Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-3	
5290 MHz	
5530 MHz	

4.6. Peak Power Spectral Density Measurement

■ **Limit**

Conducted power spectral density

Frequency Range	FCC Limit
5.250 ~ 5.350 GHz	11 dBm/MHz
5.470 ~ 5.725 GHz	11 dBm/MHz

According FCC KDB 662911 D01 v02r01 – for power measurements on IEEE802.11 devices,

Module : QCA9984 (EW-7955MAC)

Master mode

∗ MIMO mode：Directional Gain = 10*log{[10^(G1/20)+10^(G2/20)+…+10^(Gn/20)]^2/NANT} = 13.02 dBi > 6dBi

MIMO mode power limit shall be reduced = 11dBm + 10log (B) - 7.02

= 11 - 7.02 = 3.98 dBm

Module : QCA9990 (EW-7944MAC)

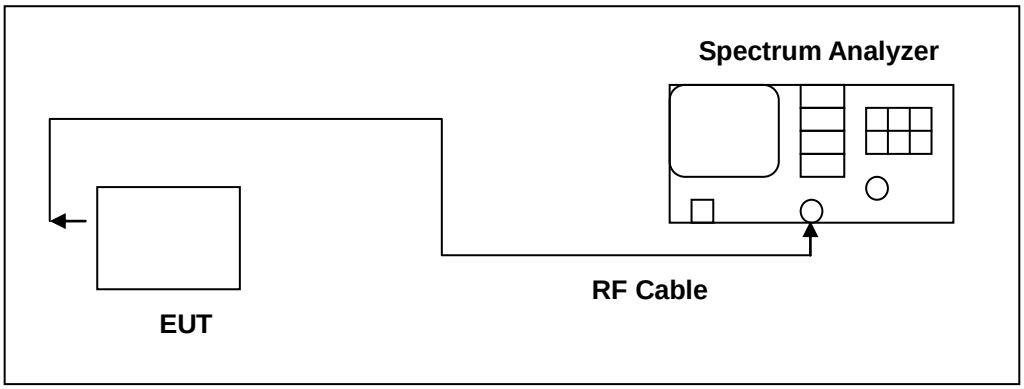
Master mode

∗ MIMO mode：Directional Gain = 10*log{[10^(G1/20)+10^(G2/20)+…+10^(Gn/20)]^2/NANT} = 12.02 dBi > 6dBi

MIMO mode power limit shall be reduced = 11dBm + 10log (B) - 7.02

= 11 - 6.02 = 4.98 dBm

■ **Test Setup**



■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/19/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Test Procedure**

The test is performed in accordance with KDB789033: D02 General UNII Test Procedures New Rules v01r02, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1 MHz (5725 ~ 5850MHz use 100 kHz)
VBW	3 MHz (5725 ~ 5850MHz use 300 kHz)
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times
Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/100kHz) to the measured result.	

■ **Test Result**

Module : QCA9984 (EW-7955MAC)

Test Mode	Mode 2: IEEE 802.11a link mode			
Frequency (MHz)	Conducted power spectral density			
	ANT-0			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-2.845	0.103	-2.742	< 3.98
5280.0	-3.014	0.103	-2.911	
5320.0	-4.801	0.103	-4.698	
5500.0	-5.988	0.103	-5.885	
5560.0	-6.189	0.103	-6.086	
5700.0	-4.016	0.103	-3.913	
Frequency (MHz)	ANT-1			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-1.202	0.103	-1.099	< 3.98
5280.0	-1.006	0.103	-0.903	
5320.0	-2.984	0.103	-2.881	
5500.0	-2.357	0.103	-2.254	
5560.0	-3.503	0.103	-3.400	
5700.0	-3.383	0.103	-3.280	
Frequency (MHz)	ANT-2			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-2.970	0.103	-2.867	< 3.98
5280.0	-2.563	0.103	-2.460	
5320.0	-4.667	0.103	-4.564	
5500.0	-4.490	0.103	-4.387	
5560.0	-5.093	0.103	-4.990	
5700.0	-3.972	0.103	-3.869	

Frequency (MHz)	ANT-3			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-3.512	0.103	-3.409	< 3.98
5280.0	-3.799	0.103	-3.696	
5320.0	-5.260	0.103	-5.157	
5500.0	-3.294	0.103	-3.191	
5560.0	-4.711	0.103	-4.608	
5700.0	-3.191	0.103	-3.088	

Frequency (MHz)	ANT-0+1+2+3	
	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	3.582	< 3.98
5280.0	3.652	
5320.0	1.787	
5500.0	2.297	
5560.0	1.356	
5700.0	2.498	

Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

Test Mode	Mode 3: IEEE 802.11ac 20MHz link mode			
Frequency (MHz)	ANT-0			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-3.127	0.026	-3.101	< 3.98
5280.0	-3.144	0.026	-3.118	
5320.0	-4.240	0.026	-4.214	
5500.0	-6.185	0.026	-6.159	
5560.0	-5.817	0.026	-5.791	
5700.0	-3.875	0.026	-3.849	
Frequency (MHz)	ANT-1			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-1.730	0.026	-1.704	< 3.98
5280.0	-1.606	0.026	-1.580	
5320.0	-2.142	0.026	-2.116	
5500.0	-2.754	0.026	-2.728	
5560.0	-3.196	0.026	-3.170	
5700.0	-3.467	0.026	-3.441	
Frequency (MHz)	ANT-2			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-1.625	0.026	-1.599	< 3.98
5280.0	-1.721	0.026	-1.695	
5320.0	-2.445	0.026	-2.419	
5500.0	-4.766	0.026	-4.740	
5560.0	-5.215	0.026	-5.189	
5700.0	-4.128	0.026	-4.102	
Frequency (MHz)	ANT-3			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-2.210	0.026	-2.184	< 3.98
5280.0	-2.594	0.026	-2.568	
5320.0	-2.883	0.026	-2.857	
5500.0	-4.105	0.026	-4.079	
5560.0	-4.223	0.026	-4.197	
5700.0	-2.582	0.026	-2.556	

Frequency (MHz)	ANT-0+1+2+3	
	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	3.912	< 3.98
5280.0	3.826	
5320.0	3.189	
5500.0	1.768	
5560.0	1.549	
5700.0	2.574	

Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

Conversion ratio = 10*Log(500k/100k)

Test Mode	Mode 4: IEEE 802.11ac 40MHz link mode			
Frequency (MHz)	Conducted power spectral density			
	ANT-0			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-4.388	0.084	-4.304	< 3.98
5310.0	-4.262	0.084	-4.178	
5510.0	-7.604	0.084	-7.520	
5550.0	-7.812	0.084	-7.728	
5670.0	-5.084	0.084	-5.000	
Frequency (MHz)	ANT-1			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-2.974	0.084	-2.890	< 3.98
5310.0	-2.884	0.084	-2.800	
5510.0	-4.457	0.084	-4.373	
5550.0	-5.602	0.084	-5.518	
5670.0	-4.837	0.084	-4.753	
Frequency (MHz)	ANT-2			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-3.239	0.084	-3.155	< 3.98
5310.0	-2.910	0.084	-2.826	
5510.0	-6.526	0.084	-6.442	
5550.0	-6.921	0.084	-6.837	
5670.0	-5.195	0.084	-5.111	
Frequency (MHz)	ANT-3			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-4.401	0.084	-4.317	< 3.98
5310.0	-3.376	0.084	-3.292	
5510.0	-6.185	0.084	-6.101	
5550.0	-6.206	0.084	-6.122	
5670.0	-4.808	0.084	-4.724	

Frequency (MHz)	ANT-0+1+2+3	
	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	2.403	< 3.98
5310.0	2.781	
5510.0	0.063	
5550.0	-0.454	
5670.0	1.127	

Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

Test Mode	Mode 5: IEEE 802.11ac 80MHz link mode			
Frequency (MHz)	Conducted power spectral density			
	ANT-0			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-7.949	0.201	-7.748	< 3.98
5530.0	-9.641	0.201	-9.440	
Frequency (MHz)	ANT-1			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-6.575	0.201	-6.374	< 3.98
5530.0	-7.309	0.201	-7.108	
Frequency (MHz)	ANT-2			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-6.864	0.201	-6.663	< 3.98
5530.0	-8.716	0.201	-8.515	
Frequency (MHz)	ANT-3			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-7.497	0.201	-7.296	< 3.98
5530.0	-8.157	0.201	-7.956	
Frequency (MHz)	ANT-0+1+2+3			
	Calculated (dBm/500KHz)			Limit (dBm/500KHz)
5290.0	-0.967			< 3.98
5530.0	-2.152			

Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

Conversion ratio = 10*Log(500k/100k)

Module : QCA9990 (EW-7944MAC)

Test Mode	Mode 2: IEEE 802.11a link mode			
Frequency (MHz)	Conducted power spectral density			
	ANT-0			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-2.147	0.124	-2.023	< 4.98
5280.0	-2.487	0.124	-2.363	
5320.0	-1.880	0.124	-1.756	
5500.0	-1.825	0.124	-1.701	
5560.0	-1.851	0.124	-1.727	
5700.0	-1.882	0.124	-1.758	
Frequency (MHz)	ANT-1			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-0.804	0.124	-0.680	< 4.98
5280.0	-0.456	0.124	-0.332	
5320.0	-0.415	0.124	-0.291	
5500.0	-1.155	0.124	-1.031	
5560.0	-1.263	0.124	-1.139	
5700.0	-0.981	0.124	-0.857	
Frequency (MHz)	ANT-2			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-1.650	0.124	-1.526	< 4.98
5280.0	-1.713	0.124	-1.589	
5320.0	-2.113	0.124	-1.989	
5500.0	-2.237	0.124	-2.113	
5560.0	-0.890	0.124	-0.766	
5700.0	-1.061	0.124	-0.937	

Frequency (MHz)	ANT-3			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5260.0	-1.169	0.124	-1.045	< 4.98
5280.0	-1.153	0.124	-1.029	
5320.0	-0.750	0.124	-0.626	
5500.0	-0.749	0.124	-0.625	
5560.0	-0.975	0.124	-0.851	
5700.0	-0.921	0.124	-0.797	
Frequency (MHz)	ANT-0+1+2+3			
	Calculated (dBm/MHz)			Limit (dBm/MHz)
5260.0	4.731			< 4.98
5280.0	4.756			
5320.0	4.915			
5500.0	4.691			
5560.0	4.916			
5700.0	4.950			

Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

Test Mode	Mode 3: IEEE 802.11ac 20MHz link mode			
Frequency (MHz)	ANT-0			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-1.988	0.026	-1.952	< 4.98
5280.0	-2.104	0.036	-2.068	
5320.0	-2.227	0.036	-2.191	
5500.0	-1.695	0.036	-1.659	
5560.0	-1.972	0.036	-1.936	
5700.0	-1.942	0.036	-1.906	
Frequency (MHz)	ANT-1			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-0.168	0.036	-0.132	< 4.98
5280.0	0.073	0.036	0.109	
5320.0	-0.401	0.036	-0.365	
5500.0	-1.002	0.036	-0.966	
5560.0	-1.510	0.036	-1.474	
5700.0	-1.092	0.036	-1.056	
Frequency (MHz)	ANT-2			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-1.374	0.036	-1.338	< 4.98
5280.0	-1.801	0.036	-1.765	
5320.0	-1.455	0.036	-1.419	
5500.0	-1.233	0.036	-1.197	
5560.0	-0.866	0.036	-0.830	
5700.0	-0.585	0.036	-0.549	
Frequency (MHz)	ANT-3			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	-1.078	0.036	-1.042	< 4.98
5280.0	-0.850	0.036	-0.814	
5320.0	-0.758	0.036	-0.722	
5500.0	-0.851	0.036	-0.815	
5560.0	-1.009	0.036	-0.973	
5700.0	-0.873	0.036	-0.837	

Frequency (MHz)	ANT-0+1+2+3	
	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5260.0	4.955	< 4.98
5280.0	4.972	
5320.0	4.902	
5500.0	4.873	
5560.0	4.739	
5700.0	4.962	

Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

Conversion ratio = 10*Log(500k/100k)

Test Mode	Mode 4: IEEE 802.11ac 40MHz link mode			
Frequency (MHz)	Conducted power spectral density			
	ANT-0			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-2.376	0.098	-2.278	< 4.98
5310.0	-2.623	0.098	-2.525	
5510.0	-2.286	0.098	-2.188	
5550.0	-2.654	0.098	-2.556	
5670.0	-3.611	0.098	-3.513	
Frequency (MHz)	ANT-1			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-1.733	0.098	-1.635	< 4.98
5310.0	-1.612	0.098	-1.514	
5510.0	-2.030	0.098	-1.932	
5550.0	-1.997	0.098	-1.899	
5670.0	-2.419	0.098	-2.321	
Frequency (MHz)	ANT-2			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-1.971	0.098	-1.873	< 4.98
5310.0	-2.084	0.098	-1.986	
5510.0	-2.320	0.098	-2.222	
5550.0	-1.944	0.098	-1.846	
5670.0	-2.062	0.098	-1.964	
Frequency (MHz)	ANT-3			
	Measurement (dBm/MHz)	Duty Factor (dB)	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	-2.048	0.098	-1.950	< 4.98
5310.0	-2.022	0.098	-1.924	
5510.0	-2.011	0.098	-1.913	
5550.0	-1.911	0.098	-1.813	
5670.0	-2.759	0.098	-2.661	

Frequency (MHz)	ANT-0+1+2+3	
	Calculated (dBm/MHz)	Limit (dBm/MHz)
5270.0	4.093	< 4.98
5310.0	4.048	
5510.0	3.959	
5550.0	4.003	
5670.0	3.443	

Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

Test Mode	Mode 5: IEEE 802.11ac 80MHz link mode			
Frequency (MHz)	Conducted power spectral density			
	ANT-0			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-6.596	0.231	-6.365	< 4.98
5530.0	-5.628	0.231	-5.397	
Frequency (MHz)	ANT-1			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-6.029	0.231	-5.798	< 4.98
5530.0	-5.392	0.231	-5.161	
Frequency (MHz)	ANT-2			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-6.902	0.231	-6.671	< 4.98
5530.0	-4.875	0.231	-4.644	
Frequency (MHz)	ANT-3			
	Measurement (dBm/100KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5290.0	-6.354	0.231	-6.123	< 4.98
5530.0	-5.491	0.231	-5.260	
Frequency (MHz)	ANT-0+1+2+3			
	Calculated (dBm/500KHz)			Limit (dBm/500KHz)
5290.0	-0.207			< 4.98
5530.0	0.914			

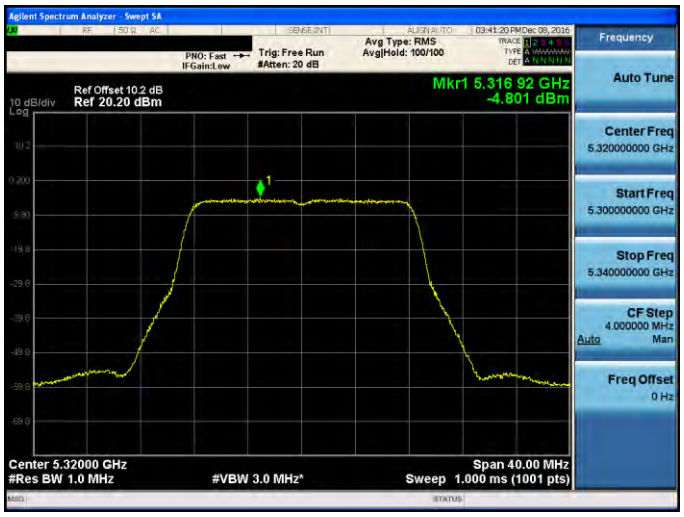
Note: Method SA-2, Power density = measured result + 10log(1/duty cycle) + Conversion ratio = measured result + duty factor.

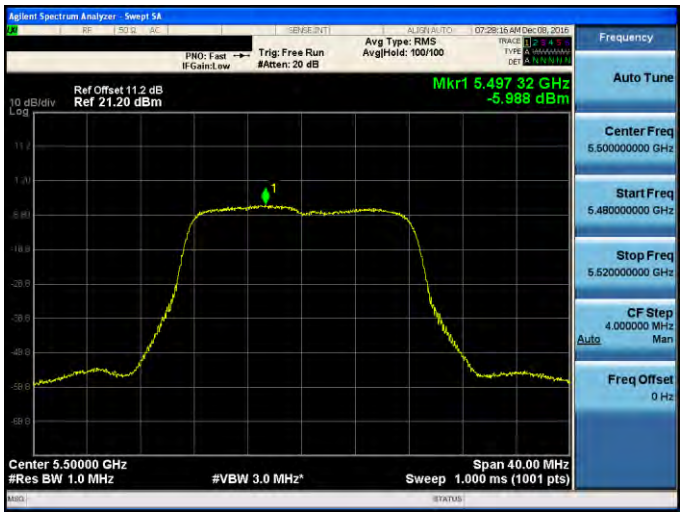
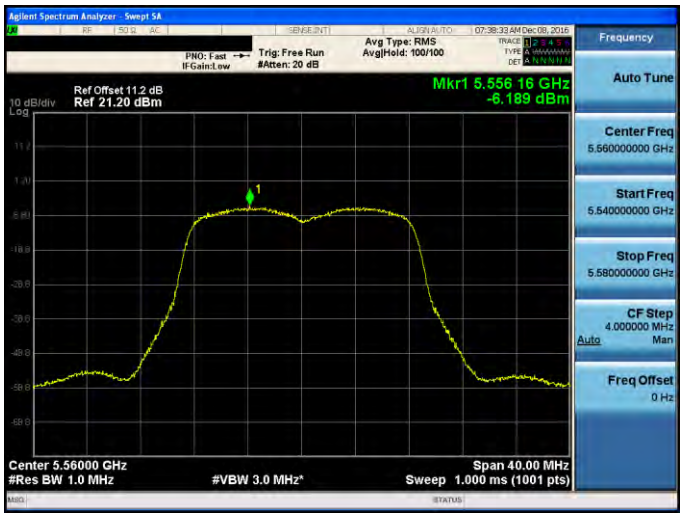
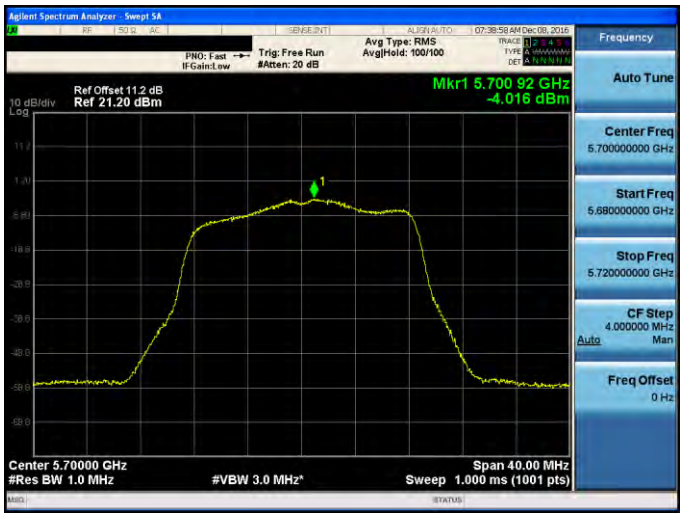
Conversion ratio = 10*Log(500k/100k)

■ **Test Graphs**

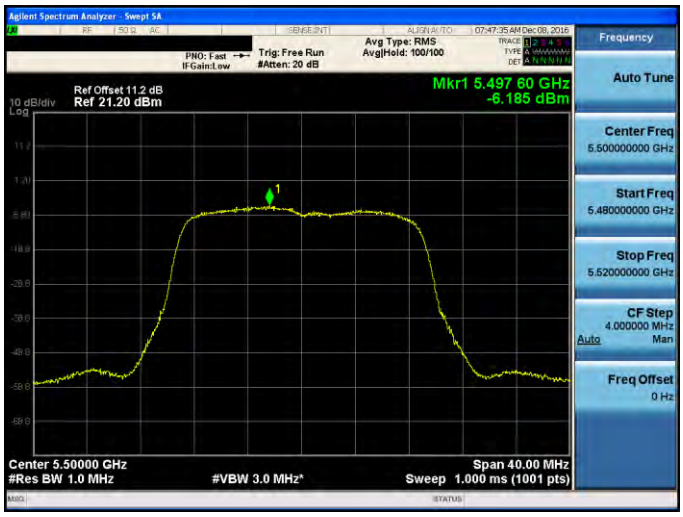
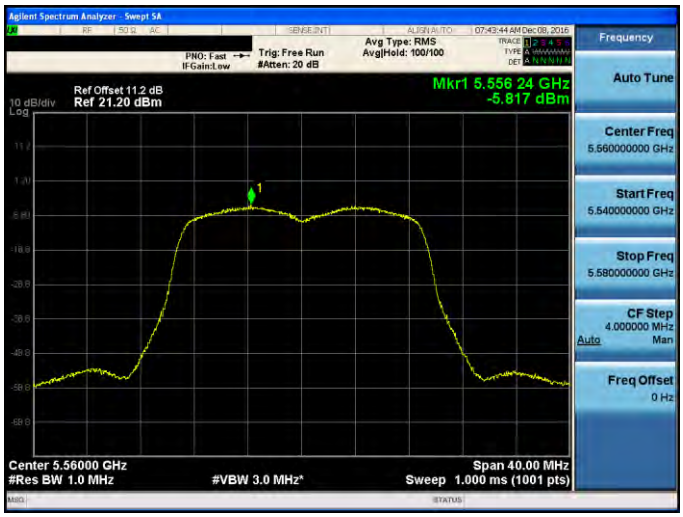
Module : QCA9984 (EW-7955MAC)

