



# TEST REPORT

**APPLICANT** : JACS Solutions, Inc.  
**PRODUCT NAME** : Smart Display with Android System  
**MODEL NAME** : TP1503, TP1003  
**BRAND NAME** : N/A  
**FCC ID** : 2AGCDJACSTPTS  
**STANDARD(S)** : 47 CFR Part 15 Subpart C  
**RECEIPT DATE** : 2020-09-02  
**TEST DATE** : 2020-09-14 to 2020-10-23  
**ISSUE DATE** : 2020-11-30

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Change History		
Version	Date	Reason for change
1.0	2020-11-30	First edition



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	JACS Solutions, Inc.
<b>Applicant Address:</b>	809 Pinnacle Drive, Suite R, Linthicum Heights, MD 21090
<b>Manufacturer:</b>	JACS Solutions, Inc.
<b>Manufacturer Address:</b>	809 Pinnacle Drive, Suite R, Linthicum Heights, MD 21090

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	Smart Display with Android System	
<b>Serial No.:</b>	(N/A, marked #1 by test site)	
<b>Hardware Version:</b>	V1.0	
<b>Software Version:</b>	TP1003 JACS V1.0.0	
<b>Modulation Technology:</b>	DSSS, OFDM	
<b>Modulation Type:</b>	Refer to section 1.3	
<b>Operating Frequency Range:</b>	802.11b/g/n (HT20): 2412MHz–2472MHz	
<b>Antenna Type:</b>	Glue Stick Antenna	
<b>Antenna Gain:</b>	4.10dBi	
<b>Accessory Information:</b>	AC Adapter	
	<b>Brand Name:</b>	Shenzhen Juke Electronics Co.,Ltd
	<b>Model No.:</b>	JK120300-S52AA
	<b>Serial No.:</b>	(N/A, marked #1 by test site)
	<b>Rated Output:</b>	12V=3A
	<b>Rated Input:</b>	100-240V~50/60Hz, 0.8A
	<b>Manufacturer:</b>	Shenzhen Juke Electronics Co.,Ltd

**Note 1:** According to the certificate holder, they declared that the models: TP1503 and TP1003 are the very similar products. The differences between the two models are as follows:

1. Product size is different, TP1503 is 15 inches, TP1003 is 10 inches.
2. The two models have different frame shapes, speakers, TP touch screen, and LCM display. The main measuring model is TP1503, only the results for TP1503 were recorded in this report.

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

**Note 3:** 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) <sup>Note1</sup>
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

**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>		

**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	No deviation
2	N/A	Duty Cycle of Test Signal	Sep 27, 2020	Ouyang Feng	PASS	No deviation
3	15.247(b)	Maximum Peak and Average Conducted Output Power	Sep 27, 2020	Ouyang Feng	PASS	No deviation
4	15.247(a)	Bandwidth	Sep 27, 2020	Ouyang Feng	PASS	No deviation
5	15.247(d)	Conducted Spurious Emission and Band Edge	Sep 27, 2020	Ouyang Feng	PASS	No deviation
6	15.247(e)	Power Spectral Density (PSD)	Sep 27, 2020	Ouyang Feng	PASS	No deviation
7	15.207	Conducted Emission	Sep 14, 2020	Huang Zhiye	PASS	No deviation
8	15.247(d)	Restricted Frequency Bands	Oct 23, 2020	Peng Xuwei	PASS	No deviation
9	15.209, 15.247(d)	Radiated Emission	Sep 16, 2020	Peng Xuwei	PASS	No deviation

**Note 1:** The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013, KDB558074 D01 v05r02.

**Note 2:** The path loss during the RF test is calibrated to correct the results by the offset setting



in the test equipments. The ref offset 12dB contains two parts that cable loss 2dB and Attenuator 10dB.

**Note 3:** Additions to, deviation, or exclusions from the method 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 4:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

## 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

Inside of the EUT has a Glue Stick Antenna coupled with the I-PEX connector. Please refer to the EUT internal photos.

## 2.2. Duty Cycle of Test Signal

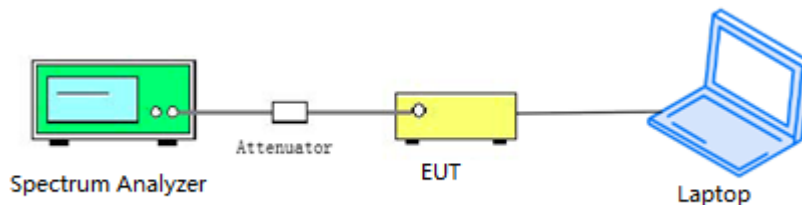
### 2.2.1. Requirement

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.



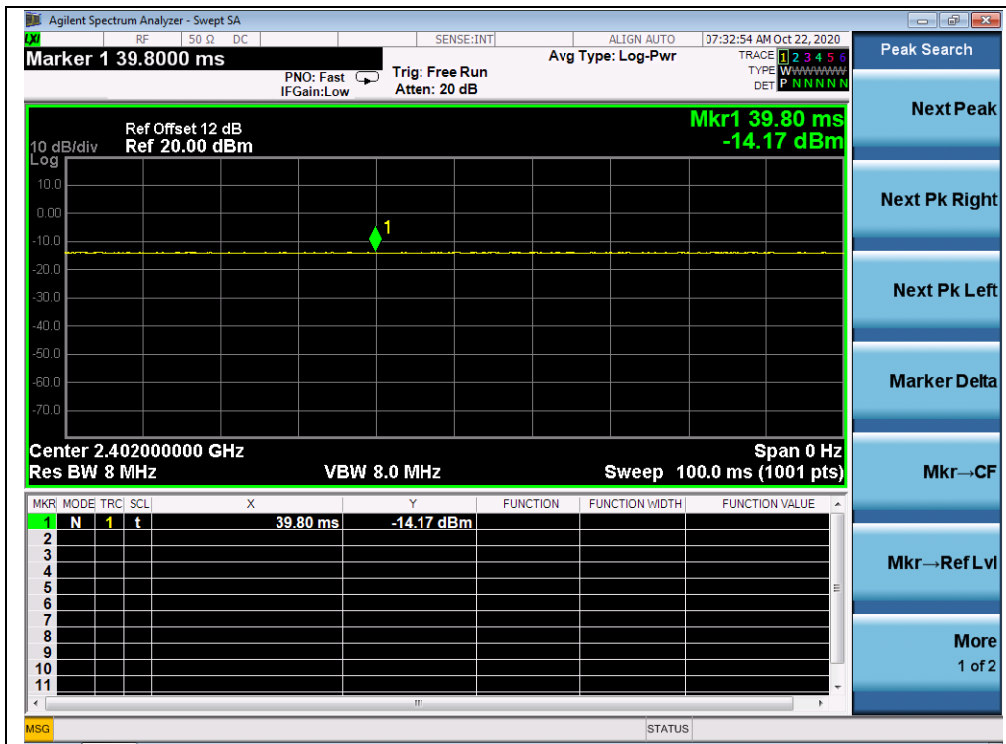


2.2.3. Test Result

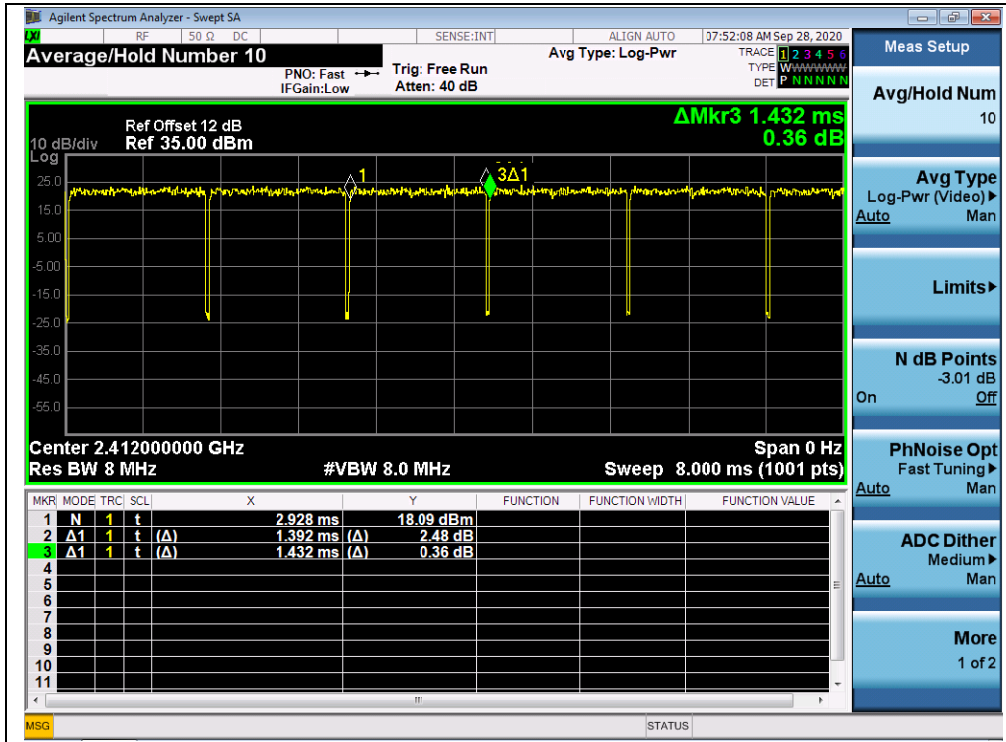
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*Ig[1/D])
802.11b	100.00	0.00
802.11g	97.21	0.12
802.11n (HT20)	96.68	0.15

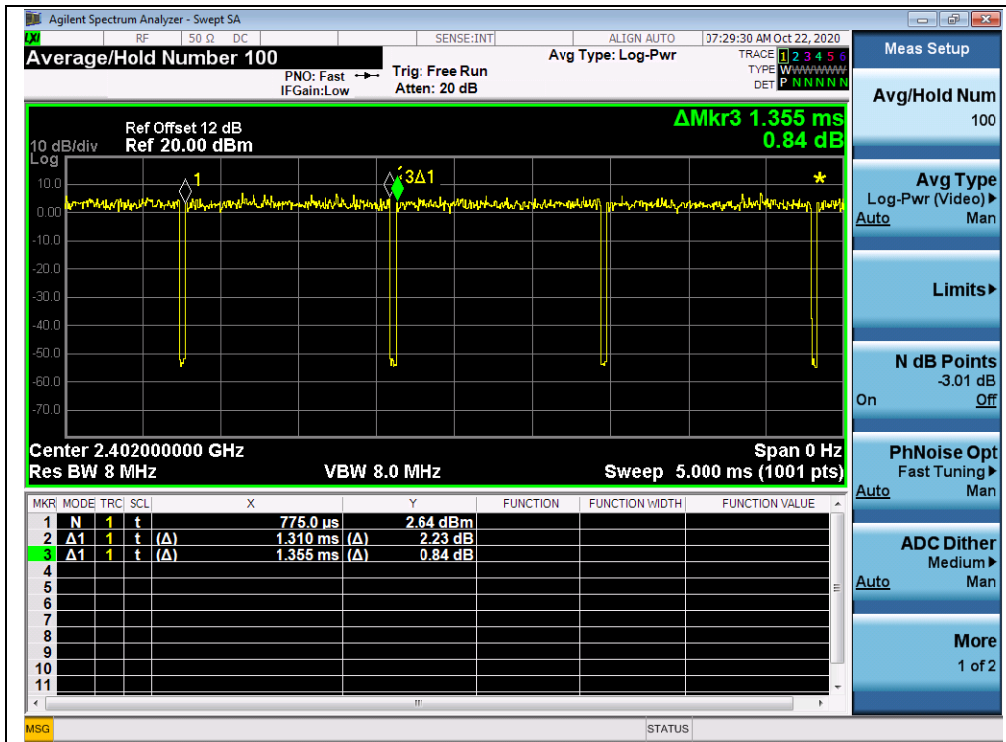
B. Test Plot:



(Channel 1, 802.11b)



(Channel 1, 802.11g)



(Channel 1, 802.11n (HT20))

## 2.3. Maximum Peak and Average Conducted Output Power

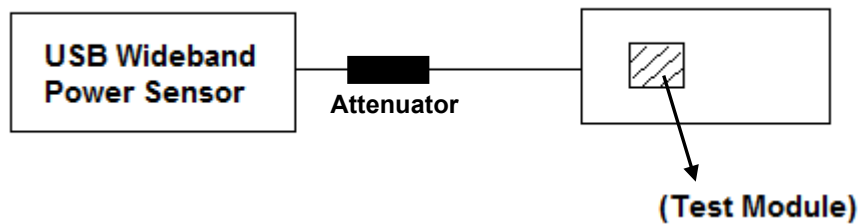
### 2.3.1. Requirement

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 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 Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	9.70	0.009	30	1	PASS
7	2442	9.90	0.010			PASS
13	2472	10.10	0.010			PASS

##### 802.11g Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.70	0.059	30	1	PASS
7	2442	18.00	0.063			PASS
13	2472	18.10	0.065			PASS

##### 802.11n (HT20) Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	18.70	0.074	30	1	PASS
7	2442	19.30	0.085			PASS
13	2472	<b>19.66</b>	<b>0.092</b>			PASS



**Maximum Average Conducted Output Power**

**802.11b Mode**

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated		dBm	W	
		dBm		dBm	W			
1	2412	5.84	0.00	5.84	0.004	30	1	PASS
7	2442	6.92		6.92	0.005			PASS
13	2472	7.78		7.78	0.006			PASS

**802.11g Mode**

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated		dBm	W	
		dBm		dBm	W			
1	2412	6.68	0.12	6.80	0.005	30	1	PASS
7	2442	6.91		7.03	0.005			PASS
13	2472	6.96		7.08	0.005			PASS

**802.11n (HT20) Mode**

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated		dBm	W	
		dBm		dBm	W			
1	2412	8.40	0.15	8.55	0.007	30	1	PASS
7	2442	8.40		8.55	0.007			PASS
13	2472	8.70		<b>8.85</b>	<b>0.008</b>			PASS

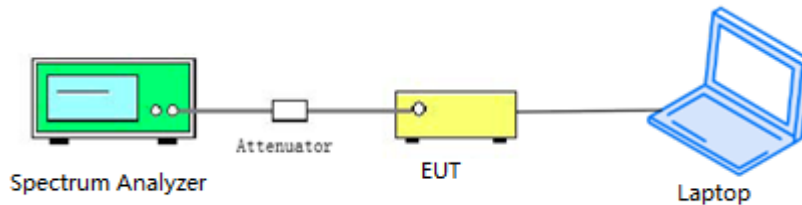
## 2.4. Bandwidth

### 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.



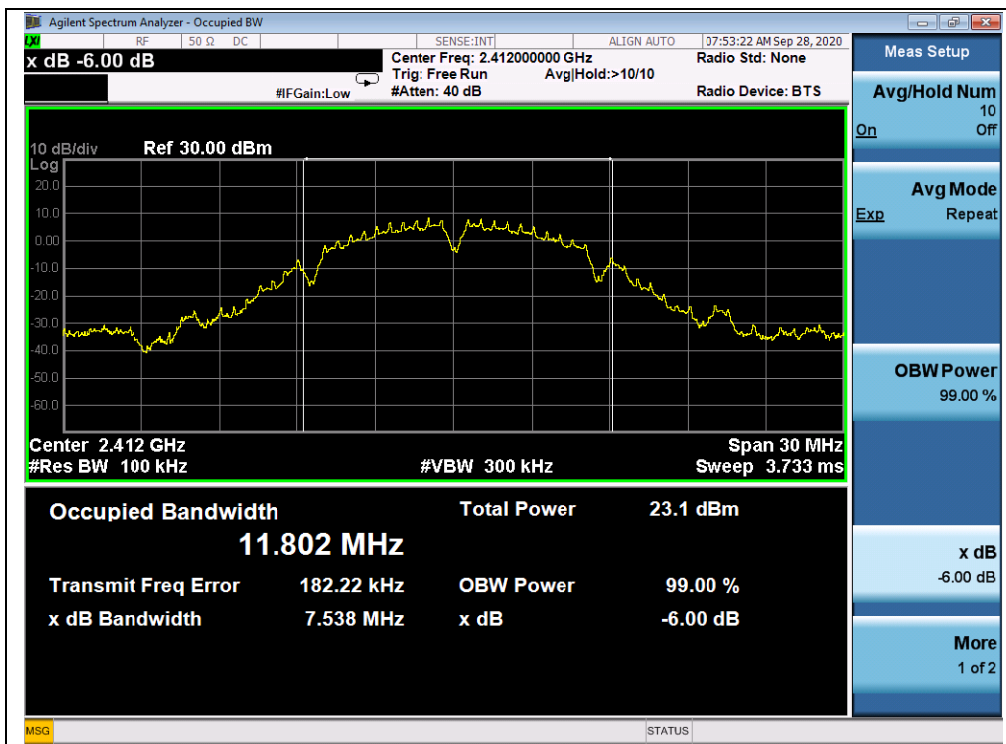
2.4.4. Test Result

802.11b Mode

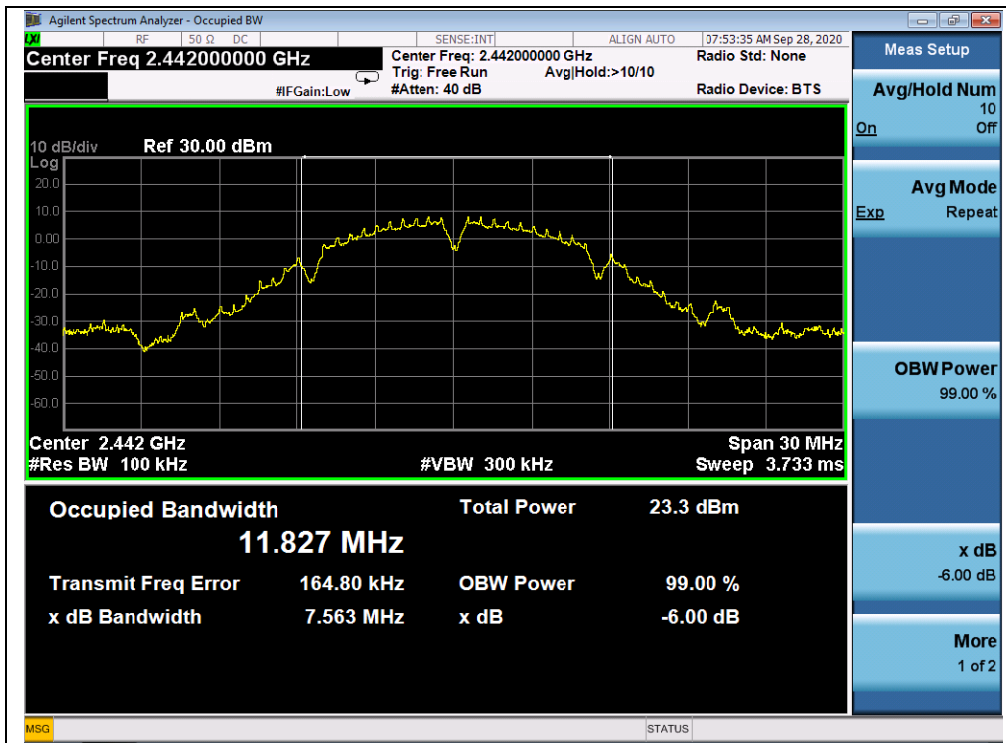
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	7.54	≥500	PASS
7	2442	7.56	≥500	PASS
13	2472	7.56	≥500	PASS

B. Test Plot:



(Channel 1, 802.11b)



(Channel 7, 802.11b)



(Channel 13, 802.11b)



