802.11ax (HE80)

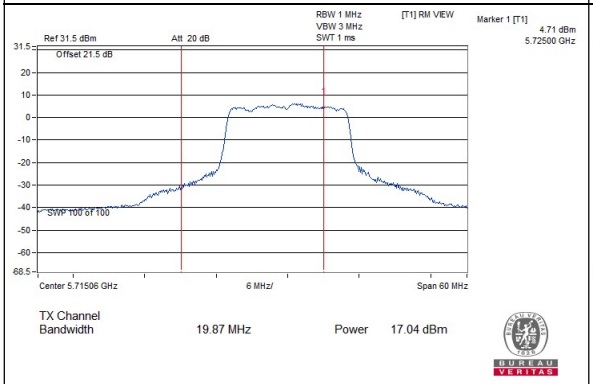
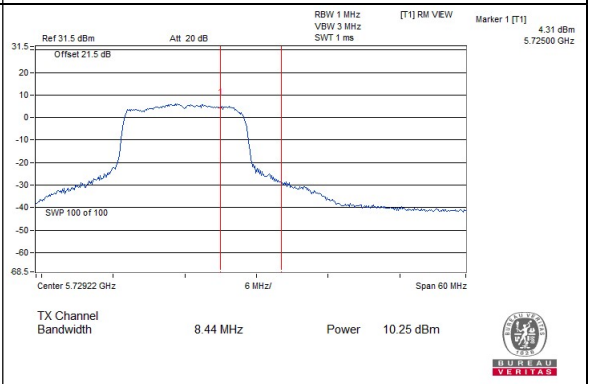
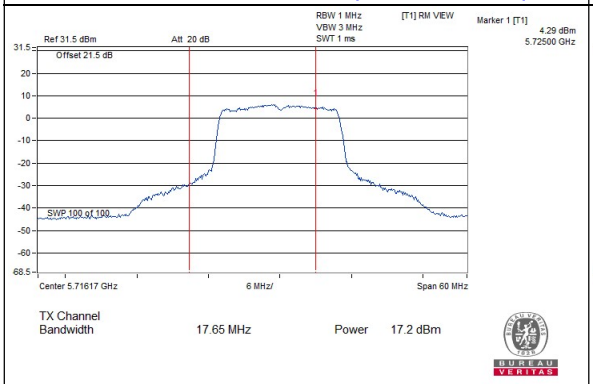
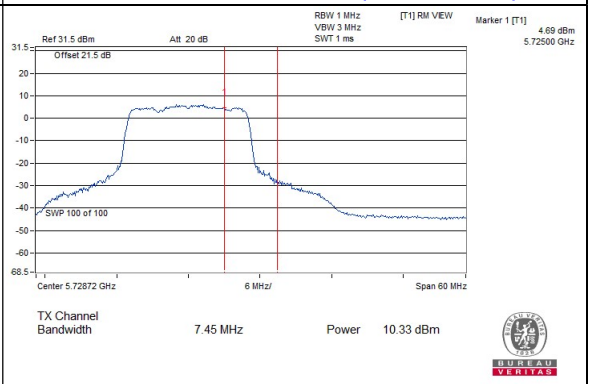
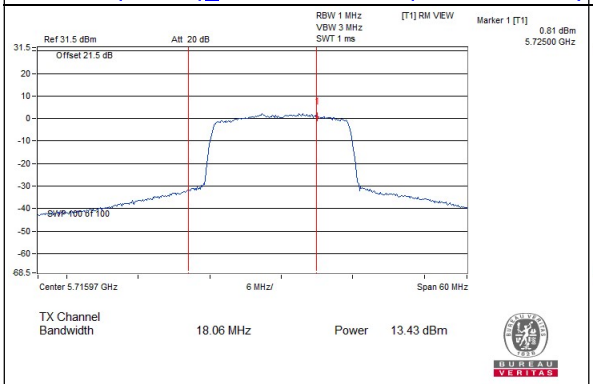
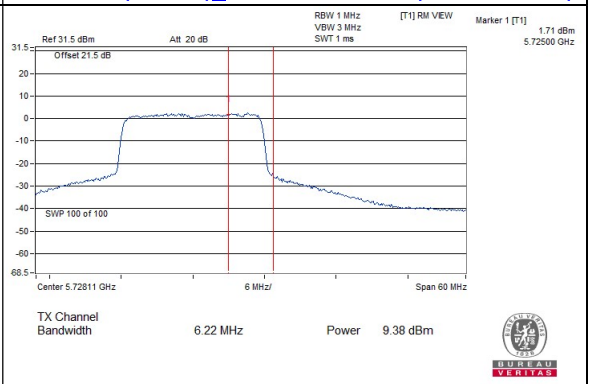
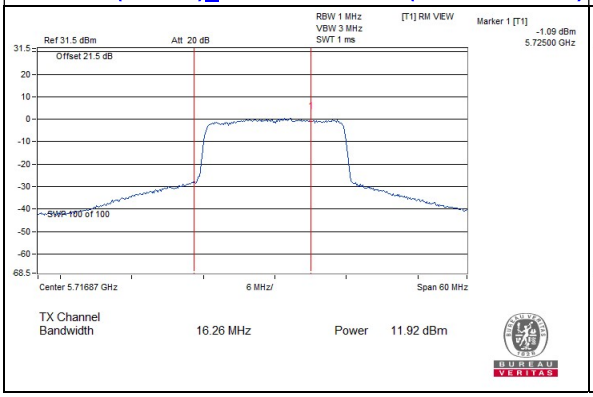
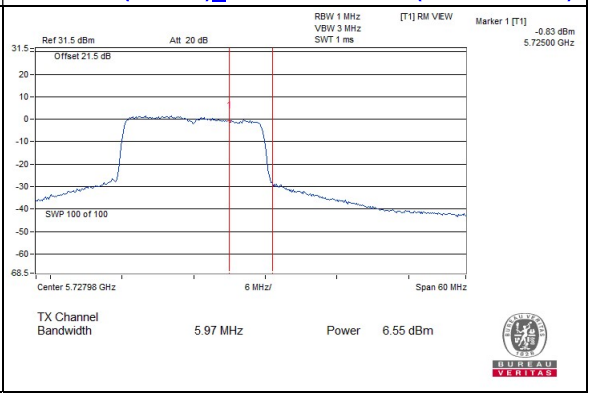
Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
42	5210	14.32	14.02	52.274	17.18	24.00	Pass
58	5290	14.49	14.29	54.972	17.40	24.00	Pass
106	5530	15.49	14.74	65.185	18.14	24.00	Pass
122	5610	16.75	16.55	92.501	19.66	24.00	Pass
*138 (U-NII-2C Band)	5690	14.02	7.92	39.705	15.99	24.00	Pass
*138 (U-NII-3 Band)	5690	-4.70	-5.78	0.7619	-1.18	30.00	Pass
155	5775	16.70	16.47	91.134	19.60	30.00	Pass

