REPORT No.: SZ18030098W01

TEST REPORT

APPLICANT	:	Universal Electronics Inc
PRODUCT NAME	:	Wi-Fi Dongle
MODEL NAME	:	UEI2236B
BRAND NAME	:	UNIVERSAL ELECTRONICS INC
FCC ID	:	MG3-2236B
STANDARD(S)	:	47 CFR Part 15 Subpart C
TEST DATE	:	2018-03-16 to 2018-05-12
ISSUE DATE	:	2018-05-14

Tested by: Su Hang

Su Hang (Test Engineer)

Approved by: Andy Yeh

Andy Yeh (Technical Director)

MORLAB

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DIRECTORY

Change History		
Issue	**Date**	**Reason for change**
1.0	2018-05-14	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Universal Electronics Inc
Applicant Address:	201 East Sandpointe Ave, 8th Floor, Santa Ana, CA, United States
Manufacturer:	ITON Technology Corp.
Manufacturer Address:	Room 1302, Block A, Building 4, Tianan Cyber Park, Huangge Road, Longgang District, Shenzhen, China

1.2. Equipment Under Test (EUT) Description

Product Name:	Wi-Fi Dongle
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	V1.1
Software Version:	V1.0
Modulation Type:	DSSS, OFDM
Modulation Mode:	802.11b, 802.11g, 802.11n(HT20), 802.11n(HT40)
Operating Frequency Range:	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz 802.11n-40MHz: 2.422GHz - 2.452GHz
Channel Number:	802.11b/g/n-20MHz: 11 802.11n-40MHz: 7
Modulation Type:	DSSS, OFDM
Antenna Type:	PCB Antenna
Antenna Gain:	Ant0: 1.5 dBi; Ant1: 1.5 dBi$_{Note6}$
Directional Gain:	4.51 dBi $_{Note\ 3}$

Note 1: The EUT is 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 HT20, the frequencies allocated is F (MHz) =2412+5*(n-1) (1<=n<=11). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2412MHz), 6 (2437MHz) and 11 (2462MHz).

For 802.11n HT40, the frequencies allocated is F (MHz) =2412+5*(n-1) (3<=n<=9). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 3 (2422MHz), 6 (2437MHz) and 9 (2452MHz).

Note 2: The EUT has two antennas, only 802.11n modulation mode supports a MIMO function.

Modulation Mode:	TX Function	Relationship between the two output signals
802.11b	1TX	Uncorrelated
802.11g	1TX	Uncorrelated
802.11n	2TX	Correlated

Note 3: According to KDB 662911 D01, the directional gain = G_{ANT} +10log(N_{ANT}) dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

Note 4: For conducted test item Peak Power and Power spectral density of each modulation mode, we recorded the test result of two antennas separately, for other conducted test items both of the two antennas were tested separately, we only recorded the worst test result(ANT1) in this report.

Note 5: All radiation test items for 802.11n modulation mode operate at MIMO mode during the test. Other modulation mode operate at SISO mode, both of the two antennas were tested separately, we only recorded the worst test result(ANT1) in this report.

Note 6: The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT continuous transmission.

Note 7: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C 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	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.247(b)	Peak Output Power	May 12, 2018	Su Hang	PASS
3	15.247(a)	Bandwidth	Mar 24, 2018	Su Hang	PASS
4	15.247(d)	Conducted Spurious Emission and Band Edge	Mar 31, 2018	Su Hang	PASS
5	15.247(e)	Power spectral density	Mar 31, 2018	Su Hang	PASS
6	15.247(d)	Restricted Frequency Bands	Apr 24&25, 2018	Peng Xuewei	PASS
7	15.207	Conducted Emission	Mar 16, 2018	Peng Xuewei	PASS
8	15.209, 15.247(d)	Radiated Emission	Apr 25, 2018	Peng Xuewei	PASS

Note1: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

Note2: These RF tests were performed according to the method of measurements prescribed in KDB558074 D01 DTS Meas Guidance v04, KDB662911 D01 Multiple Transmitter Output v02r01.

1.4. Environmental 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 USB Wideband Power Sensor and calibration.

A. Test Setup:

The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; 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 refer 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)	ANT0 Measured Peak Power		ANT1 Measured Peak Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
1	2412	19.37	0.0865	20.11	0.1026	30	1	PASS
6	2437	19.90	0.0977	19.39	0.0869			PASS
11	2462	18.94	0.0783	19.00	0.0794			PASS

Channel	Frequency (MHz)	ANT0 Average Power		ANT1 Average Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
1	2412	15.60	0.0363	15.72	0.0373	30	1	PASS
6	2437	15.28	0.0337	15.09	0.0323			PASS
11	2462	14.77	0.0300	15.26	0.0336			PASS

2.2.3.2 802.11g Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power		ANT1 Measured Peak Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
1	2412	23.75	0.2371	24.39	0.2748	30	1	PASS
6	2437	22.78	0.1897	24.63	0.2904			PASS
11	2462	23.18	0.2080	23.68	0.2333			PASS

Channel	Frequency (MHz)	ANT0 Average Power		ANT1 Average Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
1	2412	12.34	0.0171	11.82	0.0152	30	1	PASS
6	2437	12.12	0.0163	11.67	0.0147			PASS
11	2462	11.47	0.0140	11.39	0.0138			PASS

2.2.3.3 802.11n-20MHz Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power		ANT1 Measured Peak Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
1	2412	23.34	0.2158	22.76	0.1888	30	1	PASS
6	2437	21.78	0.1507	23.37	0.2173			PASS
11	2462	22.27	0.1687	23.07	0.2028			PASS

Channel	Frequency (MHz)	ANT0 Average Power		ANT1 Average Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
1	2412	10.88	0.0122	11.02	0.0126	30	1	PASS
6	2437	10.32	0.0108	9.87	0.0097			PASS
11	2462	8.61	0.0073	10.17	0.0104			PASS

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (dBm)	Total Peak Power (W)	Limit		Verdict
				dBm	W	
1	2412	26.07	0.4046	30	1	PASS
6	2437	25.66	0.3681			PASS
11	2462	25.70	0.3715			PASS
Note: Directional gain = 1.5dBi + 10log(2) = 4.51dBi＜6dBi, so the power limit is 1W(30dBm).						

2.2.3.4 802.11n-40MHz Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power		ANT1 Measured Peak Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
3	2422	19.18	0.0828	21.55	0.1429	30	1	PASS
6	2437	19.73	0.0940	20.54	0.1132			PASS
9	2452	19.03	0.0800	20.60	0.1148			PASS

Channel	Frequency (MHz)	ANT0 Average Power		ANT1 Average Power		Limit		Verdict
		dBm	W	dBm	W	dBm	W	
3	2422	7.69	0.0059	8.78	0.0076	30	1	PASS
6	2437	7.39	0.0055	8.90	0.0078			PASS
9	2452	6.96	0.0050	8.04	0.0064			PASS

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (dBm)	Total Peak Power (W)	Limit		Verdict
				dBm	W	
3	2422	23.54	0.2259	30	1	PASS
6	2437	23.16	0.2070			PASS
9	2452	22.90	0.1950			PASS
Note: Directional gain = 1.5dBi + 10log(2) = 4.51dBi＜6dBi, so the power limit is 1W(30dBm).						

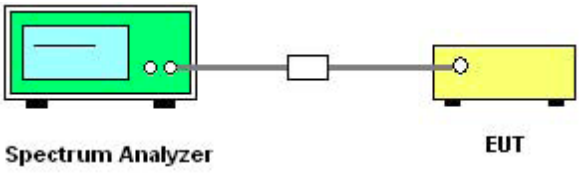
2.3. Bandwidth

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 refer ANNEX A(1.5).

2.3.3. Test Result

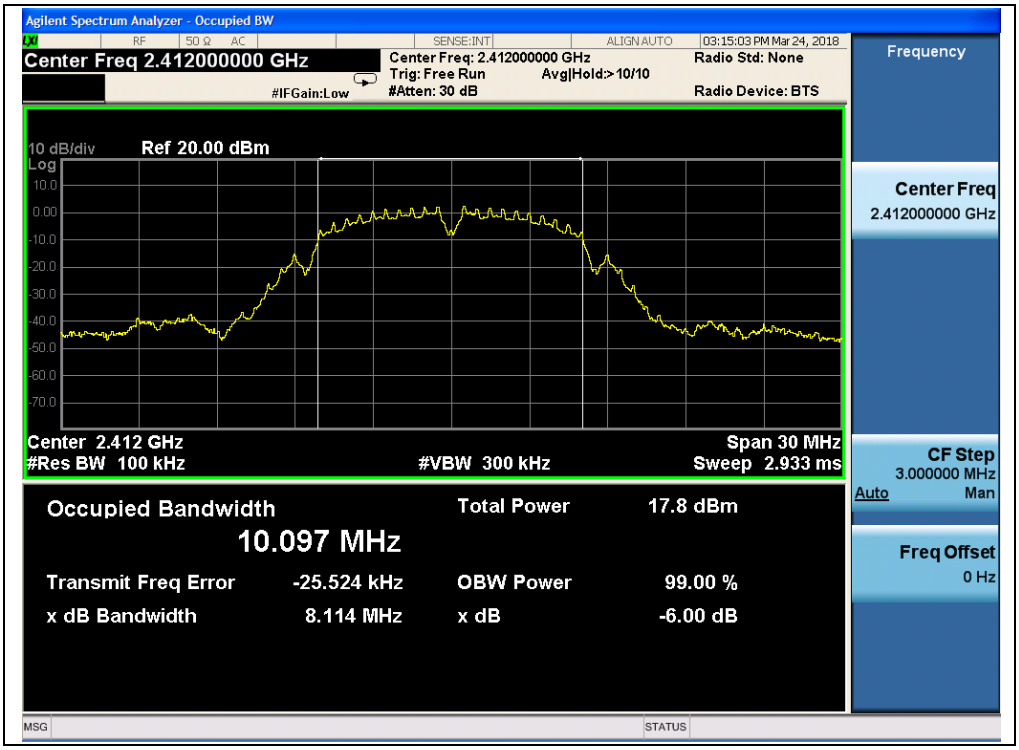
The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the Module.

2.3.3.1 802.11b Test mode

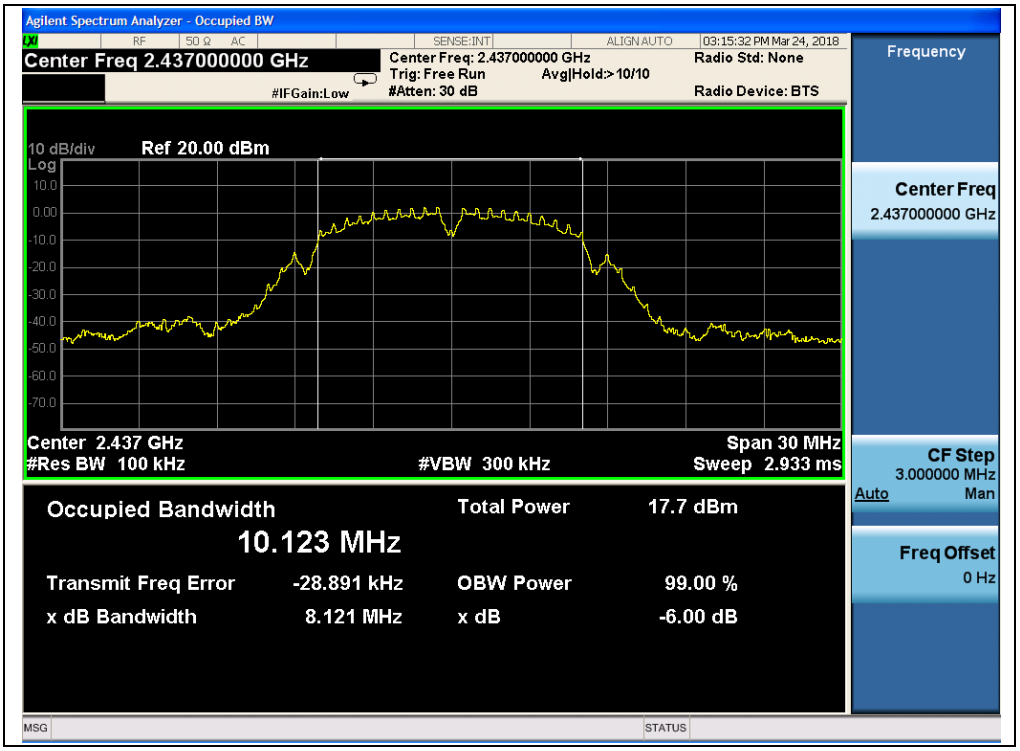
A. Test Verdict:

Channel	Frequency (MHz)	ANT1 6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	8.114	≥500	PASS
6	2437	8.121	≥500	PASS
11	2462	8.573	≥500	PASS

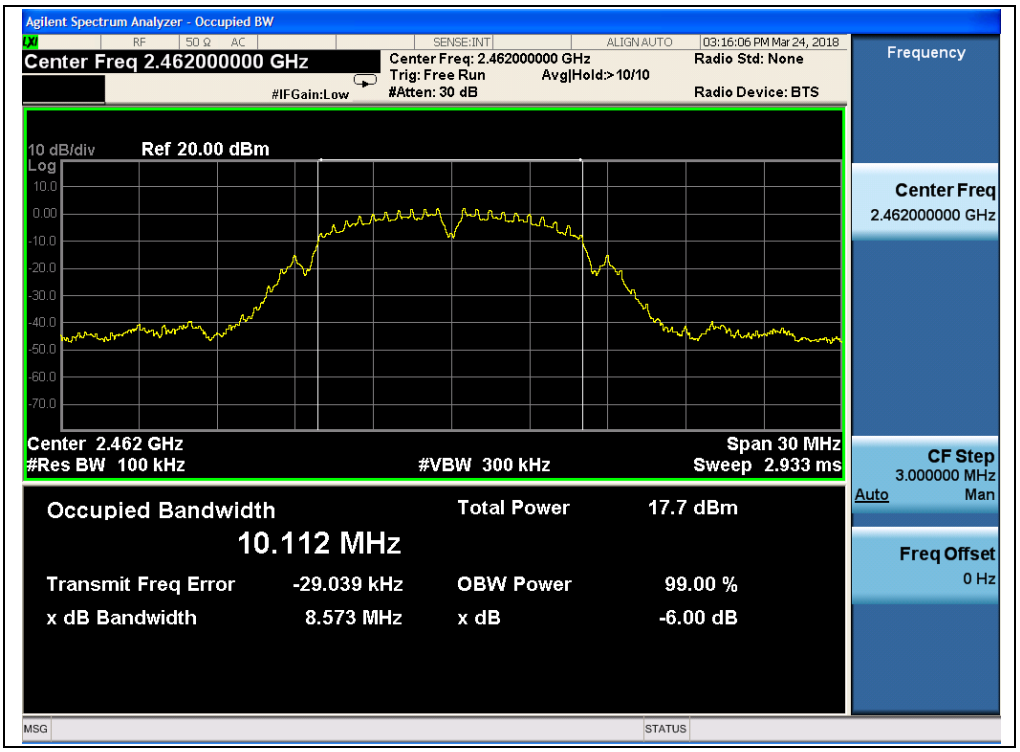
B. Test Plots



(ANT1, Channel 1, 2412MHz, 802.11b)



(ANT1, Channel 6, 2437 MHz, 802.11b)



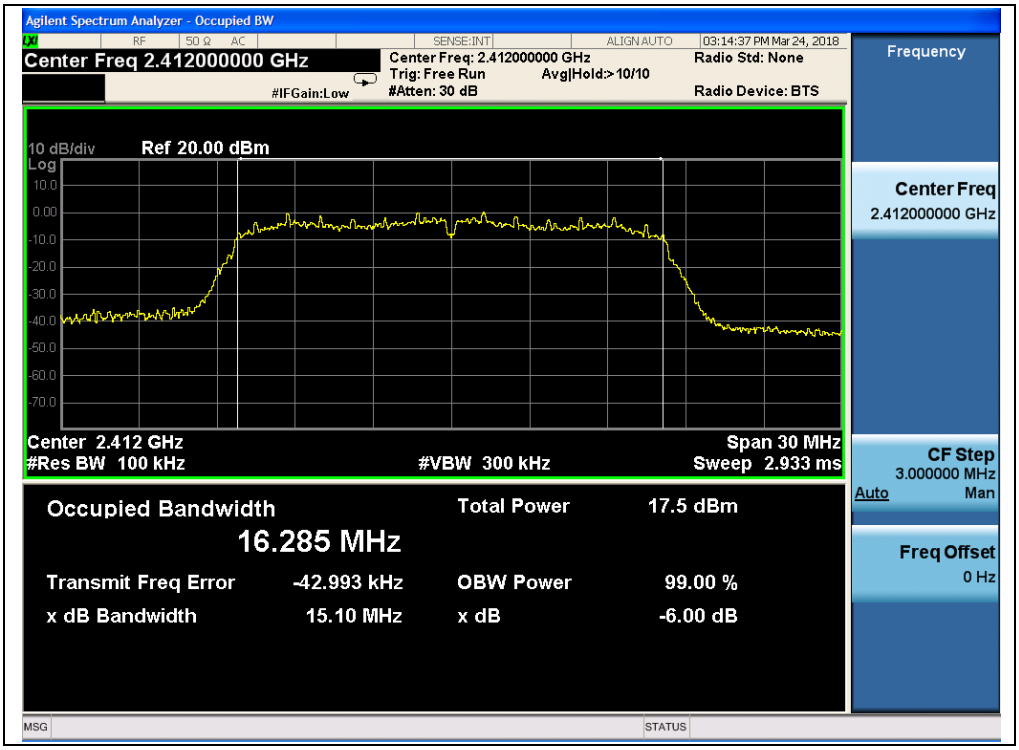
(ANT1, Channel 11, 2462MHz, 802.11b)

2.3.3.2 802.11g Test mode

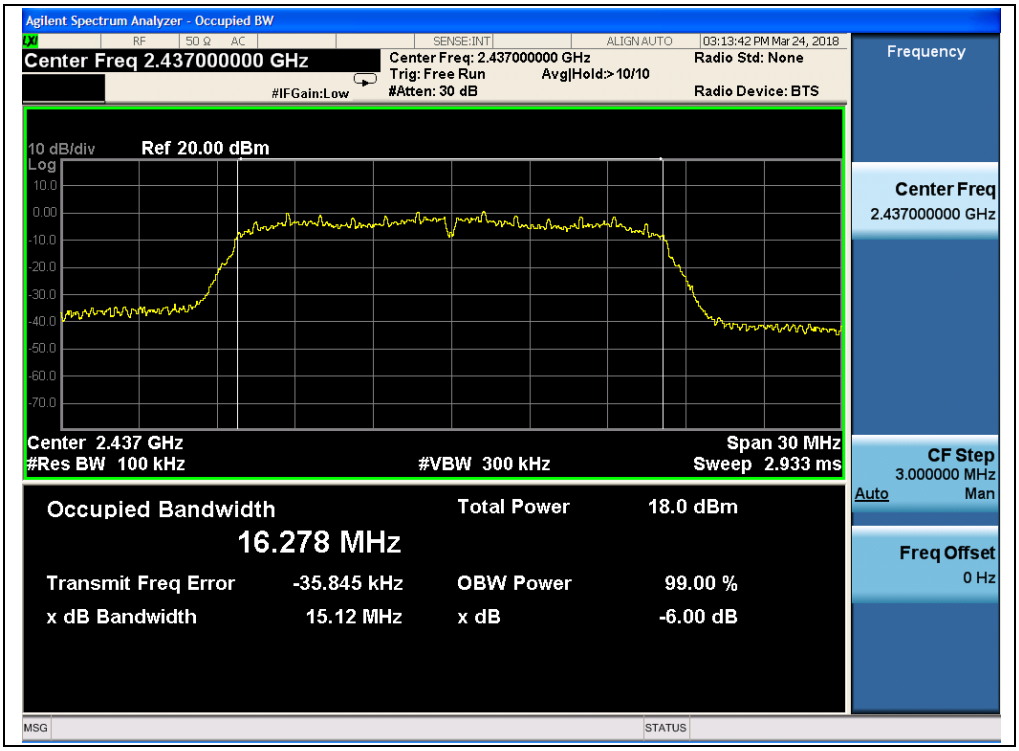
A. Test Verdict:

Channel	Frequency (MHz)	ANT1 6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	15.10	≥500	PASS
6	2437	15.12	≥500	PASS
11	2462	15.11	≥500	PASS

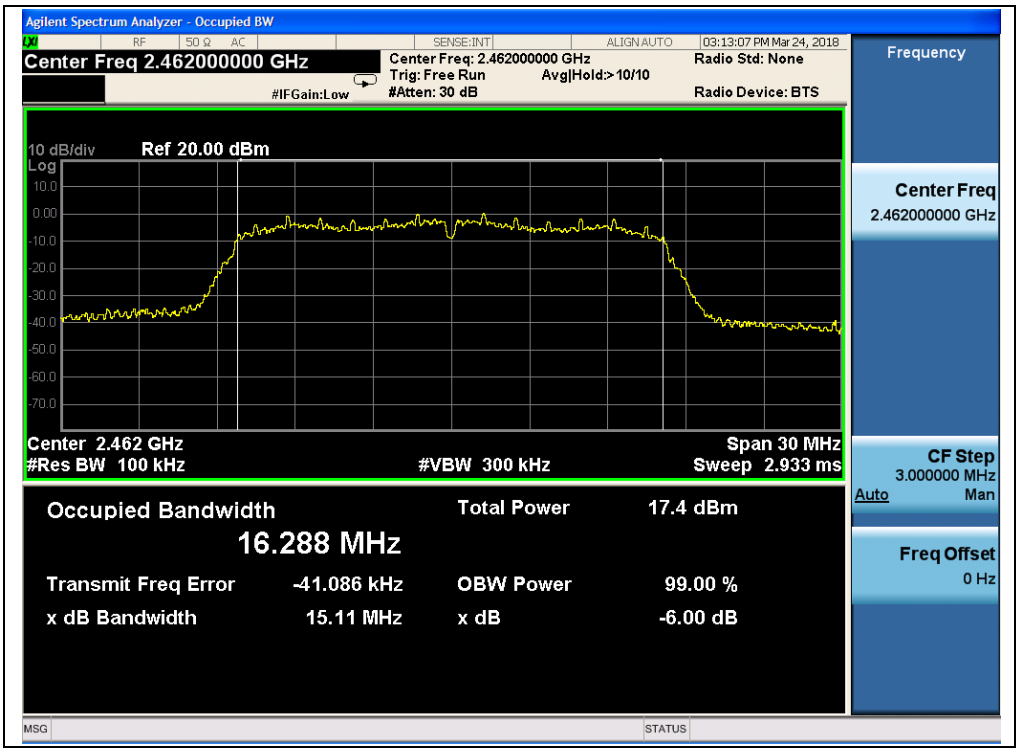
B. Test Plots:



(ANT1, Channel 1, 2412MHz, 802.11g)



(ANT1, Channel 6, 2437MHz, 802.11g)



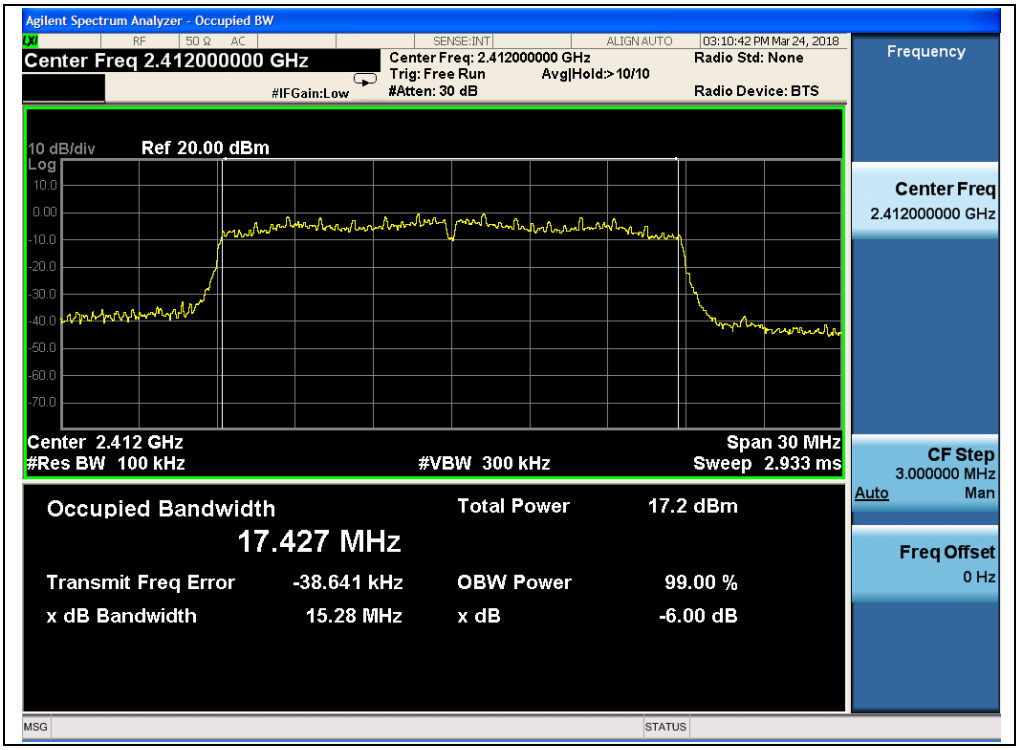
(ANT1, Channel 11, 2462MHz, 802.11g)

