TEST REPORT

APPLICANT	:	Stellar Vision Operations Pty Ltd
PRODUCT NAME	:	21.5 inch Full HD LCD POC Terminal
MODEL NAME	:	HC21SV
BRAND NAME	:	Nova
FCC ID	:	2AXYGHC21SV
STANDARD(S)	:	47 CFR Part 15 Subpart E
RECEIPT DATE	:	2020-10-27
TEST DATE	:	2020-11-10 to 2021-03-05
ISSUE DATE	:	2021-03-30

Edited by: Peng Mi (Rapporteur)

Approved by: Peng Huarui (Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2021-03-30	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Stellar Vision Operations Pty Ltd
Applicant Address:	Entertainment Quarter Level 2, Building 215, 122 Lang Road Moore Park, Sydney 2021, Australia
Manufacturer:	Shenzhen Saintway Technology CO., LTD
Manufacturer Address:	8F, Bldg. 1 (3# Elevator), Jia'an Tech Park, Liuxian 1st, Bao'an District, Shenzhen, Guangdong, China

1.2. Equipment Under Test (EUT) Description

Product Name:	21.5 inch Full HD LCD POC Terminal	
Serial No.:	(N/A, marked #1 by test site)	
Hardware Version:	V2.0	
Software Version:	V2.0	
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:	PCB Antenna	
Antenna Gain:	2.6dBi	
Accessory Information:	AC Adapter	
	Brand Name:	WENTONG
	Model No.:	WTA36-1203000-U
	Serial No.:	(N/A, marked #1 by test site)
	Rated Output:	12V⎓3A
	Rated Input:	100-240V~50/60Hz, 1.6A
	Manufacturer:	ShenZhen WenTong Electronic Co.,Ltd.

Note 1: WIFI hotspot does not support U-NII band.

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	Nov 16, 2020	Liu Bo	PASS	No deviation
3	15.407(a)	Maximum Conducted Output Power	Nov 19, 2020	Liu Bo	PASS	No deviation
4	15.407(a)(e)	Emission Bandwidth	Nov 25, 2020	Liu Bo	PASS	No deviation
5	15.407(a)	Peak Power Spectral Density	Nov 16, 2020	Liu Bo	PASS	No deviation
6	15.407(g)	Frequency Stability	Dec 01, 2020	Liu Bo	PASS	No deviation
7	15.207	Conducted Emission	Mar 05, 2021	Wu Runfeng	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Dec 13&16, 2020	Gao Jianrou	PASS	No deviation
9	15.407(b)	Radiated Emission	Dec 13&14, 2020	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 12.5dB contains two parts that cable loss 2.5dB 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.

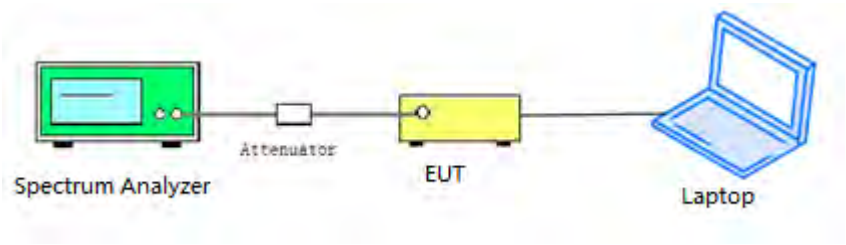
2.2. Duty Cycle of the Test Signal

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 ±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 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.2.3.Test Procedure

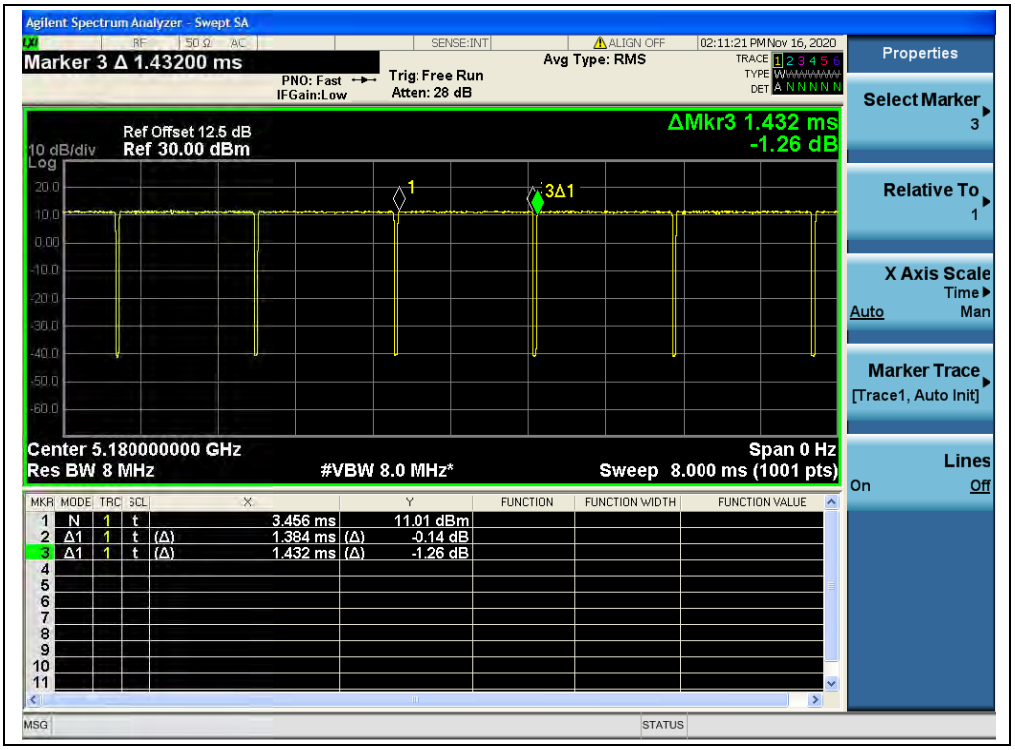
KDB 789033 Section B was used in order to prove compliance.

2.2.4.Test Result

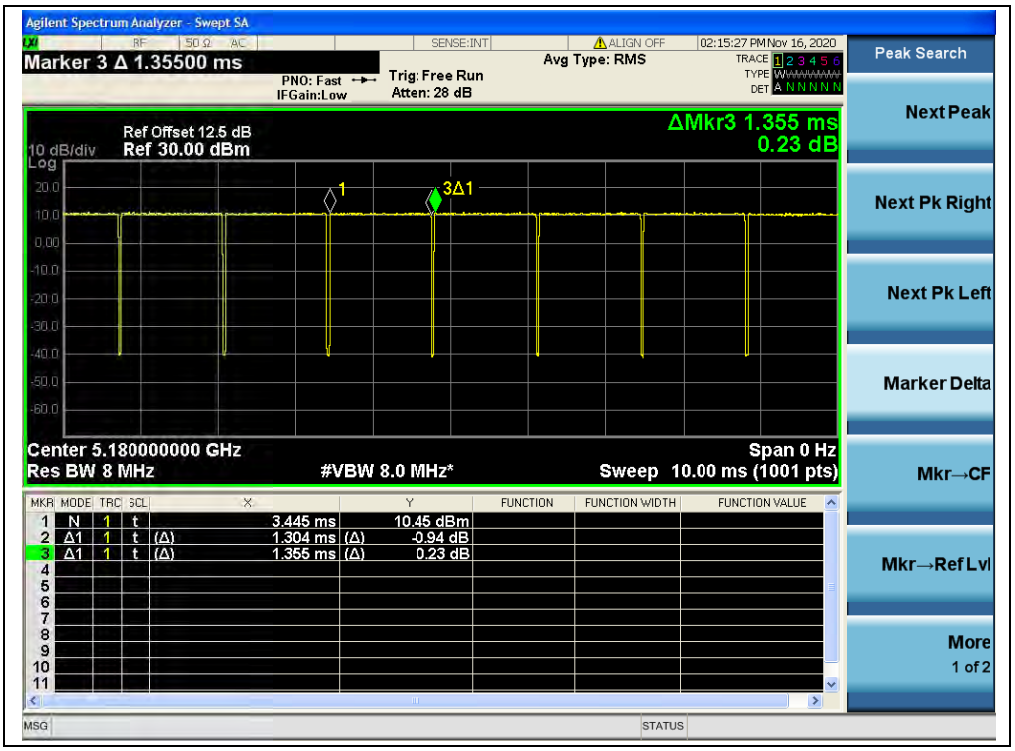
A.Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	96.65	0.15
802.11n (HT20)	96.24	0.17
802.11n (HT40)	93.33	0.30
802.11ac(VHT20)	96.45	0.16
802.11ac(VHT40)	93.97	0.27
802.11ac(VHT80)	88.52	0.53

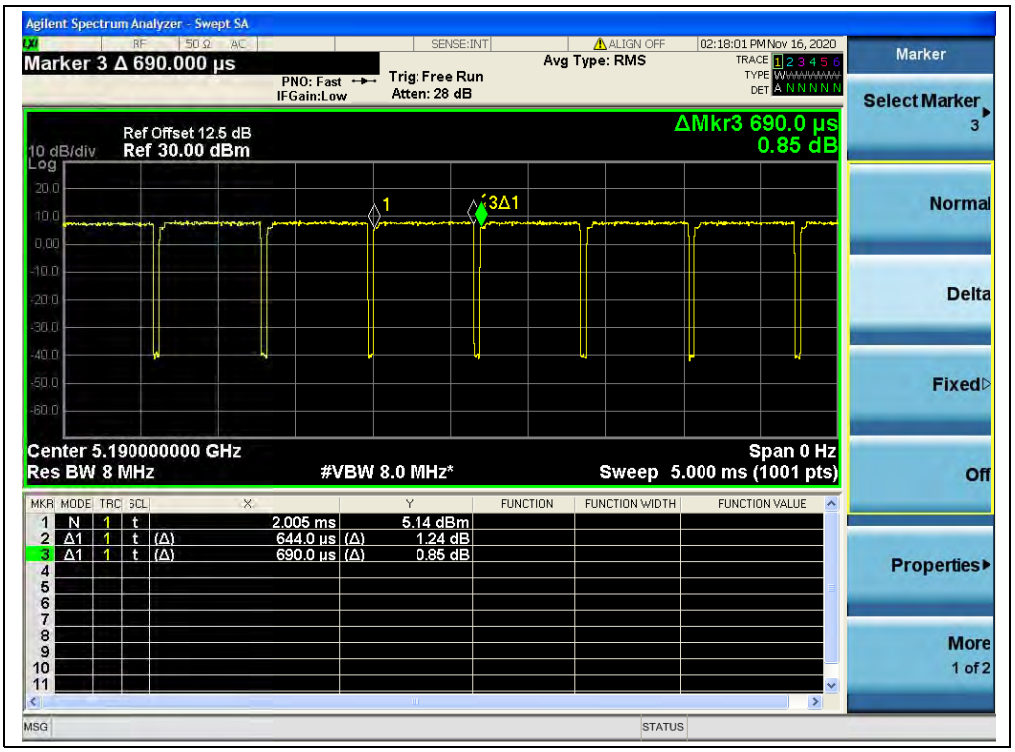
B.Test Plot:



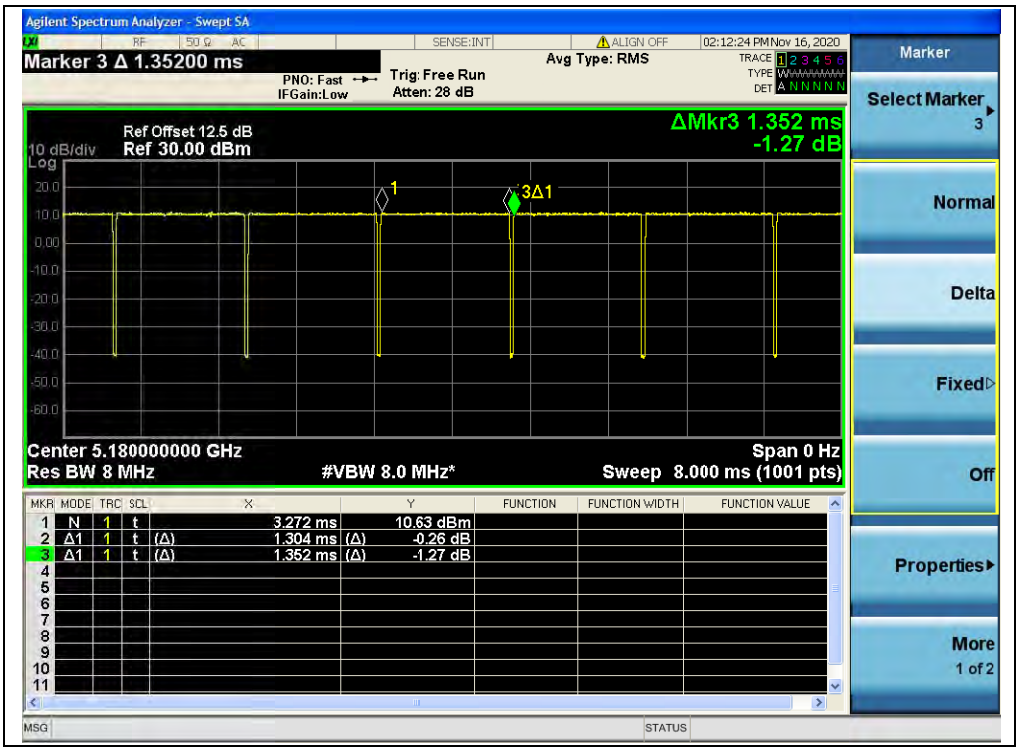
(Channel 36, 5180MHz, 802.11a)



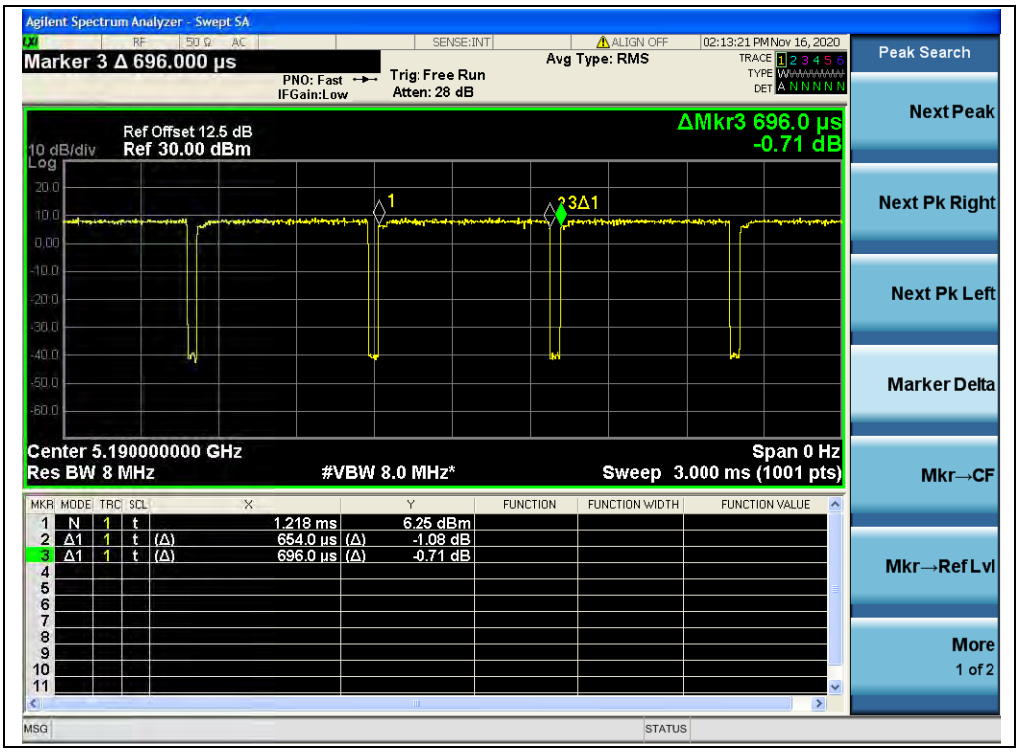
(Channel 36, 5180MHz, 802.11n (HT20))



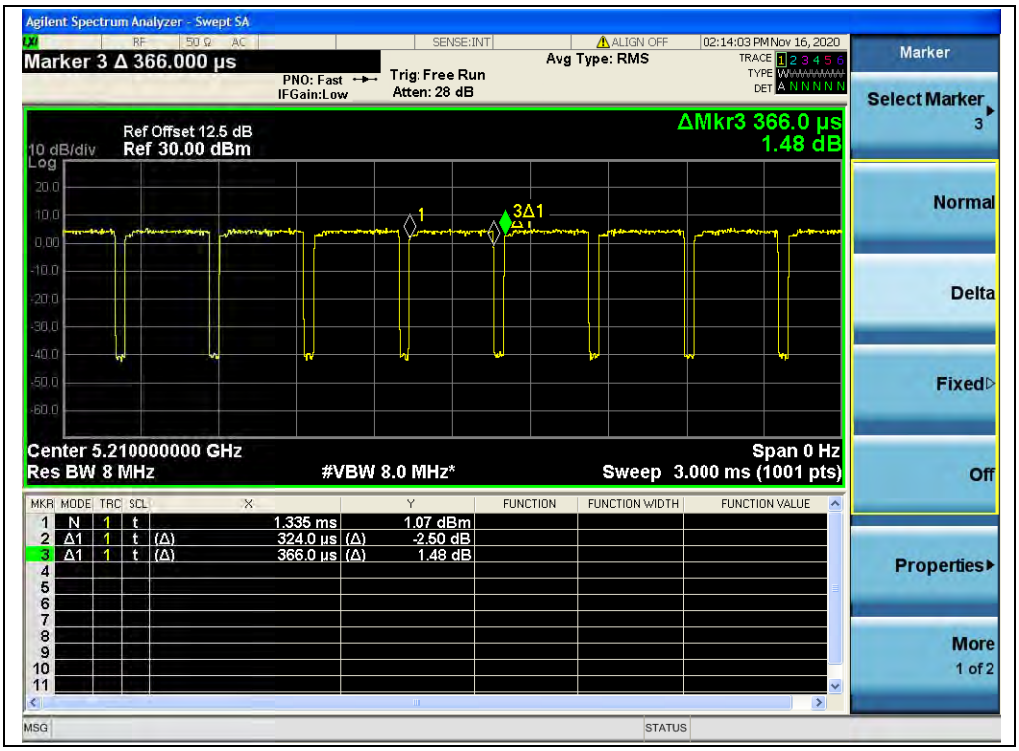
(Channel 38, 5190MHz, 802.11n (HT40))



(CH36_5180MHz _802.11ac (VHT20))



(CH38_5190MHz _802.11ac (VHT40))



(CH42_5210MHz _802.11ac (VHT80))

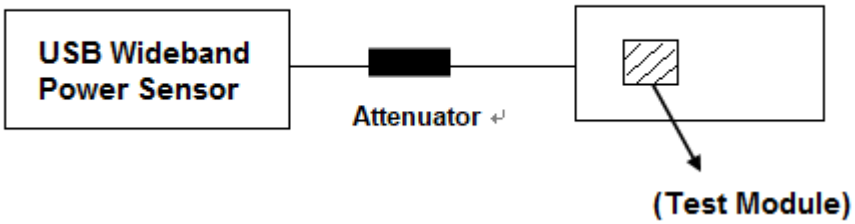
2.3. Maximum Conducted Output Power

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 11dBm + 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 KDB662911D01Measure-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} +10log(N_{ANT})dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

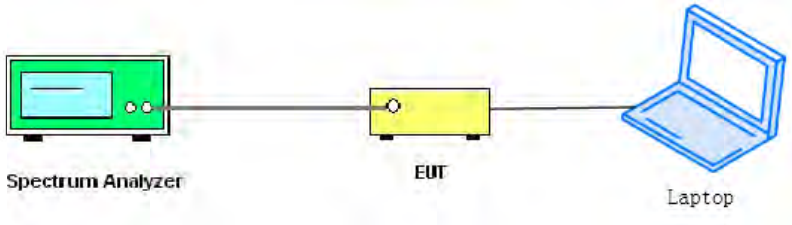
2.3.2.Test Description

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	dBm	W	
36	5180	15.29	0.15	15.44	0.035	24	0.25	PASS
44	5220	15.12		15.27	0.034			
48	5240	15.17		15.32	0.034			
149	5745	15.55		**15.70**	**0.037**	30	1	
157	5785	14.85		15.00	0.032			
165	5825	14.50		14.65	0.029			

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	14.71	0.17	14.88	0.031	24	0.25	PASS
44	5220	15.13		15.30	0.034			
48	5240	15.06		15.23	0.033			
149	5745	15.52		15.69	0.037	30	1	
157	5785	15.50		15.67	0.037			
165	5825	14.54		14.71	0.030			

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	14.74	0.30	15.04	0.032	24	0.25	PASS
46	5230	15.41		15.71	0.037			
151	5755	15.76		16.06	0.040	30	1	
159	5795	15.12		15.42	0.035			

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	14.78	0.16	14.94	0.031	24	0.25	PASS
44	5220	15.14		15.30	0.034			
48	5240	15.12		15.28	0.034			
149	5745	15.48		15.64	0.037	30	1	
157	5785	14.80		14.96	0.031			
165	5825	14.52		14.68	0.029			

802.11ac (VHT40) Mode

Channel	Frequency (MHz)	Average Power				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
38	5190	14.77	0.27	15.04	0.032	24	0.25	PASS
46	5230	15.35		15.62	0.036			
151	5755	15.85		**16.12**	**0.041**	30	1	
159	5795	15.13		15.40	0.035			

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	14.27	0.53	14.80	0.030	24	0.25	PASS
155	5775	14.93		**15.46**	**0.035**	30	1	

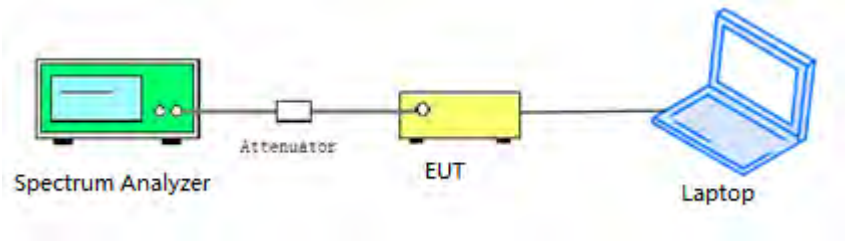
2.4. Emission Bandwidth

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 50Ohm; 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 theband5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW = 100 kHz.
b) Set video bandwidth (VBW) ≥ 3 × 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

