TEST REPORT

APPLICANT	:	Nanjing Juplink Intelligent Technologies Co., Ltd.
PRODUCT NAME	:	Dual-band Gigabit Repeater
MODEL NAME	:	EC4-1200
BRAND NAME	:	JupLink
FCC ID	:	2AT9Z-EC4-1200
STANDARD(S)	:	47 CFR Part 15 Subpart E
RECEIPT DATE	:	2019-08-06
TEST DATE	:	2019-10-07 to 2019-10-22
ISSUE DATE	:	2019-11-14

Edited by: Lai Huihuang (Test Engineer)

Approved by: Anne Liu(Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2019-11-14	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Nanjing Juplink Intelligent Technologies Co., Ltd.
Applicant Address:	No. 757, Dixiu Road, Binjiang Economic Development Zone, Jiangning District, Nanjing
Manufacturer:	YICHEN(SHENZHEN)TECHNOLOGYCO.,LTDLONGGONGBRANCH
Manufacturer Address:	1-4F,No.6,YasenIndustrialFactory,No.8ChenxinRoad,BaolongIndustrialCity,BaolongCommunity,BaolongStreet,LonggangDistrict,Shenzhen,China

1.2. Equipment Under Test (EUT) Description

Product Name:	Dual-band Gigabit Repeater
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	Z-V1.4
Software Version:	616.10.1.394
Modulation Type:	OFDM
Modulation Mode:	802.11ac(HT20), 802.11ac(HT40),802.11ac(HT80)
Operating Frequency Range:	5.180 GHz- 5.240 GHz;5.725GHz- 5.850GHz
Channel Number:	Refer to 1.3
Antenna Type:	Undetachable antennas
Antenna Gain:	Ant 0:3 dBi;Ant1:3dBi

Note 1: The U-NII band is applicable to this report, another bands of operation (2.4GHz) is documented in a separate report.

Note 2: The EUT has two antennas and supports a MIMO function. Physically, the EUT provides two completed transmitters and two receivers for 802.11ac modulation mode.

Modulation Mode: TX Function

Modulation Mode:	**TX Function**
802.11ac	2TX

Note 3: According to KDB 662911 D01, the directional gain = GANT + 10log(NANT) dBi, where GANT is the maximum antenna gain in dBi, NANT is the number of outputs.

Note 4: During test, the duty cycle of the EUT was setting to 100%.

Note 5: For conducted test item Maximum conducted output Power and Peak Power spectral

density of each modulation mode, we recorded the test result of two antennas separately, for other conducted test items both of the two antennas were tested separately, we only recorded the worst test result(Ant 0) in this report.

Note 6: All radiation test items for 802.11ac modulation mode operate at MIMO mode during the test.

Note 7: 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 (802.11ac)	BPSK	**6**/9
	QPSK	12/18
	16QAM	24/36
	64QAM	48/54

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 of EUT

Frequency Range: 5180-5240MHz				
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: 5725-5850MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	**149**	**5745**	153	5765
	157	**5785**	161	5805
	165	**5825**	/	/
40MHz	**151**	**5755**	**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 for the EUT FCC ID Certification:

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

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

No.	Section	Description	Test Date	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.407(a) (e)	Emission Bandwidth	Oct 07, 2019 Oct 18, 2019	Lai Haihuang	PASS
3	15.407(a)	Maximum conducted output Power	Oct 07, 2019 Oct 18, 2019	Lai Haihuang	PASS
4	15.407(a)	Peak Power spectral density	Oct 07, 2019 Oct 18, 2019	Lai Haihuang	PASS
5	15.407(b)	Restricted Frequency Bands	Oct 21, 2019	Wang Hao	PASS
6	15.407(g)	Frequency Stability	Oct 07, 2019 Oct 18, 2019	Lai Haihuang	PASS
7	15.207	Conducted Emission	Oct 20, 2019	Yi You Zhong	PASS
8	15.407(b)	Radiated Emission	Oct 22, 2019	Wang Hao	PASS
9	15.407(c)	Automatically discontinue transmission requirement	N/A	N/A	PASS
Note: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013 and KDB789033 D02 V02r01.					

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.

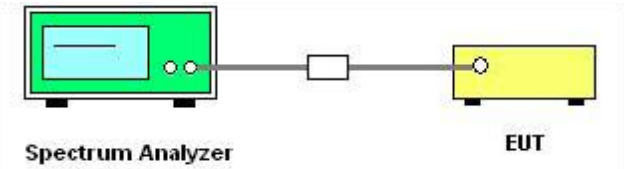
2.2. Emission Bandwidth

2.2.1. 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.

2.2.2. Test Description

A. 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.

B. 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 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 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 = 300 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.

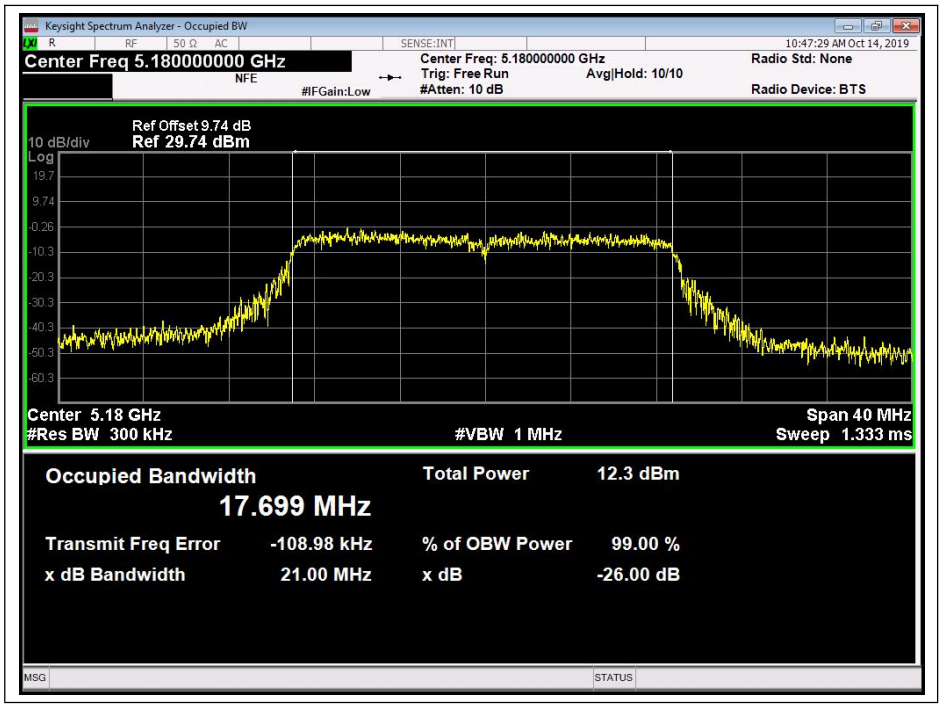
2.2.3. Test Result

802.11ac20 Test mode

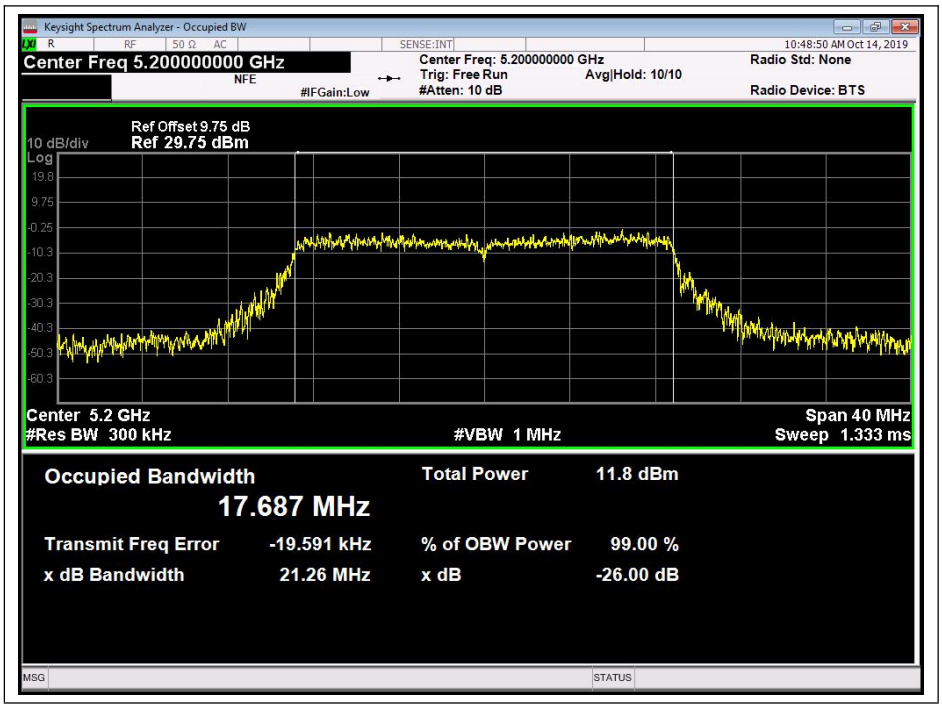
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 26 dB Bandwidth (MHz)
36	5180	21.00
40	5200	21.26
48	5240	21.51
Channel	**Frequency (MHz)**	**ANT0 6dB Bandwidth (MHz)**
149	5745	17.68
157	5785	17.61
165	5825	17.60

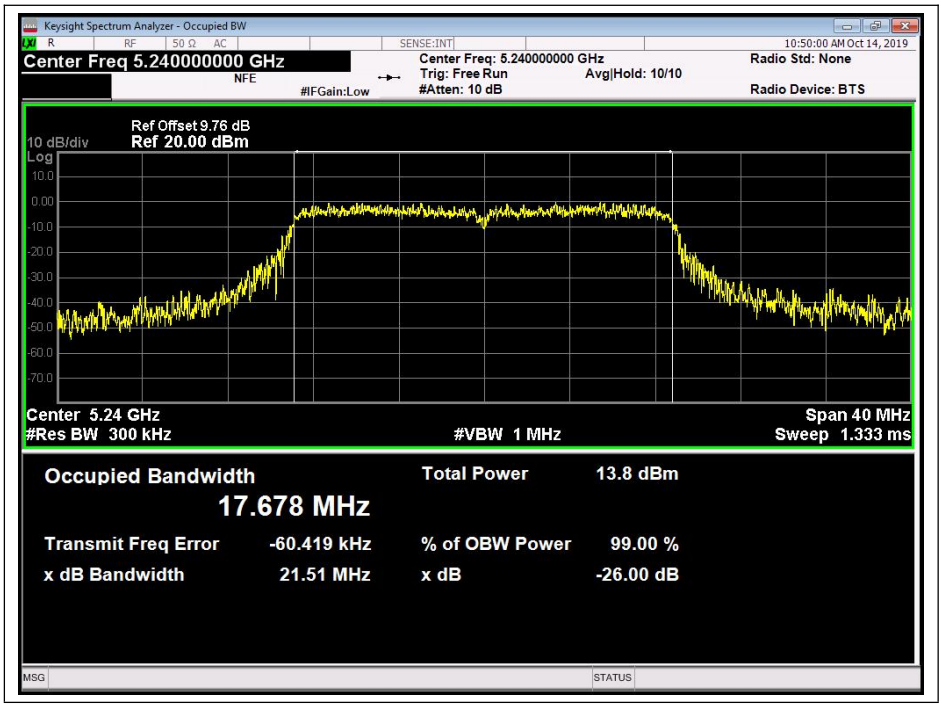
B. Test Plots



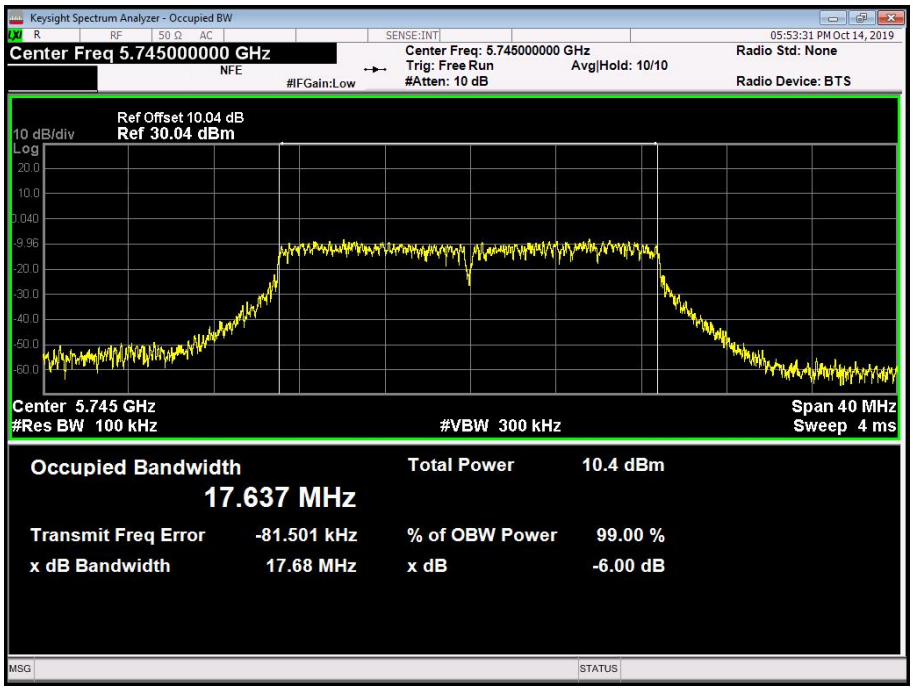
(Channel 36, 5180MHz, 802.11ac)



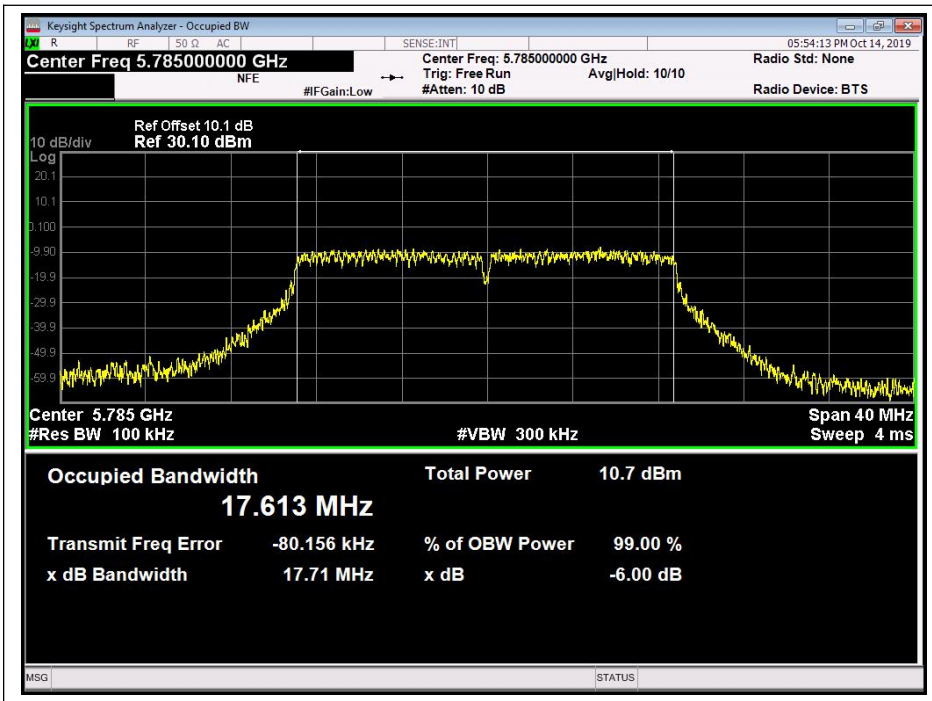
(Channel 40, 5200 MHz, 802.11ac)



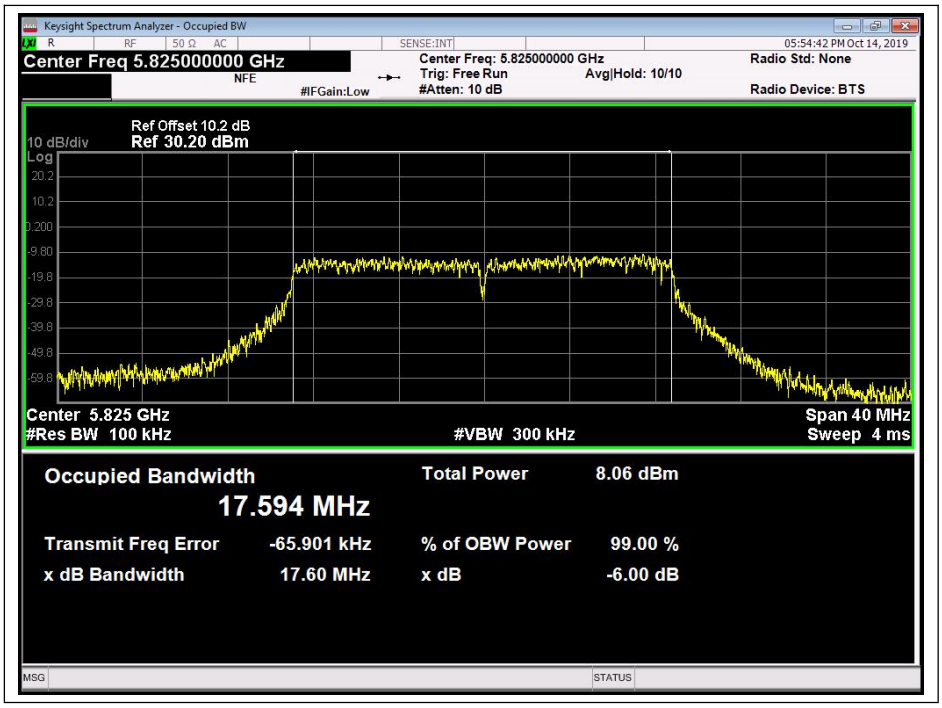
(Channel 48, 5240MHz, 802.11ac)



(Channel 149, 5745MHz, 802.11ac)



(Channel 157, 5785MHz, 802.11ac)



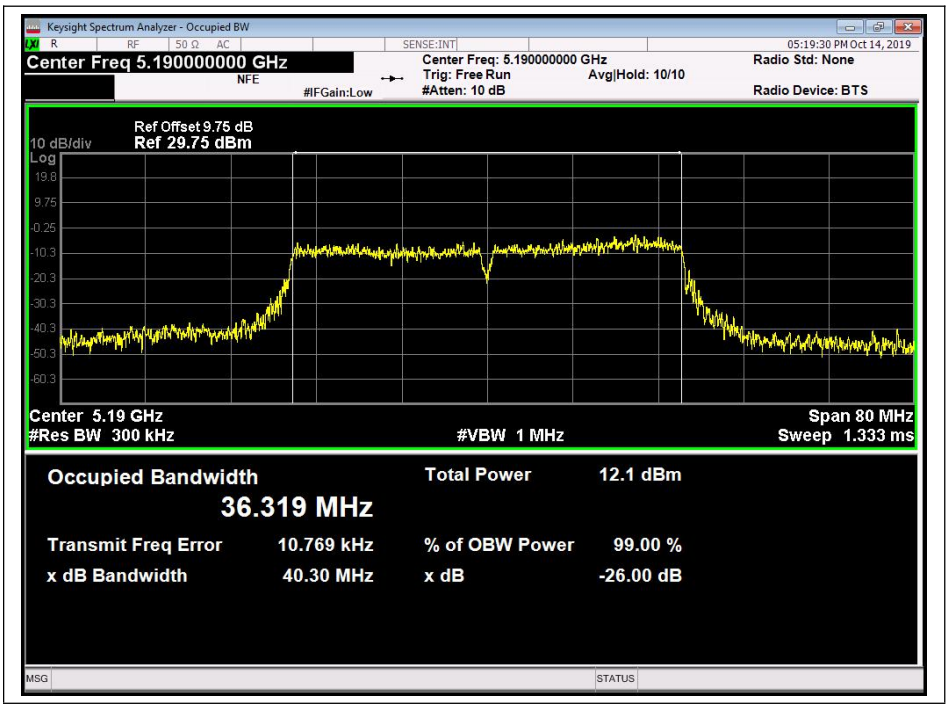
(Channel 165, 5825MHz, 802.11ac)

