

(Channel 165, PEAK, 802.11 n (HT20))

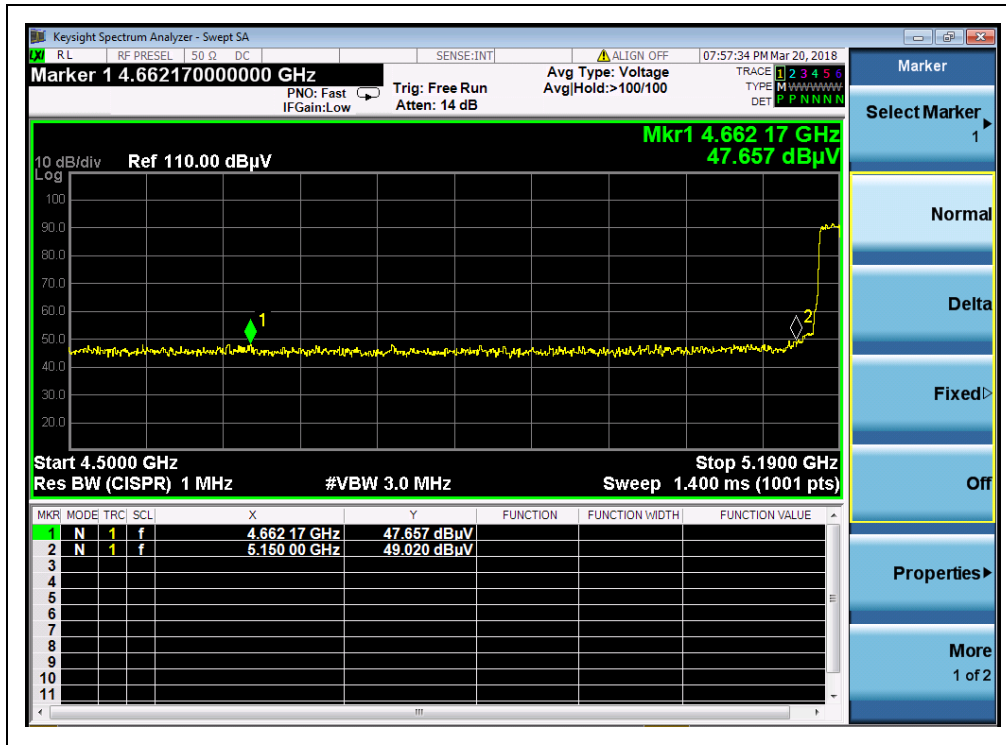


(Channel 165, AVG, 802.11 n (HT20))

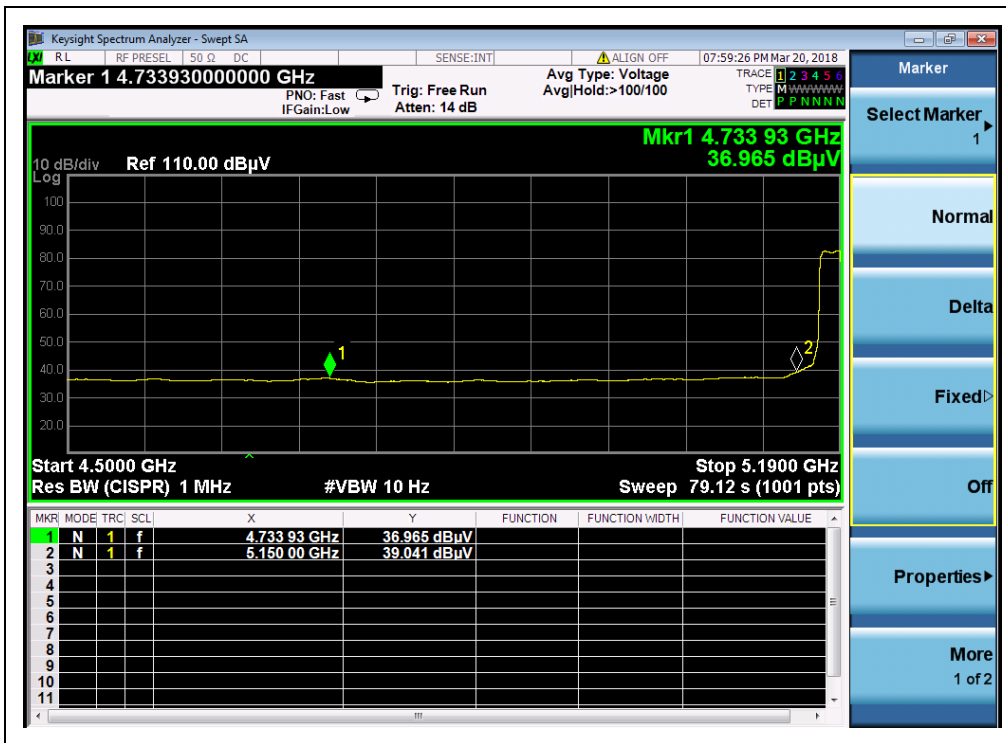
**802.11n (HT40) Test mode****A. Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
38	4662.17	PK	47.66	-50.65	32.11	29.12	74	PASS
38	4733.93	AV	36.97	-50.15	31.92	18.74	54	PASS
62	5374.60	PK	44.73	-52.24	31.57	24.06	74	PASS
62	5374.60	AV	35.25	-52.24	31.57	14.58	54	PASS
102	5152.27	PK	46.06	-51.67	31.86	26.25	68.23	PASS
102	5152.27	AV	36.97	-51.67	31.86	17.16	54	PASS
142	5833.27	PK	47.27	-53.17	32.98	27.08	68.23	PASS
142	5748.13	AV	36.99	-53.12	32.96	16.83	54	PASS
151	5720.00	PK	48.83	-53.37	33.28	28.74	110.83	PASS
151	5723.23	AV	39.36	-53.25	33.31	19.42	54	PASS
159	5853.42	PK	49.05	-53.53	33.46	28.98	68.23	PASS
159	5855.00	AV	36.60	-53.55	33.42	16.47	54	PASS

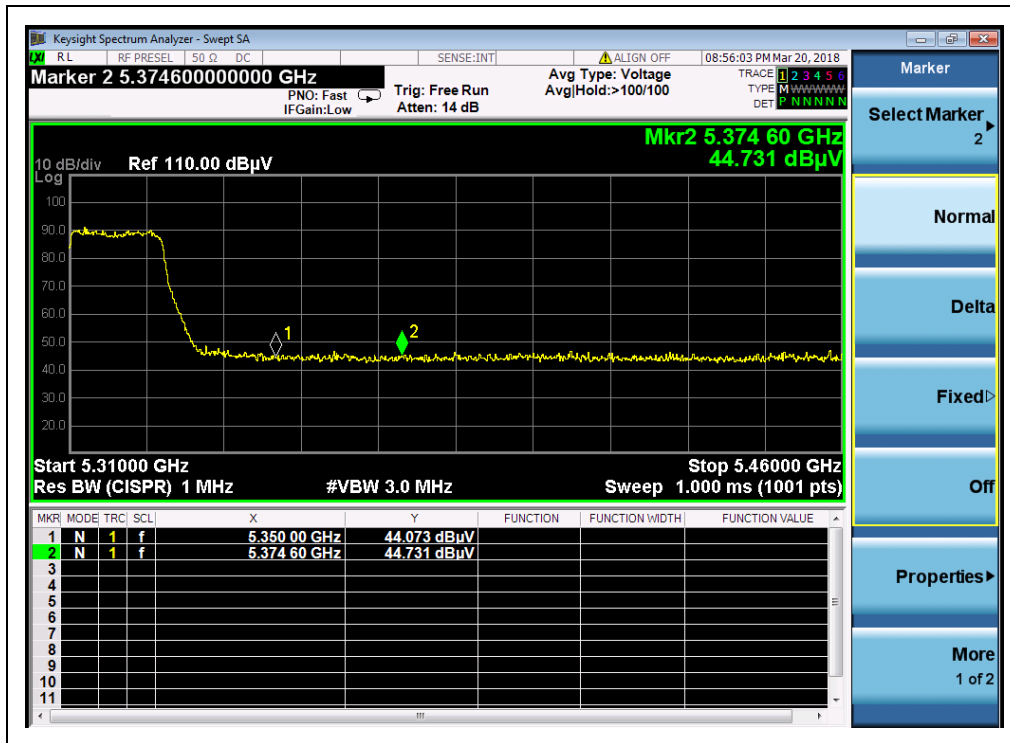
B. Test Plots:



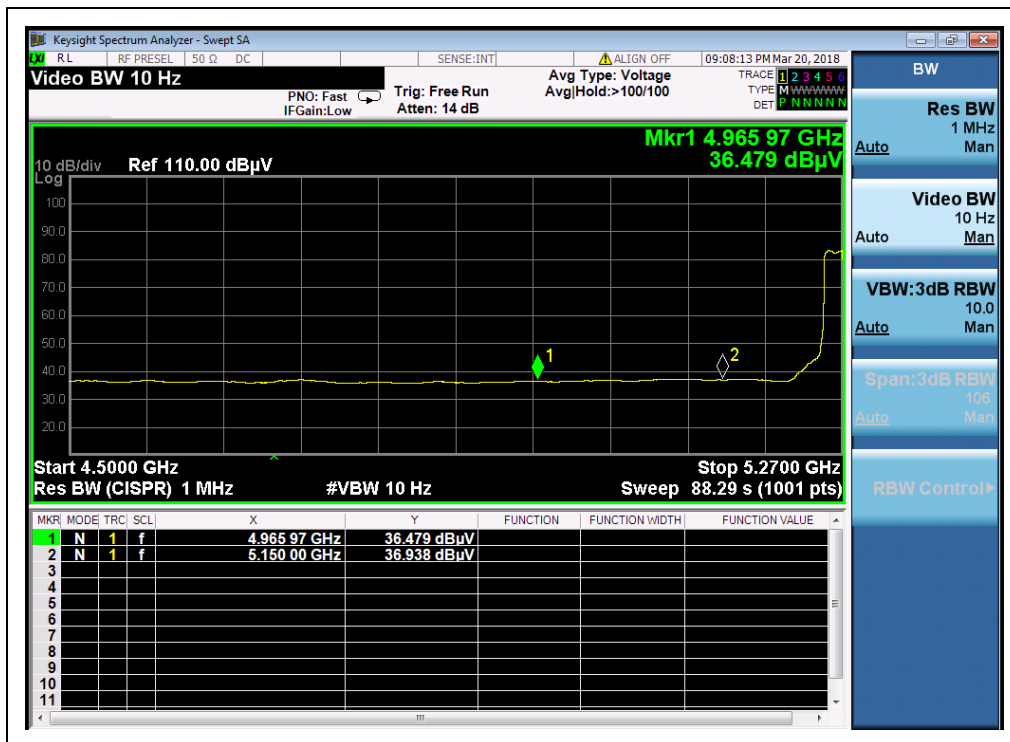
(Channel 38, PEAK, 802.11n (HT40))



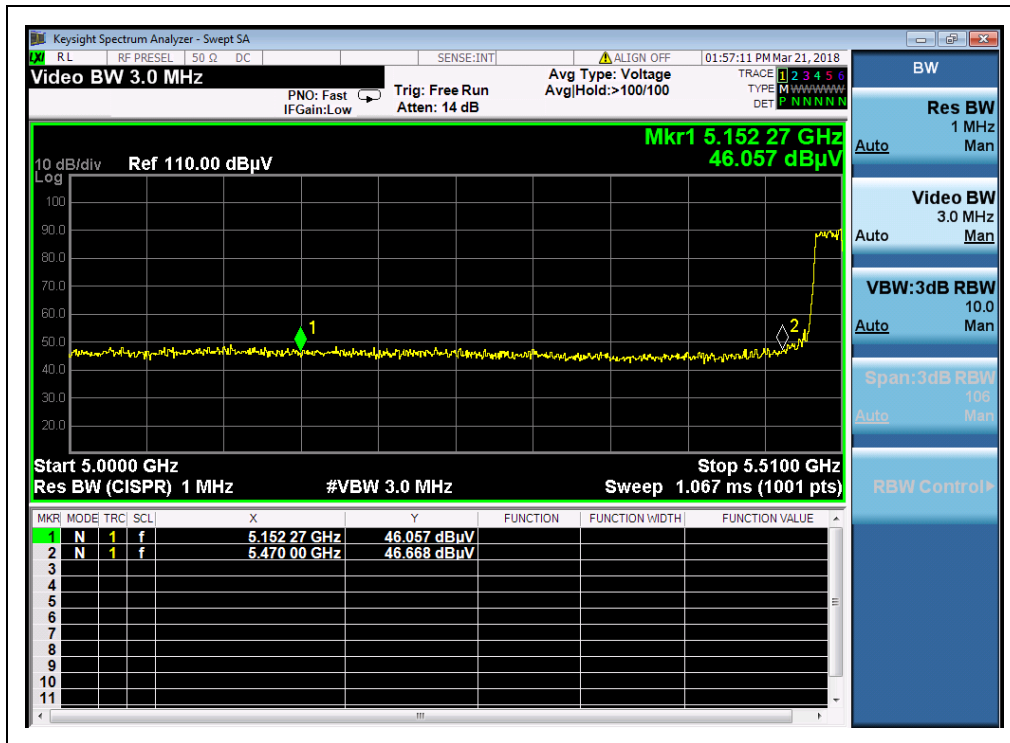
(Channel 38, AVG, 802.11n (HT40))



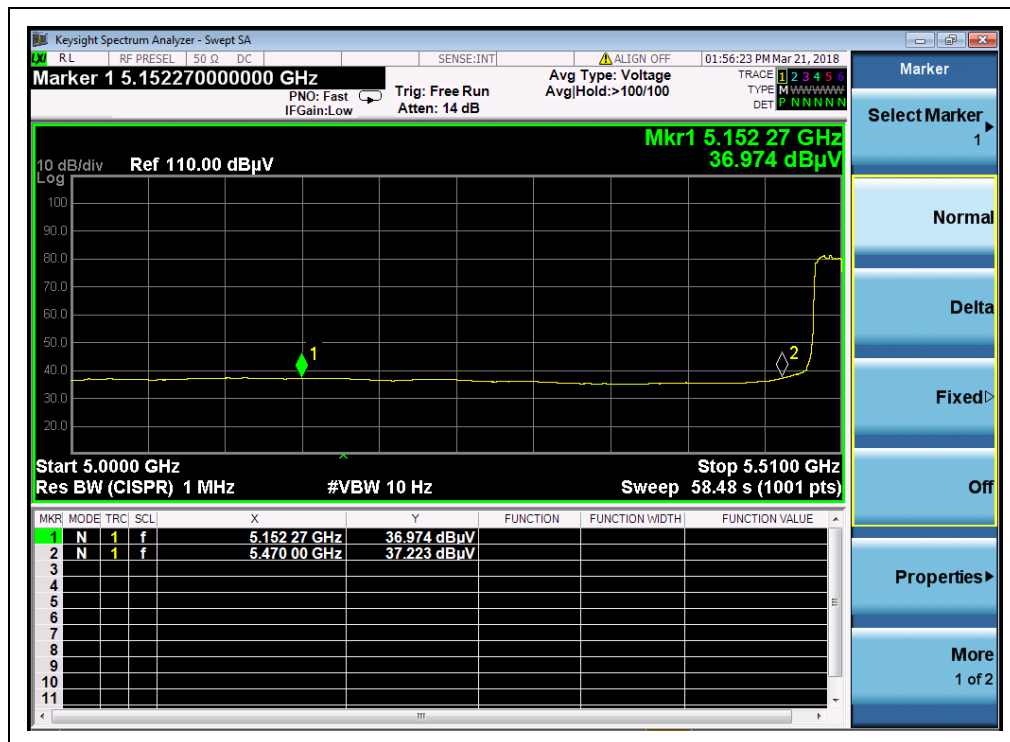
(Channel 62, PEAK, 802.11n (HT40))



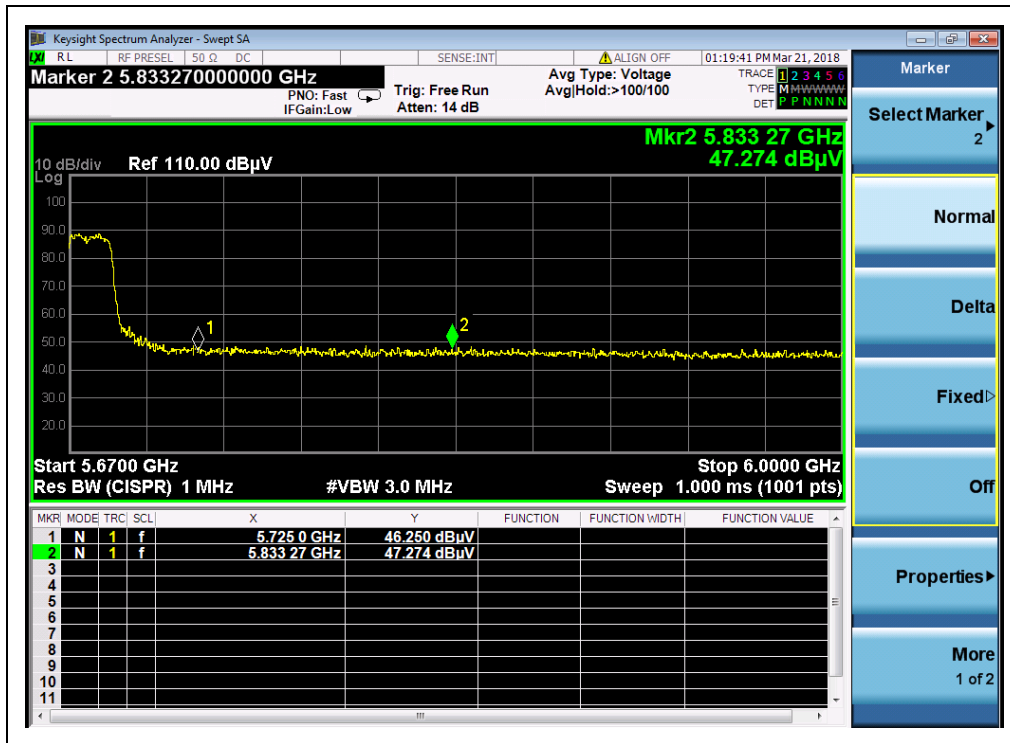
(Channel 62, AVG, 802.11n (HT40))



(Channel 102, PEAK, 802.11n (HT40))



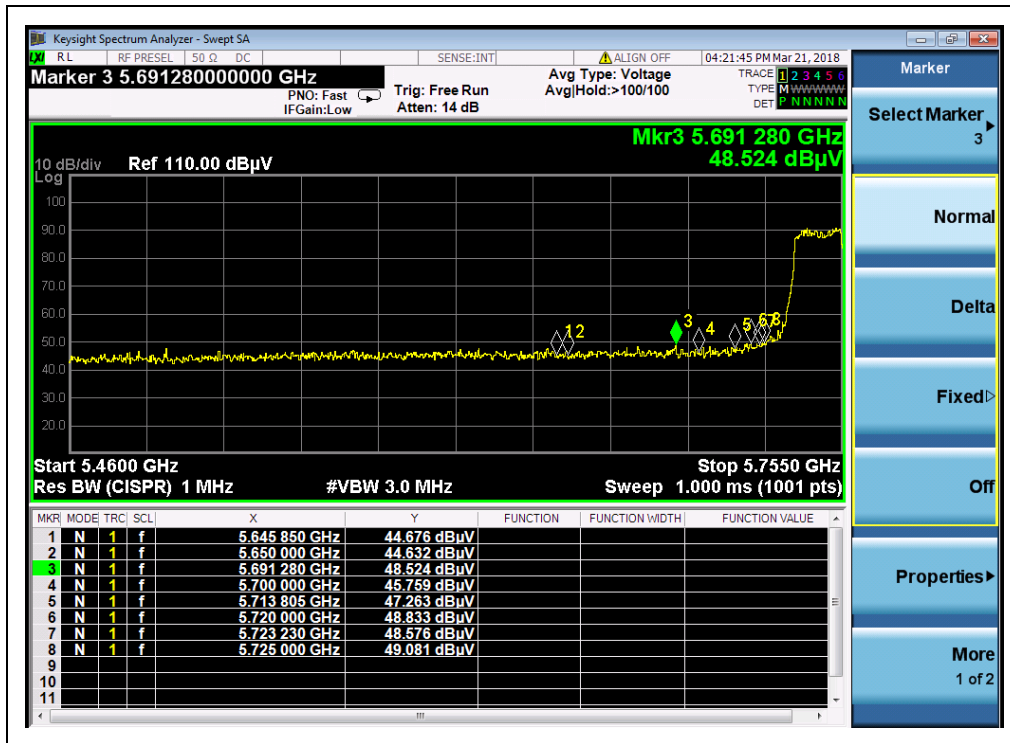
(Channel 102, AVG, 802.11n (HT40))



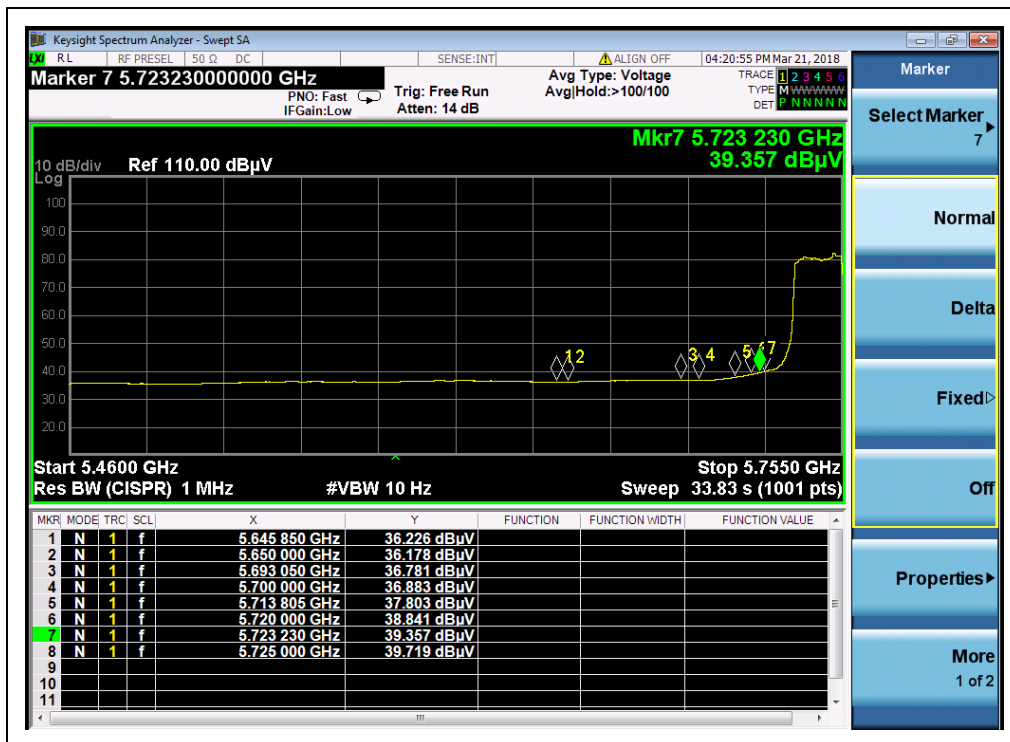
(Channel 142, PEAK, 802.11n (HT40))



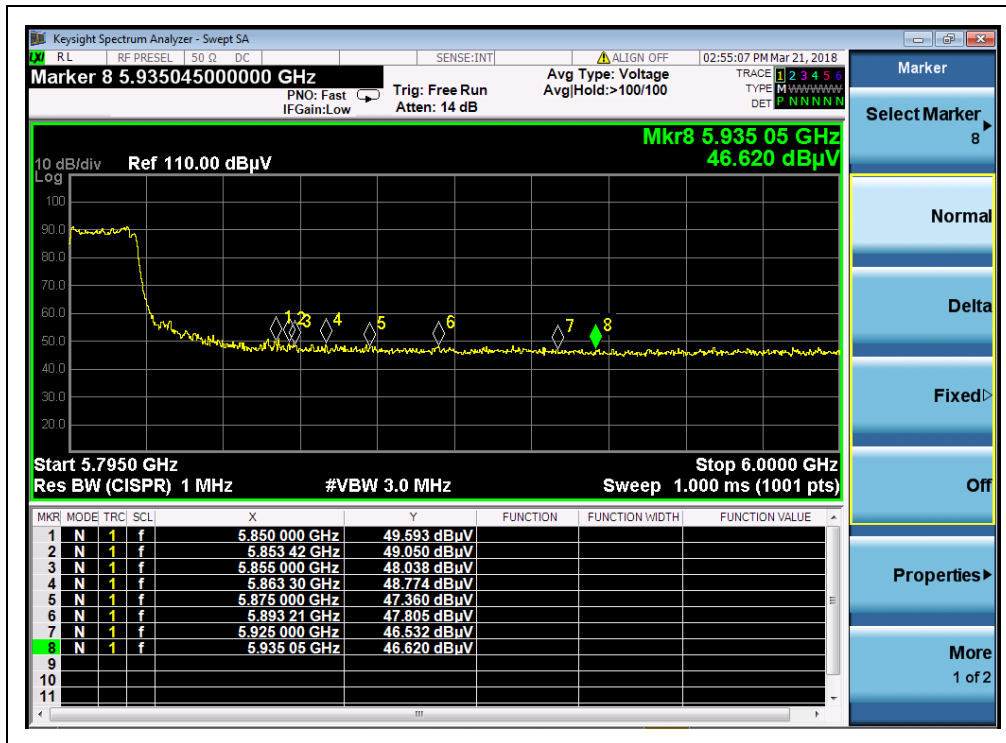
(Channel 142, AVG, 802.11n (HT40))



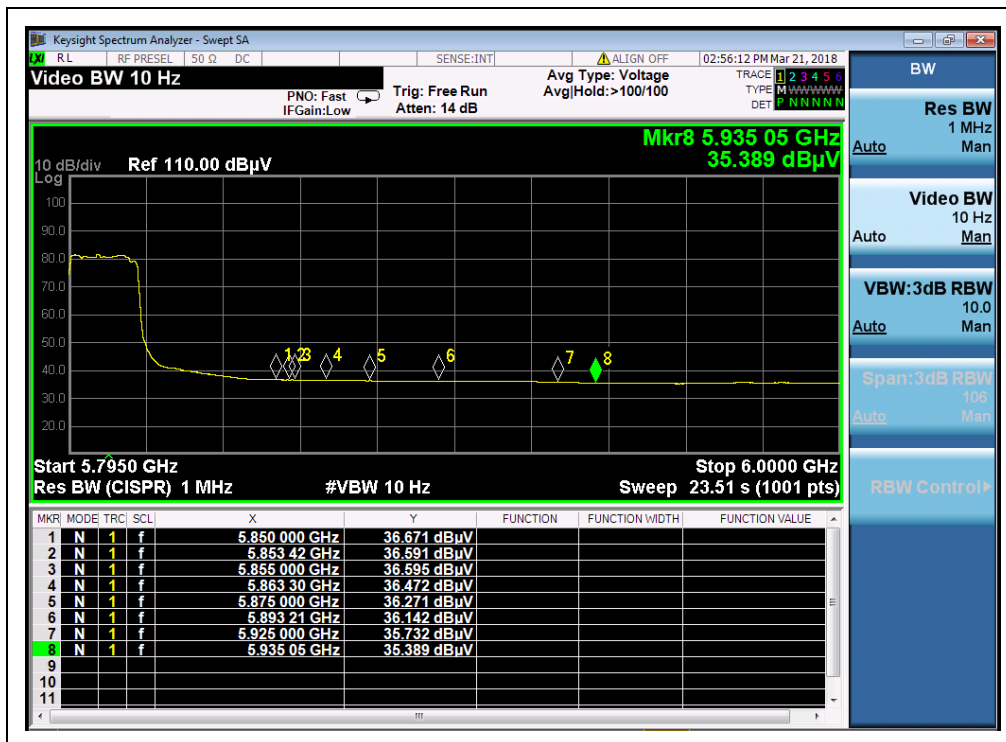
(Channel 151, PEAK, 802.11n (HT40))



(Channel 151, AVG, 802.11n (HT40))



(Channel 159, PEAK, 802.11n (HT40))

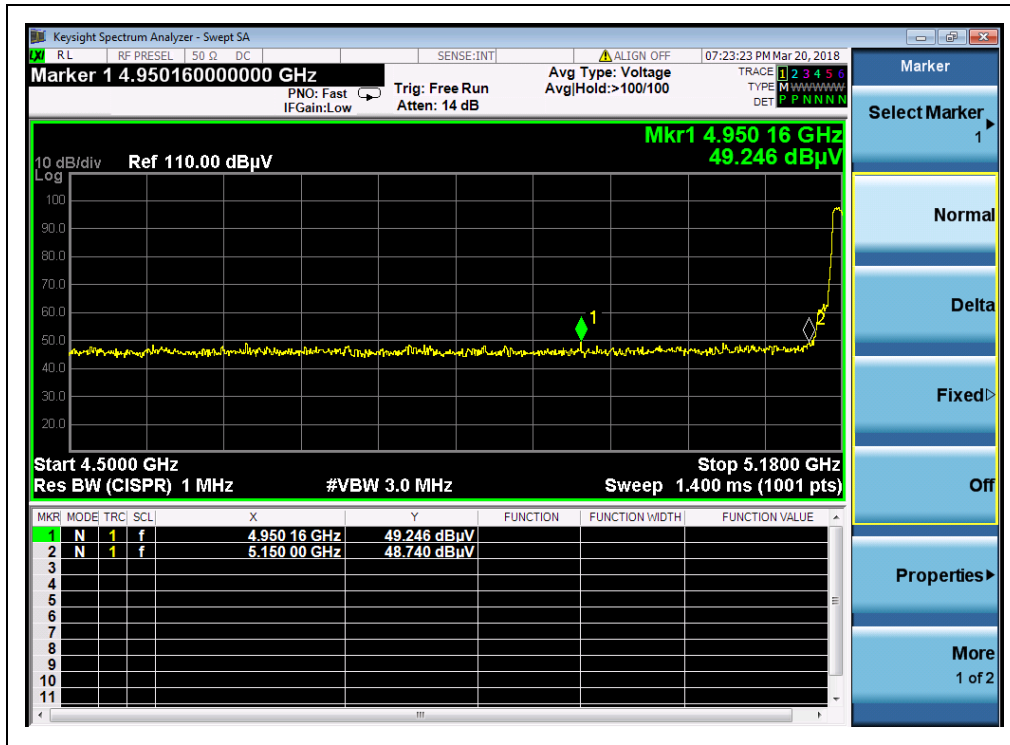


(Channel 159, AVG, 802.11n (HT40))

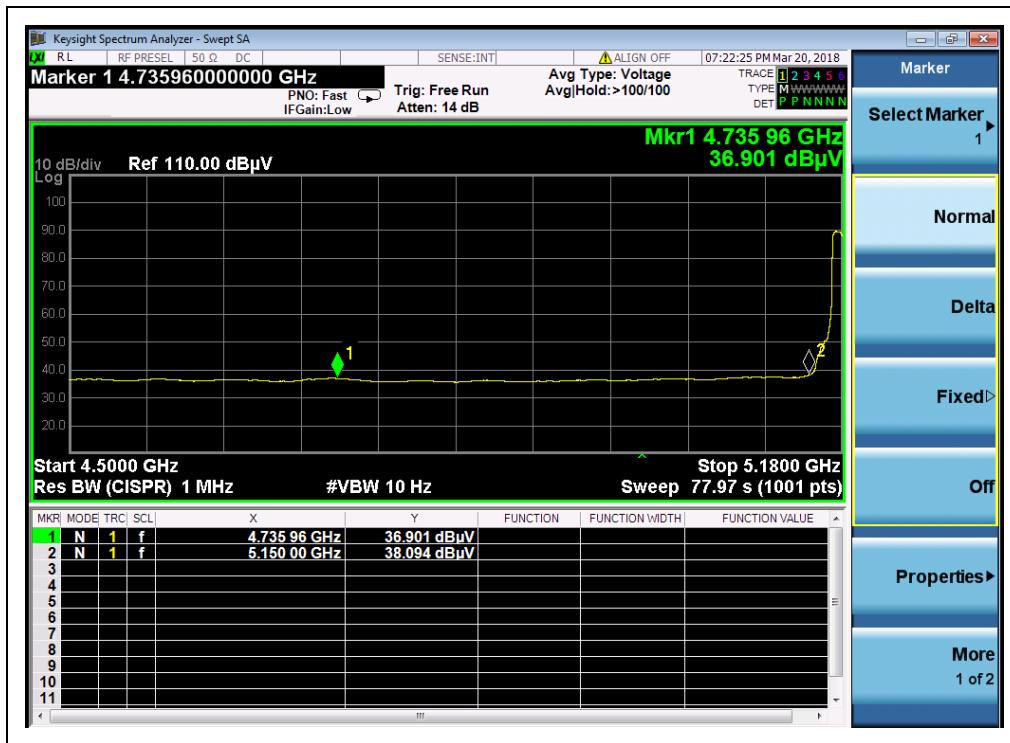
**802.11ac (VHT20) Test mode****A. Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
36	4950.16	PK	49.25	-50.65	32.11	30.71	74	PASS
36	4735.96	AV	36.90	-50.15	31.92	18.67	54	PASS
64	5356.72	PK	46.64	-52.24	31.57	25.97	74	PASS
64	5370.72	AV	35.08	-52.24	31.57	14.41	54	PASS
100	5328.44	PK	46.38	-51.67	31.86	26.57	74	PASS
100	5306.00	AV	35.99	-51.67	31.86	16.18	54	PASS
144	5727.40	PK	51.25	-53.17	32.98	31.06	68.23	PASS
144	5765.50	AV	36.94	-53.12	32.96	16.78	54	PASS
149	5722.15	PK	53.58	-53.37	33.28	33.49	115.73	PASS
149	5722.44	AV	38.31	-53.25	33.31	18.37	54	PASS
165	5868.30	PK	53.06	-53.53	33.46	32.99	73.59	PASS
165	5851.40	AV	37.62	-53.55	33.42	17.49	54	PASS