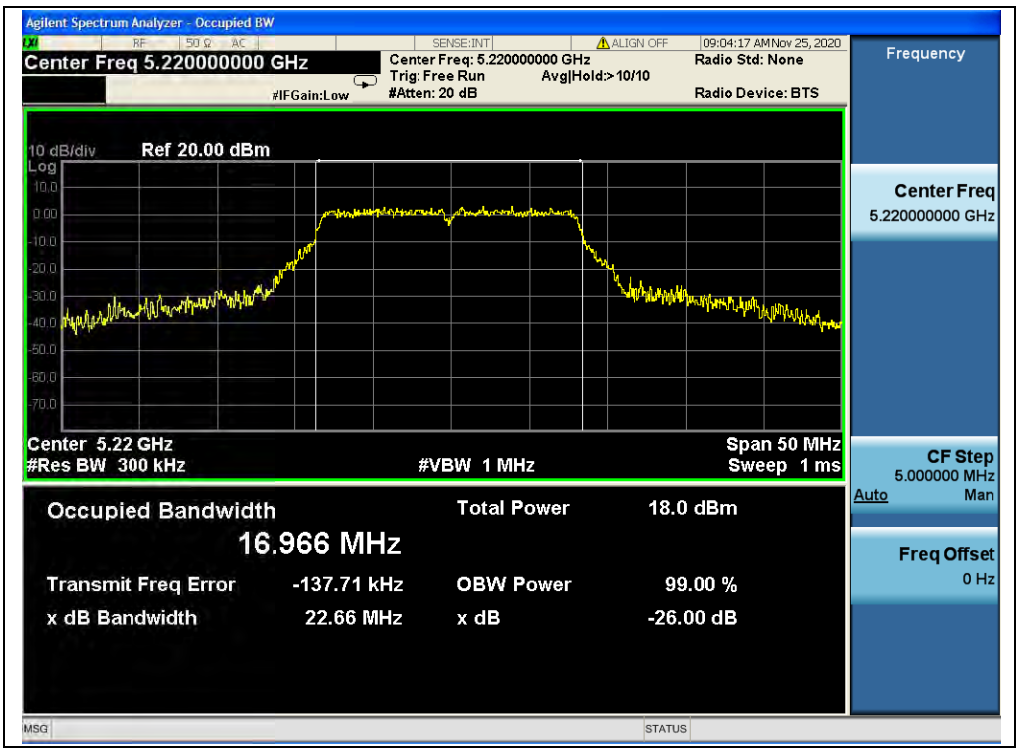
802.11a Mode

A.Test Verdict:

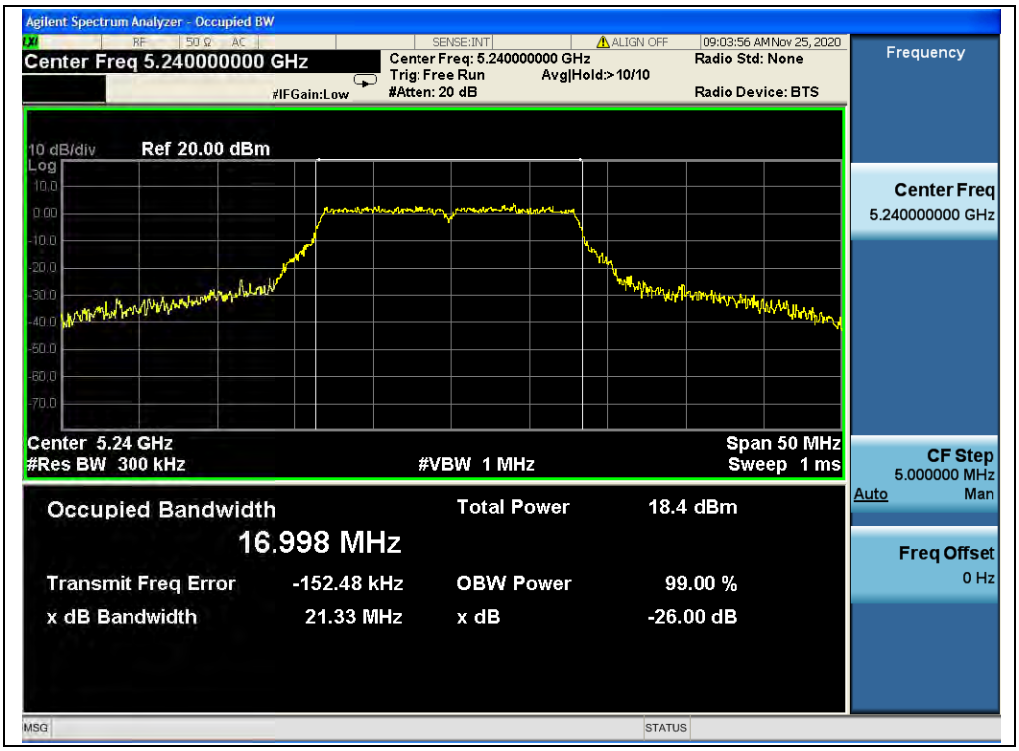
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	22.47
44	5220	22.66
48	5240	21.33
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	16.40
157	5785	16.39
165	5825	16.42

B.Test Plot:

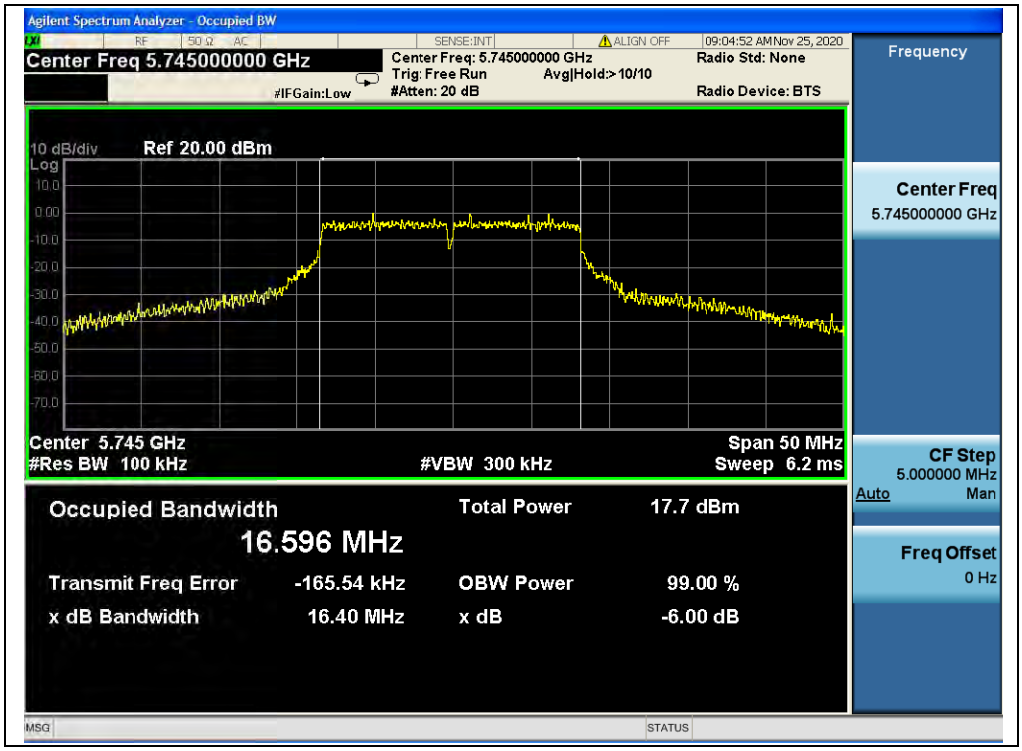
(Channel 36, 5180MHz, 802.11a)



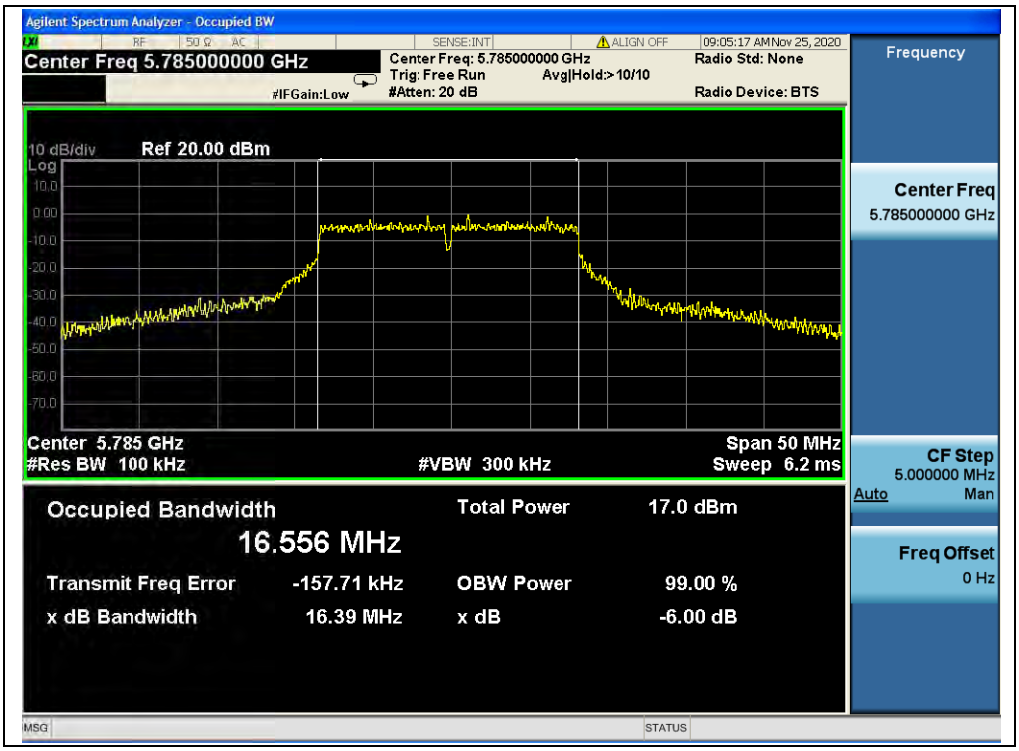
(Channel 44, 5220 MHz, 802.11a)



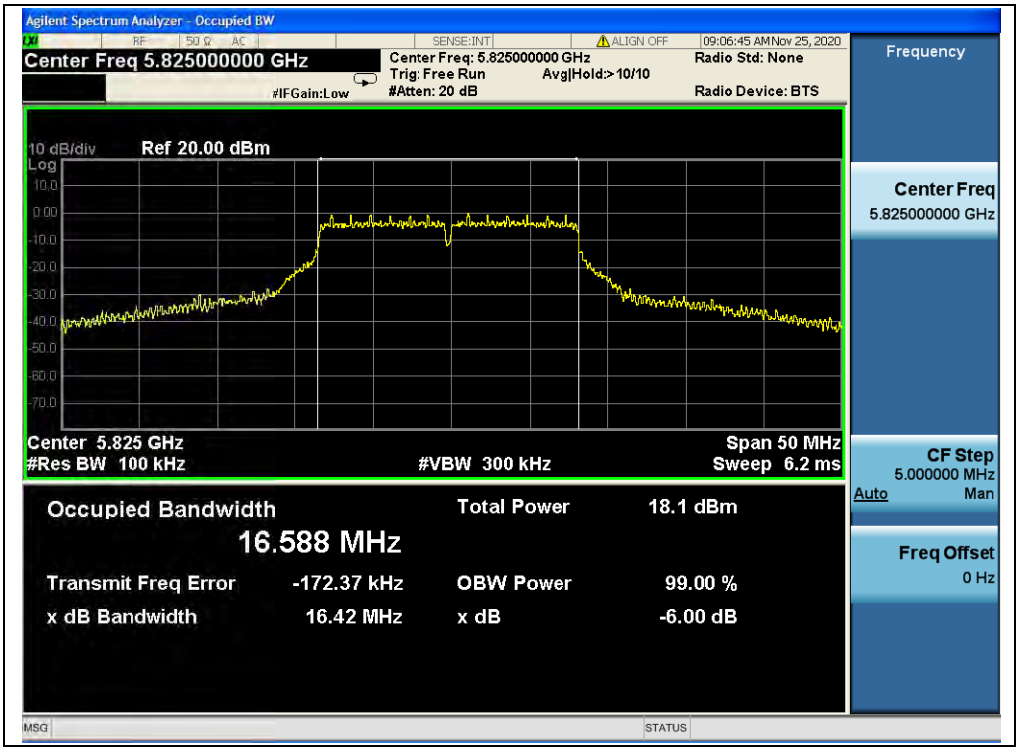
(Channel 48, 5240MHz, 802.11a)



(Channel 149,5745MHz, 802.11a)



(Channel 157,5785MHz, 802.11a)



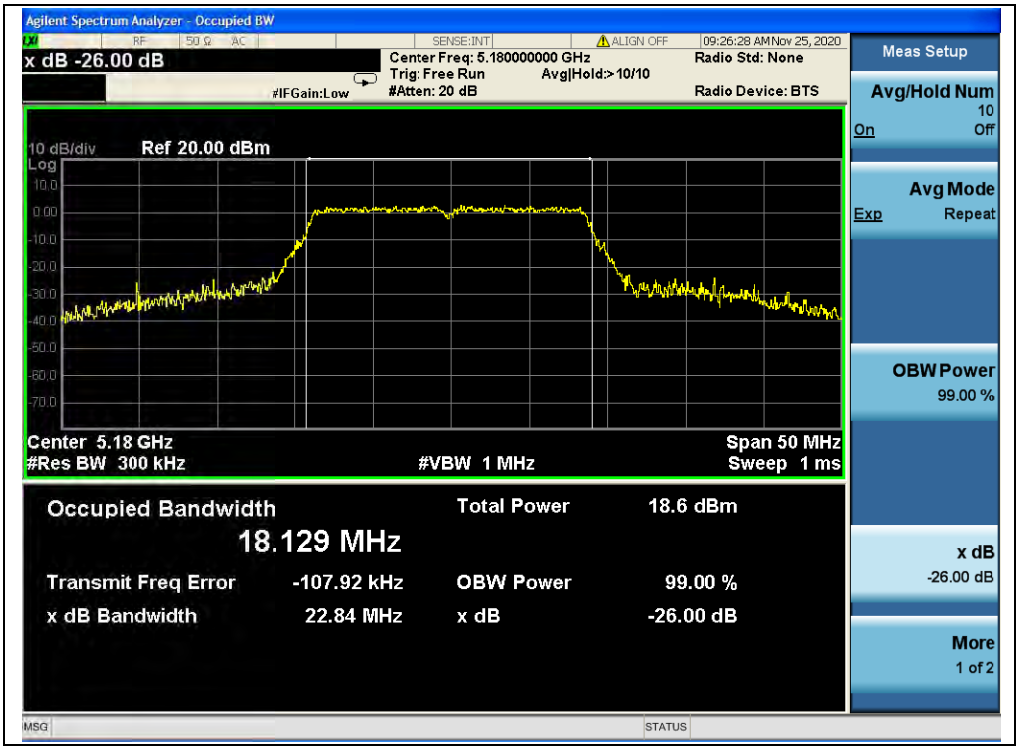
(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Mode

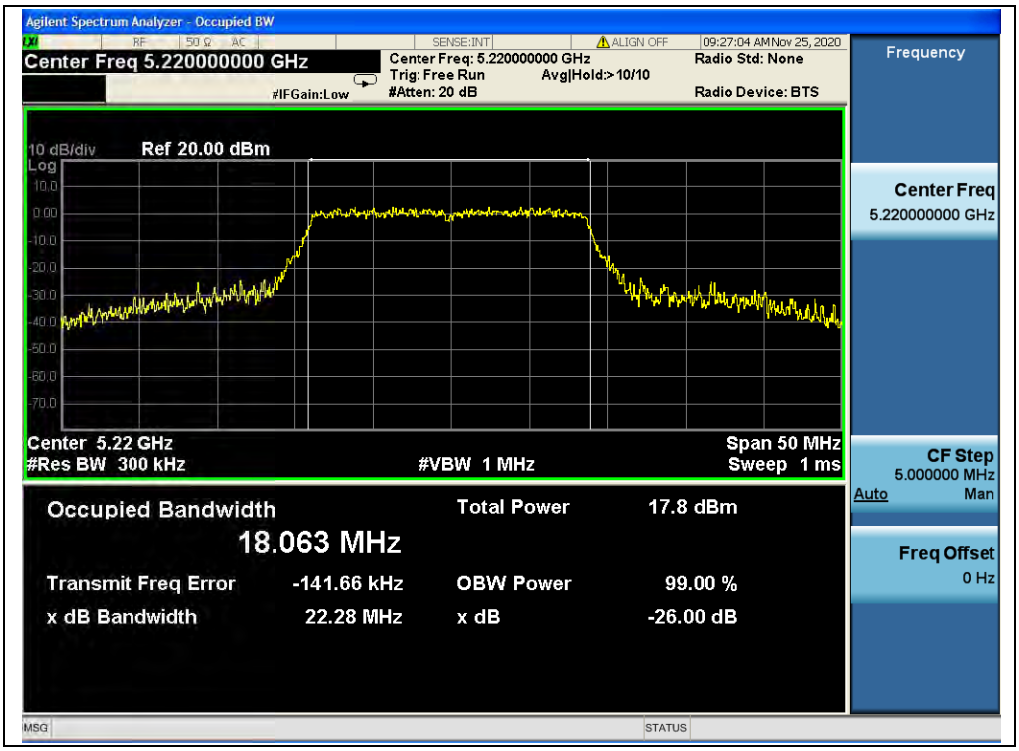
A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	22.84
44	5220	22.28
48	5240	22.09
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	17.69
157	5785	17.67
165	5825	17.61

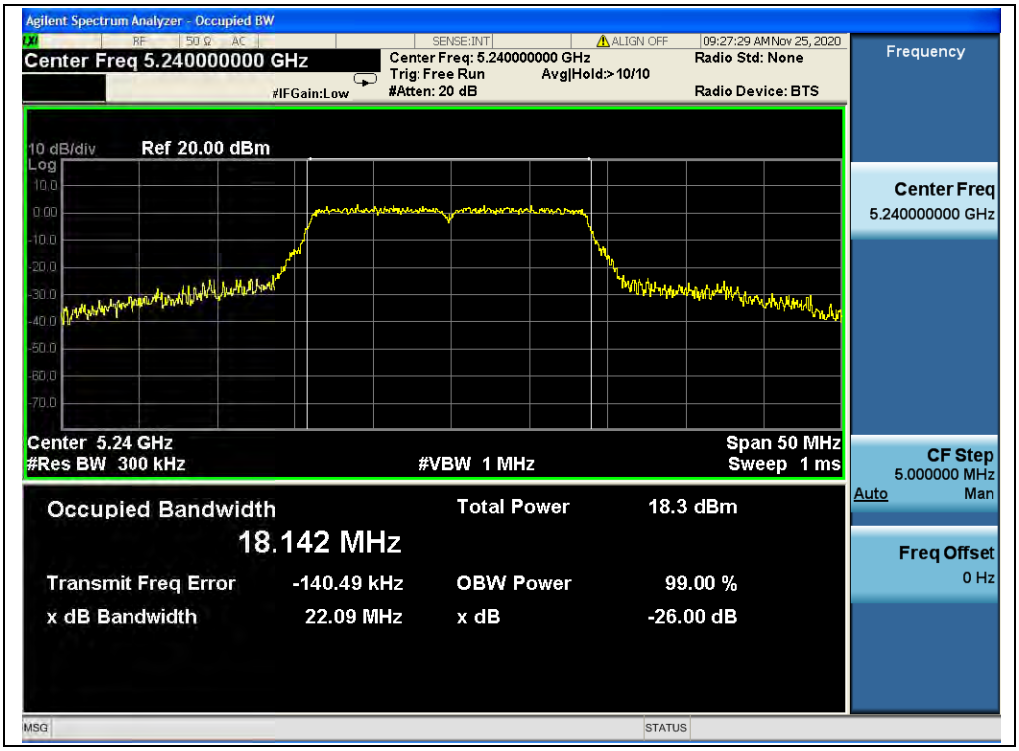
B.Test Plot:



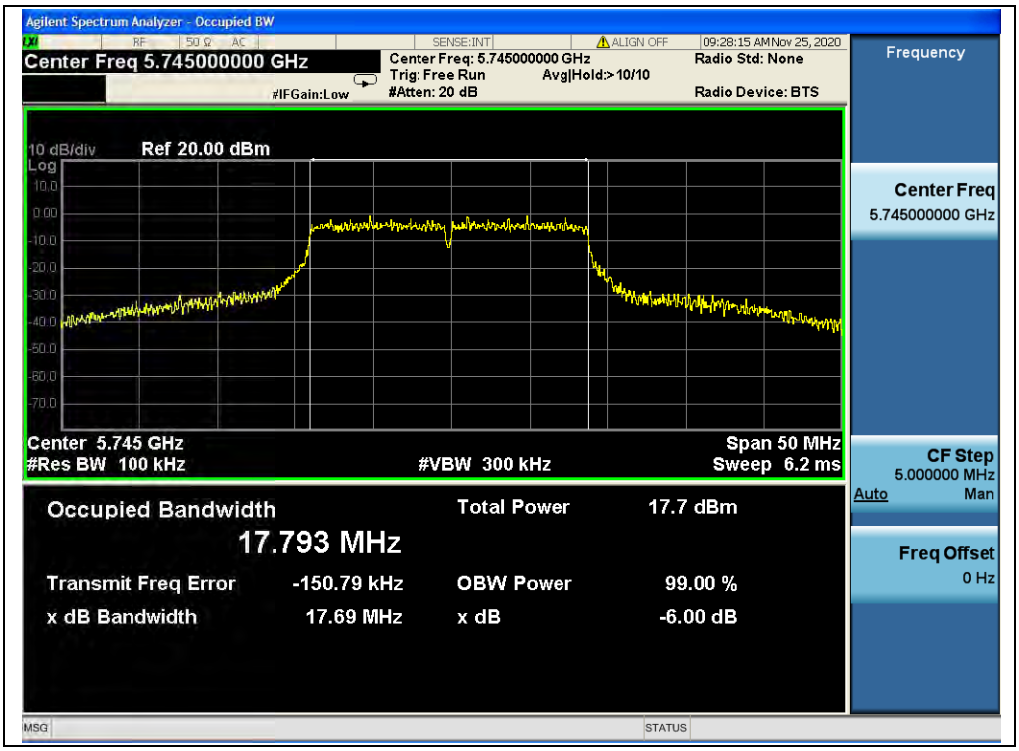
(Channel 36, 5180MHz, 802.11n (HT20))



