



REPORT No.: SZ20120271W04

TEST REPORT

APPLICANT : Golden Mark (HK) Limited

PRODUCT NAME : Smart Home Controller

MODEL NAME : EzloPlus-US, e450-US

BRAND NAME : N/A

FCC ID : 2AMY9PLUS450

STANDARD(S) : 47 CFR Part 15 Subpart E

RECEIPT DATE : 2020-12-21

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Change History		
Version	Date	Reason for change
1.0	2021-03-31	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Golden Mark (HK) Limited
Applicant Address:	6/F, Kimberley Plaza, 45-47 Kimberley Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer:	Golden Mark (HK) Limited
Manufacturer Address:	6/F, Kimberley Plaza, 45-47 Kimberley Road, Tsim Sha Tsui, Kowloon, Hong Kong

1.2. Equipment Under Test (EUT) Description

Product Name:	Smart Home Controller	
Serial No.:	(N/A, marked #1 by test site)	
Hardware Version:	N/A	
Software Version:	N/A	
Modulation Type:	OFDM	
Modulation Mode:	802.11a, 802.11n (HT20), 802.11n (HT40) 802.11ac (VHT20), 802.11ac (VHT40), 802.11ac (VHT80)	
Operating Frequency Range:	5180MHz-5240MHz; 5745MHz-5825MHz	
Channel Number:	Refer to 1.3	
Antenna Type:	Chip Antenna	
Antenna Gain:	2.3dBi	
Accessory Information:	AC Adapter	
	Brand Name:	N/A
	Model No.:	FX18U-050300C
	Serial No.:	(N/A, marked #1 by test site)
	Rated Output:	5V=3A
	Rated Input:	100-240V~50/60Hz, 0.5A
	Manufacturer:	Shenzhen Fangxin Technology Co., Ltd

Note 1: According to the certificate holder, they declared that the models EzloPlus-US, e450-US are the same products. These two models only differ in model name. Except for the above differences, their electrical circuit design, layout, components used and internal wiring are identical. The main measuring model is EzloPlus-US, only the results for EzloPlus-US were recorded in this



report.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Modulation Type and Data Rate of EUT

Modulation technology	Modulation Type	Data Rate (Mbps) ^{Note1}
OFDM (802.11a)	BPSK	6/9
	QPSK	12/18
	16QAM	24/36
	64QAM	48/54
OFDM (802.11n)	BPSK	6.5
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65
OFDM (802.11ac)	BPSK	6.5
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65
	256QAM	78

Note1: The worst-case mode(black bold) 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

Frequency Range: 5180MHz-5240MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	36	5180	40	5200
	44	5220	48	5240
40MHz	38	5190	46	5230
80MHz	42	5210		
Frequency Range: 5745-5825MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	149	5745	153	5765
	157	5785	161	5805
	165	5825		
40MHz	151	5775	159	5795
80MHz	155	5775		

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 E (U-NII band) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15(5-1-14 Edition)	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	ANSI C63.10	Duty Cycle of the Test Signal	Jan 20, 2021 Mar 09, 2021	Liu Bo	PASS	No deviation
3	15.407(a)	Maximum Conducted Output Power	Mar 23, 2021	Liu Bo	PASS	No deviation
4	15.407(a) (e)	Emission Bandwidth	Jan 20, 2021 Mar 09&11, 2021	Liu Bo	PASS	No deviation
5	15.407(a)	Peak Power Spectral Density	Jan 20, 2021 Mar 11&23, 2021	Liu Bo	PASS	No deviation
6	15.407(g)	Frequency Stability	Feb 26, 2021	Liu Bo	PASS	No deviation
7	15.207	Conducted Emission	Jan 11, 2021	Wu Runfeng	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Jan 14, 2021 Mar 12, 2021	Gao Jianrou	PASS	No deviation
9	15.407(b)	Radiated Emission	Jan 31, 2021 Mar 12, 2021	Gao Jianrou	PASS	No deviation

Note 1: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.102013.

Note 2: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v01r03.

Note 3: The path loss during the RF test is calibrated to correct the results by the offset setting in



the test equipments. The ref offset 11.5dB contains two parts that cable loss 1.5dB and Attenuator 10dB.

Note 4: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 5: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% 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 15E Requirements

2.1. Antenna Requirement

2.1.1. Applicable Standard

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

2.1.2. Test Result: Compliant

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

2.2. Duty Cycle of the Test Signal

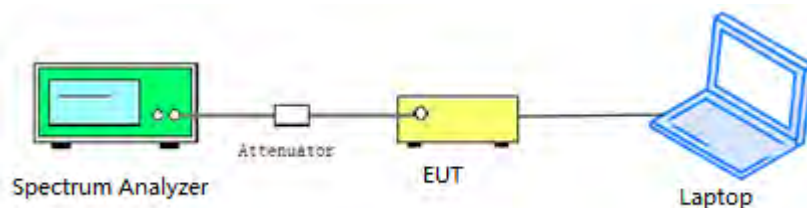
2.2.1. Requirement

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 sub clause, 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:



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

2.2.3. Test Procedure

KDB 789033 Section B was used in order to prove compliance.

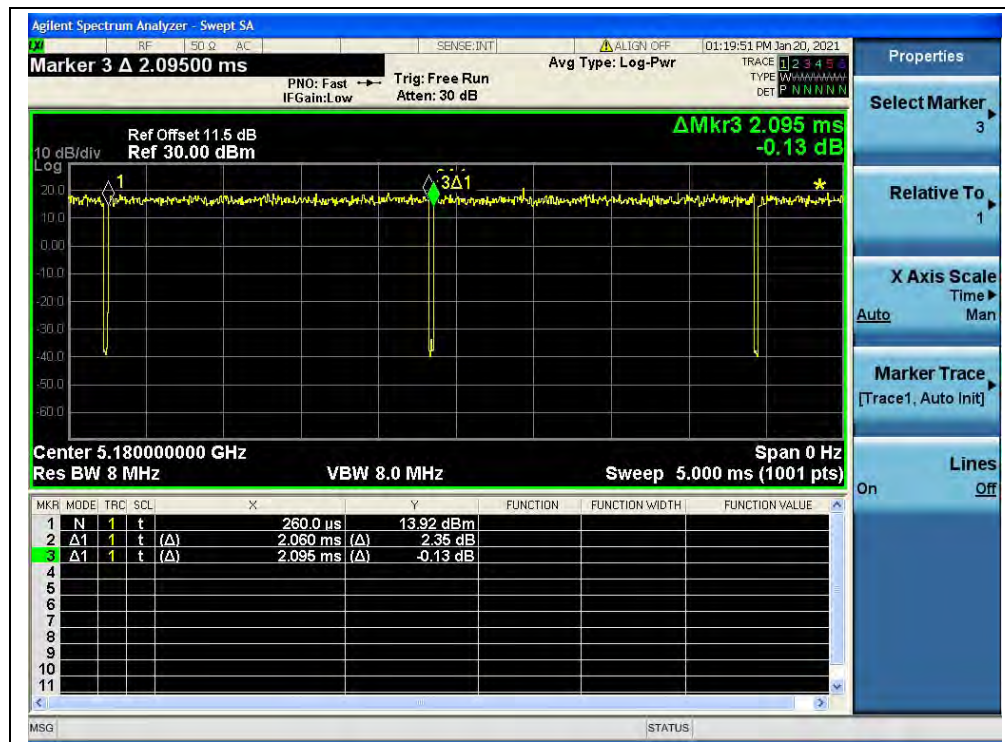


2.2.4. Test Result

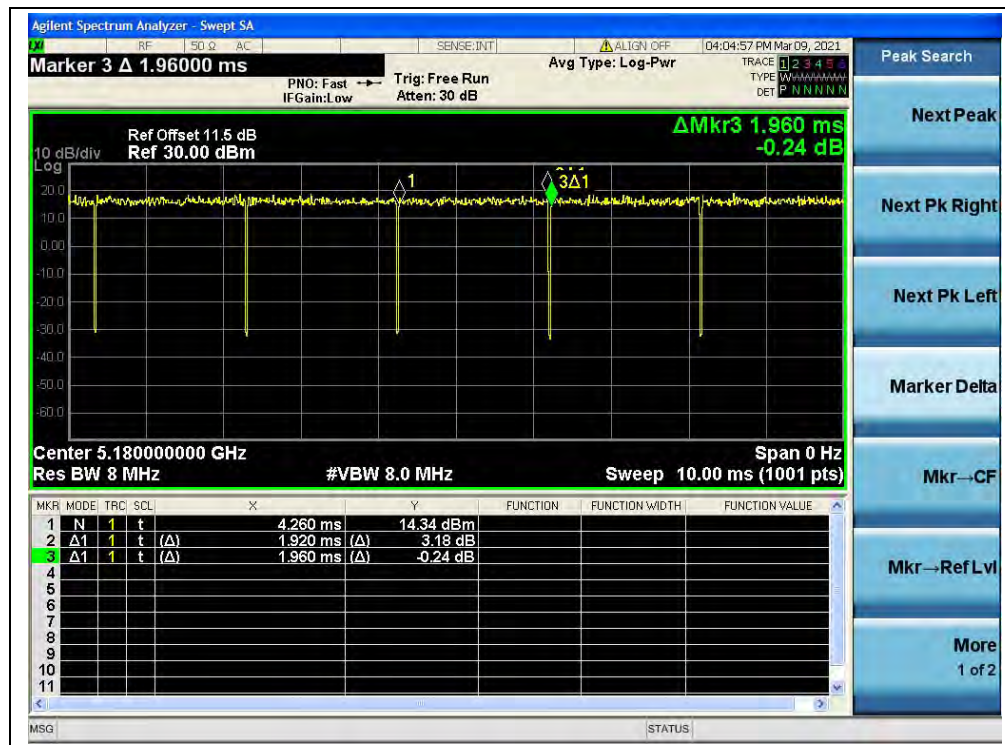
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	98.33	0.07
802.11n (HT20)	97.96	0.09
802.11n (HT40)	96.41	0.16
802.11ac(VHT20)	98.47	0.07
802.11ac(VHT40)	97.96	0.09
802.11ac(VHT80)	93.29	0.30

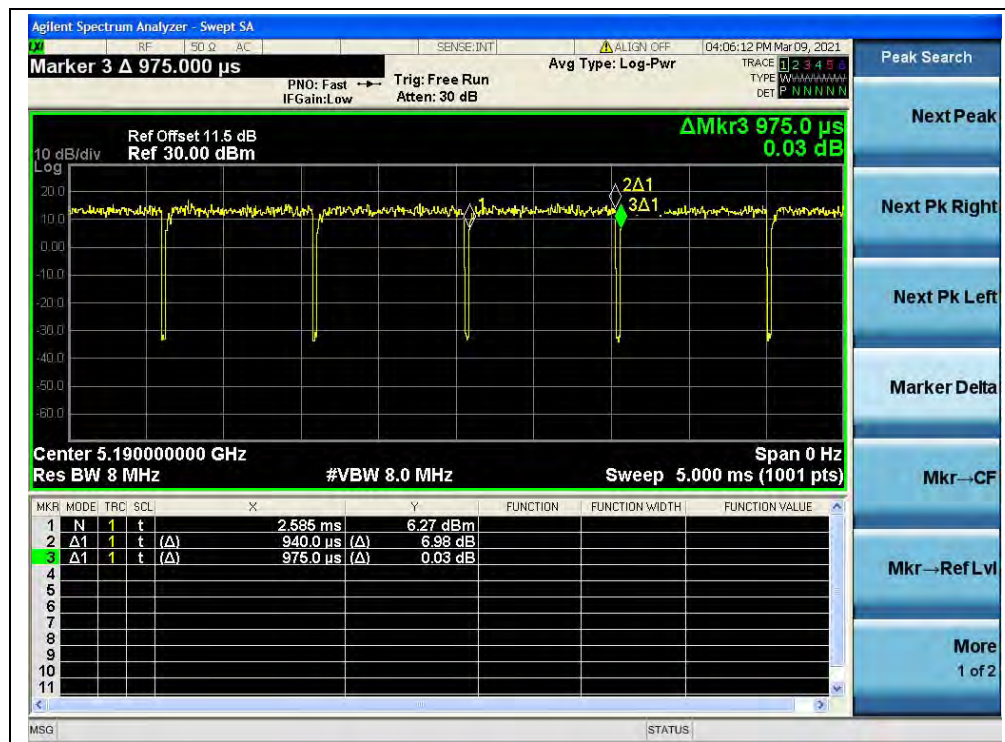
B. Test Plot:



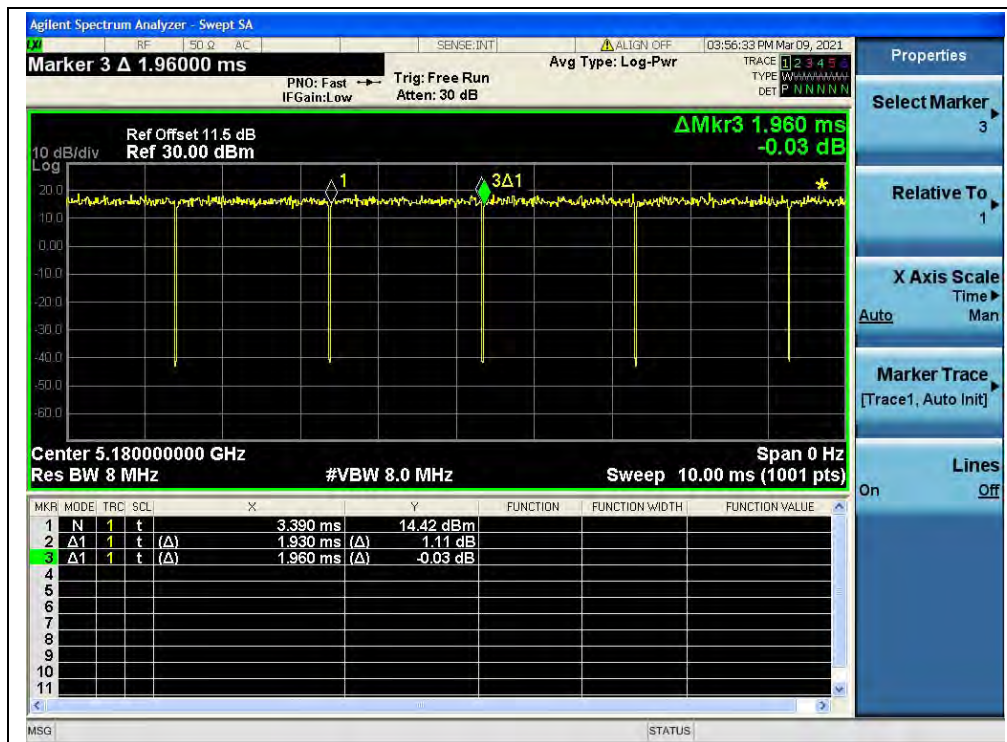
(Channel 36, 5180MHz, 802.11a)



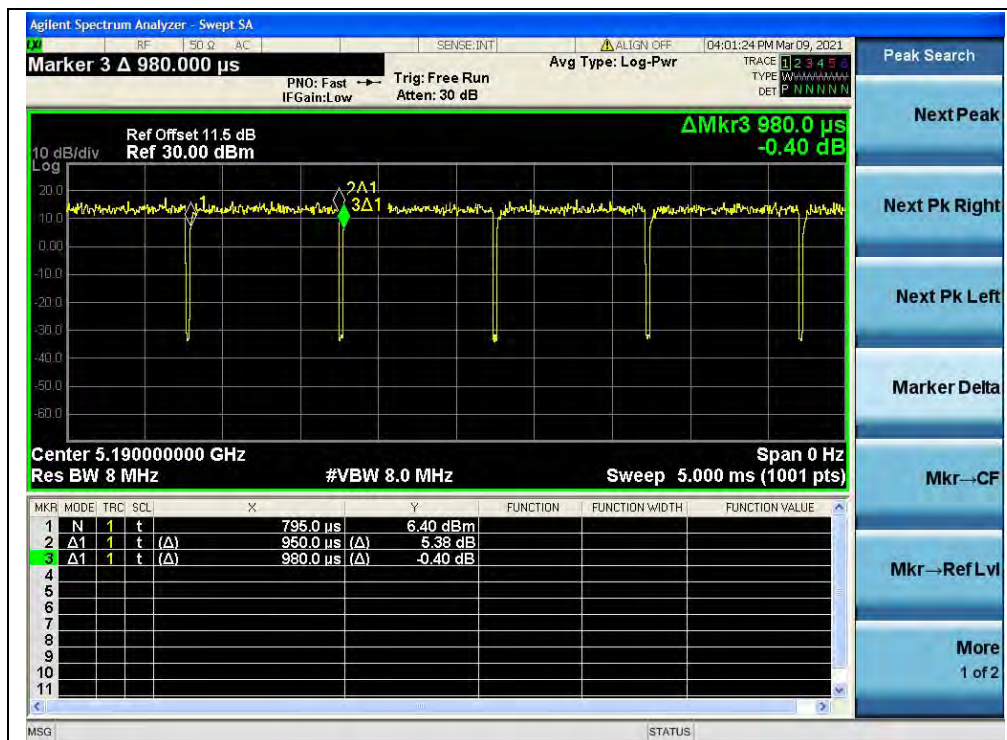
(Channel 36, 5180MHz, 802.11n (HT20))



