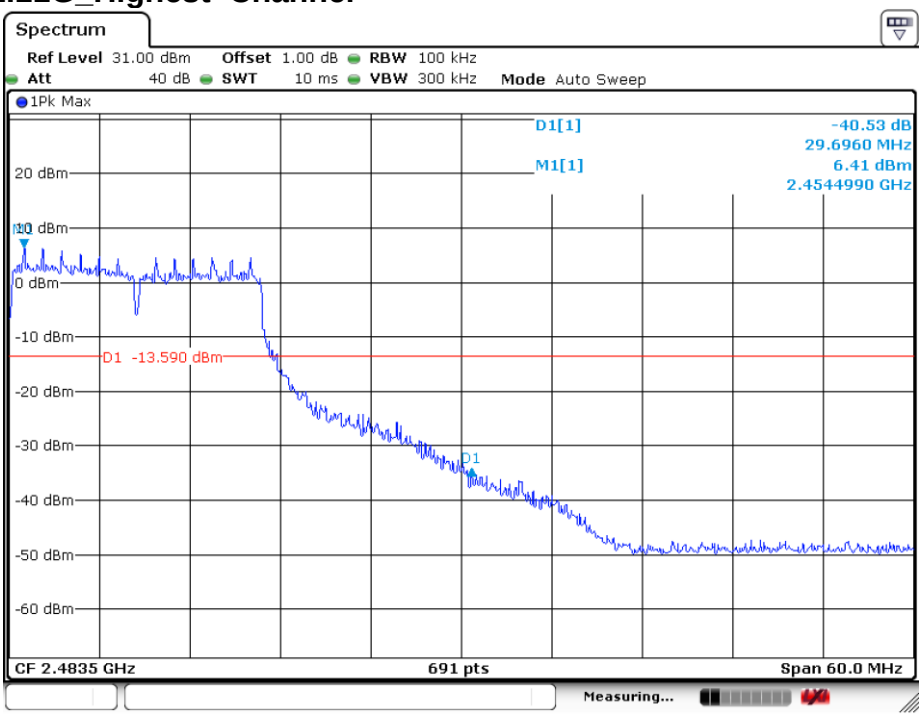
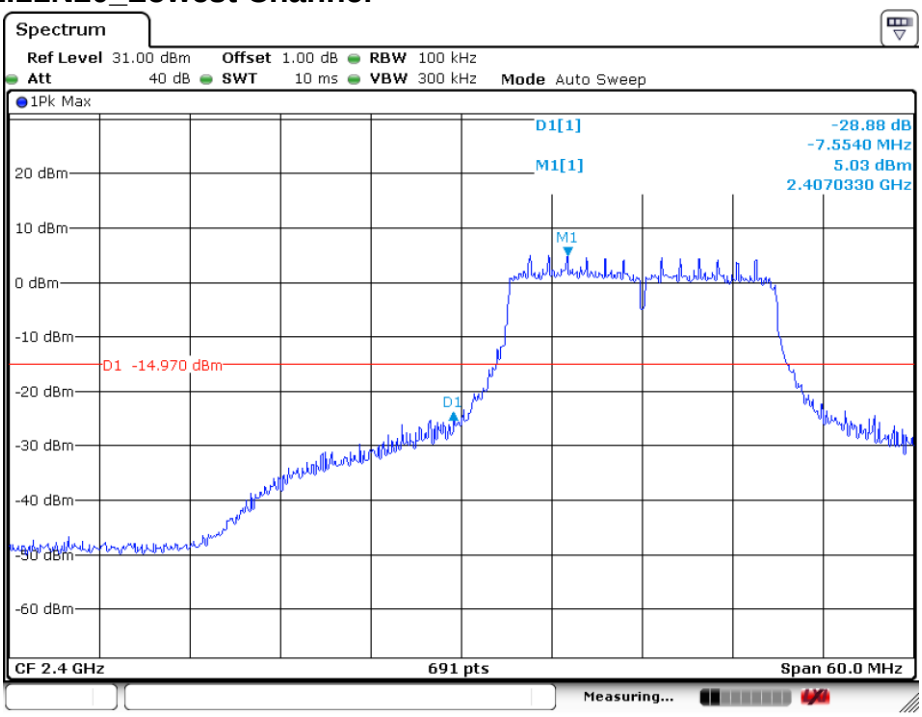
4.7.1.1.4 802.11G_Highest Channel



Date: 8.NOV.2020 14:34:57

4.7.1.1.5 802.11N20_Lowest Channel



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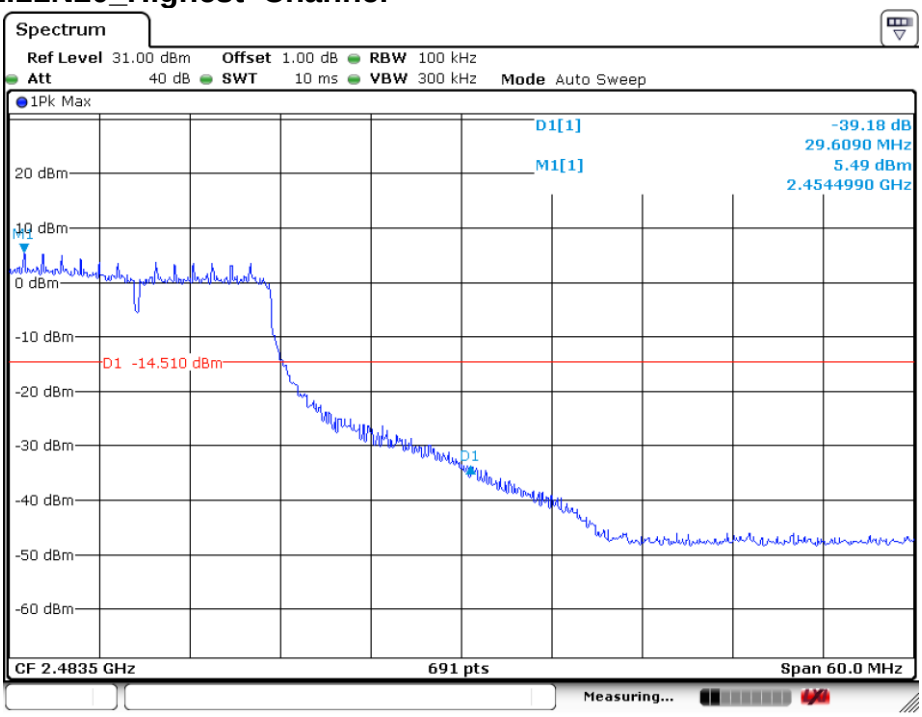
4.7.1.1.6 802.11N20_Highest Channel



