REPORT No.: SZ20010031W04

TEST REPORT

APPLICANT	:	Atmoph Inc.
PRODUCT NAME	:	Atmoph Window 2
MODEL NAME	:	AW102
BRAND NAME	:	ATMOPH
FCC ID	:	2AVSP-AW102A
STANDARD(S)	:	47 CFR Part 15 Subpart E
RECEIPT DATE	:	2020-01-13
TEST DATE	:	2020-03-05 to 2020-04-04
ISSUE DATE	:	2020-05-08

Edited by: Peng Mi (Rapporteur)

Approved by: Peng Huarui(Supervisor)

MORLAB

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DIRECTORY

Change History		
Version	**Date**	**Reason for change**
1.0	2020-05-08	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and ManufacturerInformation

Applicant:	Atmoph Inc.
Applicant Address:	75-6 Yanagihachimancho, Nakagyo-ku, LS Kyoto 3F, Kyoto, 604-8101, Japan
Manufacturer:	Jenesis (Shenzhen) Co., Ltd.
ManufacturerAddress:	401-1 Building 2nd, Runheng industrial factory building , No.1 Liu'xian 3rd Road, Xingdong Community, Xin'an Avenue, Bao'an District, Shenzhen, Guangdong, China 518101

1.2. Equipment Under Test (EUT) Description

Product Name:	Atmoph Window 2	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	AW102-V1	
Software Version:	1.0.0	
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:	5.180 GHz- 5.240GHz; 5.260 GHz -5.320GHz ; 5.500 GHz -5.720 GHz	
Channel Number:	Refer to 1.3	
Antenna Type:	FPC Antenna	
Antenna Gain:	3.05dBi	
Accessory Information:	Battery(button cell)	
	Brand Name:	Panasonic
	Model No.:	CR1220
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	35mAh
	Rated Voltage:	3.0V

Accessory Information:	AC Adapter	
	Brand Name:	XinSPower
	Model No.:	A653-1903000DI
	Serial No.:	(N/A, marked #1 by test site)
	Rated Output:	19V⎓3.0A
	Rated Input:	100-240V ～ 50/60Hz 1.5A

Note1: WIFI hotspot does not support U-NII band.

Note2: 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: 5260MHz-5320MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	**52**	**5260**	56	5280
	60	**5300**	**64**	**5320**
40MHz	**54**	**5270**	**62**	**5310**
80MHz	**58**	**5290**		
Frequency Range: 5500MHz-5720MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	**100**	**5500**	105	5520
	108	5540	112	5560
	116	5580	**120**	**5600**
	124	5620	128	5640
	132	5660	136	5680
	140	5700	**144**	**5720**
40MHz	**102**	**5510**	110	5550
	118	5590	**126**	**5630**
	134	5670	**142**	**5710**
80MHz	**106**	**5530**	**122**	**5610**
	138	**5690**		

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	Mar05, 2020	Ouyang Feng	PASS	No deviation
3	15.407(a)	Maximum conducted output Power	Mar05, 2020	Ouyang Feng	PASS	No deviation
4	15.407(a) (e)	Emission Bandwidth	Mar05, 2020	Ouyang Feng	PASS	No deviation
5	15.407(a)	Peak Power spectral density	Mar05, 2020	Ouyang Feng	PASS	No deviation
6	15.407(g)	Frequency Stability	Mar05, 2020	Ouyang Feng	PASS	No deviation
7	15.207	Conducted Emission	Mar28, 2020	Huang Zhiye	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Apr 04, 2020	Peng Xuewei	PASS	No deviation
9	15.407(b)	Radiated Emission	Apr 04, 2020	Peng Xuewei	PASS	No deviation

Note1: The DFS test report was documented in a separate report (Report No.: SZ20010031W05).

Note2: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.102013.

Note3: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v01r03.

Note4: 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 2.0dB and

Attenuator 10dB.

Note 5: 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.

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. Result: Compliant

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

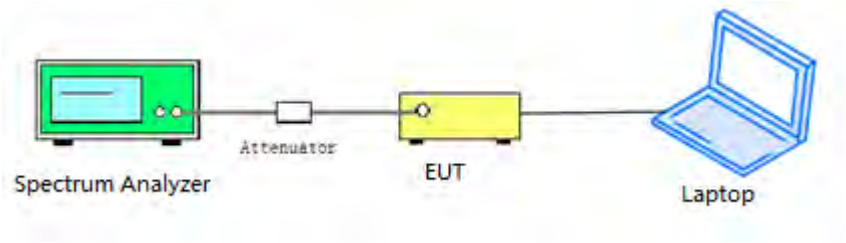
2.2. Duty Cycle of the test signal

2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with theEUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).
When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this subclause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±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

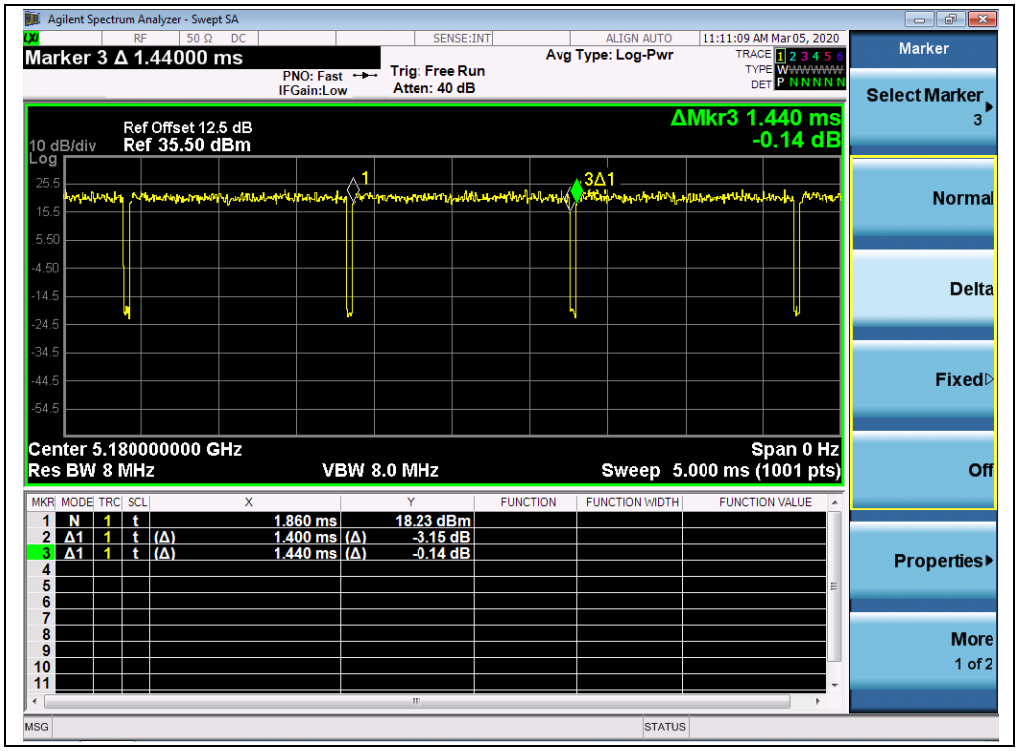
KDB 789033 Section B was used in order to provecompliance.

2.2.4. Test Result

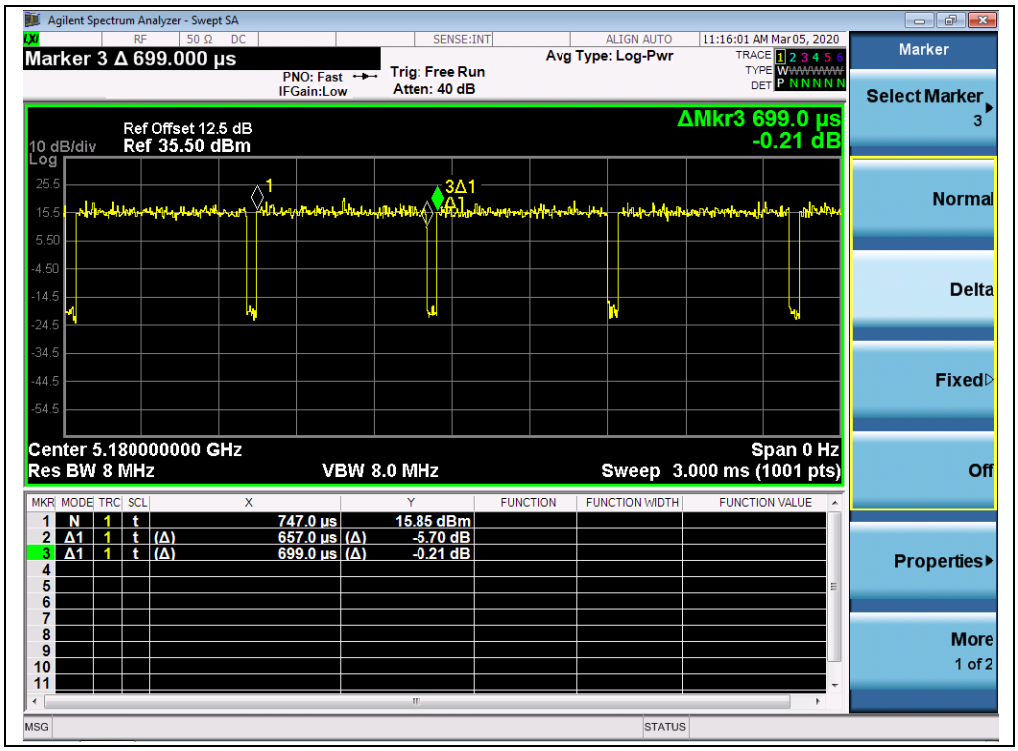
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	97.22	0.12
802.11n(HT20)	93.99	0.27
802.11n(HT40)	93.91	0.27
802.11ac(VHT20)	96.69	0.15
802.11ac(VHT40)	96.69	0.15
802.11ac(VHT80)	93.99	0.27

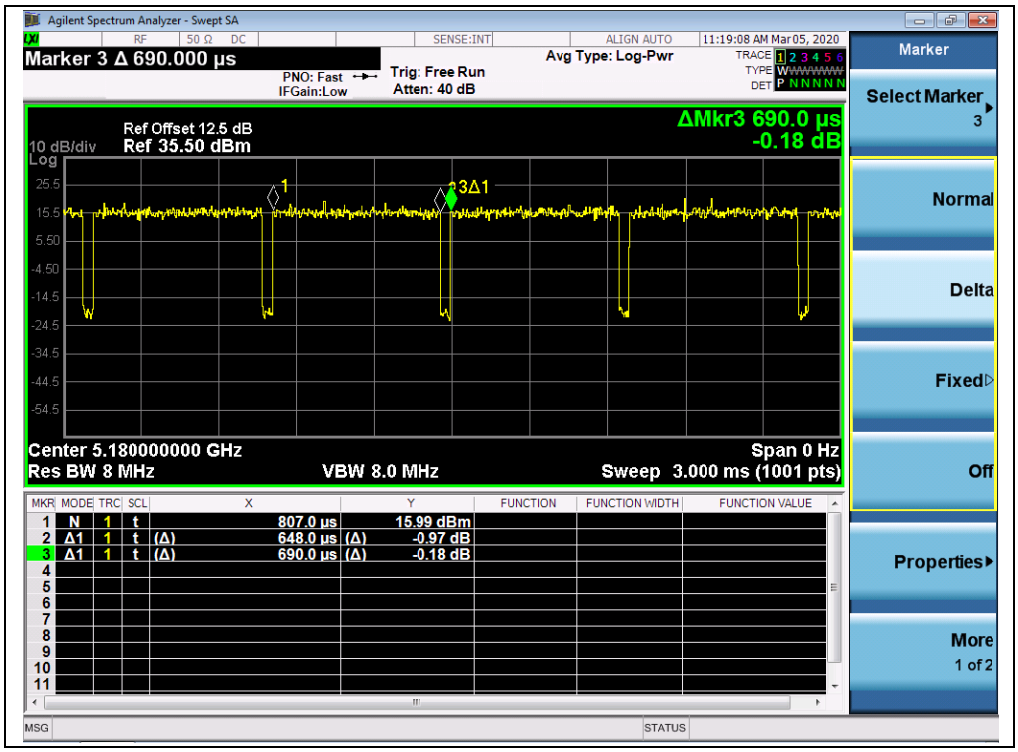
B. Test Plots



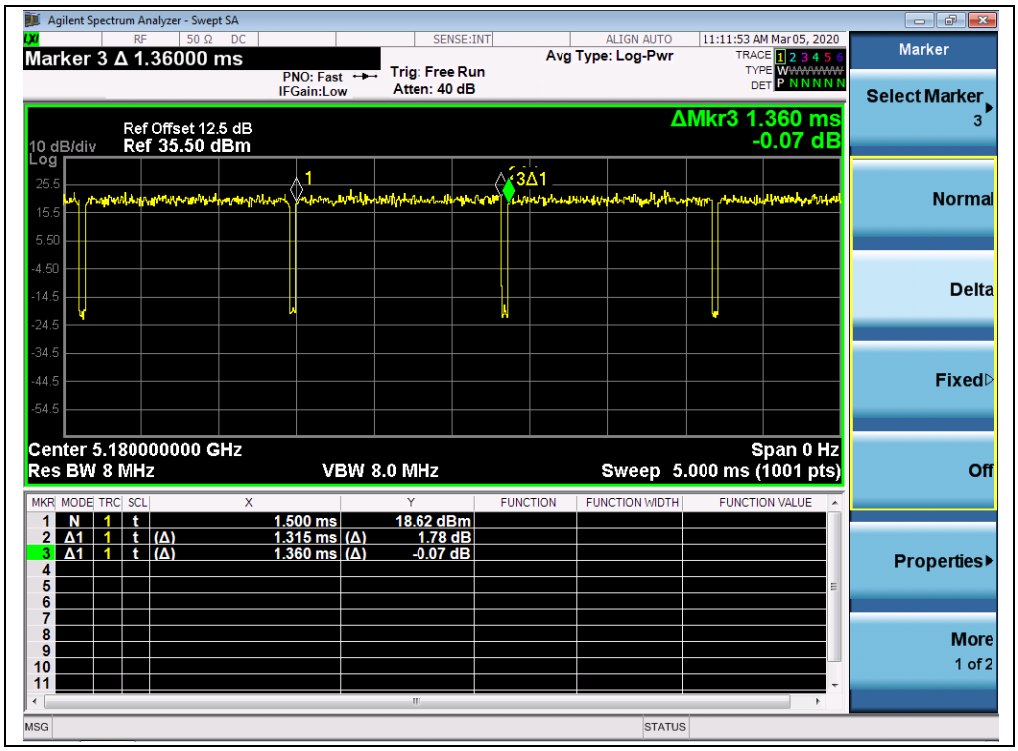
(CH36_5180MHz_802.11a)



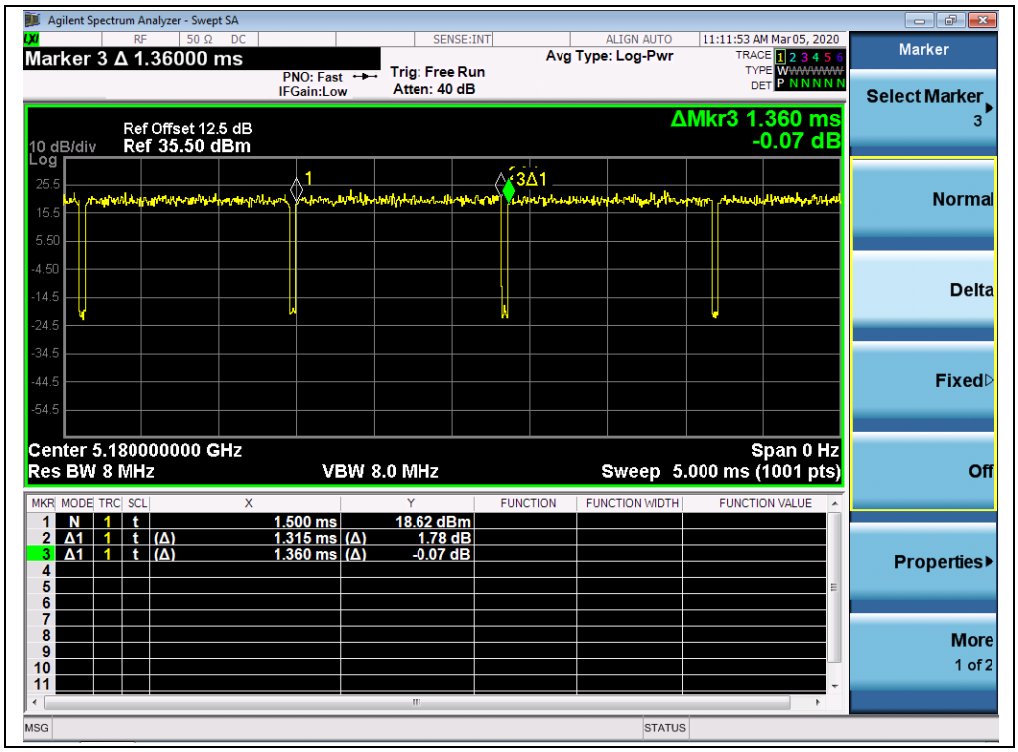
(CH36_5180MHz _802.11n(HT20))



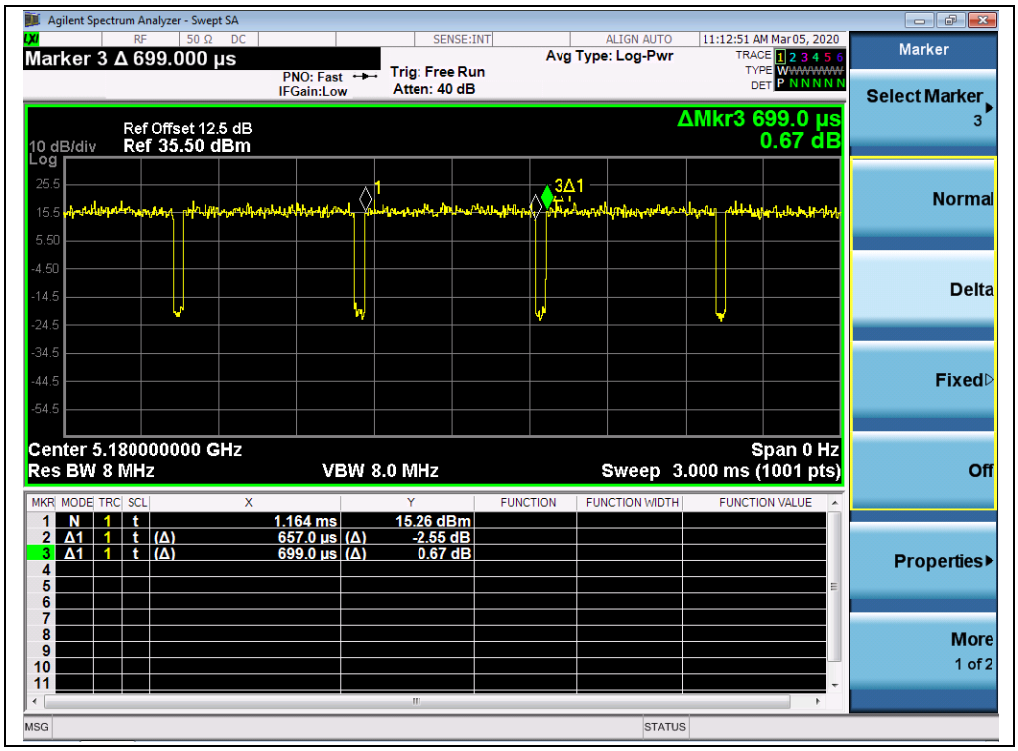
(CH38_5190MHz _802.11n(HT40))



(CH36_5180MHz _802.11ac(VHT20))



(CH38_5190MHz _802.11ac(VHT40))



(CH42_5210MHz _802.11ac(VHT80))

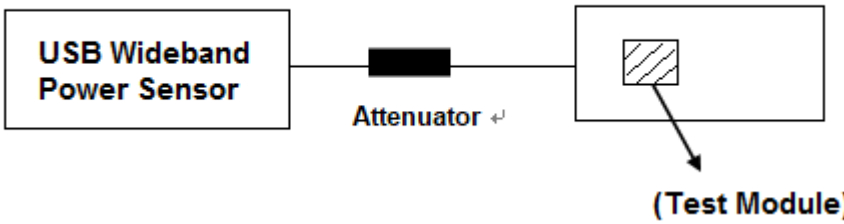
2.3. Maximum Conducted OutputPower

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 250 mW provided the maximum antenna gain does not exceed 6 dBi.
(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 250 mW or 11 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 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(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.

