



REPORT No. : SZ14090085W05

FCC RF TEST REPORT

APPLICANT : Motic China Group Co., Ltd
PRODUCT NAME : Moticam T2 Smart Camera
MODEL NAME : Moticam T2
TRADE NAME : Motic
BRAND NAME : Motic
FCC ID : PVEMOTICAMT2
STANDARD(S) : 47 CFR Part 15 Subpart C
ISSUE DATE : 2014-10-20



SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

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Change History		
Issue	Date	Reason for change
1.0	2014-10-20	First edition



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Test Report Declaration

Applicant	Motic China Group Co., Ltd
Applicant Address	MOTIC BLDG, TORCH HI-TECH INDUSTRIAL DEV ZONE XIAMEN FUJIAN; 361006;CN
Manufacturer	Motic China Group Co., Ltd
Manufacturer Address	MOTIC BLDG, TORCH HI-TECH INDUSTRIAL DEV ZONE XIAMEN FUJIAN; 361006;CN
Product Name	Moticam T2 Smart Camera
Model Name	Moticam T2
Brand Name	Motic
HW Version	1.0.0.0
SW Version	4.2.2.0
Test Standards	47 CFR Part 15 Subpart C
Test Date	2014-09-18 to 2014-10-16
Test Result	PASS

Tested by : Nie Quan
Nie Quan

Reviewed by : Qiu Xiaojun
Qiu Xiaojun

Approved by : Zeng Dexin
Zeng Dexin



1. Technical Information

Note: Provide by applicant.

1.1. Applicant Information

Company:	Motic China Group Co., Ltd
Address:	MOTIC BLDG, TORCH HI-TECH INDUSTRIAL DEV ZONE XIAMEN FUJIAN; 361006;CN

1.2. Equipment under Test (EUT) Description

Brand Name:	Motic
Trade Name:	Motic
Model Name:	Moticam T2
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:	2.34dBi

NOTE:

The EUT is a Moticam T2 Smart Camera, 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 $F(n) = 2412 + 5 \times (n-1)$ ($1 \leq n \leq 11$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2412MHz), 6 (2437MHz) and 11 (2462MHz).

For 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	1.0.0.0	4.2.2.0

1.3. Test Standards and Results

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

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

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

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

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

These RF tests were performed according to the method of measurements prescribed in KDB558074 D01 v03r02 (05/06/2014).

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

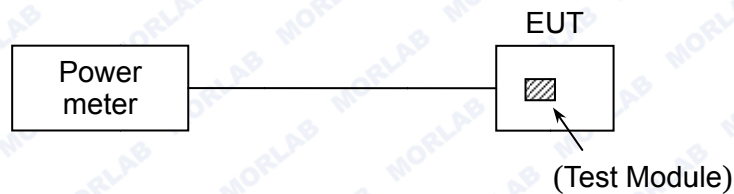
According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

2.2.2. Test Description

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

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

A. Test Setup:



The EUT (Equipment under the test) which is powered by the Battery is coupled to the Power Meter; the RF load attached to the EUT antenna terminal is 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	17.46	0.055719	30	1	PASS
6	2437	17.40	0.054954			PASS
11	2462	17.46	0.055720			PASS

2.2.3.2. 802.11g Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.96	0.062517	30	1	PASS
6	2437	17.97	0.062661			PASS
11	2462	18.11	0.064710			PASS



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2.2.3.3. 802.11n-20MHz Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.57	0.057148	30	1	PASS
6	2437	17.62	0.057810			PASS
11	2462	17.95	0.062370			PASS

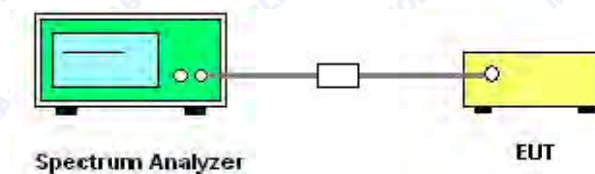
2.3. Bandwidth

2.3.1. Requirement

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

2.3.2. Test Description

A. Test Set:



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50 Ohm; 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.



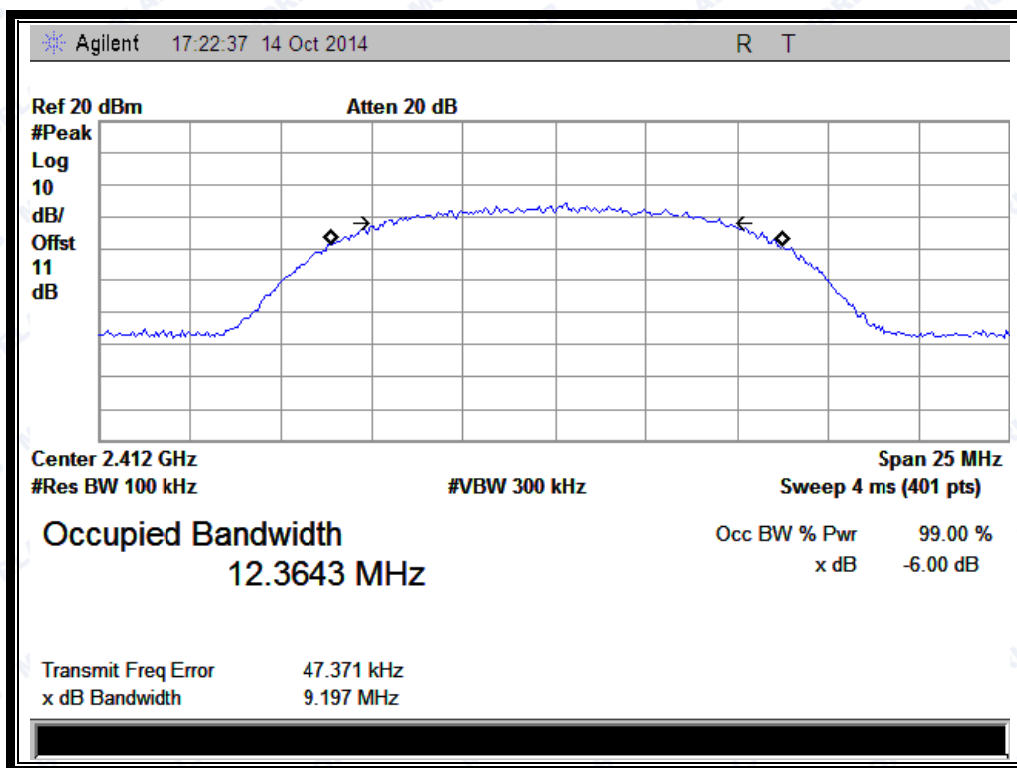
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2.3.3.1. 802.11b Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.197	≥ 500	PASS
6	2437	9.642	≥ 500	PASS
11	2462	10.040	≥ 500	PASS

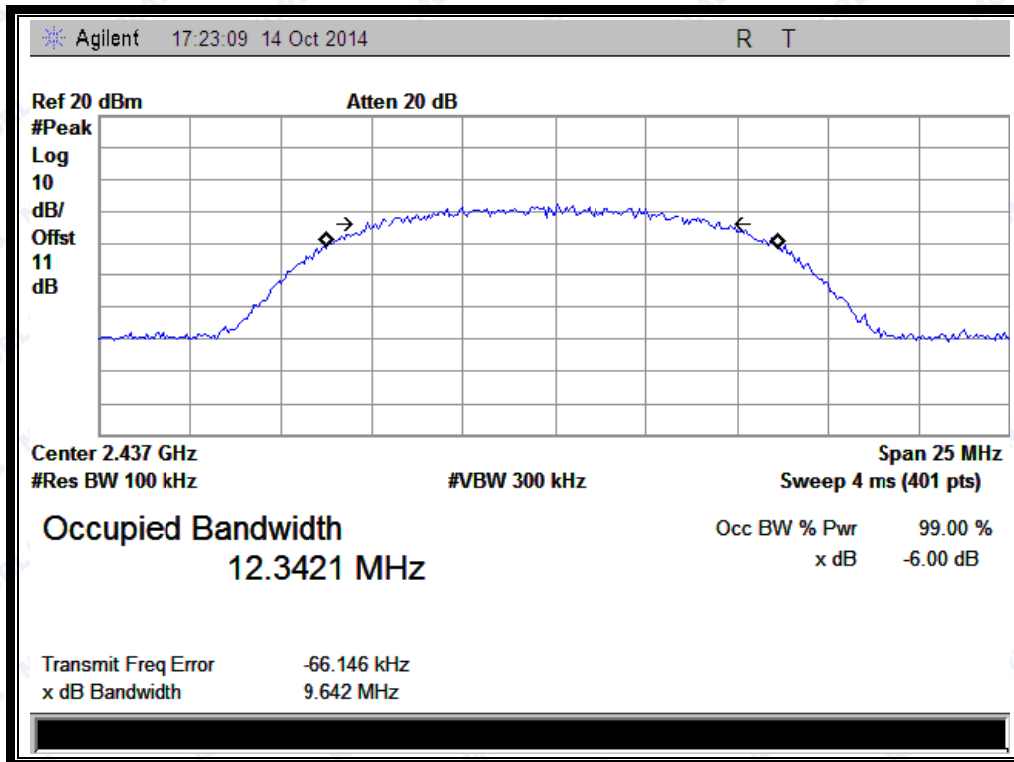
B. Test Plots



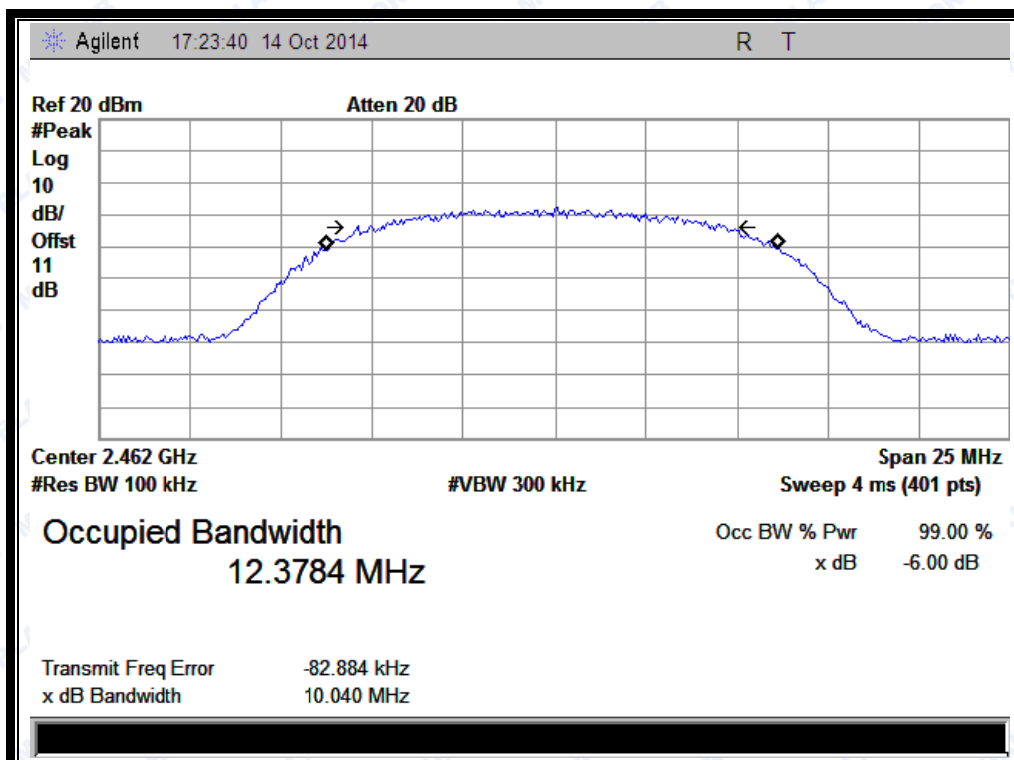
(Channel 1: 2412MHz @ 802.11b)



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(Channel 6: 2437 MHz @ 802.11b)



(Channel 11: 2462MHz @ 802.11b)



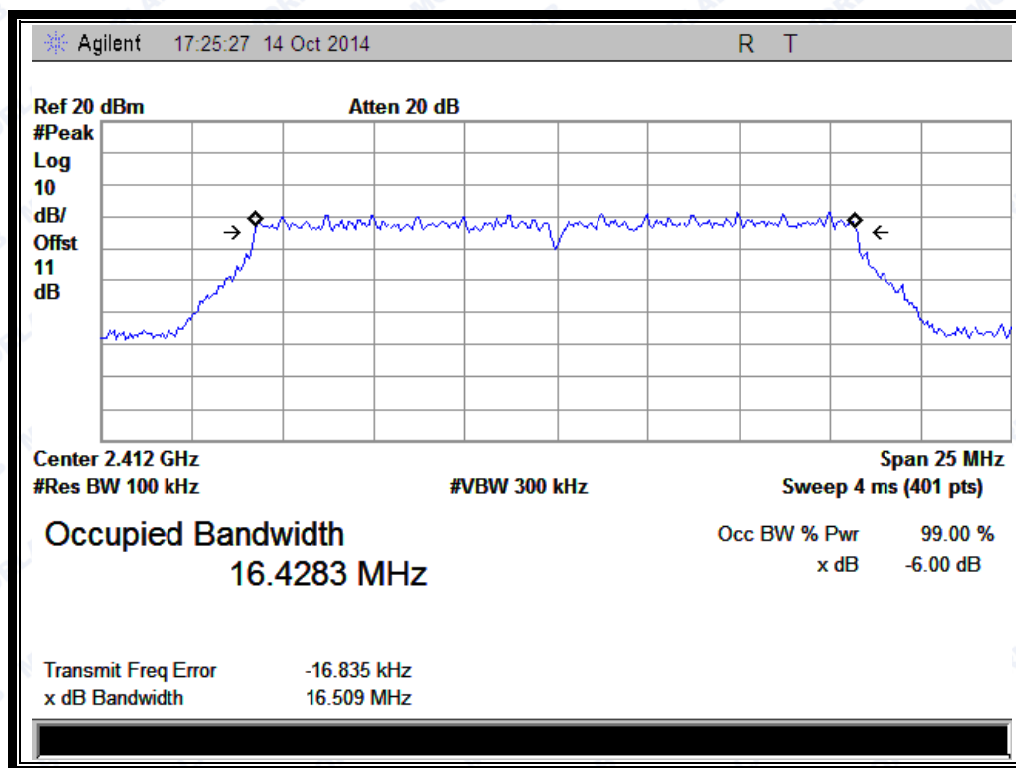
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2.3.3.2. 802.11g Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.509	≥ 500	PASS
6	2437	16.529	≥ 500	PASS
11	2462	16.402	≥ 500	PASS

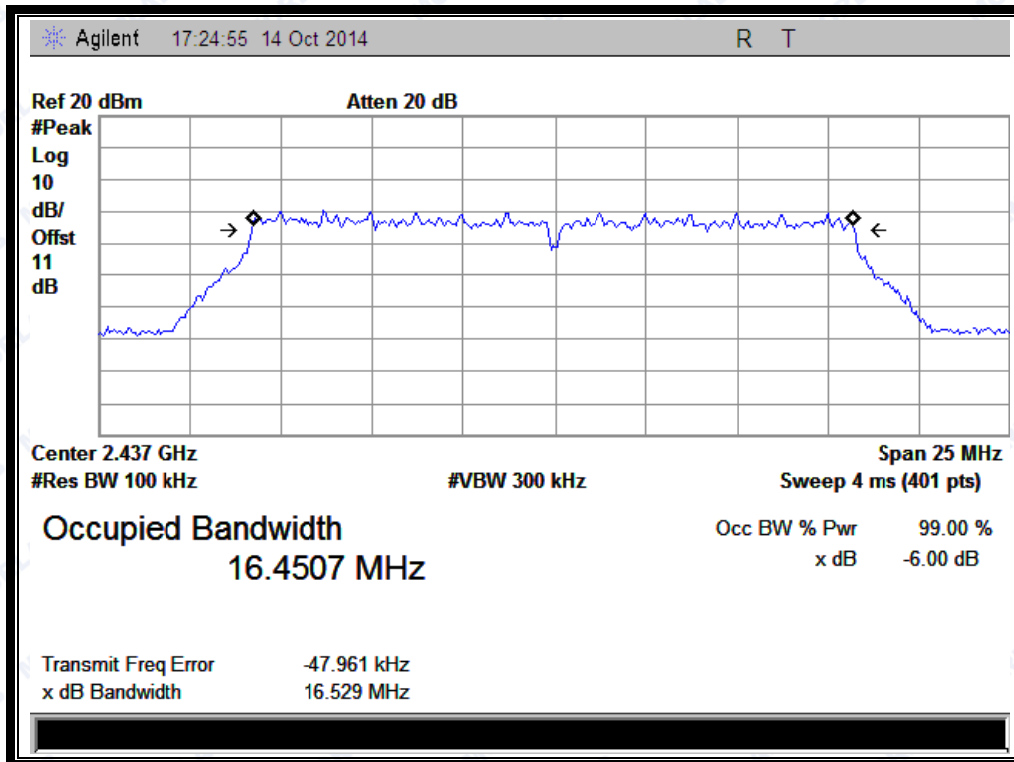
B. Test Plots:



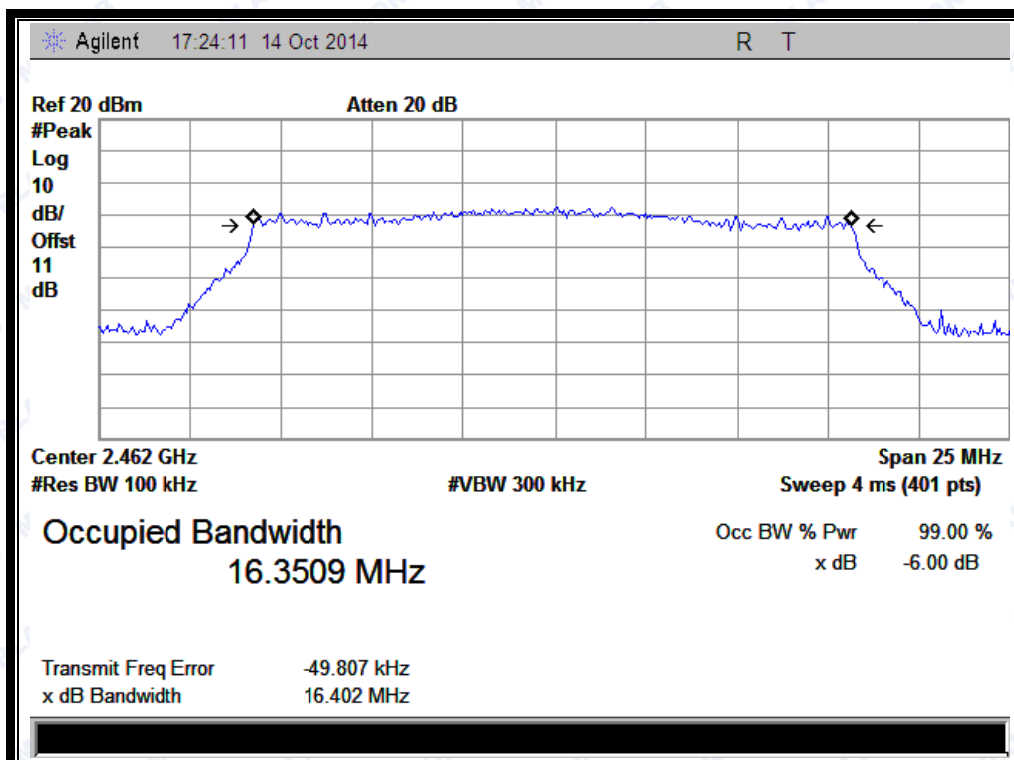
(Channel 1: 2412MHz @ 802.11g)



REPORT No. : SZ14090085W05



(Channel 6: 2437MHz @ 802.11g)



(Channel 11: 2462MHz @ 802.11g)



