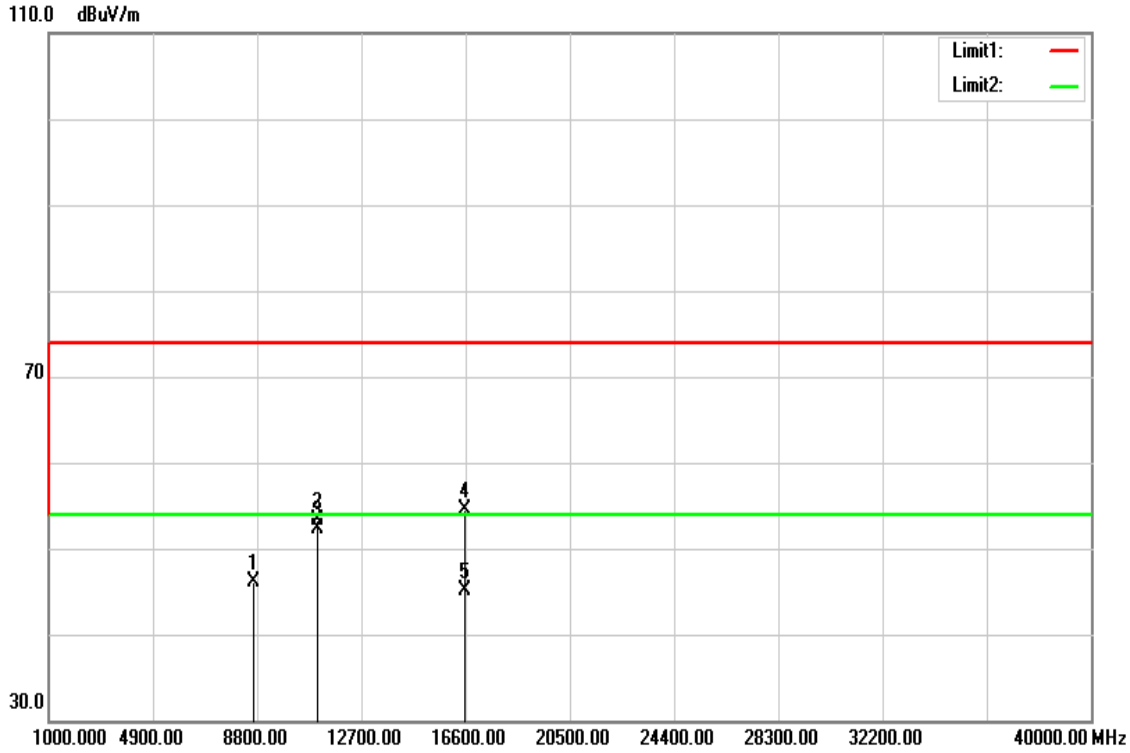
Test Mode	IEEE 802.11ac VHT80 Mid CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz



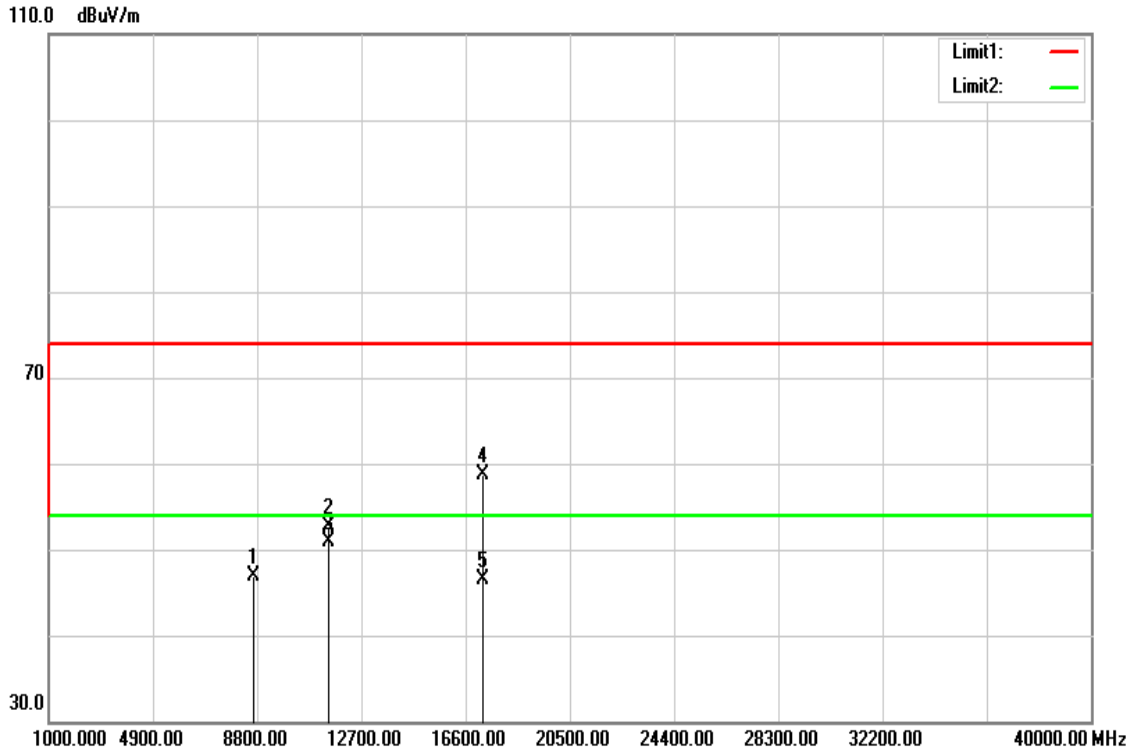
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	R mark
8660.000	32.40	13.71	46.11	74.00	-27.89	peak
11060.000	36.62	16.74	53.36	74.00	-20.64	peak
11060.000	35.57	16.74	52.31	54.00	-1.69	AVG
16590.000	32.58	21.92	54.50	74.00	-19.50	peak
16590.000	23.27	21.92	45.19	54.00	-8.81	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Above 1G Test Data for UNII-3

Test Mode	IEEE 802.11a Low CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

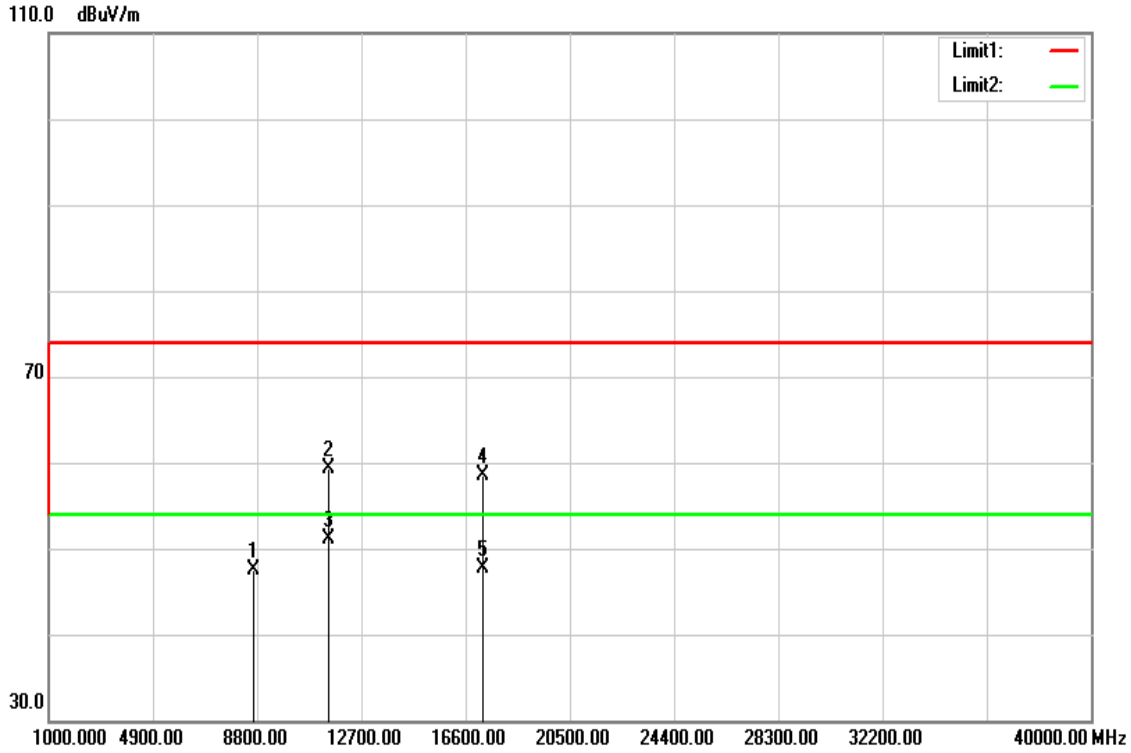


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBu /m)	Margin (dB)	Remark
8690.000	33.17	13.73	46.90	74.00	-27.10	peak
11490.000	35.91	16.78	52.69	74.00	-21.31	peak
11490.000	34.20	16.78	50.98	54.00	-3.02	AVG
17235.000	33.48	25.28	58.76	74.00	-15.24	peak
17235.000	21.30	25.28	46.58	54.00	-7.42	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11a Low CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