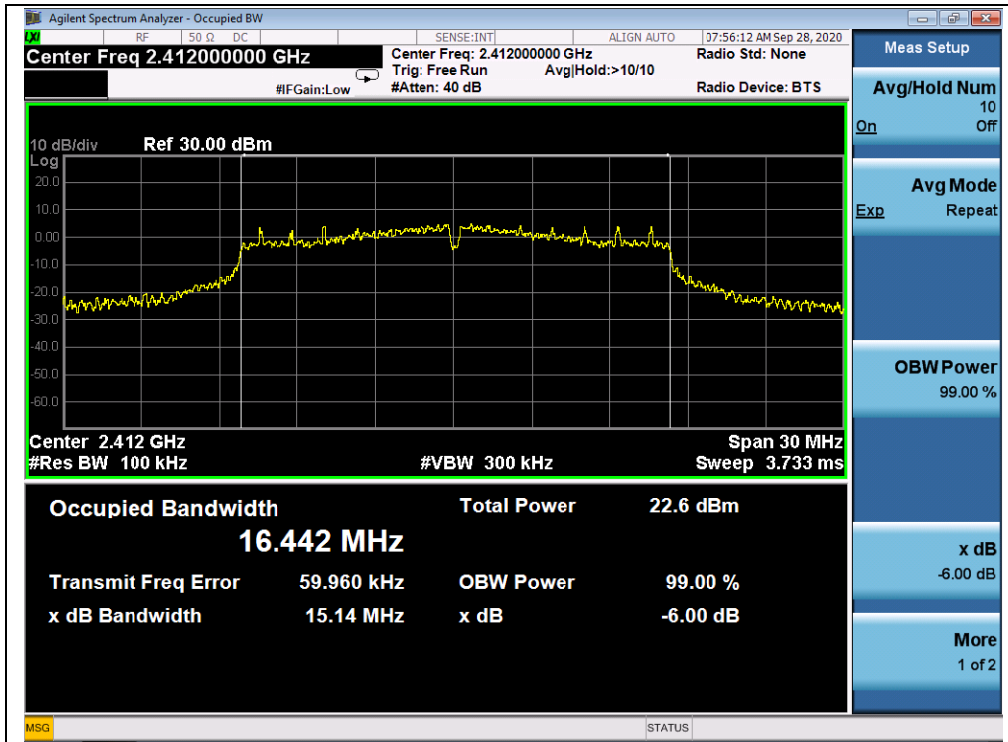


802.11g Mode

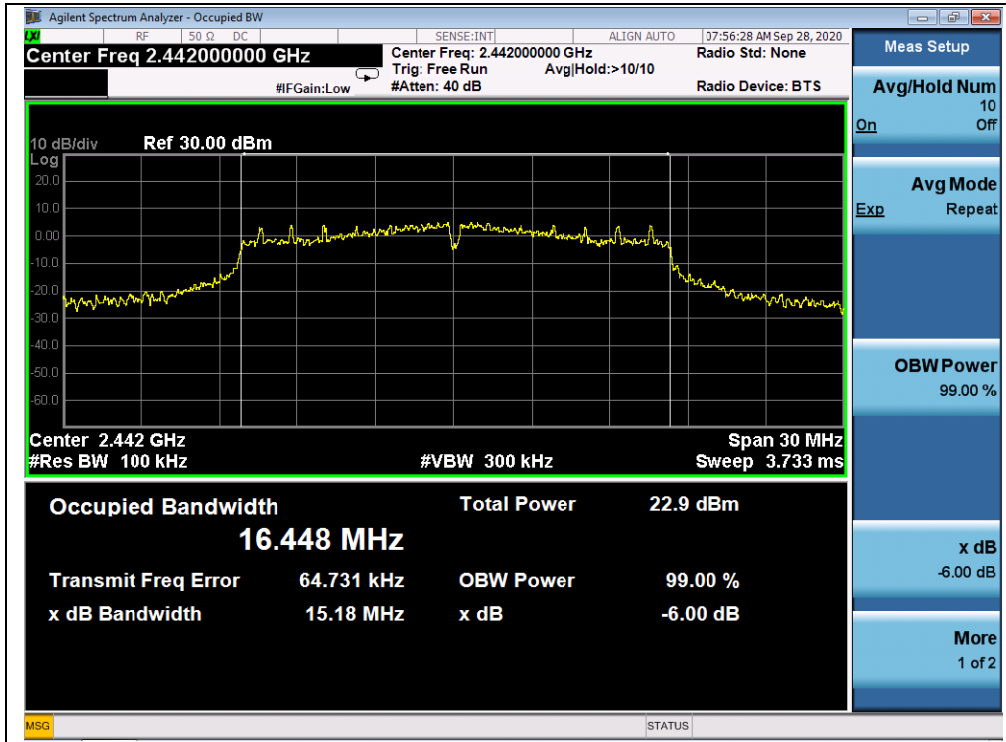
A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	15.14	≥500	PASS
7	2442	15.18	≥500	PASS
13	2472	15.15	≥500	PASS

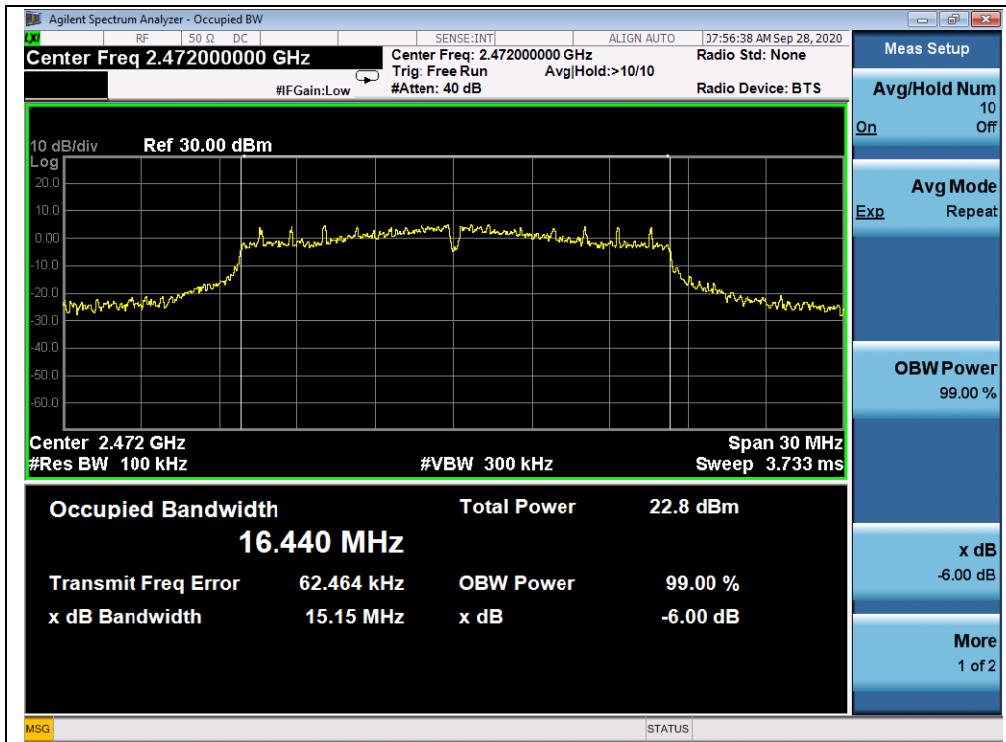
B.Test Plot:



(Channel 1, 802.11g)



(Channel 7, 802.11g)



(Channel 13, 802.11g)

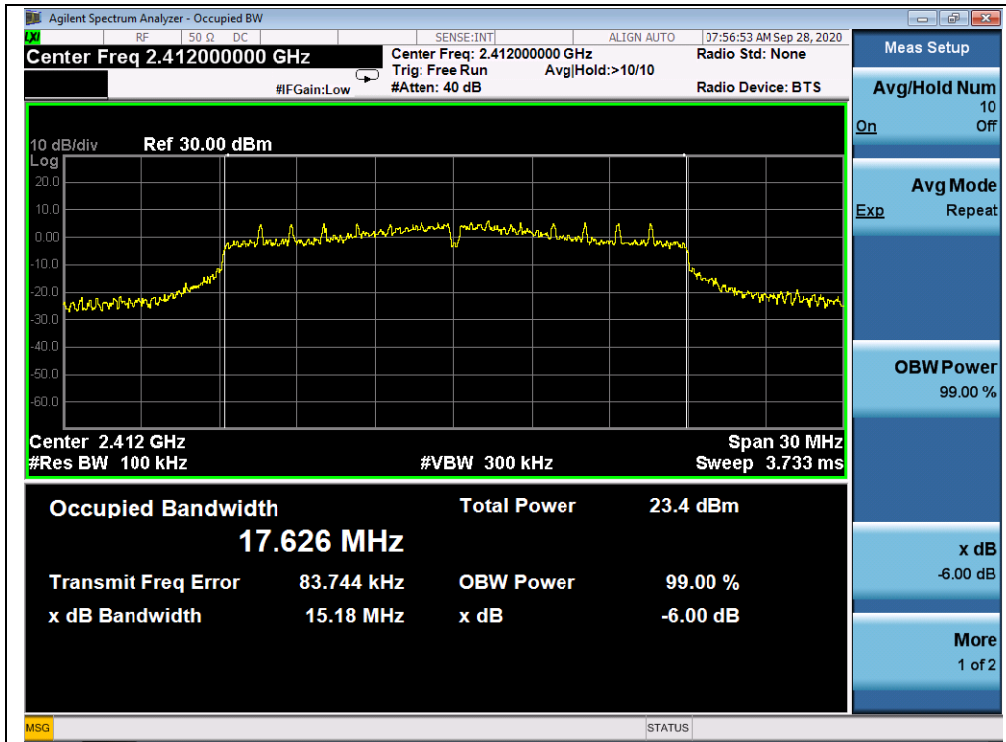


**802.11n (HT20) Mode**

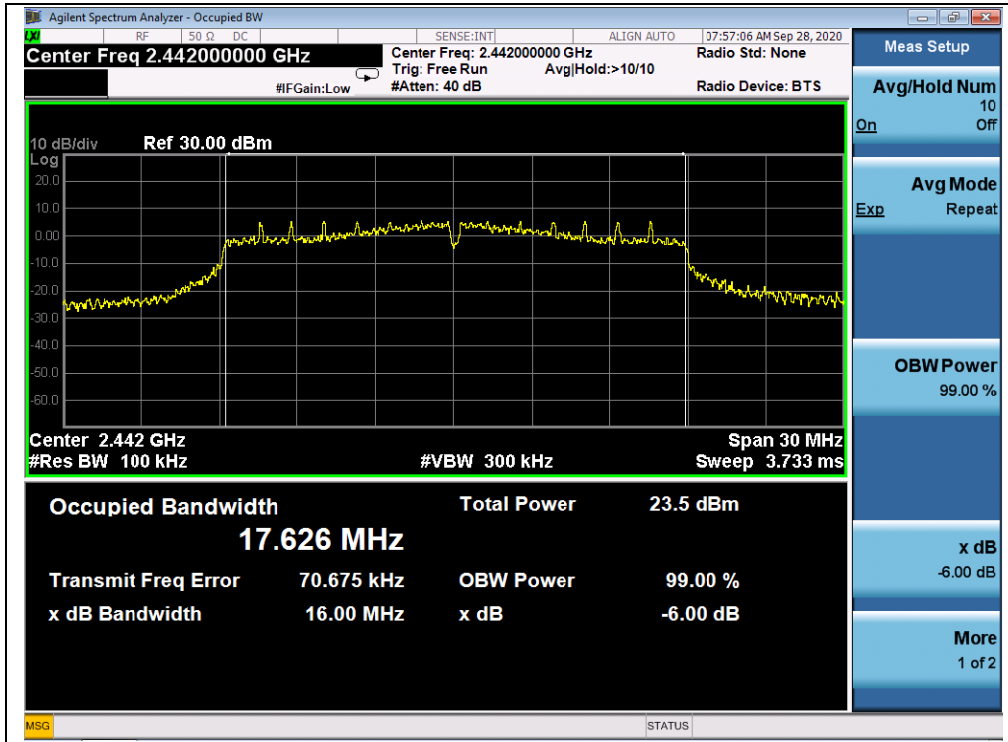
**A.Test Verdict:**

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	15.18	≥500	PASS
7	2442	16.00	≥500	PASS
13	2472	15.17	≥500	PASS

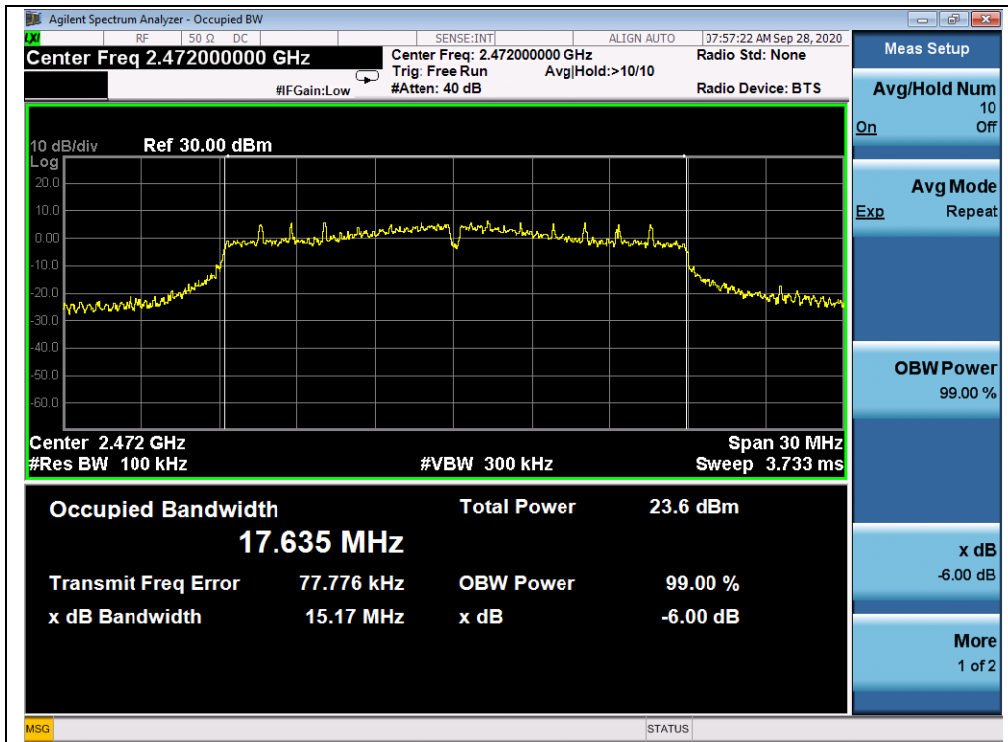
**B.Test Plot:**



(Channel 1, 802.11n (HT20))



(Channel 7, 802.11n (HT20))



(Channel 13, 802.11n (HT20))

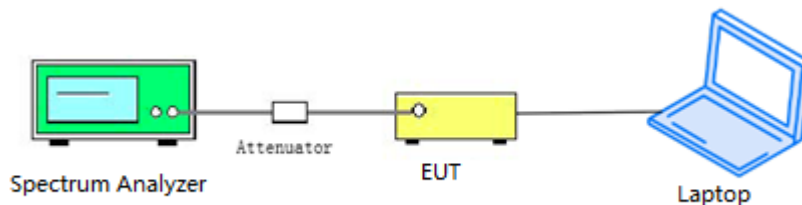
## 2.5. Conducted Spurious Emissions and Band Edge

### 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.



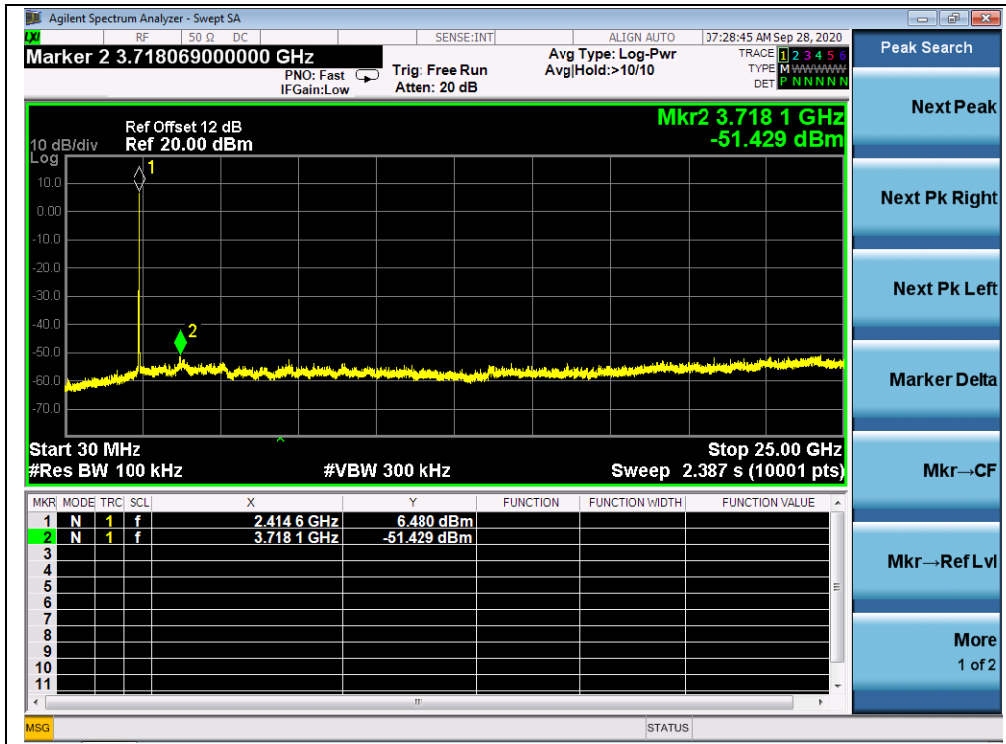
2.5.4. Test Result

802.11b Mode

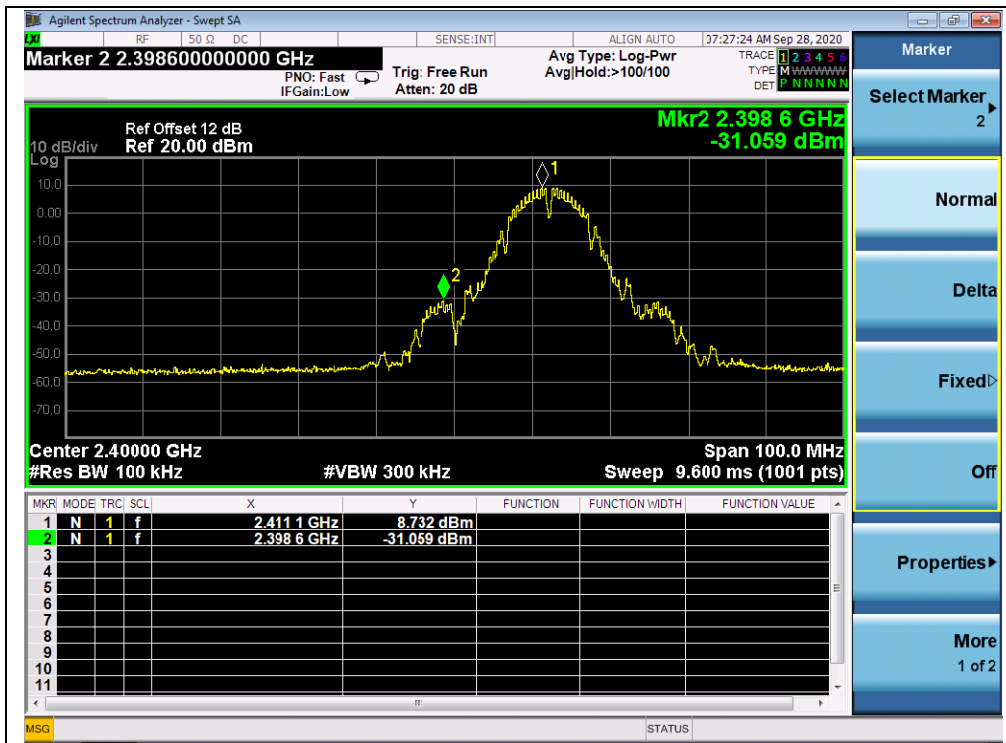
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-51.43	6.48	-13.52	PASS
7	2442	-52.55	7.04	-12.96	PASS
13	2472	-52.43	7.38	-12.62	PASS

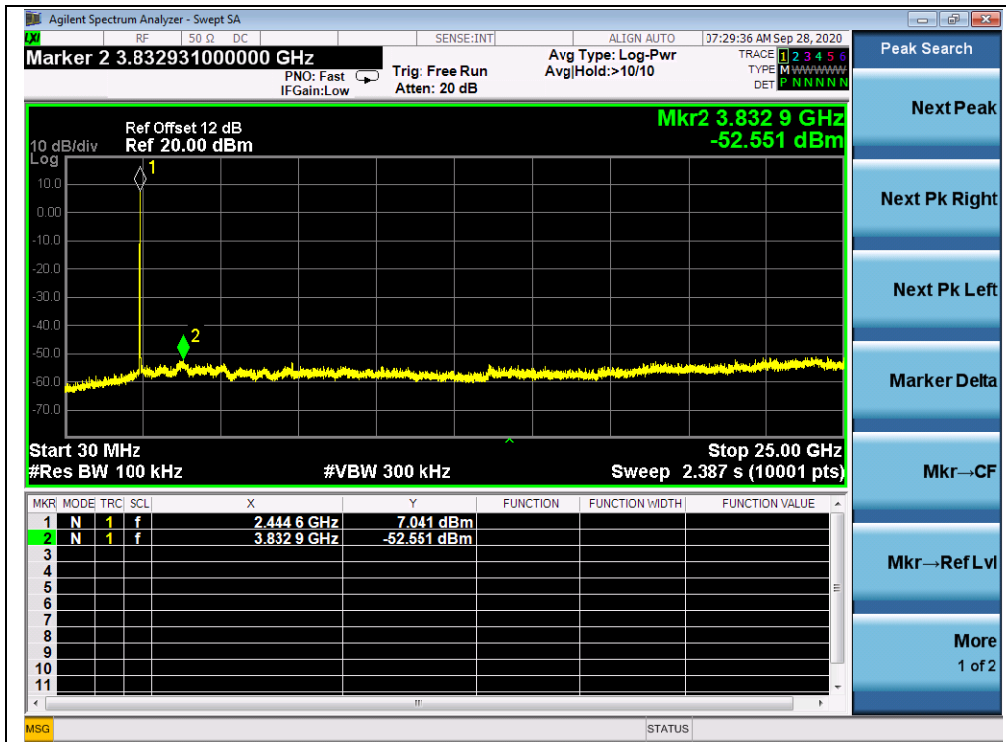
B. Test Plot:



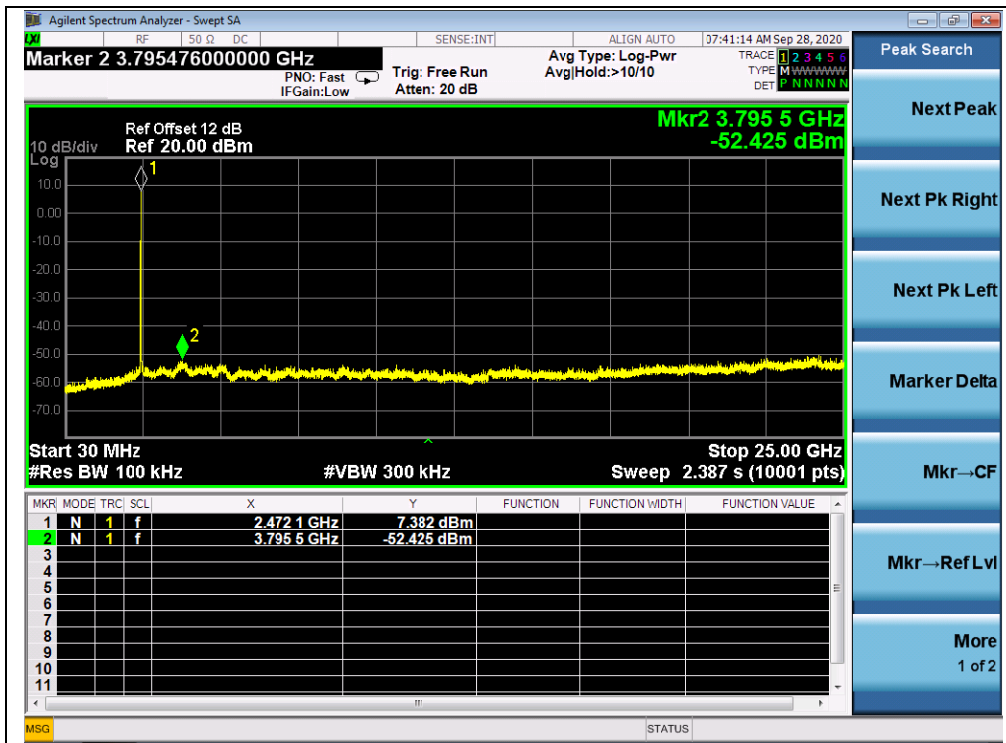
(30MHz to 25GHz, Channel 1, 802.11b)



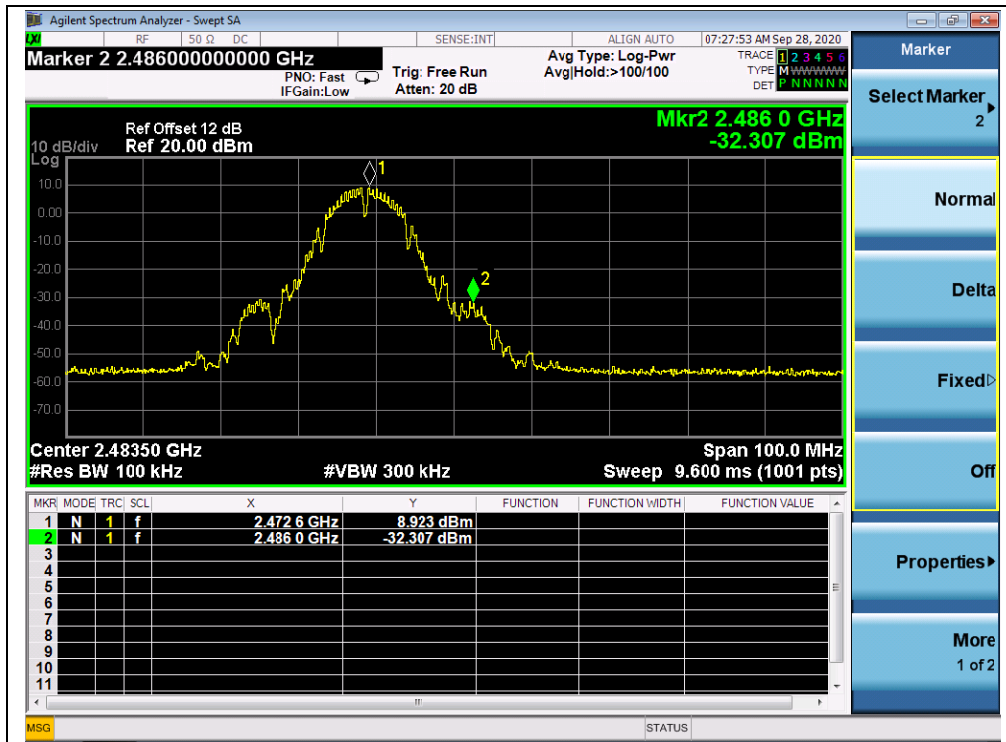
(Band Edge, Channel 1, 802.11b)



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



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



(Band Edge, Channel 13, 802.11b)



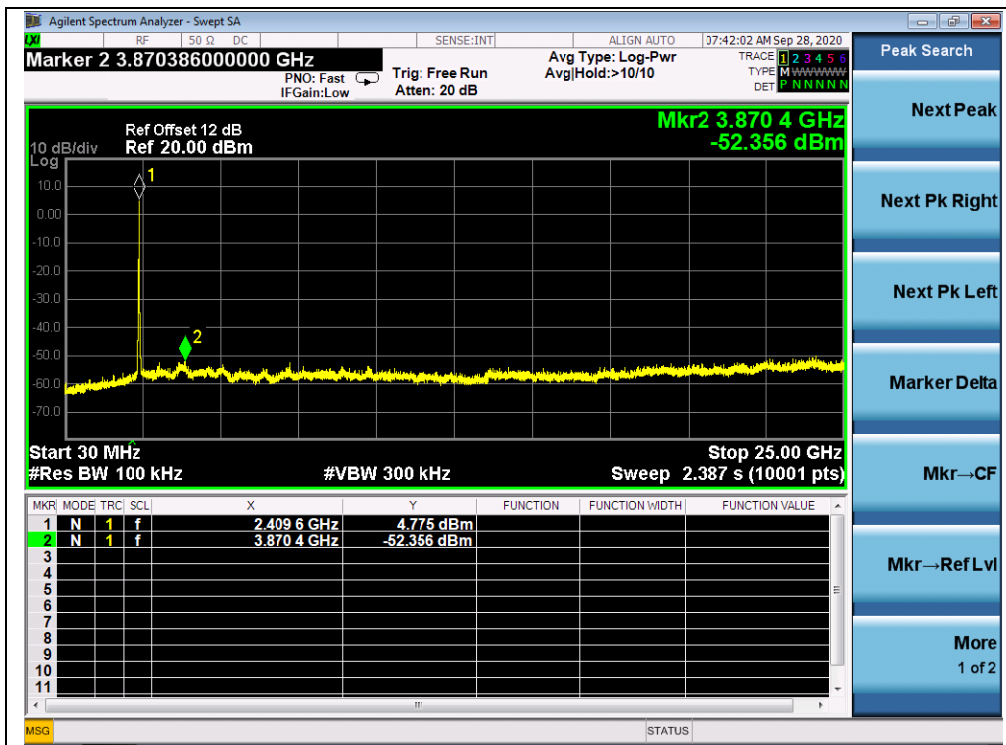


802.11g Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-52.36	4.78	-15.22	PASS
7	2442	-52.50	5.22	-14.78	PASS
13	2472	-52.81	5.00	-15.00	PASS

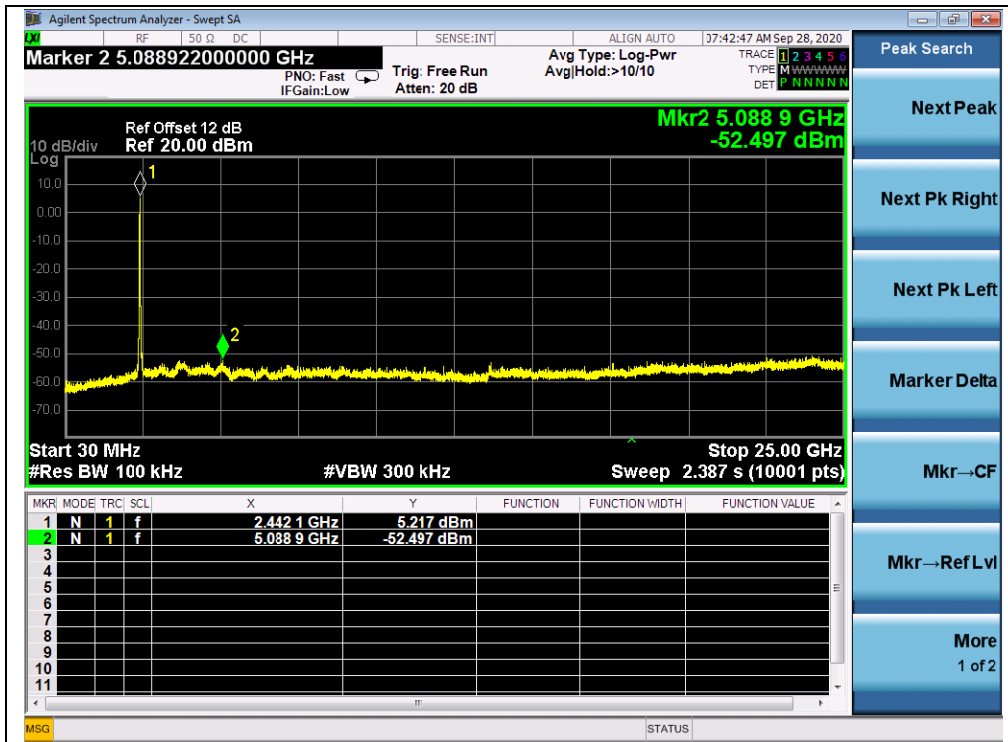
B. Test Plot:



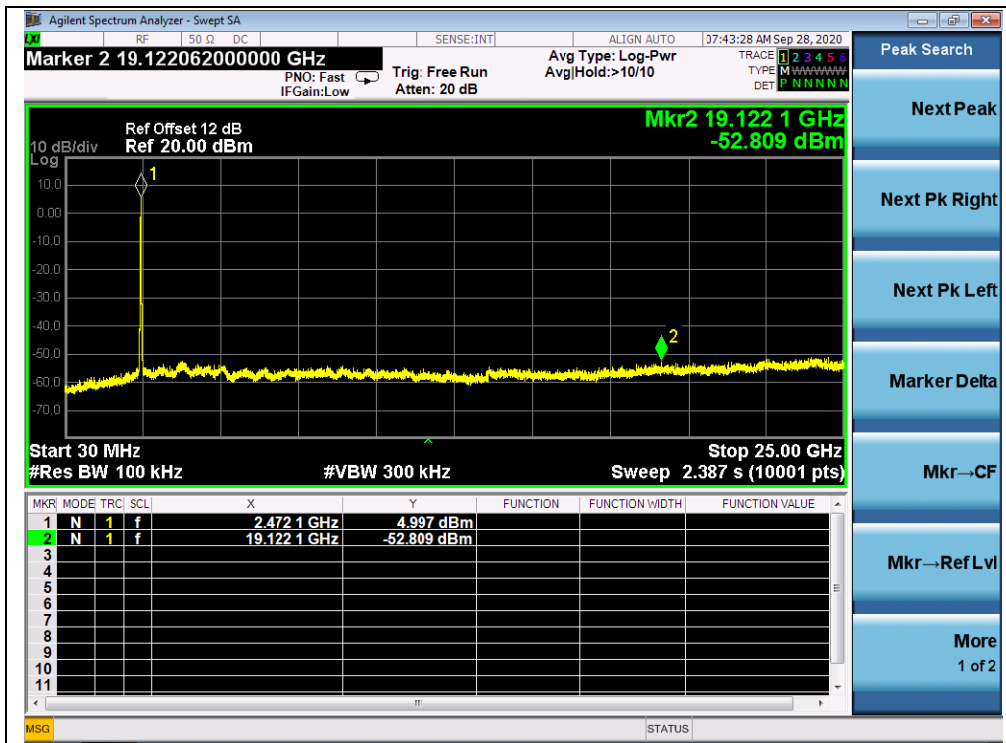
(30MHz to 25GHz, Channel 1, 802.11g)



(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)

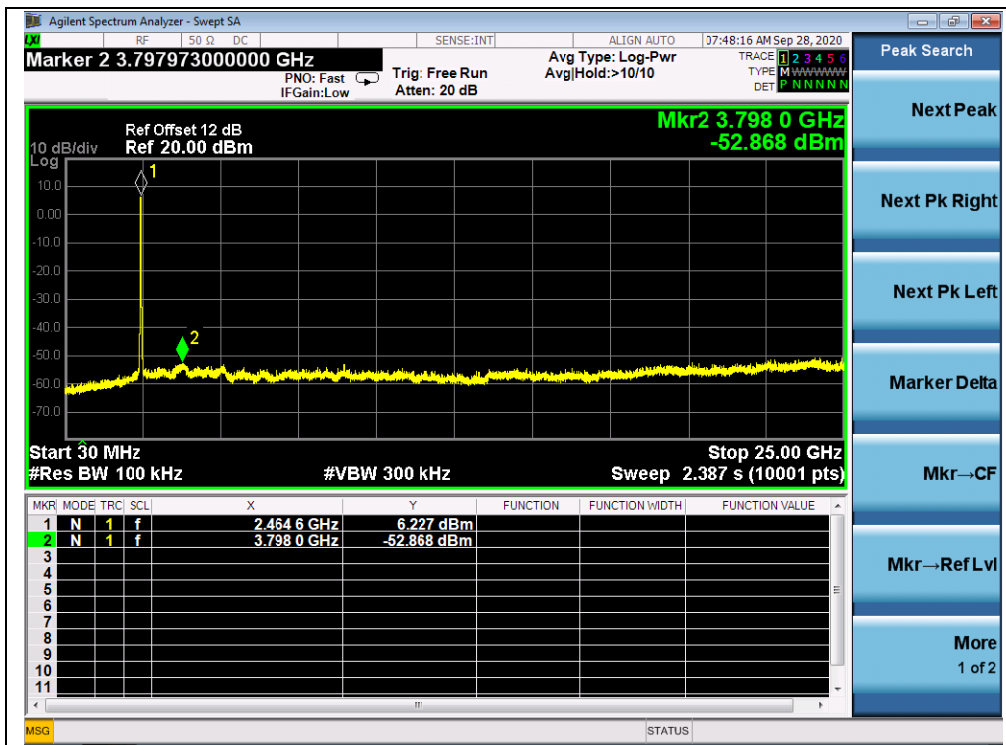


802.11n (HT20) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-52.87	6.23	-13.77	PASS
7	2442	-51.90	4.64	-15.36	PASS
13	2472	-52.21	6.19	-13.81	PASS

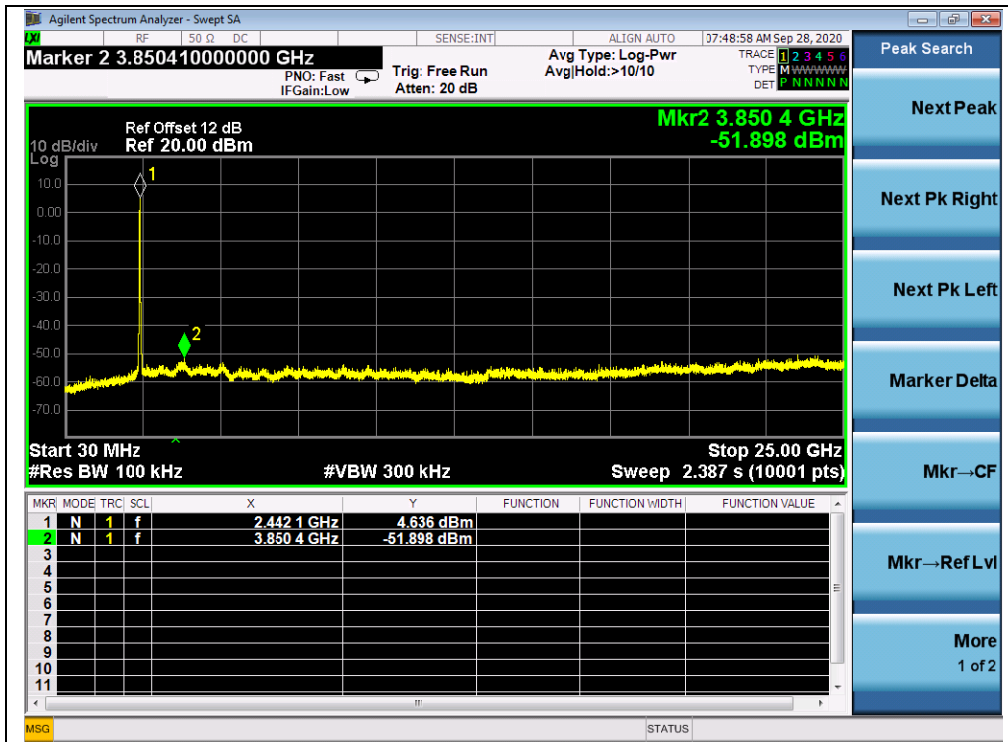
B. Test Plot:



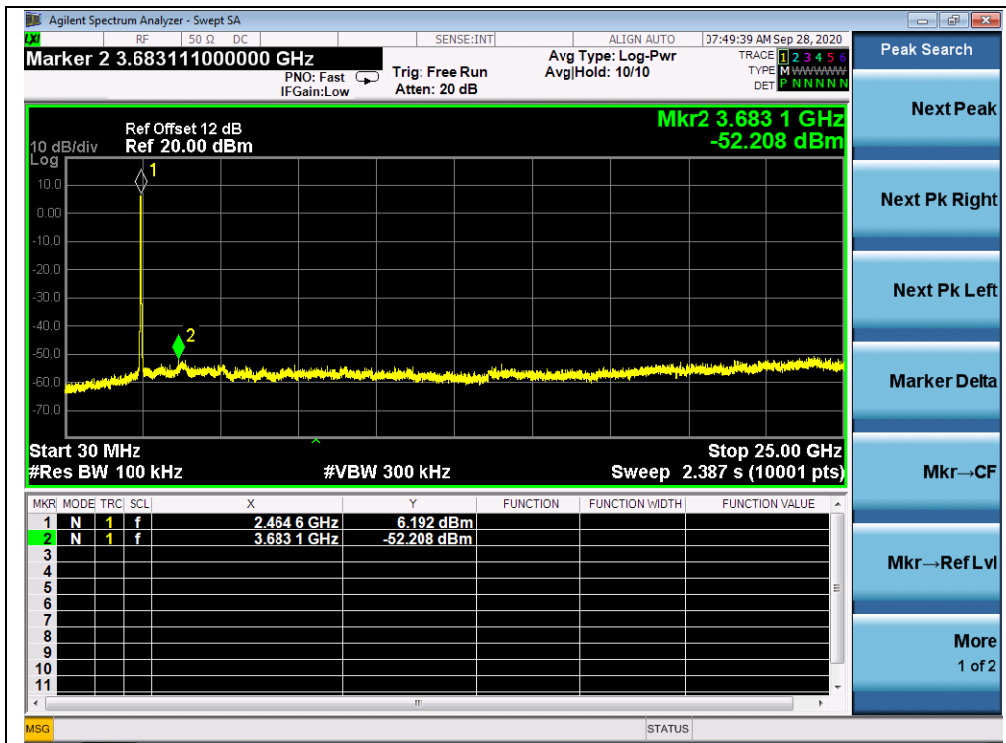
(30MHz to 25GHz, Channel 1, 802.11n (HT20))



(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))

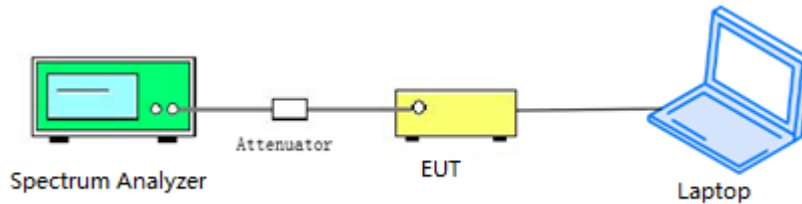
## 2.6. Power Spectral Density (PSD)