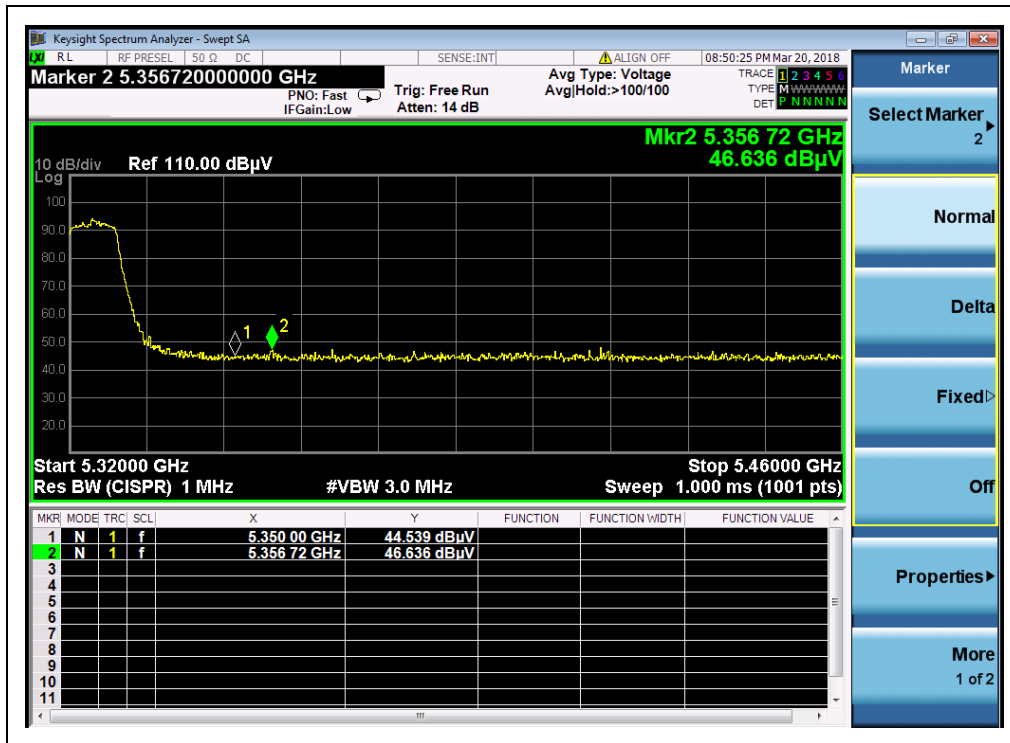
B. Test Plots:



(Channel 36, PEAK, 802.11ac (VHT20))



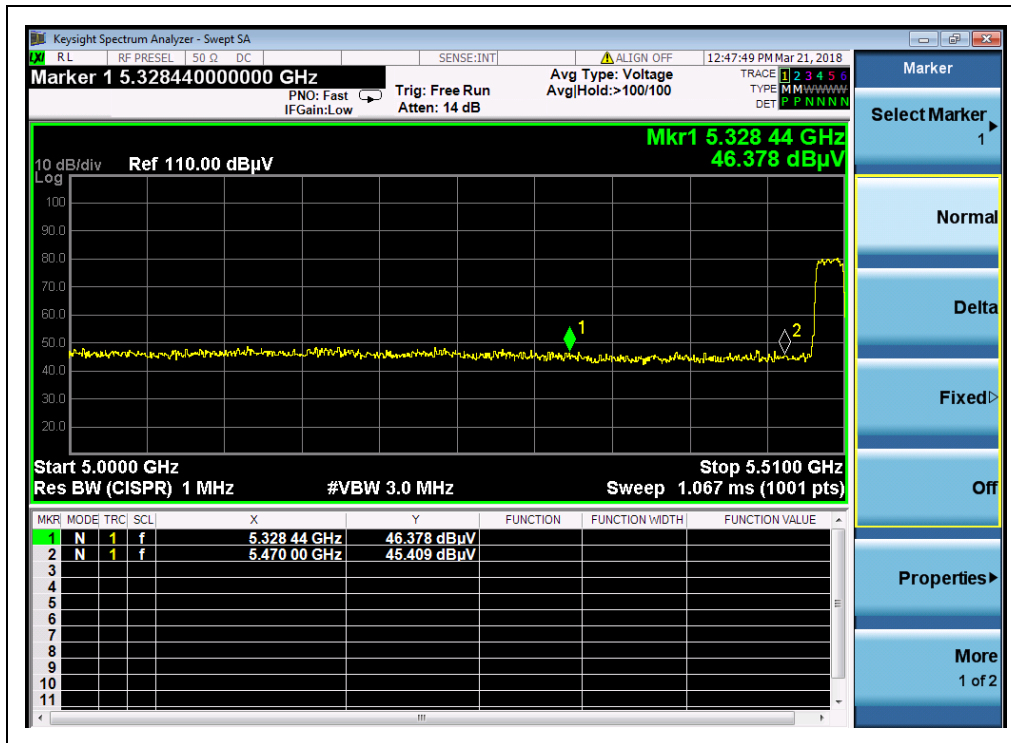
(Channel 36, AVG, 802.11ac (VHT20))



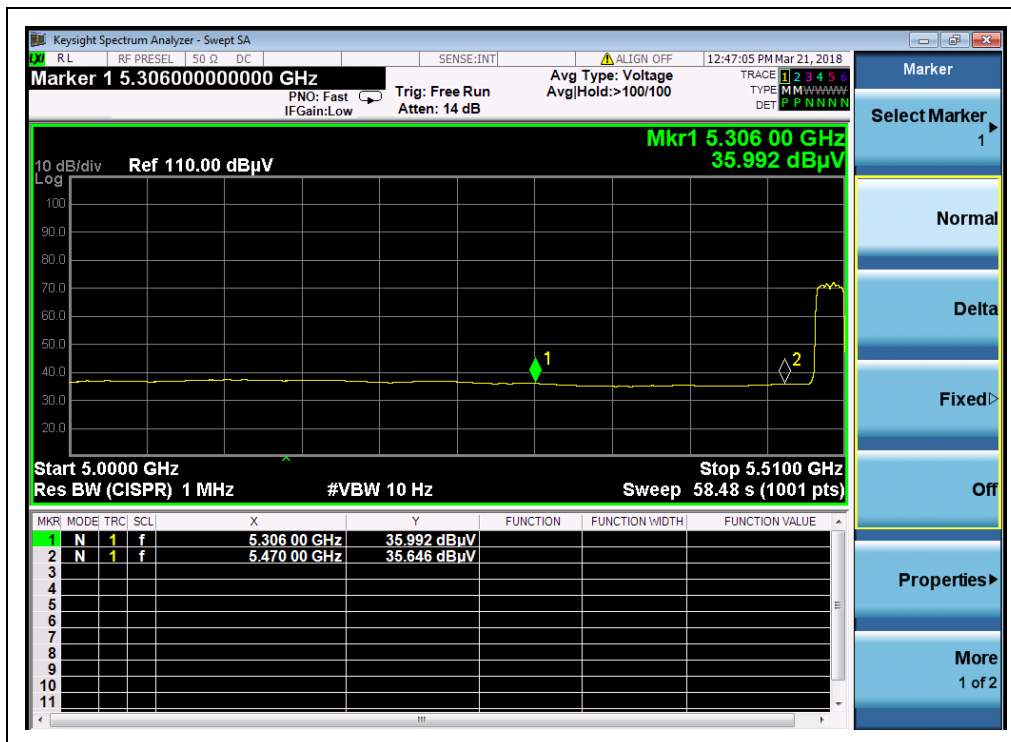
(Channel 64, PEAK, 802.11ac (VHT20))



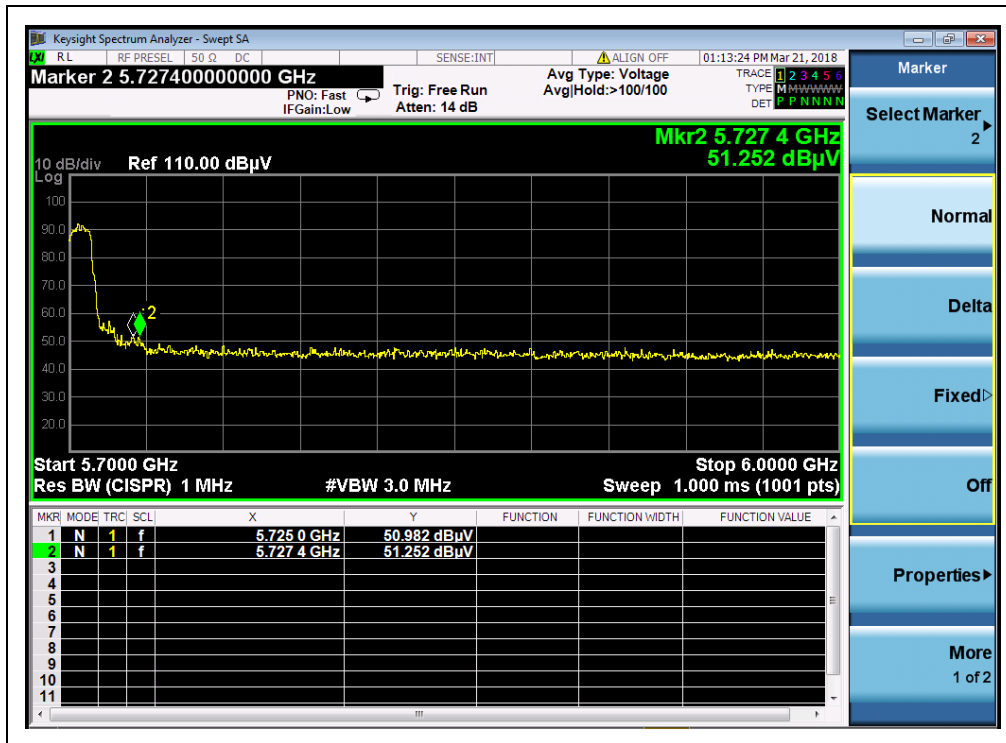
(Channel 64, AVG, 802.11ac (VHT20))



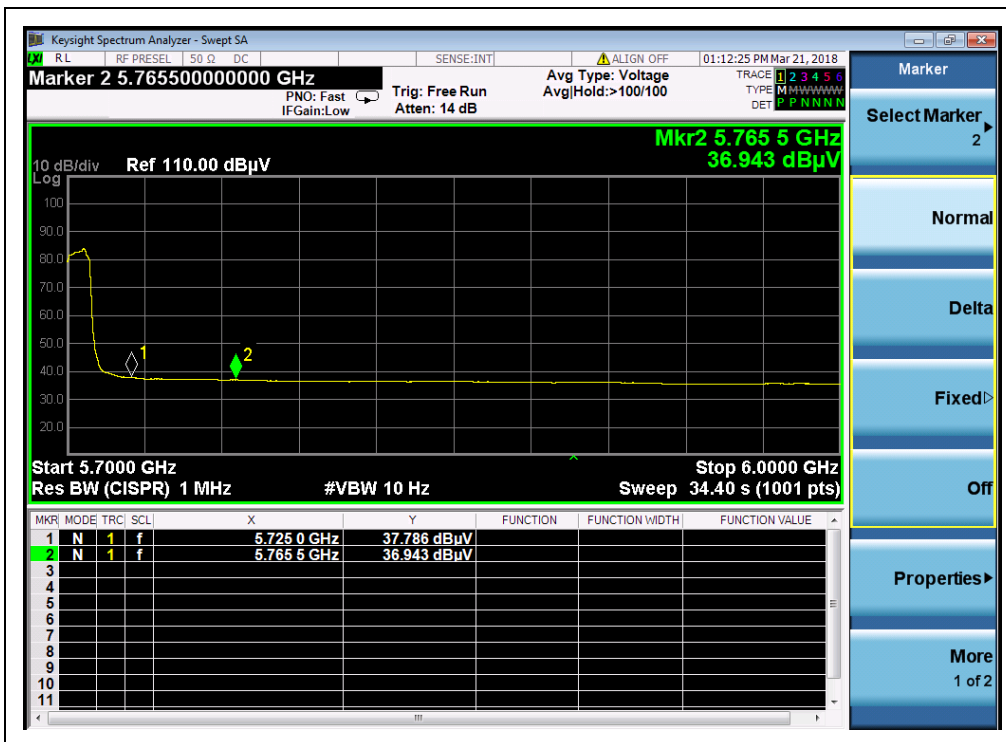
(Channel 100, PEAK, 802.11ac (VHT20))



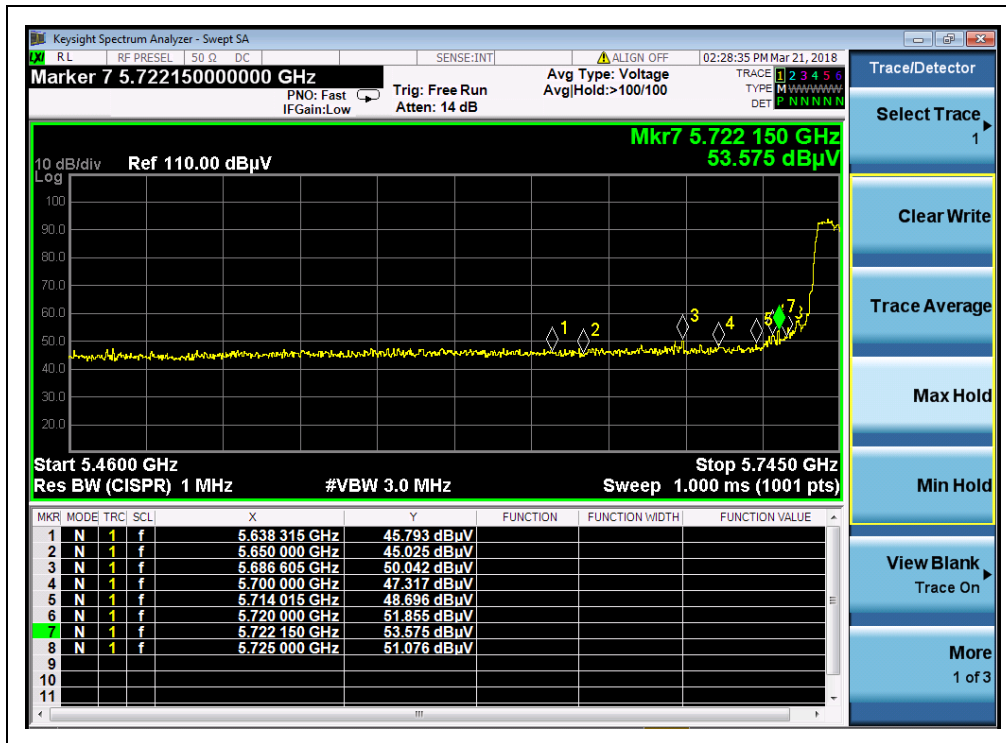
(Channel 100, AVG, 802.11ac (VHT20))



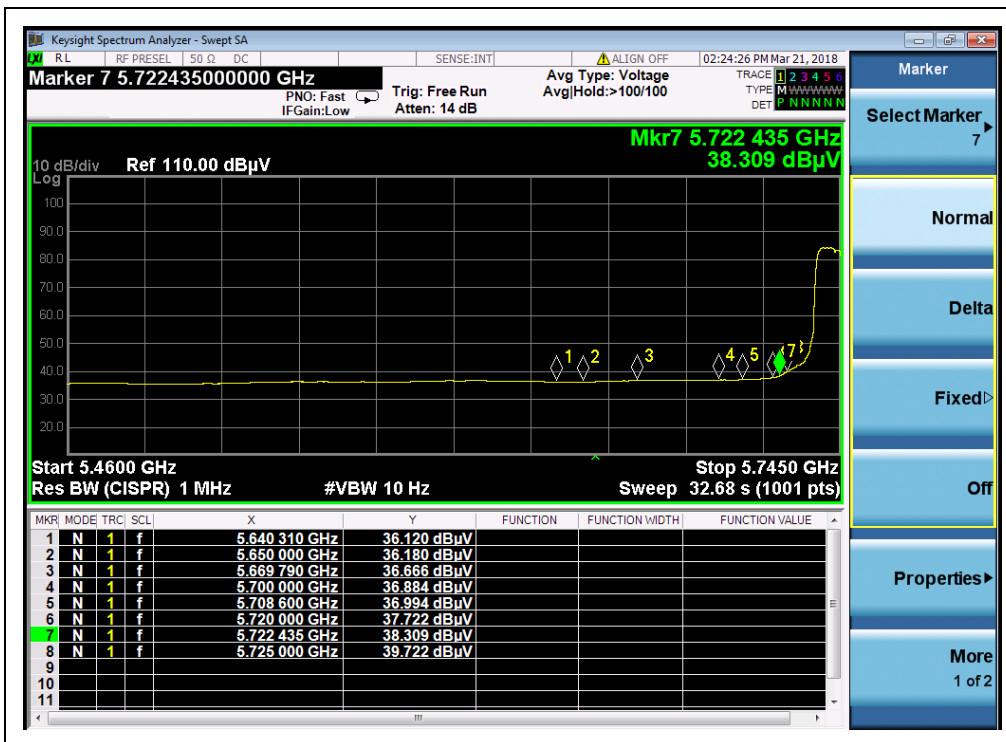
(Channel 144, PEAK, 802.11ac (VHT20))



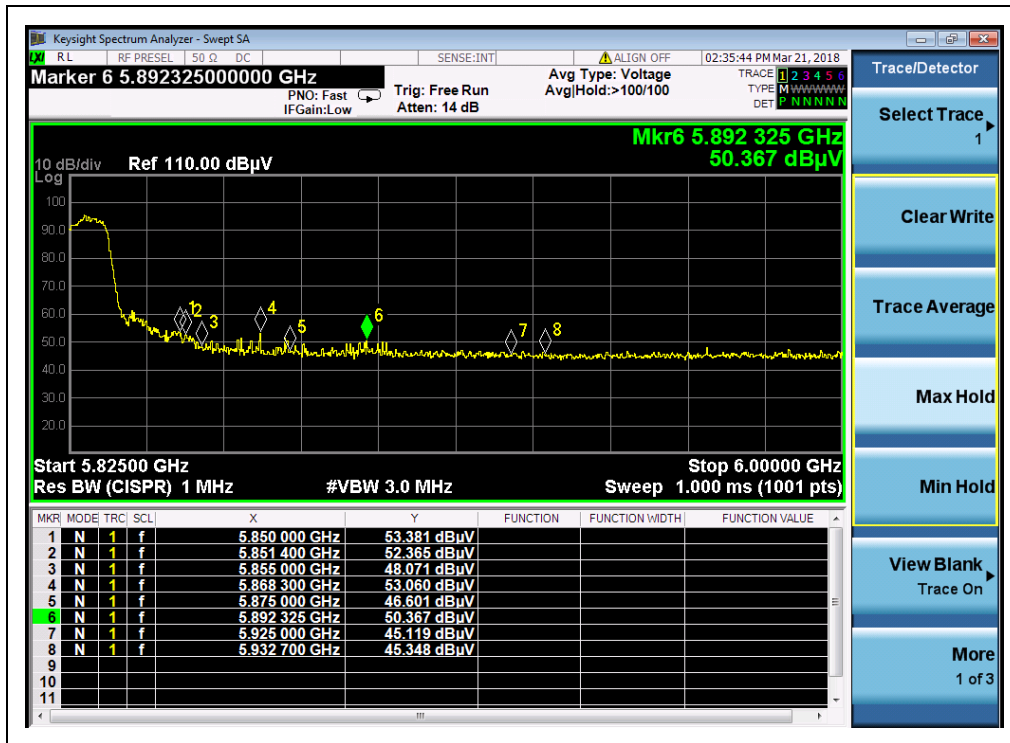
(Channel 144, AVG, 802.11ac (VHT20))



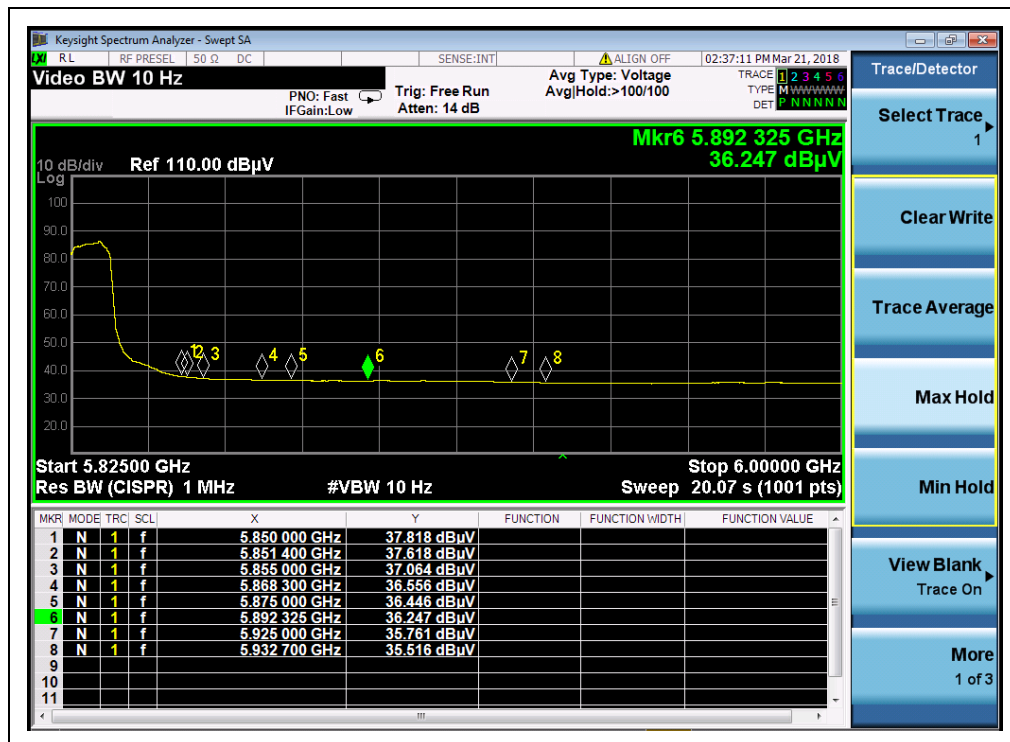
(Channel 149, PEAK, 802.11ac (VHT20))



(Channel 149, AVG, 802.11ac (VHT20))



(Channel 165, PEAK, 802.11ac (VHT20))

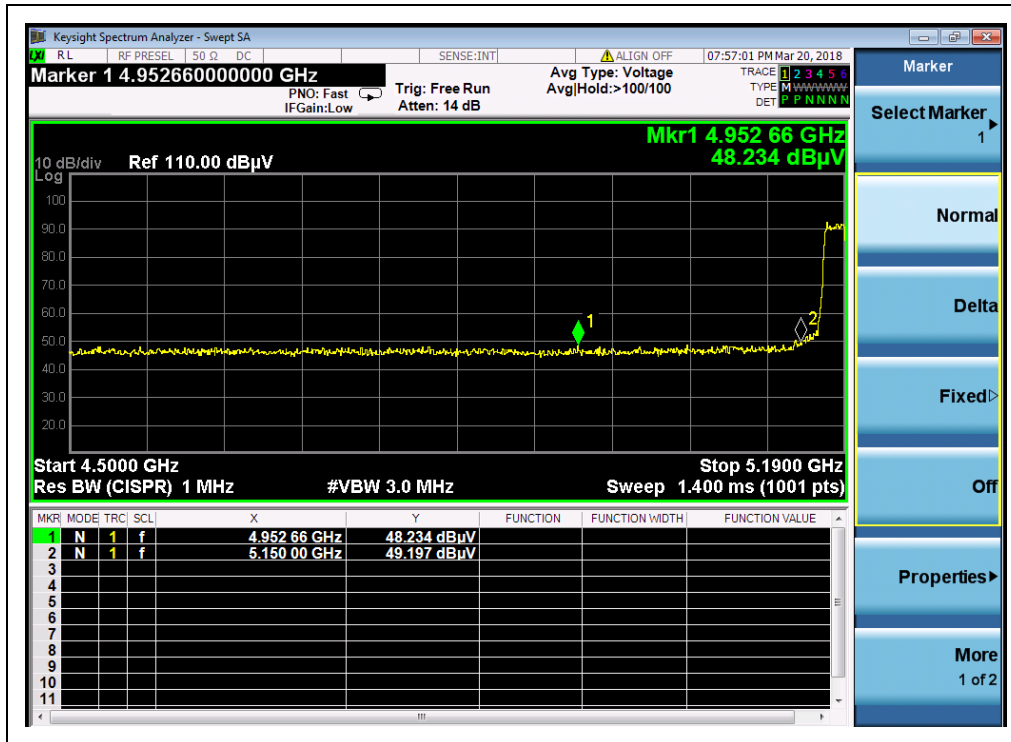


(Channel 165, AVG, 802.11ac (VHT20))

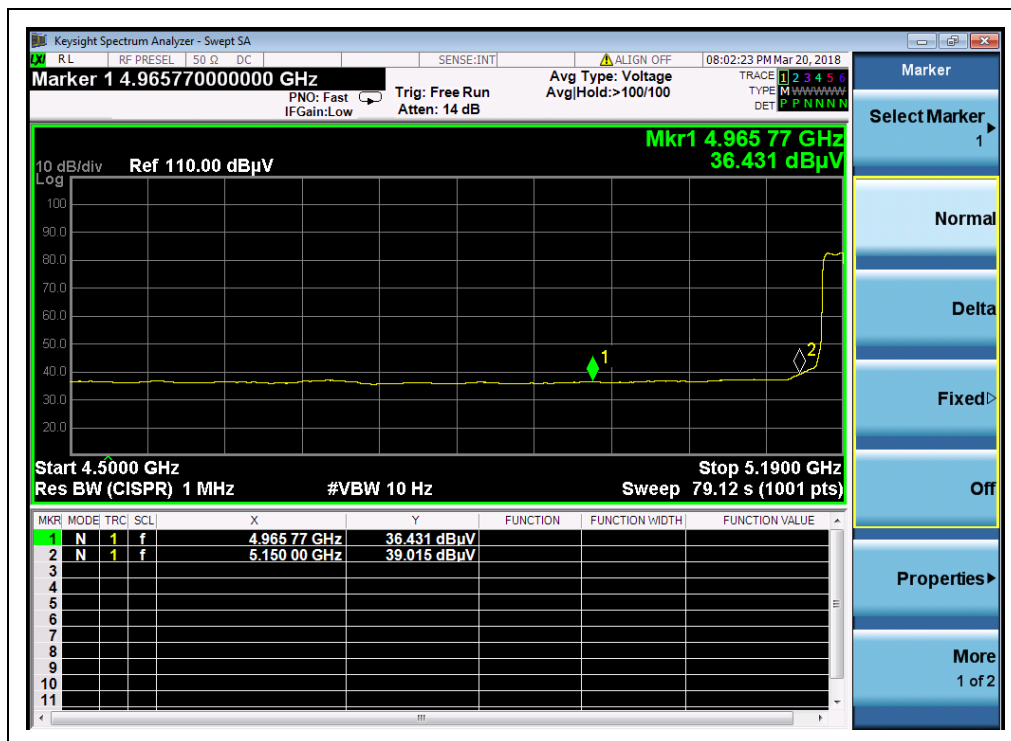
**802.11ac (VHT40) Test mode****A. Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
38	4952.66	PK	48.23	-50.65	32.11	29.69	74	PASS
38	4965.77	AV	36.43	-50.15	31.92	18.20	54	PASS
62	5355.55	PK	45.85	-52.24	31.57	25.18	74	PASS
62	5355.85	AV	35.40	-52.24	31.57	14.73	54	PASS
102	5304.76	PK	49.04	-51.67	31.86	29.23	74	PASS
102	5304.76	AV	35.98	-51.67	31.86	16.17	54	PASS
142	5750.77	PK	48.13	-53.17	32.98	27.94	68.23	PASS
142	5895.31	AV	36.07	-53.12	32.96	15.91	54	PASS
151	5721.46	PK	51.42	-53.37	33.28	31.33	114.16	PASS
151	5721.46	AV	39.06	-53.25	33.31	19.12	54	PASS
159	5854.65	PK	48.26	-53.53	33.46	28.19	111.63	PASS
159	5851.78	AV	36.65	-53.55	33.42	16.52	54	PASS

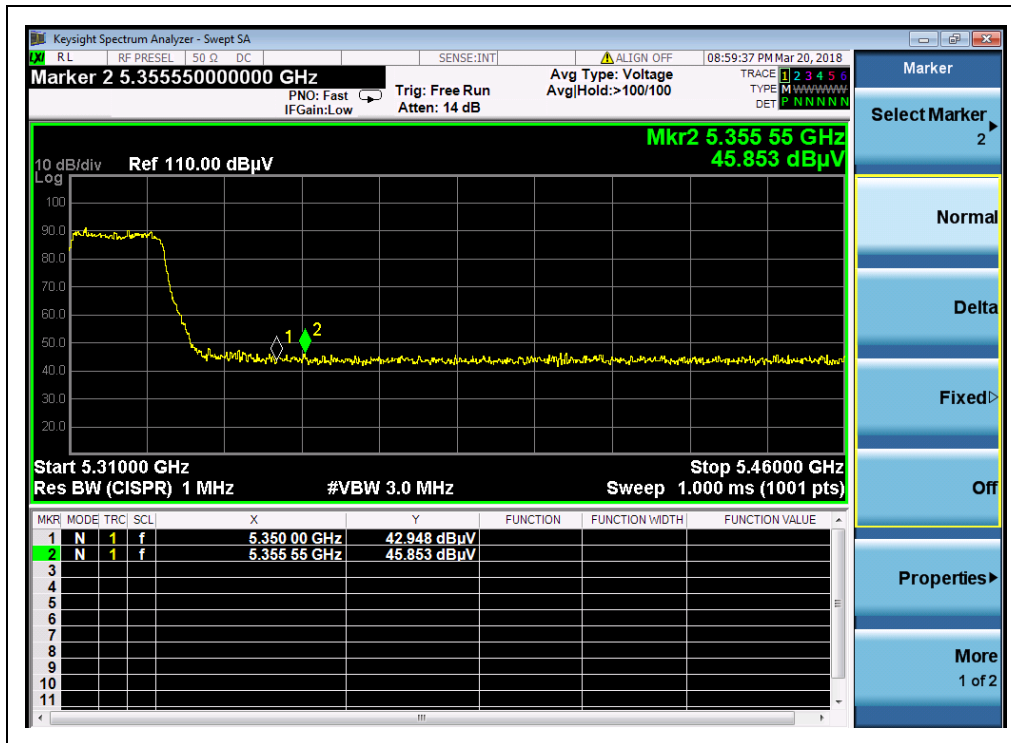
B. Test Plots:



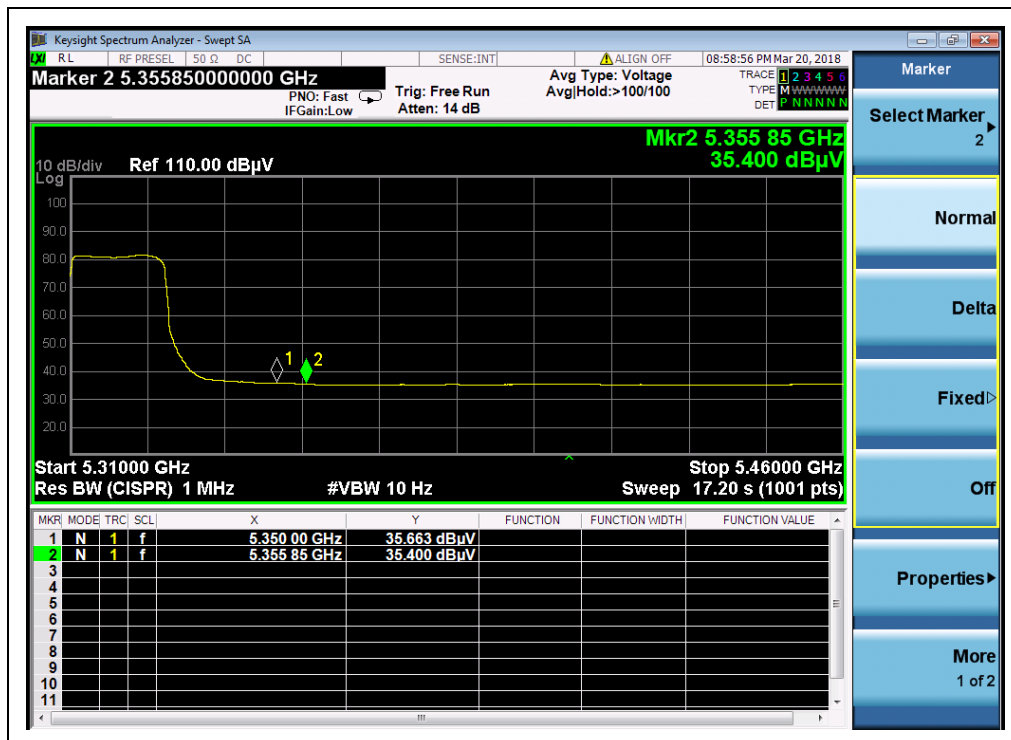
(Channel 38, PEAK, 802.11ac (VHT40))