2.3.3.3 802.11n-20 Test mode

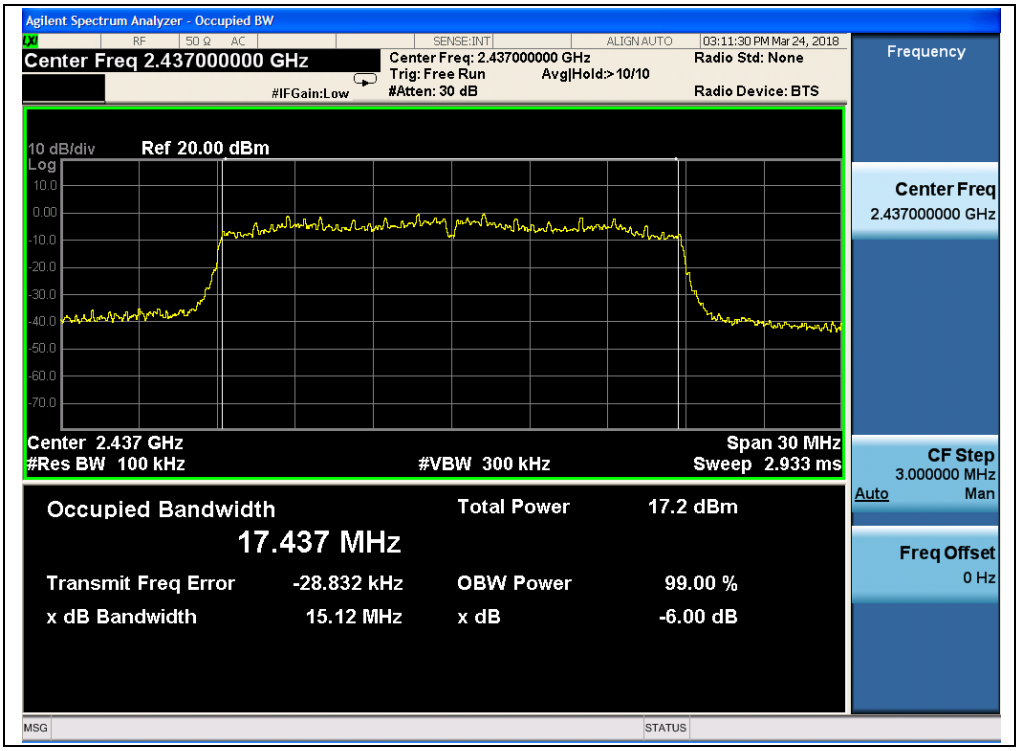
A. Test Verdict:

Channel	Frequency (MHz)	ANT1 6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	15.28	≥500	PASS
6	2437	15.12	≥500	PASS
11	2462	15.72	≥500	PASS

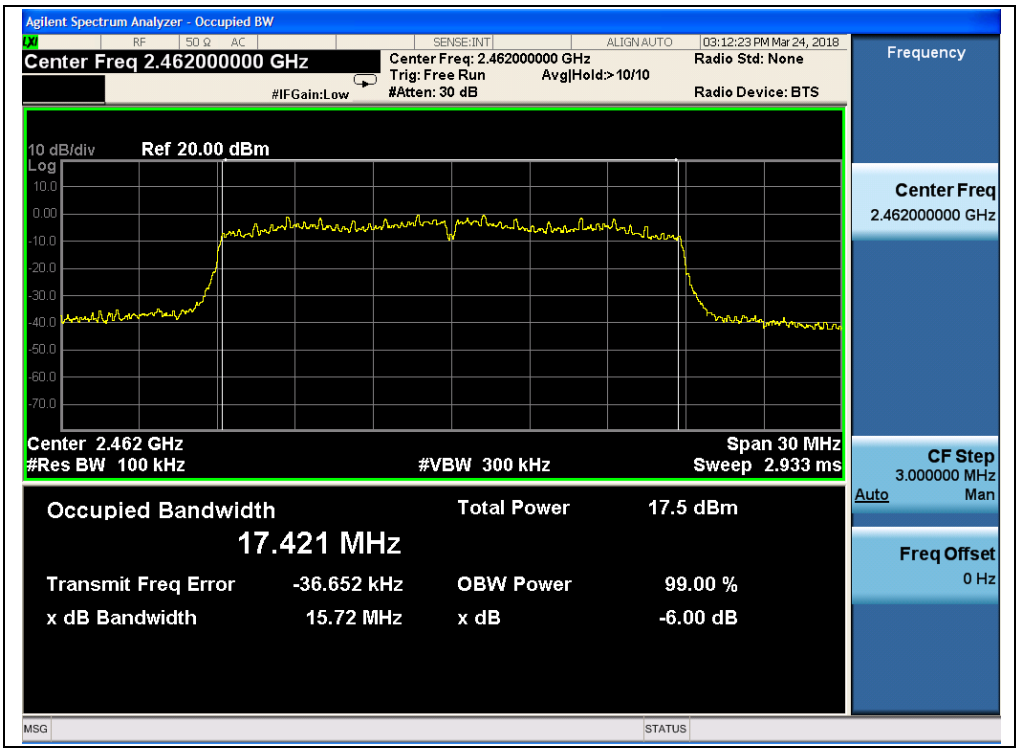
B. Test Plots:



(ANT1, Channel 1, 2412MHz, 802.11n-20)



(ANT1, Channel 6, 2437MHz, 802.11n-20)



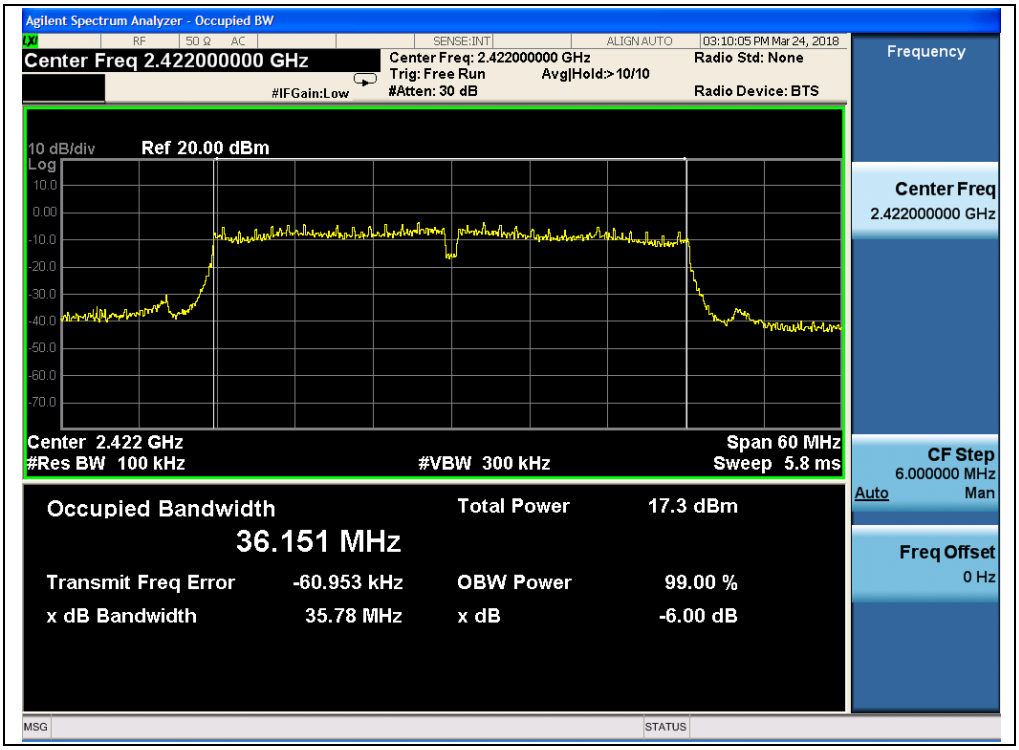
(ANT1, Channel 11, 2462MHz, 802.11n-20)

2.3.3.4 802.11n-40 Test mode

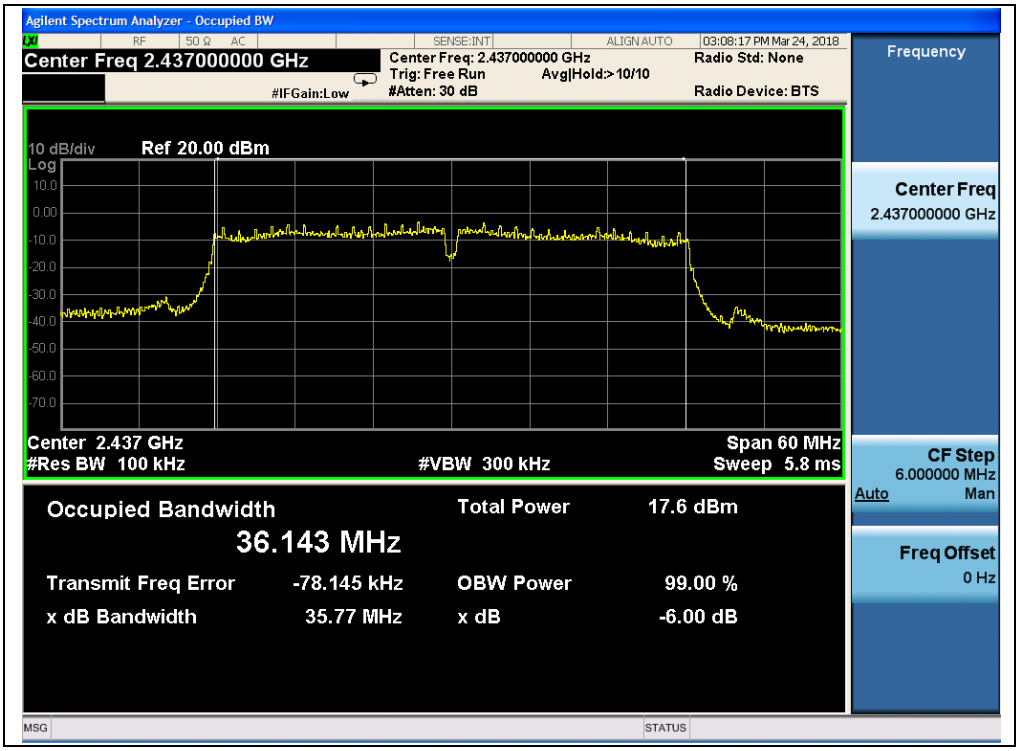
A. Test Verdict:

Channel	Frequency (MHz)	ANT1 6 dB Bandwidth (MHz)	Limits(kHz)	Result
3	2422	35.78	≥500	PASS
6	2437	35.77	≥500	PASS
9	2452	36.35	≥500	PASS

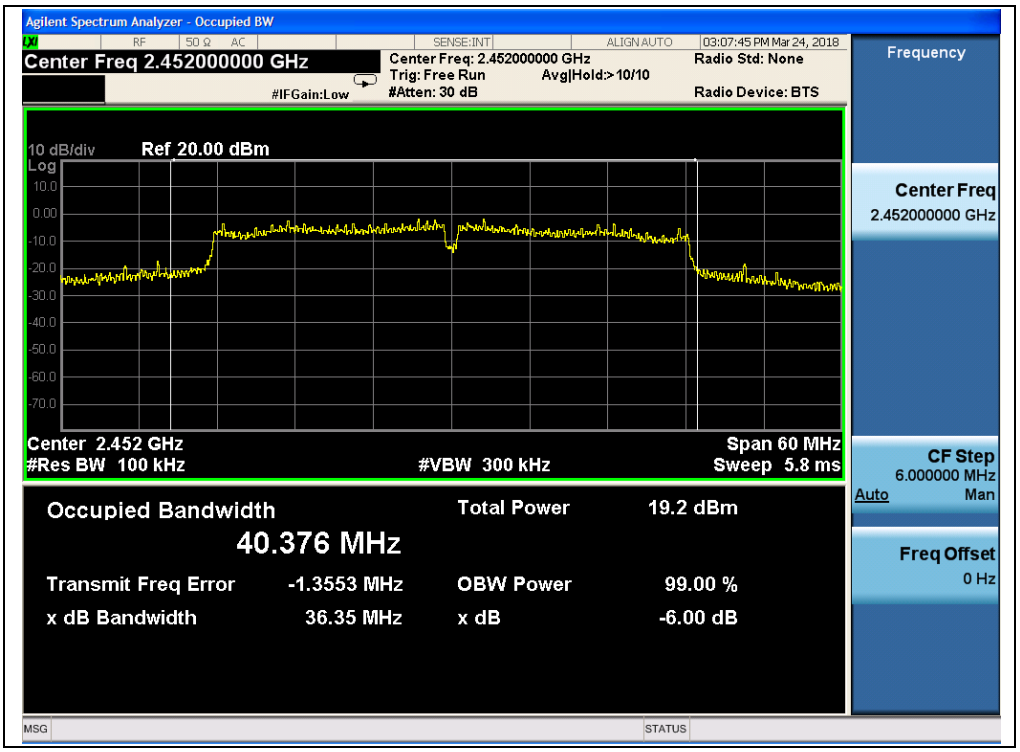
B. Test Plots:



(ANT1, Channel 3, 2422Mz, 802.11n-40)



(ANT1, Channel 6, 2437MHz, 802.11n-40)



(ANT1, Channel 9, 2452MHz, 802.11n-40)

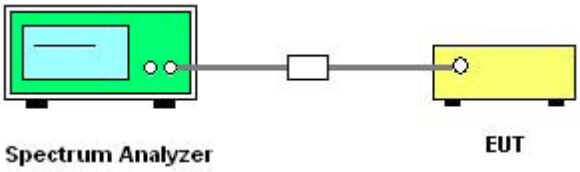
2.4. Conducted Spurious Emissions and Band Edge

2.4.1. Requirement

According to FCC section 15.247(c), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.4.2. Test Description

A. Test Set:



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

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

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

B. Equipments List:

Please refer 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.

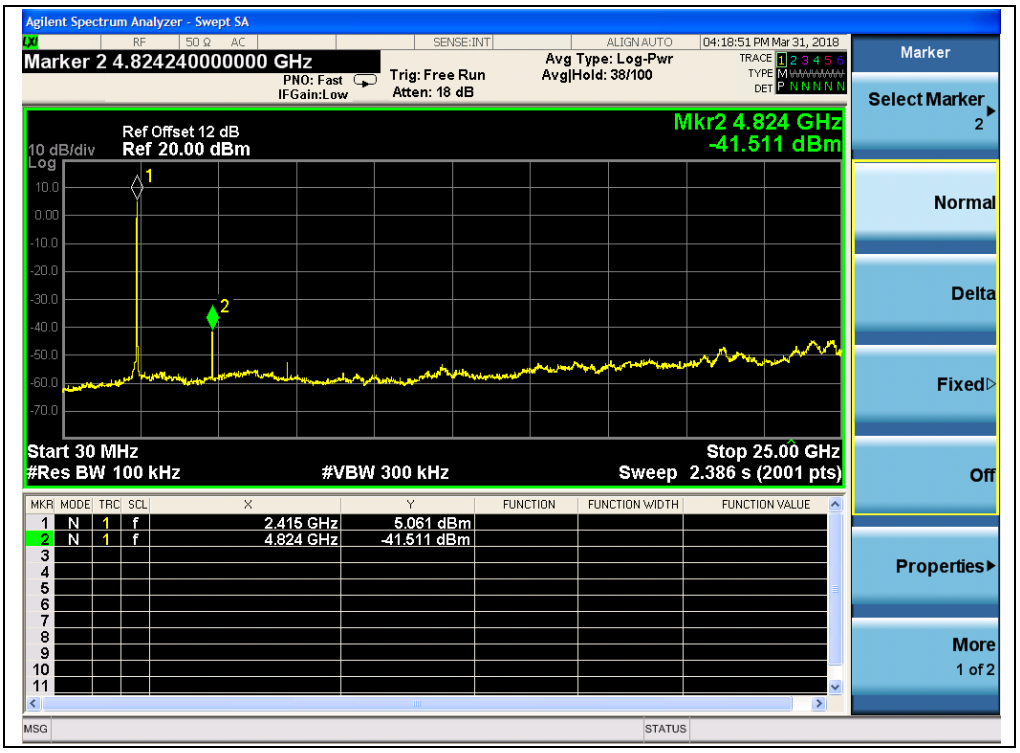
2.4.3.1 802.11b Test mode

A. Test Verdict:

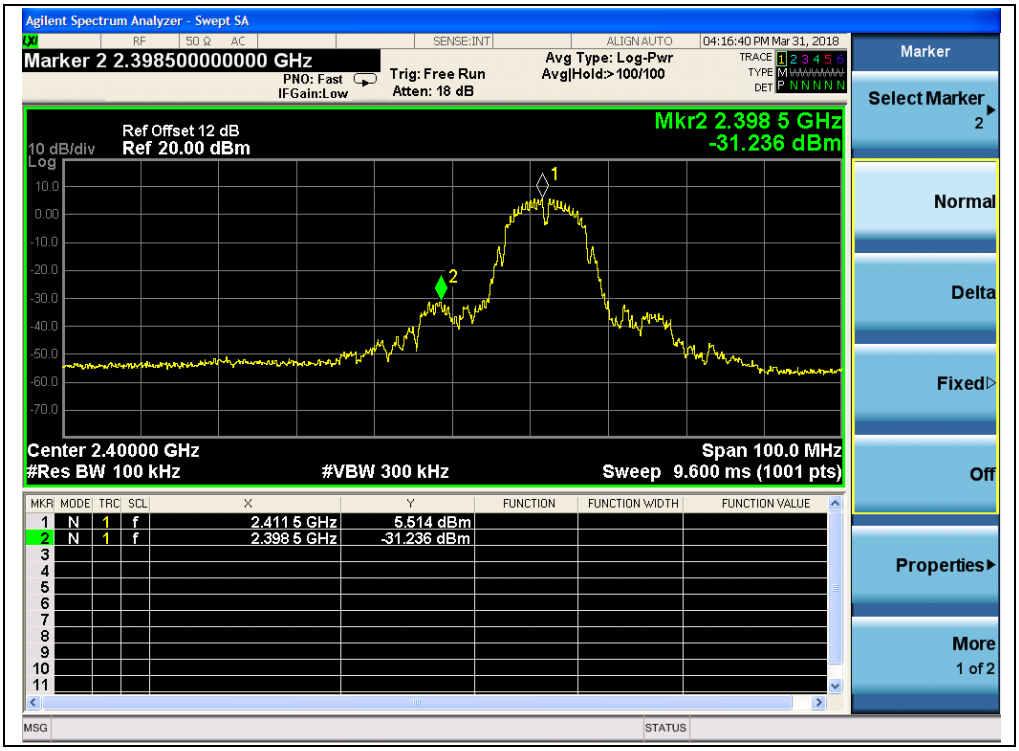
Channel	Frequency (MHz)	ANT1 Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-41.51	5.06	-14.94	PASS
6	2437	-40.92	5.11	-14.89	PASS
11	2462	-41.54	3.70	-16.30	PASS

B. Test Plots:

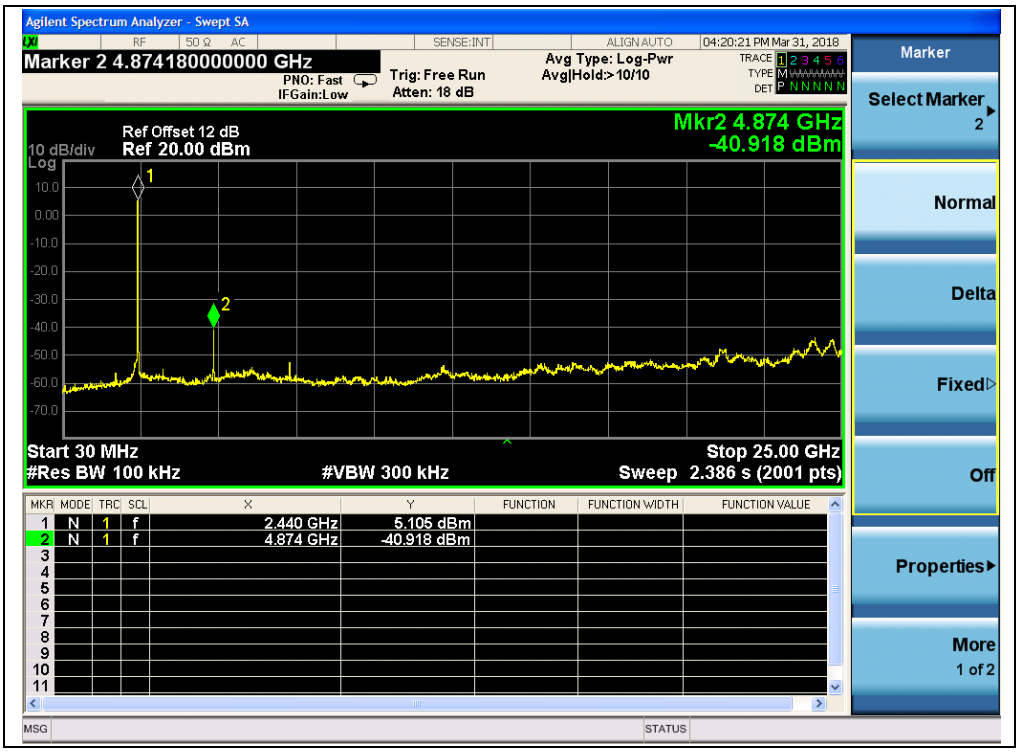
Note: The power of the Module transmitting frequency should be ignored.