802.11ac (HT40) Test mode

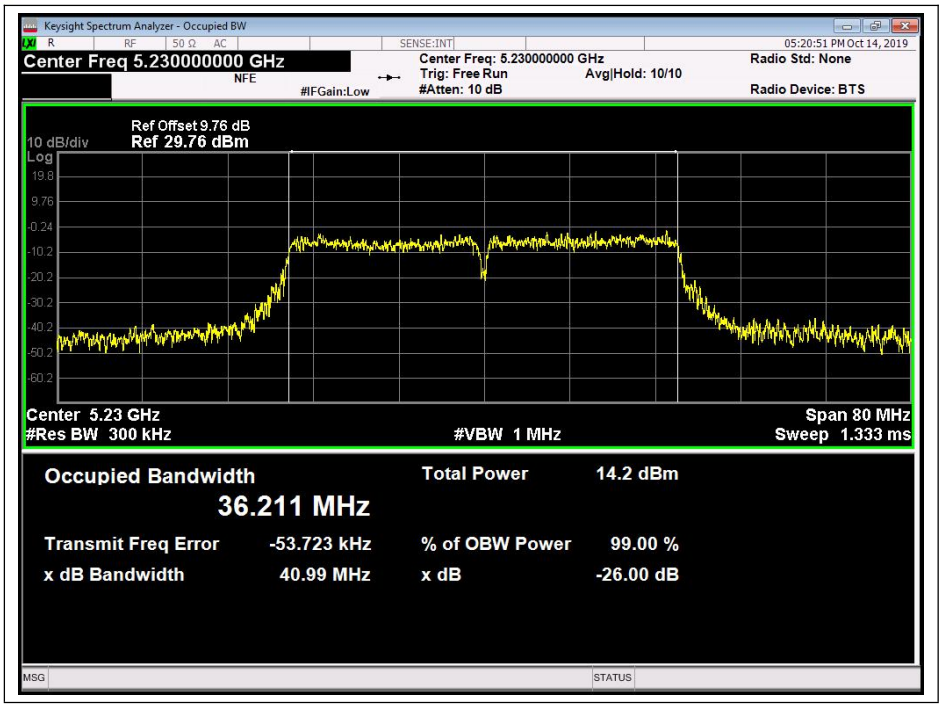
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.30
46	5230	40.99
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
151	5755	36.45
159	5795	36.41

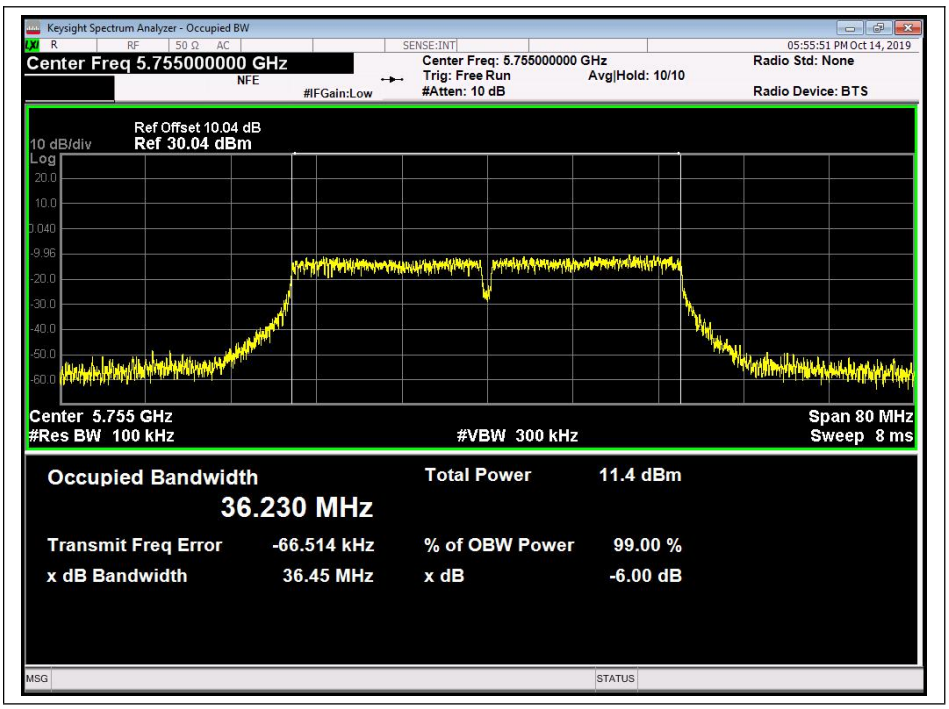
B. Test Plots



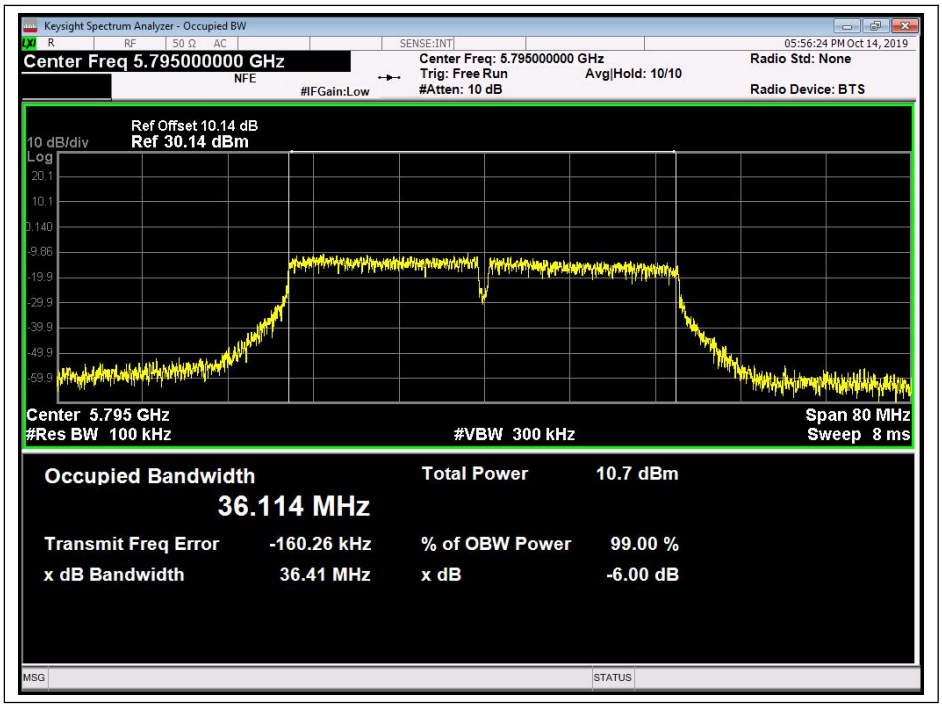
(Channel 38, 5190MHz, 802.11ac (HT40))



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



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



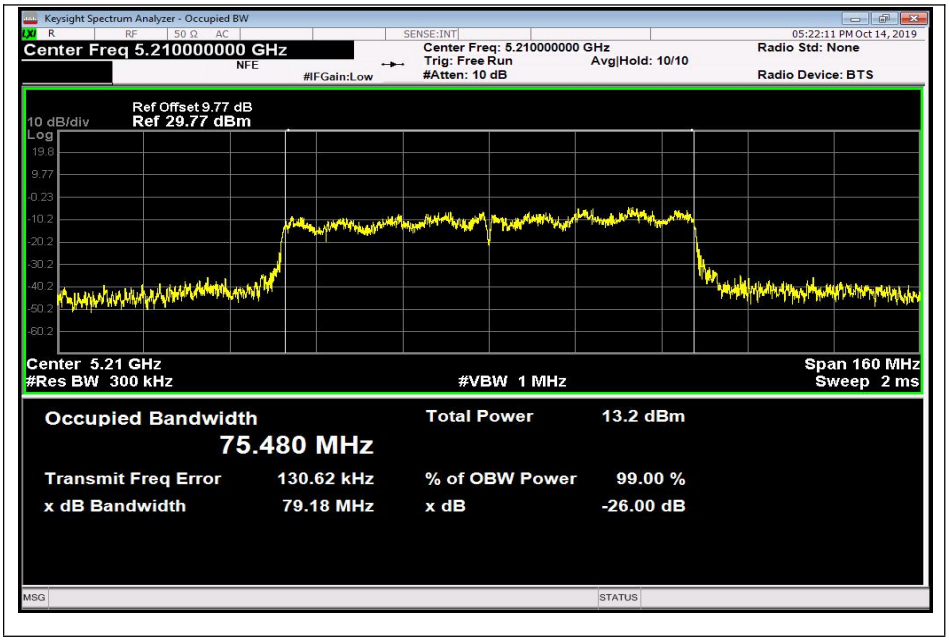
(Channel 159, 5795MHz, 802.11ac (HT40))

802.11ac (HT80) Test mode

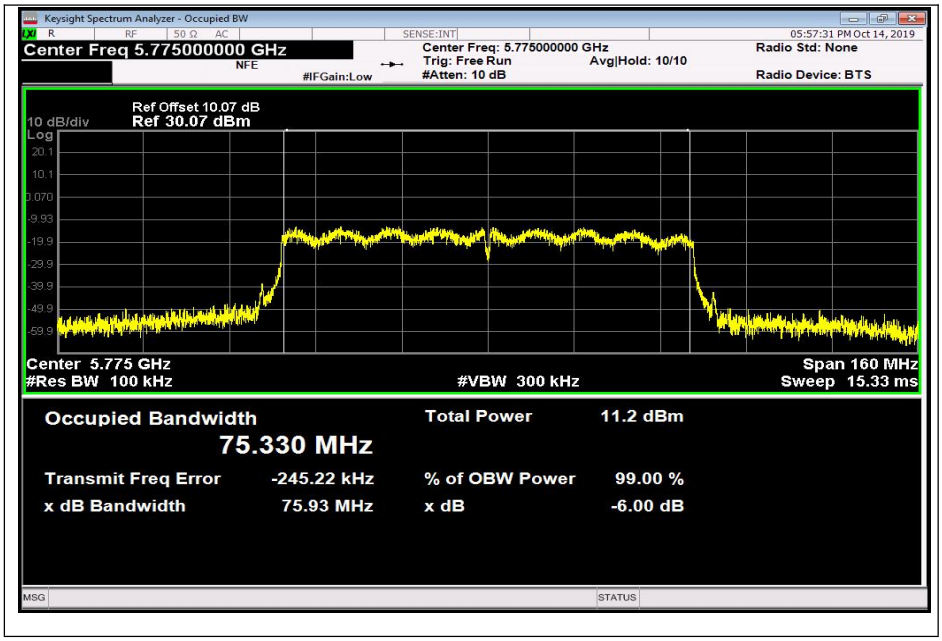
C. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	79.18
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
155	5775	75.93

D. Test Plots



(Channel 42, 5210MHz, 802.11ac (HT80))



(Channel155, 5775MHz, 802.11ac (HT80))

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 250 mW provided the maximum antenna gain does not exceed 6 dBi.
(2) For the 5.25-5.35 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.

A. Test Set:

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.

2.3.3. Test Result

Duty Cycle Factor

ANT0

Mode	Channel	Frequency (MHz)	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty Cycle (%)	Duty Cycle Factor
802.11 ac20	36	5180	100	100	100	0
802.11 ac40	38	5190	100	100	100	0
802.11 ac80	42	5210	100	100	100	0

ANT1

Mode	Channel	Frequency (MHz)	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty Cycle (%)	Duty Cycle Factor
802.11 ac20	36	5180	100	100	100	0
802.11 ac40	38	5190	100	100	100	0
802.11 ac80	42	5210	100	100	100	0

802.11ac (HT20) Test mode

Channel	Frequency (MHz)	Average Output Power (dBm)			Limit		Verdict
		ANT0	ANT1	Total	(dBm)	11+10*log(EBW) (dBm)	
36	5180	13.36	13.24	16.31	24	24.37	PASS
40	5200	12.74	14.51	16.72		24.33	
48	5240	14.48	15.42	17.99		24.33	
149	5745	13.24	13.14	16.25	30		
157	5785	13.75	12.17	16.04			
165	5825	10.78	10.88	13.84			
Note: Power limit is 24dBm or 11+10*log(EBW)							

802.11ac (HT40) Test mode

Channel	Frequency (MHz)	Average Output Power (dBm)			Limit		Verdict
		ANT0	ANT1	Total	(dBm)	11+10*log(EBW) (dBm)	
38	5190	12.65	12.80	15.74	24	26.93	PASS
46	5230	14.95	14.12	17.56		26.92	PASS
151	5755	13.80	13.24	16.54	30		PASS
159	5795	12.74	12.32	15.55			PASS

Channel	Frequency (MHz)	Average Output Power (dBm)			Limit		Verdict
		ANT0	ANT1	Total	(dBm)	11+10*log(EBW) (dBm)	
Note: Power limit is 24dBm or 11+10*log(EBW)							

802.11ac (HT80) Test mode

Channel	Frequency (MHz)	Average Output Power (dBm)			Limit		Verdict
		ANT0	ANT1	Total	(dBm)	11+10*log(EBW) (dBm)	
42	5210	13.81	13.43	16.63	24	30.03	PASS
149	5745	12.93	12.57	15.76	30		
Note: Power limit is 24dBm or 11+10*log(EBW)							

Note: The duty cycle factor has been compensated into the test result

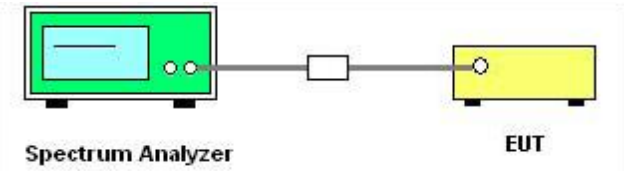
2.4. Peak Power spectral density

2.4.1. 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 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.

2.4.2. Test Description

A. Test Set:



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

B. Test Procedure

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

1) Set span to encompass the entire 26-dB emission bandwidth
2) Set RBW = 1 MHz. Set VBW ≥ 3 MHz.
3) Number of points in sweep ≥ 2 Span / RBW. Sweep time = auto.
4) Detector = RMS (i.e., power averaging)
5) Trace average at least 100 traces in power averaging (i.e., RMS) mode
6) Record the max value

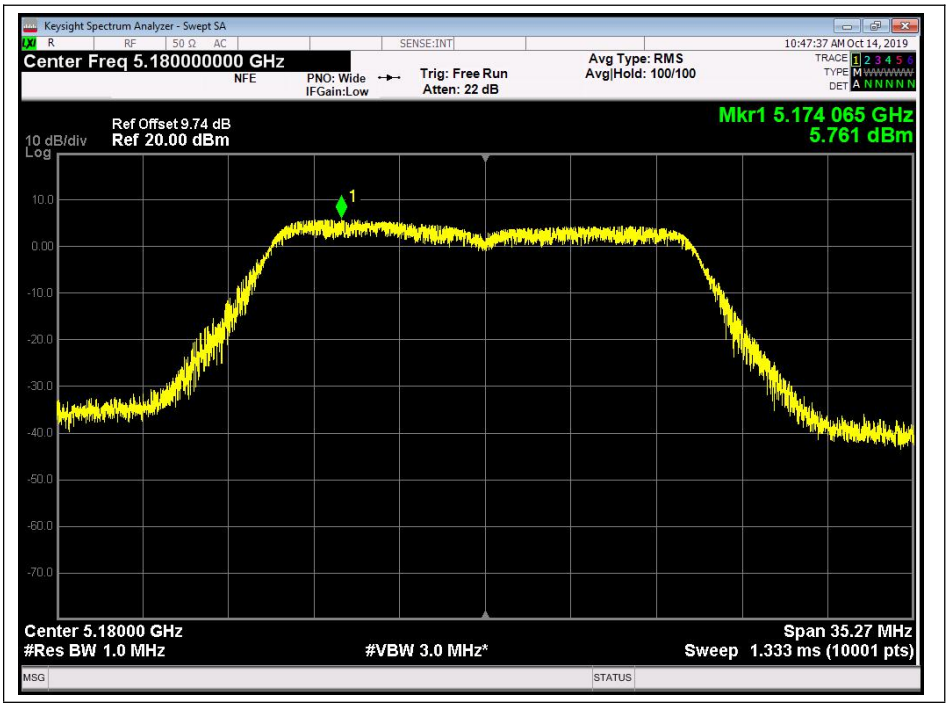
2.4.3. Test Result

802.11ac20 Test mode

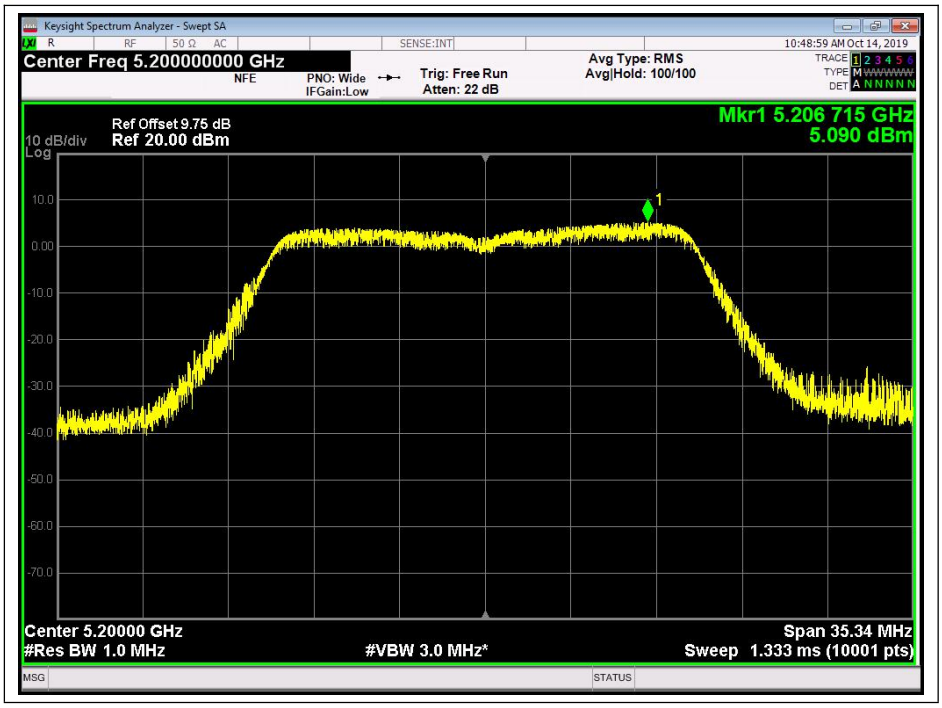
A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)			Limit (dBm/MHz)	Verdict
		ANT0	ANT1	Total		
36	5180	5.761	5.431	8.609	11	PASS
40	5200	5.090	6.473	8.847		
48	5240	6.513	7.076	9.814		
Channel	**Frequency (MHz)**	**Measured PSD (dBm/500KHz)**			**Limit (dBm/500KHz)**	**Verdict**
		ANT0	ANT1	Total		
149	5745	1.728	1.819	4.784	30	PASS
157	5785	2.277	1.031	4.709		
165	5825	-0.319	-0.543	2.581		

