



TEST REPORT

APPLICANT : Ugreen Group Limited

PRODUCT NAME : AirPlay 2 Wireless Audio Receiver

MODEL NAME : CM539, 80664

BRAND NAME : UGREEN

FCC ID : 2AQI5-CM539

STANDARD(S) : 47 CFR Part 15 Subpart E

RECEIPT DATE : 2021-11-03

TEST DATE : 2021-11-12 to 2021-11-23

ISSUE DATE : 2021-11-25

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Shen Junsheng (Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2021-11-25	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Ugreen Group Limited
Applicant Address:	UGREEN Building, Longcheng Industrial Park, Longguanxi Road, Longhua, ShenZhen, China
Manufacturer:	Ugreen Group Limited
Manufacturer Address:	UGREEN Building, Longcheng Industrial Park, Longguanxi Road, Longhua, ShenZhen, China

1.2. Equipment Under Test (EUT) Description

Product Name:	AirPlay 2 Wireless Audio Receiver
Sample No.:	8#
Hardware Version:	V1.0
Software Version:	V1.0
Modulation Technology:	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; 5260MHz-5320MHz; 5745MHz-5825MHz
Channel Number:	Refer to 1.3
Antenna Type:	PIFA Antenna
Antenna Gain:	1.89dBi

Note 1: According to the certificate holder, they declared that the models CM539 and 80664 only the model numbers are different, everything else is the same. The main measuring model is CM539, only the results for CM539 were recorded in this report.

Note 2: WiFi hotspot only support U-NII-1 and U-NII-3 band.

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



1.3. Modulation Type and Data Rate of EUT

Modulation Technology	Modulation Type	Data Rate (Mbps) ^{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

(U-NII-1) 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		
(U-NII-2A) 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		
(U-NII-3) 5745MHz-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 15, 2021	Su Xiaoxian	PASS	No deviation
3	15.407(a)	Maximum Conducted Output Power	Nov 17, 2021	Su Xiaoxian	PASS	No deviation
4	15.407(a)(e)	Emission Bandwidth	Nov 17, 2021	Su Xiaoxian	PASS	No deviation
5	15.407(a)	Peak Power Spectral Density	Nov 17, 2021	Su Xiaoxian	PASS	No deviation
6	15.407(g)	Frequency Stability	Nov 17, 2021	Su Xiaoxian	PASS	No deviation
7	15.207	Conducted Emission	Nov 15, 2021	Yang Lian	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Nov 23, 2021	Huang Zhiye	PASS	No deviation
9	15.407(b)	Radiated Emission	Nov 23, 2021	Huang Zhiye	PASS	No deviation

Note 1: The DFS test report was documented in a separate report (Report No.: SZ21110027W03).

Note 2: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.102013.

Note 3: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v02r01.



Note 4: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 12dB contains two parts that cable loss 2dB and Attenuator 10dB.

Note 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.

Note 6: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

1.6. Environmental Conditions

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

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



2.47 CFR Part 15E Requirements

2.1. Antenna Requirement

2.1.1. Applicable Standard

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

2.1.2. Test Result: Compliant

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

2.2. Duty Cycle of the Test Signal

2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than $\pm 2\%$; otherwise, the duty cycle is considered to be nonconstant.

2.2.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 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.

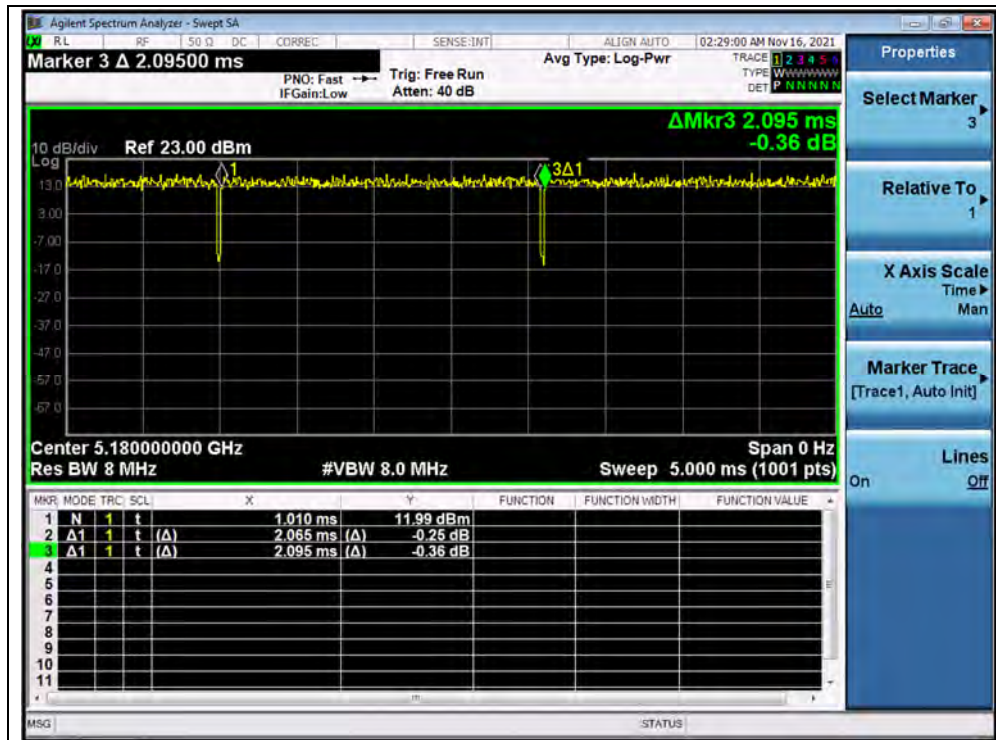


2.2.4. Test Result

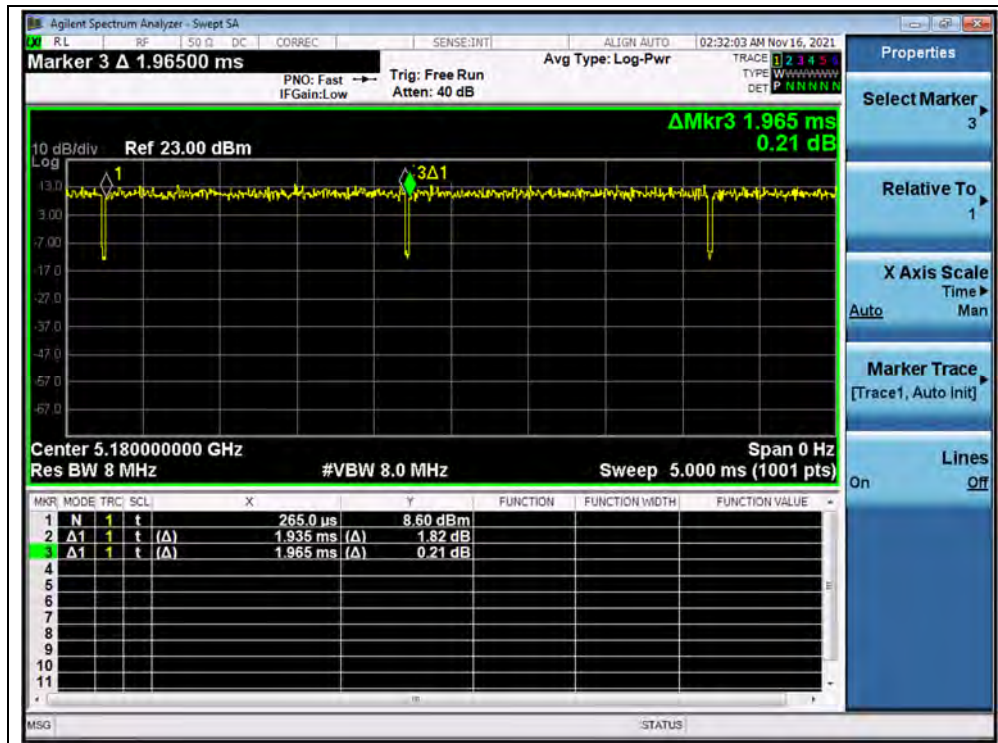
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	98.57	0.06
802.11n (HT20)	98.33	0.07
802.11n (HT40)	93.30	0.30
802.11ac (VHT20)	98.47	0.07
802.11ac (VHT40)	95.31	0.21
802.11ac (VHT80)	98.57	0.06

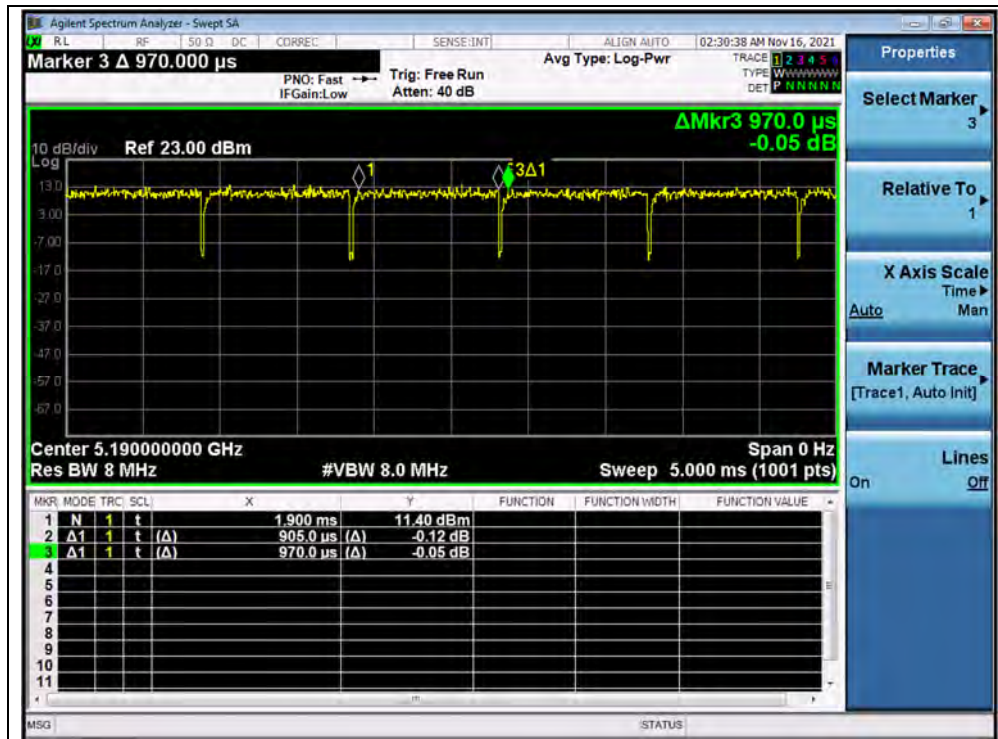
B. Test Plot:



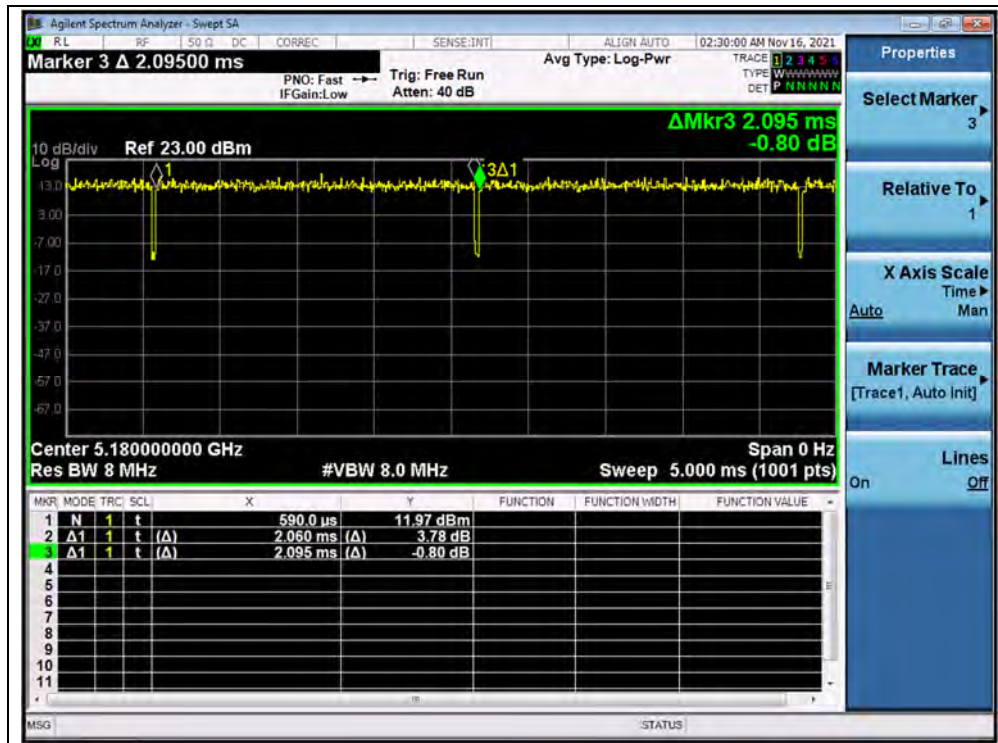
(Channel 36, 5180MHz, 802.11a)



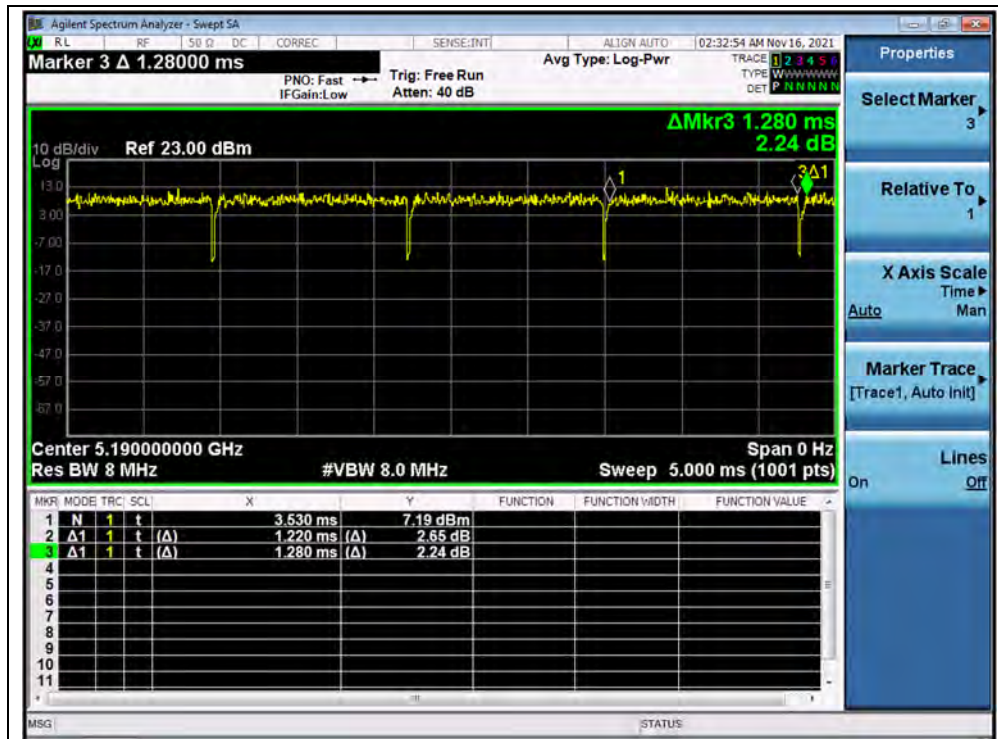
(Channel 36, 5180MHz, 802.11n (HT20))



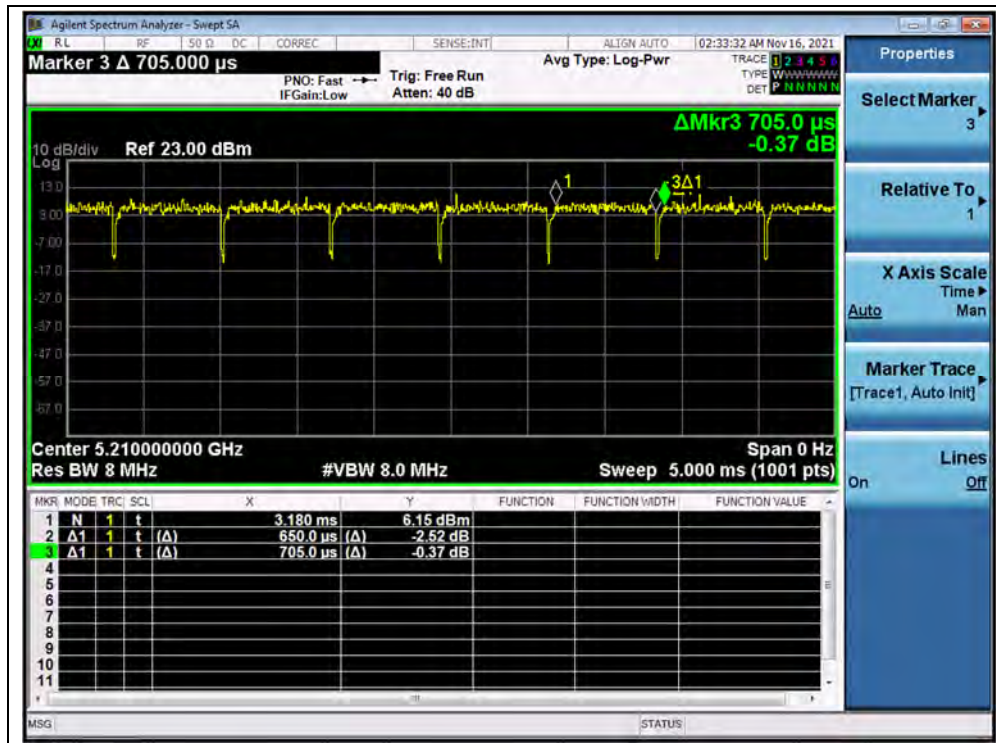
(Channel 38, 5190MHz, 802.11n (HT40))



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



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



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

2.3. Maximum Conducted Output Power

2.3.1. Requirement

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

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

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

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

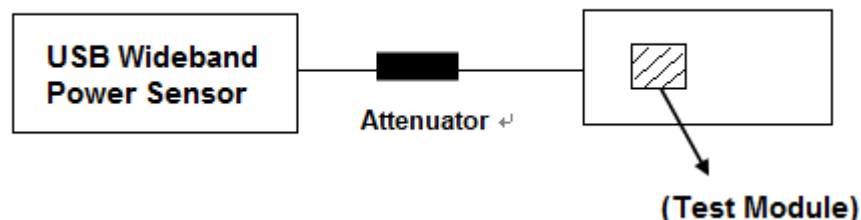
(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the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

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

2.3.2. Test Description

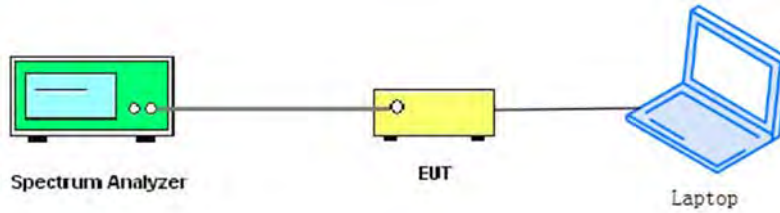
Section E) 3) of KDB 789033 defines a methodology using a USB Wideband Power Sensor.

Test Setup:



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

For ac (VHT80) mode power



The EUT (Equipment under the test) is coupled to the Spectrum analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in Spectrum analyzer.

2.3.3. 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	21.15	24.25	24.00
		5300	21.06	24.23	24.00
		5320	20.90	24.20	24.00
n20	UNII-2a	5260	21.13	24.25	24.00
		5300	21.21	24.27	24.00
		5320	21.22	24.27	24.00
ac20	UNII-2a	5260	21.25	24.27	24.00
		5300	21.34	24.29	24.00
		5320	21.55	24.33	24.00



2.3.4. Test Result

Maximum Average Conducted Output Power

802.11a Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5180	9.45	0.06	9.51	0.009	24	0.25	PASS
5220	10.15		10.21	0.010			
5240	10.41		10.47	0.011			
5260	10.71		10.77	0.012			
5300	11.05		11.11	0.013			
5320	11.07		11.13	0.013			
5745	14.18		14.24	0.027	30	1	
5785	13.96		14.02	0.025			
5825	13.92		13.98	0.025			

802.11n (HT20) Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5180	7.86	0.07	7.93	0.006	24	0.25	PASS
5220	9.24		9.31	0.009			
5240	9.48		9.55	0.009			
5260	10.08		10.15	0.010			
5300	10.12		10.19	0.010			
5320	10.31		10.38	0.011			
5745	12.82		12.89	0.019	30	1	
5785	12.52		12.59	0.018			
5825	12.63		12.70	0.019			



802.11n (HT40) Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5190	8.66	0.30	8.96	0.008	24	0.25	PASS
5230	9.34		9.64	0.009			
5270	10.19		10.49	0.011			
5310	10.42		10.72	0.012	30	1	
5755	12.65		12.95	0.020			
5795	12.60		12.90	0.019			

802.11ac (VHT20) Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5180	7.39	0.07	7.46	0.006	24	0.25	PASS
5220	7.37		7.44	0.006			
5240	7.71		7.78	0.006			
5260	7.82		7.89	0.006			
5300	8.24		8.31	0.007			
5320	8.48		8.55	0.007			
5745	8.77		8.84	0.008			
5785	8.71		8.78	0.008			
5825	8.80		8.87	0.008			

802.11ac (VHT40) Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5190	6.86	0.21	7.07	0.005	24	0.25	PASS
5230	7.32		7.53	0.006			
5270	8.55		8.76	0.008			
5310	7.91		8.12	0.006			
5755	8.82		9.03	0.008			
5795	8.85		9.06	0.008			



802.11ac (VHT80) Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5210	7.07	0.35	7.42	0.006	24	0.25	PASS
5290	8.30		8.65	0.007			
5775	8.34		8.69	0.007	30	1	

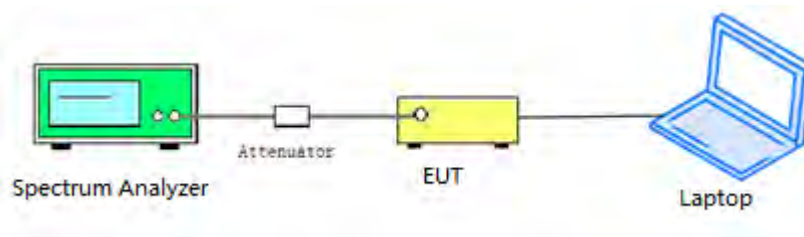
2.4. Emission Bandwidth

2.4.1. Requirement

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

2.4.2. Test Description

Test Setup:



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

2.4.3. Test Procedure

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



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

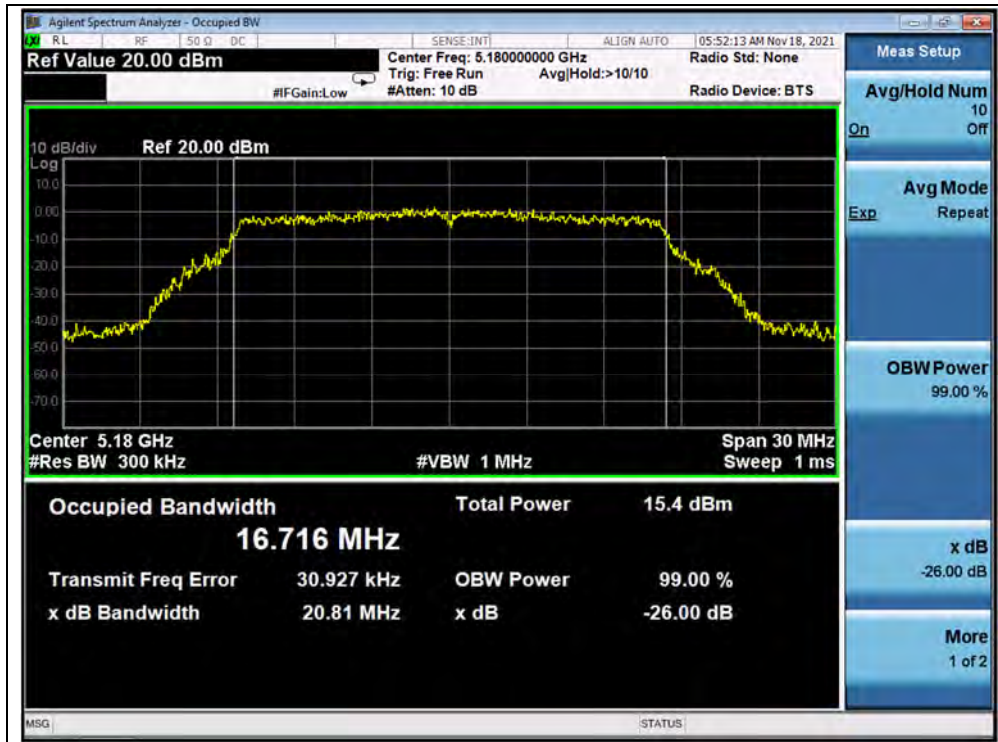
2.4.4. Test Result

802.11a Mode

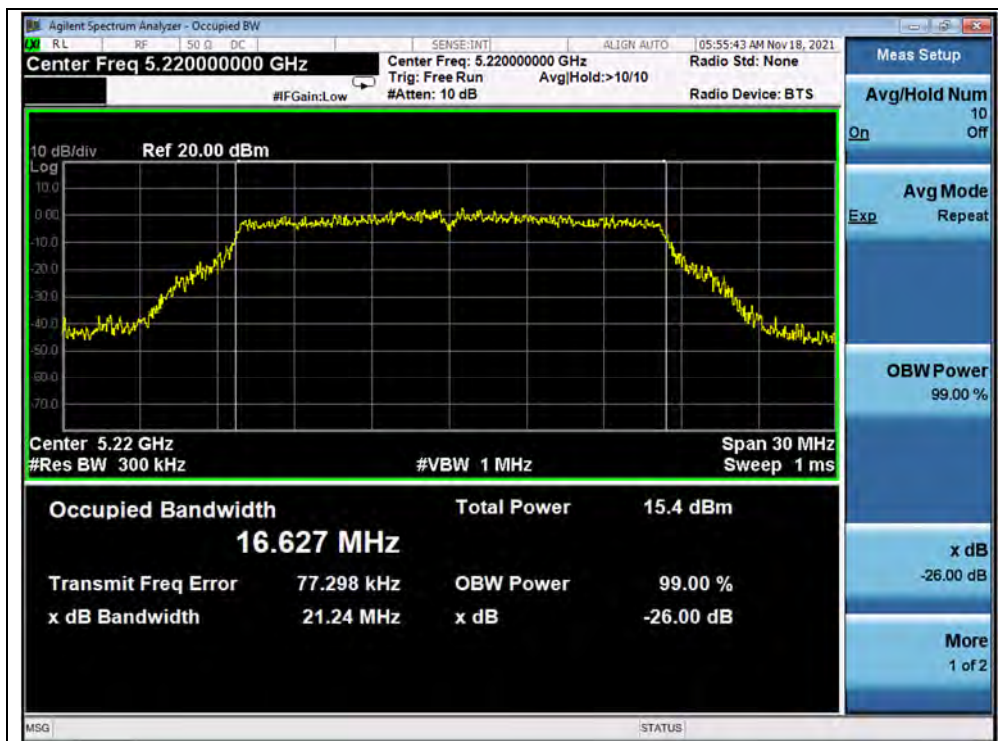
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.81
44	5220	21.24
48	5240	20.62
52	5260	21.15
60	5300	21.06
64	5320	20.90
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	16.34
157	5785	16.34
165	5825	16.28

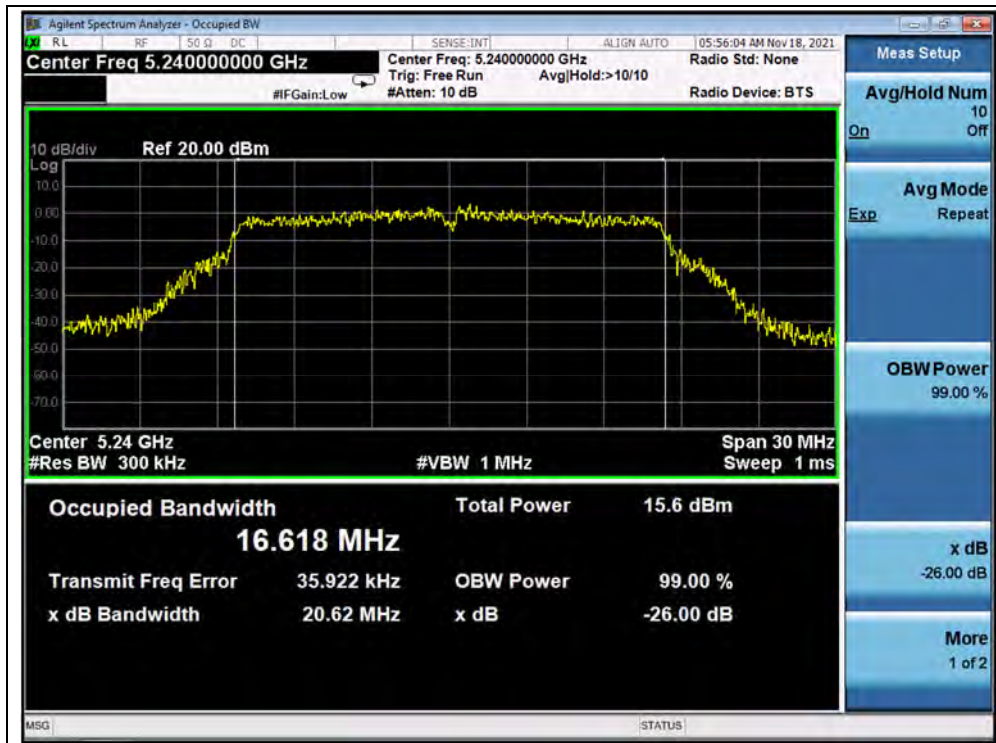
B. Test Plot:



(Channel 36, 5180MHz, 802.11a)



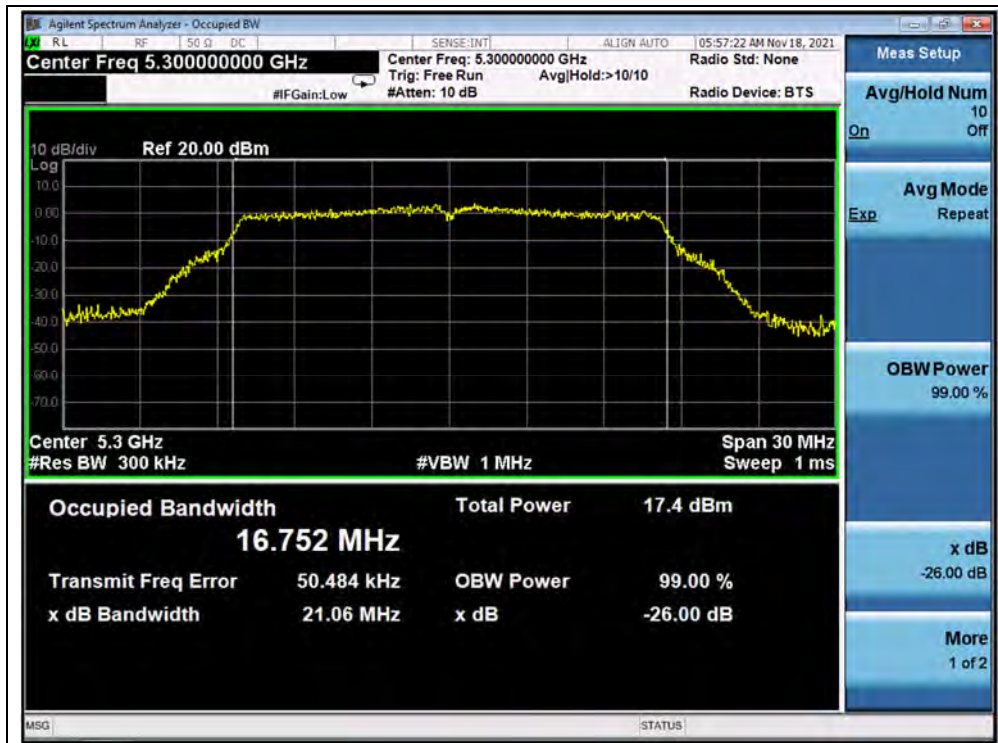
(Channel 44, 5220 MHz, 802.11a)



