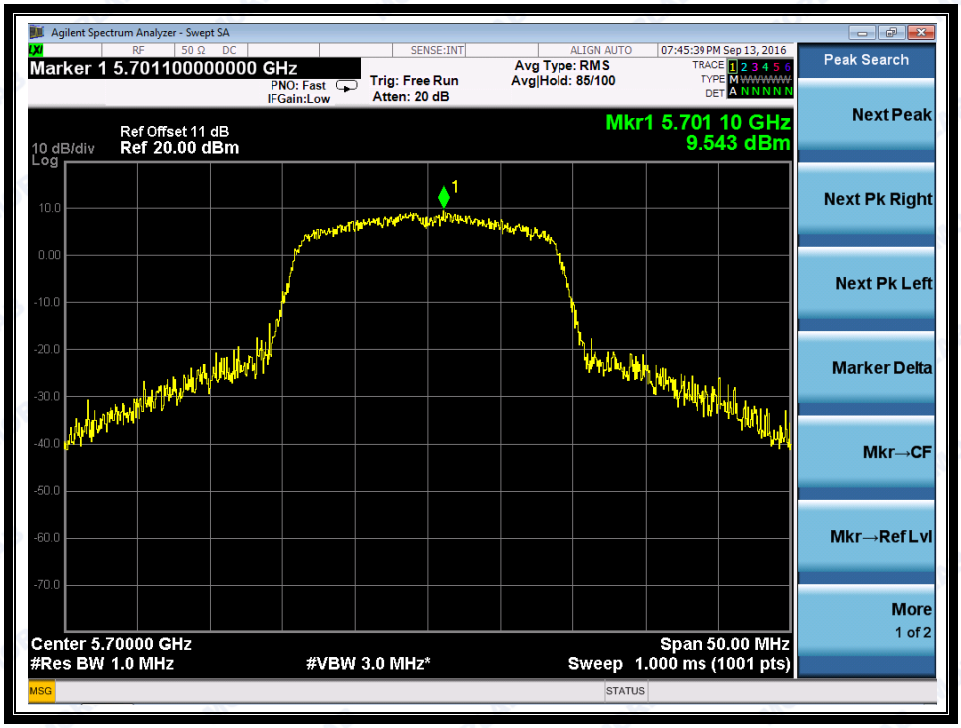
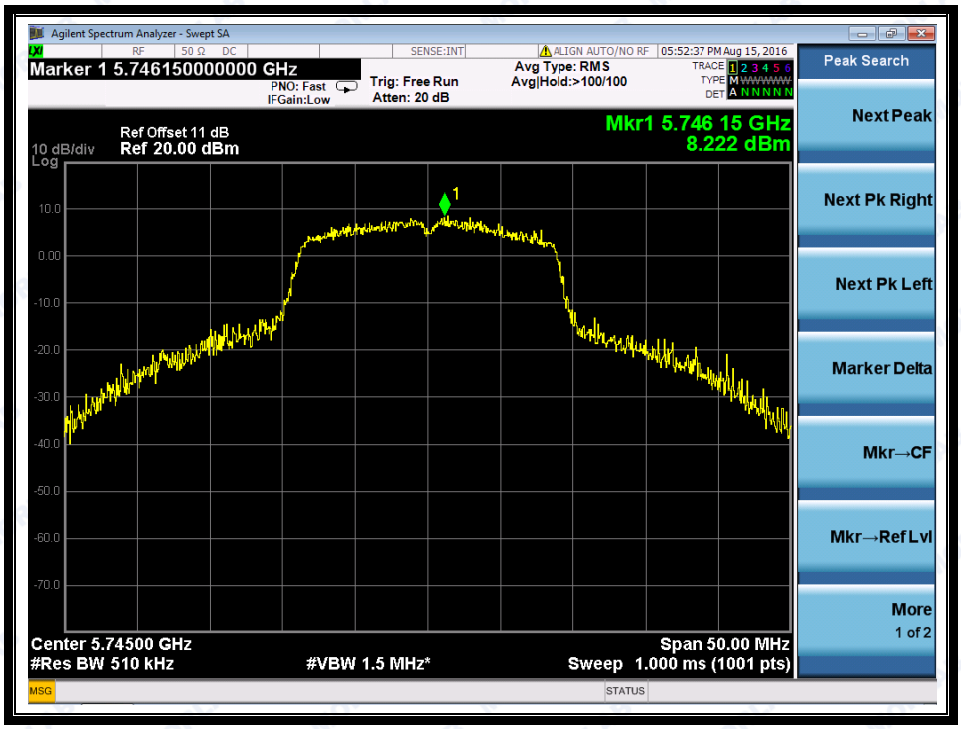
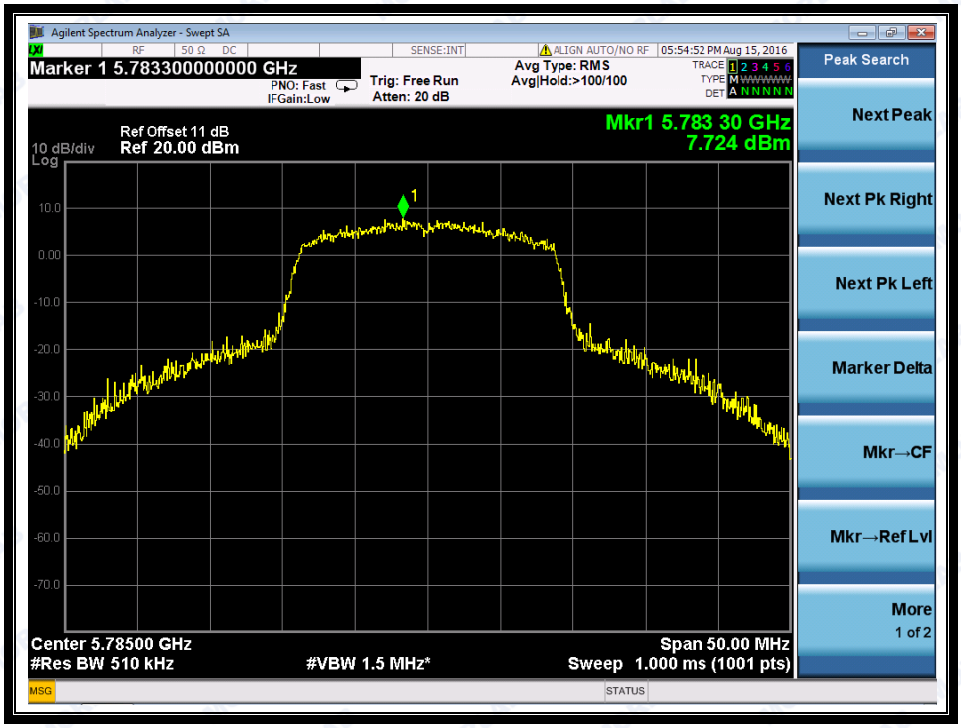


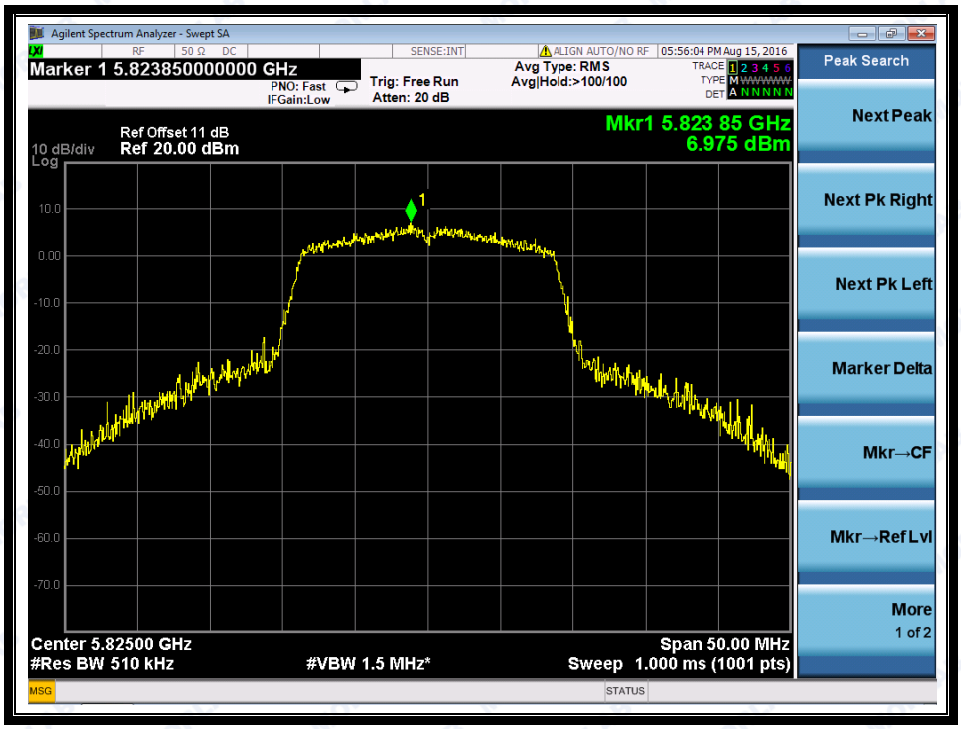
(Channel 140: 5700MHz @ 802.11n-20MHz)



(Channel 149: 5745MHz @ 802.11n-20MHz)



(Channel 157: 5785MHz @802.11n-20MHz)



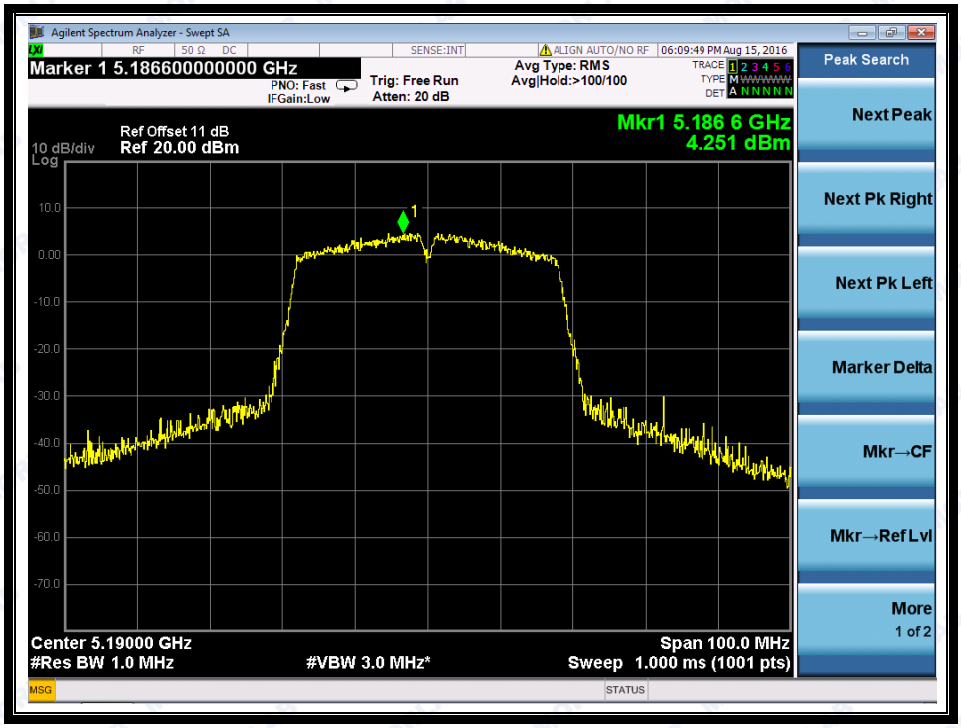
(Channel 165: 5825MHz @ 802.11n-20MHz)

2.4.3.5 802.11n-40MHz Test mode

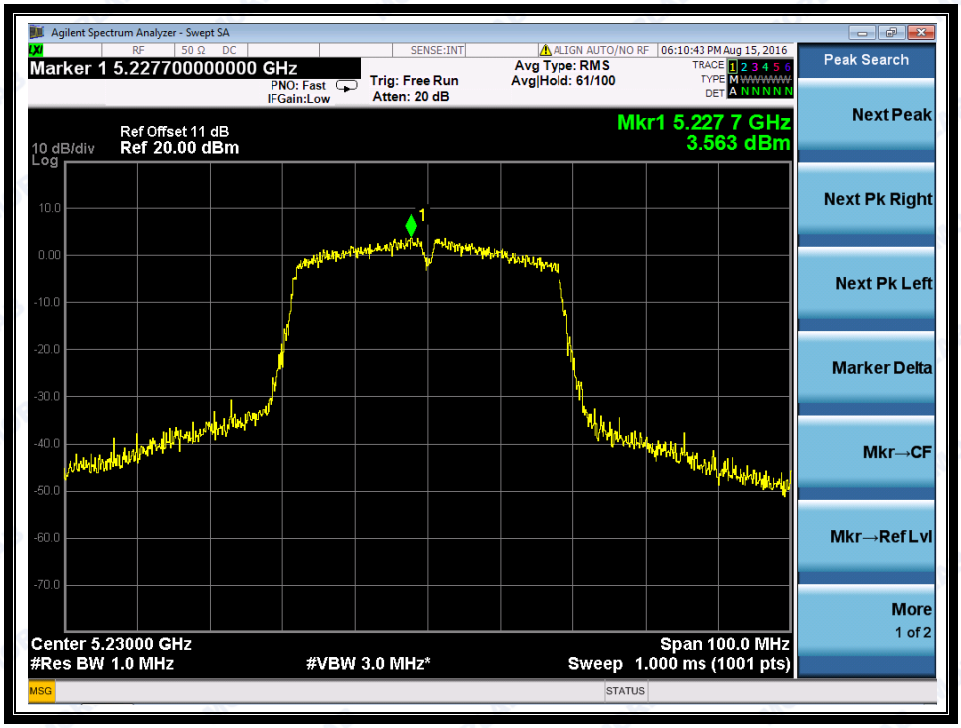
A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Verdict
38	5190	4.251	11	PASS
46	5230	3.563		
54	5270	2.965		
62	5310	2.984		
102	5510	3.225		
126	5590	6.194		
142	5670	7.439		
151	5755	4.497	30	
159	5795	3.681		

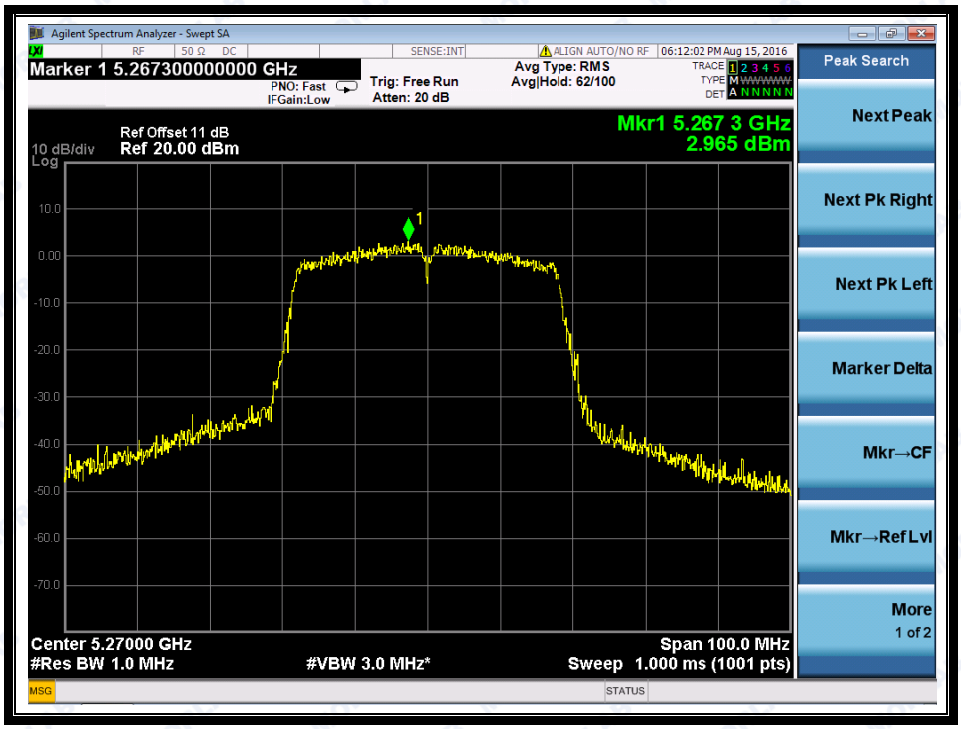
B. Test Plots



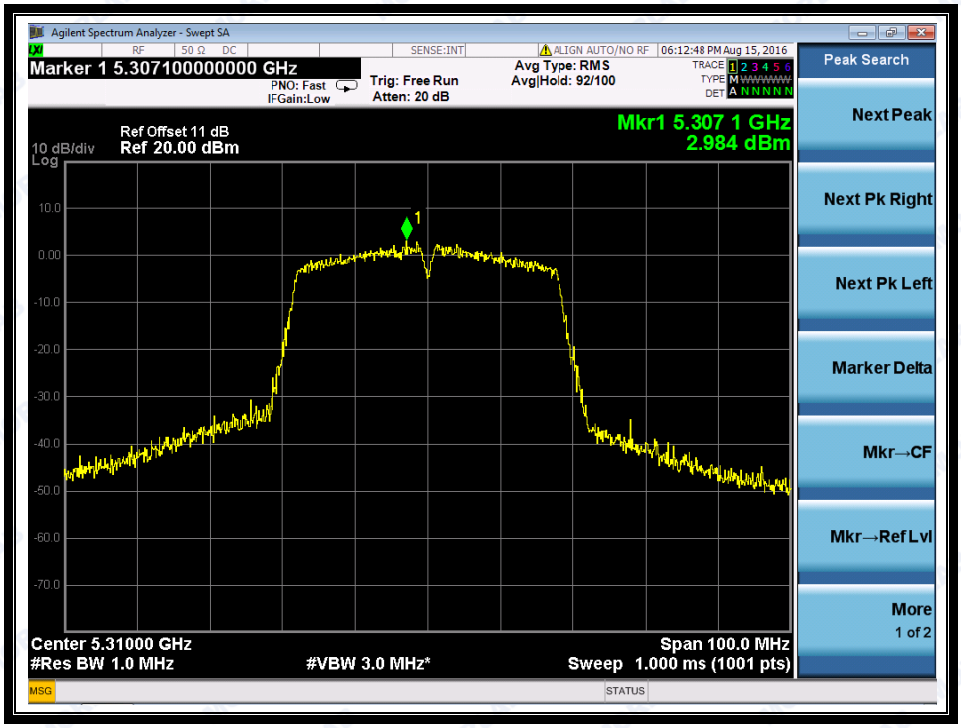
(Channel 38: 5190MHz @ 802.11n-40MHz)



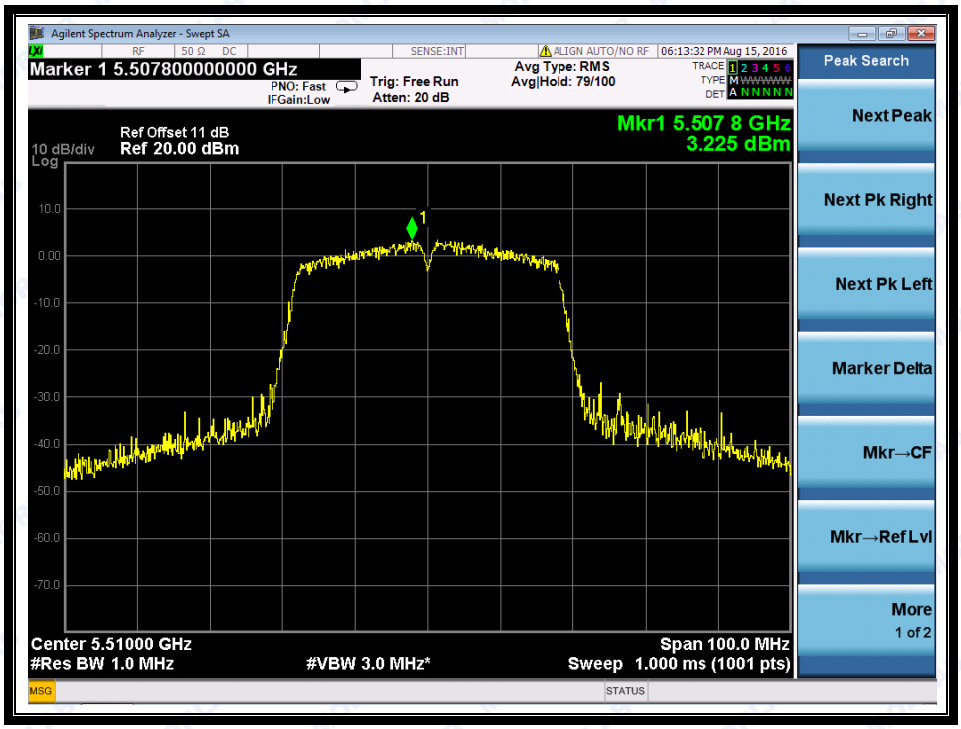
(Channel 46: 5230 MHz @ 802.11n-40MHz)



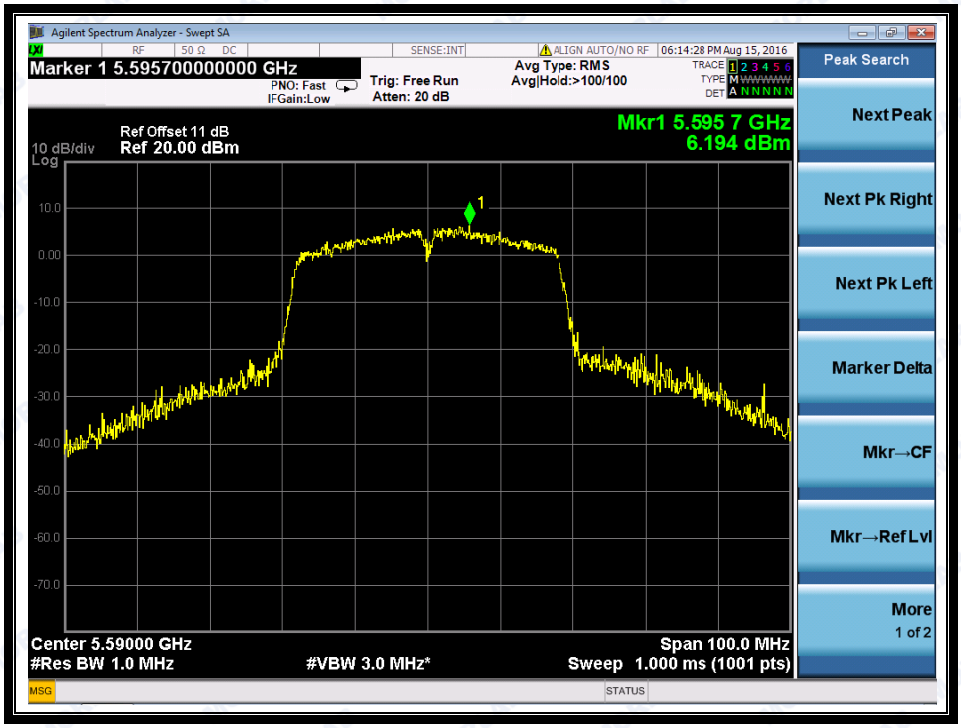
(Channel 54: 5270MHz @802.11n-40MHz)



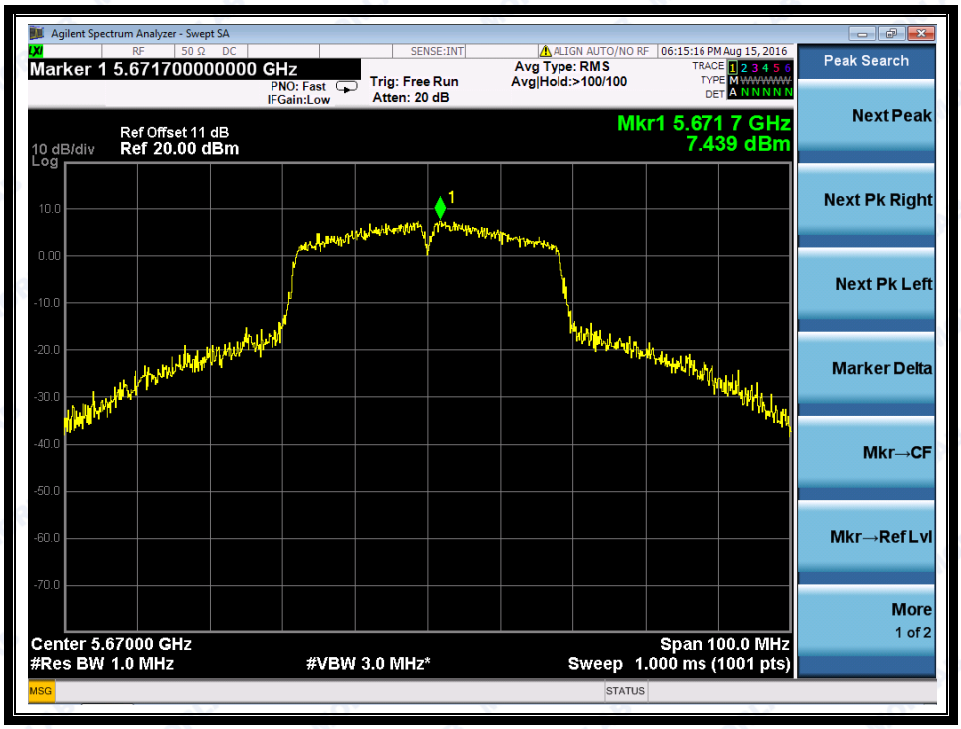
(Channel 62: 5310MHz @ 802.11n-40MHz)



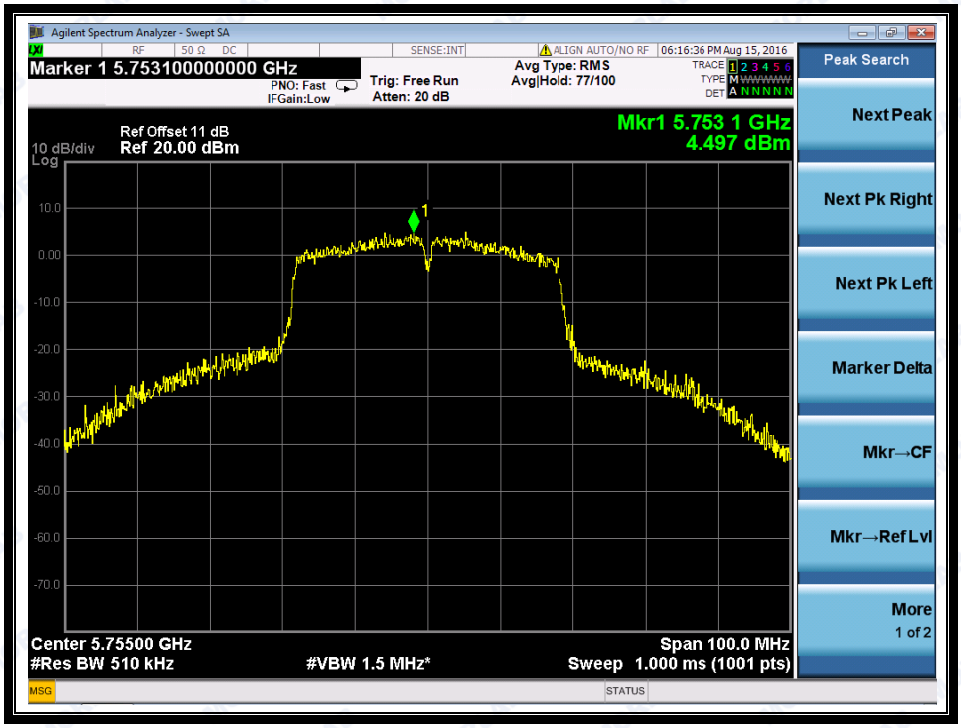
(Channel 102: 5510MHz @802.11n-40MHz)