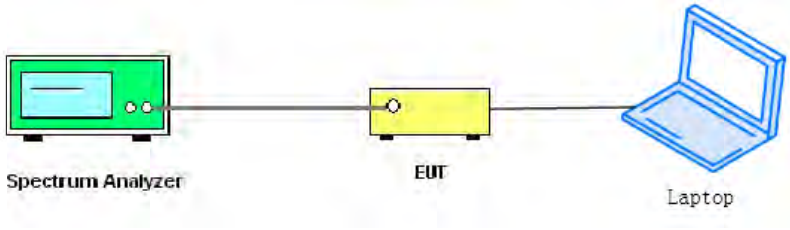
2.3.2. Test Description

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



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. Limits

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 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

Mode	Band	Channel (MHz)	26dB BW (MHz)	11+10log(26dB BW)	Limits (dBm)
a	UNII-2a	5260	21.67	24.36	24.00
		5300	21.83	24.39	24.00
		5320	21.36	24.30	24.00
	UNII-2c	5500	21.72	24.37	24.00
		5600	22.06	24.44	24.00
		5720	21.5	24.32	24.00
n20	UNII-2a	5260	21.83	24.39	24.00
		5300	21.73	24.37	24.00
		5320	22.25	24.47	24.00
	UNII-2c	5500	22.02	24.43	24.00
		5600	22.09	24.44	24.00
		5720	22.3	24.48	24.00
ac20	UNII-2a	5260	22.04	24.43	24.00
		5300	21.88	24.40	24.00
		5320	22.3	24.48	24.00
	UNII-2c	5500	21.89	24.40	24.00
		5600	21.97	24.42	24.00
		5720	22.14	24.45	24.00

2.3.4. Test Result

Maximum Average Conducted Output Power

802.11a Test mode

Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
	Measured	Duty Factor	Duty factor Calculated				
	dBm		dBm	W	dBm	W	
5180	15.84	0.12	**15.96**	**0.039**	24	0.25	PASS
5220	15.62		15.74	0.038			
5240	15.30		15.42	0.035			
5260	15.15		15.27	0.034			
5300	14.82		14.94	0.031			
5320	14.50		14.62	0.029			
5500	13.64		13.76	0.024			
5600	14.59		14.71	0.030			
5720	14.73		14.85	0.031			

802.11n (HT20) Test mode

Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
	Measured	Duty Factor	Duty factor Calculated				
	dBm		dBm	W	dBm	W	
5180	15.36	0.27	**15.63**	**0.037**	24	0.25	PASS
5220	15.31		15.58	0.036			
5240	14.91		15.18	0.033			
5260	14.91		15.18	0.033			
5300	14.50		14.77	0.030			
5320	14.25		14.52	0.028			
5500	13.39		13.66	0.023			
5600	14.24		14.51	0.028			
5720	14.30		14.57	0.029			

802.11n (HT40) Test mode

Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
	Measured	Duty Factor	Duty factor Calculated				
	dBm		dBm	W	dBm	W	
5190	15.41	0.27	**15.68**	**0.037**	24	0.25	PASS
5230	15.10		15.37	0.034			
5270	14.75		15.02	0.032			
5310	14.51		14.78	0.030			
5510	13.65		13.92	0.025			
5630	14.34		14.61	0.029			
5710	14.60		14.87	0.031			

802.11ac (VHT20) Test mode

Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
	Measured	Duty Factor	Duty factor Calculated				
	dBm		dBm	W	dBm	W	
5180	15.72	0.15	**15.87**	**0.039**	24	0.25	PASS
5220	15.57		15.72	0.037			
5240	15.19		15.34	0.034			
5260	15.34		15.49	0.035			
5300	14.95		15.10	0.032			
5320	14.74		14.89	0.031			
5500	13.71		13.86	0.024			
5600	14.59		14.74	0.030			
5720	14.79		14.94	0.031			

802.11ac (VHT40) Test mode

Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
	Measured	Duty Factor	Duty factor Calculated				
	dBm		dBm	W	dBm	W	
5190	15.39	0.15	**15.54**	**0.036**	24	0.25	PASS
5230	15.14		15.29	0.034			
5270	14.94		15.09	0.032			
5310	14.35		14.50	0.028			
5510	13.69		13.84	0.024			
5630	14.37		14.52	0.028			
5710	14.65		14.80	0.030			

802.11ac (VHT80) Test mode

Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
	Measured	Duty Factor	Duty factor Calculated				
	dBm		dBm	W	dBm	W	
5210	14.12	0.27	**14.39**	**0.027**	24	0.25	PASS
5290	13.67		13.94	0.025			
5530	12.56		12.83	0.019			
5610	13.35		13.62	0.023			
5690	13.50		13.77	0.024			

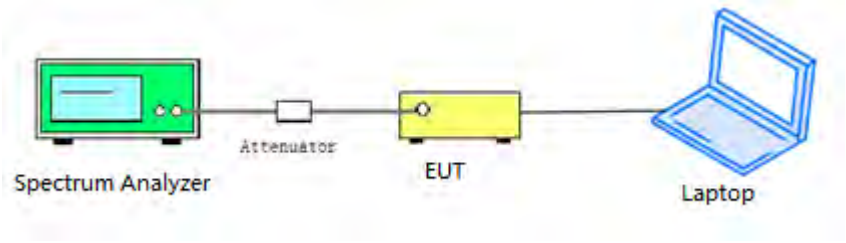
2.4. Emission Bandwidth

2.4.1. Requirement

For purposesof this subpart the emission bandwidthshall be determined by measuring thewidth of the signal between two points,one below the carrier center frequencyand one above the carrier center frequency,that are 26 dB down relative tothe maximum level of the modulatedcarrier. Determination of the emissionsbandwidth is based on the use of measurementinstrumentation employing apeak detector function with an instrumentresolution bandwidth approximatelyequal to 1.0 percent of the emissionbandwidth of the device undermeasurement.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

TestSetup:



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 provecompliance
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the 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 provecompliance.
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for theband

5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the 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.

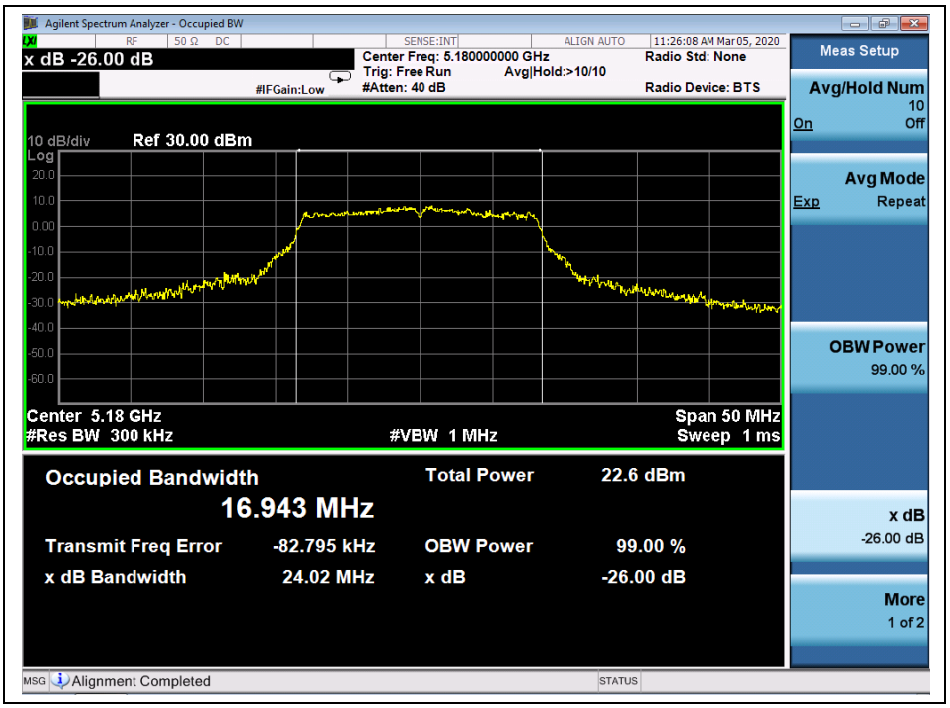
2.4.4. Test Result

802.11a Test mode

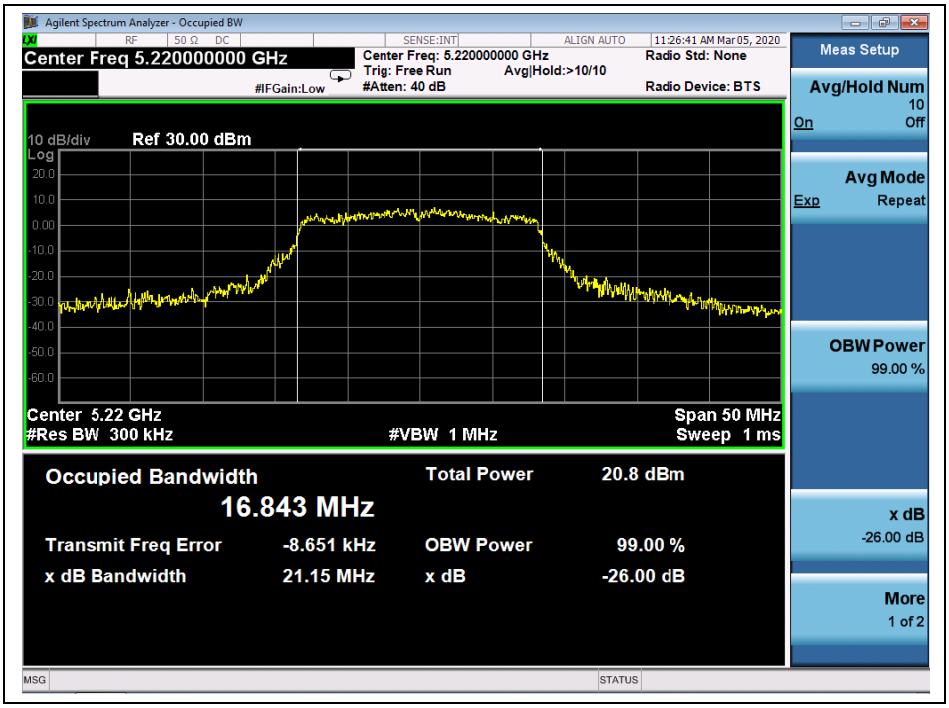
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	24.02
44	5220	21.15
48	5240	25.93
52	5260	25.53
60	5300	23.53
64	5320	21.15
100	5500	24.28
120	5600	21.71
144	5720	21.35
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
144	5720	16.35

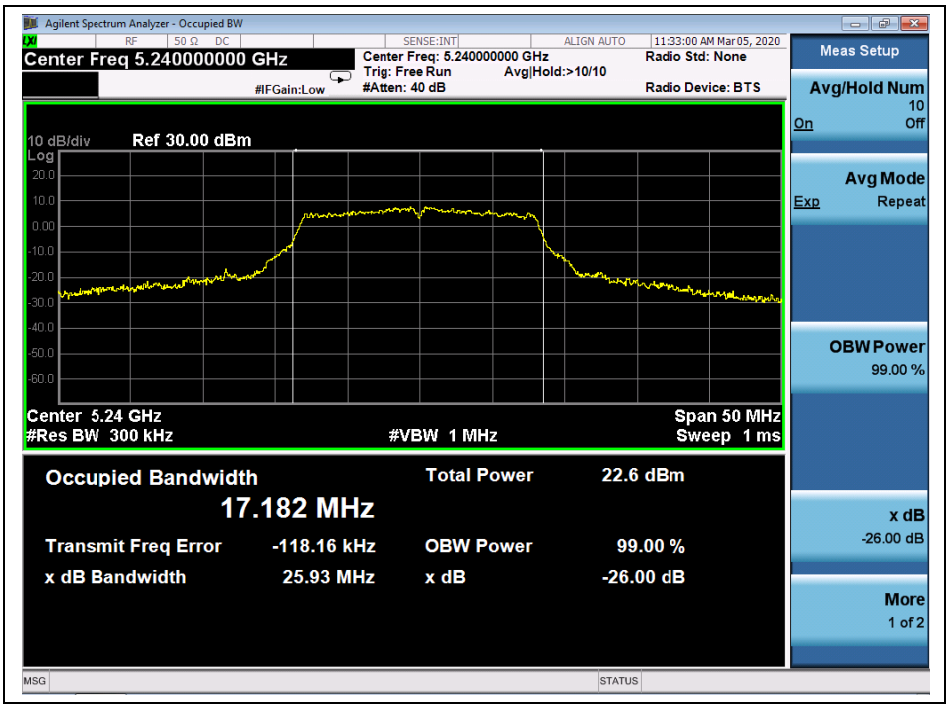
B. Test Plots



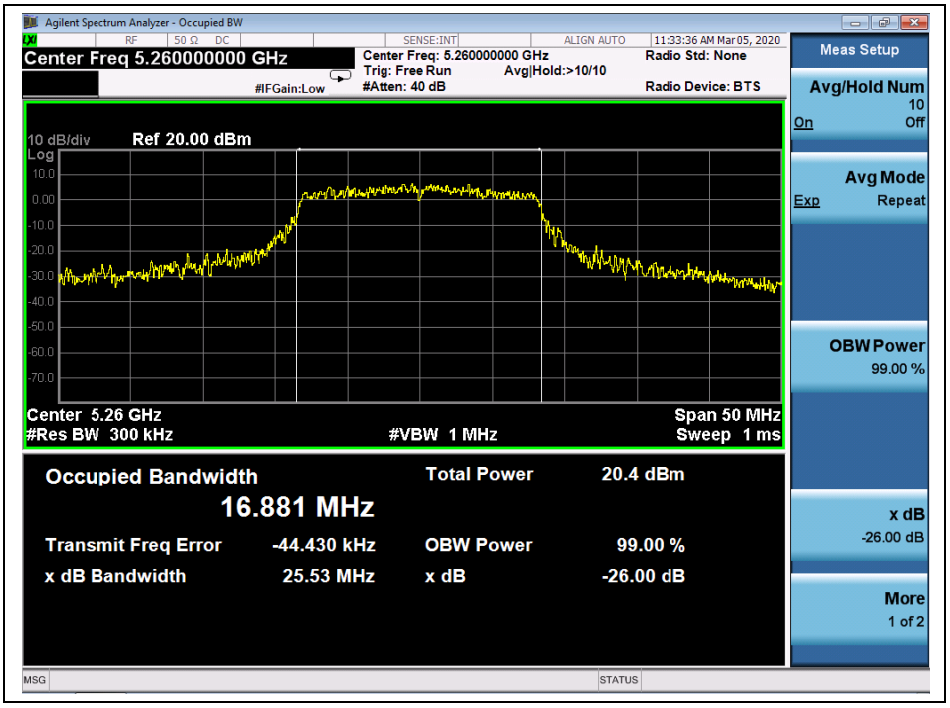
(Channel 36,5180MHz, 802.11a,)



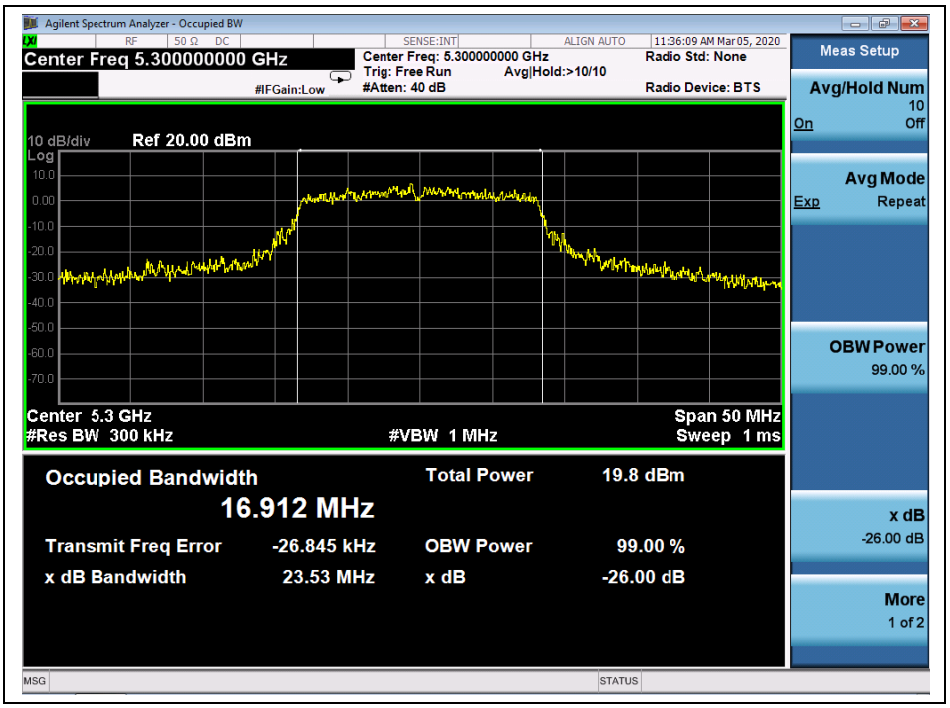
(Channel 44, 5220 MHz, 802.11a,)