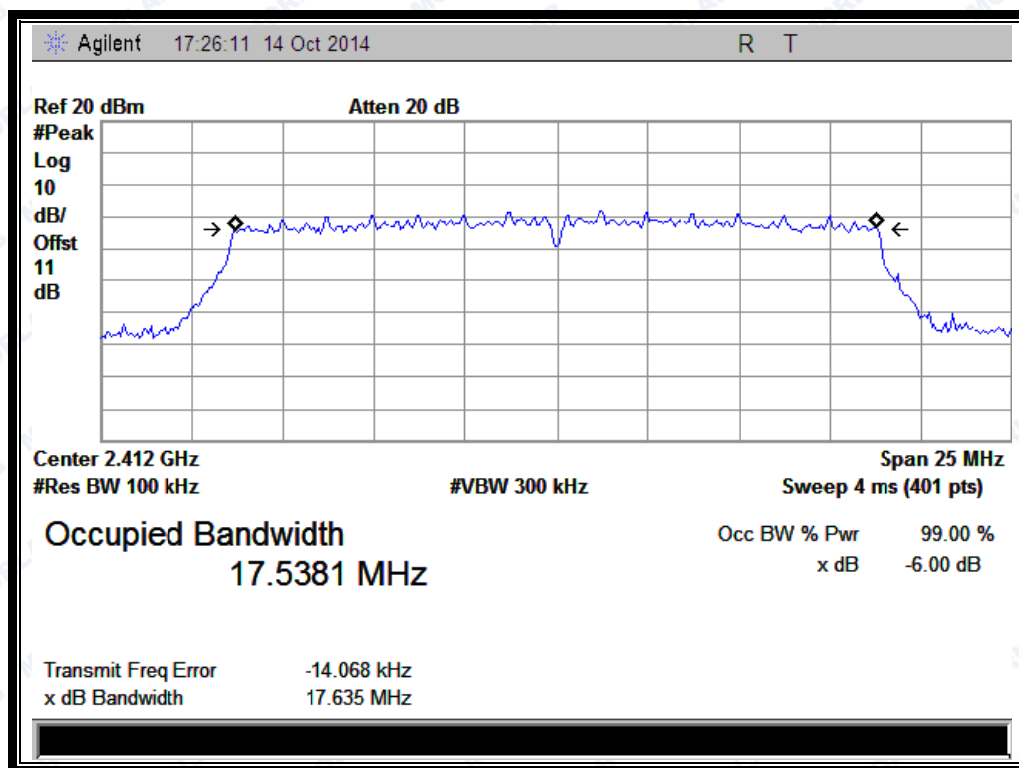
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2.3.3.3. 802.11n-20 Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.635	≥500	PASS
6	2437	17.535	≥500	PASS
11	2462	17.651	≥500	PASS

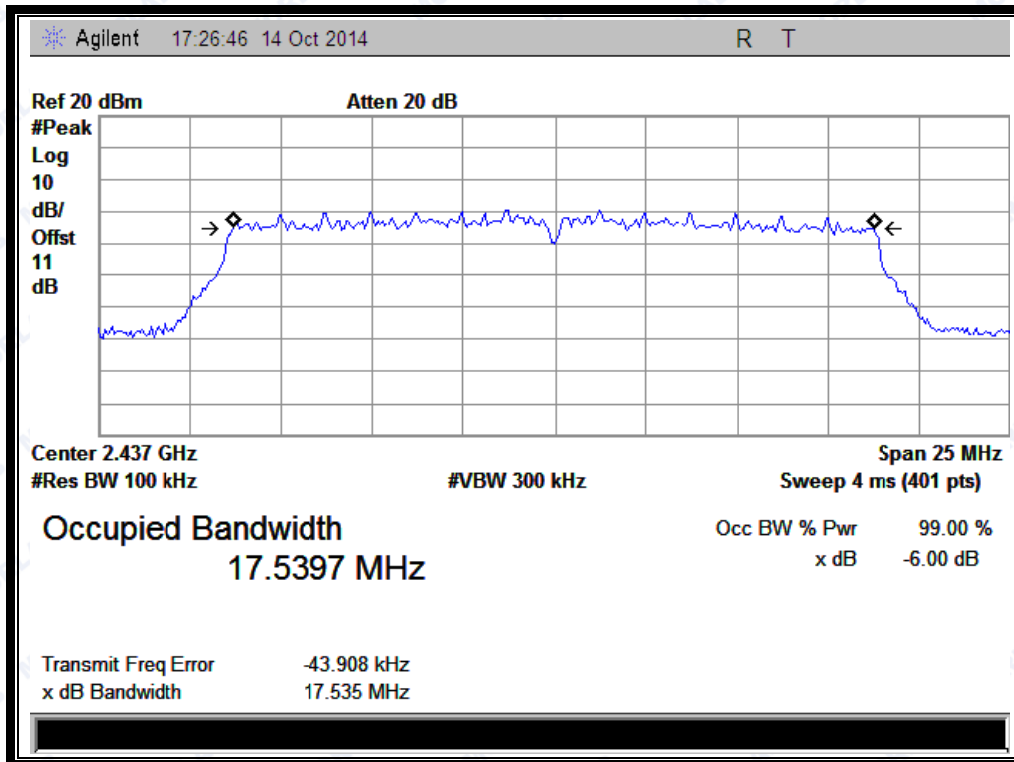
B. Test Plots:



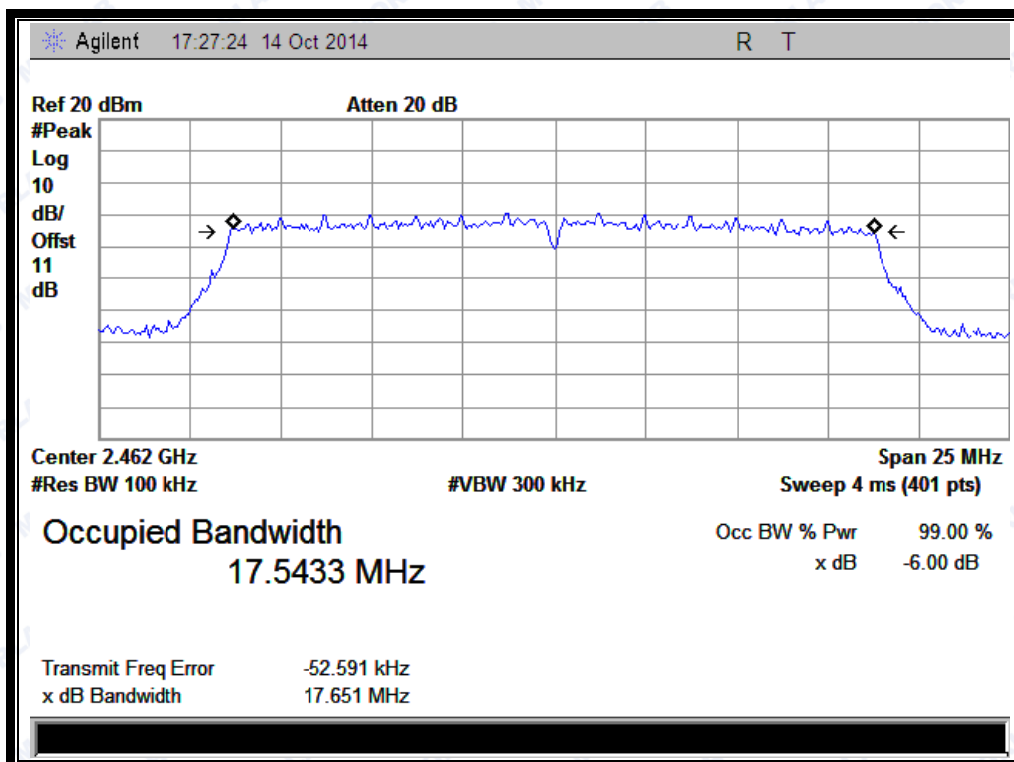
(Channel 1: 2412MHz @ 802.11n-20)



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



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

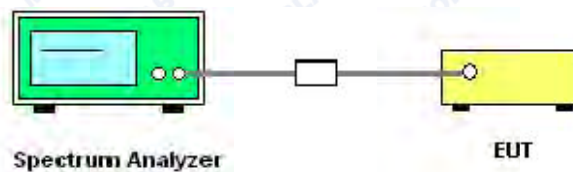
2.4. Conducted Spurious Emissions and Band Edge

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

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

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

B. Equipments List:

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.



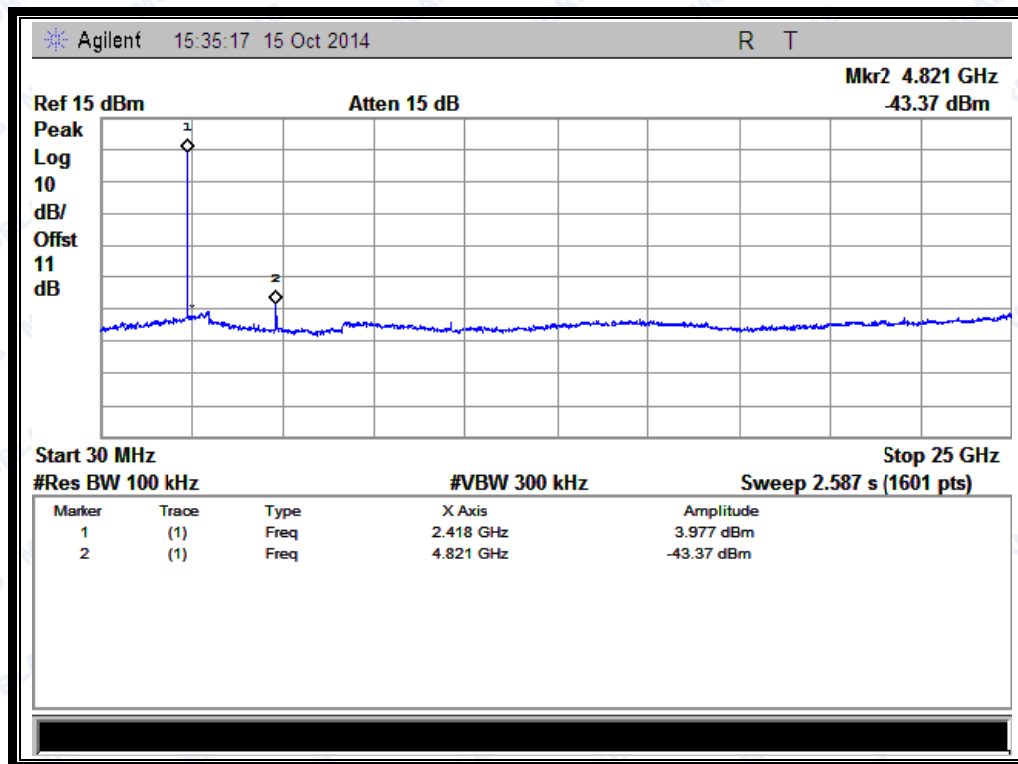
2.4.3.1. 802.11b Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-43.37	3.977	-16.0	PASS
6	2437	-44.30	2.869	-17.1	PASS
11	2462	-42.39	3.50	-17.5	PASS

B. Test Plots:

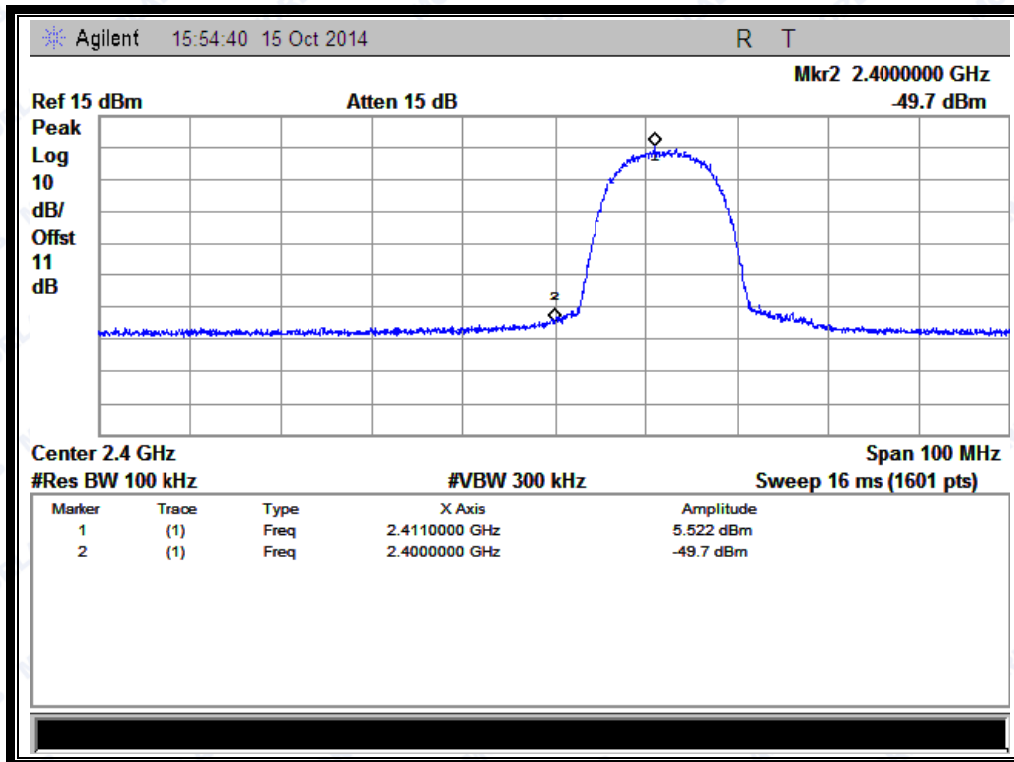
Note: the power of the Module transmitting frequency should be ignored.



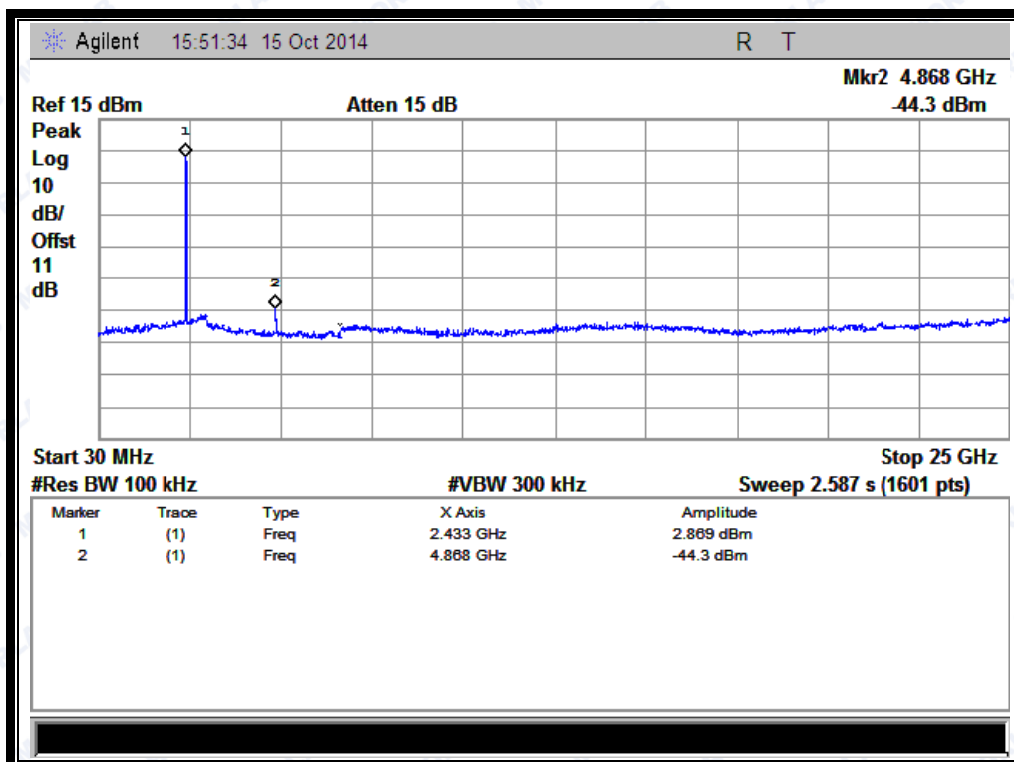
(Channel = 1, 30MHz to 25GHz)



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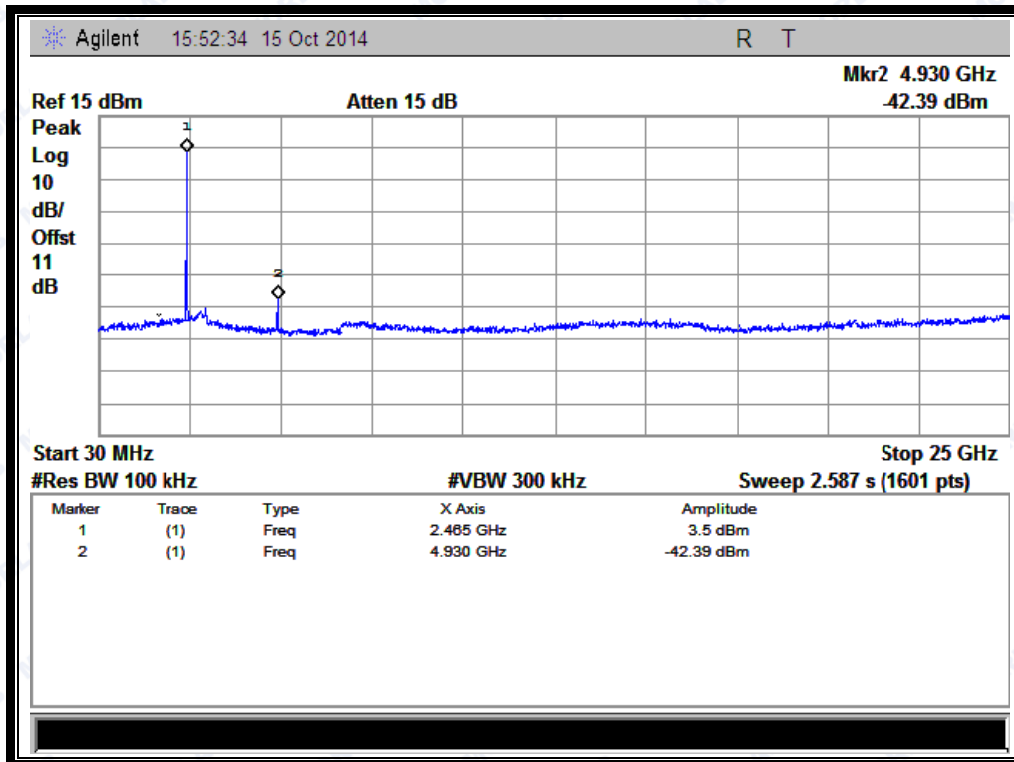
(Band Edge @ Channel = 1)



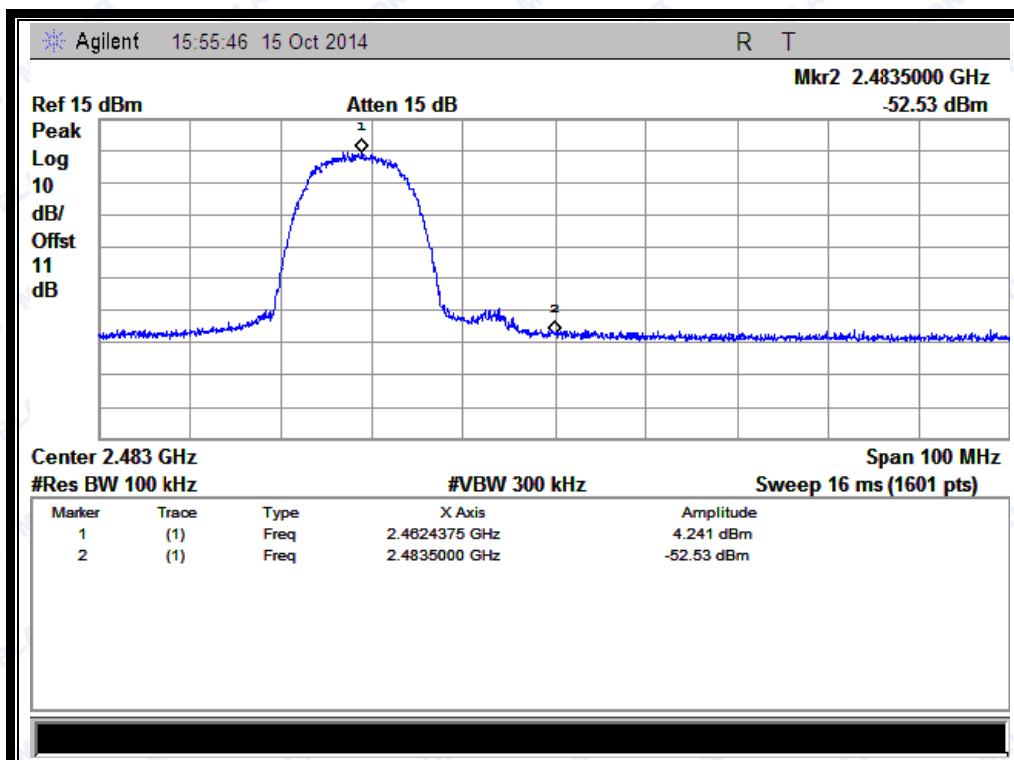
(Channel = 6, 30MHz to 25GHz)



