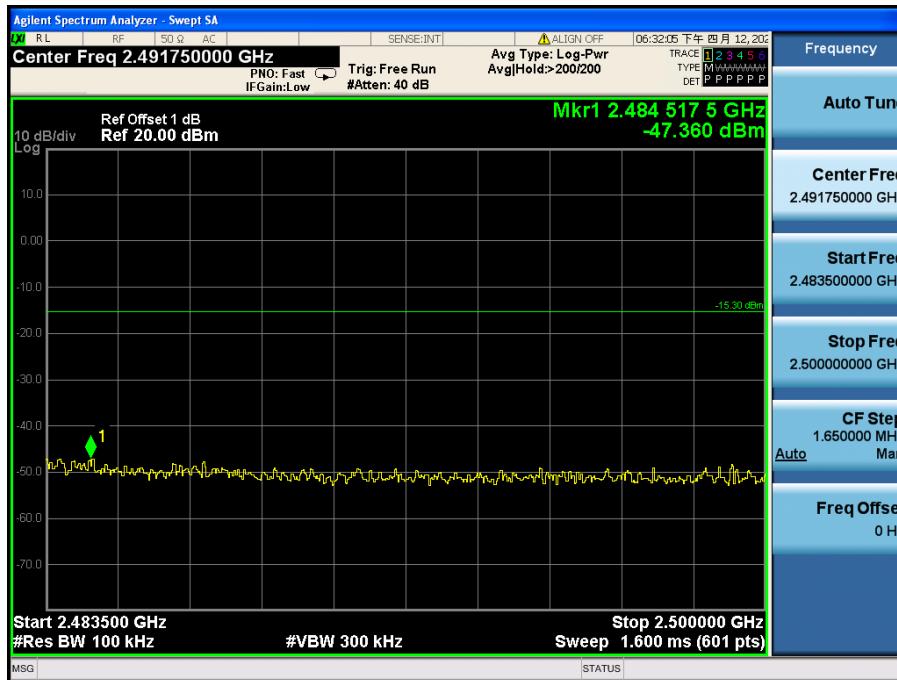


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## 4.8.1.1.7 802.11N20\_Lowest Channel



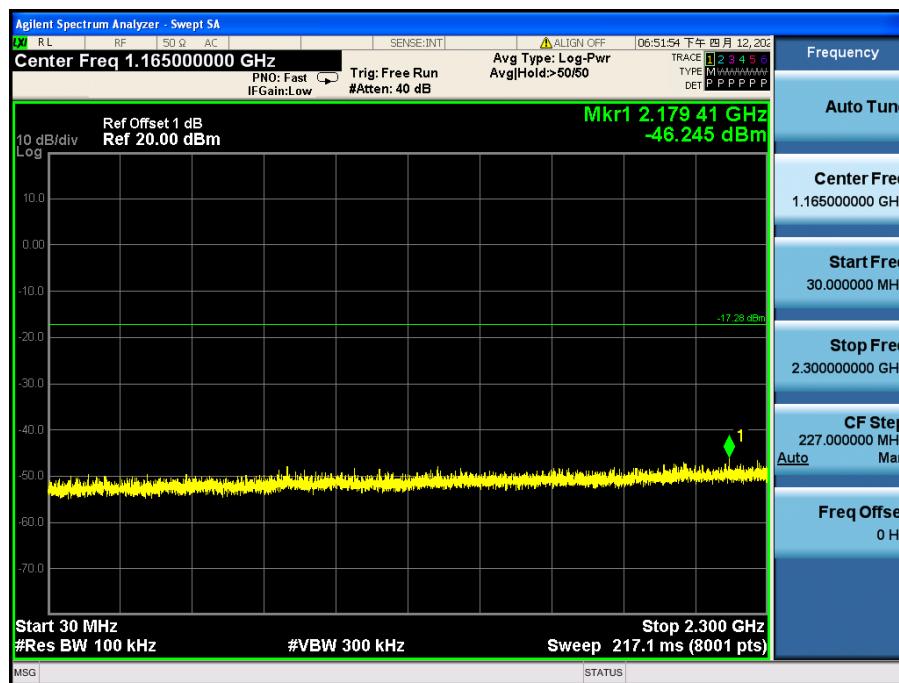
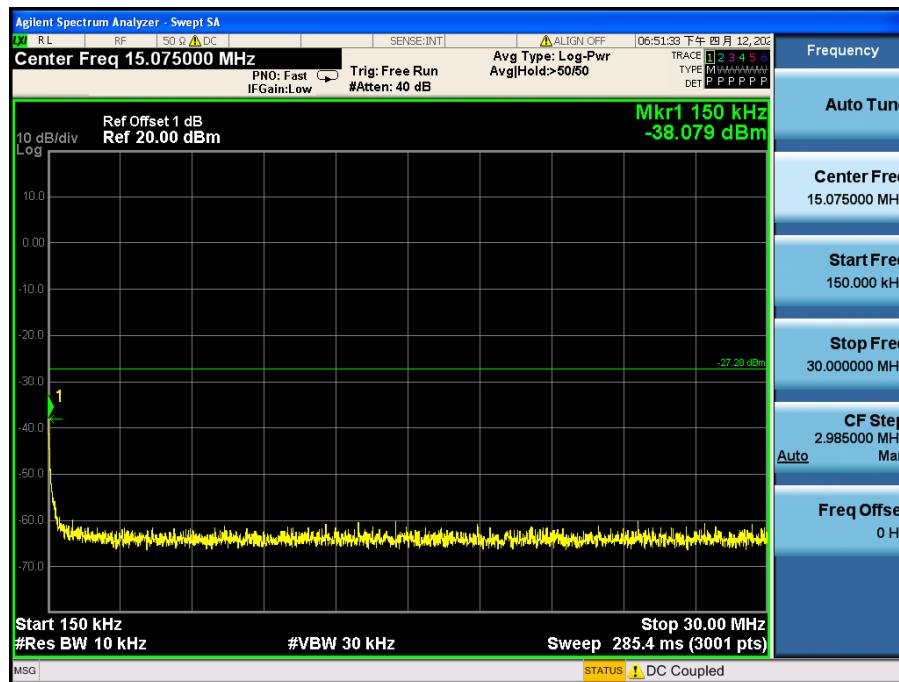
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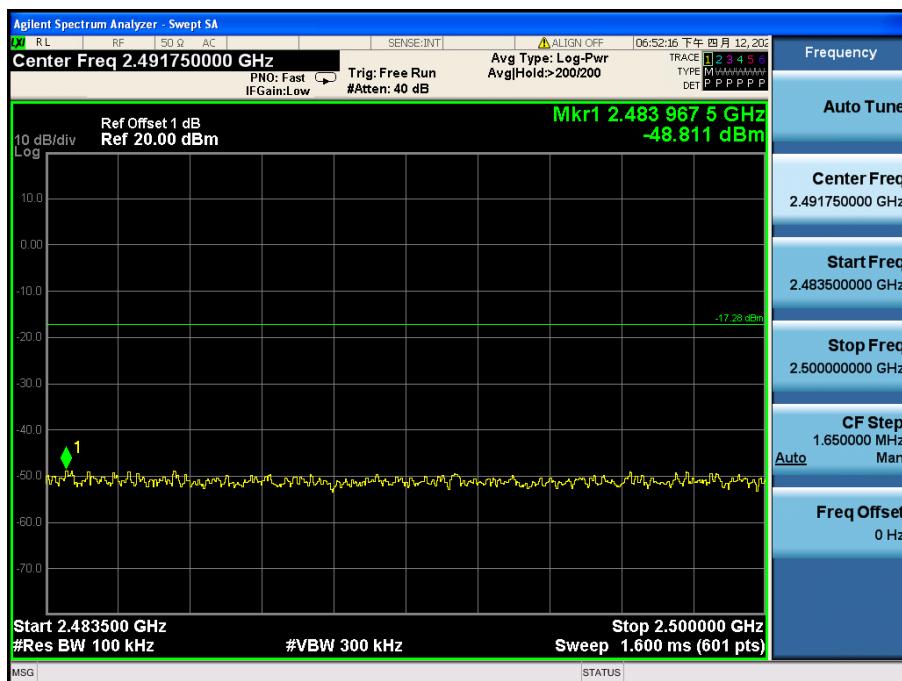
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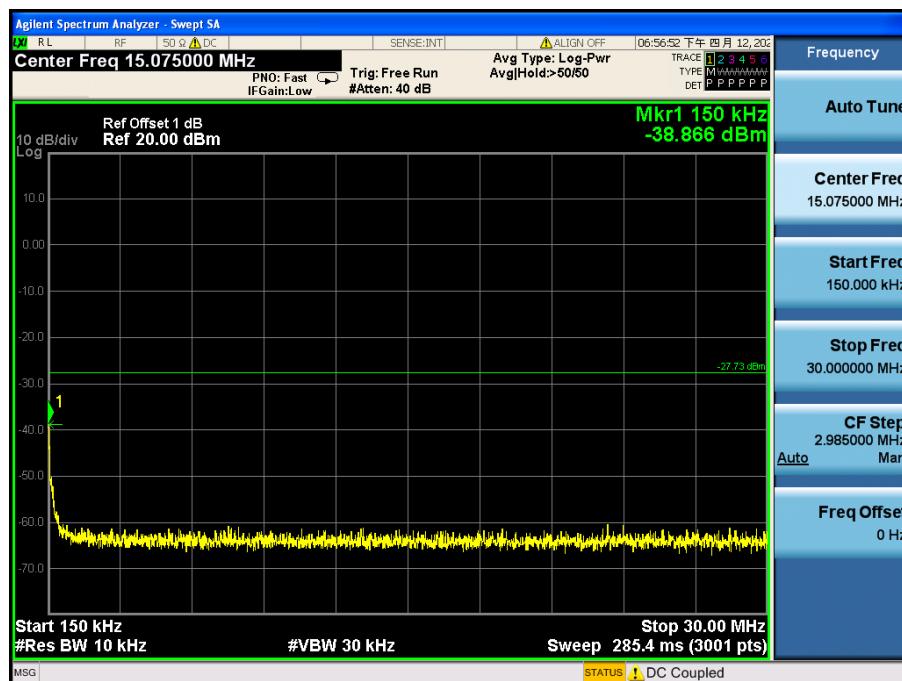


