



REPORT No.: SZ18120173W01

# TEST REPORT

**APPLICANT** : Shenzhen Concox Information Technology Co.,Ltd  
**PRODUCT NAME** : Asset GPS Tracker  
**MODEL NAME** : AT4  
**BRAND NAME** : Concox  
**FCC ID** : X7IAT4  
**STANDARD(S)** : 47 CFR Part 15 Subpart C  
**RECEIPT DATE** : 2018-12-24  
**TEST DATE** : 2019-02-18 to 2019-02-20  
**ISSUE DATE** : 2019-02-21

Edited by:

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Change History		
Version	Date	Reason for change
1.0	2019-02-21	First edition

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# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	Shenzhen Concox Information Technology Co.,Ltd
<b>Applicant Address:</b>	Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen, China
<b>Manufacturer:</b>	Shenzhen Concox Information Technology Co.,Ltd
<b>Manufacturer Address:</b>	Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen, China

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	Asset GPS Tracker	
<b>Serial No:</b>	(N/A, marked #1 by test site)	
<b>Hardware Version:</b>	NT97_MB_V2.1	
<b>Software Version:</b>	NT97_10_A1D_D23_R0_V02_FCC_20170726_1422	
<b>Modulation Type:</b>	DSSS, OFDM	
<b>Operating Frequency Range:</b>	802.11b/g/ n(HT20): 2.412GHz - 2.462GHz	
<b>Channel Number:</b>	802.11b/g/ n(HT20): 11	
<b>Antenna Type:</b>	Bracket Antenna	
<b>Antenna Gain:</b>	-1.5 dBi	
<b>Operating voltage:</b>	3.7 V	
<b>Accessory Information:</b>	Battery	
	Brand Name:	Weishi
	Model No.:	PL165182
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	10000mAh
	Rated Voltage:	3.7V
	Charge Limit:	4.2V



<b>Accessory Information:</b>	AC Adapter	
	Brand Name:	Huajin
	Model No.:	HJ-0502000N2-US
	Serial No.:	(N/A, marked #1 by test site)
	Rated Input:	100-240V ~ 50/60Hz 0.3A
	Rated Output:	5V=2.0A

**Note1:** The EUT is operating at 2.4GHz ISM; it supports 802.11b, 802.11g, 802.11n and they are all tested in this report.

For 802.11b/g/n(HT20) (2.4GHz band), the frequencies allocated is  $F$  (MHz) = $2412+5*(n-1)$  ( $1 \leq n \leq 11$ ). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2412MHz), 6 (2437MHz) and 11 (2462MHz).

**Note 2:** The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT continuous transmission.

**Note 3:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



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## 1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

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

No.	Section	Description	Test Date	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	N/A	Duty Cycle Of Test Signal	Feb 18, 2019	Zhang Guofeng	PASS
3	15.247(b)	Peak Output Power	Feb 18, 2019	Zhang Guofeng	PASS
4	15.247(a)	Bandwidth	Feb 18, 2019	Zhang Guofeng	PASS
5	15.247(d)	Conducted Spurious Emission and Band Edge	Feb 18, 2019	Zhang Guofeng	PASS
6	15.247(e)	Power spectral density (PSD)	Feb 18, 2019	Zhang Guofeng	PASS
7	15.207	Conducted Emission	Feb 20, 2019	Ya Xinhou	PASS
8	15.247(d)	Restricted Frequency Bands	Feb 20, 2019	Ya Xinhou	PASS
9	15.209, 15.247(d)	Radiated Emission	Feb 18, 2019	Ya Xinhou	PASS

**Note1:** The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013 and KDB558074 D01 v05r01.

**Note2:** The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 11.5dB contains two parts that cable loss 1.5dB and Attenuator 10dB.

## 1.4. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106



## 2. 47 CFR Part 15C Requirements

### 2.1. Antenna requirement

#### 2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

#### 2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

### 2.2. Duty Cycle Of Test Signal

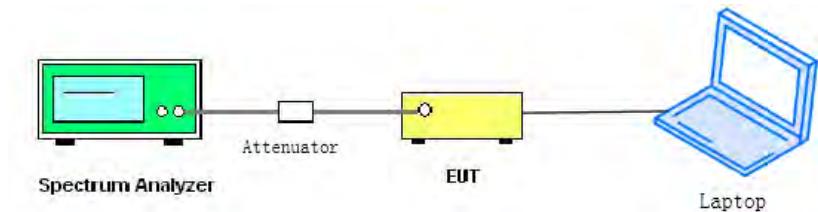
#### 2.2.1. Requirement

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

### A. Test Set:



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

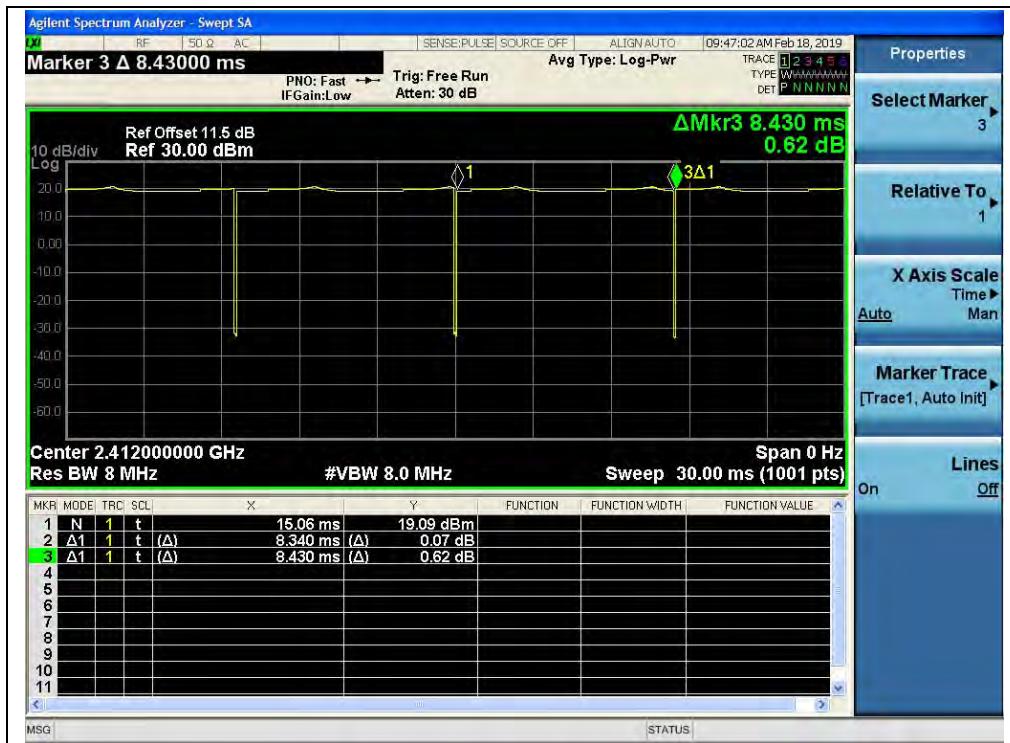
### B. Equipments List:

Please refer ANNEX B(4).

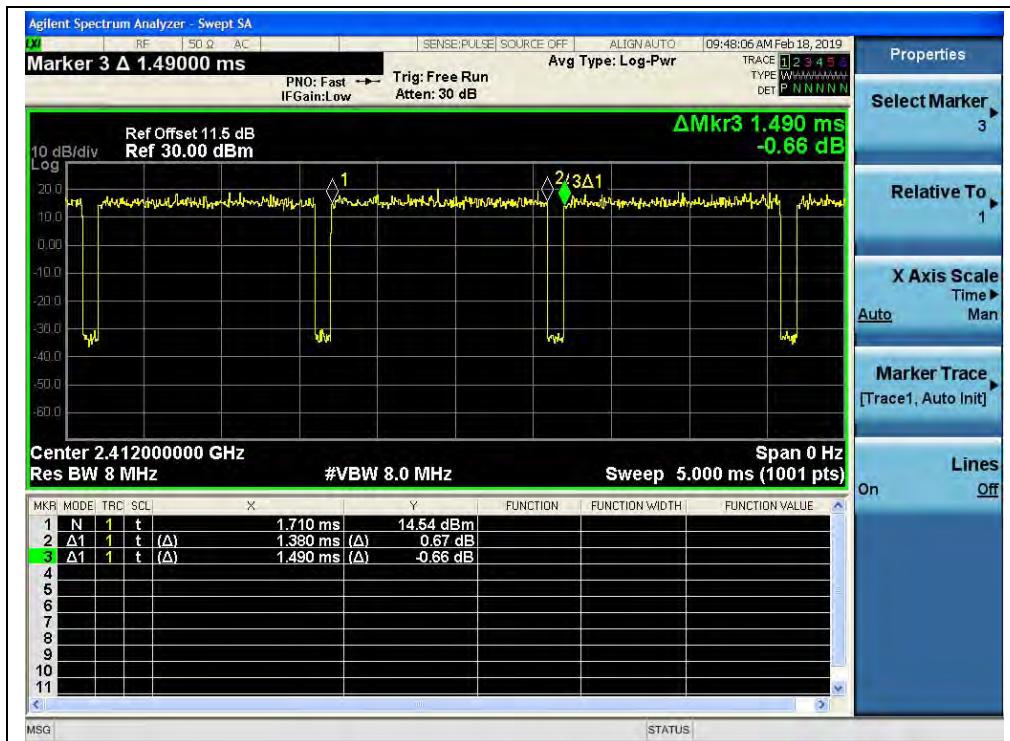
## 2.2.3. Test Result

### A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor ( $10 \cdot \lg[1/D]$ )
802.11b	98.93	0.05
802.11g	92.62	0.33
802.11n(HT20)	92.14	0.36
802.11n(HT40)	86.67	0.62

**B. Test Plots**


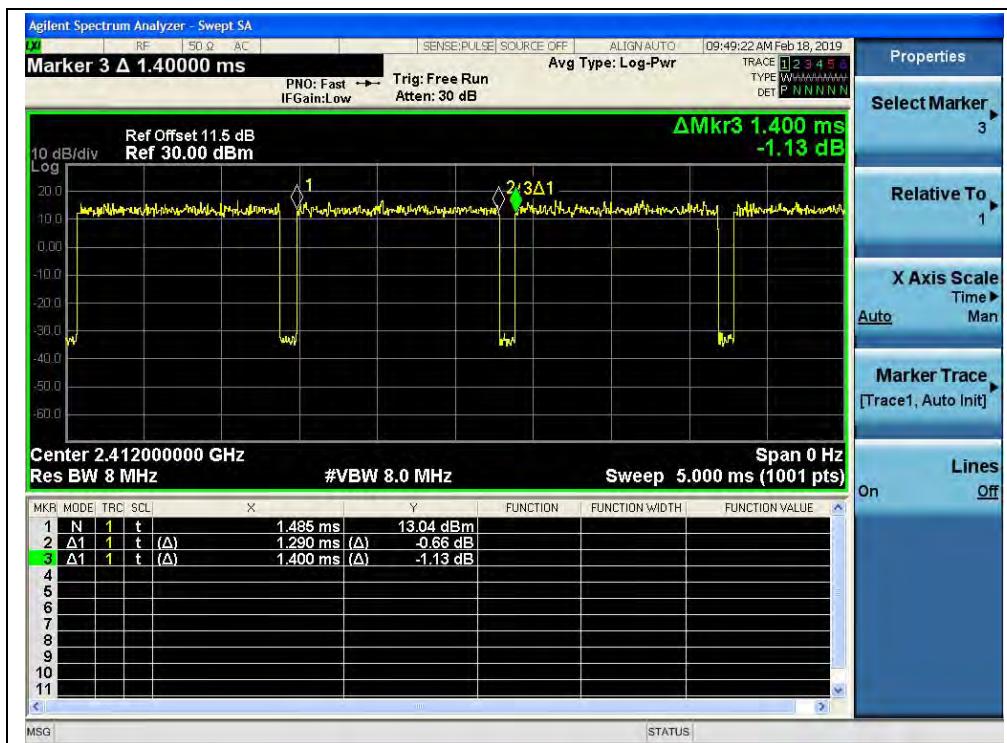
(Channel 1, 2412MHz, 802.11b)



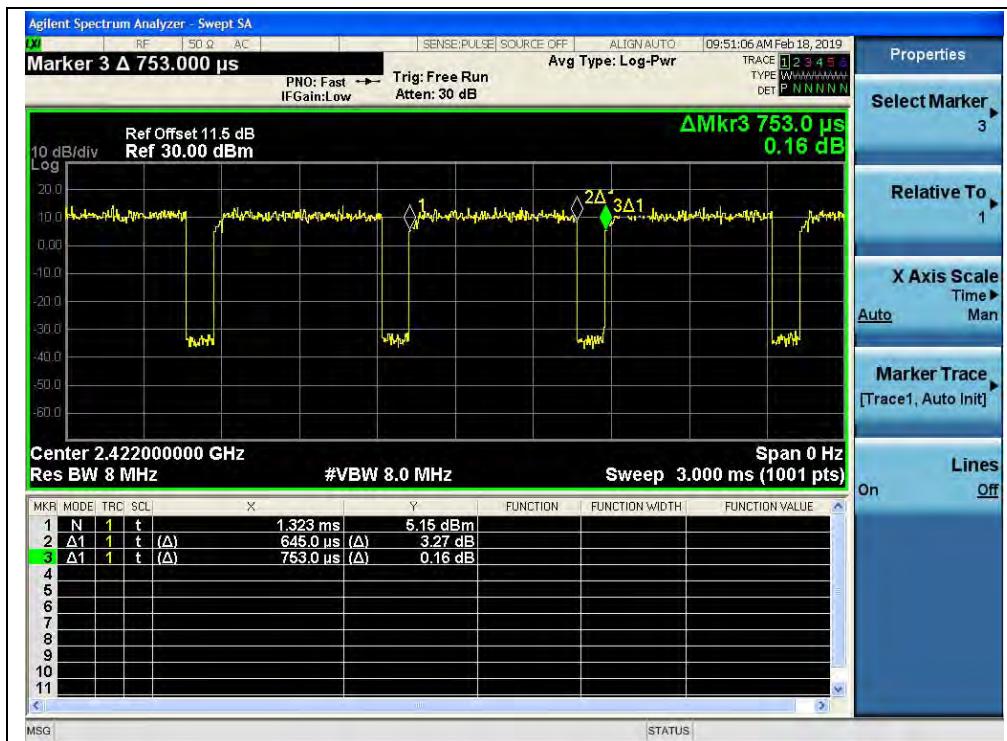
(Channel 1, 2412MHz, 802.11g)



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



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

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## 2.3. Peak Output Power

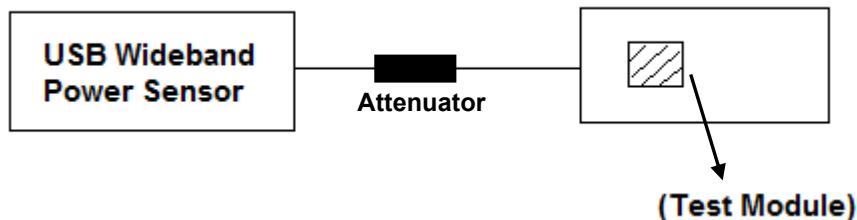
### 2.3.1. Requirement

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.

#### A. Test Setup:



The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

#### B. Equipments List:

Please refer ANNEX B(4).



### 2.3.3. Test Result

#### 802.11b Test Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.94	0.062	30	1	PASS
6	2437	18.45	0.070			PASS
11	2462	19.08	0.081			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	14.53	0.028	30	1	PASS
6	2437	15.13	0.033			PASS
11	2462	15.61	0.036			PASS

#### 802.11g Test mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	21.78	0.151	30	1	PASS
6	2437	21.99	0.158			PASS
11	2462	22.33	0.171			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	11.42	0.014	30	1	PASS
6	2437	12.11	0.016			PASS
11	2462	12.71	0.019			PASS



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**802.11n(HT20) Test mode**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	16.38	0.043	30	1	PASS
6	2437	16.95	0.050			PASS
11	2462	17.96	0.063			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	9.24	0.008	30	1	PASS
6	2437	9.81	0.010			PASS
11	2462	10.17	0.010			PASS

**802.11n(HT40) Test mode**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	16.52	0.045	30	1	PASS
6	2437	17.02	0.050			PASS
9	2452	17.72	0.059			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	9.43	0.009	30	1	PASS
6	2437	9.78	0.010			PASS
9	2452	10.26	0.011			PASS

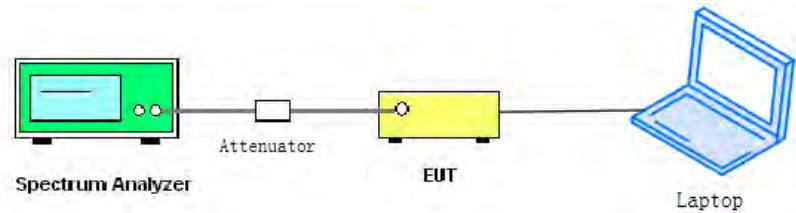
## 2.4. Bandwidth

### 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

#### A. Test Set:



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

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

KDB 558074 Section 8.1 Option 1 was used in order to prove compliance.

#### B. Equipments List:

Please refer ANNEX B(4).

### 2.4.3. Test Result

#### 802.11b Test mode

##### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.069	≥500	PASS
6	2437	9.081	≥500	PASS
11	2462	9.060	≥500	PASS

##### B. Test Plots



(Channel 1, 2412MHz, 802.11b)



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(Channel 6, 2437 MHz, 802.11b)



(Channel 11, 2462MHz, 802.11b)

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## 802.11g Test mode

### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.47	≥500	PASS
6	2437	16.42	≥500	PASS
11	2462	16.42	≥500	PASS

### B. Test Plots:



(Channel 1, 2412MHz, 802.11g)



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(Channel 6, 2437MHz, 802.11g)



(Channel 11, 2462MHz, 802.11g)

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## 802.11n(HT20) Test mode

### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.08	≥500	PASS
6	2437	16.94	≥500	PASS
11	2462	16.33	≥500	PASS

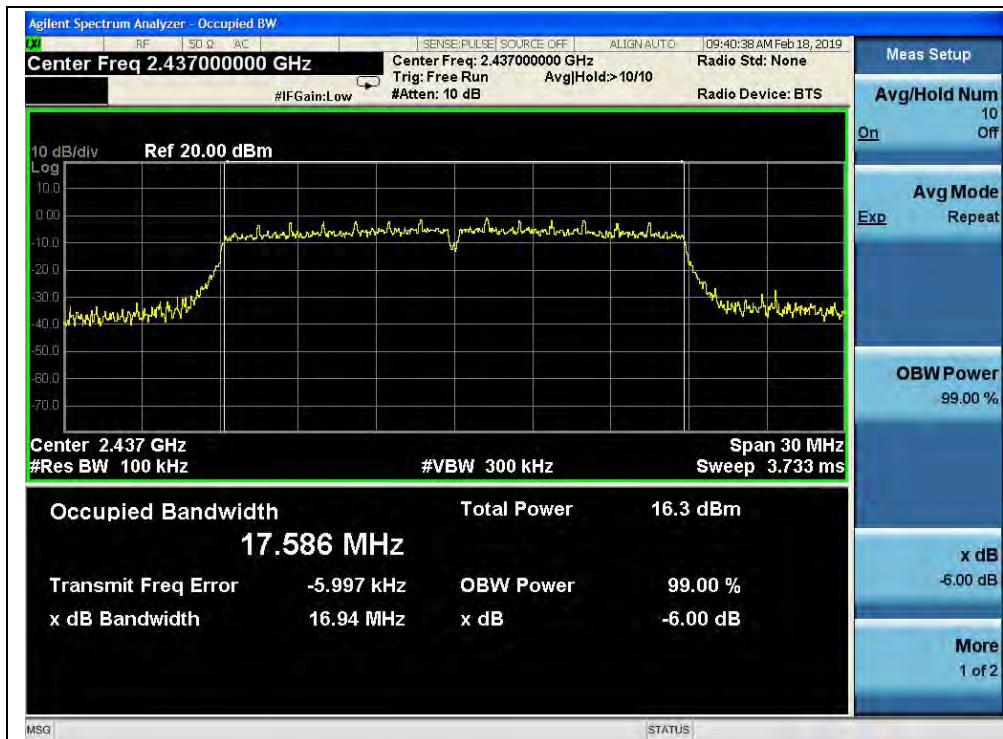
### B. Test Plots:



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



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(Channel 6, 2437MHz, 802.11n(HT20))



(Channel 11, 2462MHz, 802.11n(HT20))

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## 802.11n(HT40) Test mode

### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	35.51	≥500	PASS
6	2437	35.47	≥500	PASS
9	2452	35.74	≥500	PASS

### B. Test Plots:



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



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(Channel 6, 2437MHz, 802.11n(HT40))



(Channel 9, 2452MHz, 802.11n(HT40))

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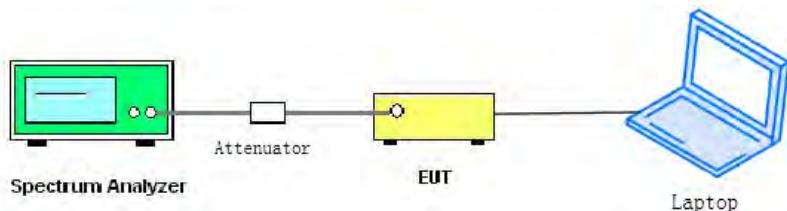
## 2.5. Conducted Spurious Emissions and Band Edge

### 2.5.1. Requirement

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

### 2.5.2. Test Description

#### A. Test Set:



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

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

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

#### B. Equipments List:

Please refer ANNEX B(4).



