REPORT No.: SZ20020118W02

TEST REPORT

APPLICANT	:	Anker Innovations Limited
PRODUCT NAME	:	Indoor Cam 2K Pan & Tilt
MODEL NAME	:	T8410
BRAND NAME	:	eufy SECURITY
FCC ID	:	2AOKB-T8410
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2020-02-27
TEST DATE	:	2020-03-11 to 2020-03-27
ISSUE DATE	:	2020-03-30

Edited by: Peng Mi (Rapporteur)

Approved by: Peng Huarui (Supervisor)

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MORLAB

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Change History		
Version	**Date**	**Reason for change**
1.0	2020-03-30	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Anker Innovations Limited
Applicant Address:	Room 1318-19,Hollywood Plaza,610 Nathan Road, Mongkok, Kowloon, Hong Kong
Manufacturer:	Anker Innovations Limited
Manufacturer Address:	Room 1318-19,Hollywood Plaza,610 Nathan Road, Mongkok, Kowloon, Hong Kong

1.2. Equipment Under Test (EUT) Description

Product Name:	Indoor Cam 2K Pan & Tilt	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	V0.2	
Software Version:	1.0.1.7	
Equipment Type:	WLAN2.4G	
Modulation Type:	DSSS, OFDM	
Operating Frequency Range:	802.11b/g/ n(HT20): 2.412GHz - 2.462GHz	
Antenna Type:	PIFA Antenna	
Antenna Gain:	0dBi	
Accessory Information:	AC Adapter	
	Brand Name:	N/A
	Model No.:	TEKA012-0502000UK
	Serial No.:	(N/A, marked #1 by test site)
	Rated Voltage:	5.00V⎓2.00A
	Charge Limit:	100-240V ～ 0.35A

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

Note 2: 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

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		
	6	**2437**		
	7	2442		

Note1: The Lowest Channel (1), Middle Channel (6) and Highest Channel (11) was selected test for 802.11b/g/n(HT20) 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	Mar 18, 2020	Ouyang Feng	PASS	No deviation
3	15.247(b)	Maximum Peak and Average Conducted Output Power	Mar 18, 2020	Ouyang Feng	PASS	No deviation
4	15.247(a)	Bandwidth	Mar 18, 2020	Ouyang Feng	PASS	No deviation
5	15.247(d)	Conducted Spurious Emission and Band Edge	Mar 18, 2020	Ouyang Feng	PASS	No deviation
6	15.247(e)	Power spectral density (PSD)	Mar 18, 2020	Ouyang Feng	PASS	No deviation
7	15.207	Conducted Emission	Mar 11, 2020	Huang Zhiye	PASS	No deviation
8	15.247(d)	Restricted Frequency Bands	Mar 27, 2020	Li Zihao	PASS	No deviation
9	15.209, 15.247(d)	Radiated Emission	Mar 27, 2020	Li Zihao	PASS	No deviation

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

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 14dB.

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

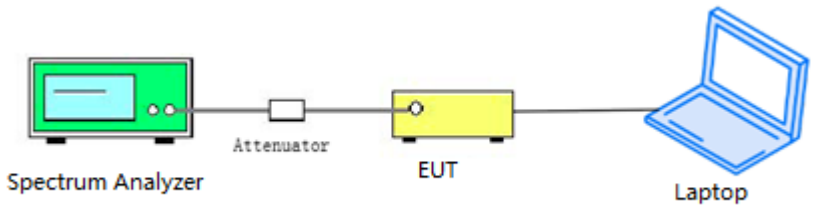
2.2. Duty Cycle of Test Signal

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

Test Setup:



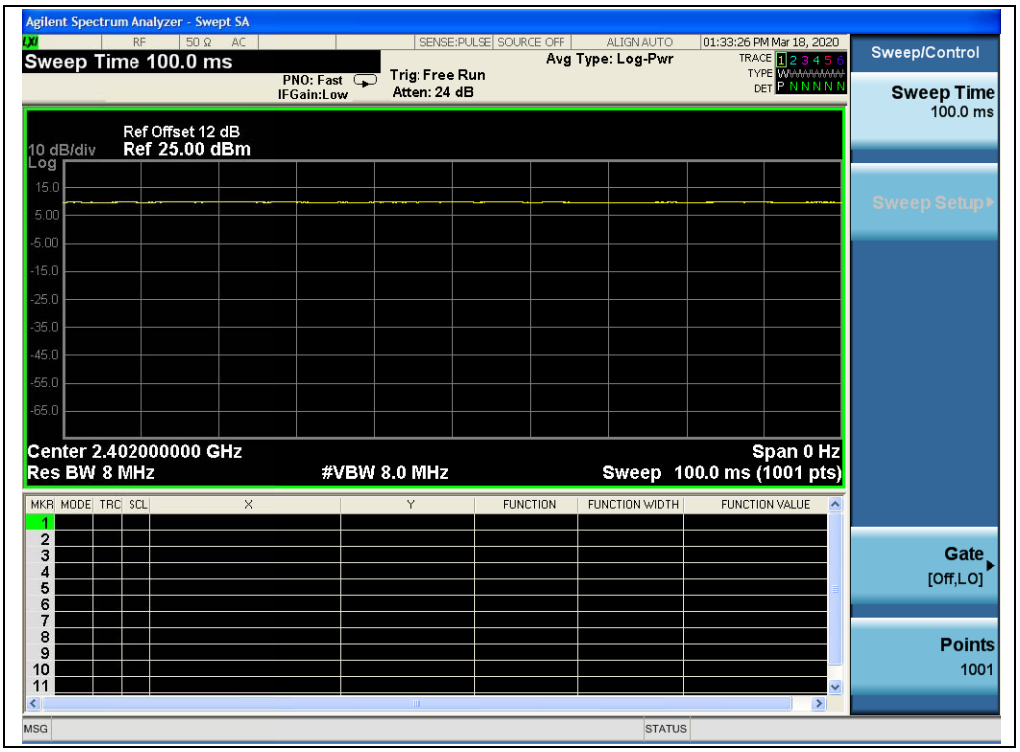
ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.

2.2.3. Test Result

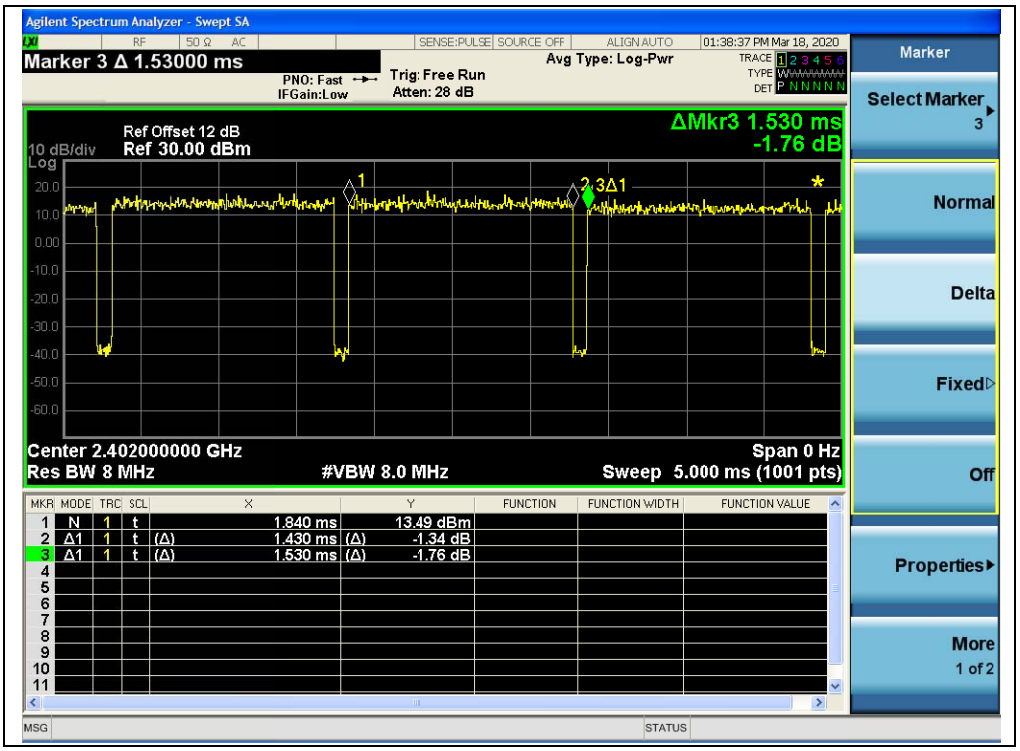
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
802.11b	100.00	0.00
802.11g	93.46	0.29
802.11n(HT20)	92.97	0.32

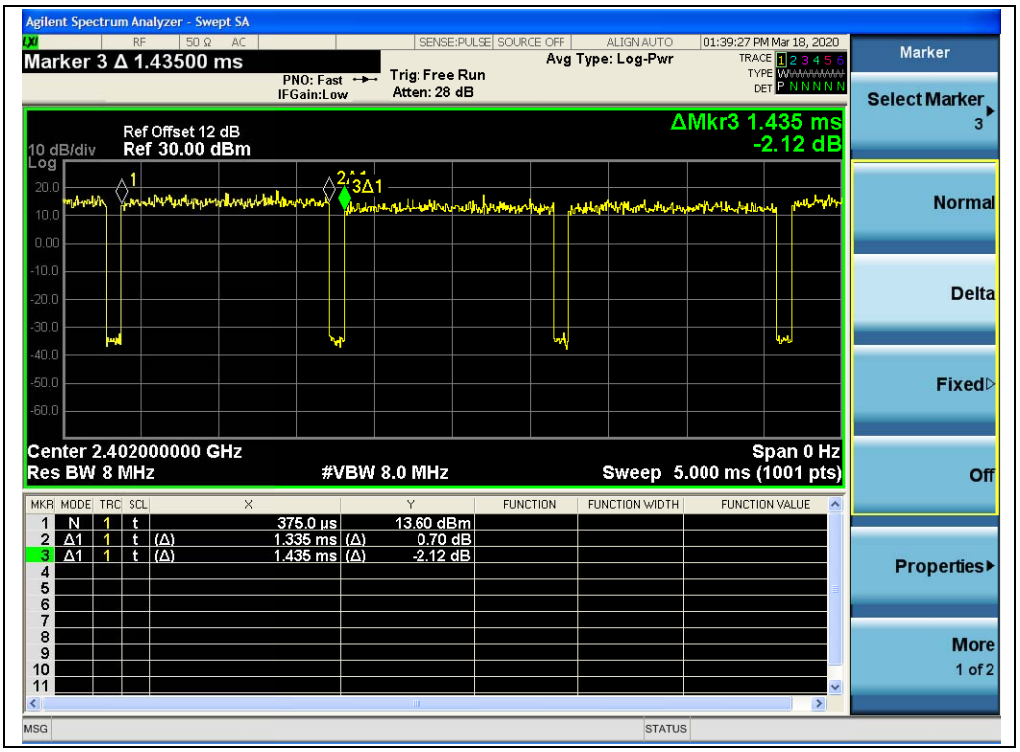
B. Test Plots



(Channel 1, 2412MHz, 802.11b)



(Channel 1, 2412MHz, 802.11g)



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

2.3. Maximum Peak and Average Conducted Output Power

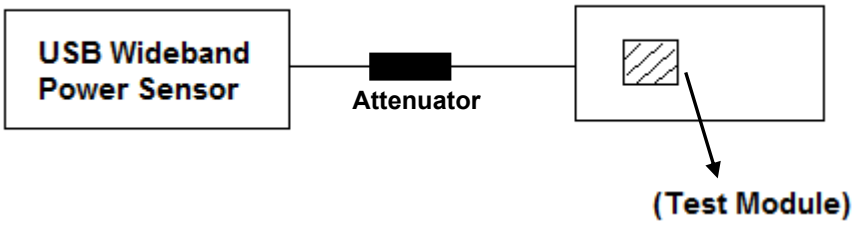
2.3.1. Requirement

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.

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 Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	23.65	0.232	30	1	PASS
6	2437	24.34	0.272			PASS
11	2462	23.86	0.243			PASS

802.11g Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	25.86	0.385	30	1	PASS
6	2437	25.72	0.373			PASS
11	2462	26.17	0.414			PASS

802.11n (HT20) Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	**26.23**	**0.420**	30	1	PASS
6	2437	26.06	0.404			PASS
11	2462	25.95	0.394			PASS

Maximum Average Conducted Output Power

802.11b Test Mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
1	2412	21.64	0.00	21.64	0.146	30	1	PASS
6	2437	21.92		**21.92**	**0.156**			PASS
11	2462	21.57		21.57	0.144			PASS

802.11g Test mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
1	2412	17.74	0.29	18.03	0.064	30	1	PASS
6	2437	17.71		18.00	0.063			PASS
11	2462	17.71		18.00	0.063			PASS

802.11n (HT20) Test mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
1	2412	17.64	0.32	17.96	0.062	30	1	PASS
6	2437	17.37		17.69	0.059			PASS
11	2462	17.30		17.62	0.058			PASS

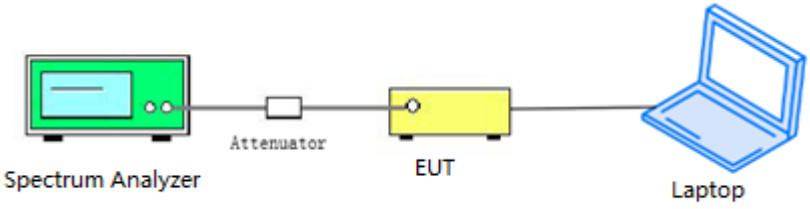
2.4. Bandwidth

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

Test Setup:



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	9.55	≥500	PASS
6	2437	9.02	≥500	PASS
11	2462	9.05	≥500	PASS

B. Test Plots

(Channel 1, 802.11b)

(Channel 6, 802.11b)

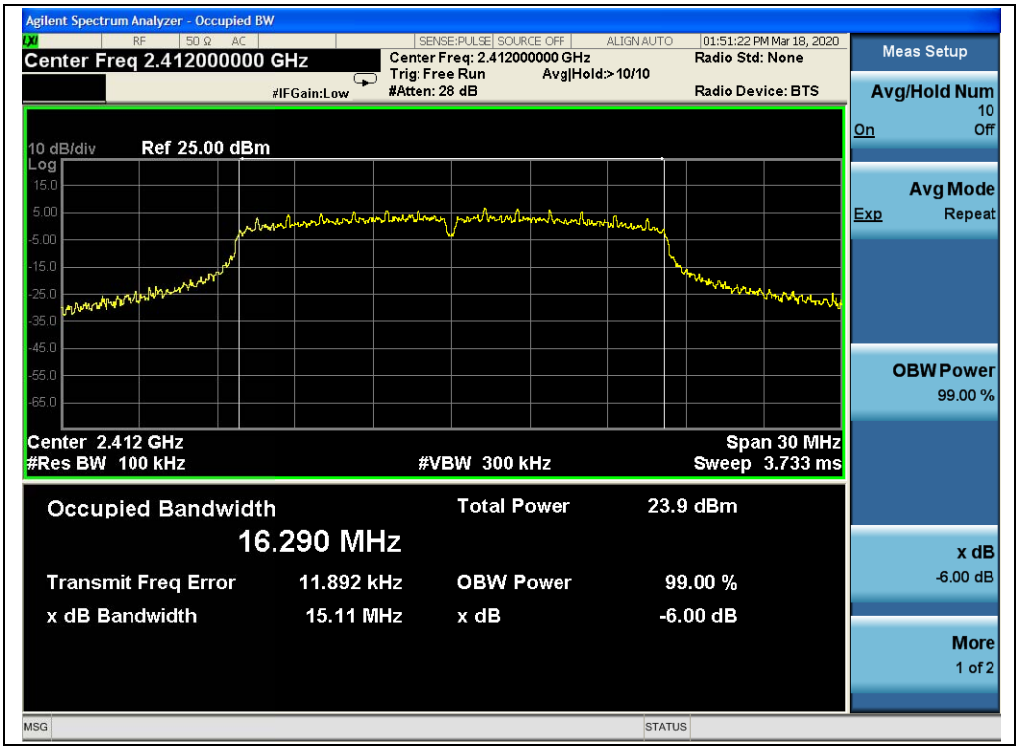
(Channel 11, 802.11b)

802.11g Test mode

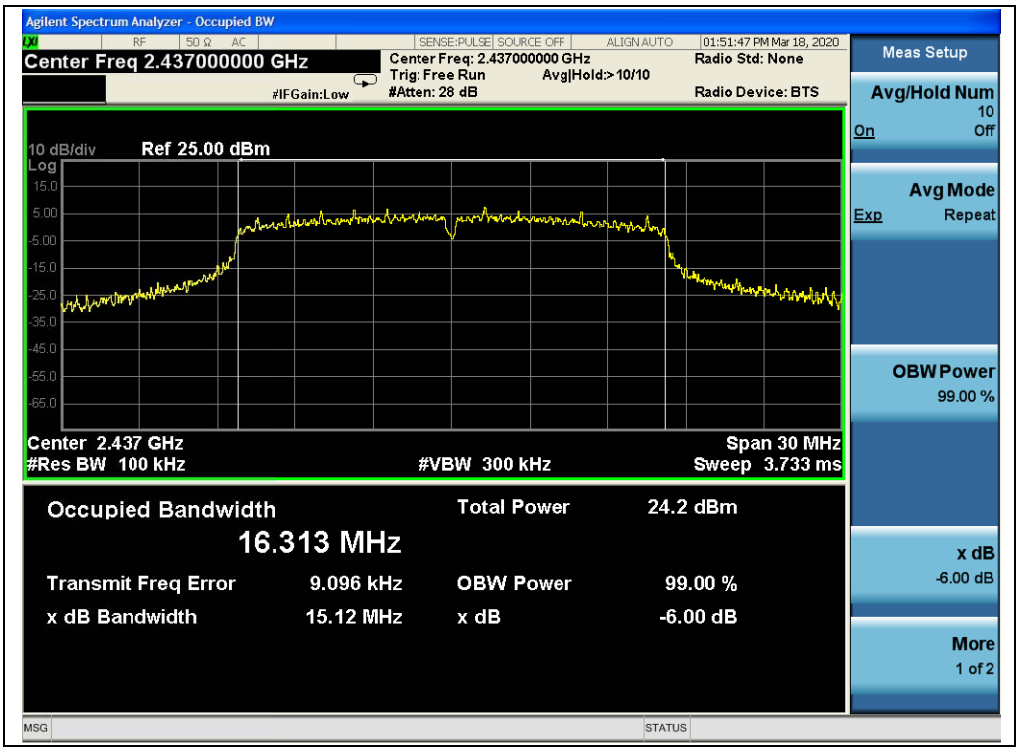
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	15.11	≥500	PASS
6	2437	15.12	≥500	PASS
11	2462	14.44	≥500	PASS