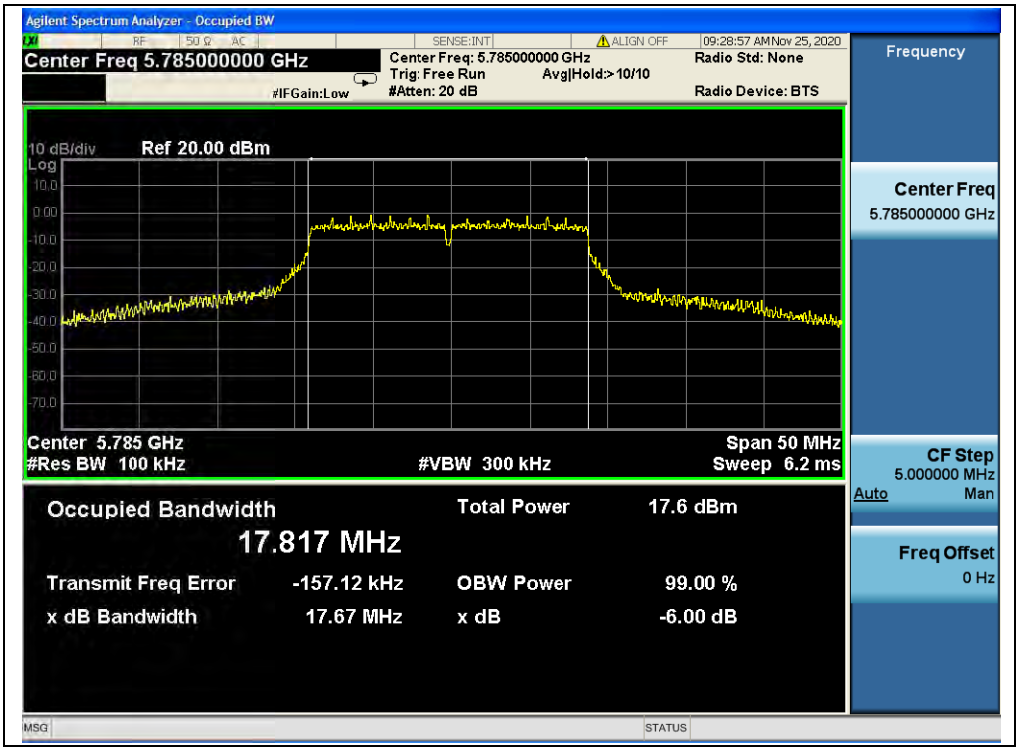
(Channel 44, 5220MHz, 802.11n (HT20))



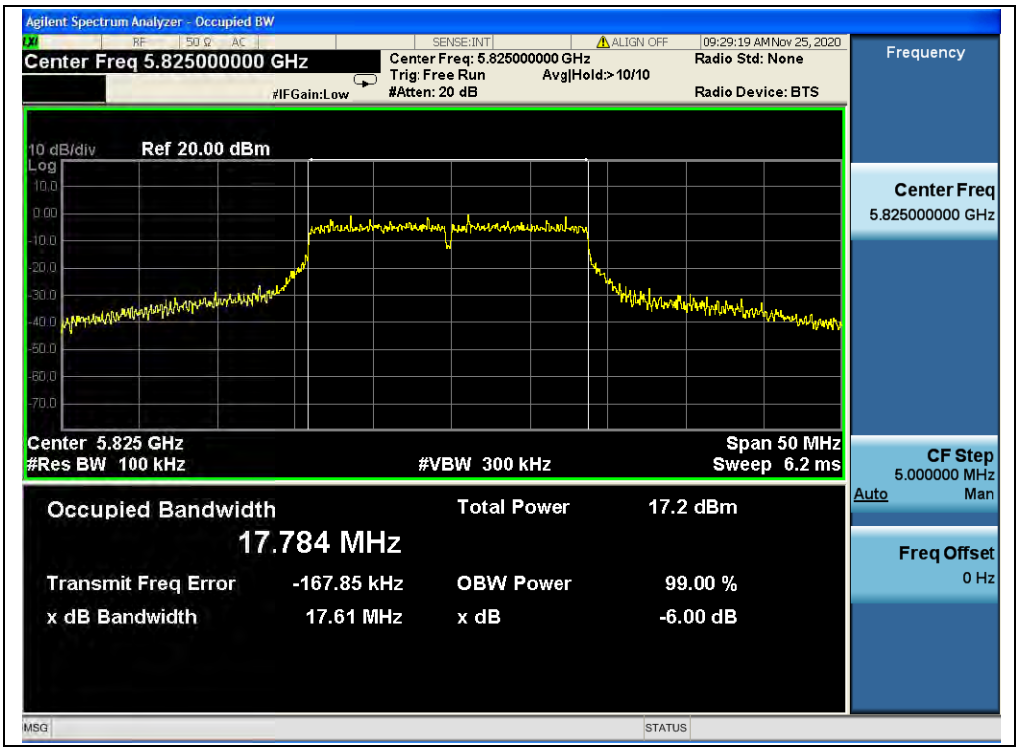
(Channel 48, 5240MHz, 802.11n (HT20))



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



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



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

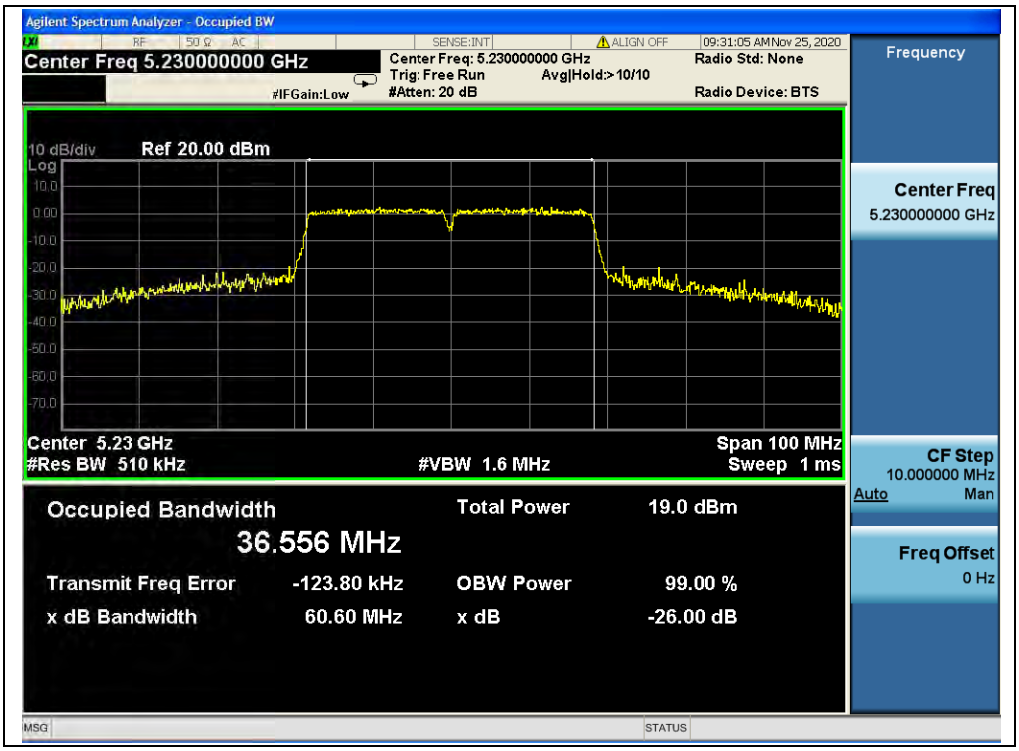
802.11n (HT40) Test mode

A.Test Verdict:

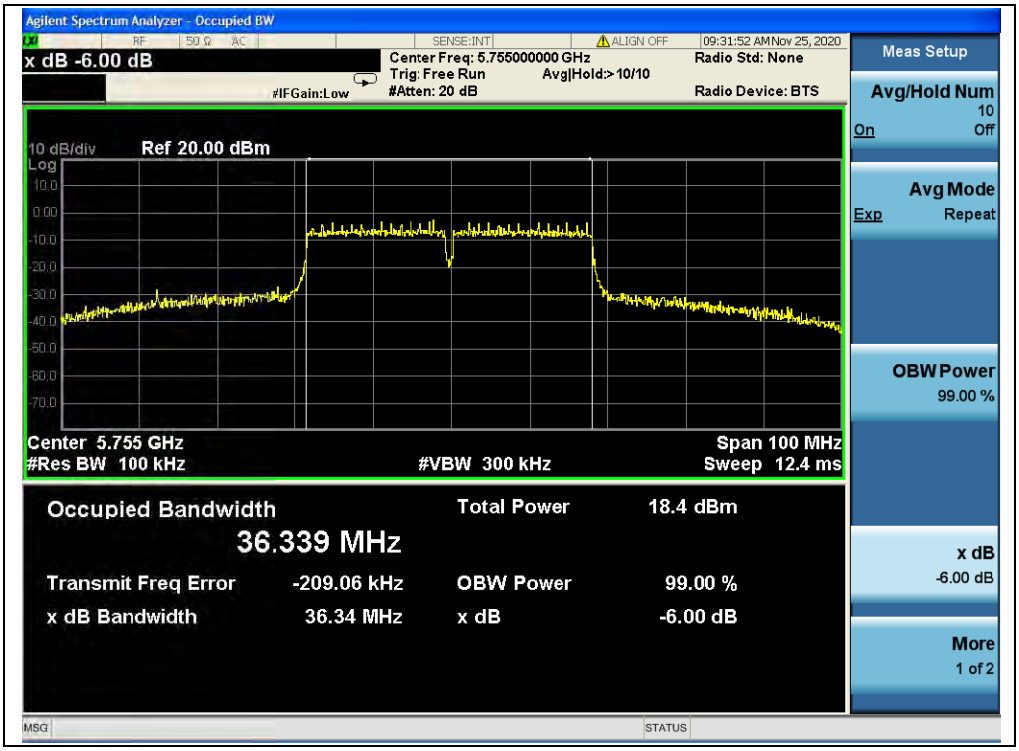
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	54.56
46	5230	60.60
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
151	5755	36.34
159	5795	36.41

B.Test Plot:

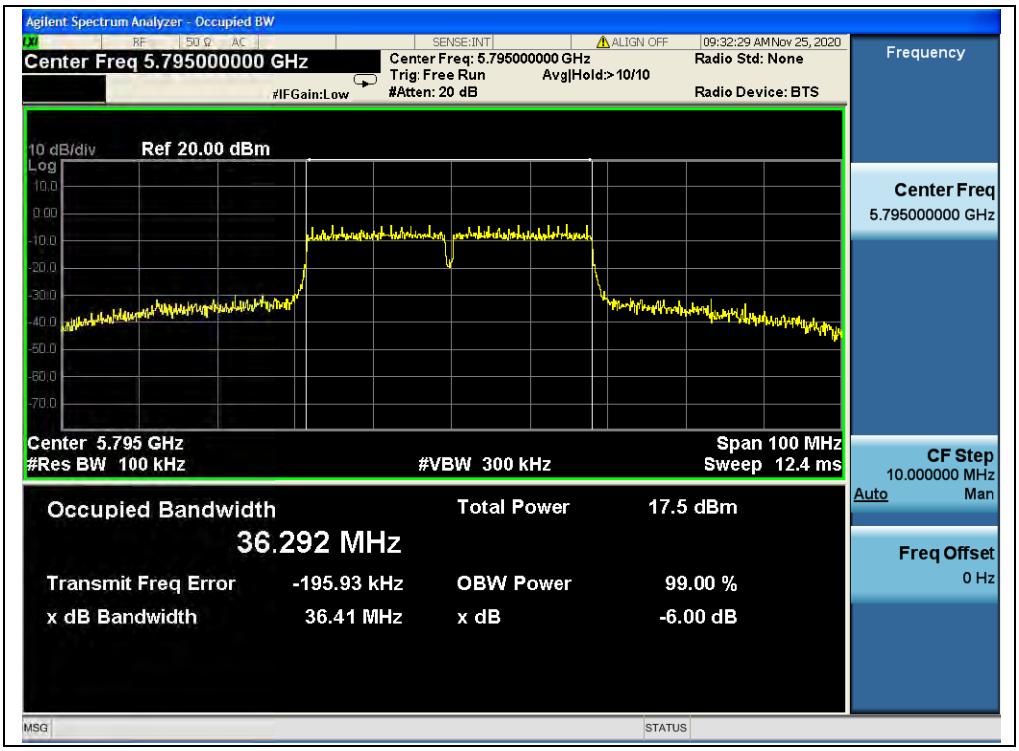
(Channel 38, 5190MHz, 802.11n (HT40))



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



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



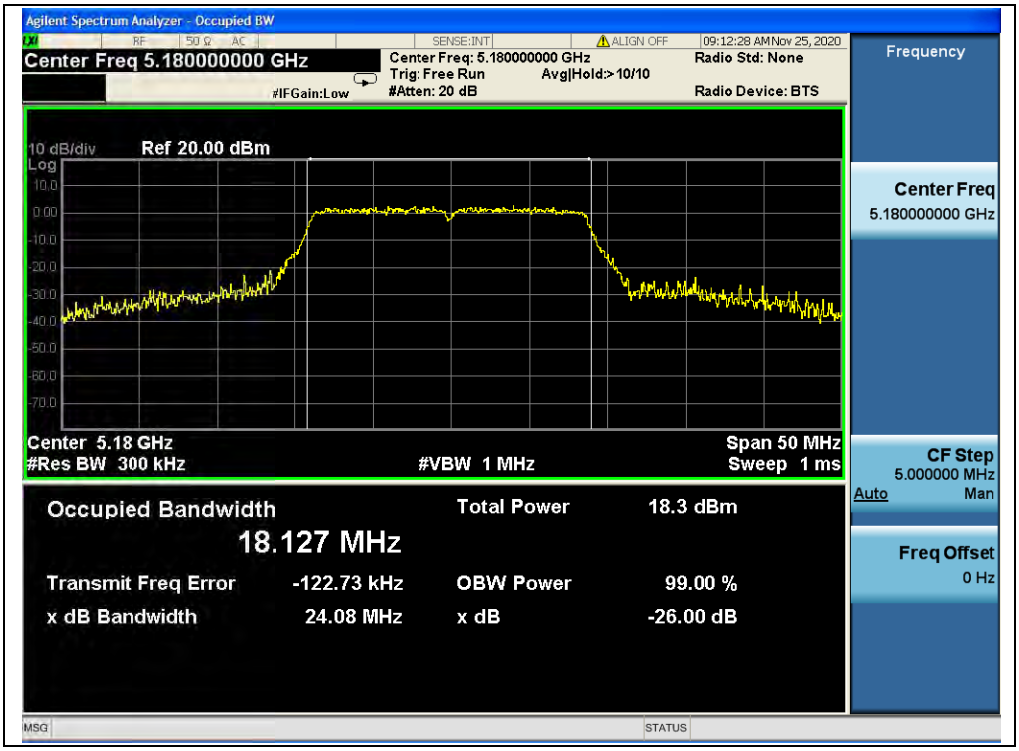
(Channel 159, 5795MHz, 802.11n (HT40))

802.11ac (VHT20) Test mode

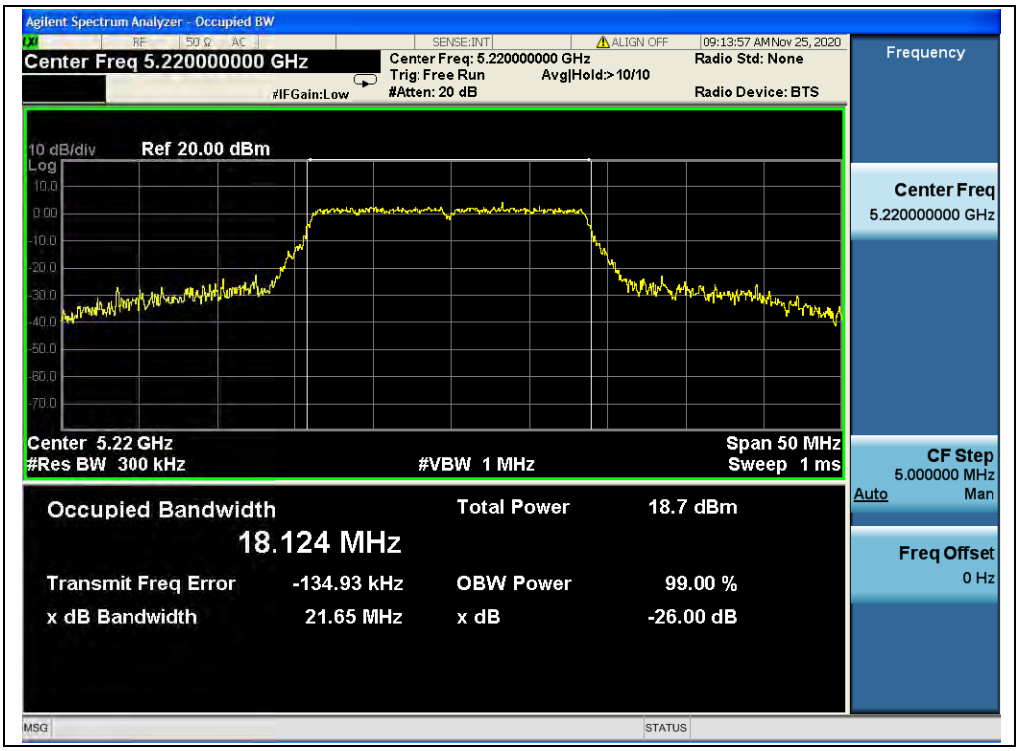
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	24.08
44	5220	21.65
48	5240	24.47
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
149	5745	17.64
157	5785	17.63
165	5825	17.61

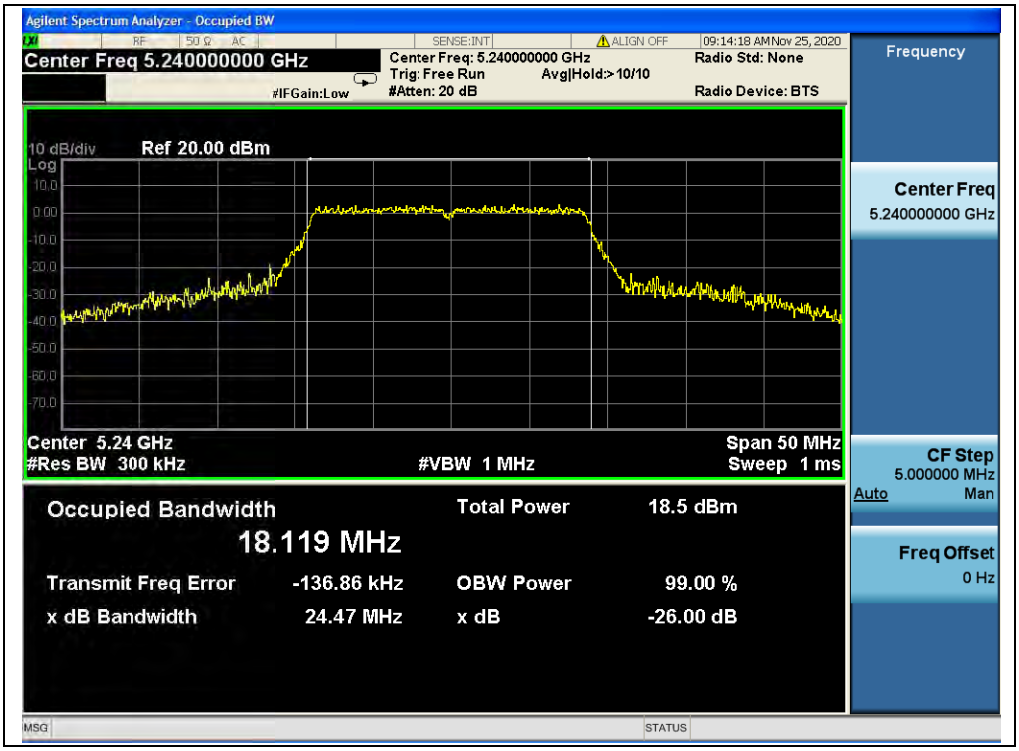
B. Test Plot:



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

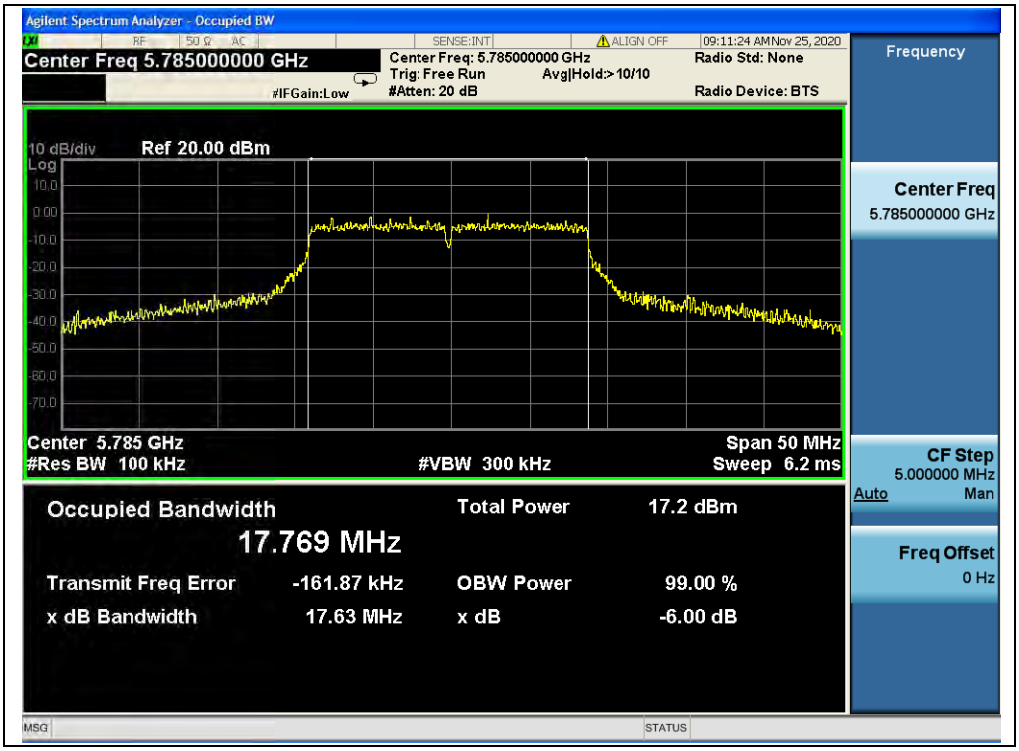


(Channel 44, 5220 MHz, 802.11ac (VHT20))