### 2.5.3. Test Result

#### 802.11b Test mode

##### A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-31.58	5.55	-14.45	PASS
6	2437	-35.22	6.43	-13.57	PASS
11	2462	-32.21	7.59	-12.41	PASS

##### B. Test Plots:

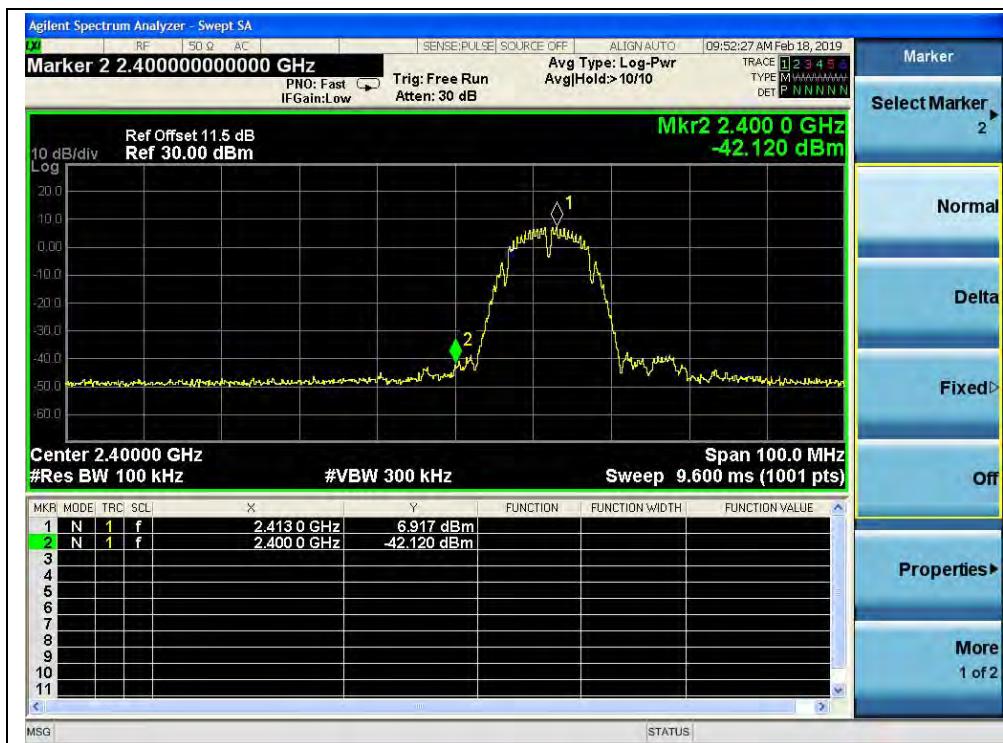
Note: The power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)



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(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)

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(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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## 802.11g Test mode

### A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-32.48	-1.86	-21.86	PASS
6	2437	-33.28	-1.46	-21.46	PASS
11	2462	-32.85	1.53	-18.47	PASS

### B. Test Plots:

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



(Channel = 1, 30MHz to 25GHz)

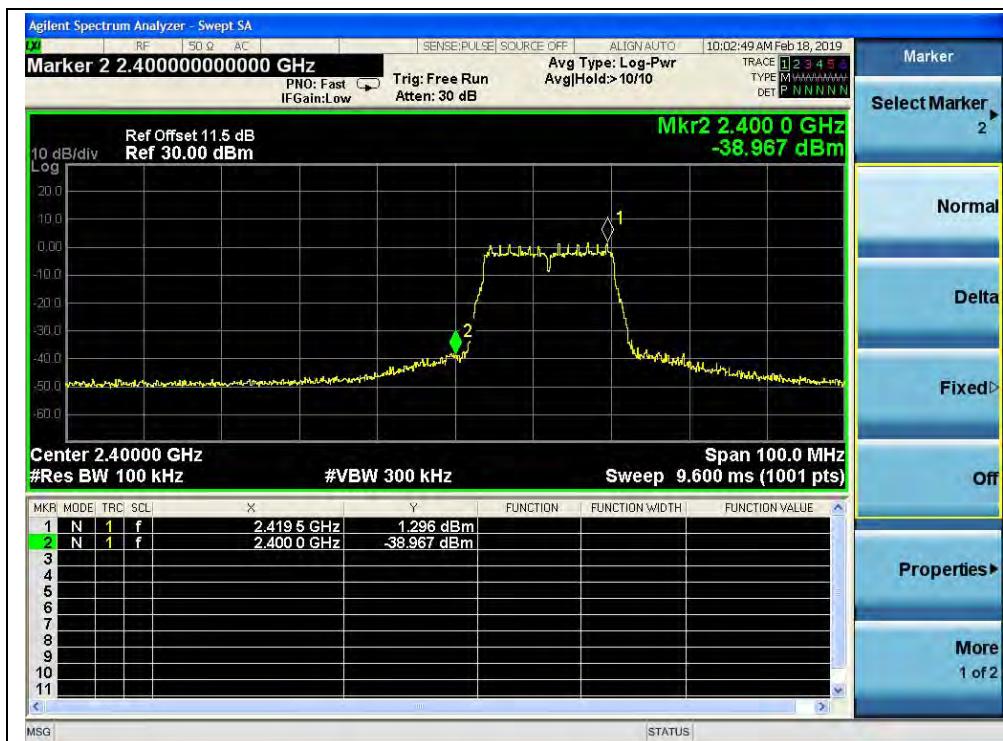
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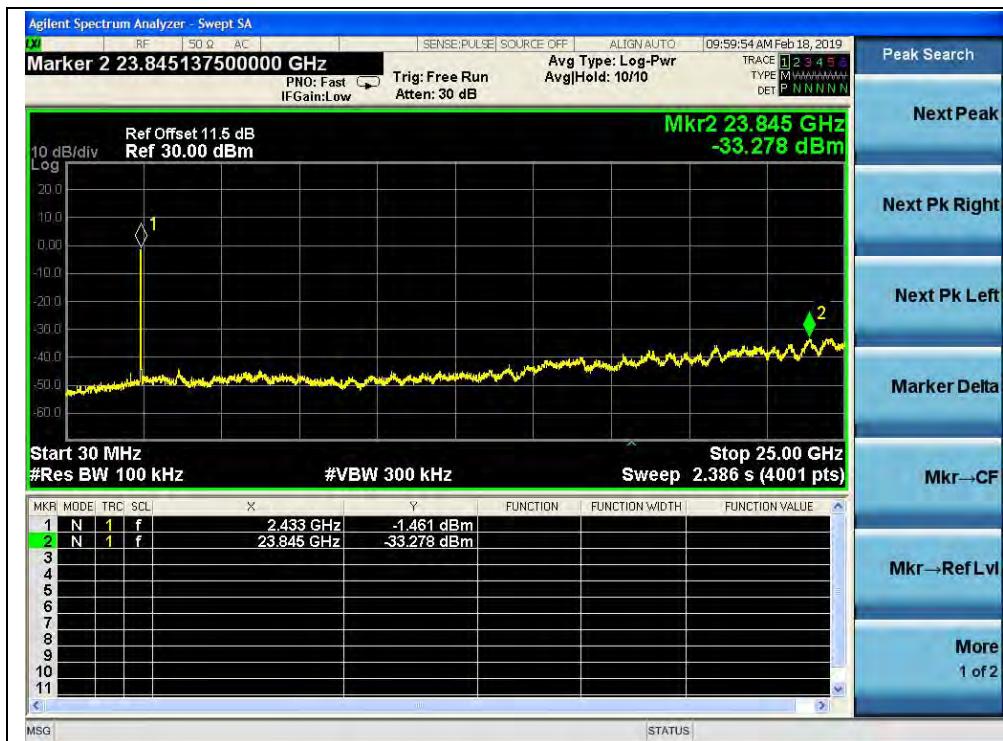
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(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)

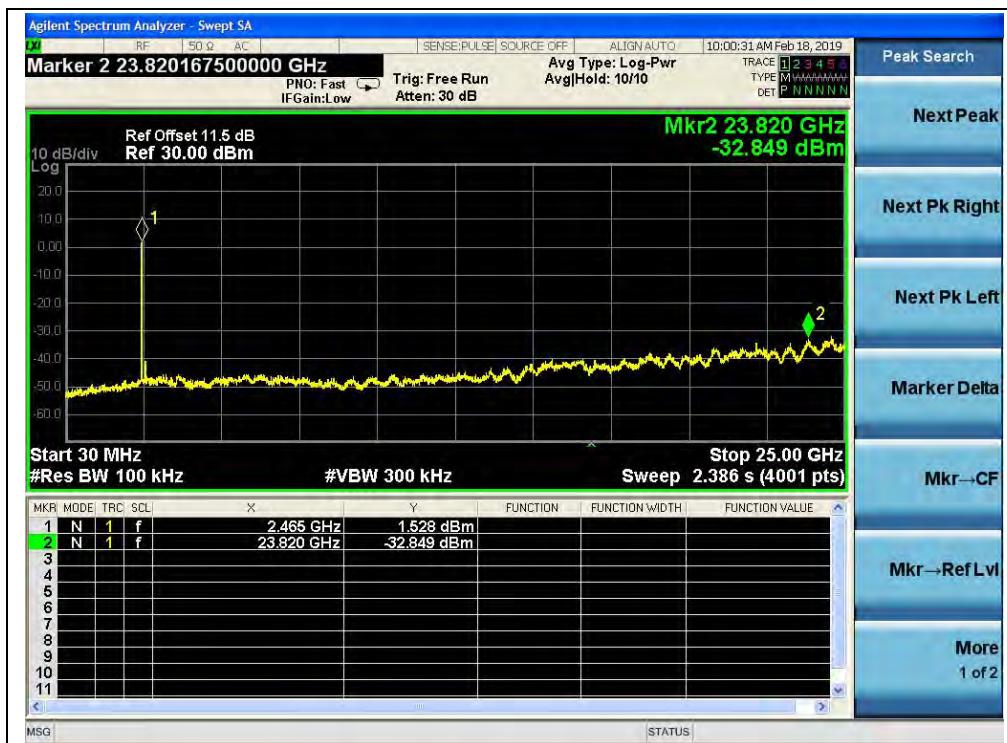
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(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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## 802.11n(HT20) Test mode

### A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-33.17	-1.60	-21.60	PASS
6	2437	-32.86	-4.28	-24.28	PASS
11	2462	-33.07	-3.01	-23.01	PASS

### B. Test Plots:

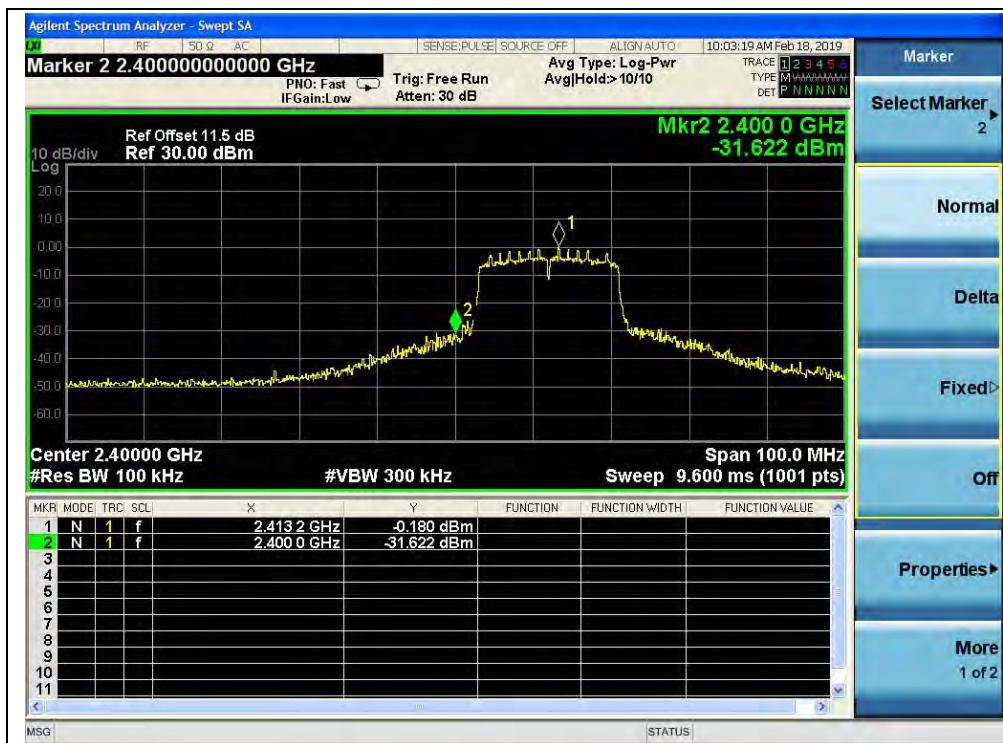
Note: The power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)



REPORT No.: SZ18120173W01



(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)

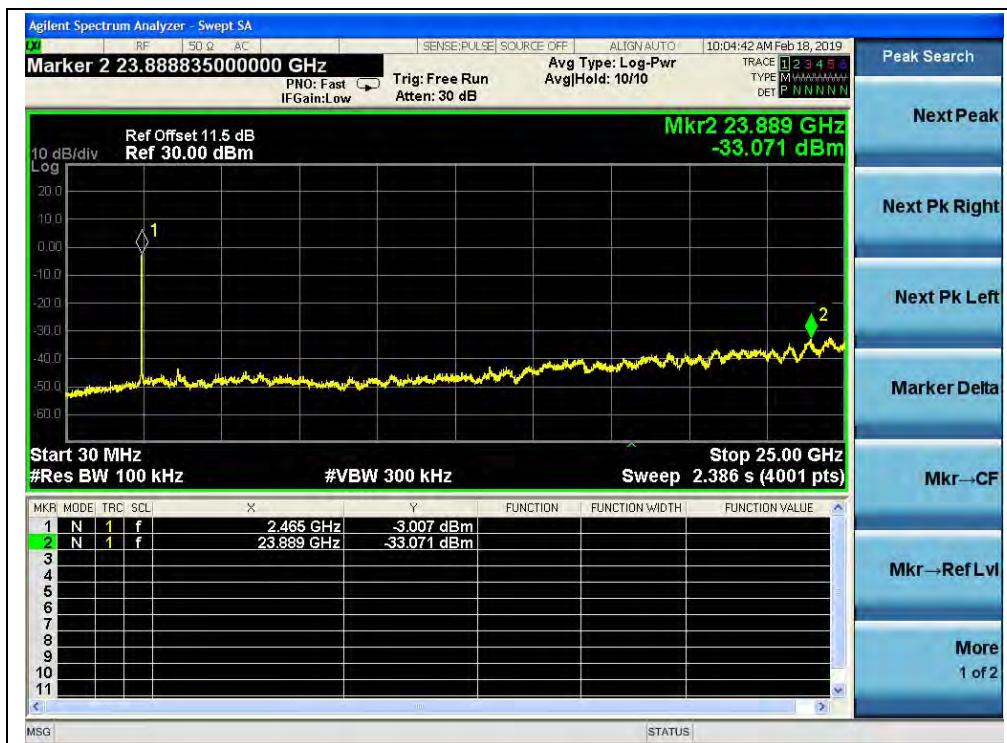
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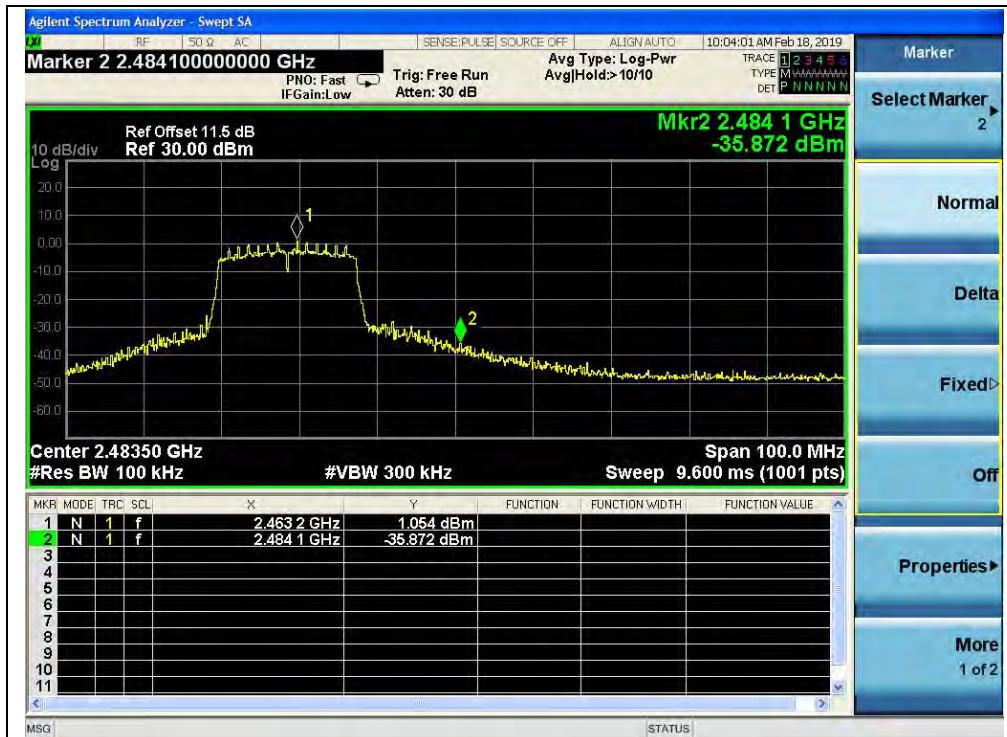
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(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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**802.11n(HT40) Test mode****A. Test Verdict:**

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
3	2422	-34.90	-3.39	-23.39	PASS
6	2437	-35.13	-3.35	-23.35	PASS
9	2452	-32.90	-4.15	-24.15	PASS

**B. Test Plots:**

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



(Channel = 3, 30MHz to 25GHz)



REPORT No.: SZ18120173W01



(Band Edge, Channel = 3)



(Channel = 6, 30MHz to 25GHz)

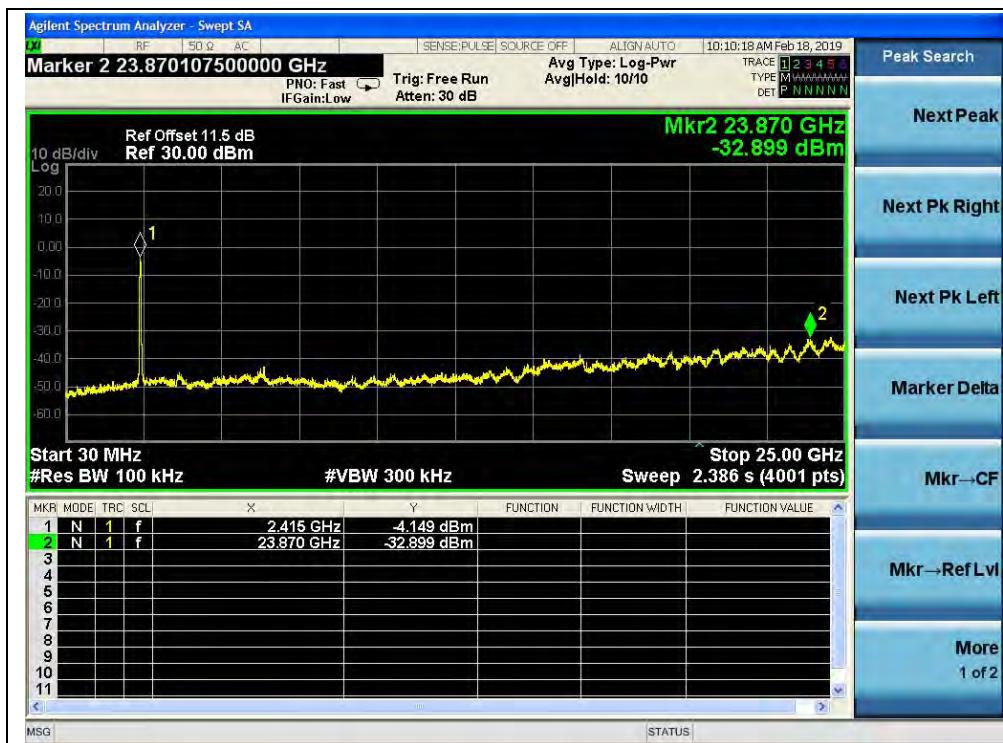
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(Channel = 9, 30MHz to 25GHz)



(Band Edge, Channel = 9)

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## 2.6. Power spectral density (PSD)

### 2.6.1. Requirement

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

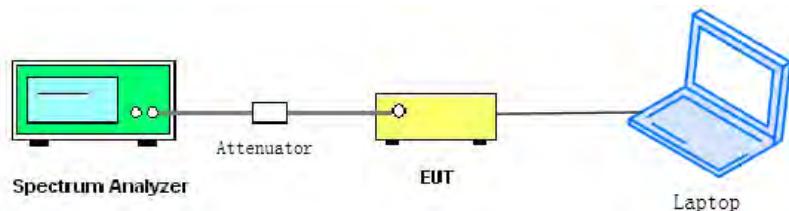
### 2.6.2. Test Description

#### A. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:

- a) Set analyzer center frequency to channel center frequency.
- b) Set the span to 1.5 times DTS
- c) Set the RBW to 3 kHz
- d) Set the VBW to 10 kHz
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

#### B. Test Set:



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

KDB 558074 Section 10.2 was used in order to prove compliance.

