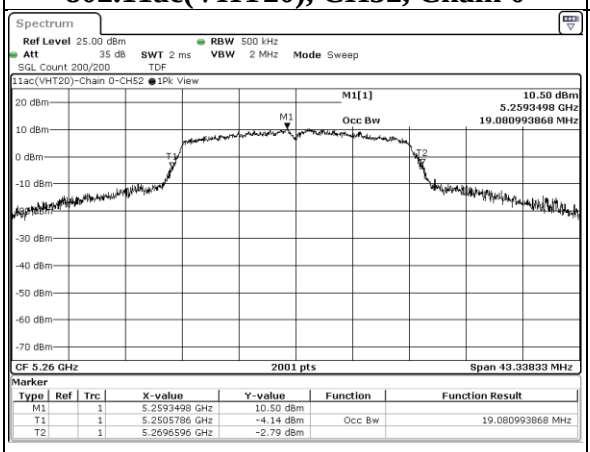
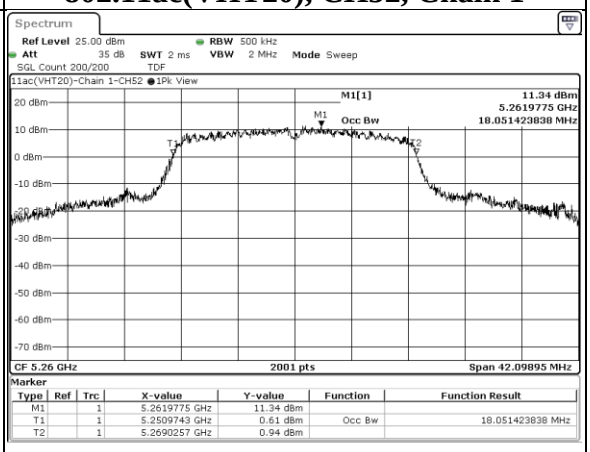
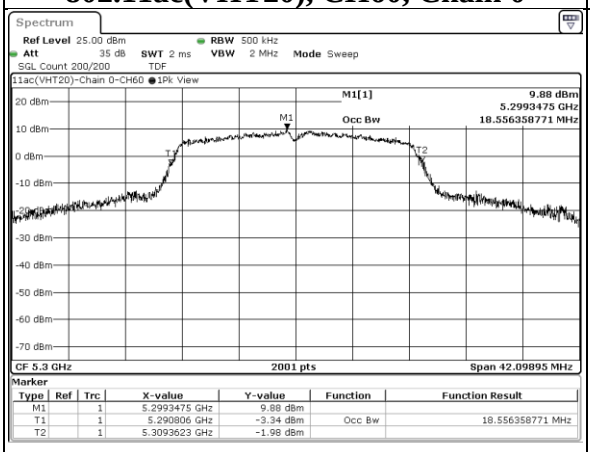
802.11ac(VHT20), CH52, Chain 0



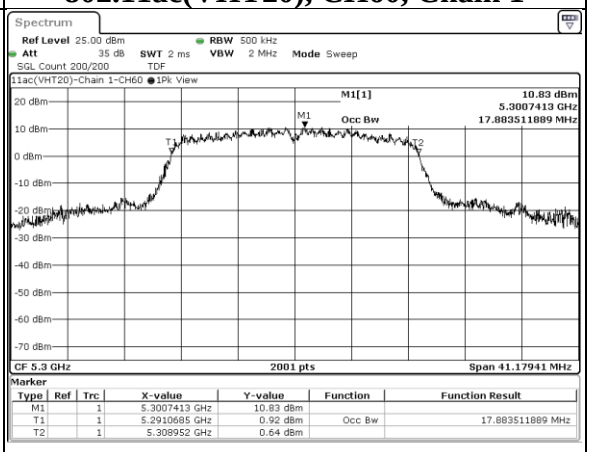
802.11ac(VHT20), CH52, Chain 1



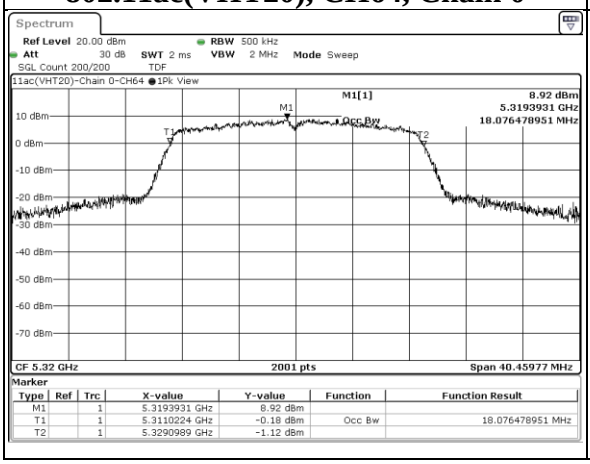
802.11ac(VHT20), CH60, Chain 0



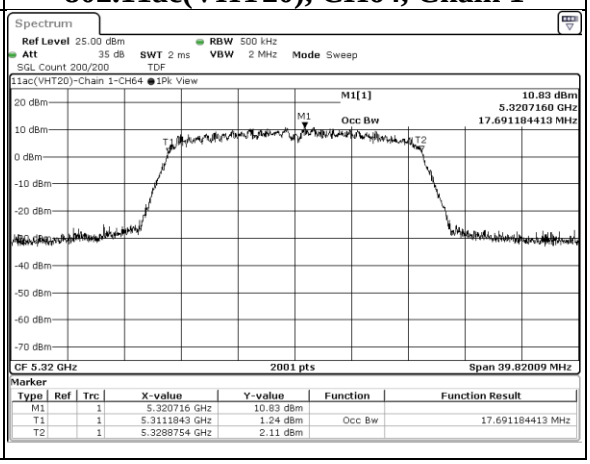
802.11ac(VHT20), CH60, Chain 1



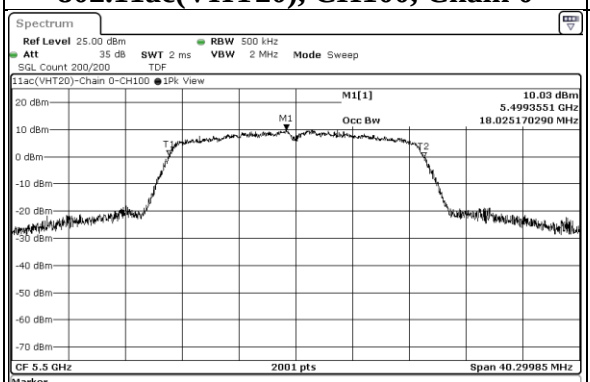
802.11ac(VHT20), CH64, Chain 0



802.11ac(VHT20), CH64, Chain 1



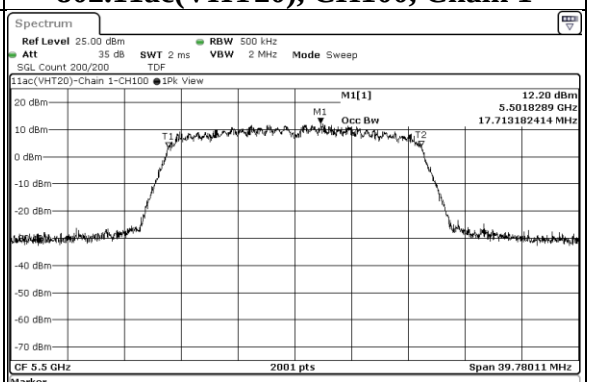
802.11ac(VHT20), CH100, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.4993551 GHz	10.03 dBm		
T1		1	5.4910378 GHz	0.52 dBm	Occ Bw	18.02517029 MHz
T2		1	5.5090629 GHz	-0.45 dBm		

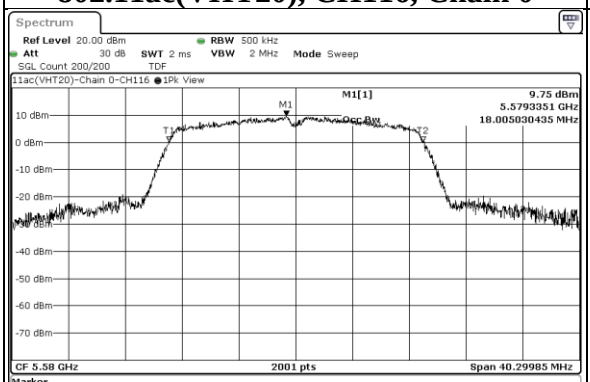
802.11ac(VHT20), CH100, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.5018289 GHz	12.20 dBm		
T1		1	5.4911533 GHz	3.31 dBm	Occ Bw	17.713182414 MHz
T2		1	5.5088665 GHz	3.83 dBm		

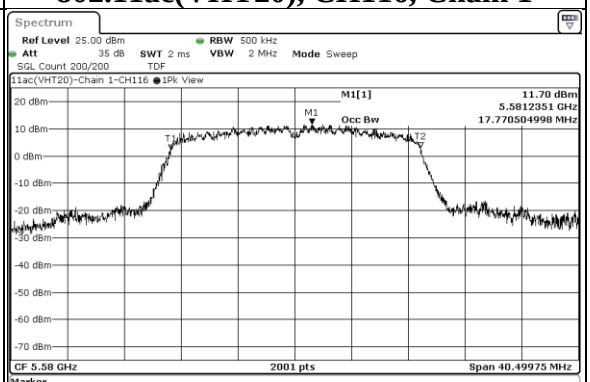
802.11ac(VHT20), CH116, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.5793351 GHz	9.75 dBm		
T1		1	5.5710378 GHz	0.08 dBm	Occ Bw	18.005030435 MHz
T2		1	5.5890428 GHz	0.05 dBm		

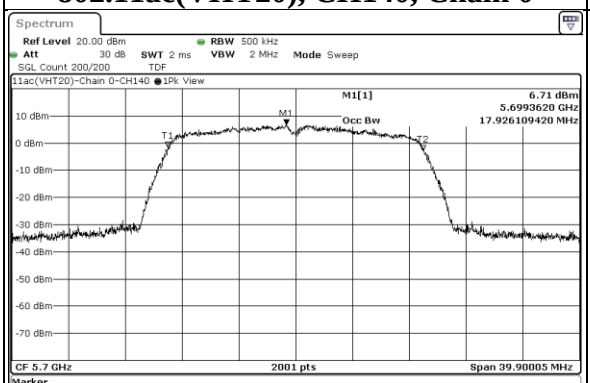
802.11ac(VHT20), CH116, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.5812351 GHz	11.70 dBm		
T1		1	5.5711755 GHz	2.16 dBm	Occ Bw	17.770504998 MHz
T2		1	5.588946 GHz	3.09 dBm		

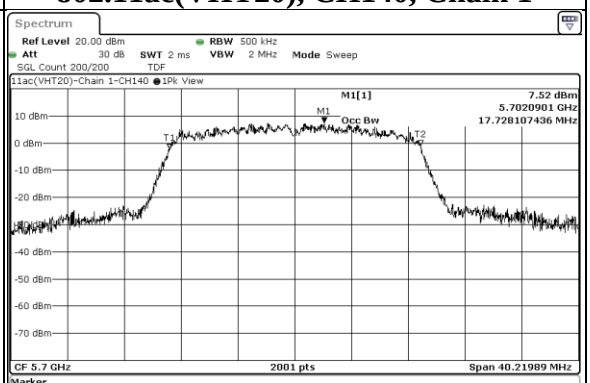
802.11ac(VHT20), CH140, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.699362 GHz	6.71 dBm		
T1		1	5.691027 GHz	-1.49 dBm	Occ Bw	17.92610942 MHz
T2		1	5.7089531 GHz	-2.68 dBm		

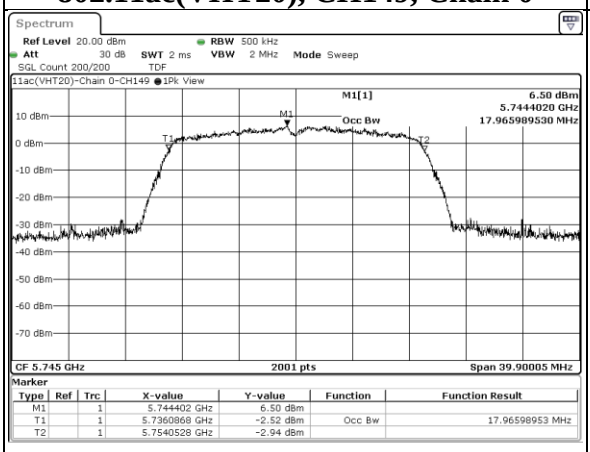
802.11ac(VHT20), CH140, Chain 1



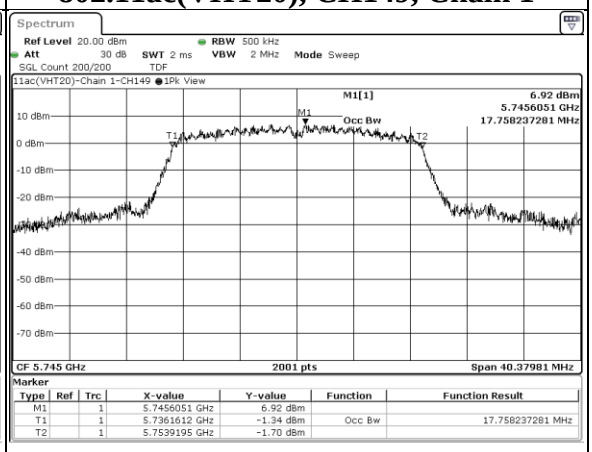
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.7020901 GHz	7.52 dBm		
T1		1	5.691156 GHz	-2.20 dBm	Occ Bw	17.728107436 MHz
T2		1	5.7088842 GHz	-0.99 dBm		