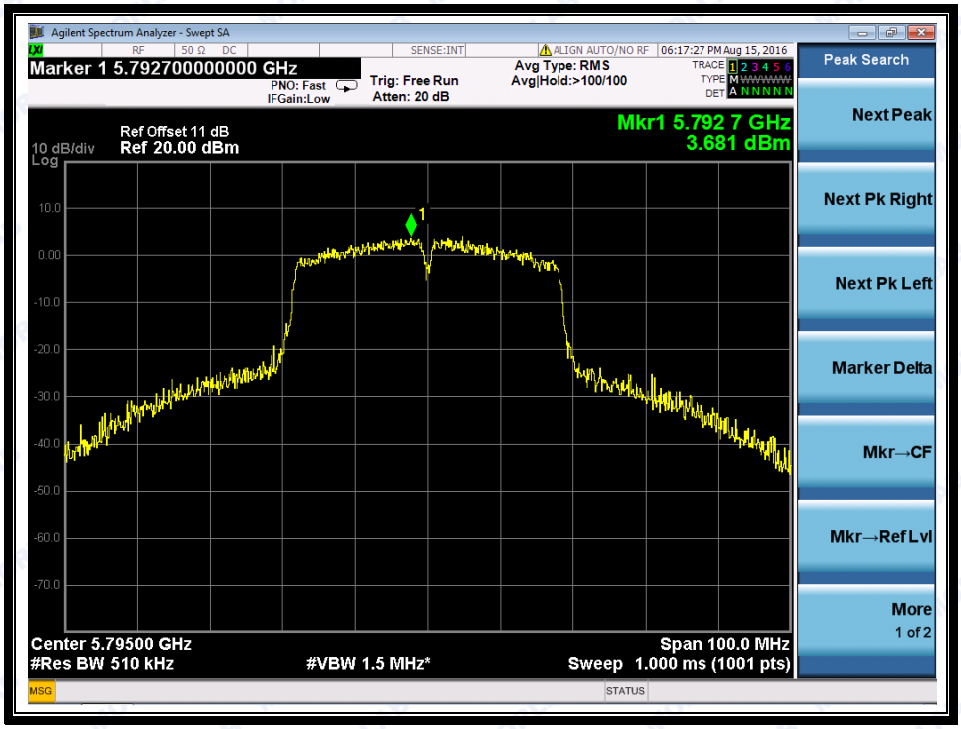
(Channel 126: 5590MHz @ 802.11n-40MHz)



(Channel 142: 5670MHz @ 802.11n-40MHz)



(Channel 151: 5755MHz @ 802.11n-40MHz)



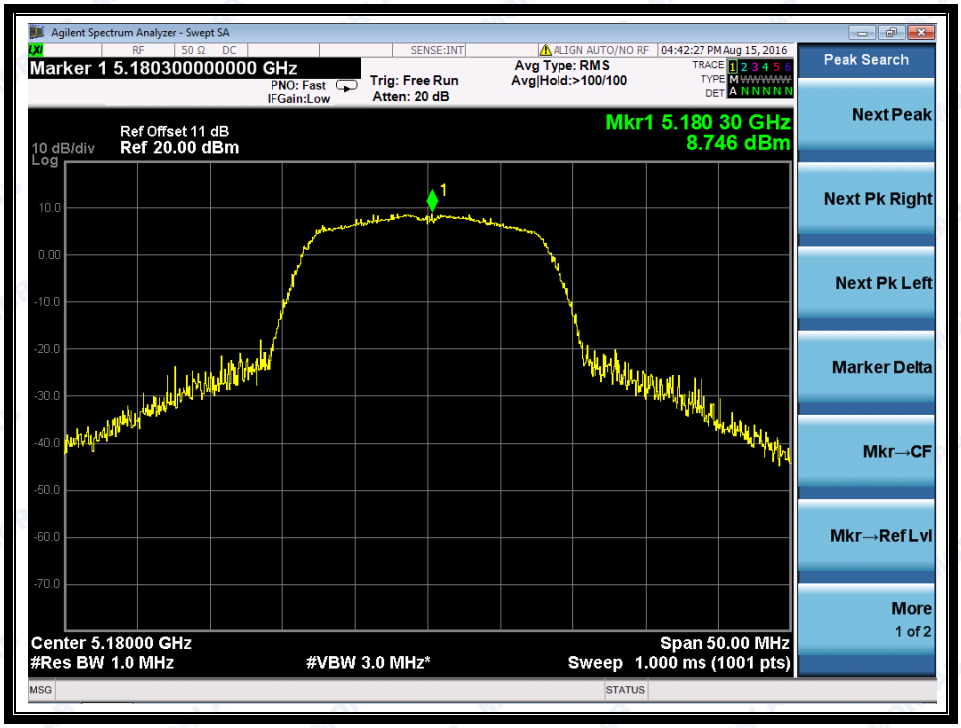
(Channel 159: 5795MHz @802.11n-40MHz)

2.4.3.6 802.11a Test mode

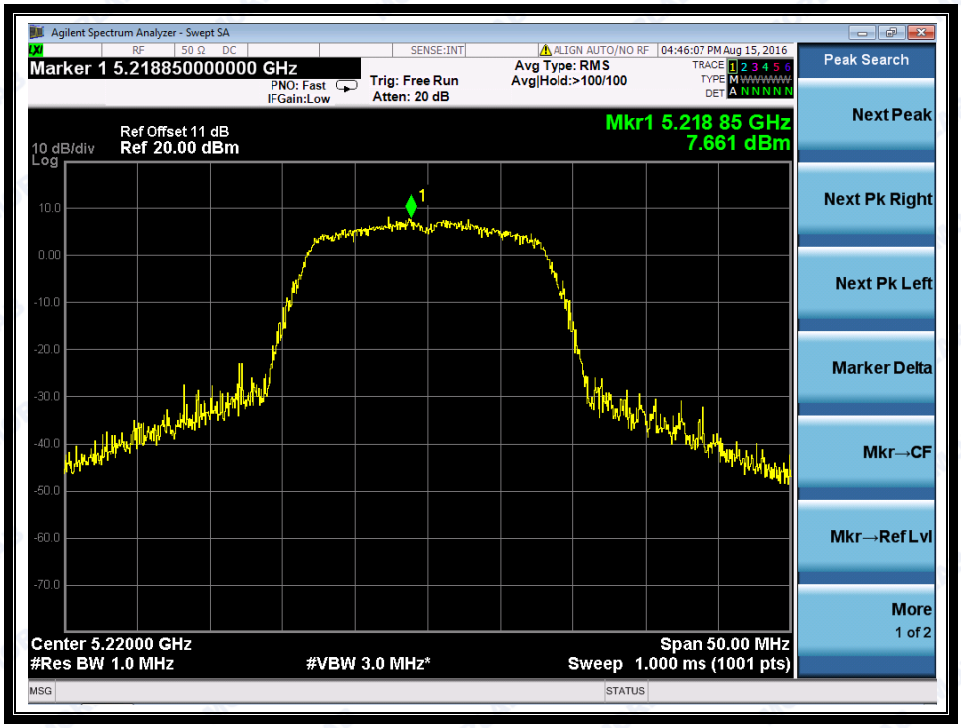
A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Verdict
36	5180	8.746	11	PASS
44	5220	7.661		
48	5240	6.889		
52	5260	6.452		
60	5300	6.423		
64	5320	5.667		
100	5500	6.993		
116	5580	9.124		
140	5700	10.045		
149	5745	8.665	30	
157	5785	7.502		
165	5825	6.607		

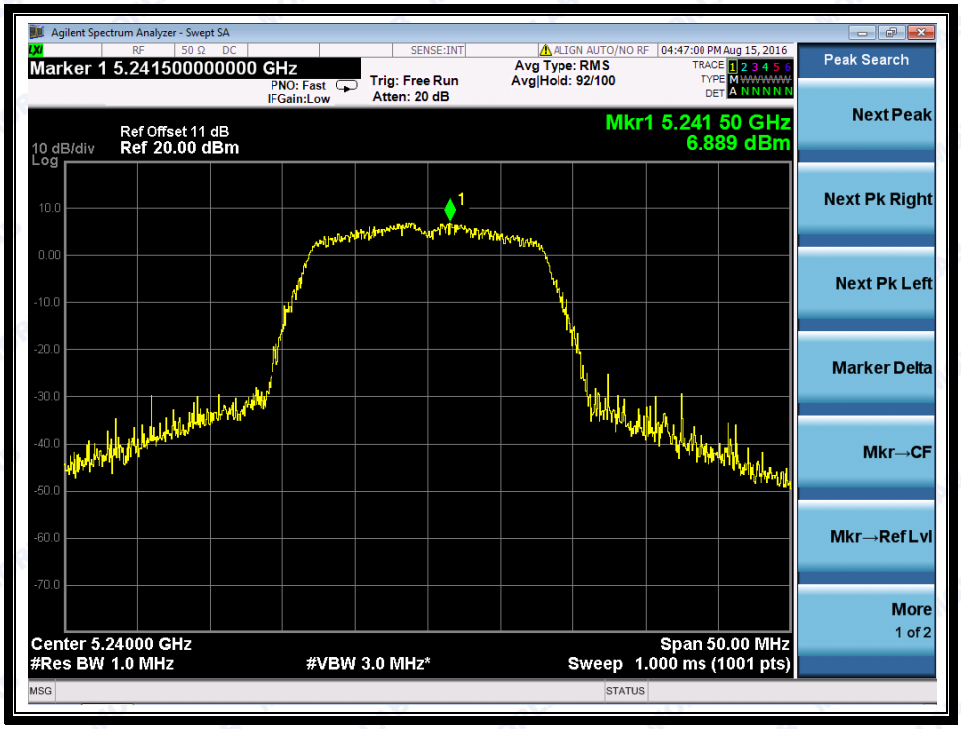
A. Test Plots



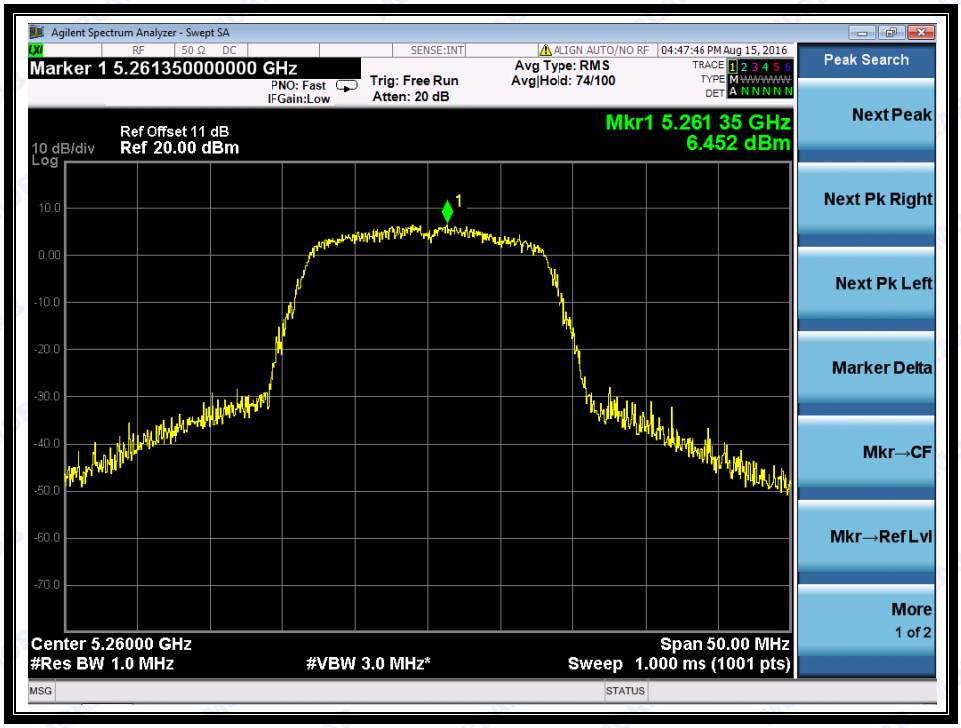
(Channel 36: 5180MHz @ 802.11a)



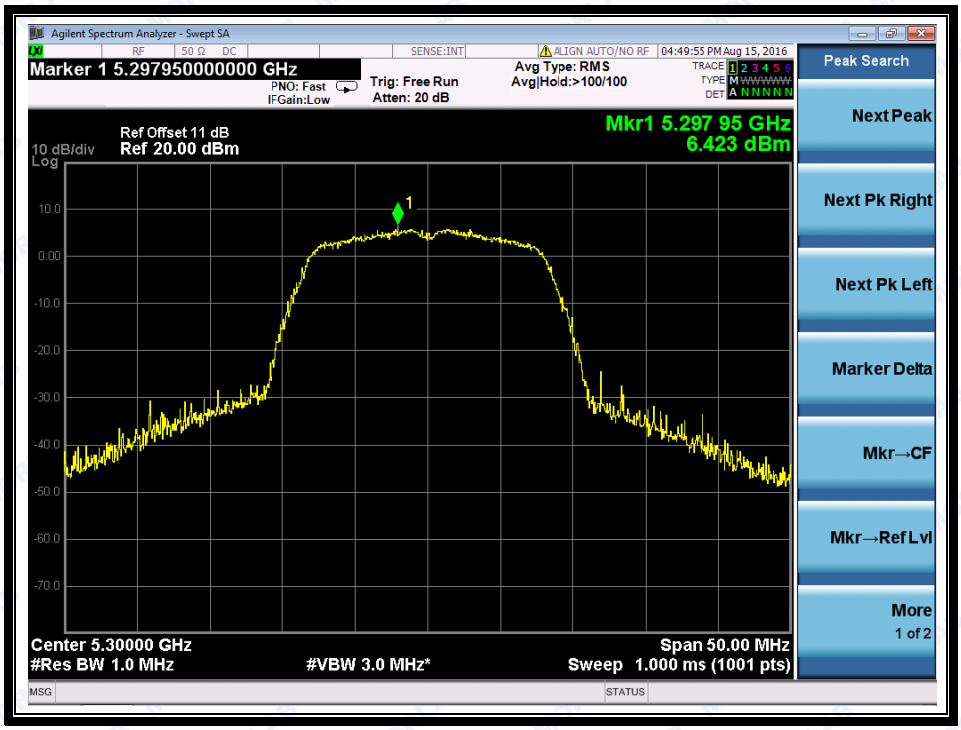
(Channel 44: 5220 MHz @802.11a)



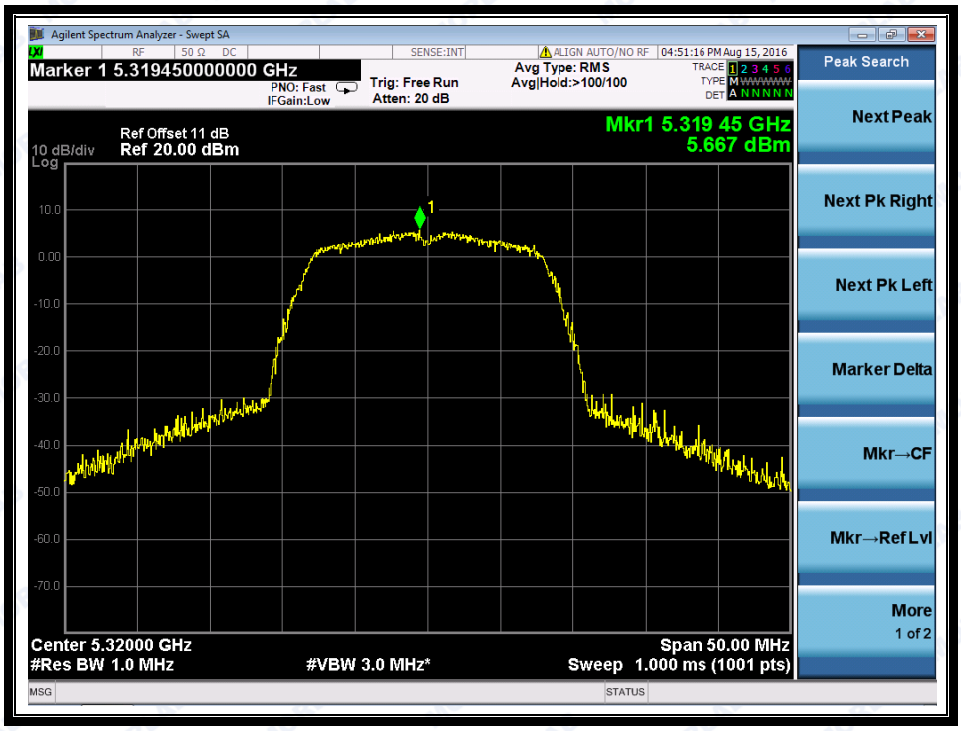
(Channel 48: 5240MHz @802.11a)



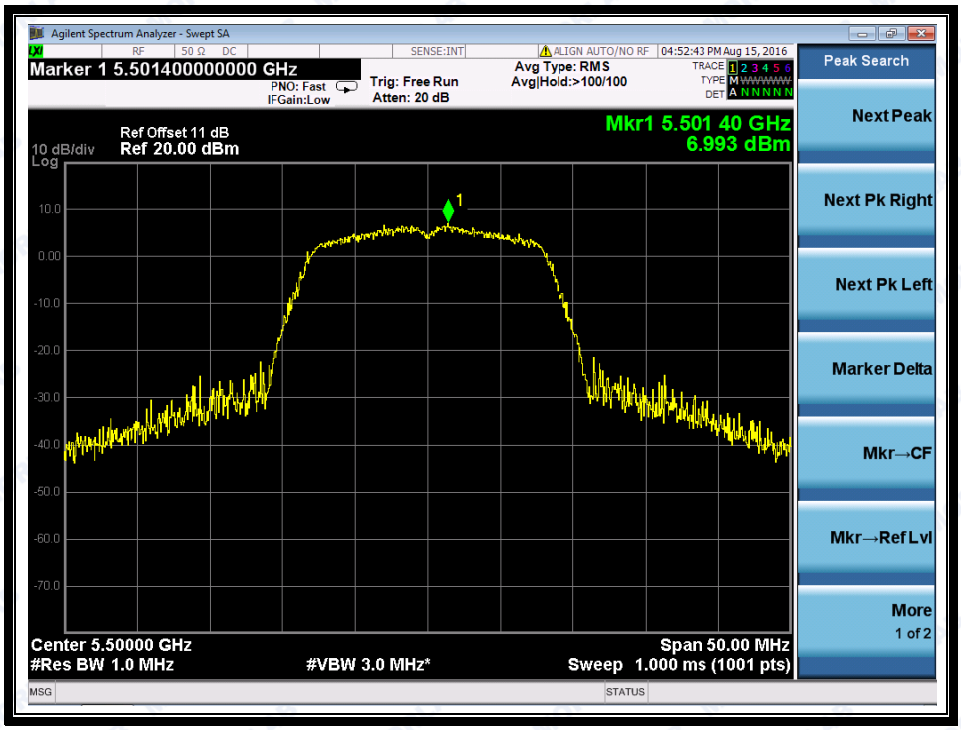
(Channel 52: 5260MHz @ 802.11a)



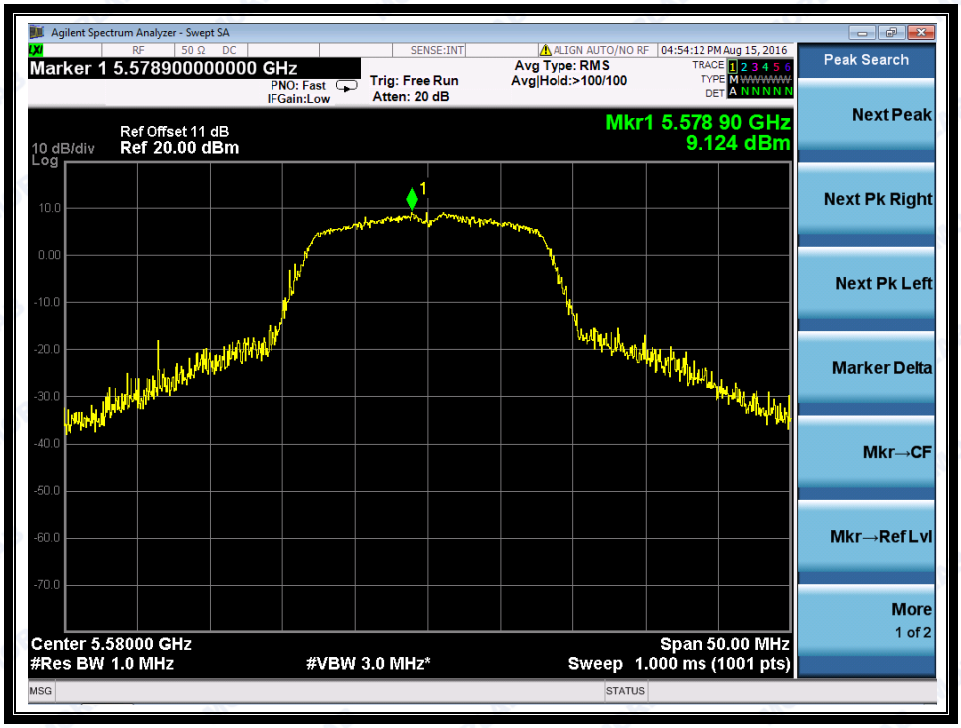
(Channel 60: 5300MHz @ 802.11a)



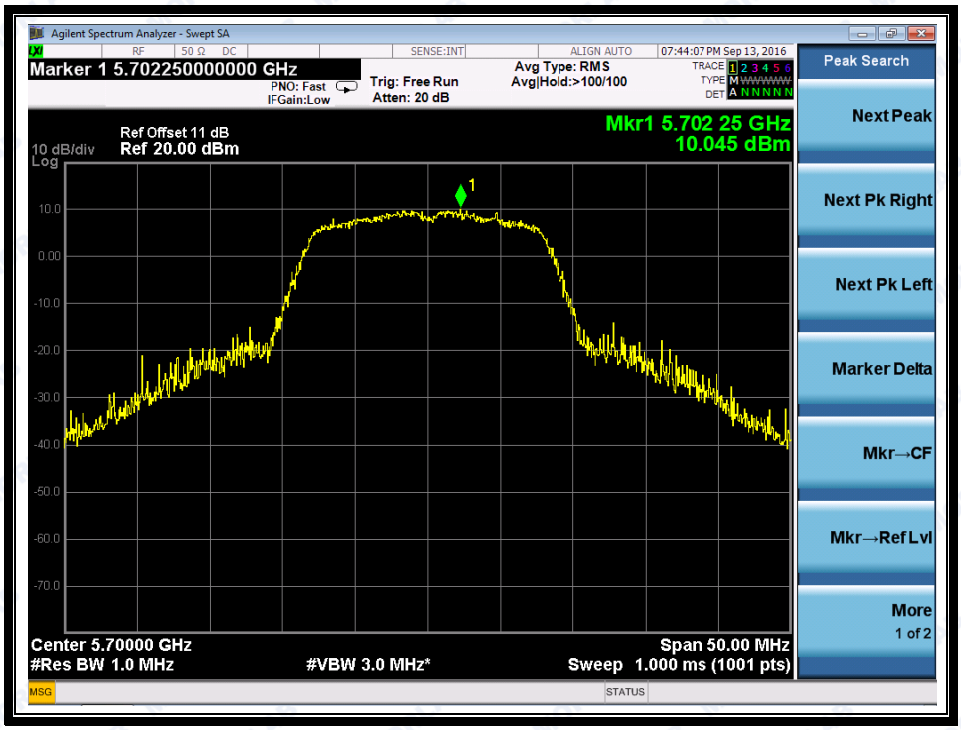
(Channel 64: 5320MHz @ 802.11a)



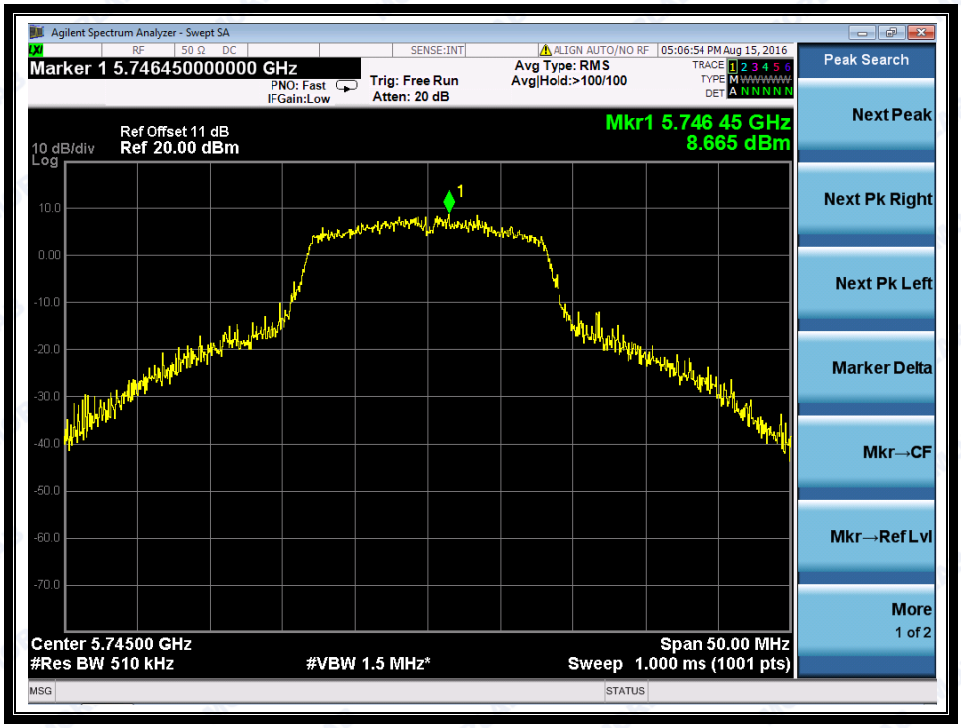
(Channel 100: 5500MHz @ 802.11a)