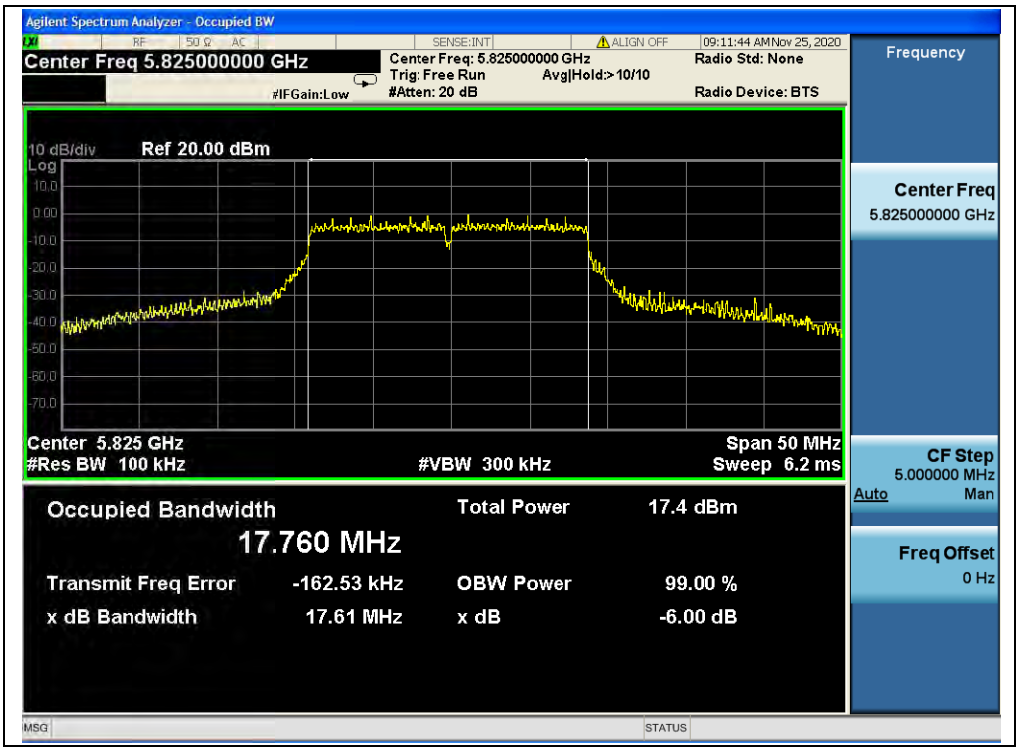


(Channel 48, 5240MHz, 802.11ac (VHT20))

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



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



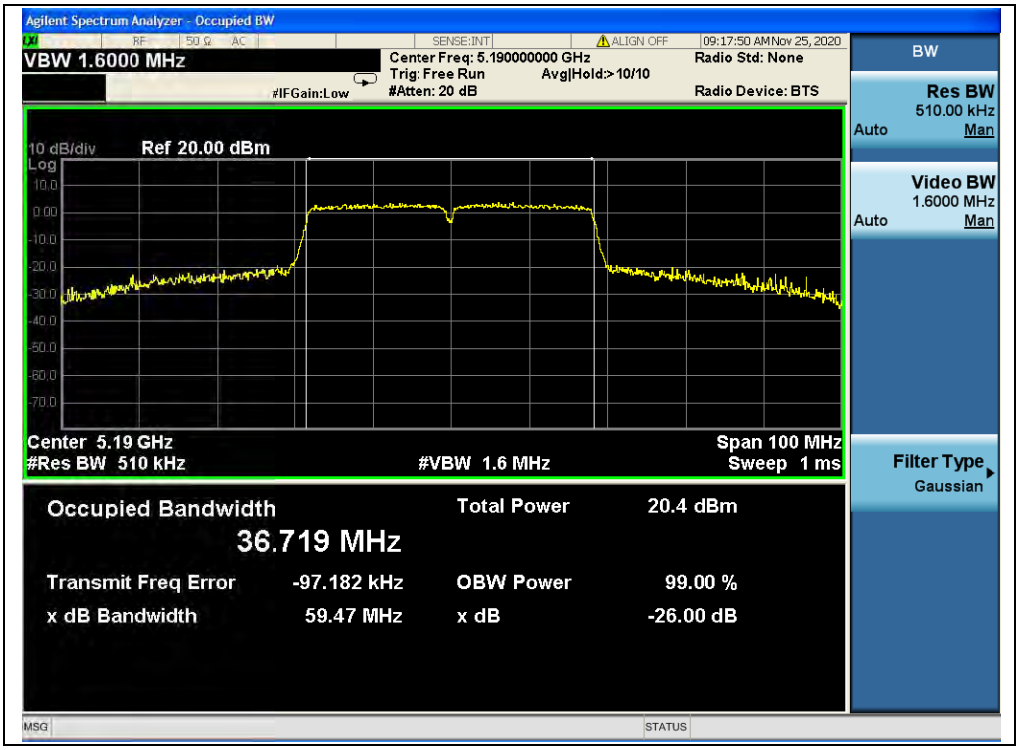
(Channel 165, 5825MHz, 802.11ac (VHT20))

802.11 ac (VHT40) Test mode

A. Test Verdict:

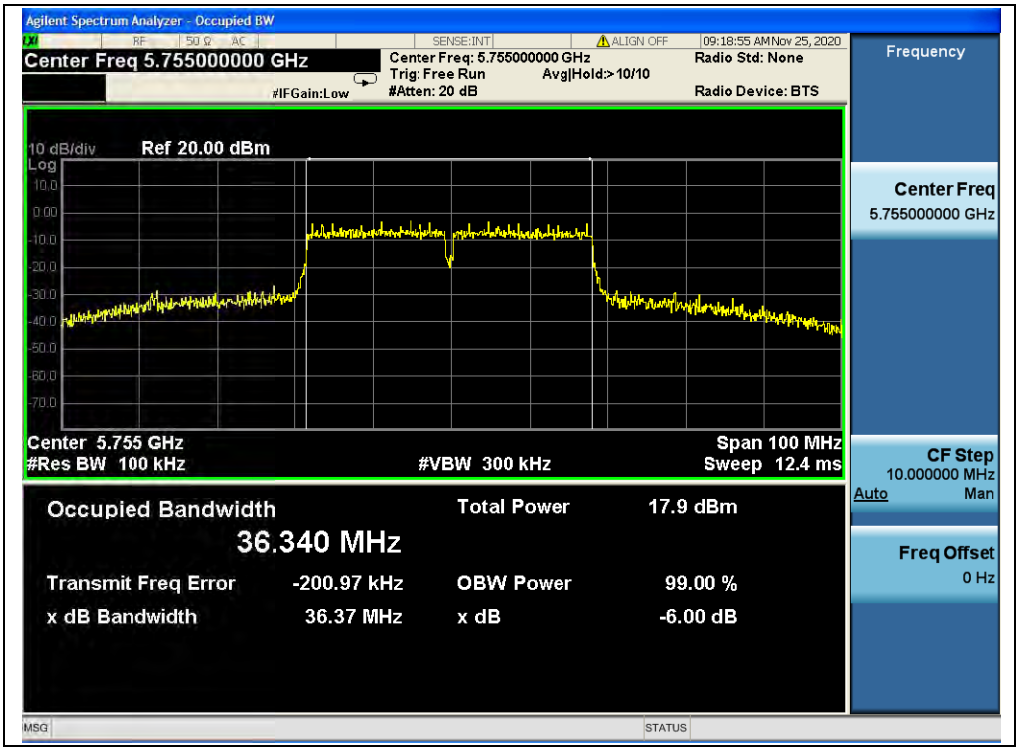
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	59.47
46	5230	52.98
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
151	5755	36.37
159	5795	36.42

B. Test Plot:

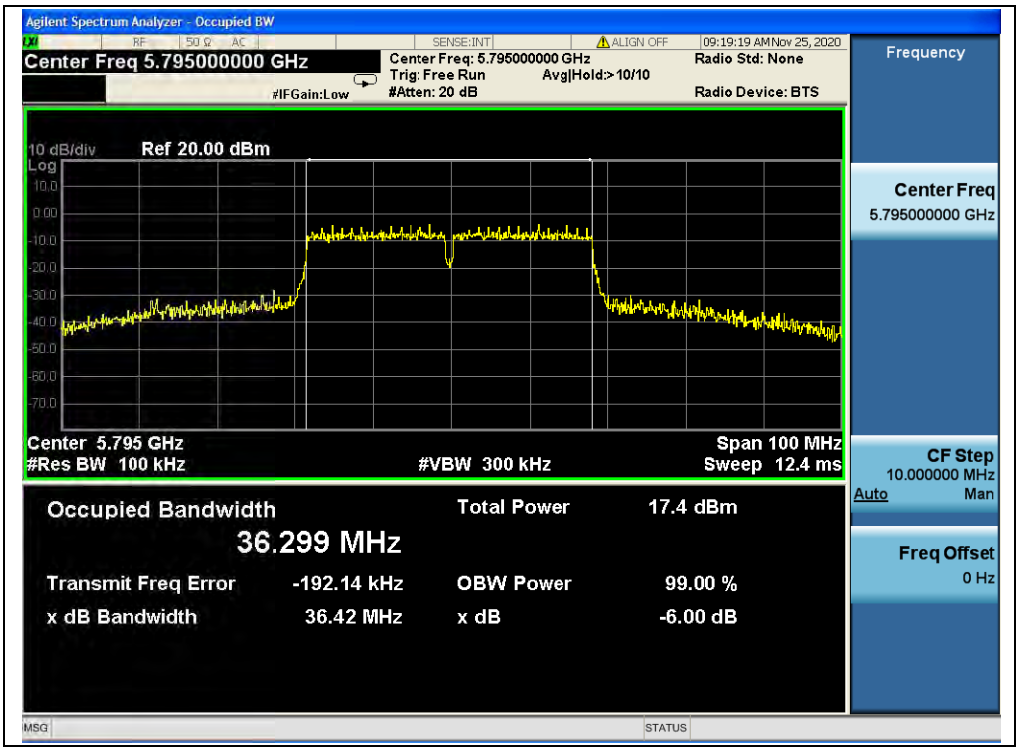


(Channel 38, 5190MHz, 802.11ac (VHT40))

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



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



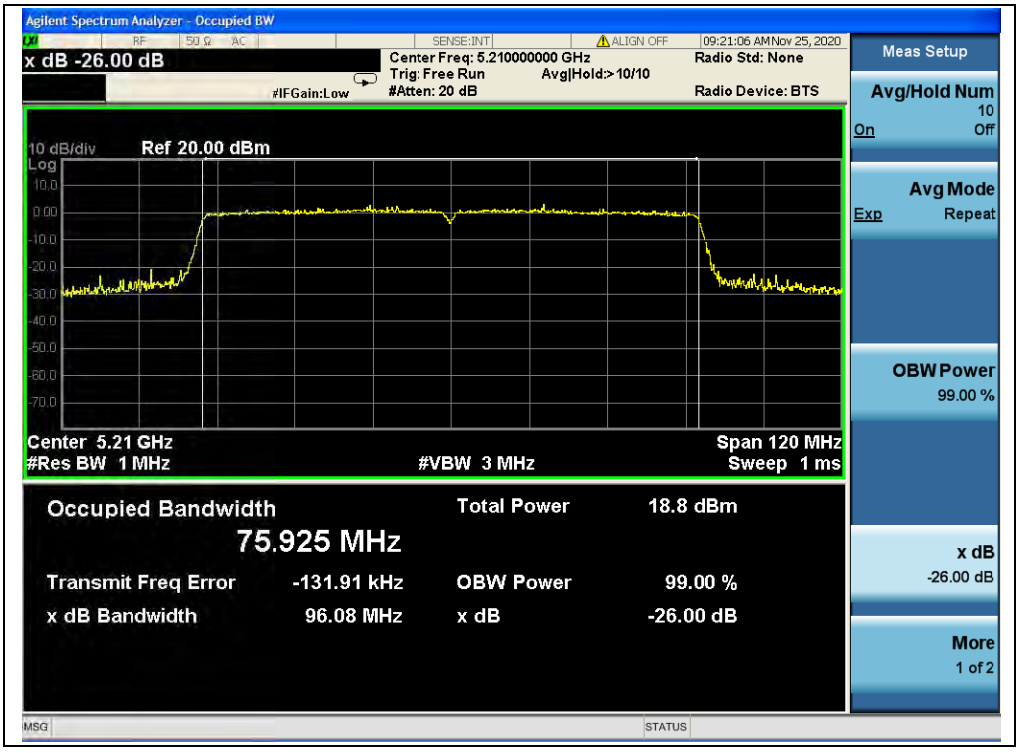
(Channel 159, 5795MHz, 802.11ac (VHT40))

802.11 ac (VHT80) Test mode

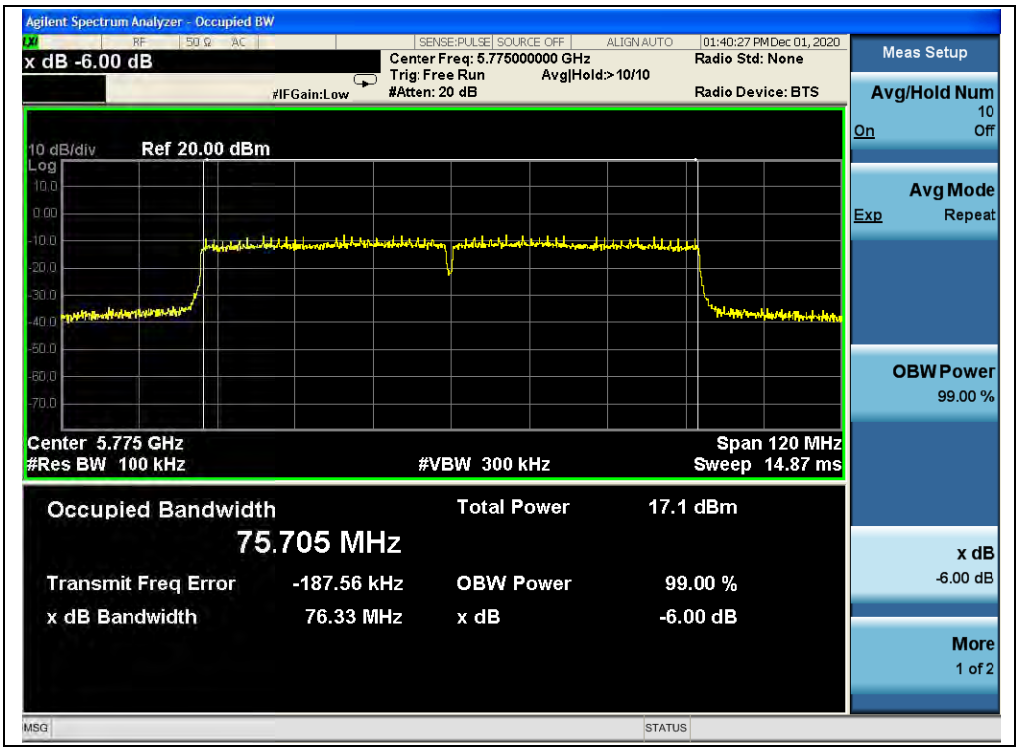
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	96.08
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
155	5775	76.33

B. Test Plot:



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



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

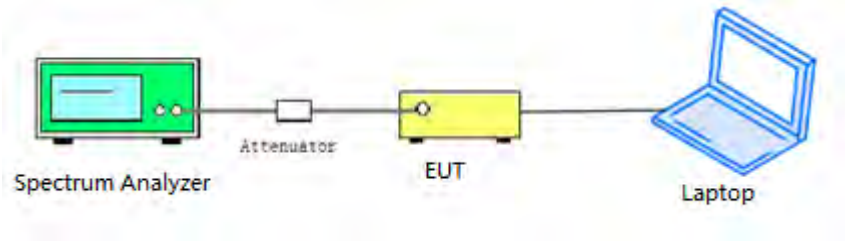
2.5. Peak Power Spectral Density

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 KDB662911D01Measure-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} +10log(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 ≥ 3MHz
3) Number of points in sweep ≥ 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 PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	2.46	0.15	2.61	11	PASS
44	5220	2.87		3.02		
48	5240	2.92		3.07		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-0.51	0.15	-0.36	30	PASS
157	5785	-0.87		-0.72		
165	5825	-1.03		-0.88		

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 PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	2.10	0.17	2.27	11	PASS
44	5220	2.28		2.45		
48	5240	2.21		2.38		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-0.53	0.17	-0.36	30	PASS
157	5785	-1.17		-1.00		
165	5825	-1.26		-1.09		

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))

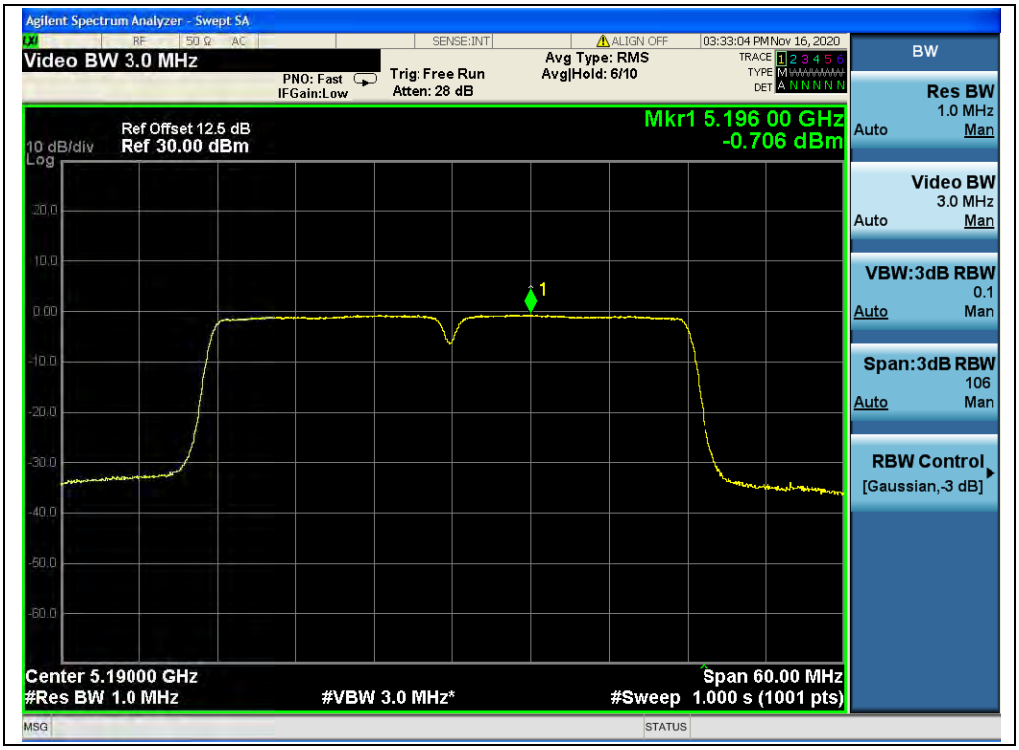
(Channel 165, 5825MHz, 802.11n (HT20))

802.11n (HT40) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-0.71	0.30	-0.41	11	PASS
46	5230	-0.32		-0.02		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-3.08	0.30	-2.78	30	PASS
159	5795	-3.84		-3.54		

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) Test mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	1.88	0.16	2.04	11	PASS
44	5220	2.36		2.52		
48	5240	2.14		2.30		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-0.69	0.16	-0.53	30	PASS
157	5785	-1.31		-1.15		
165	5825	-1.30		-1.14		

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))

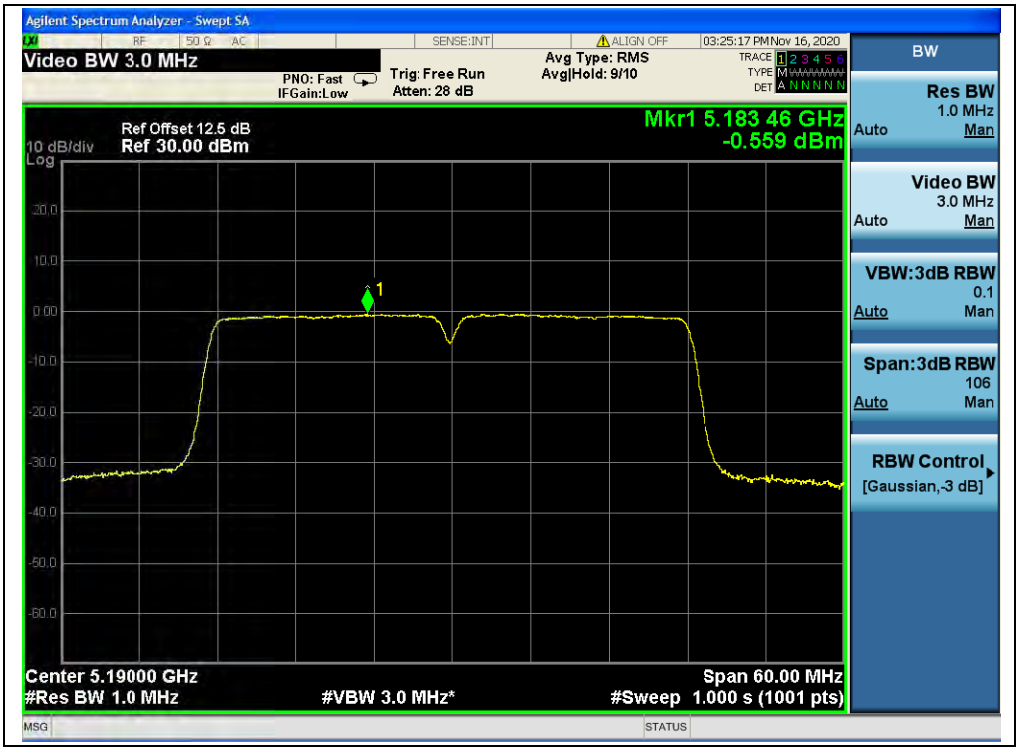
(Channel 165, 5825MHz, 802.11ac (VHT20))

802.11ac (VHT40) Test mode

A.Test Verdict:

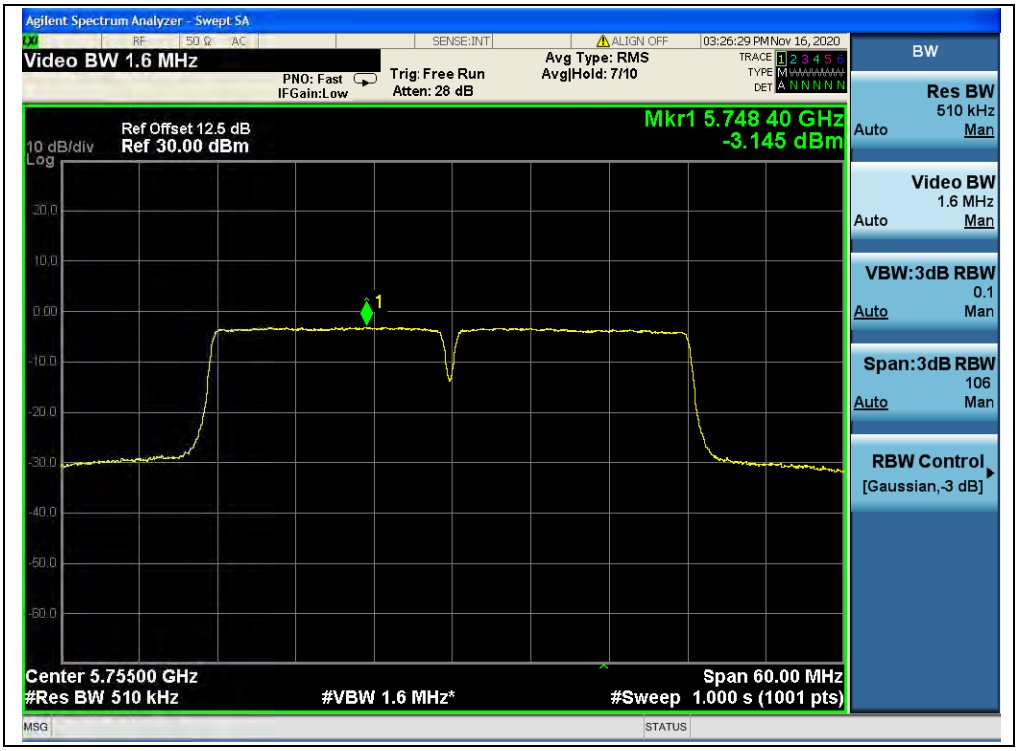
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-0.56	0.27	-0.29	11	PASS
46	5230	-0.28		-0.01		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-3.15	0.27	-2.88	30	PASS
159	5795	-3.81		-3.54		

B.Test Plot:



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

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



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

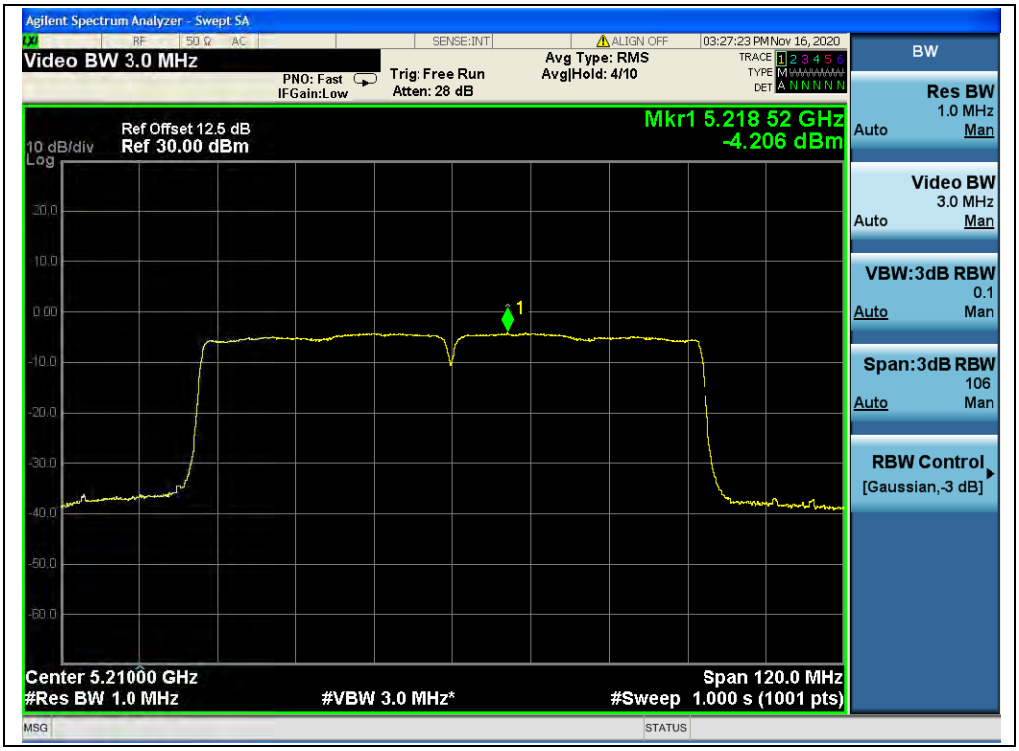
(Channel 159, 5795MHz, 802.11ac (VHT40))

802.11ac (VHT80) Test mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	-4.21	0.53	-3.68	11	PASS
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-6.81	0.53	-6.28	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°Cto 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%	5.00	+20(Ref)	143	27.606
100%		-30	145	27.992
100%		-20	139	26.834
100%		-10	141	27.220
100%		0	140	27.027
100%		+10	135	26.062
100%		+20	142	27.413
100%		+30	146	28.185
100%		+40	148	28.571
100%		+50	151	29.151
85%	4.25	+20	136	26.255
115%	5.75	+20	135	26.062

U-NII-3 (Ch. 149) 5745MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	149	25.936
100%		-30	153	26.632
100%		-20	151	26.284
100%		-10	150	26.110
100%		0	145	25.239
100%		+10	146	25.413
100%		+20	144	25.065
100%		+30	149	25.936
100%		+40	151	26.284
100%		+50	155	26.980
85%	4.25	+20	140	24.369
115%	5.75	+20	143	24.891

2.7. Conducted Emission

2.7.1.Requirement

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

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

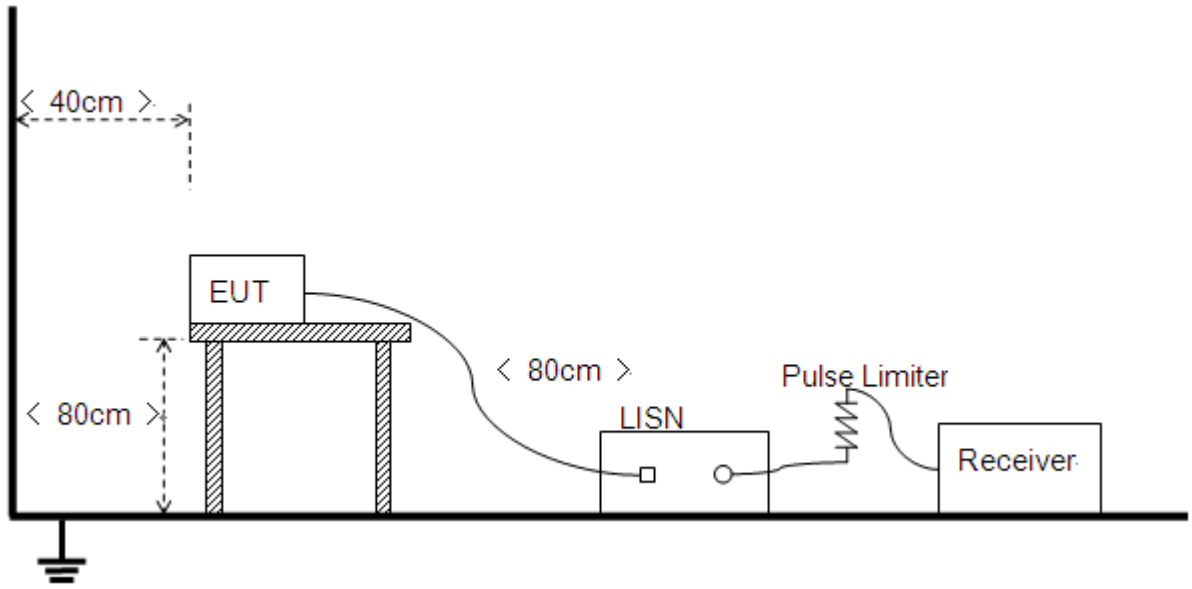
Note:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.7.2.Test Description

Test Setup:



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

2.7.3.Test Result

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

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hzwere 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

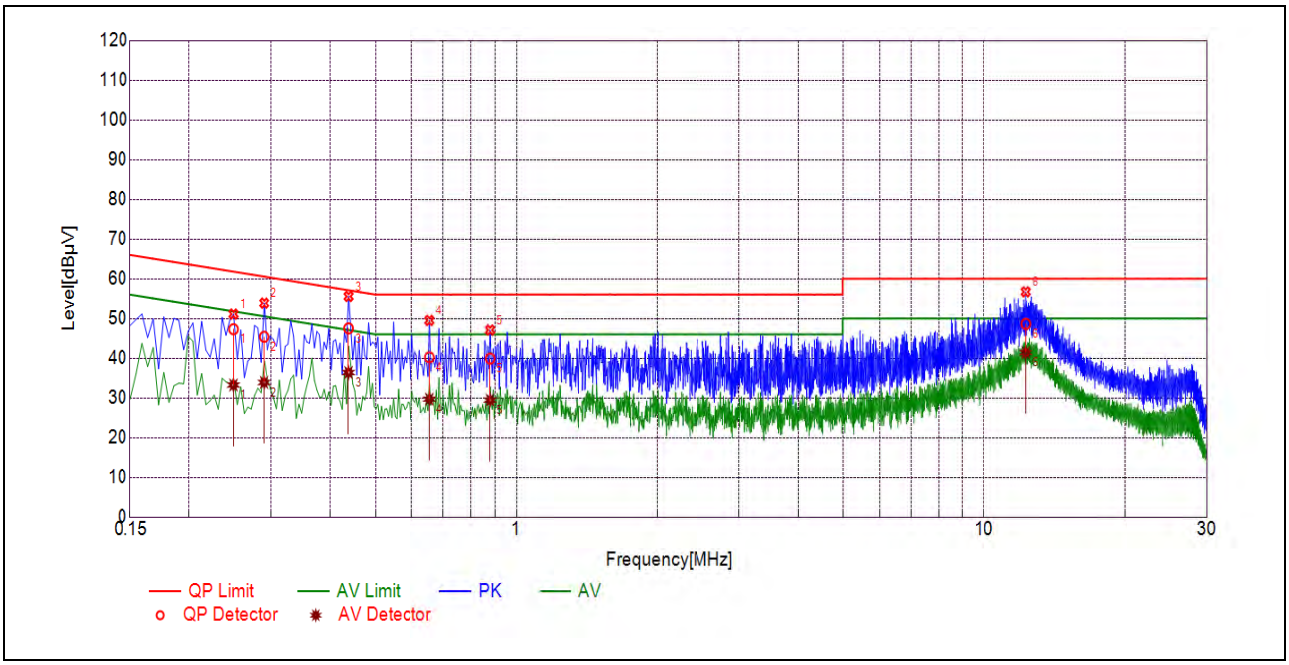
The measurement results are obtained as below:

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

U_R: Receiver Reading

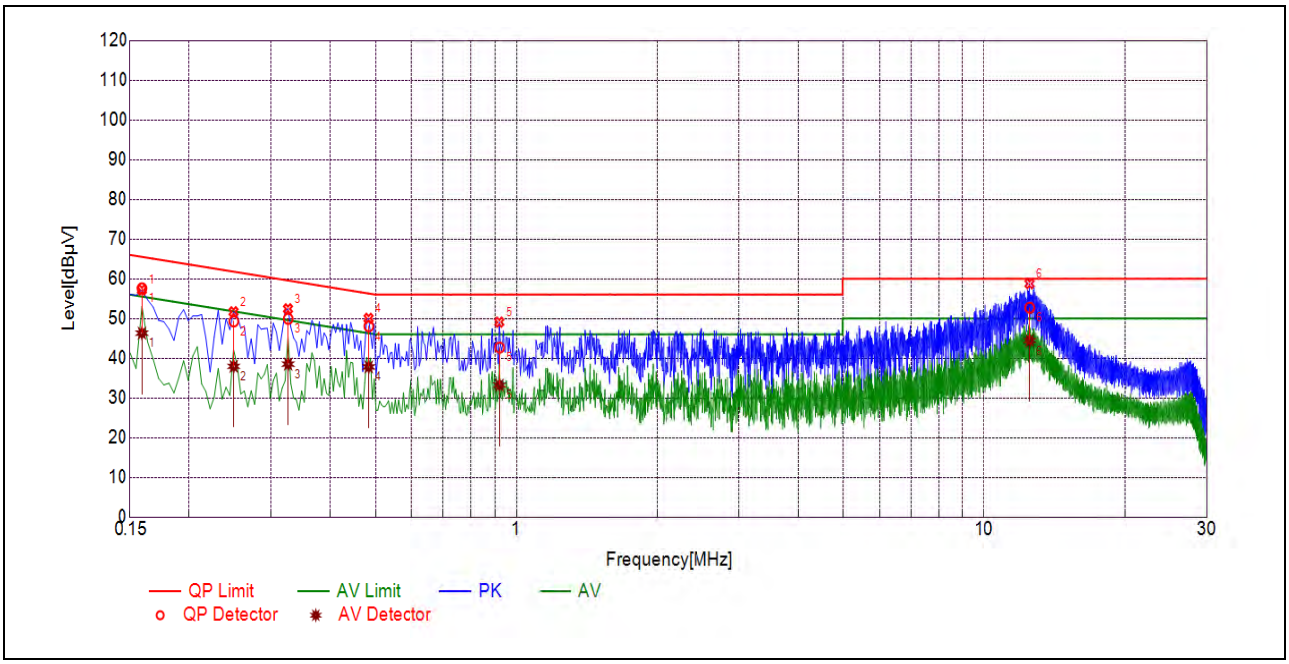
A_{Factor}: Voltage division factor of LISN

B.Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2489	47.30	33.25	61.79	51.79	Line	PASS
2	0.2893	45.40	33.89	60.54	50.54		PASS
3	0.4378	47.51	36.39	57.10	47.10		PASS
4	0.6542	40.21	29.69	56.00	46.00		PASS
5	0.8790	39.91	29.45	56.00	46.00		PASS
6	12.3161	48.66	41.41	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	0.1590	57.59	46.31	65.52	55.52	Neutral	PASS
2	0.2492	49.26	37.95	61.78	51.78		PASS
3	0.3258	49.92	38.51	59.56	49.56		PASS
4	0.4834	48.04	37.80	56.28	46.28		PASS
5	0.9204	42.69	33.22	56.00	46.00		PASS
6	12.5522	52.71	44.44	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);

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

where P is the EIRP in Watts

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

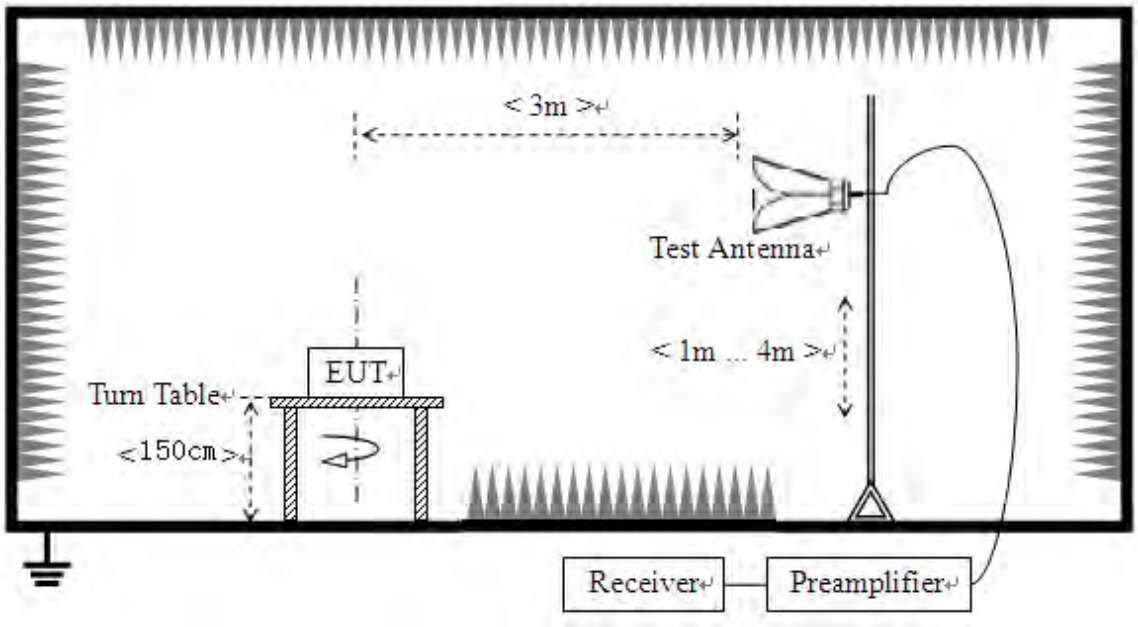
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following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

2.8.2.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

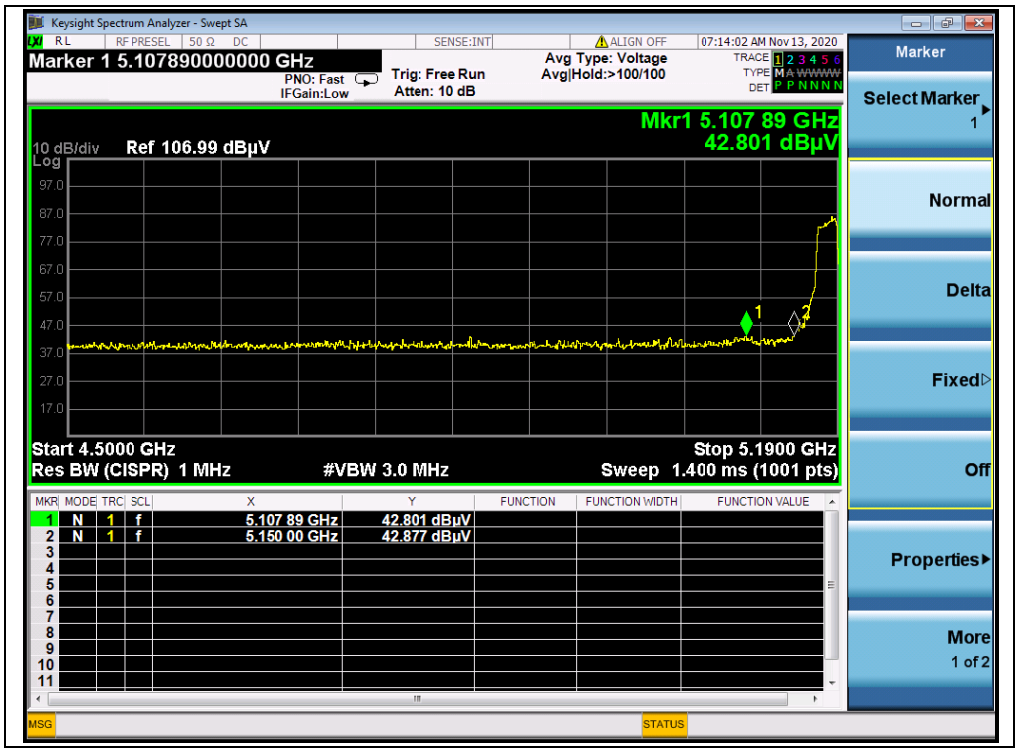
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]$-G_{preamp}$ [dB]
A_T: Total correction Factor except Antenna; U_R: Receiver Reading
G_{preamp}: Preamplifier Gain; A_{Factor}: Antenna Factor at 3m
Note 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

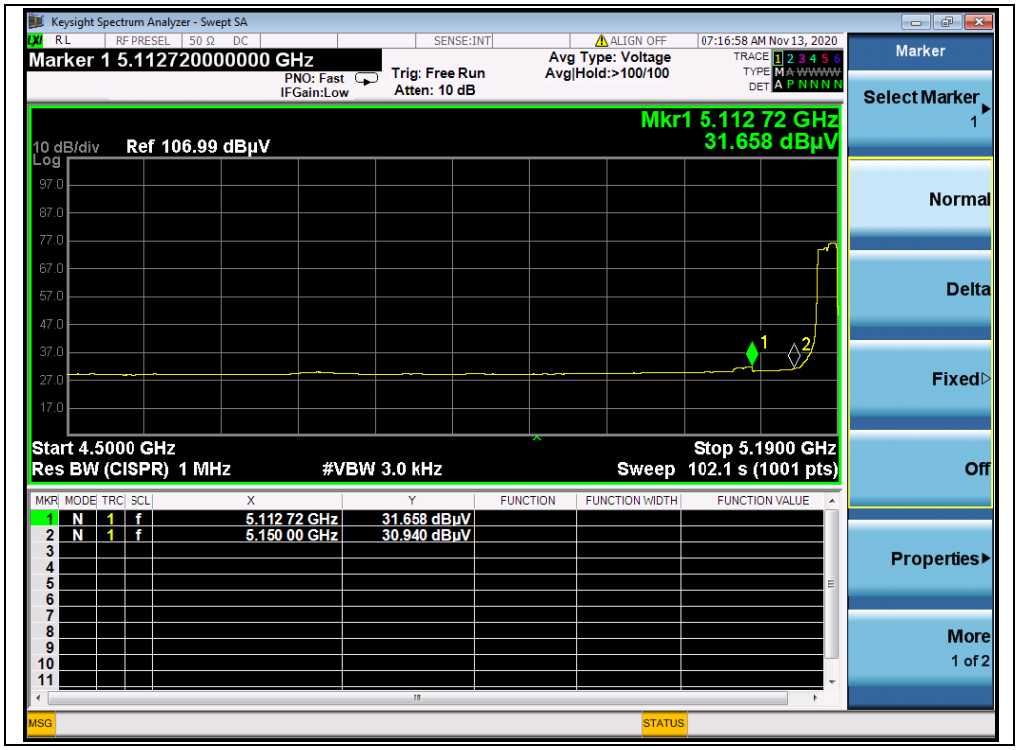
A.Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
36	5150.00	PK	42.88	-26.92	32.20	48.16	74	PASS
36	5112.72	AV	31.66	-26.92	32.20	36.94	54	PASS
48	5355.06	PK	38.25	-26.92	32.20	43.53	74	PASS
48	5354.18	AV	28.34	-26.92	32.20	33.62	54	PASS
149	5725.00	PK	53.78	-26.23	32.20	59.75	122.23	PASS
165	5850.00	PK	48.74	-26.23	32.20	54.71	122.23	PASS