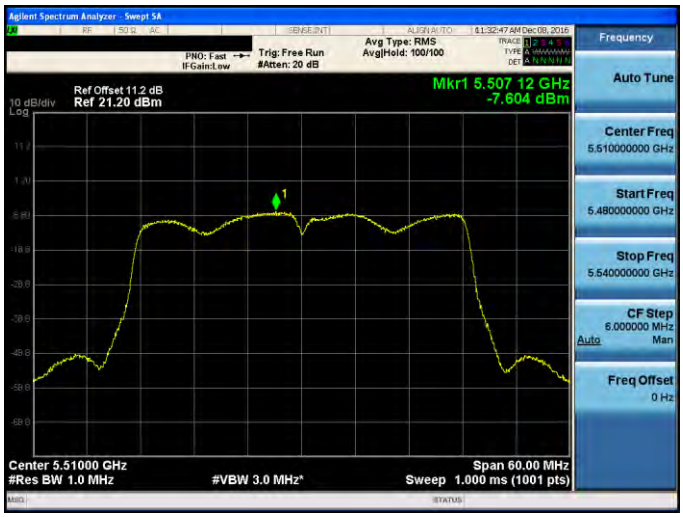
Mode 2: IEEE 802.11a Link Mode	
ANT-0	
5260 MHz	
5280 MHz	

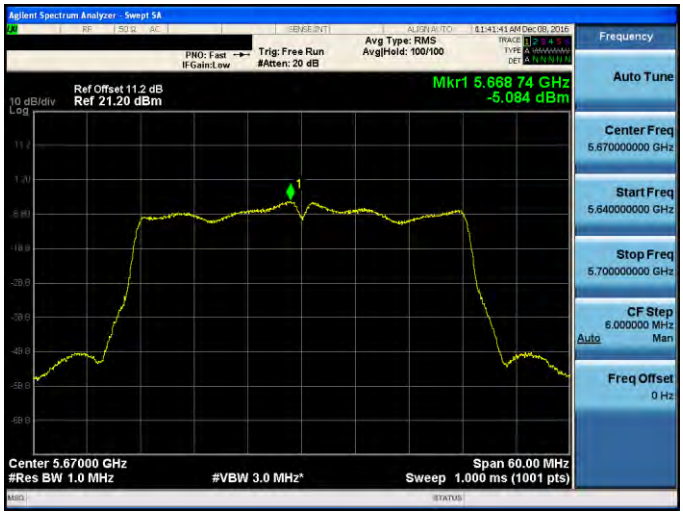
Mode 2: IEEE 802.11a Link Mode	
ANT-0	
5320 MHz	

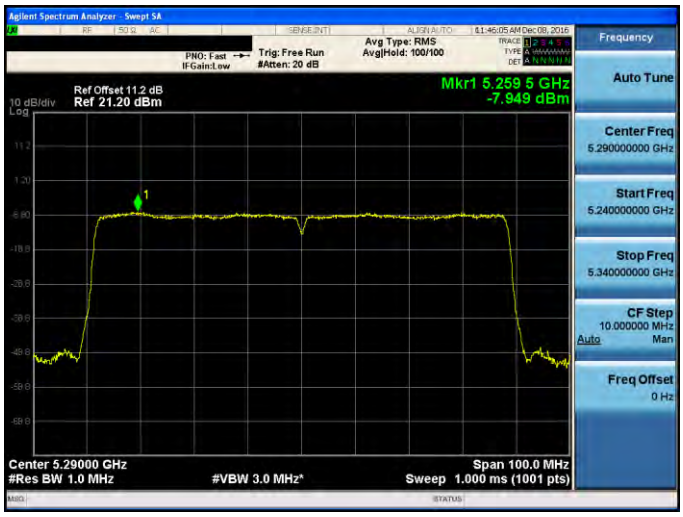
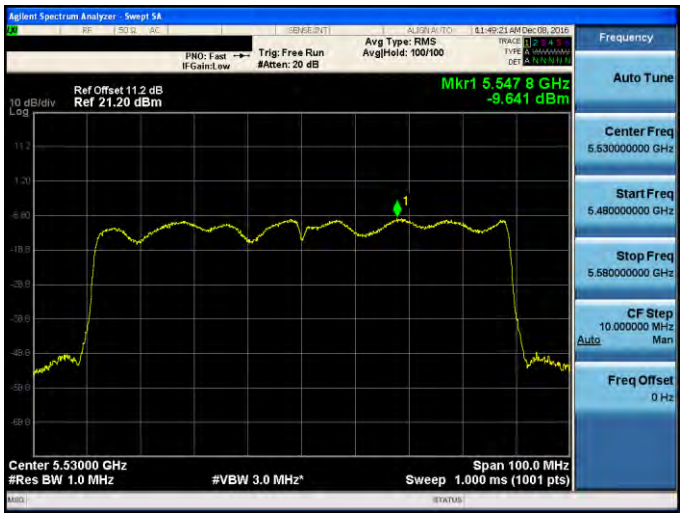
Mode 2: IEEE 802.11a Link Mode	
ANT-0	
5500 MHz	
5560 MHz	
5700 MHz	

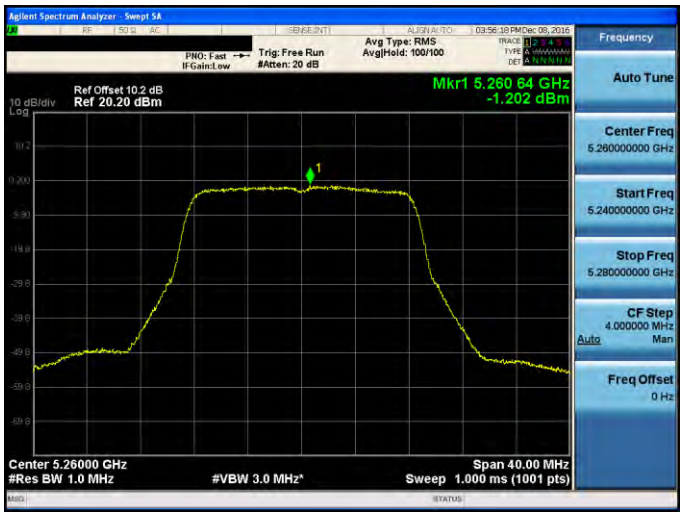
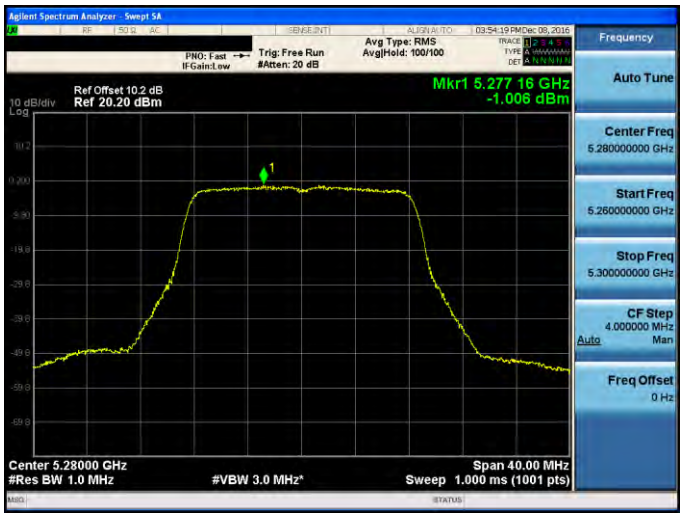
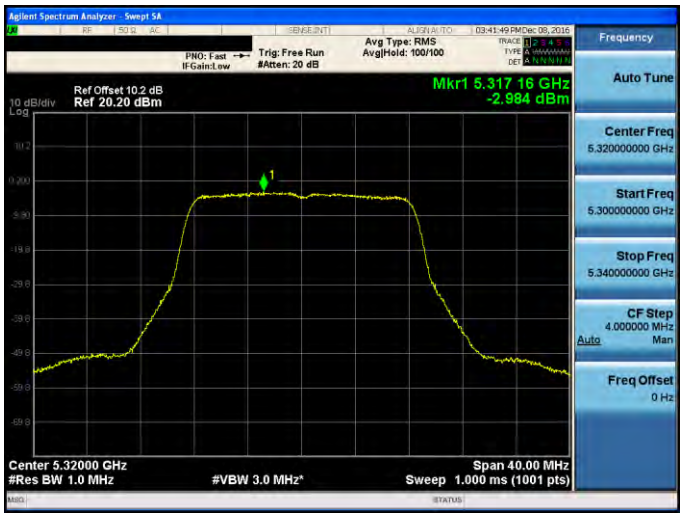
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-0	
5260 MHz	
5280 MHz	
5320 MHz	

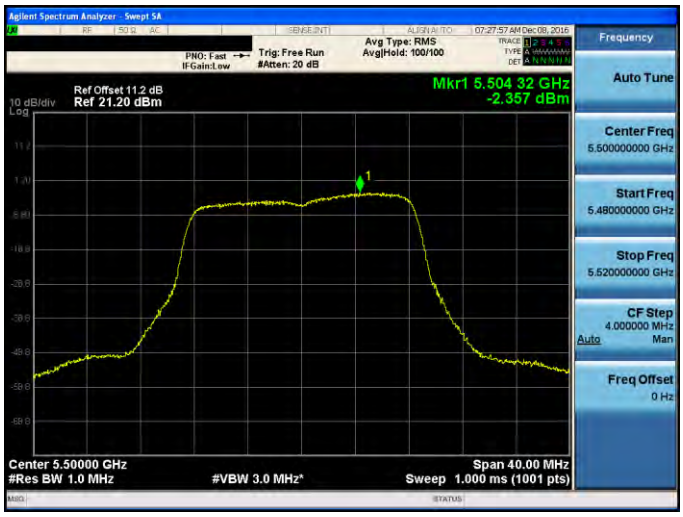
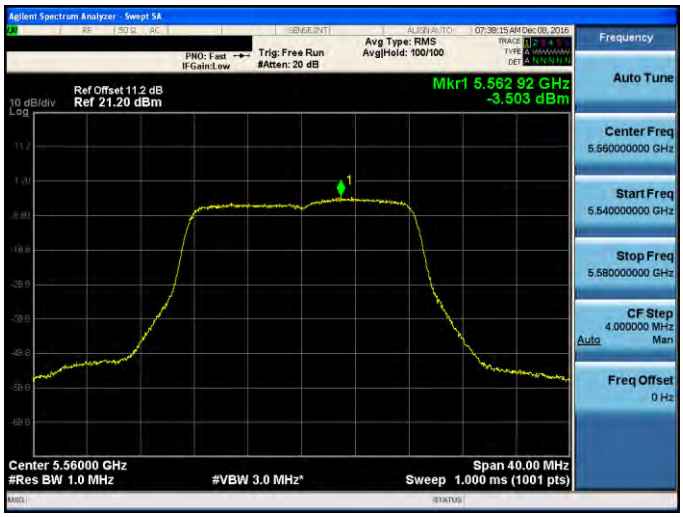
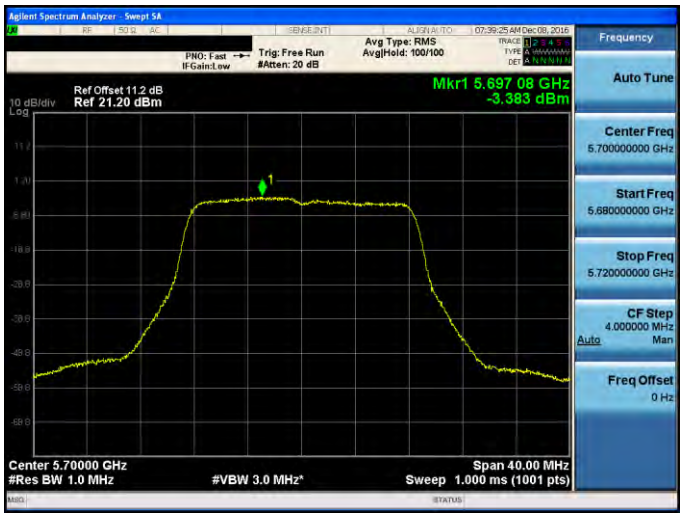
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-0	
5500 MHz	
5560 MHz	
5700 MHz	

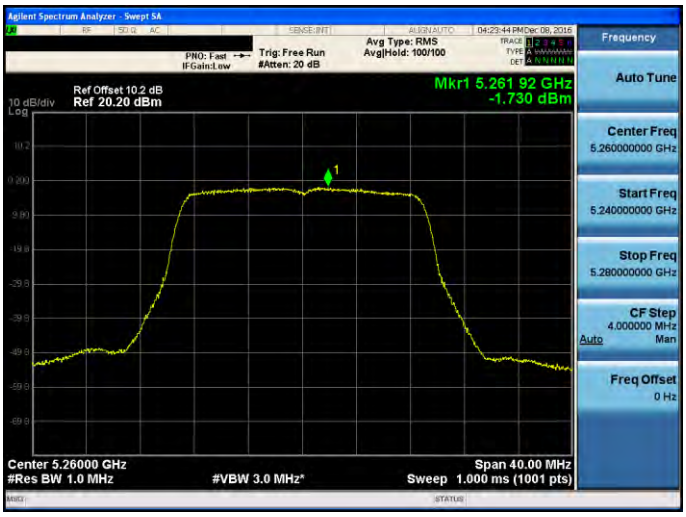
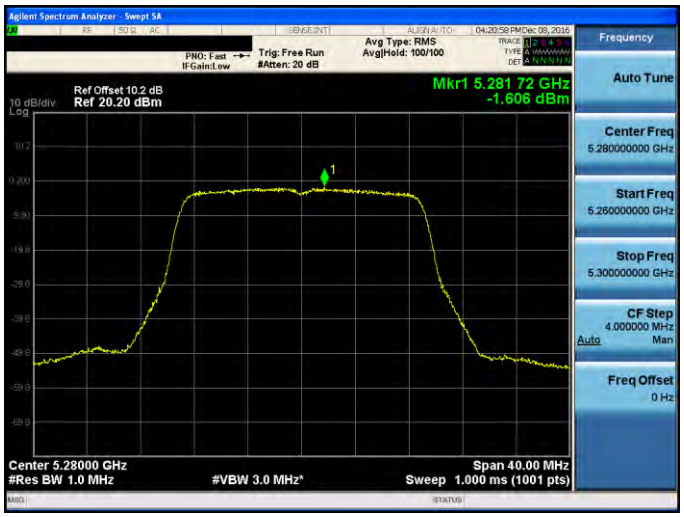
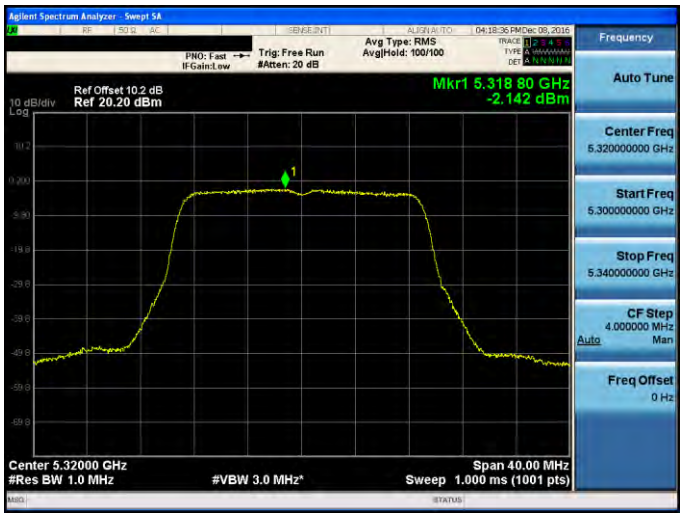
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-0	
5270 MHz	
5310 MHz	
5510 MHz	

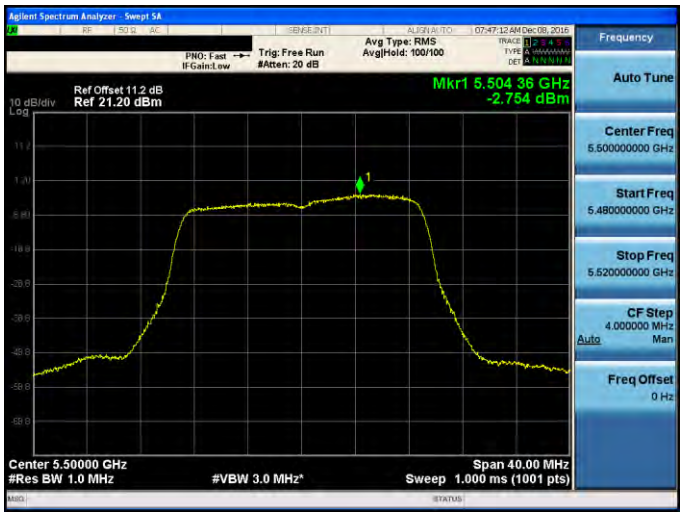
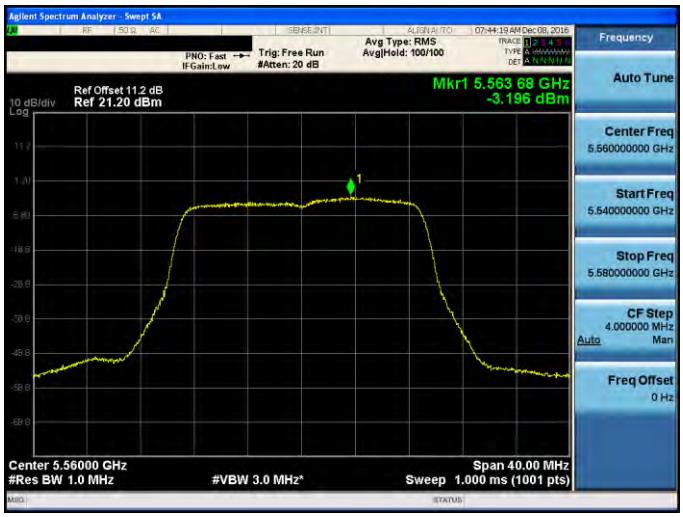
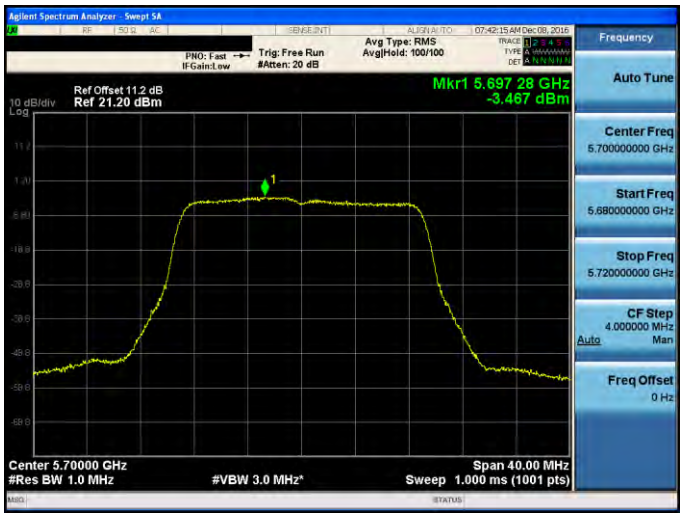
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-0	
5550 MHz	
5670 MHz	

Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-0	
5290 MHz	
5530 MHz	

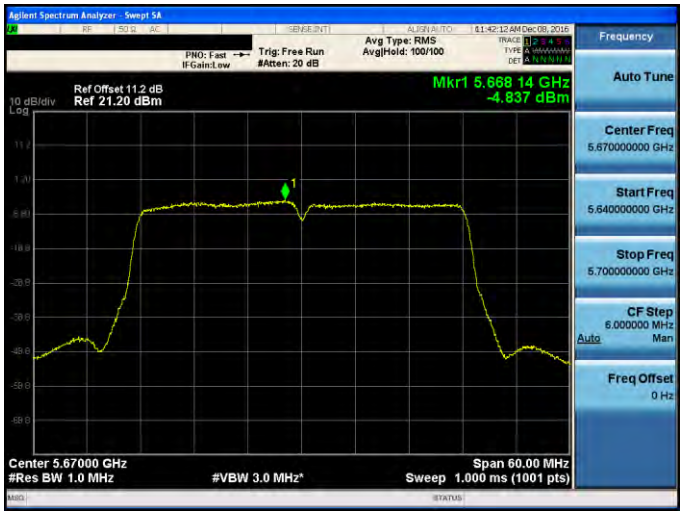
Mode 2: IEEE 802.11a Link Mode	
ANT-1	
5260 MHz	
5280 MHz	
5320 MHz	