#### 4.8.1.1.8 802.11 N20\_Middle Channel



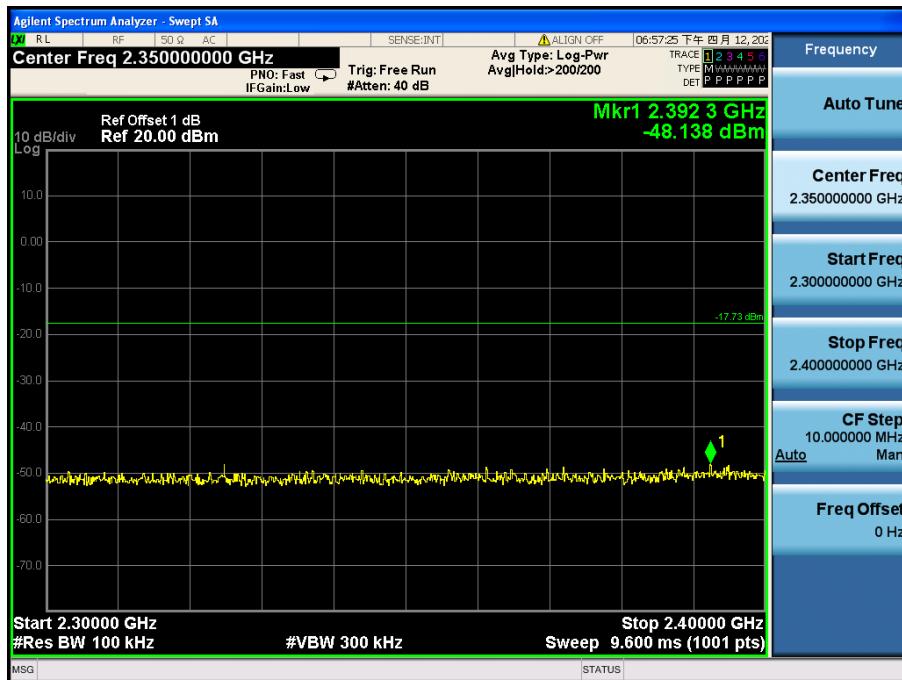
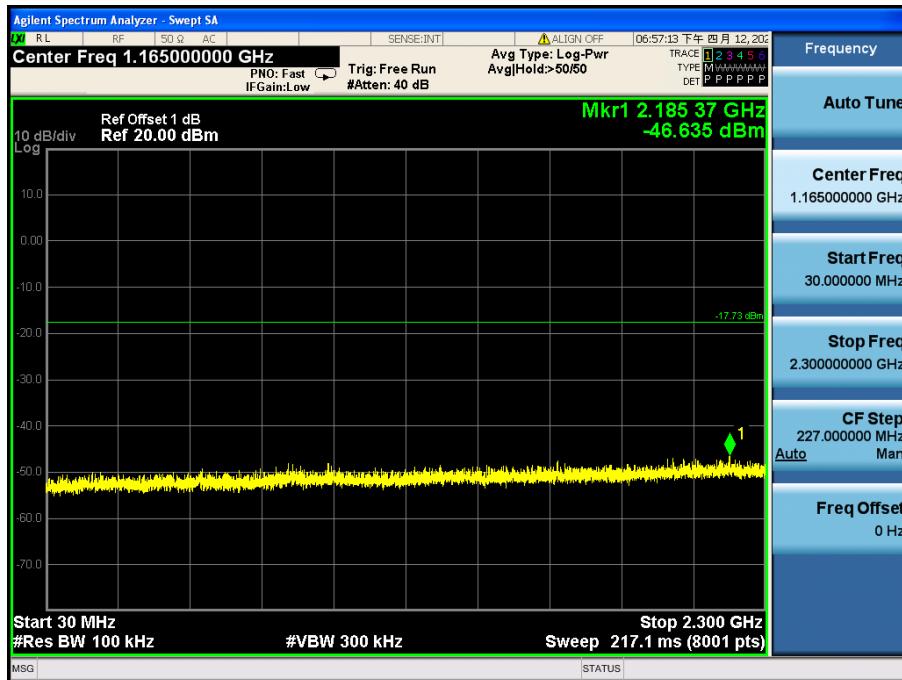
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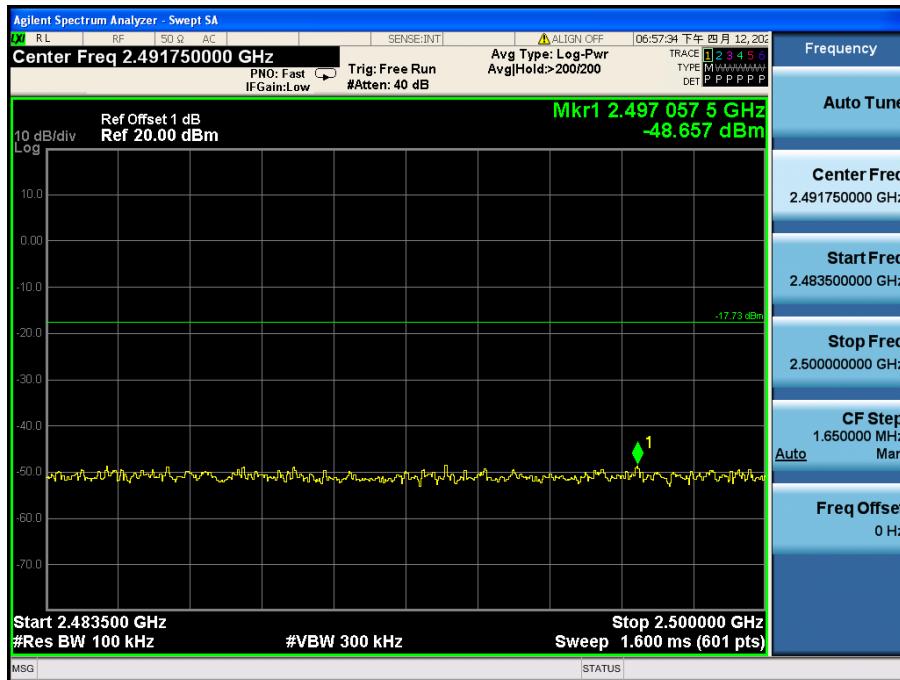
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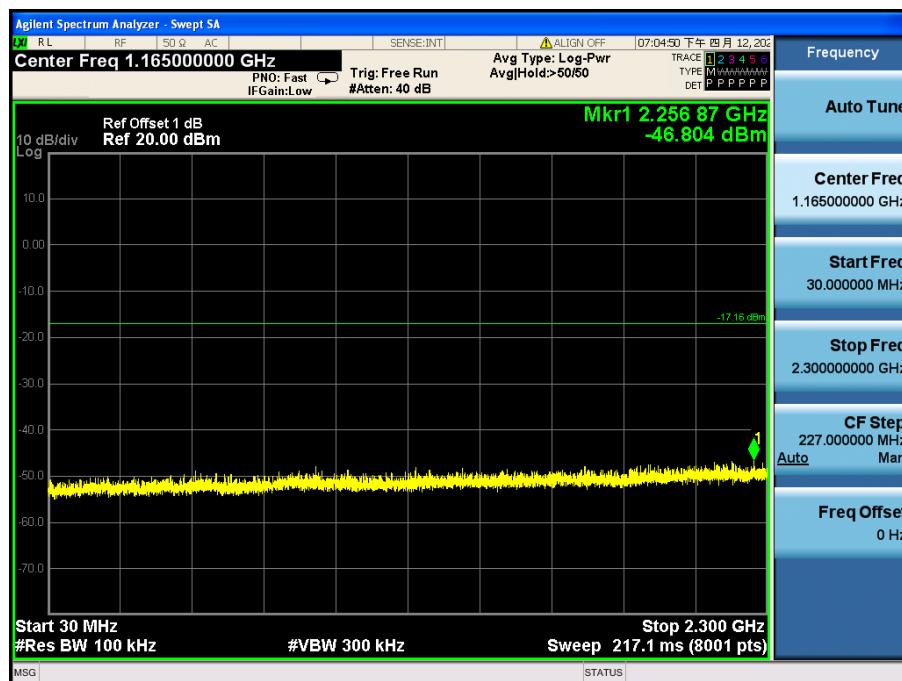
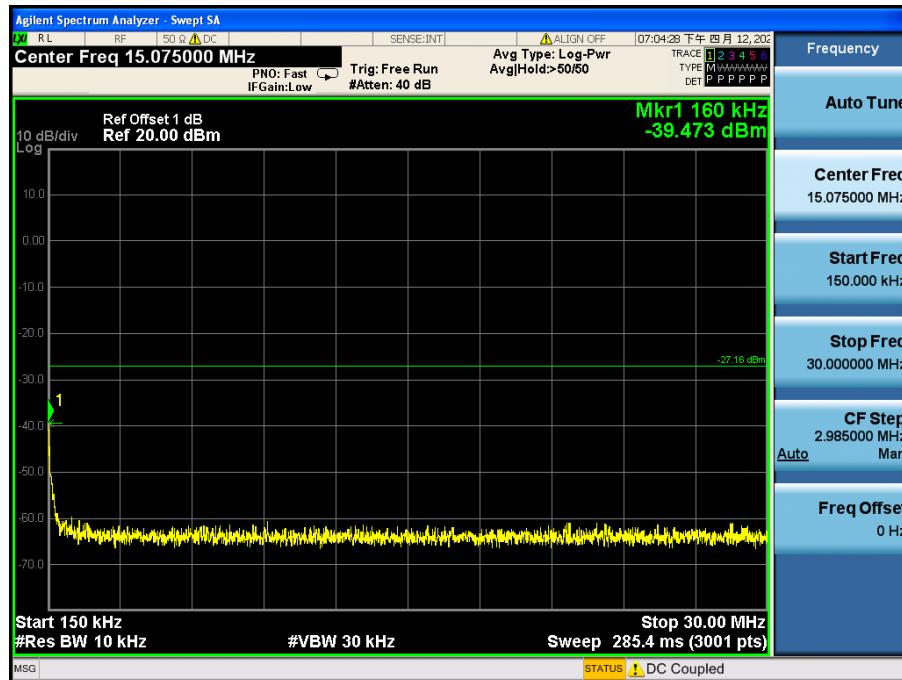
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## 4.8.1.1.9 802.11 N20 Highest Channel



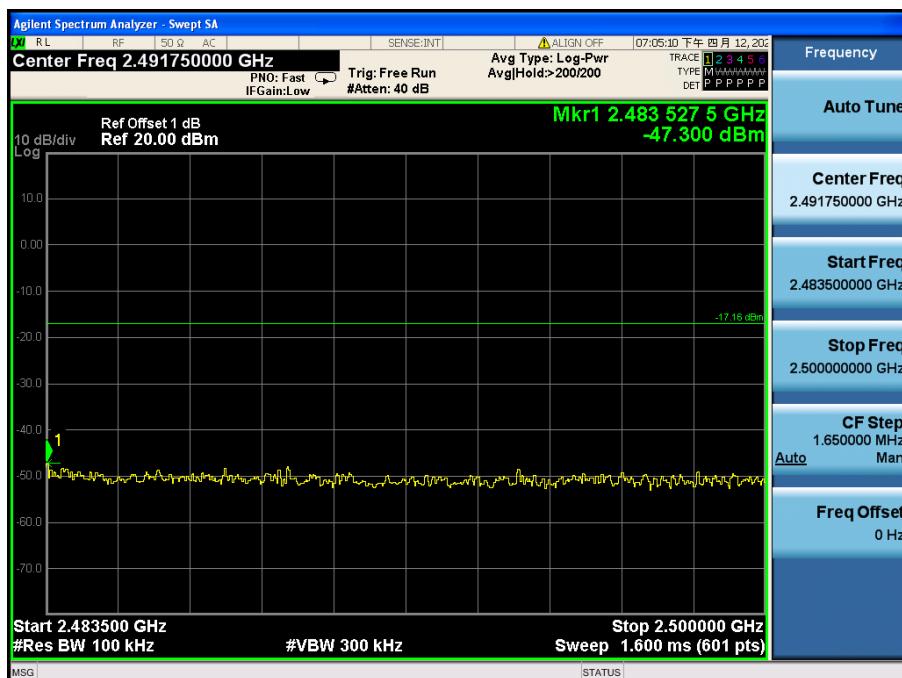
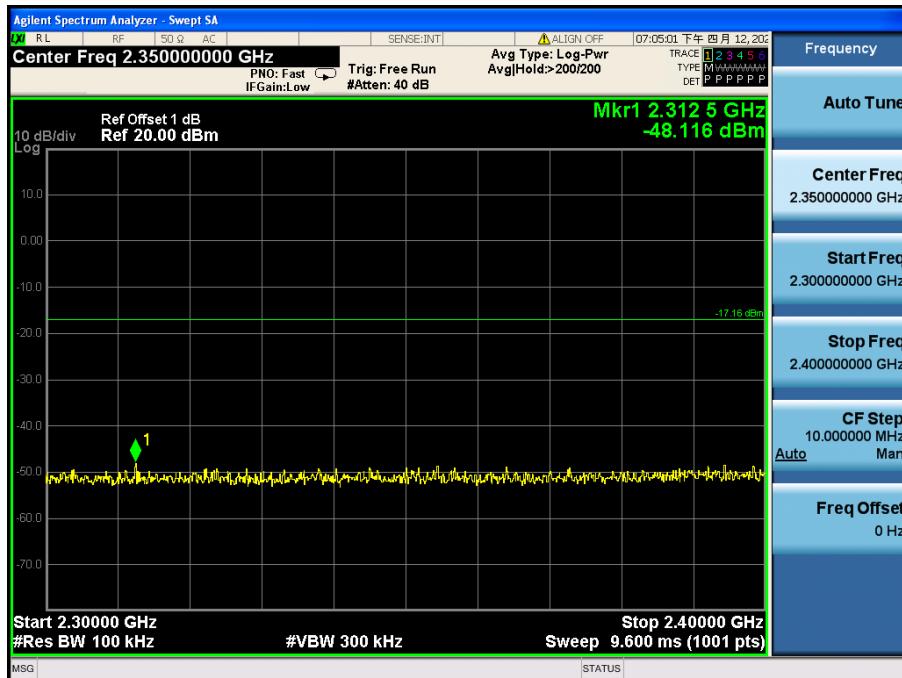
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### Remark:

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.				

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## Test Setup:

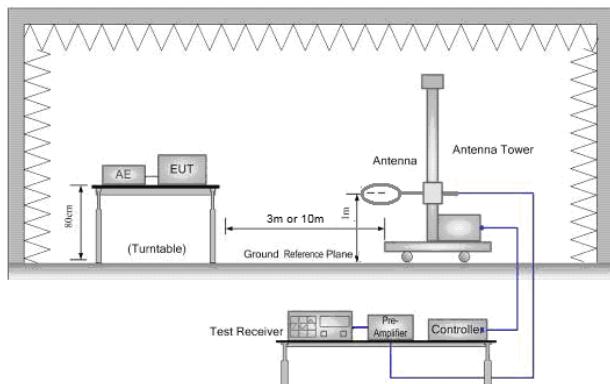


Figure 1. Below 30MHz

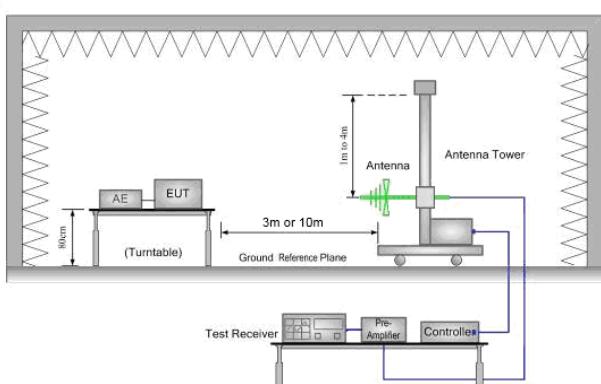


Figure 2. 30MHz to 1GHz

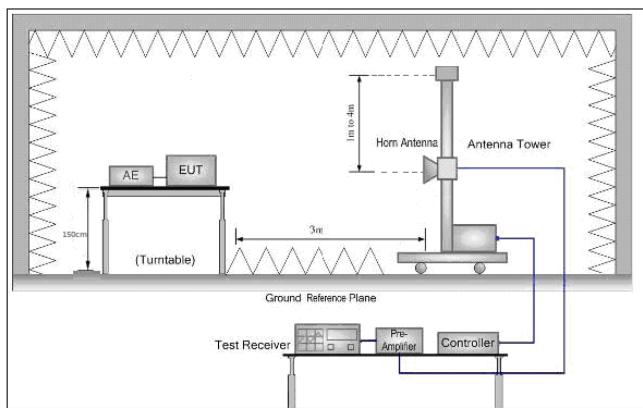


Figure 3. Above 1 GHz

## Test Procedure:

- 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation
- 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.
- 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.
- Use the following spectrum analyzer settings:
  - Span shall wide enough to fully capture the emission being measured;
  - Set RBW=100 kHz for  $f < 1$  GHz, RBW=1MHz for  $f > 1$  GHz ; VBW  $\geq$  RBW; Sweep = auto;
  - Detector function = peak; Trace = max hold for peak
- For average measurement: use duty cycle correction factor method per



