



# TEST REPORT

**APPLICANT** : Reliance Communications LLC

**PRODUCT NAME** : Orbic Speed 5G

**MODEL NAME** : R500L5S6

**BRAND NAME** : Orbic

**FCC ID** : 2ABGH-R500L5S6

**STANDARD(S)** : 47 CFR Part 15 Subpart C

**RECEIPT DATE** : 2021-06-10

**TEST DATE** : 2021-07-03 to 2021-07-20

**ISSUE DATE** : 2022-08-16

Edited by: Peng Mi  
Peng Mi (Rapporteur)

Approved by: Shen Junsheng  
Shen Junsheng (Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2022-08-16	First edition



# 1. Technical Information

Note: Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	Reliance Communications LLC
<b>Applicant Address:</b>	1560 Fifth Ave BayShore, NY 11706
<b>Manufacturer:</b>	Unimaxcomm
<b>Manufacturer Address:</b>	Room 602, Floor 6th, Building B, Software Park T3,Hi-Tech Park South, Nanshan District, Shenzhen, P.R. China

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	Orbic Speed 5G	
<b>Sample No.:</b>	8#	
<b>Hardware Version:</b>	V1.2	
<b>Software Version:</b>	ORB500L5S6_V1.0.6_BVT-NA	
<b>Modulation Technology:</b>	DSSS, OFDM	
<b>Modulation Type:</b>	Refer to section1.3	
<b>Operating Frequency Range:</b>	802.11b/g/ n (HT20): 2412MHz–2472MHz 802.11n (HT40): 2422MHz–2462MHz	
<b>Antenna Type:</b>	PIFA Antenna	
<b>Antenna Gain:</b>	ANT 0: 1.90dBi; ANT 1: -0.70dBi	
<b>Directional Gain:</b>	4.91dBi <sub>Note 3</sub>	
<b>Accessory Information:</b>	Battery	
	<b>Brand Name:</b>	Orbic
	<b>Model No.:</b>	BTE-4401
	<b>Serial No.:</b>	N/A
	<b>Capacity:</b>	4400mAh
	<b>Rated Voltage:</b>	3.80V
	<b>Charge Limit:</b>	4.35V
	<b>Manufacturer:</b>	HUIZHOU DXDRAGON INC



<b>Accessory Information:</b>	AC Adapter	
	Brand Name:	Orbic
	Model No.:	TPA-23A050200UU01
	Serial No.:	N/A
	Rated Output:	5V=2A
	Rated Input:	100-240V~50/60Hz, 0.3A
	Manufacturer:	Dongguan summer electronics Co., LTD

**Note 1:** This test report is variant from the original report (Report No.: SZ22050178W01, FCC ID: 2ABGH-R500L5S6), based on the similarity between before, only changed the applicant address and enable LTE B17 by software. However, there is no other evaluation for LTE B17 due to the band is completely covered by LTE B12 and its power level setting also same as LTE B12. The changes do not affect the results in this report.

**Note 2:** We use the dedicated software to control the EUT continuous transmission.

**Note 3:** The EUT has two antennas, only 802.11n modulation mode supports a MIMO function.

**Note 4:** According to KDB 662911 D01, the directional gain =  $G_{ANT} + 10\log(N_{ANT})$  dBi, where  $G_{ANT}$  is the maximum antenna gain in dBi,  $N_{ANT}$  is the number of outputs.

**Note 5:** For conducted test item Conducted Output 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 0) in this report.

**Note 6:** Radiation test items for all modulation operate at 2Tx mode during the test, only the worst test result(ANT0) was recorded in this report.

**Note 7:** 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) <small>Note1</small>
DSSS (802.11b)	DBPSK	<b>1</b>
	DQPSK	2
	CCK	5.5/ 11
OFDM (802.11g)	BPSK	<b>6 / 9</b>
	QPSK	12 / 18
	16QAM	24 / 36
	64QAM	48 / 54
OFDM (802.11n (HT20))	BPSK	<b>6.5</b>
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65
OFDM (802.11n (HT40))	BPSK	<b>13.5</b>
	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)	<b>1</b>	<b>2412</b>	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	11	2462
	5	2432	12	2467
	6	2437	<b>13</b>	<b>2472</b>
	<b>7</b>	<b>2442</b>		
Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
802.11n (HT40)	<b>3</b>	<b>2422</b>	8	2447
	4	2427	9	2452
	5	2432	10	2457
	6	2437	<b>11</b>	<b>2462</b>
	<b>7</b>	<b>2442</b>		

**Note 1:** The black bold channels were selected for test.



## 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 <sub>Note1</sub>	No deviation
2	N/A	Duty Cycle of Test Signal	Jul 03, 2021	Su Xiaoxian	PASS <sub>Note1</sub>	No deviation
3	15.247(b)	Maximum Peak and Average Conducted Output Power	Jul 03, 2021	Su Xiaoxian	PASS <sub>Note1</sub>	No deviation
4	15.247(a)	Bandwidth	Jul 03, 2021	Su Xiaoxian	PASS <sub>Note1</sub>	No deviation
5	15.247(d)	Conducted Spurious Emission and Band Edge	Jul 03, 2021	Su Xiaoxian	PASS <sub>Note1</sub>	No deviation
6	15.247(e)	Power Spectral Density	Jul 03, 2021	Su Xiaoxian	PASS <sub>Note1</sub>	No deviation
7	15.207	Conducted Emission	Jul 06, 2021	Wu Runfeng	PASS <sub>Note1</sub>	No deviation
8	15.247(d)	Restricted Frequency Bands	Jul 03&16&20, 2021	Gao Jianrou	PASS <sub>Note1</sub>	No deviation
9	15.209, 15.247(d)	Radiated Emission	Jul 15&16, 2021	Gao Jianrou	PASS <sub>Note1</sub>	No deviation

**Note 1:** The test results of these test items in this report refer to the test report (Report No.: SZ22050178W01).

**Note 2:** The tests were performed according to the method of measurements prescribed in



ANSIC63.10-2013, KDB558074 D01 v05r02.

**Note 3:** The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 11.5dB contains two parts that cable loss 1.5dB and Attenuator 10dB.

**Note 4:** 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.

**Note 5:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

## 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. Test Result: Compliant

Inside of the EUT has a PIFA antenna coupled with the I-PEX connector. Please refer to the EUT internal photos.

## 2.2. Duty Cycle of Test Signal

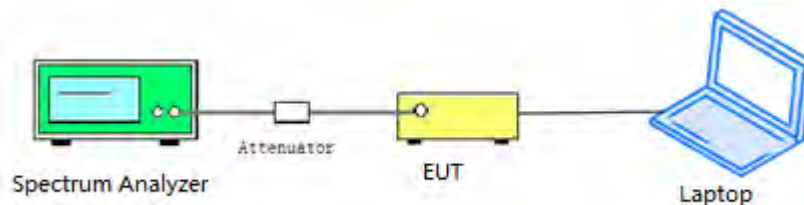
### 2.2.1. Requirement

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  $\pm 2\%$ ; 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.

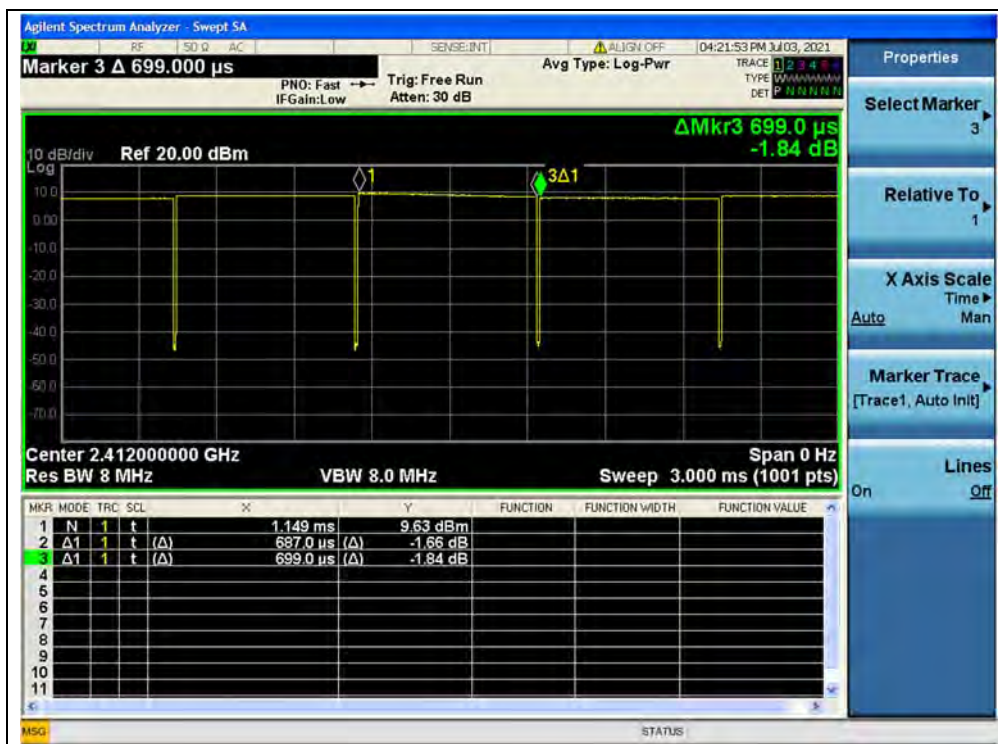


2.2.3. Test Result

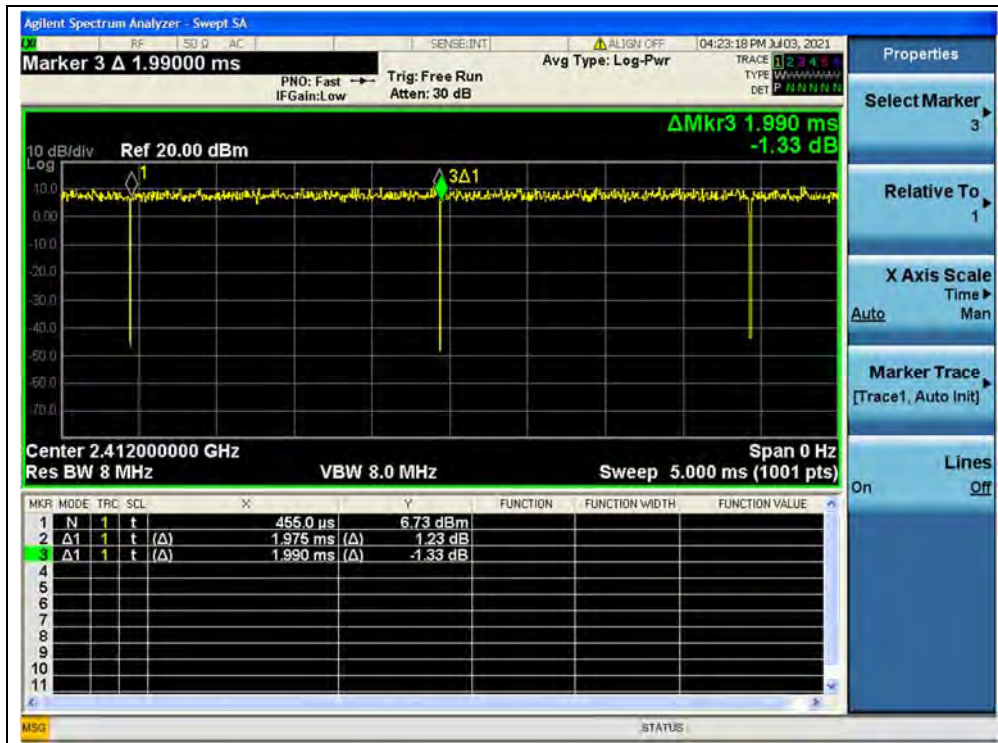
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11b	98.28	0.08
802.11g	99.25	0.03
802.11n (HT20)	100.00	0.00
802.11n (HT40)	100.00	0.00

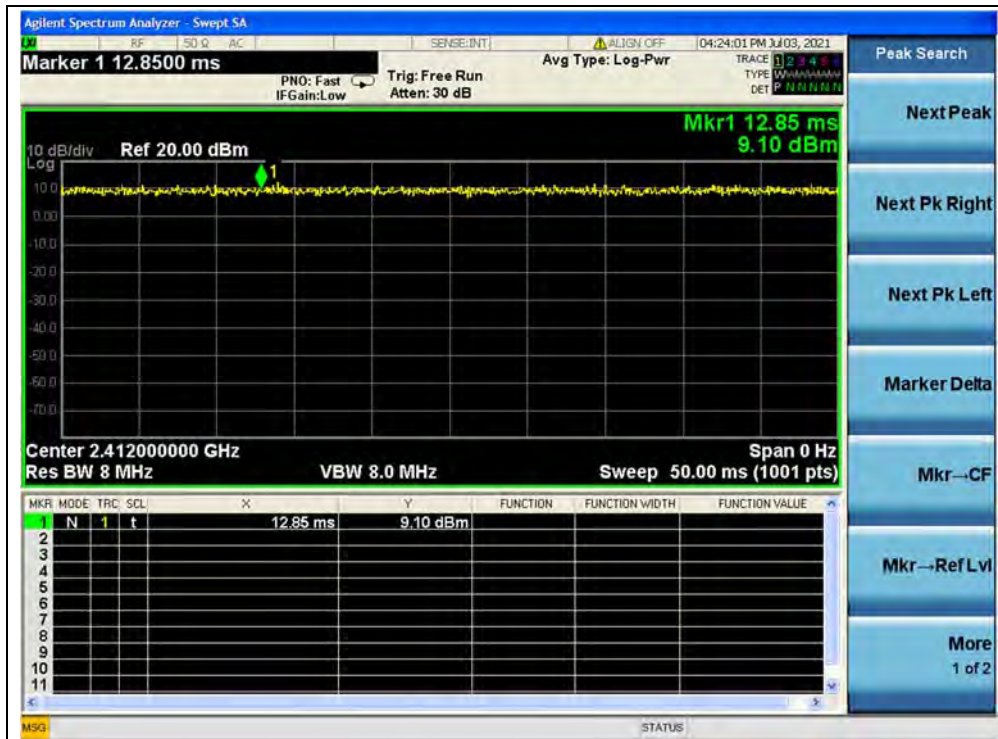
B. Test Plot:



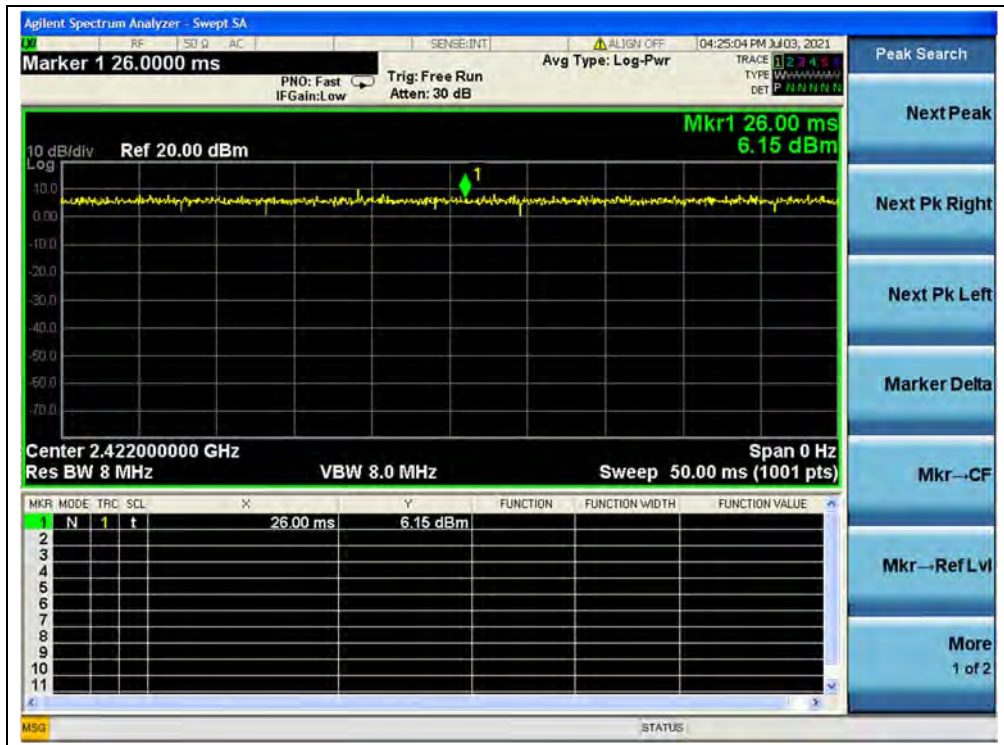
(Channel 1, 802.11b)



(Channel 1, 802.11g)



(Channel 1, 802.11n (HT20))



(Channel 3, 802.11n (HT40))

## 2.3. Maximum Peak and Average Conducted Output Power

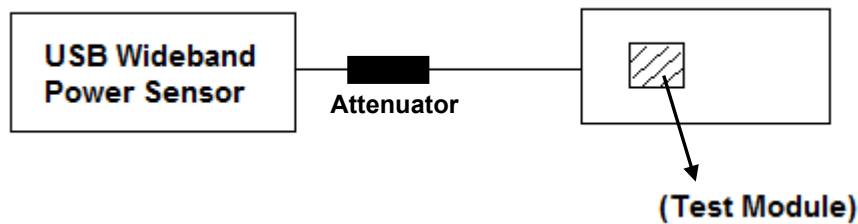
### 2.3.1. Requirement

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 exceed 1 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 Mode

Channel	Frequency (MHz)	Measured Peak Power				Limit (dBm)		Verdict
		ANT 0		ANT 1		dBm	W	
		dBm	W	dBm	W			
1	2412	18.24	0.067	18.66	0.073	30	1	PASS
7	2442	18.70	0.074	18.24	0.067			PASS
13	2472	18.16	0.065	17.52	0.056			PASS

802.11g Mode

Channel	Frequency (MHz)	Measured Peak Power				Limit (dBm)		Verdict
		ANT 0		ANT 1		dBm	W	
		dBm	W	dBm	W			
1	2412	21.90	0.155	22.77	0.189	30	1	PASS
7	2442	<b>23.11</b>	<b>0.205</b>	22.98	0.199			PASS
13	2472	20.04	0.101	21.35	0.136			PASS

802.11n (HT20) Mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
1	2412	22.02	22.57	25.31	0.340	30	1	PASS
7	2442	23.01	22.92	25.98	0.396			PASS
13	2472	20.05	21.44	23.80	0.240			PASS

**Note:** Directional gain = 1.90dBi + 10log(2) = 4.91dBi < 6dBi, so the power limit is 1W(30dBm).

802.11n (HT40) Mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)		Total Power (dBm)	Total Power (W)	Limit		Verdict
		ANT 0	ANT 1			dBm	W	
3	2422	20.89	22.28	24.65	0.292	30	1	PASS
7	2442	22.65	21.76	25.24	0.334			PASS
11	2462	20.69	21.34	24.03	0.253			PASS

**Note:** Directional gain = 1.90dBi + 10log(2) = 4.91dBi < 6dBi, so the power limit is 1W(30dBm).



**Maximum Average Conducted Output Power**

**802.11b Mode**

Frequency (MHz)	Average Power						Limit		Verdict	
	Measured		Duty Factor	Duty Factor Calculated						
	ANT0	ANT1		ANT0		ANT1				
	dBm	dBm		dBm	W	dBm	W	dBm		W
2412	14.68	15.82	0.08	14.68	0.029	15.82	0.038	30	1	PASS
2442	15.96	15.52		15.96	0.039	15.52	0.036			PASS
2472	14.82	14.80		14.82	0.030	14.80	0.030			PASS

**802.11g Mode**

Frequency (MHz)	Average Power						Limit		Verdict	
	Measured		Duty Factor	Duty Factor Calculated						
	ANT0	ANT1		ANT0		ANT1				
	dBm	dBm		dBm	W	dBm	W	dBm		W
2412	14.66	15.50	0.03	14.66	0.029	15.50	0.035	30	1	PASS
2442	15.89	15.34		15.89	0.039	15.34	0.034			PASS
2472	14.41	14.49		14.41	0.028	14.49	0.028			PASS

**802.11n (HT20) Mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm		W
2412	14.57	15.38	0.00	17.99	0.063	30	1	PASS
2442	15.84	15.24		18.57	0.072			PASS
2472	14.33	14.35		17.32	0.054			PASS

**Note:** Directional gain = 1.90dBi + 10log(2) = 4.91dBi < 6dBi, so the power limit is 1W(30dBm).

**802.11n (HT40) Mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm		W
2422	14.45	15.39	0.00	17.92	0.062	30	1	PASS
2442	15.76	15.16		18.45	0.070			PASS
2462	14.73	14.60		17.71	0.059			PASS

**Note:** Directional gain = 1.90dBi + 10log(2) = 4.91dBi < 6dBi, so the power limit is 1W(30dBm).



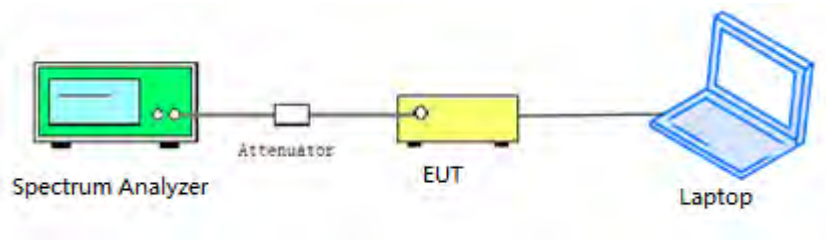
## 2.4. Bandwidth

### 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

#### 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 Mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	7.572	≥500	PASS
7	2442	8.081	≥500	PASS
13	2472	8.062	≥500	PASS

B. Test Plot:



(Channel 1, 802.11b)



(Channel 7, 802.11b)



(Channel 13, 802.11b)