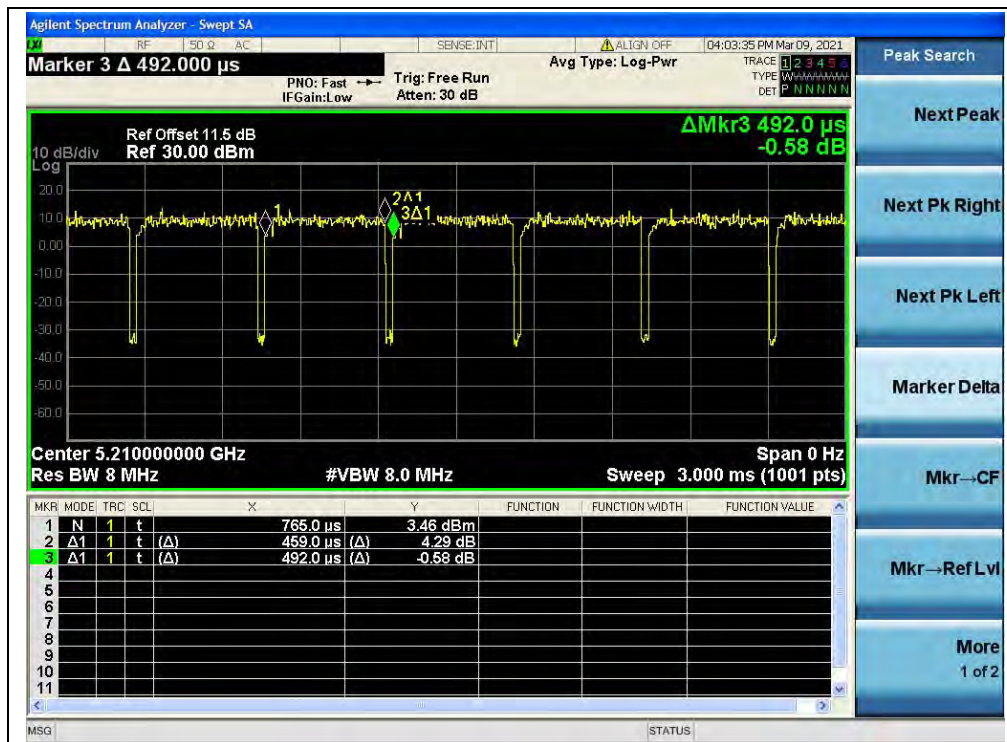
(Channel 38, 5190MHz, 802.11n (HT40))



(CH36_5180MHz_802.11ac (VHT20))



(CH38_5190MHz_802.11ac (VHT40))



(CH42_5210MHz_802.11ac (VHT80))

2.3. Maximum Conducted Output Power

2.3.1. Requirement

(1) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or $11\text{dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

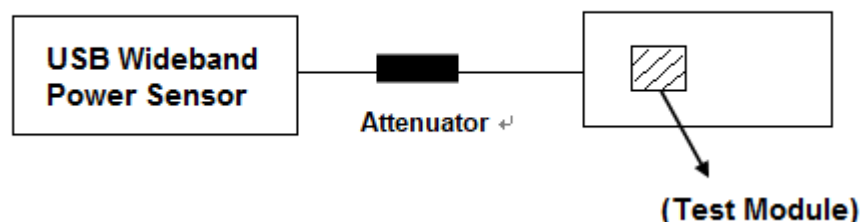
(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.

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

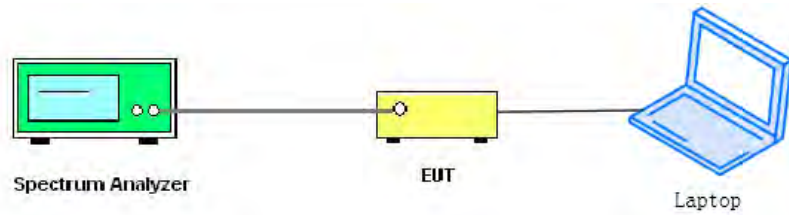
2.3.2. Test Description

Section E) 3) of KDB 789033 defines a methodology using a USB Wideband Power Sensor.

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, all test result in USB Wideband Power Sensor.

For ac (VHT80) mode power

The EUT (Equipment under the test) 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, all test result in Spectrum analyzer.



2.3.3. Test Result

Maximum Average Conducted Output Power

802.11a Mode

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
				dBm		dBm	W	
36	5180	12.60	0.07	12.67	0.018	24	0.25	PASS
44	5220	11.93		12.00	0.016			
48	5240	11.52		11.59	0.014			
149	5745	10.93		11.00	0.013	30	1	
157	5785	11.05		11.12	0.013			
165	5825	11.11		11.18	0.013			

802.11n (HT20) Mode

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
36	5180	10.09	0.09	10.18	0.010	24	0.25	PASS
44	5220	9.08		9.17	0.008			
48	5240	8.56		8.65	0.007			
149	5745	12.35		12.44	0.018	30	1	
157	5785	11.91		12.00	0.016			
165	5825	10.87		10.96	0.012			

802.11n (HT40) Mode

Channel	Frequency (MHz)	Average Power				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
38	5190	5.06	0.16	5.22	0.003	24	0.25	PASS
46	5230	3.86		4.02	0.003			
151	5755	5.85		6.01	0.004	30	1	
159	5795	5.38		5.54	0.004			

**802.11ac (VHT20) Mode**

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
36	5180	11.02	0.07	11.09	0.013	24	0.25	PASS
44	5220	9.16		9.23	0.008			
48	5240	8.50		8.57	0.007			
149	5745	12.38		12.45	0.018	30	1	
157	5785	11.96		12.03	0.016			
165	5825	10.77		10.84	0.012			

802.11ac (VHT40) Mode

Channel	Frequency (MHz)	Average Power				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated		dBm	W	
		dBm		dBm	W			
38	5190	10.66	0.09	10.75	0.012	24	0.25	PASS
46	5230	9.30		9.39	0.009			
151	5755	12.61		12.70	0.019	30	1	
159	5795	11.98		12.07	0.016			

802.11ac (VHT80) Mode

Channel	Frequency (MHz)	Average Power				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
42	5210	4.65	0.30	4.95	0.003	24	0.25	PASS
155	5775	5.81		6.11	0.004	30	1	

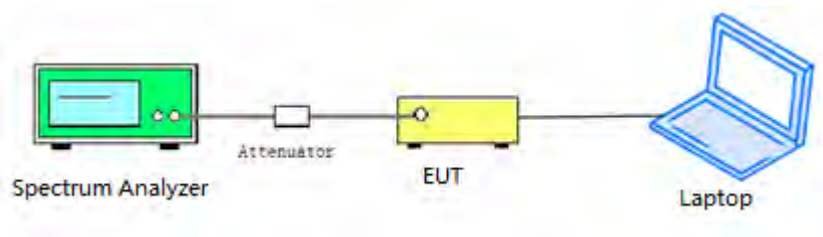
2.4. Emission Bandwidth

2.4.1. Requirement

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices 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 50 Ohm; the path loss as the factor is calibrated to correct the reading.

2.4.3. Test Procedure

1. KDB 789033 Section C) 1) Emission Bandwidth was used in order to prove compliance
 - a) Set RBW = approximately 1% of the emission bandwidth.
 - b) Set VBW > RBW.
 - c) Detector = Peak.
 - d) Trace mode = max hold.
 - e) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
 2. KDB 789033 Section C) 2) minimum emission bandwidth for the band 5.725-5.85GHz was used in order to prove compliance.
- Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:



- a) Set RBW = 100 kHz.
- b) Set video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

2.4.4. Test Result

802.11a Mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	23.57
44	5220	22.97
48	5240	22.71
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	16.35
157	5785	16.37
165	5825	16.35



B.Test Plot:



(Channel 36, 5180MHz, 802.11a)



(Channel 44, 5220 MHz, 802.11a)



(Channel 48, 5240MHz, 802.11a)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)



802.11n (HT20) Mode

A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	23.21
44	5220	21.53
48	5240	21.69
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	17.54
157	5785	17.55
165	5825	17.30

B.Test Plot:



(Channel 36, 5180MHz, 802.11n (HT20))



(Channel 44, 5220MHz, 802.11n (HT20))



(Channel 48, 5240MHz, 802.11n (HT20))



(Channel 149, 5745MHz, 802.11 n (HT20))



(Channel 157, 5785MHz, 802.11 n (HT20))



(Channel 165, 5825MHz, 802.11 n (HT20))



802.11n (HT40) Mode

A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	46.22
46	5230	46.06
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
151	5755	36.05
159	5795	36.36

B.Test Plot:



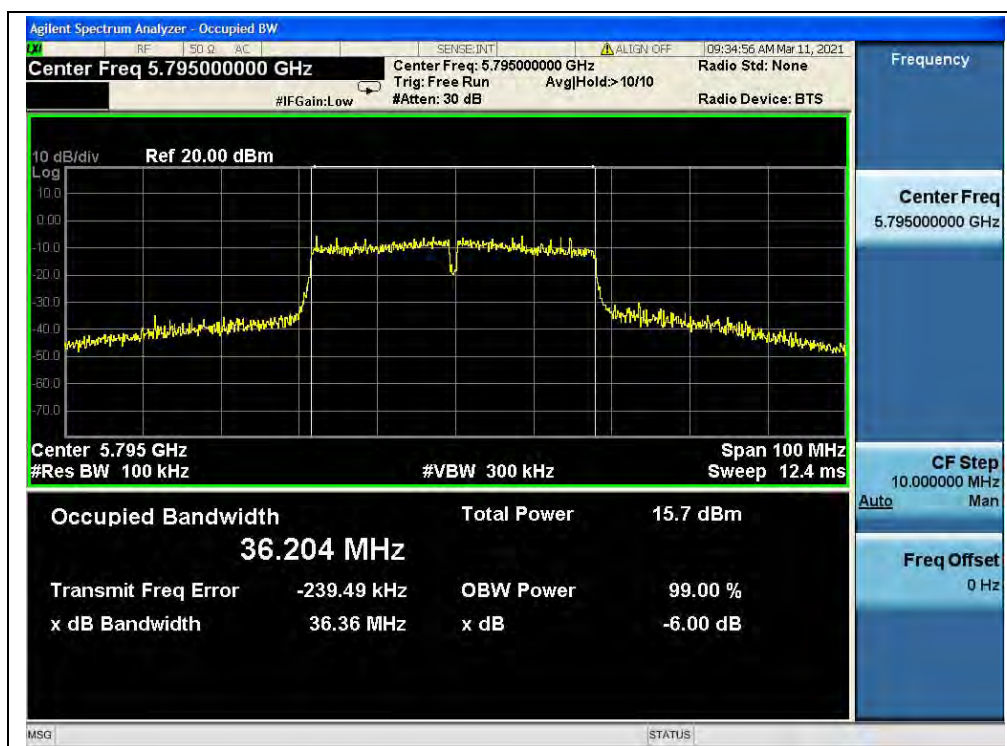
(Channel 38, 5190MHz, 802.11n (HT40))



(Channel 46, 5230MHz, 802.11n (HT40))



(Channel 151, 5755MHz, 802.11n (HT40))



(Channel 159, 5795MHz, 802.11n (HT40))

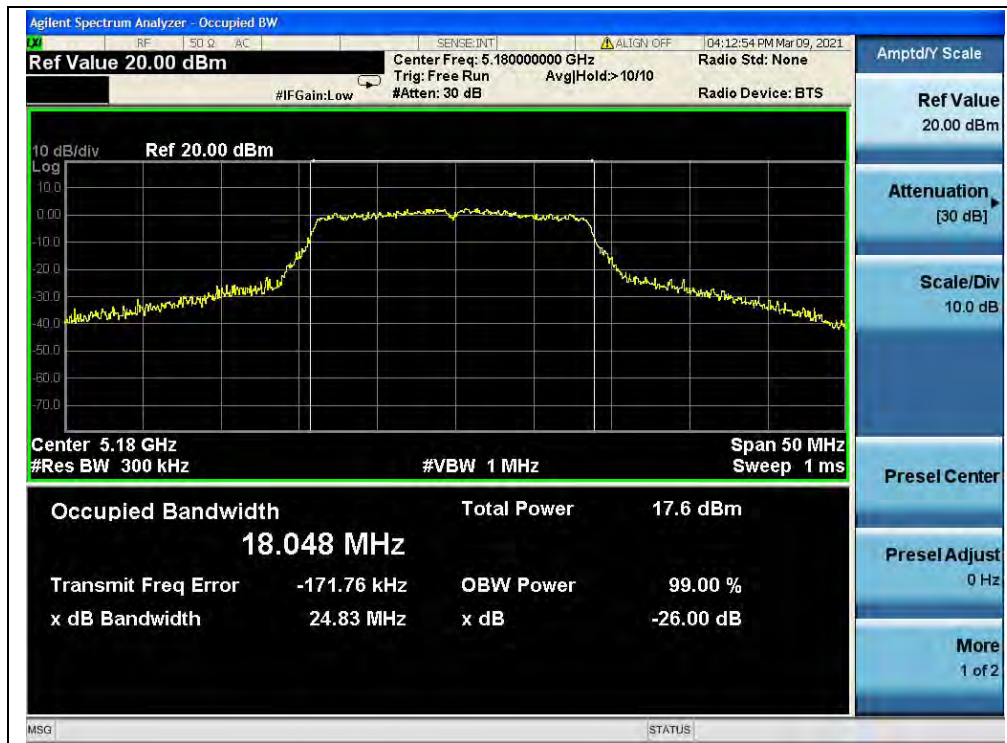


802.11ac (VHT20) Mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	24.83
44	5220	21.58
48	5240	21.64
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
149	5745	17.62
157	5785	17.61
165	5825	17.56

B. Test Plot:



(Channel 36, 5180MHz, 802.11ac (VHT20))



(Channel 44, 5220 MHz, 802.11ac (VHT20))



(Channel 48, 5240MHz, 802.11ac (VHT20))



(Channel 149, 5745MHz, 802.11ac (VHT20))



(Channel 157, 5785MHz, 802.11ac (VHT20))



(Channel 165, 5825MHz, 802.11ac (VHT20))



802.11 ac (VHT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	50.36
46	5230	42.93
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
151	5755	36.37
159	5795	36.06

B. Test Plot:



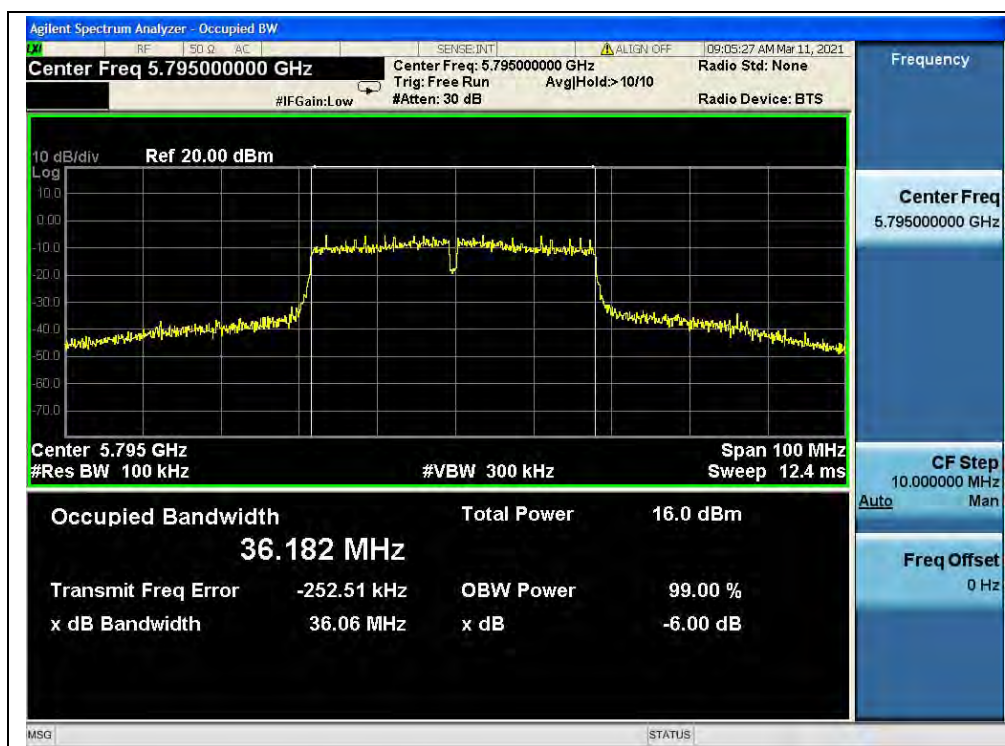
(Channel 38, 5190MHz, 802.11ac (VHT40))



(Channel 46, 5230 MHz, 802.11ac (VHT40))



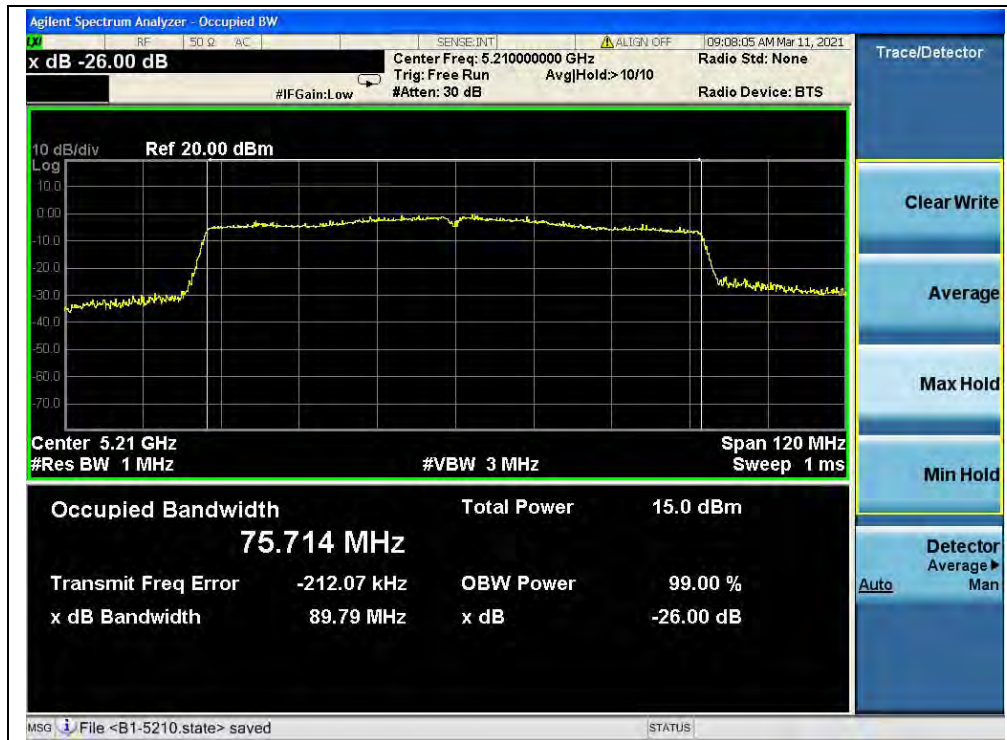
(Channel 151, 5755 MHz, 802.11ac (VHT40))