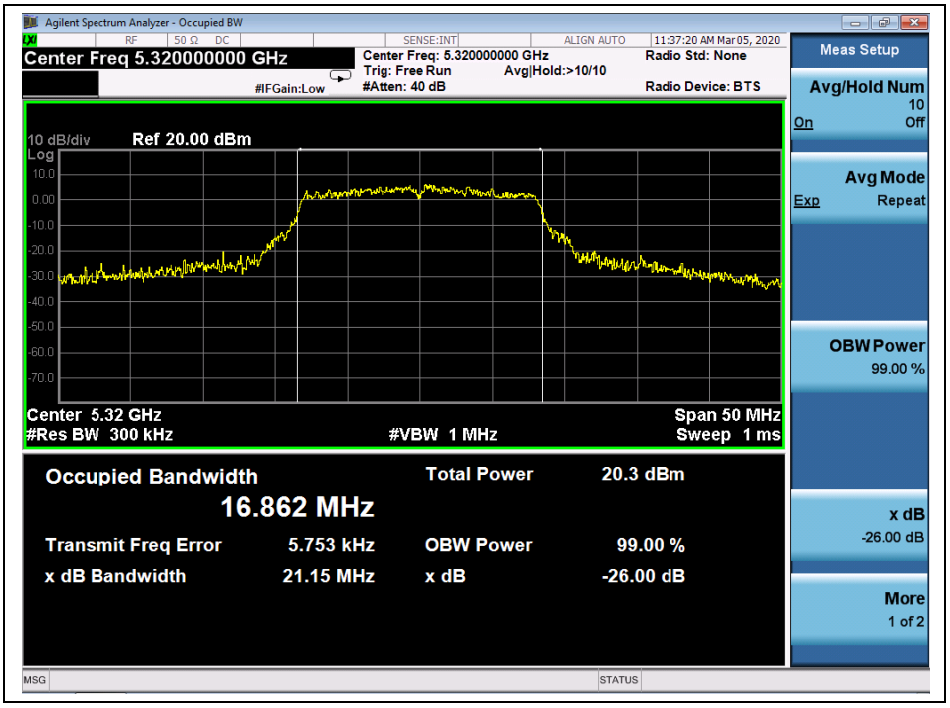
(Channel 48, 5240MHz, 802.11a,)



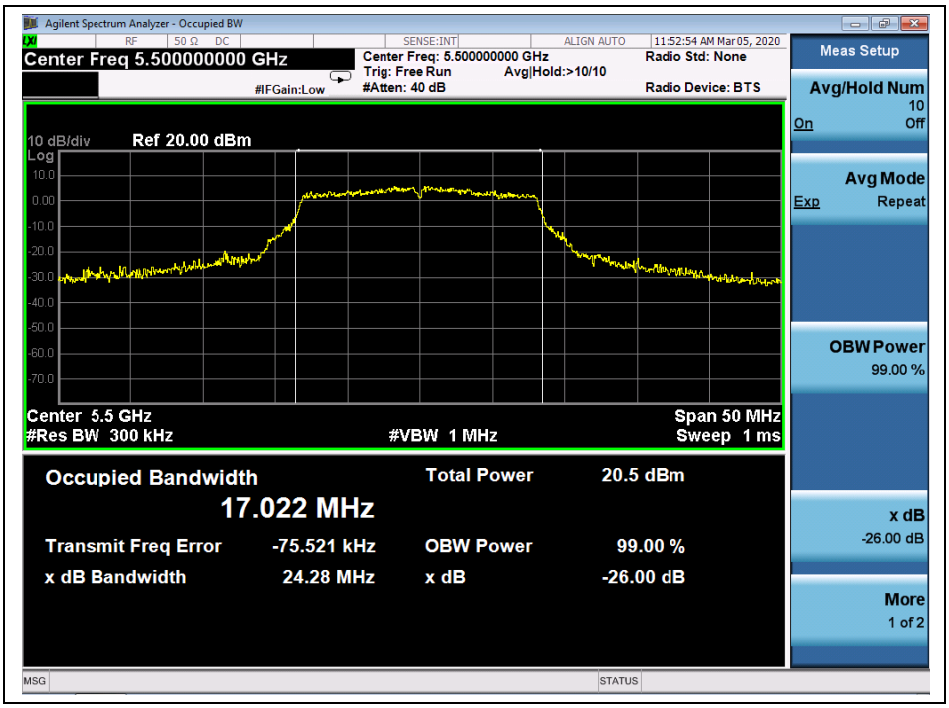
(Channel 52,5260MHz, 802.11a,)



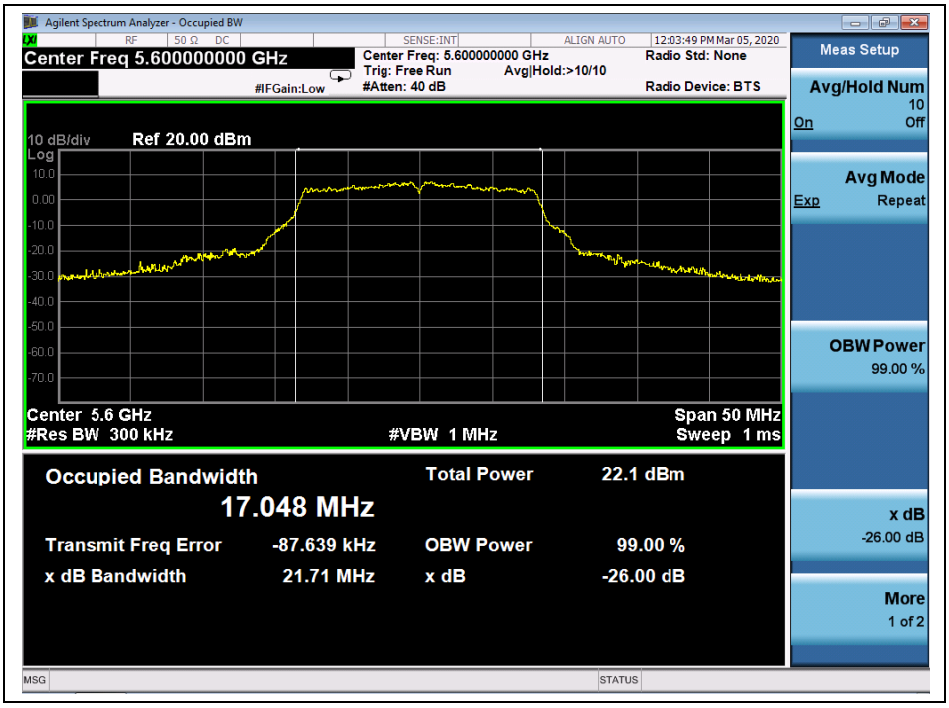
(Channel 60, 5300 MHz, 802.11a,)



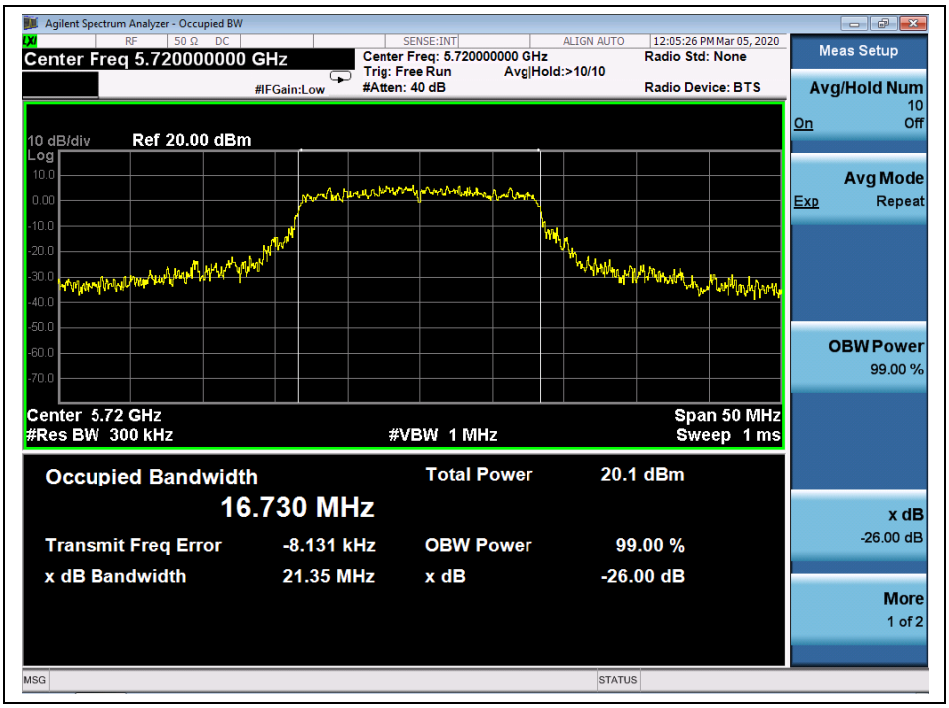
(Channel 64, 5320MHz, 802.11a,)



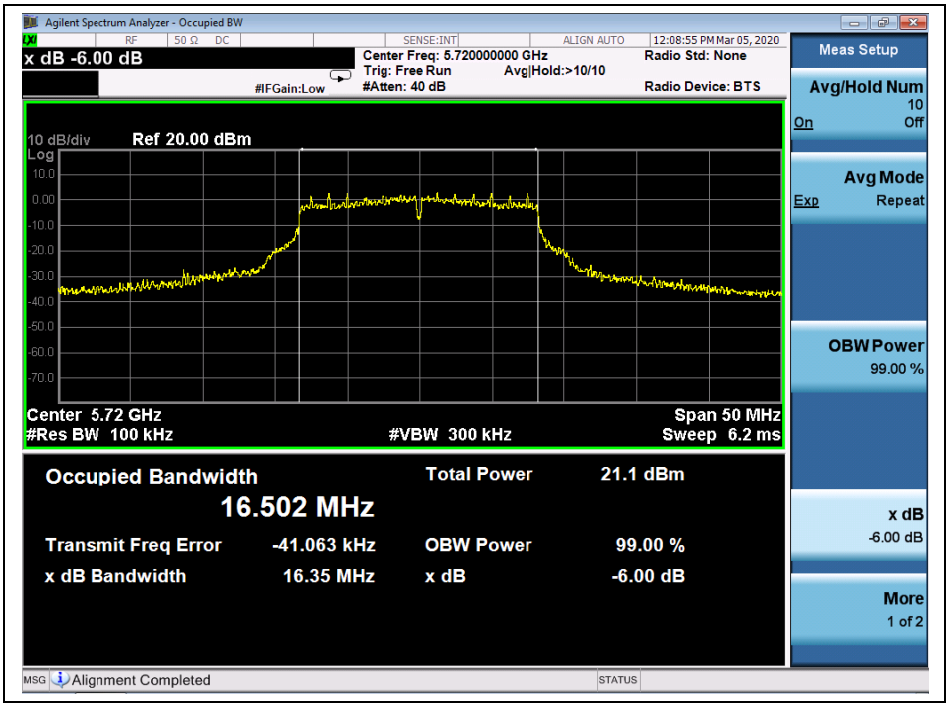
(Channel 100,5500MHz, 802.11a,)



(Channel 120, 5600 MHz, 802.11a,)



(Channel 144, 5720MHz, 802.11a,)



(Channel 144, 5720MHz, 802.11a,)

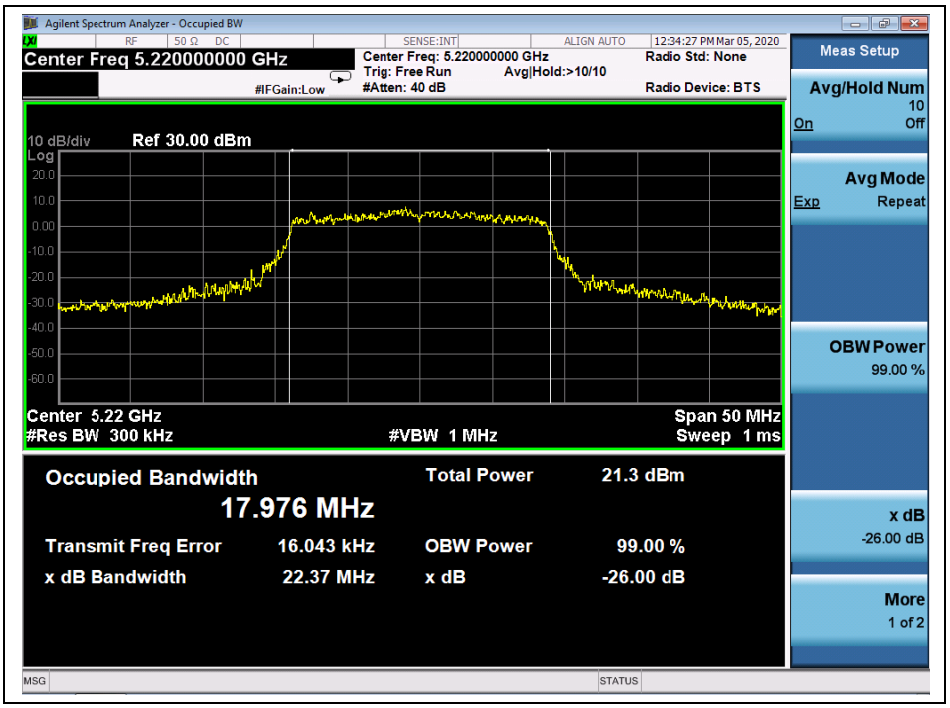
802.11n (HT20) Test mode

A. Test Verdict:

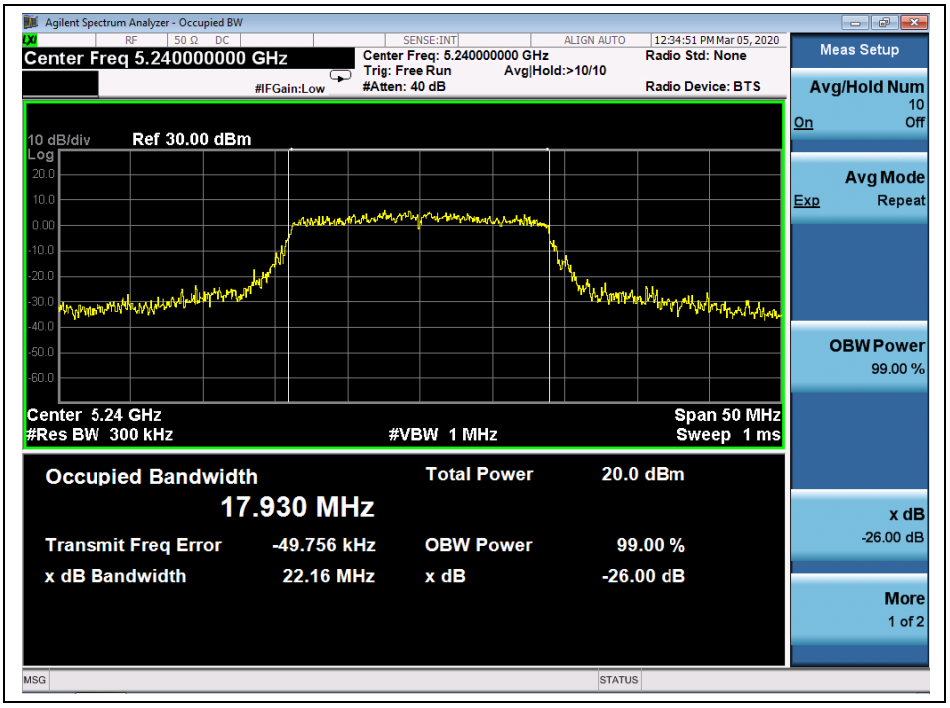
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.59
44	5220	22.37
48	5240	22.16
52	5260	28.27
60	5300	20.95
64	5320	21.84
100	5500	21.46
120	5600	20.89
144	5720	21.10
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
144	5720	17.29

B. Test Plots

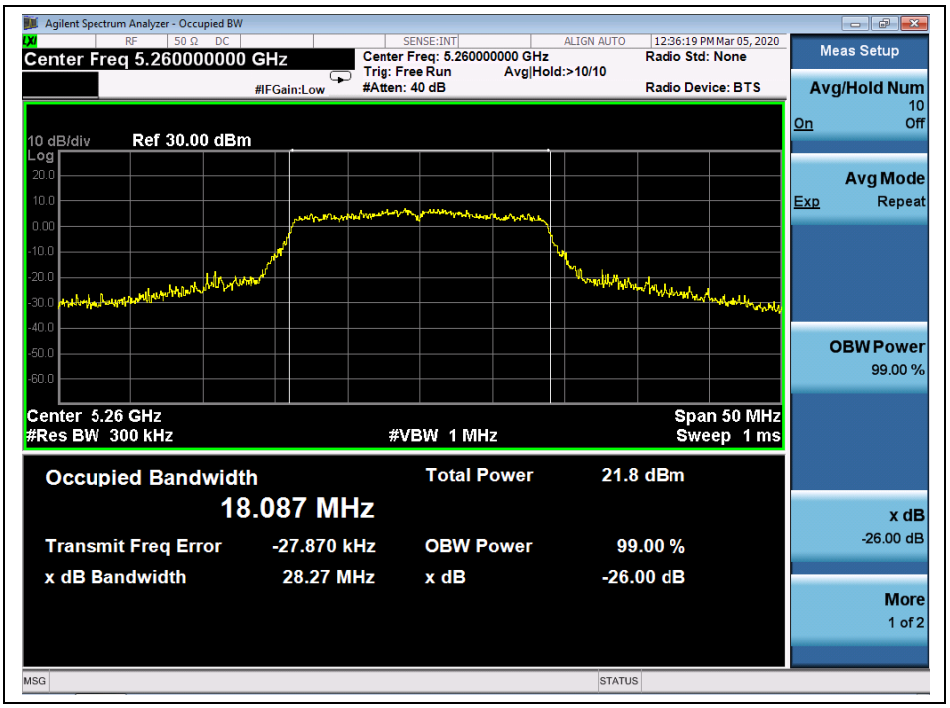
(Channel 36,5180MHz, 802.11n (HT20))



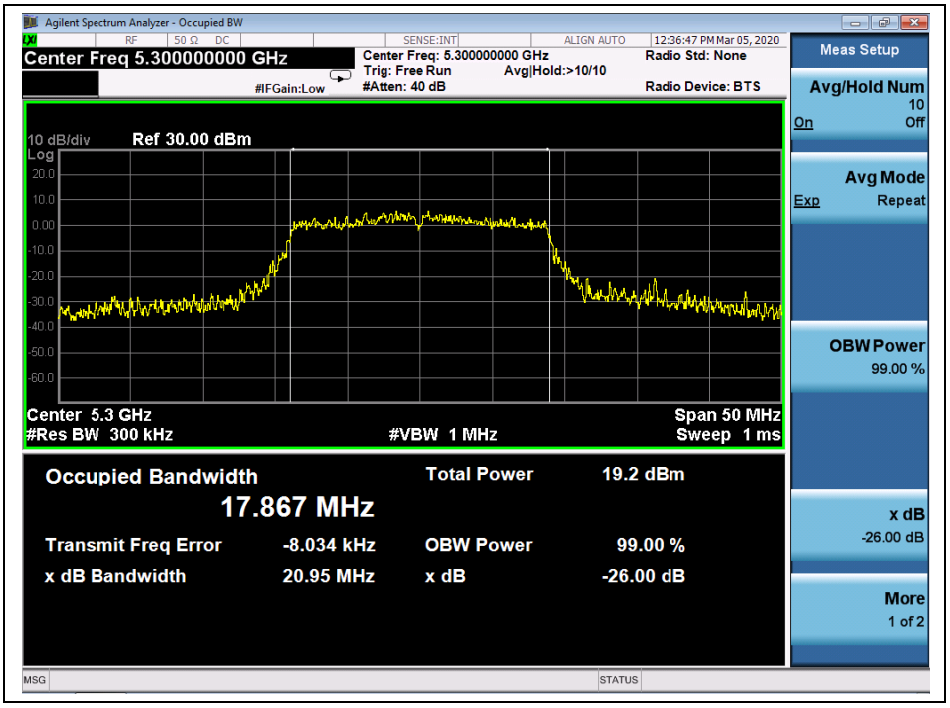
(Channel 44, 5220 MHz, 802.11n (HT20))