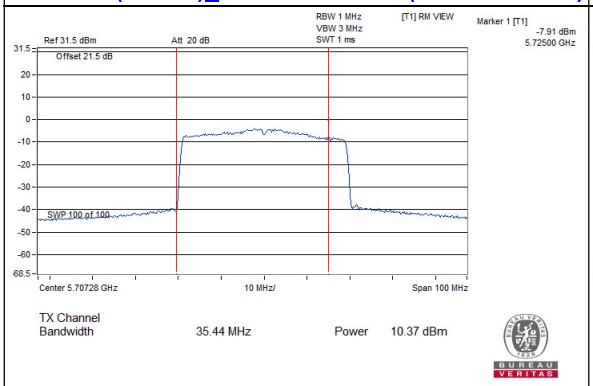
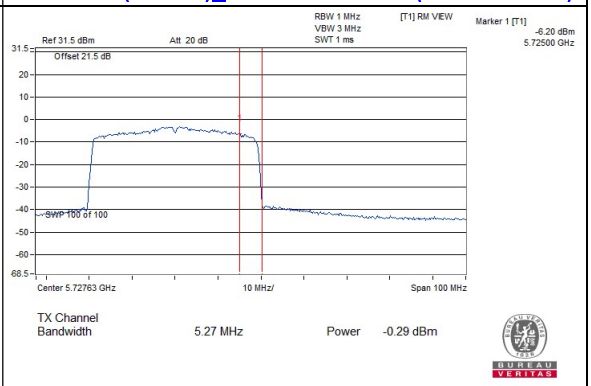
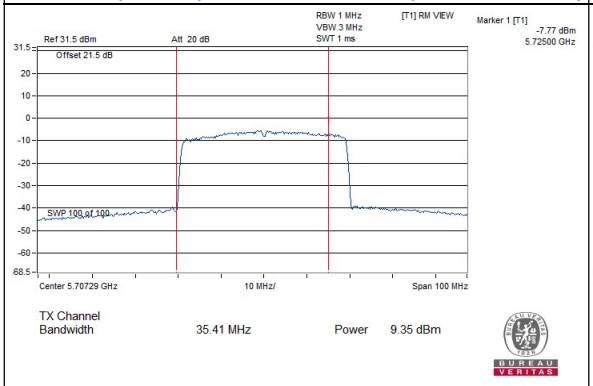
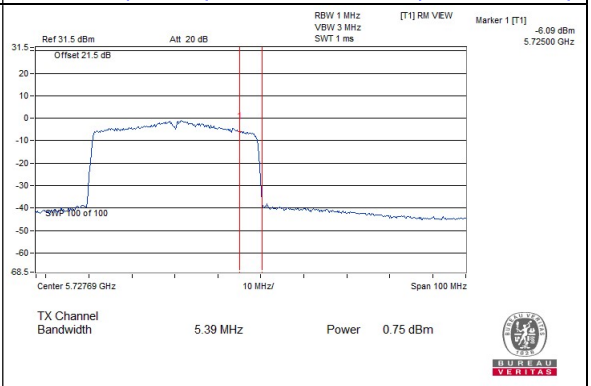
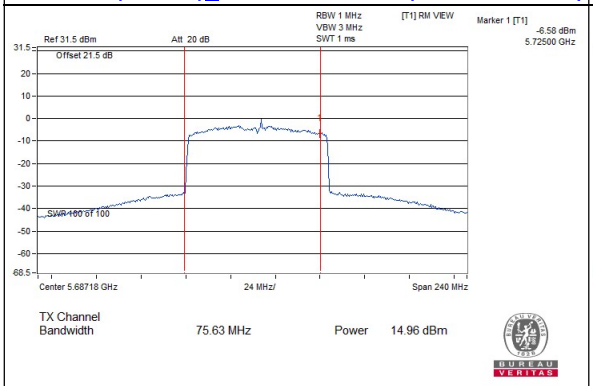
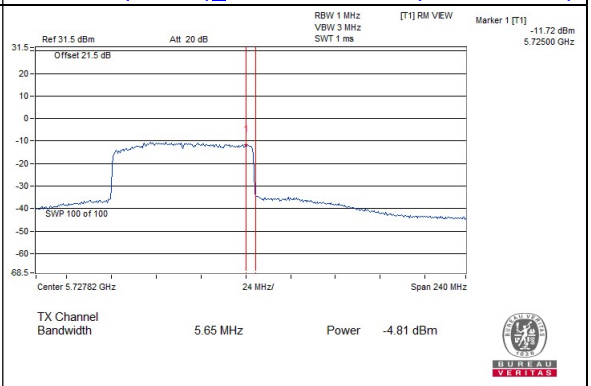
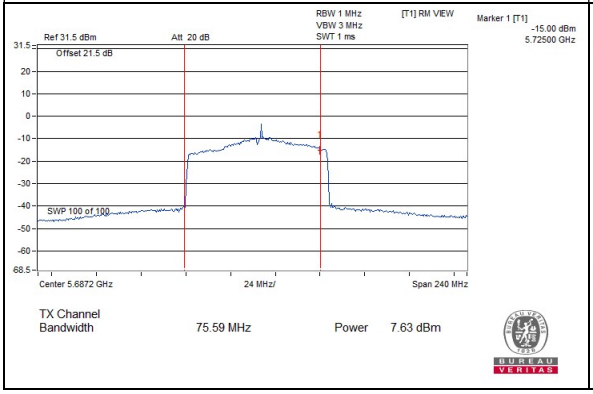
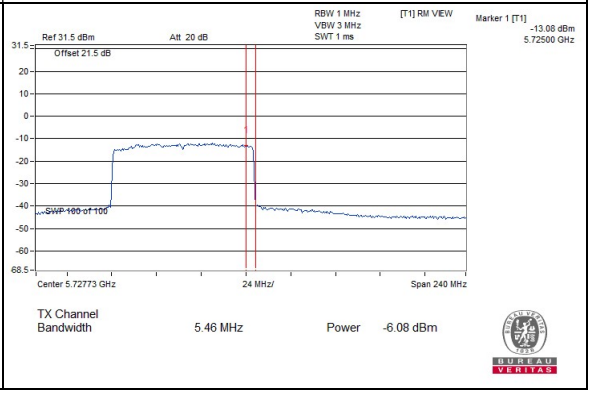
Note: * Test was performed in accordance with Measurement follow FCC KDB 789033 UNII test procedure Method SA-2 and use spectrum analyzer test.

Note: For U-NII-2A, U-NII-2C Band output power limitation is determined based on 26dBc bandwidth

Power Limit = 11dBm + 10logB < U-NII-2A, U-NII-2C >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
58	5290	81.05	30.08 > 24
106	5530	81.12	30.09 > 24
122	5610	81.16	30.09 > 24
138 (U-NII-2C Band)	5690	75.59	29.78 > 24

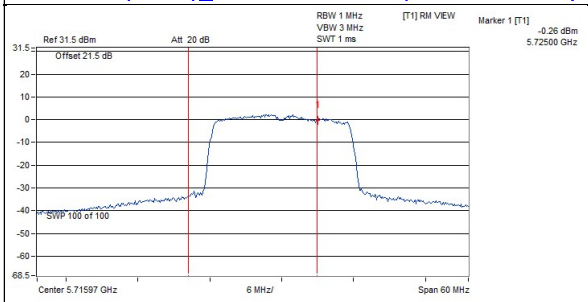
For channel straddling 5725MHz of Power

Spectrum Plot Value of Power	
802.11a_Chain 0 / CH144 (U-NII-2C Band)	**802.11a_Chain 0 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 19.87 MHz Power 17.04 dBm	 TX Channel Bandwidth 8.44 MHz Power 10.25 dBm
802.11a_Chain 1 / CH144 (U-NII-2C Band)	**802.11a_Chain 1 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 17.65 MHz Power 17.2 dBm	 TX Channel Bandwidth 7.45 MHz Power 10.33 dBm
802.11ac (VHT20)_Chain 0 / CH144 (U-NII-2C Band)	**802.11ac (VHT20)_Chain 0 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 18.06 MHz Power 13.43 dBm	 TX Channel Bandwidth 6.22 MHz Power 9.38 dBm
802.11ac (VHT20)_Chain 1 / CH144 (U-NII-2C Band)	**802.11ac (VHT20)_Chain 1 / CH144 (U-NII-3 Band)**
 TX Channel Bandwidth 16.26 MHz Power 11.92 dBm	 TX Channel Bandwidth 5.97 MHz Power 6.55 dBm

Spectrum Plot Value of Power	
802.11ac (VHT40)_Chain 0 / CH142 (U-NII-2C Band)	**802.11ac (VHT40)_Chain 0 / CH142 (U-NII-3 Band)**
 TX Channel Bandwidth 35.44 MHz Power 10.37 dBm	 TX Channel Bandwidth 5.27 MHz Power -0.29 dBm
802.11ac (VHT40)_Chain 1 / CH142 (U-NII-2C Band)	**802.11ac (VHT40)_Chain 1 / CH142 (U-NII-3 Band)**
 TX Channel Bandwidth 35.41 MHz Power 9.35 dBm	 TX Channel Bandwidth 5.39 MHz Power 0.75 dBm
802.11ac (VHT80)_Chain 0 / CH138 (U-NII-2C Band)	**802.11ac (VHT80)_Chain 0 / CH138 (U-NII-3 Band)**
 TX Channel Bandwidth 75.63 MHz Power 14.96 dBm	 TX Channel Bandwidth 5.65 MHz Power -4.81 dBm
802.11ac (VHT80)_Chain 1 / CH138 (U-NII-2C Band)	**802.11ac (VHT80)_Chain 1 / CH138 (U-NII-3 Band)**
 TX Channel Bandwidth 75.59 MHz Power 7.63 dBm	 TX Channel Bandwidth 5.46 MHz Power -6.08 dBm