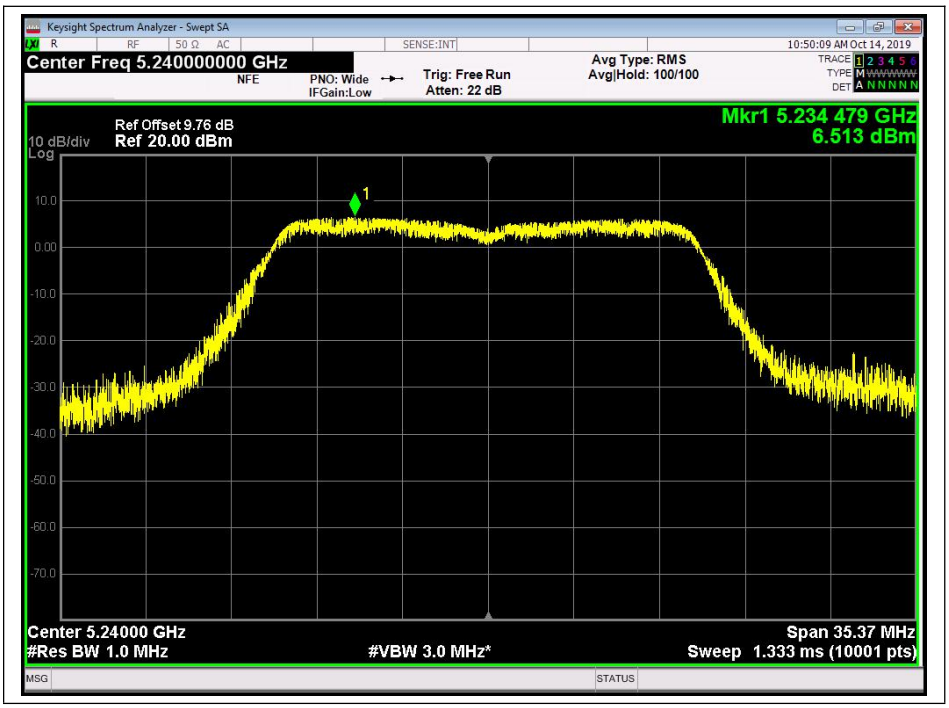
B. Test Plots



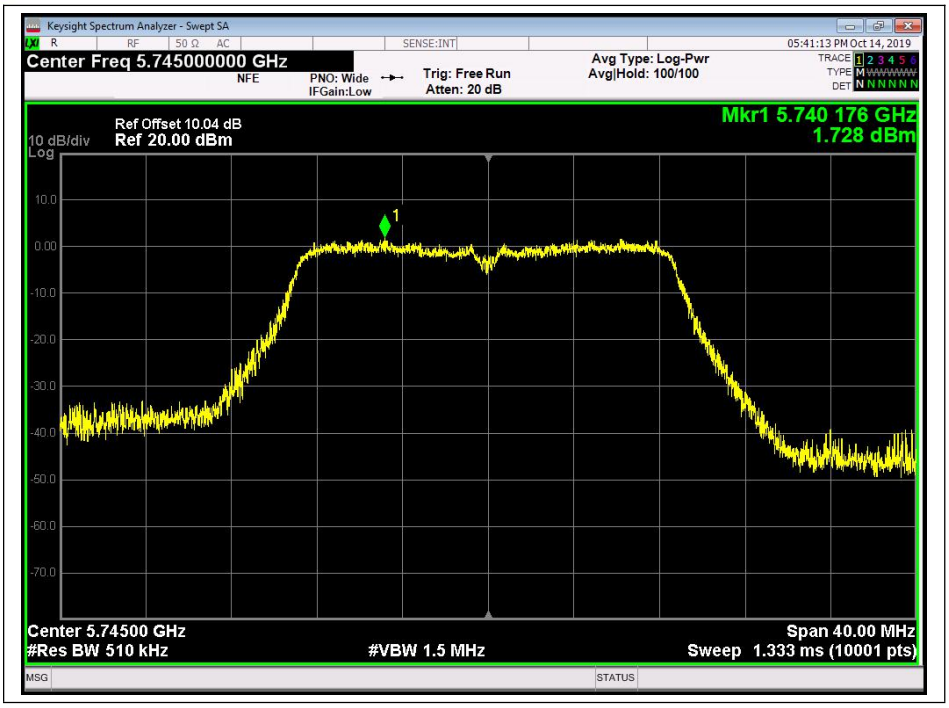
(Channel 36, 5180MHz, 802.11ac,ANT0)



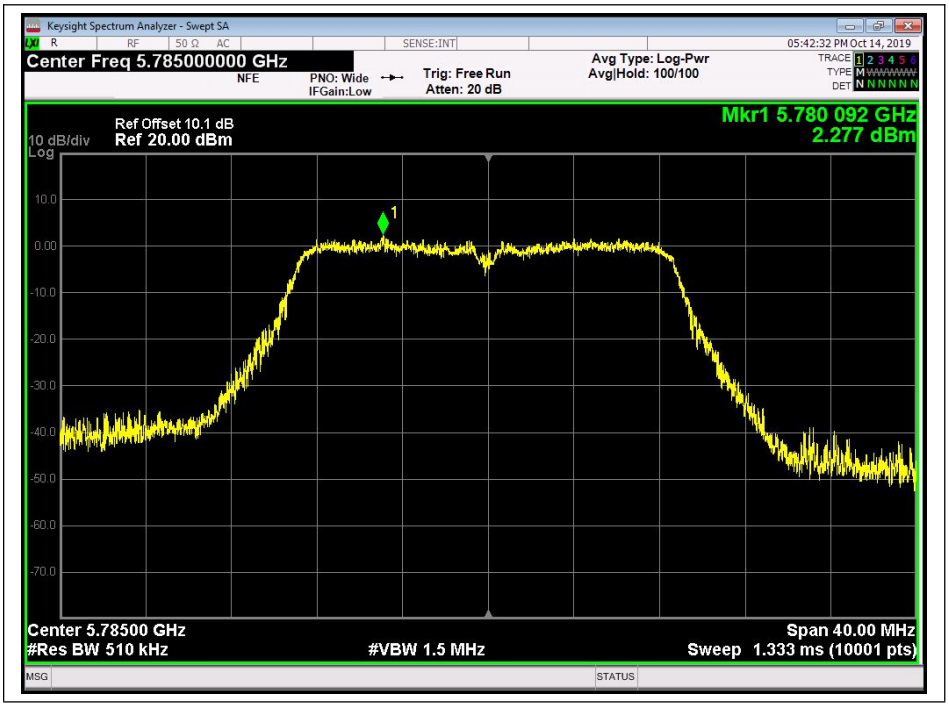
(Channel 40, 5200 MHz, 802.11ac,ANT0)



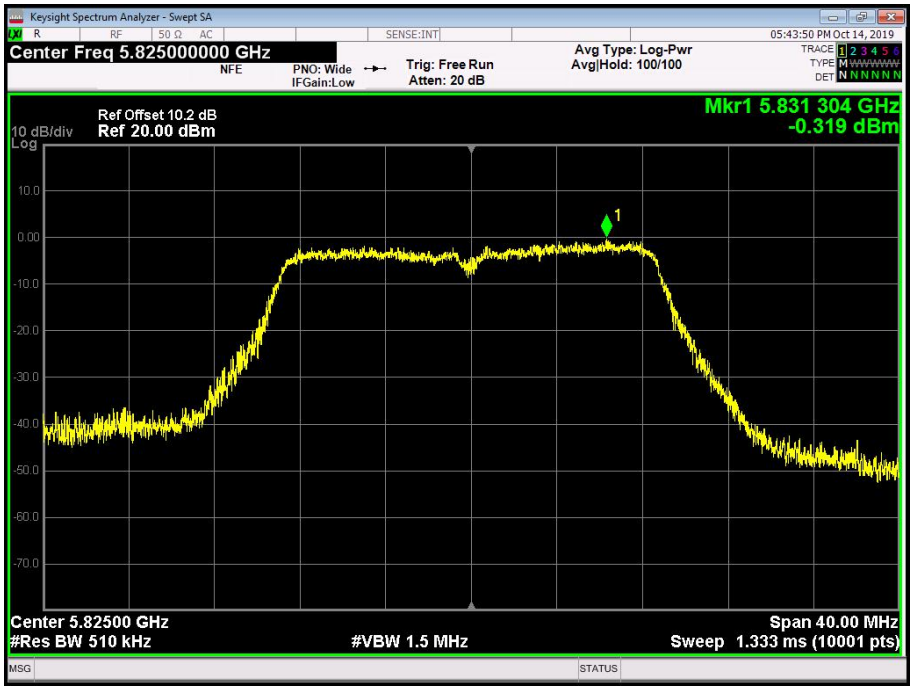
(Channel 48, 5240MHz, 802.11ac,ANT0)



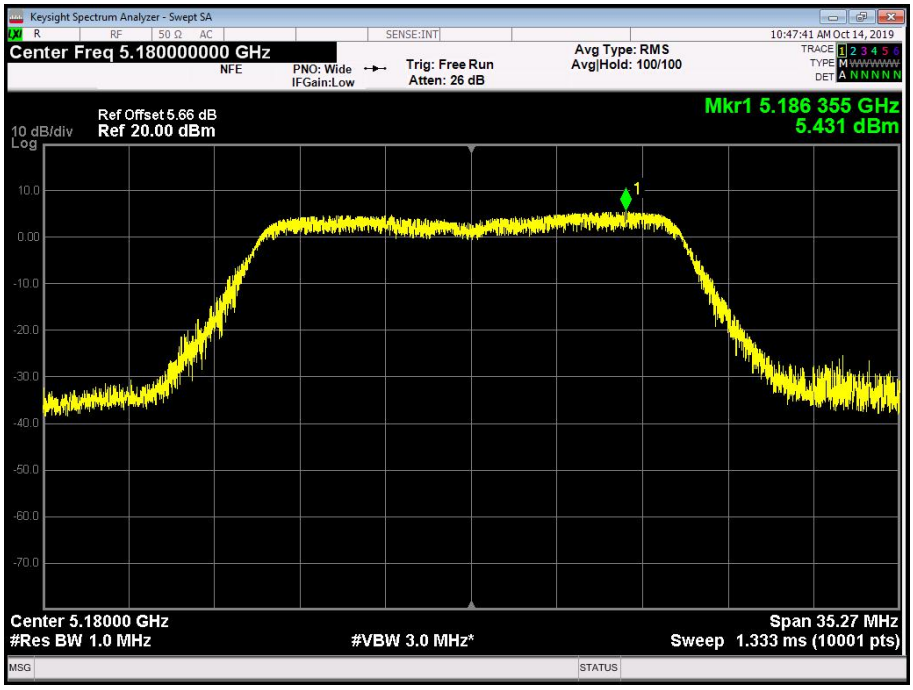
(Channel 149, 5745MHz, 802.11ac,ANT0)



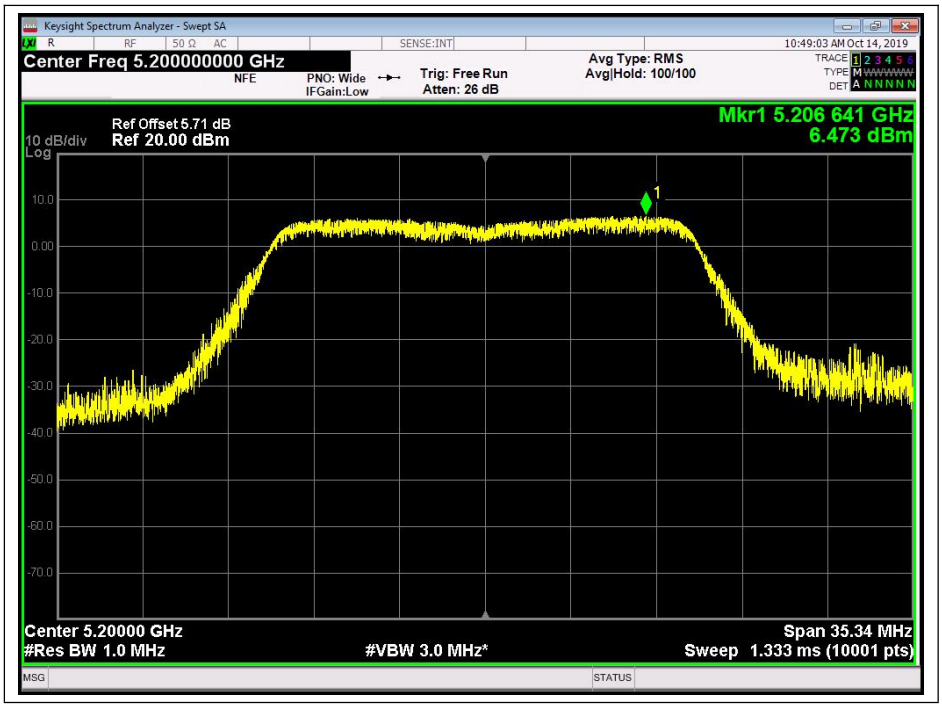
(Channel 157, 5785MHz, 802.11ac,ANT0)



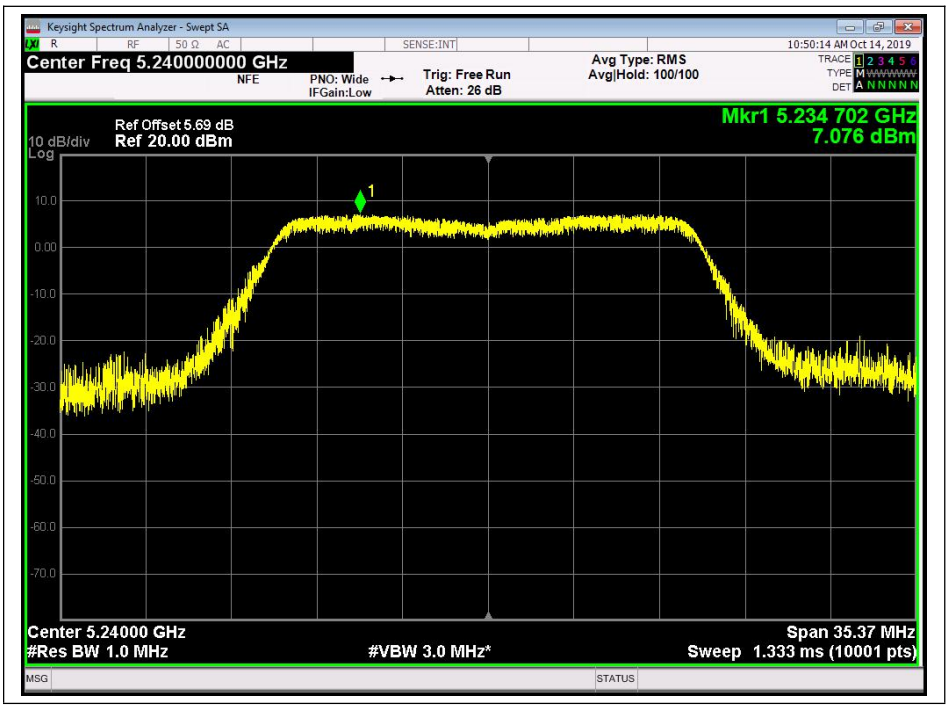
(Channel 165, 5825MHz, 802.11ac,ANT0)



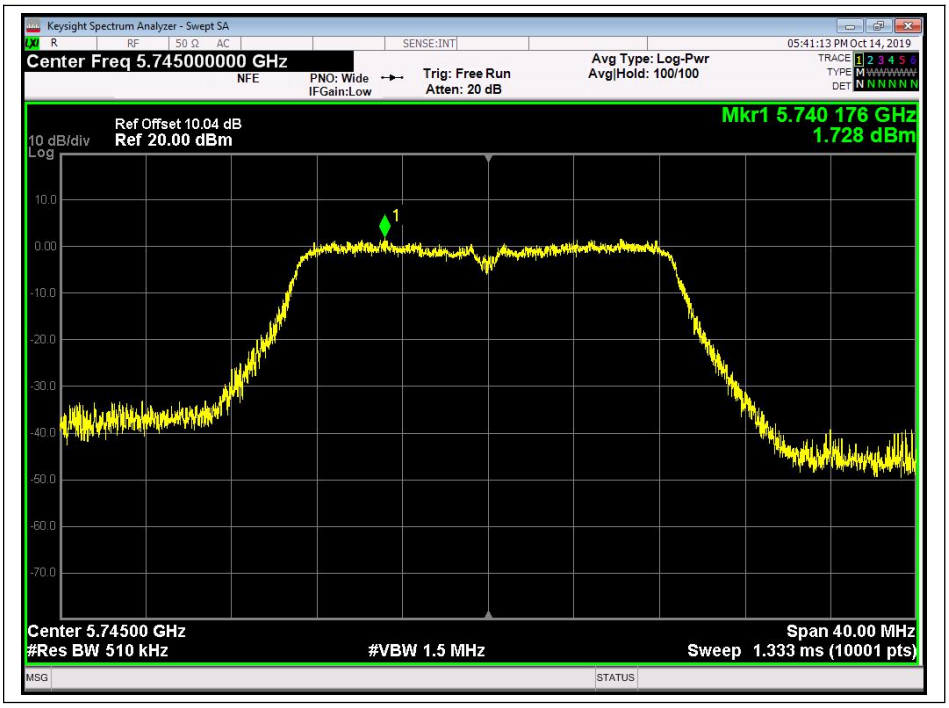
(Channel 36, 5180MHz, 802.11ac,ANT1)



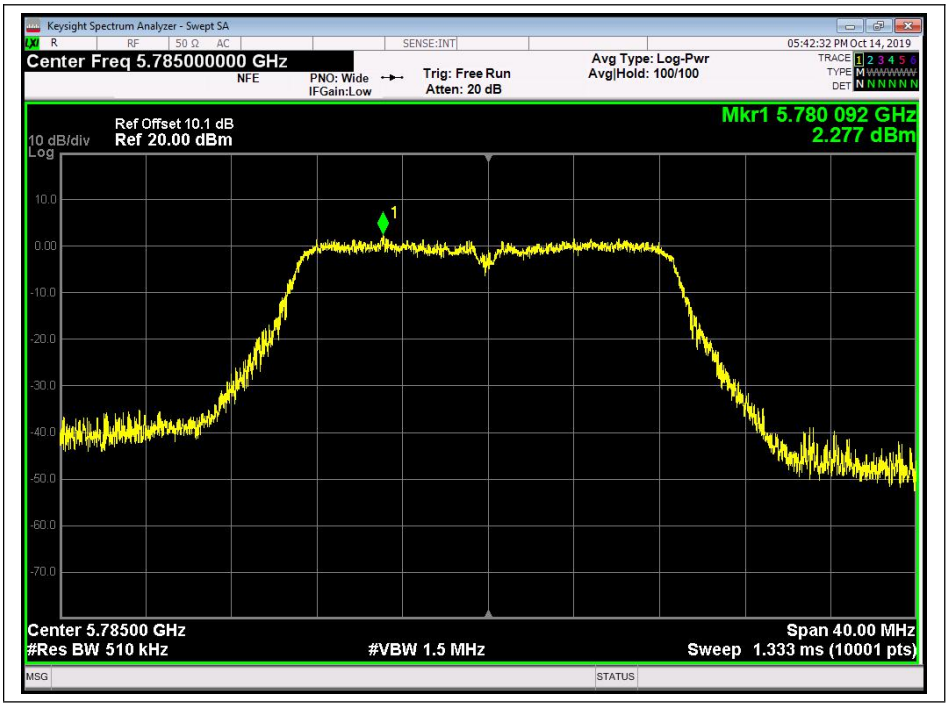
(Channel 40, 5200 MHz, 802.11ac,ANT1)



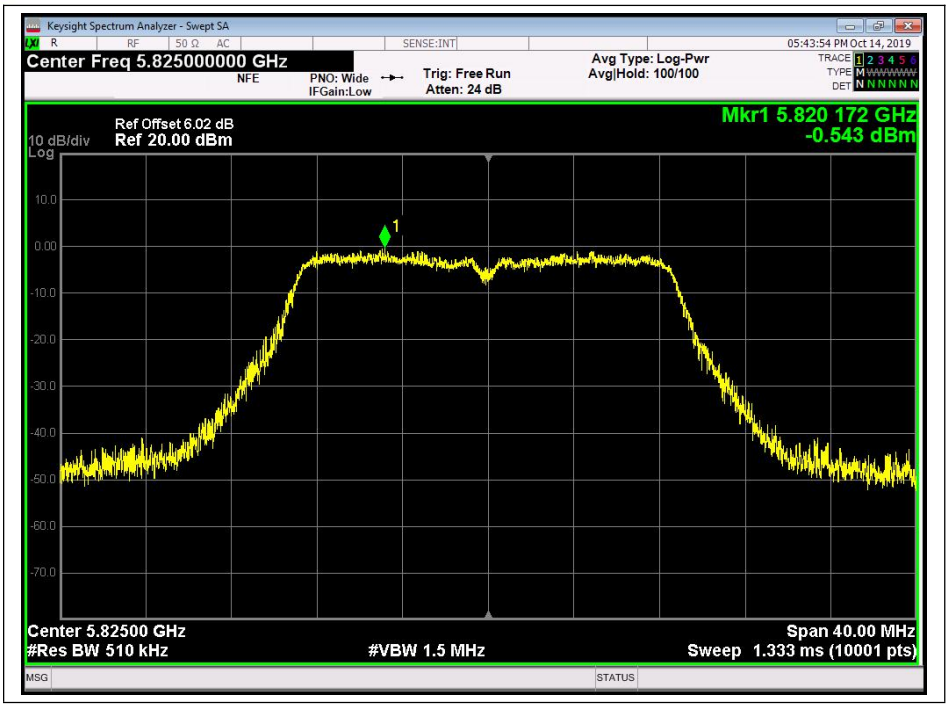
(Channel 48, 5240MHz, 802.11ac,ANT1)



(Channel 149, 5745MHz, 802.11ac,ANT1)



(Channel 157, 5785MHz, 802.11ac,ANT1)