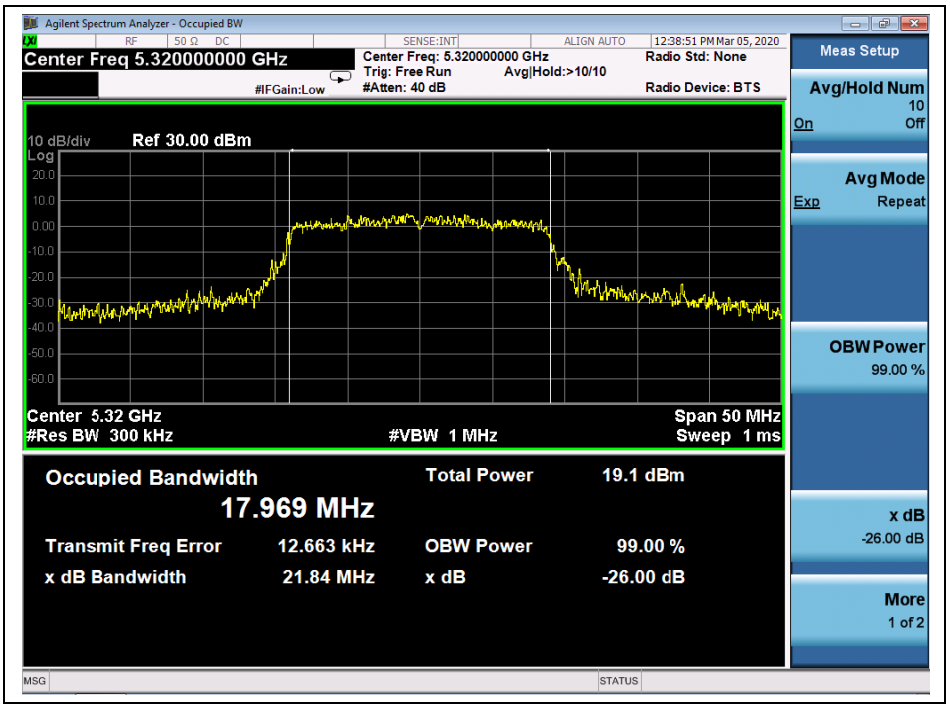
(Channel 48, 5240MHz, 802.11n (HT20))



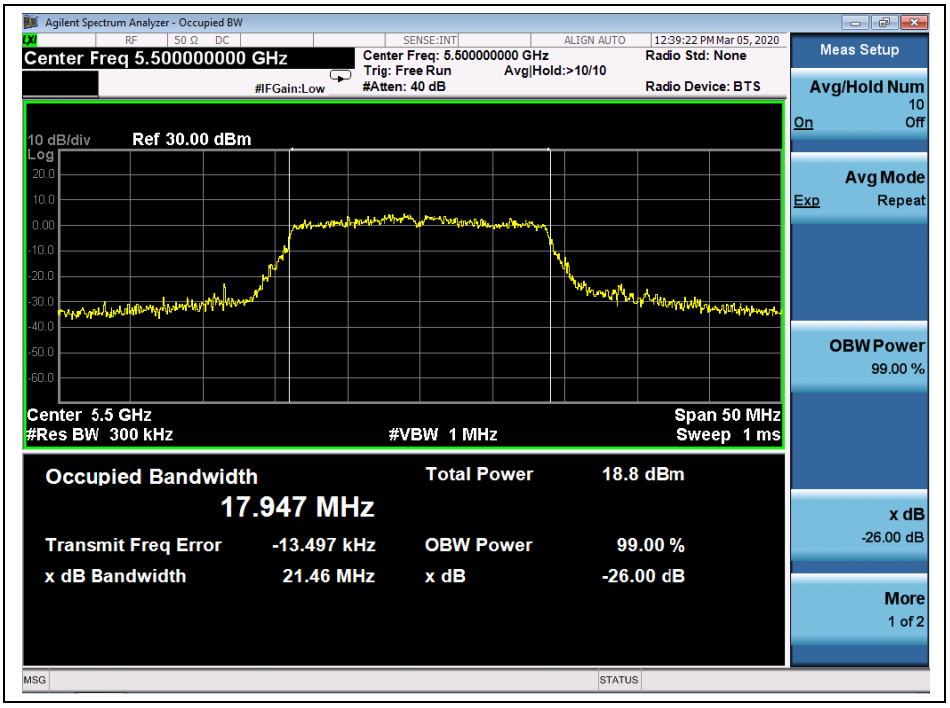
(Channel 52,5260MHz, 802.11n (HT20))



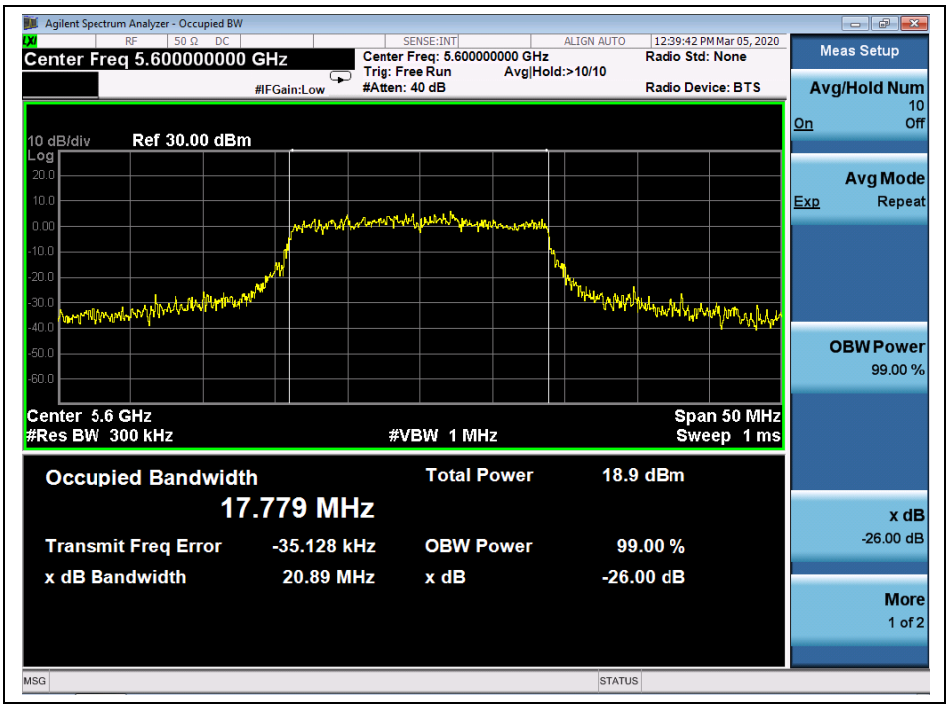
(Channel 60, 5300 MHz, 802.11n (HT20))



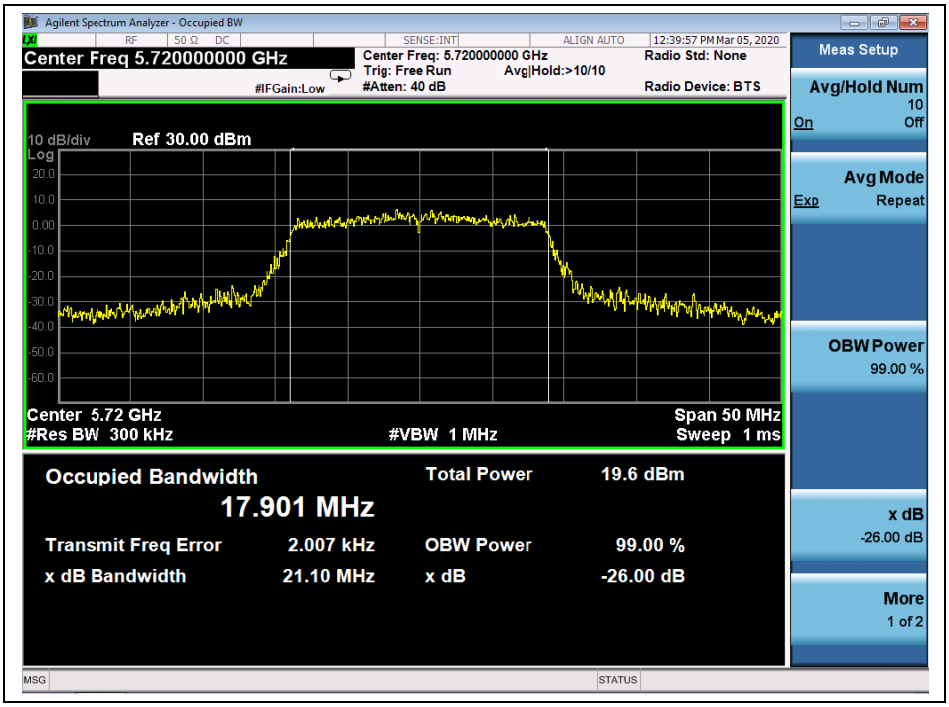
(Channel 64, 5320MHz, 802.11n (HT20))



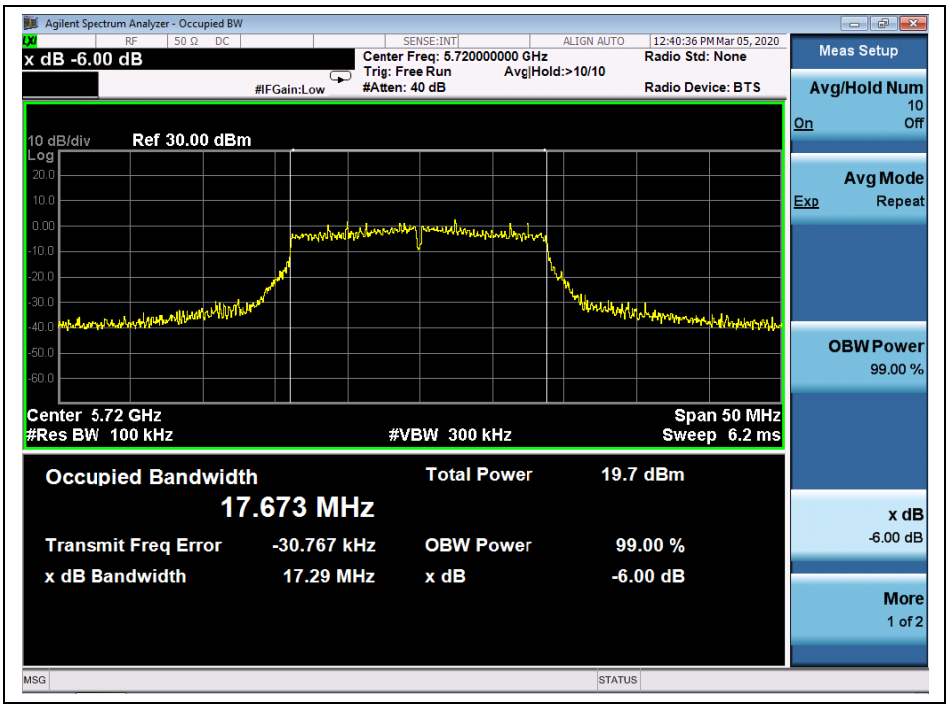
(Channel 100,5500MHz, 802.11n (HT20))



(Channel 120, 5600 MHz, 802.11n (HT20))



(Channel 144, 5720MHz, 802.11n (HT20))



(Channel 144, 5720MHz, 802.11 n (HT20))

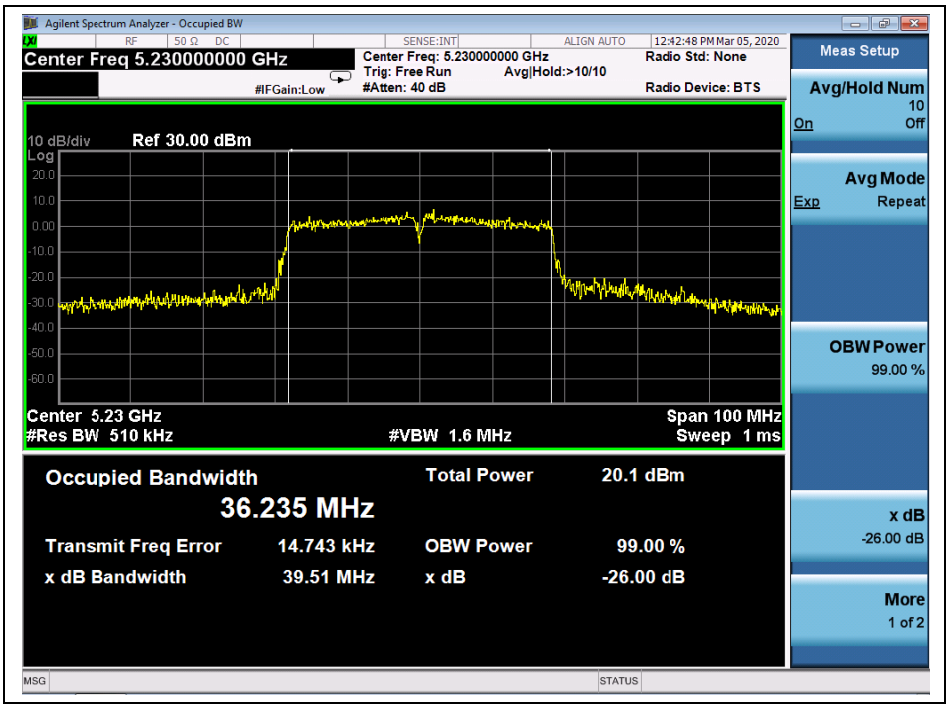
802.11n (HT40) Test mode

A. Test Verdict:

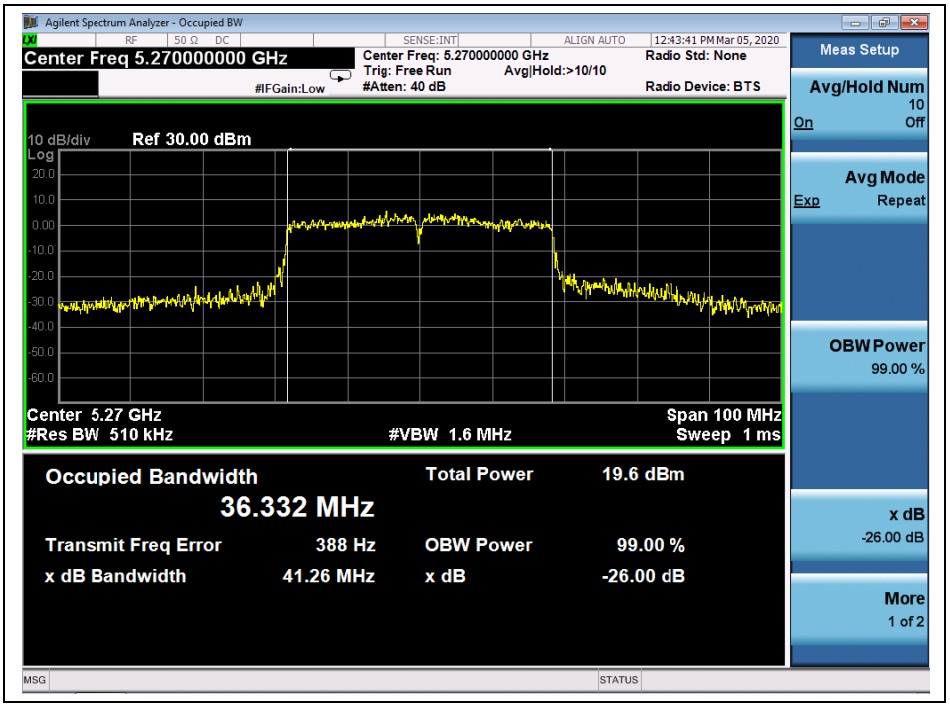
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	51.73
46	5230	39.51
54	5270	41.26
62	5310	48.37
102	5510	48.36
126	5630	44.89
142	5710	46.43
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
142	5710	36.34

B. Test Plots

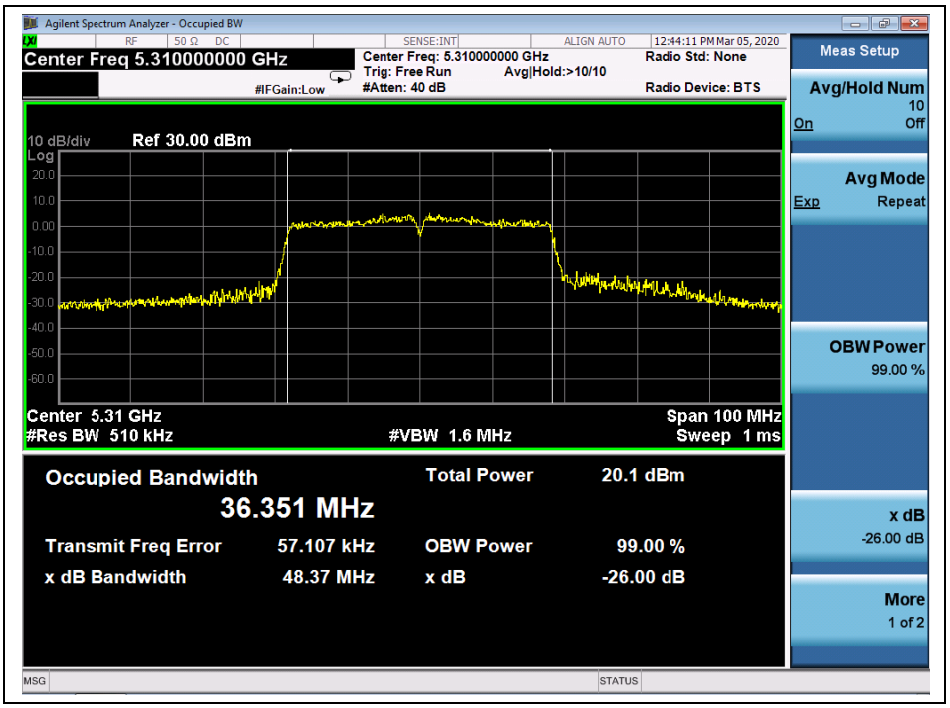
(Channel 38,5190MHz, 802.11n(HT40))