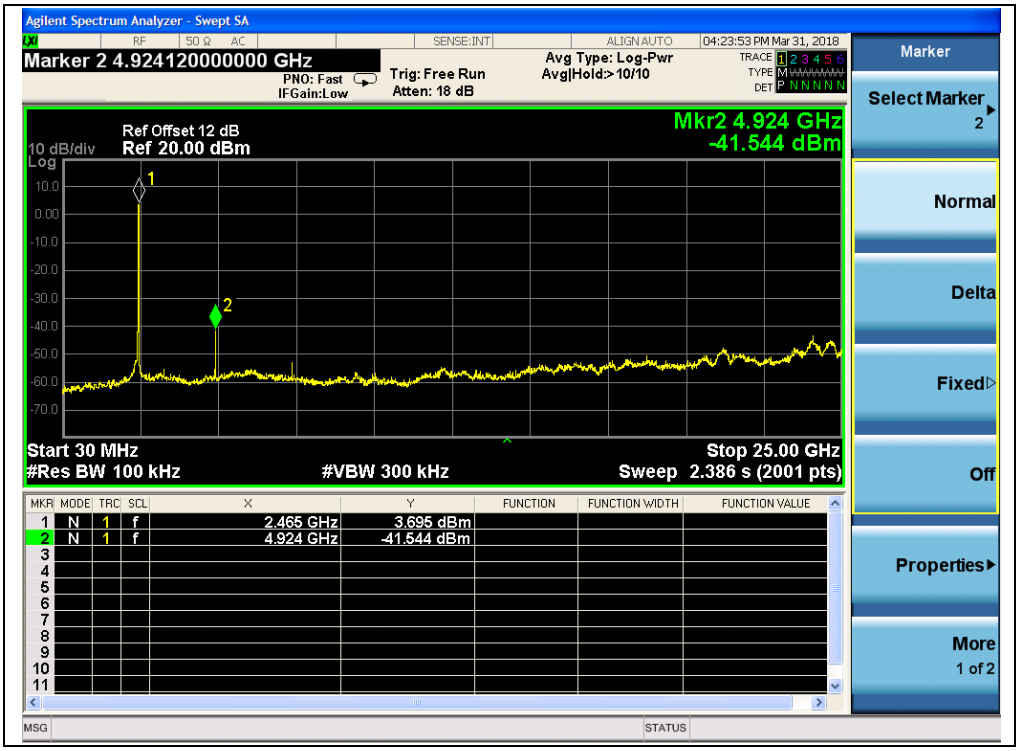
(ANT1, Channel = 1, 30MHz to 25GHz)



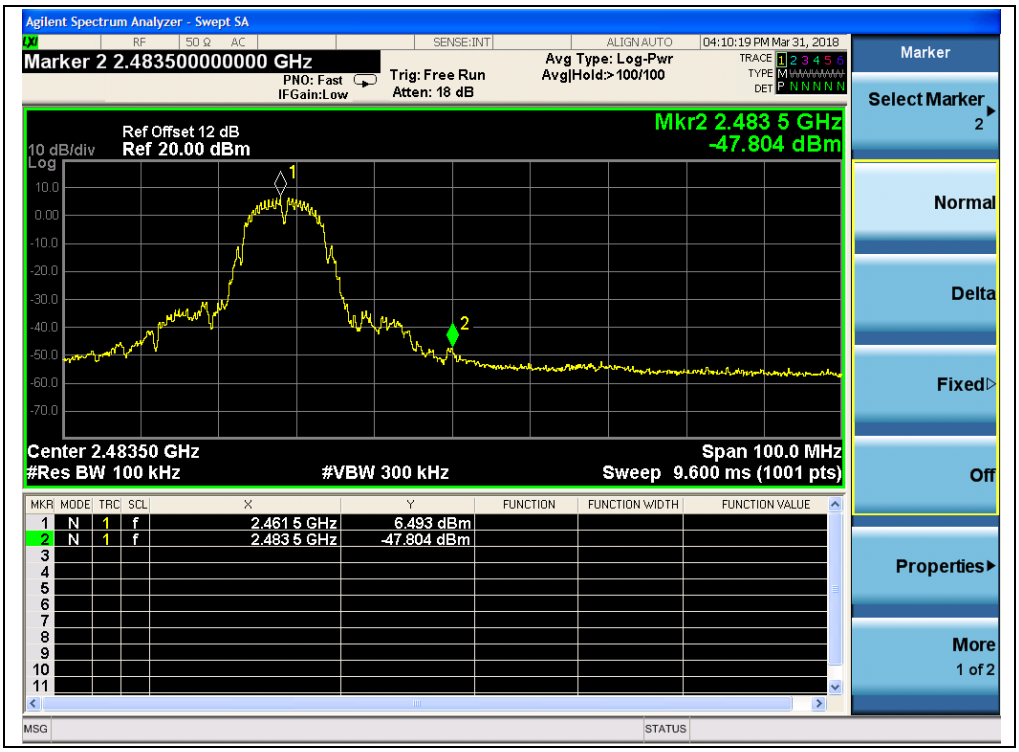
(ANT1, Band Edge @ Channel = 1)



(ANT1, Channel = 6, 30MHz to 25GHz)



(ANT1, Channel = 11, 30MHz to 25GHz)



(ANT1, Band Edge @ Channel = 11)

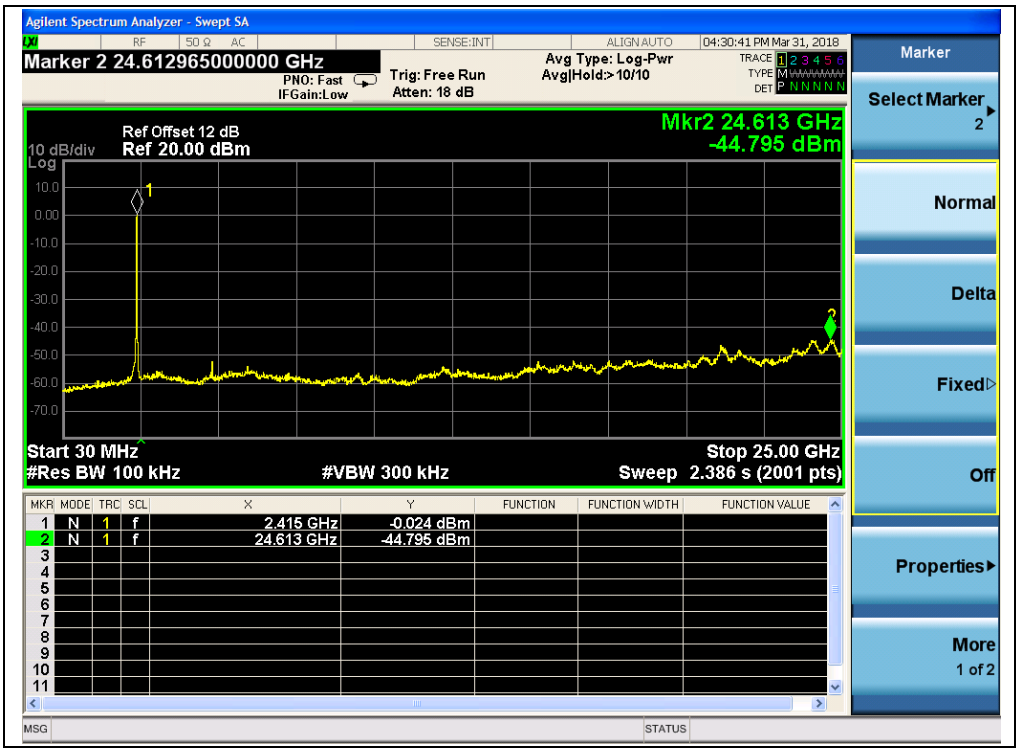
2.4.3.2 802.11g Test mode

A. Test Verdict:

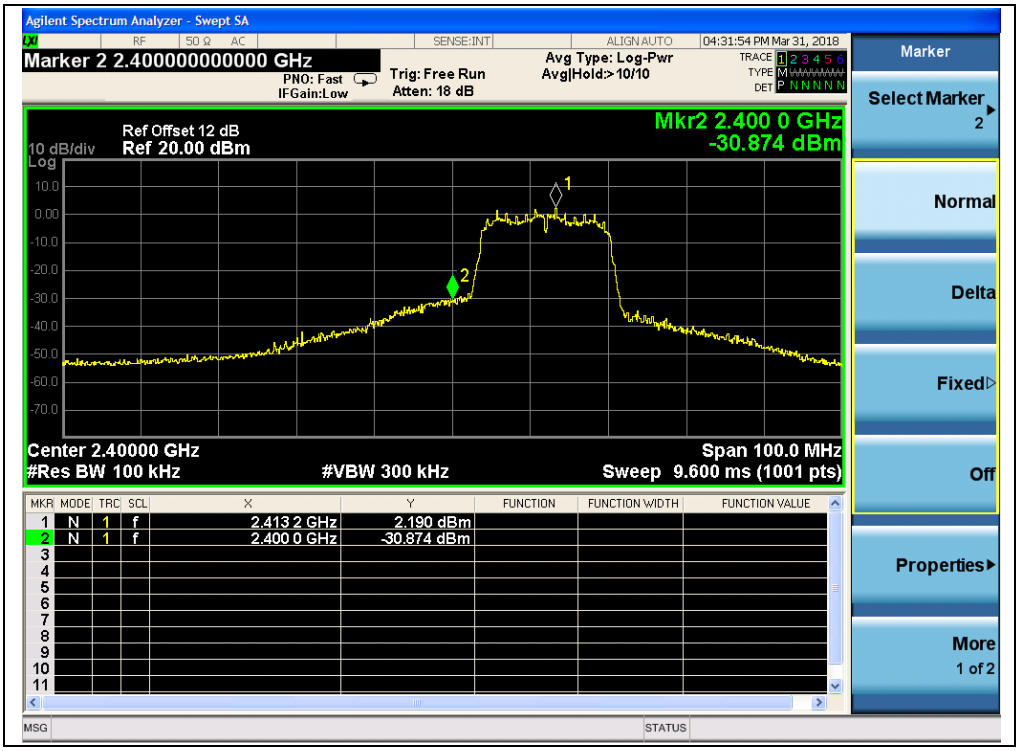
Channel	Frequency (MHz)	ANT1 Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-44.80	-0.02	-20.02	PASS
6	2437	-44.60	-1.06	-21.06	PASS
11	2462	-43.60	-0.51	-20.51	PASS

B. Test Plots:

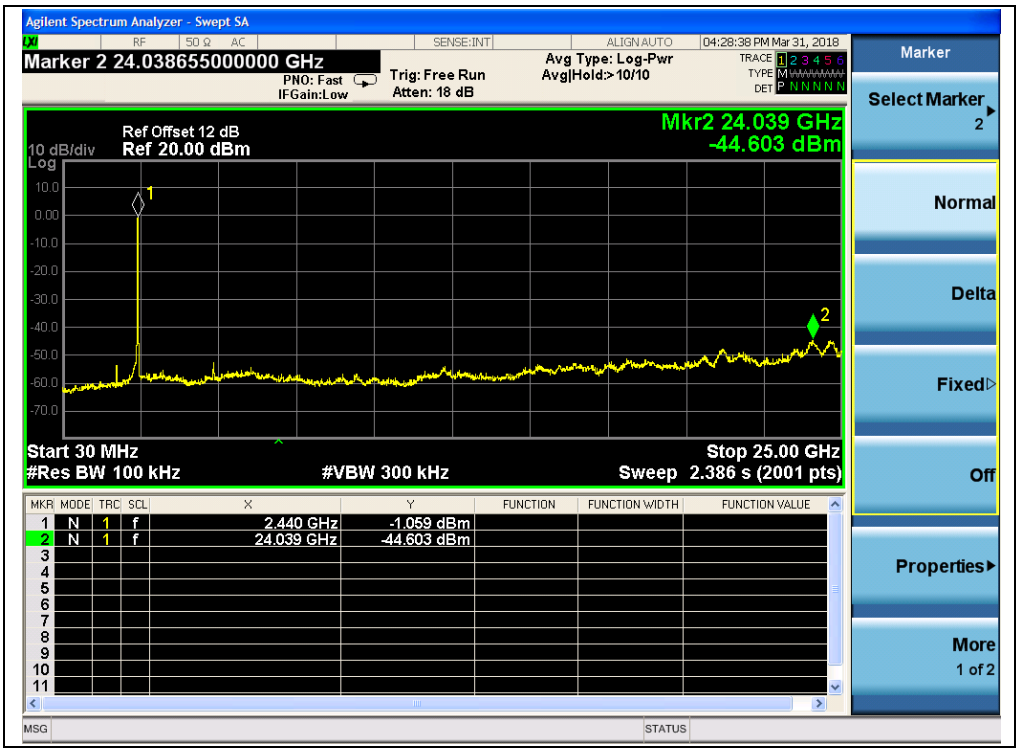
Note: The power of the Module transmitting frequency should be ignored.



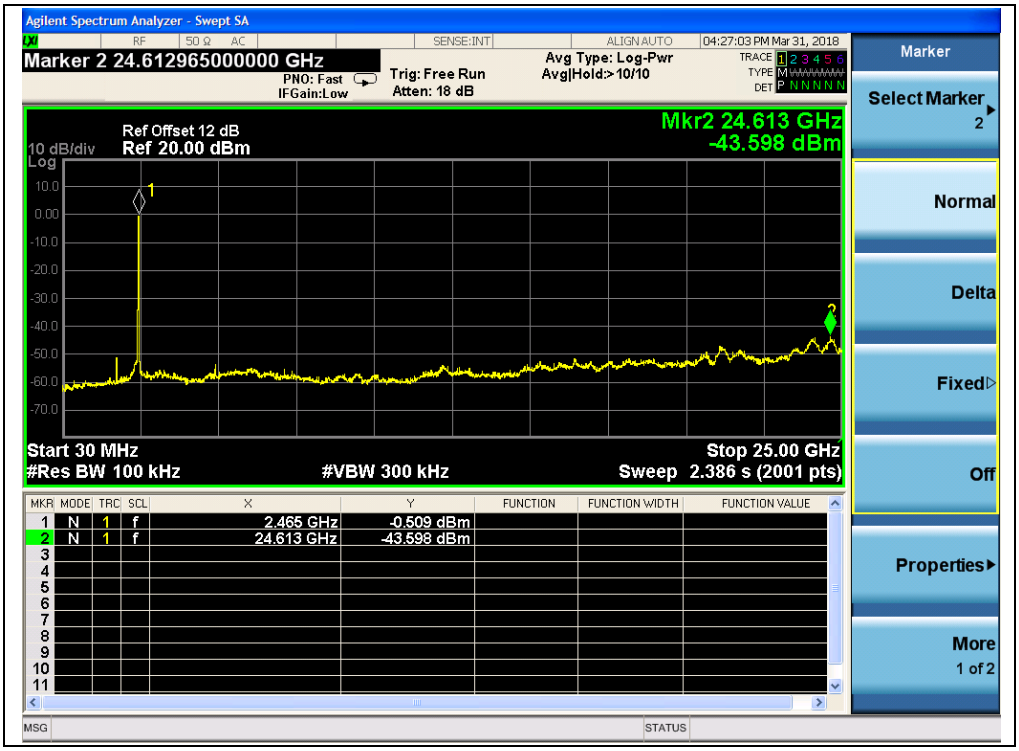
(ANT1, Channel = 1, 30MHz to 25GHz)



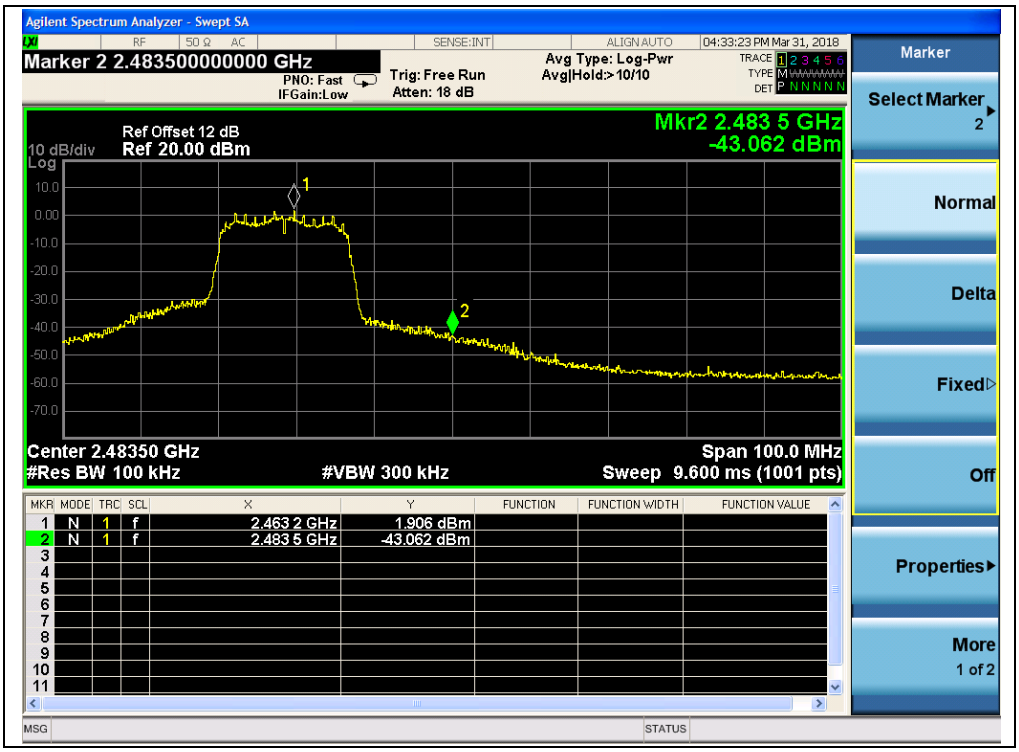
(ANT1, Band Edge, Channel = 1)



(ANT1, Channel = 6, 30MHz to 25GHz)



(ANT1, Channel = 11, 30MHz to 25GHz)



(ANT1, Band Edge, Channel = 11)

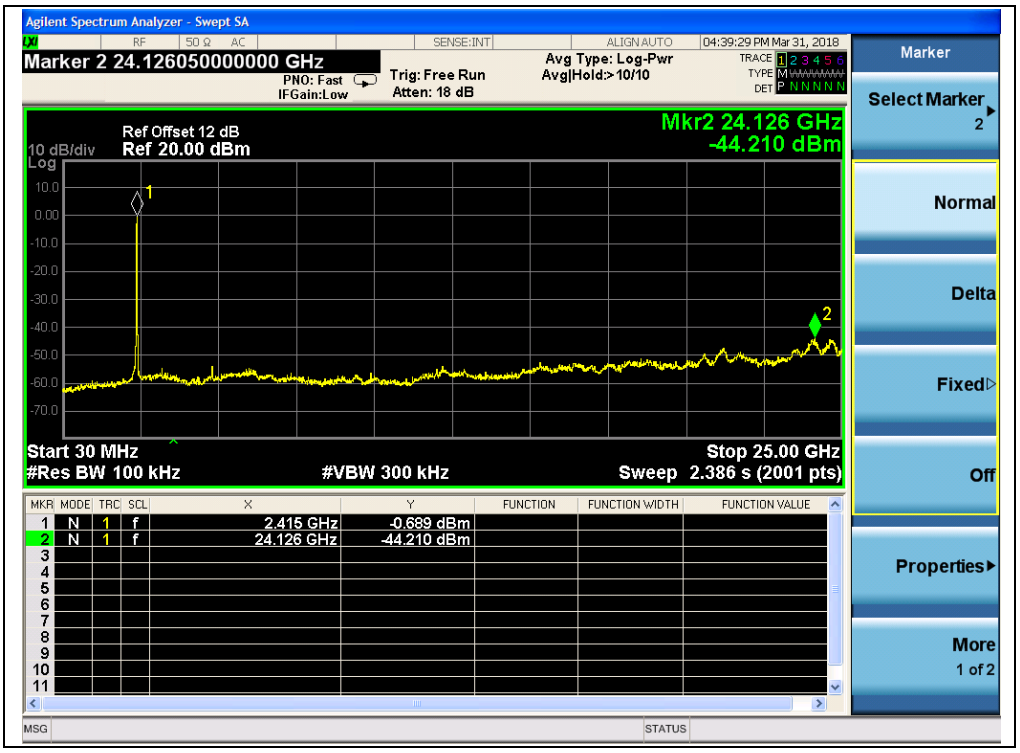
2.4.3.3 802.11n -20MHz Test mode

A. Test Verdict:

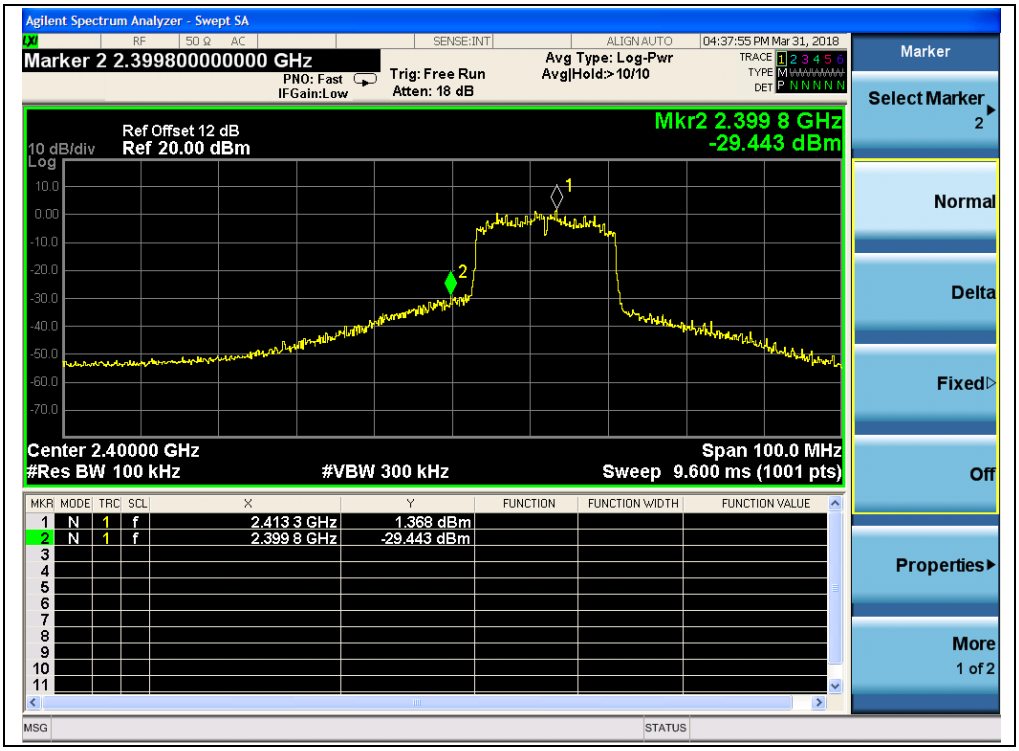
Channel	Frequency (MHz)	ANT1 Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-44.21	-0.69	-20.69	PASS
6	2437	-43.75	-0.43	-20.43	PASS
11	2462	-42.83	-0.63	-20.63	PASS

B. Test Plots:

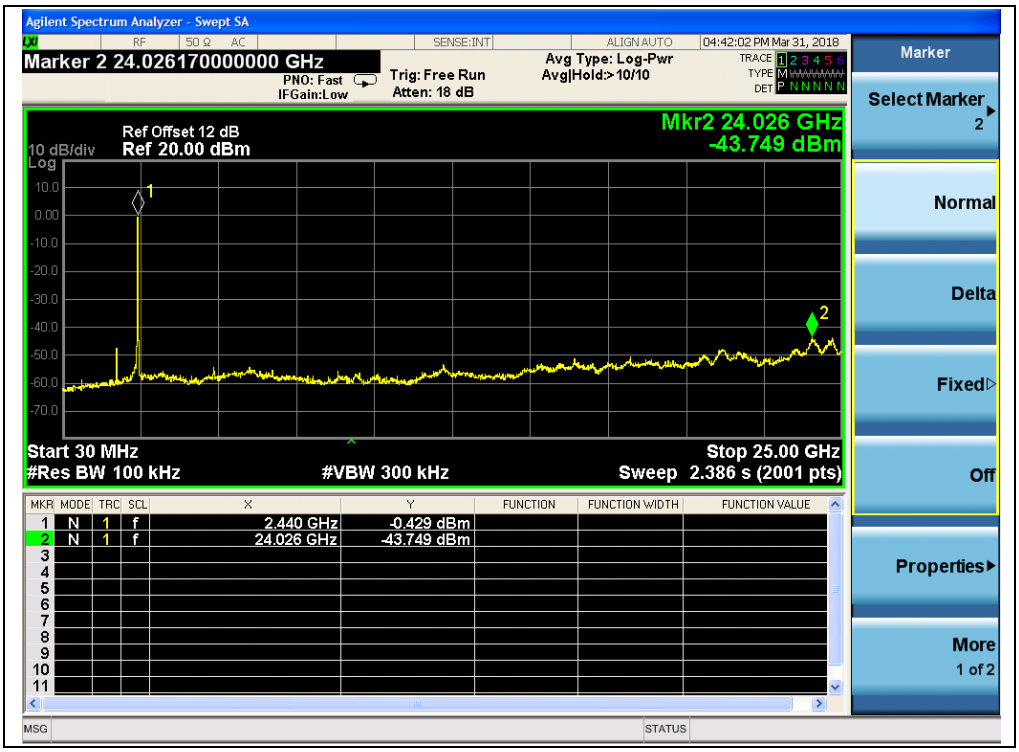
Note: The power of the Module transmitting frequency should be ignored.