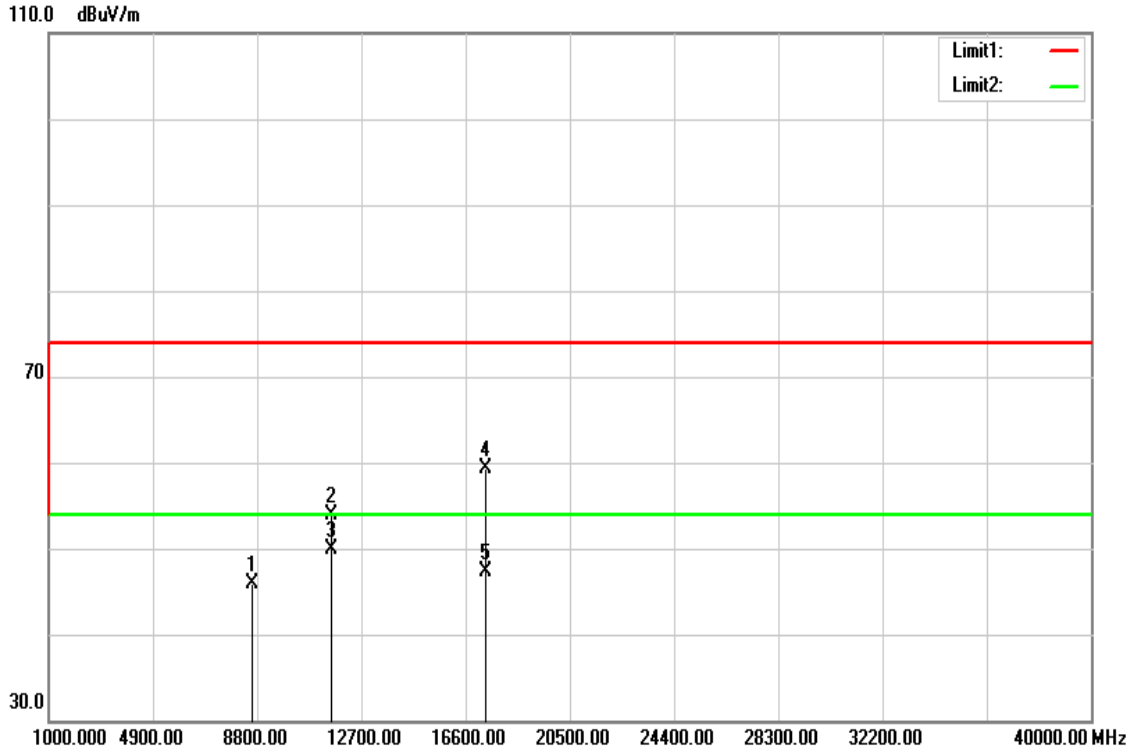


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
8660.000	33.71	13.71	47.42	74.00	-26.58	peak
11490.000	42.44	16.78	59.22	74.00	-14.78	peak
11490.000	34.25	16.78	51.03	54.00	-2.97	AVG
17235.000	33.16	25.28	58.44	74.00	-15.56	peak
17235.000	22.45	25.28	47.73	54.00	-6.27	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11a Mid CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

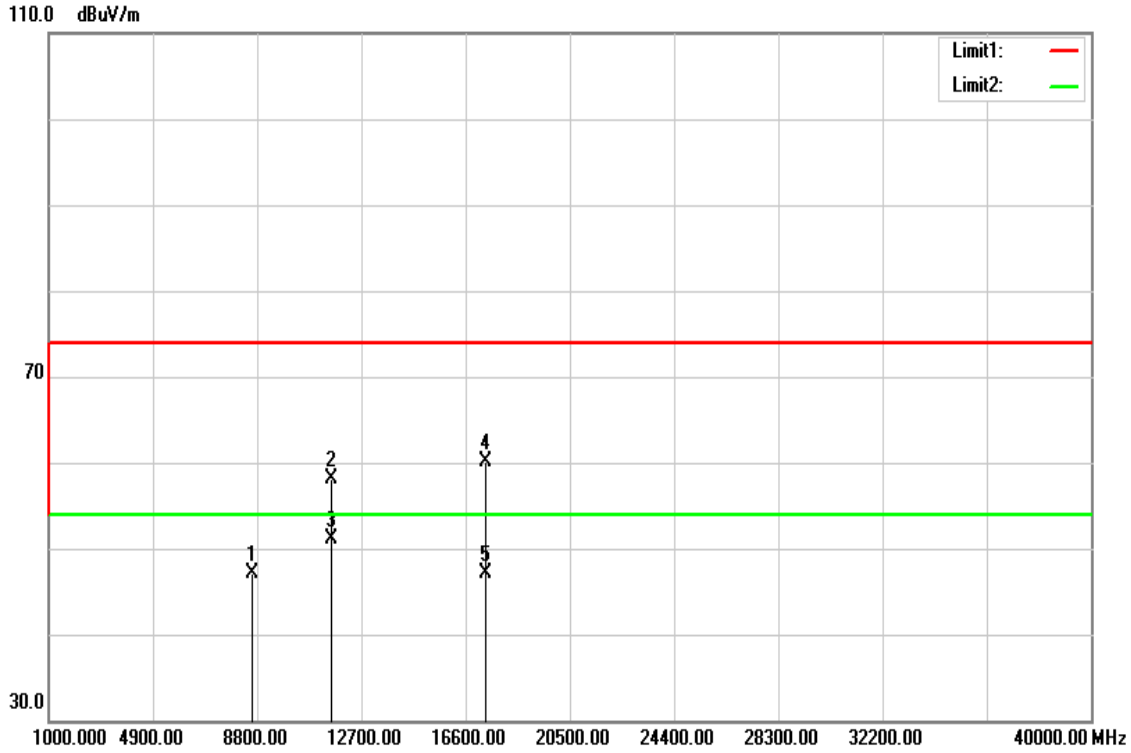


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Rem rk
8640.000	32.15	13.70	45.85	74.00	-28.15	peak
11570.000	37.11	16.84	53.95	74.00	-20.05	peak
11570.000	33.01	16.84	49.85	54.00	-4.15	AVG
17355.000	33.61	25.75	59.36	74.00	-14.64	peak
17355.000	21.45	25.75	47.20	54.00	-6.80	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11a Mid CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

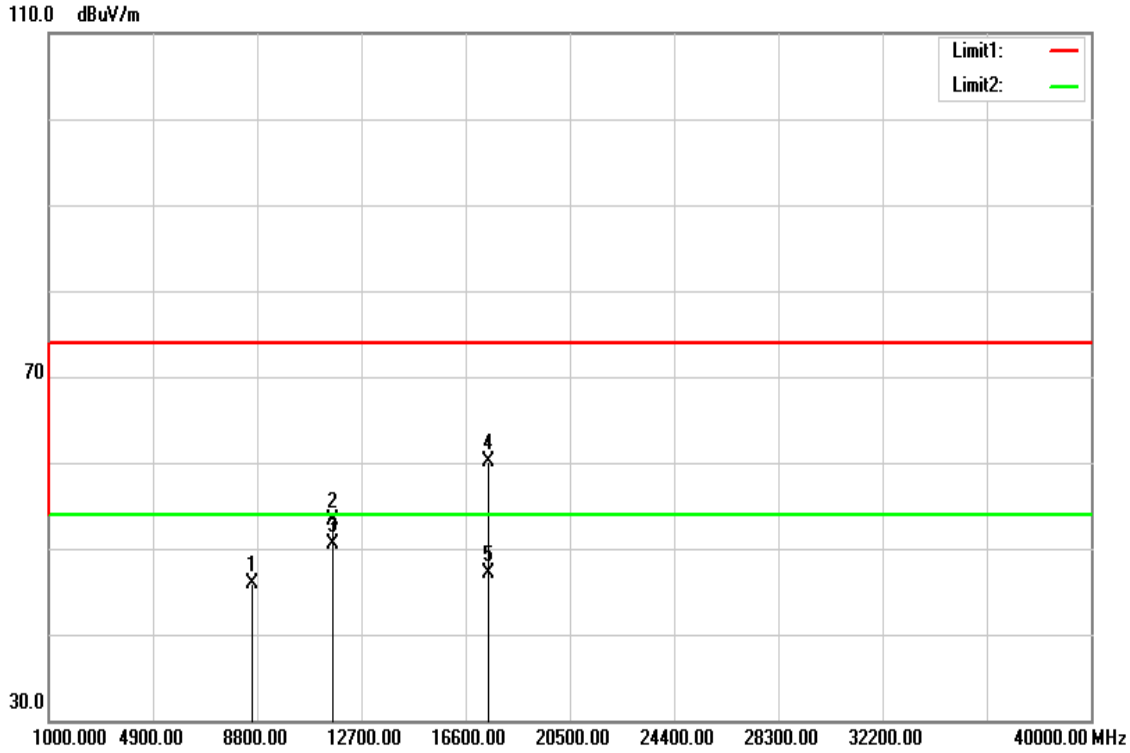


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	R mark
8610.000	33.47	13.69	47.16	74.00	-26.84	peak
11570.000	41.30	16.84	58.14	74.00	-15.86	peak
11570.000	34.21	16.84	51.05	54.00	-2.95	AVG
17355.000	34.40	25.75	60.15	74.00	-13.85	peak
17355.000	21.42	25.75	47.17	54.00	-6.83	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11a High CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

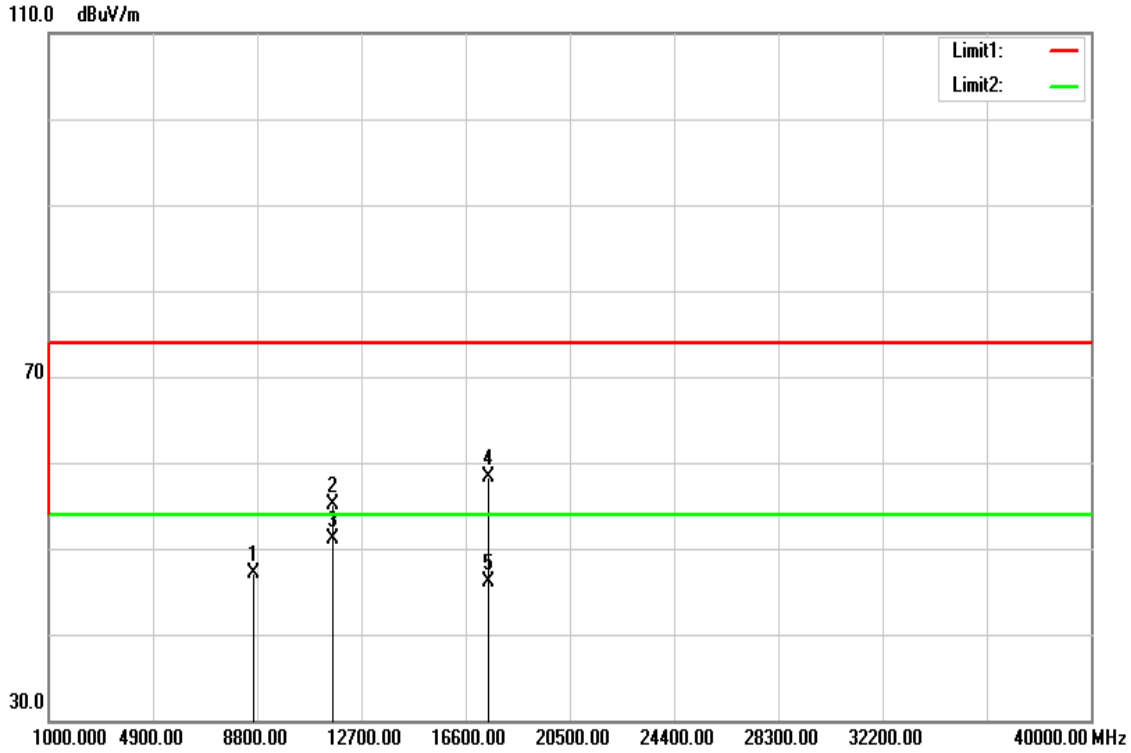


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Rem rk
8620.000	32.29	13.70	45.99	74.00	-28.01	peak
11650.000	36.46	16.91	53.37	74.00	-20.63	peak
11650.000	33.50	16.91	50.41	54.00	-3.59	AVG
17475.000	33.86	26.22	60.08	74.00	-13.92	peak
17475.000	20.79	26.22	47.01	54.00	-6.99	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11a High CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

