TEST REPORT

APPLICANT	:	Green Packet Berhad, Taiwan
PRODUCT NAME	:	MIFI
MODEL NAME	:	MX-725
BRAND NAME	:	GreenPacket
FCC ID	:	W9V-MX725-GP
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2019-08-26
TEST DATE	:	2019-08-30 to 2019-09-19
ISSUE DATE	:	2019-09-24

Edited by: Peng Mi (Rapporteur)

Approved by: Peng Huarui (Supervisor)

MORLAB

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DIRECTORY

Change History		
Version	**Date**	**Reason for change**
1.0	2019-09-24	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Green Packet Berhad, Taiwan
Applicant Address:	6F, NO.21, LANE 583 RUEIGUANG RD, NEIHU DISTRICT, Taipei City, Taiwan, China
Manufacturer:	Green Packet Berhad, Taiwan
Manufacturer Address:	6F, NO.21, LANE 583 RUEIGUANG RD, NEIHU DISTRICT, Taipei City, Taiwan, China

1.2. Equipment Under Test (EUT) Description

Product Name:	MIFI	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	Mobile.Router.M01	
Software Version:	Mobile.Router.B01	
Equipment type:	WLAN2.4G	
Modulation Type:	DSSS, OFDM	
Operating Frequency Range:	802.11b/g/ n(HT20): 2.412GHz - 2.472GHz 802.11 n(HT40): 2.422GHz - 2.462GHz	
Antenna Type:	Monopole Antenna	
Antenna Gain:	Ant A: 2.0 dBi; Ant B: 2.2 dBi	
Directional Gain:	5.21 dBi Note 3	
Accessory Information:	Battery	
	Brand Name:	TG
	Model No.:	DC015
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	3000mAh
	Rated Voltage:	3.80V
	Charge Limit:	4.35V

Note 1: We use the dedicated software to control the EUT continuous transmission.

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 maximum 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 (Ant A) 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 (ANTA) in this report.

Note 6: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Modulation Type and Data Rate of EUT

Modulation technology	Modulation Type	Data Rate (Mbps) Note1
DSSS (802.11b)	DBPSK	**1**
	DQPSK	2
	CCK	5.5/ 11
OFDM (802.11g)	BPSK	**6** / 9
	QPSK	12 / 18
	16QAM	24 / 36
	64QAM	48 / 54
OFDM (802.11n-20MHz)	BPSK	**6.5**
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65
OFDM (802.11 n (HT40))	BPSK	**13.5**
	QPSK	27/40.5
	16QAM	54/81/108
	64QAM	121.5/135

Note1: The worst-case mode (bold face) in all data rates has been determined during the pre-scan,
only the test data of the worst-case were recorded in this report.

1.4. The channel number and frequency

Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
802.11b/g/ n(HT20)	**1**	**2412**	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	11	2462
	5	2432	12	2467
	6	2437	**13**	**2472**
	7	**2442**		
Test Mode	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
n(HT40)	**3**	**2422**	8	2447
	4	2427	9	2452
	5	2432	10	2457
	6	2437	**11**	**2462**
	7	**2442**		

Note1: The Lowest Channel (1), Middle Channel (7) and Highest Channel (13) was selected test for 802.11b/g/n(HT20) mode;

Note2: The Lowest Channel (3), Middle Channel (7) and Highest Channel (11) was selected test for n(HT40) mode;

1.5. 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	Radio Frequency Devices

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

No.	Section	Description	Test Date	Test Engineer	Result	Method determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	N/A	Duty Cycle Of Test Signal	Aug 30, 2019	Ouyang Feng	PASS	No deviation
3	15.247(b)	Maximum Peak and Average Conducted Output Power	Aug 30, 2019	Ouyang Feng	PASS	No deviation
4	15.247(a)	Bandwidth	Aug 30, 2019	Ouyang Feng	PASS	No deviation
5	15.247(d)	Conducted Spurious Emission and Band Edge	Aug 30, 2019	Ouyang Feng	PASS	No deviation
6	15.247(e)	Power spectral density (PSD)	Aug 30, 2019	Ouyang Feng	PASS	No deviation
7	15.207	Conducted Emission	Sep 09, 2019	Lin Jiayong	PASS	No deviation
8	15.247(d)	Restricted Frequency Bands	Sep 19, 2019	Gao Jianrou	PASS	No deviation
9	15.209, 15.247(d)	Radiated Emission	Sep 18, 2019	Gao Jianrou	PASS	No deviation

Note1: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013, KDB558074 D01 v05r02 and KDB594280 D01 v02r01.

Note2: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 12dB contains two parts that cable loss 2dB and Attenuator 10dB.

Note 3: Additions to, deviation, or exclusions from the method should be judged in the "method determination" column of add, deviate or exclude from the specific method should be explained in the "Remark" of the above table.

1.6. 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.

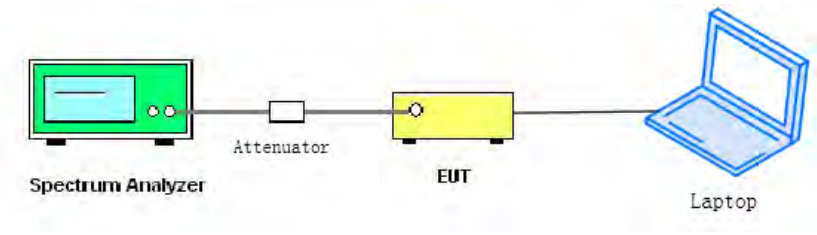
2.2. Duty Cycle Of Test Signal

2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).
When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this subclause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be nonconstant.

2.2.2. Test Description

A. Test Set:



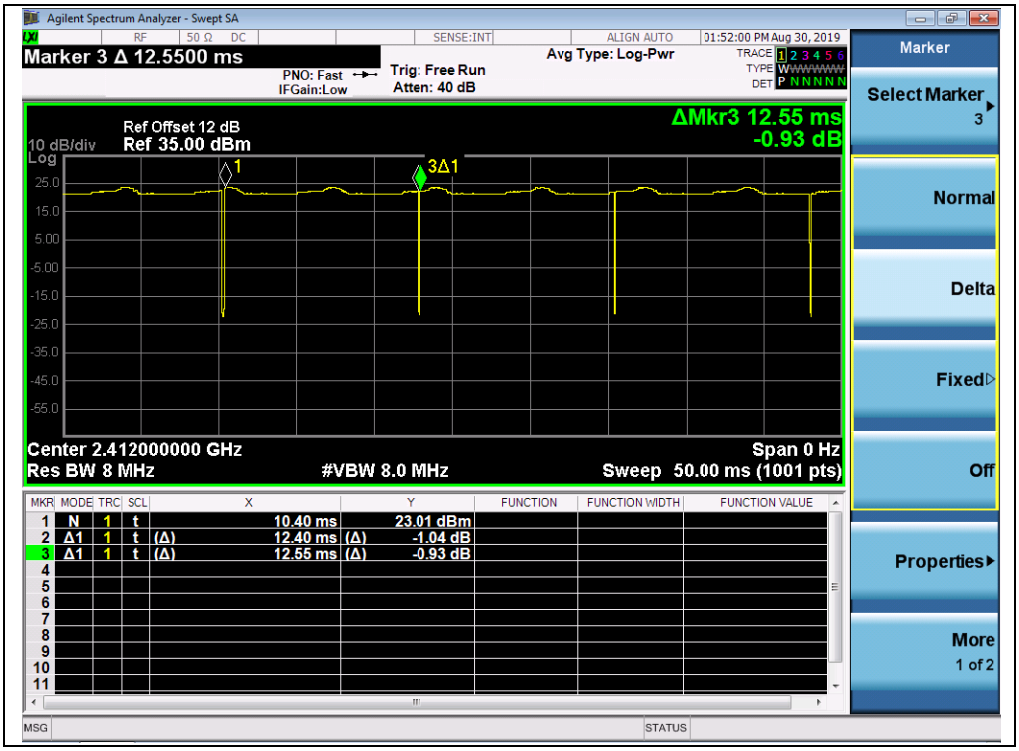
ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.

2.2.3. Test Result

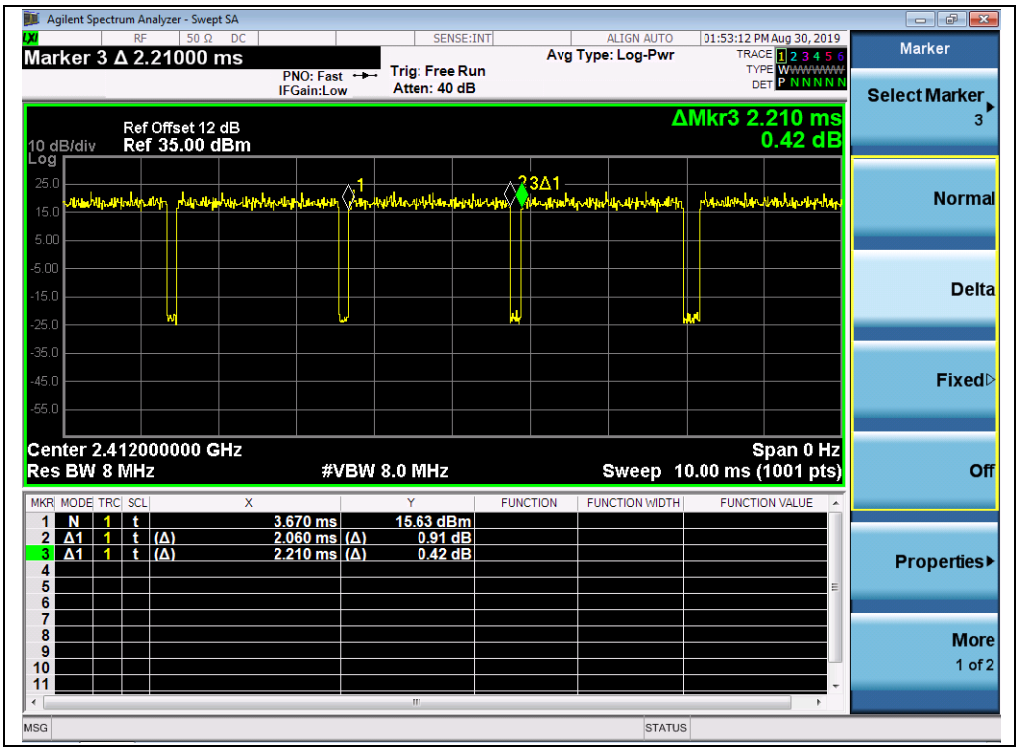
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
802.11b	98.80	0.05
802.11g	93.21	0.31
802.11n(HT20)	91.43	0.39
802.11n(HT40)	90.87	0.42

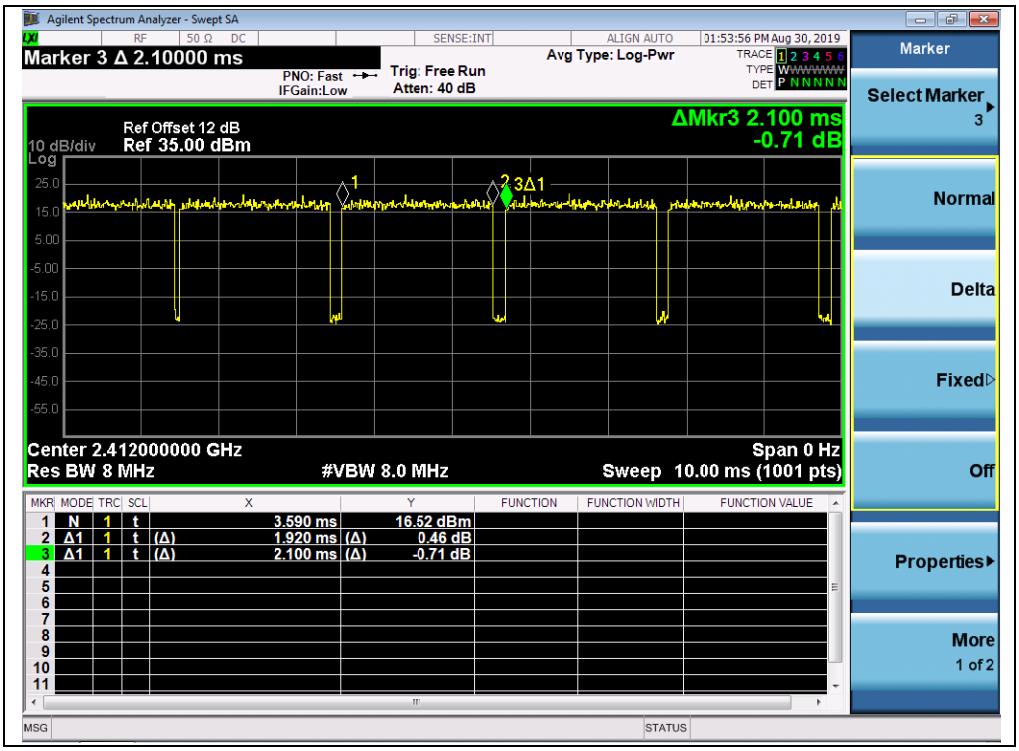
B. Test Plots



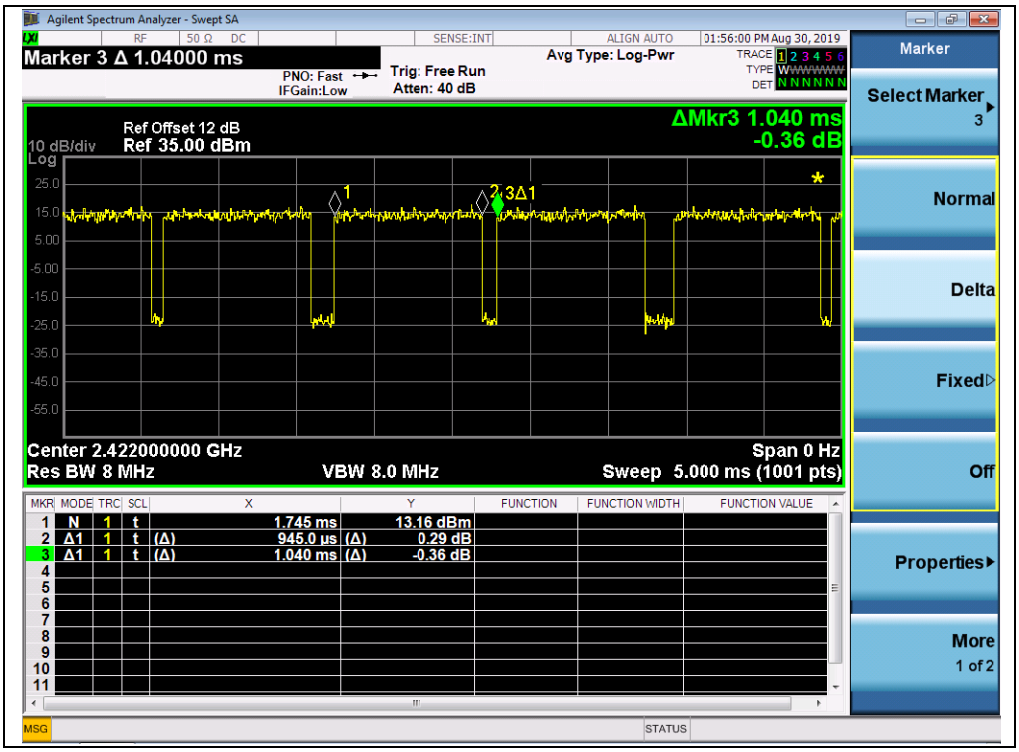
(Channel 1, 2412MHz, 802.11b)



(Channel 1, 2412MHz, 802.11g)



(Channel 1, 2412MHz, 802.11 n(HT20))



(Channel 3, 2422MHz, 802.11 n(HT40))

2.3. Maximum Peak and Average Conducted Output Power

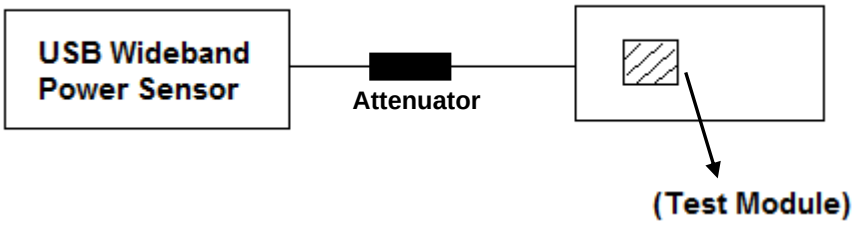
2.3.1. Requirement

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.

2.3.2. 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.

2.3.3. Test Result

Maximum Peak Conducted Output Power

802.11b Test Mode

Channel	Frequency (MHz)	Measured Peak Power				Limit (dBm)		Verdict
		ANT A		ANT B				
		dBm	W	dBm	W	dBm	W	
1	2412	**20.43**	**0.110**	**17.61**	**0.058**	30	1	PASS
7	2442	20.34	0.108	17.25	0.053			PASS
13	2472	20.07	0.102	17.18	0.052			PASS

802.11g Test mode

Channel	Frequency (MHz)	Measured Peak Power				Limit (dBm)		Verdict
		ANT A		ANT B				
		dBm	W	dBm	W	dBm	W	
1	2412	21.74	0.149	18.76	0.075	30	1	PASS
7	2442	21.05	0.127	18.90	0.078			PASS
13	2472	**21.69**	**0.148**	**19.26**	**0.084**			PASS

802.11n (HT20) Test mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (W)	Total Power (dBm)	Limit		Verdict
		ANT A	ANT B			dBm	W	
1	2412	21.76	18.75	0.225	23.52	30	1	PASS
7	2442	21.89	18.93	0.233	23.67			PASS
13	2472	21.53	19.78	**0.237**	**23.75**			PASS
Note: Directional gain = 2.2dBi +10log(2) = 5.21dBi＜6dBi, so the power limit is 1W(30dBm).								

802.11n (HT40) Test mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (W)	Total Power (dBm)	Limit		Verdict
		ANT A	ANT B			dBm	W	
3	2422	21.05	17.84	**0.188**	**22.75**	30	1	PASS
7	2442	20.58	18.16	0.180	22.55			PASS
11	2462	20.49	17.79	0.172	22.36			PASS
Note: Directional gain = 2.2dBi +10log(2) = 5.21dBi＜6dBi, so the power limit is 1W(30dBm).								

Maximum Average Conducted Output Power

802.11b Test Mode

Frequency (MHz)	Average Power							Limit		Verdict
	Measured		Duty Factor	Duty factor Calculated						
	ANT A	ANT B		ANT A		ANT B				
	dBm	dBm		dBm	W	dBm	W	dBm	W	
2412	17.35	15.58	0.05	17.40	0.055	**15.63**	**0.037**	30	1	PASS
2442	17.95	15.09		**18.00**	**0.063**	15.14	0.033			PASS
2472	17.36	15.23		17.41	0.055	15.28	0.034			PASS

802.11g Test mode

Frequency (MHz)	Average Power							Limit		Verdict
	Measured		Duty Factor	Duty factor Calculated						
	ANT A	ANT B		ANT A		ANT B				
	dBm	dBm		dBm	W	dBm	W	dBm	W	
2412	13.27	10.13	0.31	13.58	0.023	10.44	0.011	30	1	PASS
2442	13.17	10.87		13.48	0.022	**11.18**	**0.013**			PASS
2472	13.54	10.71		**13.85**	**0.024**	11.02	0.013			PASS

802.11n (HT20) Test mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT A	ANT B						
	dBm	dBm		W	dBm	dBm	W	
2412	13.29	10.24	0.39	0.035	15.43	30	1	PASS
2442	13.70	10.95		**0.039**	**15.94**			PASS
2472	13.45	10.96		0.038	15.78			PASS
Note: Directional gain = 2.2dBi +10log(2) =5.21dBi＜6dBi, so the power limit is 1W(30dBm).								

802.11n (HT40) Test mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT A	ANT B						
	dBm	dBm		W	dBm	dBm	W	
2422	12.04	9.56	0.42	0.028	14.40	30	1	PASS
2442	12.59	9.73		**0.030**	**14.82**			PASS
2462	12.28	9.70		0.029	14.60			PASS
Note: Directional gain = 2.2dBi +10log(2) =5.21dBi＜6dBi, so the power limit is 1W(30dBm).								

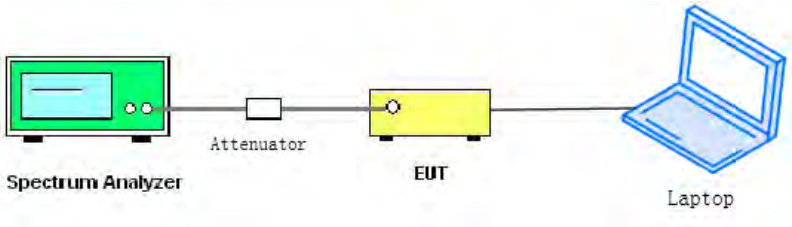
2.4. Bandwidth

2.4.1. 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.

2.4.2. 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.

2.4.3. Test procedure

KDB 558074 Section 8.2 was used in order to prove compliance.

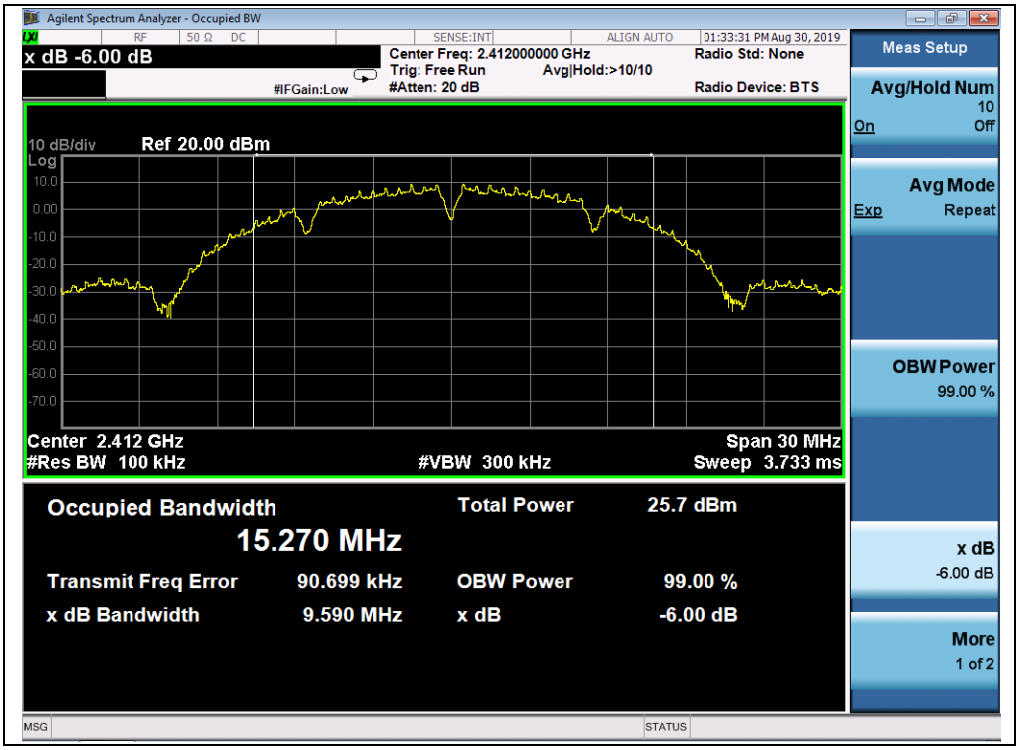
2.4.4. Test Result

802.11b Test mode

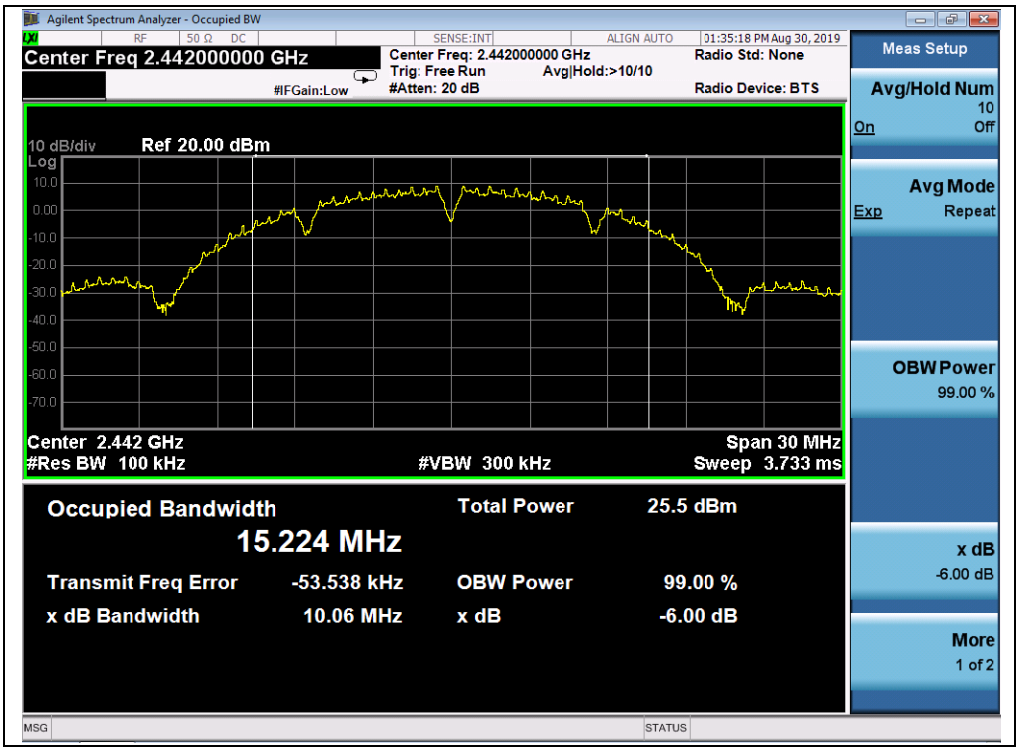
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.59	≥500	PASS
7	2442	10.06	≥500	PASS
13	2472	10.02	≥500	PASS