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(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)



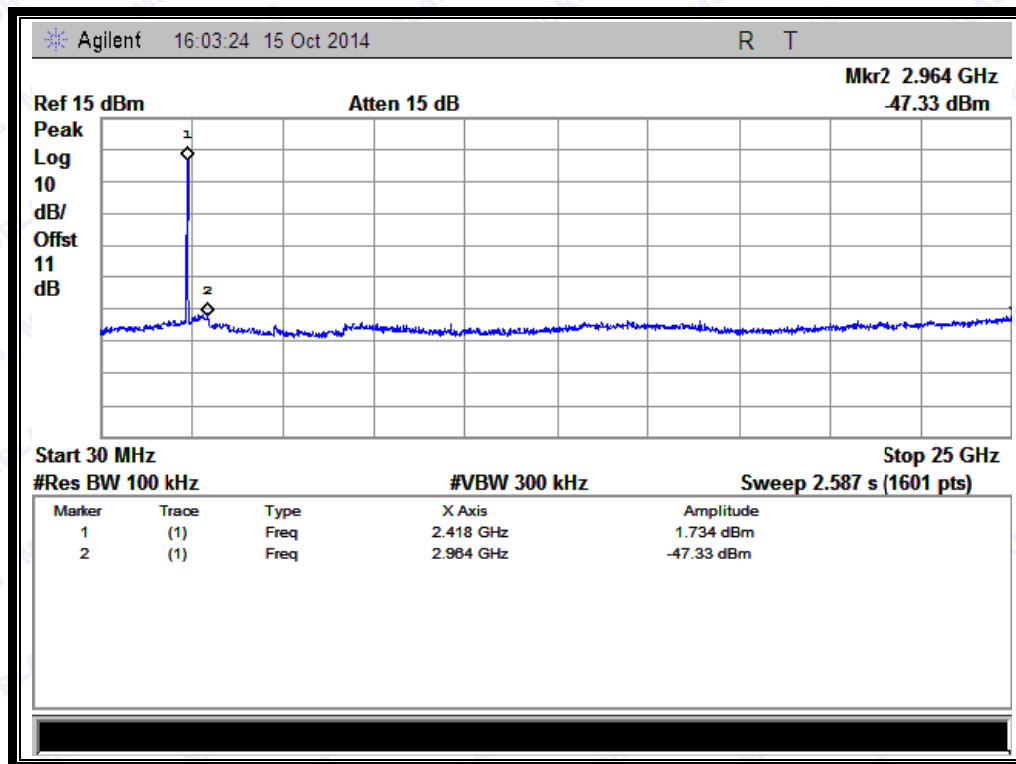
2.4.3.2. 802.11g Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-47.33	1.734	-18.3	PASS
6	2437	-48.02	2.040	-18.0	PASS
11	2462	-47.35	2.294	-17.7	PASS

B. Test Plots:

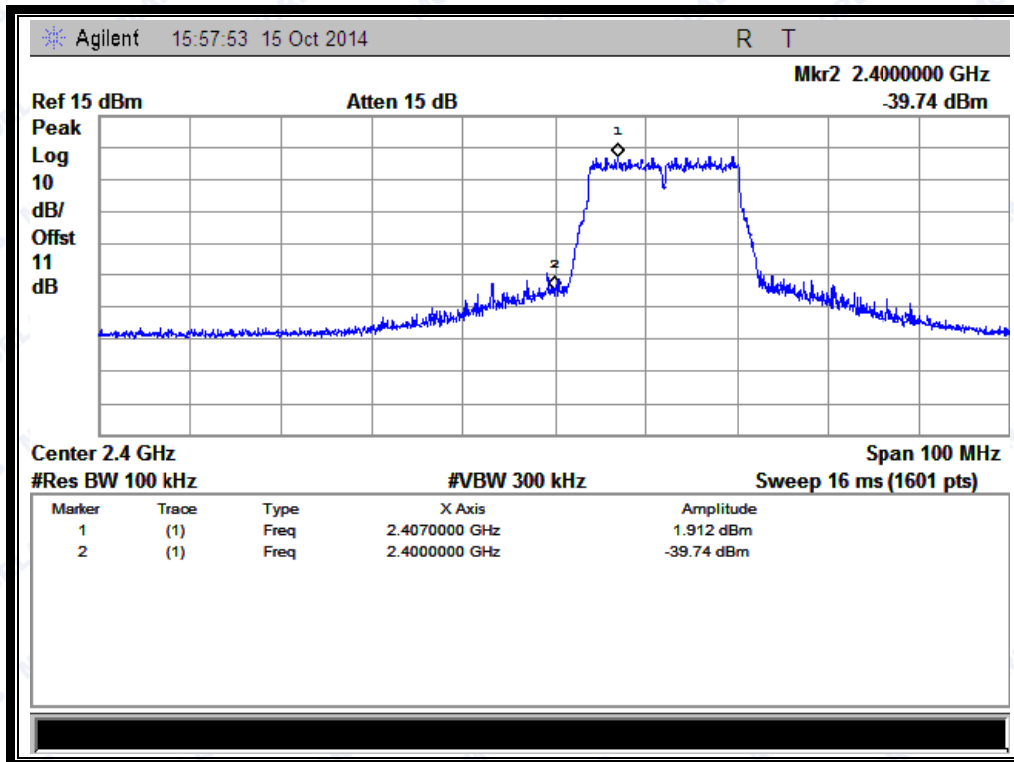
Note: the power of the Module transmitting frequency should be ignored.



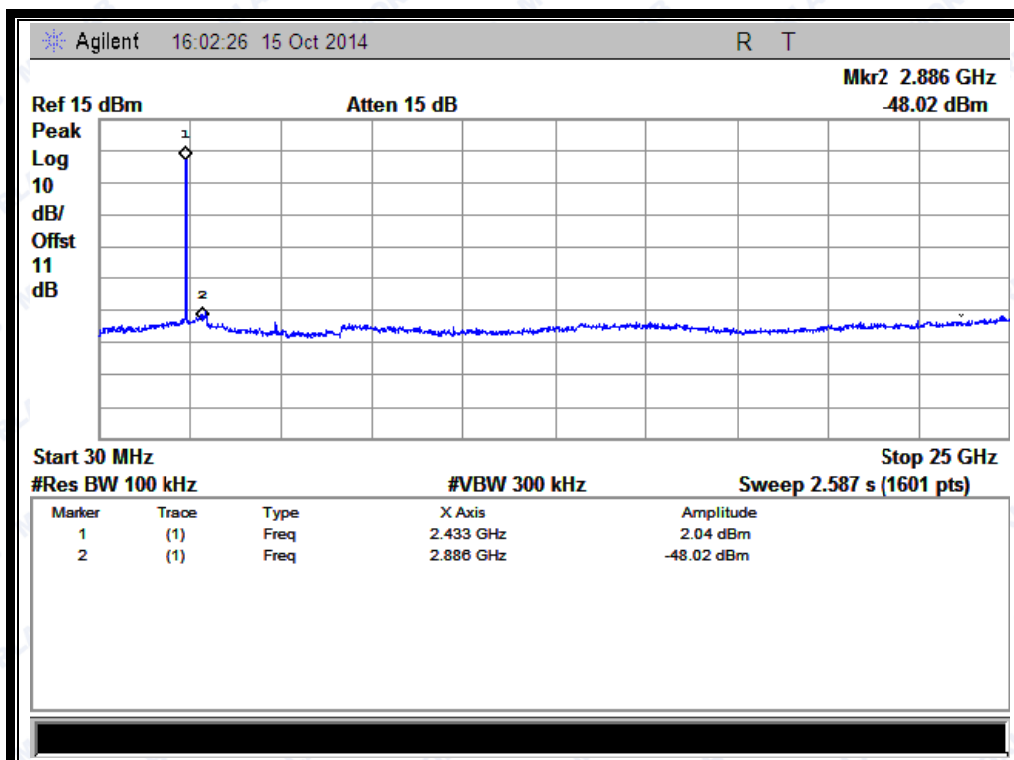
(Channel = 1, 30MHz to 25GHz)



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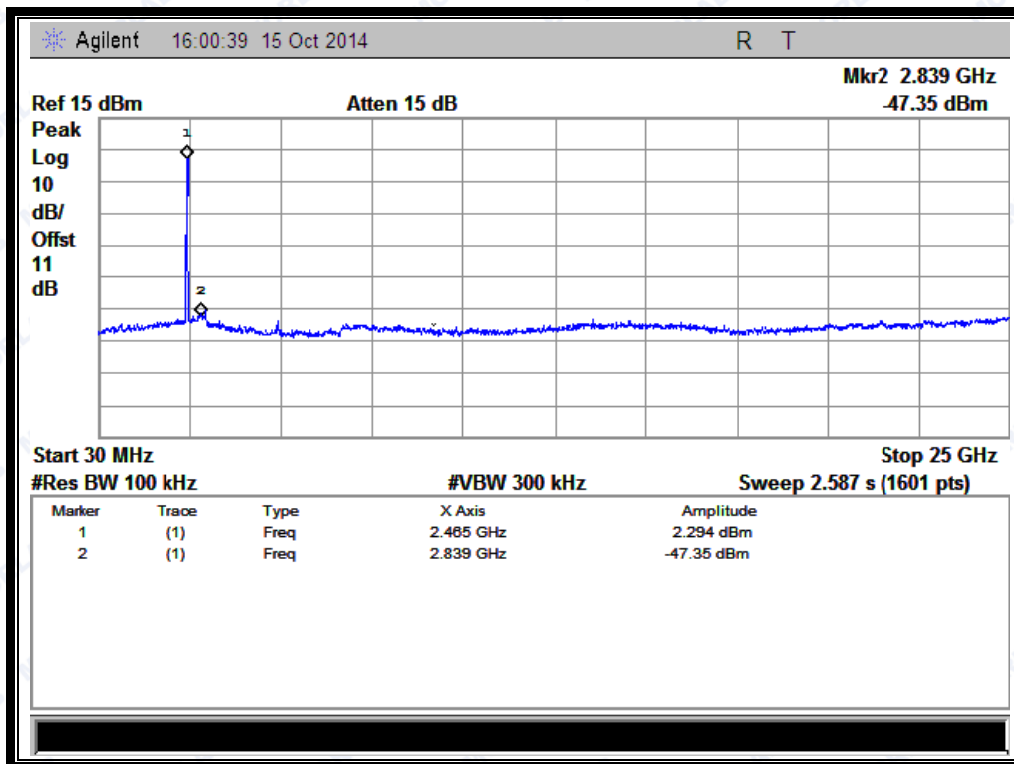
(Band Edge @ Channel = 1)



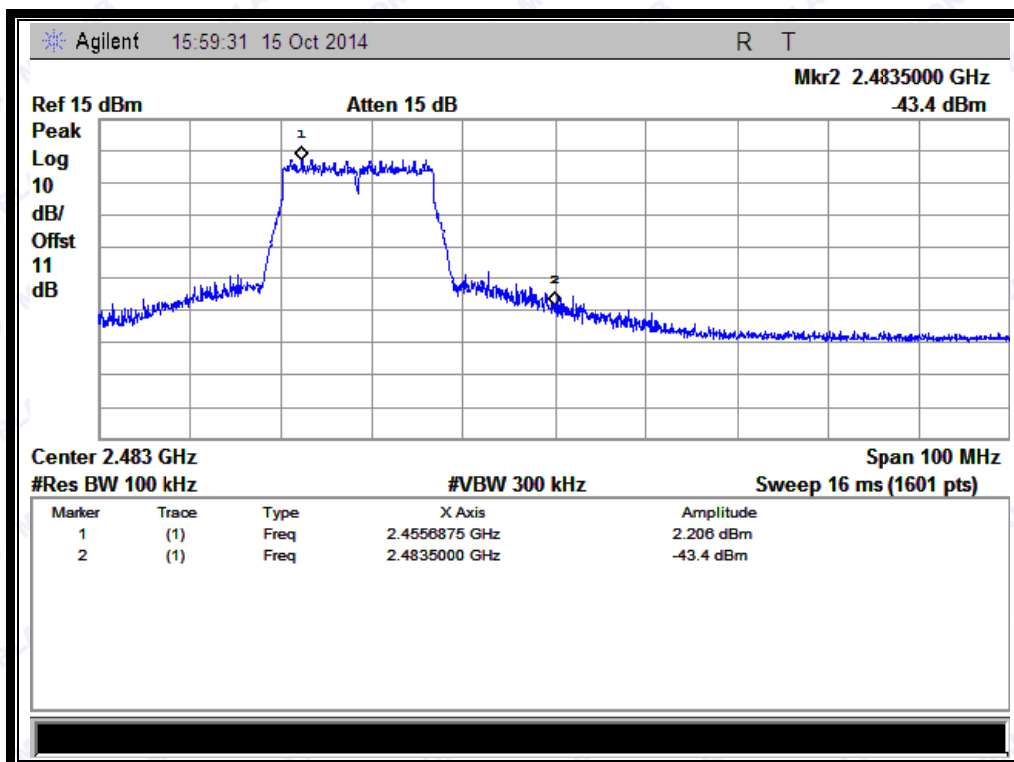
(Channel = 6, 30MHz to 25GHz)



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(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)



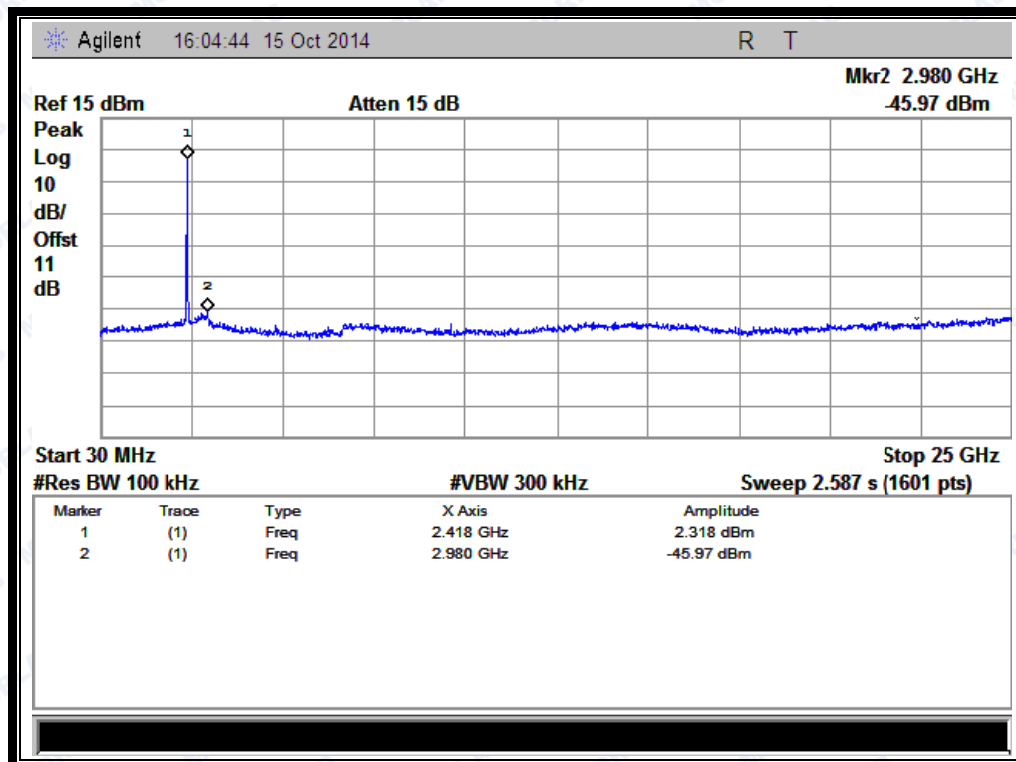
2.4.3.3. 802.11n -20MHz Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-45.97	2.318	-17.7	PASS
6	2437	-48.38	2.944	-17.1	PASS
11	2462	-46.77	1.855	-18.2	PASS

B. Test Plots:

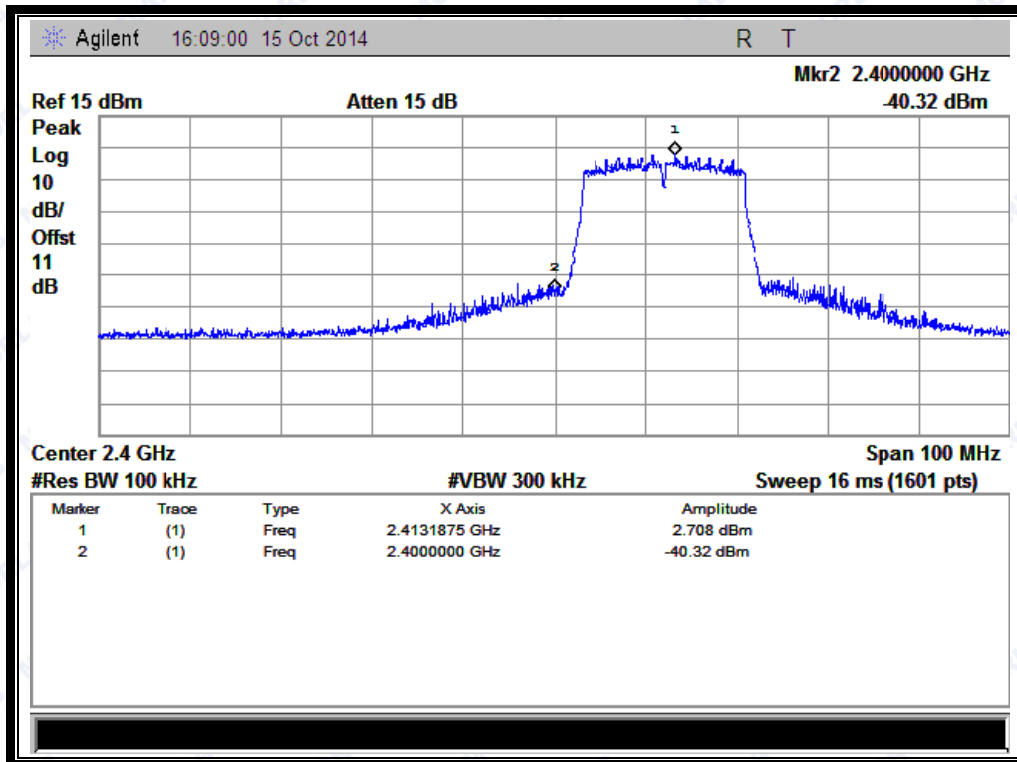
Note: the power of the Module transmitting frequency should be ignored.