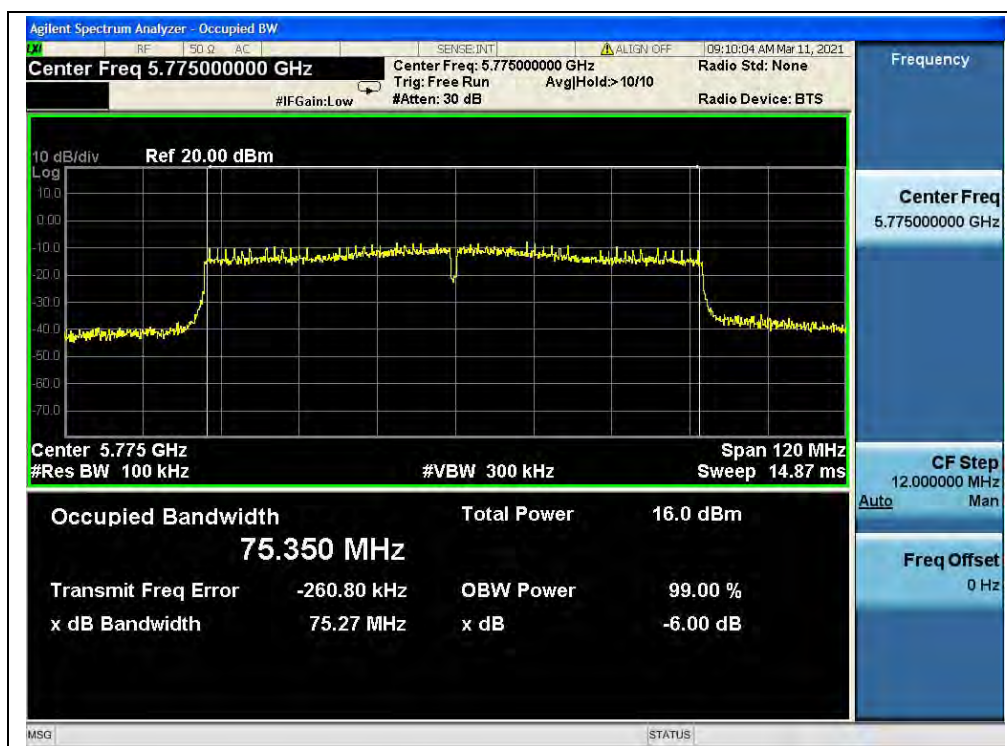
(Channel 159, 5795MHz, 802.11ac (VHT40))

**802.11 ac (VHT80) Mode****A.Test Verdict:**

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	89.79
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
155	5775	75.27

B.Test Plot:

(Channel 42, 5210MHz, 802.11ac (VHT80))



(Channel 155, 5775 MHz, 802.11ac (VHT80))

2.5. Peak Power Spectral Density

2.5.1. Requirement

(1) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.

(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30dBm in any 500kHz band.

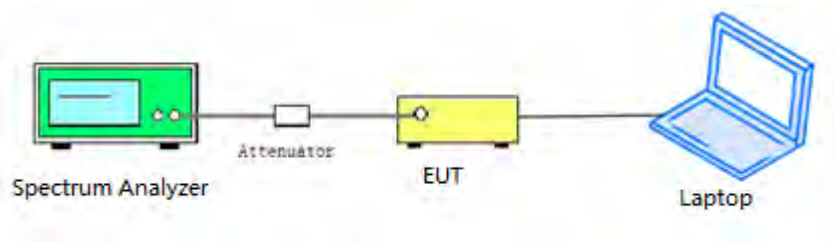
If transmitting antennas of directional gain greater than 6dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.

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

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.



2.5.3.Test Procedure

KDB 789033 Section F) Maximum Power Spectral Density (PSD) Method SA-1 was used in order to prove compliance

- 1) Set span to encompass the entire 26-dB emission bandwidth
- 2) Set RBW = 1MHz. Set VBW $\geq$ 3MHz
- 3) Number of points in sweep $\geq$ 2 Span / RBW. Sweep time = auto
- 4) Detector = Average
- 5) Trace mode=Max hold
- 6) Record the max value

2.5.4.Test Result

802.11a Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	2.41	0.07	2.48	11	PASS
44	5220	1.83		1.90		
48	5240	1.40		1.47		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-0.69	0.07	-0.62	30	PASS
157	5785	-0.79		-0.72		
165	5825	-0.89		-0.82		



B.Test Plot:



(Channel 36, 5180MHz, 802.11)



(Channel 44, 5220MHz, 802.11a)



(Channel 48, 5240MHz, 802.11a)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)



802.11n (HT20) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	0.03	0.09	0.12	11	PASS
44	5220	-0.62		-0.53		
48	5240	-1.14		-1.05		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	0.07	0.09	0.16	30	PASS
157	5785	-0.42		-0.33		
165	5825	-1.36		-1.27		

B.Test Plot:



(Channel 36, 5180MHz, 802.11n (HT20))



(Channel 44, 5220MHz, 802.11n (HT20))



(Channel 48, 5240MHz, 802.11n (HT20))



(Channel 149, 5745MHz, 802.11n (HT20))



(Channel 157, 5785MHz, 802.11n (HT20))



(Channel 165, 5825MHz, 802.11n (HT20))



A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-7.73	0.16	-7.57	11	PASS
46	5230	-8.75		-8.59		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-9.69	0.16	-9.53	30	PASS
159	5795	-10.50		-10.34		

Agilent Spectrum Analyzer - Swept SA

SENSE: PULSE	SOURCE OFF	ALIGN AUTO	09:59:15 AM Mar 23, 2021
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Center Freq 5.19000000 GHz

PNO: Fast IF Gain: Low Trig: Free Run Avg Type: RMS Avg/Hold: > 10/10

TRACE 1 2 3 4 5
TYPE M M M M M M M M M M
DET A N N N N N N

Ref Offset 11.5 dB
Ref 21.50 dBm

**Mkr1 5.188 08 GHz
-7.734 dBm**

10 dB/div
Log

Center 5.19000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*

Span 60.00 MHz
#Sweep 1.000 s (1001 pts)

MSG File <B1-5190.state> recalled STATUS

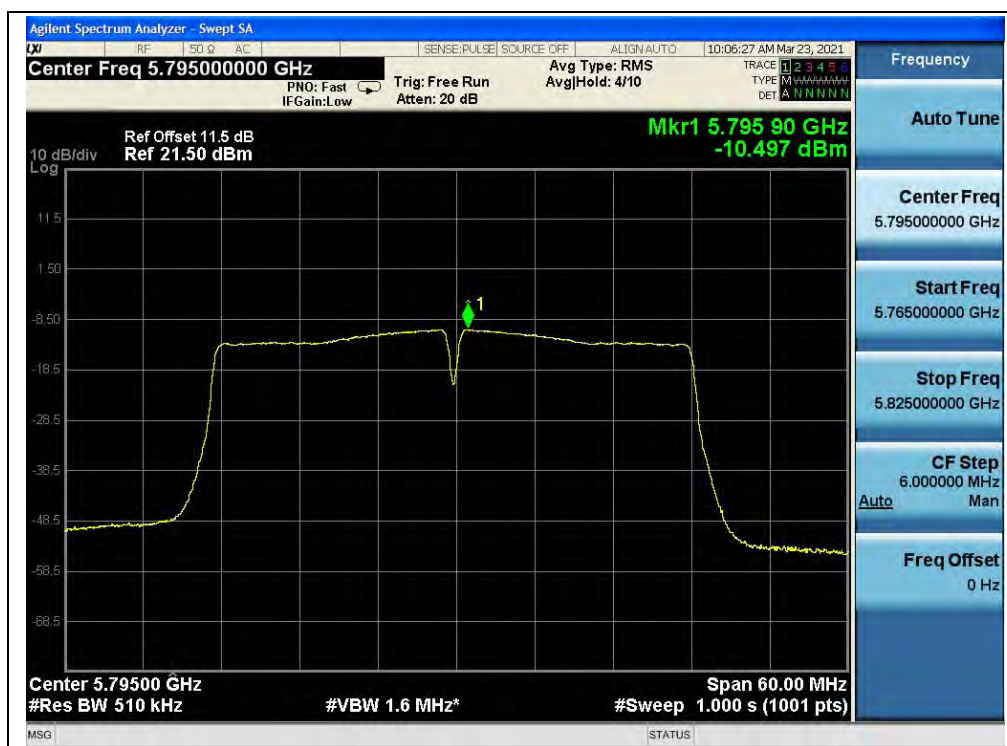
(Channel 38, 5190MHz, 802.11n (HT40))



(Channel 46, 5230MHz, 802.11n (HT40))



(Channel 151, 5755MHz, 802.11n (HT40))



(Channel 159, 5795MHz, 802.11n (HT40))



802.11ac (VHT20) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	0.27	0.07	0.34	11	PASS
44	5220	-0.56		-0.49		
48	5240	-1.15		-1.08		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	0.04	0.07	0.11	30	PASS
157	5785	-0.56		-0.49		
165	5825	-1.55		-1.48		

B.Test Plot:



(Channel 36, 5180MHz, 802.11ac (VHT20))



(Channel 44, 5220 MHz, 802.11ac (VHT20))



(Channel 48, 5240MHz, 802.11ac (VHT20))



(Channel 149, 5745MHz, 802.11ac (VHT20))



(Channel 157, 5785MHz, 802.11ac (VHT20))



(Channel 165, 5825MHz, 802.11ac (VHT20))



802.11ac (VHT40) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-2.62	0.09	-2.53	11	PASS
46	5230	-3.86		-3.77		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-3.17	0.09	-3.08	30	PASS
159	5795	-3.77		-3.68		

B.Test Plot:



(Channel 38, 5190MHz, 802.11ac (VHT40))



(Channel 46, 5230 MHz, 802.11ac (VHT40))



(Channel 151, 5755MHz, 802.11ac (VHT40))



(Channel 159, 5795MHz, 802.11ac (VHT40))



802.11ac (VHT80) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
42	5210	-11.62	0.30	-11.32	11	PASS
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
155	5775	-13.19	0.30	-12.89	30	PASS

B.Test Plot:



(Channel 42, 5210MHz, 802.11ac (VHT80))



(Channel 155, 5775MHz, 802.11ac (VHT80))



2.6. Frequency Stability

2.6.1. Requirement

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

2.6.2. Test Procedure

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between 5°C to 40°C. The temperature was incremented by 10° intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

2.6.3. Test Result

U-NII-1 (Ch. 36) 5180MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.0	+20(Ref)	23	4.440
100%		-30	31	5.985
100%		-20	29	5.598
100%		-10	26	5.019
100%		0	25	4.826
100%		+10	22	4.247
100%		+20	20	3.861
100%		+30	23	4.440
100%		+40	26	5.019
100%		+50	23	4.440
85%	4.7	+20	30	5.792
115%	5.3	+20	28	5.405



U-NII-3 (Ch. 149) 5745MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.0	+20(Ref)	22	3.829
100%		-30	26	4.526
100%		-20	27	4.700
100%		-10	21	3.655
100%		0	30	5.222
100%		+10	25	4.352
100%		+20	26	4.526
100%		+30	26	4.526
100%		+40	28	4.874
100%		+50	28	4.874
85%	4.7	+20	29	5.048
115%	5.3	+20	31	5.396

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 μ H/50 Ω line impedance stabilization network (LISN).

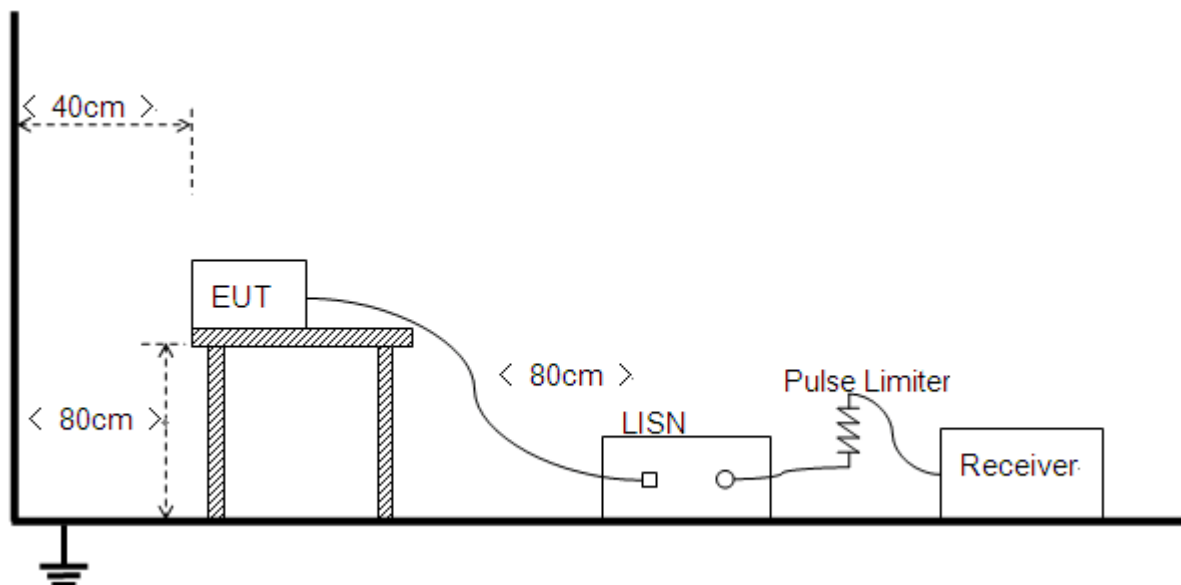
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

Note:

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

2.7.2. Test Description

Test Setup:



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



2.7.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test Setup:

Test Mode: EUT+ADAPTER + WIFI TX

Test Voltage: AC 120V/60Hz

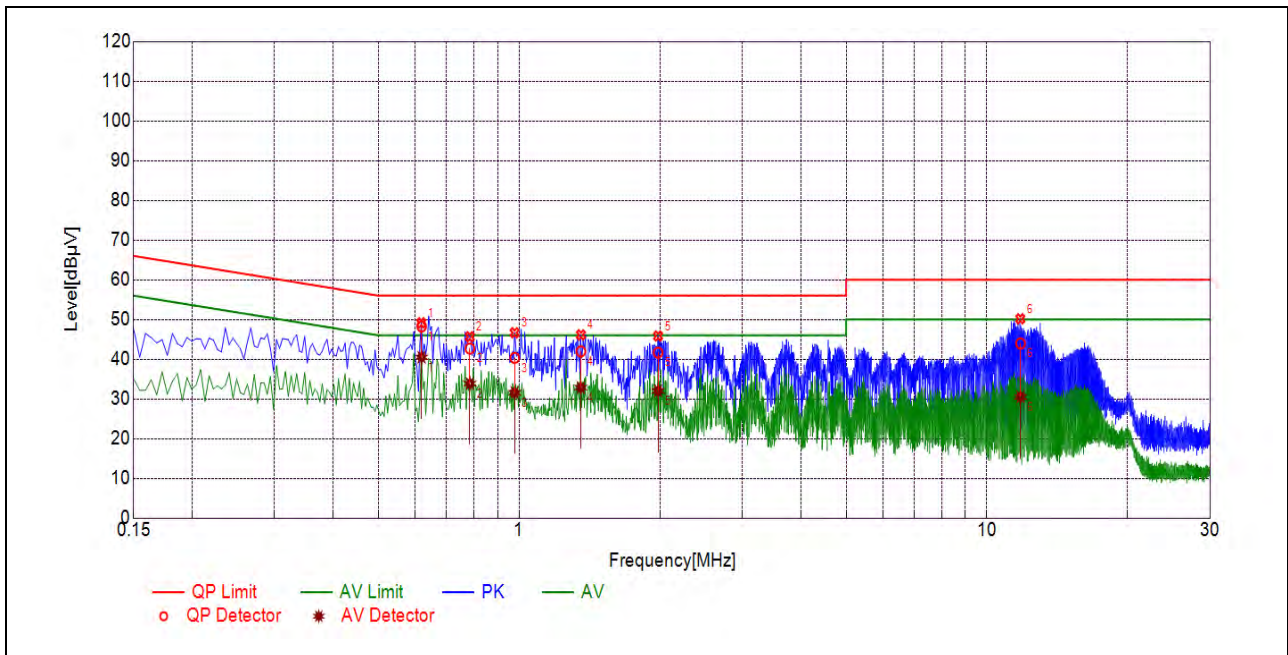
The measurement results are obtained as below:

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

U_R : Receiver Reading

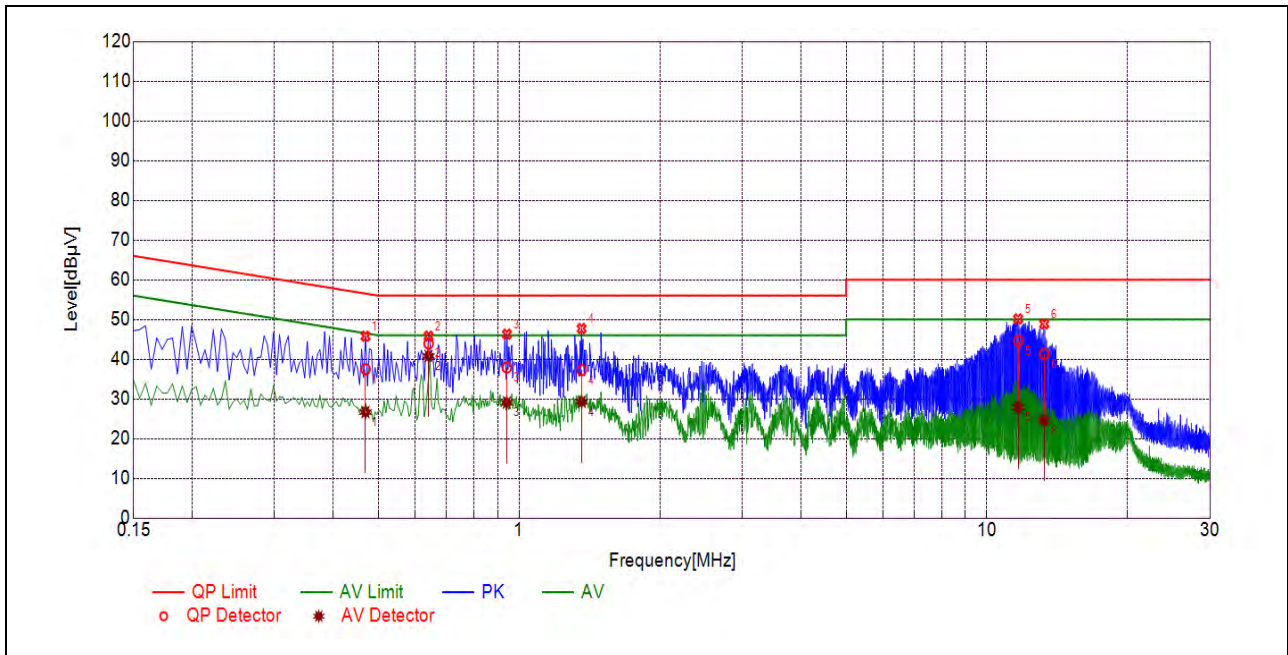
A_{Factor} : Voltage division factor of LISN

B.Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.6186	48.26	40.50	56.00	46.00	Line	PASS
2	0.7847	42.69	33.86	56.00	46.00		PASS
3	0.9782	40.33	31.58	56.00	46.00		PASS
4	1.3552	41.97	32.85	56.00	46.00		PASS
5	1.9818	41.66	32.04	56.00	46.00		PASS
6	11.7978	43.97	30.49	60.00	50.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.4695	37.45	26.70	56.52	46.52	Neutral	PASS
2	0.6402	43.96	40.81	56.00	46.00		PASS
3	0.9412	37.90	29.08	56.00	46.00		PASS
4	1.3608	37.24	29.31	56.00	46.00		PASS
5	11.6721	44.65	27.93	60.00	50.00		PASS
6	13.2567	41.34	24.62	60.00	50.00		PASS

2.8. Restricted Frequency Bands

2.8.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

The following formula is used to convert the equipment isotropic radiated power(e.i.r.p.) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \mu\text{V/m}$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

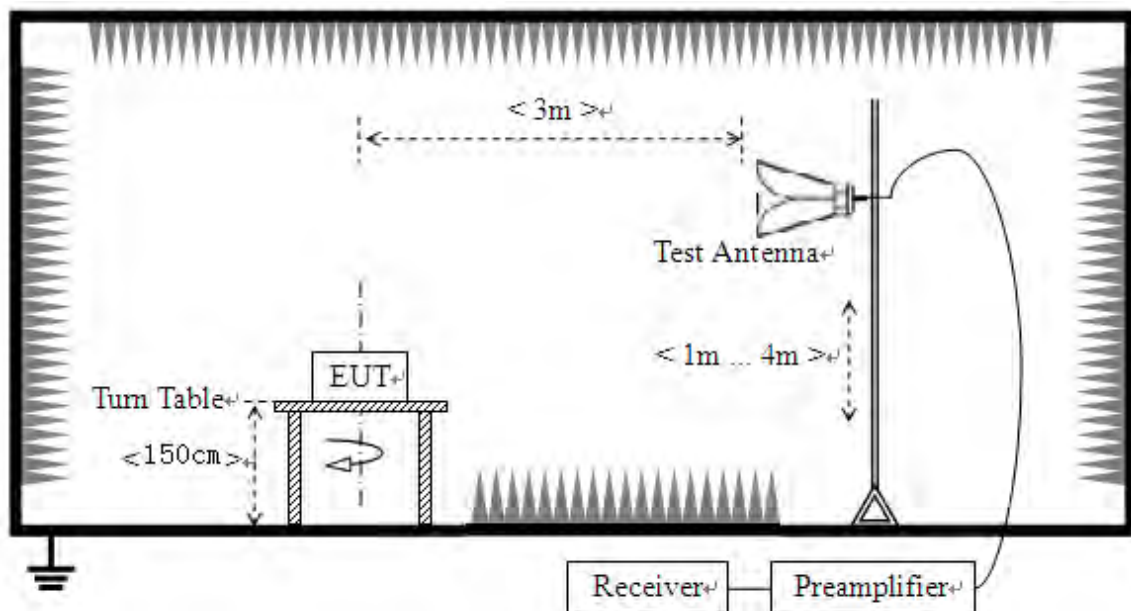
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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. 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).

2.8.2.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.

KDB 789033 Section H) 3)5)6(d)) was used in order to prove compliance

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 Result

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

The measurement results are obtained as below:

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

A_T : Total correction Factor except Antenna; U_R : Receiver Reading

G_{preamp} : Preamplifier Gain; A_{Factor} : Antenna Factor at 3m

Note 1: 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.

Note 2 All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.

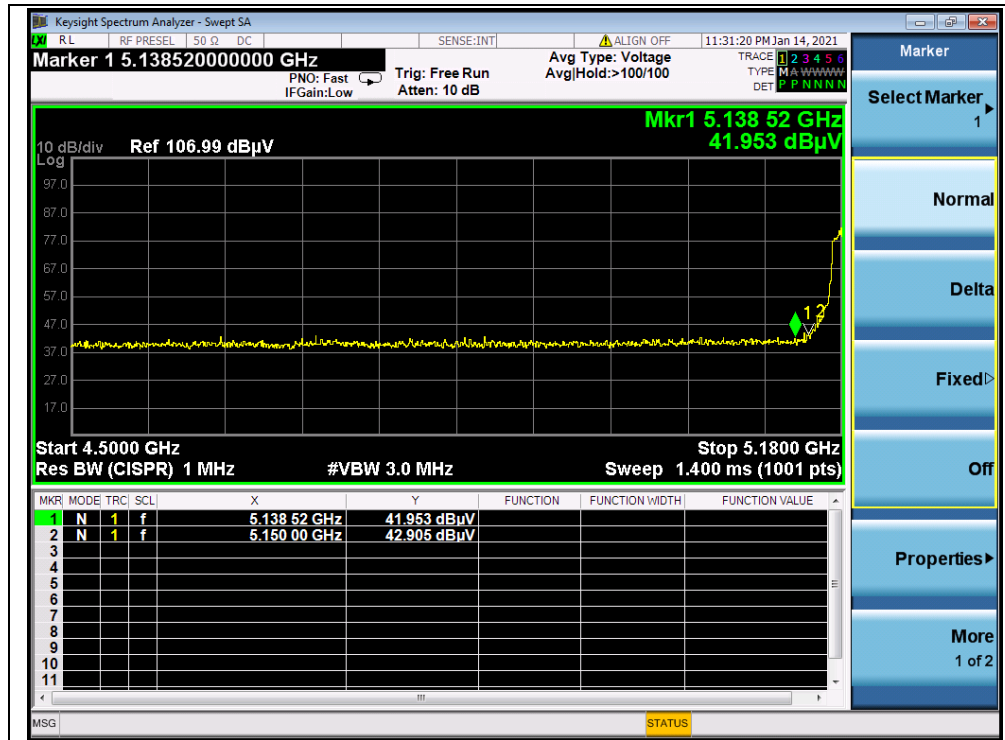
802.11a Mode

A.Test Verdict:

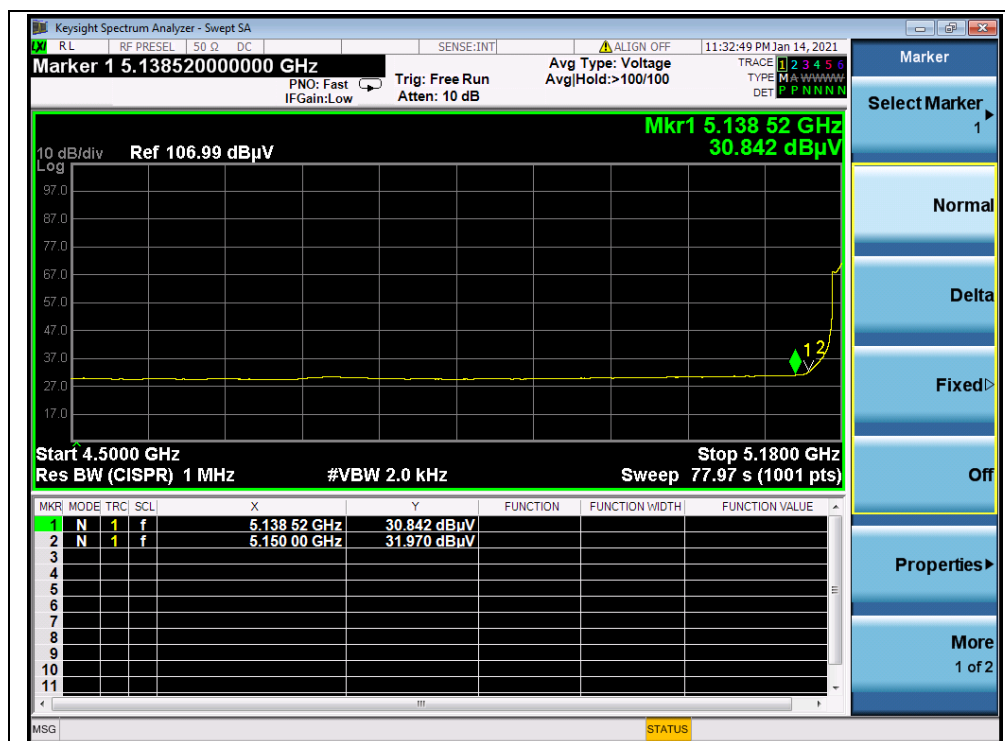
Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dB μ V)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
36	5150.00	PK	42.91	-16.92	32.20	58.19	74	PASS
36	5150.00	AV	31.97	-16.92	32.20	47.25	54	PASS
48	5357.04	PK	39.52	-16.92	32.20	54.80	74	PASS
48	5350.00	AV	28.35	-16.92	32.20	43.63	54	PASS
149	5725.00	PK	49.95	-16.23	32.20	65.92	122.23	PASS
165	5850.00	PK	41.01	-16.23	32.20	56.98	122.23	PASS



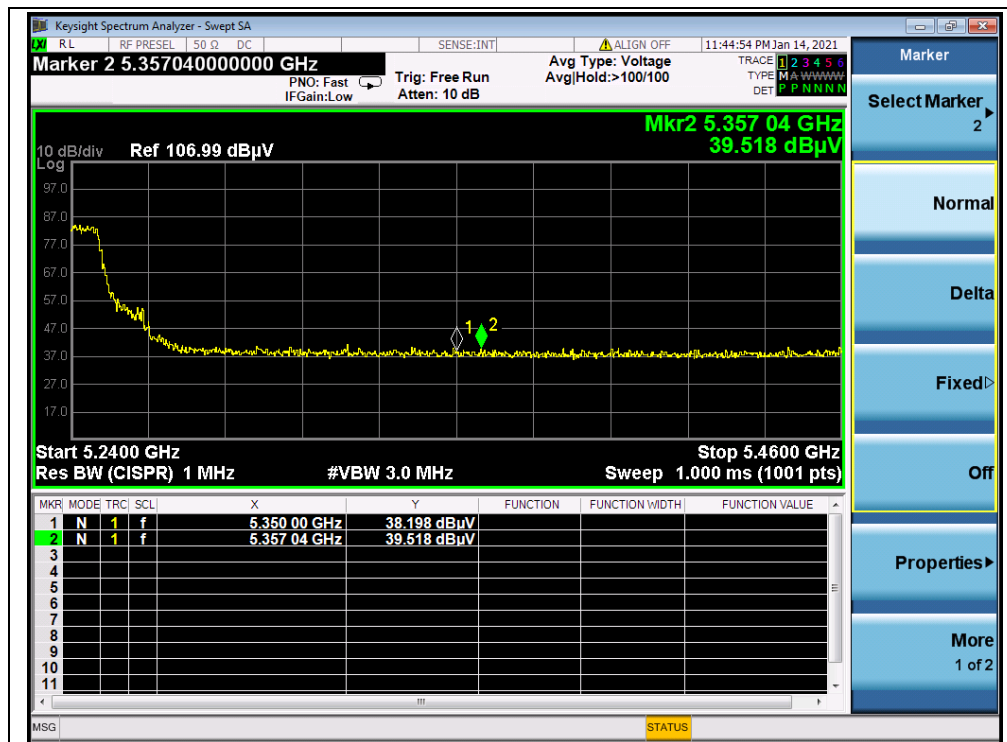
B.Test Plot:



(PEAK, Channel 36, 802.11a)



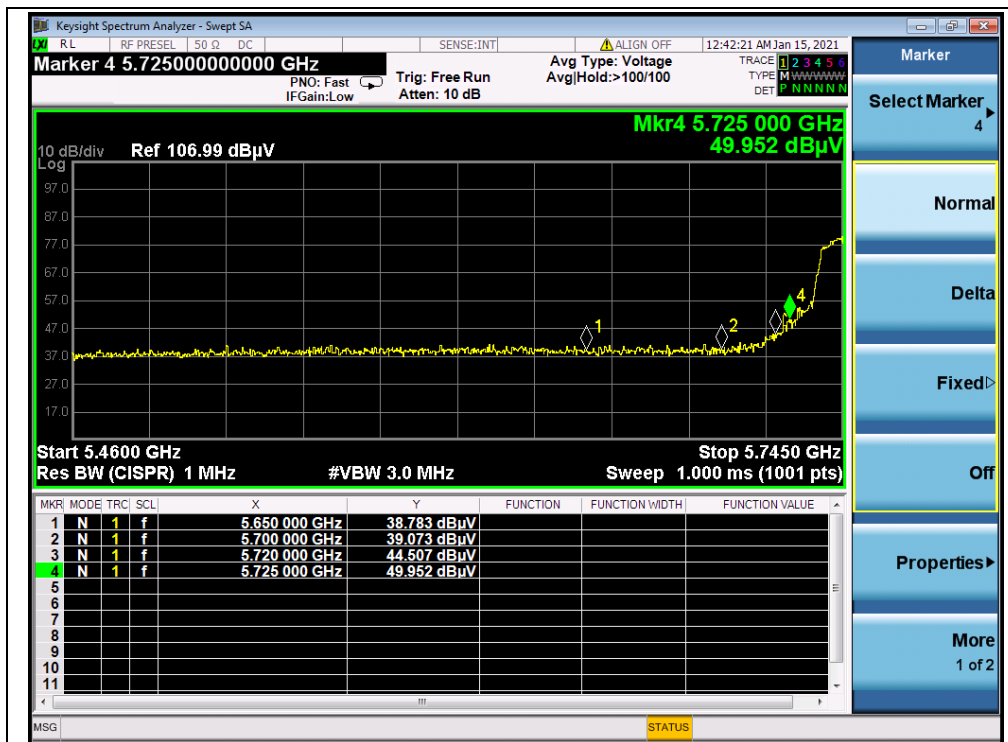
(AVERAGE, Channel 36, 802.11a)



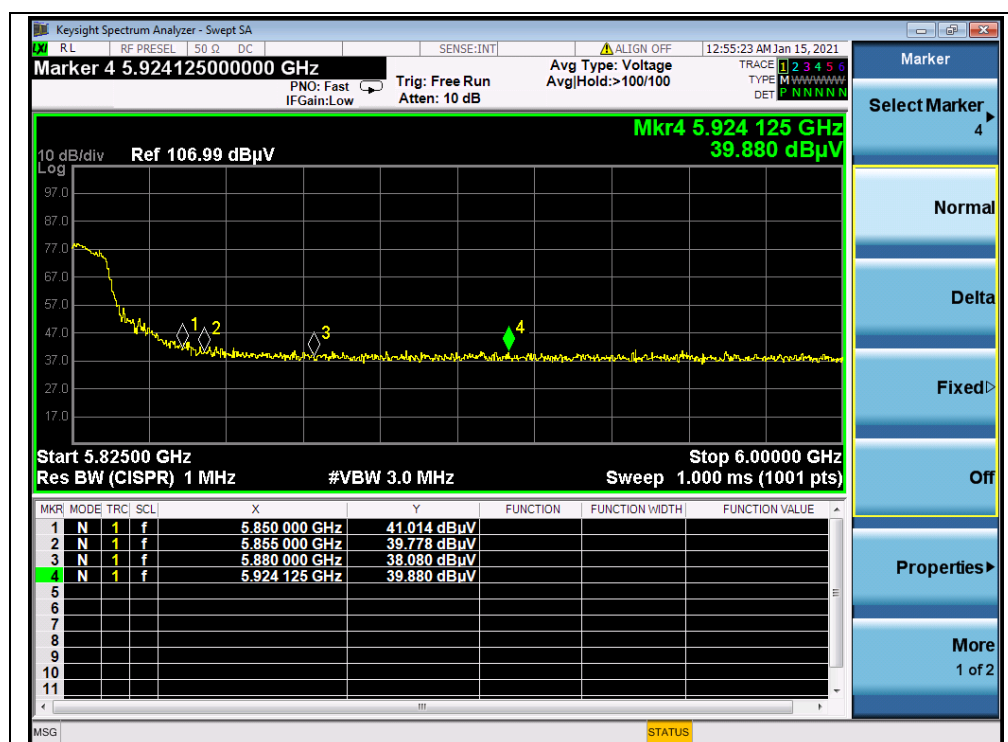
(PEAK, Channel 48, 802.11a)