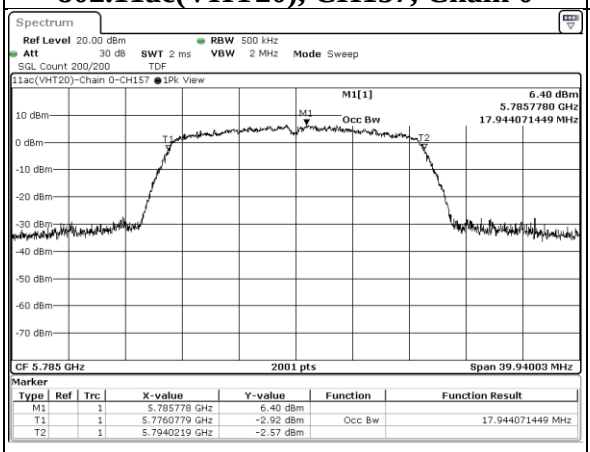
802.11ac(VHT20), CH149, Chain 0



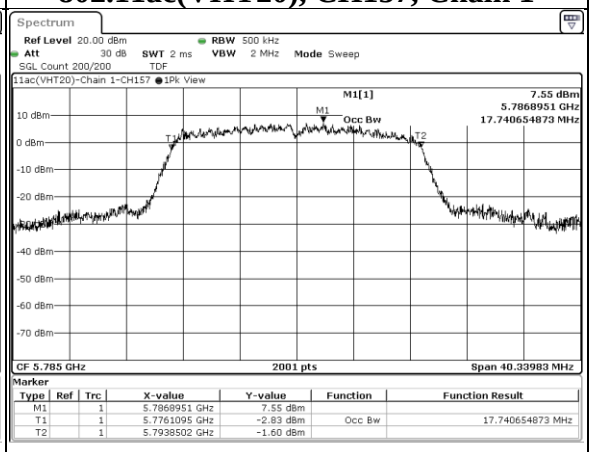
802.11ac(VHT20), CH149, Chain 1



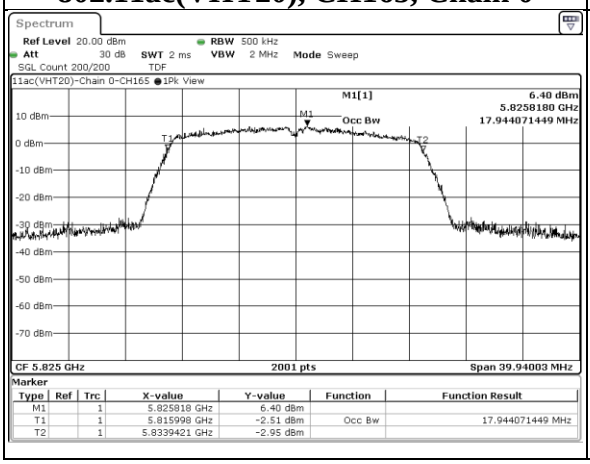
802.11ac(VHT20), CH157, Chain 0



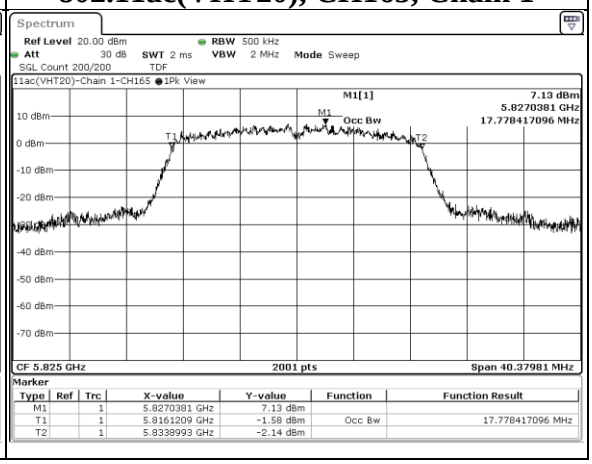
802.11ac(VHT20), CH157, Chain 1



802.11ac(VHT20), CH165, Chain 0

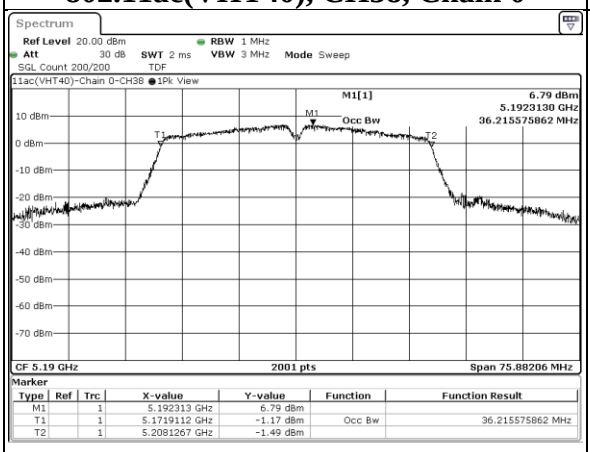


802.11ac(VHT20), CH165, Chain 1

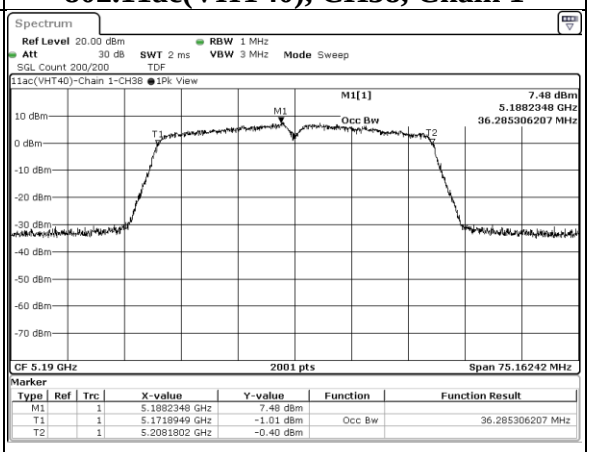


Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT40)	38	5190	36.216	36.285	N/A	Pass
	46	5230	37.638	36.888	N/A	Pass
	54	5270	39.939	37.325	N/A	Pass
	62	5310	36.098	36.442	N/A	Pass
	102	5510	36.174	36.323	N/A	Pass
	110	5550	36.519	36.521	N/A	Pass
	134	5670	36.253	37.043	N/A	Pass
	151	5755	36.137	36.482	N/A	Pass
	159	5795	36.138	36.483	N/A	Pass

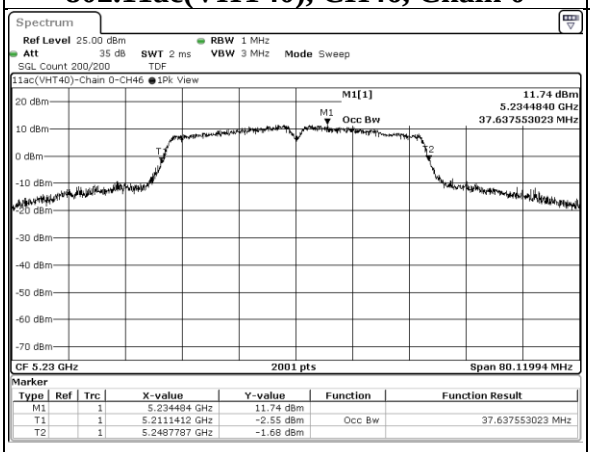
802.11ac(VHT40), CH38, Chain 0



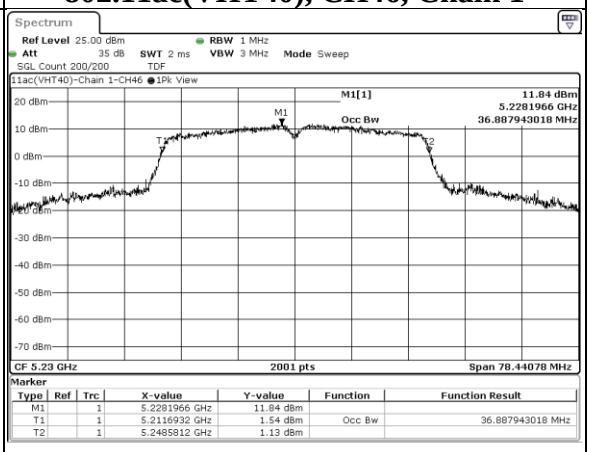
802.11ac(VHT40), CH38, Chain 1



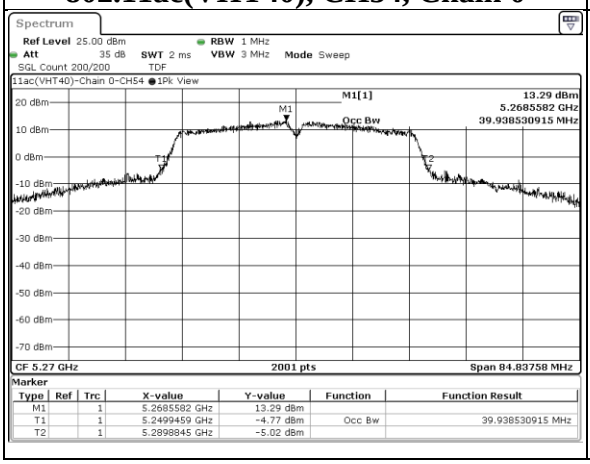
802.11ac(VHT40), CH46, Chain 0



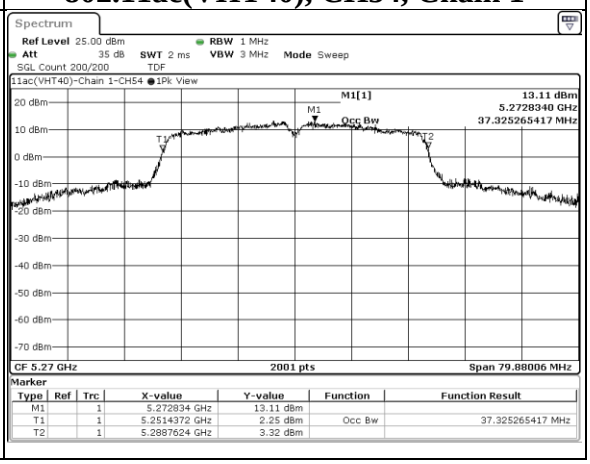
802.11ac(VHT40), CH46, Chain 1



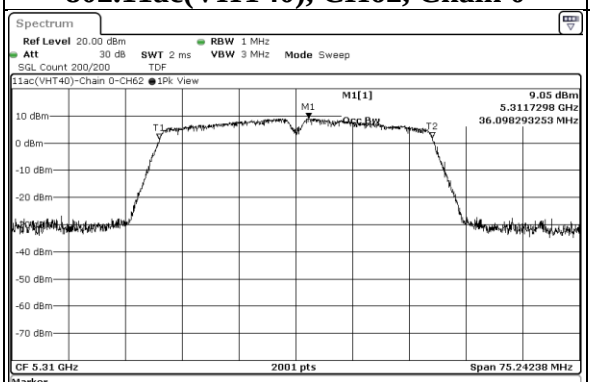
802.11ac(VHT40), CH54, Chain 0



802.11ac(VHT40), CH54, Chain 1



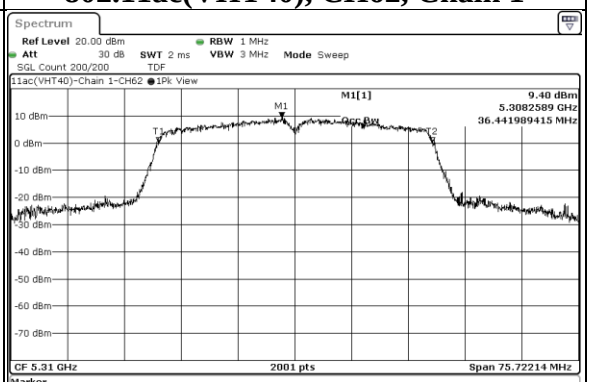
802.11ac(VHT40), CH62, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.3117298 GHz	9.05 dBm		
T1		1	5.2919509 GHz	1.46 dBm	Occ Bw	36.098293253 MHz
T2		1	5.3280491 GHz	2.06 dBm		

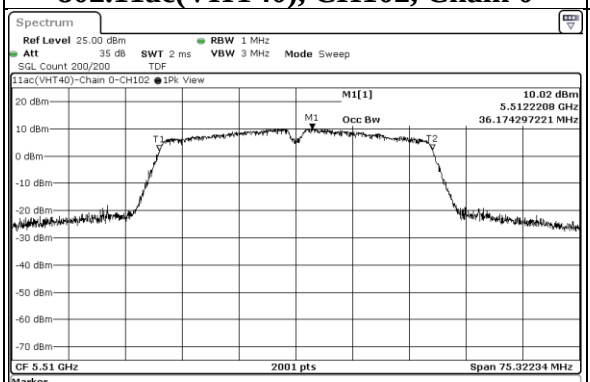
802.11ac(VHT40), CH62, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.3082589 GHz	9.40 dBm		
T1		1	5.2918736 GHz	0.27 dBm	Occ Bw	36.441989415 MHz
T2		1	5.3283156 GHz	0.13 dBm		

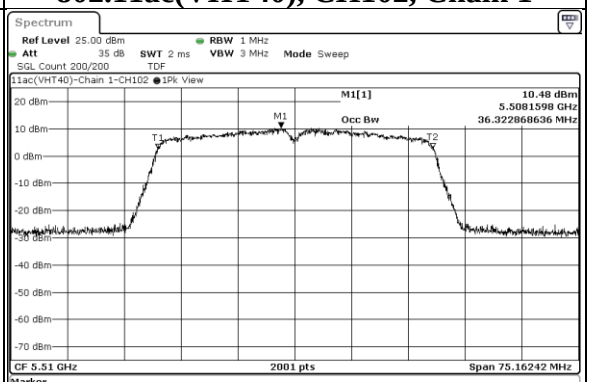
802.11ac(VHT40), CH102, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.5122208 GHz	10.02 dBm		
T1		1	5.4919317 GHz	1.98 dBm	Occ Bw	36.174297221 MHz
T2		1	5.528106 GHz	2.37 dBm		

