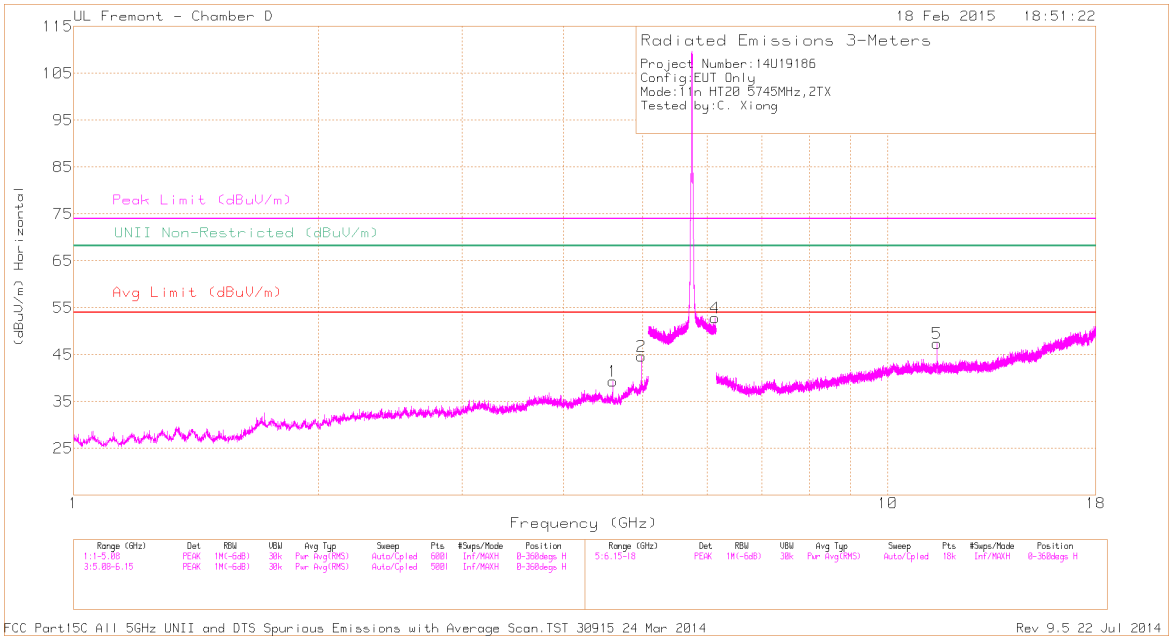
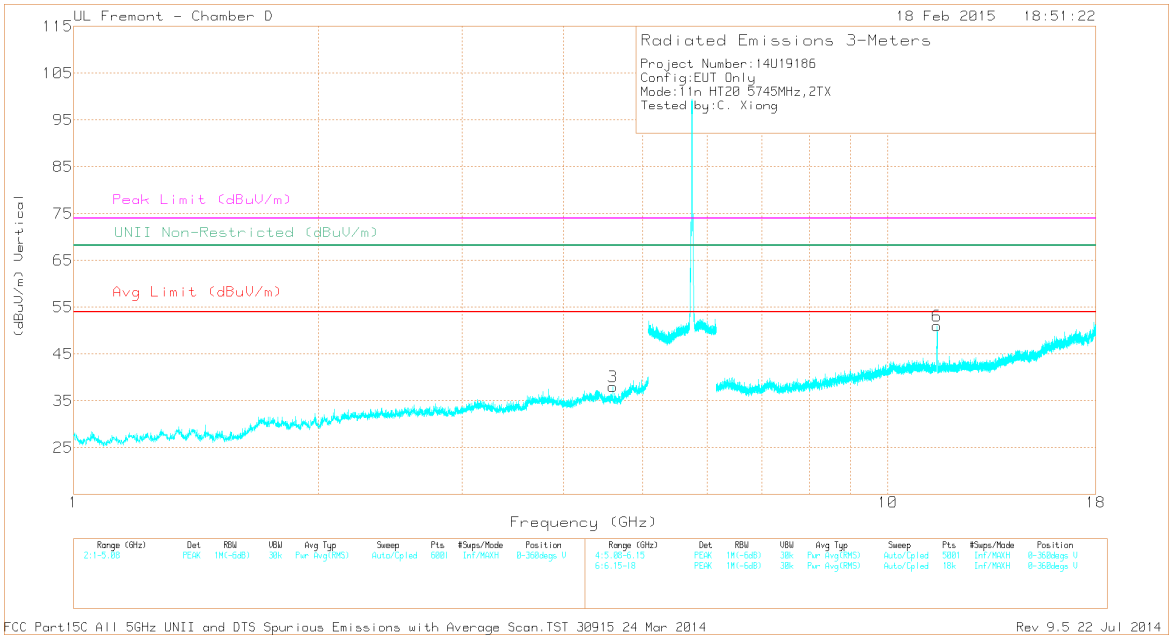
9.21.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.596	41.04	PK1	33.5	-27	47.54	-	-	74	-26.46	-	-	34	184	H
	* 4.596	31.35	AD1	33.5	-27	37.85	54	-16.15	-	-	-	-	34	184	H
2	* 4.979	43.72	PK1	34	-26.9	50.82	-	-	74	-23.18	-	-	320	134	H
	* 4.979	37.14	AD1	34	-26.9	44.24	54	-9.76	-	-	-	-	320	134	H
3	* 4.596	39.01	PK1	33.5	-27	45.51	-	-	74	-28.49	-	-	13	167	V
	* 4.596	30.27	AD1	33.5	-27	36.77	54	-17.23	-	-	-	-	13	167	V
5	* 11.49	37.66	PK1	38.1	-21.8	53.96	-	-	74	-20.04	-	-	329	340	H