(AVERAGE, Channel 48, 802.11a)



(PEAK, Channel 149, 802.11a)



(PEAK, Channel 165, 802.11a)

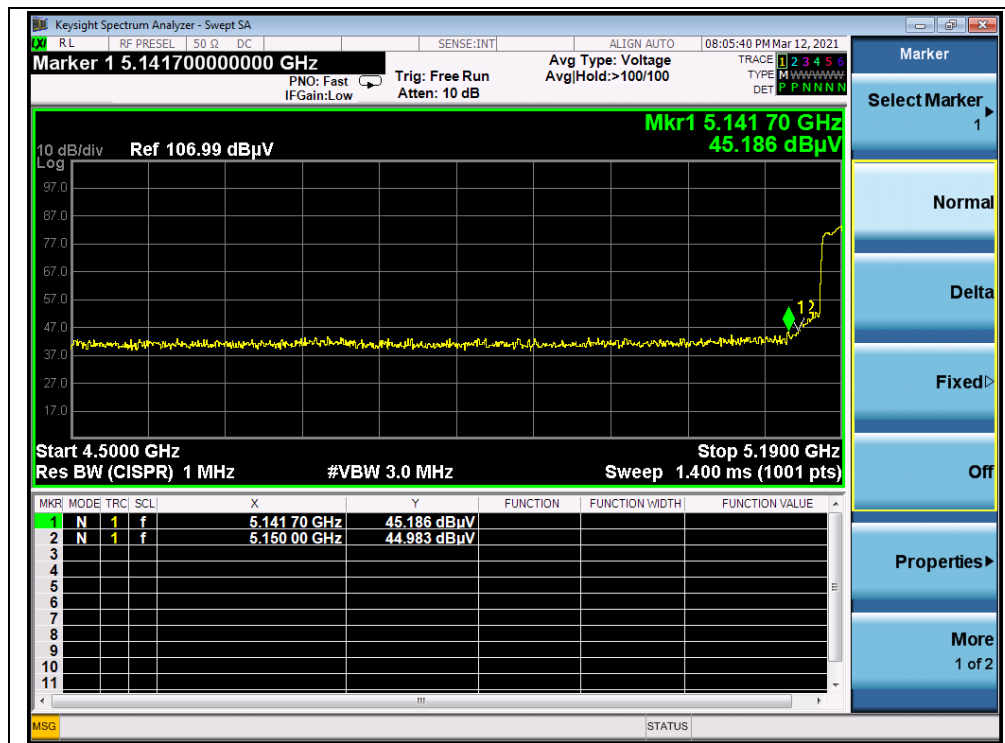


802.11n (HT40) Mode

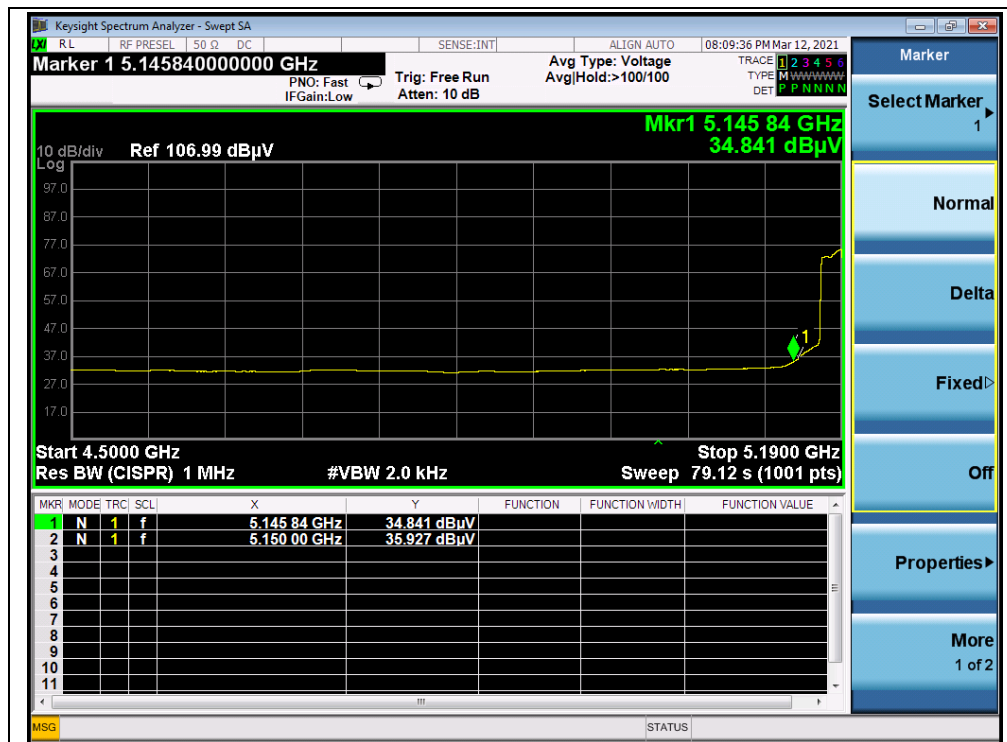
A.Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dB μ V)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
38	5141.70	PK	45.19	-16.92	32.2	60.47	74	PASS
38	5150.00	AV	35.93	-16.92	32.2	51.21	54	PASS
48	5369.15	PK	42.14	-16.92	32.2	57.42	74	PASS
48	5350.29	AV	30.90	-16.92	32.2	46.18	54	PASS
151	5725.00	PK	44.19	-16.23	32.2	60.16	122.23	PASS
159	5855.00	PK	41.54	-16.23	32.2	57.51	122.23	PASS

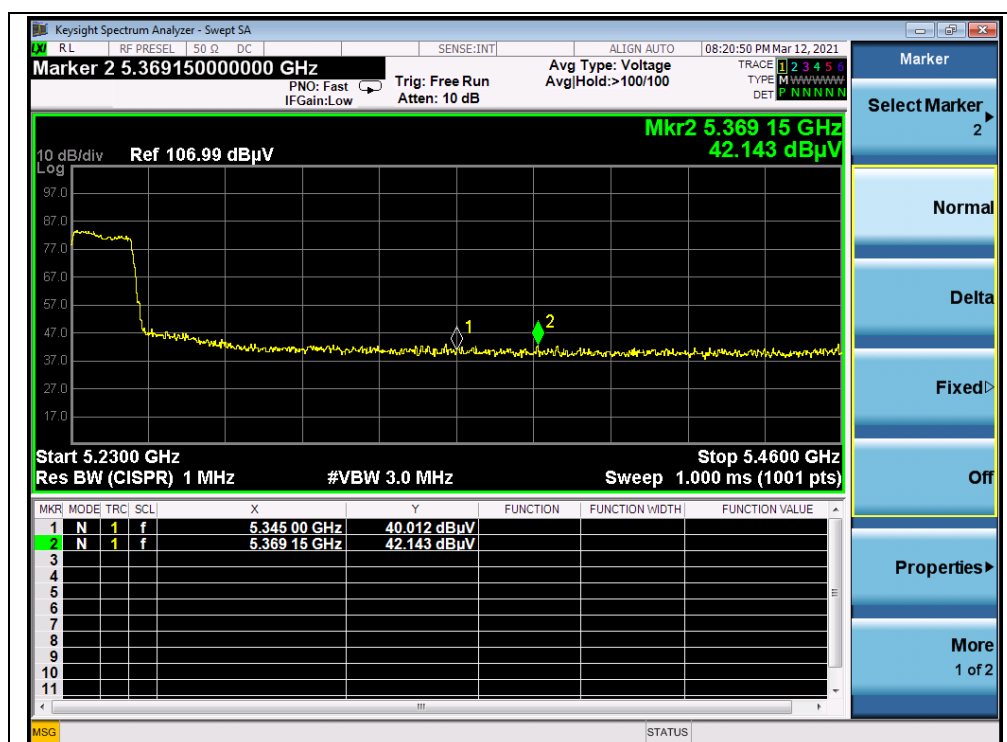
B.Test Plot:



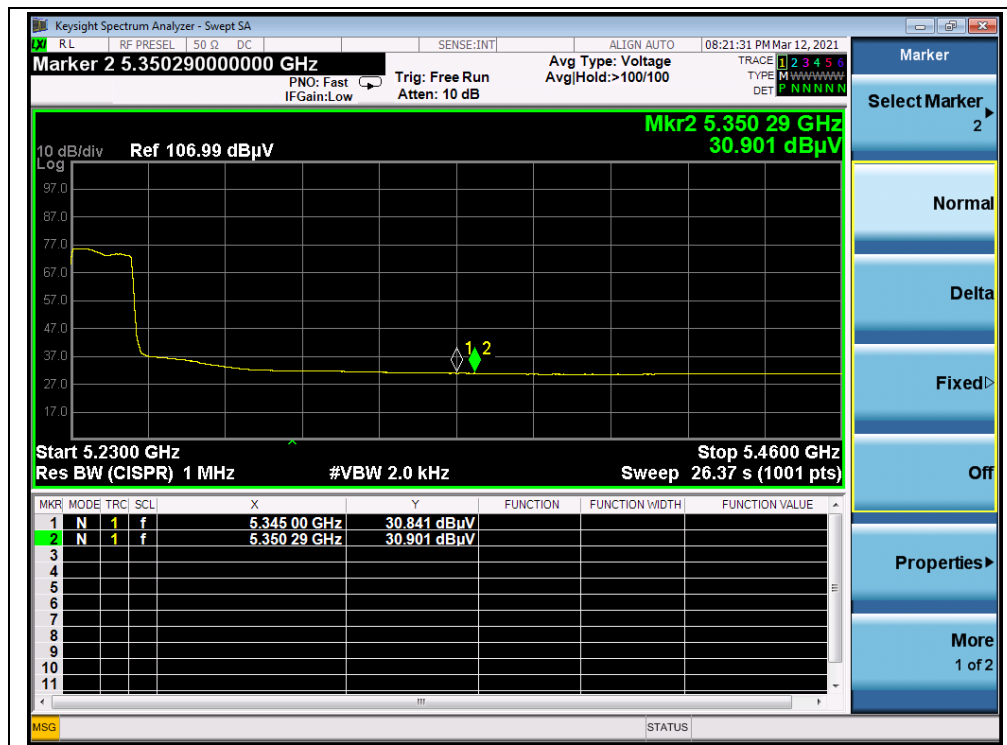
(PEAK, Channel 38, 802.11n (HT40))



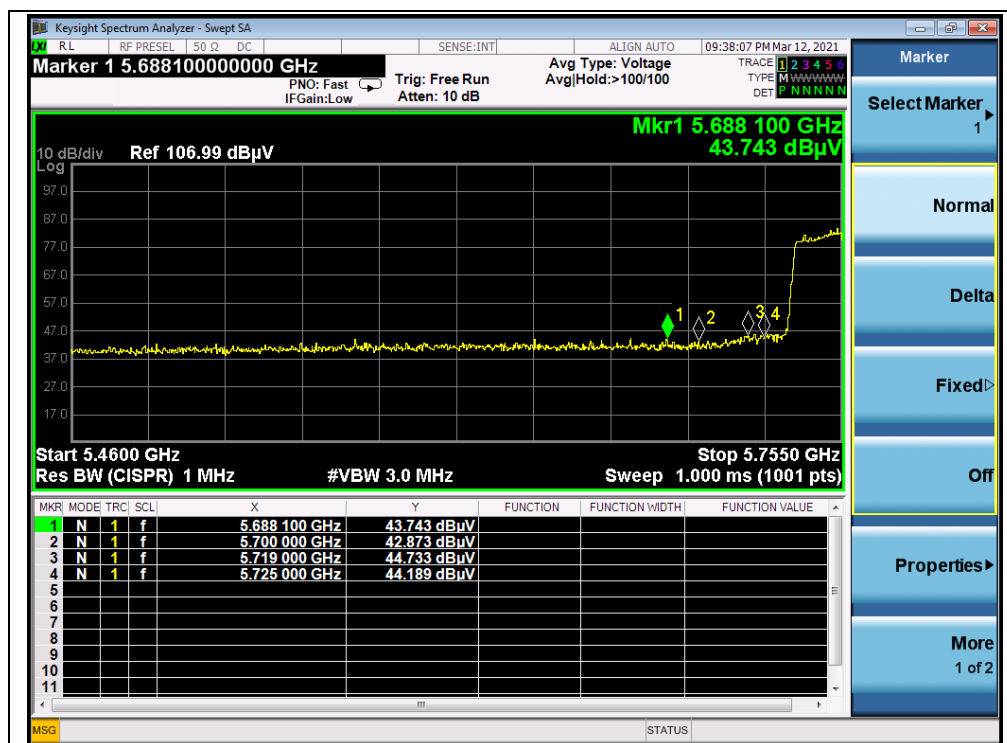
(AVERAGE, Channel 38, 802.11n (HT40))



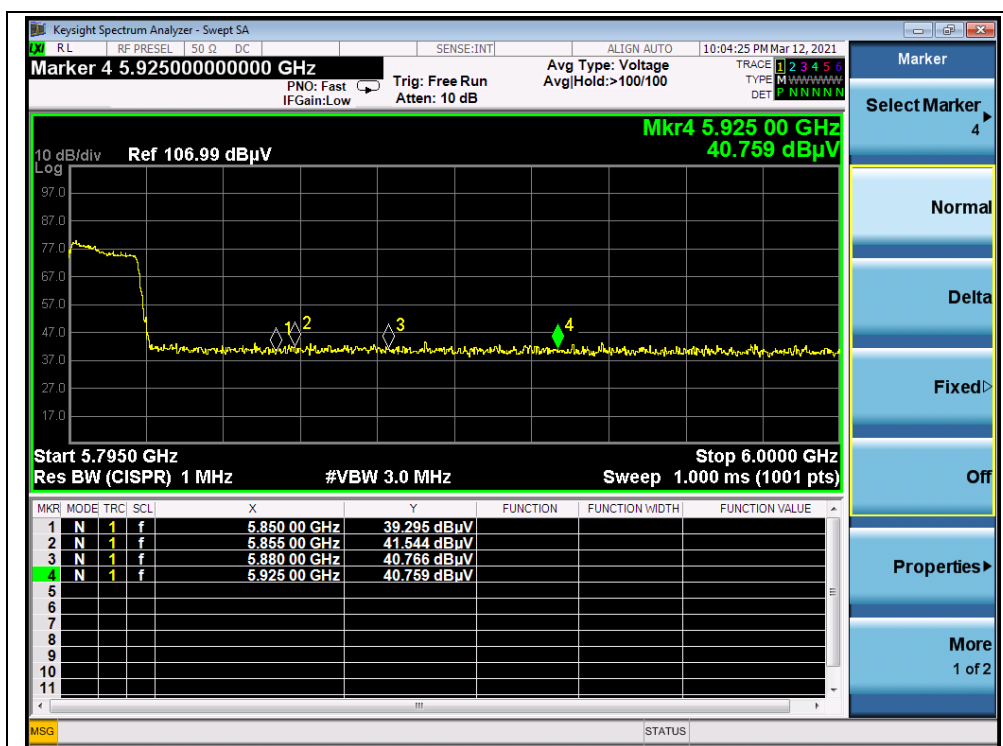
(PEAK, Channel 48, 802.11n (HT40))



(AVERAGE, Channel 48, 802.11n (HT40))



(PEAK, Channel 151, 802.11n (HT40))



(PEAK, Channel 159, 802.11n (HT40))