#### C. Equipments List:

Please refer ANNEX B(4).

### 2.6.3. Test Result

#### 802.11b Test mode

##### A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-6.61	8	PASS
6	2437	-6.73	8	PASS
11	2462	-6.19	8	PASS

##### B. Test Plots:



(Channel = 1, 802.11b)



REPORT No.: SZ18120173W01



(Channel = 6, 802.11b)



(Channel = 11, 802.11b)

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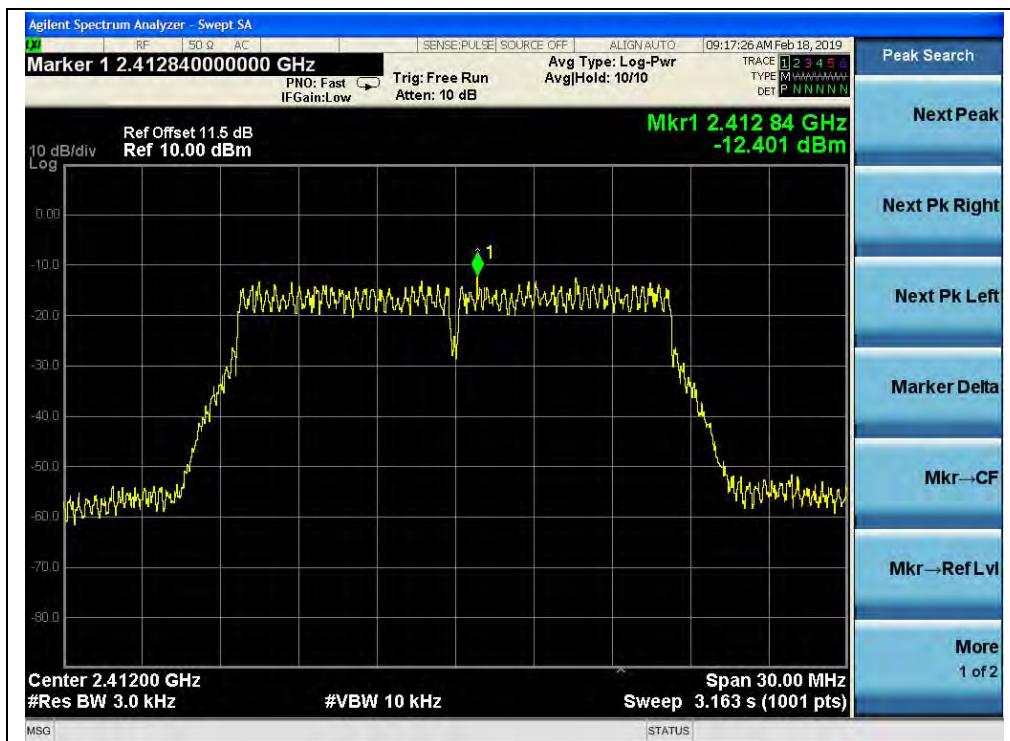
REPORT No.: SZ18120173W01

## 802.11g Test mode

### A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-12.40	8	PASS
6	2437	-10.13	8	PASS
11	2462	-10.57	8	PASS

### B. Test Plots:



(Channel = 1, 802.11g)

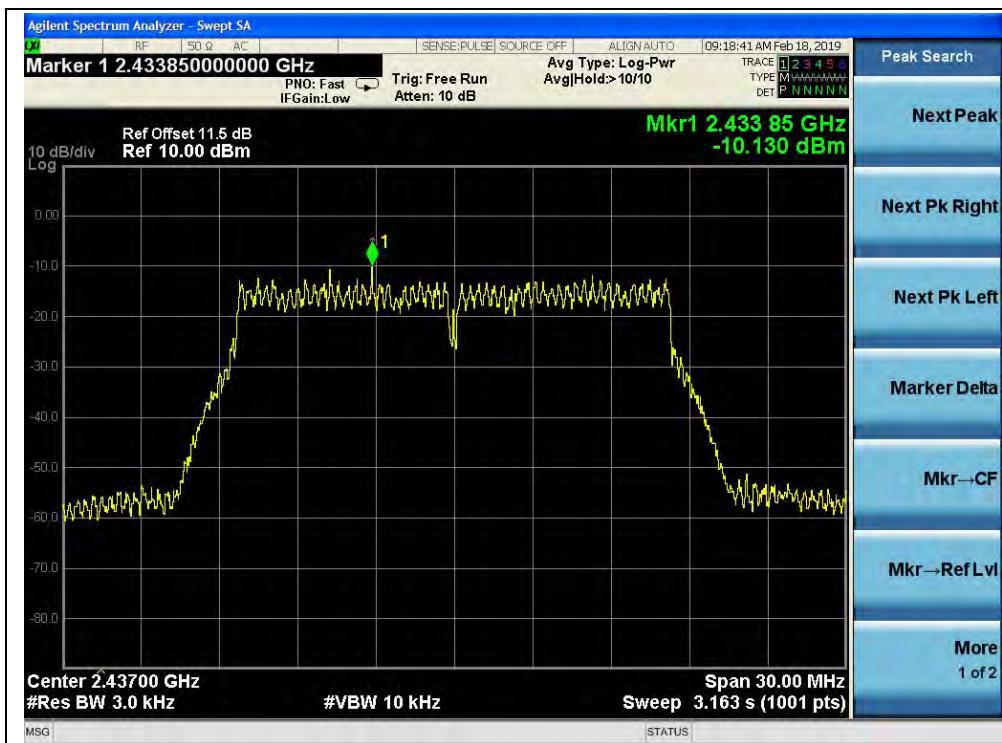
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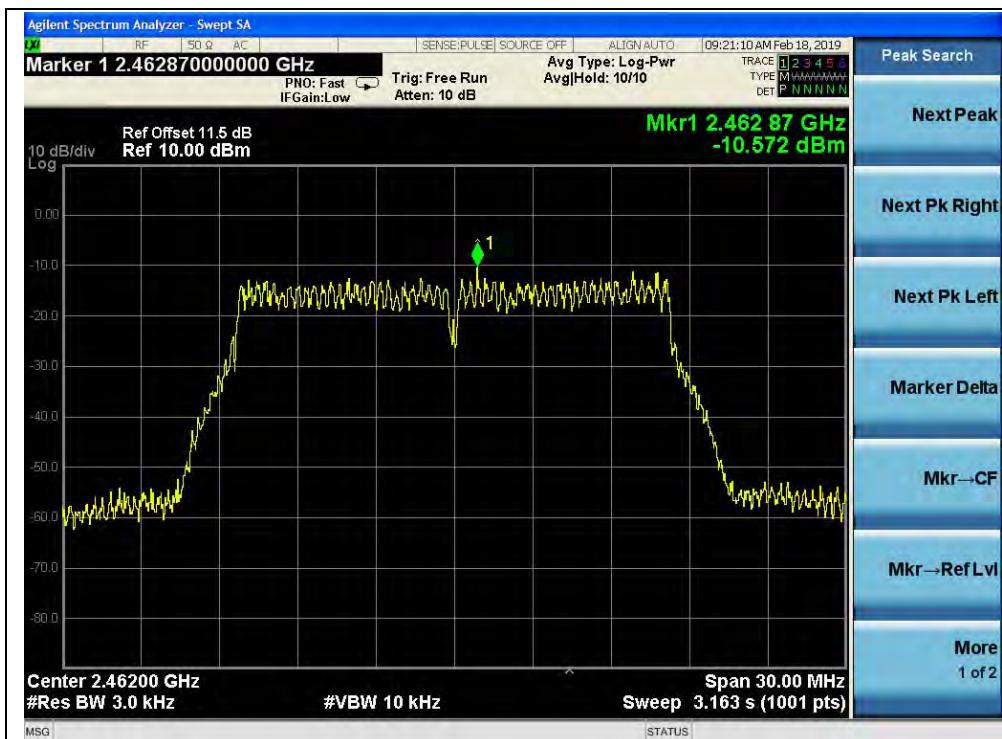
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REPORT No.: SZ18120173W01



(Channel = 6, 802.11g)



(Channel = 11, 802.11g)

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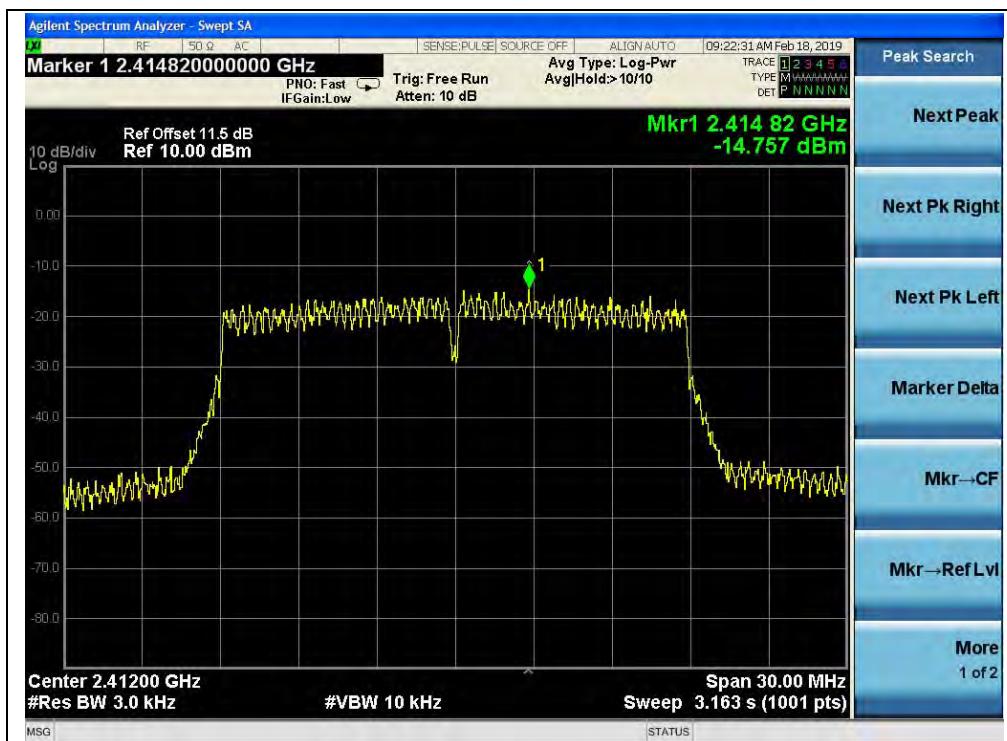
REPORT No.: SZ18120173W01

## 802.11n(HT20) Test mode

### A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-14.76	8	PASS
6	2437	-13.90	8	PASS
11	2462	-13.30	8	PASS

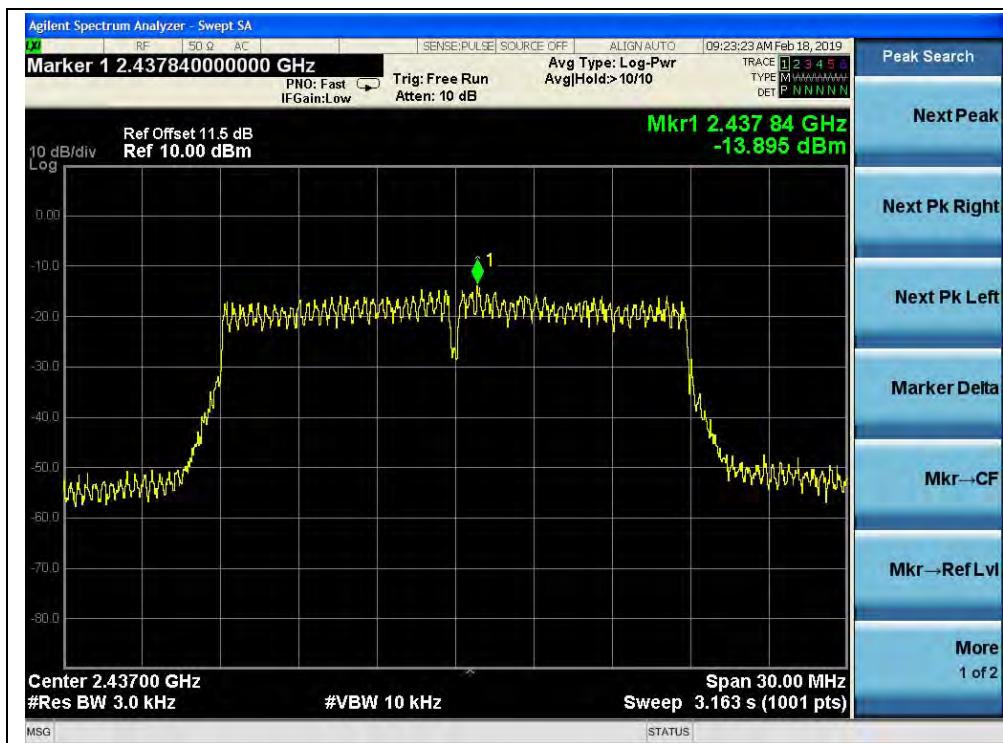
### B. Test Plots:



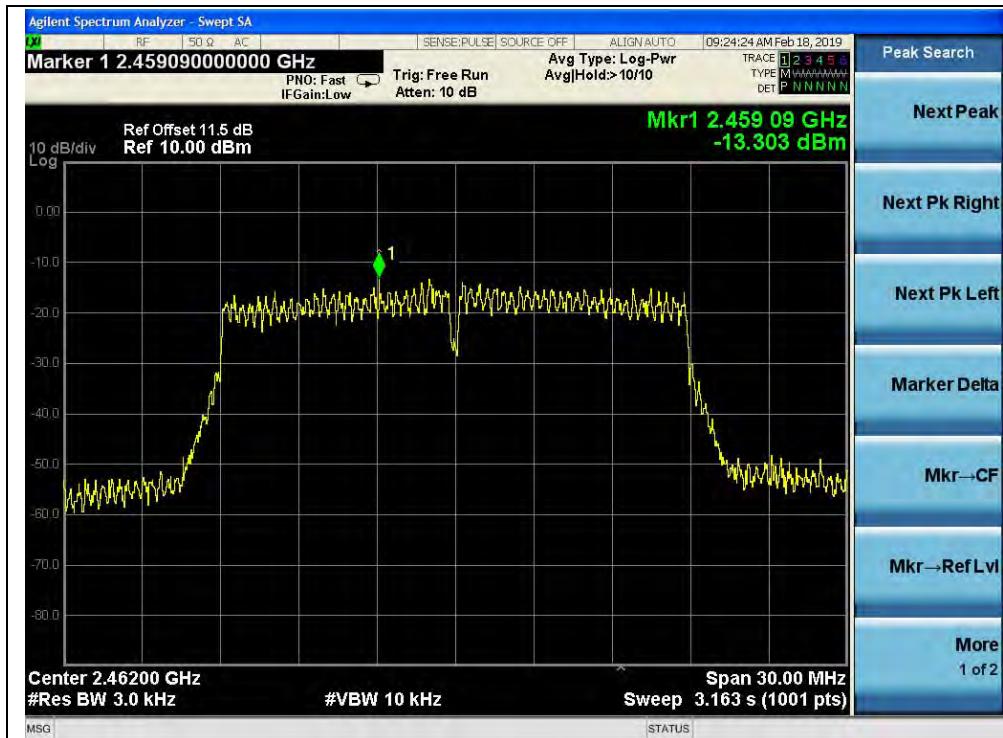
(Channel = 1, 802.11n(HT20))



REPORT No.: SZ18120173W01



(Channel = 6, 802.11n(HT20))



(Channel = 11, 802.11n(HT20))

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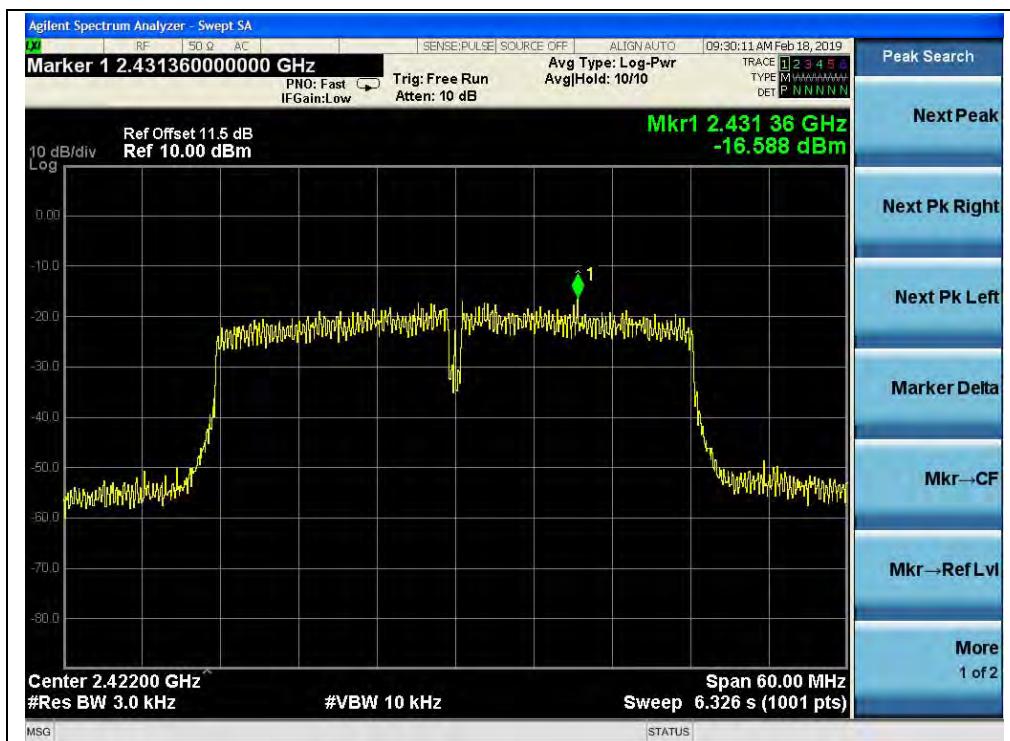
REPORT No.: SZ18120173W01