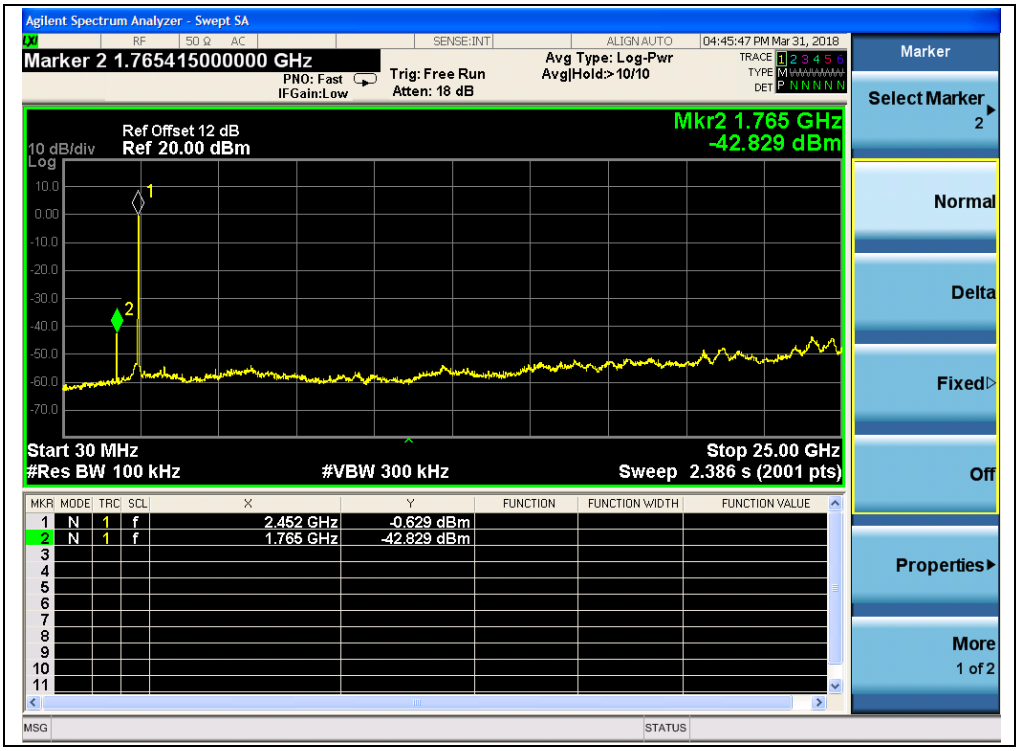
(ANT1, Channel = 1, 30MHz to 25GHz)



(ANT1, Band Edge, Channel = 1)



(ANT1, Channel = 6, 30MHz to 25GHz)



(ANT1, Channel = 11, 30MHz to 25GHz)

(ANT1, Band Edge, Channel = 11)

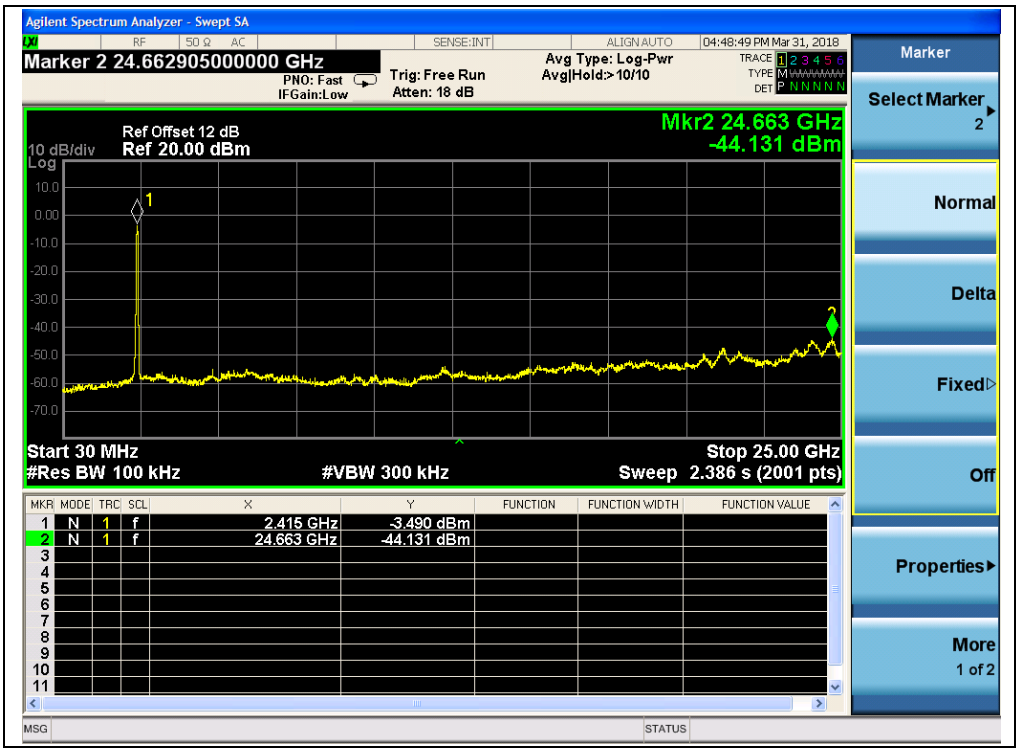
2.4.3.4 802.11n -40MHz Test mode

A. Test Verdict:

Channel	Frequency (MHz)	ANT1 Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-44.13	-3.49	-23.49	PASS
6	2437	-43.79	-3.85	-23.85	PASS
9	2452	-43.56	-3.41	-23.41	PASS

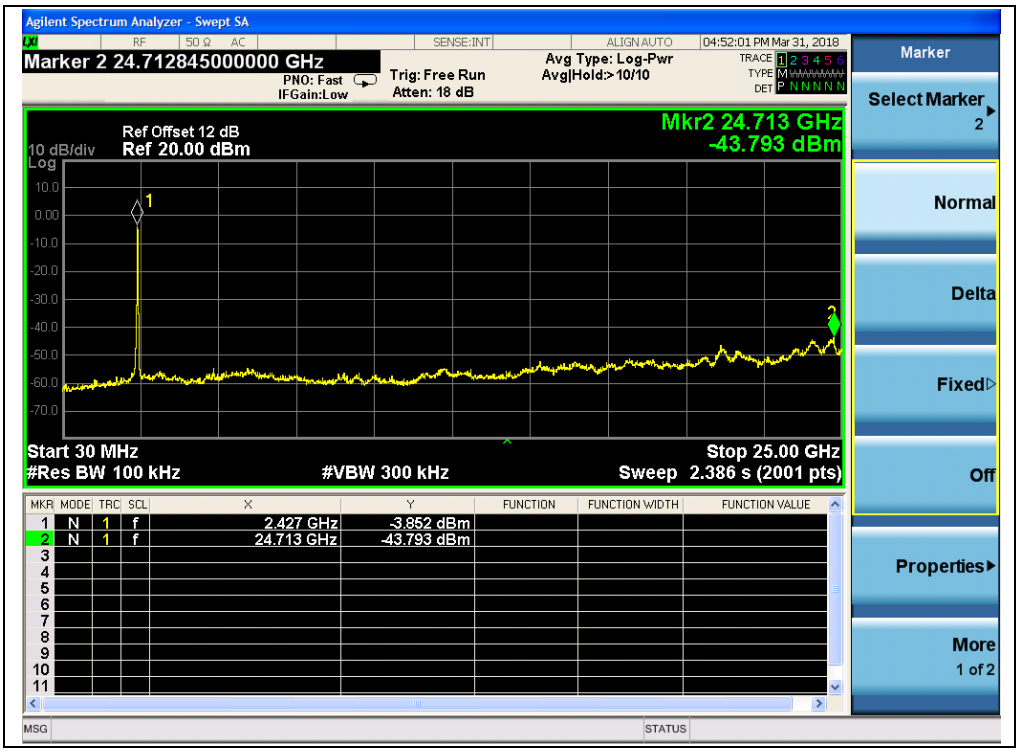
B. Test Plots:

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

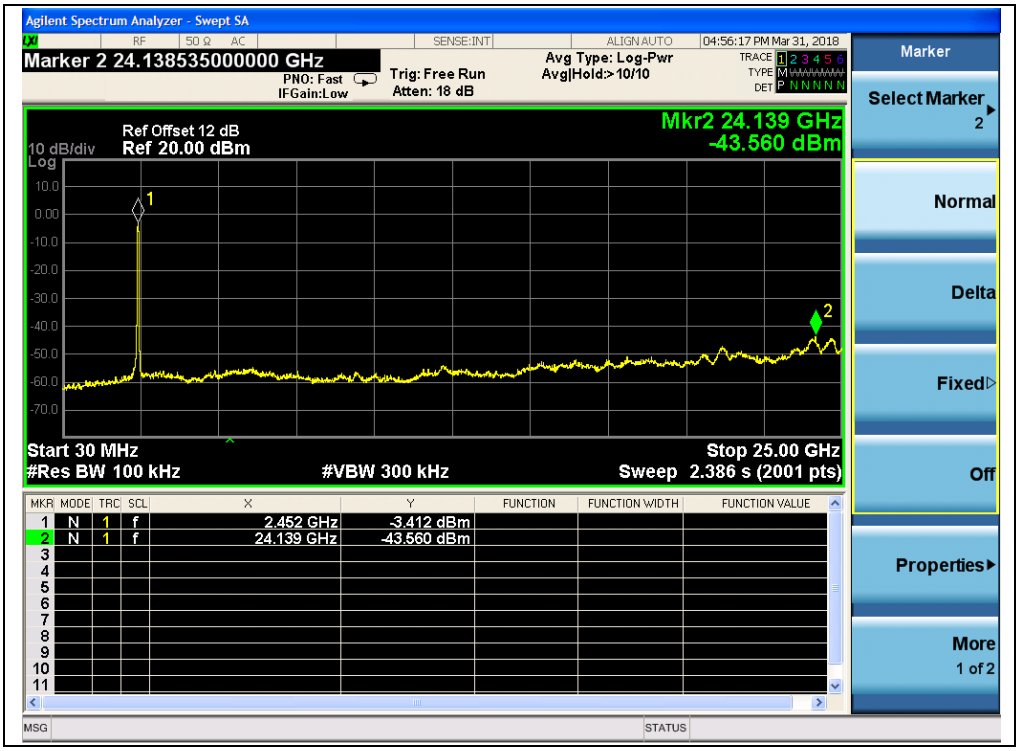


(ANT1, Channel = 3, 30MHz to 25GHz)

(ANT1, Band Edge, Channel = 3)



(ANT1, Channel = 6, 30MHz to 25GHz)



(ANT1, Channel = 9, 30MHz to 25GHz)

(ANT1, Band Edge, Channel = 9)

2.5. Power spectral density (PSD)

2.5.1. Requirement

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

2.5.2. Test Description

A. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:
a) Set analyzer center frequency to channel center frequency.
b) Set the span to 1.5 times DTS bandwidth
c) Set the RBW to 3 kHz
d) Set the VBW to 10 kHz
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 refer ANNEX A(1.5).

2.5.3. Test Result

2.5.3.1 802.11b Test mode

A. Test Verdict:

Channel	Frequency (MHz)	ANT0 Measured PSD (dBm/3kHz)	ANT1 Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-7.26	-7.09	8	PASS
6	2437	-7.93	-7.18	8	PASS
11	2462	-7.24	-7.90	8	PASS

B. Test Plots:

(Channel = 1, 802.11b, ANT0)

(Channel = 6, 802.11b, ANT0)

(Channel = 11, 802.11b, ANT0)

(Channel = 1, 802.11b, ANT1)

(Channel = 6, 802.11b, ANT1)

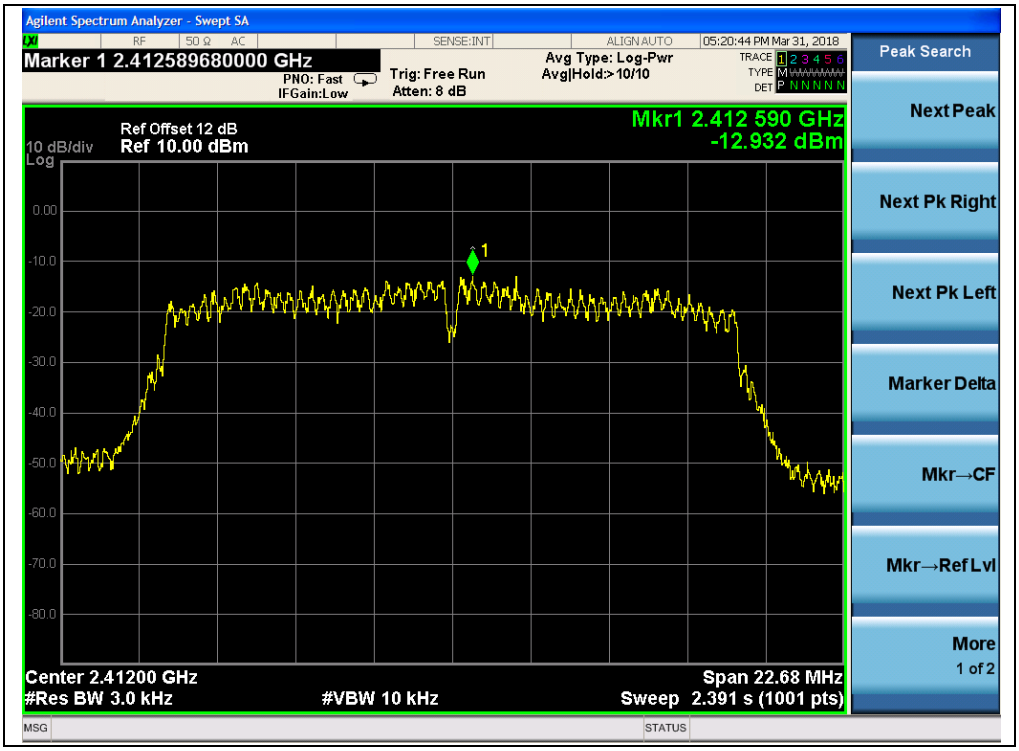
(Channel = 11, 802.11b, ANT1)

2.5.3.2 802.11g Test mode

A. Test Verdict:

Channel	Frequency (MHz)	ANT0 Measured PSD (dBm/3kHz)	ANT1 Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-12.93	-12.13	8	PASS
6	2437	-12.61	-11.38	8	PASS
11	2462	-13.63	-12.13	8	PASS

B. Test Plots:



(Channel = 1, 802.11g, ANT0)

(Channel = 6, 802.11g, ANT0)

(Channel = 11, 802.11g, ANT0)

(Channel = 1, 802.11g, ANT1)

(Channel = 6, 802.11g, ANT1)

(Channel = 11, 802.11g, ANT1)

2.5.3.3 802.11n-20MHz Test mode

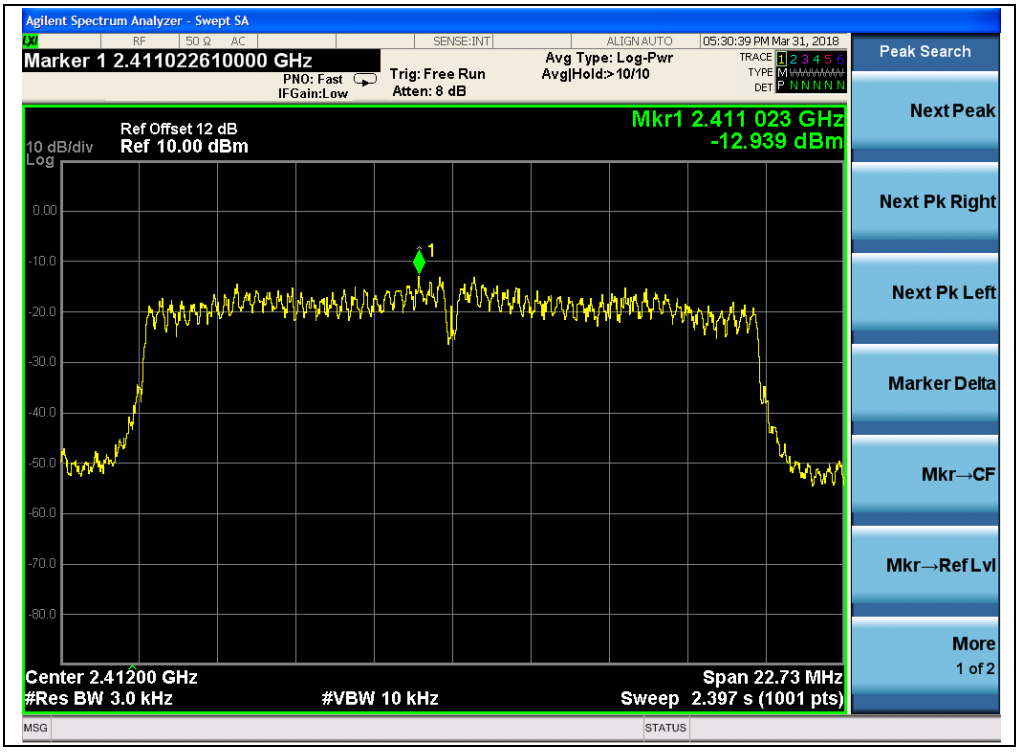
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 Measured PSD (dBm/3kHz)	ANT1 Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-12.94	-13.16	8	PASS
6	2437	-12.71	-14.02	8	PASS
11	2462	-12.91	-13.81	8	PASS

Total Power spectral density (ANT0+ANT1)

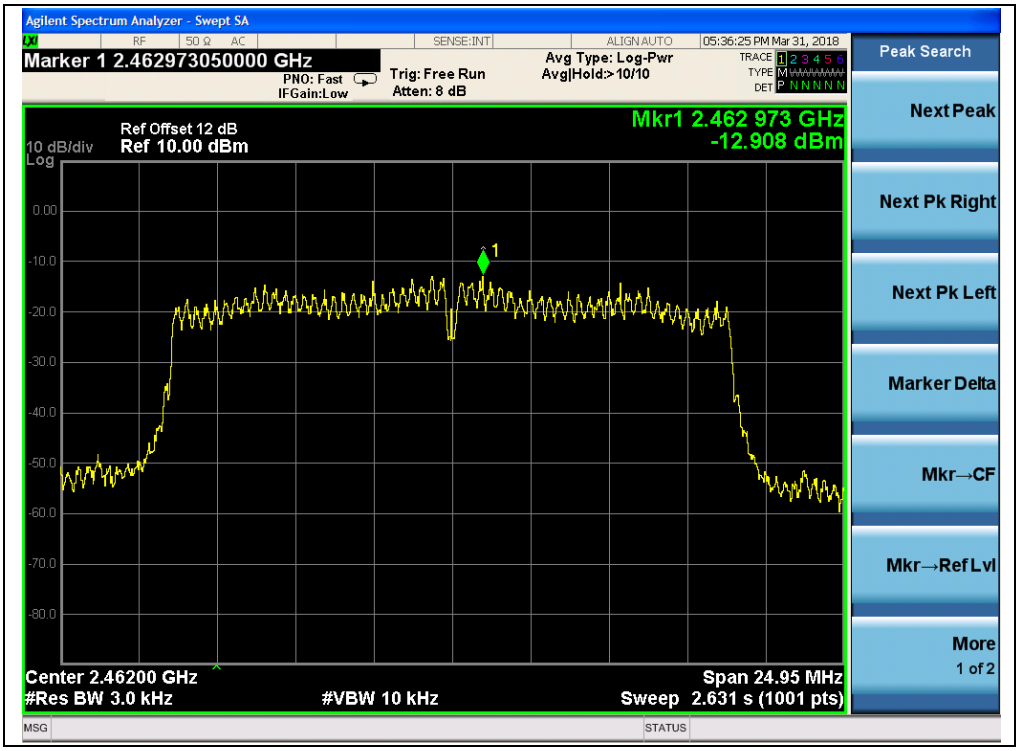
Channel	Frequency (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-10.04	8	PASS
6	2437	-10.31	8	PASS
11	2462	-10.33	8	PASS
Note: Directional gain = 1.5dBi + 10log(2) = 4.51dBi＜6dBi, so the limit is 8 dBm/3kHz.				

B. Test Plots:

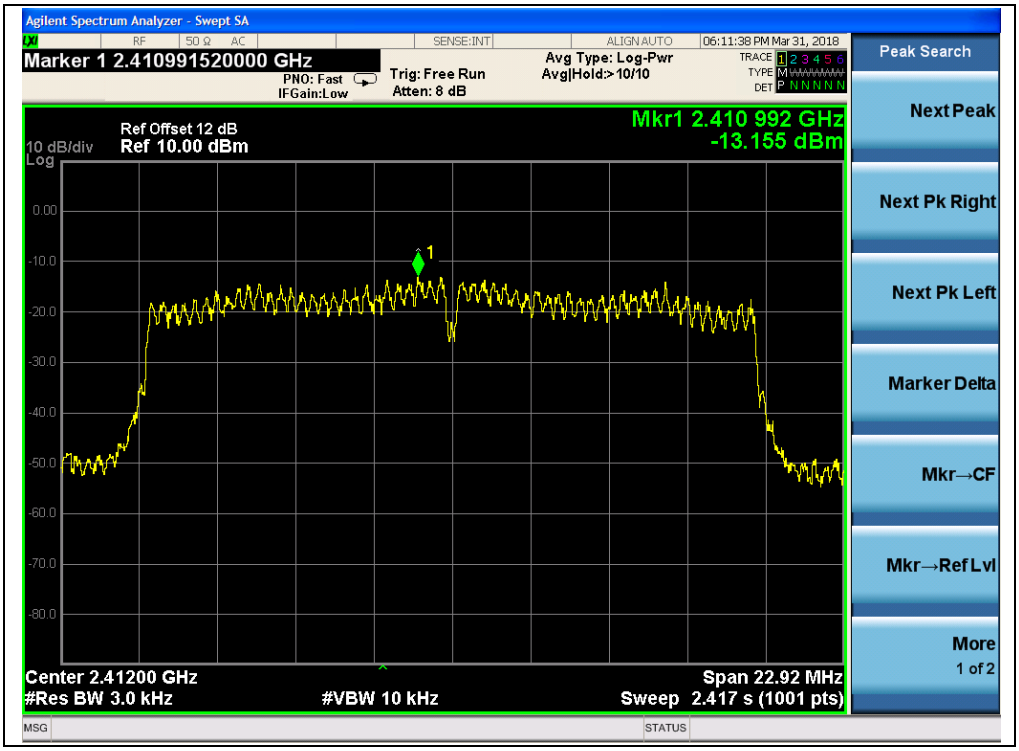


(Channel = 1, 802.11n-20MHz, ANT0)

(Channel = 6, 802.11n-20MHz, ANT0)



(Channel = 11, 802.11n-20MHz, ANT0)



(Channel = 1, 802.11n-20MHz, ANT1)

(Channel = 6, 802.11n-20MHz, ANT1)

(Channel = 11, 802.11n-20MHz, ANT1)

2.5.3.4 802.11n-40MHz Test mode

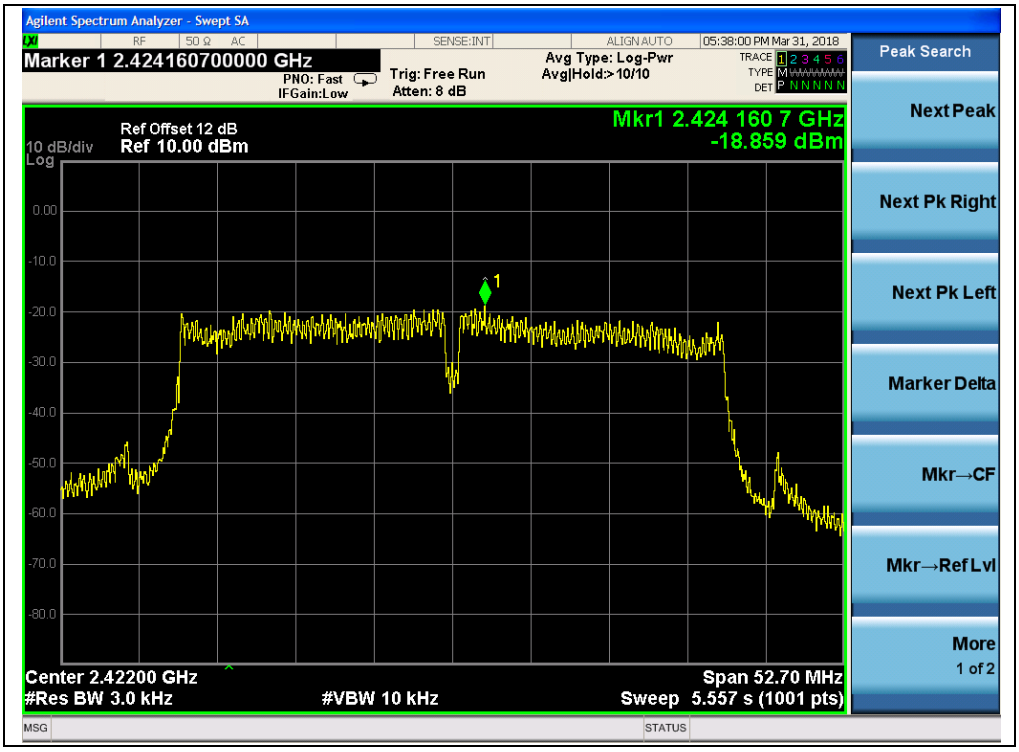
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 Measured PSD (dBm/3kHz)	ANT1 Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-18.86	-15.38	8	PASS
6	2437	-18.40	-17.24	8	PASS
9	2452	-17.83	-16.94	8	PASS

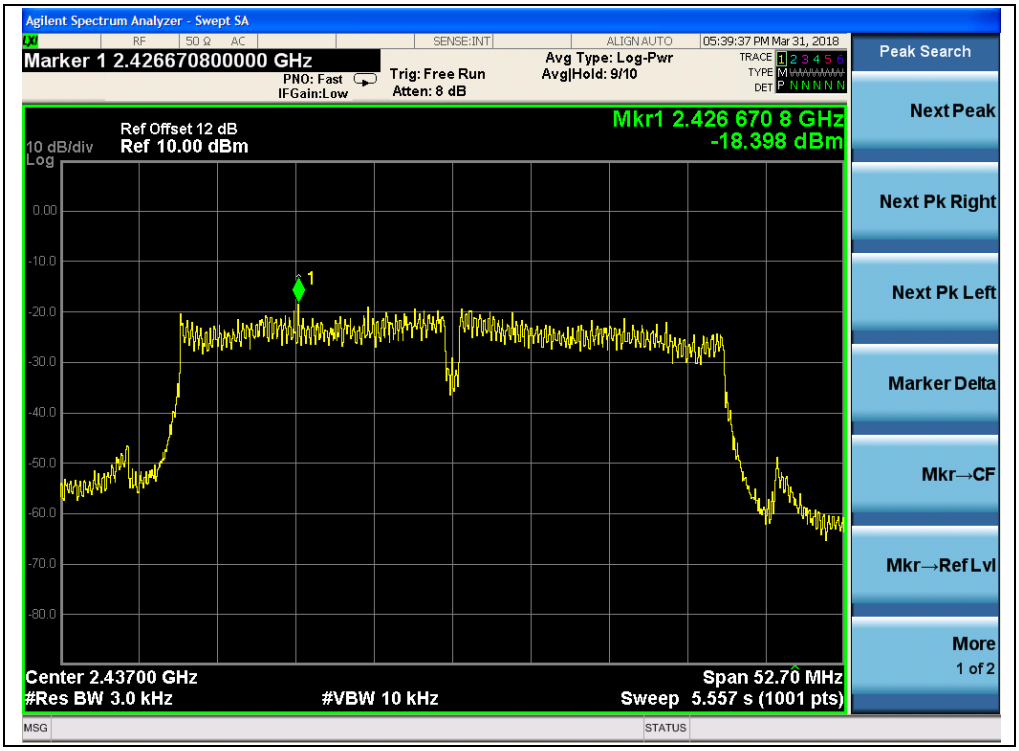
Total Power spectral density (ANT0+ANT1)

Channel	Frequency (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-13.77	8	PASS
6	2437	-14.77	8	PASS
9	2452	-14.35	8	PASS
Note: Directional gain = 1.5dBi + 10log(2) = 4.51dBi＜6dBi, so the power limit is 8 dBm/3kHz.				