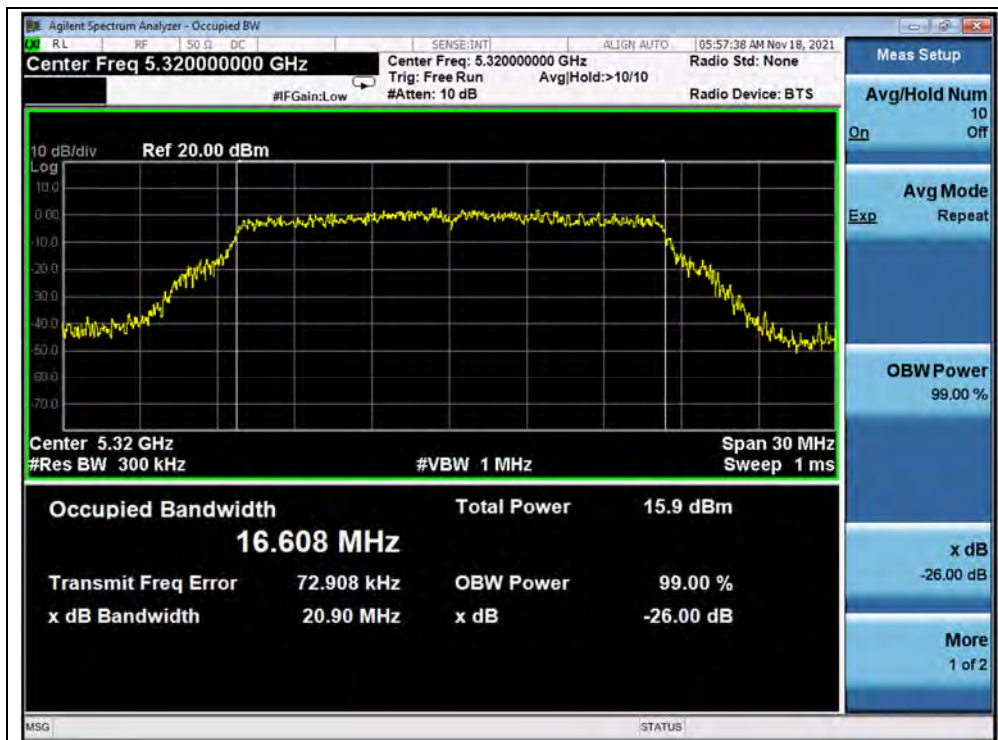
(Channel 48, 5240MHz, 802.11a)



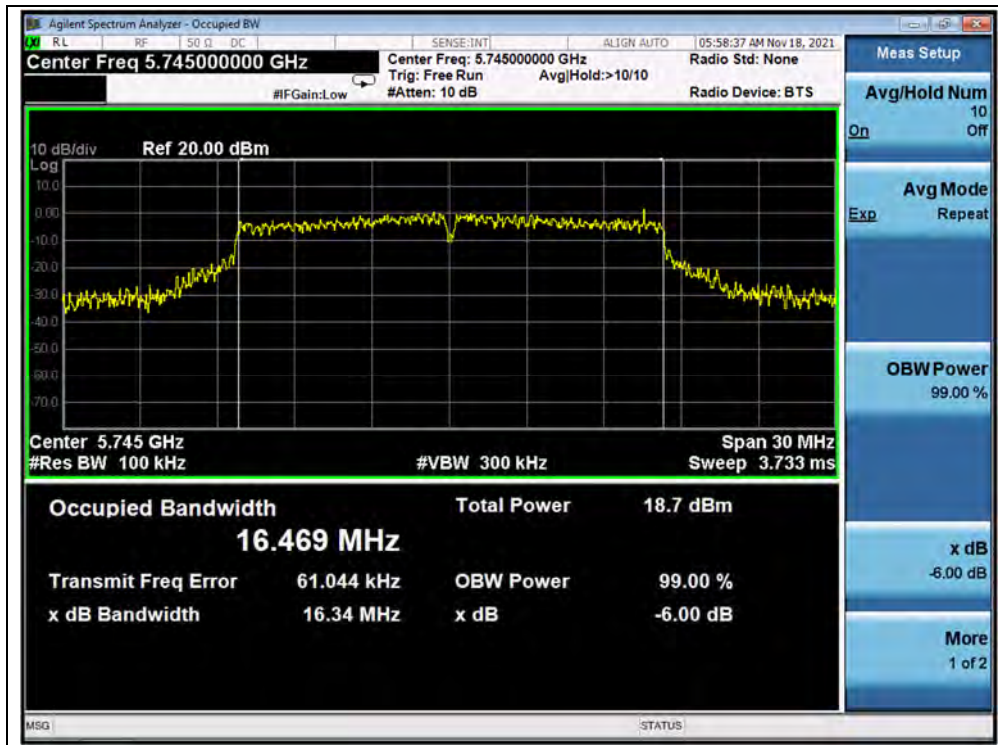
(Channel 52, 5260MHz, 802.11a)



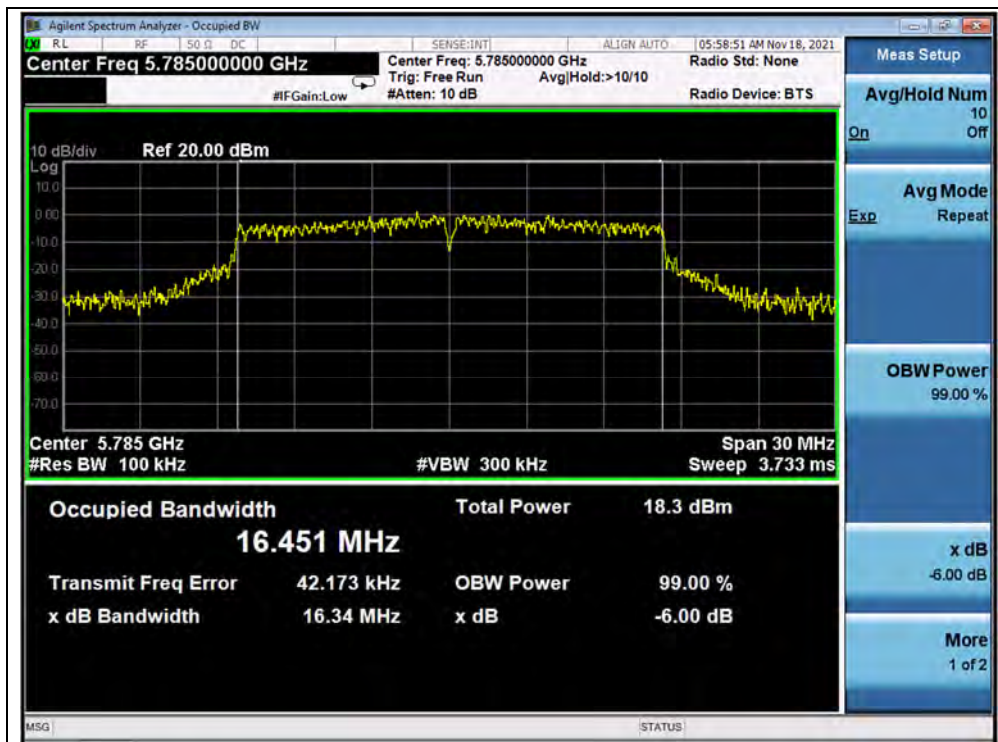
(Channel 60, 5300 MHz, 802.11a)



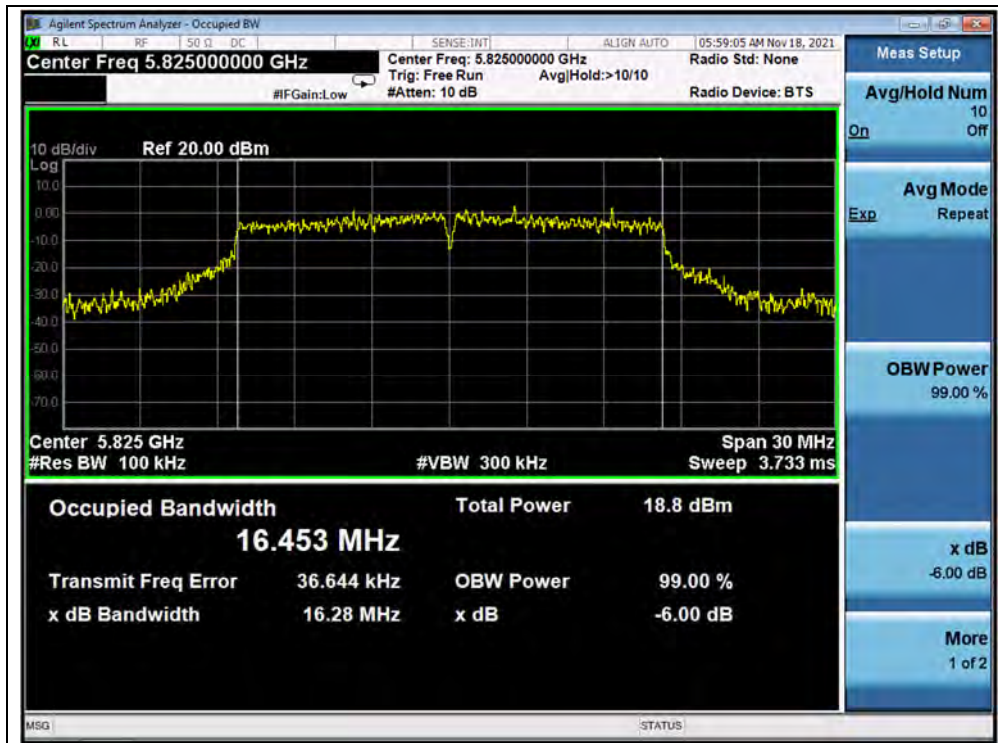
(Channel 64, 5320MHz, 802.11a)



(Channel 149,5745MHz, 802.11a)



(Channel 157,5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)

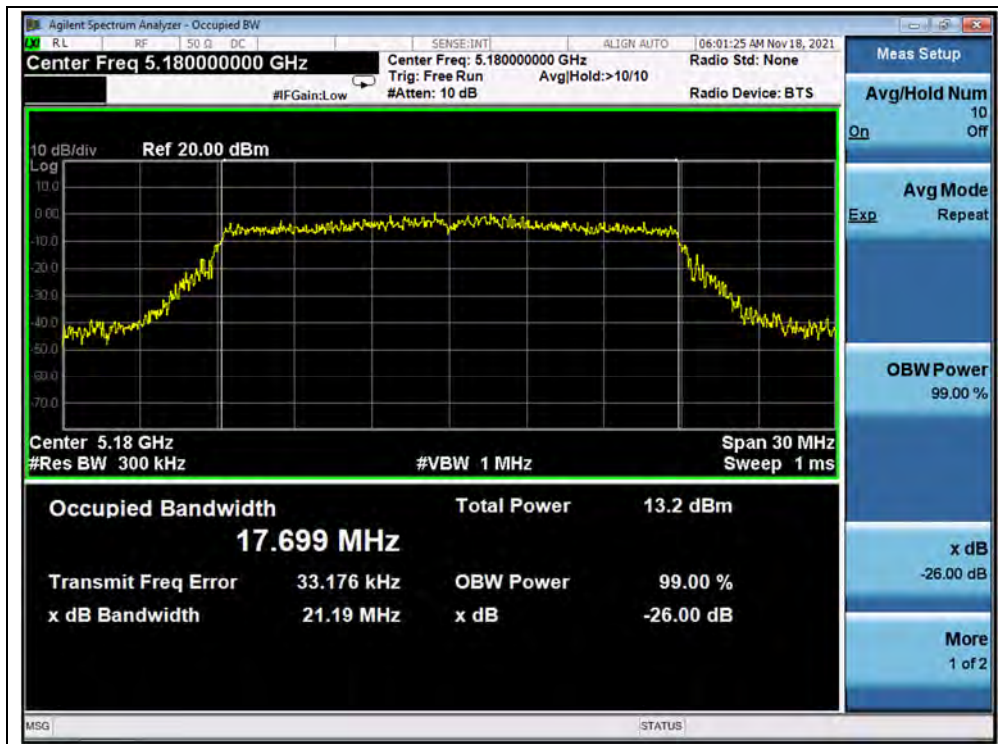


802.11n (HT20) Mode

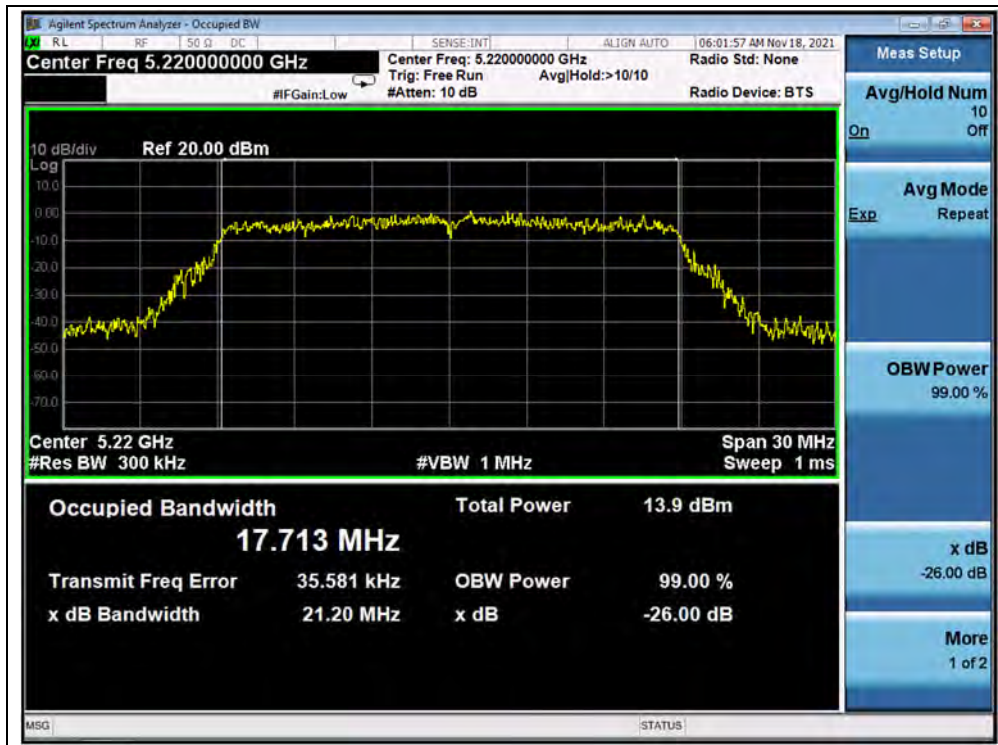
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.19
44	5220	21.20
48	5240	21.26
52	5260	21.13
60	5300	21.21
64	5320	21.22
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	17.23
157	5785	17.61
165	5825	17.55

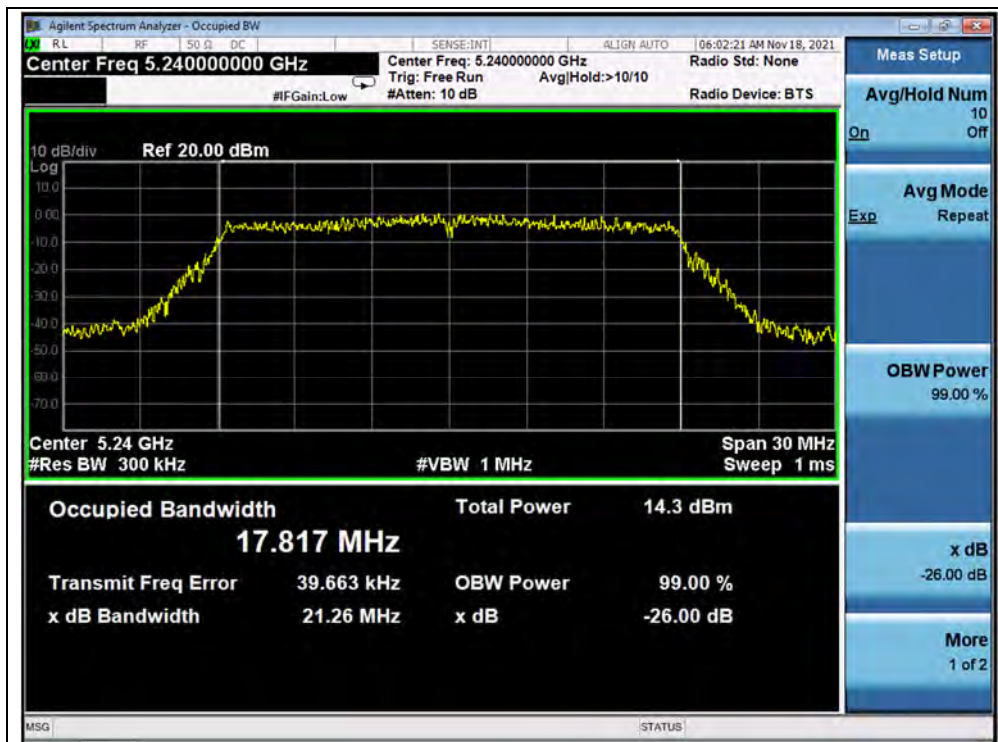
B. Test Plot:



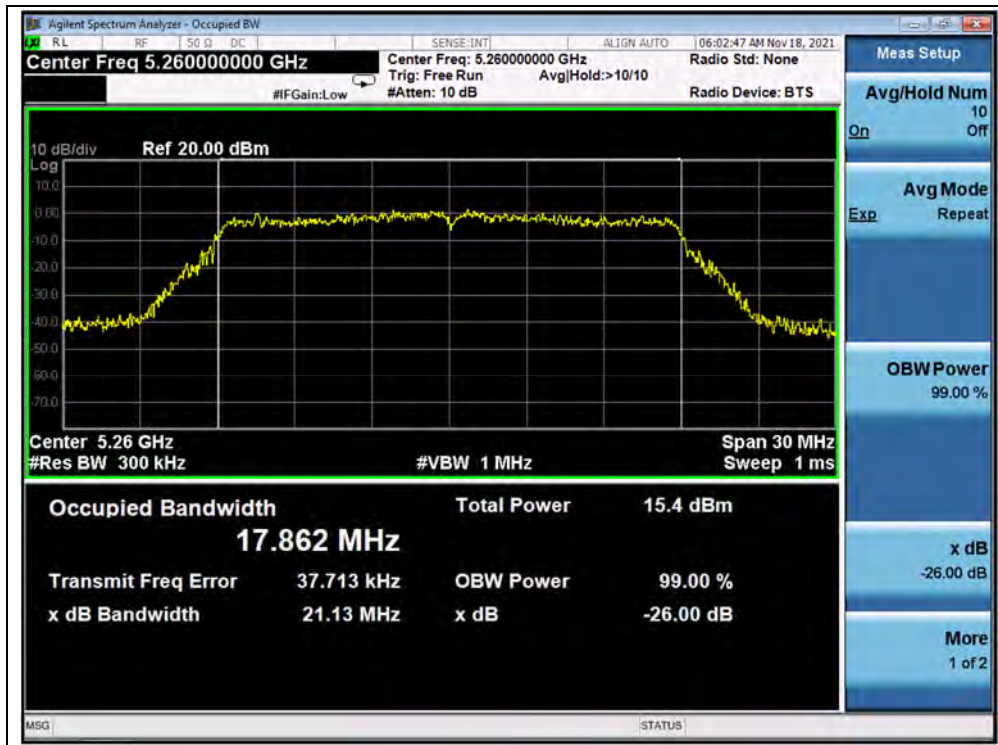
(Channel 36, 5180MHz, 802.11n (HT20))



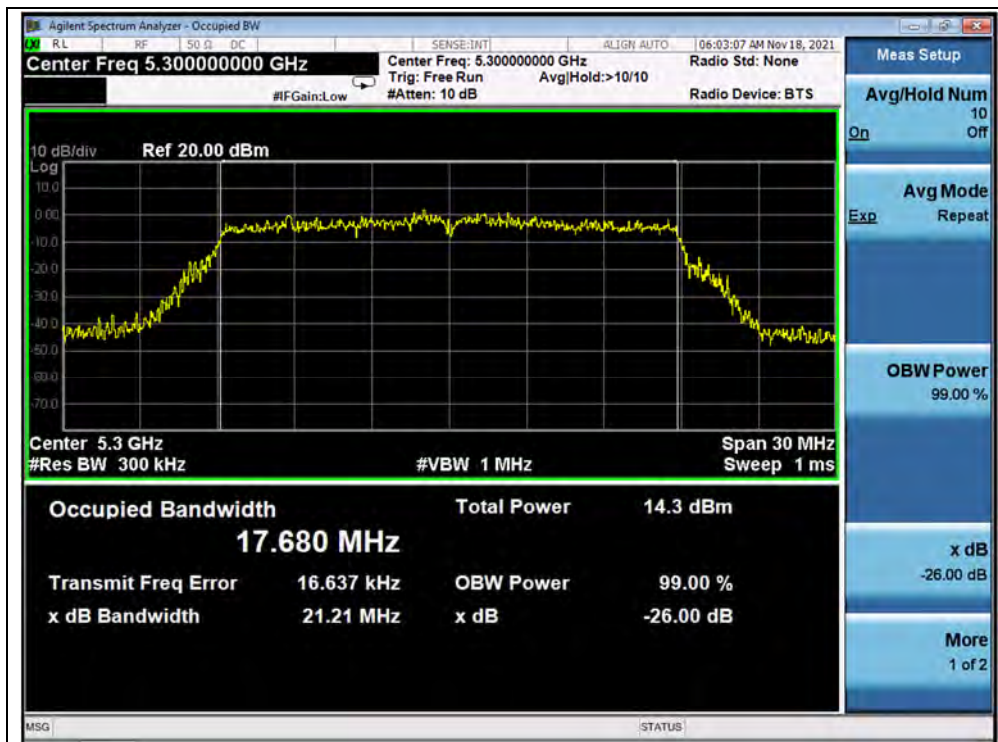
(Channel 44, 5220MHz, 802.11n (HT20))



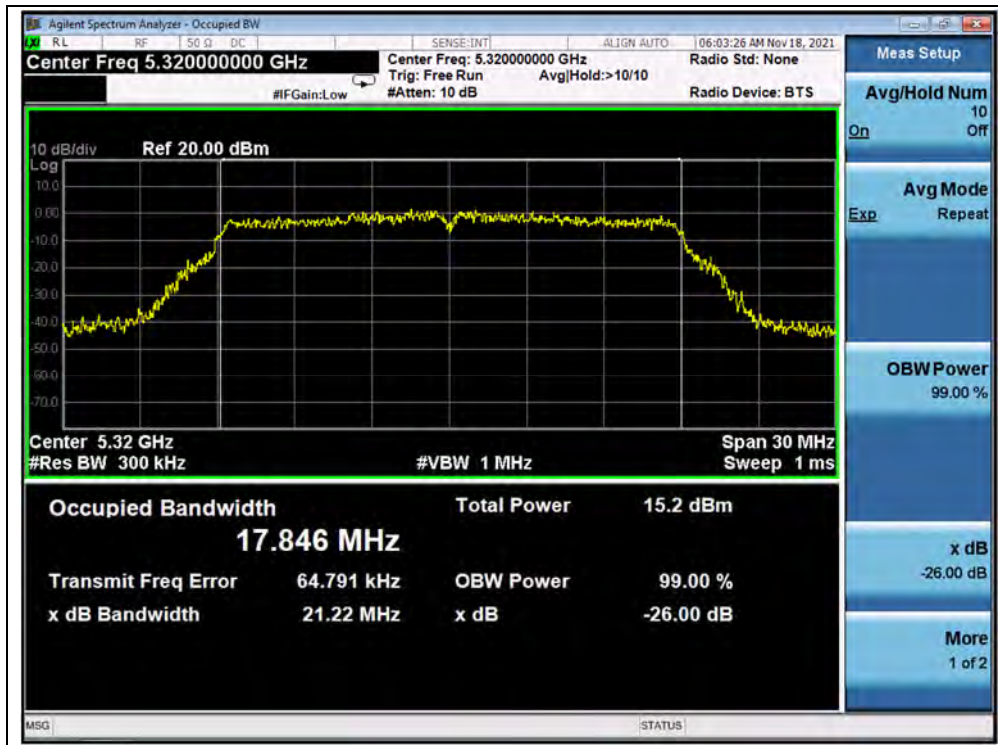
(Channel 48, 5240MHz, 802.11n (HT20))



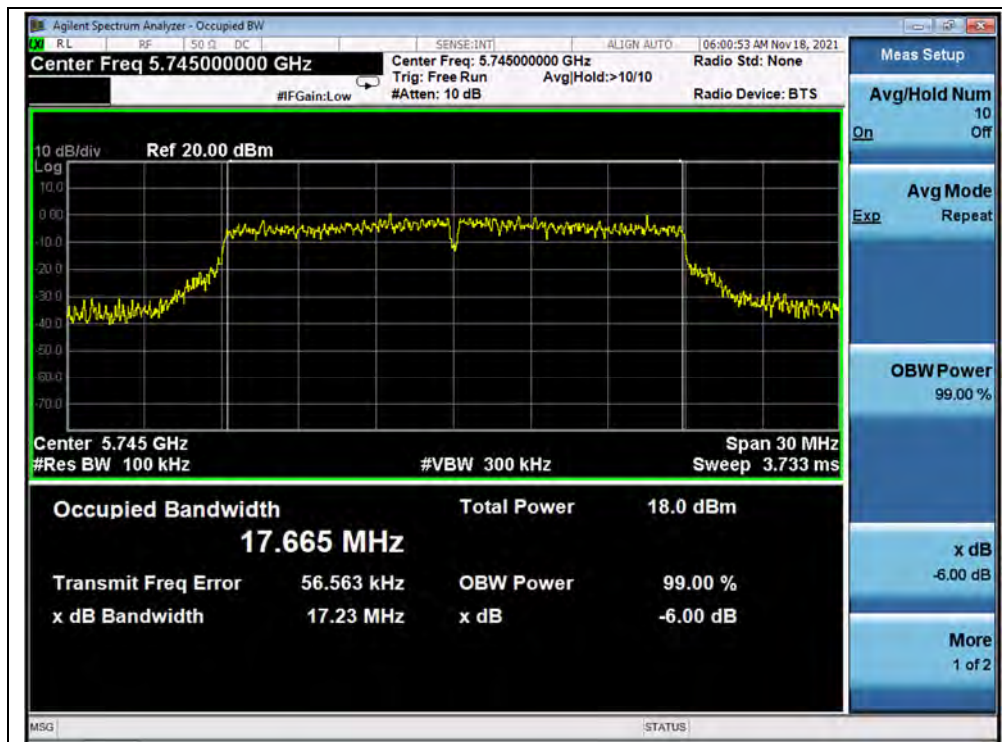
(Channel 52, 5260MHz, 802.11n (HT20))



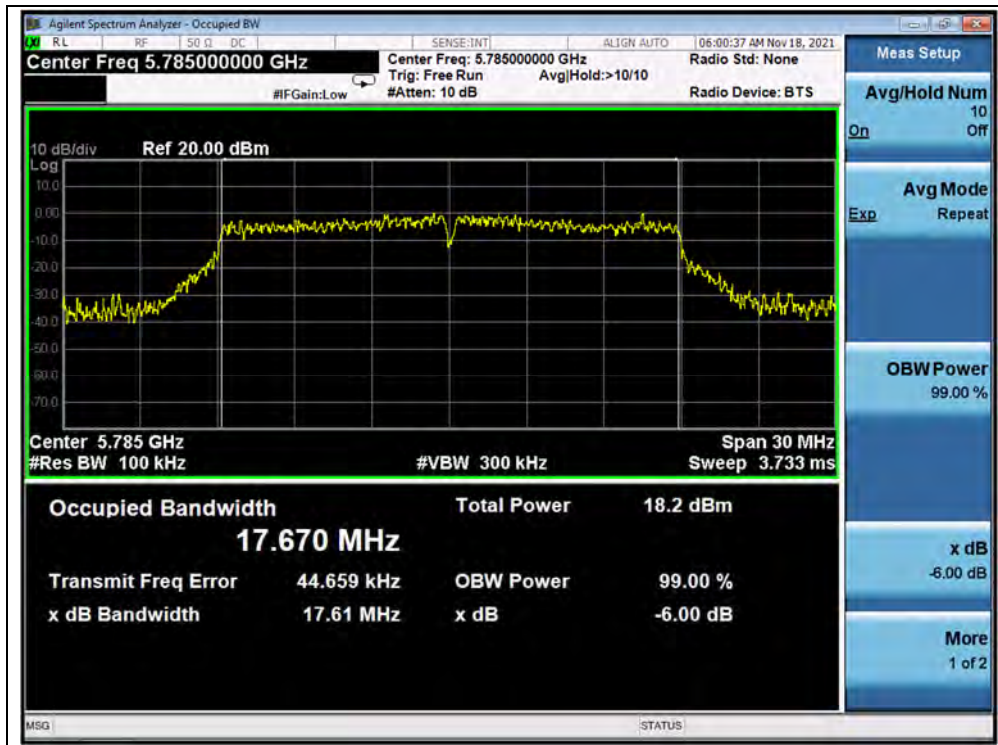
(Channel 60, 5300MHz, 802.11n (HT20))



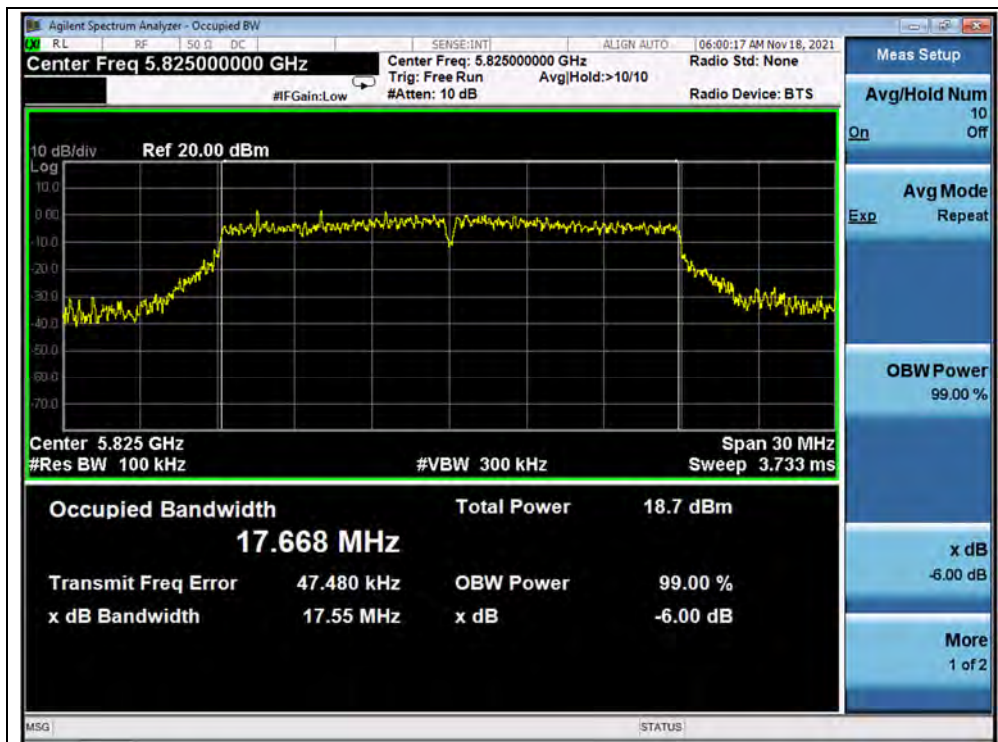
(Channel 64, 5320MHz, 802.11n (HT20))