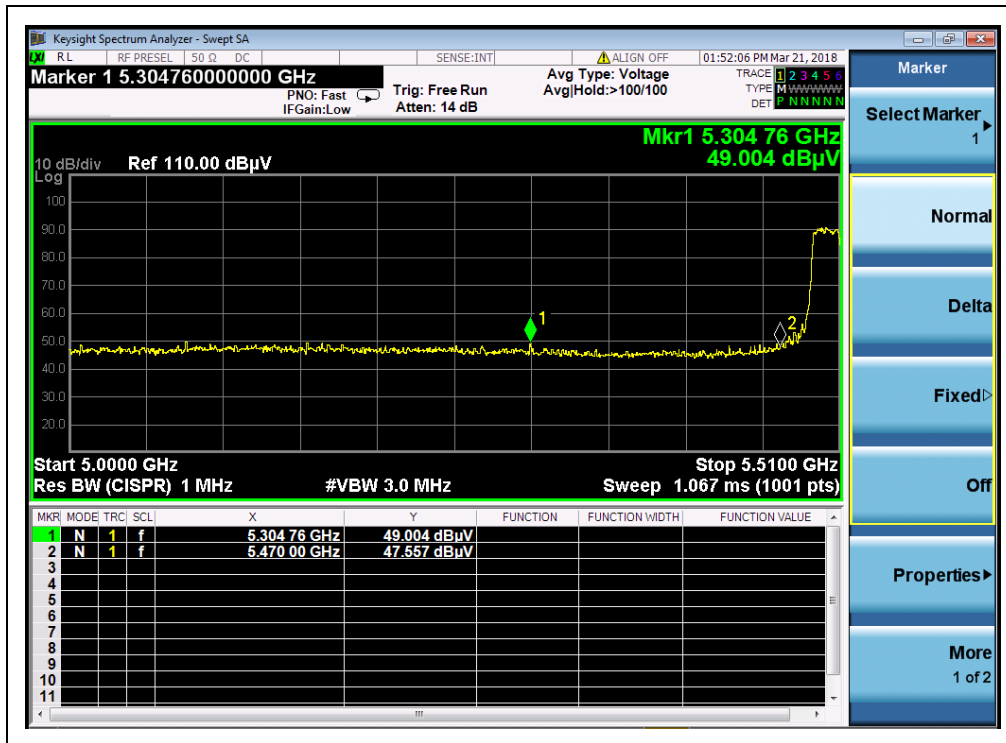
(Channel 38, AVG, 802.11 ac (VHT40))



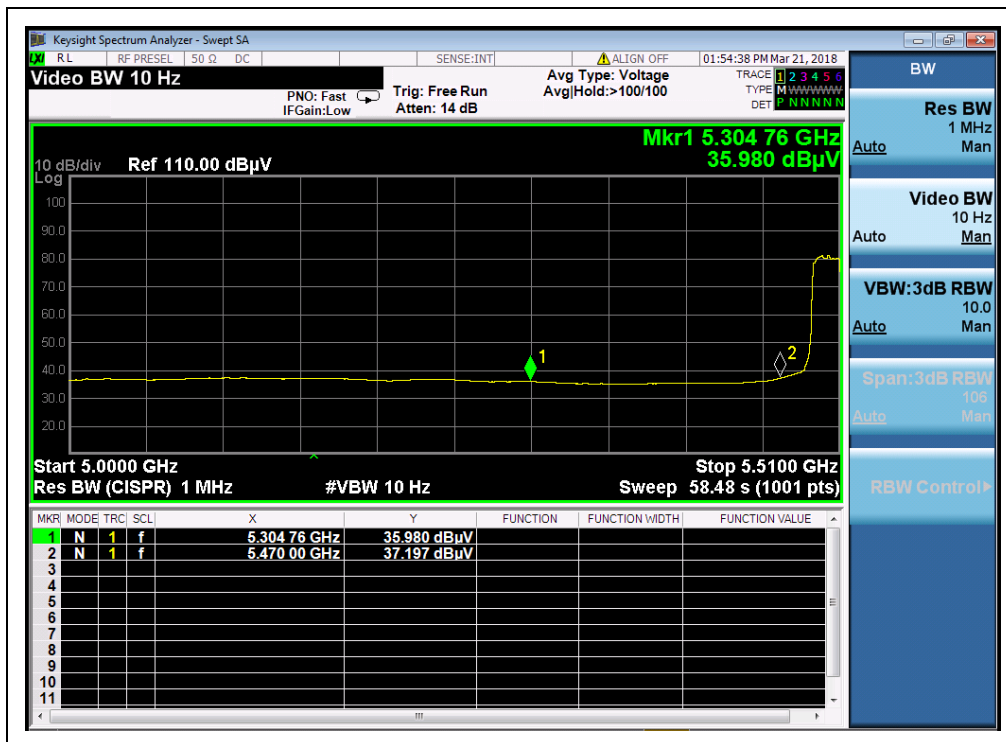
(Channel 62, PEAK, 802.11 ac (VHT40))



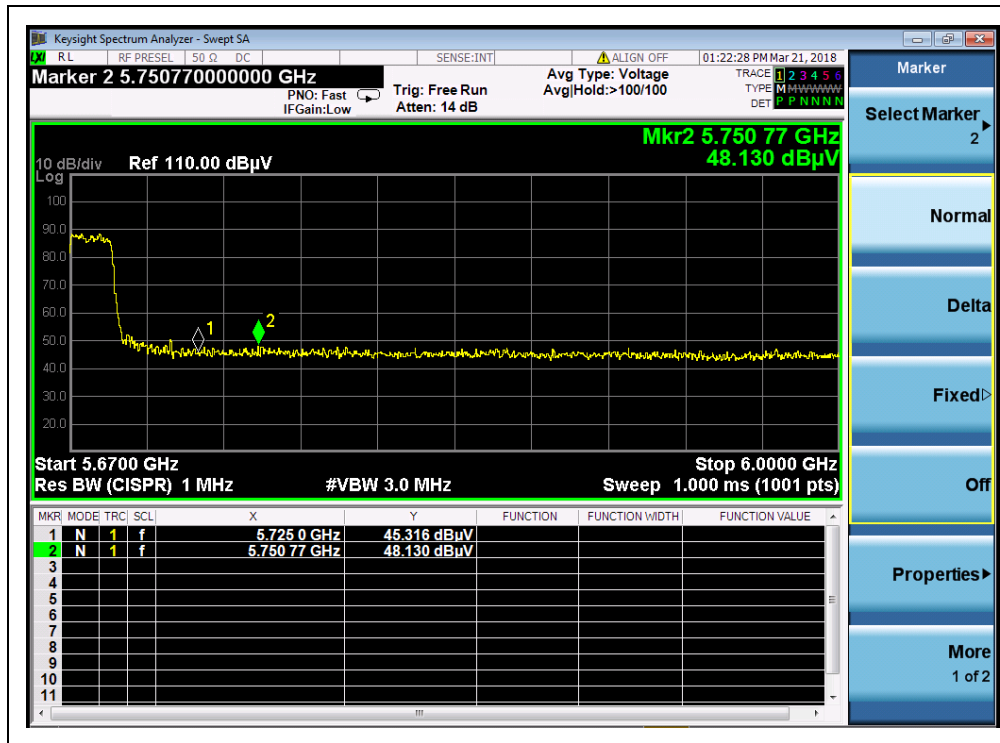
(Channel 62, AVG, 802.11 ac (VHT40))



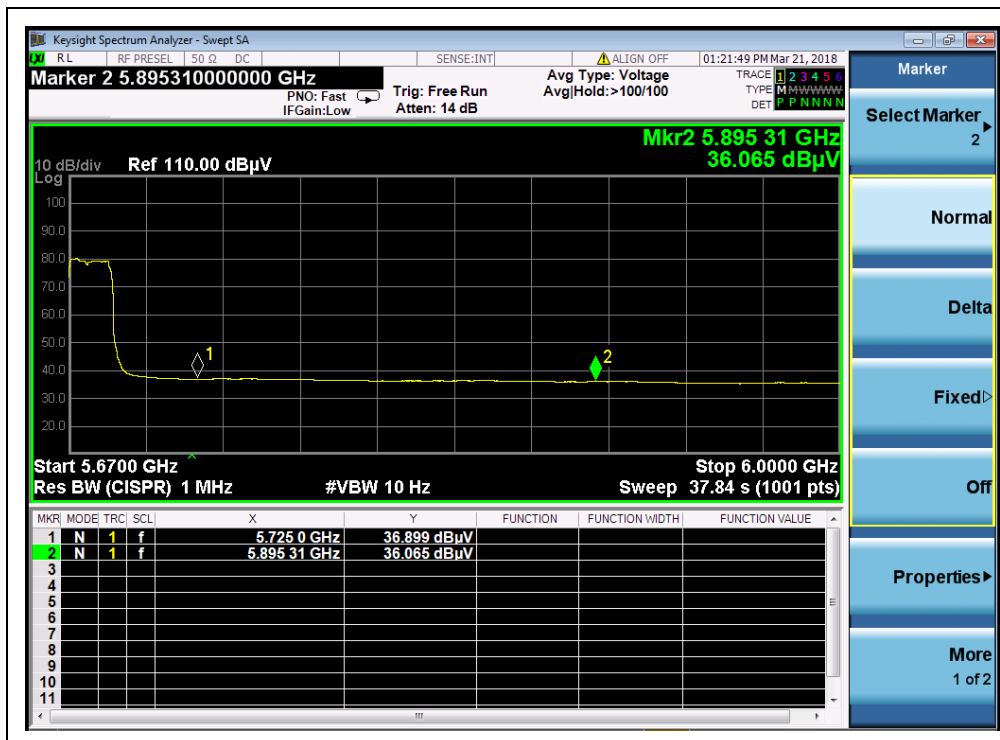
(Channel 102, PEAK, 802.11 ac (VHT40))



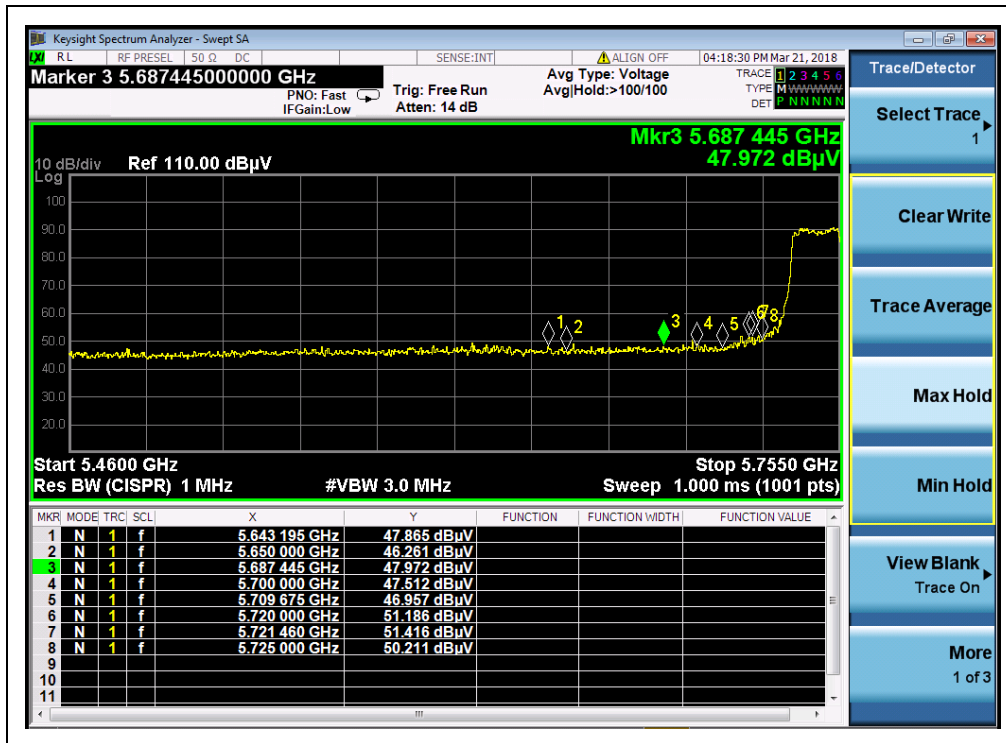
(Channel 102, AVG, 802.11 ac (VHT40))



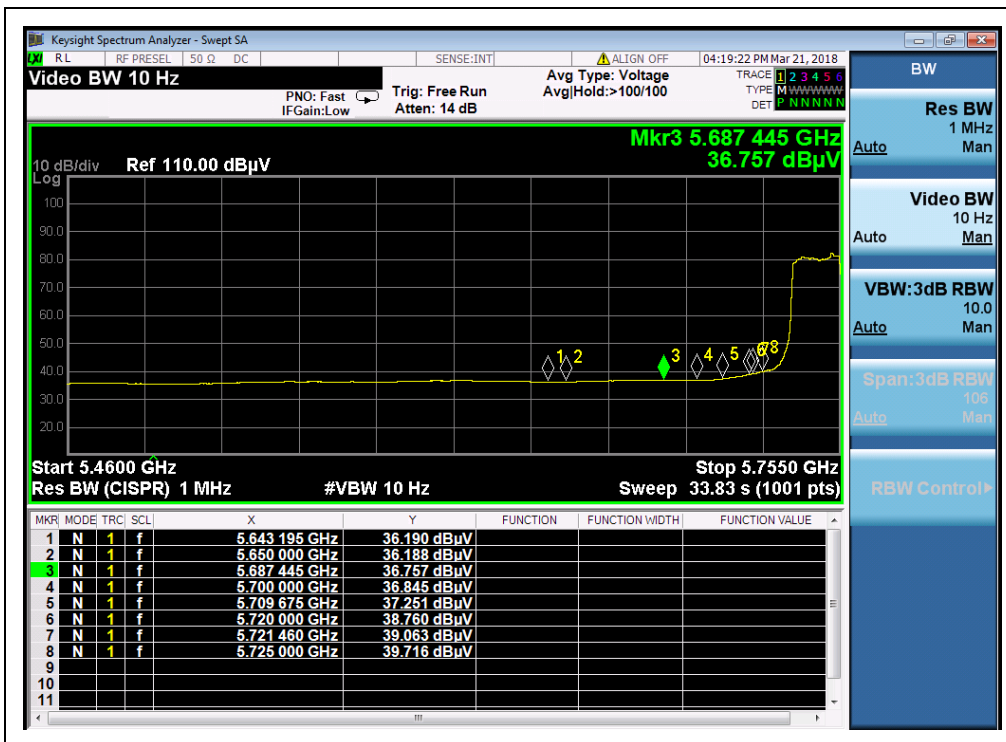
(Channel 142, PEAK, 802.11 ac (VHT40))



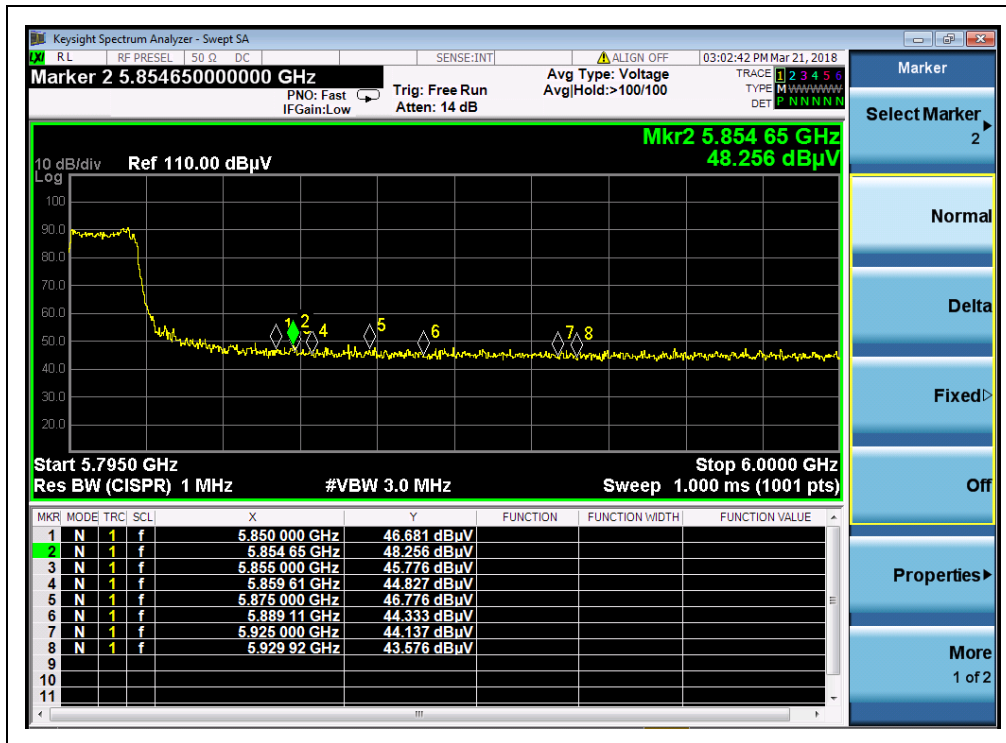
(Channel 142, AVG, 802.11 ac (VHT40))



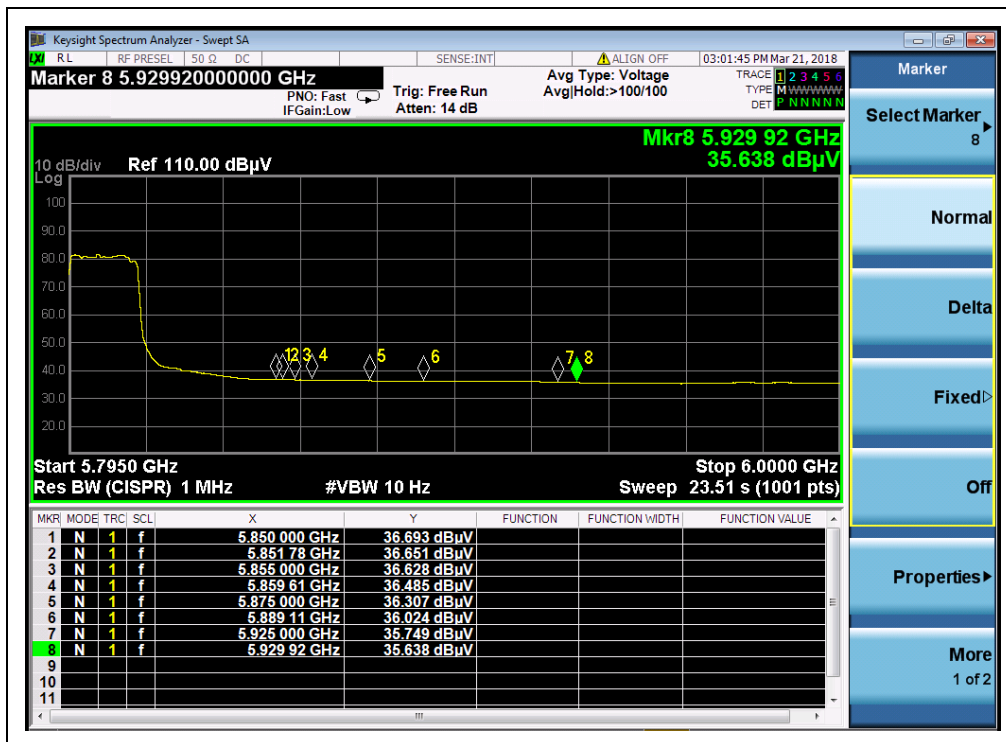
(Channel 151, PEAK, 802.11 ac (VHT40))



(Channel 151, AVG, 802.11 ac (VHT40))



(Channel 159, PEAK, 802.11 ac (VHT40))

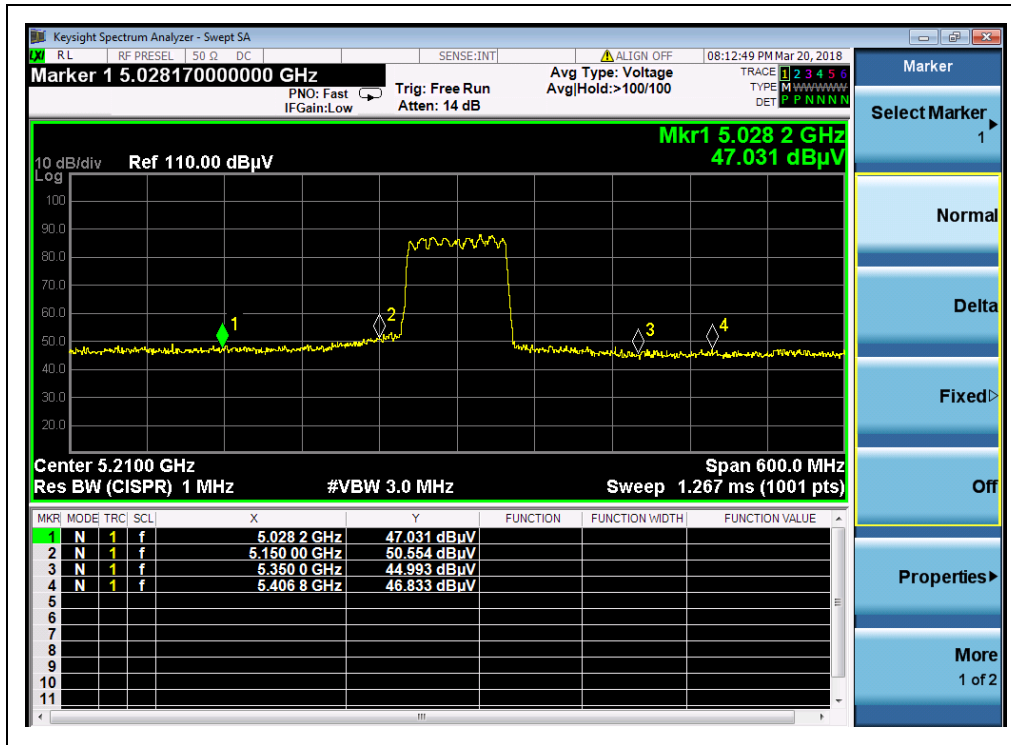


(Channel 159, AVG, 802.11 ac (VHT40))

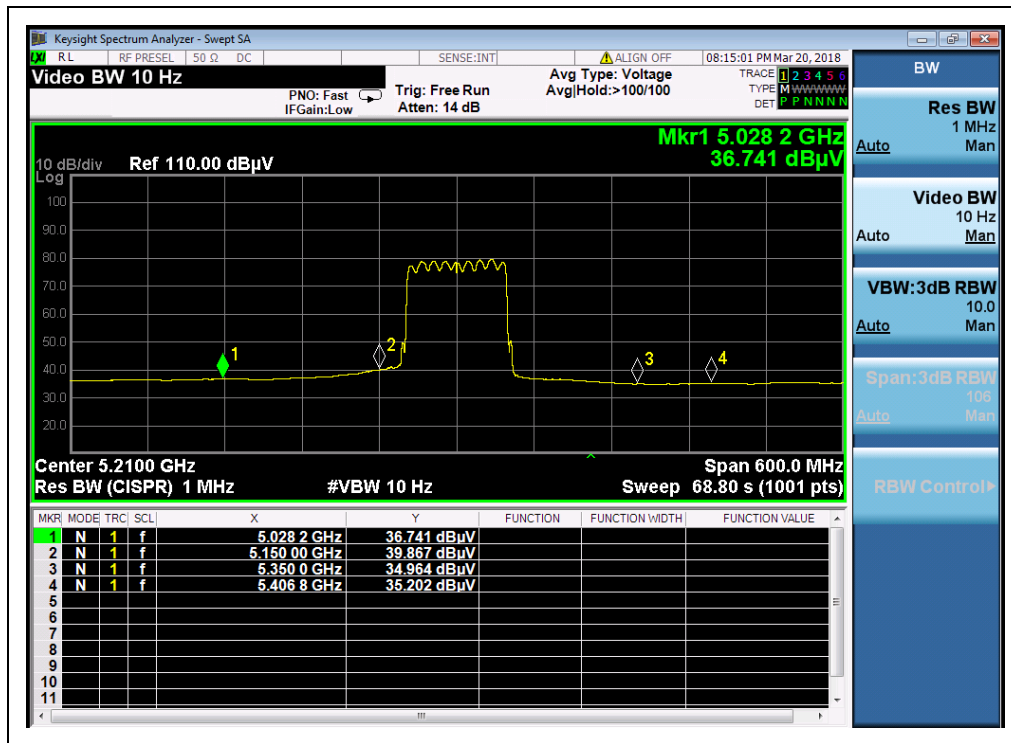
**802.11ac (VHT80) Test mode****A. Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
42	5028.20	PK	47.03	-50.65	32.11	28.49	74	PASS
42	5028.20	AV	36.74	-50.15	31.92	18.51	54	PASS
58	5473.60	PK	46.98	-52.24	31.57	26.31	74	PASS
58	5473.60	AV	35.56	-52.24	31.57	14.89	54	PASS
106	5249.20	PK	48.72	-51.67	31.86	28.91	74	PASS
106	5423.20	AV	35.30	-51.67	31.86	15.49	54	PASS
138	5751.60	PK	49.38	-53.17	32.98	29.19	68.23	PASS
138	5751.60	AV	36.76	-53.12	32.96	16.60	54	PASS
155	5622.00	PK	47.93	-53.37	33.28	27.84	114.16	PASS
155	5622.00	AV	36.56	-53.25	33.31	16.62	54	PASS
155	5923.80	PK	46.62	-53.53	33.46	26.55	111.63	PASS
155	5923.80	AV	35.76	-53.55	33.42	15.63	54	PASS

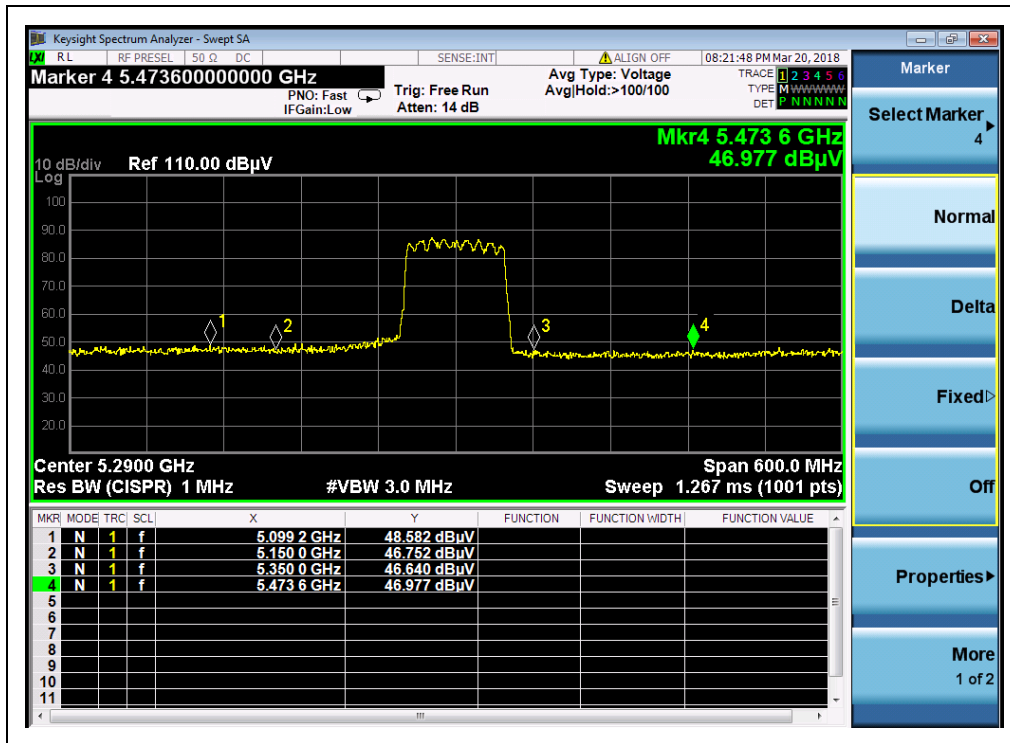
B. Test Plots:



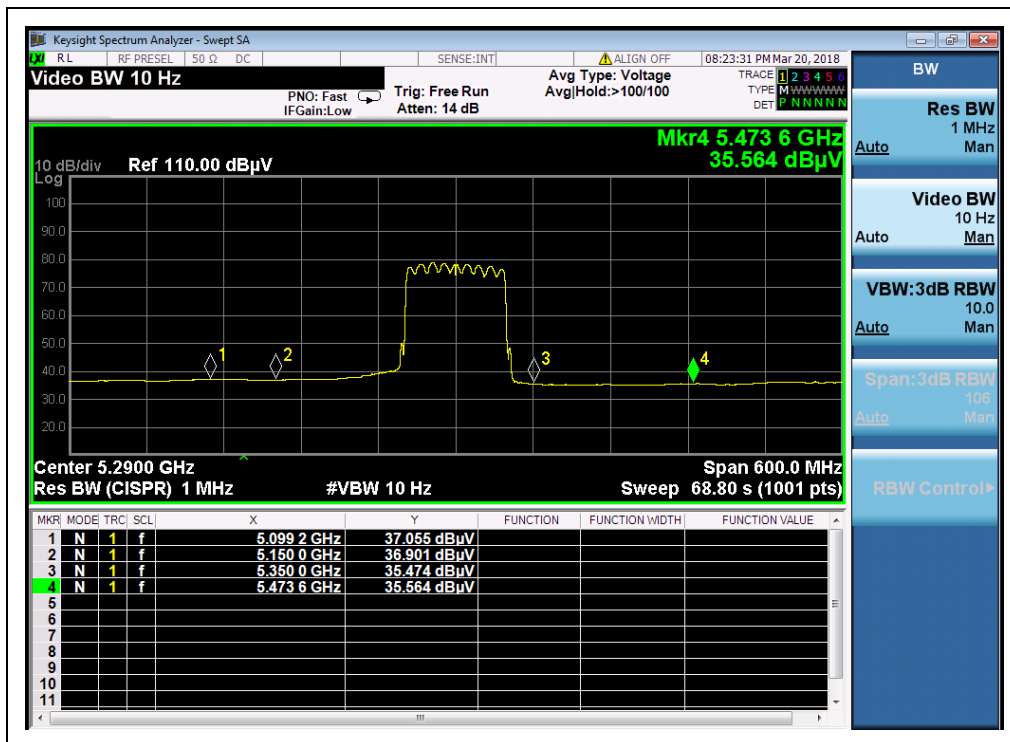
(Channel 42, PEAK, 802.11ac (VHT80))



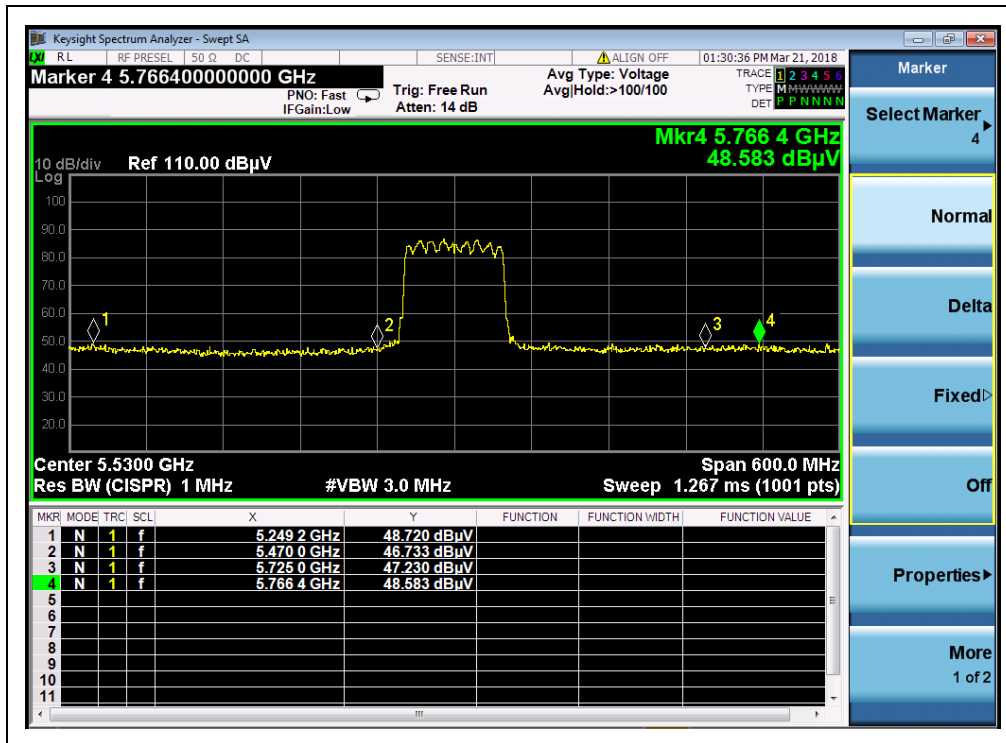
(Channel 42, AVG, 802.11 ac (VHT4=80))



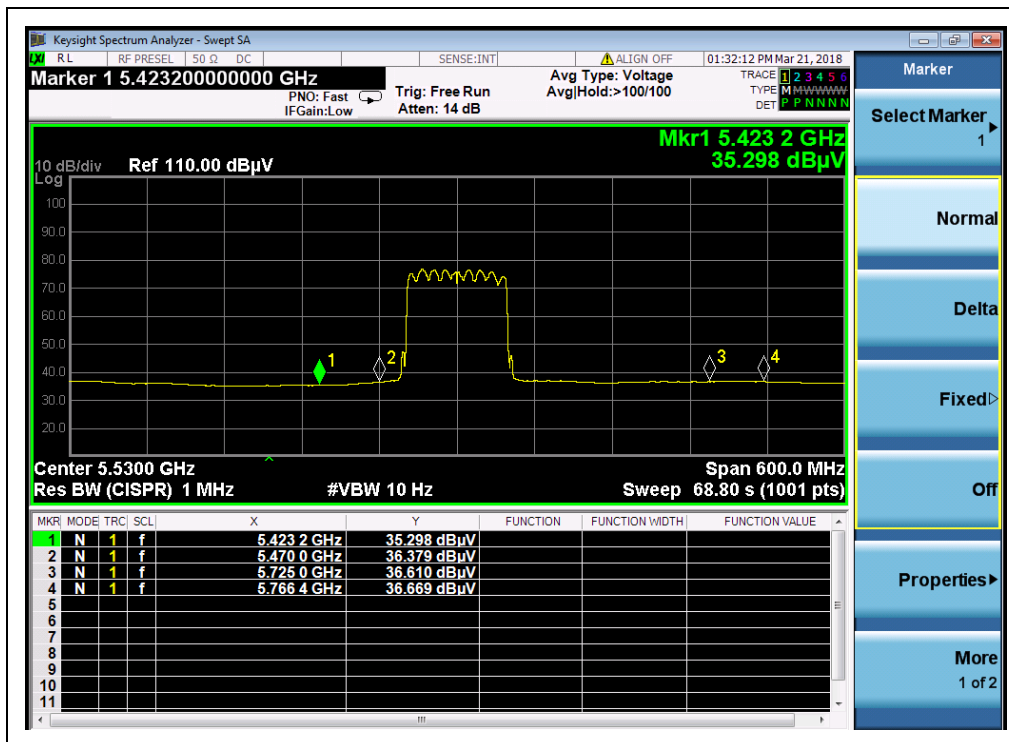
(Channel 58, PEAK, 802.11 ac (VHT40))