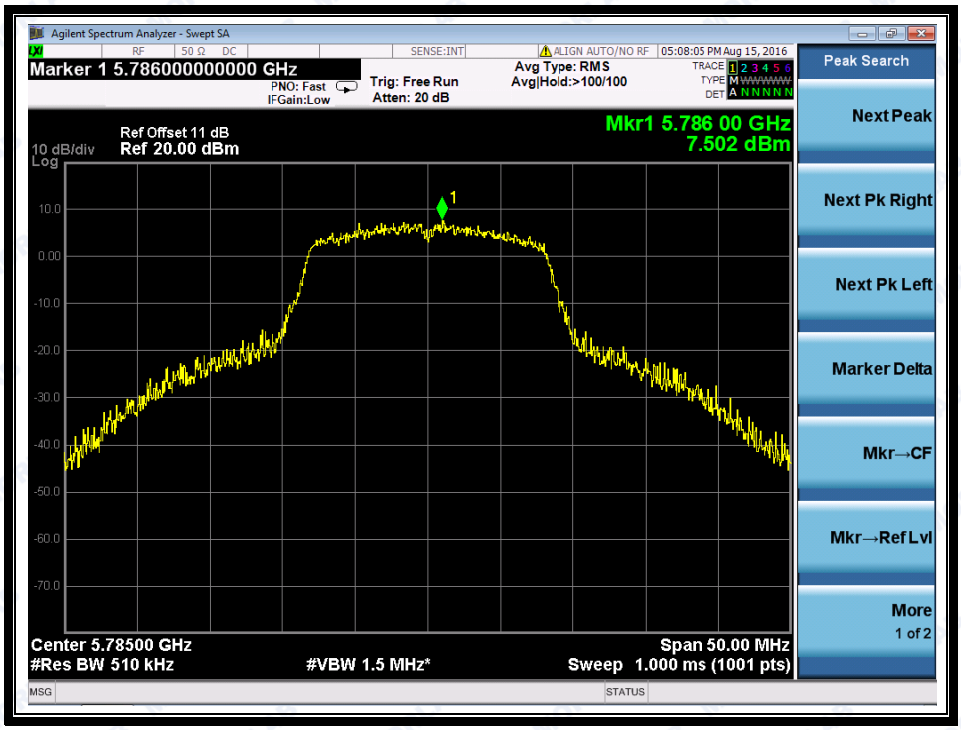
(Channel 120: 5580MHz @ 802.11a)



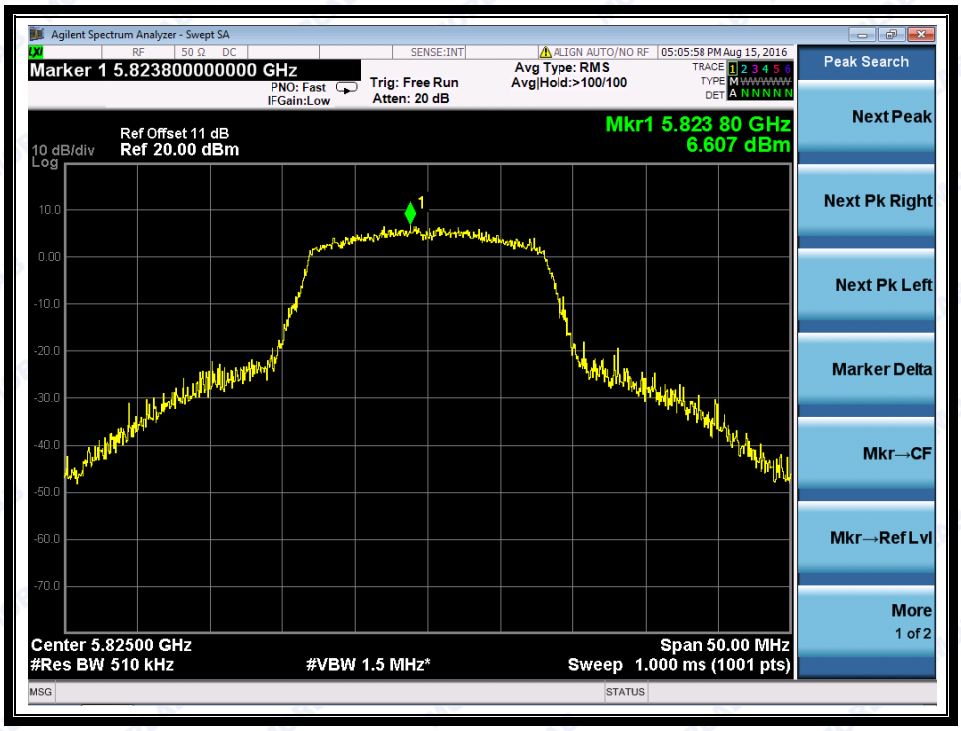
(Channel 140: 5700MHz @ 802.11a)



(Channel 149: 5745MHz @ 802.11a)



(Channel 157: 5785MHz @ 802.11a)



(Channel 165: 5825MHz @ 802.11a)

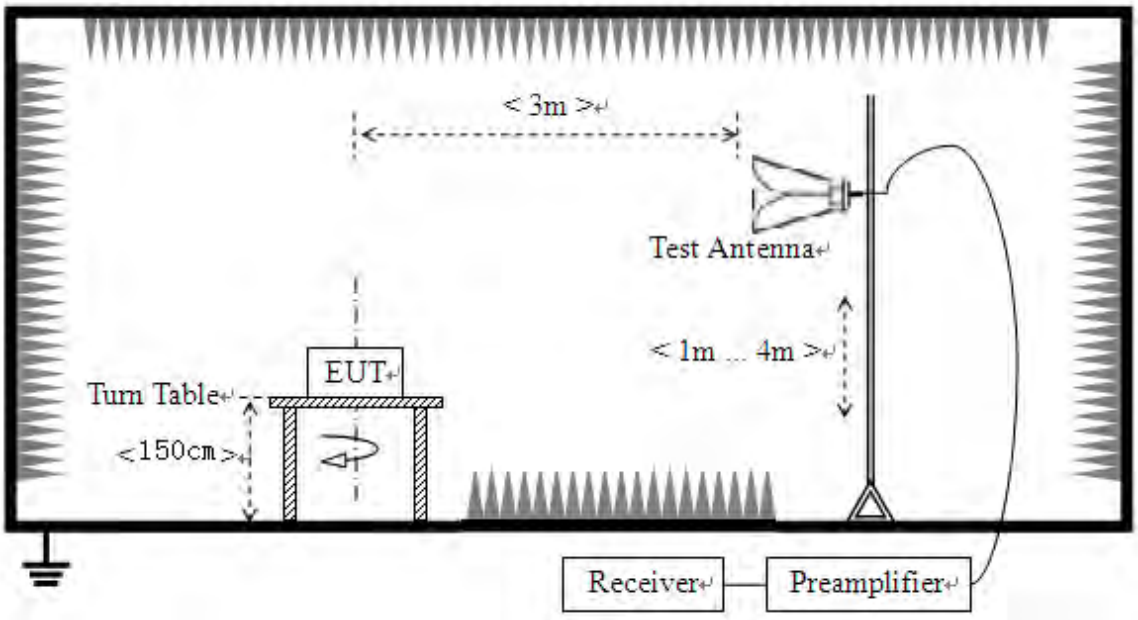
2.5 Restricted Frequency Bands

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.

2.5.3 Test Result

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

The measurement results are obtained as below:

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

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

Note: 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.

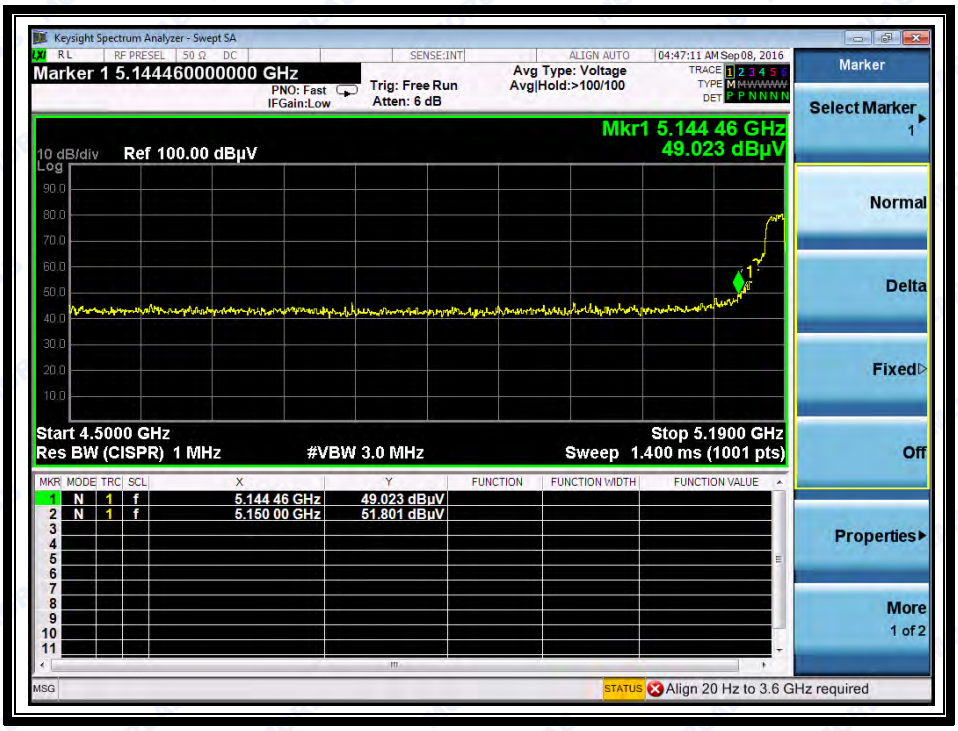
2.5.3.1 802.11ac-20MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

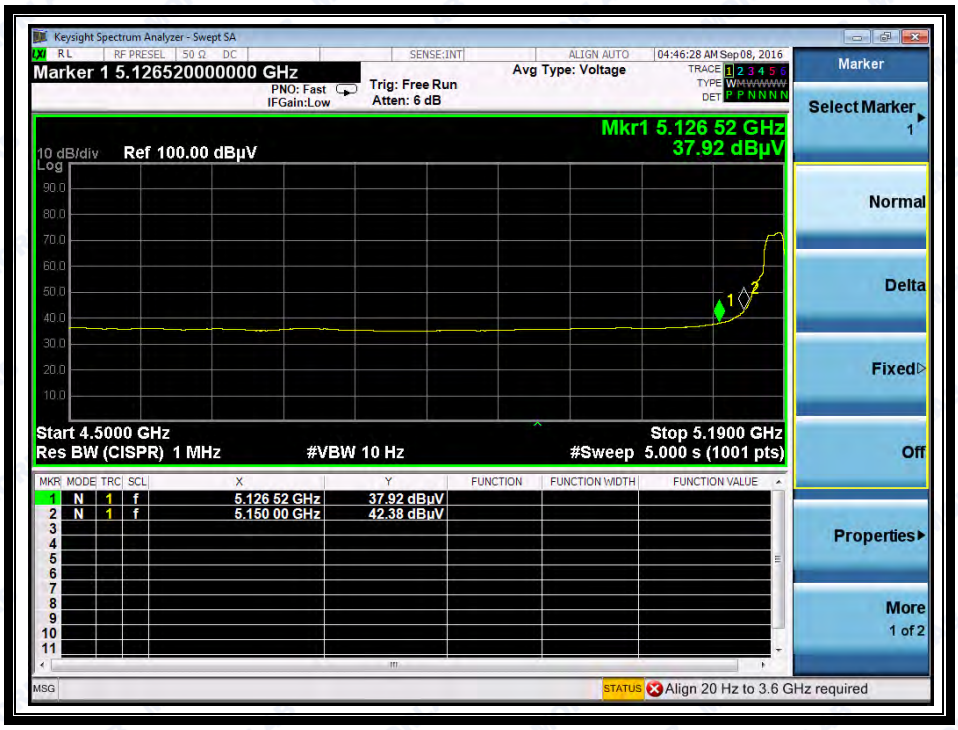
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
36	5144.46	PK	49.02	-50.65	32.11	30.48	74	Pass
36	5126.52	AV	37.92	-50.65	32.11	19.38	54	Pass
64	5392.80	PK	42.33	-50.65	32.11	23.79	74	Pass
64	5369.70	AV	32.84	-50.65	32.11	14.3	54	Pass
100	5451.00	PK	44.80	-50.65	32.11	26.26	74	Pass
100	5470.00	AV	32.96	-50.65	32.11	14.42	54	Pass
140	5769.90	PK	44.98	-50.65	32.11	26.44	74	Pass
140	5769.90	AV	34.10	-50.65	32.11	15.56	54	Pass

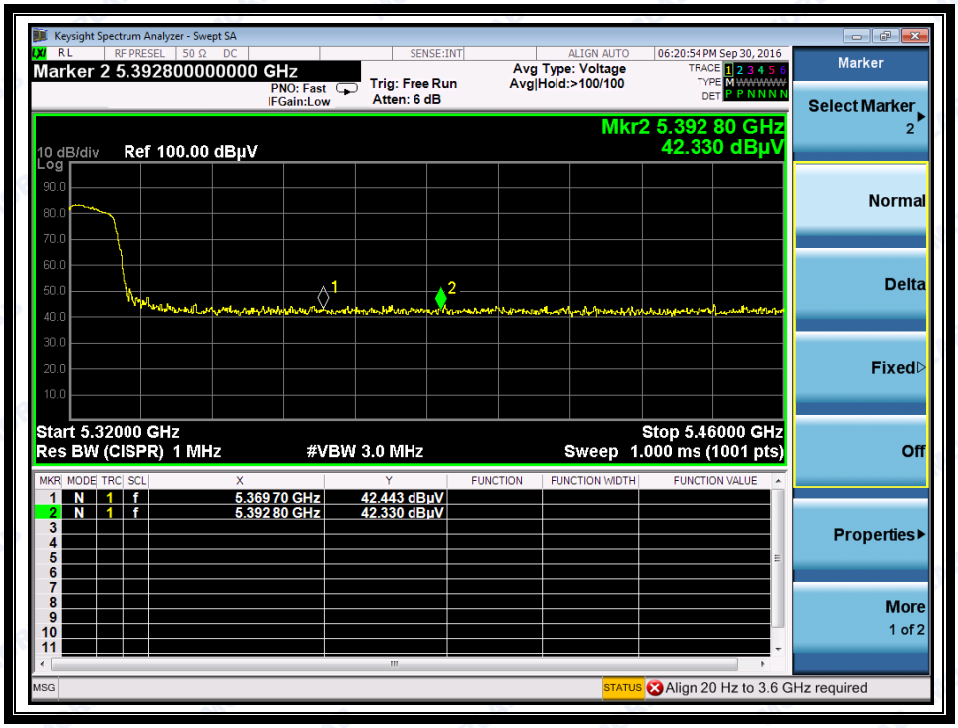
B. Test Plots:



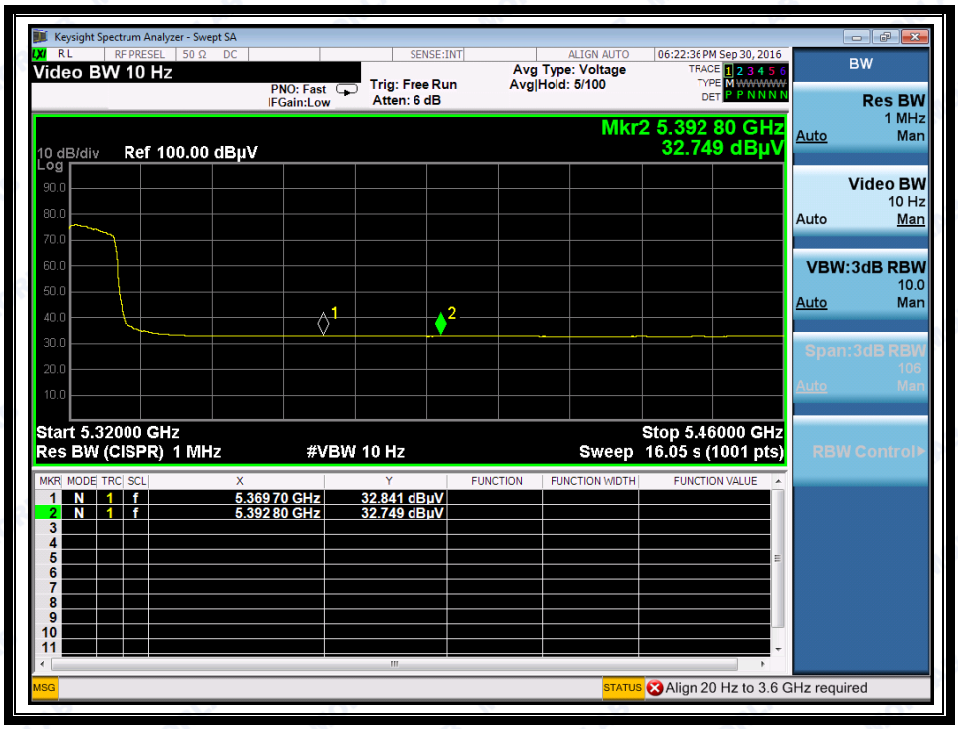
(Channel = 36 PEAK @ 802.11ac)



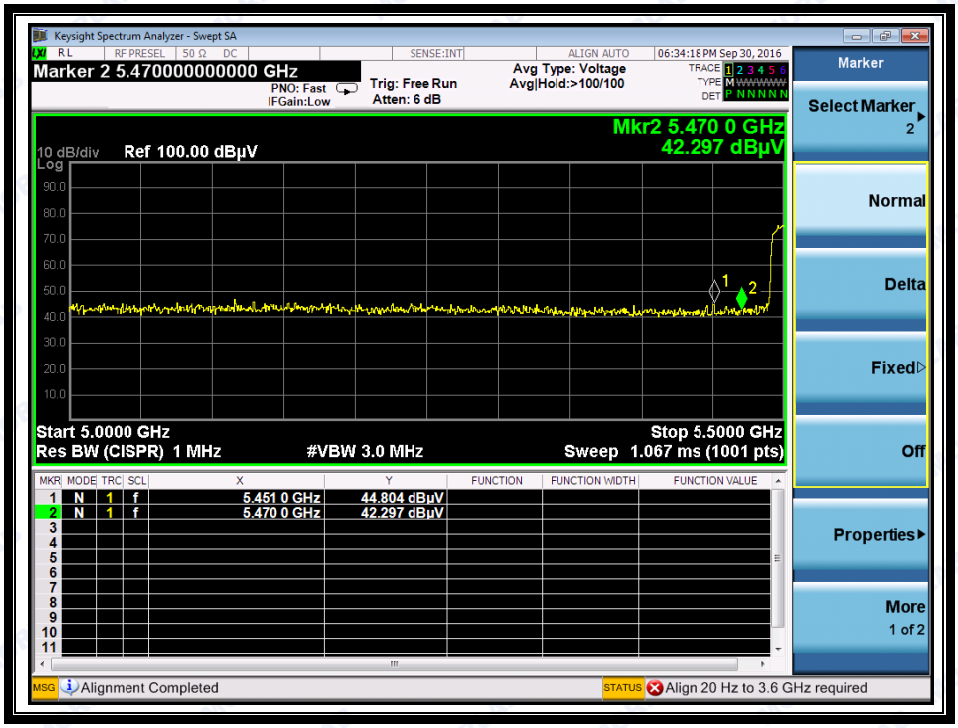
(Channel = 36 AVG @ 802.11ac)



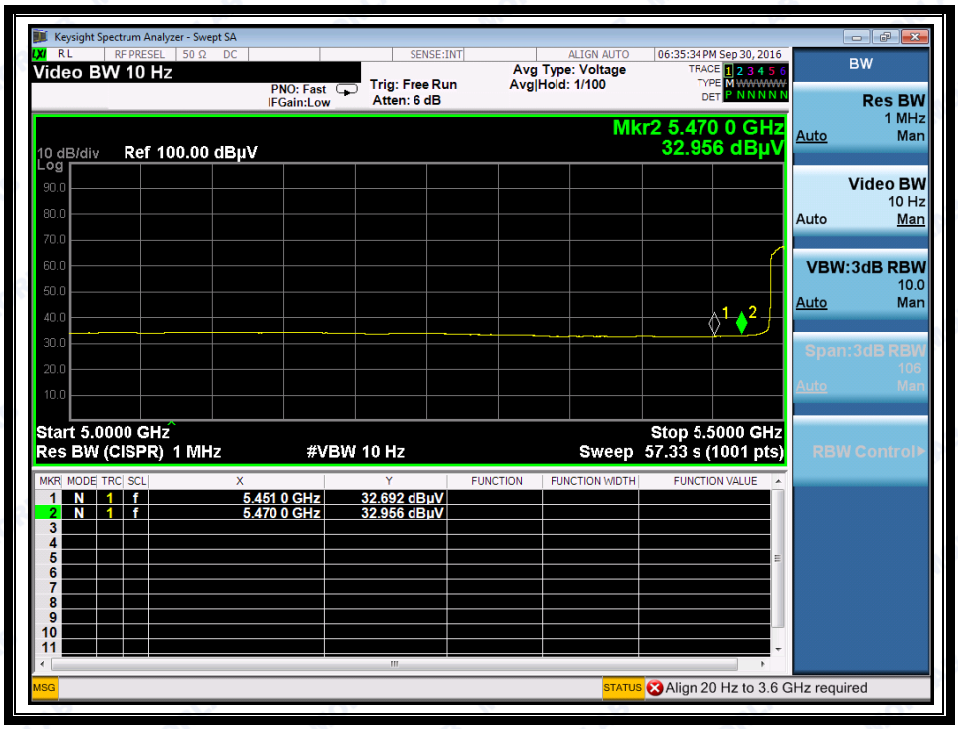
(Channel = 64 PEAK @ 802.11ac)



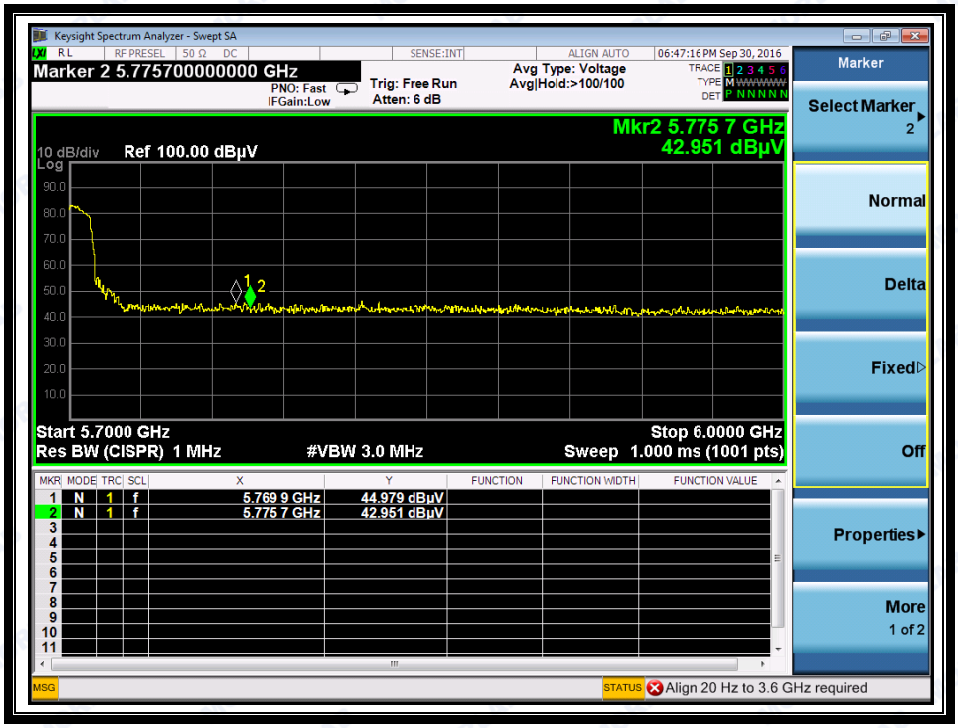
(Channel = 64 AVG @ 802.11ac)



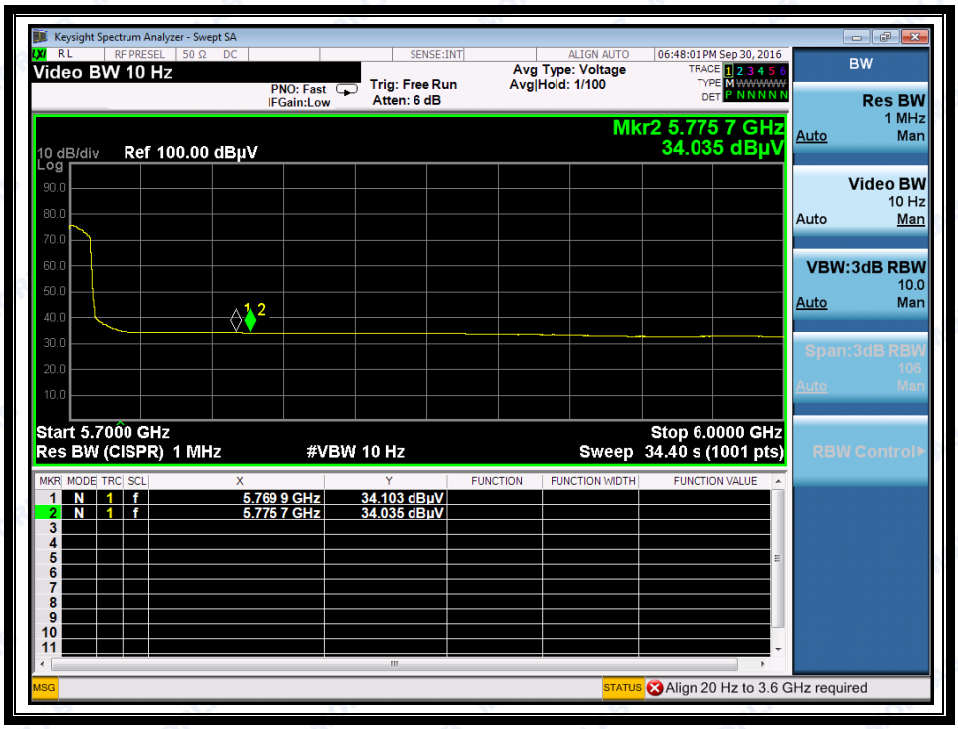
(Channel = 100 PEAK @ 802.11ac)



(Channel =100 AVG @ 802.11ac)



(Channel = 140 PEAK @ 802.11ac)



(Channel = 140 AVG @ 802.11ac)