## 802.11n(HT40) Test mode

### A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-16.59	8	PASS
6	2437	-16.42	8	PASS
9	2452	-16.10	8	PASS

### B. Test Plots:



(Channel = 3, 802.11n(HT40))

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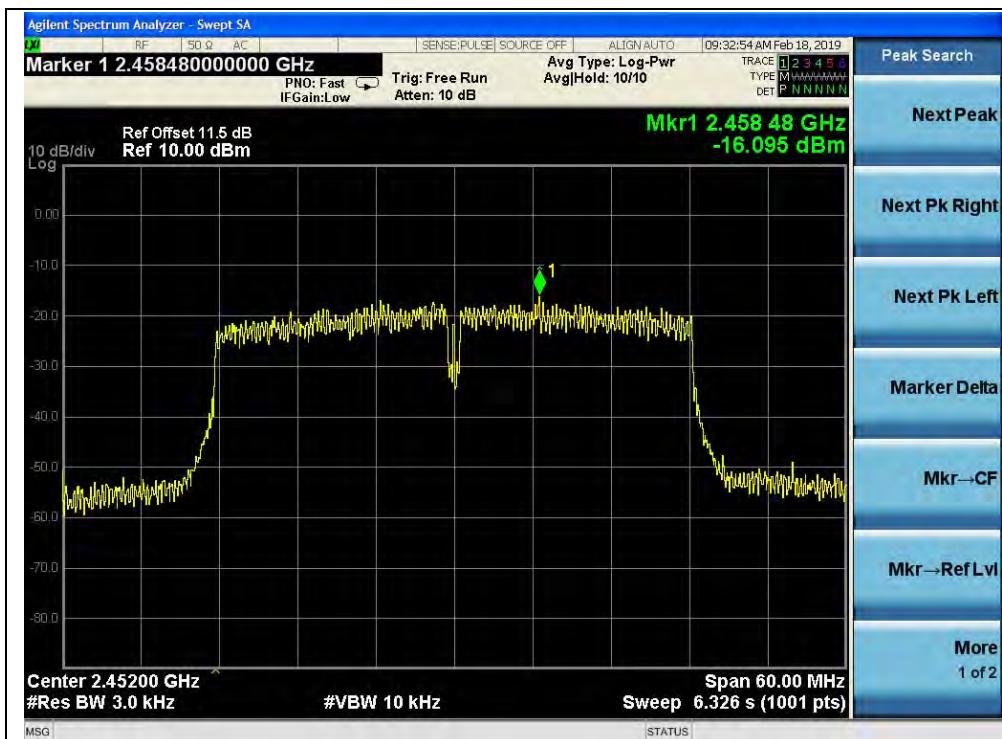
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REPORT No.: SZ18120173W01



(Channel = 6, 802.11n(HT40))



(Channel = 9, 802.11n(HT40))

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## 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).

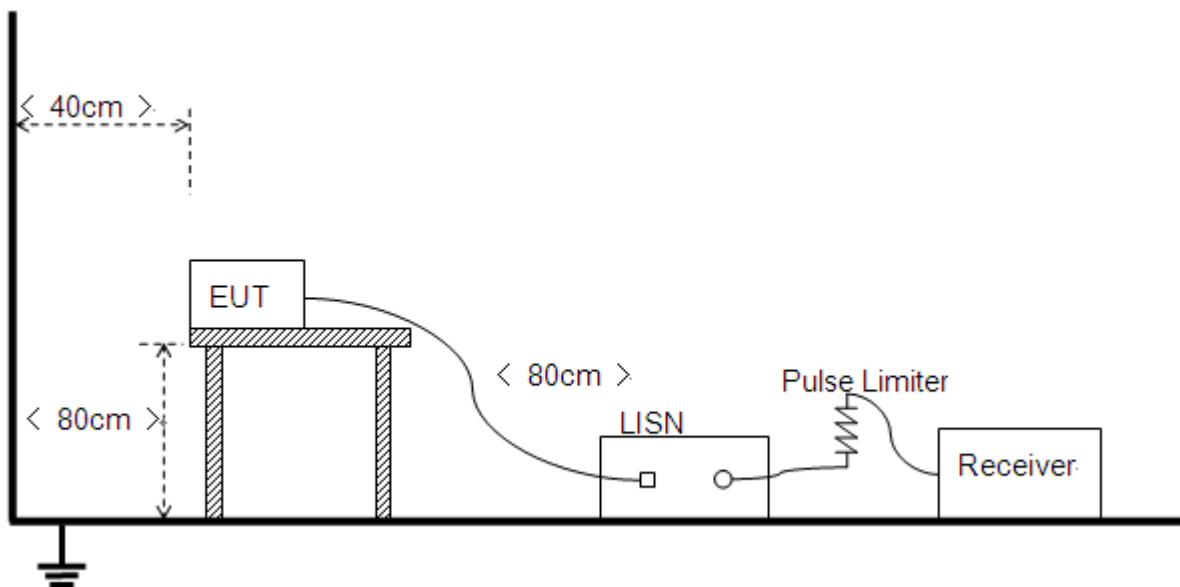
Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**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

#### A. Test Setup:



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

**B. Equipments List:**

Please refer ANNEX B(4).

**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: Adapter + USB + EUT + WIFI TX

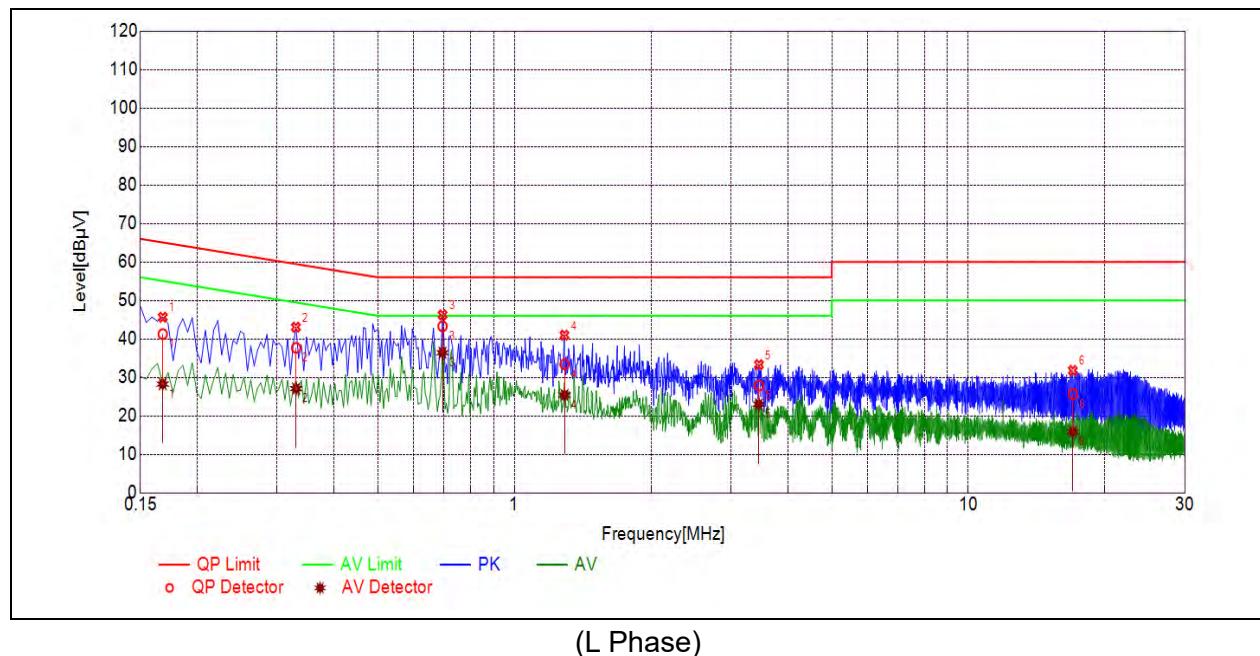
Test Voltage: AC 120V/60Hz

The measurement results are obtained as below:

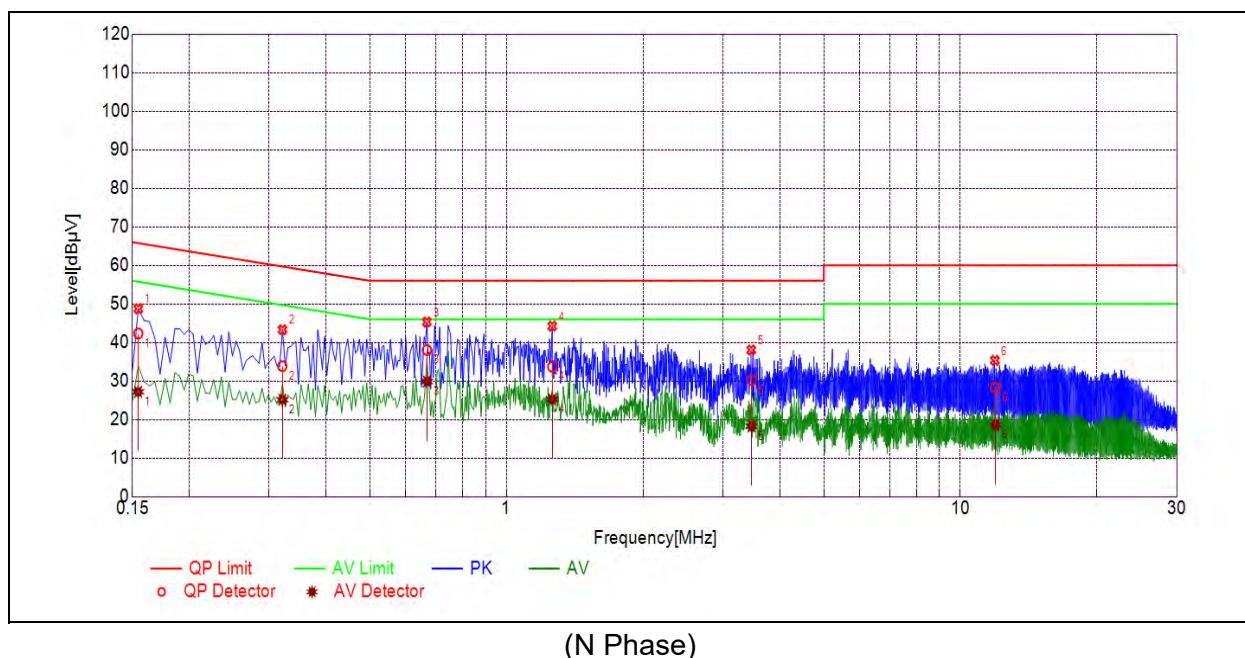
$$E [\text{dB}\mu\text{V}] = U_R + L_{\text{Cable loss}} [\text{dB}] + A_{\text{Factor}}$$

$U_R$ : Receiver Reading

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

**B. Test Plots:**

NO.	Fre. (MHz)	Emission Level (dB $\mu$ V)		Limit (dB $\mu$ V)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1679	41.26	28.26	65.06	55.06	Line	PASS
2	0.3303	37.67	27.07	59.44	49.44		PASS
3	0.6941	43.28	36.40	56.00	46.00		PASS
4	1.2892	33.41	25.41	56.00	46.00		PASS
5	3.4557	27.85	23.02	56.00	46.00		PASS
6	16.9844	25.68	15.89	60.00	50.00		PASS



NO.	Fre. (MHz)	Emission Level (dB $\mu$ V)		Limit (dB $\mu$ V)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1544	42.32	27.20	65.76	55.76	Neutral	PASS
2	0.3208	33.86	25.15	59.69	49.69		PASS
3	0.6678	38.05	29.87	56.00	46.00		PASS
4	1.2607	33.70	25.23	56.00	46.00		PASS
5	3.4655	30.25	18.25	56.00	46.00		PASS
6	11.9290	28.30	18.66	60.00	50.00		PASS

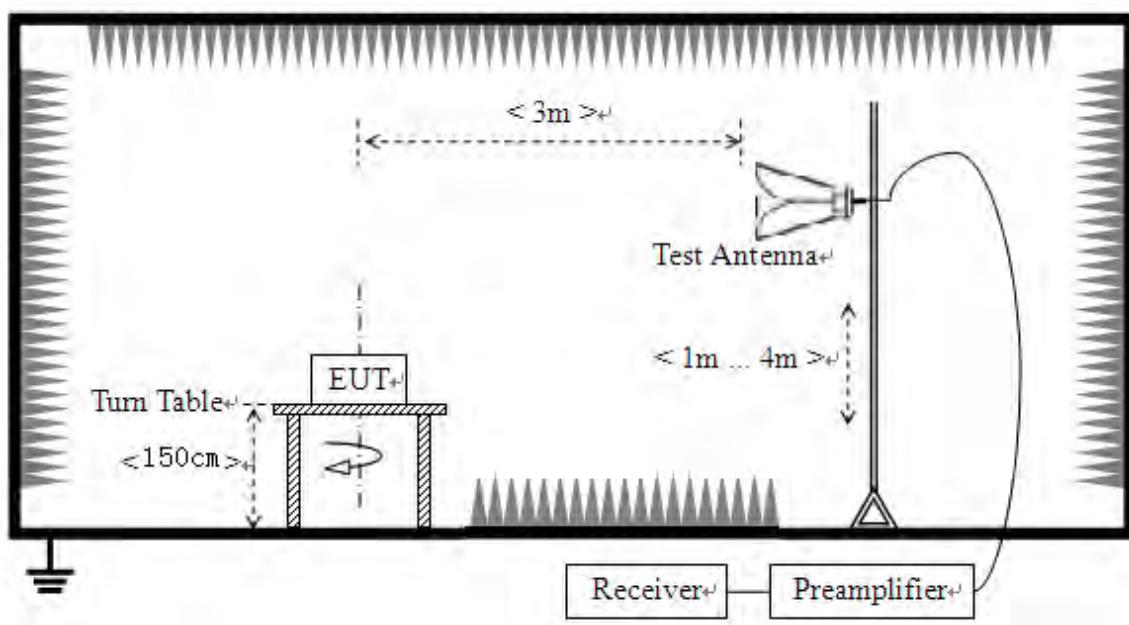
## 2.8. Restricted Frequency Bands

### 2.8.1. Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

### 2.8.2. Test Description

#### A. Test Setup



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

KDB 558074 Section 12.1 was used in order to prove compliance.

**B. Equipments List:**

Please refer ANNEX B(4).

**2.8.3. Test Result**

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below:

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

$A_T$ : Total correction Factor except Antenna

$U_R$ : Receiver Reading

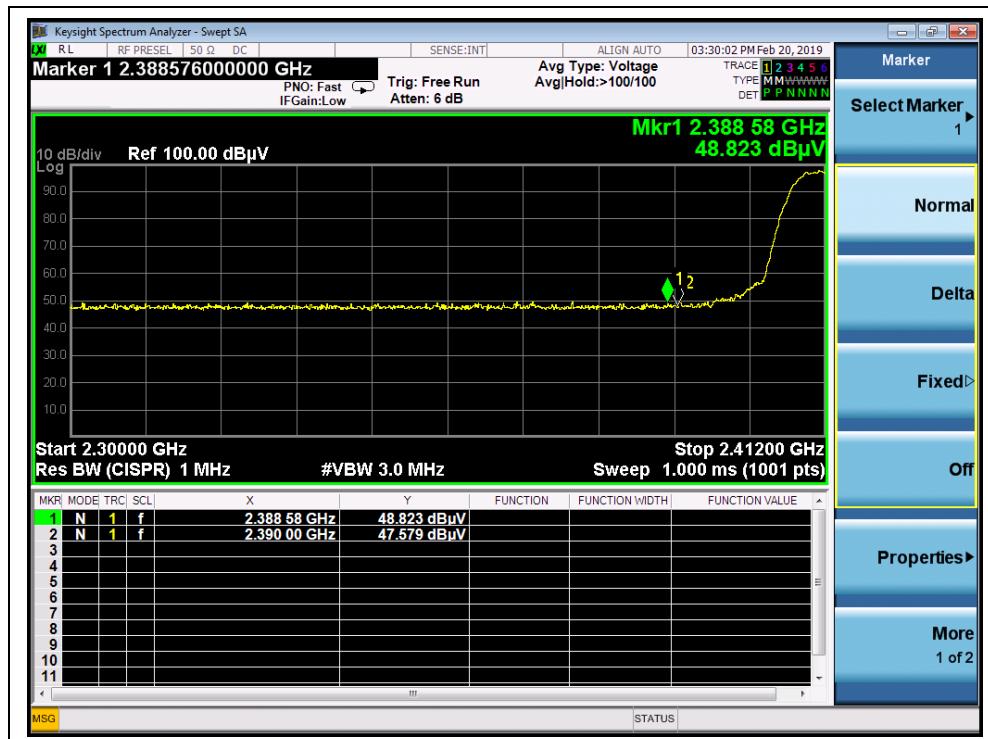
$G_{\text{preamp}}$ : Preamplifier Gain

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

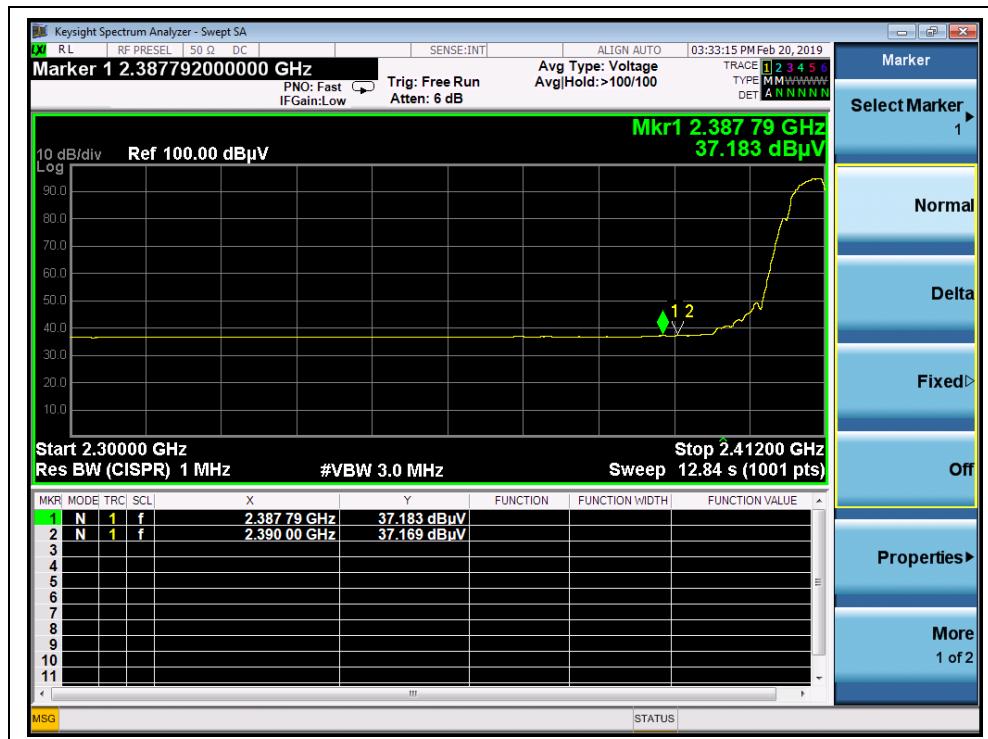
**Note:** Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