### 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 Mode

A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-4.89	8	PASS
7	2442	-4.02	8	PASS
13	2472	-4.87	8	PASS

B. Test Plot:



(Channel 1, 802.11b)





(Channel 7, 802.11b)



(Channel 13, 802.11b)

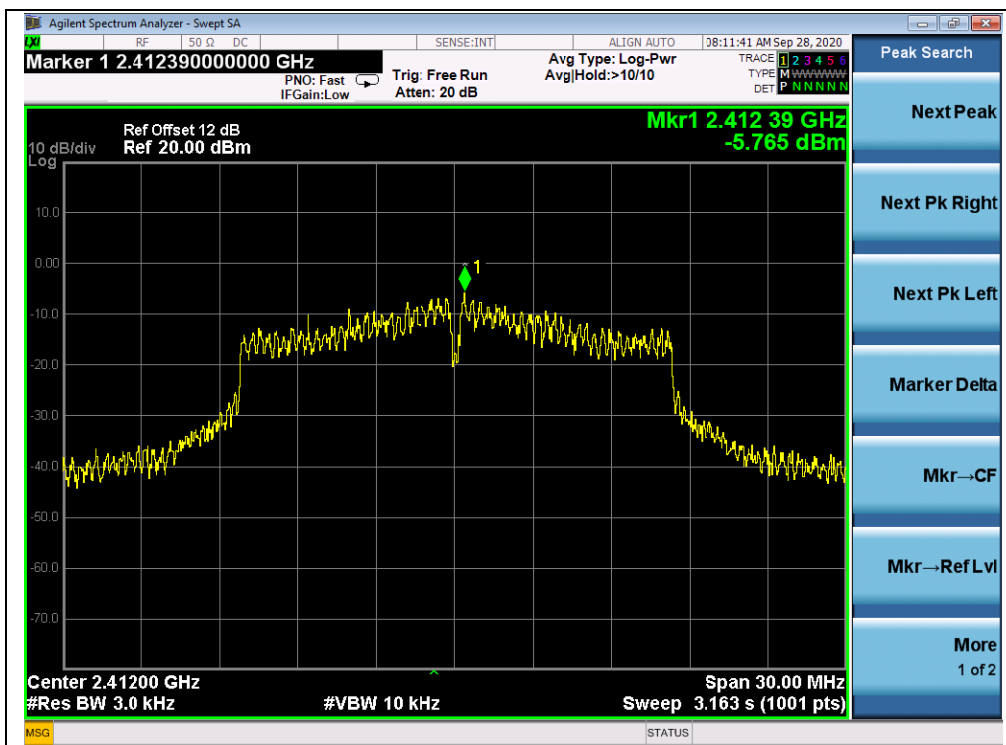


802.11g Mode

A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-5.77	8	PASS
7	2442	-5.61	8	PASS
13	2472	-5.70	8	PASS

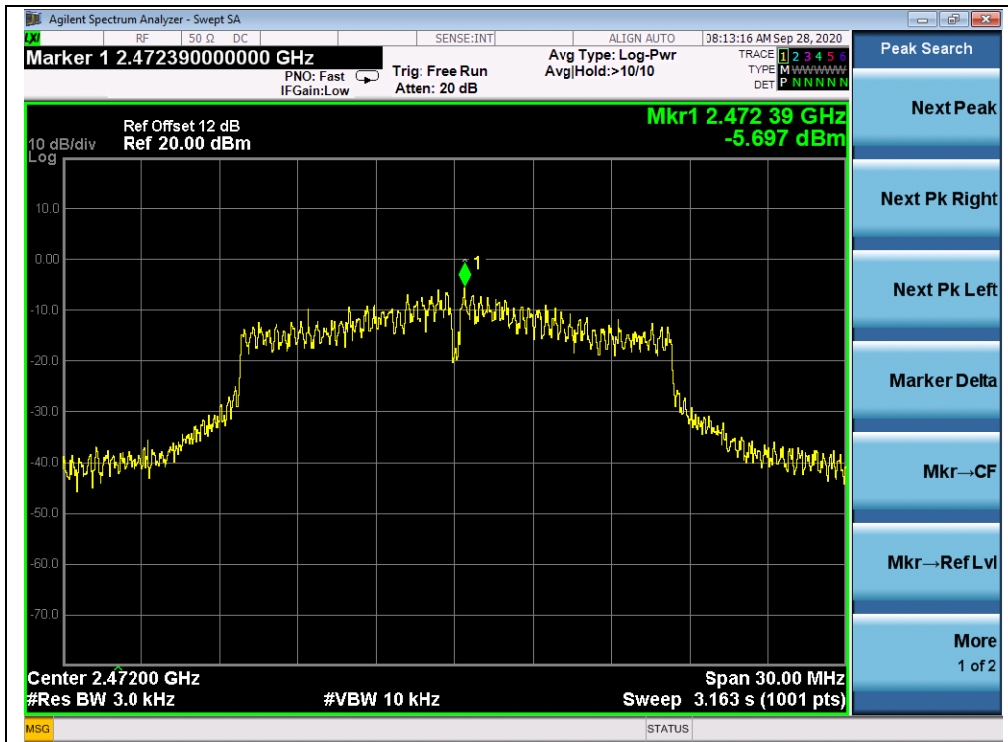
B. Test Plot:



(Channel 1, 802.11g)



(Channel 7, 802.11g)



(Channel 13, 802.11g)

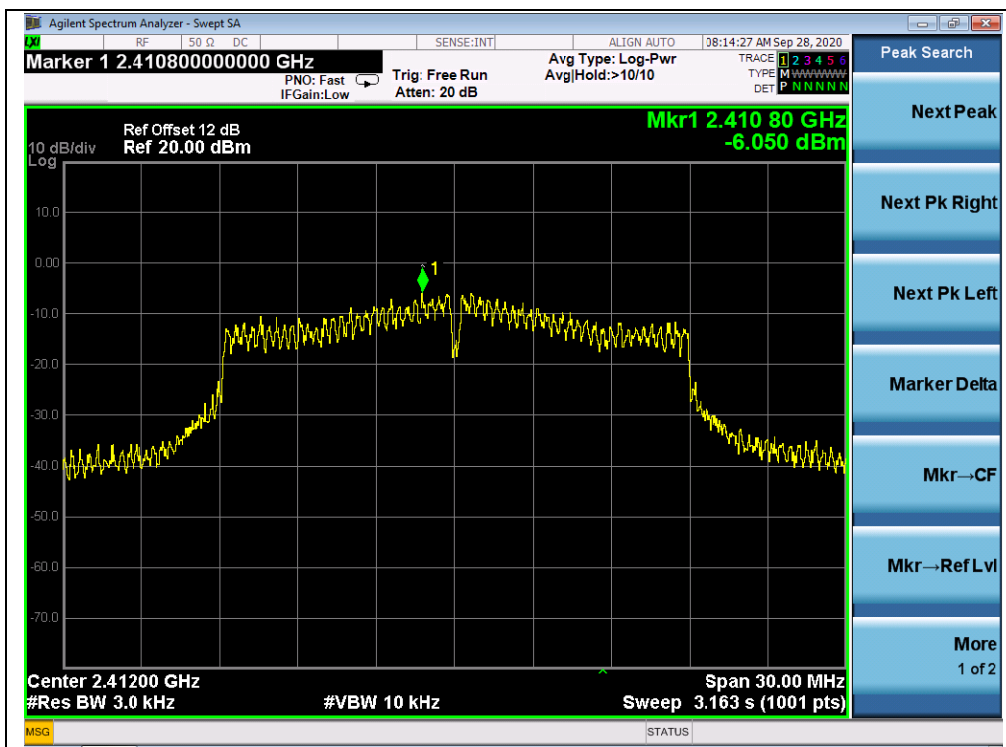


802.11n (HT20) Mode

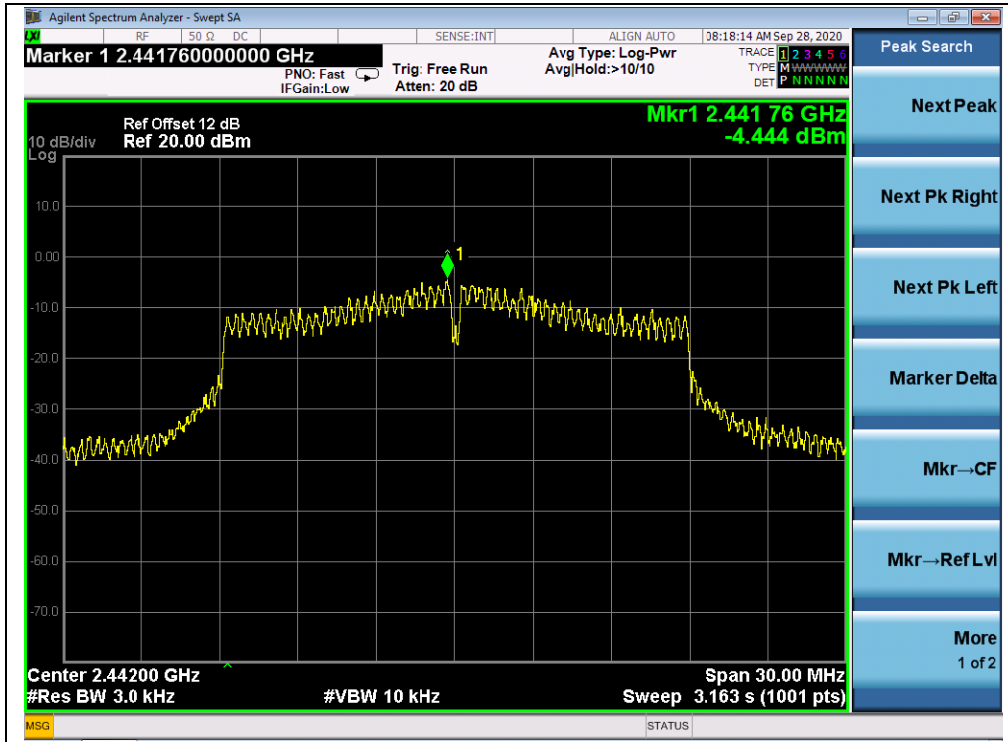
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-6.05	8	PASS
7	2442	-4.44	8	PASS
13	2472	-4.97	8	PASS

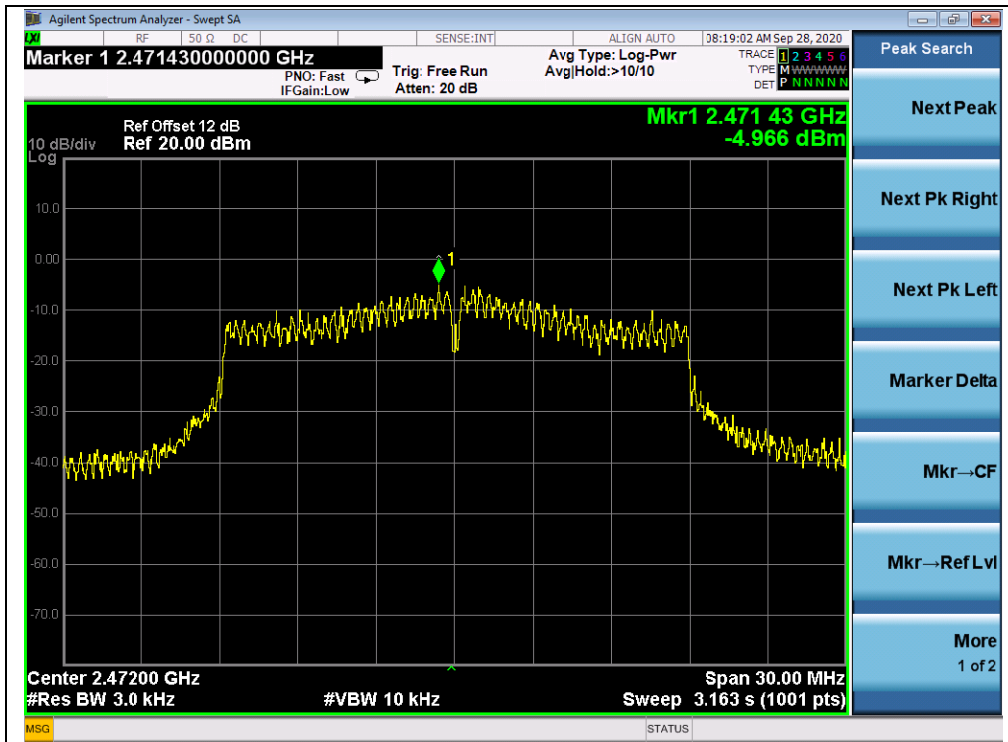
B. Test Plot:



(Channel 1, 802.11n (HT20))



(Channel 7, 802.11n (HT20))



(Channel 13, 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 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

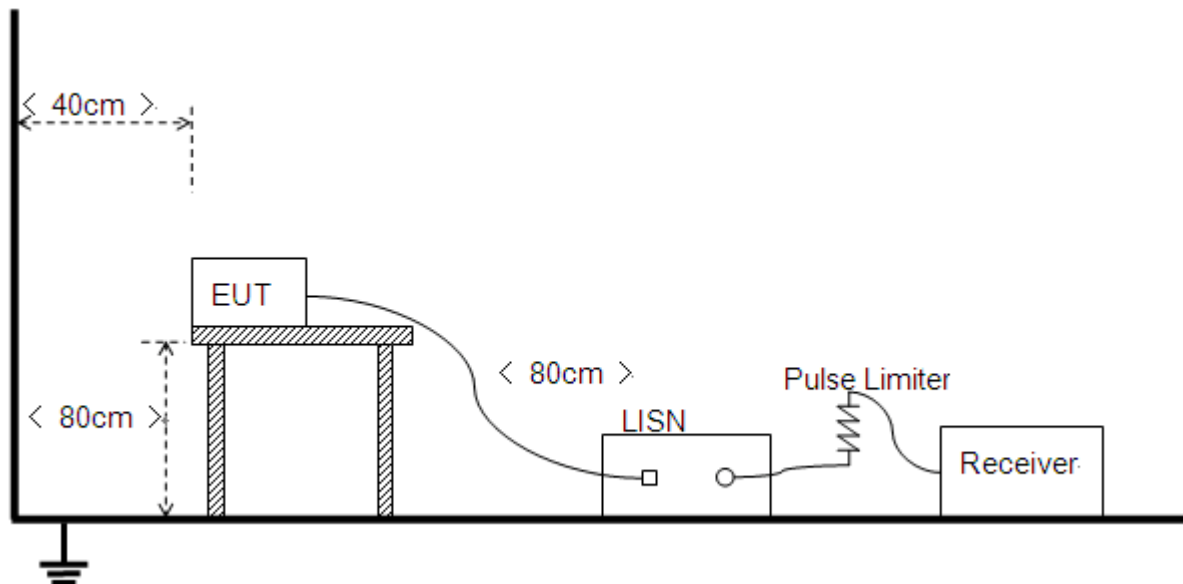
Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**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. 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

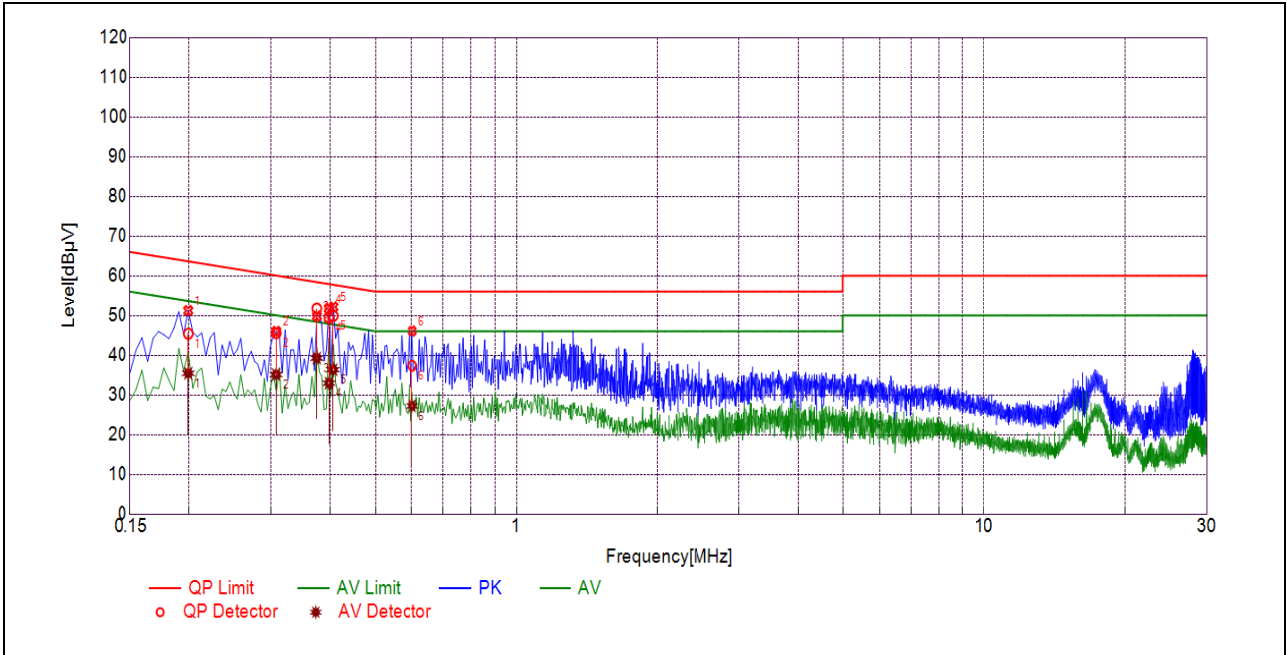
The measurement results are obtained as below:

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

$U_R$ : Receiver Reading

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

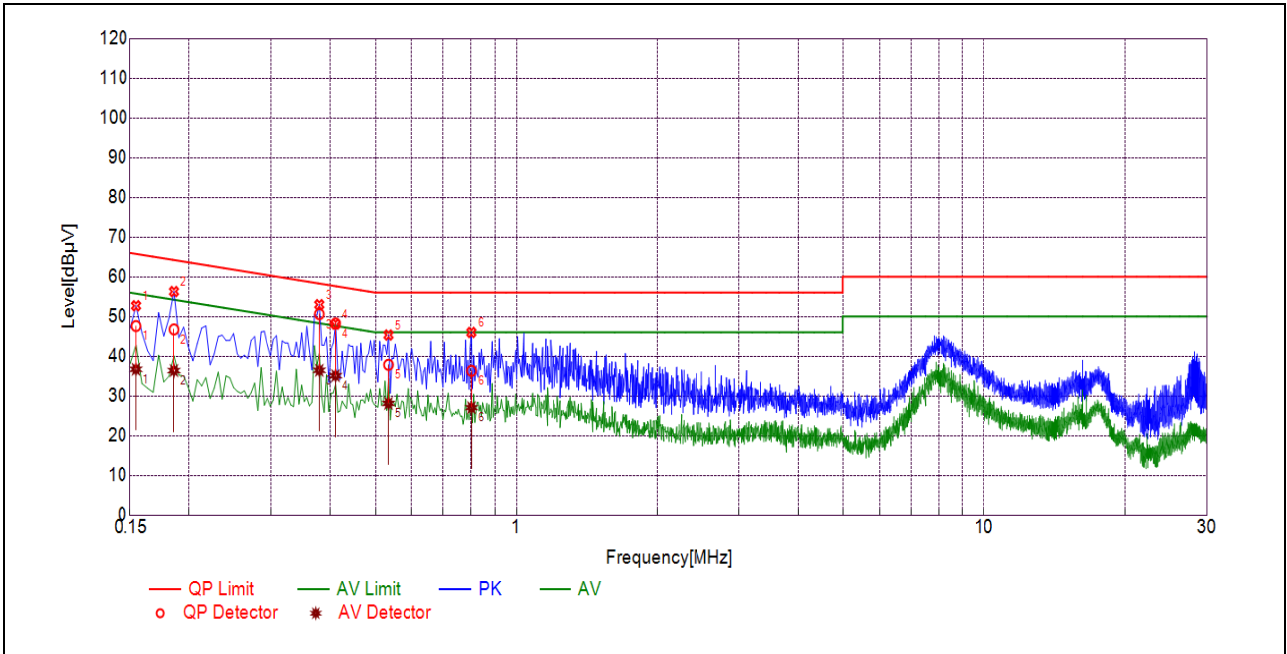
**B.Test Plot:**



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1995	45.42	35.44	63.63	53.63	Line	PASS
2	0.3072	45.55	35.14	60.05	50.05		PASS
3	0.3748	51.74	39.27	58.39	48.39		PASS
4	0.3978	49.42	32.96	57.90	47.90		PASS
5	0.4063	49.91	36.35	57.72	47.72		PASS
6	0.5997	37.34	27.23	56.00	46.00		PASS





(N Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1544	47.60	36.71	65.76	55.76	Neutral	PASS
2	0.1860	46.75	36.39	64.21	54.21		PASS
3	0.3795	50.60	36.45	58.29	48.29		PASS
4	0.4109	48.24	35.10	57.63	47.63		PASS
5	0.5324	37.83	28.12	56.00	46.00		PASS
6	0.8029	36.31	27.05	56.00	46.00		PASS