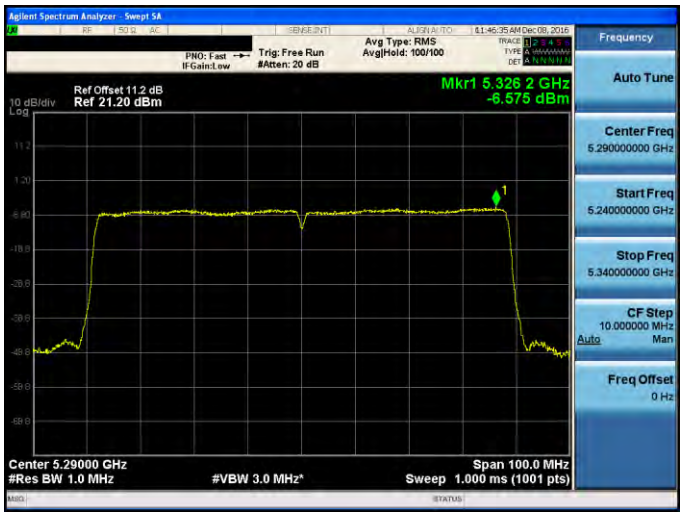
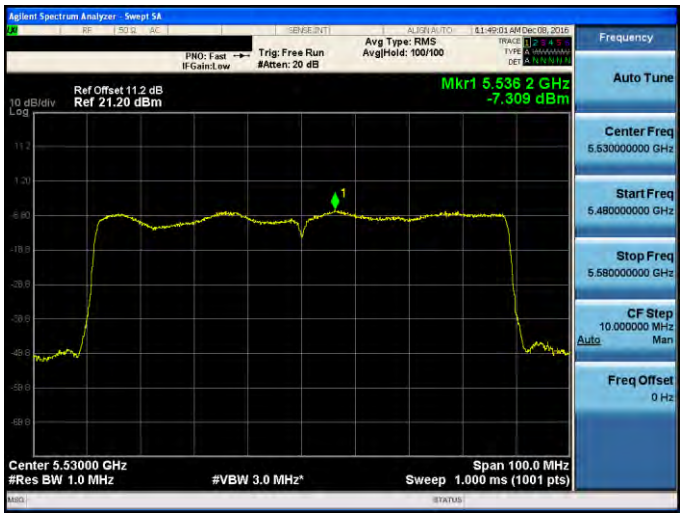
Mode 2: IEEE 802.11a Link Mode	
ANT-1	
5500 MHz	
5560 MHz	
5700 MHz	

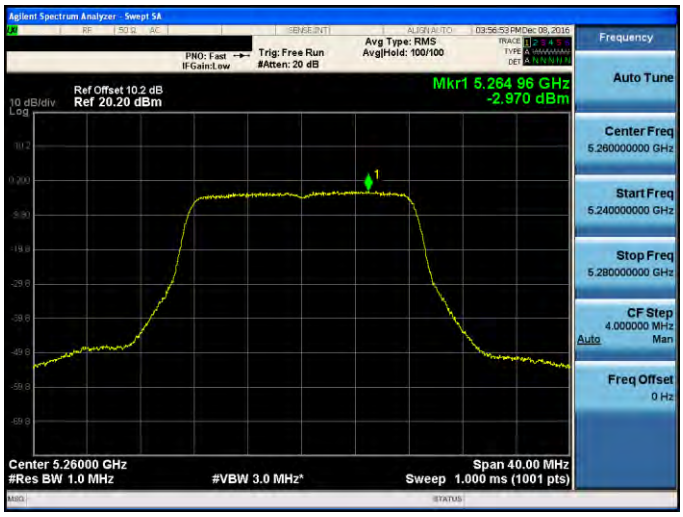
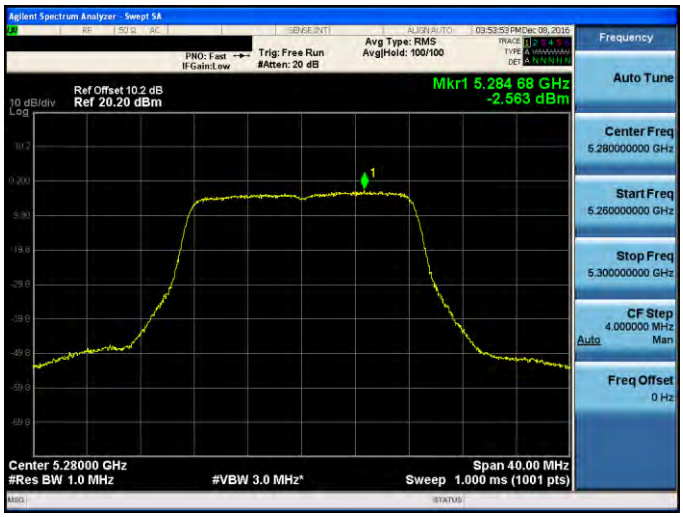
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-1	
5260 MHz	
5280 MHz	
5320 MHz	

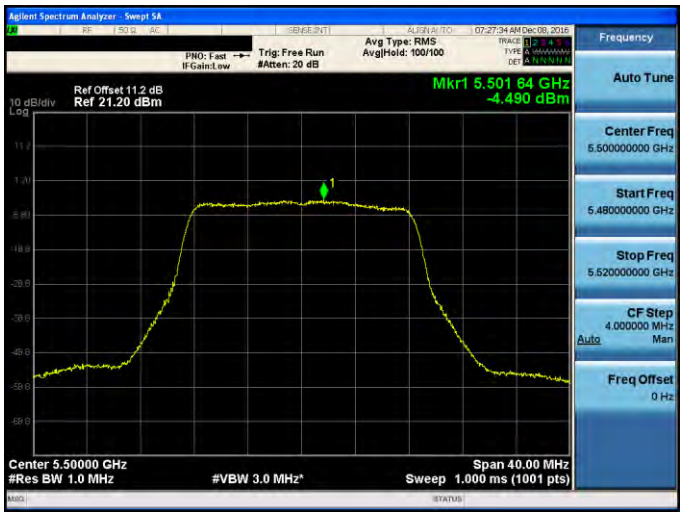
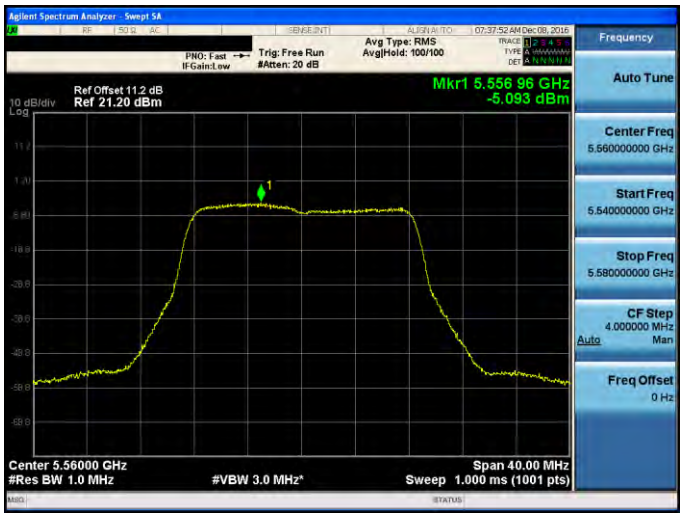
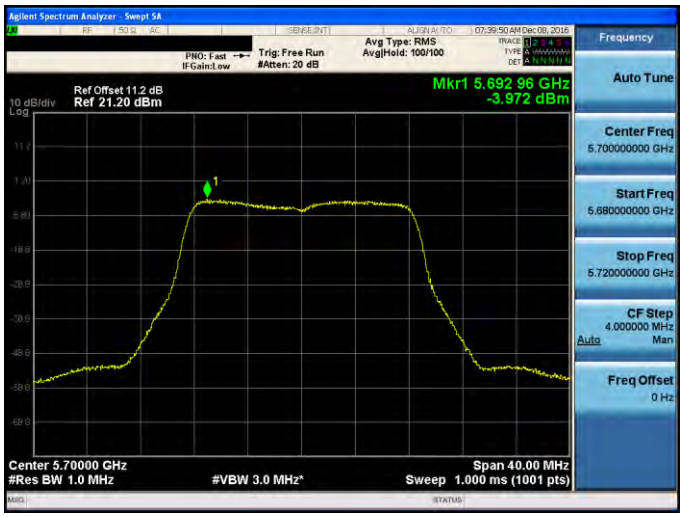
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-1	
5500 MHz	
5560 MHz	
5700 MHz	

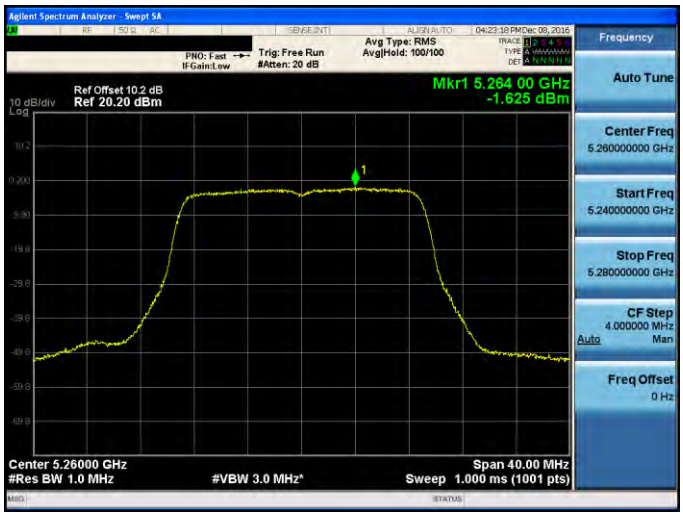
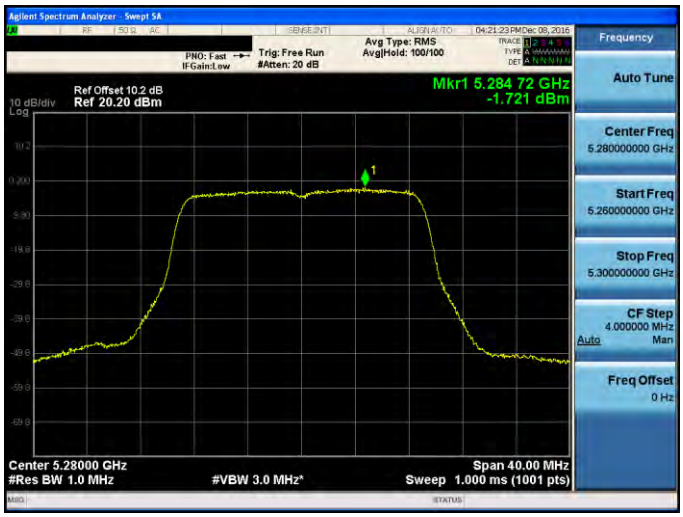
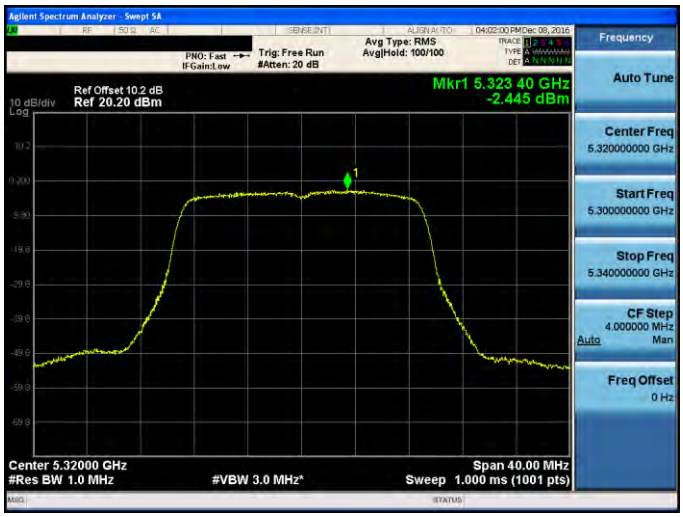
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-1	
5270 MHz	
5310 MHz	
5510 MHz	

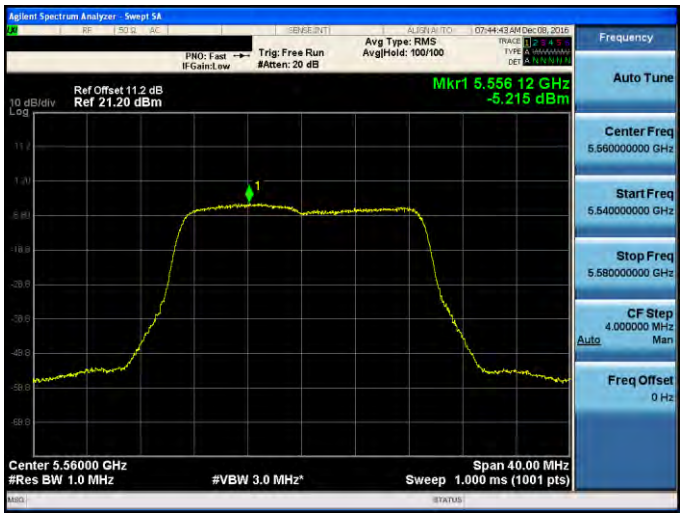
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-1	
5550 MHz	
5670 MHz	

Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-1	
5290 MHz	
5530 MHz	

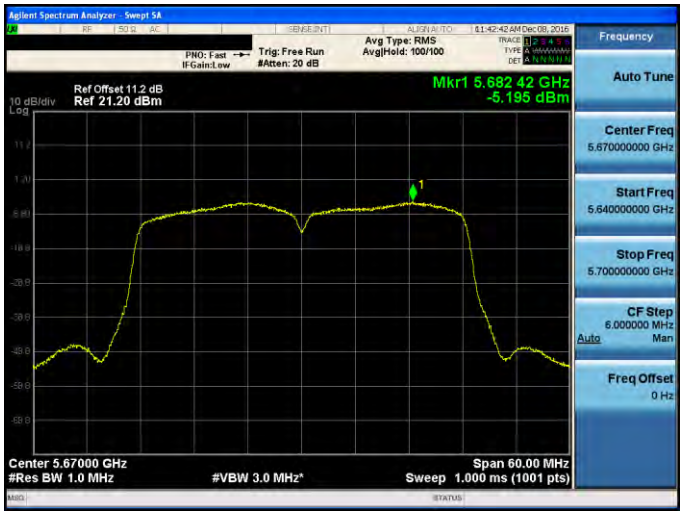
Mode 2: IEEE 802.11a Link Mode	
ANT-2	
5260 MHz	
5280 MHz	
5320 MHz	

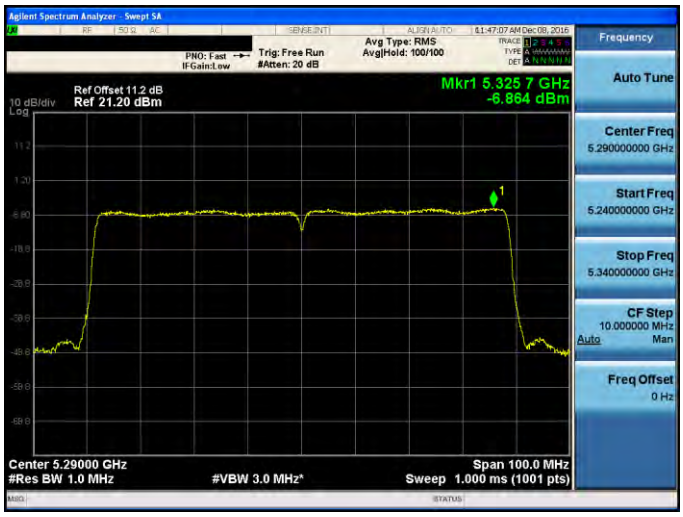
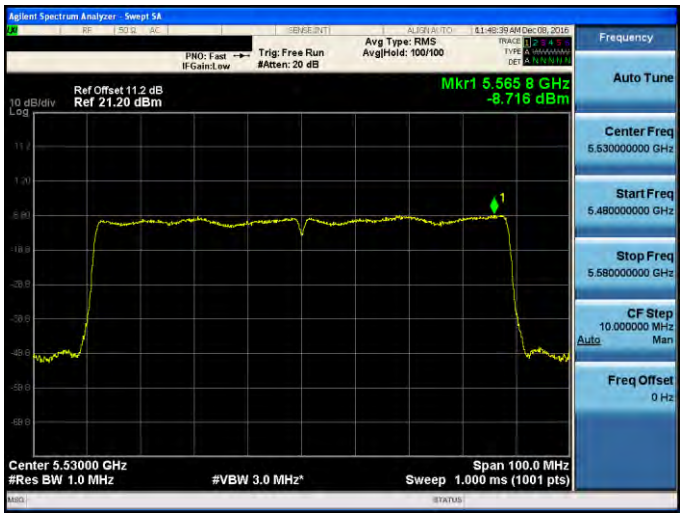
Mode 2: IEEE 802.11a Link Mode	
ANT-2	
5500 MHz	
5560 MHz	
5700 MHz	

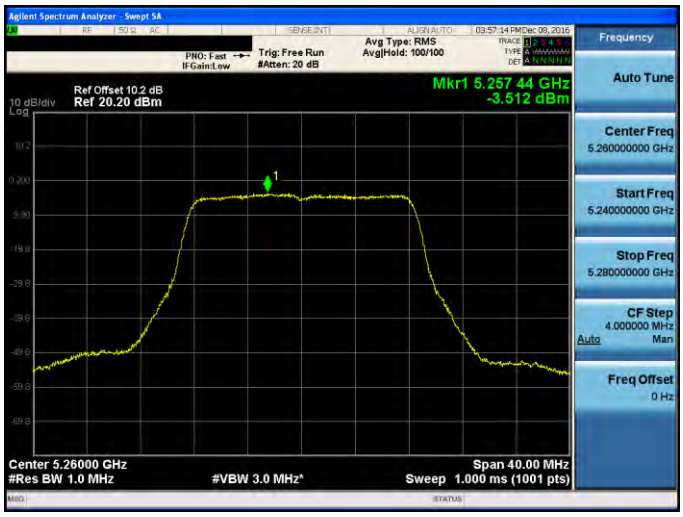
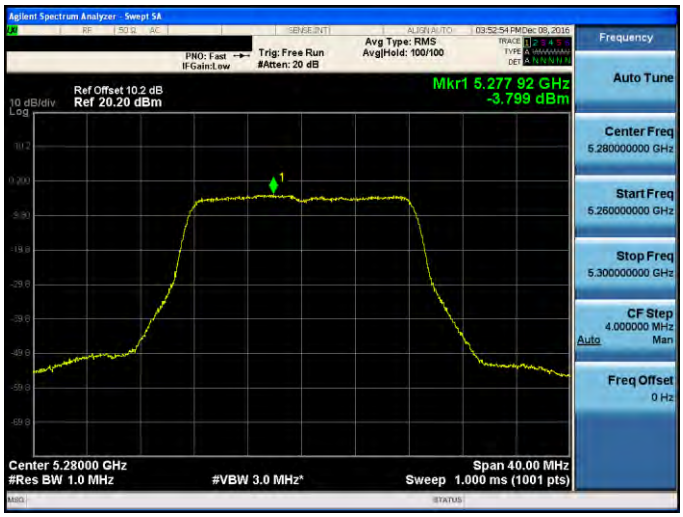
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-2	
5260 MHz	
5280 MHz	
5320 MHz	