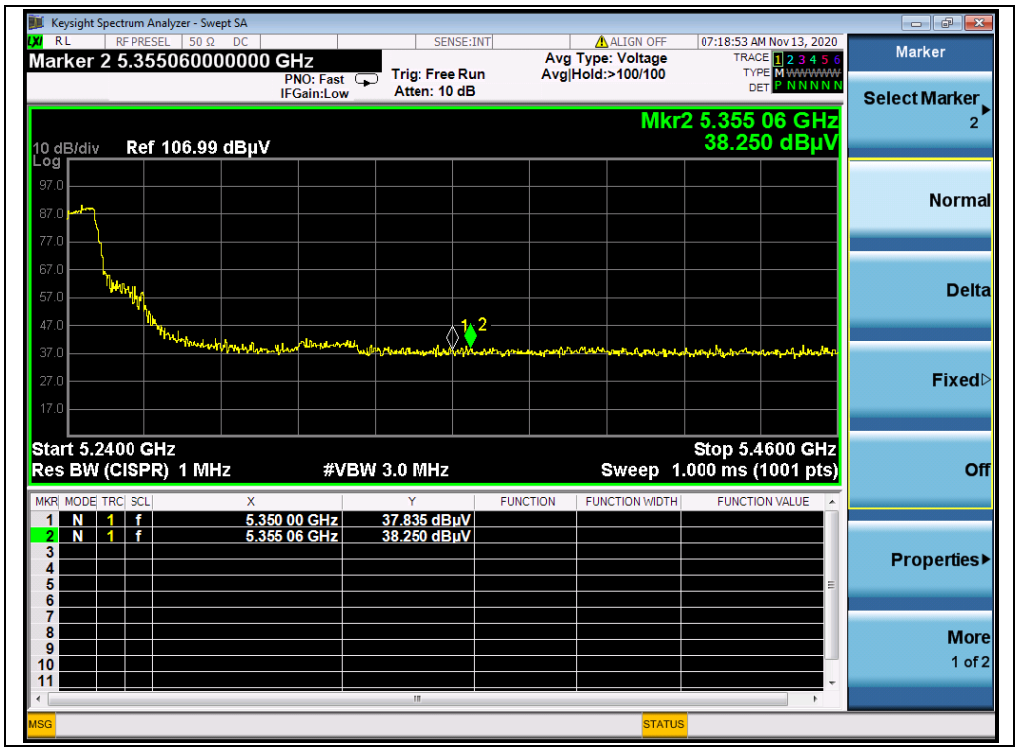
B.Test Plot:



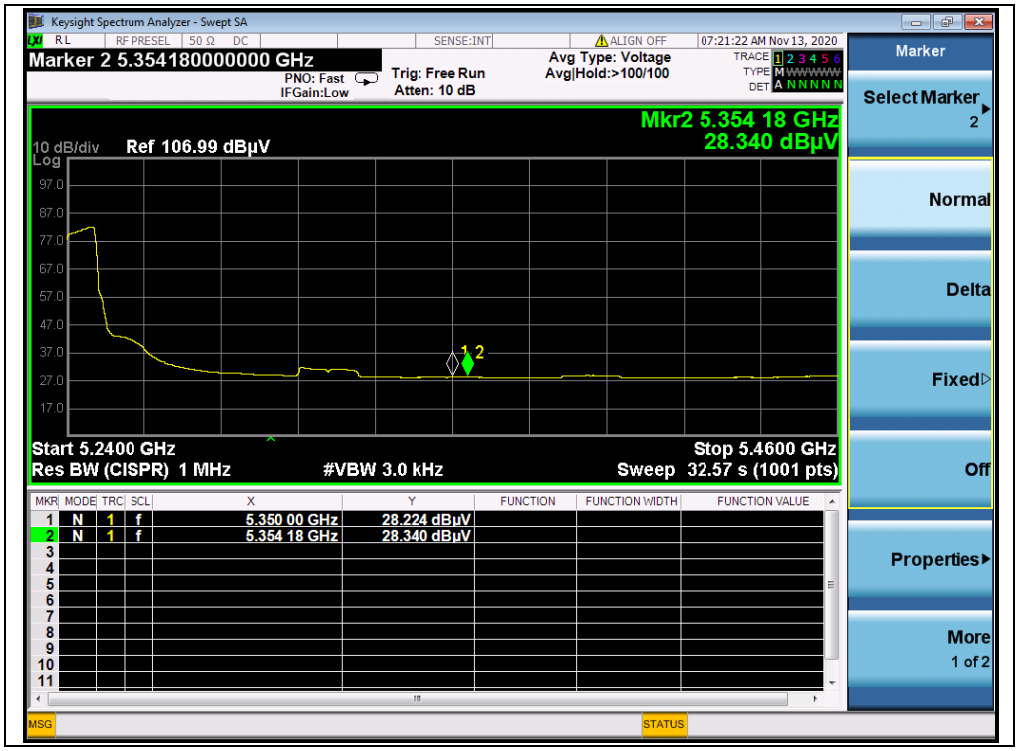
(PEAK, Channel 36, 802.11a)



(AVERAGE, Channel 36, 802.11a)

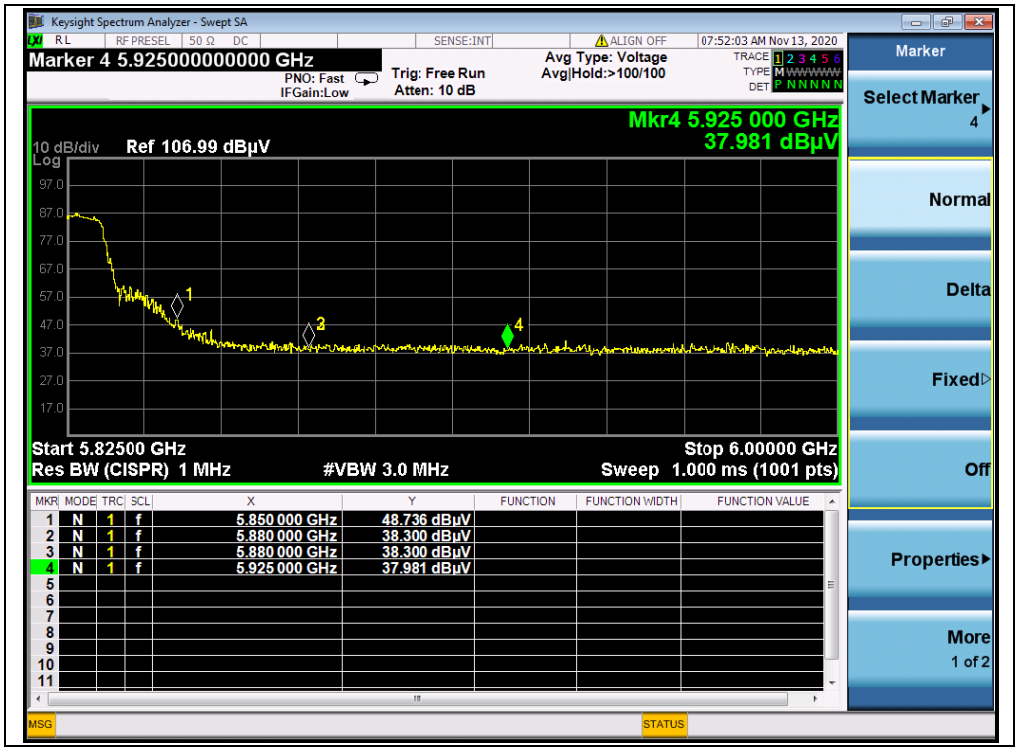


(PEAK, Channel 48, 802.11a)



(AVERAGE, Channel 48, 802.11a)

(PEAK, Channel 149, 802.11a)



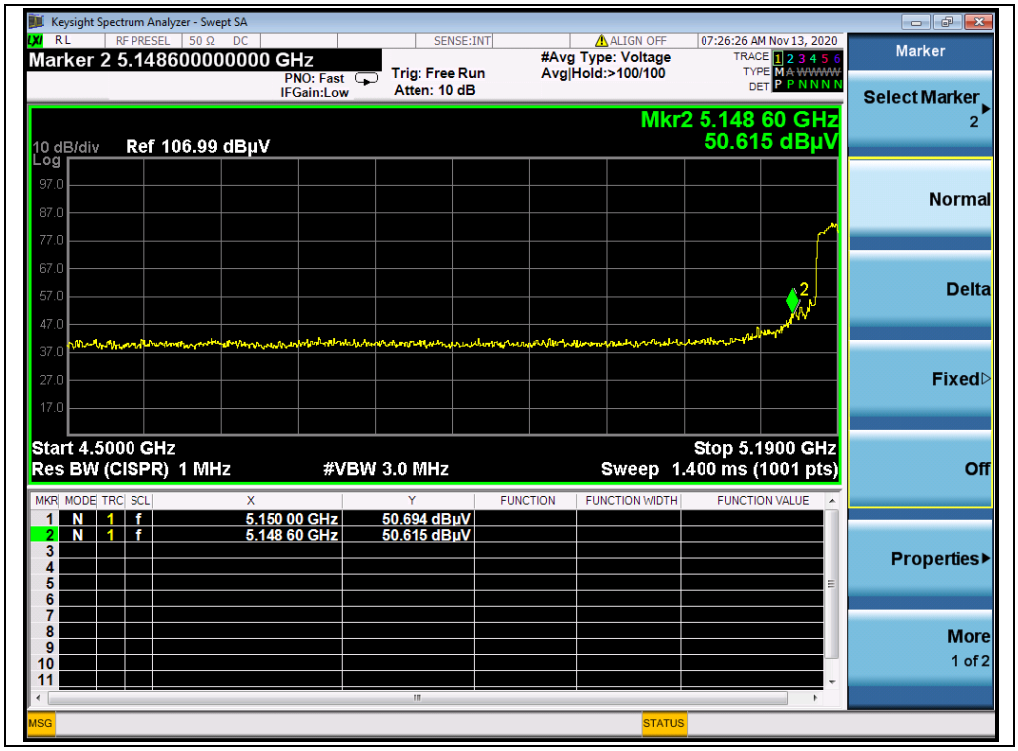
(PEAK, Channel 165, 802.11a)

802.11n (HT40) Mode

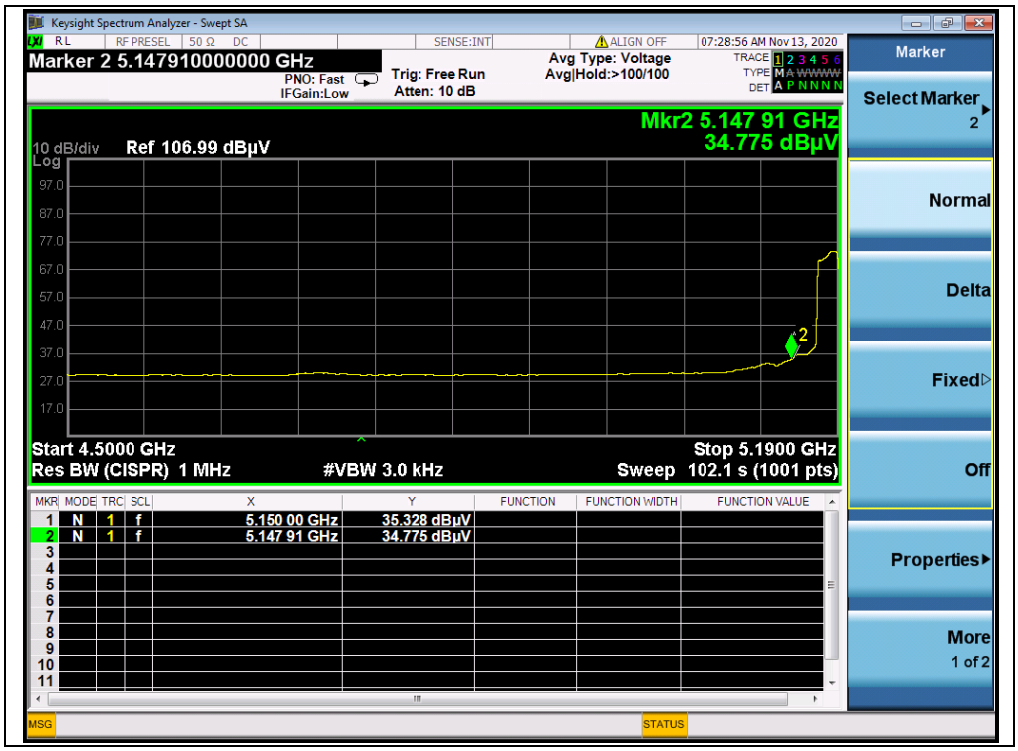
A.Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
38	5150.00	PK	50.69	-26.92	32.20	55.97	74	PASS
38	5150.00	AV	35.33	-26.92	32.20	40.61	54	PASS
48	5352.99	PK	39.08	-26.92	32.20	44.36	74	PASS
48	5352.07	AV	28.19	-26.92	32.20	33.47	54	PASS
151	5725.00	PK	56.78	-26.23	32.20	62.75	122.23	PASS
159	5855.00	PK	45.58	-26.23	32.20	51.55	110.83	PASS

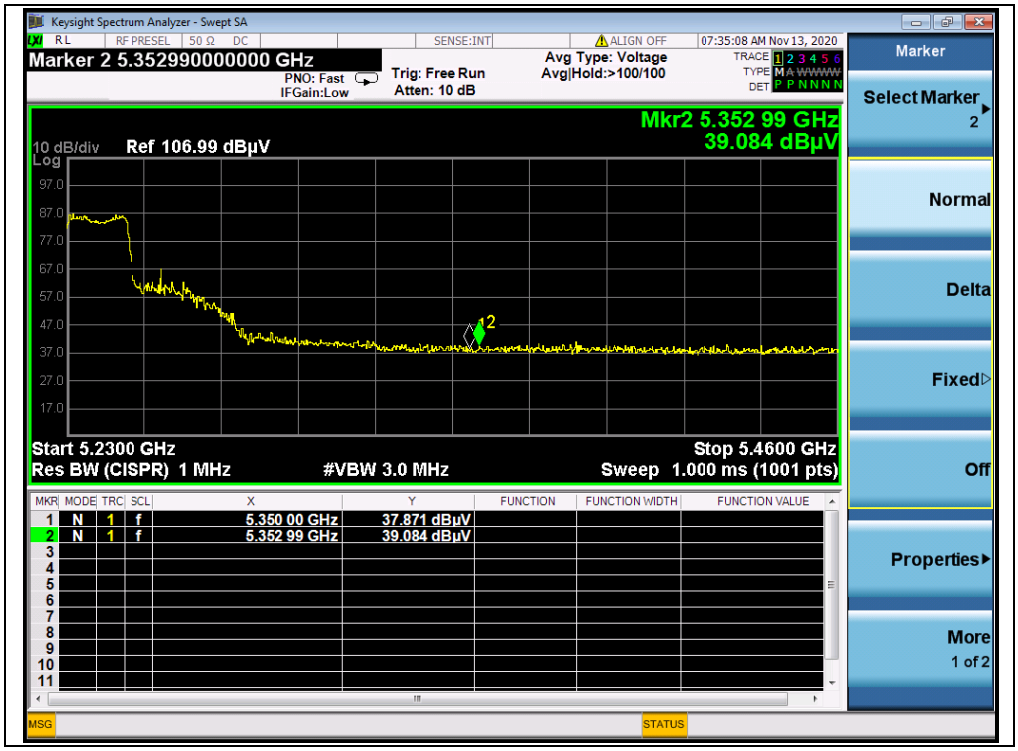
B.Test Plot:



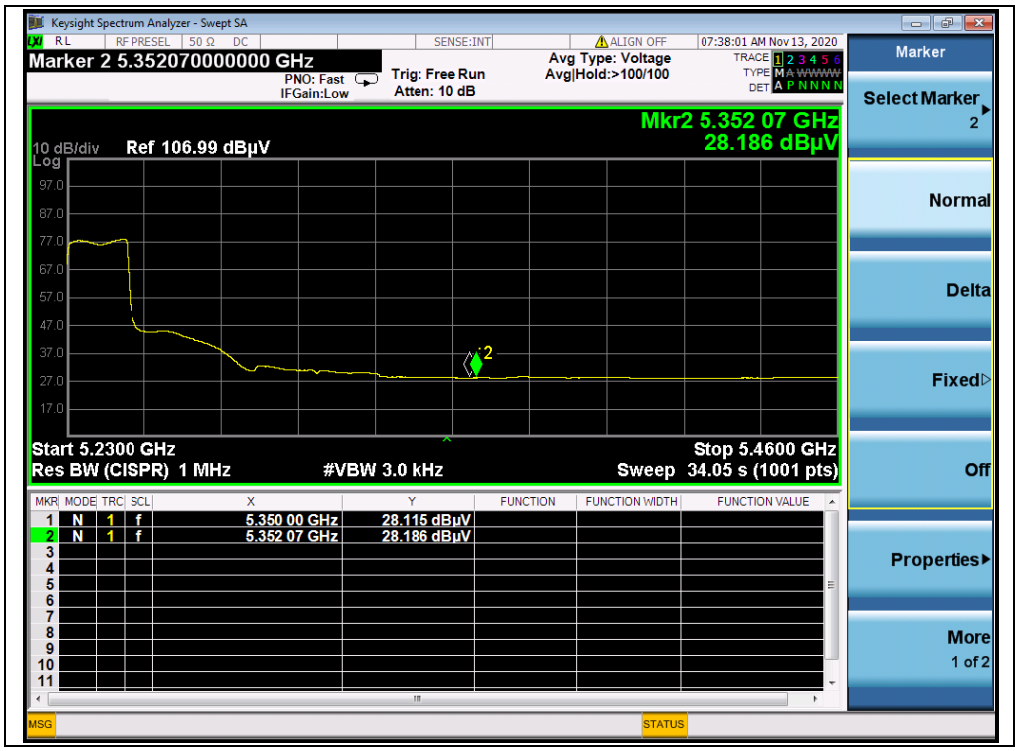
(PEAK, Channel 38, 802.11n (HT40))



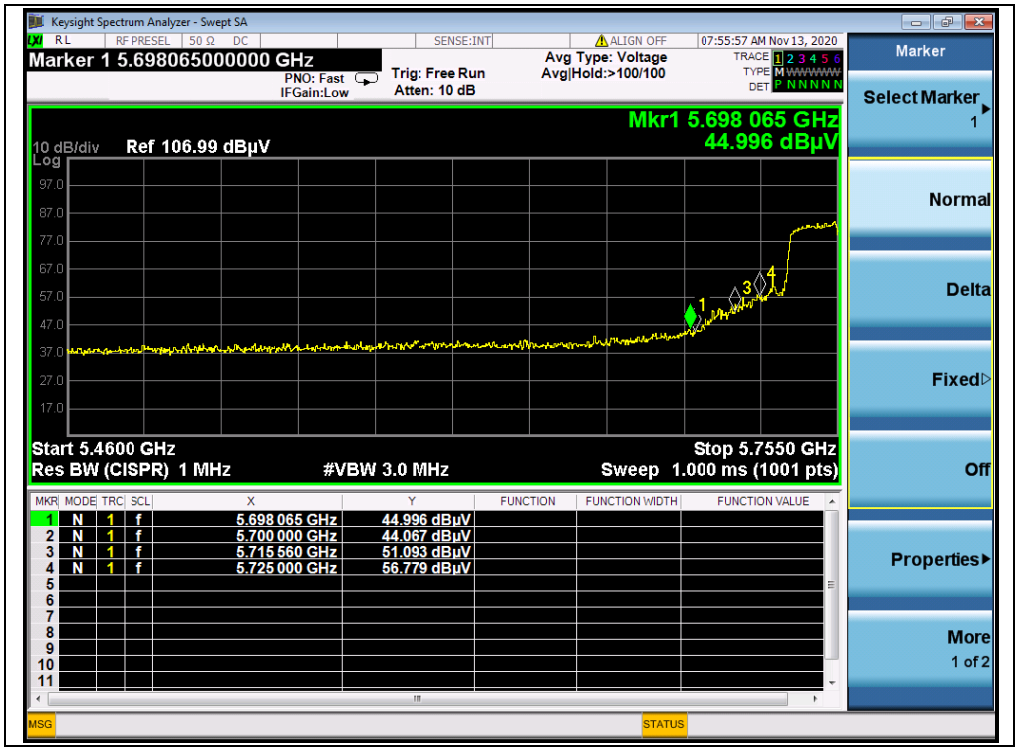
(AVERAGE, Channel 38, 802.11n (HT40))



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



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



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

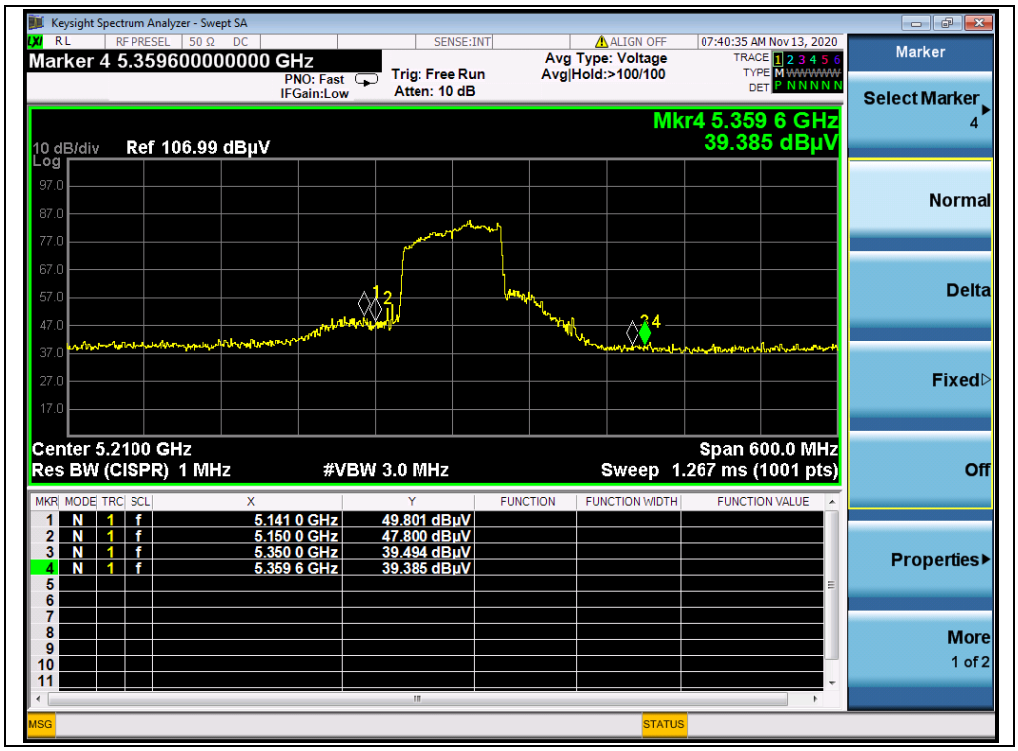
(PEAK, Channel 159, 802.11n (HT40))