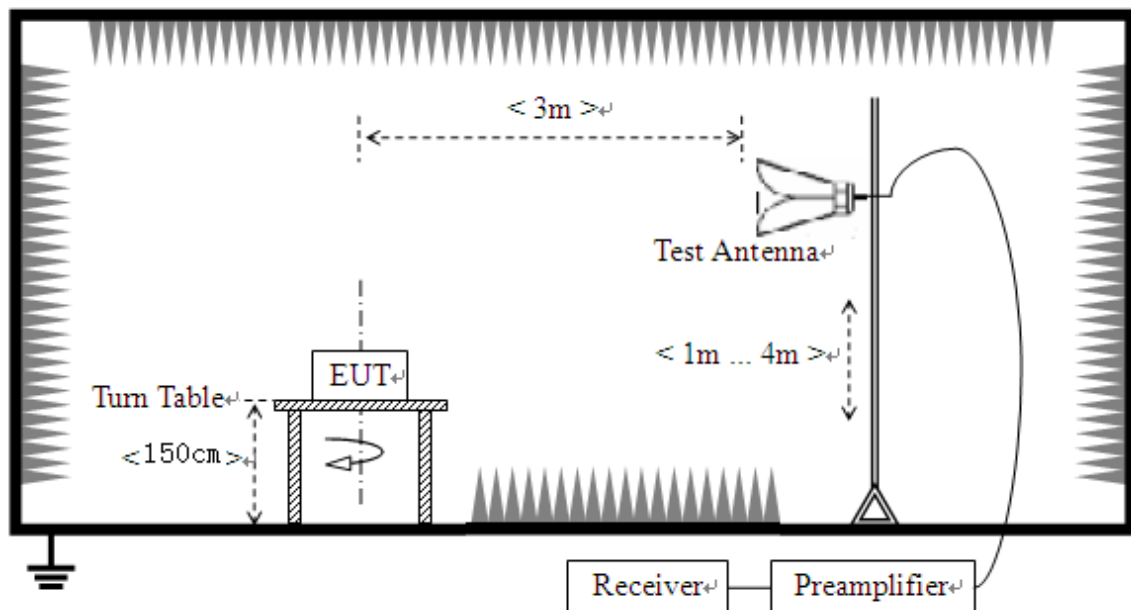
## 2.8. Restricted Frequency Bands

### 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.

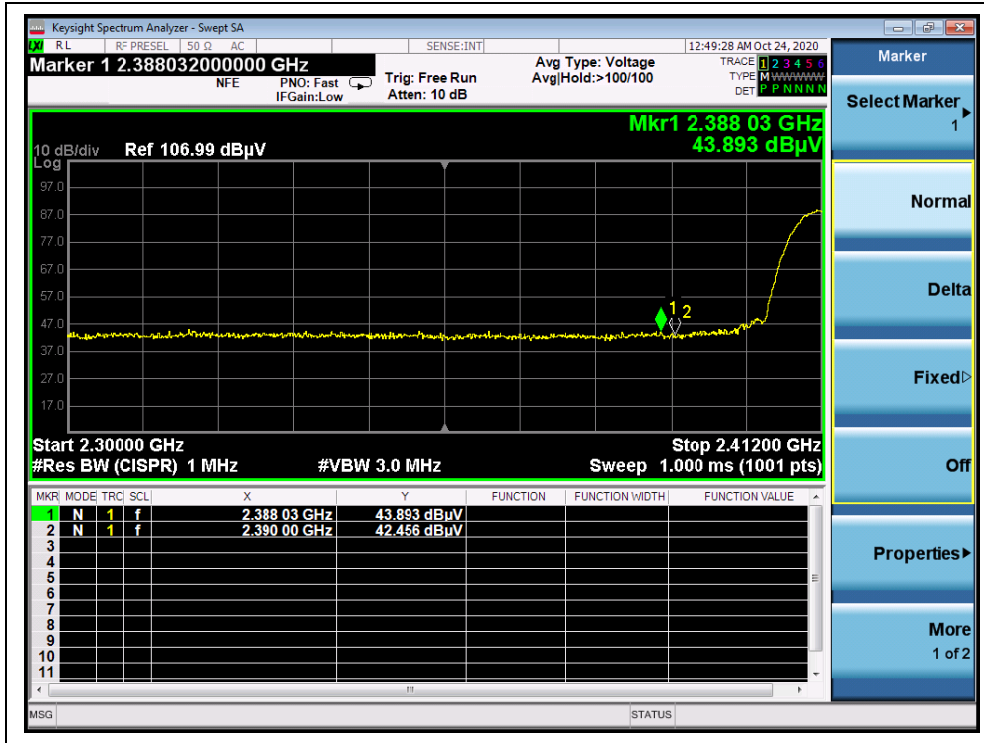
### 802.11b Mode

#### A. Test Verdict:

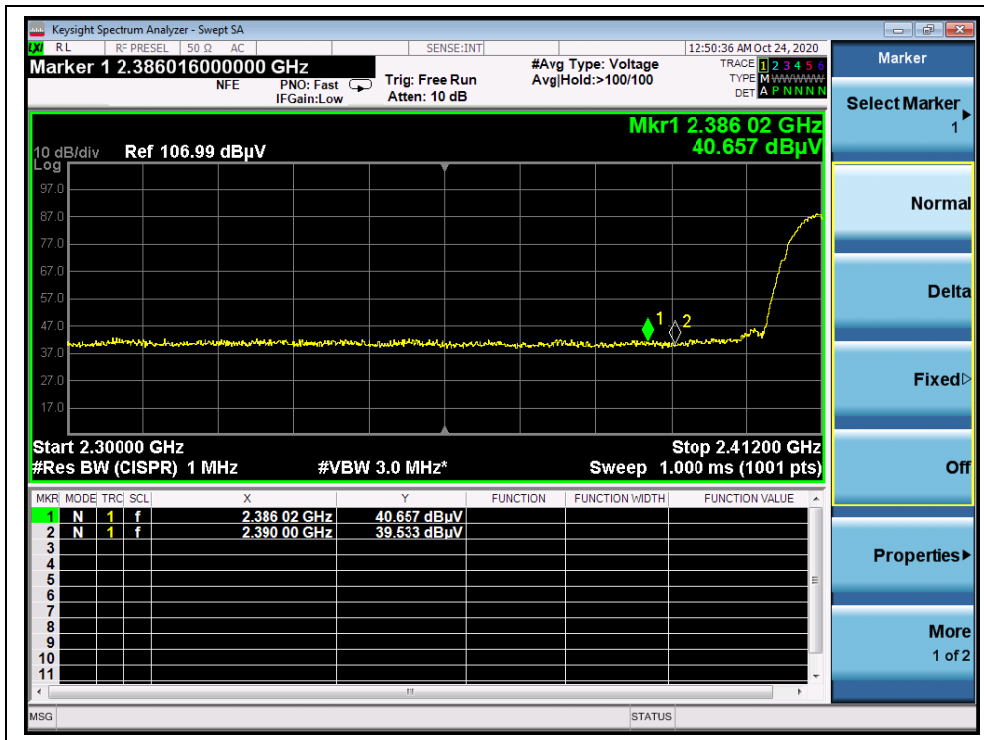
Channel	Frequency (MHz)	Detector	Receiver Reading	$A_T$ (dB)	$A_{\text{Factor}}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV	$U_R$ (dB $\mu$ V)					
1	2388.03	PK	43.89	-31.01	31.60	44.48	74	PASS
1	2386.02	AV	40.66	-31.01	31.60	41.25	54	PASS
13	2484.02	PK	44.50	-31.01	31.60	45.09	74	PASS
13	2484.93	AV	42.68	-31.01	31.60	43.27	54	PASS



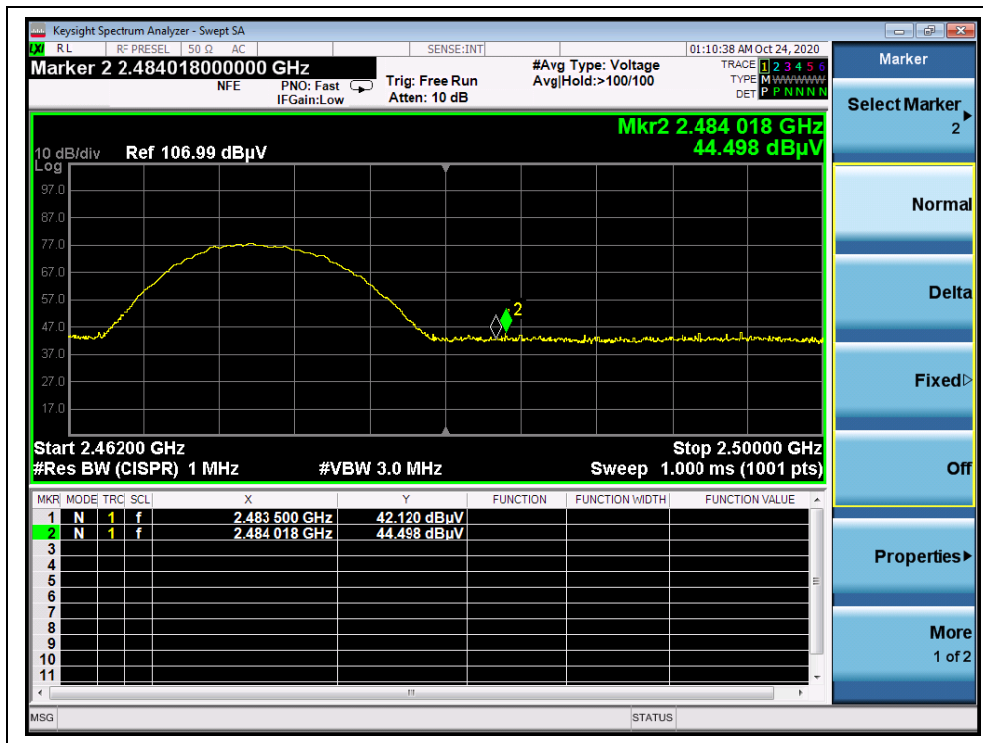
B.Test Plot:



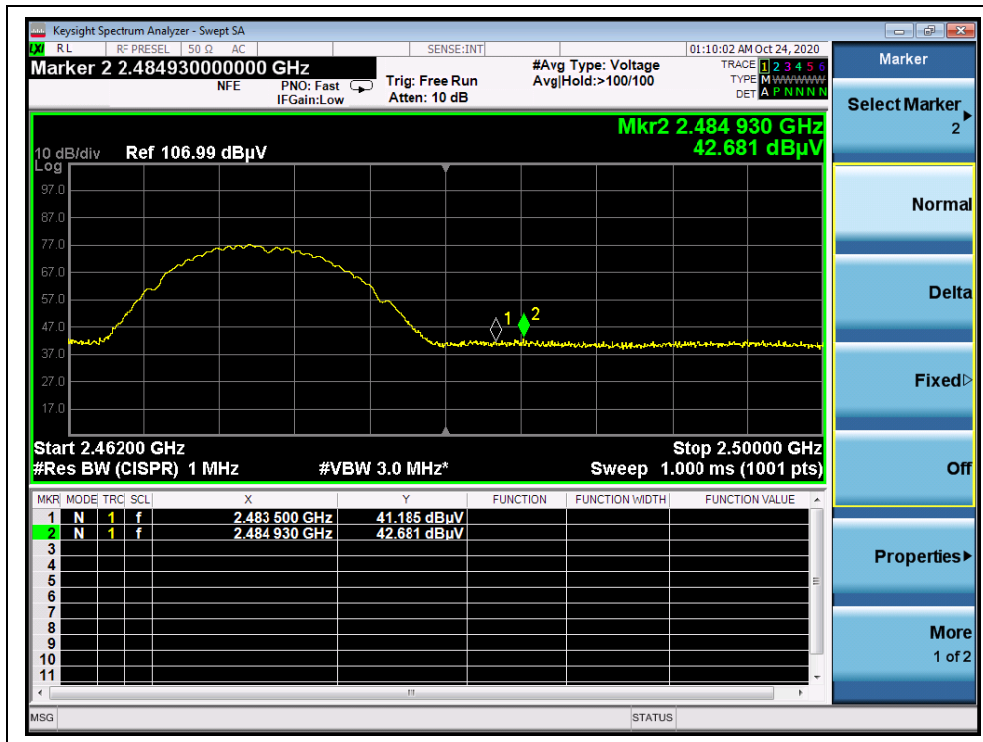
(PEAK, Channel 1, 802.11b)



(AVERAGE, Channel 1, 802.11b)



(PEAK, Channel 13, 802.11b)



(AVERAGE, Channel 13, 802.11b)

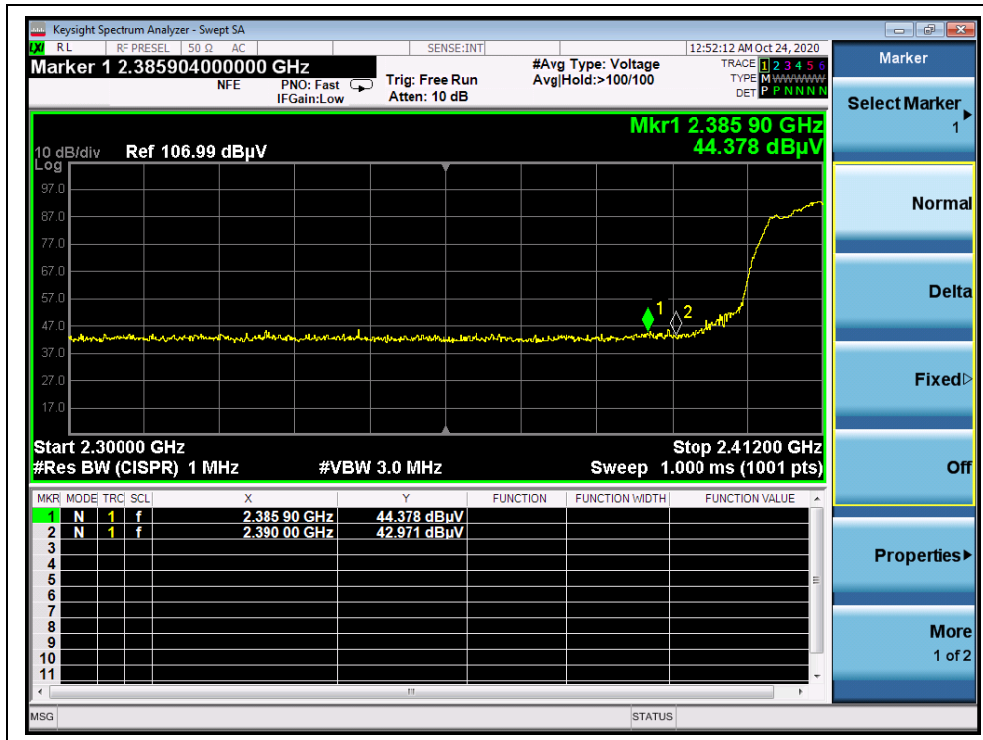


802.11g Mode

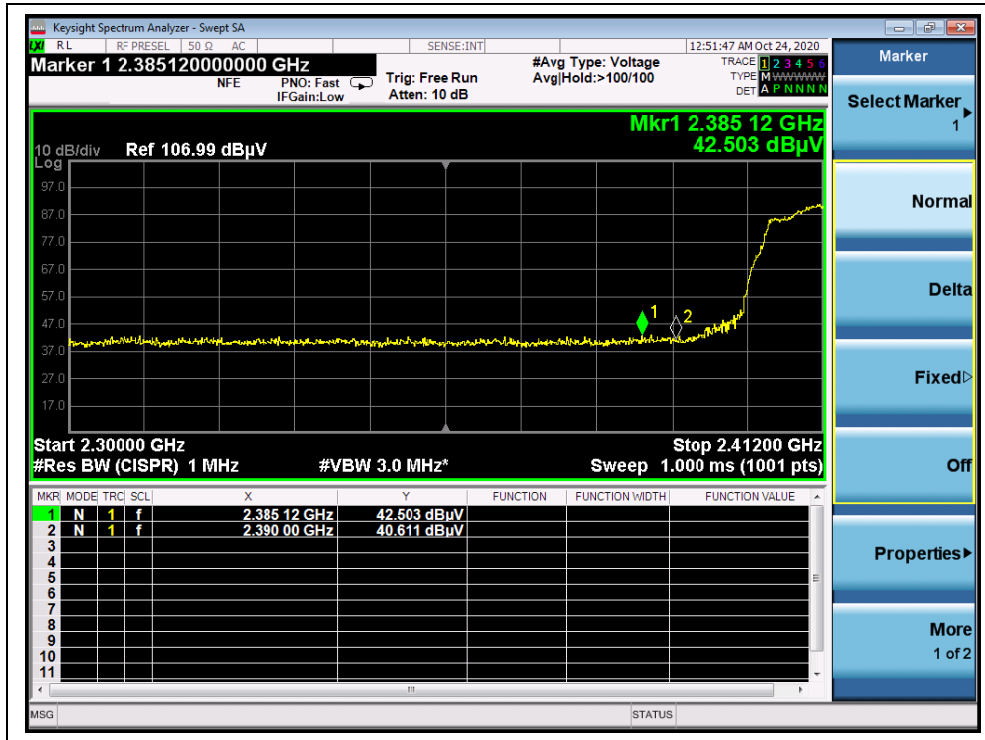
A.Test Verdict:

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	2385.90	PK	44.38	-31.01	31.60	44.97	74	PASS
1	2385.12	AV	42.50	-31.01	31.60	43.09	54	PASS
13	2483.50	PK	48.56	-31.01	31.60	49.15	74	PASS
13	2483.50	AV	45.48	-31.01	31.60	46.07	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)



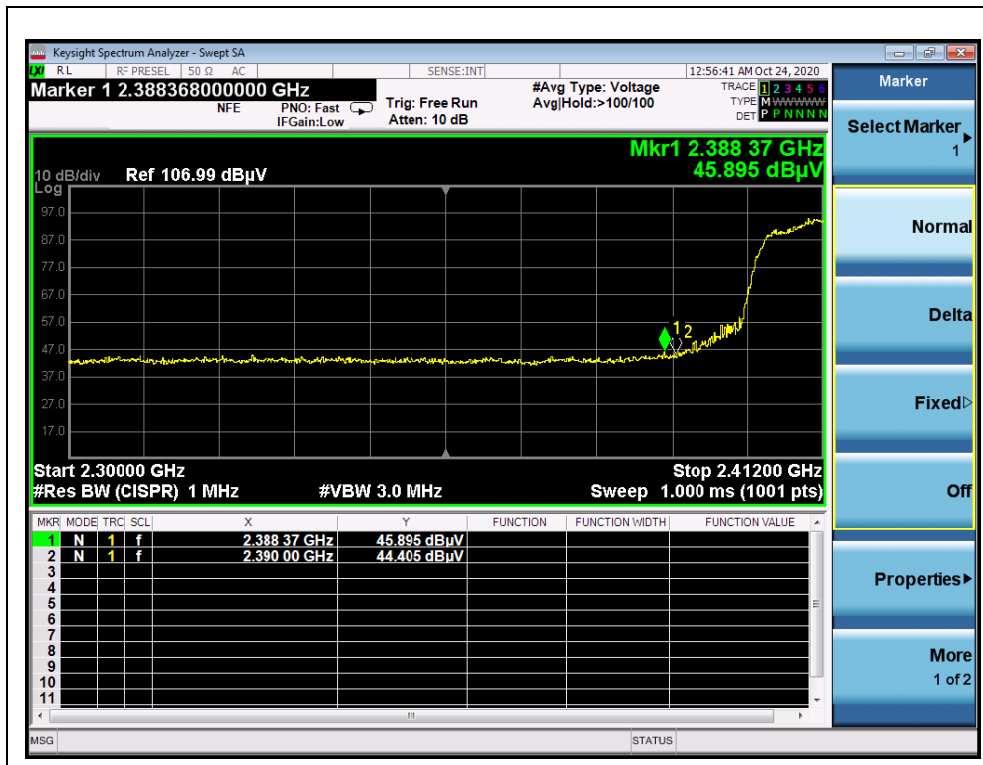


802.11 n (HT20) Mode

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						
1	2388.37	PK	45.90	-31.01	31.60	46.49	74	PASS
1	2387.58	AV	42.77	-31.01	31.60	43.36	54	PASS
13	2483.50	PK	51.44	-31.01	31.60	52.03	74	PASS
13	2483.50	AV	46.91	-31.01	31.60	47.50	54	PASS