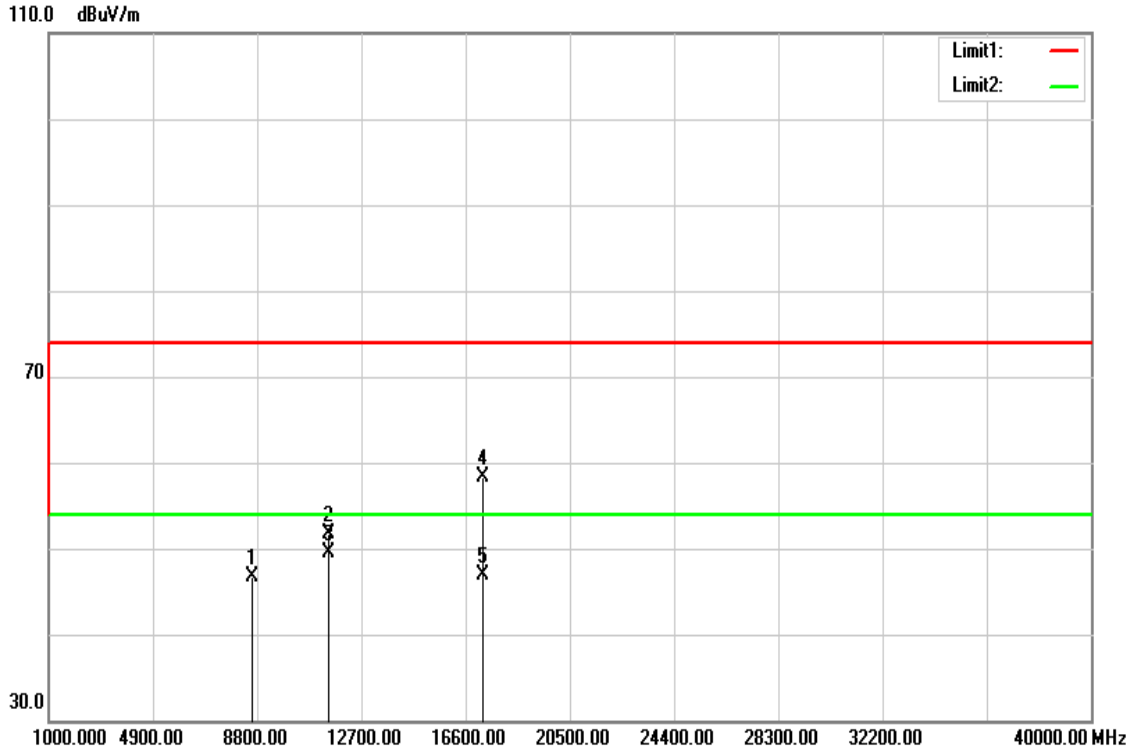


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	R mark
8670.000	33.38	13.72	47.10	74.00	-26.90	peak
11650.000	38.23	16.91	55.14	74.00	-18.86	peak
11650.000	34.24	16.91	51.15	54.00	-2.85	AVG
17475.000	32.18	26.22	58.40	74.00	-15.60	peak
17475.000	19.93	26.22	46.15	54.00	-7.85	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT20 Low CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

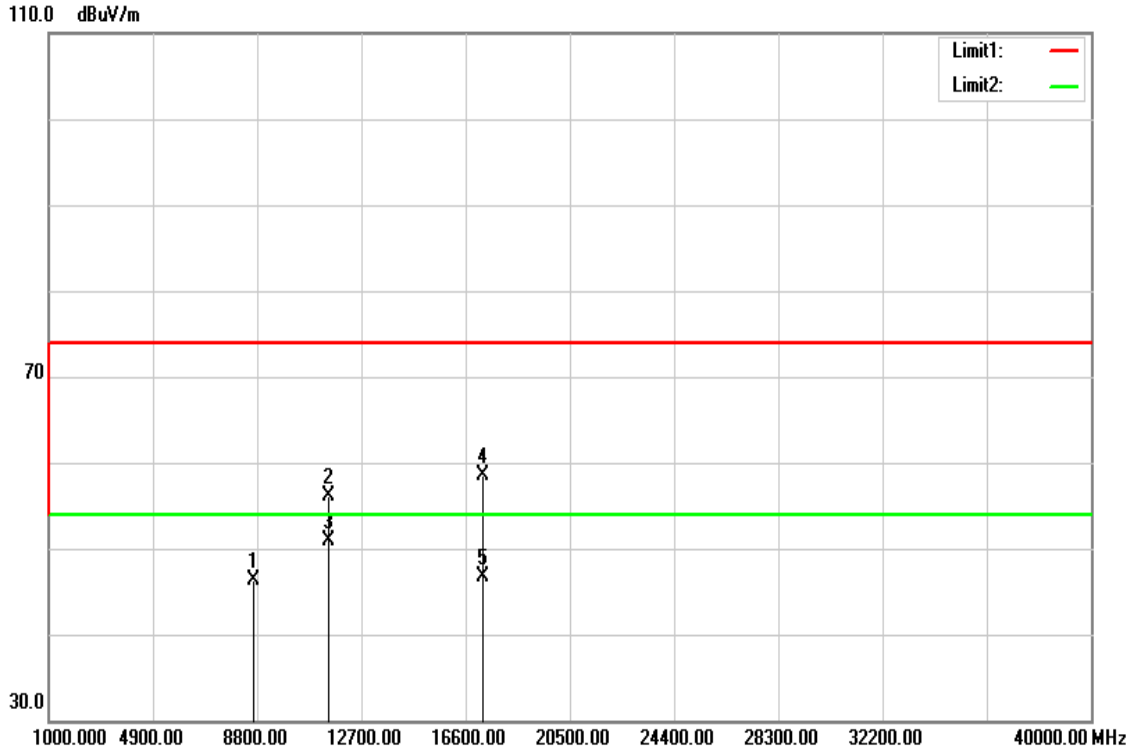


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Rem rk
8640.000	33.10	13.70	46.80	74.00	-27.20	peak
11490.000	35.00	16.78	51.78	74.00	-22.22	peak
11490.000	32.78	16.78	49.56	54.00	-4.44	AVG
17235.000	33.03	25.28	58.31	74.00	-15.69	peak
17235.000	21.71	25.28	46.99	54.00	-7.01	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT20 Low CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

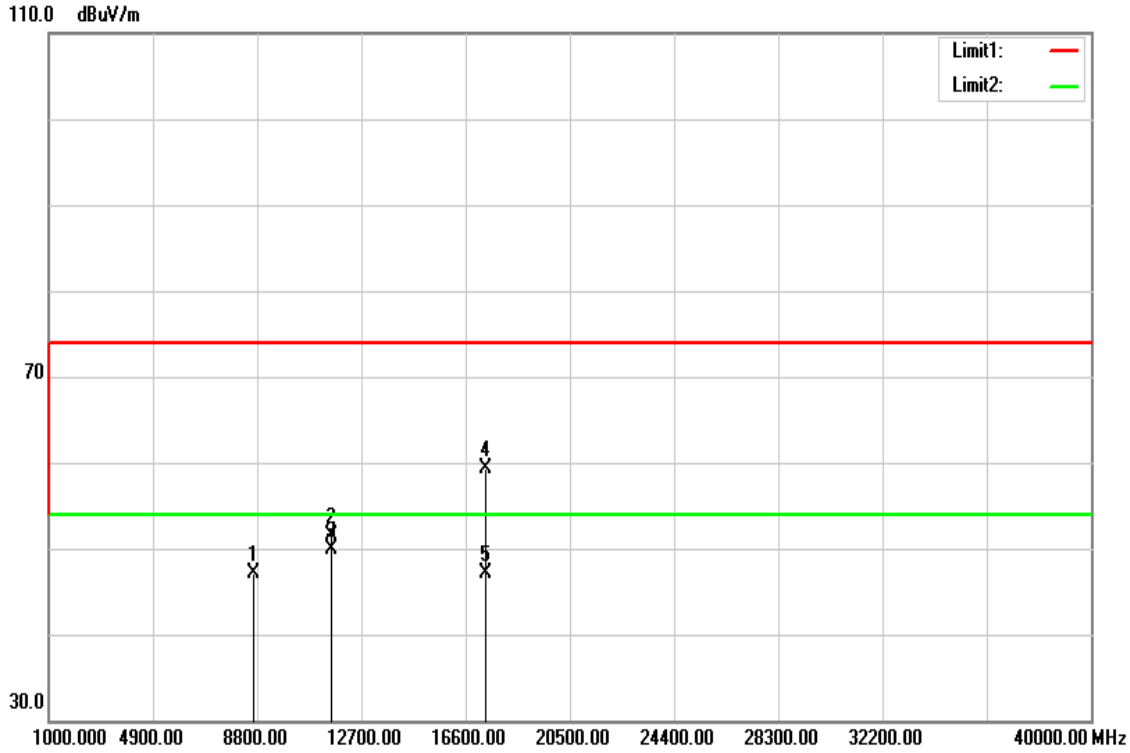


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	R mark
8650.000	32.55	13.71	46.26	74.00	-27.74	peak
11490.000	39.27	16.78	56.05	74.00	-17.95	peak
11490.000	34.07	16.78	50.85	54.00	-3.15	AVG
17235.000	33.26	25.28	58.54	74.00	-15.46	peak
17235.000	21.42	25.28	46.70	54.00	-7.30	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT20 Mid CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