802.11g Mode

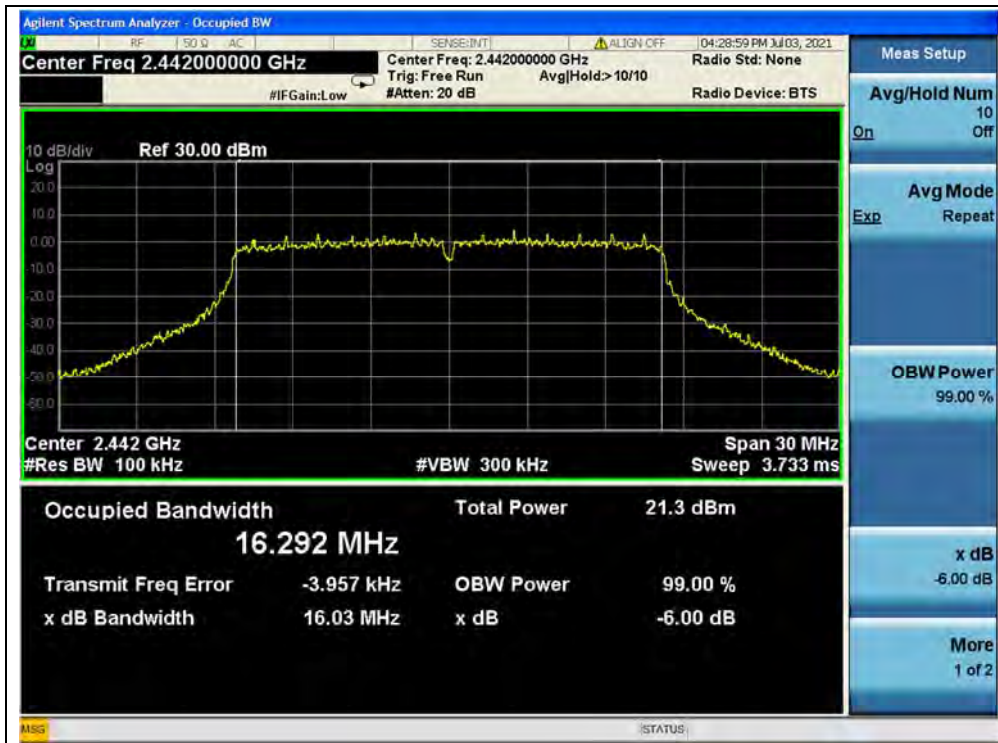
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	16.06	≥500	PASS
7	2442	16.03	≥500	PASS
13	2472	16.05	≥500	PASS

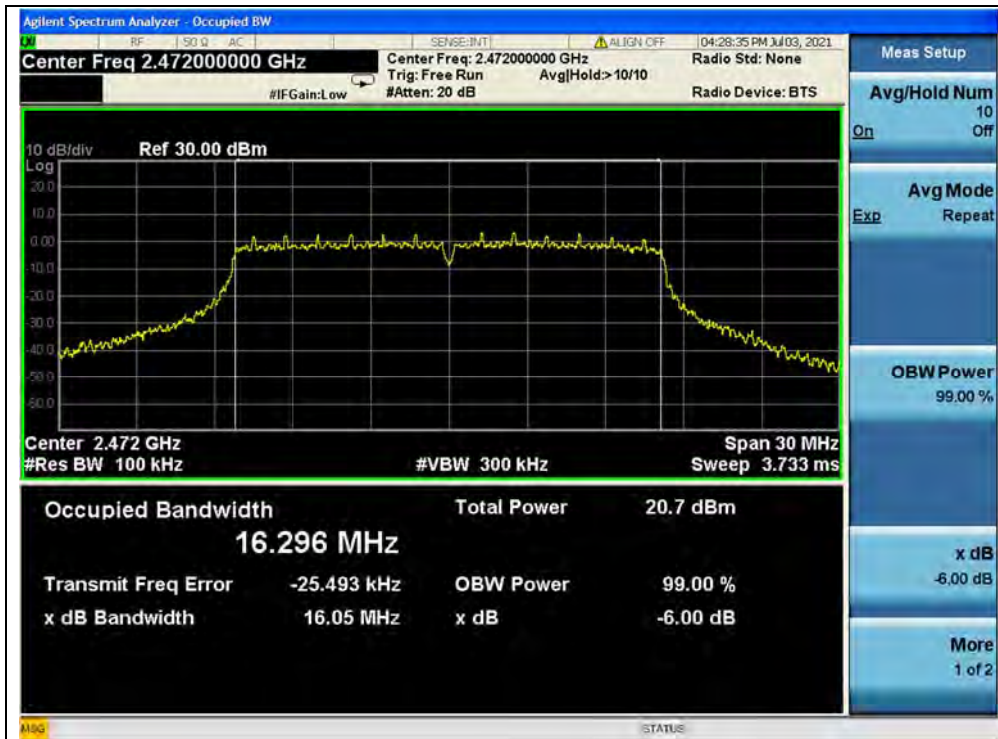
B. Test Plot:



(Channel 1, 802.11g)



(Channel 7, 802.11g)



(Channel 13, 802.11g)



**802.11n (HT20) Mode**

**A. Test Verdict:**

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	17.27	≥500	PASS
7	2442	17.17	≥500	PASS
13	2472	16.89	≥500	PASS

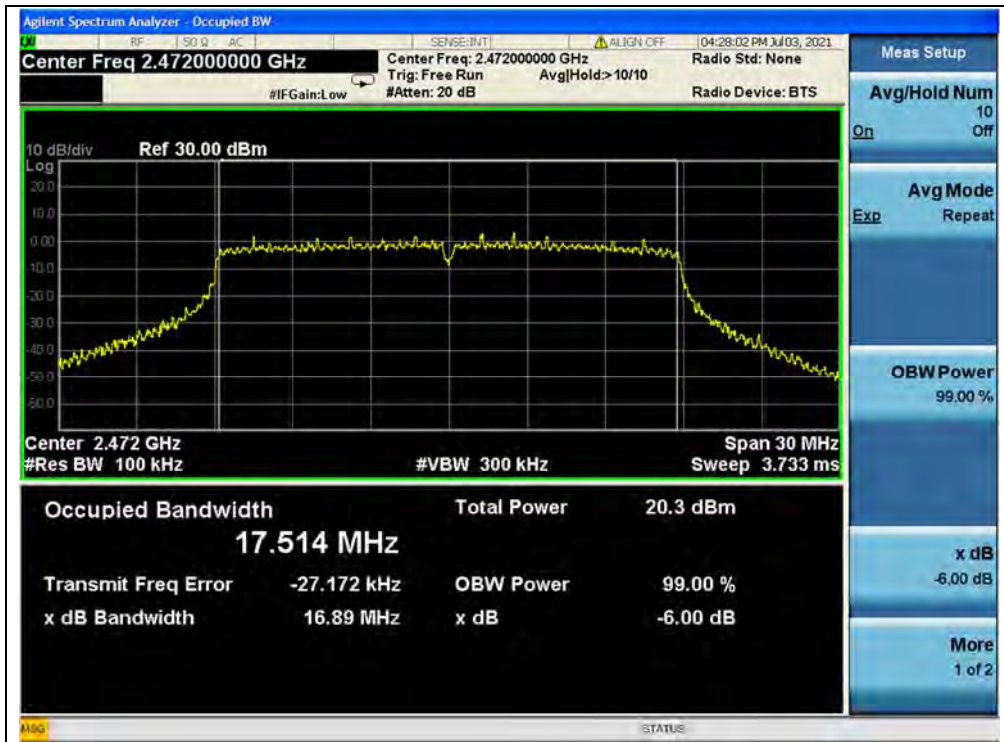
**B. Test Plot:**



(Channel 1, 802.11n (HT20))



(Channel 7, 802.11n (HT20))



(Channel 13, 802.11n (HT20))

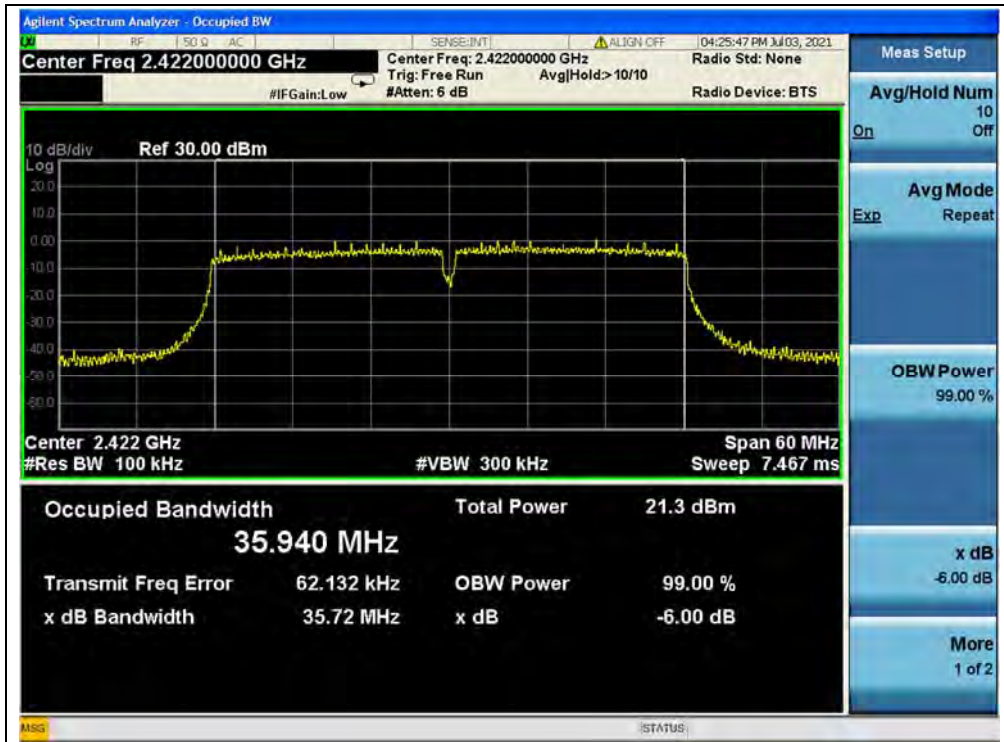


**802.11n (HT40) Mode**

**A. Test Verdict:**

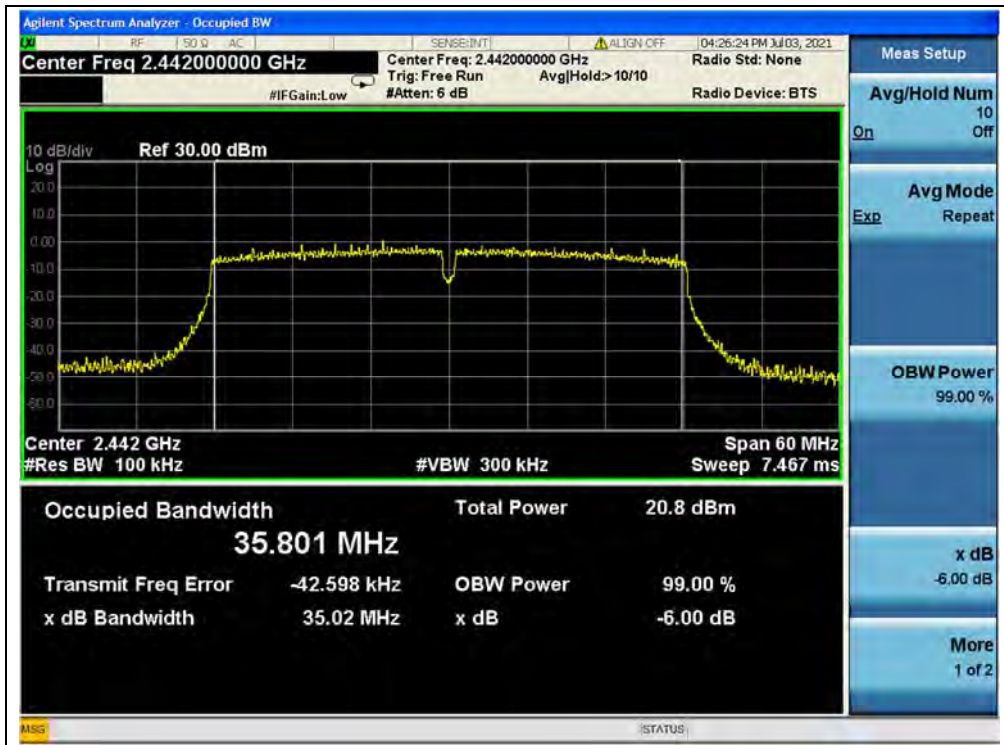
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
3	2422	35.72	≥500	PASS
7	2442	35.02	≥500	PASS
11	2462	35.69	≥500	PASS

**B. Test Plot:**



(Channel 3, 802.11n (HT40))





(Channel 7, 802.11n (HT40))



(Channel 11, 802.11n (HT40))

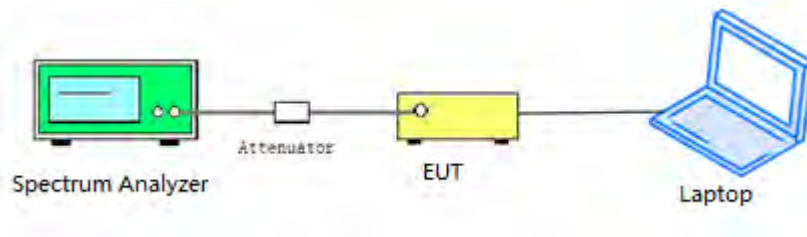
## 2.5. Conducted Spurious Emissions and Band Edge

### 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

#### 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 Mode

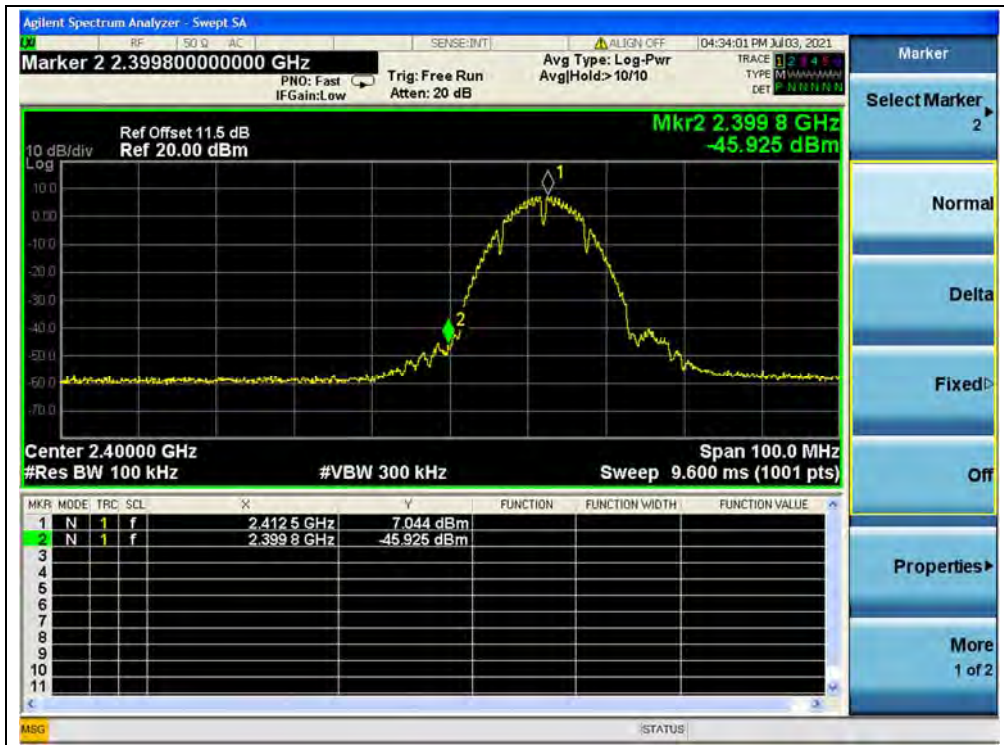
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-43.61	7.05	-12.95	PASS
7	2442	-42.96	6.21	-13.79	PASS
13	2472	-41.96	5.35	-14.65	PASS

B. Test Plot:



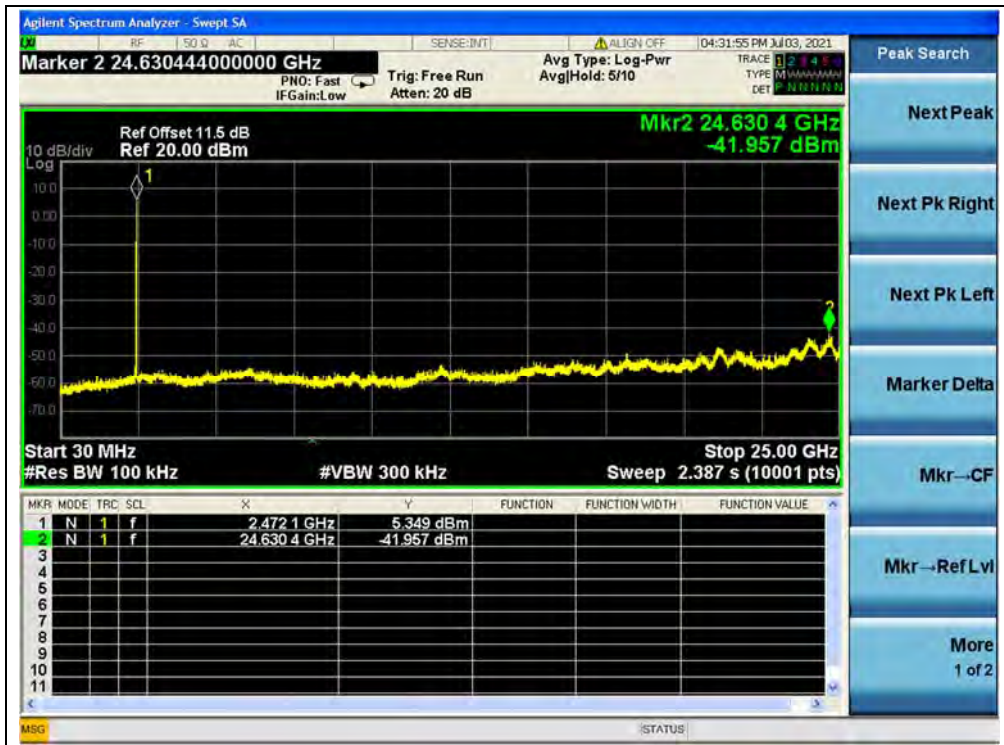
(30MHz to 25GHz, Channel 1, 802.11b)



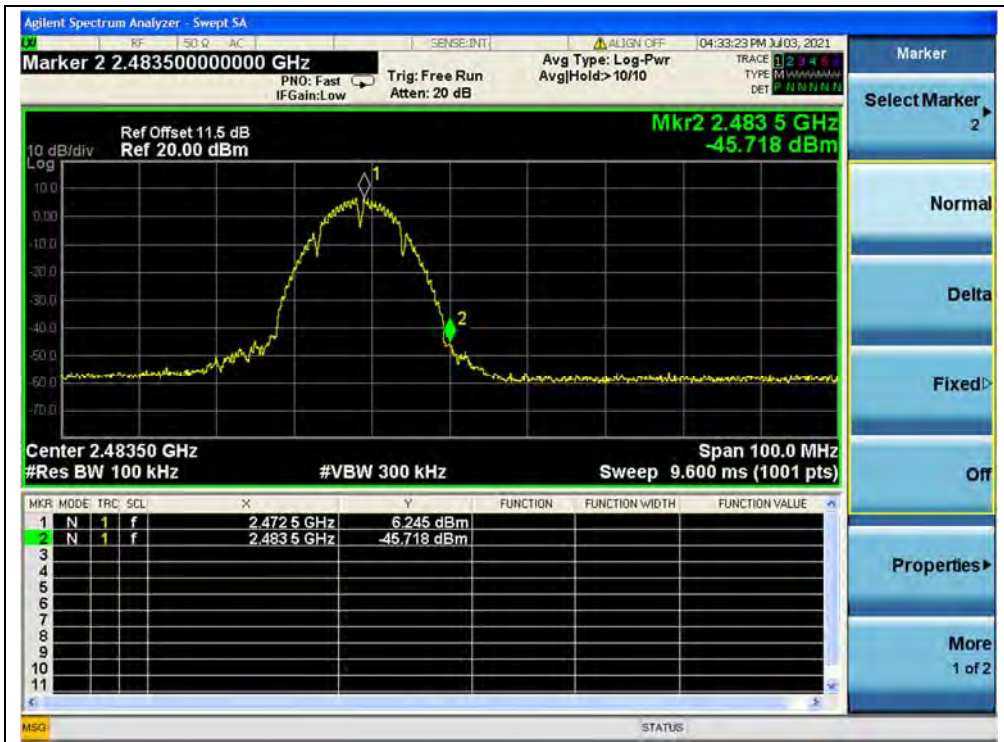
(Band Edge, Channel 1, 802.11b)



(30MHz to 25GHz, Channel 7, 802.11b)



(30MHz to 25GHz, Channel 13, 802.11b)



(Band Edge, Channel 13, 802.11b)