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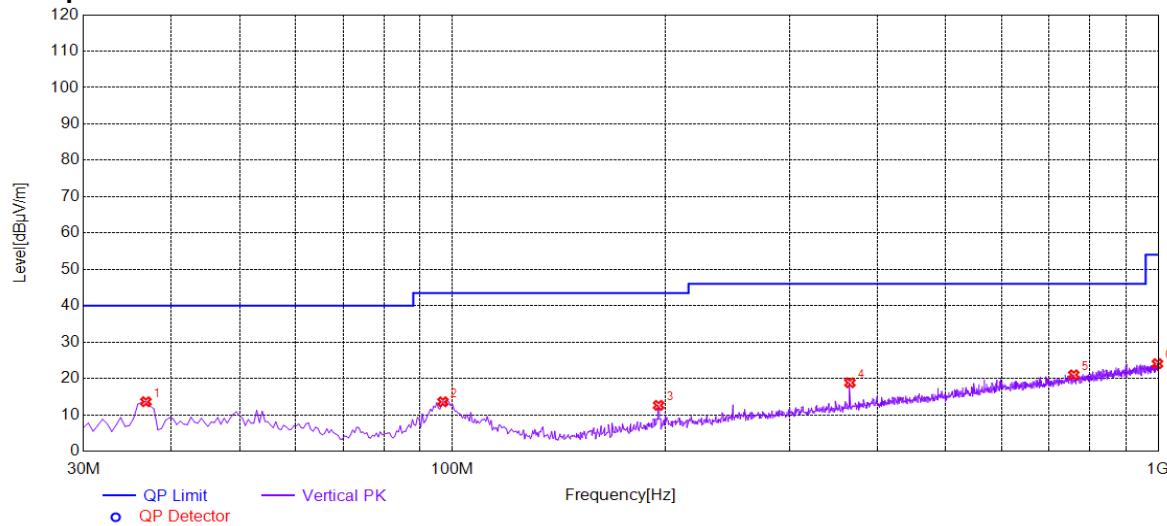
	<p>15.35(c).</p> <p>Duty cycle = On time/100 milliseconds</p> <p>On time = <math>N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n</math></p> <p>Where <math>N_1</math> is number of type 1 pulses, <math>L_1</math> is length of type 1 pulses, etc.</p> <p>Average Emission Level = Peak Emission Level + <math>20 * \log(\text{Duty cycle})</math></p> <p>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.</p> <p>g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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.</p> <p>i. Test the EUT in the lowest channel, the middle channel ,the Highest channel</p> <p>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.</p> <p>k. Repeat above procedures until all frequencies measured was complete.</p>
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****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7934	13.60	-32.19	40.00	26.40	235	344	Vertical
2	96.9635	13.58	-32.21	43.50	29.92	209	108	Vertical
3	195.953	12.61	-31.24	43.50	30.89	236	136	Vertical
4	365.787	18.83	-25.86	46.00	27.17	269	338	Vertical
5	759.319	20.99	-17.34	46.00	25.01	197	39	Vertical
6	997.573	24.06	-13.90	54.00	29.94	241	316	Vertical

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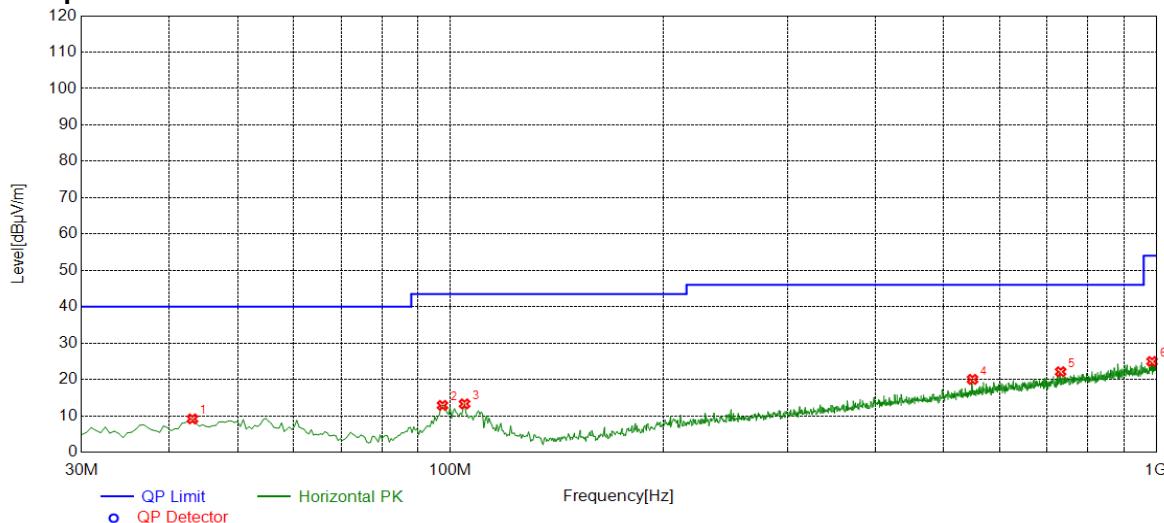
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**4.9.1.2 Charge + Transmitting, Horizontal****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	43.1016	9.15	-30.57	40.00	30.85	130	140	Horizontal
2	97.4487	12.87	-32.13	43.50	30.63	186	271	Horizontal
3	104.727	13.28	-31.68	43.50	30.22	181	64	Horizontal
4	549.209	20.02	-21.47	46.00	25.98	166	111	Horizontal
5	732.146	22.12	-17.92	46.00	23.88	240	89	Horizontal
6	986.413	24.94	-14.03	54.00	29.06	233	230	Horizontal

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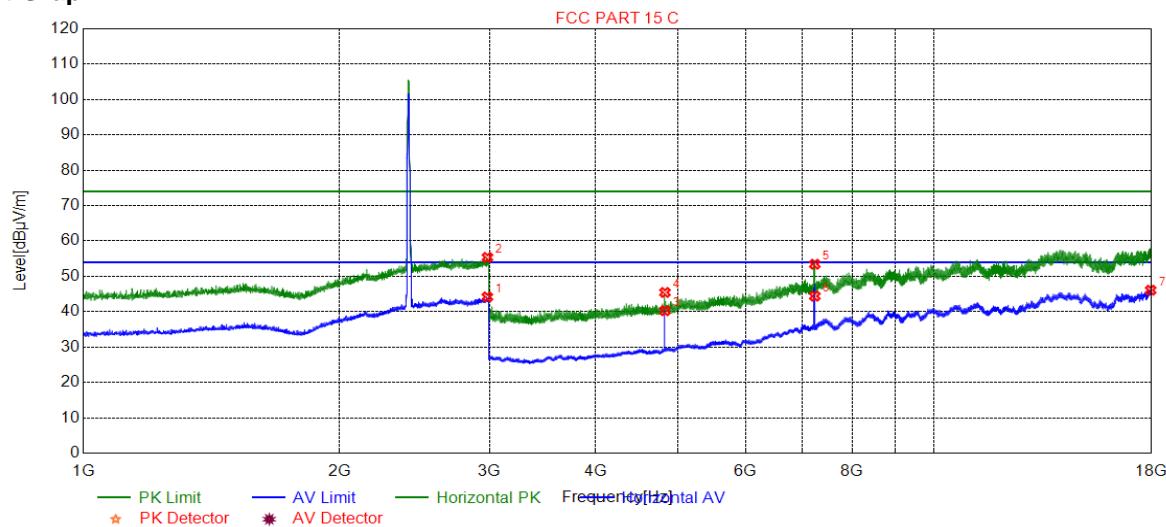
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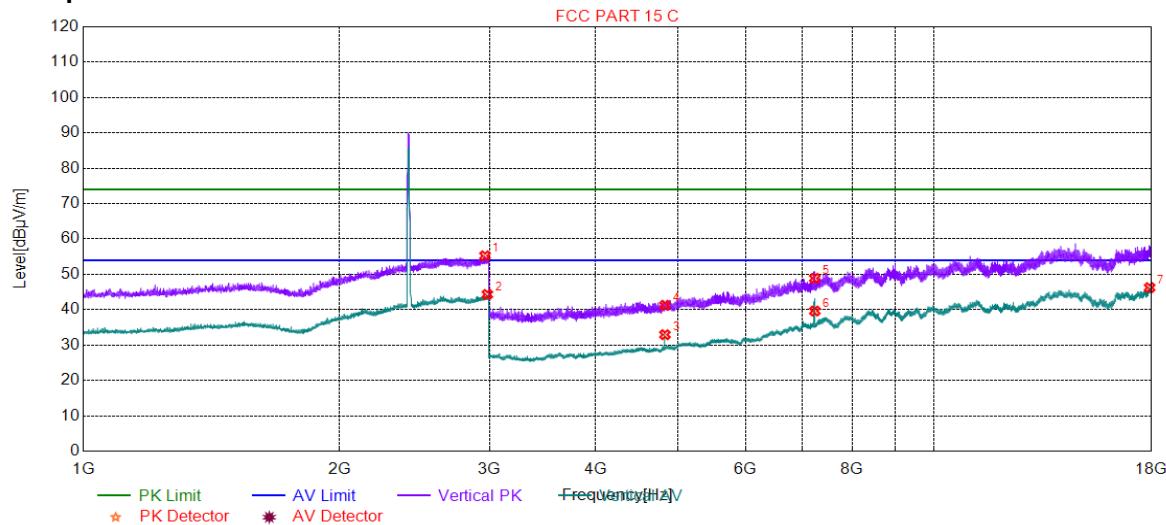
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**4.9.2 Transmitter emission above 1GHz****4.9.2.1 ANT1****4.9.2.1.1 802.11B\_Lowest Channel\_Horizontal****Test Graph****Suspected List**

Suspected List									
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	
1	2983.49	44.18	9.53	54.00	9.82	195	301	Horizontal	
2	2983.99	55.36	9.52	74.00	18.64	114	164	Horizontal	
3	4824.00	40.28	-18.21	54.00	13.72	222	342	Horizontal	
4	4824.00	45.45	-18.21	74.00	28.55	131	314	Horizontal	
5	7236.00	53.43	-9.99	74.00	20.57	105	360	Horizontal	
6	7236.00	44.40	-9.99	54.00	9.60	122	18	Horizontal	
7	17955.4	46.09	0.71	54.00	7.91	172	18	Horizontal	

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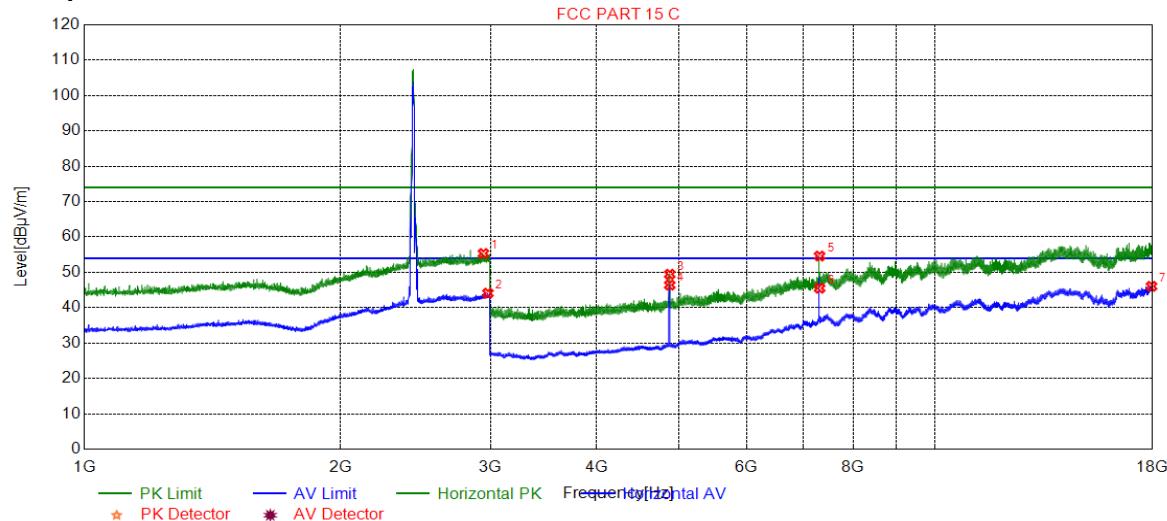
**4.9.2.1.2 802.11B\_Lowest Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2964.49	55.25	9.61	74.00	18.75	278	321	Vertical
2	2983.49	44.33	9.53	54.00	9.67	257	252	Vertical
3	4824.00	32.94	-18.21	54.00	21.06	289	260	Vertical
4	4824.00	41.25	-18.21	74.00	32.75	255	314	Vertical
5	7236.00	48.88	-9.99	74.00	25.12	212	269	Vertical
6	7236.00	39.63	-9.99	54.00	14.37	241	119	Vertical
7	17903.7	46.26	0.69	54.00	7.74	231	218	Vertical

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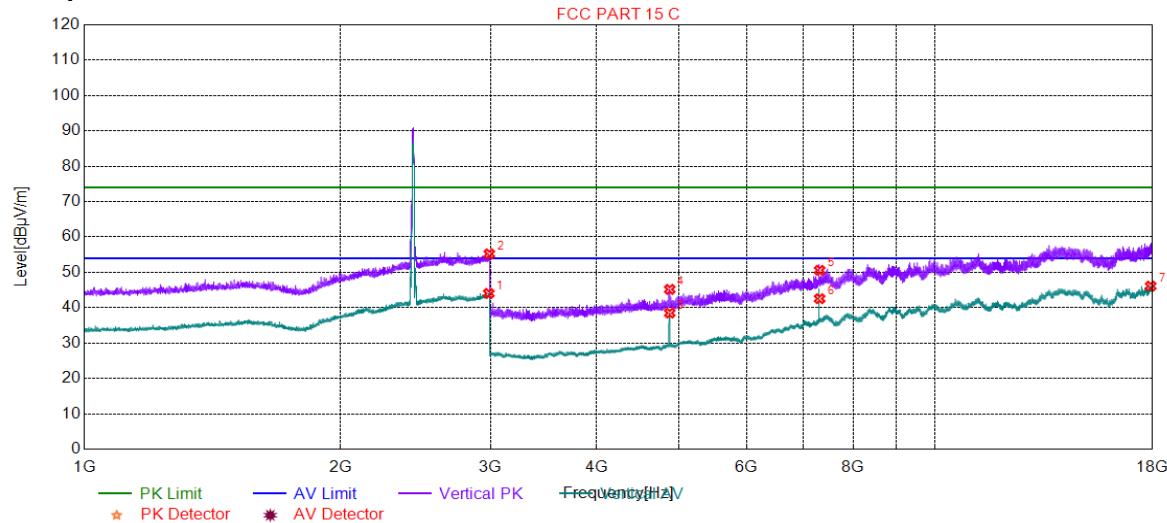