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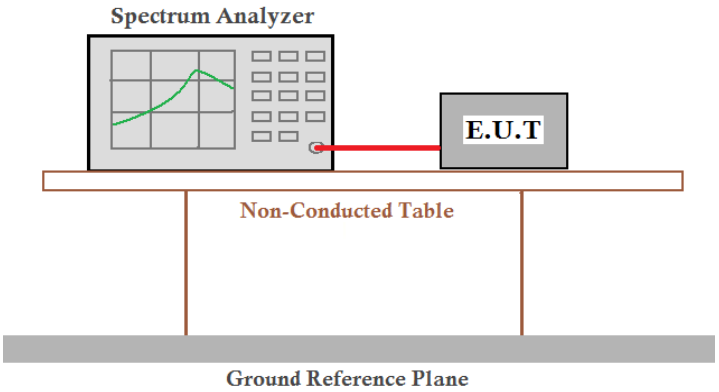
4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test 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);
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass

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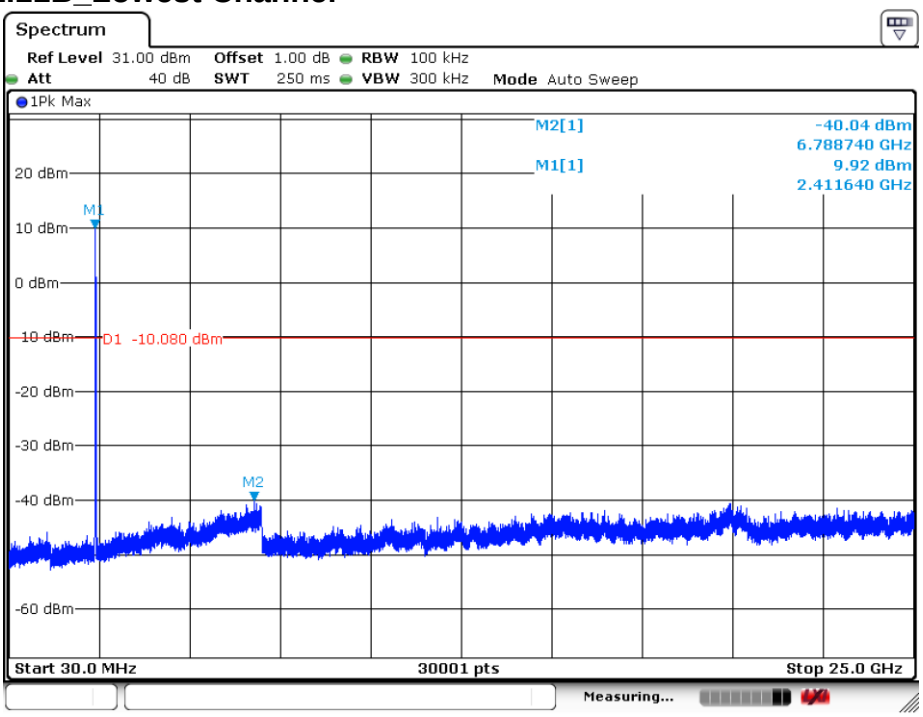
4.8.1 Test Plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



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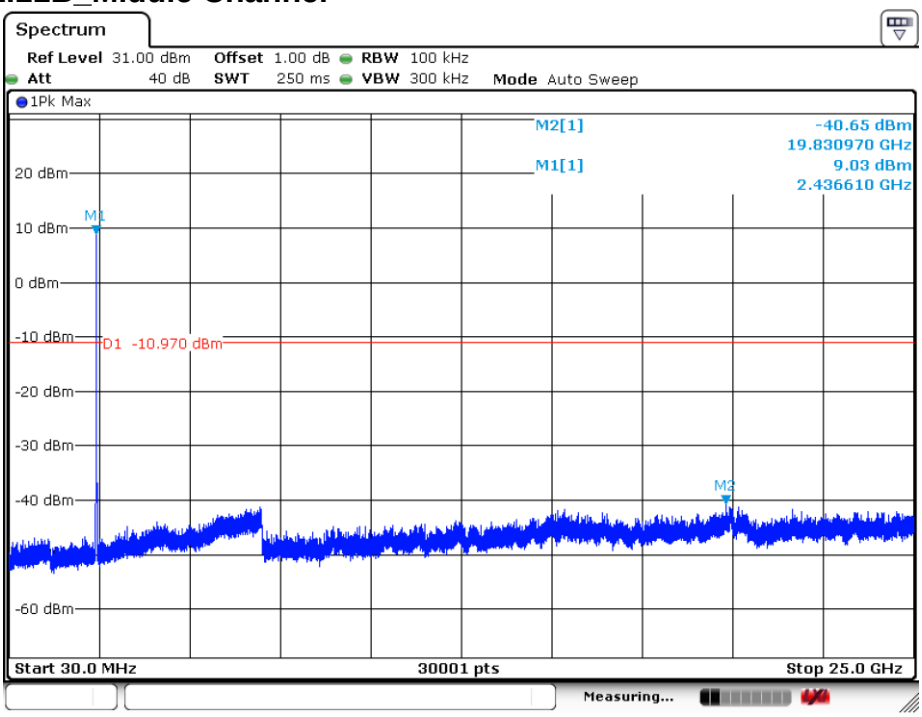
4.8.1.1.2 802.11B_Middle Channel



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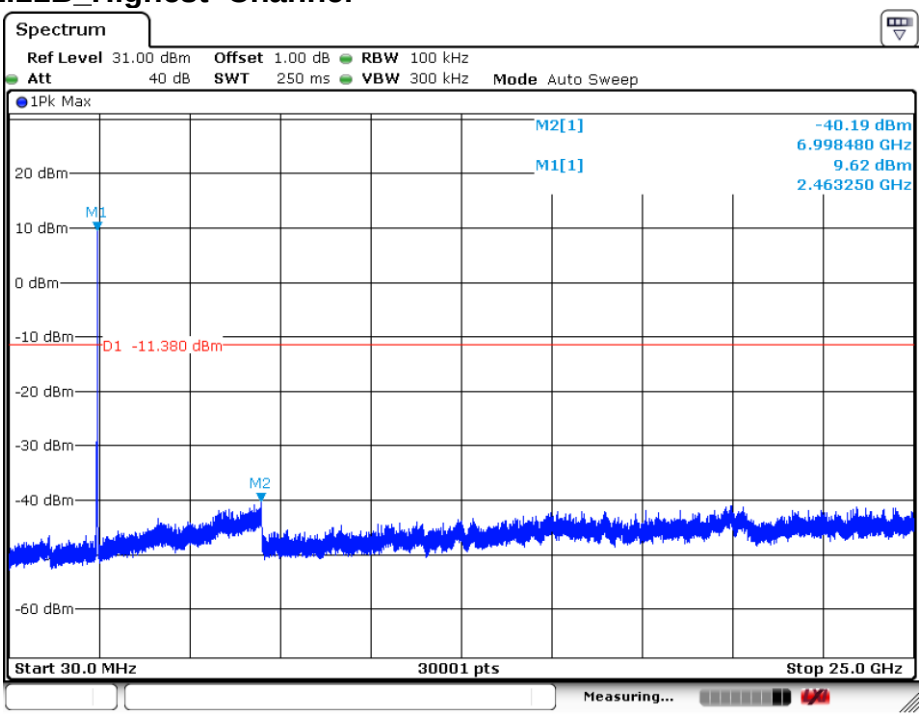
4.8.1.1.3 802.11B_Highest Channel