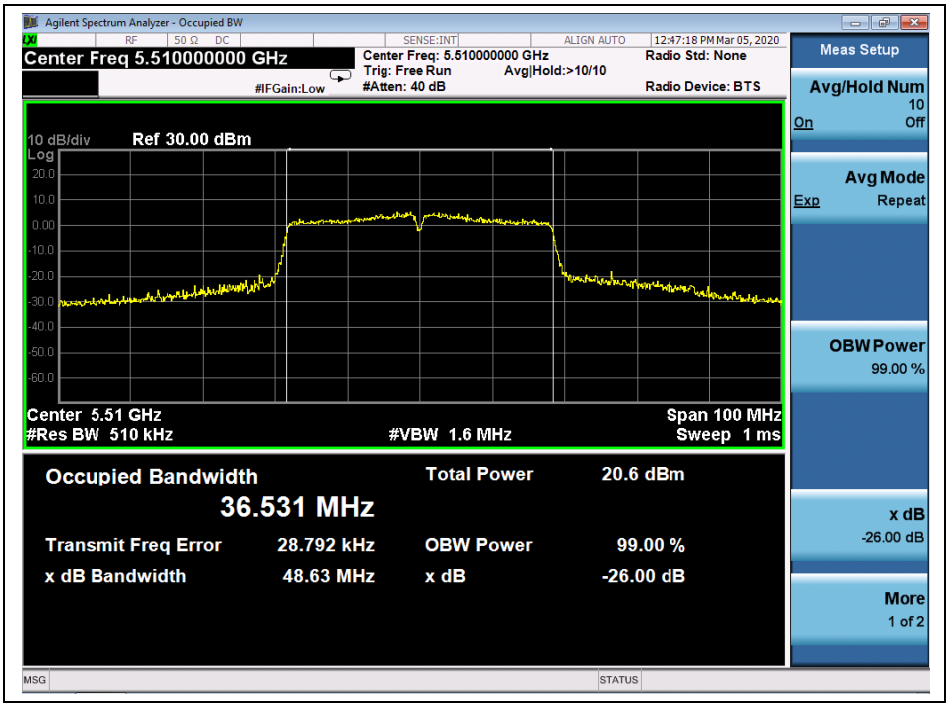
(Channel 46, 5230 MHz, 802.11n(HT40))



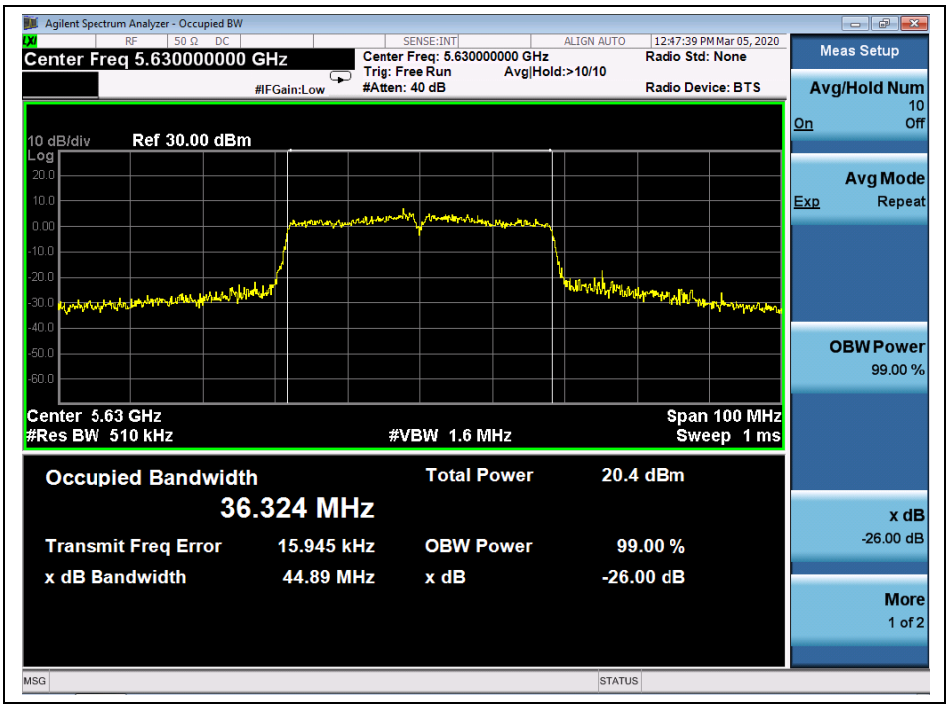
(Channel 54,5270MHz, 802.11n(HT40))



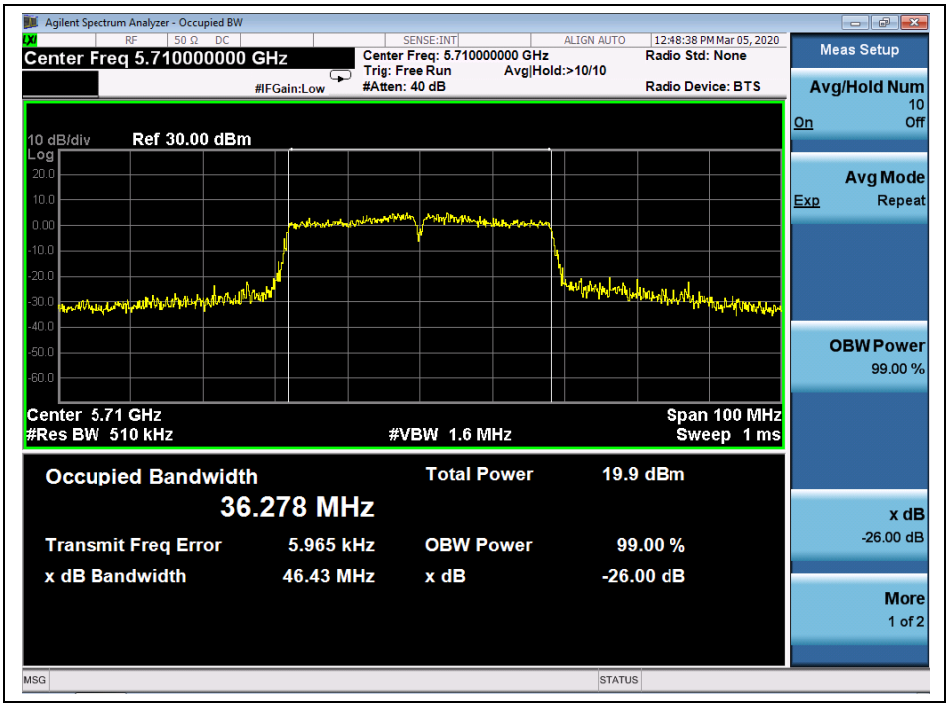
(Channel 62, 5310 MHz, 802.11n(HT40))



(Channel 102,5510MHz, 802.11n(HT40))



(Channel 126, 5630 MHz, 802.11n(HT40))



(Channel 142,5710MHz, 802.11n(HT40))

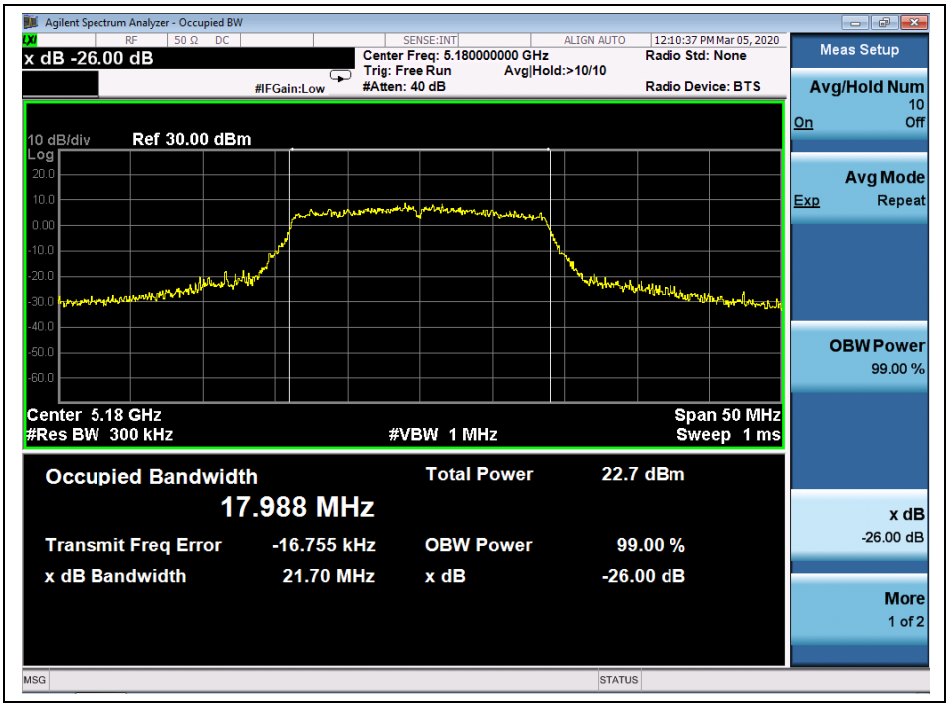
(Channel 142,5710MHz, 802.11n(HT40))

802.11ac (VHT20) Test mode

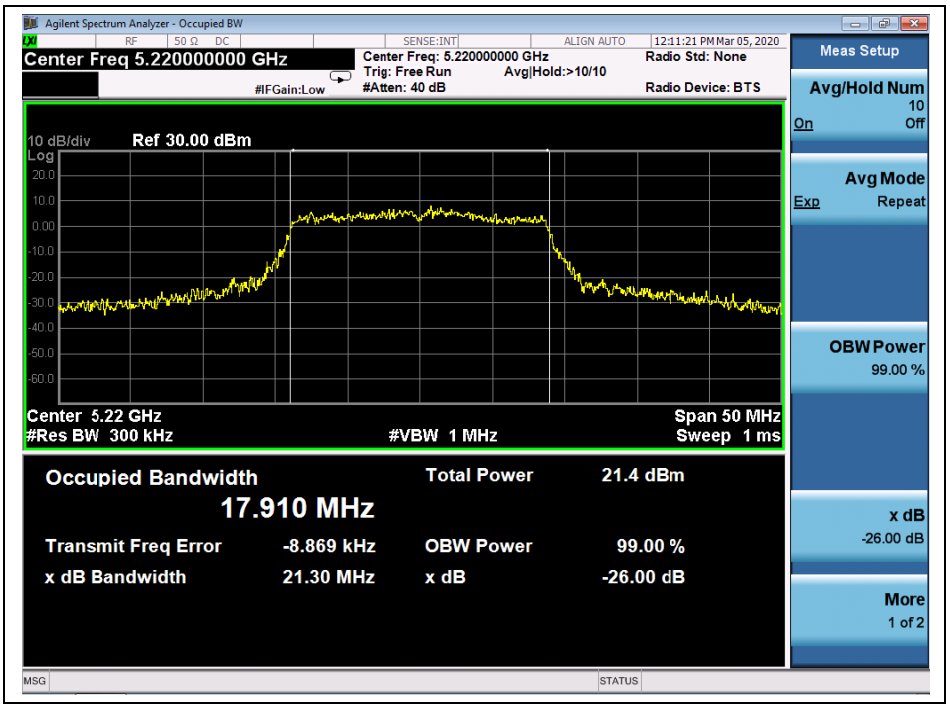
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.70
44	5220	21.30
48	5240	21.36
52	5260	21.63
60	5300	21.15
64	5320	21.38
100	5500	21.24
120	5600	21.22
144	5720	22.14
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
144	5720	16.94

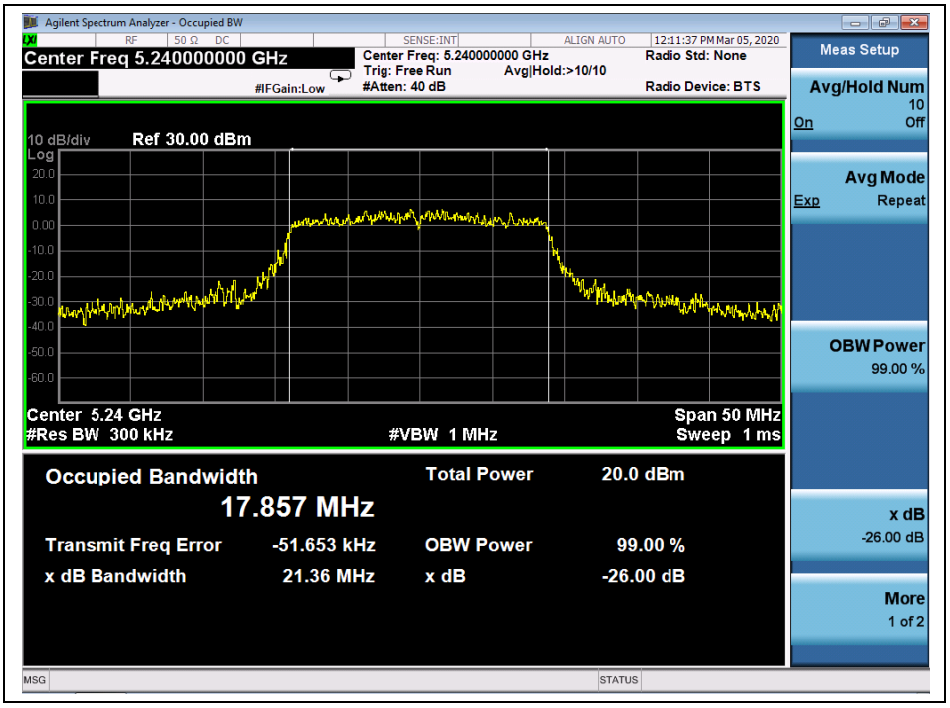
B. Test Plots



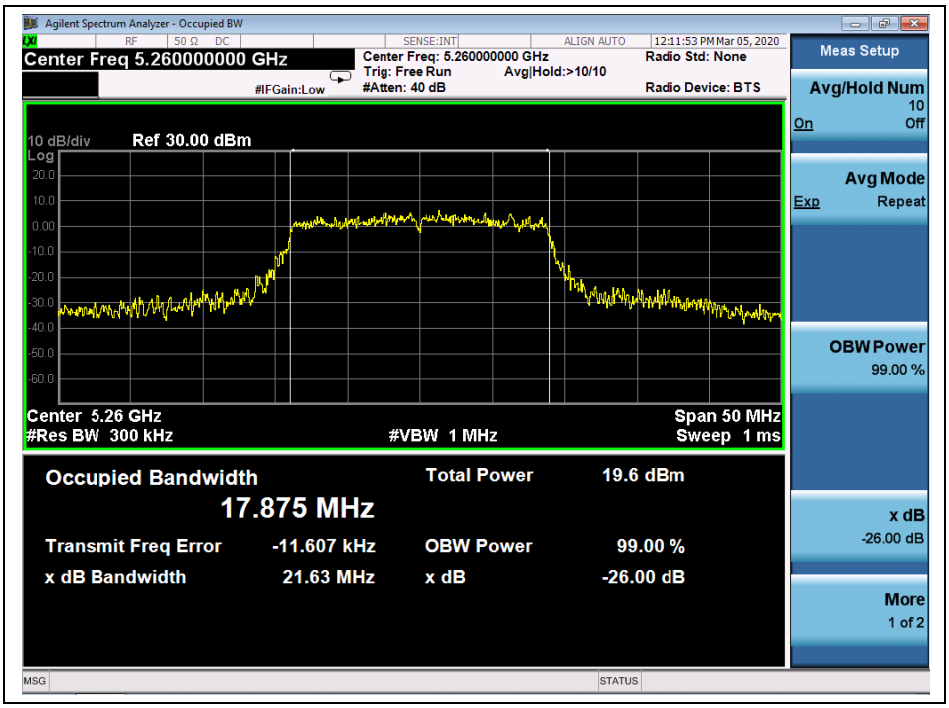
(Channel 36,5180MHz, 802.11ac (VHT20))



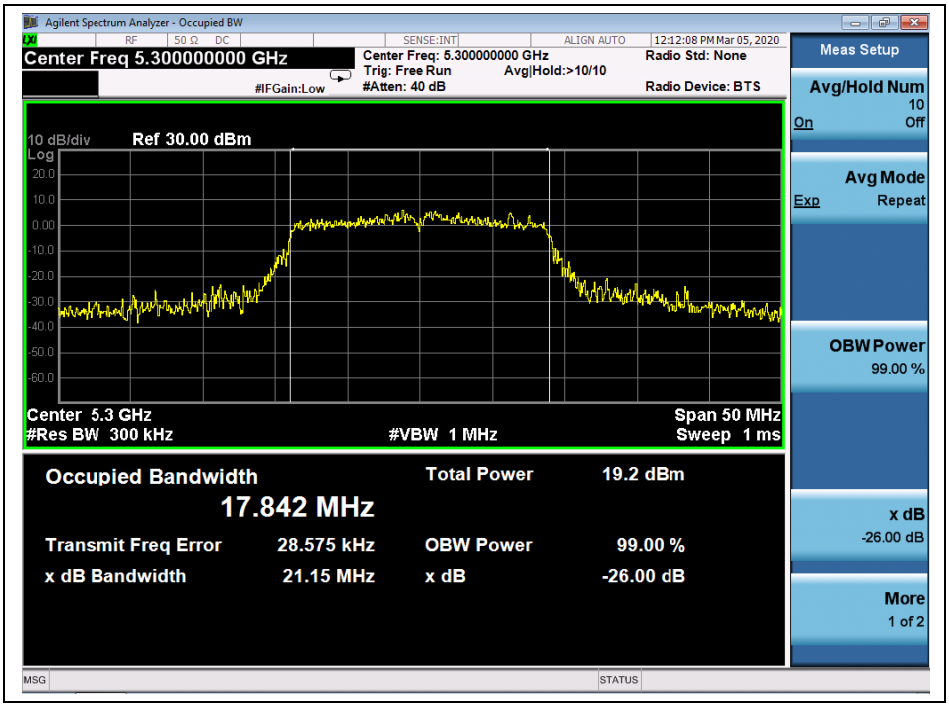
(Channel 44, 5220 MHz, 802.11ac (VHT20))



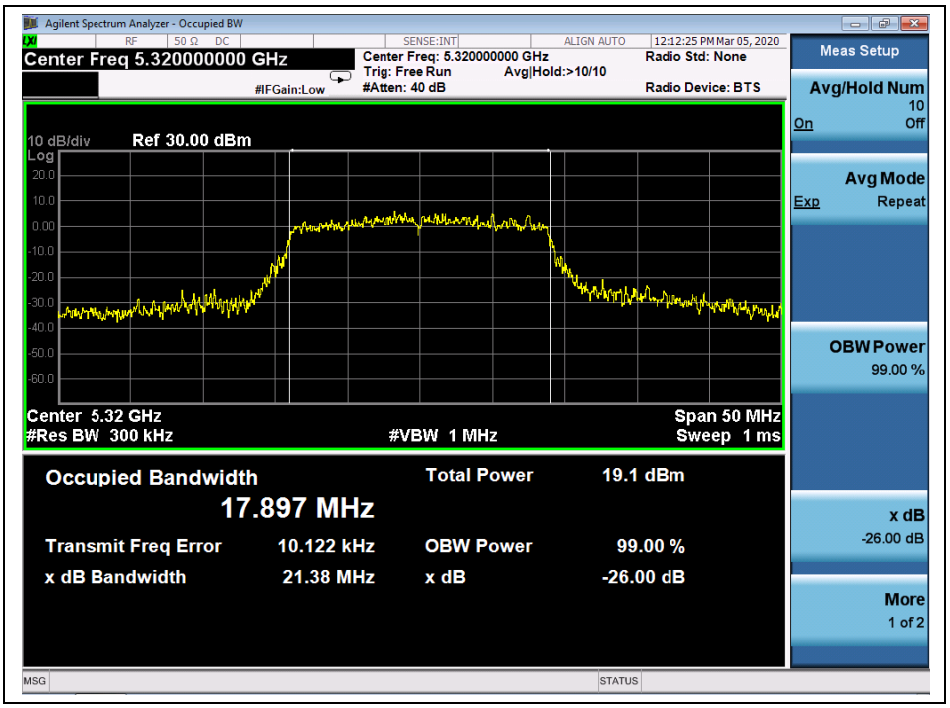
(Channel 48, 5240MHz, 802.11ac (VHT20))