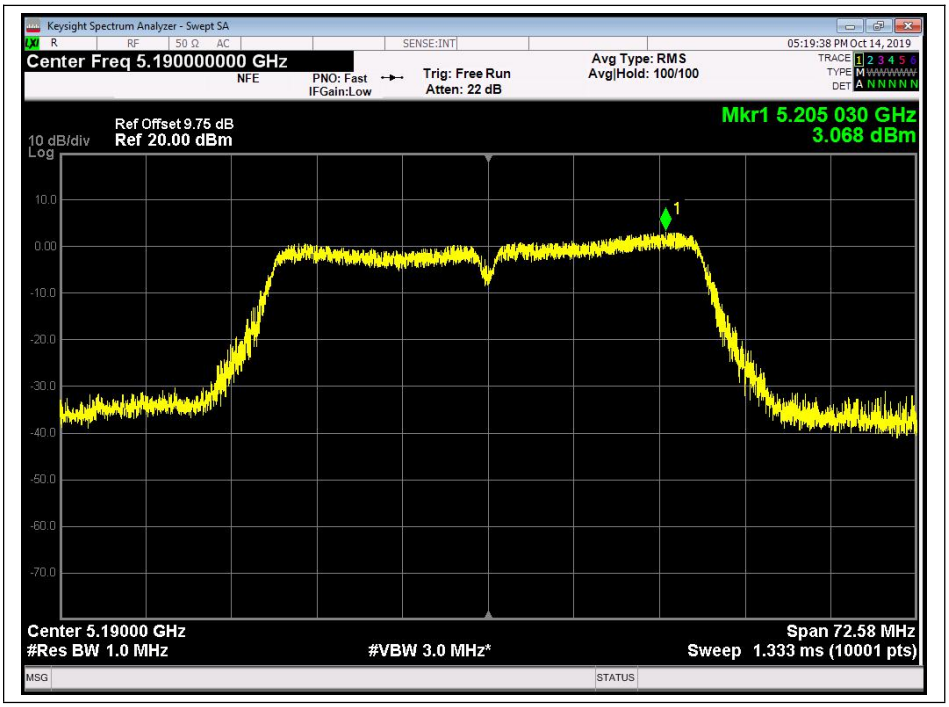
(Channel 165, 5825MHz, 802.11ac,ANT1)

802.11ac (HT40) Test mode

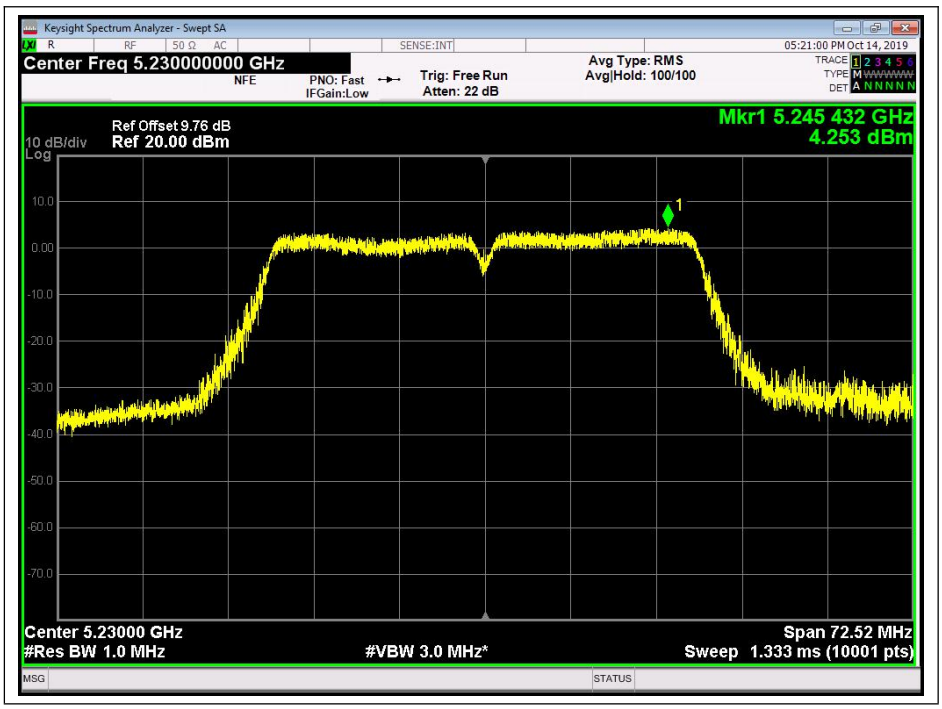
A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)			Limit (dBm/MHz)	Verdict
		ANT0	ANT1	Total		
38	5190	3.068	2.122	5.631	11	PASS
46	5230	4.253	3.078	6.715		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)			Limit (dBm/500KHz)	Verdict
		ANT0	ANT1	Total		
151	5755	-0.692	-0.883	2.224	30	PASS
159	5795	-1.042	1.534	1.729		

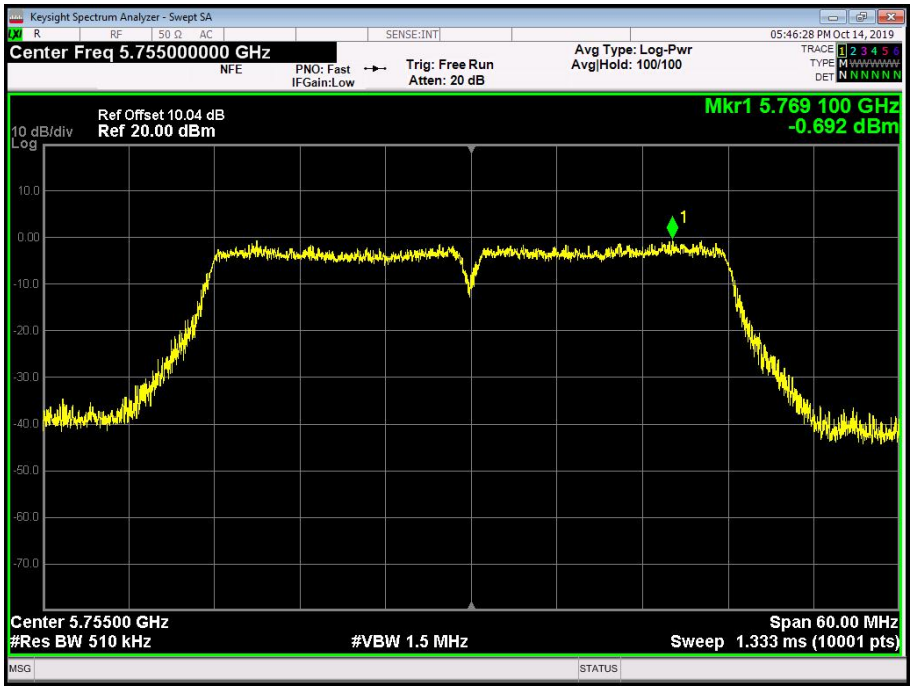
B. Test Plots



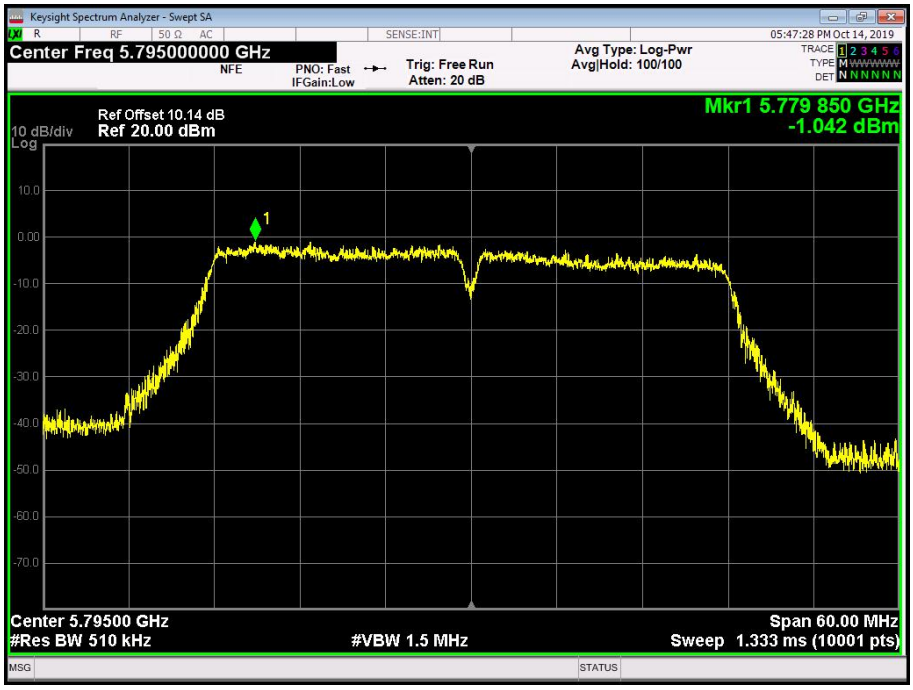
(Channel 38, 5190MHz, 802.11ac (HT40),ANT0)



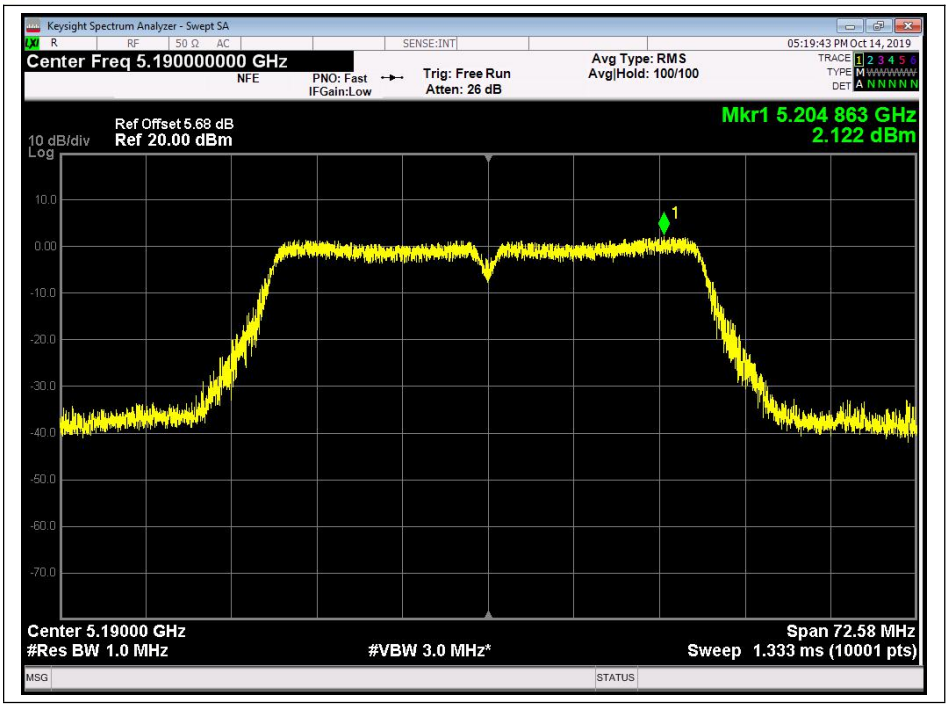
(Channel 46, 5230 MHz, 802.11ac (HT40),ANT0)



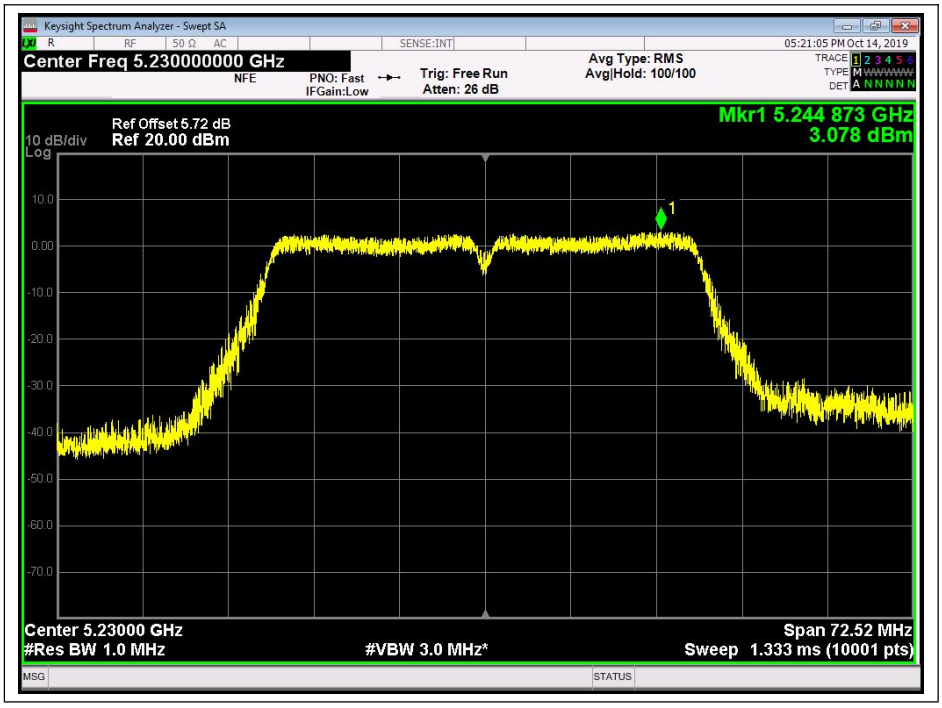
(Channel 151, 5755 MHz, 802.11ac (HT40),ANT0)



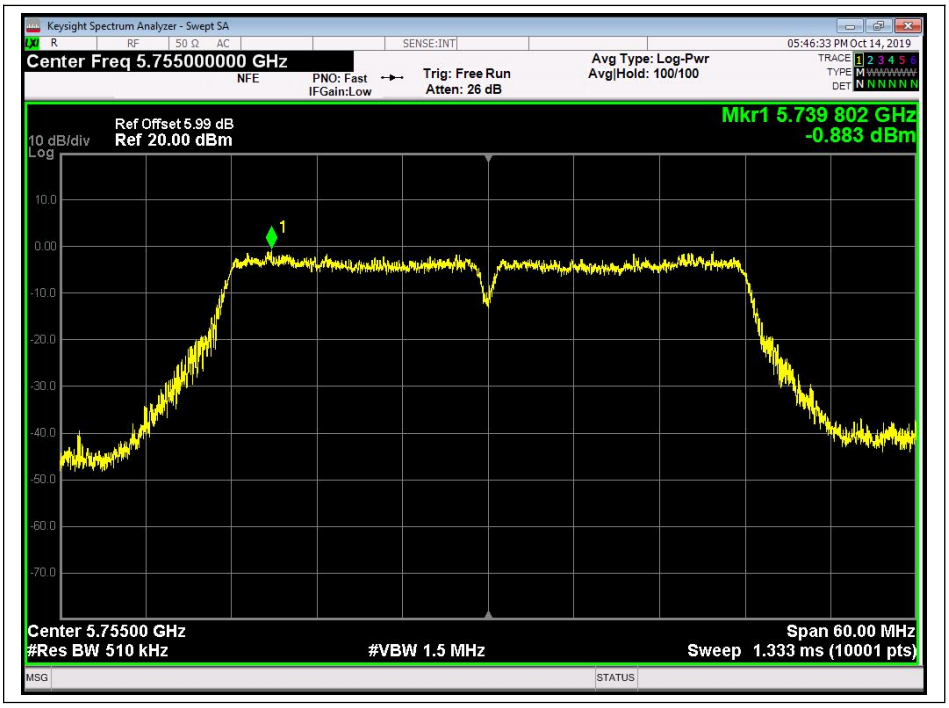
(Channel 159, 5795MHz, 802.11ac (HT40),ANT0)



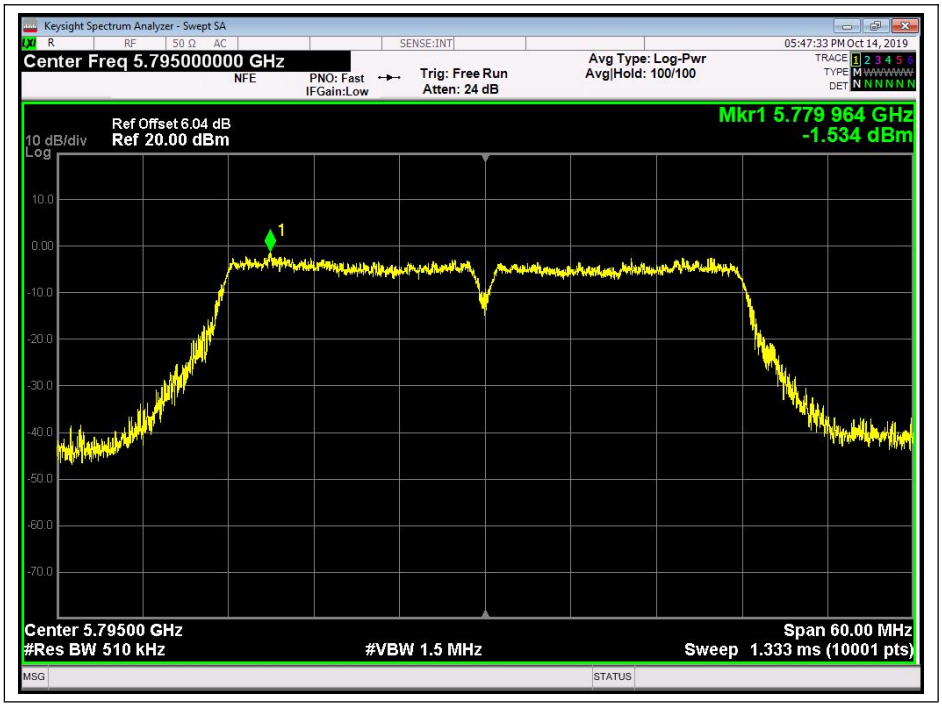
(Channel 38, 5190MHz, 802.11ac (HT40),ANT1)



(Channel 46, 5230 MHz, 802.11ac (HT40),ANT1)



(Channel 151, 5755 MHz, 802.11ac (HT40),ANT1)



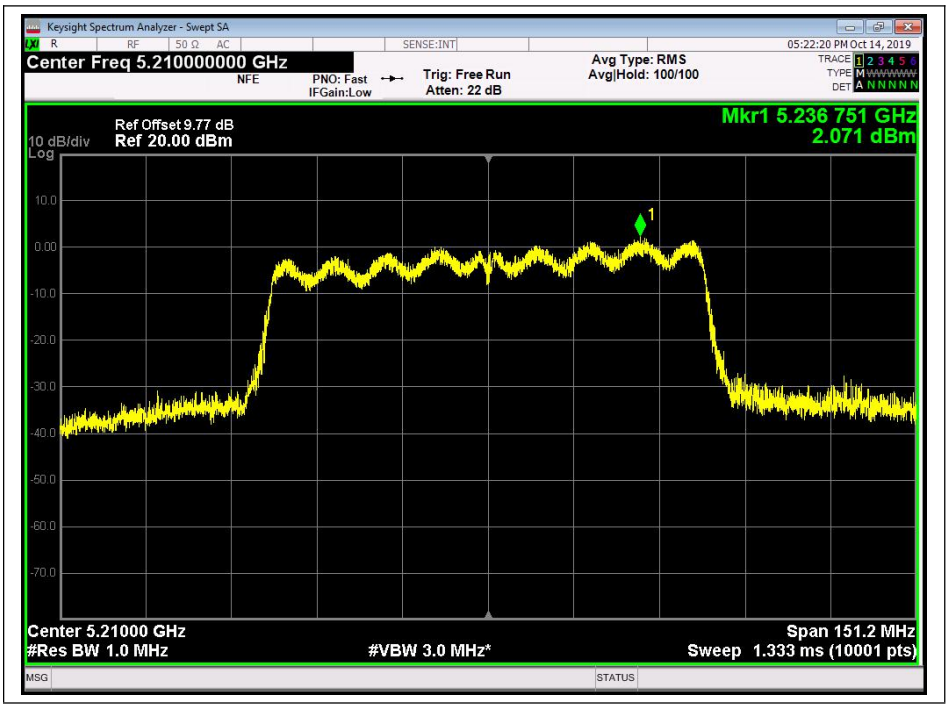
(Channel 159, 5795MHz, 802.11ac (HT40),ANT1)