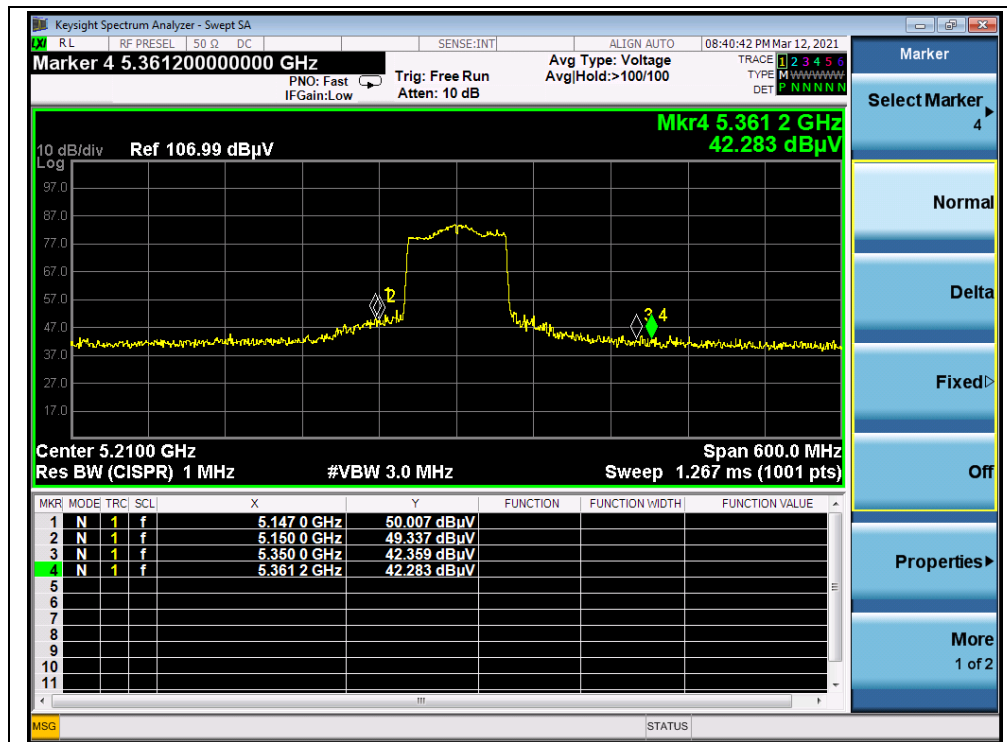


802.11 ac (VHT80) Mode

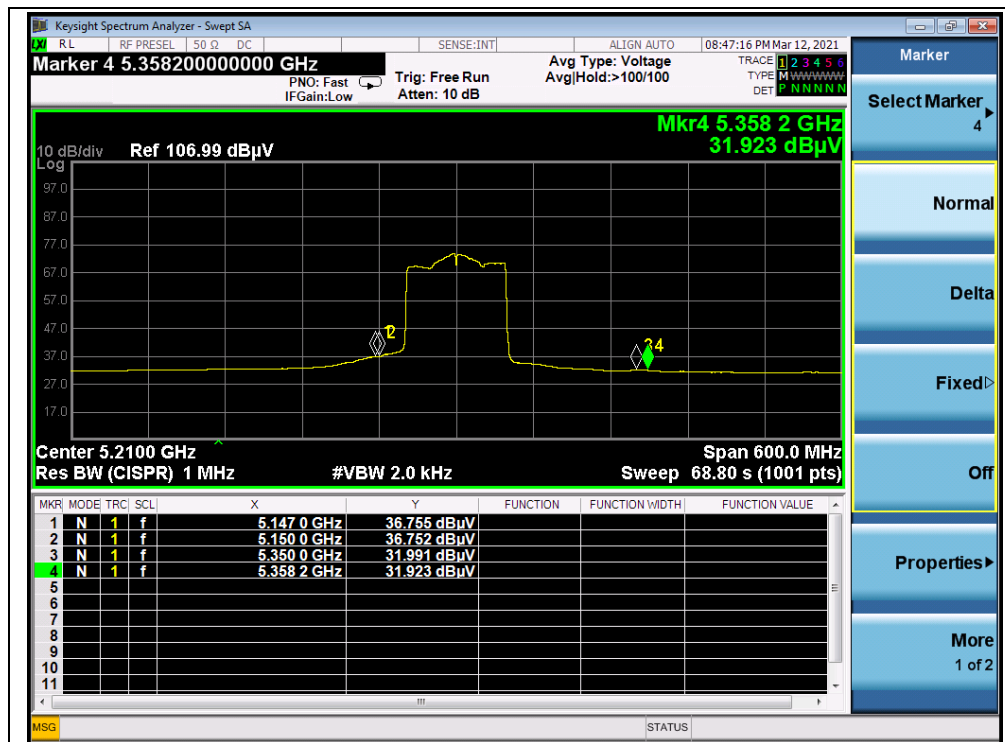
A.Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
42	5147.00	PK	50.01	-16.92	32.20	65.29	74	PASS
42	5147.00	AV	36.76	-16.92	32.20	52.04	54	PASS
42	5350.00	PK	42.36	-16.92	32.20	57.64	74	PASS
42	5350.00	AV	31.99	-16.92	32.20	47.27	54	PASS
155	5697.00	PK	44.37	-16.23	32.20	60.34	103.01	PASS
155	5850.00	PK	42.74	-16.23	32.20	58.71	122.23	PASS

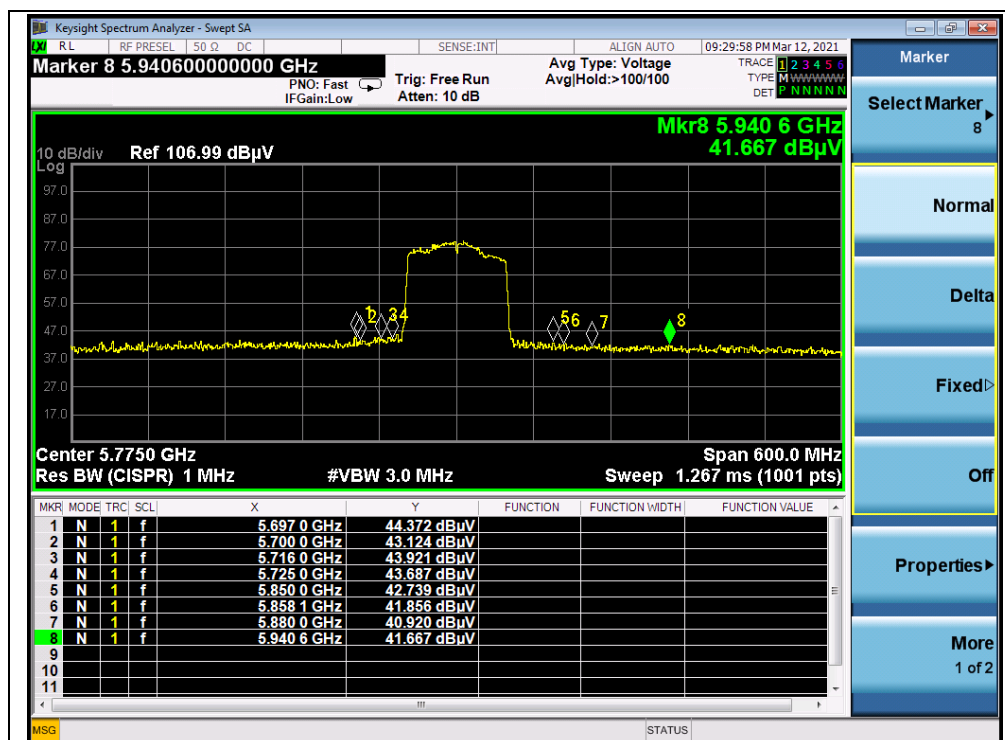
B.Test Plot:



(Channel 42, PEAK, 802.11ac (VHT80))



(Channel 42, AVG, 802.11ac (VHT80))



(Channel 155, PEAK, 802.11ac (VHT80))

2.9. Radiated Emission

2.9.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

The following formula is used to convert the equipment isotropic radiated power(e.i.r.p.) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \mu\text{V/m}$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

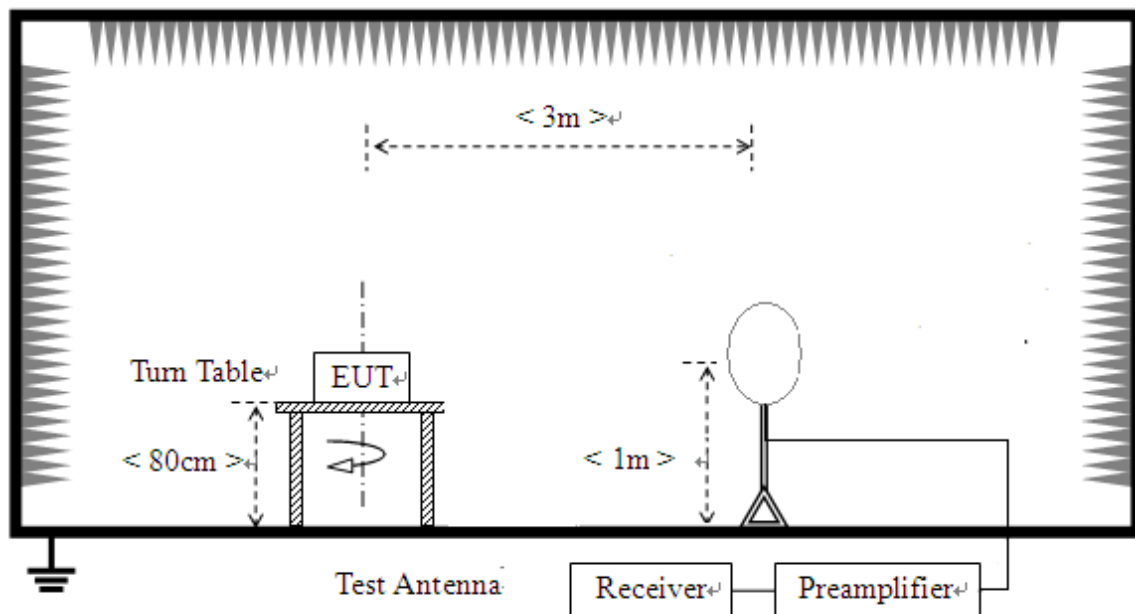
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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

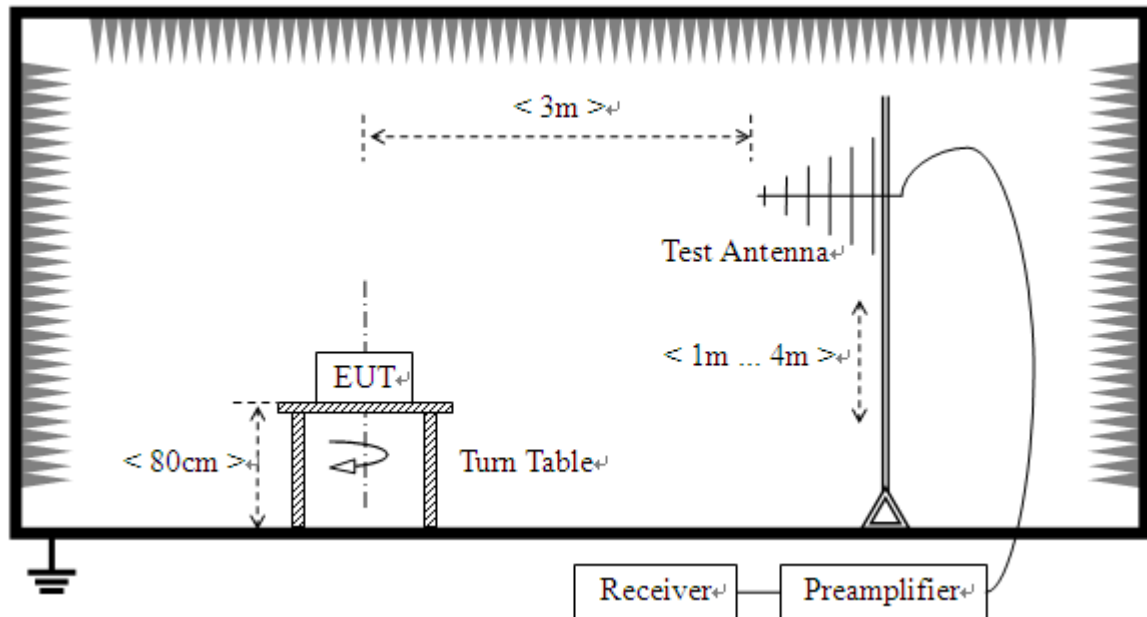
2.9.2. Test Description

Test Setup:

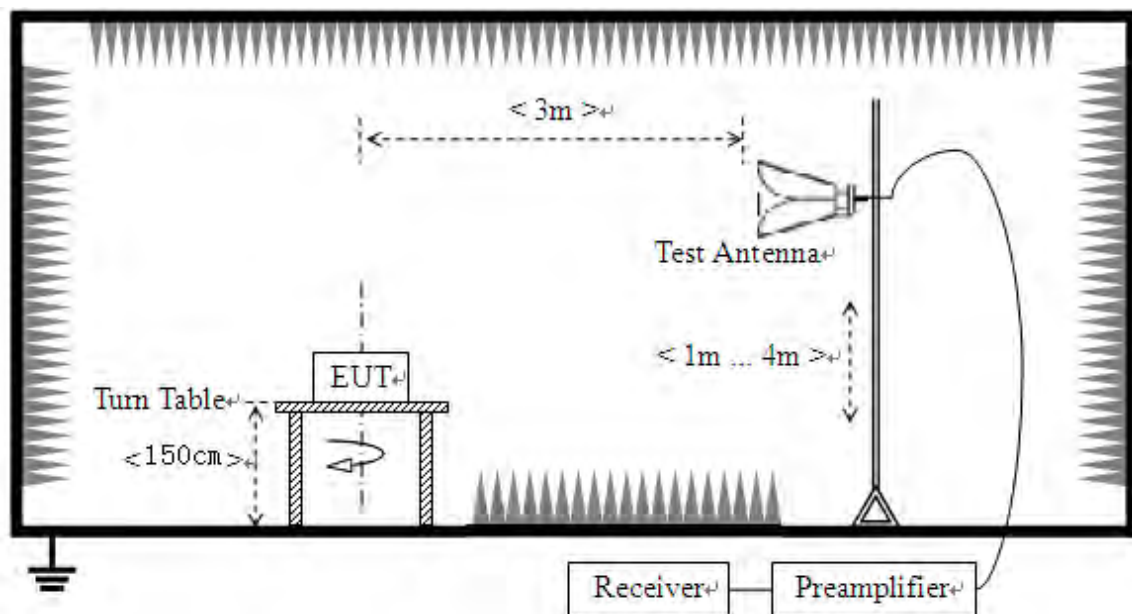
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



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



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

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

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

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

2.9.3.Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

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

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

Note 1: 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.

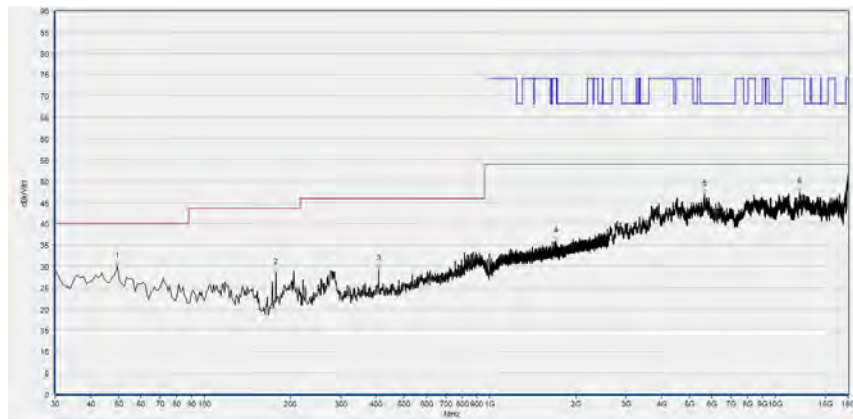
Note 2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note 3: 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.

Note 4: All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.

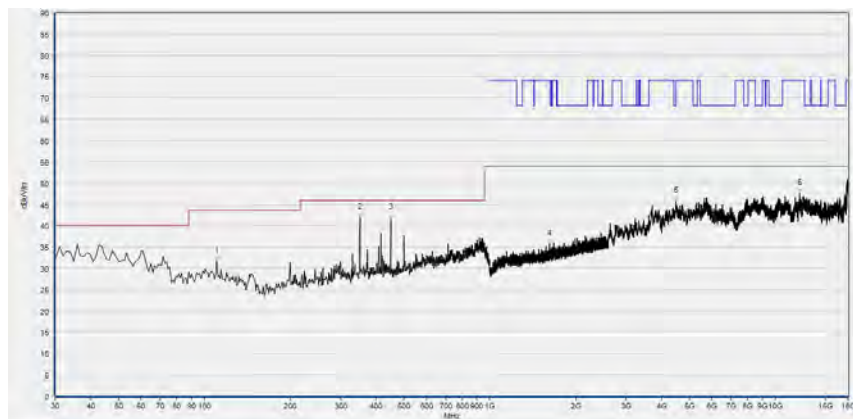
**802.11a Mode**

Plot for Channel 36



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
49.419	29.93	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
177.588	28.55	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
407.708	29.38	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1705.302	35.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5640.568	46.96	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12162.232	47.46	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

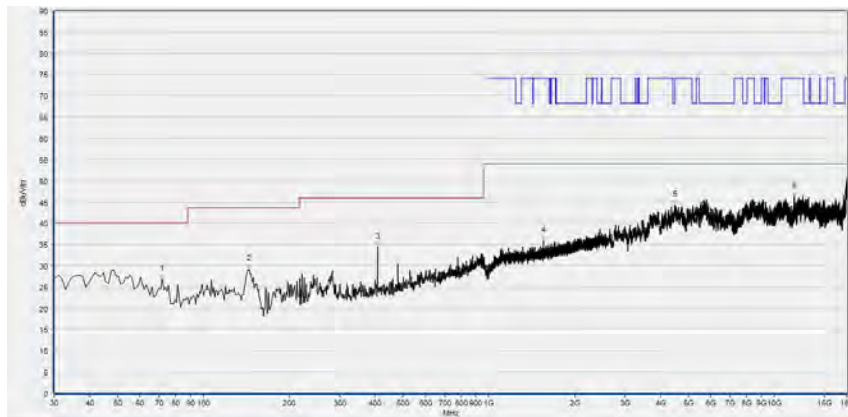


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
110.591	31.65	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
350.420	41.86	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
450.430	41.41	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1616.205	35.65	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4494.579	45.68	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12196.119	47.65	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

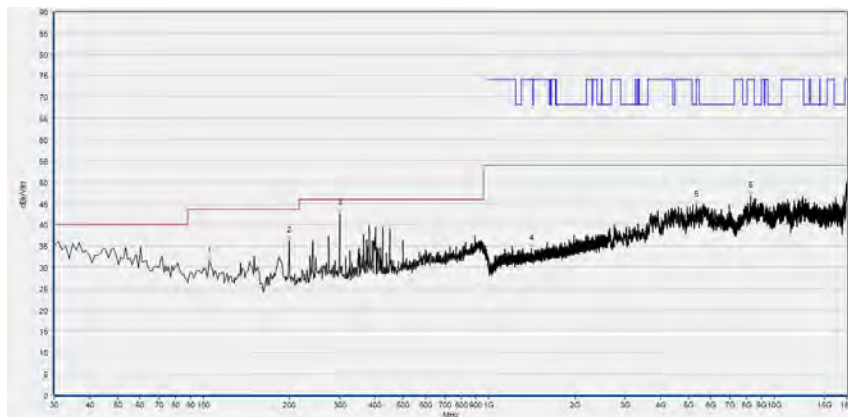


Plot for Channel 44



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
71.752	26.82	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
144.575	29.24	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
407.708	34.44	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1556.452	35.83	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4488.418	44.23	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
11724.785	46.25	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

