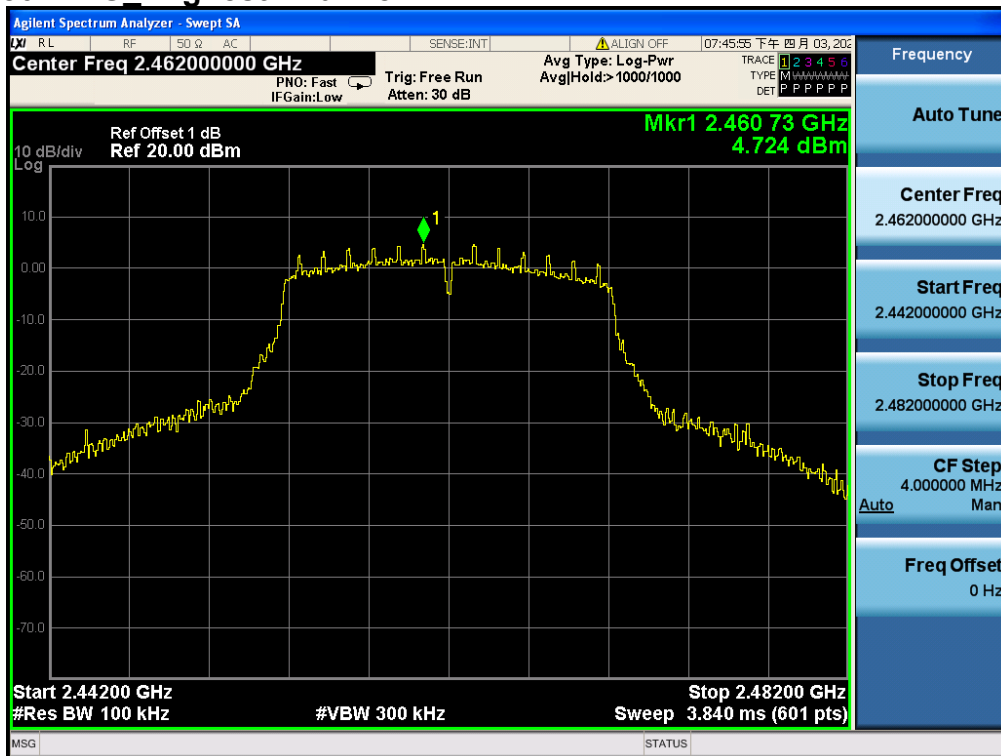
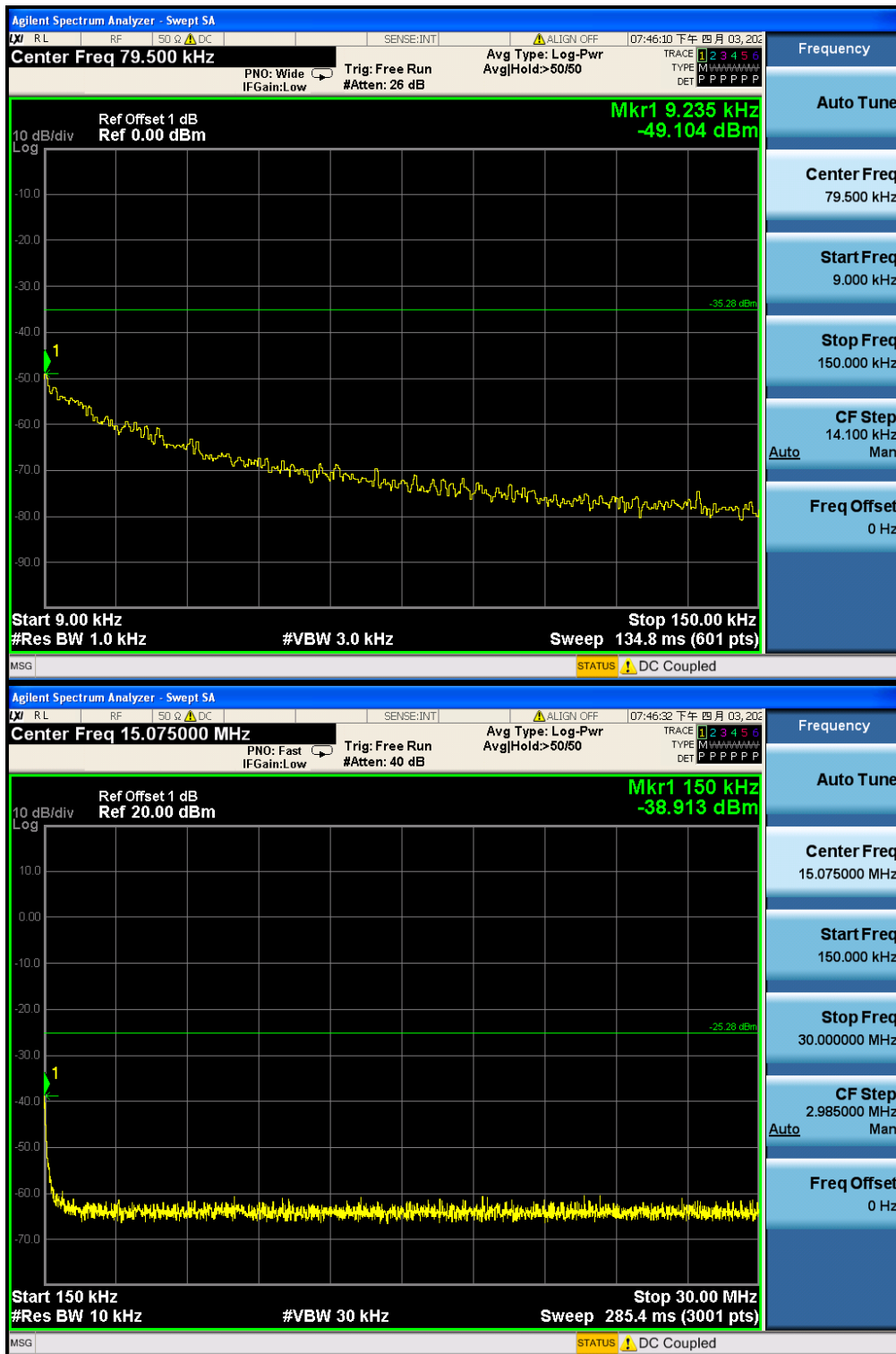
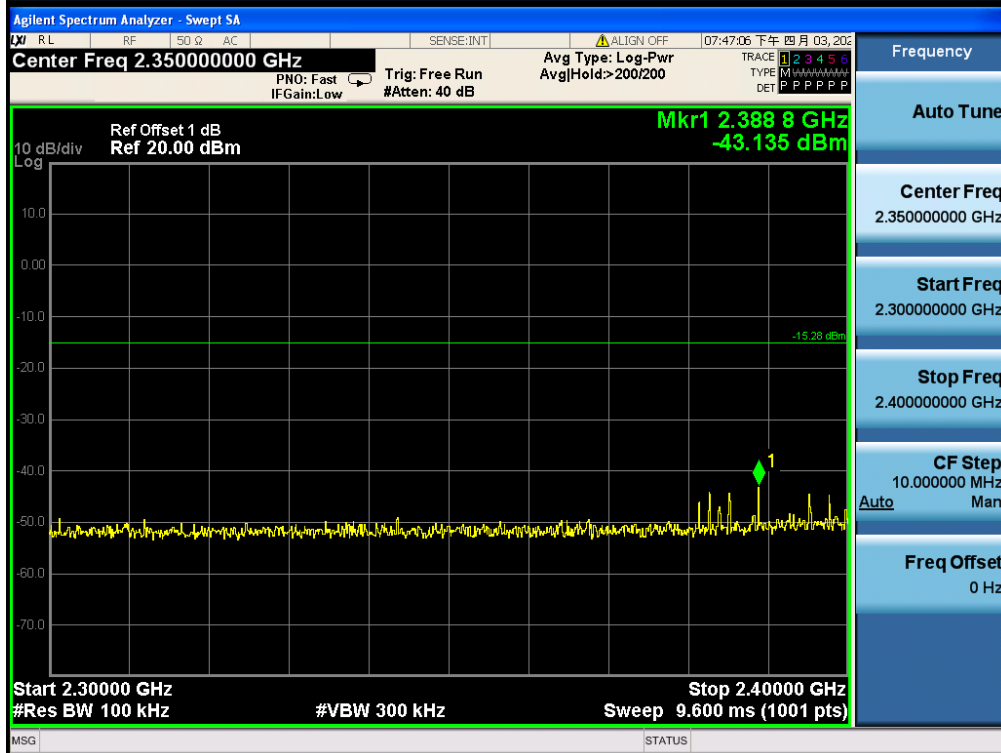
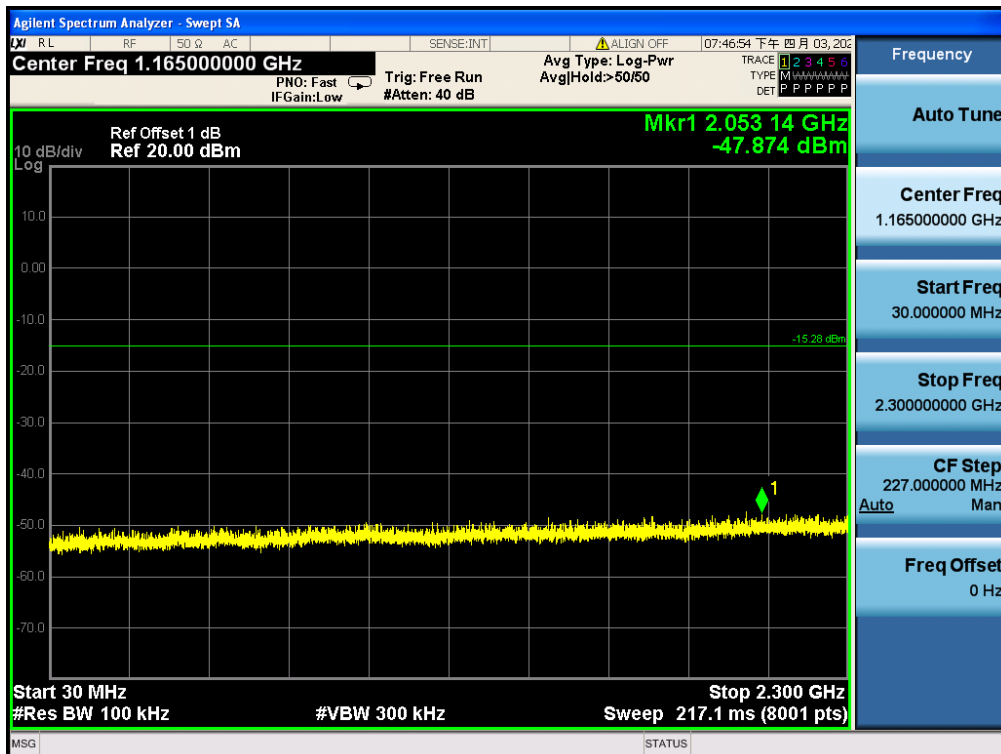