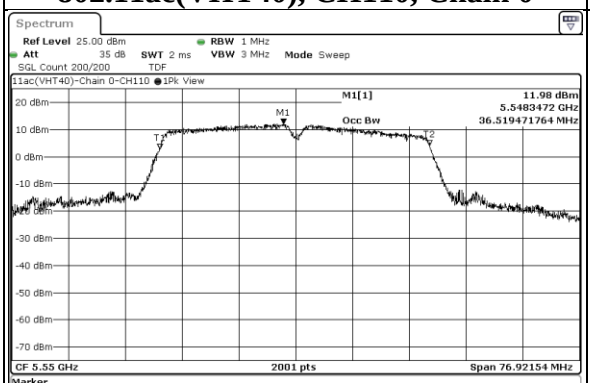
802.11ac(VHT40), CH102, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.5081598 GHz	10.48 dBm		
T1		1	5.4919325 GHz	2.43 dBm	Occ Bw	36.322868636 MHz
T2		1	5.5282553 GHz	2.80 dBm		

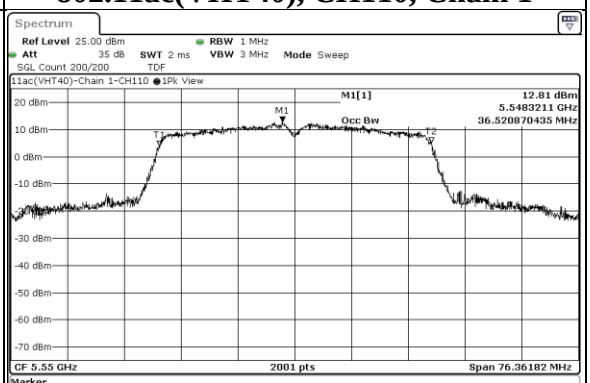
802.11ac(VHT40), CH110, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.5483472 GHz	11.98 dBm		
T1		1	5.5315865 GHz	2.65 dBm	Occ Bw	36.519471764 MHz
T2		1	5.568106 GHz	4.05 dBm		

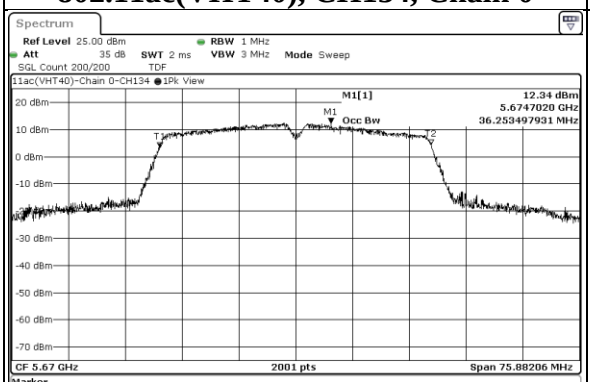
802.11ac(VHT40), CH110, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.5483211 GHz	12.81 dBm		
T1		1	5.531835 GHz	3.72 dBm	Occ Bw	36.520870435 MHz
T2		1	5.5683558 GHz	5.06 dBm		

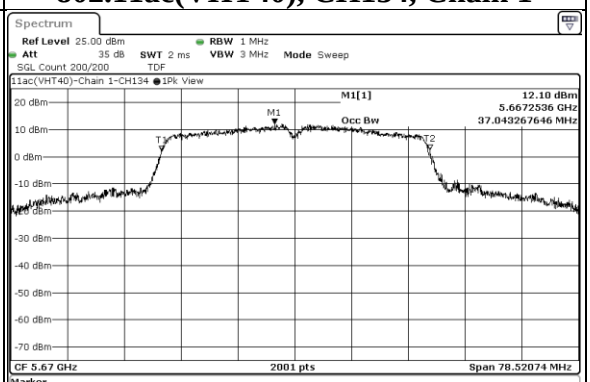
802.11ac(VHT40), CH134, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.674702 GHz	12.34 dBm		
T1		1	5.6518353 GHz	3.38 dBm	Occ Bw	36.253497931 MHz
T2		1	5.6880888 GHz	4.42 dBm		

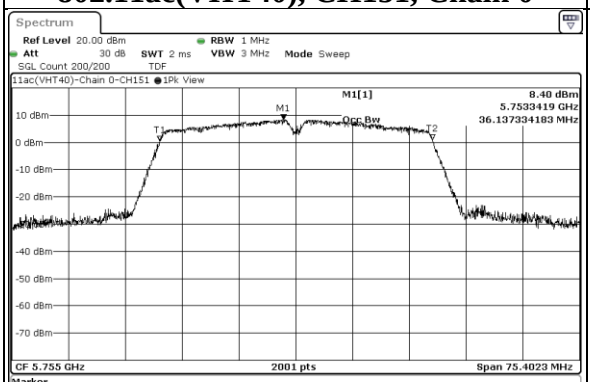
802.11ac(VHT40), CH134, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.6672536 GHz	12.10 dBm		
T1		1	5.6516353 GHz	2.03 dBm	Occ Bw	37.043267646 MHz
T2		1	5.6886786 GHz	2.61 dBm		

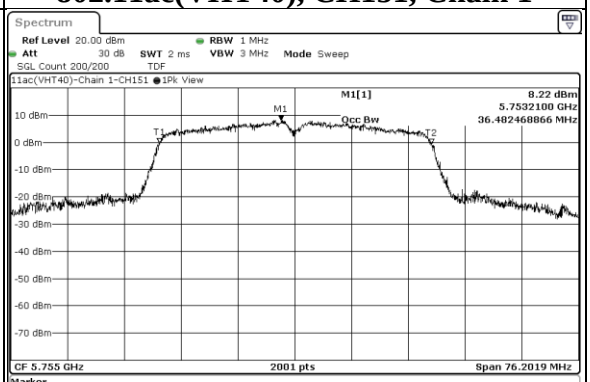
802.11ac(VHT40), CH151, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.7533419 GHz	8.40 dBm		
T1		1	5.7369879 GHz	0.53 dBm	Occ Bw	36.137334183 MHz
T2		1	5.7731252 GHz	0.85 dBm		

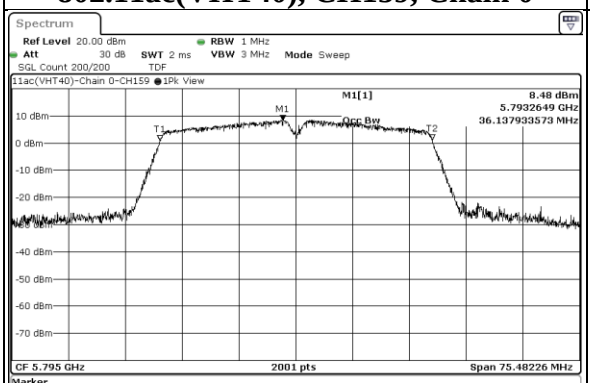
802.11ac(VHT40), CH151, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.75321 GHz	8.22 dBm		
T1		1	5.7368349 GHz	-0.40 dBm	Occ Bw	36.482468866 MHz
T2		1	5.7733174 GHz	-0.56 dBm		

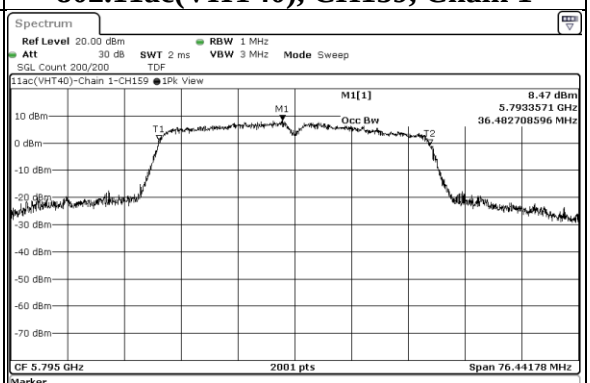
802.11ac(VHT40), CH159, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.7932649 GHz	8.48 dBm		
T1		1	5.7769688 GHz	0.82 dBm	Occ Bw	36.137933573 MHz
T2		1	5.8131067 GHz	1.16 dBm		

802.11ac(VHT40), CH159, Chain 1

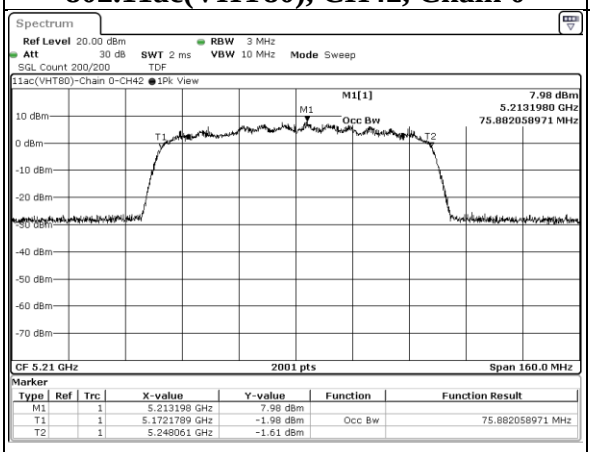


Marker

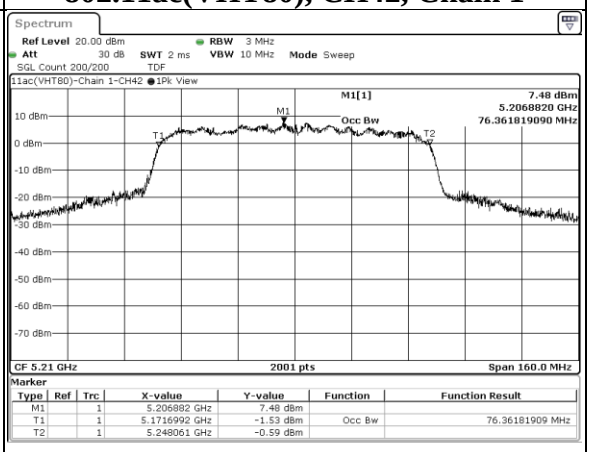
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.7933571 GHz	8.47 dBm		
T1		1	5.7767013 GHz	0.83 dBm	Occ Bw	36.482708596 MHz
T2		1	5.8131841 GHz	-0.57 dBm		

Mode	CH	Freq (MHz)	OBW (MHz)		Limit (MHz)	Result
			Chain 0	Chain 1		
802.11ac(VHT80)	42	5210	75.882	76.362	N/A	Pass
	58	5290	76.042	75.722	N/A	Pass
	106	5530	75.642	75.722	N/A	Pass
	122	5610	76.122	76.922	N/A	Pass
	155	5775	76.202	76.362	N/A	Pass