2.5.3.2 802.11ac-40MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

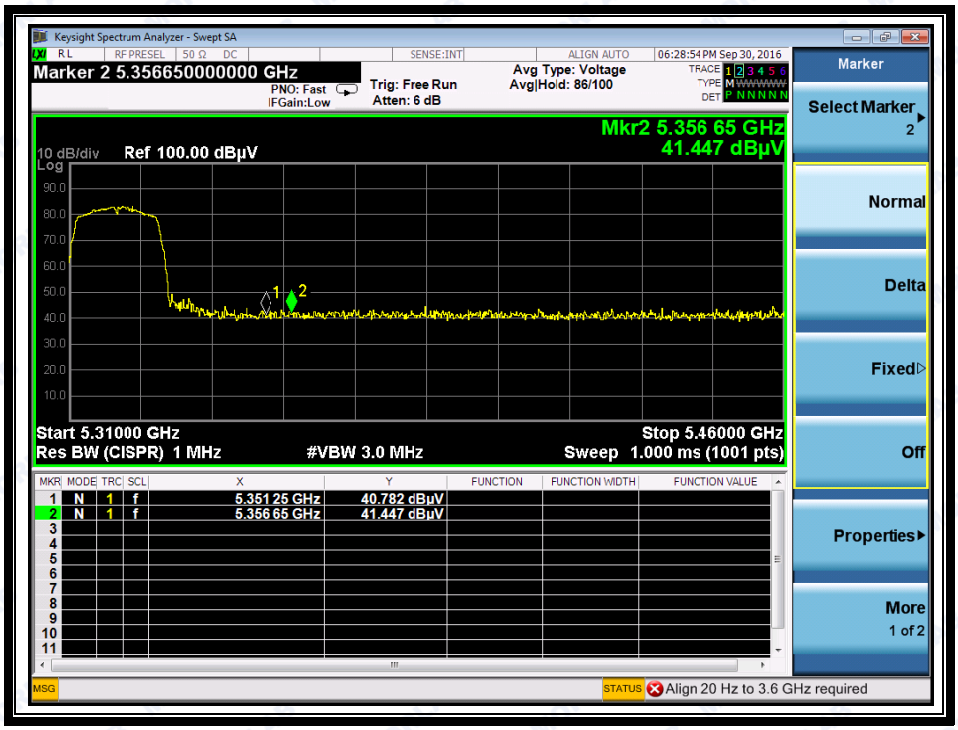
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
38	5140.32	PK	51.61	-50.65	32.11	33.07	74	Pass
38	5118.93	AV	37.77	-50.65	32.11	19.23	54	Pass
62	5356.65	PK	41.45	-50.65	32.11	22.91	74	Pass
62	5351.25	AV	32.95	-50.65	32.11	14.41	54	Pass
102	5431.46	PK	43.29	-50.65	32.11	24.75	74	Pass
102	5448.45	AV	32.63	-50.65	32.11	14.09	54	Pass
142	5717.40	PK	51.16	-50.65	32.11	32.62	74	Pass
142	5717.40	AV	36.56	-50.65	32.11	18.02	54	Pass

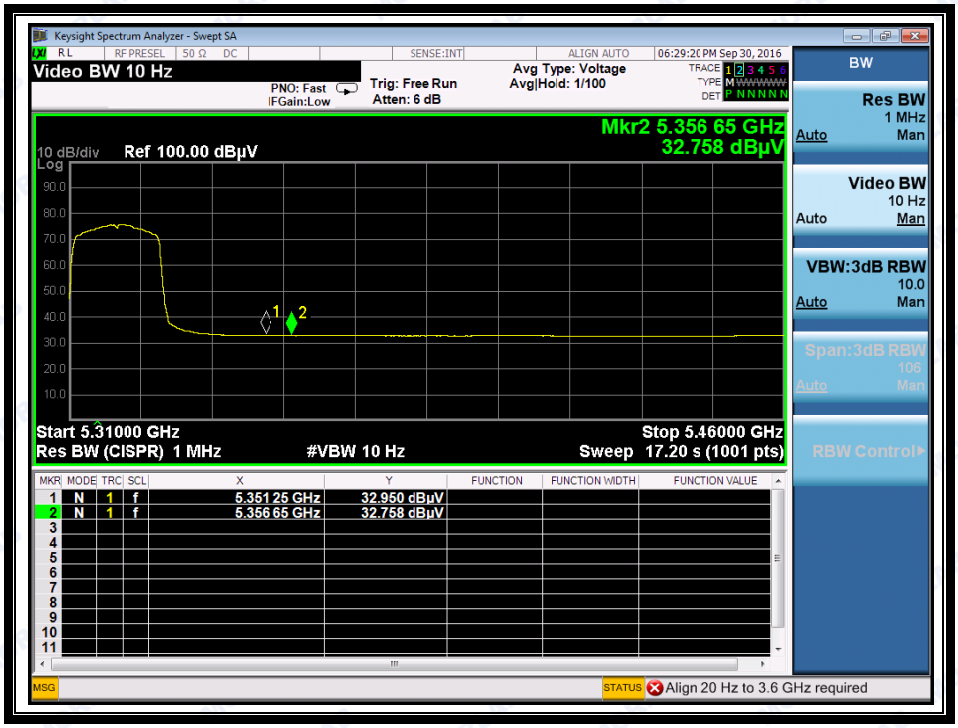
B. Test Plots:

(Channel = 38 PEAK @ 802.11ac)

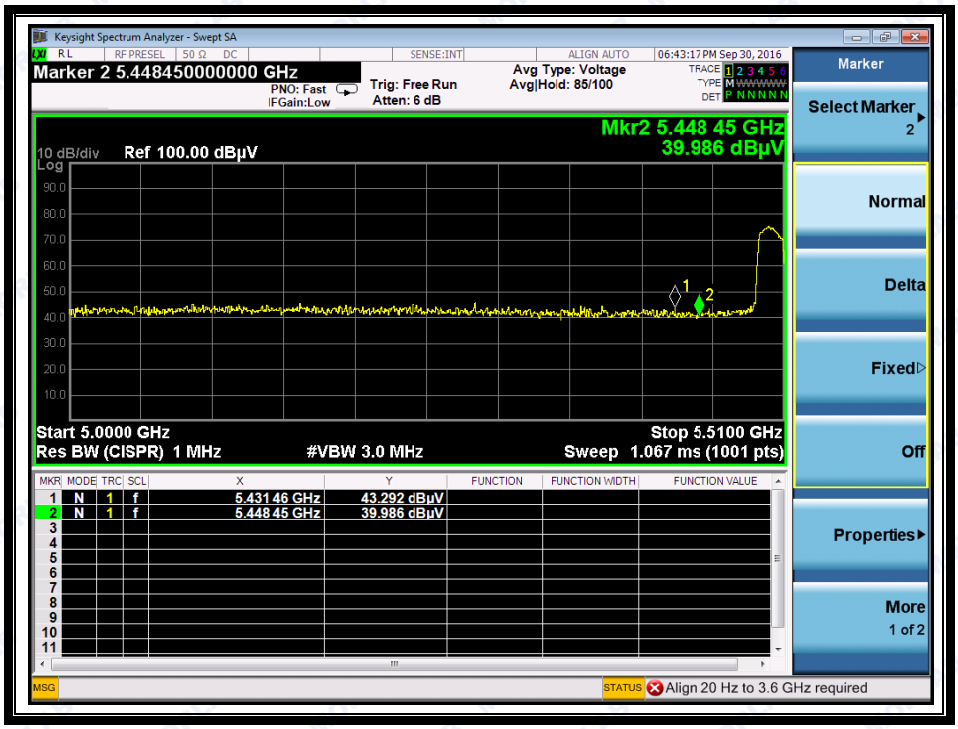
(Channel = 38 AVG @ 802.11ac)



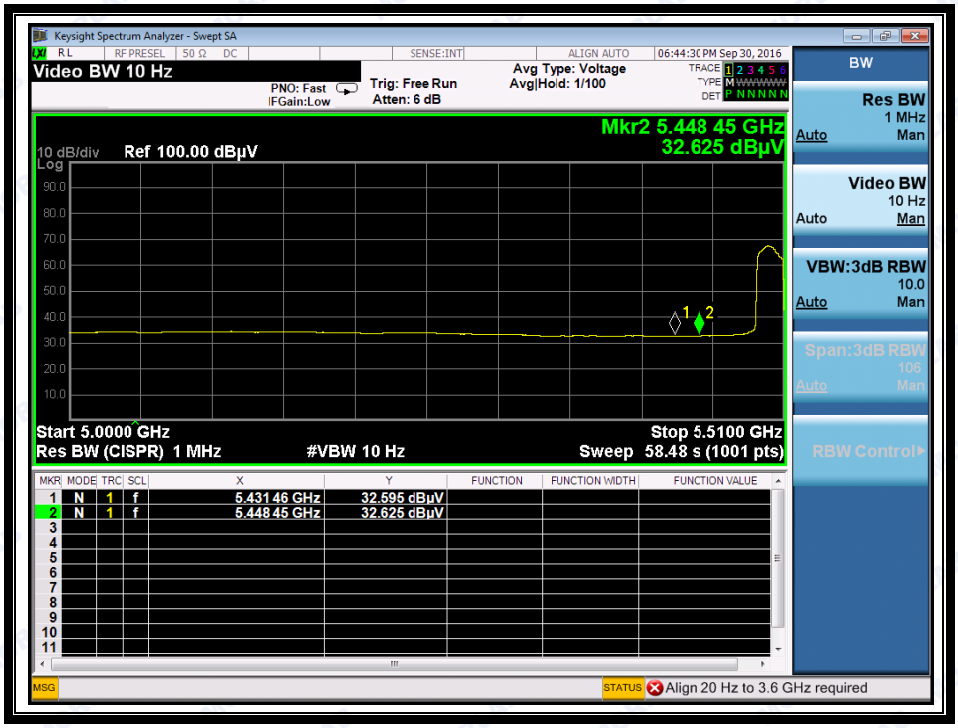
(Channel = 62 PEAK @ 802.11ac)



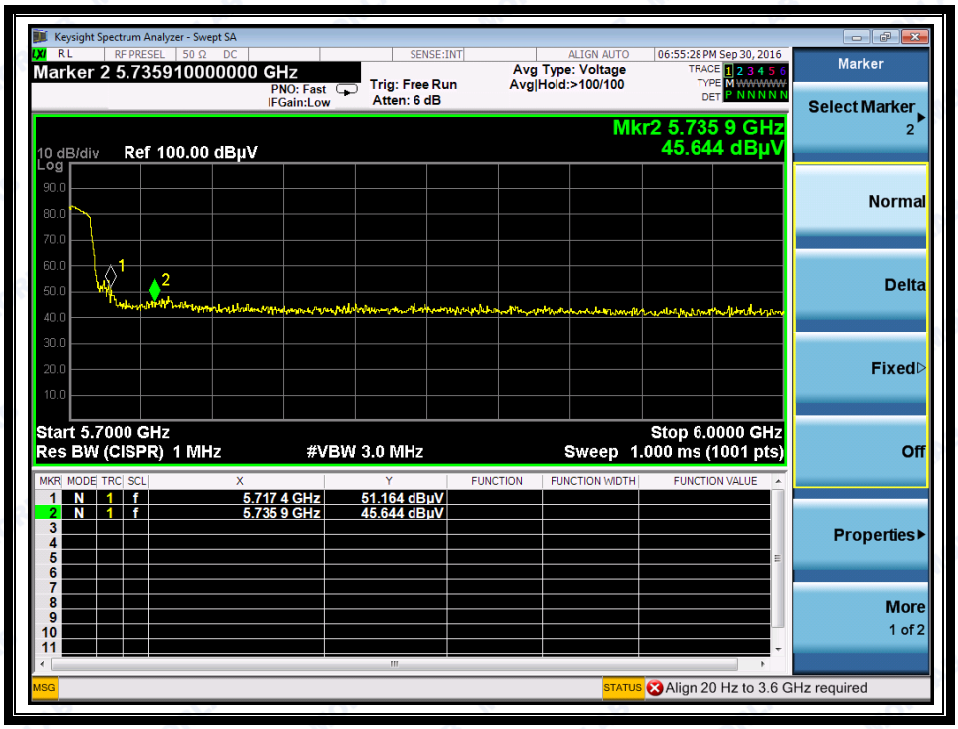
(Channel = 62 AVG @ 802.11ac)



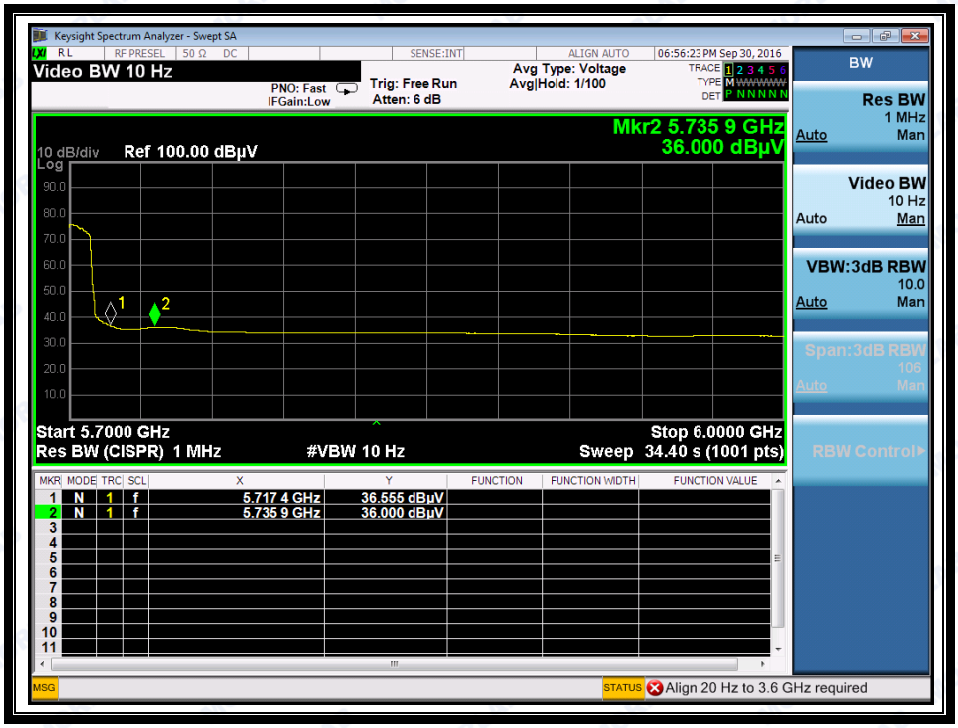
(Channel =102 PEAK @ 802.11ac)



(Channel = 102AVG @ 802.11ac)



(Channel = 142 PEAK @ 802.11ac)



(Channel = 142 AVG @ 802.11ac)

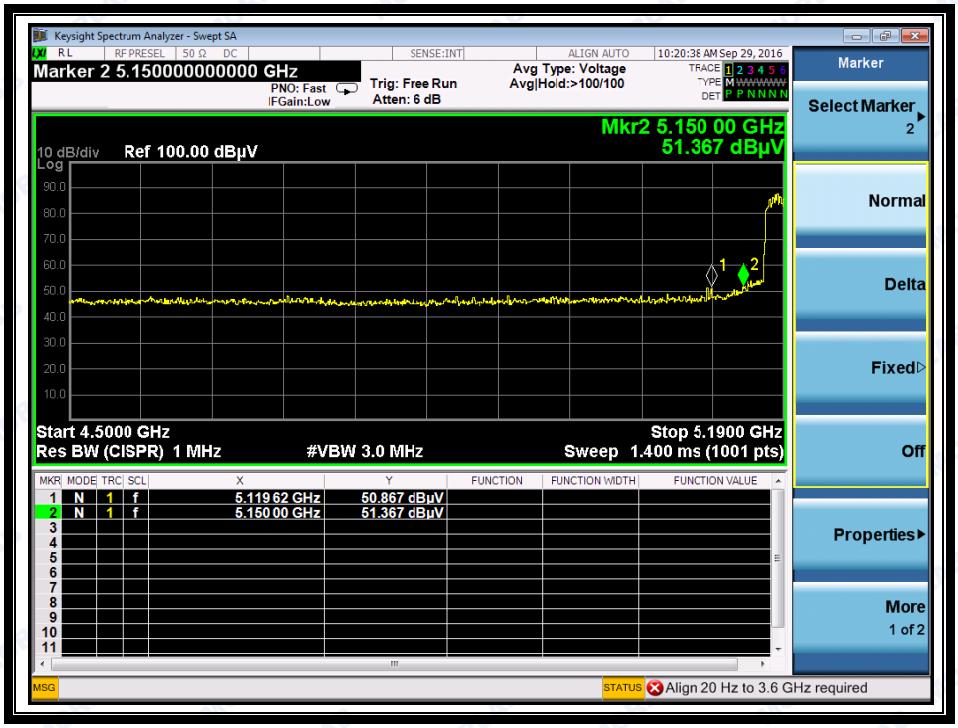
2.5.3.3 802.11ac-80MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

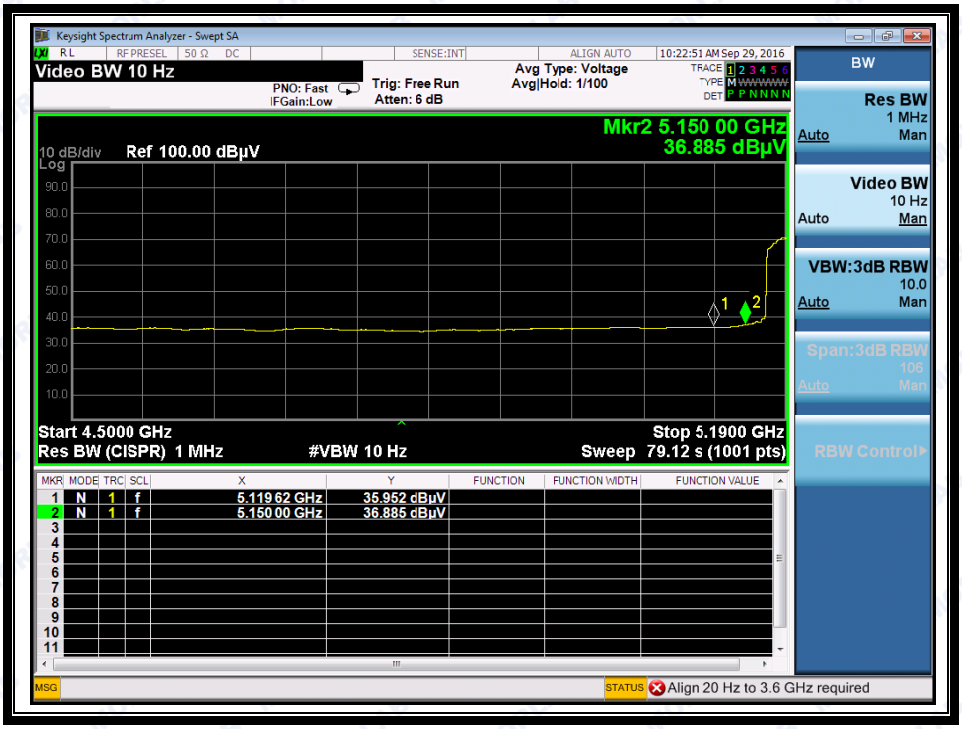
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
42	5150.00	PK	51.37	-50.65	32.11	32.83	74	Pass
42	5150.00	AV	36.89	-50.65	32.11	18.35	54	Pass
58	5364.97	PK	43.19	-50.65	32.11	24.65	74	Pass
58	5364.97	AV	33.22	-50.65	32.11	14.68	54	Pass
106	5465.87	PK	43.73	-50.65	32.11	25.19	74	Pass
106	5465.87	AV	33.34	-50.65	32.11	14.8	54	Pass
138	5726.89	PK	73.72	-50.65	32.11	55.18	74	Pass
138	5726.89	AV	65.1	-50.65	32.11	46.56	54	Pass

B. Test Plots:

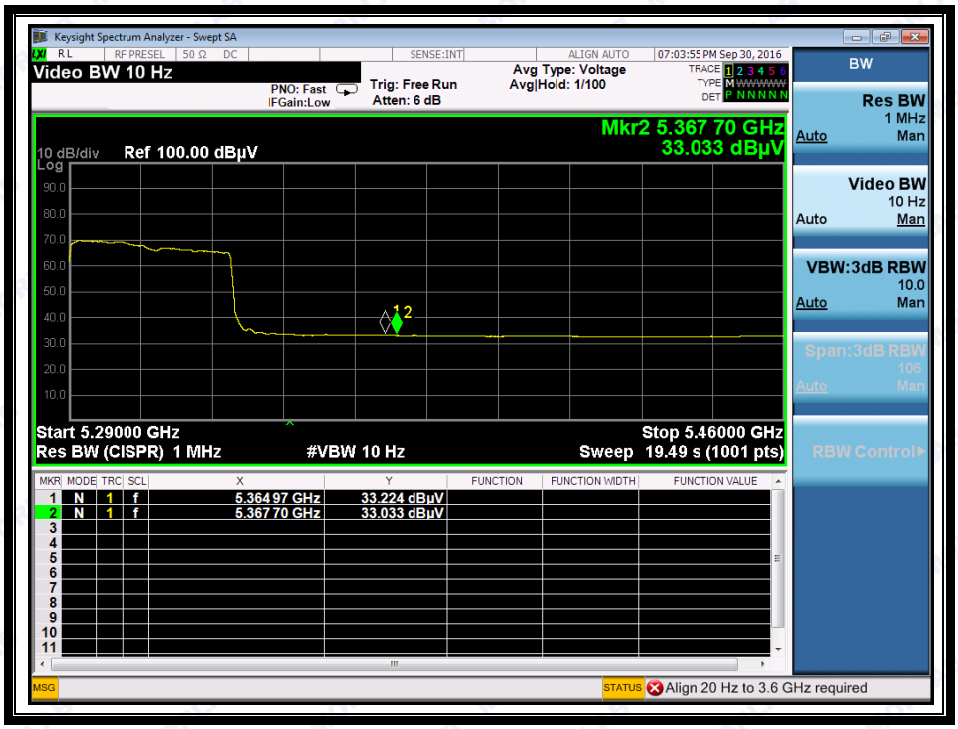


(Channel = 42 PEAK @ 802.11ac)

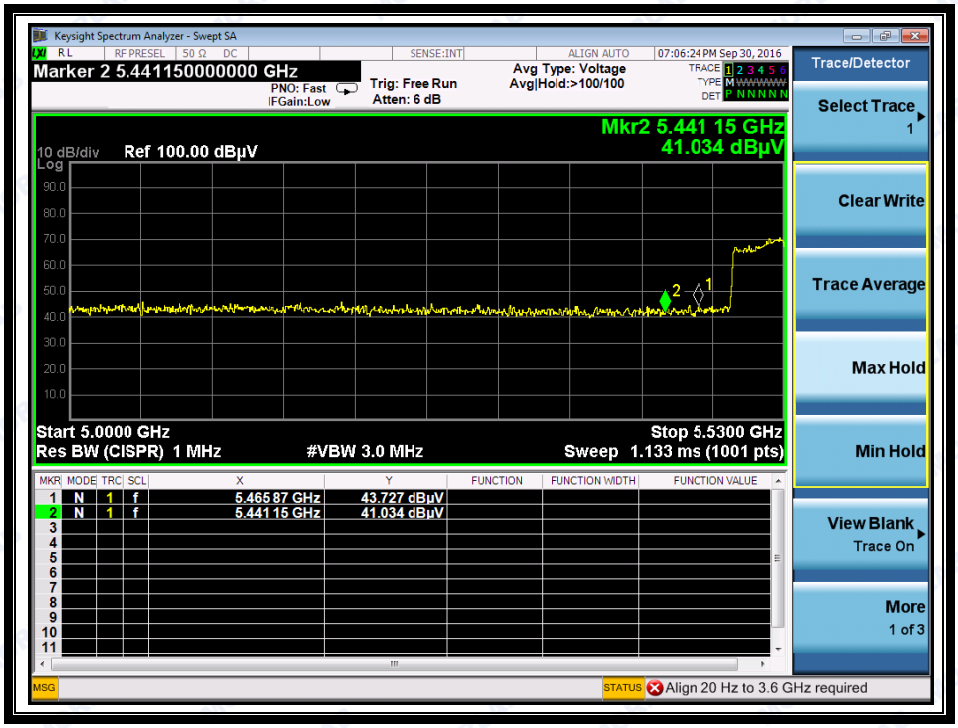


(Channel = 42 AVG @ 802.11ac)

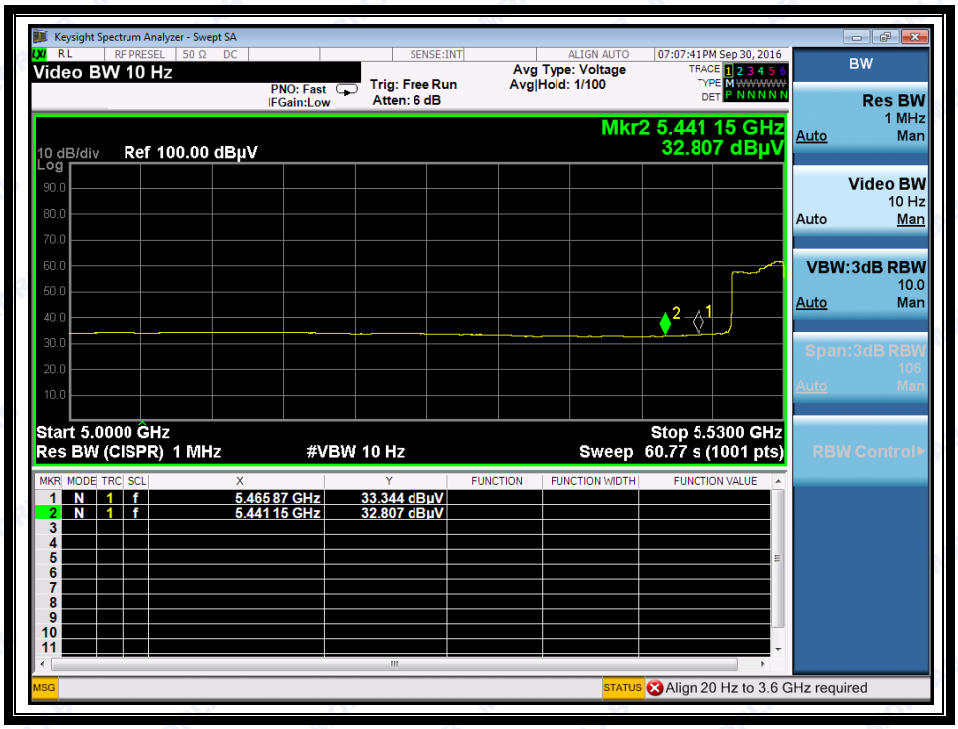
(Channel = 58 PEAK @ 802.11ac)