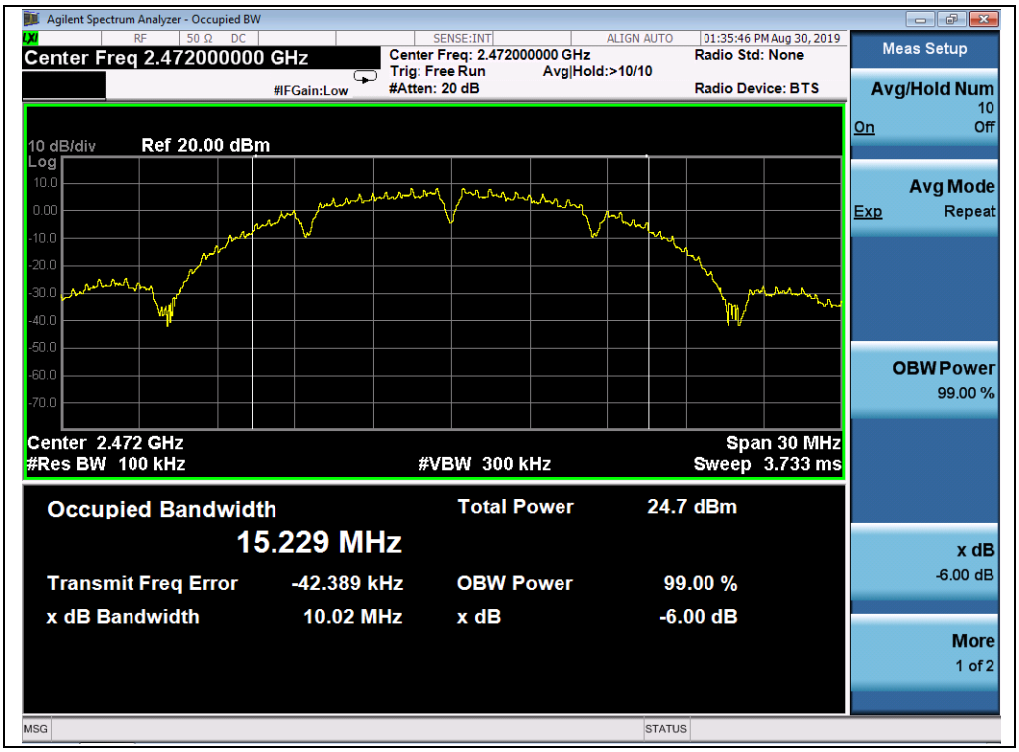
B. Test Plots



(Channel 1, 2412MHz, 802.11b)



(Channel 7, 2442 MHz, 802.11b)



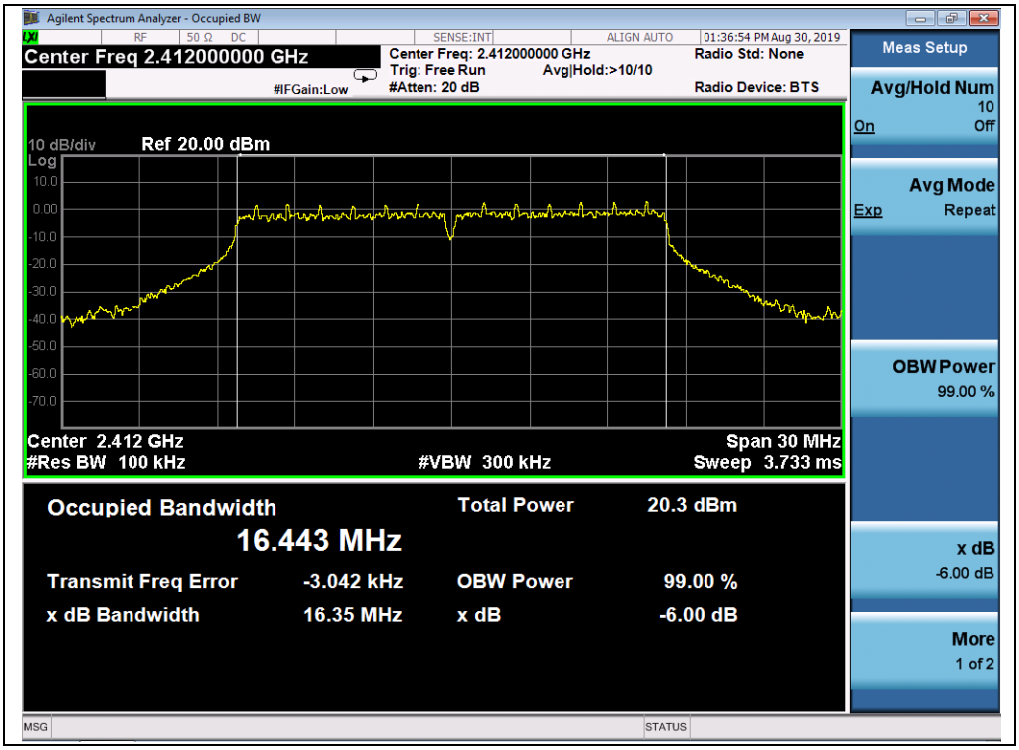
(Channel 13, 2472MHz, 802.11b)

802.11g Test mode

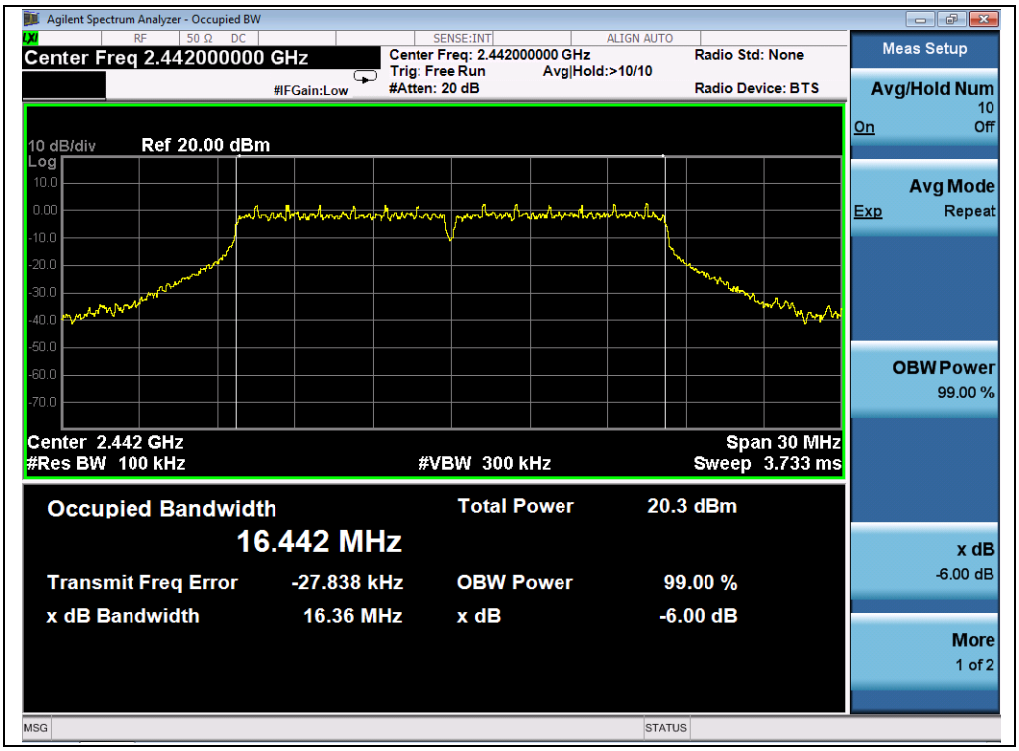
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.35	≥500	PASS
7	2442	16.36	≥500	PASS
13	2472	16.35	≥500	PASS

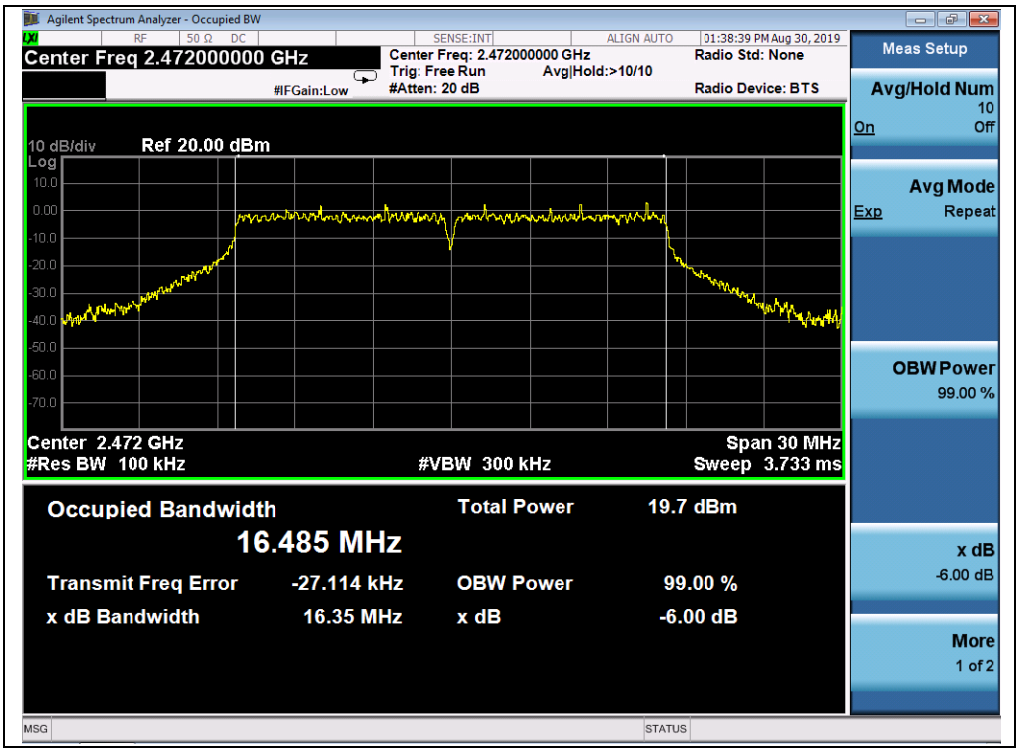
B. Test Plots:



(Channel 1, 2412MHz, 802.11g)



(Channel 7, 2442MHz, 802.11g)



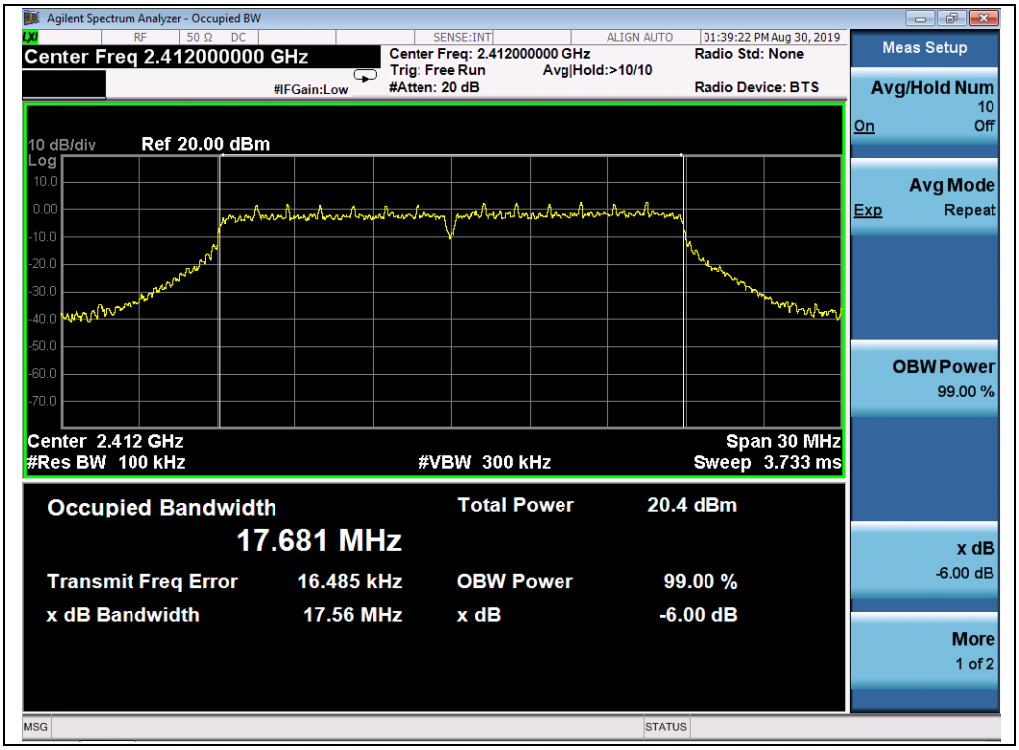
(Channel 13, 2472MHz, 802.11g)

802.11n (HT20) Test mode

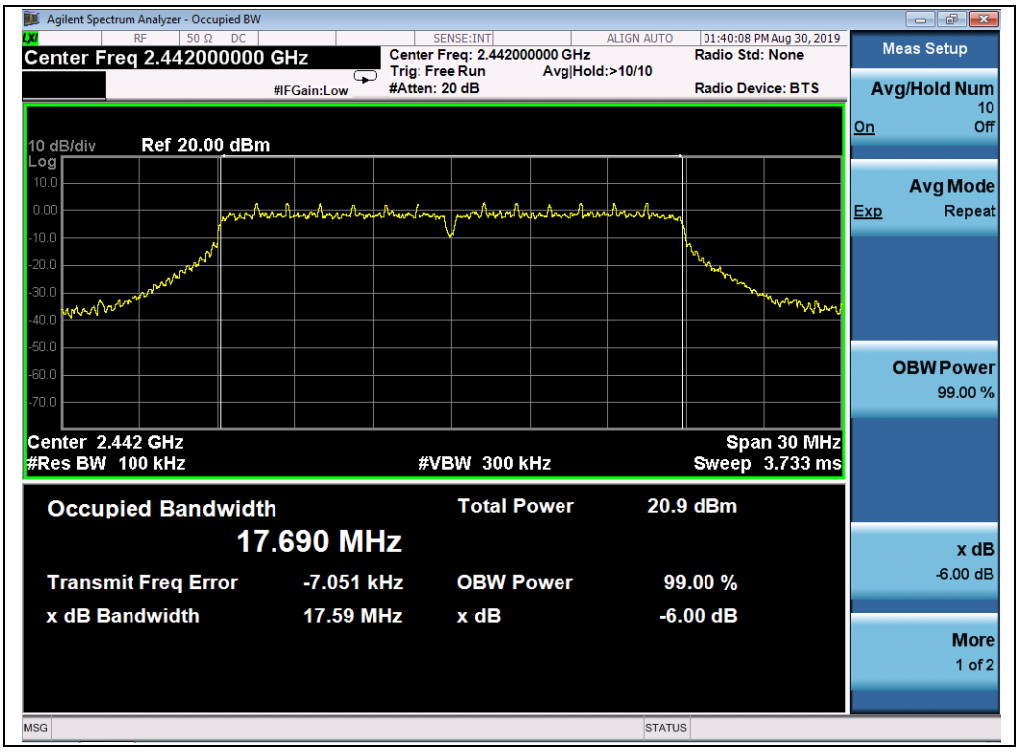
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.56	≥500	PASS
7	2442	17.59	≥500	PASS
13	2472	17.60	≥500	PASS

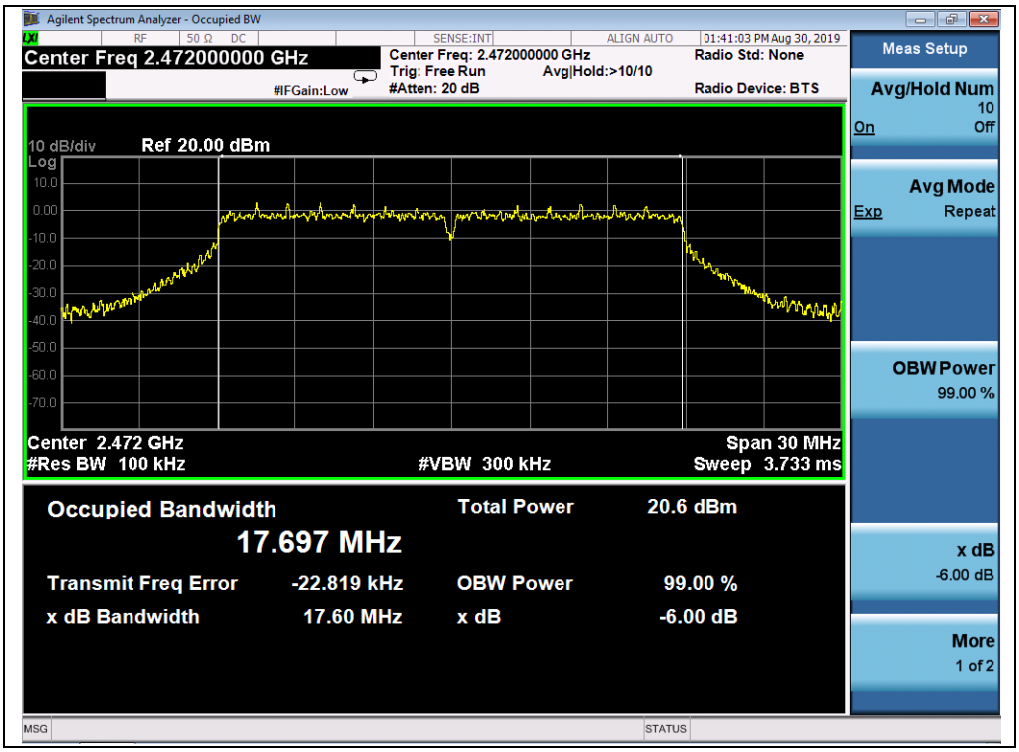
B. Test Plots:



(Channel 1, 2412MHz, 802.11n(HT20))



(Channel 7, 2442MHz, 802.11n(HT20))



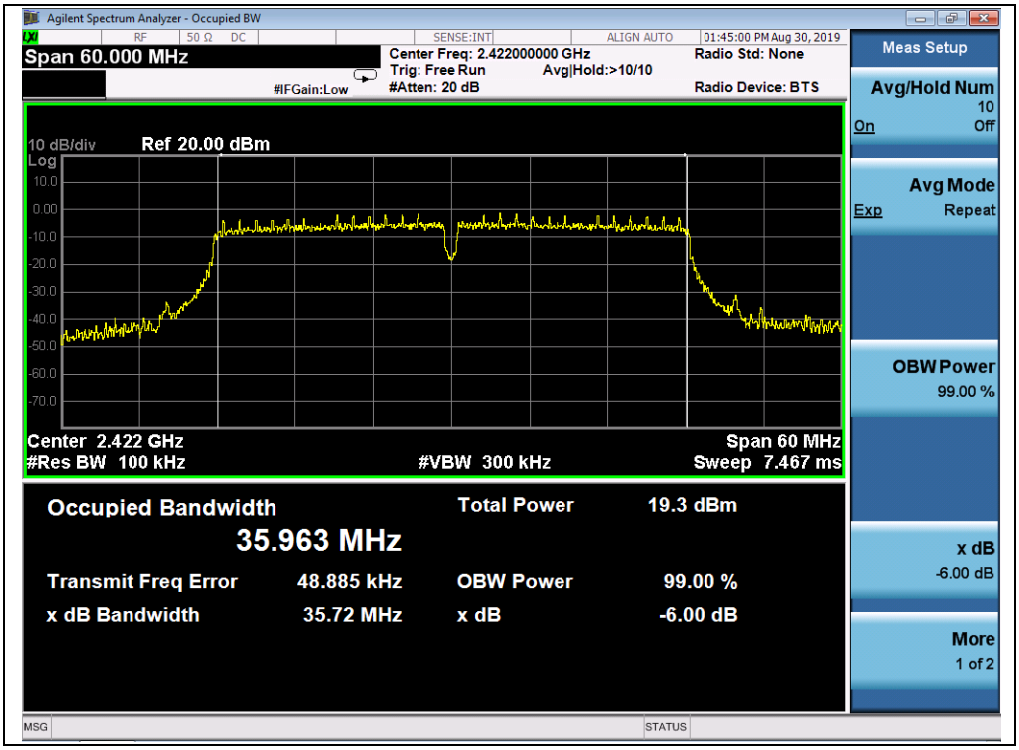
(Channel 13, 2472MHz, 802.11n(HT20))

802.11n (HT40) Test mode

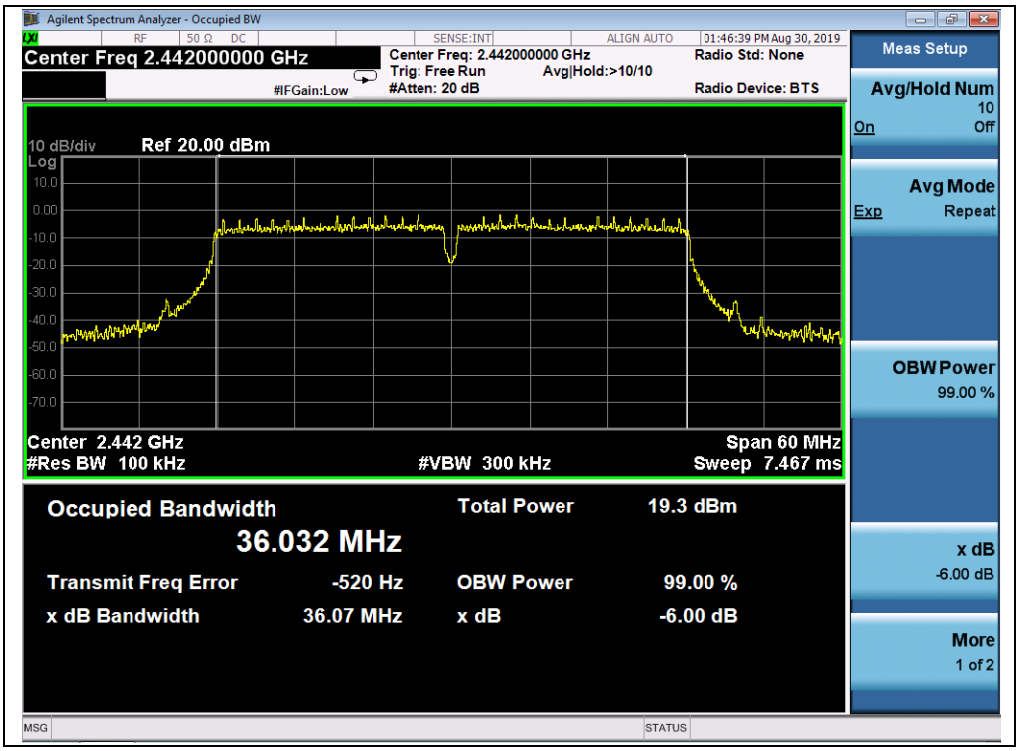
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	35.72	≥500	PASS
7	2442	36.07	≥500	PASS
11	2462	35.88	≥500	PASS

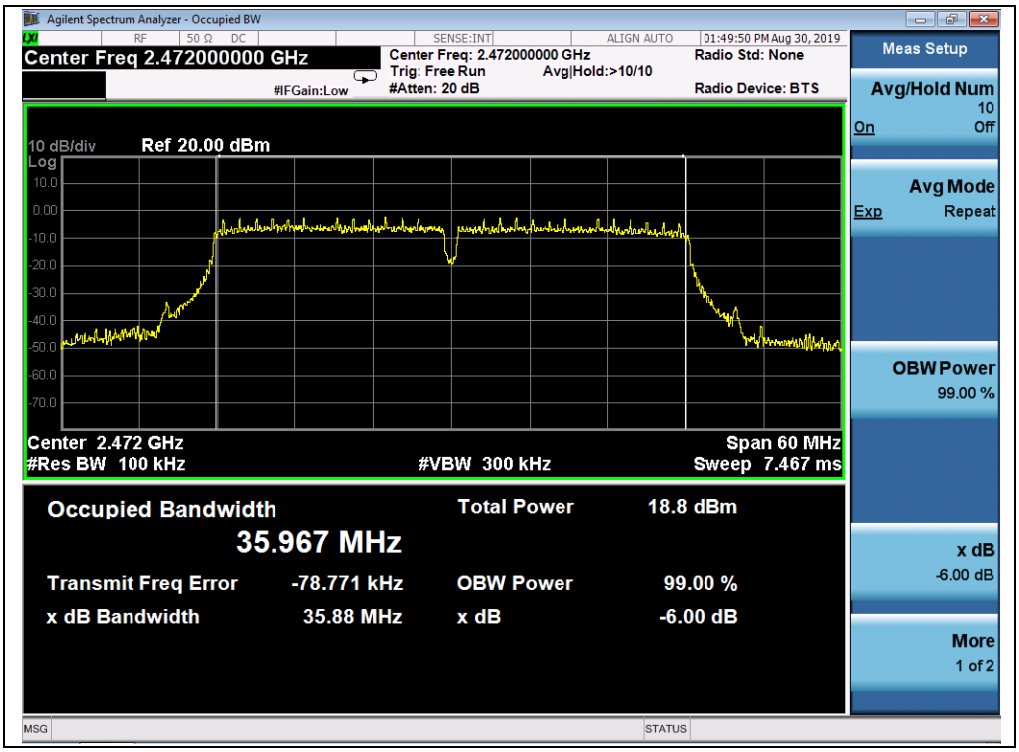
B. Test Plots:



(Channel 3, 2422Mz, 802.11n(HT40))



(Channel 7, 2442MHz, 802.11n(HT40))



(Channel 11, 2462MHz, 802.11n (HT40))

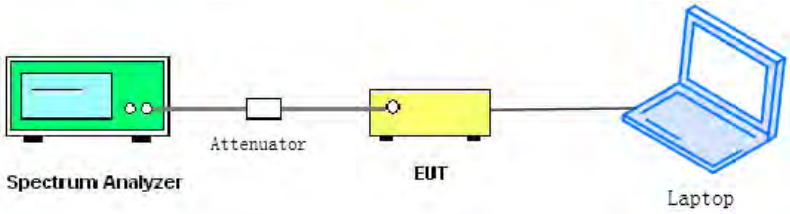
2.5. Conducted Spurious Emissions and Band Edge

2.5.1. 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.

2.5.2. Test Description

A. Test Set:



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

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.

2.5.3. Test procedure

KDB 558074 Section 8.5 and 8.7 was used in order to prove compliance.