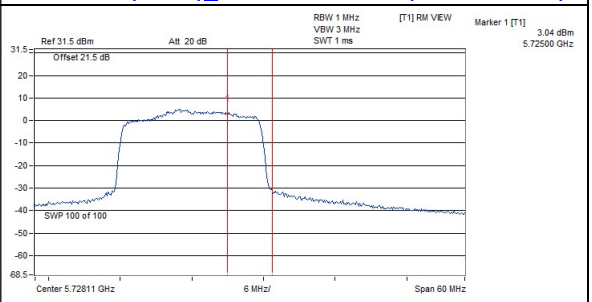
Spectrum Plot Value of Power

802.11ax (HE20)_Chain 0 / CH144 (U-NII-2C Band)



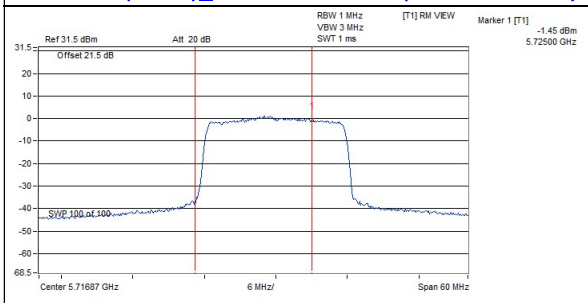
TX Channel Bandwidth 18.06 MHz Power 13.61 dBm

802.11ax (HE20)_Chain 0 / CH144 (U-NII-3 Band)



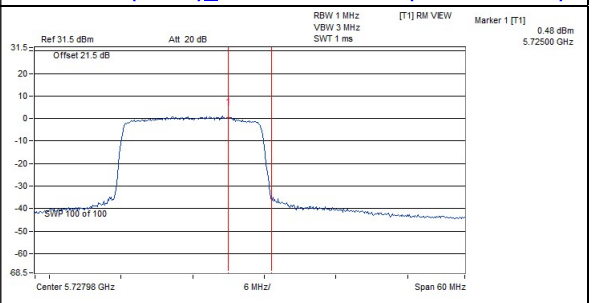
TX Channel Bandwidth 6.22 MHz Power 9.7 dBm

802.11ax (HE20)_Chain 1 / CH144 (U-NII-2C Band)



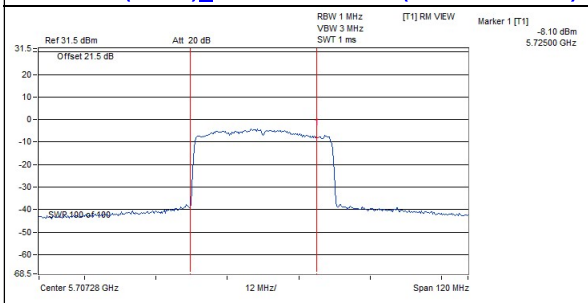
TX Channel Bandwidth 16.26 MHz Power 12.2 dBm

802.11ax (HE20)_Chain 1 / CH144 (U-NII-3 Band)



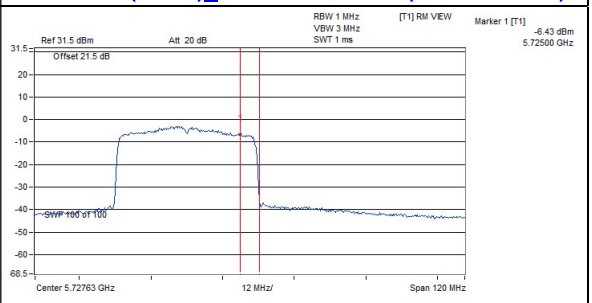
TX Channel Bandwidth 5.97 MHz Power 6.83 dBm

802.11ax (HE40)_Chain 0 / CH142 (U-NII-2C Band)



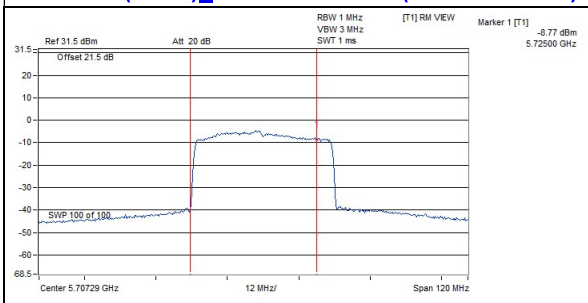
TX Channel Bandwidth 35.44 MHz Power 10.6 dBm

802.11ax (HE40)_Chain 0 / CH142 (U-NII-3 Band)



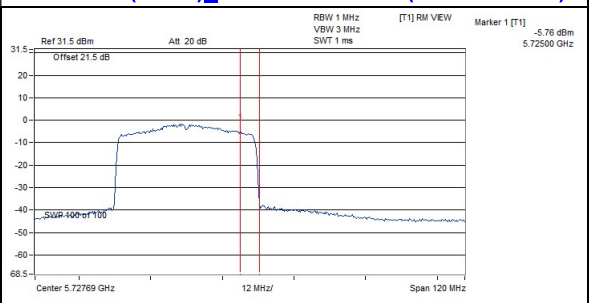
TX Channel Bandwidth 5.27 MHz Power -0.02 dBm

802.11ax (HE40)_Chain 1 / CH142 (U-NII-2C Band)

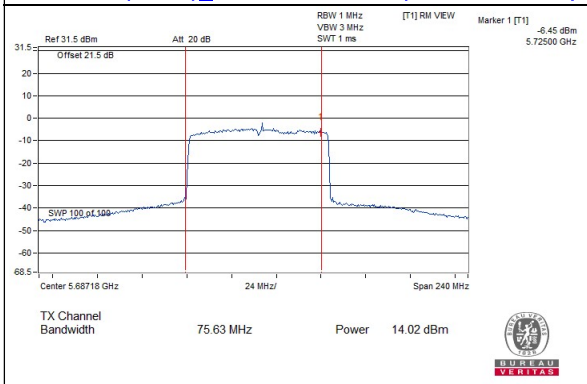
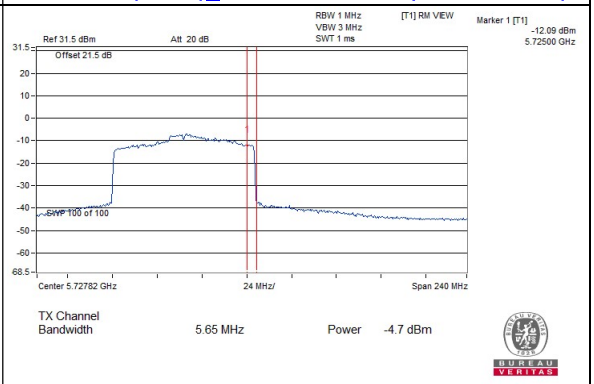
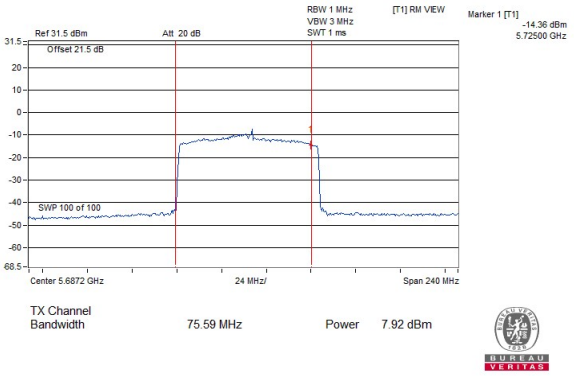
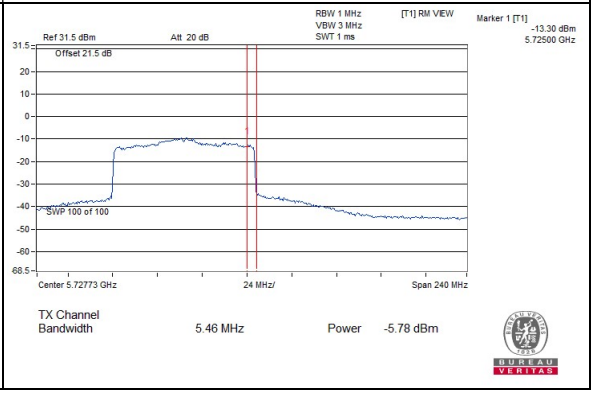