**4.9.2.1.3 802.11B\_ Middle Channel\_ Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2943.98	55.34	9.62	74.00	18.66	220	11	Horizontal
2	2979.99	44.11	9.54	54.00	9.89	126	246	Horizontal
3	4874.00	49.46	-17.99	74.00	24.54	152	314	Horizontal
4	4874.00	46.41	-17.99	54.00	7.59	134	314	Horizontal
5	7311.00	54.61	-9.74	74.00	19.39	117	18	Horizontal
6	7311.00	45.52	-9.74	54.00	8.48	215	360	Horizontal
7	17947.7	46.06	0.70	54.00	7.94	101	360	Horizontal

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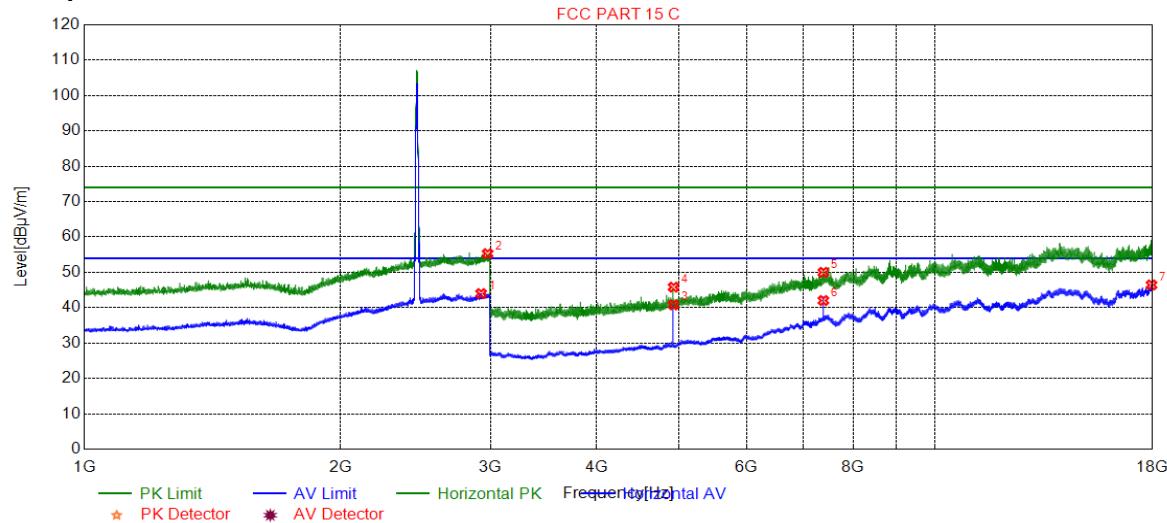
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**4.9.2.1.4 802.11B\_Middle Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2986.99	44.04	9.51	54.00	9.96	193	86	Vertical
2	2990.99	55.23	9.49	74.00	18.77	287	334	Vertical
3	4874.00	38.49	-17.99	54.00	15.51	206	260	Vertical
4	4874.00	45.19	-17.99	74.00	28.81	187	233	Vertical
5	7311.00	50.58	-9.74	74.00	23.42	248	320	Vertical
6	7311.00	42.56	-9.74	54.00	11.44	187	119	Vertical
7	17907.0	46.12	0.69	54.00	7.88	262	270	Vertical

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**4.9.2.1.5 802.11B\_Highest Channel\_Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2925.48	44.01	9.42	54.00	9.99	140	82	Horizontal
2	2977.49	55.30	9.55	74.00	18.70	211	109	Horizontal
3	4924.00	40.80	-17.72	54.00	13.20	227	314	Horizontal
4	4924.00	45.82	-17.72	74.00	28.18	224	314	Horizontal
5	7386.00	50.01	-9.55	74.00	23.99	164	18	Horizontal
6	7386.00	42.04	-9.55	54.00	11.96	176	18	Horizontal
7	17945.5	46.44	0.70	54.00	7.56	199	18	Horizontal

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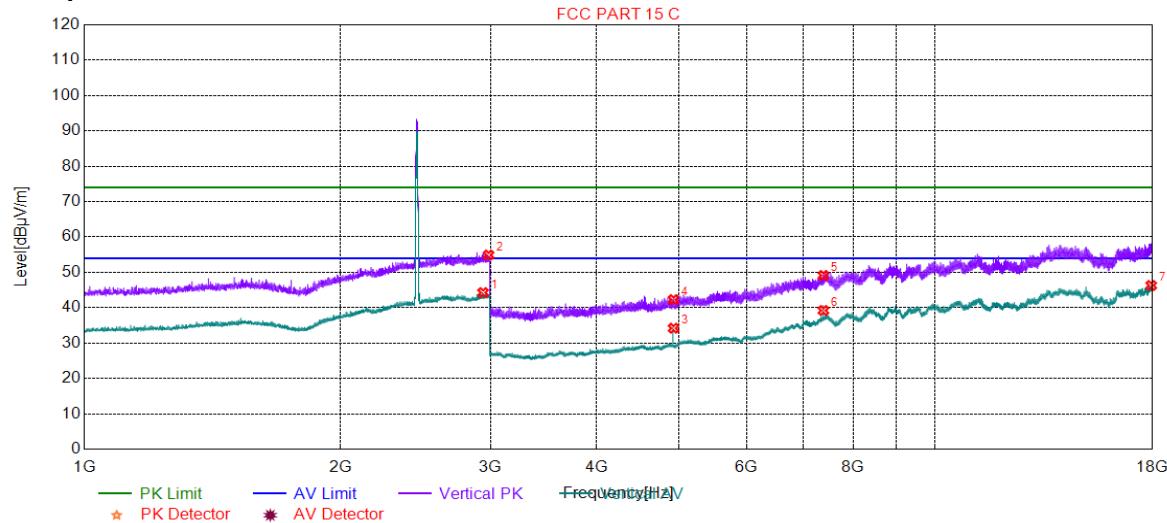


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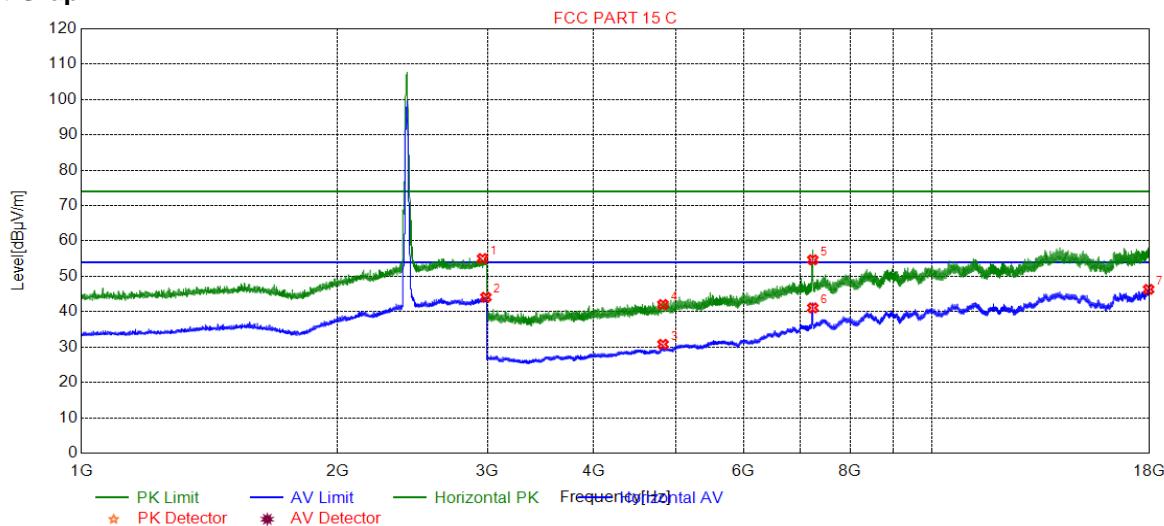
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**4.9.2.1.6 802.11B\_Highest Channel\_Verical****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.98	44.28	9.58	54.00	9.72	290	73	Vertical
2	2984.99	54.91	9.52	74.00	19.09	277	18	Vertical
3	4924.00	34.21	-17.72	54.00	19.79	217	260	Vertical
4	4924.00	42.30	-17.72	74.00	31.70	299	260	Vertical
5	7386.00	49.13	-9.55	74.00	24.87	176	18	Vertical
6	7386.00	39.21	-9.55	54.00	14.79	156	119	Vertical
7	17931.2	46.29	0.70	54.00	7.71	169	323	Vertical

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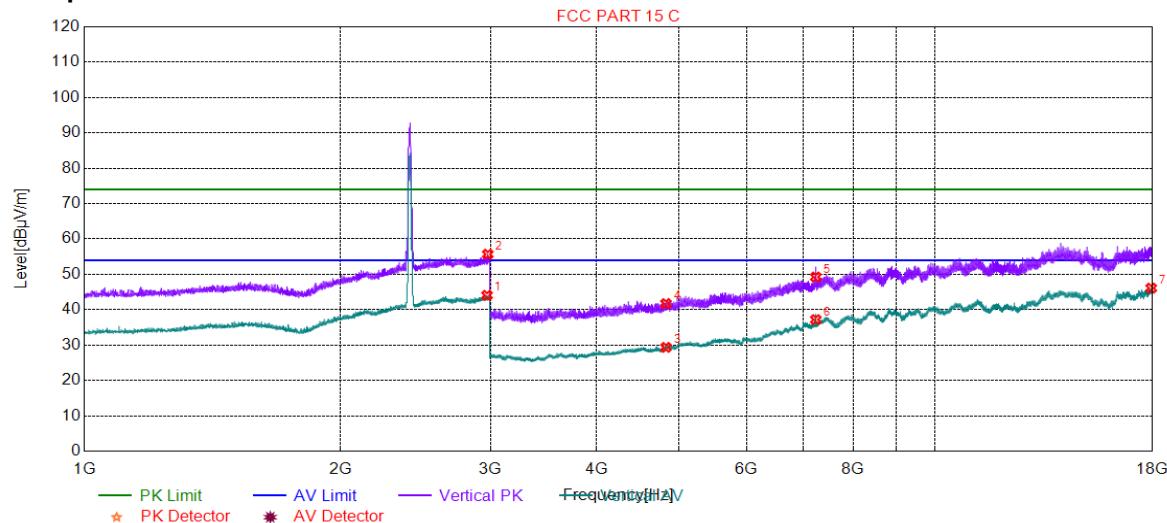
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**4.9.2.1.7 802.11G\_Lowest Channel\_ Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2960.49	55.04	9.63	74.00	18.96	238	123	Horizontal
2	2987.49	44.10	9.51	54.00	9.90	228	109	Horizontal
3	4824.00	30.80	-18.21	54.00	23.20	185	315	Horizontal
4	4824.00	42.05	-18.21	74.00	31.95	221	287	Horizontal
5	7236.00	54.68	-9.99	74.00	19.32	217	360	Horizontal
6	7236.00	41.09	-9.99	54.00	12.91	108	360	Horizontal
7	17949.3	46.33	0.70	54.00	7.67	182	360	Horizontal

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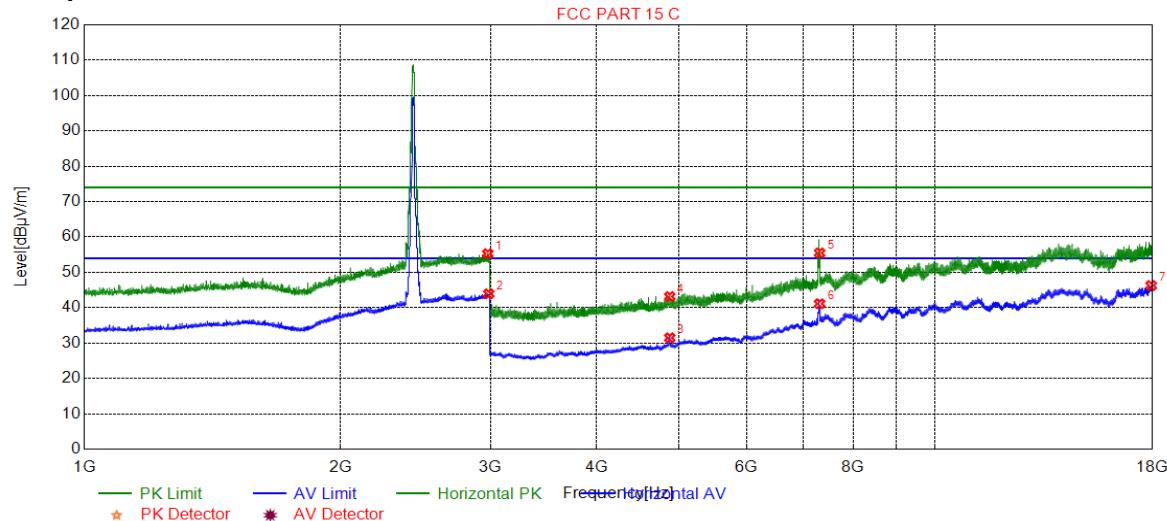
**4.9.2.1.8 802.11G\_Lowest Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2972.99	44.07	9.57	54.00	9.93	168	196	Vertical
2	2978.99	55.70	9.55	74.00	18.30	247	358	Vertical
3	4824.00	29.36	-18.21	54.00	24.64	218	42	Vertical
4	4824.00	41.74	-18.21	74.00	32.26	176	260	Vertical
5	7236.00	49.25	-9.99	74.00	24.75	227	320	Vertical
6	7236.00	37.20	-9.99	54.00	16.80	255	119	Vertical
7	17931.2	46.11	0.70	54.00	7.89	210	119	Vertical

