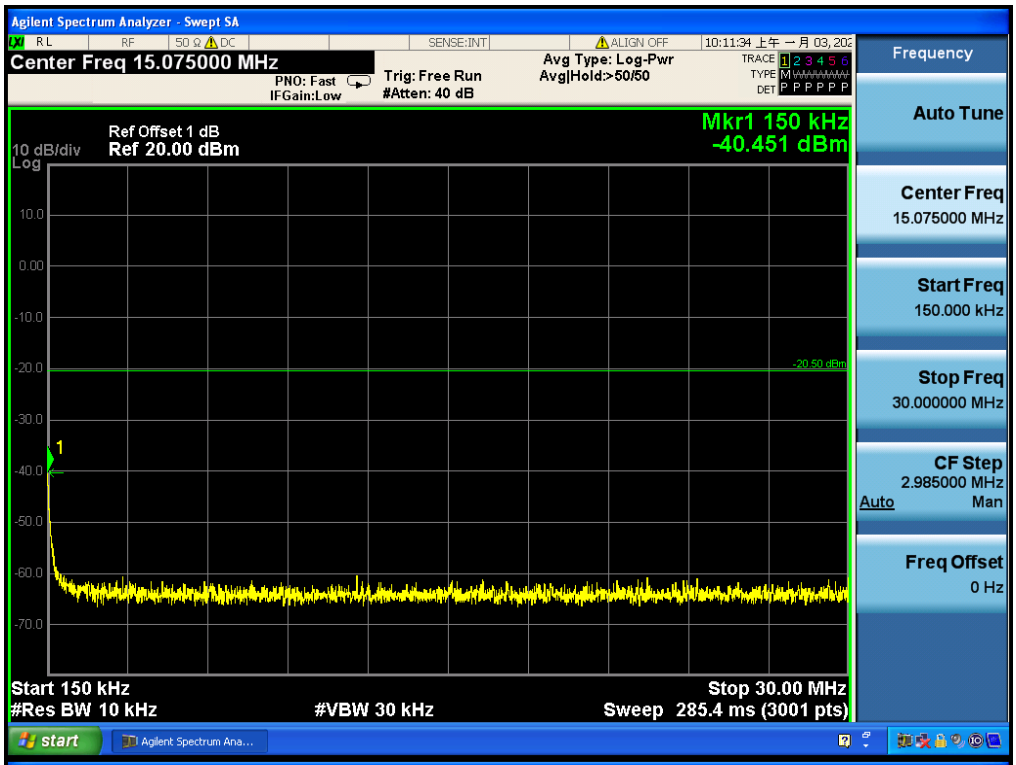

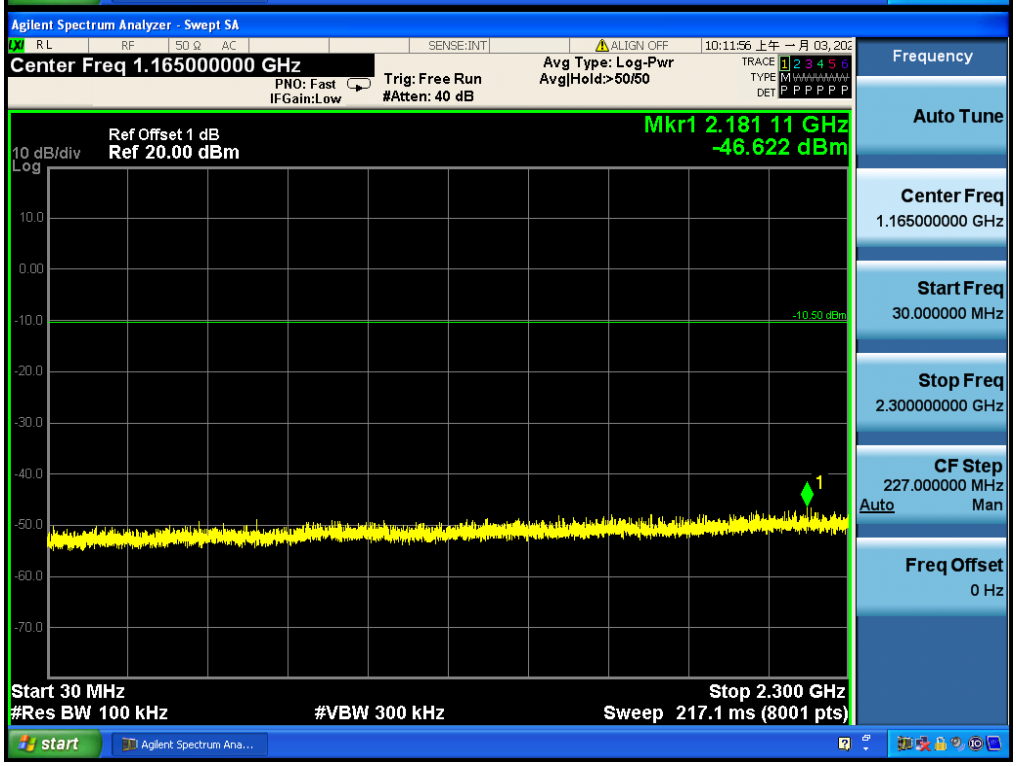

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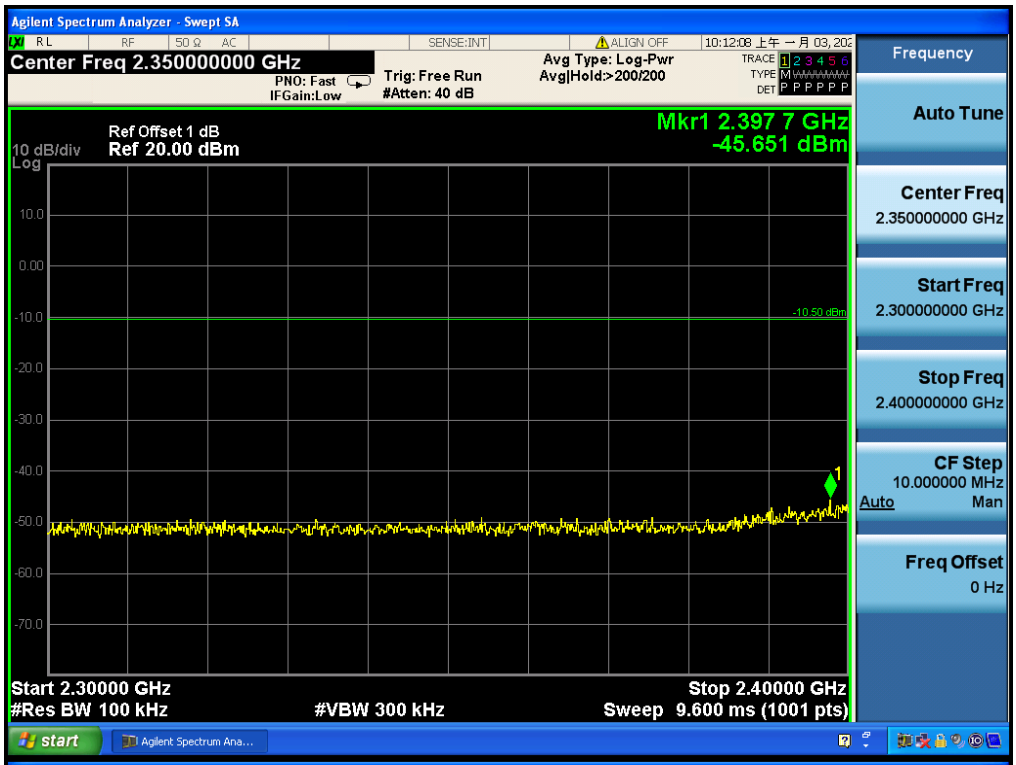

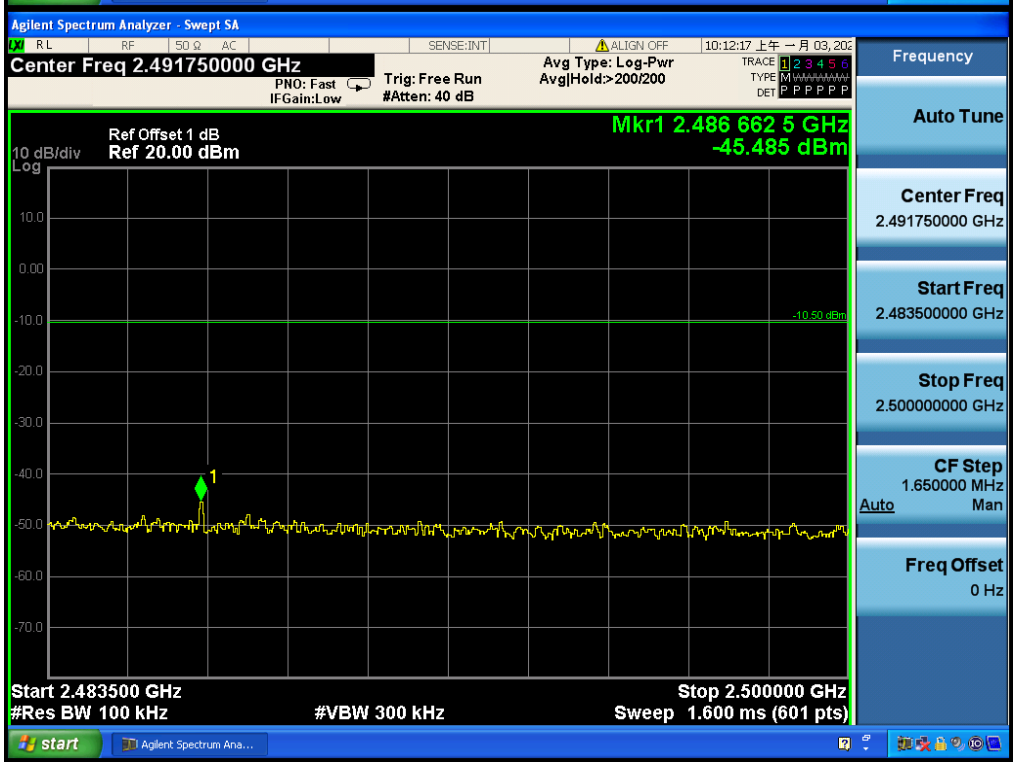

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4.8.1.2.6 802.11G_ Highest Channel

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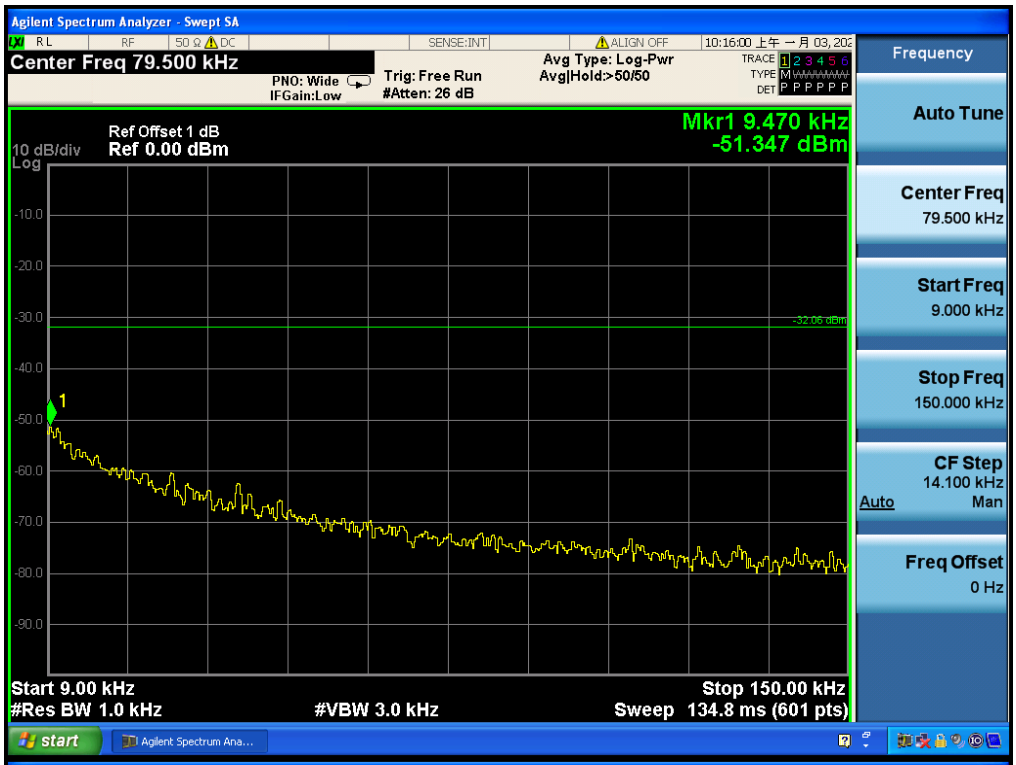

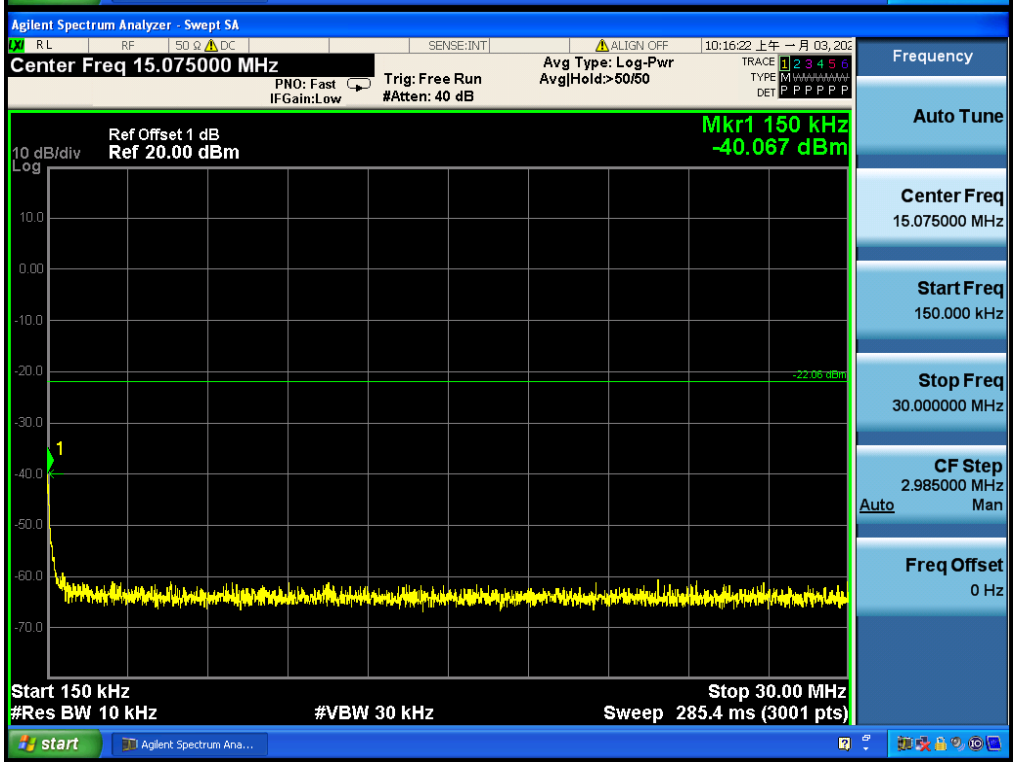

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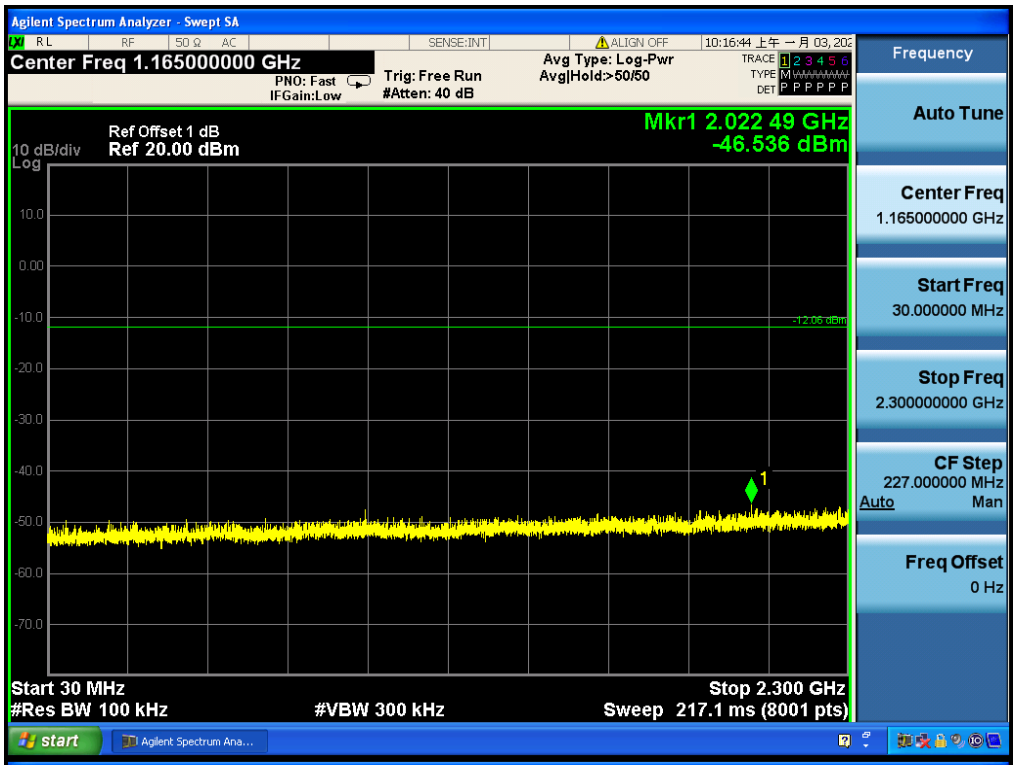

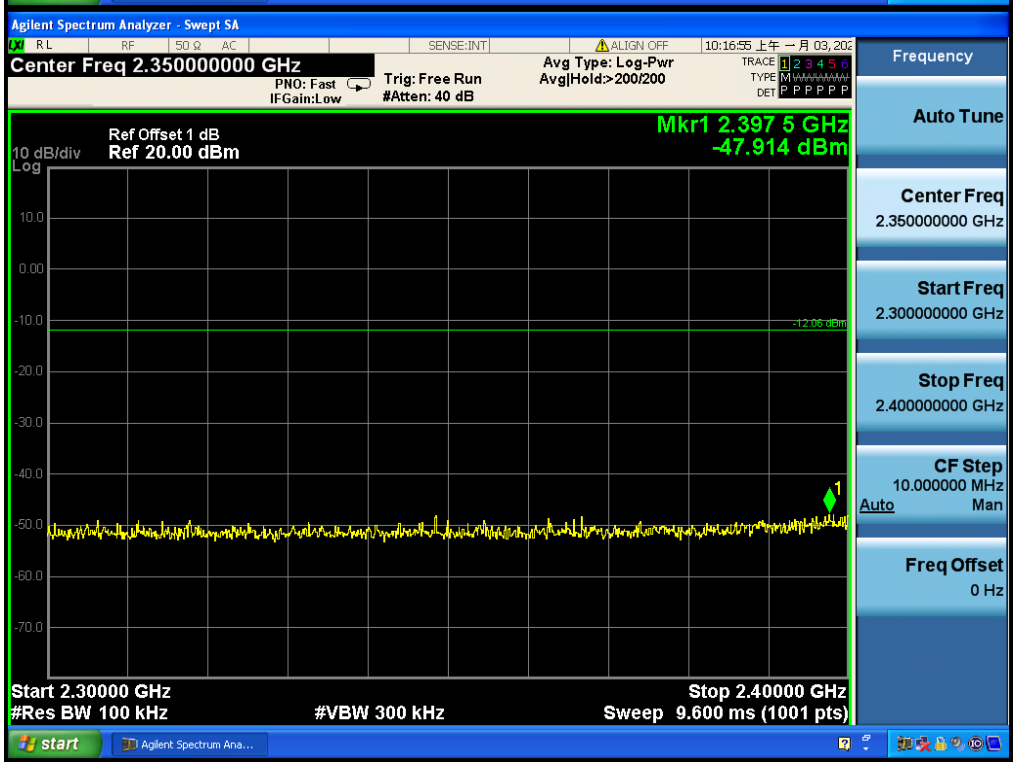

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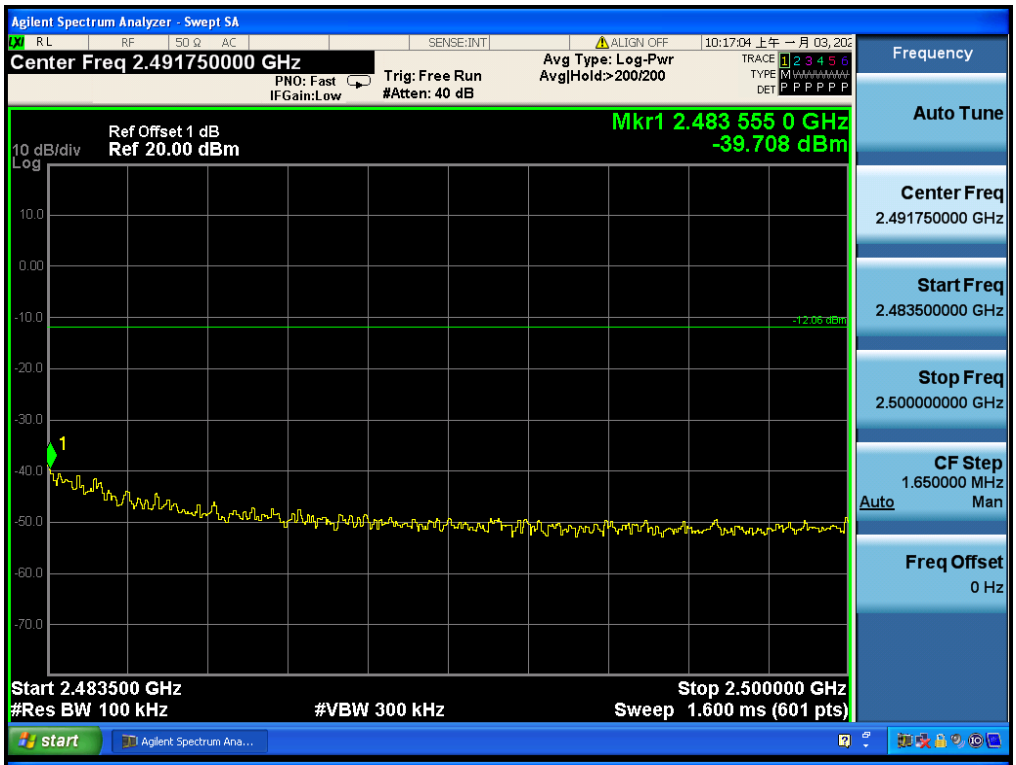