TX Channel Bandwidth 35.41 MHz Power 9.7 dBm

802.11ax (HE40)_Chain 1 / CH142 (U-NII-3 Band)



TX Channel Bandwidth 5.39 MHz Power 1.12 dBm

Spectrum Plot Value of Power	
802.11ax (HE80)_Chain 0 / CH138 (U-NII-2C Band)	**802.11ax (HE80)_Chain 0 / CH138 (U-NII-3 Band)**
 TX Channel Bandwidth 75.63 MHz Power 14.02 dBm	 TX Channel Bandwidth 5.65 MHz Power -4.7 dBm
802.11ax (HE80)_Chain 1 / CH138 (U-NII-2C Band)	**802.11ax (HE80)_Chain 1 / CH138 (U-NII-3 Band)**
 TX Channel Bandwidth 75.59 MHz Power 7.92 dBm	 TX Channel Bandwidth 5.46 MHz Power -5.78 dBm

26dB OCCUPIED BANDWIDTH

802.11a

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
36	5180	27.35	24.81
40	5200	27.3	25.6
48	5240	27.75	26.44
52	5260	27.13	26.35
60	5300	26.82	25.85
64	5320	25.72	26.06
100	5500	26.99	25.82
116	5580	27.29	25.69
140	5700	28.1	25.54
144 (U-NII-2C Band)	5720	19.87	17.65
144 (U-NII-3 Band)	5720	8.44	7.45
149	5745	29.92	26.3
157	5785	38.24	28.77
165	5825	40.63	27.84

802.11ax (HE20)

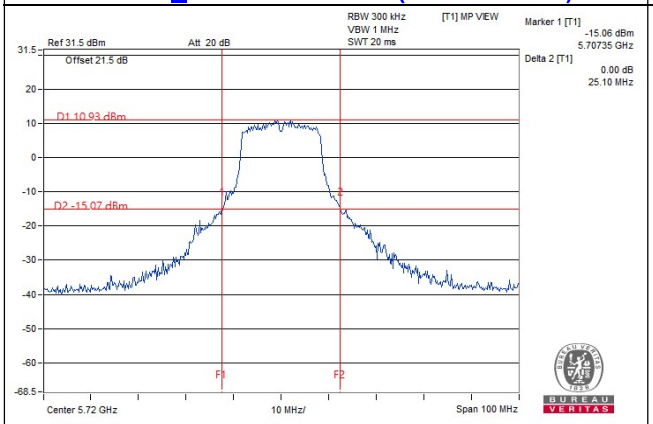
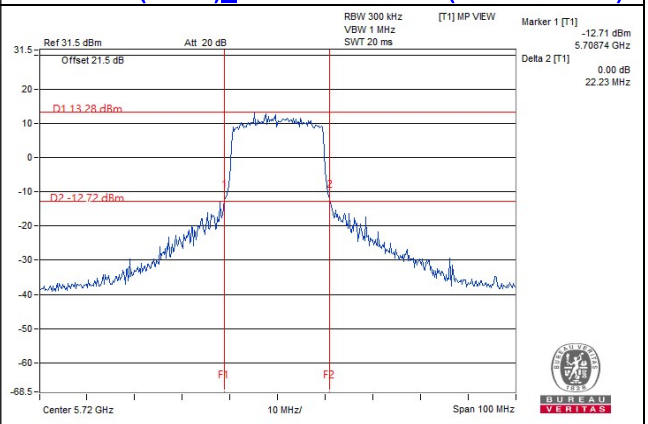
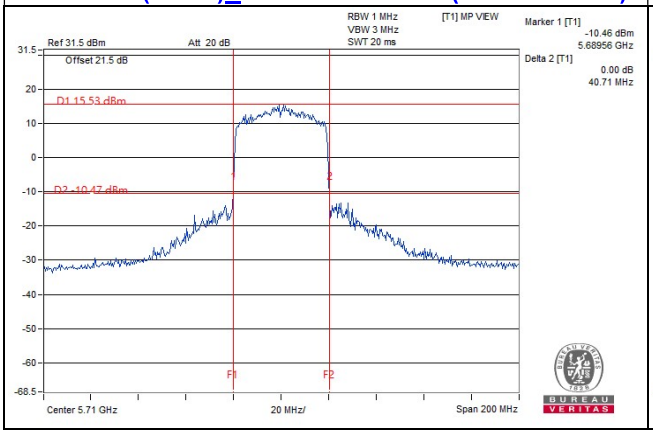
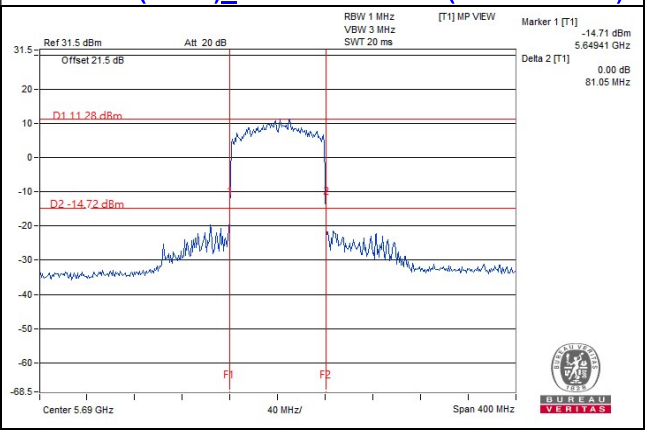
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
36	5180	26.31	23.69
40	5200	25.72	24.16
48	5240	23.8	29.22
52	5260	26.24	23.22
60	5300	26.68	23.17
64	5320	25.08	22.2
100	5500	22.85	22.64
116	5580	24.38	23.86
140	5700	22.73	23.3
144 (U-NII-2C Band)	5720	18.06	16.26
144 (U-NII-3 Band)	5720	6.22	5.97
149	5745	34.24	22.59
157	5785	24.62	22.45
165	5825	35.36	24.74

802.11ax (HE40)

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
38	5190	40.8	40.8
46	5230	40.71	41.89
54	5270	40.76	40.83
62	5310	40.67	40.59
102	5510	40.79	40.62
110	5550	40.86	40.69
134	5670	40.69	40.69
142 (U-NII-2C Band)	5710	35.44	35.41
142 (U-NII-3 Band)	5710	5.27	5.39
151	5755	40.86	40.87
159	5795	43.17	40.67

802.11ax (HE80)

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain0	Chain1
42	5210	81.08	81.17
58	5290	81.05	81.22
106	5530	81.12	81.25
122	5610	81.17	81.16
138 (U-NII-2C Band)	5690	75.63	75.59
138 (U-NII-3 Band)	5690	5.65	5.46
155	5775	81.32	91.41

Spectrum Plot of Worst Value	
802.11a_Chain 1 / CH144 (U-NII-3 Band)	**802.11ax (HE20)_Chain 1 / CH144 (U-NII-3 Band)**
	
802.11ax (HE40)_Chain 0 / CH142 (U-NII-3 Band)	**802.11ax (HE80)_Chain 1 / CH138 (U-NII-3 Band)**
	

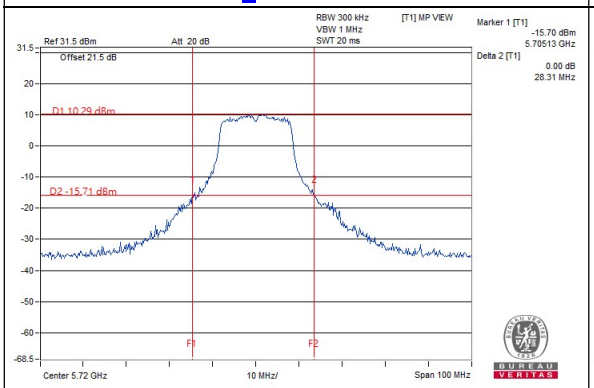
Note:

For CH144 (U-NII-3) = Delta 2 - (5725MHz - Marker 1)
For CH142 (U-NII-3) = Delta 2 - (5725MHz - Marker 1)
For CH138 (U-NII-3) = Delta 2 - (5725MHz - Marker 1)

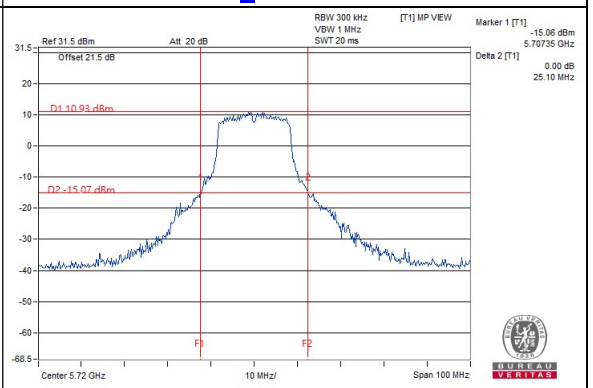
For channel straddling 5725MHz of 26dB BW

Spectrum Plot Value of 26dB BW

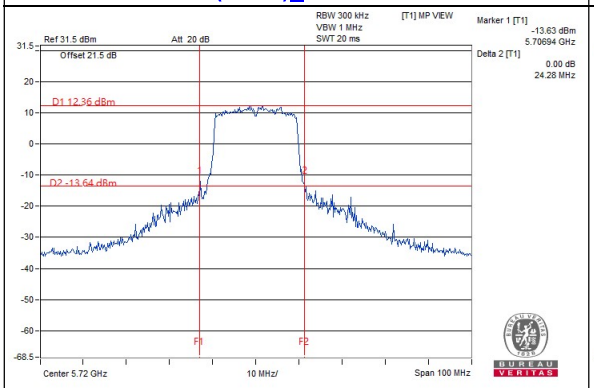
802.11a_Chain 0 / CH144



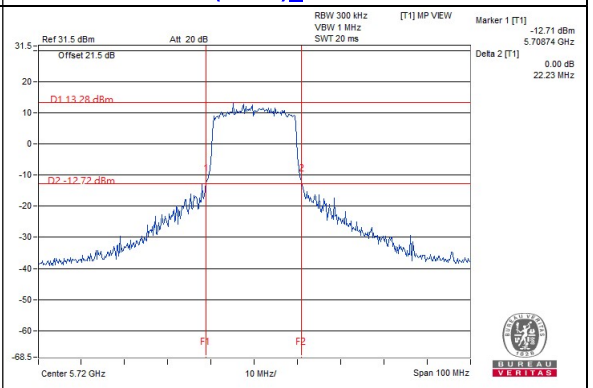
802.11a_Chain 1 / CH144



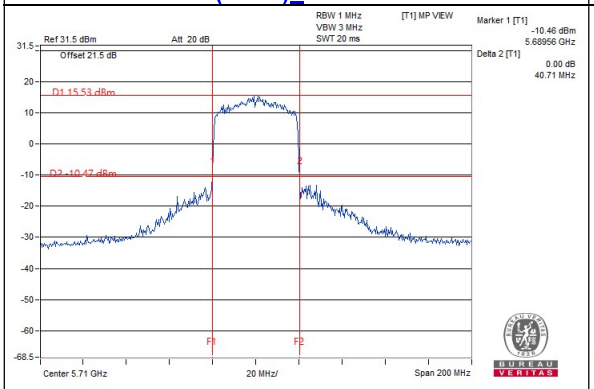
802.11ax (HE20)_Chain 0 / CH144



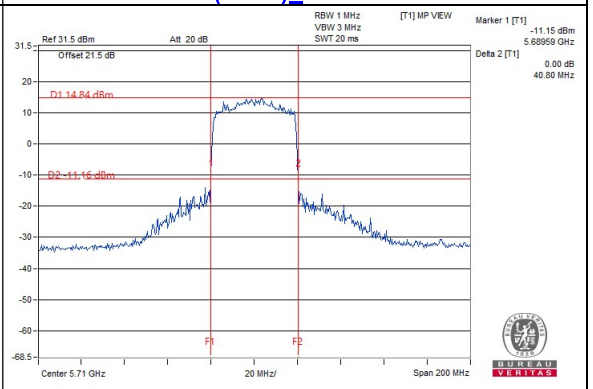
802.11ax (HE20)_Chain 1 / CH144



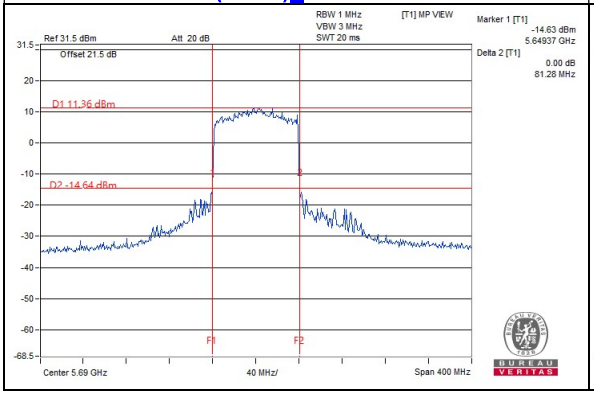
802.11ax (HE40)_Chain 0 / CH142



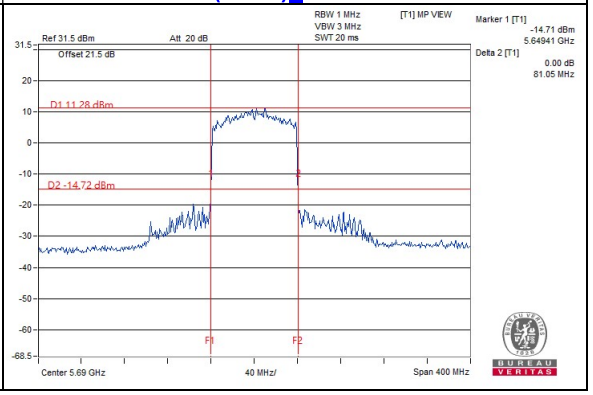
802.11ax (HE40)_Chain 1 / CH142



802.11ax (HE80)_Chain 0 / CH138



802.11ax (HE80)_Chain 1 / CH138

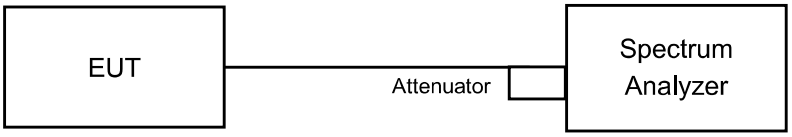


Note:

For CH144 (U-NII-2C) = 5725MHz - Marker 1
For CH142 (U-NII-2C) = 5725MHz - Marker 1
For CH138 (U-NII-2C) = 5725MHz - Marker 1

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to SAMPLE. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

4.4.4 Test Results

802.11a

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	17.52	17.04
40	5200	17.16	17.16
48	5240	17.52	17.16
52	5260	17.28	17.16
60	5300	17.4	17.16
64	5320	17.52	17.04
100	5500	17.52	17.04
116	5580	17.4	17.16
140	5700	17.52	17.04
144 (U-NII-2C Band)	5720	13.76	13.52
144 (U-NII-3 Band)	5720	3.64	3.52
149	5745	17.52	17.28
157	5785	17.64	17.28
165	5825	17.88	17.16

802.11ax (HE20)