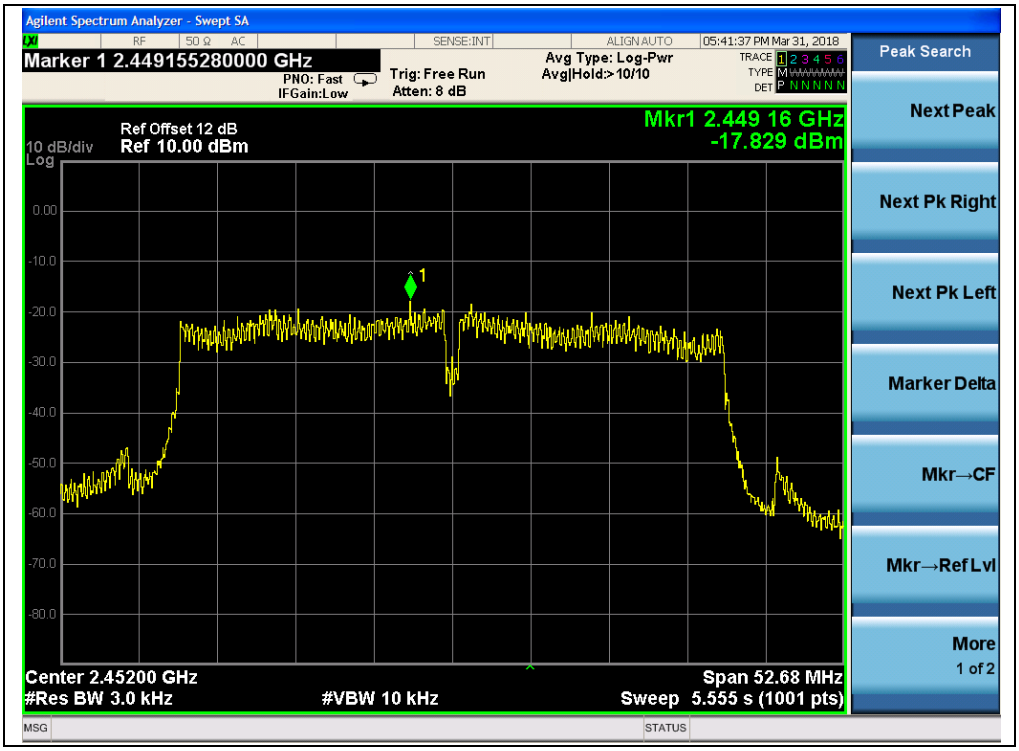
B. Test Plots:



(Channel = 3, 802.11n-40MHz, ANT0)



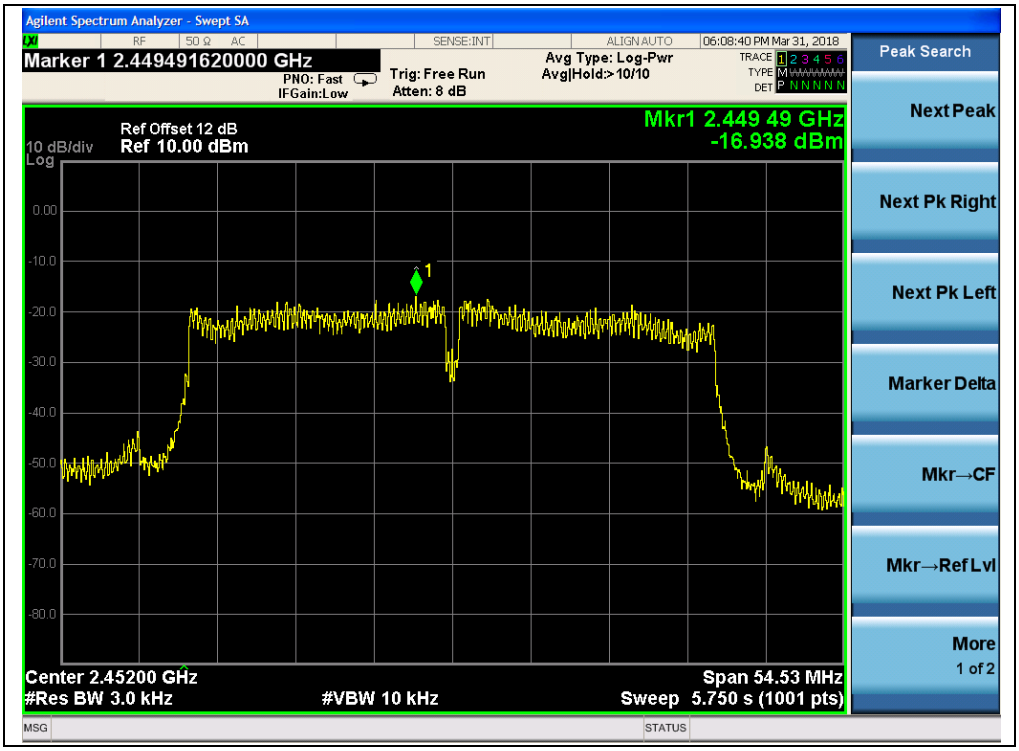
(Channel = 6, 802.11n-40MHz, ANT0)



(Channel = 9, 802.11n-40MHz, ANT0)

(Channel = 3, 802.11n-40MHz, ANT1)

(Channel = 6, 802.11n-40MHz, ANT1)



(Channel = 9, 802.11n-40MHz, ANT1)

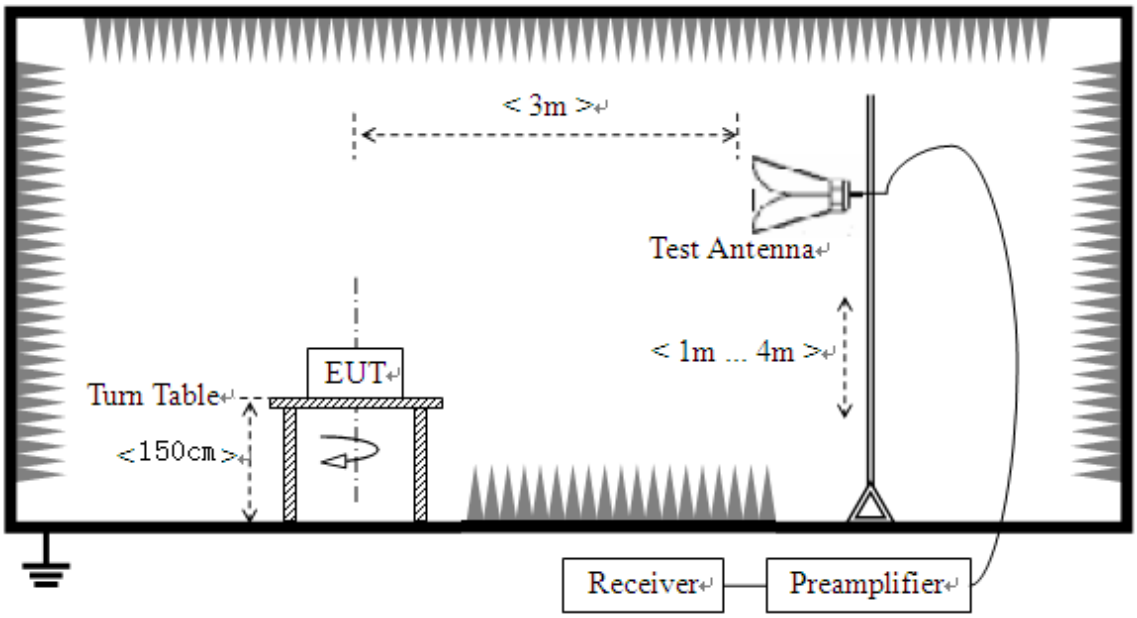
2.6. Restricted Frequency Bands

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 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:

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 refer 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.

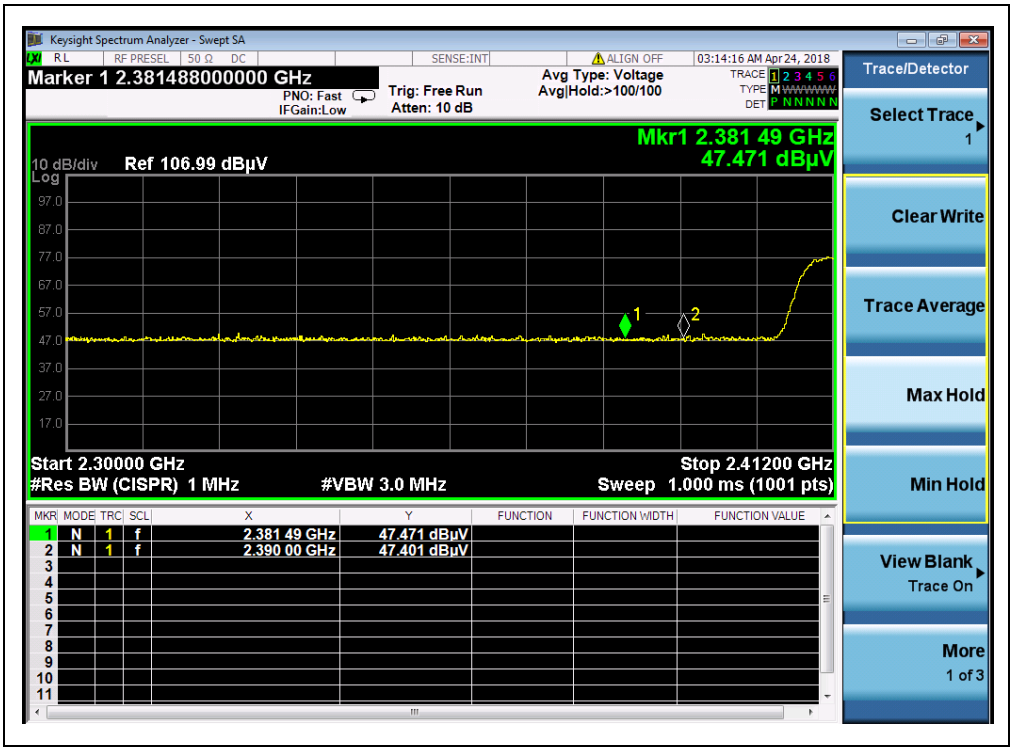
2.6.3.1 802.11b Test mode

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

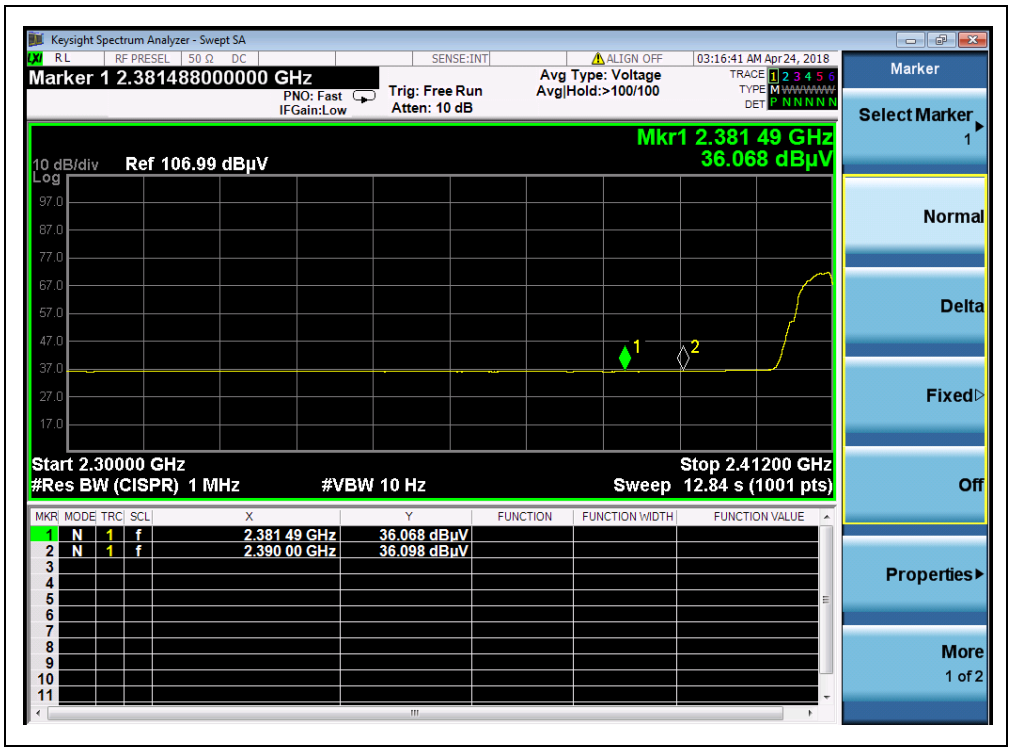
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2381.49	PK	47.47	-33.63	32.56	46.40	74	PASS
1	2381.49	AV	36.07	-33.63	32.56	35.00	54	PASS
11	2484.19	PK	48.43	-33.18	32.50	47.75	74	PASS
11	2483.81	AV	36.33	-33.18	32.50	35.65	54	PASS

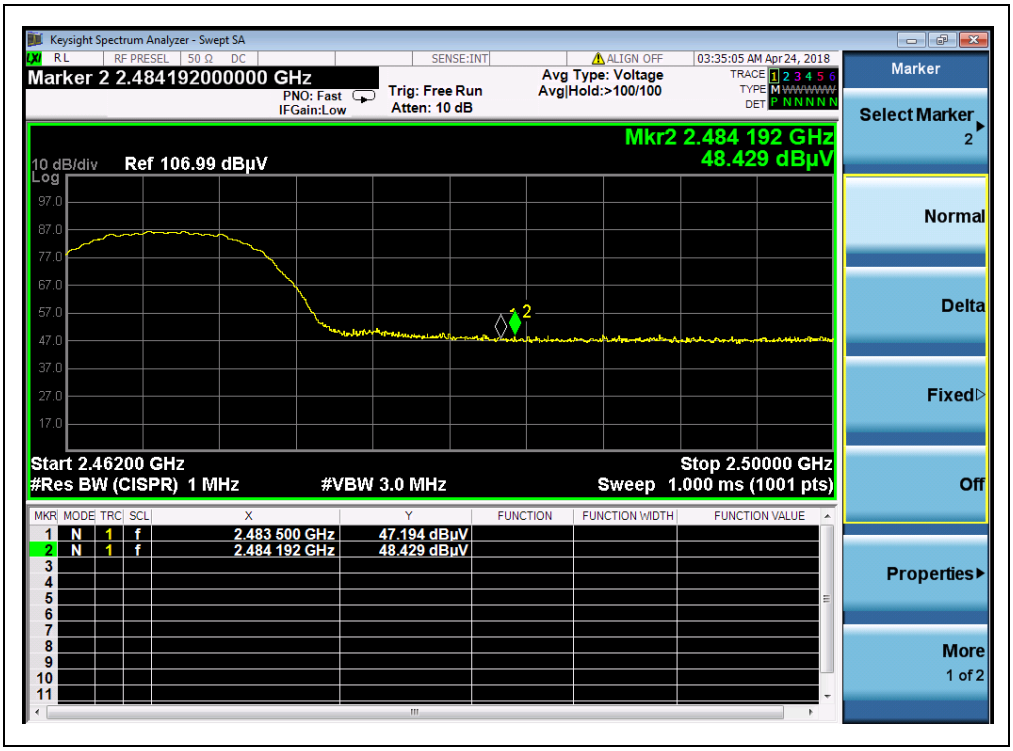
B. Test Plots:



(Channel = 1 PEAK, 802.11b)



(Channel = 1 AVG, 802.11b)



(Channel = 11 PEAK, 802.11b)

(Channel = 11 AVG, 802.11b)

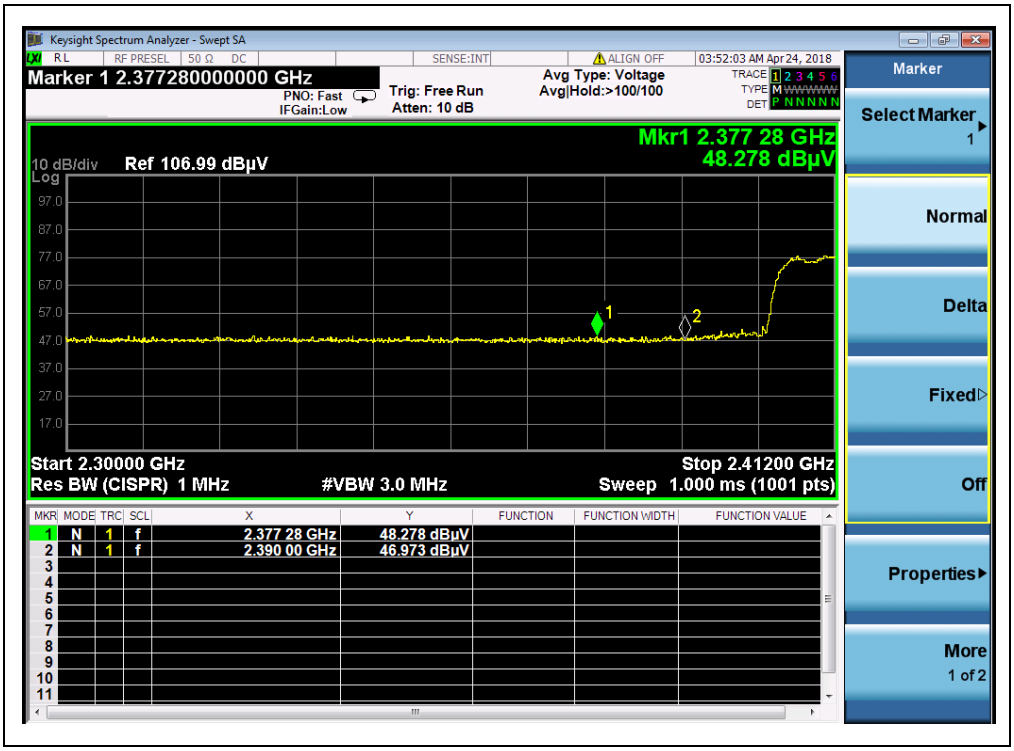
2.6.3.2 802.11g Test mode

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

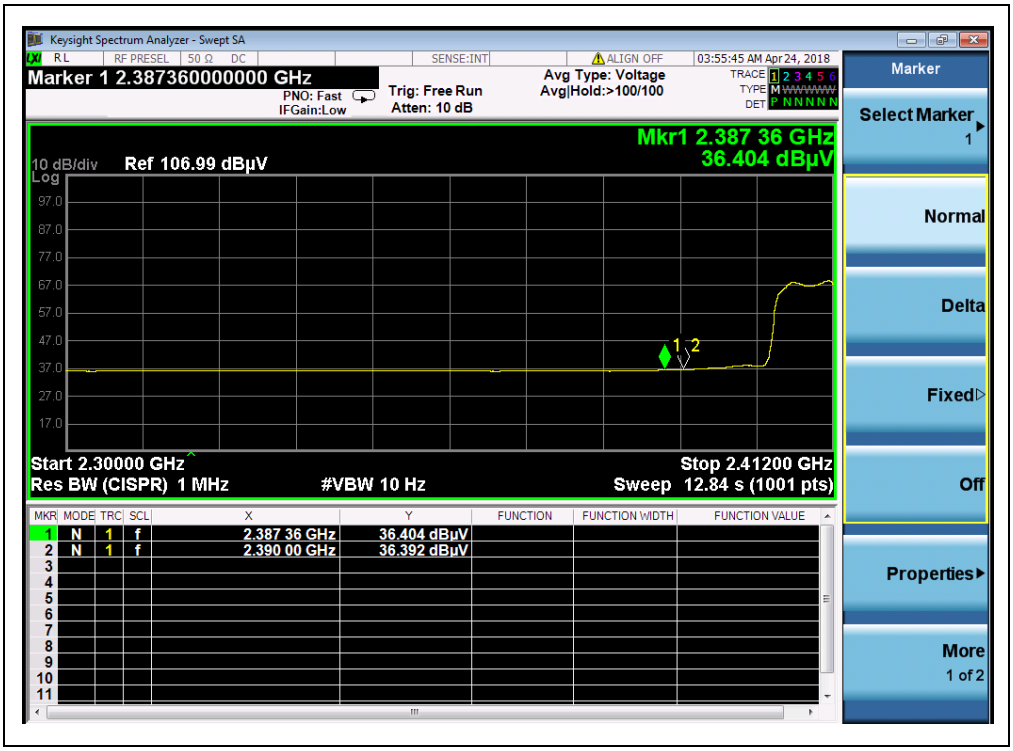
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2377.28	PK	48.28	-33.63	32.56	47.21	74	Pass
1	2387.36	AV	36.40	-33.63	32.56	35.33	54	Pass
11	2484.91	PK	48.60	-33.18	32.50	47.92	74	Pass
11	2484.15	AV	36.07	-33.18	32.50	35.39	54	Pass

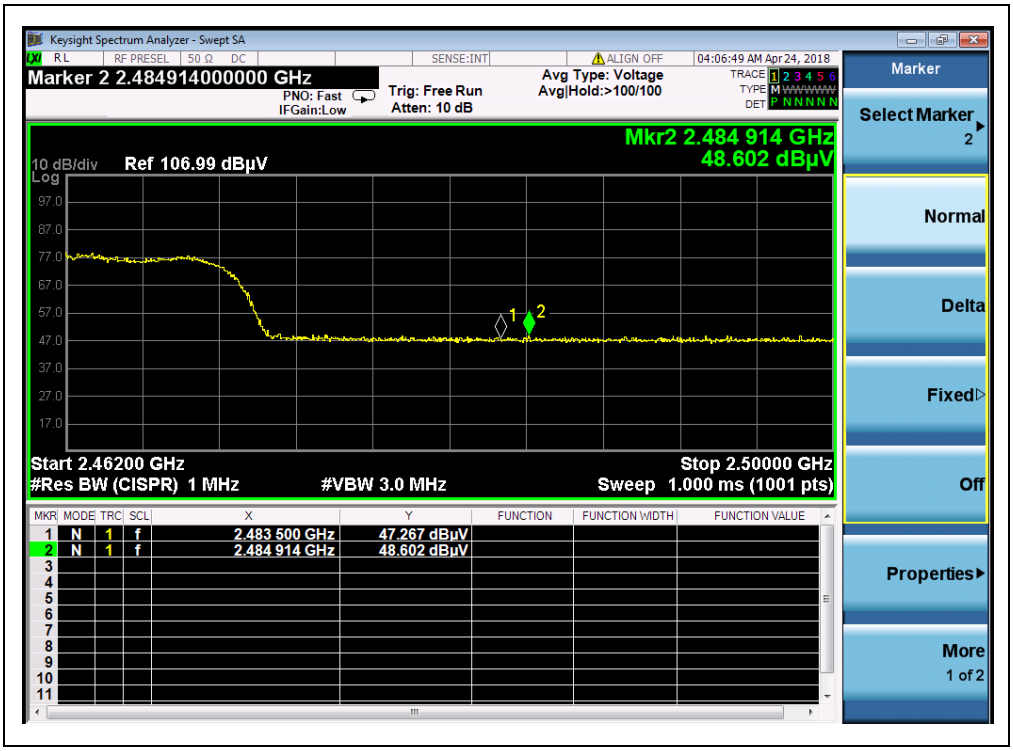
B. Test Plots:



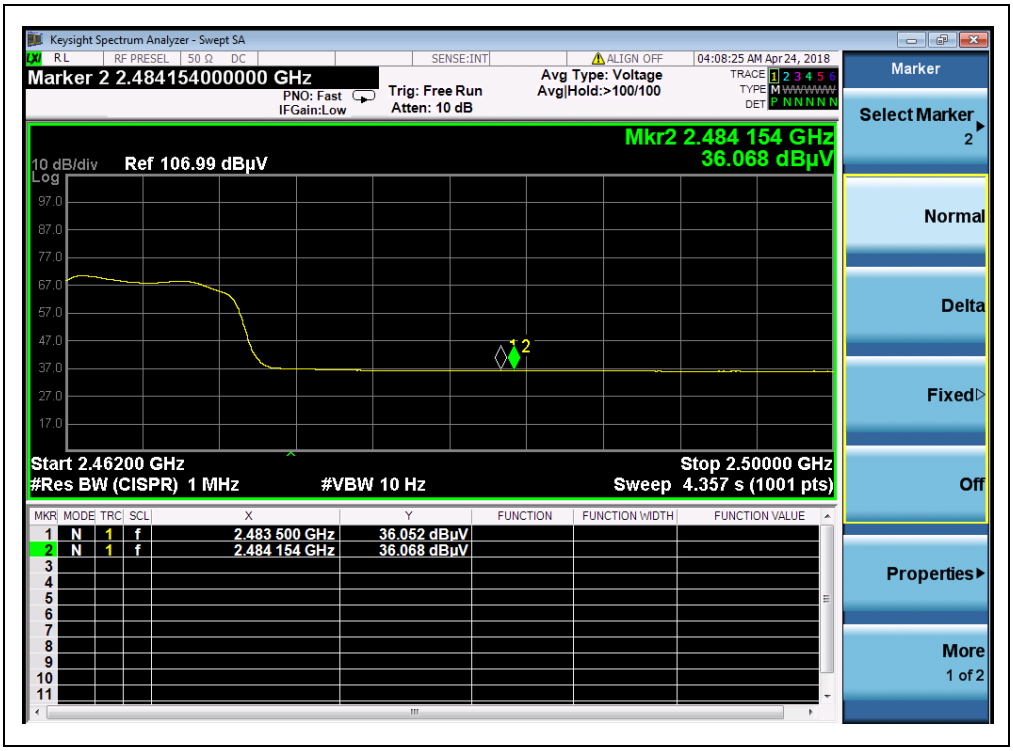
(Channel = 1 PEAK, 802.11g)



(Channel = 1 AVG, 802.11g)



(Channel = 11 PEAK, 802.11g)



(Channel = 11 AVG, 802.11g)

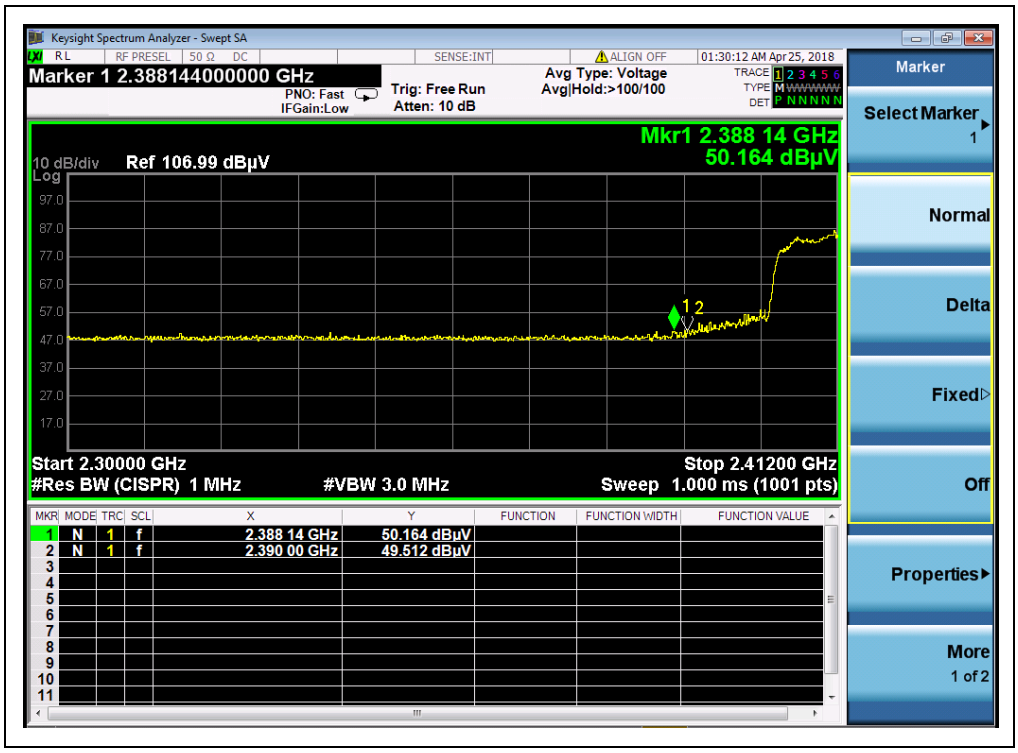
2.6.3.3 802.11n-20MHz Test mode

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

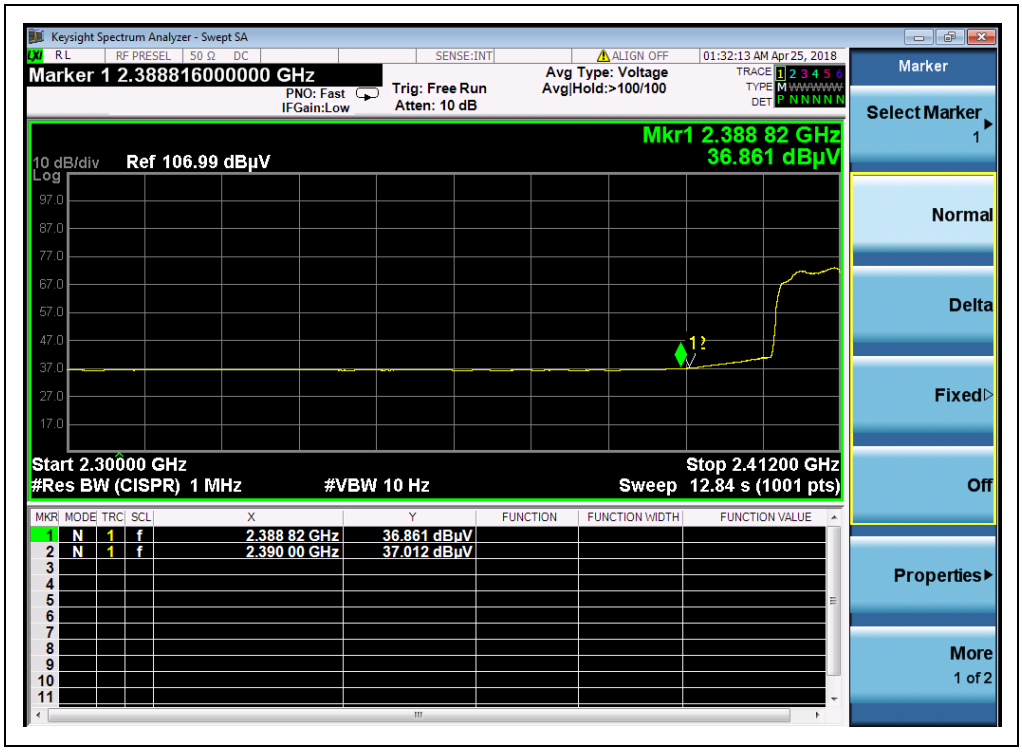
A. Test Verdict:

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	2388.14	PK	50.16	-33.63	32.56	49.09	74	Pass
1	2388.82	AV	36.86	-33.63	32.56	35.79	54	Pass
11	2487.16	PK	48.87	-33.18	32.50	48.19	74	Pass
11	2484.99	AV	36.84	-33.18	32.50	36.16	54	Pass

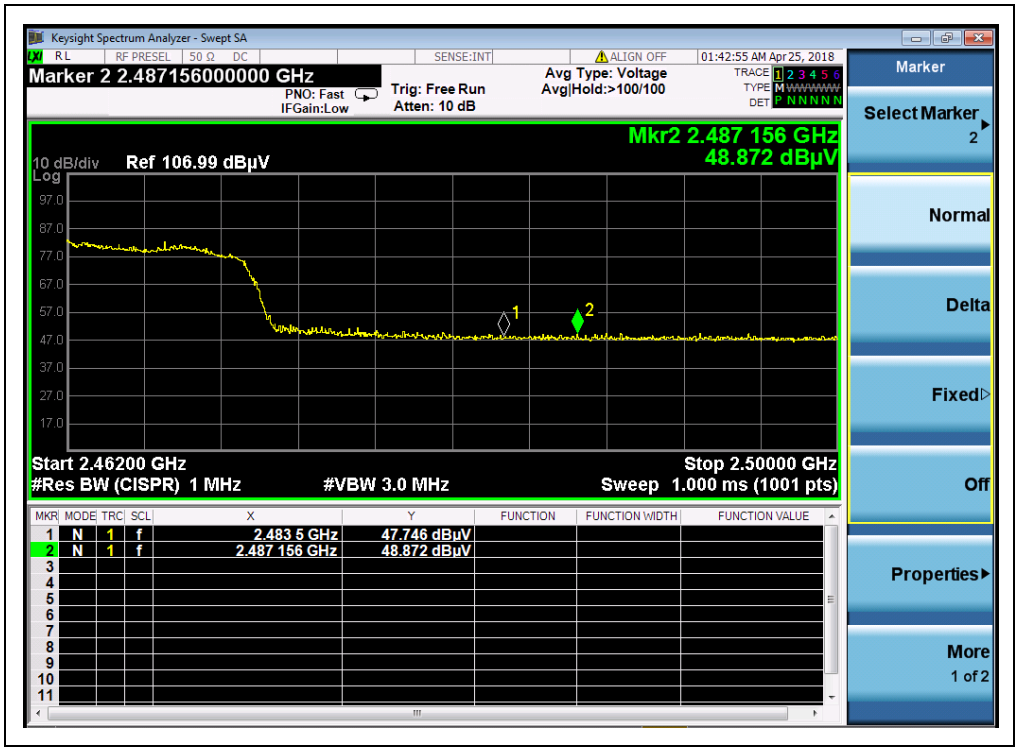
B. Test Plots:



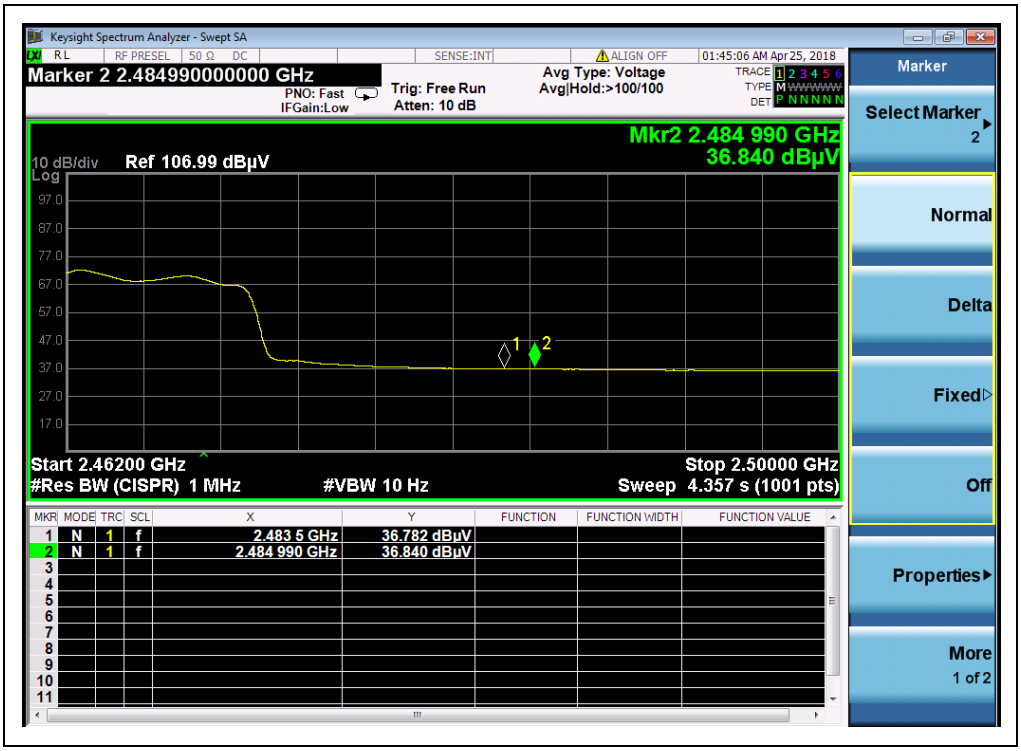
(Channel = 1 PEAK, 802.11n-20)



(Channel = 1 AVG, 802.11n-20)



(Channel = 11 PEAK, 802.11n-20)



(Channel = 11 AVG, 802.11n-20)

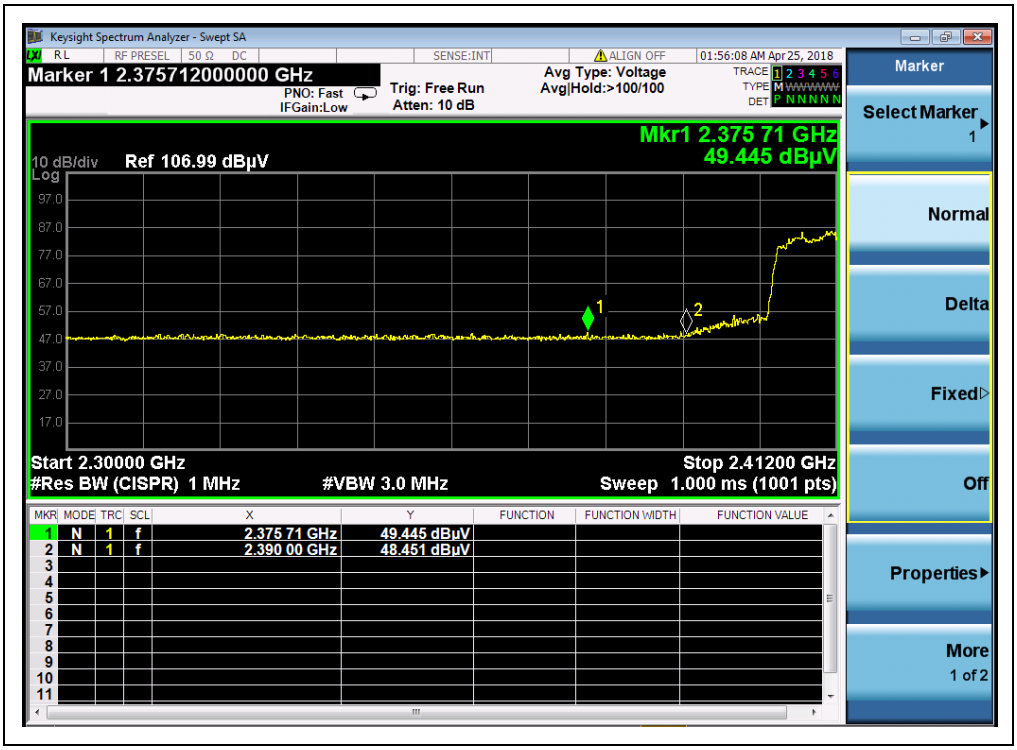
2.6.3.4 802.11n-40MHz Test mode

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

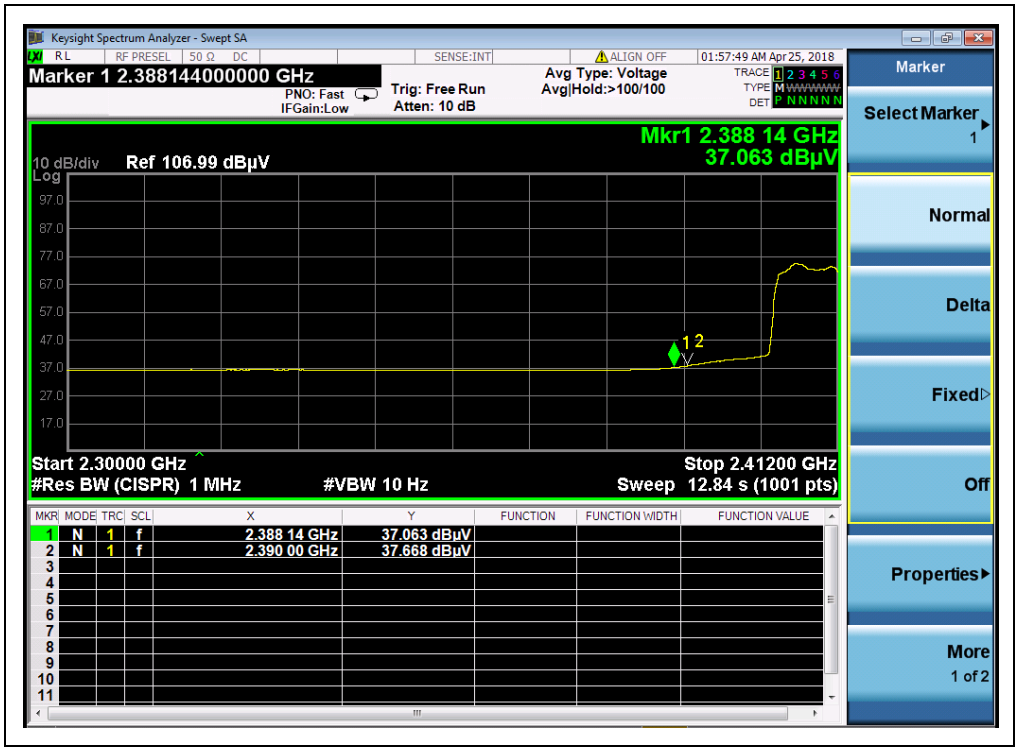
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
3	2375.71	PK	49.45	-33.63	32.56	48.38	74	Pass
3	2388.14	AV	37.06	-33.63	32.56	35.99	54	Pass
9	2484.00	PK	50.69	-33.18	32.50	50.01	74	Pass
9	2484.08	AV	40.55	-33.18	32.50	39.87	54	Pass

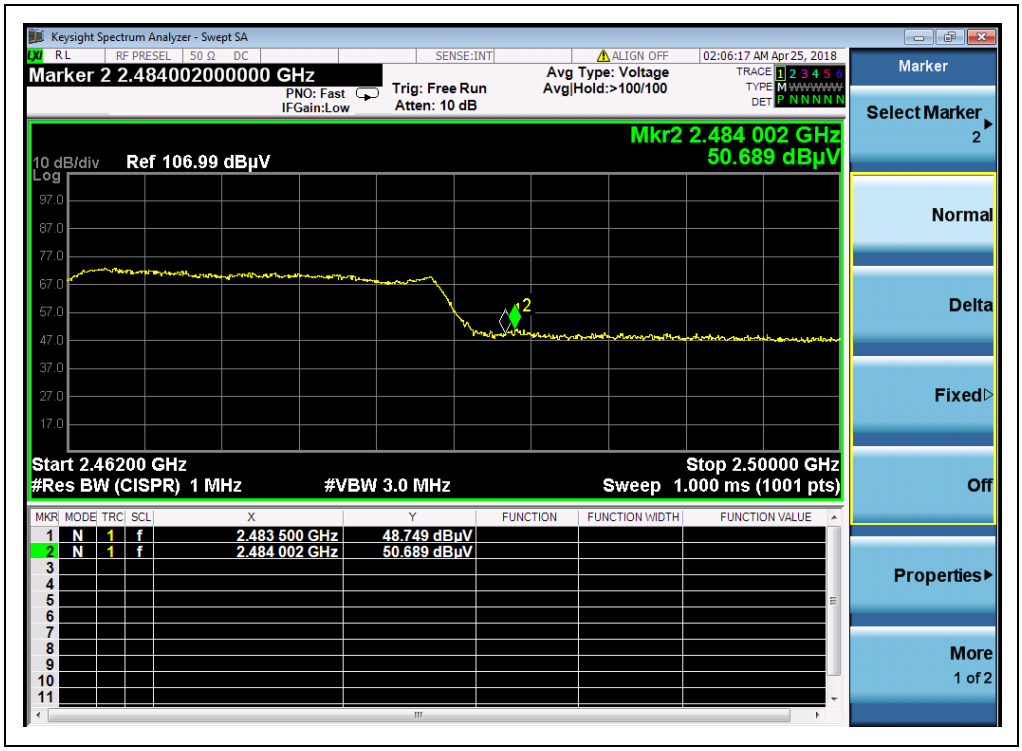
B. Test Plots:



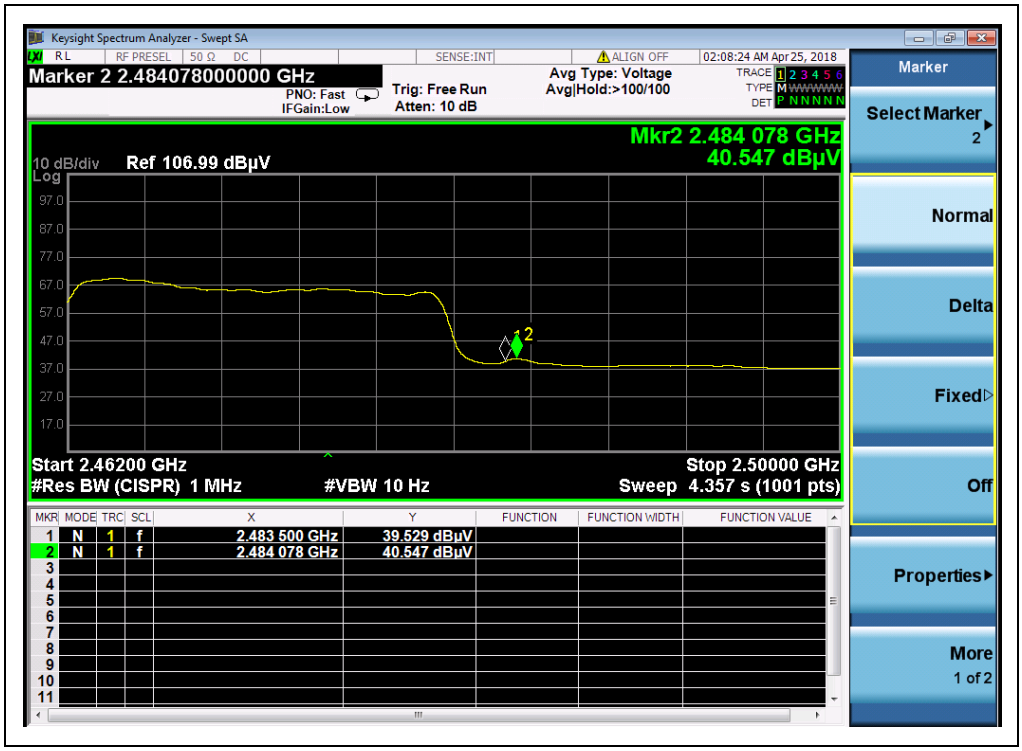
(Channel = 3 PEAK, 802.11n-40)



(Channel = 3 AVG, 802.11n-40)



(Channel = 9 PEAK, 802.11n-40)



(Channel = 9 AVG, 802.11n-40)

2.7. Conducted Emission

2.7.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

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

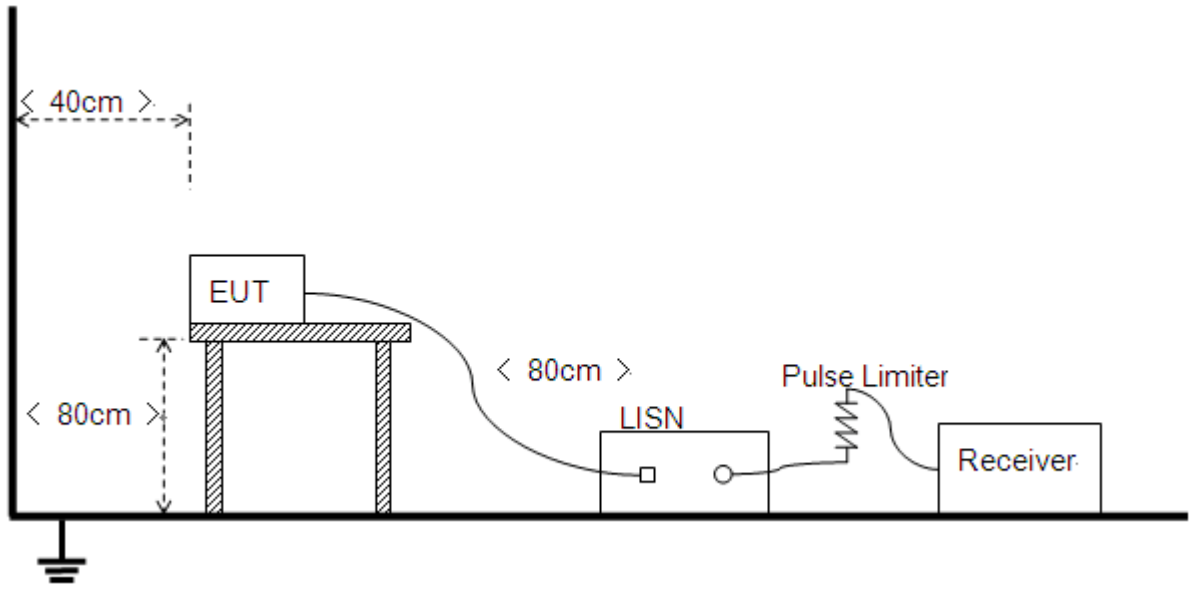
NOTE:

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

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.7.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10 2013.