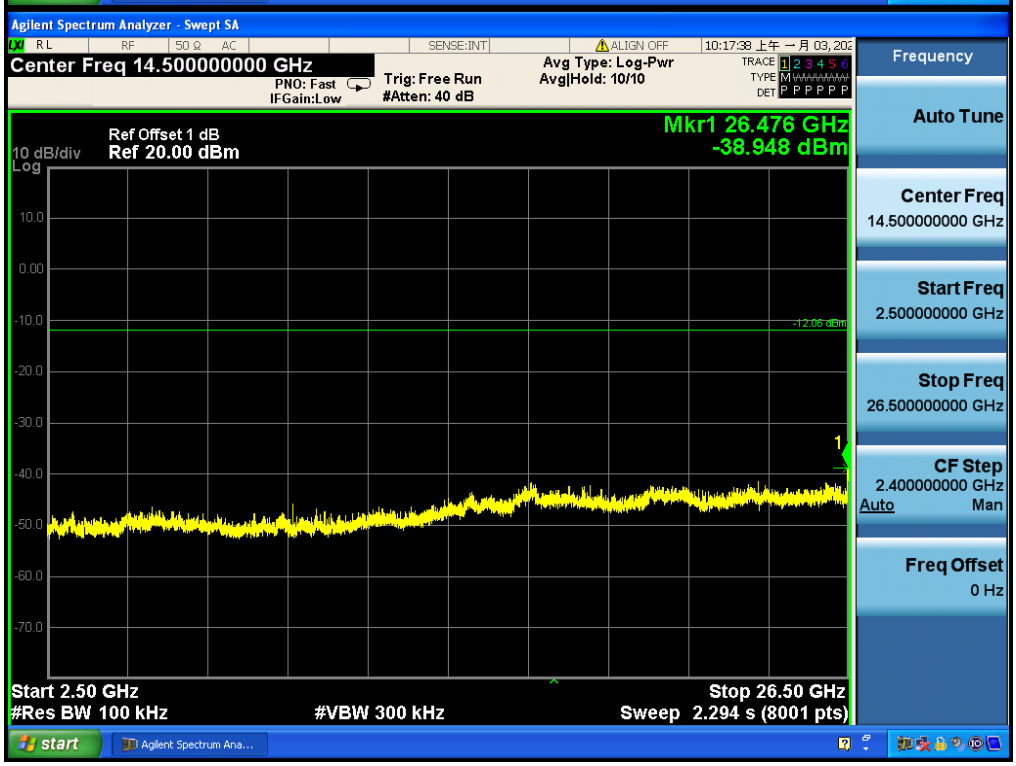

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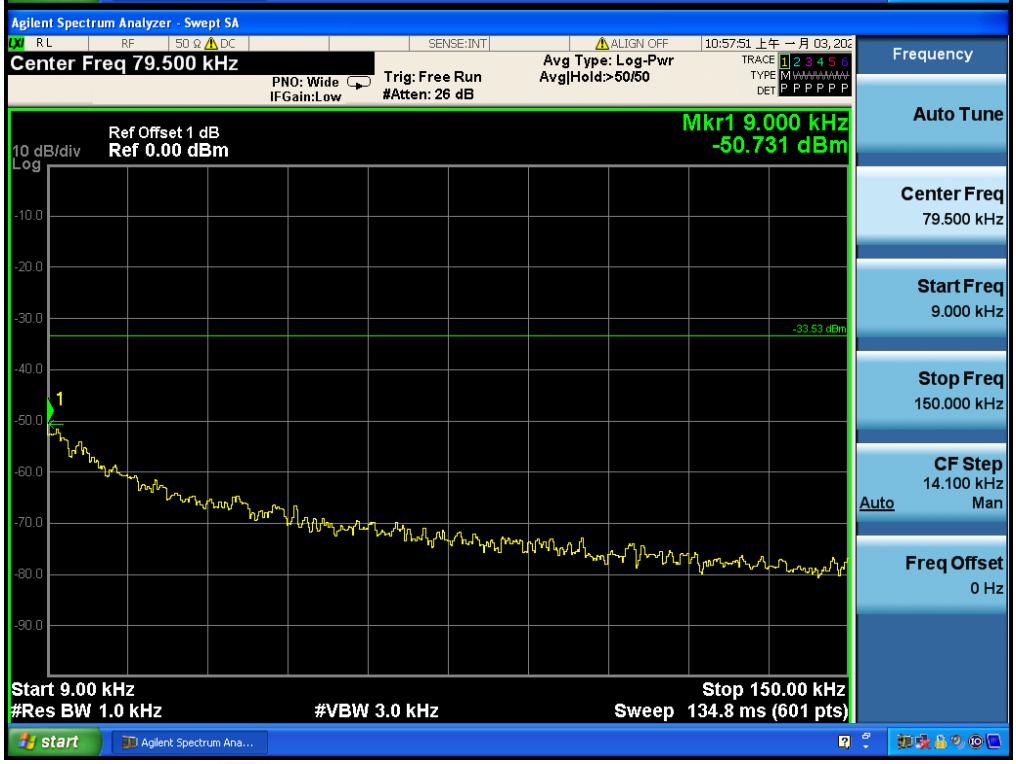
4.8.1.2.7 802.11N20_Lowest Channel



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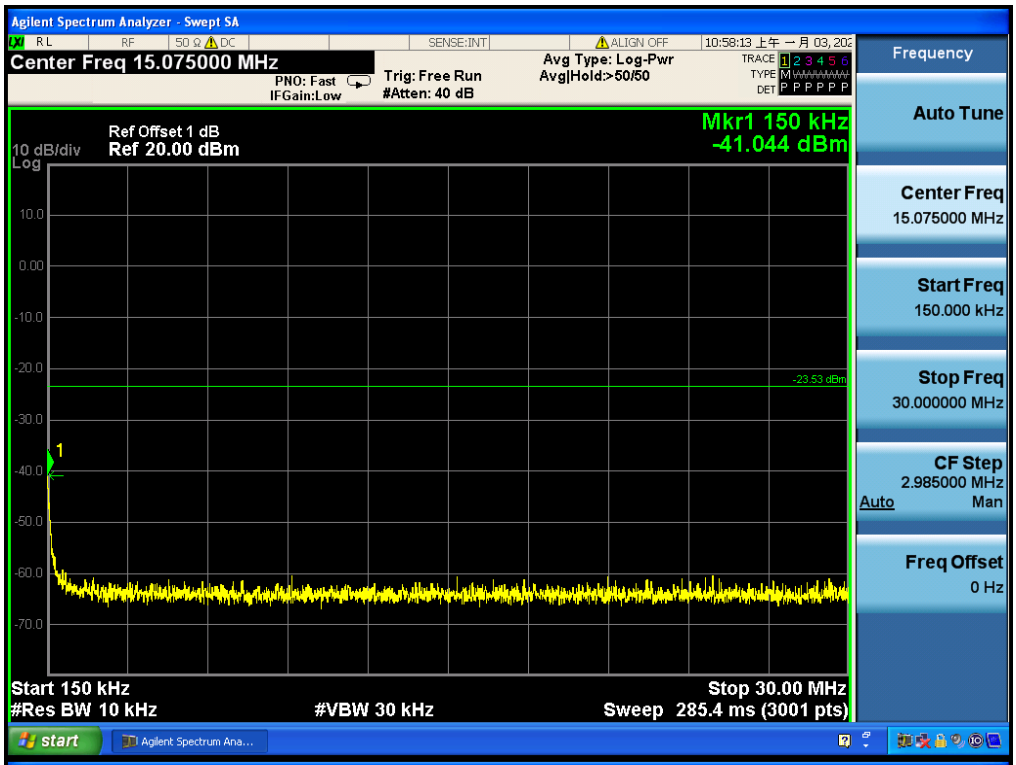

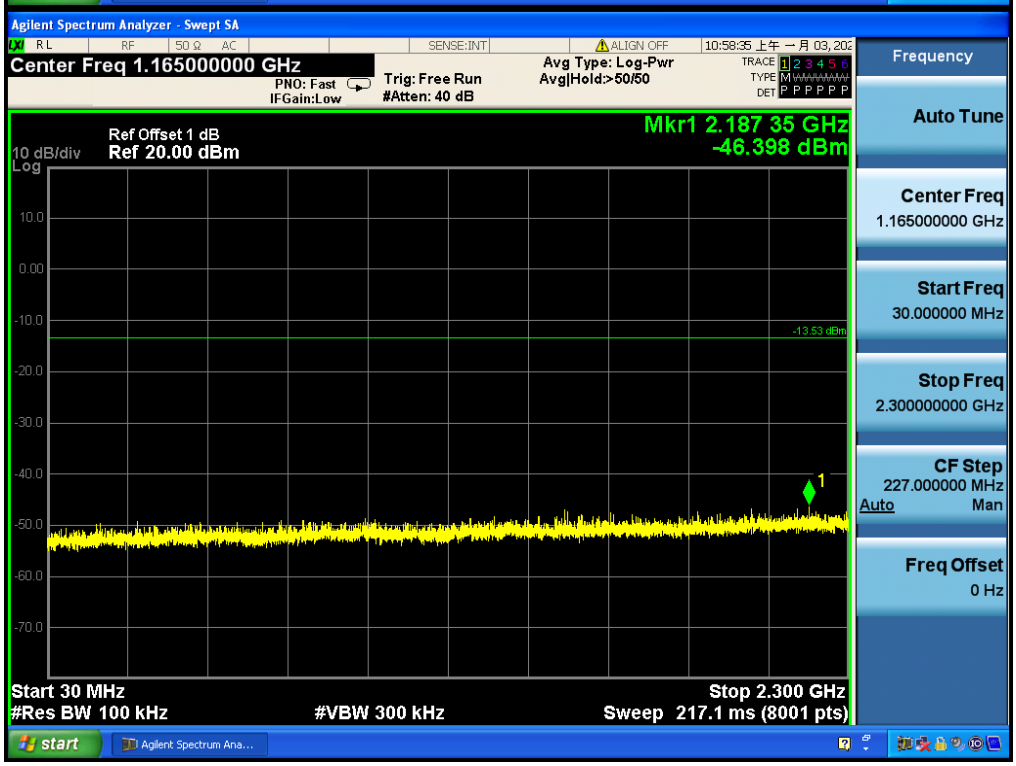

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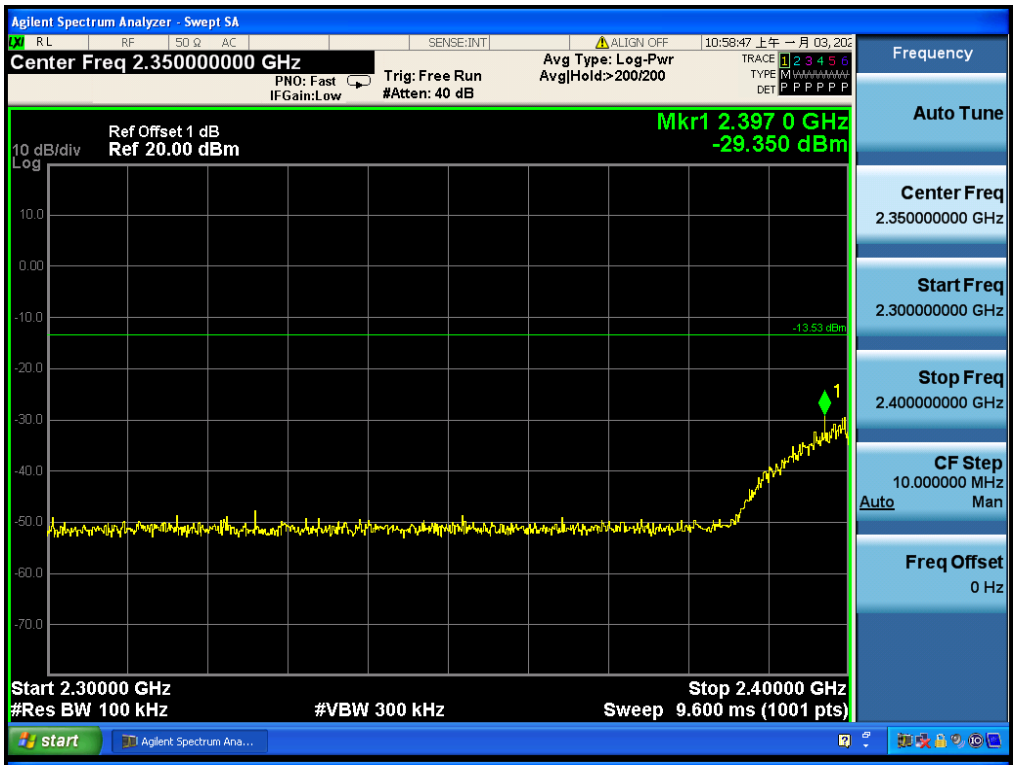

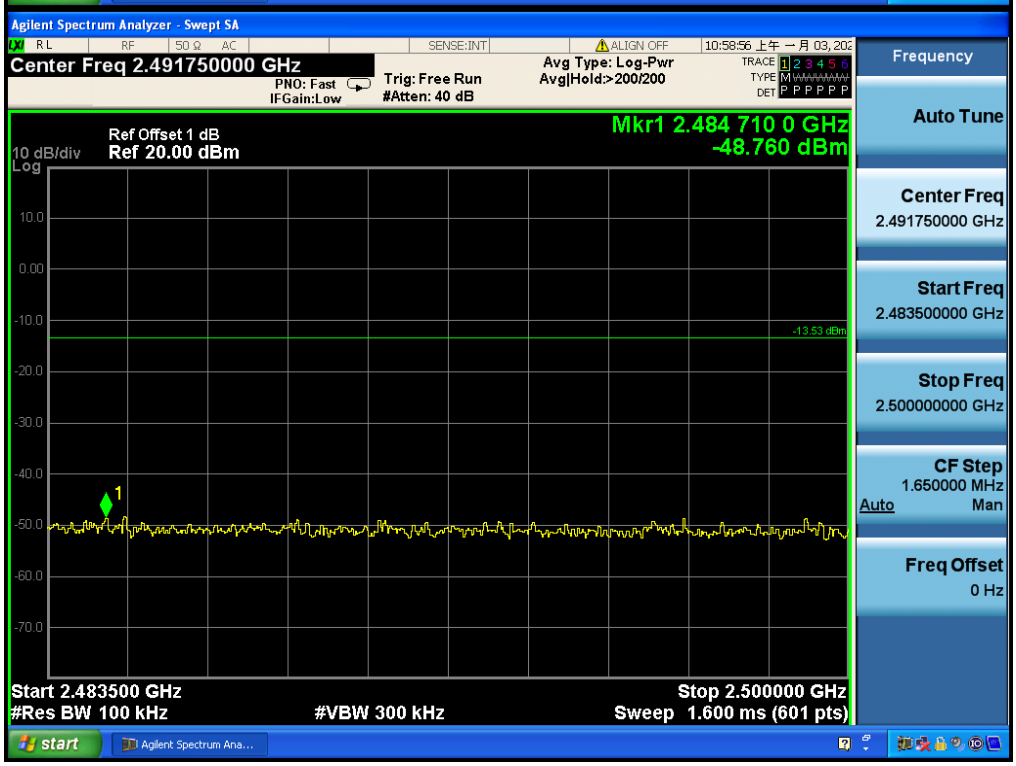

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4.8.1.2.8 802.11 N20_ Middle Channel

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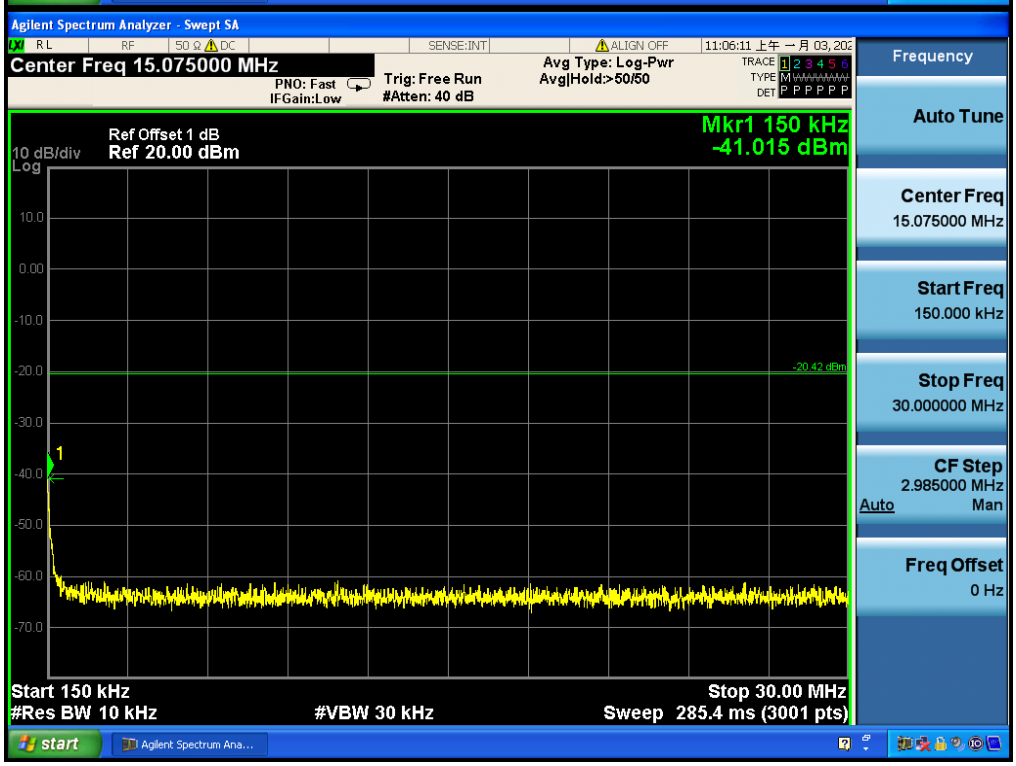

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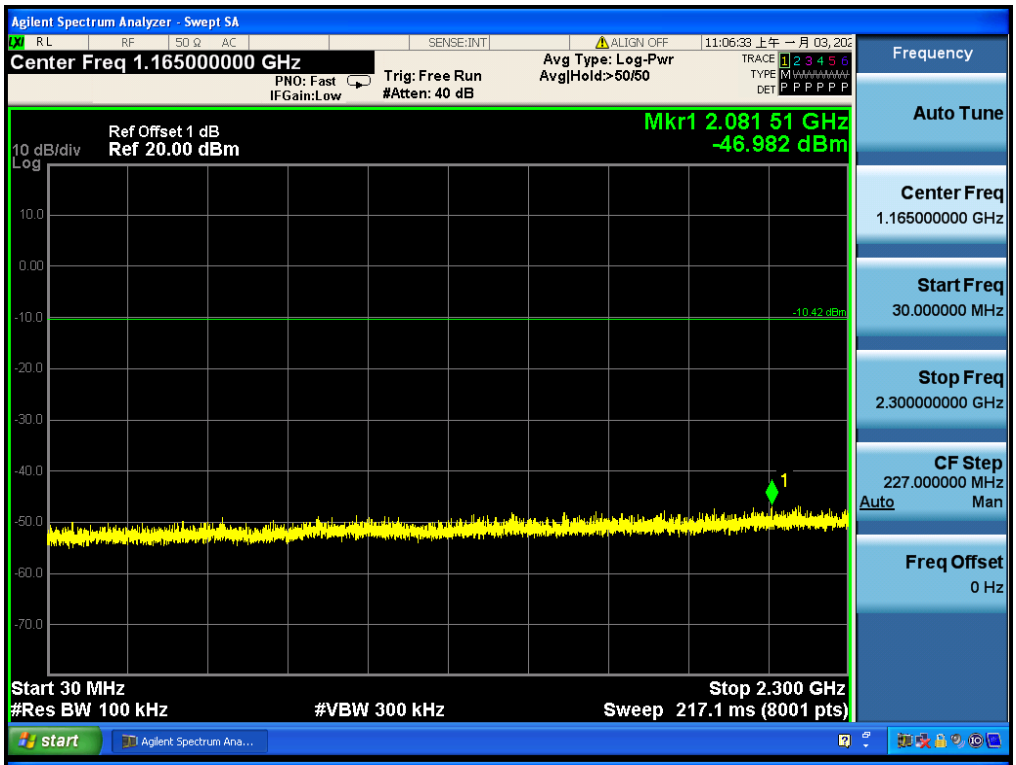

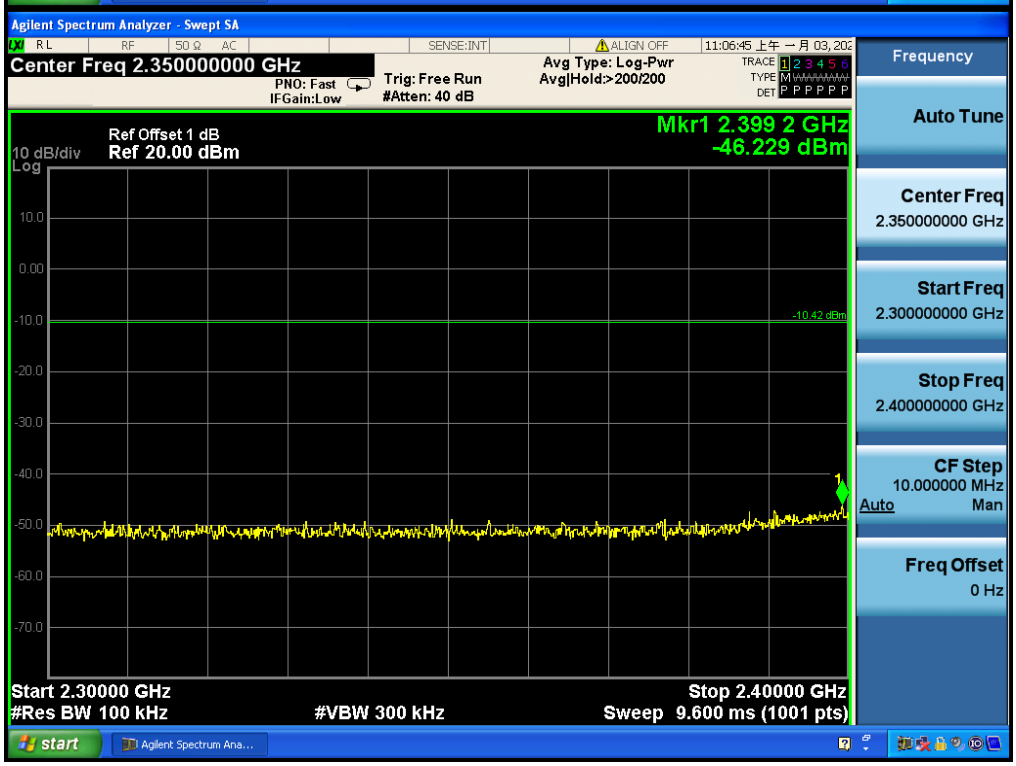

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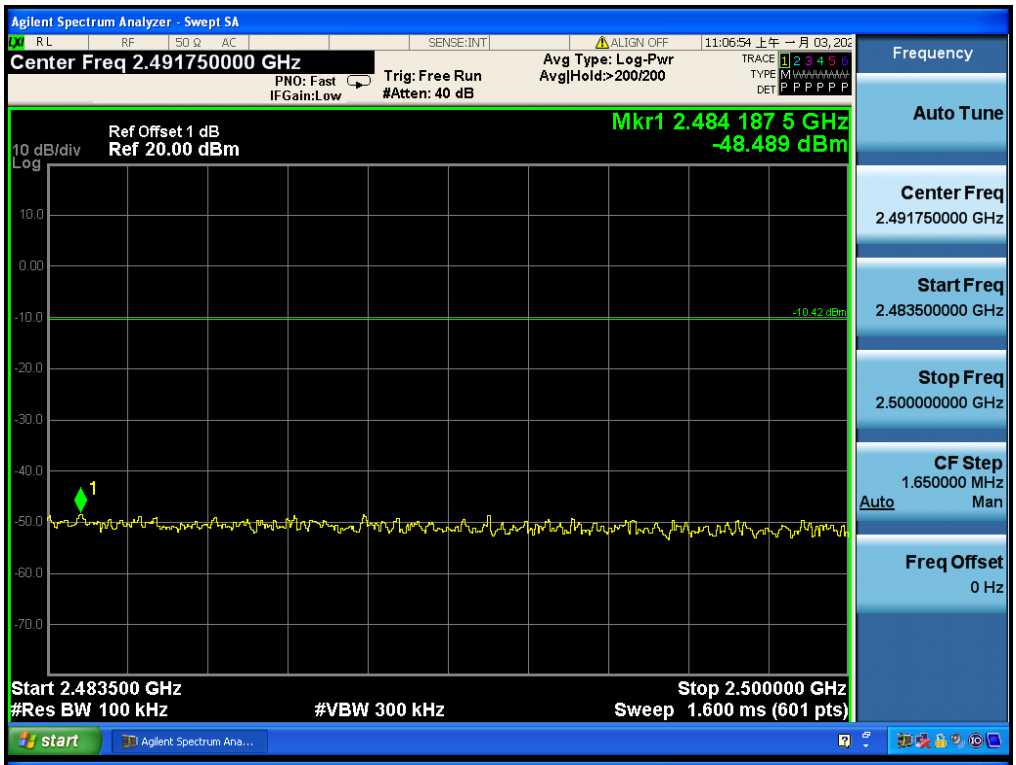