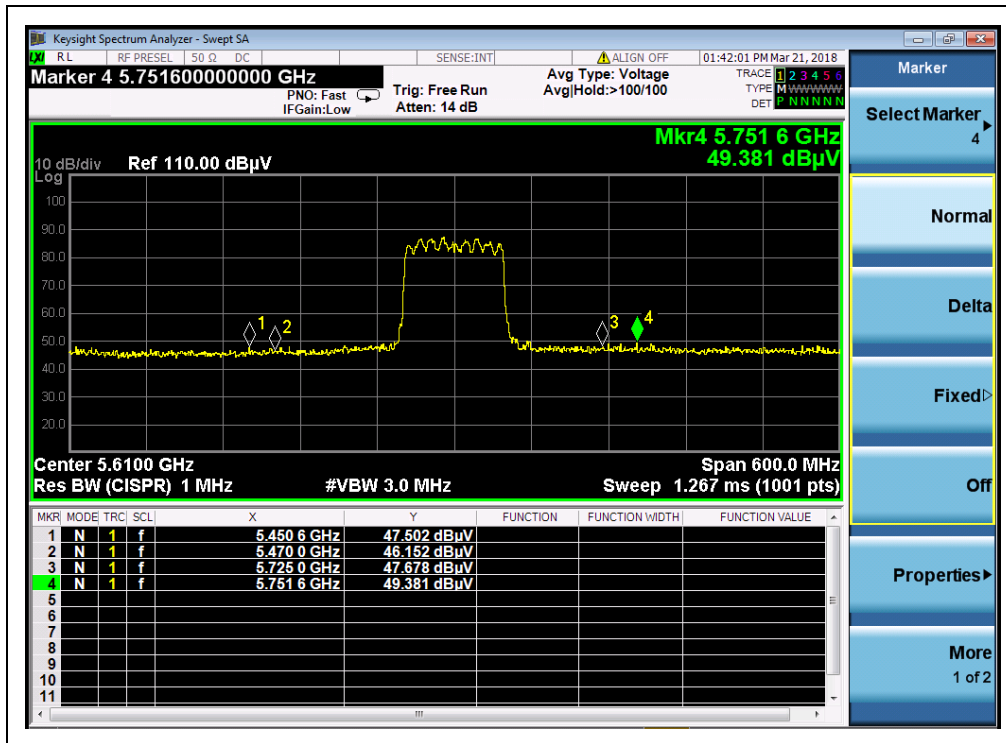
(Channel 58, AVG, 802.11 ac (VHT40))



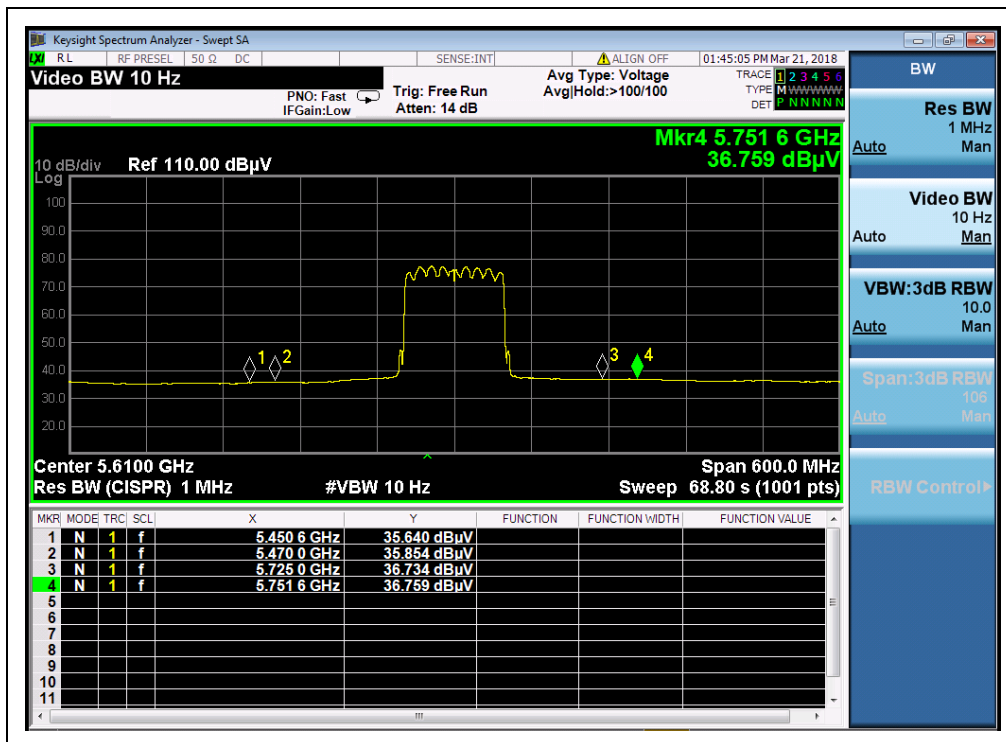
(Channel 106, PEAK, 802.11 ac (VHT80))



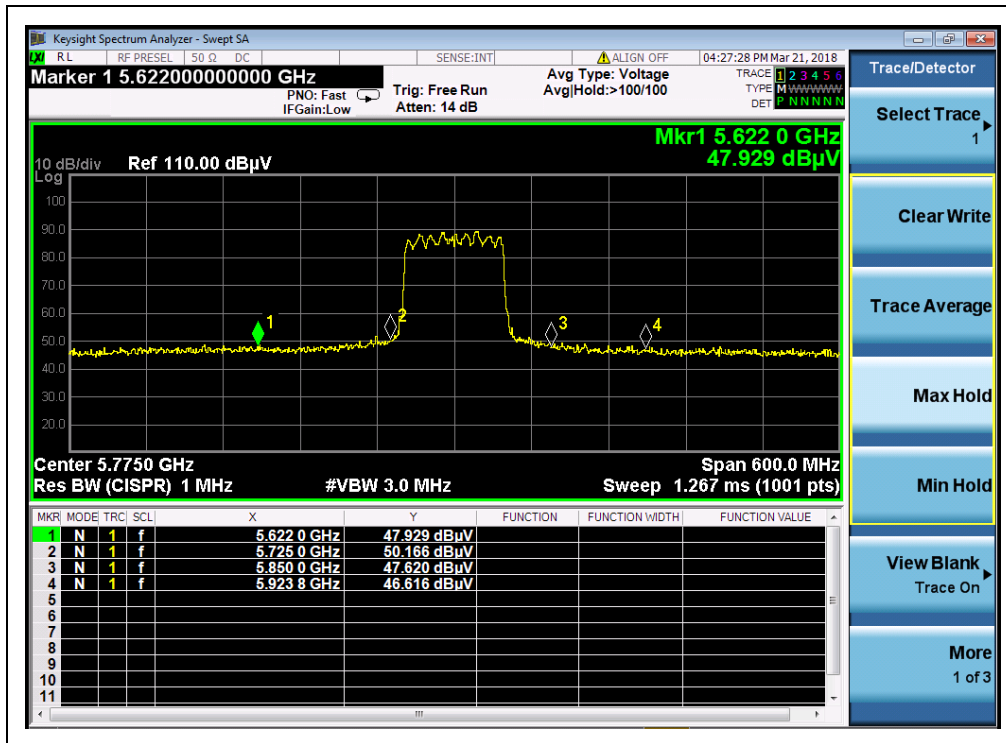
(Channel 106, AVG, 802.11 ac (VHT80))



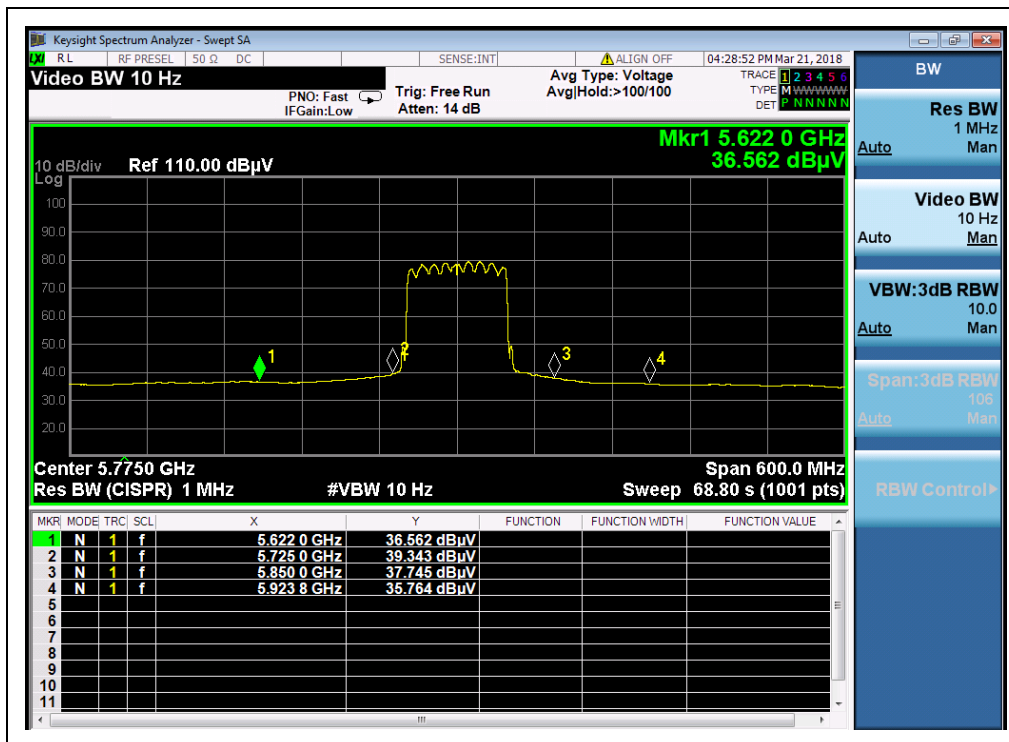
(Channel 138, PEAK, 802.11 ac (VHT80))



(Channel 138, AVG, 802.11 ac (VHT80))



(Channel 155, PEAK, 802.11 ac (VHT80))



(Channel 155, AVG, 802.11 ac (VHT80))

2.7. Conducted Emission

2.7.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

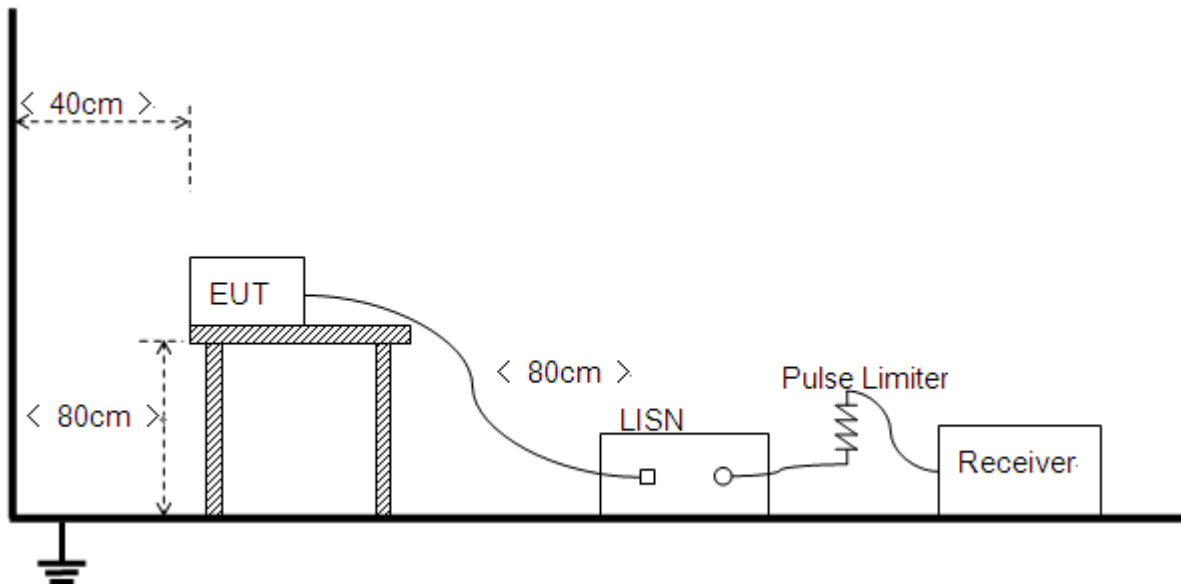
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.7.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

2.7.3. Test Result

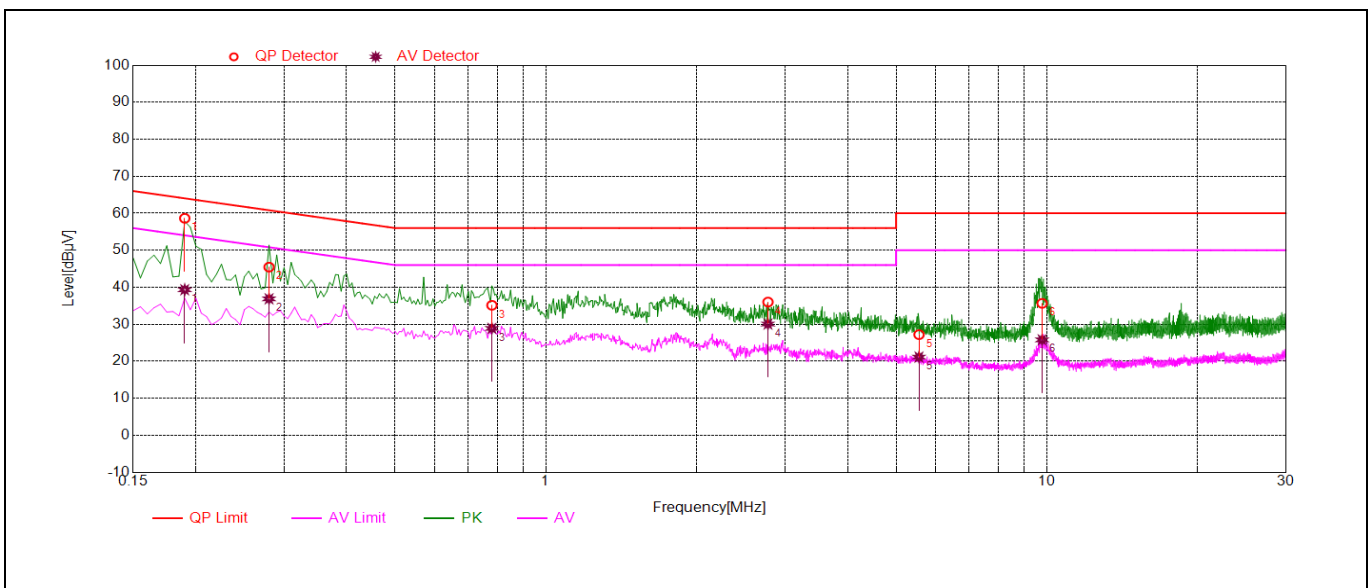
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

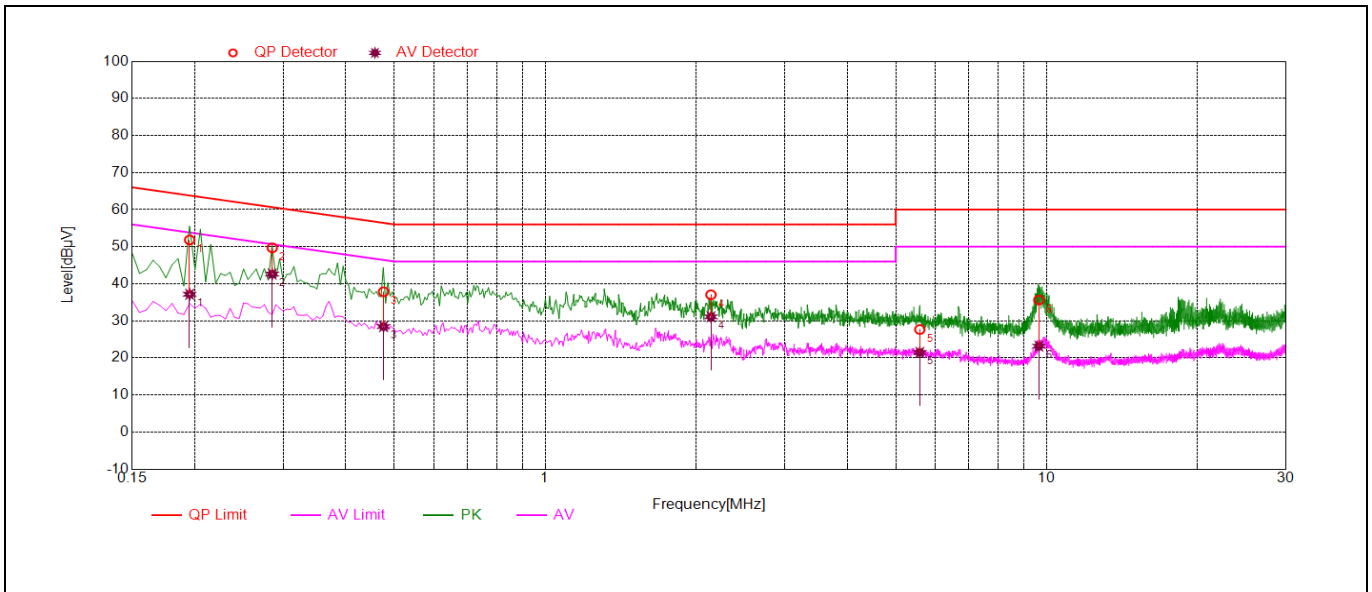
The EUT configuration of the emission tests is EUT + Link. The test voltage is AC 120V/60Hz.

B. Test Plots:



(Plot A: L Phase)

NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.19	58.65	39.33	64.04	54.04	Line	PASS
2	0.28	45.45	36.88	60.82	50.82		PASS
3	0.78	35.13	28.89	56.00	46.00		PASS
4	2.77	36.01	30.06	56.00	46.00		PASS
5	5.56	27.21	21.13	60.00	50.00		PASS
6	9.78	35.65	25.79	60.00	50.00		PASS



(Plot B: N Phase)

NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.20	51.83	37.16	63.82	53.82	Neutral	PASS
2	0.29	49.71	42.62	60.66	50.66		PASS
3	0.48	37.84	28.46	56.42	46.42		PASS
4	2.14	37.04	31.08	56.00	46.00		PASS
5	5.59	27.67	21.48	60.00	50.00		PASS
6	9.66	35.61	23.17	60.00	50.00		PASS

2.8. Radiated Emission

2.8.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. The following formula is used to convert the equipment isotropic radiated power(eirp) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \mu\text{V/m}$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

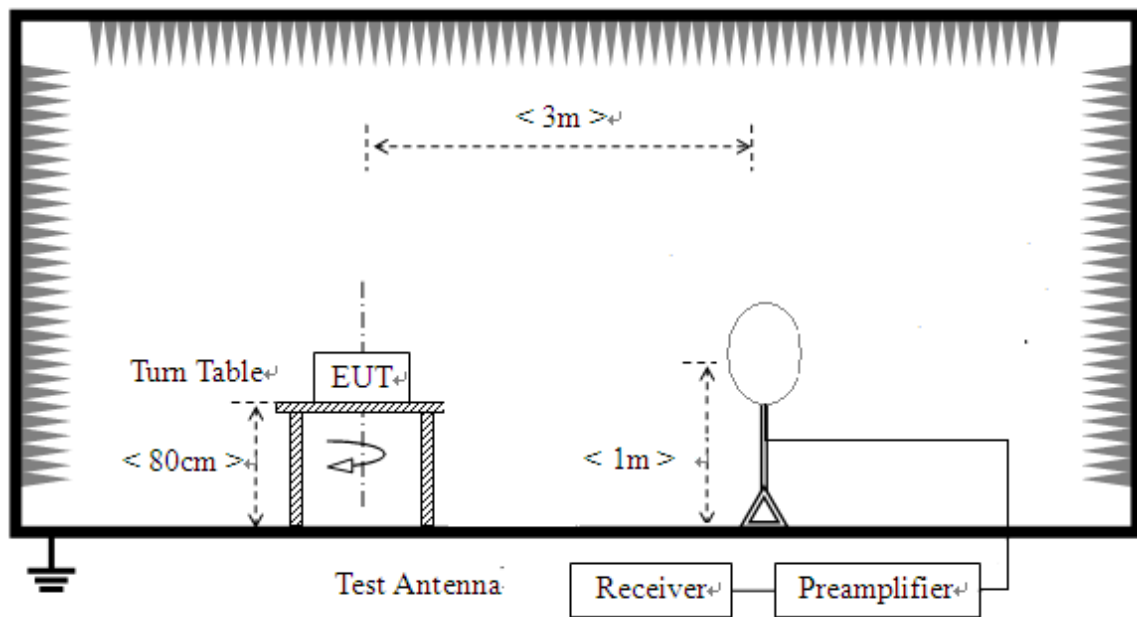
For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

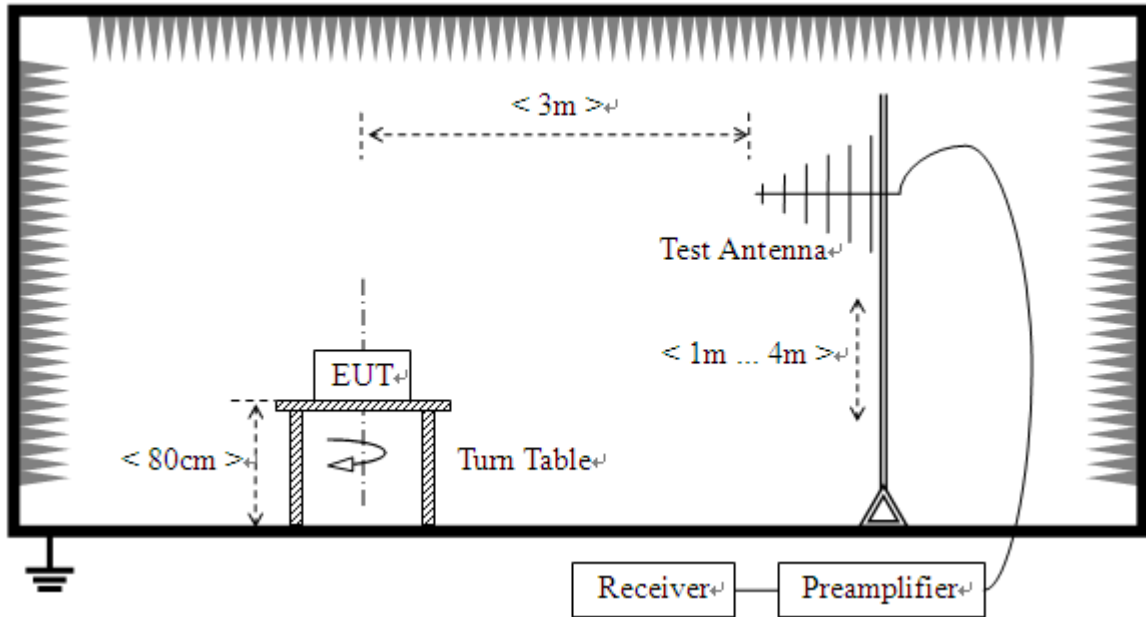
2.8.2. Test Description

A. Test Setup:

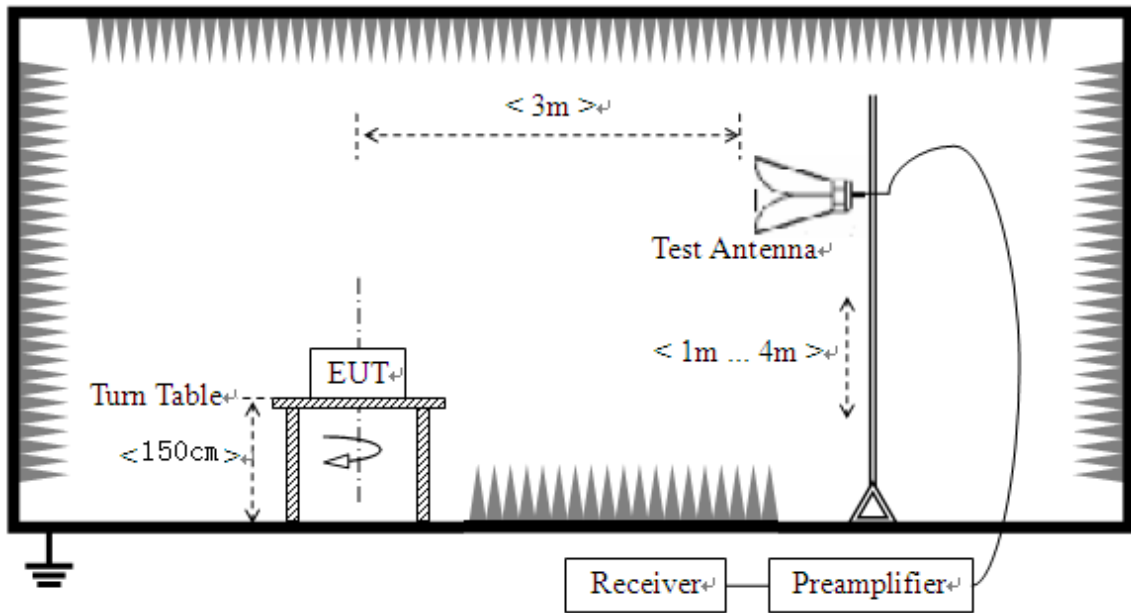
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT



was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The test antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final test antenna elevation shall be that which maximizes the emissions. The test antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. The emission levels at both horizontal and vertical polarizations should be tested.



2.8.3. Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$$E [\text{dB}\mu\text{V}/\text{m}] = U_R + A_T + A_{\text{Factor}} [\text{dB}]; A_T = L_{\text{Cable loss}} [\text{dB}] - G_{\text{preamp}} [\text{dB}]$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

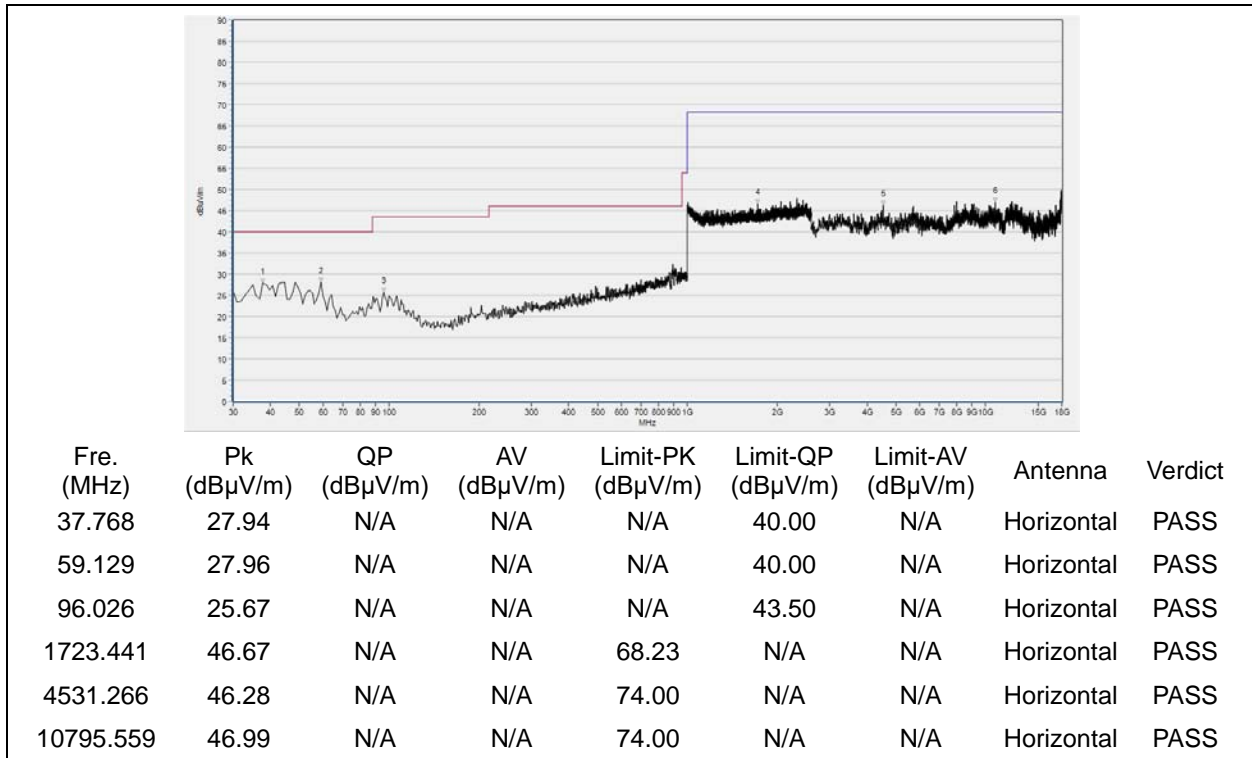
Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not recorded.