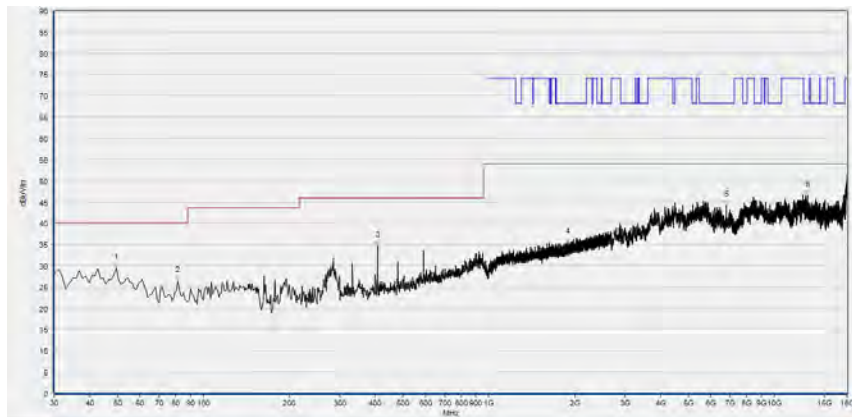
(Antenna Horizontal, 30MHz to 18GHz)



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
104.765	31.31	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
199.920	36.23	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
299.930	42.59	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1410.270	34.36	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5332.507	44.64	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8256.011	46.69	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

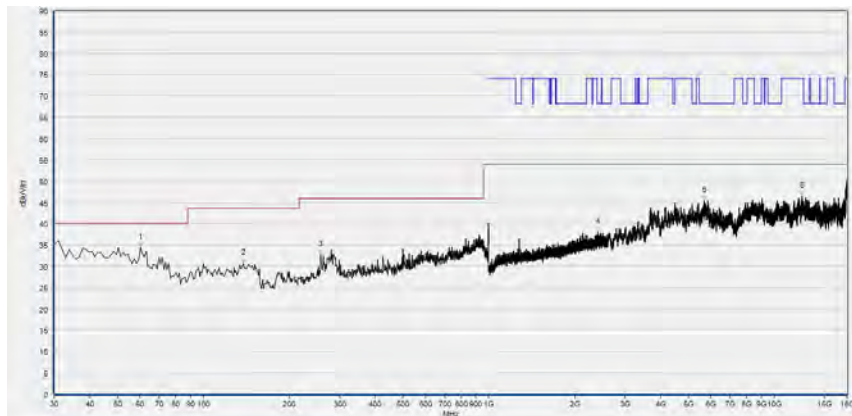
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 48



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
49.419	29.55	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
81.461	26.47	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
407.708	34.65	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1895.232	35.59	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
6805.041	44.21	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
13074.095	46.52	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

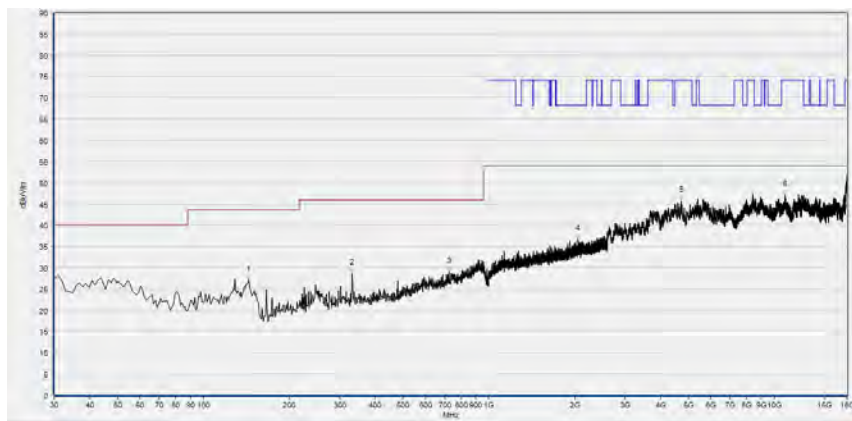
(Antenna Horizontal, 30MHz to 18GHz)



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
60.100	34.38	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
137.778	30.72	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
258.178	32.70	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2410.070	38.13	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5671.374	45.40	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12550.390	46.38	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

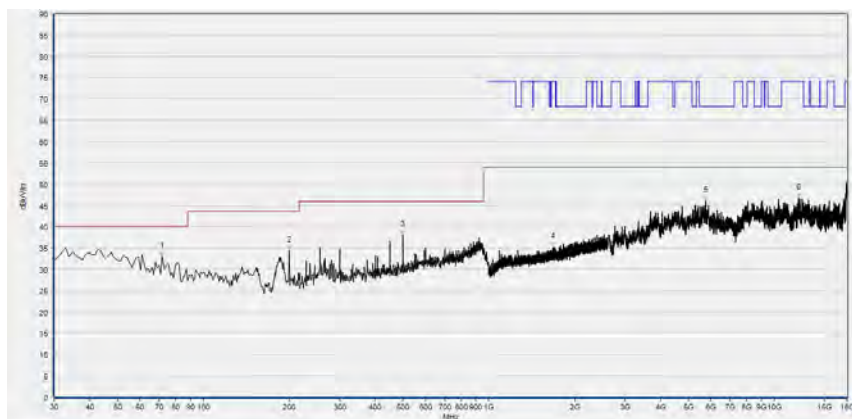
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 149



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
143.604	27.08	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
331.972	28.67	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
725.215	28.95	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2055.285	36.66	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
4716.383	45.74	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10933.067	47.07	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

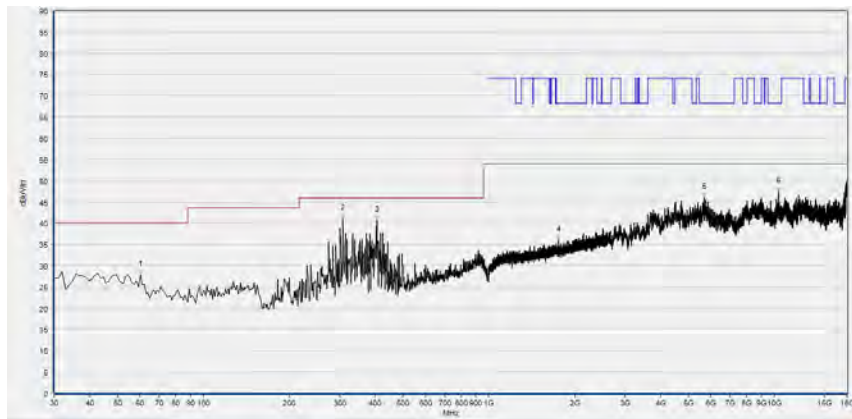
(Antenna Horizontal, 30MHz to 18GHz)



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
71.752	33.07	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
199.920	34.34	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
499.950	38.07	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1672.224	35.21	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5766.873	46.11	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12196.119	46.76	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

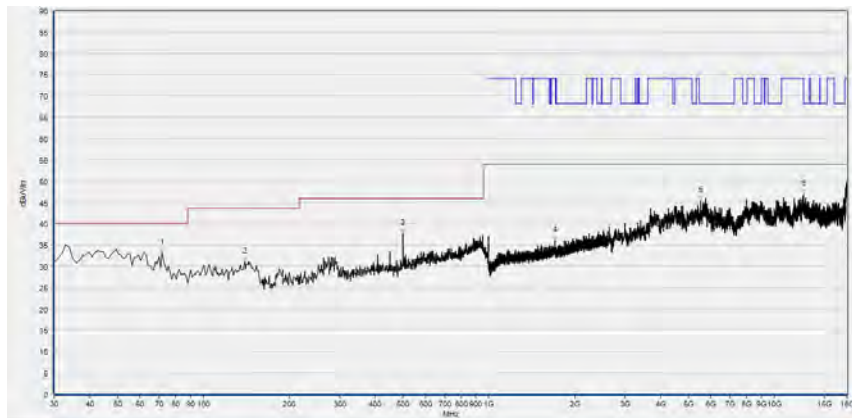
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 157



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
60.100	27.85	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
308.669	41.00	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
404.795	40.78	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1758.119	35.95	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5674.455	46.03	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
10372.394	47.35	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

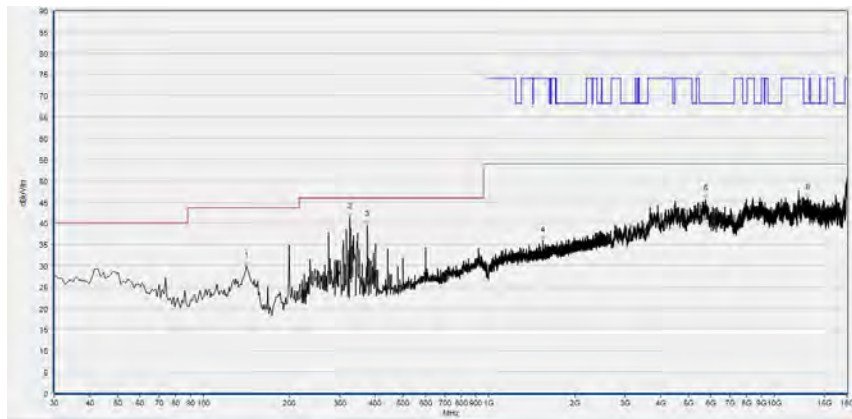
(Antenna Horizontal, 30MHz to 18GHz)



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
71.752	33.27	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
139.720	30.93	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
499.950	37.73	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1704.235	36.09	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5529.666	45.35	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12679.776	46.87	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

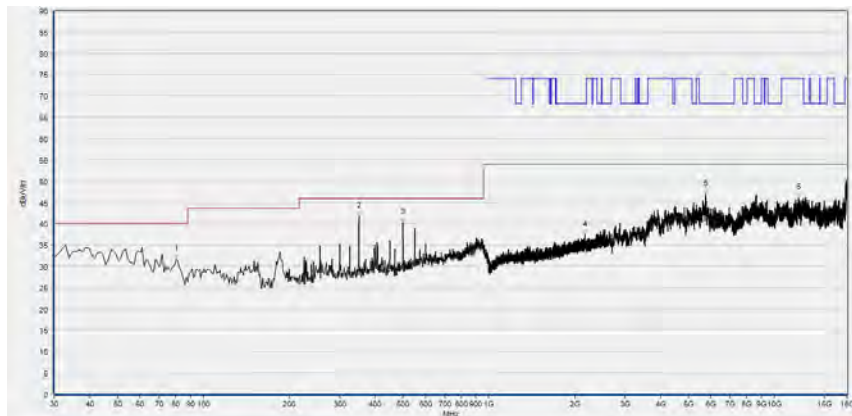
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 165



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
141.662	29.83	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
325.175	41.37	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
374.695	39.60	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1543.114	35.94	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5751.470	45.65	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
13080.256	45.91	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



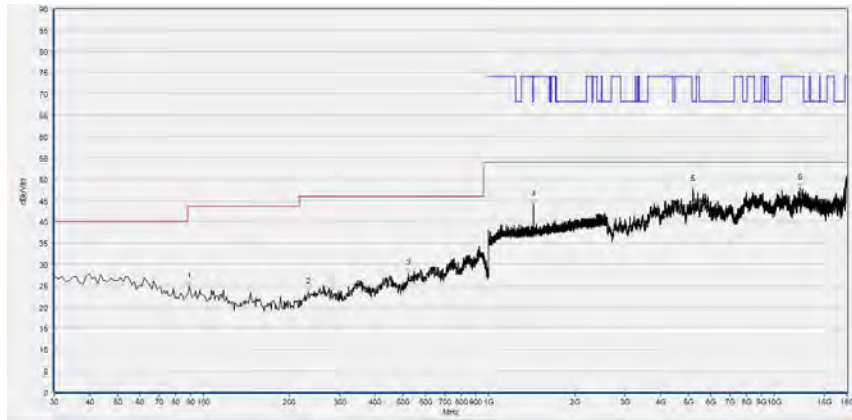
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
80.490	31.76	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
350.420	41.80	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
499.950	40.18	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2175.325	37.42	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5760.712	47.00	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12152.991	46.02	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)



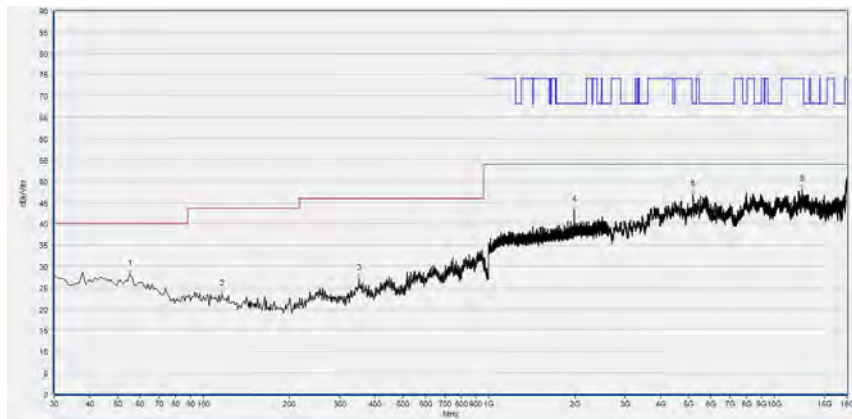
802.11n (HT40) Mode

Plot for Channel 38



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
89.229	24.87	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
232.933	23.52	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
523.253	27.88	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1430.544	44.03	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5190.798	47.59	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12294.699	47.86	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

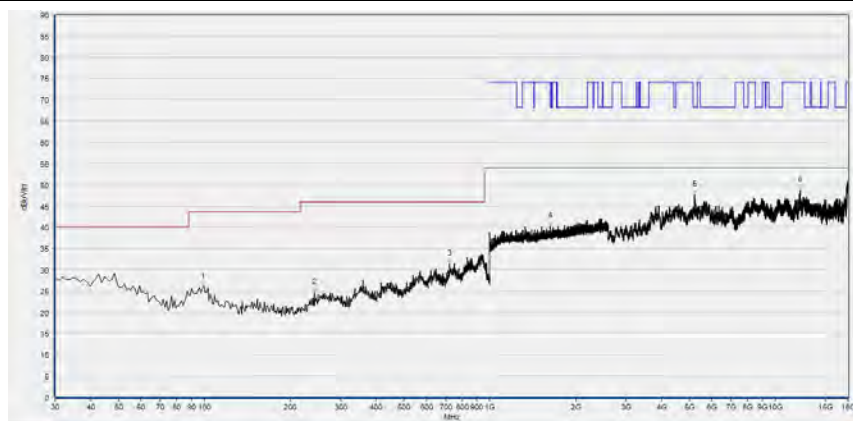
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
55.245	28.16	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
116.416	23.40	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
350.420	27.23	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1993.931	43.17	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5190.798	46.93	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12513.423	48.13	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

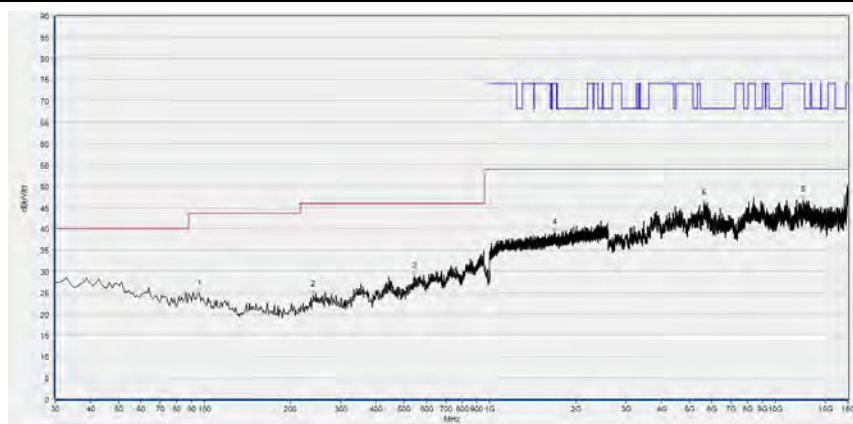
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 46



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
98.939	25.98	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
242.643	24.59	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
724.244	31.38	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1627.943	40.29	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5212.362	47.65	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12214.603	48.56	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