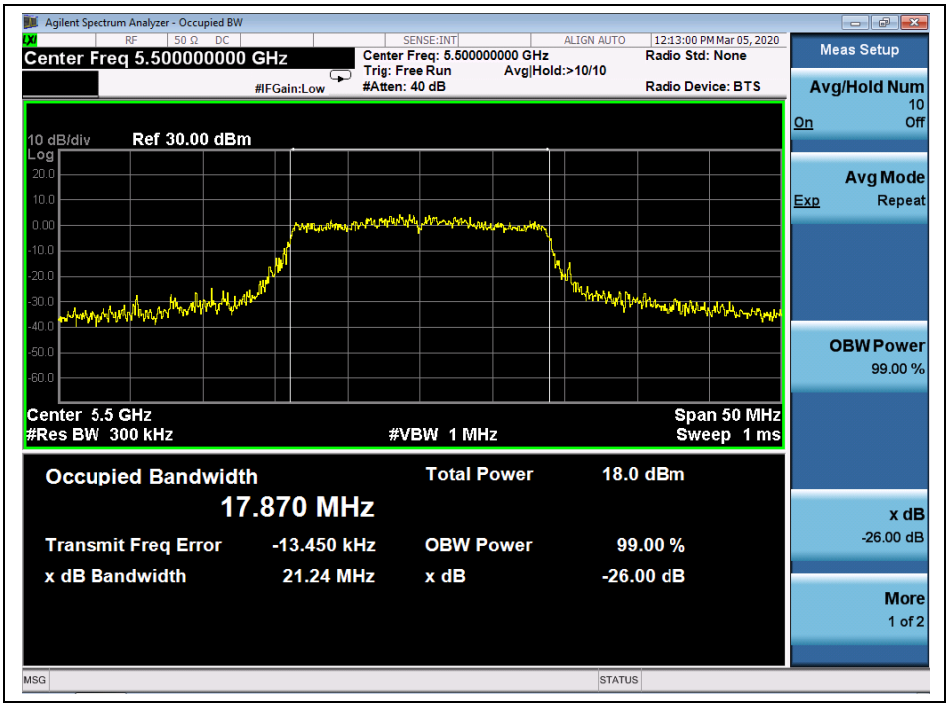
(Channel 52,5260MHz, 802.11ac (VHT20))



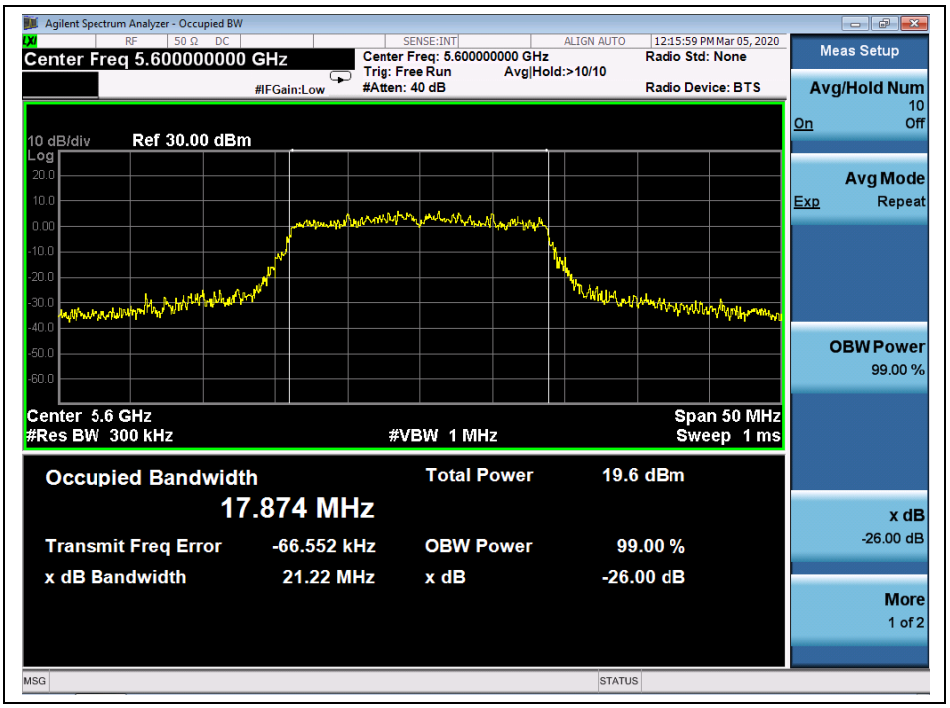
(Channel 60, 5300 MHz, 802.11ac (VHT20))



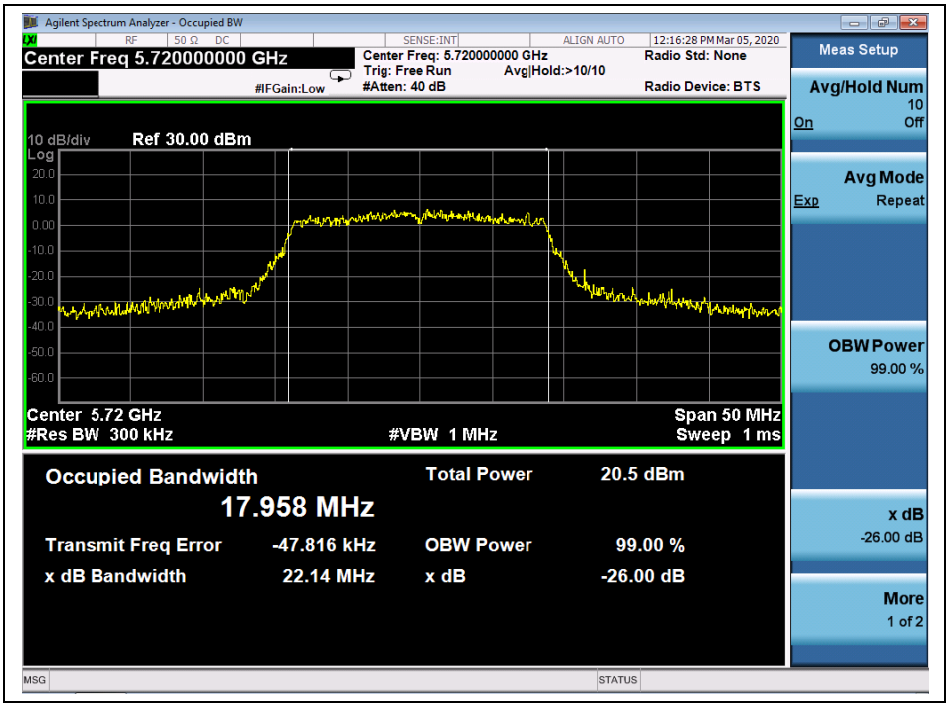
(Channel 64, 5320MHz, 802.11ac (VHT20))



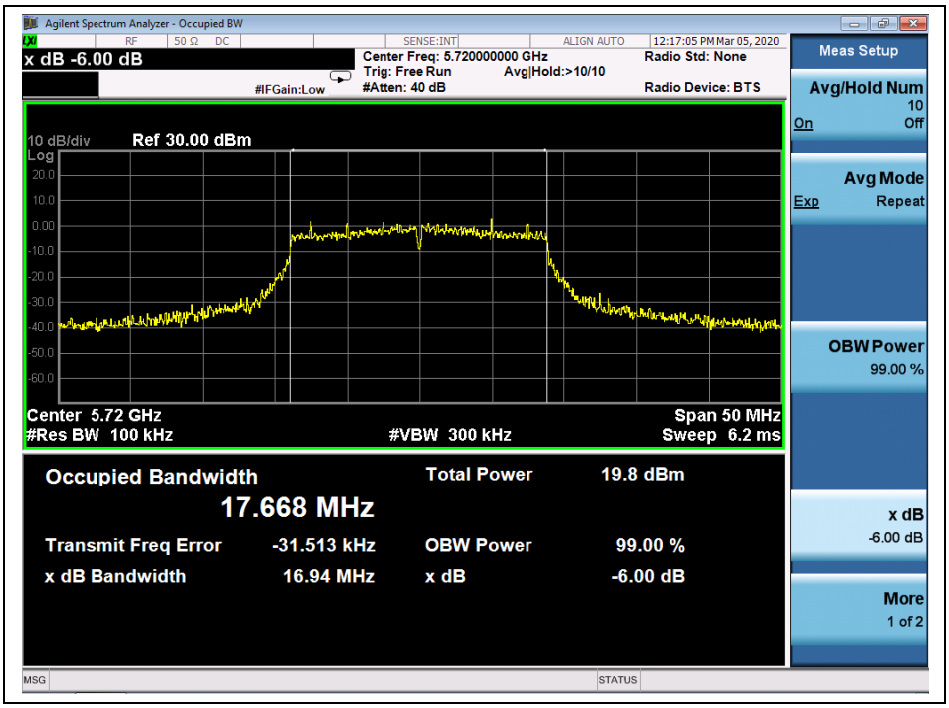
(Channel 100,5500MHz, 802.11ac (VHT20))



(Channel 120, 5600 MHz, 802.11ac (VHT20))



(Channel 144, 5720MHz, 802.11ac (VHT20))



(Channel 144, 5720MHz, 802.11ac (VHT20))

802.11ac (VHT40) Test mode

A. Test Verdict:

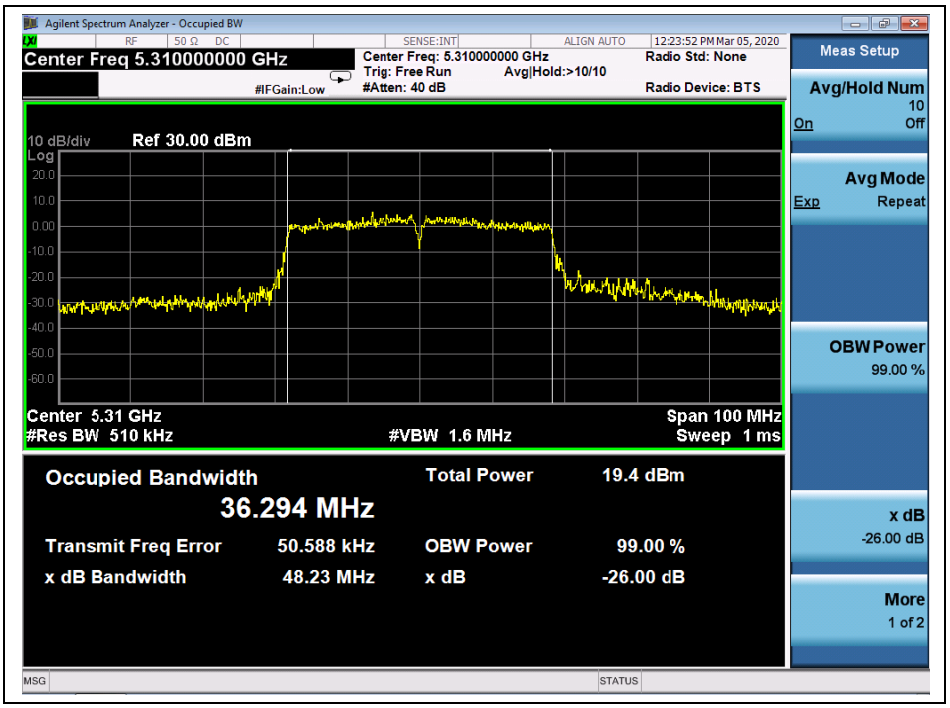
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	47.16
46	5230	48.27
54	5270	50.84
62	5310	48.23
102	5510	46.64
126	5630	39.36
142	5710	45.22
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
142	5710	36.36

B. Test Plots

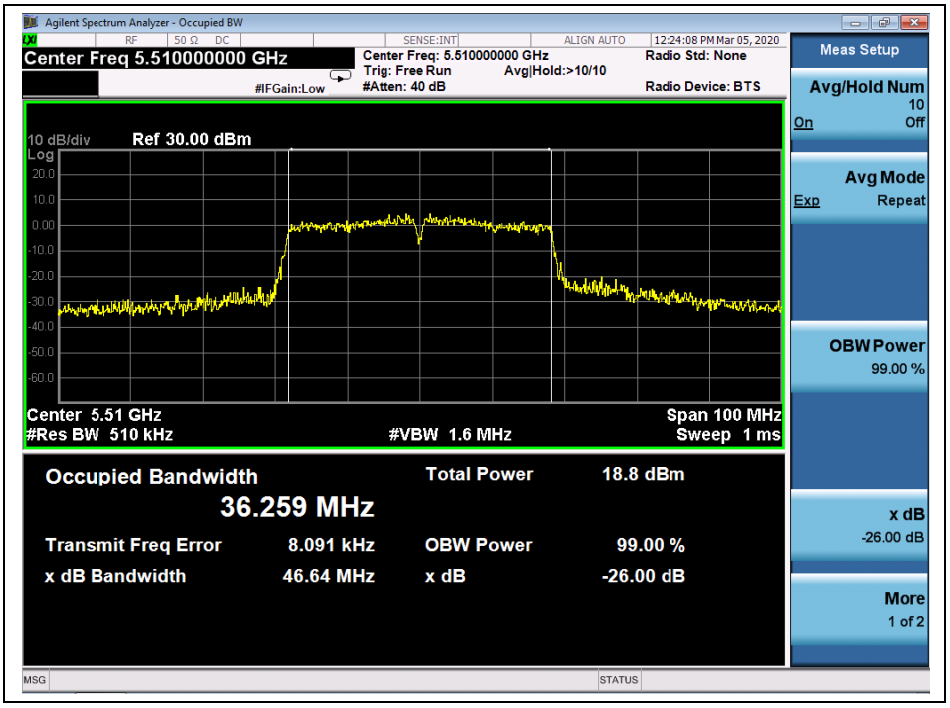
(Channel 38,5190MHz, 802.11ac(VHT40))

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

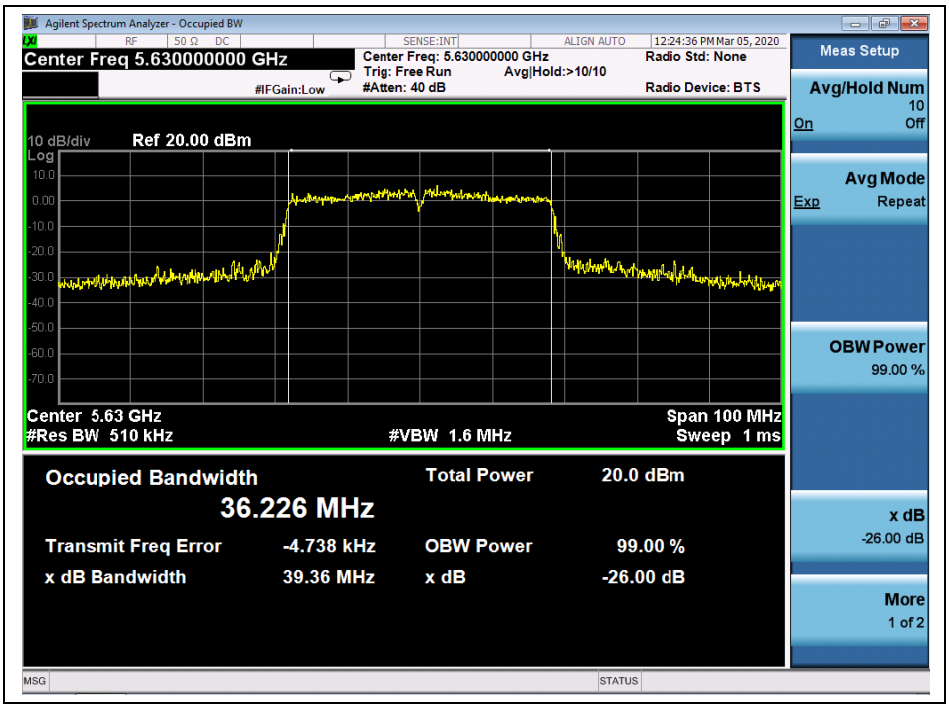
(Channel 54,5270MHz, 802.11ac(VHT40))



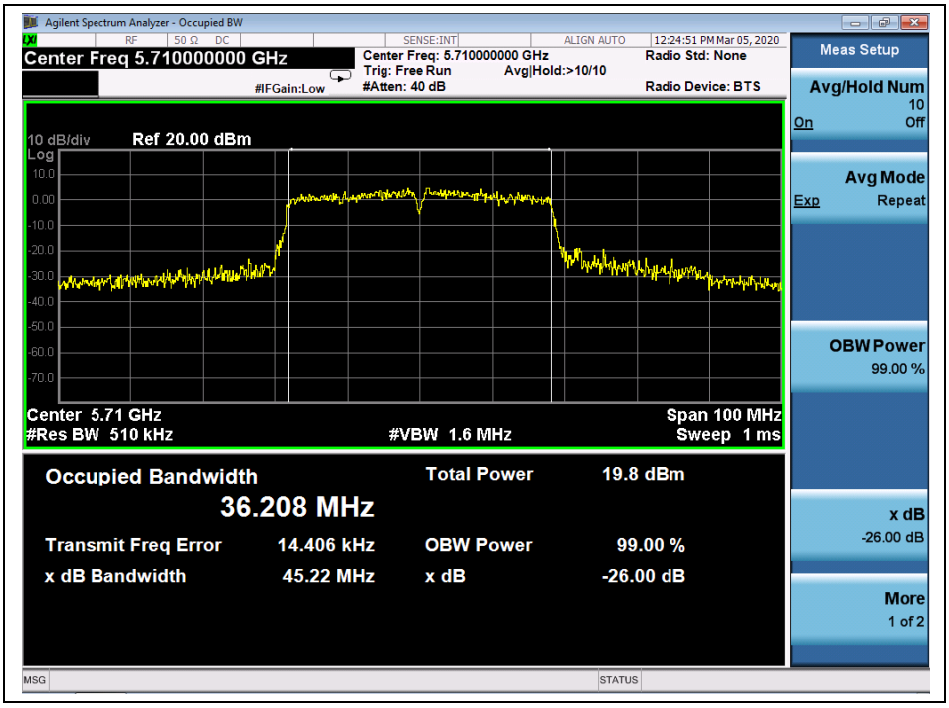
(Channel 62, 5310 MHz, 802.11ac(VHT40))



(Channel 102,5510MHz, 802.11ac(VHT40))



(Channel 126, 5630 MHz, 802.11ac(VHT40))



(Channel 142,5710MHz, 802.11ac(VHT40))