#### 4.8.1.1.6 802.11G\_Highest Channel





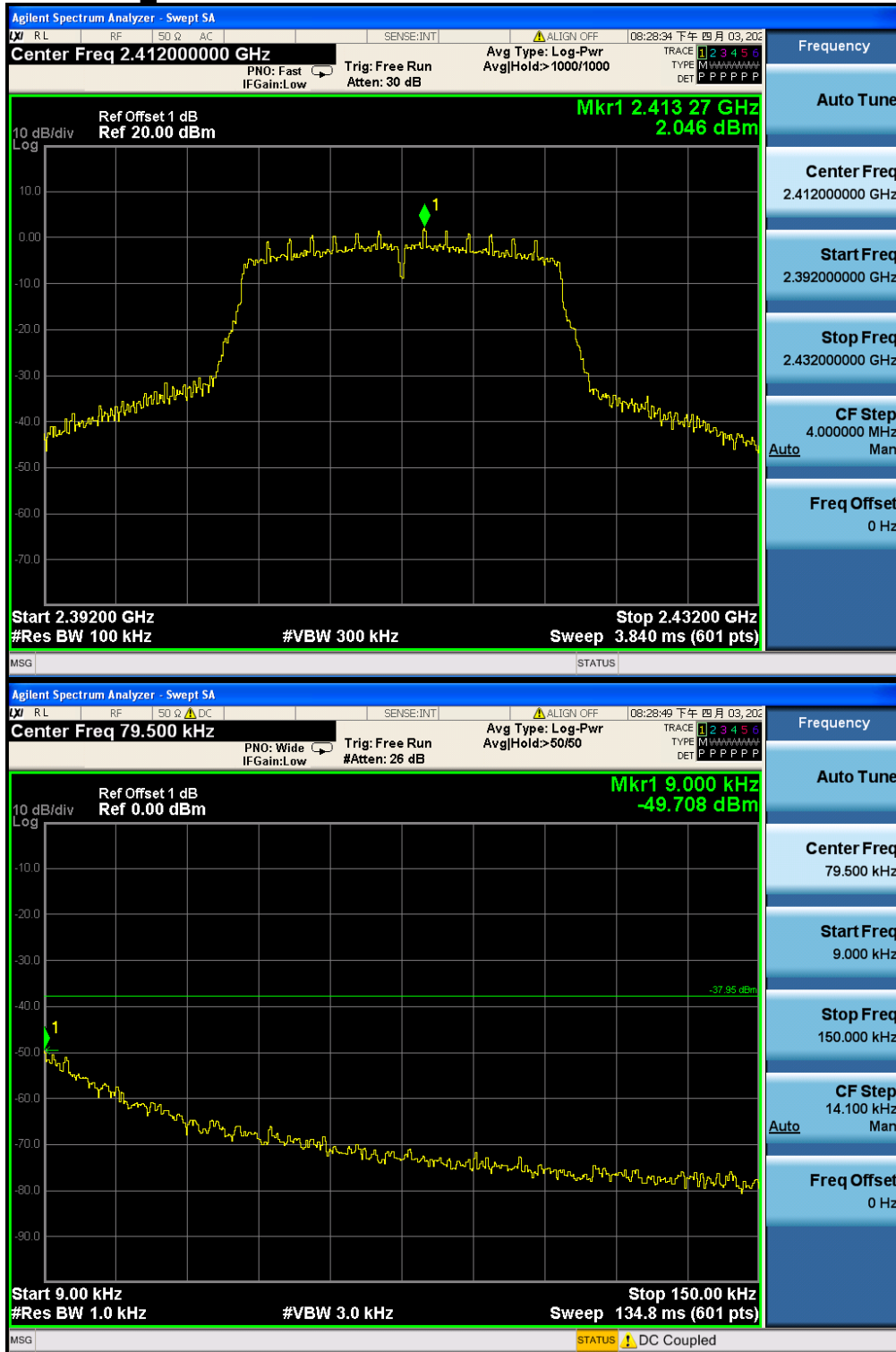


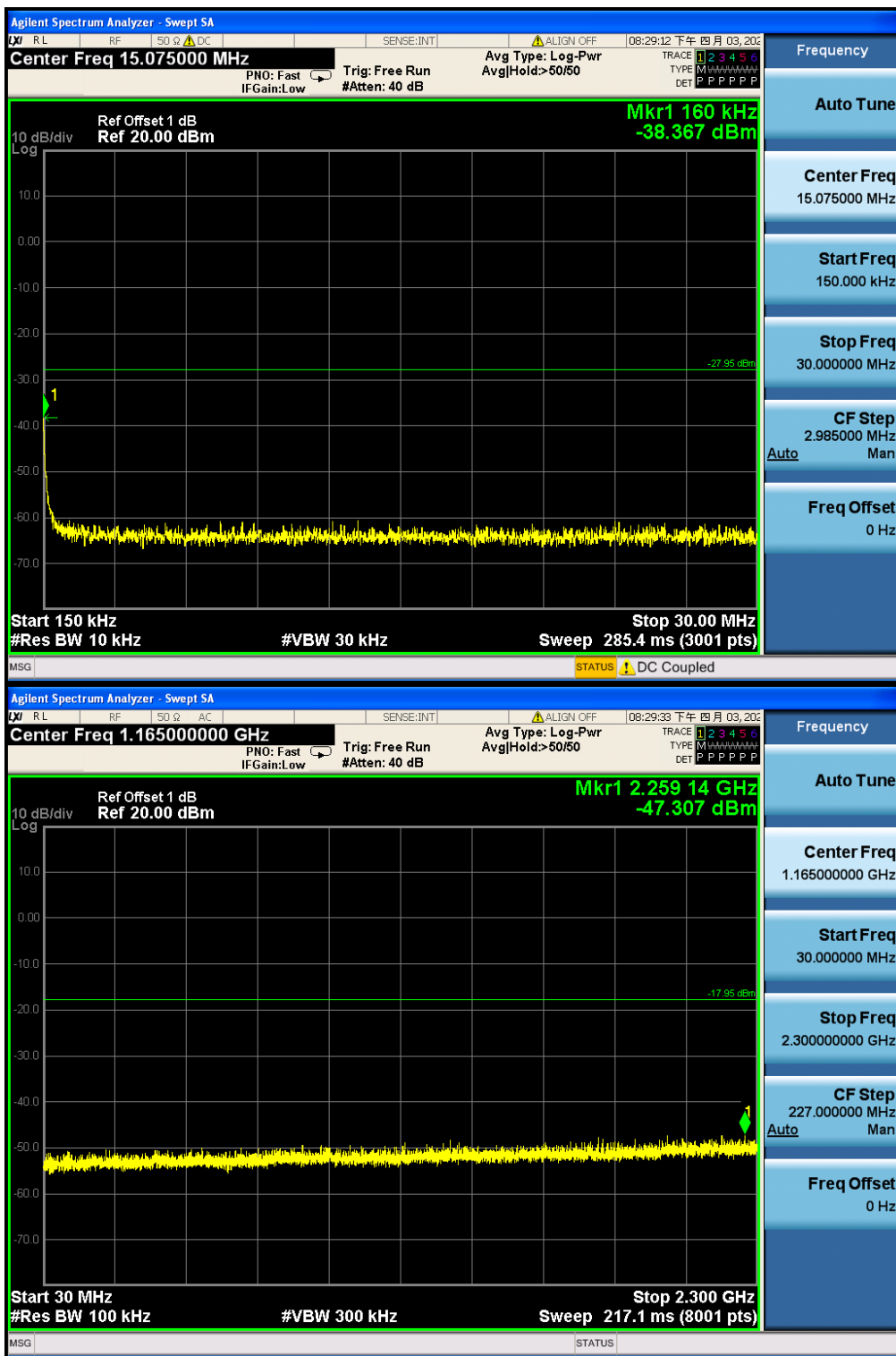
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**4.8.1.1.7 802.11N20 Lowest Channel**



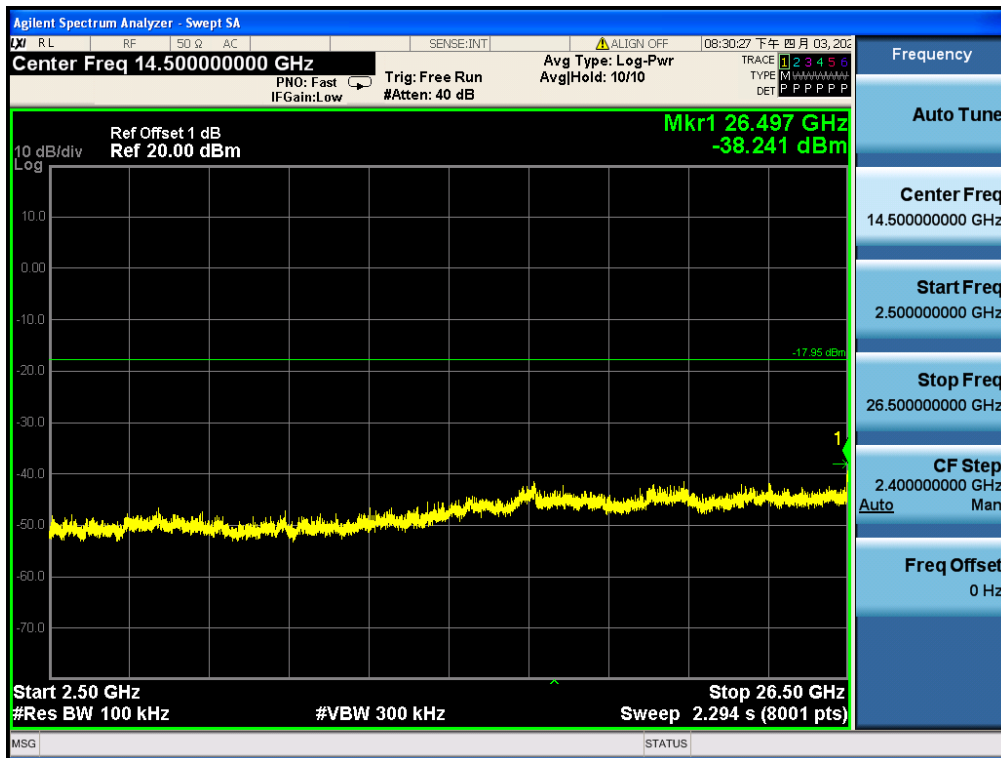


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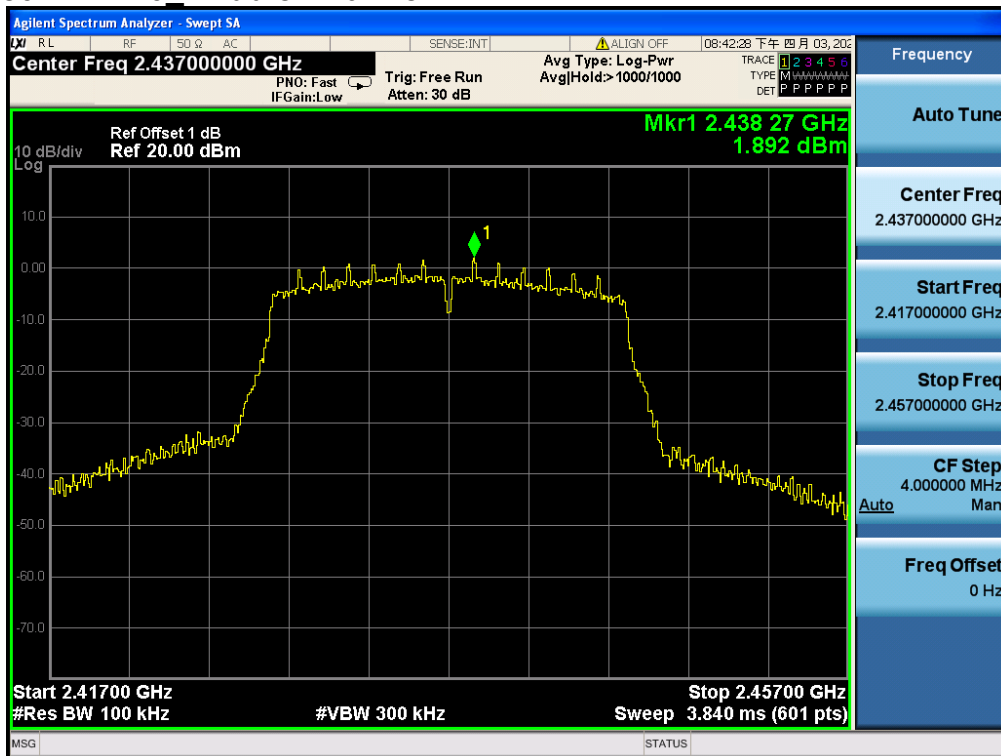
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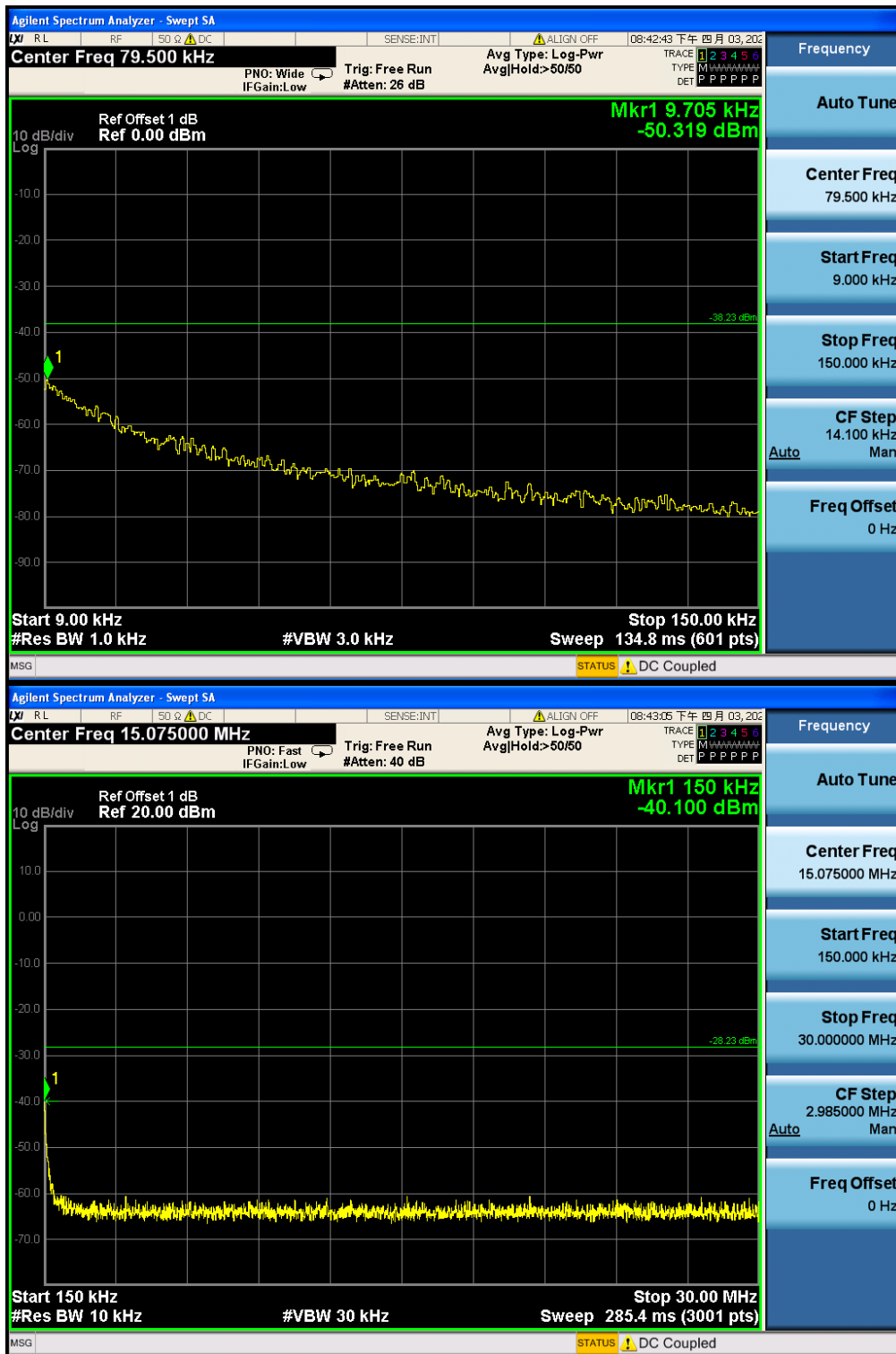