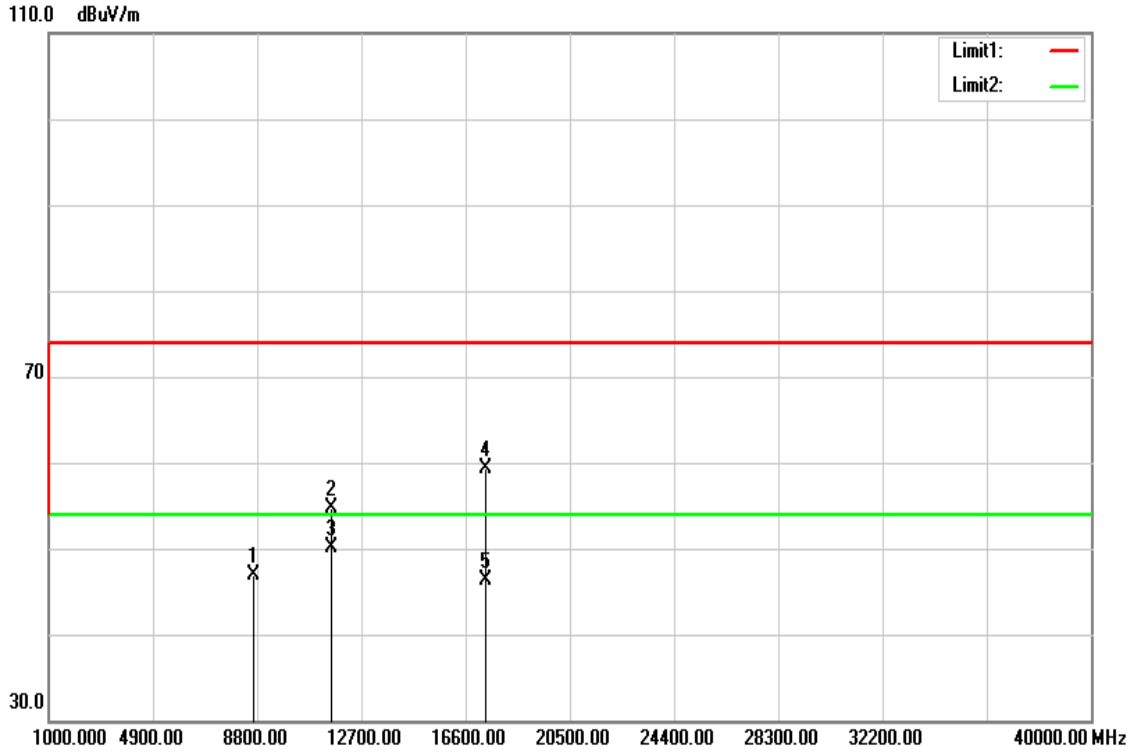


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Rem rk
8650.000	33.33	13.71	47.04	74.00	-26.96	peak
11570.000	34.65	16.84	51.49	74.00	-22.51	peak
11570.000	33.04	16.84	49.88	54.00	-4.12	AVG
17355.000	33.49	25.75	59.24	74.00	-14.76	peak
17355.000	21.27	25.75	47.02	54.00	-6.98	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT20 Mid CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

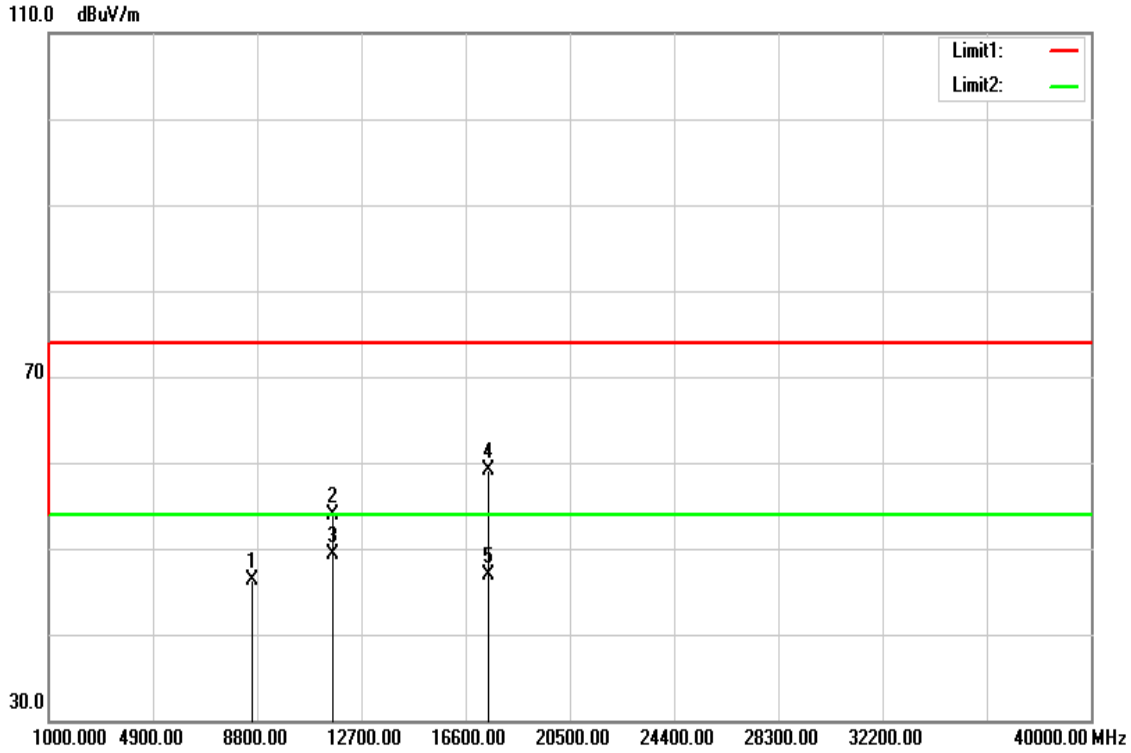


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	R mark
8650.000	33.16	13.71	46.87	74.00	-27.13	peak
11570.000	37.84	16.84	54.68	74.00	-19.32	peak
11570.000	33.18	16.84	50.02	54.00	-3.98	AVG
17355.000	33.54	25.75	59.29	74.00	-14.71	peak
17355.000	20.59	25.75	46.34	54.00	-7.66	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT20 High CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

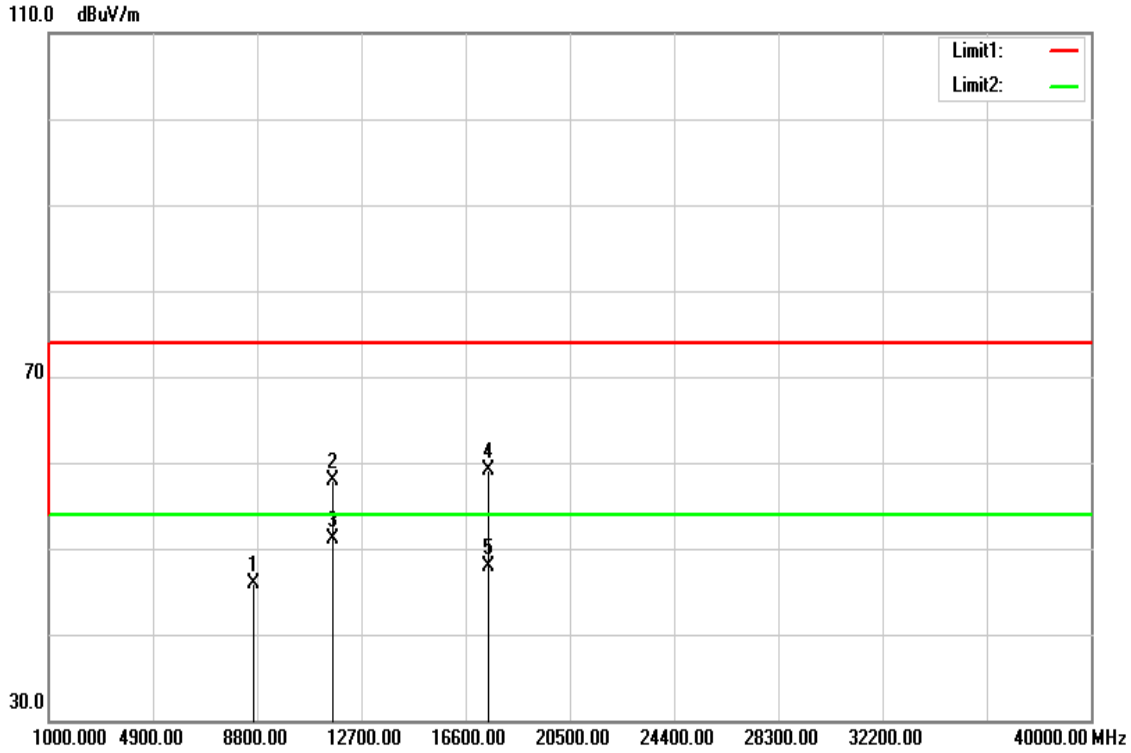


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Re ark
8620.000	32.55	13.70	46.25	74.00	-27.75	peak
11650.000	37.04	16.91	53.95	74.00	-20.05	peak
11650.000	32.35	16.91	49.26	54.00	-4.74	AVG
17475.000	32.96	26.22	59.18	74.00	-14.82	peak
17475.000	20.68	26.22	46.90	54.00	-7.10	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT20 High CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