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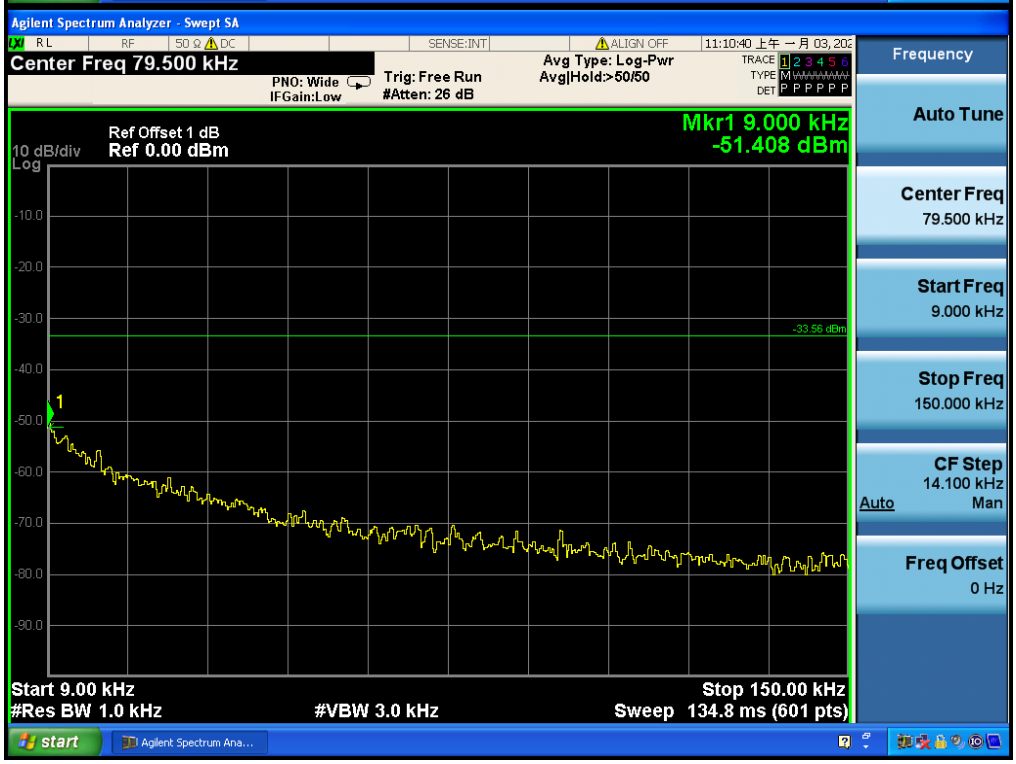
4.8.1.2.9 802.11 N20_ Highest Channel



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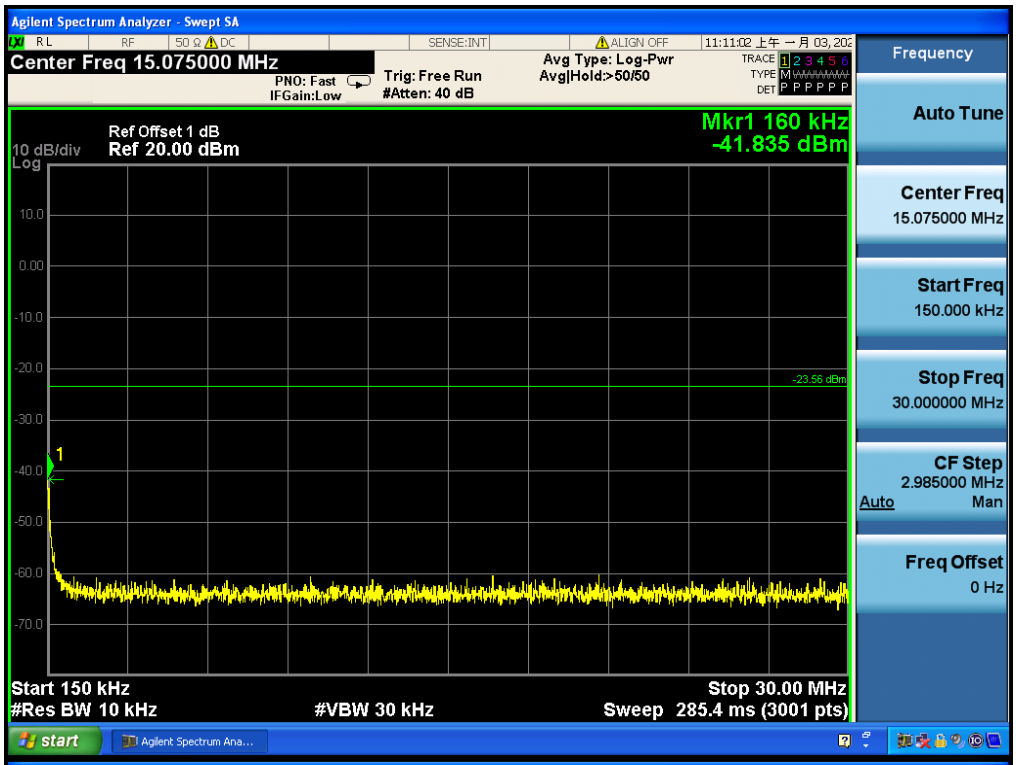

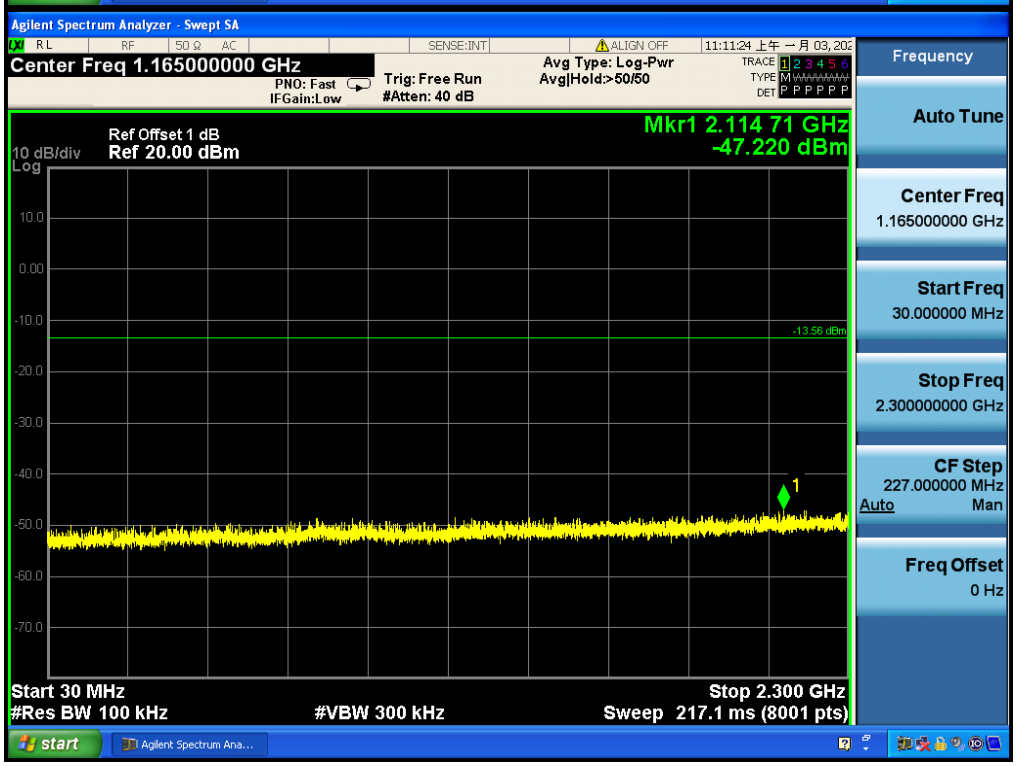

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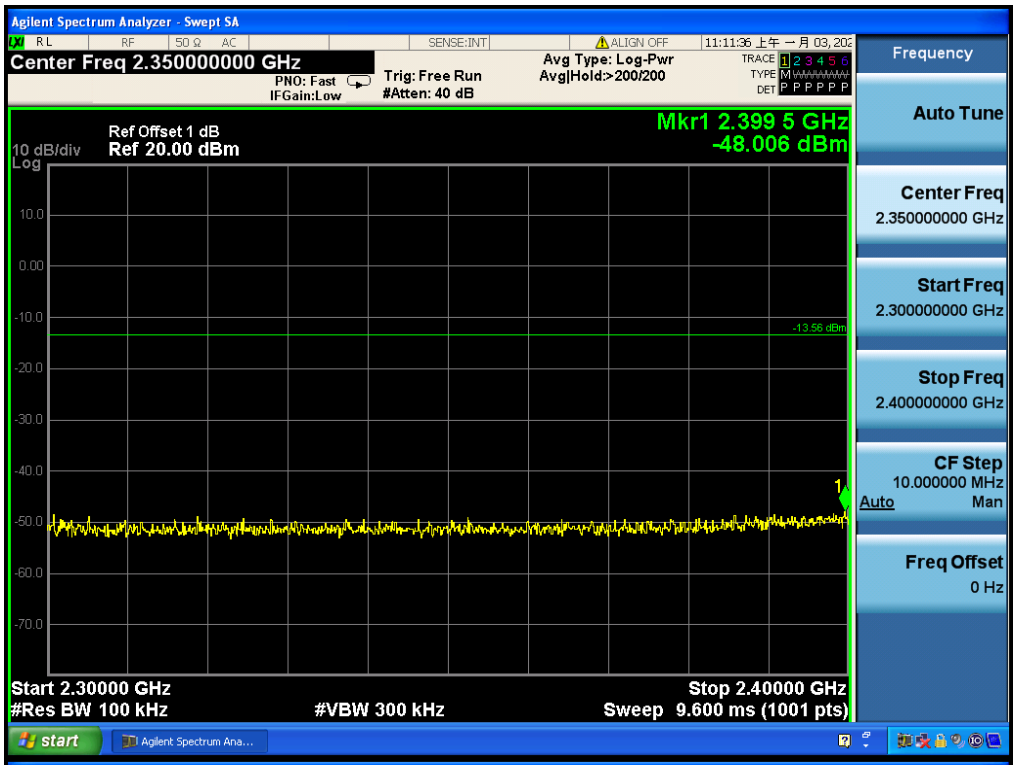

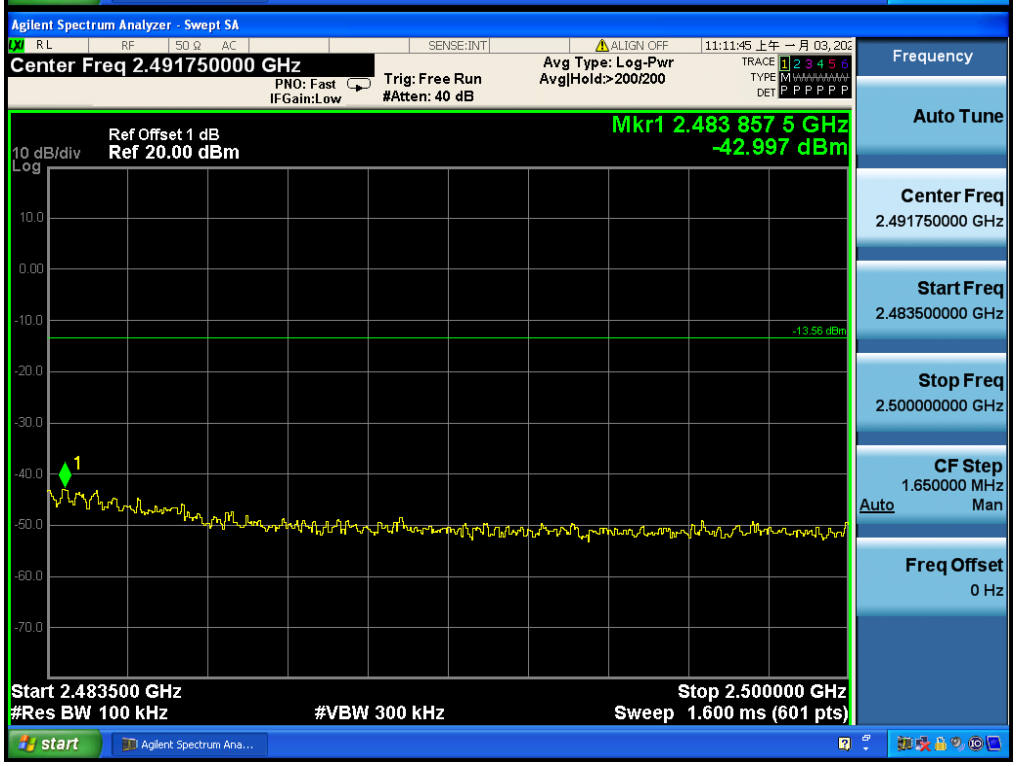

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4.8.1.2.10 802.11N20_MIMO_Lowest Channel

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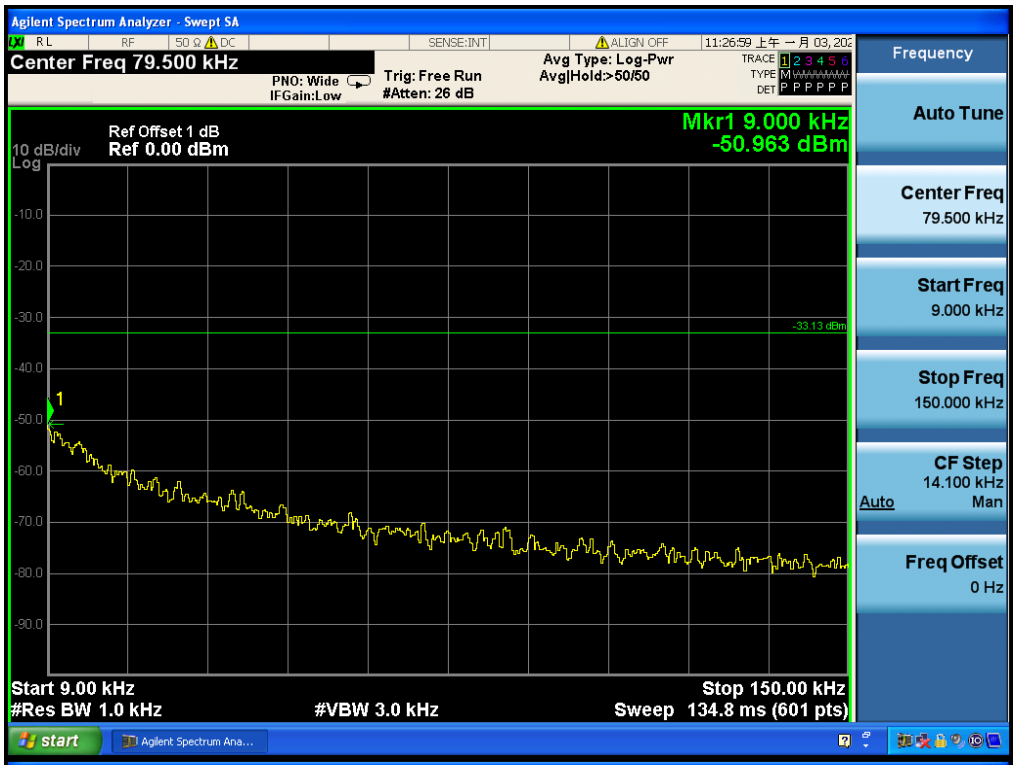

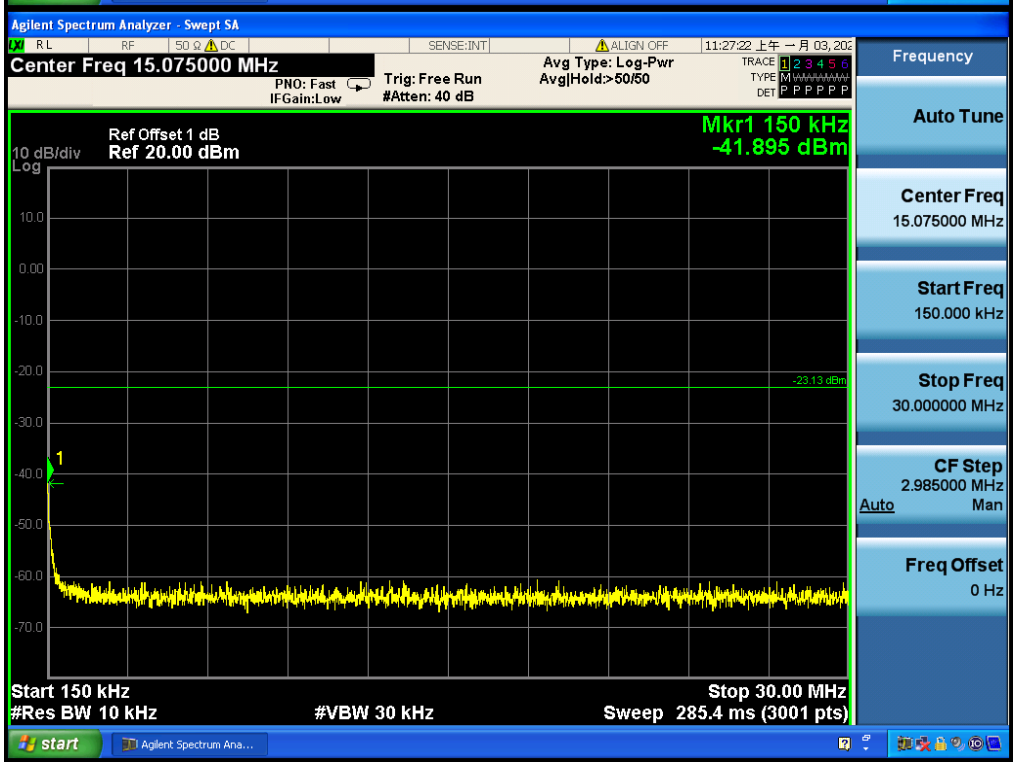

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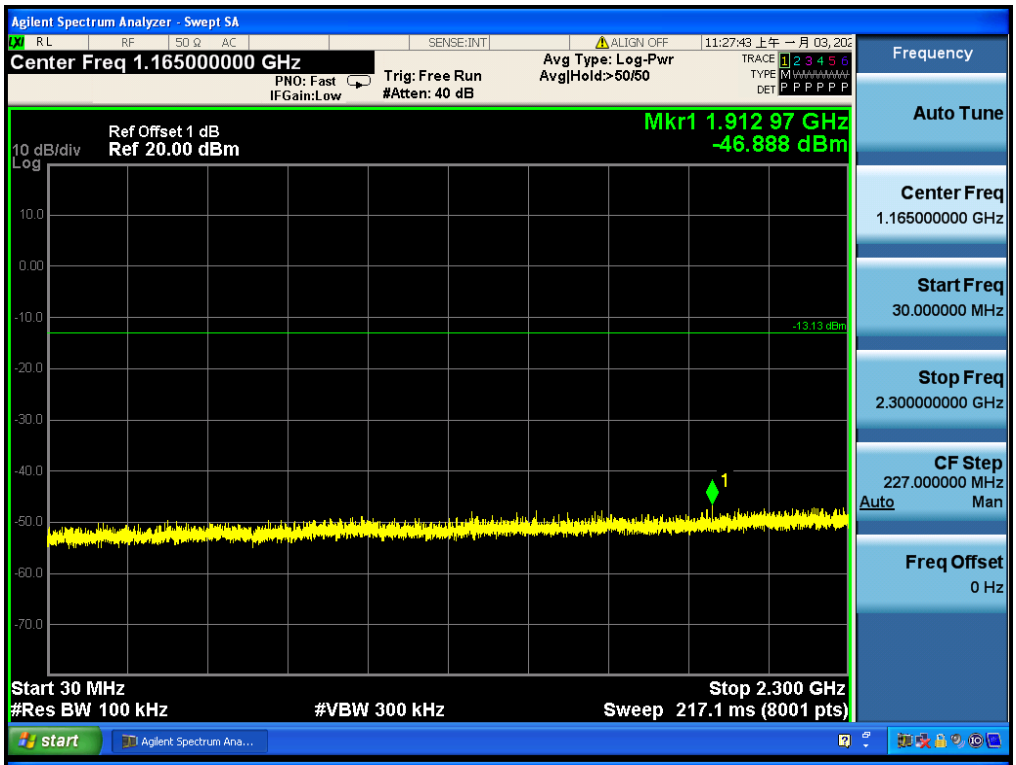