**802.11b Test mode****A. Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver	$A_T$ (dB)	$A_{\text{Factor}}$ (dB@3m)	Max. Emission $E$ (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
			Reading $U_R$ (dB $\mu$ V)					
1	2388.58	PK	48.82	-29.67	32.56	51.71	74	PASS
1	2387.79	AV	37.18	-29.67	32.56	40.07	54	PASS
11	2483.50	PK	48.13	-29.67	32.56	51.02	74	PASS
11	2483.50	AV	36.79	-29.67	32.56	39.68	54	PASS

**B. Test Plots:**

(Channel = 1 PEAK, 802.11b)



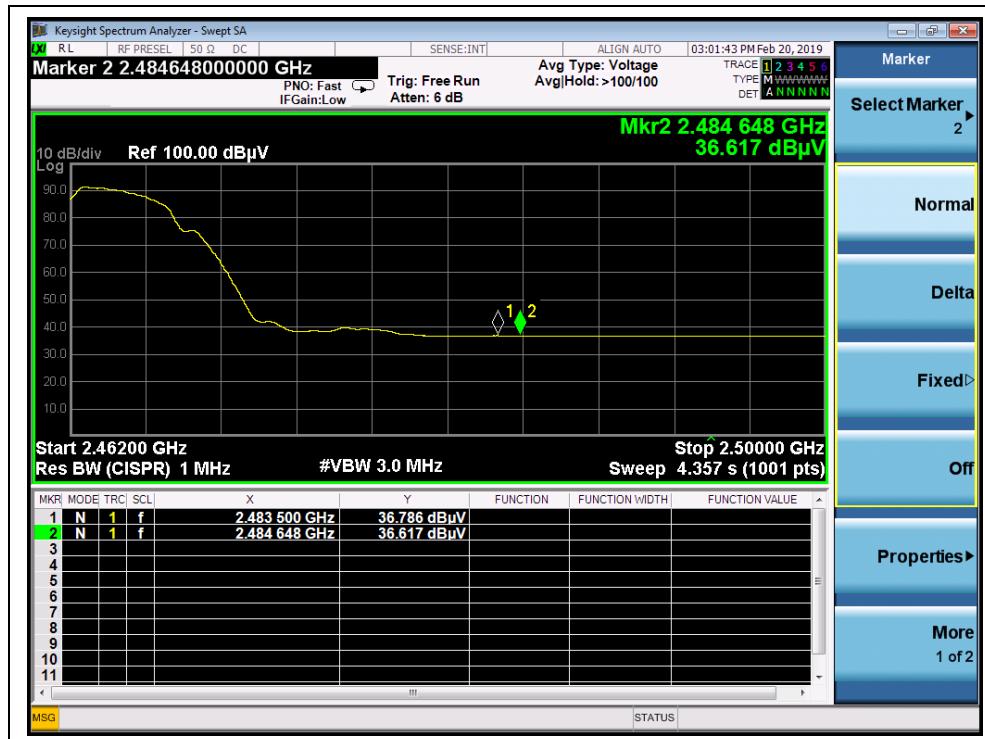
(Channel = 1 AVG, 802.11b)



REPORT No.: SZ18120173W01



(Channel = 11 PEAK, 802.11b)



(Channel = 11 AVG, 802.11b)



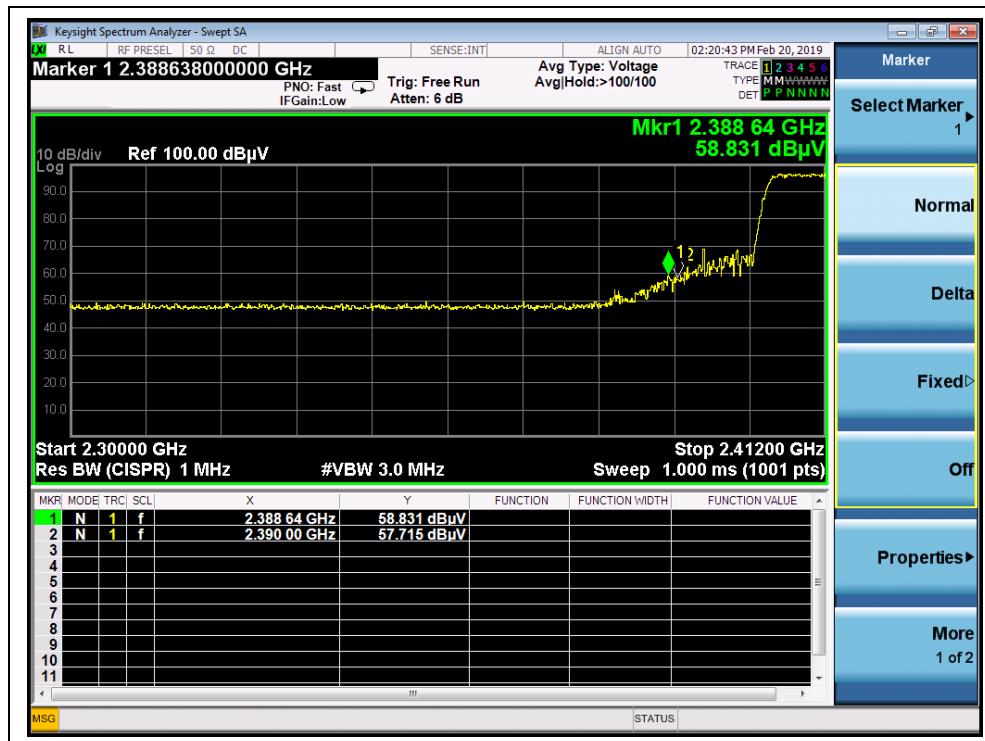
REPORT No.: SZ18120173W01

## 802.11g Test mode

### A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading $U_R$ (dB $\mu$ V)	$A_T$ (dB)	$A_{\text{Factor}}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
			(dB $\mu$ V)	(dB)	(dB@3m)			
1	2388.64	PK	58.83	-29.67	32.56	61.72	74	PASS
1	2390.00	AV	40.27	-29.67	32.56	43.16	54	PASS
11	2484.71	PK	56.11	-29.67	32.56	58.00	74	PASS
11	2483.50	AV	40.32	-29.67	32.56	43.21	54	PASS

### B. Test Plots:



(Channel = 1 PEAK, 802.11g)



REPORT No.: SZ18120173W01



(Channel = 1 AVG, 802.11g)



(Channel = 11 PEAK, 802.11g)

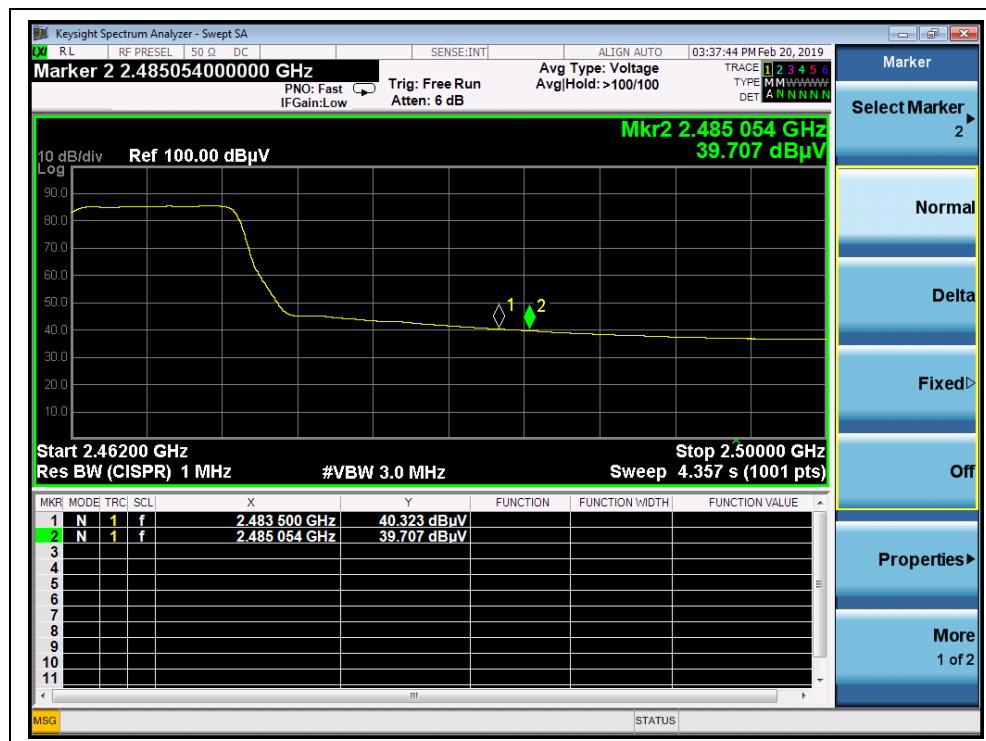
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(Channel = 11 AVG, 802.11g)

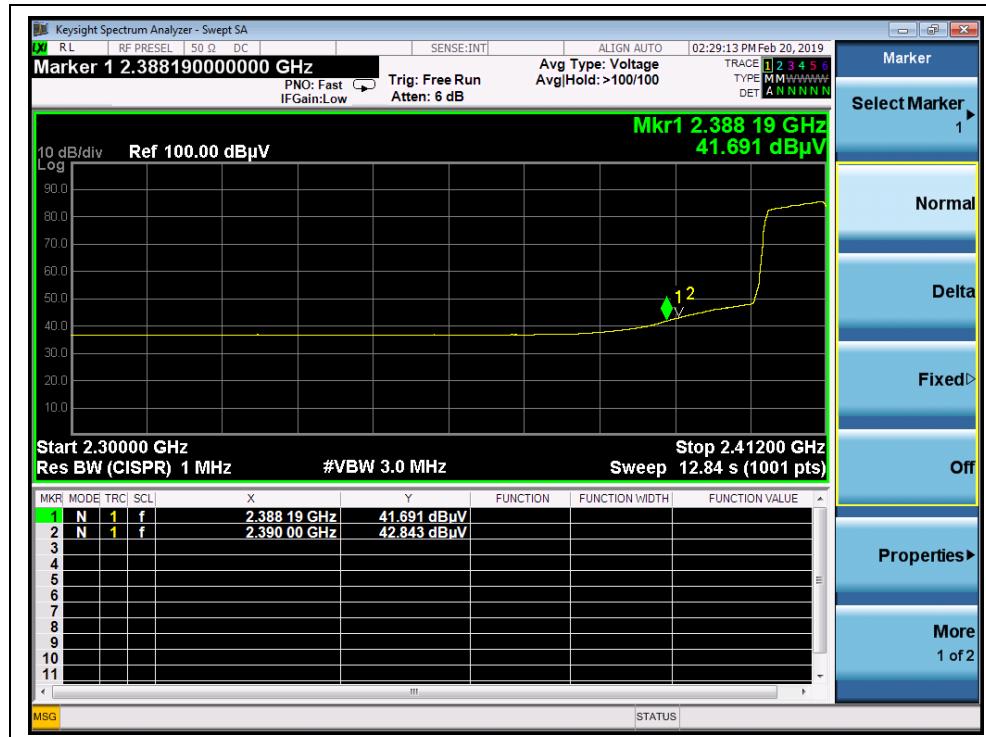
## 802.11 n(HT20) Test mode

### A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver	A <sub>T</sub> (dB)	A <sub>Factor</sub> (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
			U <sub>R</sub> (dB $\mu$ V)					
1	2390.00	PK	61.39	-29.67	32.56	64.28	74	PASS
1	2390.00	AV	42.84	-29.67	32.56	45.73	54	PASS
11	2485.26	PK	57.21	-29.67	32.56	60.10	74	PASS
11	2483.50	AV	38.86	-29.67	32.56	41.75	54	PASS

**B. Test Plots:**

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



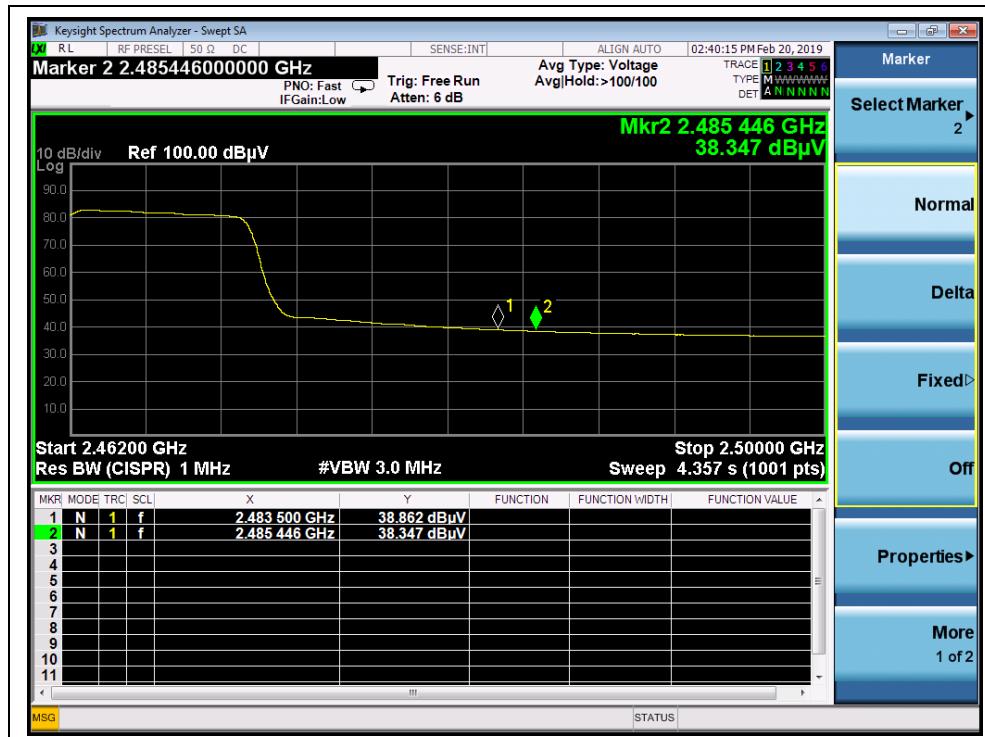
(Channel = 1 AVG, 802.11n(HT20))



REPORT No.: SZ18120173W01



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



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

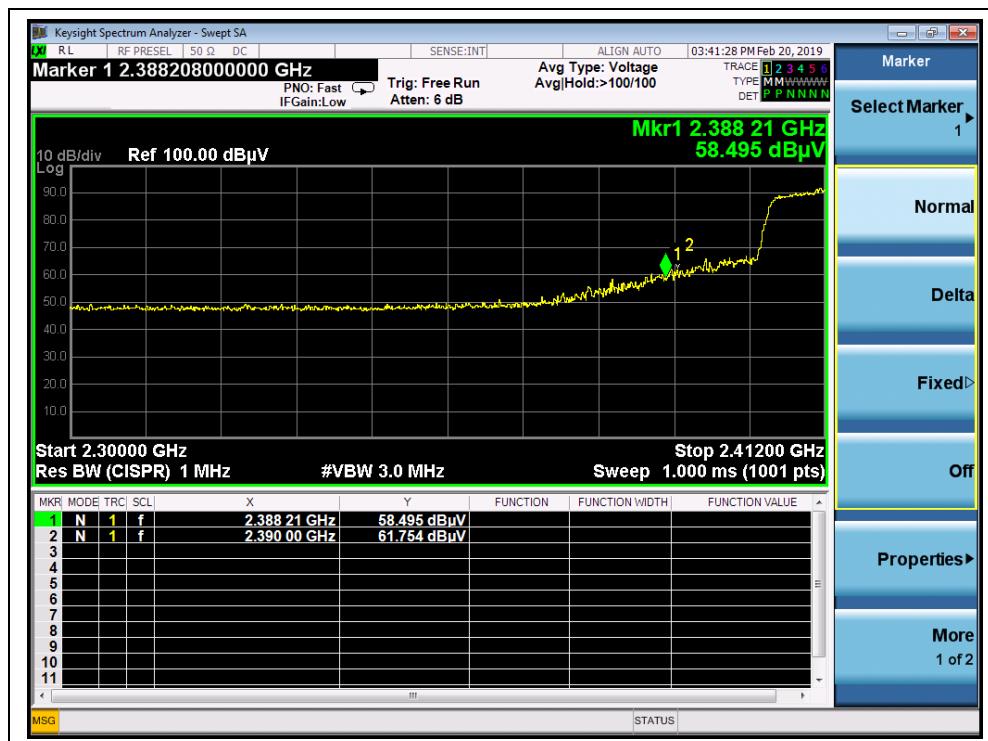
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**802.11n(HT40) Test mode****A. Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver Reading	A <sub>T</sub> (dB)	A <sub>Factor</sub> (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
			U <sub>R</sub> (dB $\mu$ V)					
3	2388.21	PK	58.50	-29.67	32.56	61.39	74	PASS
3	2390.00	AV	42.17	-29.67	32.56	45.06	54	PASS
9	2484.98	PK	59.70	-29.67	32.56	62.59	74	PASS
9	2485.10	AV	39.43	-29.67	32.56	42.32	54	PASS

**B. Test Plots:**

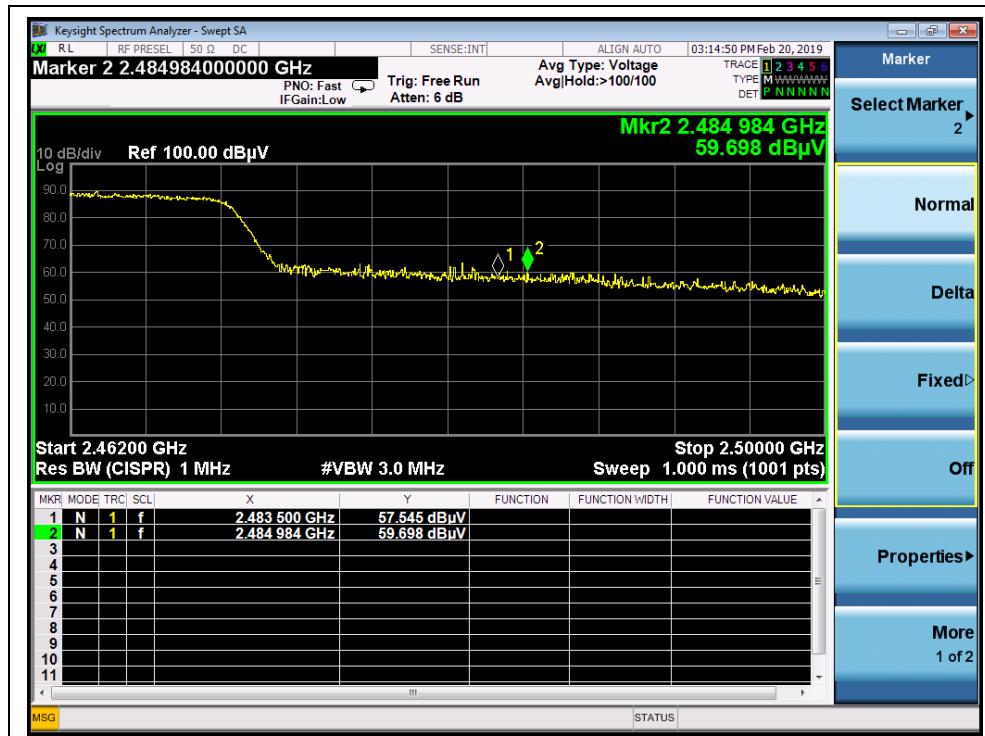
(Channel = 3 PEAK, 802.11n(HT40))



REPORT No.: SZ18120173W01



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



(Channel = 9 PEAK, 802.11n(HT40))