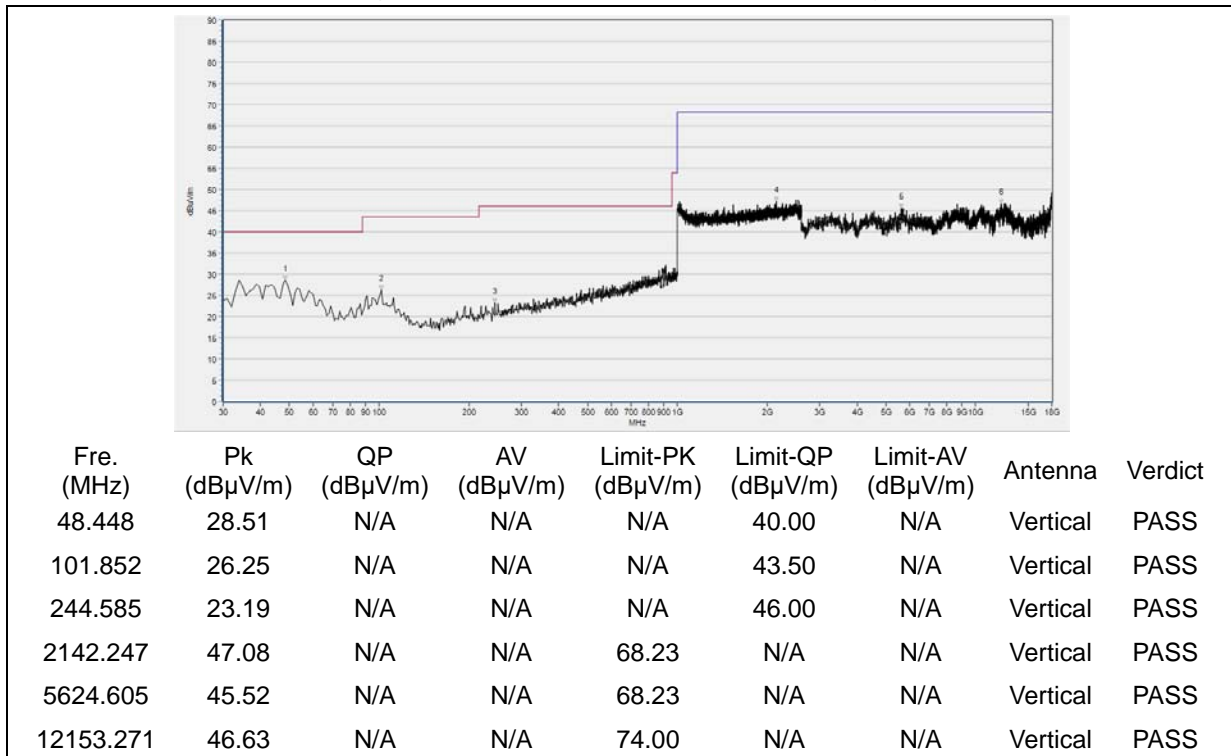
Note3: For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

802.11a Test mode

Plots for Channel = 36

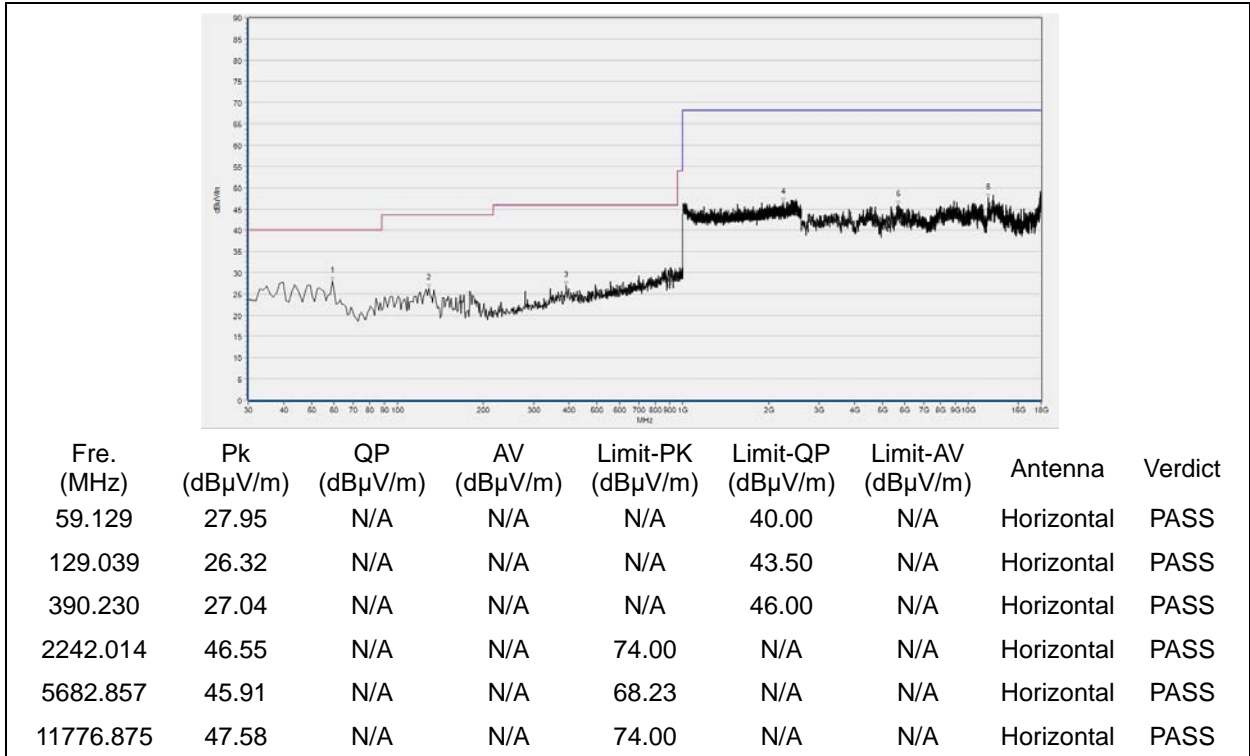


(Antenna Horizontal, 30MHz to 18GHz)

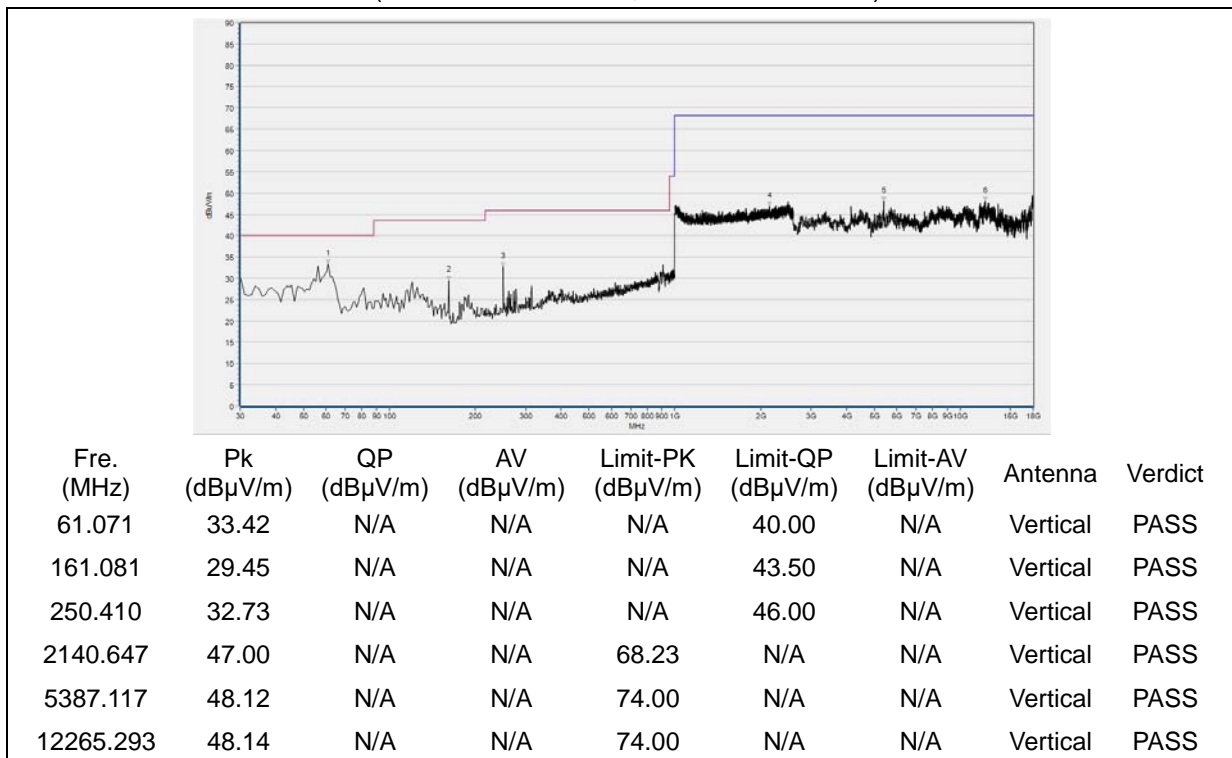


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 44

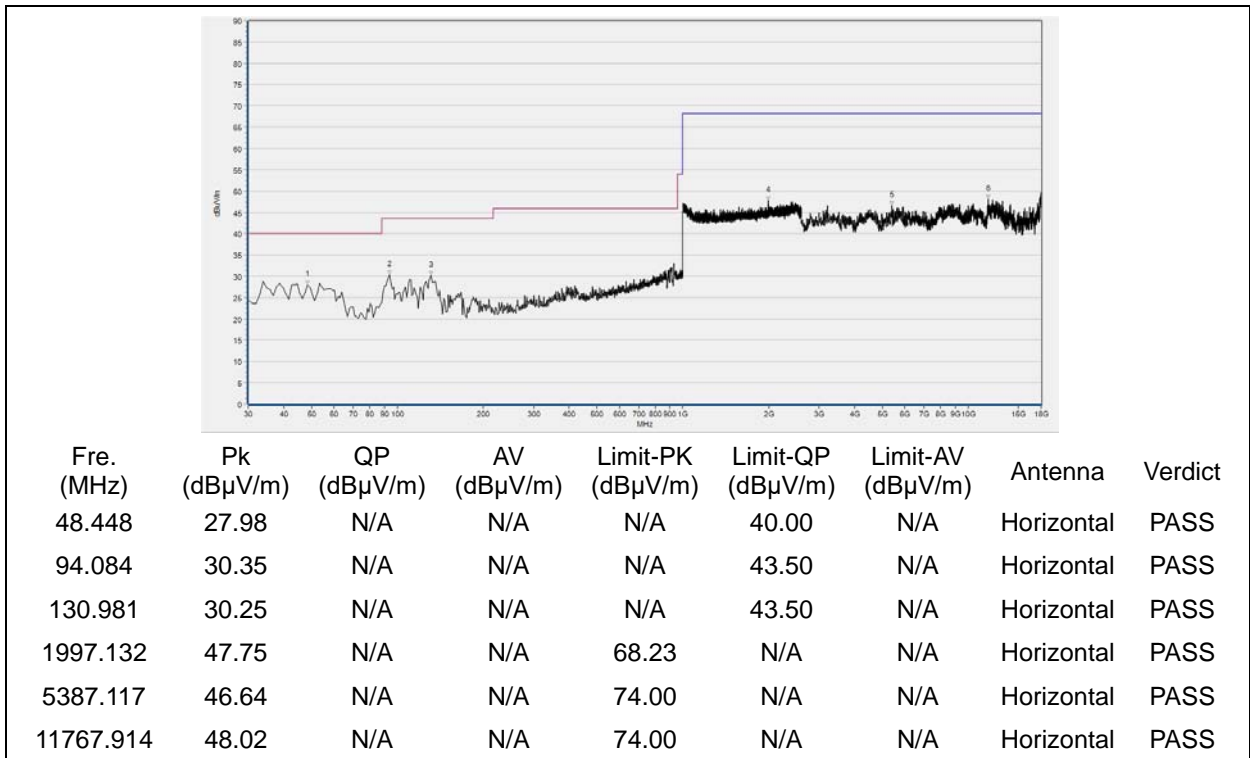


(Antenna Horizontal, 30MHz to 18GHz)

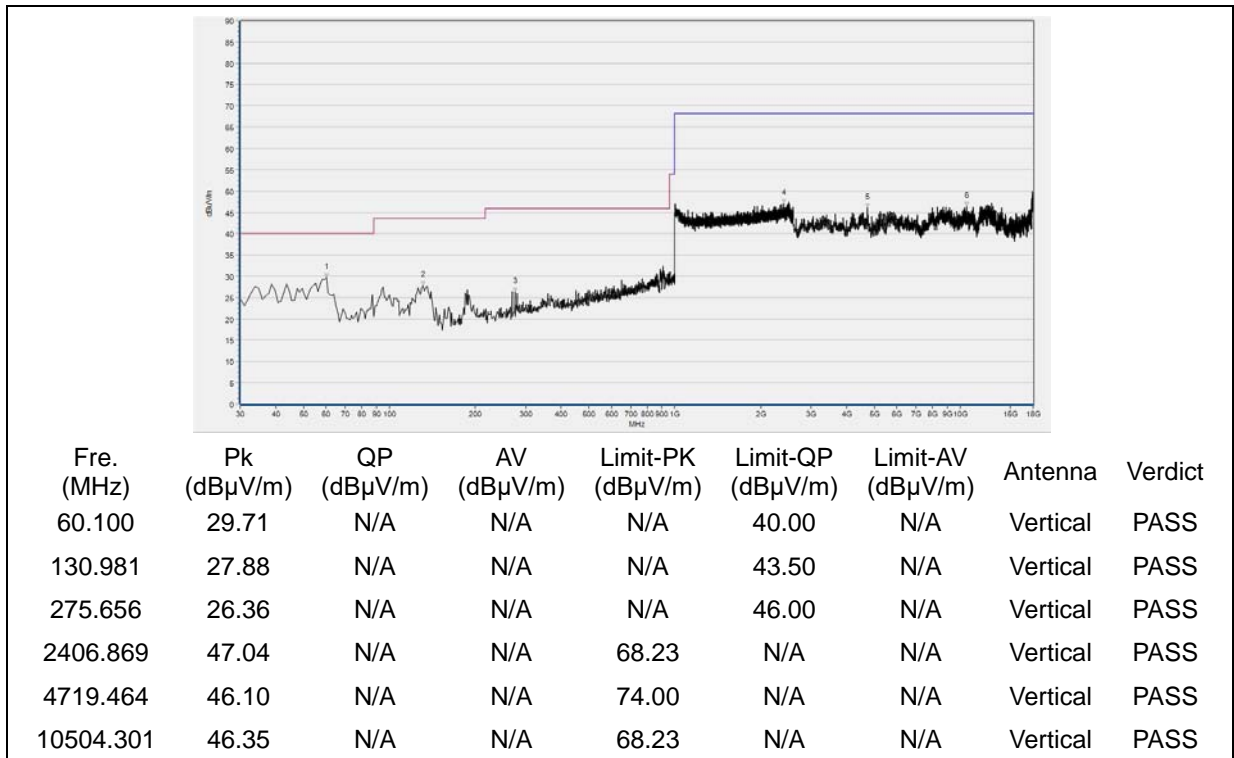


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 48

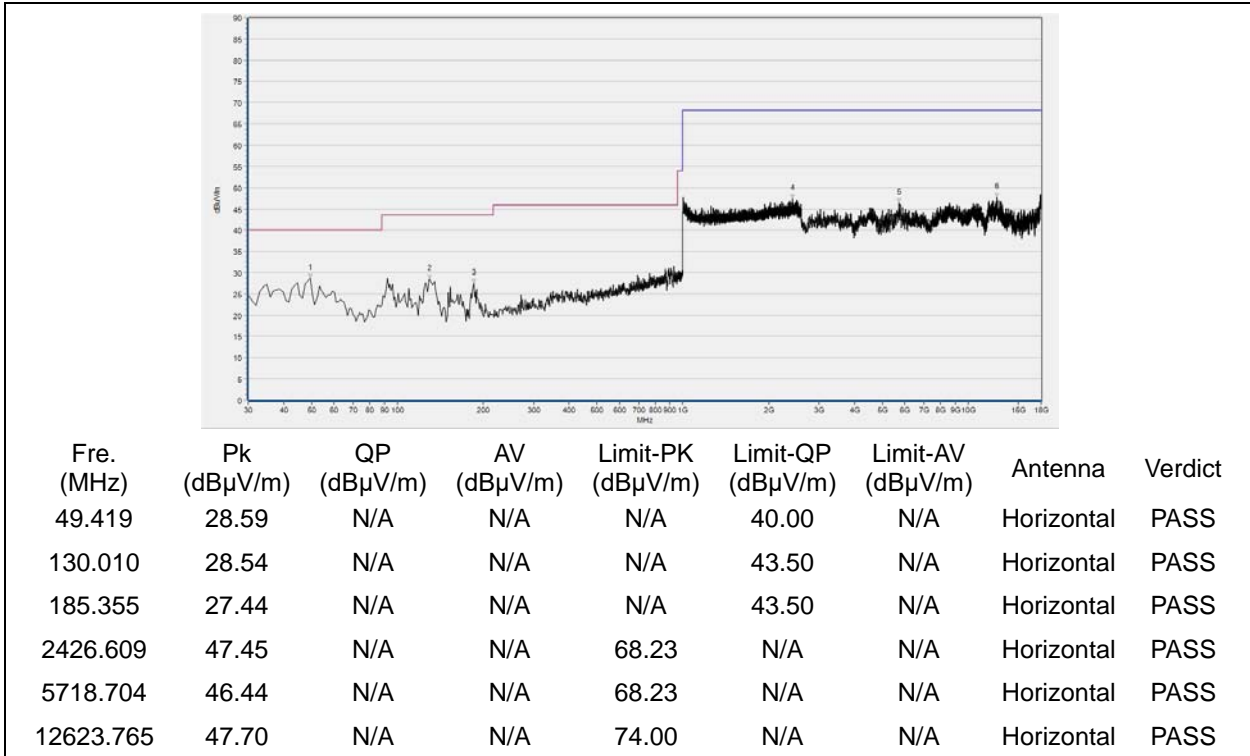


(Antenna Horizontal, 30MHz to 18GHz)

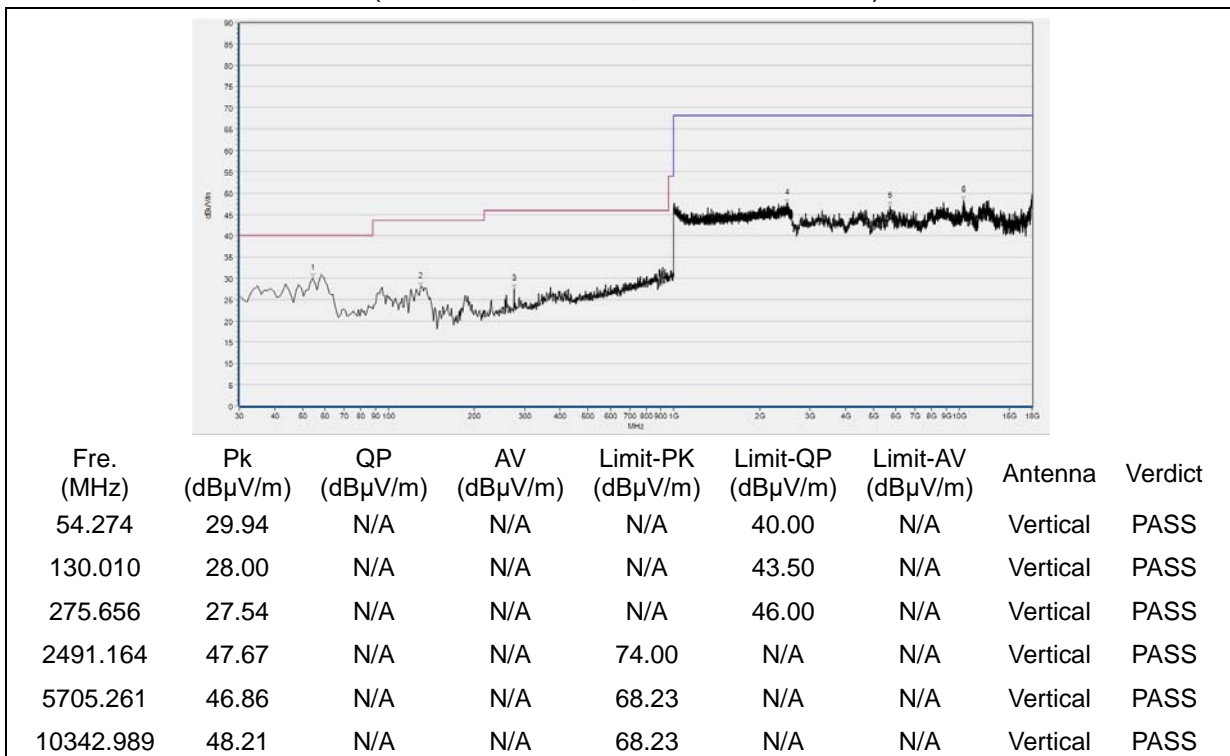


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 52

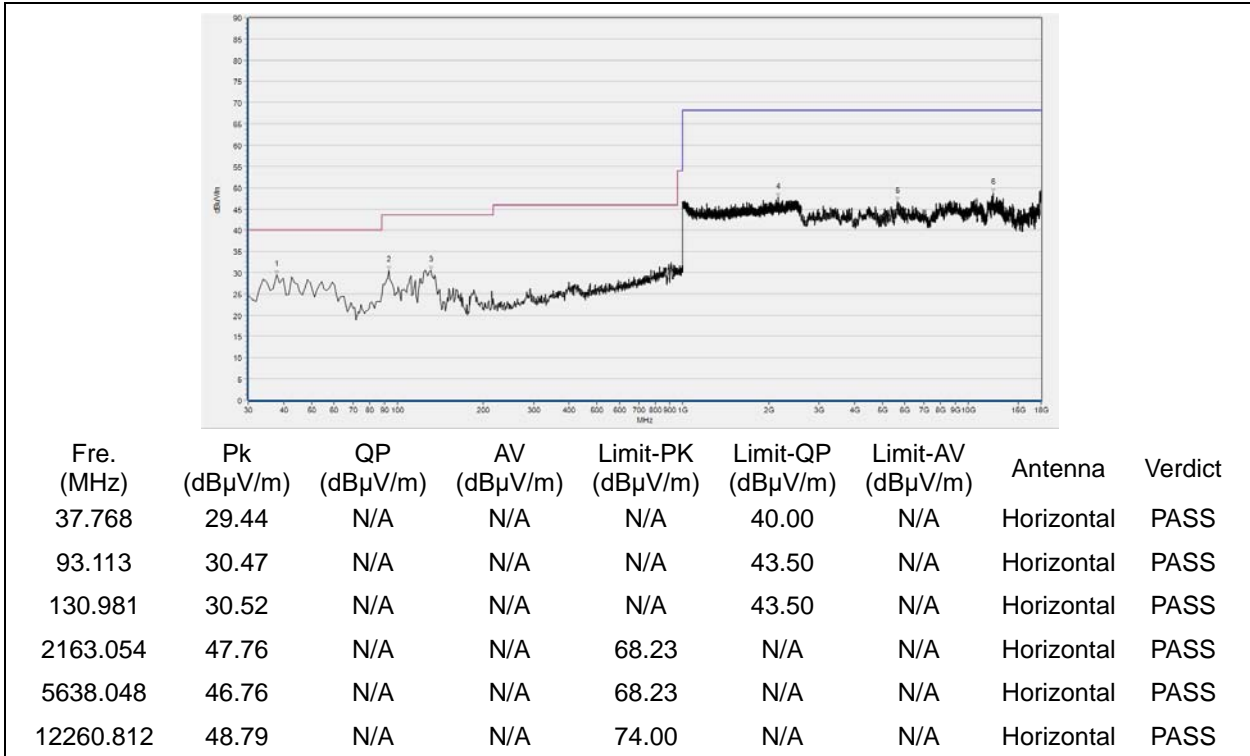


(Antenna Horizontal, 30MHz to 18GHz)

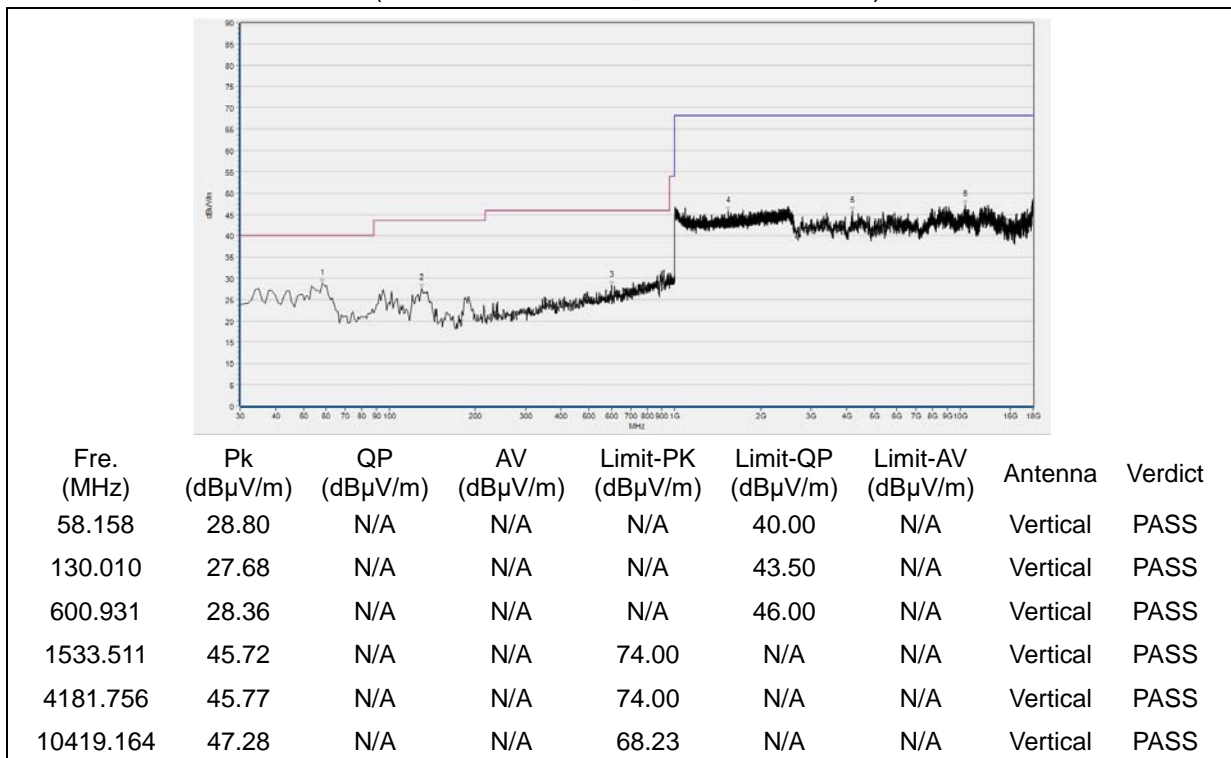


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 60

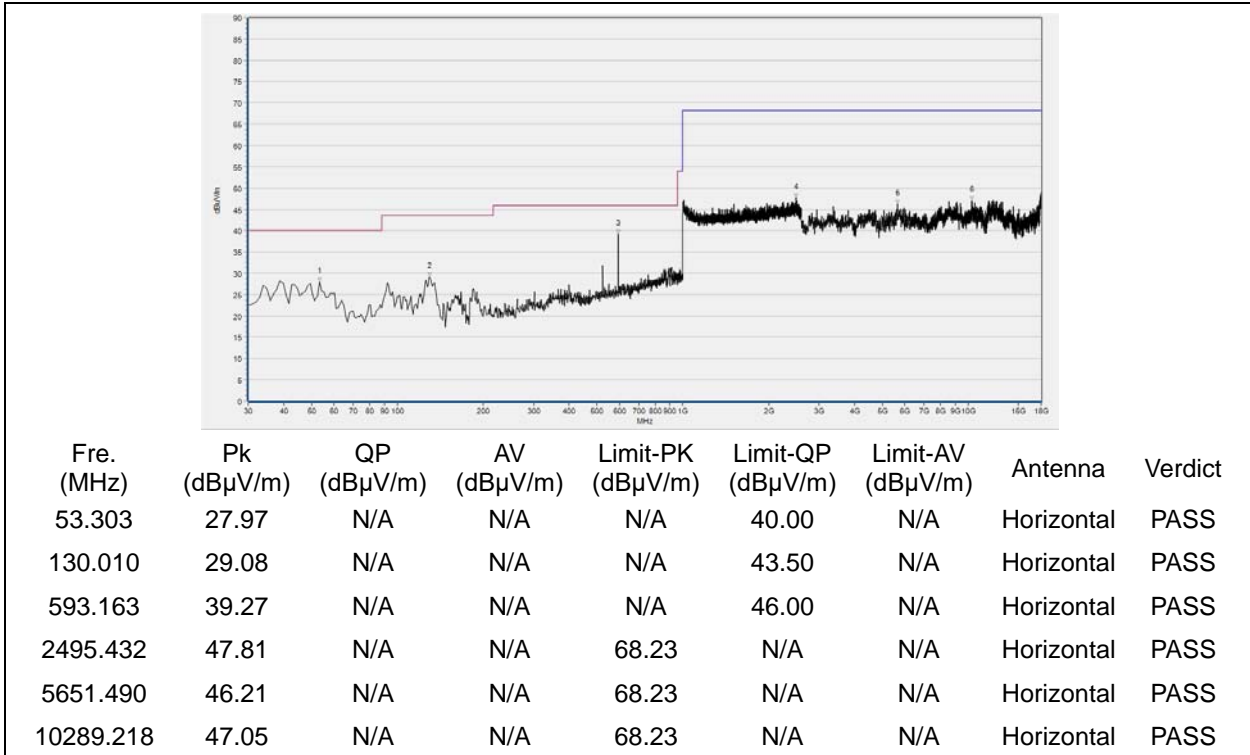


(Antenna Horizontal, 30MHz to 18GHz)

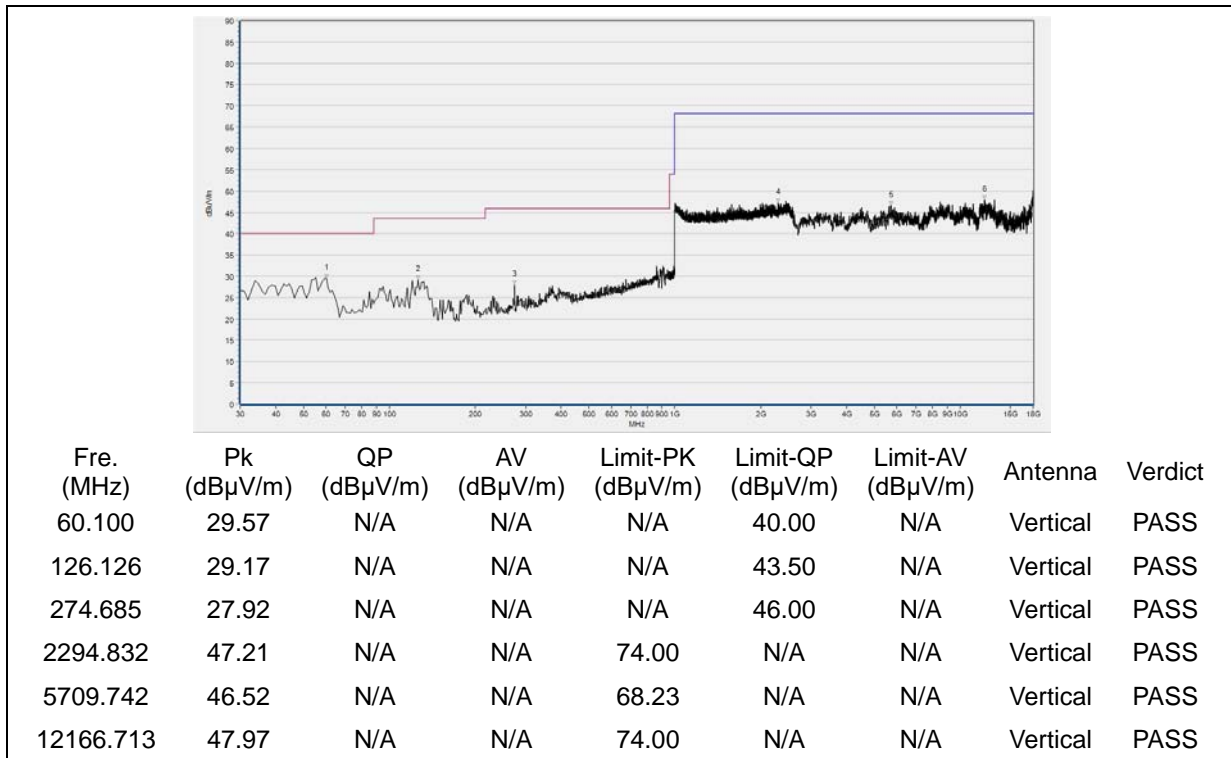


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 64

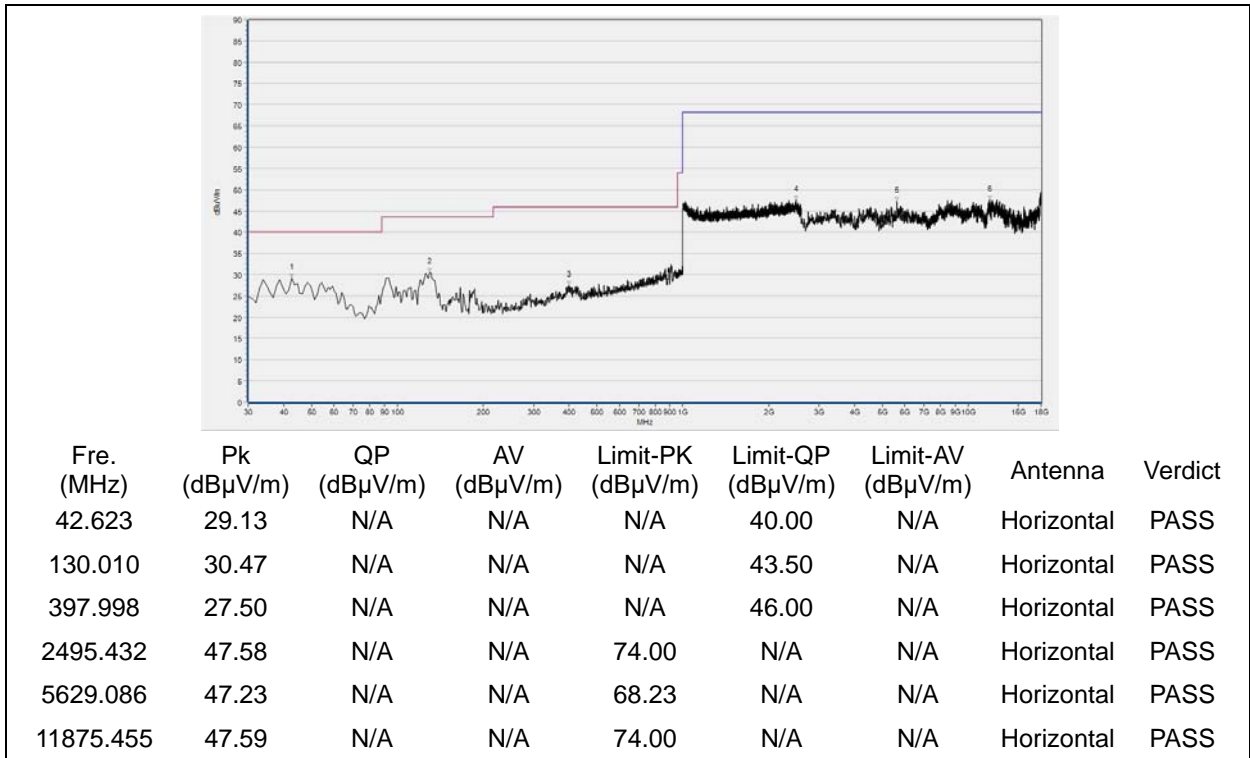


(Antenna Horizontal, 30MHz to 18GHz)