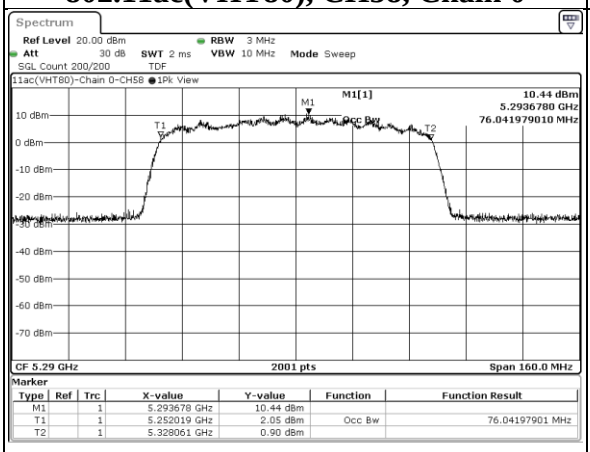
802.11ac(VHT80), CH42, Chain 0



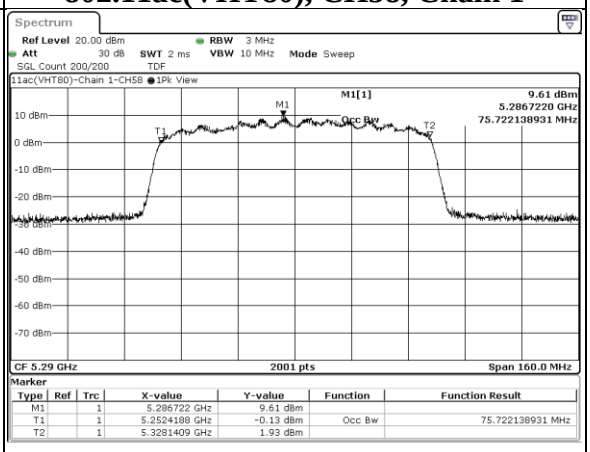
802.11ac(VHT80), CH42, Chain 1



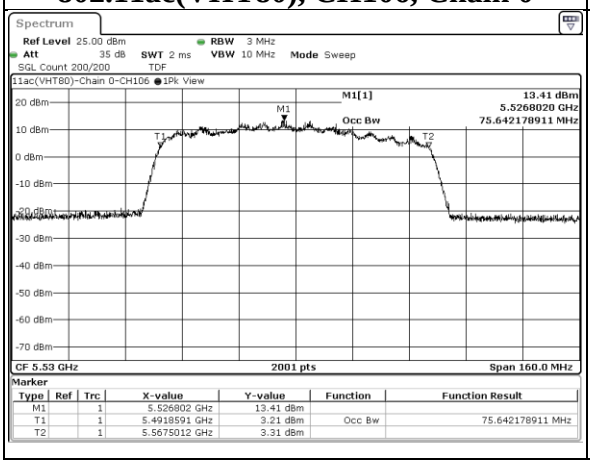
802.11ac(VHT80), CH58, Chain 0



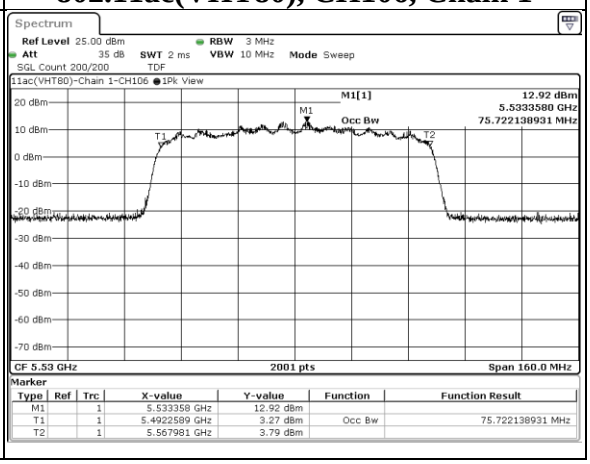
802.11ac(VHT80), CH58, Chain 1



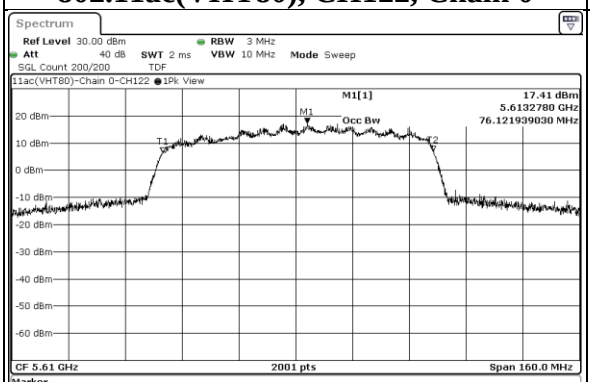
802.11ac(VHT80), CH106, Chain 0



802.11ac(VHT80), CH106, Chain 1



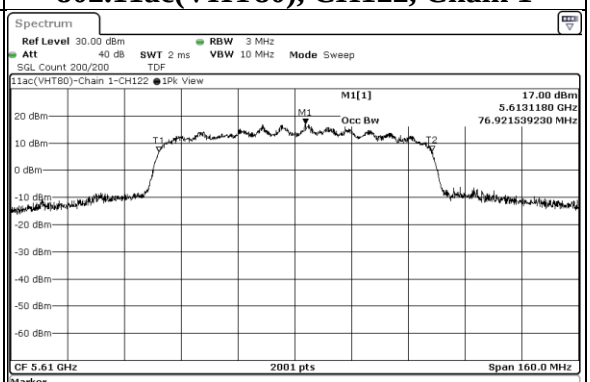
802.11ac(VHT80), CH122, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.613278 GHz	17.41 dBm		
T1		1	5.5724988 GHz	6.54 dBm	Occ Bw	76.12193903 MHz
T2		1	5.6486207 GHz	7.09 dBm		

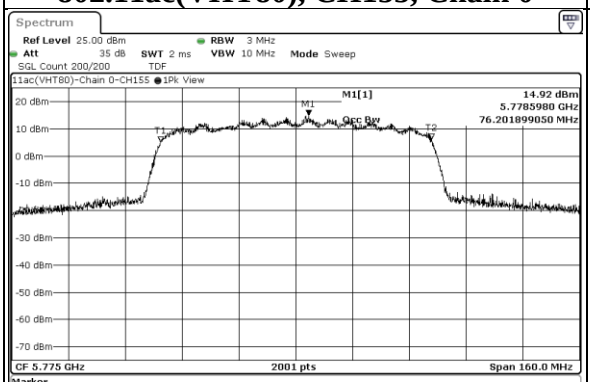
802.11ac(VHT80), CH122, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.613118 GHz	17.00 dBm		
T1		1	5.5716992 GHz	6.74 dBm	Occ Bw	76.92153923 MHz
T2		1	5.6486207 GHz	6.96 dBm		

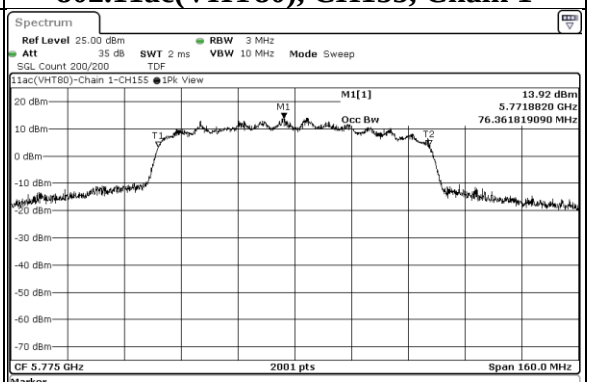
802.11ac(VHT80), CH155, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.778598 GHz	14.92 dBm		
T1		1	5.737019 GHz	5.06 dBm	Occ Bw	76.20189905 MHz
T2		1	5.8132209 GHz	6.23 dBm		

802.11ac(VHT80), CH155, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.771882 GHz	13.92 dBm		
T1		1	5.7365392 GHz	3.31 dBm	Occ Bw	76.36181909 MHz
T2		1	5.812901 GHz	3.96 dBm		

9.4. Conducted output power

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6)
		Fixed point-to-point Access Point	1 Watt (30 dBm) If G_{TX} > 23 dBi, then P_{Out} = 30 – (G_{TX} – 23)
		Indoor Access Point	1 Watt (30 dBm) If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6)
	√	Client device	250mW (24 dBm) If G_{TX} > 6 dBi, then P_{Out} = 23.98 – (G_{TX} – 6)
U-NII-2A	√		250mW (24 dBm) or 11 dBm+10 log B* If G_{TX} > 6 dBi, then P_{Out} = 23.98 – (G_{TX} – 6)
U-NII-2C	√		250mW (24 dBm) or 11 dBm+10 log B* If G_{TX} > 6 dBi, then P_{Out} = 23.98 – (G_{TX} – 6)
U-NII-3	√		For Point-to-multipoint systems (P2M): 1 Watt (30 dBm). If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) For Point-to-point systems (P2P): 1 Watt (30 dBm)

Note:
1. P_{Out} = maximum conducted output power in dBm,
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. B is the 26 dB emission bandwidth in megahertz
4. Directional Gain = G_{ant} + 10 log (Nant) dBi.

   N*a*nt: Number of Transmit Antennas
   G1, G2,..., Gn: Gain of Individual Antennas (Same for Each Antenna)

5. Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

   Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
   Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
   Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

Test Procedure

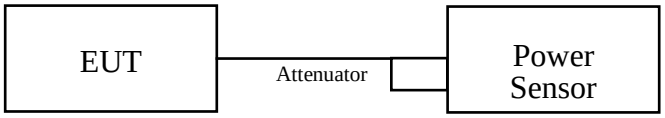
For Average Power Measurement

Test method PM

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst and set the detector to AVERAGE. Duty factor is not added to measured value.

Test Setup

For Average Power Measurement



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.

Test Data

802.11a

Channel	Channel Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
36	5180	14.60	15.02	60.674	17.83	23.98	PASS
44	5220	17.27	17.60	110.917	20.45	23.98	PASS
48	5240	17.69	17.67	117.22	20.69	23.98	PASS
52	5260	17.79	17.39	114.815	20.60	23.98	PASS
60	5300	16.65	16.09	86.896	19.39	23.98	PASS
64	5320	16.37	15.90	82.224	19.15	23.95	PASS
100	5500	17.24	17.34	107.152	20.30	23.94	PASS
116	5580	16.92	17.21	101.859	20.08	23.96	PASS
140	5700	14.08	13.16	46.238	16.65	23.94	PASS
149	5745	14.14	13.54	48.529	16.86	30	PASS
157	5785	14.23	13.49	48.865	16.89	30	PASS
165	5825	14.04	13.31	46.774	16.70	30	PASS

Note: The directional gain = 5 dBi < 6 dBi, so the power limit shall not be reduced.

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
36	5180	14.32	14.97	58.479	17.67	23.98	PASS
44	5220	17.51	18.07	120.504	20.81	23.98	PASS
48	5240	17.41	17.67	113.501	20.55	23.98	PASS
52	5260	17.73	17.43	114.551	20.59	23.98	PASS
60	5300	16.96	16.52	94.624	19.76	23.98	PASS
64	5320	16.67	16.63	92.47	19.66	23.98	PASS
100	5500	17.74	17.64	117.49	20.70	23.98	PASS
116	5580	17.23	17.74	112.202	20.50	23.98	PASS
140	5700	14.44	13.77	51.642	17.13	23.98	PASS
149	5745	13.94	13.48	47.098	16.73	30	PASS
157	5785	14.10	13.45	47.863	16.80	30	PASS
165	5825	13.85	13.31	45.709	16.60	30	PASS

Note: The directional gain = 5 dBi < 6 dBi, so the power limit shall not be reduced.

802.11ac (VHT40)

Channel	Channel Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
38	5190	13.34	13.63	44.668	16.50	23.98	PASS
46	5230	17.75	17.92	121.619	20.85	23.98	PASS
54	5270	19.54	19.05	170.216	22.31	23.98	PASS
62	5310	16.02	15.26	73.621	18.67	23.98	PASS
102	5510	16.98	16.75	97.275	19.88	23.98	PASS
110	5550	18.90	18.73	152.405	21.83	23.98	PASS
134	5670	19.01	18.54	151.008	21.79	23.98	PASS
151	5755	15.27	14.64	62.806	17.98	30	PASS
159	5795	15.20	14.56	61.66	17.90	30	PASS

Note: The directional gain = 5 dBi < 6 dBi, so the power limit shall not be reduced.

802.11ac (VHT80)

Channel	Channel Frequency (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
42	5210	10.17	10.42	21.429	13.31	23.98	PASS
58	5290	12.62	11.92	33.806	15.29	23.98	PASS
106	5530	15.11	14.90	63.387	18.02	23.98	PASS
122	5610	19.48	19.39	175.792	22.45	23.98	PASS
155	5775	16.93	16.27	91.622	19.62	30	PASS

Note: The directional gain = 5 dBi < 6 dBi, so the power limit shall not be reduced.

9.5. Power Spectral Density

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz If G_{TX} > 6 dBi, then PSD = 17 – (G_{TX} – 6)
		Fixed point-to-point Access Point	17dBm/ MHz If G_{TX} > 23 dBi, then PSD = 17 – (G_{TX} – 23)
		Indoor Access Point	17dBm/ MHz If G_{TX} > 6 dBi, then PSD = 17 – (G_{TX} – 6)
	√	Client device	11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-2A	√		11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-2C	√		11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-3	√		For Point-to-multipoint systems (P2M): 30dBm/ 500kHz. If G_{TX} > 6 dBi, then PSD = 30 – (G_{TX} – 6) For Point-to-point systems (P2P): 30dBm/ 500kHz

Note:
1. PSD = power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = G_{ant} + 10 log (Nant) dBi.

   Nant: Number of Transmit Antennas
   G1, G2,..., Gn: Gain of Individual Antennas (Same for Each Antenna)

4. "PSD per chain" of the report shown is maximum value for each chain, at the "Total PSD" is summing entire spectra across corresponding frequency bins on the various outputs by computer, refer KDB 662911 Method a) for calculating total power density.

Test procedure

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

Using method as below:

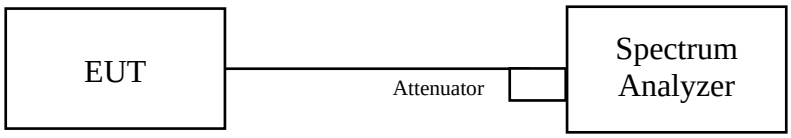
a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 1 MHz, Set VBW ≥ 3 RBW, Detector = RMS
c. Sweep time = auto, trigger set to "free run".
d. Trace average at least 100 traces in power averaging mode.
e. Record the max value. (if Duty cycle <98 %, add 10 log (1/duty cycle))

For U-NII-3 band:

Using method as below:

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10 log (500 kHz/300kHz)
e. Sweep time = auto, trigger set to "free run".
f. Trace average at least 100 traces in power averaging mode.
g. Record the max value. (if Duty cycle <98 %, add 10 log (1/duty cycle))

Test Setup



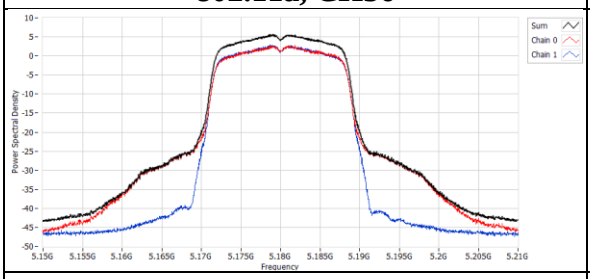
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

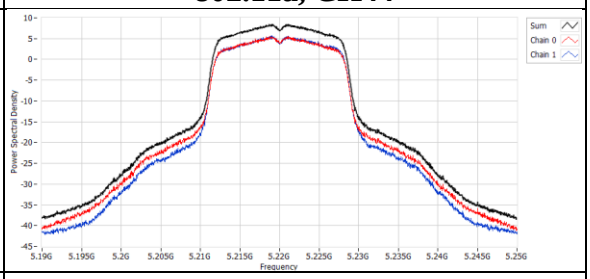
Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	36	5180	8.01	5.73	8.99	Pass
	44	5220	8.01	8.48	8.99	Pass
	48	5240	8.01	8.72	8.99	Pass

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11a	36	5180	2.75	2.905
	44	5220	5.562	5.685
	48	5240	5.83	5.82

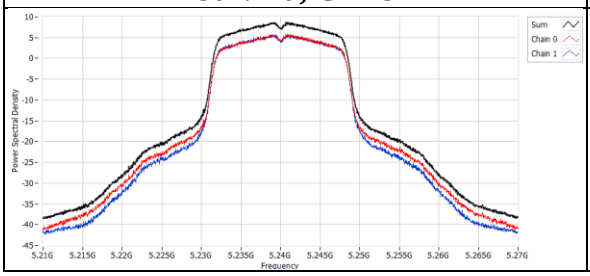
802.11a, CH36



802.11a, CH44



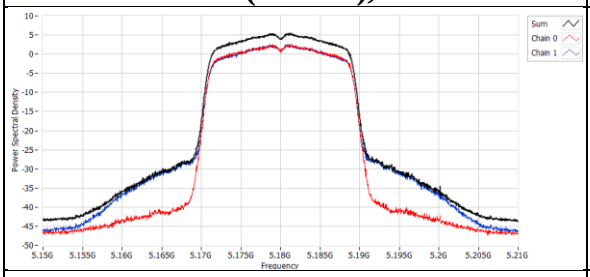
802.11a, CH48



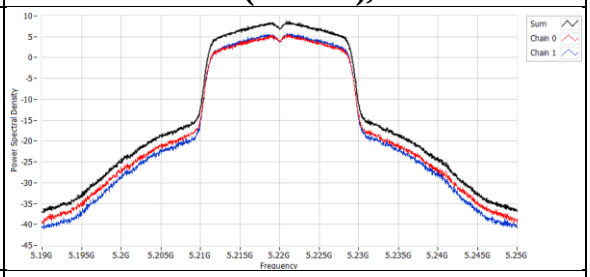
Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT20)	36	5180	8.01	5.54	8.99	Pass
	44	5220	8.01	8.69	8.99	Pass
	48	5240	8.01	8.54	8.99	Pass