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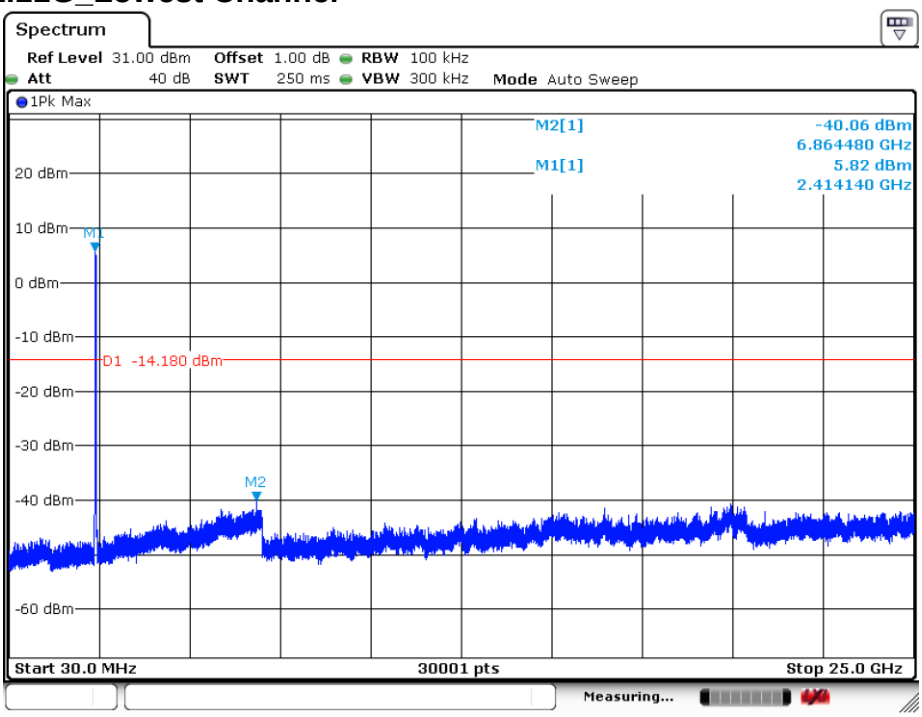
4.8.1.1.4 802.11G_Lowest Channel



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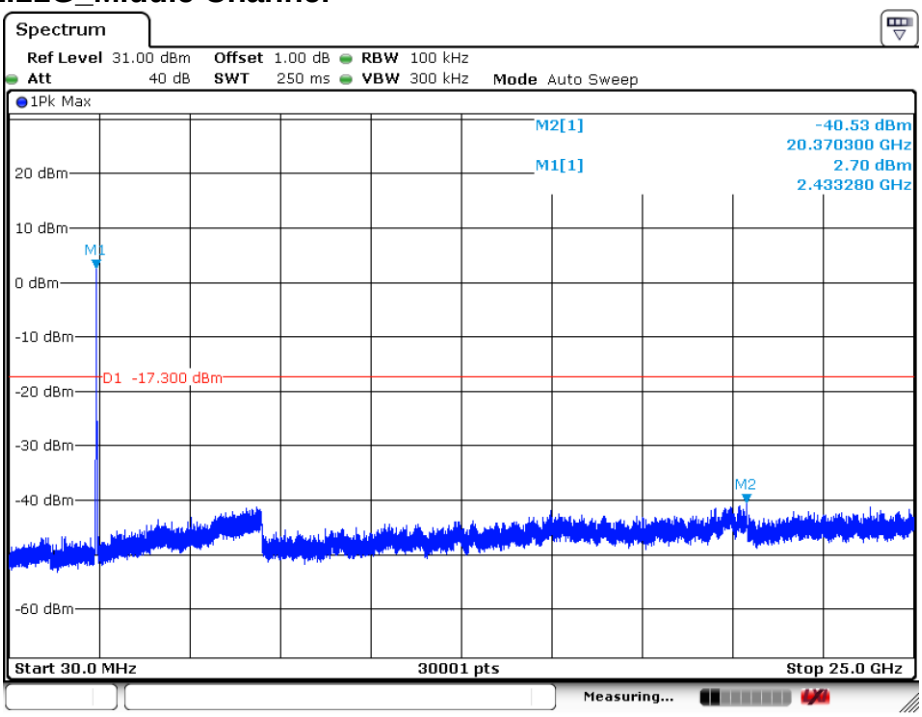
4.8.1.1.5 802.11G_Middle Channel



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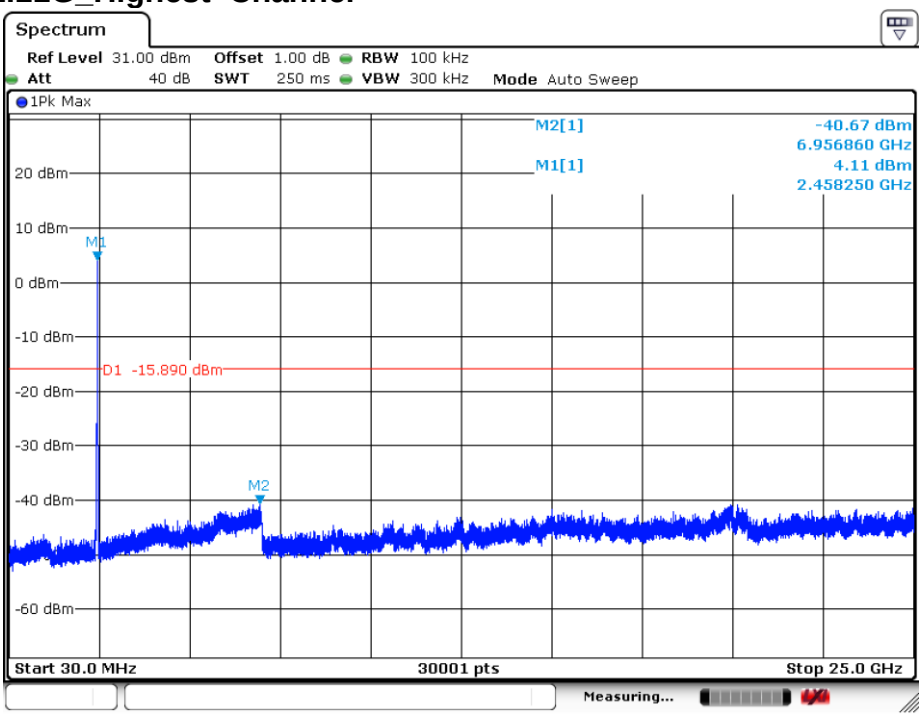
4.8.1.1.6 802.11G_Highest Channel