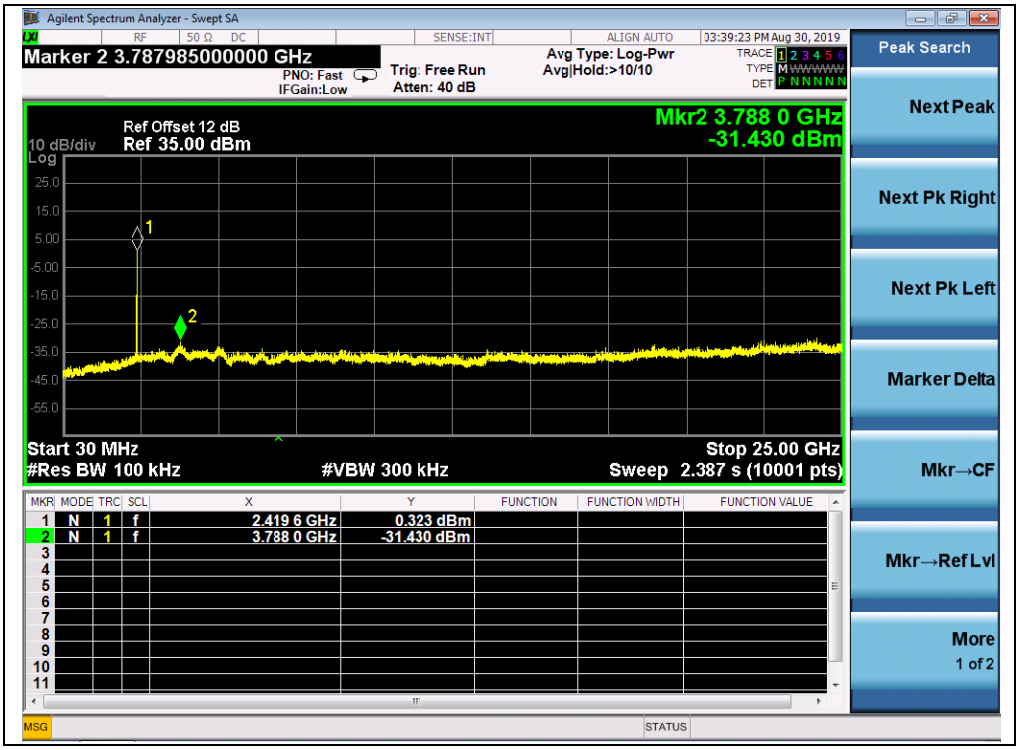
2.5.4. Test Result

802.11b Test mode

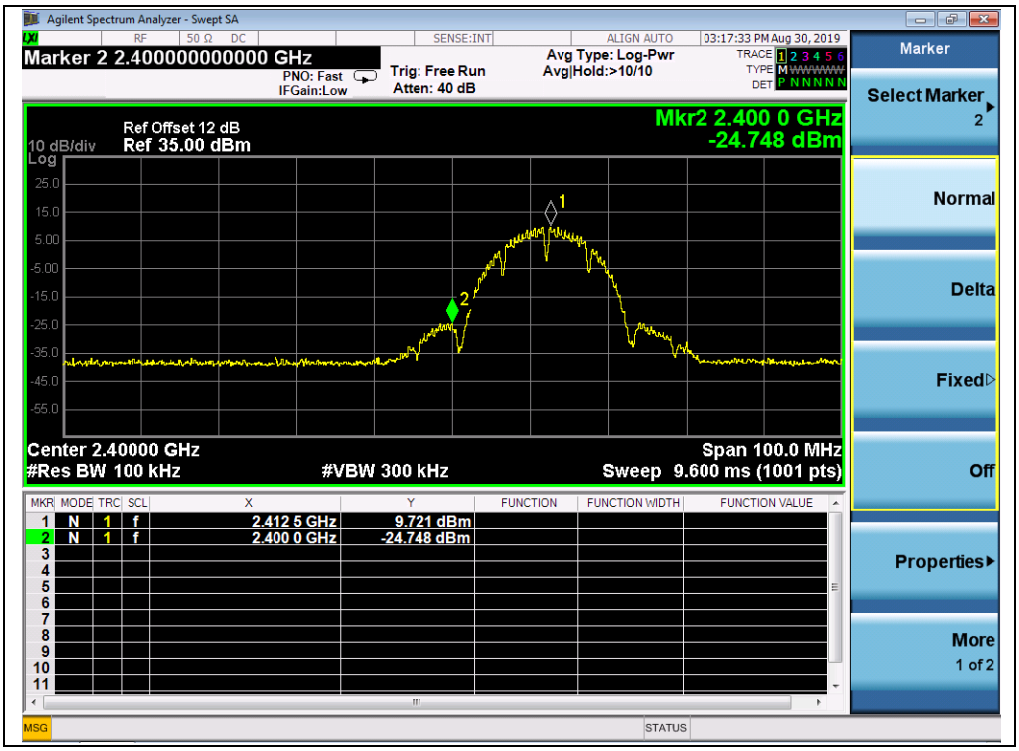
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-31.43	0.32	-19.68	PASS
7	2442	-31.70	9.41	-10.59	PASS
13	2472	-32.46	8.89	-11.11	PASS

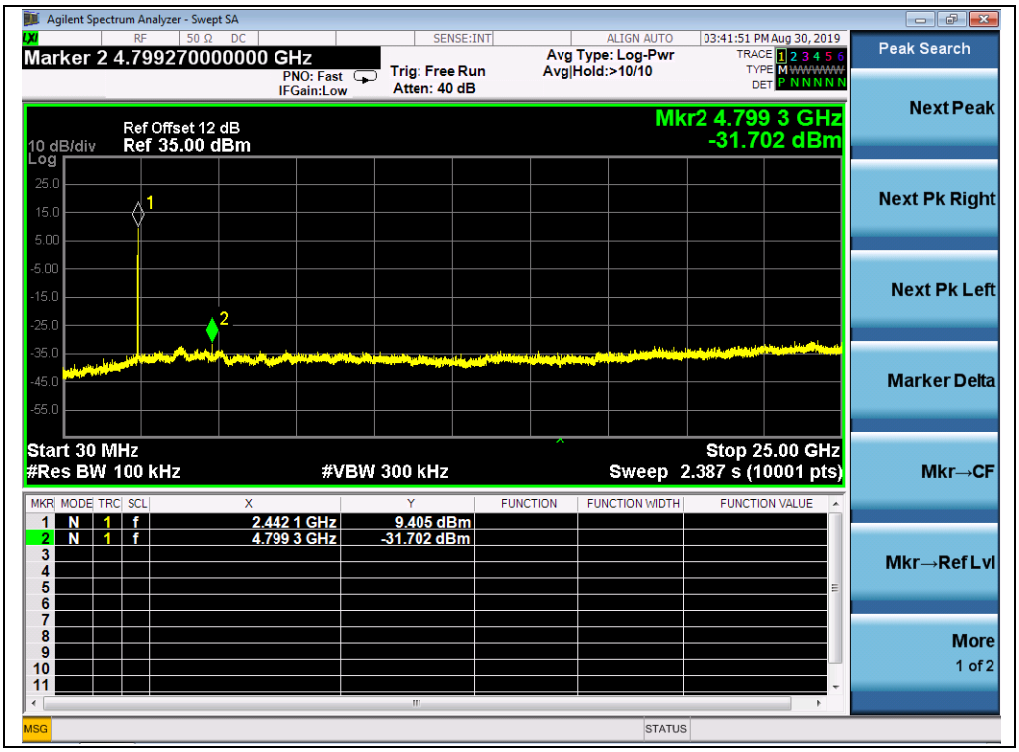
B. Test Plots:



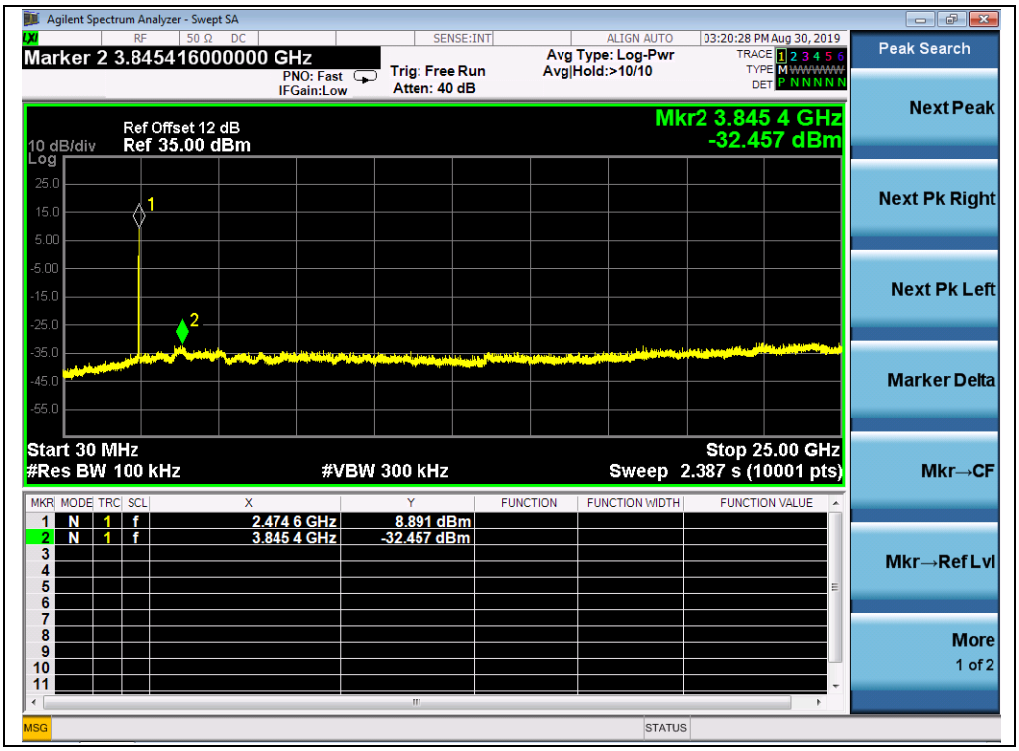
(Channel = 1, 30MHz to 25GHz)



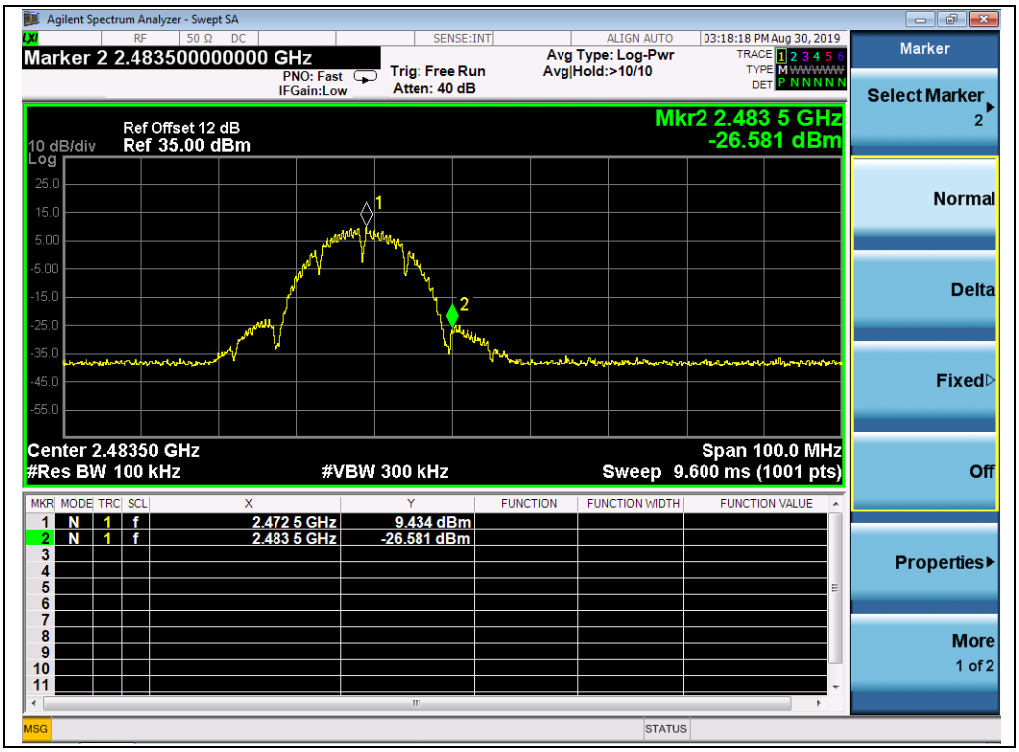
(Band Edge, Channel = 1)



(Channel = 7, 30MHz to 25GHz)



(Channel = 13, 30MHz to 25GHz)



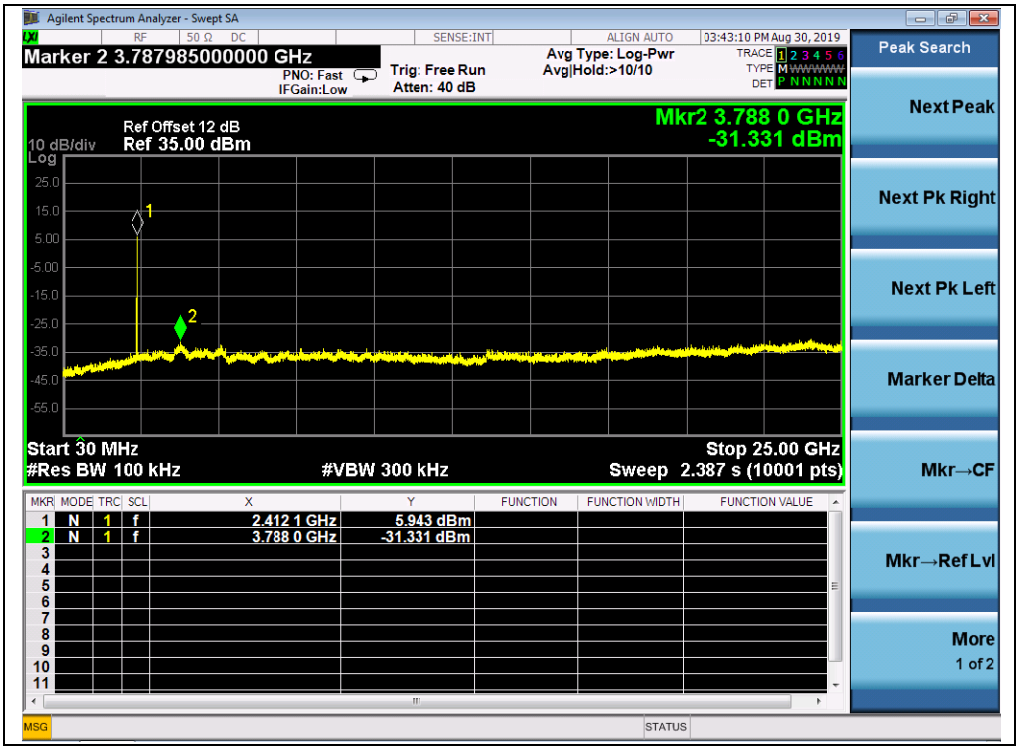
(Band Edge, Channel = 13)

802.11g Test mode

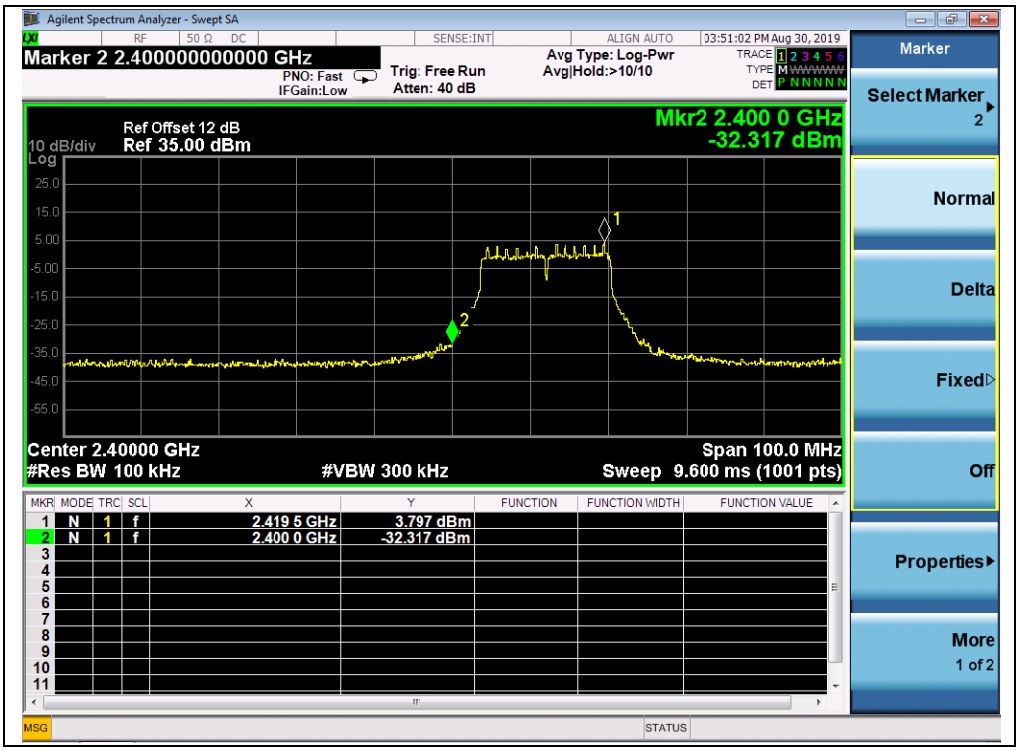
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-31.33	5.94	-14.06	PASS
7	2442	-31.25	3.79	-16.21	PASS
13	2472	-31.78	-0.62	-20.62	PASS

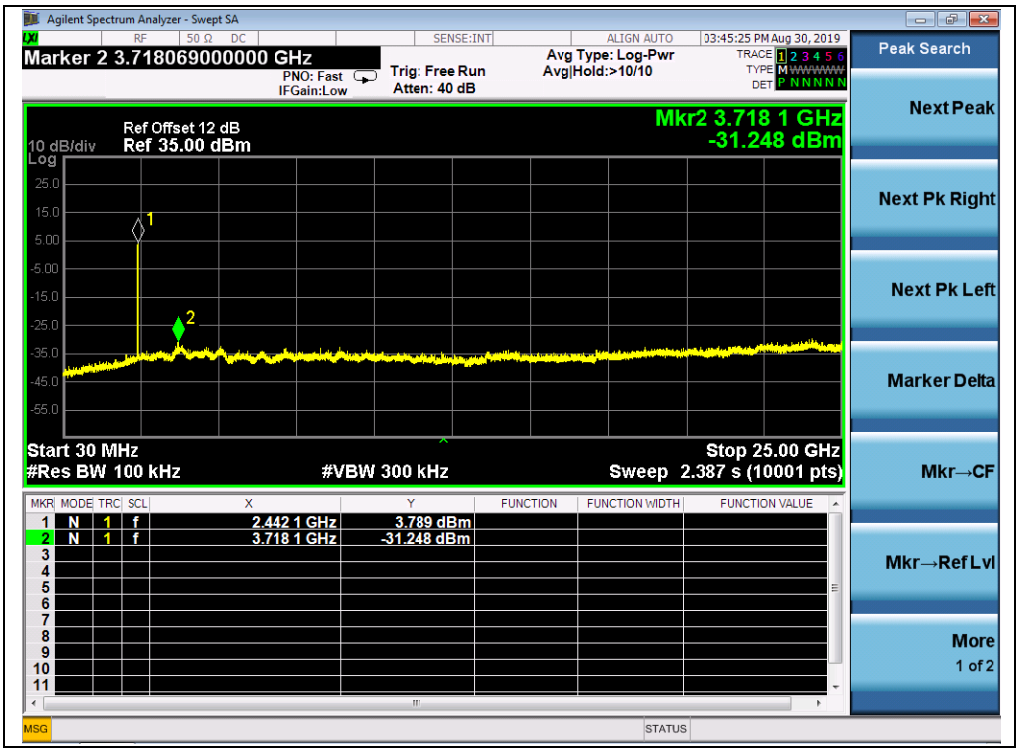
B. Test Plots:



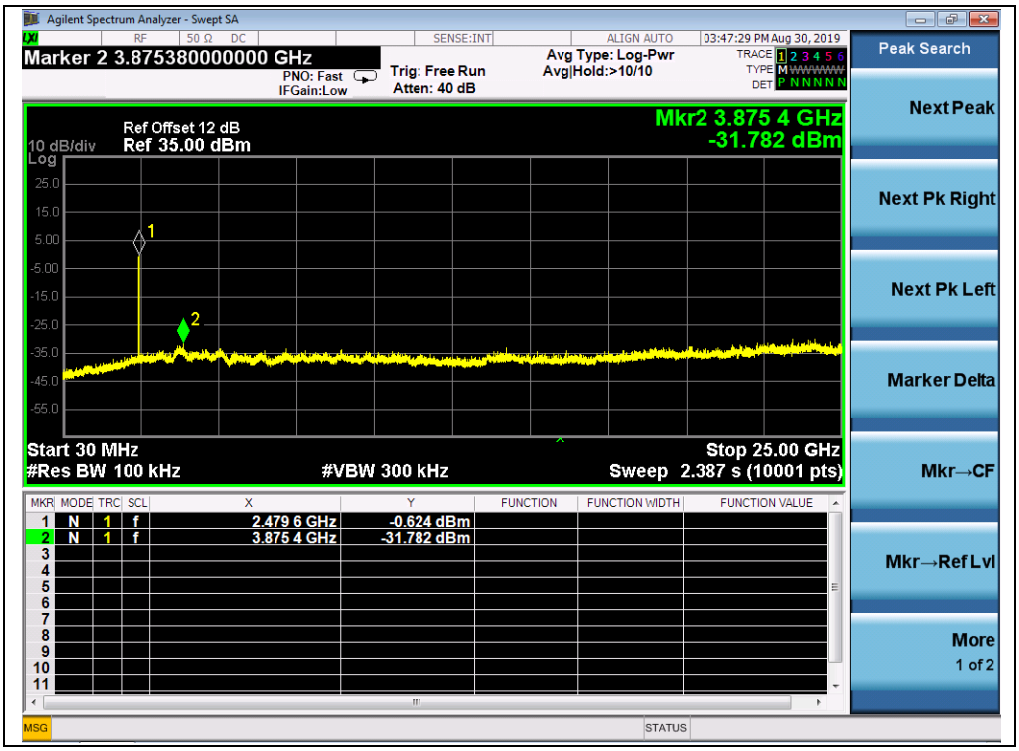
(Channel = 1, 30MHz to 25GHz)



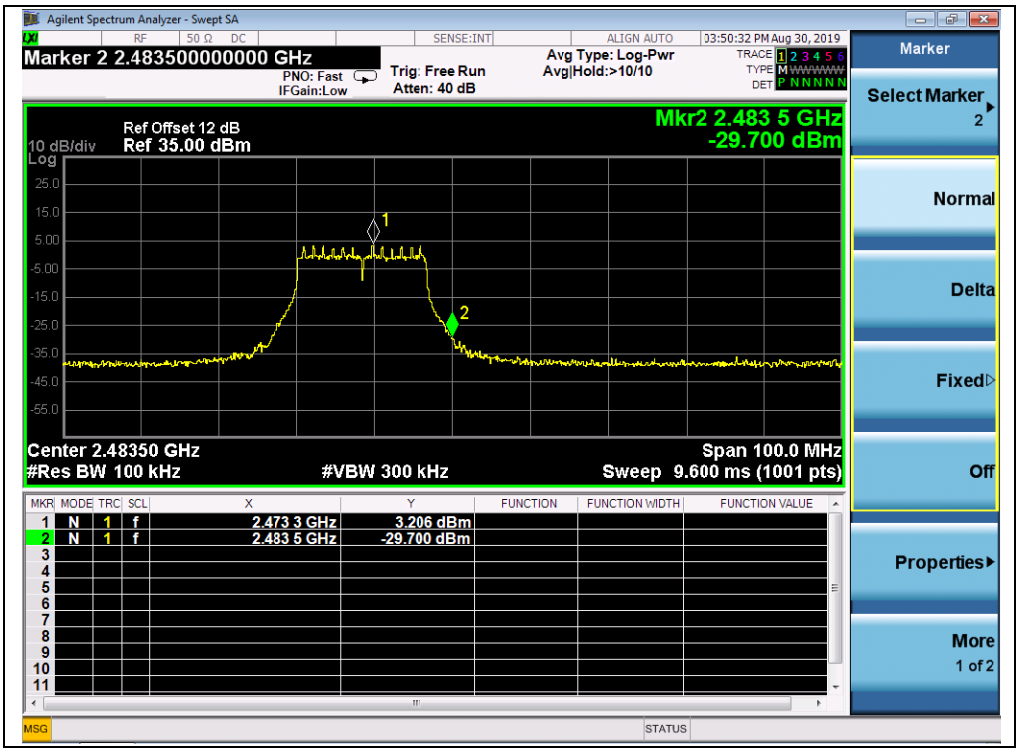
(Band Edge, Channel = 1)



(Channel = 7, 30MHz to 25GHz)



(Channel = 13, 30MHz to 25GHz)



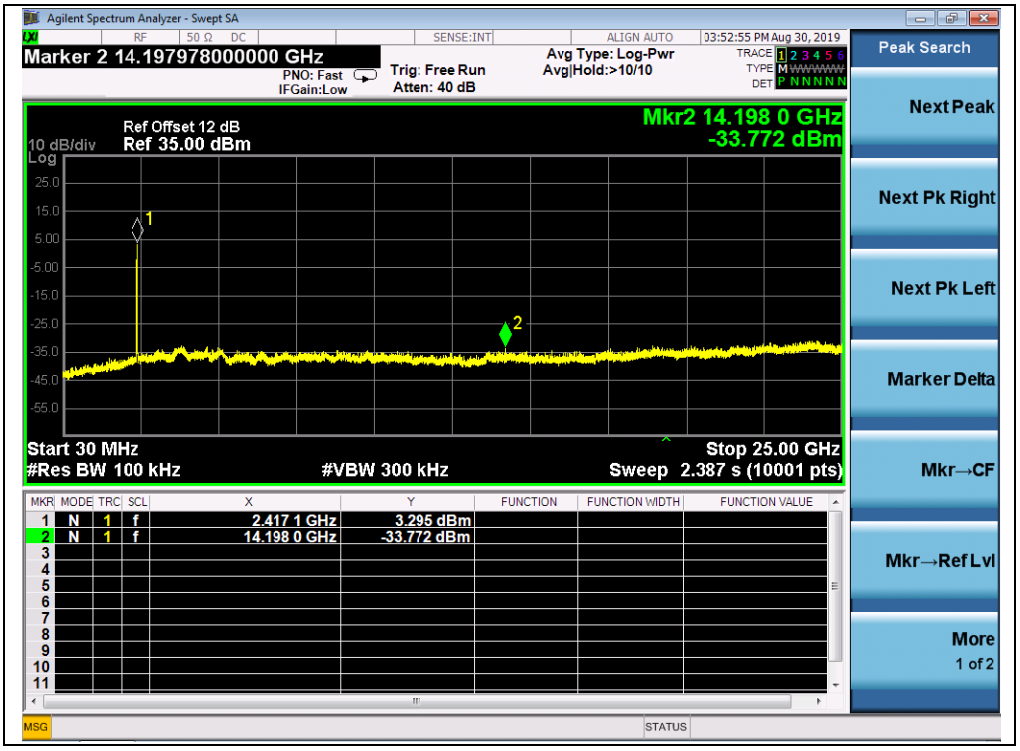
(Band Edge, Channel = 13)