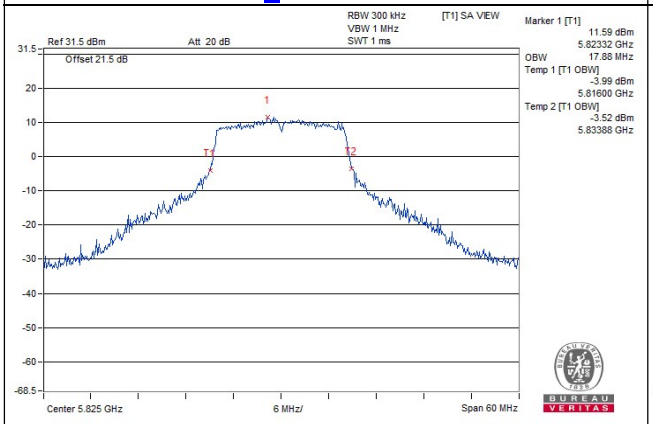
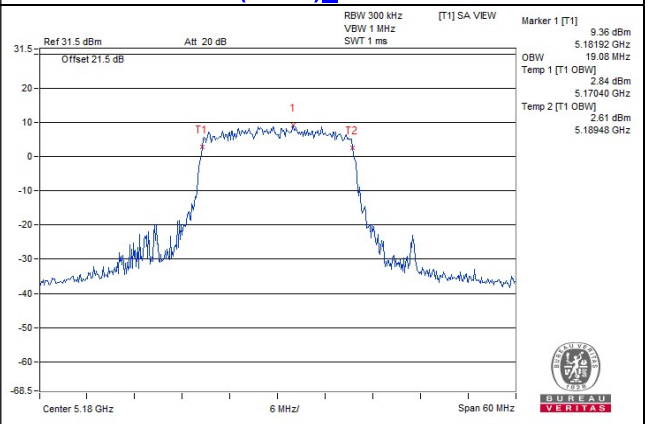
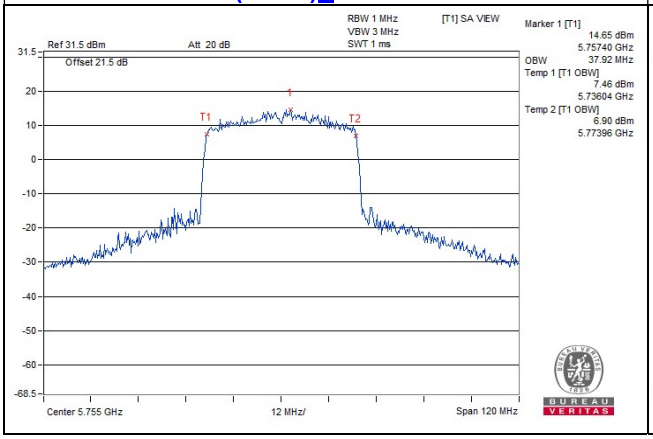
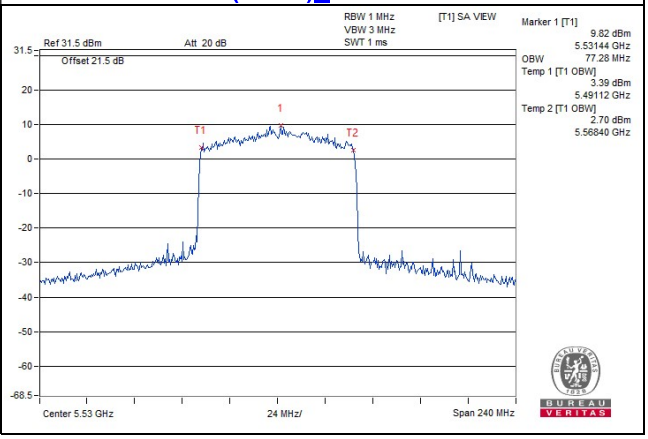
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	19.08	19.08
40	5200	19.08	19.08
48	5240	19.08	19.08
52	5260	19.08	19.08
60	5300	19.08	19.08
64	5320	19.08	19.08
100	5500	19.08	19.08
116	5580	19.08	19.08
140	5700	19.08	19.08
144 (U-NII-2C Band)	5720	14.72	14.6
144 (U-NII-3 Band)	5720	4.48	4.48
149	5745	19.08	19.08
157	5785	19.08	19.08
165	5825	19.08	19.08

802.11ax (HE40)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
38	5190	37.68	37.68
46	5230	37.68	37.68
54	5270	37.68	37.68
62	5310	37.68	37.92
102	5510	37.68	37.68
110	5550	37.68	37.68
134	5670	37.68	37.68
142 (U-NII-2C Band)	5710	33.96	33.96
142 (U-NII-3 Band)	5710	3.72	3.96
151	5755	37.92	37.92
159	5795	37.68	37.68

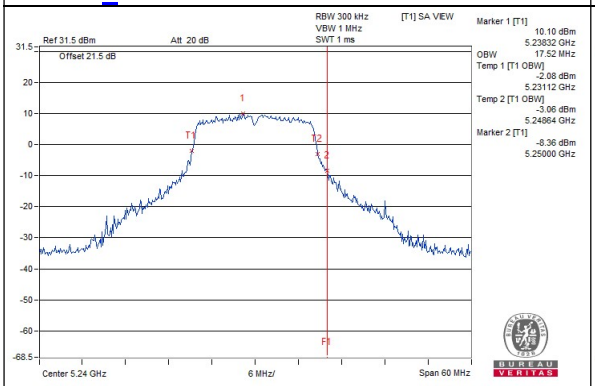
802.11ax (HE80)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
42	5210	76.8	77.28
58	5290	76.8	76.8
106	5530	77.28	76.8
122	5610	76.8	76.8
138 (U-NII-2C Band)	5690	73.4	73.4
138 (U-NII-3 Band)	5690	3.4	3.4
155	5775	76.8	76.8

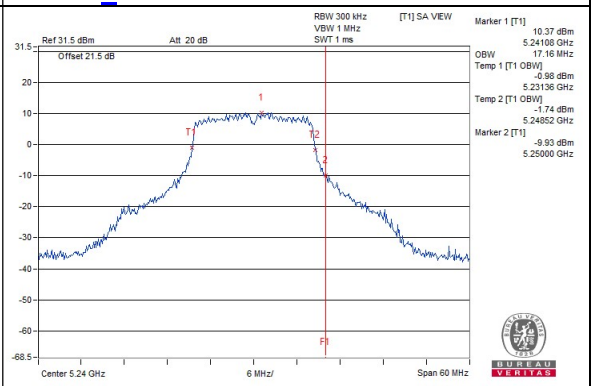
Spectrum Plot of Max. Value	
802.11a_Chain 0 / CH165	**802.11ax (HE20)_Chain 0 / CH36**
	