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	36	5180	2.495	2.644
	44	5220	5.608	5.801
	48	5240	5.474	5.592

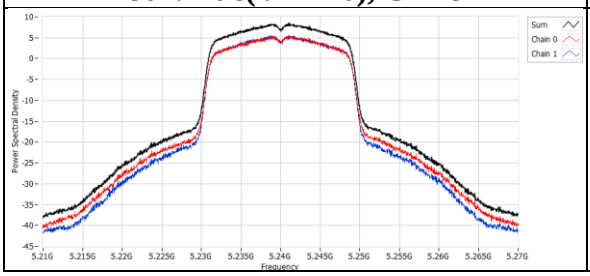
802.11ac(VHT20), CH36



802.11ac(VHT20), CH44



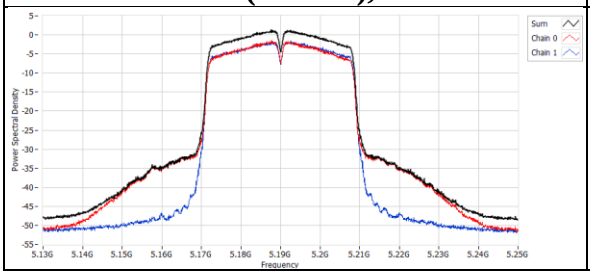
802.11ac(VHT20), CH48



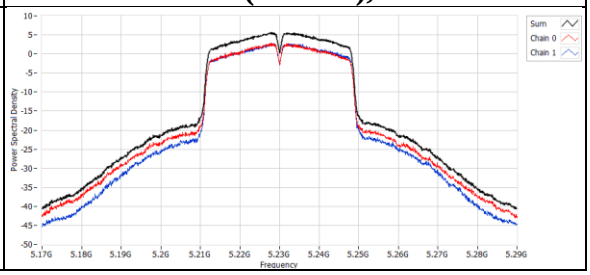
Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT40)	38	5190	8.01	1.35	8.99	Pass
	46	5230	8.01	5.63	8.99	Pass

Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	38	5190	-1.499	-1.588
	46	5230	2.878	2.678

802.11ac(VHT40), CH38

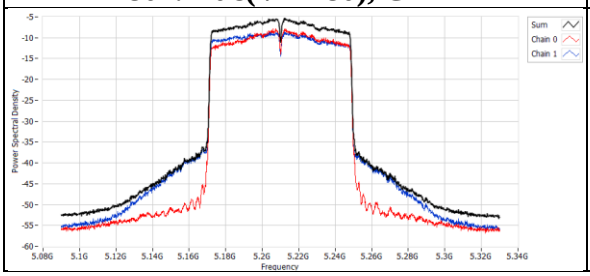


802.11ac(VHT40), CH46



Mode (U-NII-1)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT80)	42	5210	8.01	-5.28	8.99	Pass

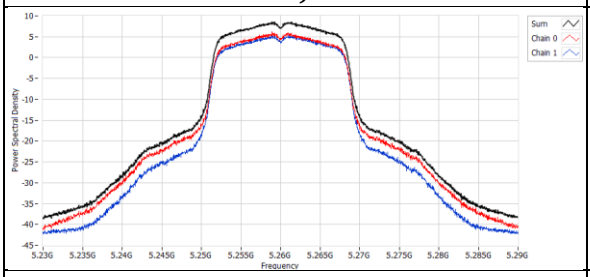
Mode (U-NII-1)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	42	5210	-7.77	-8.66

802.11ac(VHT80), CH42	
	

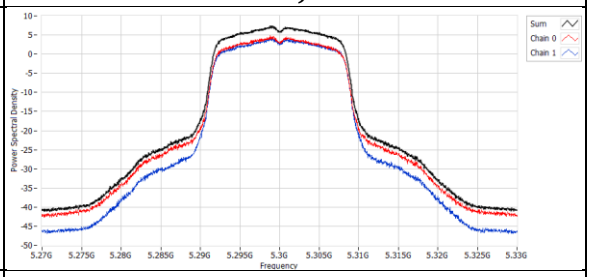
Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	52	5260	8.01	8.64	8.99	Pass
	60	5300	8.01	7.38	8.99	Pass
	64	5320	8.01	7.23	8.99	Pass

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11a	52	5260	6.178	5.303
	60	5300	4.768	4.159
	64	5320	4.241	4.276

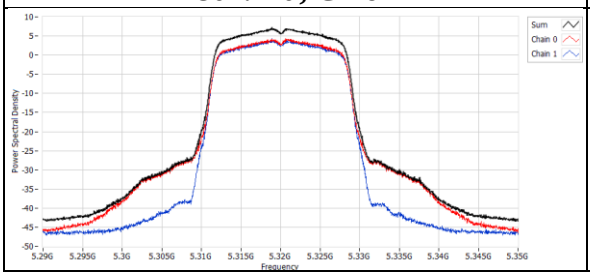
802.11a, CH52



802.11a, CH60



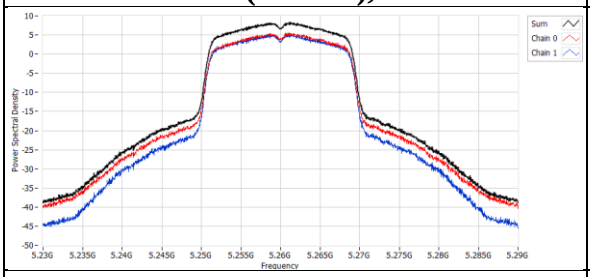
802.11a, CH64



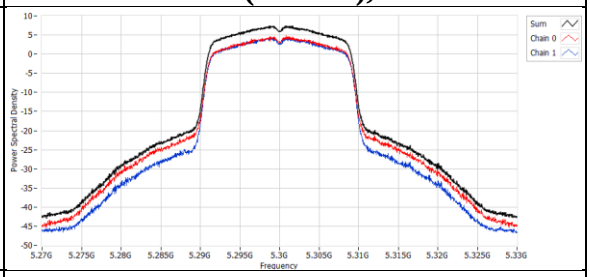
Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT20)	52	5260	8.01	8.33	8.99	Pass
	60	5300	8.01	7.4	8.99	Pass
	64	5320	8.01	7.2	8.99	Pass

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	52	5260	5.704	5.264
	60	5300	4.804	4.368
	64	5320	4.435	4.43

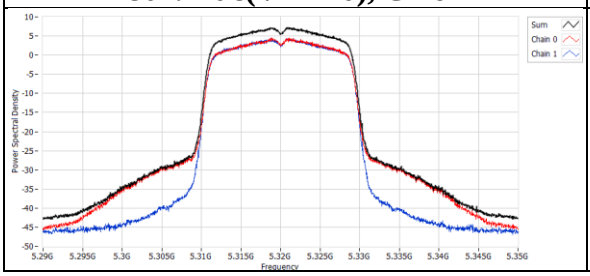
802.11ac(VHT20), CH52



802.11ac(VHT20), CH60



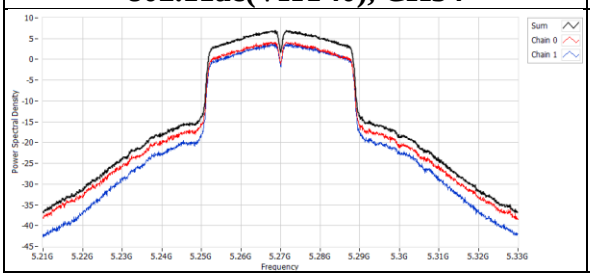
802.11ac(VHT20), CH64



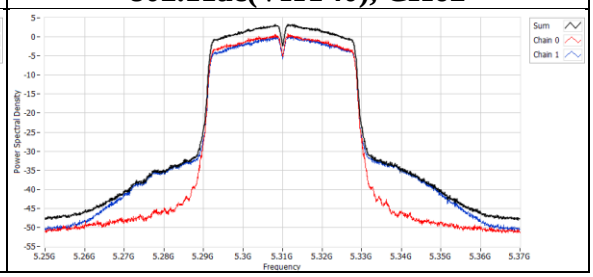
Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT40)	54	5270	8.01	6.95	8.99	Pass
	62	5310	8.01	3.25	8.99	Pass

Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	54	5270	4.237	3.892
	62	5310	0.806	0.168

802.11ac(VHT40), CH54

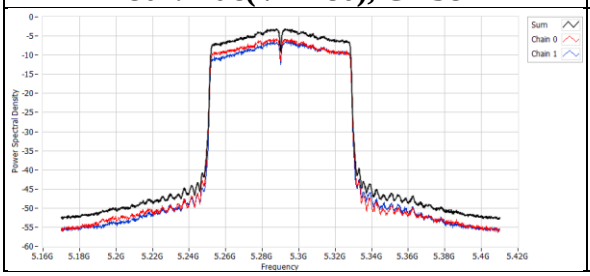


802.11ac(VHT40), CH62



Mode (U-NII-2A)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT80)	58	5290	8.01	-3.08	8.99	Pass

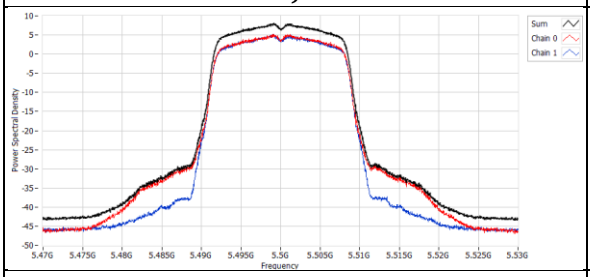
Mode (U-NII-2A)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	58	5290	-5.686	-6.345

802.11ac(VHT80), CH58	
	

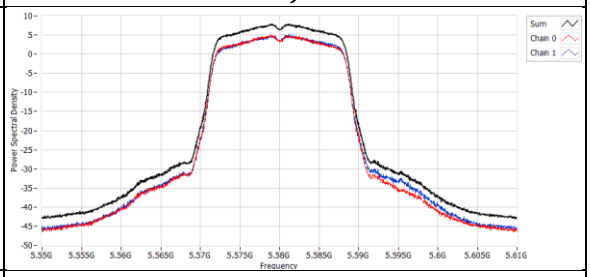
Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11a	100	5500	8.01	8.07	8.99	Pass
	116	5580	8.01	7.93	8.99	Pass
	140	5700	8.01	4.5	8.99	Pass

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11a	100	5500	5.218	5.217
	116	5580	4.973	5.171
	140	5700	2.296	1.12

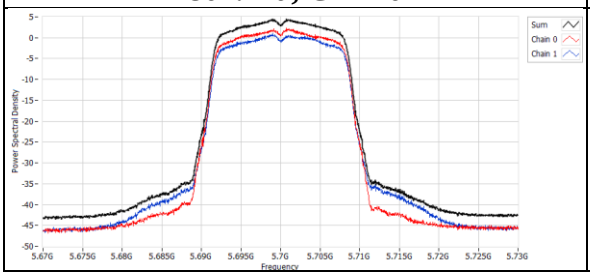
802.11a, CH100



802.11a, CH116



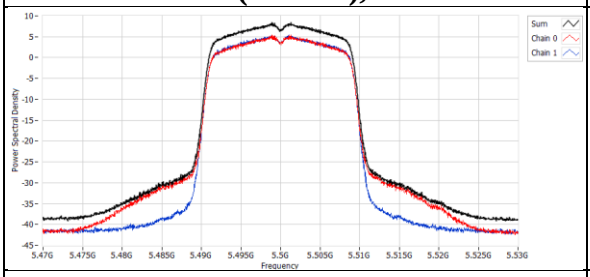
802.11a, CH140



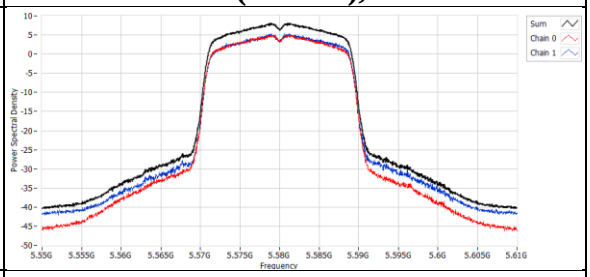
Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT20)	100	5500	8.01	8.4	8.99	Pass
	116	5580	8.01	8.14	8.99	Pass
	140	5700	8.01	4.62	8.99	Pass

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	100	5500	5.45	5.501
	116	5580	5.068	5.377
	140	5700	2.402	1.024