#### 4.8.1.1.8 802.11 N20 Middle Channel





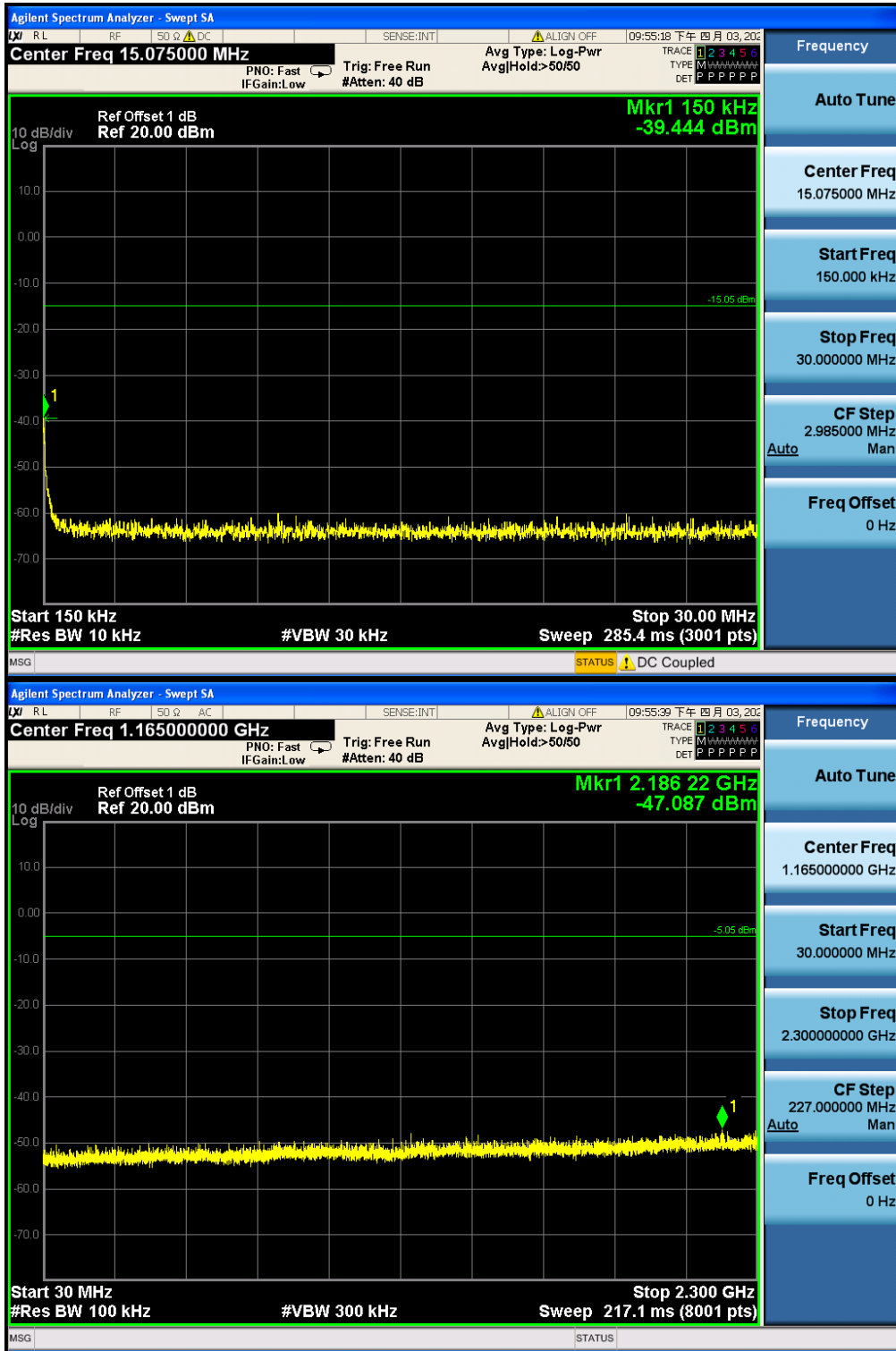






### 4.8.1.1.9 802.11 N20\_Highest Channel





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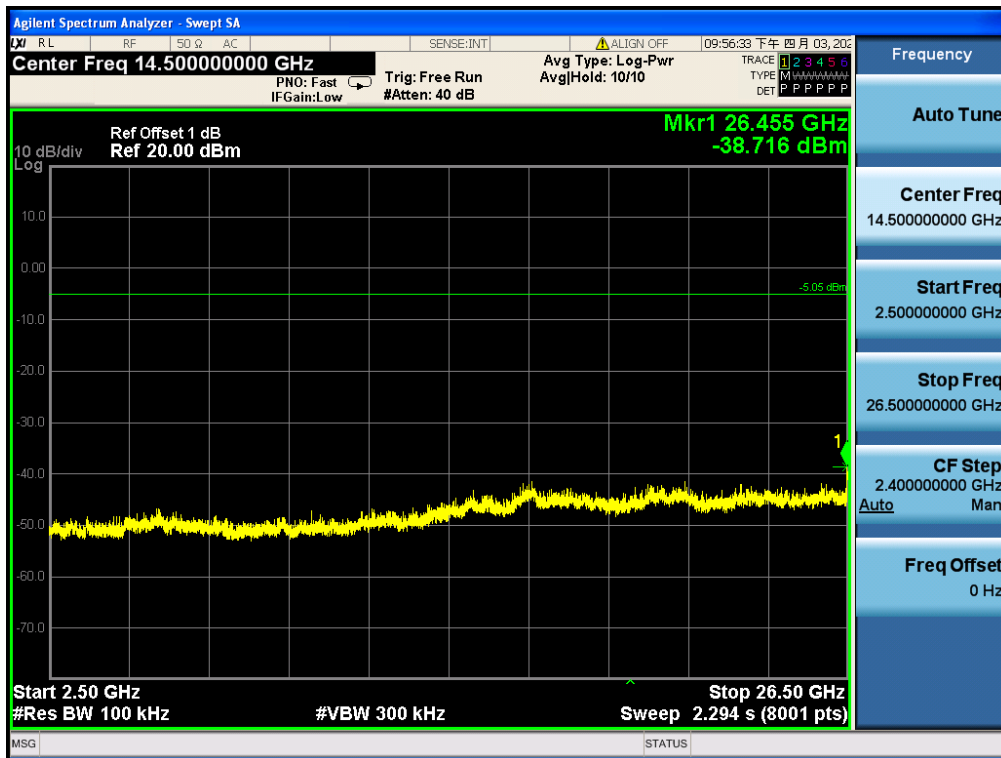
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**Remark:**

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.



### 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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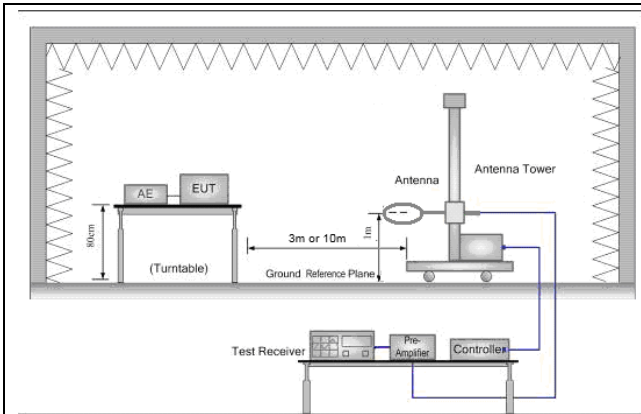


Figure 1. Below 30MHz

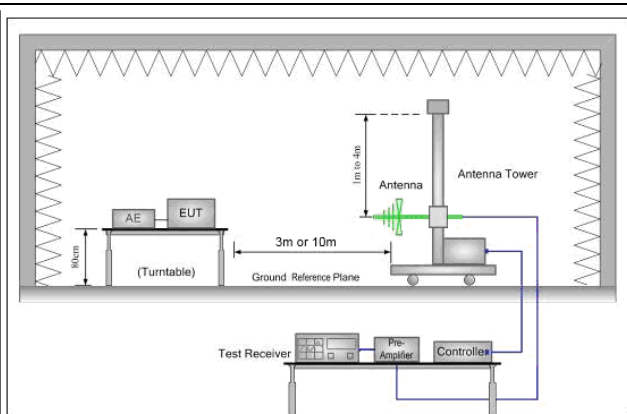


Figure 2. 30MHz to 1GHz

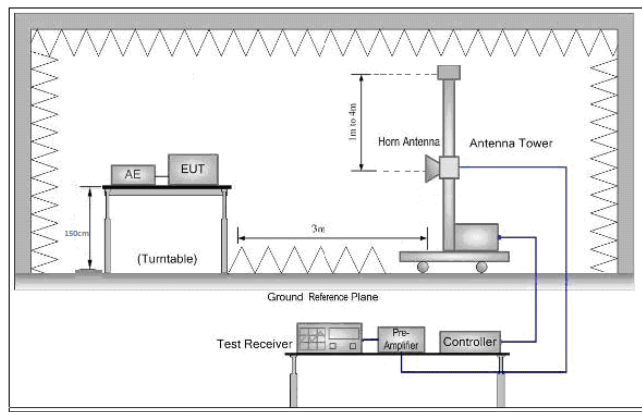


Figure 3. Above 1 GHz

**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 chamber. 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 chamber. 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  $f > 1$ GHz ; VBW  $\geq$  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



	<p>On time = <math>N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n</math>            Where <math>N_1</math> is number of type 1 pulses, <math>L_1</math> is length of type 1 pulses, etc.            Average Emission Level = Peak Emission Level + <math>20 * \log(\text{Duty cycl}</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:	<p>Pretest the EUT at Charge + Transmitting mode.</p> <p>Through Pre-scan, find the</p> <p>1Mbps of rate is the worst case of 802.11B;</p> <p>6Mbps of rate is the worst case of 802.11G;</p> <p>6.5Mbps of rate is the worst case of 802.11N(HT20);</p> <p>13.5Mbps of rate is the worst case of 802.11N(HT40)</p> <p>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.</p>
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

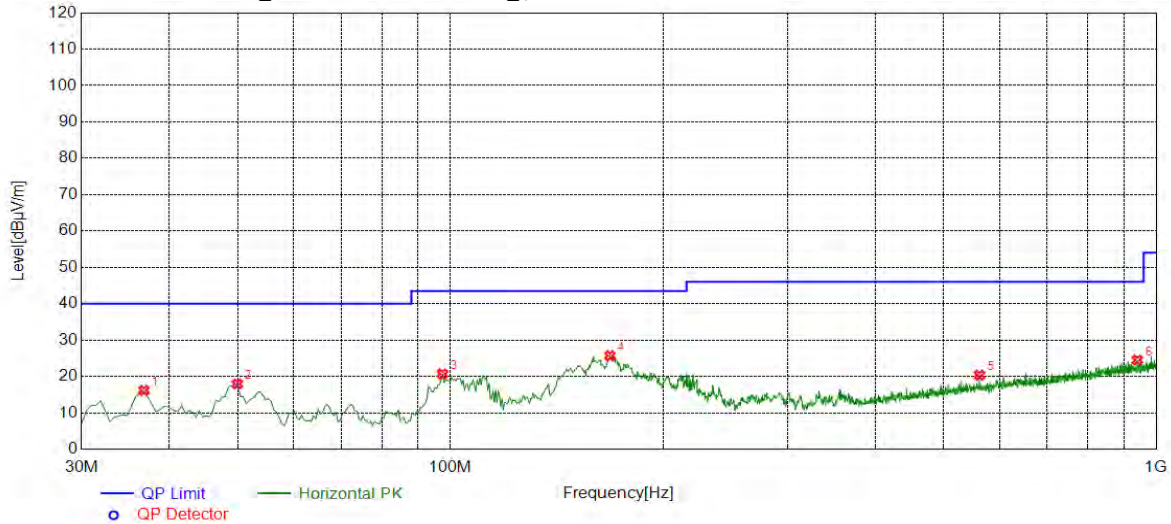


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### 4.9.1 Radiated emission below 1GHz

#### 4.9.1.1 Charge + Transmitting, Vertical



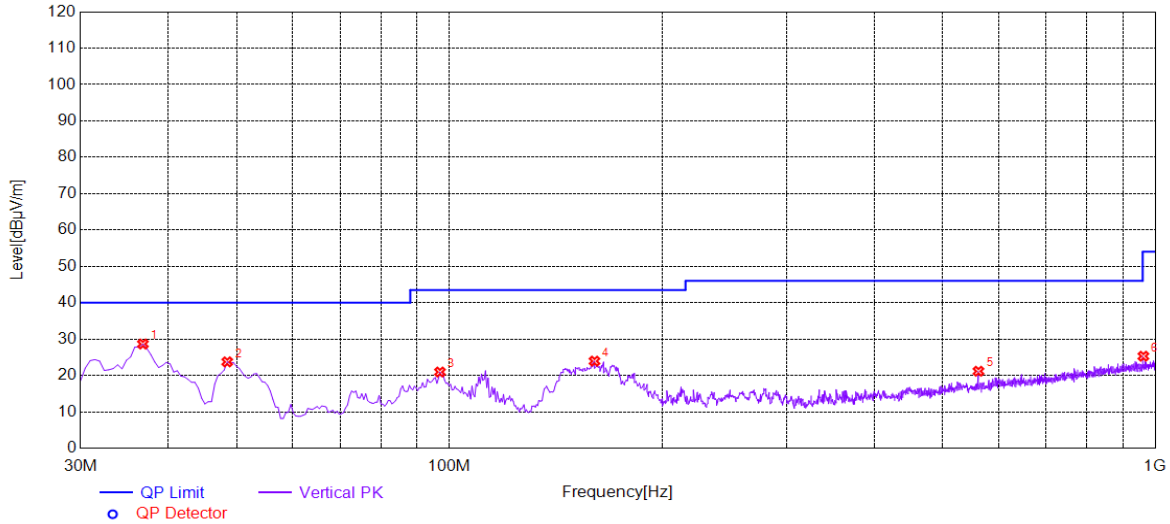
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7934	16.15	-32.19	40.00	23.85	150	275	Horizontal
2	49.8949	17.94	-30.18	40.00	22.06	150	217	Horizontal
3	97.4487	20.72	-32.13	43.50	22.78	150	253	Horizontal
4	168.2941	25.71	-33.73	43.50	17.79	150	298	Horizontal
5	561.8259	20.35	-21.13	46.00	25.65	150	226	Horizontal
6	940.3152	24.52	-14.62	46.00	21.48	150	349	Horizontal



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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	36.7934	28.65	-32.19	40.00	11.35	150	344	Vertical
2	48.4392	23.74	-30.19	40.00	16.26	150	344	Vertical
3	96.9635	20.95	-32.21	43.50	22.55	150	29	Vertical
4	160.5303	23.94	-34.26	43.50	19.56	150	1	Vertical
5	561.8259	21.16	-21.13	46.00	24.84	150	150	Vertical
6	962.1511	25.30	-14.32	54.00	28.70	150	54	Vertical

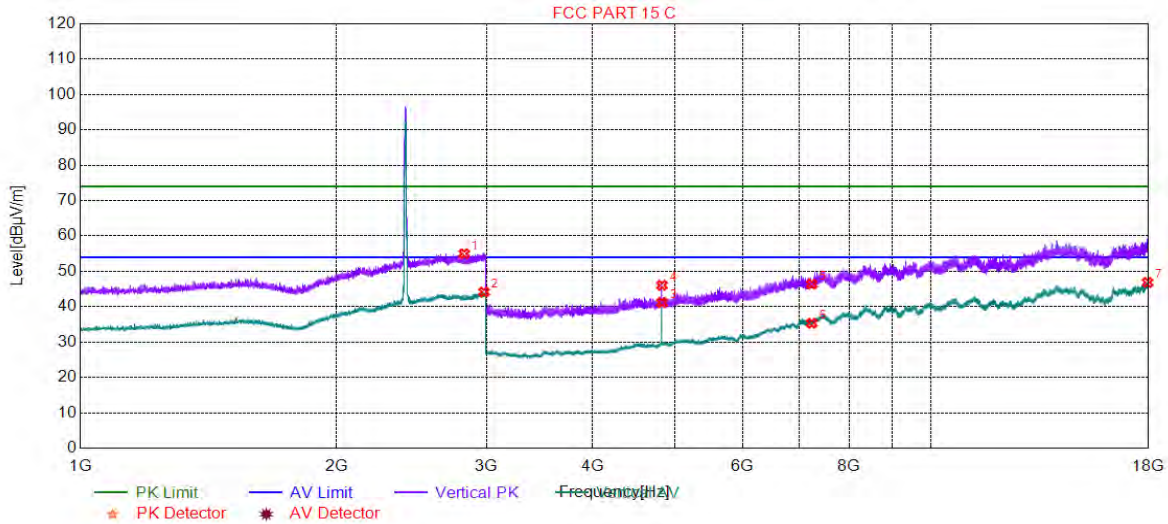


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### 4.9.2 Transmitter emission above 1GHz

#### 4.9.2.1 ANT1

##### 4.9.2.1.1 802.11B\_Lowest Channel\_ Vertical



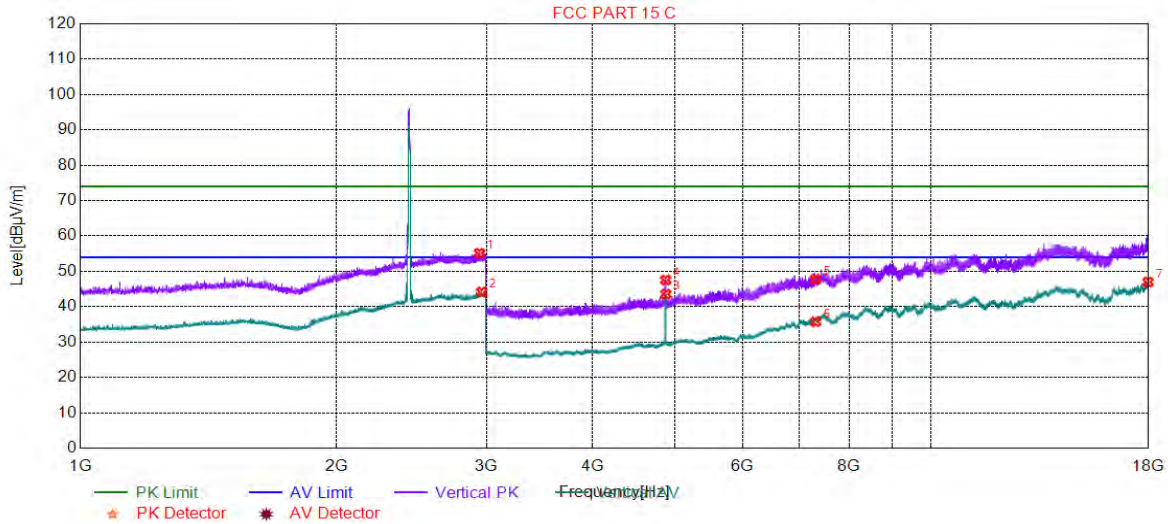
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2824.9562	54.99	9.11	74.00	19.01	150	11	Vertical
2	2980.9952	44.17	9.54	54.00	9.83	150	231	Vertical
3	4824.0000	41.16	-18.21	54.00	12.84	150	347	Vertical
4	4824.0000	46.07	-18.21	74.00	27.93	150	347	Vertical
5	7236.0000	46.37	-9.99	74.00	27.63	150	191	Vertical
6	7236.0000	35.34	-9.99	54.00	18.66	150	342	Vertical
7	17949.947	46.84	0.70	54.00	7.16	150	342	Vertical