(Channel = 58 PEAK @ 802.11ac)



(Channel = 106 PEAK @ 802.11ac)



(Channel = 106 PEAK @ 802.11ac)

(Channel = 138 PEAK @ 802.11ac)

(Channel = 138 PEAK @ 802.11ac)

2.5.3.4 802.11n-20MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

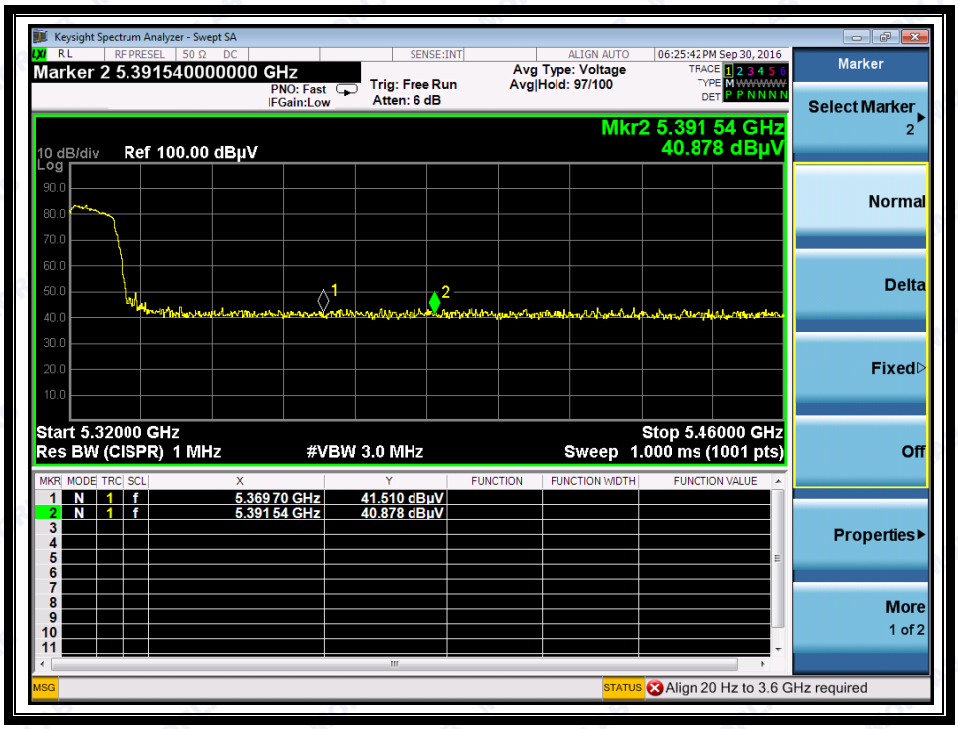
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
36	5140.32	PK	48.24	-50.65	32.11	29.7	74	Pass
36	5032.68	AV	36.15	-50.65	32.11	17.61	54	Pass
64	5369.70	PK	41.51	-50.65	32.11	22.97	74	Pass
64	5369.70	AV	32.83	-50.65	32.11	14.29	54	Pass
100	5443.5	PK	41.38	-50.65	32.11	22.84	74	Pass
100	5443.5	AV	32.92	-50.65	32.11	14.38	54	Pass
140	5766.3	PK	44.91	-50.65	32.11	26.37	74	Pass
140	5766.3	AV	34.25	-50.65	32.11	15.71	54	Pass

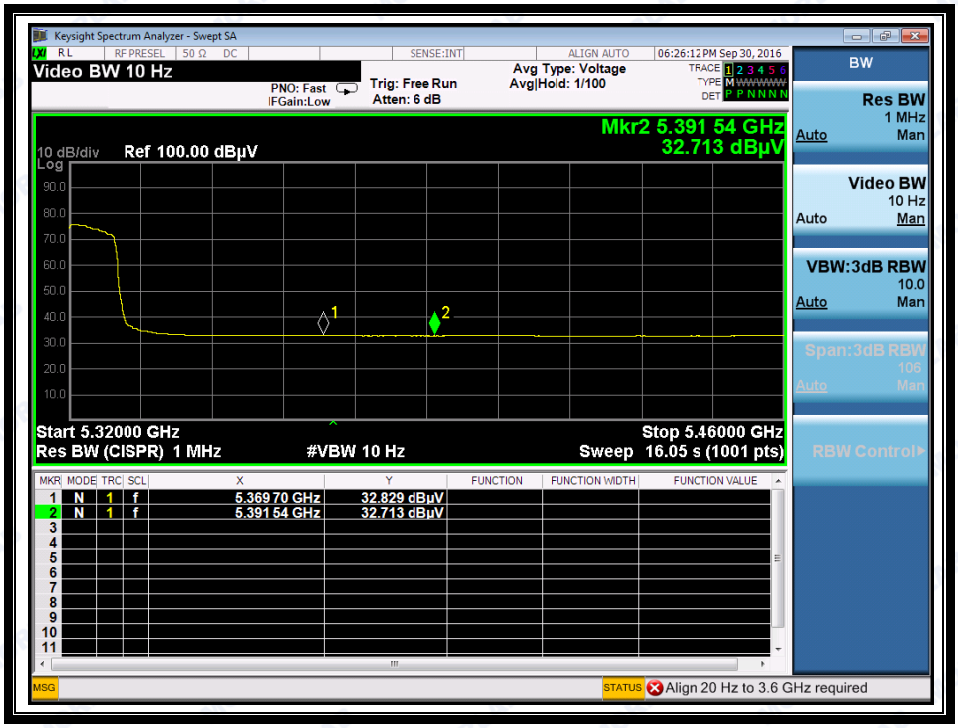
B. Test Plots:

(Channel = 36 PEAK @ 802.11n 20MHz)

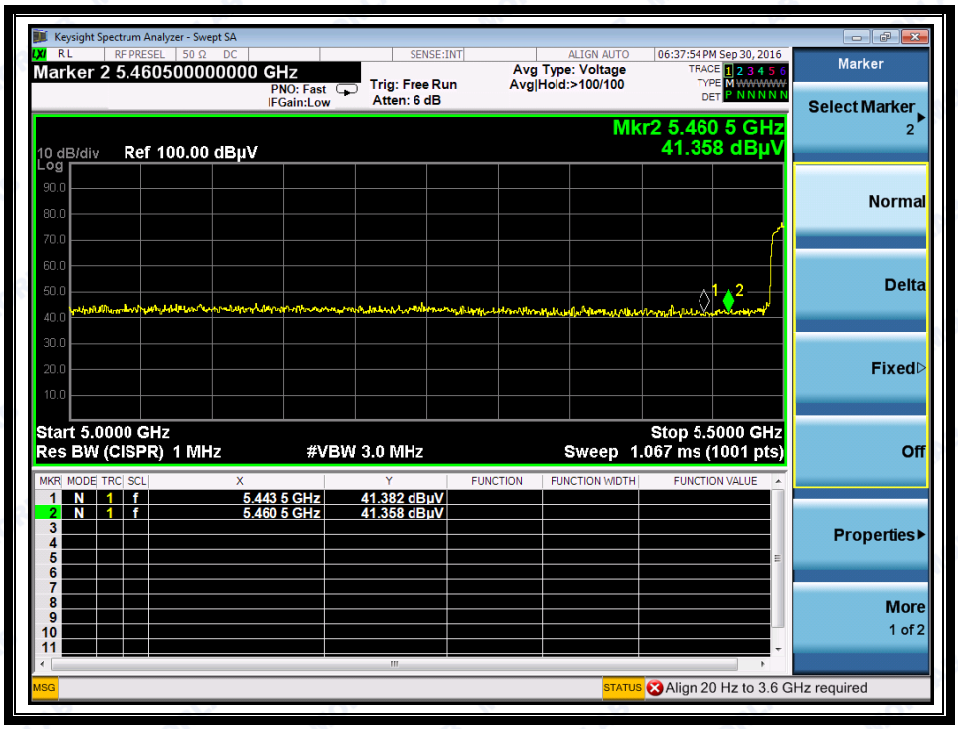
(Channel = 36 AVG @ 802.11n 20MHz)



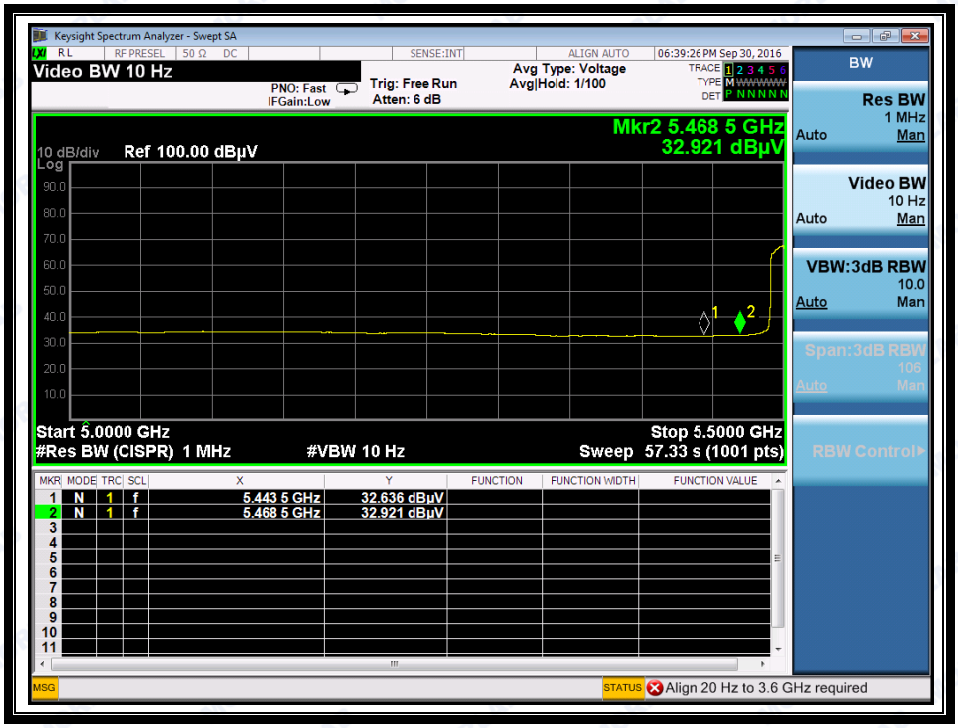
(Channel = 64 PEAK @ 802.11n 20MHz)



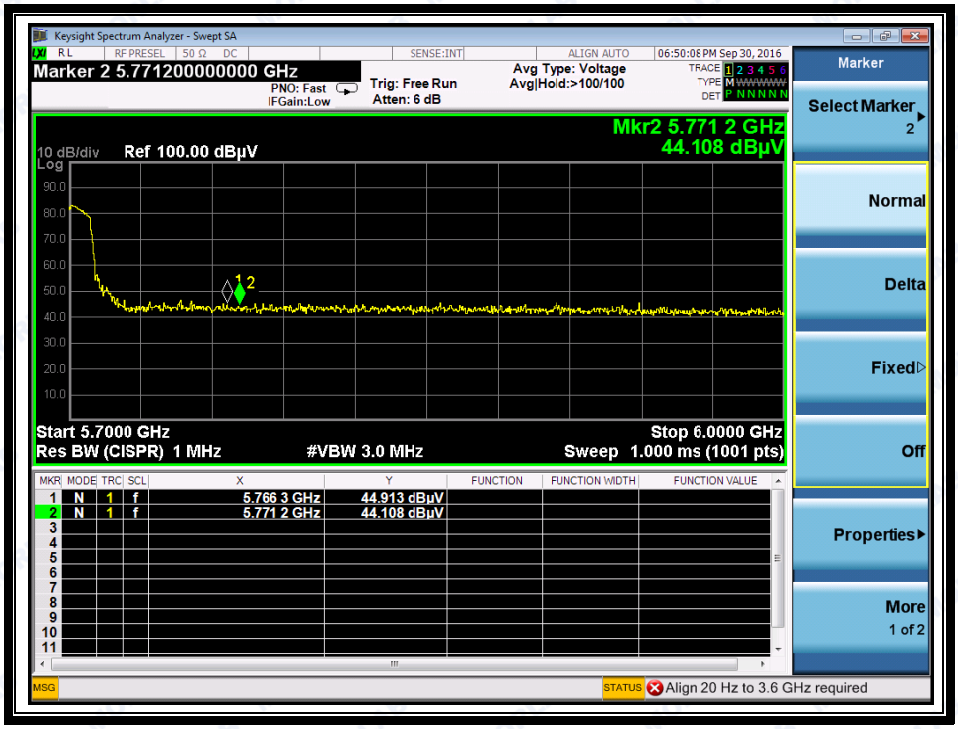
(Channel = 64 AVG @ 802.11n 20MHz)



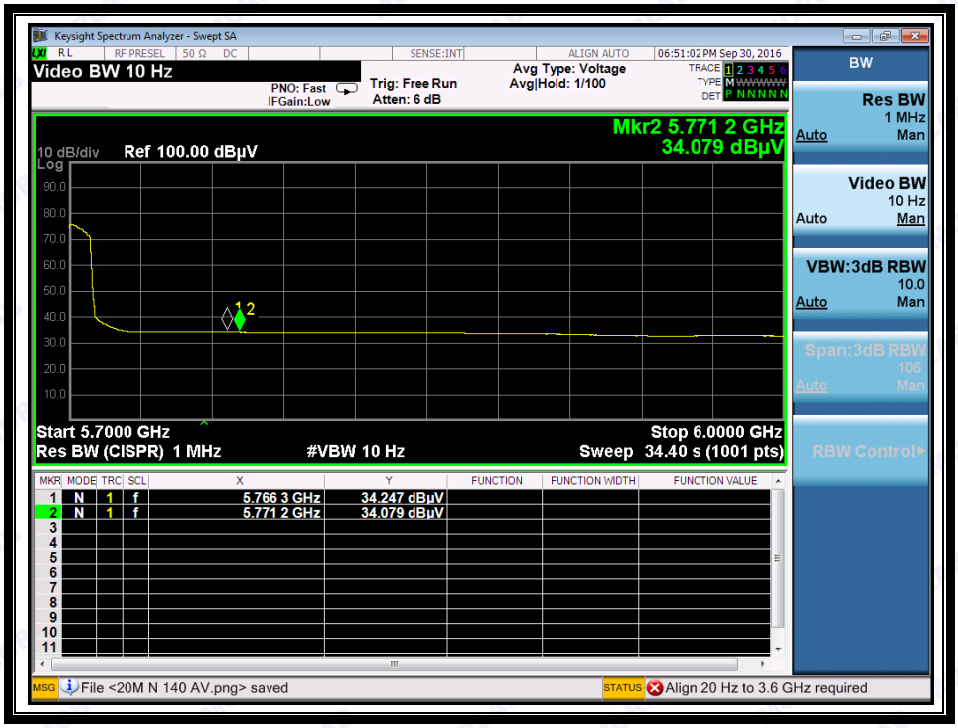
(Channel = 100 PEAK @ 802.11n 20MHz)



(Channel =100 AVG @802.11n 20MHz)



(Channel = 140 PEAK @802.11n 20MHz)



(Channel = 140 AVG @ 802.11n 20MHz)

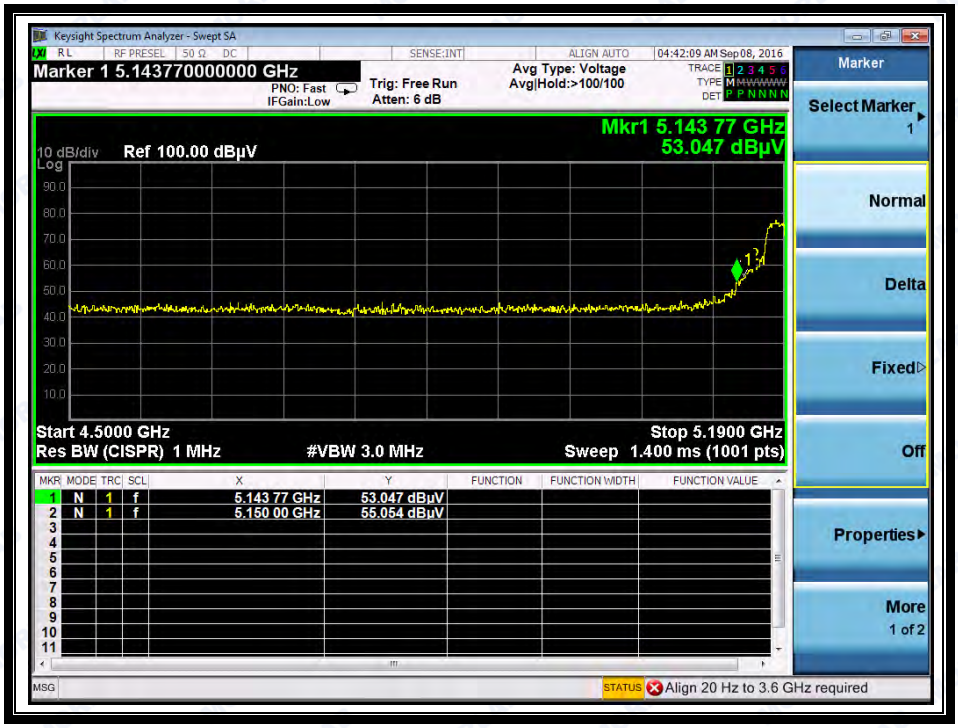
2.5.3.5 802.11n-40MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

A. Test Verdict:

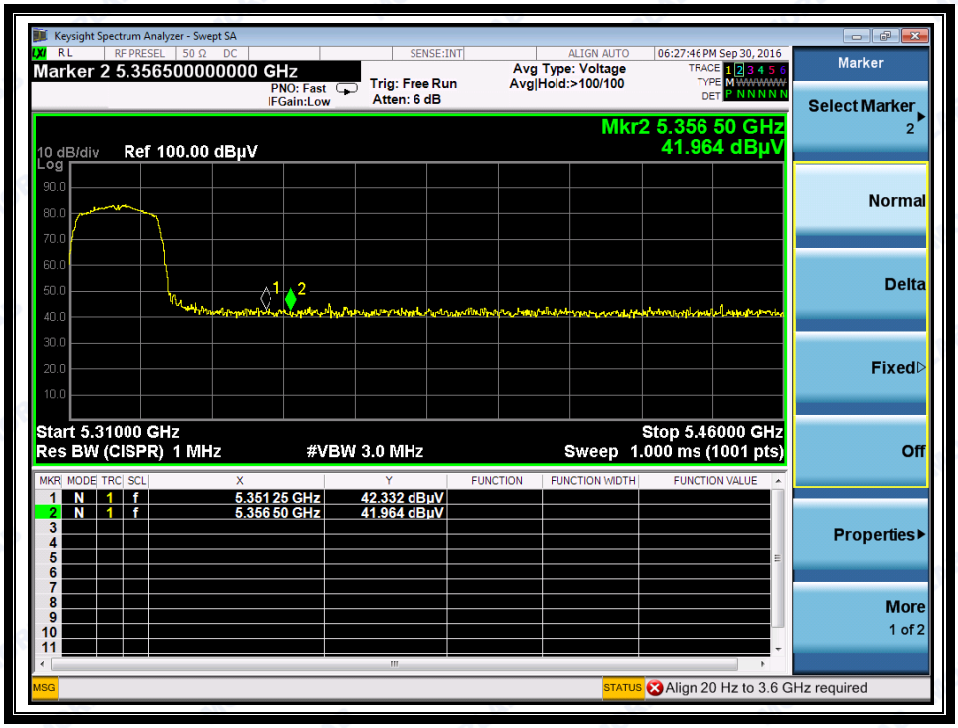
Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
38	5143.77	PK	53.05	-50.65	32.11	34.51	74	Pass
38	5123.07	AV	38.21	-50.65	32.11	19.67	54	Pass
62	5351.25	PK	42.33	-50.65	32.11	23.79	74	Pass
62	5351.25	AV	32.96	-50.65	32.11	14.42	54	Pass
102	5402.39	PK	42.91	-50.65	32.11	24.37	74	Pass
102	5454.57	AV	32.72	-50.65	32.11	14.18	54	Pass
142	5735.9	PK	45.66	-50.65	32.11	27.12	74	Pass
142	5735.9	AV	35.97	-50.65	32.11	17.43	54	Pass

B. Test Plots:

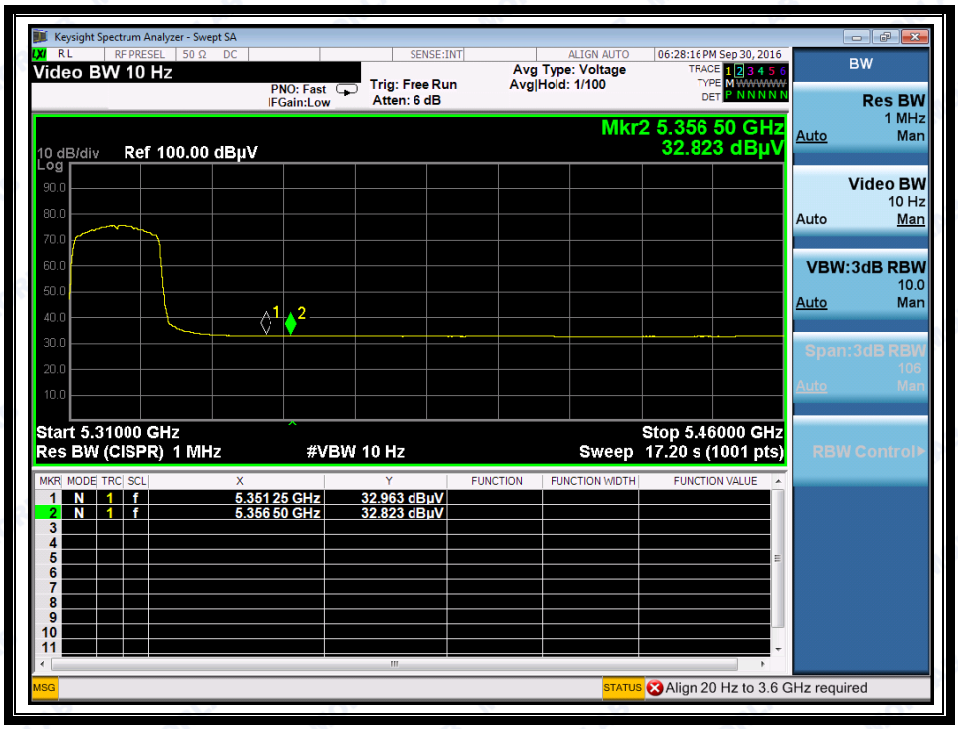


(Channel = 38 PEAK @ 802.11n 40MHz)

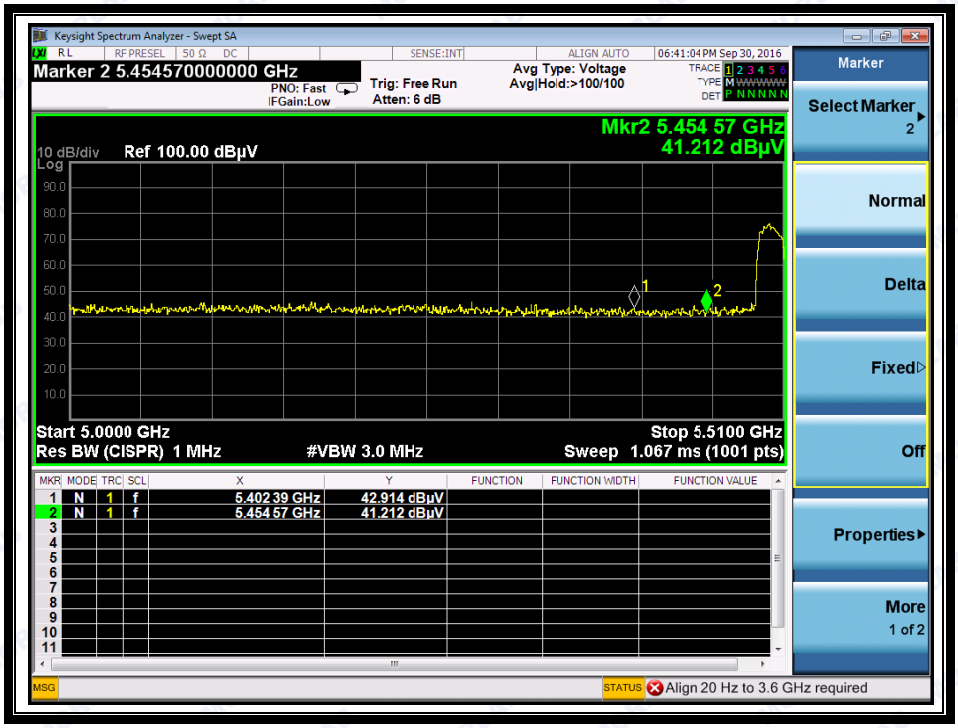
(Channel = 38 AVG @ 802.11n 40MHz)



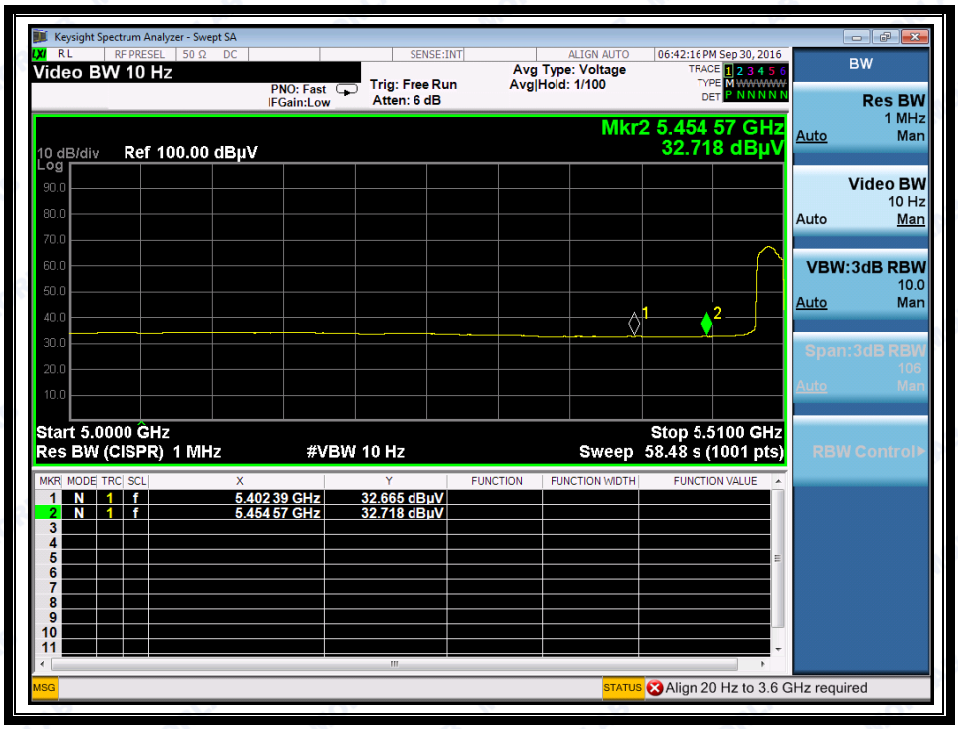
(Channel = 62 PEAK @ 802.11n 40MHz)