802.11ac (HT80) Test mode

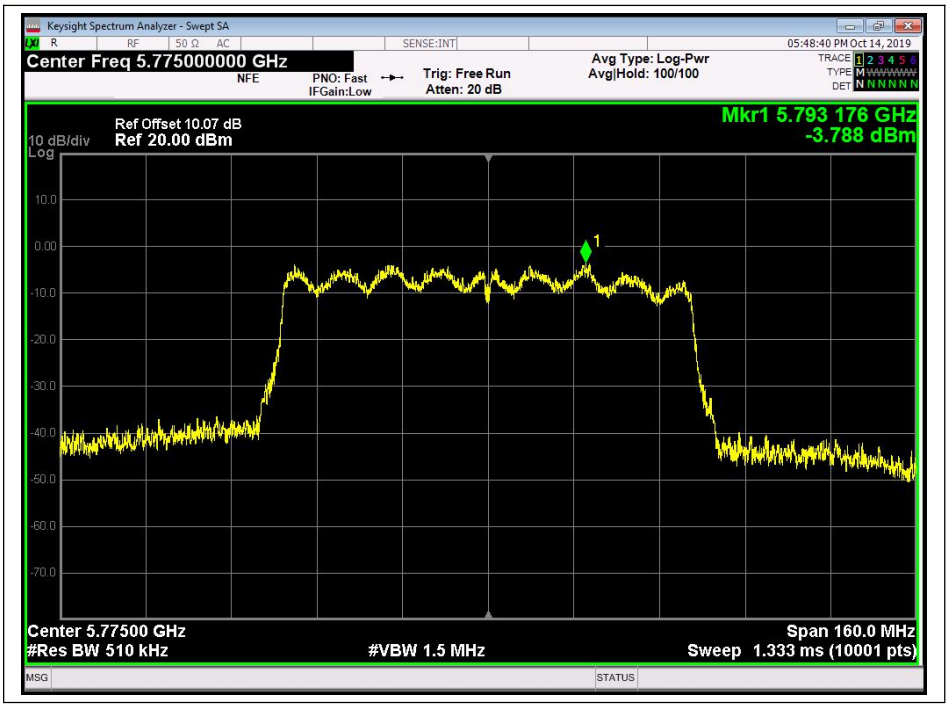
C. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)			Limit (dBm/MHz)	Verdict
		ANT0	ANT1	Total		
42	5210	2.071	0.981	4.570	11	PASS
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)			Limit (dBm/500KHz)	Verdict
		ANT0	ANT1	Total		
155	5775	-3.788	-3.805	-0.786	30	PASS

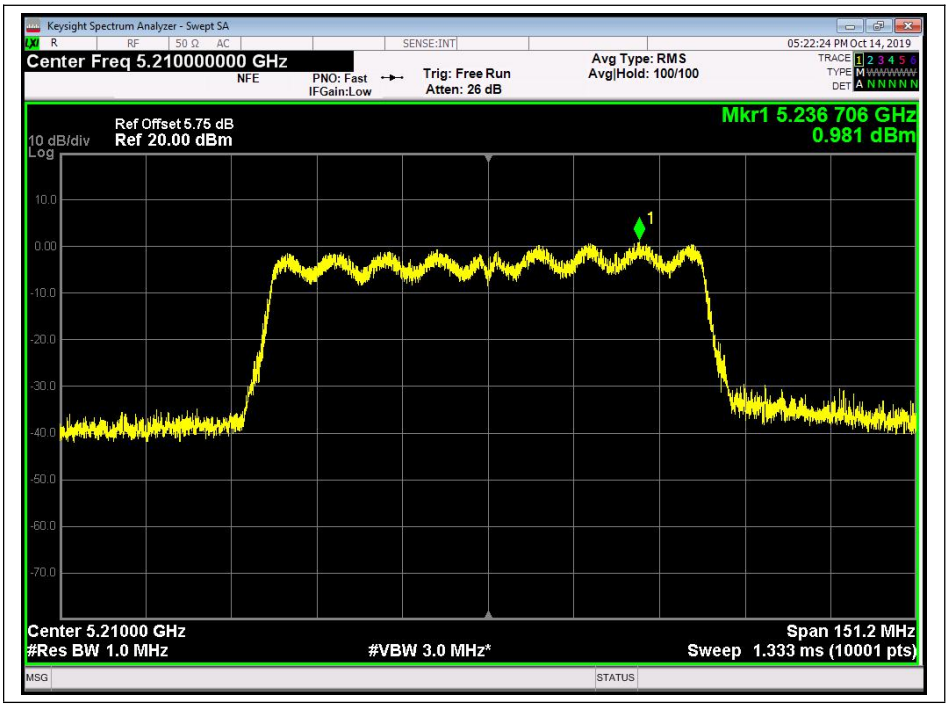
D. Test Plots



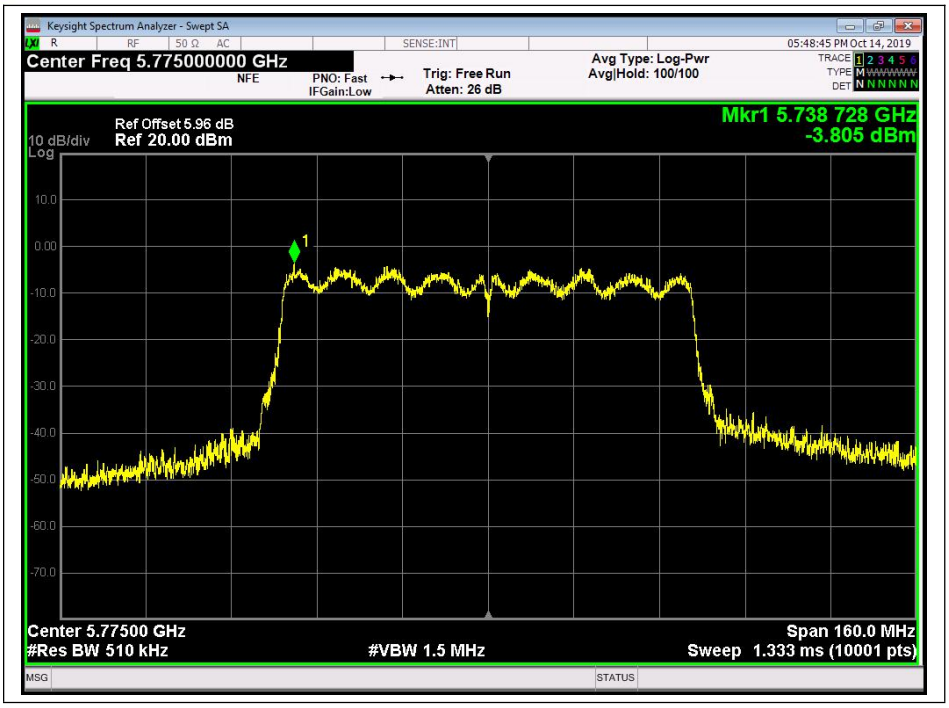
(Channel 42, 5210MHz, 802.11ac (HT80),ANT0)



(Channel 155, 5775MHz, 802.11ac (HT80),ANT0)



(Channel 42, 5210MHz, 802.11ac (HT80),ANT1)



(Channel 155, 5775MHz, 802.11ac (HT80),ANT1)

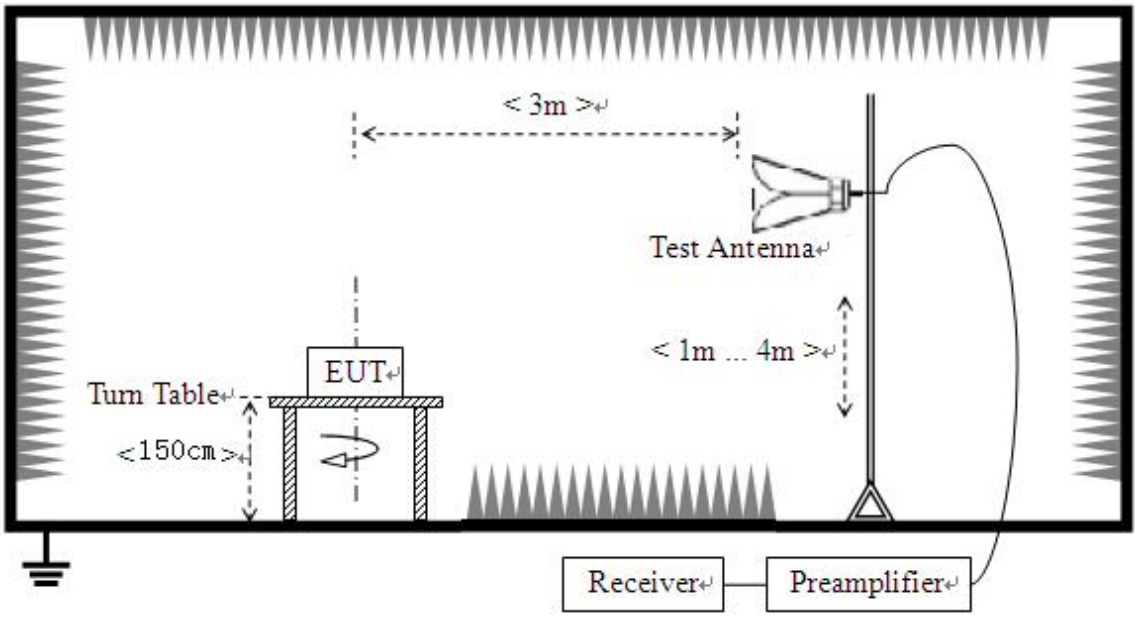
2.5. Restricted Frequency Bands

2.5.1. Requirement

According to FCC section 15.407(b)(7), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.5.2. Test Description

A. Test Setup



The Module 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.
For Radiated emission above 30MHz
a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

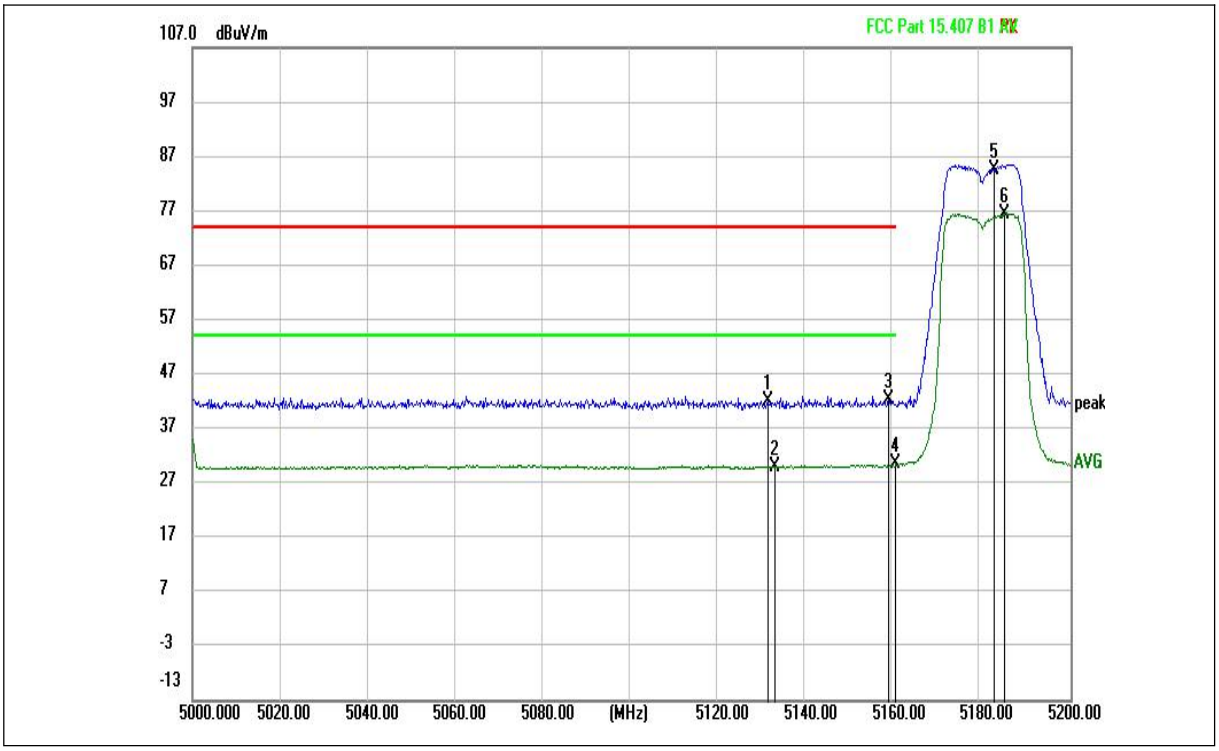
f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasipeak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

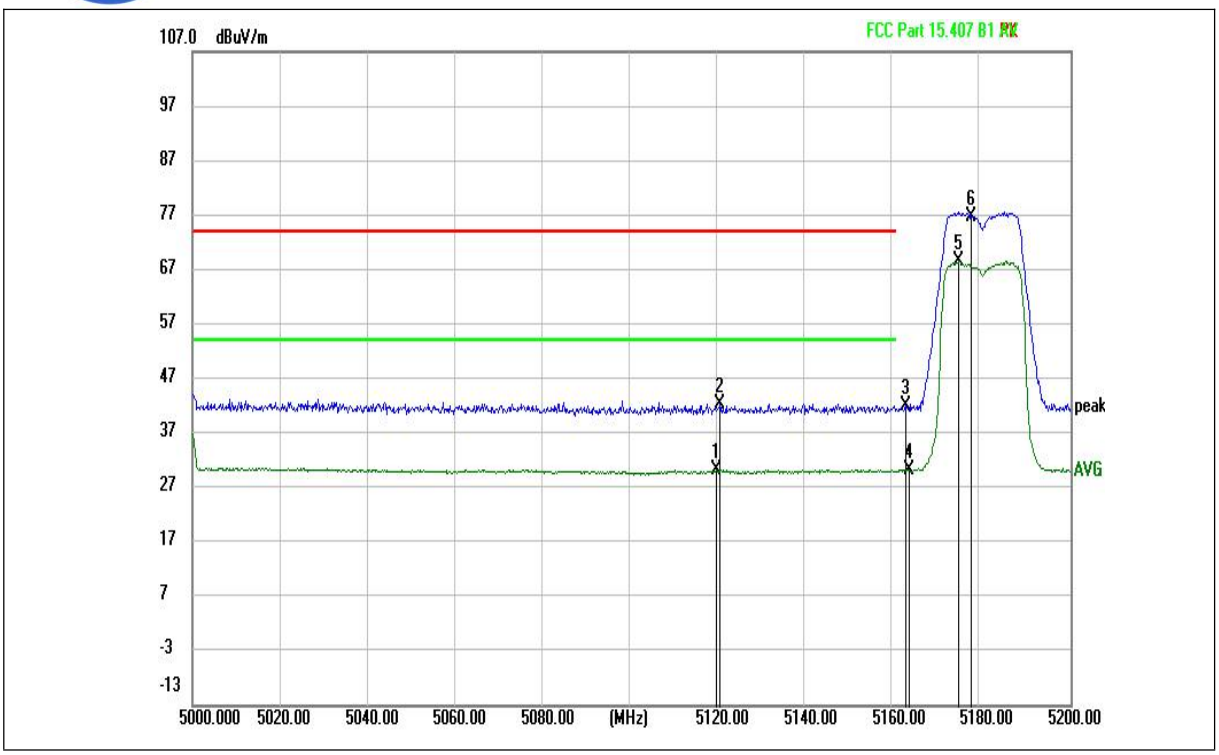
2.5.3. Test Result

802.11ac20 Test mode



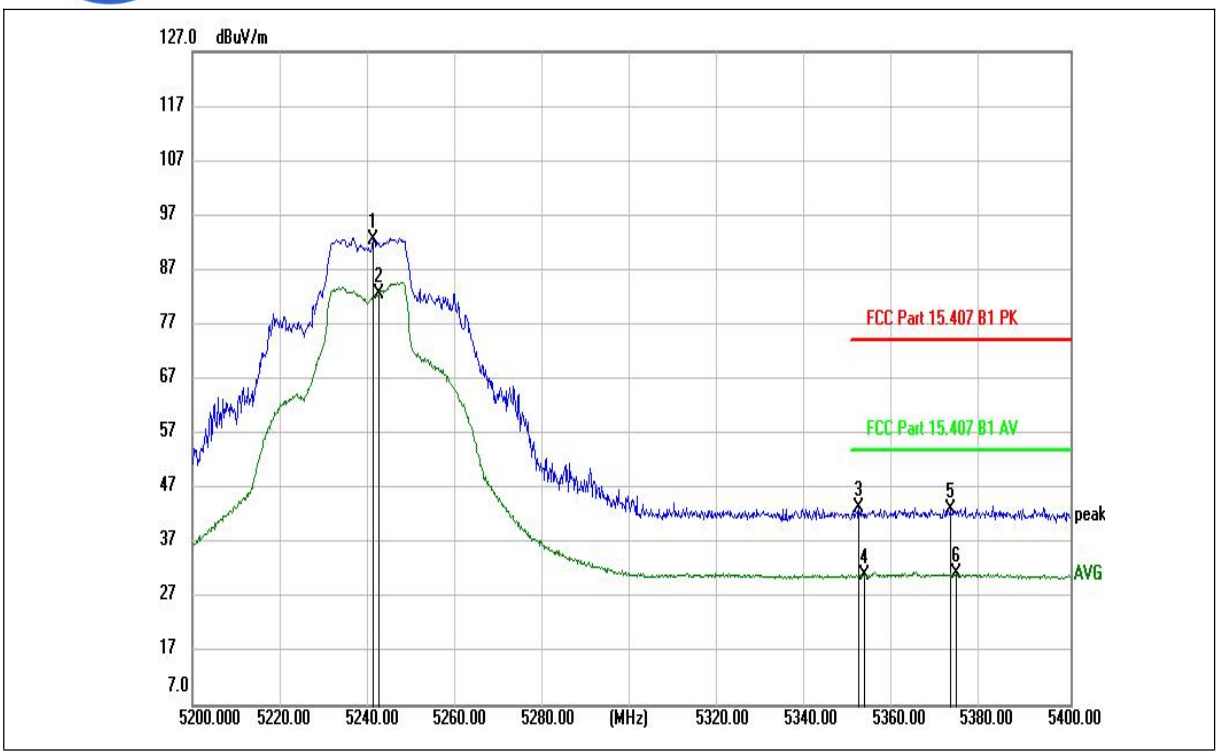
(802.11ac _5180MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5131.000	42.02	---	74.00	31.98	H	-3.15
5132.800	---	30.09	54.00	23.91	H	-3.15
5158.600	42.44	---	74.00	31.56	H	-3.14
5160.200	---	30.64	---	---	H	-3.12
5182.600	84.66	---	---	---	H	-3.04
5185.000	---	76.31	---	---	H	-3.03



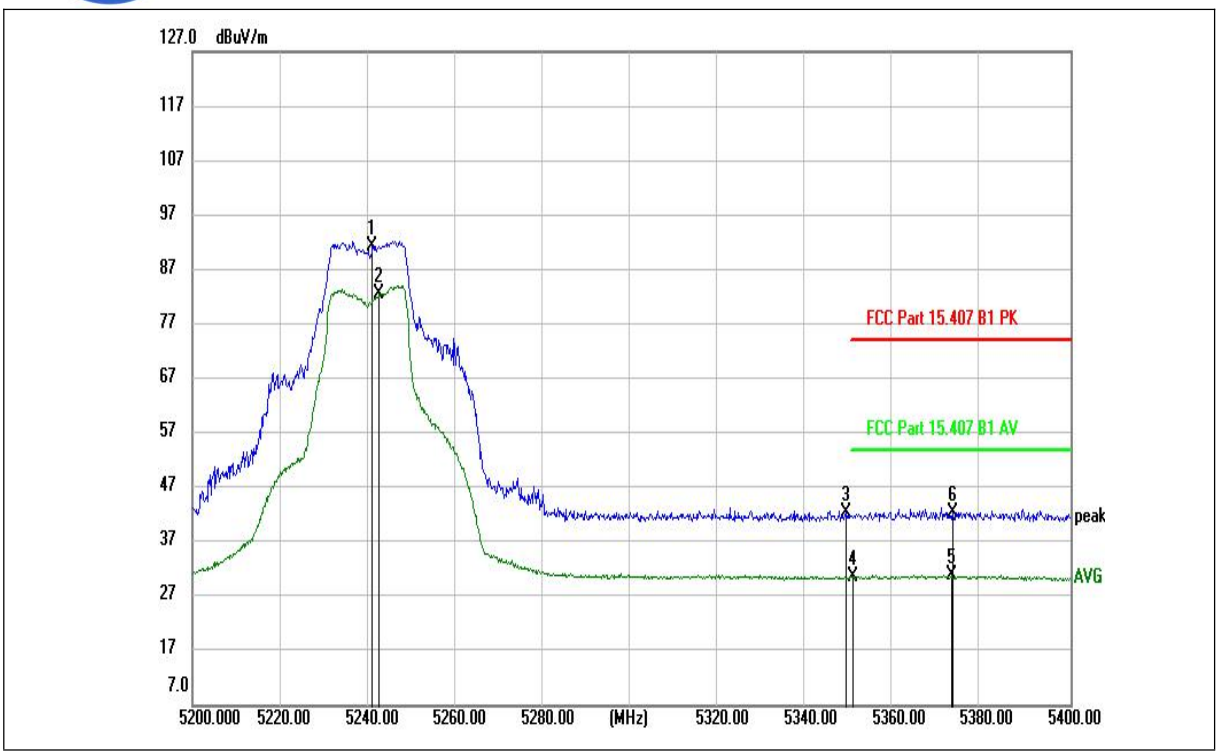
(802.11ac _5180MHz, Antenna Vertical)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5119.400	---	30.18	54.00	23.82	V	-3.09
5120.200	42.42	---	74.00	31.58	V	-3.09
5162.400	42.00	---	---	---	V	-3.09
5163.200	---	30.35	---	---	V	-3.09
5174.400	---	68.51	---	---	V	-3.05
5177.400	76.79	---	---	---	V	-3.04