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**4.9.2.1.2 802.11B\_ Middle Channel\_ Vertical**



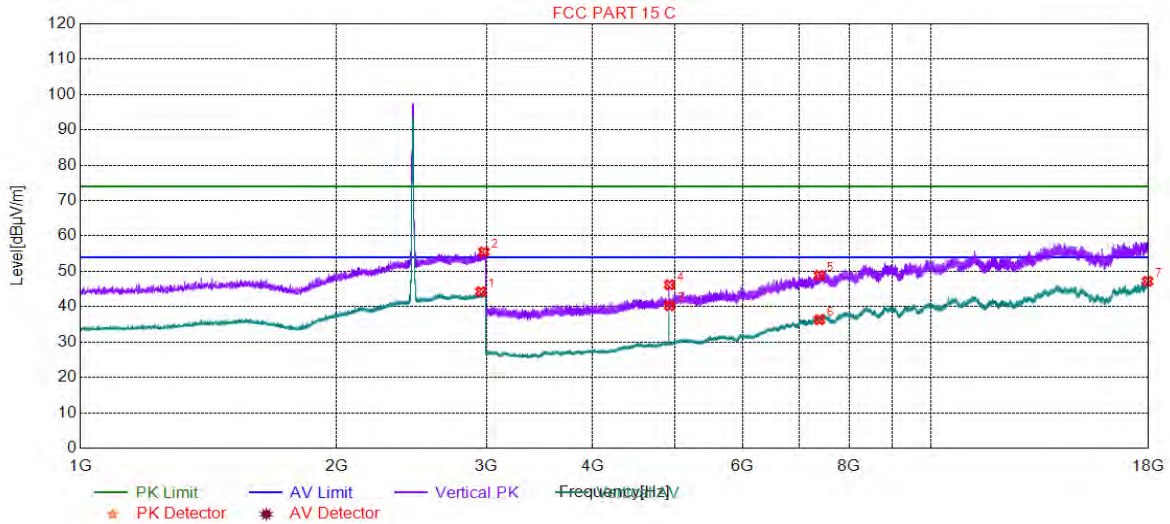
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2944.4861	55.18	9.62	74.00	18.82	150	204	Vertical
2	2962.4906	44.14	9.62	54.00	9.86	150	82	Vertical
3	4874.0000	43.55	-17.99	54.00	10.45	150	292	Vertical
4	4874.0000	47.56	-17.99	74.00	26.44	150	320	Vertical
5	7311.0000	47.82	-9.74	74.00	26.18	150	41	Vertical
6	7311.0000	35.75	-9.74	54.00	18.25	150	142	Vertical
7	17969.748	46.98	0.71	54.00	7.02	150	0	Vertical



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**4.9.2.1.3 802.11B\_ Highest Channel\_ Vertical**



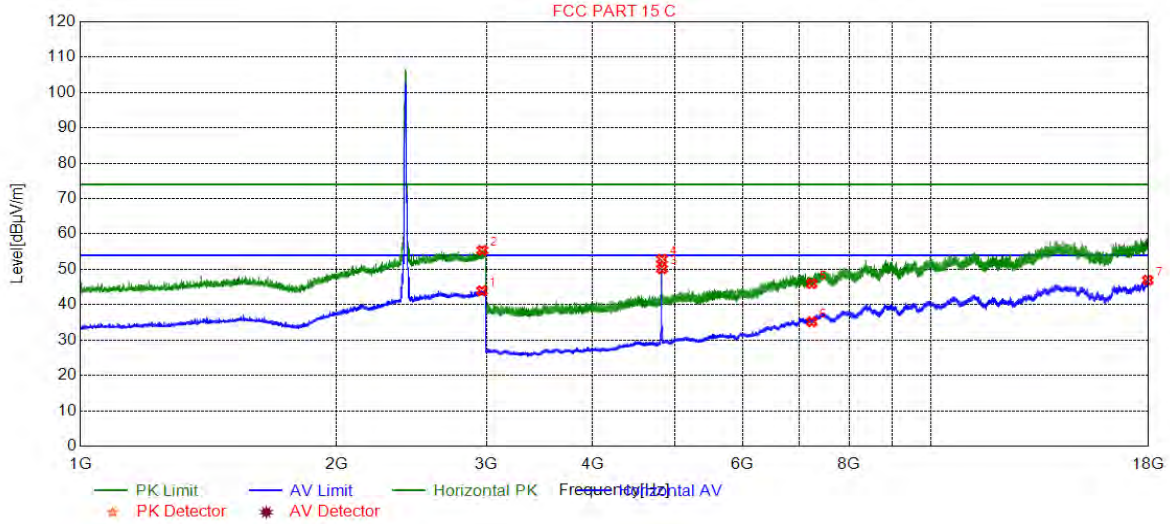
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2955.4889	44.27	9.65	54.00	9.73	150	301	Vertical
2	2980.4951	55.50	9.54	74.00	18.50	150	192	Vertical
3	4924.0000	40.25	-17.72	54.00	13.75	150	296	Vertical
4	4924.0000	46.19	-17.72	74.00	27.81	150	324	Vertical
5	7386.0000	48.84	-9.55	74.00	25.16	150	241	Vertical
6	7386.0000	36.33	-9.55	54.00	17.67	150	0	Vertical
7	17949.397	47.17	0.70	54.00	6.83	150	92	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	2964.4911	43.94	9.61	54.00	10.06	150	223	Horizontal
2	2966.9917	55.39	9.60	74.00	18.61	150	142	Horizontal
3	4824.0000	50.14	-18.21	54.00	3.86	150	18	Horizontal
4	4824.0000	52.86	-18.21	74.00	21.14	150	360	Horizontal
5	7236.0000	45.95	-9.99	74.00	28.05	150	41	Horizontal
6	7236.0000	35.20	-9.99	54.00	18.80	150	241	Horizontal
7	17955.447	46.92	0.71	54.00	7.08	150	342	Horizontal

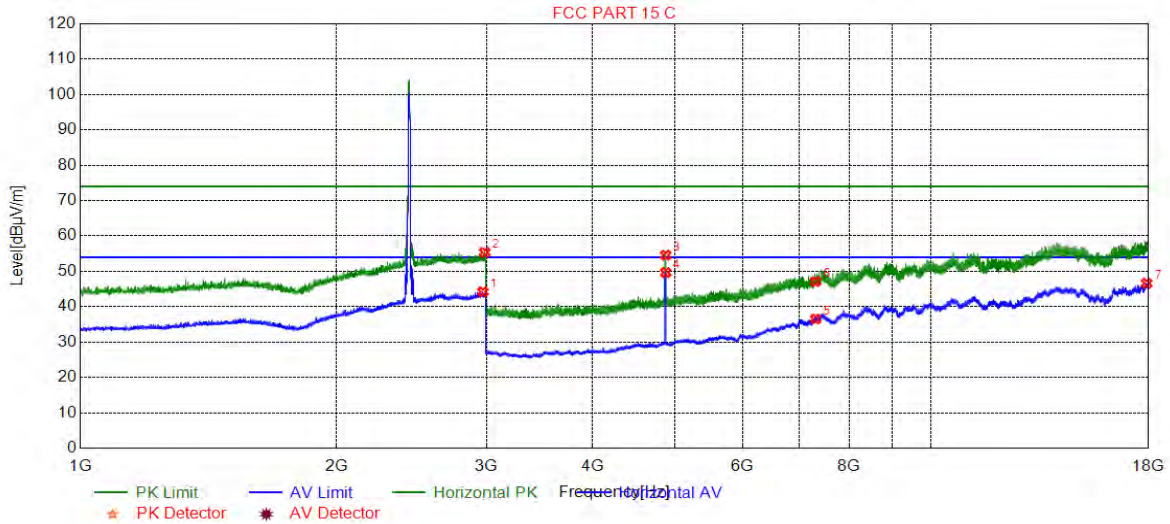


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**4.9.2.1.5 802.11B\_ Middle Channel\_ Horizontal**



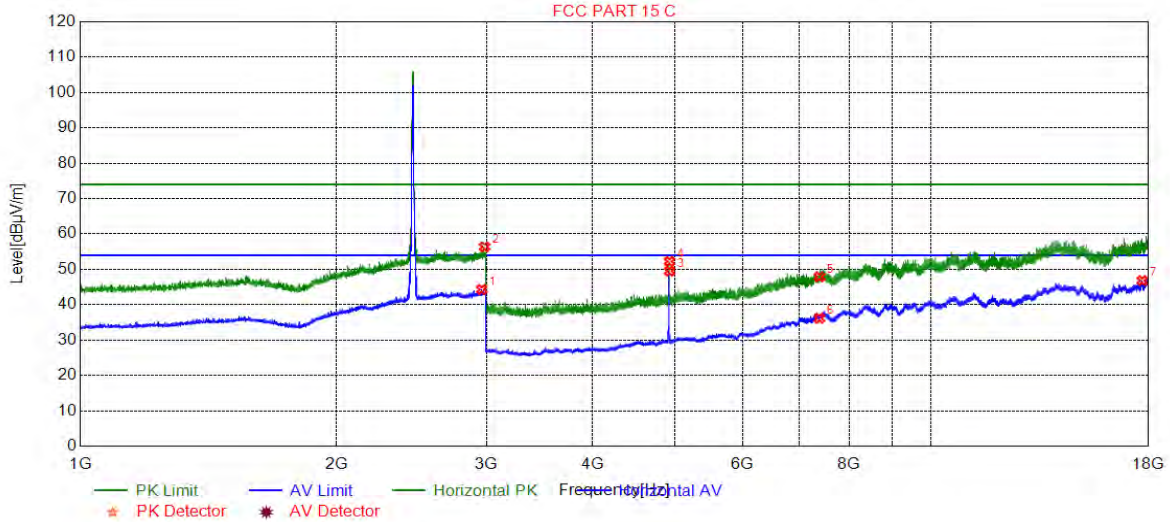
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2972.4931	44.23	9.58	54.00	9.77	150	267	Horizontal
2	2986.9967	55.36	9.51	74.00	18.64	150	59	Horizontal
3	4874.0000	54.59	-17.99	74.00	19.41	150	18	Horizontal
4	4874.1874	49.66	-17.99	54.00	4.34	150	18	Horizontal
5	7311.0000	36.53	-9.74	54.00	17.47	150	90	Horizontal
6	7311.0000	47.11	-9.74	74.00	26.89	150	191	Horizontal
7	17904.845	46.62	0.69	54.00	7.38	150	0	Horizontal



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**4.9.2.1.6 802.11B\_ Highest Channel\_ Horizontal**



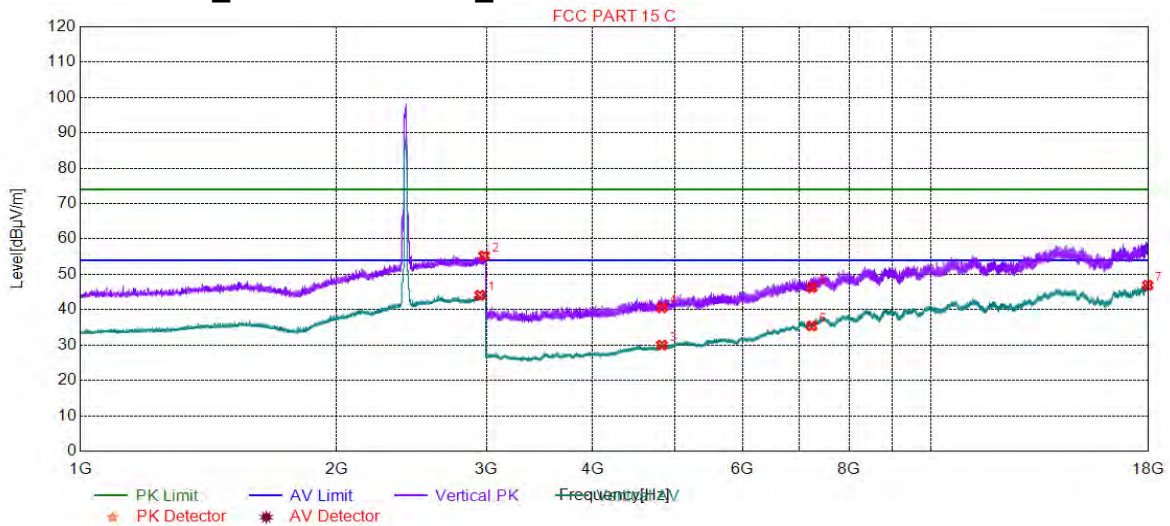
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2962.9907	44.31	9.62	54.00	9.69	150	73	Horizontal
2	2985.9965	56.36	9.51	74.00	17.64	150	196	Horizontal
3	4924.0000	49.51	-17.72	54.00	4.49	150	18	Horizontal
4	4924.0000	52.24	-17.72	74.00	21.76	150	18	Horizontal
5	7386.0000	47.88	-9.55	74.00	26.12	150	292	Horizontal
6	7386.0000	36.20	-9.55	54.00	17.80	150	242	Horizontal
7	17693.634	46.82	1.36	54.00	7.18	150	93	Horizontal



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**4.9.2.1.7 802.11G\_Lowest Channel\_Vertical**



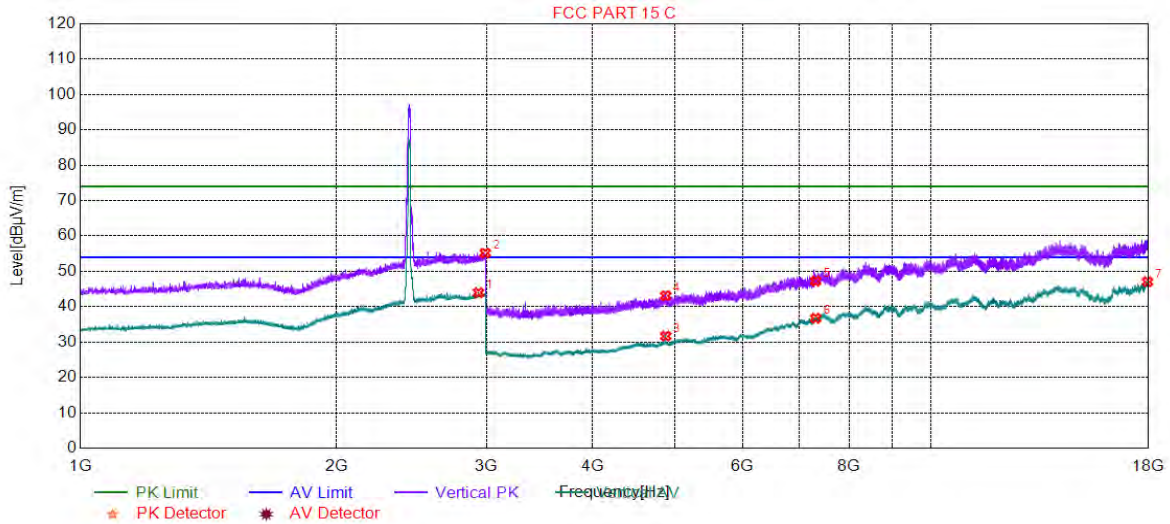
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2948.4871	44.09	9.66	54.00	9.91	150	14	Vertical
2	2981.4954	55.23	9.54	74.00	18.77	150	3	Vertical
3	4824.0000	30.00	-18.21	54.00	24.00	150	100	Vertical
4	4824.0000	40.58	-18.21	74.00	33.42	150	156	Vertical
5	7236.0000	46.25	-9.99	74.00	27.75	150	342	Vertical
6	7236.0000	35.41	-9.99	54.00	18.59	150	140	Vertical
7	17954.347	46.91	0.71	54.00	7.09	150	39	Vertical