802.11n (HT20) Test mode

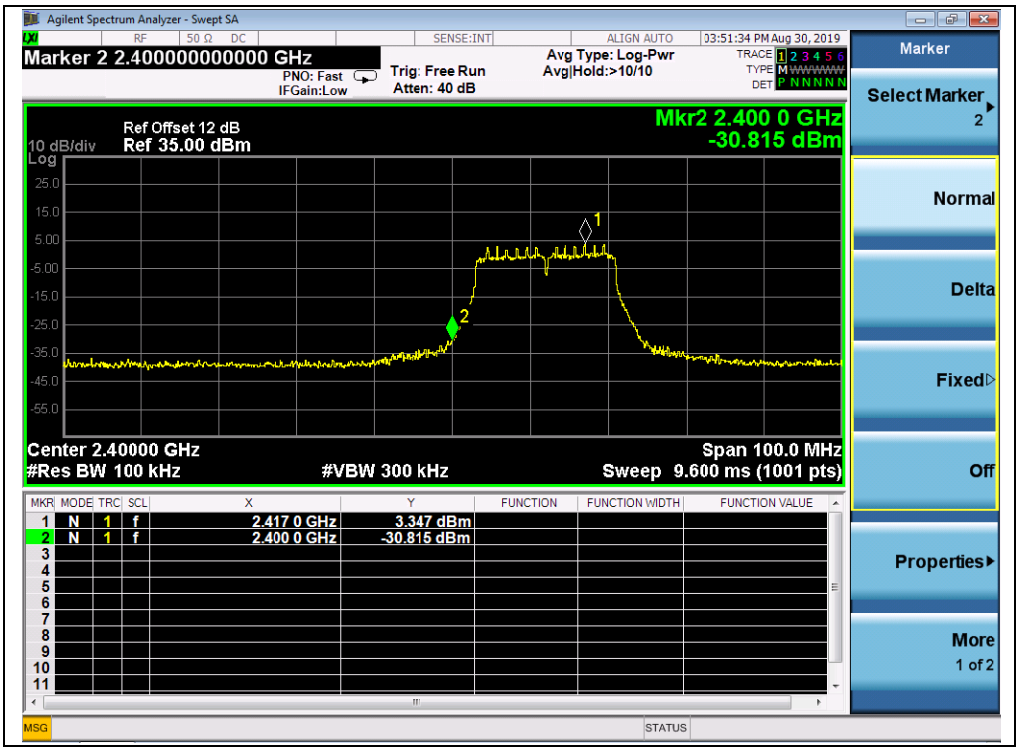
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-33.77	3.30	-16.70	PASS
7	2442	-31.49	2.26	-17.74	PASS
13	2472	-32.13	1.93	-18.07	PASS

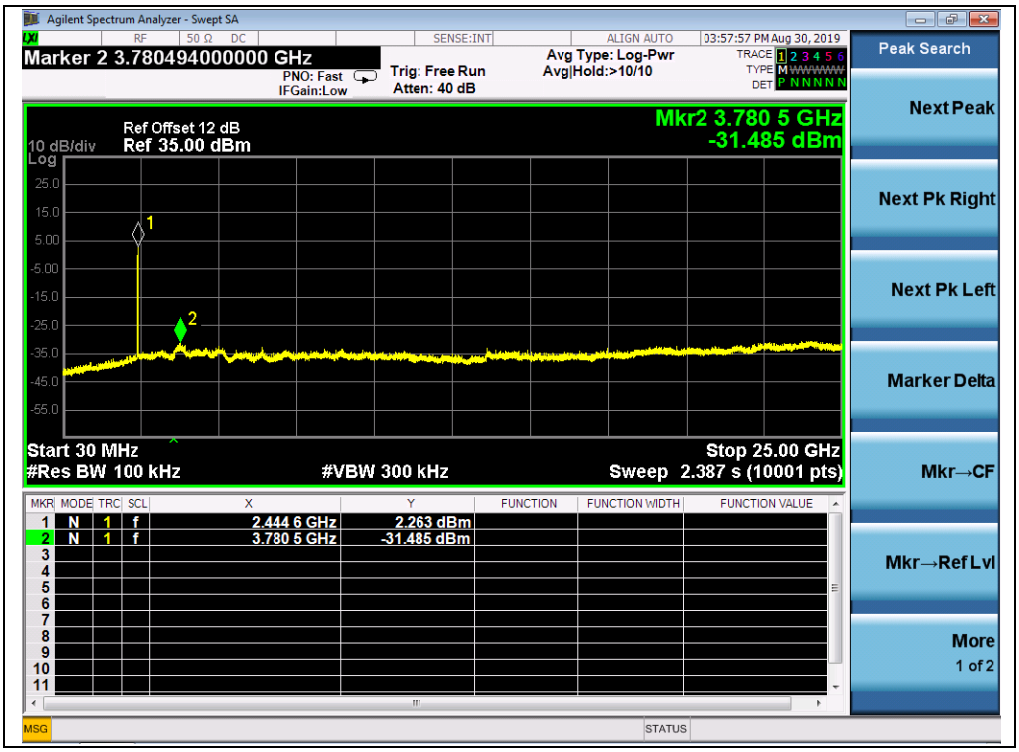
B. Test Plots:



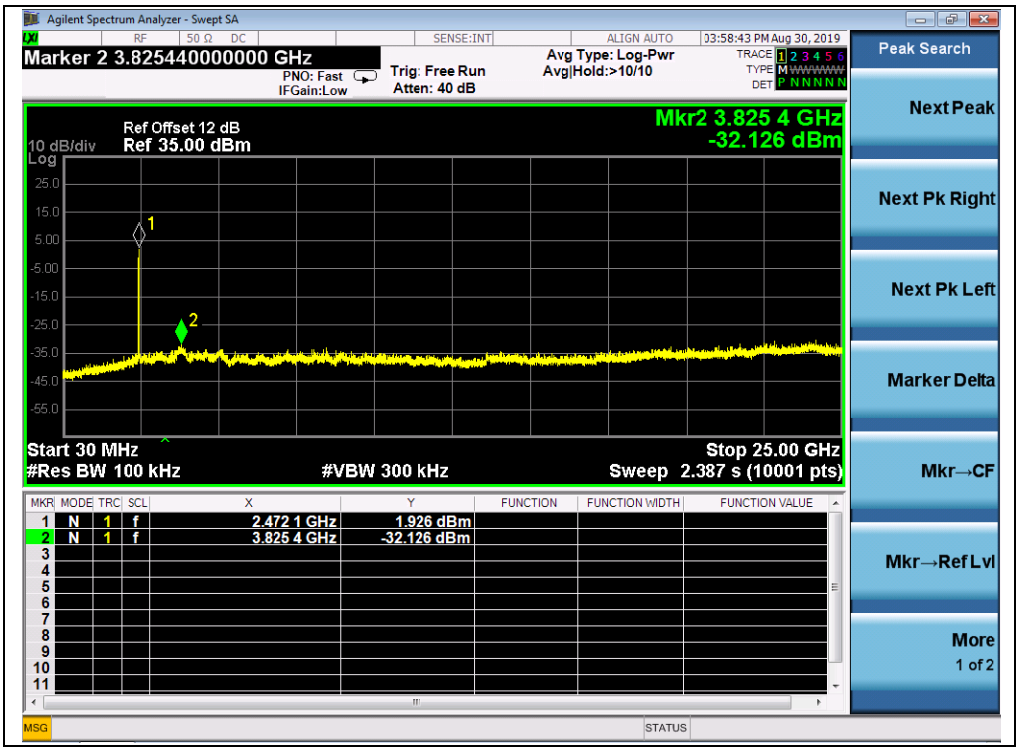
(Channel = 1, 30MHz to 25GHz)



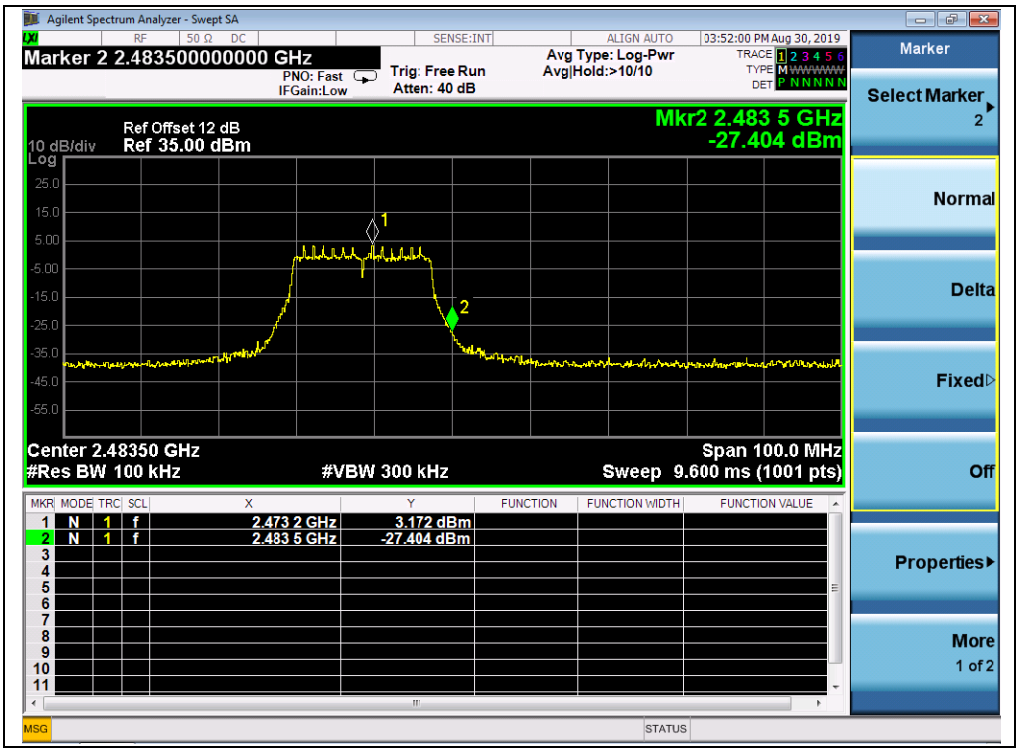
(Band Edge, Channel = 1)



(Channel = 7, 30MHz to 25GHz)



(Channel = 13, 30MHz to 25GHz)



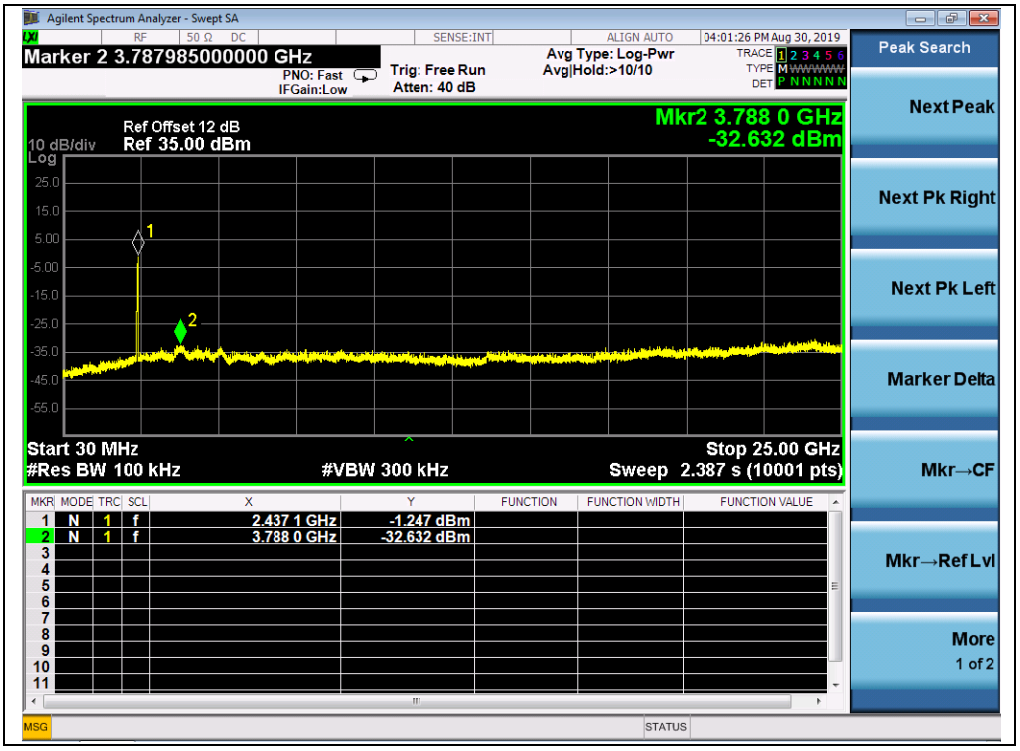
(Band Edge, Channel = 13)

802.11n (HT40) Test mode

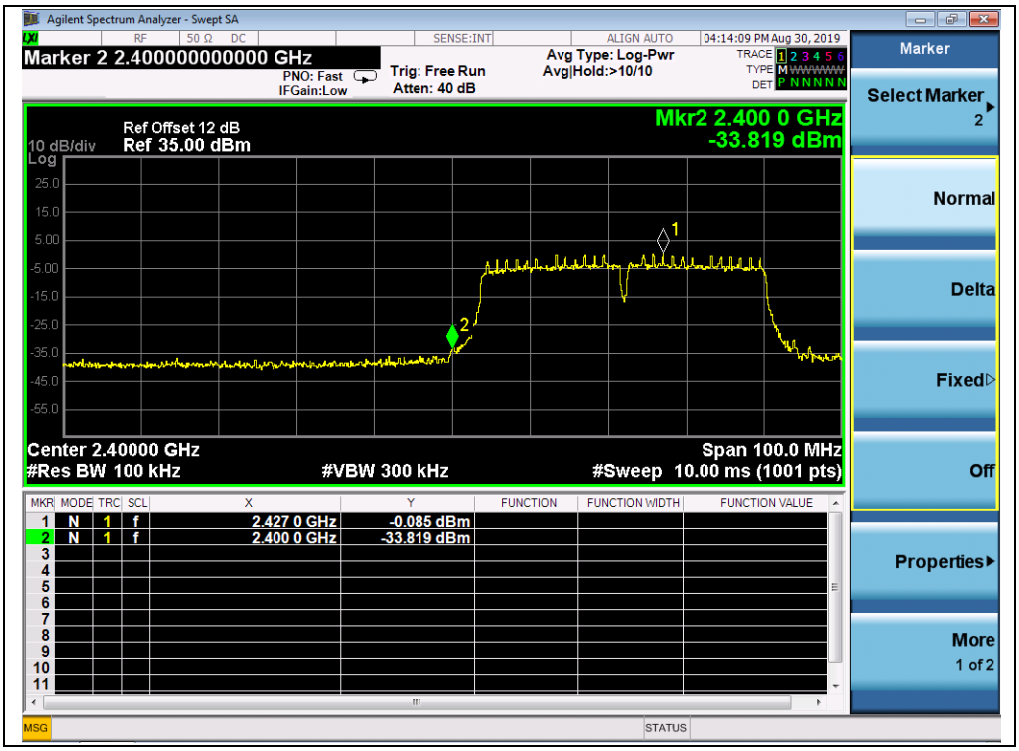
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-32.63	-1.25	-21.25	PASS
7	2442	-32.44	-0.49	-20.49	PASS
11	2462	-31.96	0.09	-19.91	PASS

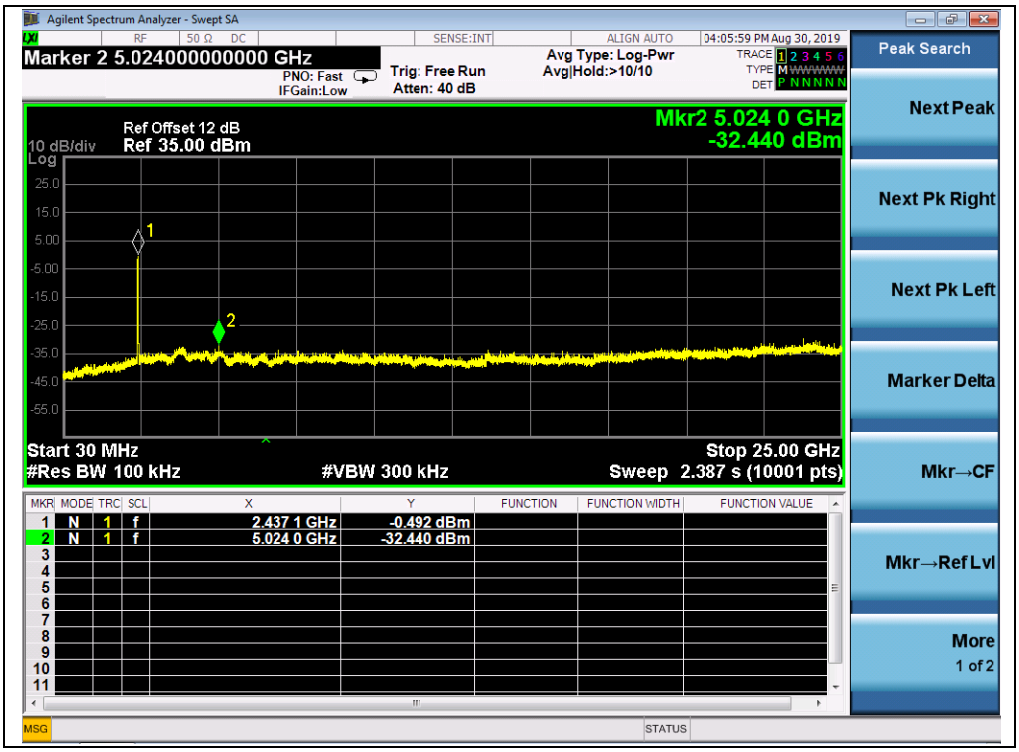
B. Test Plots:



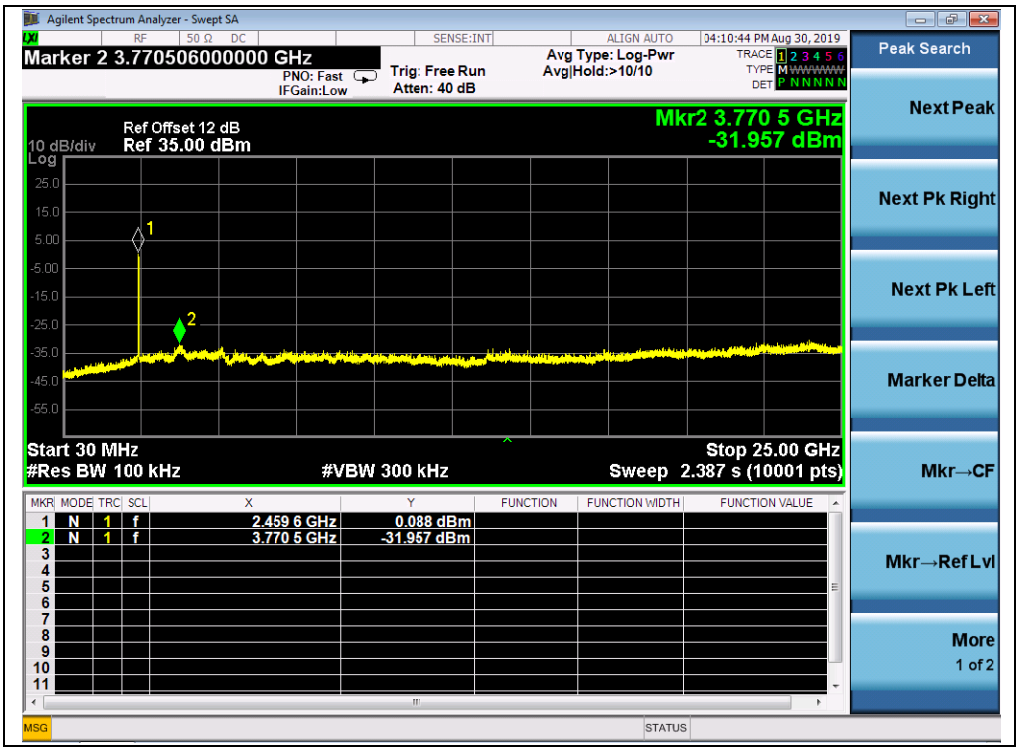
(Channel = 3, 30MHz to 25GHz)



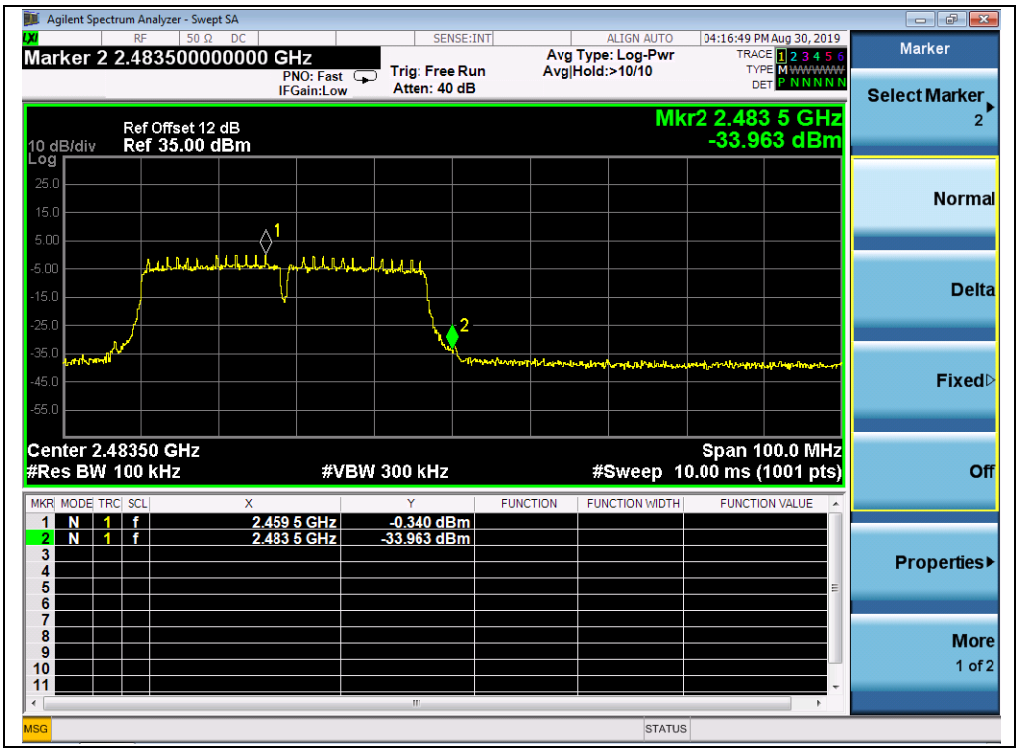
(Band Edge, Channel = 3)



(Channel = 7, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

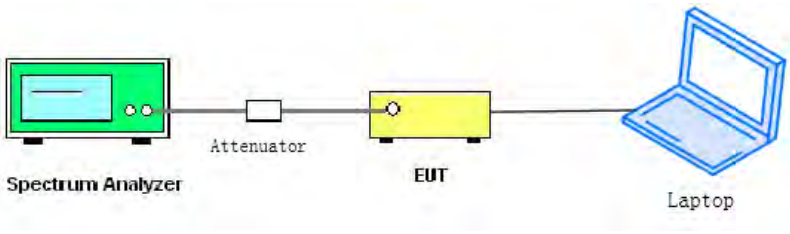
2.6. Power spectral density (PSD)

2.6.1. 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.

2.6.2. 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.

2.6.3. Test procedure

KDB 558074 Section 8.4 was used in order to prove compliance.