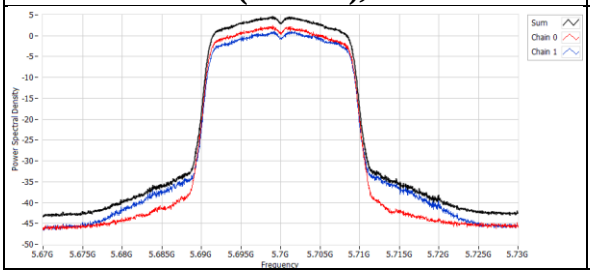
802.11ac(VHT20), CH100



802.11ac(VHT20), CH116



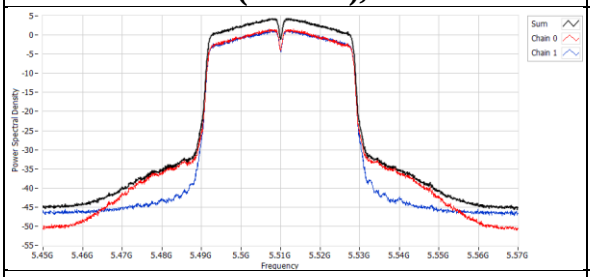
802.11ac(VHT20), CH140



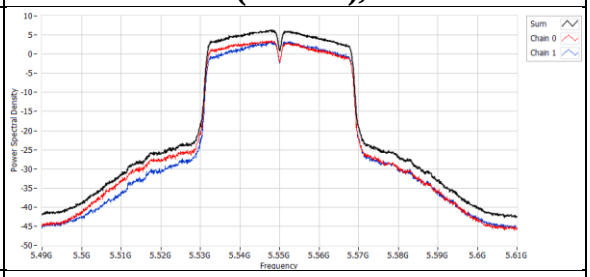
Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT40)	102	5510	8.01	4.37	8.99	Pass
	110	5550	8.01	6.43	8.99	Pass
	134	5670	8.01	6.17	8.99	Pass

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	102	5510	1.598	1.358
	110	5550	3.423	3.486
	134	5670	3.74	2.978

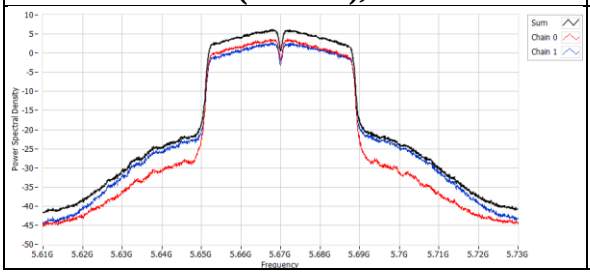
802.11ac(VHT40), CH102



802.11ac(VHT40), CH110



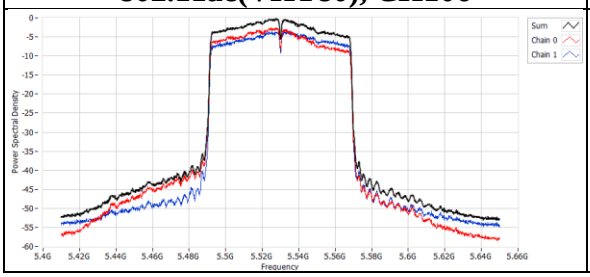
802.11ac(VHT40), CH134



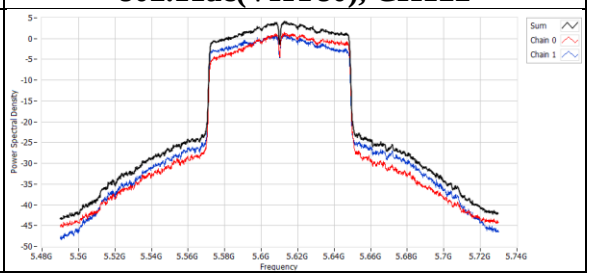
Mode (U-NII-2C)	CH	Freq (MHz)	Directional Gain (dBi)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
802.11ac(VHT80)	106	5530	8.01	-0.21	8.99	Pass
	122	5610	0	4.14	11	Pass

Mode (U-NII-2C)	CH	Freq (MHz)	PSD per Chain (dBm/MHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	106	5530	-2.571	-3.513
	122	5610	1.458	0.875

802.11ac(VHT80), CH106



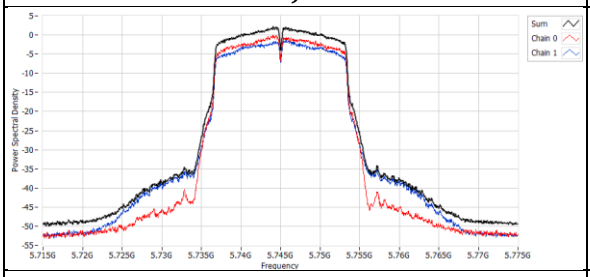
802.11ac(VHT80), CH122



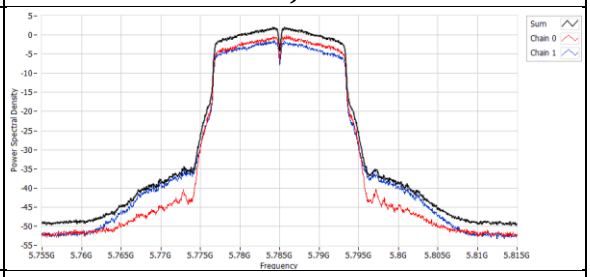
Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11a	149	5745	2.22	8.01	4.43	27.99	Pass
	157	5785	2.22	8.01	4.25	27.99	Pass
	165	5825	2.22	8.01	4.18	27.99	Pass

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11a	149	5745	0.079	-1.18
	157	5785	-0.139	-1.406
	165	5825	-0.418	-1.532

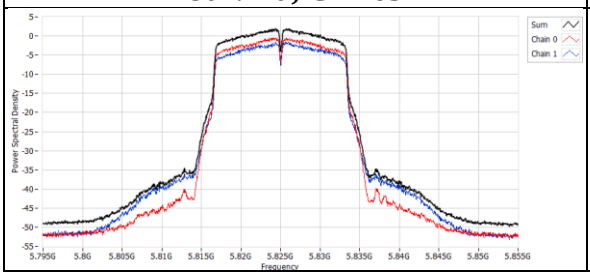
802.11a, CH149



802.11a, CH157



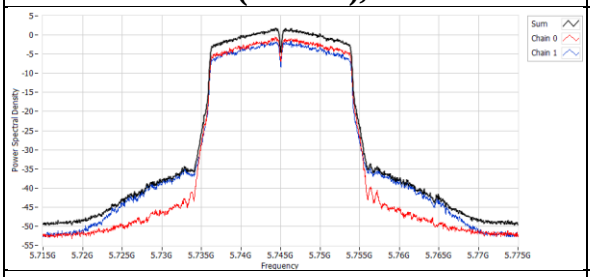
802.11a, CH165



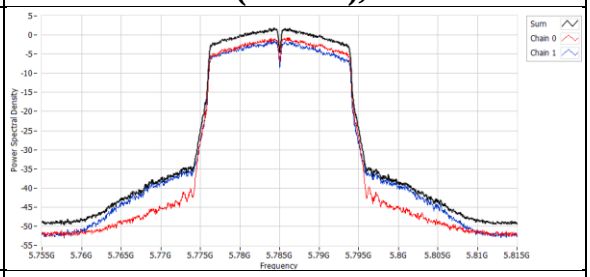
Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ac(VHT20)	149	5745	2.22	8.01	4.03	27.99	Pass
	157	5785	2.22	8.01	4.07	27.99	Pass
	165	5825	2.22	8.01	4.18	27.99	Pass

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ac(VHT20)	149	5745	-0.491	-1.593
	157	5785	-0.684	-1.389
	165	5825	-0.618	-1.094

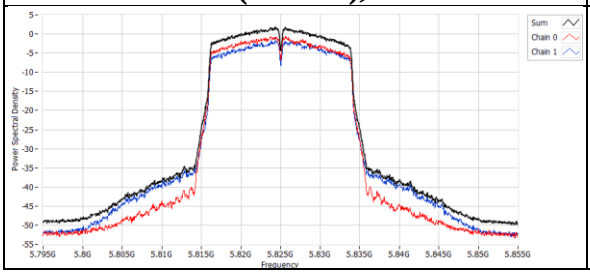
802.11ac(VHT20), CH149



802.11ac(VHT20), CH157



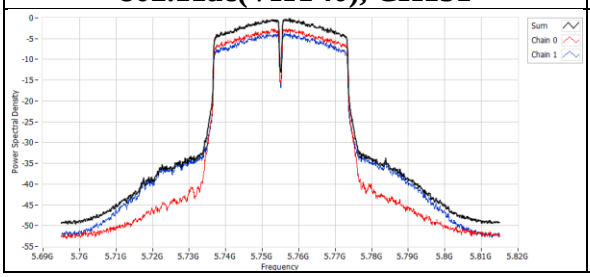
802.11ac(VHT20), CH165



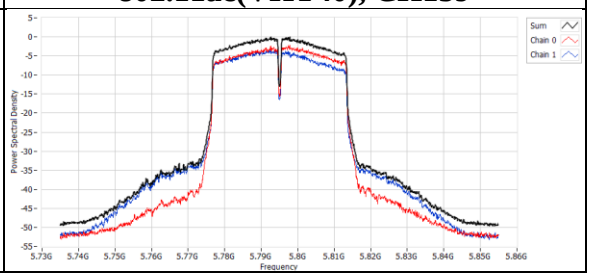
Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ac(VHT40)	151	5755	2.22	8.01	2.03	27.99	Pass
	159	5795	2.22	8.01	2.31	27.99	Pass

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ac(VHT40)	151	5755	-2.58	-3.667
	159	5795	-2.171	-3.489

802.11ac(VHT40), CH151



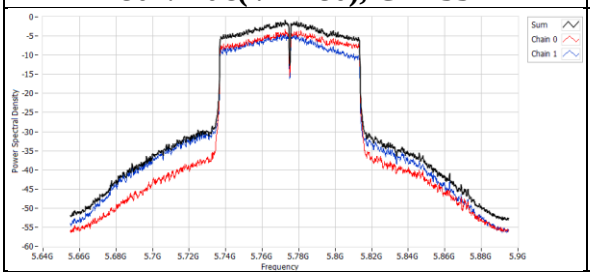
802.11ac(VHT40), CH159



Mode (U-NII-3)	CH	Freq (MHz)	BWCF	Directional Gain (dBi)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
802.11ac(VHT80)	155	5775	2.22	8.01	1.43	27.99	Pass

Mode (U-NII-3)	CH	Freq (MHz)	PSD per Chain (dBm/500kHz)	
			Chain 0	Chain 1
802.11ac(VHT80)	155	5775	-3.339	-4.314

802.11ac(VHT80), CH155



9.6. Frequency Stability

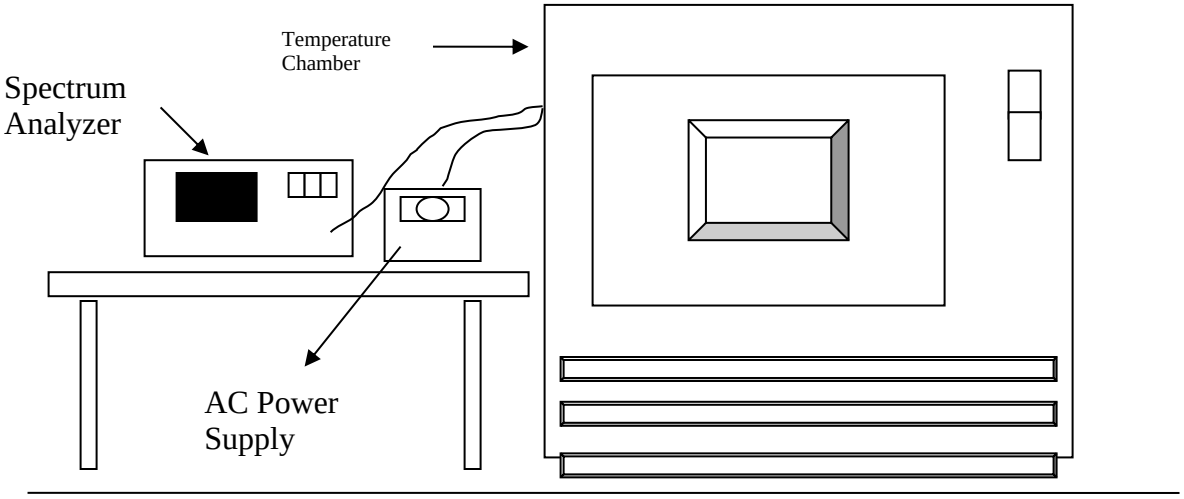
Requirements

The frequency of the carrier signal shall be maintained within band of operation.

Test procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
b. Turn the EUT on and couple its output to a spectrum analyzer.
c. Turn the EUT off and set the chamber to the highest temperature specified.
d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 Minutes.
e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 Minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

Test Setup



Test Data

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
50	120	5179.9918	-1.58	5179.9945	-1.06	5179.9926	-1.43	5179.9933	-1.29
40	120	5180.0177	3.42	5180.0168	3.24	5180.0152	2.93	5180.0172	3.32
30	120	5179.9942	-1.12	5179.9977	-0.44	5179.9957	-0.83	5179.9979	-0.41
20	120	5179.9814	-3.59	5179.9828	-3.32	5179.9805	-3.76	5179.9794	-3.98
10	120	5180.0248	4.79	5180.0227	4.38	5180.0277	5.35	5180.0251	4.85
0	120	5180.0164	3.17	5180.0187	3.61	5180.0147	2.84	5180.0177	3.42
-10	120	5179.9952	-0.93	5179.9949	-0.98	5179.9961	-0.75	5179.9975	-0.48
-20	120	5179.9976	-0.46	5179.9982	-0.35	5179.9963	-0.71	5179.9939	-1.18
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
20	138	5179.9805	-3.76	5179.9822	-3.44	5179.9795	-3.96	5179.9798	-3.90
20	120	5179.9814	-3.59	5179.9828	-3.32	5179.9805	-3.76	5179.9794	-3.98
20	102	5179.9805	-3.76	5179.982	-3.47	5179.9811	-3.65	5179.9785	-4.15

9.7. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK:74 (dBµV/m)	AV:54 (dBµV/m)
Frequency Band	**Applicable To**	**EIRP Limit**	**Equivalent Field Strength at 3m**
5150~5250 MHz	15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBµV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4
*1 beyond 75 MHz or more above of the band edge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.			

Note:
The following formula is used to convert the effective isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ µV/m, where P is the eirp (Watts).