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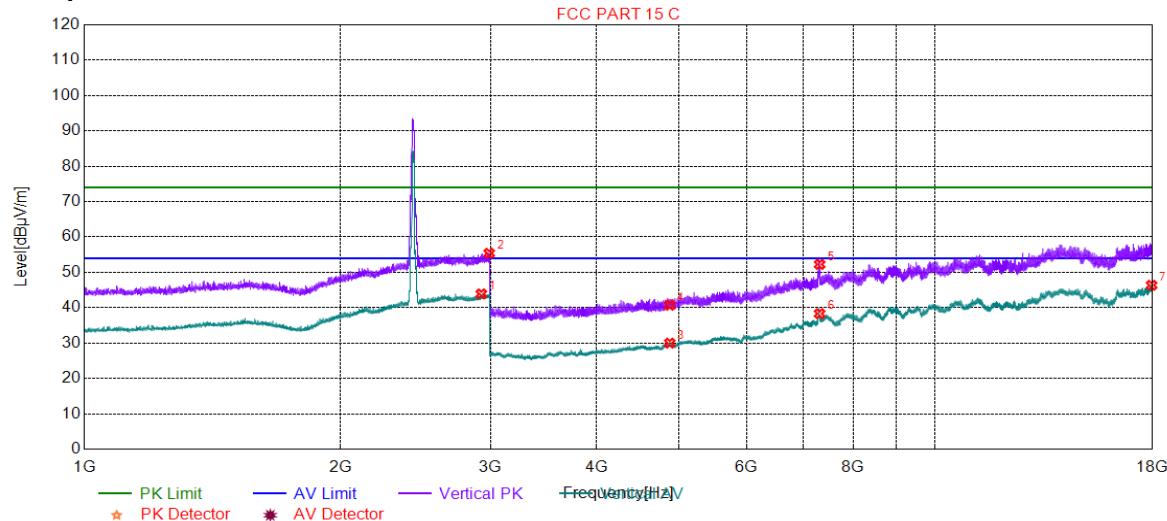


**4.9.2.1.9 802.11G\_ Middle Channel\_ Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2978.49	55.29	9.55	74.00	18.71	163	233	Horizontal
2	2986.49	43.95	9.51	54.00	10.05	102	315	Horizontal
3	4874.00	31.49	-17.99	54.00	22.51	240	314	Horizontal
4	4874.00	43.16	-17.99	74.00	30.84	170	314	Horizontal
5	7311.00	55.48	-9.74	74.00	18.52	230	360	Horizontal
6	7311.00	41.12	-9.74	54.00	12.88	110	360	Horizontal
7	17927.3	46.27	0.70	54.00	7.73	128	319	Horizontal

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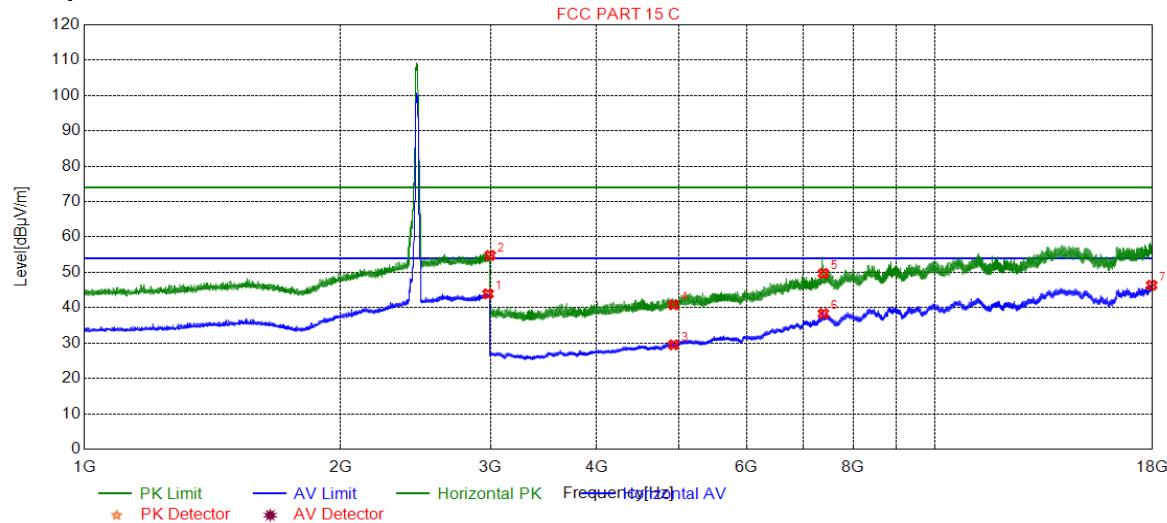
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**4.9.2.1.10 802.11G\_Middle Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2926.98	43.91	9.43	54.00	10.09	247	98	Vertical
2	2990.49	55.41	9.49	74.00	18.59	215	98	Vertical
3	4874.00	30.00	-17.99	54.00	24.00	178	260	Vertical
4	4874.00	40.71	-17.99	74.00	33.29	279	342	Vertical
5	7311.00	52.25	-9.74	74.00	21.75	291	119	Vertical
6	7311.00	38.32	-9.74	54.00	15.68	246	119	Vertical
7	17951.0	46.35	0.71	54.00	7.65	174	320	Vertical

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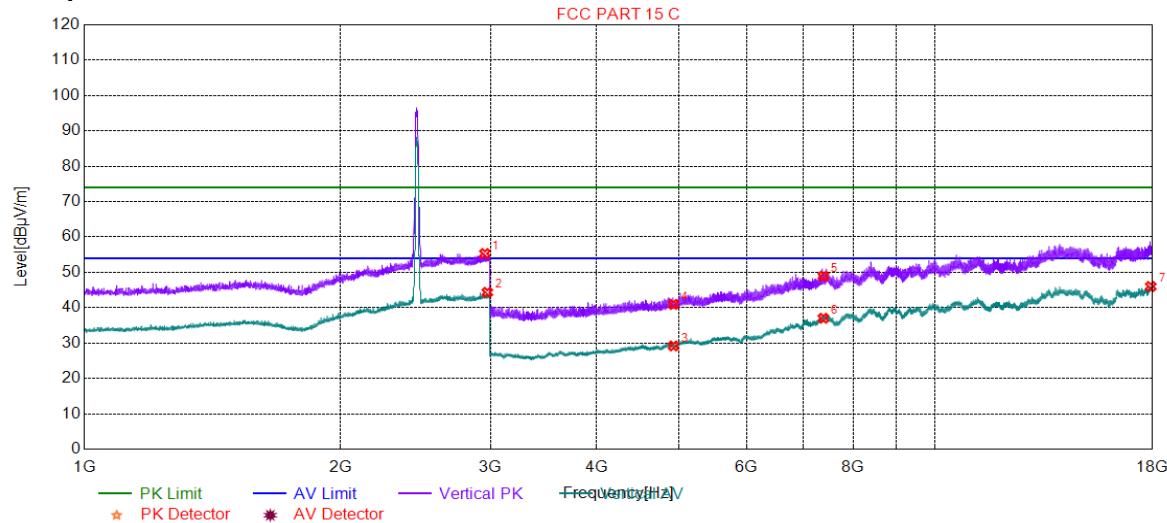
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**4.9.2.1.11 802.11G\_Highest Channel\_Horizontal****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2980.99	43.94	9.54	54.00	10.06	132	273	Horizontal
2	2997.99	54.77	9.46	74.00	19.23	170	2	Horizontal
3	4924.00	29.51	-17.72	54.00	24.49	177	315	Horizontal
4	4924.00	40.82	-17.72	74.00	33.18	145	233	Horizontal
5	7386.00	49.71	-9.55	74.00	24.29	159	360	Horizontal
6	7386.00	38.35	-9.55	54.00	15.65	203	18	Horizontal
7	17952.6	46.35	0.71	54.00	7.65	120	69	Horizontal

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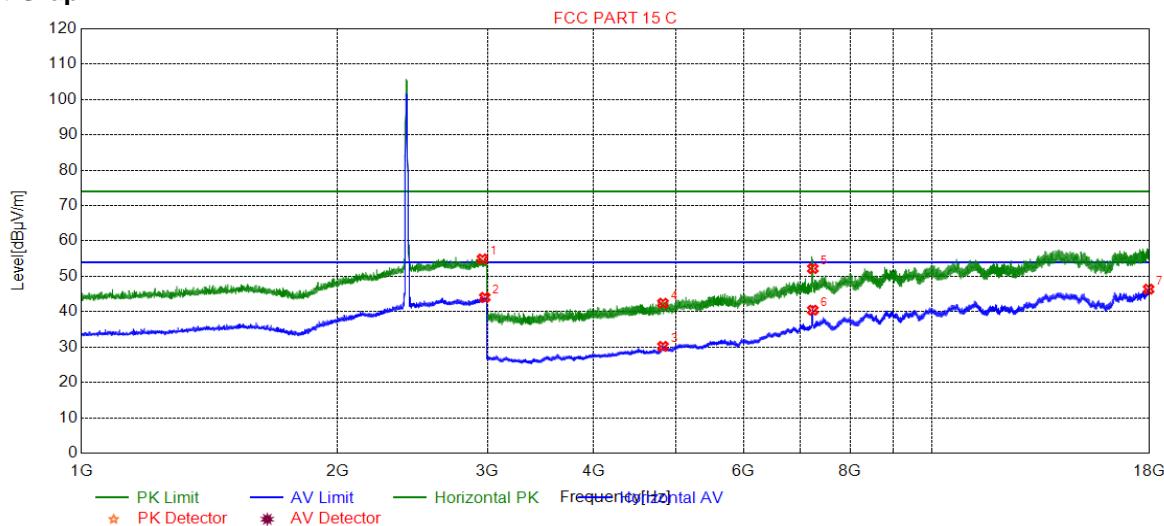
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**4.9.2.1.12 802.11G\_Highest Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2955.48	55.32	9.65	74.00	18.68	289	100	Vertical
2	2974.99	44.35	9.57	54.00	9.65	273	292	Vertical
3	4924.00	29.20	-17.72	54.00	24.80	264	259	Vertical
4	4924.00	40.95	-17.72	74.00	33.05	209	314	Vertical
5	7386.00	48.92	-9.55	74.00	25.08	298	318	Vertical
6	7386.00	37.02	-9.55	54.00	16.98	176	268	Vertical
7	17910.8	46.01	0.69	54.00	7.99	259	268	Vertical

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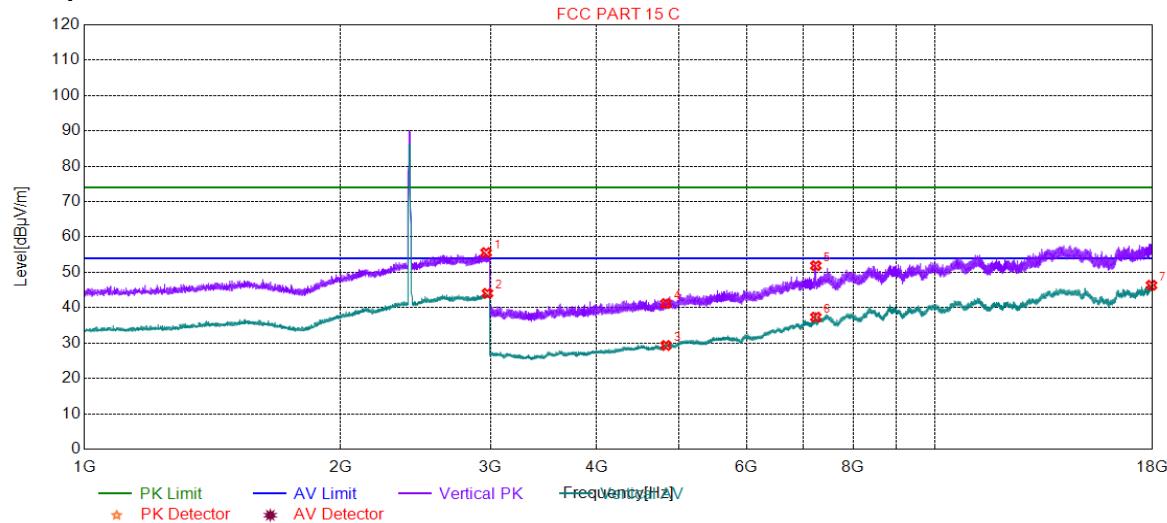
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**4.9.2.1.13 802.11N20\_Lowest Channel\_Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.99	54.92	9.63	74.00	19.08	104	138	Horizontal
2	2978.99	44.06	9.55	54.00	9.94	179	342	Horizontal
3	4824.00	30.21	-18.21	54.00	23.79	157	287	Horizontal
4	4824.00	42.41	-18.21	74.00	31.59	164	116	Horizontal
5	7236.00	52.20	-9.99	74.00	21.80	118	18	Horizontal
6	7236.00	40.44	-9.99	54.00	13.56	149	18	Horizontal
7	17948.2	46.39	0.70	54.00	7.61	239	220	Horizontal

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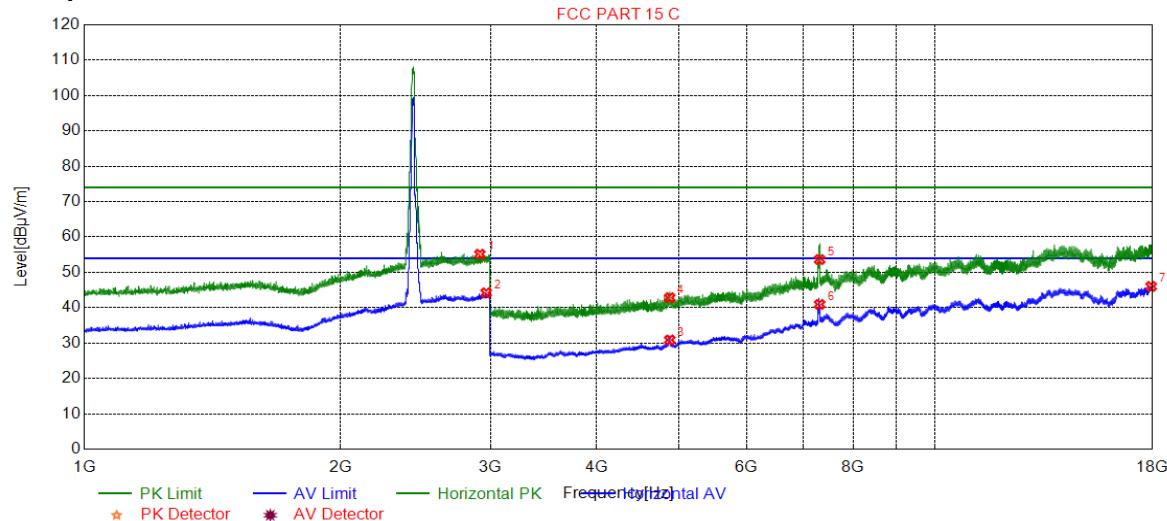
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**4.9.2.1.14 802.11N20\_Lowest Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2965.49	55.57	9.61	74.00	18.43	205	336	Vertical
2	2975.99	44.07	9.56	54.00	9.93	195	336	Vertical
3	4824.00	29.32	-18.21	54.00	24.68	187	260	Vertical
4	4824.00	41.19	-18.21	74.00	32.81	274	41	Vertical
5	7236.00	51.89	-9.99	74.00	22.11	213	320	Vertical
6	7236.00	37.34	-9.99	54.00	16.66	185	119	Vertical
7	17944.9	46.35	0.70	54.00	7.65	184	219	Vertical