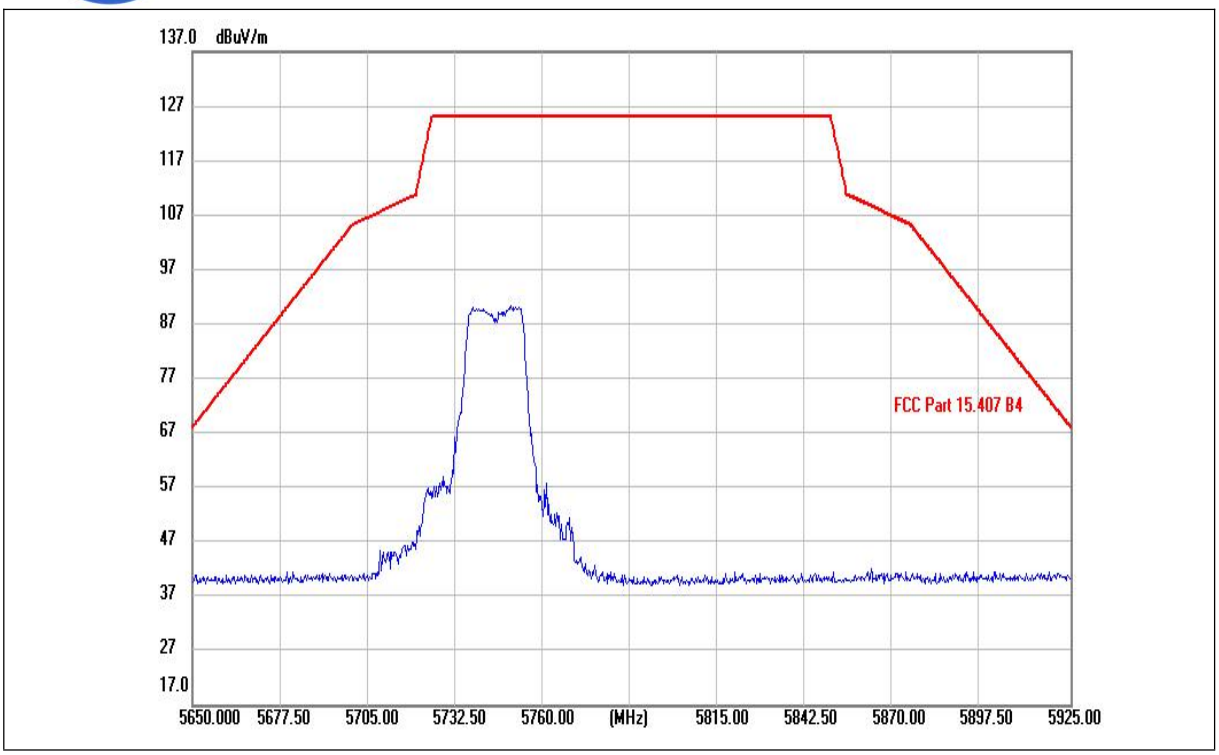
(802.11ac _5240MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5241.200	92.38	---	---	---	H	-3.06
5242.400	---	82.59	---	---	H	-3.07
5351.800	43.37	---	74.00	30.63	H	-2.54
5353.200	---	31.09	54.00	22.91	H	-2.51
5372.600	43.12	---	74.00	30.88	H	-2.24
5374.000	---	31.24	54.00	22.76	H	-2.22

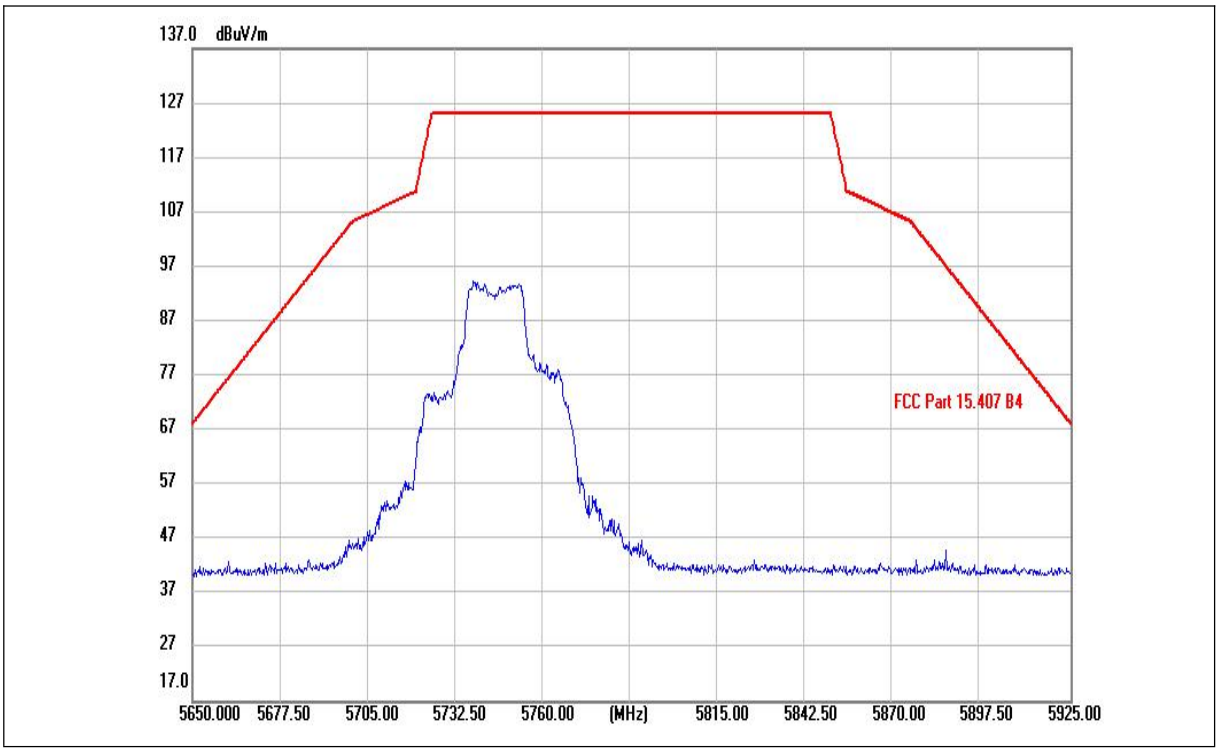


(802.11ac _5240MHz, Antenna Vertical)

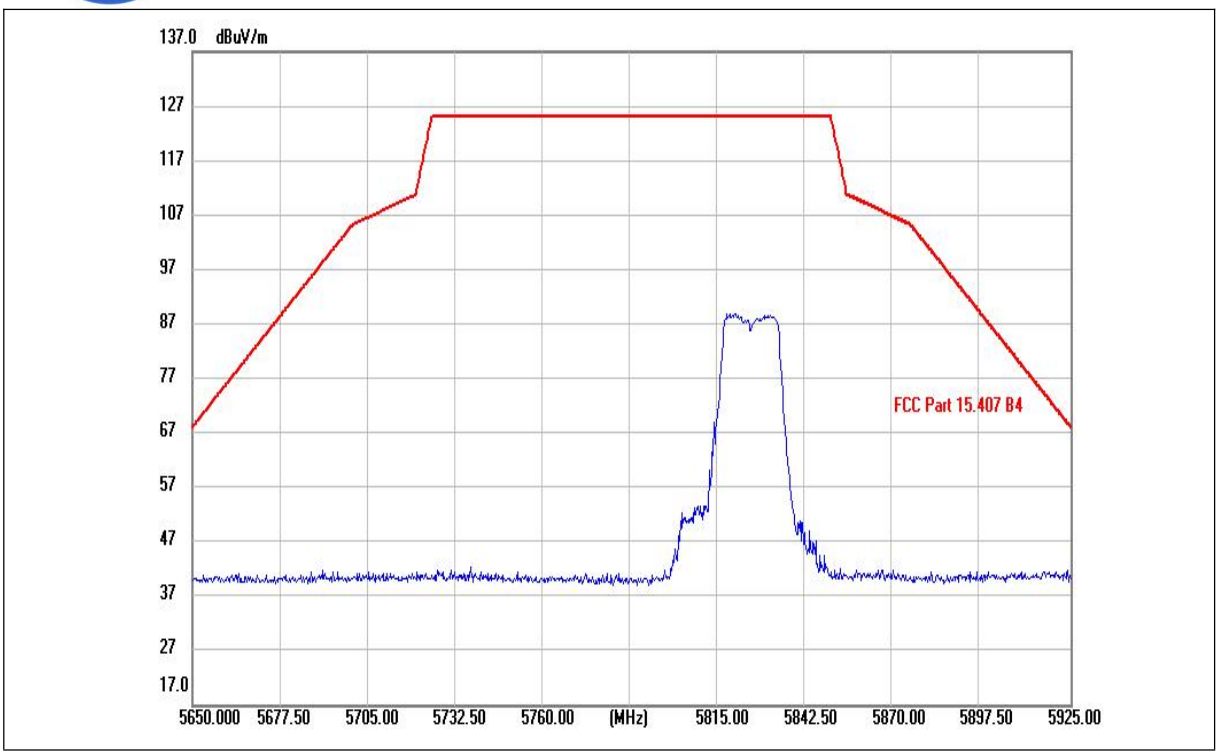
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5241.000	91.24	---	---	---	V	-3.06
5242.600	---	82.41	---	---	V	-3.07
5349.000	42.31	---	---	---	V	-2.57
5350.400	---	30.74	54.00	23.26	V	-2.56
5373.000	---	30.91	54.00	23.09	V	-2.23
5373.200	42.56	---	74.00	31.44	V	-2.23



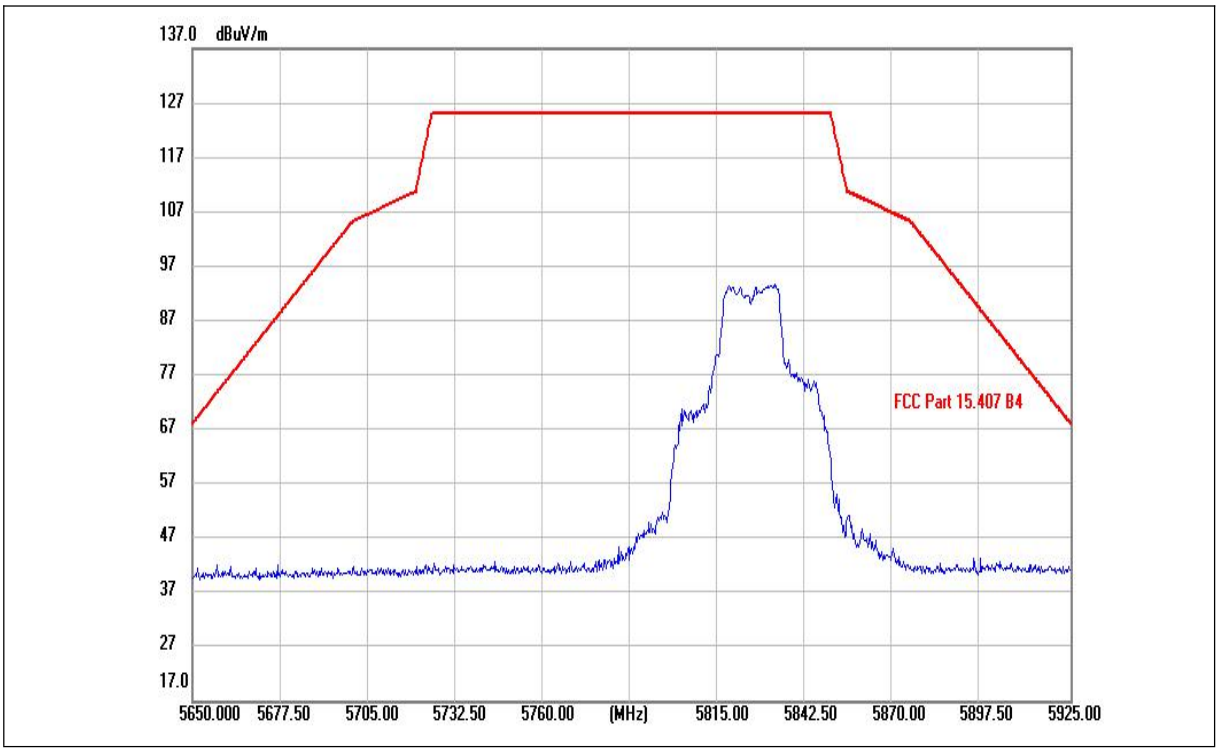
(802.11ac _5745MHz, Antenna Horizontal)



(802.11ac _5745MHz, Antenna Vertical)

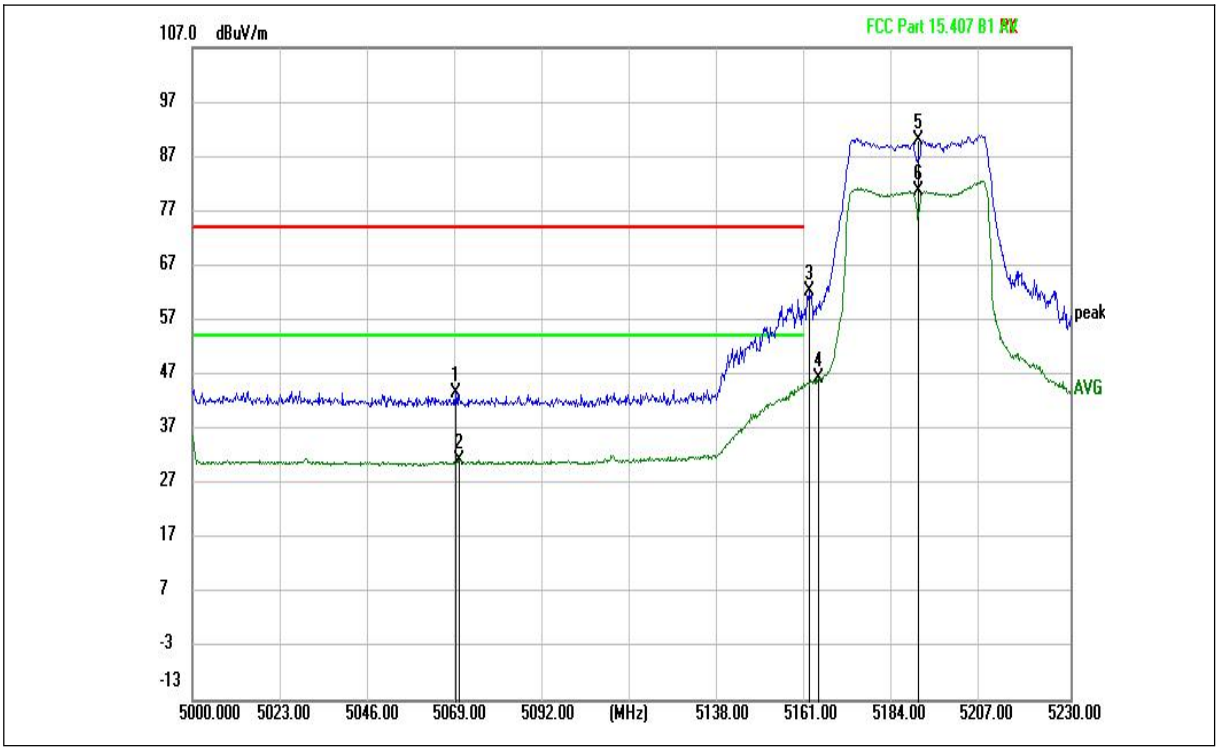


(802.11ac _5825MHz, Antenna Horizontal)



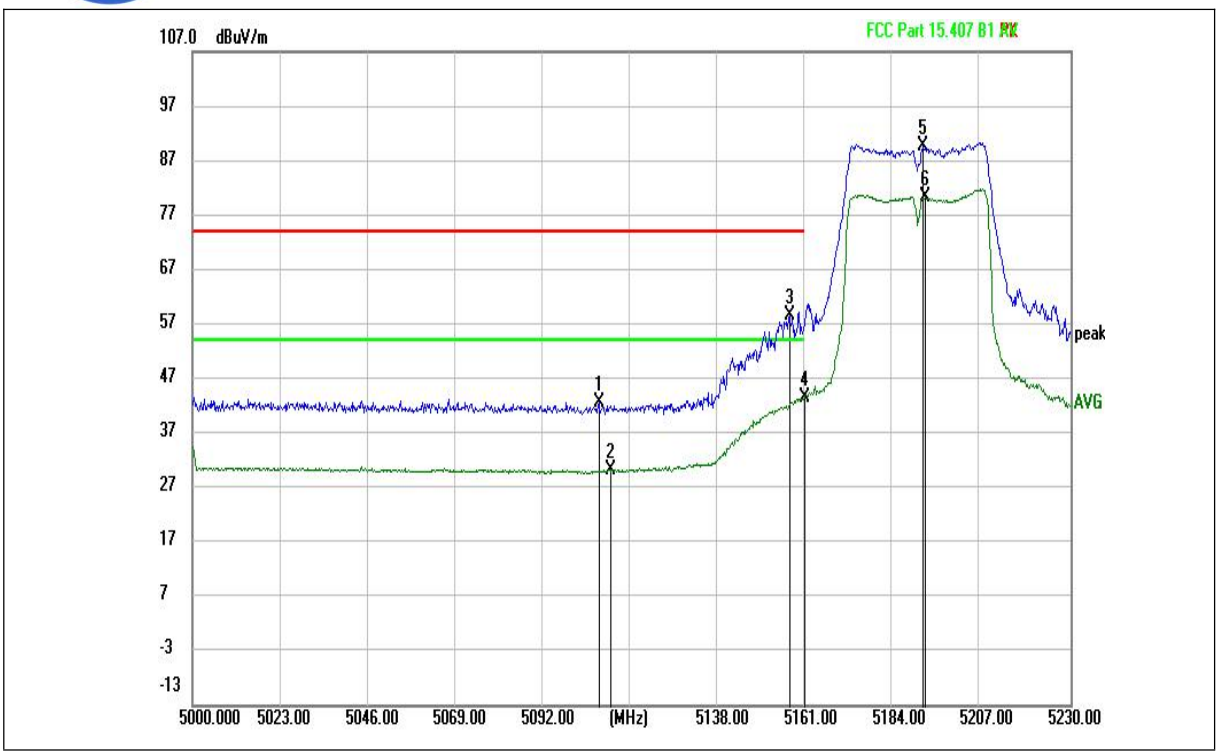
(802.11ac _5825MHz, Antenna Vertical)

802.11ac (HT40) Test mode



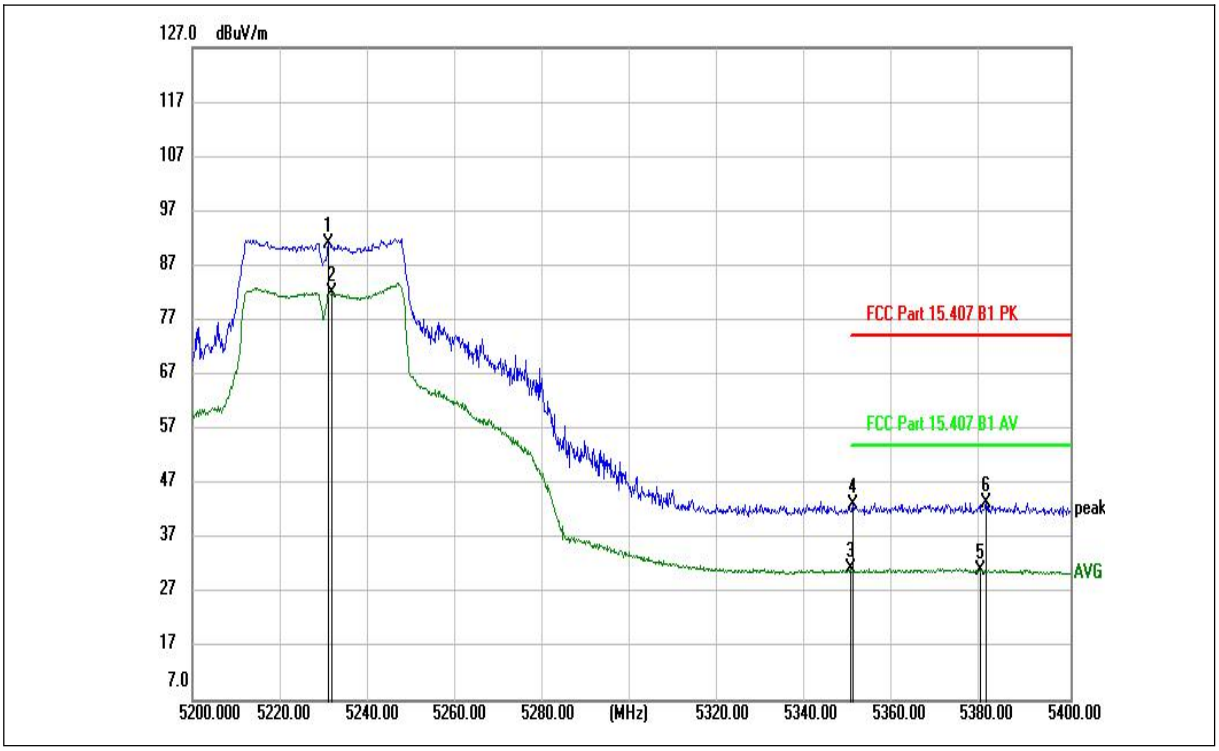
(802.11ac (HT40) _5190MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5069.000	43.68	---	74.00	30.32	H	-2.96
5069.920	---	31.20	54.00	22.80	H	-2.96
5161.690	62.32	---	---	---	H	-3.10
5163.990	---	46.27	---	---	H	-3.08
5190.000	89.98	---	---	---	H	-3.02
5190.000	---	80.65	---	---	H	-3.02