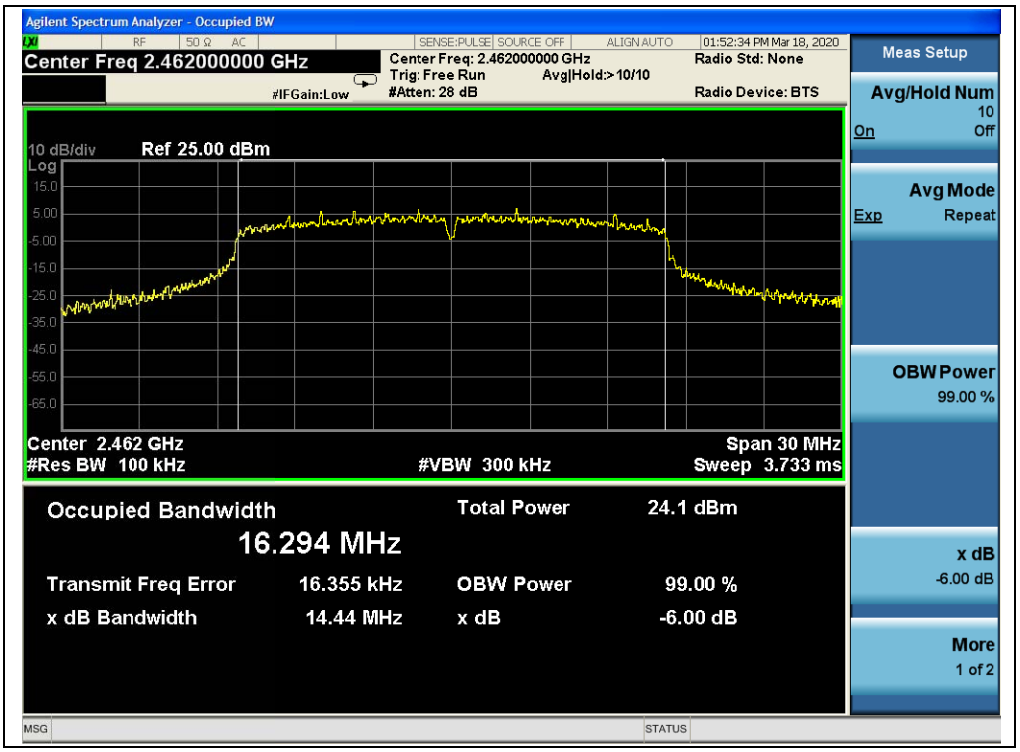
B. Test Plots:



(Channel 1, 802.11g)



(Channel 6, 802.11g)



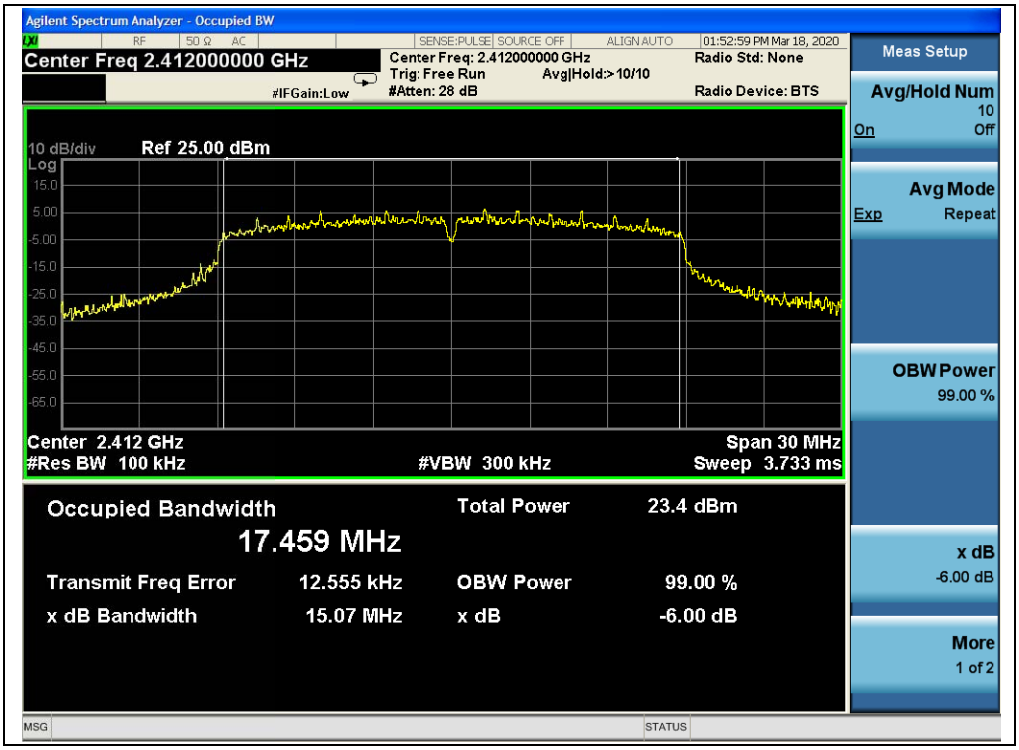
(Channel 11, 802.11g)

802.11n (HT20) Test mode

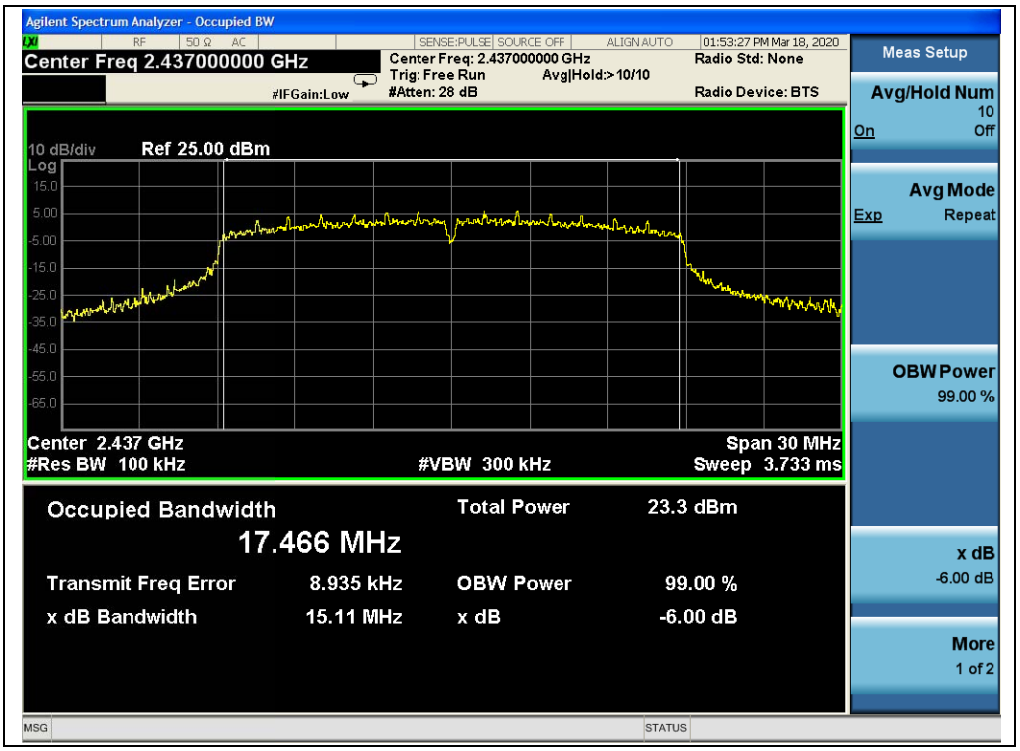
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	15.07	≥500	PASS
6	2437	15.11	≥500	PASS
11	2462	15.05	≥500	PASS

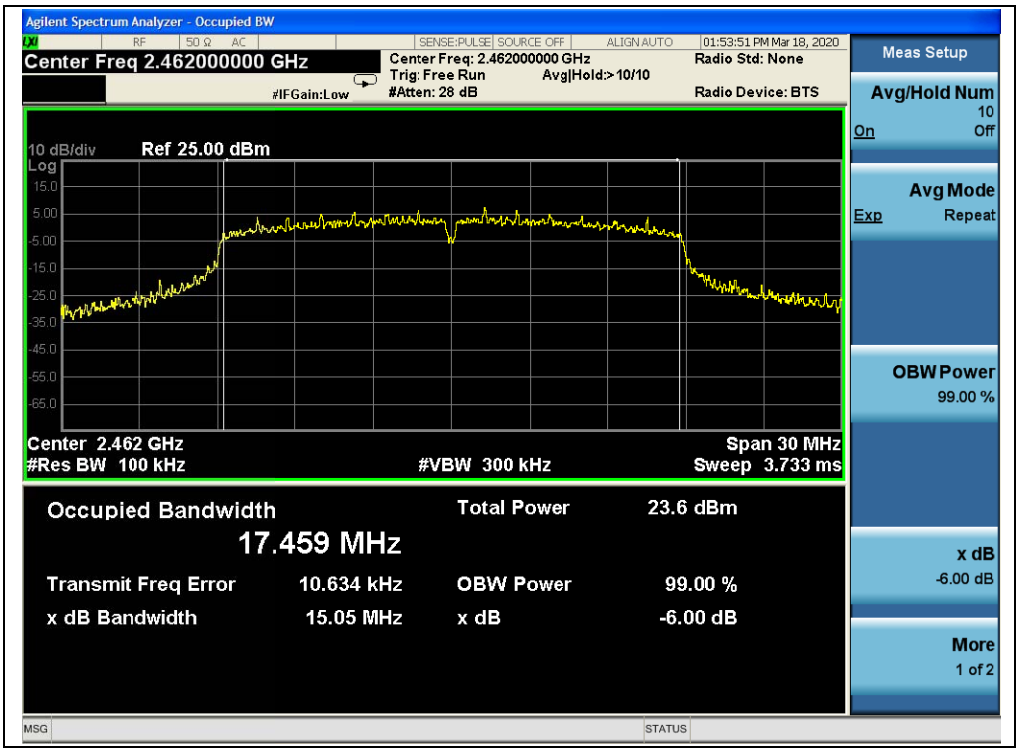
B. Test Plots:



(Channel 1, 802.11n(HT20))



(Channel 6, 802.11n(HT20))



(Channel 11, 802.11n(HT20))

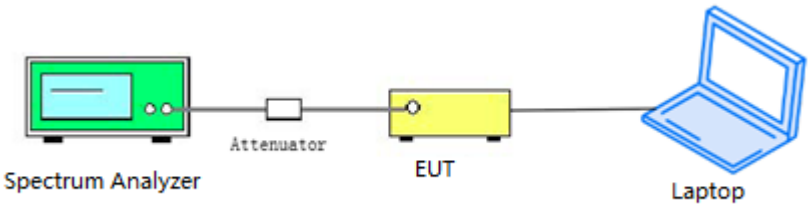
2.5. Conducted Spurious Emissions and Band Edge

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

Test Setup:



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.

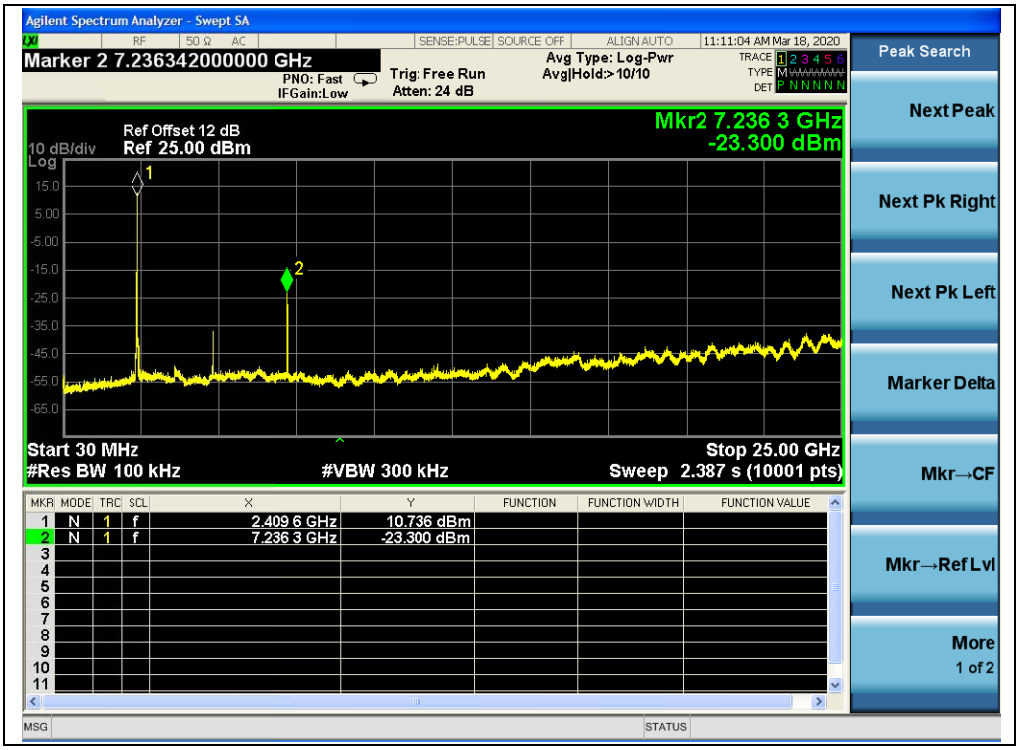
2.5.4. Test Result

802.11b Test mode

A. Test Verdict:

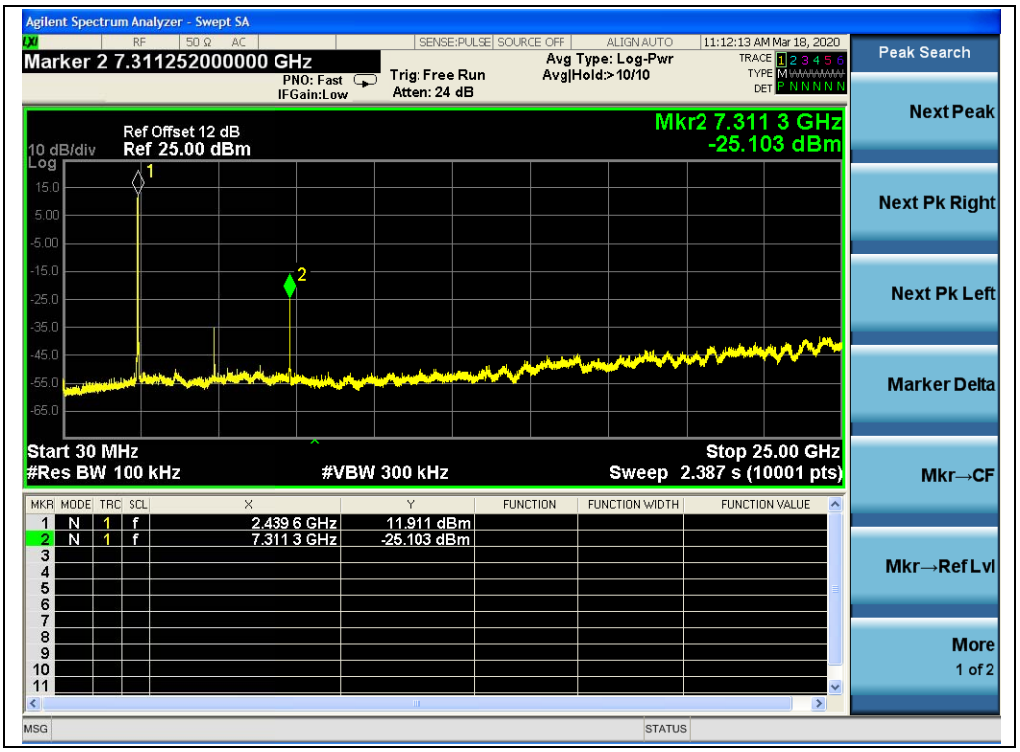
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-23.30	10.74	-9.26	PASS
6	2437	-25.10	11.91	-8.09	PASS
11	2462	-26.58	12.74	-7.26	PASS

B. Test Plots:

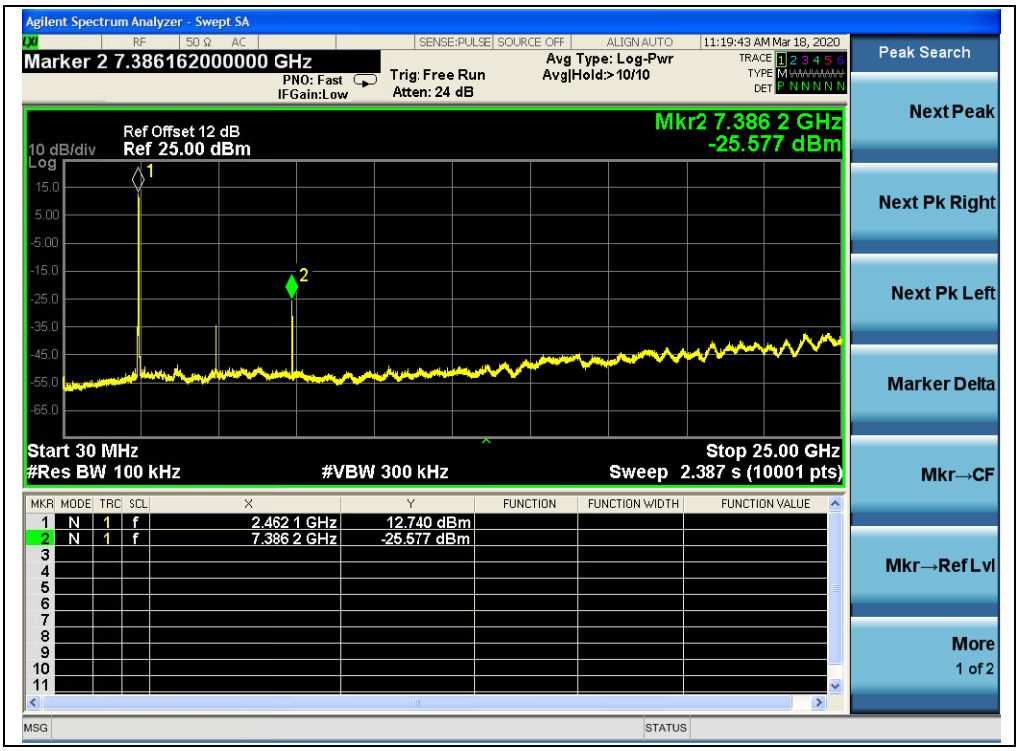


(Channel = 1, 30MHz to 25GHz)

(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)