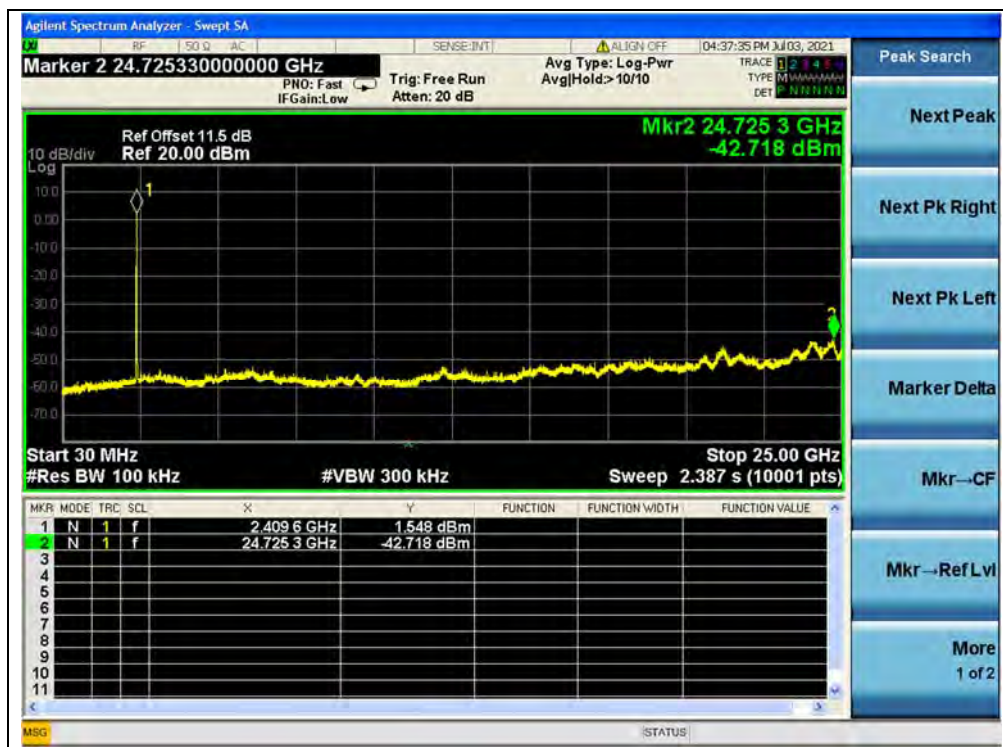


802.11g Mode

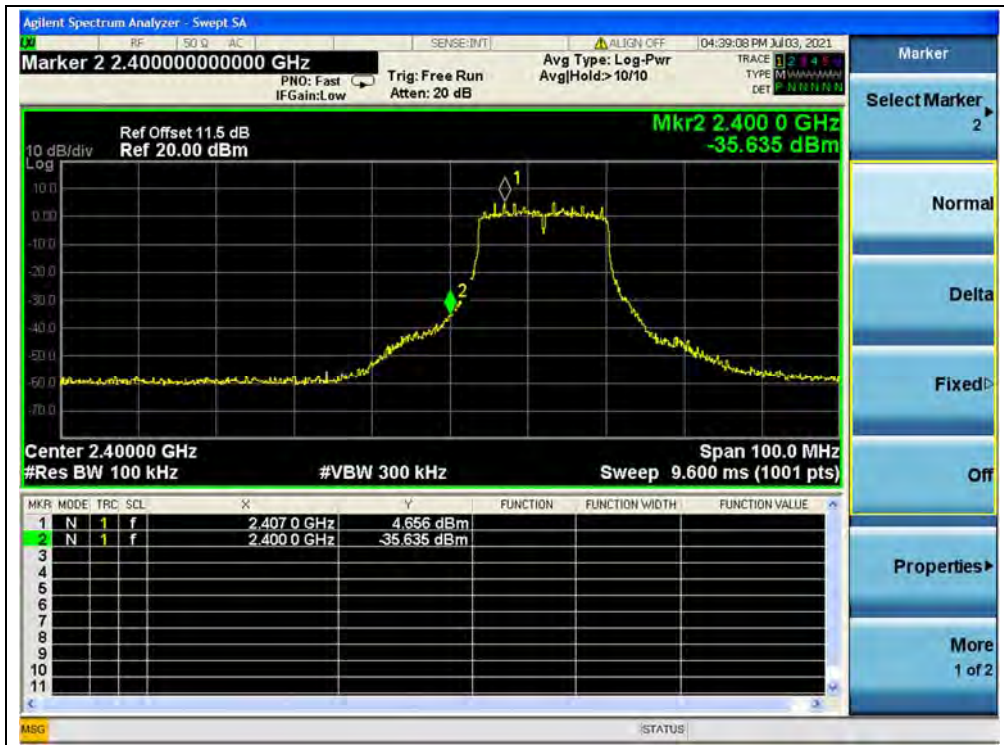
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-42.72	1.55	-18.45	PASS
7	2442	-42.91	1.12	-18.88	PASS
13	2472	-43.38	-0.20	-20.20	PASS

B. Test Plot:



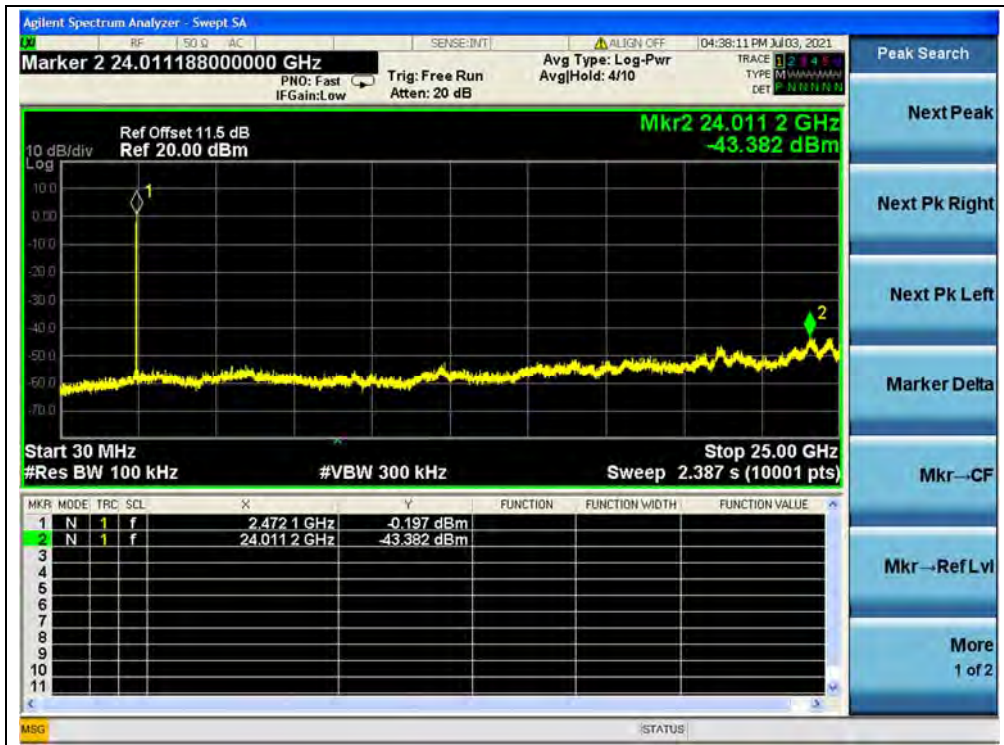
(30MHz to 25GHz, Channel 1, 802.11g)



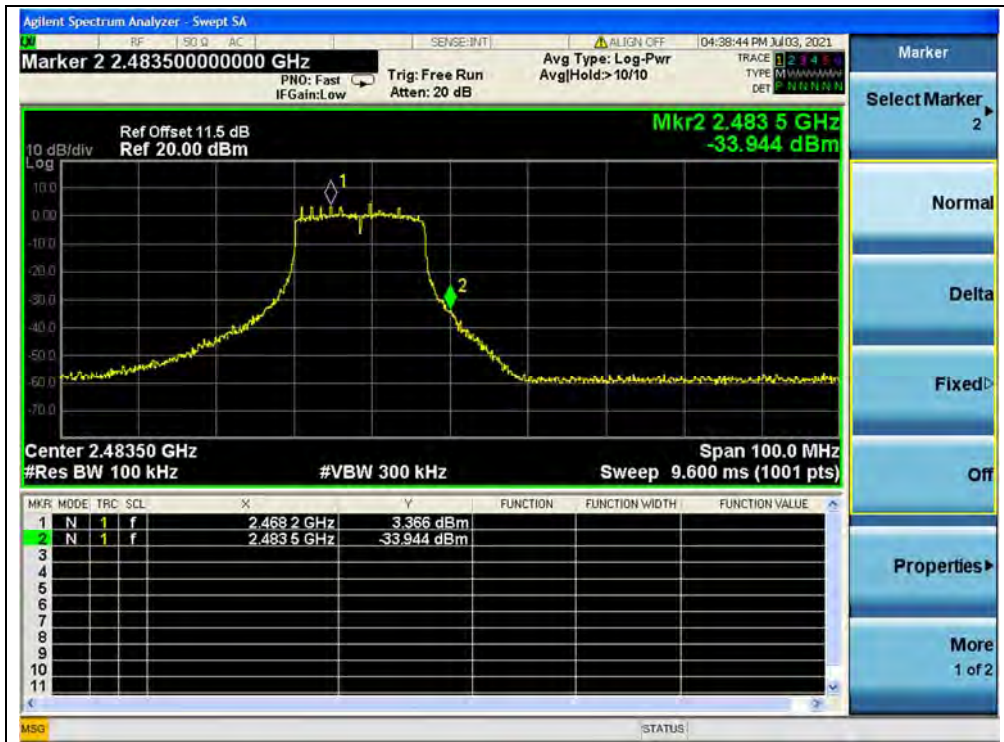
(Band Edge, Channel 1, 802.11g)



(30MHz to 25GHz, Channel 7, 802.11g)



(30MHz to 25GHz, Channel 13, 802.11g)



(Band Edge, Channel 13, 802.11g)





802.11n (HT20) Mode

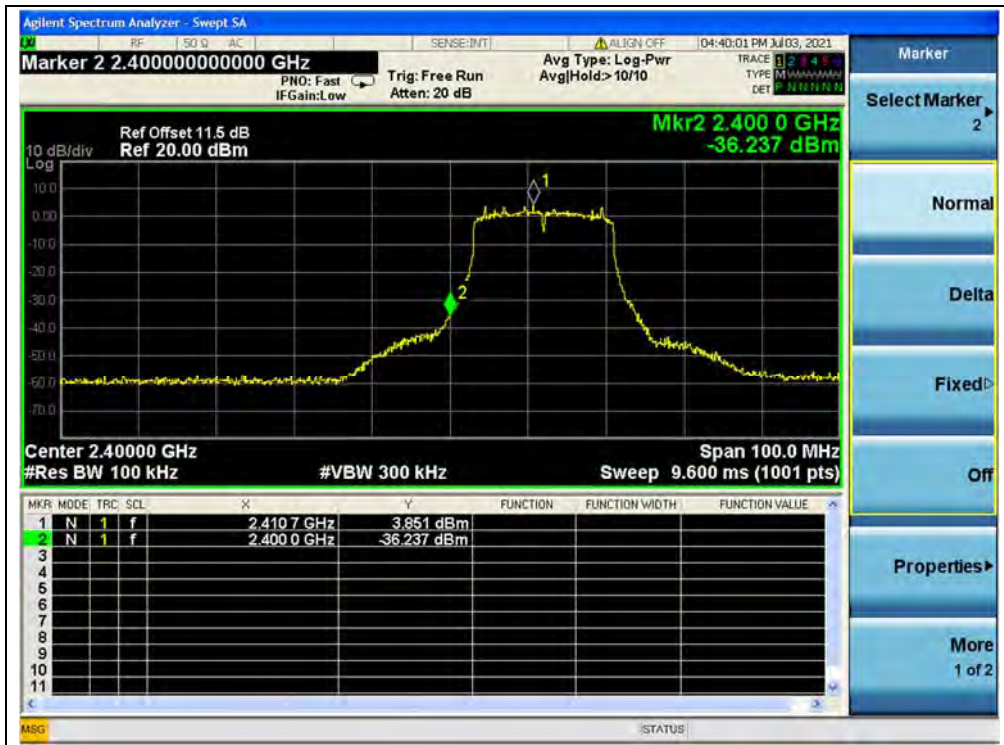
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-42.99	0.88	-19.12	PASS
7	2442	-42.24	0.81	-19.19	PASS
13	2472	-43.14	0.42	-19.58	PASS

B. Test Plot:



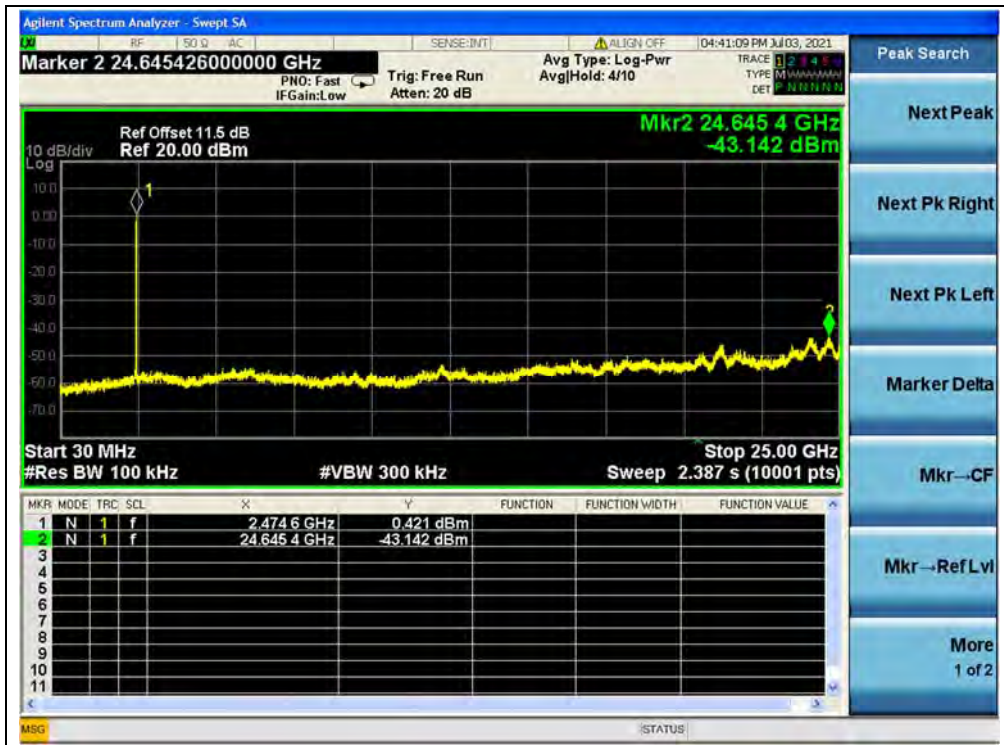
(30MHz to 25GHz, Channel 1, 802.11n (HT20))



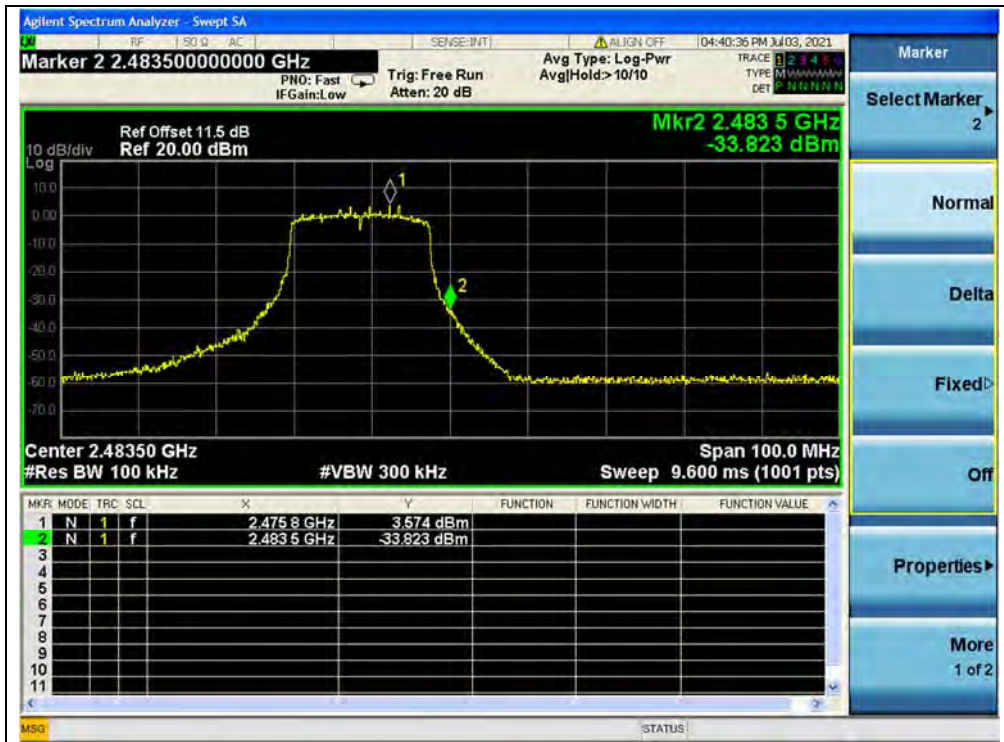
(Band Edge, Channel 1, 802.11n (HT20))



(30MHz to 25GHz, Channel 7, 802.11n (HT20))



(30MHz to 25GHz, Channel 13, 802.11n (HT20))



(Band Edge, Channel 13, 802.11n (HT20))



802.11n (HT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-42.28	-1.90	-21.90	PASS
7	2442	-43.21	-1.97	-21.97	PASS
11	2462	-43.84	-2.39	-22.39	PASS

B. Test Plot:



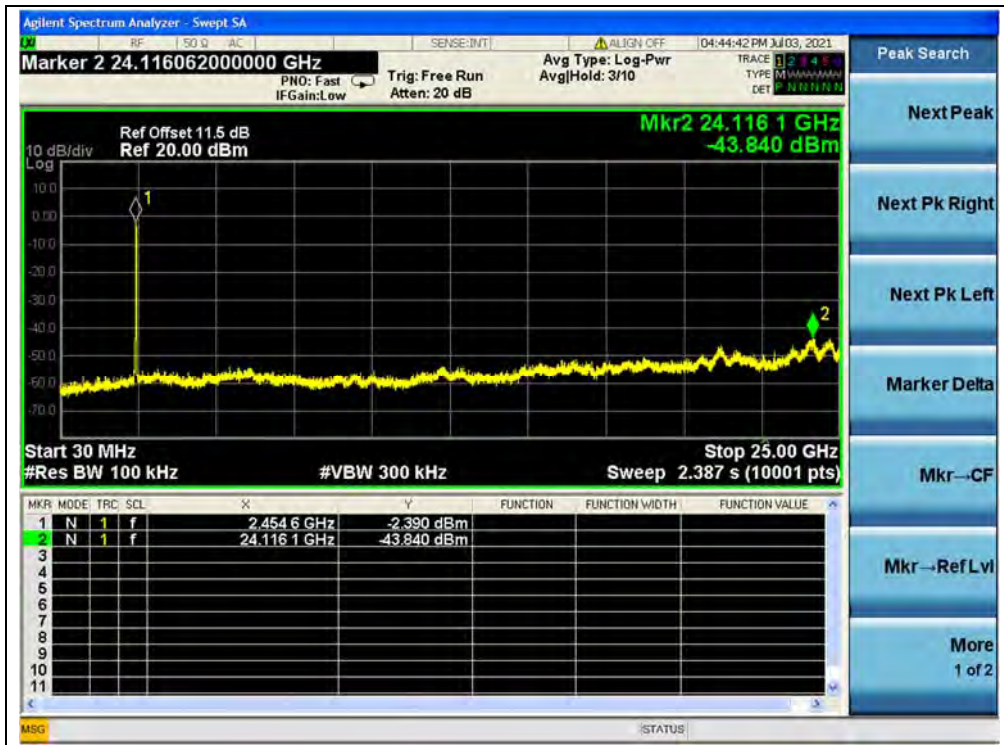
(30MHz to 25GHz, Channel 3, 802.11n (HT40))



(Band Edge, Channel 3, 802.11n (HT40))



(30MHz to 25GHz, Channel 7, 802.11n (HT40))



(30MHz to 25GHz, Channel 11, 802.11n (HT40))



(Band Edge, Channel 11, 802.11n (HT40))

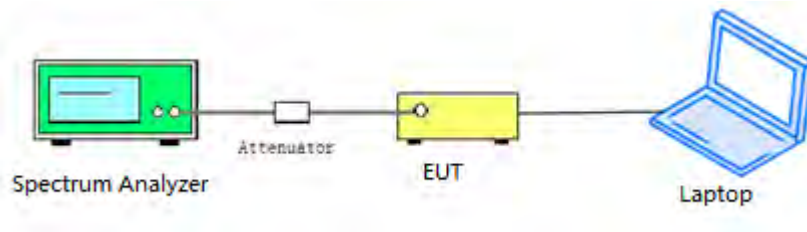
## 2.6. Power Spectral Density

### 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 Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Limit (dBm/3kHz)	Verdict
		ANT 0	ANT 1		
1	2412	-7.88	-8.88	8	PASS
7	2442	-7.95	-8.35	8	PASS
13	2472	-9.20	-8.85	8	PASS

B. Test Plot:



(Channel 1, 802.11b, ANT0)





(Channel 7, 802.11b, ANT0)



(Channel 13, 802.11b, ANT0)



(Channel 1, 802.11b, ANT1)



(Channel 7, 802.11b, ANT1)



(Channel 13, 802.11b, ANT1)