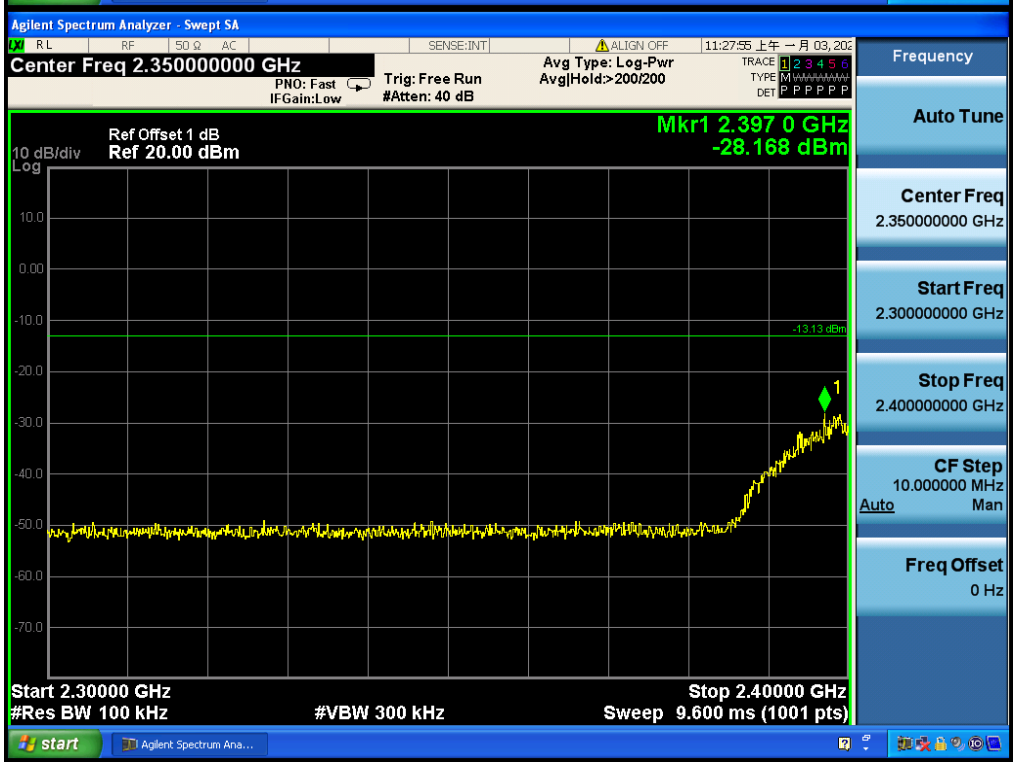

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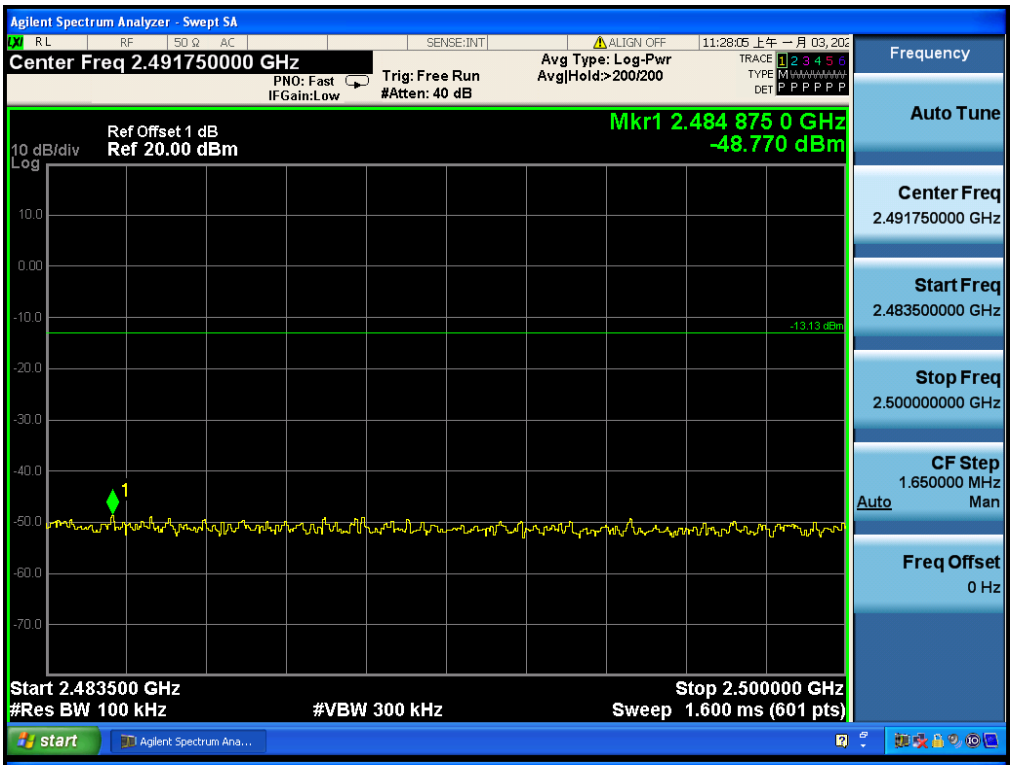

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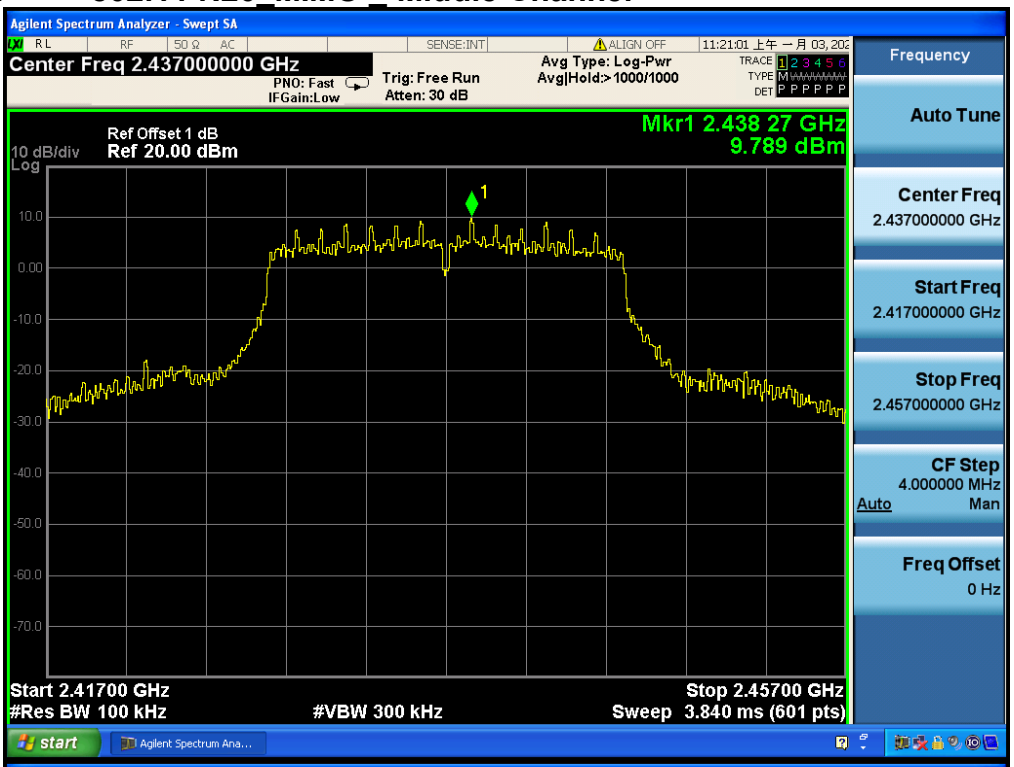
4.8.1.2.11 802.11 N20_MIMO _ Middle Channel



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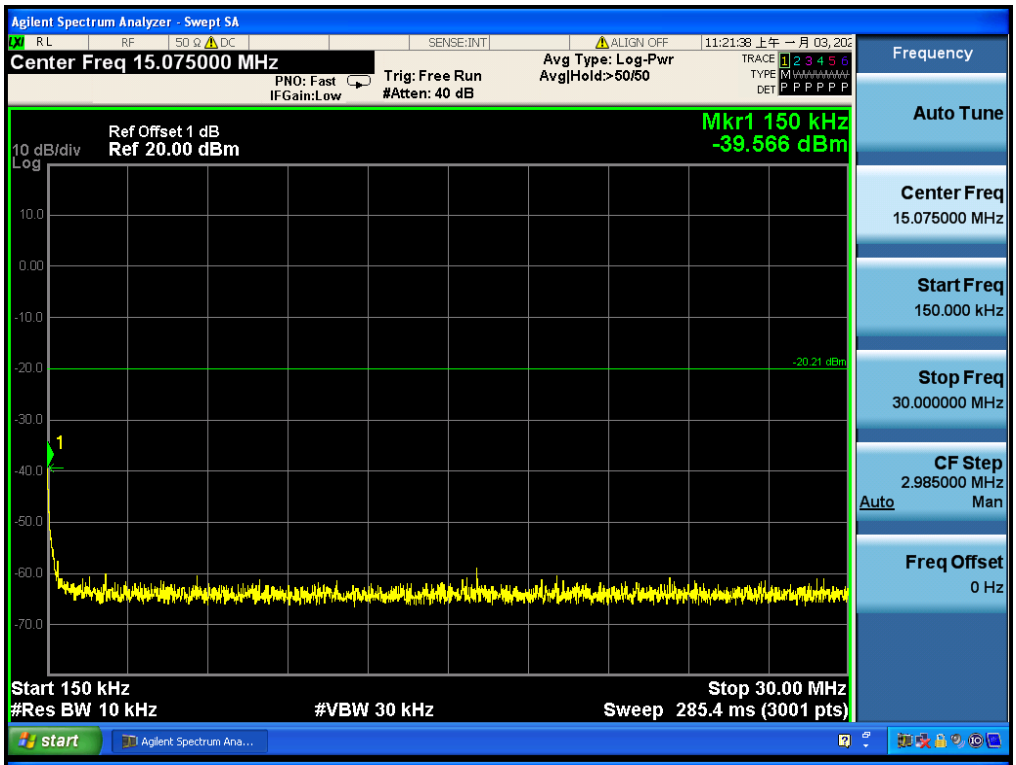

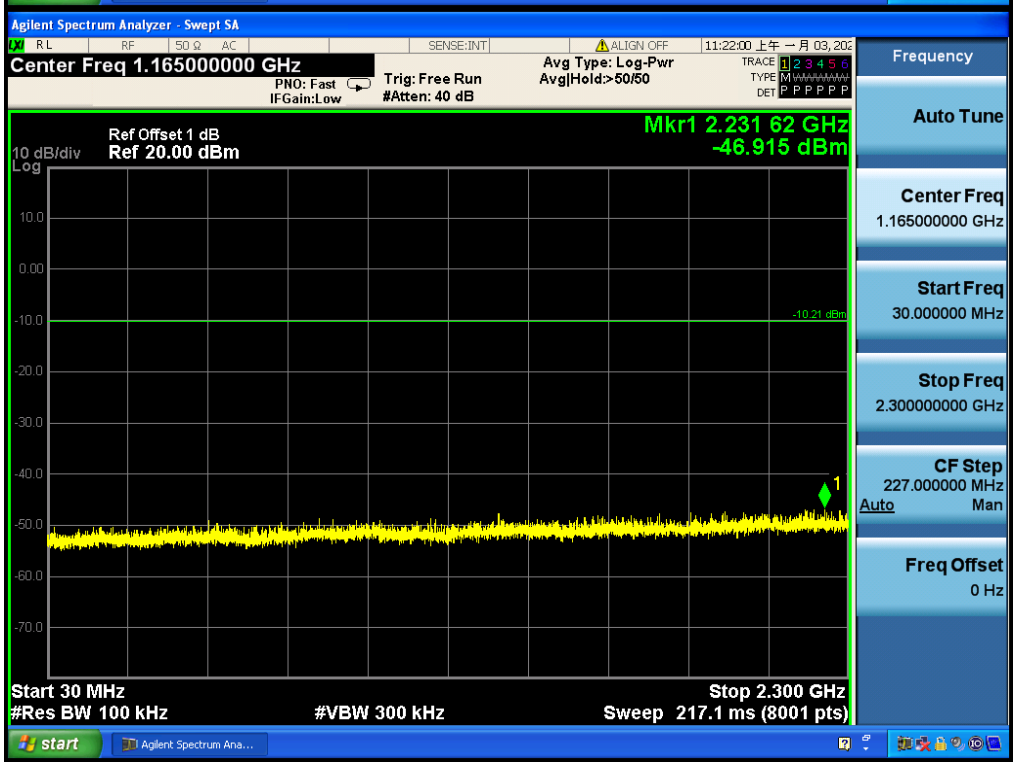

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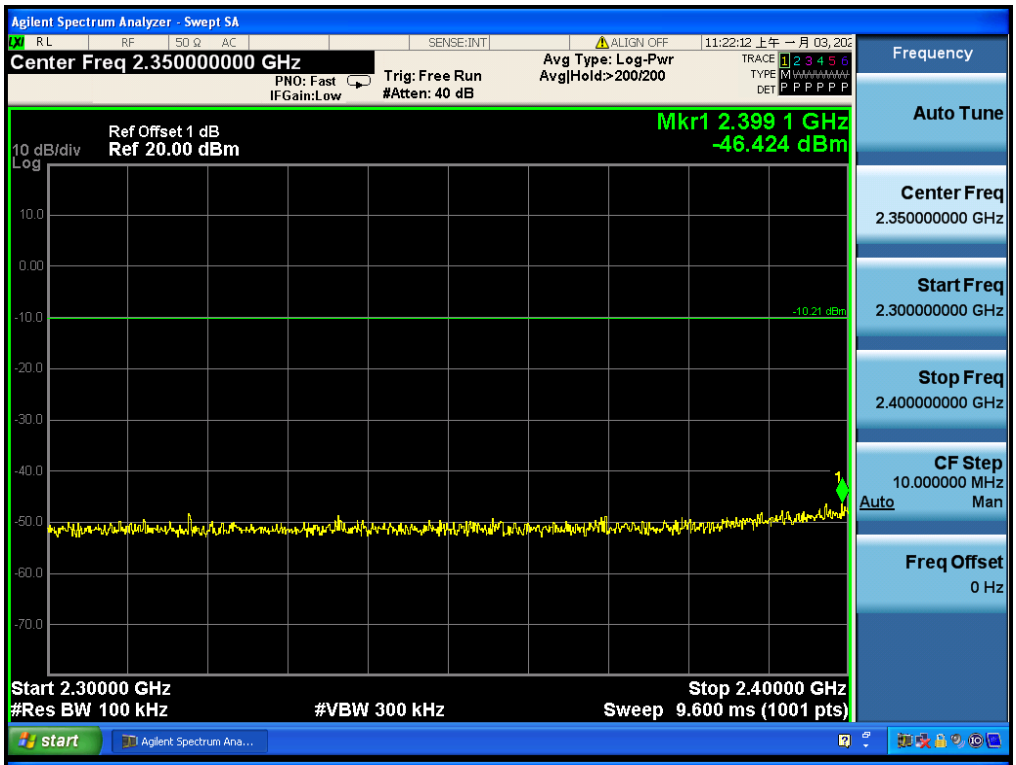

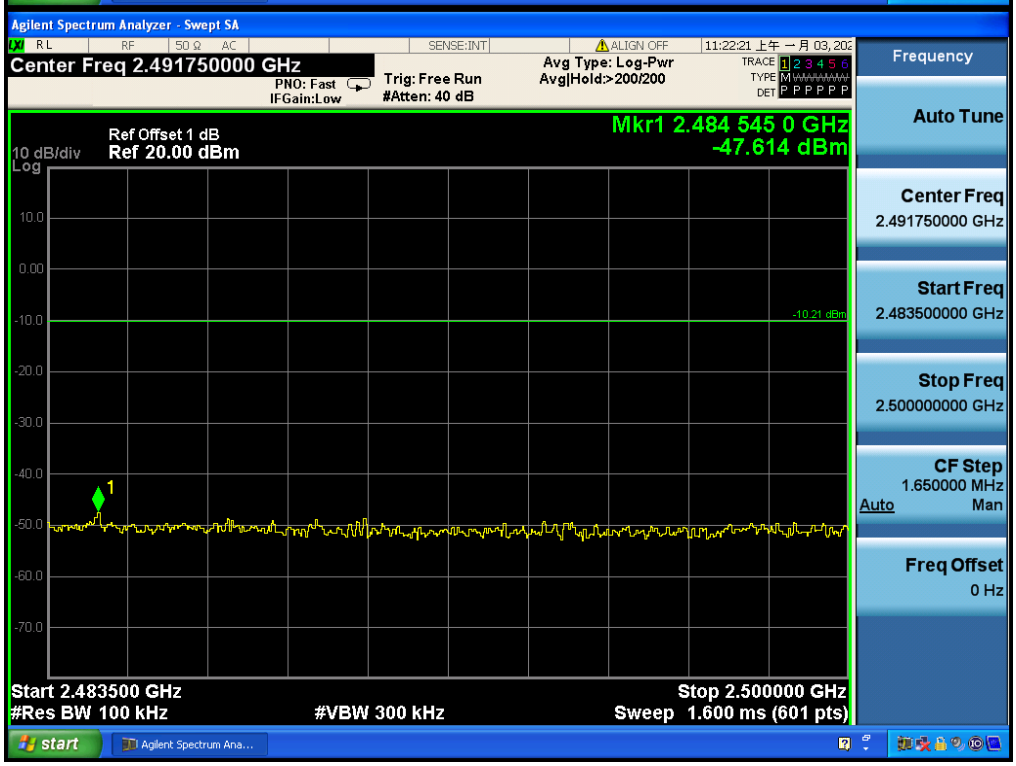

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4.8.1.2.12 802.11 N20_MIMO _ Highest Channel

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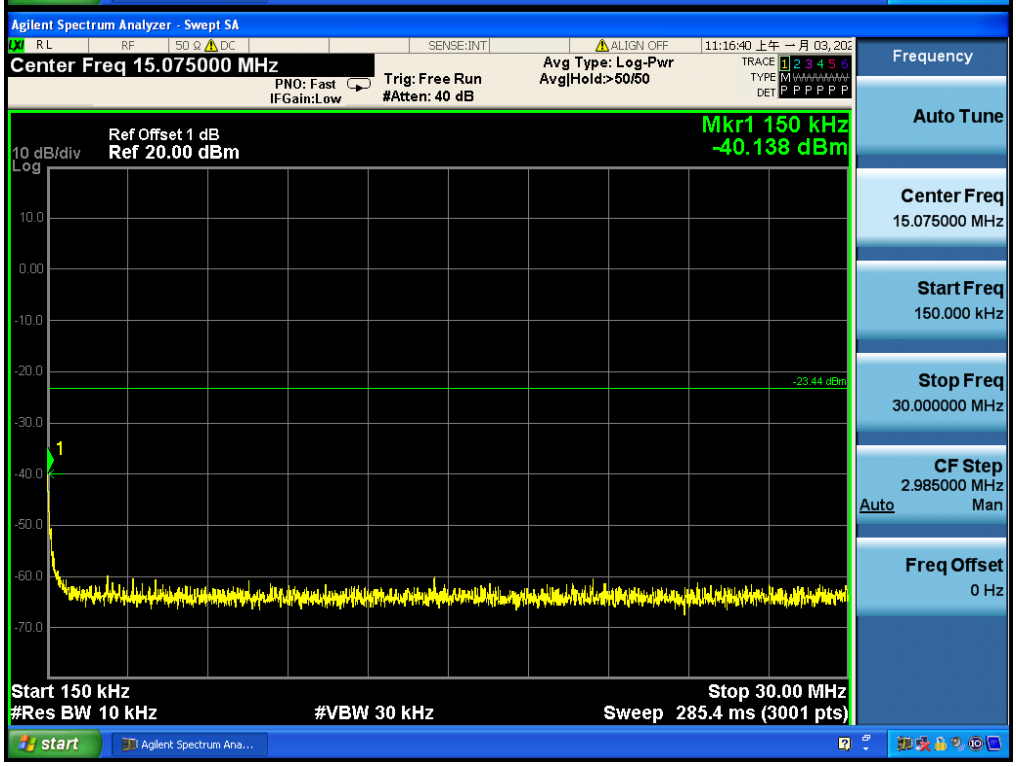

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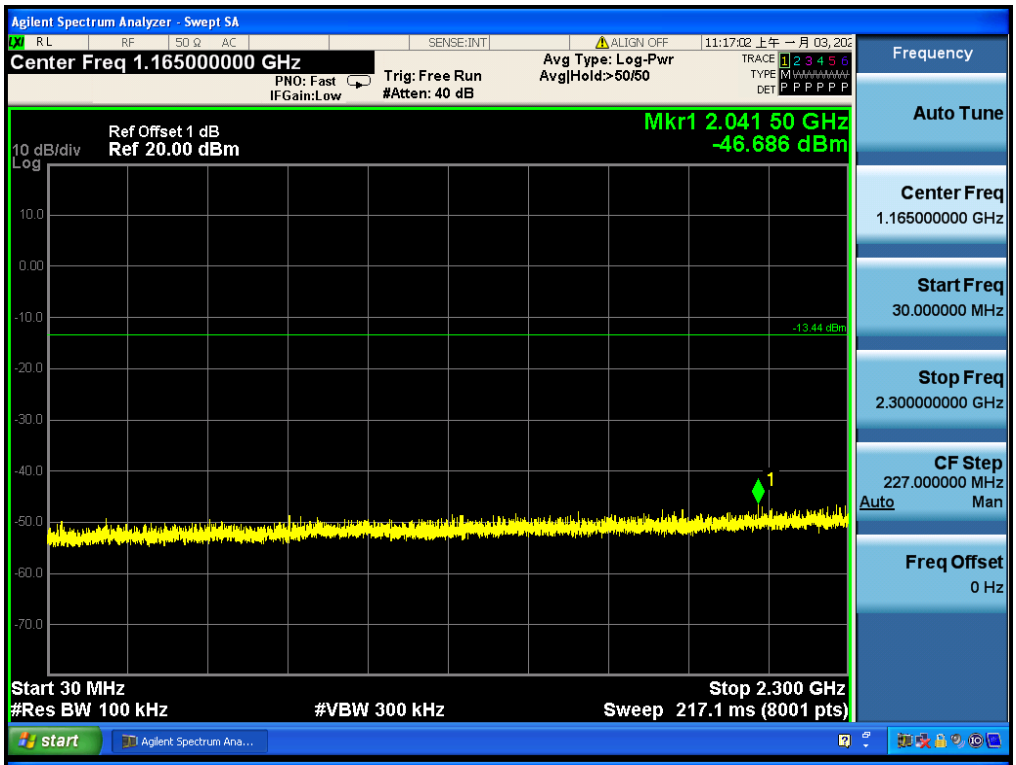