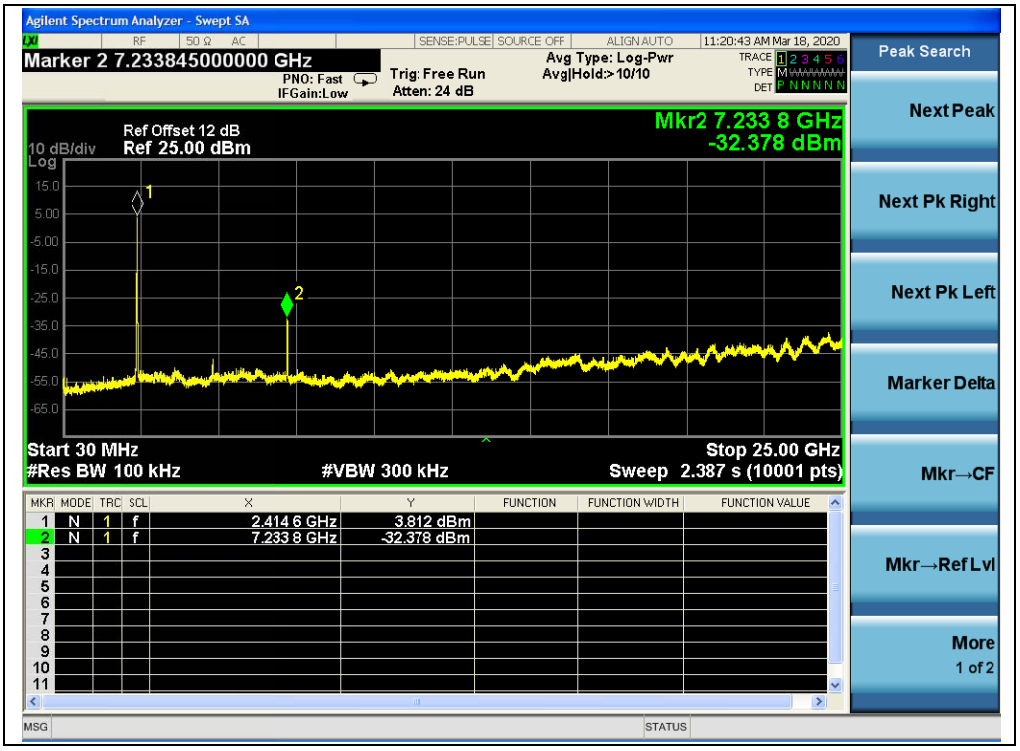
(Band Edge, Channel = 11)

802.11g Test mode

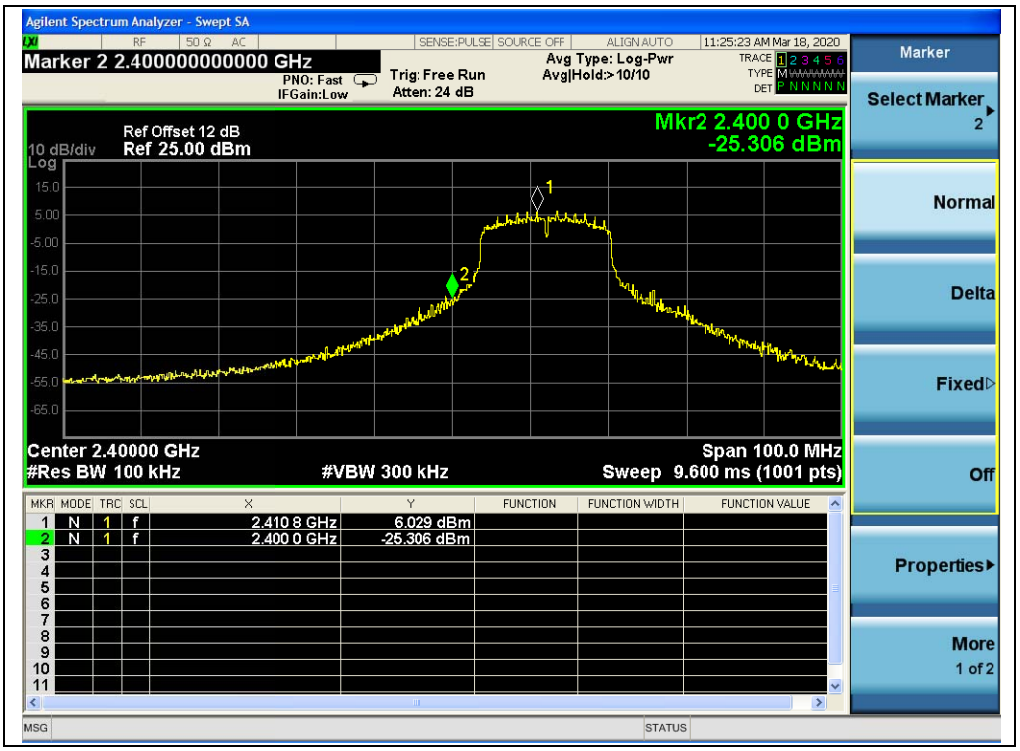
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-32.38	3.81	-16.19	PASS
6	2437	-33.16	4.44	-15.56	PASS
11	2462	-34.11	4.67	-15.33	PASS

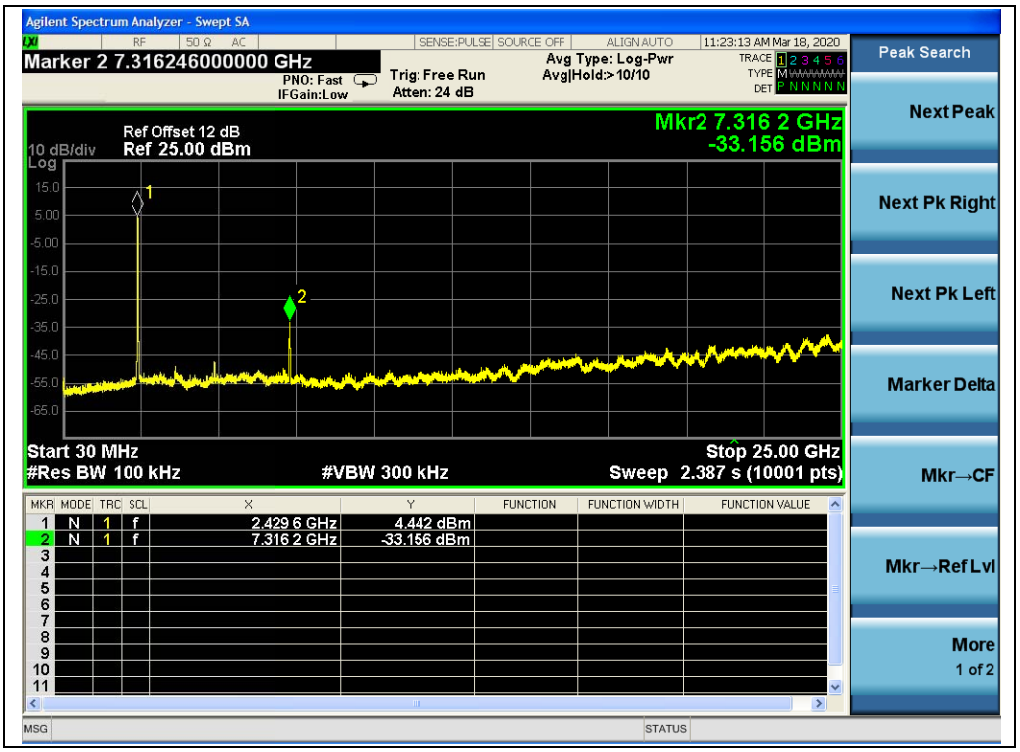
B. Test Plots:



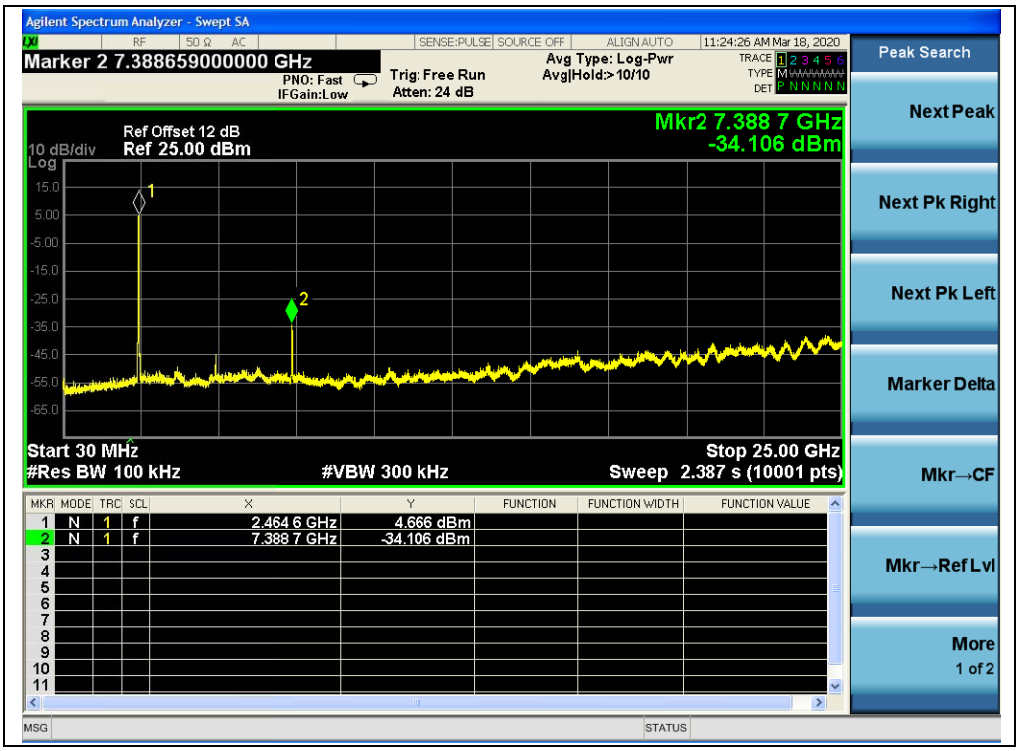
(Channel = 1, 30MHz to 25GHz)



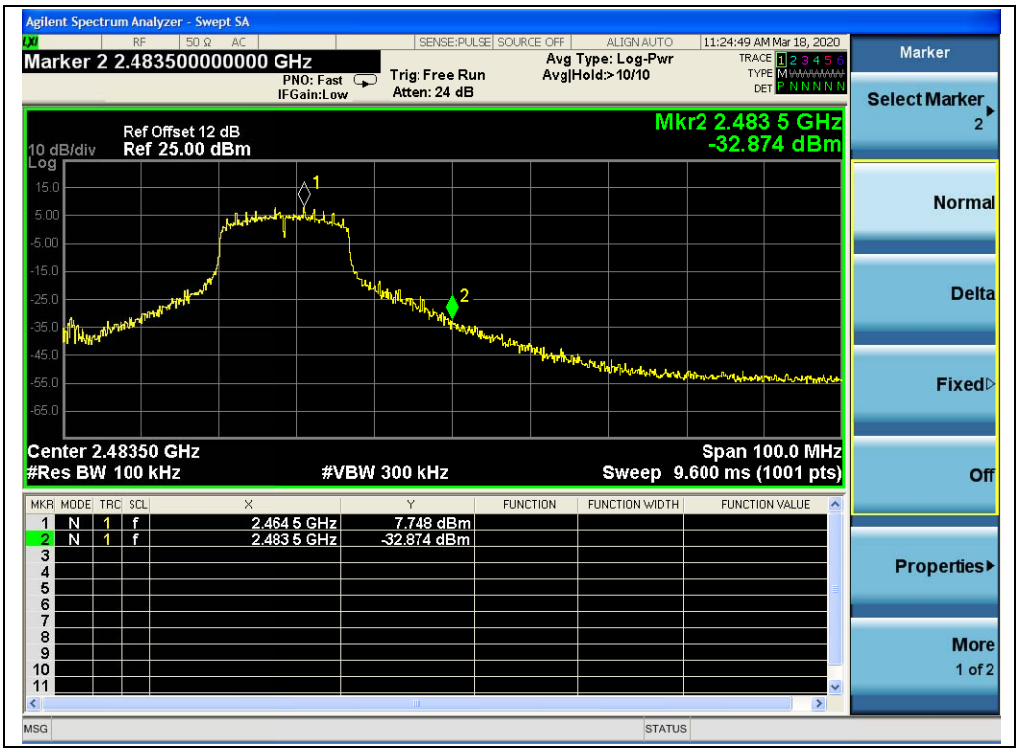
(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



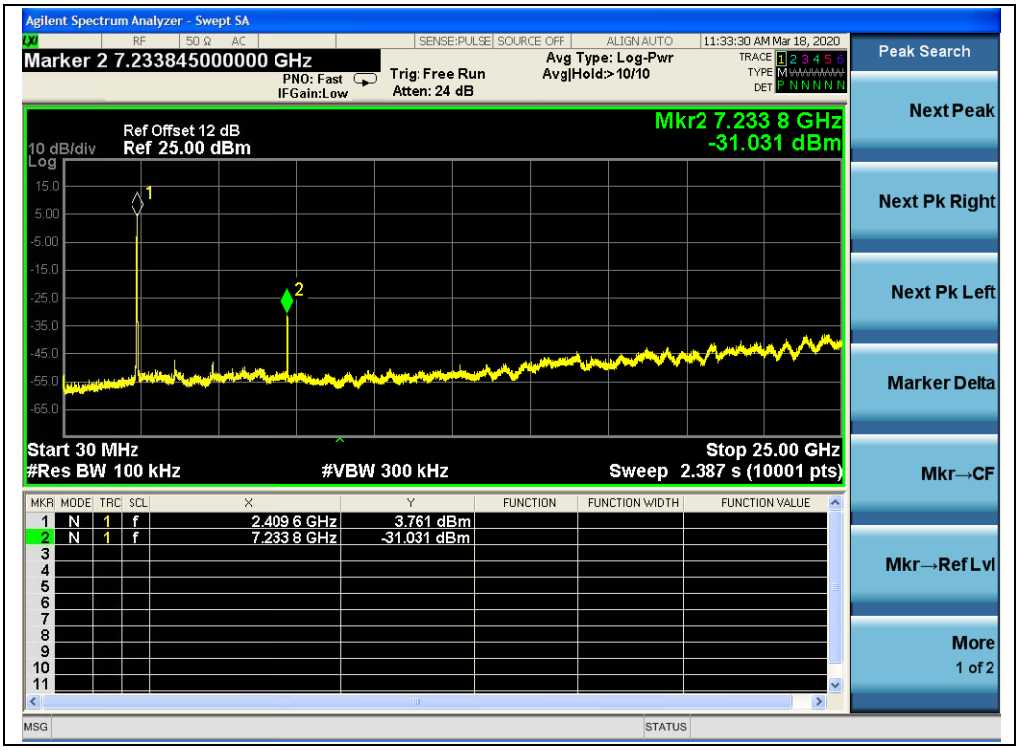
(Band Edge, Channel = 11)

802.11n (HT20) Test mode

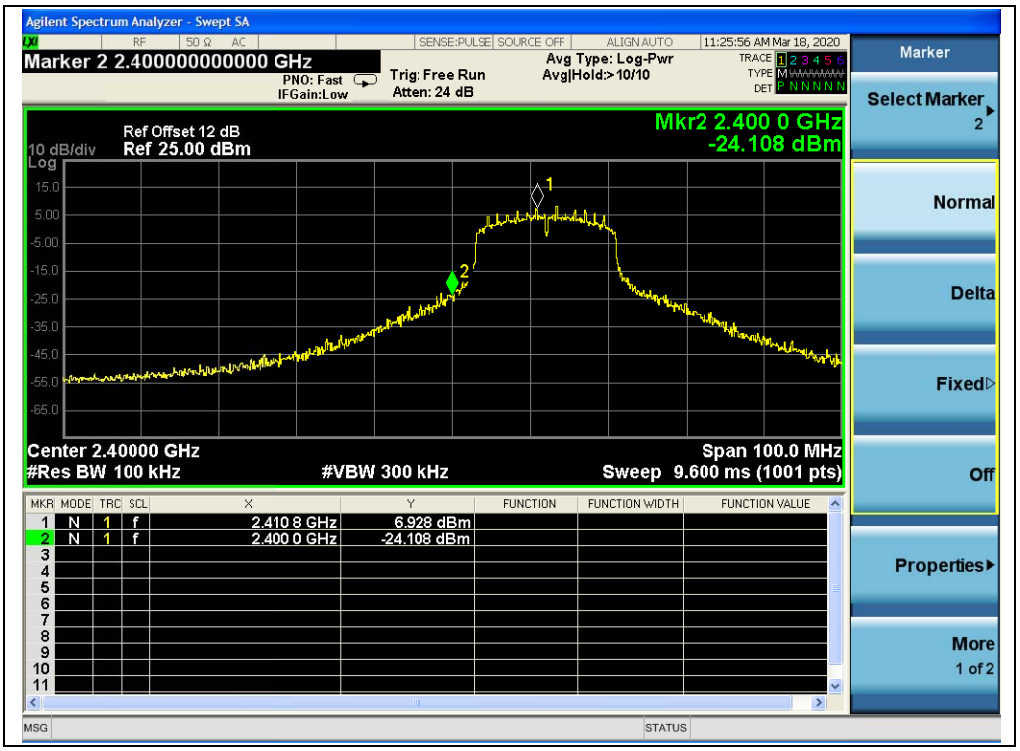
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-31.03	3.76	-16.24	PASS
6	2437	-32.03	7.18	-12.82	PASS
11	2462	-33.24	7.23	-12.77	PASS

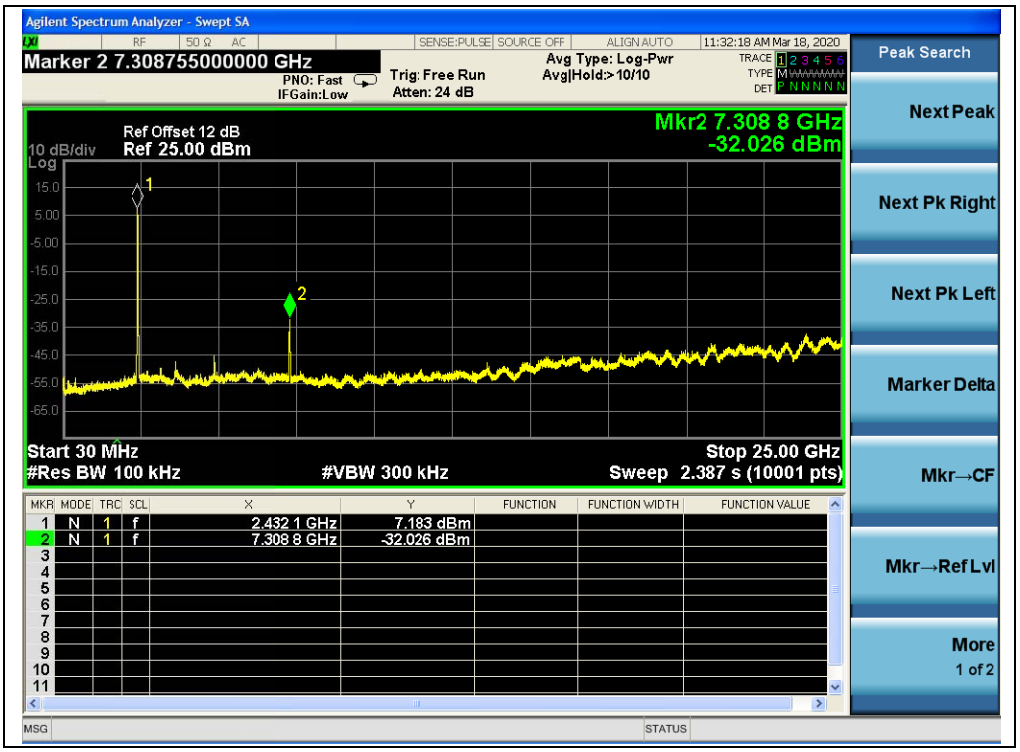
B. Test Plots:



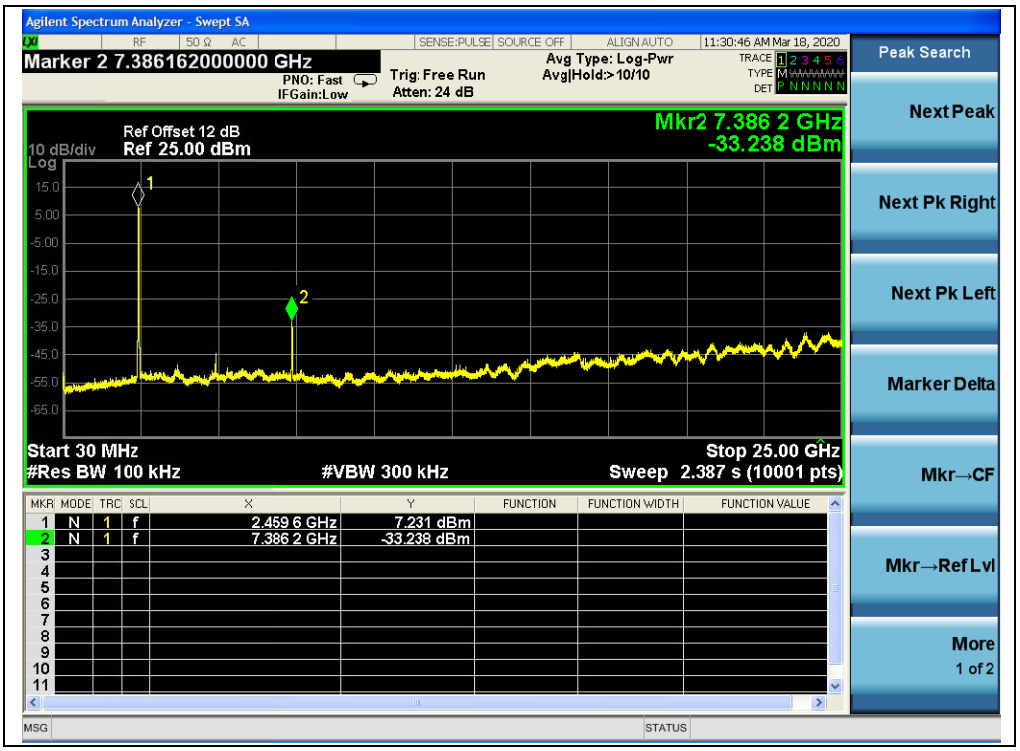
(Channel = 1, 30MHz to 25GHz)



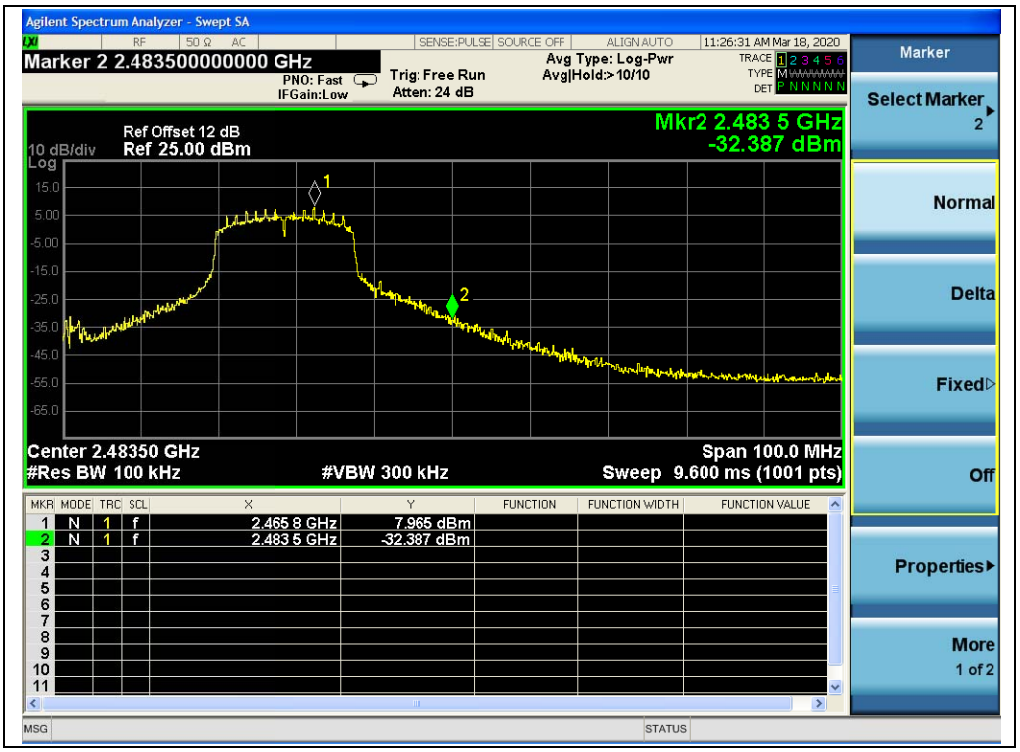
(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)



(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

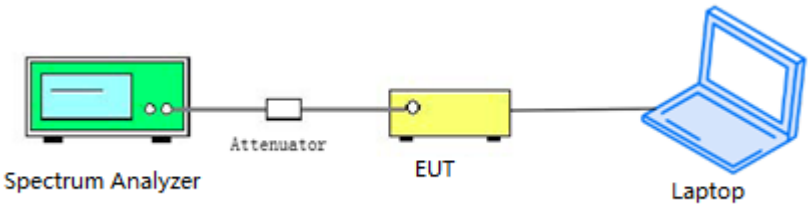
2.6. Power Spectral Density (PSD)

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

Test Setup:



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:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-0.27	8	PASS
6	2437	-1.65	8	PASS
11	2462	-0.40	8	PASS

B. Test Plots:

(Channel = 1, 802.11b)

(Channel = 6, 802.11b)

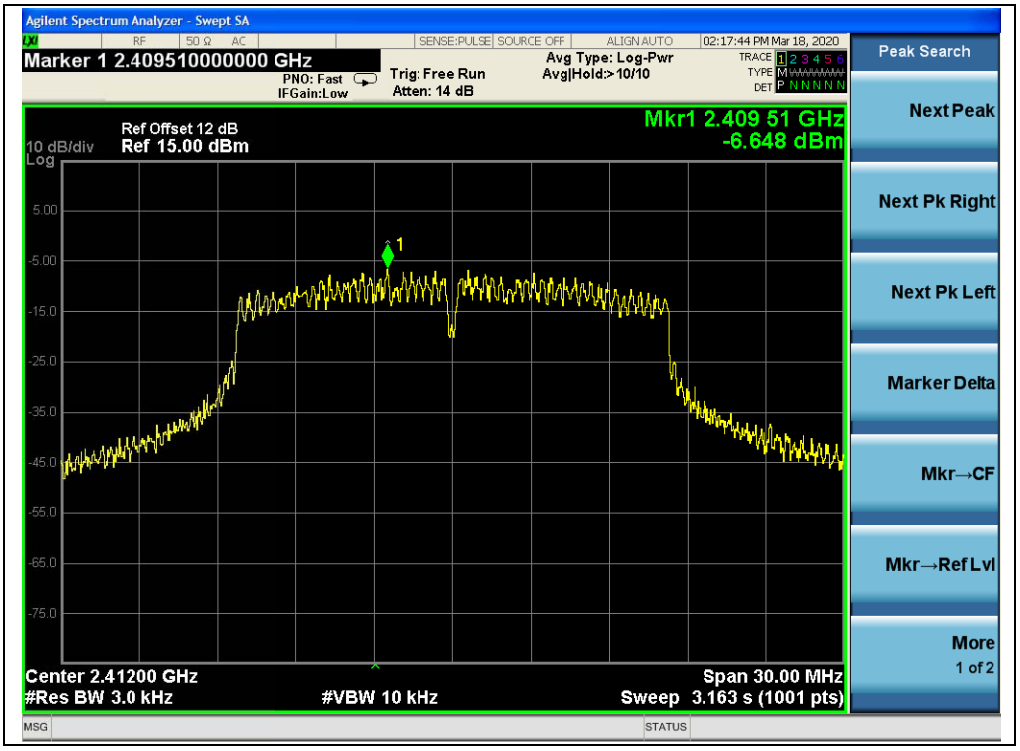
(Channel = 11, 802.11b)

802.11g Test mode

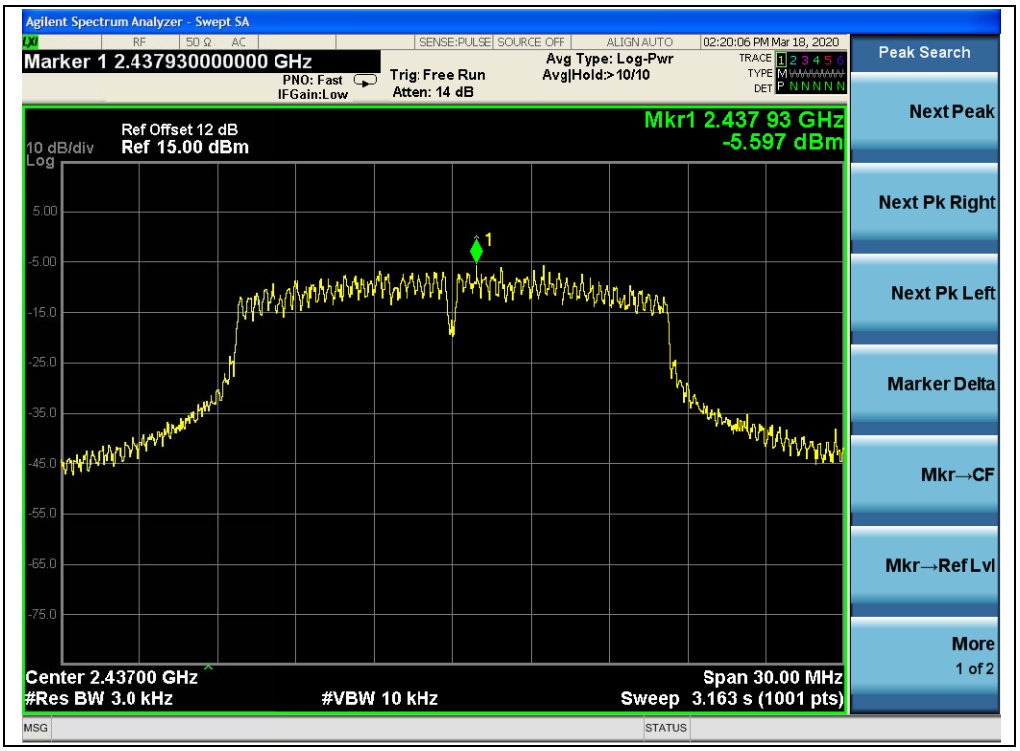
A. Test Verd0.90t:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-6.65	8	PASS
6	2437	-5.60	8	PASS
11	2462	-4.63	8	PASS

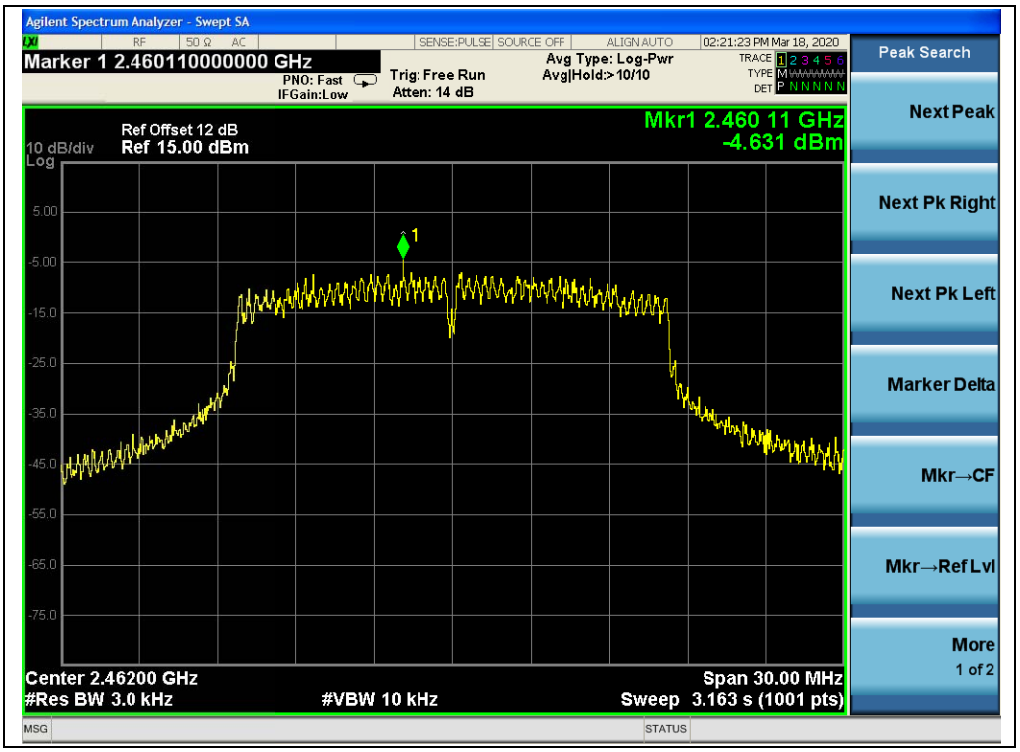
B. Test Plots:



(Channel = 1, 802.11g)



(Channel = 6, 802.11g)



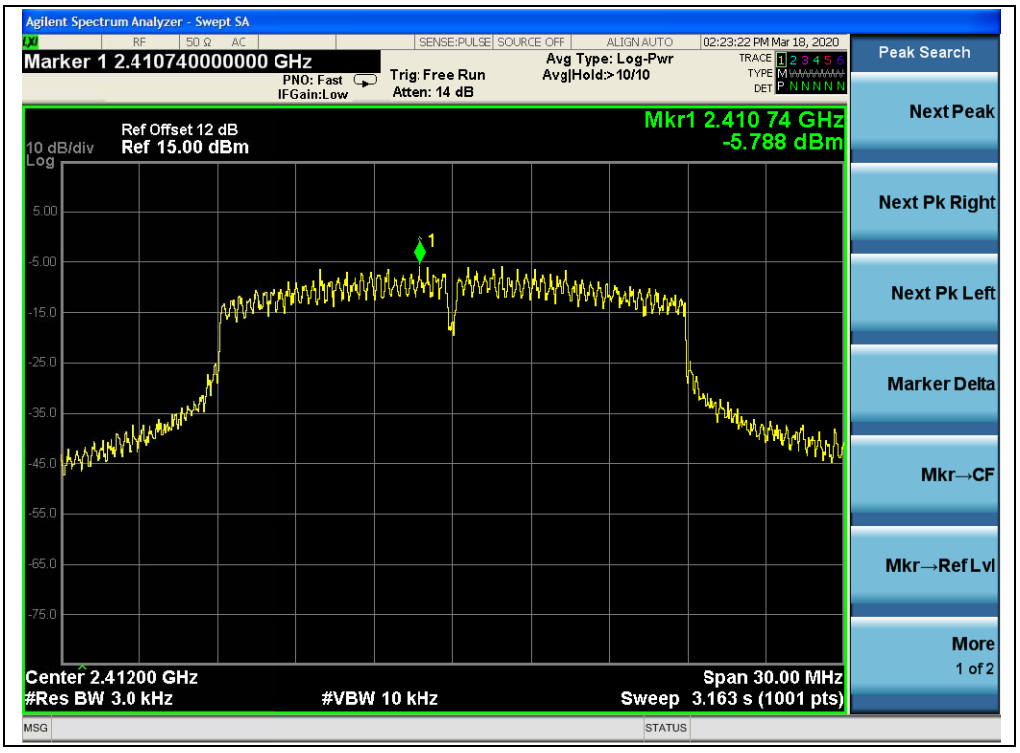
(Channel = 11, 802.11g)

802.11n (HT20) Test mode

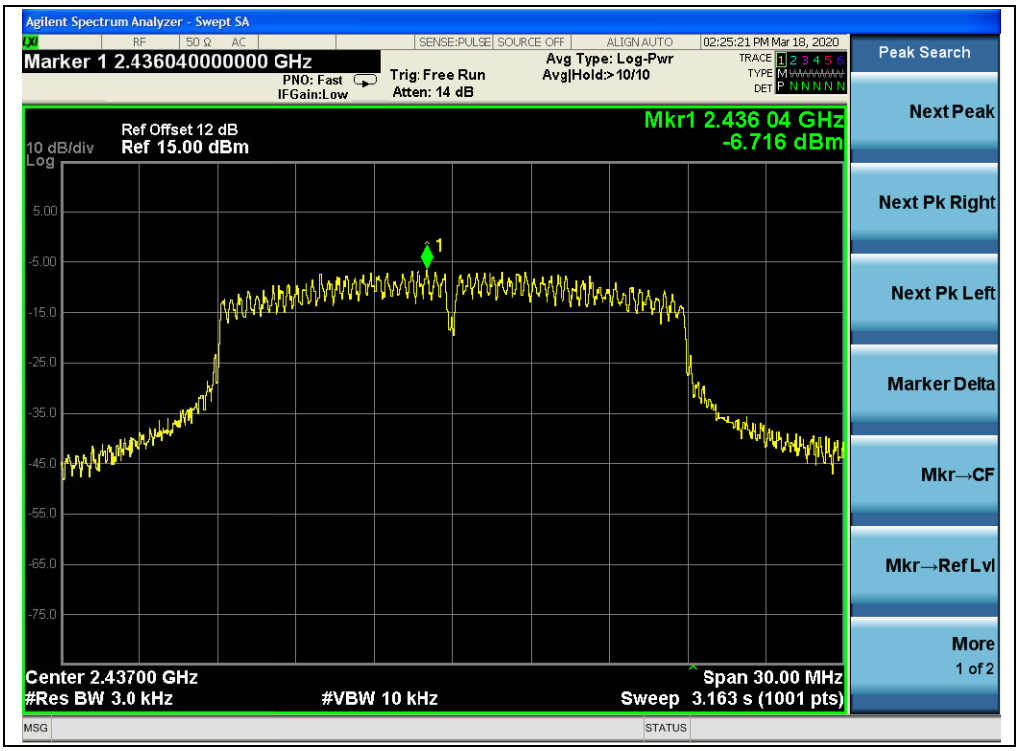
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-5.79	8	PASS
6	2437	-6.72	8	PASS
11	2462	-6.15	8	PASS