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**4.9.2.1.8 802.11G\_Middle Channel\_Vertical**



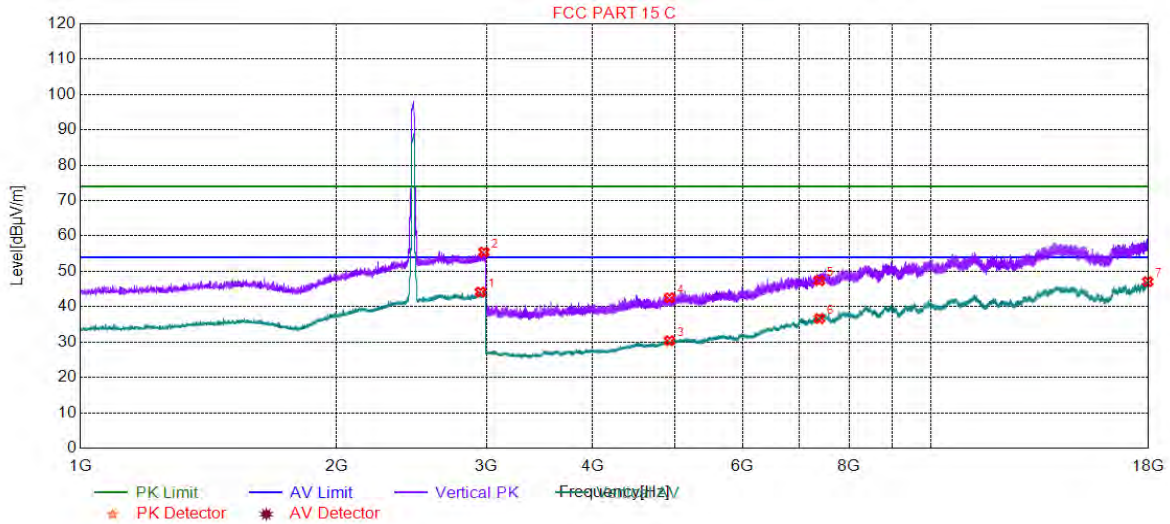
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2936.4841	43.97	9.53	54.00	10.03	150	301	Vertical
2	2990.4976	55.19	9.49	74.00	18.81	150	287	Vertical
3	4874.0000	31.68	-17.99	54.00	22.32	150	293	Vertical
4	4874.0000	43.10	-17.99	74.00	30.90	150	18	Vertical
5	7311.0000	47.25	-9.74	74.00	26.75	150	242	Vertical
6	7311.0000	36.75	-9.74	54.00	17.25	150	0	Vertical
7	17942.797	47.07	0.70	54.00	6.93	150	292	Vertical



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**4.9.2.1.9 802.11G\_Highest Channel\_Vertical**



**Suspected List**

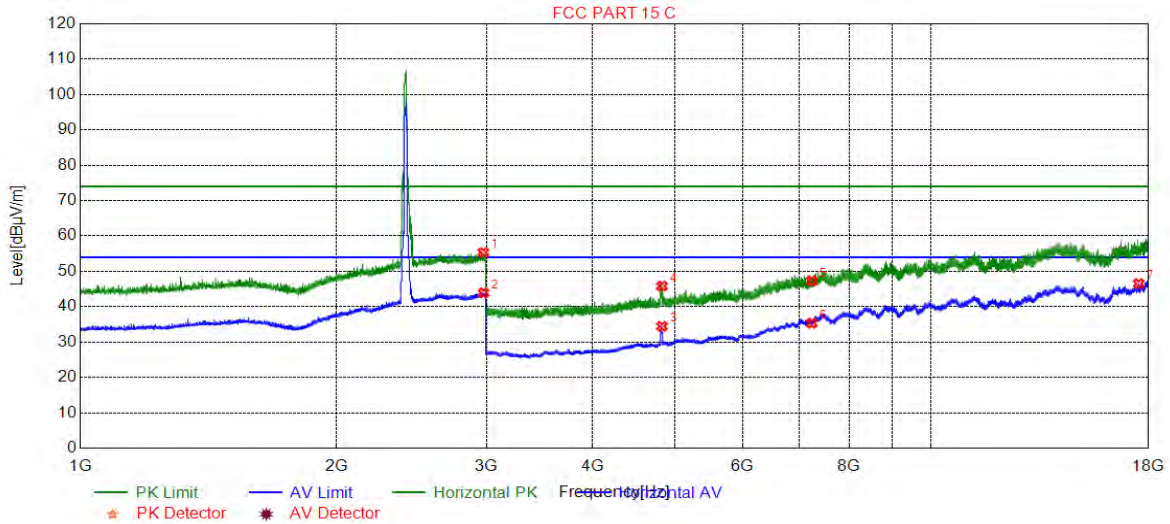
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2952.9882	44.15	9.67	54.00	9.85	150	273	Vertical
2	2980.9952	55.44	9.54	74.00	18.56	150	29	Vertical
3	4924.0000	30.40	-17.72	54.00	23.60	150	321	Vertical
4	4924.0000	42.53	-17.72	74.00	31.47	150	266	Vertical
5	7386.0000	47.36	-9.55	74.00	26.64	150	41	Vertical
6	7386.0000	36.67	-9.55	54.00	17.33	150	41	Vertical
7	17953.797	47.09	0.71	54.00	6.91	150	142	Vertical



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**4.9.2.1.10 802.11G\_Lowest Channel\_ Horizontal**



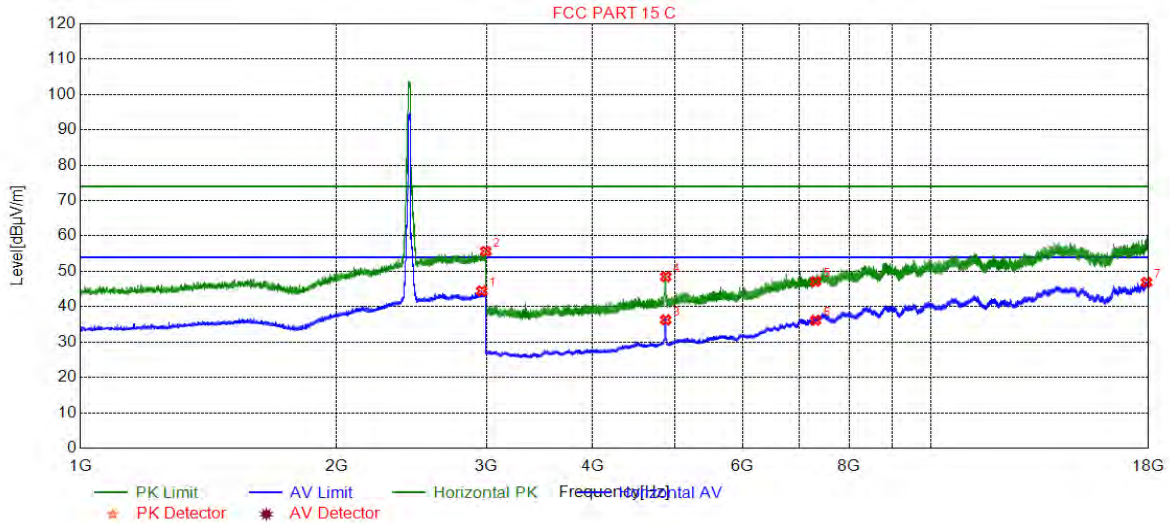
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2974.9937	55.35	9.57	74.00	18.65	150	224	Horizontal
2	2977.4944	43.92	9.55	54.00	10.08	150	18	Horizontal
3	4824.0000	34.46	-18.21	54.00	19.54	150	360	Horizontal
4	4824.0000	45.82	-18.21	74.00	28.18	150	18	Horizontal
5	7236.0000	47.32	-9.99	74.00	26.68	150	192	Horizontal
6	7236.0000	35.34	-9.99	54.00	18.66	150	0	Horizontal
7	17525.876	46.54	1.02	54.00	7.46	150	342	Horizontal



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**4.9.2.1.11 802.11G\_Middle Channel\_Horizontal**



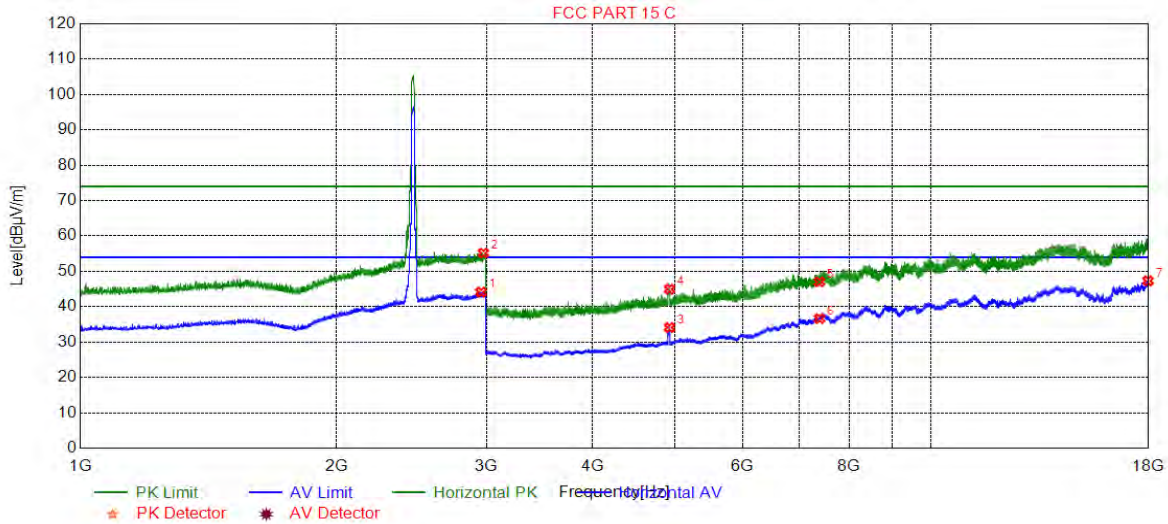
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2963.4909	44.45	9.62	54.00	9.55	150	347	Horizontal
2	2995.4989	55.68	9.47	74.00	18.32	150	18	Horizontal
3	4874.0000	36.28	-17.99	54.00	17.72	150	45	Horizontal
4	4874.0000	48.46	-17.99	74.00	25.54	150	360	Horizontal
5	7311.0000	47.10	-9.74	74.00	26.90	150	141	Horizontal
6	7311.0000	36.16	-9.74	54.00	17.84	150	0	Horizontal
7	17900.445	46.91	0.69	54.00	7.09	150	141	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	2956.4891	44.14	9.65	54.00	9.86	150	349	Horizontal
2	2975.9940	55.18	9.56	74.00	18.82	150	196	Horizontal
3	4924.0000	34.11	-17.72	54.00	19.89	150	18	Horizontal
4	4924.0000	44.97	-17.72	74.00	29.03	150	46	Horizontal
5	7386.0000	47.02	-9.55	74.00	26.98	150	41	Horizontal
6	7386.0000	36.65	-9.55	54.00	17.35	150	91	Horizontal
7	17972.498	47.30	0.71	54.00	6.70	150	91	Horizontal

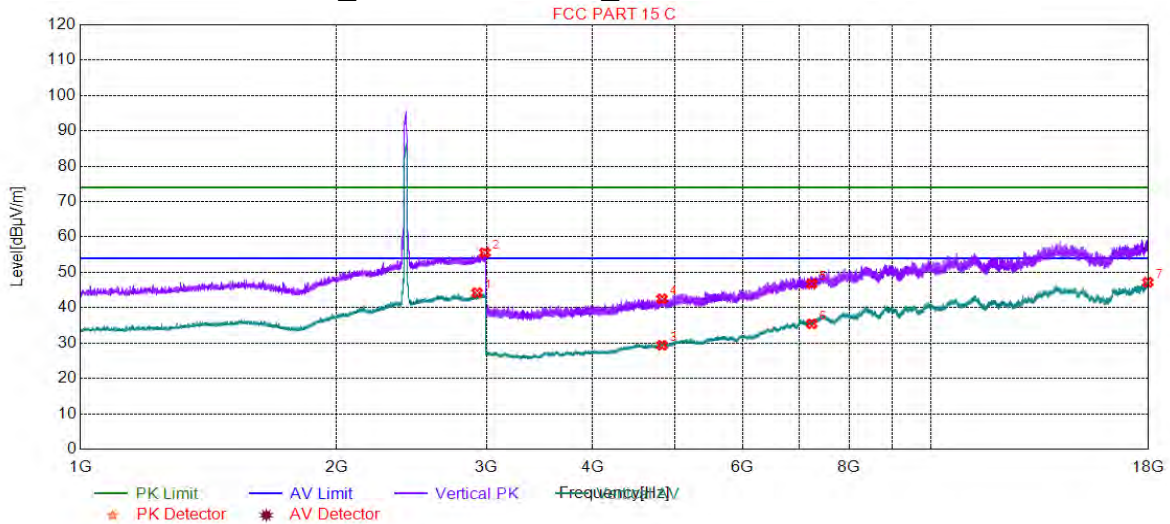


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**4.9.2.1.13 802.11N20\_Lowest Channel\_Vertical**



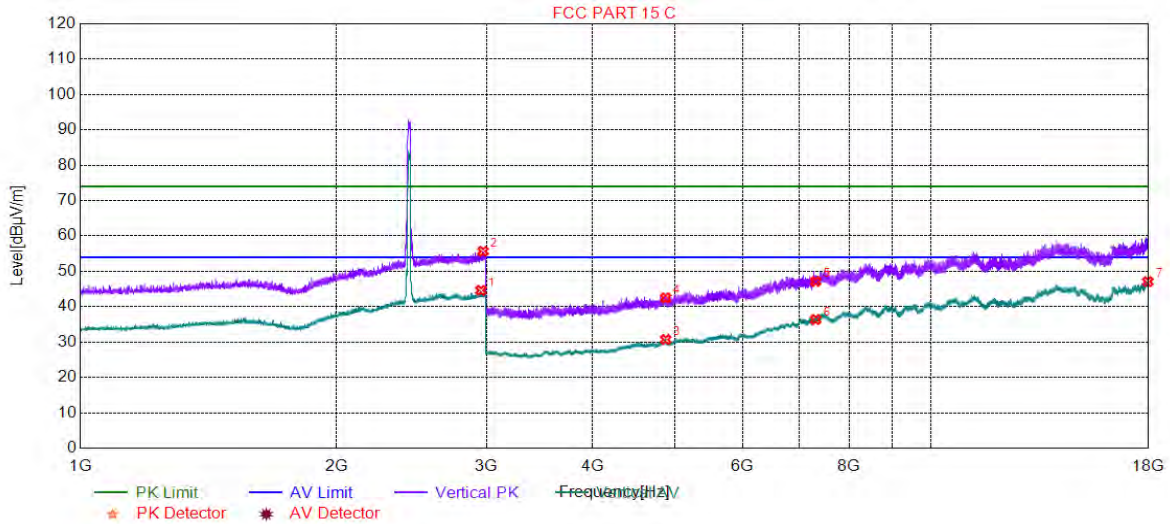
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2925.4814	44.21	9.42	54.00	9.79	150	342	Vertical
2	2987.4969	55.56	9.51	74.00	18.44	150	260	Vertical
3	4824.0000	29.38	-18.21	54.00	24.62	150	45	Vertical
4	4824.0000	42.50	-18.21	74.00	31.50	150	155	Vertical
5	7236.0000	46.74	-9.99	74.00	27.26	150	292	Vertical
6	7236.0000	35.45	-9.99	54.00	18.55	150	90	Vertical
7	17958.747	47.17	0.71	54.00	6.83	150	0	Vertical