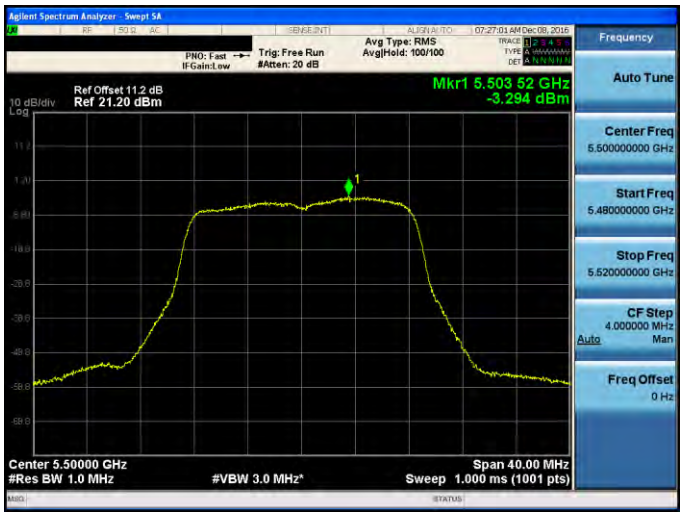
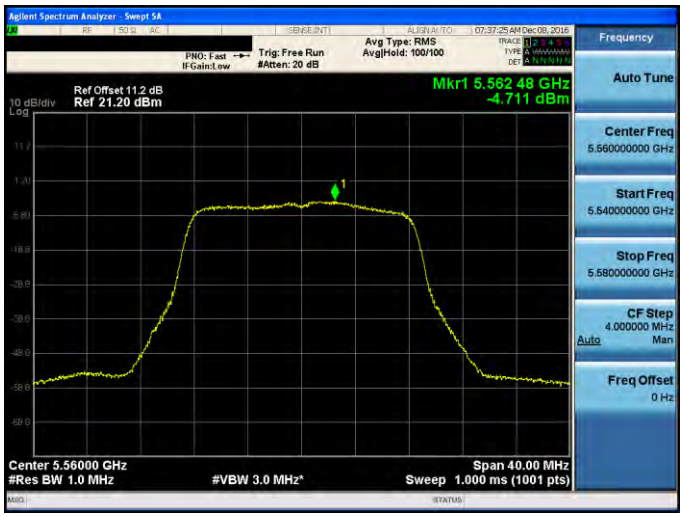
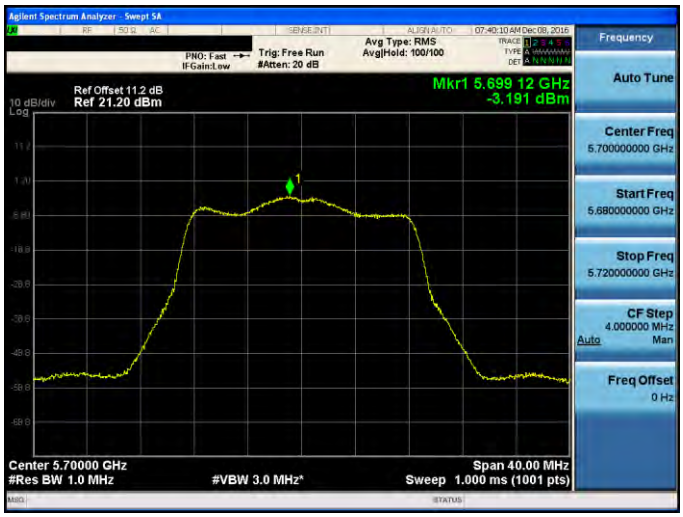
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-2	
5500 MHz	
5560 MHz	
5700 MHz	

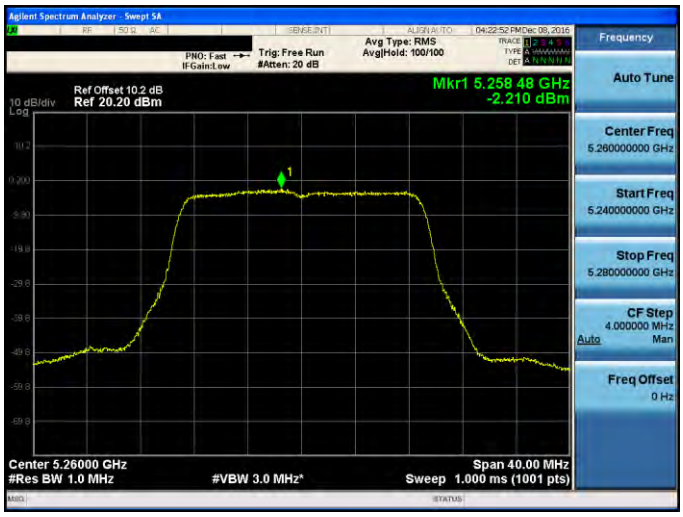
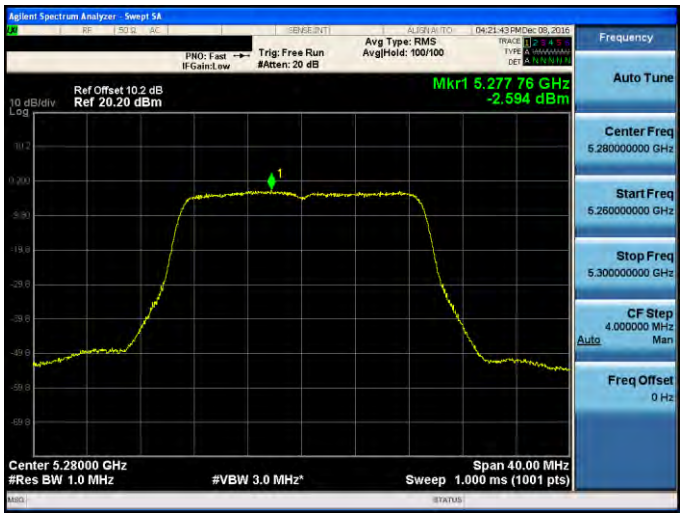
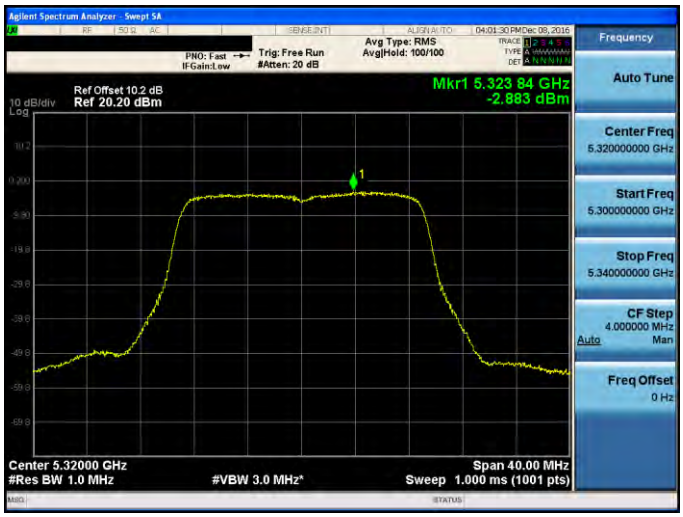
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-2	
5270 MHz	
5310 MHz	
5510 MHz	

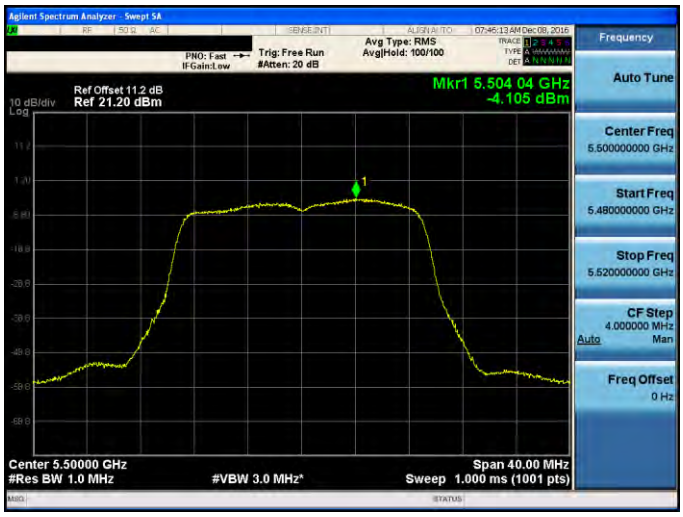
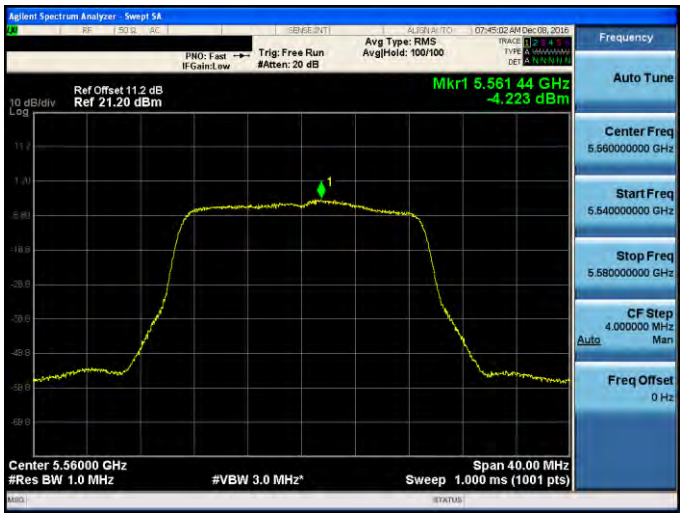
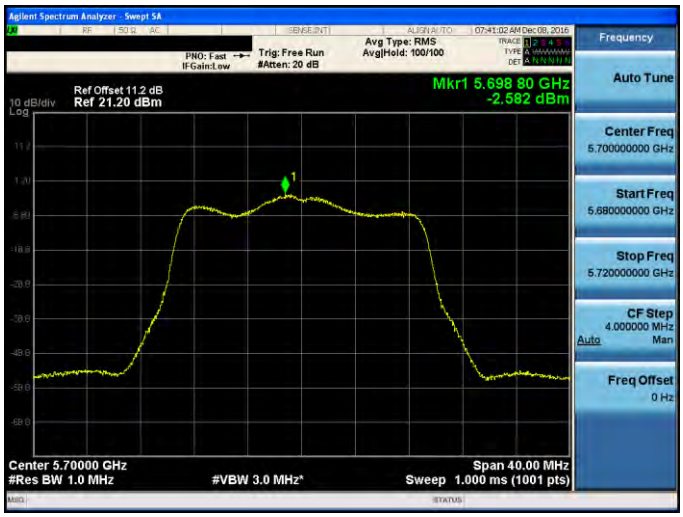
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-2	
5550 MHz	
5670 MHz	

Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-2	
5290 MHz	
5530 MHz	

Mode 2: IEEE 802.11a Link Mode	
ANT-3	
5260 MHz	
5280 MHz	
5320 MHz	

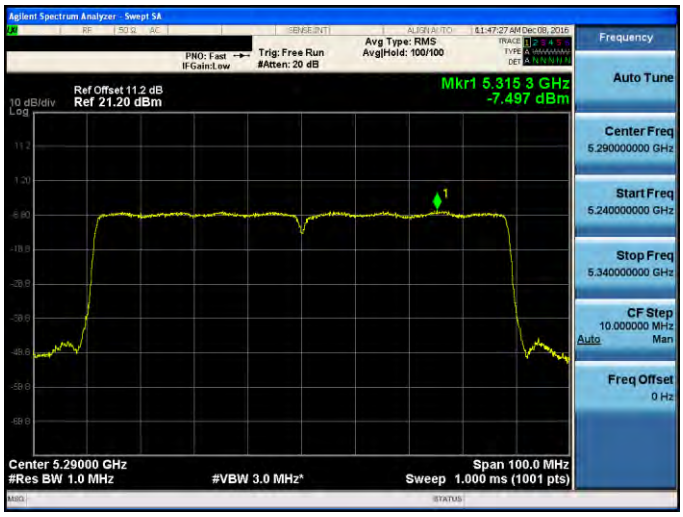
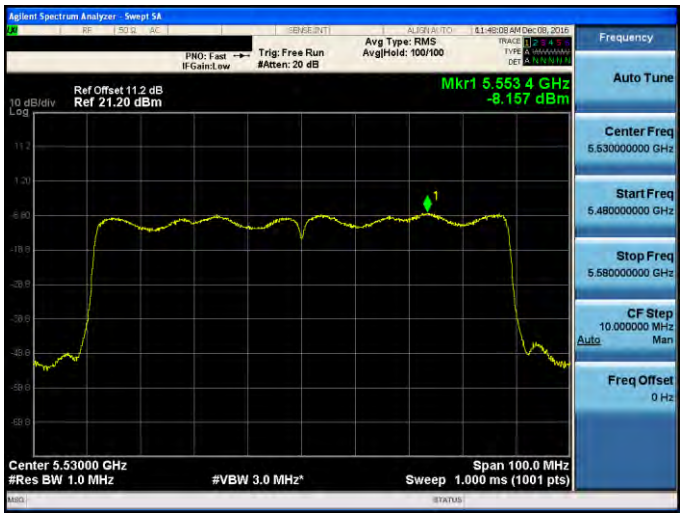
Mode 2: IEEE 802.11a Link Mode	
ANT-3	
5500 MHz	
5560 MHz	
5700 MHz	

Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-3	
5260 MHz	
5280 MHz	
5320 MHz	

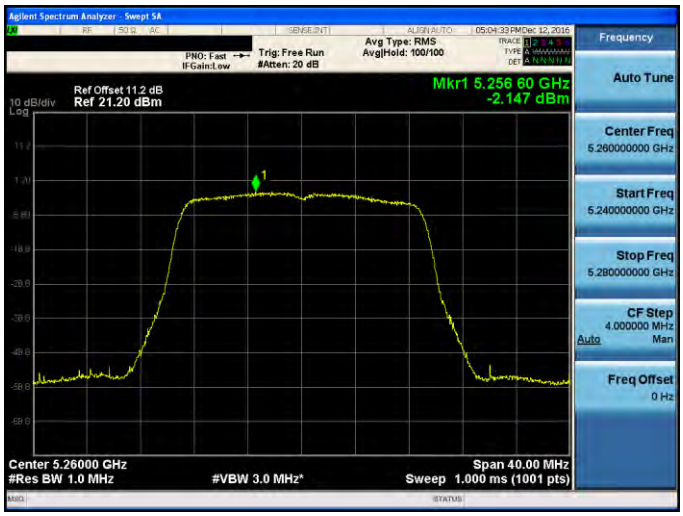
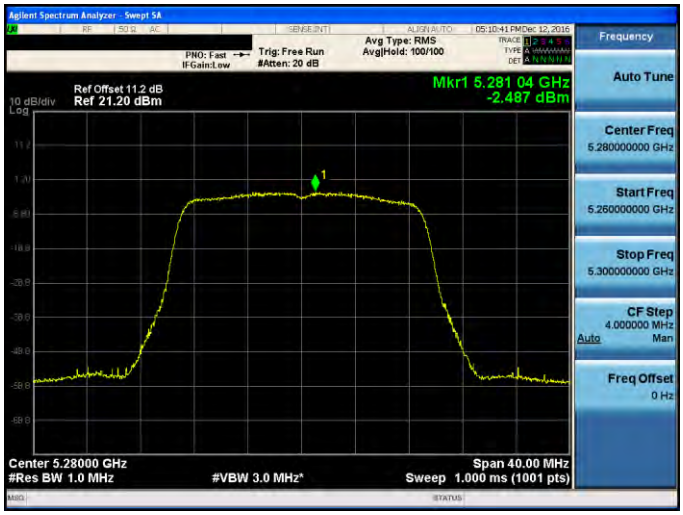
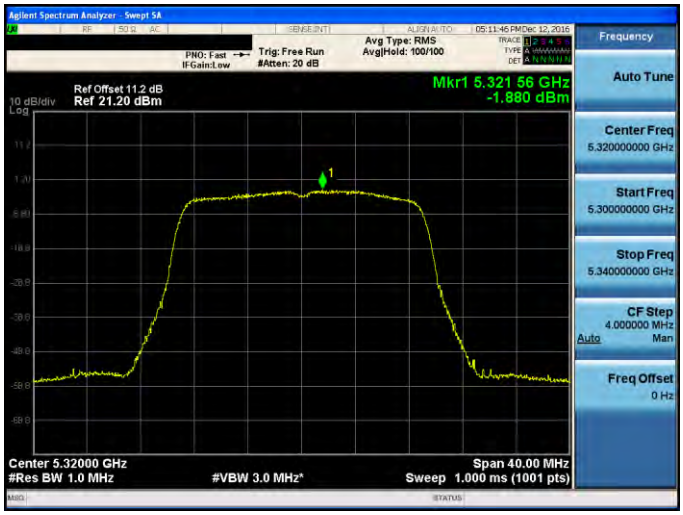
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-3	
5500 MHz	
5560 MHz	
5700 MHz	

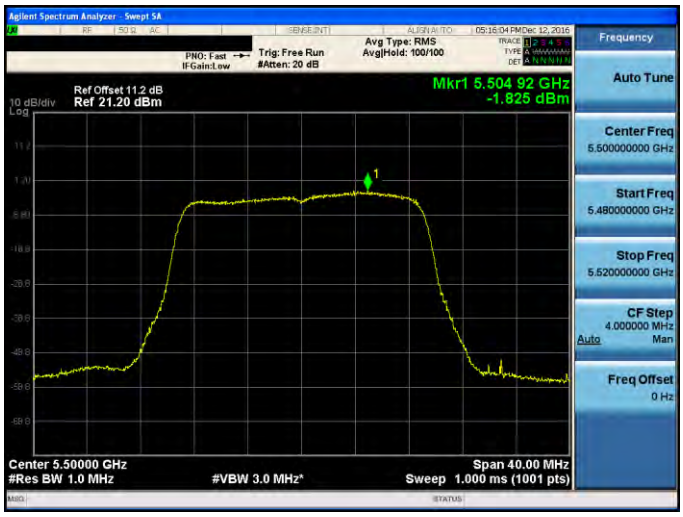
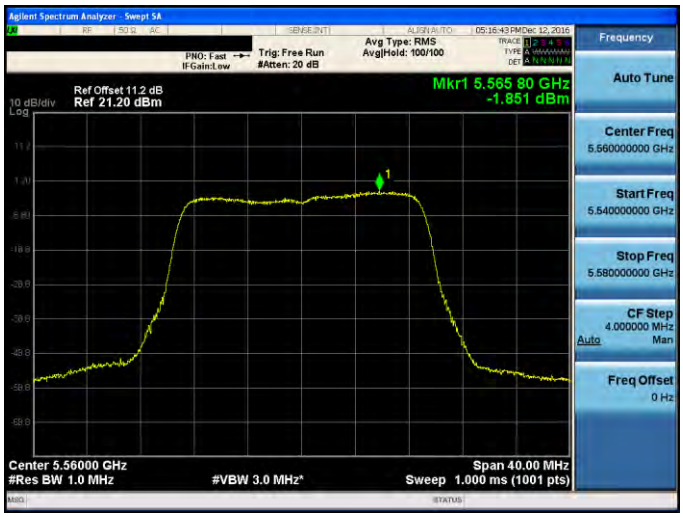
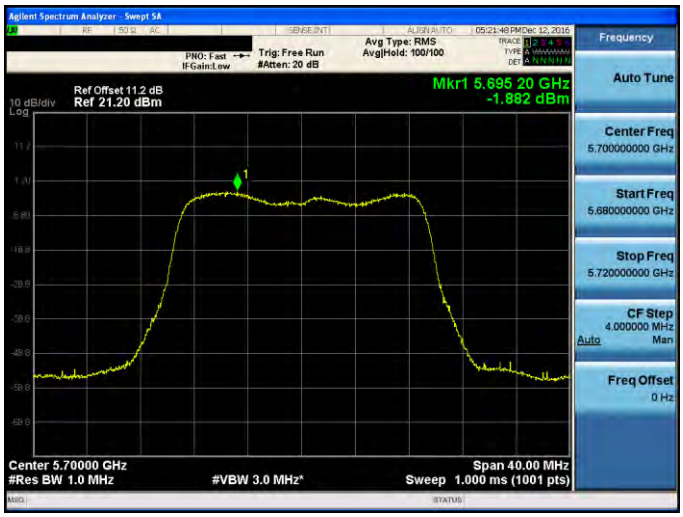
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-3	
5270 MHz	
5310 MHz	
5510 MHz	