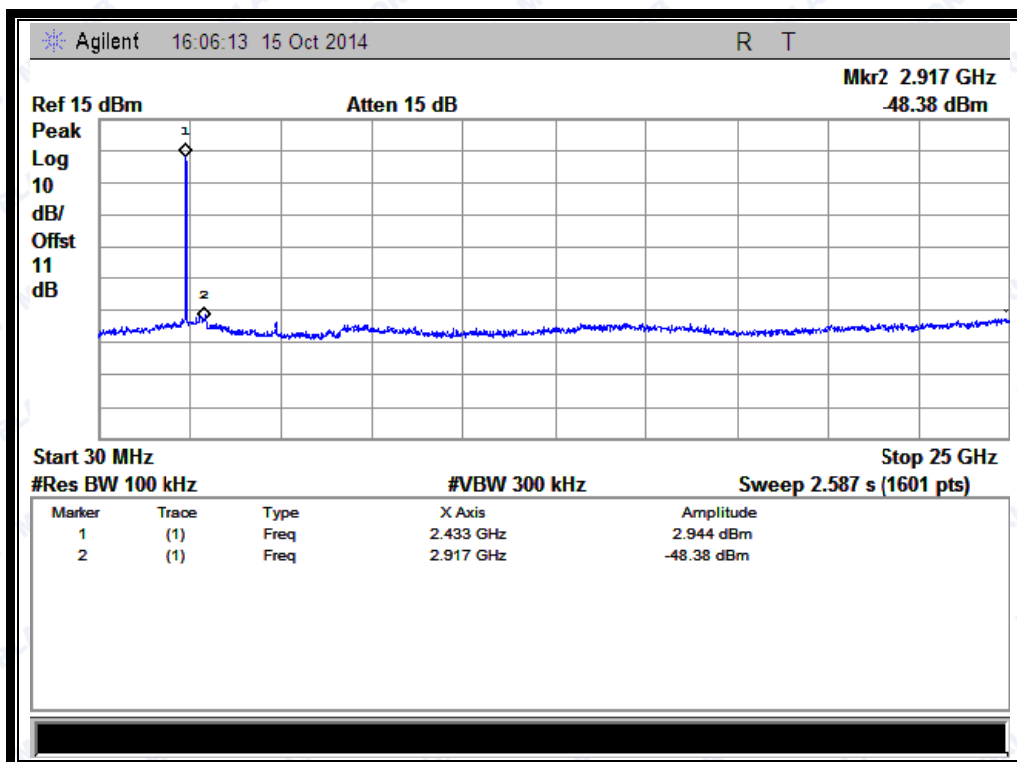
(Channel = 1, 30MHz to 25GHz)



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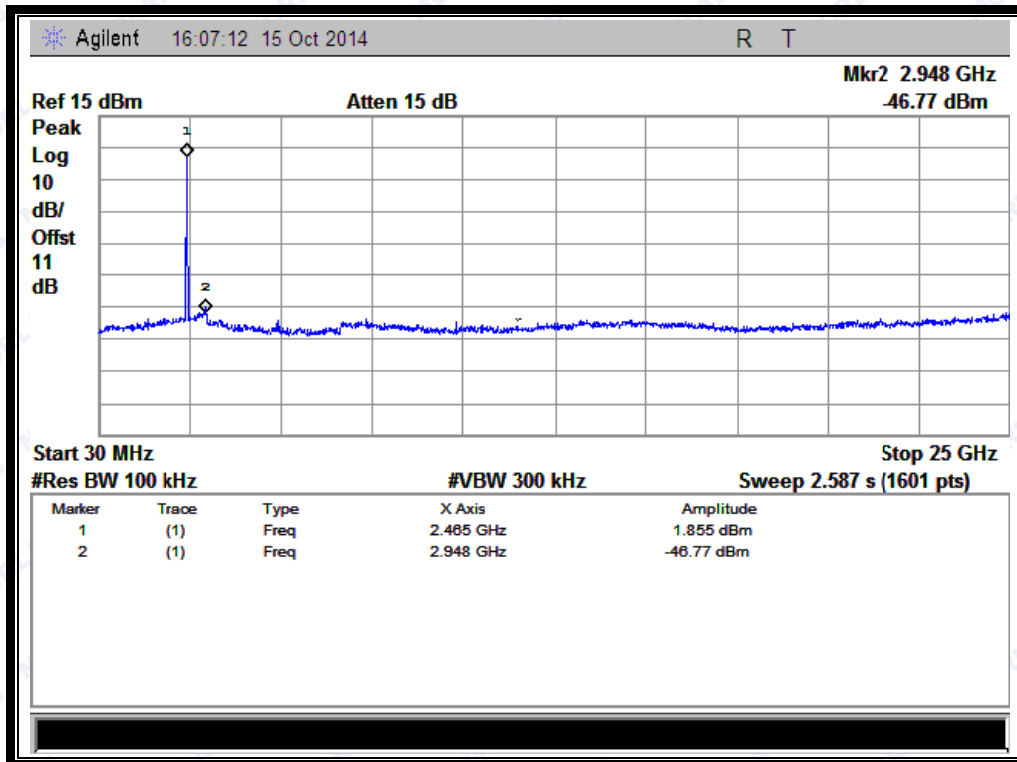
(Band Edge @ Channel = 1)



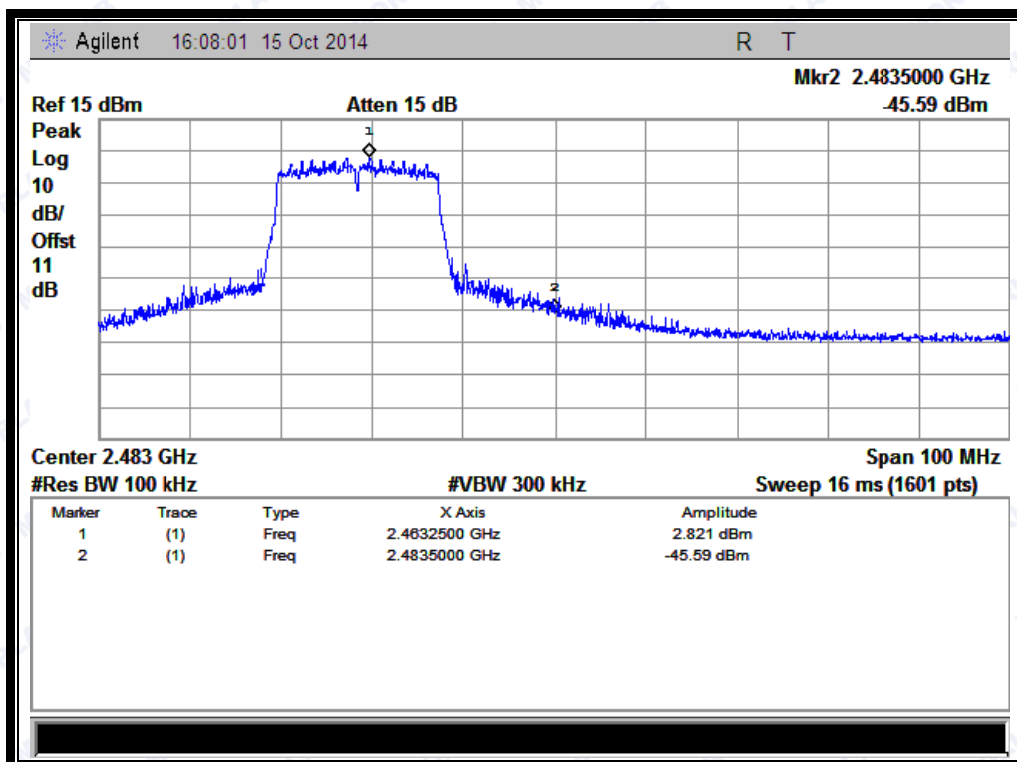
(Channel = 6, 30MHz to 25GHz)



REPORT No. : SZ14090085W05



(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

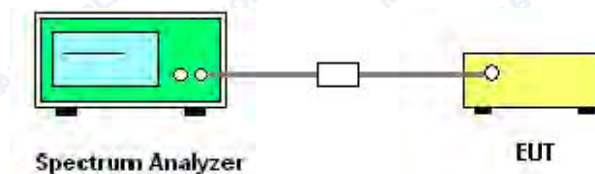
2.5. Power spectral density (PSD)

2.5.1. Requirement

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

2.5.2. Test Description

A. Test Set:



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

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

B. Equipments List:

Please reference ANNEX A(1.4).

2.5.3. Test Result

2.5.3.1. 802.11b Test mode

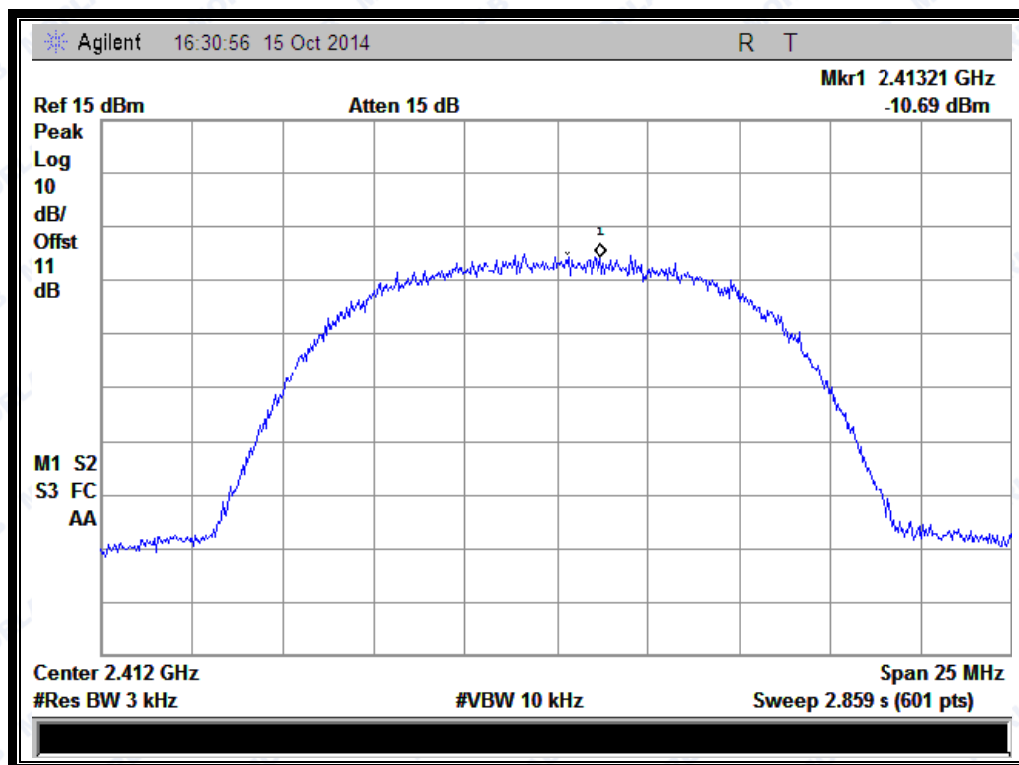
A. Test Verdict:



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Spectral power density (dBm/3kHz)				
Chann el	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-10.69	8	PASS
6	2437	-10.24	8	PASS
11	2462	-9.964	8	PASS
Measurement uncertainty: ± 1.3 dB				

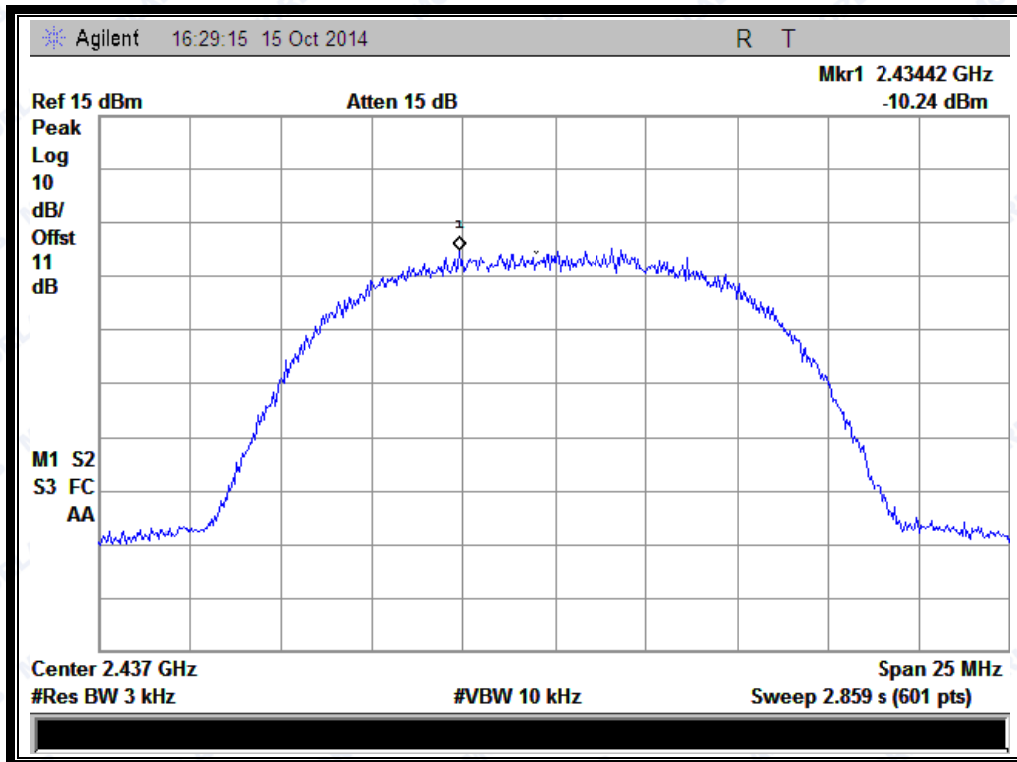
B. Test Plots:



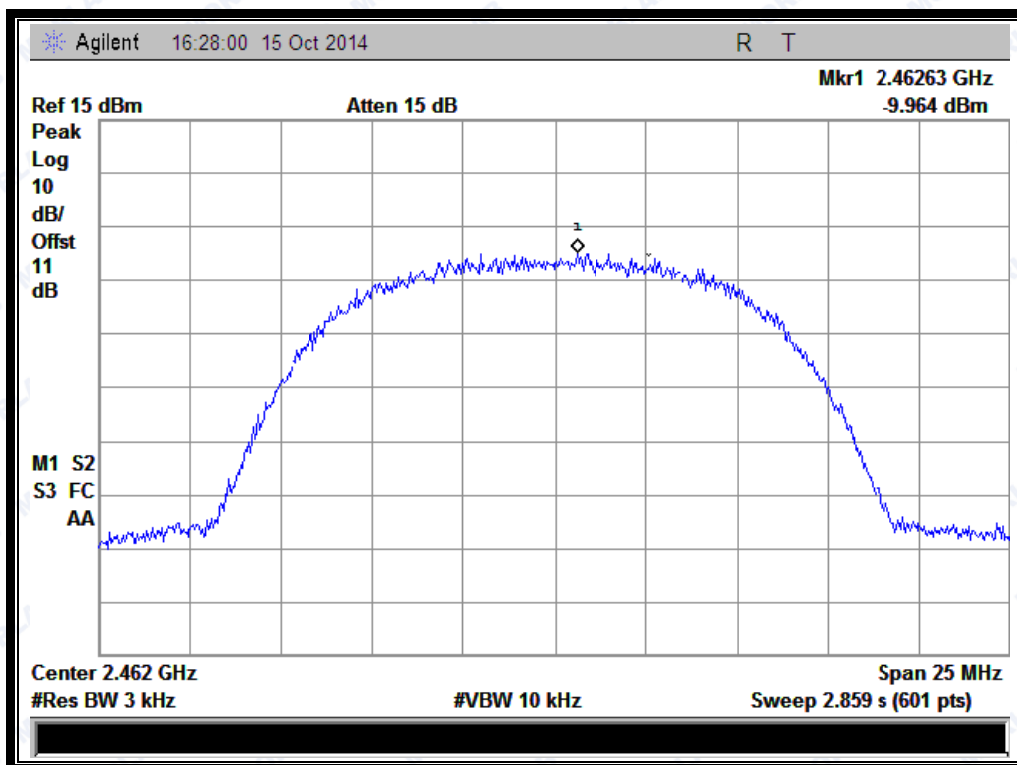
(Channel = 1 @ 802.11b)



REPORT No. : SZ14090085W05



(Channel = 6 @ 802.11b)



(Channel = 11 @ 802.11b)



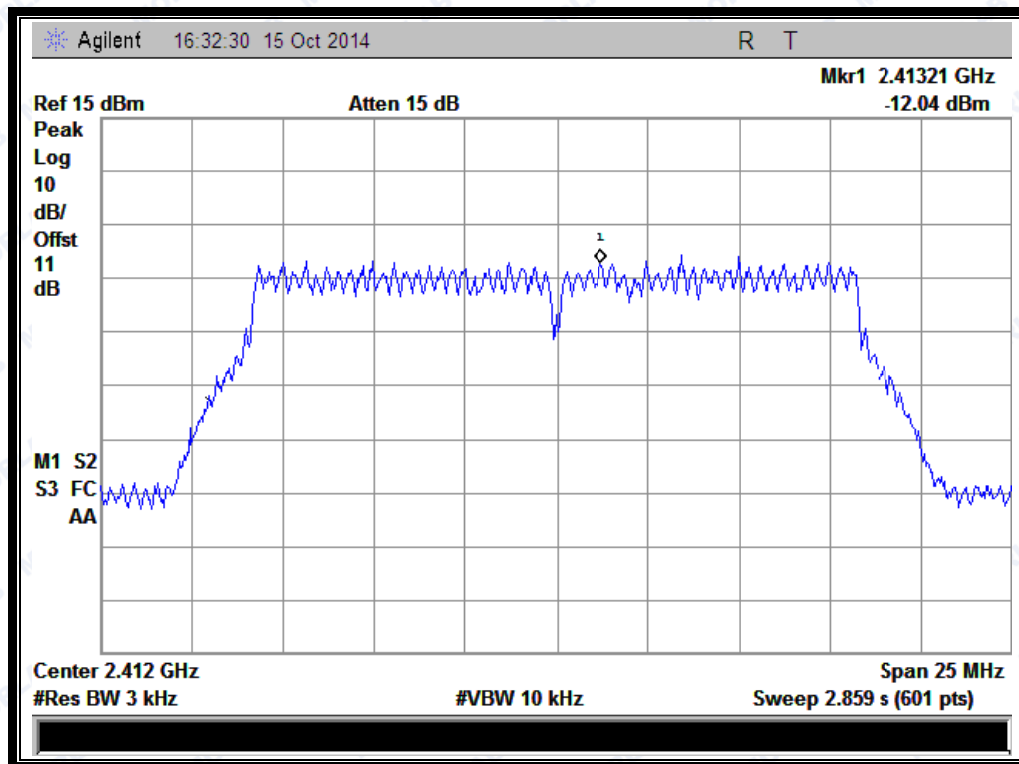
2.5.3.2. 802.11g Test mode

A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-12.04	8	PASS
6	2437	-11.35	8	PASS
11	2462	-12.77	8	PASS

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

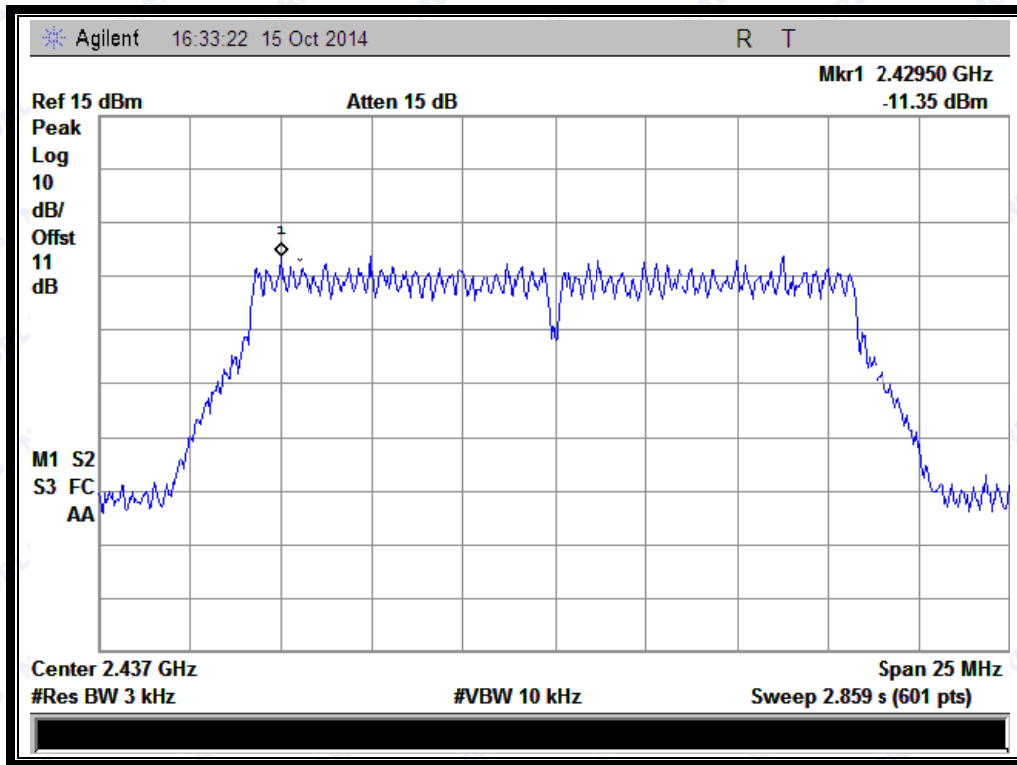
B. Test Plots:



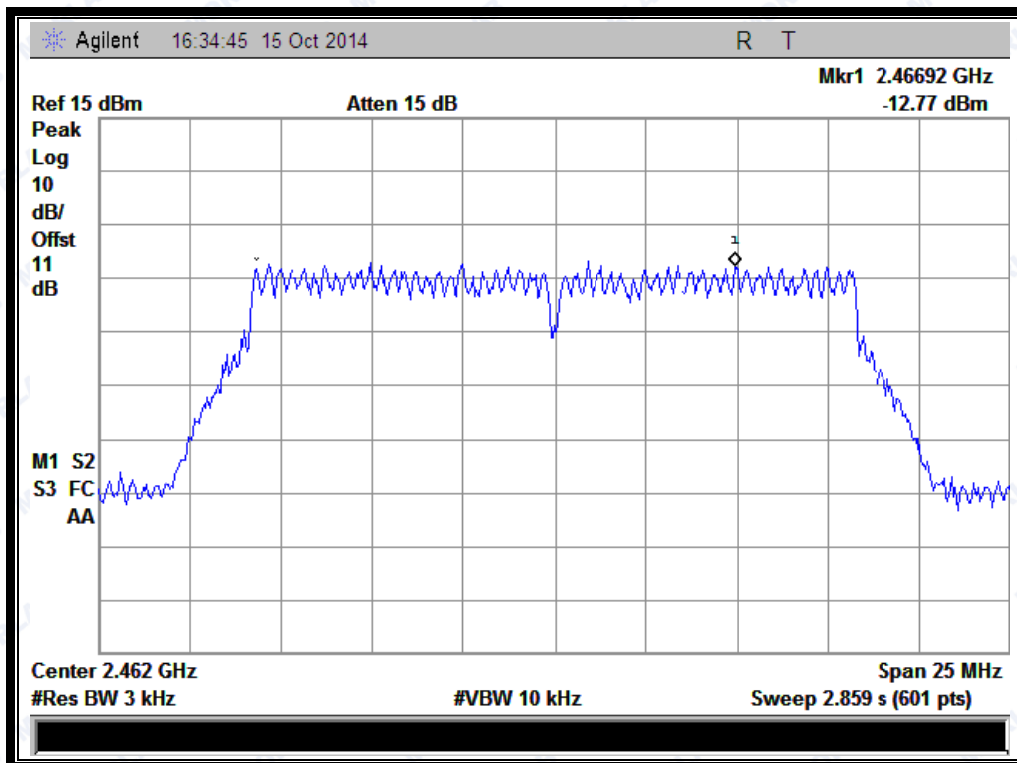
(Channel = 1 @ 802.11g)



REPORT No. : SZ14090085W05



(Channel = 6 @ 802.11g)



(Channel = 11 @ 802.11g)

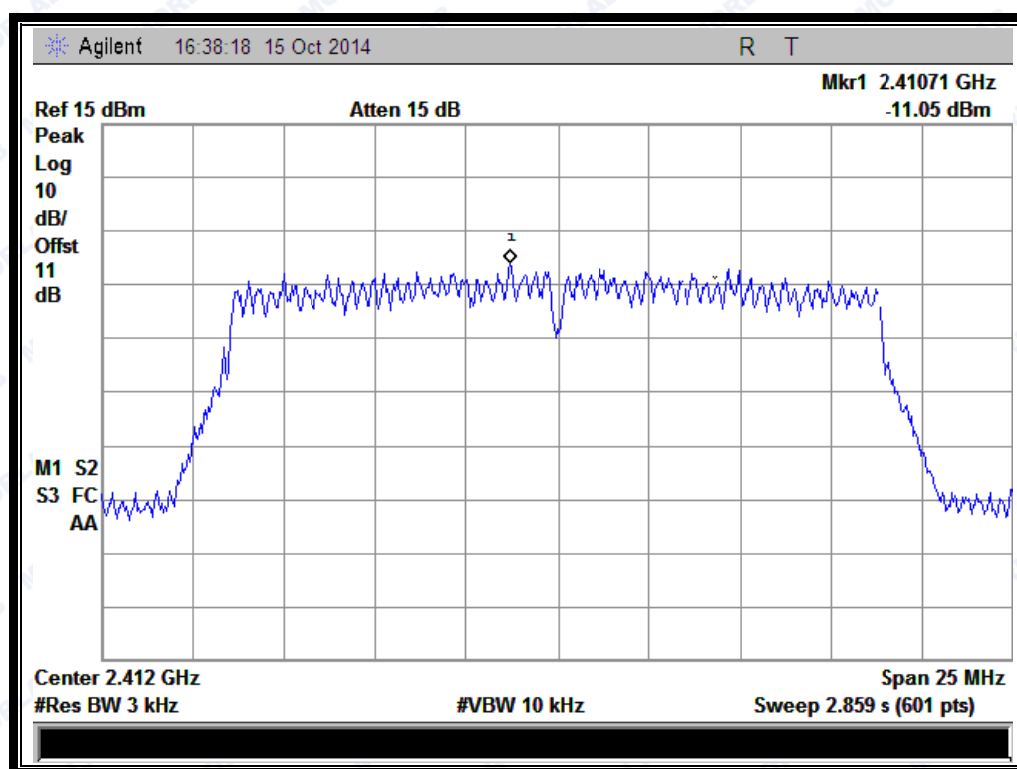


2.5.3.3. 802.11n-20MHz Test mode

A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-11.05	8	PASS
6	2437	-11.80	8	PASS
11	2462	-12.07	8	PASS
Measurement uncertainty: ± 1.3 dB				

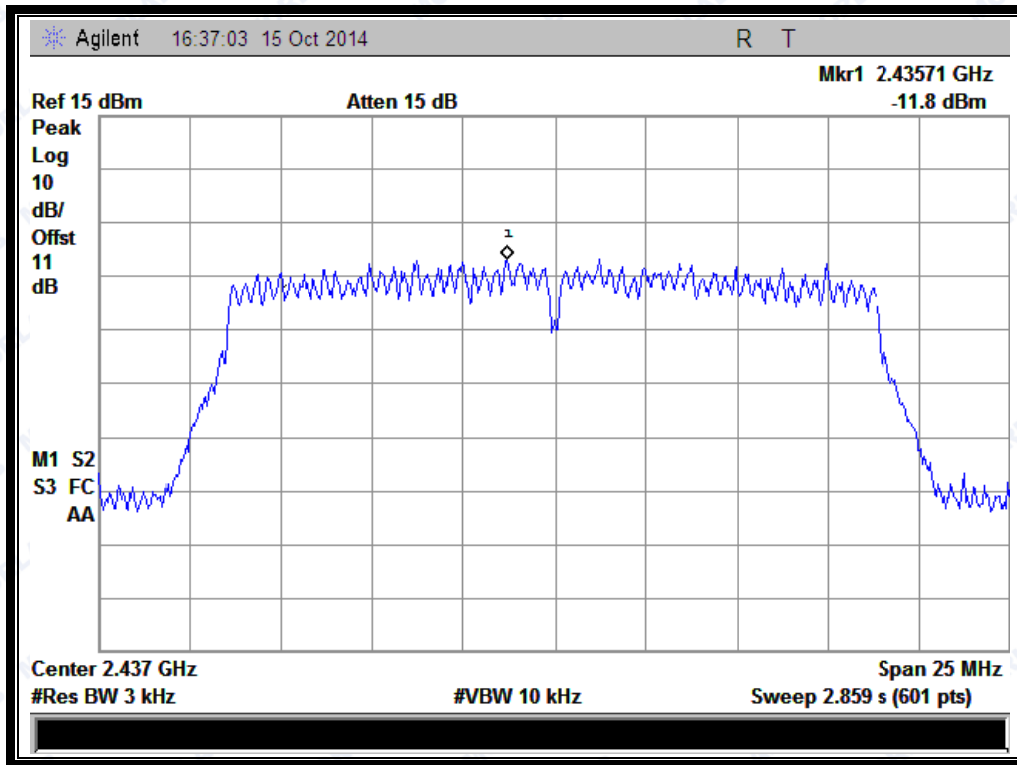
B. Test Plots:



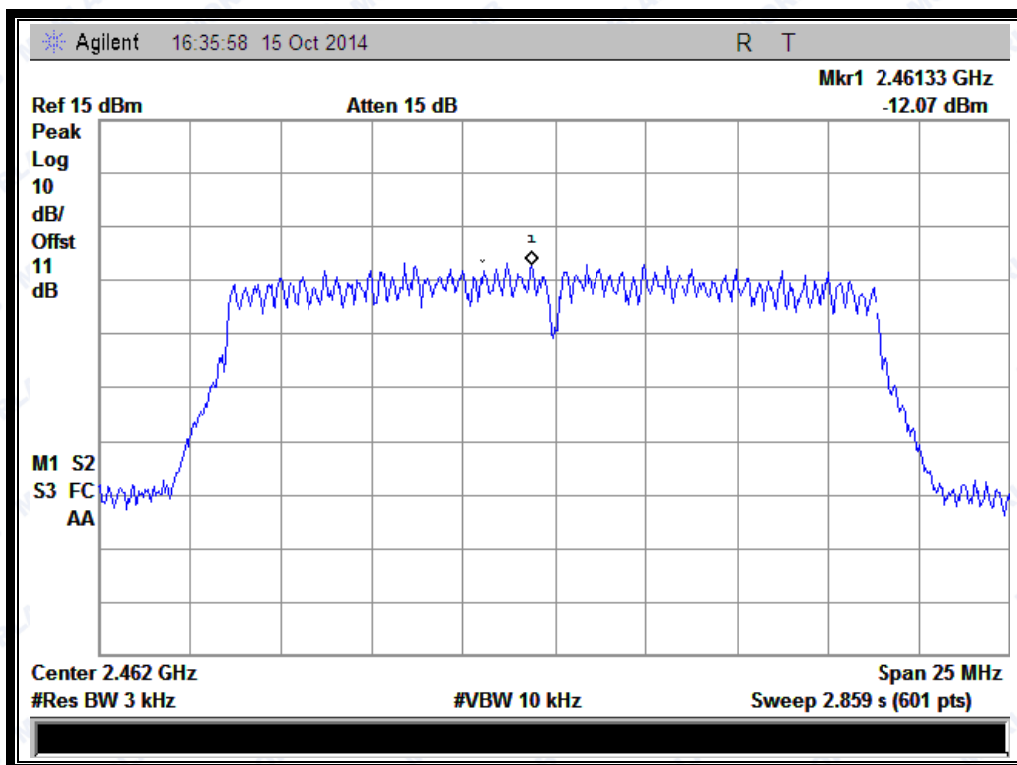
(Channel = 1 @ 802.11n-20MHz)



REPORT No. : SZ14090085W05



(Channel = 6 @ 802.11n-20MHz)



(Channel = 11 @ 802.11n-20MHz)

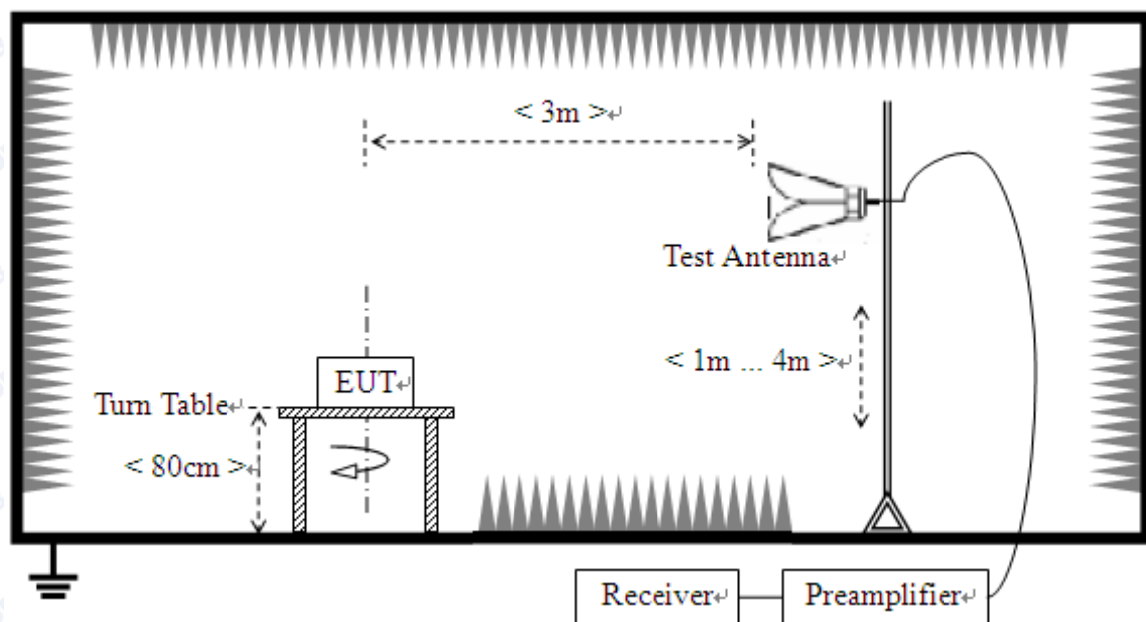
2.6. Restricted Frequency Bands

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:

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

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{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.

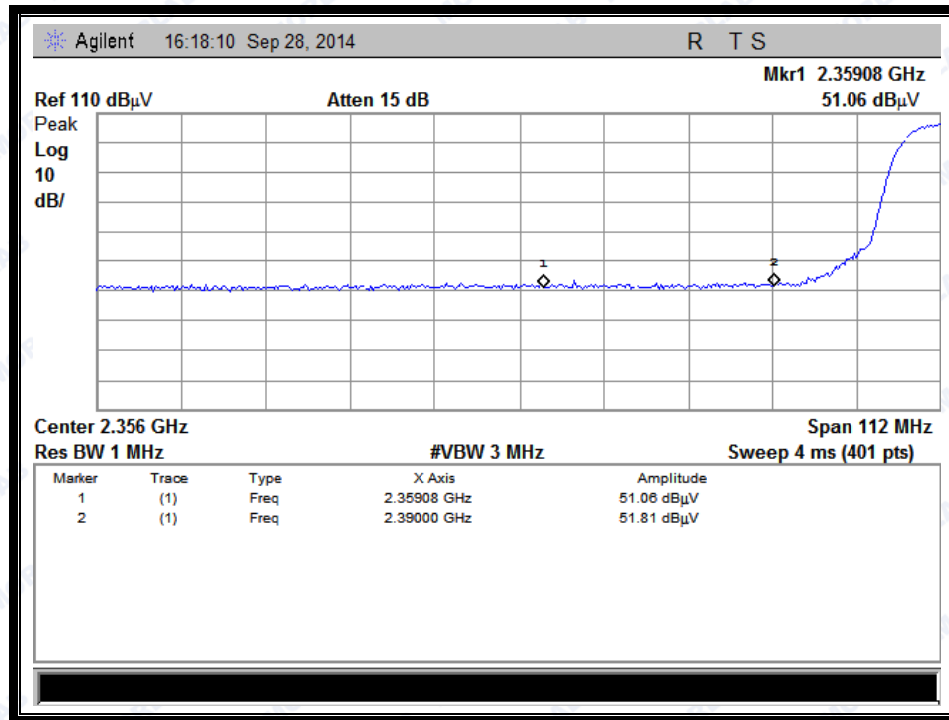
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
1	2390.00	PK	51.81	-33.63	32.56	50.74	74	Pass
1	2390.00	AV	41.98	-33.63	32.56	40.91	54	Pass
11	2484.99	PK	50.51	-33.18	32.5	49.83	74	Pass
11	2483.50	AV	39.81	-33.18	32.5	39.13	54	Pass

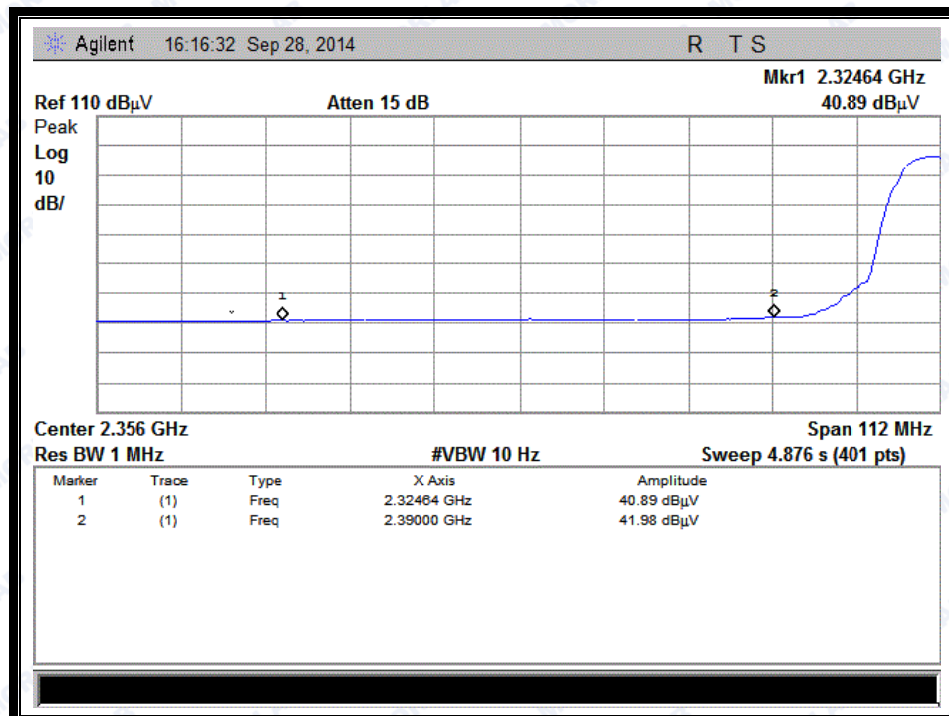


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B. Test Plots:



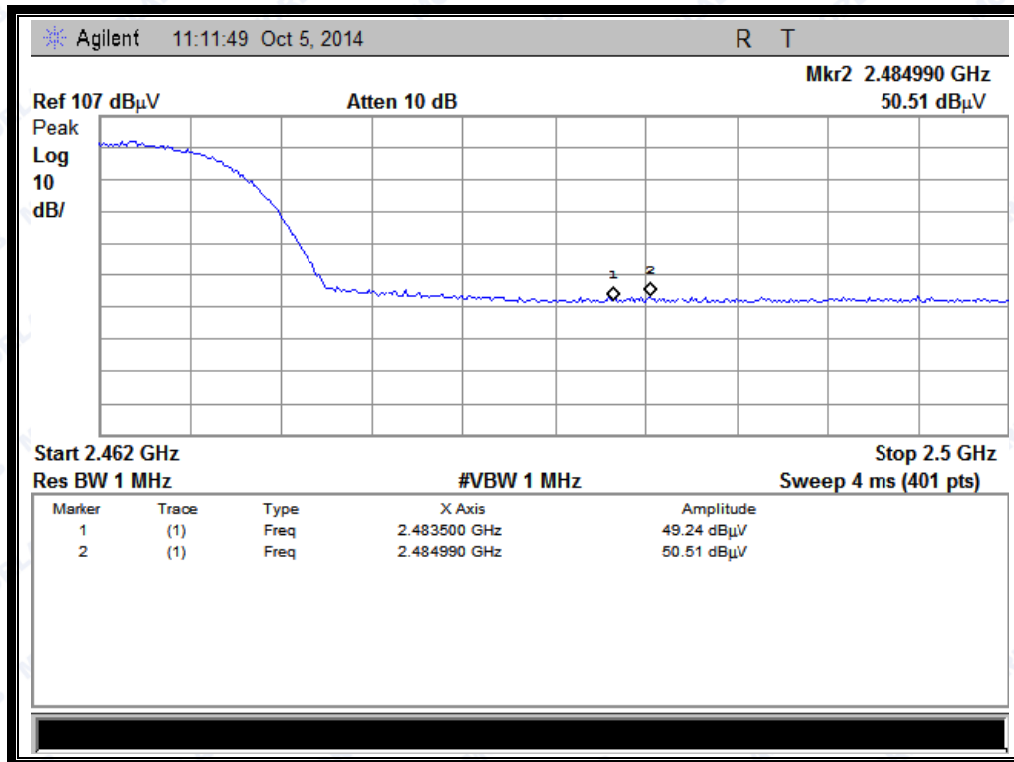
(Plot A1: Channel = 1 PEAK @ 802.11b)