2.6.4. Test Result

802.11b Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Limit (dBm/3kHz)	Verdict
		ANT A	ANT B		
1	2412	3.55	-2.50	8	PASS
7	2442	2.29	1.12	8	PASS
13	2472	3.14	-1.66	8	PASS

B. Test Plots:

(Channel = 1, 802.11b, ANT A)

(Channel = 7, 802.11b, ANT A)

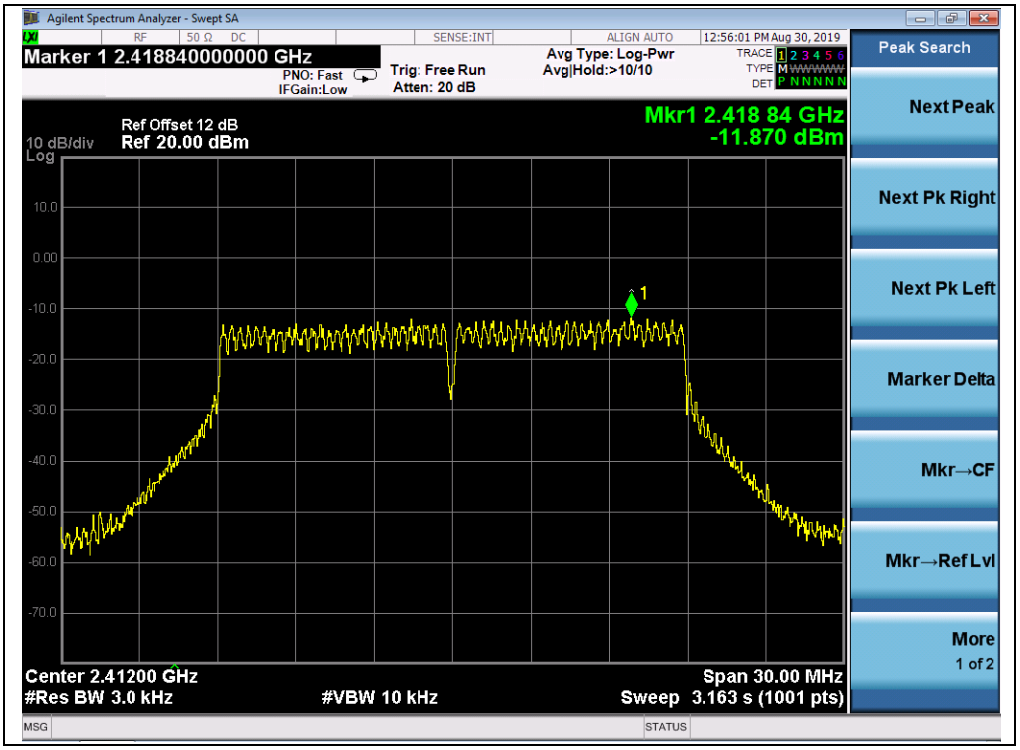
(Channel = 13, 802.11b, ANT A)

802.11g Test mode

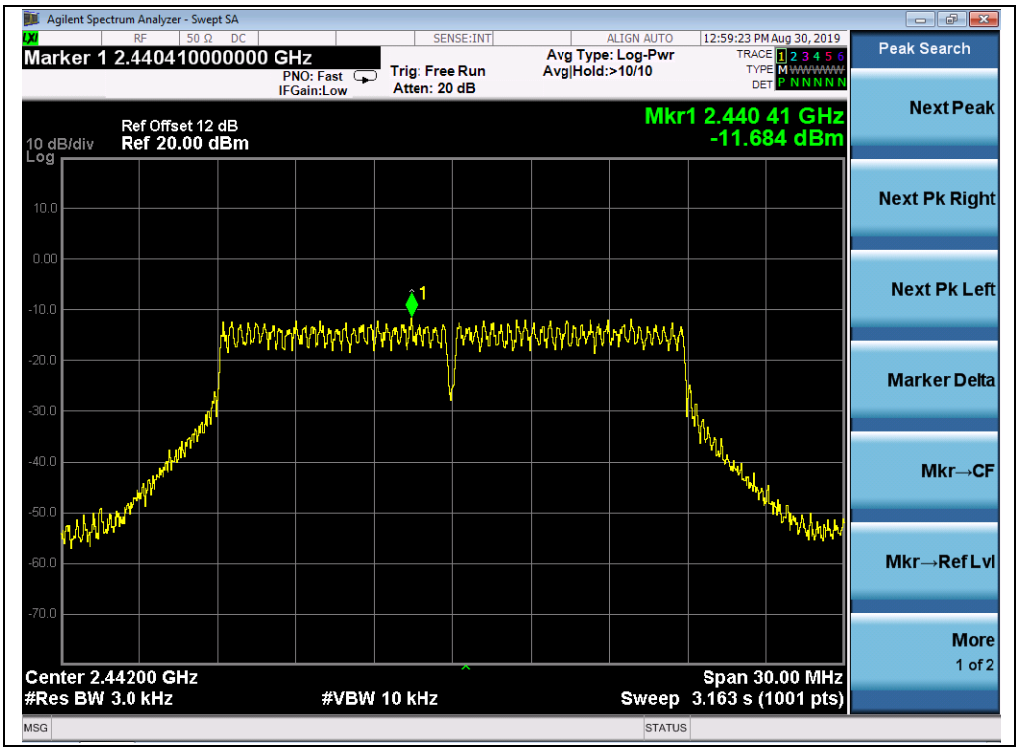
A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Limit (dBm/3kHz)	Verdict
		ANT A	ANT B		
1	2412	-11.87	-14.40	8	PASS
7	2442	-11.68	-13.26	8	PASS
13	2472	-12.68	-12.90	8	PASS

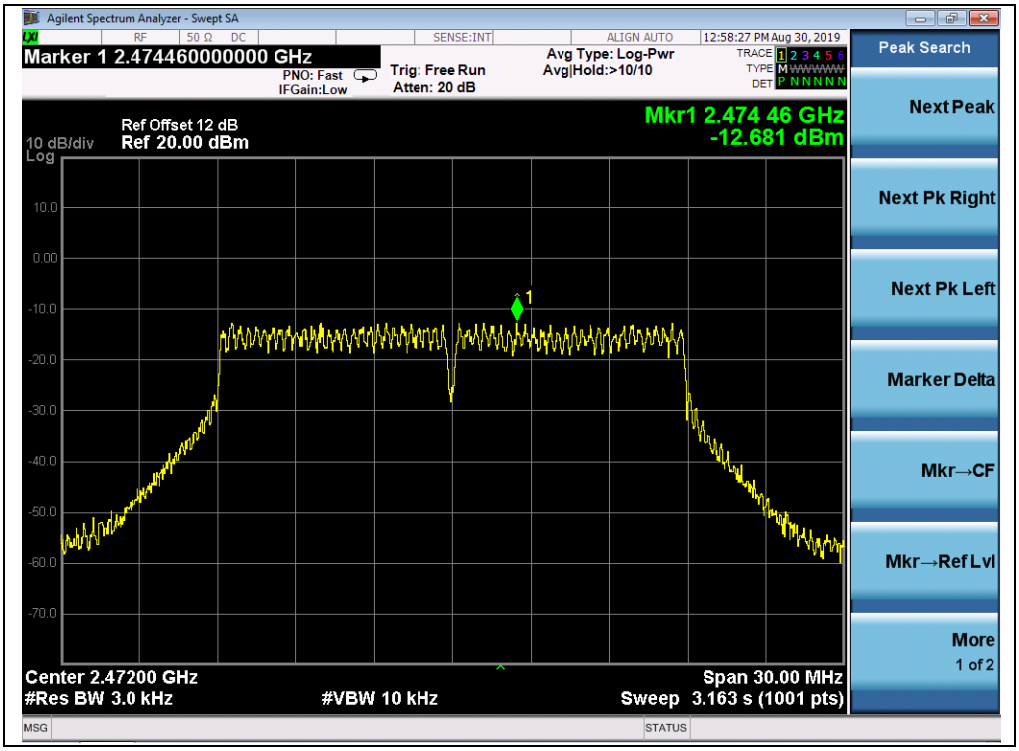
B. Test Plots:



(Channel = 1, 802.11g, ANT A)



(Channel = 7, 802.11g, ANT A)



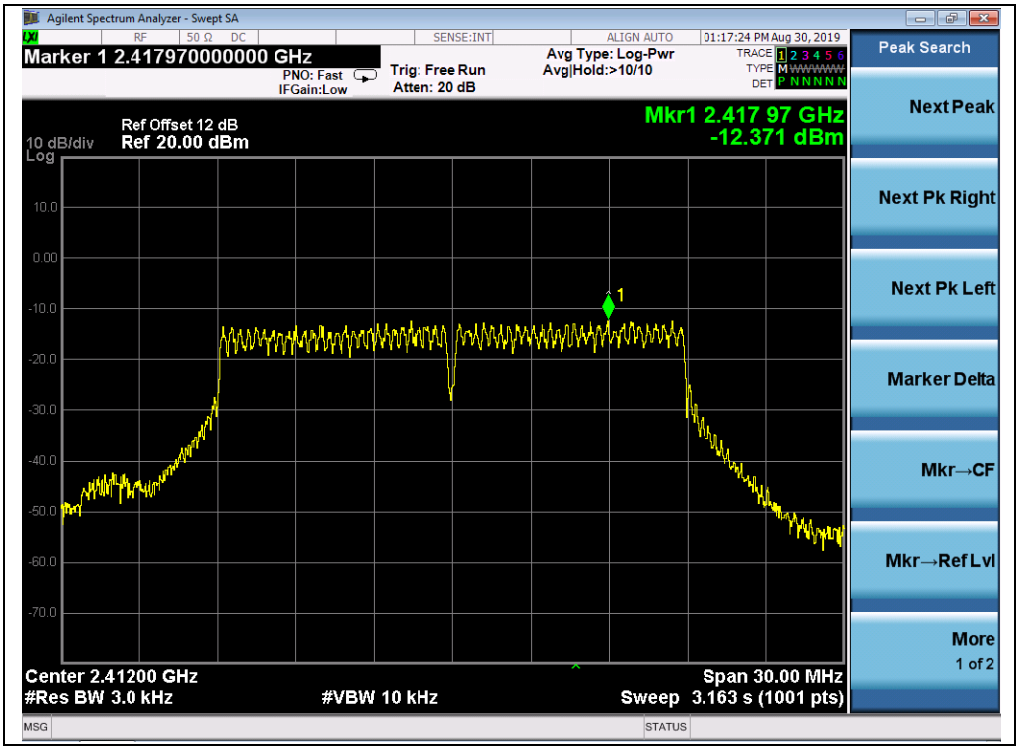
(Channel = 13, 802.11g, ANT A)

802.11n (HT20) Test mode

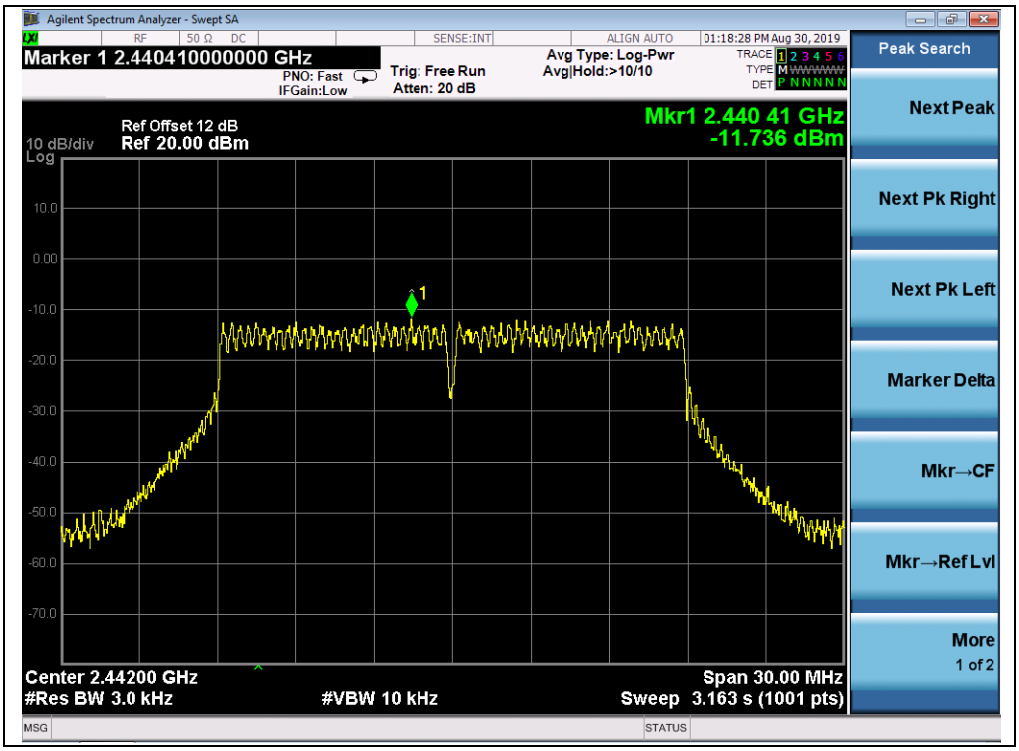
A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Limit (dBm/3kHz)	Verdict
		ANT A	ANT B		
1	2412	-12.37	-13.95	8	PASS
7	2442	-11.74	-14.11	8	PASS
13	2472	-12.52	-14.01	8	PASS
Note: Directional gain = 2.2dBi +10log(2) = 5.21dBi＜6dBi, so the power limit is 8 dBm/3kHz.					

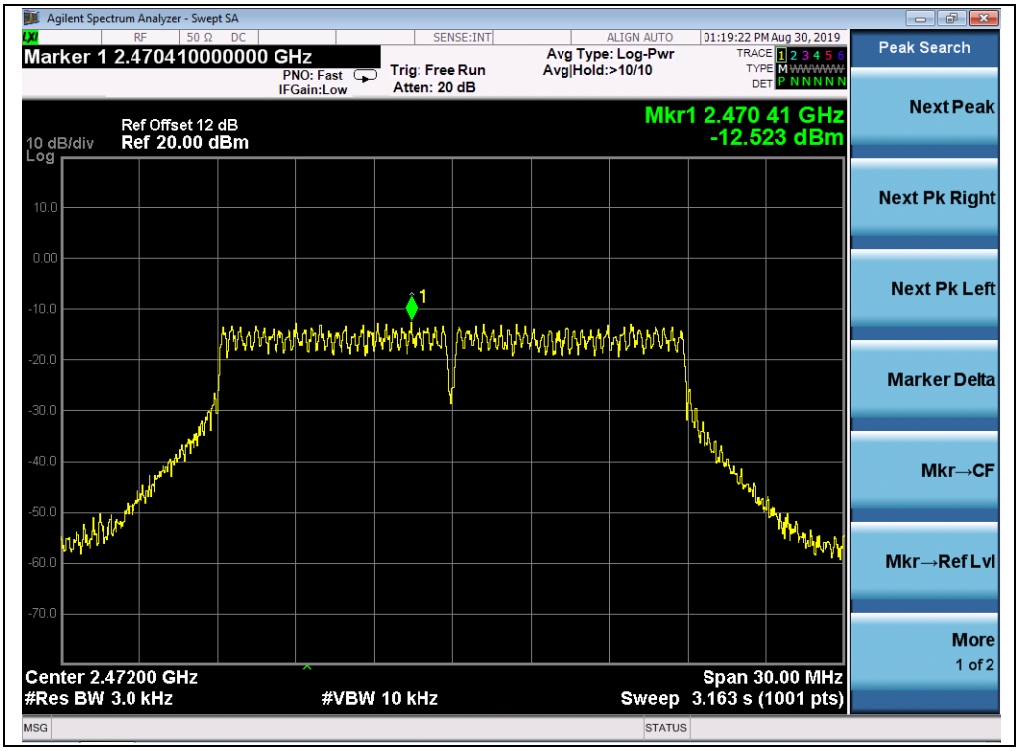
B. Test Plots:



(Channel = 1, 802.11n (HT20), ANT A)



(Channel = 7, 802.11n (HT20), ANT A)



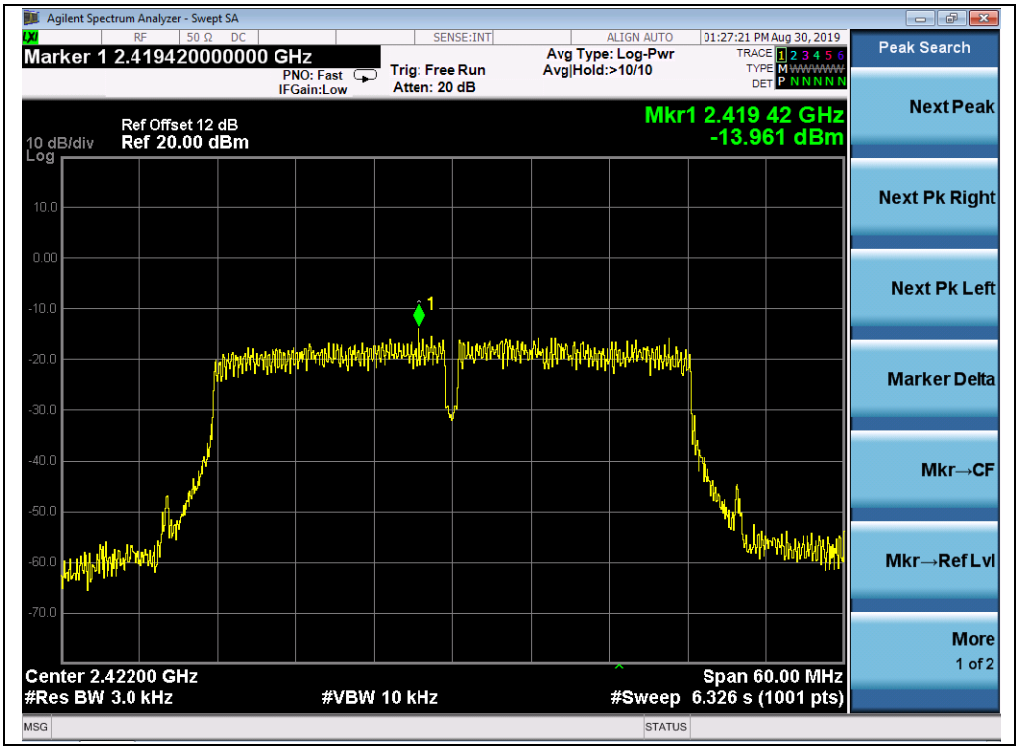
(Channel = 13, 802.11n (HT20), ANT A)

802.11n (HT40) Test mode

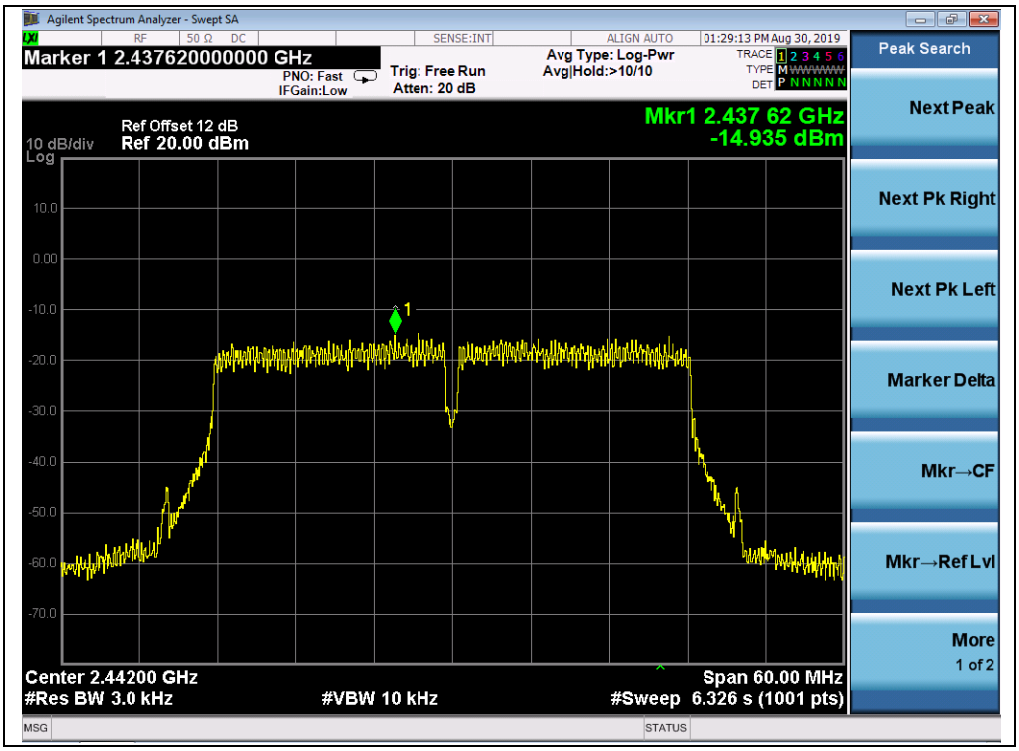
A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
		ANT A	ANT B			
3	2422	-13.96	-16.95	-12.19	8	PASS
7	2442	-14.94	-17.00	-12.84	8	PASS
11	2462	-14.51	-16.62	-12.43	8	PASS
Note: Directional gain = 2.2dBi +10log(2) = 5.21dBi＜6dBi, so the power limit is 8 dBm/3kHz.						

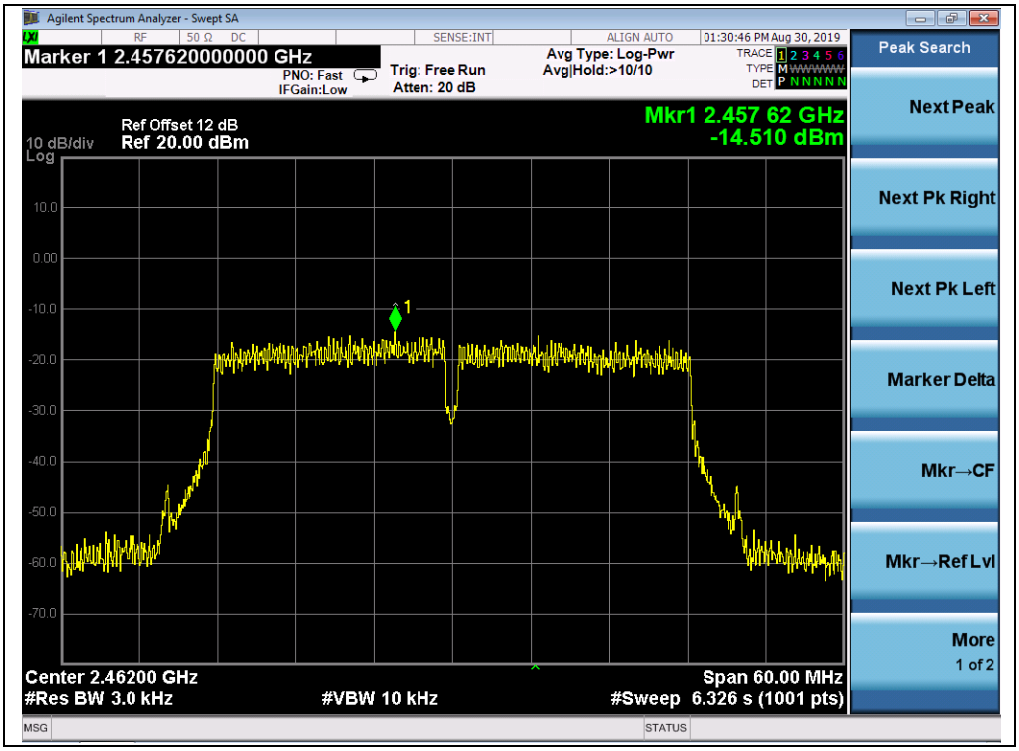
B. Test Plots:



(Channel = 3, 802.11n (HT40), ANT A))



(Channel = 7, 802.11n (HT40), ANT A))



(Channel = 11, 802.11n (HT40), ANT A))

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

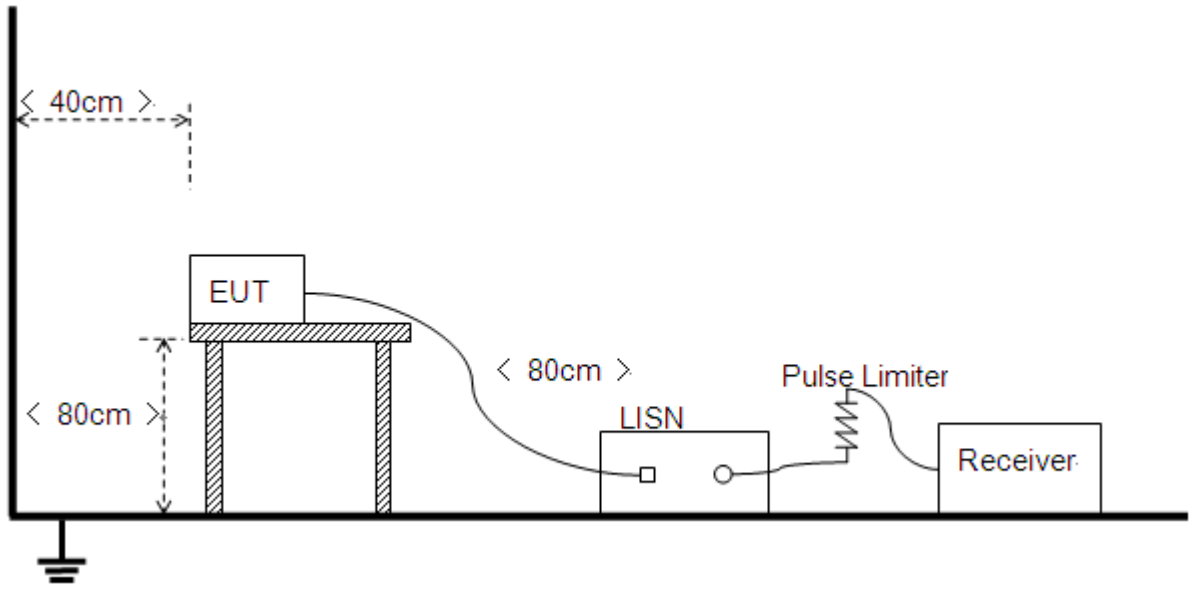
NOTE:

(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.