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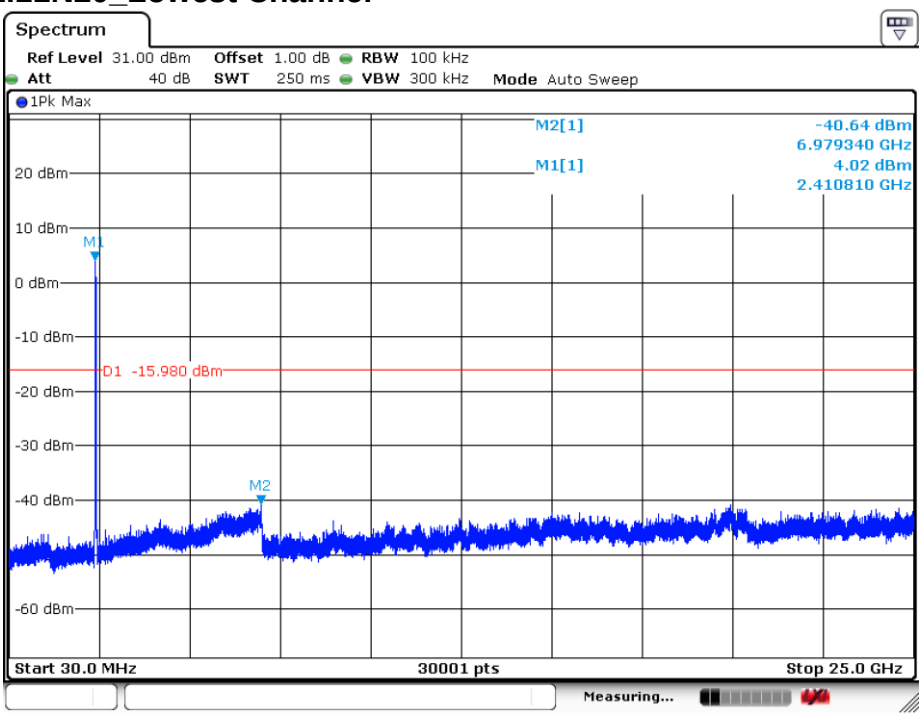
4.8.1.1.7 802.11N20_Lowest Channel



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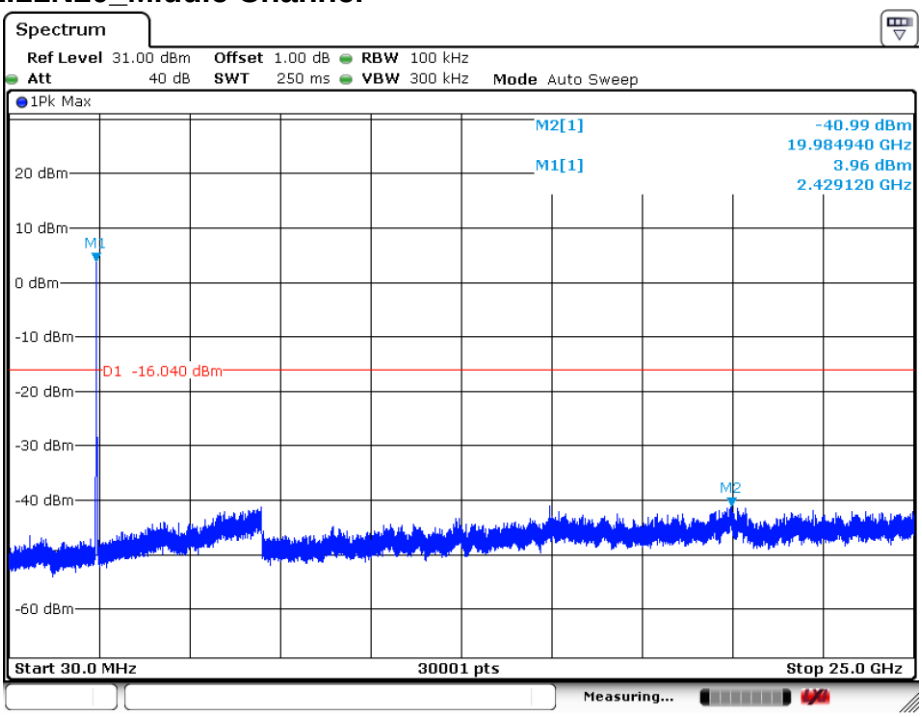
4.8.1.1.8 802.11N20_Middle Channel



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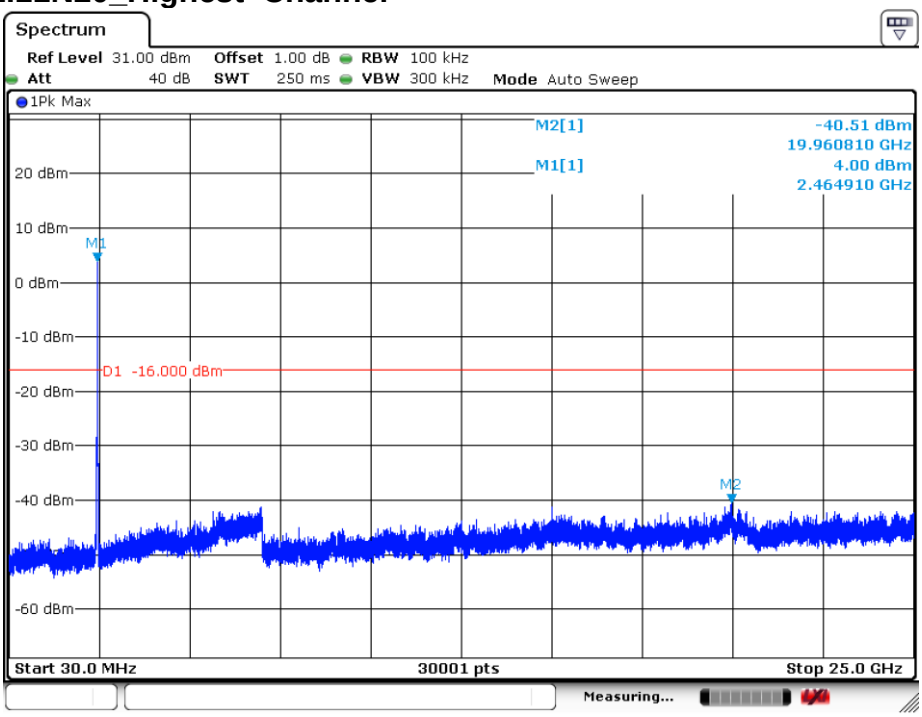
4.8.1.1.9 802.11N20_Highest Channel



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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	100kHz	30kHz	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:	