B. Equipments List:

Please reference ANNEX A(1.5).

2.7.3. Test Result

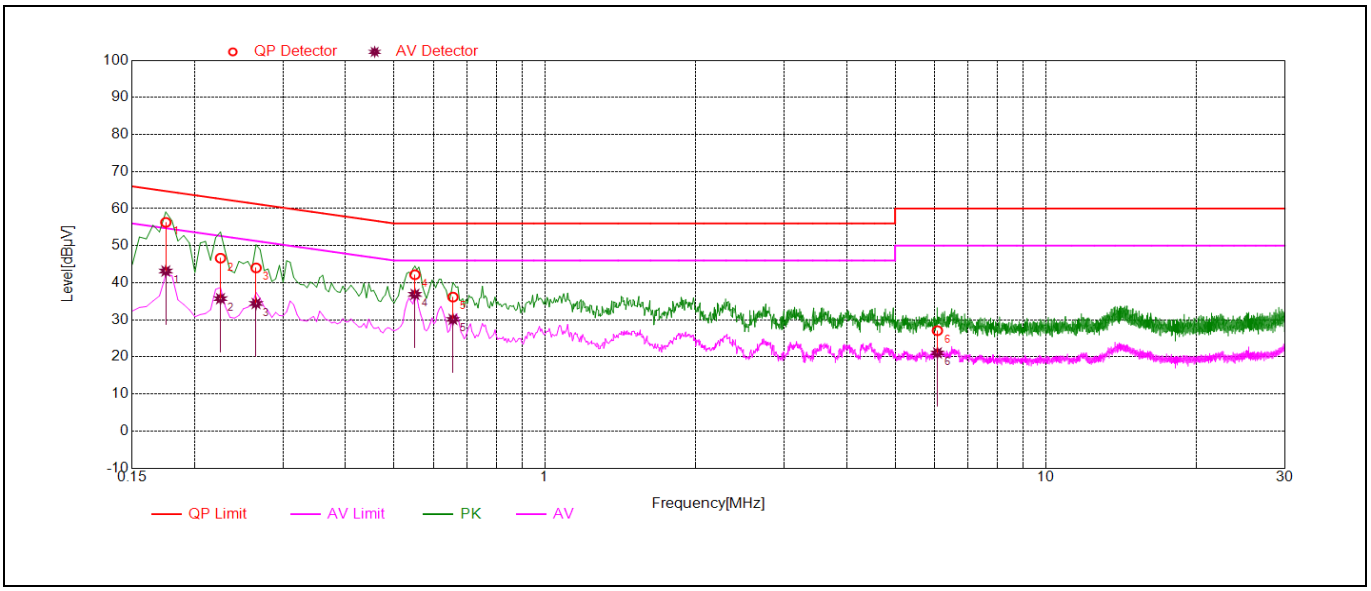
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT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

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

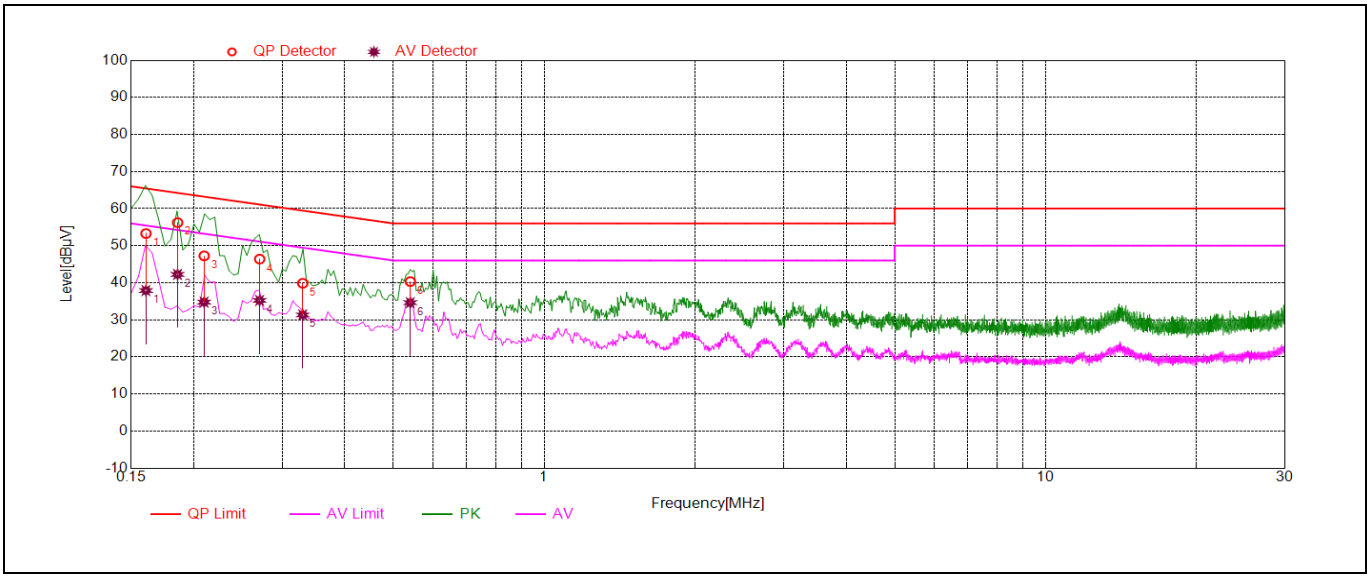
The EUT configuration of the emission tests is EUT + Link. The test voltage is AC 120V/60Hz.

B. Test Plots:



(Plot A: L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.17	56.29	43.17	64.72	54.72	Line	PASS
2	0.22	46.63	35.71	62.63	52.63		PASS
3	0.26	44.01	34.41	61.27	51.27		PASS
4	0.55	42.17	36.88	56.00	46.00		PASS
5	0.66	36.14	30.13	56.00	46.00		PASS
6	6.07	27.07	21.08	60.00	50.00		PASS



(Plot B: N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.16	53.29	37.90	65.44	55.44	Neutral	PASS
2	0.19	56.22	42.25	64.24	54.24		PASS
3	0.21	47.27	34.78	63.22	53.22		PASS
4	0.27	46.39	35.23	61.11	51.11		PASS
5	0.33	39.86	31.33	59.46	49.46		PASS
6	0.54	40.33	34.63	56.00	46.00		PASS

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.

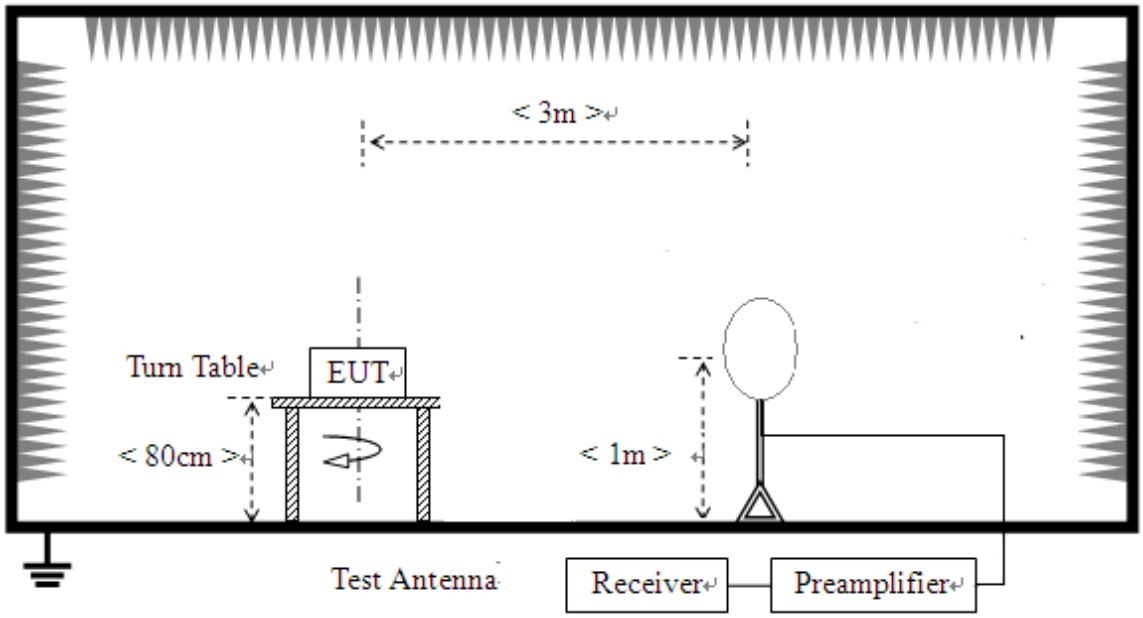
For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

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)

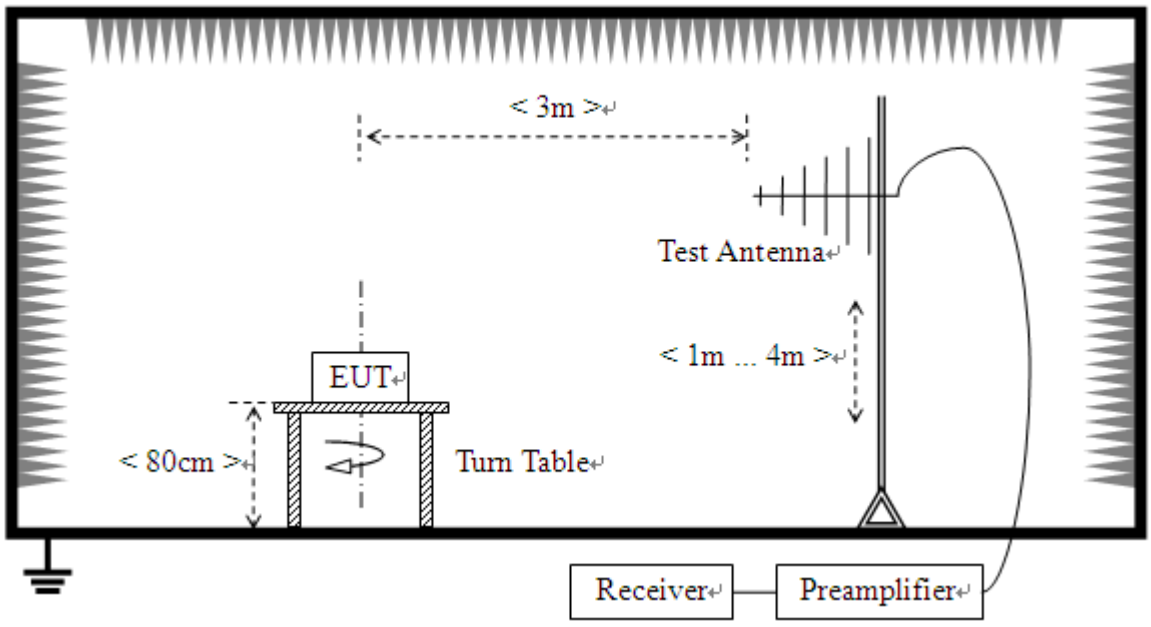
2.8.2. Test Description

A. Test Setup:

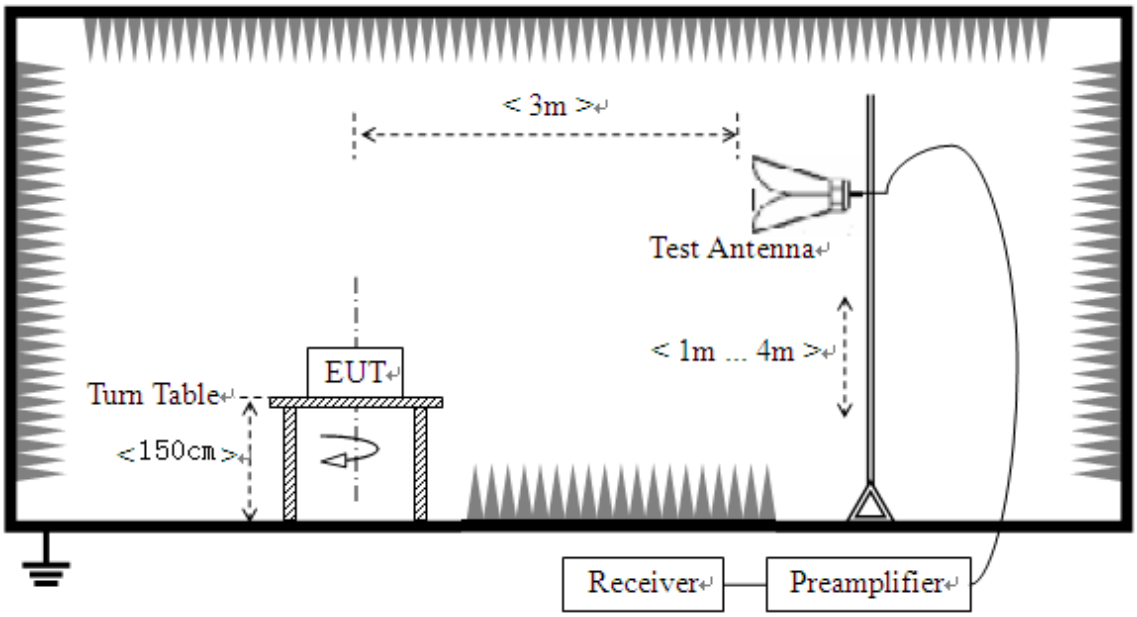
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz.

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. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The test 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 test antenna elevation shall be that which maximizes the emissions. The test 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 emission levels at both horizontal and vertical polarizations should be tested.

A. Equipments List:

Please reference ANNEX A(1.5).

2.8.3. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

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

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

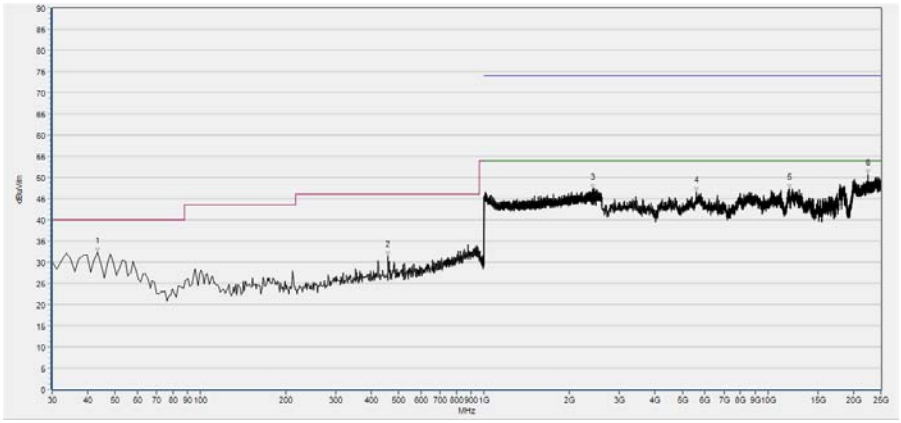
A_{Factor}: Antenna Factor at 3m

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

Note1: 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.
Note2: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.
Note3: For the frequency, which started from 25GHz to 40GHz, was pre-scanned and the result which was 10dB lower than the limit was not recorded.

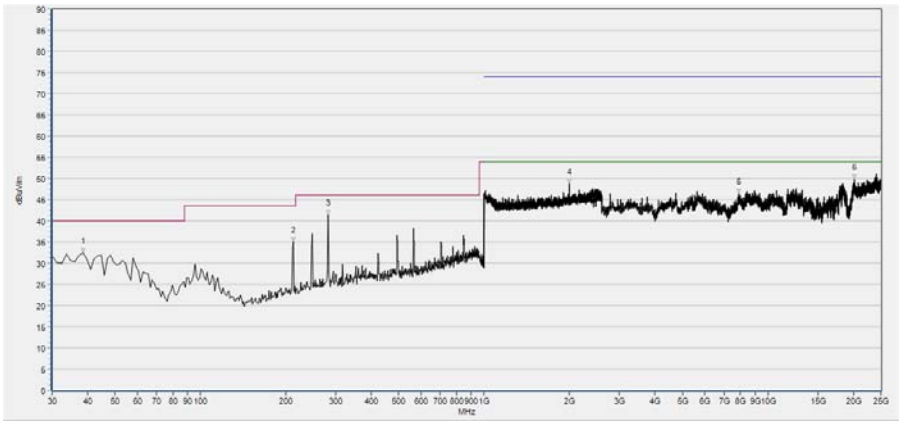
2.8.3.1 802.11b Test mode

Plots for Channel = 1



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
43.354	32.24	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
458.548	31.45	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2406.643	47.29	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5585.852	46.64	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
11867.139	47.25	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
22555.919	50.80	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

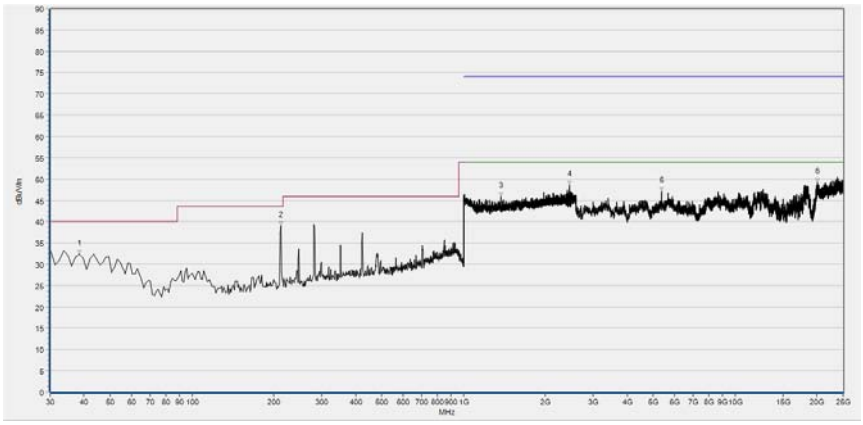
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.42	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
212.103	34.94	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
282.516	41.41	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1996.238	48.67	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7883.288	46.43	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
20197.381	49.78	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

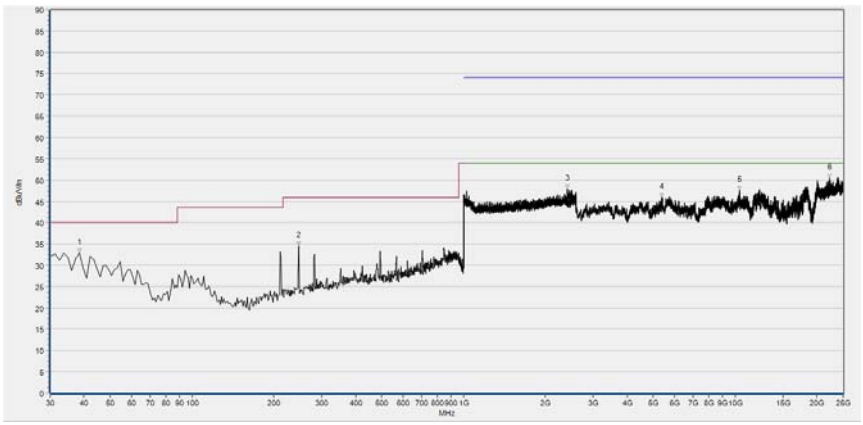
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.39	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
212.103	39.05	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1370.068	45.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2450.180	48.58	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5349.591	47.11	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
20140.353	49.31	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

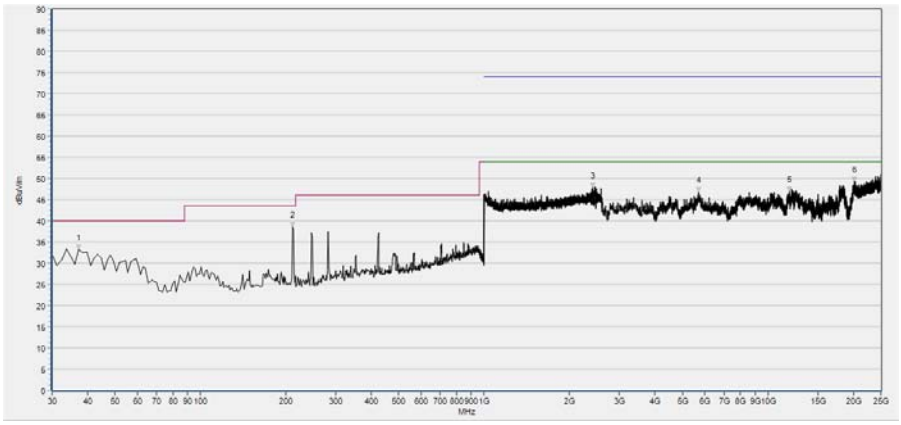
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.90	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
247.309	34.58	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2411.124	47.94	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5369.958	46.00	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10359.956	47.60	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
22319.658	50.40	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

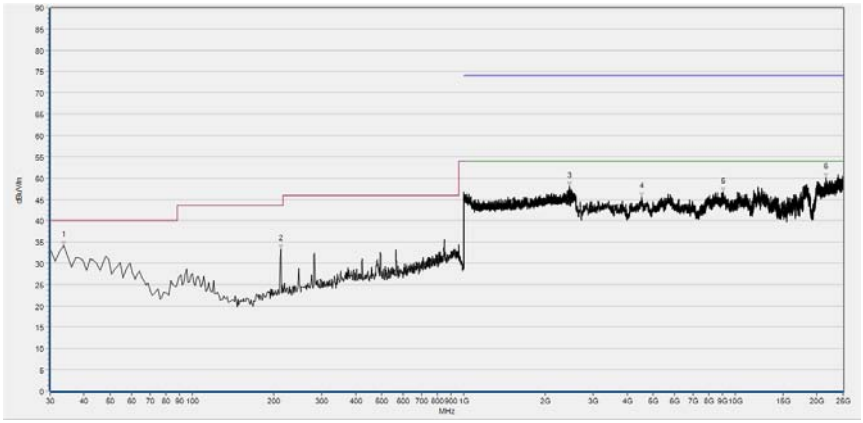
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
37.284	33.20	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
210.889	38.57	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2407.283	47.79	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5691.762	46.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
11875.286	46.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
20177.014	49.31	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

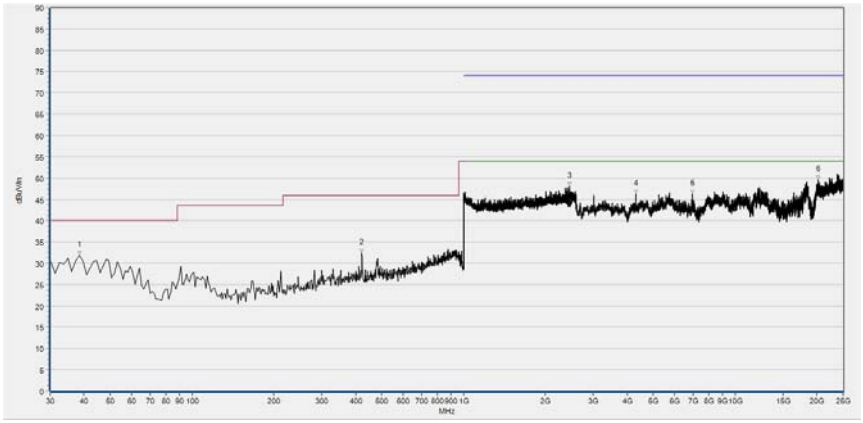


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
33.642	34.18	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
212.103	33.38	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2449.540	48.04	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4538.971	45.60	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9060.520	46.82	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
21557.920	50.06	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