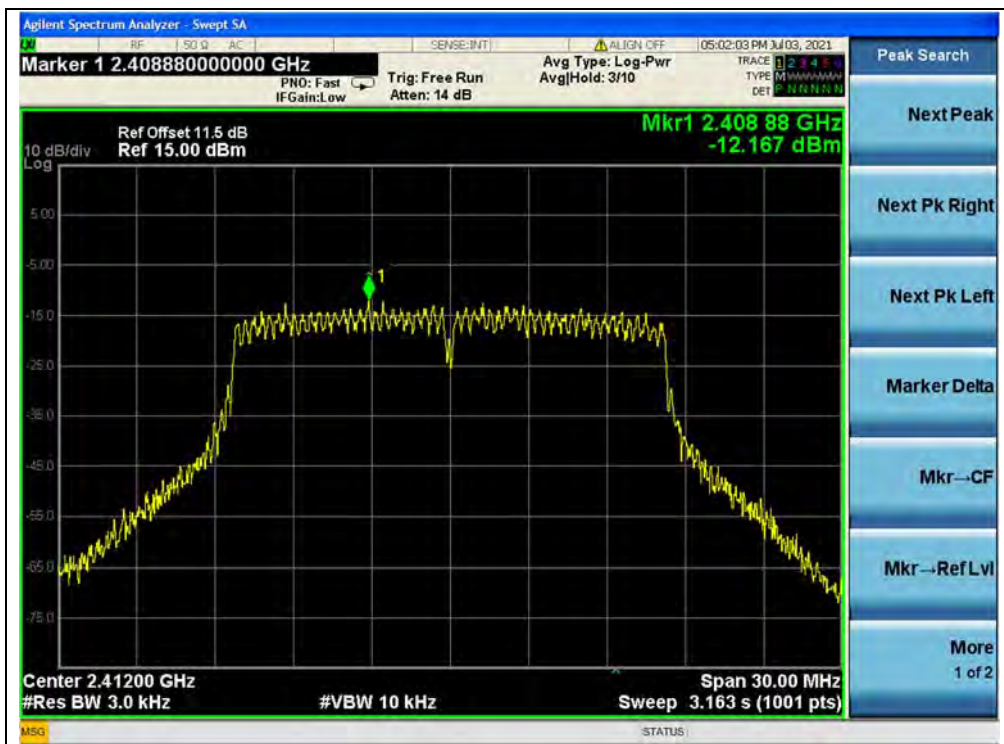


**802.11g Mode**

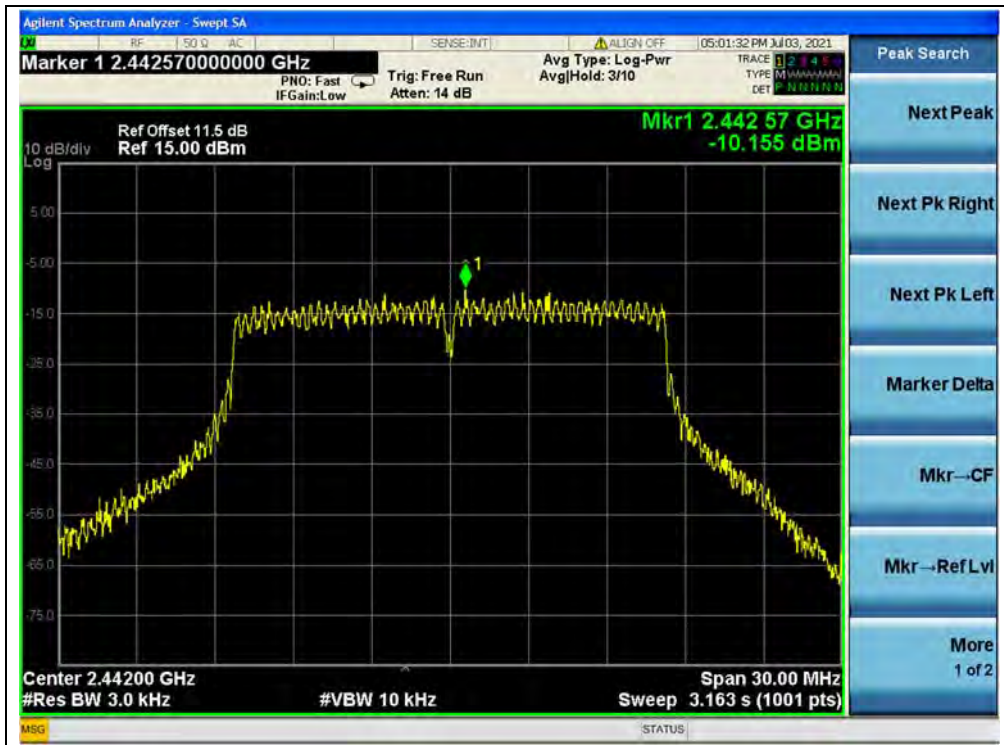
**A. Test Verdict:**

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Limit (dBm/3kHz)	Verdict
		ANT 0	ANT 1		
1	2412	-12.17	-11.64	8	PASS
7	2442	-10.16	-10.62	8	PASS
13	2472	-11.71	-12.32	8	PASS

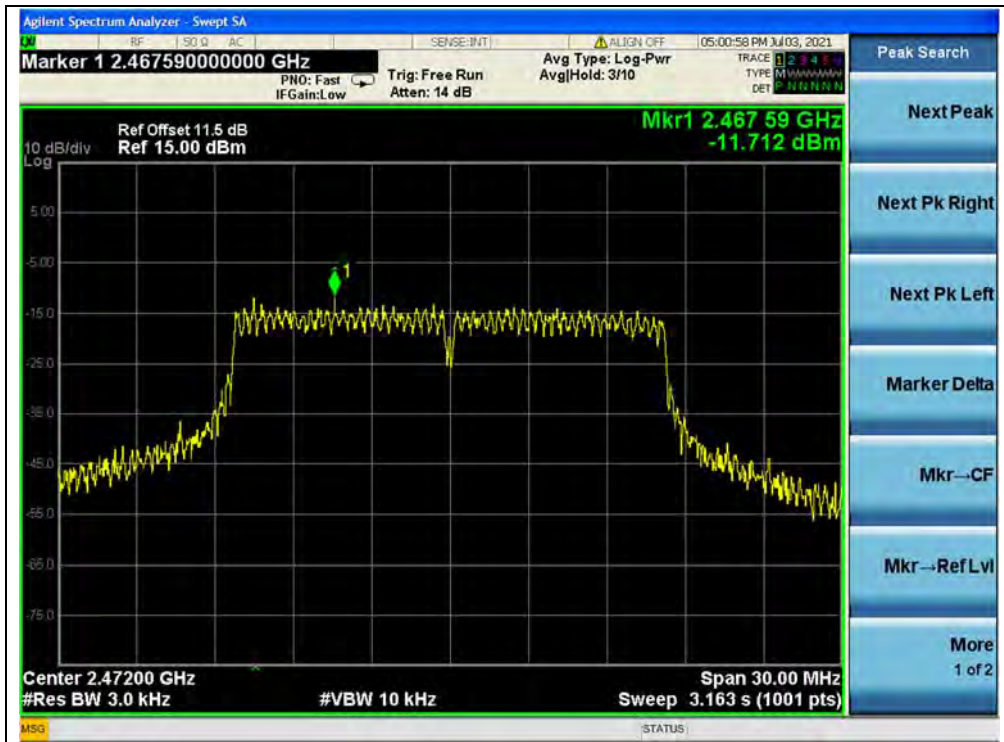
**B. Test Plot:**



(Channel 1, 802.11g, ANT0)



(Channel 7, 802.11g, ANT0)



(Channel 13, 802.11g, ANT0)



(Channel 1, 802.11g, ANT1)



(Channel 7, 802.11g, ANT1)





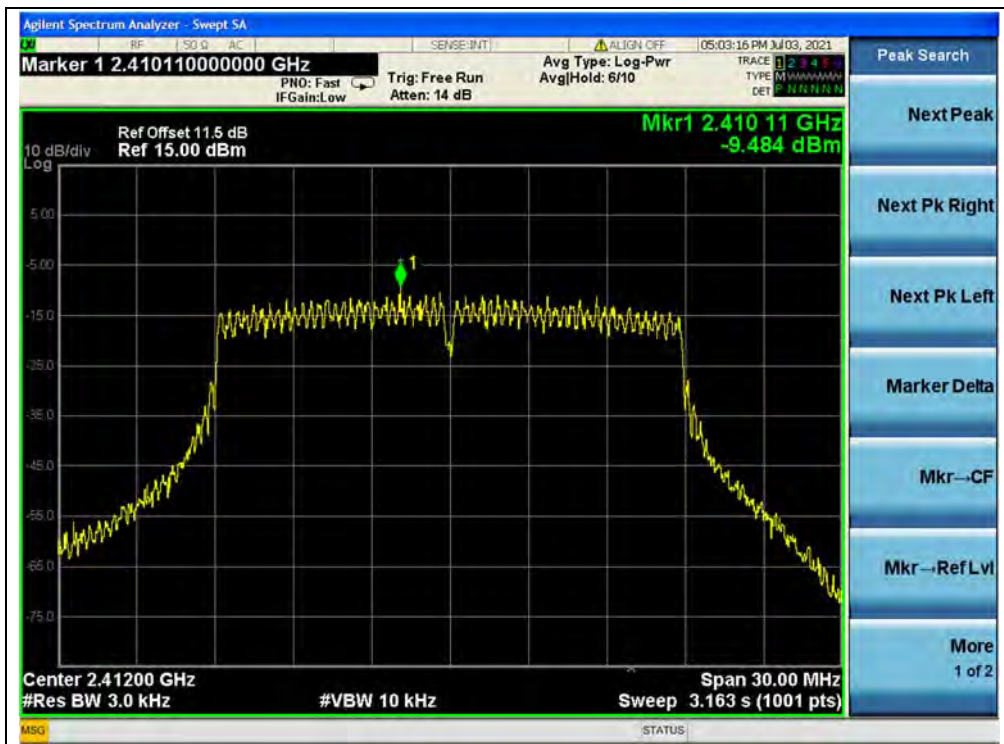
**802.11n (HT20) Mode**

**A. Test Verdict:**

Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
		ANT 0	ANT 1			
1	2412	-9.48	-9.70	-6.58	8	PASS
7	2442	-8.64	-10.07	-6.29	8	PASS
13	2472	-10.19	-10.82	-7.48	8	PASS

**Note:** Directional gain =  $1.90\text{dBi} + 10\log(2) = 4.91\text{dBi} < 6\text{dBi}$ , so the power limit is 8 dBm/3kHz.

**B. Test Plot:**



(Channel 1, 802.11n (HT20), ANT0)





(Channel 7, 802.11n (HT20), ANT0)



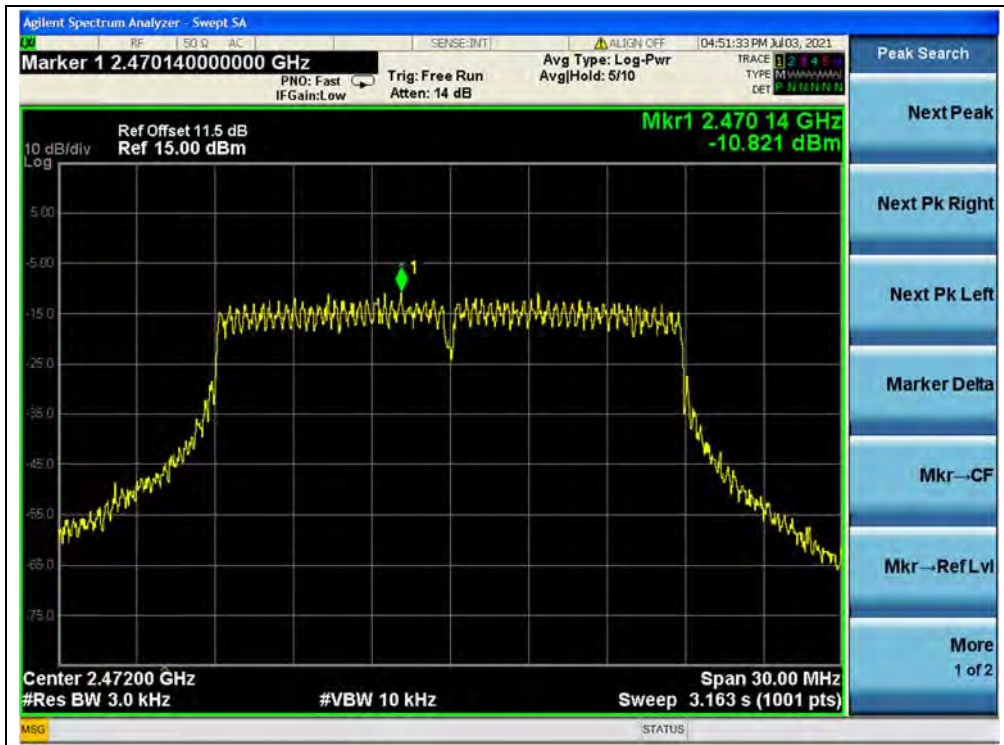
(Channel 13, 802.11n (HT20), ANT0)



(Channel 1, 802.11n (HT20), ANT1)



(Channel 7, 802.11n (HT20), ANT1)



(Channel 13, 802.11n (HT20), ANT1)

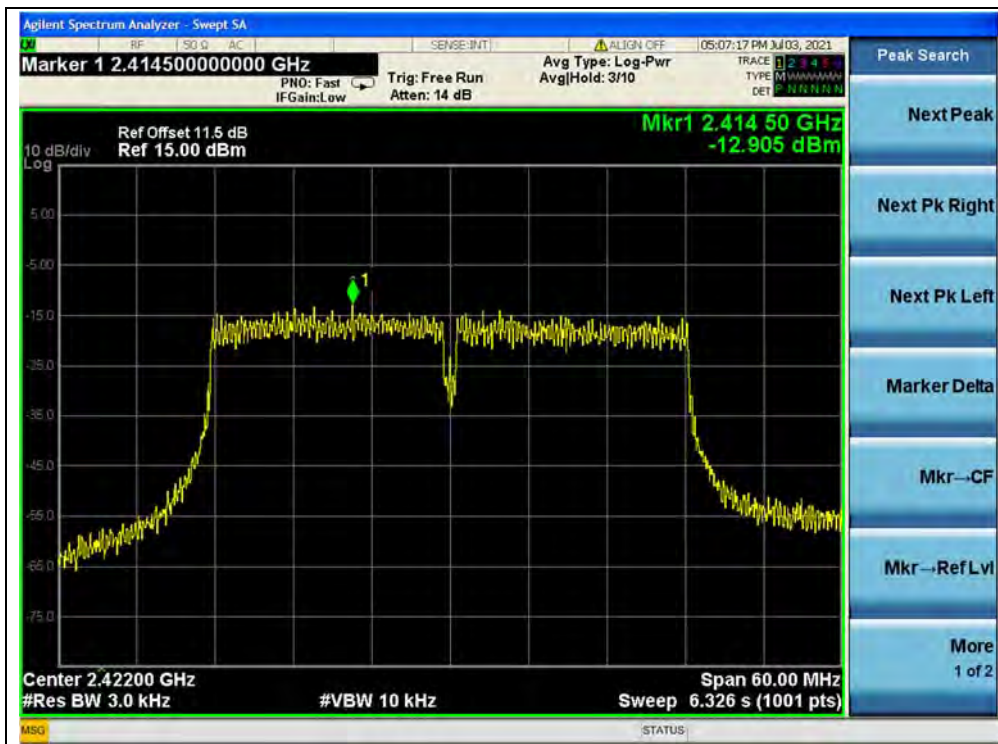
**802.11n (HT40) Mode**

**A. Test Verdict:**

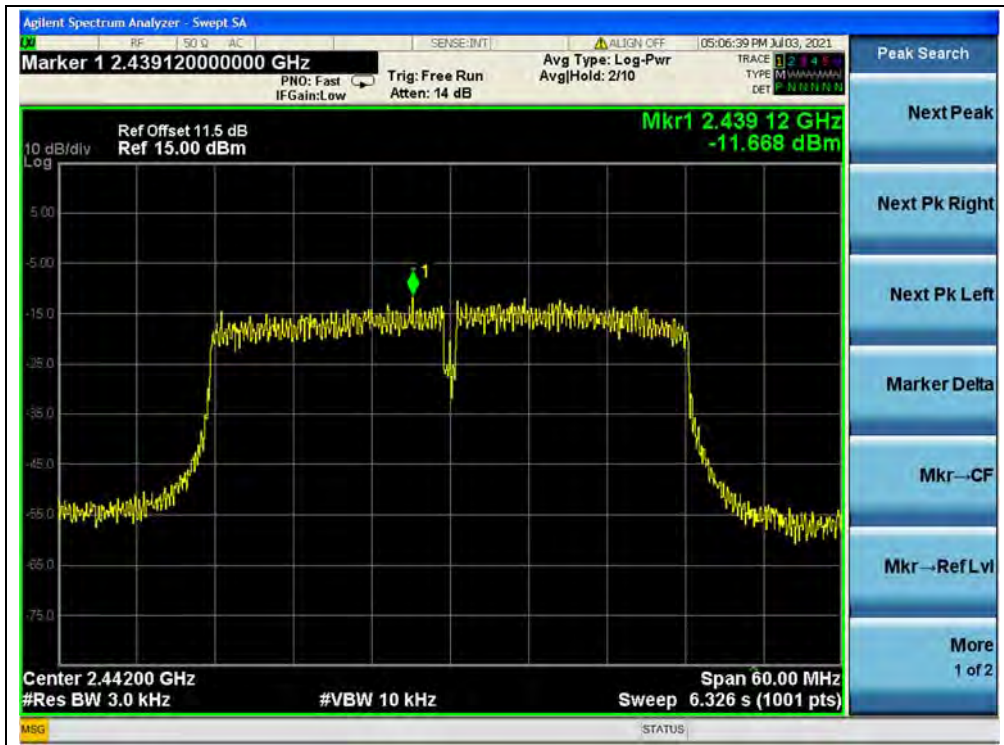
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
		ANT 0	ANT 1			
3	2422	-12.91	-12.12	-9.49	8	PASS
7	2442	-11.67	-11.65	-8.65	8	PASS
11	2462	-12.17	-13.28	-9.68	8	PASS

**Note:** Directional gain =  $1.90\text{dBi} + 10\log(2) = 4.91\text{dBi} < 6\text{dBi}$ , so the power limit is 8 dBm/3kHz.

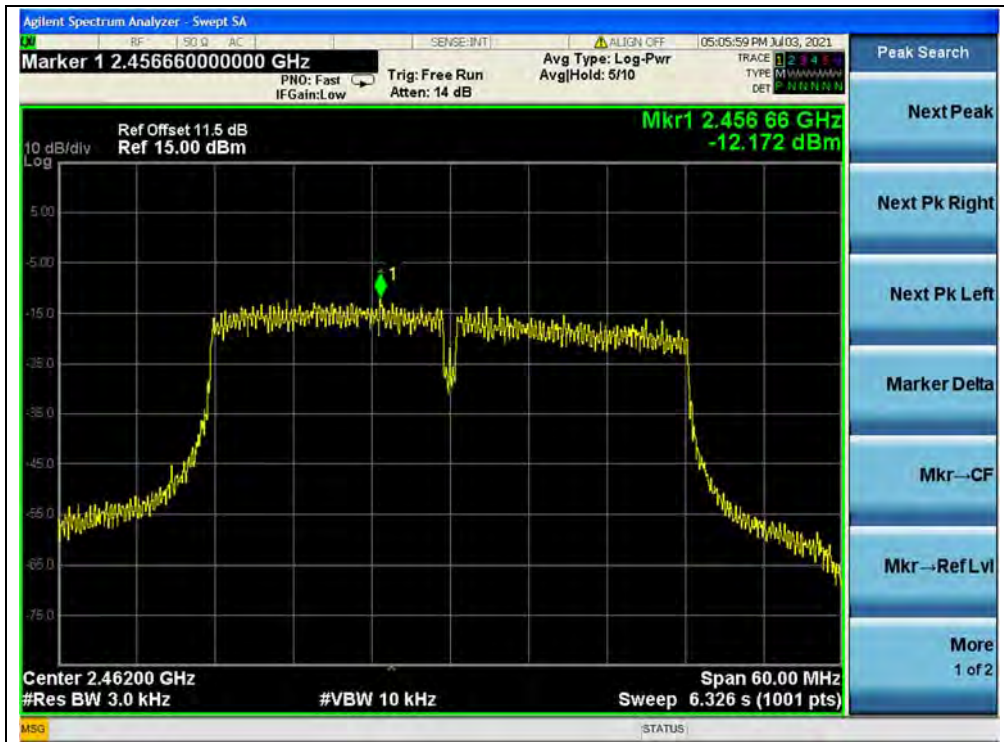
**B. Test Plot:**



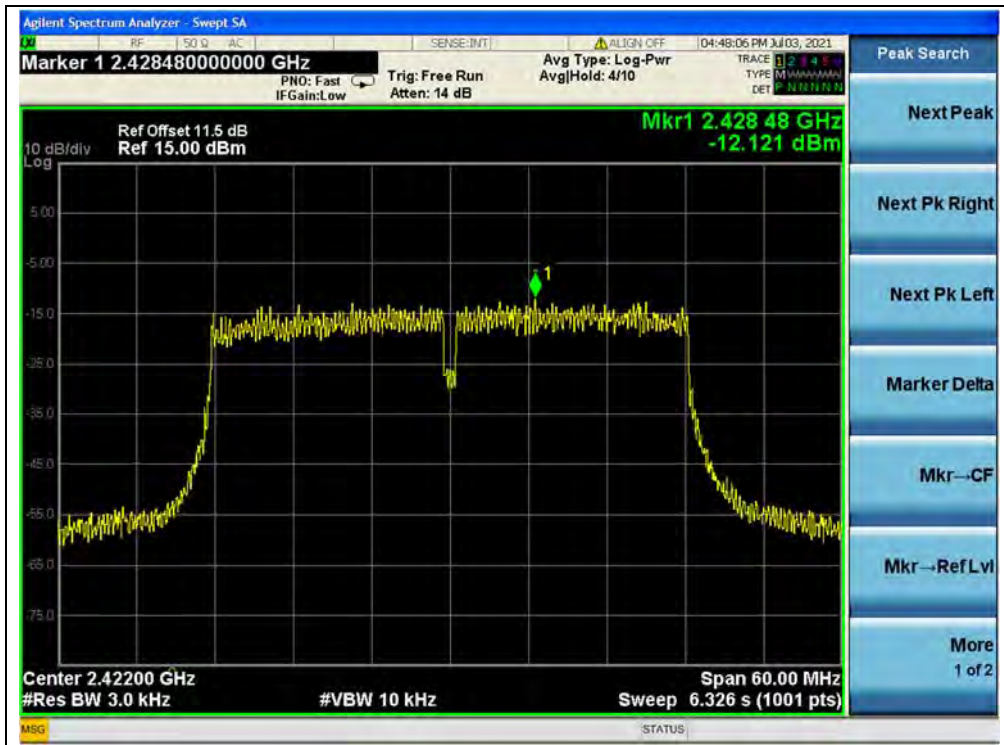
(Channel 3, 802.11n (HT40), ANT0)



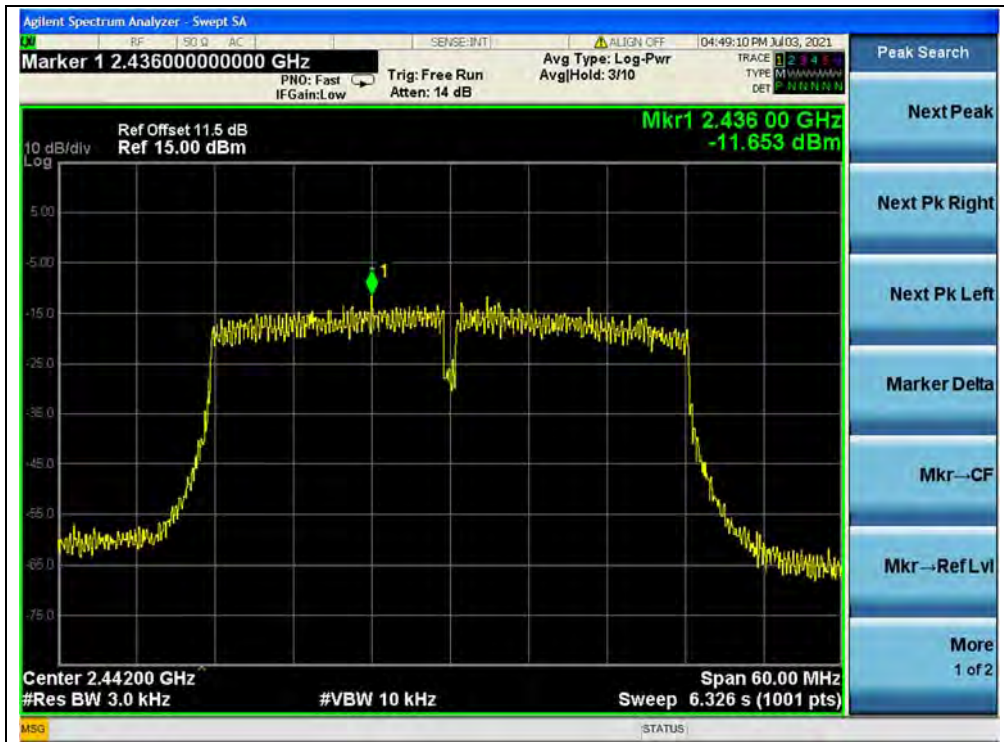
(Channel 7, 802.11n (HT40), ANT0)