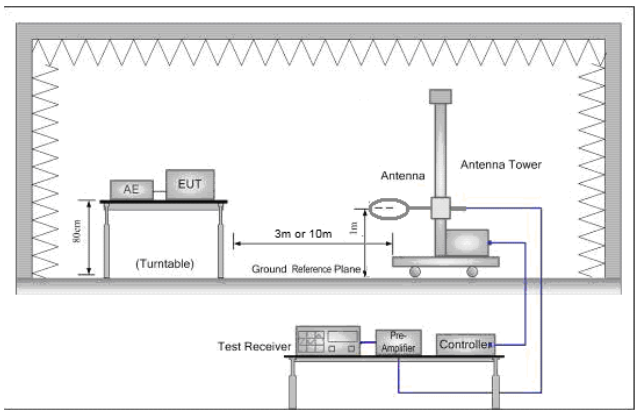

Figure 1. Below 30MHz

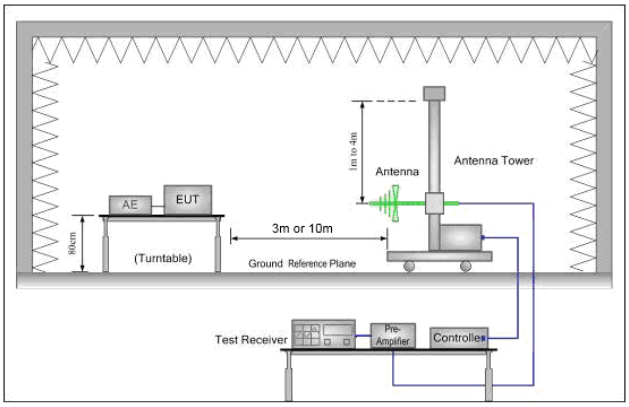

Figure 2. 30MHz to 1GHz

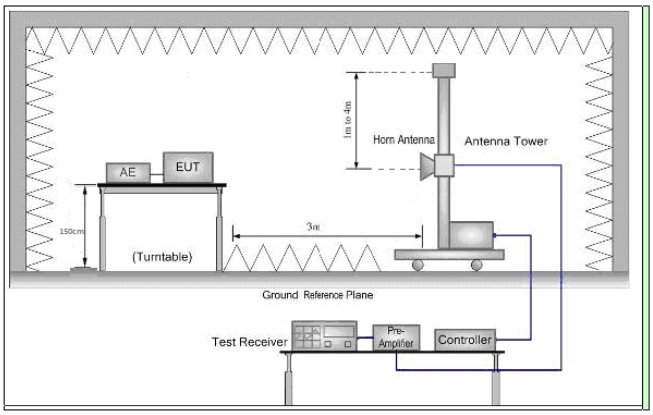

Figure 3. Above 1 GHz

Test Procedure:	

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).

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	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. 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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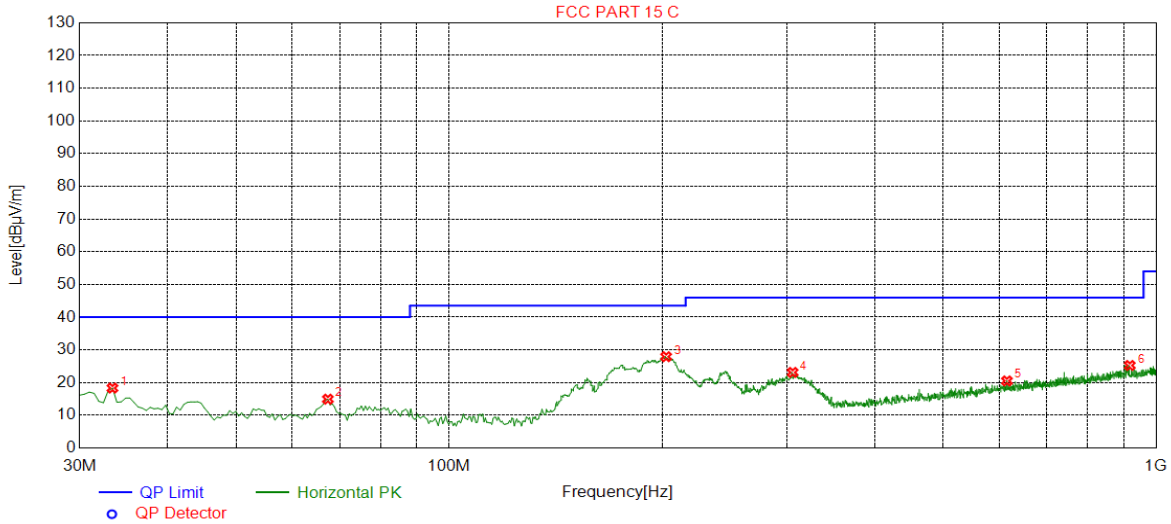
Firstly Supply:

4.9.1 Radiated emission below 1GHz

4.9.1.1 Charge + Transmitting



Suspected List							
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Polarity
1	33.3967	18.33	-32.79	40.00	21.67	167	Horizontal
2	67.3637	14.94	-33.51	40.00	25.06	143	Horizontal
3	202.7464	27.93	-30.76	43.50	15.57	213	Horizontal
4	306.1031	23.12	-27.68	46.00	22.88	141	Horizontal
5	615.2026	20.52	-19.87	46.00	25.48	225	Horizontal
6	917.9940	25.25	-14.96	46.00	20.75	131	Horizontal

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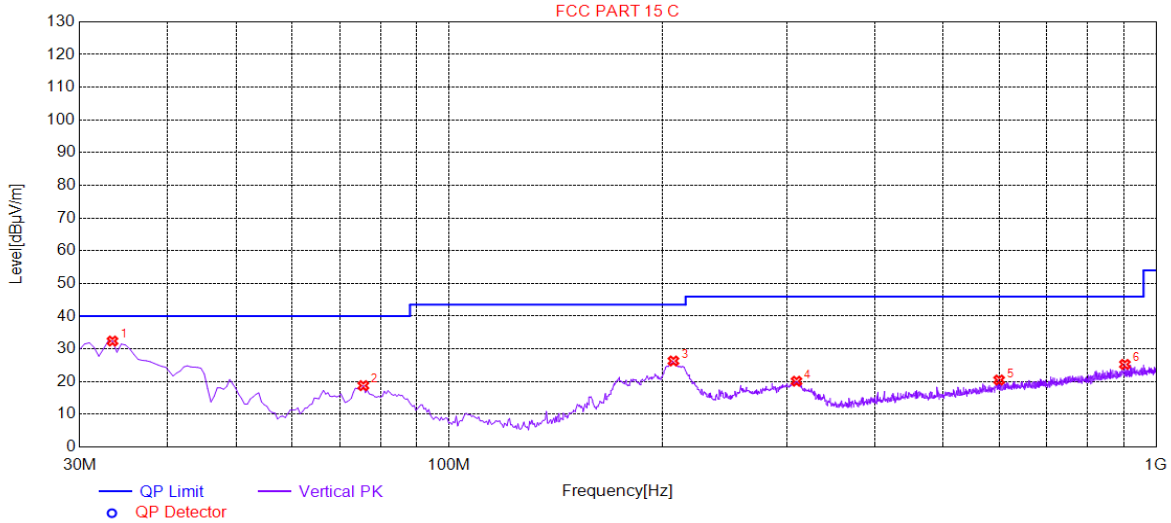

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Polarity
1	33.3967	32.40	-32.79	40.00	7.60	264	Vertical
2	75.6128	18.77	-35.13	40.00	21.23	187	Vertical
3	207.5988	26.31	-30.67	43.50	17.19	274	Vertical
4	309.9850	20.12	-27.56	46.00	25.88	164	Vertical
5	599.6748	20.49	-20.09	46.00	25.51	165	Vertical
6	903.4367	25.27	-15.18	46.00	20.73	170	Vertical