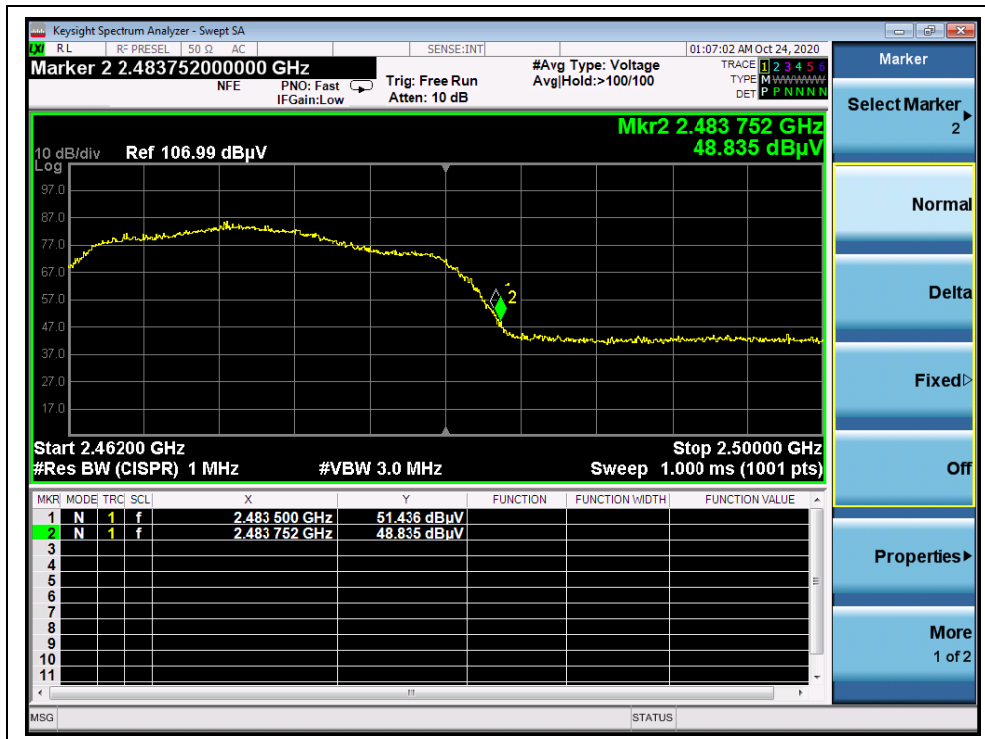
B. Test Plot:



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



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



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



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



## 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

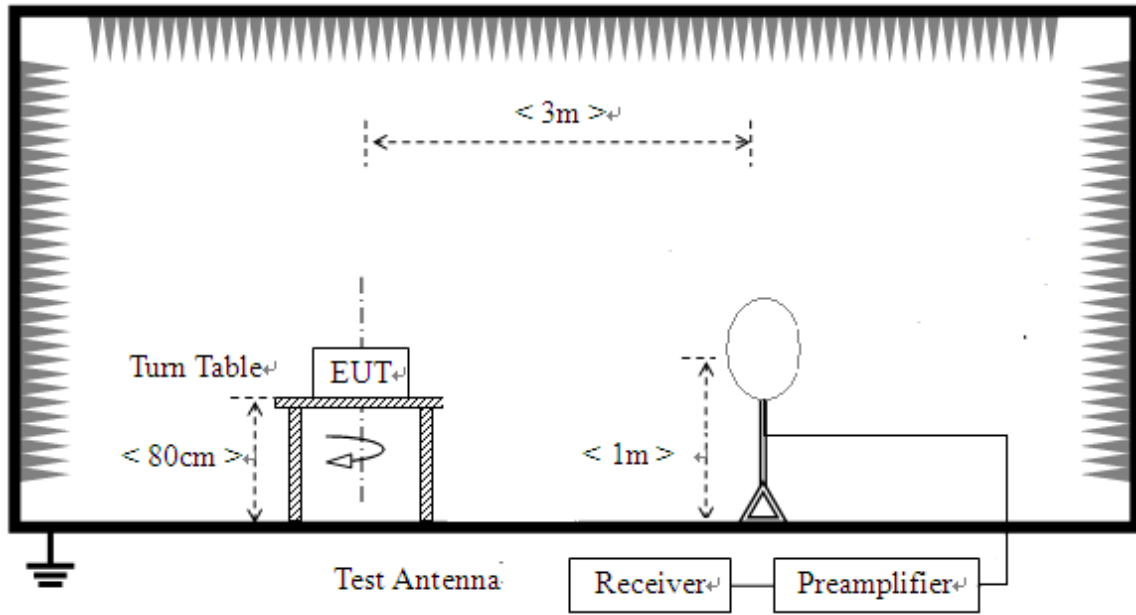
**Note1:** For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

**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).

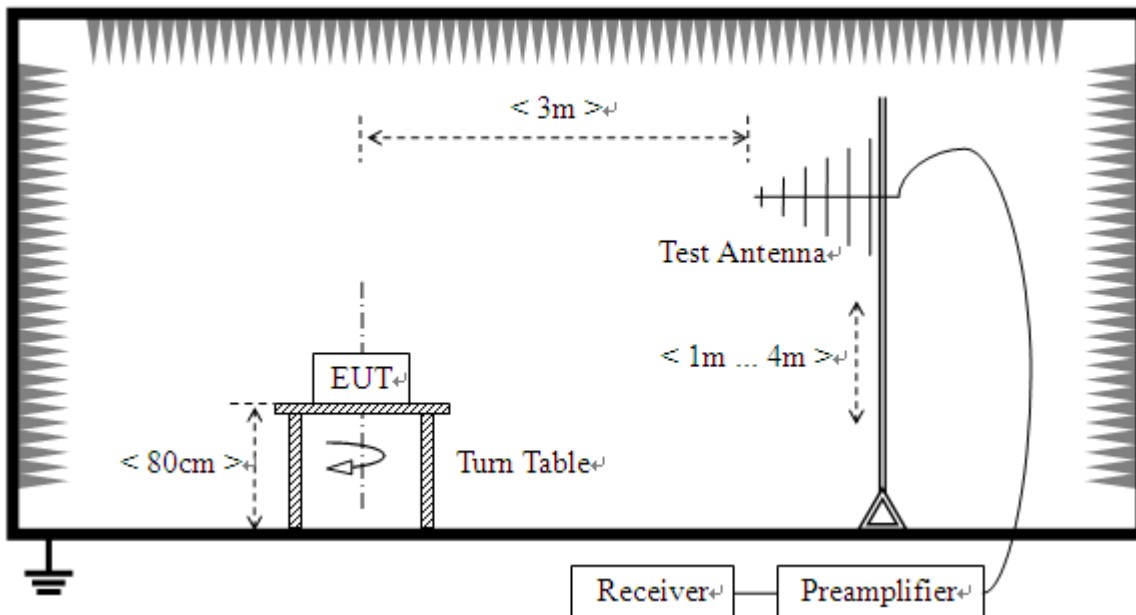
### 2.9.2. Test Description

#### Test Setup:

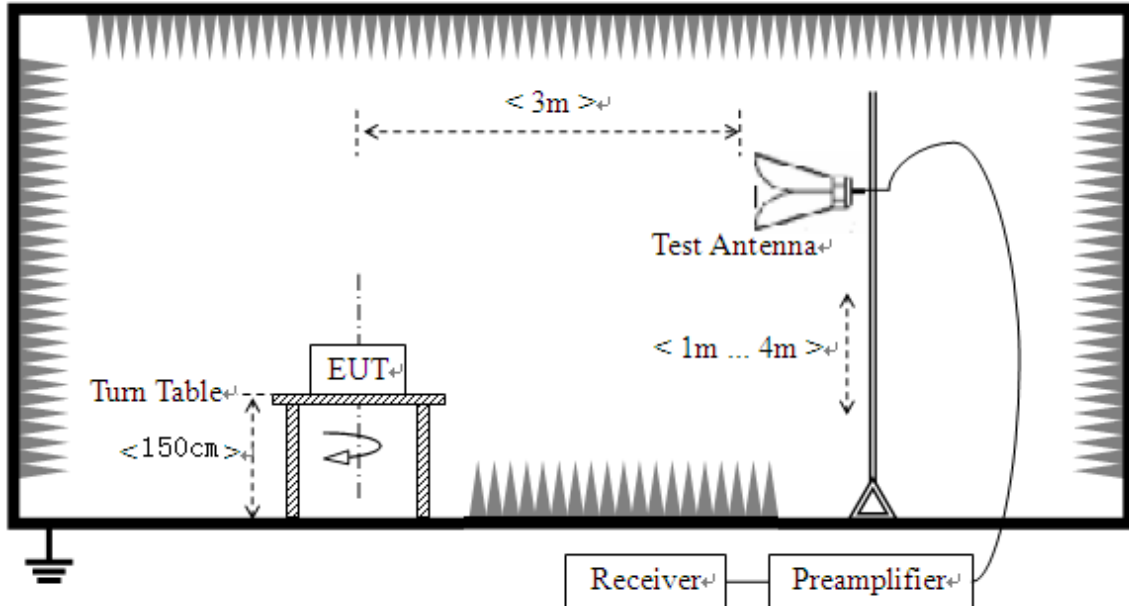
- 1) For radiated emissions from 9kHz to 30MHz



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



3) For radiated emissions above 1GHz



The 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:

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

$A_T$ : 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.

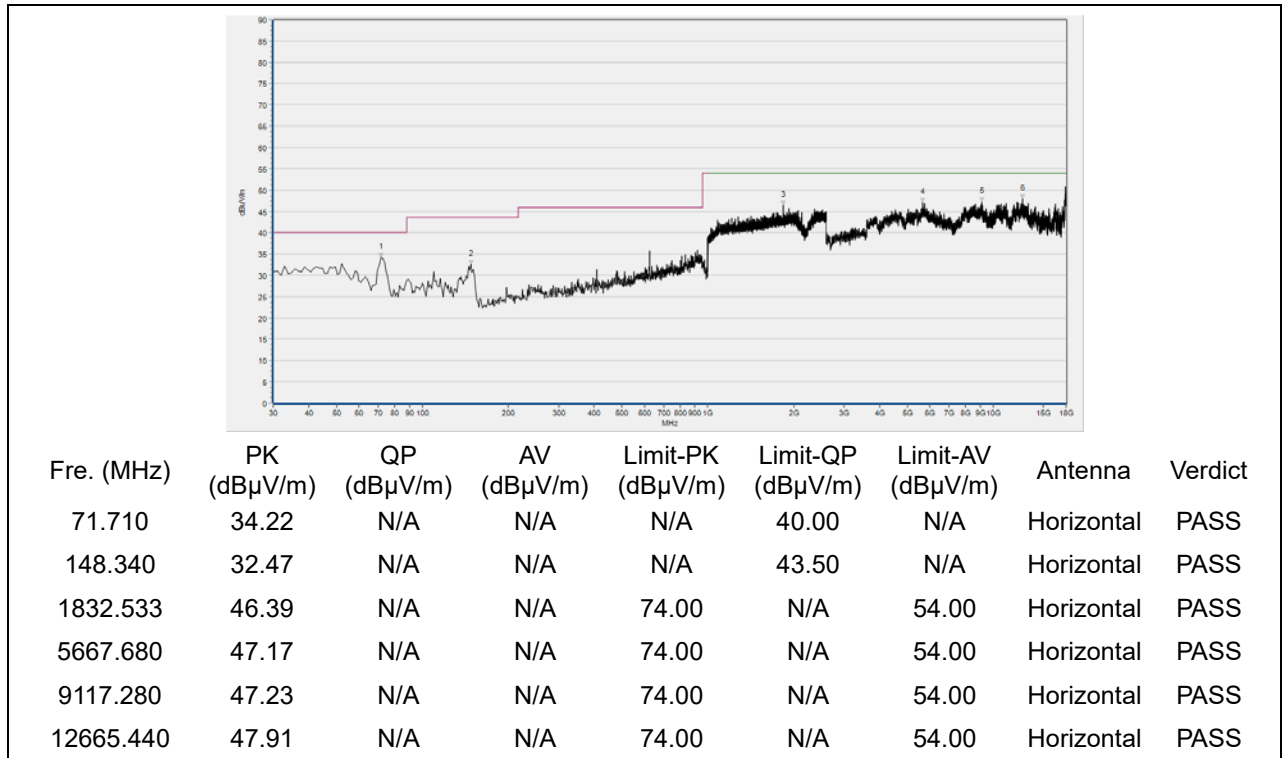
**Note2:** For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

**Note3:** For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

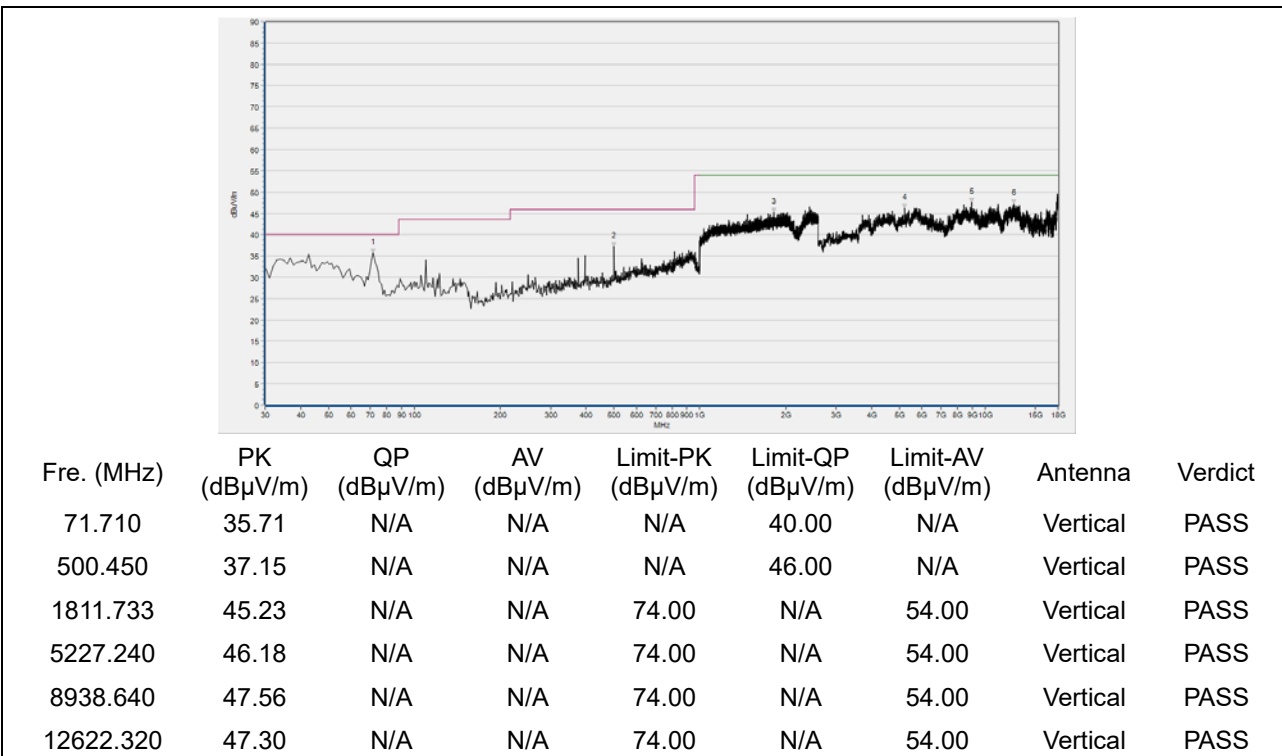


**802.11b Mode**

**Plot for Channel 1**



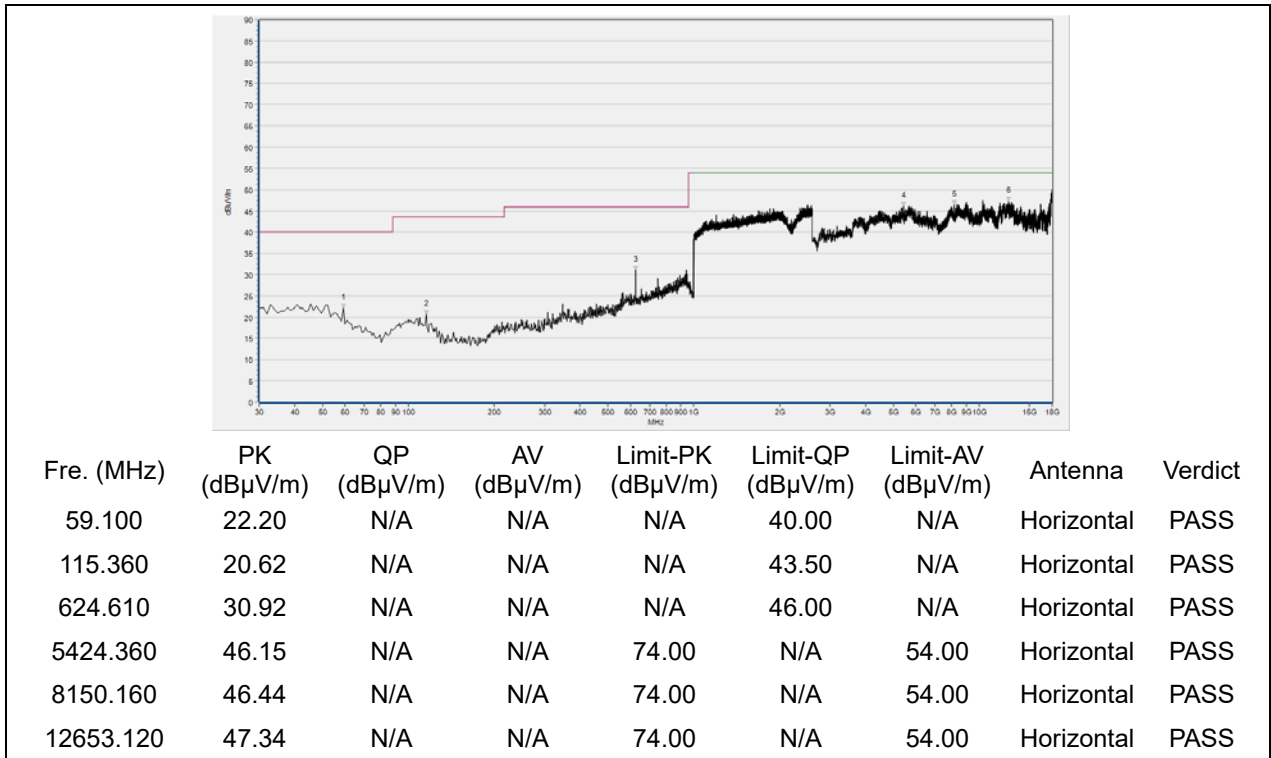
(Antenna Horizontal, 30MHz to 18GHz)



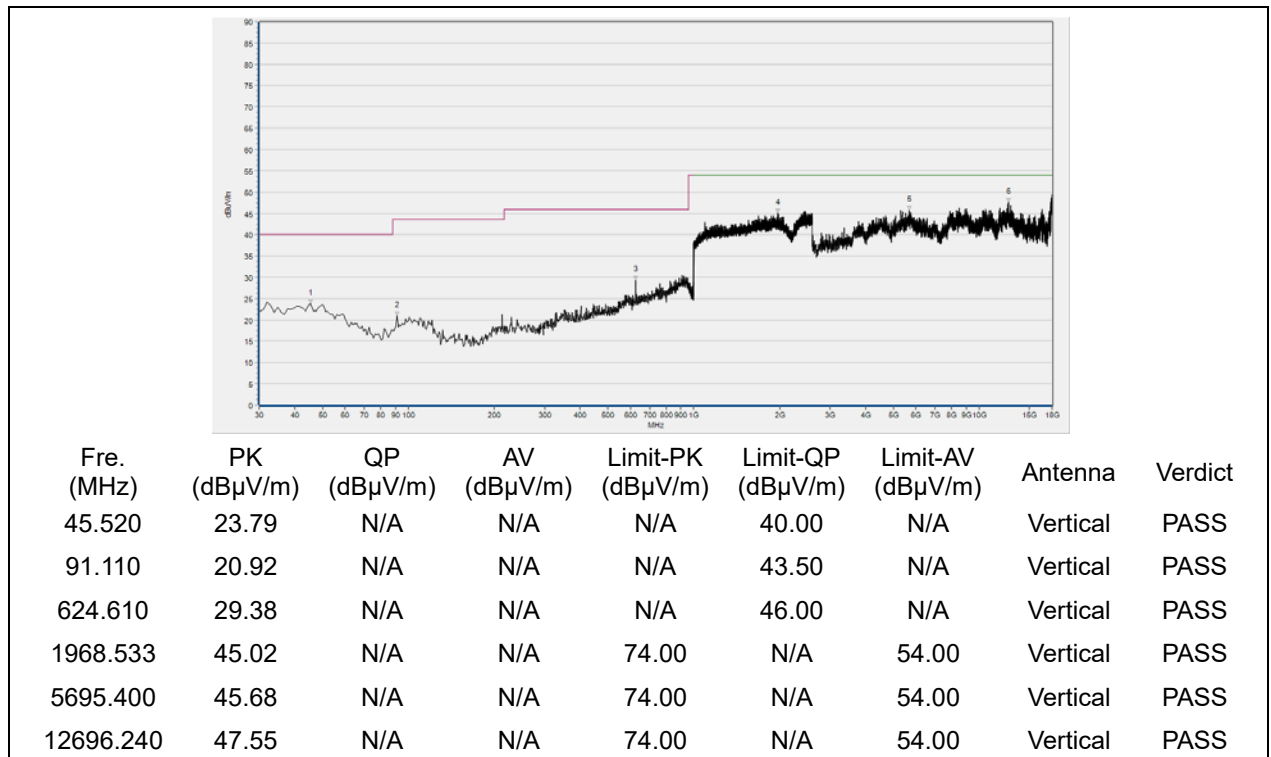
(Antenna Vertical, 30MHz to 18GHz)