(Channel 11, 802.11n (HT40), ANT0)



(Channel 3, 802.11n (HT40), ANT1)



(Channel 7, 802.11n (HT40), ANT1)



(Channel 11, 802.11n (HT40), ANT1)

## 2.7. Conducted Emission

### 2.7.1. Requirement

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

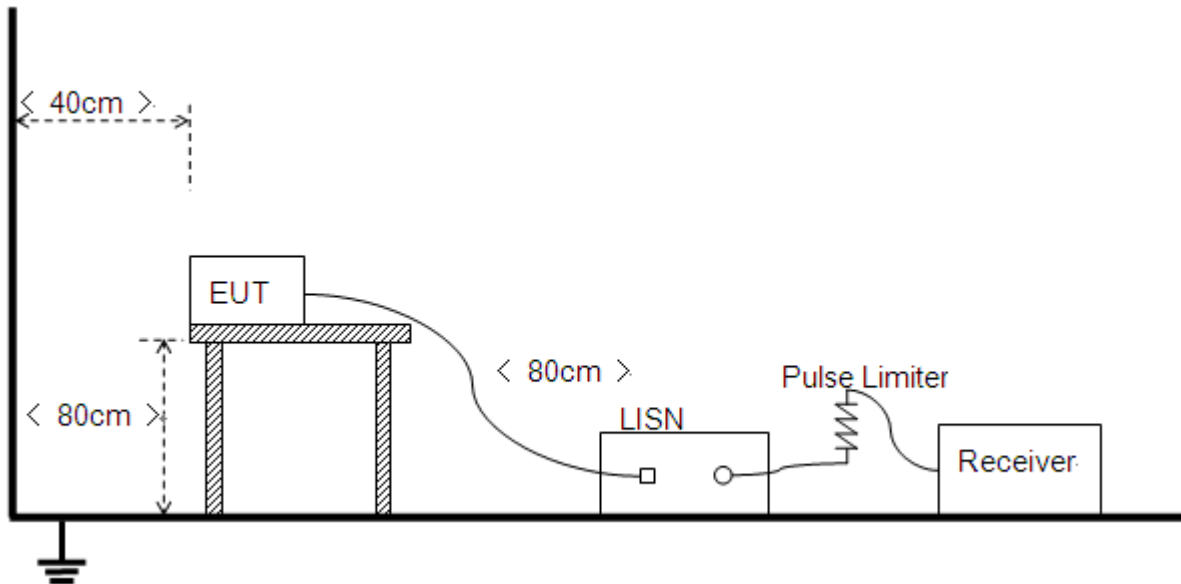
Frequency Range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**NOTE:**

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

### 2.7.2. Test Description

**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. Set RBW=9kHz, VBW=30kHz. 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 + WIFI TX

Test Voltage: AC 120V/60Hz

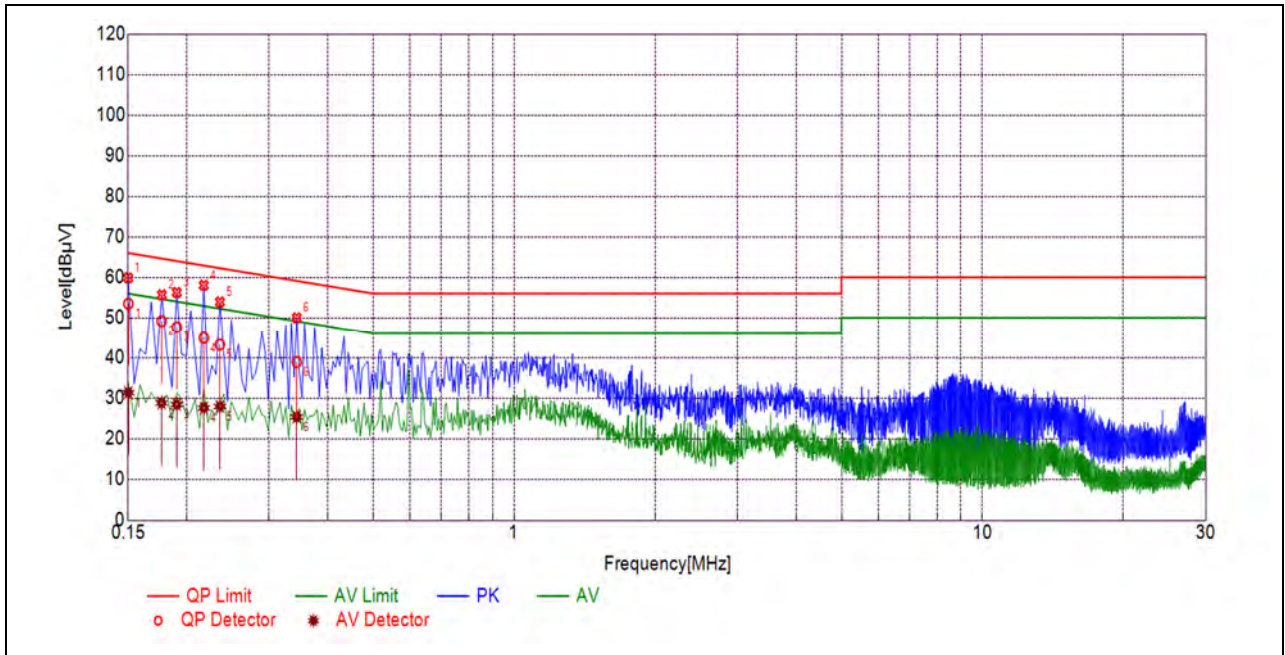
The measurement results are obtained as below:

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

$U_R$ : Receiver Reading

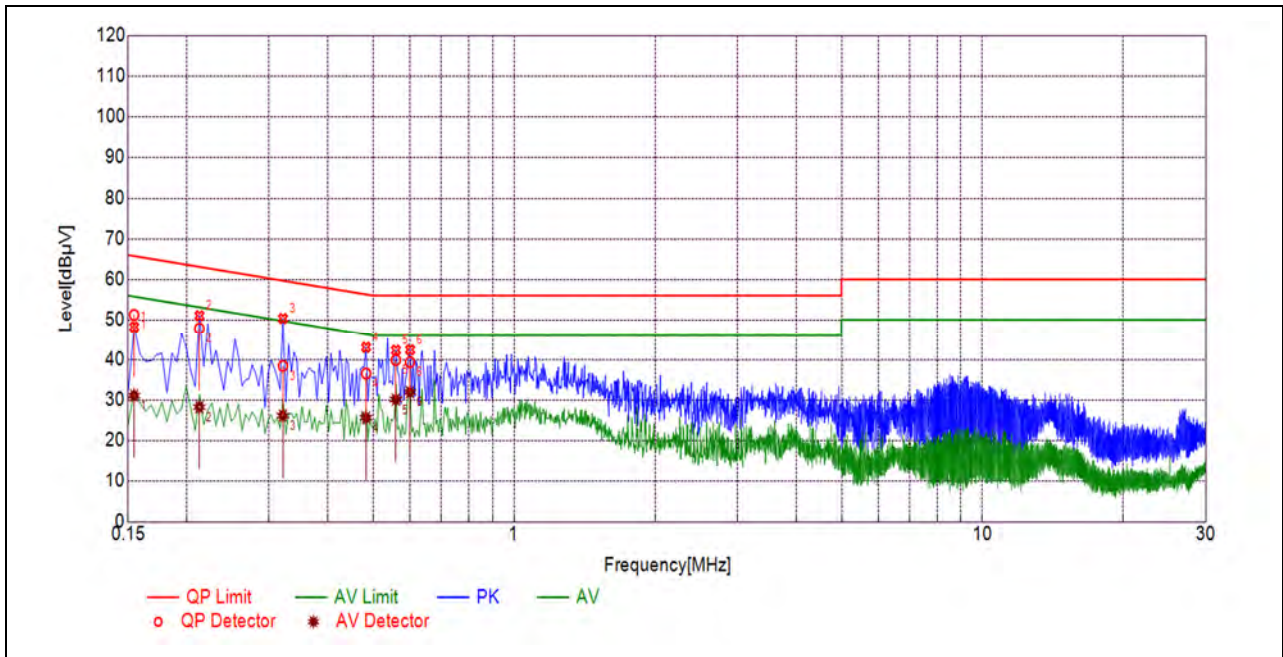
$A_{\text{Factor}}$ : Voltage division factor of LISN

**B. Test Plot:**



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1501	53.50	31.34	65.99	55.99	Line	PASS
2	0.1768	49.17	28.78	64.63	54.63		PASS
3	0.1905	47.65	28.42	64.01	54.01		PASS
4	0.2176	44.90	27.56	62.91	52.91		PASS
5	0.2354	43.23	27.92	62.26	52.26		PASS
6	0.3435	38.89	25.34	59.12	49.12		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1544	51.24	31.07	65.76	55.76	Neutral	PASS
2	0.2128	47.85	28.22	63.09	53.09		PASS
3	0.3209	38.41	26.11	59.68	49.68		PASS
4	0.4830	36.54	25.61	56.29	46.29		PASS
5	0.5591	39.86	30.09	56.00	46.00		PASS
6	0.5995	39.34	31.91	56.00	46.00		PASS

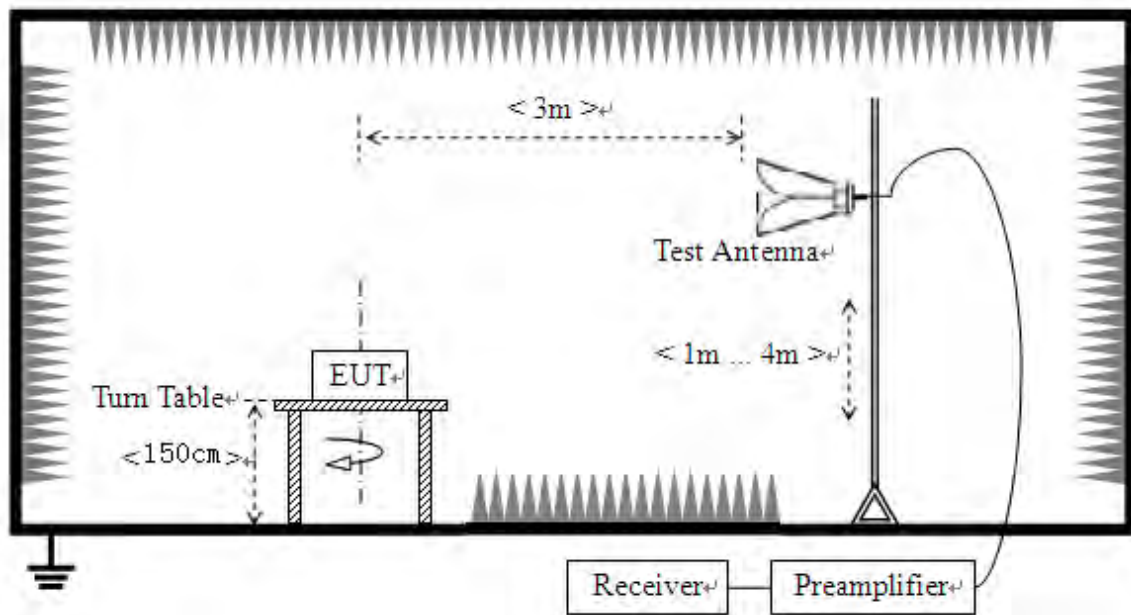
## 2.8. Restricted Frequency Bands

### 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:

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

$A_T$ : Total correction Factor except Antenna

$U_R$ : Receiver Reading

$G_{\text{preamp}}$ : Preamplifier Gain

$A_{\text{Factor}}$ : 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.

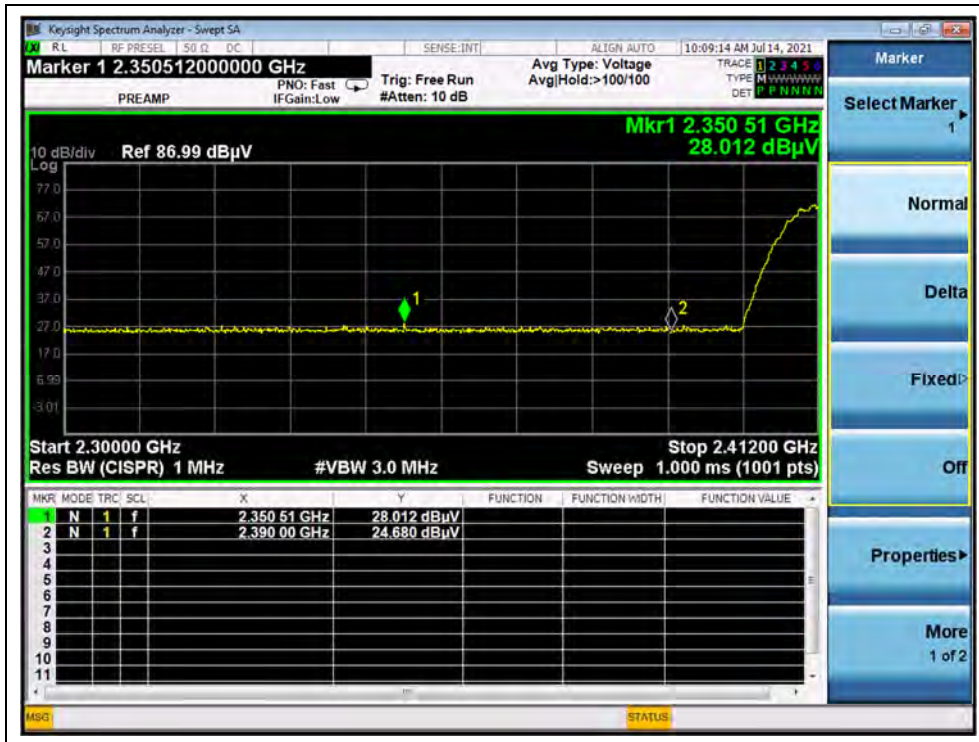
### 802.11b Mode

#### A. Test Verdict:

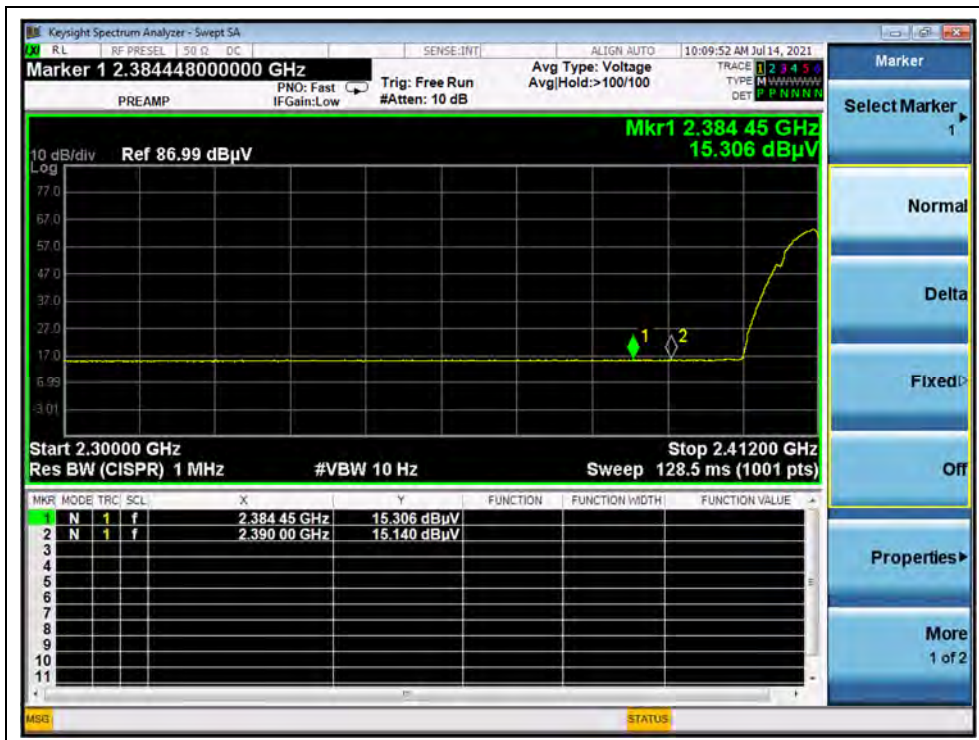
Channel	Frequency (MHz)	Detector	Receiver Reading	$A_T$ (dB)	$A_{\text{Factor}}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV	$U_R$ (dB $\mu$ V)					
1	2350.51	PK	28.01	6.74	27.20	61.95	74	PASS
1	2384.45	AV	15.31	6.74	27.20	49.25	54	PASS
13	2483.74	PK	27.87	6.74	27.20	61.81	74	PASS
13	2483.50	AV	15.59	6.74	27.20	49.53	54	PASS



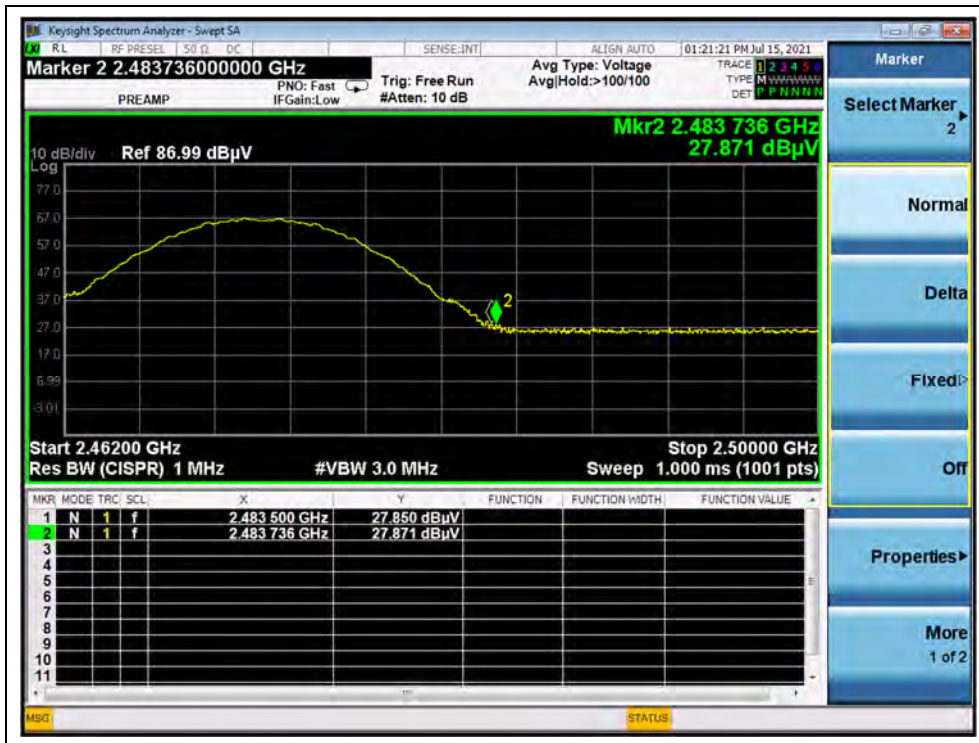
B. Test Plot:



(PEAK, Channel 1, 802.11b)



(AVERAGE, Channel 1, 802.11b)



(PEAK, Channel 13, 802.11b)



(AVERAGE, Channel 13, 802.11b)



802.11g Mode

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading	A <sub>T</sub> (dB)	A <sub>Factor</sub> (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV	U <sub>R</sub> (dBμV)					
1	2332.48	PK	27.86	6.74	27.20	61.80	74	PASS
1	2390.00	AV	14.61	6.74	27.20	48.55	54	PASS
13	2483.50	PK	29.69	6.74	27.20	63.63	74	PASS
13	2483.50	AV	16.78	6.74	27.20	50.72	54	PASS

B. Test Plot:

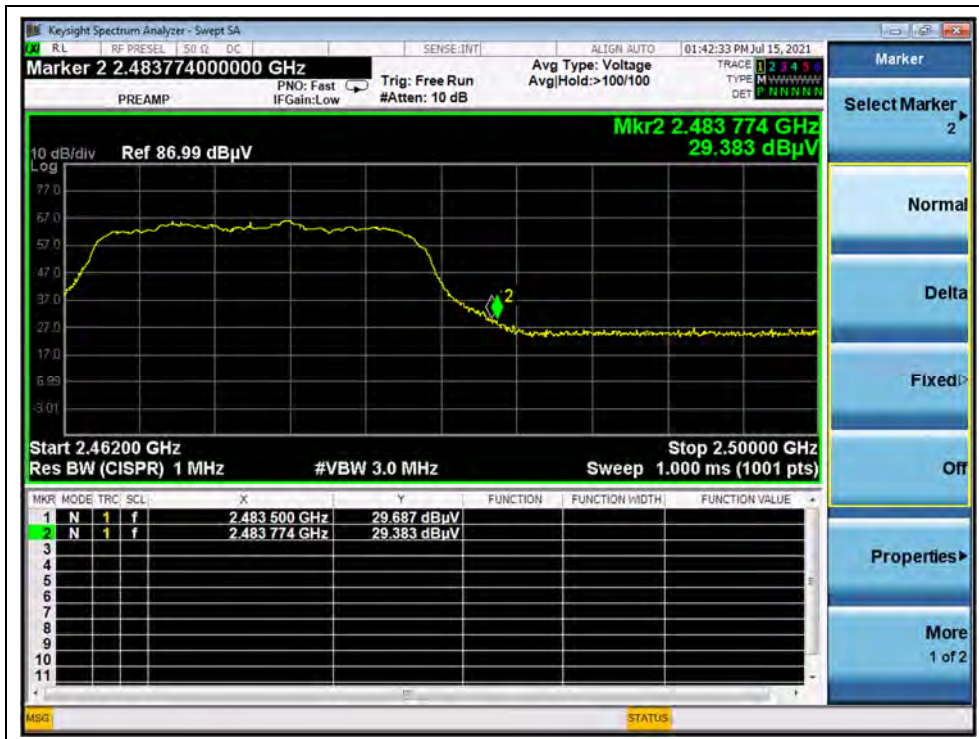


(PEAK, Channel 1, 802.11g)