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**4.9.2.1.14 802.11N20\_Middle Channel\_Vertical**



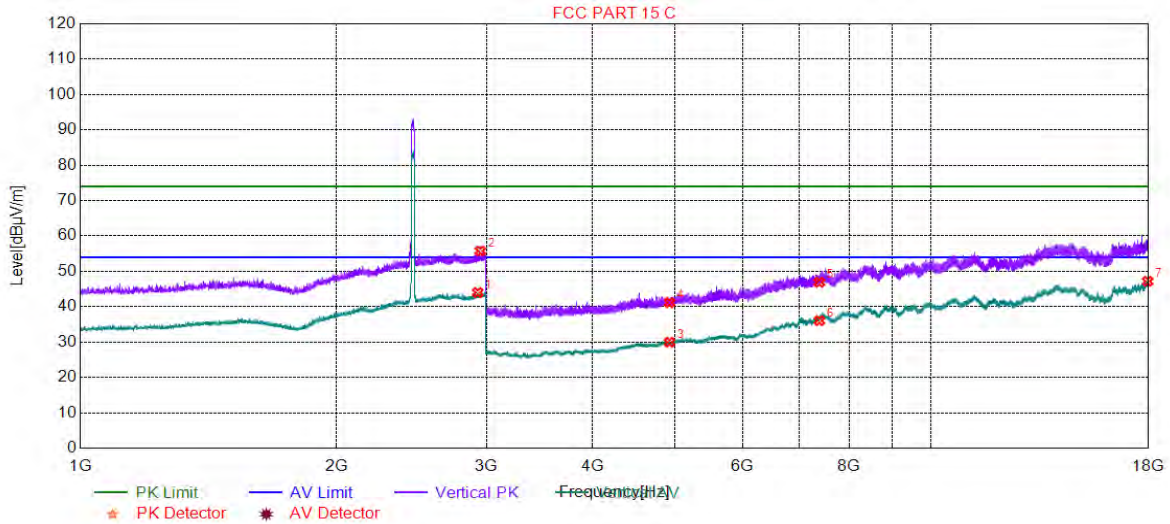
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2955.4889	44.61	9.65	54.00	9.39	150	286	Vertical
2	2972.9932	55.66	9.57	74.00	18.34	150	286	Vertical
3	4874.0000	30.72	-17.99	54.00	23.28	150	349	Vertical
4	4874.0000	42.50	-17.99	74.00	31.50	150	211	Vertical
5	7311.0000	47.13	-9.74	74.00	26.87	150	0	Vertical
6	7311.0000	36.37	-9.74	54.00	17.63	150	92	Vertical
7	17958.747	47.10	0.71	54.00	6.90	150	242	Vertical



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**4.9.2.1.15 802.11N20\_ Highest Channel\_ Vertical**



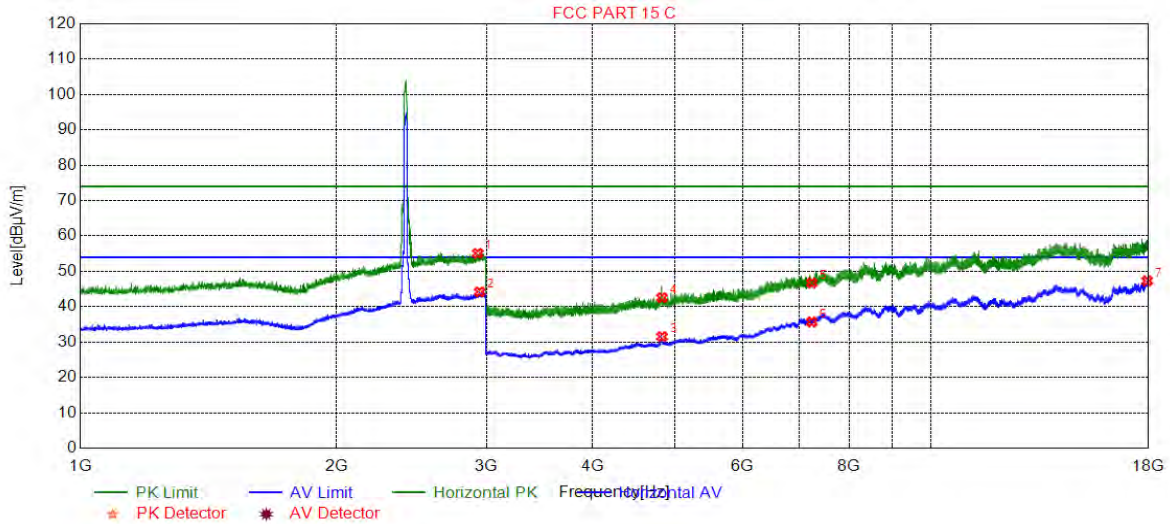
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2930.4826	44.02	9.47	54.00	9.98	150	94	Vertical
2	2950.9877	55.79	9.68	74.00	18.21	150	176	Vertical
3	4924.0000	29.95	-17.72	54.00	24.05	150	360	Vertical
4	4924.0000	41.15	-17.72	74.00	32.85	150	360	Vertical
5	7386.0000	46.89	-9.55	74.00	27.11	150	190	Vertical
6	7386.0000	36.06	-9.55	54.00	17.94	150	291	Vertical
7	17953.797	47.19	0.71	54.00	6.81	150	0	Vertical



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**4.9.2.1.16 802.11N20\_Lowest Channel\_Horizontal**



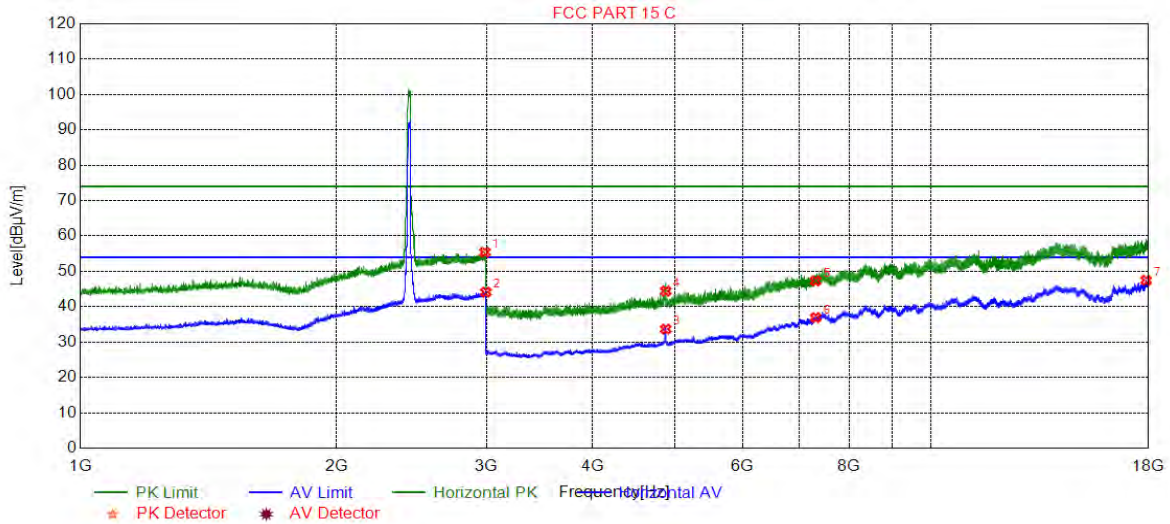
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2930.9827	55.09	9.47	74.00	18.91	150	358	Horizontal
2	2945.9865	44.19	9.64	54.00	9.81	150	73	Horizontal
3	4824.0000	31.54	-18.21	54.00	22.46	150	18	Horizontal
4	4824.0000	42.56	-18.21	74.00	31.44	150	18	Horizontal
5	7236.0000	46.72	-9.99	74.00	27.28	150	90	Horizontal
6	7236.0000	35.70	-9.99	54.00	18.30	150	0	Horizontal
7	17927.396	47.29	0.70	54.00	6.71	150	41	Horizontal



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**4.9.2.1.17 802.11N20\_Middle Channel\_Horizontal**

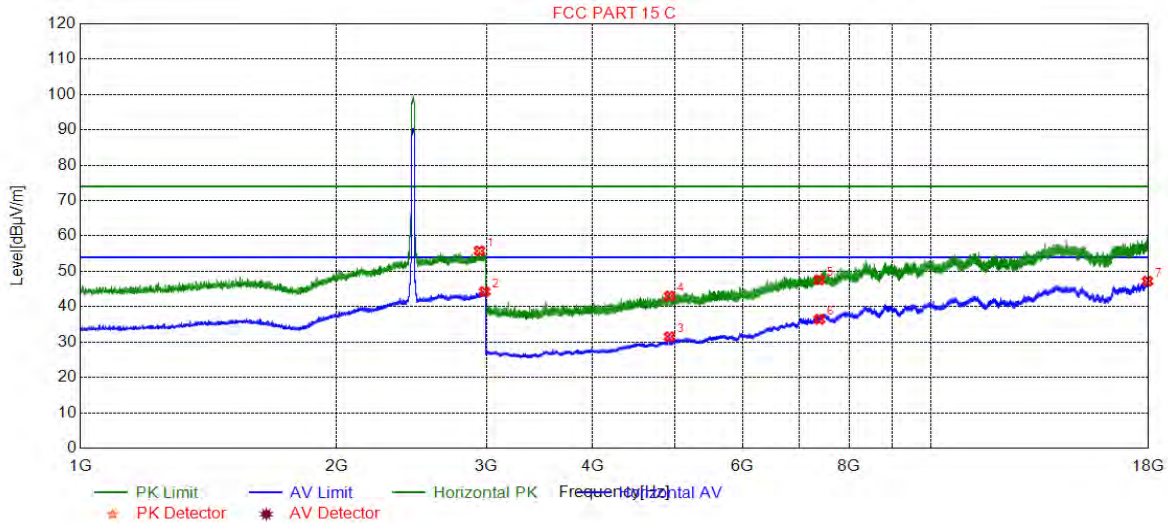


Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2987.9970	55.46	9.51	74.00	18.54	150	18	Horizontal
2	2995.9990	44.13	9.47	54.00	9.87	150	209	Horizontal
3	4874.0000	33.66	-17.99	54.00	20.34	150	18	Horizontal
4	4874.0000	44.43	-17.99	74.00	29.57	150	18	Horizontal
5	7311.0000	47.29	-9.74	74.00	26.71	150	292	Horizontal
6	7311.0000	36.92	-9.74	54.00	17.08	150	141	Horizontal
7	17880.644	47.46	0.43	54.00	6.54	150	91	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	2944.9862	55.79	9.63	74.00	18.21	150	305	Horizontal
2	2985.9965	44.27	9.51	54.00	9.73	150	196	Horizontal
3	4924.0000	31.51	-17.72	54.00	22.49	150	18	Horizontal
4	4924.0000	42.97	-17.72	74.00	31.03	150	348	Horizontal
5	7386.0000	47.59	-9.55	74.00	26.41	150	192	Horizontal
6	7386.0000	36.44	-9.55	54.00	17.56	150	292	Horizontal
7	17942.797	47.22	0.70	54.00	6.78	150	92	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:			

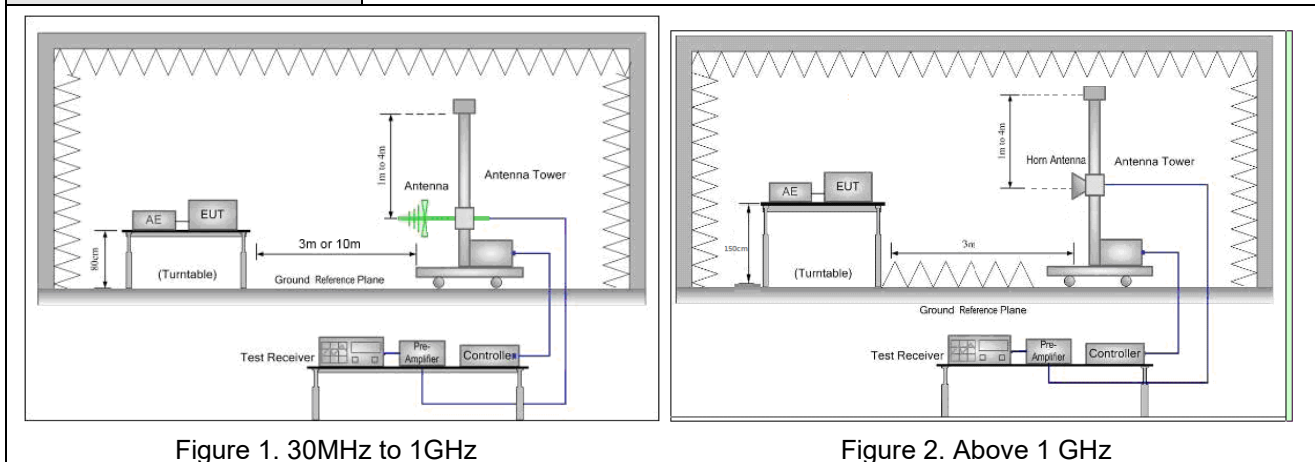


Figure 1. 30MHz to 1GHz

Figure 2. Above 1 GHz



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<p>Test Procedure:</p>	<ol 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 camber. 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 camber. 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> </ol>
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>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.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Test Results:</p>	<p>Pass</p>

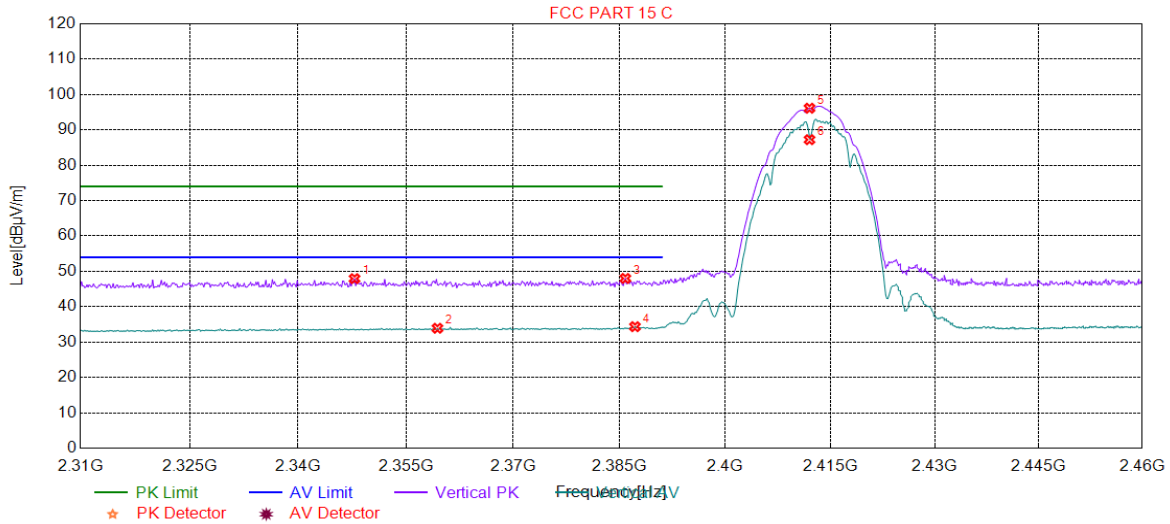




Test plot as follows:

**4.10.1 ANT1**

**4.10.1.1 802.11B\_Lowest Channel\_Vertical**

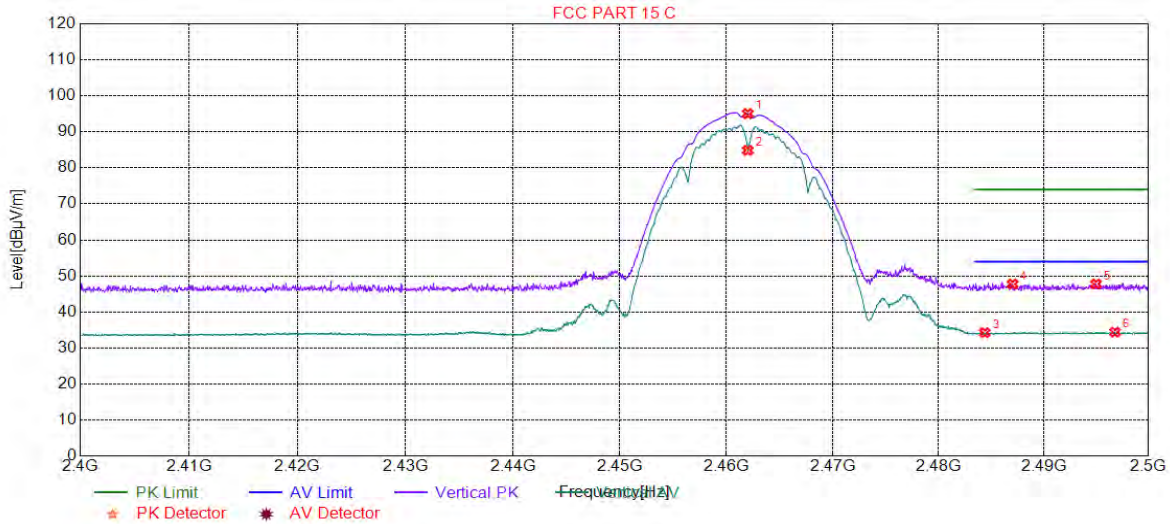


Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2347.8378	47.94	7.79	74.00	26.06	150	14	Vertical
2	2359.3994	33.91	7.80	54.00	20.09	150	109	Vertical
3	2385.8258	48.00	7.77	74.00	26.00	150	170	Vertical
4	2387.1772	34.36	7.77	54.00	19.64	150	326	Vertical
5	2412.0000	96.13	7.81	0.00	-96.13	150	14	Vertical
6	2412.0000	87.23	7.81	0.00	-87.23	150	14	Vertical



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**4.10.1.2 802.11B\_ Highest Channel\_ Vertical**



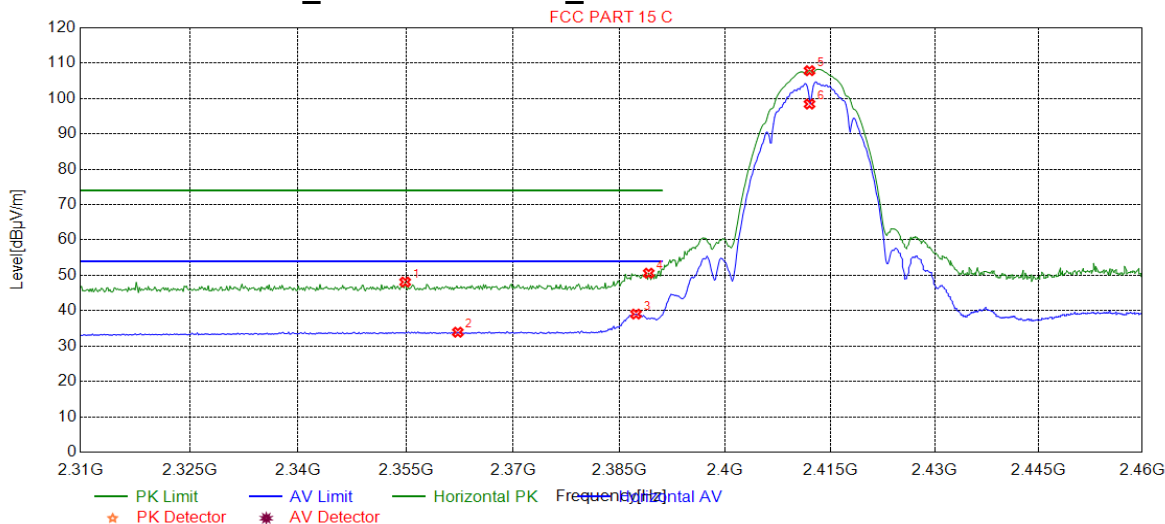
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	95.05	7.98	0.00	-95.05	150	18	Vertical
2	2462.0000	84.85	7.98	0.00	-84.85	150	14	Vertical
3	2484.3922	34.26	8.01	54.00	19.74	150	324	Vertical
4	2487.0435	47.75	8.01	74.00	26.25	150	62	Vertical
5	2494.9975	47.78	8.02	74.00	26.22	150	105	Vertical
6	2496.7984	34.39	8.03	54.00	19.61	150	127	Vertical



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**4.10.1.3 802.11B\_Lowest Channel\_Horizontal**



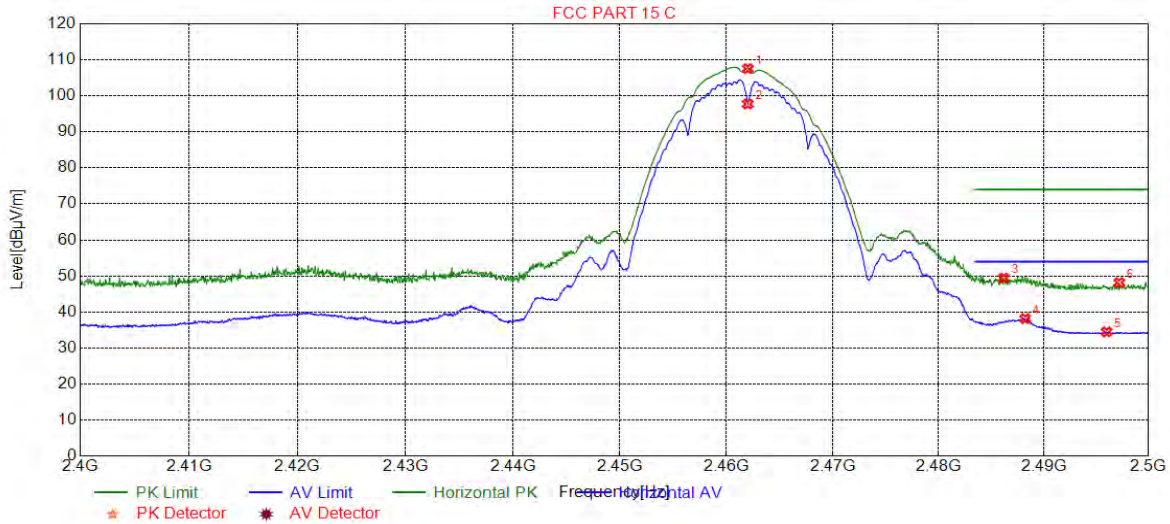
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2354.8949	48.11	7.81	74.00	25.89	150	236	Horizontal
2	2362.2523	33.92	7.80	54.00	20.08	150	42	Horizontal
3	2387.3273	39.06	7.77	54.00	14.94	150	204	Horizontal
4	2389.1291	50.61	7.77	74.00	23.39	150	212	Horizontal
5	2412.0000	107.87	7.81	0.00	-107.87	150	204	Horizontal
6	2412.0000	98.43	7.81	0.00	-98.43	150	208	Horizontal



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**4.10.1.4 802.11B\_ Highest Channel\_ Horizontal**



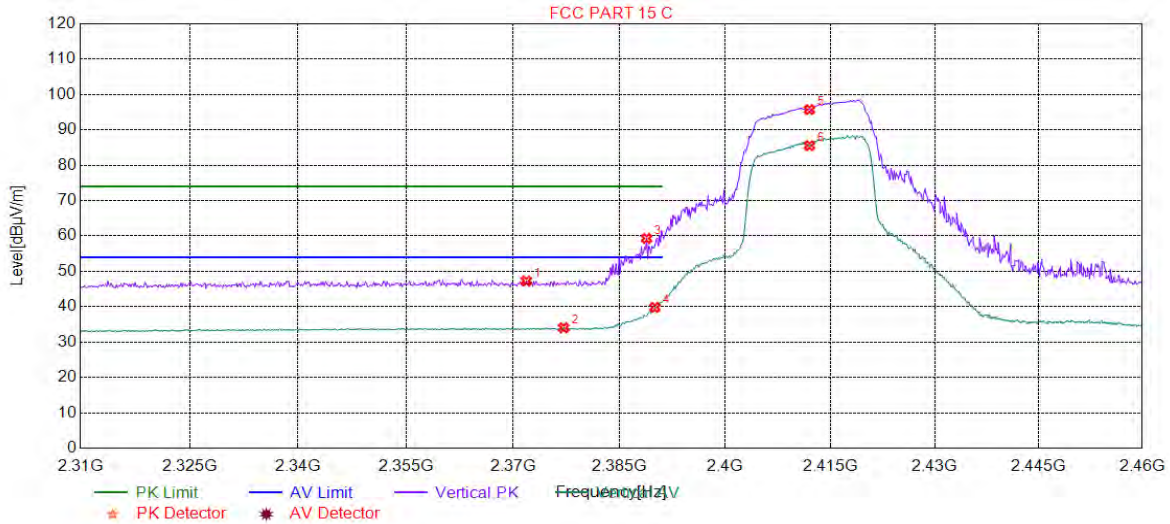
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	107.56	7.98	0.00	-107.56	150	204	Horizontal
2	2462.0000	97.72	7.98	0.00	-97.72	150	204	Horizontal
3	2486.1931	49.41	8.01	74.00	24.59	150	199	Horizontal
4	2488.2441	38.16	8.02	54.00	15.84	150	204	Horizontal
5	2495.9980	34.48	8.03	54.00	19.52	150	221	Horizontal
6	2497.1986	48.14	8.03	74.00	25.86	150	160	Horizontal



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**4.10.1.5 802.11G\_Lowest Channel\_Vertical**



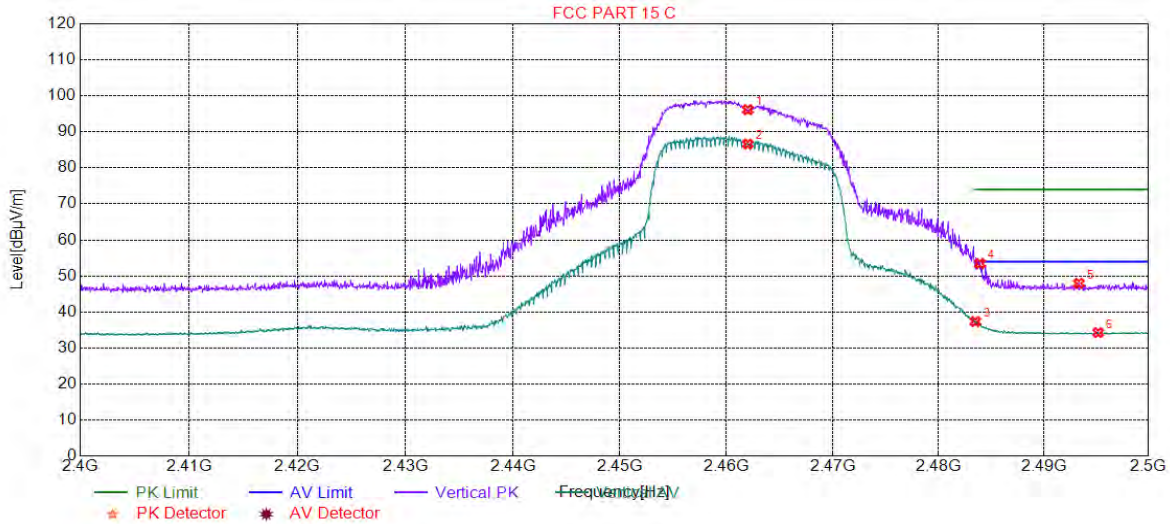
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2371.8619	47.28	7.79	74.00	26.72	150	133	Vertical
2	2377.1171	34.05	7.78	54.00	19.95	150	18	Vertical
3	2388.8288	59.30	7.77	74.00	14.70	150	21	Vertical
4	2390.0000	39.78	7.77	54.00	14.22	150	21	Vertical
5	2412.0000	95.73	7.81	0.00	-95.73	150	18	Vertical
6	2412.0000	85.54	7.81	0.00	-85.54	150	18	Vertical



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**4.10.1.6 802.11G\_ Highest Channel\_ Vertical**



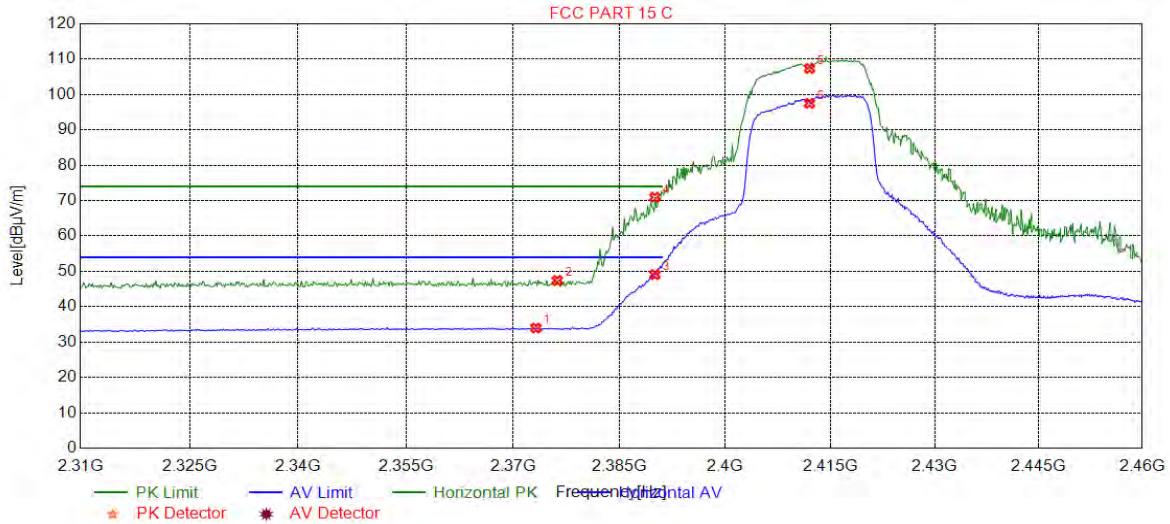
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	96.15	7.98	0.00	-96.15	150	330	Vertical
2	2462.0000	86.64	7.98	0.00	-86.64	150	330	Vertical
3	2483.5000	37.34	8.01	54.00	16.66	150	287	Vertical
4	2483.9420	53.46	8.01	74.00	20.54	150	346	Vertical
5	2493.3467	47.96	8.02	74.00	26.04	150	14	Vertical
6	2495.1976	34.27	8.02	54.00	19.73	150	73	Vertical