Test Procedures

[For 9 kHz ~ 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

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. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
f. The test-receiver system was set to peak and average detects 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:

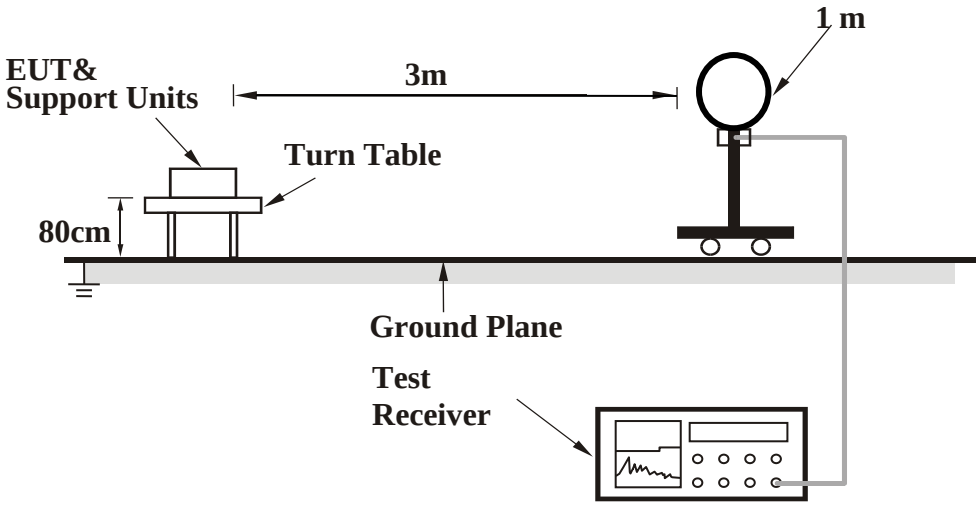
a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
c. 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.

Configuration	Average	
	RBW	VBW
802.11a	1MHz	Refer to section 6.6 for duty cycle.
802.11n (HT20)		
802.11n (HT40)		
802.11ac (VHT80)		

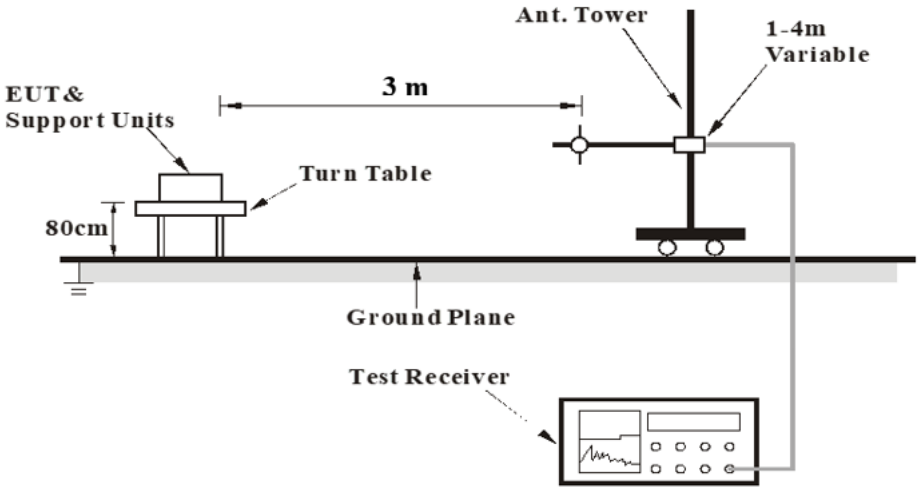
d. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
e. Test data of Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
f. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
g. Test data of Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
h. Test data of Notation "@" = Fundamental Frequency
i. Test data of Notation " * " = Only required peak limit or the peak result under 20 dB above and complies with AVG limit, AVG result is deemed to comply with AVG limit.

Test Setup

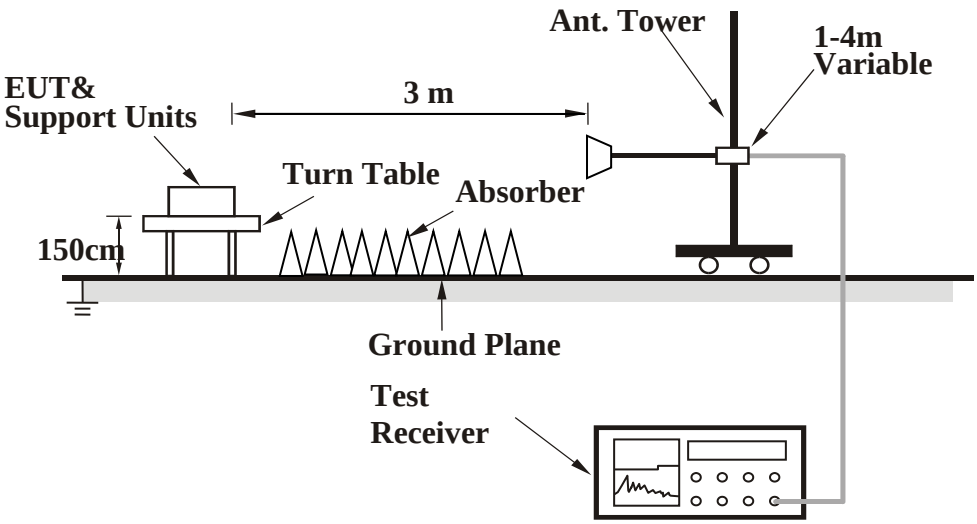
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.

Test Data

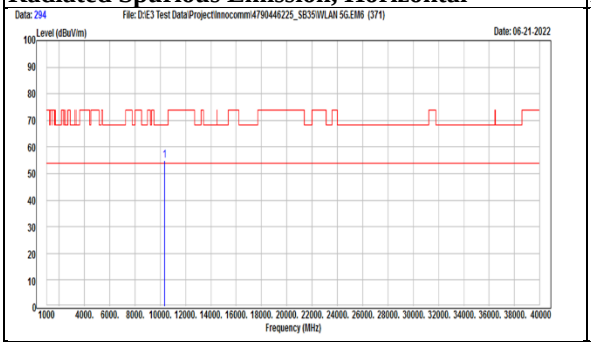
Dipole Antenna

Above 1 GHz

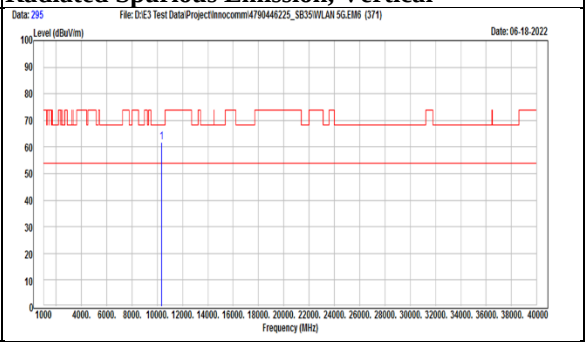
Mode	802.11a	Channel	36

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		5042.35	43.86	19.02	62.88	74	-11.12	PK
		5105	31.17	19.44	50.61	54	-3.39	AVG
	@	5180	85.91	19.31	105.22	N/A	N/A	PK
	@	5180	76.8	19.31	96.11	N/A	N/A	AVG
	*	10360	37.31	17.51	54.82	68.2	-13.38	PK
Vertical		5149.1	43.97	19.4	63.37	74	-10.63	PK
		5149.8	34.4	19.4	53.8	54	-0.2	AVG
	@	5180	94.36	19.31	113.67	N/A	N/A	PK
	@	5180	88.26	19.31	107.57	N/A	N/A	AVG
	*	10360	44.29	17.51	61.8	68.2	-6.4	PK

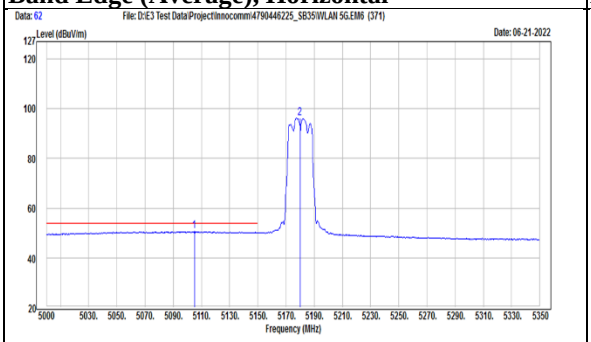
TX, 802.11a (Ch 36)
Radiated Spurious Emission, Horizontal



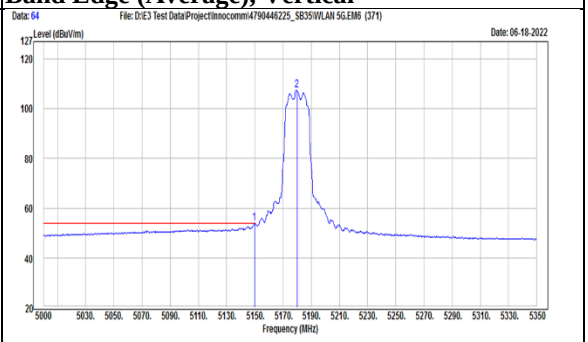
TX, 802.11a (Ch 36)
Radiated Spurious Emission, Vertical



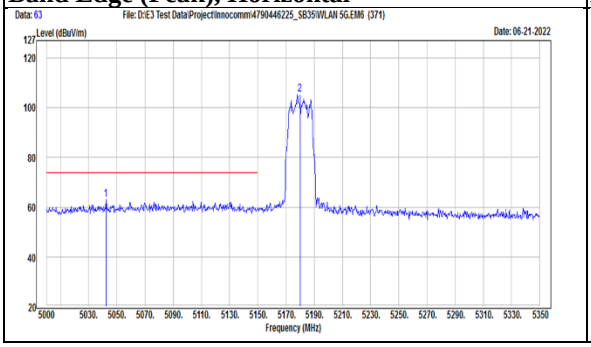
TX, 802.11a (Ch 36)
Band Edge (Average), Horizontal



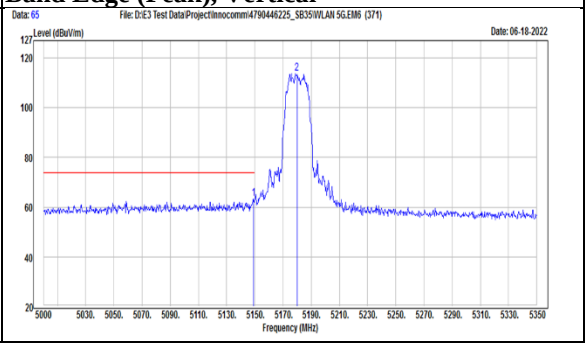
TX, 802.11a (Ch 36)
Band Edge (Average), Vertical



TX, 802.11a (Ch 36)
Band Edge (Peak), Horizontal



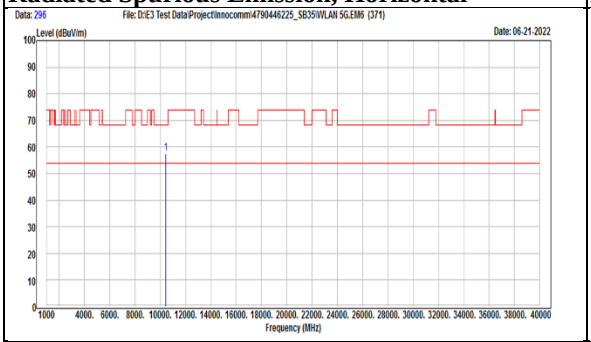
TX, 802.11a (Ch 36)
Band Edge (Peak), Vertical



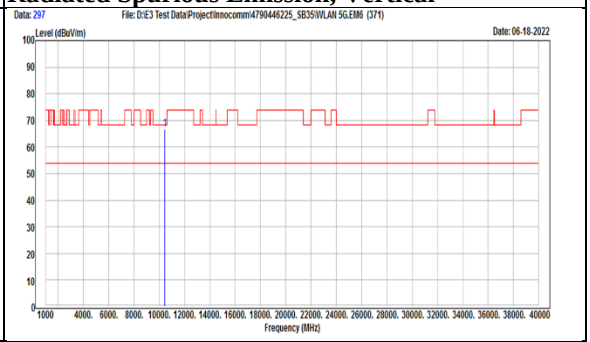
Mode	802.11a	Channel	44

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		5097.65	31.13	19.43	50.56	54	-3.44	AVG
		5145.95	43.16	19.41	62.57	74	-11.43	PK
	@	5220	89.24	19.12	108.36	N/A	N/A	PK
	@	5220	80.87	19.12	99.99	N/A	N/A	AVG
	*	10440	39.55	17.81	57.36	68.2	-10.84	PK
Vertical		5143.15	43.43	19.4	62.83	74	-11.17	PK
		5147.7	31.69	19.4	51.09	54	-2.91	AVG
	@	5220	97.7	19.12	116.82	N/A	N/A	PK
	@	5220	89.58	19.12	108.7	N/A	N/A	AVG
	*	10440	48.82	17.81	66.63	68.2	-1.57	PK

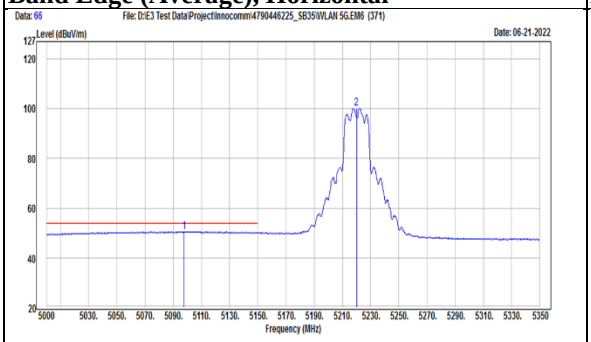
TX, 802.11a (Ch 44)
Radiated Spurious Emission, Horizontal