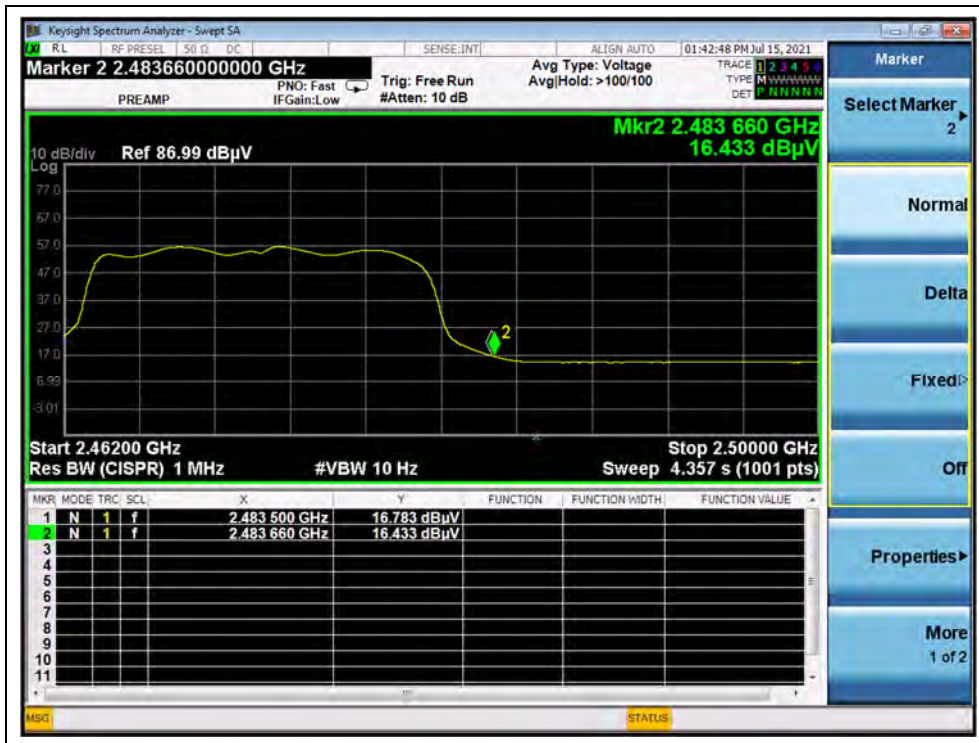




(AVERAGE, Channel 1, 802.11g)



(PEAK, Channel 13, 802.11g)



(AVERAGE, Channel 13, 802.11g)

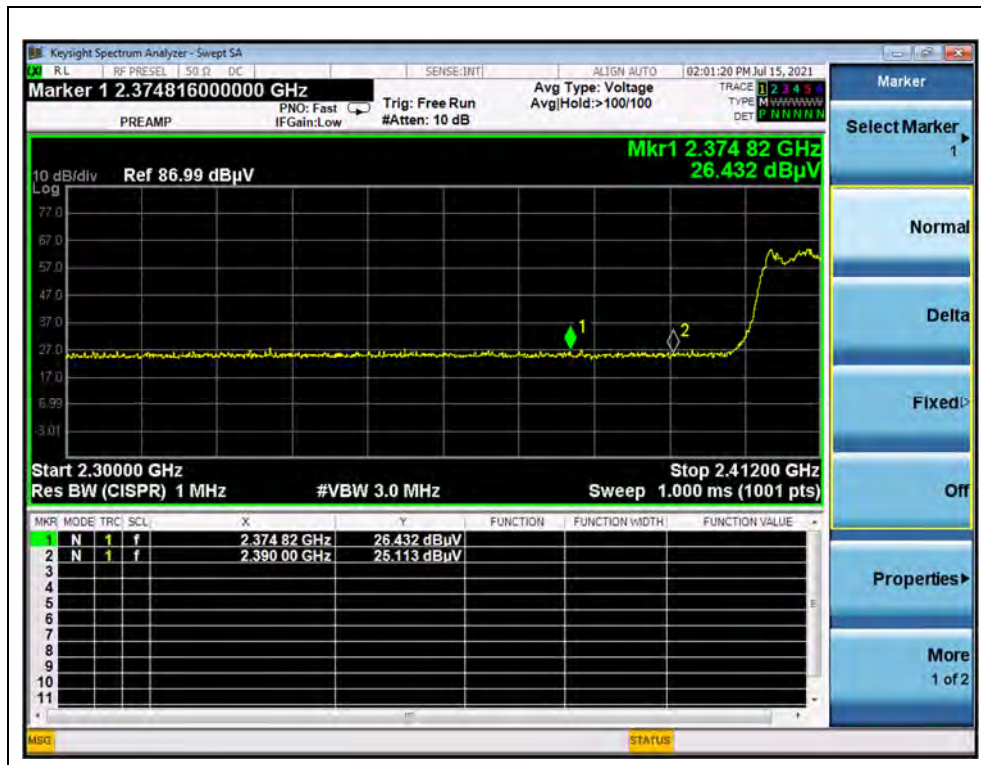


802.11n (HT20) Mode

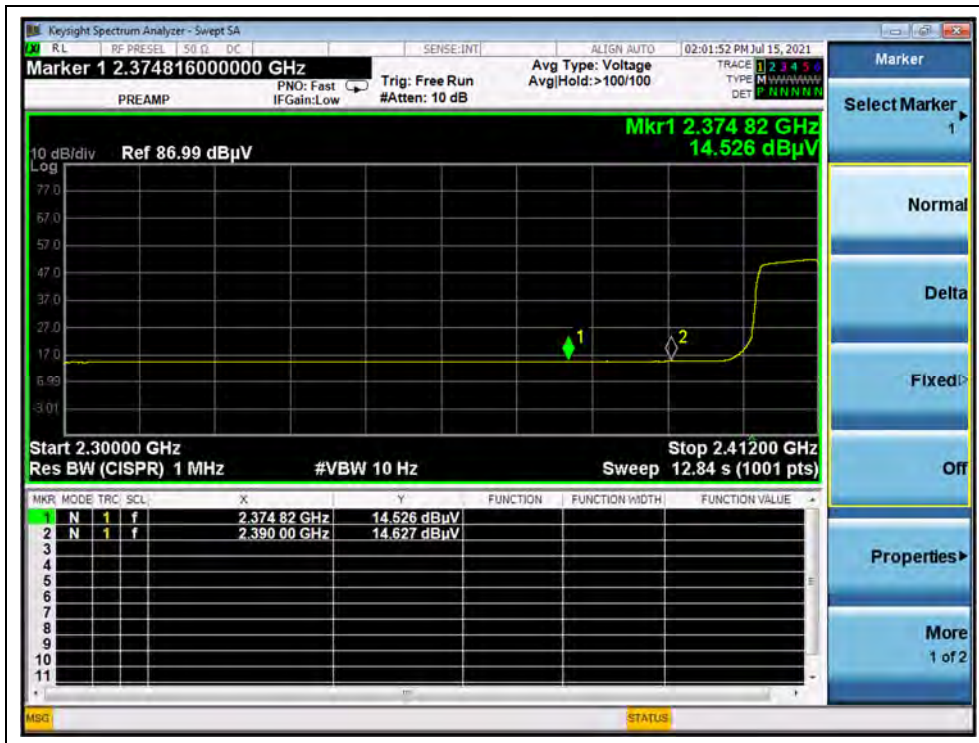
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading	A <sub>T</sub> (dB)	A <sub>Factor</sub> (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV	U <sub>R</sub> (dBμV)					
1	2374.82	PK	26.43	6.74	27.20	60.37	74	PASS
1	2390.00	AV	14.63	6.74	27.20	48.57	54	PASS
13	2483.66	PK	32.20	6.74	27.20	66.14	74	PASS
13	2483.50	AV	17.97	6.74	27.20	51.91	54	PASS

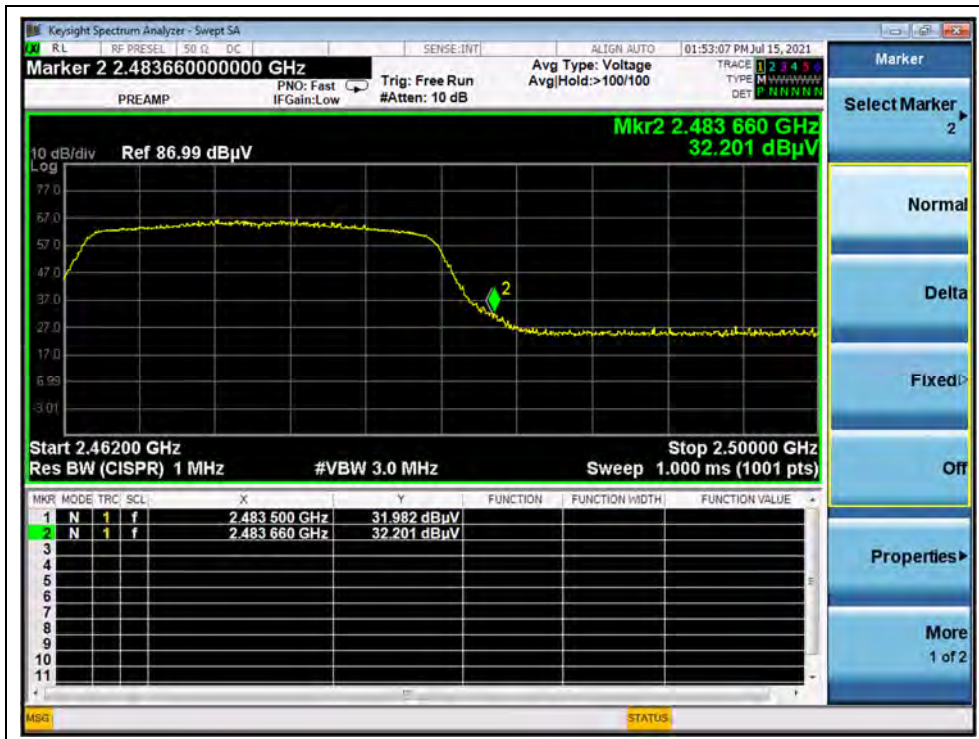
B. Test Plot:



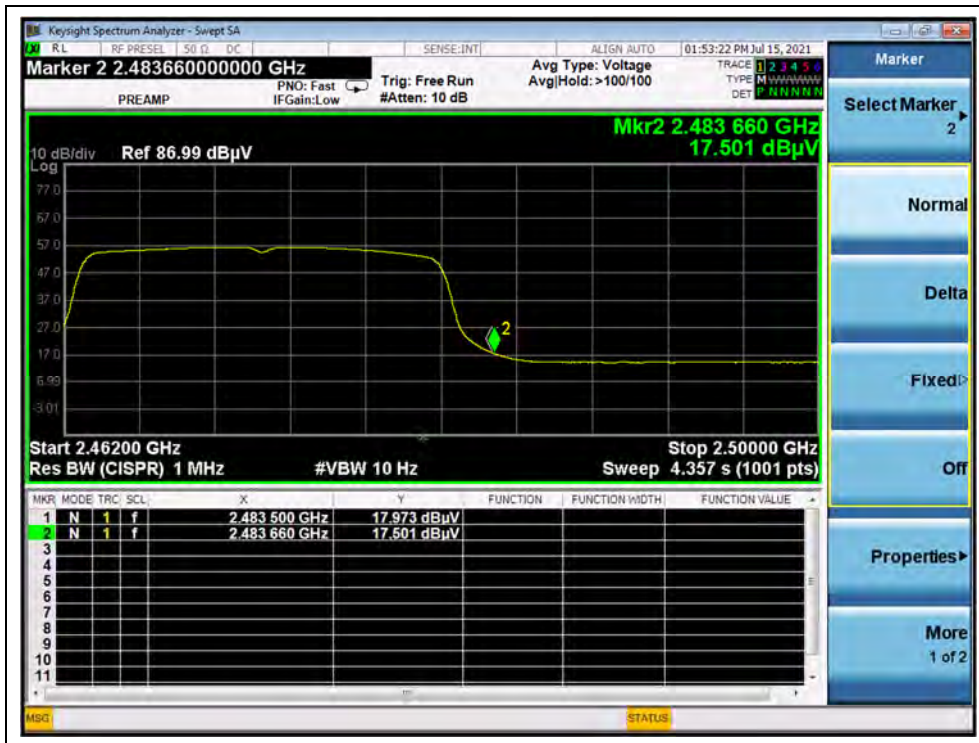
(PEAK, Channel 1, 802.11n (HT20))



(AVERAGE, Channel 1, 802.11n (HT20))



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



(AVERAGE, Channel 13, 802.11n (HT20))

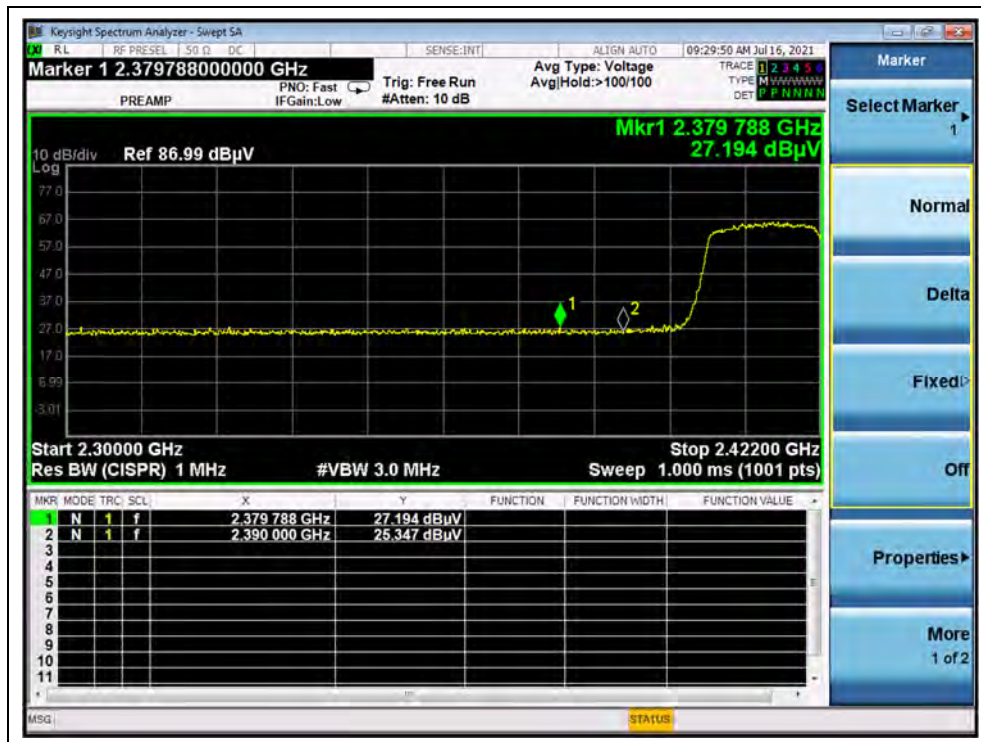


802.11n (HT40) Mode

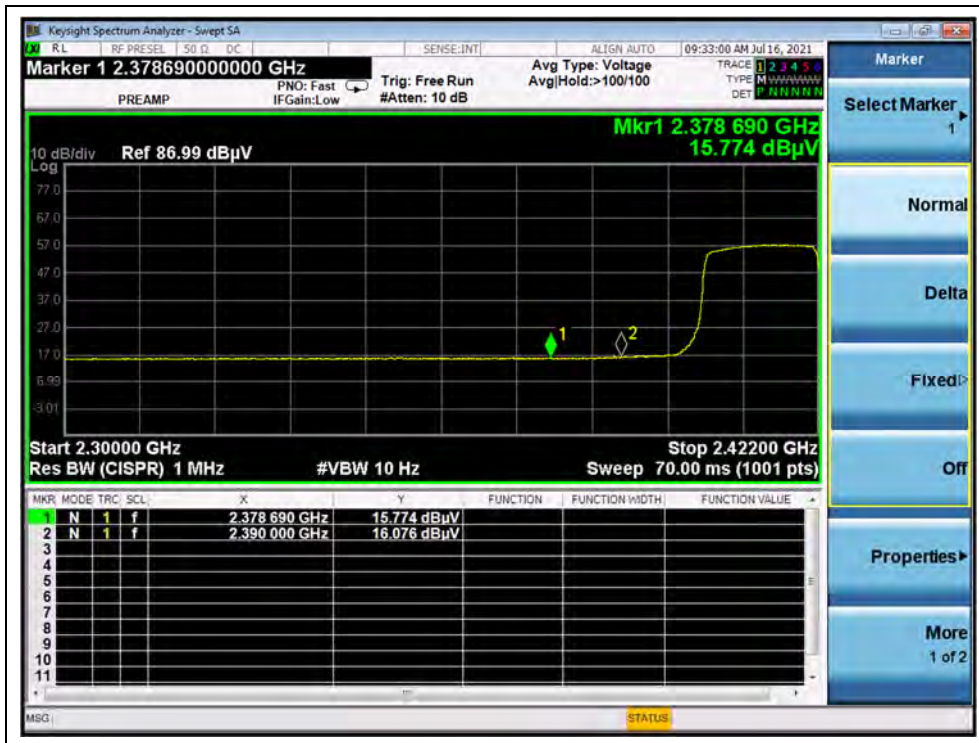
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading $U_R$ (dB $\mu$ V)	$A_T$ (dB)	$A_{Factor}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV						
3	2379.79	PK	27.19	6.74	27.20	61.13	74	PASS
3	2390.00	AV	16.08	6.74	27.20	50.02	54	PASS
11	2483.93	PK	28.20	6.74	27.20	62.14	74	PASS
11	2483.50	AV	16.80	6.74	27.20	50.74	54	PASS

B. Test Plot:



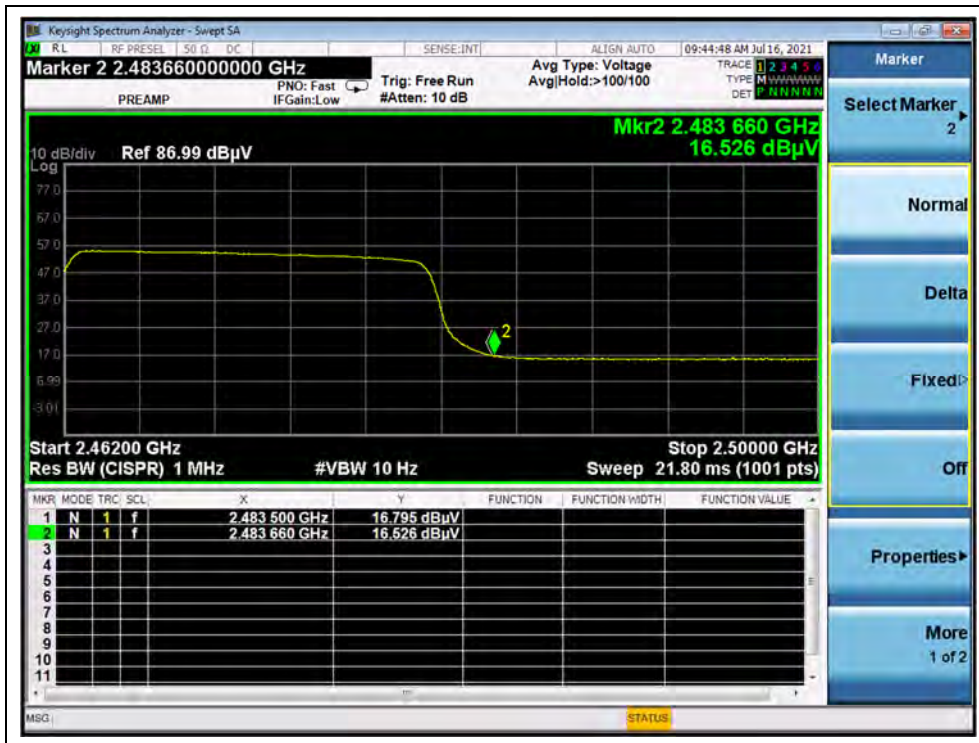
(PEAK, Channel 3, 802.11n (HT40))



(AVERAGE, Channel 3, 802.11n (HT40))



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



(AVERAGE, Channel 11, 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 ( $\mu\text{V}/\text{m}$ )	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

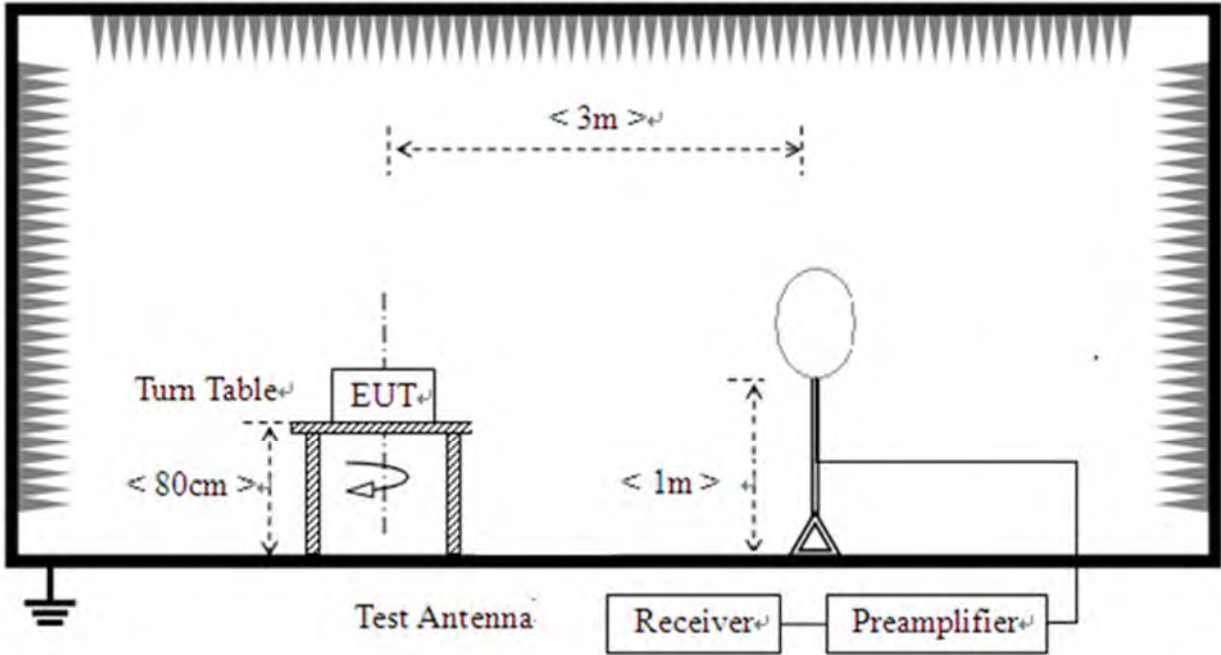
**Note1:** For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