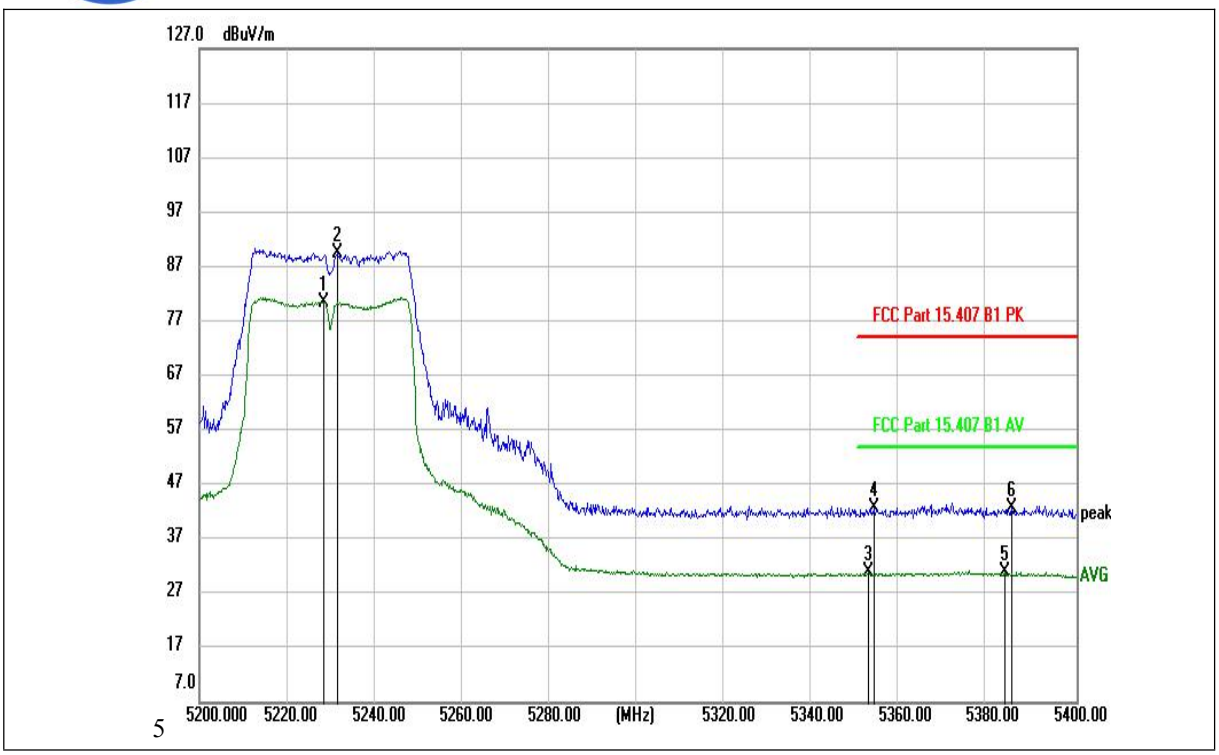
(802.11ac (HT40) _5190MHz, Antenna Vertical)

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5106.490	42.53	---	74.00	31.47	V	-3.04
5109.710	---	30.34	54.00	23.66	V	-3.05
5156.400	58.75	---	74.00	15.25	V	-3.16
5160.310	---	43.65	---	---	V	-3.12
5191.360	89.54	---	---	---	V	-3.02
5191.820	---	43.65	---	---	V	-3.01



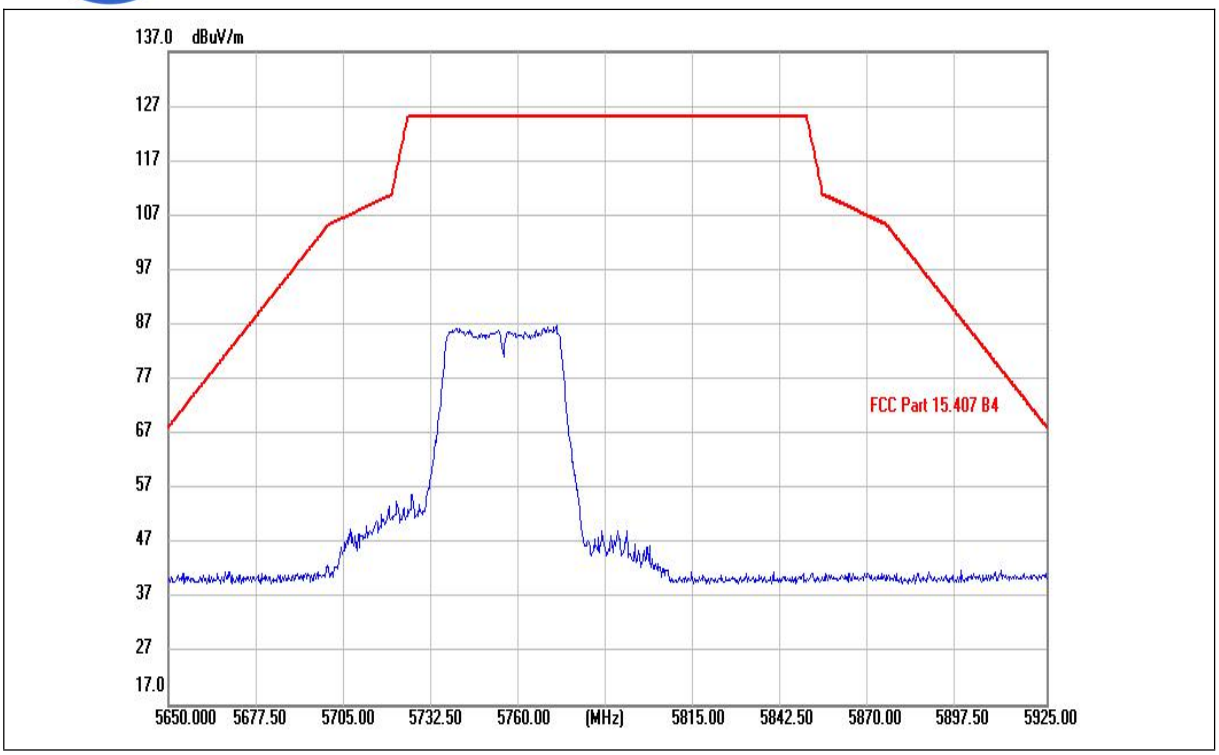
(802.11ac (HT40) _5230MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5231.000	91.11	---	---	---	H	-3.01
5231.800	---	82.03	---	---	H	-3.00
5350.000	---	31.21	54.00	22.79	H	-2.56
5350.400	42.88	---	74.00	31.12	H	-2.56
5379.600	---	31.01	54.00	22.99	H	-2.28
5380.800	43.22	---	74.00	30.78	H	-2.29

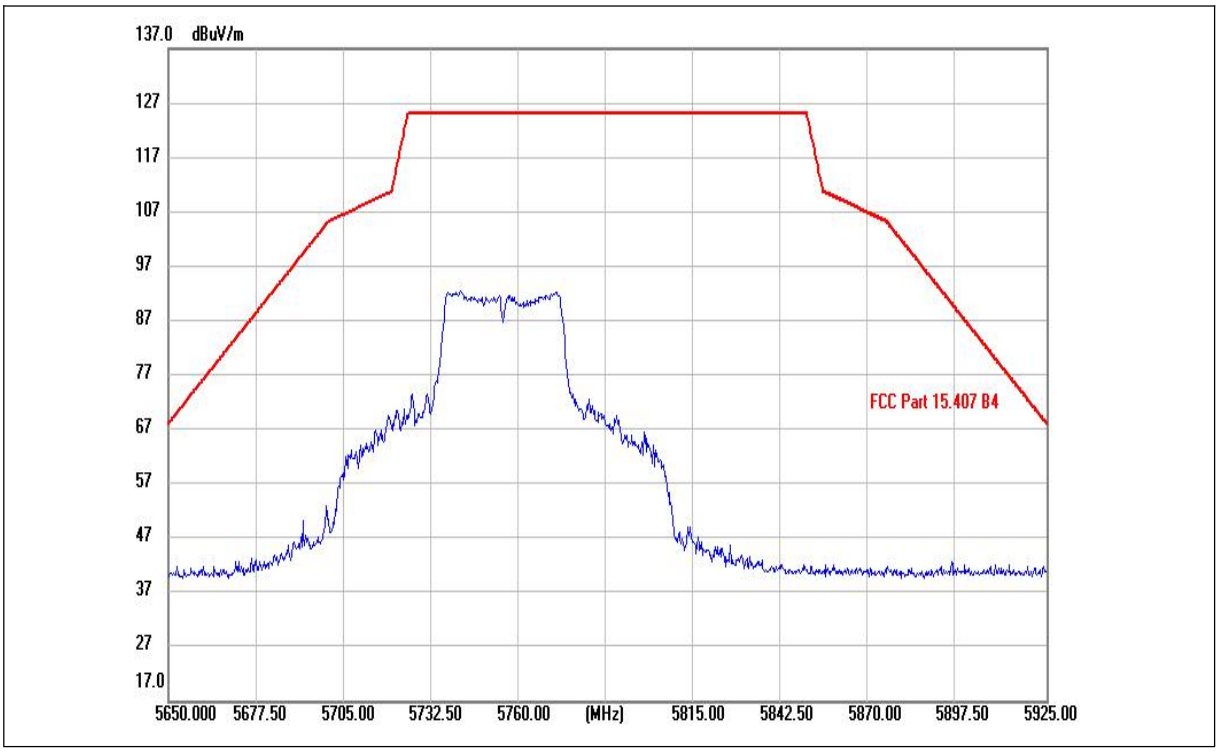


(802.11ac (HT40) _5230MHz, Antenna Vertical)

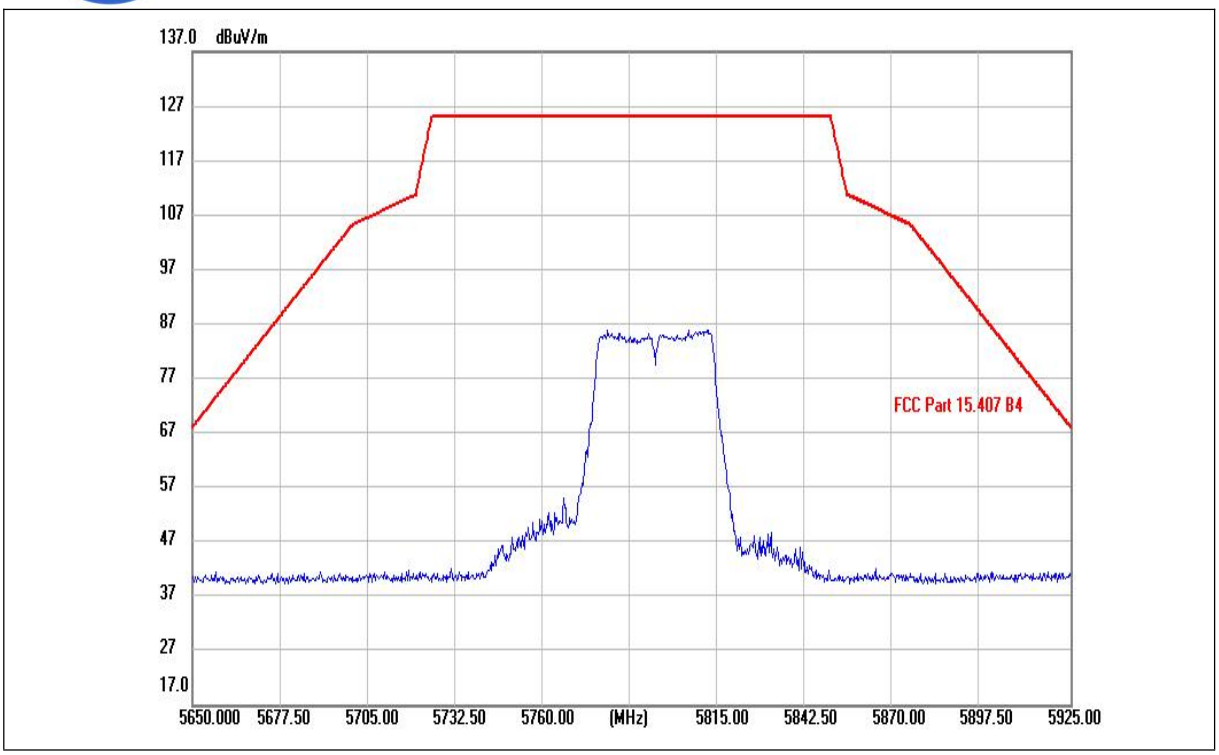
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5230.900000	98.35	---	---	---	V	-3.0
5230.900000	---	86.32	---	---	V	-3.0
5350.700000	52.26	---	74.00	21.74	V	-2.5
5350.700000	---	39.71	54.00	14.29	V	-2.5
5371.950000	---	33.71	54.00	20.29	V	-2.3
5371.950000	46.12	---	74.00	27.88	V	-2.3



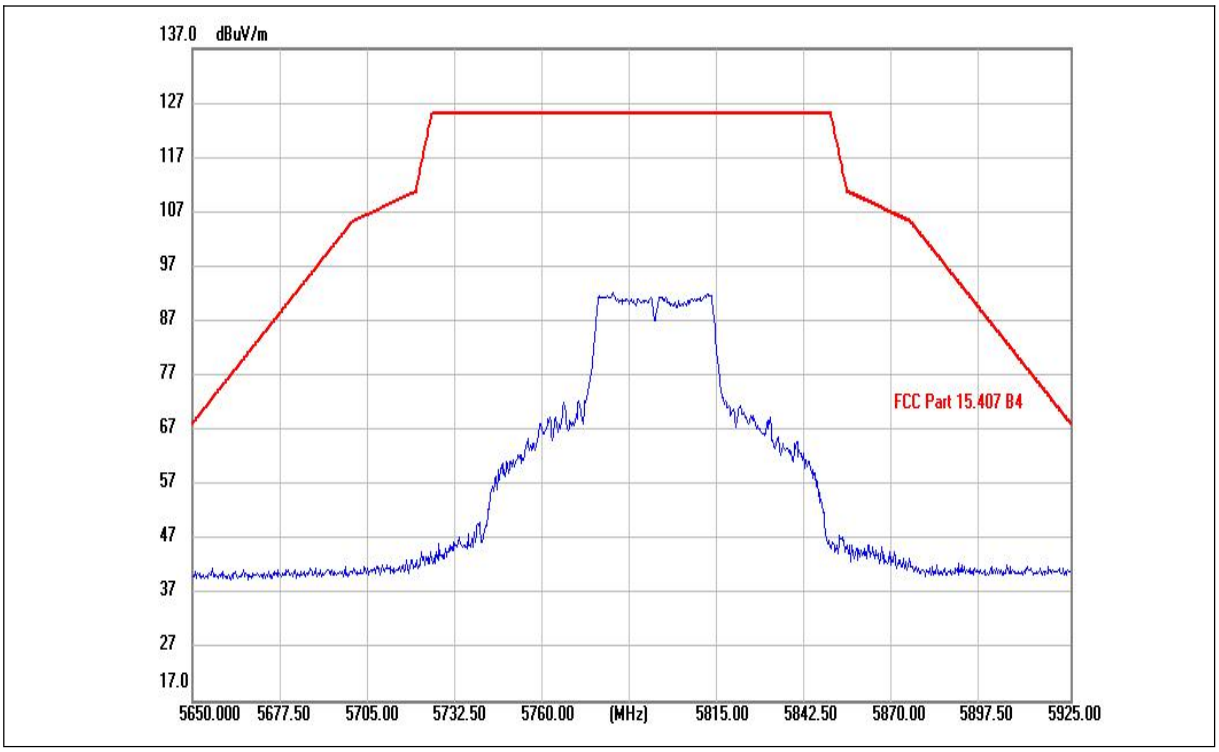
(802.11ac(HT40) _5755MHz, Antenna Horizontal)



(802.11ac(HT40) _5755MHz, Antenna Vertical)

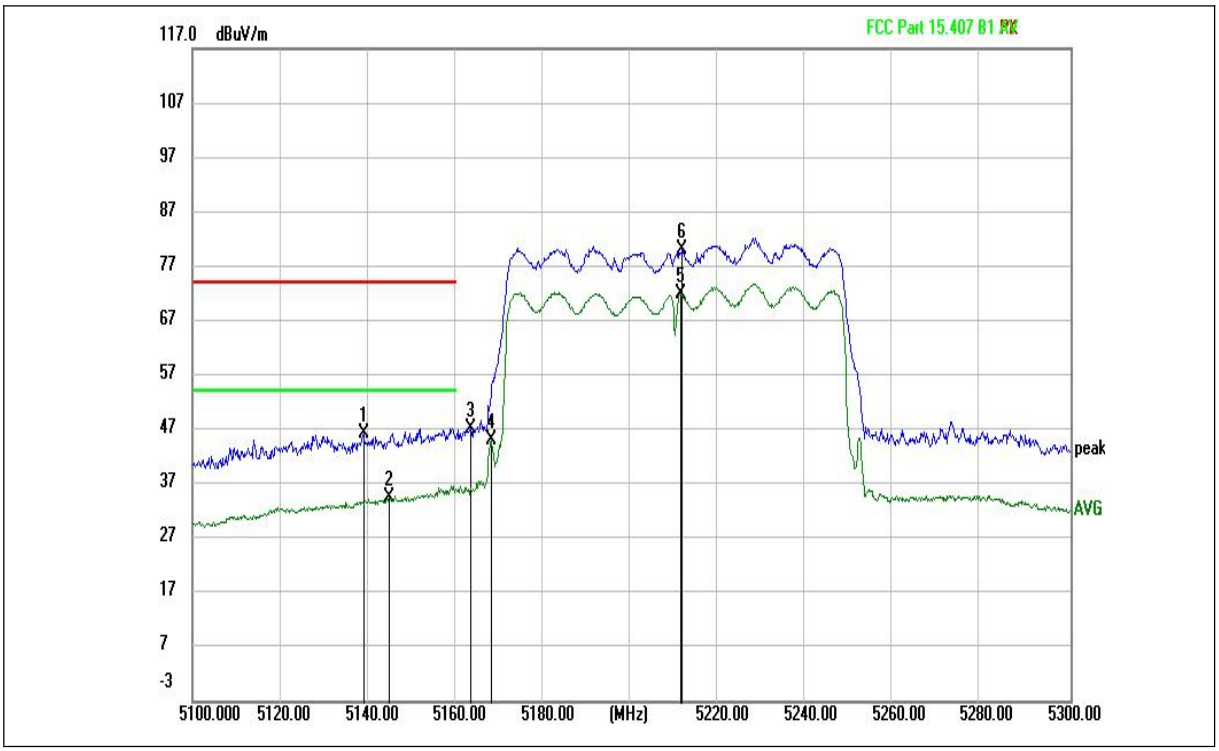


(802.11ac(HT40) _5795MHz, Antenna Horizontal)