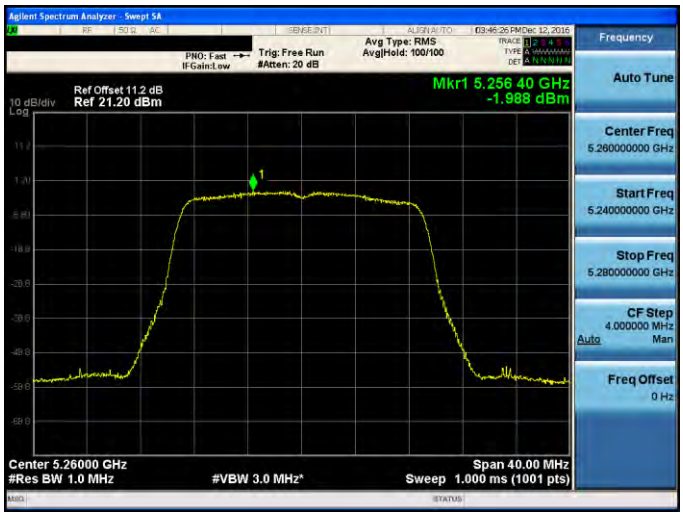
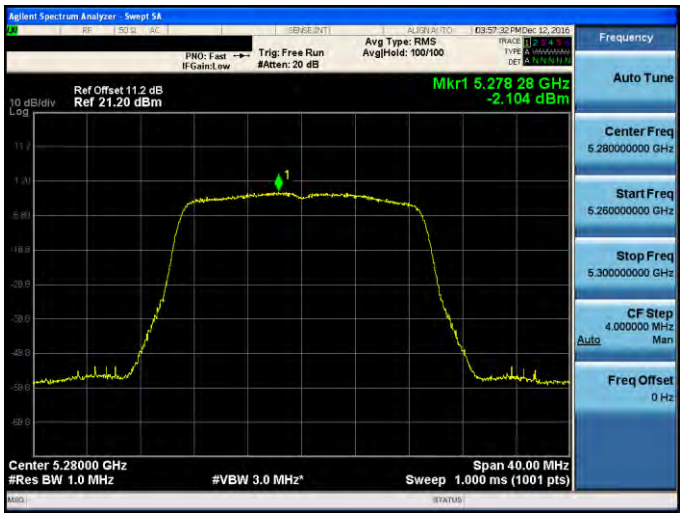
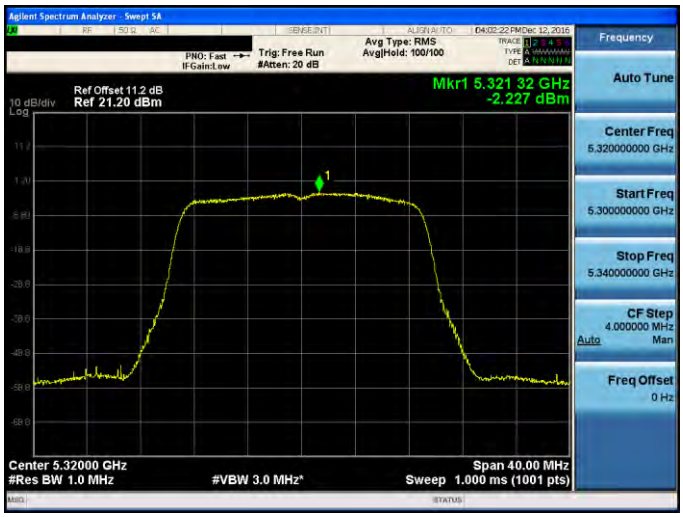
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-3	
5550 MHz	
5670 MHz	

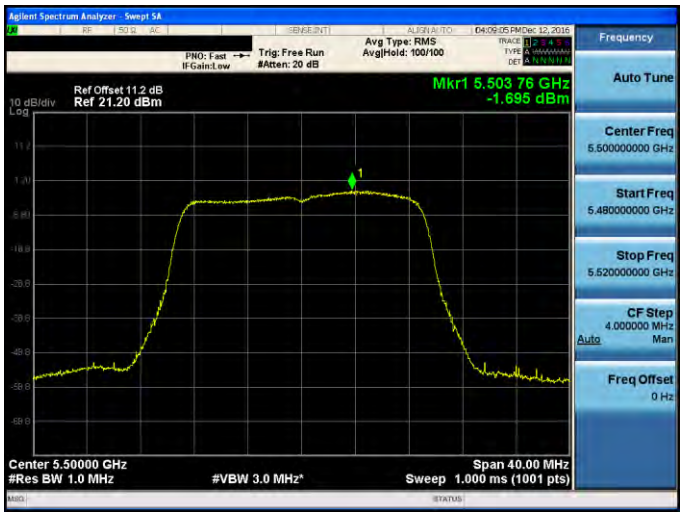
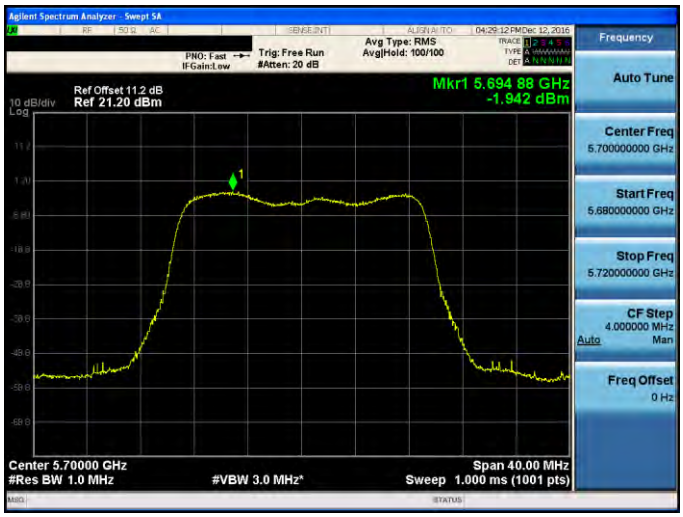
Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-3	
5290 MHz	
5530 MHz	

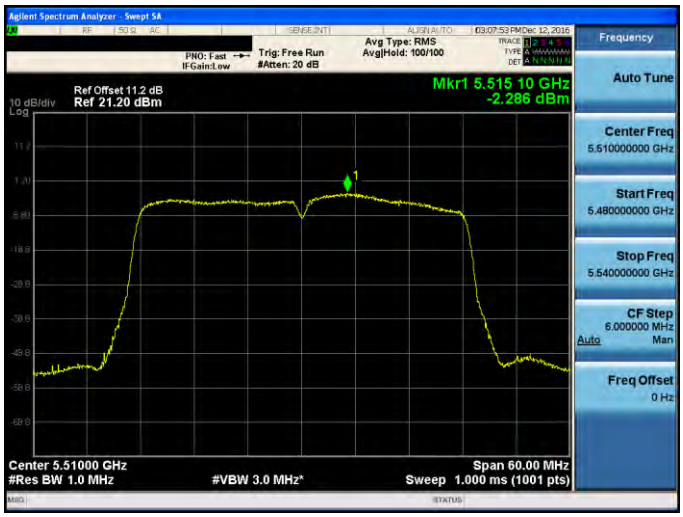
Module : QCA9990 (EW-7944MAC)

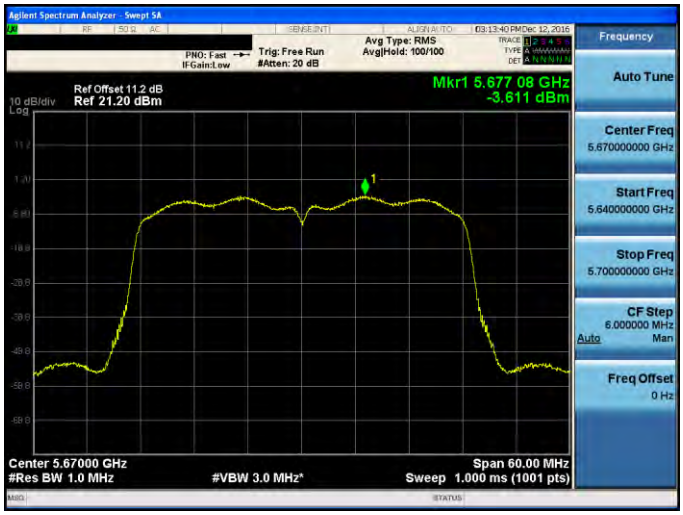
Mode 2: IEEE 802.11a Link Mode	
ANT-0	
5260 MHz	
5280 MHz	
5320 MHz	

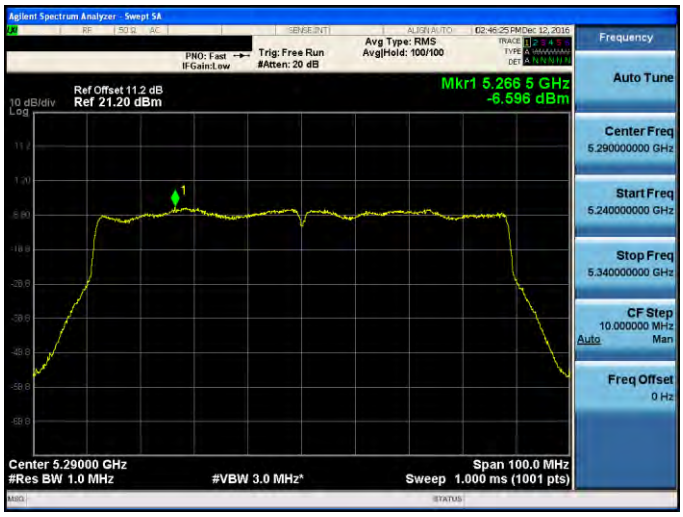
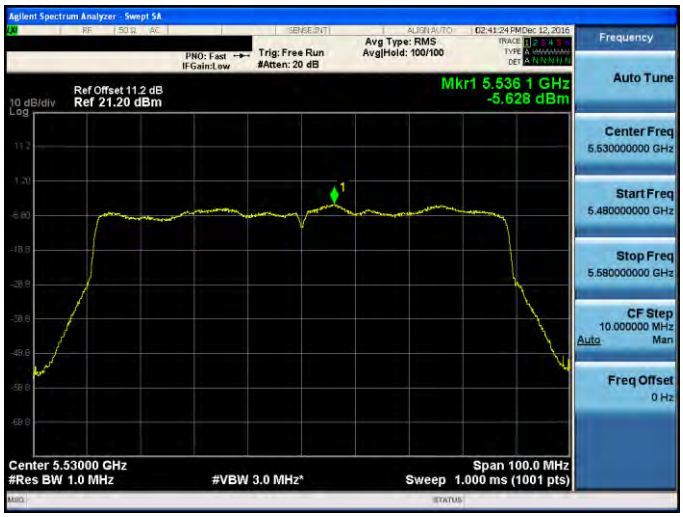
Mode 2: IEEE 802.11a Link Mode	
ANT-0	
5500 MHz	
5560 MHz	
5700 MHz	

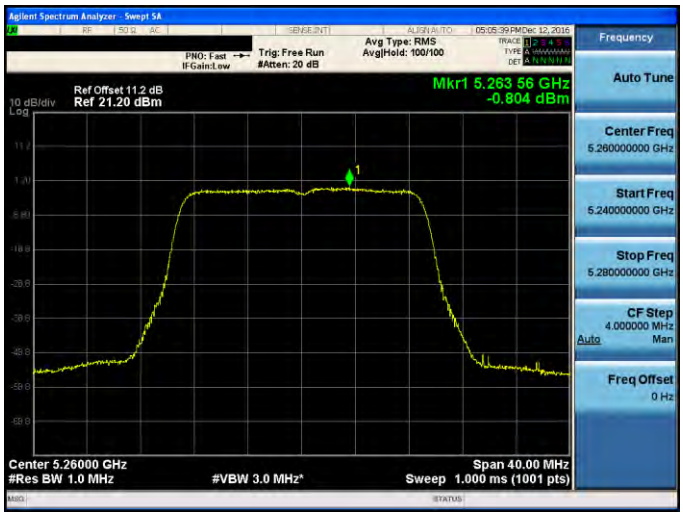
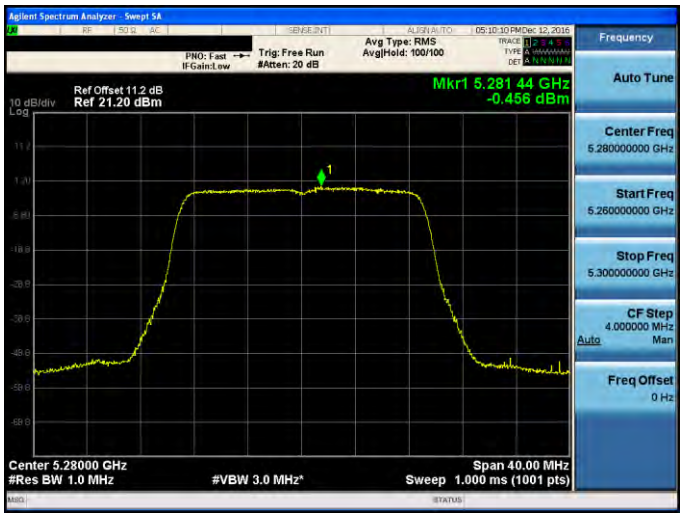
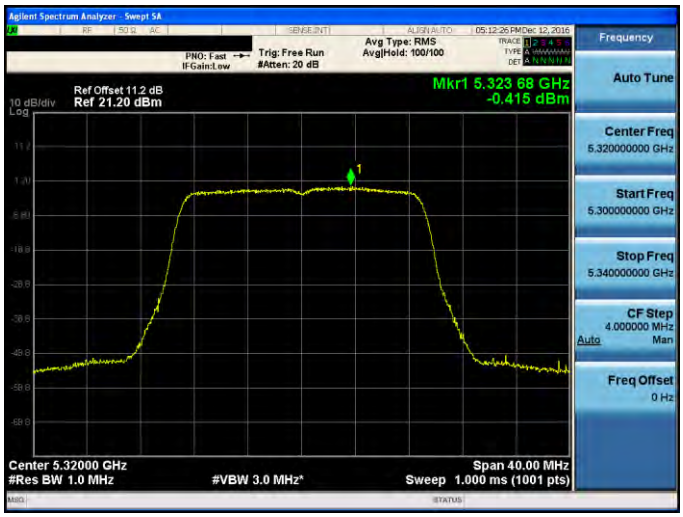
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-0	
5260 MHz	
5280 MHz	
5320 MHz	

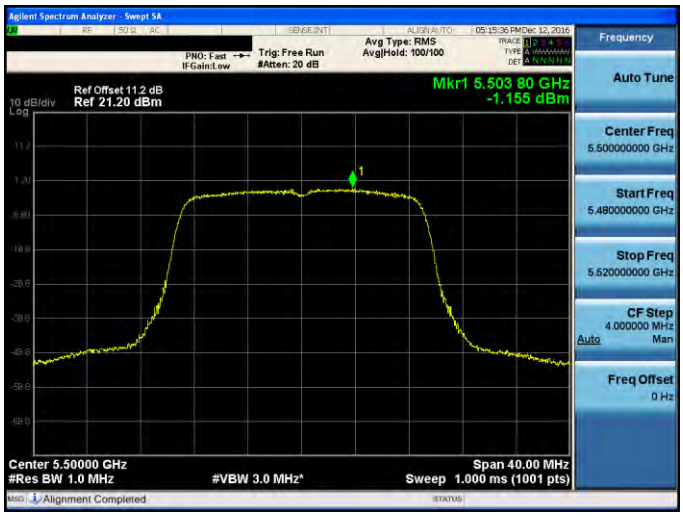
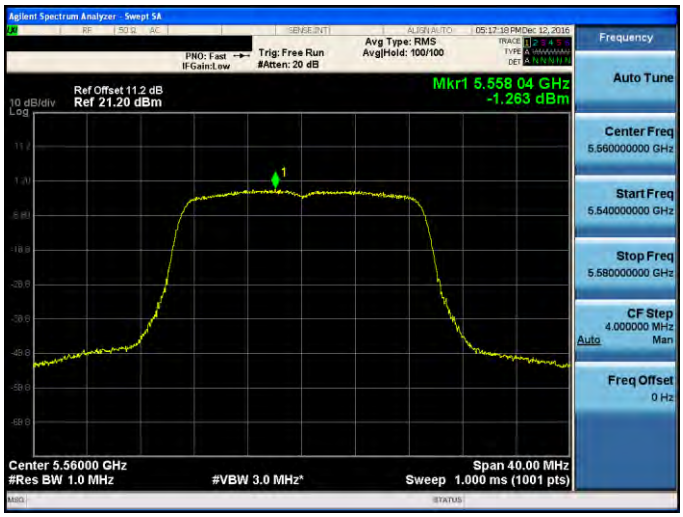
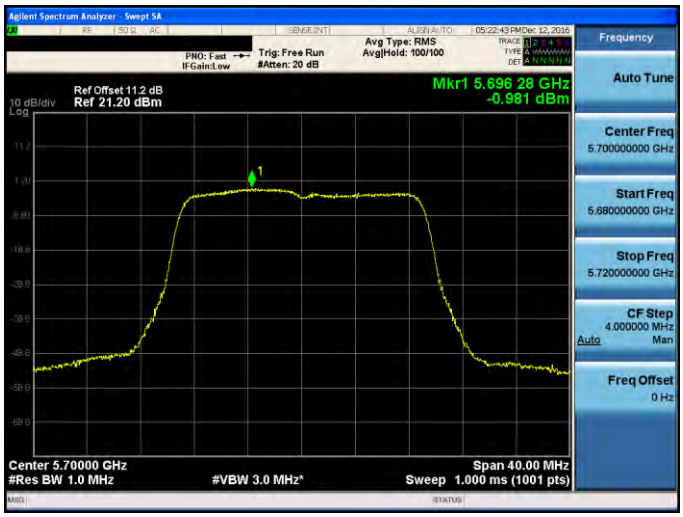
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-0	
5500 MHz	
5560 MHz	
5700 MHz	

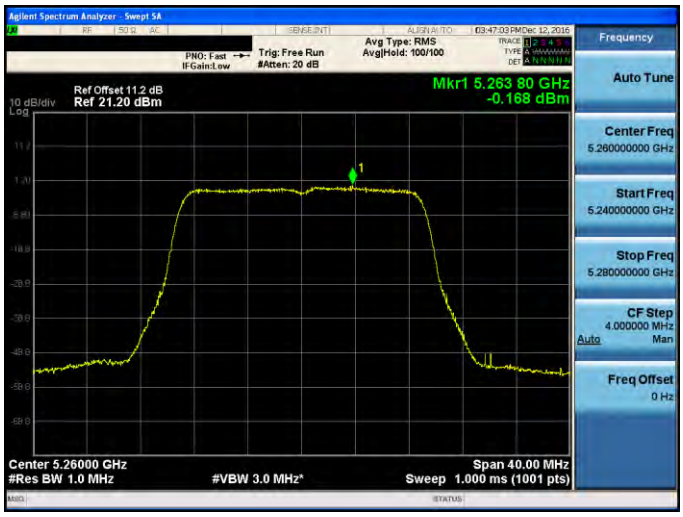
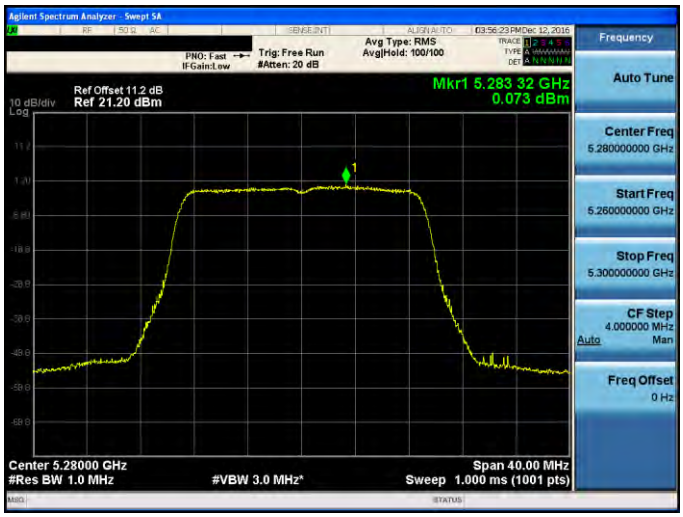
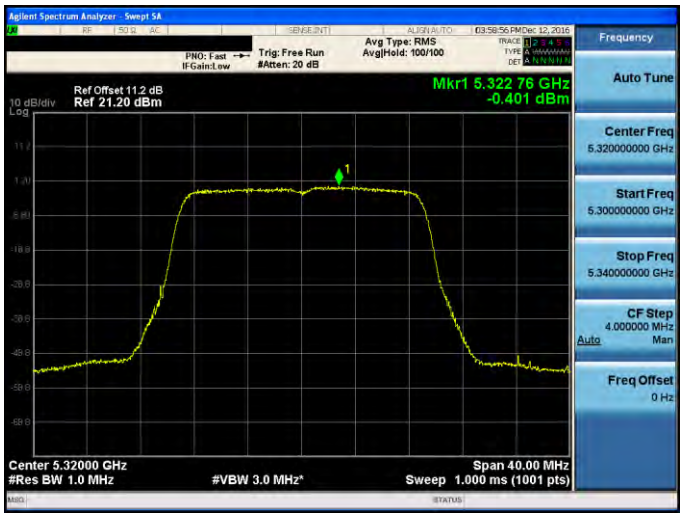
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-0	
5270 MHz	
5310 MHz	
5510 MHz	