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**4.10.1.7 802.11G\_Lowest Channel\_Horizontal**

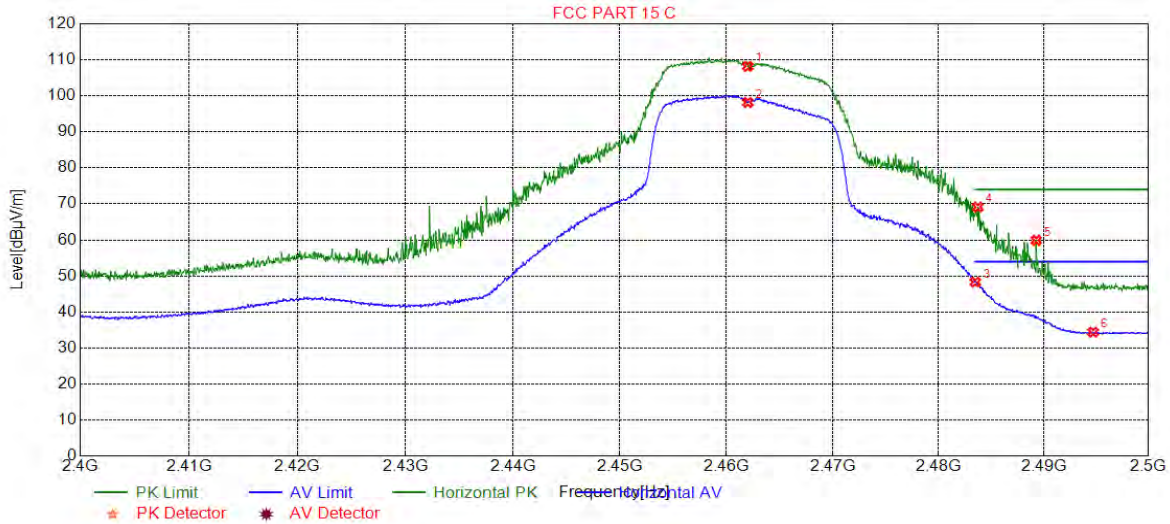


Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2373.2132	33.98	7.79	54.00	20.02	150	196	Horizontal
2	2376.2162	47.42	7.78	74.00	26.58	150	167	Horizontal
3	2390.0000	49.09	7.77	54.00	4.91	150	216	Horizontal
4	2390.0000	70.93	7.77	74.00	3.07	150	216	Horizontal
5	2412.0000	107.39	7.81	0.00	-107.39	150	216	Horizontal
6	2412.0000	97.52	7.81	0.00	-97.52	150	216	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	108.17	7.98	0.00	-108.17	150	210	Horizontal
2	2462.0000	98.17	7.98	0.00	-98.17	150	216	Horizontal
3	2483.5000	48.28	8.01	54.00	5.72	150	216	Horizontal
4	2483.7419	69.12	8.01	74.00	4.88	150	205	Horizontal
5	2489.2946	59.90	8.02	74.00	14.10	150	216	Horizontal
6	2494.6973	34.41	8.02	54.00	19.59	150	221	Horizontal

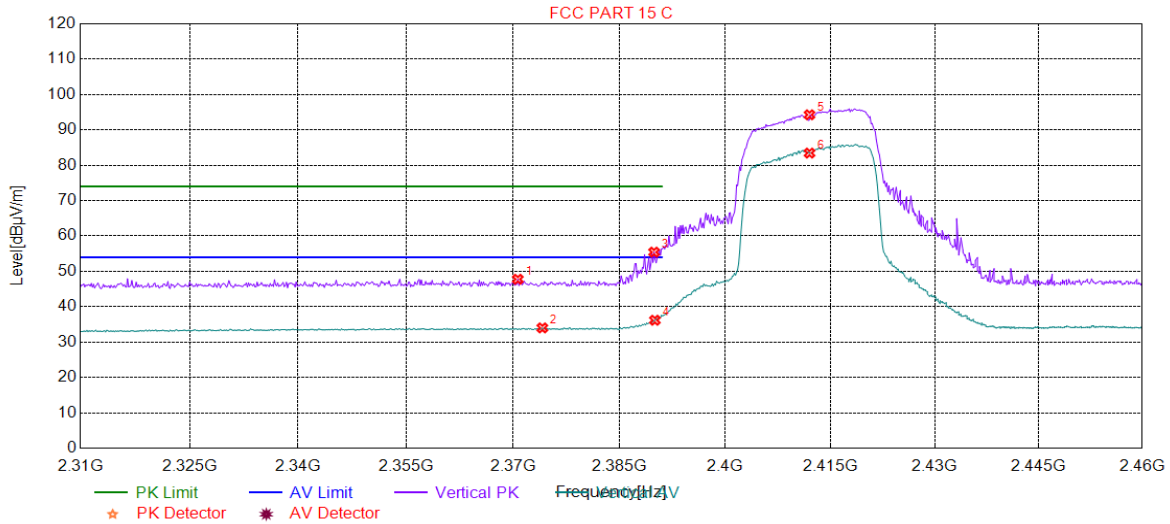


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**4.10.1.9 802.11N20\_Lowest Channel\_Vertical**



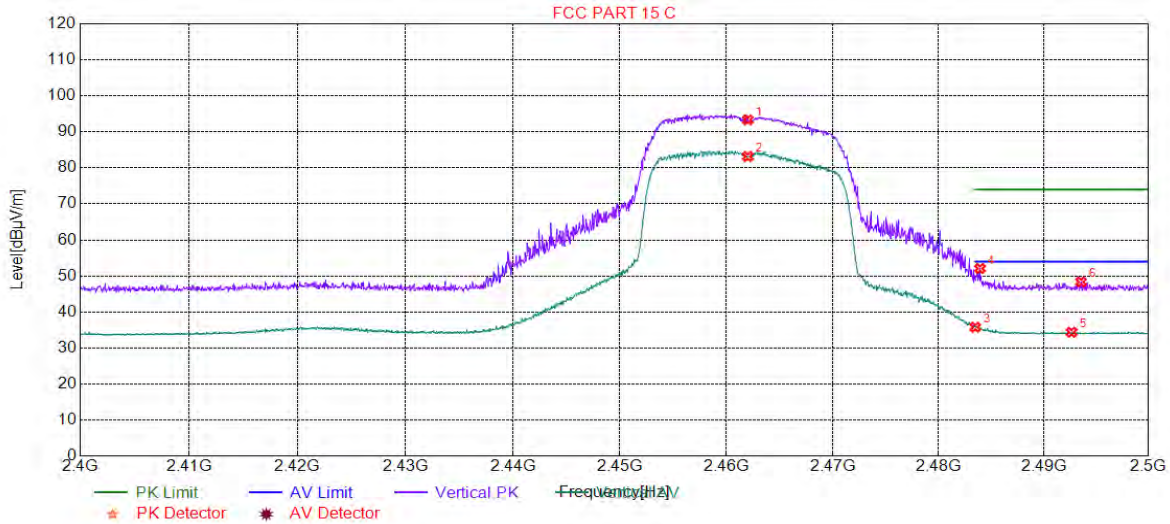
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2370.6607	47.77	7.79	74.00	26.23	150	79	Vertical
2	2374.1141	34.01	7.79	54.00	19.99	150	94	Vertical
3	2389.8799	55.43	7.77	74.00	18.57	150	18	Vertical
4	2390.0000	36.18	7.77	54.00	17.82	150	18	Vertical
5	2412.0000	94.27	7.81	0.00	-94.27	150	18	Vertical
6	2412.0000	83.44	7.81	0.00	-83.44	150	18	Vertical



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**4.10.1.10 802.11N20\_ Highest Channel\_ Vertical**

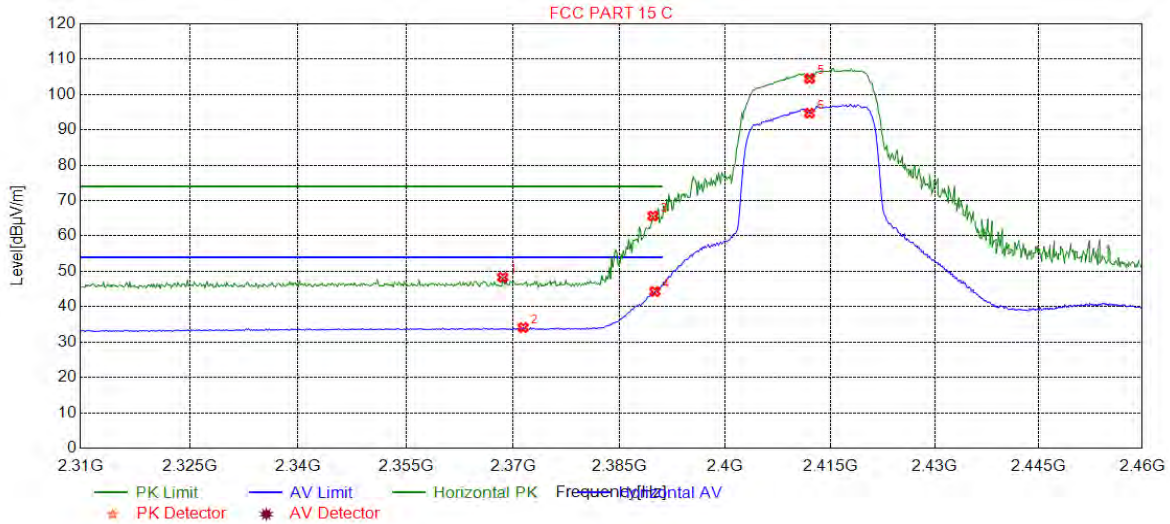


Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	93.33	7.98	0.00	-93.33	150	349	Vertical
2	2462.0000	83.16	7.98	0.00	-83.16	150	343	Vertical
3	2483.5000	35.77	8.01	54.00	18.23	150	343	Vertical
4	2483.9420	52.06	8.01	74.00	21.94	150	327	Vertical
5	2492.6463	34.38	8.02	54.00	19.62	150	354	Vertical
6	2493.5468	48.37	8.02	74.00	25.63	150	206	Vertical



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**4.10.1.11 802.11N20\_Lowest Channel\_Horizontal**



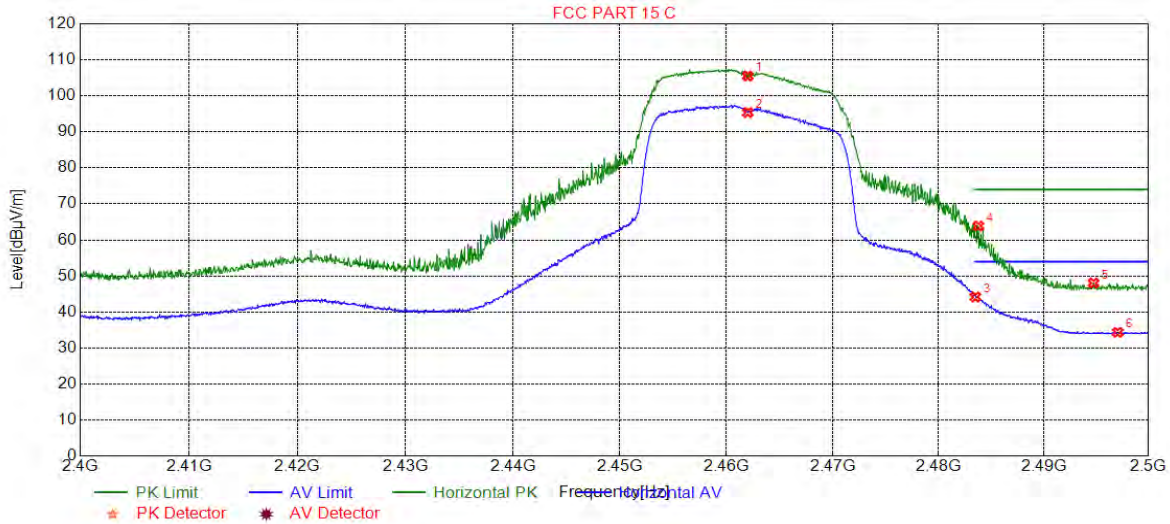
Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2368.5586	48.32	7.79	74.00	25.68	150	346	Horizontal
2	2371.4114	34.11	7.79	54.00	19.89	150	223	Horizontal
3	2389.7297	65.67	7.77	74.00	8.33	150	215	Horizontal
4	2390.0000	44.31	7.77	54.00	9.69	150	211	Horizontal
5	2412.0000	104.50	7.81	0.00	-104.50	150	215	Horizontal
6	2412.0000	94.72	7.81	0.00	-94.72	150	219	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	2462.0000	105.51	7.98	0.00	-105.51	150	204	Horizontal
2	2462.0000	95.38	7.98	0.00	-95.38	150	209	Horizontal
3	2483.5000	44.17	8.01	54.00	9.83	150	214	Horizontal
4	2483.7919	63.86	8.01	74.00	10.14	150	209	Horizontal
5	2494.7474	48.05	8.02	74.00	25.95	150	270	Horizontal
6	2497.0485	34.34	8.03	54.00	19.66	150	209	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:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$

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	Cal. Due date
				(yyyy-mm-dd)	(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	2020/4/13	2021/4/12
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	2020/2/11	2021/2/10
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2020/3/22	2021/3/21

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal. Due date
				(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

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal. Due date
				(yyyy-mm-dd)	(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	2020/3/22	2021/3/21
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	2020/3/22	2021/3/21
Band filter	N/A	N/A	SEM023-01	N/A	N/A



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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
Wideband Radio Communication Tester	Anristu	MT8821C	6201462742	2020/3/22	2021/3/21
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	W005-02	2020/1/3	2021/1/2
Wideband Radio Communication Tester	Keysight	UXM	K-E7515B 50667	2019/8/20	2020/8/19
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2020/3/3	2021/3/2
Spectrum Analyzer (20Hz-43GHz)	Rohde & Schwarz	FSU43	SEM004-08	2019/10/22	2020/10/21
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017/6/27	2020/6/26
Horn Antenna (800MHz-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2020/3/22	2022/3/21
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017/10/17	2020/10/16
Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2019/7/25	2020/7/24
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019/7/25	2020/7/24
Pre-amplifier (26-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2019/10/22	2020/10/21
Band filter	N/A	N/A	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2019/6/12	2020/6/11
Tunable Notch Filter WRCD1700/2000-0.2/40-10EEK	WAINRIGHT Instruments GMBH	N/A	N/A	N/A	N/A
Tunable Notch Filter WRCD800/960-0.2/40-10EEK	WAINRIGHT Instruments GMBH	N/A	N/A	N/A	N/A
HighPass Filter WHK1.2/15G-10SS	WAINRIGHT Instruments GMBH	N/A	N/A	N/A	N/A
HighPass Filter WHKX10-2700-3000-18000-40SS	WAINRIGHT Instruments GMBH	N/A	N/A	N/A	N/A
HighPass Filter WHKX7.0/26.5G-6SS	WAINRIGHT Instruments GMBH	N/A	N/A	N/A	N/A
Band Reject Filter WRCG 824/849-814/859-40/8SS	WAINRIGHT Instruments GMBH	N/A	N/A	N/A	N/A
Band Reject Filter WRCG 1850/1910-1835/1925-40/8SS	WAINRIGHT Instruments GMBH	N/A	N/A	N/A	N/A

## 7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-Up for ZR/2020/40013.

The End



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