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



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



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

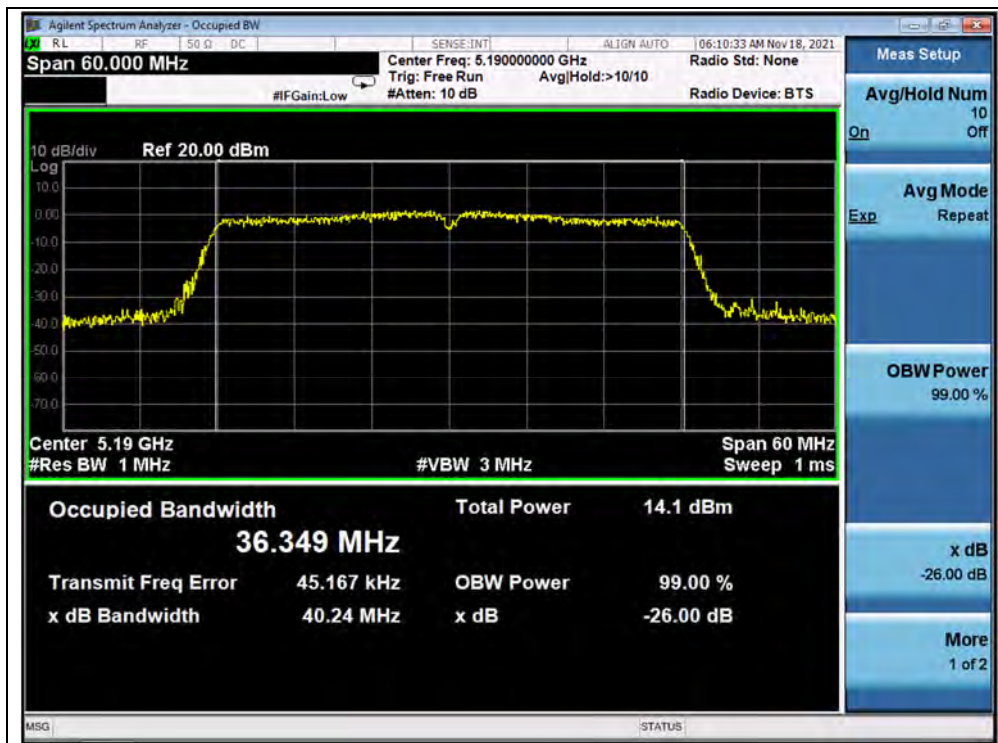


802.11n (HT40) Test mode

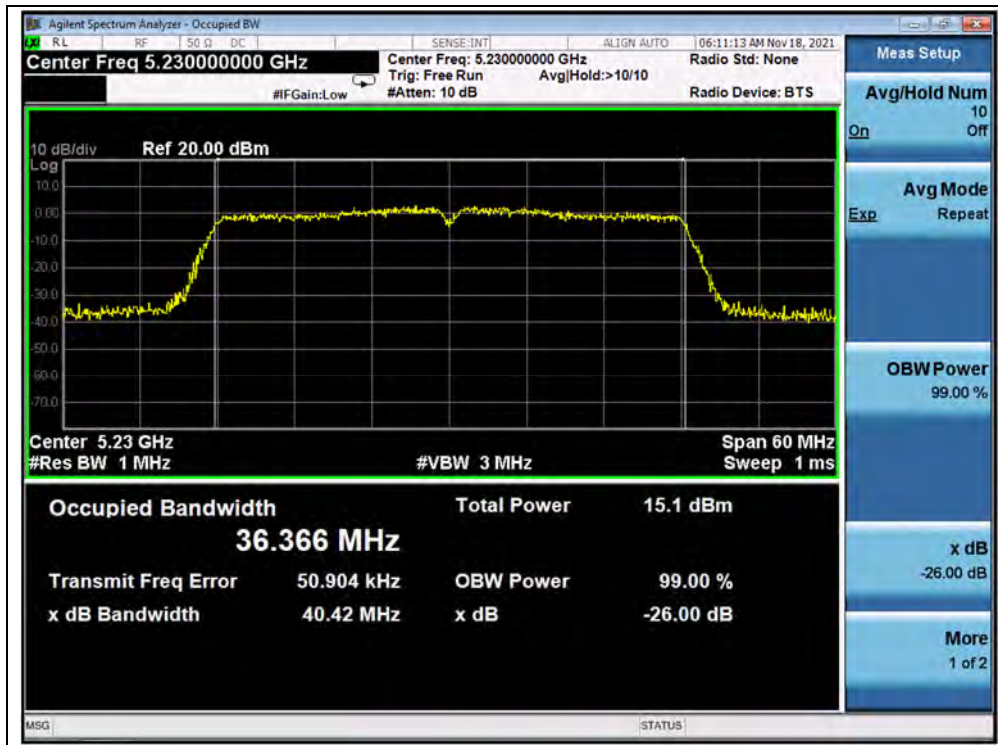
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.24
46	5230	40.42
54	5270	40.48
62	5310	40.40
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
151	5755	35.26
159	5795	35.80

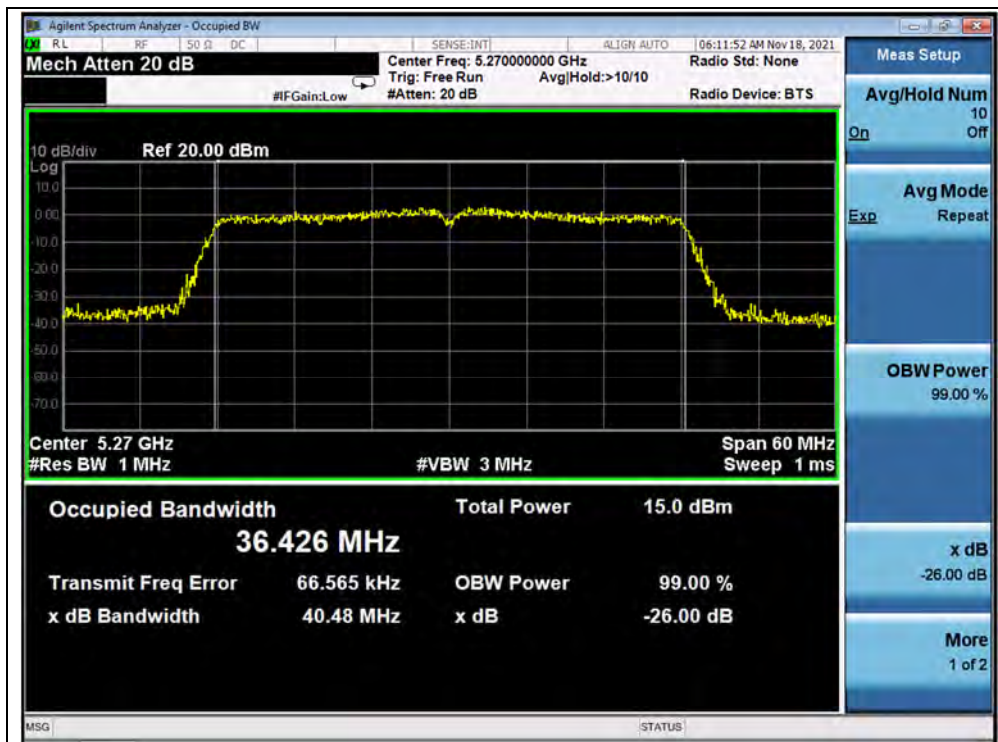
B. Test Plot:



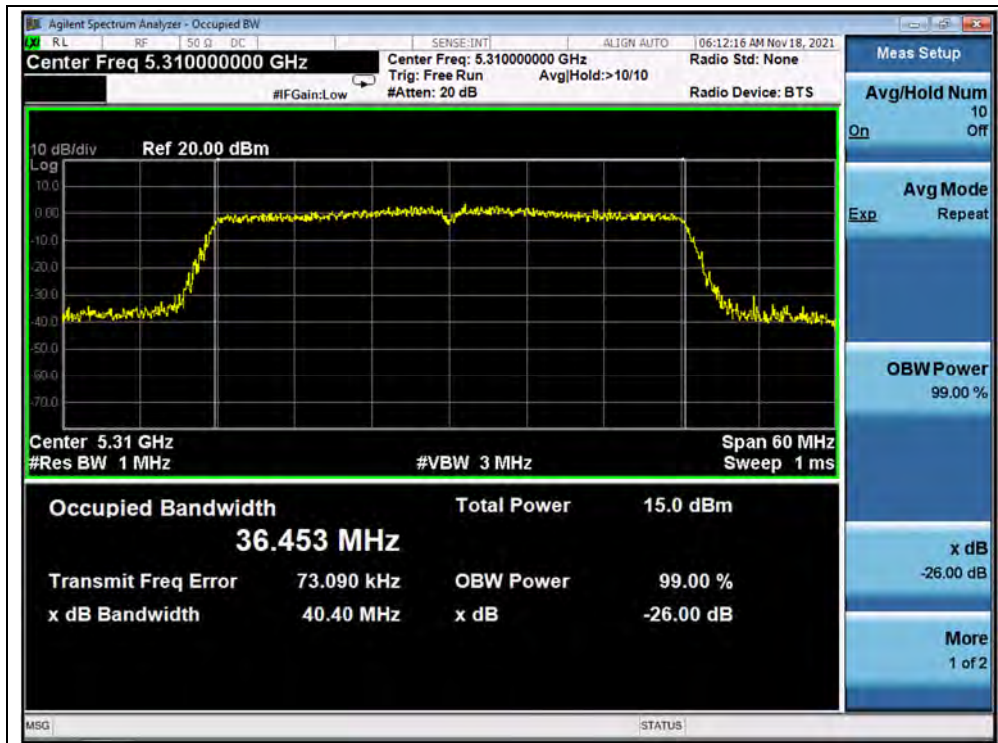
(Channel 38, 5190MHz, 802.11n (HT40))



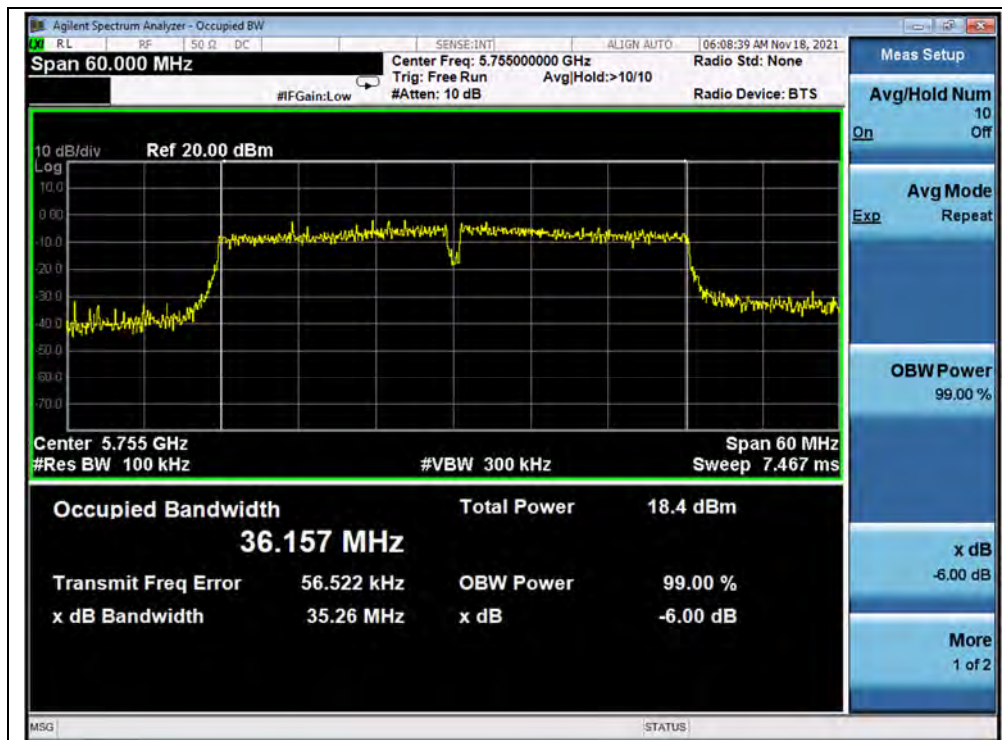
(Channel 46, 5230MHz, 802.11n (HT40))



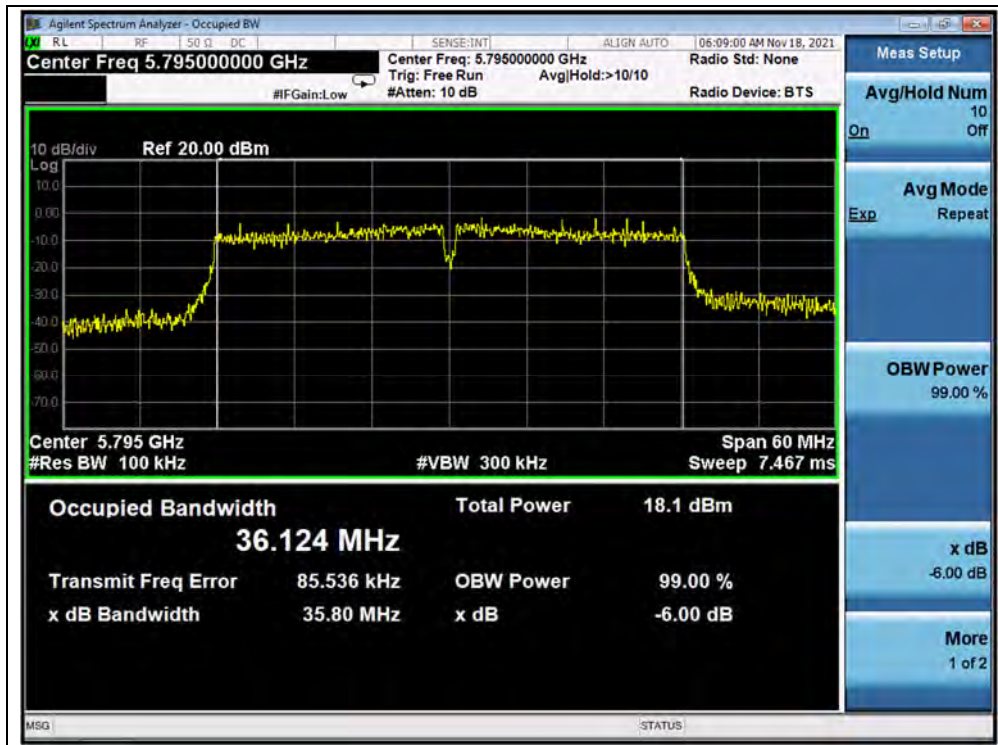
(Channel 54, 5270MHz, 802.11n (HT40))



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



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



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

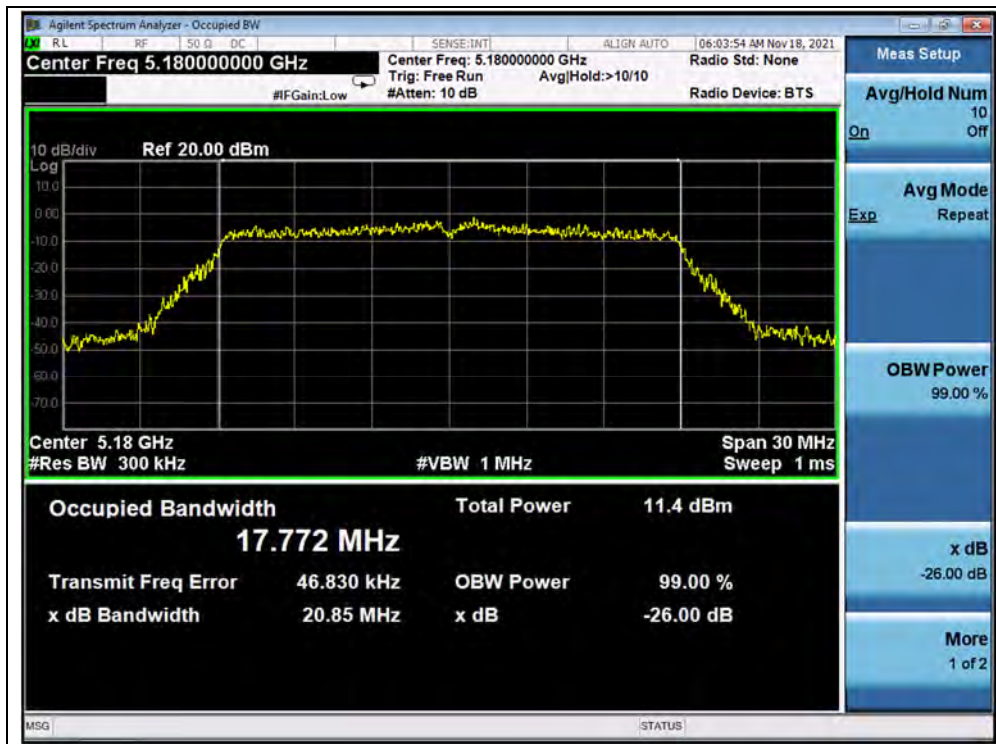


802.11ac (VHT20) Mode

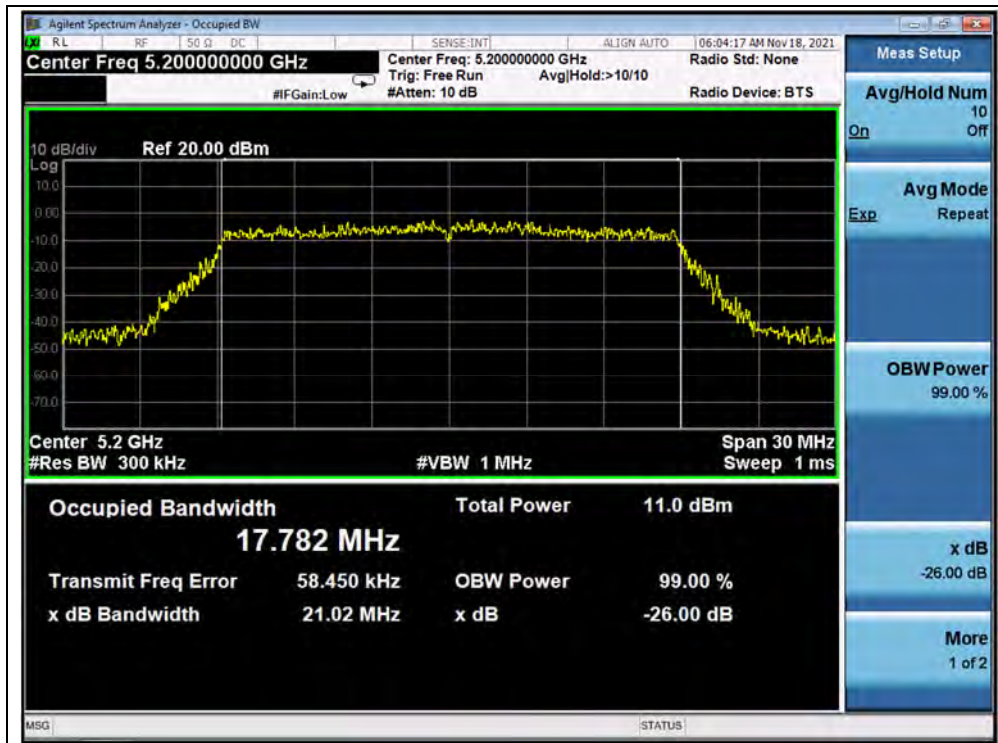
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.85
44	5220	21.02
48	5240	21.46
52	5260	21.25
60	5300	21.34
64	5320	21.55
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	17.18
157	5785	17.60
165	5825	17.57

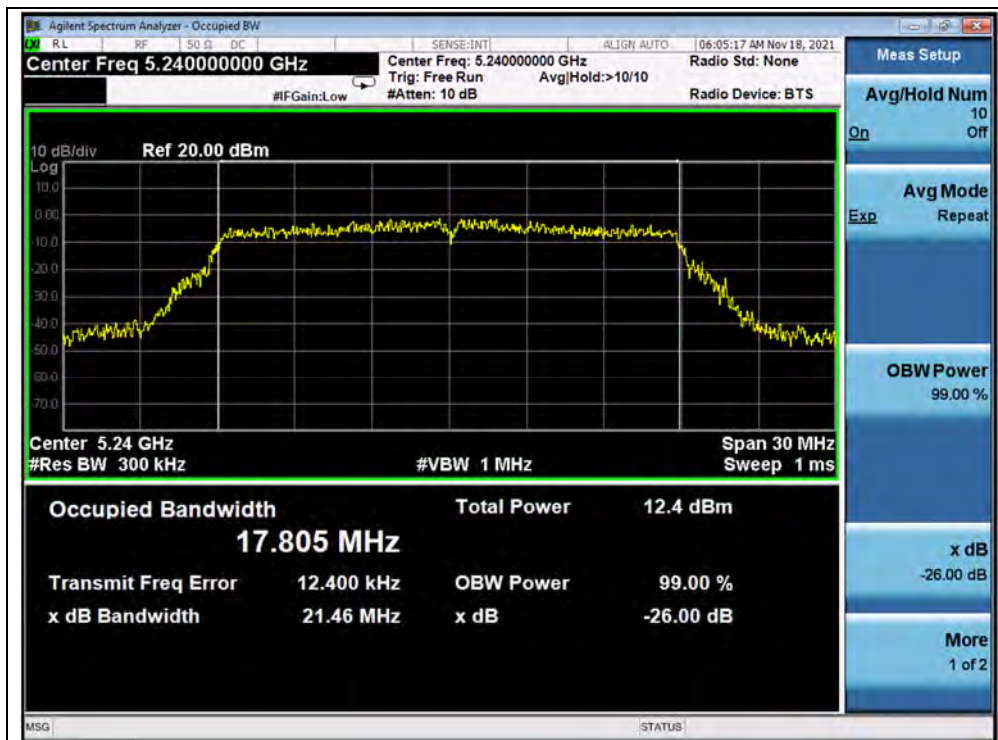
B. Test Plot:



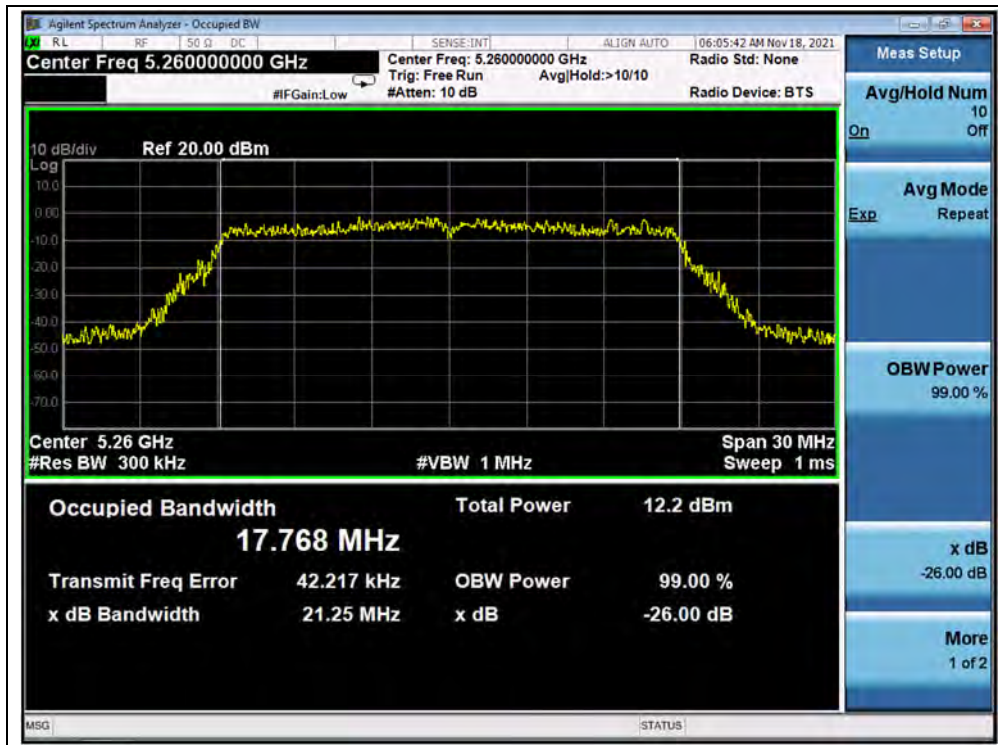
(Channel 36, 5180MHz, 802.11ac (VHT20))



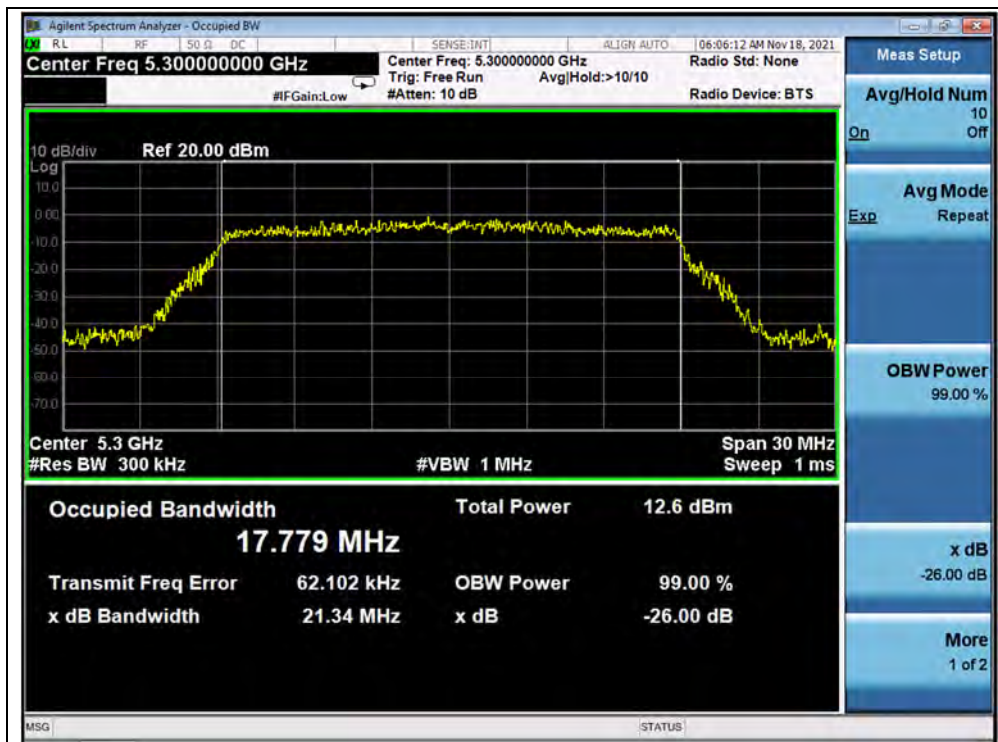
(Channel 44, 5220MHz, 802.11ac (VHT20))



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



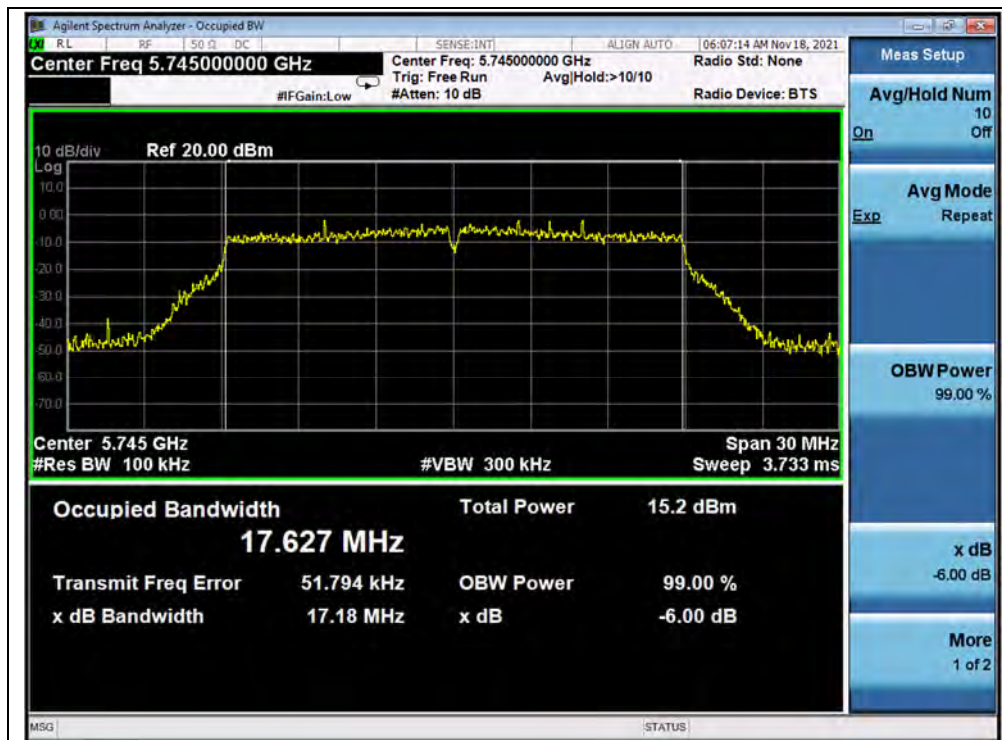
(Channel 52, 5260MHz, 802.11ac (VHT20))



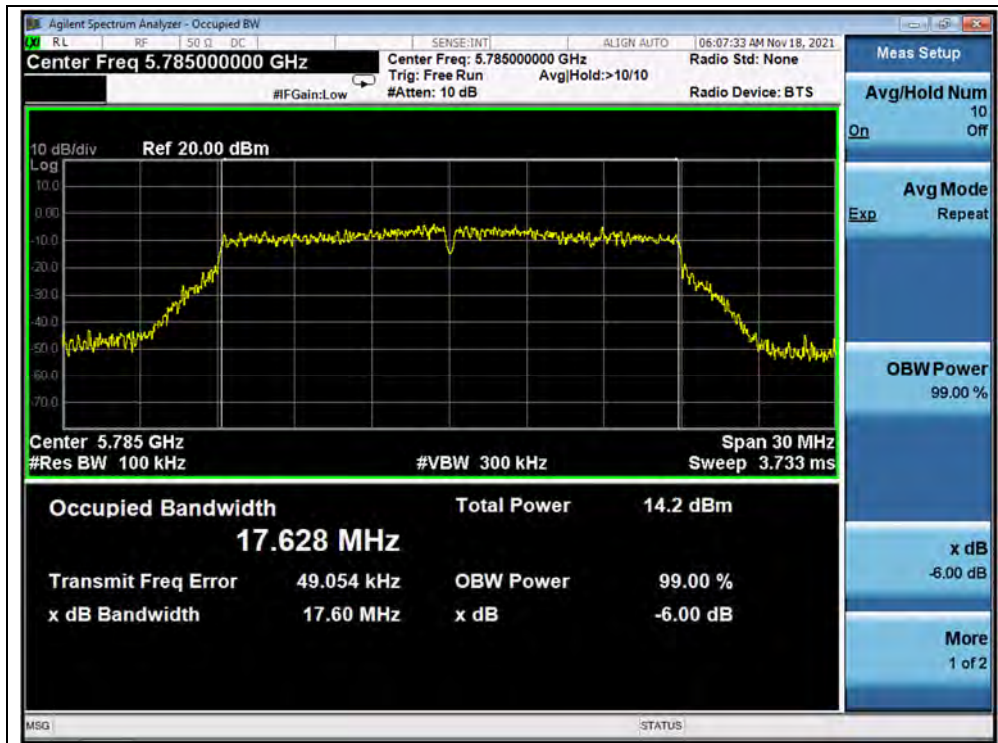
(Channel 60, 5300MHz, 802.11ac (VHT20))