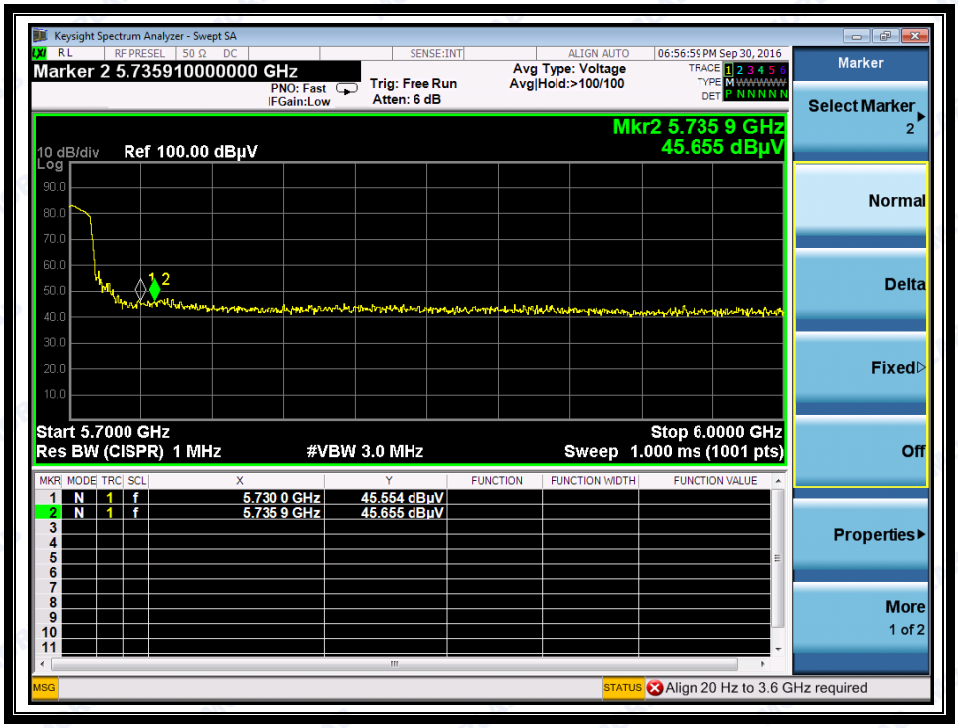
(Channel = 62 AVG @ 802.11n 40MHz)



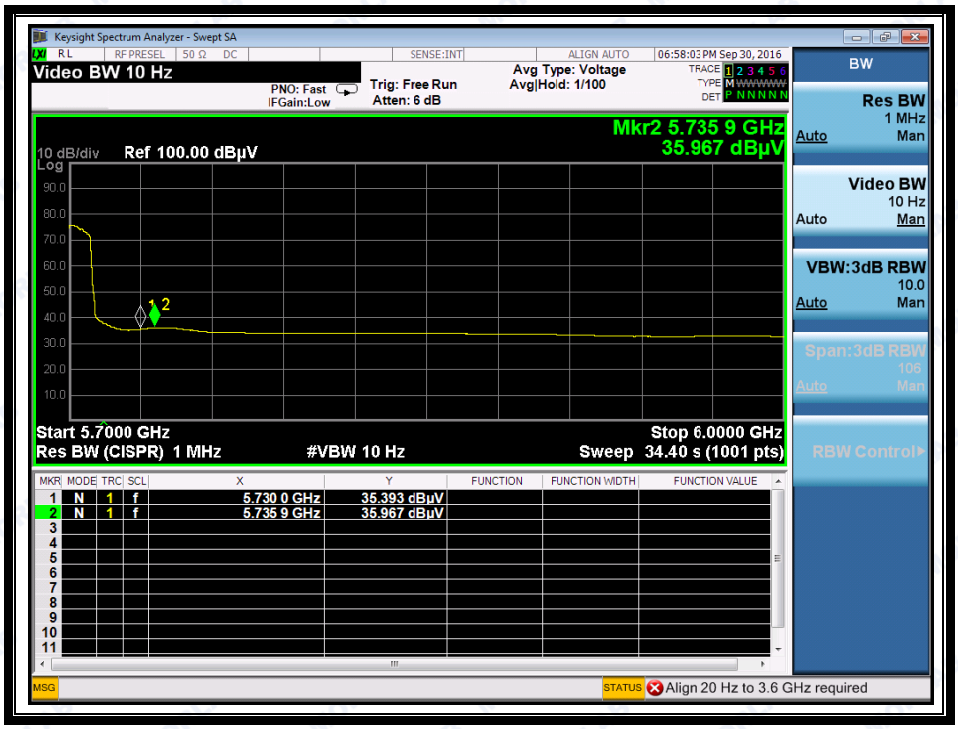
(Channel =102 PEAK @ 802.11n 40MHz)



(Channel = 102AVG @ 802.11n 40MHz)



(Channel = 142 PEAK @ 802.11n 40MHz)



(Channel = 142 AVG @ 802.11n 40MHz)

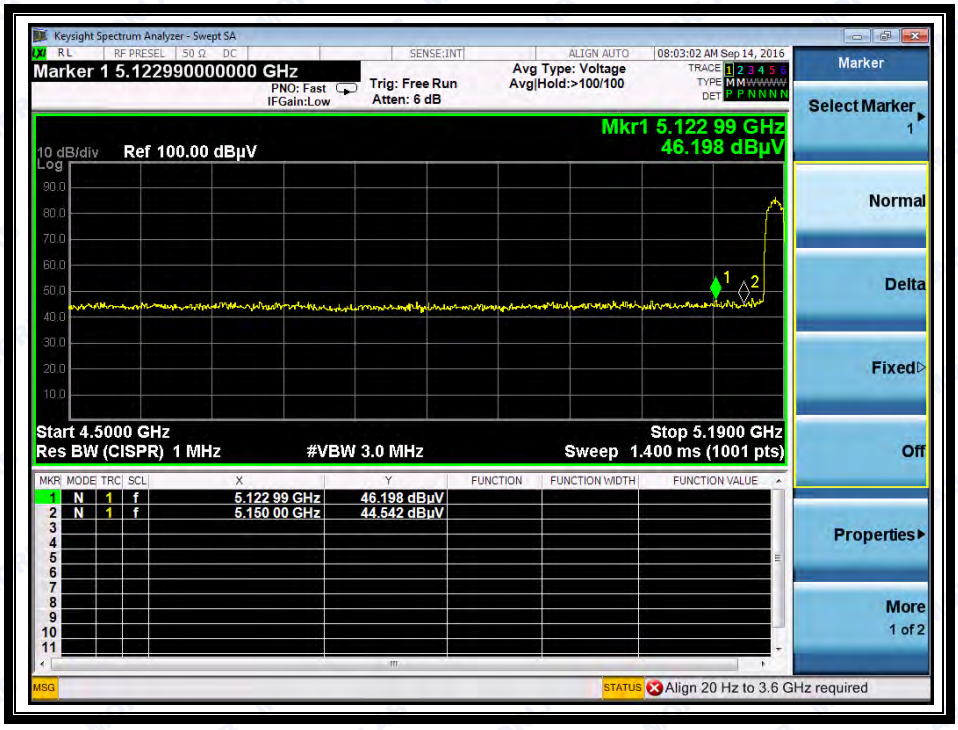
2.5.3.6 802.11a Test mode

The lowest and highest channels are tested to verify the band edge emissions.

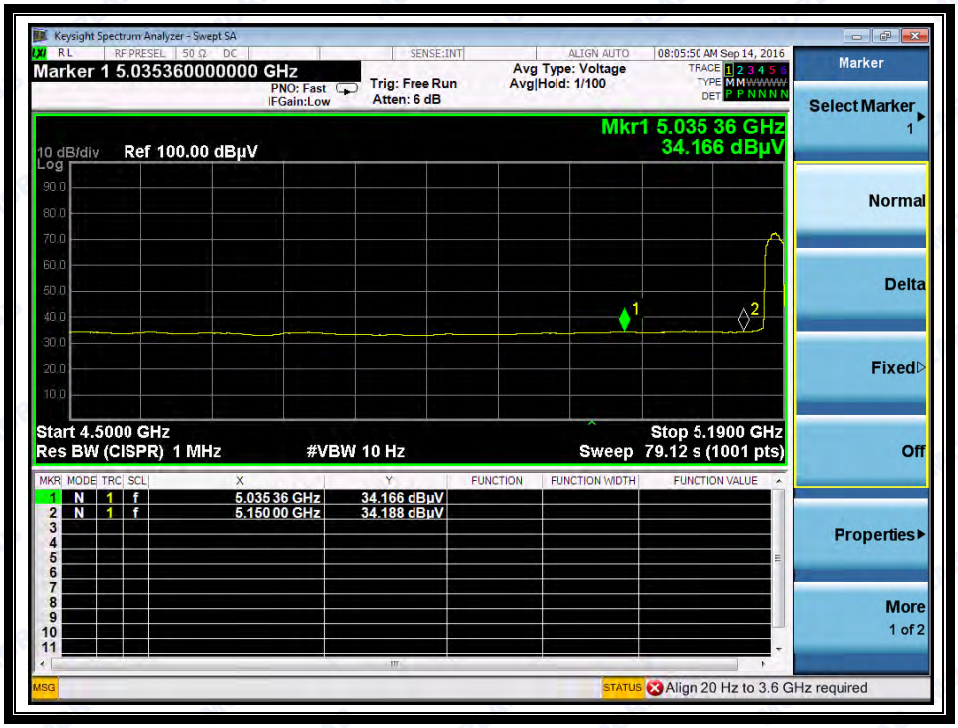
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
36	5122.99	PK	46.20	-50.65	32.11	27.66	74	Pass
36	5035.36	AV	34.17	-50.65	32.11	15.63	54	Pass
64	5393.08	PK	41.18	-50.65	32.11	22.64	74	Pass
64	5369.70	AV	32.86	-50.65	32.11	14.32	54	Pass
100	5461.50	PK	41.98	-50.65	32.11	23.44	74	Pass
100	5461.50	AV	32.83	-50.65	32.11	14.29	54	Pass
140	5766.30	PK	43.42	-50.65	32.11	24.88	74	Pass
140	5766.30	AV	34.21	-50.65	32.11	15.67	54	Pass

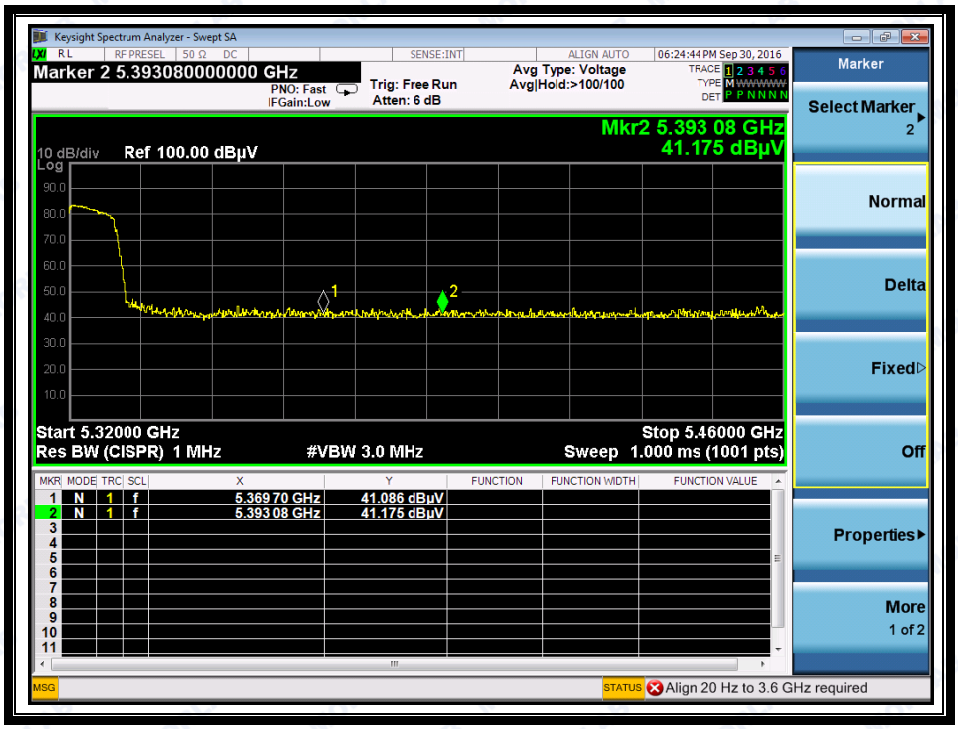
B. Test Plots:



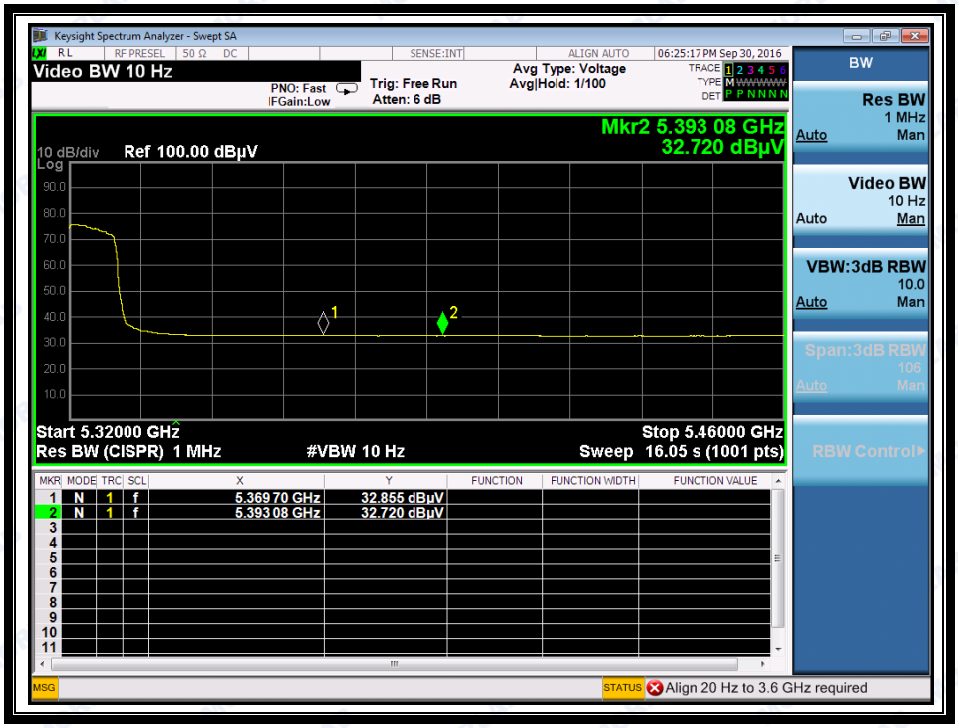
(Channel = 36 PEAK @ 802.11a)



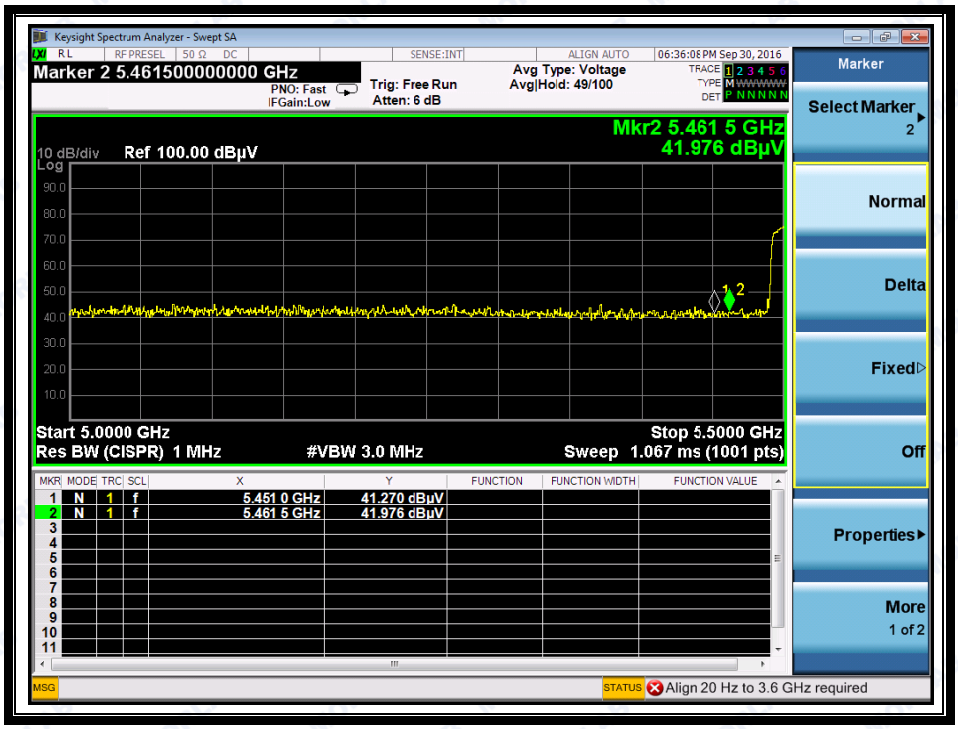
(Channel = 36 AVG @ 802.11a)



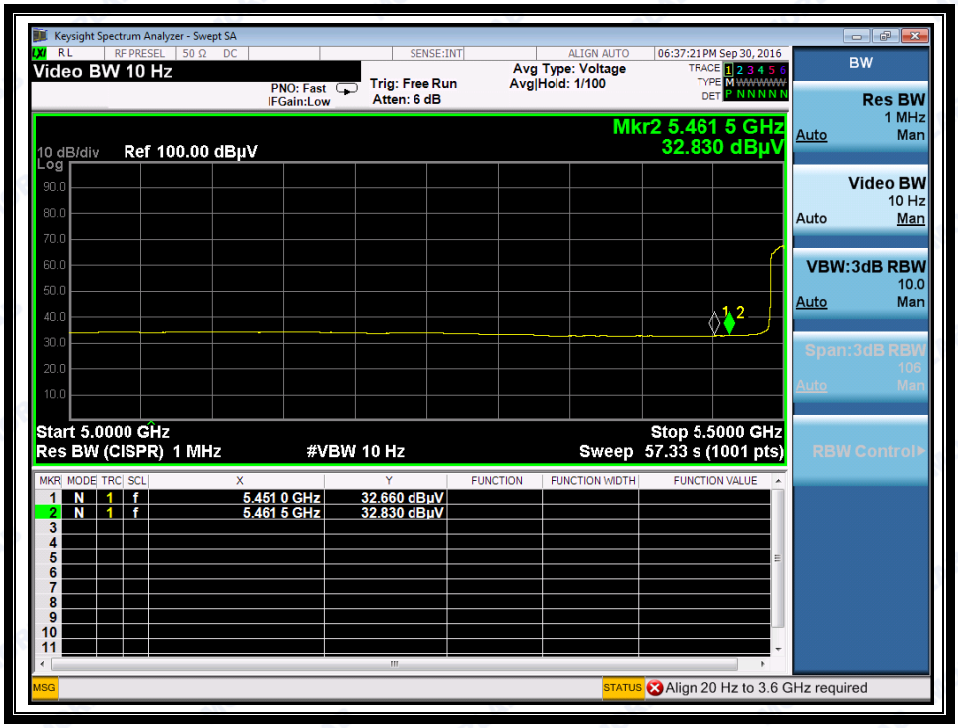
(Channel = 64 PEAK @ 802.11a)



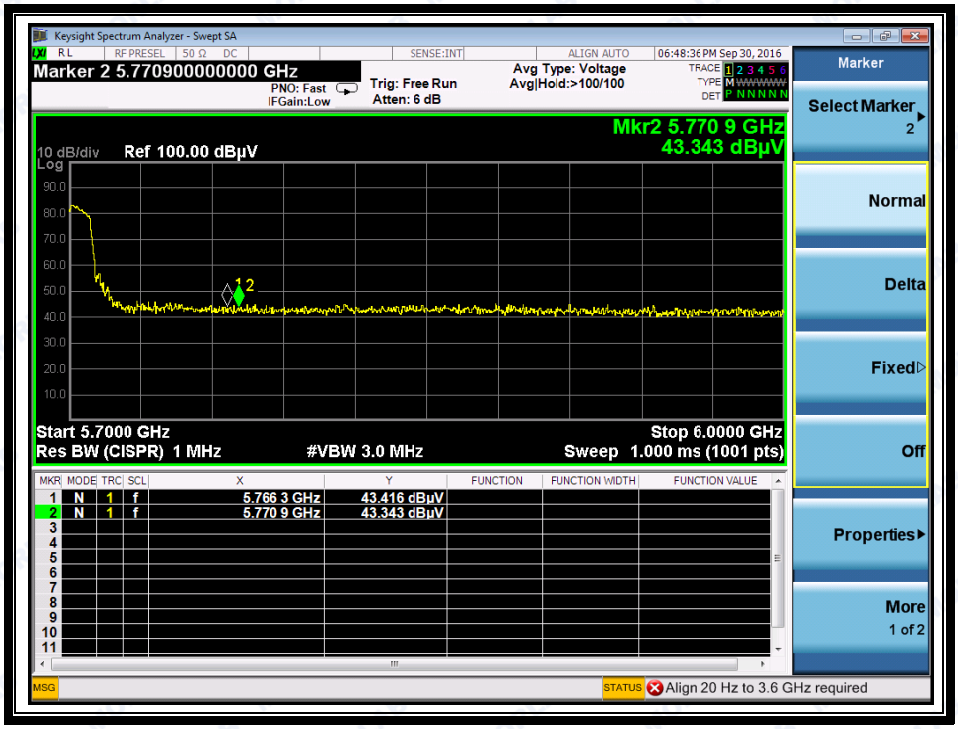
(Channel = 64 AVG @ 802.11a)



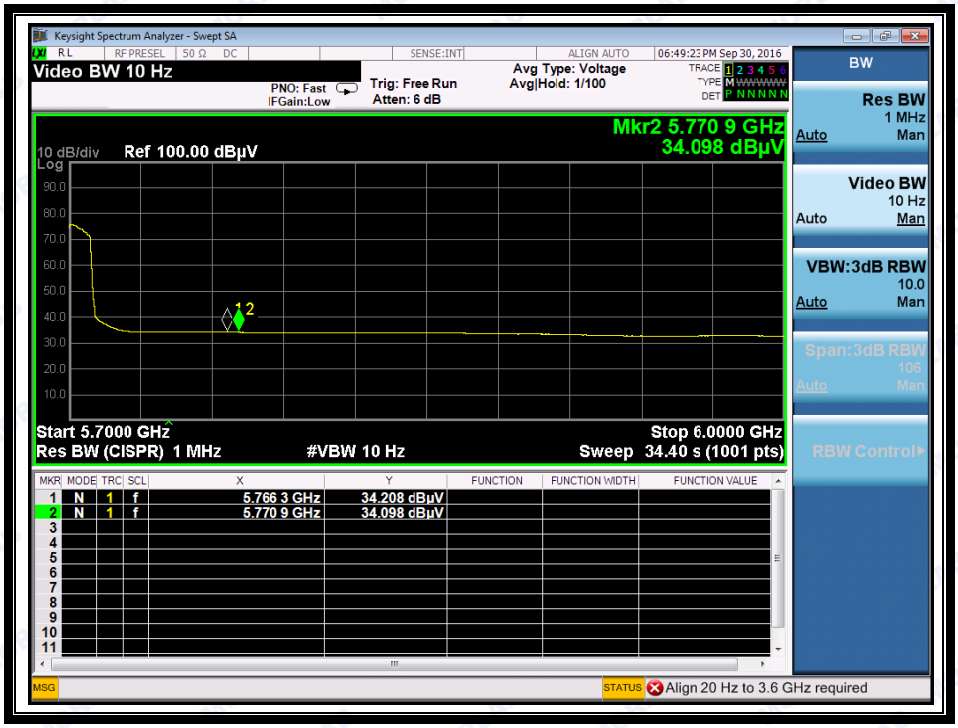
(Channel = 100 PEAK @ 802.11a)



(Channel =100 AVG @ 802.11a)



(Channel = 140 PEAK @ 802.11a)



(Channel = 140 AVG @ 802.11a)

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 -30°C and +50°C. The temperature was incremented by 10^{o} 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%	7.6	+20(Ref)	5,179,999,985	-15	-0.00000029
100%		-30	5,180,000,011	11	0.00000021
100%		-20	5,180,000,004	4	0.00000008
100%		-10	5,179,999,976	-24	-0.00000046
100%		0	5,179,999,991	-9	-0.00000017
100%		+10	5,180,000,008	8	0.00000015
100%		+20	5,179,999,982	-18	-0.00000035
100%		+30	5,180,000,017	17	0.00000033
100%		+40	5,180,000,006	6	0.00000012
100%		+50	5,179,999,988	-12	-0.00000023
114%	6.4	+20	5,180,000,017	17	0.00000033
BATT.END POINT	8.7	+20	5,179,999,985	-15	-0.00000029

Frequency Stability Measurements for UNII Band 2A (Ch. 52)

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq Dev. (Hz)	Deviation (%)
100%	7.6	+20(Ref)	5,260,000,024	24	0.00000046
100%		-30	5,260,000,033	33	0.00000063
100%		-20	5,259,999,972	-28	-0.00000053
100%		-10	5,260,000,092	92	0.00000175
100%		0	5,260,000,014	14	0.00000027
100%		+10	5,259,999,927	-73	-0.00000139
100%		+20	5,259,999,971	-29	-0.00000055
100%		+30	5,259,999,937	-63	-0.00000120
100%		+40	5,260,000,016	16	0.00000030
100%		+50	5,260,000,092	92	0.00000175
114%	6.4	+20	5,259,999,957	-43	-0.00000082
BATT.END POINT	8.7	+20	5,259,999,982	-18	-0.00000034

Frequency Stability Measurements for UNII Band 2C (Ch. 100)

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq Dev. (Hz)	Deviation (%)
100%	7.6	+20(Ref)	5,499,999,995	-5	-0.00000009
100%		-30	5,499,999,936	-64	-0.00000116
100%		-20	5,500,000,021	21	0.00000038
100%		-10	5,499,999,972	-28	-0.00000051
100%		0	5,500,000,082	82	0.00000149
100%		+10	5,500,000,044	44	0.00000080
100%		+20	5,500,000,052	52	0.00000095
100%		+30	5,500,000,031	31	0.00000056
100%		+40	5,499,999,947	-53	-0.00000096
100%		+50	5,500,000,032	32	0.00000058
114%	6.4	+20	5,500,000,090	90	0.00000164
BATT.END POINT	8.7	+20	5,499,999,977	-23	-0.00000042

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

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq Dev. (Hz)	Deviation (%)
100%	7.6	+20(Ref)	5,744,999,978	-22	-0.00000038
100%		-30	5,744,999,997	-3	-0.00000005
100%		-20	5,745,000,024	24	0.00000042
100%		-10	5,744,999,986	-14	-0.00000024
100%		0	5,745,000,012	12	0.00000021
100%		+10	5,745,000,007	7	0.00000012
100%		+20	5,745,000,017	17	0.00000030
100%		+30	5,745,000,012	12	0.00000021
100%		+40	5,744,999,988	-12	-0.00000021
100%		+50	5,745,000,001	1	0.00000002
114%	6.4	+20	5,745,000,016	16	0.00000028
BATT.ENDPOINT	8.7	+20	5,744,999,997	-3	-0.00000005

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 Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)

2.7.1 Requirement

According to FCC section 15.407(h), (1) Transmit power control (TPC). U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

(2) Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands. The device must sense for radar signals at 100 percent of its emission bandwidth. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is −64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is −62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. For the initial channel setting, the manufacturers shall be permitted to provide for either random channel selection or manual channel selection.