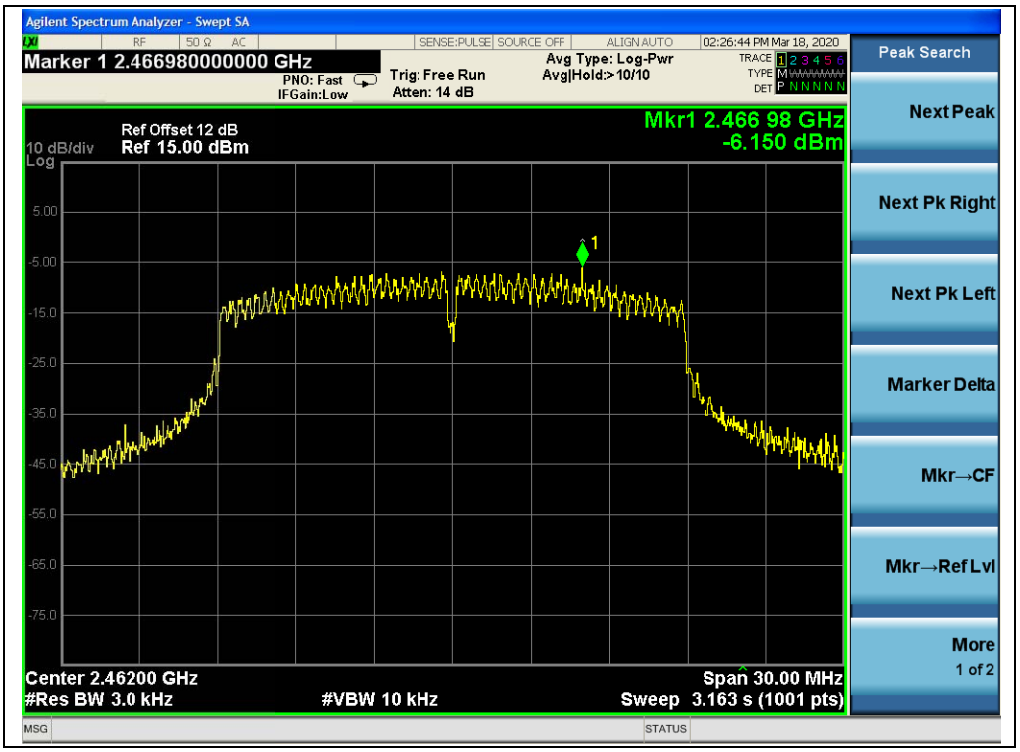
B. Test Plots:



(Channel = 1, 802.11n(HT20))



(Channel = 6, 802.11n(HT20))



(Channel = 11, 802.11n(HT20))

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

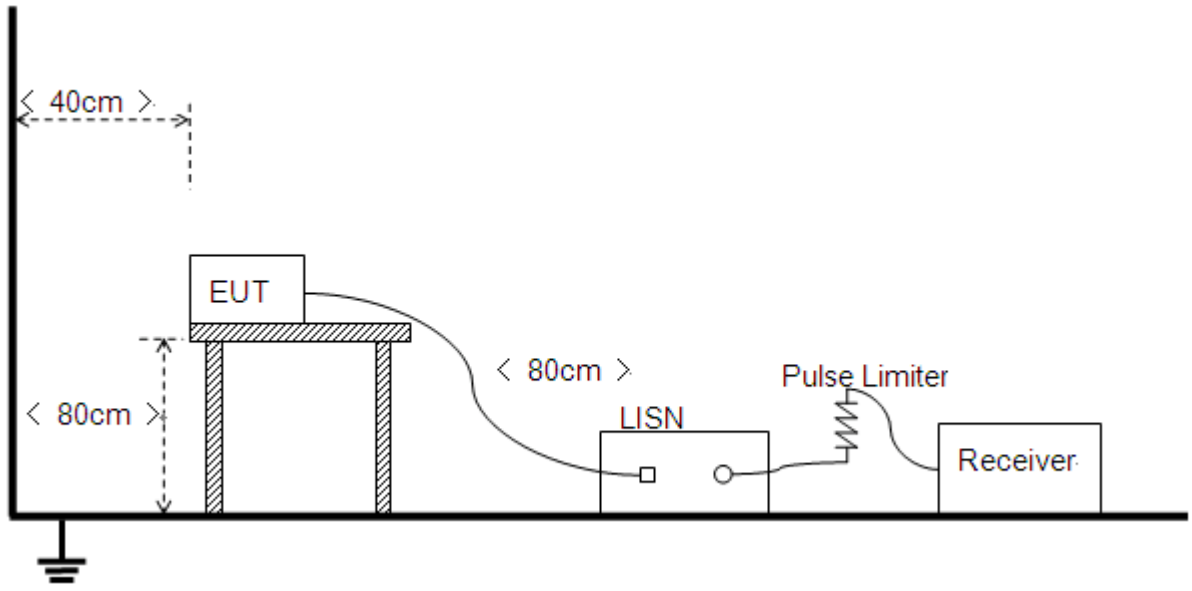
NOTE:

(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

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 Mode1: EUT+ADAPTER+ WIFI TX

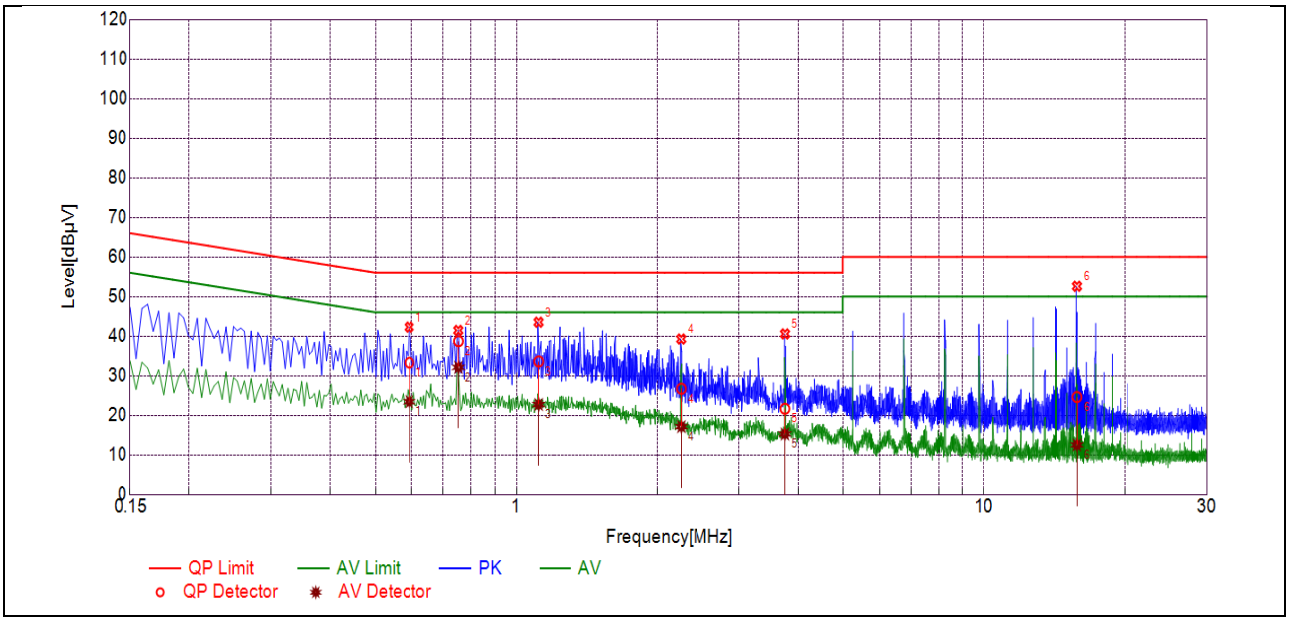
Test Voltage: AC 120V/60Hz

The measurement results are obtained as below:

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

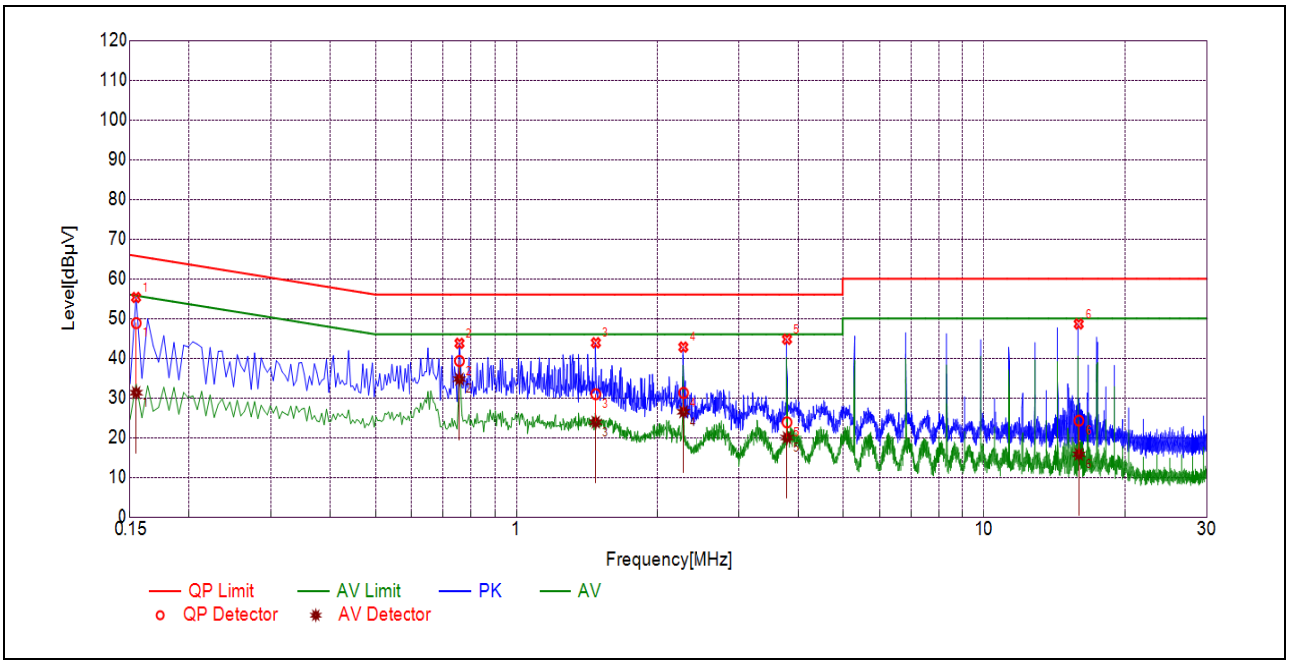
U_R: Receiver Reading

A_{Factor}: Voltage division factor of LISN



(L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.5912	33.28	23.44	56.00	46.00	Line	PASS
2	0.7536	38.72	32.11	56.00	46.00		PASS
3	1.1136	33.61	22.72	56.00	46.00		PASS
4	2.2526	26.72	17.13	56.00	46.00		PASS
5	3.7516	21.65	15.27	56.00	46.00		PASS
6	15.7909	24.62	12.51	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	0.1546	48.83	31.32	65.75	55.75	Neutral	PASS
2	0.7573	39.29	34.74	56.00	46.00		PASS
3	1.4809	30.94	23.89	56.00	46.00		PASS
4	2.2761	31.27	26.50	56.00	46.00		PASS
5	3.7898	23.85	20.01	56.00	46.00		PASS
6	15.9422	24.28	15.82	60.00	50.00		PASS

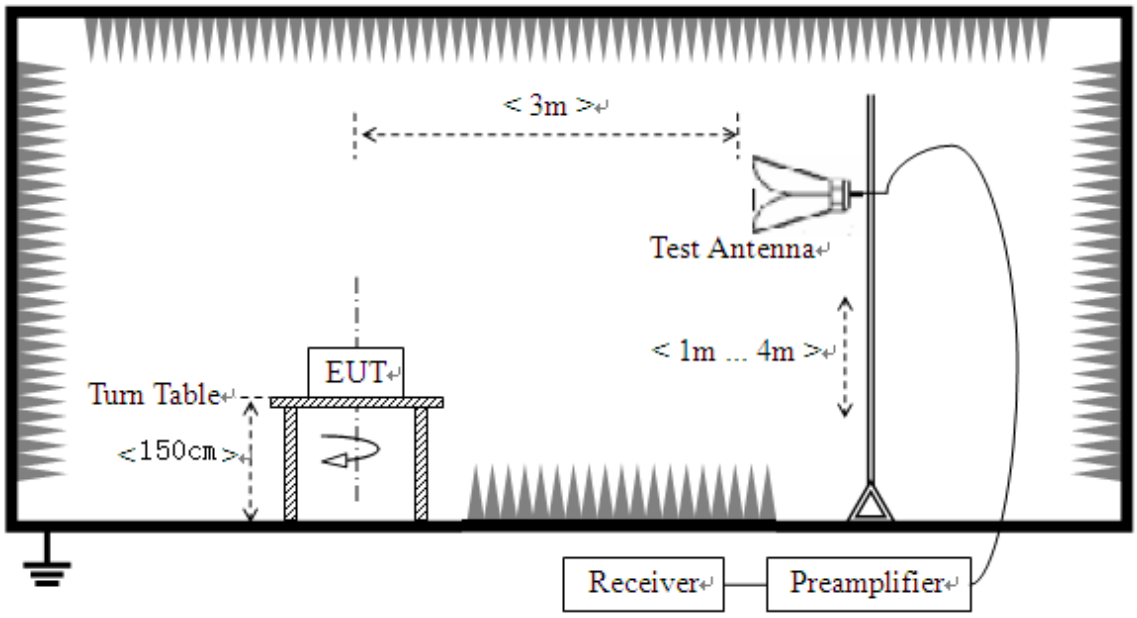
2.8. Restricted Frequency Bands

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

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

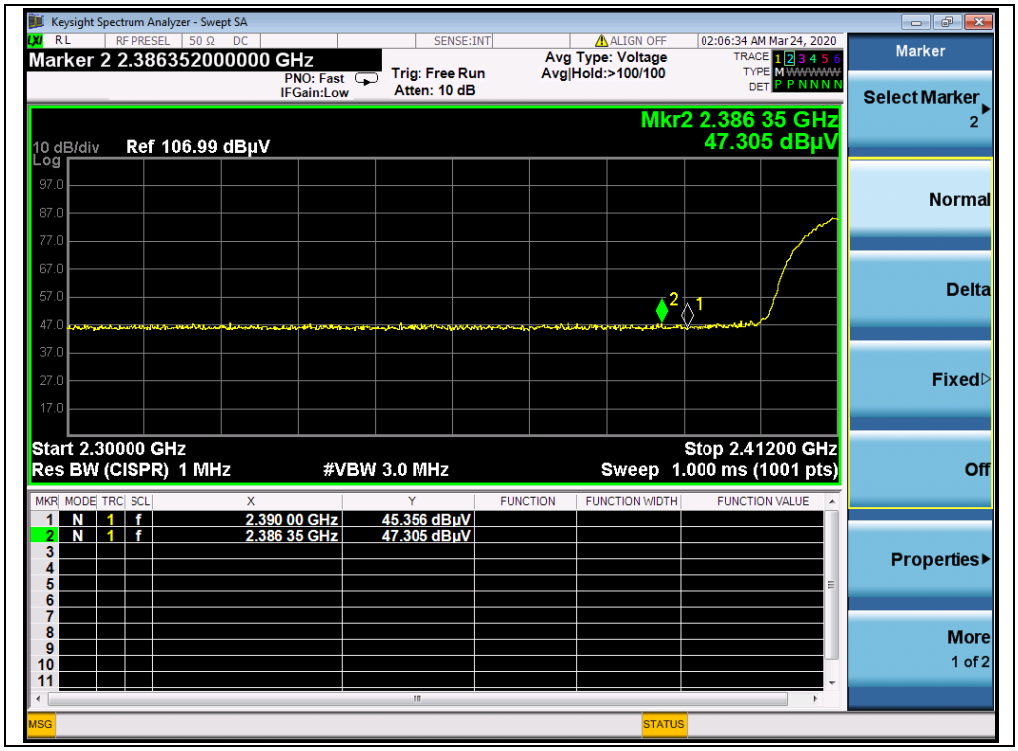
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

802.11b Test mode

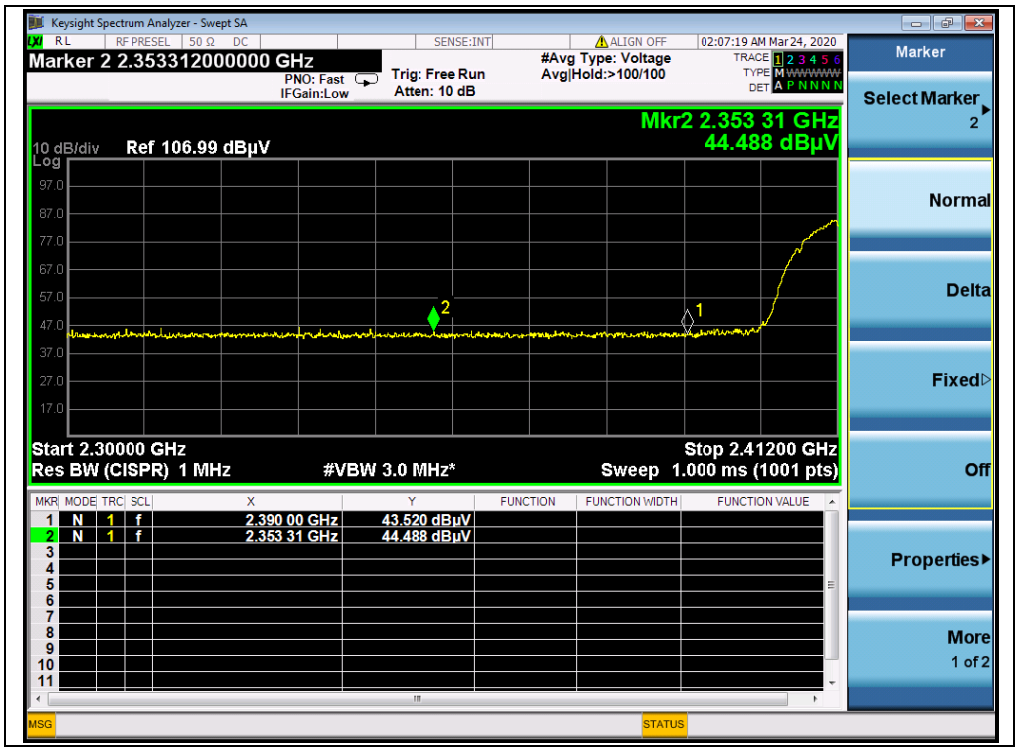
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2386.35	PK	47.31	-29.67	32.56	50.20	74	PASS
1	2353.31	AV	44.49	-29.67	32.56	47.38	54	PASS
11	2483.50	PK	47.62	-29.67	32.56	50.51	74	PASS
11	2486.97	AV	46.05	-29.67	32.56	48.94	54	PASS