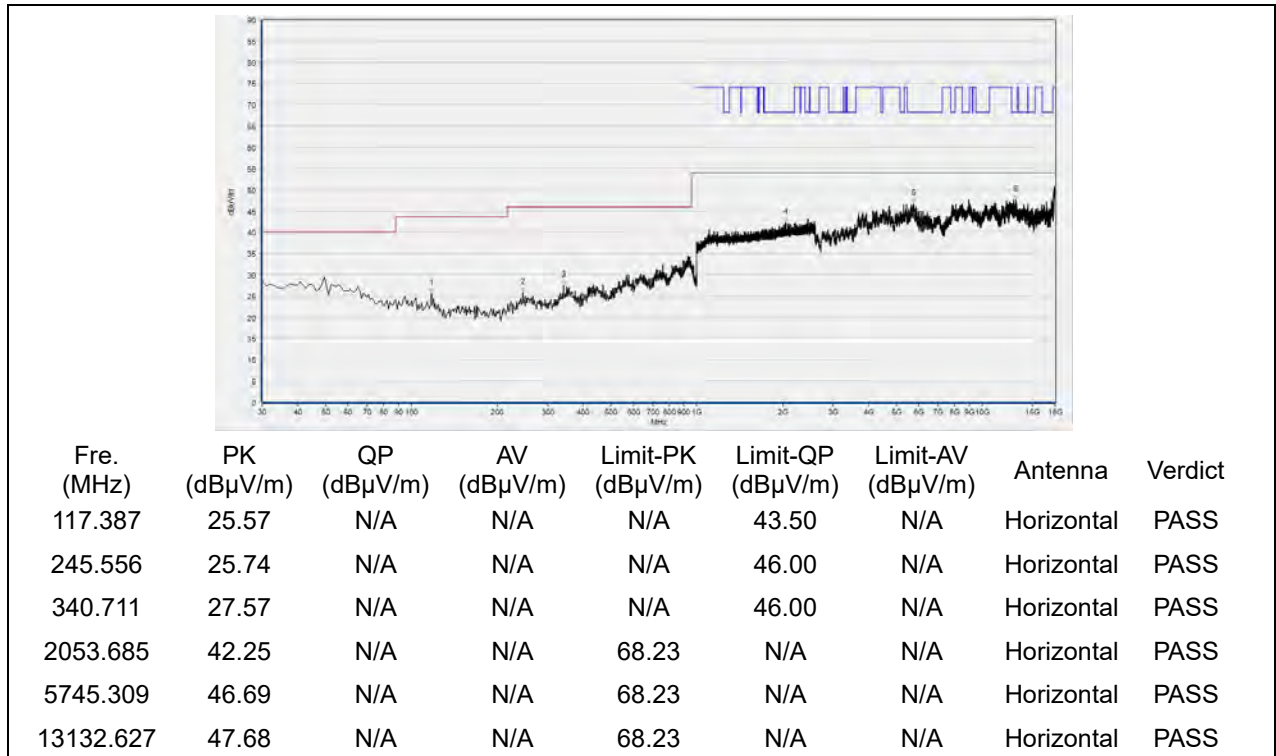
(Antenna Horizontal, 30MHz to 18GHz)



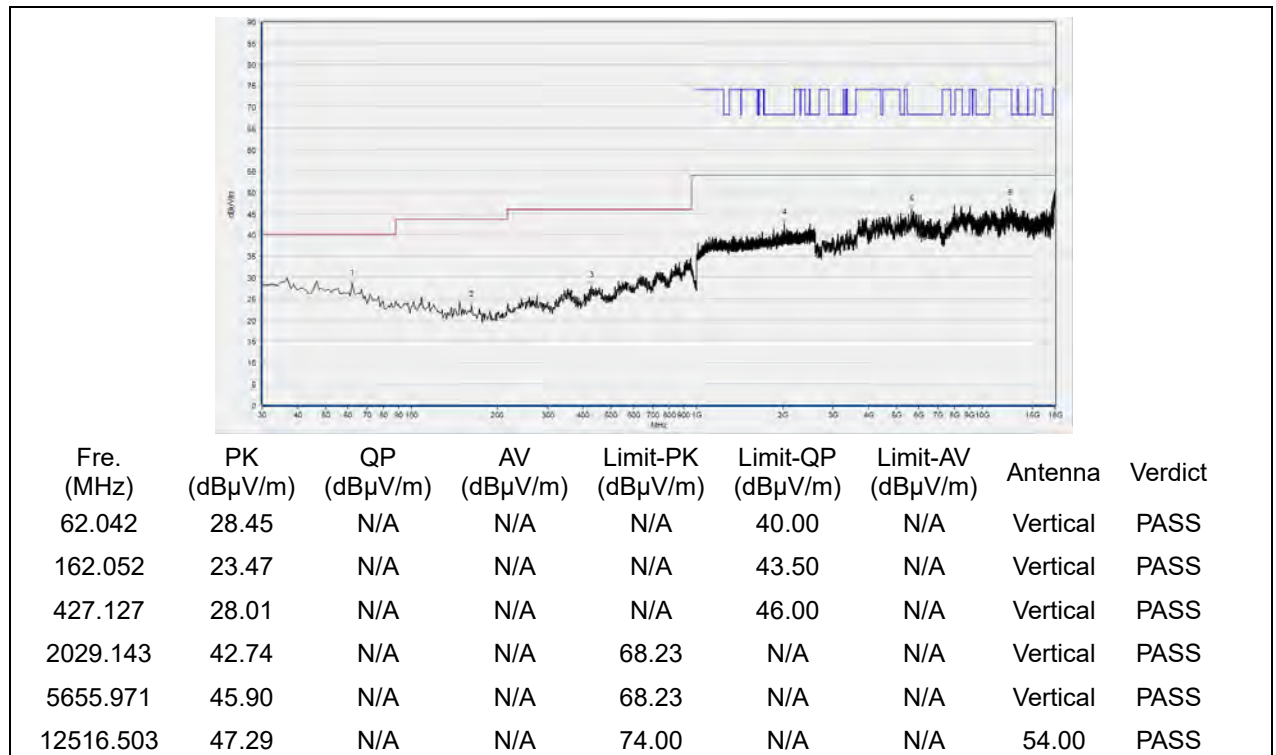
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.026	24.87	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
240.701	24.42	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
545.586	28.85	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1688.763	39.10	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5609.762	45.84	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12498.020	46.69	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 151

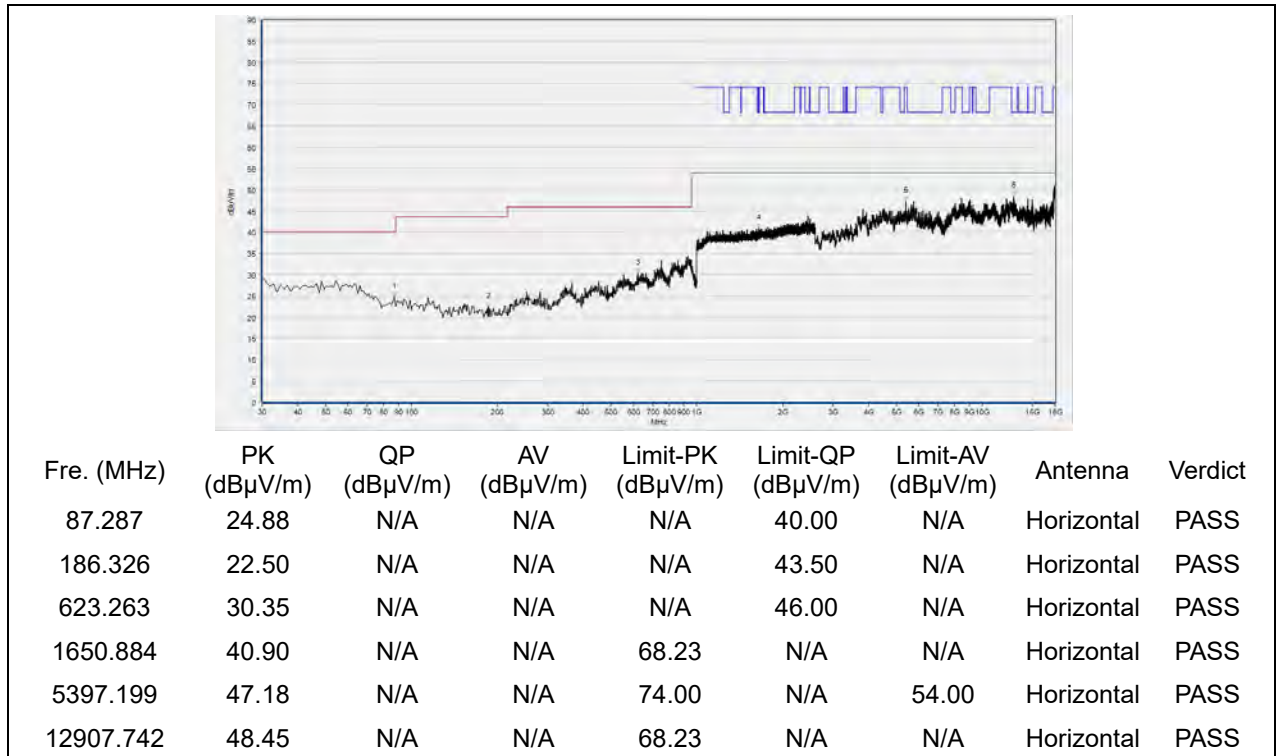


(Antenna Horizontal, 30MHz to 18GHz)

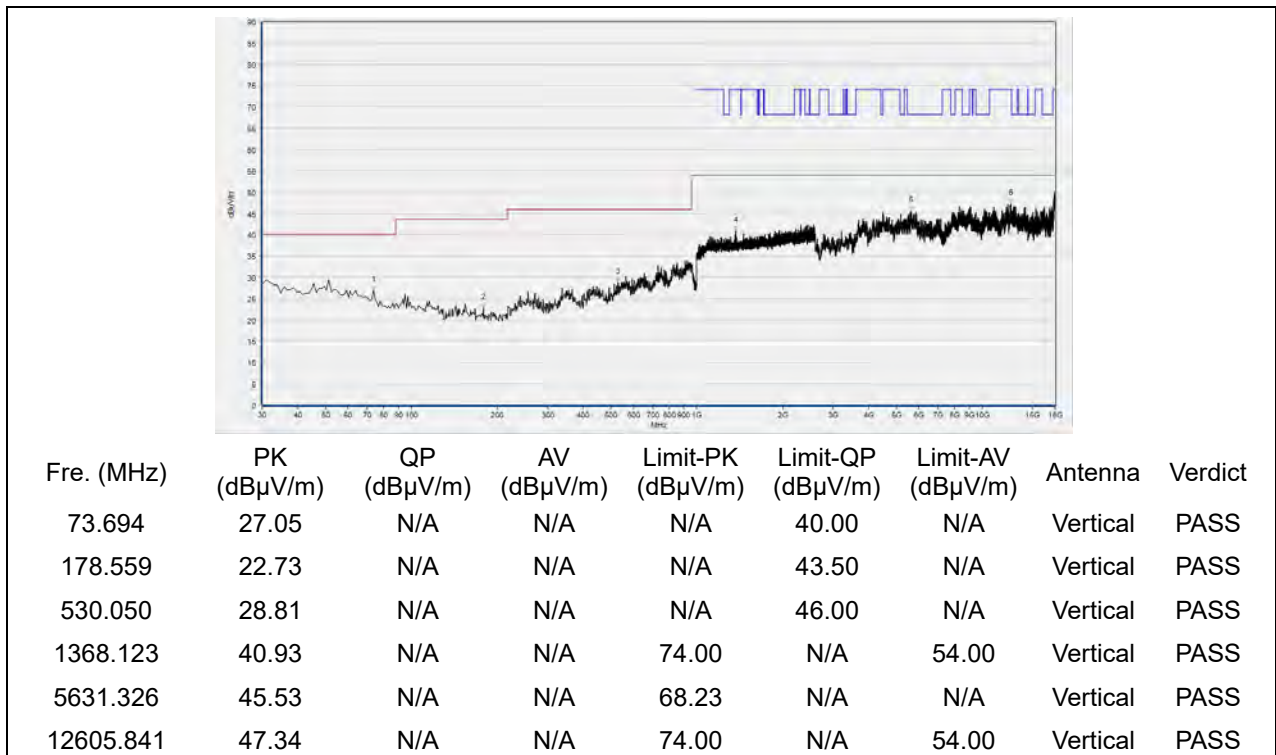


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 159



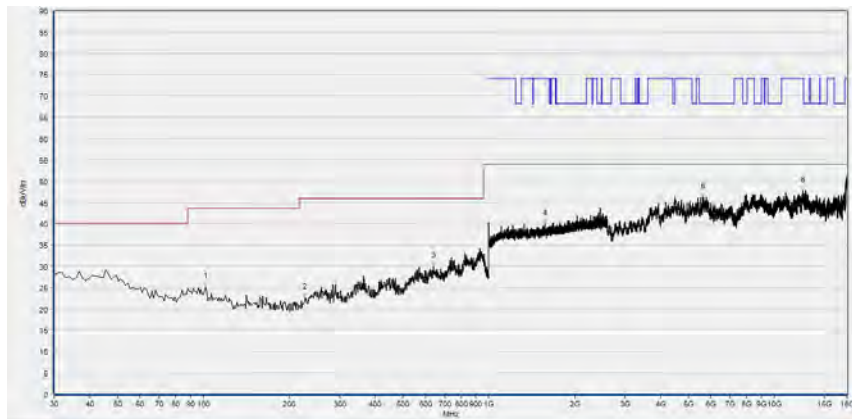
(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)

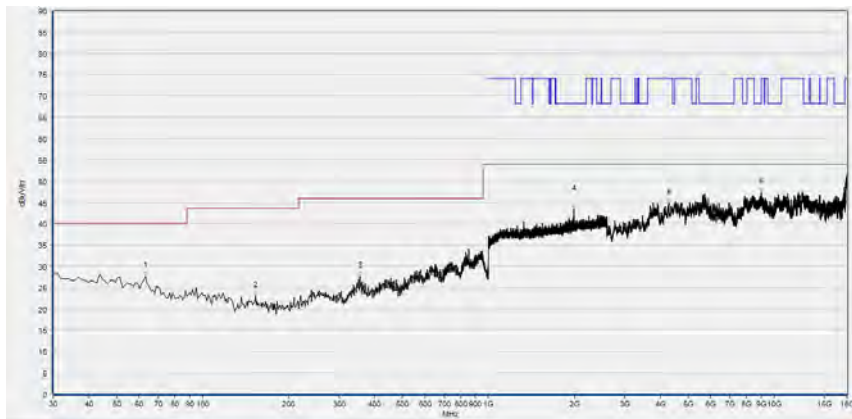
**802.11ac (VHT80) Mode**

Plot for Channel 42



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
101.852	25.13	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
227.107	22.59	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
639.770	29.95	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1569.790	39.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5625.165	46.27	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12602.761	47.75	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

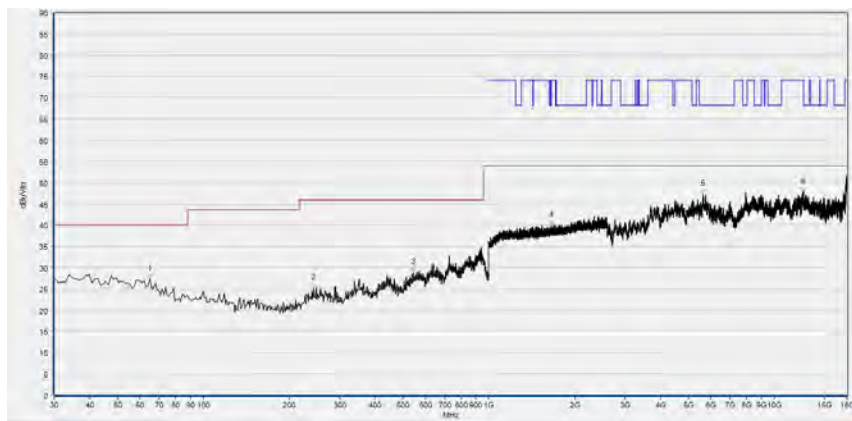
(Antenna Horizontal, 30MHz to 18GHz)



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
63.013	27.59	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
153.313	23.19	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
355.275	27.59	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1992.864	43.33	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
4285.097	44.76	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8995.359	47.36	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

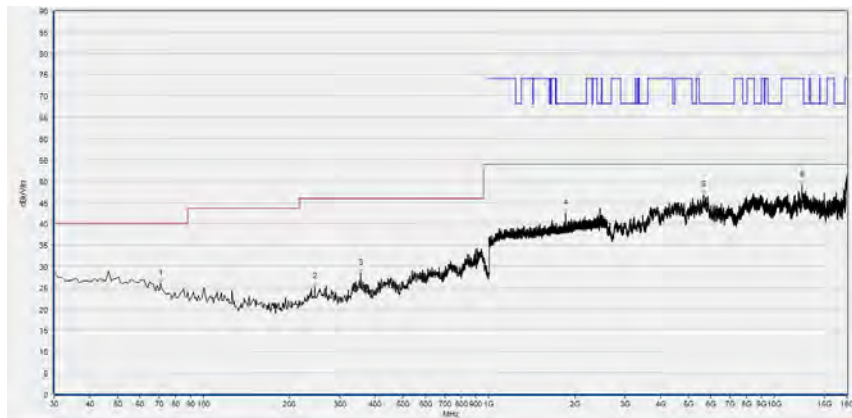
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 155



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
64.955	27.32	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
243.614	25.10	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
544.615	28.79	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1659.420	39.92	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5634.407	47.22	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12612.002	47.83	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
70.781	26.05	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
245.556	25.19	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
356.246	28.37	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1856.285	42.42	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5643.649	46.73	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12516.503	48.97	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

Annex A Test Uncertainty

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

Test items	Uncertainty
Peak Output Power	$\pm 2.22\text{dB}$
Power spectral density (PSD)	$\pm 2.22\text{dB}$
Bandwidth	$\pm 5\%$
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

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

2. Identification of the Responsible Testing Location

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

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.



4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Attenuator 1	N/A	10dB	Resnet	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
Temperature Chamber	12108015	DTL-003S101	YOMA	2020.10.26	2021.10.25

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

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	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 - Horn	BBHA9170 #774	BBHA 9170	Schwarzbeck	2019.07.26	2022.07.25
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
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
26-40GHz pre-Amplifier	56774	S40M400L4 002	Tonscend	2020.07.21	2021.07.20
18-26.5GHz pre-Amplifier	46732	S10M100L38 02	Tonscend	2020.07.21	2021.07.20
Notch Filter	N/A	WRCG-5150-5350	Wainwright	2020.07.21	2021.07.20
Notch Filter	N/A	WRCG-5470-5725	Wainwright	2020.07.21	2021.07.20
Notch Filter	N/A	WRCG-5725-5850	Wainwright	2020.07.21	2021.07.20



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Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

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