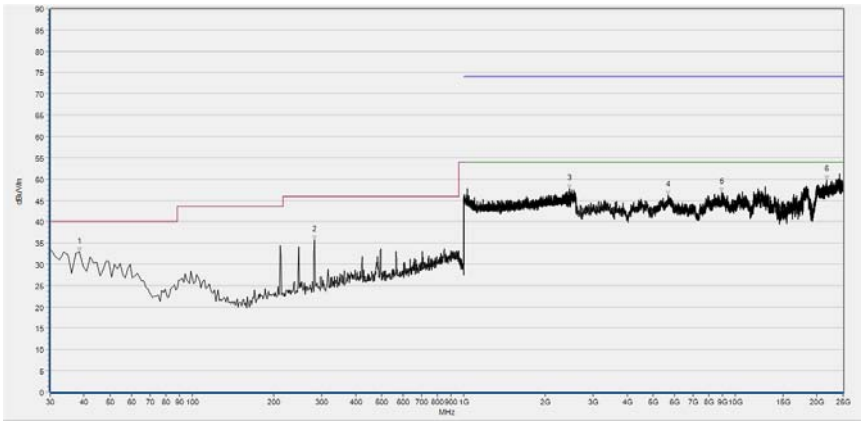
2.8.3.2 802.11g Test mode

Plots for Channel = 1



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
38.498	31.81	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
422.128	32.36	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2455.942	48.13	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4302.710	46.30	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6966.758	46.32	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
20177.014	49.64	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

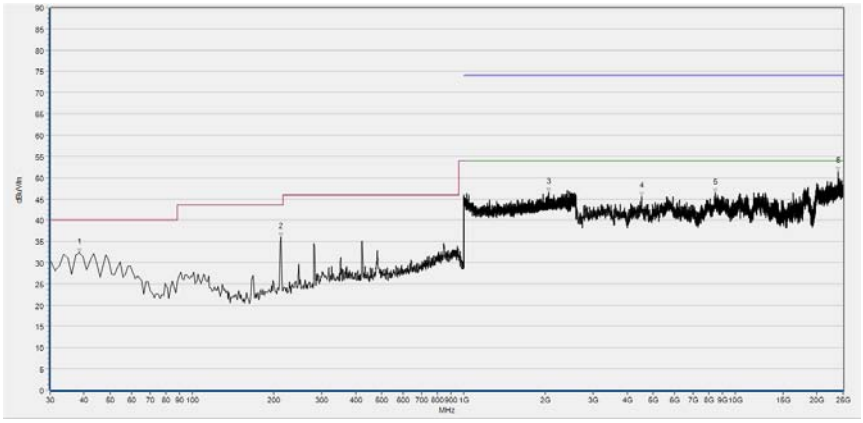
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
38.498	32.88	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
282.516	35.75	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2449.540	47.81	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5671.395	46.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8946.463	46.92	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
21724.932	49.75	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

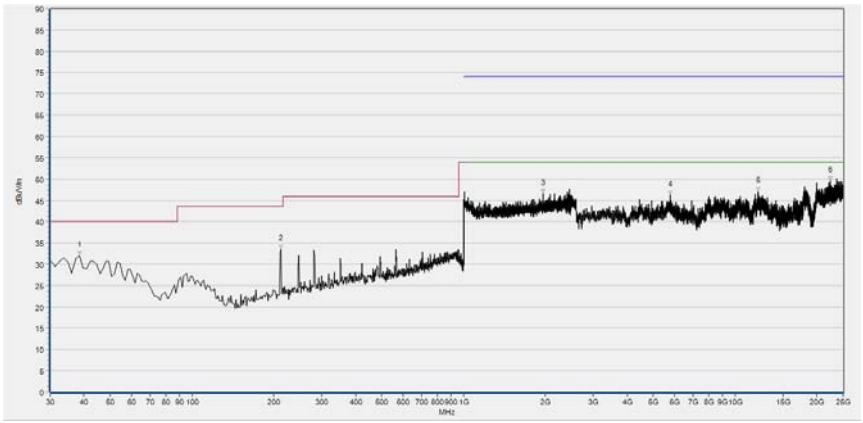
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.29	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
212.103	35.97	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2060.904	46.57	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4526.750	45.61	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8461.720	46.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
23904.237	51.49	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

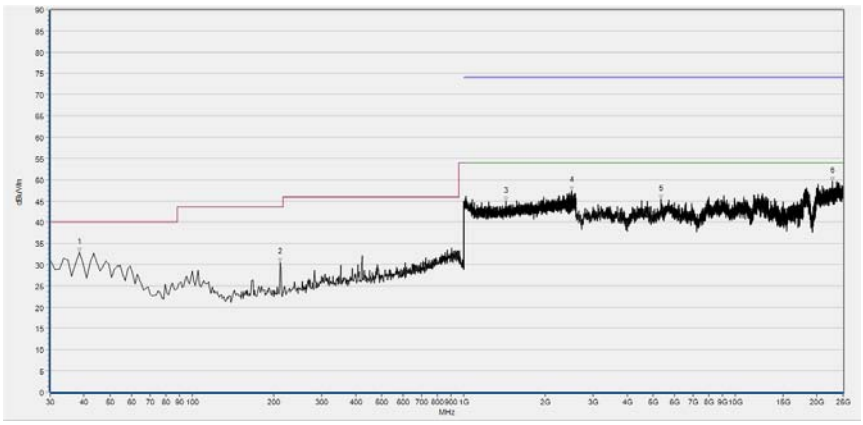
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.03	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
212.103	33.49	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1962.945	46.54	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5765.085	46.21	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12144.135	47.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
22478.523	49.60	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

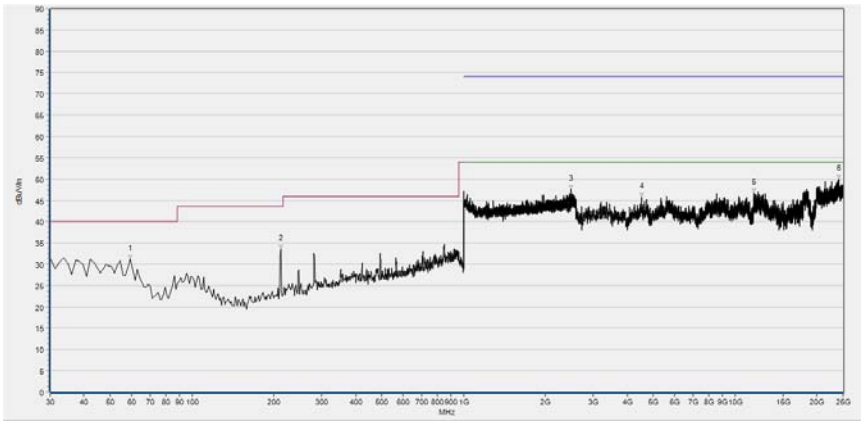
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.83	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
210.889	30.55	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1430.252	44.83	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2493.077	47.47	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5337.370	45.49	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
22885.870	49.56	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

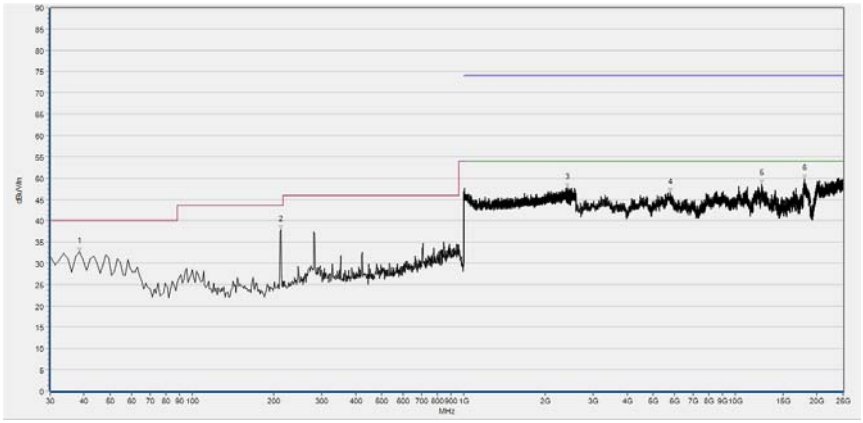


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
59.136	31.19	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
212.103	33.55	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2489.236	47.53	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4514.530	45.71	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
11736.789	46.71	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
24059.029	49.91	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

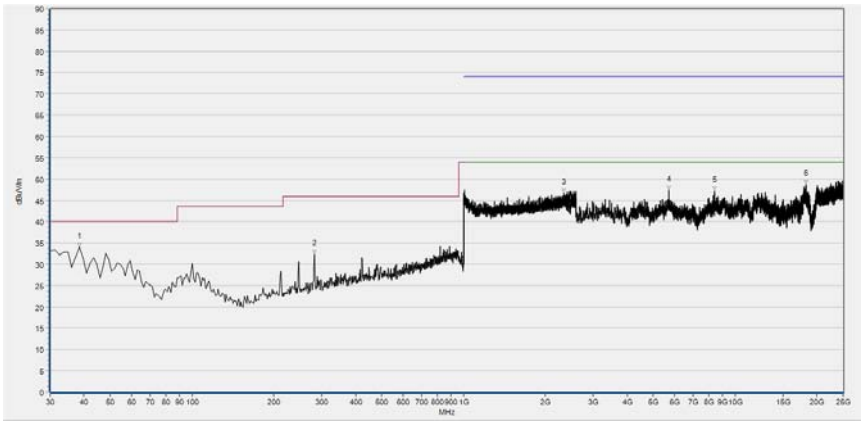
2.8.3.3 802.11n-20MHz Test mode

Plots for Channel = 1



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.74	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
212.103	37.81	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2414.966	47.70	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
5752.864	46.64	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
12531.115	48.59	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
17985.488	49.71	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS

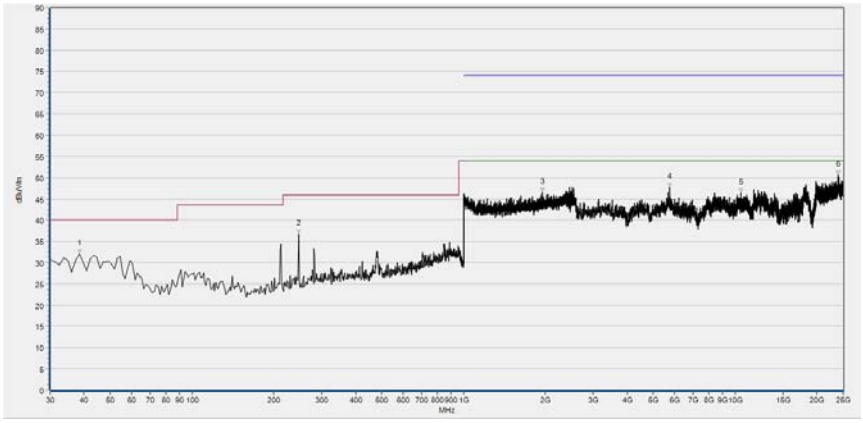
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	33.97	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
282.516	32.32	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2341.337	46.75	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
5691.762	47.41	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
8420.986	47.20	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
18229.896	48.73	N/A	N/A	74.0	N/A	54.0	Vertical	PASS

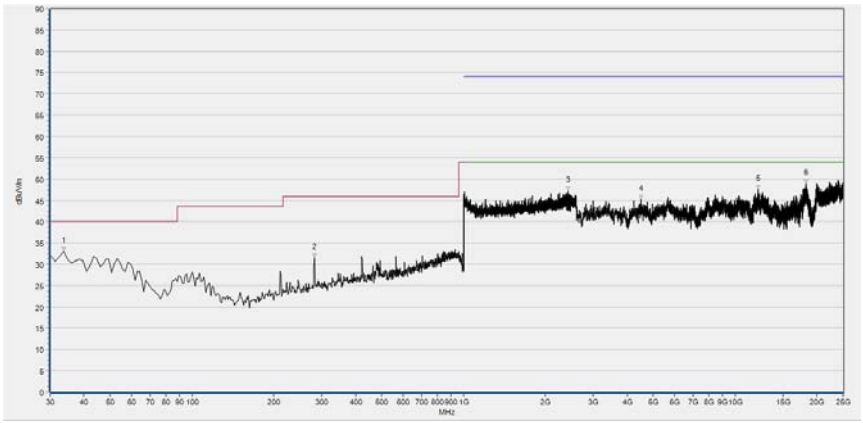
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 6



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.02	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
247.309	36.77	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1952.701	46.57	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
5748.791	47.71	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
10498.454	46.45	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
23944.972	50.55	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS

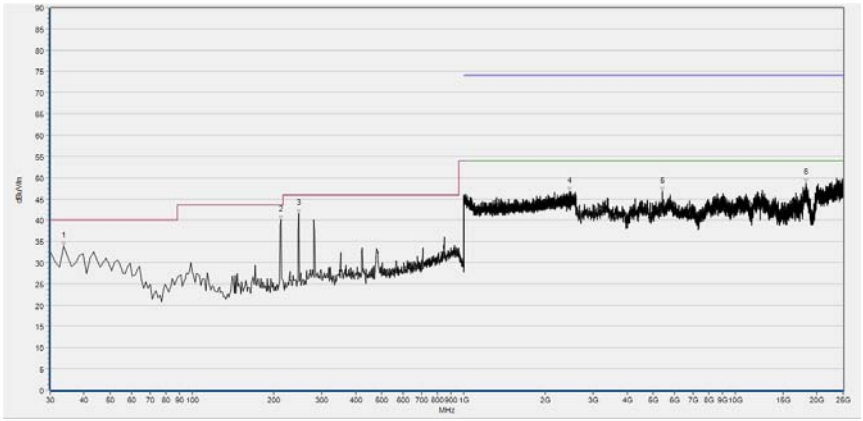
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
33.642	33.03	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
282.516	31.53	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2420.088	47.18	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
4510.456	45.18	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
12140.062	47.58	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
18270.631	48.92	N/A	N/A	74.0	N/A	54.0	Vertical	PASS

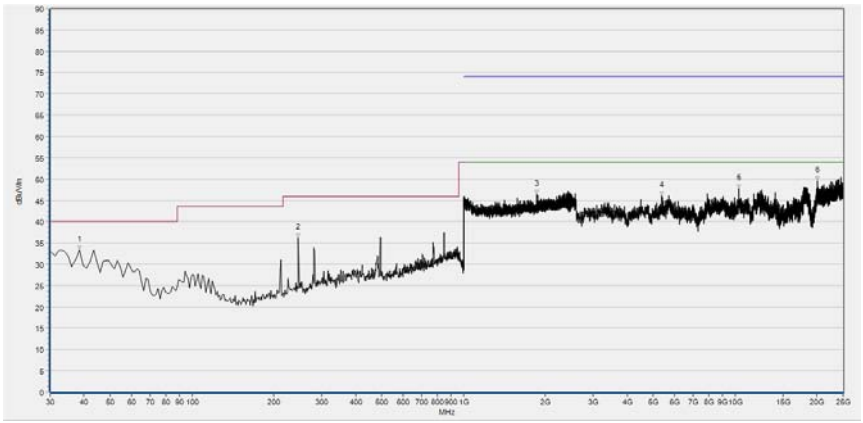
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
33.642	33.93	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
212.103	39.99	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
247.309	41.55	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2454.022	46.83	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
5386.252	46.68	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
18213.602	48.84	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

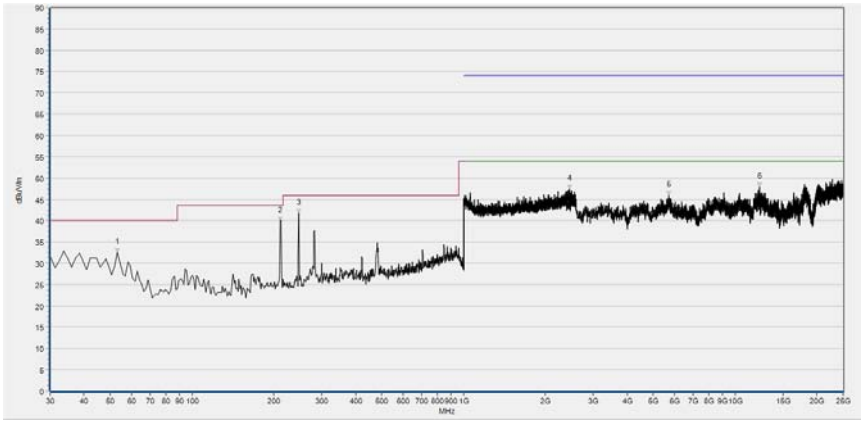


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	33.27	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
246.095	36.13	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1853.461	46.48	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
5357.738	46.10	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
10307.001	47.74	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
20132.206	49.59	N/A	N/A	74.0	N/A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

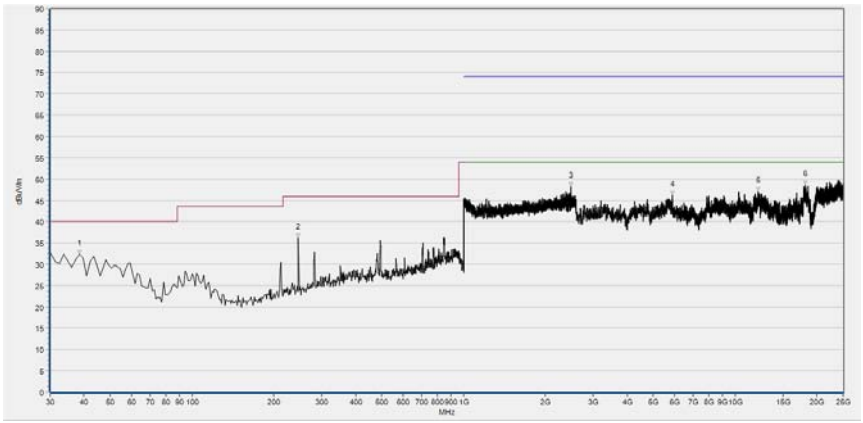
2.8.3.4 802.11n-40MHz Test mode

Plots for Channel = 3



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
53.066	32.46	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
210.889	39.92	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
247.309	41.81	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2456.583	47.40	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
5695.836	45.98	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
12286.707	47.94	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS

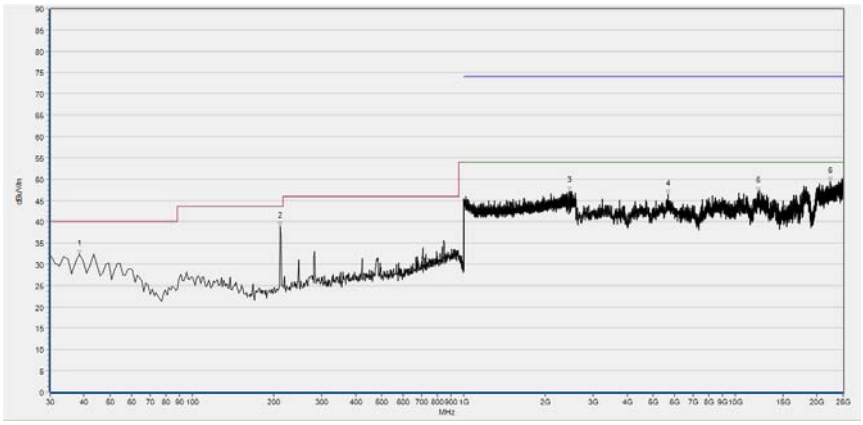
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.36	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
246.095	36.23	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2491.797	48.26	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
5875.068	46.29	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
12140.062	47.12	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
18185.088	48.53	N/A	N/A	74.0	N/A	54.0	Vertical	PASS

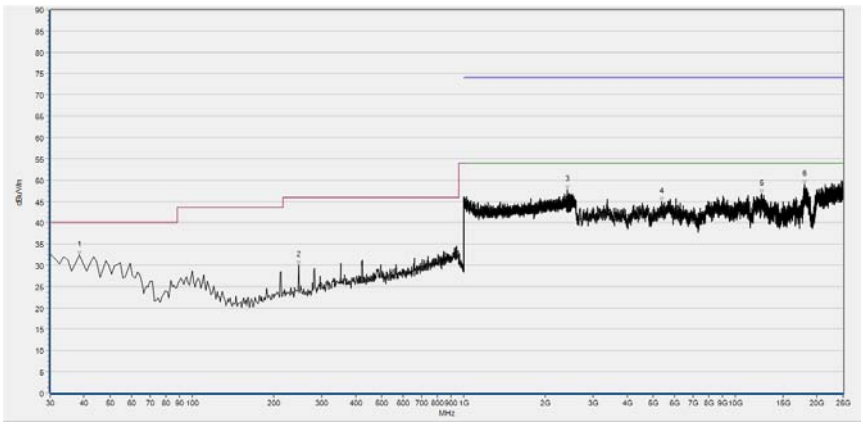
(Plot A.3: Antenna Vertical, 30MHz to 25GHz)

Plots for Channel = 6



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.31	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
210.889	38.87	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2457.223	47.25	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
5659.174	46.42	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
12148.209	47.10	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
22417.421	49.47	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS

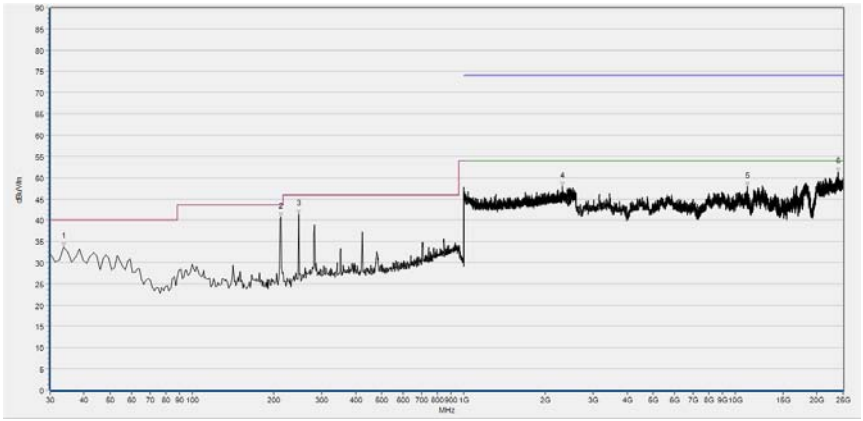
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
38.498	32.41	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
247.309	29.97	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2410.484	47.79	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
5369.958	44.92	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
12539.262	46.74	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
17985.488	48.87	N/A	N/A	74.0	N/A	54.0	Vertical	PASS

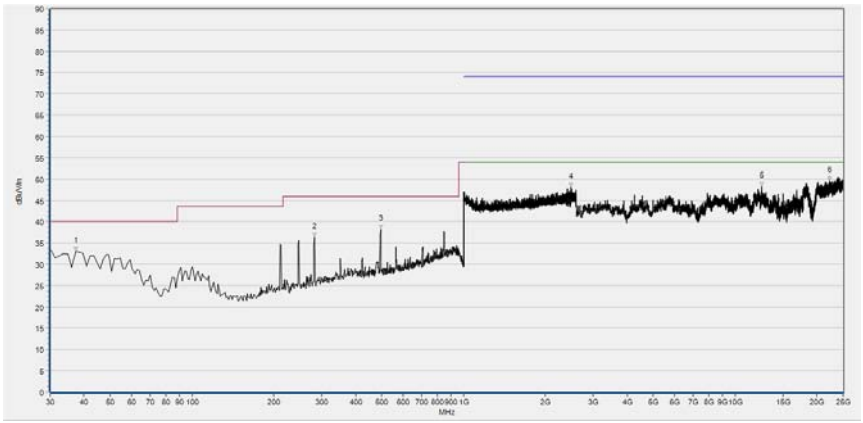
(Antenna Vertical, 30MHz to 25GHz)

Plots for Channel = 9



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
33.642	33.66	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
212.103	40.26	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
247.309	41.40	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2311.244	48.01	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
11121.695	47.89	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
23900.164	51.30	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
37.284	32.95	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
282.516	36.43	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
494.969	38.21	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2489.236	48.14	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
12535.188	48.22	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
22217.821	49.54	N/A	N/A	74.0	N/A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

Annex A Test Uncertainty

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

Test items	Uncertainty
Peak Output Power	±2.22dB
Power spectral density (PSD)	±2.22dB
Bandwidth	±5%
Conducted Spurious Emission	±2.77 dB
Restricted Frequency Bands	±5%
Radiated Emission	±2.95dB
Conducted Emission	±2.44dB

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

Annex B Testing Laboratory Information

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

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

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192.

4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Power Splitter	NW521	1506A	Weinschel	2017.05.24	2018.05.23
Attenuator 1	(N/A.)	10dB	Resnet	2017.05.24	2018.05.23
Attenuator 2	(N/A.)	3dB	Resnet	2017.05.24	2018.05.23
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2017.12.03	2018.12.02
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2017.05.24	2018.05.23
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2017.07.13	2018.07.12
LISN	812744	NSLK 8127	Schwarzbeck	2017.05.17	2018.05.16
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2017.05.17	2018.05.16
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3Auxiliary Test Equipment

Equipment Name	Model No.	Brand Name	Manufacturer	Cal.Date	Cal. Due
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.4 List of Software Used

Description	Manufacturer	Software Version
Test system	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V 1.0

4.5 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2017.05.17	2018.05.16
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2017.05.14	2018.05.13
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2017.09.13	2018.09.12
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2017.09.13	2018.09.12
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2017.05.17	2018.05.16
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2017.05.17	2018.05.16
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

END OF REPORT