A U-NII network will employ a DFS function to detect signals from radar systems and to avoid co-channel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHz bands.1

Within the context of the operation of the DFS function, a U-NII device will operate in either Master Mode or Client Mode. U-NII devices operating in Client Mode can only operate in a network controlled by a U-NII device operating in Master Mode.2

Tables 1 and 2 shown below summarize the information contained in sections 5.1.1 and 5.1.2.

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

The operational behavior and individual DFS requirements that are associated with these modes are as follows:

2.7.1.1 Master Devices

a) The Master Device will use DFS in order to detect Radar Waveforms with received signal strength above the DFS Detection Threshold in the 5250 − 5350 MHz and 5470 − 5725 MHz bands. DFS is not required in the 5150 − 5250 MHz or 5725 − 5825 MHz bands.

b) Before initiating a network on a Channel, the Master Device will perform a Channel Availability Check for a specified time duration (Channel Availability Check Time) to ensure that there is no radar system operating on the Channel, using DFS described under subsection a) above.

c) The Master Device initiates a U-NII network by transmitting control signals that will enable other U-NII devices to Associate with the Master Device.

d) During normal operation, the Master Device will monitor the Channel (In-Service Monitoring) to ensure that there is no radar system operating on the Channel, using DFS described under a).

e) If the Master Device has detected a Radar Waveform during In-Service Monitoring as described under d), the Operating Channel of the U-NII network is no longer an Available Channel. The Master Device will instruct all associated Client Device(s) to stop transmitting on this Channel within the Channel Move Time. The transmissions during the Channel Move Time will be limited to

the Channel Closing Transmission Time.

f) Once the Master Device has detected a Radar Waveform it will not utilize the Channel for the duration of the Non-Occupancy Period. 3

g) If the Master Device delegates the In-Service Monitoring to a Client Device, then the combination will be tested to the requirements described under d) through f) above.

2.7.1.2 Client Devices

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.

b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.

c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.

d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.

e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.

2.7.1.3 DFS Detection Thresholds

Table 3 below provides the DFS Detection Thresholds for Master Devices as well as Client Devices incorporating In-Service Monitoring.

Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

2.7.1.4 Response Requirements

Table 4 provides the response requirements for Master and Client Devices incorporating DFS.

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

2.7.2 Test Description

Section 7.2 of KDB 905462 D02 V01R01

B. Test Setup:

B .1 Setup for Master with injection at the Master

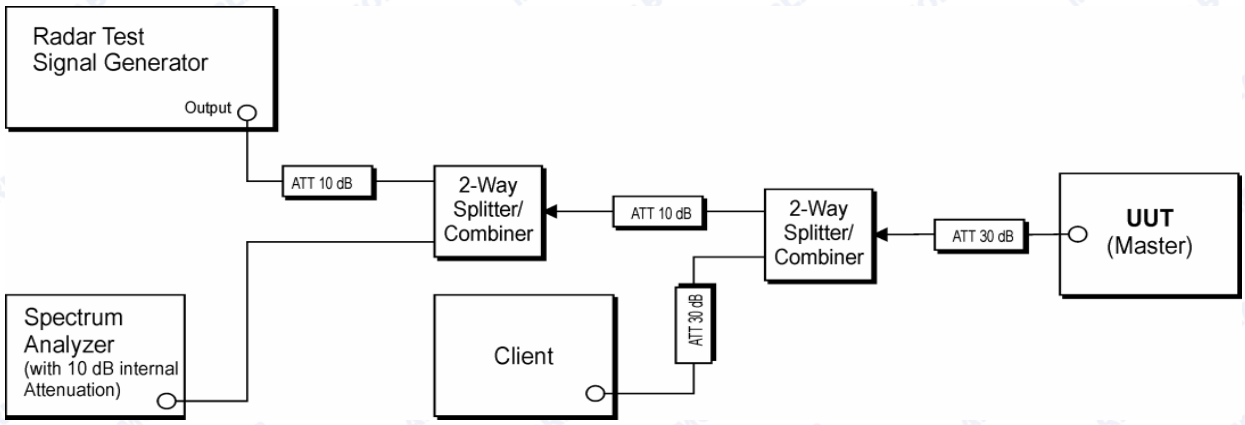


Figure 2: Example Conducted Setup where UUT is a Master and Radar Test Waveforms are injected into the Master

B.2 Setup for Client with injection at the Master

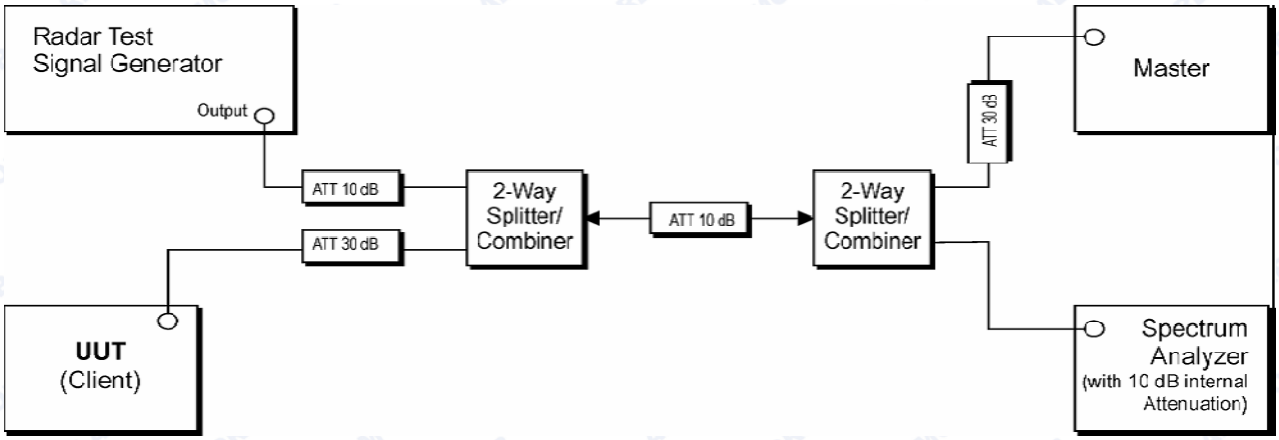


Figure 3: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Master

B.3 Setup for Client with injection at the Client

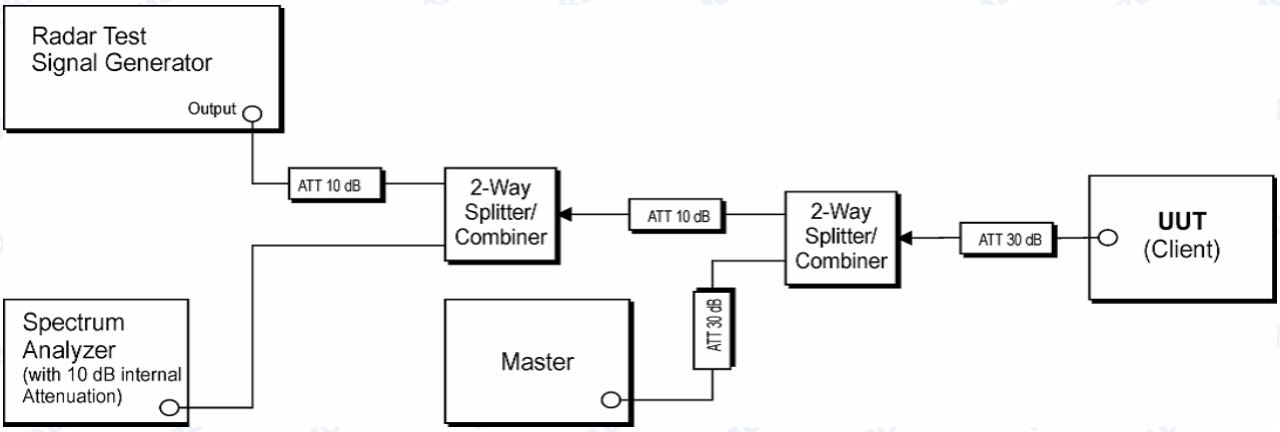
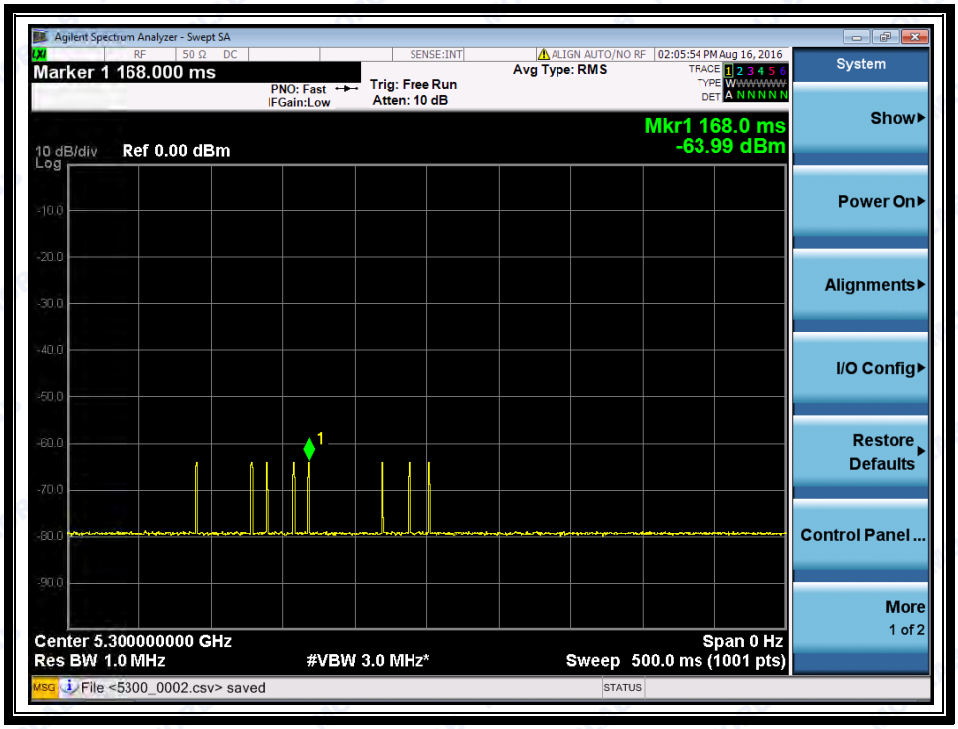


Figure 4: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Client

2.7.3 Test Result

2.7.3.1 Radar Test Waveforms are injected into the Master：



2.7.3.2 EUT is a Client Device Without Radar Detection :

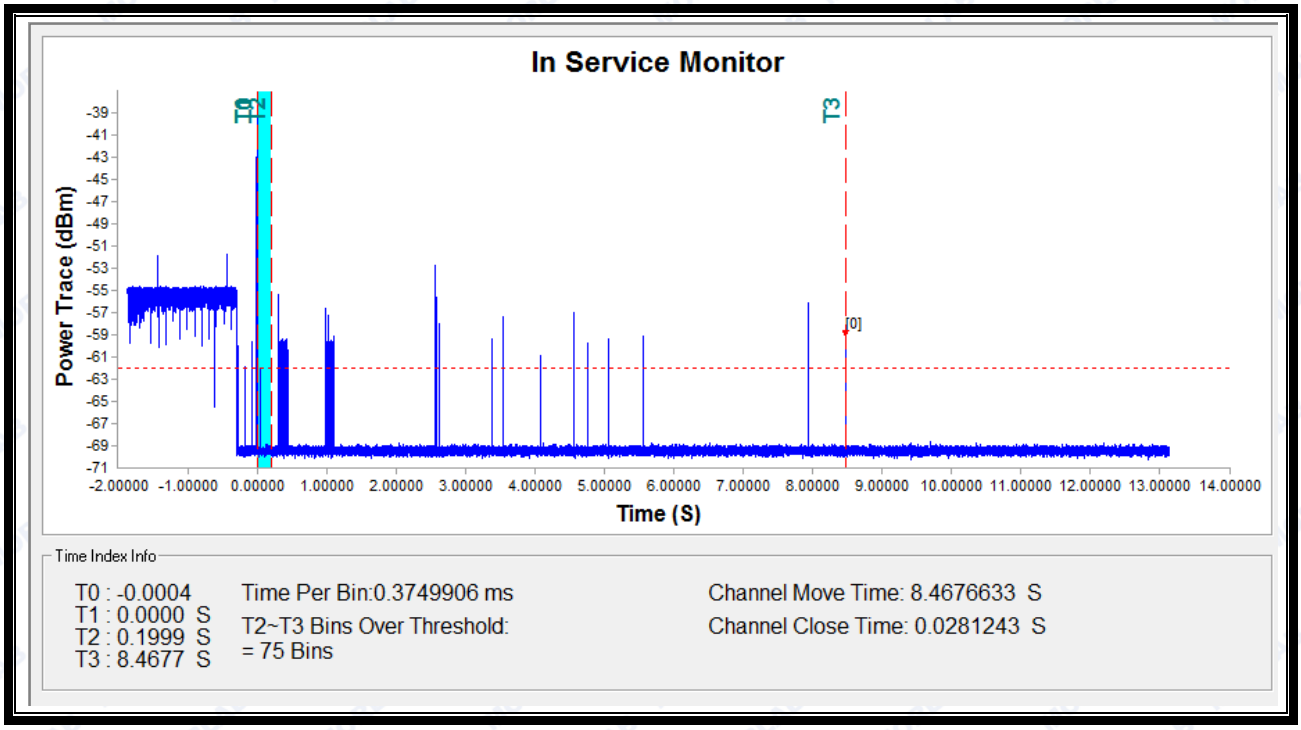
Channel & Bandwidth	Requirement	Operational Mode	Test Result	Limit	Verdict
		Client Without Radar Detection			
20MHz 5260MHz	Channel Move Time	Yes	8.47s	＜10s	Pass
	Channel Closing Transmission Time	Yes	0.03s	＜1s	Pass
	Non-occupancy period	Yes	≥30	≥30 Minutes	Pass
40MHz 5510MHz	Channel Move Time	Yes	3.48s	＜10s	Pass
	Channel Closing Transmission Time	Yes	0.08s	＜1s	Pass
	Non-occupancy period	Yes	≥30	≥30 Minutes	Pass
80MHz 5290MHz	Channel Move Time	Yes	7.08s	＜10s	Pass
	Channel Closing Transmission Time	Yes	0.22s	＜1s	Pass
	Non-occupancy period	Yes	≥30	≥30 Minutes	Pass

2.7.3.3 Test Plots

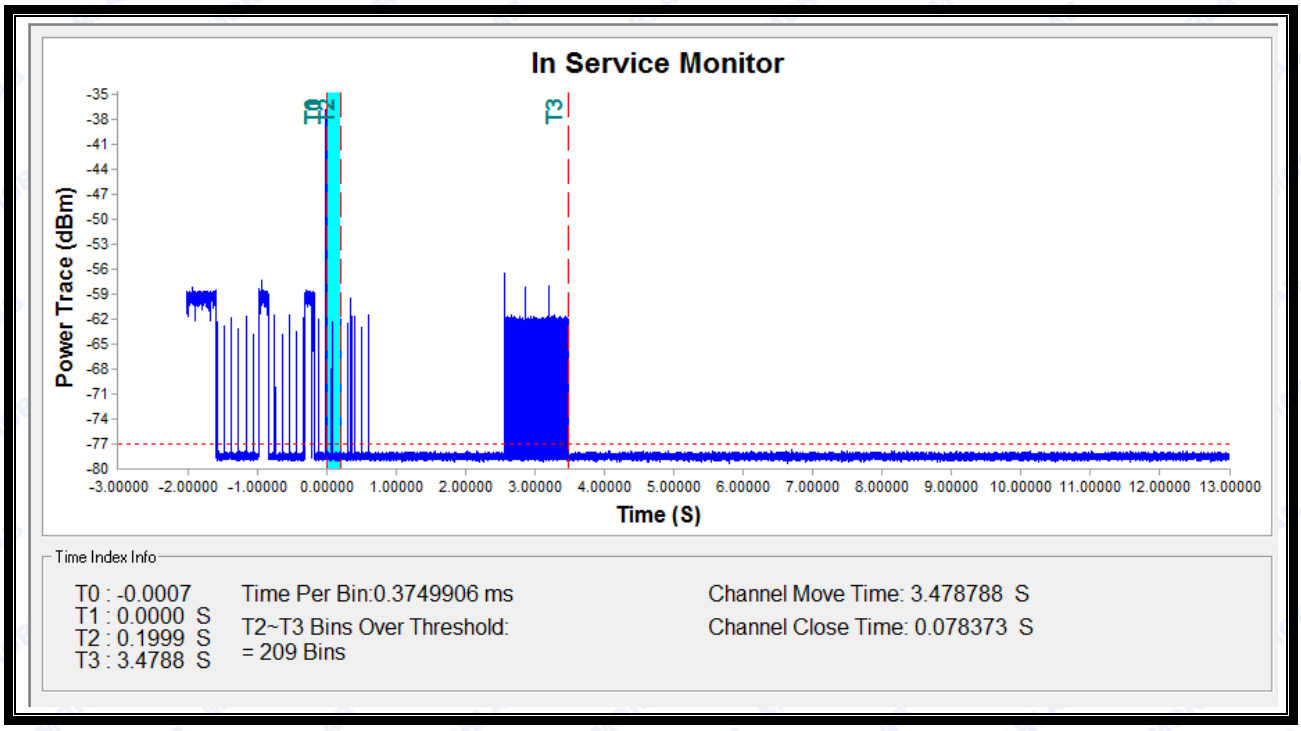
Note:T0 denotes the start time of the Radar single transmitted,T1 denotes the end time of the

Radar single transmit end. T2 denotes the data transmission time of 200ms from T1. T3 denotes the end of the Channel Move Time, the time of T3 from T1 is less than 12s.

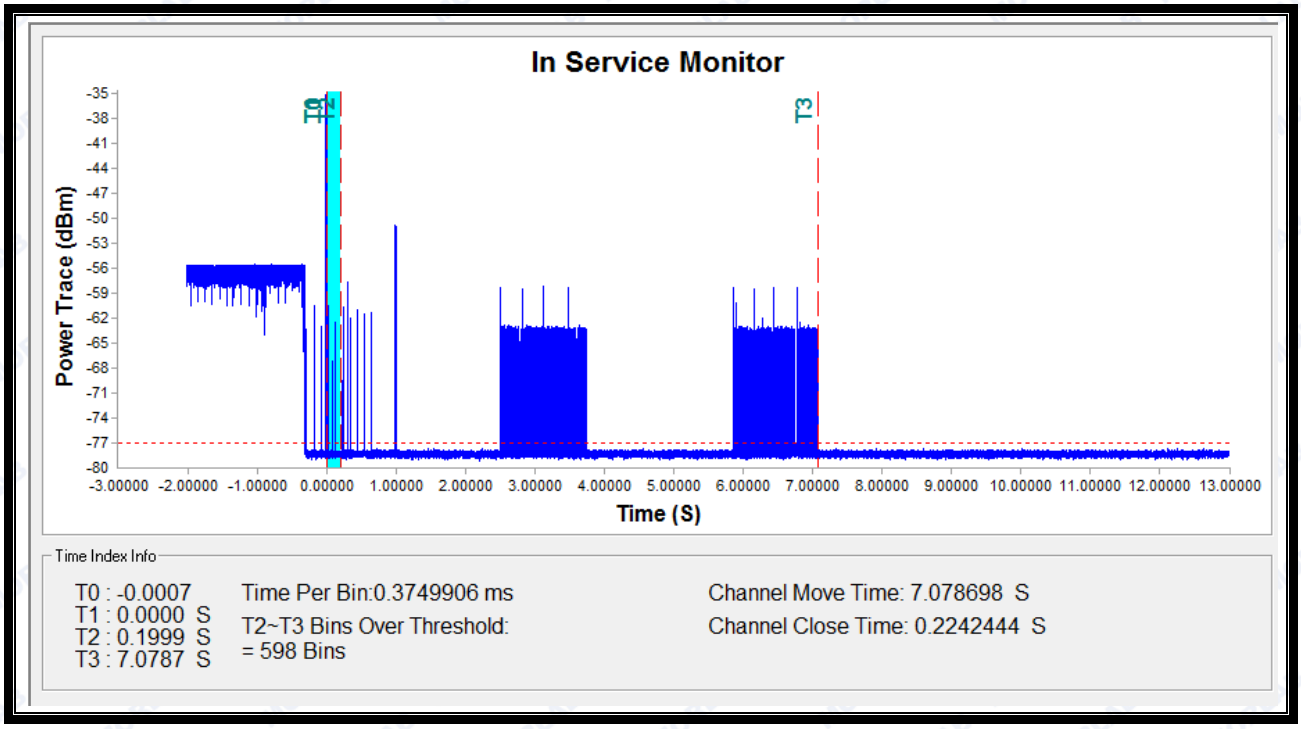
20MHz/5260MHz:



40MHz/5510MHz:



80MHz/5290MHz:



2.8 Conducted Emission

2.8.1 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

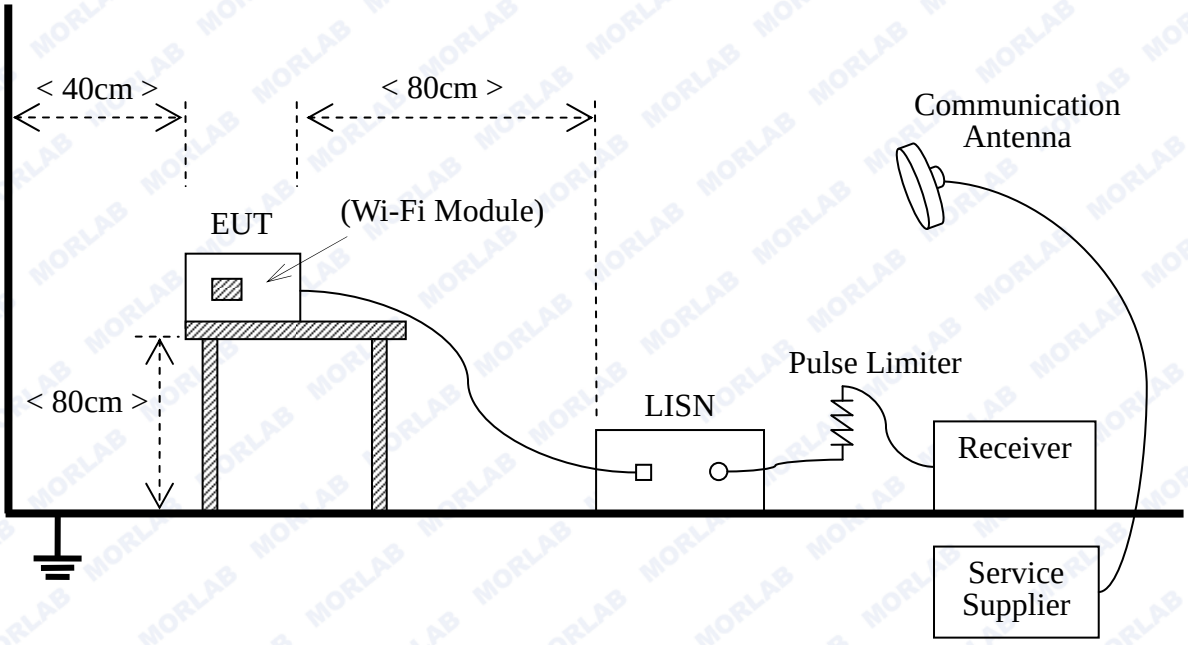
NOTE:

(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.

2.8.2 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 C63.4:2014

The EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz

AC mains supply. The factors of the site are calibrated to correct the reading. During the measurement, the EUT is activated and controlled by the Wi-Fi Service Supplier (SS) via a Common Antenna.

2.8.3 Test Result

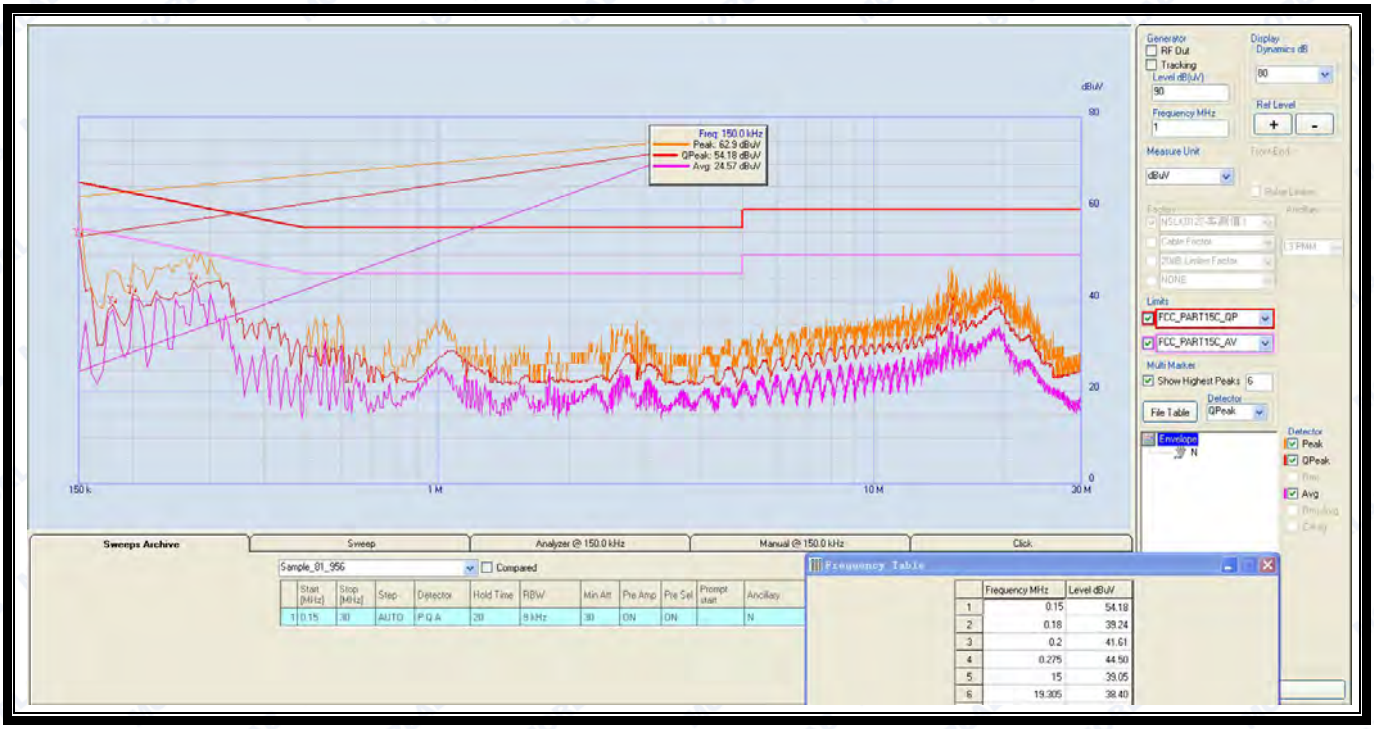
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT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

Note: All test modes are performed, only the worst case is recorded in this report.