	* 11.495	26.01	AD1	38.1	-21.8	42.31	54	-11.69	-	-	-	-	329	340	H
6	* 11.501	41.77	PK1	38.1	-21.9	57.97	-	-	74	-16.03	-	-	227	360	V
	* 11.49	30.33	AD1	38.1	-21.8	46.63	54	-7.37	-	-	-	-	227	360	V
4	6.13	41.2	PK1	35.8	-17.6	59.4	-	-	-	-	68.2	-8.8	27	100	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

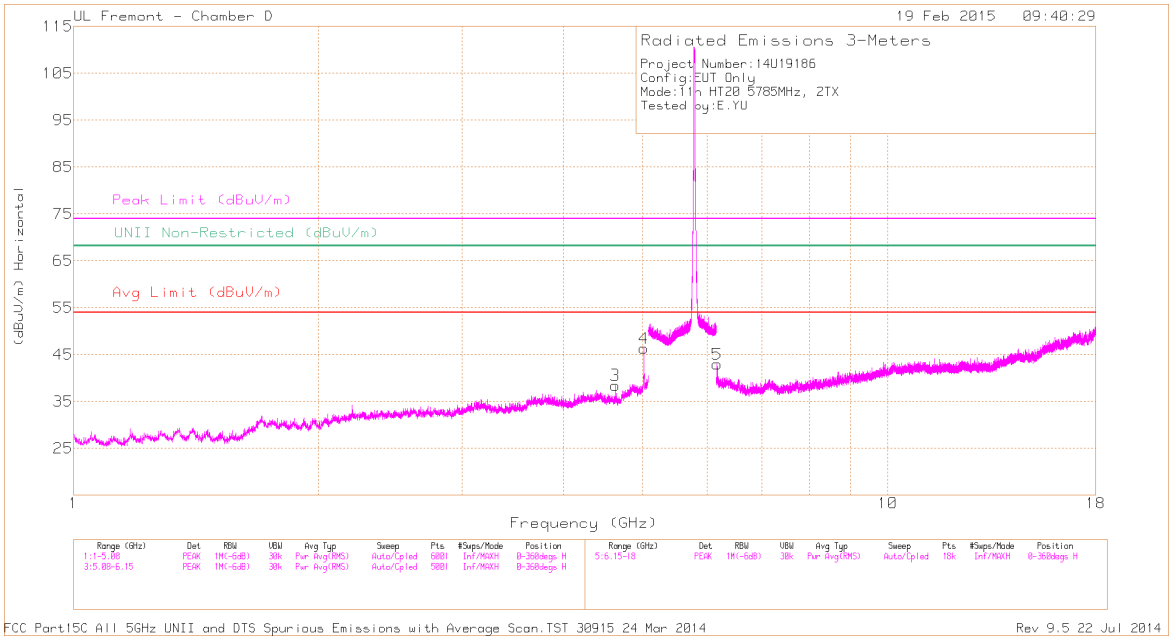
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

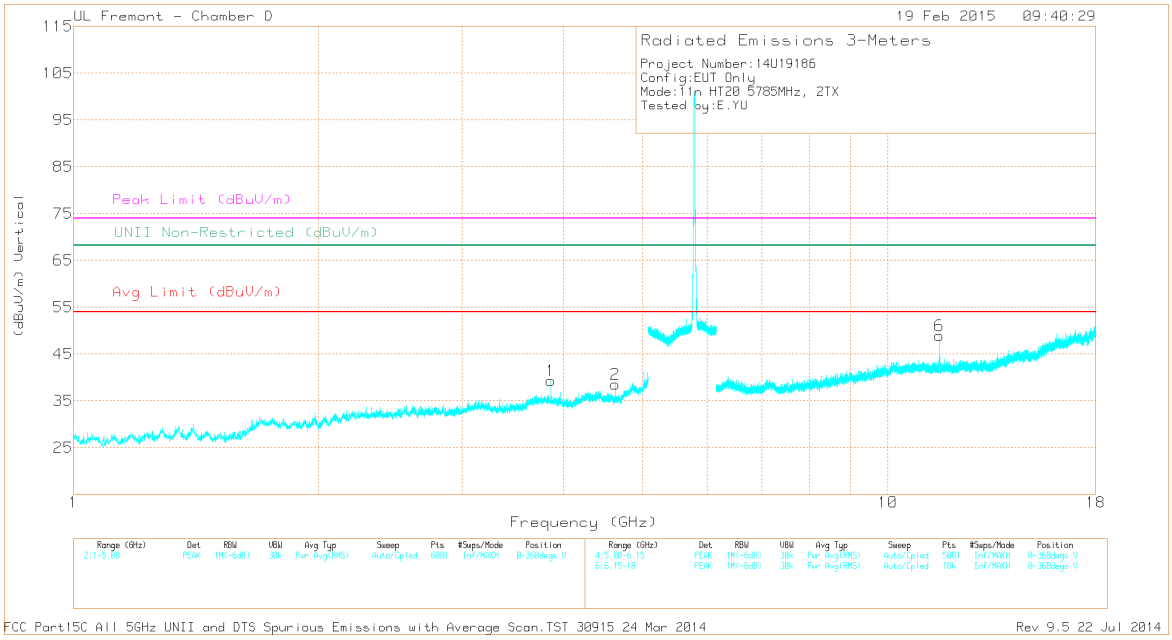