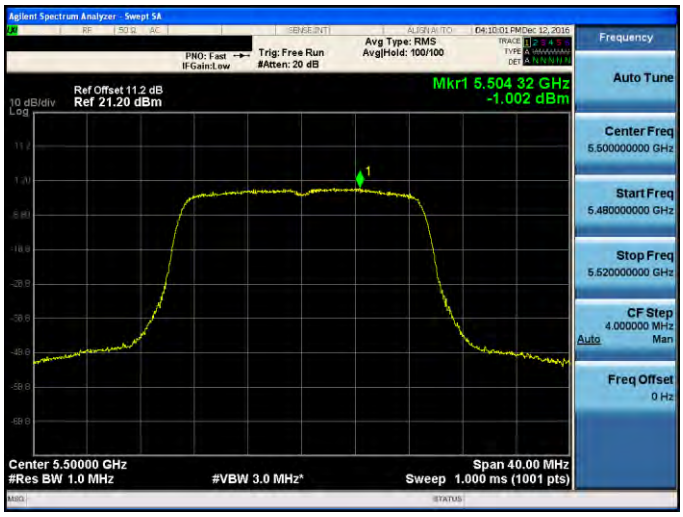
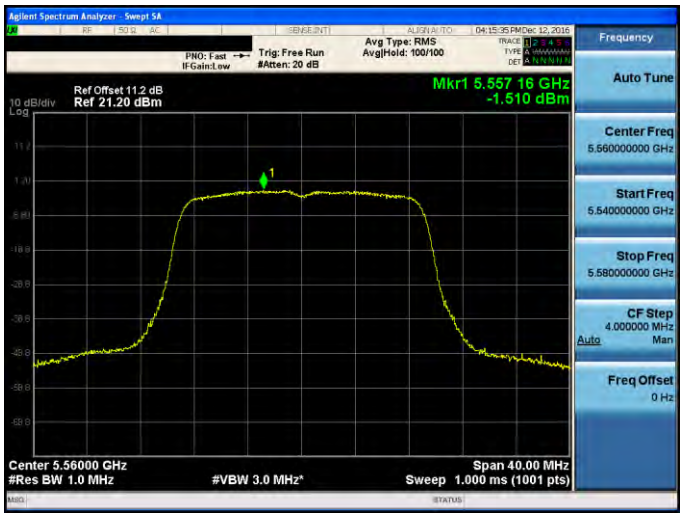
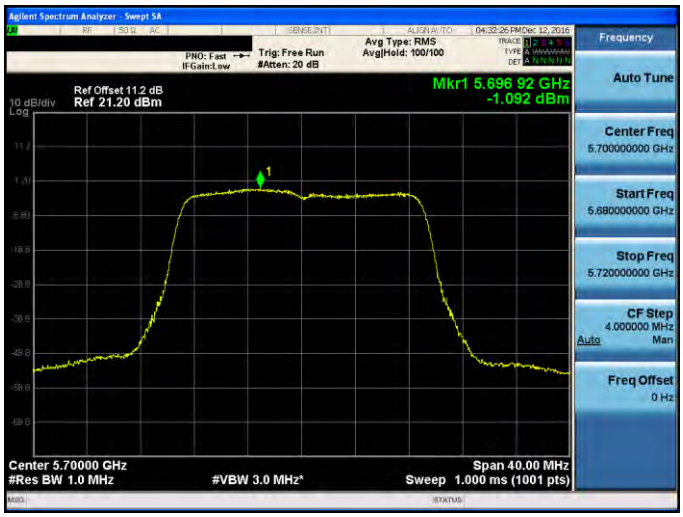
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-0	
5550 MHz	
5670 MHz	

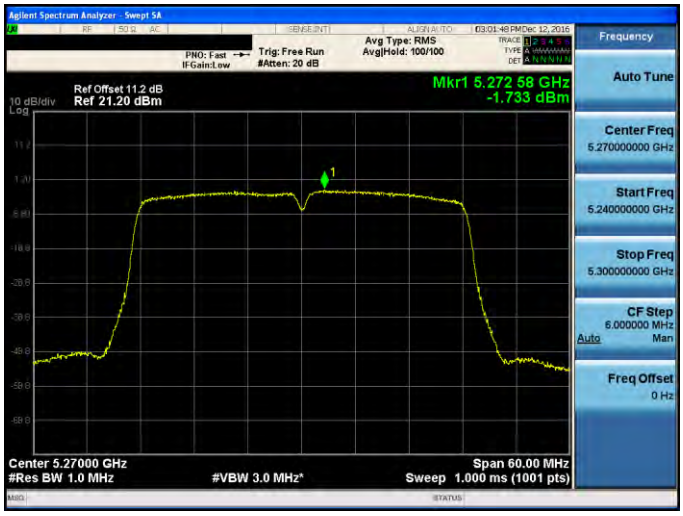
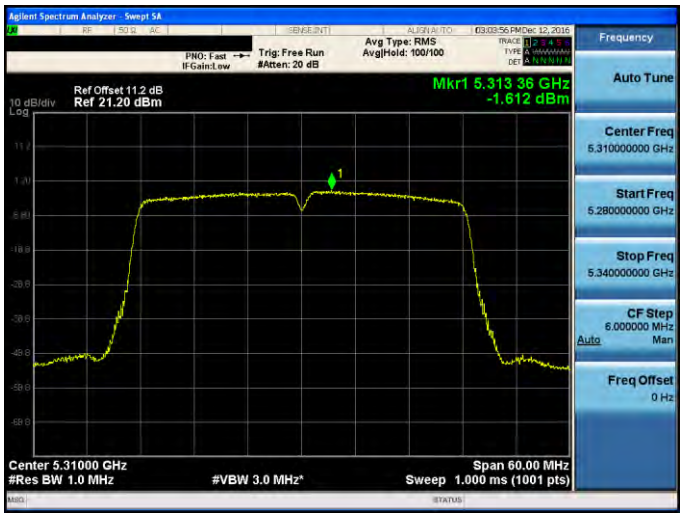
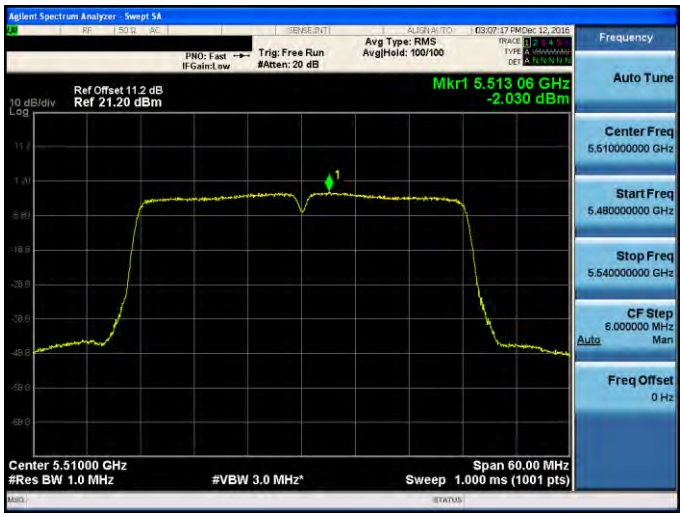
Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-0	
5290 MHz	
5530 MHz	

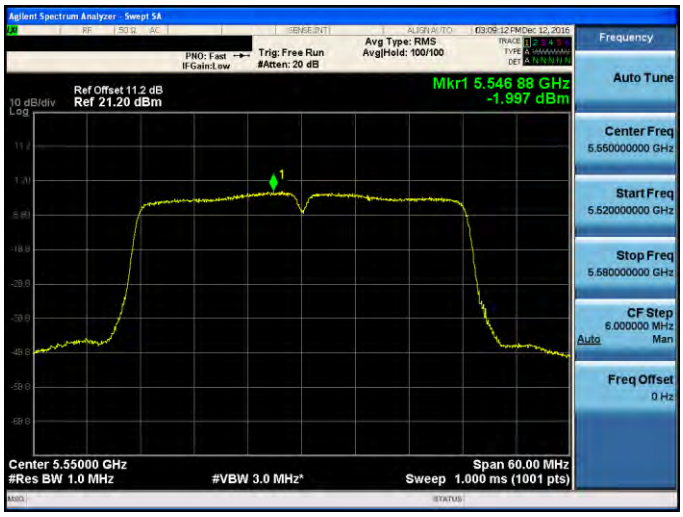
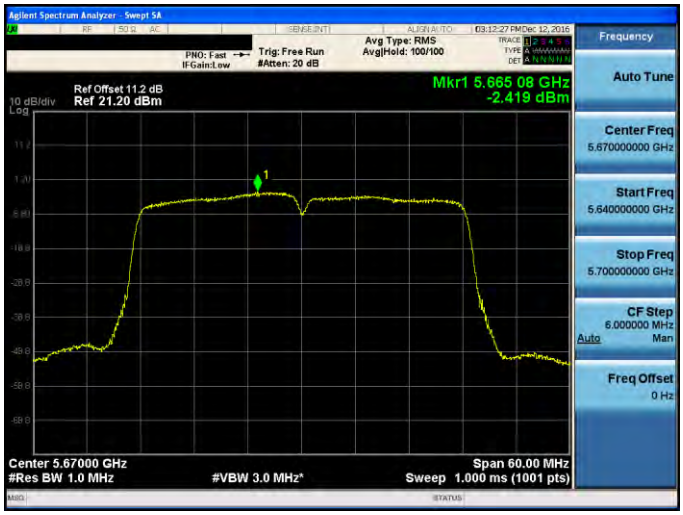
Mode 2: IEEE 802.11a Link Mode	
ANT-1	
5260 MHz	
5280 MHz	
5320 MHz	

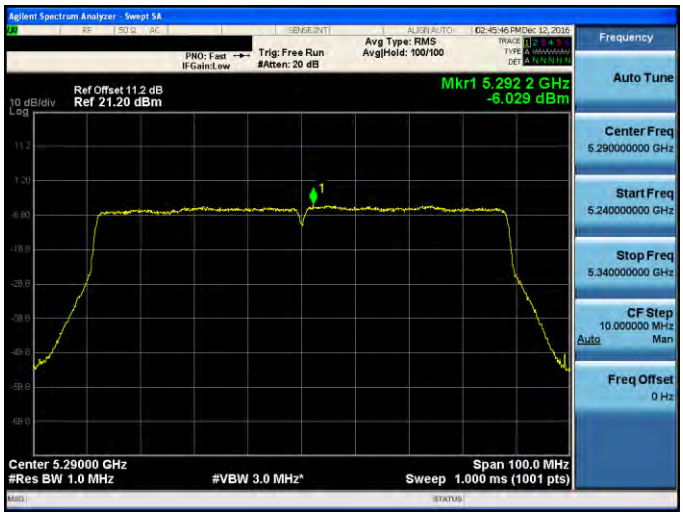
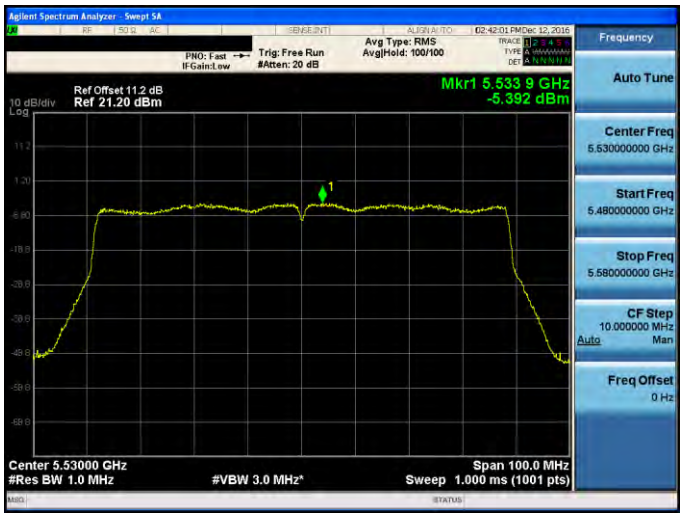
Mode 2: IEEE 802.11a Link Mode	
ANT-1	
5500 MHz	
5560 MHz	
5700 MHz	

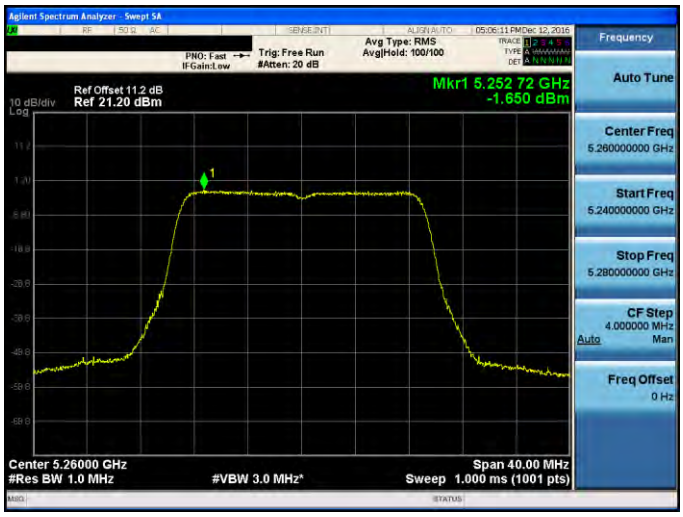
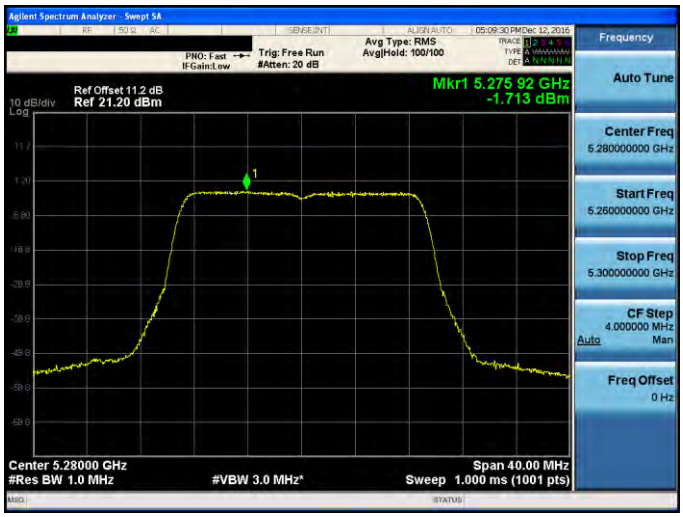
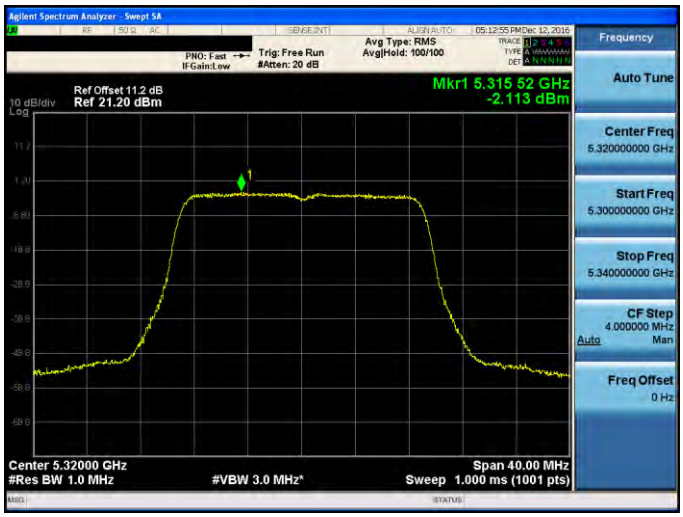
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-1	
5260 MHz	
5280 MHz	
5320 MHz	

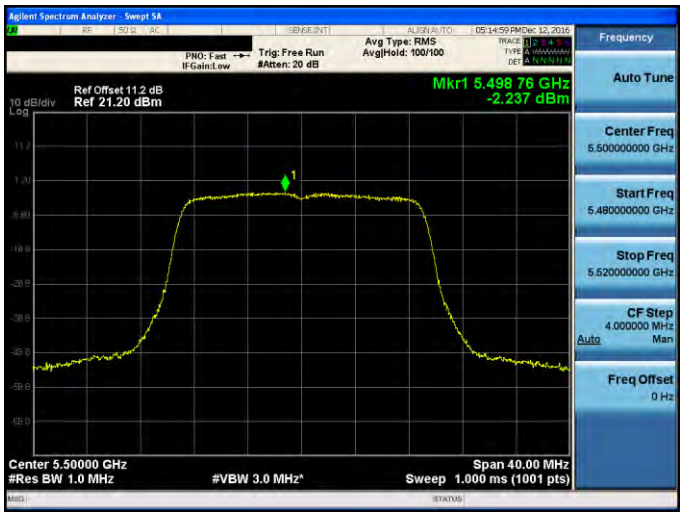
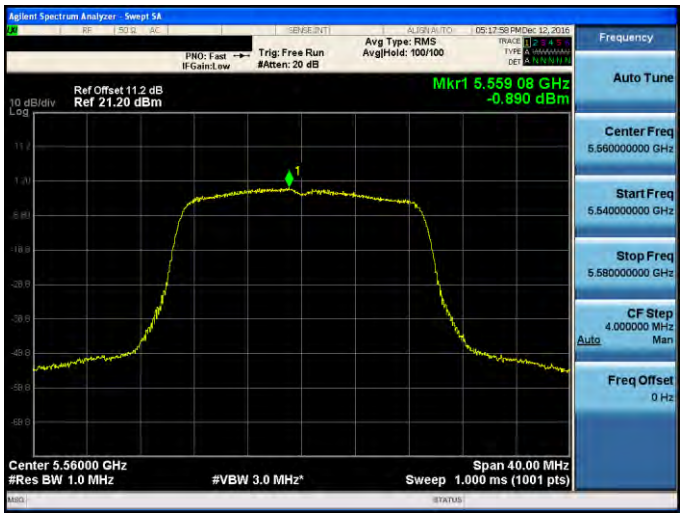
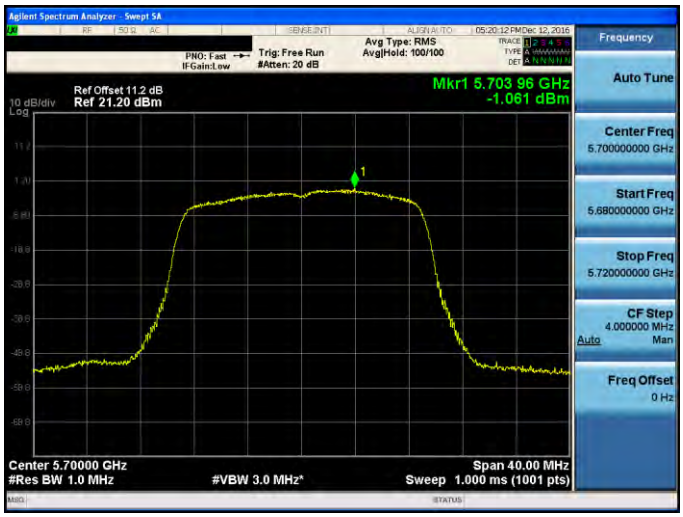
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-1	
5500 MHz	
5560 MHz	
5700 MHz	

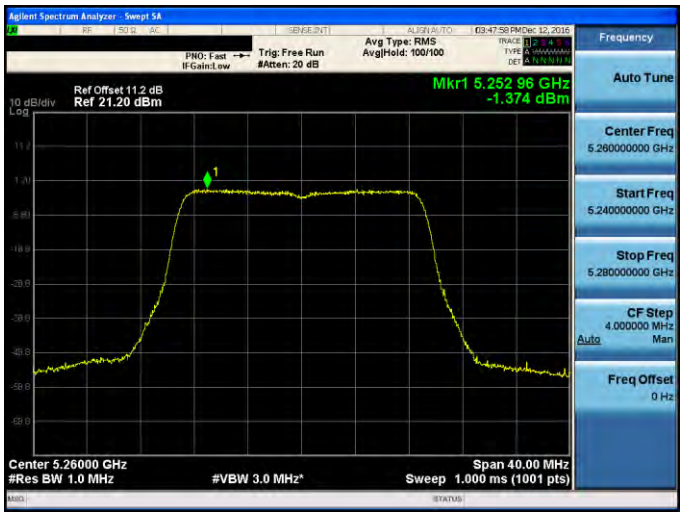
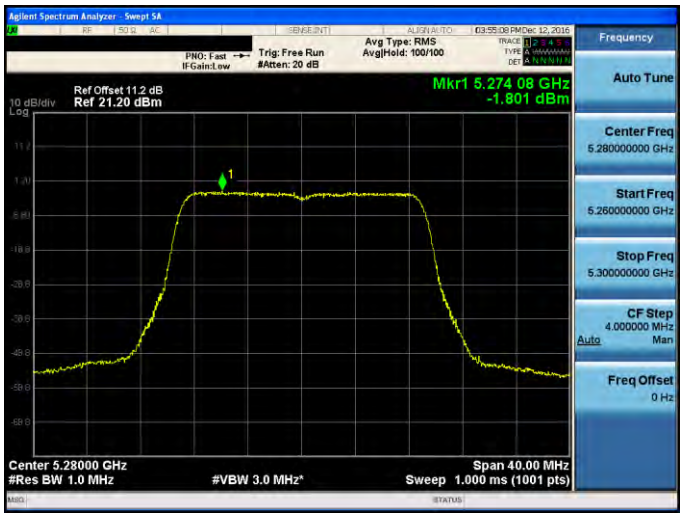
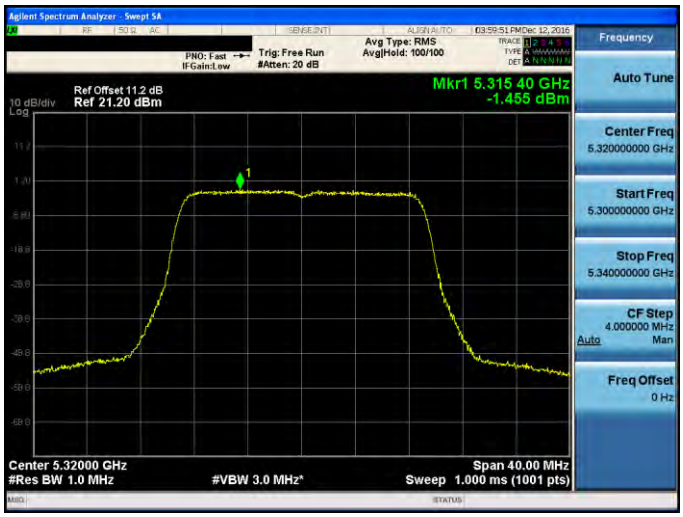
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-1	
5270 MHz	
5310 MHz	
5510 MHz	