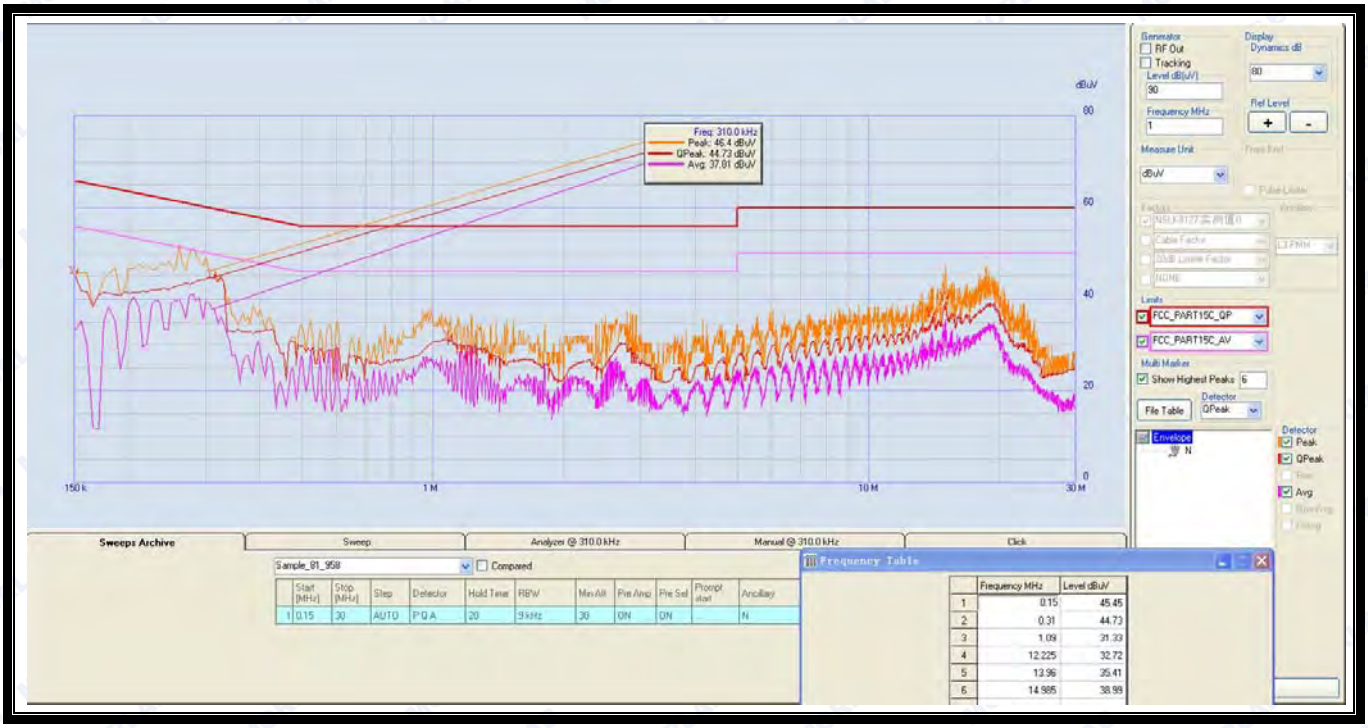
A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)

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(eirp) to field strength (dBμV/m);

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

where P is the EIRP in Watts

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

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

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

Note:

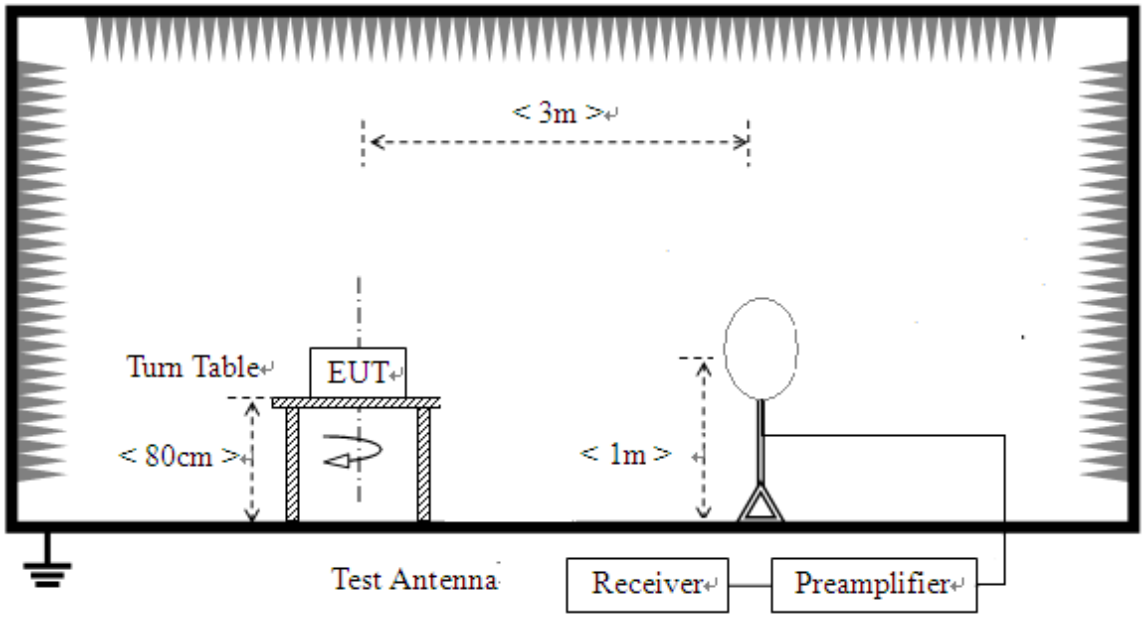
For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

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)

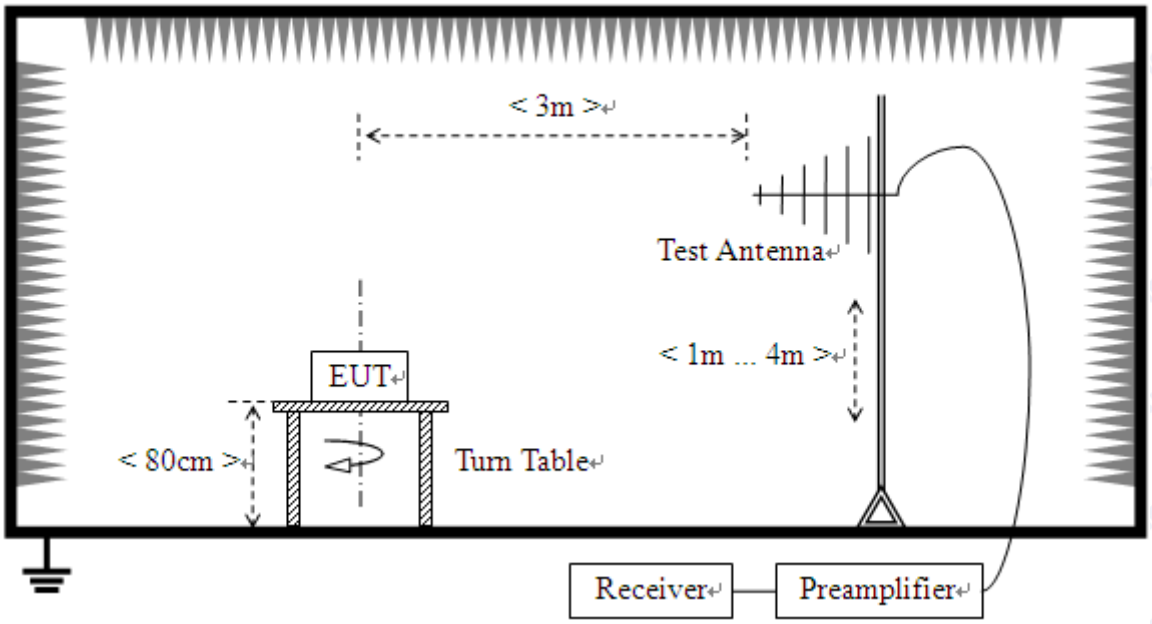
2.9.2 Test Description

A. Test Setup:

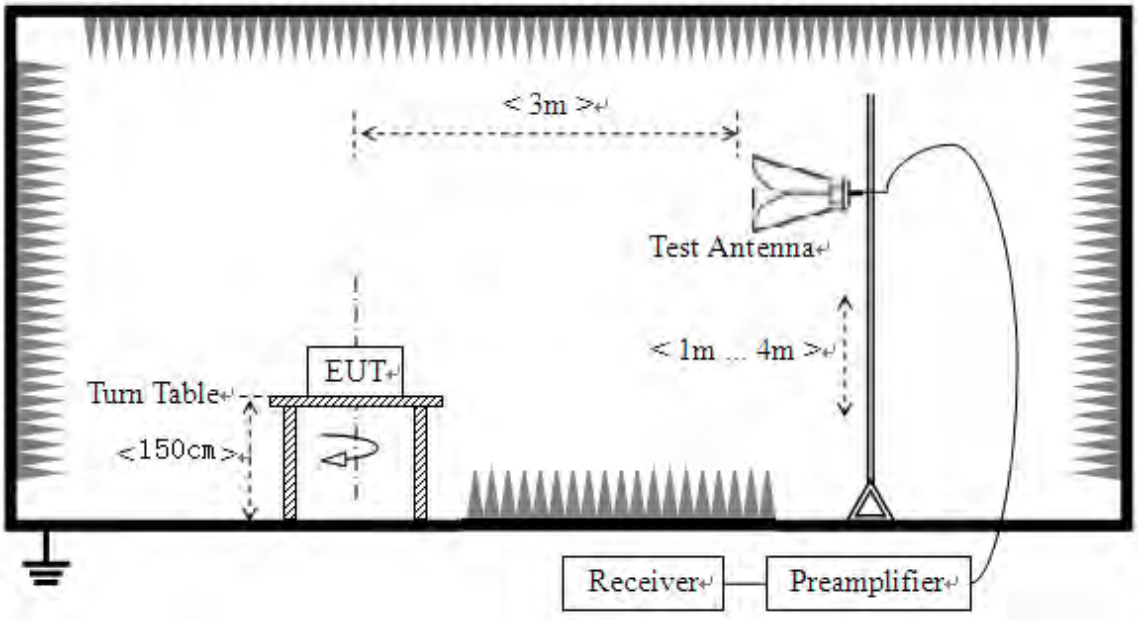
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The EUT of the EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. 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. During the measurement, the EUT is activated and controlled by the Wireless Router via a Common Antenna, and is set to operate under hopping-on test mode.

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 2GHz) and Horn Test Antenna (above 2GHz) are used. 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. The emission levels at both horizontal and vertical polarizations should be tested.

2.9.3 Test Result

According to ANSI C63.4 selection 4.2.2, 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 limit, it is unnecessary to perform an quasi-peak measurement.
The measurement results are obtained as below:

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

A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{Factor}: Antenna Factor at 3m

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

Note1: 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.

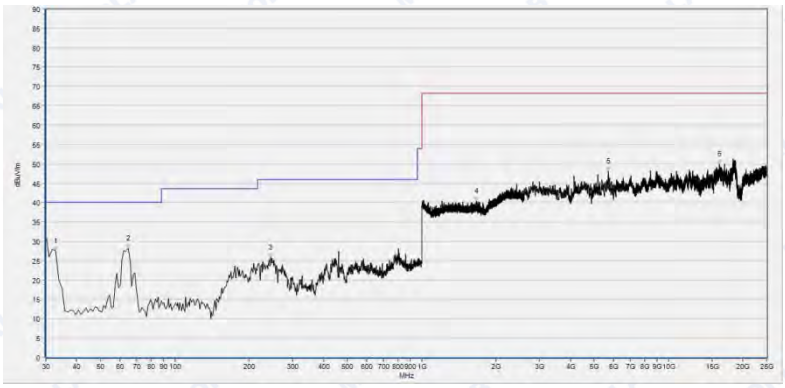
Note2: The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

For the frequency, which started from 25G to 40G, was pre-scanned and the result which was 10dB lower than the limit.

2.9.3.1 802.11ac-20MHz Test mode

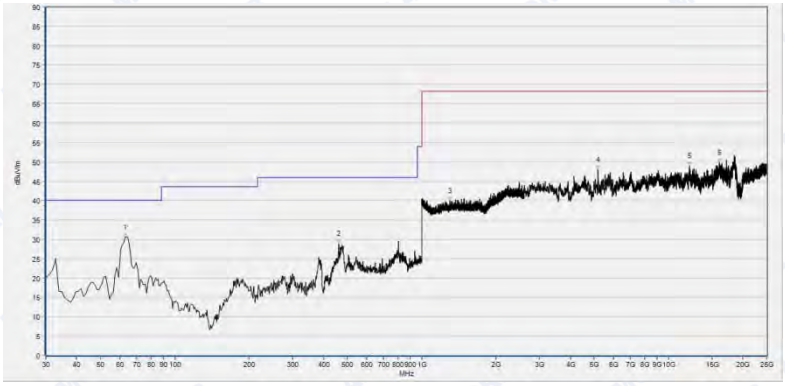
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 36



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.913	27.41	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
64.955	28.13	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
244.585	25.75	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1663.688	40.35	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
5714.223	48.04	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
16038.208	49.96	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS

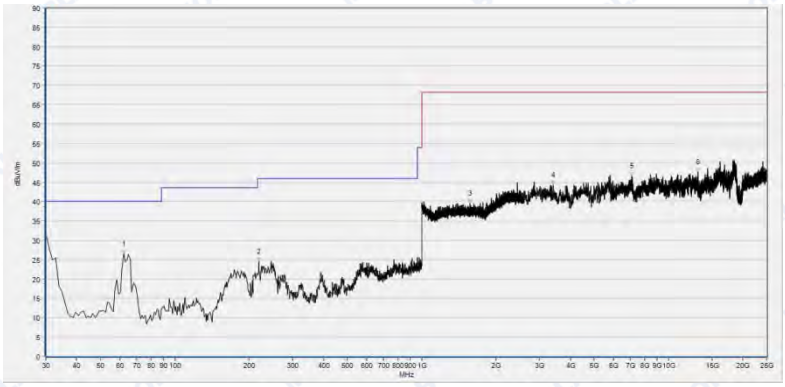
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
63.013	30.55	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
460.140	28.86	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1299.833	39.89	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
5180.996	47.92	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
12166.713	48.86	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
16024.765	49.79	N.A	N.A	68.23	N.A	N.A	Vertical	PASS

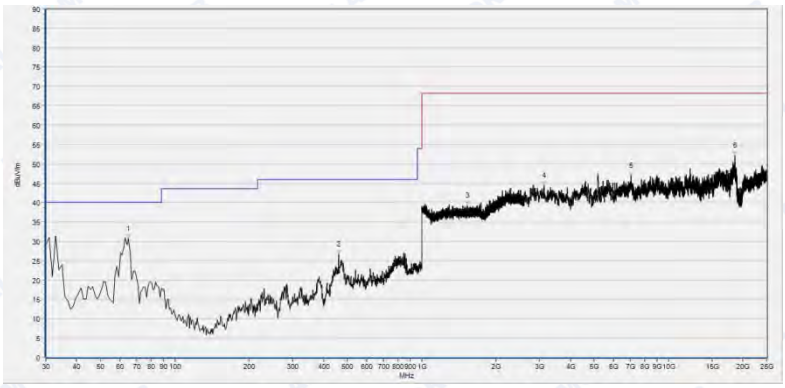
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 44



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
62.042	26.47	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
218.368	24.47	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1567.122	39.53	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
3415.523	44.25	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
7107.782	46.65	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
13165.953	47.66	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS

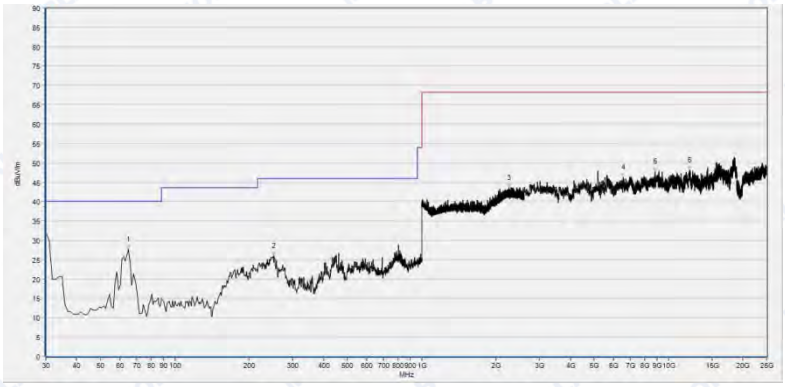
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
64.955	30.62	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
460.140	26.62	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
1535.112	39.22	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
3124.265	44.44	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
7067.453	46.95	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
18583.357	52.08	N.A	N.A	68.23	N.A	N.A	Vertical	PASS

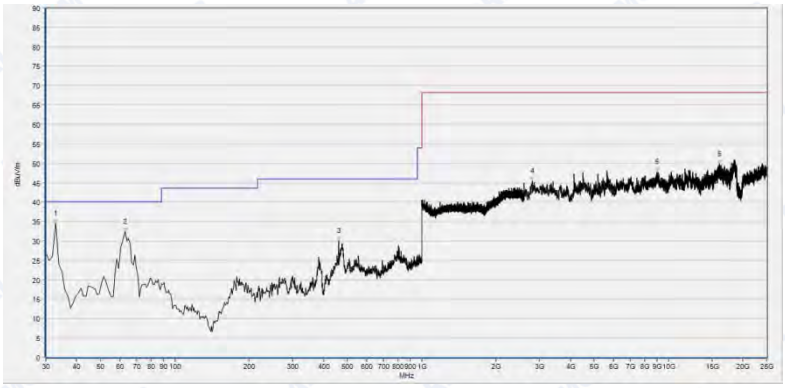
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 48



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
64.955	27.62	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
252.352	25.97	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2261.220	43.61	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
6570.074	46.22	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
8810.522	47.70	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
12171.194	48.03	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS

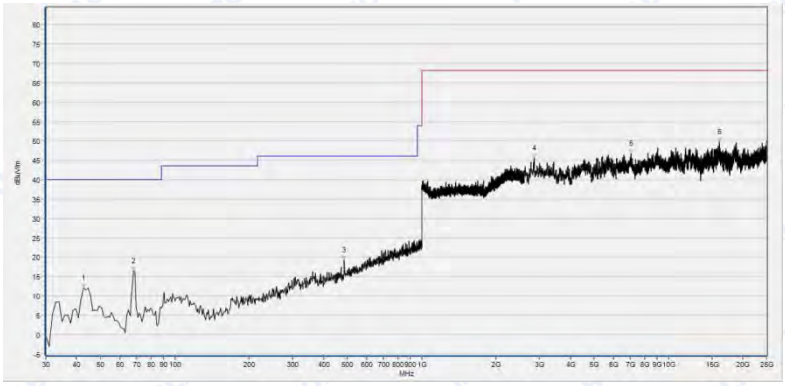
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.913	34.47	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
63.013	32.36	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
460.140	29.96	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2810.602	45.48	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
8998.720	47.82	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
16083.017	49.73	N.A	N.A	68.23	N.A	N.A	Vertical	PASS

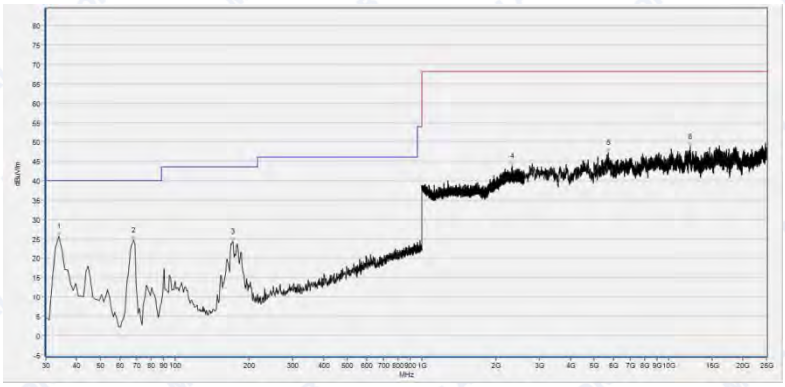
(Antenna Vertical, 30MHz to 25GHz)

Plots for Channel = 52



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
42.903	12.22	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
68.148	16.56	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
485.665	19.28	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2851.21	45.7	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
7045.329	46.92	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
16096.739	49.9	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS

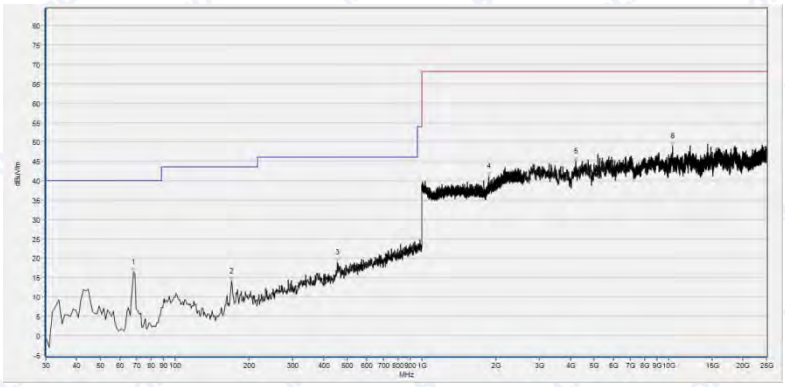
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.164	25.74	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
68.148	24.71	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
172.042	24.37	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2323.921	43.87	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
5710.022	47.31	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
12261.092	48.9	N.A	N.A	68.23	N.A	N.A	Vertical	PASS

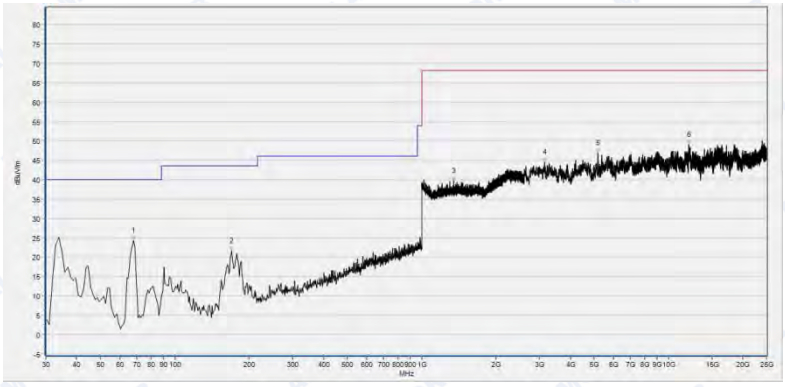
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 60



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
68.148	16.56	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
170.1	14.15	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
454.594	19.01	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1870.437	41.32	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
4208.922	45.17	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
10361.192	49.01	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS

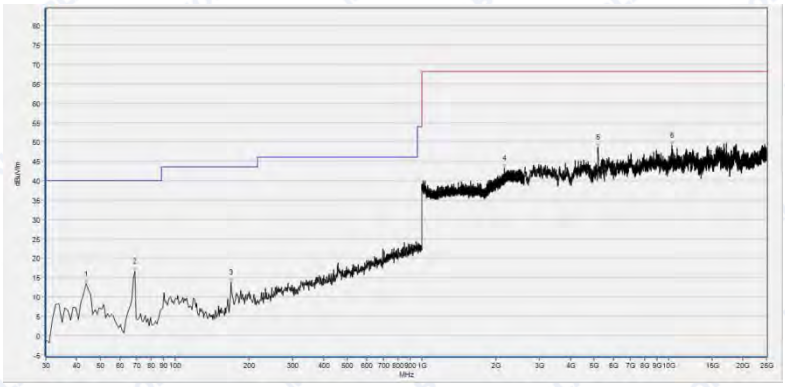
(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
68.148	24.47	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
170.1	21.7	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
1350.797	39.76	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
3142.468	44.71	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
5185.757	47	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
12090.818	49.15	N.A	N.A	68.23	N.A	N.A	Vertical	PASS

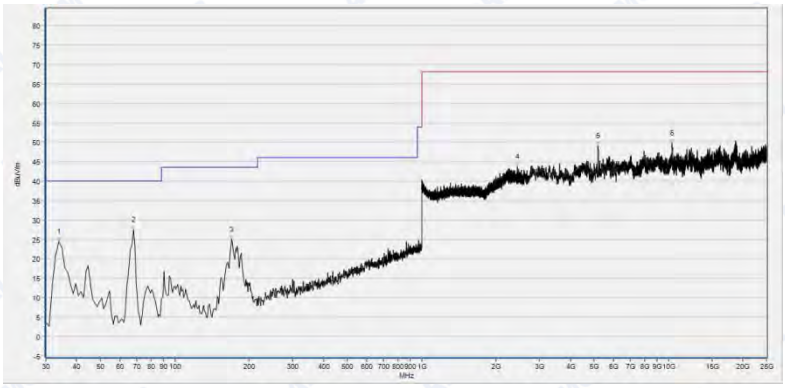
(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 64



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.845	12.85	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
68.148	15.43	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
445.856	17.28	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2414.085	45.07	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
4518.104	46.27	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS
10276.055	48.37	N.A	N.A	68.23	N.A	N.A	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.164	24.57	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
68.148	27.65	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
170.1	25.04	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2441.294	43.92	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
5181.276	49.28	N.A	N.A	68.23	N.A	N.A	Vertical	PASS
10347.749	49.84	N.A	N.A	68.23	N.A	N.A	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)