802.11ax (HE40)_Chain 0 / CH151	**802.11ax (HE80)_Chain 0 / CH106**
	

Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

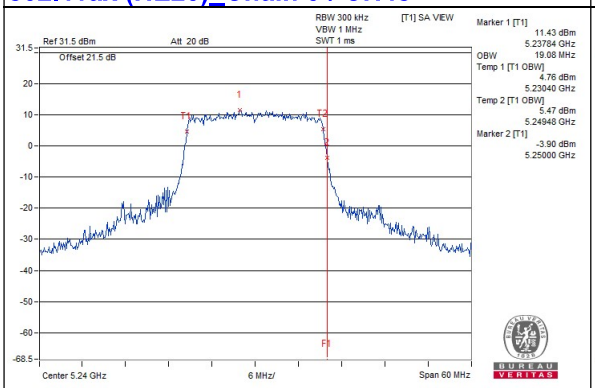
802.11a_Chain 0 / CH48



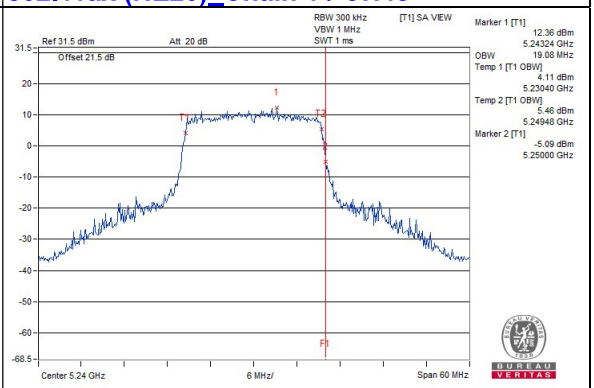
802.11a_Chain 1 / CH48



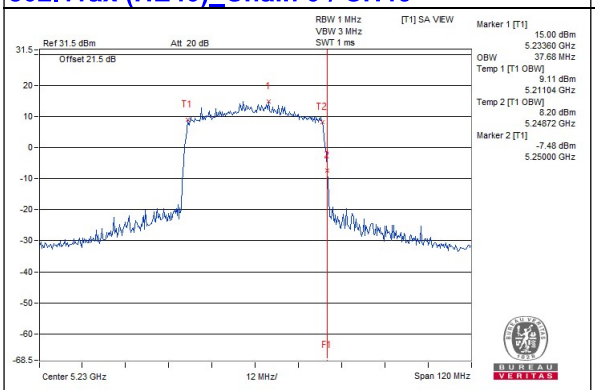
802.11ax (HE20)_Chain 0 / CH48



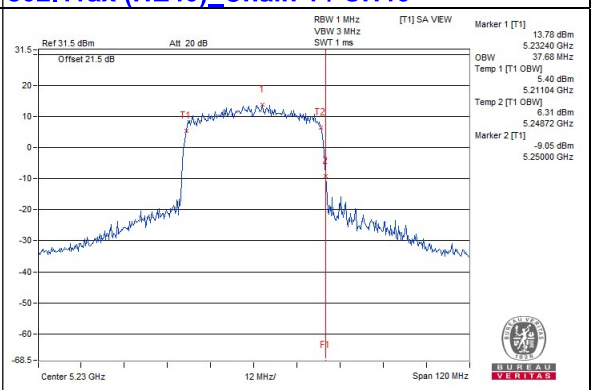
802.11ax (HE20)_Chain 1 / CH48



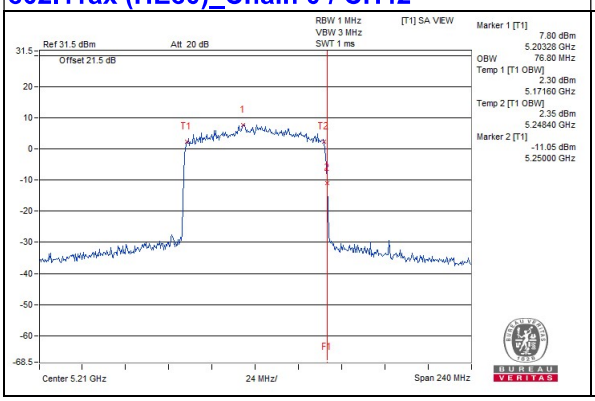
802.11ax (HE40)_Chain 0 / CH46



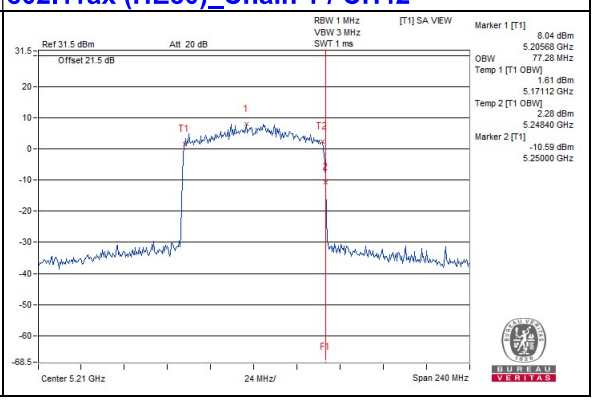
802.11ax (HE40)_Chain 1 / CH46



802.11ax (HE80)_Chain 0 / CH42

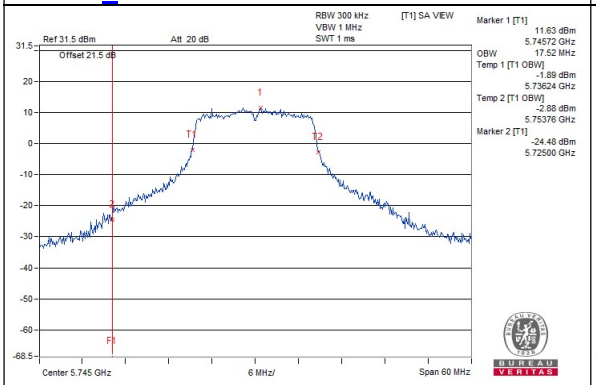


802.11ax (HE80)_Chain 1 / CH42

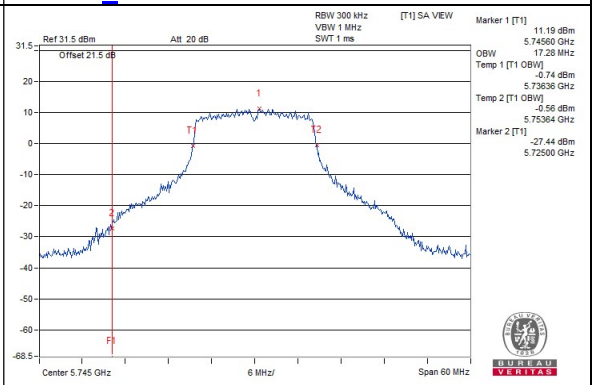


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

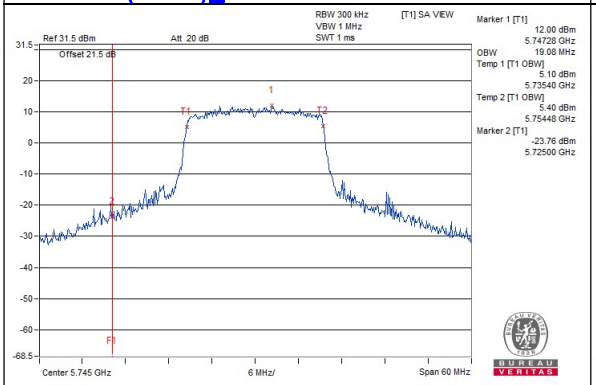
802.11a_Chain 0 / CH149



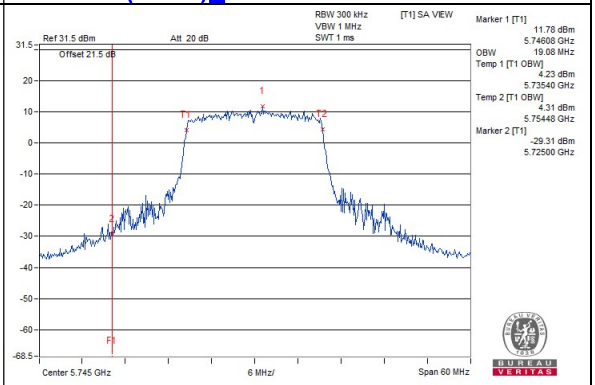
802.11a_Chain 1 / CH149



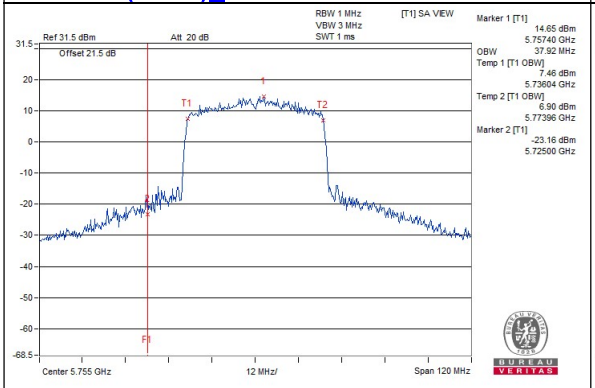
802.11ax (HE20)_Chain 0 / CH149



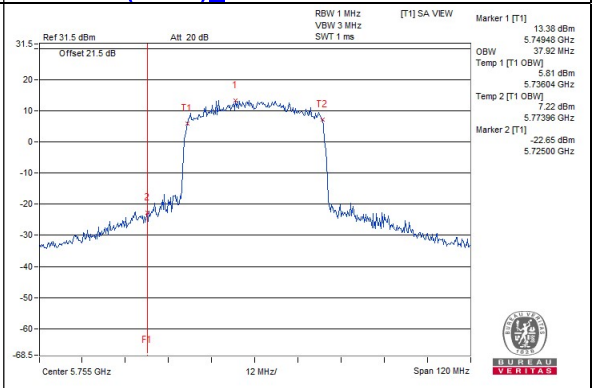
802.11ax (HE20)_Chain 1 / CH149



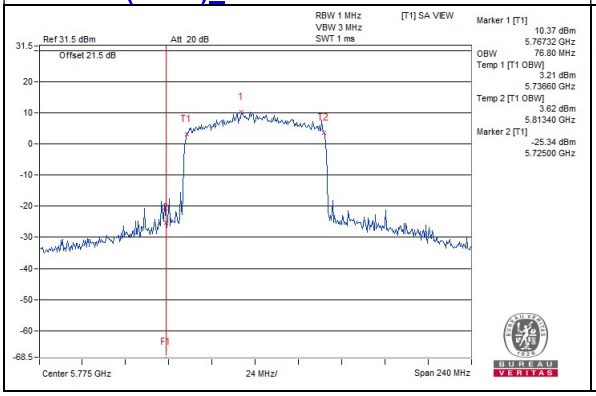
802.11ax (HE40)_Chain 0 / CH151



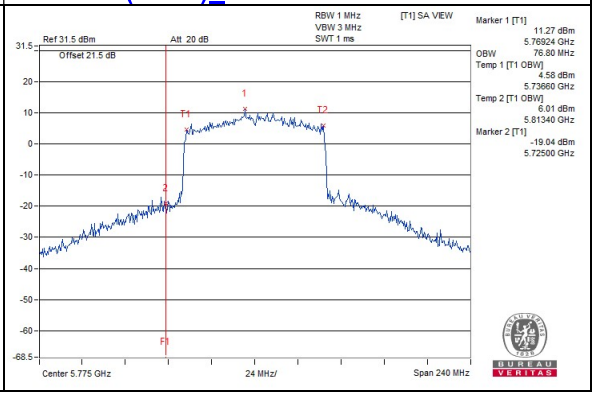
802.11ax (HE40)_Chain 1 / CH151



802.11ax (HE80)_Chain 0 / CH155



802.11ax (HE80)_Chain 1 / CH155

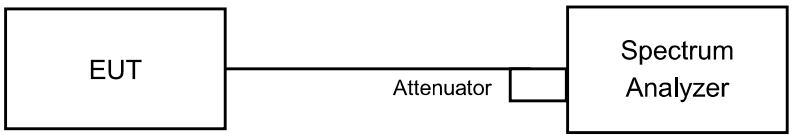


4.5 Peak Power Spectral Density Measurement

4.5.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
	√	Client device	11dBm/ MHz
U-NII-2A	√		11dBm/ MHz
U-NII-2C	√		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For 802.11a

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-1

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to “free run”.
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value

For U-NII-3 band:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent value in 500 kHz by adjusting (increasing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500kHz/300kHz)
5. Sweep time = auto, trigger set to “free run”.
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value

For 802.11ax (HE20), 802.11ax (HE40), 802.11ax (HE80)

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-2

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to “free run”.
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent value in 500 kHz by adjusting (increasing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz/300kHz)
5. Sweep time = auto, trigger set to “free run”.
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value and add 10 log (1/duty cycle)

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6.

4.5.7 Test Results

For U-NII-1, U-NII-2A, U-NII-2C band:

CDD Mode

802.11a

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