802.11ac (VHT80) Test mode

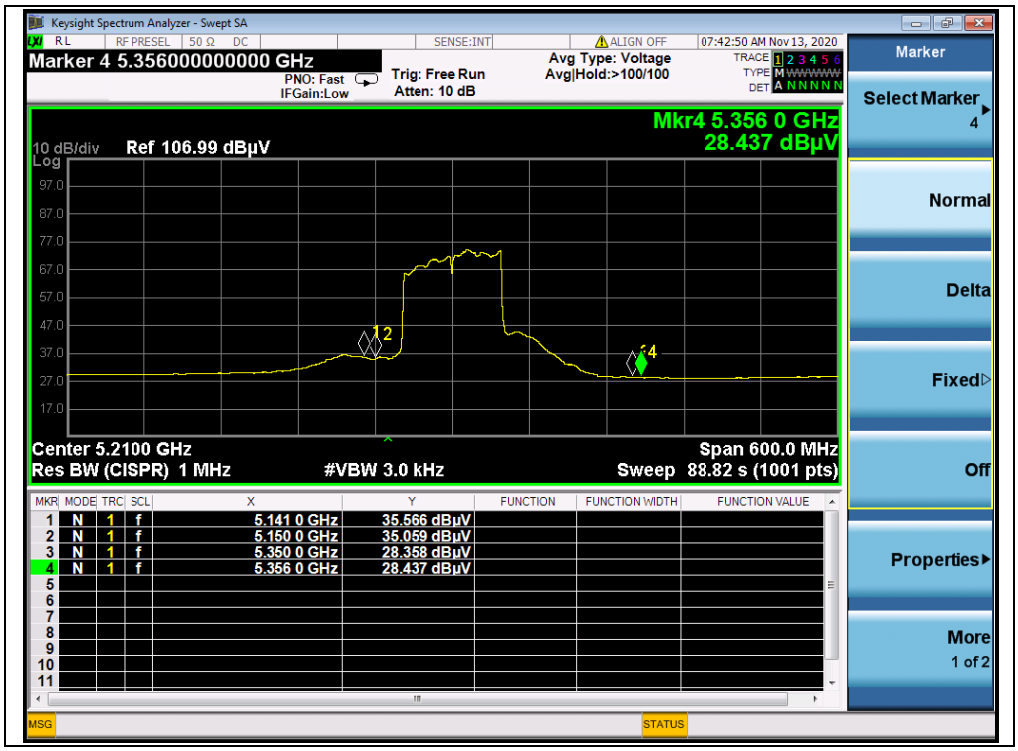
A.Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
42	5141.00	PK	49.80	-26.92	32.20	55.08	74	PASS
42	5141.00	AV	35.57	-26.92	32.20	40.85	54	PASS
42	5350.00	PK	39.49	-26.92	32.20	44.77	74	PASS
42	5356.00	AV	28.44	-26.92	32.20	33.72	54	PASS
155	5725.00	PK	51.43	-26.23	32.20	57.4	122.23	PASS
155	5850.00	PK	52.10	-26.23	32.20	58.07	122.23	PASS

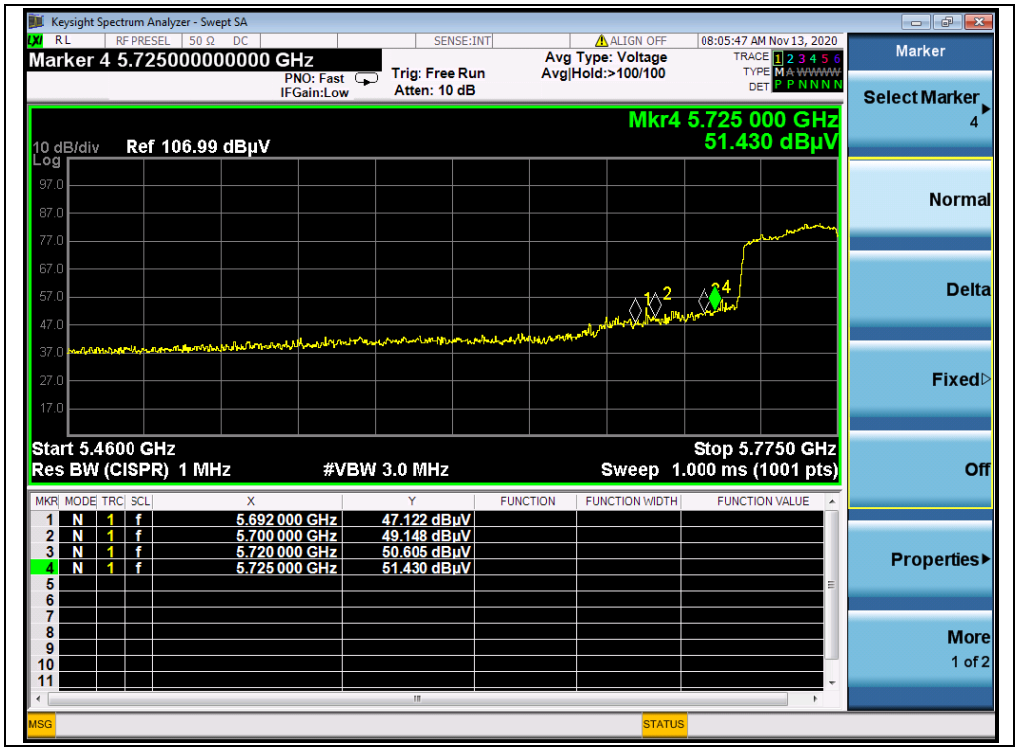
B.Test Plot:



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



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



(Channel 155, PEAK, 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);

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

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:

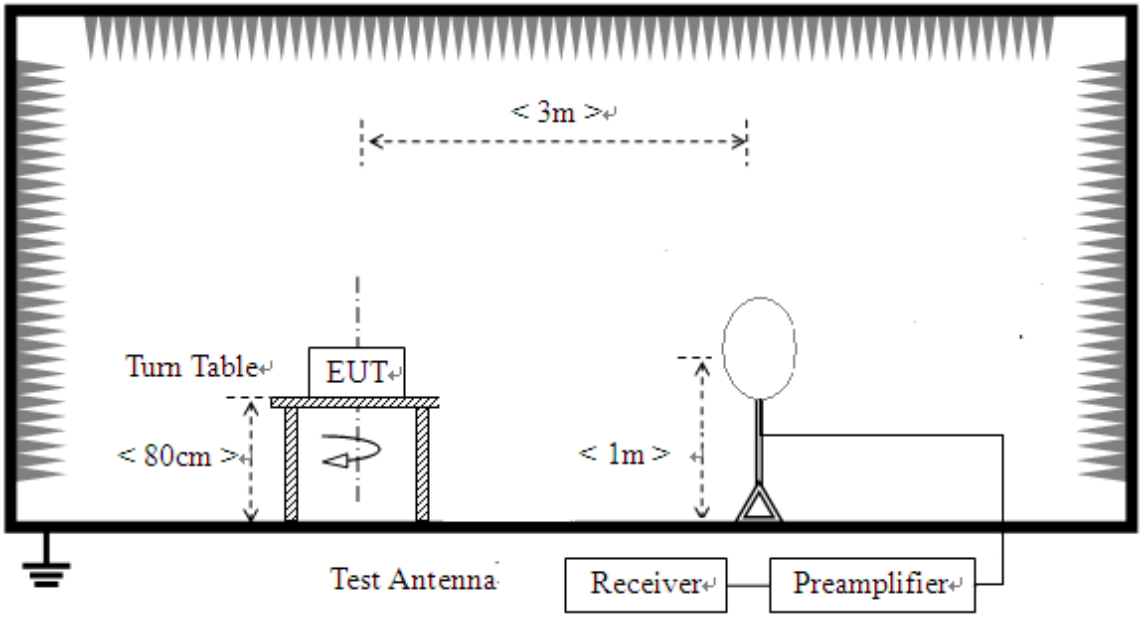
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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).

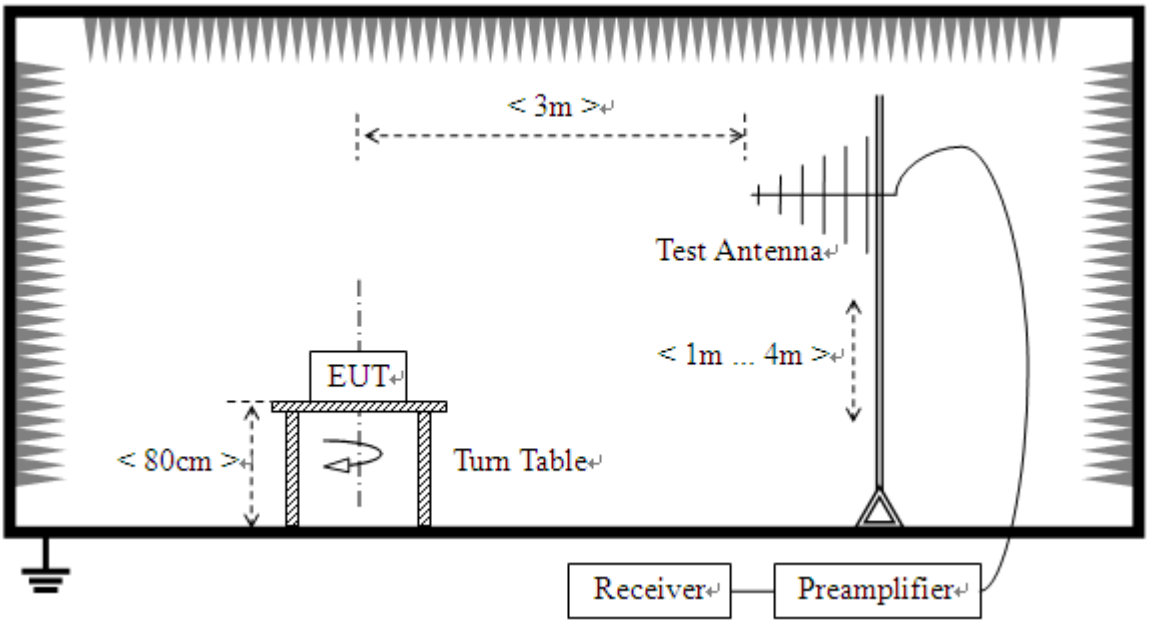
2.9.2.Test Description

Test Setup:

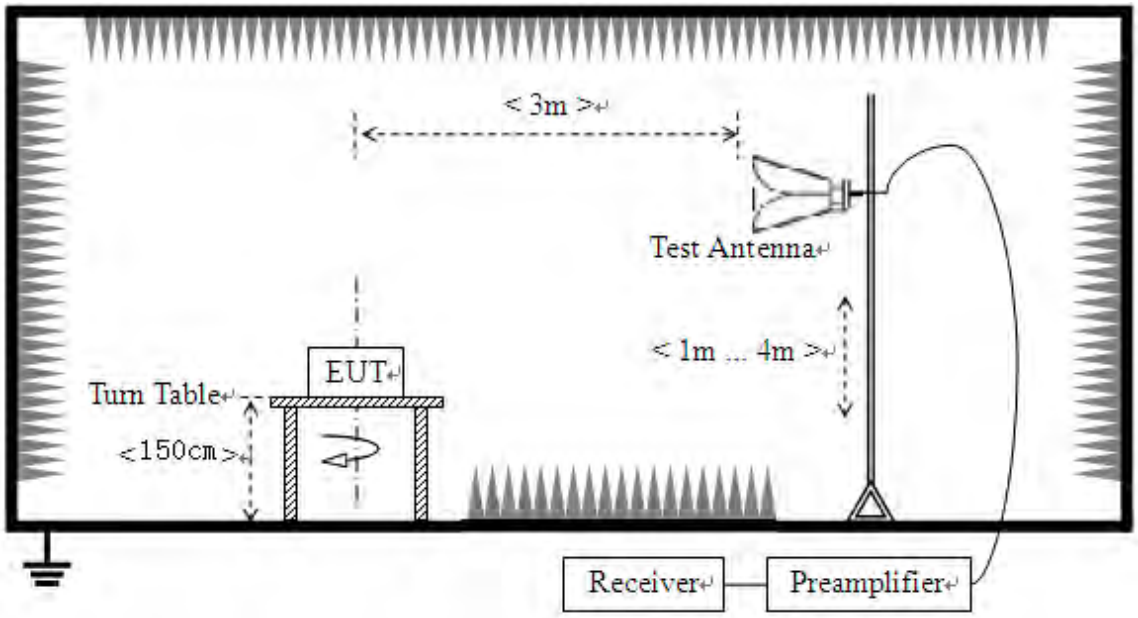
1) For radiated emissions from 9kHz to 30MHz



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

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

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.

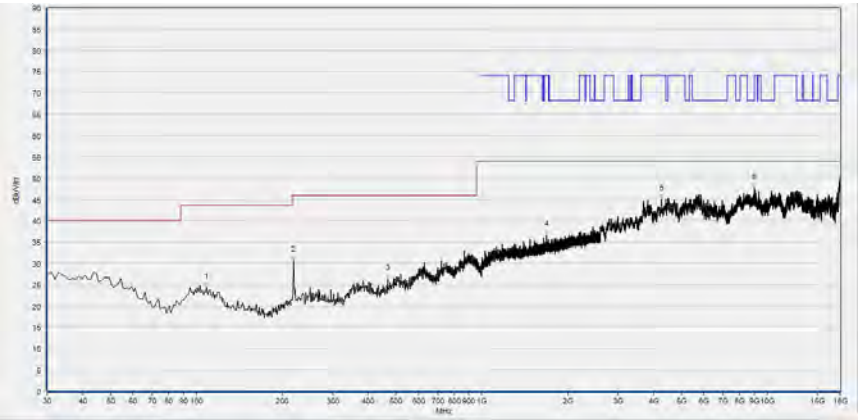
Note 2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

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.

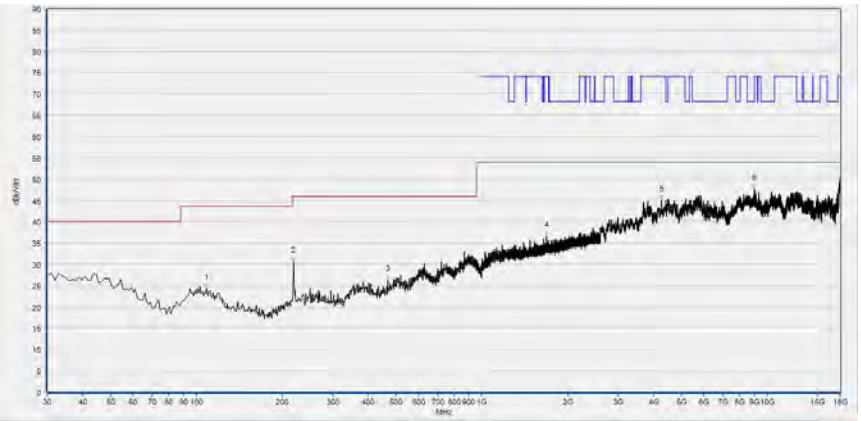
802.11a Mode

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
108.649	22.37	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	31.74	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
467.908	25.24	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1682.827	35.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4261.452	42.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8993.440	47.86	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

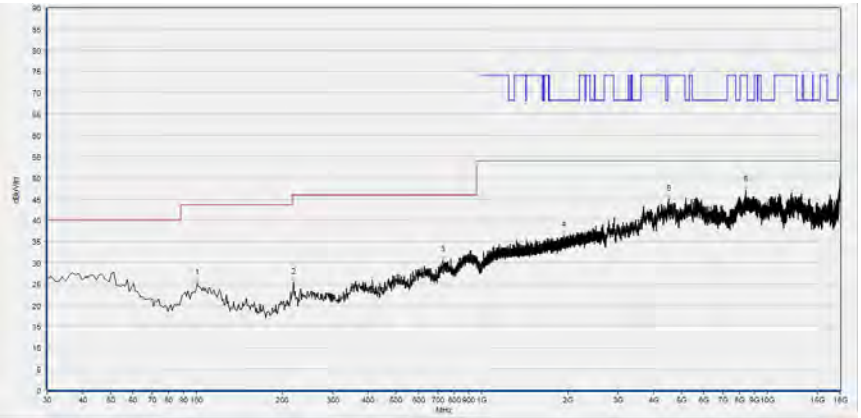
(Antenna Horizontal, 30MHz to 18GHz)



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
108.649	24.37	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	30.74	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
467.908	26.24	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1681.827	36.69	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4260.452	45.10	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8998.440	47.73	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

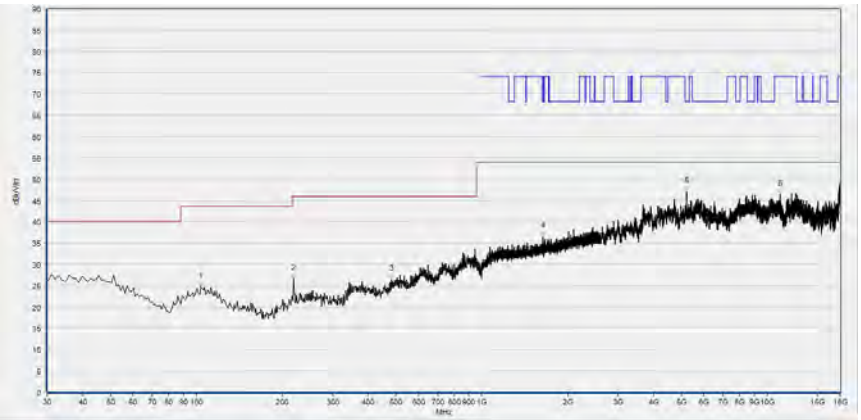
(Antenna Vertical, 30MHz to 18GHz)

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
100.881	25.14	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	25.35	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
729.099	30.51	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1940.047	36.31	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
4503.821	44.93	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8431.606	47.13	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

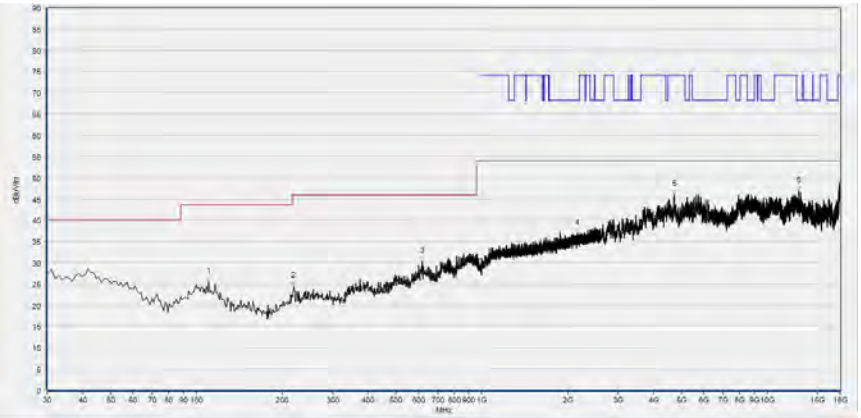
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
103.794	24.79	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	26.62	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
483.443	26.40	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1635.412	36.47	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5218.524	47.05	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
11111.742	46.42	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

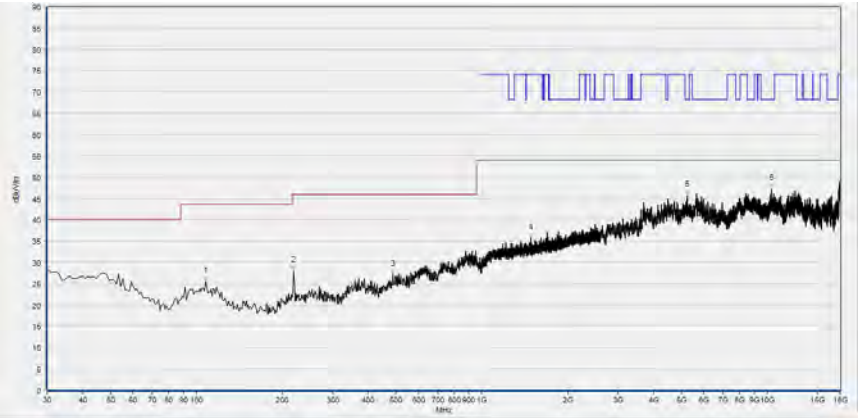
(Antenna Vertical, 30MHz to 18GHz)

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
110.591	25.51	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	24.42	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
616.466	30.40	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2159.320	36.88	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
4716.383	46.09	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12901.580	46.96	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

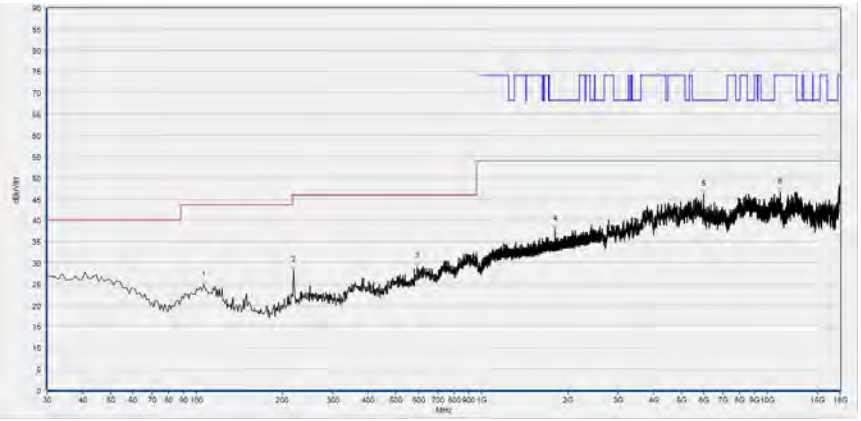
(Antenna Horizontal, 30MHz to 18GHz)



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
107.678	25.56	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	27.99	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
487.327	27.21	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1485.495	35.77	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5233.927	45.81	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10332.346	47.26	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

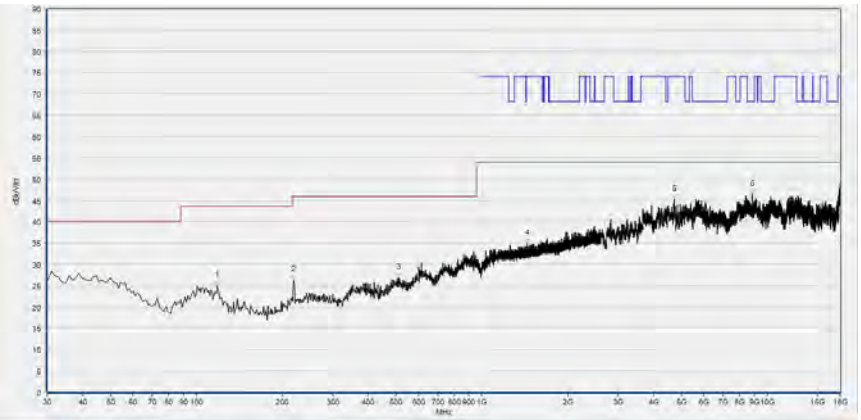
(Antenna Vertical, 30MHz to 18GHz)