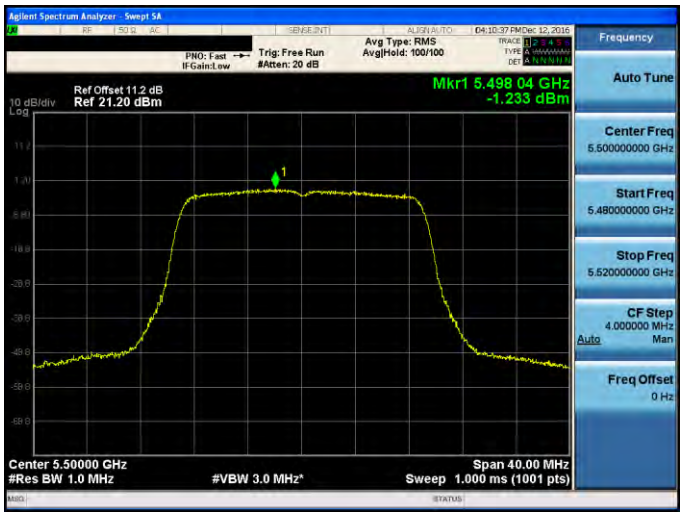
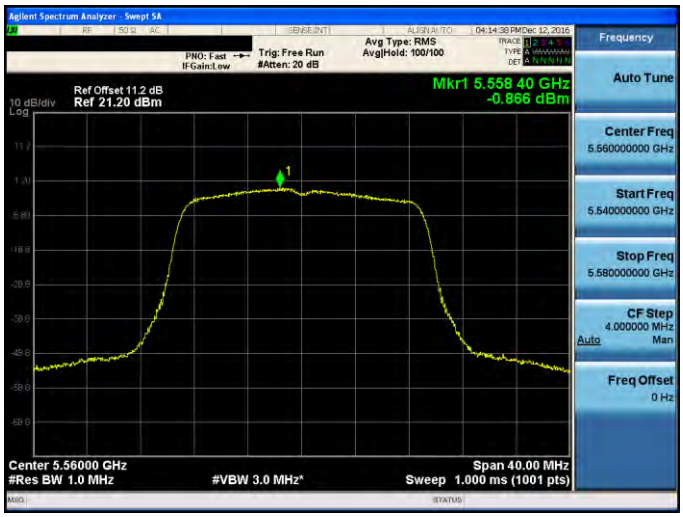
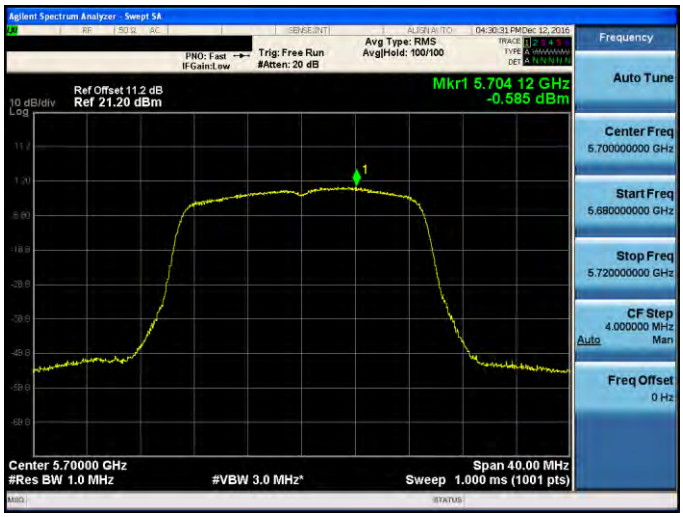
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-1	
5550 MHz	
5670 MHz	

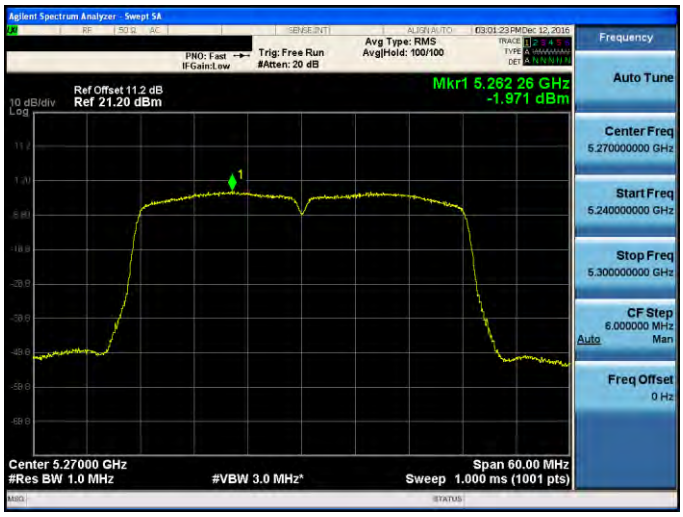
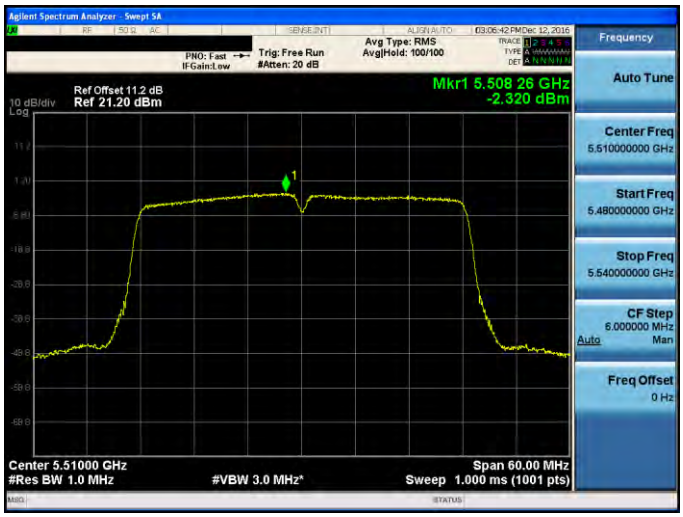
Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-1	
5290 MHz	
5530 MHz	

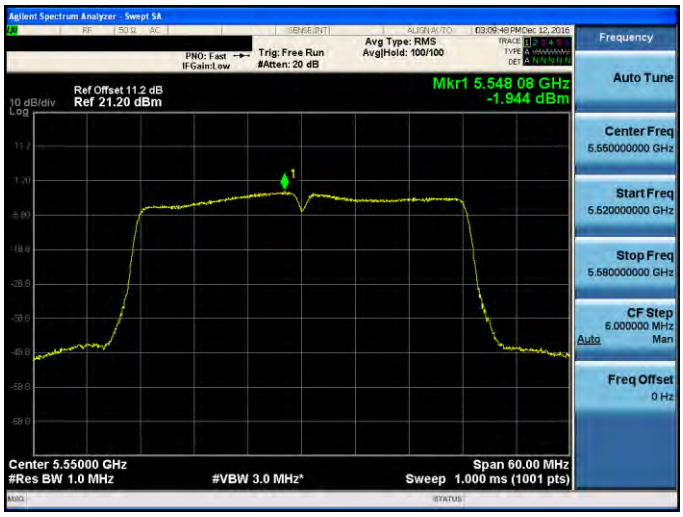
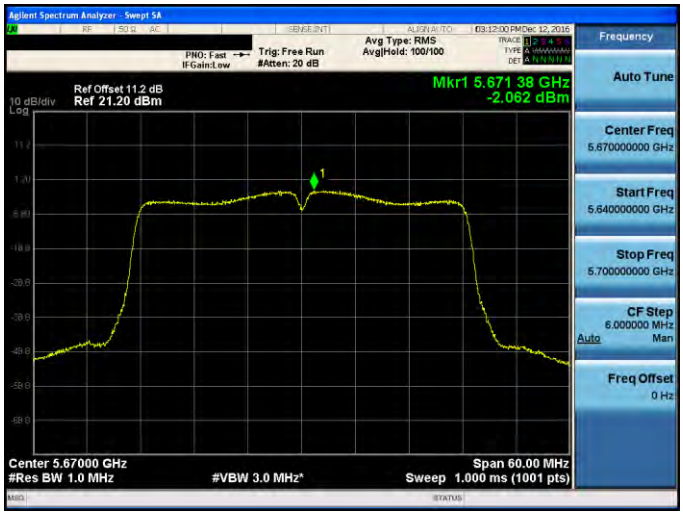
Mode 2: IEEE 802.11a Link Mode	
ANT-2	
5260 MHz	
5280 MHz	
5320 MHz	

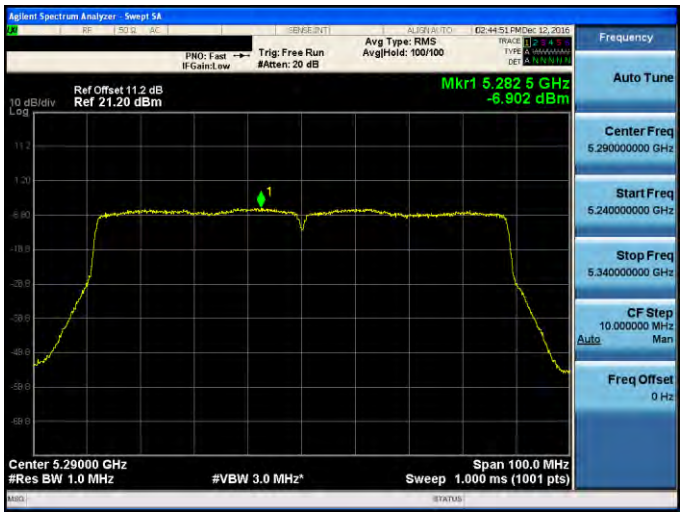
Mode 2: IEEE 802.11a Link Mode	
ANT-2	
5500 MHz	
5560 MHz	
5700 MHz	

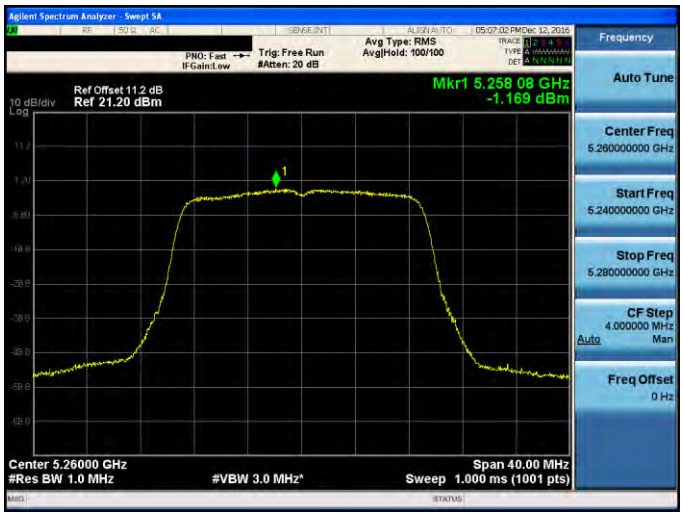
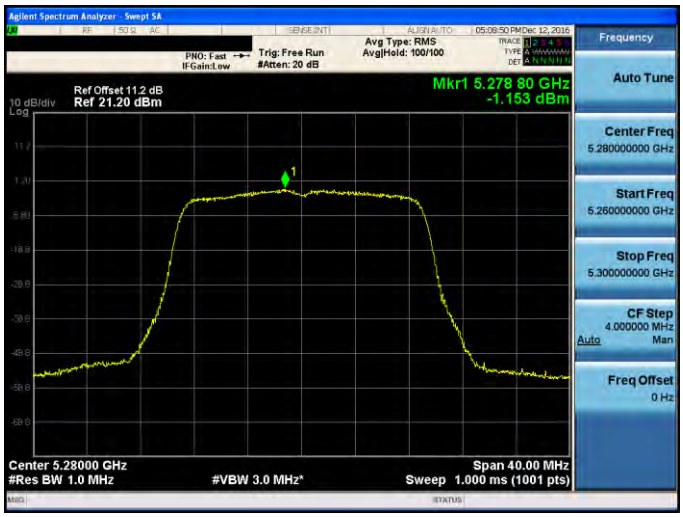
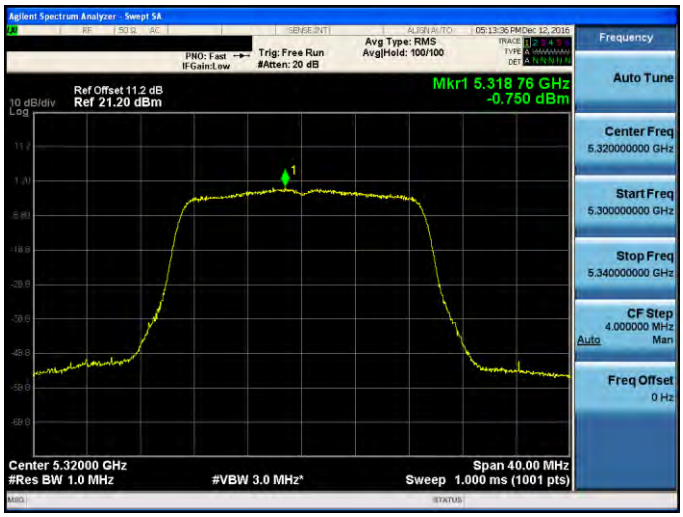
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-2	
5260 MHz	
5280 MHz	
5320 MHz	

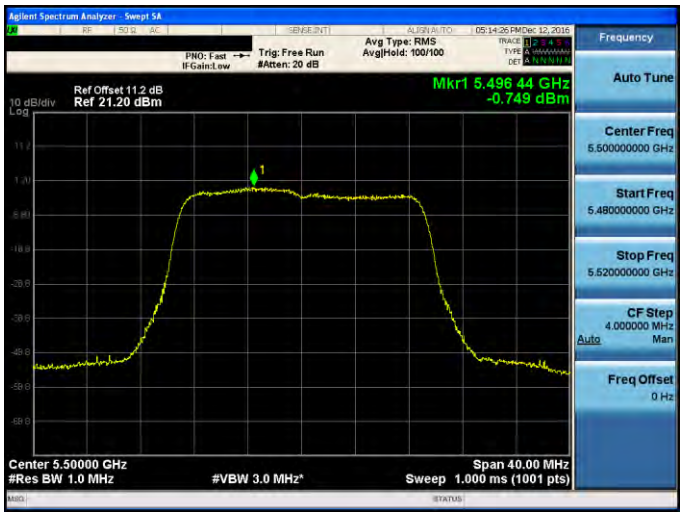
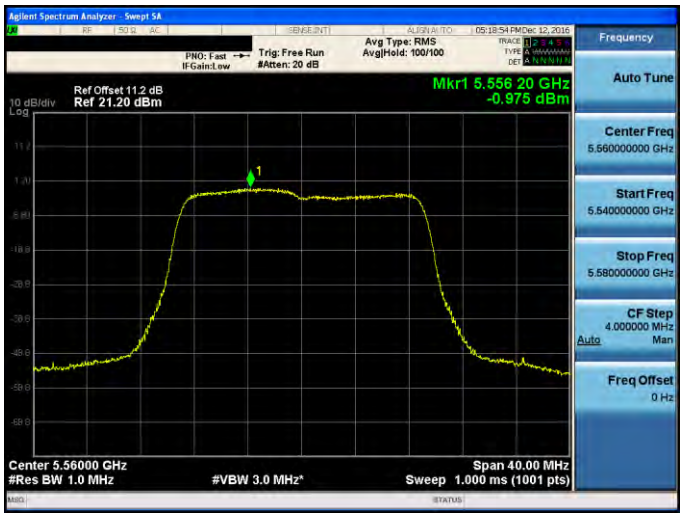
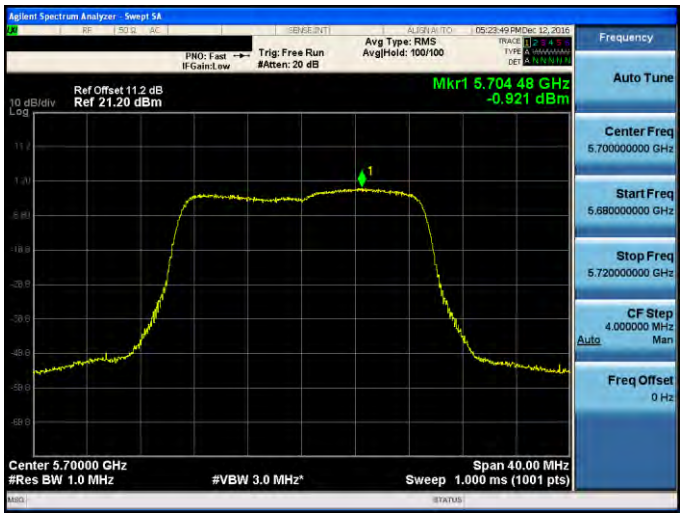
Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-2	
5500 MHz	
5560 MHz	
5700 MHz	

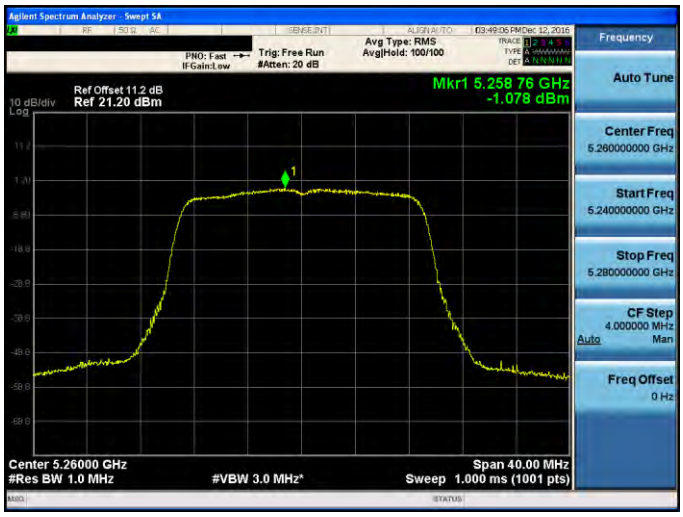
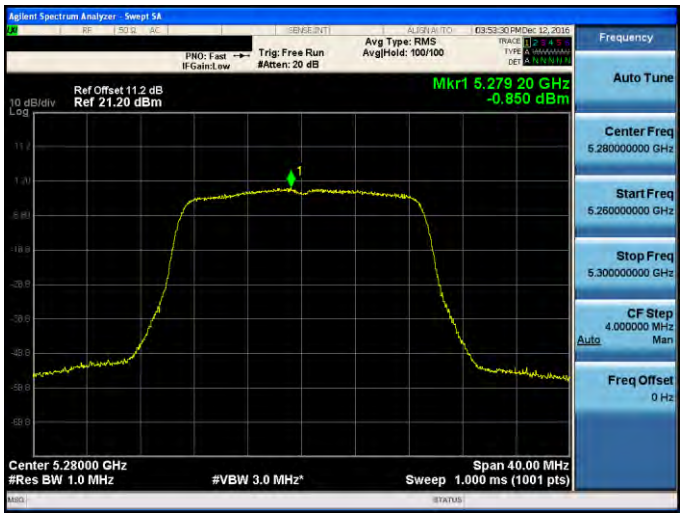
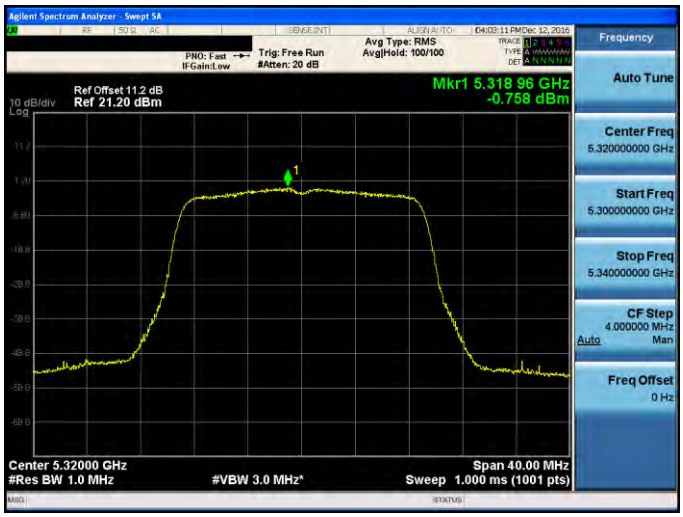
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-2	
5270 MHz	
5310 MHz	
5510 MHz	