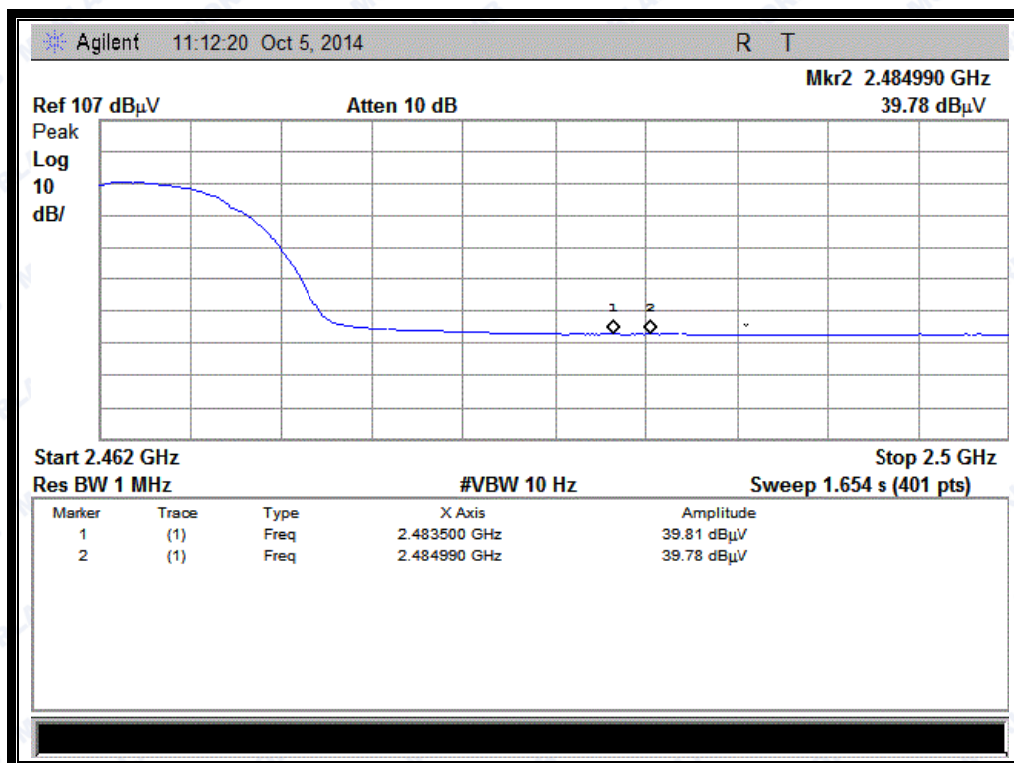
(Plot A2: Channel = 1 AVG @ 802.11b)



REPORT No. : SZ14090085W05



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



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



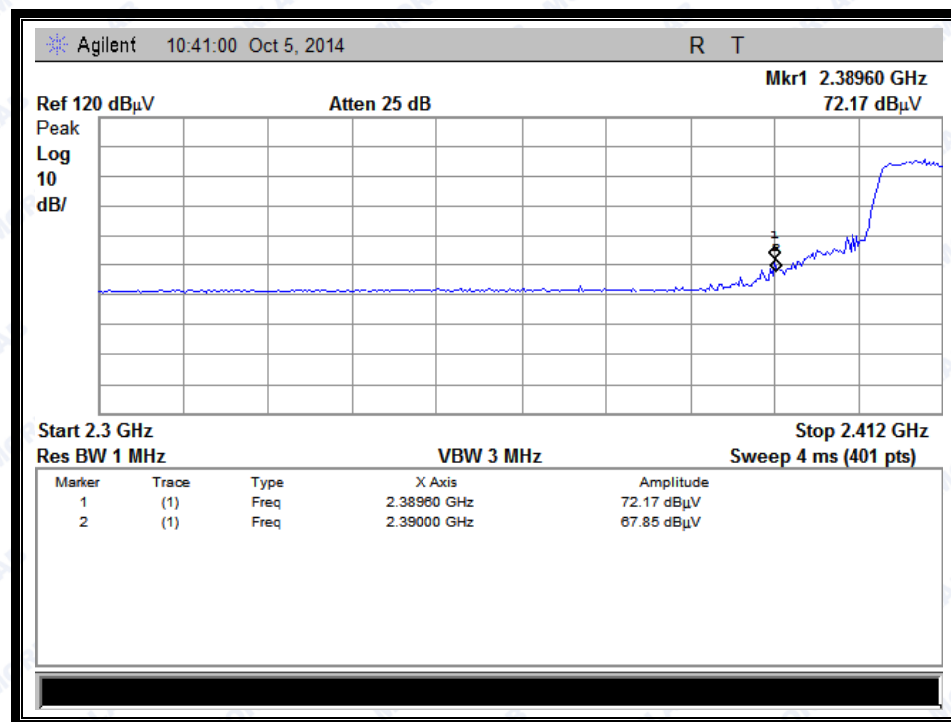
2.6.3.2. 802.11g Test mode

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

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
1	2389.60	PK	72.17	-33.63	32.56	71.1	74	Pass
1	2390.00	AV	52.27	-33.63	32.56	51.2	54	Pass
11	2484.04	PK	70.97	-33.18	32.5	70.29	74	Pass
11	2483.50	AV	50.20	-33.18	32.5	49.52	54	Pass

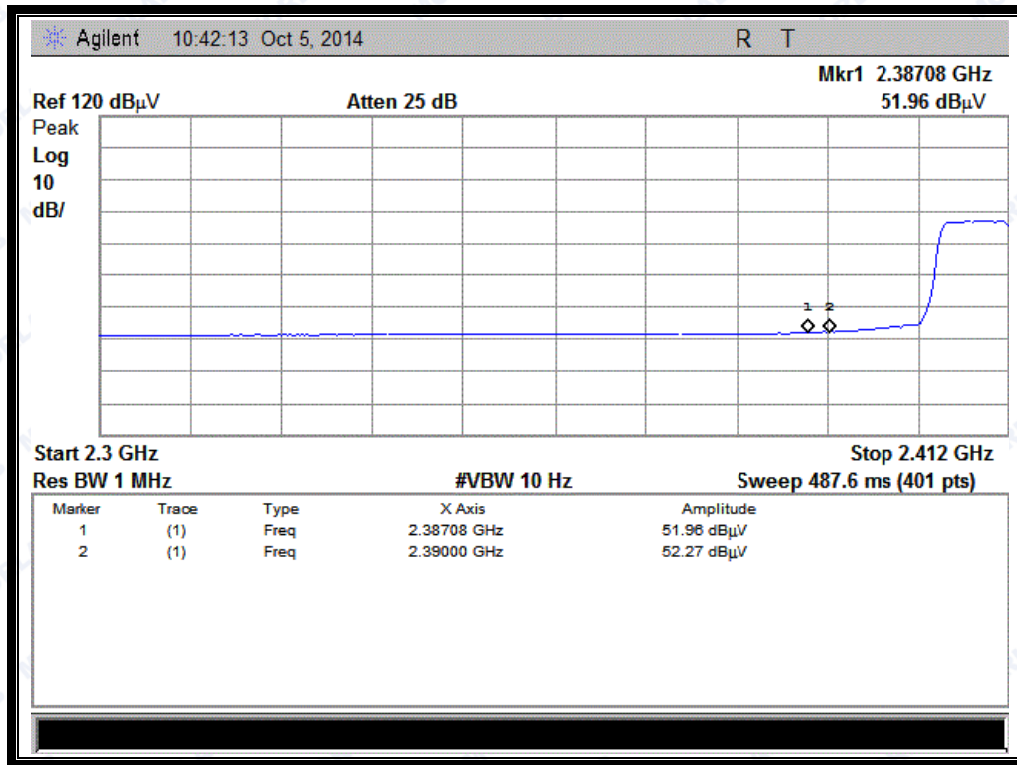
B. Test Plots:



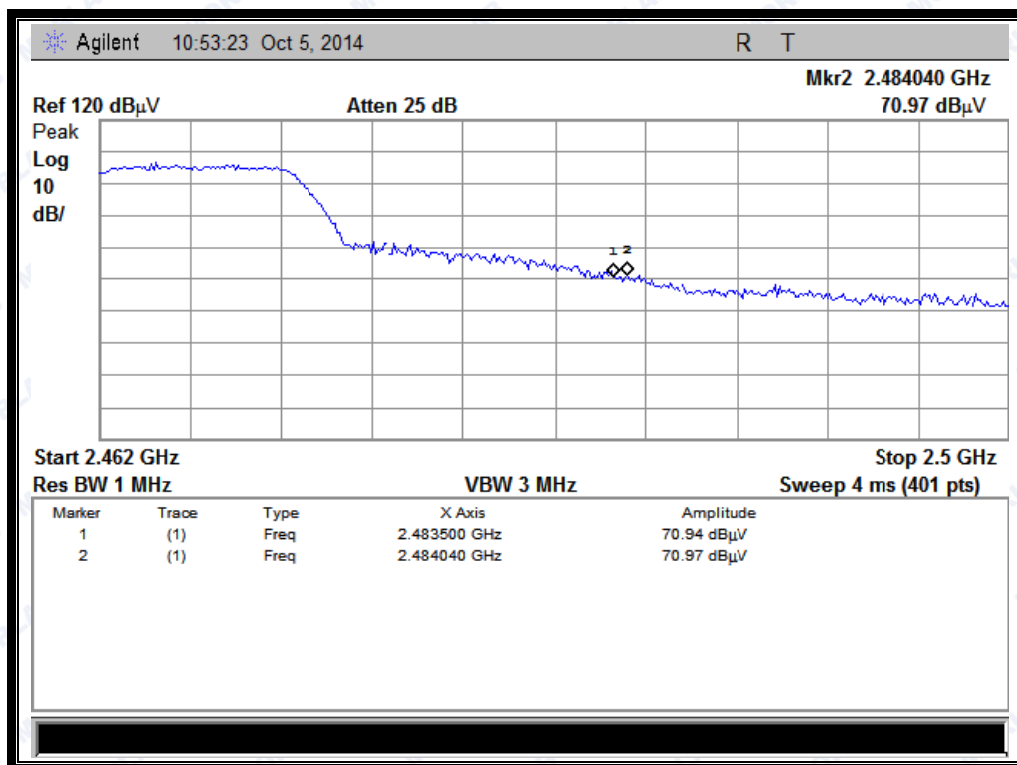
(Plot C1: Channel = 1 PEAK @ 802.11g)



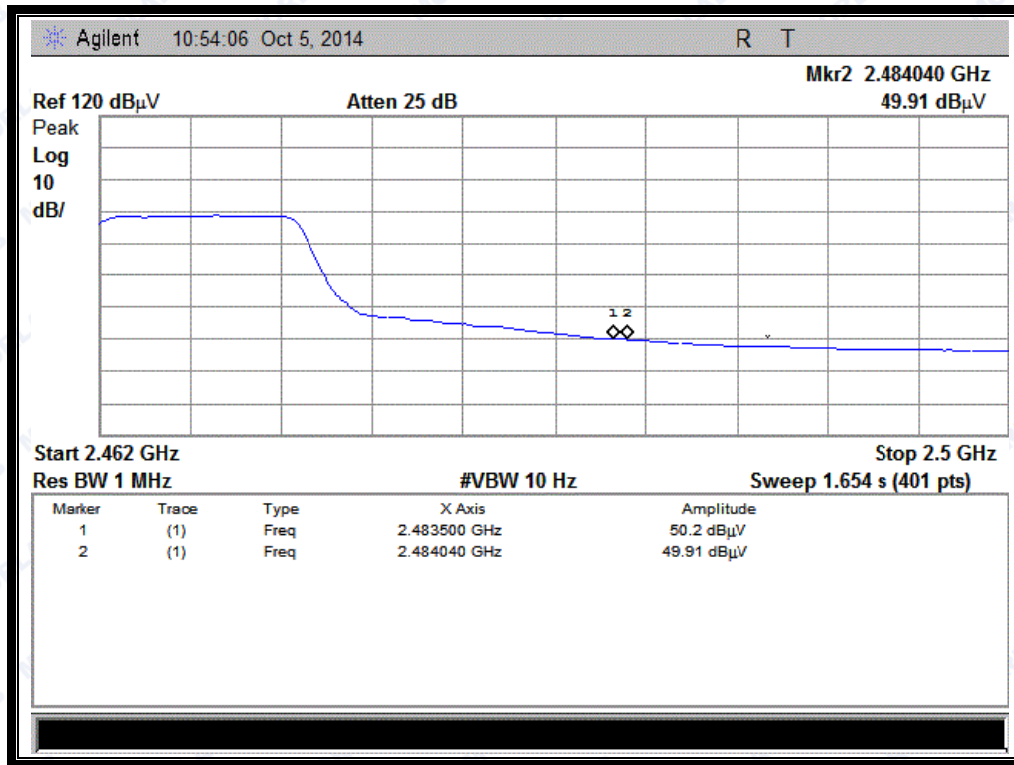
REPORT No. : SZ14090085W05



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



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



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

2.6.3.3. 802.11n-20MHz Test mode

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

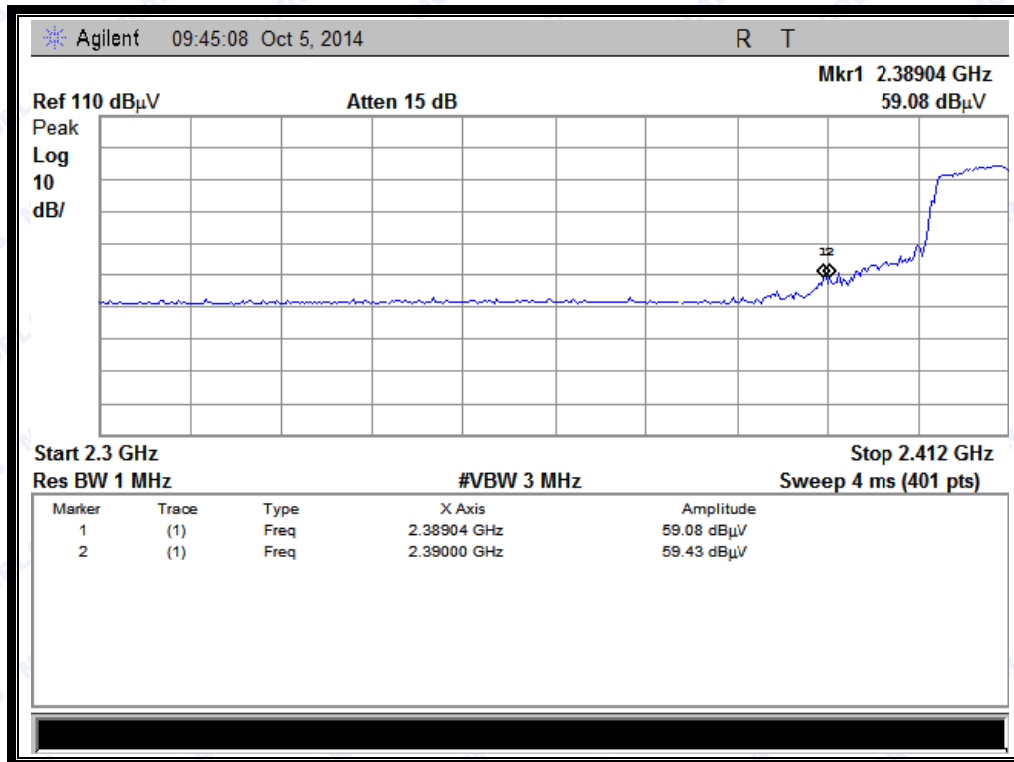
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2390.00	PK	59.43	-33.63	32.56	58.36	74	Pass
1	2390.00	AV	41.70	-33.63	32.56	40.63	54	Pass
11	2486.61	PK	63.62	-33.18	32.5	62.94	74	Pass
11	2483.50	AV	44.95	-33.18	32.5	44.27	54	Pass

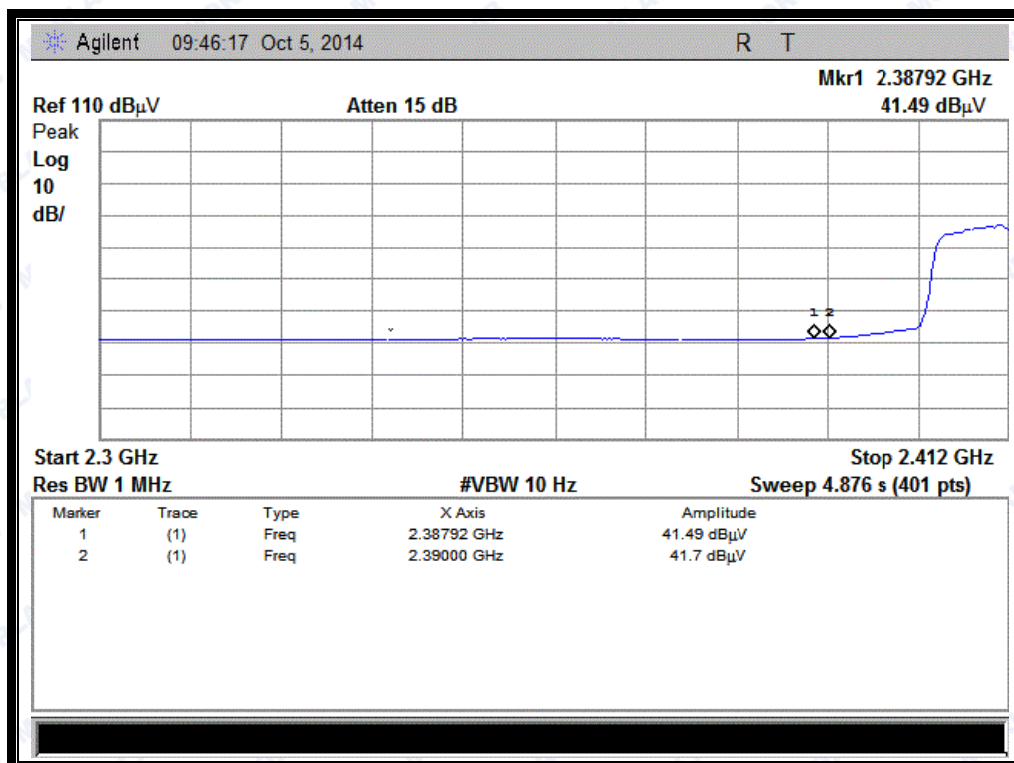
B. Test Plots:



REPORT No. : SZ14090085W05



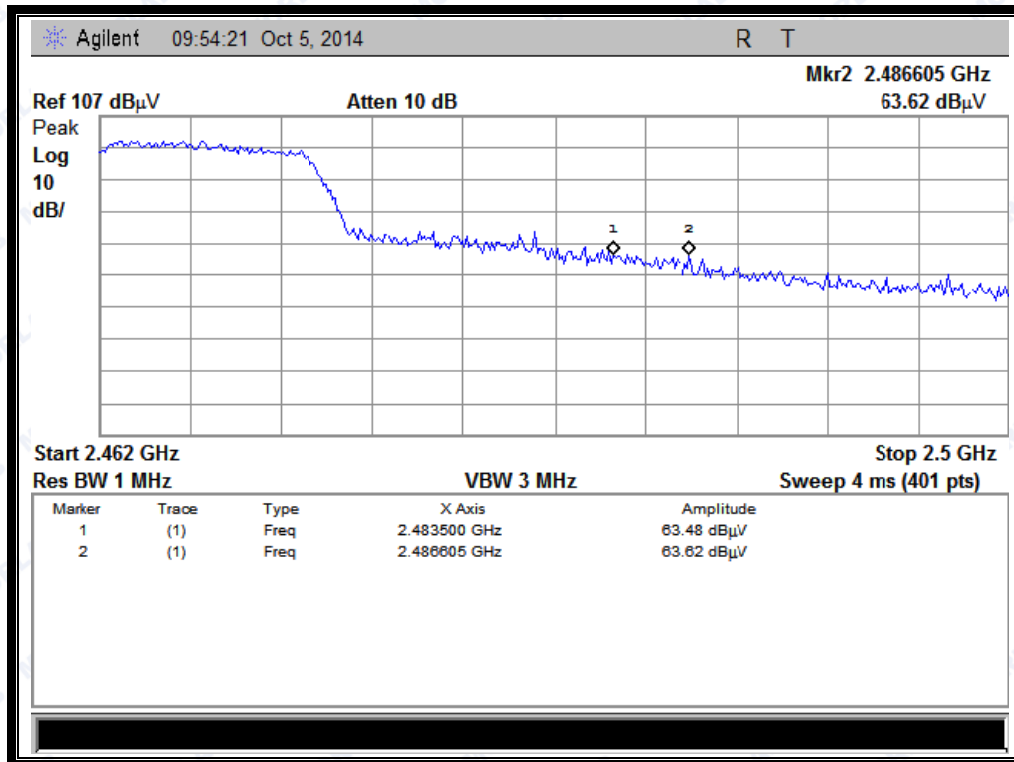
(Plot E1: Channel = 1 PEAK @ 802.11n-20)