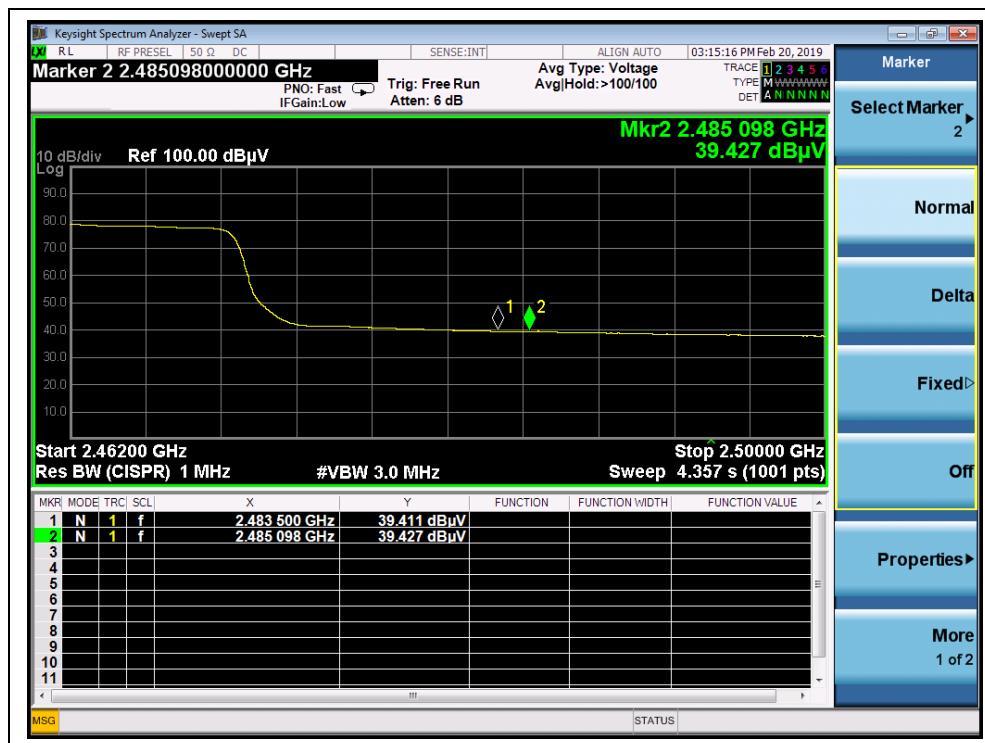
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REPORT No.: SZ18120173W01



(Channel = 9 AVG, 802.11n(HT40))

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## 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 ( $\mu$ V/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

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

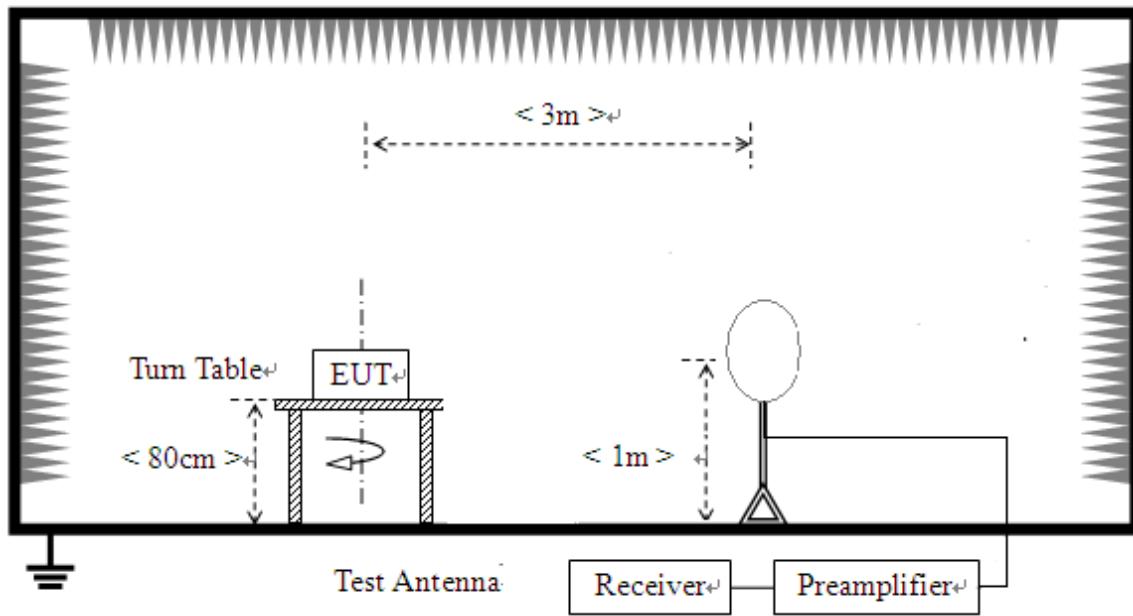
For above 1000MHz, limit field strength of harmonics: 54dB<sub>UV</sub>/m@3m (AV) and 74dB<sub>UV</sub>/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

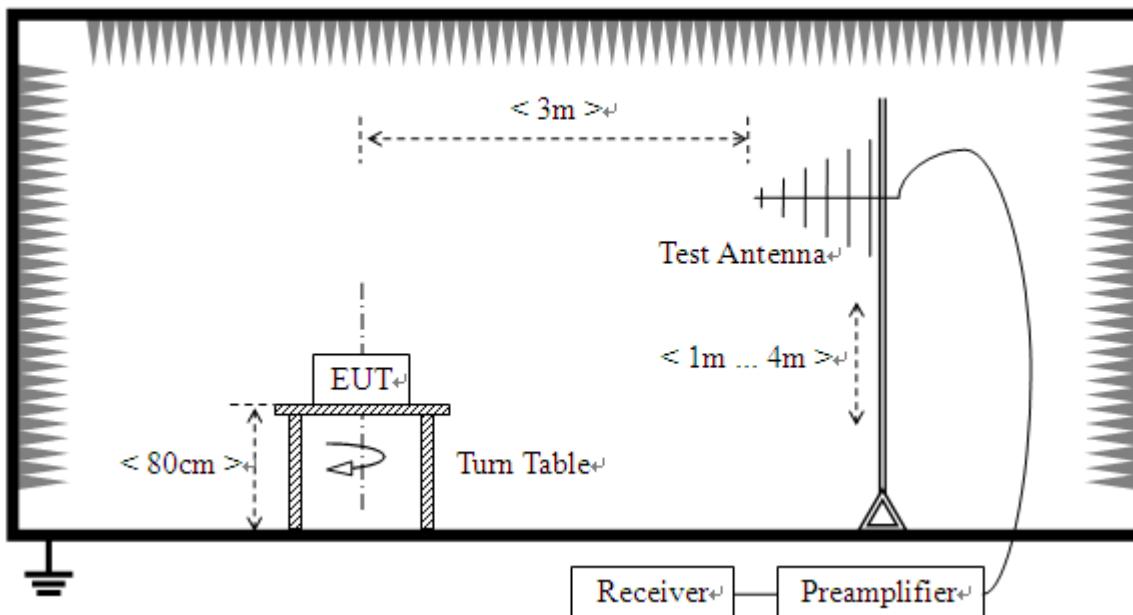
## 2.9.2. Test Description

### A. Test Setup:

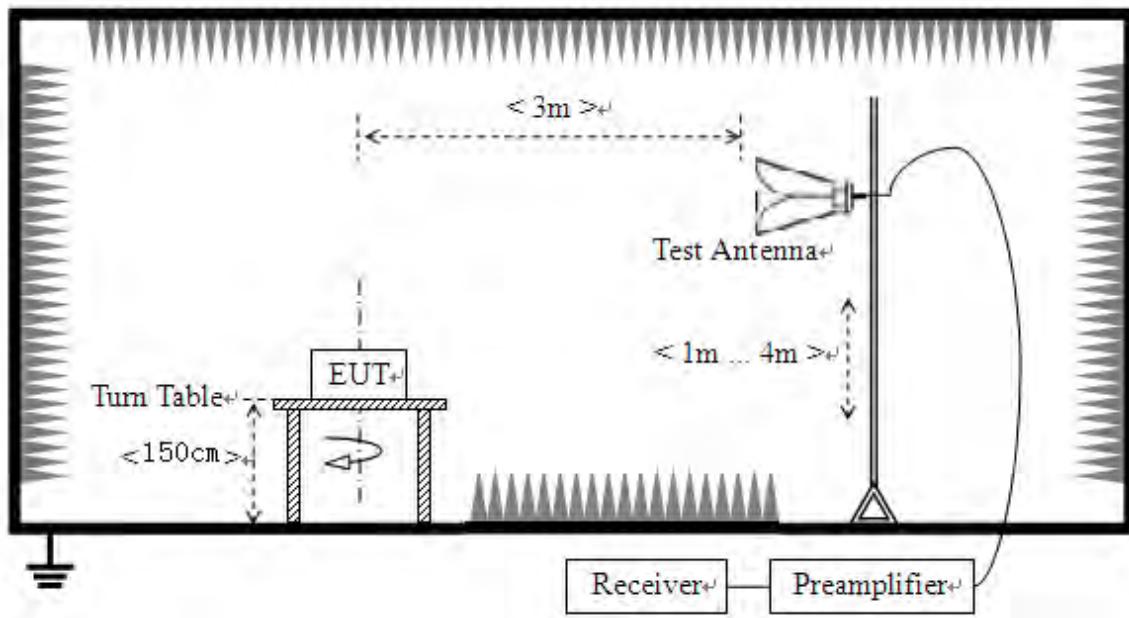
- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz 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.

#### A. Equipments List:

Please refere ANNEX B(4).

#### 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 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

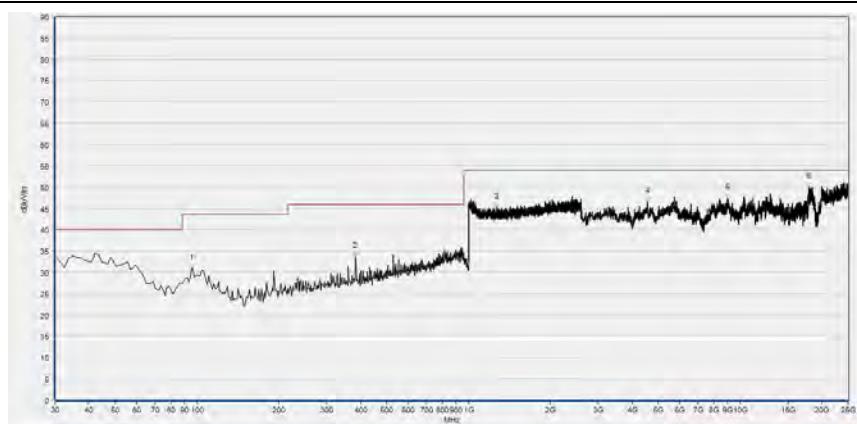
**Note3:** For the frequency, which started from 25GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.



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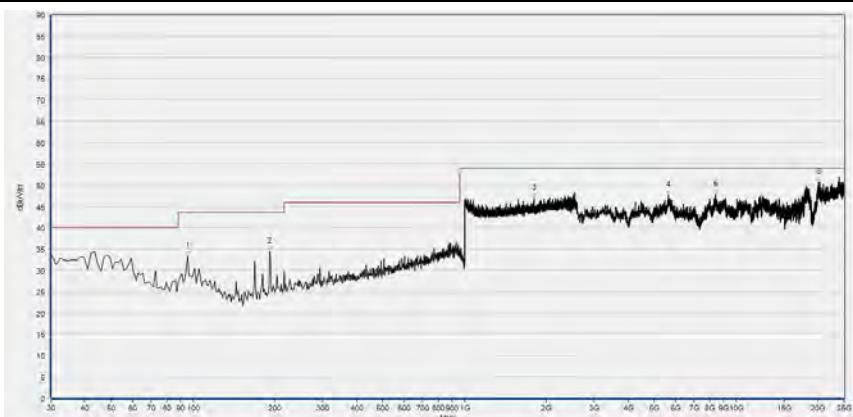
**802.11b Test mode**

Plots for Channel = 1



Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
95.557	30.80	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
383.279	33.74	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1268.267	45.29	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4559.338	46.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8995.345	47.49	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
17952.901	49.93	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

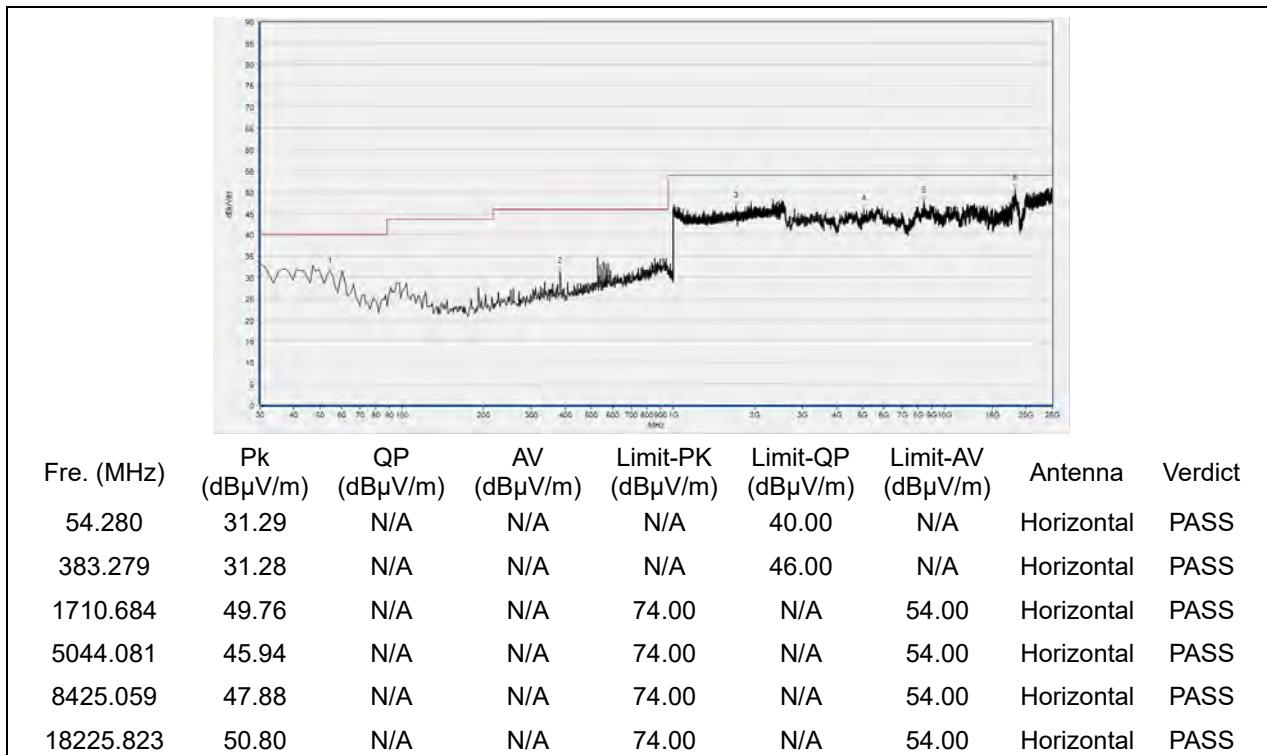
(Antenna Horizontal, 30MHz to 25GHz)



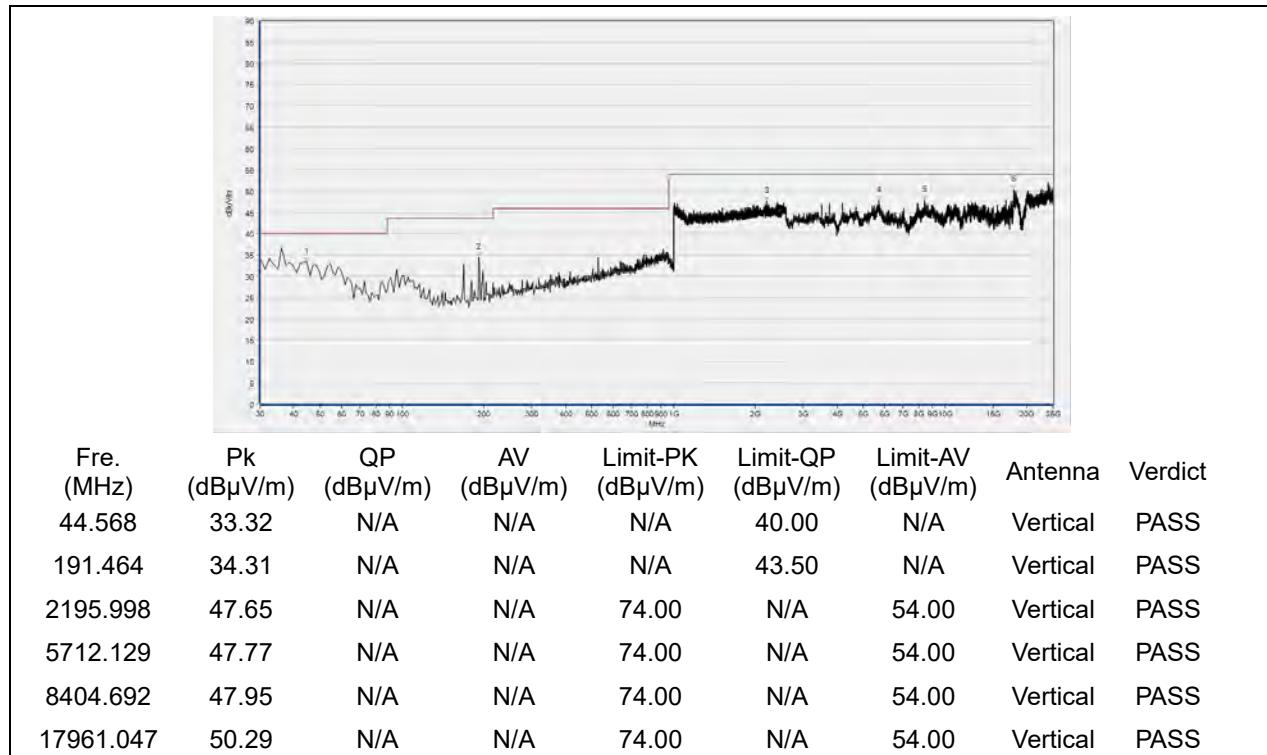
Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
95.557	33.38	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
191.464	34.39	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1798.399	46.86	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5634.734	47.57	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8420.986	47.83	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
20099.618	50.57	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

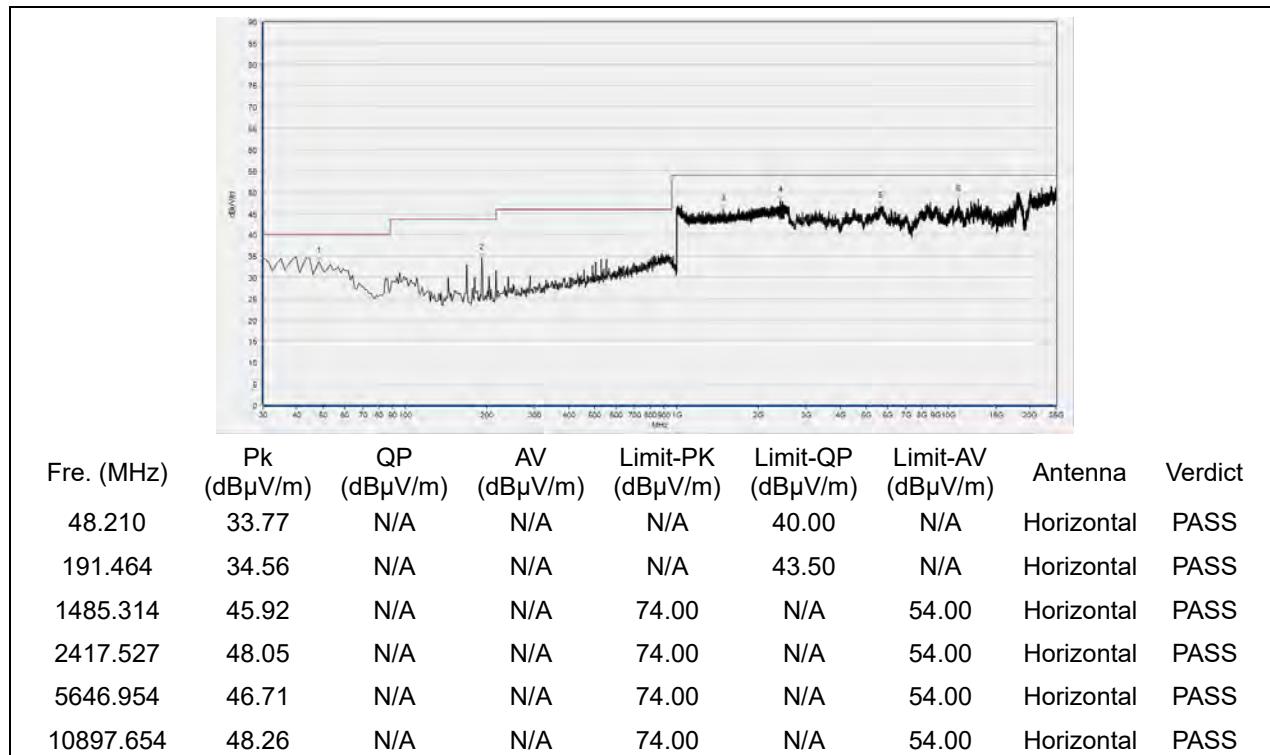
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Plot for Channel = 6