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:

Test Mode: EUT +ADAPTER+ USB Cable + WIFI TX

Test Voltage: AC 120V/60Hz

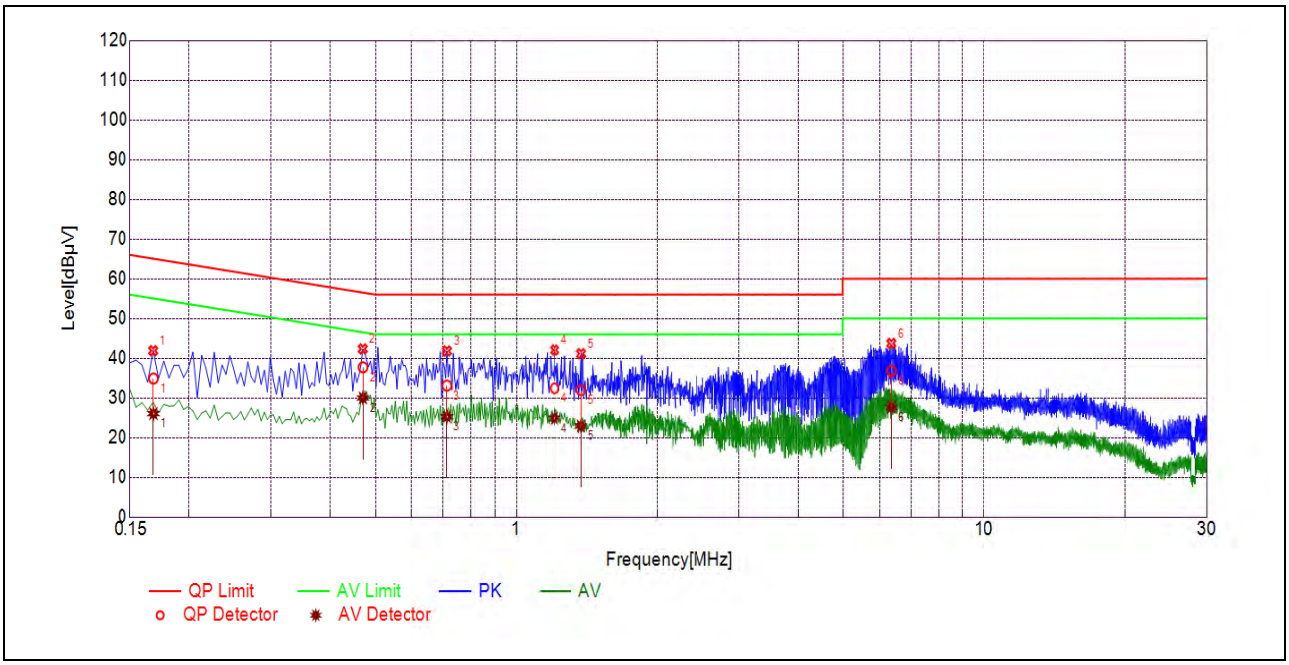
The measurement results are obtained as below:

$E\ [dB\mu V] = U_R + L_{Cable\ loss}\ [dB] + A_{Factor}$

U_R: Receiver Reading

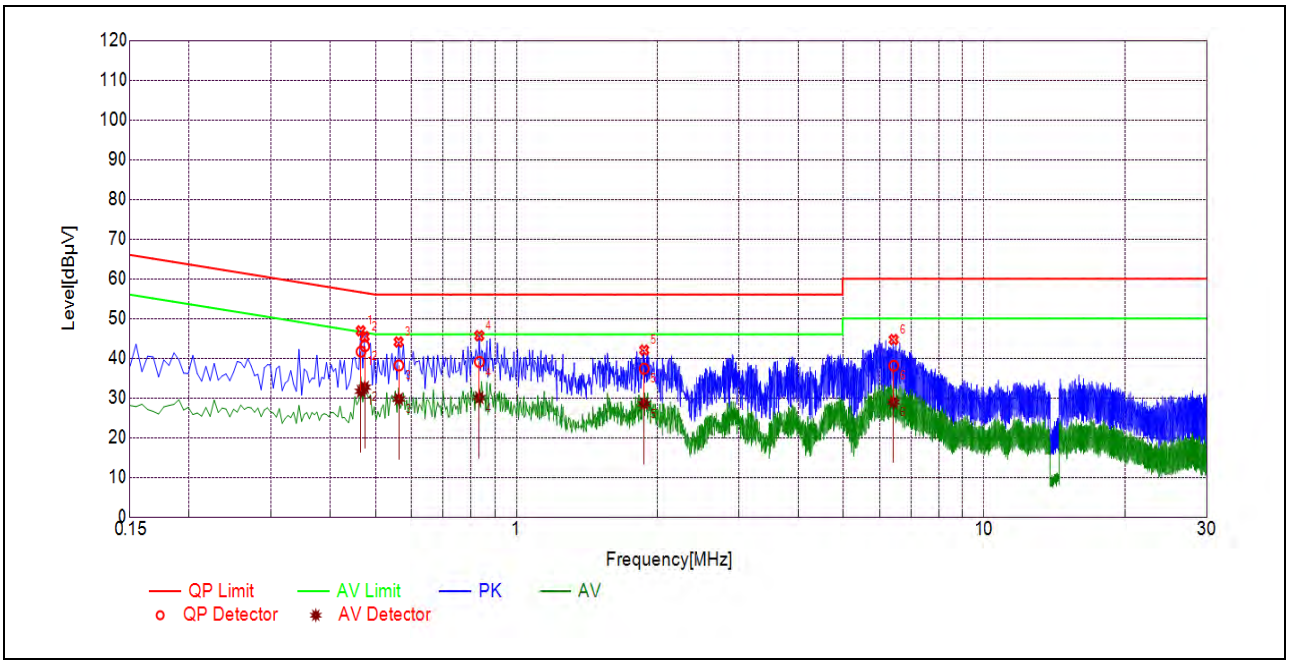
A_{Factor}: Voltage division factor of LISN

B. Test Plots:



(L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1682	34.88	26.05	65.05	55.05	Line	PASS
2	0.4698	37.71	30.00	56.52	46.52		PASS
3	0.7122	33.10	25.27	56.00	46.00		PASS
4	1.2063	32.42	24.92	56.00	46.00		PASS
5	1.3774	31.95	22.93	56.00	46.00		PASS
6	6.3484	36.78	27.64	60.00	50.00		PASS



(N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.4654	41.65	31.67	56.60	46.60	Neutral	PASS
2	0.4741	43.04	32.69	56.44	46.44		PASS
3	0.5601	38.15	29.76	56.00	46.00		PASS
4	0.8342	39.06	30.08	56.00	46.00		PASS
5	1.8771	37.36	28.54	56.00	46.00		PASS
6	6.4177	38.09	28.98	60.00	50.00		PASS

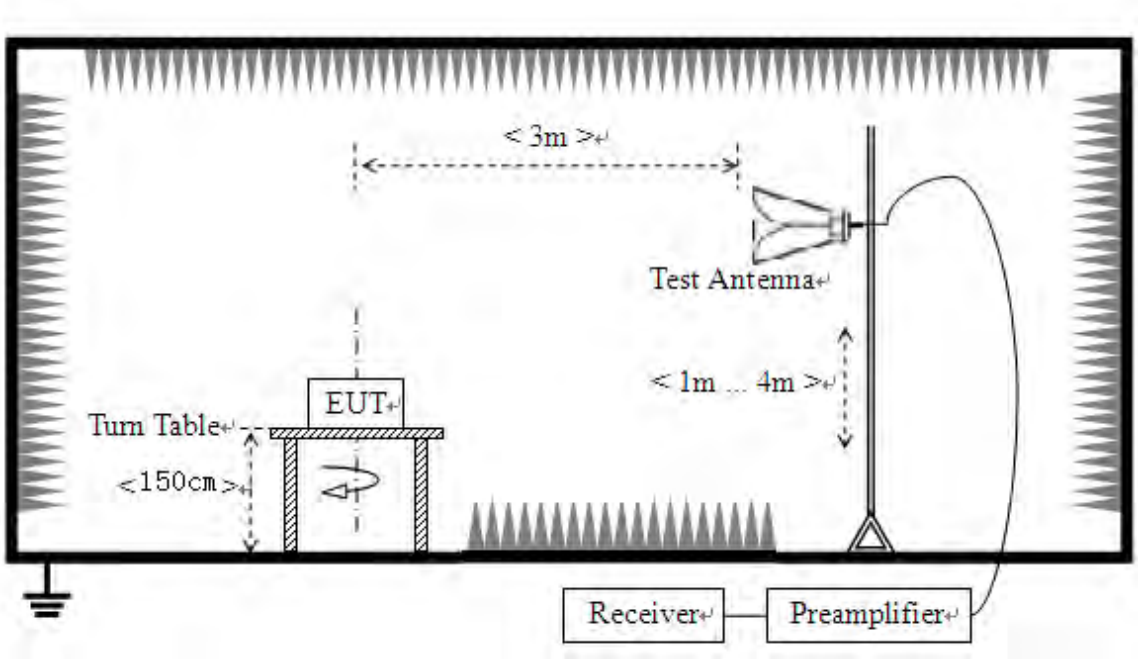
2.8. Restricted Frequency Bands

2.8.1. 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).

2.8.2. 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.

2.8.3. Test procedure

KDB 558074 Section 8.6 and 8.7 was used in order to prove compliance.

2.8.4. 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

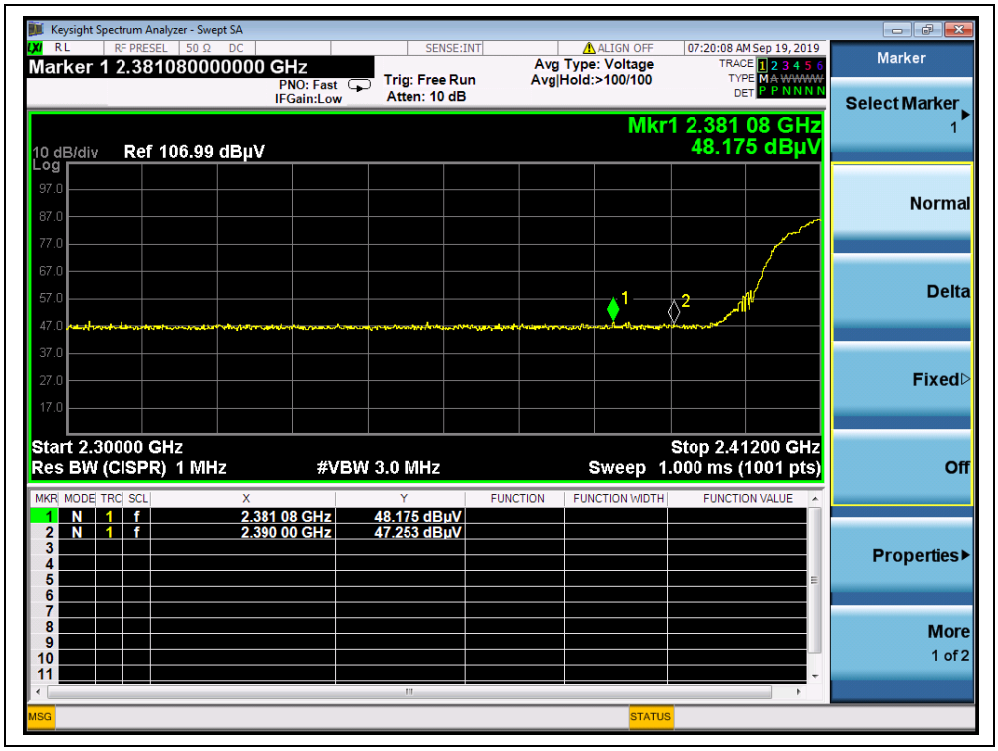
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

802.11b Test mode

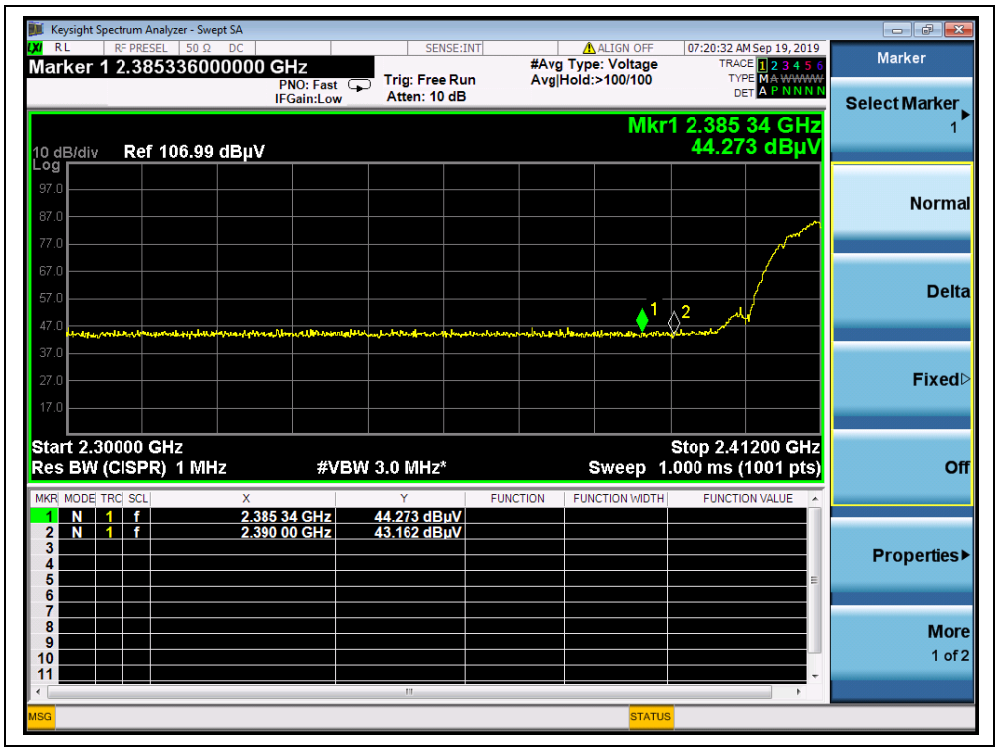
A. Test Verdict:

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	2381.08	PK	48.18	-29.67	32.56	51.07	74	PASS
1	2385.34	AV	44.27	-29.67	32.56	47.16	54	PASS
13	2484.71	PK	55.51	-29.67	32.56	58.40	74	PASS
13	2483.50	AV	51.30	-29.67	32.56	54.19	54	PASS

B. Test Plots:



(Channel = 1 PEAK, 802.11b)



(Channel = 1 AVG, 802.11b)

(Channel = 13 PEAK, 802.11b)

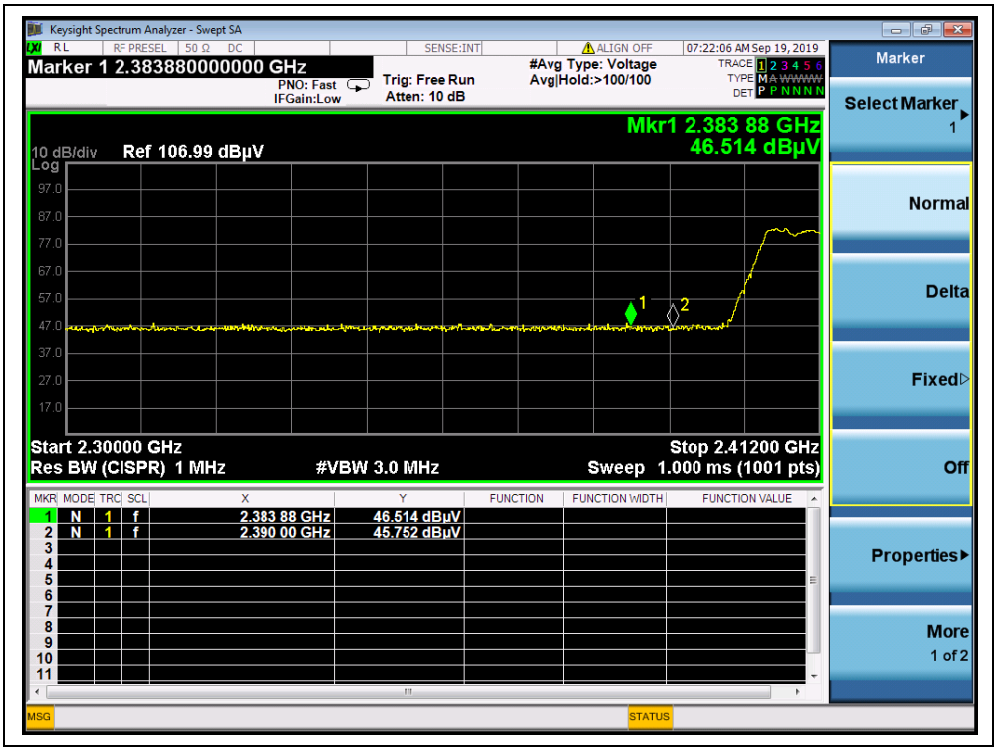
(Channel = 13 AVG, 802.11b)

802.11g Test mode

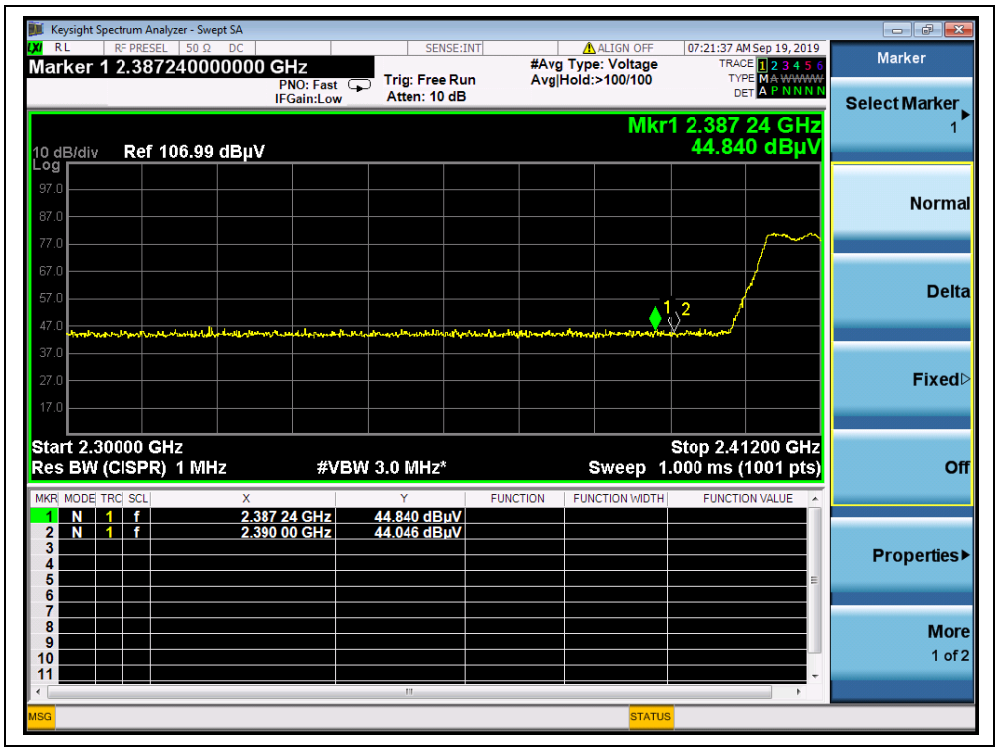
A. Test Verdict:

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	2383.88	PK	46.51	-29.67	32.56	49.40	74	PASS
1	2387.24	AV	44.84	-29.67	32.56	47.73	54	PASS
13	2483.50	PK	58.40	-29.67	32.56	61.29	74	PASS
13	2483.50	AV	55.81	-29.67	32.56	58.70	54	PASS

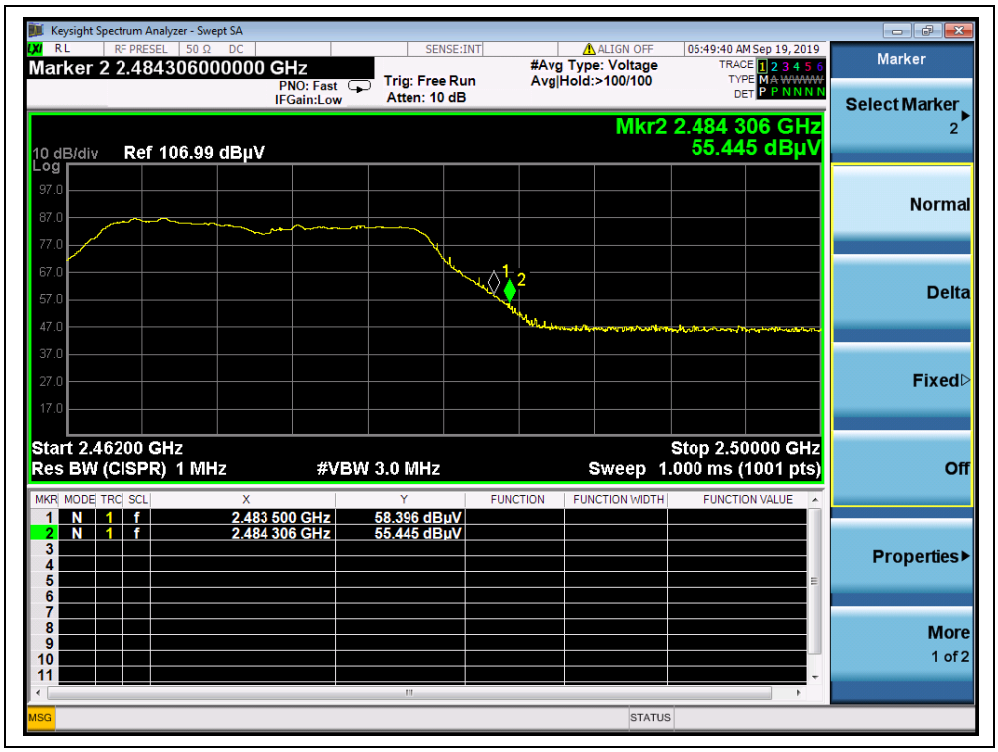
B. Test Plots:



(Channel = 1 PEAK, 802.11g)



(Channel = 1 AVG, 802.11g)



(Channel = 13 PEAK, 802.11g)

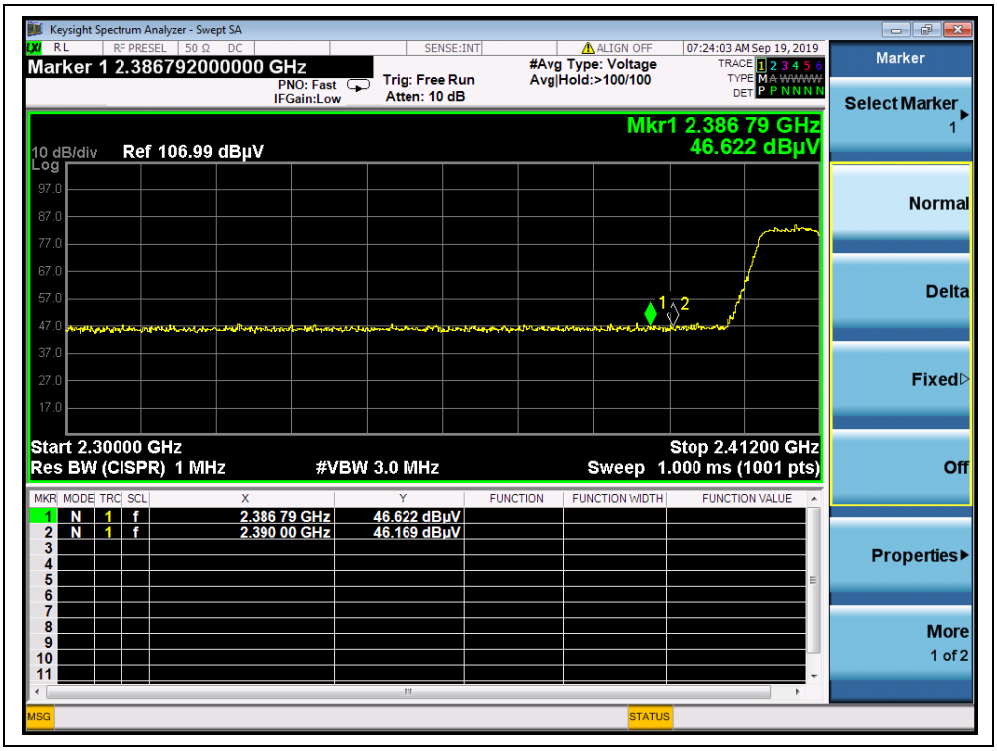
(Channel = 13 AVG, 802.11g)

802.11 n (HT20) Test mode

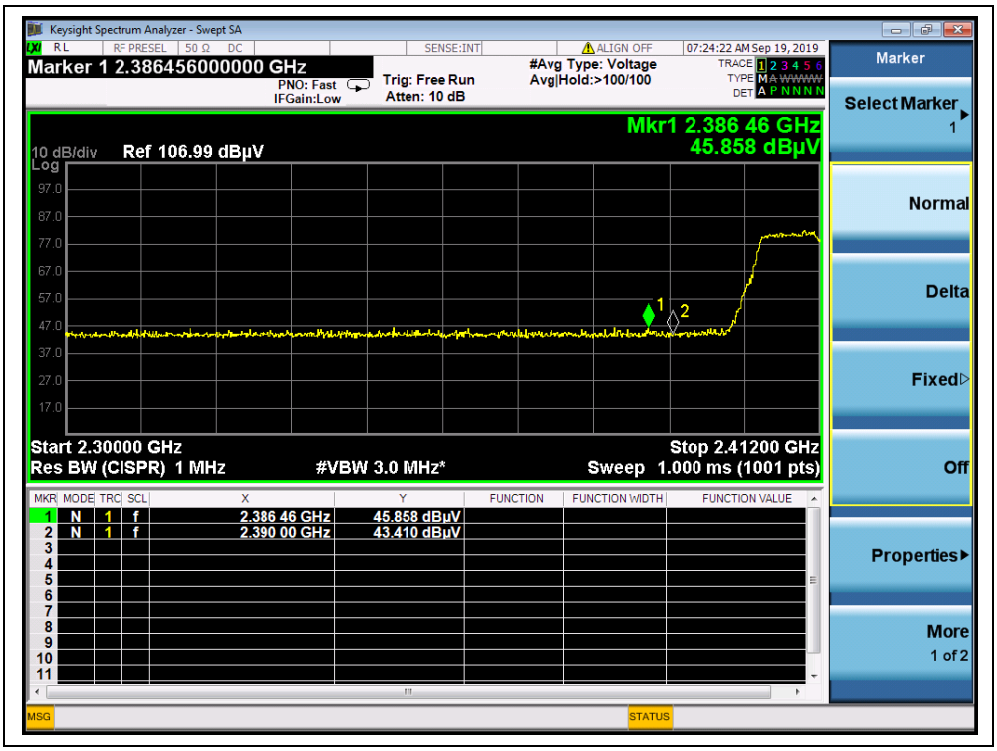
A. Test Verdict:

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	2386.79	PK	46.62	-29.67	32.56	49.51	74	PASS
1	2386.46	AV	45.86	-29.67	32.56	48.75	54	PASS
13	2483.50	PK	60.83	-29.67	32.56	63.72	74	PASS
13	2483.50	AV	59.19	-29.67	32.56	62.08	54	PASS

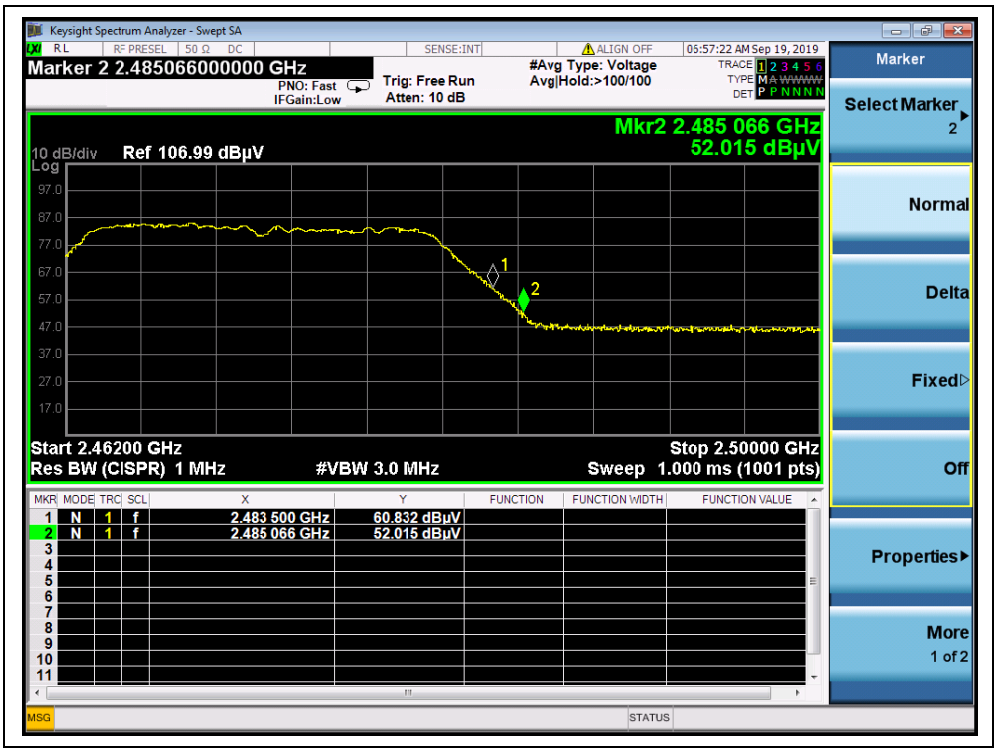
B. Test Plots:



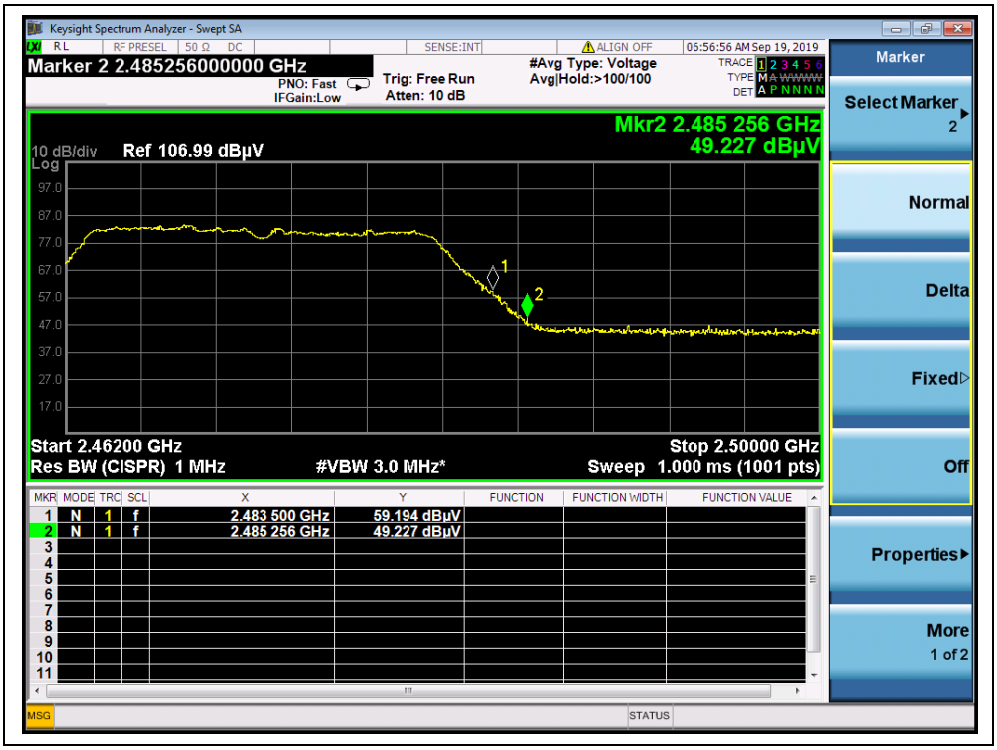
(Channel = 1 PEAK, 802.11n(HT20))



(Channel = 1 AVG, 802.11n(HT20))



(Channel = 13 PEAK, 802.11n (HT20))



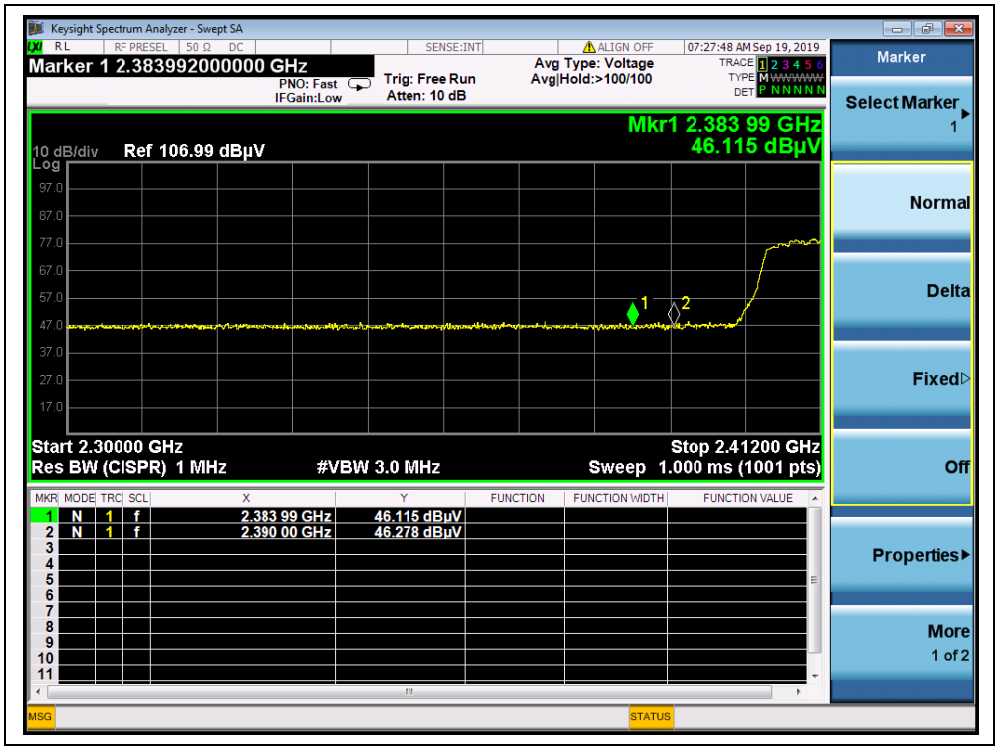
(Channel = 13 AVG, 802.11n (HT20))

802.11n (HT40) Test mode

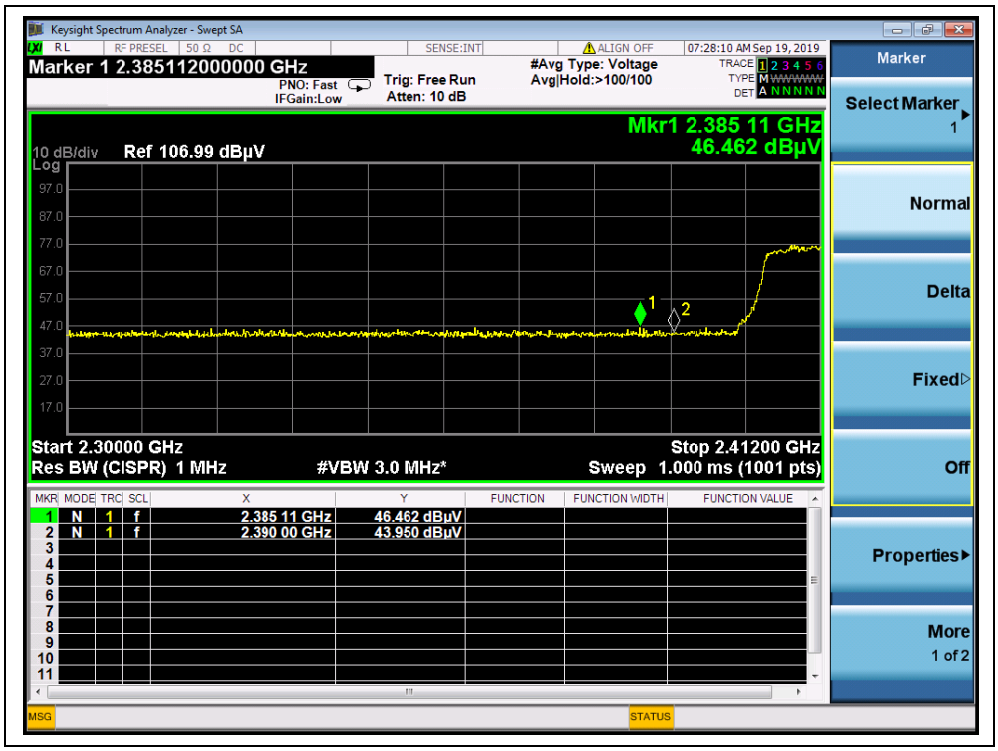
A. Test Verdict:

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	2390.00	PK	46.28	-29.67	32.56	49.17	74	PASS
3	2385.11	AV	46.46	-29.67	32.56	49.35	54	PASS
11	2483.50	PK	52.54	-29.67	32.56	55.43	74	PASS
11	2483.50	AV	49.46	-29.67	32.56	52.35	54	PASS

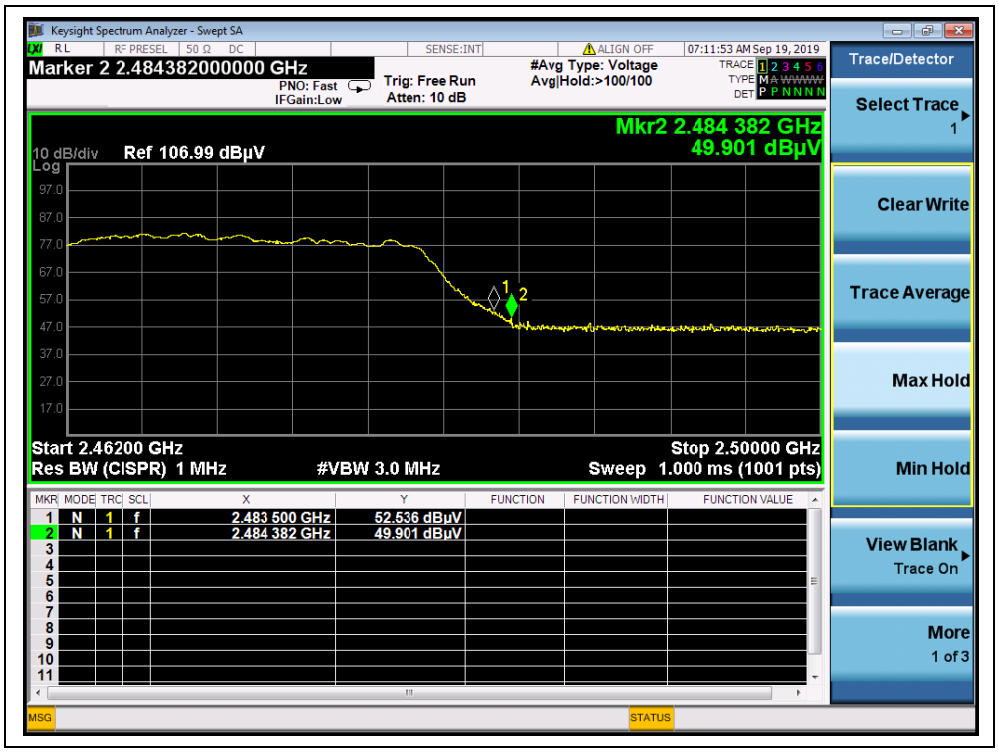
B. Test Plots:



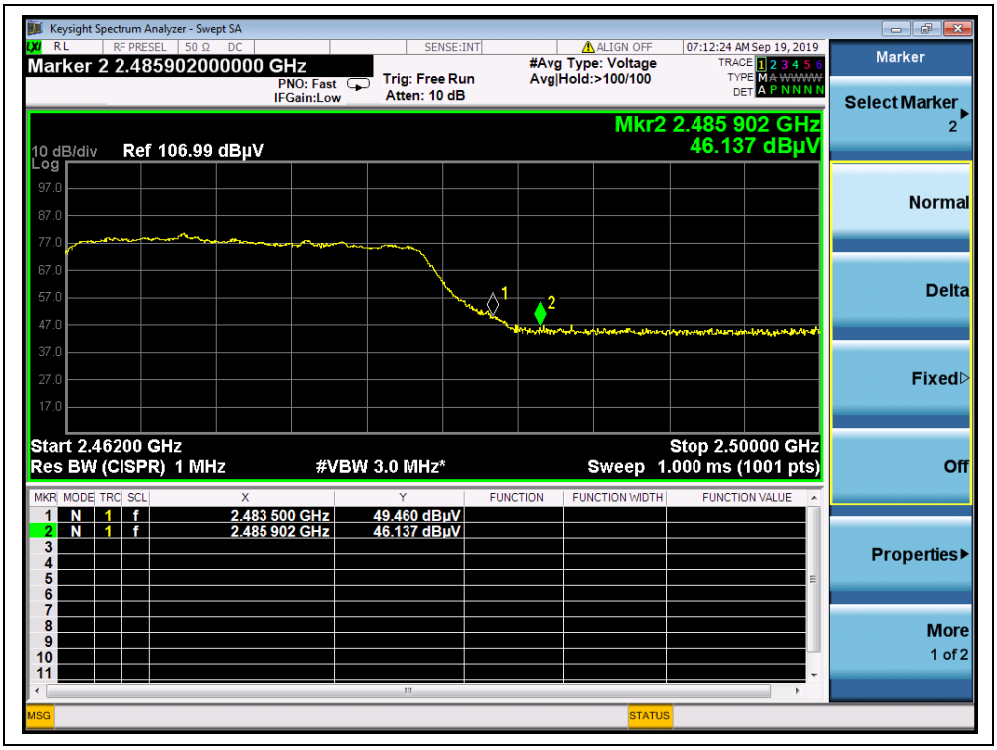
(Channel = 3 PEAK, 802.11n(HT40))



(Channel = 3 AVG, 802.11n(HT40))



(Channel = 11 PEAK, 802.11n(HT40))



(Channel = 11 AVG, 802.11n(HT40))

2.9. Radiated Emission

2.9.1. 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.

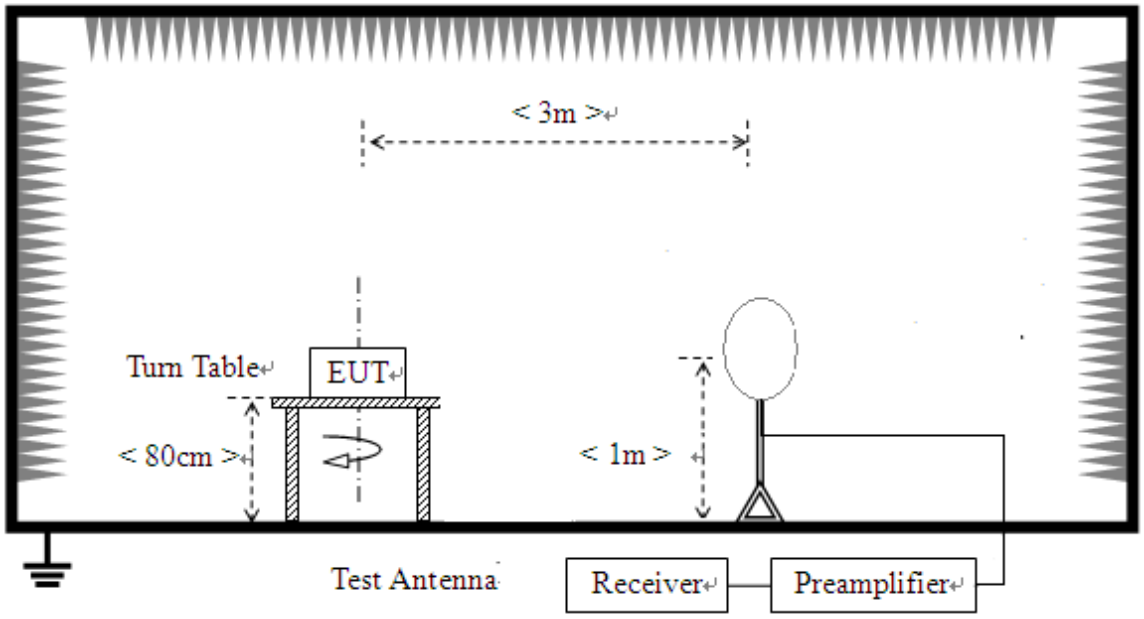
For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

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)

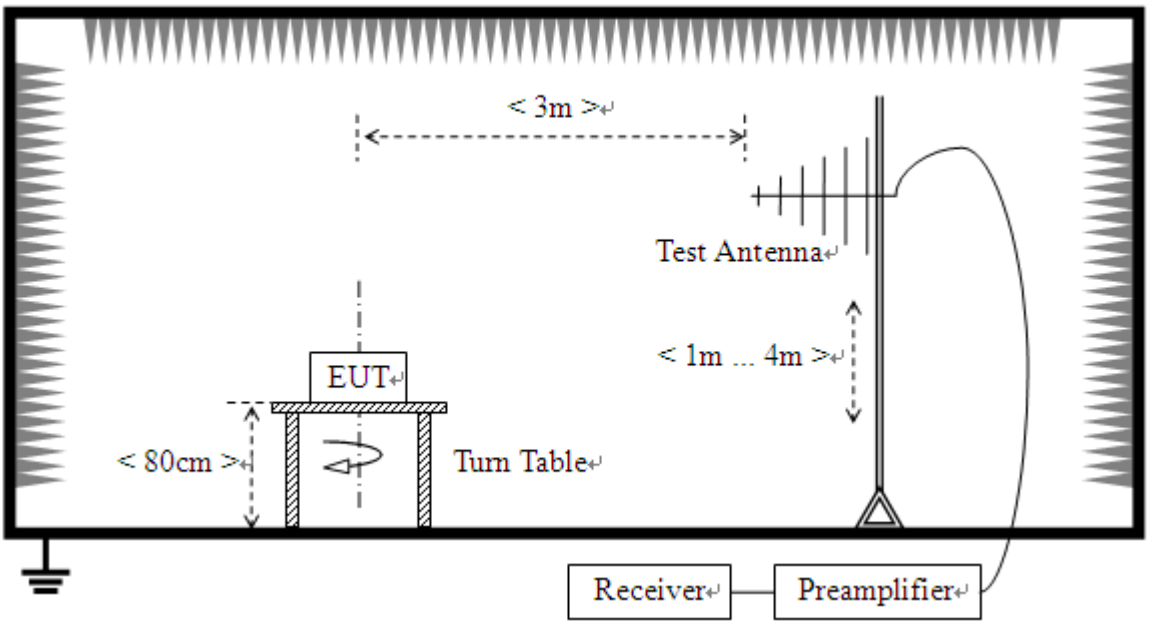
2.9.2. Test Description

A. Test Setup:

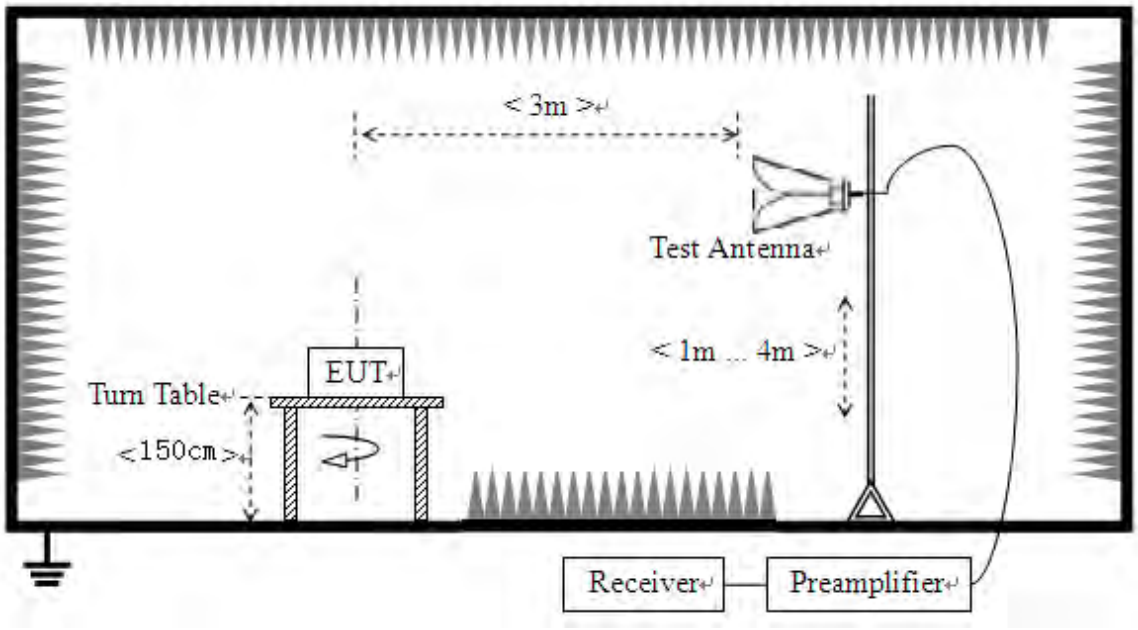
1) For radiated emissions from 9kHz to 30MHz



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. Test site have a minimum area of the ground plane covered with RF absorbing material as specified in Figure 6 of ANSI C63.4: 2014.

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.

2.9.3. Test Result

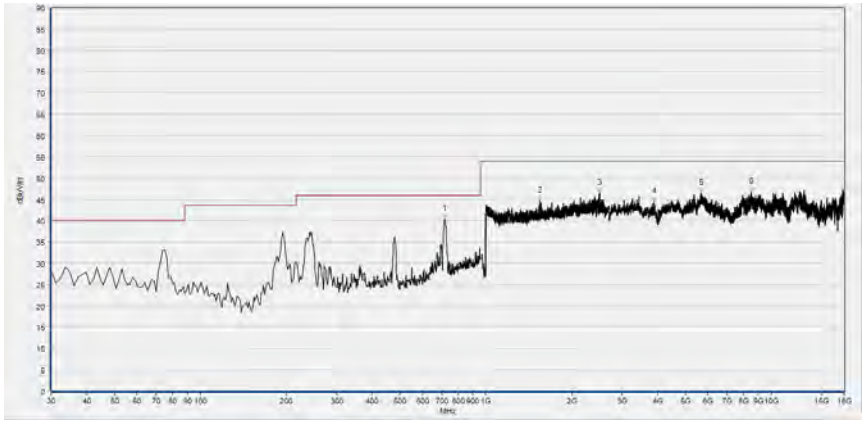
According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with 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 20dB lower than the limit was not recorded.

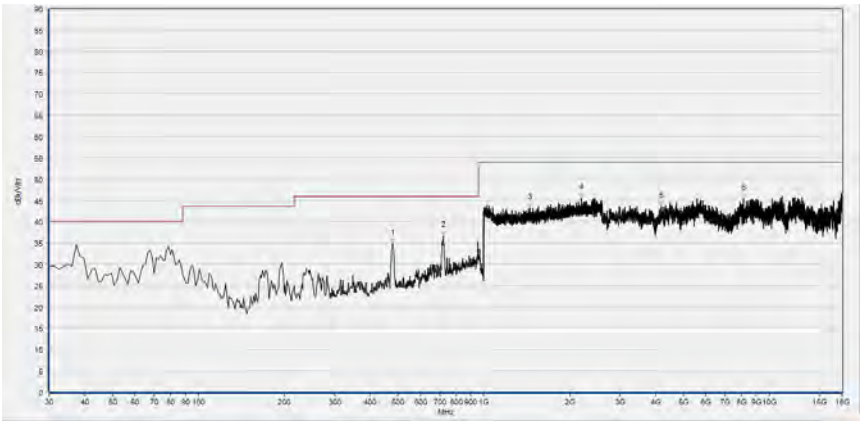
802.11b Test mode

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
717.134	40.41	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1544.858	44.63	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2510.364	46.46	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3879.833	44.40	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5669.358	46.43	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8497.872	46.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

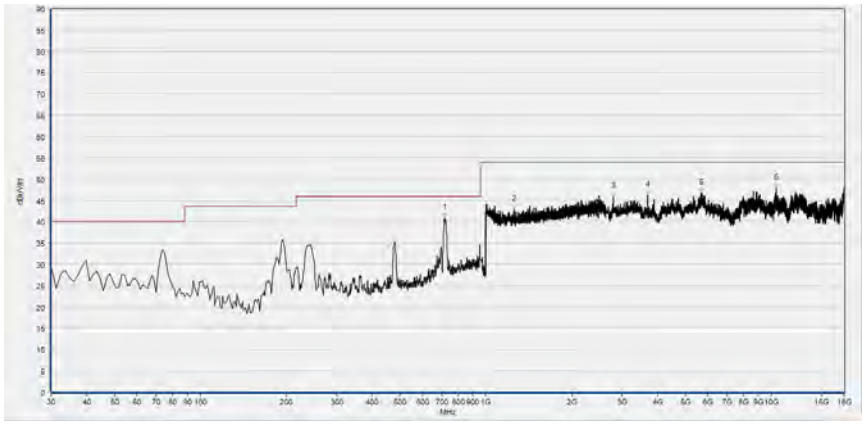
(Antenna Horizontal, 30MHz to 25GHz)



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
479.186	34.79	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
720.776	36.71	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1448.179	43.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2195.358	45.61	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4199.091	43.58	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8103.001	45.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

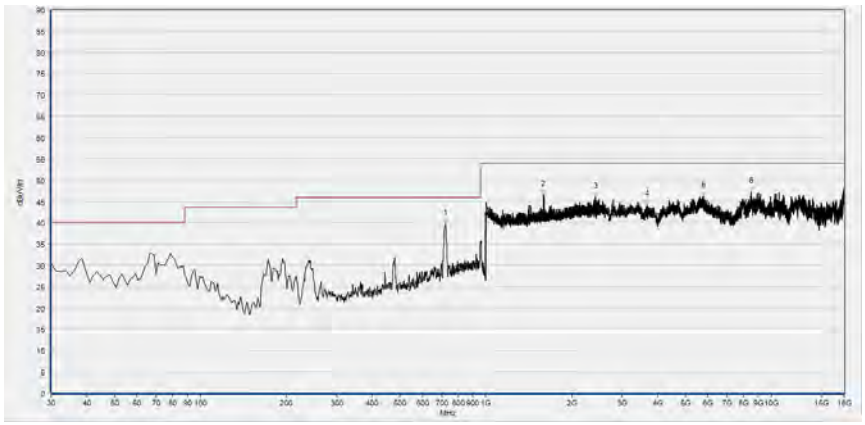
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 7



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
718.348	40.85	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1254.822	42.97	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2796.036	45.97	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3692.199	46.19	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5669.358	46.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10433.024	47.90	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

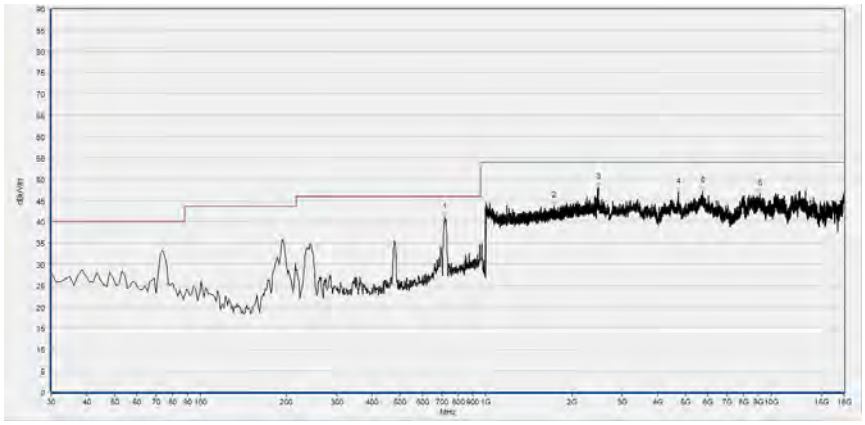
(Antenna Horizontal, 30MHz to 25GHz)



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
721.990	39.79	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1594.798	46.66	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2416.246	46.12	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3675.396	44.18	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5778.578	46.19	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8495.072	47.30	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

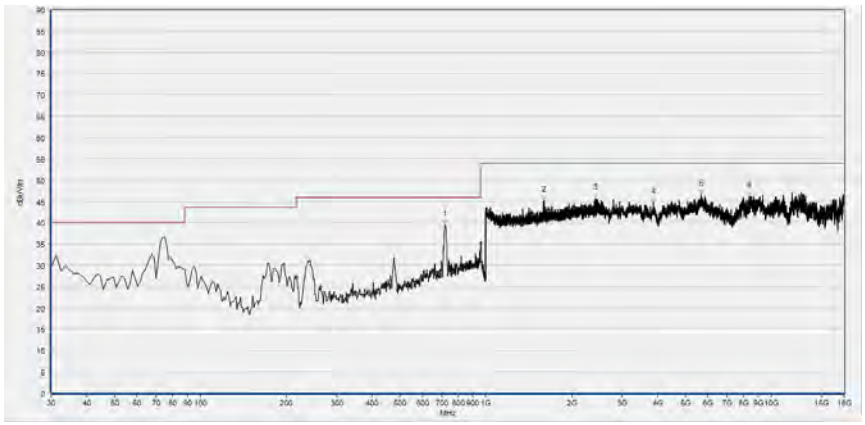
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 13