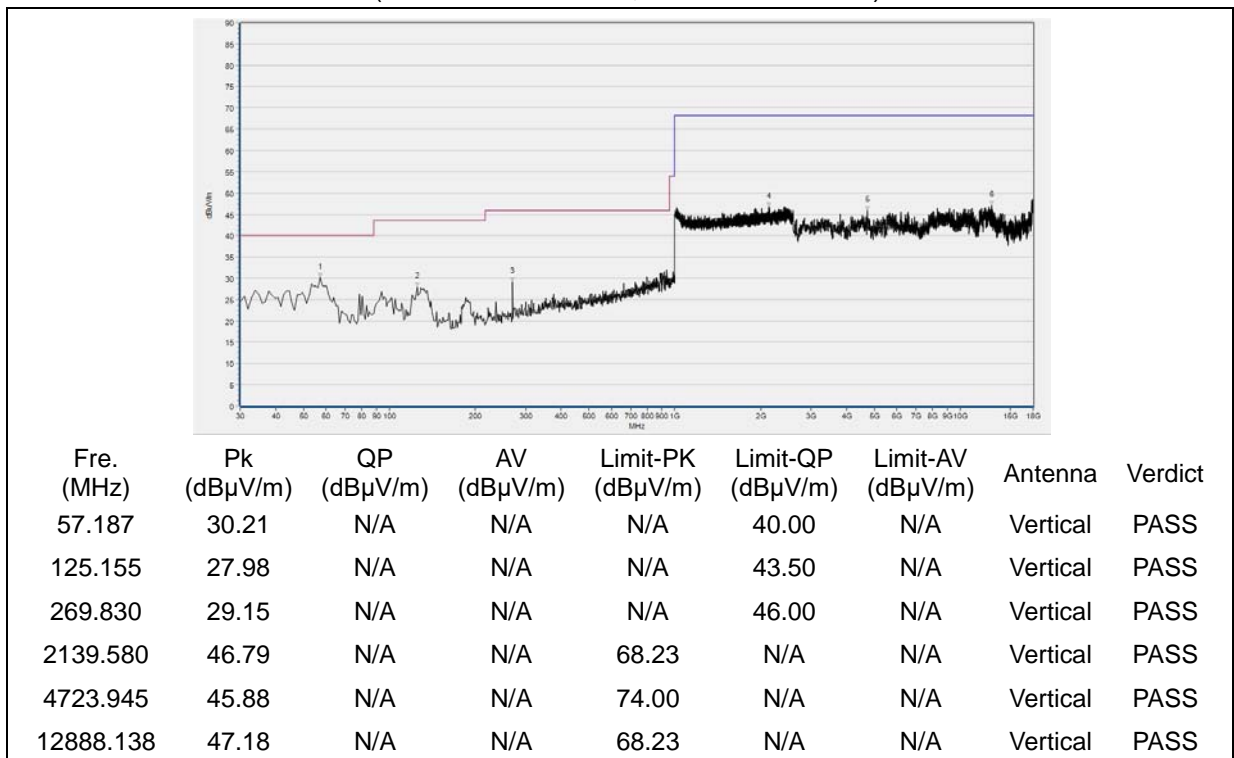


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 100

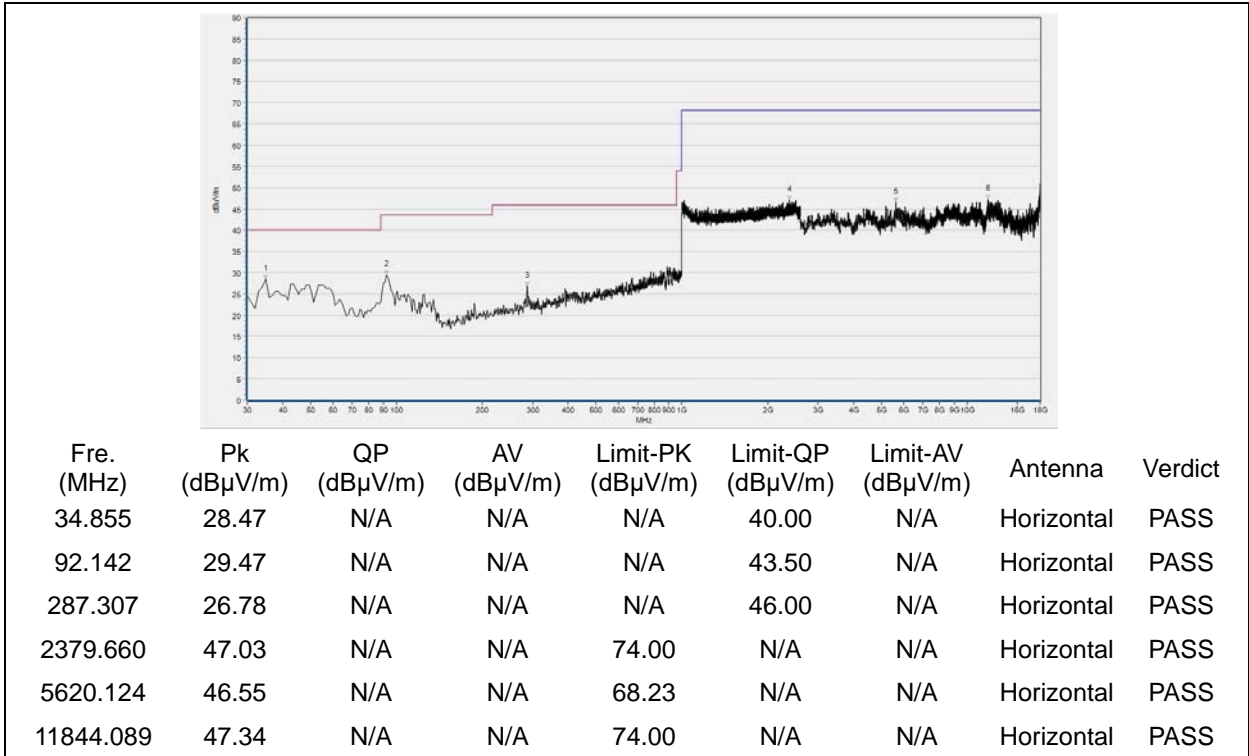


(Antenna Horizontal, 30MHz to 18GHz)

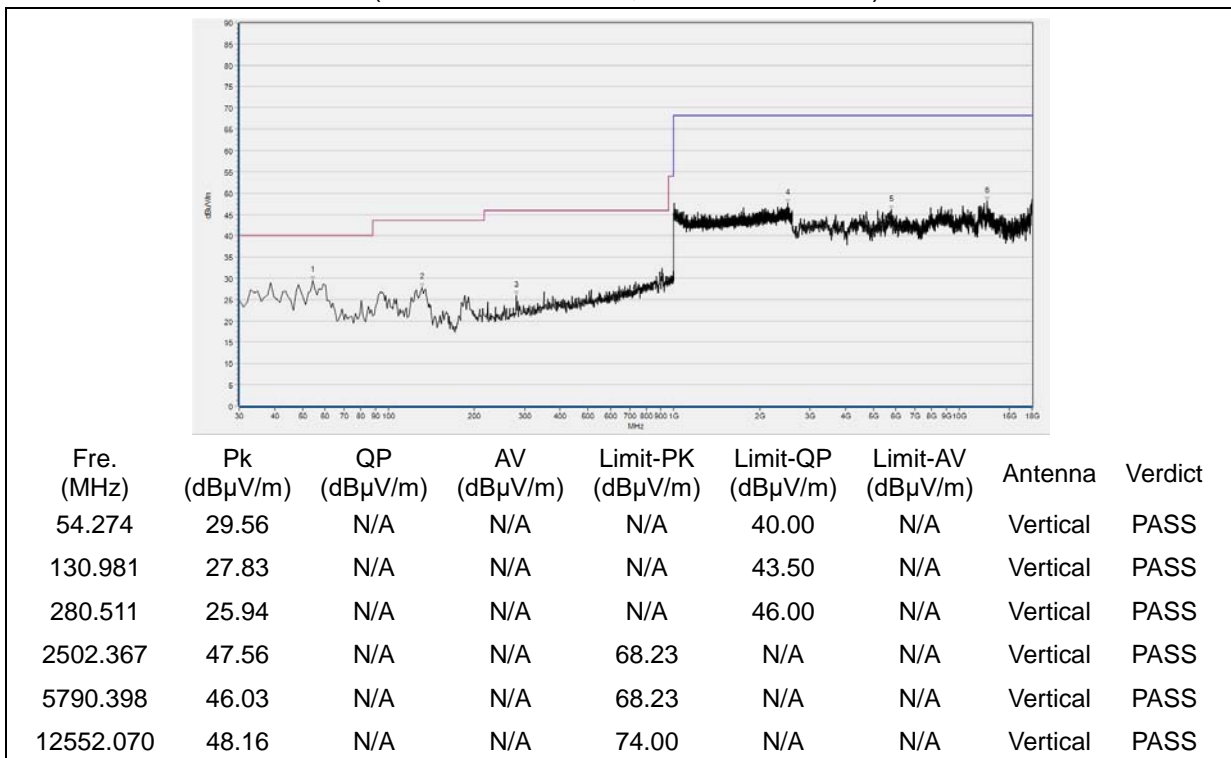


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 120

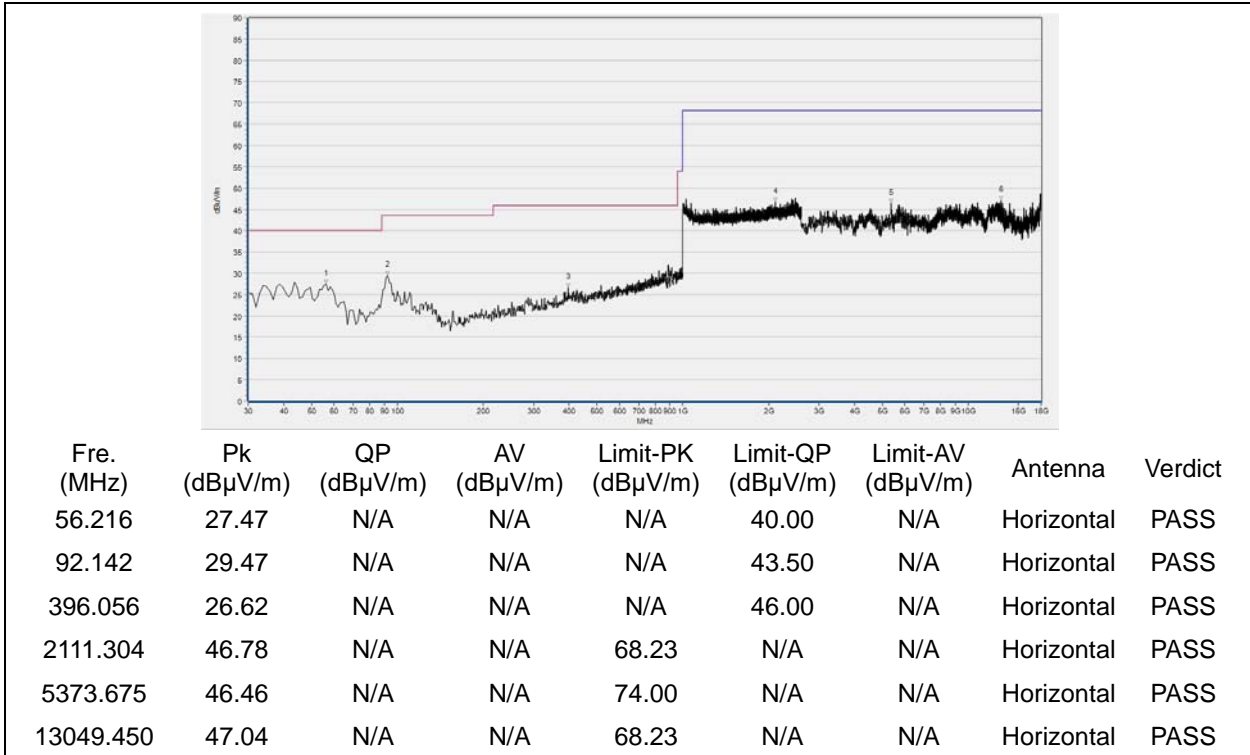


(Antenna Horizontal, 30MHz to 18GHz)

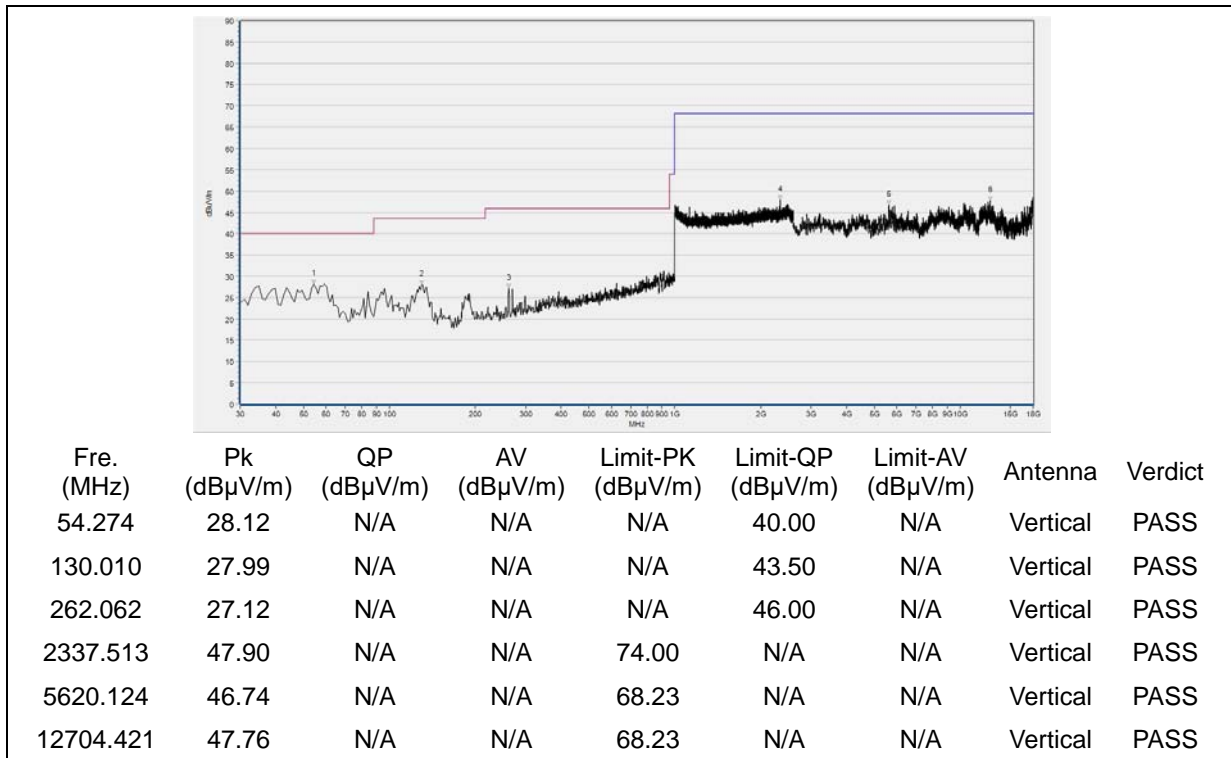


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 142

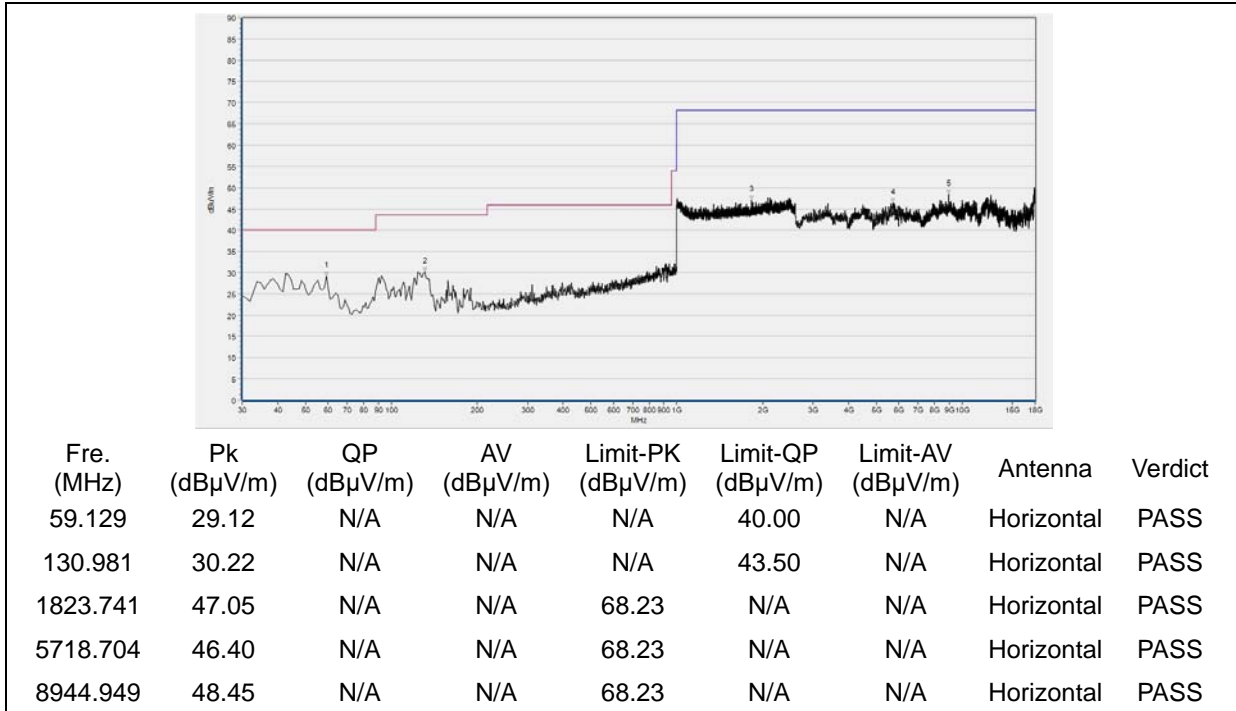


(Antenna Horizontal, 30MHz to 18GHz)

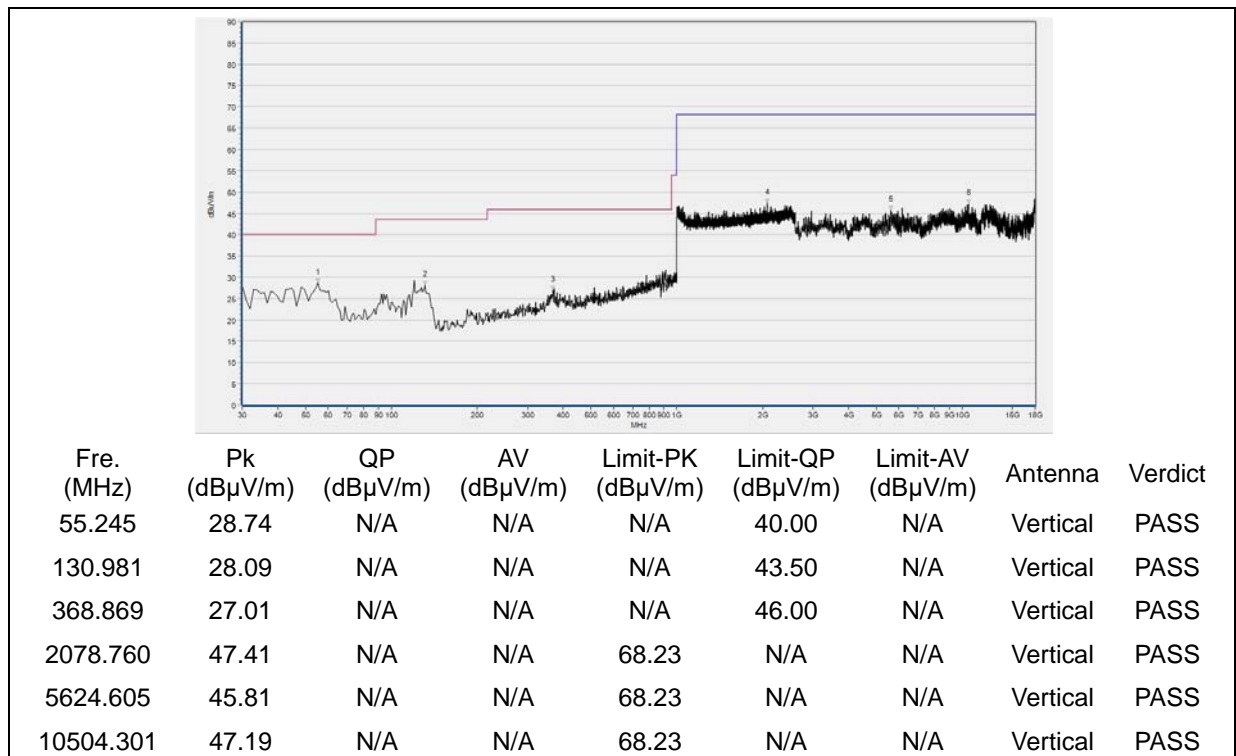


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 149

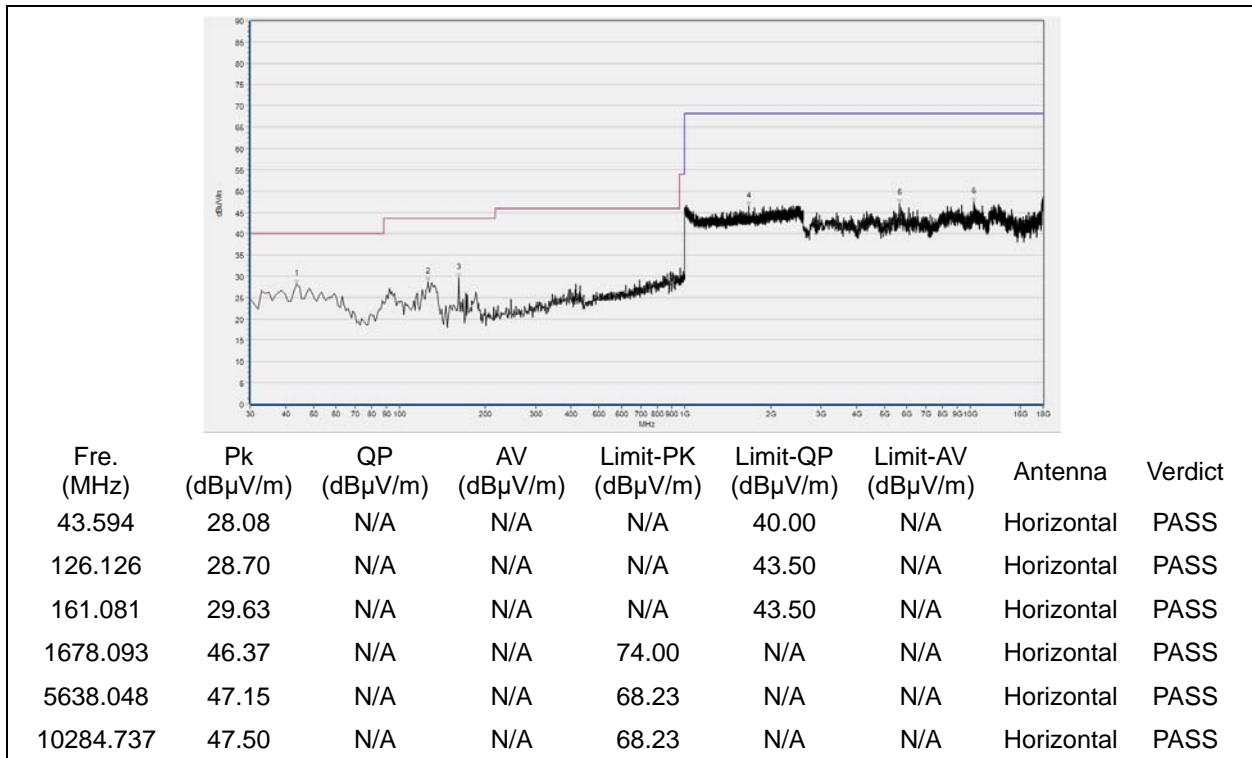


(Antenna Horizontal, 30MHz to 18GHz)

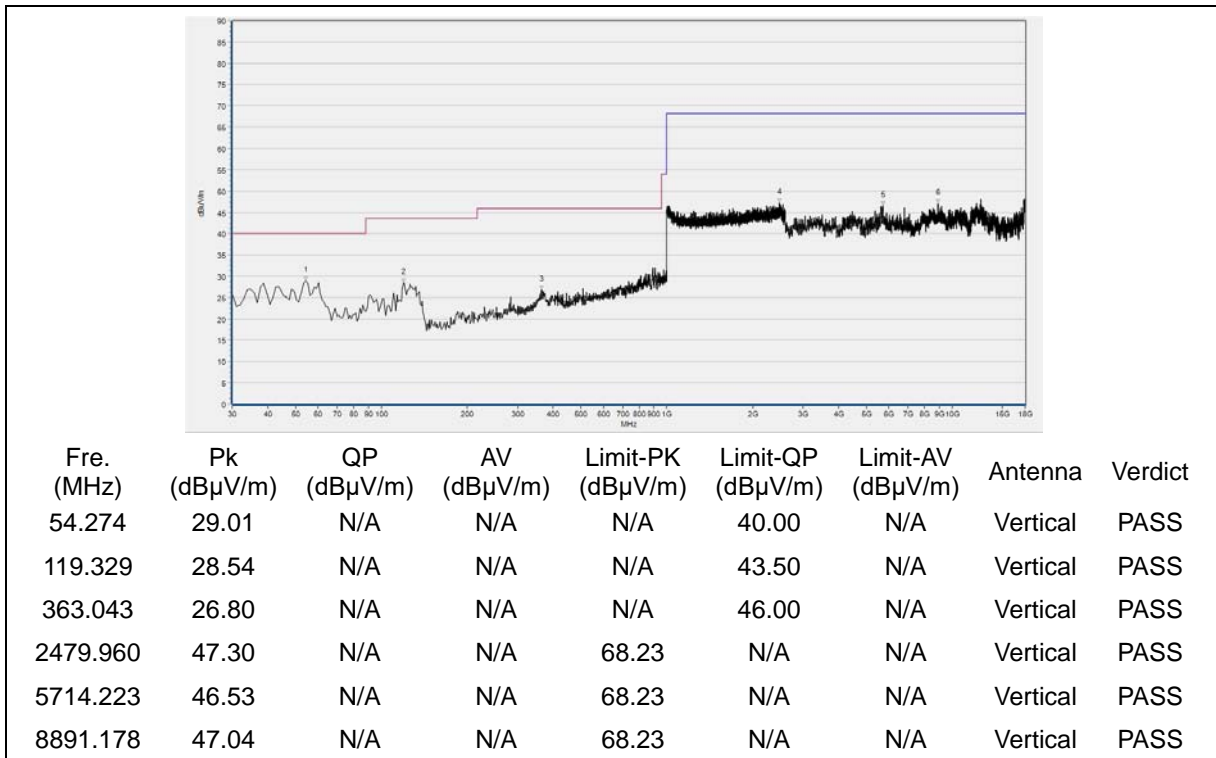


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 157

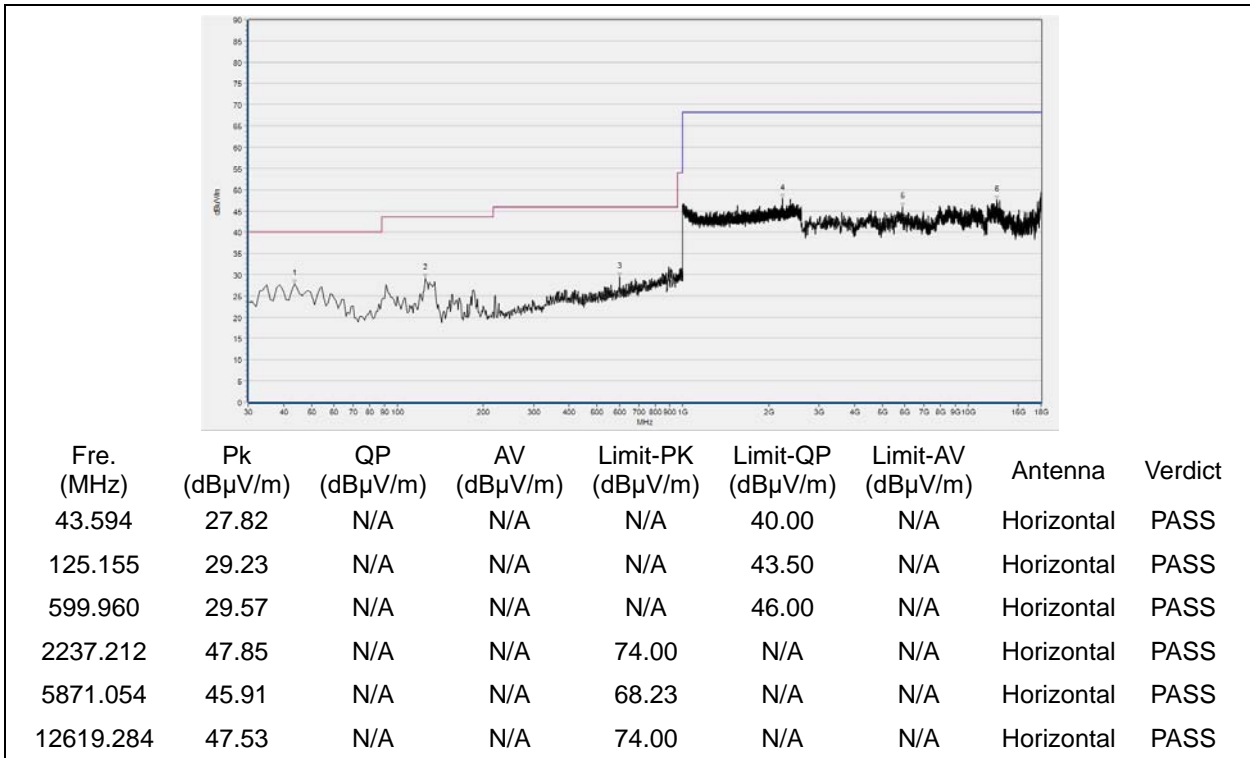


(Antenna Horizontal, 30MHz to 18GHz)

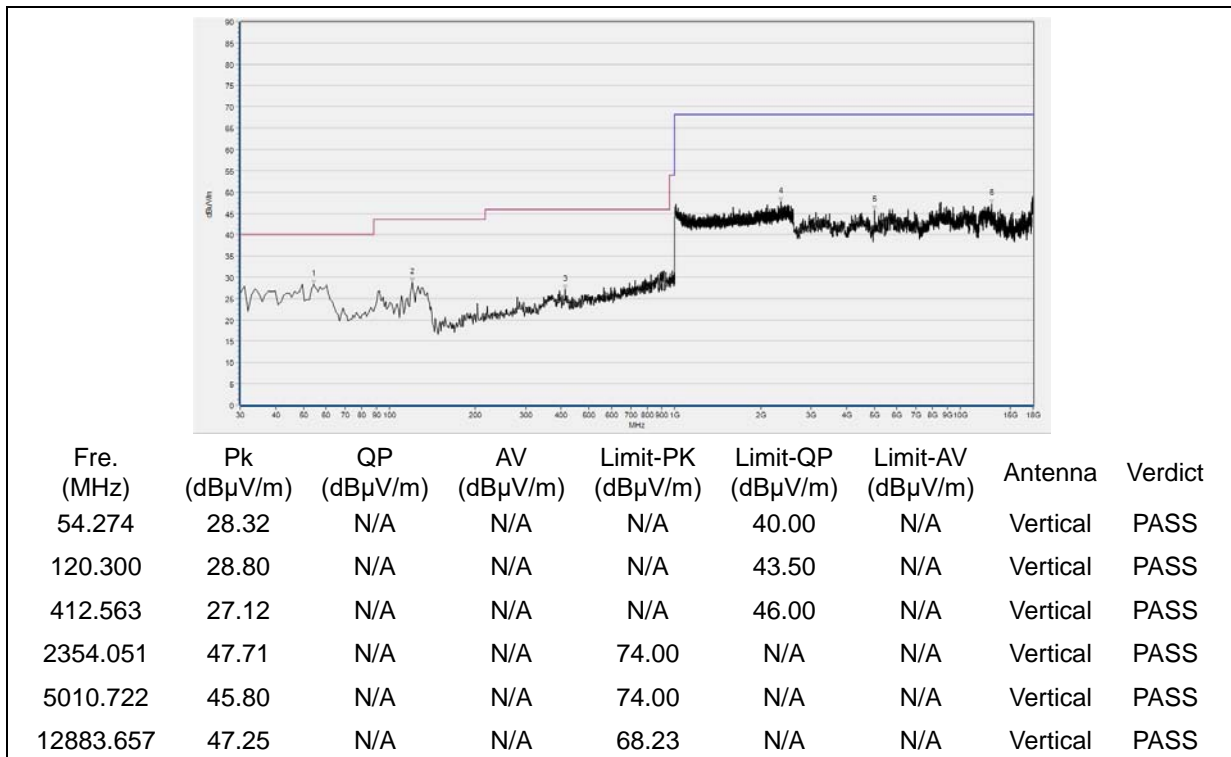


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 165



(Antenna Horizontal, 30MHz to 18GHz)

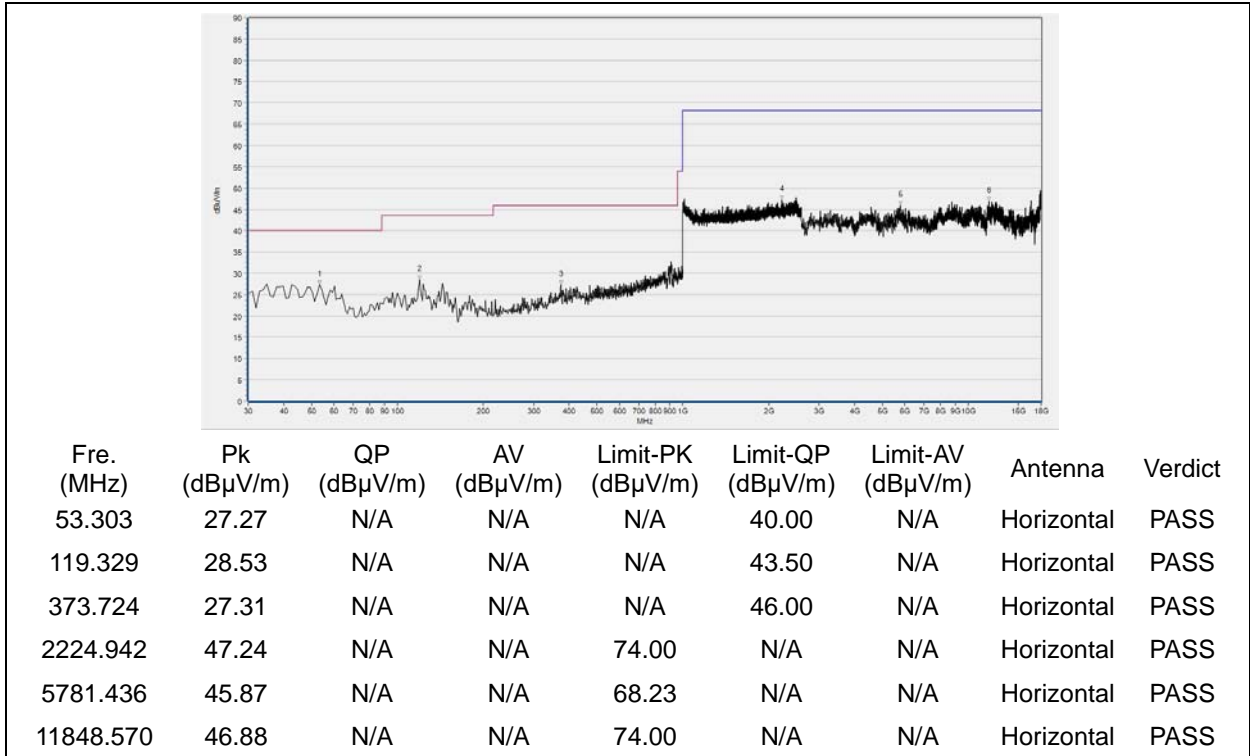


(Antenna Vertical, 30MHz to 18GHz)