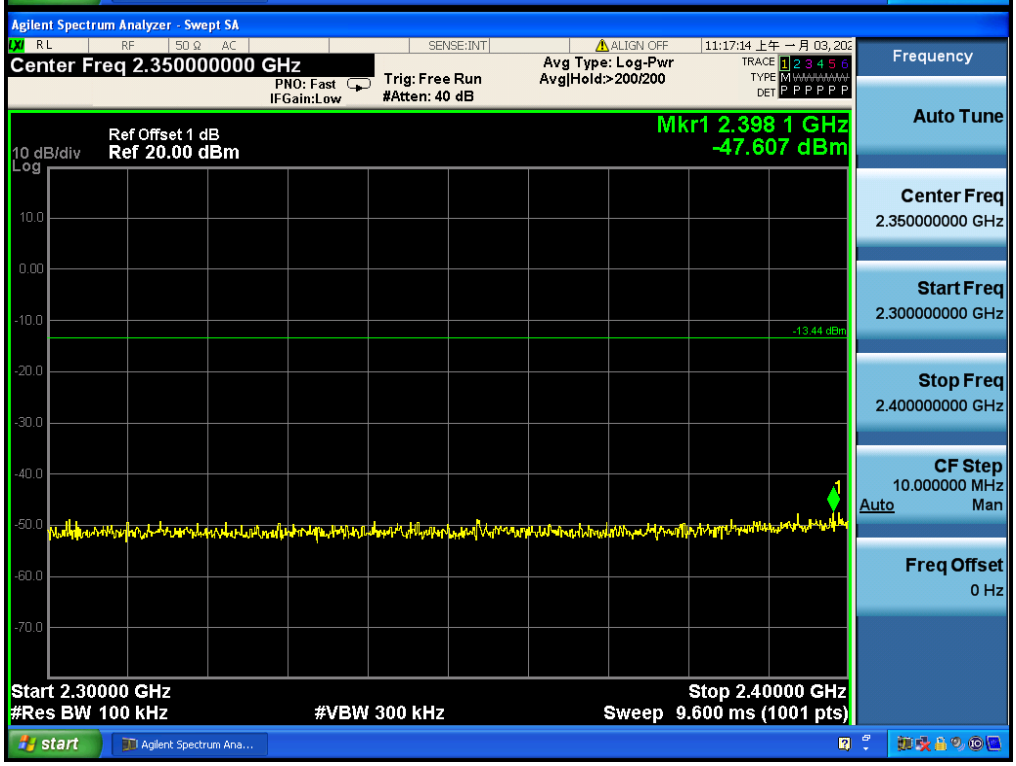

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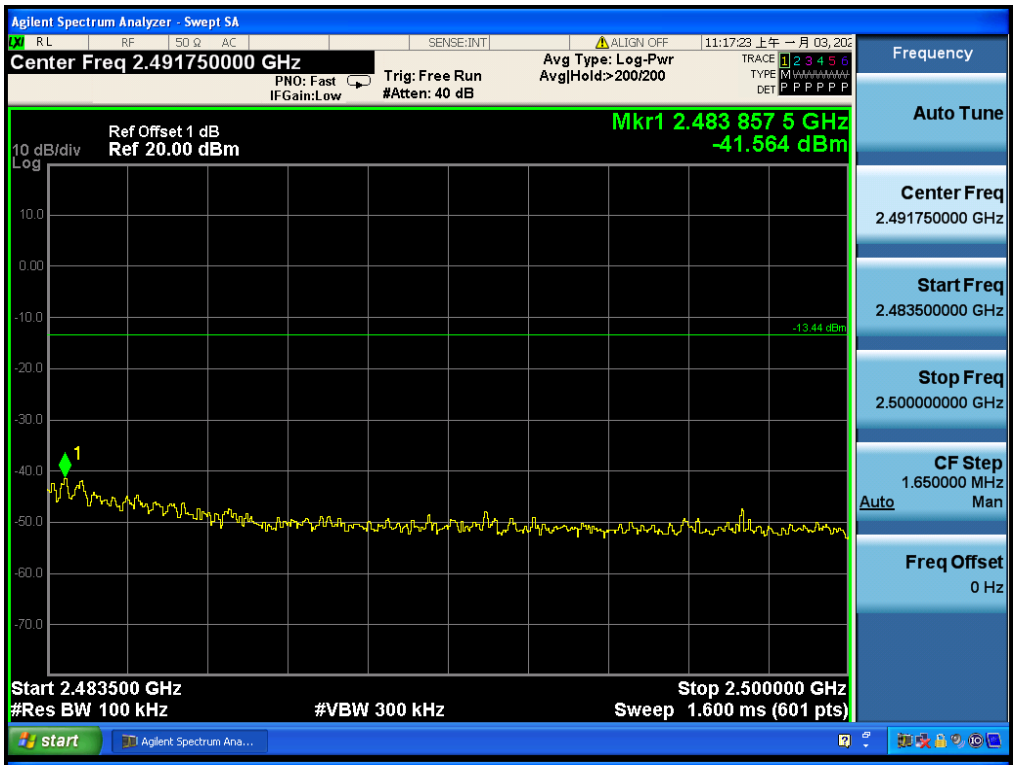

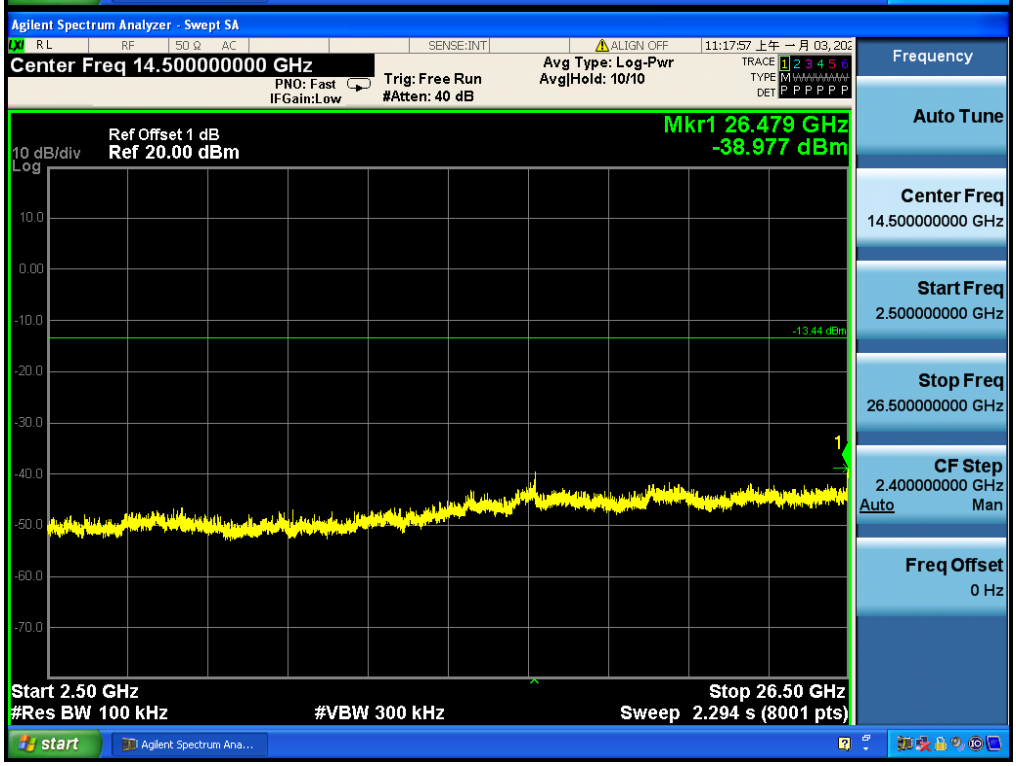

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Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

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4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 :2013 Section 11.12				
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

Test Setup:	

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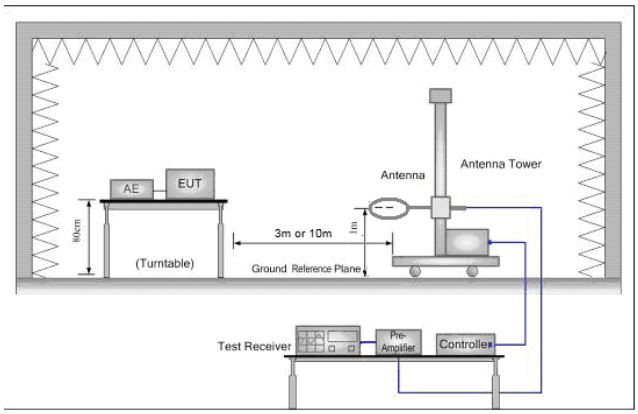

Figure 1. Below 30MHz

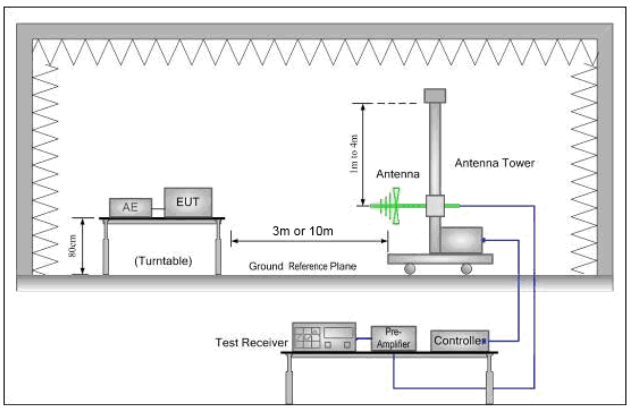

Figure 2. 30MHz to 1GHz

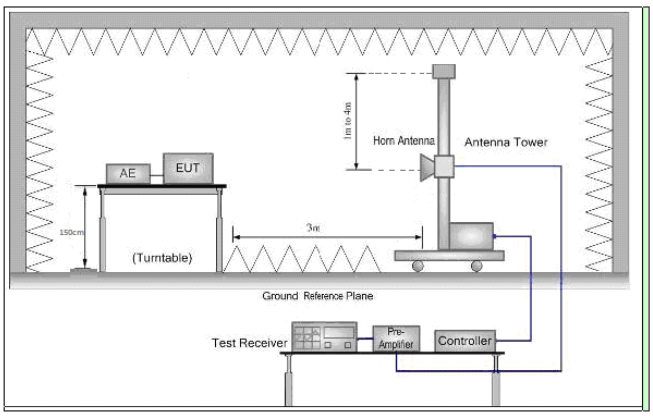

Figure 3. Above 1 GHz

Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height 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. e. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak (3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = N 1 *L 1 +N 2 *L 2 +...+N n-1 *LN n-1 +N n *L n Where N 1 is number of type 1 pulses, L 1 is length of type 1 pulses, etc.

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	Average Emission Level = Peak Emission Level + 20*log(Duty cycle) f. 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(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. h. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. i. Test the EUT in the lowest channel, the middle channel ,the Highest channel j. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. k. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge + Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20); For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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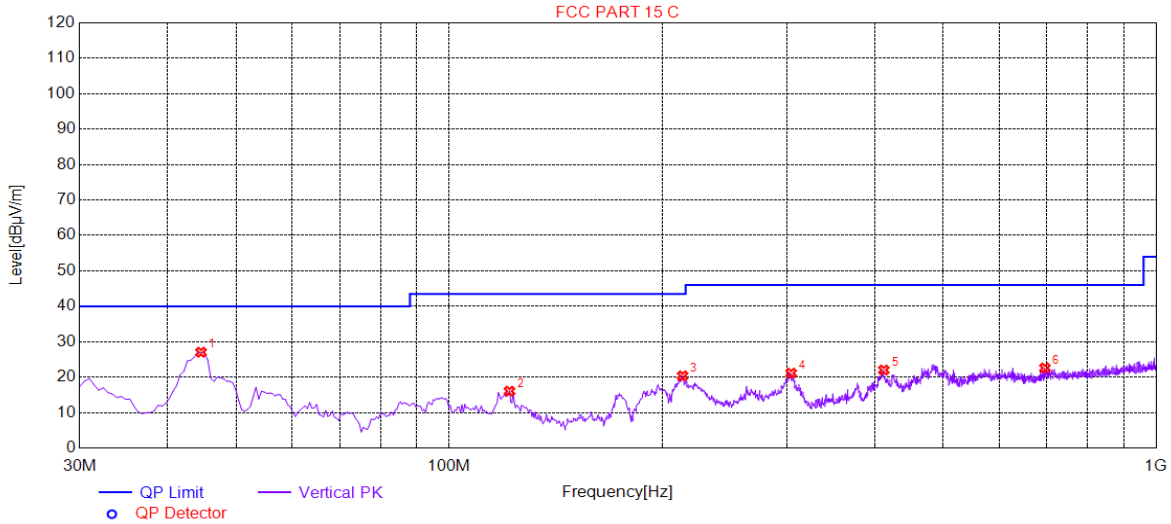
4.9.1 Radiated emission below 1GHz

4.9.1.1 Charge + Transmitting, Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	44.5573	27.05	-30.29	40.00	12.95	100	6	Vertical
2	121.7109	16.05	-33.52	43.50	27.45	100	0	Vertical
3	213.9070	20.37	-30.50	43.50	23.13	100	332	Vertical
4	304.6473	21.13	-27.72	46.00	24.87	100	206	Vertical
5	411.8859	22.02	-24.65	46.00	23.98	100	304	Vertical
6	696.2381	22.59	-18.85	46.00	23.41	100	182	Vertical

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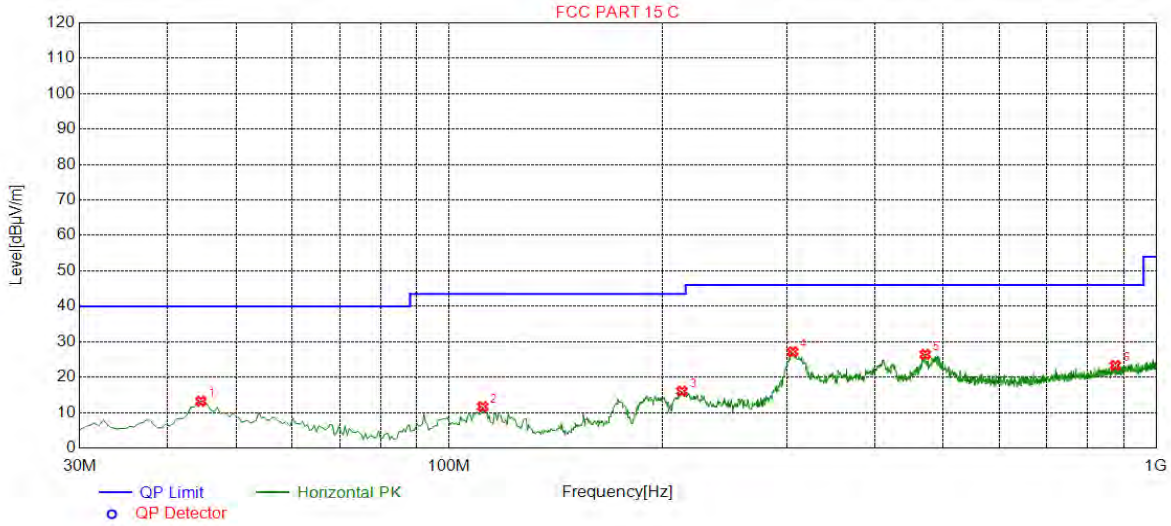
4.9.1.2 Charge + Transmitting, Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	44.5573	13.22	-30.29	40.00	26.78	100	344	Horizontal
2	111.5208	11.66	-31.93	43.50	31.84	100	102	Horizontal
3	213.4217	16.04	-30.52	43.50	27.46	100	282	Horizontal
4	306.1031	27.16	-27.68	46.00	18.84	100	335	Horizontal
5	471.5708	26.42	-23.39	46.00	19.58	100	356	Horizontal
6	875.7779	23.29	-15.62	46.00	22.71	100	86	Horizontal

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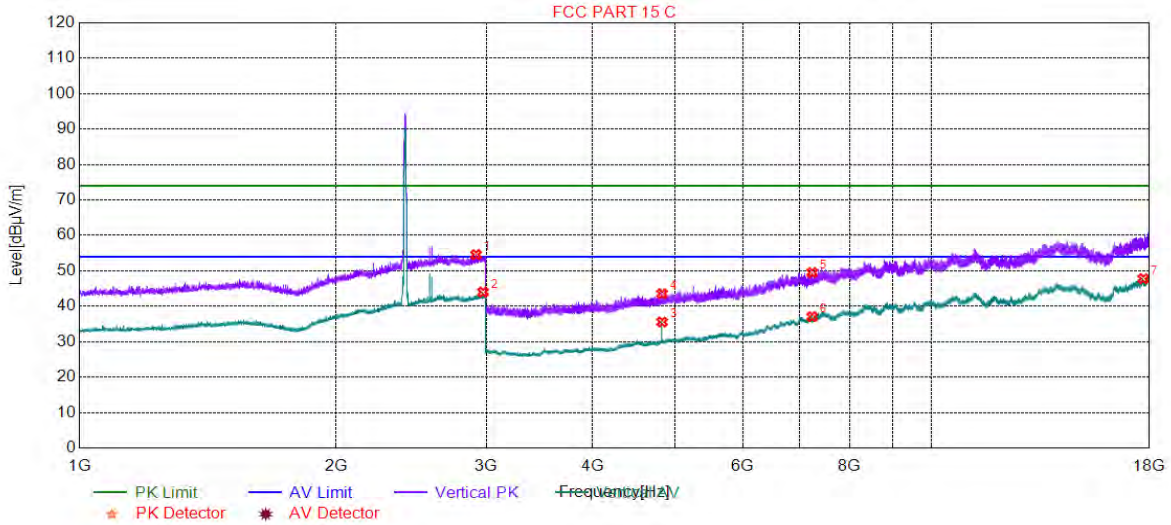
4.9.2 Transmitter emission above 1GHz

4.9.2.1 ANT1

4.9.2.1.1 802.11B_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2918.9797	54.59	9.34	74.00	19.41	150	246	Vertical
2	2973.9935	44.01	9.57	54.00	9.99	150	219	Vertical
3	4824.0000	35.56	-18.21	54.00	18.44	150	209	Vertical
4	4824.0000	43.54	-18.21	74.00	30.46	150	209	Vertical
5	7236.0000	49.52	-9.99	74.00	24.48	150	0	Vertical
6	7236.0000	37.08	-9.99	54.00	16.92	150	41	Vertical
7	17702.4351	47.78	2.31	54.00	6.22	150	242	Vertical

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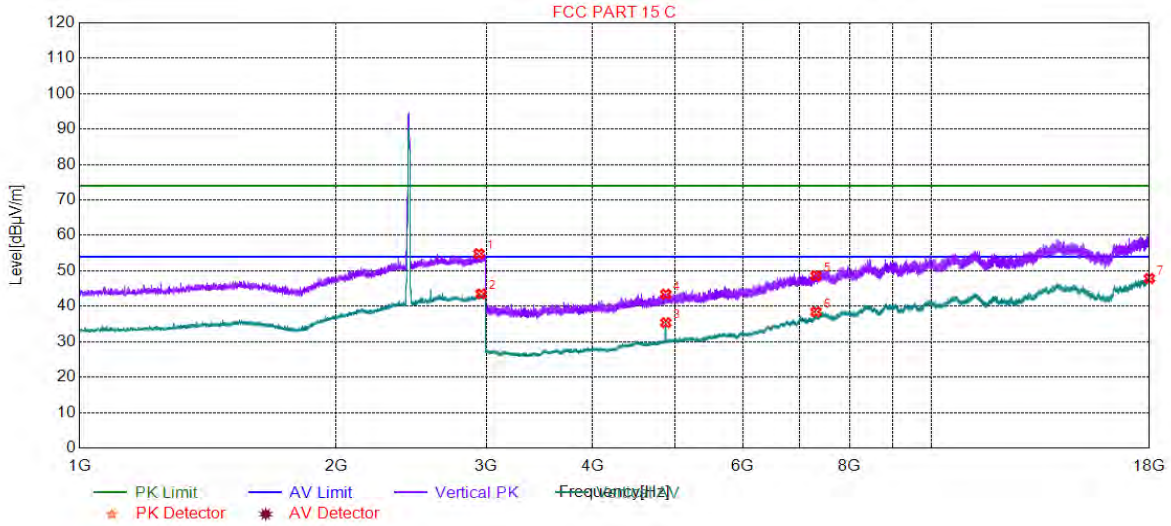
4.9.2.1.2 802.11B_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.9852	54.86	9.58	74.00	19.14	150	218	Vertical
2	2958.9897	43.52	9.64	54.00	10.48	150	108	Vertical
3	4874.0000	35.36	-17.99	54.00	18.64	150	211	Vertical
4	4874.0000	43.41	-17.99	74.00	30.59	150	211	Vertical
5	7311.0000	48.63	-9.74	74.00	25.37	150	292	Vertical
6	7311.0000	38.41	-9.74	54.00	15.59	150	0	Vertical
7	17993.9497	47.86	1.72	54.00	6.14	150	143	Vertical

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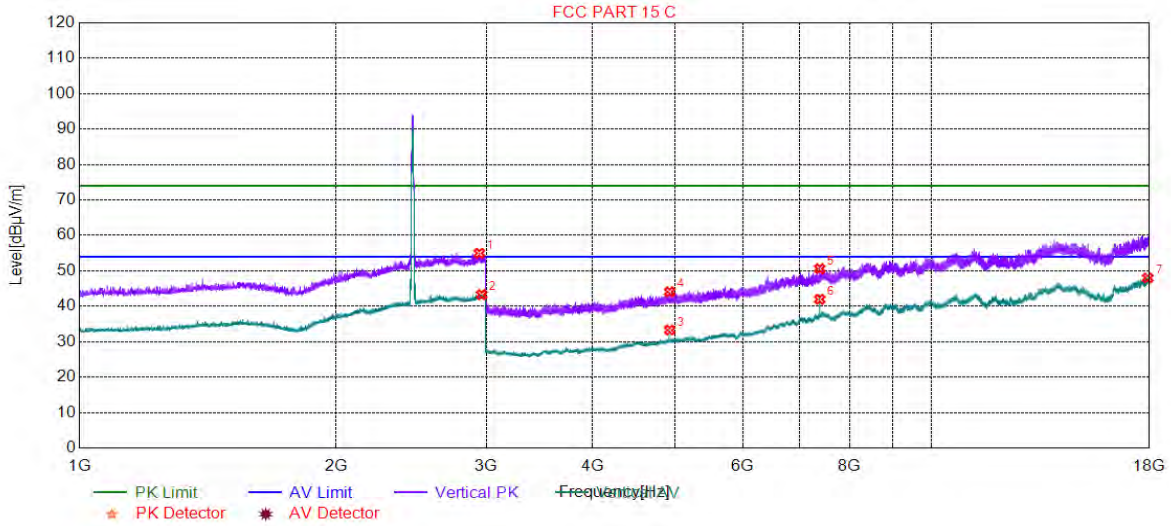
4.9.2.1.3 802.11B_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2944.9862	54.99	9.63	74.00	19.01	150	328	Vertical
2	2962.9907	43.28	9.62	54.00	10.72	150	219	Vertical
3	4924.0000	33.32	-17.72	54.00	20.68	150	210	Vertical
4	4924.0000	44.08	-17.72	74.00	29.92	150	238	Vertical
5	7386.0000	50.60	-9.55	74.00	23.40	150	0	Vertical
6	7386.0000	41.97	-9.55	54.00	12.03	150	0	Vertical
7	17914.1957	47.98	1.69	54.00	6.02	150	142	Vertical

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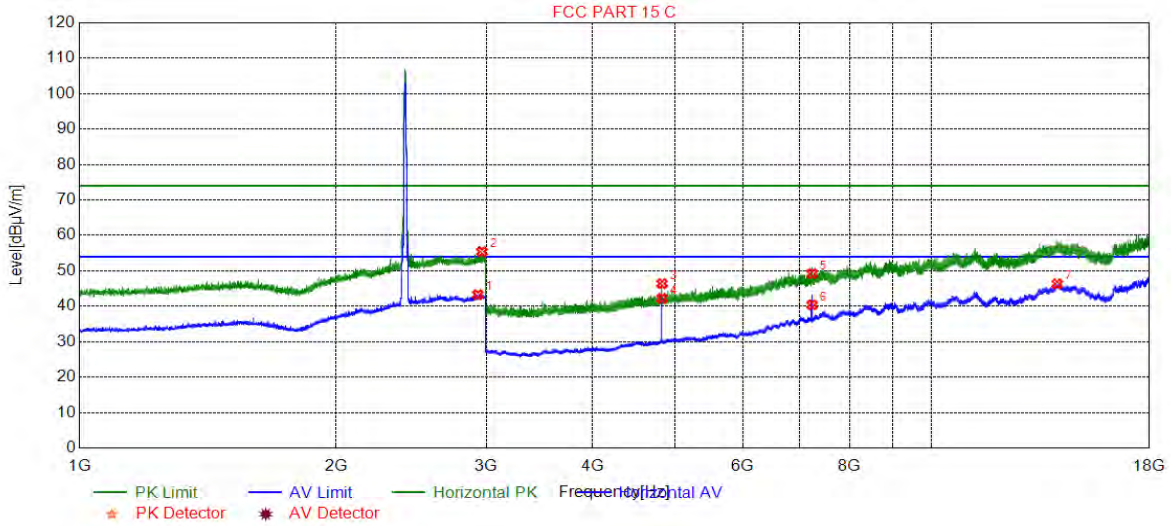
4.9.2.1.4 802.11B_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2932.9832	43.28	9.50	54.00	10.72	150	266	Horizontal
2	2965.9915	55.42	9.61	74.00	18.58	150	101	Horizontal
3	4824.0000	46.39	-18.21	74.00	27.61	150	346	Horizontal
4	4824.0000	42.23	-18.21	54.00	11.77	150	236	Horizontal
5	7236.0000	49.24	-9.99	74.00	24.76	150	292	Horizontal
6	7236.0000	40.41	-9.99	54.00	13.59	150	342	Horizontal
7	14028.8014	46.32	2.60	54.00	7.68	150	242	Horizontal