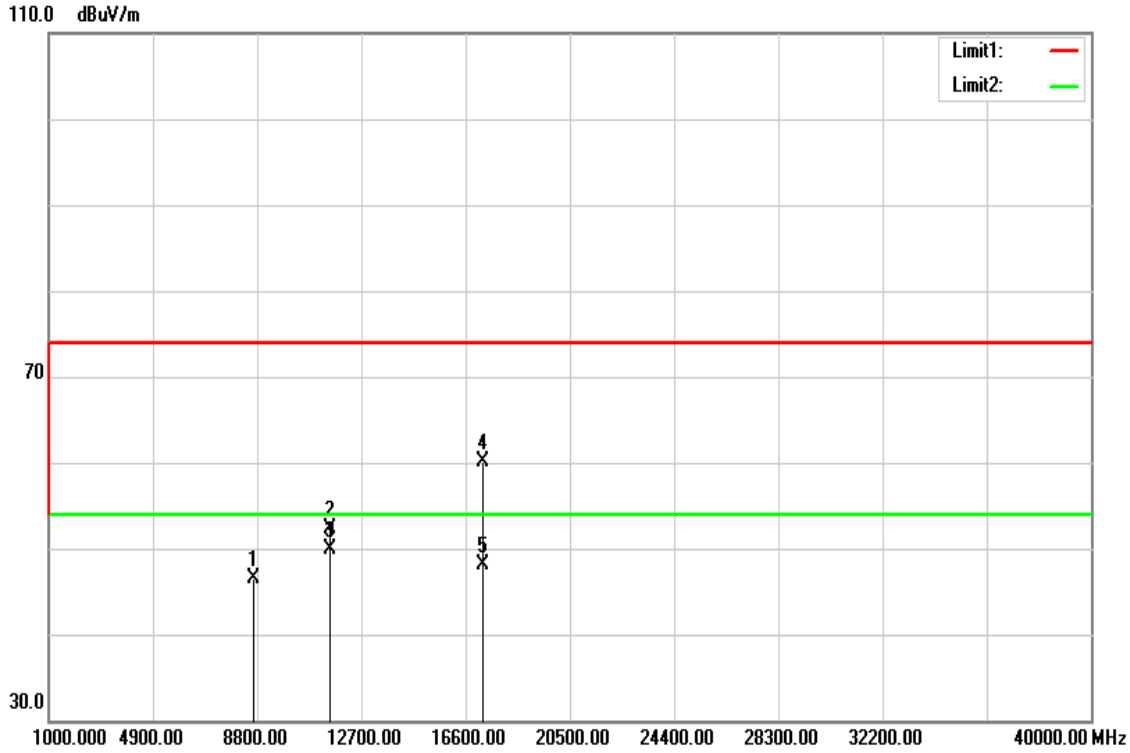


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	emark
8650.000	32.29	13.71	46.00	74.00	-28.00	peak
11650.000	41.07	16.91	57.98	74.00	-16.02	peak
11650.000	34.26	16.91	51.17	54.00	-2.83	AVG
17475.000	32.81	26.22	59.03	74.00	-14.97	peak
17475.000	21.65	26.22	47.87	54.00	-6.13	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT40 Low CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

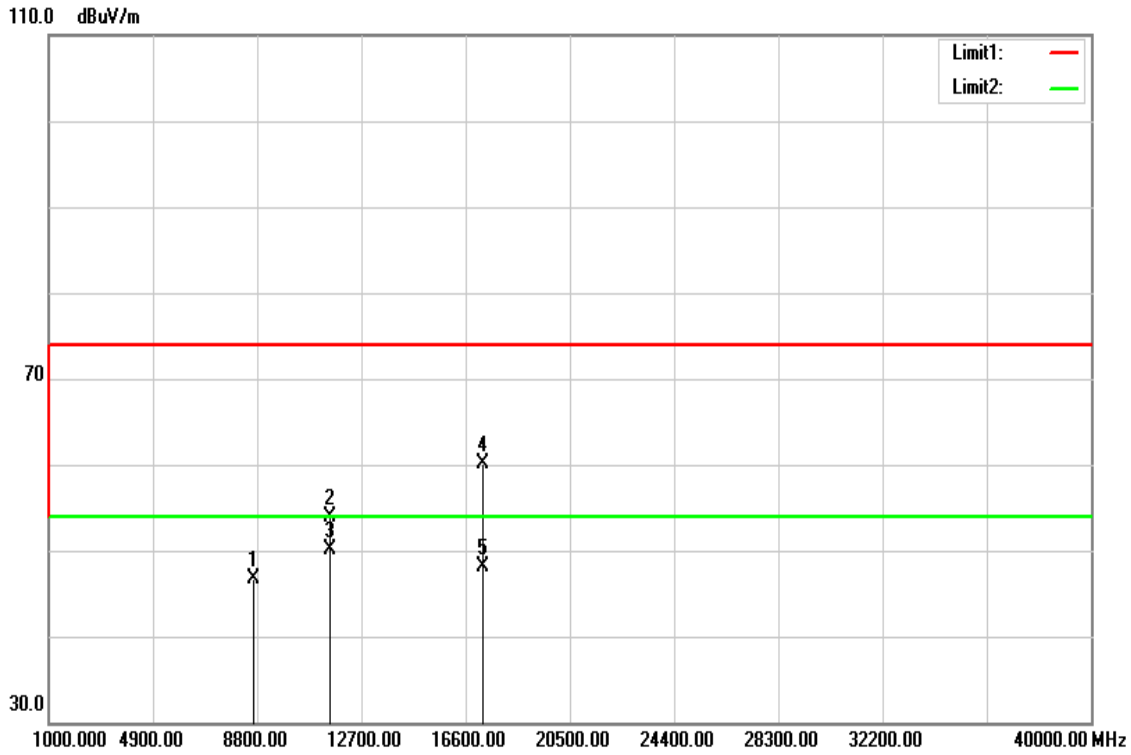


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Re ark
8690.000	32.69	13.73	46.42	74.00	-27.58	peak
11510.000	35.58	16.79	52.37	74.00	-21.63	peak
11510.000	33.20	16.79	49.99	54.00	-4.01	AVG
17265.000	34.72	25.40	60.12	74.00	-13.88	peak
17265.000	22.61	25.40	48.01	54.00	-5.99	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT40 Low CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

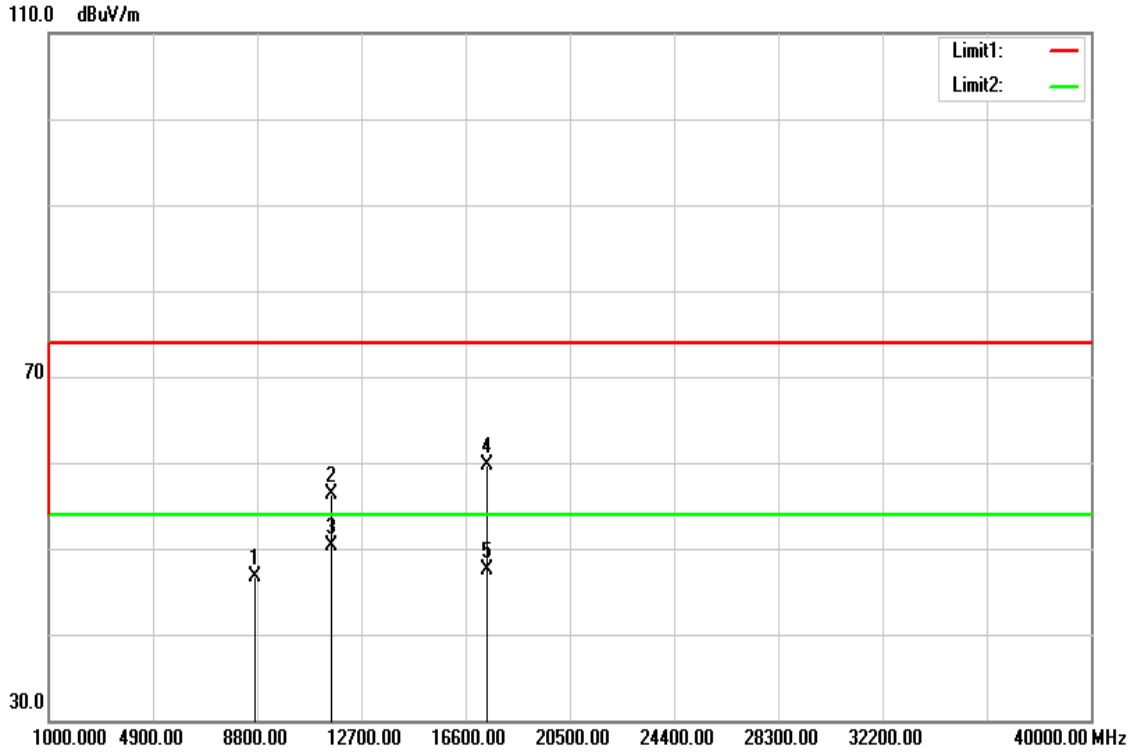


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	emark
8680.000	32.89	13.72	46.61	74.00	-27.39	peak
11510.000	37.05	16.79	53.84	74.00	-20.16	peak
11510.000	33.32	16.79	50.11	54.00	-3.89	AVG
17265.000	34.63	25.40	60.03	74.00	-13.97	peak
17265.000	22.64	25.40	48.04	54.00	-5.96	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT40 High CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