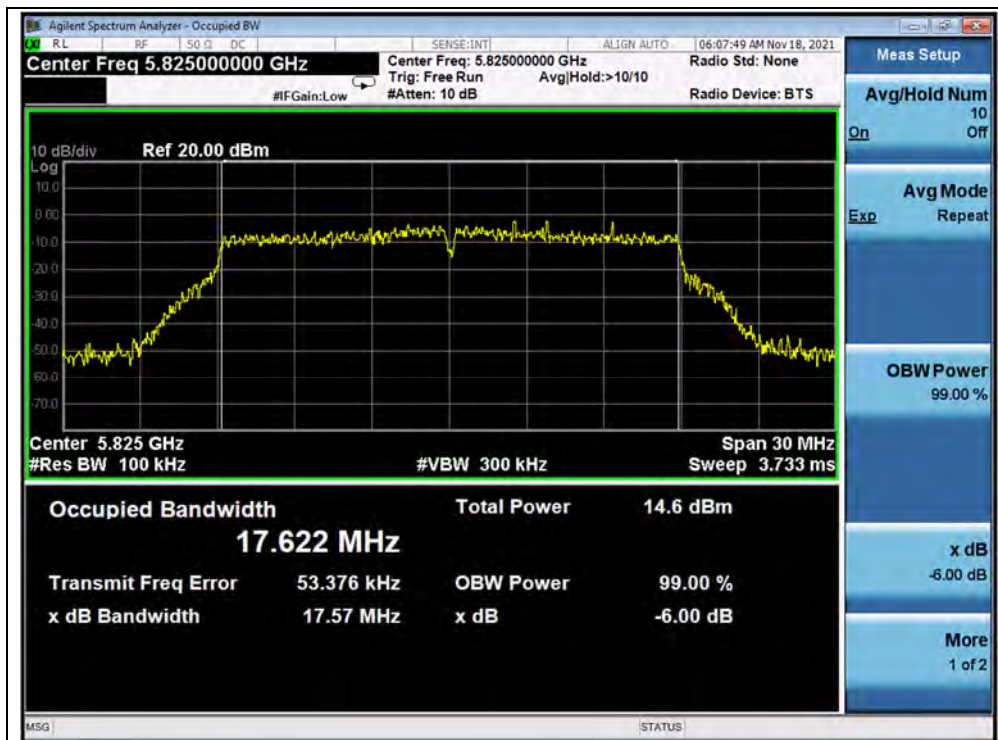
(Channel 64, 5320MHz, 802.11ac (VHT20))



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



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



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

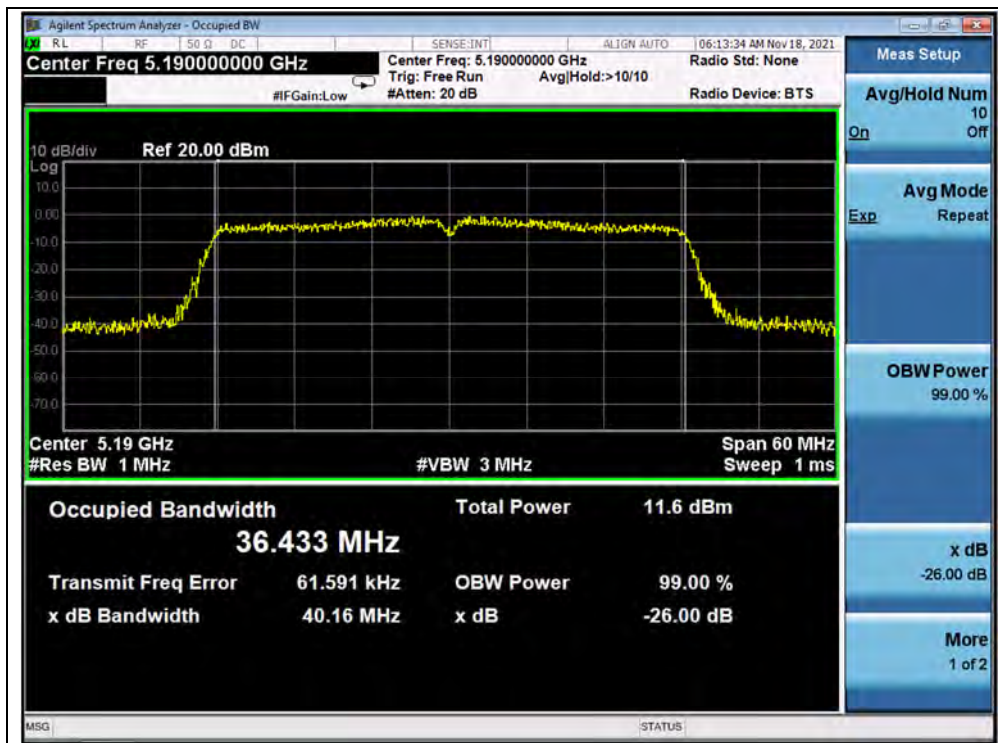


802.11ac (VHT40) Mode

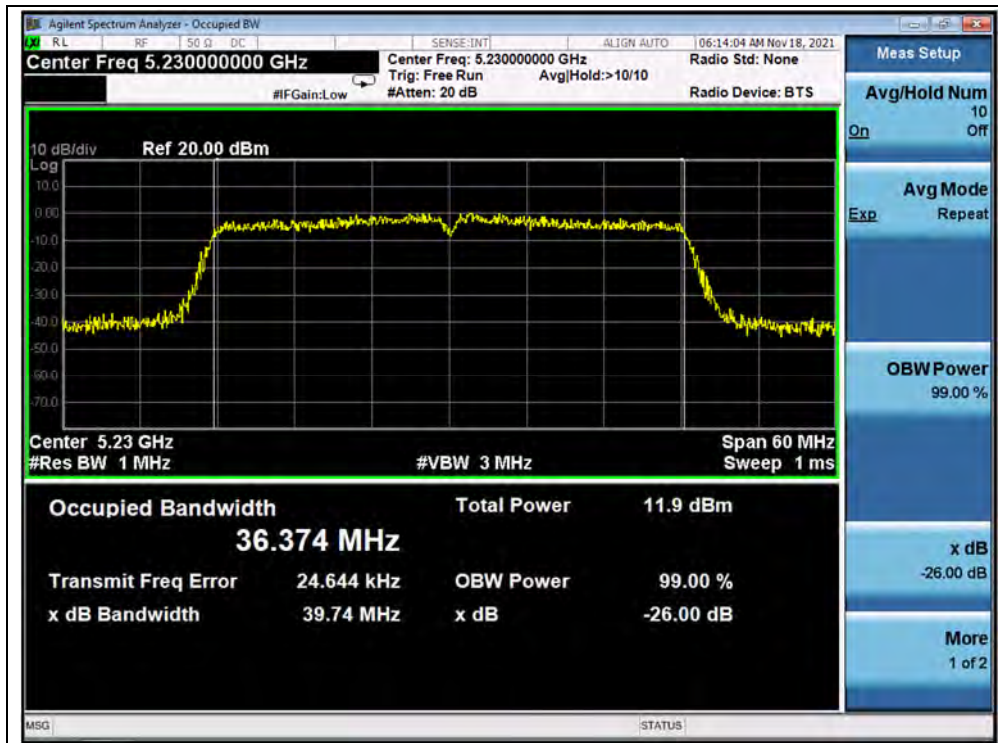
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.16
46	5230	39.74
54	5270	39.51
62	5310	40.04
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
151	5755	36.10
159	5795	36.37

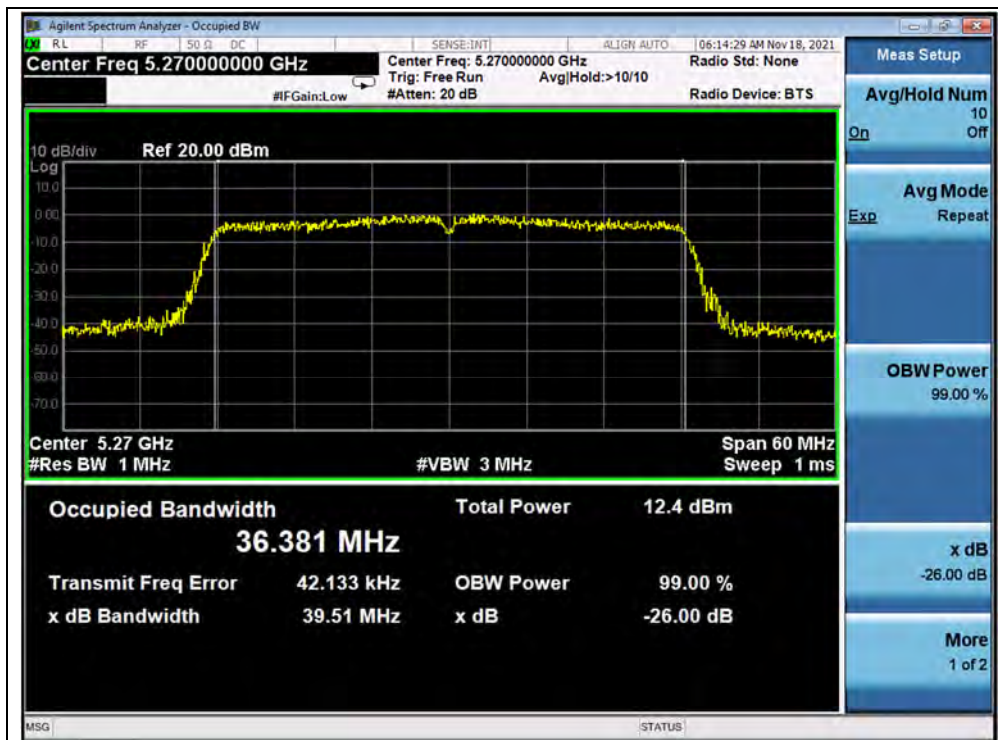
B. Test Plot:



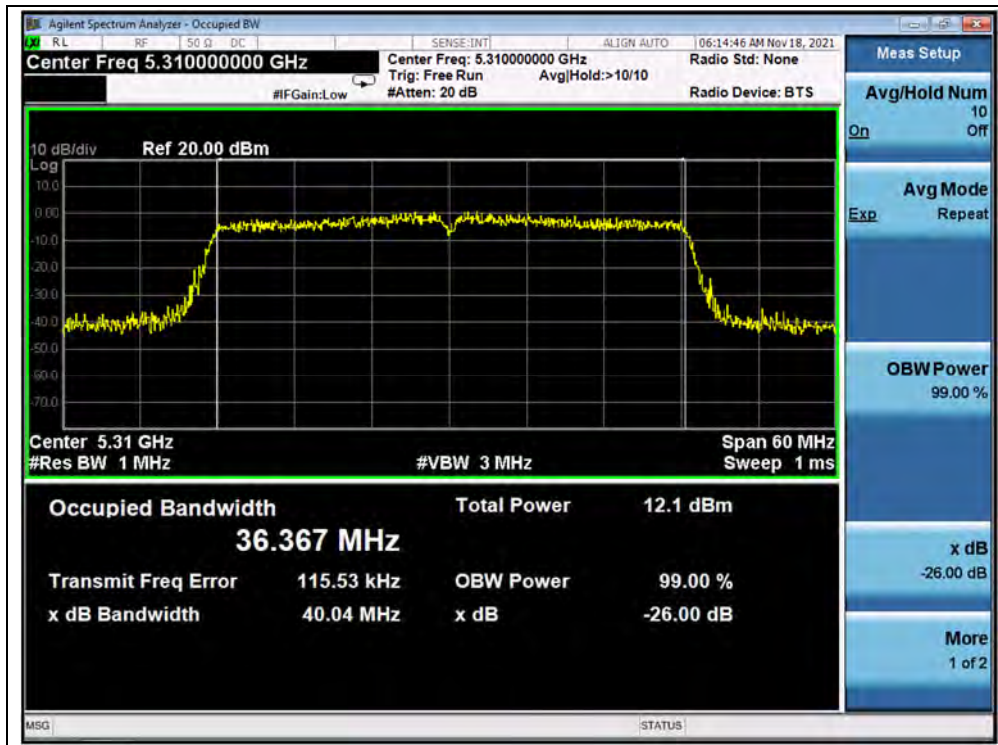
(Channel 38, 5190MHz, 802.11ac (VHT40))



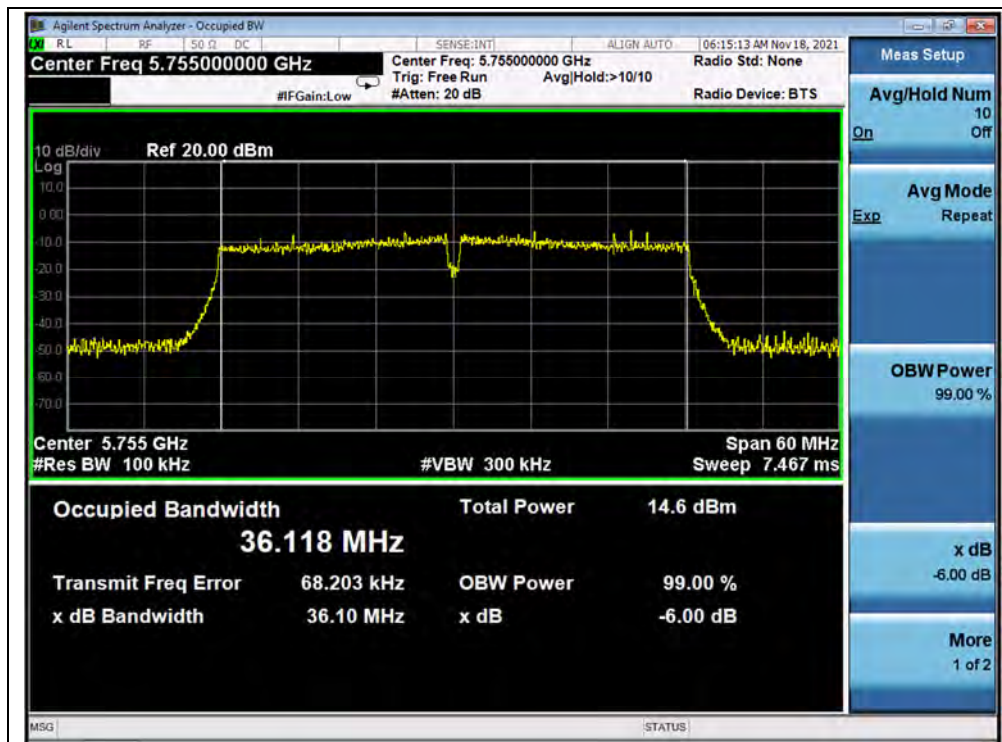
(Channel 46, 5230MHz, 802.11ac (VHT40))



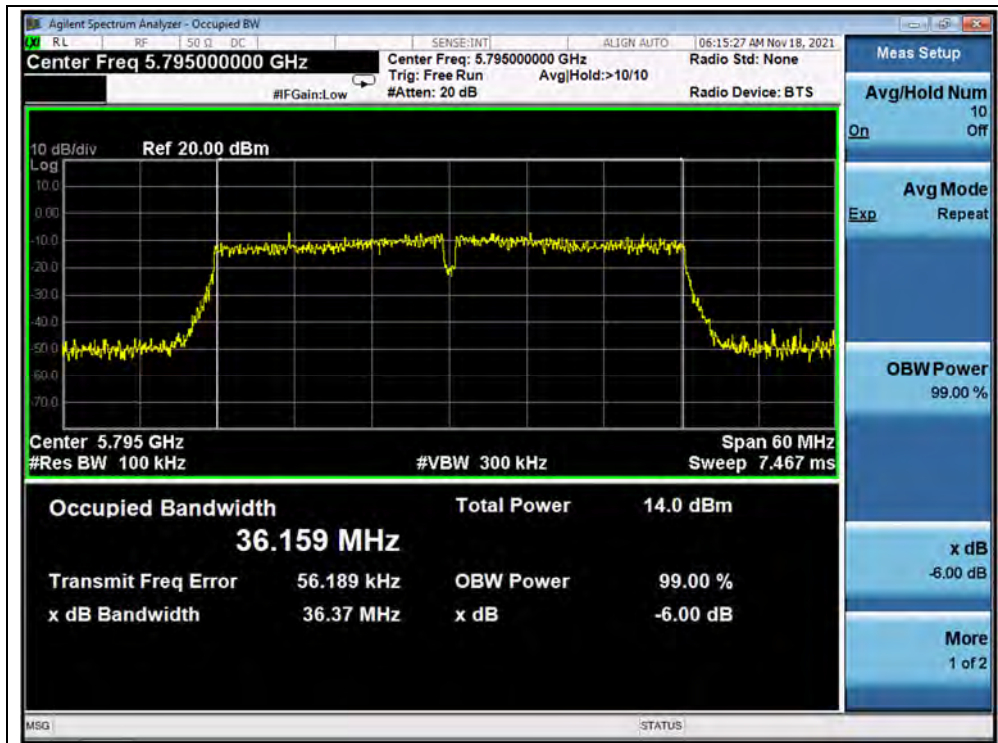
(Channel 54, 5270MHz, 802.11ac (VHT40))



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



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



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

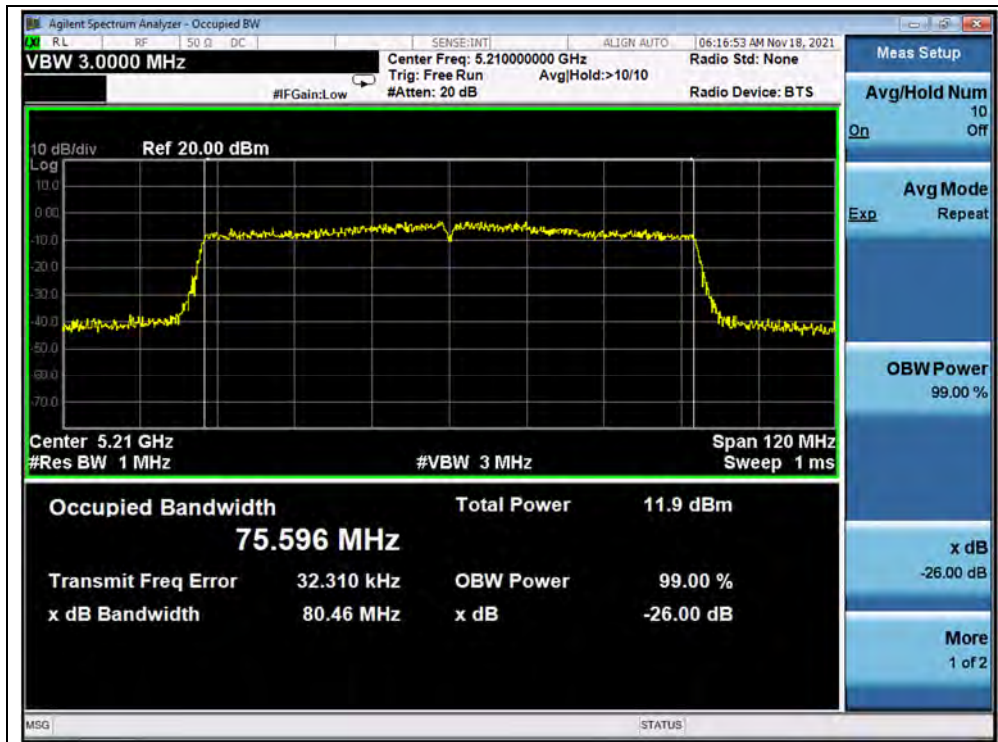


802.11ac (VHT80) Mode

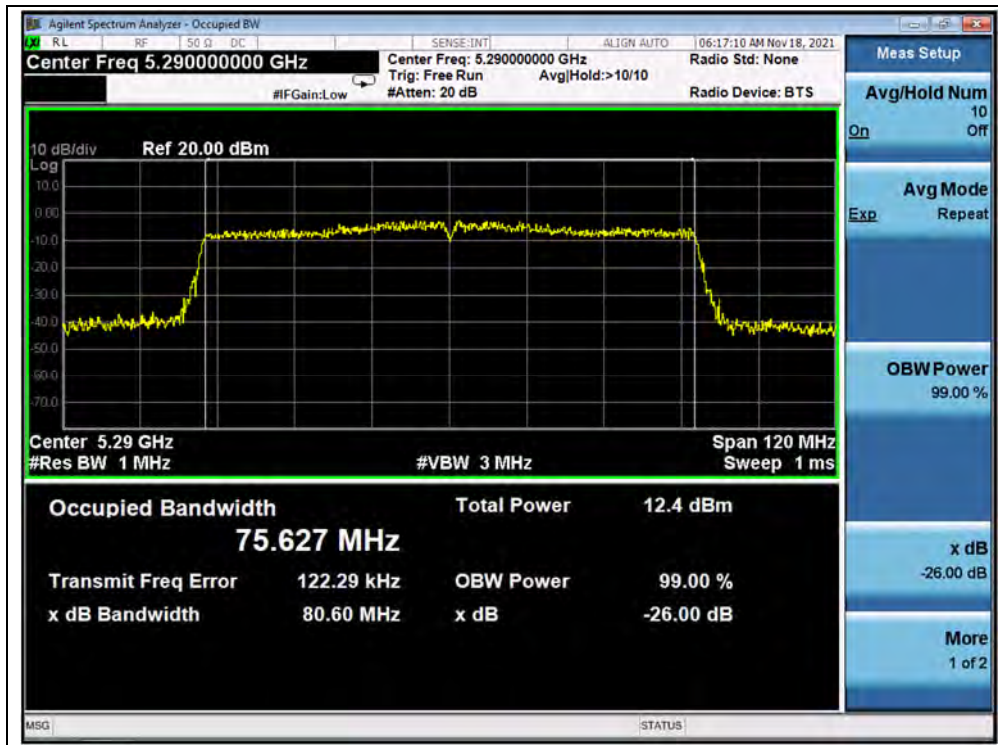
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	80.46
58	5290	80.60
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
155	5775	70.40

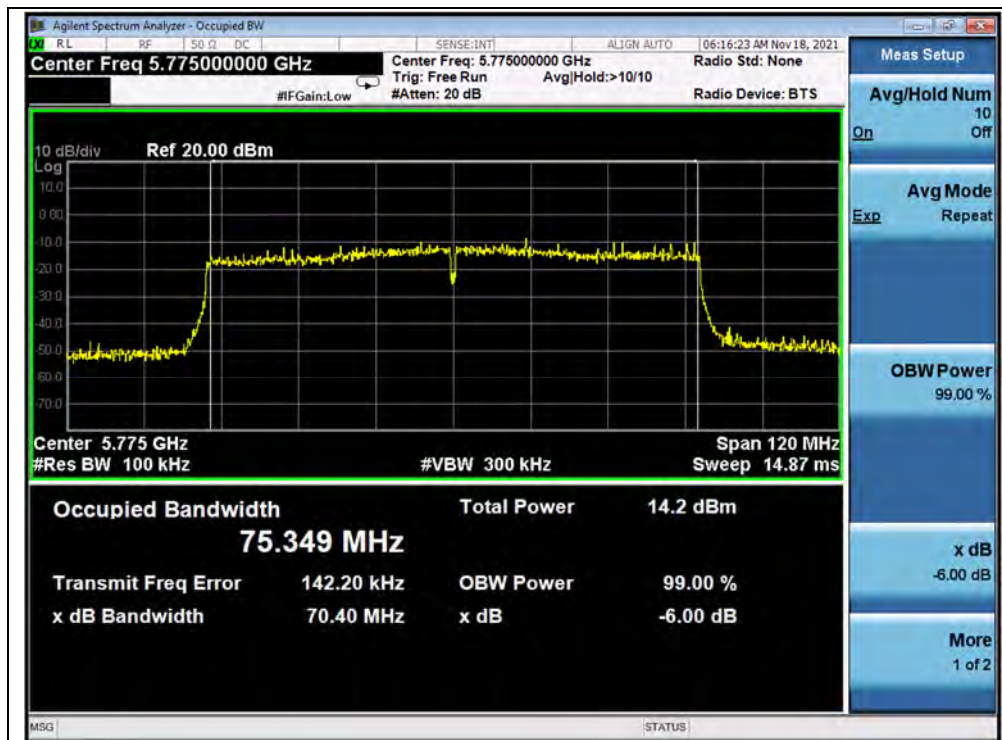
B. Test Plot:



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



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



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

2.5. Peak Power Spectral Density

2.5.1. Requirement

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

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

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

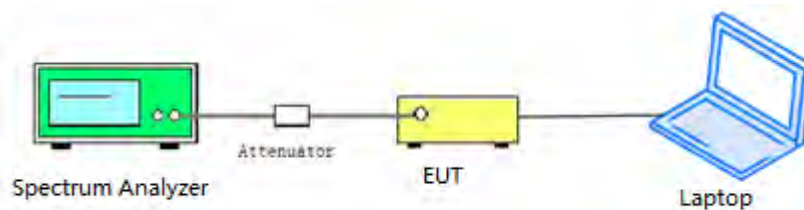
If transmitting antennas of directional gain greater than 6dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

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

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

2.5.2. Test Description

Test Setup:



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



2.5.3. Test Procedure

KDB 789033 Section F) Maximum Power Spectral Density (PSD) Method SA-3 was used in order to prove compliance

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

2.5.4. Test Result

802.11a Mode

A. Test Verdict:

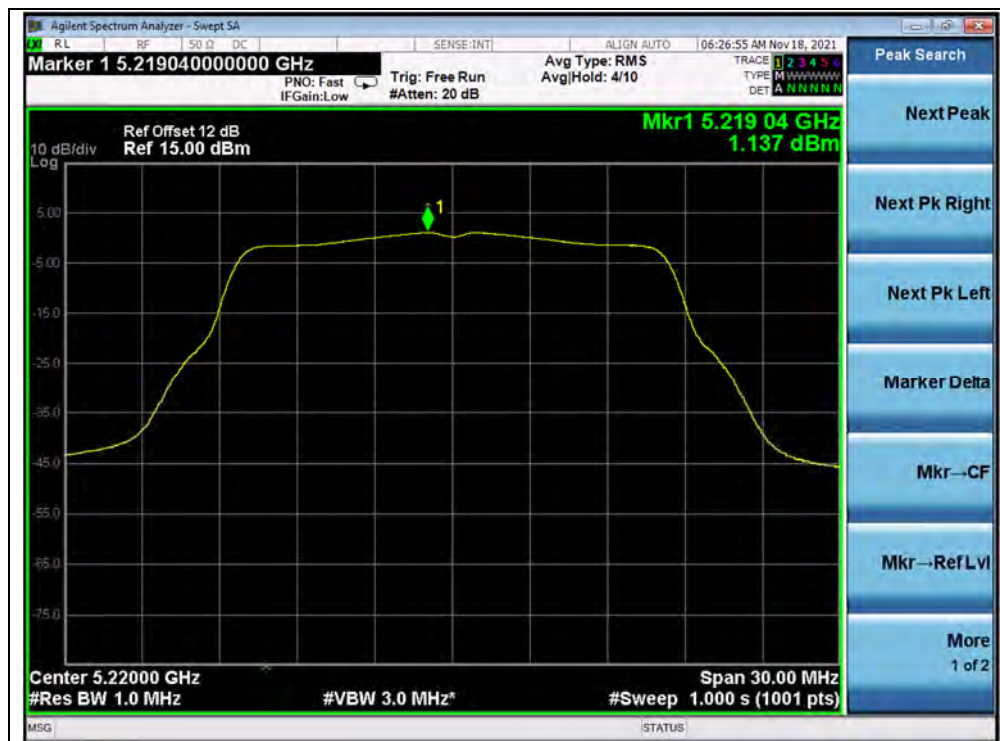
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	0.54	0.15	0.60	11	PASS
44	5220	1.14		1.20		
48	5240	1.34		1.40		
52	5260	1.84		1.90		
60	5300	1.77		1.83		
64	5320	1.92		1.98		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	2.49	0.15	2.55	30	PASS
157	5785	2.65		2.71		
165	5825	3.14		3.20		



B. Test Plot:



(Channel 36, 5180MHz, 802.11a)



(Channel 44, 5220MHz, 802.11a)



(Channel 48, 5240MHz, 802.11a)



(Channel 52, 5260MHz, 802.11a)



(Channel 60, 5300MHz, 802.11a)



(Channel 64, 5320MHz, 802.11a)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)

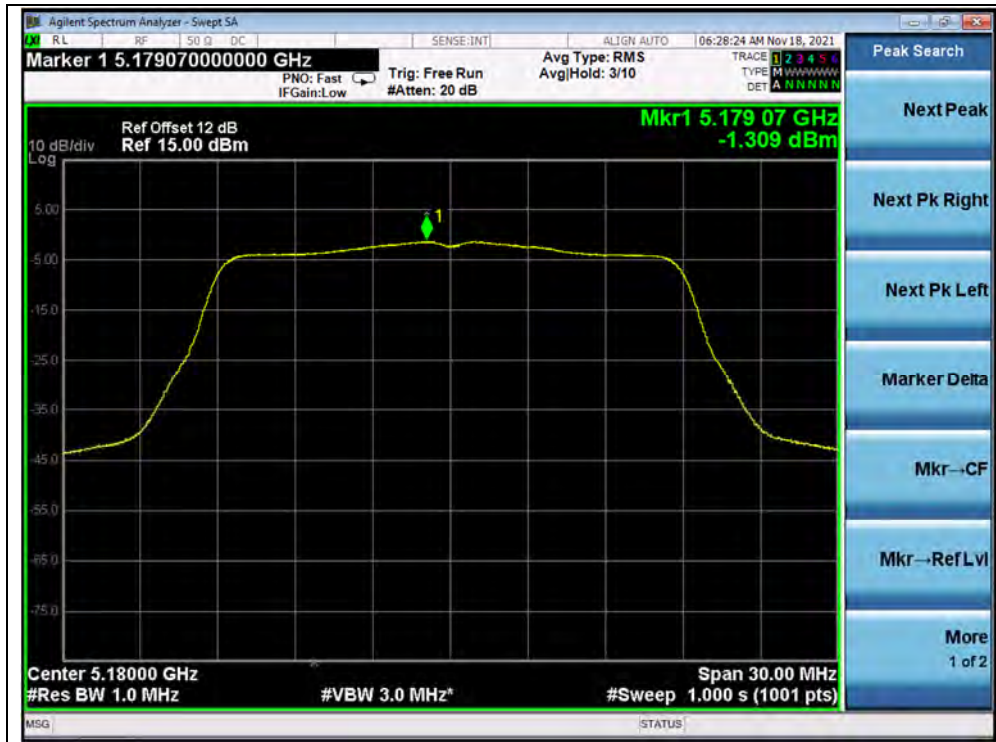


802.11n (HT20) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	-1.31	0.07	-1.24	11	PASS
44	5220	-0.26		-0.19		
48	5240	0.10		0.17		
52	5260	0.09		0.16		
60	5300	0.30		0.37		
64	5320	0.19		0.26		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	1.27	0.07	1.34	30	PASS
157	5785	1.32		1.39		
165	5825	1.64		1.71		

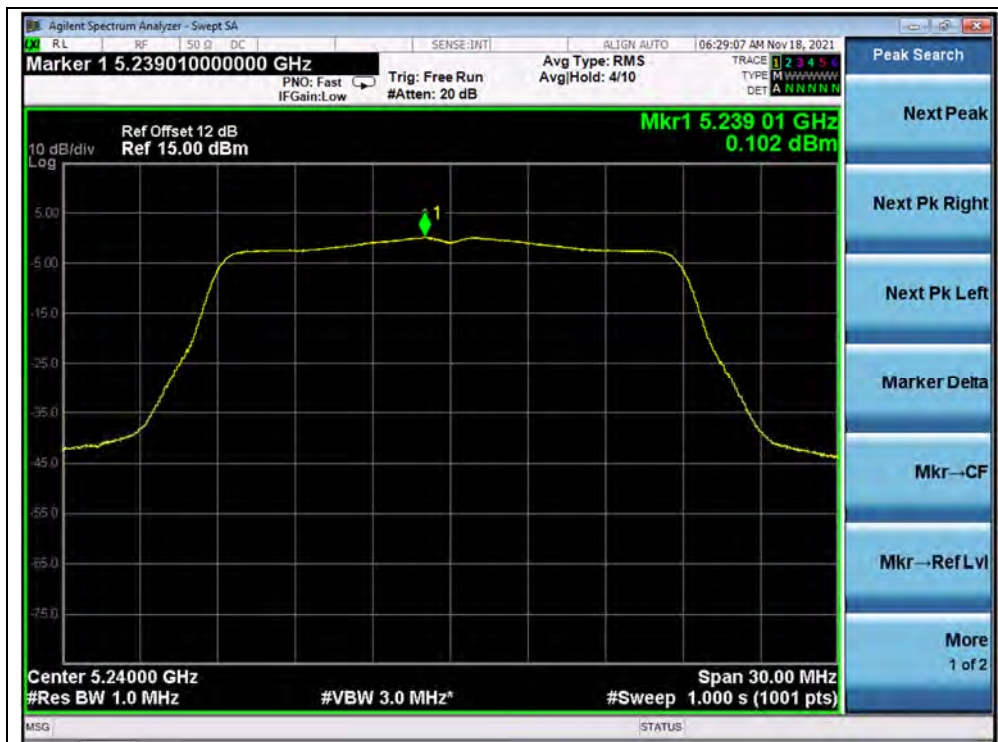
B. Test Plot:



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



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



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



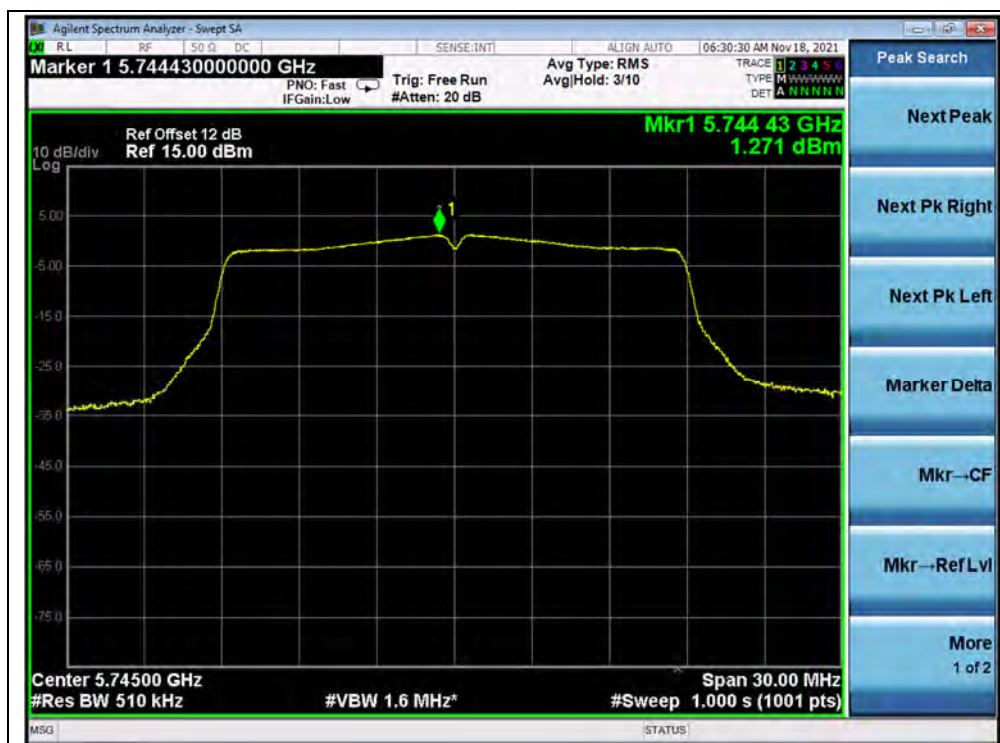
(Channel 52, 5260MHz, 802.11n (HT20))



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



(Channel 64, 5320MHz, 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 PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-3.93	0.30	-3.63	11	PASS
46	5230	-2.94		-2.64		
54	5270	-2.57		-2.27		
62	5310	-2.67		-2.37		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-1.76	0.30	-1.46	30	PASS
159	5795	-1.78		-1.48		

B. Test Plot:



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



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



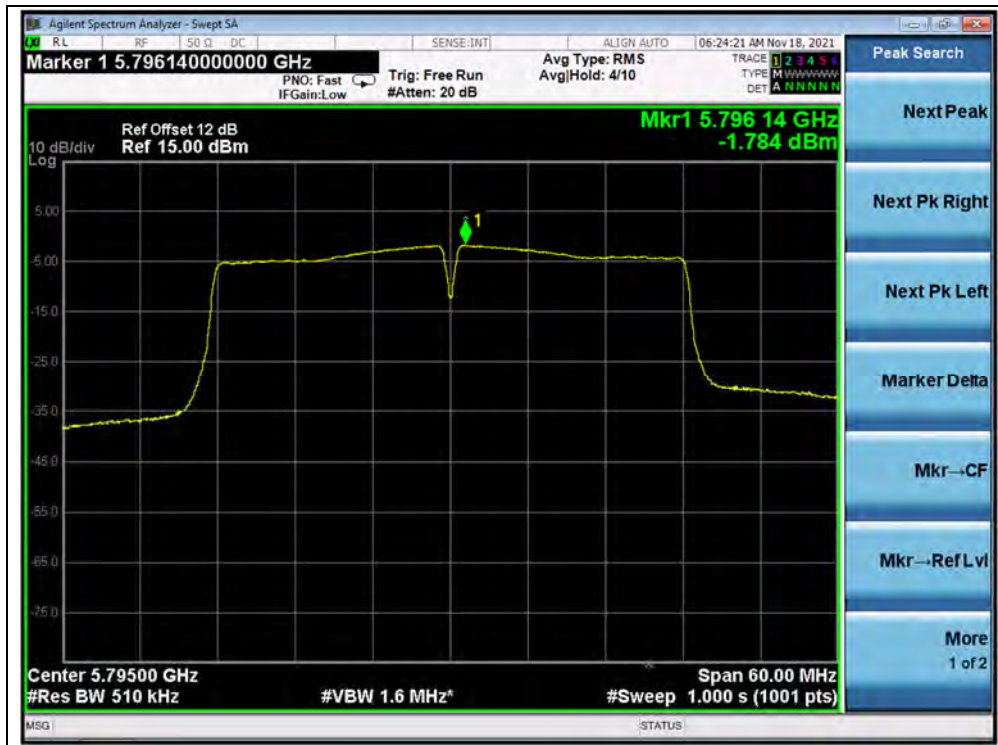
(Channel 54, 5270MHz, 802.11n (HT40))



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



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



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



802.11ac (VHT20) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	-3.34	0.07	-3.27	11	PASS
44	5220	-2.40		-2.33		
48	5240	-2.17		-2.10		
52	5260	-1.96		-1.89		
60	5300	-1.85		-1.78		
64	5320	-2.00		-1.93		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-2.80	0.07	-2.73	30	PASS
157	5785	-2.69		-2.62		
165	5825	-2.29		-2.22		

B. Test Plot:



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



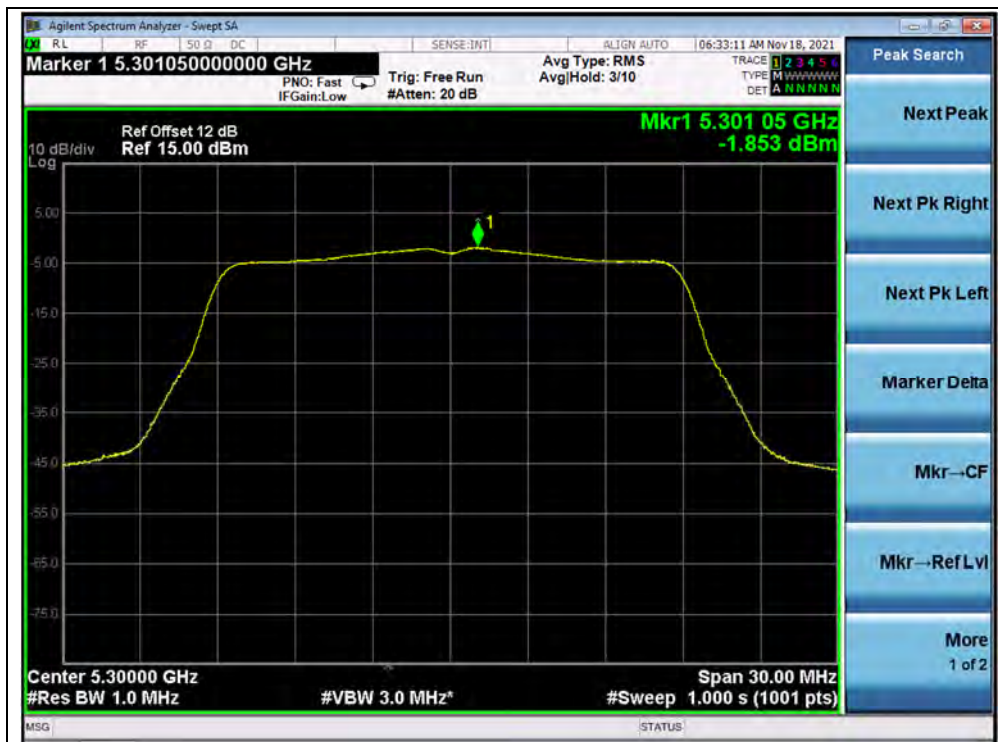
(Channel 44, 5220MHz, 802.11ac (VHT20))



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



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



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



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



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



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



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

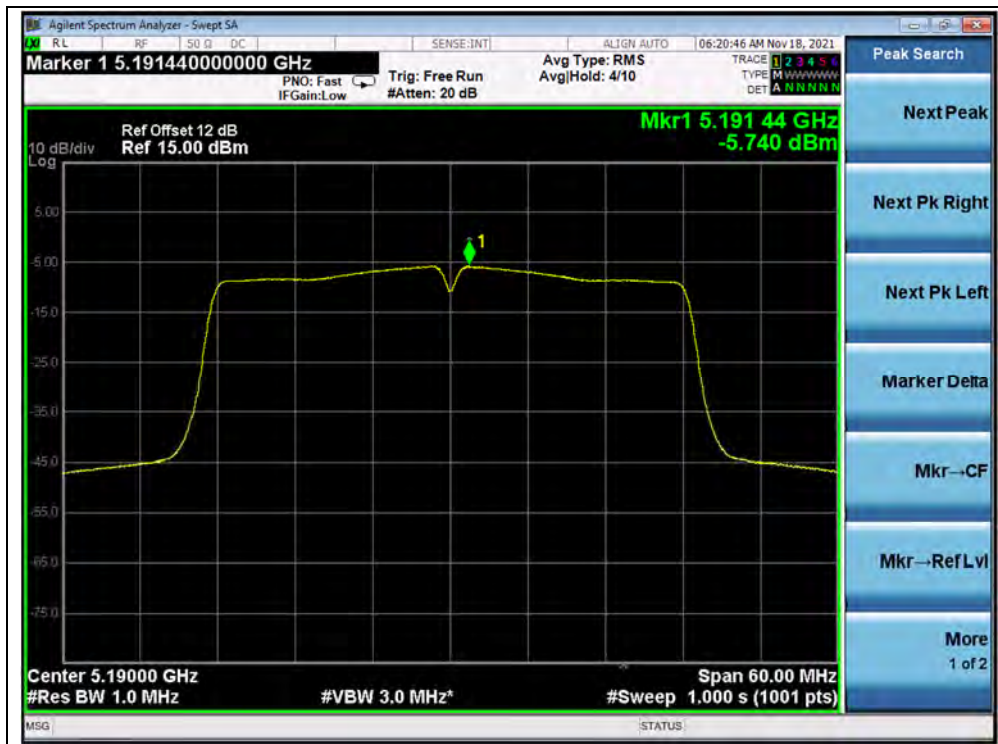


802.11ac (VHT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-5.74	0.21	-5.53	11	PASS
46	5230	-4.74		-4.53		
54	5270	-4.38		-4.17		
62	5310	-4.45		-4.24		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-5.62	0.21	-5.41	30	PASS
155	5795	-5.04		-4.83		

B. Test Plot:



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



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



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



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



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



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

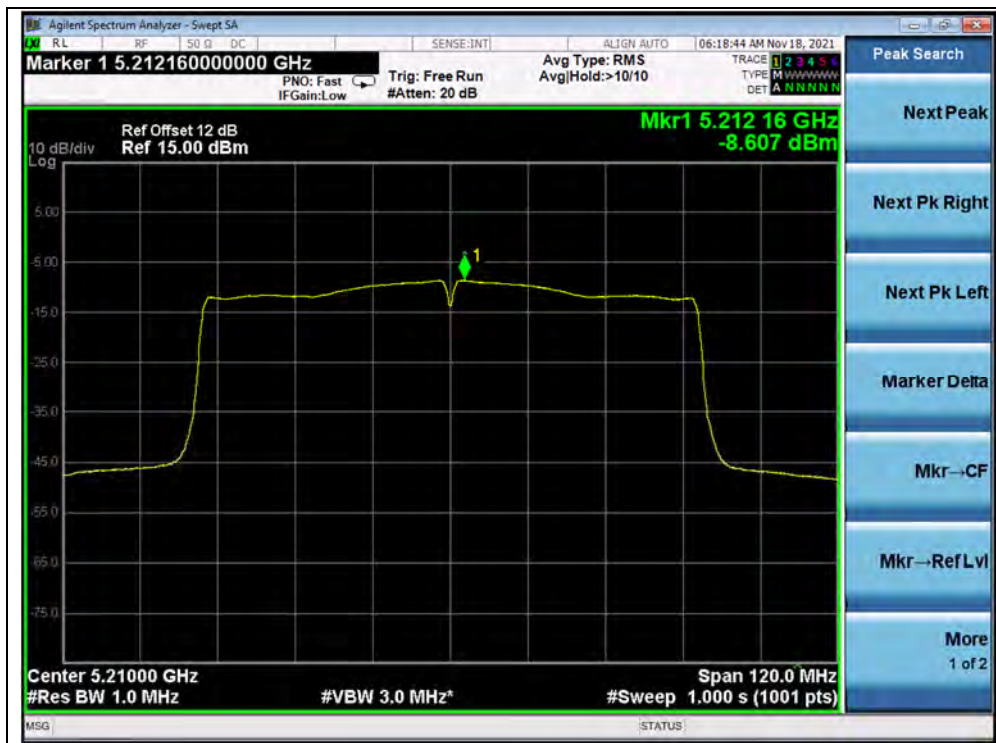


802.11ac (VHT80) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
42	5210	-8.61	0.35	-8.26	11	PASS
58	5290	-7.64		-7.29		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
155	5775	-9.00	0.35	-8.65	30	PASS

B. Test Plot:



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



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



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



2.6. Frequency Stability

2.6.1. Requirement

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

2.6.2. Test Procedure

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

2.6.3. Test Result

U-NII-1 (Ch. 36) 5180MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	23	4.440
100%		-30	31	5.985
100%		-20	29	5.598
100%		-10	26	5.019
100%		0	25	4.826
100%		+10	22	4.247
100%		+20	20	3.861
100%		+30	23	4.440
100%		+40	26	5.019
100%		+50	23	4.440
85%		4.25	+20	28
115%	5.75	+20	30	5.792



U-NII-2A (Ch. 52)				
5260MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	18	3.422
100%		-30	22	4.183
100%		-20	25	4.753
100%		-10	27	5.133
100%		0	19	3.612
100%		+10	17	3.232
100%		+20	21	3.992
100%		+30	26	4.943
100%		+40	30	5.703
100%		+50	25	4.753
85%	4.25	+20	19	3.612
115%	5.75	+20	21	3.992

U-NII-3 (Ch. 149)				
5745MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	22	3.829
100%		-30	26	4.526
100%		-20	27	4.700
100%		-10	21	3.655
100%		0	30	5.222
100%		+10	25	4.352
100%		+20	26	4.526
100%		+30	26	4.526
100%		+40	28	4.874
100%		+50	28	4.874
85%	4.25	+20	31	5.396
115%	5.75	+20	29	5.048

2.7. Conducted Emission

2.7.1. Requirement

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

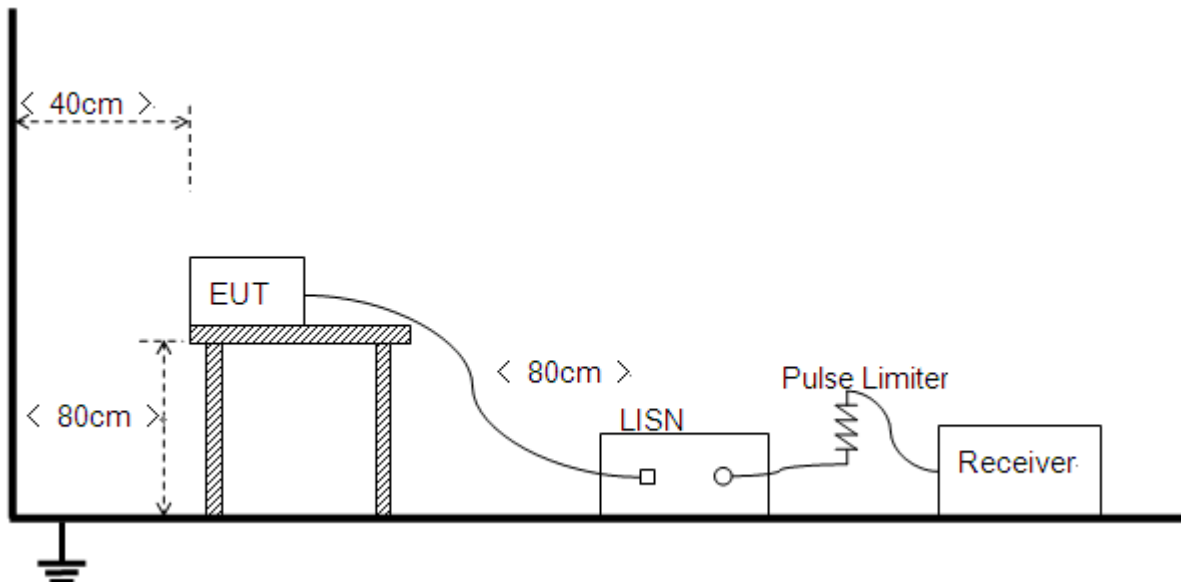
Frequency Range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

Note:

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

2.7.2. Test Description

Test Setup:



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



2.7.3. Test Result

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

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

A. Test Setup:

Test Mode: EUT + adapter+ headset+WIFI TX

Test Voltage: AC 120V/60Hz

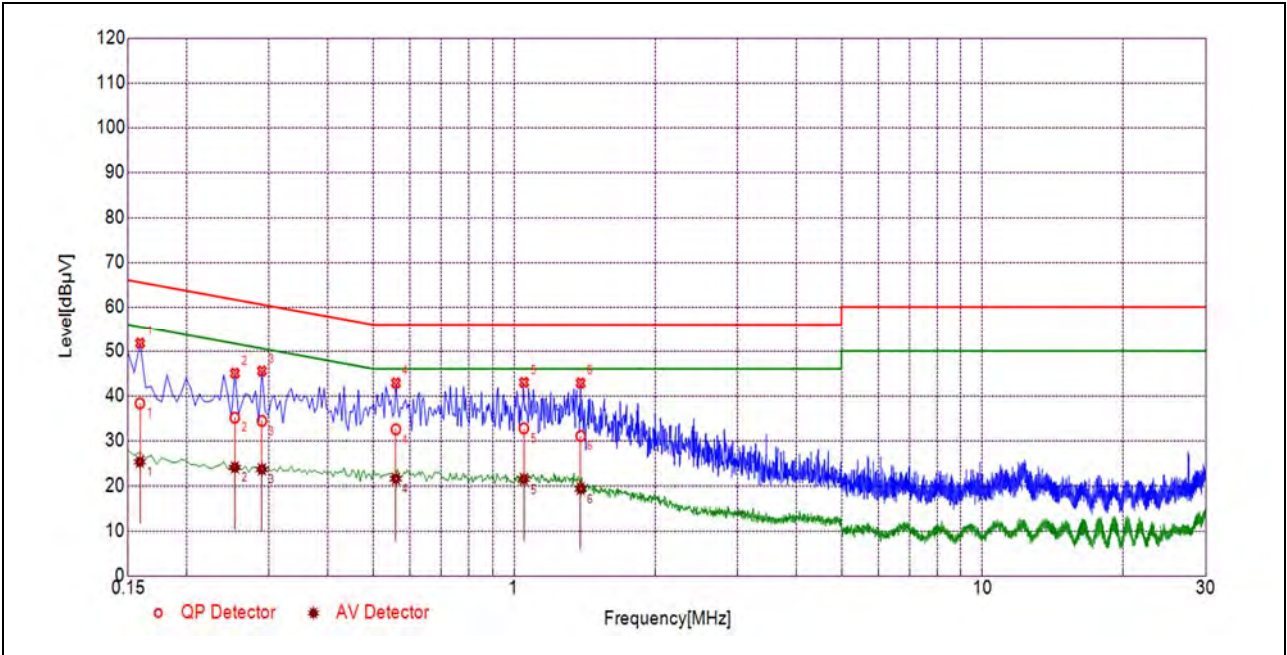
The measurement results are obtained as below:

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

U_R : Receiver Reading

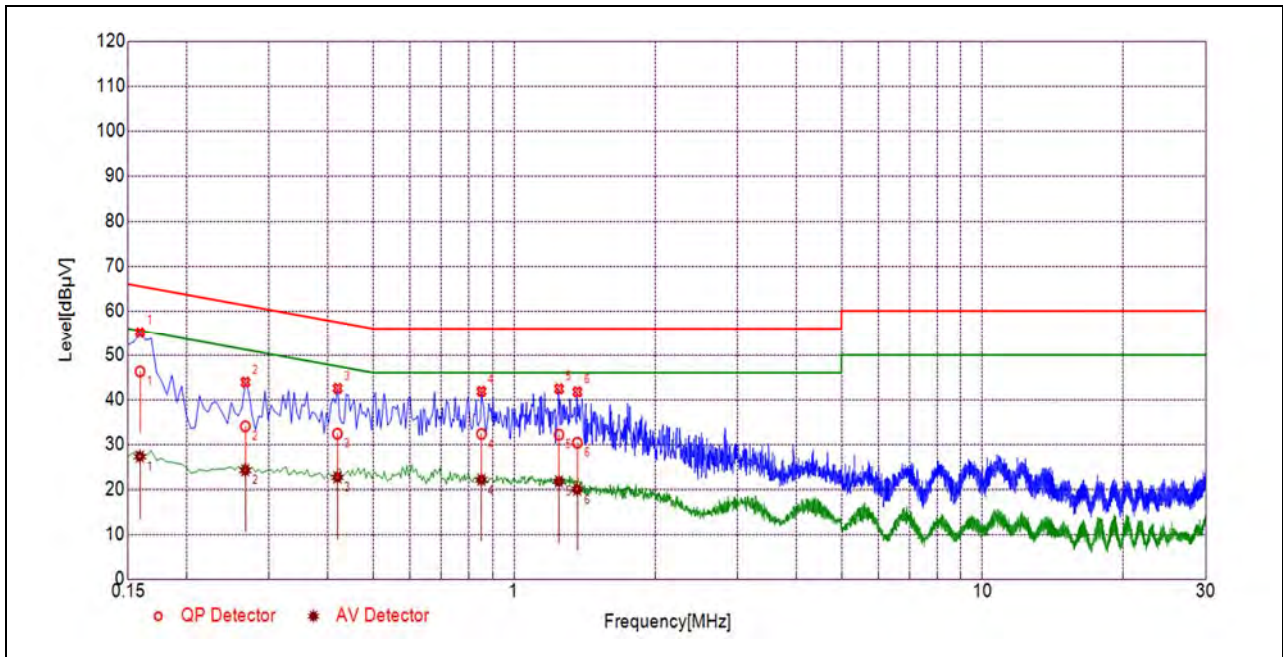
A_{Factor} : Voltage division factor of LISN

B. Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1589	38.30	25.27	65.52	55.52	Line	PASS
2	0.2534	35.08	24.02	61.65	51.65		PASS
3	0.2895	34.37	23.60	60.54	50.54		PASS
4	0.5593	32.51	21.50	56.00	46.00		PASS
5	1.0493	32.72	21.42	56.00	46.00		PASS
6	1.3877	31.03	19.37	56.00	46.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1589	46.30	27.25	65.52	55.52	Neutral	PASS
2	0.2668	34.02	24.16	61.22	51.22		PASS
3	0.4196	32.36	22.60	57.46	47.46		PASS
4	0.8517	32.30	22.08	56.00	46.00		PASS
5	1.2470	32.13	21.69	56.00	46.00		PASS
6	1.3642	30.33	19.99	56.00	46.00		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 (dB μ V/m);

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

where P is the EIRP in Watts

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

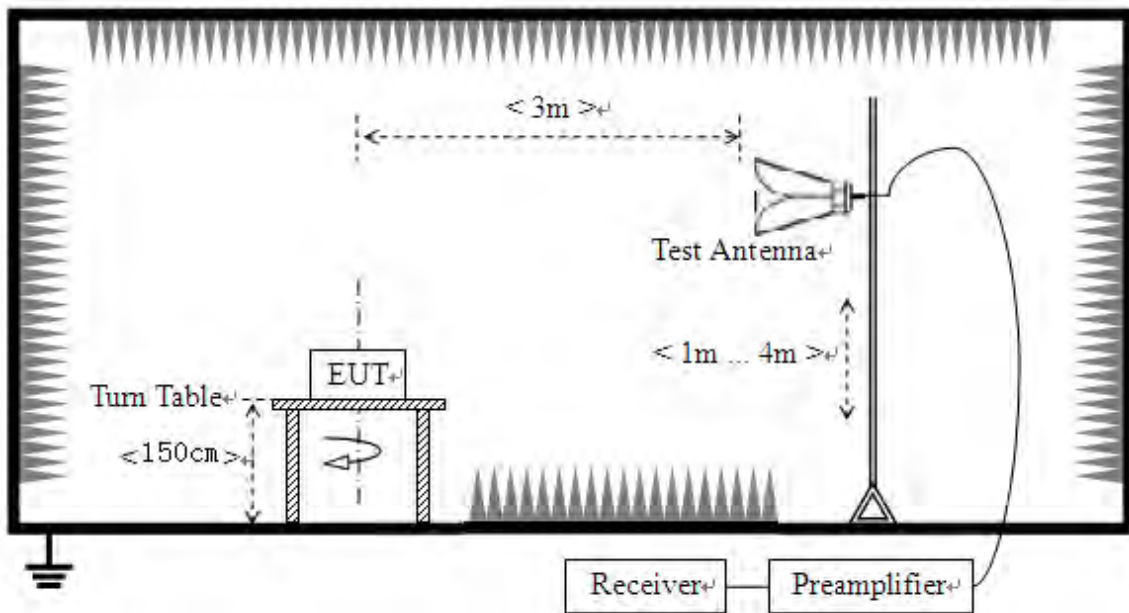
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following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

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Measurement Distance (m)
0.009 - 0.490	2400/F(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:

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

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

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

Note 1: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

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

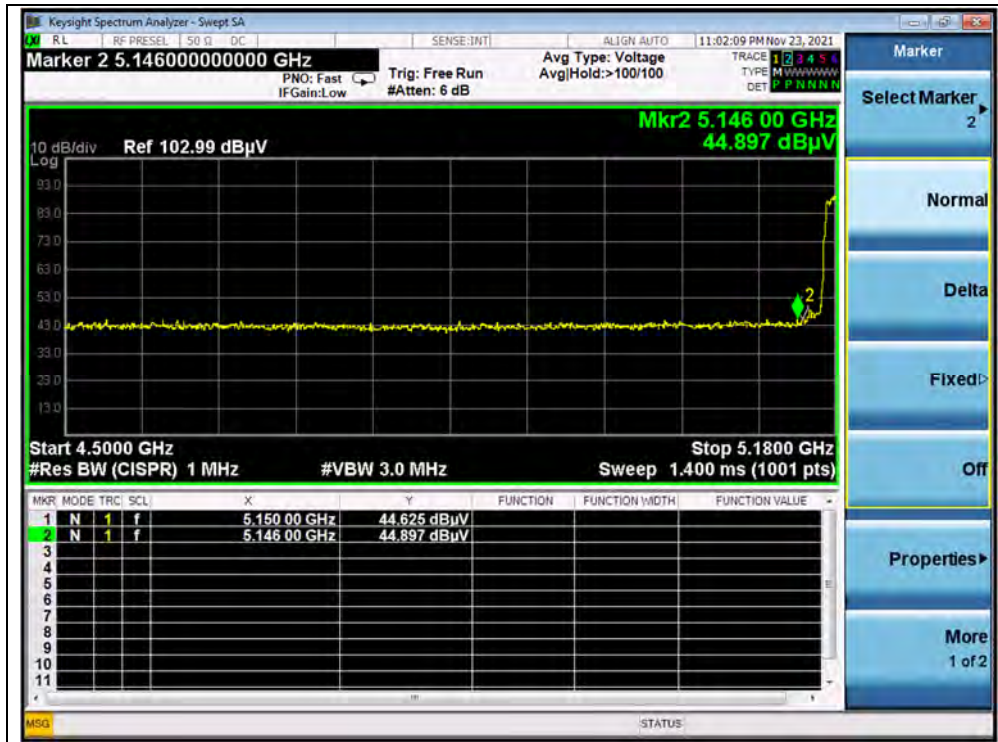
802.11a Mode

A. Test Verdict:

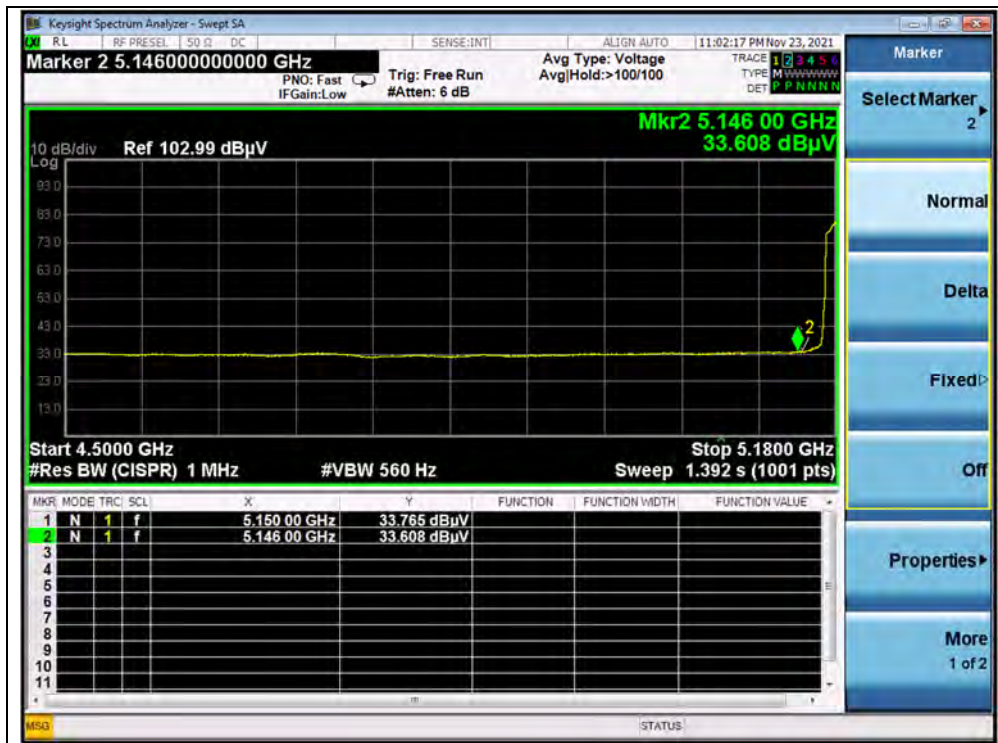
Channel	Frequency (MHz)	Detector	Receiver Reading	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV	U_R (dB μ V)					
36	5146.00	PK	44.90	-19.54	32.20	57.56	74	PASS
36	5150.00	AV	33.77	-19.54	32.20	46.43	54	PASS
64	5353.04	PK	44.49	-18.80	32.20	57.89	74	PASS
64	5350.00	AV	31.95	-18.80	32.20	45.35	54	PASS
149	5725.00	PK	45.25	-19.01	32.20	58.44	122.23	PASS
165	5855.00	PK	42.44	-19.01	32.20	55.63	110.83	PASS