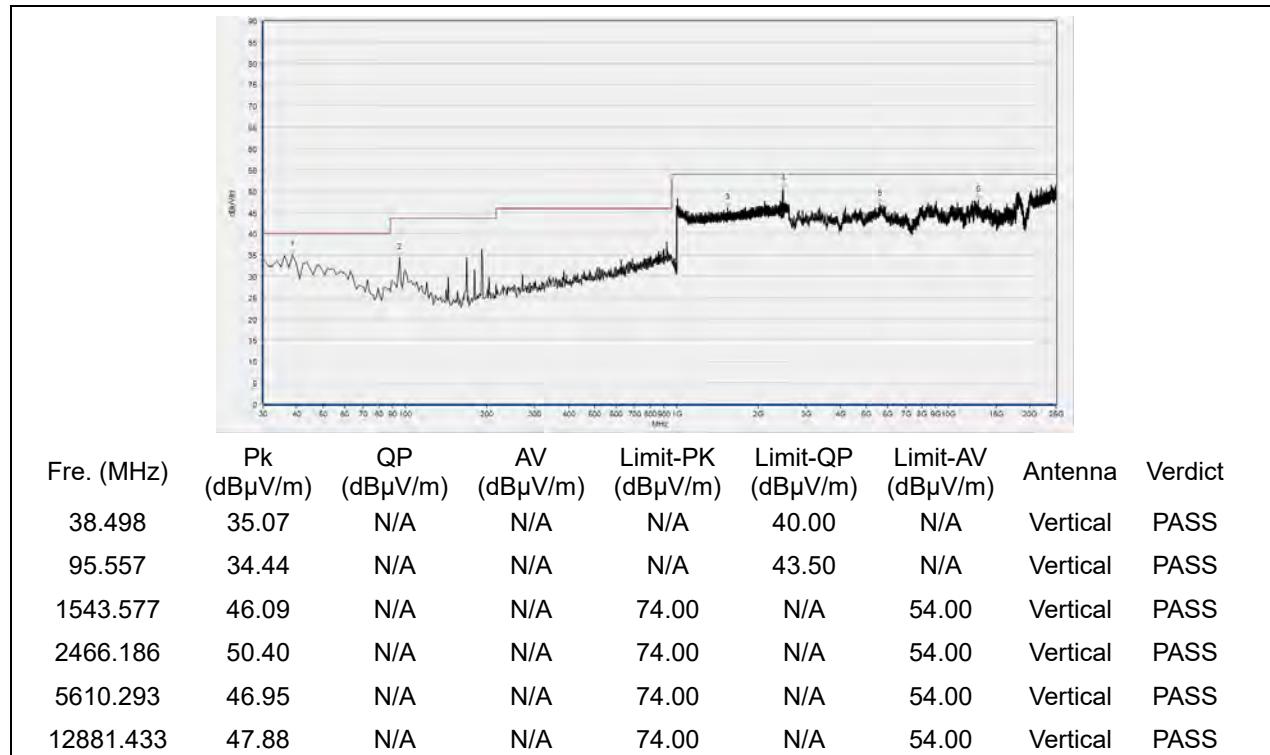
(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11


(Antenna Horizontal, 30MHz to 25GHz)



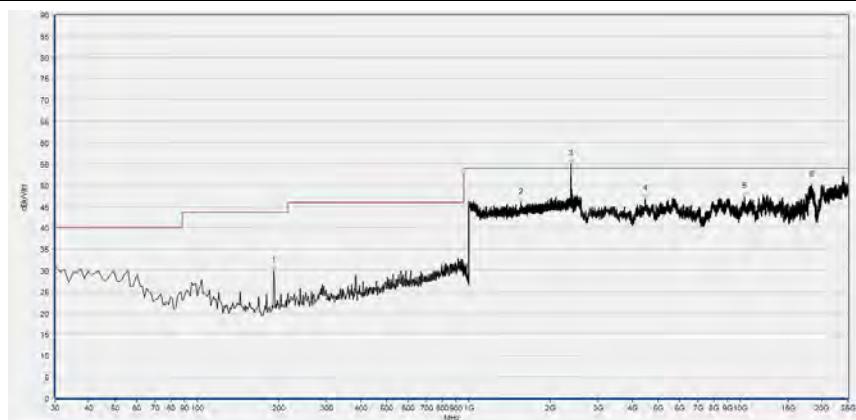
(Antenna Vertical, 30MHz to 25GHz)



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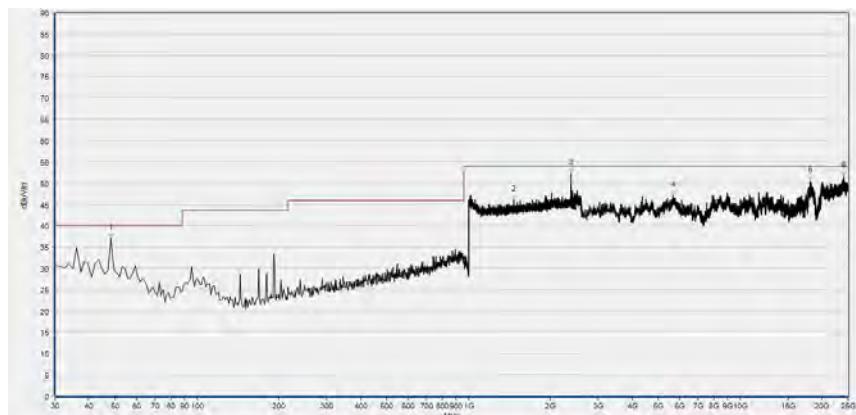
**802.11g Test mode**

Plots for Channel = 1



Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
191.464	29.84	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1555.742	45.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2377.800	54.96	N/A	33.88	74.00	N/A	54.00	Horizontal	PASS
4473.795	46.74	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10408.838	47.29	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
18303.219	50.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

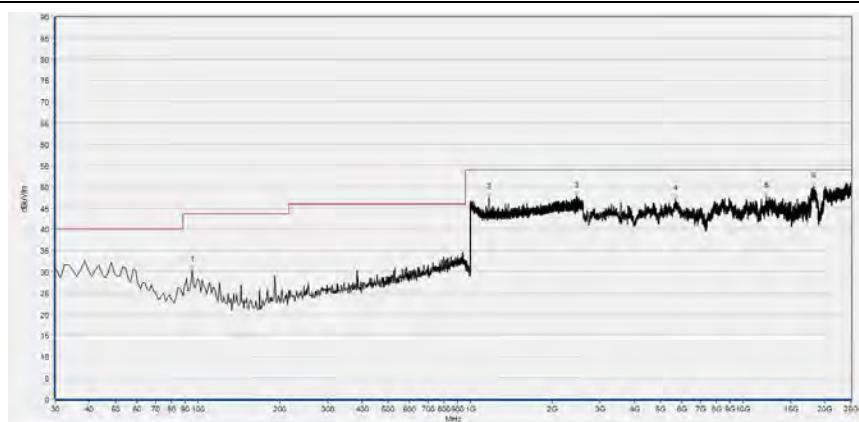


Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
48.210	37.06	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
1464.826	46.11	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2386.795	52.31	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5667.321	47.13	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
18119.913	50.39	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
24034.588	51.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

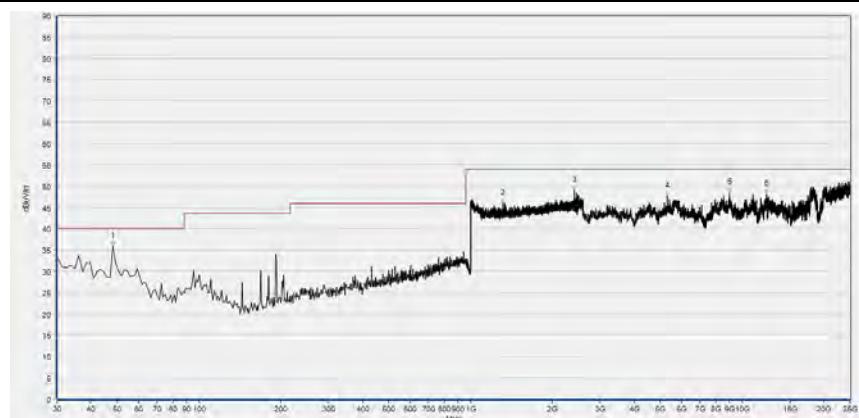
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## Plot for Channel = 6



Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
95.557	30.39	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1174.150	47.42	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2449.540	47.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5659.174	47.15	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12209.311	47.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
18274.704	50.16	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

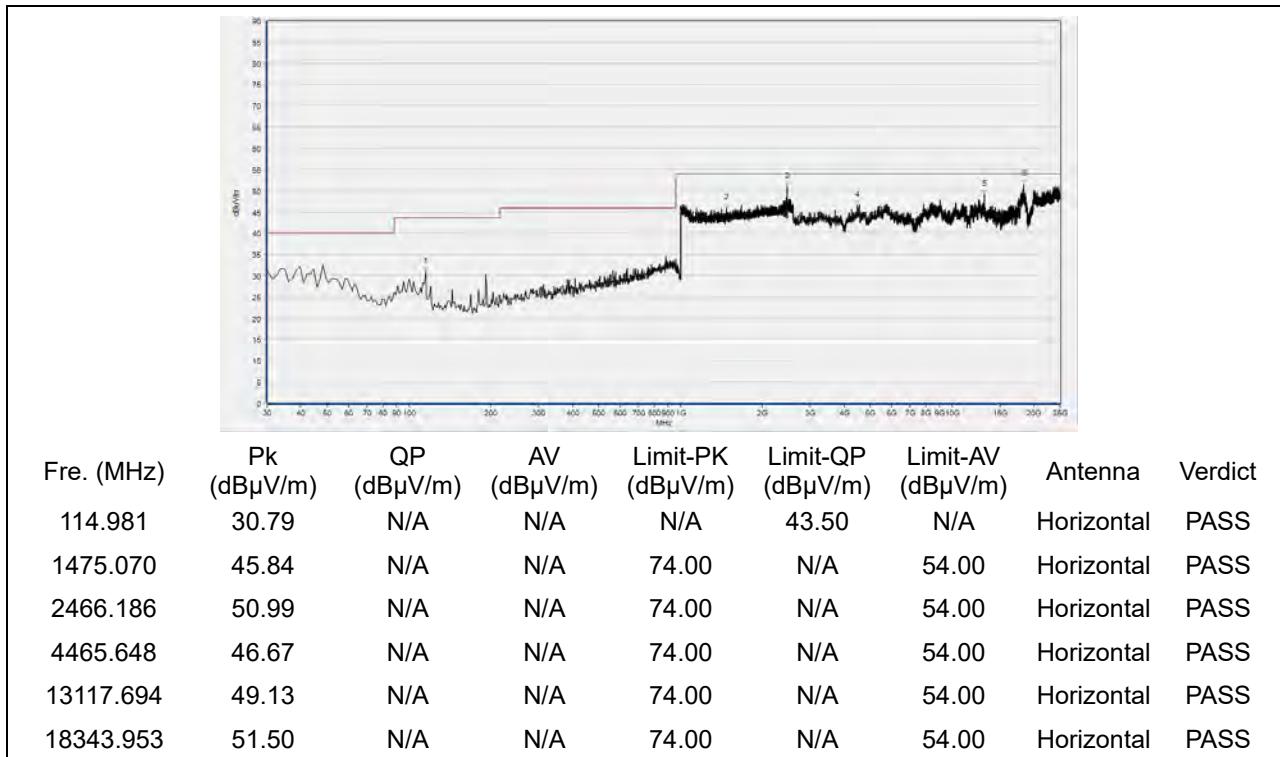
(Antenna Horizontal, 30MHz to 25GHz)



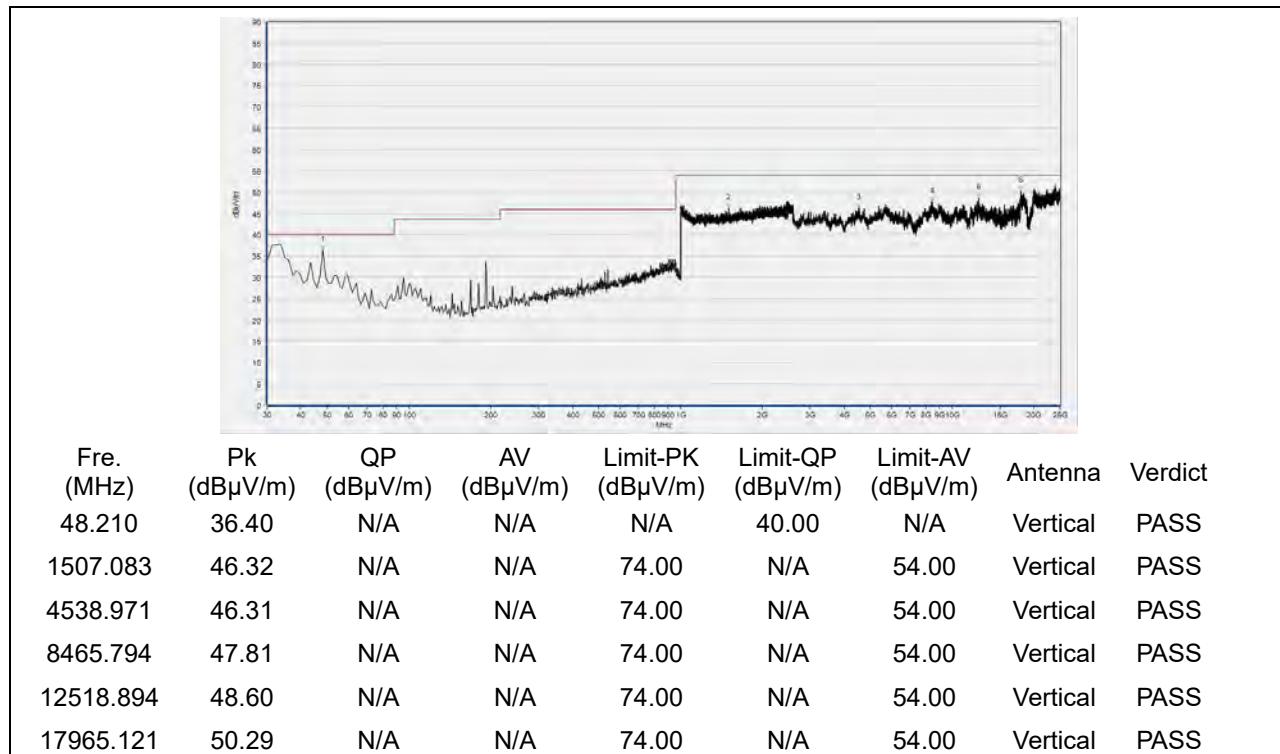
Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
48.210	35.94	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
1317.567	45.98	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2412.405	48.95	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5288.489	47.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9003.492	48.40	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12298.927	48.06	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

## Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



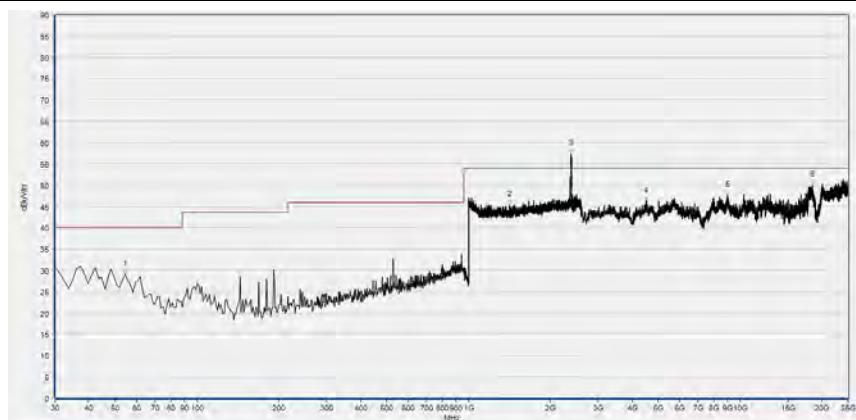
(Antenna Vertical, 30MHz to 25GHz)



REPORT No.: SZ18120173W01

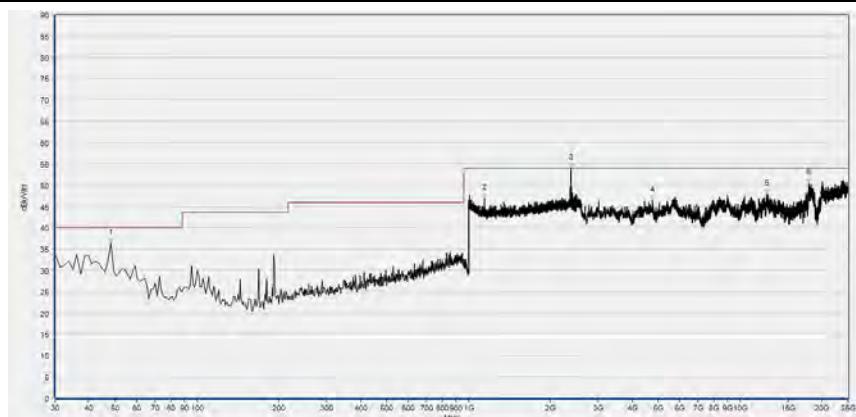
**802.11n(HT20) Test mode**

Plots for Channel = 1



Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
54.280	29.06	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
1416.166	45.41	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2380.200	59.47	N/A	38.21	74.00	N/A	54.00	Horizontal	PASS
4510.456	46.22	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8999.418	47.63	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
18474.304	49.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

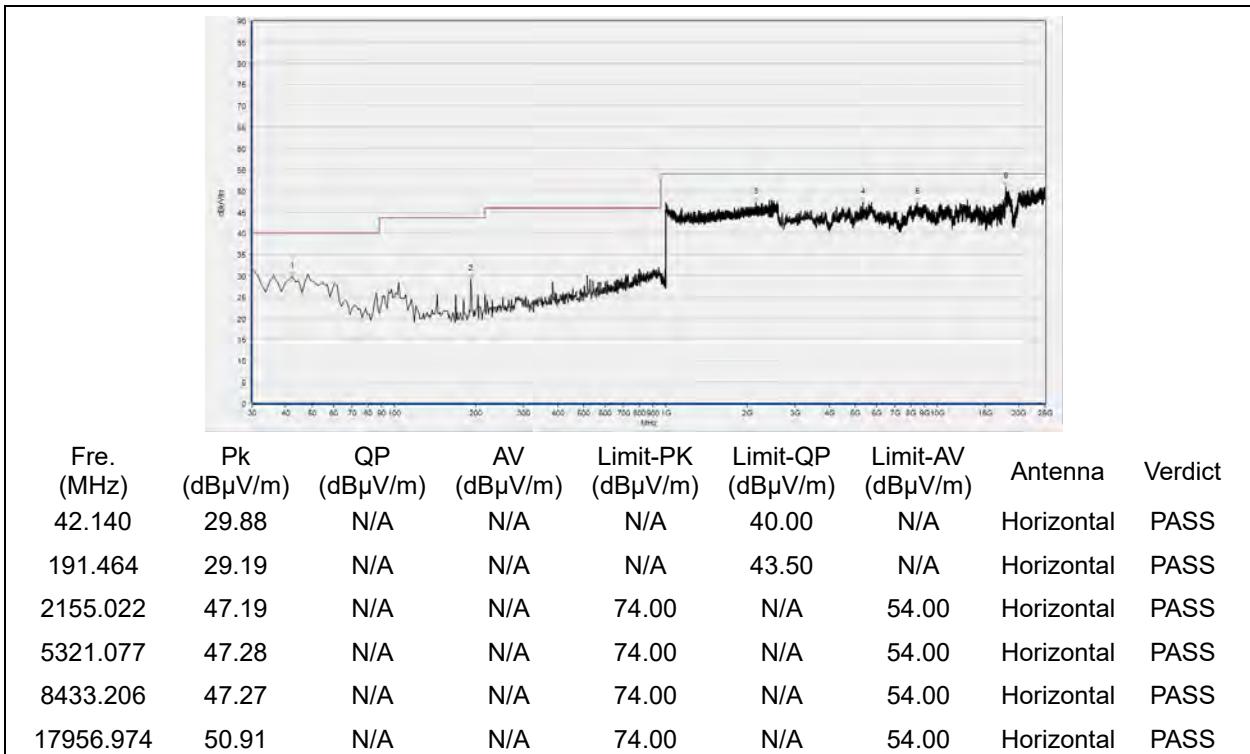
(Antenna Horizontal, 30MHz to 25GHz)