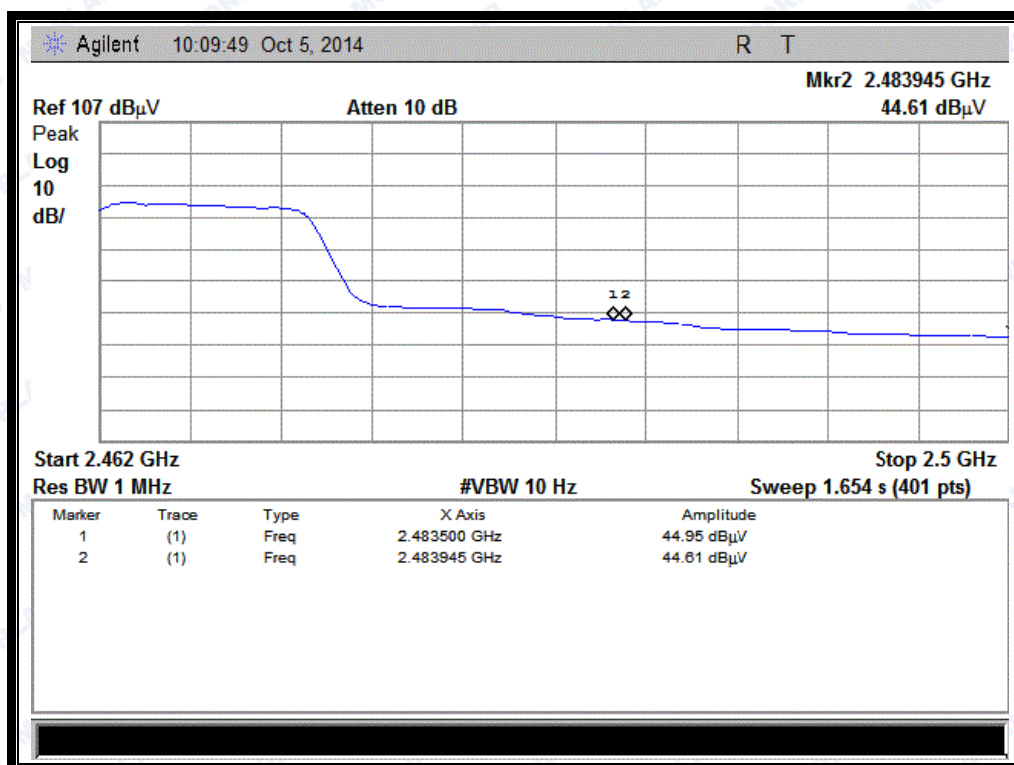
(Plot E2: Channel = 1 AVG @ 802.11n-20)



REPORT No. : SZ14090085W05



(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 50 μ H/50 Ω line impedance stabilization network (LISN).

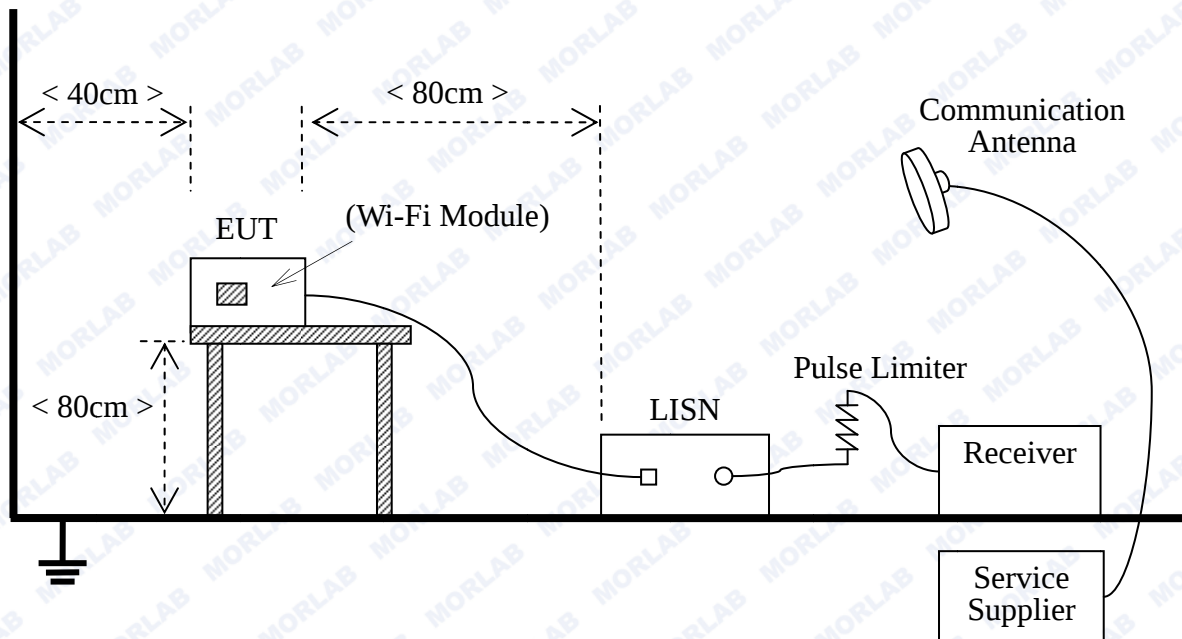
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

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

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

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.

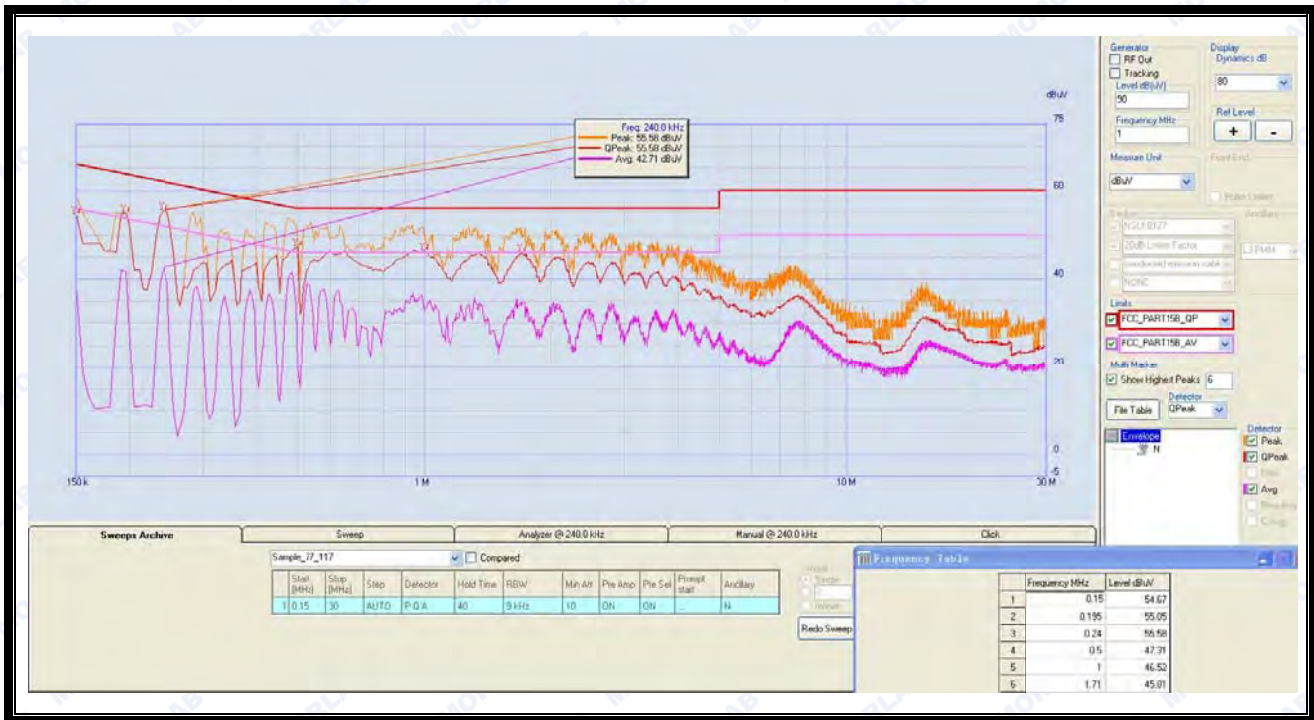
Note: All test modes are performed, only the worst case is recorded in this report.

A. Test setup:

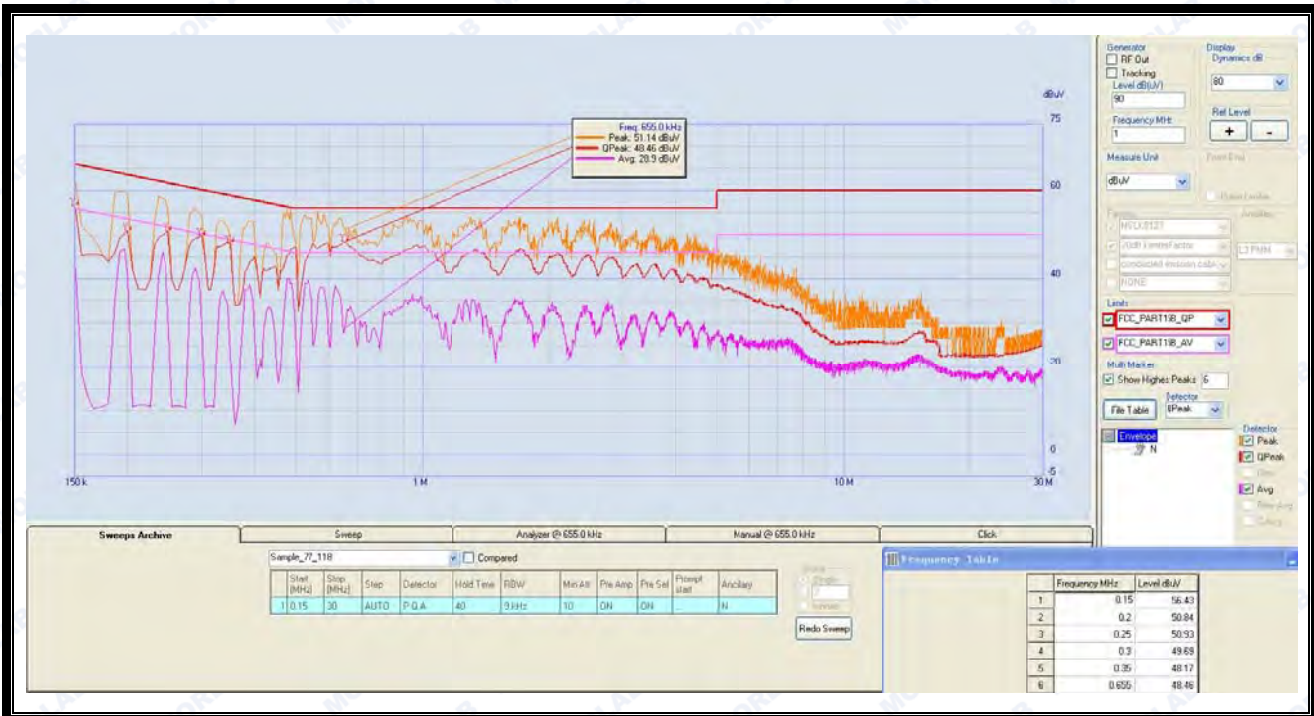
The EUT configuration of the emission tests is EUT + Link.



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 a ttenuation below the general limits specified in FCC s ection 15.209(a) is n ot required. In addition, radiated emissions which fall in the rest ricted ban ds, as defi ned in FC C section 15.205(a), must als o comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

Note:

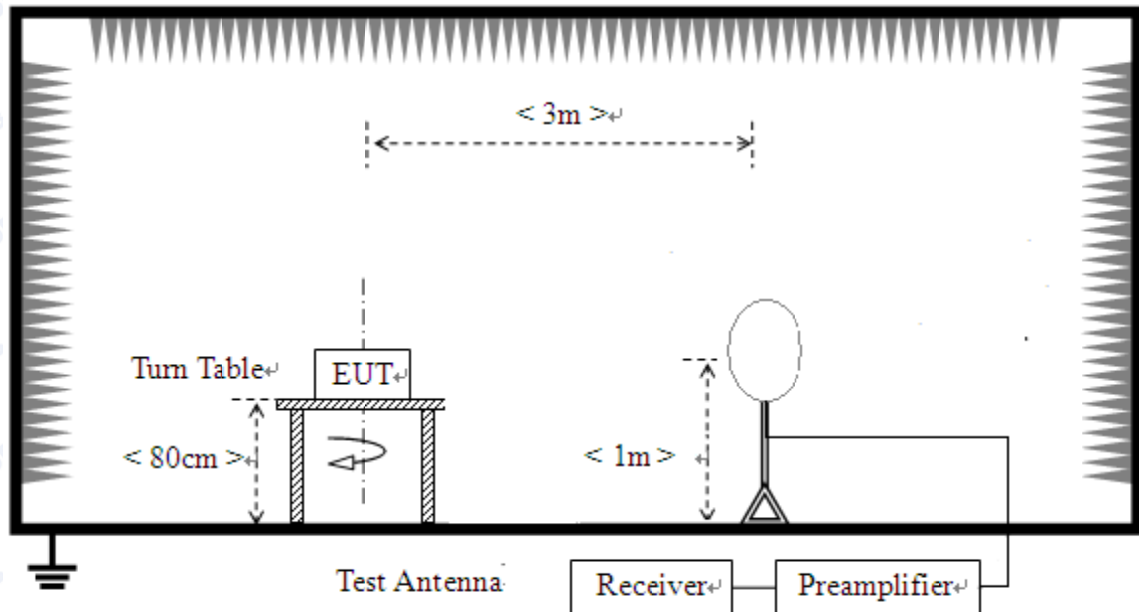
1. For Above 1000MHz, t he emissi on limit in this paragr aph is bas ed o n me asurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmoni cs: 54dBu V/m@3m (AV) a nd 74dBuV/m@3m (PK)

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

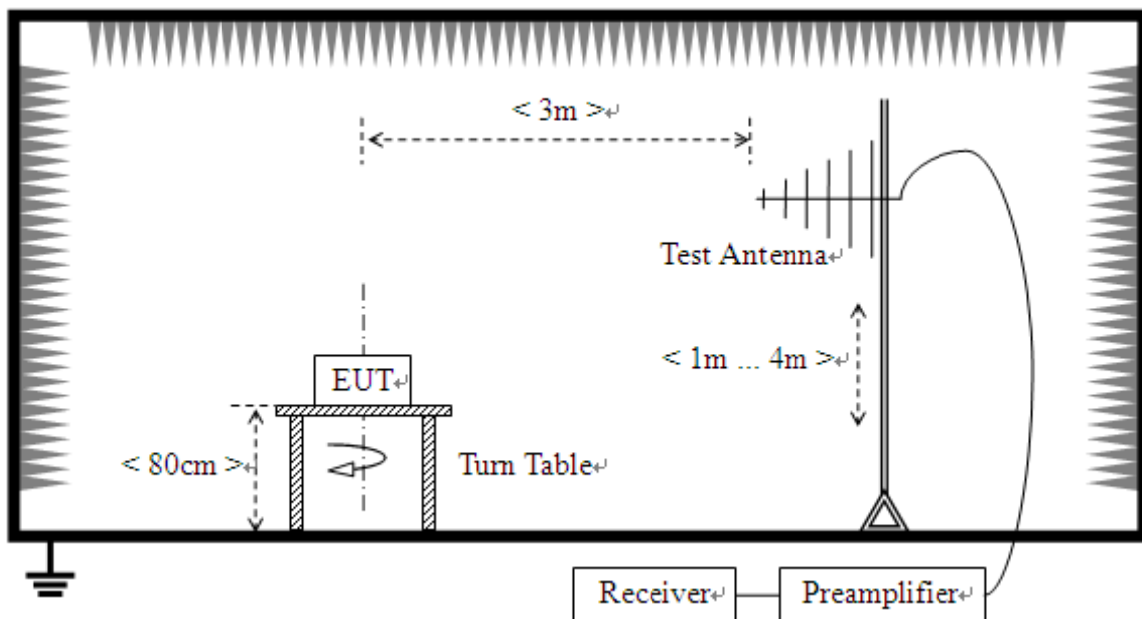
2.8.2. Test Description

A. Test Setup:

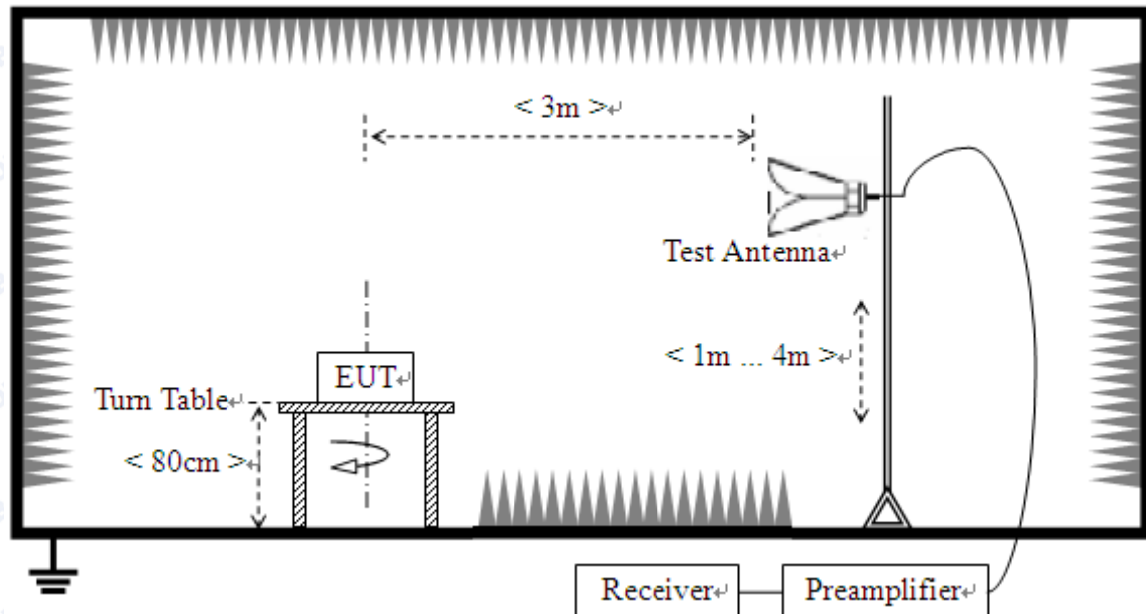
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz



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

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

For the Test Antenna:

- 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.
- In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 2GHz) and Horn Test Antenna (above 2GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

**B. Equipments List:**

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 a quasi-peak measurement.

The measurement results are obtained as below:

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

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{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.