Plot for Channel 7

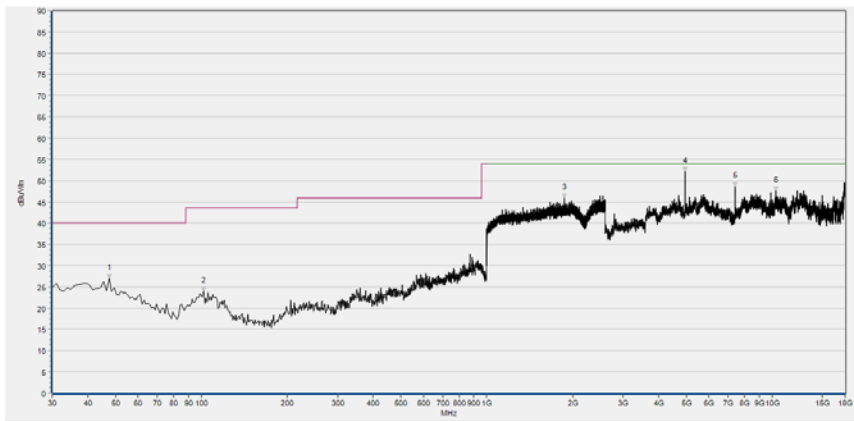


(Antenna Horizontal, 30MHz to 18GHz)



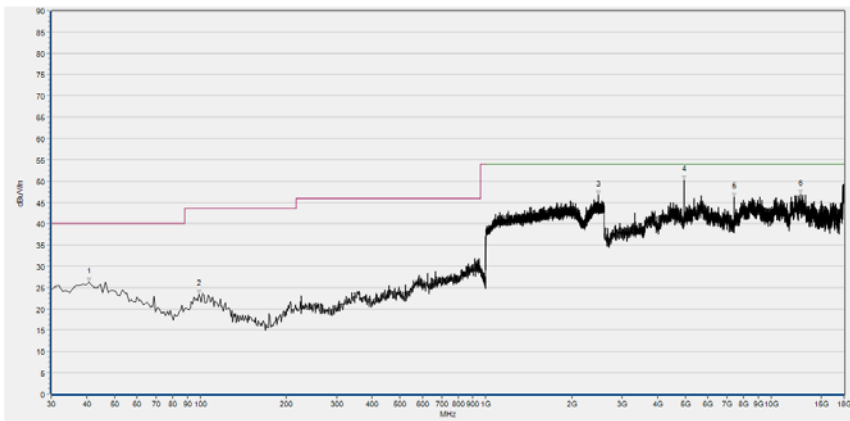
(Antenna Vertical, 30MHz to 18GHz)

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
47.460	26.98	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
101.780	24.01	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1872.533	45.92	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4944.100	53.10	N/A	48.54	74.00	N/A	54.00	Horizontal	PASS
7417.120	48.61	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10303.080	47.61	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

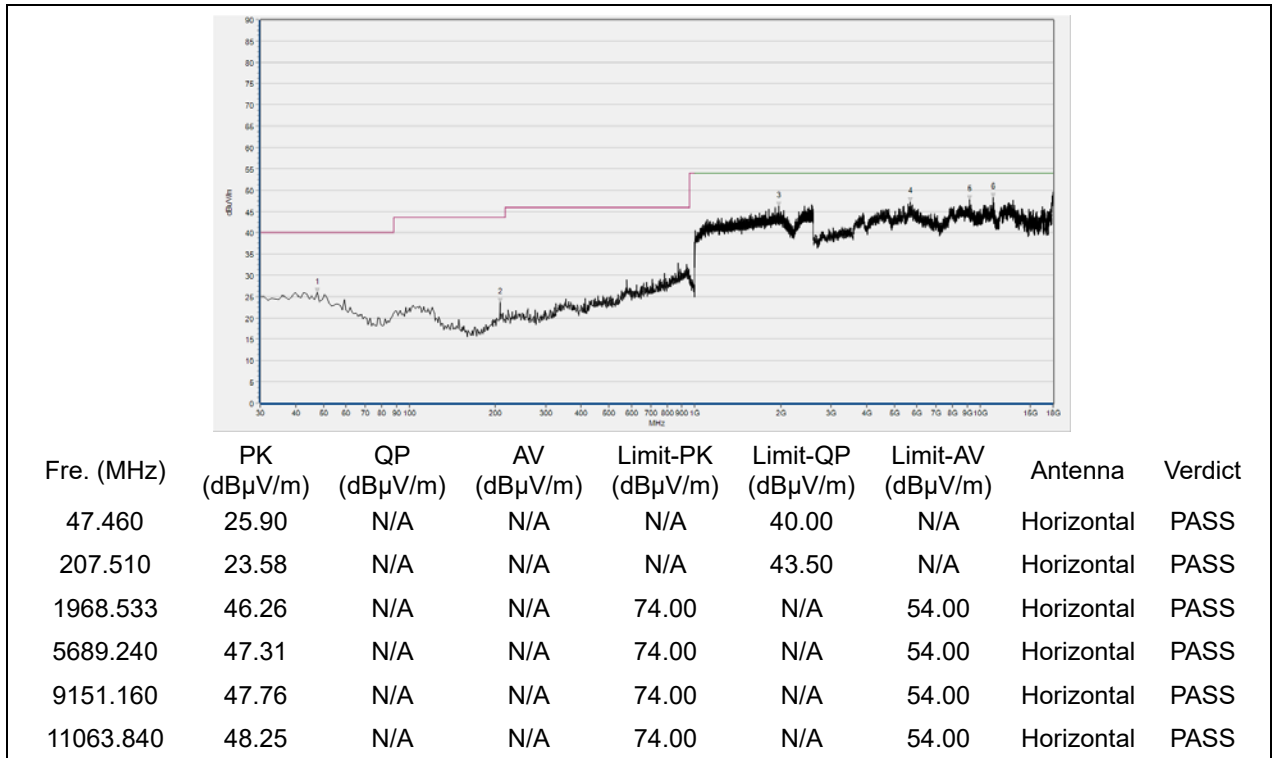


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
40.670	26.23	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
98.870	23.49	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2475.733	46.73	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4943.880	50.36	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7417.120	46.33	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12637.720	46.89	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

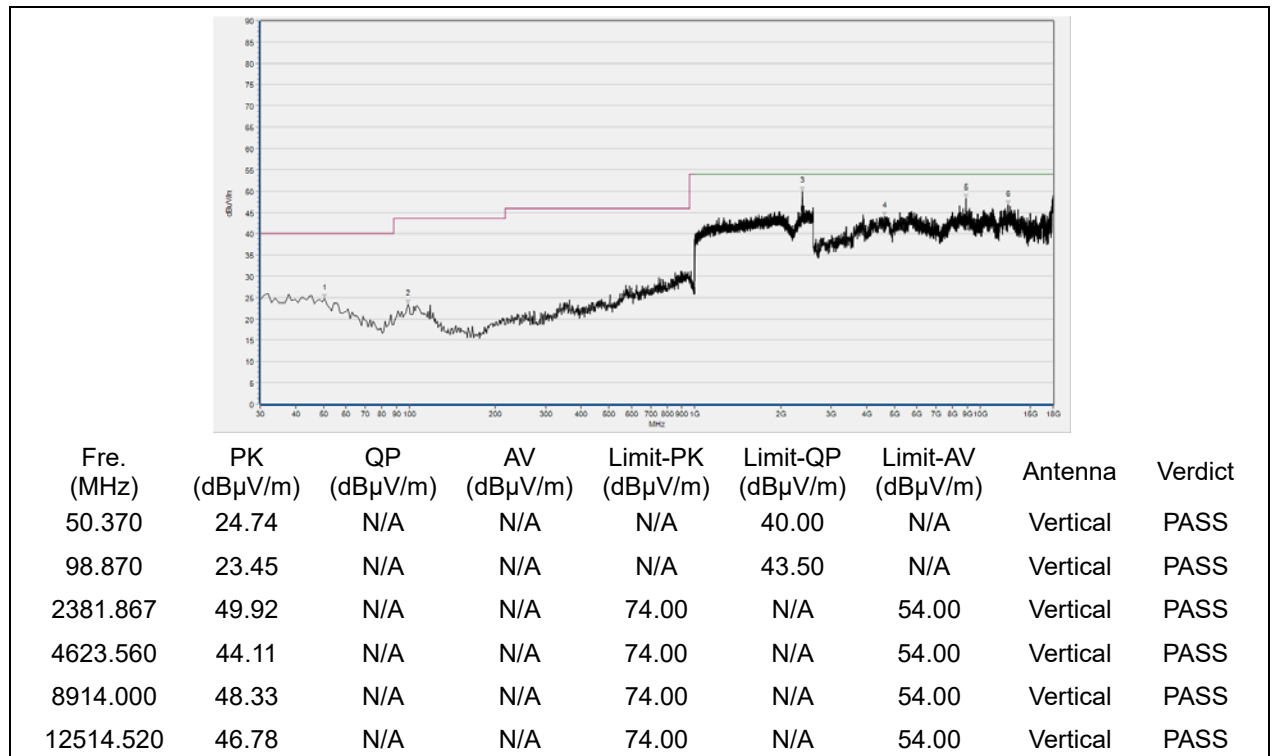
(Antenna Vertical, 30MHz to 18GHz)

**802.11g Mode**

**Plot for Channel 1**

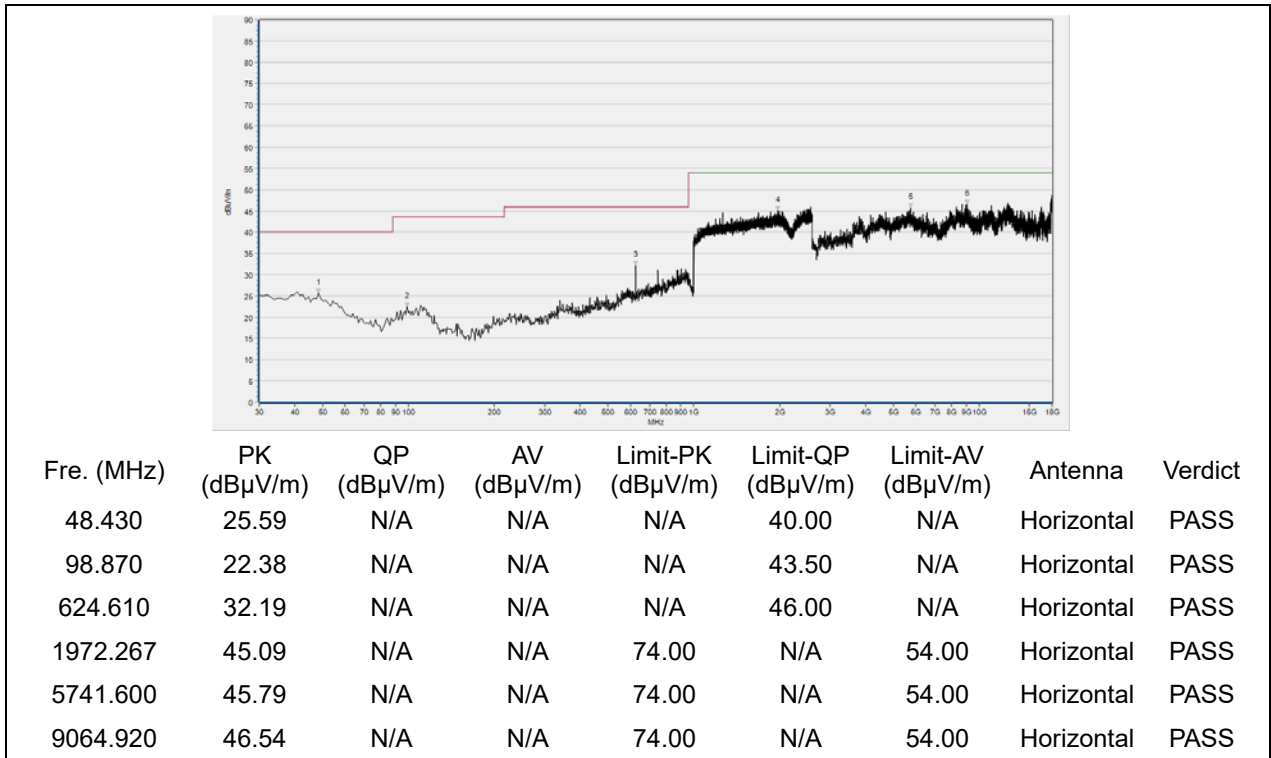


(Antenna Horizontal, 30MHz to 18GHz)

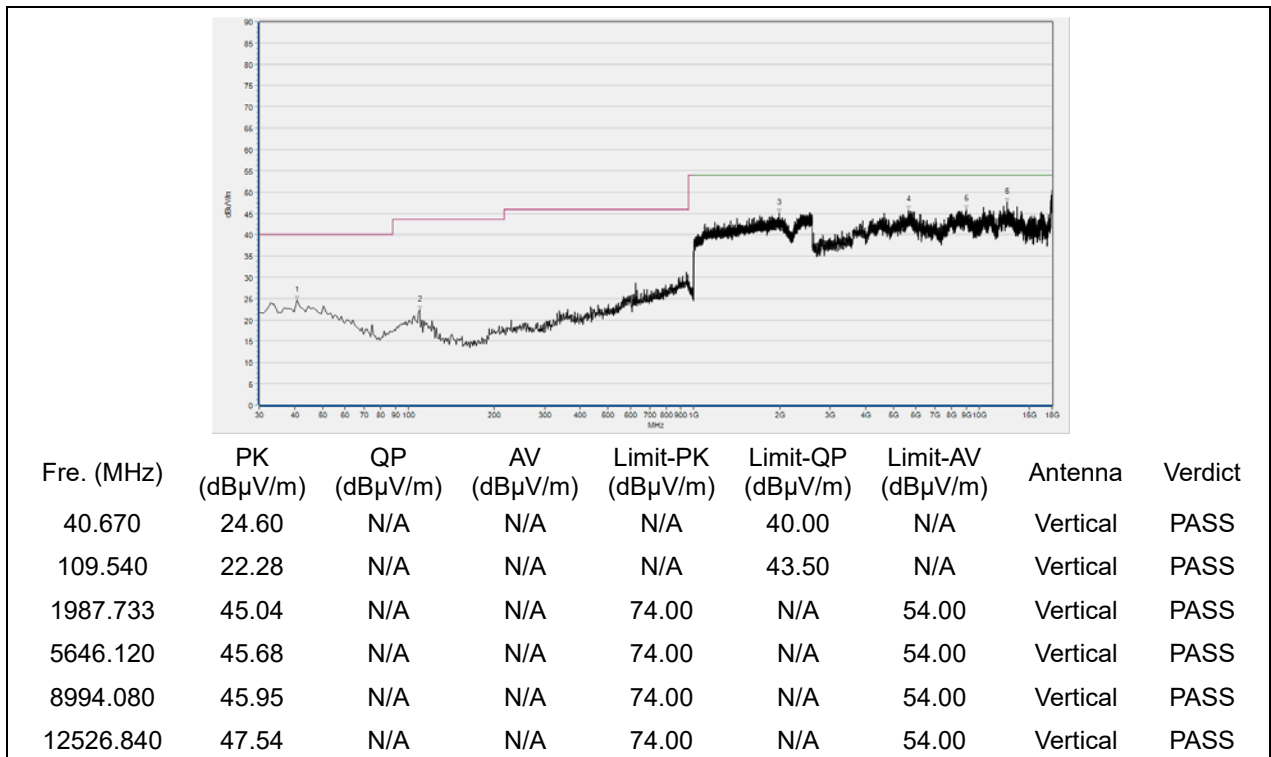


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 7

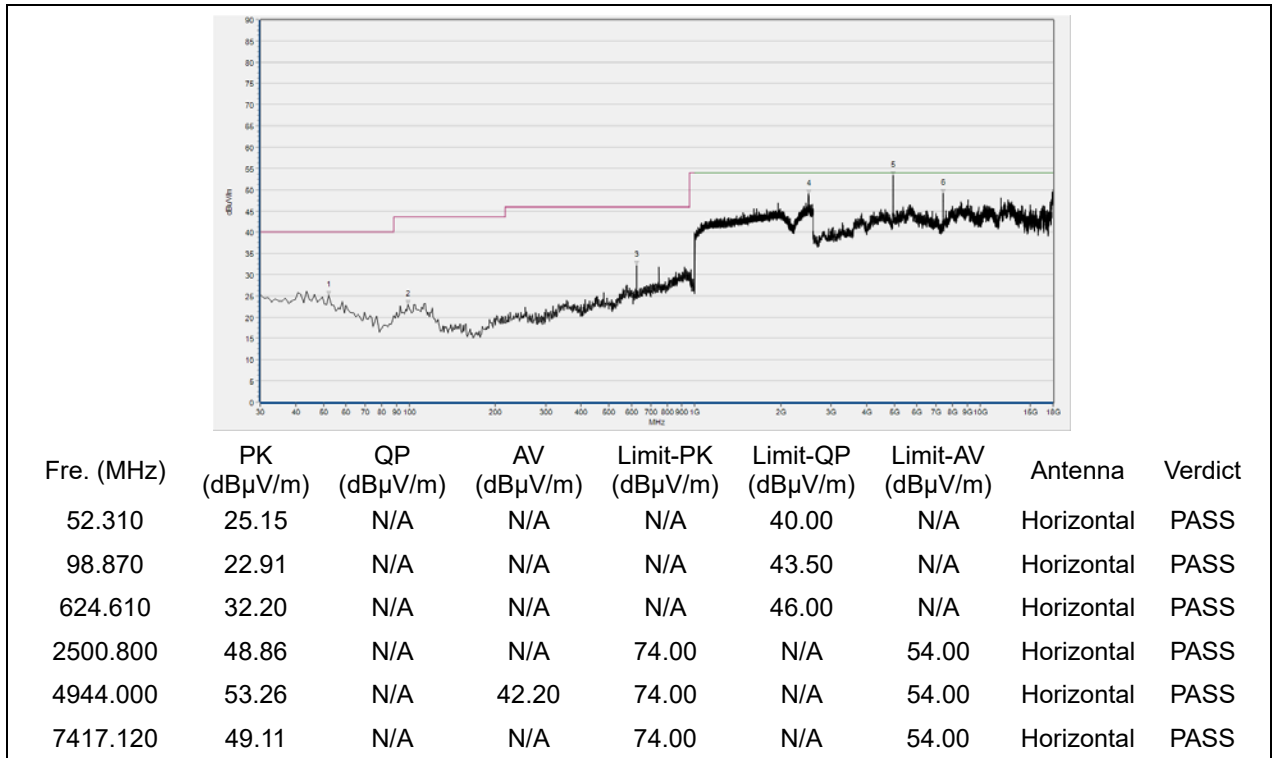


(Antenna Horizontal, 30MHz to 18GHz)