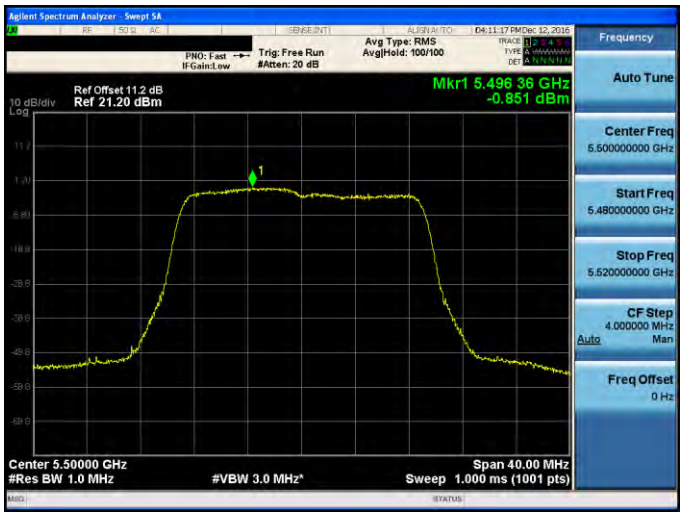
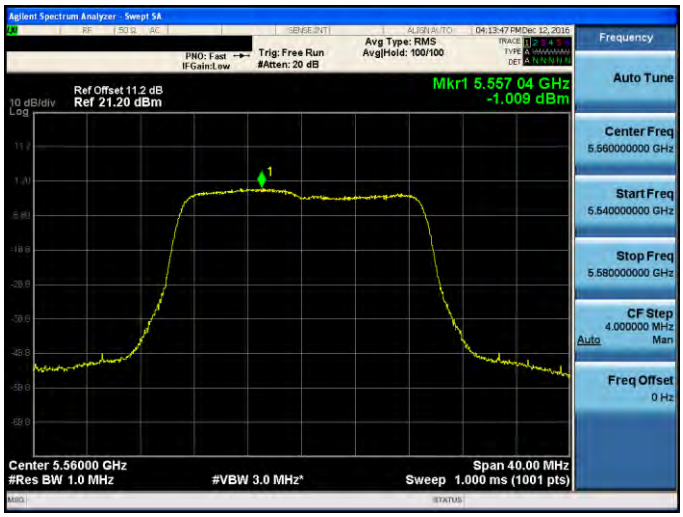
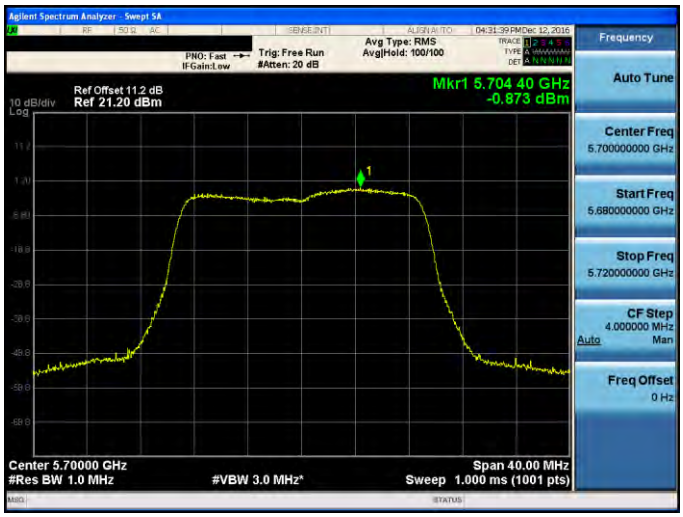
Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-2	
5550 MHz	
5670 MHz	

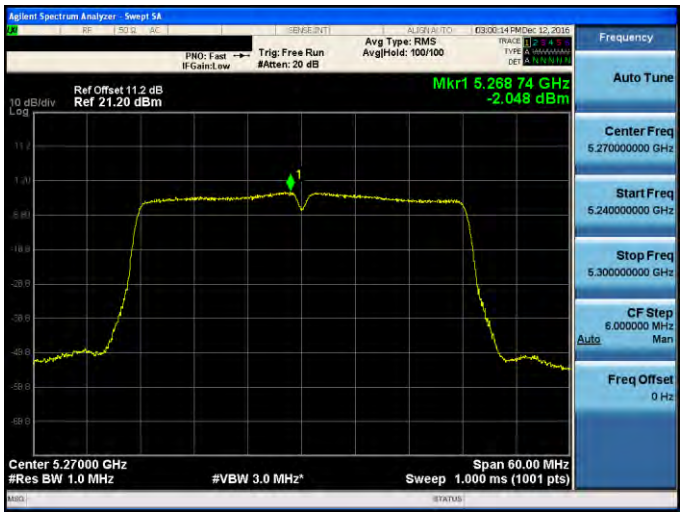
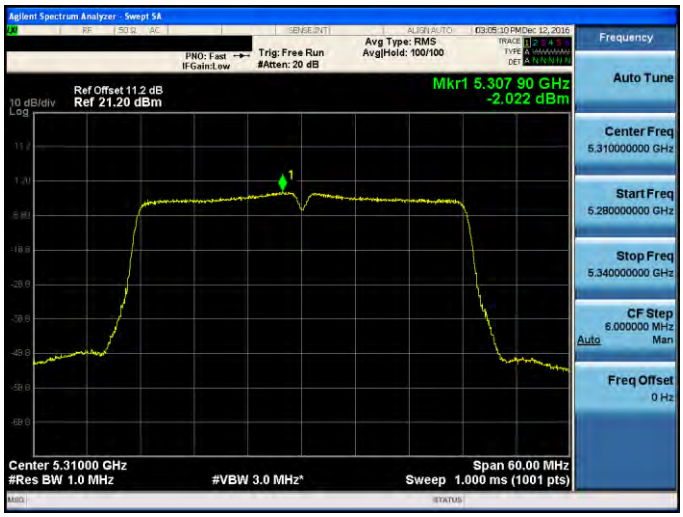
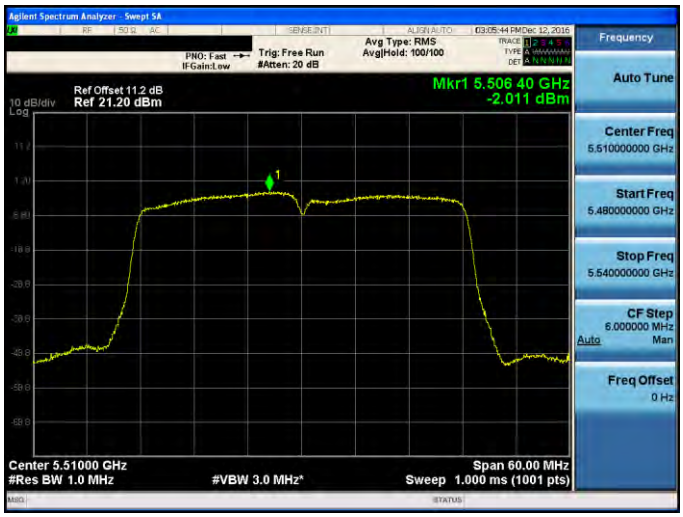
Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-2	
5290 MHz	
5530 MHz	

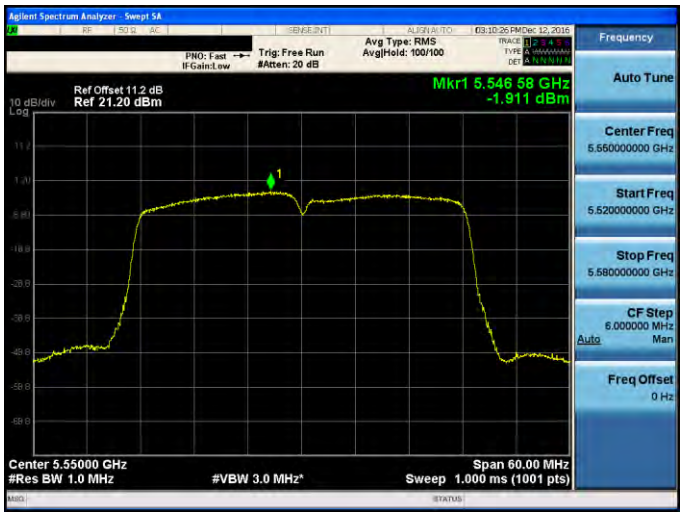
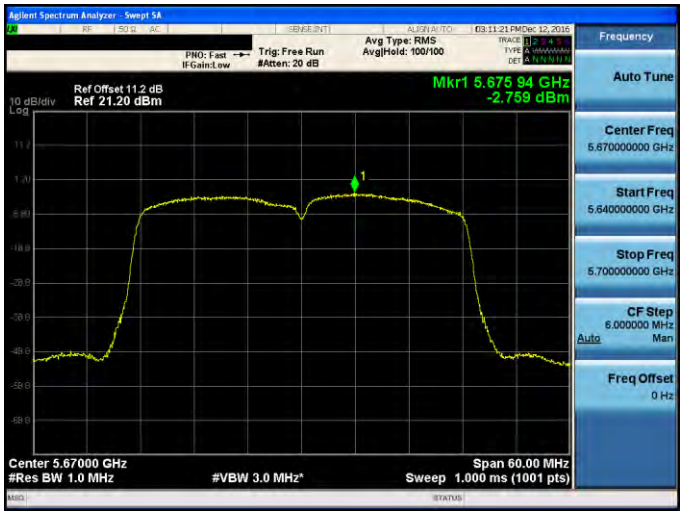
Mode 2: IEEE 802.11a Link Mode	
ANT-3	
5260 MHz	
5280 MHz	
5320 MHz	

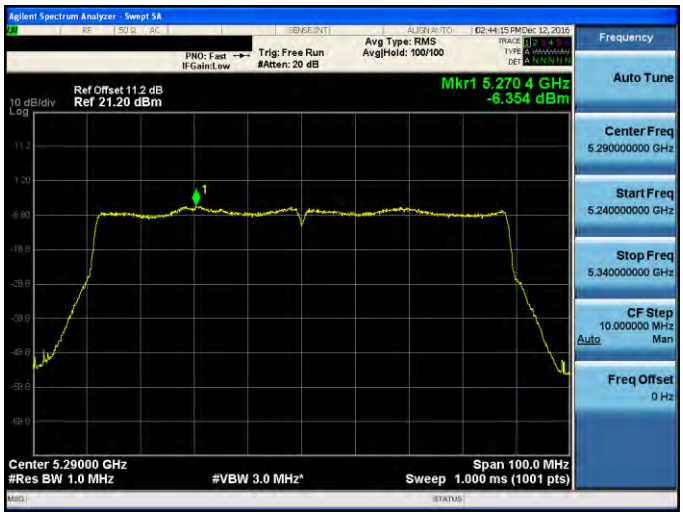
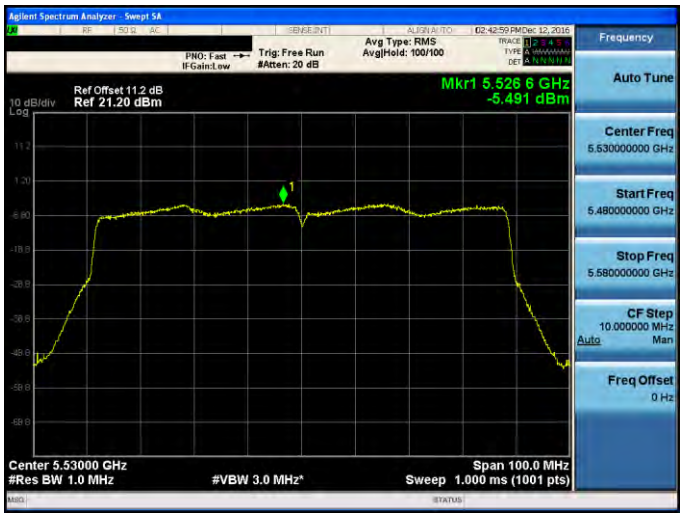
Mode 2: IEEE 802.11a Link Mode	
ANT-3	
5500 MHz	
5560 MHz	
5700 MHz	

Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-3	
5260 MHz	
5280 MHz	
5320 MHz	

Mode 3: IEEE 802.11ac 20MHz Link Mode	
ANT-3	
5500 MHz	
5560 MHz	
5700 MHz	

Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-3	
5270 MHz	
5310 MHz	
5510 MHz	

Mode 4: IEEE 802.11ac 40MHz Link Mode	
ANT-3	
5550 MHz	
5670 MHz	

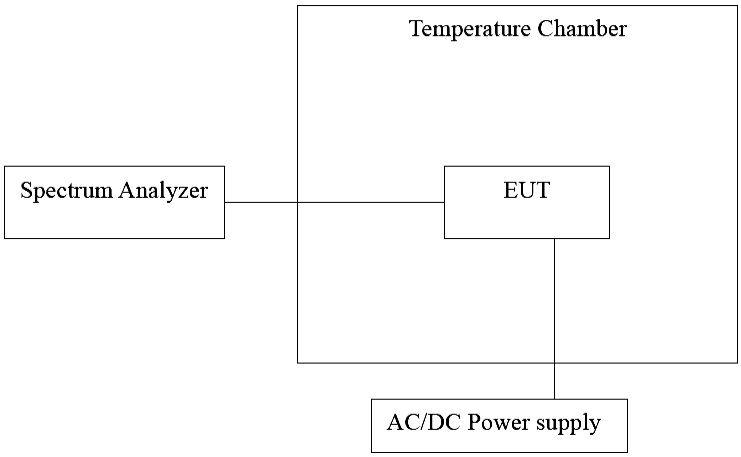
Mode 5: IEEE 802.11ac 80MHz Link Mode	
ANT-3	
5290 MHz	
5530 MHz	

4.7. Frequency Stability Measurement

■ **Limit**

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

■ **Test Setup**



■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4408B	MY45107753	08/08/2016	1 year
Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	04/18/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Test Procedure**

1. The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. 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 Result**

Module : QCA9984 (EW-7955MAC)

Temperature Variations

Frequency	Temp. (°C)	Voltage (Vac)	Measured Freq. (MHz)	Delta Freq. (Hz)	Tolerance (ppm)	Result (Pass/Fail)
5280 MHz	-30	120	5280.0377	37700	7.140	Pass
	-20		5280.0396	39600	7.500	Pass
	-10		5280.0379	37900	7.178	Pass
	0		5280.0408	40800	7.727	Pass
	10		5280.0449	44900	8.504	Pass
	20		5280.0474	47400	8.977	Pass
	30		5280.0561	56100	10.625	Pass
	40		5280.0510	51000	9.659	Pass
	50		5280.0527	52700	9.981	Pass
5560 MHz	-30	120	5560.0479	47900	8.615	Pass
	-20		5560.0470	47000	8.453	Pass
	-10		5560.0490	49000	8.813	Pass
	0		5560.0466	46600	8.381	Pass
	10		5560.0397	39700	7.140	Pass
	20		5560.0495	49500	8.903	Pass
	30		5560.0582	58200	10.468	Pass
	40		5560.0571	57100	10.270	Pass
	50		5560.0590	59000	10.612	Pass

Voltage Variations

Frequency	Temp. (°C)	Voltage (Vac)	Measured Freq. (MHz)	Delta Freq. (Hz)	Tolerance (ppm)	Result (Pass/Fail)
5280 MHz	20	138.00	5280.0400	40000	7.576	Pass
		120.00	5280.0474	47400	8.977	Pass
		102.00	5280.0574	57400	10.871	Pass
5560 MHz	20	138.00	5560.0467	46700	8.399	Pass
		120.00	5560.0495	49500	8.903	Pass
		102.00	5560.0526	52600	9.460	Pass

Note: The manufacturer's frequency stability specification is better then 20ppm.

Module : QCA9990 (EW-7944MAC)

Temperature Variations

Frequency	Temp. (°C)	Voltage (Vac)	Measured Freq. (MHz)	Delta Freq. (Hz)	Tolerance (ppm)	Result (Pass/Fail)
5280 MHz	-30	120	5280.0334	33400	6.326	Pass
	-20		5280.0364	36400	6.894	Pass
	-10		5280.0324	32400	6.136	Pass
	0		5280.0344	34400	6.515	Pass
	10		5280.0344	34400	6.515	Pass
	20		5280.0414	41400	7.841	Pass
	30		5280.0434	43400	8.220	Pass
	40		5280.0504	50400	9.545	Pass
	50		5280.0464	46400	8.788	Pass
5560 MHz	-30	120	5560.0327	32700	5.881	Pass
	-20		5560.0357	35700	6.421	Pass
	-10		5560.0417	41700	7.500	Pass
	0		5560.0347	34700	6.241	Pass
	10		5560.0317	31700	5.701	Pass
	20		5560.0417	41700	7.500	Pass
	30		5560.0467	46700	8.399	Pass
	40		5560.0437	43700	7.860	Pass
	50		5560.0437	43700	7.860	Pass

Voltage Variations

Frequency	Temp. (°C)	Voltage (Vac)	Measured Freq. (MHz)	Delta Freq. (Hz)	Tolerance (ppm)	Result (Pass/Fail)
5280 MHz	20	138.00	5280.0334	33400	6.326	Pass
		120.00	5280.0414	41400	7.841	Pass
		102.00	5280.0474	47400	8.977	Pass
5560 MHz	20	138.00	5560.0317	31700	5.701	Pass
		120.00	5560.0417	41700	7.500	Pass
		102.00	5560.0427	42700	7.680	Pass

Note: The manufacturer's frequency stability specification is better then 20ppm.

4.8. Antenna Requirement

■ **Limit**

For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And According to 15.407 (a), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

■ **Antenna Connector Construction**

See section 2 – antenna information.

■ **Directional Gain Calculated**

For Maximum Conducted Output Power

Directional Gain = 10*log{[10^(G1/20)+10^(G2/20)+…+10^(Gn/20)]^2/NANT}

Module : QCA9984 (EW-7955MAC)		
Operate Freq. Band		Directional Gain (dBi)
IEEE 802.11a	U-NII Band II-A	7
	U-NII Band II-C	7
IEEE 802.11ac 20MHz	U-NII Band II-A	13.02
	U-NII Band II-C	13.02
IEEE 802.11ac 40MHz	U-NII Band II-A	13.02
	U-NII Band II-C	13.02
IEEE 802.11ac 80MHz	U-NII Band II-A	13.02
	U-NII Band II-C	13.02
Module : QCA9990 (EW-7944MAC)		
Operate Freq. Band		Directional Gain (dBi)
IEEE 802.11a	U-NII Band II-A	6
	U-NII Band II-C	6
IEEE 802.11ac 20MHz	U-NII Band II-A	12.02
	U-NII Band II-C	12.02
IEEE 802.11ac 40MHz	U-NII Band II-A	12.02
	U-NII Band II-C	12.02
IEEE 802.11ac 80MHz	U-NII Band II-A	12.02
	U-NII Band II-C	12.02

For Peak Power Spectral Density

Directional Gain = 10*log{[10^(G1/20)+10^(G2/20)+…+10^(Gn/20)]^2/NANT}

Module : QCA9984 (EW-7955MAC)		
Operate Freq. Band		Directional Gain (dBi)
IEEE 802.11a	U-NII Band II-A	13.02
	U-NII Band II-C	13.02
IEEE 802.11ac 20MHz	U-NII Band II-A	13.02
	U-NII Band II-C	13.02
IEEE 802.11ac 40MHz	U-NII Band II-A	13.02
	U-NII Band II-C	13.02
IEEE 802.11ac 80MHz	U-NII Band II-A	13.02
	U-NII Band II-C	13.02
Module : QCA9984 (EW-7955MAC)		
Operate Freq. Band		Directional Gain (dBi)
IEEE 802.11a	U-NII Band II-A	12.02
	U-NII Band II-C	12.02
IEEE 802.11ac 20MHz	U-NII Band II-A	12.02
	U-NII Band II-C	12.02
IEEE 802.11ac 40MHz	U-NII Band II-A	12.02
	U-NII Band II-C	12.02
IEEE 802.11ac 80MHz	U-NII Band II-A	12.02
	U-NII Band II-C	12.02