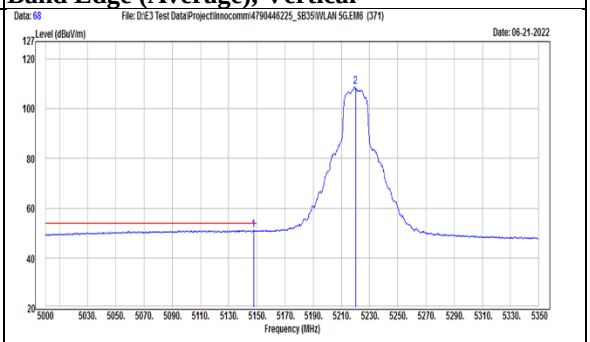
TX, 802.11a (Ch 44)
Radiated Spurious Emission, Vertical



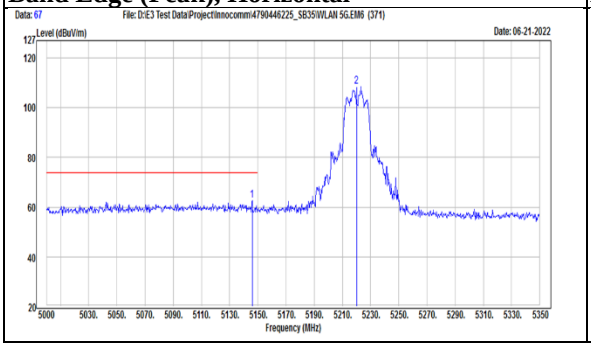
TX, 802.11a (Ch 44)
Band Edge (Average), Horizontal



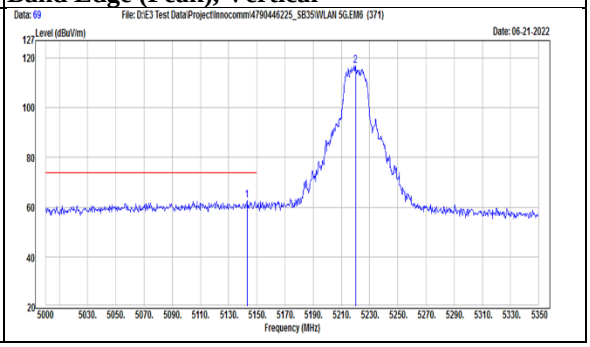
TX, 802.11a (Ch 44)
Band Edge (Average), Vertical



TX, 802.11a (Ch 44)
Band Edge (Peak), Horizontal



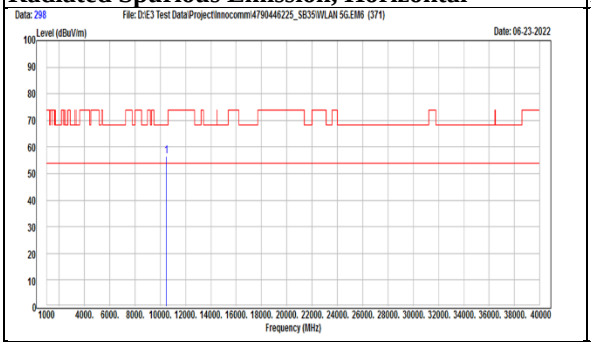
TX, 802.11a (Ch 44)
Band Edge (Peak), Vertical



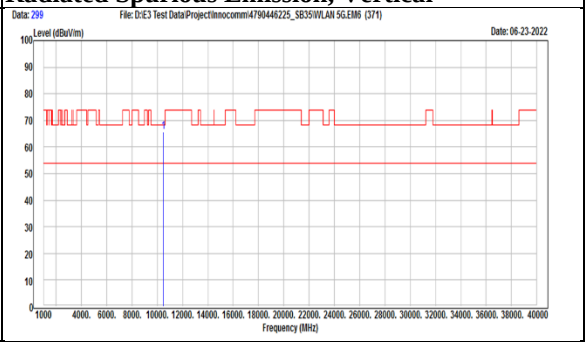
Mode	802.11a	Channel	48

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		5103.95	31.22	19.44	50.66	54	-3.34	AVG
		5124.25	42.25	19.43	61.68	74	-12.32	PK
	@	5240	87.79	18.97	106.76	N/A	N/A	PK
	@	5240	81.18	18.97	100.15	N/A	N/A	AVG
	*	10480	38.52	17.92	56.44	68.2	-11.76	PK
Vertical		5054.6	43.37	19.12	62.49	74	-11.51	PK
		5129.85	31.52	19.41	50.93	54	-3.07	AVG
	@	5240	99.06	18.97	118.03	N/A	N/A	PK
	@	5240	90.2	18.97	109.17	N/A	N/A	AVG
	*	10480	47.66	17.92	65.58	68.2	-2.62	PK

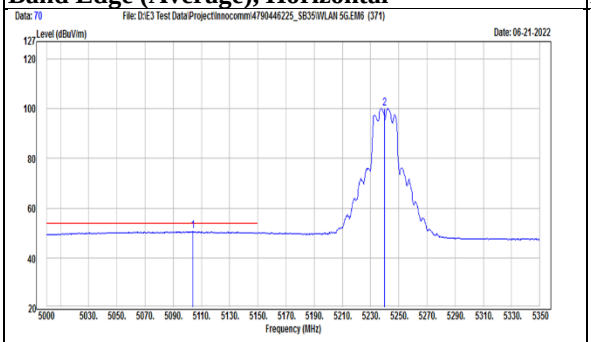
TX, 802.11a (Ch 48)
Radiated Spurious Emission, Horizontal



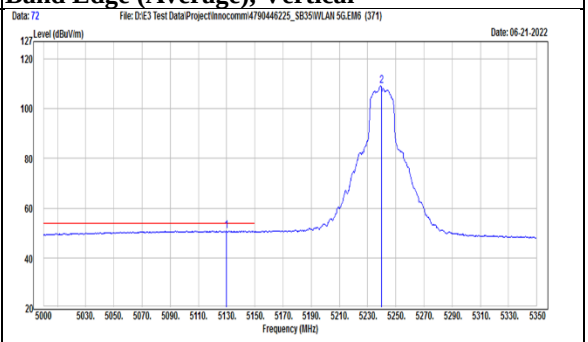
TX, 802.11a (Ch 48)
Radiated Spurious Emission, Vertical



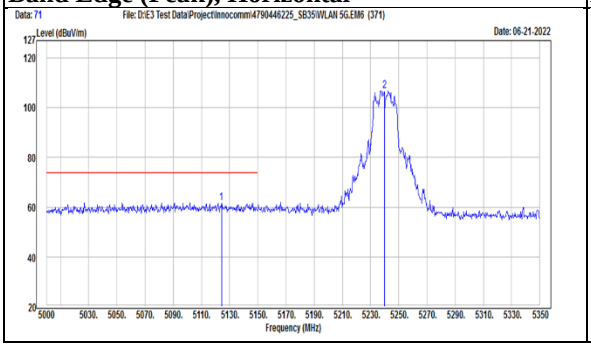
TX, 802.11a (Ch 48)
Band Edge (Average), Horizontal



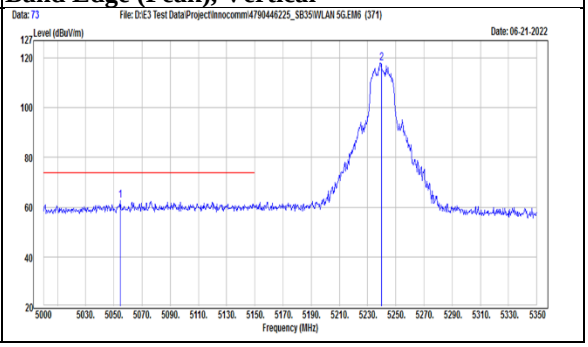
TX, 802.11a (Ch 48)
Band Edge (Average), Vertical



TX, 802.11a (Ch 48)
Band Edge (Peak), Horizontal



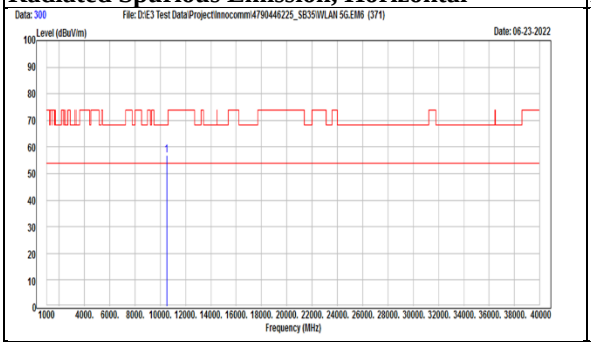
TX, 802.11a (Ch 48)
Band Edge (Peak), Vertical



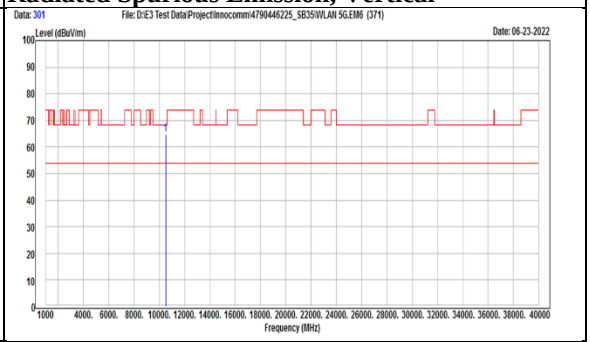
Mode	802.11a	Channel	52

Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal	@	5260	87.55	18.88	106.43	N/A	N/A	PK
	@	5260	81.52	18.88	100.4	N/A	N/A	AVG
		5361.3	40.43	19.08	59.51	74	-14.49	PK
		5456.4	28.72	19.55	48.27	54	-5.73	AVG
	*	10520	38.74	17.99	56.73	68.2	-11.47	PK
Vertical	@	5260	98.65	18.88	117.53	N/A	N/A	PK
	@	5260	89.83	18.88	108.71	N/A	N/A	AVG
		5351.7	29.72	19.02	48.74	54	-5.26	AVG
		5458.8	40.09	19.57	59.66	74	-14.34	PK
	*	10520	46.8	17.99	64.79	68.2	-3.41	PK

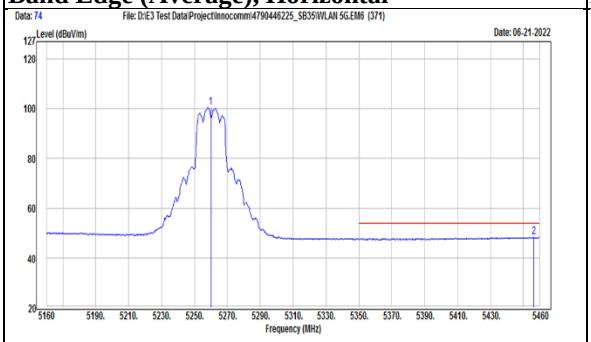
TX, 802.11a (Ch 52)
Radiated Spurious Emission, Horizontal



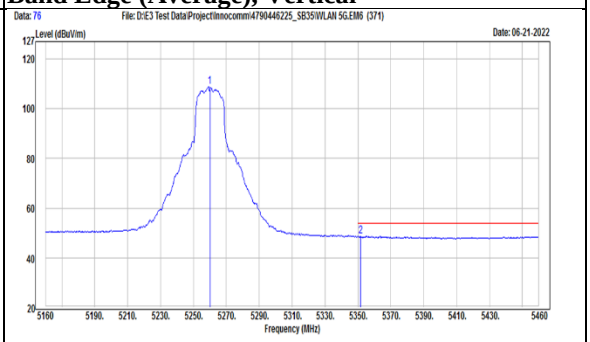
TX, 802.11a (Ch 52)
Radiated Spurious Emission, Vertical



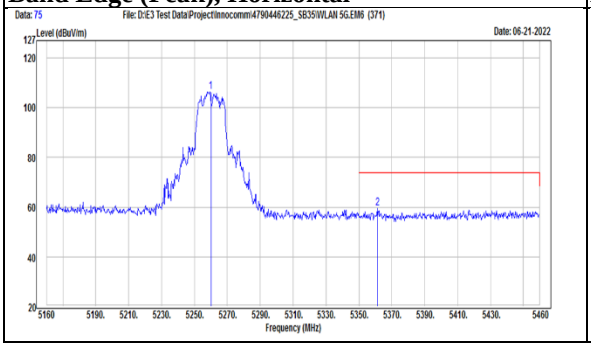
TX, 802.11a (Ch 52)
Band Edge (Average), Horizontal



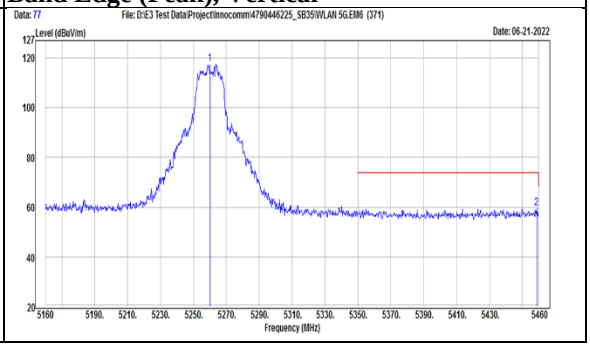
TX, 802.11a (Ch 52)
Band Edge (Average), Vertical



TX, 802.11a (Ch 52)
Band Edge (Peak), Horizontal



TX, 802.11a (Ch 52)
Band Edge (Peak), Vertical



Mode	802.11a	Channel	60

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	5300	85.86	18.77	104.63	N/A	N/A	PK
	@	5300	79.07	18.77	97.84	N/A	N/A	AVG
		5421	40.04	19.37	59.41	74	-14.59	PK
		5451.3	28.8	19.53	48.33	54	-5.67	AVG
	*	10600	32.59	18.04	50.63	68.2	-17.57	PK
Vertical	@	5300	96.91	18.77	115.68	N/A	N/A	PK
	@	5300	88.1	18.77	106.87	N/A	N/A	AVG
		5350.8	30.18	19.01	49.19	54	-4.81	AVG
		5437.2	40.15	19.46	59.61	74	-14.39	PK
		10600	40.45	18.04	58.49	68.2	-9.71	PK
		10600	34.67	18.04	52.71	54	-1.29	AVG