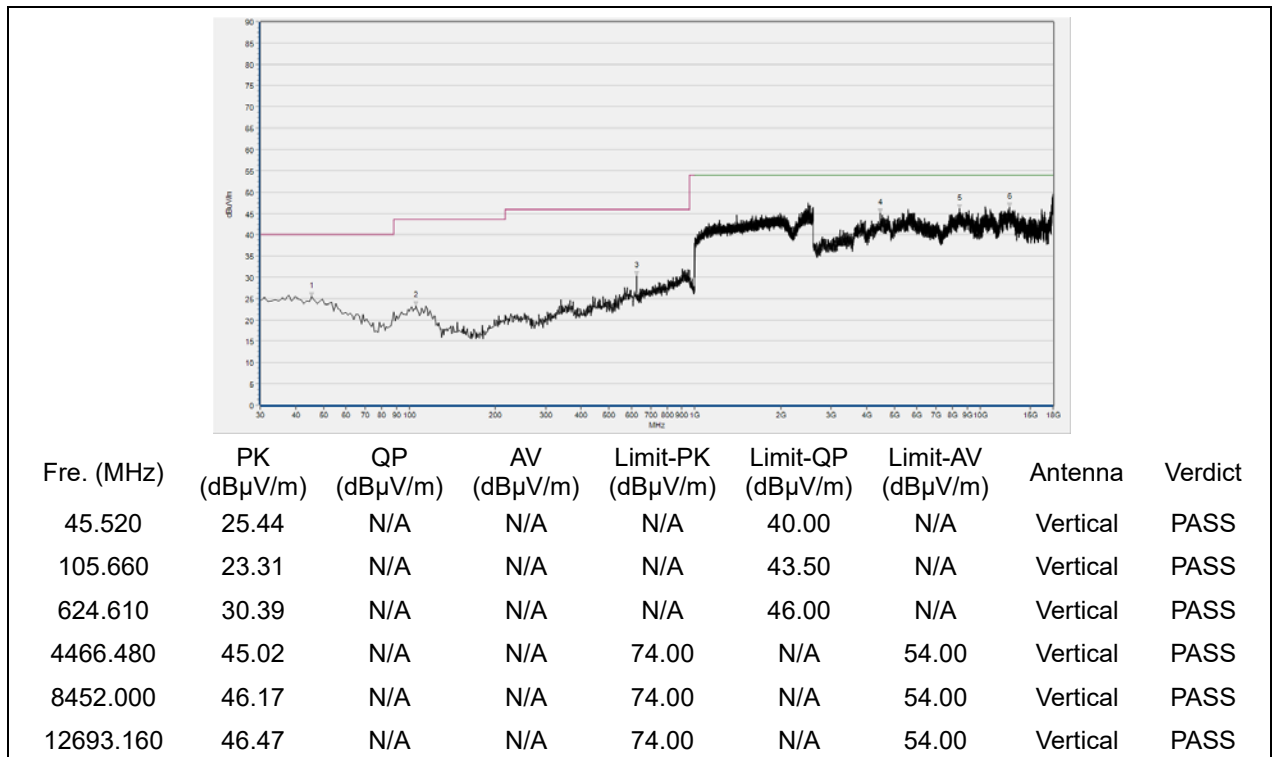


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 13



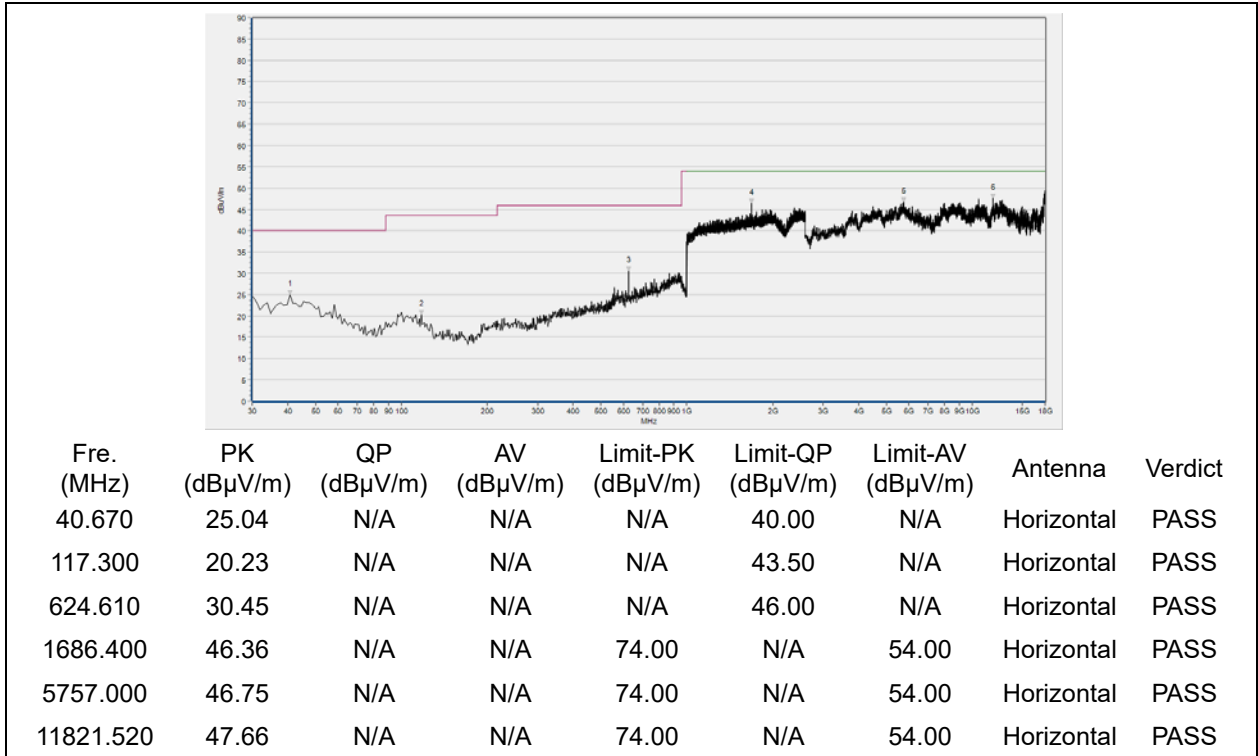
(Antenna Horizontal, 30MHz to 18GHz)



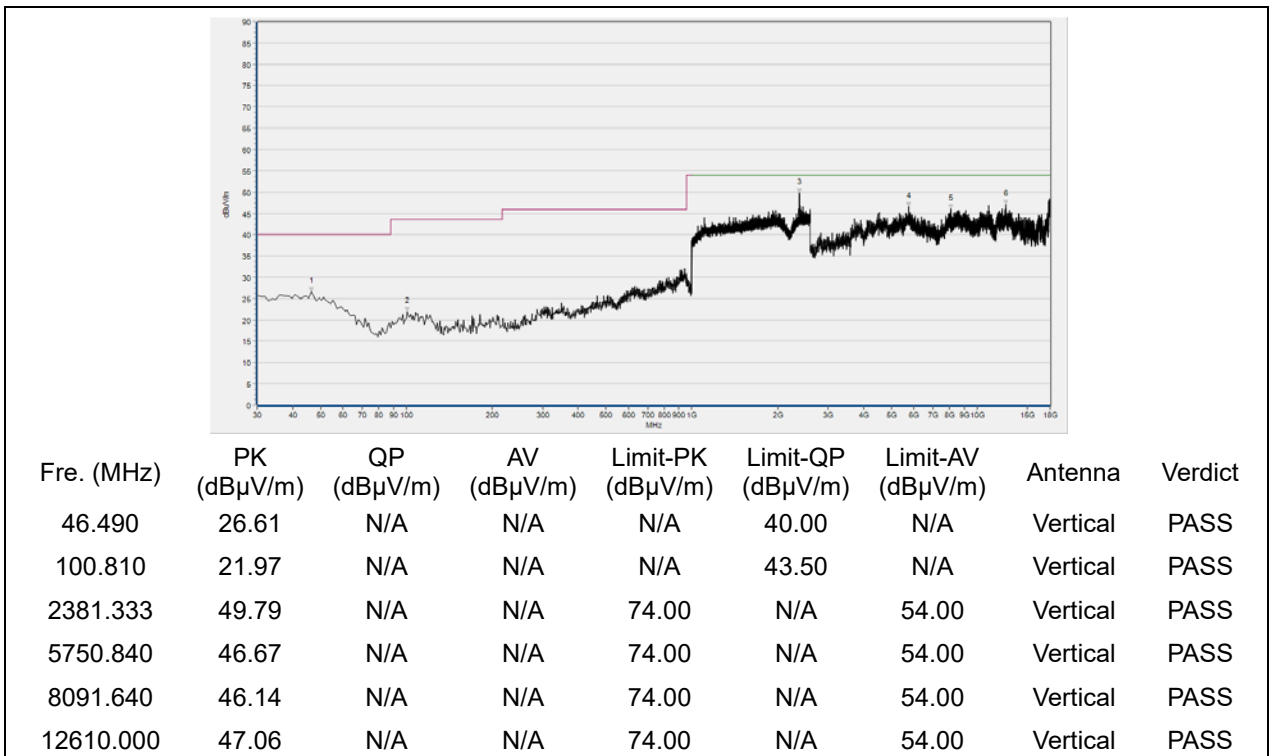
(Antenna Vertical, 30MHz to 18GHz)

**802.11n (HT20) Mode**

Plot for Channel 1

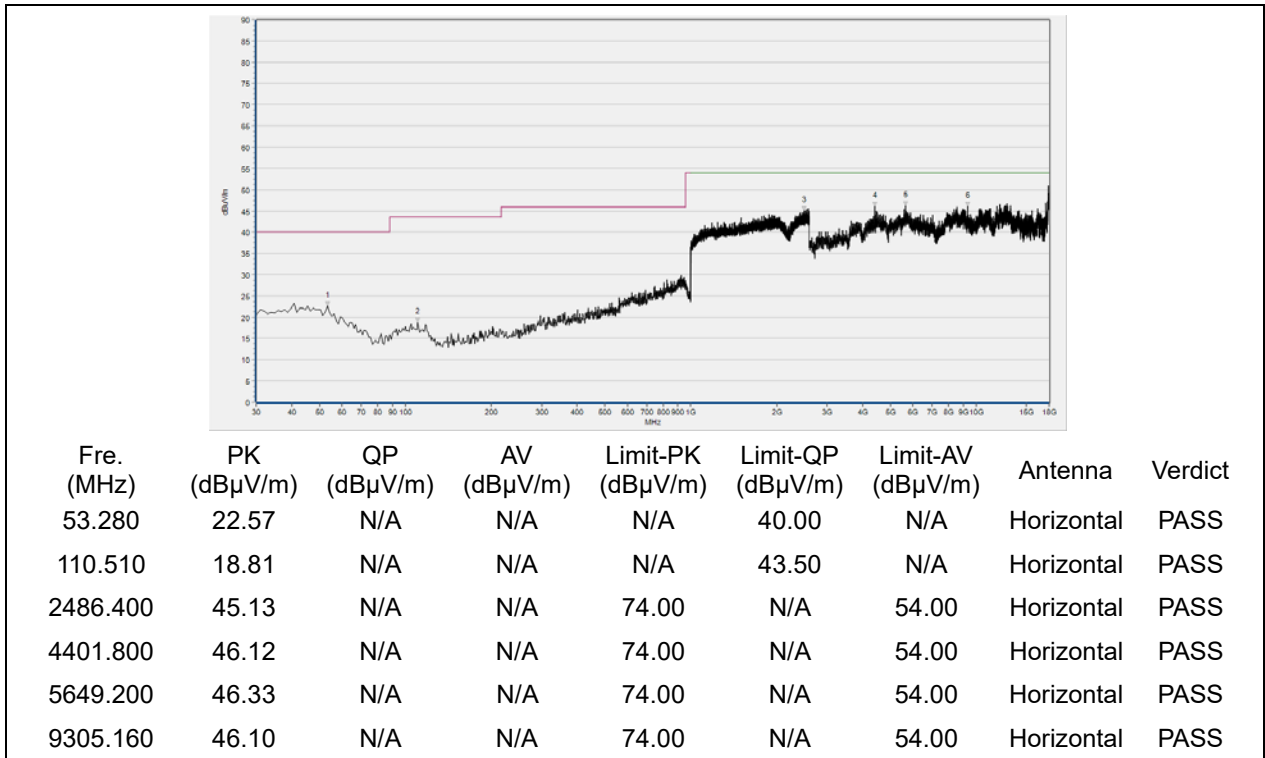


(Antenna Horizontal, 30MHz to 18GHz)

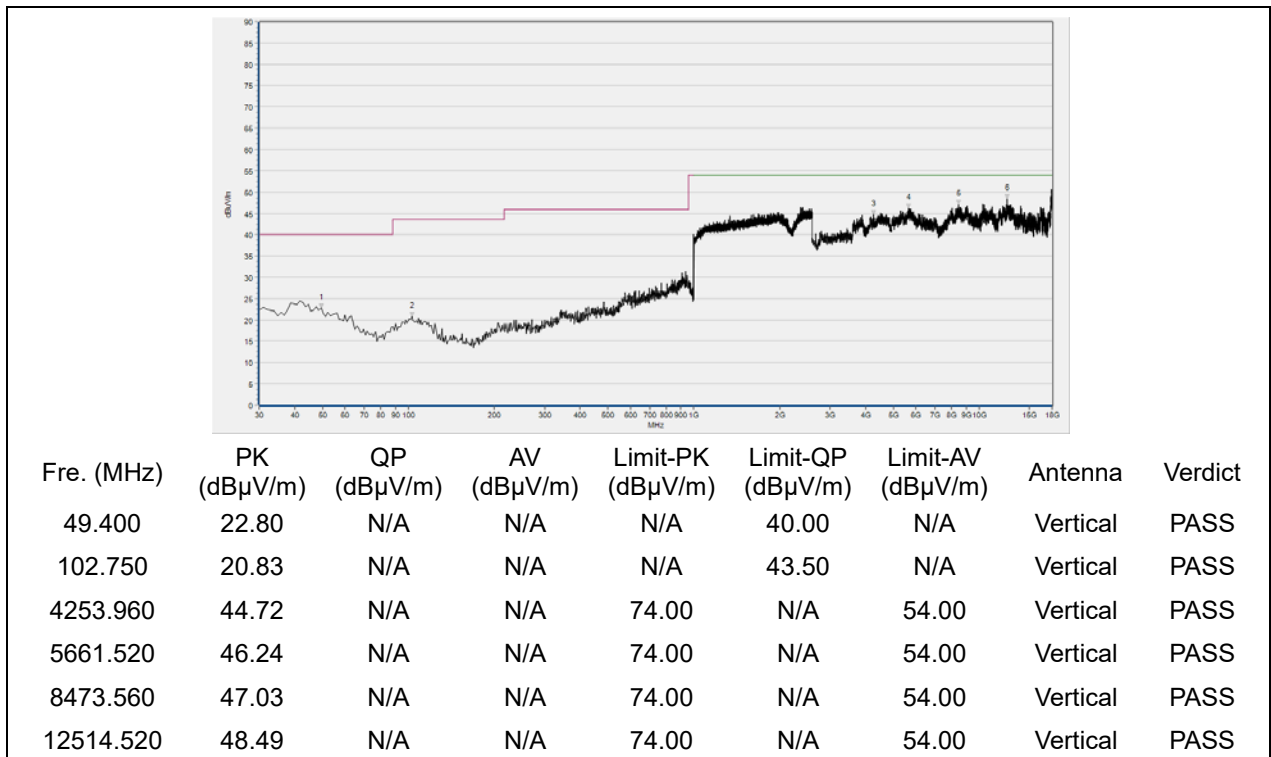


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 7

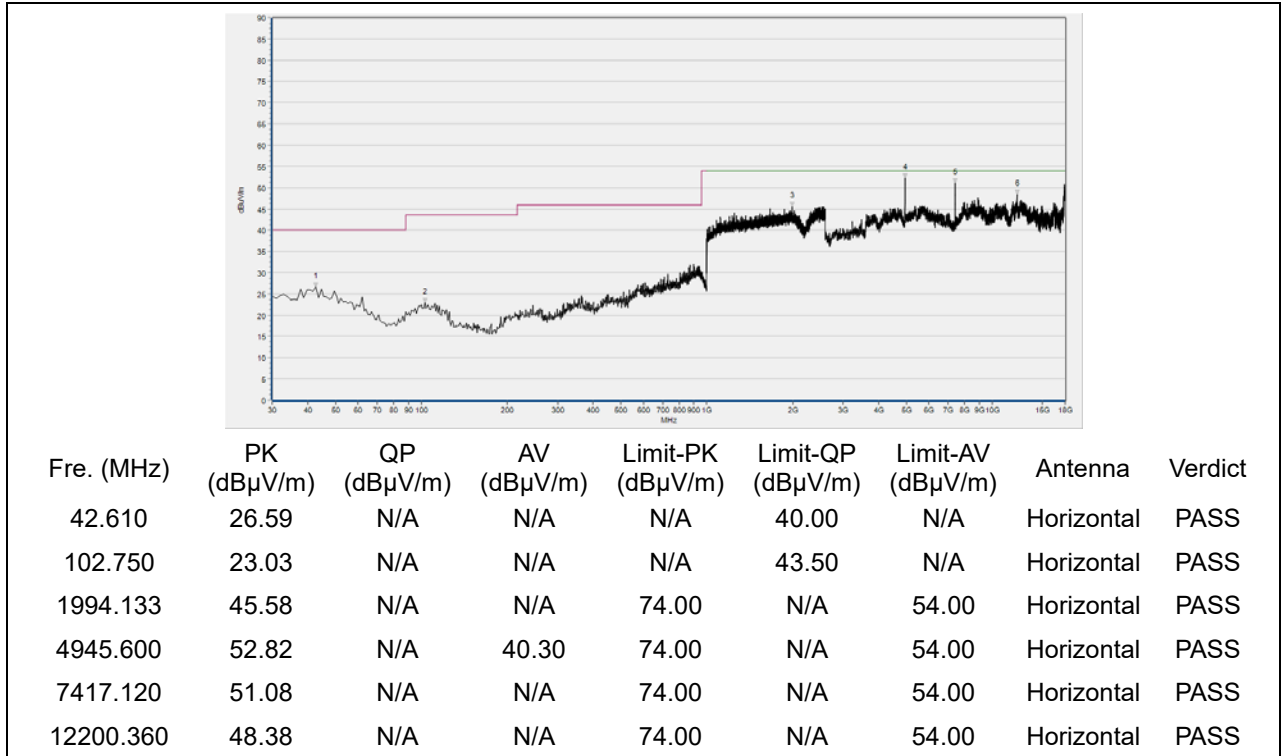


(Antenna Horizontal, 30MHz to 18GHz)

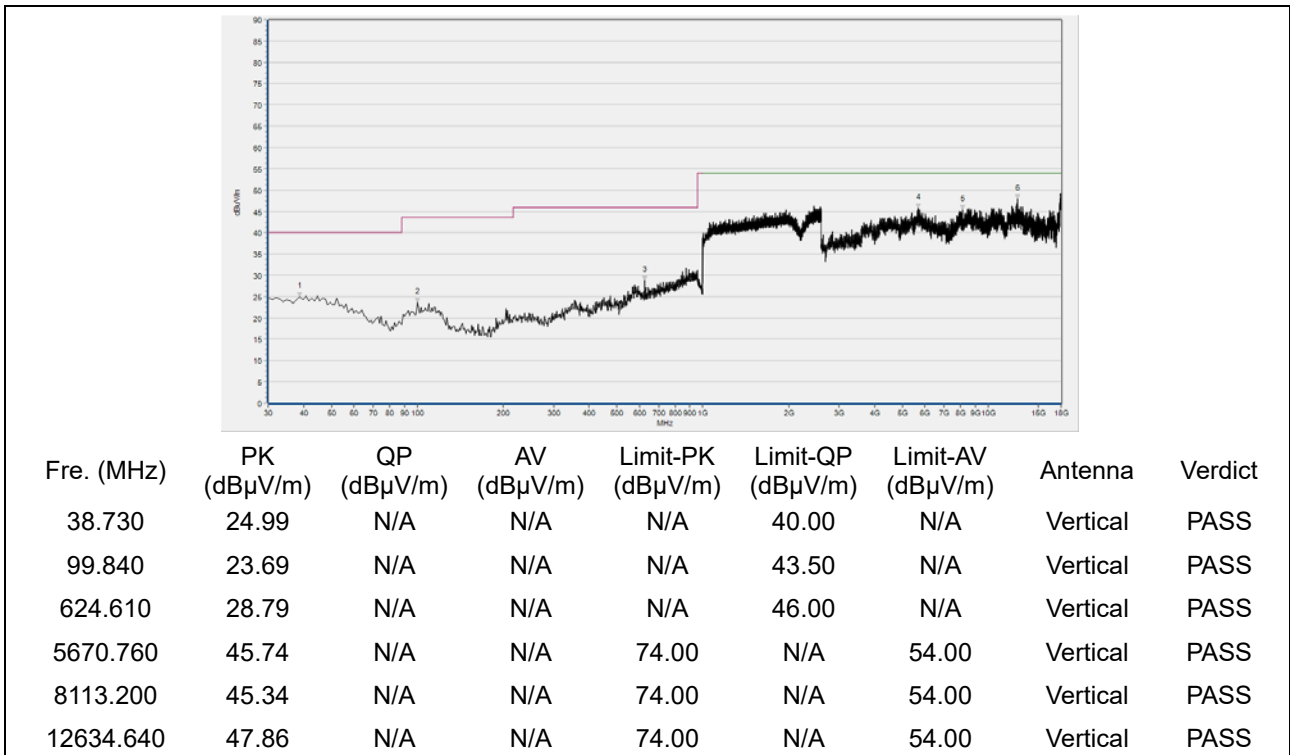


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 13



(Antenna Horizontal, 30MHz to 18GHz)



(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 (PSD)	$\pm 2.22\text{dB}$
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. Morlab Laboratory
<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. Morlab Laboratory
<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	2020.04.01	2021.03.31
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2020.04.01	2021.03.31
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	2020.03.26	2021.03.25
LISN	812744	NSLK 8127	Schwarzbeck	2020.03.26	2021.03.25
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	N/A	A1374	APPLE	N/A	N/A
EARPHONE	EMC-03	VIVO	N/A	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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