**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).

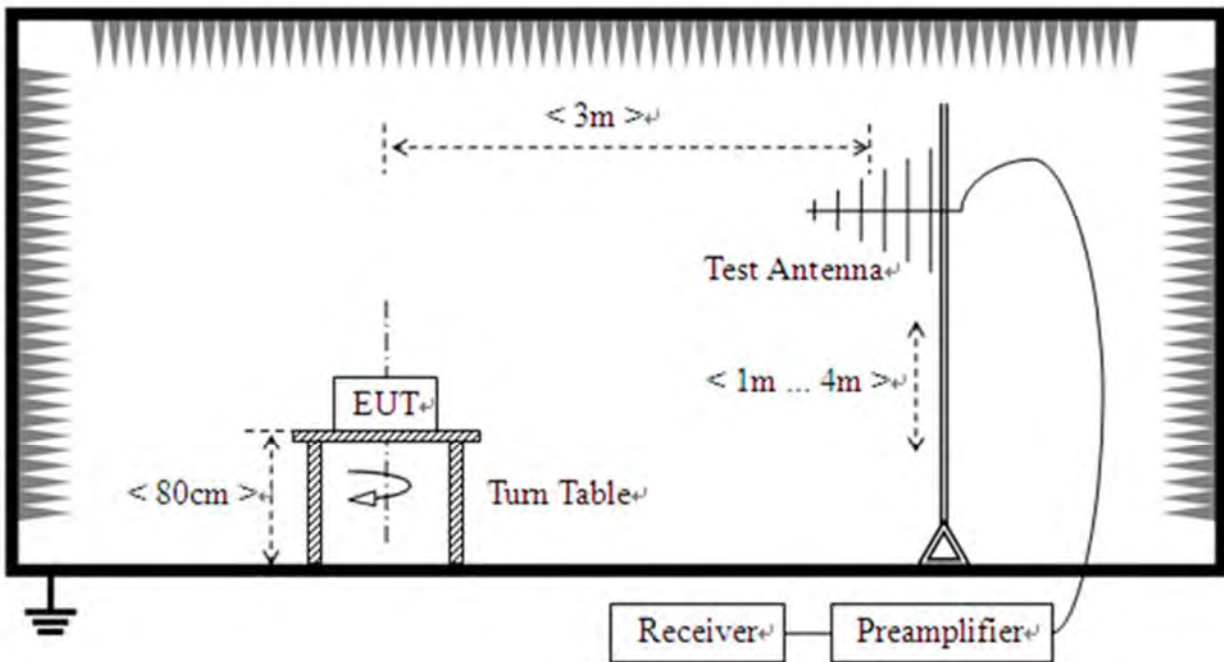
### 2.9.2. Test Description

#### Test Setup:

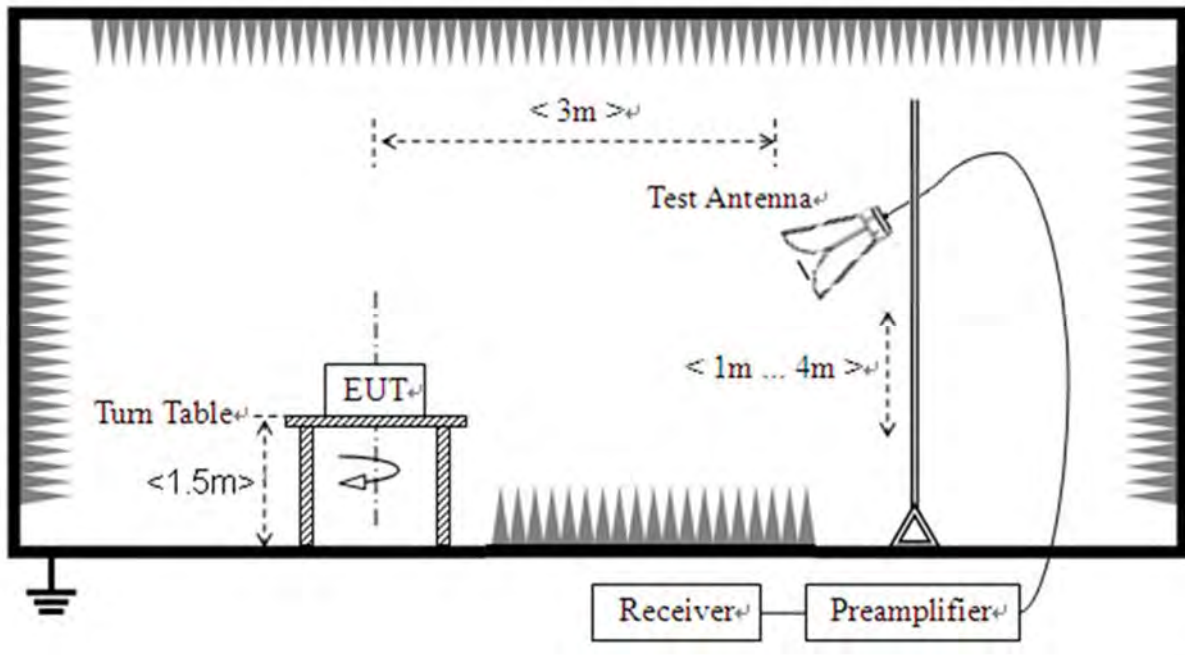
- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



## 3) For radiated emissions above 1GHz



The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.



### 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 (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

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

$A_T$ : Total correction Factor except Antenna

$U_R$ : Receiver Reading

$G_{\text{preamp}}$ : Preamplifier Gain

$A_{\text{Factor}}$ : Antenna Factor at 3m

During the test, the total correction Factor  $A_T$  and  $A_{\text{Factor}}$  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.

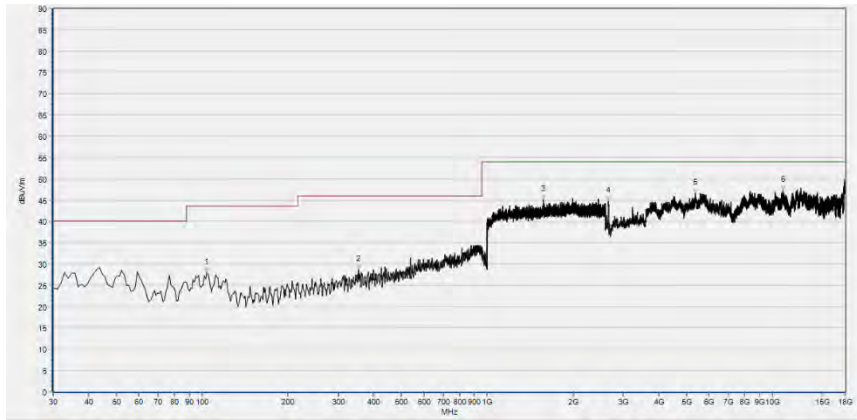
**Note2:** For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

**Note3:** For the frequency, which started from 18GHz to 10th harmonic of the highest frequency, was pre-scanned and the result which was 20dB lower than the limit was not recorded.



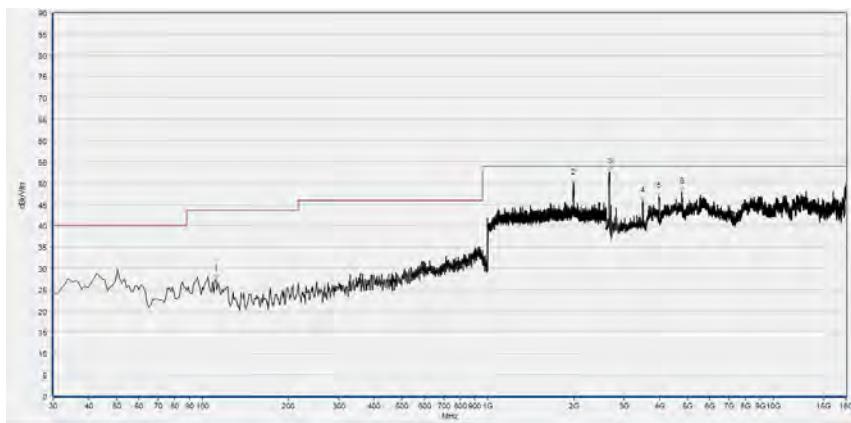
**802.11b Mode**

**Plot 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
103.720	28.00	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
353.010	28.67	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1573.867	45.15	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2655.440	44.67	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5359.680	46.59	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10922.160	47.31	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

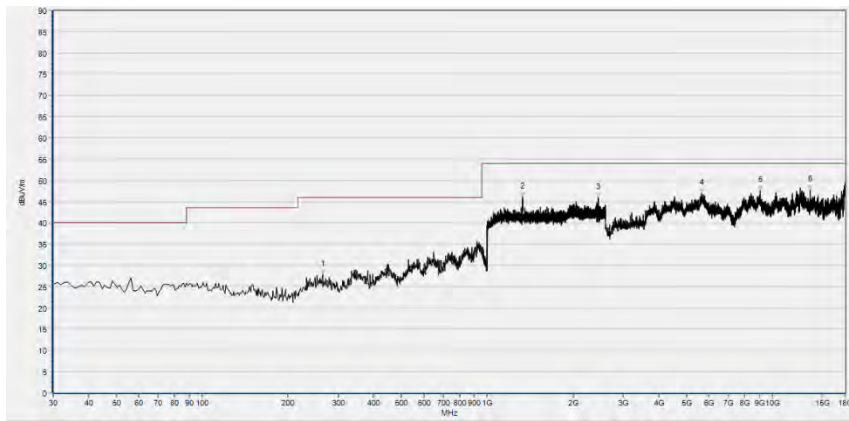
(Antenna Horizontal, 30MHz to 18GHz)



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
111.480	27.44	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1992.533	50.01	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2665.400	54.25	N/A	29.60	74.00	N/A	54.00	Vertical	PASS
3487.040	45.77	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3982.920	46.98	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4783.720	47.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

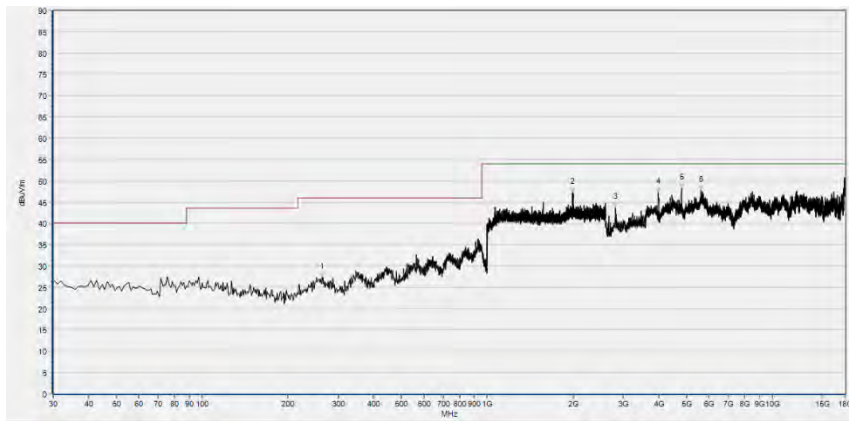
(Antenna Vertical, 30MHz to 18GHz)

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
264.740	27.81	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1326.933	46.17	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2457.067	45.90	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5655.360	46.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9077.240	47.56	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
13592.520	47.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

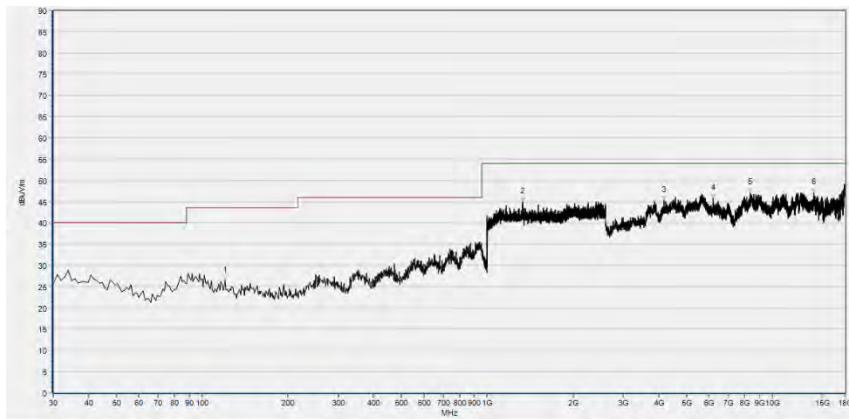
(Antenna Horizontal, 30MHz to 18GHz)



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
263.770	27.28	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1991.467	47.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2818.680	43.79	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3986.000	47.19	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4796.040	48.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5624.560	47.74	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

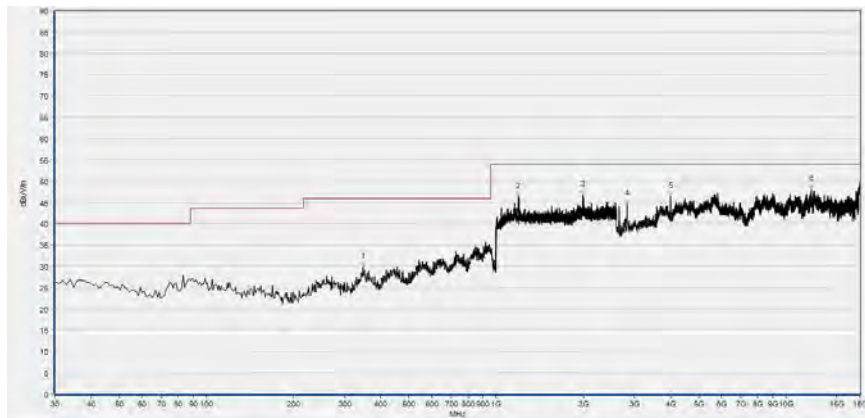
(Antenna Vertical, 30MHz to 18GHz)

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
120.210	26.29	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1330.133	44.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4167.720	45.18	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6212.840	45.80	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8378.080	47.13	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
13986.760	47.13	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



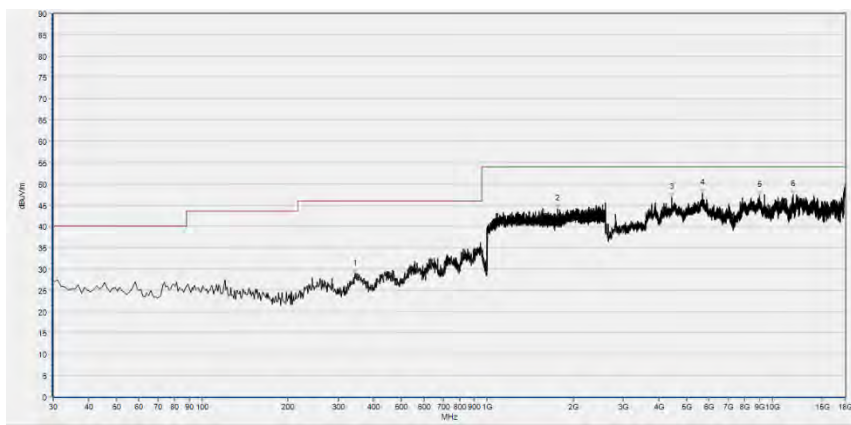
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
347.190	29.89	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1195.733	46.18	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1992.533	46.74	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2827.920	44.58	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3995.240	46.50	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12215.760	48.04	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)



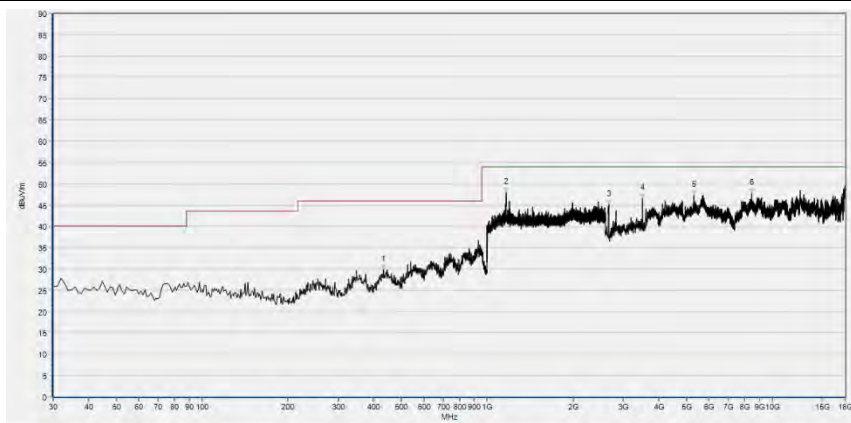
**802.11g Mode**

**Plot 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
343.310	28.86	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1767.467	44.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4432.600	46.68	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5673.840	47.80	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9000.240	47.31	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
11809.200	47.47	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

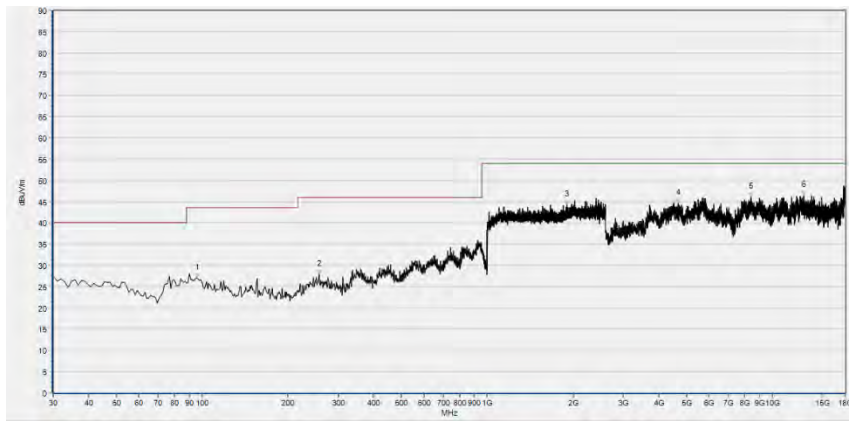


Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
431.580	29.89	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1164.800	47.86	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2664.680	45.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3496.280	46.64	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5316.560	47.24	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8458.160	47.79	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

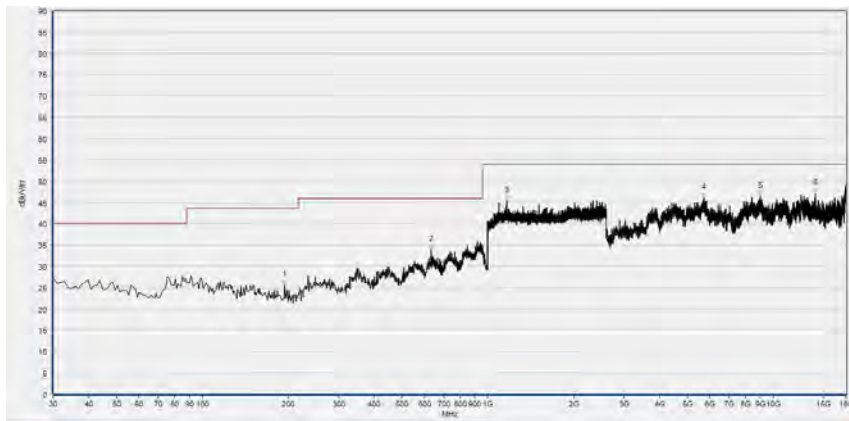


Plot for Channel 7



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
95.960	26.93	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
256.980	27.74	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1900.267	44.22	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4663.600	44.65	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8421.200	46.13	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12902.600	46.34	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

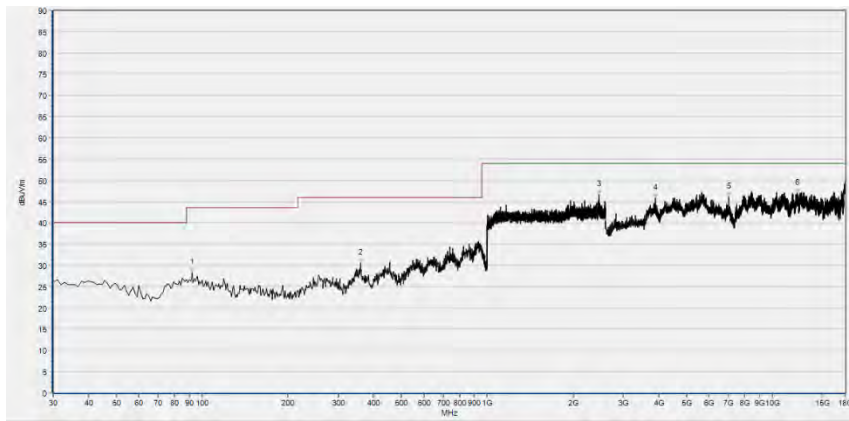
(Antenna Horizontal, 30MHz to 18GHz)



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
193.930	25.69	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
634.310	33.86	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1162.667	45.50	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5729.280	46.11	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9018.720	46.44	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
14060.680	47.03	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