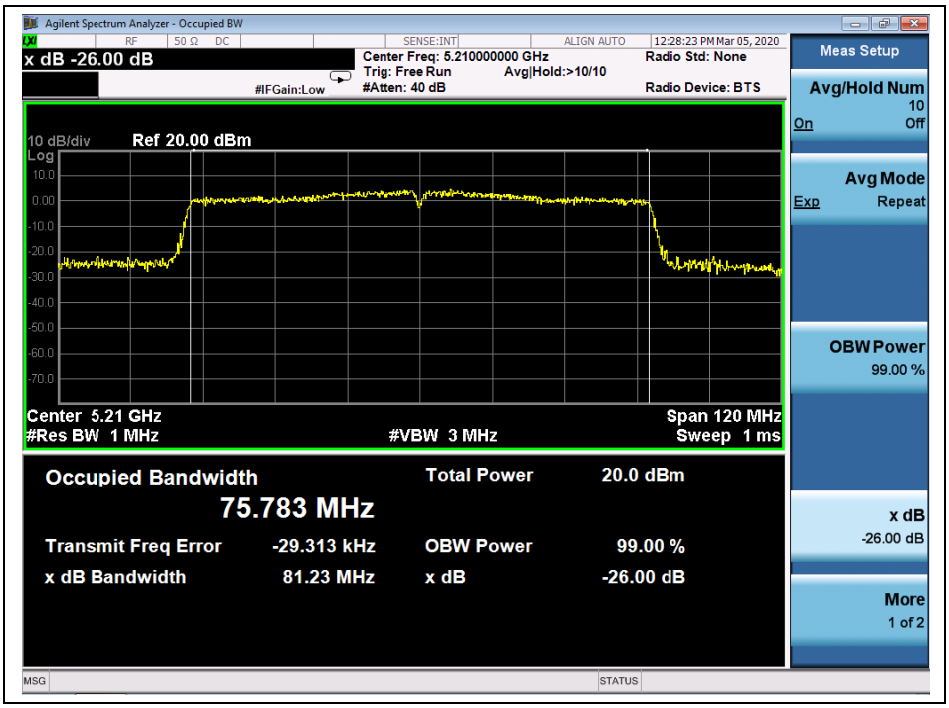
(Channel 142,5710MHz, 802.11ac(VHT40))

802.11ac (VHT80) Test mode

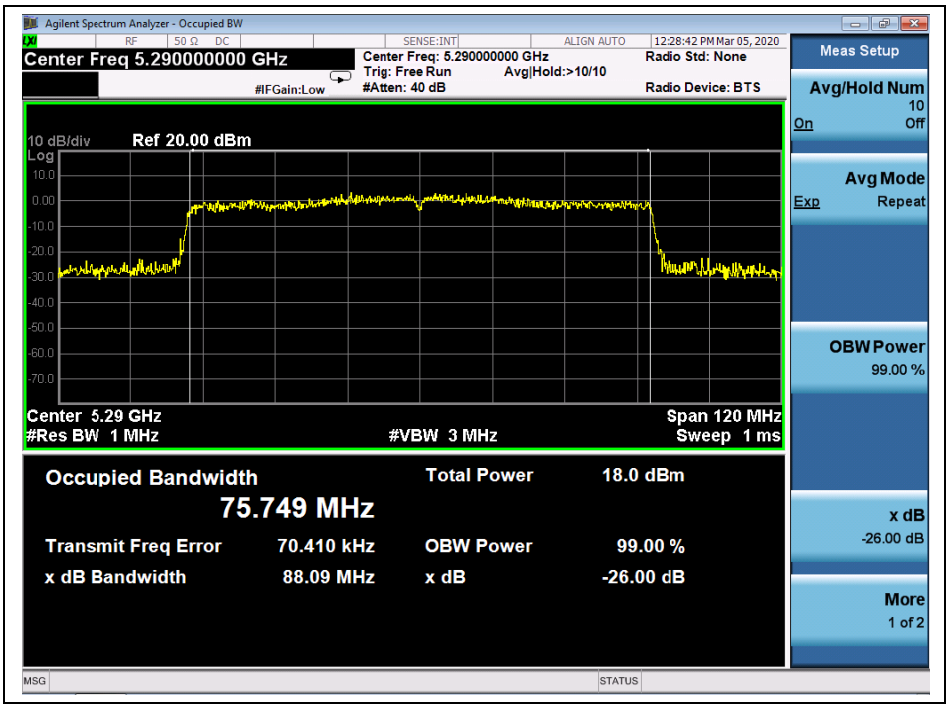
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	81.23
58	5290	88.09
106	5530	93.98
122	5610	80.75
138	5690	83.43
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
138	5690	75.75

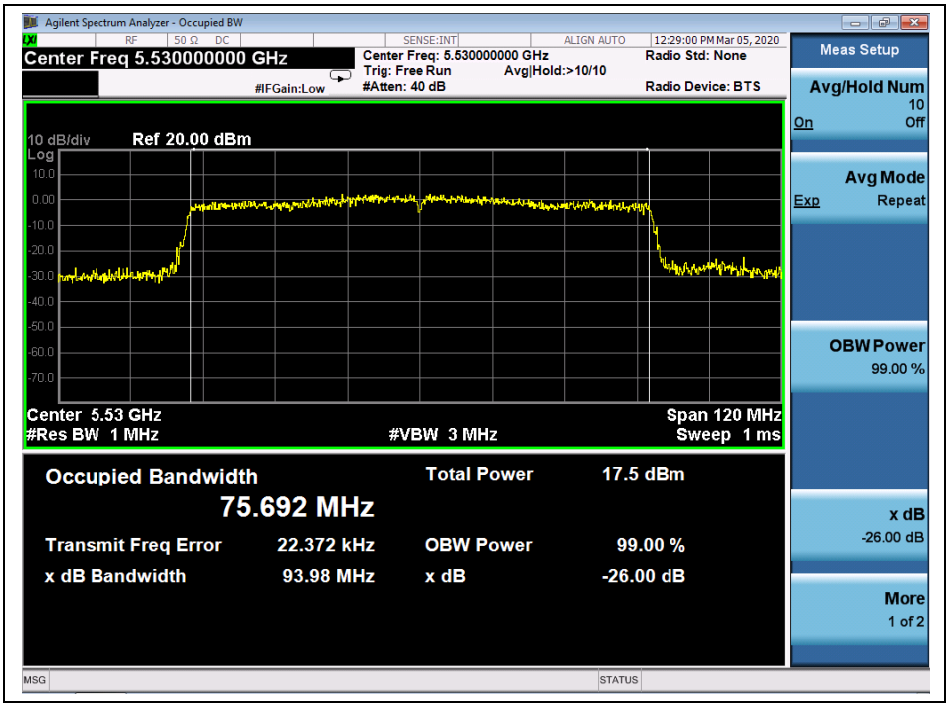
B. Test Plots



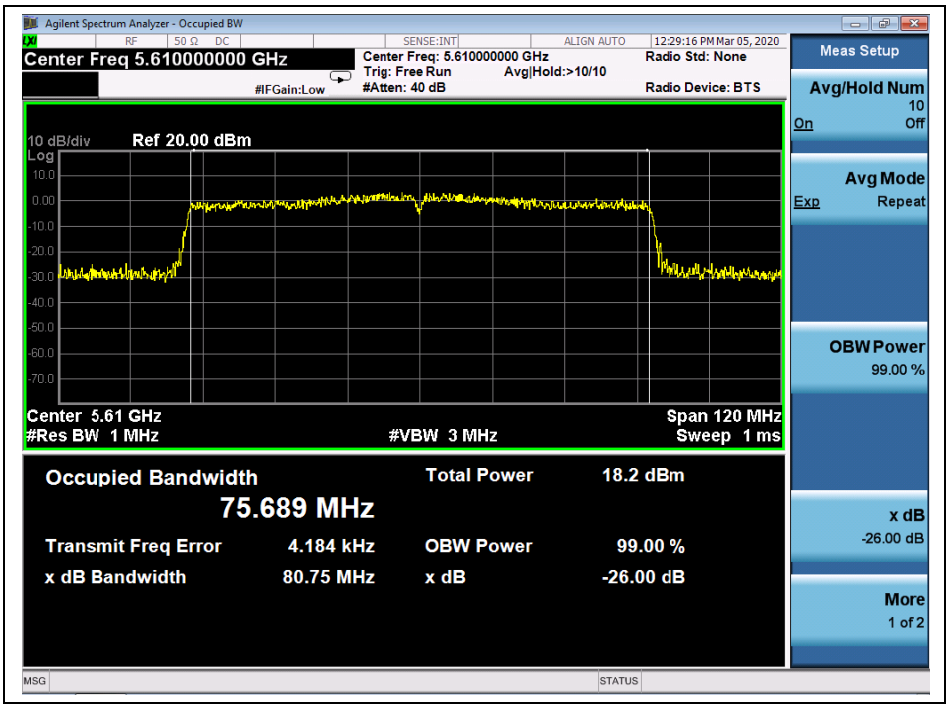
(Channel 42,5210MHz, 802.11ac(VHT80))



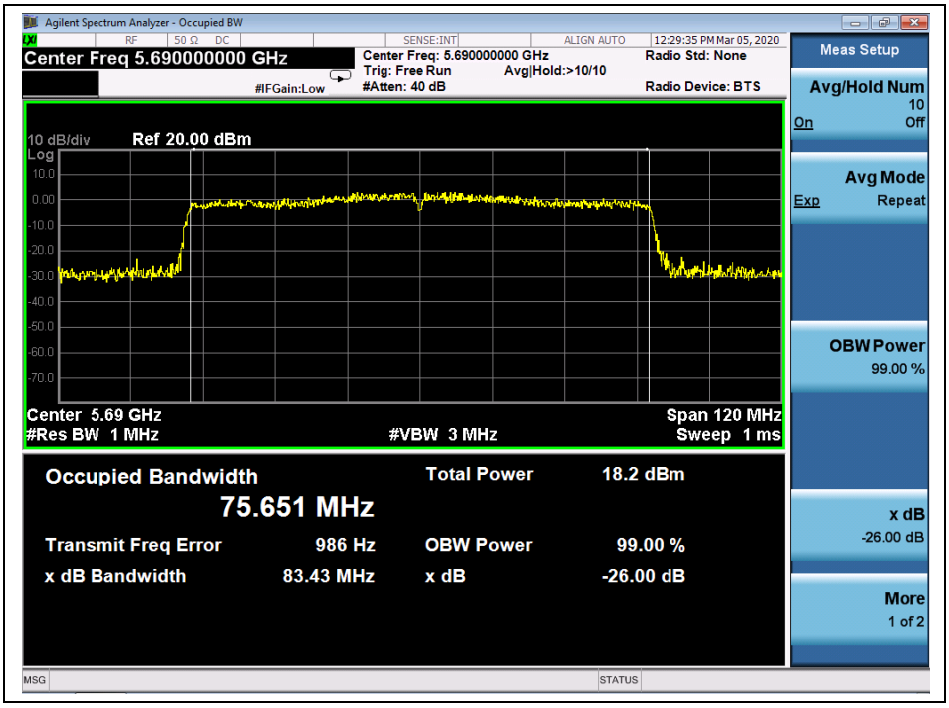
(Channel 58, 5290 MHz, 802.11ac(VHT80))



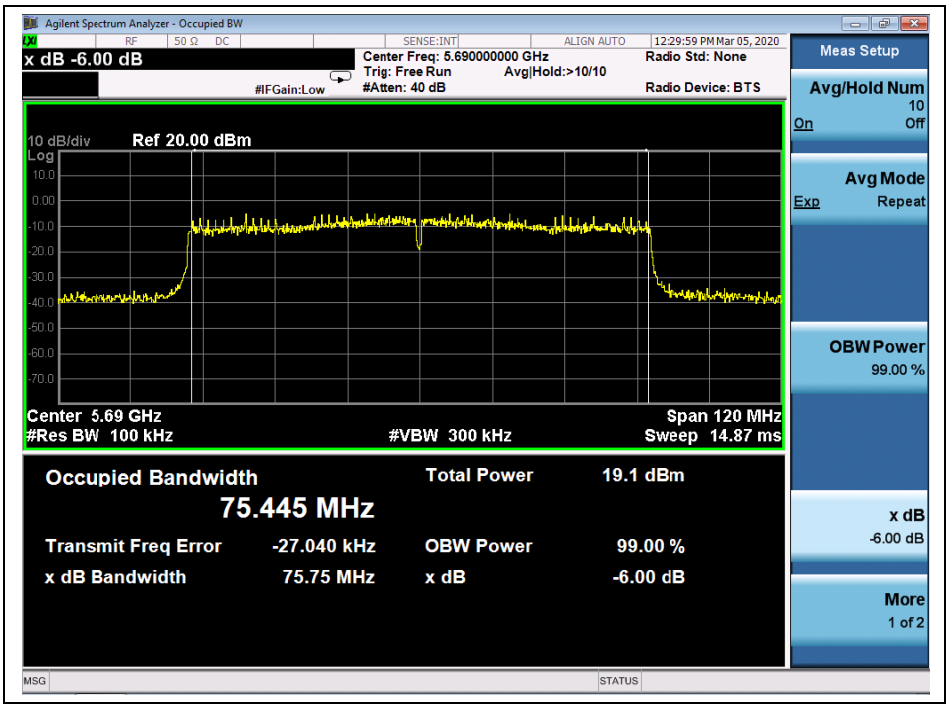
(Channel 106,5530MHz, 802.11ac(VHT80))



(Channel 122, 5610 MHz, 802.11ac(VHT80))



(Channel 138,5690MHz, 802.11ac(VHT80))



(Channel 138,5690MHz, 802.11ac(VHT80))

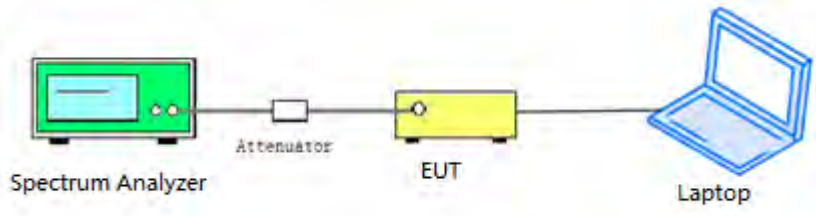
2.5. Peak Power spectral density

2.5.1. Requirement

(1)For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm 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 11 dBm in any 1 megahertz band.
(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500KHz band.
If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(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

TestSetup:



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 provecompliance
1) Set span to encompass the entire 26-dB emission bandwidth
2) Set RBW = 1 MHz. Set VBW ≥ 3 MHz.

3) Number of points in sweep ≥ 2 Span / RBW. Sweep time = auto.
4) Detector = Peak
5) Trace mode=Max hold
6) Record the max value

2.5.4. Test Result

802.11a Test mode

A. Test Verdict:

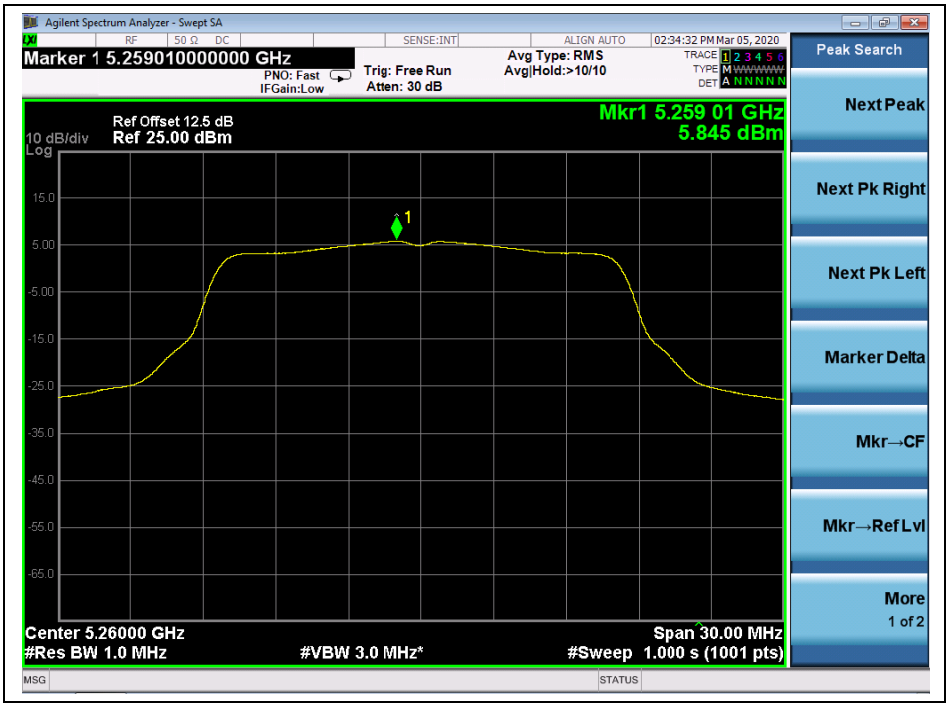
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	6.77	0.12	6.89	11	PASS
44	5220	6.37		6.49		
48	5240	6.14		6.26		
52	5260	5.85		5.97		
60	5300	5.19		5.31		
64	5320	5.13		5.25		
100	5500	4.26		4.38		
120	5600	5.30		5.42		
144	5720	4.95		5.07		
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/500KHz)	Verdict
144	5720	2.25	0.12	2.37	30	PASS

B. Test Plots

(Channel 36,5180MHz, 802.11a)

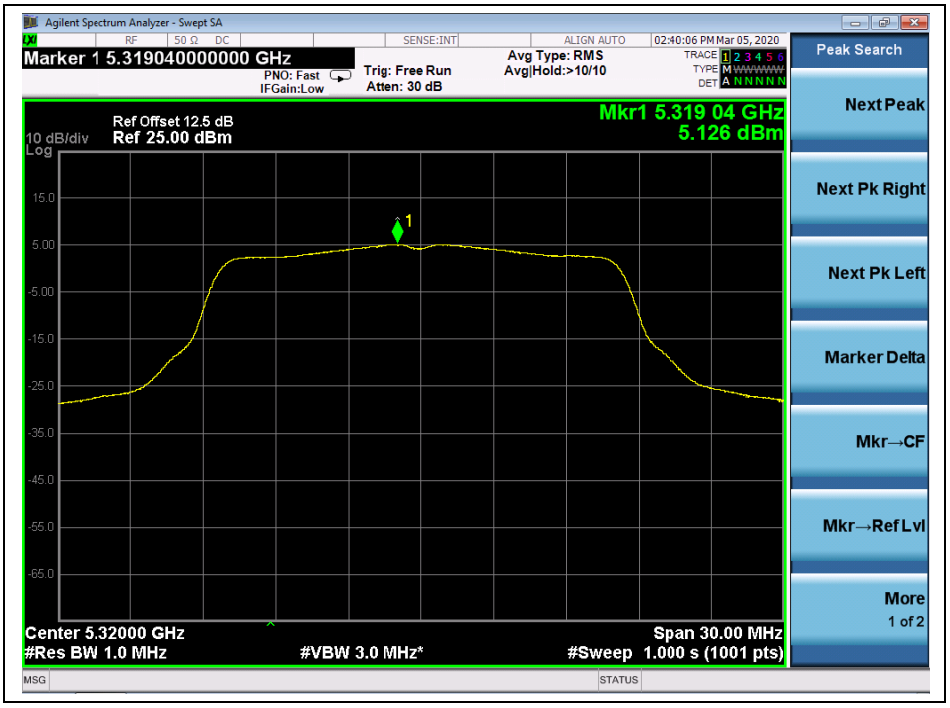
(Channel 44, 5220 MHz, 802.11a)

(Channel 48, 5240MHz, 802.11a)



(Channel 52,5260MHz, 802.11a)

(Channel 60, 5300 MHz, 802.11a)



(Channel 64, 5320MHz, 802.11a)

(Channel 100,5500MHz, 802.11a)

(Channel 120, 5600 MHz, 802.11a)