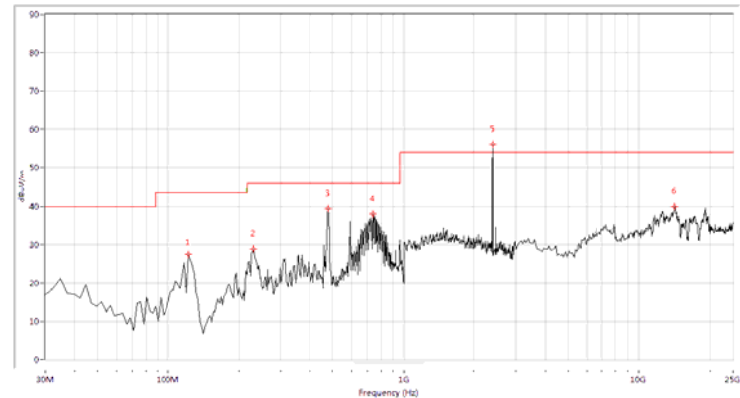
Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

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:**

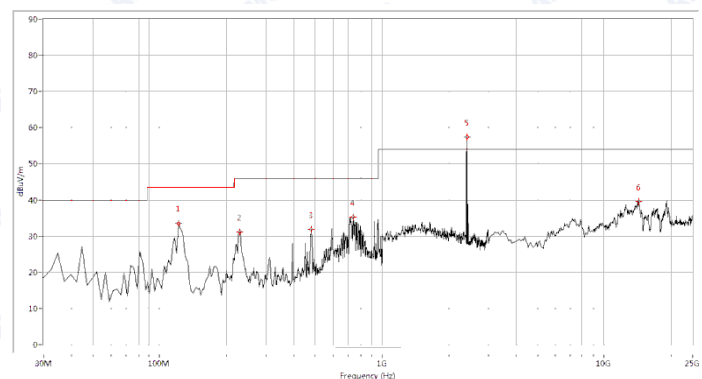


Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	27.47	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
230.773	28.93	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	39.35	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
741.172	37.89	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2412.000	56.23	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	39.90	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



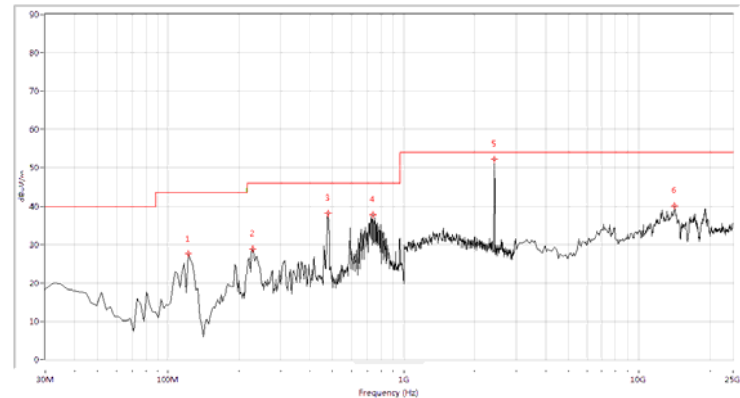
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	33.51	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
228.354	31.17	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	31.94	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
741.172	35.24	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2412.000	57.33	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14356.608	39.48	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



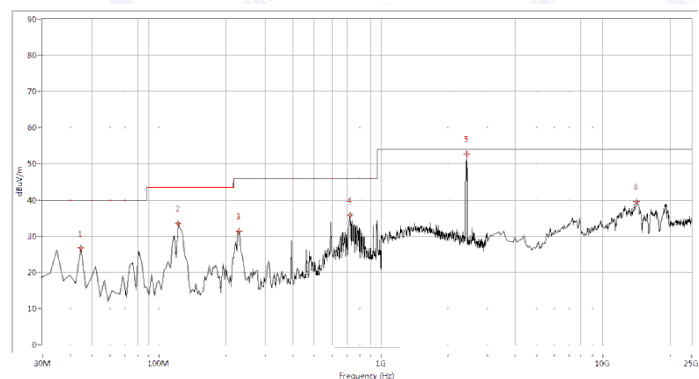
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Plot for Channel = 6



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	27.58	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
228.354	28.85	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	38.22	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
738.753	37.86	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2437.000	52.14	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14137.157	40.09	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

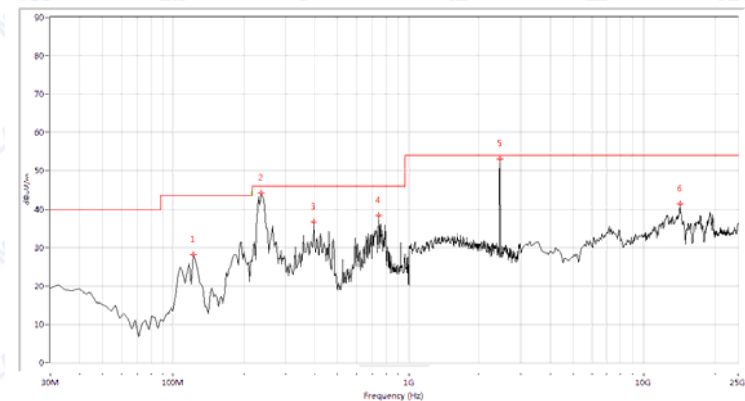


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	26.74	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
121.920	33.55	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
228.354	31.40	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
724.239	35.83	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2437.000	52.81	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14192.020	39.64	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

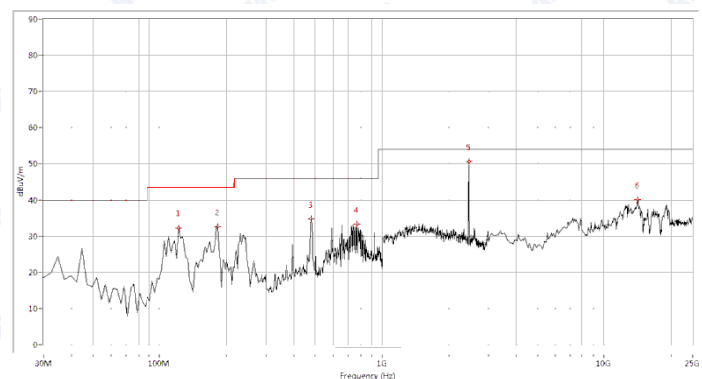


Plot for Channel = 11



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	28.12	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
235.611	44.23	39.81	N.A	N.A	46.0	N.A	Horizontal	PASS
395.262	36.77	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
746.010	38.37	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2462.000	53.16	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14246.883	41.37	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
121.920	32.21	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
182.394	32.59	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
479.925	34.77	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
770.200	33.39	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2462.000	50.58	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14137.157	40.14	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

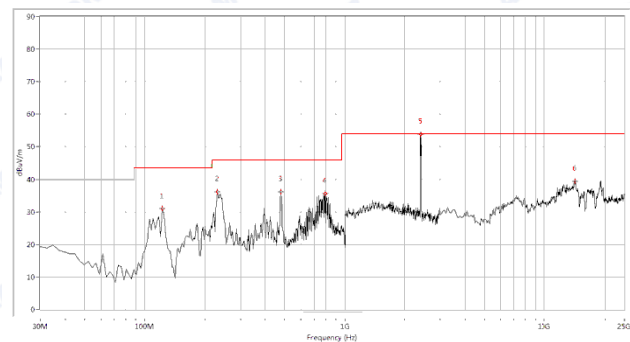
(Antenna Vertical, 30MHz to 25GHz)



2.8.3.2. 802.11g Test mode

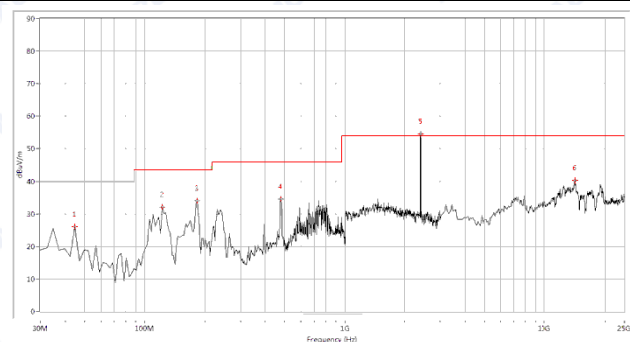
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	31.05	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
230.773	36.24	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	36.16	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	35.57	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2412.000	53.81	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14301.746	39.35	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

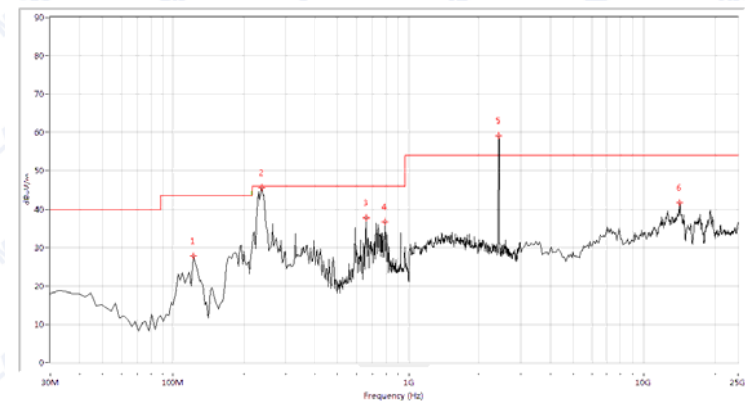


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	26.10	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
121.920	32.15	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
182.394	34.01	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
479.925	34.60	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2412.000	54.58	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14246.883	40.28	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

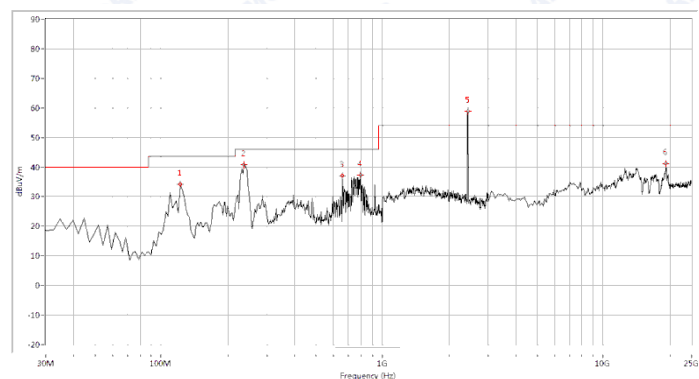


Plot for Channel = 6



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	27.87	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
238.030	45.69	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
658.928	37.69	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
789.551	36.75	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2437.000	59.24	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14137.157	41.72	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



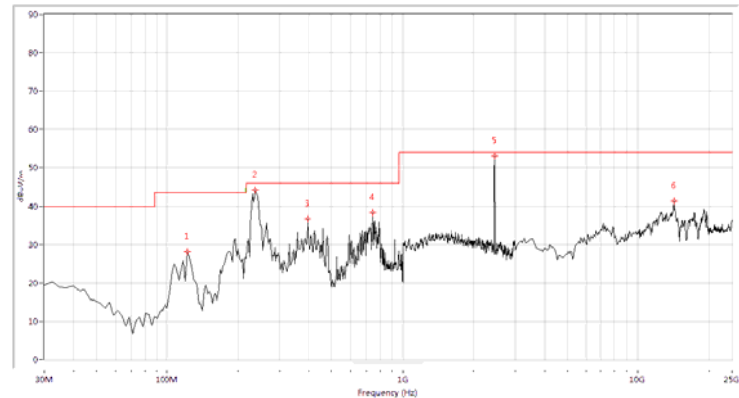
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	34.16	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
235.611	40.86	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
658.928	37.13	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
791.970	37.37	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2437.000	58.81	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
19129.676	41.19	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



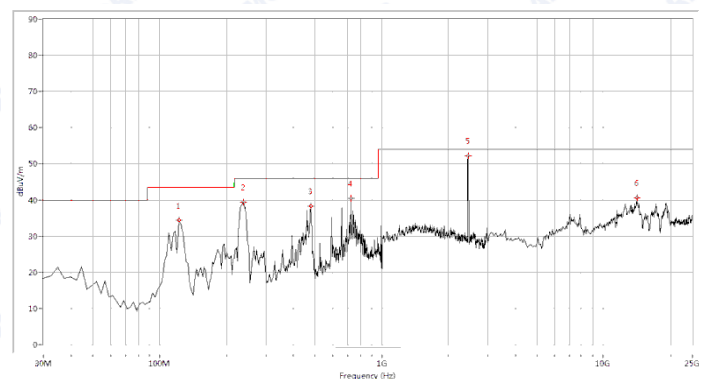
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Plot for Channel = 11



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
121.920	28.12	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
235.611	44.23	39.81	N.A	N.A	46.0	N.A	Horizontal	PASS
395.262	36.77	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
746.010	38.37	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2462.000	53.16	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14246.883	41.37	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
121.920	34.41	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
238.030	39.46	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	38.38	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
724.239	40.42	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2462.000	52.21	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14137.157	40.63	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

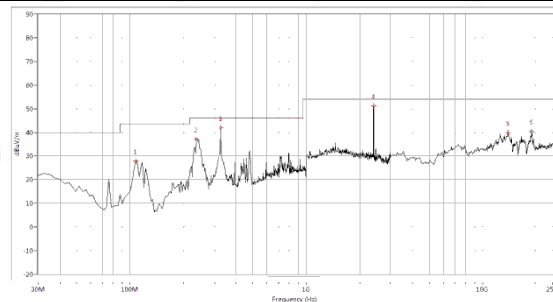
(Antenna Vertical, 30MHz to 25GHz)



2.8.3.3. 802.11n-20MHz Test mode

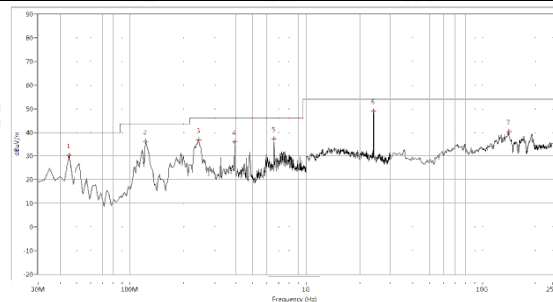
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
107.406	27.82	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
235.611	36.99	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
329.950	41.95	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2412.000	51.23	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14137.157	39.83	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19129.676	40.39	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



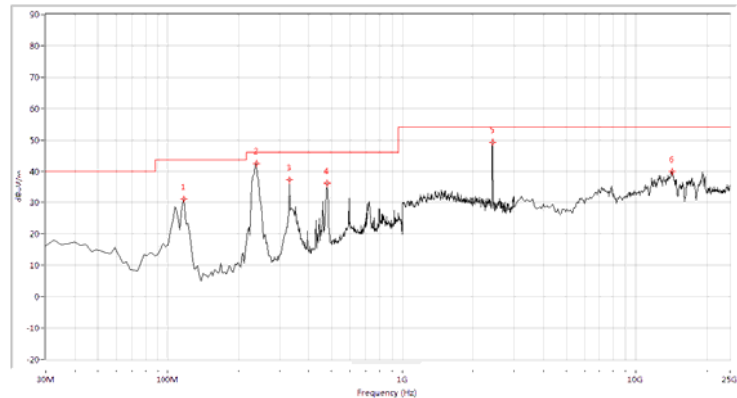
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	30.32	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
121.920	36.24	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
242.868	36.77	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
395.262	36.01	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
658.928	37.24	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2412.000	48.94	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14301.746	40.37	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



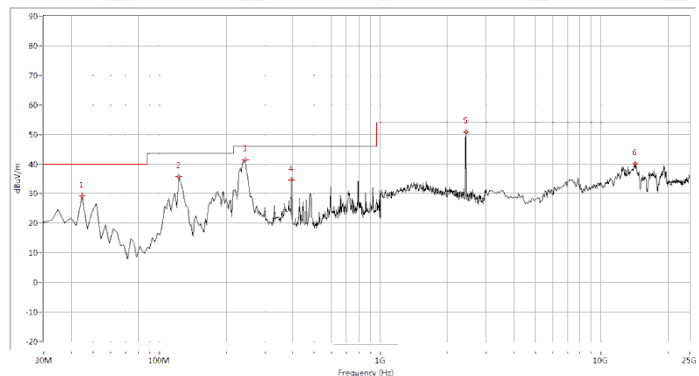
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Plot for Channel = 6



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
117.082	31.09	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
238.030	42.48	37.83	N.A	N.A	46.0	N.A	Horizontal	PASS
329.950	37.21	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	36.10	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2437.000	49.28	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	39.93	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



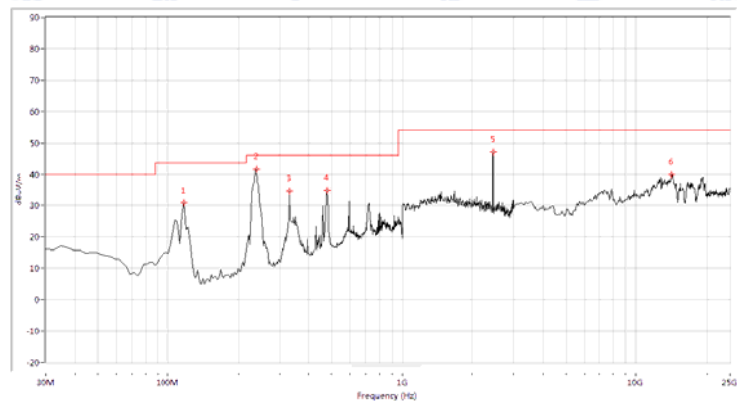
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.514	29.29	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
121.920	35.68	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
242.868	41.41	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
395.262	34.68	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2437.000	50.79	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14192.020	40.13	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



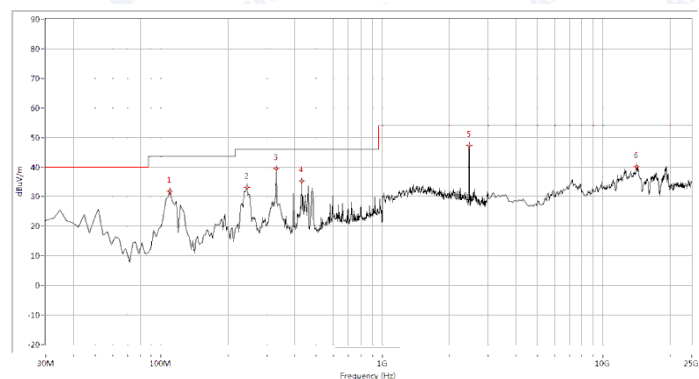
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Plot for Channel = 11



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
117.082	31.01	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
238.030	41.55	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
329.950	34.58	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	34.92	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2462.000	47.12	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14137.157	39.98	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
109.825	31.87	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
242.868	33.11	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
329.950	39.55	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
431.546	35.29	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2462.000	47.34	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14137.157	40.17	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 Di strict, Shen Zhen, Gu angDong Province, P. R. China
Responsible Test Lab Manager:	Mr. u Seng
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 Di strict, Shen Zhen, Gua ngDong 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.

The IC registration number is 7183A-2.



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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	US44210471	E7405A	Agilent	2014.02.26	2015.02.25
2	Power Splitter	NW521	1506A	Weinschel	2014.02.26	2015.02.25
3	Attenuator 1	(n.a.)	10dB	Resnet	2014.02.26	2015.02.25
4	Attenuator 2	(n.a.)	3dB	Resnet	2014.02.26	2015.02.25
5	USB Wideband Power Sensor	MY52280010	U2021XA	Agilent	2014.02.26	2015.02.25
6	EXA Signal Analyzer	MY51440152	N9010A	Agilent	2014.02.26	2015.02.25

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	2014.02.26	2015.02.25
2	LISN	812744	NSLK 8127	Schwarzbeck	2014.02.26	2015.02.25
3	Service Supplier	100448	CMU200	R&S	2014.02.26	2015.02.25
4	Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2014.02.26	2015.02.25

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	2014.02.26	2015.02.25
2	Receiver	US44210471	E7405A	Agilent	2014.02.26	2015.02.25
3	Test Antenna -	9163-274	9m*6m*6m	Albatross	2014.02.26	2015.02.25



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	Bi-Log					
4	Test Antenna - Horn	9120D-963	VULB 9163	Schwarzbeck	2014.02.26	2015.02.25
5	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2014.02.26	2015.02.25
6	Test Antenna - Loop	1519-022	HL050S7	R&S	2014.02.26	2015.02.25
7	Reject Filter	(n.a.)	BRM50702	Micro-Tronics	2014.02.26	2015.02.25

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	2014.02.26	2015.02.25

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	2014.02.26	2015.02.25

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	2014.02.26	2015.02.25

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