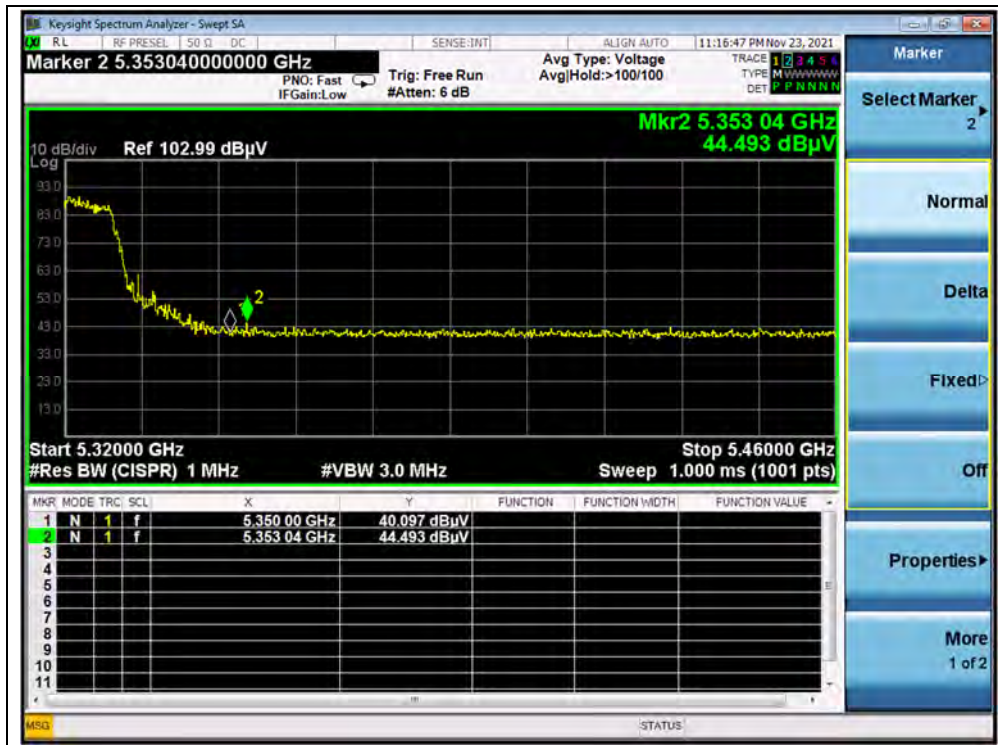
B.Test Plot:



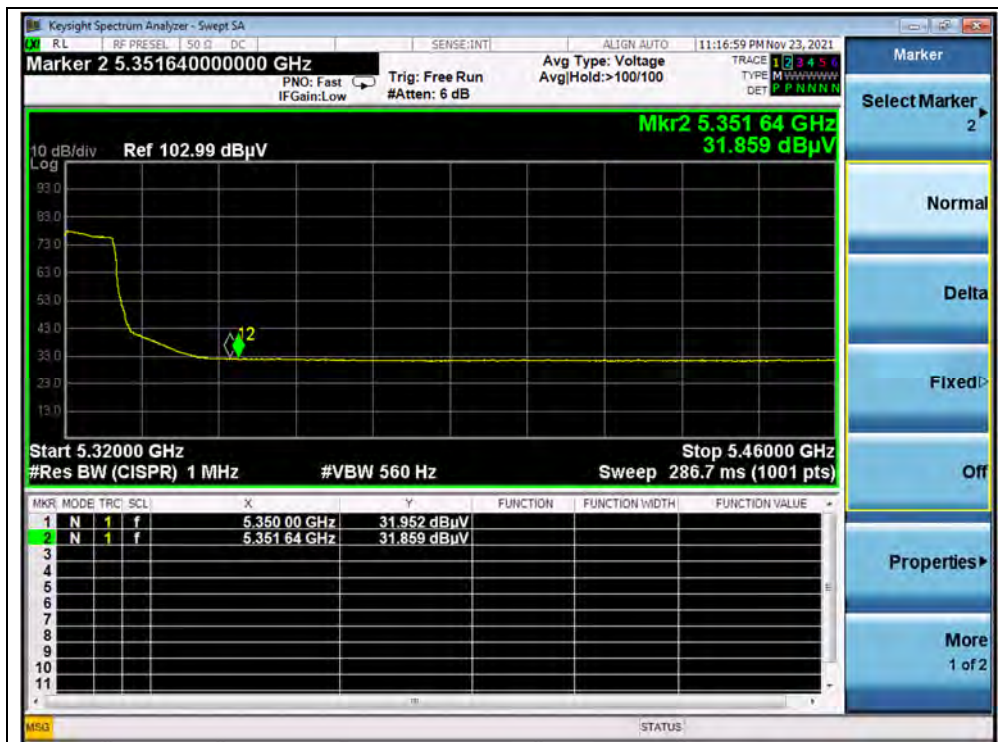
(PEAK, Channel 36, 802.11a)



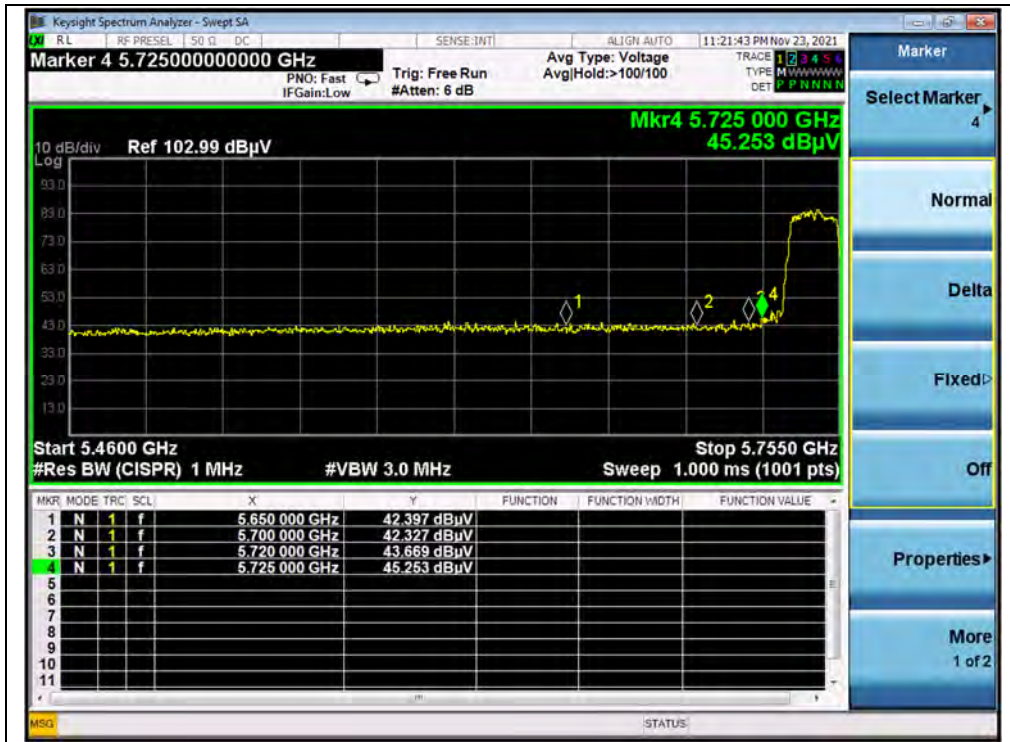
(AVERAGE, Channel 36, 802.11a)



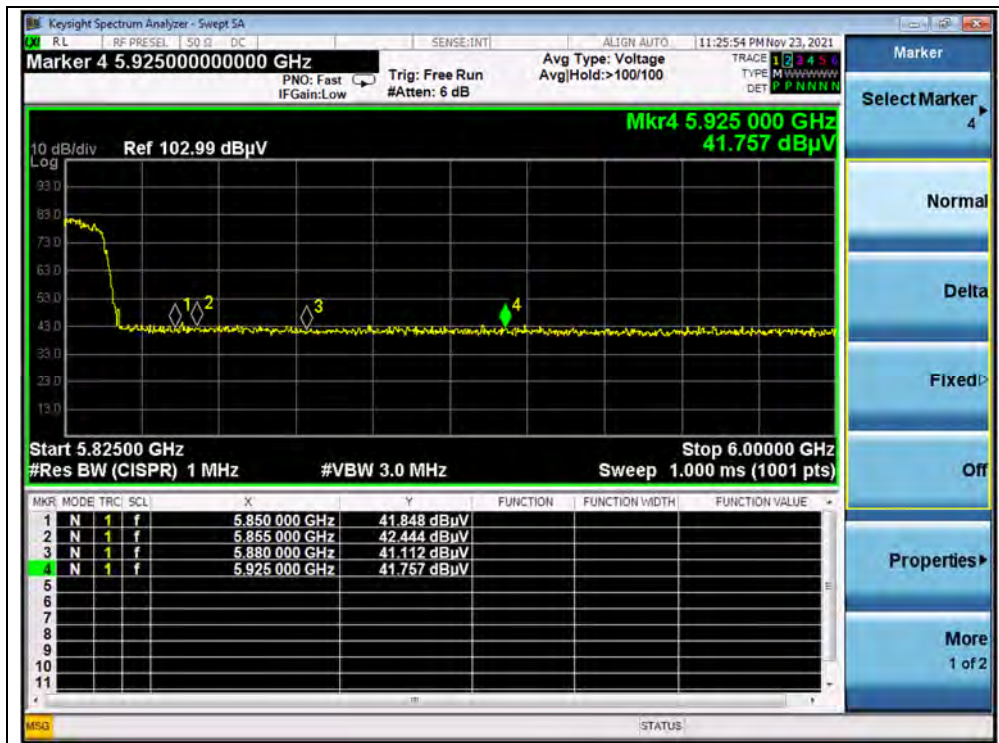
(PEAK, Channel 64, 802.11a)



(AVERAGE, Channel 64, 802.11a)



(PEAK, Channel 149, 802.11a)



(PEAK, Channel 165, 802.11a)

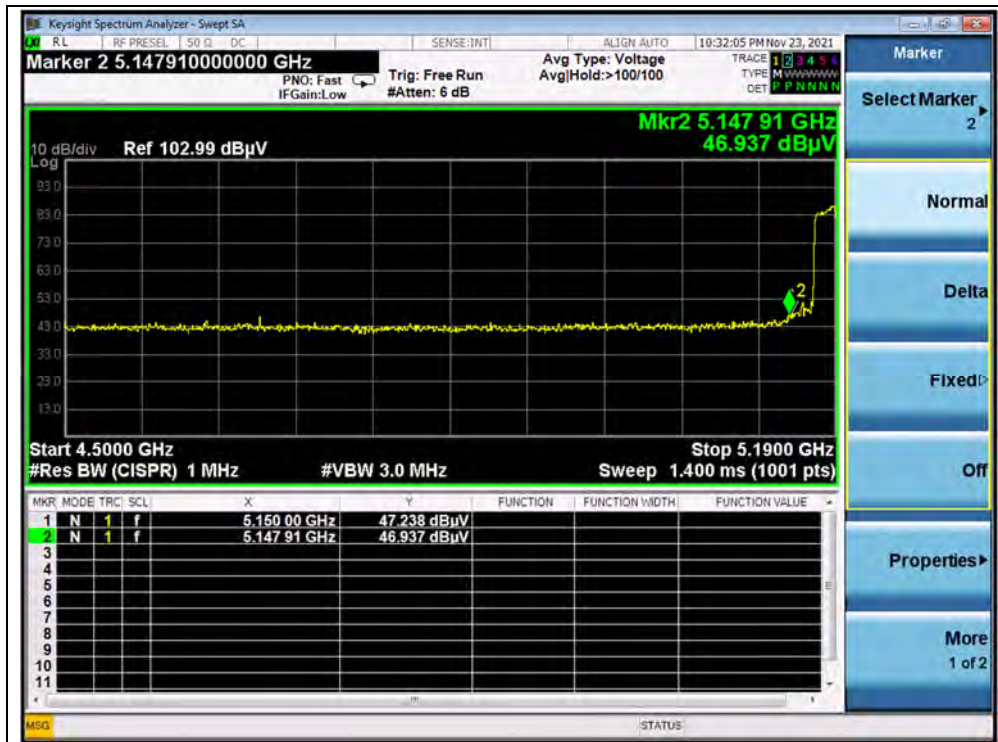


802.11n (HT40) Mode

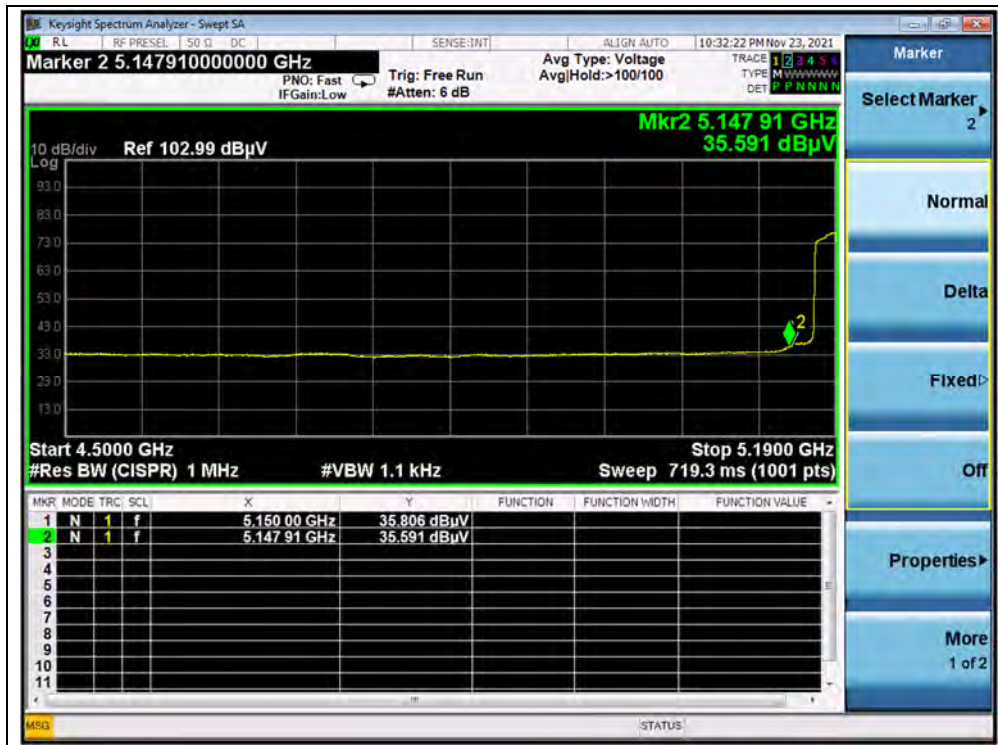
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U _R (dBμV)	A _T (dB)	A _{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
38	5150.00	PK	47.24	-19.54	32.20	59.9	74	PASS
38	5150.00	AV	35.81	-19.54	32.20	48.47	54	PASS
62	5351.85	PK	47.71	-18.80	32.20	61.11	74	PASS
62	5350.65	AV	35.43	-18.80	32.20	48.83	54	PASS
151	5725.00	PK	45.42	-19.01	32.20	58.61	122.23	PASS
159	5855.00	PK	42.80	-19.01	32.20	55.99	110.83	PASS

B. Test Plot:



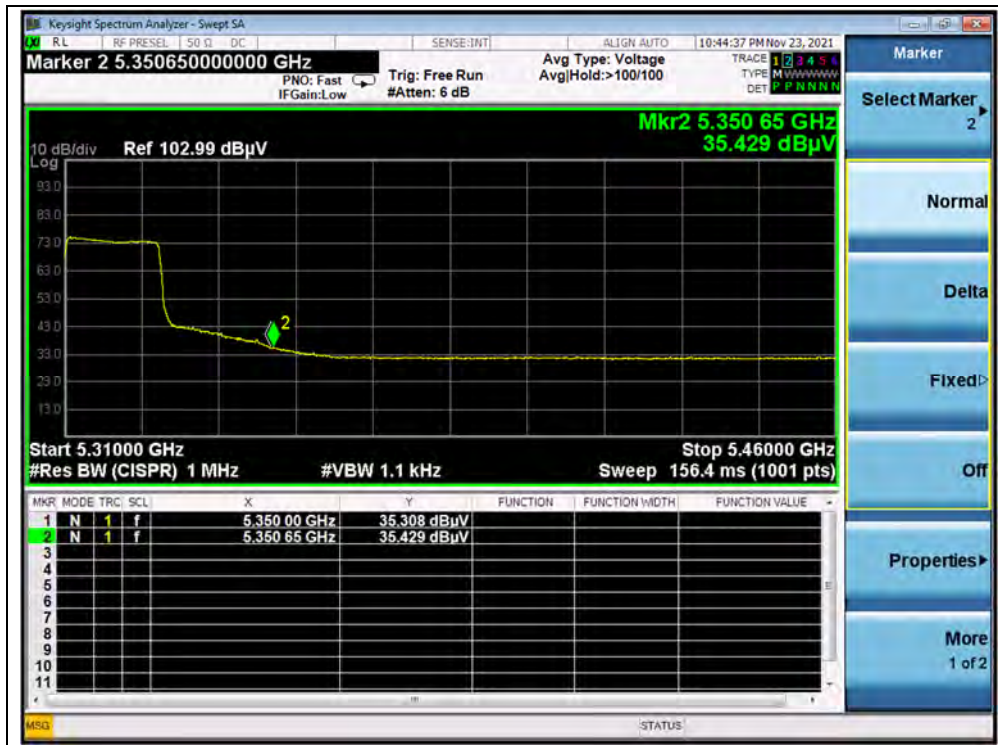
(PEAK, Channel 38, 802.11n (HT40))



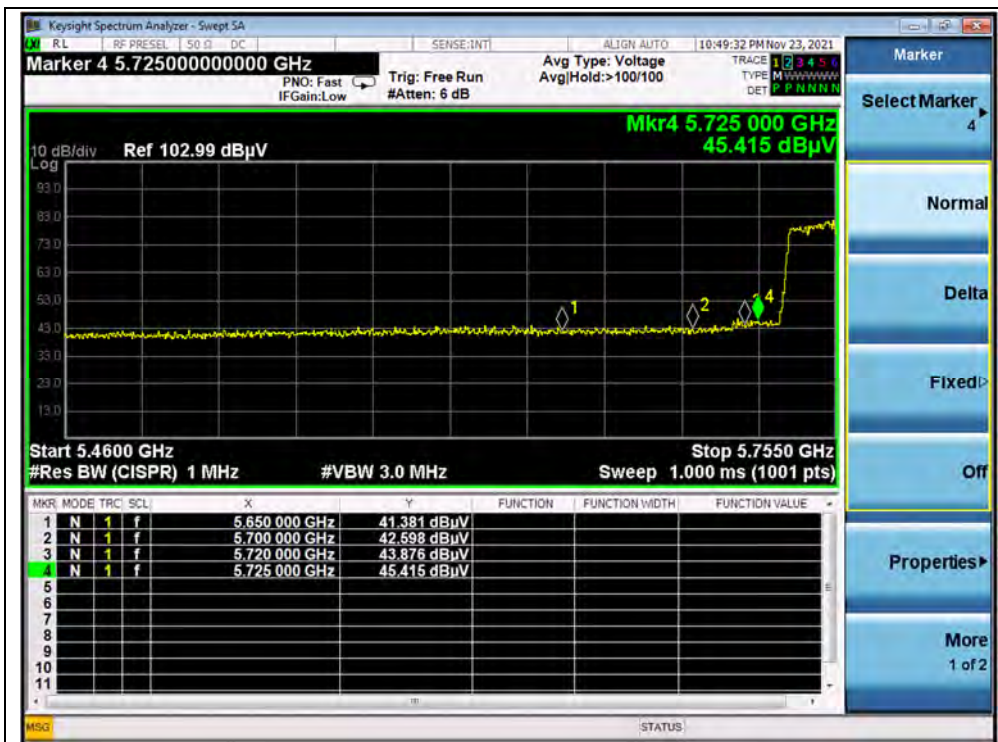
(AVERAGE, Channel 38, 802.11n (HT40))



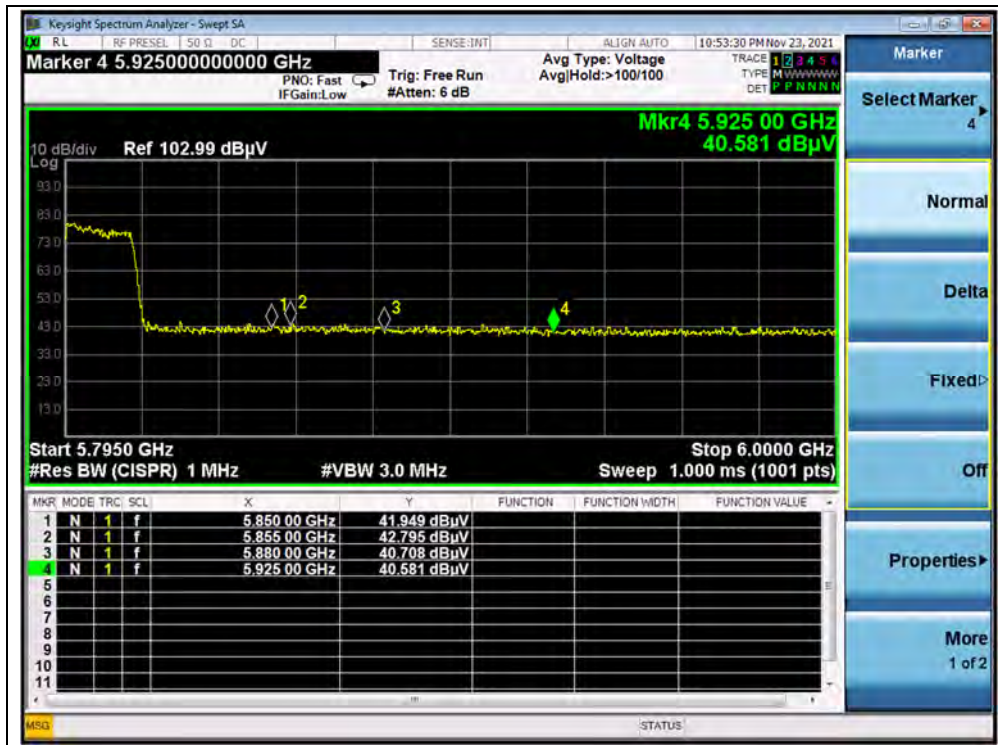
(PEAK, Channel 62, 802.11n (HT40))



(AVERAGE, Channel 62, 802.11n (HT40))



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



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

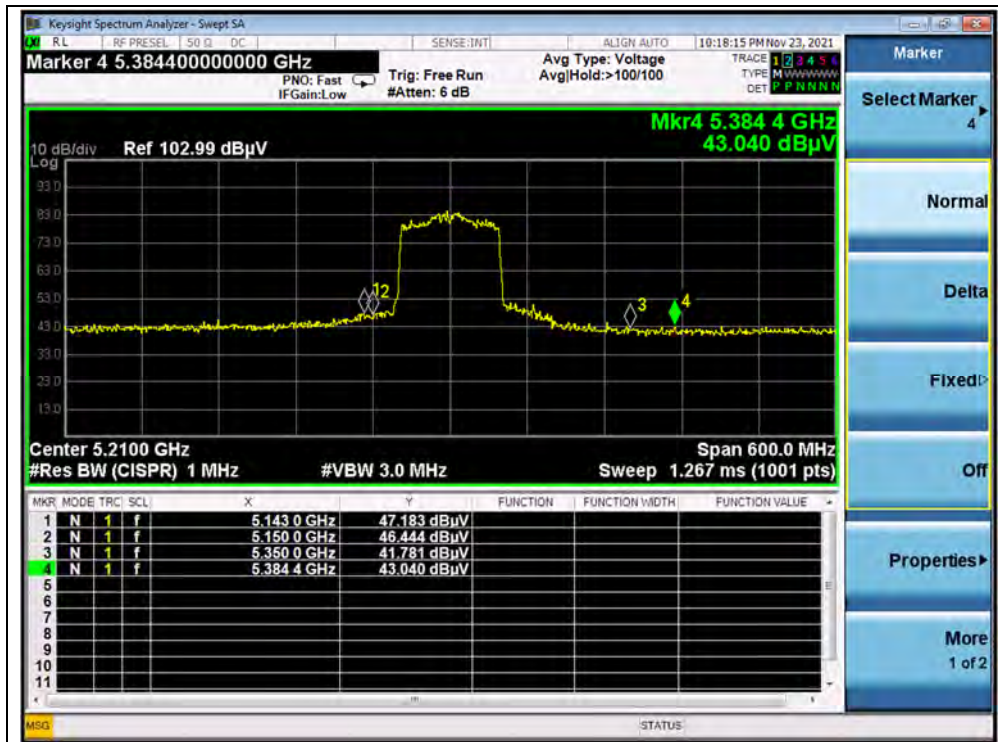


802.11ac (VHT80) Mode

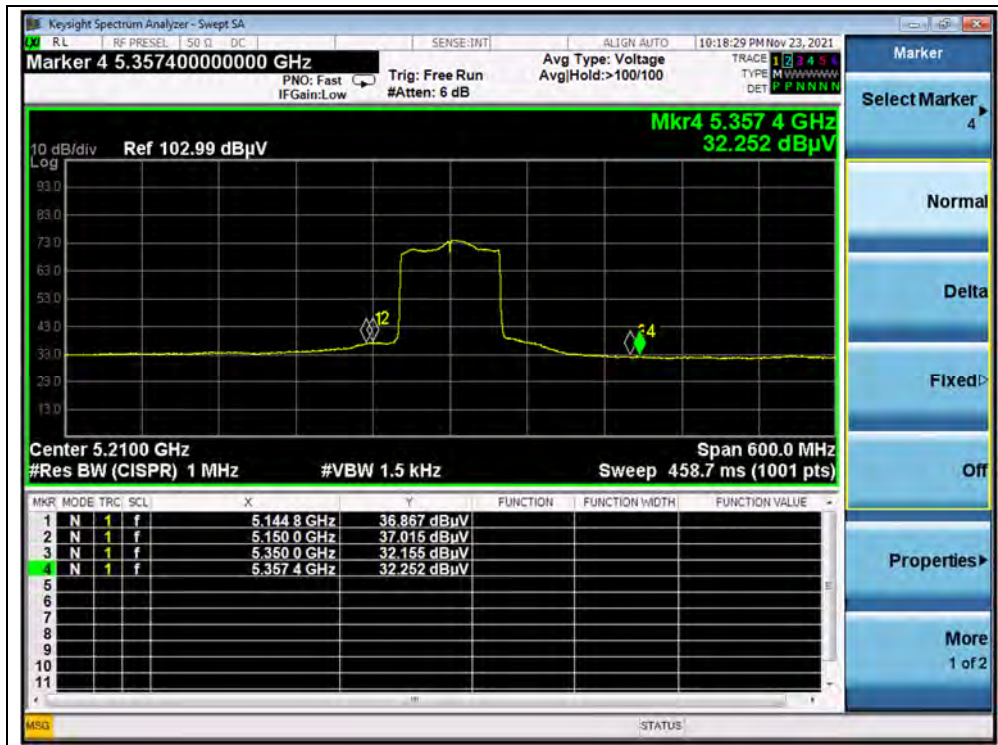
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading	A_T	A_{Factor}	Max. Emission	Limit	Verdict
		PK/ AV	U_R (dB μ V)	(dB)	(dB@3m)	E (dB μ V/m)	(dB μ V/m)	
42	5143.00	PK	47.18	-19.54	32.20	59.84	74	PASS
42	5150.00	AV	37.02	-19.54	32.20	49.68	54	PASS
58	5352.60	PK	50.82	-18.80	32.20	64.22	74	PASS
58	5350.00	AV	38.28	-18.80	32.20	51.68	54	PASS
155	5720.00	PK	45.91	-19.01	32.20	59.10	110.83	PASS
155	5925.00	PK	43.06	-19.01	32.20	56.25	68.23	PASS

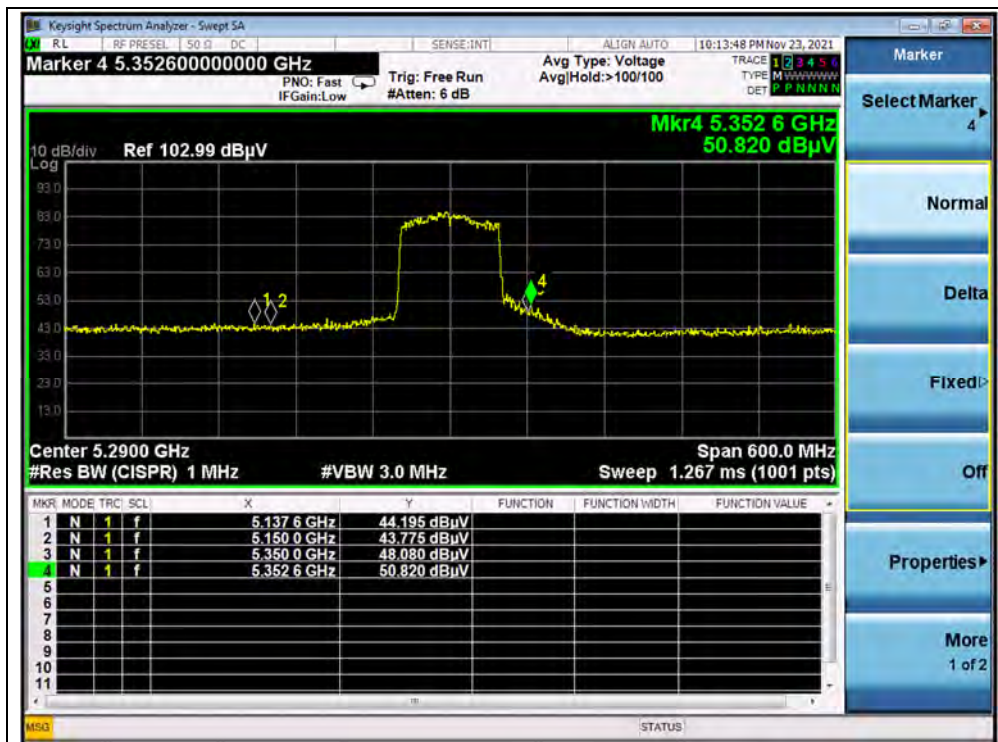
B. Test Plot:



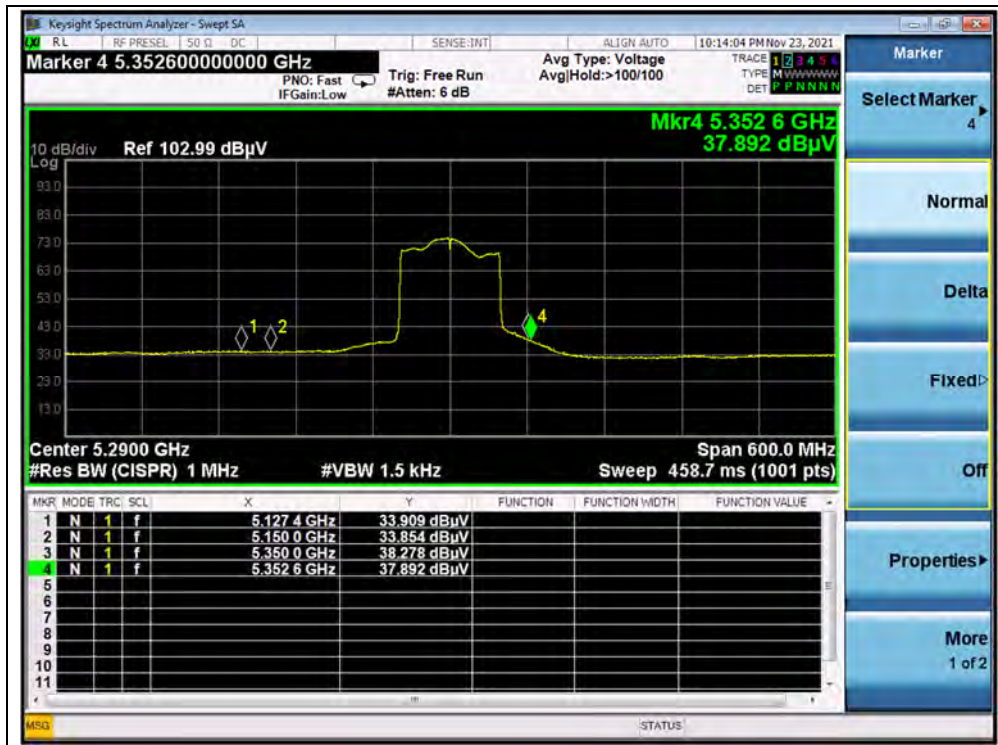
(PEAK, Channel 42, 802.11ac (VHT80))