(Channel 144, 5720MHz, 802.11a)

(Channel 144, 5720MHz, 802.11a)

802.11n (HT20) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	6.04	0.27	6.31	11	PASS
44	5220	5.49		5.76		
48	5240	5.41		5.68		
52	5260	5.41		5.68		
60	5300	4.72		4.99		
64	5320	4.57		4.84		
100	5500	3.64		3.91		
120	5600	4.59		4.86		
144	5720	4.85		5.12		
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/500KHz)	Verdict
144	5720	2.16	0.27	2.43	30	PASS

B. Test Plots

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

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

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

(Channel 52,5260MHz, 802.11n (HT20))

(Channel 60, 5300 MHz, 802.11n (HT20))

(Channel 64, 5320MHz, 802.11n (HT20))

(Channel 100,5500MHz, 802.11n (HT20))

(Channel 120, 5600 MHz, 802.11n (HT20))

(Channel 144, 5720MHz, 802.11n (HT20))

(Channel 144, 5720MHz, 802.11 n (HT20))

802.11n (HT40) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	3.18	0.27	3.45	11	PASS
46	5230	2.74		3.01		
54	5270	2.52		2.79		
62	5310	1.63		1.90		
102	5510	1.13		1.40		
126	5630	2.1		2.37		
142	5710	1.93		2.20		
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/500KHz)	Verdict
142	5710	-0.86	0.27	-0.59	30	PASS

B. Test Plots

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

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

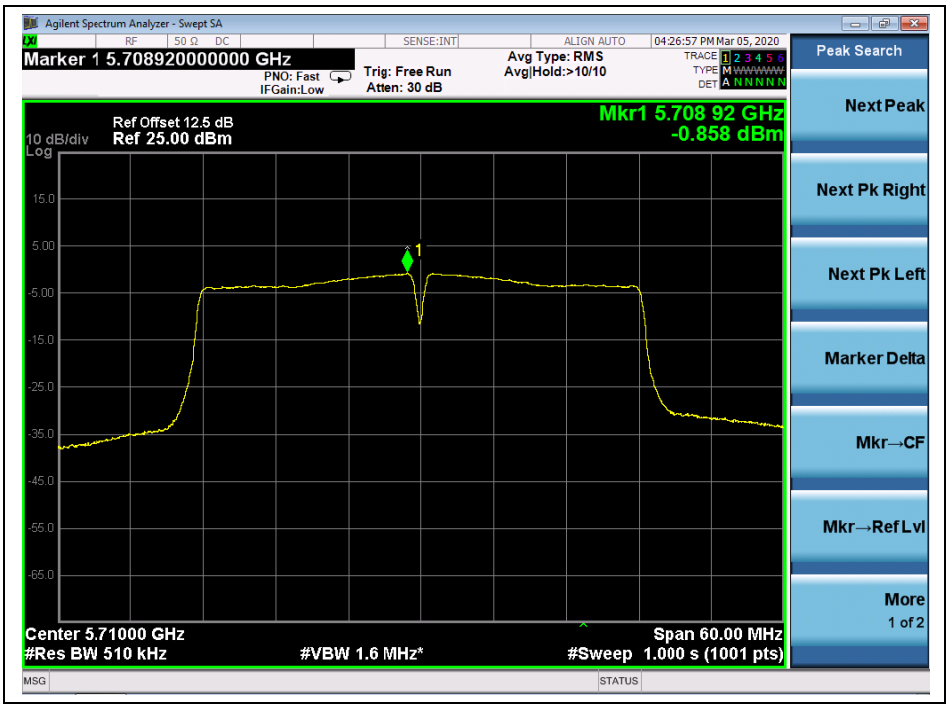
(Channel 54,5270MHz, 802.11n(HT40))

(Channel 62, 5310 MHz, 802.11n(HT40))

(Channel 102,5510MHz, 802.11n(HT40))

(Channel 126, 5630 MHz, 802.11n(HT40))

(Channel 142,5710MHz, 802.11n(HT40))



(Channel 142,5710MHz, 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	3.01	0.15	3.16	11	PASS
44	5220	5.48		5.63		
48	5240	5.5		5.65		
52	5260	5.26		5.41		
60	5300	4.83		4.98		
64	5320	4.66		4.81		
100	5500	3.83		3.98		
120	5600	4.62		4.77		
144	5720	4.69		4.84		
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/500KHz)	Verdict
144	5720	1.94	0.15	2.09	30	PASS

B. Test Plots

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

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

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

(Channel 52,5260MHz, 802.11ac(VHT20))

(Channel 60, 5300 MHz, 802.11ac(VHT20))

(Channel 64, 5320MHz, 802.11ac (VHT20))

(Channel 100,5500MHz, 802.11ac (VHT20))

(Channel 120, 5600 MHz, 802.11ac (VHT20))

(Channel 144, 5720MHz, 802.11ac (VHT20))

(Channel 144, 5720MHz, 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	3.01	0.15	3.16	11	PASS
46	5230	2.61		2.76		
54	5270	2.42		2.57		
62	5310	1.51		1.66		
102	5510	1.08		1.23		
126	5630	2.03		2.18		
142	5710	1.99		2.14		
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/500KHz)	Verdict
142	5710	-0.73	0.15	-0.58	30	PASS

B. Test Plots

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

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

(Channel 54, 5270MHz, 802.11ac (VHT40))

(Channel 62,5310MHz, 802.11ac (VHT40))

(Channel 102, 5510 MHz, 802.11ac (VHT40))

(Channel 126, 5630MHz, 802.11ac (VHT40))

(Channel 142,5710MHz, 802.11ac (VHT40))

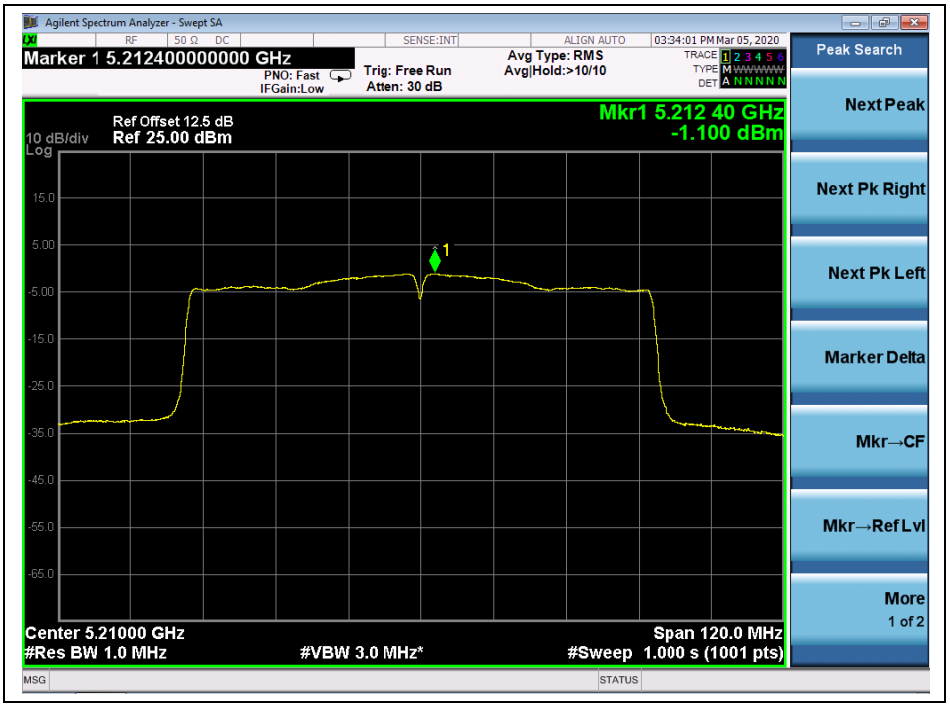
(Channel 142, 5710 MHz, 802.11ac (VHT40))

802.11ac (VHT80) Test mode

A. Test Verdict:

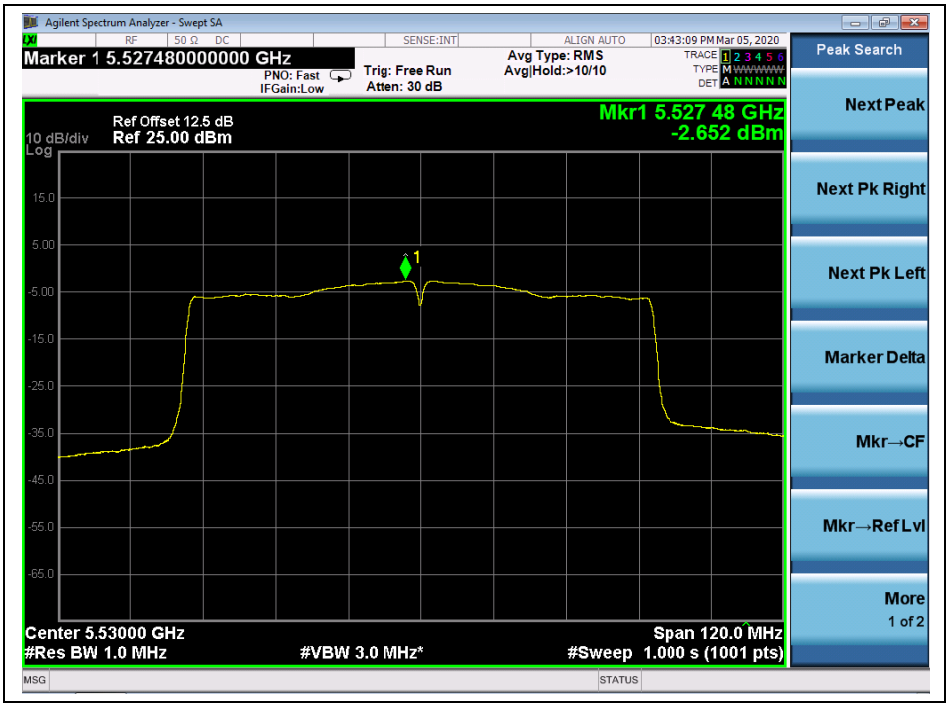
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
42	5210	-1.10	0.27	-0.83	11	PASS
58	5290	-1.73		-1.46		
106	5530	-2.65		-2.38		
122	5610	-2.02		-1.75		
138	5690	-2.02		-1.75		
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/500KHz)	Verdict
138	5690	-4.68	0.27	-4.41	30	PASS

B. Test Plots

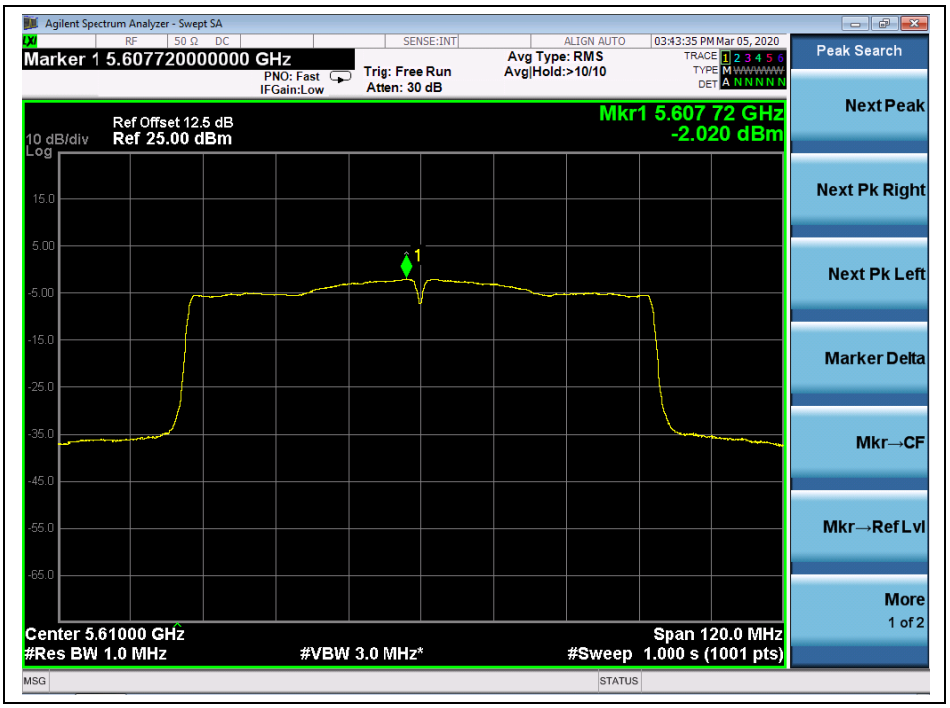


(Channel 42,5210MHz, 802.11ac(VHT80))

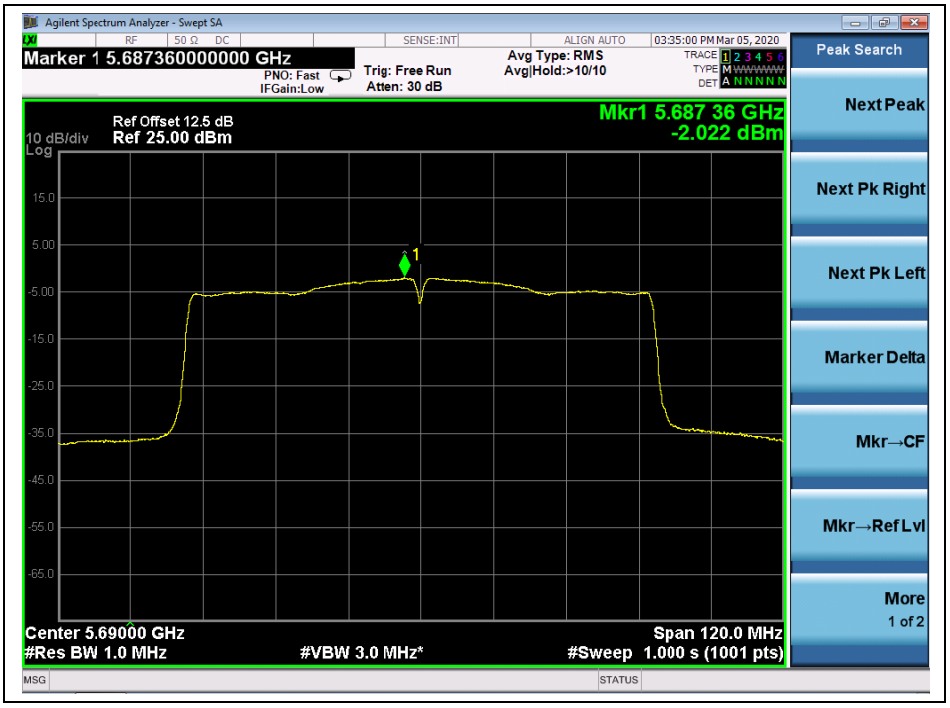
(Channel 58, 5290 MHz, 802.11ac(VHT80))



(Channel 106,5530MHz, 802.11ac(VHT80))



(Channel 122, 5610 MHz, 802.11ac(VHT80))



(Channel 138,5690MHz, 802.11ac(VHT80))

(Channel 138, 5690 MHz, 802.11ac(VHT80))

2.6. Frequency Stability

2.6.1. Requirement

Manufacturers of U-NII devices are responsible for ensuring frequency stabilitysuch that an emission is maintained within the band of operation under all conditions ofnormal 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 variedbetween 5°Cto 40°C. The temperature was incremented by 10° intervals and the unit was allowed tostabilize at each temperature before each measurement. The center frequency of the transmitting channel wasevaluated 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)	Freq Dev. (Hz)	Deviation (ppm)
100%	3.30	+20(Ref)	34	0.004
100%		-30	25	0.010
100%		-20	22	0.009
100%		-10	49	0.007
100%		0	51	0.006
100%		+10	32	0.005
100%		+20	37	0.005
100%		+30	44	0.007
100%		+40	49	0.008
100%		+50	51	0.009
85%	2.81	+20	25	0.010
115%	3.80	+20	28	0.008

U-NII-2A (Ch. 52) 5260MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (Hz)	Deviation (ppm)
100%	3.30	+20(Ref)	37	0.006
100%		-30	44	0.010
100%		-20	49	0.009
100%		-10	51	0.007
100%		0	25	0.006
100%		+10	22	0.006
100%		+20	49	0.007
100%		+30	51	0.008
100%		+40	22	0.009
100%		+50	32	0.011
85%	2.81	+20	36	0.006
115%	3.80	+20	28	0.006

U-NII-2C (Ch. 100) 5500MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (Hz)	Deviation (ppm)
100%	3.30	+20(Ref)	32	0.004
100%		-30	26	0.009
100%		-20	41	0.007
100%		-10	38	0.005
100%		0	25	0.004
100%		+10	33	0.003
100%		+20	46	0.004
100%		+30	55	0.005
100%		+40	58	0.006
100%		+50	61	0.009
85%	2.81	+20	30	0.005
115%	3.80	+20	36	0.006

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

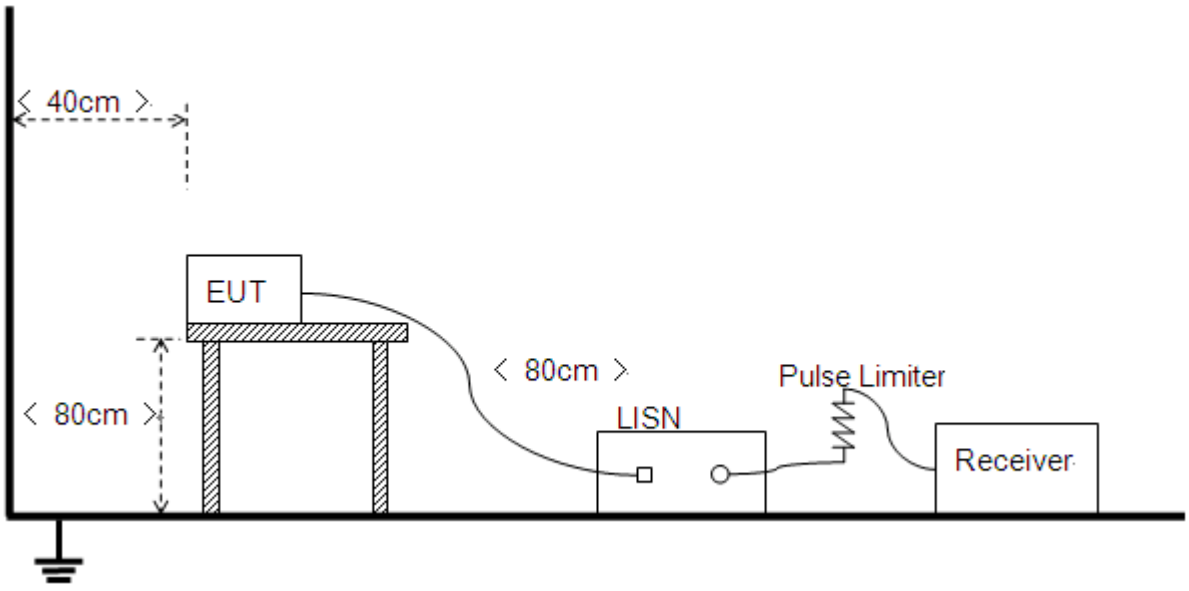
NOTE:

(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

TestSetup:



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

2.7.3. Test Result

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

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

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

U_R: Receiver Reading

A_{Factor}: Voltage division factor of LISN