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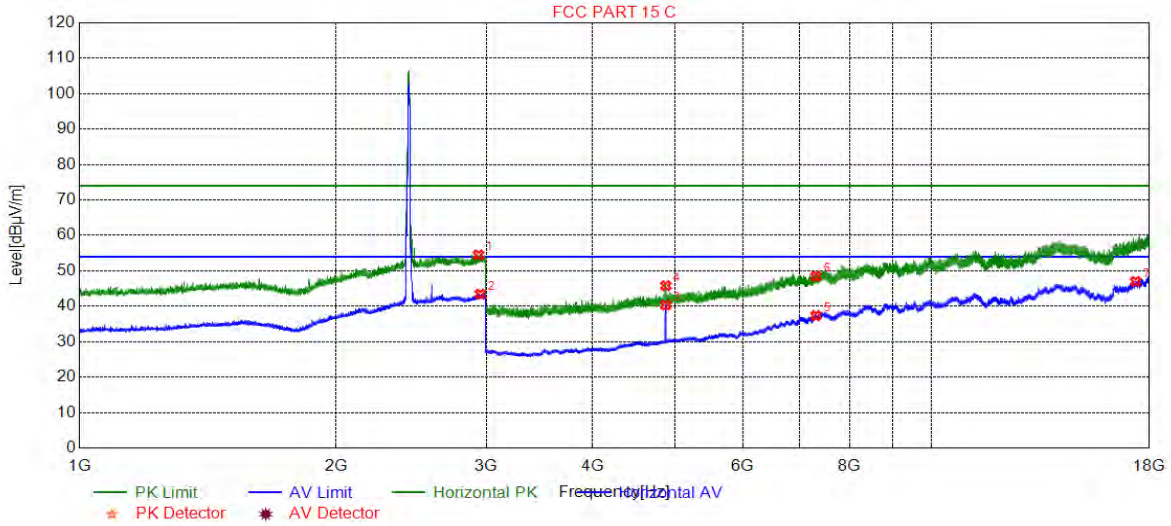
4.9.2.1.5 802.11B_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2938.4846	54.50	9.56	74.00	19.50	150	170	Horizontal
2	2952.4881	43.44	9.67	54.00	10.56	150	198	Horizontal
3	4874.0000	40.33	-17.99	54.00	13.67	150	237	Horizontal
4	4874.0000	45.81	-17.99	74.00	28.19	150	237	Horizontal
5	7311.0000	37.37	-9.74	54.00	16.63	150	40	Horizontal
6	7311.0000	48.47	-9.74	74.00	25.53	150	40	Horizontal
7	17338.3169	47.01	0.98	54.00	6.99	150	91	Horizontal

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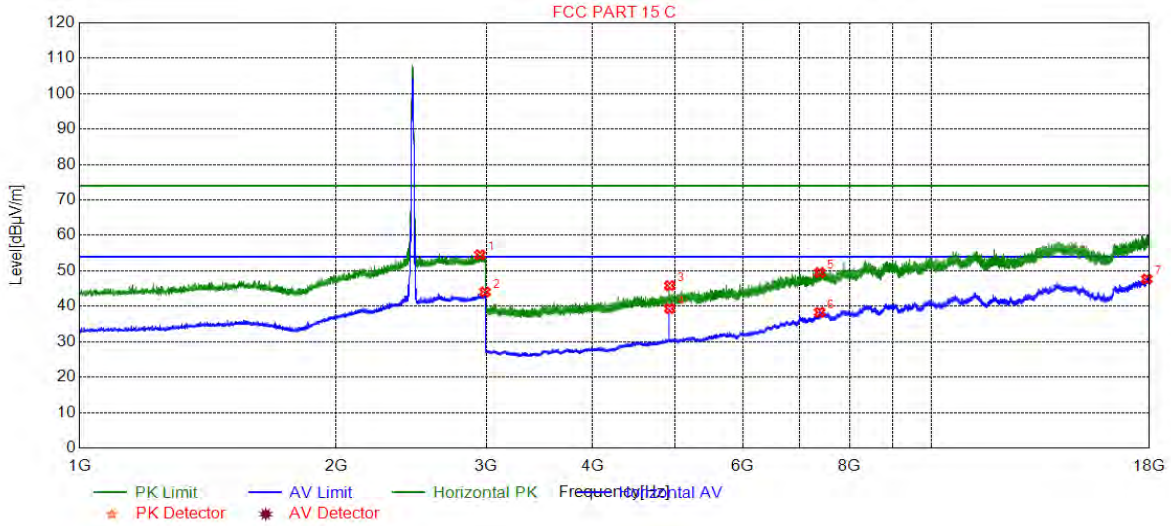
4.9.2.1.6 802.11B_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2948.9872	54.52	9.67	74.00	19.48	150	31	Horizontal
2	2989.9975	44.05	9.50	54.00	9.95	150	86	Horizontal
3	4924.0000	45.82	-17.72	74.00	28.18	150	238	Horizontal
4	4924.0000	39.35	-17.72	54.00	14.65	150	73	Horizontal
5	7386.0000	49.50	-9.55	74.00	24.50	150	42	Horizontal
6	7386.0000	38.29	-9.55	54.00	15.71	150	42	Horizontal
7	17866.8933	47.69	1.25	54.00	6.31	150	292	Horizontal

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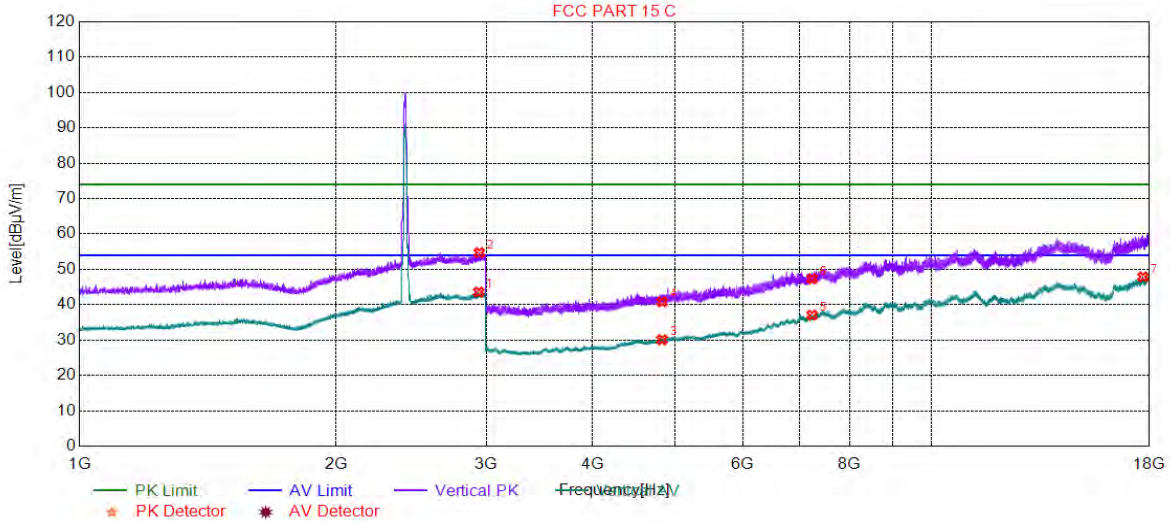
4.9.2.1.7 802.11G_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2939.4849	43.57	9.57	54.00	10.43	150	328	Vertical
2	2944.4861	54.74	9.62	74.00	19.26	150	108	Vertical
3	4824.0000	30.10	-18.21	54.00	23.90	150	188	Vertical
4	4824.0000	40.84	-18.21	74.00	33.16	150	157	Vertical
5	7236.0000	37.07	-9.99	54.00	16.93	150	41	Vertical
6	7236.0000	47.31	-9.99	74.00	26.69	150	0	Vertical
7	17690.3345	47.89	2.36	54.00	6.11	150	141	Vertical

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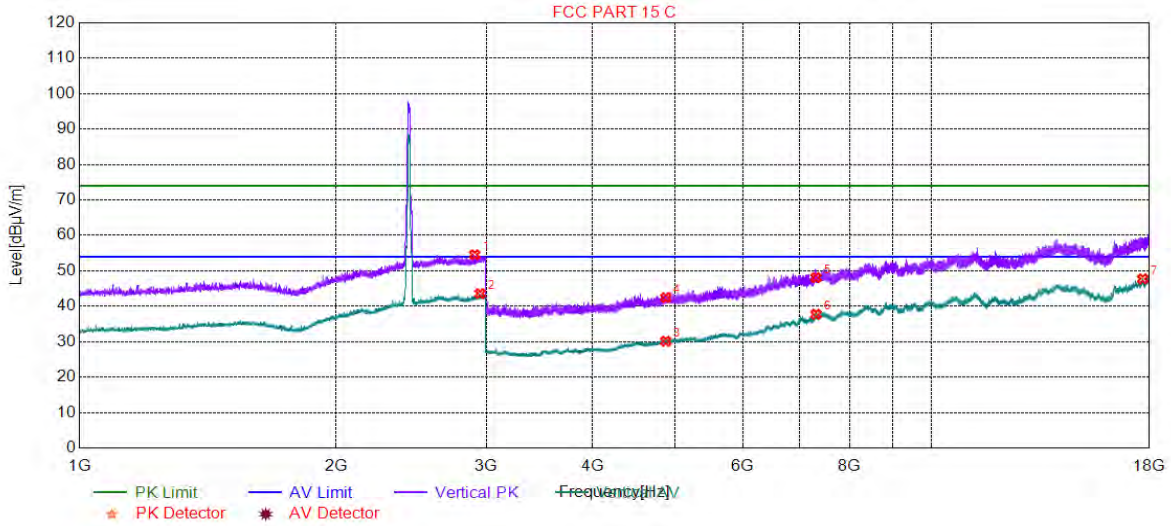
4.9.2.1.8 802.11G_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2907.4769	54.55	9.22	74.00	19.45	150	218	Vertical
2	2950.4876	43.58	9.68	54.00	10.42	150	38	Vertical
3	4874.0000	30.14	-17.99	54.00	23.86	150	56	Vertical
4	4874.0000	42.44	-17.99	74.00	31.56	150	352	Vertical
5	7311.0000	48.09	-9.74	74.00	25.91	150	164	Vertical
6	7311.0000	37.76	-9.74	54.00	16.24	150	2	Vertical
7	17674.3837	47.73	2.35	54.00	6.27	150	2	Vertical

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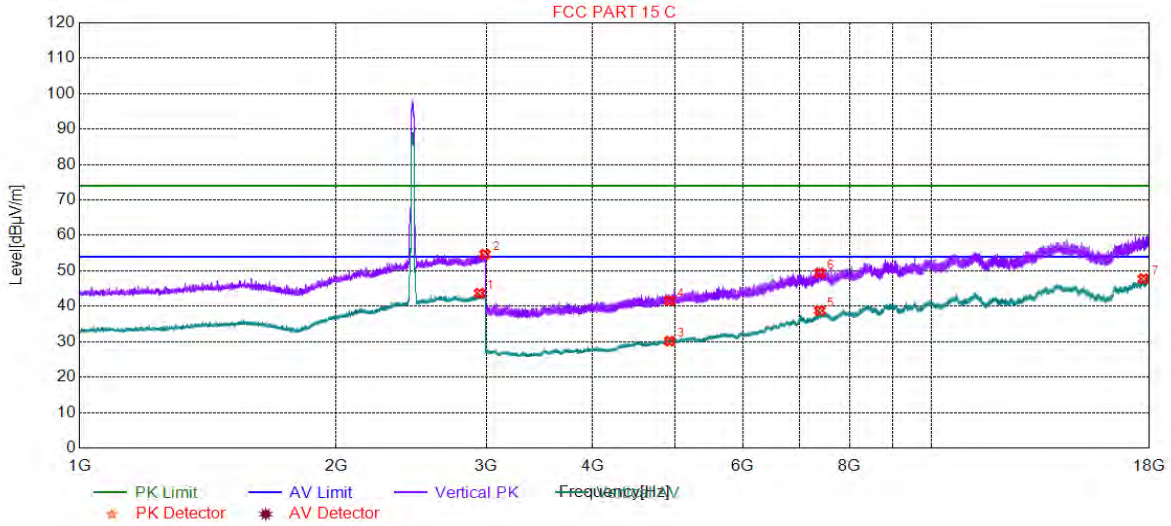
4.9.2.1.9 802.11G_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2946.9867	43.67	9.65	54.00	10.33	150	53	Vertical
2	2989.9975	54.69	9.50	74.00	19.31	150	288	Vertical
3	4924.0000	30.17	-17.72	54.00	23.83	150	46	Vertical
4	4924.0000	41.56	-17.72	74.00	32.44	150	346	Vertical
5	7386.0000	38.81	-9.55	54.00	15.19	150	0	Vertical
6	7386.0000	49.38	-9.55	74.00	24.62	150	342	Vertical
7	17706.2853	47.75	2.23	54.00	6.25	150	342	Vertical

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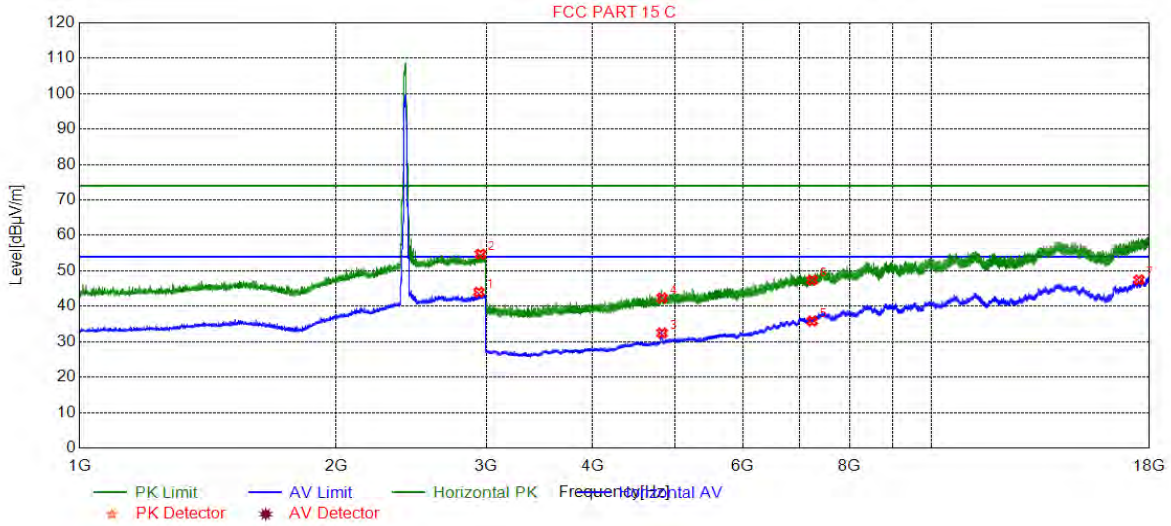
4.9.2.1.10 802.11G_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.9852	43.98	9.58	54.00	10.02	150	292	Horizontal
2	2953.9885	54.72	9.66	74.00	19.28	150	237	Horizontal
3	4824.0000	32.44	-18.21	54.00	21.56	150	240	Horizontal
4	4824.0000	42.33	-18.21	74.00	31.67	150	326	Horizontal
5	7236.0000	35.82	-9.99	54.00	18.18	150	342	Horizontal
6	7236.0000	47.35	-9.99	74.00	26.65	150	190	Horizontal
7	17497.2749	47.41	1.90	54.00	6.59	150	0	Horizontal

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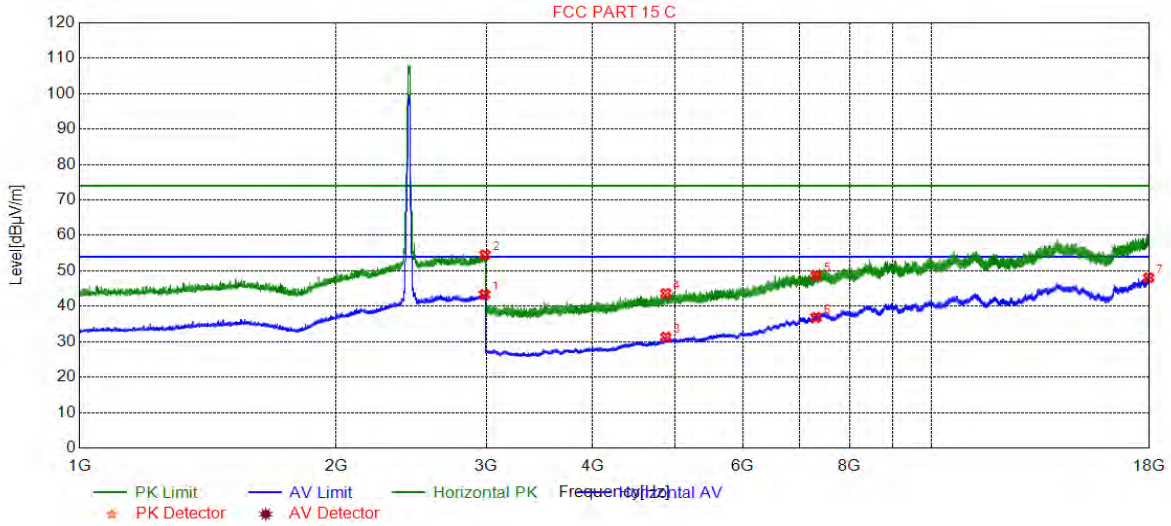
4.9.2.1.11 802.11G_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2986.4966	43.33	9.51	54.00	10.67	150	99	Horizontal
2	2989.9975	54.54	9.50	74.00	19.46	150	196	Horizontal
3	4874.0000	31.30	-17.99	54.00	22.70	150	249	Horizontal
4	4874.0000	43.65	-17.99	74.00	30.35	150	70	Horizontal
5	7311.0000	48.73	-9.74	74.00	25.27	150	232	Horizontal
6	7311.0000	36.83	-9.74	54.00	17.17	150	76	Horizontal
7	17952.6976	48.05	1.71	54.00	5.95	150	127	Horizontal

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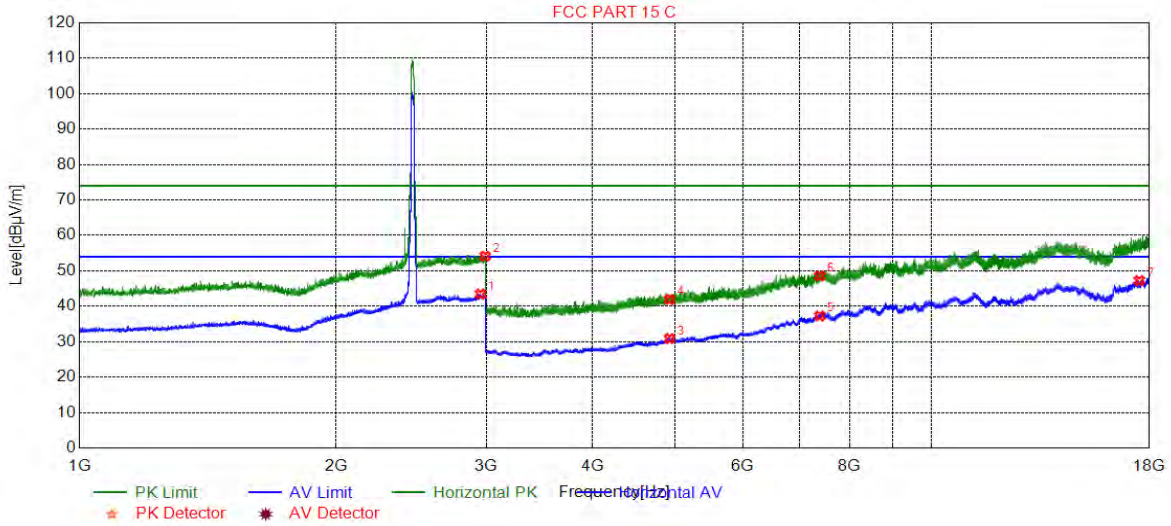
4.9.2.1.12 802.11G_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2954.4886	43.43	9.66	54.00	10.57	150	18	Horizontal
2	2991.4979	54.14	9.49	74.00	19.86	150	99	Horizontal
3	4924.0000	30.88	-17.72	54.00	23.12	150	73	Horizontal
4	4924.0000	41.93	-17.72	74.00	32.07	150	73	Horizontal
5	7386.0000	37.27	-9.55	54.00	16.73	150	42	Horizontal
6	7386.0000	48.58	-9.55	74.00	25.42	150	292	Horizontal
7	17511.0256	47.24	1.96	54.00	6.76	150	292	Horizontal

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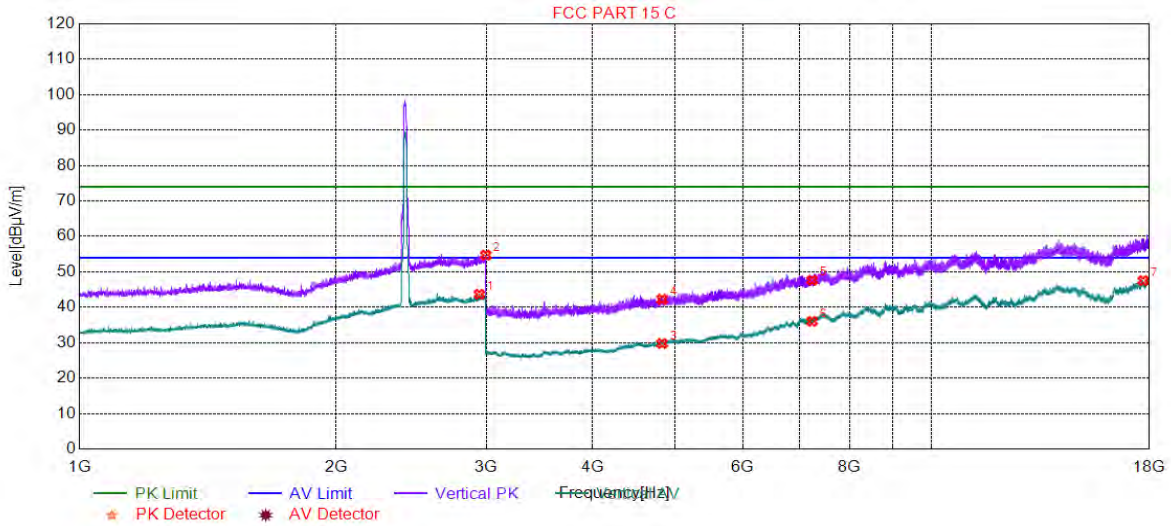
4.9.2.1.13 802.11N20_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2944.9862	43.69	9.63	54.00	10.31	150	82	Vertical
2	2996.9993	54.71	9.46	74.00	19.29	150	27	Vertical
3	4824.0000	29.79	-18.21	54.00	24.21	150	154	Vertical
4	4824.0000	42.26	-18.21	74.00	31.74	150	360	Vertical
5	7236.0000	47.65	-9.99	74.00	26.35	150	192	Vertical
6	7236.0000	36.03	-9.99	54.00	17.97	150	0	Vertical
7	17702.4351	47.53	2.31	54.00	6.47	150	241	Vertical