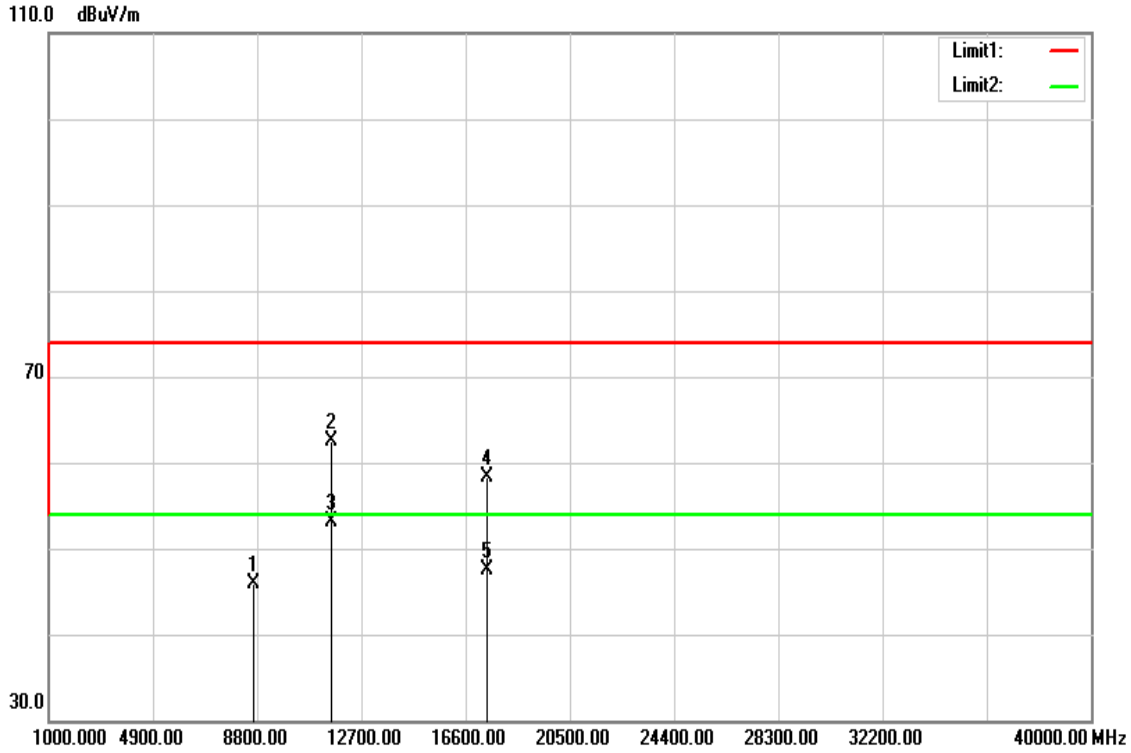


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Re ark
8740.000	32.92	13.75	46.67	74.00	-27.33	peak
11590.000	39.44	16.86	56.30	74.00	-17.70	peak
11590.000	33.48	16.86	50.34	54.00	-3.66	AVG
17385.000	33.89	25.87	59.76	74.00	-14.24	peak
17385.000	21.62	25.87	47.49	54.00	-6.51	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11n HT40 High CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

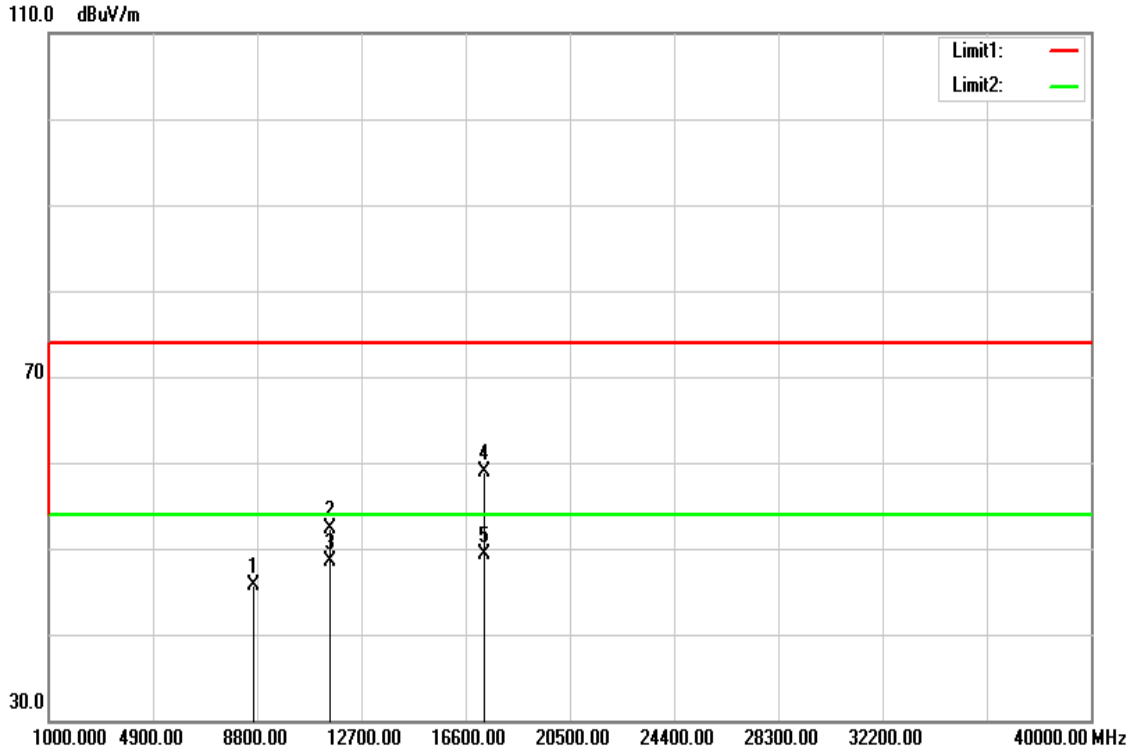


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	emark
8650.000	32.17	13.71	45.88	74.00	-28.12	peak
11590.000	45.67	16.86	62.53	74.00	-11.47	peak
11590.000	36.28	16.86	53.14	54.00	-0.86	AVG
17385.000	32.52	25.87	58.39	74.00	-15.61	peak
17385.000	21.68	25.87	47.55	54.00	-6.45	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11ac VHT80 Mid CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz

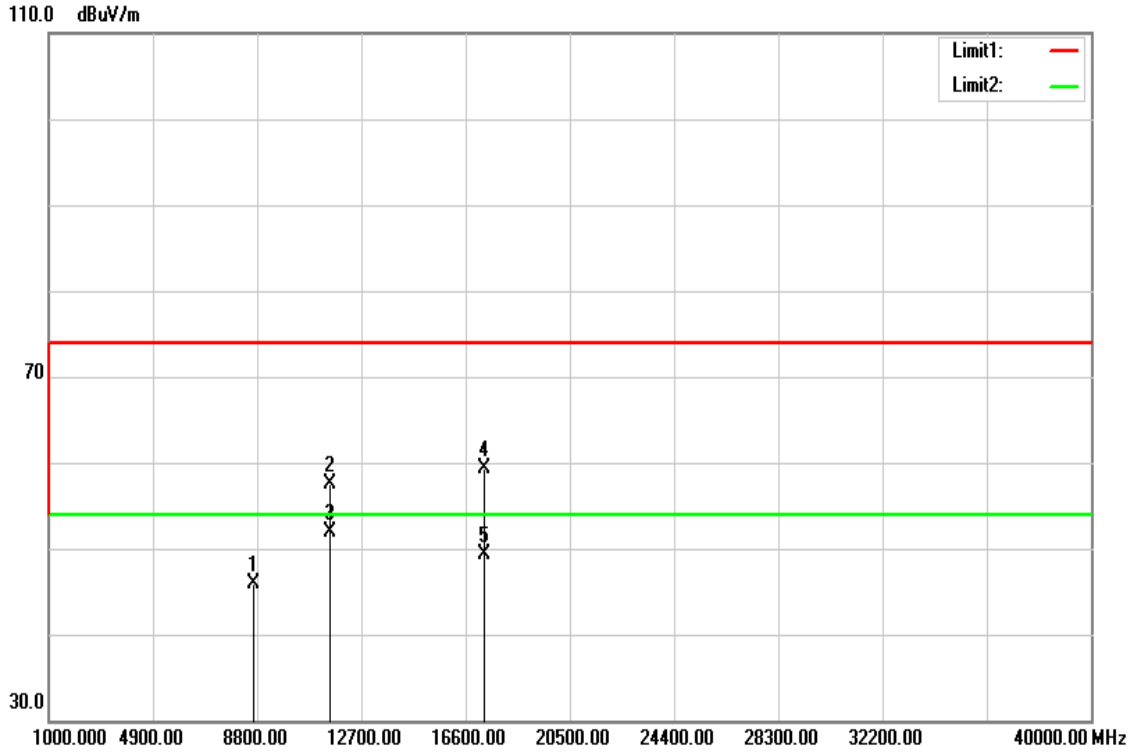


Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Re ark
8680.000	31.91	13.72	45.63	74.00	-28.37	peak
11550.000	35.48	16.82	52.30	74.00	-21.70	peak
11550.000	31.78	16.82	48.60	54.00	-5.40	AVG
17325.000	33.18	25.63	58.81	74.00	-15.19	peak
17325.000	23.65	25.63	49.28	54.00	-4.72	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode	IEEE 802.11ac VHT80 Mid CH	Temp/Hum	22(℃)/ 47%RH
Test Item	Harmonic	Test Date	May 8, 2017
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak and Average	Test Voltage	120Vac / 60Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	emark
8680.000	32.17	13.72	45.89	74.00	-28.11	peak
11550.000	40.60	16.82	57.42	74.00	-16.58	peak
11550.000	35.17	16.82	51.99	54.00	-2.01	AVG
17325.000	33.61	25.63	59.24	74.00	-14.76	peak
17325.000	23.68	25.63	49.31	54.00	-4.69	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

4.6 FREQUENCY STABILITY

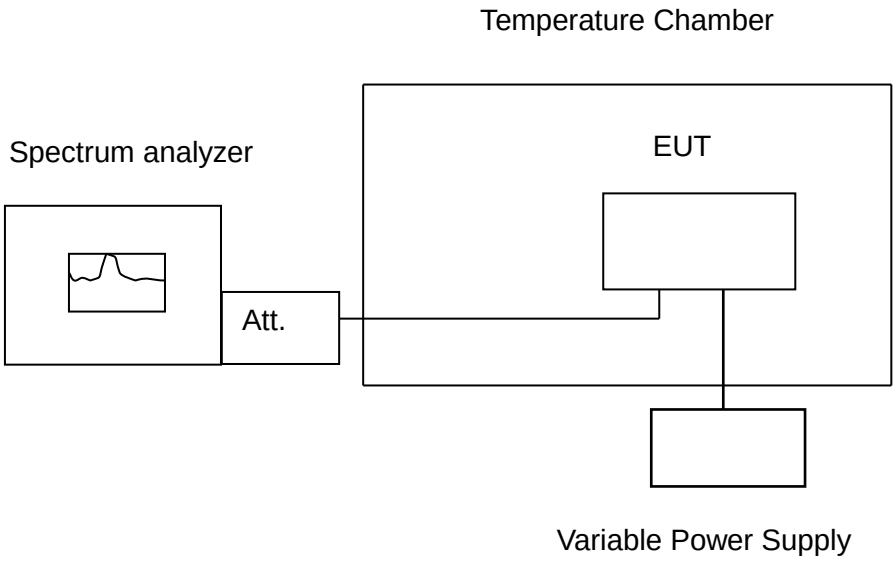
4.6.1 Test Limit

According to §15.407(g) manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the operational description.