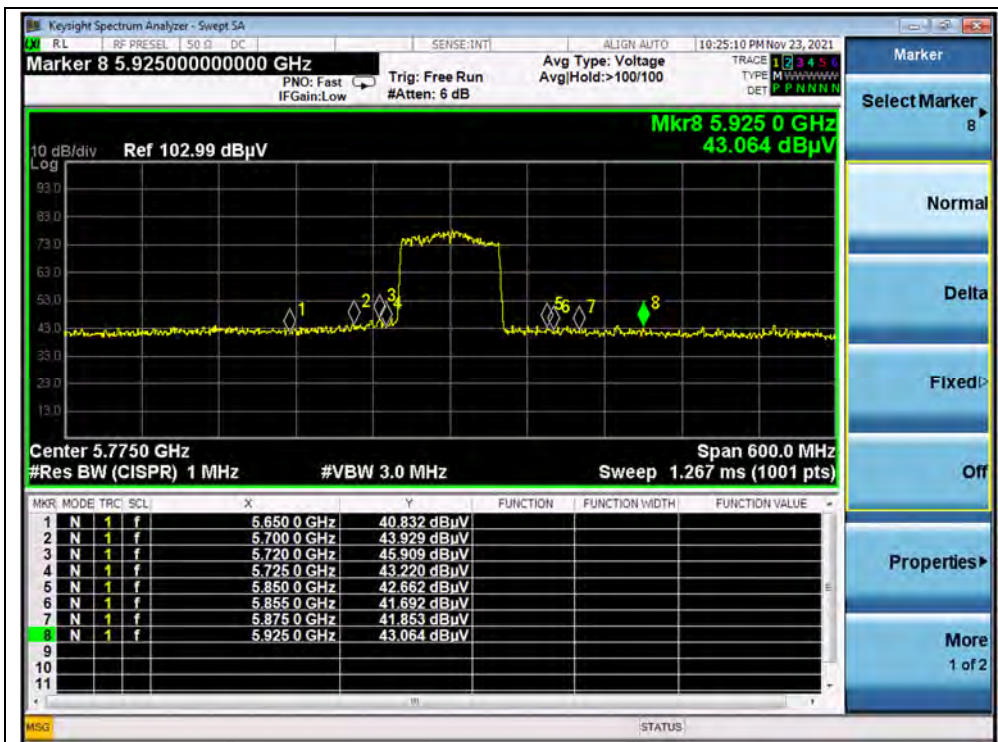
(AVERAGE, Channel 42, 802.11ac (VHT80))



(PEAK, Channel 58, 802.11ac (VHT80))



(AVERAGE, Channel 58, 802.11ac (VHT80))



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



2.9. Radiated Emission

2.9.1. Requirement

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

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

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

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

where P is the EIRP in Watts

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

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

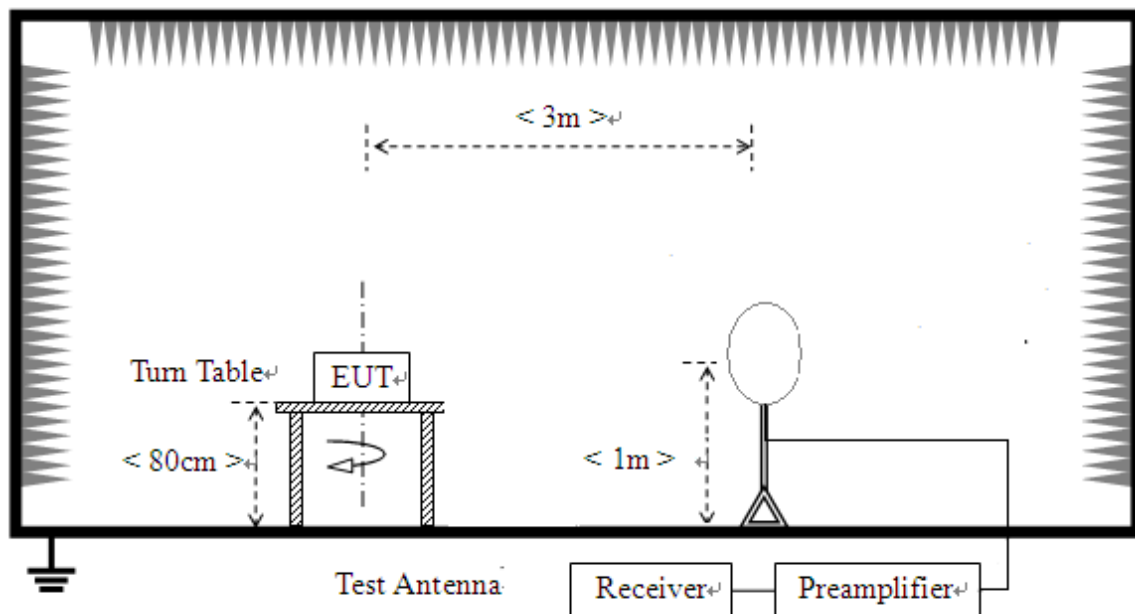
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

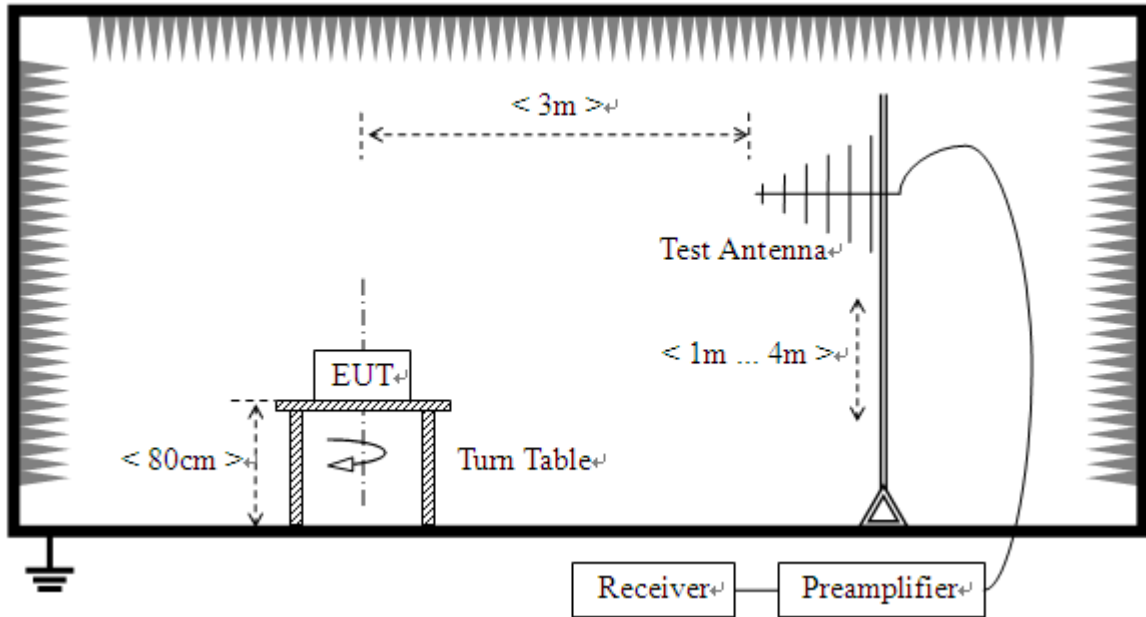
2.9.2. Test Description

Test Setup:

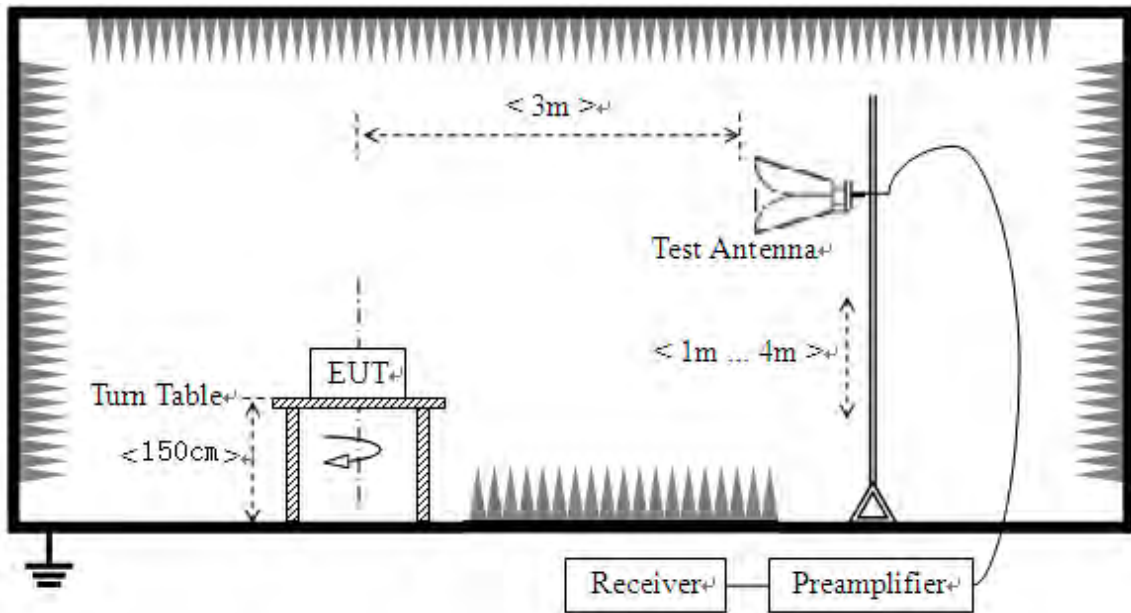
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



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



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

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

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

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

2.9.3. Test Result

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

The measurement results are obtained as below:

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

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

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

Note 1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

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

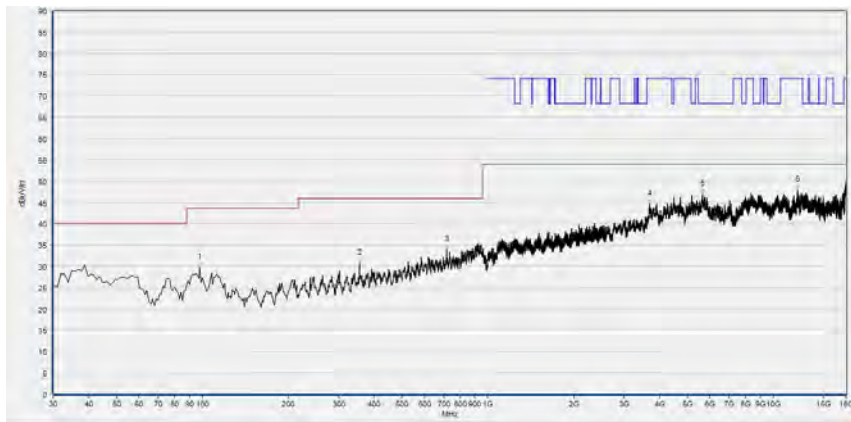
Note 3: For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

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



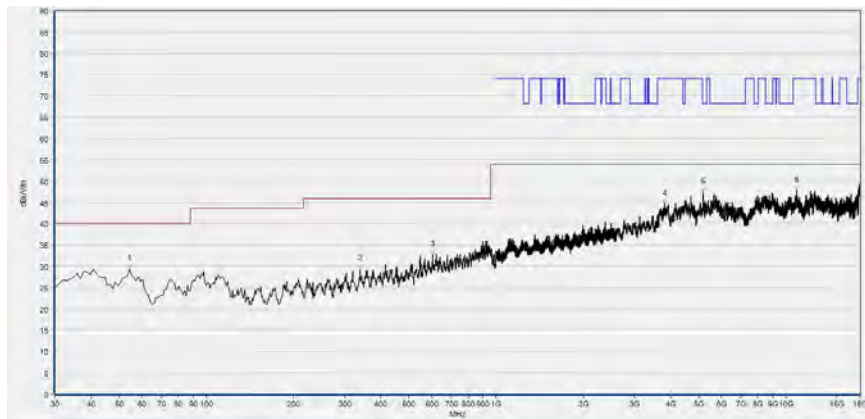
802.11a Mode

Plot for Channel 36



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
97.968	29.72	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
355.275	30.62	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
716.476	33.78	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3696.699	44.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5637.487	46.92	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12149.910	47.90	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

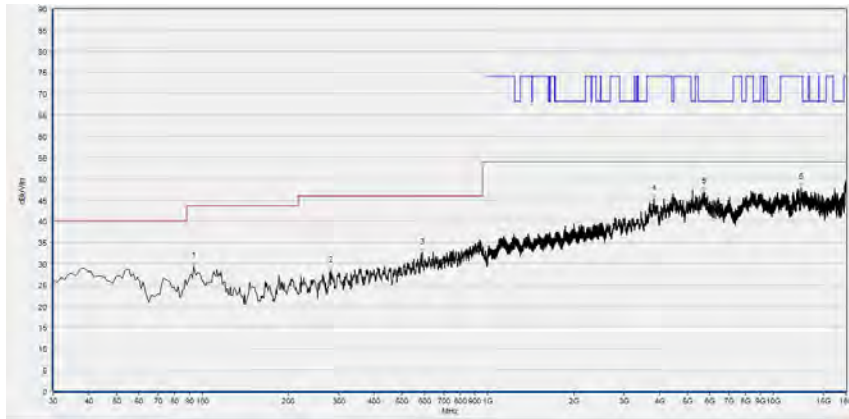
(Antenna Horizontal, 30MHz to 18GHz)



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
54.274	29.34	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
338.769	29.25	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
603.844	32.68	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3819.924	44.51	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5181.556	47.38	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10911.502	47.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

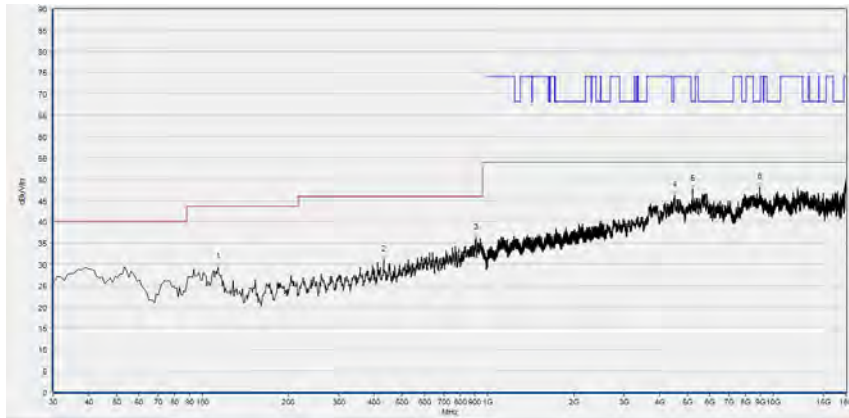
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 44



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
93.113	29.32	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
282.452	28.26	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
589.279	32.48	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3819.924	45.20	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5729.906	46.94	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12544.229	47.94	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

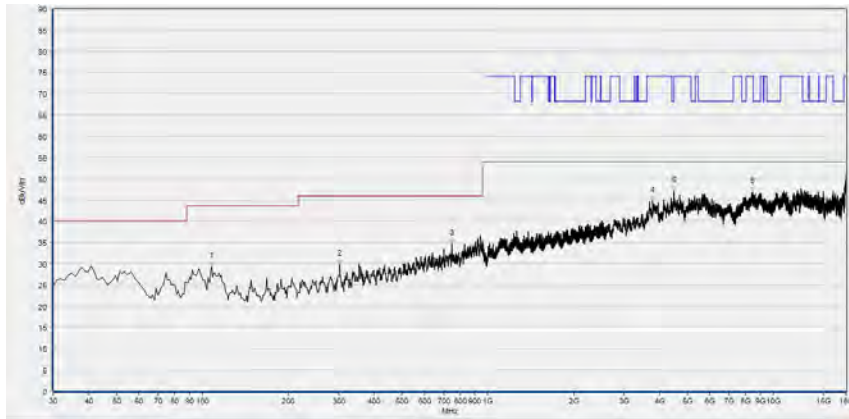
(Antenna Horizontal, 30MHz to 18GHz)



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
113.504	29.29	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
431.982	30.97	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
908.729	36.19	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4506.901	46.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5218.524	47.57	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8983.037	48.10	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

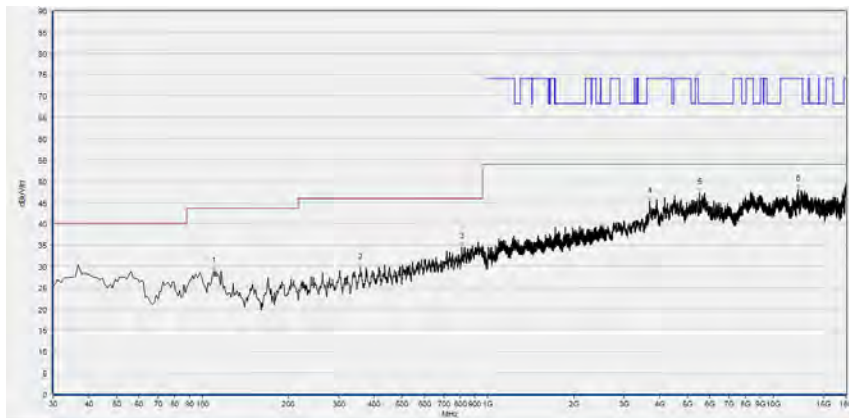
(Antenna Vertical, 30MHz to 18GHz)

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
107.678	29.34	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
302.843	29.77	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
749.489	34.63	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3786.037	44.79	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4485.337	47.06	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8453.171	46.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

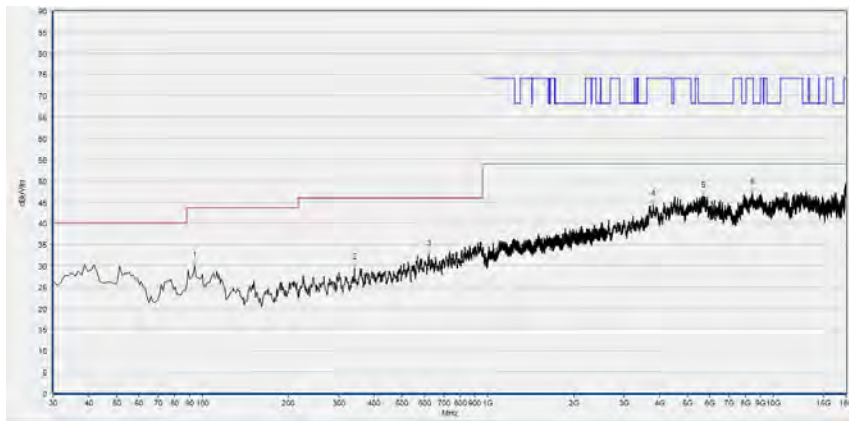
(Antenna Horizontal, 30MHz to 18GHz)



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	28.87	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
358.188	29.71	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
809.690	34.61	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3696.699	45.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5529.666	47.19	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12202.280	48.16	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

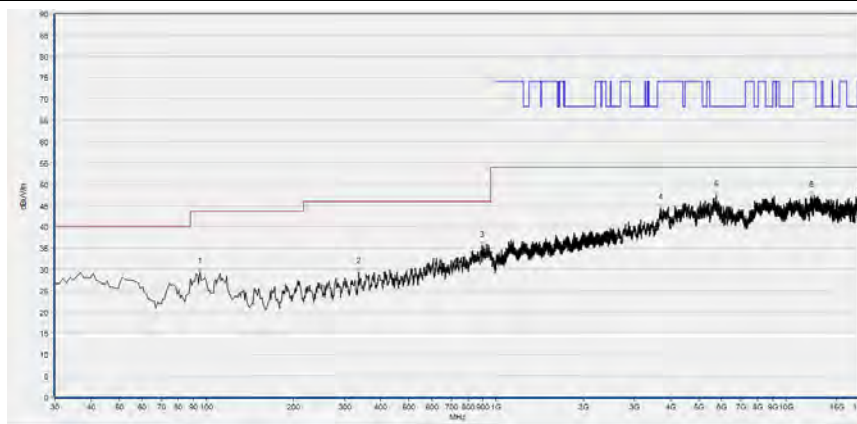
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 52



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
94.084	29.95	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
340.711	29.46	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
620.350	32.66	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3792.198	44.37	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5686.777	46.37	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8443.929	47.11	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

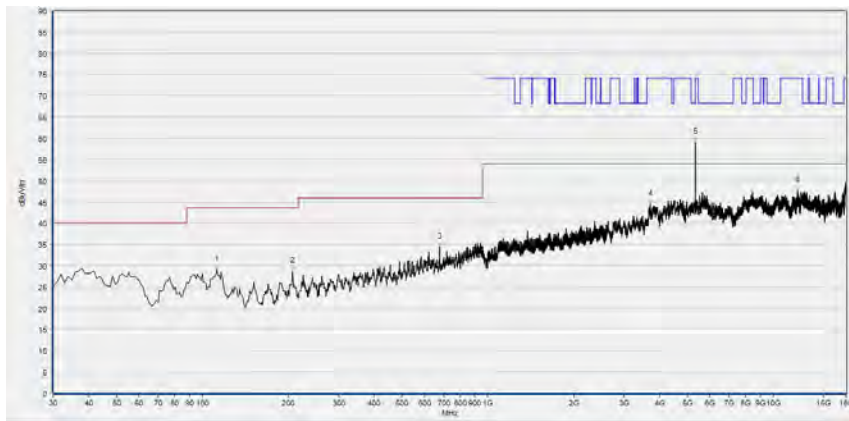
(Antenna Horizontal, 30MHz to 18GHz)



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	29.31	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
335.856	29.35	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
893.193	35.53	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3684.377	44.39	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5763.793	47.39	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12208.442	47.32	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

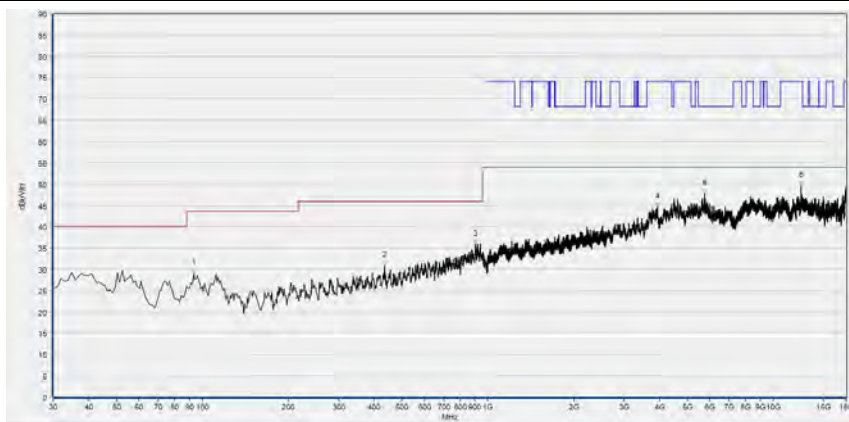
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 60



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
112.533	28.97	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
206.717	28.72	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
678.609	34.29	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3702.861	44.41	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5323.265	58.93	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12149.910	47.79	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

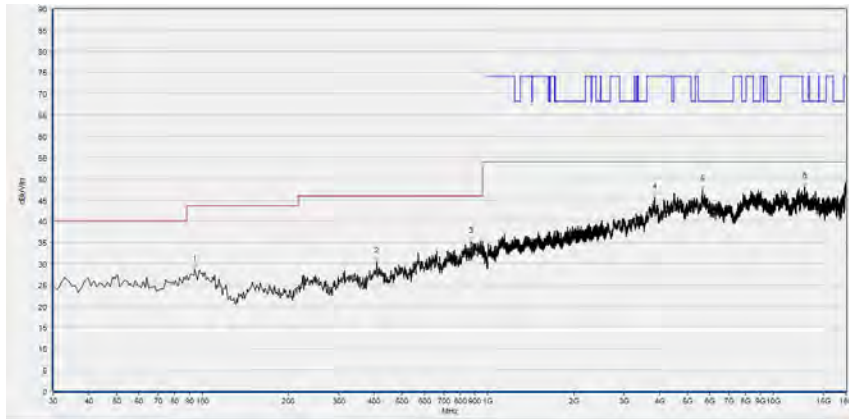
(Antenna Horizontal, 30MHz to 18GHz)



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
93.113	28.96	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
433.924	30.81	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
903.874	35.92	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3927.746	44.66	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5745.309	47.78	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12510.342	49.53	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

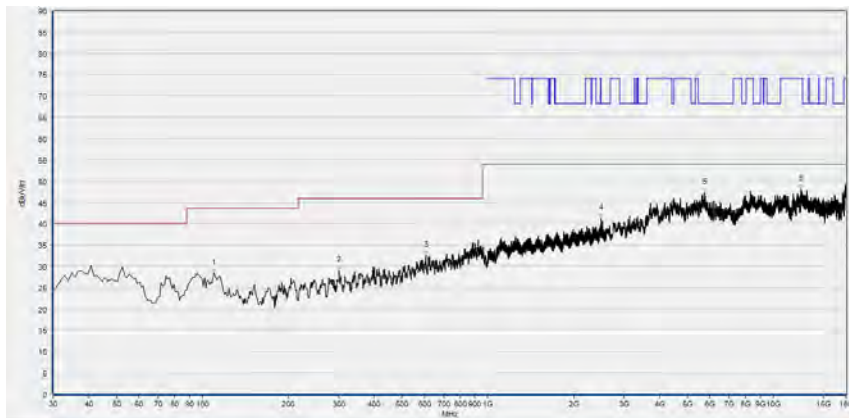
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 64



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
94.084	28.66	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
407.708	30.43	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
873.774	35.21	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3841.488	45.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5649.810	47.35	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12916.983	48.13	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

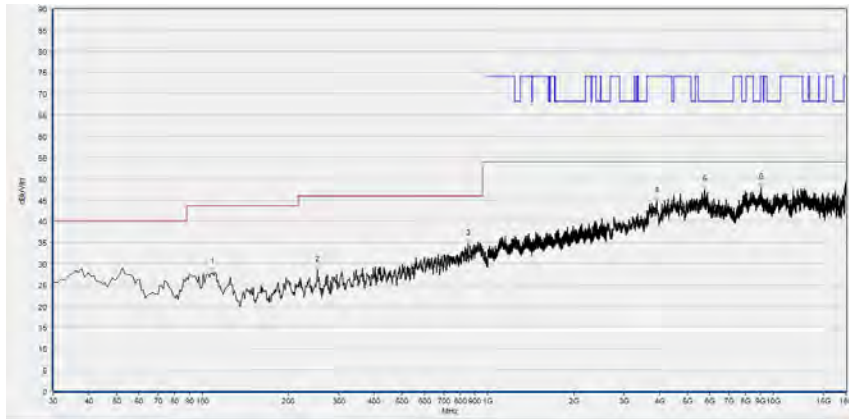
(Antenna Horizontal, 30MHz to 18GHz)



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
109.620	28.27	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
300.901	28.94	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
606.757	32.47	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2500.233	41.27	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5739.148	47.24	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12494.939	48.12	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

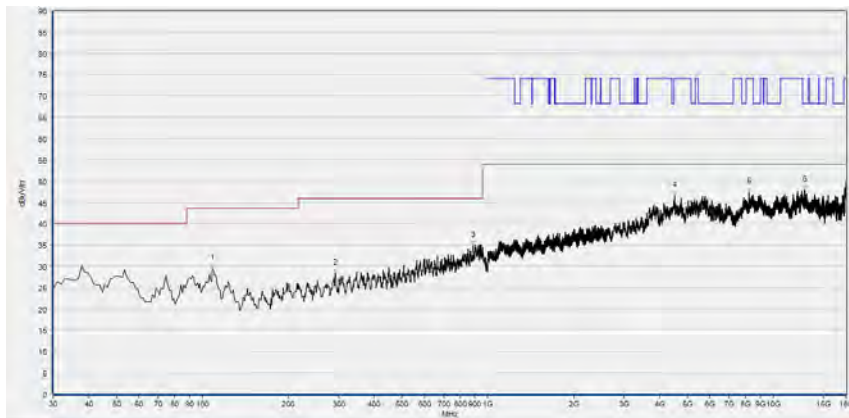
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 149



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
108.649	28.00	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
252.352	28.44	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
852.412	34.62	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3900.020	44.77	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5751.470	47.40	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
9066.213	47.92	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

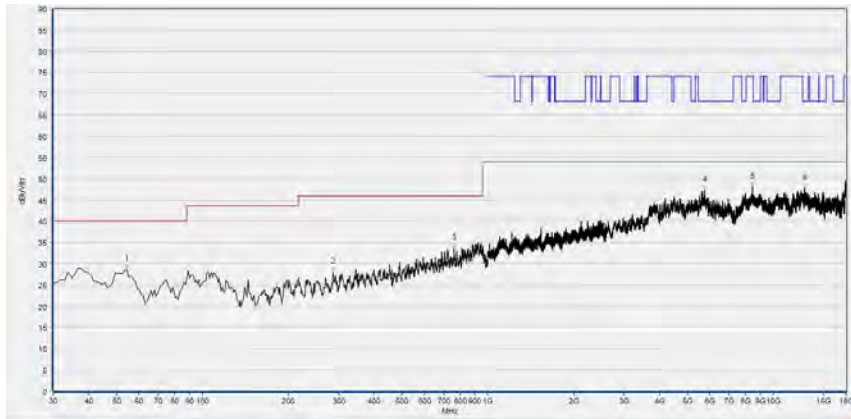
(Antenna Horizontal, 30MHz to 18GHz)



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	29.52	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
292.162	28.29	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
889.309	34.90	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4506.901	46.63	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8240.608	47.42	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12892.338	47.88	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

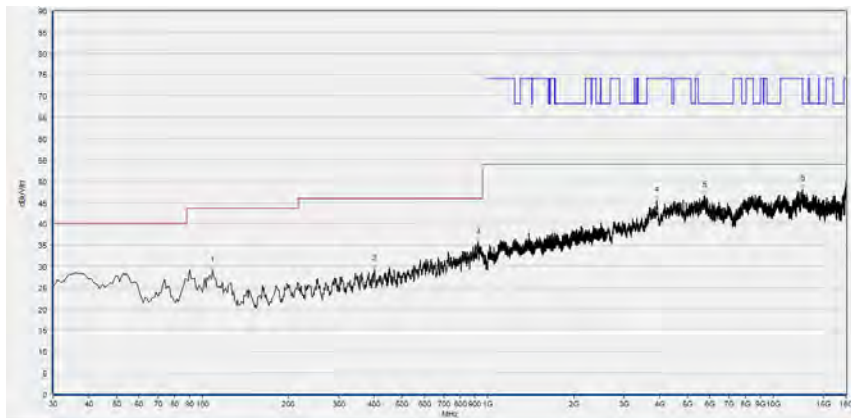
(Antenna Vertical, 30MHz to 18GHz)

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
54.274	28.65	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
287.307	28.05	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
762.112	33.46	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5739.148	47.32	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8447.009	48.14	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12873.855	47.78	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