36	5180	3.16	2.88	6.03	9.07	Pass
40	5200	4.84	4.96	7.91	9.07	Pass
48	5240	5.99	5.57	8.80	9.07	Pass
52	5260	5.96	6.02	9.00	9.07	Pass
60	5300	5.45	5.29	8.38	9.07	Pass
64	5320	3.24	3.49	6.38	9.07	Pass
100	5500	4.66	4.70	7.69	9.07	Pass
116	5580	5.89	5.94	8.93	9.07	Pass
140	5700	5.94	5.30	8.64	9.07	Pass
144 (U-NII-2C Band)	5720	5.92	5.98	8.96	9.07	Pass

Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. The directional gain = 4.92dBi + 10log(2) = 7.93dBi > 6dBi, so the power density limit shall be reduced to 11-(7.93-6)=9.07dBm.

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
36	5180	2.01	1.40	0.33	5.06	9.07	Pass
40	5200	1.94	1.23	0.33	4.94	9.07	Pass
48	5240	3.45	2.79	0.33	6.47	9.07	Pass
52	5260	4.07	2.31	0.33	6.62	9.07	Pass
60	5300	1.95	2.85	0.33	5.76	9.07	Pass
64	5320	0.98	0.89	0.33	4.28	9.07	Pass
100	5500	2.98	0.46	0.33	5.24	9.07	Pass
116	5580	4.51	2.14	0.33	6.83	9.07	Pass
140	5700	2.97	1.64	0.33	5.70	9.07	Pass
144 (U-NII-2C Band)	5720	5.60	0.85	0.33	7.18	9.07	Pass

Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. The directional gain = 4.92dBi + 10log(2) = 7.93dBi > 6dBi, so the power density limit shall be reduced to 11-(7.93-6)=9.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

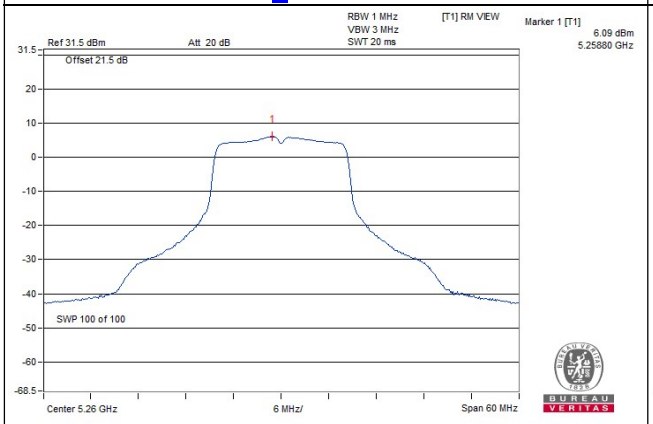
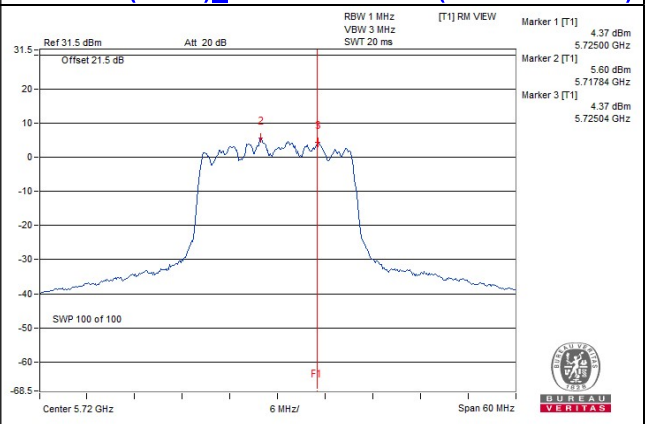
Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
38	5190	-2.52	-3.49	0.52	0.55	9.07	Pass
46	5230	-0.95	-2.23	0.52	1.99	9.07	Pass
54	5270	-0.98	-0.54	0.52	2.78	9.07	Pass
62	5310	-3.27	-2.97	0.52	0.41	9.07	Pass
102	5510	-4.37	-0.95	0.52	1.20	9.07	Pass
110	5550	1.26	0.52	0.52	4.44	9.07	Pass
134	5670	-2.11	-2.07	0.52	1.44	9.07	Pass
142 (U-NII-2C Band)	5710	-0.81	1.51	0.52	4.03	9.07	Pass

Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. The directional gain = 4.92dBi + 10log(2) = 7.93dBi > 6dBi, so the power density limit shall be reduced to 11-(7.93-6)=9.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE80)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/MHz)		Duty Factor (dB)	Total PSD (dBm/MHz)	Max. PSD Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1				
42	5210	-4.88	-5.33	1.02	-1.07	9.07	Pass
58	5290	-10.59	-9.94	1.02	-6.22	9.07	Pass
106	5530	-5.36	-6.12	1.02	-1.69	9.07	Pass
122	5610	-7.95	-7.85	1.02	-3.87	9.07	Pass
138 (U-NII-2C Band)	5690	-2.77	-3.58	1.02	0.87	9.07	Pass

Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. The directional gain = 4.92dBi + 10log(2) = 7.93dBi > 6dBi, so the power density limit shall be reduced to 11-(7.93-6)=9.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value	
802.11a_Chain 1 / CH52	**802.11ax (HE20)_Chain 0 / CH144 (U-NII-2C Band)**
	
802.11ax (HE40)_Chain 0 / CH110	**802.11ax (HE80)_Chain 0 / CH138 (U-NII-2C Band)**