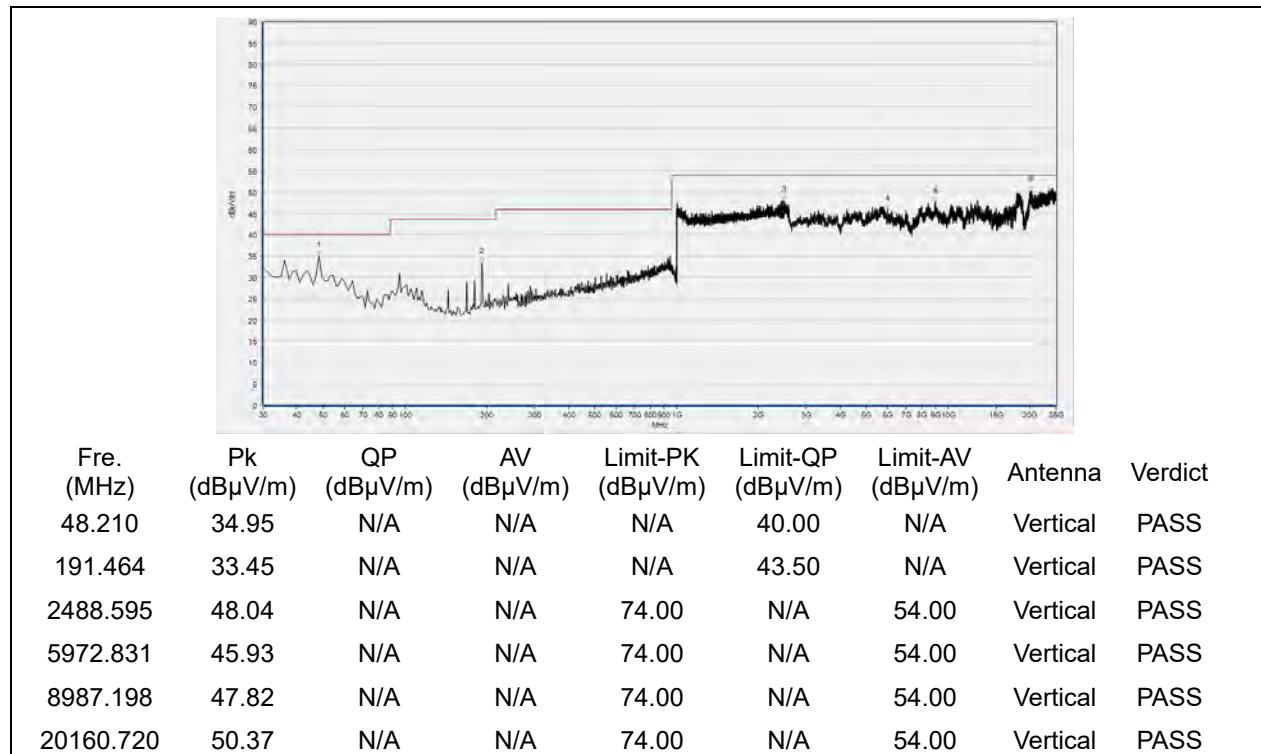
Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
48.210	36.42	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
1142.137	46.97	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2388.500	54.29	N/A	32.36	74.00	N/A	54.00	Vertical	PASS
4767.085	46.49	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12502.600	47.96	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
17920.313	50.41	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

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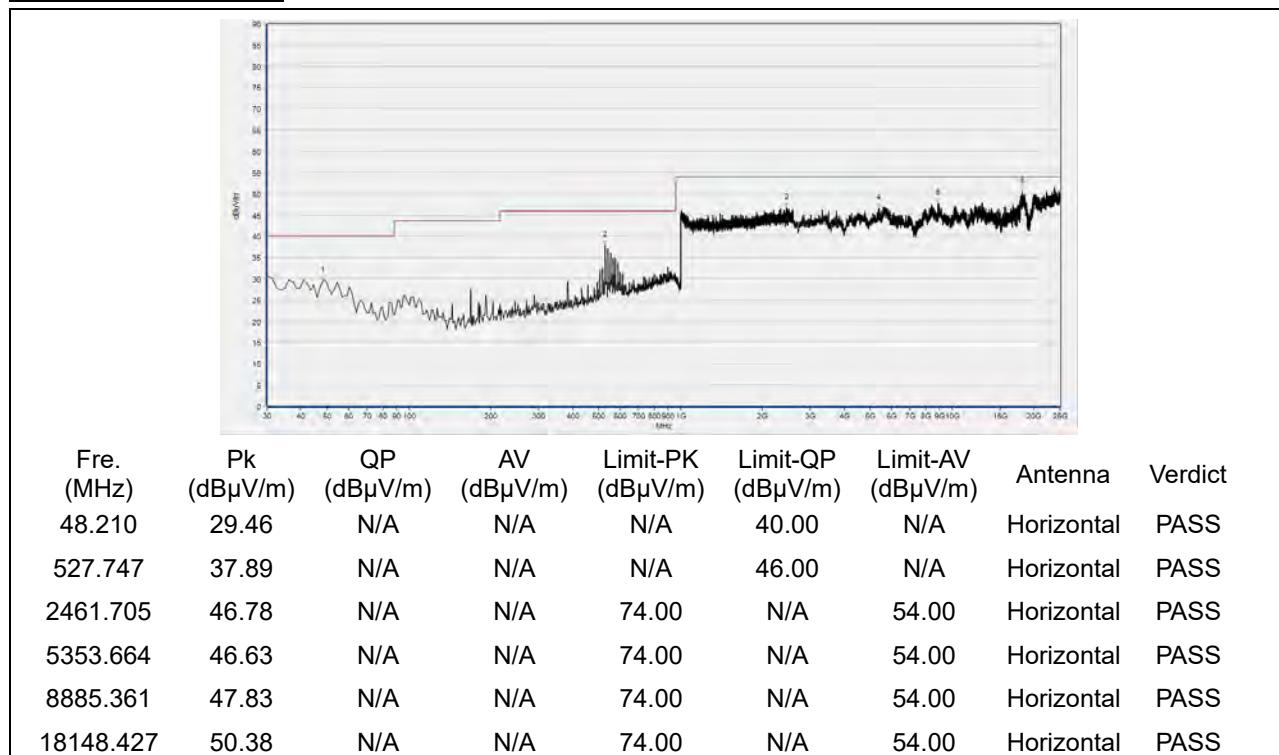
Plot for Channel = 6


(Antenna Horizontal, 30MHz to 25GHz)

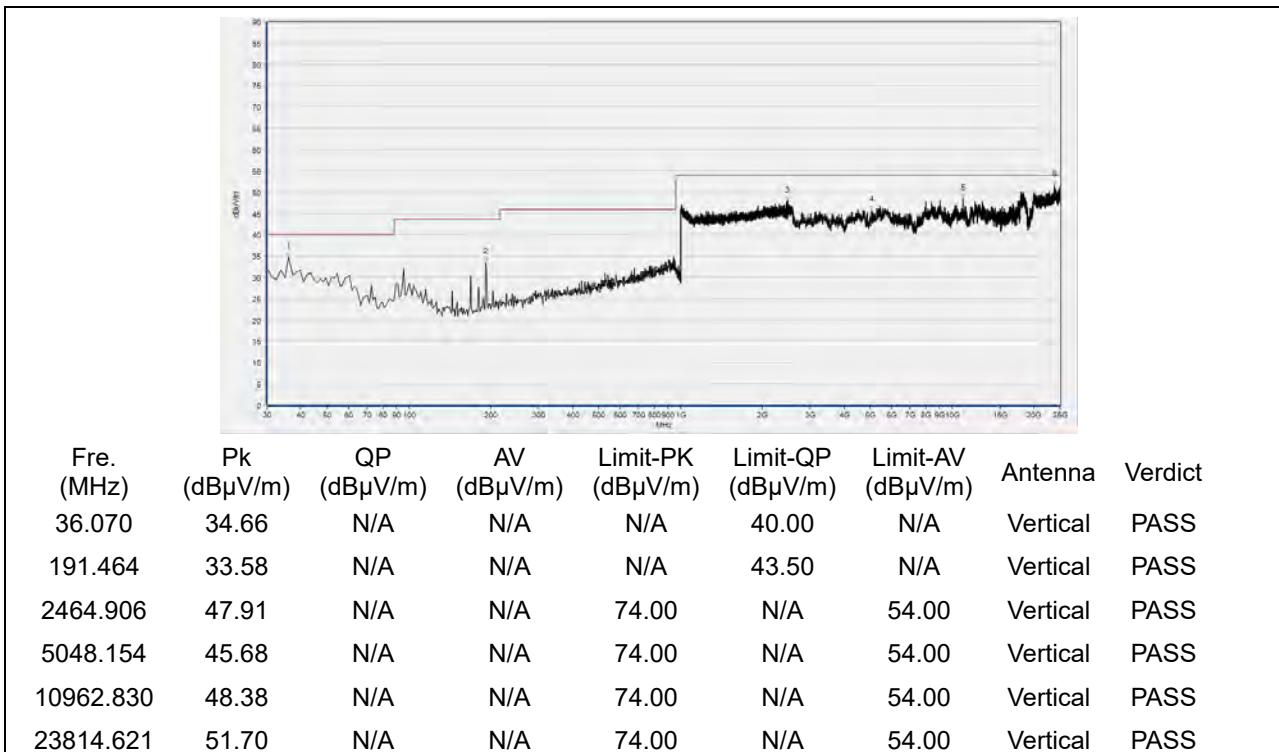


(Antenna Vertical, 30MHz to 25GHz)

## Plot for Channel = 11



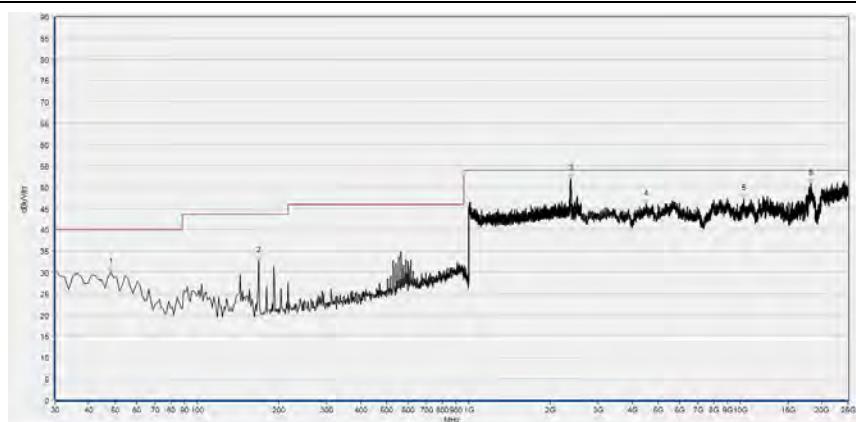
(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

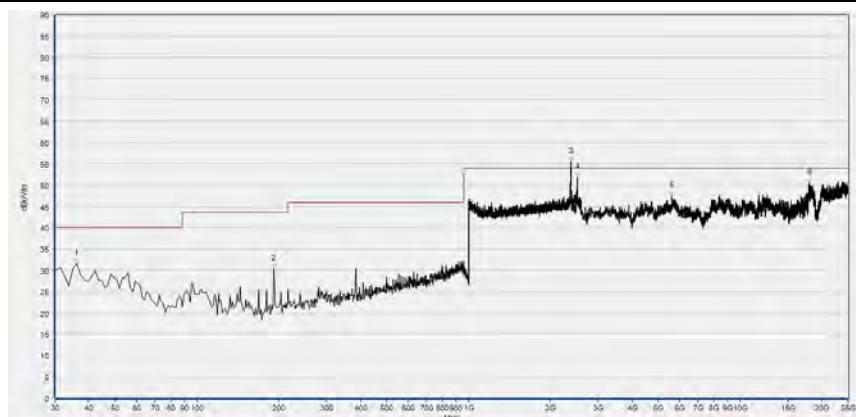
**802.11n(HT40) Test mode**

Plots for Channel = 3



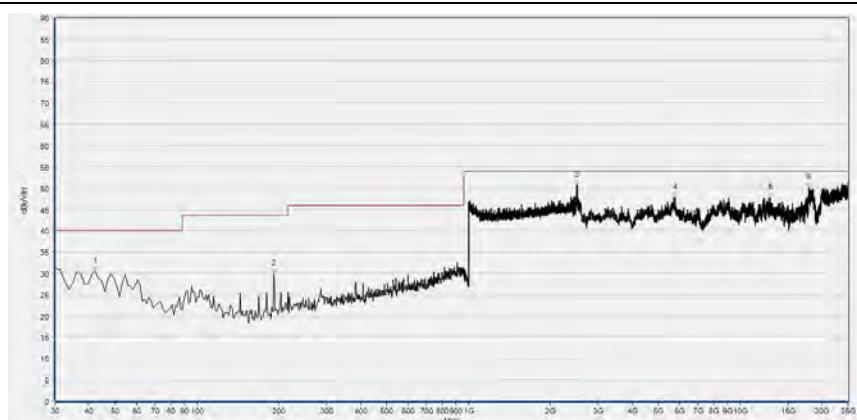
Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
48.210	30.01	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
168.398	32.66	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2377.831	51.51	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4502.310	45.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10343.662	47.27	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
18262.484	50.76	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



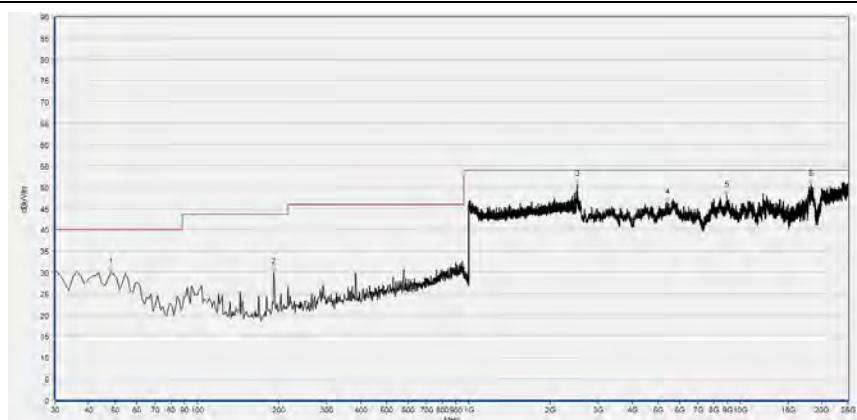
Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
36.070	31.52	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
191.464	30.33	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2383.100	55.33	N/A	37.56	74.00	N/A	54.00	Vertical	PASS
2512.285	51.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5610.293	47.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
17993.635	50.46	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

Plots for Channel = 6


Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
42.140	30.46	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
191.464	29.82	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2502.041	50.62	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5761.011	47.79	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12885.506	47.79	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
17956.974	50.17	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

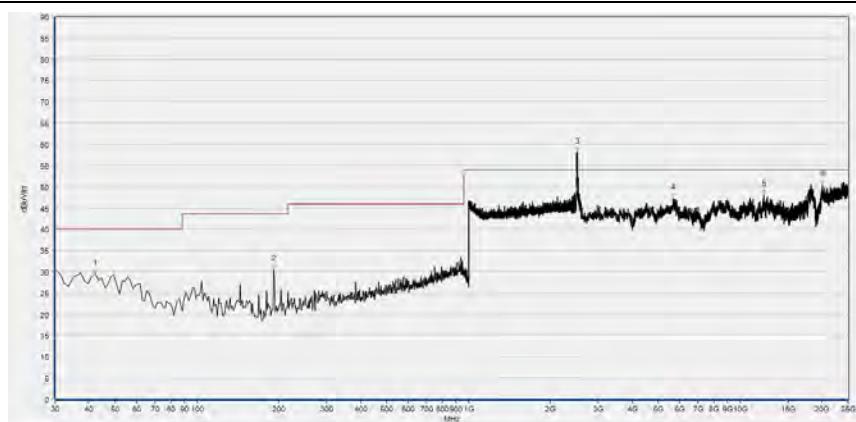
(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
48.210	29.99	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
191.464	29.97	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2517.407	50.61	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5406.619	46.34	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8913.875	48.11	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
18262.484	50.63	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

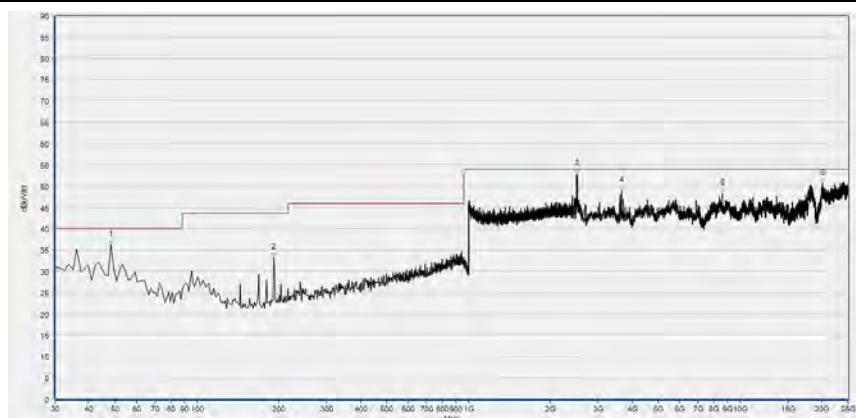
(Antenna Vertical, 30MHz to 25GHz)

## Plots for Channel = 9



Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
42.140	29.58	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
191.464	30.52	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2509.200	58.66	N/A	39.76	74.00	N/A	54.00	Horizontal	PASS
5679.542	47.25	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12201.164	48.12	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
20111.839	50.48	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk (dB $\mu$ V/m)	QP (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	Limit-PK (dB $\mu$ V/m)	Limit-QP (dB $\mu$ V/m)	Limit-AV (dB $\mu$ V/m)	Antenna	Verdict
48.210	36.19	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
191.464	33.20	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2507.803	52.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3655.028	48.98	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8620.586	48.24	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
20140.353	50.57	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



## Annex A Test Uncertainty

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

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

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



## Annex B Testing Laboratory Information

### 1. Identification of the Responsible Testing Laboratory

<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	Cal. Due
Attenuator 1	(N/A.)	10dB	Resnet	2018.04.17	2019.04.16
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2018.11.06	2019.11.05
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2018.04.17	2019.04.16
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Computer	T430i	Think Pad	Lenovo	N/A	N/A

##### 4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2018.05.08	2019.05.07
LISN	812744	NSLK 8127	Schwarzbeck	2018.05.08	2019.05.07
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2018.05.08	2019.05.07
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

##### 4.3 List of Software Used

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



#### 4.4 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2018.08.04	2019.08.03
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.18	2019.05.17
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2018.08.06	2019.08.05
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2018.08.02	2019.08.01
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	2018.12.01	2019.11.30
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

END OF REPORT