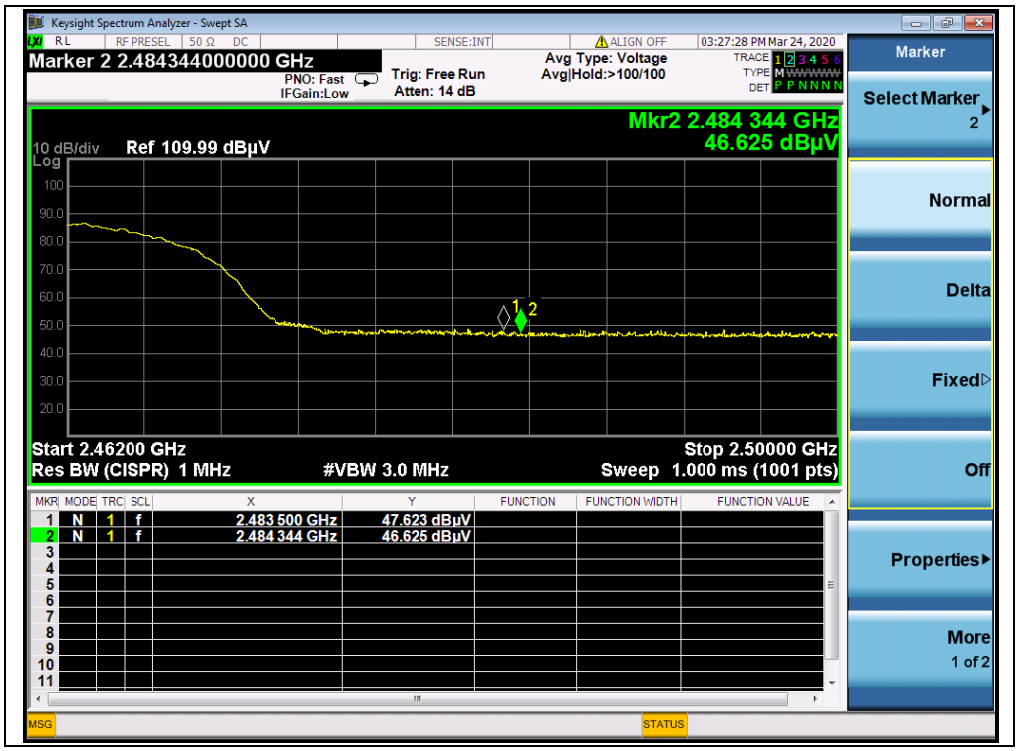
B. Test Plots:



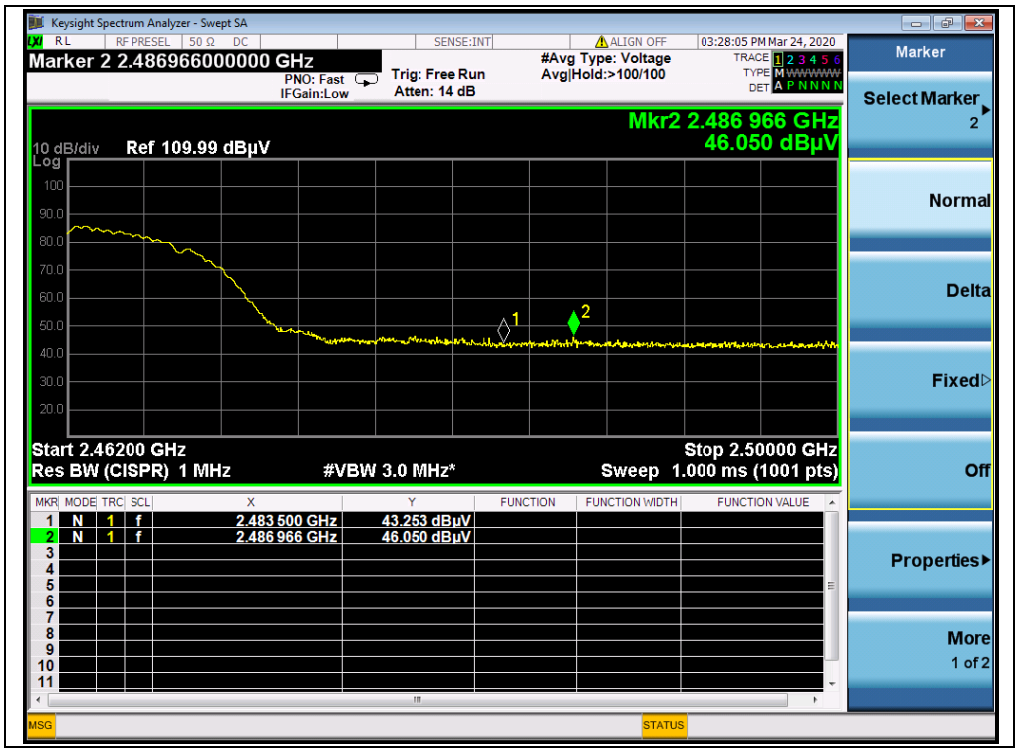
(PEAK, Channel = 1, 802.11b)



(AVG, Channel = 1, 802.11b)



(PEAK, Channel = 11, 802.11b)



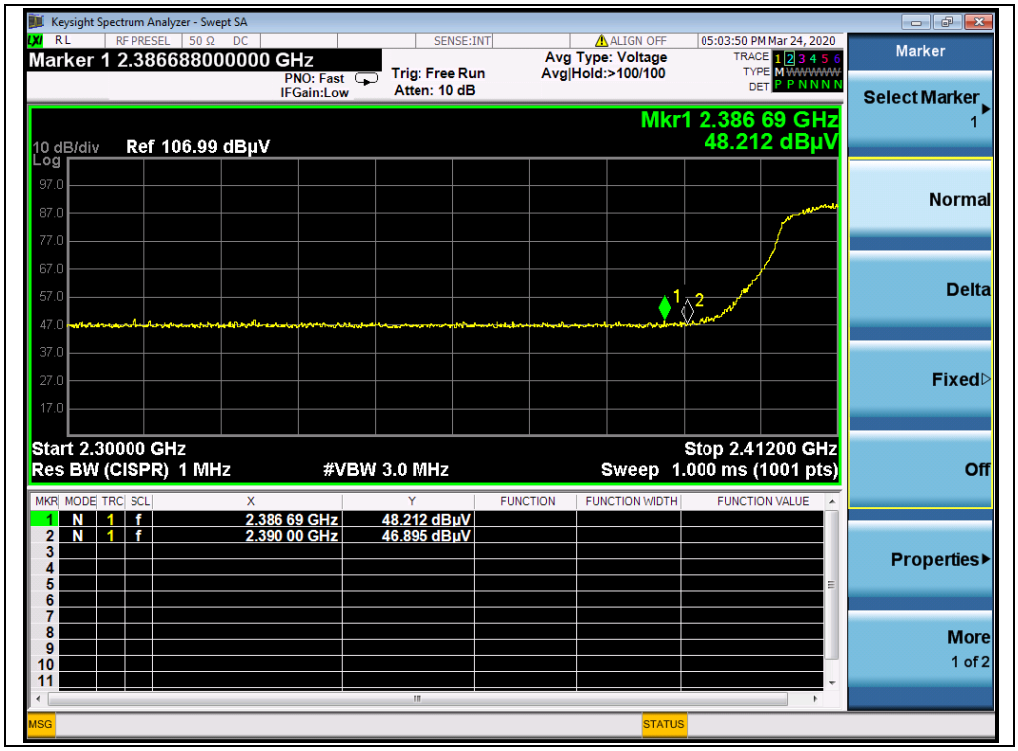
(AVG, Channel = 11, 802.11b)

802.11g Test mode

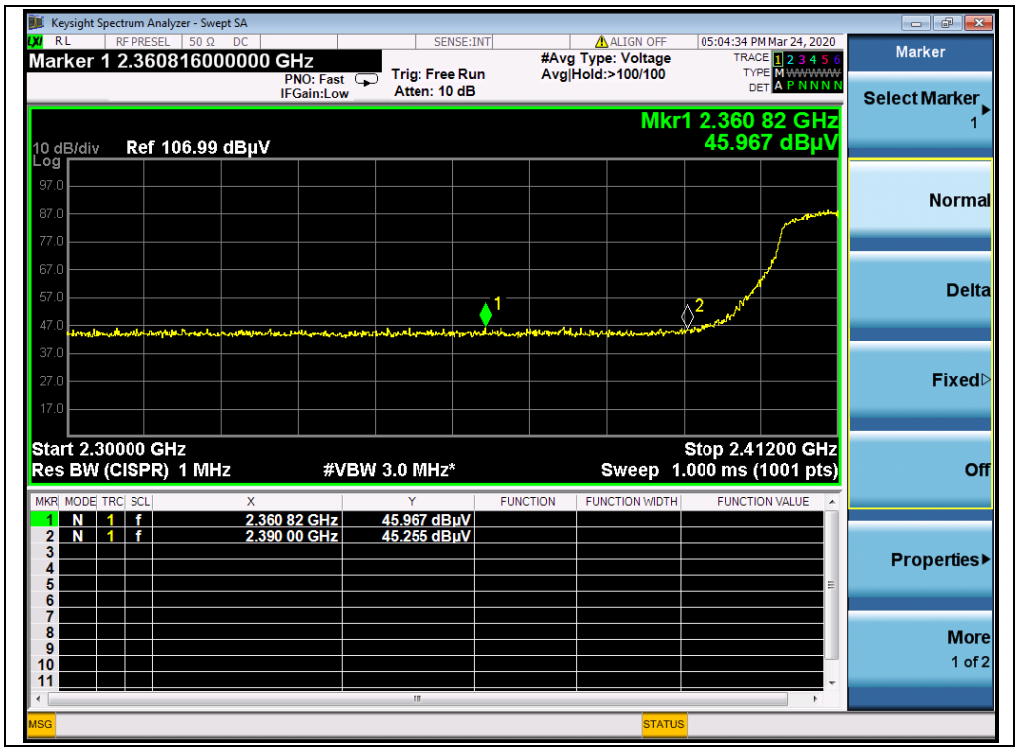
A. Test Verdict:

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	2386.69	PK	48.21	-29.67	32.56	51.10	74	PASS
1	2360.82	AV	45.97	-29.67	32.56	48.86	54	PASS
11	2487.88	PK	47.50	-29.67	32.56	50.39	74	PASS
11	2488.41	AV	45.20	-29.67	32.56	48.09	54	PASS

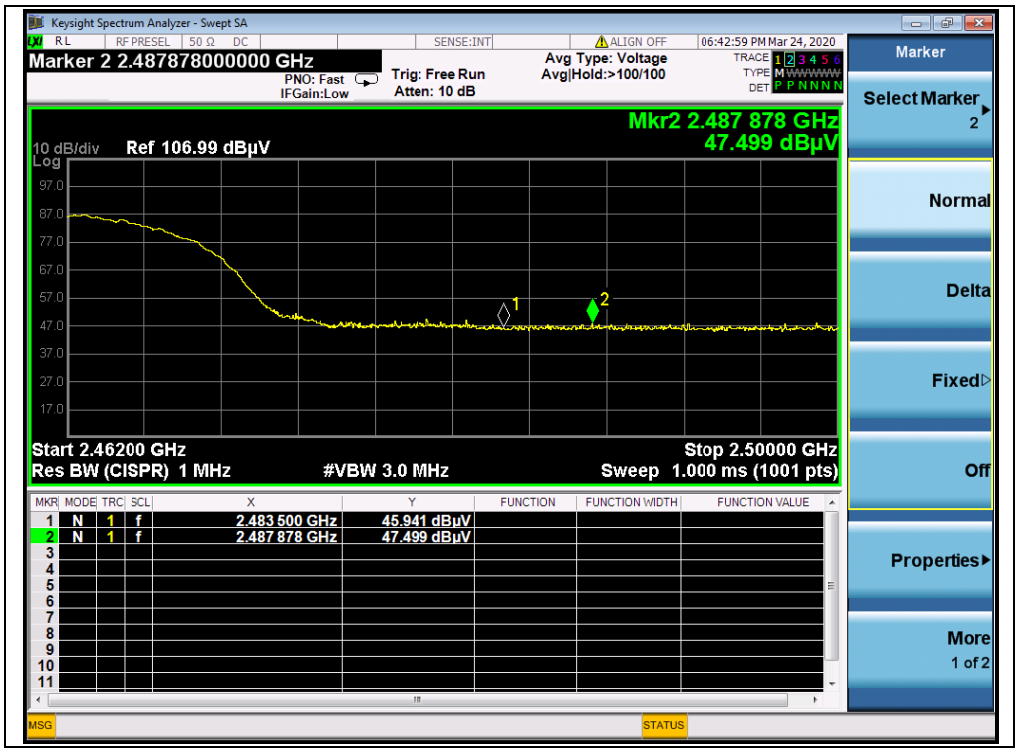
B. Test Plots:



(PEAK, Channel = 1, 802.11g)



(AVG, Channel = 1, 802.11g)



(PEAK, Channel = 11, 802.11g)

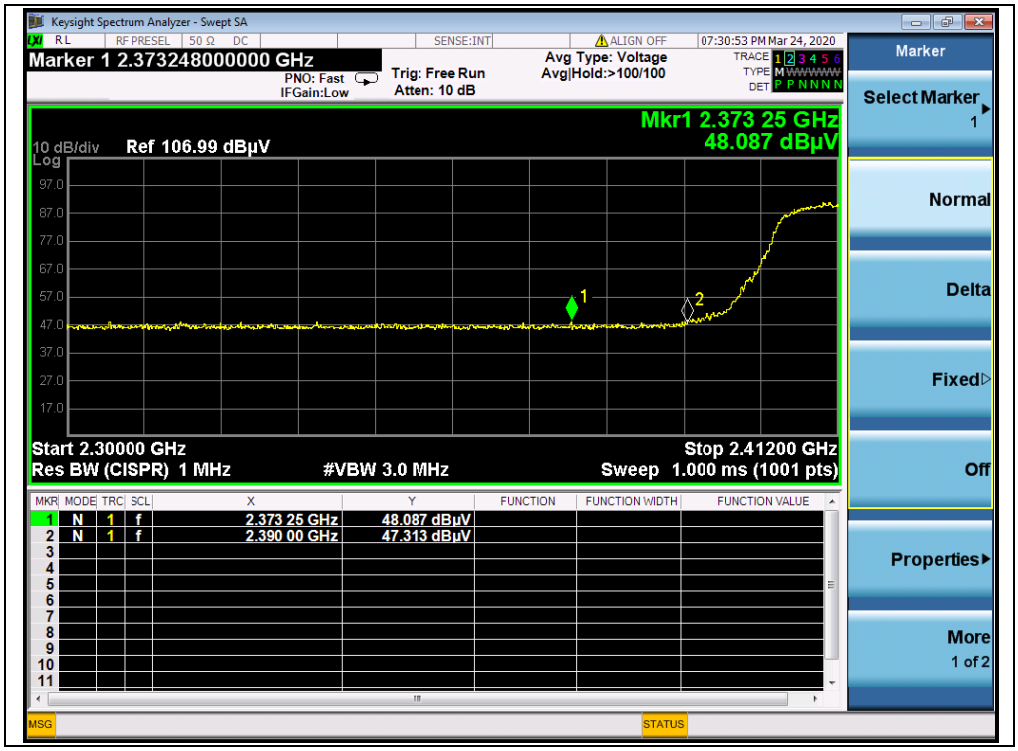
(AVG, Channel = 11,802.11g)

802.11 n (HT20) Test mode

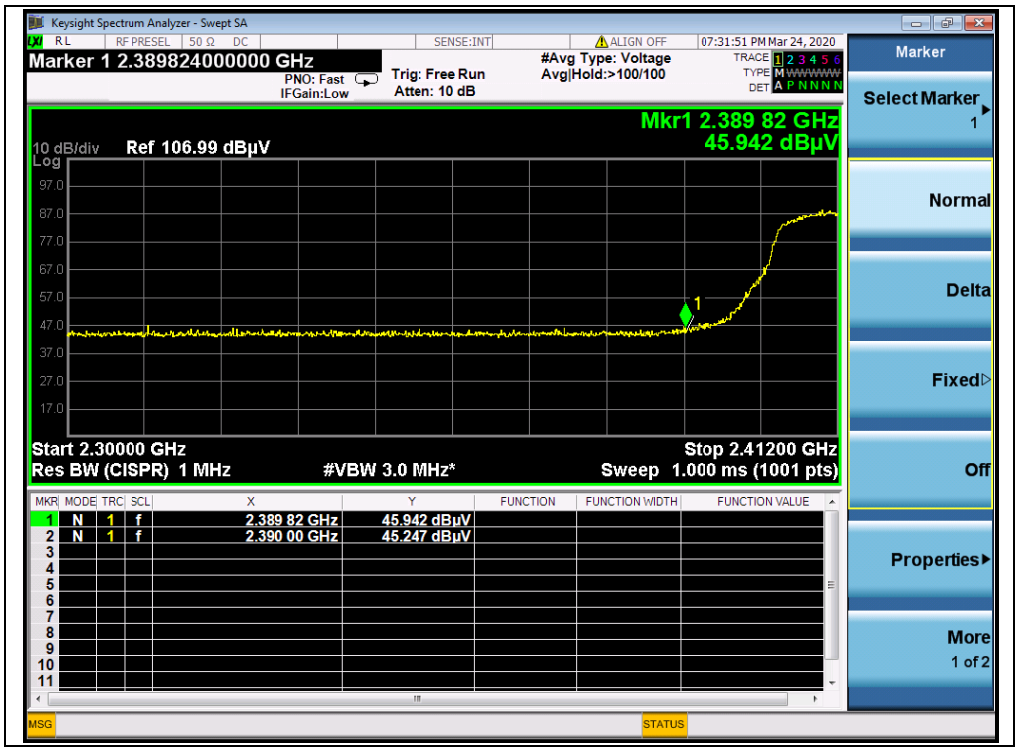
A. Test Verdict:

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	2373.25	PK	48.09	-29.67	32.56	50.98	74	PASS
1	2389.82	AV	45.94	-29.67	32.56	48.83	54	PASS
11	2494.83	PK	48.67	-29.67	32.56	51.56	74	PASS
11	2493.12	AV	45.15	-29.67	32.56	48.04	54	PASS