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**4.9.2.1.15 802.11N20\_ Middle Channel\_ Horizontal****Test Graph****Suspected List**

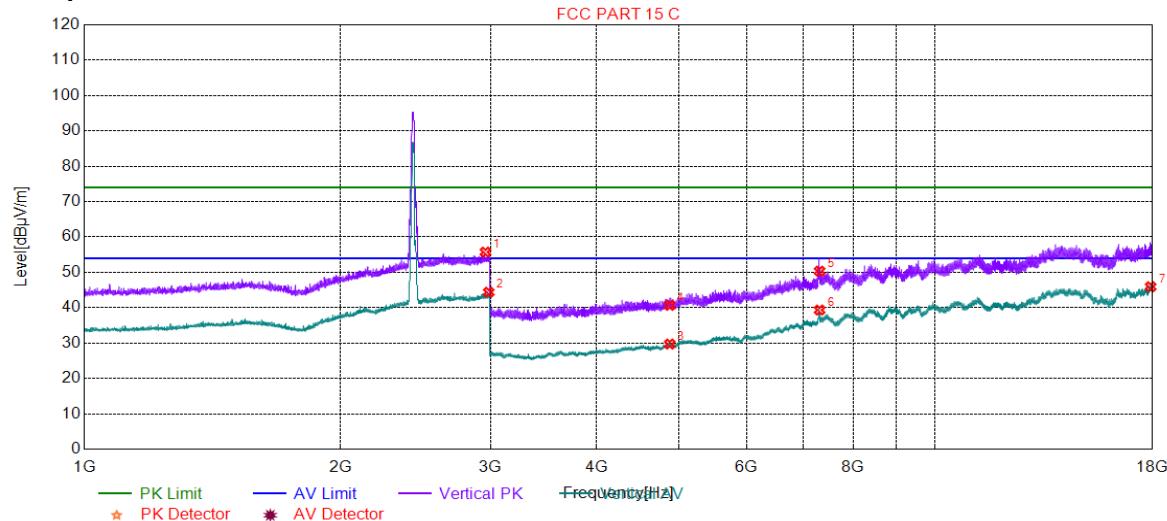
Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2915.97	55.15	9.31	74.00	18.85	143	67	Horizontal
2	2965.99	44.22	9.61	54.00	9.78	118	192	Horizontal
3	4874.00	30.88	-17.99	54.00	23.12	137	342	Horizontal
4	4874.00	42.84	-17.99	74.00	31.16	230	342	Horizontal
5	7311.00	53.61	-9.74	74.00	20.39	198	360	Horizontal
6	7311.00	40.94	-9.74	54.00	13.06	248	18	Horizontal
7	17929.0	46.03	0.70	54.00	7.97	158	18	Horizontal

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## 4.9.2.1.16 802.11N20\_Middle Channel\_Vertical

## Test Graph



## Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.99	55.74	9.63	74.00	18.26	158	18	Vertical
2	2986.49	44.39	9.51	54.00	9.61	151	18	Vertical
3	4874.00	29.73	-17.99	54.00	24.27	193	342	Vertical
4	4874.00	40.68	-17.99	74.00	33.32	151	178	Vertical
5	7311.00	50.35	-9.74	74.00	23.65	183	319	Vertical
6	7311.00	39.35	-9.74	54.00	14.65	214	269	Vertical
7	17906.4	45.95	0.69	54.00	8.05	293	18	Vertical

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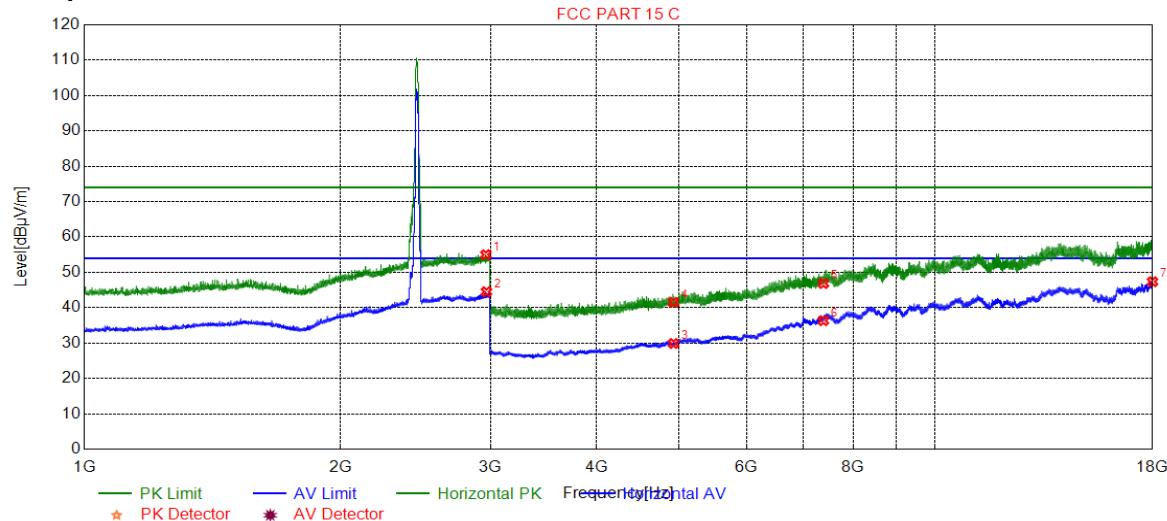


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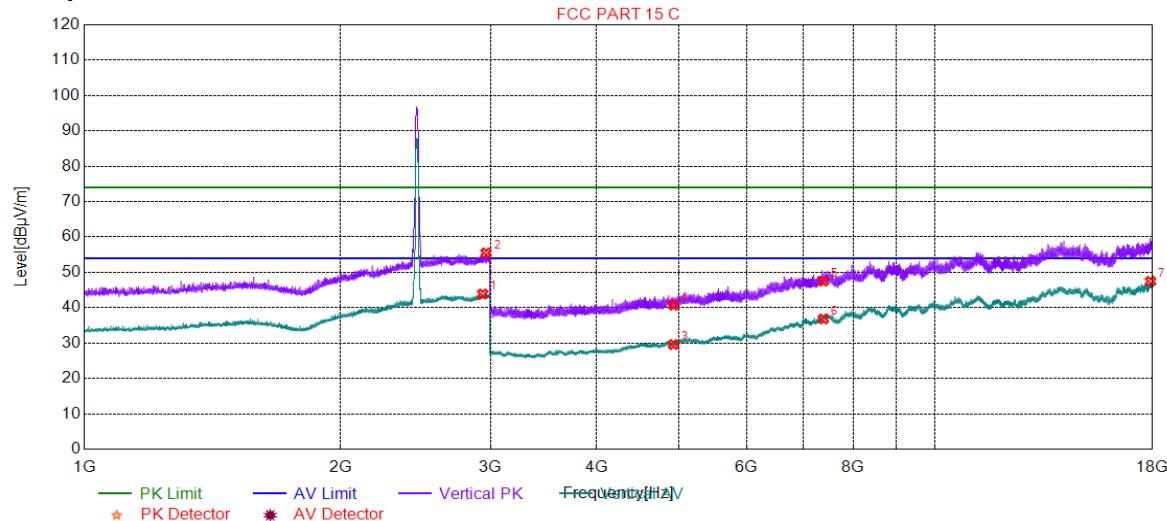
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**4.9.2.1.17 802.11N20\_Highest Channel\_Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2963.49	55.01	9.62	74.00	18.99	196	107	Horizontal
2	2967.99	44.53	9.60	54.00	9.47	126	134	Horizontal
3	4924.00	29.89	-17.72	54.00	24.11	155	0	Horizontal
4	4924.00	41.53	-17.72	74.00	32.47	212	124	Horizontal
5	7386.00	46.85	-9.55	74.00	27.15	234	320	Horizontal
6	7386.00	36.34	-9.55	54.00	17.66	111	119	Horizontal
7	17993.3	47.36	0.72	54.00	6.64	141	360	Horizontal

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**4.9.2.1.18 802.11N20\_Highest Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2937.98	43.87	9.55	54.00	10.13	166	141	Vertical
2	2964.99	55.49	9.61	74.00	18.51	212	319	Vertical
3	4924.00	29.60	-17.72	54.00	24.40	212	96	Vertical
4	4924.00	40.73	-17.72	74.00	33.27	256	232	Vertical
5	7386.00	47.50	-9.55	74.00	26.50	267	169	Vertical
6	7386.00	36.82	-9.55	54.00	17.18	255	320	Vertical
7	17898.2	47.48	0.67	54.00	6.52	185	219	Vertical

**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

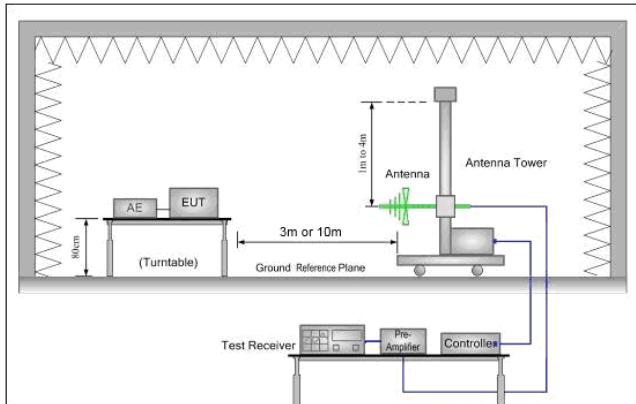
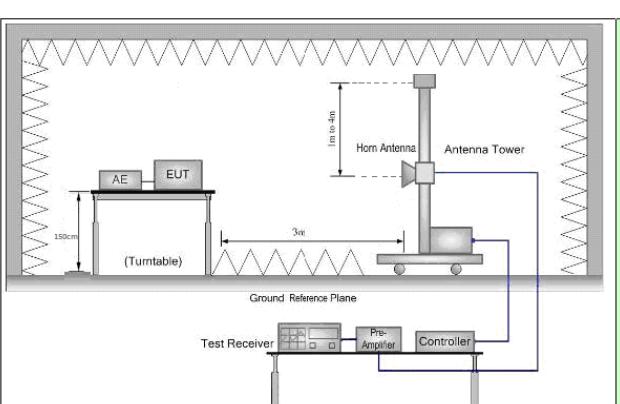
Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205					
Test Method:	ANSI C63.10: 2013 Section 11.12					
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)					
Limit:	Frequency	Limit (dBuV/m @3m)	Remark			
	30MHz-88MHz	40.0	Quasi-peak Value			
	88MHz-216MHz	43.5	Quasi-peak 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:	<ul style="list-style-type: none"><li>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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>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.</li><li>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.</li><li>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.</li><li>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>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</li><li>h. Test the EUT in the lowest channel, the Highest channel</li><li>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.</li><li>j. Repeat above procedures until all frequencies measured was complete.</li></ul>
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

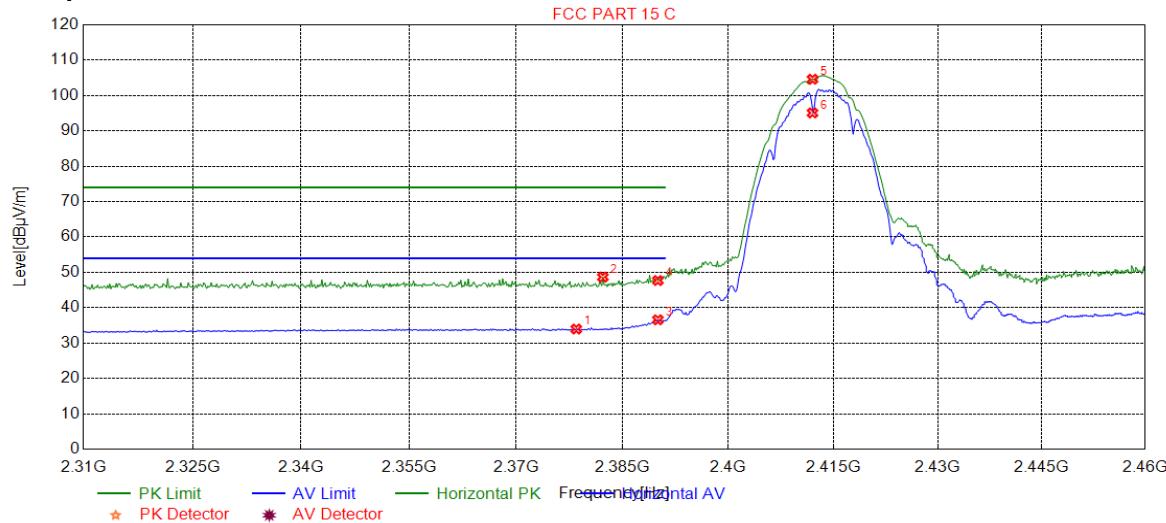
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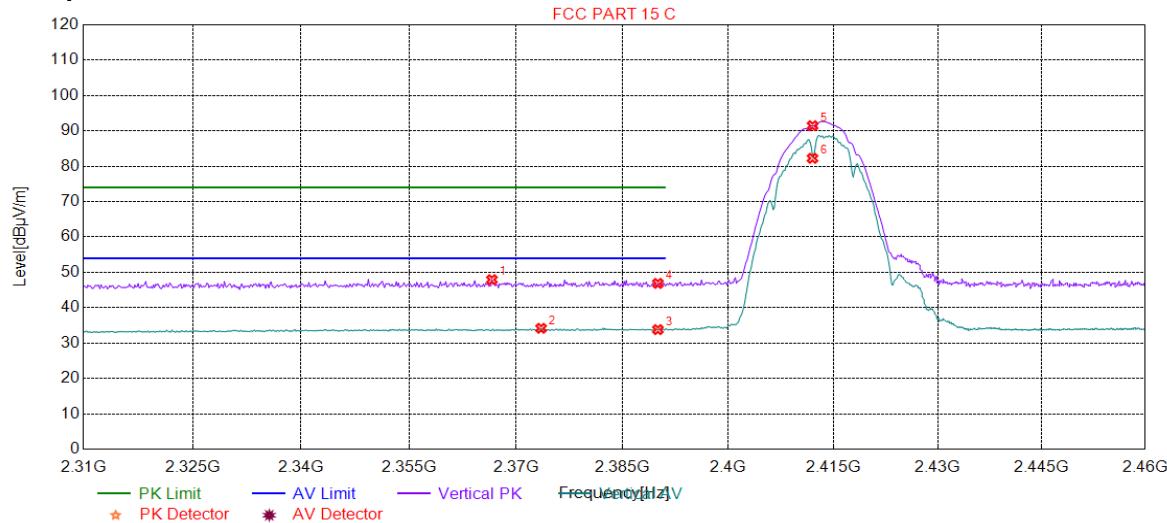
Test plot as follows:

**4.10.1 ANT1****4.10.1.1 802.11B\_Lowest Channel\_Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2378.46	33.98	7.78	54.00	20.02	169	145	Horizontal
2	2382.22	48.66	7.78	74.00	25.34	168	162	Horizontal
3	2390.00	36.59	7.77	54.00	17.41	226	308	Horizontal
4	2390.00	47.69	7.77	74.00	26.31	126	312	Horizontal
5	2412.00	104.61	7.81	0.00	-104.61	125	308	Horizontal
6	2412.00	95.08	7.81	0.00	-95.08	140	312	Horizontal

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**4.10.1.2 802.11B\_Lowest Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2366.60	47.94	7.79	74.00	26.06	210	278	Vertical
2	2373.51	34.18	7.79	54.00	19.82	255	171	Vertical
3	2390.00	33.81	7.77	54.00	20.19	177	311	Vertical
4	2390.00	46.88	7.77	74.00	27.12	267	1	Vertical
5	2412.00	91.47	7.81	0.00	-91.47	180	250	Vertical
6	2412.00	82.25	7.81	0.00	-82.25	176	254	Vertical

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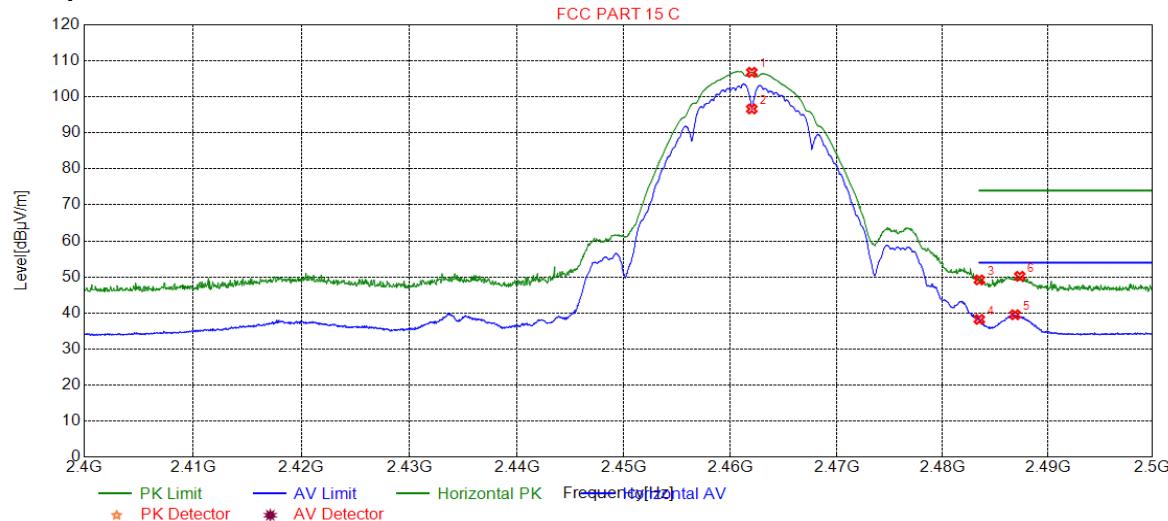


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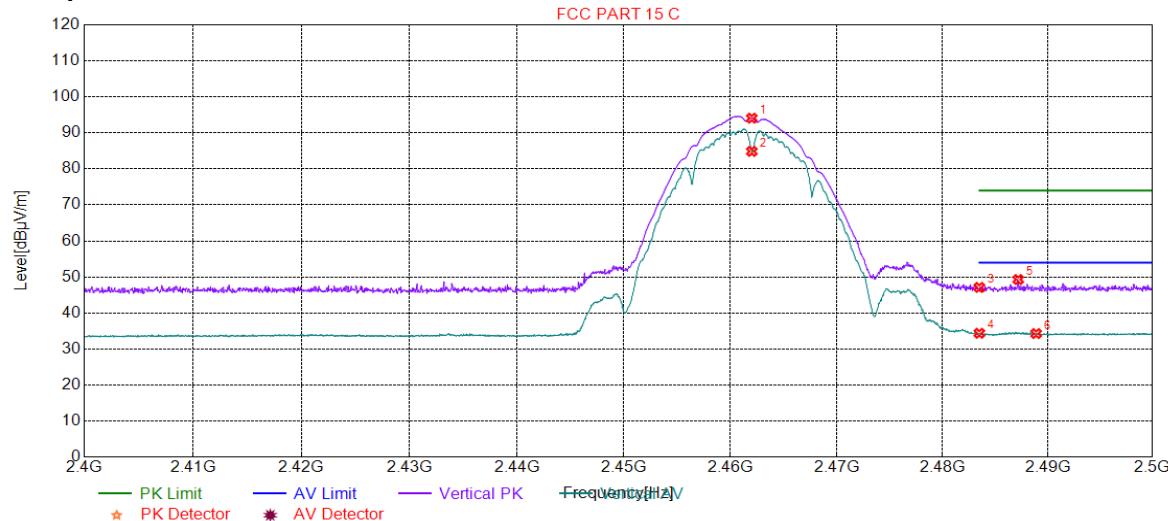
**4.10.1.3 802.11B\_Highest Channel\_Horizontal****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	106.81	7.98	0.00	-106.81	147	326	Horizontal
2	2462.00	96.64	7.98	0.00	-96.64	166	336	Horizontal
3	2483.50	49.18	8.01	74.00	24.82	175	210	Horizontal
4	2483.50	38.22	8.01	54.00	15.78	166	315	Horizontal
5	2486.89	39.52	8.01	54.00	14.48	208	326	Horizontal
6	2487.34	50.19	8.01	74.00	23.81	217	298	Horizontal

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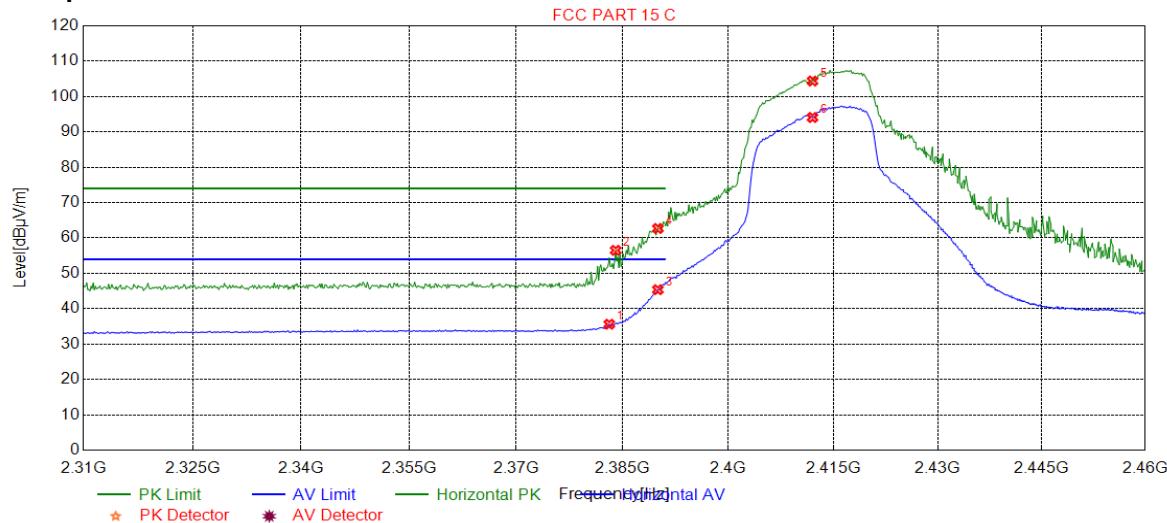


**4.10.1.4 802.11B\_Highest Channel\_Verical****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	94.08	7.98	0.00	-94.08	251	0	Vertical
2	2462.00	84.86	7.98	0.00	-84.86	189	0	Vertical
3	2483.50	47.10	8.01	74.00	26.90	206	77	Vertical
4	2483.50	34.37	8.01	54.00	19.63	295	1	Vertical
5	2487.19	49.29	8.01	74.00	24.71	221	215	Vertical
6	2488.89	34.29	8.02	54.00	19.71	224	346	Vertical

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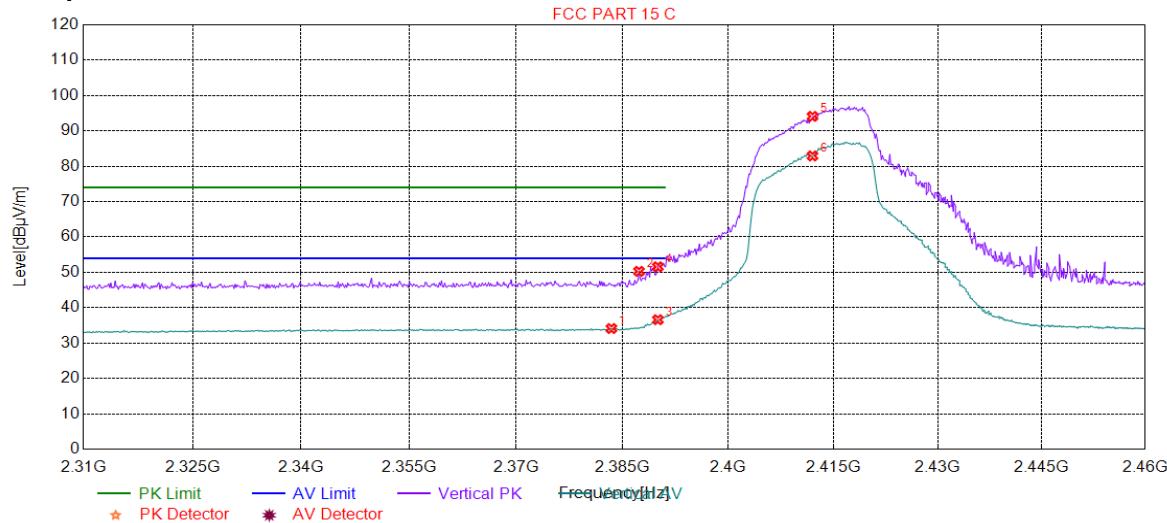
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**4.10.1.6 802.11G\_Lowest Channel\_Horizontal****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2383.12	35.63	7.78	54.00	18.37	115	271	Horizontal
2	2384.02	56.51	7.78	74.00	17.49	114	342	Horizontal
3	2390.00	45.39	7.77	54.00	8.61	112	267	Horizontal
4	2390.00	62.69	7.77	74.00	11.31	177	309	Horizontal
5	2412.00	104.38	7.81	0.00	-104.38	196	346	Horizontal
6	2412.00	94.07	7.81	0.00	-94.07	226	342	Horizontal

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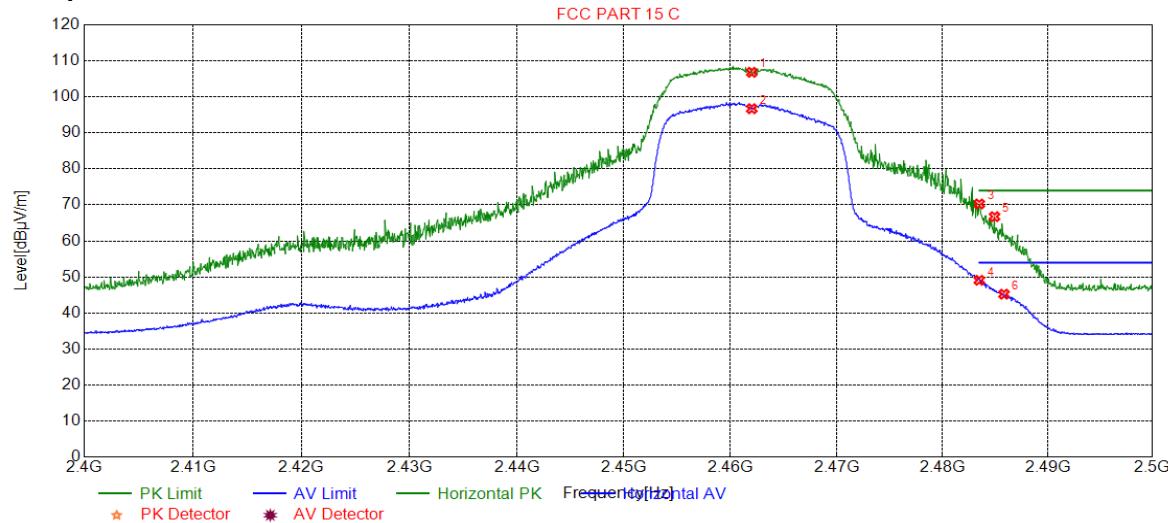
**4.10.1.7 802.11G\_Lowest Channel\_Verical****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2383.42	34.12	7.78	54.00	19.88	187	271	Vertical
2	2387.32	50.29	7.77	74.00	23.71	201	323	Vertical
3	2390.00	36.61	7.77	54.00	17.39	268	271	Vertical
4	2390.00	51.57	7.77	74.00	22.43	279	267	Vertical
5	2412.00	94.11	7.81	0.00	-94.11	219	31	Vertical
6	2412.00	82.92	7.81	0.00	-82.92	201	27	Vertical