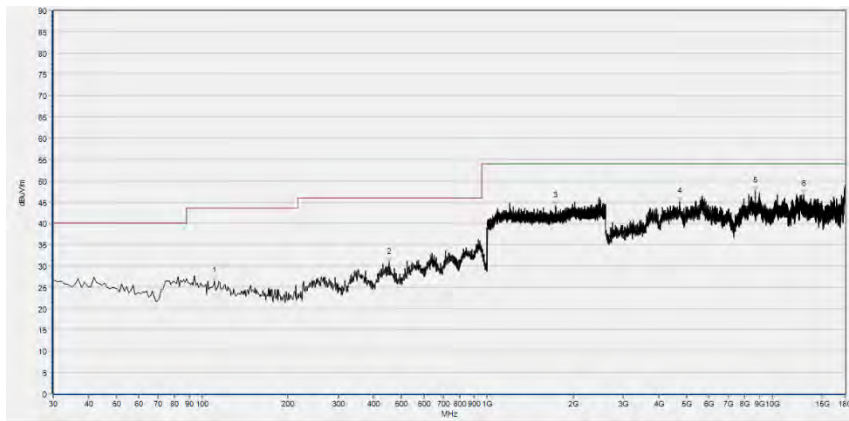
(Antenna Vertical, 30MHz to 18GHz)

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
92.080	28.40	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
358.830	30.49	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2467.733	46.66	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3878.200	45.80	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
7038.280	46.02	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12234.240	46.90	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



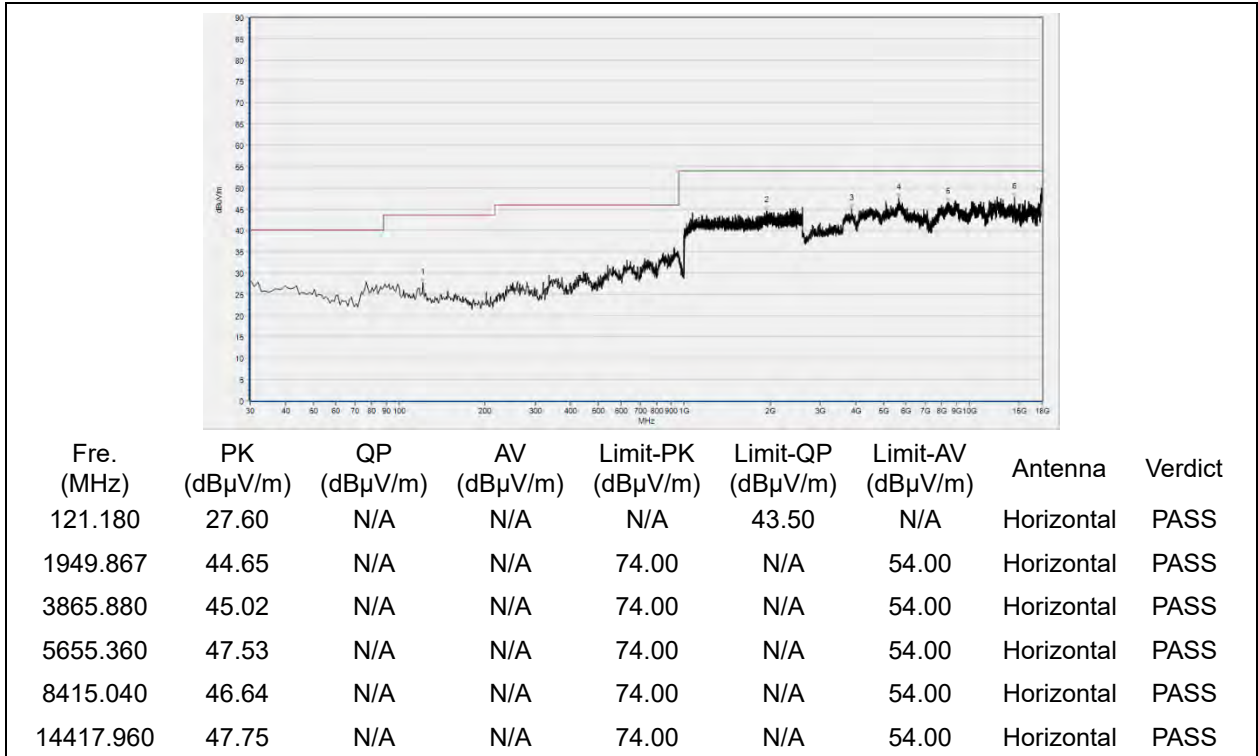
Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
110.510	26.49	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
451.950	30.78	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1731.733	44.10	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4725.200	45.01	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8723.040	47.59	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12890.280	46.70	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

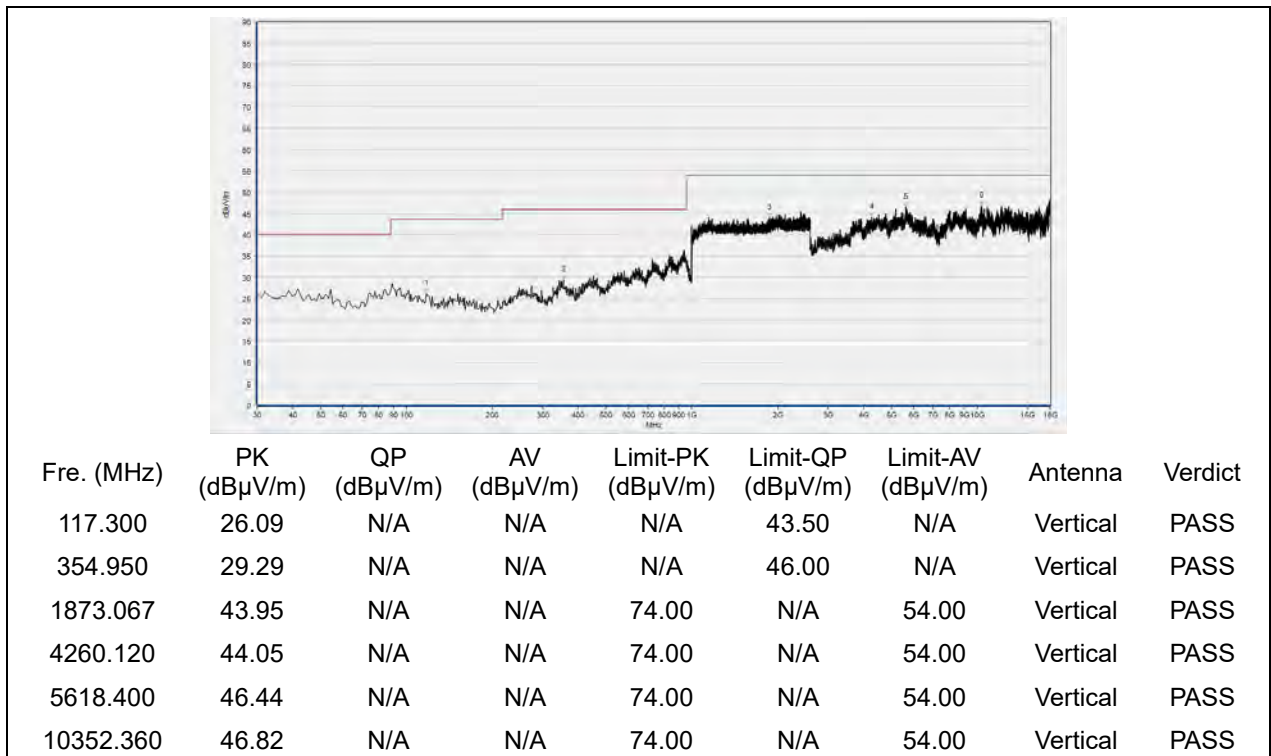


**802.11n (HT20) Mode**

**Plot for Channel 1**

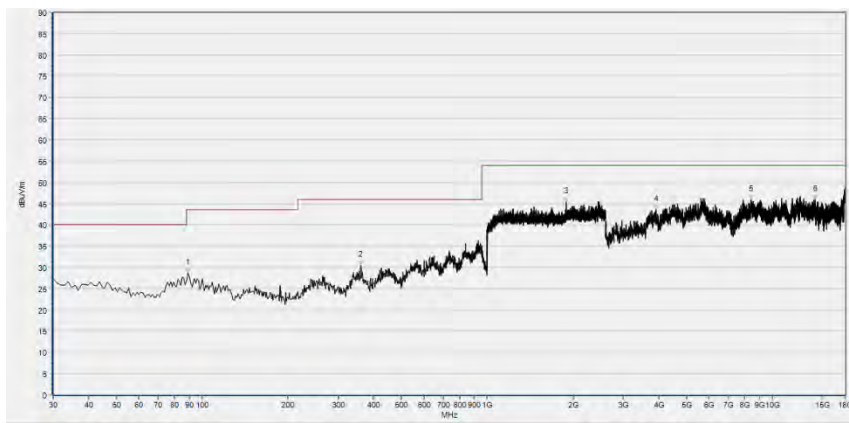


(Antenna Horizontal, 30MHz to 18GHz)



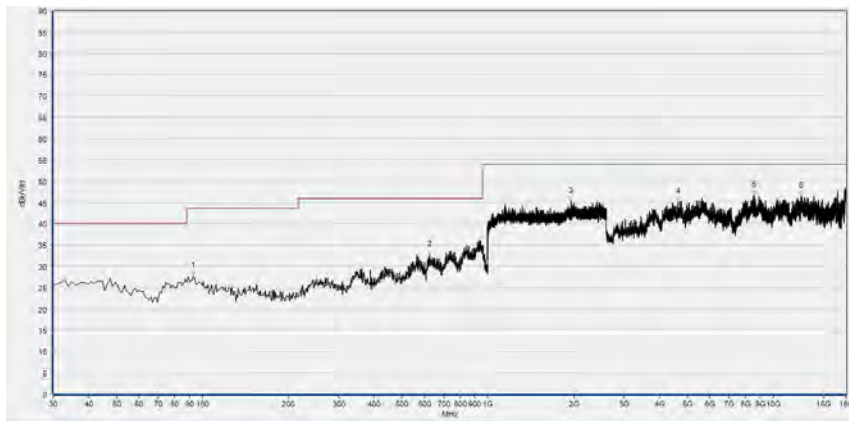
(Antenna Vertical, 30MHz to 18GHz)

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
89.170	28.59	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
359.800	30.54	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1888.000	45.36	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3905.920	43.50	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8418.120	45.89	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
14119.200	45.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

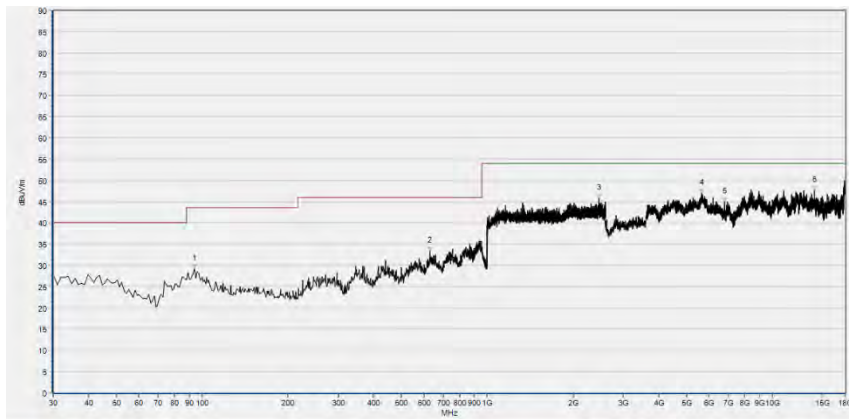
(Antenna Horizontal, 30MHz to 18GHz)



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
93.050	27.69	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
626.550	32.75	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1957.867	45.18	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4635.880	45.17	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8547.480	46.54	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12551.480	46.42	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

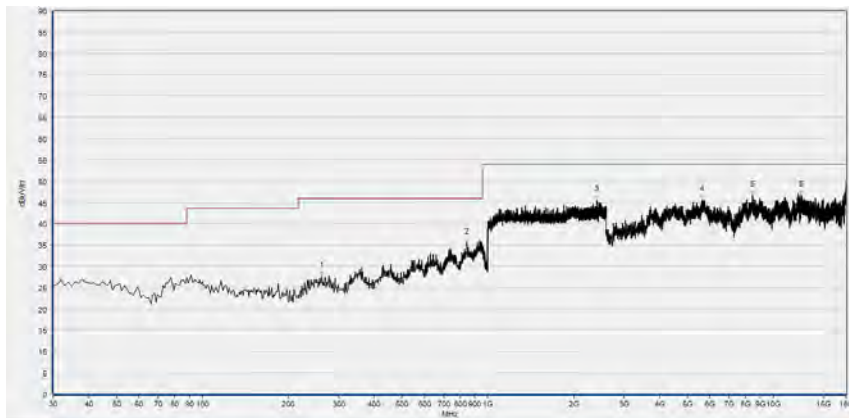
(Antenna Vertical, 30MHz to 18GHz)

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
94.020	29.19	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
628.490	33.35	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2466.667	45.76	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5655.360	46.95	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6785.720	44.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
14017.560	47.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



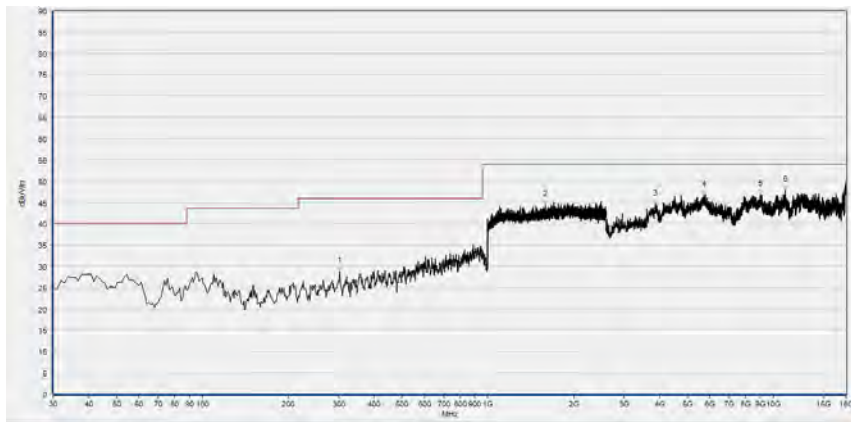
Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
261.830	27.65	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
844.800	35.61	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2412.800	45.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5624.560	45.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8439.680	46.83	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12520.680	46.68	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)



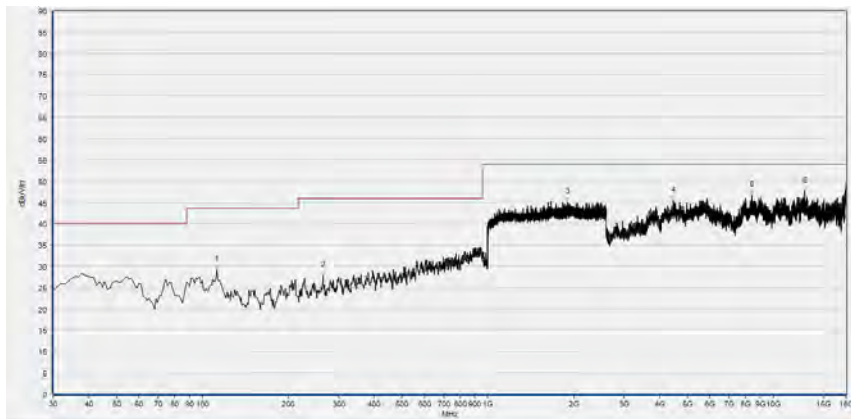
**802.11n (HT40) Mode**

**Plot 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
302.570	28.78	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1587.200	44.36	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3862.800	44.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5707.720	46.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9021.800	46.95	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10999.160	47.99	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

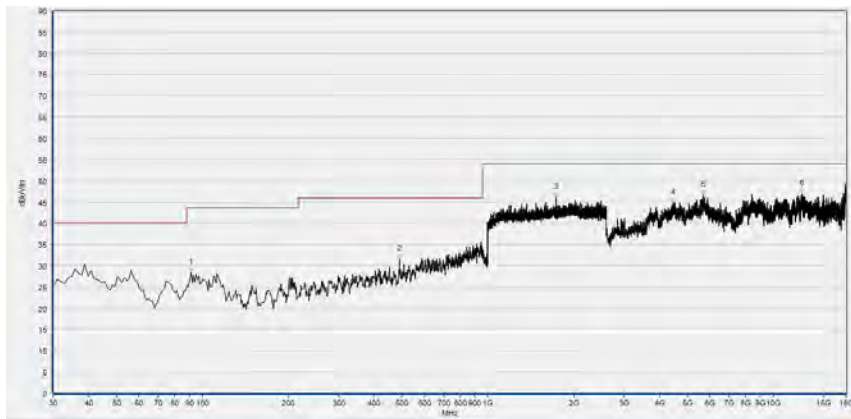
(Antenna Horizontal, 30MHz to 18GHz)



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
112.450	29.14	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
264.740	27.75	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1896.533	45.03	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4466.480	45.45	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8433.520	46.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12902.600	47.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

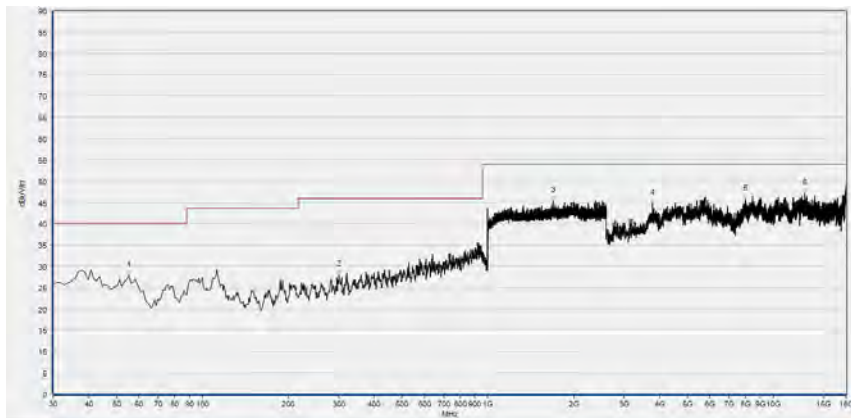
(Antenna Vertical, 30MHz to 18GHz)

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
91.110	28.36	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
489.780	31.57	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1732.267	46.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4457.240	44.76	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5680.000	46.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12603.840	46.89	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

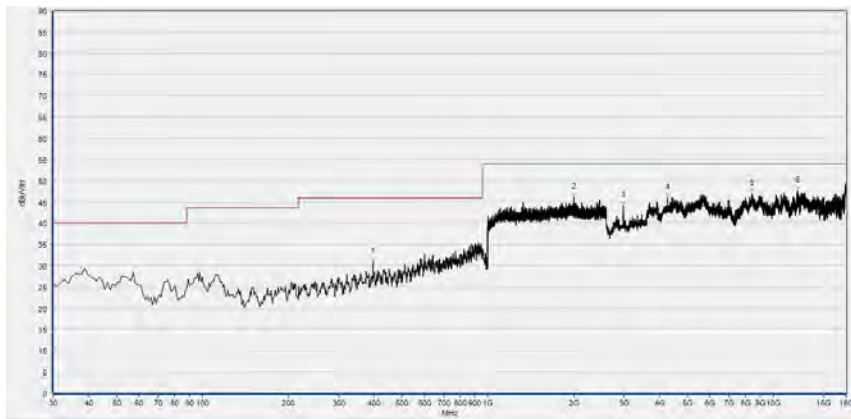
(Antenna Horizontal, 30MHz to 18GHz)



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
55.220	27.86	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
301.600	27.98	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1696.533	45.41	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3776.560	44.67	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7993.080	45.67	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12911.840	47.04	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

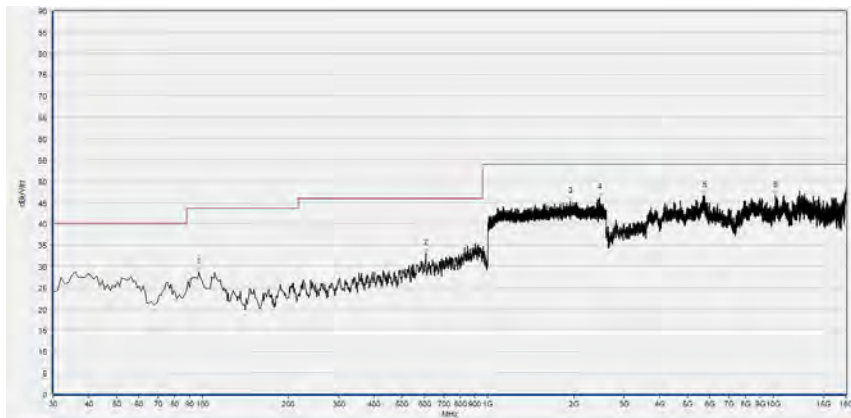
(Antenna Vertical, 30MHz to 18GHz)

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
395.690	30.84	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1997.867	46.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2988.080	44.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4272.440	45.86	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8402.720	46.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12197.280	47.59	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
96.930	28.60	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
606.180	33.06	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1944.000	45.20	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2461.333	46.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5741.600	46.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10201.440	46.54	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	$\pm 2.22\text{dB}$
Power Spectral Density	$\pm 2.22\text{dB}$
Bandwidth	$\pm 5\%$
Conducted Spurious Emission	$\pm 2.77\text{dB}$
Restricted Frequency Bands	$\pm 5\%$
Radiated Emission	$\pm 2.95\text{dB}$
Conducted Emission	$\pm 2.44\text{dB}$

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

<b>Laboratory Name:</b>	Shenzhen Morlab Communications Technology Co., Ltd.
<b>Laboratory Address:</b>	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
<b>Telephone:</b>	+86 755 36698555
<b>Facsimile:</b>	+86 755 36698525

### 2. Identification of the Responsible Testing Location

<b>Name:</b>	Shenzhen Morlab Communications Technology Co., Ltd.
<b>Address:</b>	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	Due Date
Attenuator 1	(N/A.)	10dB	Resent	N/A	N/A
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2021.03.25	2022.03.24
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2021.03.25	2022.03.24
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	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2021.03.09	2022.03.08
LISN	812744	NSLK 8127	Schwarzbeck	2021.03.09	2022.03.08
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2020.07.24	2021.07.23
Coaxial Cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A
Adapter	J5164200005	AK933JH	OPPO	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
TS+ -[JS32-CE]	Tonscend	V2.5.0.0

**4.4 Radiated Test Equipments**

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2020.07.21	2021.07.20
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2019.07.26	2022.07.25
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
Coaxial Cable (N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L32 03	Tonscend	2020.07.21	2021.07.20
18-26.5GHz pre-Amplifier	46732	S10M100L38 02	Tonscend	2020.07.21	2021.07.20
26-40GHz pre-Amplifier	56774	S40M400L40 02	Tonscend	2020.07.21	2021.07.20
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	2020.07.21	2021.07.20
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

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