4.6.2 Test Procedure

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20^{o}C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –20^{o}C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10^{o}C increased per stage until the highest temperature of +50^{o}C reached.

4.6.3 Test Setup



4.6.4 Test Result

Temp. (°C)	Voltage (V)	Measured Frequency	5180		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
50	5	5180.10320	5180.10240	5180.10120	5180.10090	19.9228	19.7683	19.5367	19.4788	Pass
40	5	5180.09510	5180.09514	5180.09423	5180.09231	18.3591	18.3658	18.1911	17.8205	Pass
30	5	5180.08123	5180.08412	5180.07641	5180.07964	15.6815	16.2394	14.7510	15.3745	Pass
20	5	5180.08531	5180.07561	5180.05644	5180.06513	16.4691	14.5965	10.8958	12.5734	Pass
10	5	5180.04564	5180.04312	5180.04645	5180.03156	8.8108	8.3243	8.9672	6.0927	Pass
0	5	5180.02199	5180.02564	5180.03457	5180.02000	4.2450	4.9506	6.6735	3.8610	Pass
-10	5	5180.00156	5180.00321	5180.00441	5180.07910	0.3012	0.6197	0.8517	15.2703	Pass
-20	5	5179.98310	5179.97312	5179.95120	5179.94532	-3.2625	-5.1892	-9.4208	-10.5560	Pass
Temp. (°C)	Voltage (V)	Measured Frequency	5180		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
20	4.5	5180.085250	5180.08531	5180.05325	5180.06432	16.4575	16.4691	10.2799	12.4170	Pass
20	5	5180.085310	5180.07561	5180.05644	5180.06513	16.4691	14.5965	10.8958	12.5734	Pass
20	5.5	5180.084320	5180.06150	5180.06312	5180.07651	16.2780	11.8726	12.1853	14.7703	Pass

Temp. (°C)	Voltage (V)	Measured Frequency	5260		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
50	5	5260.09040	5260.08561	5260.08524	5260.08785	17.1863	16.2757	16.2053	16.7015	Pass
40	5	5260.07462	5260.07560	5260.06891	5260.06780	14.1869	14.3726	13.1011	12.8901	Pass
30	5	5260.06255	5260.04568	5260.04763	5260.05542	11.8907	8.6844	9.0542	10.5361	Pass
20	5	5260.04812	5260.04472	5260.03486	5260.02890	9.1483	8.5023	6.6274	5.4943	Pass
10	5	5260.01852	5260.03852	5260.02891	5260.03453	3.5209	7.3232	5.4962	6.5646	Pass
0	5	5260.00561	5260.00130	5260.00656	5260.00460	1.0665	0.2466	1.2471	0.8741	Pass
-10	5	5259.96540	5259.96123	5259.96940	5259.95642	-6.5779	-7.3707	-5.8175	-8.2852	Pass
-20	5	5259.96746	5259.95456	5259.94654	5259.93356	-6.1863	-8.6382	-10.1633	-12.6312	Pass
Temp. (°C)	Voltage (V)	Measured Frequency	5260		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
20	4.5	5260.04765	5260.04312	5260.03472	5260.03561	9.0589	8.1977	6.6013	6.7700	Pass
20	5	5260.04812	5260.04472	5260.03486	5260.02890	9.1483	8.5023	6.6274	5.4943	Pass
20	5.5	5260.05654	5260.05752	5260.05732	5260.05741	10.7490	10.9354	10.8975	10.9148	Pass

Temp. (°C)	Voltage (V)	Measured Frequency	5500		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
50	5	5500.09855	5500.09844	5500.09825	5500.09815	17.9182	17.8989	17.8627	17.8460	Pass
40	5	5500.10055	5500.10014	5500.10016	5500.10018	18.2811	18.2073	18.2102	18.2143	Pass
30	5	5500.10486	5500.10456	5500.10879	5500.10489	19.0663	19.0117	19.7798	19.0718	Pass
20	5	5500.07552	5500.07123	5500.07453	5500.07965	13.7309	12.9511	13.5515	14.4820	Pass
10	5	5500.06182	5500.06741	5500.06779	5500.06321	11.2396	12.2564	12.3254	11.4927	Pass
0	5	5500.05128	5500.05179	5500.05790	5050.05375	9.3233	9.4162	10.5271	9.7735	Pass
-10	5	5500.03478	5500.03490	5500.03741	5500.03945	6.3236	6.3451	6.8018	7.1729	Pass
-20	5	5500.00485	5500.00898	5500.00741	5500.00259	0.8816	1.6325	1.3473	0.4704	Pass
Temp. (°C)	Voltage (V)	Measured Frequency	5500		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
20	4.5	5500.07840	5500.07074	5500.07900	5500.07050	14.2545	12.8618	14.3636	12.8182	Pass
20	5	5500.07552	5500.07123	5500.07453	5500.07965	13.7309	12.9511	13.5515	14.4820	Pass
20	5.5	5500.06916	5500.06974	5500.06914	5500.06936	12.5738	12.6802	12.5702	12.6103	Pass

Temp. (°C)	Voltage (V)	Measured Frequency	5180		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
50	5	5745.10549	5745.10189	5745.10695	5745.10980	18.3619	17.7354	18.6157	19.1123	Pass
40	5	5745.09784	5745.09841	5745.09212	5745.09078	17.0306	17.1297	16.0353	15.8016	Pass
30	5	5745.08412	5745.08048	5745.08774	5745.07022	14.6428	14.0085	15.2726	12.2222	Pass
20	5	5745.07023	5745.07319	5745.07154	5745.07945	12.2247	12.7391	12.4519	13.8296	Pass
10	5	5745.05153	5745.05123	5745.05979	5745.05059	8.9697	8.9175	10.4071	8.8057	Pass
0	5	5745.03486	5745.03741	5745.03312	5745.03987	6.0687	6.5117	5.7654	6.9406	Pass
-10	5	5745.00875	5745.00895	5745.00923	5745.00874	1.5228	1.5571	1.6069	1.5215	Pass
-20	5	5745.00040	5745.00048	5745.00071	5745.00084	0.0696	0.0833	0.1238	0.1464	Pass
Temp. (°C)	Voltage (V)	Measured Frequency	5180		(MHz)	Limit				Result
		Time (min)				20ppm				
Operating Frequency:		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	
20	4.5	5745.06916	5745.06915	5745.06905	5745.06811	12.0376	12.0362	12.0188	11.8555	Pass
20	5	5745.07023	5745.07319	5745.07154	5745.07945	12.2247	12.7391	12.4519	13.8296	Pass
20	5.5	5745.07123	5745.07849	5745.07278	5745.07212	12.3988	13.6625	12.6684	12.5541	Pass

4.7 DYNAMIC FREQUENCY SELECTION

4.7.1 Test Limit

FCC according to §15.407 (h), KDB 905462 D02 "compliance measurement procedures for unlicensed-national information infrastructure devices operating in the 5250-5350 MHz and 5470-5725 MHz bands incorporating dynamic frequency selection". and KDB 905462 D03 " U-NII client devices without radar detection capability.

IC according RSS-247 section 6.3, and it harmonized with FCC Part 15 DFS rules,

Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client(with radar detection)
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth mods	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

Table 3: Interference Threshold values, Master or Client incorporating In-Service

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. **Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. **Note3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **Note 2:** The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

Table 6 – Long Pulse Radar Test Signal

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

4.7.2 Test Procedure

Overview Of EUT With Respect To §15.407 (H) Requirements

The firmware installed in the EUT during testing was:

Firmware Rev: 0.0.13.0_20170221.181819
The EUT operates over the 5250-5350 MHz range as a Client Device that does not have radar detection capability.

The EUT uses one transmitter connected to two 50-ohm coaxial antenna ports via a diversity switch. Only one antenna port is connected to the test system since the EUT has one antenna only.

The Slave device associated with the EUT during these tests does not have radar detection capability.

WLAN traffic is generated by streaming the video file TestFile.mp2 “6 ½ Magic Hours” from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

The EUT utilizes the 802.11a architecture, with a nominal channel bandwidth of 20 MHz.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is -62 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –62 + 5 = -57dBm.

The calibrated conducted DFS Detection Threshold level is set to -57 dBm. The tested level is lower than the required level hence it provides margin to the limit.

Manufacturer’s Statement Regarding Uniform Channel Spreading

The end product implements an automatic channel selection feature at startup such that operation commences on channels distributed across the entire set of allowed 5GHz channels. This feature will ensure uniform spreading is achieved while avoiding non-allowed channels due to prior radar events.

TEST AND MEASUREMENT SYSTEM

System Overview

The measurement system is based on a conducted test method.

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

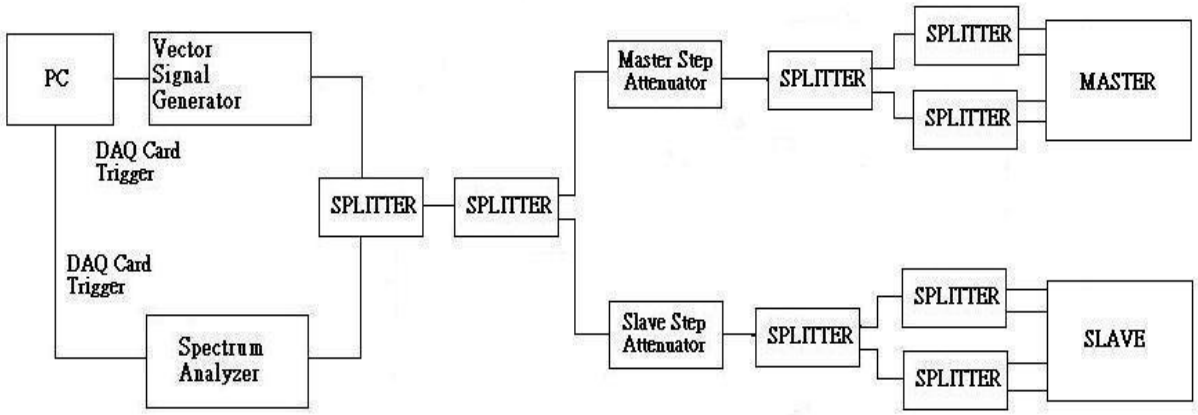
The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from FL to FH for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold. The time-domain resolution is 3 msec / bin with a 24 second sweep time, meeting the 22 second long pulse reporting criteria and allowing a minimum of 10 seconds after the end of the long pulse waveform.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), 50 ohm termination would be removed from the splitter so that connection can be established between splitter and the Master and/or Slave devices.