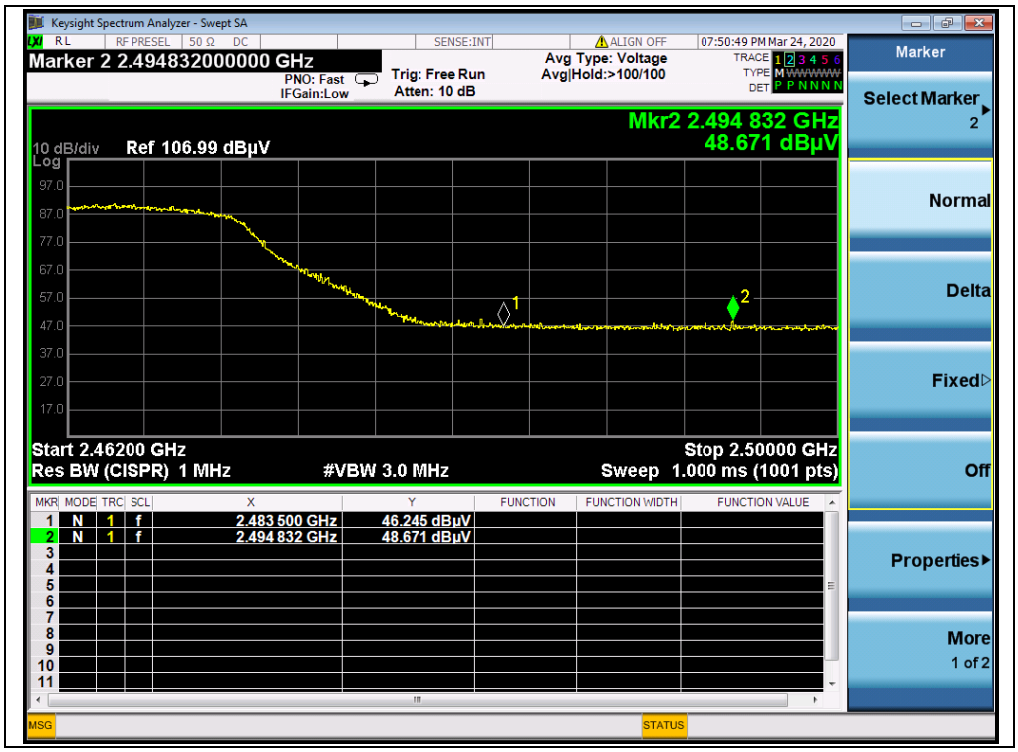
B. Test Plots:



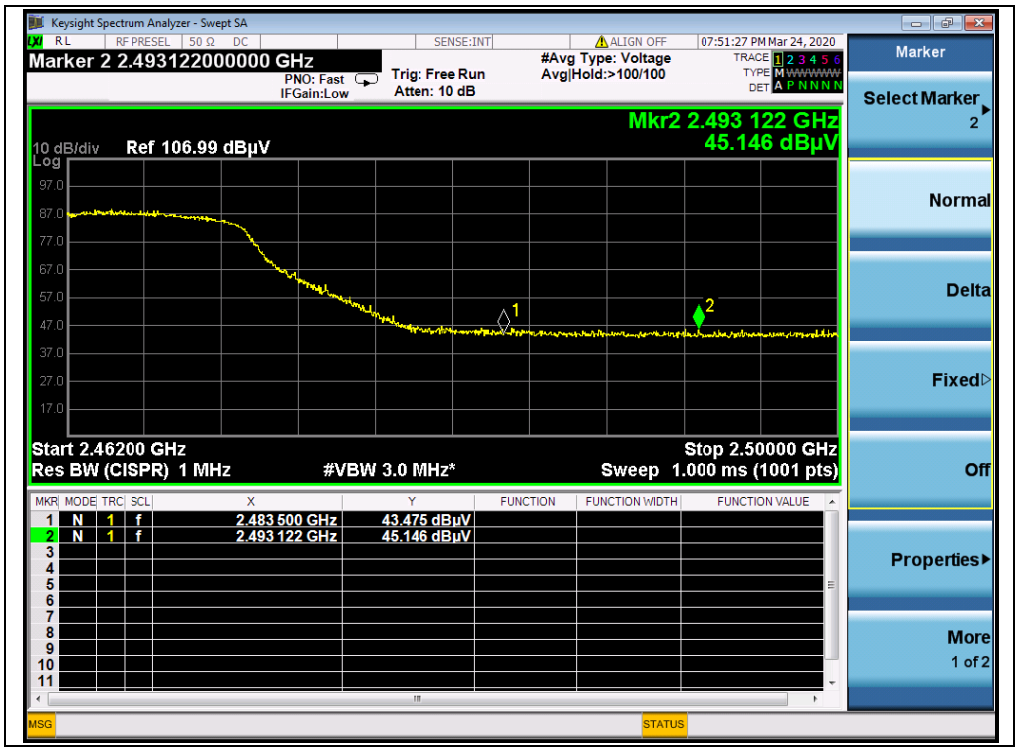
(PEAK, Channel = 1, 802.11n(HT20))



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



(PEAK, Channel = 11, 802.11n(HT20))



(AVG, Channel = 11, 802.11n(HT20))

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

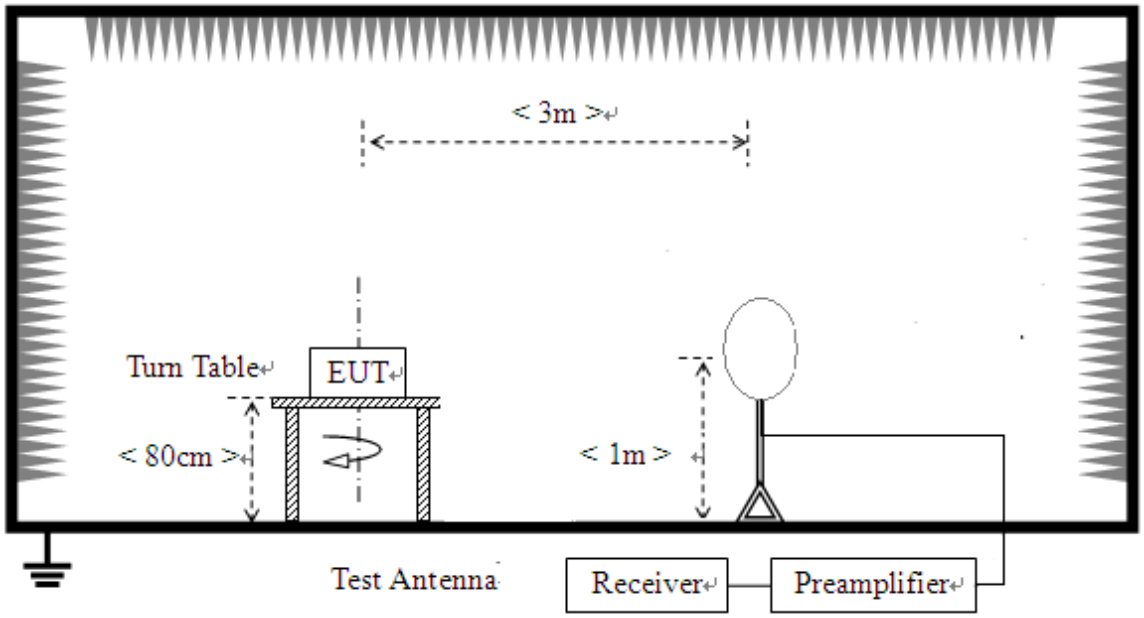
Note1: For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

Note2: 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).

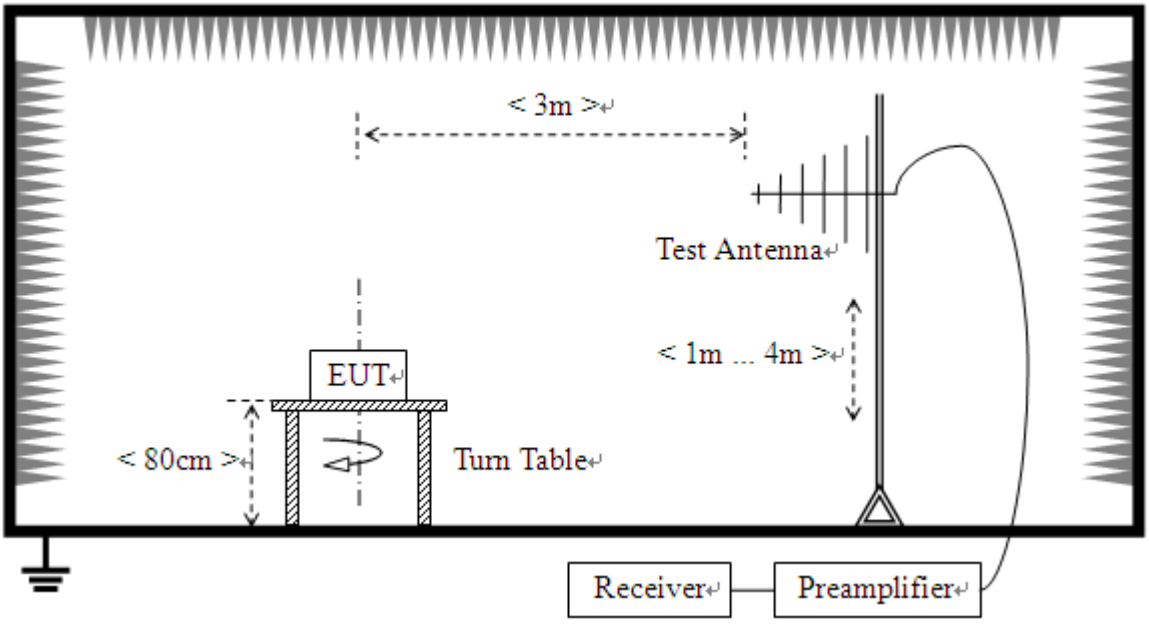
2.9.2. Test Description

Test Setup:

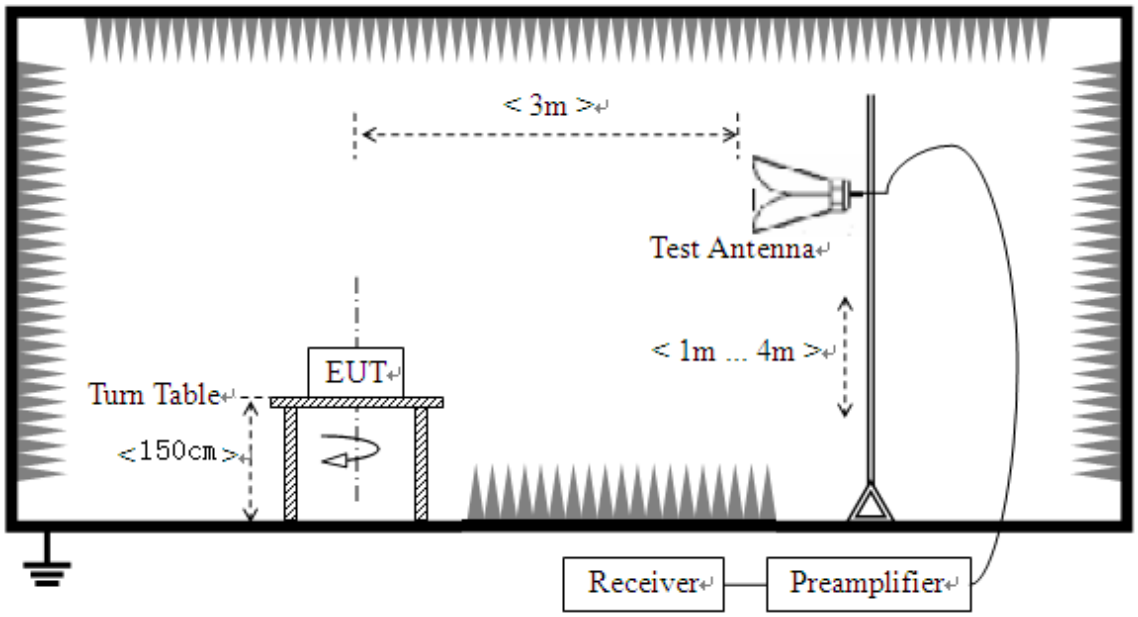
1) For radiated emissions from 9kHz to 30MHz



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

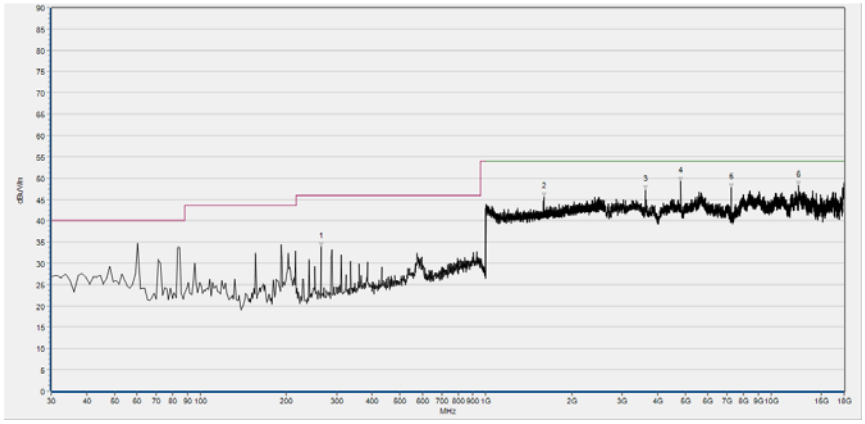
According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with 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 9kHz 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 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

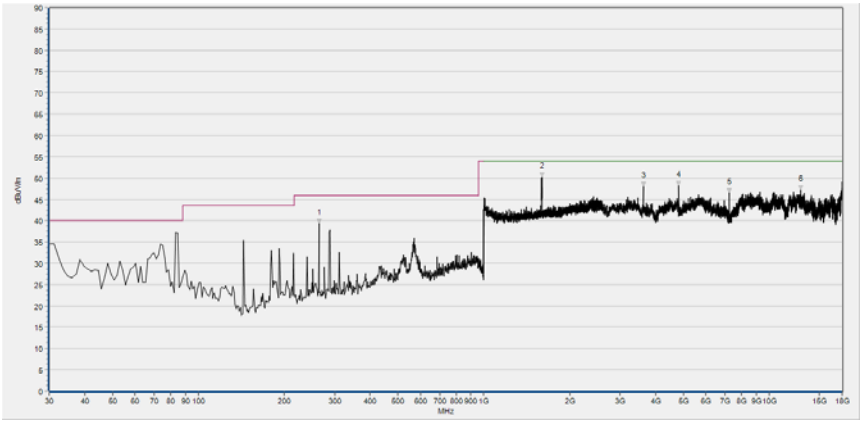
802.11b Test mode

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
264.305	33.86	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1595.438	45.65	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3616.585	47.21	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4823.604	49.28	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7234.843	47.83	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12482.997	48.26	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

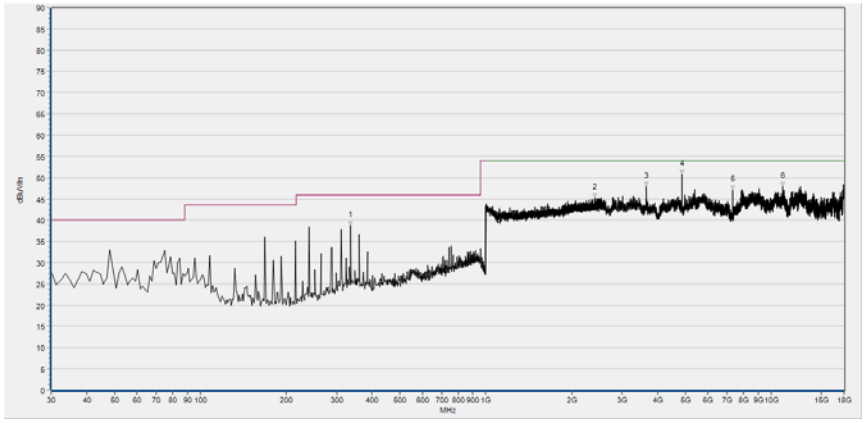
(Antenna Horizontal, 30MHz to 18GHz)



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
264.305	39.47	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1599.920	50.31	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3616.585	48.08	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4823.604	48.33	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7237.643	46.64	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12917.076	47.26	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

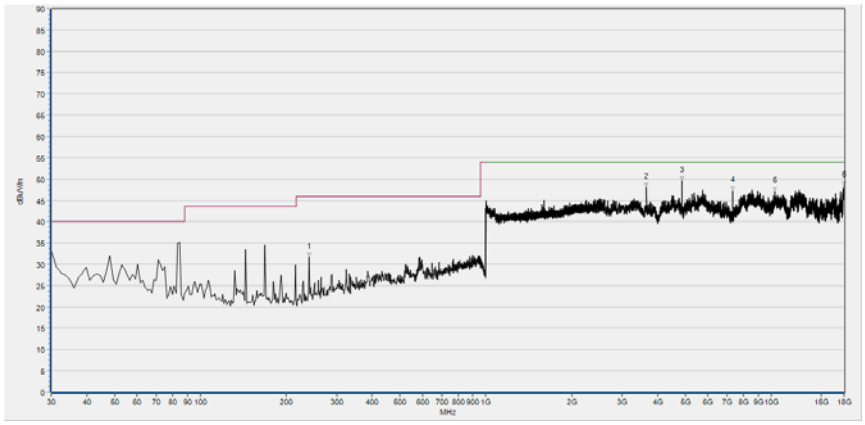
(Antenna Vertical, 30MHz to 18GHz)

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
335.932	38.67	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2411.124	45.27	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3655.792	47.94	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4874.013	50.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7310.456	47.10	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10970.722	48.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

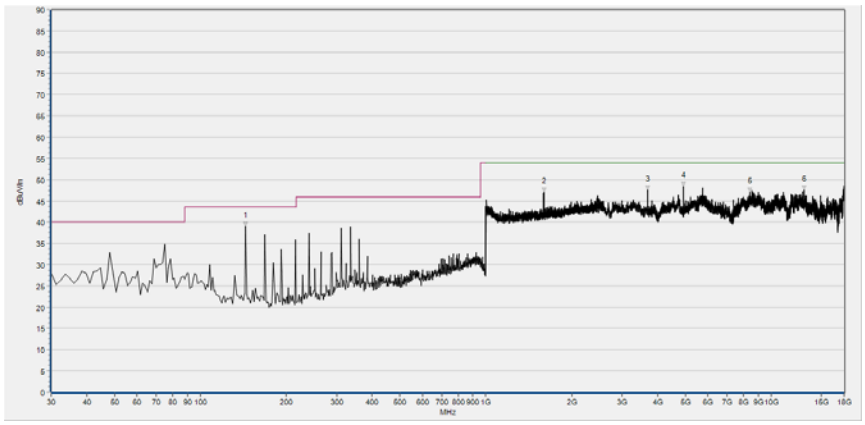
(Antenna Horizontal, 30MHz to 18GHz)



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
240.025	31.73	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3655.792	48.16	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4874.013	49.59	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7310.456	47.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10309.802	47.13	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
17960.793	48.51	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