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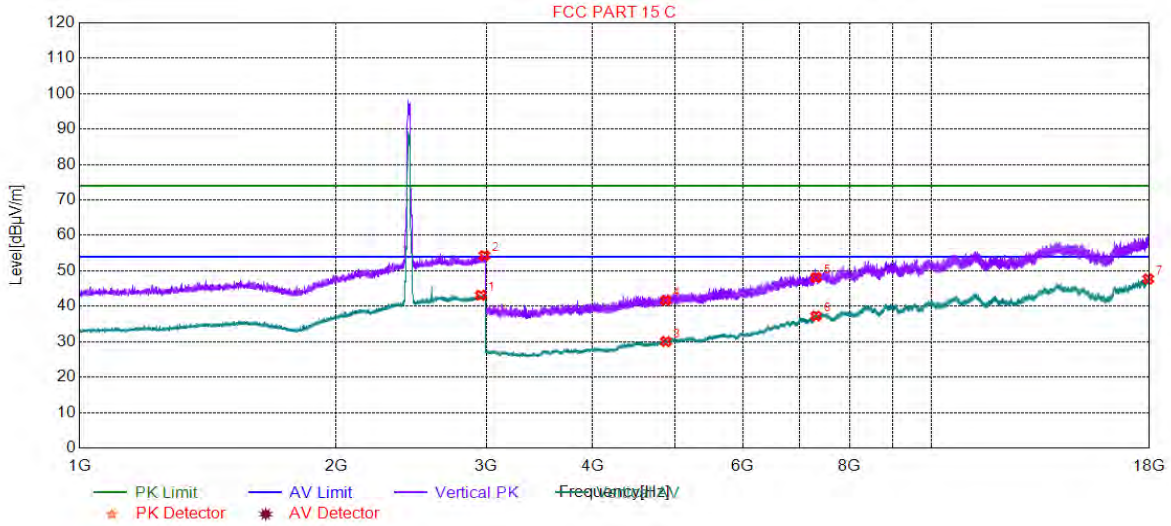
4.9.2.1.14 802.11N20_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2955.9890	43.11	9.65	54.00	10.89	150	149	Vertical
2	2985.4964	54.33	9.52	74.00	19.67	150	342	Vertical
3	4874.0000	30.06	-17.99	54.00	23.94	150	156	Vertical
4	4874.0000	41.68	-17.99	74.00	32.32	150	320	Vertical
5	7311.0000	48.13	-9.74	74.00	25.87	150	191	Vertical
6	7311.0000	37.24	-9.74	54.00	16.76	150	191	Vertical
7	17937.2969	47.73	1.70	54.00	6.27	150	0	Vertical

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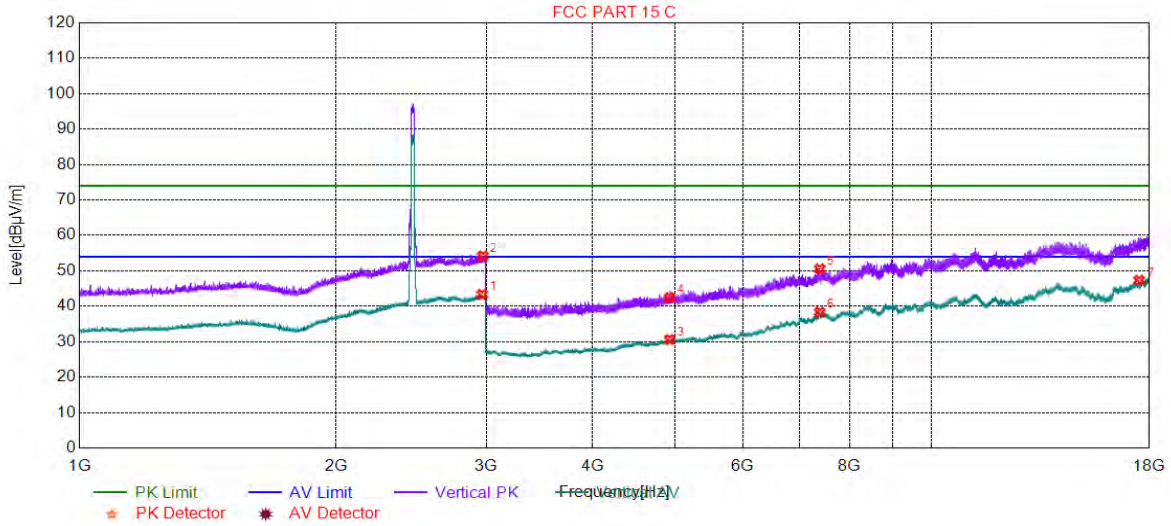
4.9.2.1.15 802.11N20_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2966.9917	43.34	9.60	54.00	10.66	150	217	Vertical
2	2972.4931	54.19	9.58	74.00	19.81	150	230	Vertical
3	4924.0000	30.61	-17.72	54.00	23.39	150	72	Vertical
4	4924.0000	42.45	-17.72	74.00	31.55	150	209	Vertical
5	7386.0000	50.54	-9.55	74.00	23.46	150	342	Vertical
6	7386.0000	38.34	-9.55	54.00	15.66	150	191	Vertical
7	17503.8752	47.33	1.94	54.00	6.67	150	191	Vertical

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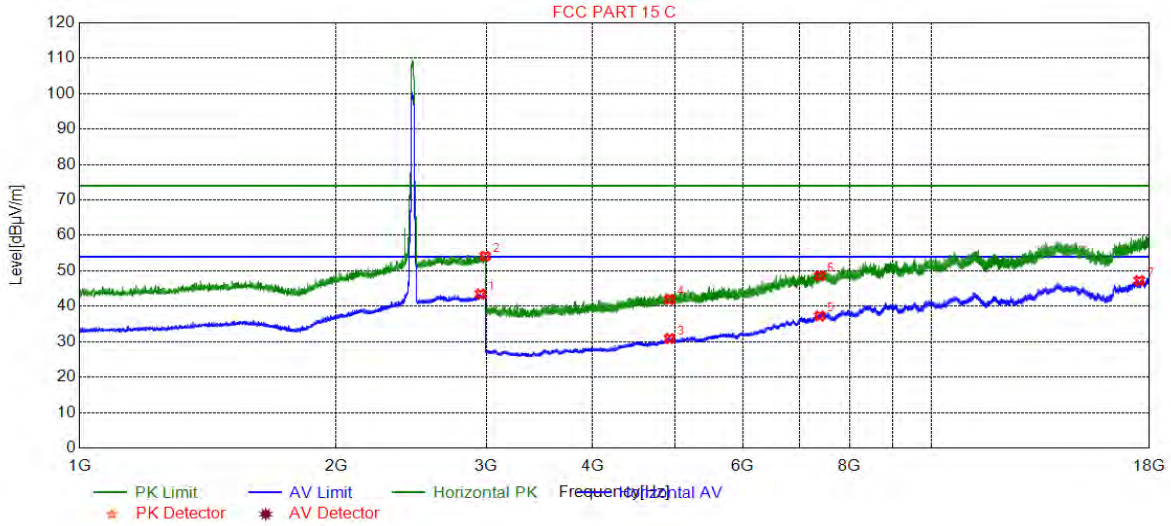
4.9.2.1.16 802.11N20_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2954.4886	43.43	9.66	54.00	10.57	150	18	Horizontal
2	2991.4979	54.14	9.49	74.00	19.86	150	99	Horizontal
3	4924.0000	30.88	-17.72	54.00	23.12	150	73	Horizontal
4	4924.0000	41.93	-17.72	74.00	32.07	150	73	Horizontal
5	7386.0000	37.27	-9.55	54.00	16.73	150	42	Horizontal
6	7386.0000	48.58	-9.55	74.00	25.42	150	292	Horizontal
7	17511.0256	47.24	1.96	54.00	6.76	150	292	Horizontal

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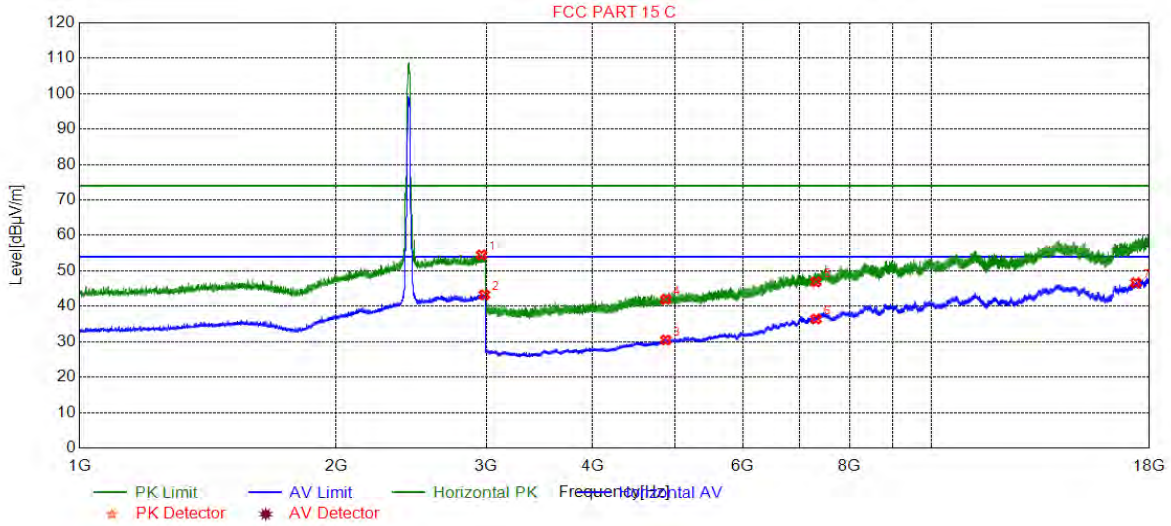
4.9.2.1.17 802.11N20_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2962.4906	54.52	9.62	74.00	19.48	150	86	Horizontal
2	2985.9965	43.25	9.51	54.00	10.75	150	265	Horizontal
3	4874.0000	30.50	-17.99	54.00	23.50	150	291	Horizontal
4	4874.0000	41.94	-17.99	74.00	32.06	150	318	Horizontal
5	7311.0000	46.89	-9.74	74.00	27.11	150	342	Horizontal
6	7311.0000	36.41	-9.74	54.00	17.59	150	0	Horizontal
7	17347.6674	46.62	1.02	54.00	7.38	150	241	Horizontal

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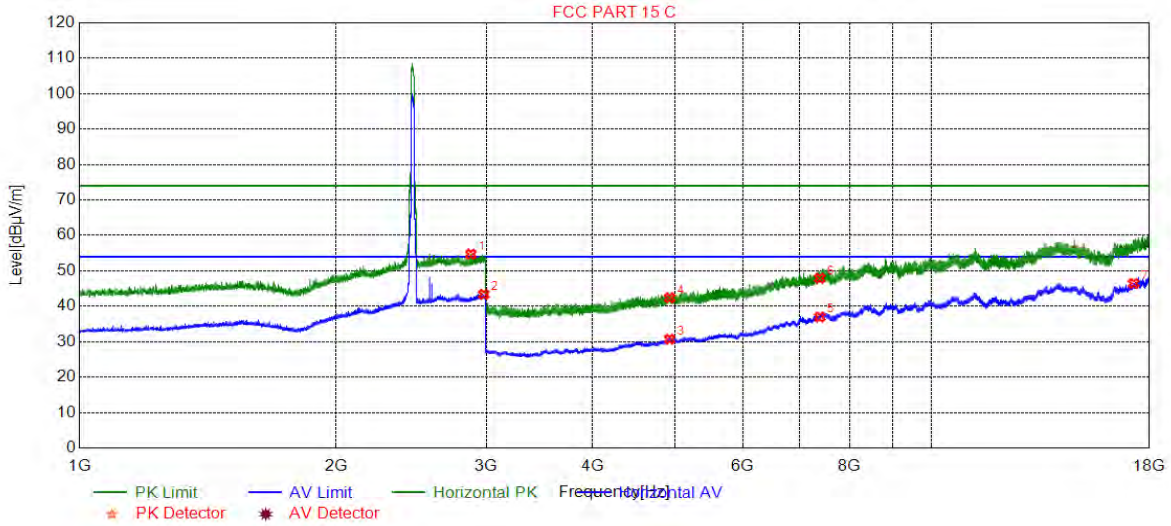
4.9.2.1.18 802.11N20_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2878.4696	54.73	9.18	74.00	19.27	150	72	Horizontal
2	2980.9952	43.37	9.54	54.00	10.63	150	306	Horizontal
3	4924.0000	30.72	-17.72	54.00	23.28	150	46	Horizontal
4	4924.0000	42.38	-17.72	74.00	31.62	150	347	Horizontal
5	7386.0000	36.97	-9.55	54.00	17.03	150	41	Horizontal
6	7386.0000	47.90	-9.55	74.00	26.10	150	242	Horizontal
7	17248.6624	46.45	0.42	54.00	7.55	150	141	Horizontal

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3）As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

4）All Modes have been tested, but only the worst case data displayed in this report.

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4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

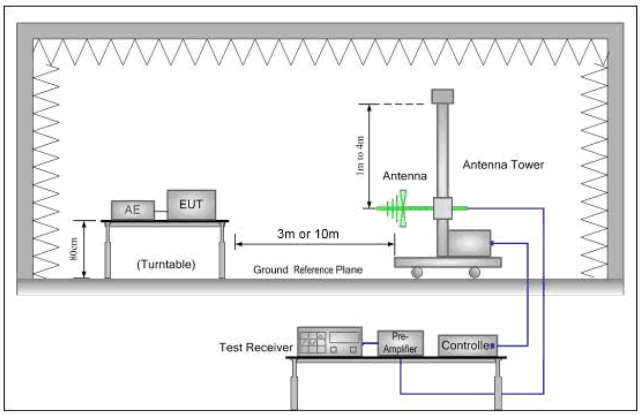

Figure 1. 30MHz to 1GHz

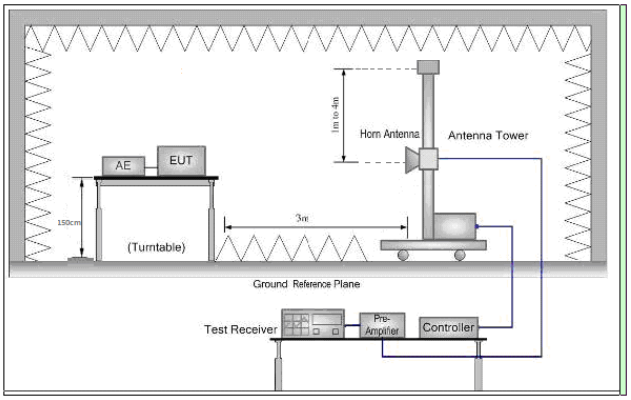

Figure 2. Above 1 GHz

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Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height 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. e. 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. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel , the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. j. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge +Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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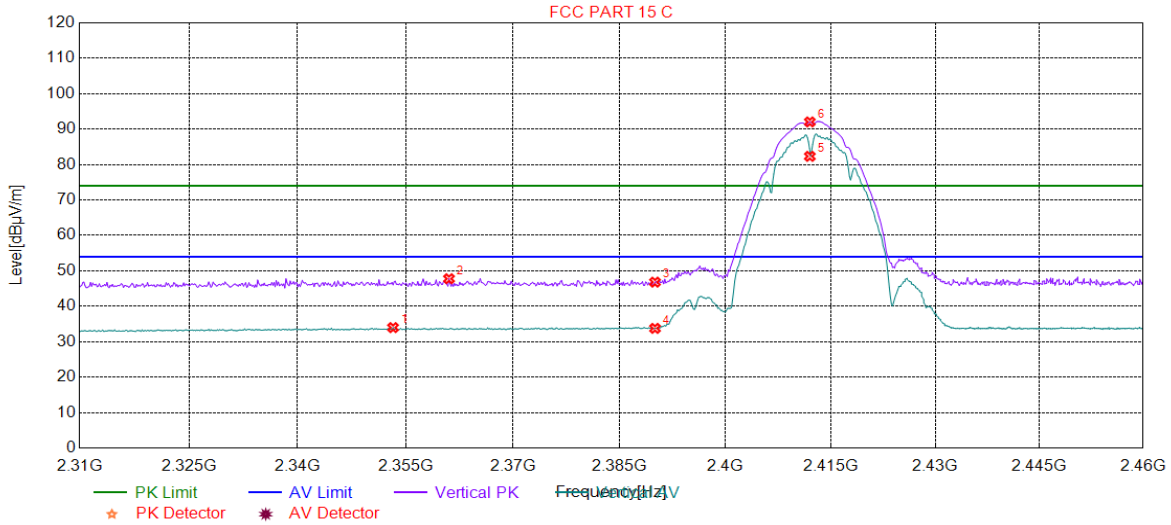
Test plot as follows:

4.10.1 ANT1

4.10.1.1 802.11B_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2353.2432	33.99	7.81	54.00	20.01	150	192	Vertical
2	2361.0511	47.78	7.80	74.00	26.22	150	2	Vertical
3	2390.0000	46.82	7.77	74.00	27.18	150	213	Vertical
4	2390.0000	33.77	7.77	54.00	20.23	150	2	Vertical
5	2412.0000	82.32	7.81	54.00	-28.32	150	80	Vertical
6	2412.0000	92.04	7.81	74.00	-18.04	150	80	Vertical

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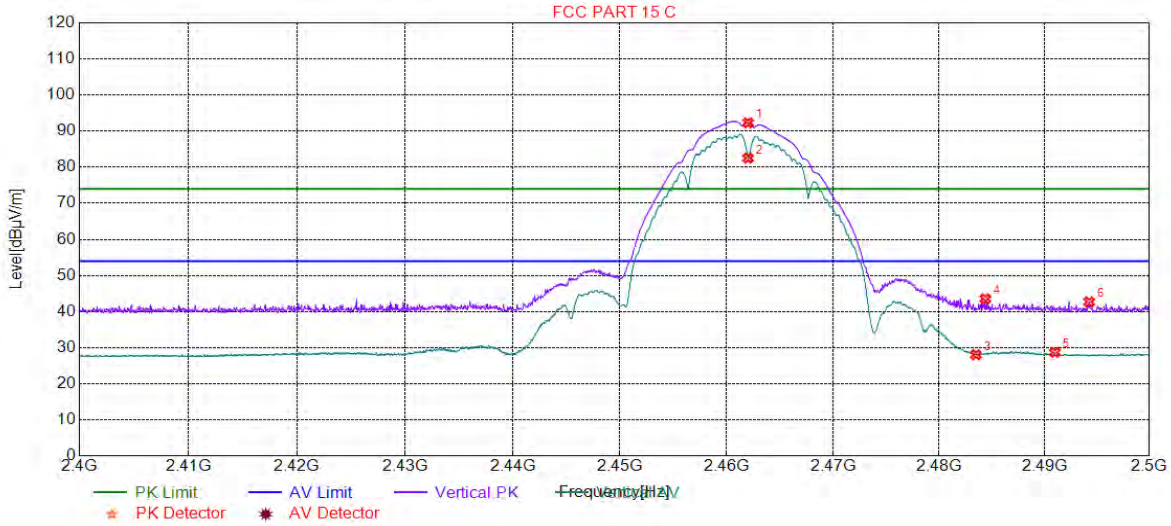
4.10.1.2 802.11B_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	92.30	7.98	74.00	-18.30	150	82	Vertical
2	2462.0000	82.53	7.98	54.00	-28.53	150	82	Vertical
3	2483.5000	28.06	8.01	54.00	25.94	150	22	Vertical
4	2484.3922	43.52	8.01	74.00	30.48	150	5	Vertical
5	2490.9955	28.68	8.02	54.00	25.32	150	143	Vertical
6	2494.2471	42.69	8.02	74.00	31.31	150	193	Vertical

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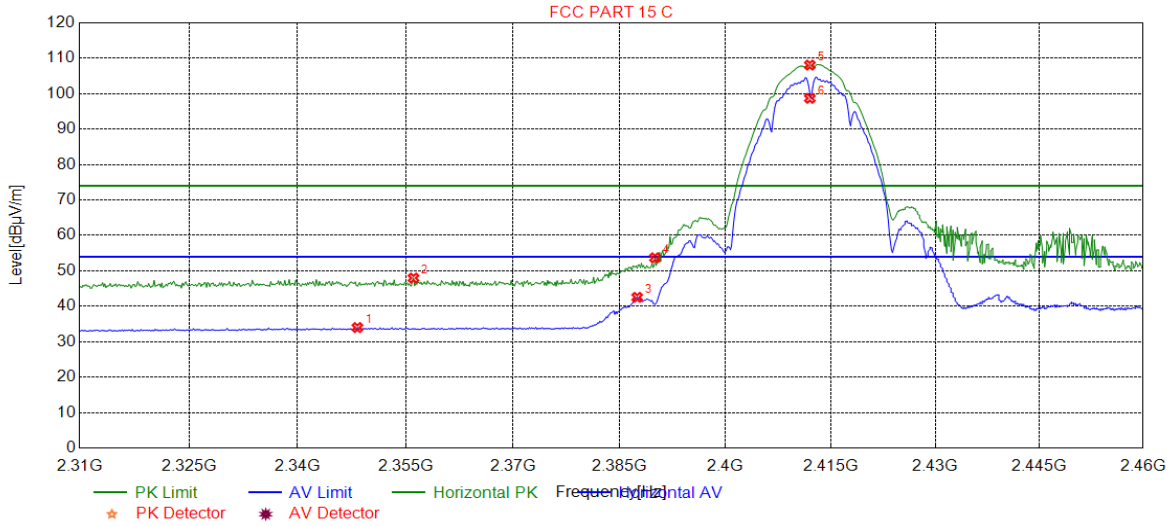
4.10.1.3 802.11B_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2348.2883	34.00	7.79	54.00	20.00	150	90	Horizontal
2	2356.0961	47.97	7.80	74.00	26.03	150	37	Horizontal
3	2387.4775	42.54	7.77	54.00	11.46	150	65	Horizontal
4	2390.0000	53.69	7.77	74.00	20.31	150	53	Horizontal
5	2412.0000	108.08	7.81	74.00	-34.08	150	62	Horizontal
6	2412.0000	98.69	7.81	54.00	-44.69	150	62	Horizontal