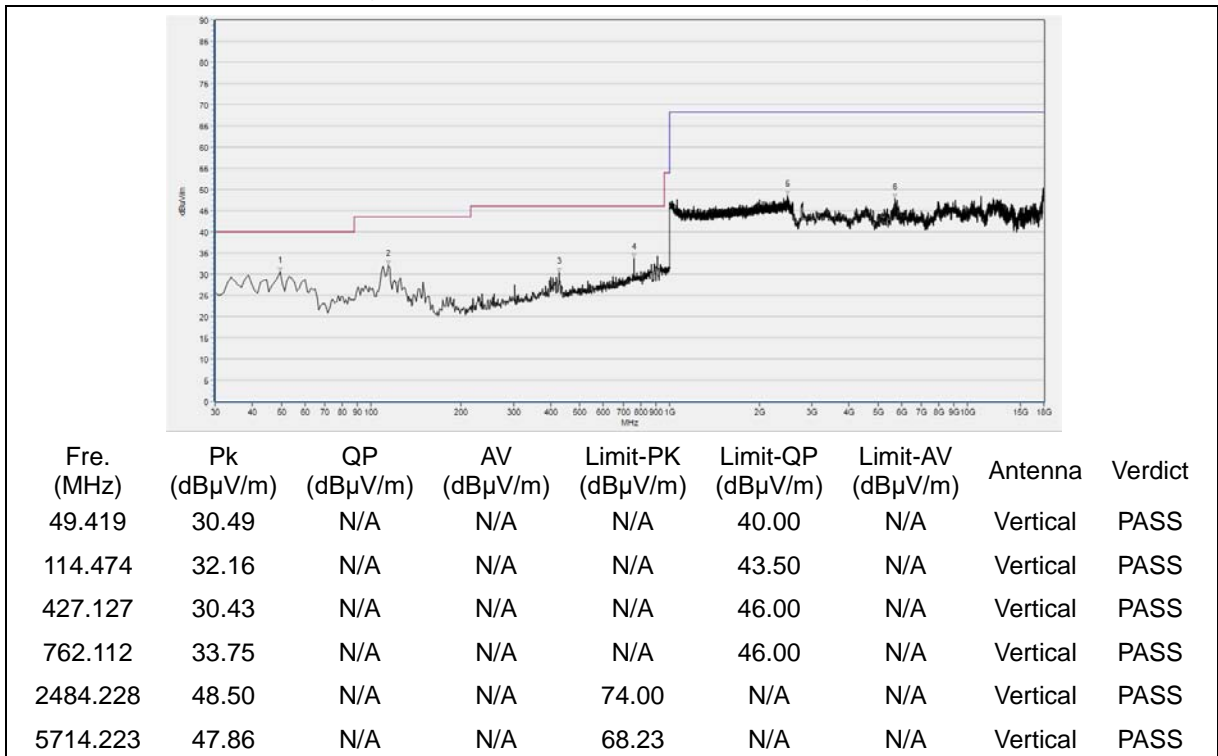


802.11n (HT20) Test mode

Plots for Channel = 36

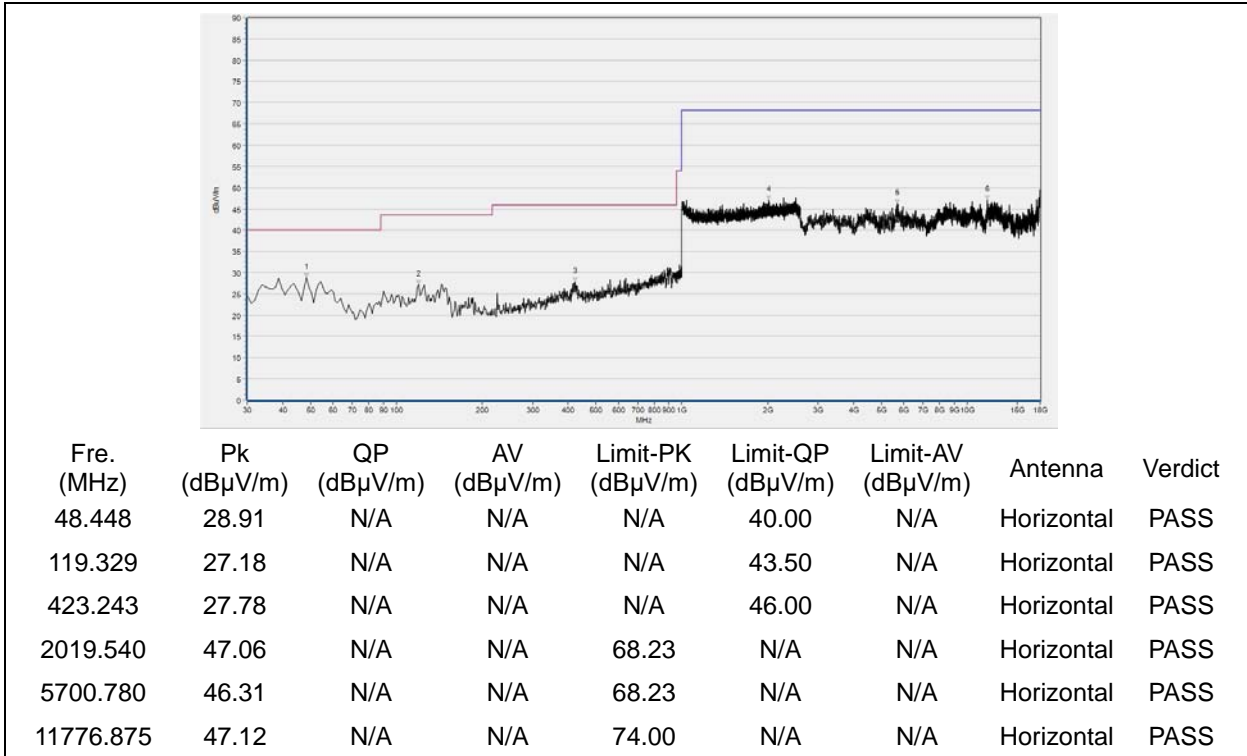


(Antenna Horizontal, 30MHz to 18GHz)

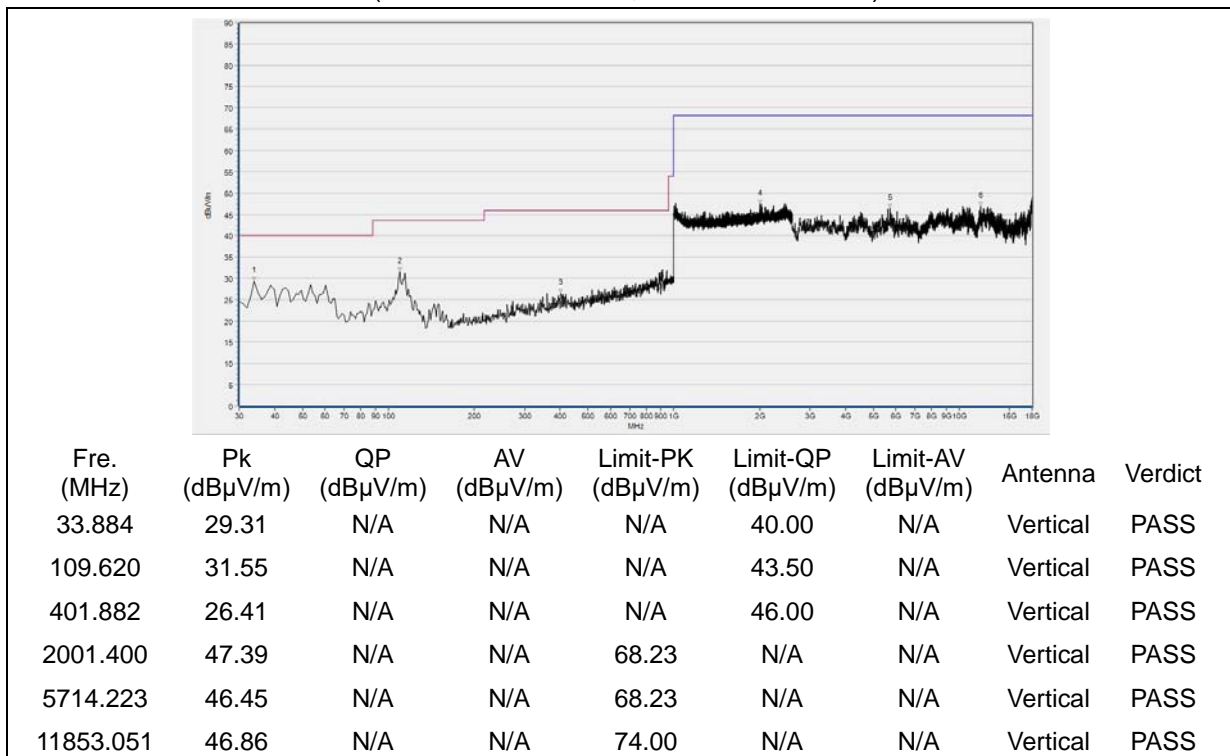


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 44

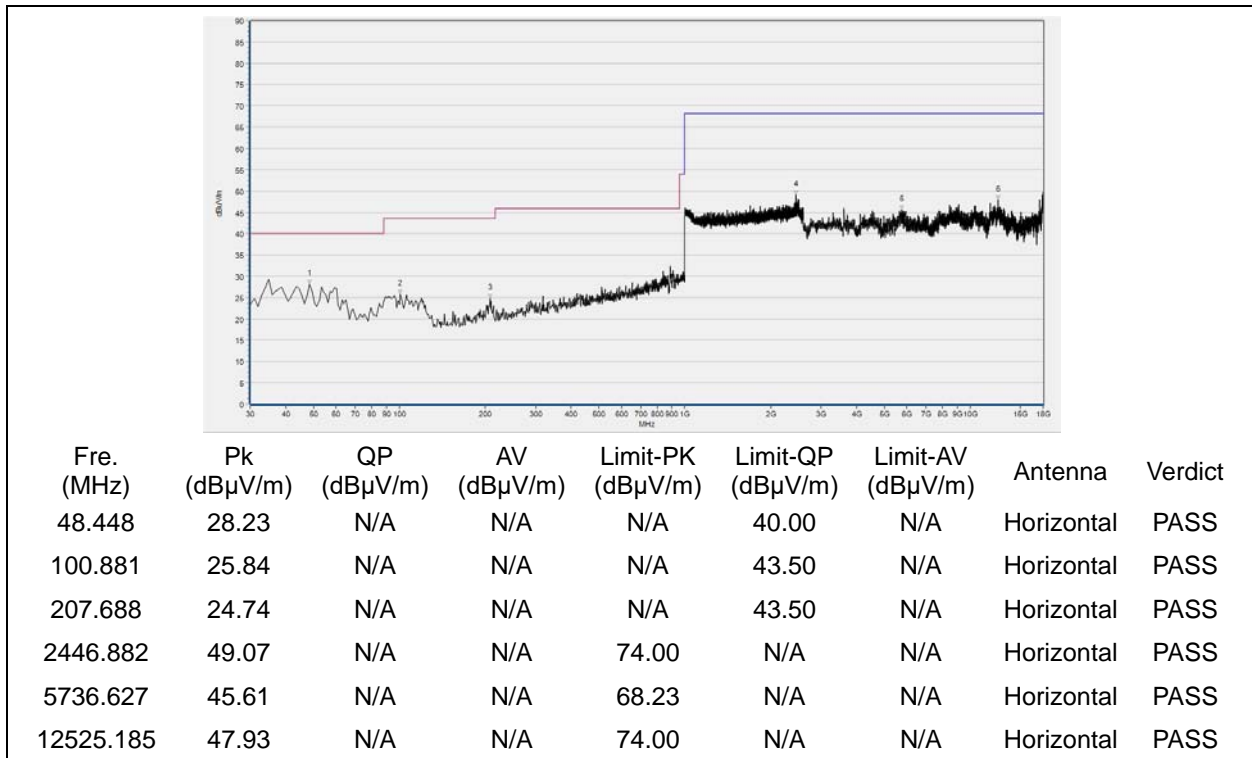


(Antenna Horizontal, 30MHz to 18GHz)

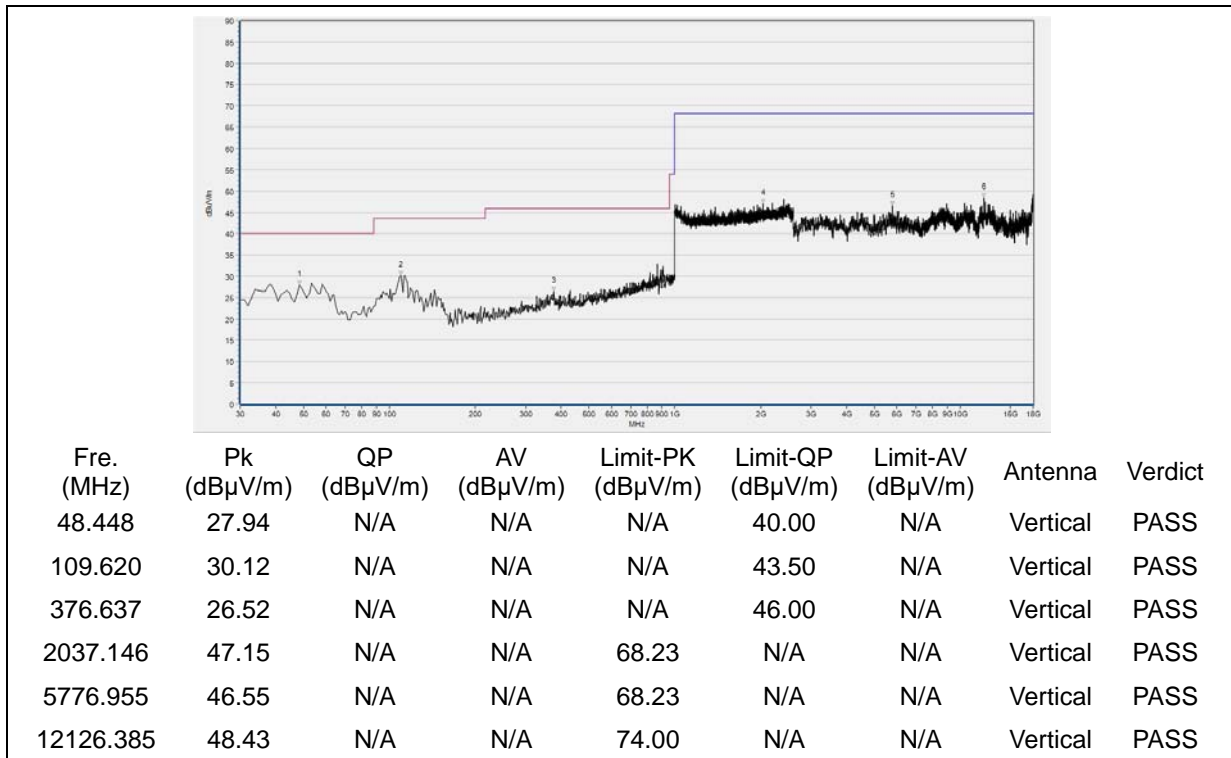


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 48

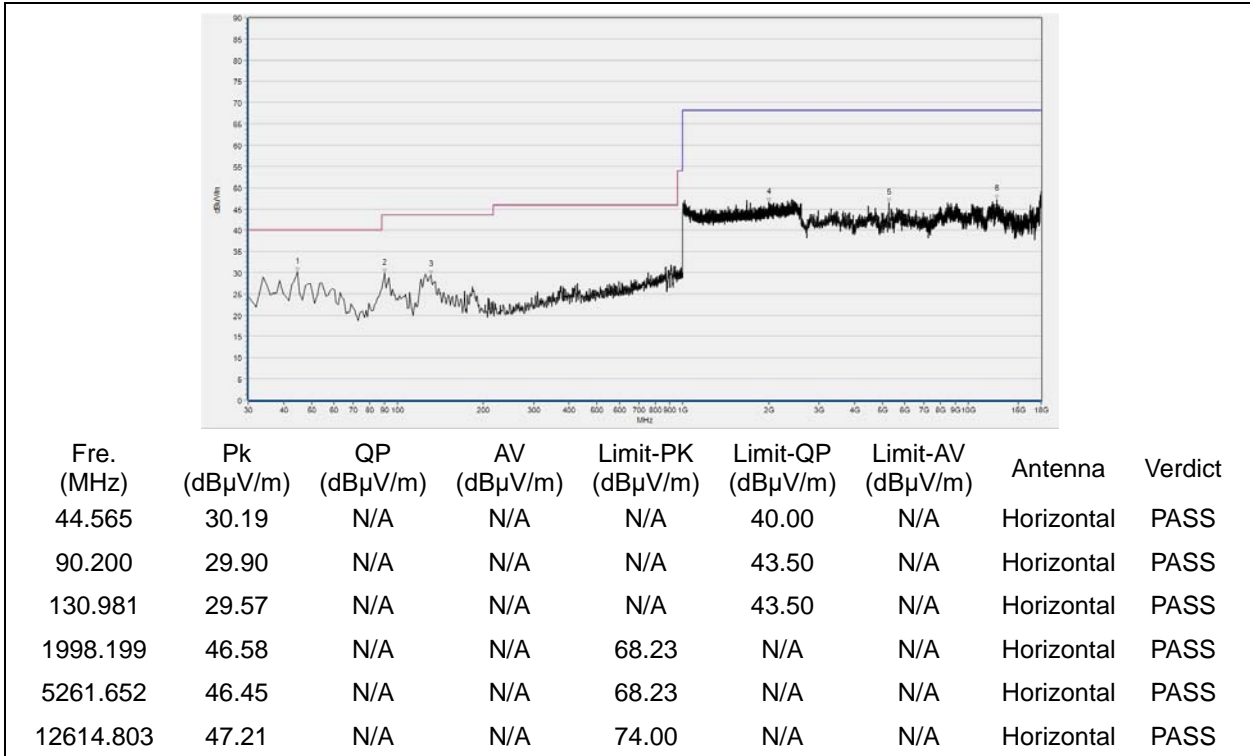


(Antenna Horizontal, 30MHz to 18GHz)

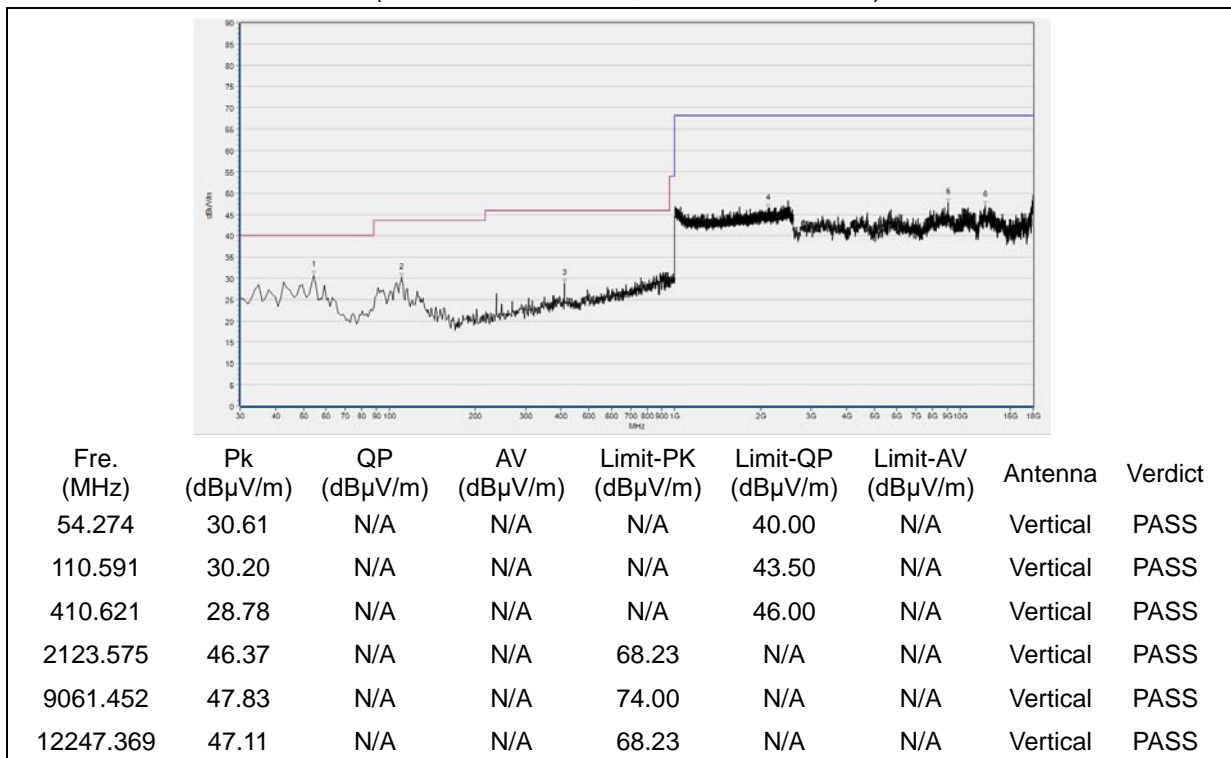


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 52

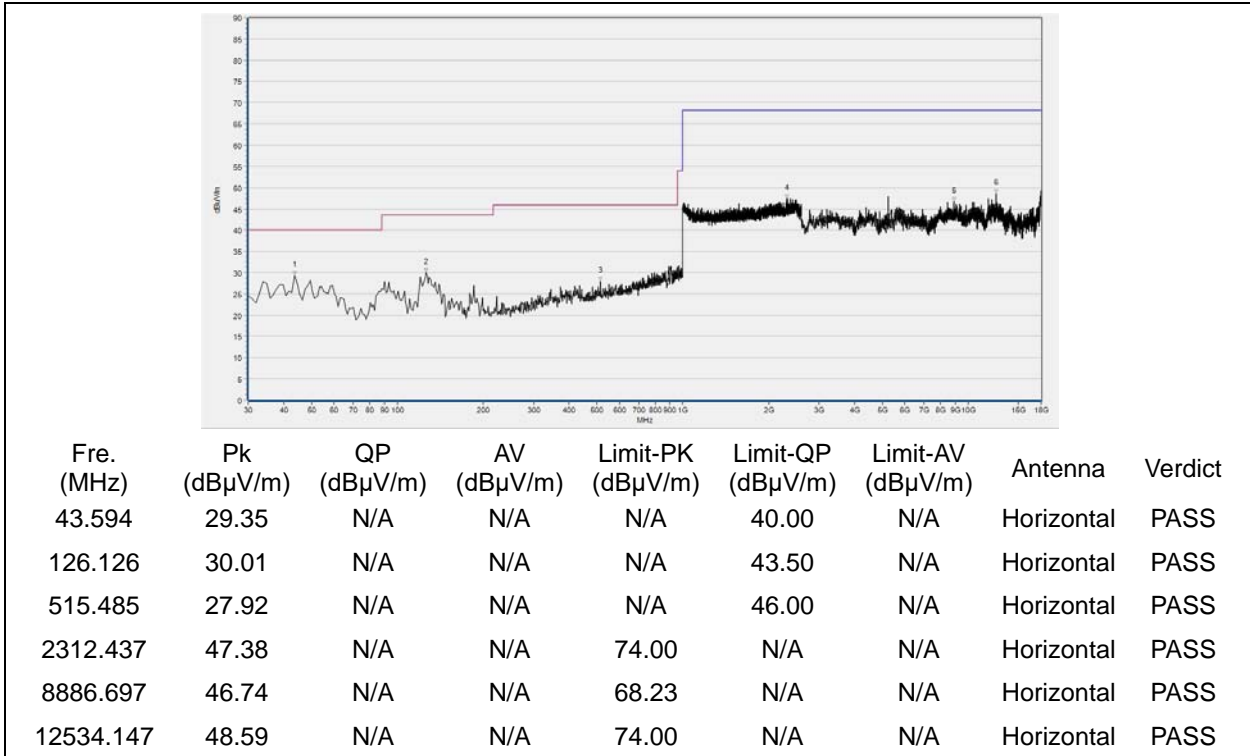


(Antenna Horizontal, 30MHz to 18GHz)

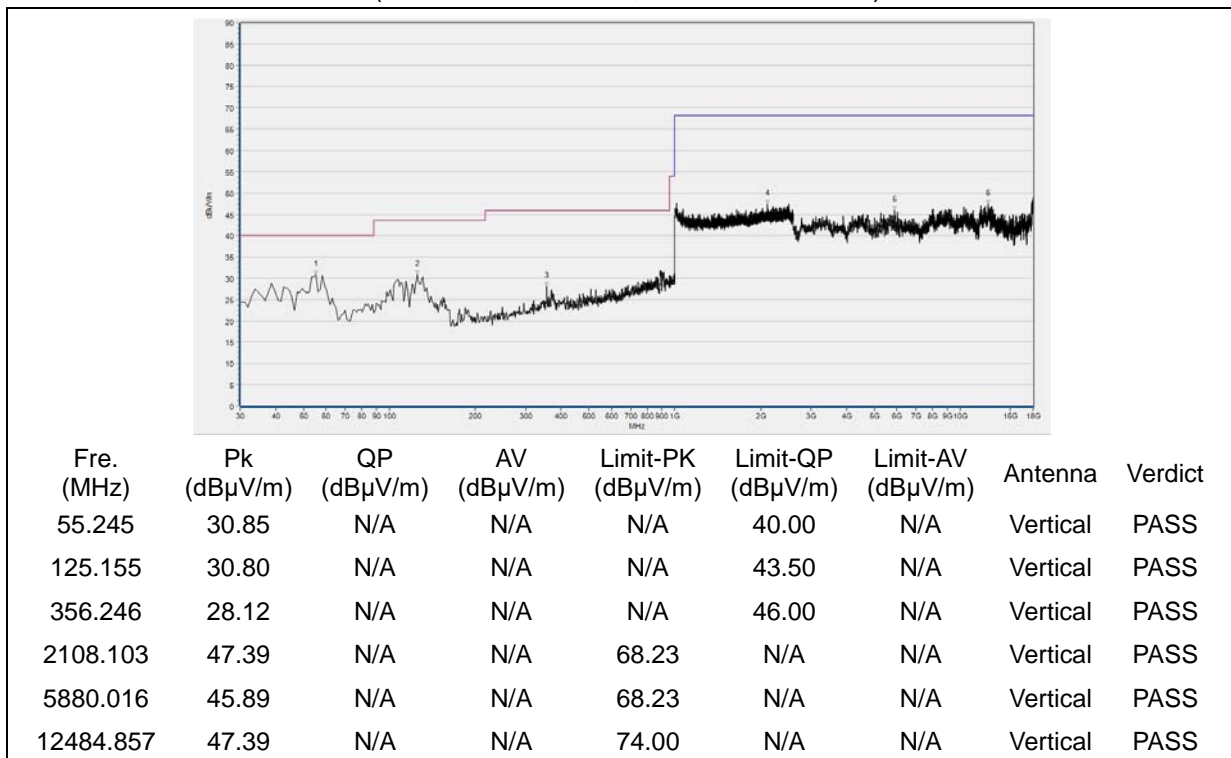


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 60

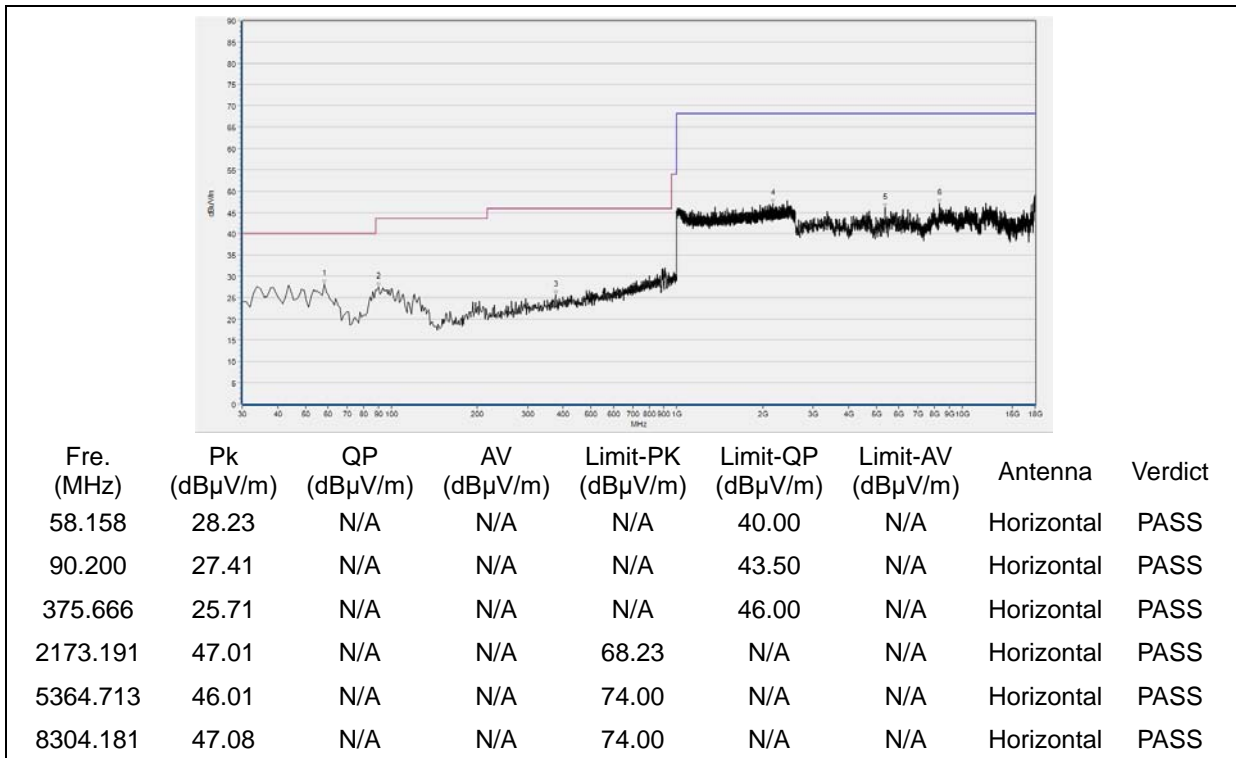


(Antenna Horizontal, 30MHz to 18GHz)

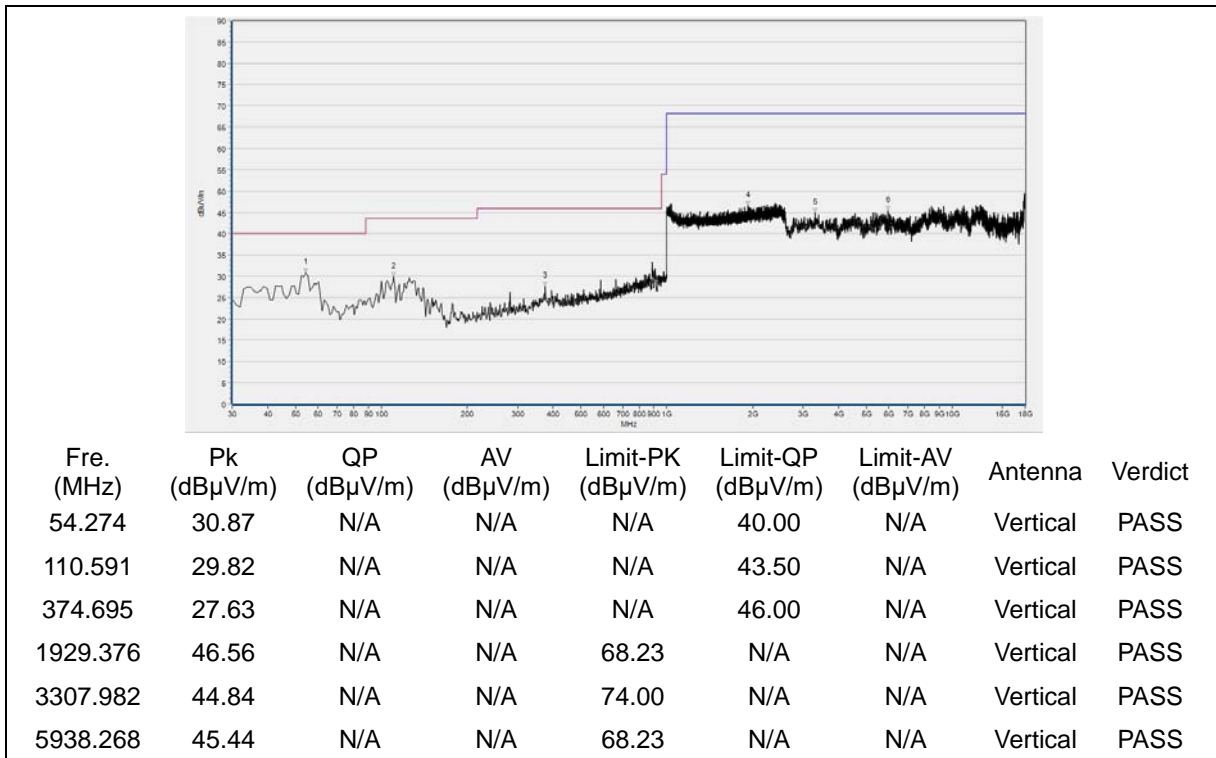


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 64

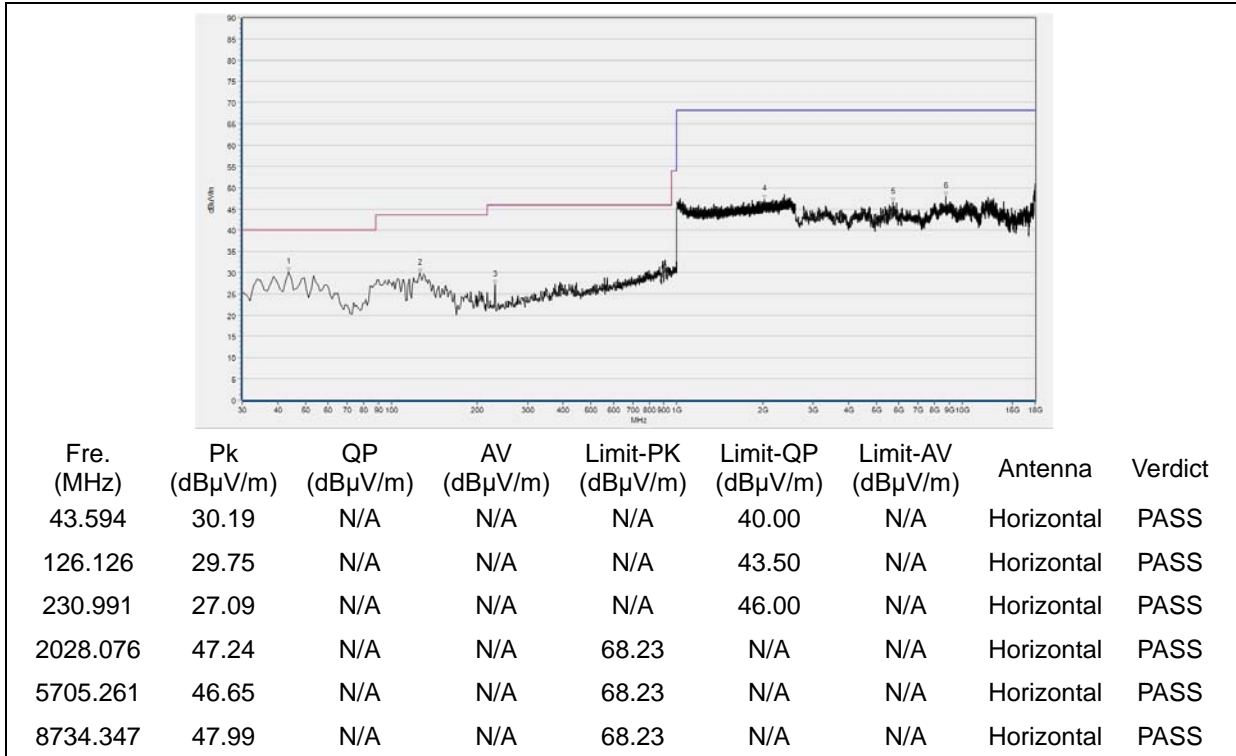


(Antenna Horizontal, 30MHz to 18GHz)