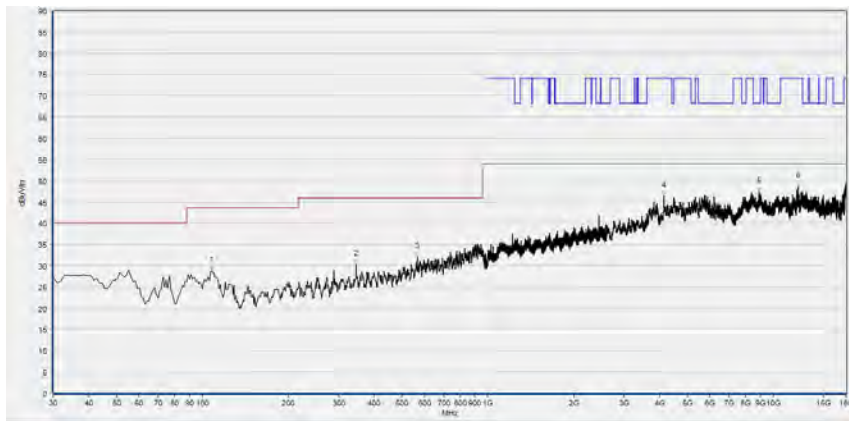
(Antenna Horizontal, 30MHz to 18GHz)



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	29.03	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
401.882	29.32	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
925.235	35.69	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3912.342	45.48	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5757.632	46.67	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12701.340	48.02	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

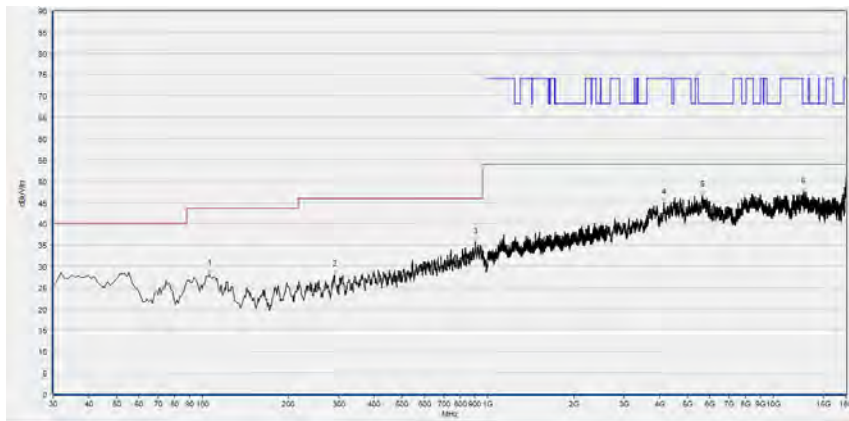
(Antenna Vertical, 30MHz to 18GHz)

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
107.678	28.78	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
345.566	30.27	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
565.976	31.99	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4143.389	46.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8933.747	47.36	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12202.280	48.59	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

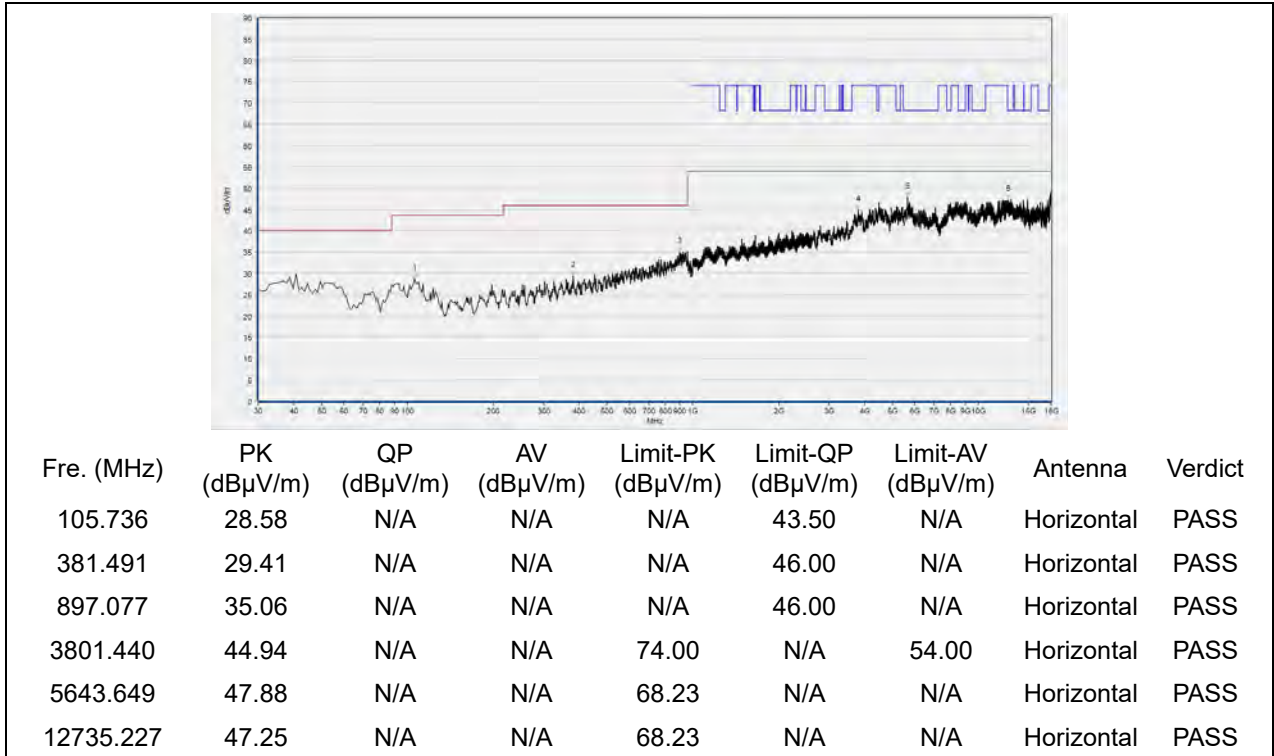


Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
105.736	28.12	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
290.220	27.91	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
906.787	35.71	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4140.308	44.86	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5640.568	46.73	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12744.469	47.41	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

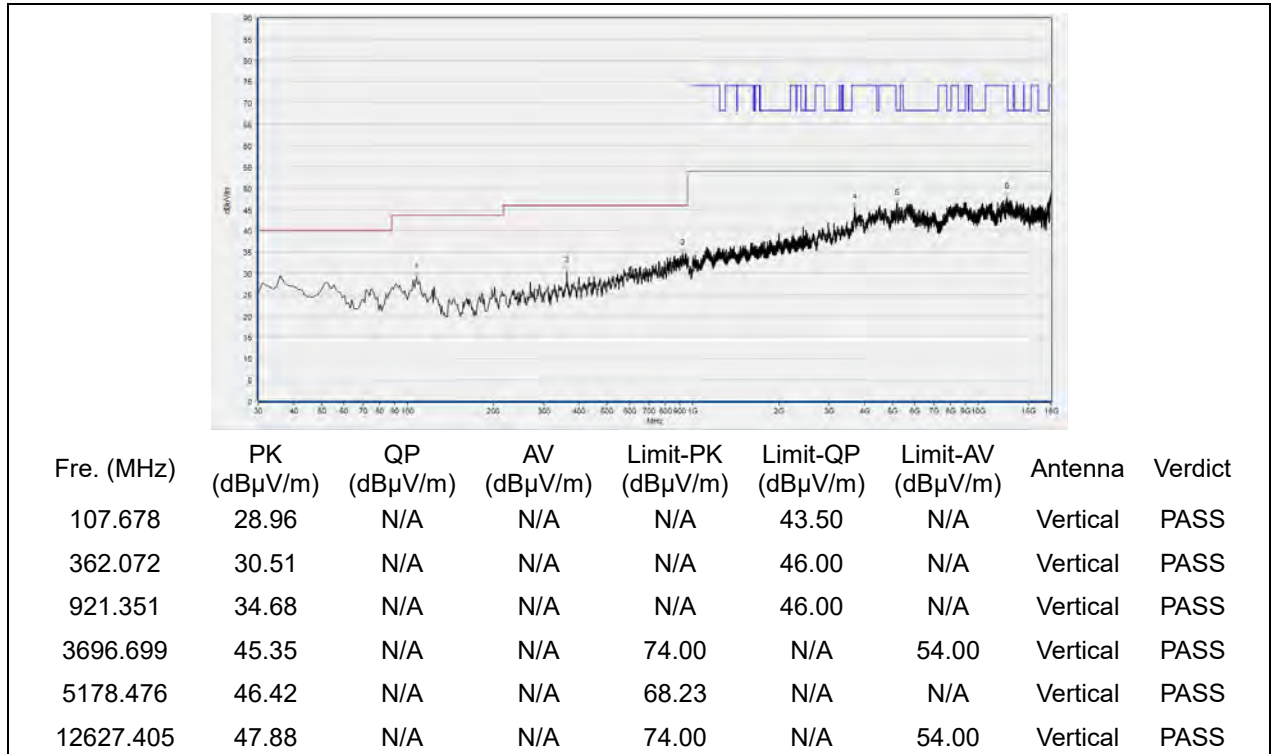
(Antenna Vertical, 30MHz to 18GHz)

802.11n (HT40) mode

Plot for Channel 38

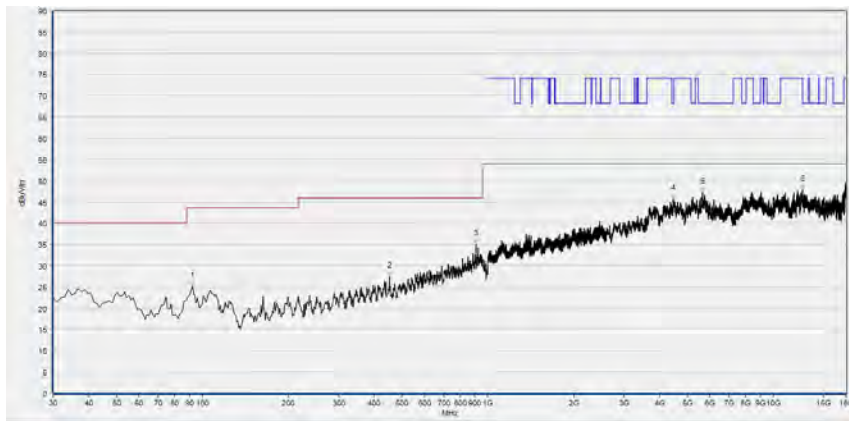


(Antenna Horizontal, 30MHz to 18GHz)



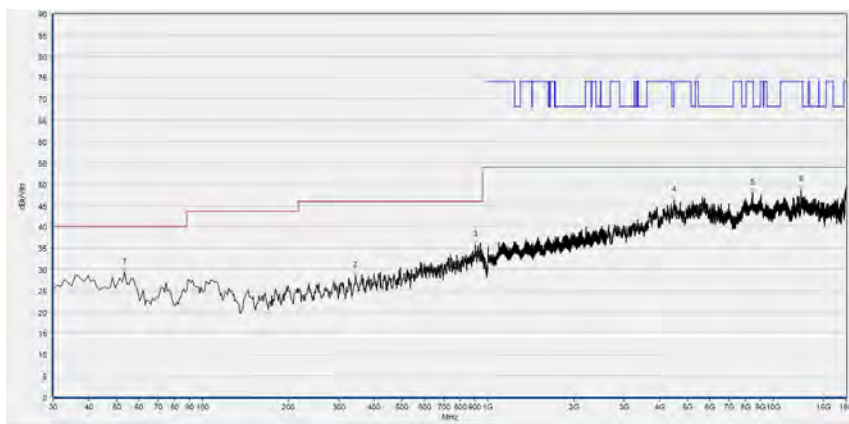
(Antenna Vertical, 30MHz to 18GHz)

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
92.142	25.14	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
452.372	27.53	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
910.671	35.04	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4457.612	45.70	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5655.971	47.28	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12639.728	48.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

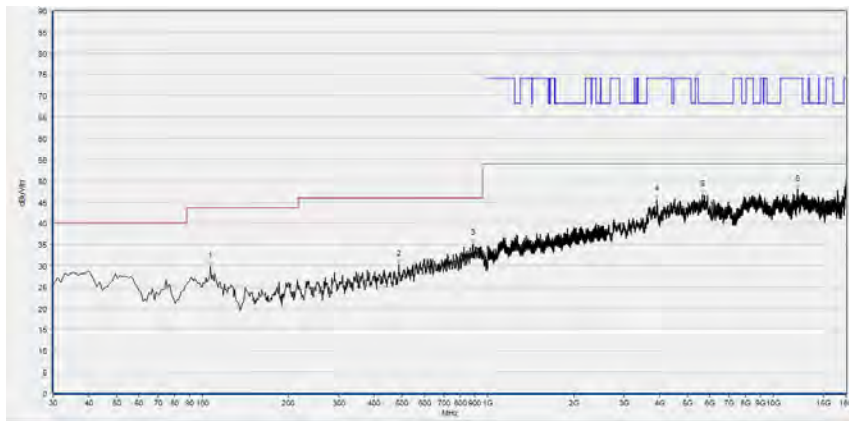
(Antenna Horizontal, 30MHz to 18GHz)



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
53.303	29.27	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
343.624	28.46	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
906.787	35.70	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4500.740	46.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8440.848	47.90	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12544.229	48.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

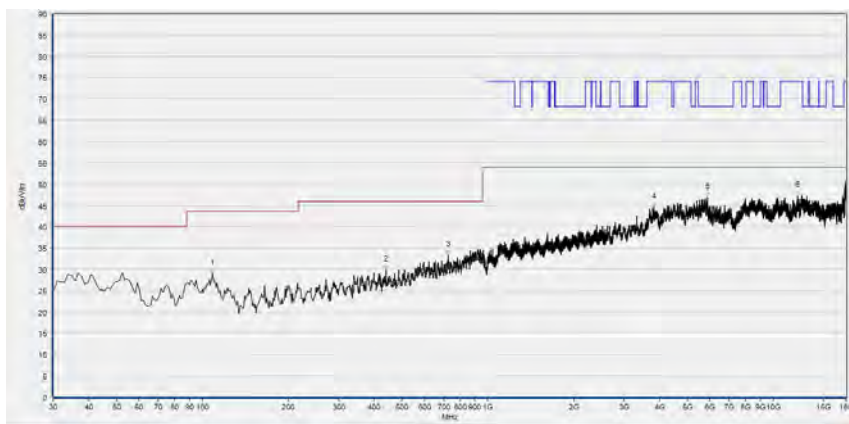
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 54



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
106.707	29.90	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
488.298	30.27	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
888.338	35.18	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3906.181	45.61	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5659.052	46.70	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12146.829	47.90	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

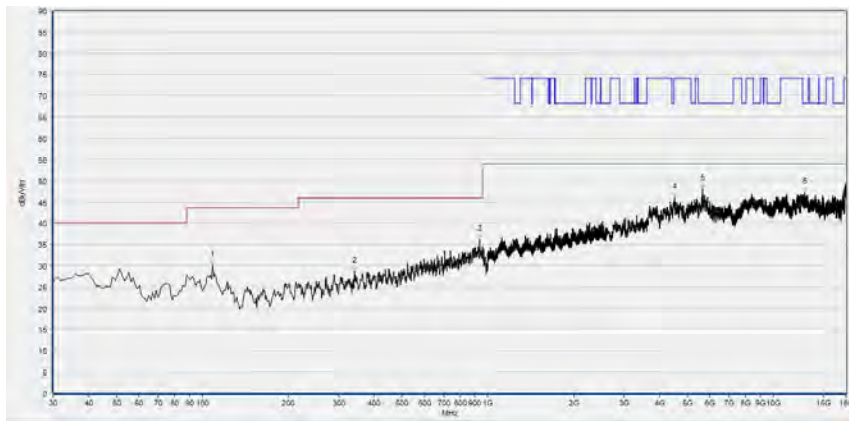
(Antenna Horizontal, 30MHz to 18GHz)



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	29.02	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
439.750	29.85	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
725.215	33.30	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3826.085	44.58	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5874.695	46.94	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12159.152	47.24	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

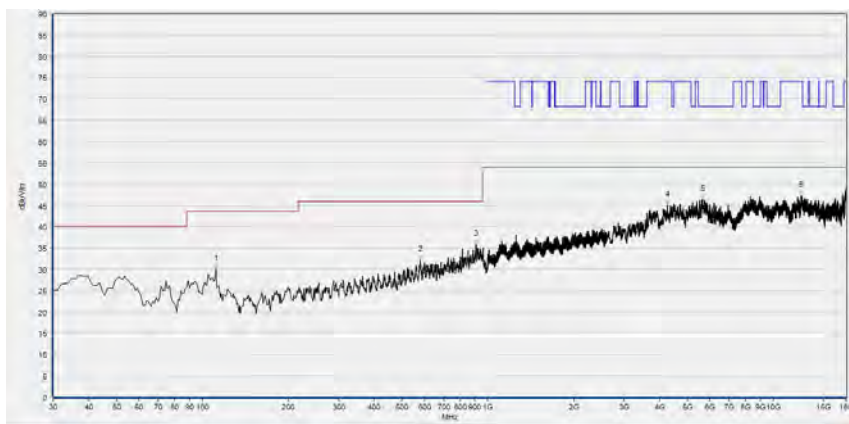
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 62



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	30.13	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
340.711	28.61	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
936.887	36.17	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4503.821	46.16	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5659.052	48.02	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12892.338	47.23	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

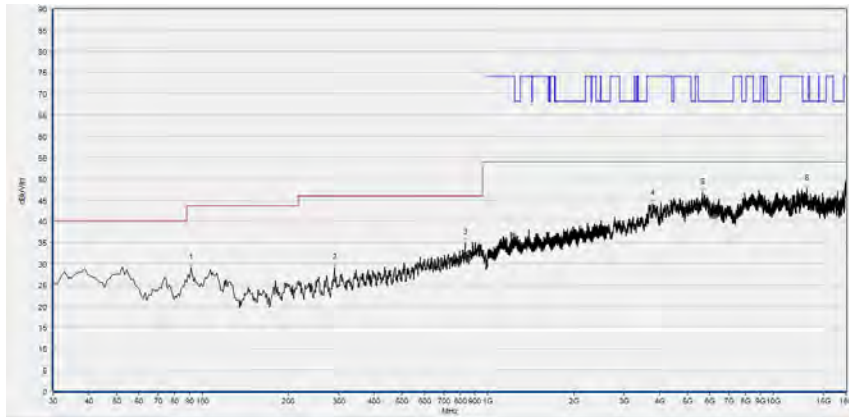
(Antenna Horizontal, 30MHz to 18GHz)



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
111.562	30.06	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
580.541	32.11	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
910.671	35.79	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4266.613	45.15	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5649.810	46.48	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12491.858	47.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

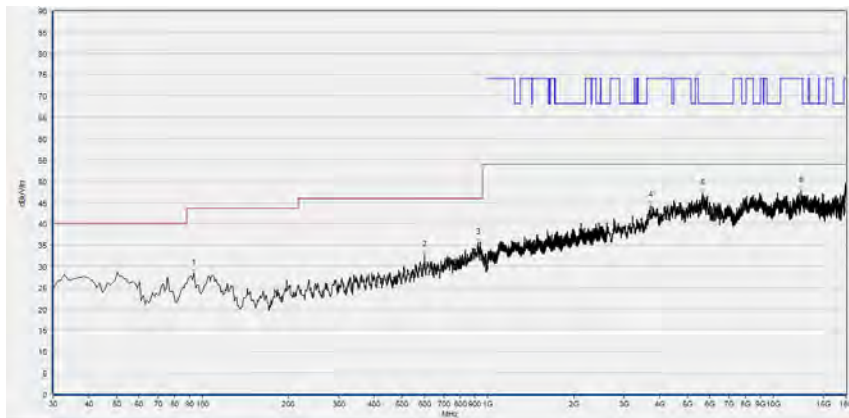
(Antenna Vertical, 30MHz to 18GHz)

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
91.171	28.92	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
290.220	28.96	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
832.022	34.92	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3776.795	44.10	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5659.052	46.84	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
13083.337	47.64	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

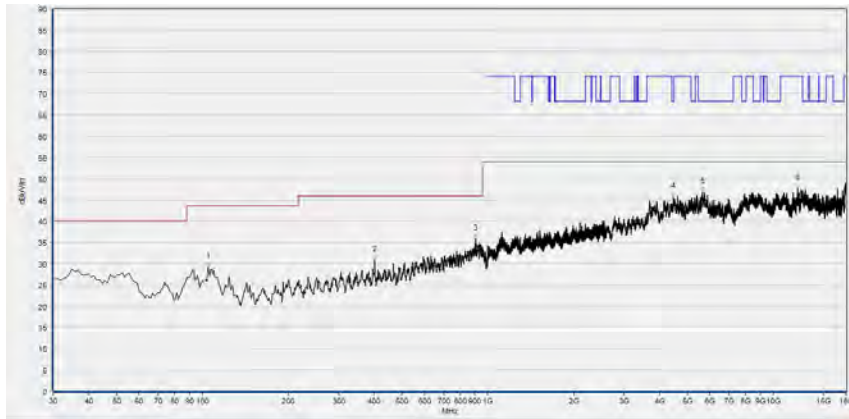
(Antenna Horizontal, 30MHz to 18GHz)



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
93.113	28.27	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
599.960	32.66	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
926.206	35.53	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3705.941	44.20	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5646.729	47.16	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12519.584	47.78	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

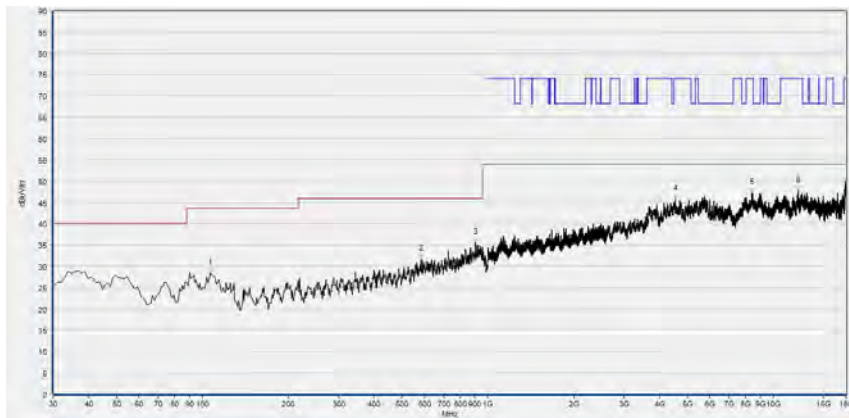
(Antenna Vertical, 30MHz to 18GHz)

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
104.765	29.16	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
401.882	30.77	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
906.787	35.84	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4473.015	45.81	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5652.891	46.93	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12196.119	47.71	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

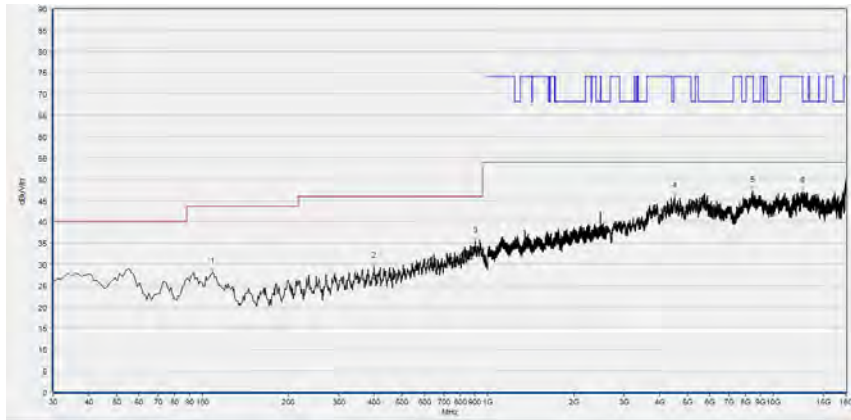


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
106.707	28.47	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
584.424	31.64	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
905.816	35.58	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4528.466	45.76	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8413.123	47.32	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12205.361	47.73	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

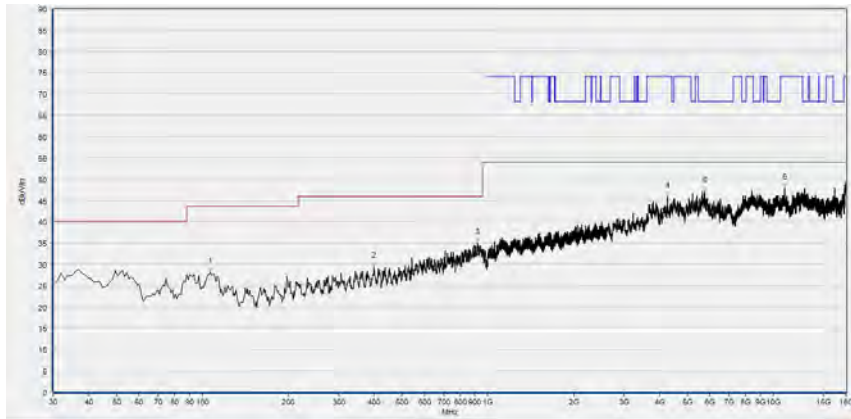
802.11ac (VHT80) Mode

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
108.649	28.18	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
399.940	29.44	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
904.845	35.29	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4509.982	45.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8437.768	47.34	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12676.695	47.02	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

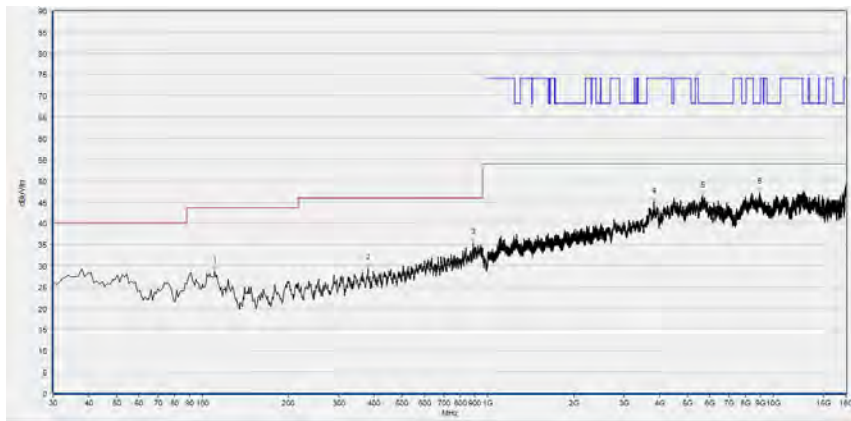
(Antenna Horizontal, 30MHz to 18GHz)



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
106.707	28.22	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
398.969	29.47	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
922.322	34.99	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4266.613	45.85	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5763.793	47.05	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10942.308	47.95	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

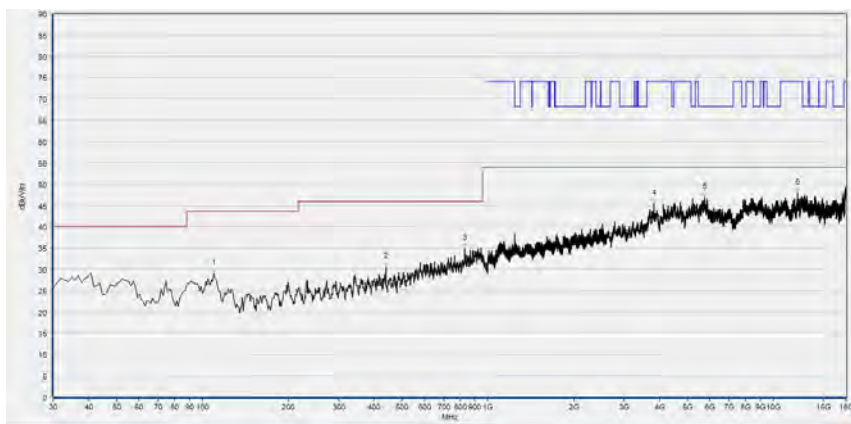
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 58



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	28.73	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
380.521	29.37	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
891.251	35.33	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
3819.924	45.02	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5637.487	46.40	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8964.553	47.22	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

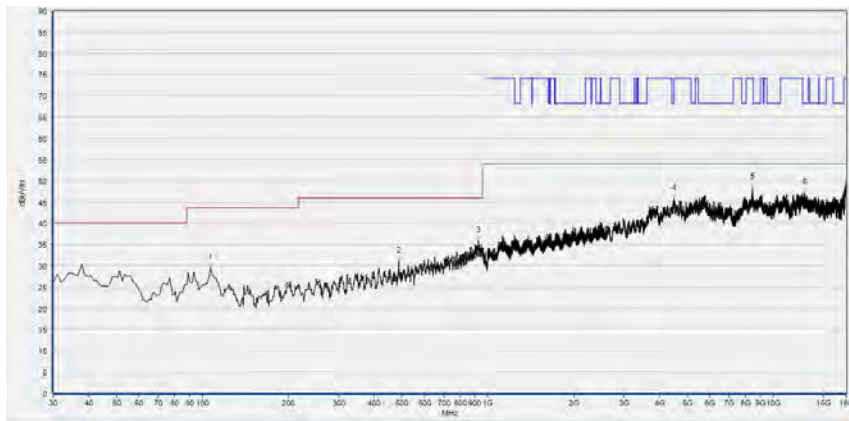
(Antenna Horizontal, 30MHz to 18GHz)



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
109.620	29.07	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
438.779	30.49	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
830.080	34.84	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3819.924	45.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5760.712	46.98	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12152.991	47.88	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

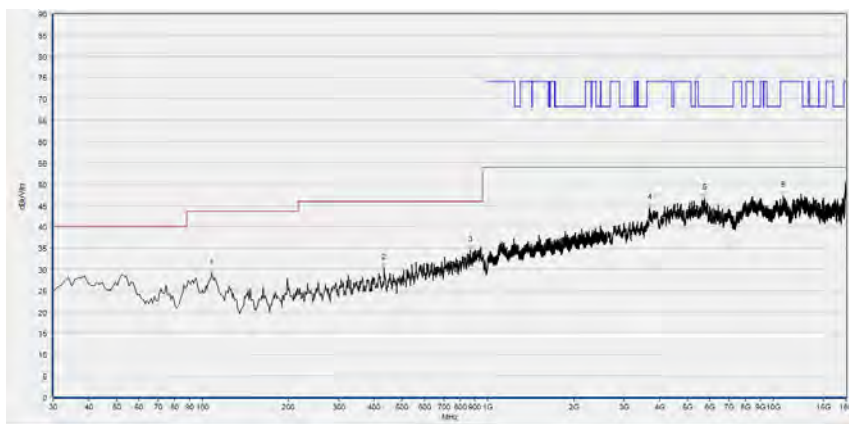
(Antenna Vertical, 30MHz to 18GHz)

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
106.707	29.44	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
487.327	31.00	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
927.177	35.80	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4491.498	45.70	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8443.929	48.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12886.177	47.03	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	28.92	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
432.953	30.32	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
867.948	34.59	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
3687.457	44.41	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5739.148	46.71	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10859.132	47.30	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)



Annex A Test Uncertainty

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

Test Items	Uncertainty
Peak Output Power	$\pm 2.22\text{dB}$
Power Spectral Density	$\pm 2.22\text{dB}$
Bandwidth	$\pm 5\%$
Restricted Frequency Bands	$\pm 5\%$
Radiated Emission	$\pm 2.95\text{dB}$
Conducted Emission	$\pm 2.44\text{dB}$

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



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

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

3. Facilities and Accreditations

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



4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Attenuator 1	N/A	10dB	Resnet	N/A	N/A
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2021.03.25	2022.03.24
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2021.03.25	2022.03.24
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	2021.10.20	2022.10.19

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2021.03.09	2022.03.08
LISN	812744	NSLK 8127	Schwarzbeck	2021.03.09	2022.03.08
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2021.07.21	2022.07.20
Coaxial Cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3 List of Software Used

Description	Manufacturer	Software Version
Test System	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V1.0
TS+ -[JS32-CE]	Tonscend	V2.5.0.0

**4.4 Radiated Test Equipments**

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2021.07.16	2022.07.15
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Horn	BBHA9170 #774	BBHA 9170	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Coaxial Cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L32 03	Tonscend	2021.07.16	2022.07.15
18-26.5GHz pre-Amplifier	46732	S10M100L38 02	Tonscend	2021.07.16	2022.07.15
26-40GHz pre-Amplifier	56774	S40M400L40 02	Tonscend	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5150-5350	Wainwright	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5470-5725	Wainwright	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5725-5850	Wainwright	2021.07.16	2022.07.15



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

————— END OF REPORT —————