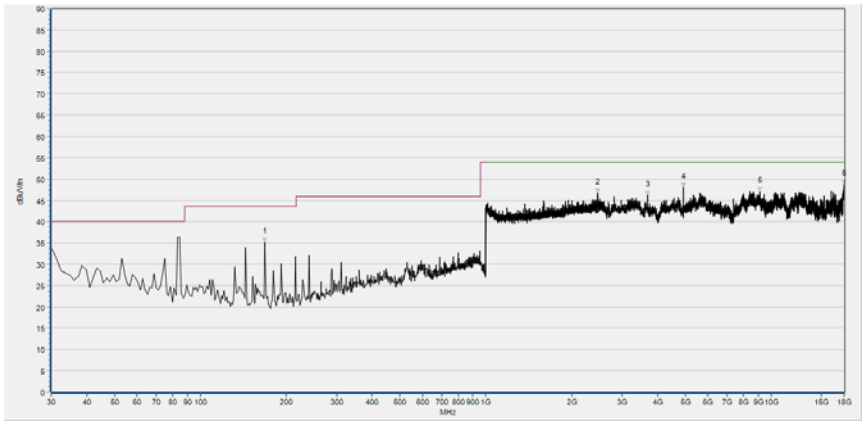
(Antenna Vertical, 30MHz to 18GHz)

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
144.118	39.01	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1597.359	47.09	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3692.199	47.58	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4924.423	48.45	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8408.256	47.13	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
13059.902	47.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

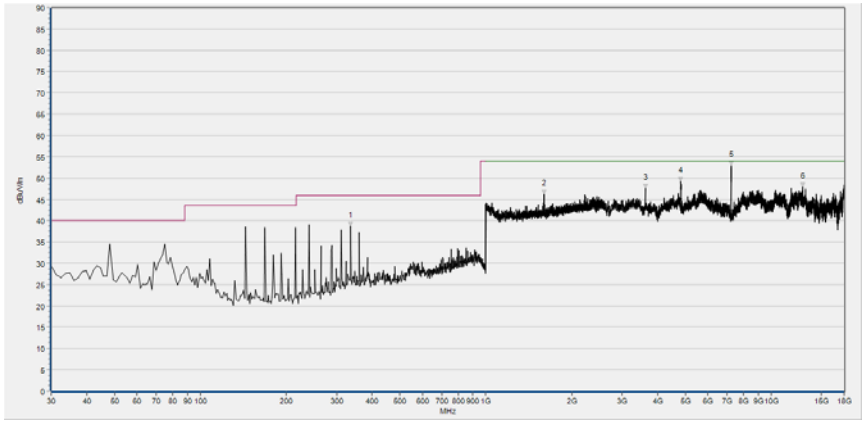


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
168.398	35.16	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2463.625	46.72	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3692.199	46.29	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4924.423	48.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9116.785	47.11	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
17994.399	48.74	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

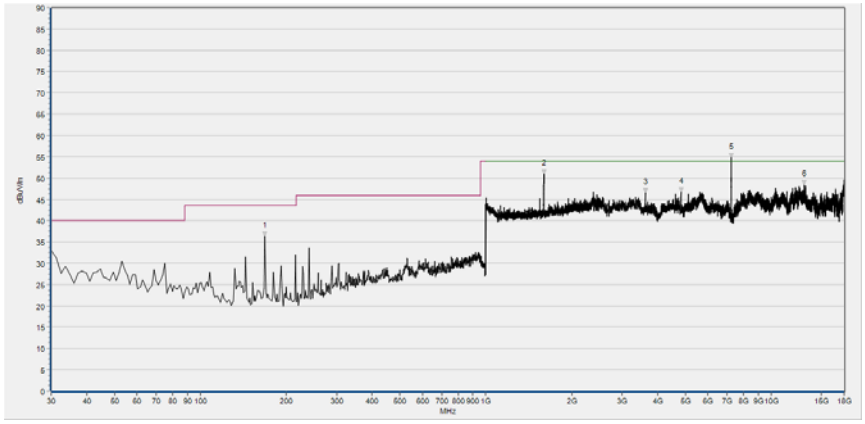
802.11g Test mode

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
335.932	38.70	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1596.719	46.18	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3616.585	47.56	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4823.604	49.22	N/A	39.38	74.00	N/A	54.00	Horizontal	PASS
7233.600	53.00	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12891.871	47.91	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

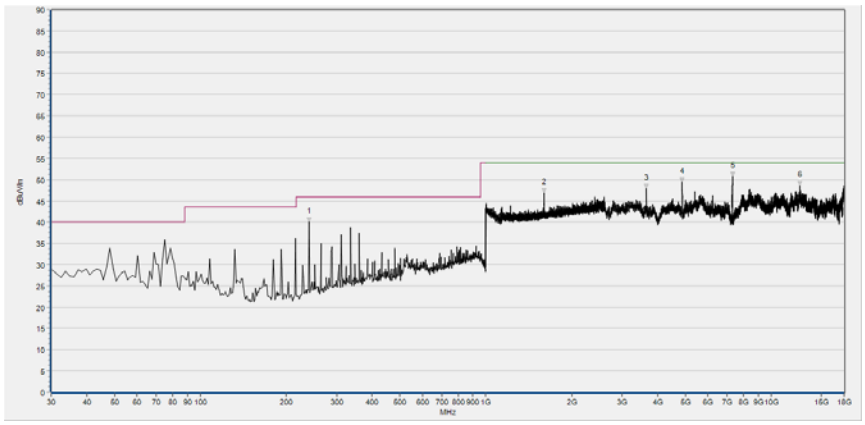
(Antenna Horizontal, 30MHz to 18GHz)



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
168.398	36.34	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1596.078	50.94	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3616.585	46.63	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4826.405	46.74	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7233.000	54.99	N/A	36.47	74.00	N/A	54.00	Vertical	PASS
13057.101	48.43	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

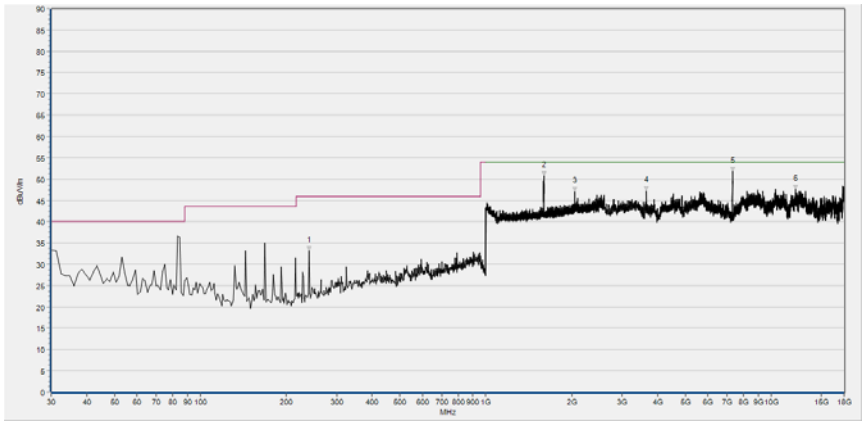
(Antenna Vertical, 30MHz to 18GHz)

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
240.025	40.06	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1597.999	46.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3655.792	47.89	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4874.013	49.40	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7316.057	50.74	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12606.219	48.63	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

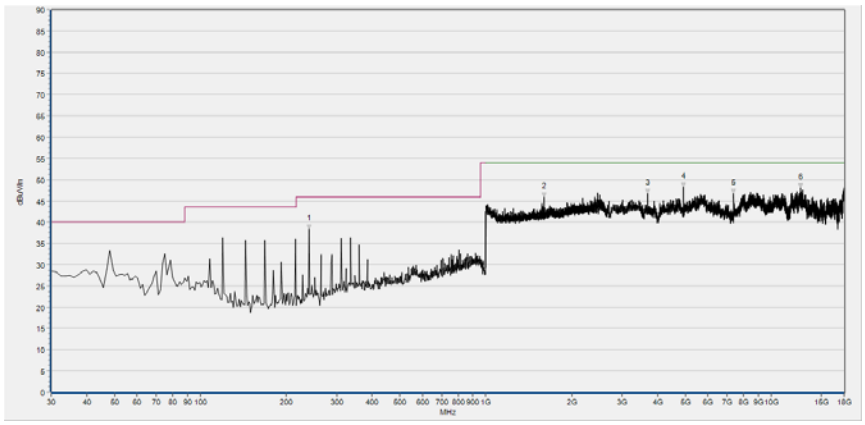
(Antenna Horizontal, 30MHz to 18GHz)



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
240.025	33.11	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1595.438	50.74	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2046.819	47.03	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3655.792	47.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7308.100	52.81	N/A	37.09	74.00	N/A	54.00	Vertical	PASS
12135.734	47.66	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

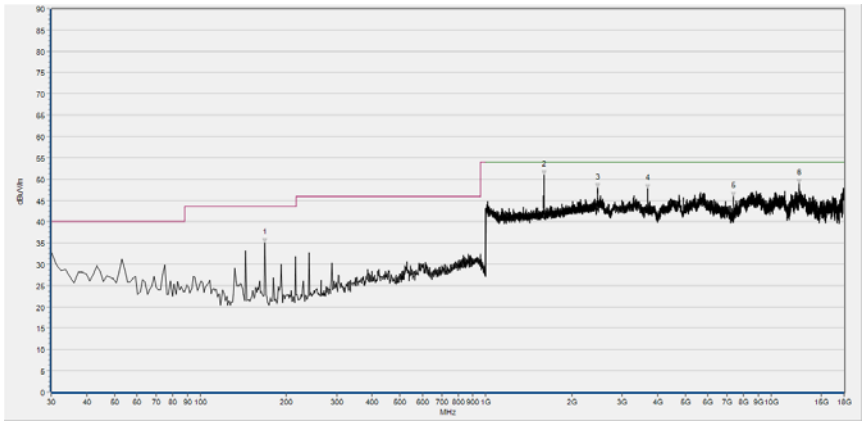
(Antenna Vertical, 30MHz to 18GHz)

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
240.025	38.40	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1597.359	45.92	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3692.199	46.72	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4924.423	48.34	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7386.070	46.82	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12690.235	48.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

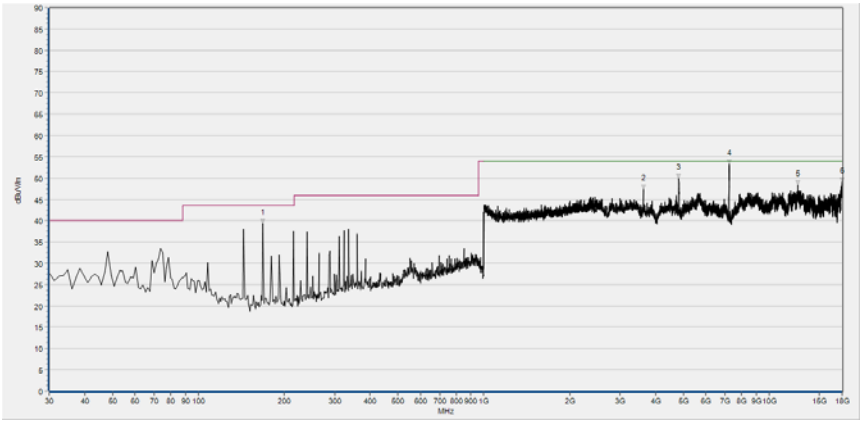


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
168.398	35.04	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1597.359	50.97	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2462.985	47.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3692.199	47.85	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7386.070	45.99	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12527.805	48.97	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

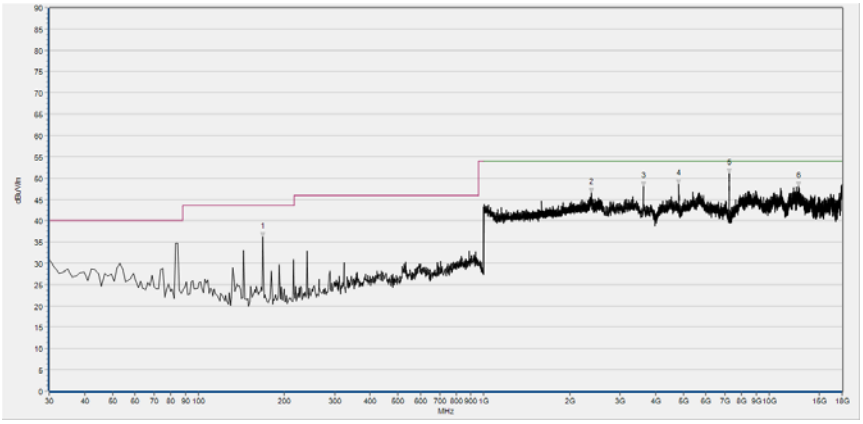
802.11n (HT20) Test mode

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
168.398	39.45	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
3619.385	47.41	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4823.604	49.93	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7233.100	53.76	N/A	41.48	74.00	N/A	54.00	Horizontal	PASS
12564.212	48.51	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
17960.793	49.12	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

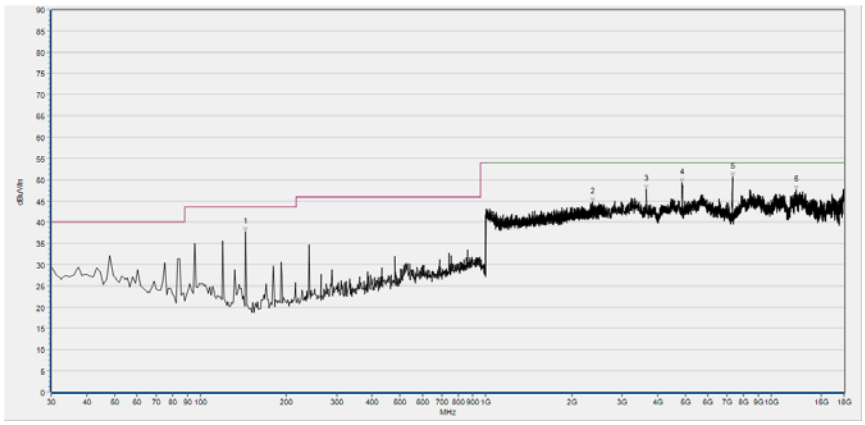
(Antenna Horizontal, 30MHz to 18GHz)



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
168.398	36.12	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2376.551	46.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3616.585	48.14	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4823.604	48.54	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7232.400	51.09	N/A	38.92	74.00	N/A	54.00	Vertical	PASS
12679.033	48.15	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

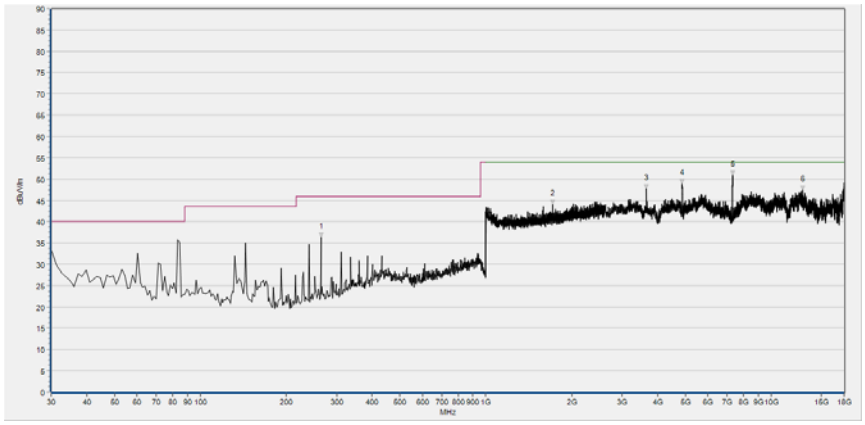
(Antenna Vertical, 30MHz to 18GHz)

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
144.118	37.65	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2372.709	44.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3655.792	47.78	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4874.013	49.31	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7313.257	50.66	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12225.350	47.68	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

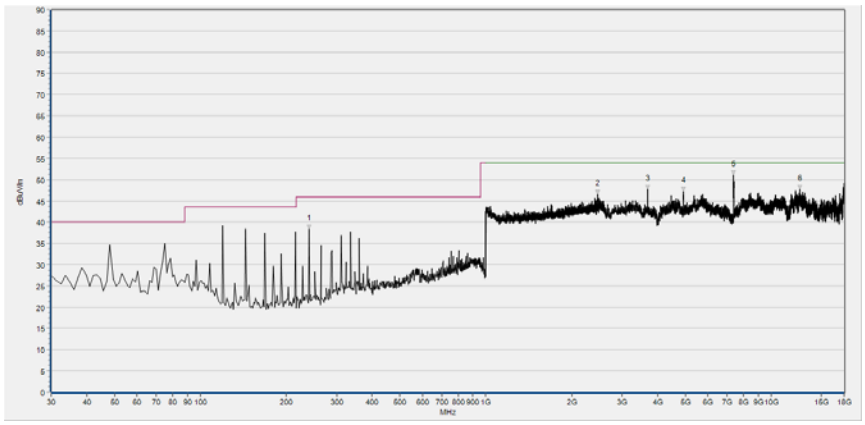
(Antenna Horizontal, 30MHz to 18GHz)



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
264.305	36.32	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1716.447	44.14	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3655.792	47.85	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4876.814	48.91	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7307.656	50.91	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12880.669	47.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

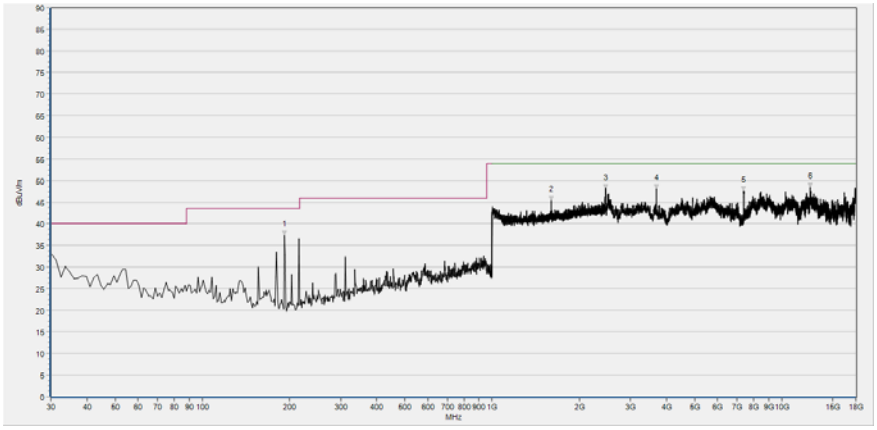
(Antenna Vertical, 30MHz to 18GHz)

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
240.025	38.42	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2464.906	46.51	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3692.199	47.74	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4927.223	47.31	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7384.900	51.25	N/A	37.23	74.00	N/A	54.00	Horizontal	PASS
12589.416	47.81	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



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
191.464	37.35	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1599.920	45.50	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2462.985	48.13	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3692.199	48.10	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7386.070	47.61	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12519.404	48.43	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

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	±2.77dB
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	Resent	N/A	N/A
EXA Signal Analyzer	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
Adapter	NA	HA-190501 00UU	HONGGUAN GDE	N/A	N/A
Mobile phone	FFMZGMJ9J C6F	iPhone 8	Apple	N/A	N/A

4.3 List of Software Used

Description	Manufacturer	Software Version
Test system	Townsend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V1.0

4.4 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2019.07.29	2020.07.28
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.08.23	2020.08.22
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.05.24	2020.05.23
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2019.07.26	2020.27.25
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	2019.12.01	2020.12.01
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

END OF REPORT