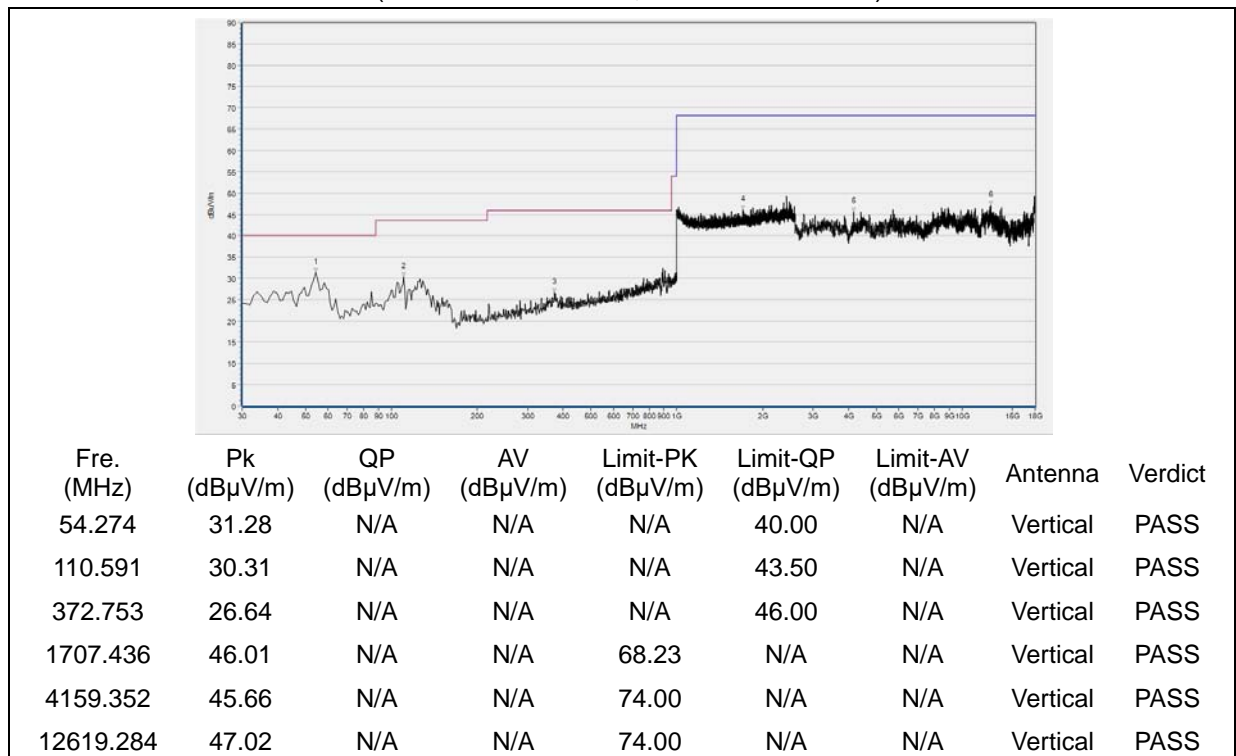


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 100

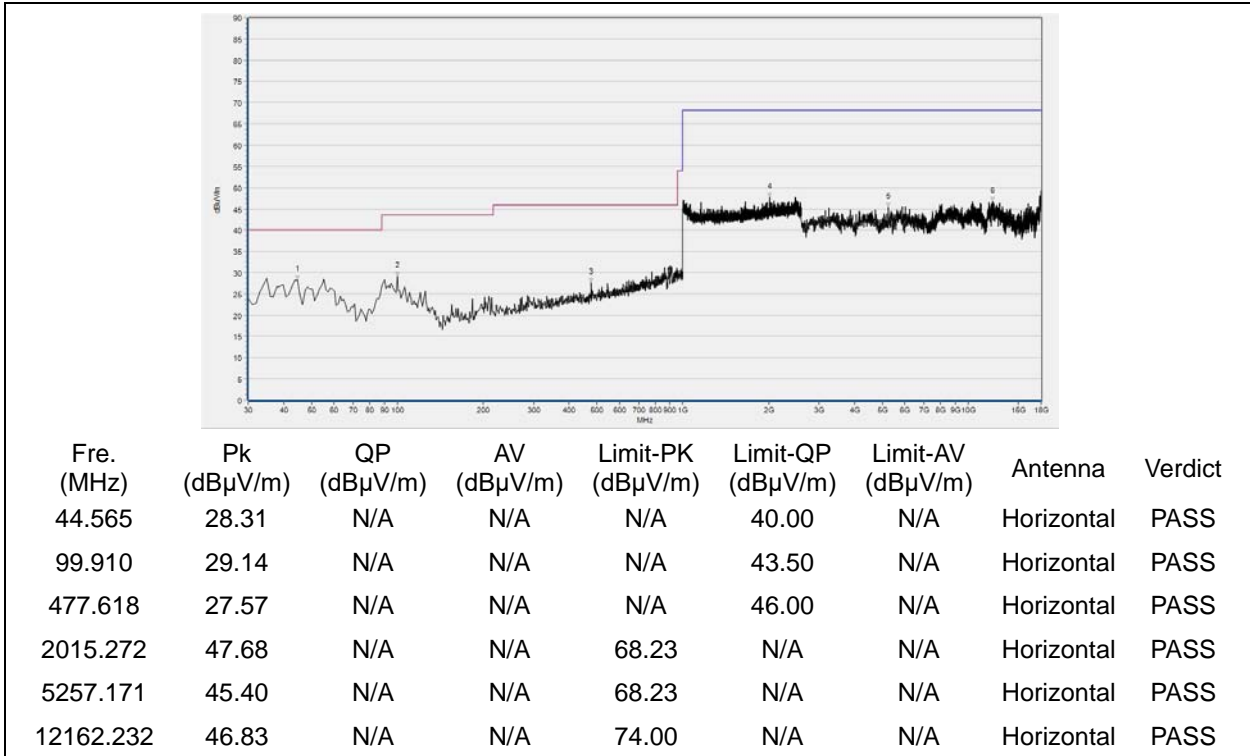


(Antenna Horizontal, 30MHz to 18GHz)

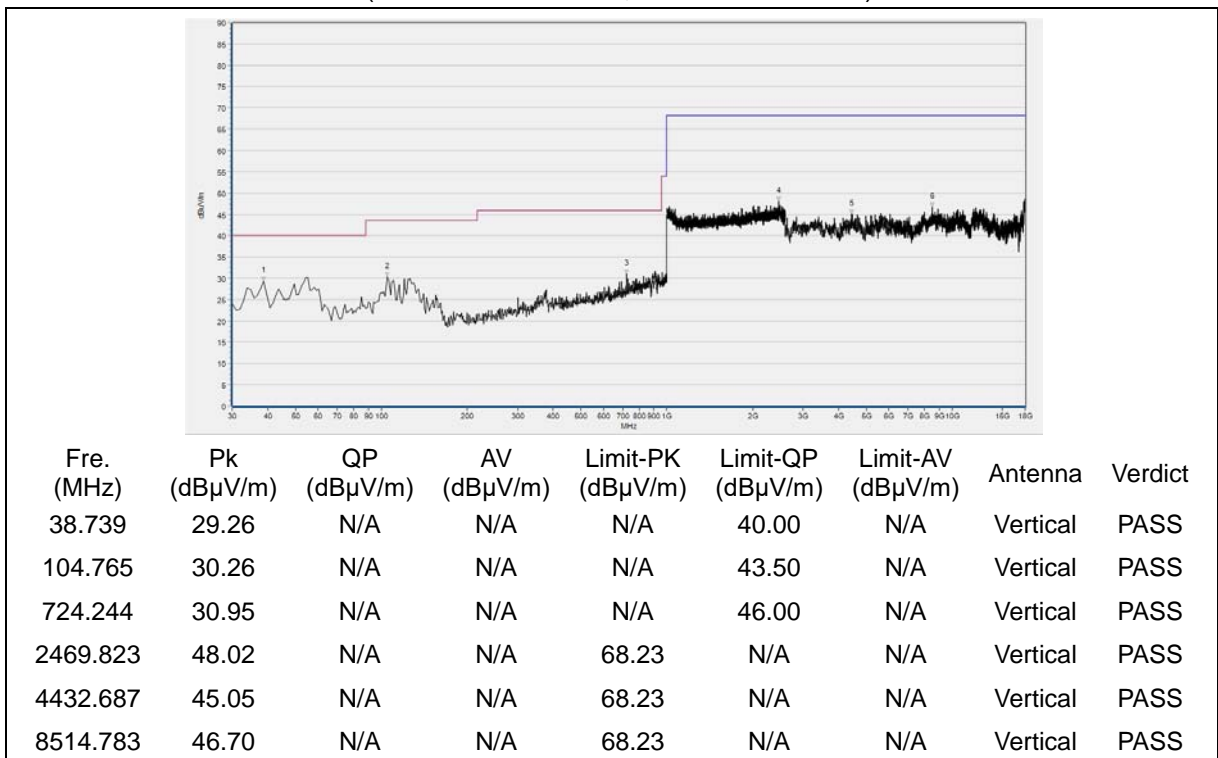


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 120

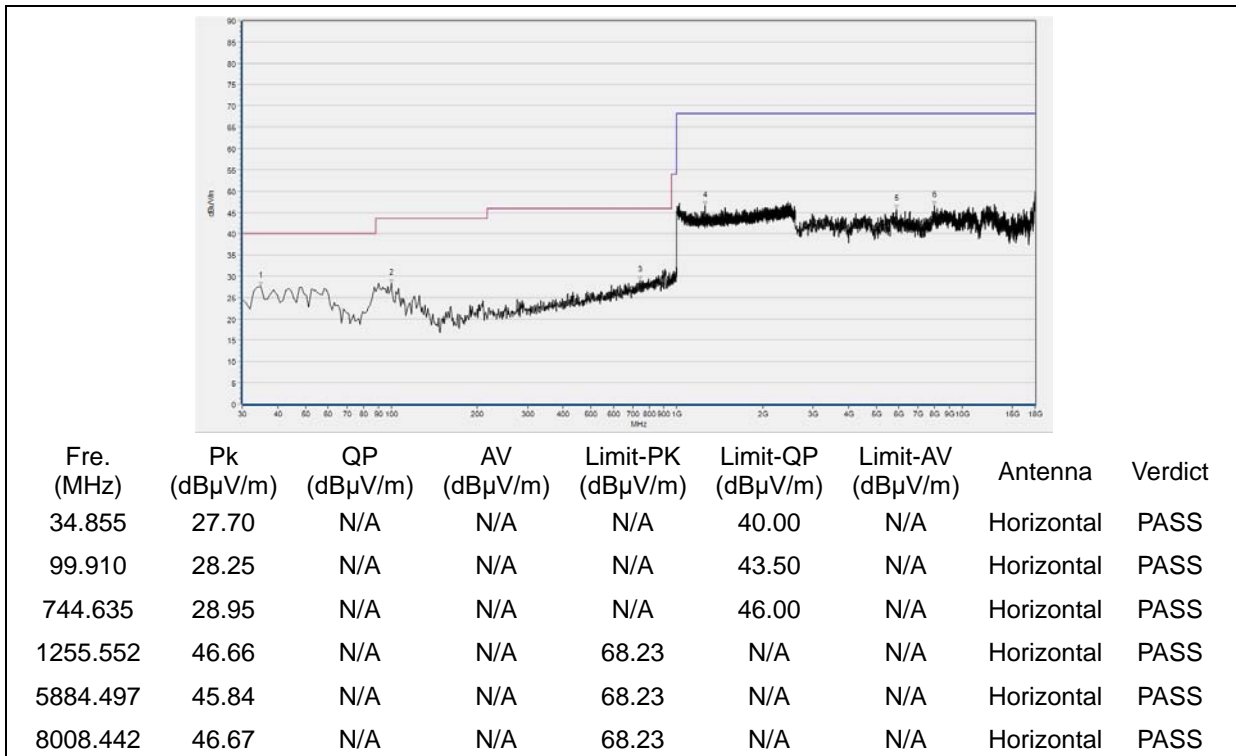


(Antenna Horizontal, 30MHz to 18GHz)

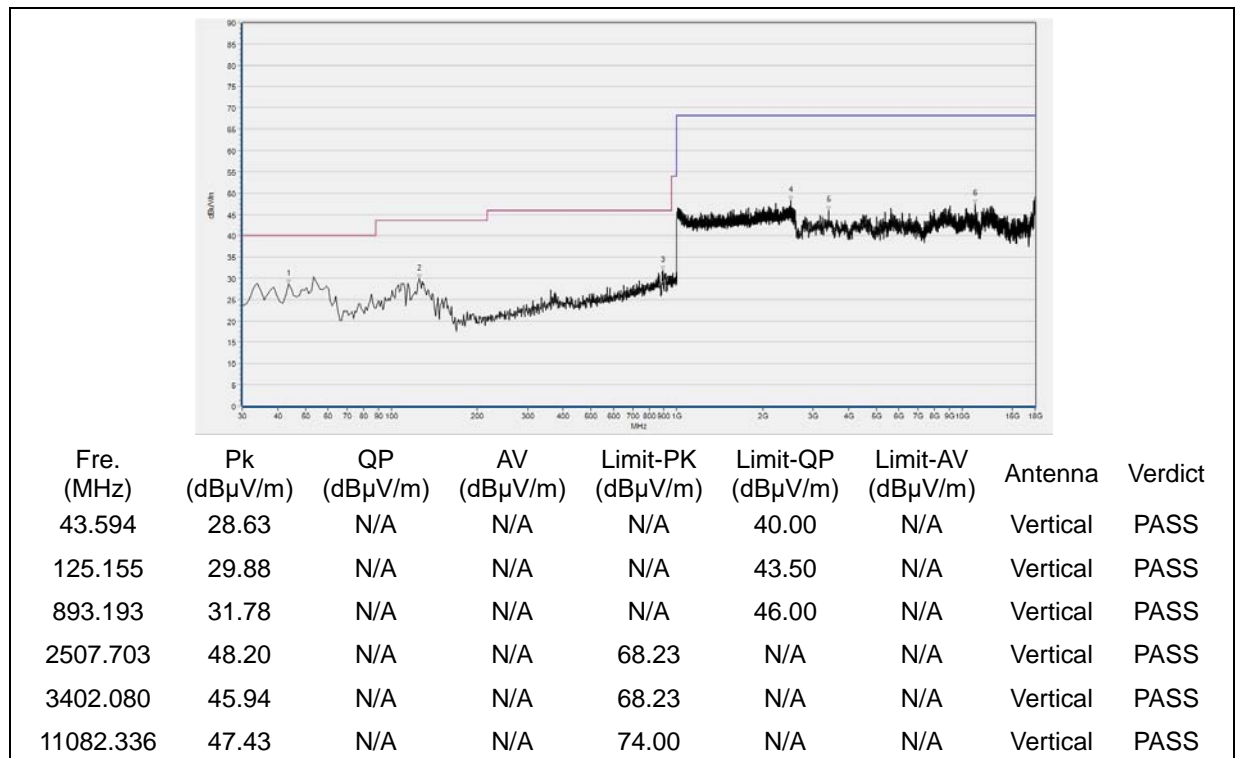


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 142

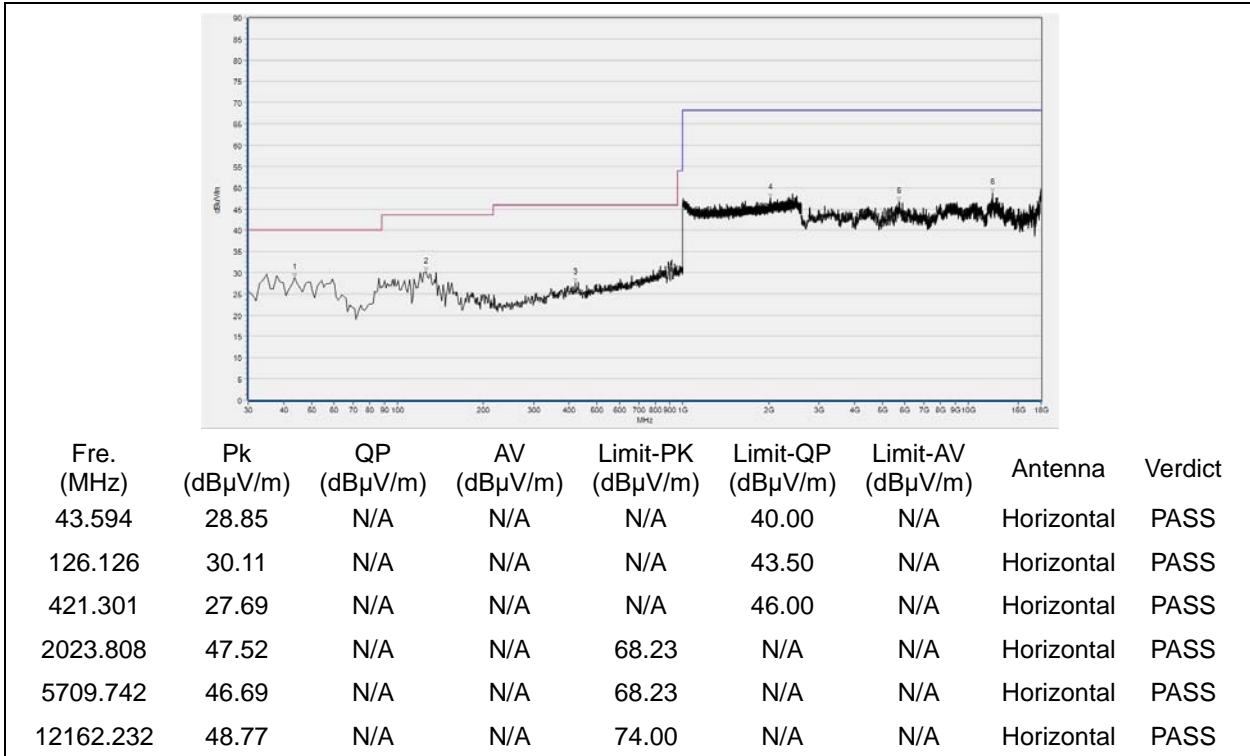


(Antenna Horizontal, 30MHz to 18GHz)

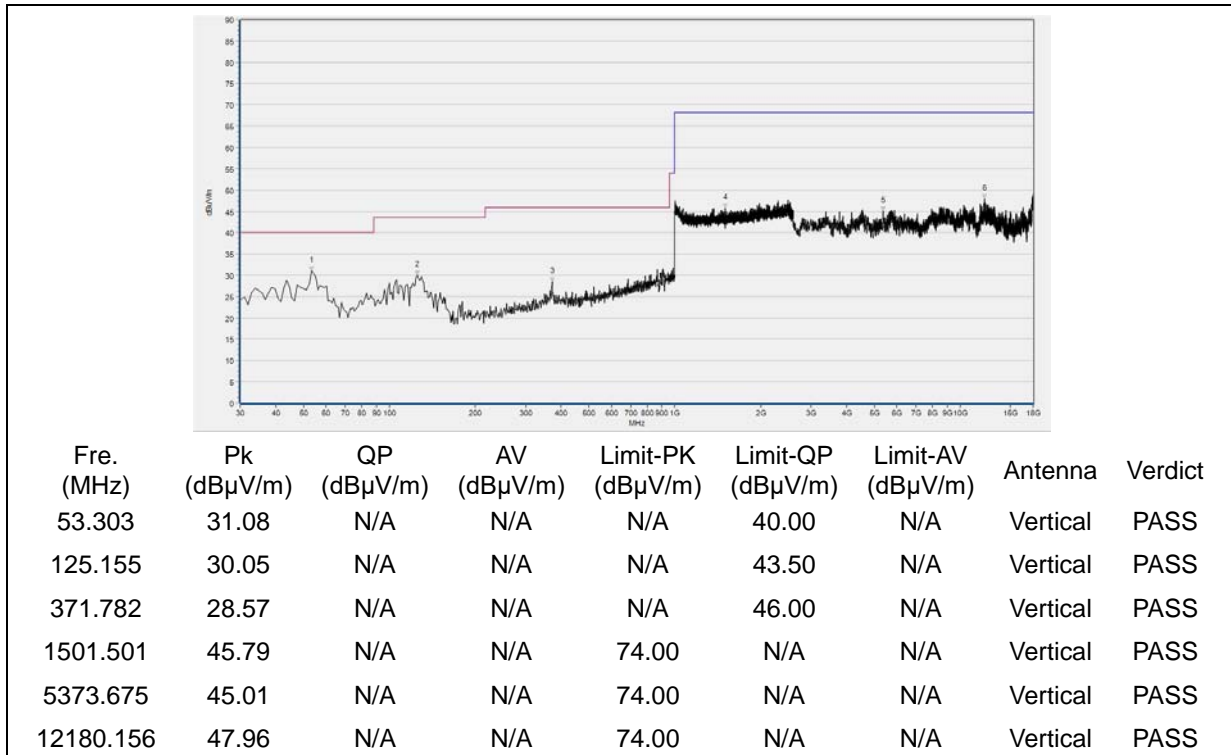


(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 149

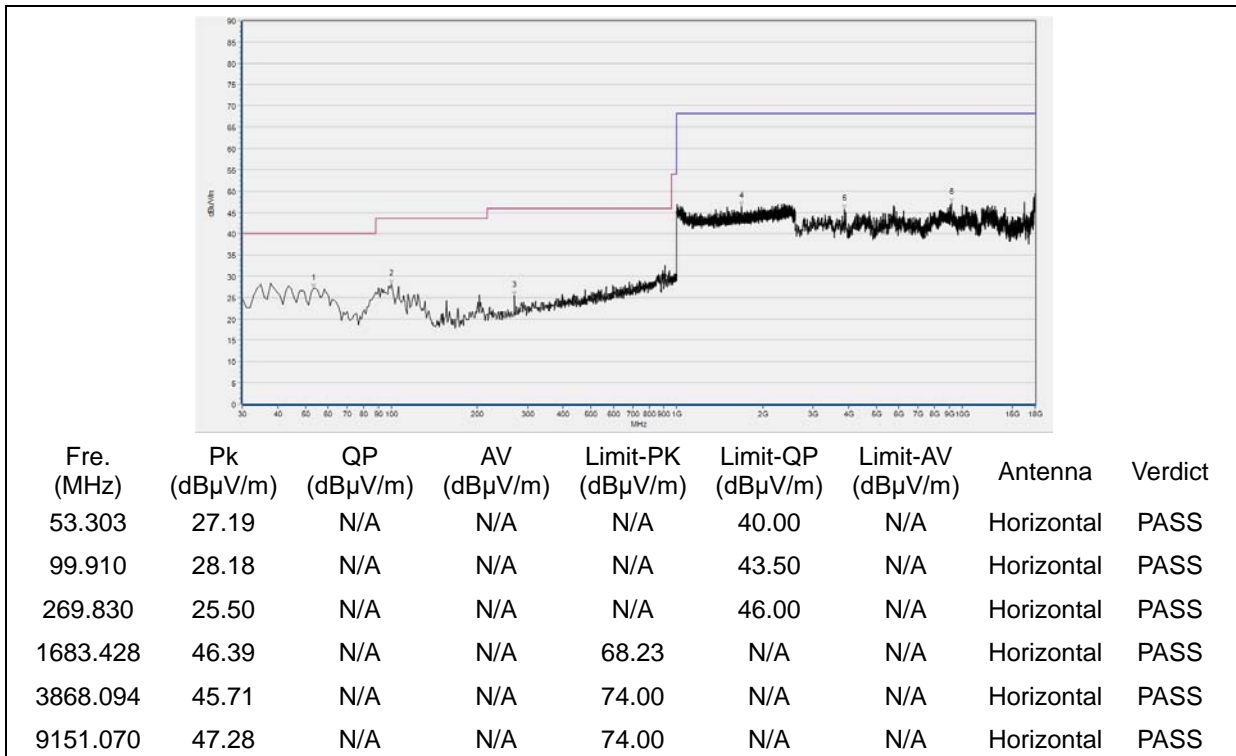


(Antenna Horizontal, 30MHz to 18GHz)

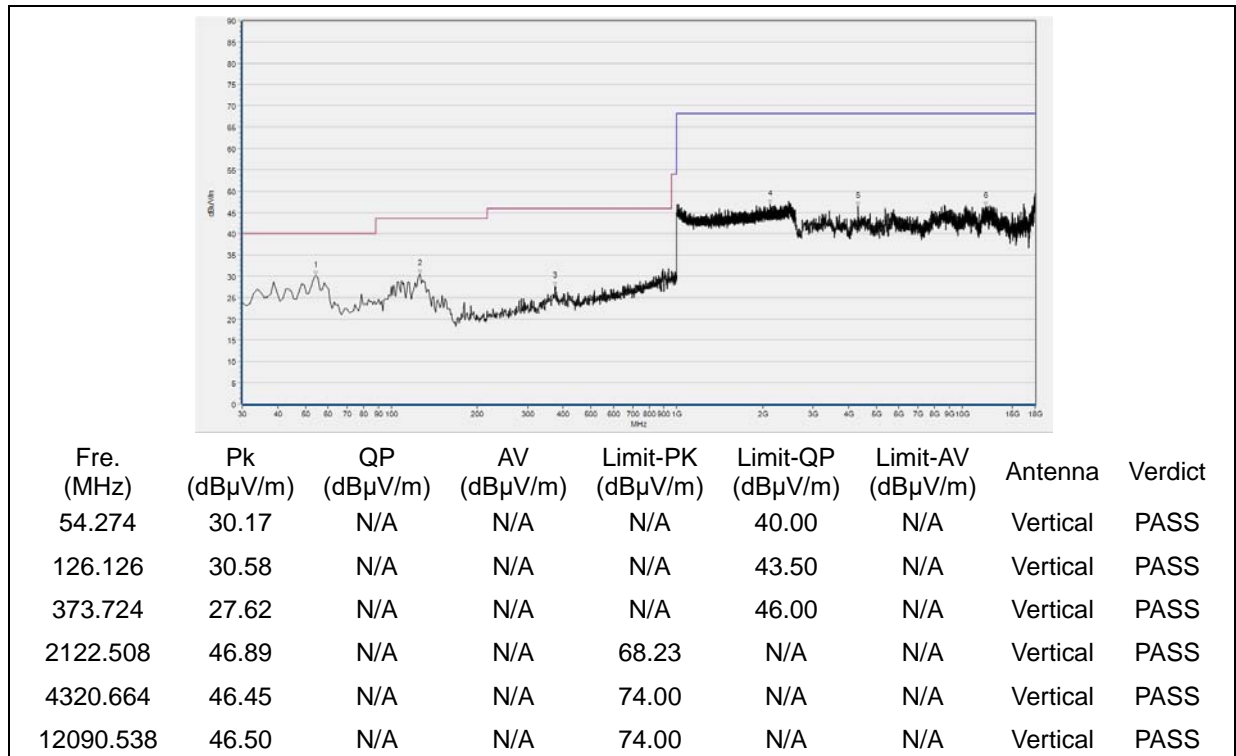


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 157

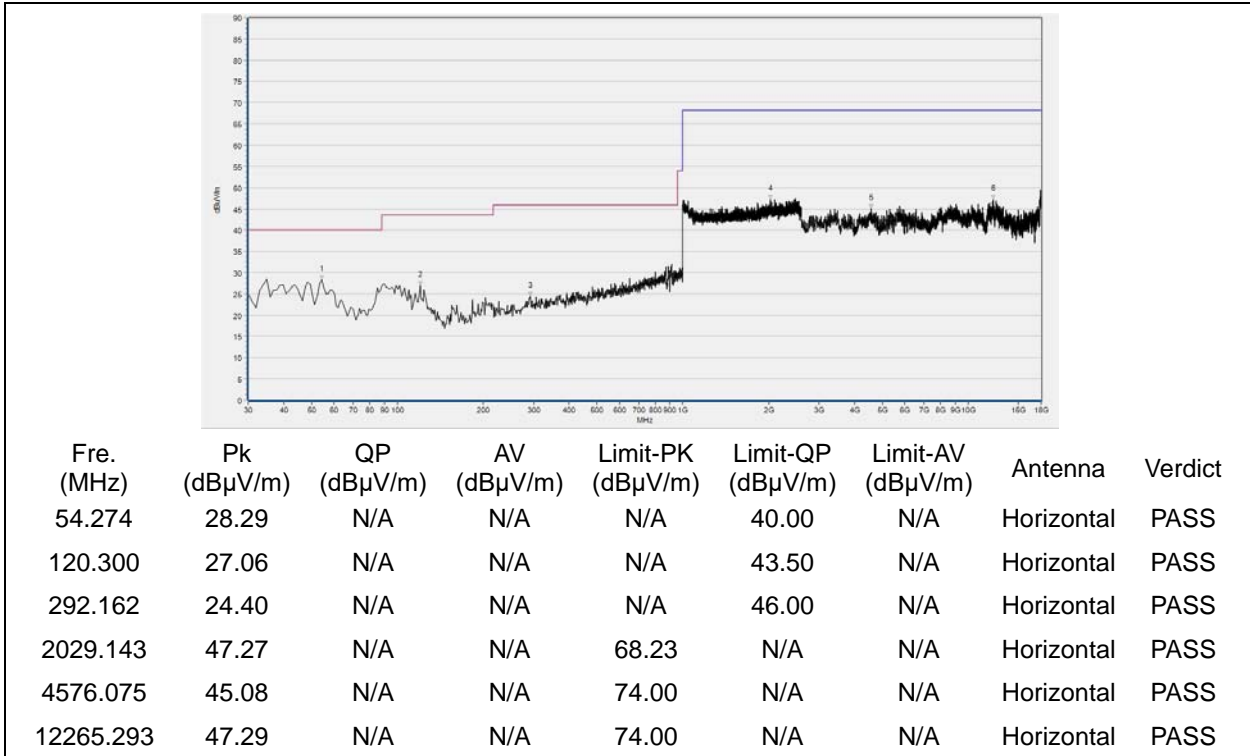


(Antenna Horizontal, 30MHz to 18GHz)

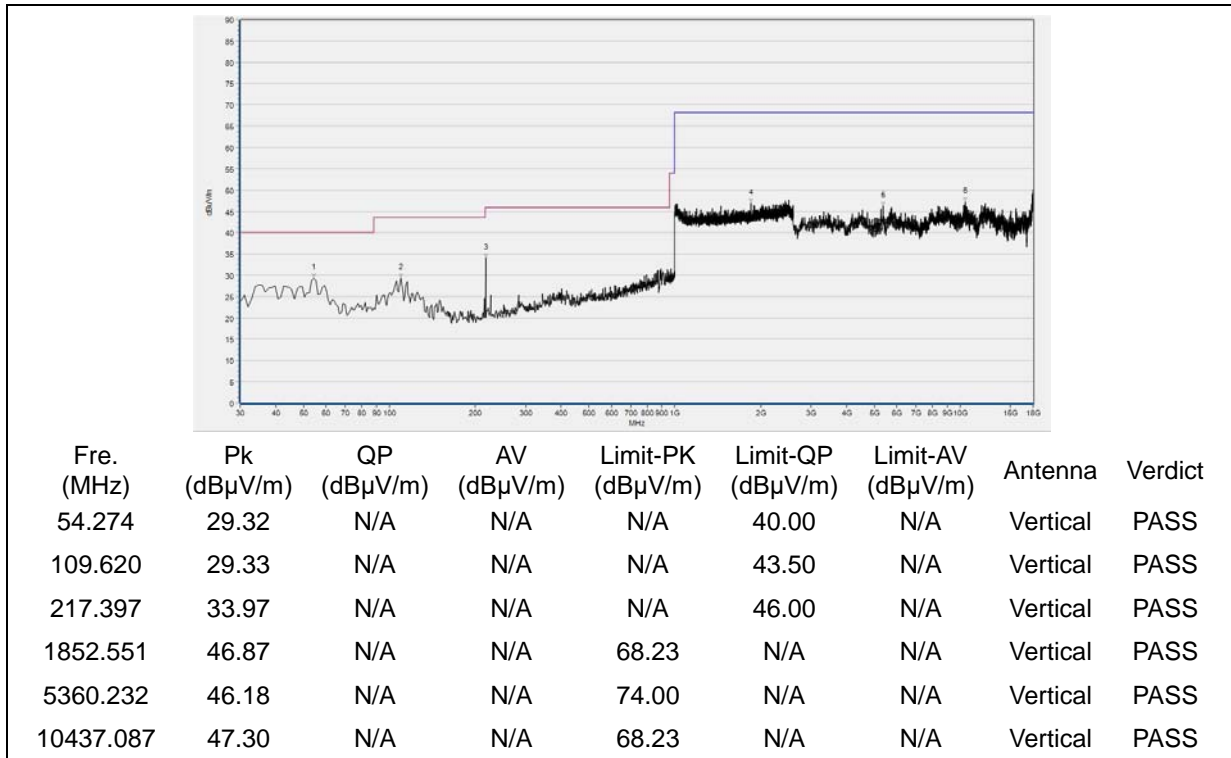


(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 165



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)