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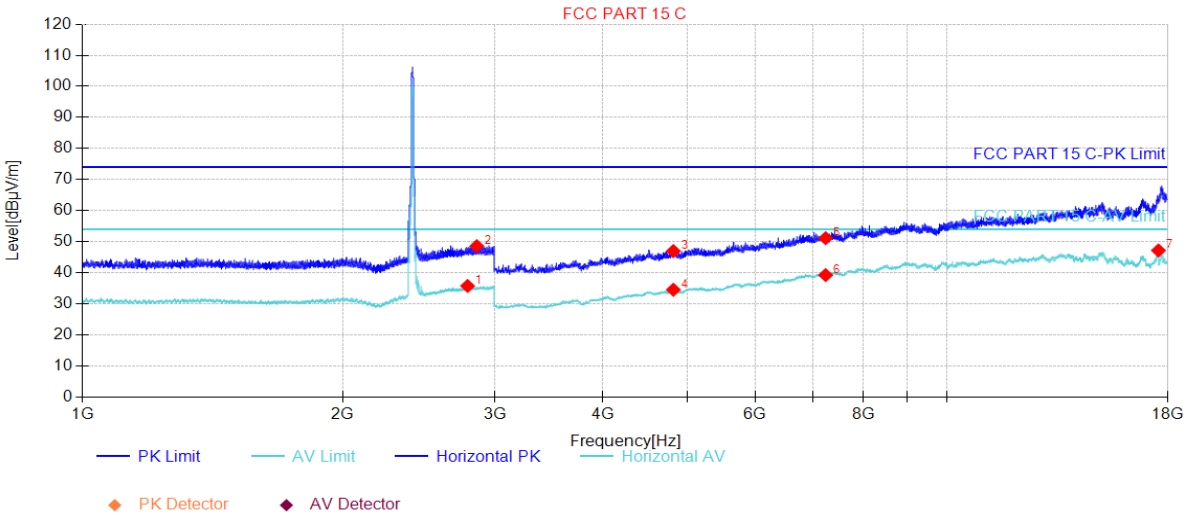
4.9.2 Transmitter emission above 1GHz

4.9.2.1 802.11B_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2788.9789	35.73	6.62	54.00	18.27	Horizontal
2	2858.1858	48.53	6.86	74.00	25.47	Horizontal
3	4824.0000	46.96	-10.56	74.00	27.04	Horizontal
4	4824.0000	34.50	-10.56	54.00	19.50	Horizontal
5	7236.0000	51.11	-2.59	74.00	22.89	Horizontal
6	7236.0000	39.23	-2.59	54.00	14.77	Horizontal
7	17554.455	47.17	12.47	54.00	6.83	Horizontal

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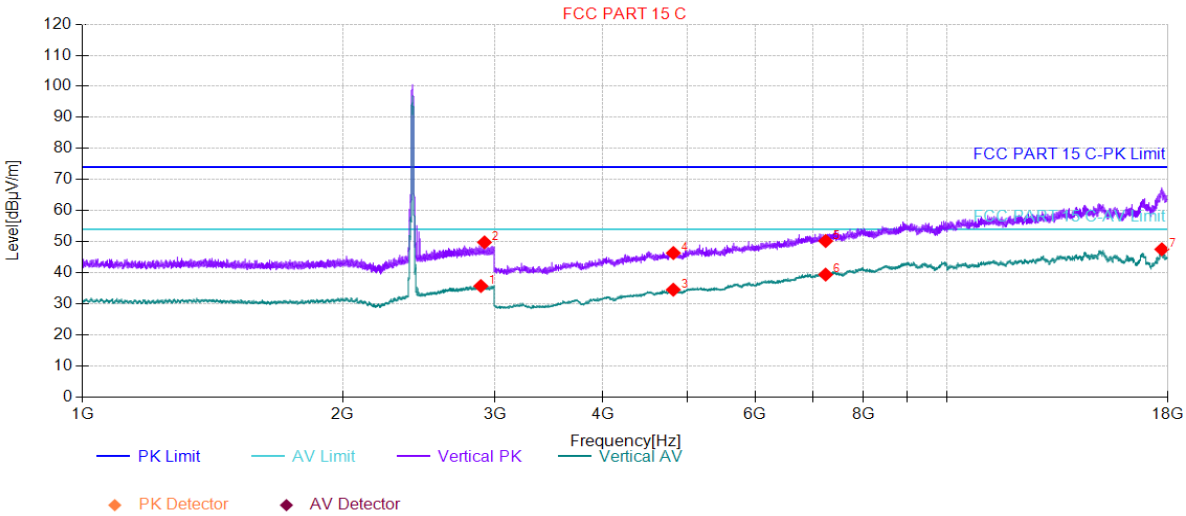
4.9.2.2 **802.11B_CH1**



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2889.5890	35.70	6.93	54.00	18.30	Vertical
2	2917.5918	49.77	7.03	74.00	24.23	Vertical
3	4824.0000	34.52	-10.56	54.00	19.48	Vertical
4	4824.0000	46.32	-10.56	74.00	27.68	Vertical
5	7236.0000	50.20	-2.59	74.00	23.80	Vertical
6	7236.0000	39.39	-2.59	54.00	14.61	Vertical
7	17713.471	47.52	14.66	54.00	6.48	Vertical

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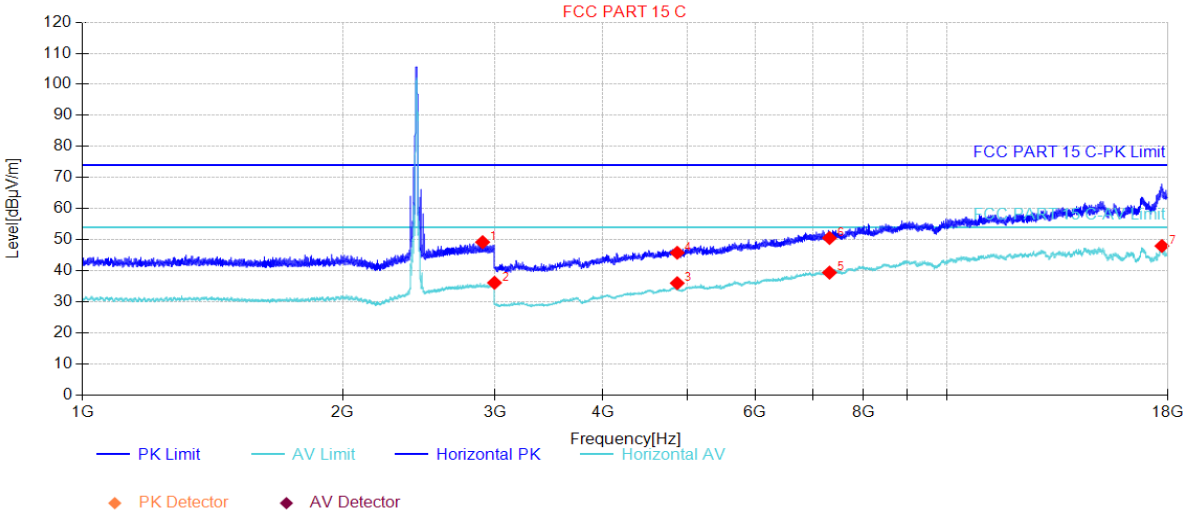
4.9.2.3 802.11B_CH6