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
105.736	24.87	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	28.20	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
594.134	28.93	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1803.468	37.79	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5985.597	46.02	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
11117.904	46.51	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

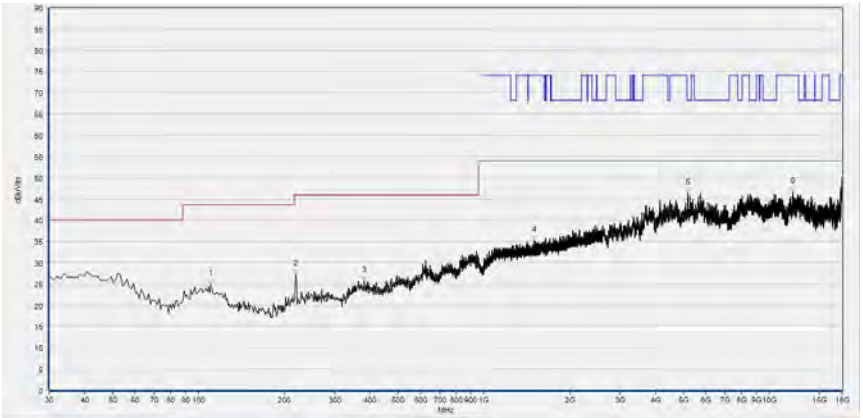
(Antenna Horizontal, 30MHz to 18GHz)



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
118.358	24.98	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	26.34	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
511.602	26.82	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1443.348	34.79	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4719.464	45.29	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8850.570	46.49	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

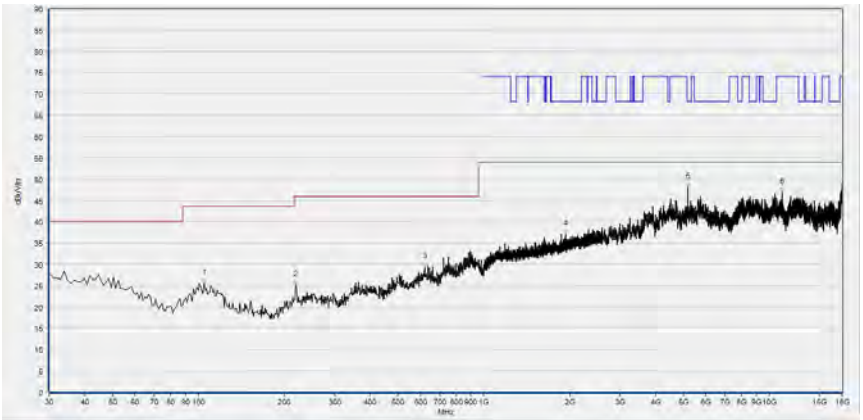
(Antenna Vertical, 30MHz to 18GHz)

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
110.591	25.03	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	27.37	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
381.491	25.81	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1502.568	35.23	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5187.718	46.38	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12082.136	46.73	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

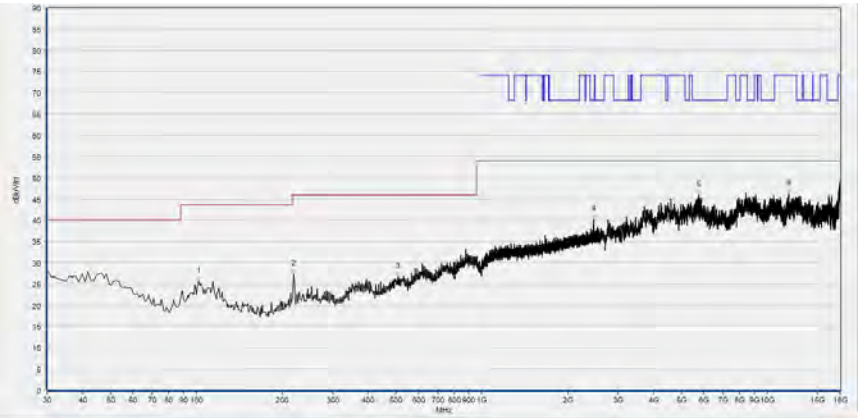
(Antenna Horizontal, 30MHz to 18GHz)



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	25.49	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	25.06	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
620.350	29.39	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1938.446	37.04	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5175.395	48.18	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
11114.823	46.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

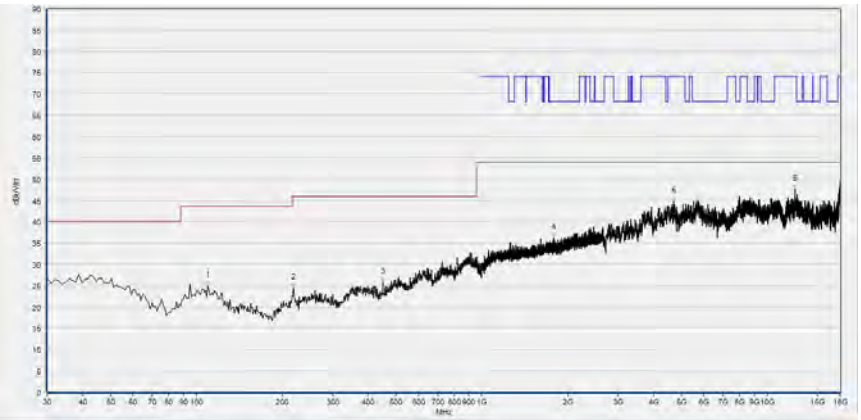
(Antenna Vertical, 30MHz to 18GHz)

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
101.852	25.72	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	27.34	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
506.747	26.58	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2464.488	40.16	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5754.551	45.87	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
11869.574	46.24	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

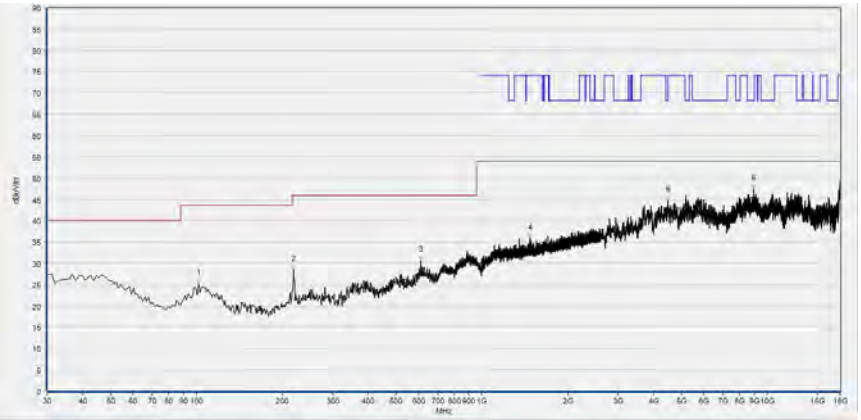


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
109.620	24.90	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	24.47	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
450.430	25.80	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1787.996	36.22	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
4700.980	44.74	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12510.342	47.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

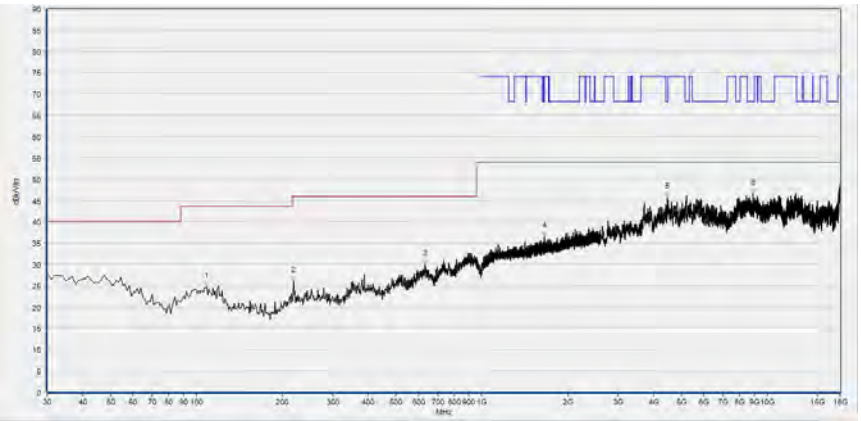
802.11n (HT40) Mode

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
101.852	25.13	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	28.57	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
611.612	30.60	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1471.624	35.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4488.418	44.74	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8976.875	47.42	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

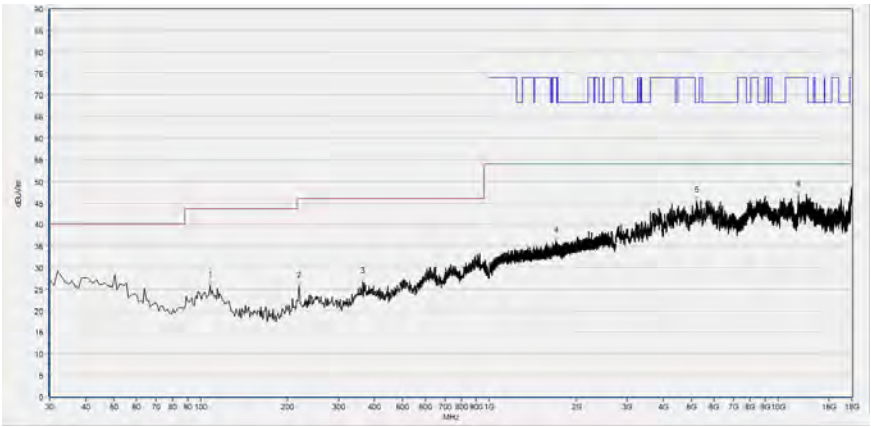
(Antenna Horizontal, 30MHz to 18GHz)



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
108.649	24.83	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	26.20	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
631.031	30.07	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1657.819	36.57	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
4473.015	45.70	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8918.344	46.54	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

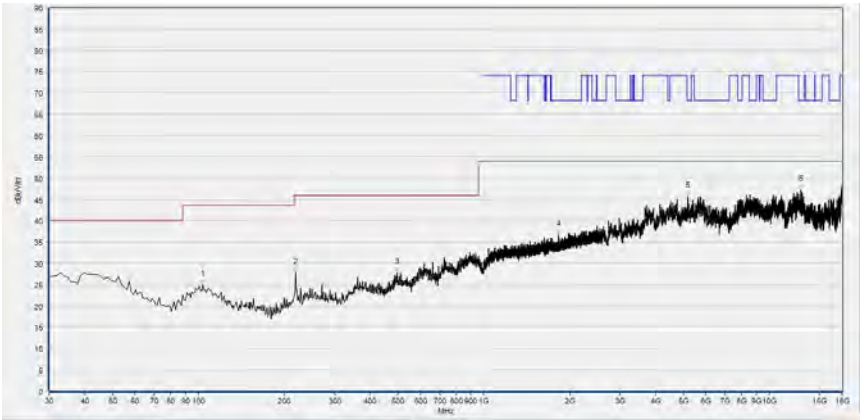
(Antenna Vertical, 30MHz to 18GHz)

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
107.678	25.86	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	25.67	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
364.014	26.67	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1702.101	36.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5218.524	45.44	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
11730.946	46.70	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

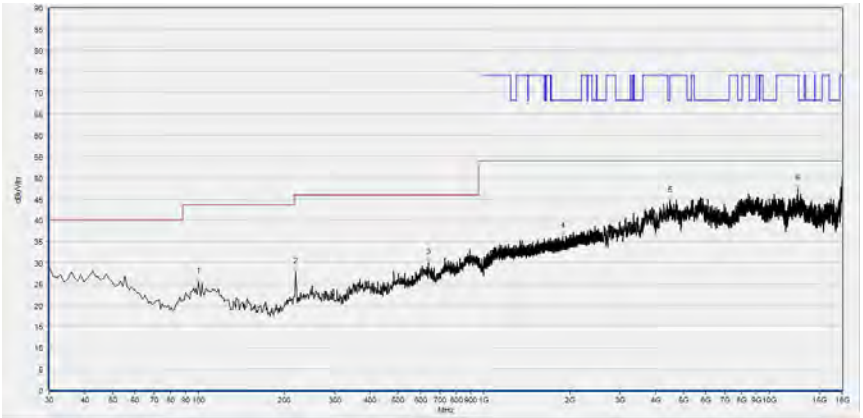
(Antenna Horizontal, 30MHz to 18GHz)



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
103.794	25.03	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	27.88	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
498.008	27.84	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1822.141	36.69	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5181.556	45.76	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12858.452	47.24	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

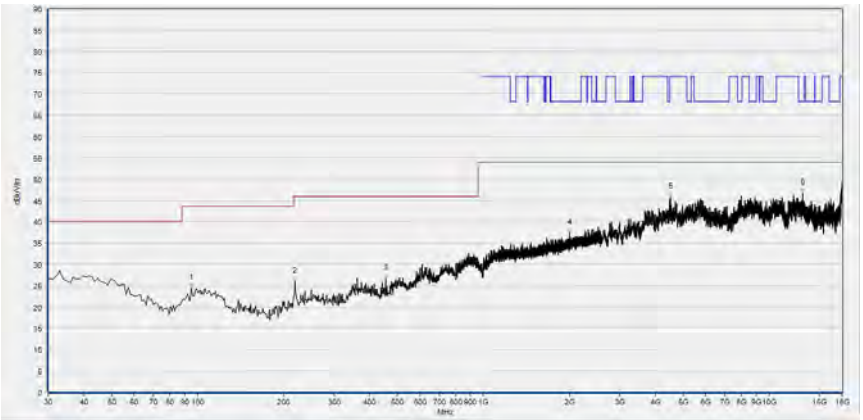
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 151



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
99.910	25.53	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	27.77	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
638.799	29.98	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1895.232	36.28	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
4491.498	44.64	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12618.164	47.43	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

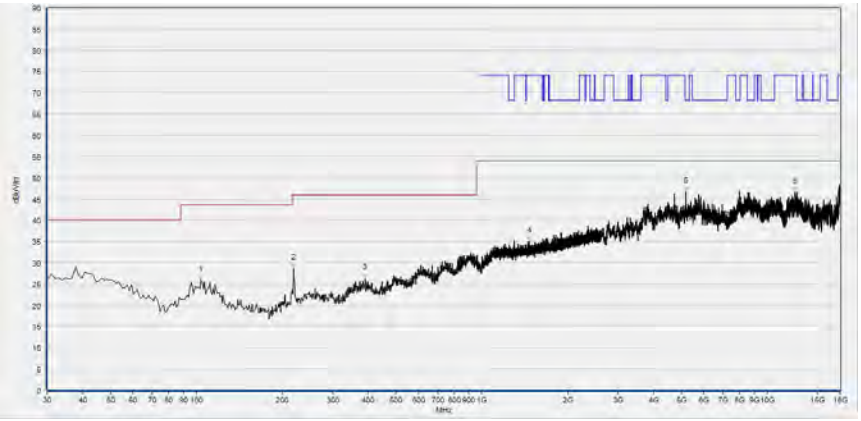
(Antenna Horizontal, 30MHz to 18GHz)



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
95.055	24.46	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	25.95	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
454.314	26.57	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2004.602	37.40	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
4516.143	45.80	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
13080.256	46.71	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

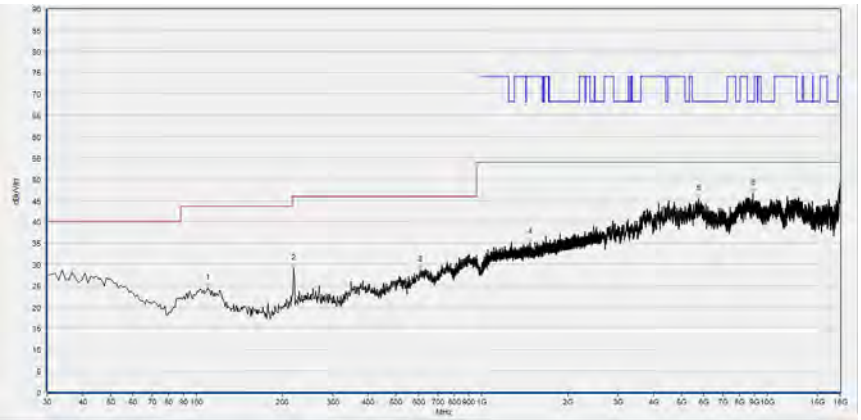
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 159



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
103.794	25.93	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	28.64	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
390.230	26.39	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1468.423	34.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5178.476	46.79	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12531.906	46.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

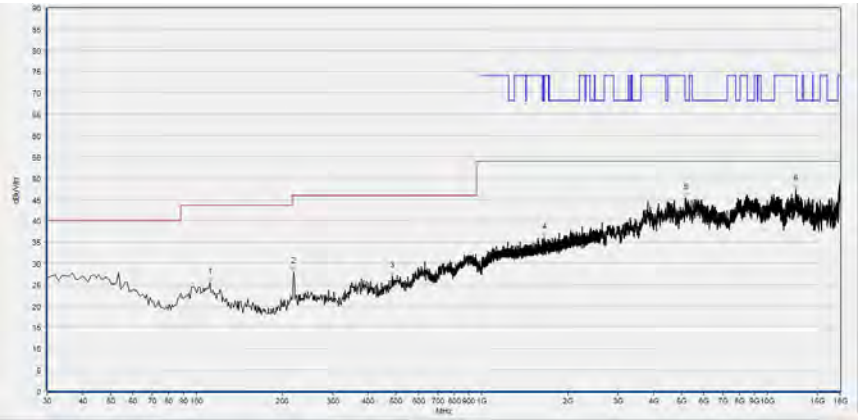


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
109.620	24.44	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	28.98	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
608.699	28.59	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1473.224	34.97	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5748.390	45.39	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8915.263	46.62	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

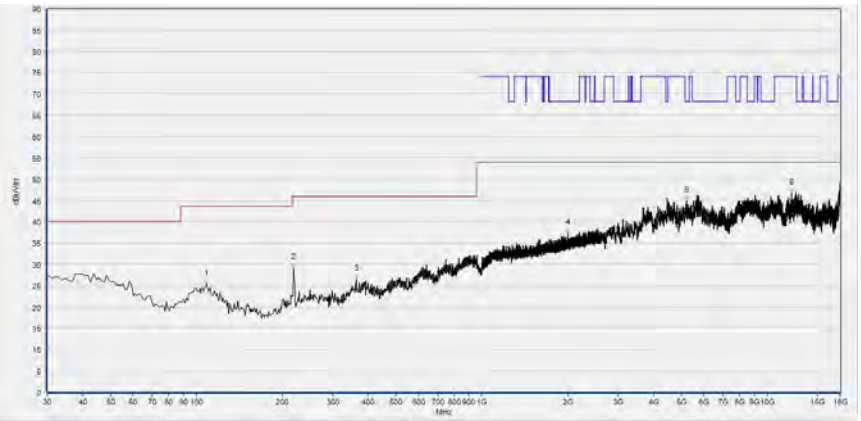
802.11ac (VHT80) Mode

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
111.562	25.41	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	28.03	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
486.356	26.92	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1654.085	36.00	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5190.798	45.41	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12621.244	47.42	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

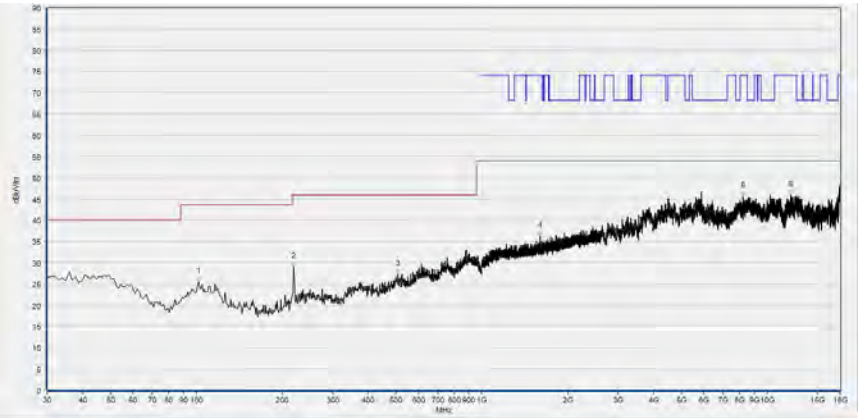
(Antenna Horizontal, 30MHz to 18GHz)



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
108.649	25.27	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	29.19	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
363.043	26.43	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2004.068	37.31	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5206.201	44.84	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12186.877	46.71	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

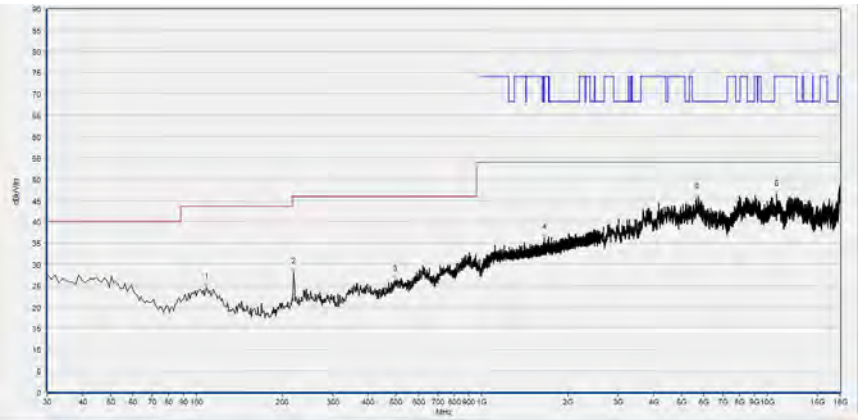
(Antenna Vertical, 30MHz to 18GHz)

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
101.852	25.46	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
219.339	28.97	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
506.747	27.30	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1601.801	36.19	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8234.447	45.66	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12066.733	45.99	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
108.649	24.64	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
219.339	28.11	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
498.008	26.26	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1659.420	36.18	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5655.971	45.55	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10803.681	46.50	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

Annex A Test Uncertainty

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

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

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

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

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

2. Identification of the Responsible Testing Location

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

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013and 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 Analzyer	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	2020.01.08	2021.01.07
				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

4.4Radiated 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	S020180L3203	Tonscend	2020.07.21	2021.07.20
26-40GHz pre-Amplifier	56774	S40M400L4002	Tonscend	2020.07.21	2021.07.20
18-26.5GHz pre-Amplifier	46732	S10M100L3802	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

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

END OF REPORT