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
719.562	40.99	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1735.014	43.68	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2475.790	48.07	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4725.586	46.86	N/A	44.70	74.00	N/A	54.00	Horizontal	PASS
5744.972	47.14	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9125.186	46.60	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

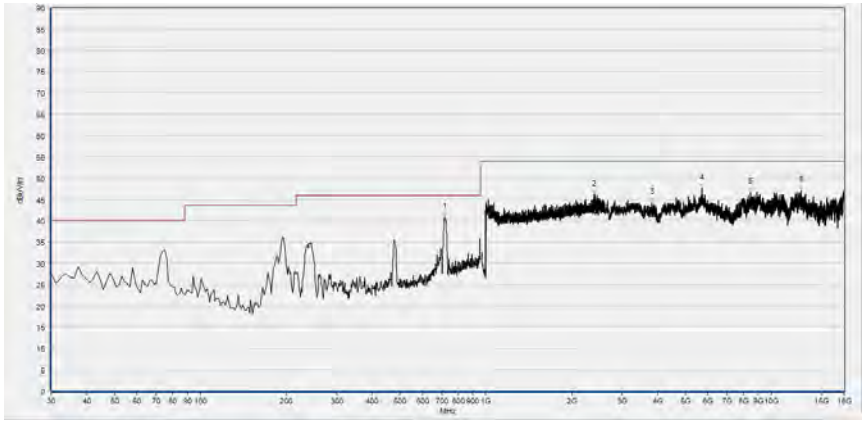


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
719.562	39.48	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1596.078	45.28	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2416.246	45.83	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3868.631	44.73	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5669.358	46.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8371.849	46.22	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

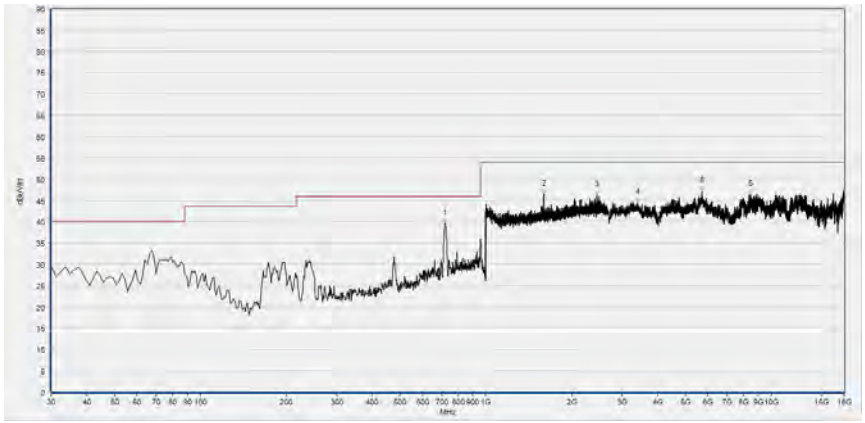
802.11g Test mode

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
719.562	40.88	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2390.636	46.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3809.820	44.20	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5725.368	47.51	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8441.862	46.77	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12737.843	47.07	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

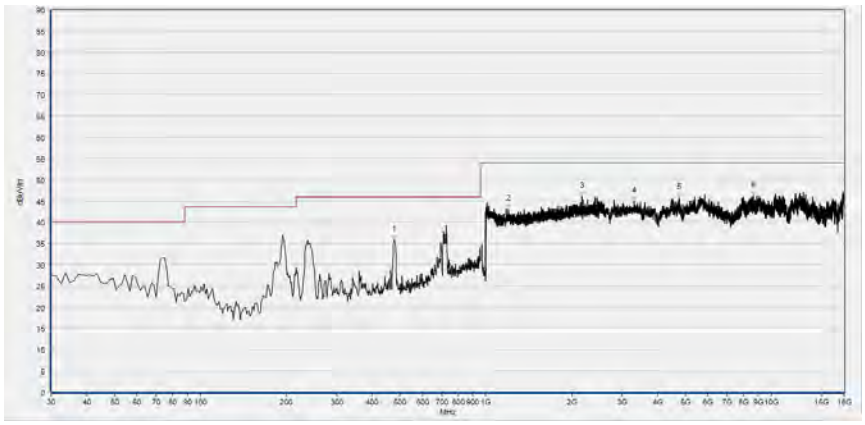
(Antenna Horizontal, 30MHz to 25GHz)



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
719.562	39.54	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1596.078	46.37	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2452.741	46.29	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3395.345	44.44	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5711.366	47.16	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8481.069	46.44	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

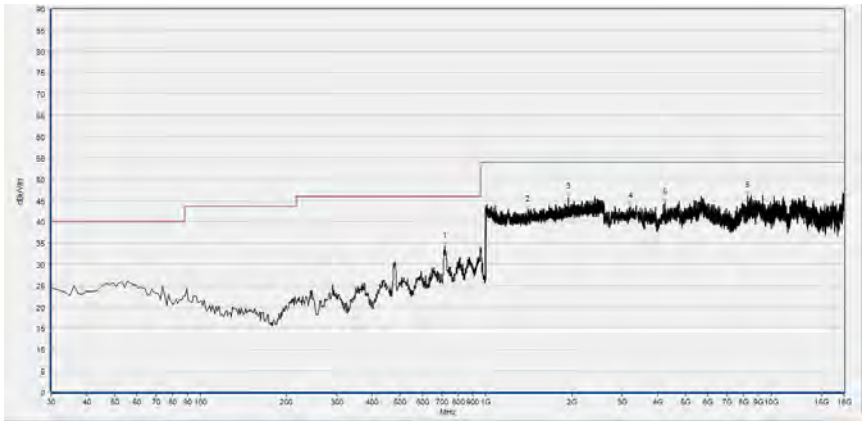
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 7



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
477.972	35.81	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1198.479	43.11	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2166.547	46.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3308.529	44.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4759.193	45.83	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8649.100	46.18	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

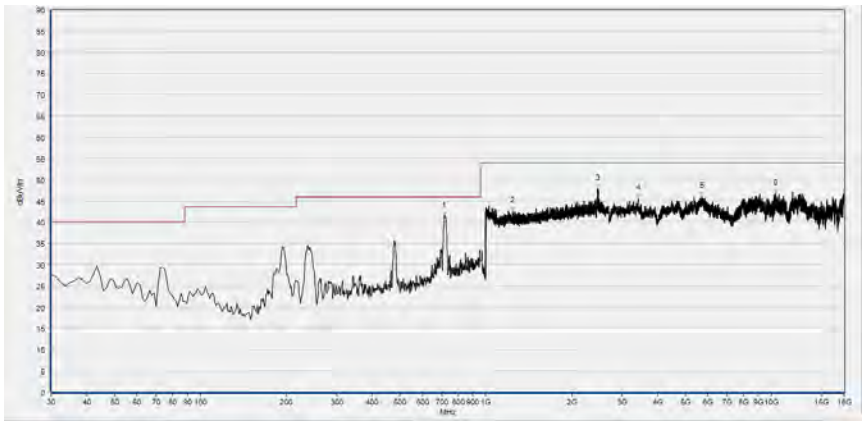
(Antenna Horizontal, 30MHz to 25GHz)



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
718.348	34.20	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1404.642	42.70	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1946.939	45.80	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3204.910	43.57	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4232.697	44.45	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8273.832	46.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

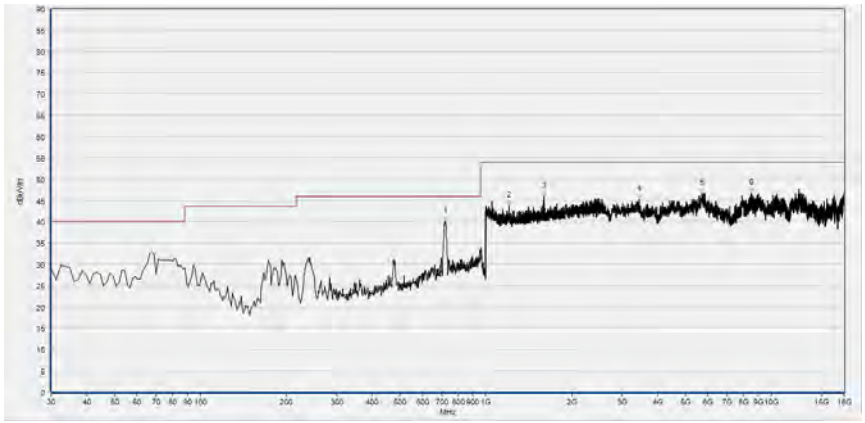
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 13



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
715.920	41.42	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1243.297	42.51	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2465.546	47.93	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3414.948	45.63	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5728.169	46.09	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10351.809	46.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

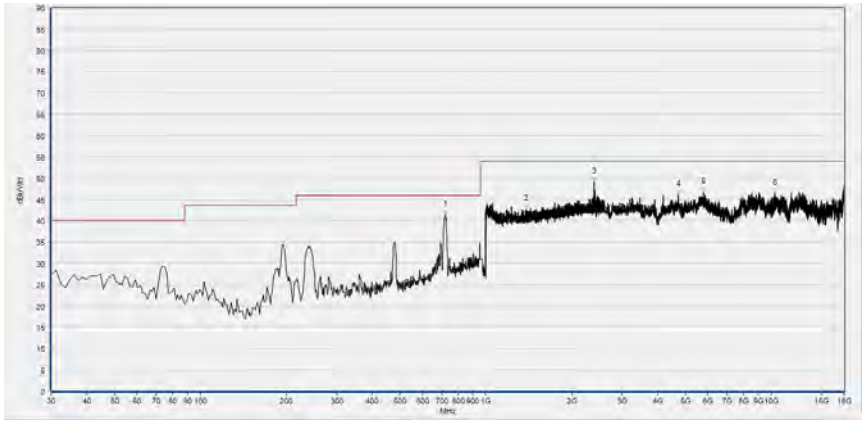


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
721.990	40.04	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1206.803	43.75	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1596.078	45.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3451.355	45.28	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5733.770	46.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8495.072	46.68	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

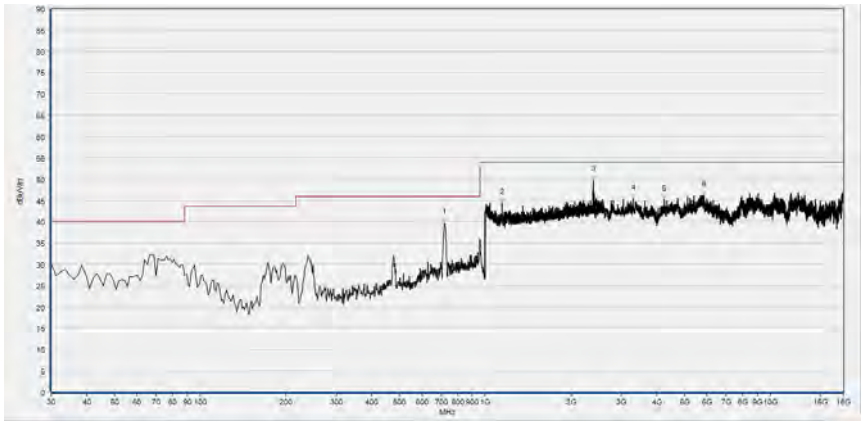
802.11n (HT20) Test mode

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
720.776	41.35	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1386.074	42.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2391.277	49.09	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4719.985	46.16	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5775.777	46.79	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10276.196	46.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

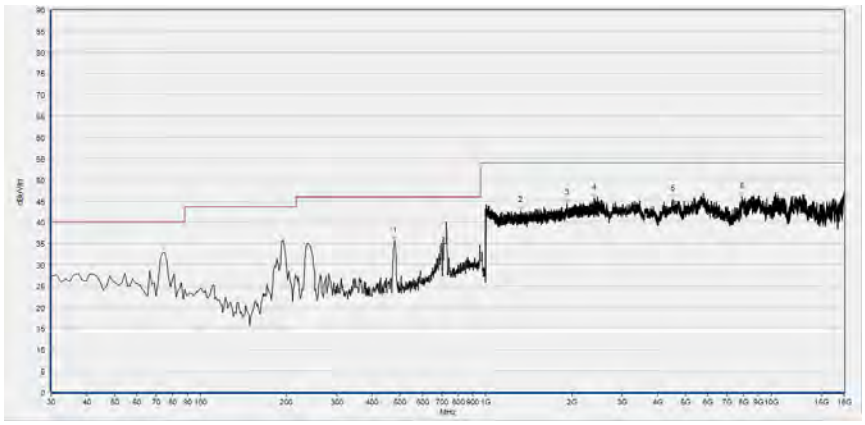
(Antenna Horizontal, 30MHz to 25GHz)



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
719.562	39.75	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1147.259	44.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2391.277	49.76	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3308.529	45.40	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4246.699	45.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5845.790	46.24	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

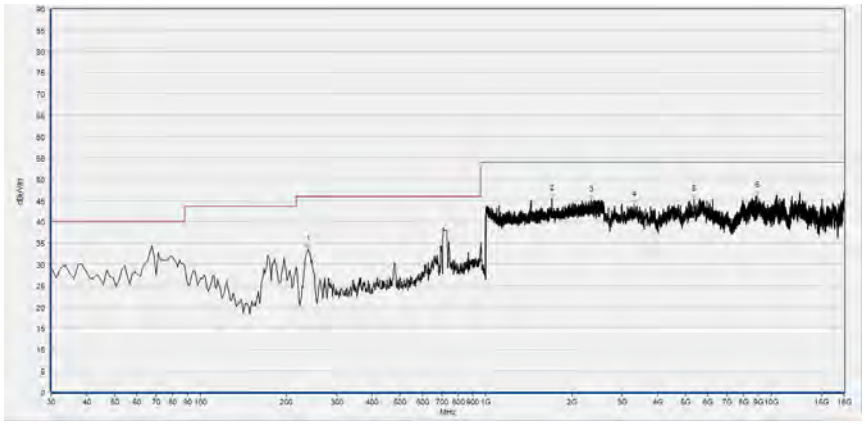
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 7



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
479.186	35.60	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1325.890	42.76	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
1925.810	44.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2391.277	45.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4521.149	45.35	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7878.960	45.94	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

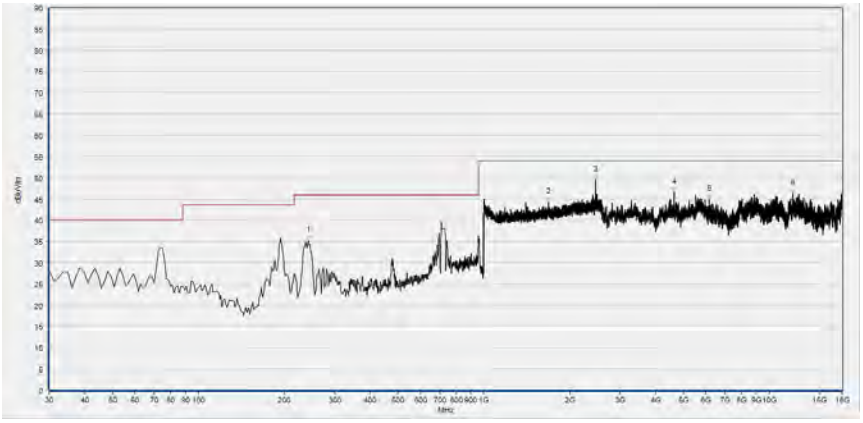
(Antenna Horizontal, 30MHz to 25GHz)



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
238.811	33.59	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1704.282	45.43	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2345.818	45.14	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3308.529	43.83	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5361.302	45.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8920.749	46.14	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

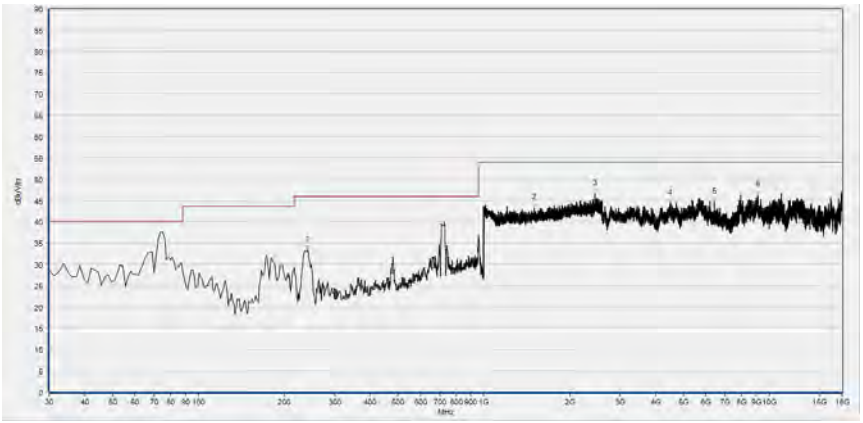
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 13



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
242.453	35.16	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1683.153	44.28	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2464.266	49.44	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4633.170	46.55	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6167.849	44.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12113.330	46.25	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

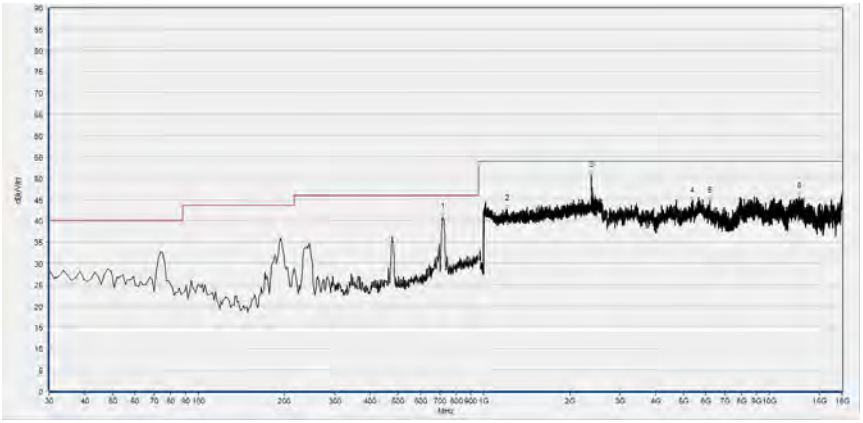


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
241.239	33.36	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1504.522	43.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2453.381	46.67	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4493.144	44.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
6419.895	44.55	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9136.388	46.22	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

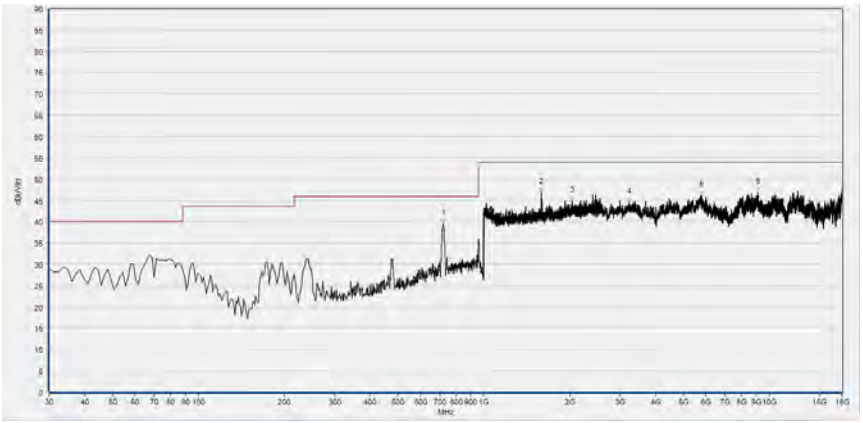
802.11n (HT40) Test mode

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
718.348	40.87	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1208.723	42.75	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2384.234	50.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5369.704	44.62	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6195.854	44.66	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12732.242	45.55	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

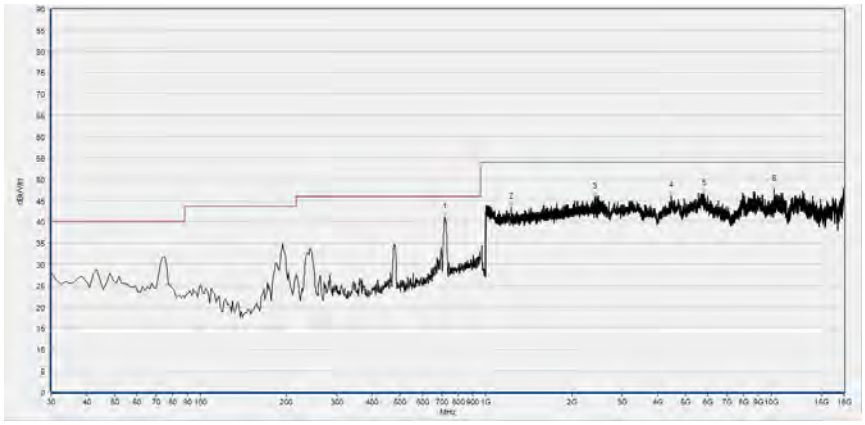
(Antenna Horizontal, 30MHz to 25GHz)



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
720.776	39.53	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1592.877	46.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2043.617	44.87	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3227.314	44.54	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5781.378	46.22	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9130.787	46.90	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

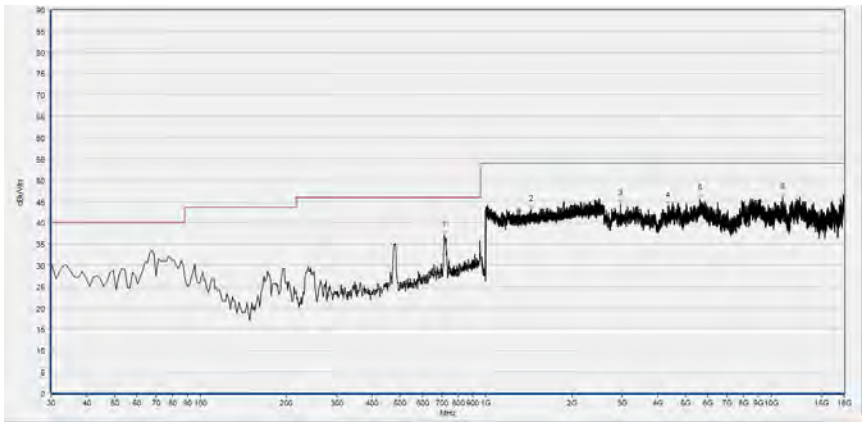
(Antenna Vertical, 30MHz to 25GHz)

Plots for Channel = 7



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
717.134	41.08	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1227.291	43.37	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2411.124	45.83	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4456.738	46.17	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5828.987	46.66	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10248.191	47.66	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

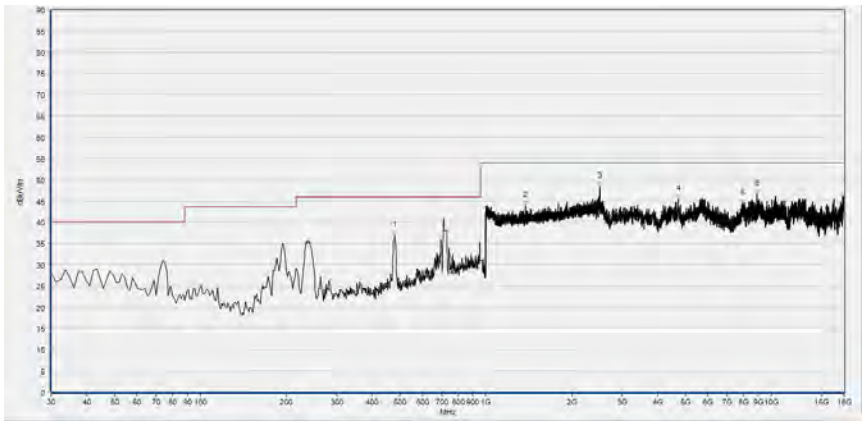
(Antenna Horizontal, 30MHz to 25GHz)



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
715.920	37.09	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1438.575	43.00	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2966.867	44.34	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4327.914	43.85	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5621.749	45.53	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10987.525	45.98	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

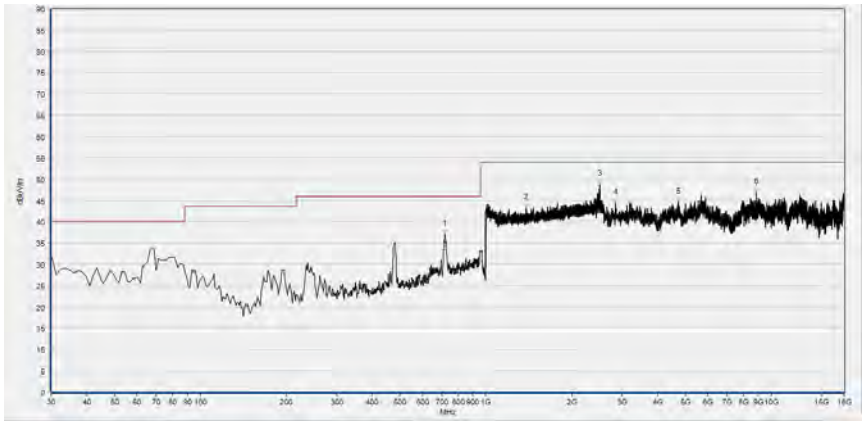
(Antenna Vertical, 30MHz to 25GHz)

Plots 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
479.186	36.83	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1375.830	43.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2502.681	48.37	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4733.988	45.41	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7918.167	44.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8929.151	46.57	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
719.562	37.01	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1388.635	43.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2502.041	48.76	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2843.644	44.46	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4725.586	44.60	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8847.936	46.92	N/A	N/A	74.00	N/A	54.00	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

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
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, the test firm registration number is 226174.

4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Attenuator 1	(N/A.)	10dB	Resnet	N/A	N/A
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2019.04.09	2020.04.08
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2019.04.16	2020.04.15
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
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2019.05.08	2020.05.09
LISN	812744	NSLK 8127	Schwarzbeck	2019.05.08	2020.05.09
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2019.05.08	2020.05.09
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3 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

4.4 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2019.07.26	2020.07.25
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.08	2020.05.09
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.15	2020.02.14
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2020.07.25
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2019.07.26	2020.07.25
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	2019.05.08	2020.05.09
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2019.05.08	2020.05.09
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	2018.12.01	2019.11.30
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

END OF REPORT