Conducted Method System Block Diagram



System Calibration

Connect the spectrum analyzer to the test system in place of the master device. Set the signal generator to CW mode. Adjust the amplitude of the signal generator to yield a measured level of –62 dBm on the spectrum analyzer.

Without changing any of the instrument settings, reconnect the spectrum analyzer to the Common port of the Spectrum Analyzer Combiner/Divider and connect a 50 ohm load to the Master Device port of the test system.

Measure the amplitude and calculate the difference from –62 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference. Confirm that the signal is displayed at –62 dBm. Readjust the RBW and VBW to 3 MHz, set the span to 10 MHz, and confirm that the signal is still displayed at –62 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –62 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

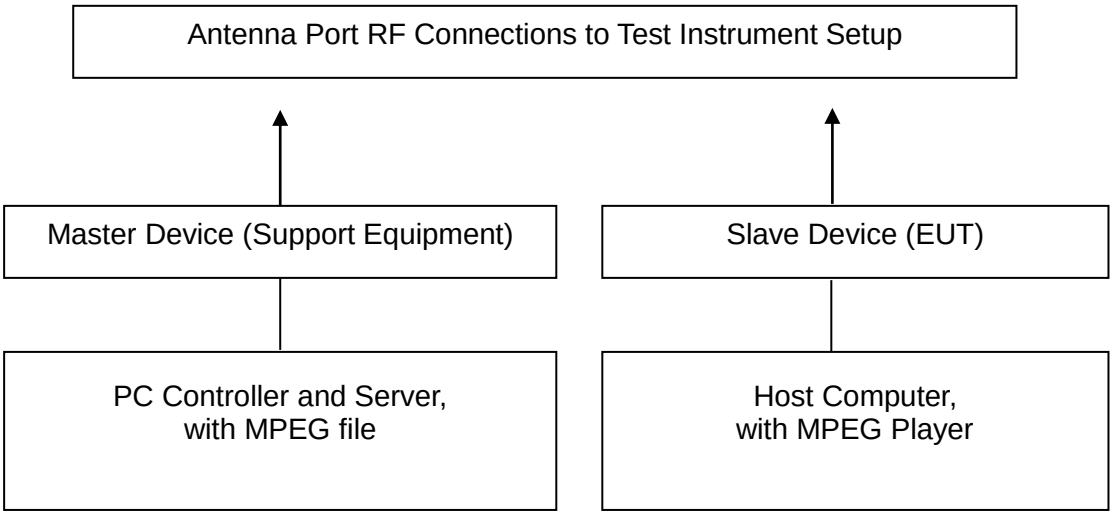
Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.

Adjustment Of Displayed Traffic Level

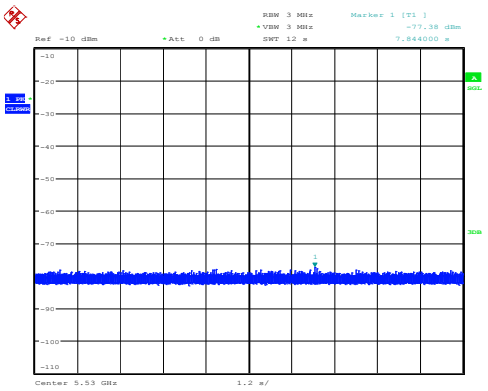
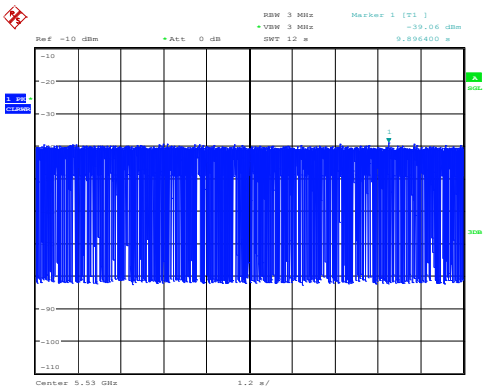
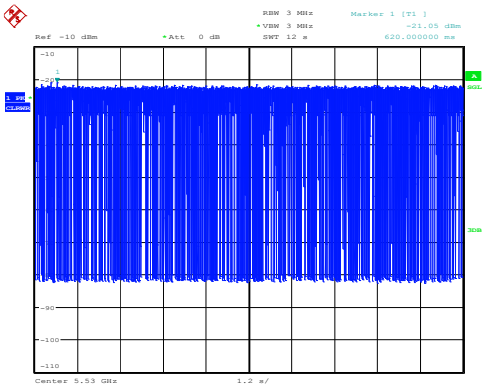
Establish a link between the Master and Slave, adjusting the Link Step Attenuator as needed to provide a suitable received level at the Master and Slave devices. Stream the video test file to generate WLAN traffic. Confirm that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold. Confirm that the displayed traffic is from the Master Device. For Master Device testing confirm that the displayed traffic does not include Slave Device traffic. For Slave Device testing confirm that the displayed traffic does not include Master Device traffic.

If a different setting of the Master Step Attenuator is required to meet the above conditions, perform a new System Calibration for the new Master Step Attenuator setting.

4.7.3 Test Setup

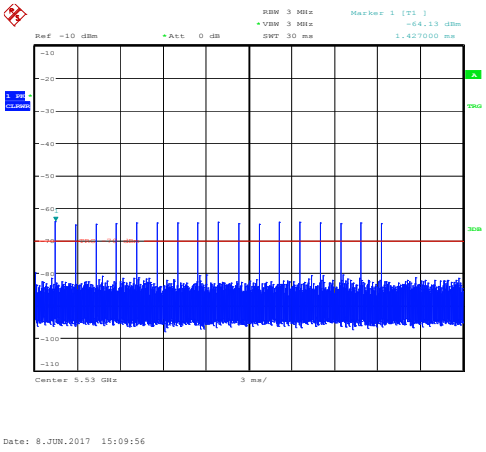


4.7.4 Test Result

IEEE 802.11ac VHT80 MHz at 5530MHz	
Noise Floor	Master Level
	
Slave Level	
	

Radar Waveforms

Sample of short Pluse Radar Type 0



TEST CHANNEL AND METHOD

All tests were performed at a channel center frequency of 5530 MHz utilizing a conducted test method.

CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

GENERAL REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =

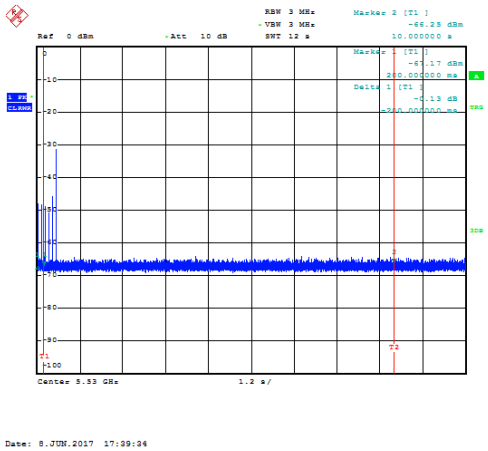
(Number of analyzer bins showing transmission) * (dwell time per bin)

The observation period over which the aggregate time is calculated

Begins at (Reference Marker + 200 msec) and

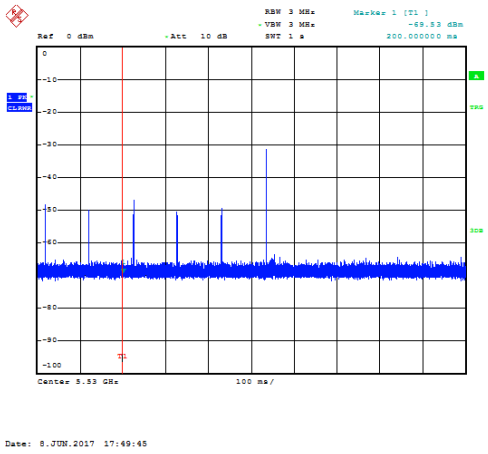
Ends no earlier than (Reference Marker + 10 sec).

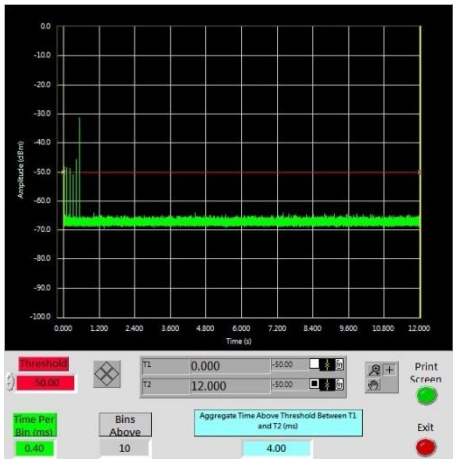
IEEE 802.11ac VHT 80 MHz at 5530	
Type 1_Channel Move Time	



Channel Move Time (ms)	Limit (s)
200	10

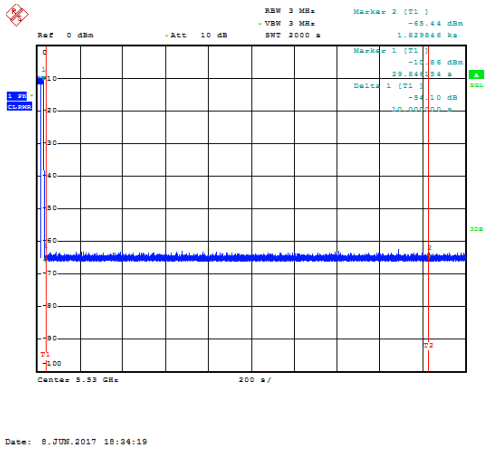
IEEE 802.11ac VHT 80 MHz at 5530	
Type 1_Channel closing transmisssion time	Type 1_Channel closing transmisssion time-caculate





Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
4	60	-54

IEEE 802.11ac VHT 80 MHz at 5530
Non-Occupancy Period



Remark :

1. No EUT transmissions were observed on the test channel during the 30 minute observation time.