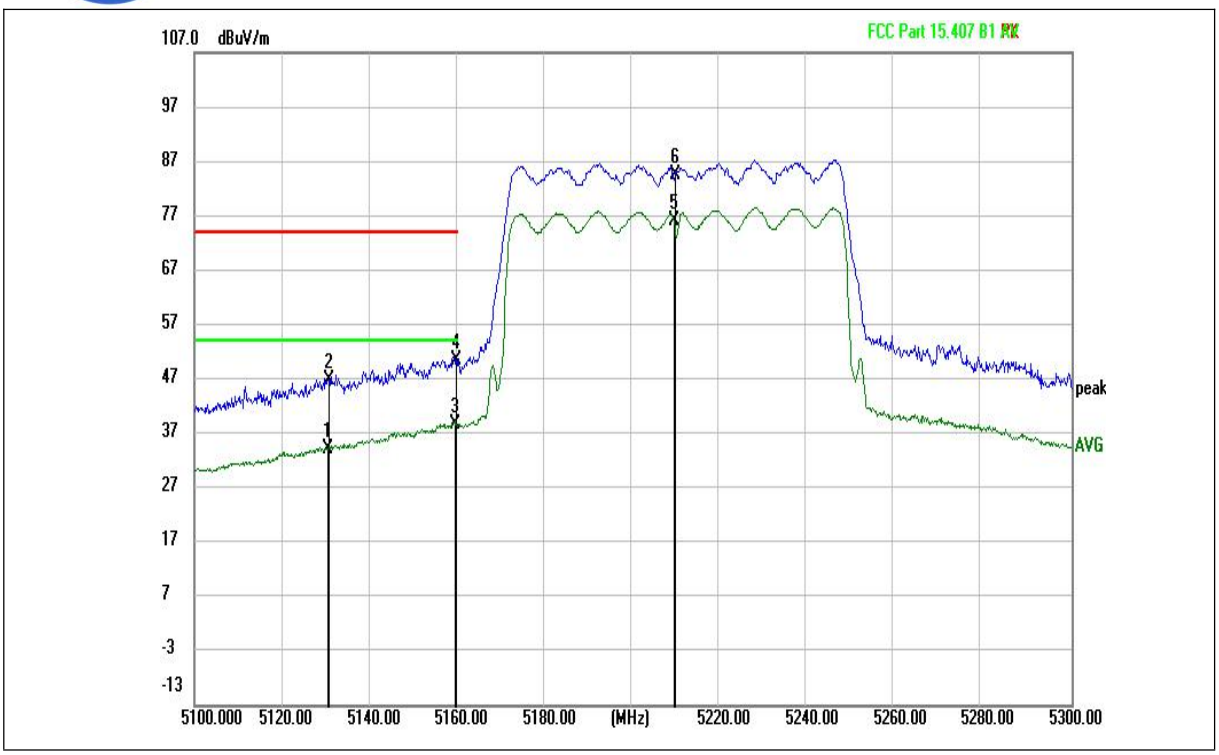
(802.11ac(HT40)_5795MHz, Antenna Vertical)

802.11ac (HT80) Test mode



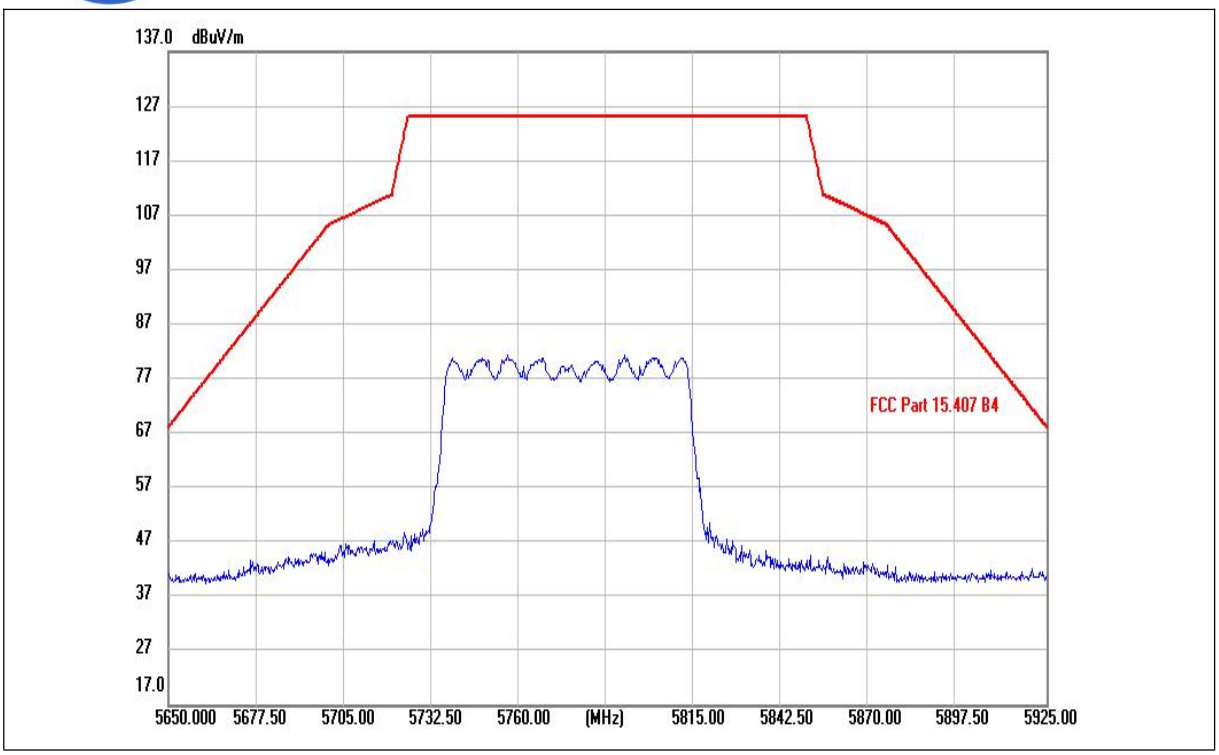
(802.11ac (HT80) _5210MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5139.000	46.36	---	74.00	27.64	H	-3.19
5144.800	---	34.54	54.00	19.46	H	-3.22
5163.400	47.34	---	---	---	H	-3.08
5168.000	---	45.17	---	---	H	-3.07
5211.200	---	72.05	---	---	H	-2.95
5211.600	80.06	---	---	---	H	-2.95

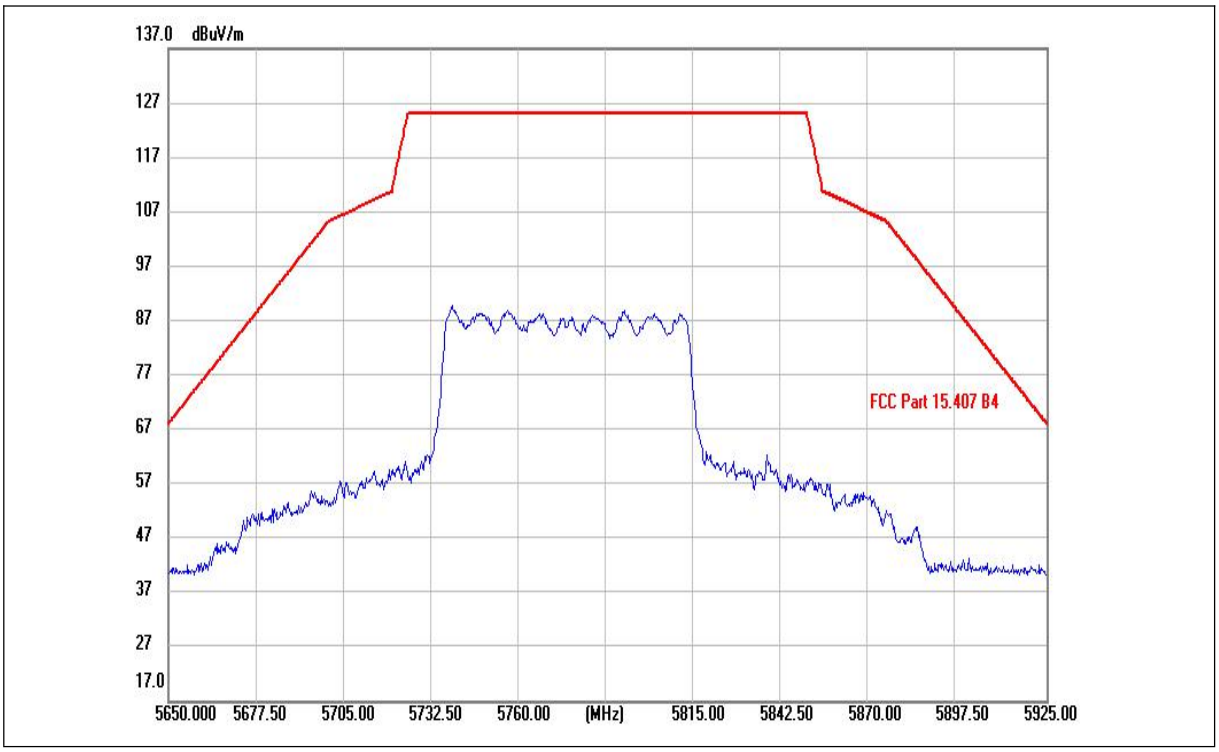


(802.11ac (HT80) _5210MHz, Antenna Vertical)

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB/m)
5130.400	---	34.11	54.00	-19.89	V	-3.15
5130.600	46.80	---	74.00	-27.20	V	-3.15
5159.400	---	38.65	54.00	-15.35	V	-3.13
5159.800	50.61	---	74.00	-23.39	V	-3.12
5209.400	---	75.97	---		V	-2.96
5209.600	84.40	---	---		V	-2.96



(802.11ac(HT80) _5775MHz, Antenna Horizontal)



(802.11ac(HT80)_5775MHz, Antenna Vertical)

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 0°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

Frequency Stability Measurements for UNII Band 1 (Ch. 36)

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq Dev. (Hz)	Deviation (%)
100%	9	0(Ref)	5179.980	-20000	-3.67
100%		10	5179.979	-21000	-4.25
100%		20	5179.986	-14000	-2.70
100%		30	5179.972	-28000	-5.41
100%		40	5179.978	-22000	-4.05
85%	7.6	20	5179.971	-29000	-5.60
115%	10.3	20	5179.985	-15000	-2.90

Frequency Stability Measurements for UNII Band 3 (Ch. 149)

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq Dev. (Hz)	Deviation (%)
100%	9	0(Ref)	5745.028	28000	8.36
100%		10	5745.031	31000	7.14
100%		20	5745.036	36000	6.27
100%		30	5745.049	49000	8.53
100%		40	5745.042	42000	7.48
85%	7.6	20	5745.045	45000	7.83
115%	10.3	20	5745.017	17000	6.44

Note: Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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

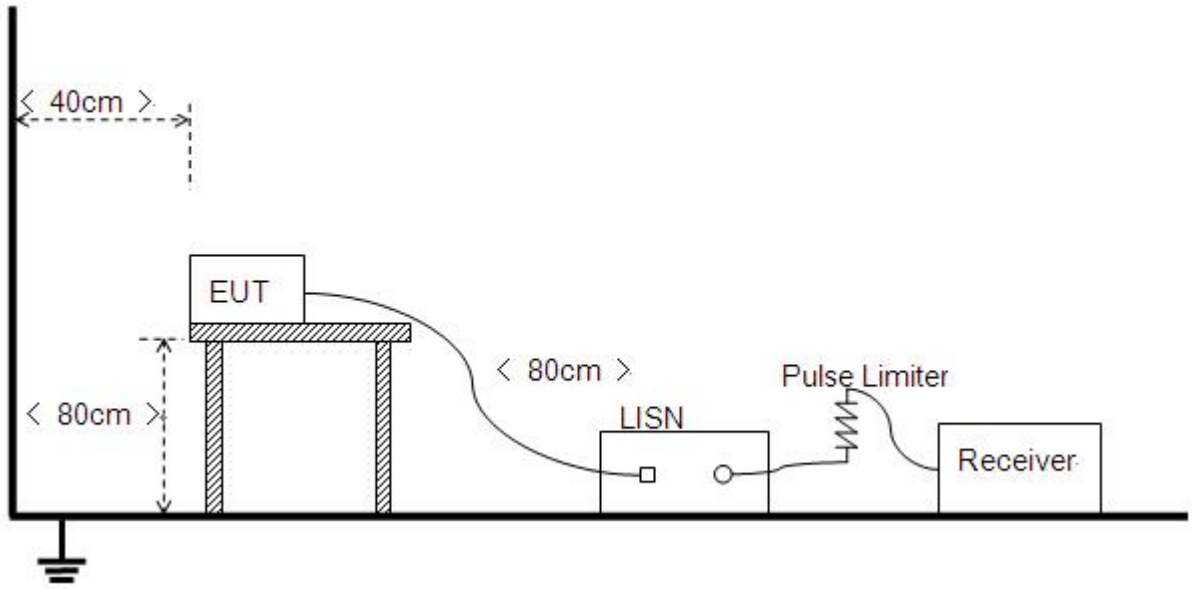
NOTE:

(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

A. Test Setup:



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

2.7.3. Test Result

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

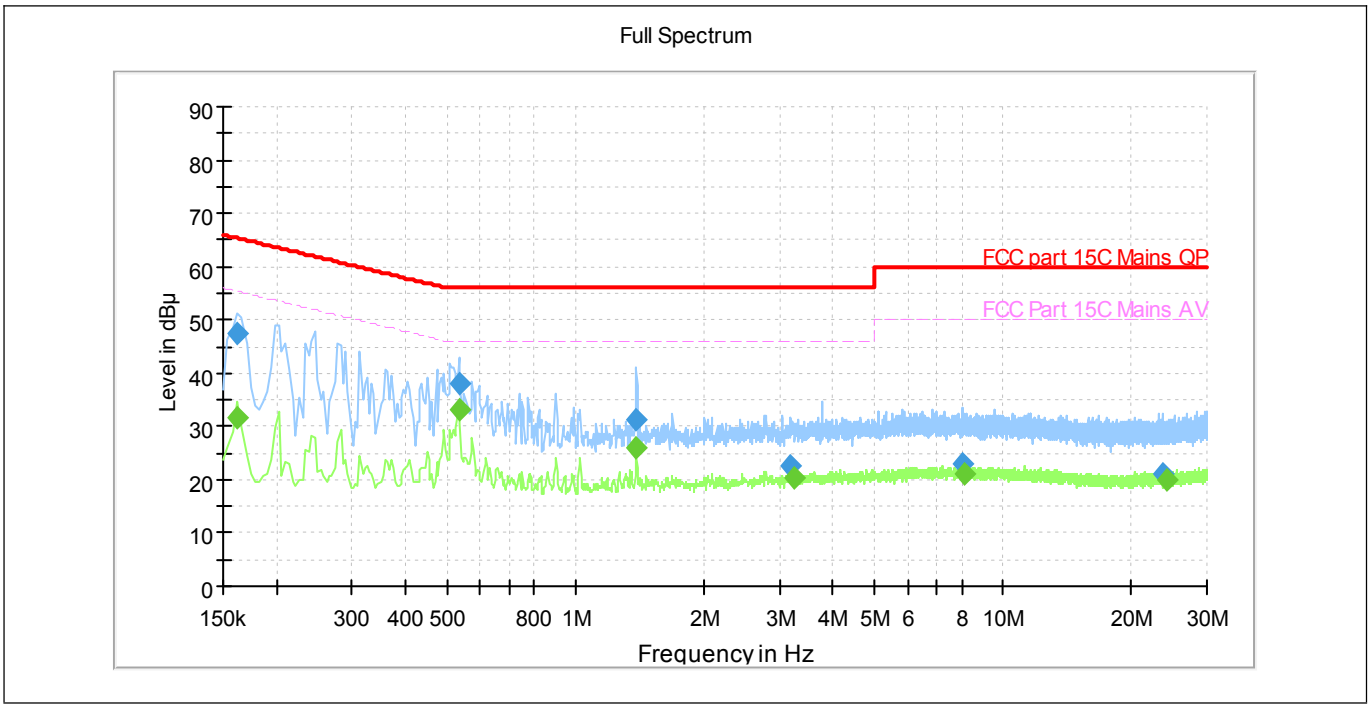
Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

The EUT configuration of the emission tests is Charging + Wlan 5G Link.

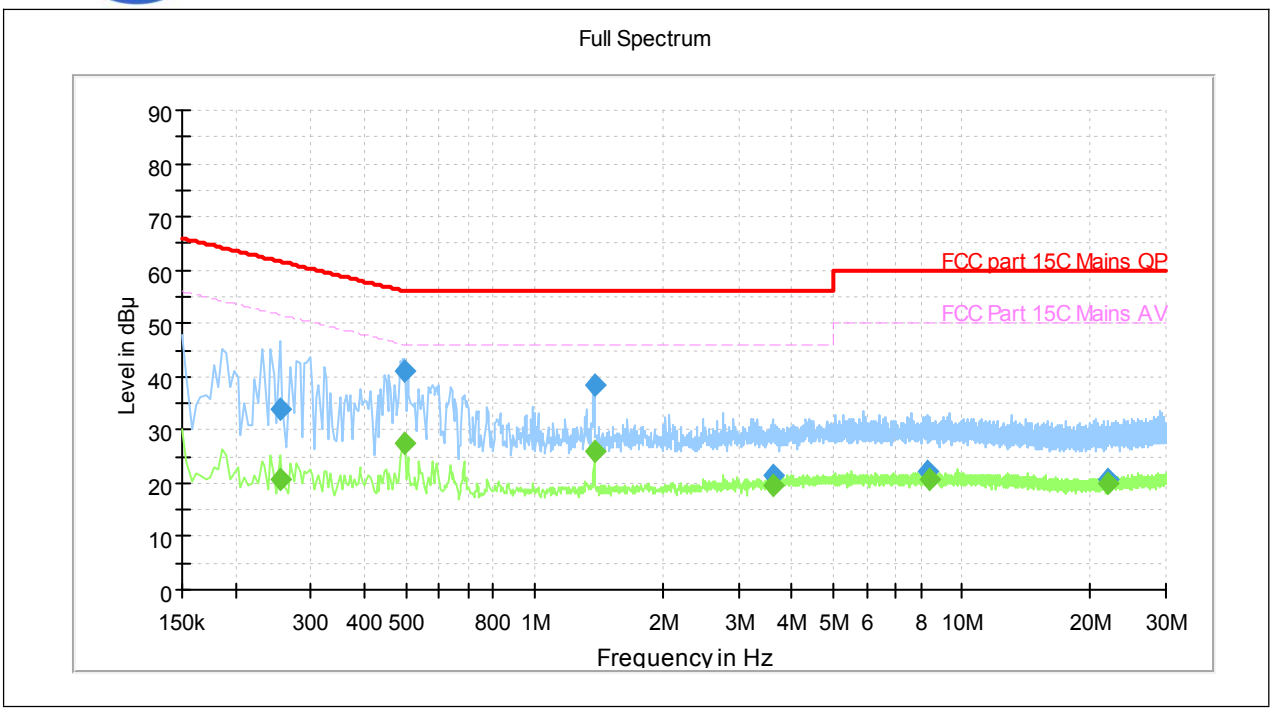
Note: The test voltage is AC 120V/60Hz.

A. Test Plots:



(Plot A: L Phase)

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.162000	---	31.45	55.36	23.91	L1	10.2
0.162000	47.47	---	65.36	17.89	L1	10.2
0.534000	---	33.23	46.00	12.78	L1	10.2
0.534000	38.10	---	56.00	17.90	L1	10.2
1.386000	---	25.96	46.00	20.04	L1	10.3
1.390000	31.20	---	56.00	24.80	L1	10.3
3.178000	22.57	---	56.00	33.43	L1	10.4
3.238000	---	20.26	46.00	25.74	L1	10.4
8.018000	22.81	---	60.00	37.19	L1	10.6
8.126000	---	21.10	50.00	28.90	L1	10.6
23.682000	21.22	---	60.00	38.78	L1	10.6
24.298000	---	20.08	50.00	29.92	L1	10.6



(Plot B: N Phase)

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.254000	---	20.90	51.63	30.73	N	10.2
0.254000	33.98	---	61.63	27.64	N	10.2
0.498000	---	27.66	46.03	18.37	N	10.2
0.498000	41.15	---	56.03	14.88	N	10.2
1.378000	---	25.82	46.00	20.18	N	10.3
1.378000	38.58	---	56.00	17.42	N	10.3
3.602000	21.38	---	56.00	34.62	N	10.4
3.602000	---	19.72	46.00	26.28	N	10.4
8.282000	22.18	---	60.00	37.82	N	10.5
8.406000	---	20.67	50.00	29.33	N	10.5
21.958000	20.82	---	60.00	39.18	N	10.6
22.042000	---	19.92	50.00	30.08	N	10.6