Suspected List						
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2902.5903	49.19	6.96	74.00	24.81	Horizontal
2	2996.1996	36.11	7.39	54.00	17.89	Horizontal
3	4874.0000	35.98	-10.40	54.00	18.02	Horizontal
4	4874.0000	45.78	-10.40	74.00	28.22	Horizontal
5	7311.0000	39.37	-2.57	54.00	14.63	Horizontal
6	7311.0000	50.52	-2.57	74.00	23.48	Horizontal
7	17717.971	47.94	14.67	54.00	6.06	Horizontal

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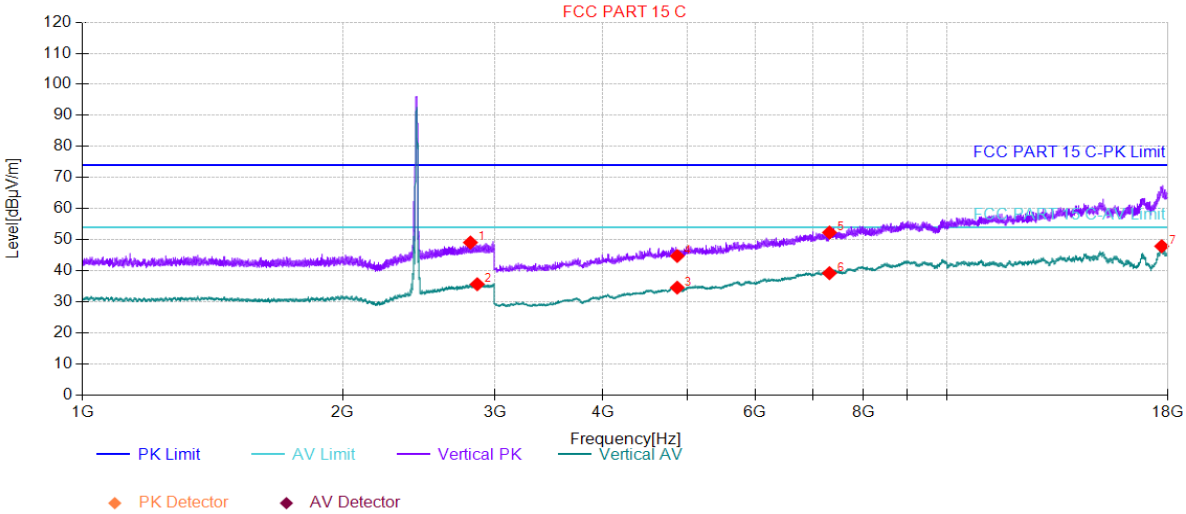
4.9.2.4 802.11B_CH6



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2810.1810	49.06	6.75	74.00	24.94	Vertical
2	2861.5862	35.64	6.87	54.00	18.36	Vertical
3	4874.0000	34.54	-10.40	54.00	19.46	Vertical
4	4874.0000	44.72	-10.40	74.00	29.28	Vertical
5	7311.0000	52.30	-2.57	74.00	21.70	Vertical
6	7311.0000	39.20	-2.57	54.00	14.80	Vertical
7	17710.471	47.87	14.66	54.00	6.13	Vertical

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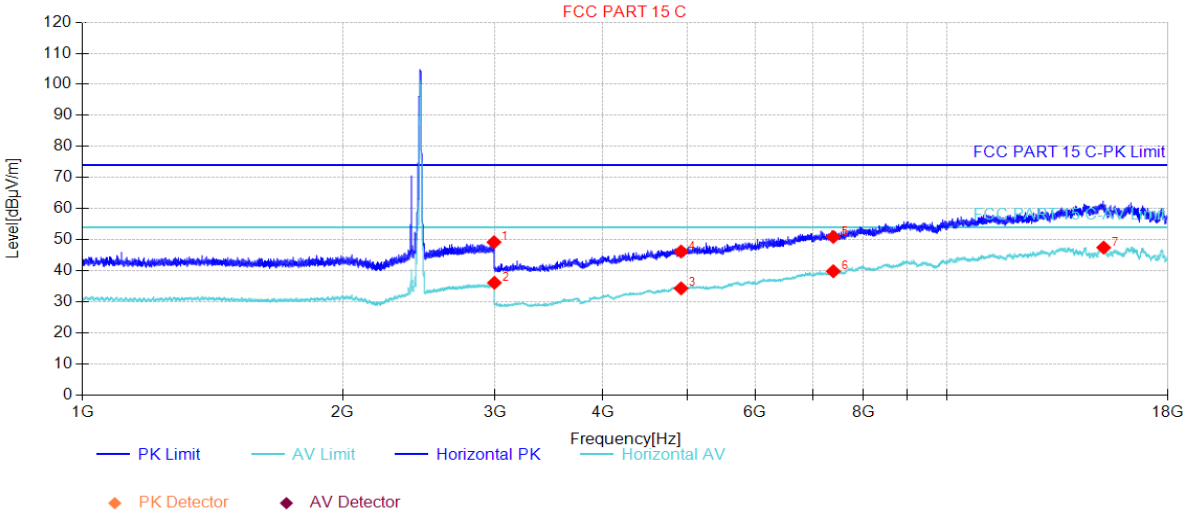
4.9.2.5 **802.11B_CH11**



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2992.3992	49.18	7.38	74.00	24.82	Horizontal
2	2995.7996	36.10	7.39	54.00	17.90	Horizontal
3	4924.0000	34.31	-10.22	54.00	19.69	Horizontal
4	4924.0000	46.16	-10.22	74.00	27.84	Horizontal
5	7386.0000	50.86	-2.06	74.00	23.14	Horizontal
6	7386.0000	39.81	-2.06	54.00	14.19	Horizontal
7	15173.717	47.43	8.95	54.00	6.57	Horizontal