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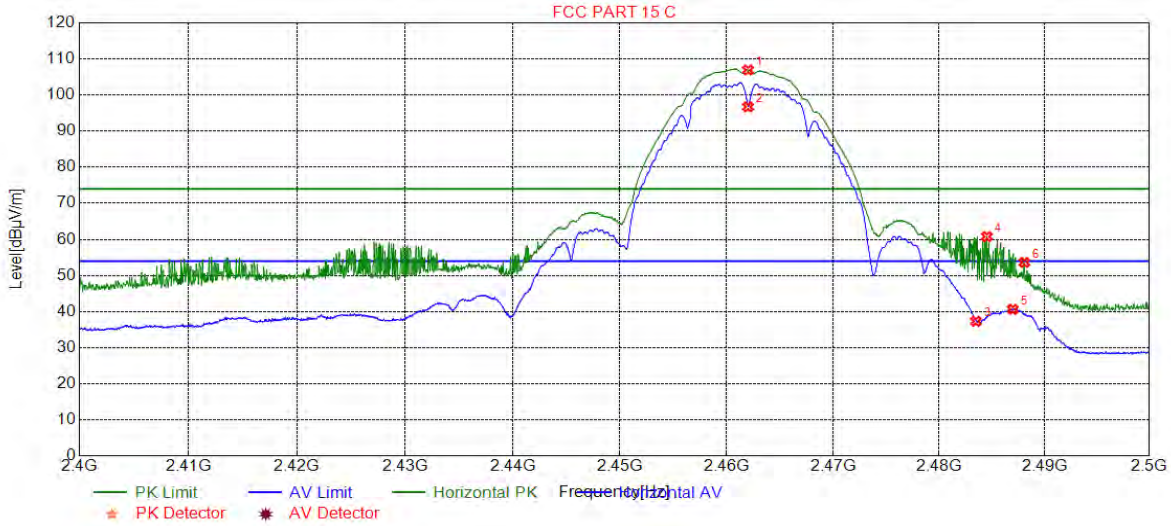
4.10.1.4 802.11B_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	106.93	7.98	74.00	-32.93	150	62	Horizontal
2	2462.0000	96.72	7.98	54.00	-42.72	150	62	Horizontal
3	2483.5000	37.31	8.01	54.00	16.69	150	62	Horizontal
4	2484.5423	60.79	8.01	74.00	13.21	150	62	Horizontal
5	2486.9935	40.61	8.01	54.00	13.39	150	62	Horizontal
6	2488.0940	53.62	8.02	74.00	20.38	150	68	Horizontal

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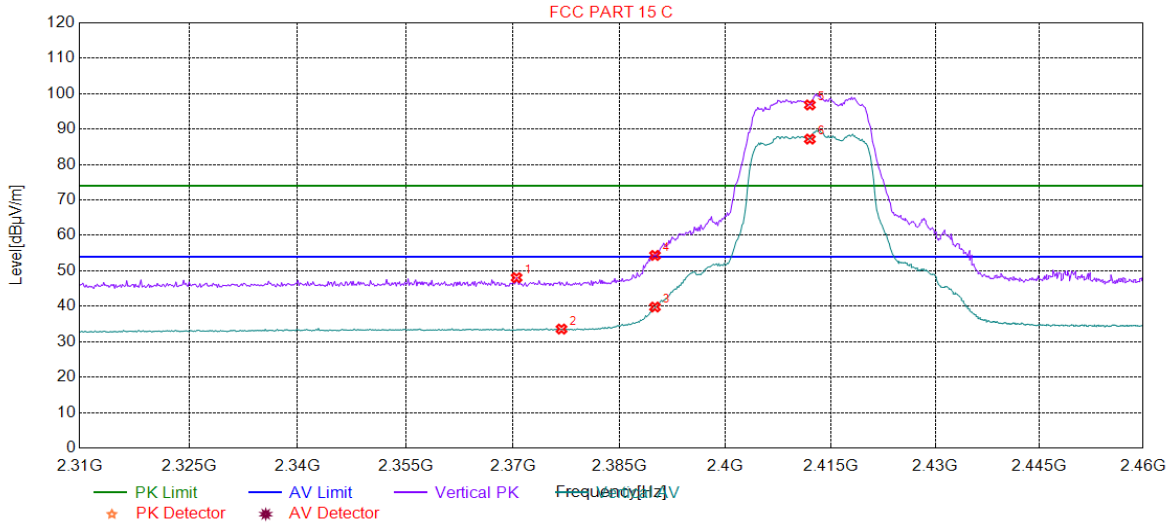
4.10.1.5 802.11G_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2370.5105	48.07	7.79	74.00	25.93	200	296	Vertical
2	2376.8168	33.58	7.78	54.00	20.42	100	106	Vertical
3	2390.0000	39.79	7.77	54.00	14.21	100	40	Vertical
4	2390.0000	54.36	7.77	74.00	19.64	100	15	Vertical
5	2412.0000	96.82	7.81	74.00	-22.82	100	152	Vertical
6	2412.0000	87.19	7.81	54.00	-33.19	100	152	Vertical

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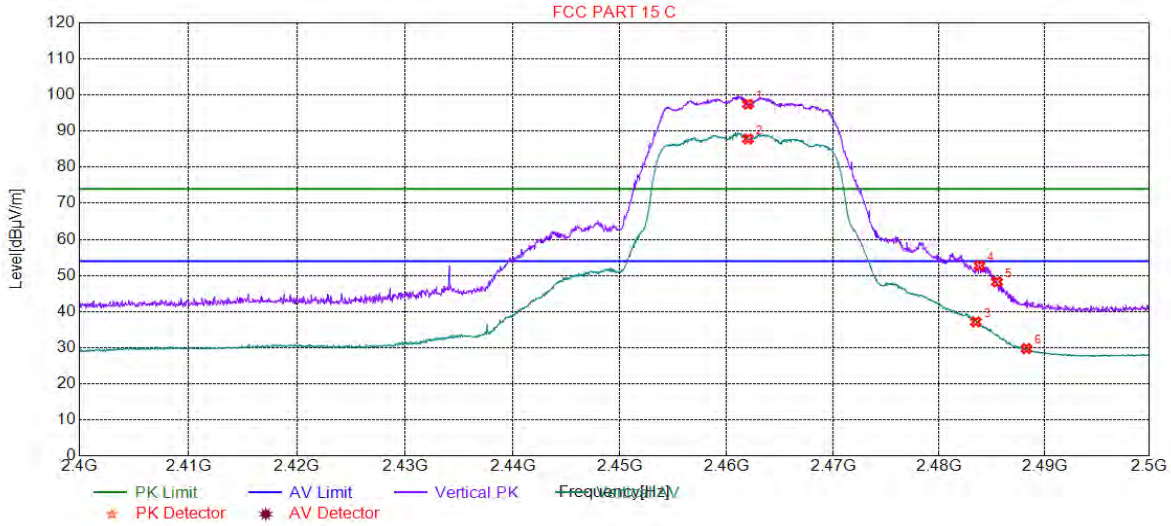
4.10.1.6 802.11G_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	97.45	7.98	74.00	-23.45	200	169	Vertical
2	2462.0000	87.85	7.98	54.00	-33.85	200	163	Vertical
3	2483.5000	37.15	8.01	54.00	16.85	200	191	Vertical
4	2483.8419	52.73	8.01	74.00	21.27	200	253	Vertical
5	2485.4927	48.23	8.01	74.00	25.77	200	247	Vertical
6	2488.2941	29.74	8.02	54.00	24.26	200	191	Vertical

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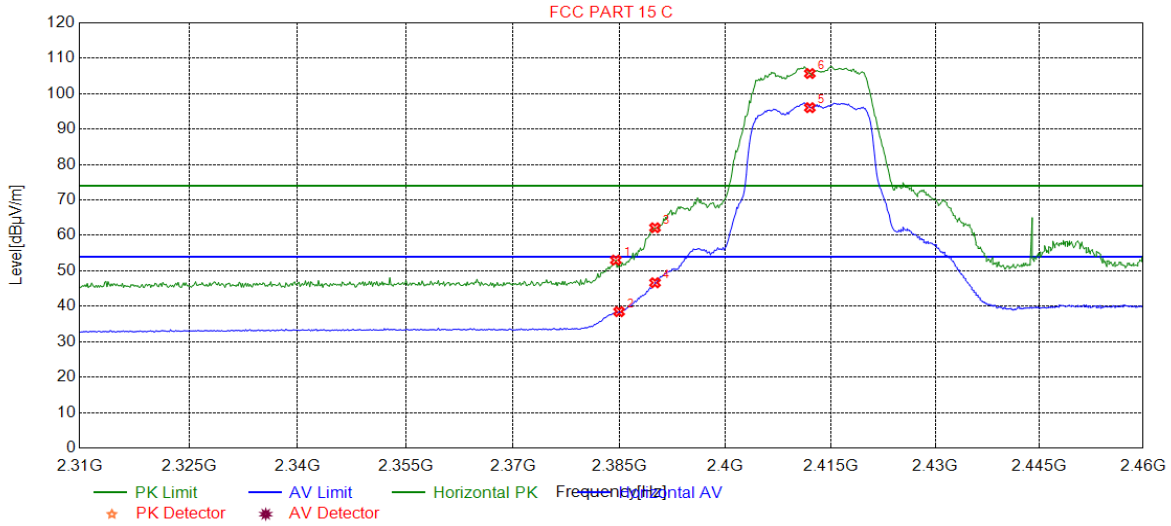
4.10.1.7 802.11G_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2384.4745	53.04	7.78	74.00	20.96	100	42	Horizontal
2	2384.9249	38.49	7.78	54.00	15.51	100	47	Horizontal
3	2390.0000	62.17	7.77	74.00	11.83	100	47	Horizontal
4	2390.0000	46.64	7.77	54.00	7.36	100	47	Horizontal
5	2412.0000	96.05	7.81	54.00	-42.05	100	51	Horizontal
6	2412.0000	105.70	7.81	74.00	-31.70	100	47	Horizontal

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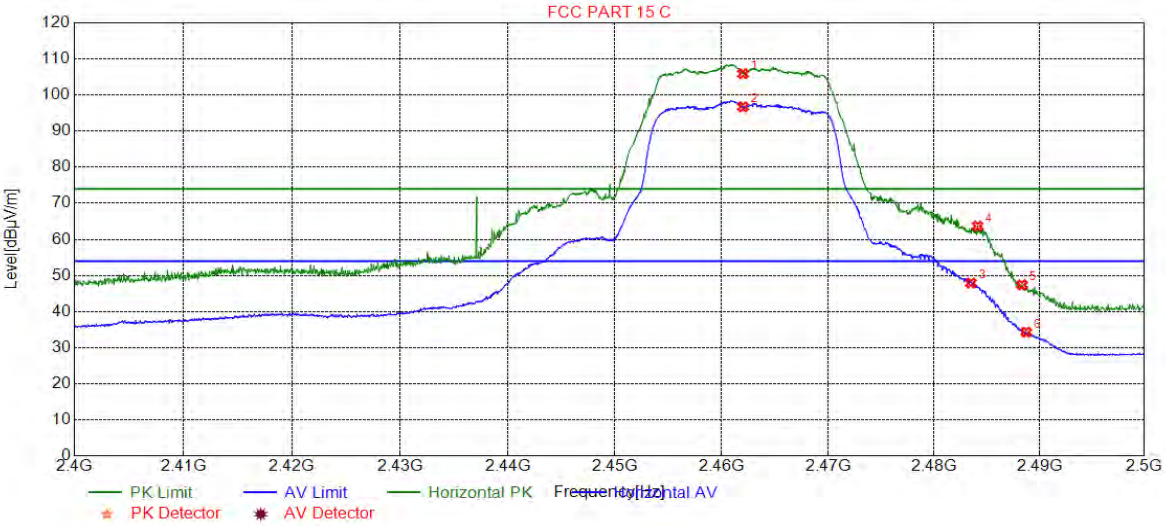
4.10.1.8 802.11G_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	105.89	7.98	74.00	-31.89	100	53	Horizontal
2	2462.0000	96.72	7.98	54.00	-42.72	100	48	Horizontal
3	2483.5000	47.92	8.01	54.00	6.08	100	53	Horizontal
4	2484.1421	63.67	8.01	74.00	10.33	100	48	Horizontal
5	2488.3442	47.40	8.02	74.00	26.60	100	59	Horizontal
6	2488.7444	34.31	8.02	54.00	19.69	100	53	Horizontal

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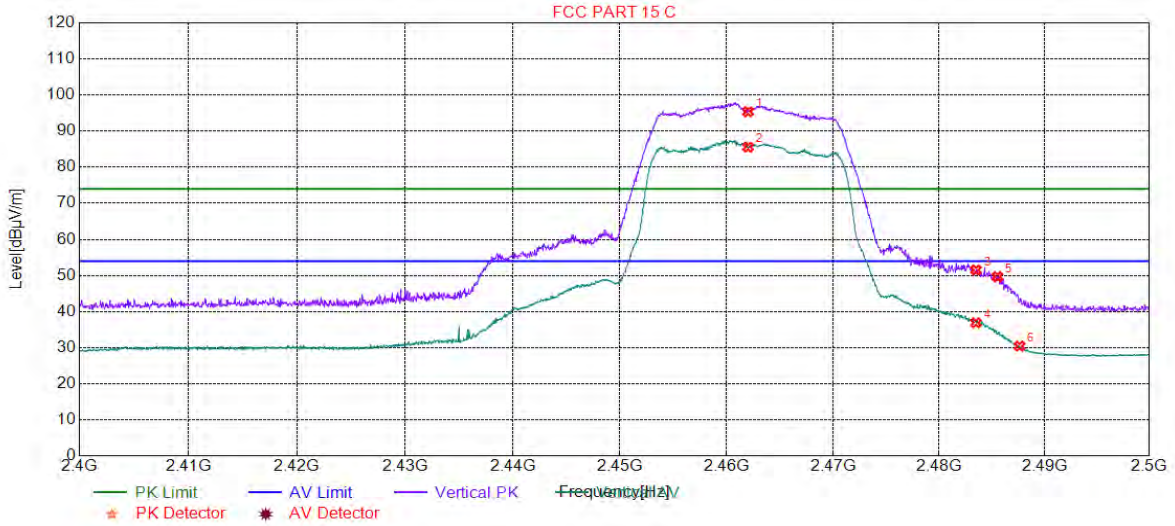
4.10.1.9 802.11N20_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	95.37	7.98	74.00	-21.37	200	167	Vertical
2	2462.0000	85.57	7.98	54.00	-31.57	200	167	Vertical
3	2483.5000	51.54	8.01	74.00	22.46	100	149	Vertical
4	2483.5000	36.89	8.01	54.00	17.11	200	118	Vertical
5	2485.5428	49.66	8.01	74.00	24.34	200	129	Vertical
6	2487.6438	30.42	8.02	54.00	23.58	100	44	Vertical

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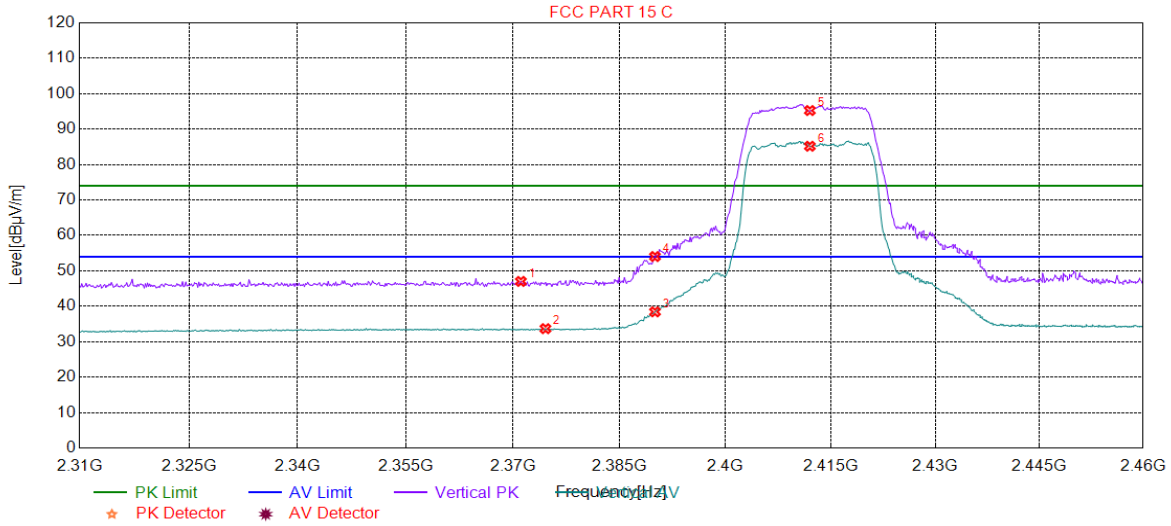
4.10.1.10 802.11N20_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2371.1111	47.02	7.79	74.00	26.98	100	29	Vertical
2	2374.5646	33.69	7.79	54.00	20.31	200	337	Vertical
3	2390.0000	38.43	7.77	54.00	15.57	100	346	Vertical
4	2390.0000	54.04	7.77	74.00	19.96	200	145	Vertical
5	2412.0000	95.25	7.81	74.00	-21.25	100	295	Vertical
6	2412.0000	85.18	7.81	54.00	-31.18	100	295	Vertical

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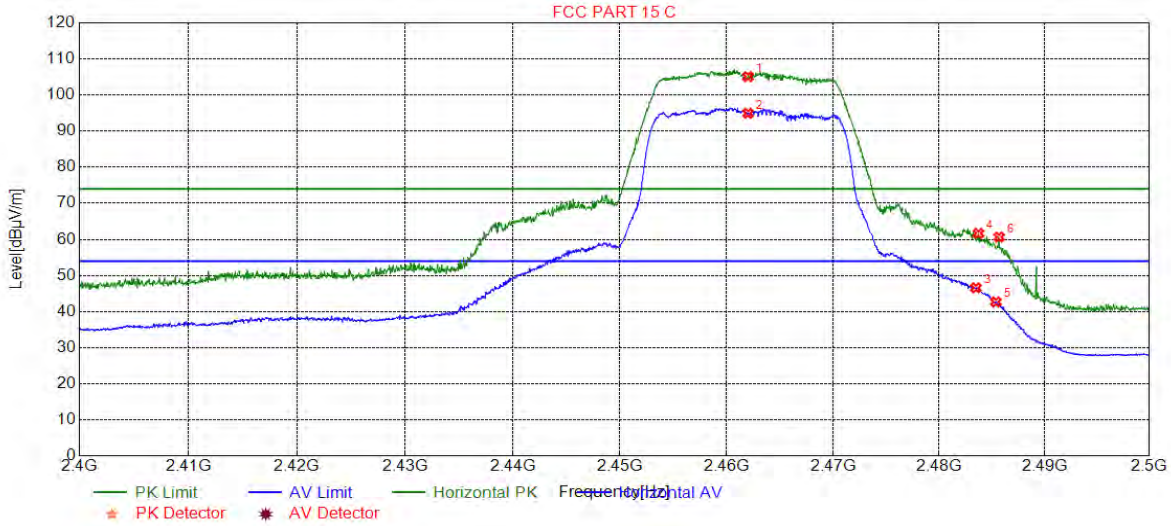
4.10.1.11 802.11N20_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	105.08	7.98	74.00	-31.08	100	56	Horizontal
2	2462.0000	94.93	7.98	54.00	-40.93	100	56	Horizontal
3	2483.5000	46.58	8.01	54.00	7.42	100	62	Horizontal
4	2483.7419	61.65	8.01	74.00	12.35	100	88	Horizontal
5	2485.3927	42.67	8.01	54.00	11.33	100	56	Horizontal
6	2485.6928	60.64	8.01	74.00	13.36	100	56	Horizontal

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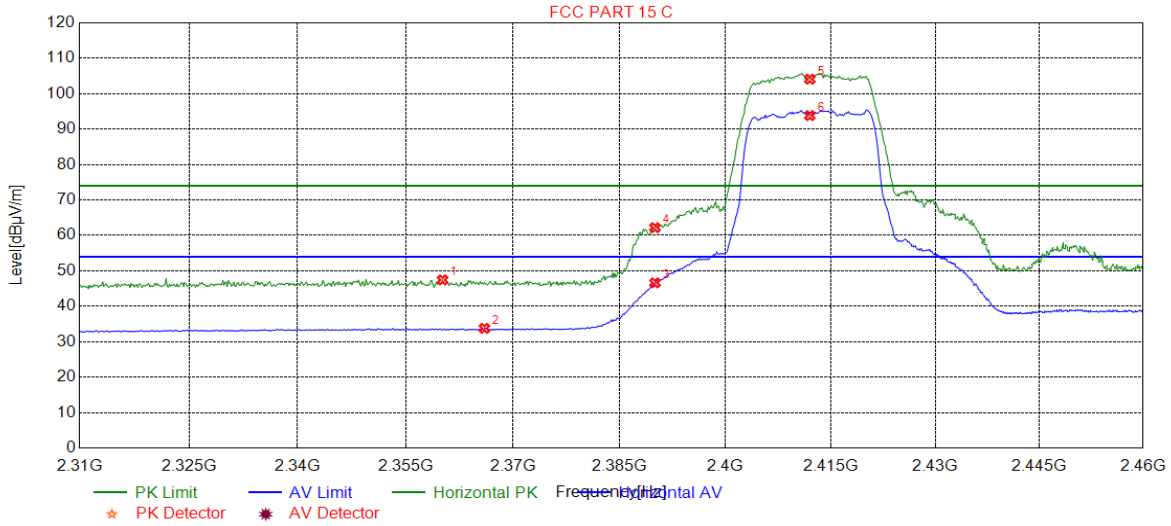
4.10.1.12 802.11N20_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2360.1502	47.45	7.80	74.00	26.55	100	0	Horizontal
2	2366.0060	33.77	7.79	54.00	20.23	100	91	Horizontal
3	2390.0000	46.61	7.77	54.00	7.39	200	38	Horizontal
4	2390.0000	62.20	7.77	74.00	11.80	100	42	Horizontal
5	2412.0000	104.10	7.81	74.00	-30.10	200	42	Horizontal
6	2412.0000	93.82	7.81	54.00	-39.82	200	52	Horizontal

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

All Modes have been tested, but only the worst case data displayed in this report.

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5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB
4	Radiated Spurious emission test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-25GHz)
5	Conduct emission test	±3.12 dB (9KHz- 30MHz)
6	Temperature test	±1°C
7	Humidity test	±3%
8	DC and low frequency voltages	±0.5%

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6 Equipment List

Conducted Emission					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2017/5/10	2020/5/9
LISN	Rohde & Schwarz	ENV216	SEM007-01	2019/7/14	2020/7/14
LISN	ETS-LINDGREN	Feb-16	SEM007-02	2019/4/1	2020/3/31
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2019/6/12	2020/6/11
2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	EMC0122	2019/12/22	2020/12/21
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2019/12/22	2020/12/21

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2019/7/15	2020/7/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2020/1/3	202/1/2
Coaxial Cable	SGS	N/A	SEM031-01	2019/6/12	2020/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019/7/14	2020/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2019/10/27	2020/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019/7/14	2020/7/14

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018/3/13	2021/3/12
Measurement Software	AUDIX	e3V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2019/6/12	2020/6/11
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2019/3/12	2020/3/11
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017/6/27	2020/6/26
Horn Antenna (0.8-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018/4/13	2021/4/12
Pre-amplifier(0.1-1.3GHz)	HP	8447D	SEM005-02	2019/7/14	2020/7/14
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2019/9/3	2020/9/2
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017/10/17	2020/10/16
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2019/12/22	2020/12/21
Band filter	N/A	N/A	SEM023-01	N/A	N/A

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017/8/5	2020/8/4
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2019/6/12	2020/6/11
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2019/7/14	2020/7/14
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017/6/27	2020/6/26
Pre-amplifier (0.1-1.3GHz)	Agilent Technologies	8447D	SEM005-01	2019/12/22	2020/12/21

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7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-Up for ZR/2019/C0026.

The End

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