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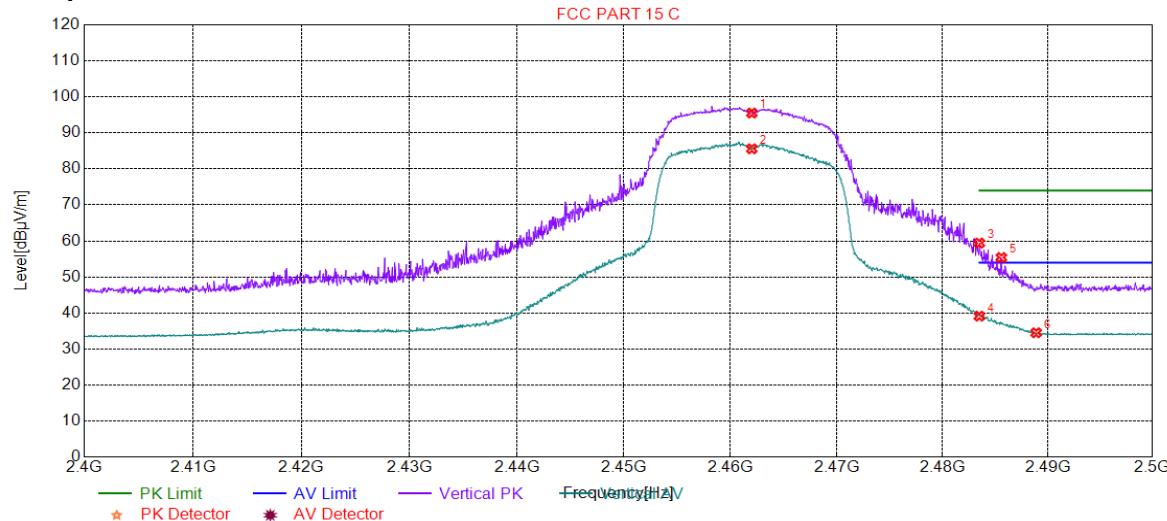


**4.10.1.8 802.11G\_Highest Channel\_Horizontal****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	106.81	7.98	0.00	-106.81	234	332	Horizontal
2	2462.00	96.70	7.98	0.00	-96.70	119	316	Horizontal
3	2483.50	70.27	8.01	74.00	3.73	240	300	Horizontal
4	2483.50	49.08	8.01	54.00	4.92	190	316	Horizontal
5	2484.94	66.74	8.01	74.00	7.26	183	305	Horizontal
6	2485.84	45.23	8.01	54.00	8.77	178	316	Horizontal

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**4.10.1.9 802.11G\_Highest Channel\_Verical****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	95.50	7.98	0.00	-95.50	233	27	Vertical
2	2462.00	85.57	7.98	0.00	-85.57	223	38	Vertical
3	2483.50	59.41	8.01	74.00	14.59	186	32	Vertical
4	2483.50	39.13	8.01	54.00	14.87	269	32	Vertical
5	2485.59	55.40	8.01	74.00	18.60	244	38	Vertical
6	2488.89	34.51	8.02	54.00	19.49	235	32	Vertical

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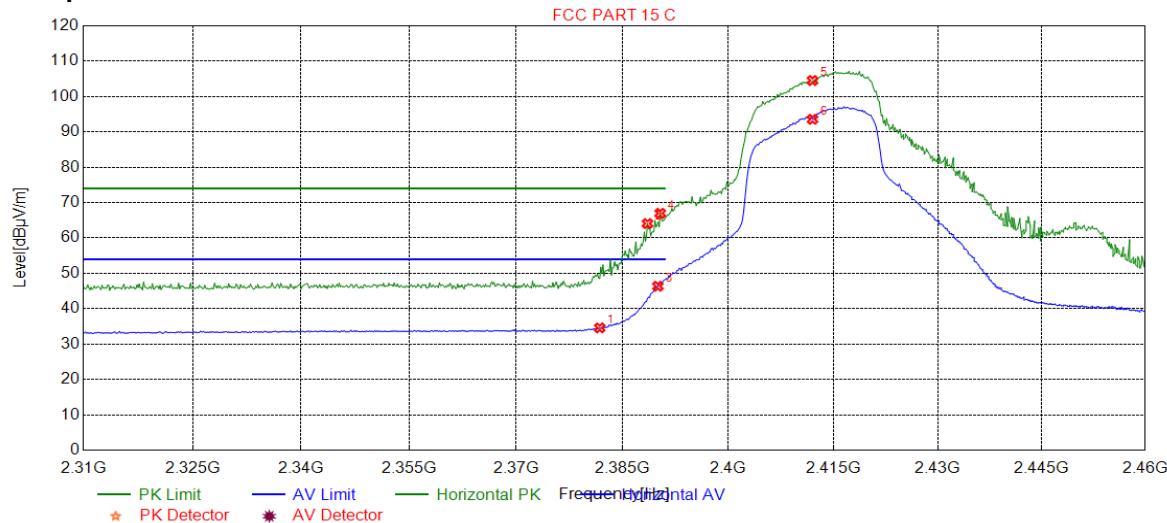
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#### 4.10.1.11 802.11N20\_Lowest Channel\_Horizontal

## Test Graph



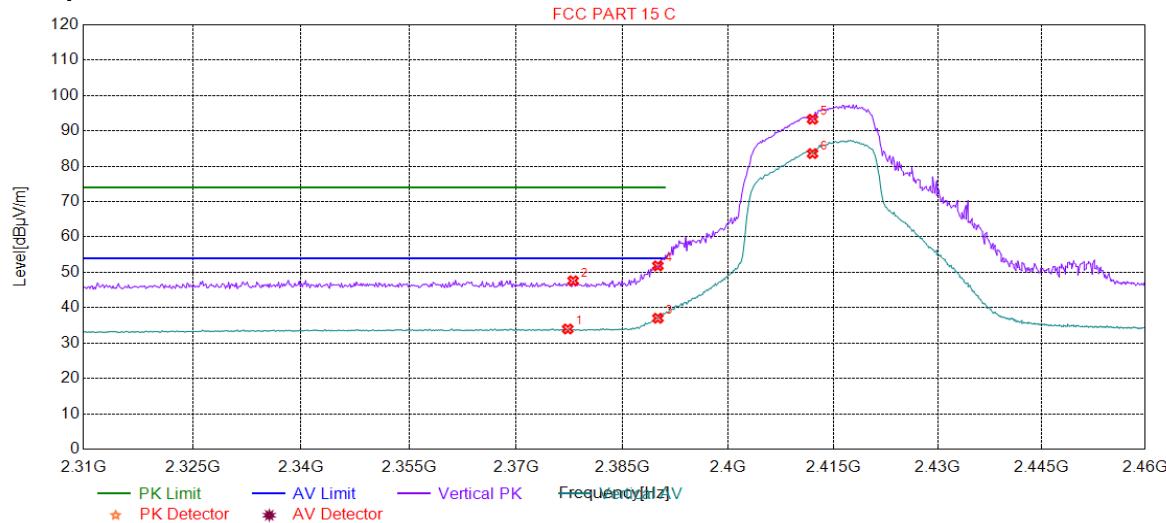
## Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2381.77	34.59	7.78	54.00	19.41	186	307	Horizontal
2	2388.52	64.08	7.77	74.00	9.92	217	262	Horizontal
3	2390.00	46.36	7.77	54.00	7.64	156	262	Horizontal
4	2390.33	66.98	7.77	74.00	7.02	125	299	Horizontal
5	2412.00	104.52	7.81	0.00	-104.52	103	339	Horizontal
6	2412.00	93.56	7.81	0.00	-93.56	188	339	Horizontal

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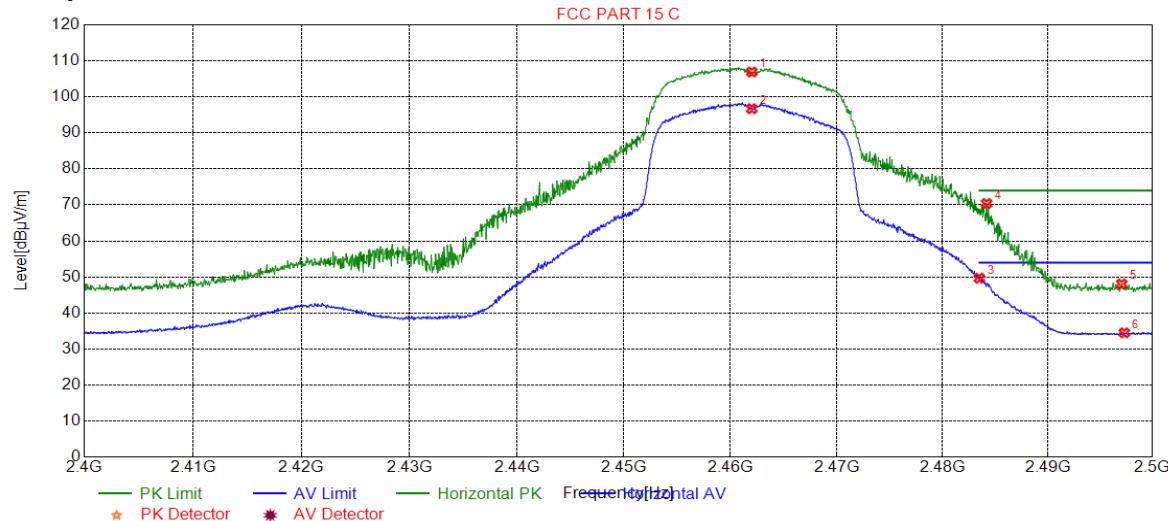


**4.10.1.12 802.11N20\_Lowest Channel\_Verical****Test Graph****Suspected List**

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2377.26	33.99	7.78	54.00	20.01	159	78	Vertical
2	2378.01	47.62	7.78	74.00	26.38	170	53	Vertical
3	2390.00	37.03	7.77	54.00	16.97	293	36	Vertical
4	2390.00	51.84	7.77	74.00	22.16	152	33	Vertical
5	2412.00	93.29	7.81	0.00	-93.29	162	29	Vertical
6	2412.00	83.58	7.81	0.00	-83.58	217	33	Vertical

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**4.10.1.13 802.11N20\_Highest Channel\_Horizontal****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	106.89	7.98	0.00	-106.89	242	259	Horizontal
2	2462.00	96.70	7.98	0.00	-96.70	210	253	Horizontal
3	2483.50	49.66	8.01	54.00	4.34	117	302	Horizontal
4	2484.19	70.40	8.01	74.00	3.60	152	286	Horizontal
5	2497.04	48.08	8.03	74.00	25.92	199	335	Horizontal
6	2497.29	34.49	8.03	54.00	19.51	229	297	Horizontal

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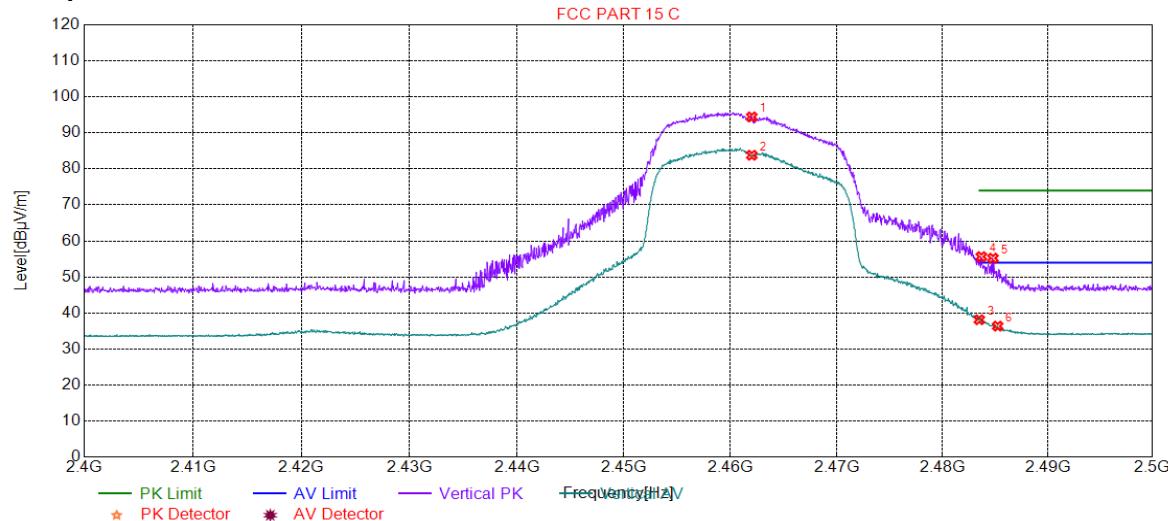


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**4.10.1.14 802.11N20\_Highest Channel\_Verical****Test Graph****Suspected List**

<b>Suspected List</b>								
NO.	Freq. [MHz]	Level [dB $\mu$ V/m]	Factor [dB]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	94.44	7.98	0.00	-94.44	274	24	Vertical
2	2462.00	83.79	7.98	0.00	-83.79	223	19	Vertical
3	2483.50	38.13	8.01	54.00	15.87	238	52	Vertical
4	2483.69	55.64	8.01	74.00	18.36	294	139	Vertical
5	2484.79	55.21	8.01	74.00	18.79	278	62	Vertical
6	2485.24	36.36	8.01	54.00	17.64	251	46	Vertical

**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)

Lab A:

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	Temperature test	±1°C
5	Humidity test	±3%
6	DC and low frequency voltages	±0.5%

Lab B:

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0dB (150kHz to 30MHz)
2	Radiated Emission	± 4.8dB (Below 1GHz)
		± 4.8dB (1GHz to 6GHz)
		± 4.5dB (6GHz to 18GHz)
		± 5.02dB (Above 18GHz)

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## 6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(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	2021/1/2
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

CE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2019-07-16	2020-07-15
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR

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<b>RSE Test System</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2019-06-27	2020-06-26
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP00903040	XAW01-41-01	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2019-12-03	2020-12-02
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2019-11-18	2020-11-17
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR

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## 7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-Up for ZR/2020/40002.

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The End



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