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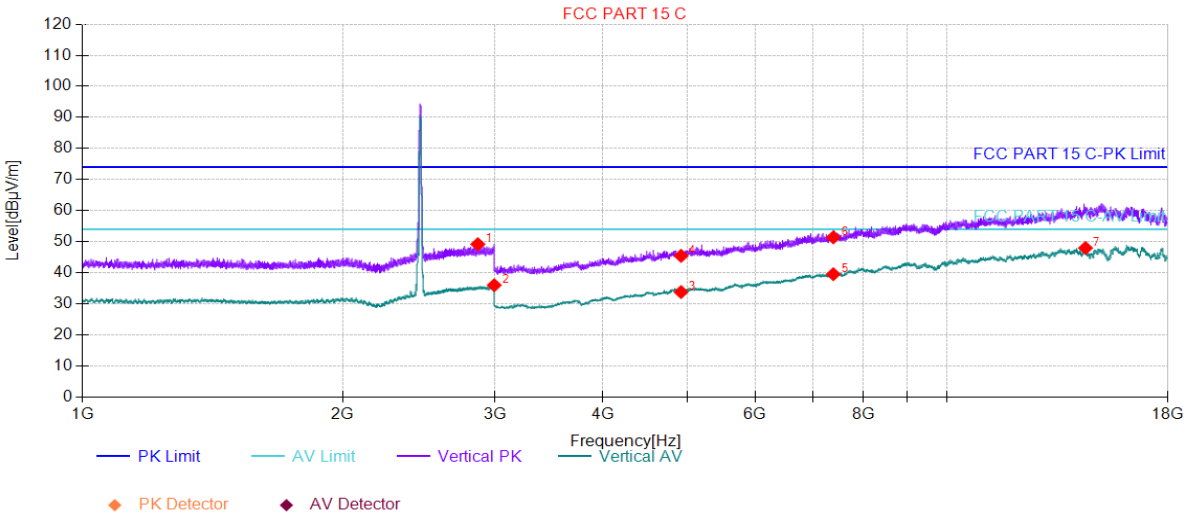
4.9.2.6 **802.11B_CH11**



Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Polarity
1	2865.986	49.16	6.88	74.00	24.84	162	Vertical
2	2994.199	35.97	7.38	54.00	18.03	191	Vertical
3	4924.000	33.77	-10.22	54.00	20.23	151	Vertical
4	4924.000	45.42	-10.22	74.00	28.58	182	Vertical
5	7386.000	39.52	-2.06	54.00	14.48	210	Vertical
6	7386.000	51.37	-2.06	74.00	22.63	228	Vertical
7	14456.64	47.93	7.69	54.00	6.07	93	Vertical

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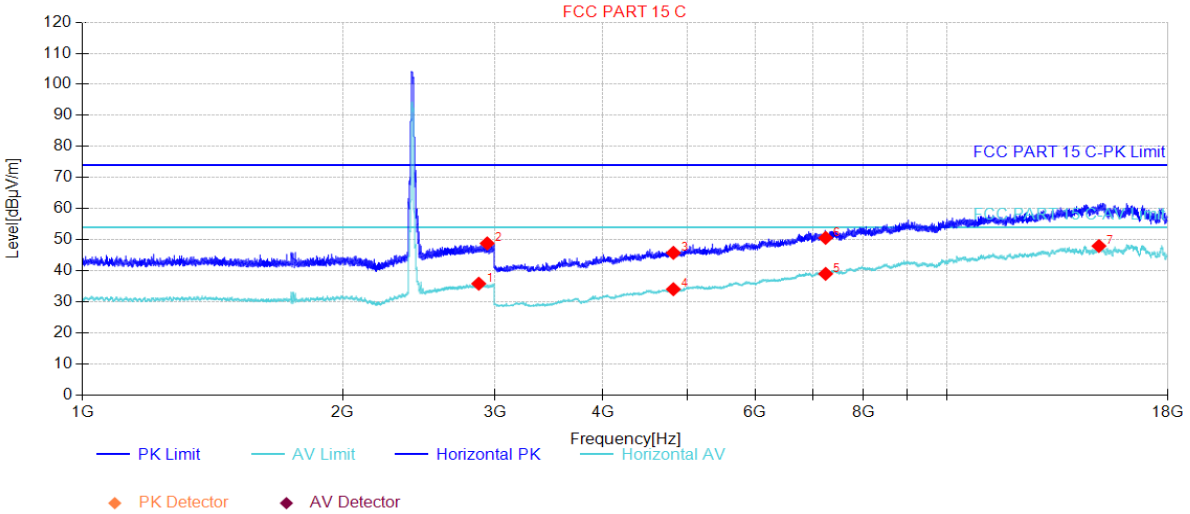
4.9.2.7 802.11G_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2873.3873	35.81	6.89	54.00	18.19	Horizontal
2	2938.7939	48.79	7.13	74.00	25.21	Horizontal
3	4824.0000	45.73	-10.56	74.00	28.27	Horizontal
4	4824.0000	34.03	-10.56	54.00	19.97	Horizontal
5	7236.0000	38.98	-2.59	54.00	15.02	Horizontal
6	7236.0000	50.57	-2.59	74.00	23.43	Horizontal
7	14983.198	47.94	8.49	54.00	6.06	Horizontal

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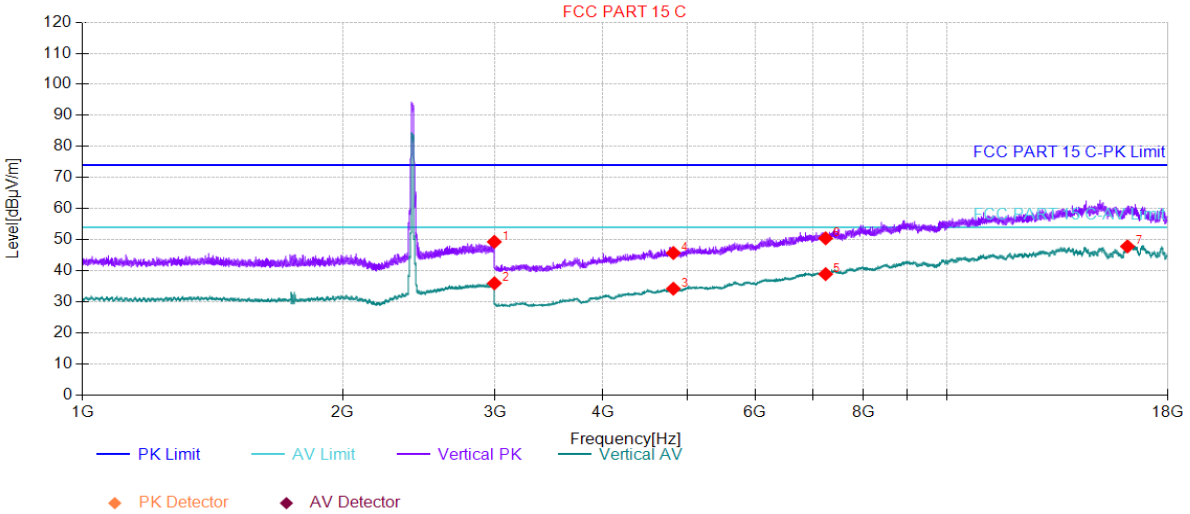
4.9.2.8 802.11G_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2994.5995	49.28	7.39	74.00	24.72	Vertical
2	2995.5996	35.94	7.39	54.00	18.06	Vertical
3	4824.0000	34.20	-10.56	54.00	19.80	Vertical
4	4824.0000	45.70	-10.56	74.00	28.30	Vertical
5	7236.0000	38.90	-2.59	54.00	15.10	Vertical
6	7236.0000	50.43	-2.59	74.00	23.57	Vertical
7	16166.816	47.82	8.40	54.00	6.18	Vertical

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