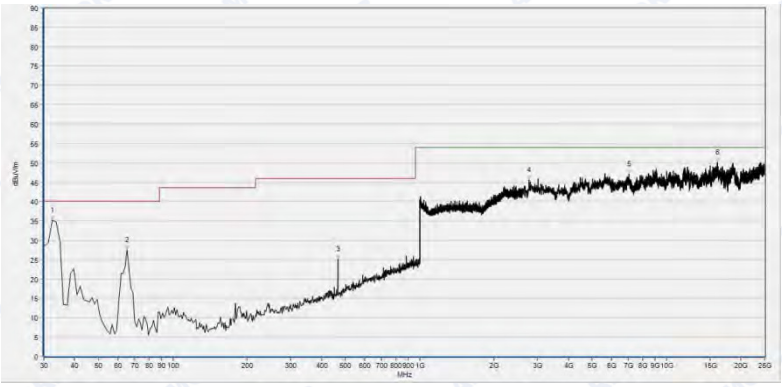
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.428	26.26	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
65.207	19.65	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
465.832	29.19	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2815.894	45.85	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7048.227	47.11	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15606.583	51.32	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
32.428	35.23	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
65.207	27.56	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
465.832	25.14	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2771.086	45.51	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7027.860	47.08	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
16038.371	50.08	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(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	2015.05.07	2016.05.06
2	Receiver	MY54130016	N9038A	Agilent	2015.05.07	2016.05.06
3	Test Antenna - Bi-Log	N/A	VULB9163	Schwarzbeck	2015.05.14	2016.05.13
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	2015.05.14	2016.05.13

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 *****