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.21.4. HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 4.628	40	PK1	33.6	-27.1	46.5	-	-	74	-27.5	-	-	35	199	H
	* 4.628	31.08	AD1	33.6	-27.1	37.58	54	-16.42	-	-	-	-	35	199	H
4	* 5.013	43.75	PK1	34	-26.4	51.35	-	-	74	-22.65	-	-	347	102	H
	* 5.014	36.39	AD1	34	-26.4	43.99	54	-10.01	-	-	-	-	347	102	H
1	* 3.857	41.82	PK1	33	-29	45.82	-	-	74	-28.18	-	-	351	318	V
	* 3.857	33.25	AD1	33	-29	37.25	54	-16.75	-	-	-	-	351	318	V
2	* 4.628	39.64	PK1	33.6	-27.1	46.14	-	-	74	-27.86	-	-	28	108	V
	* 4.628	30.83	AD1	33.6	-27.1	37.33	54	-16.67	-	-	-	-	28	108	V
6	* 11.571	39.82	PK1	38.1	-22	55.92	-	-	74	-18.08	-	-	61	219	V
	* 11.571	27.41	AD1	38.1	-22	43.51	54	-10.49	-	-	-	-	61	219	V
5	6.171	42.87	PK1	35.9	-26.4	52.37	-	-	-	-	68.2	-15.83	24	103	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

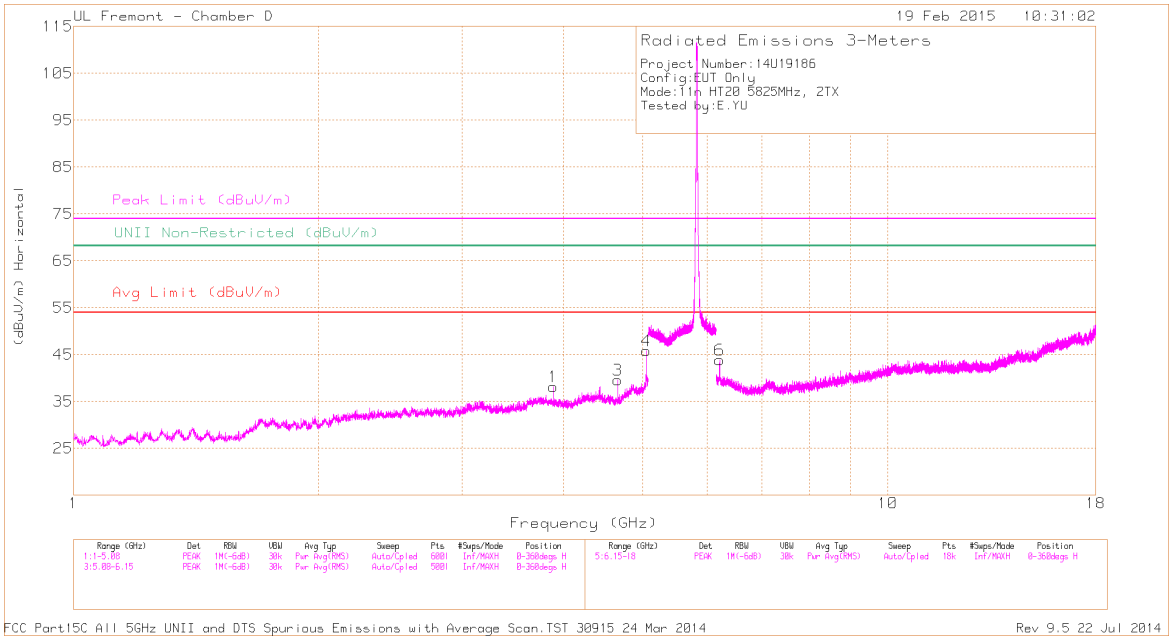
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

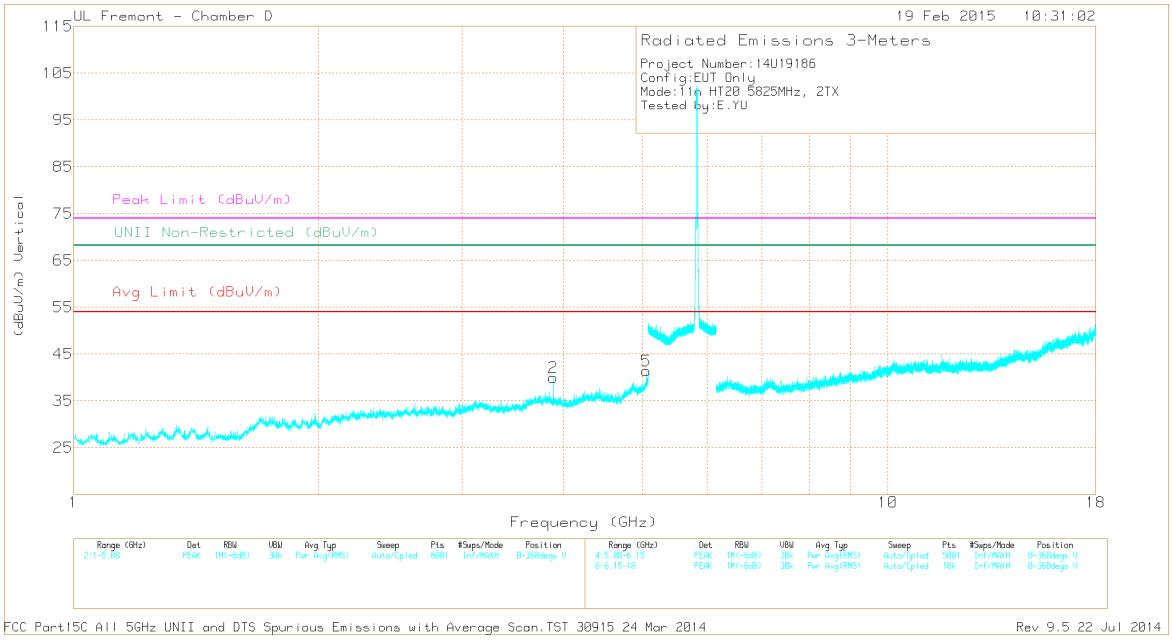
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.21.5. HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.883	40.37	PK1	33.1	-29.1	44.37	-	-	74	-29.63	-	-	343	298	H
	* 3.883	31.61	AD1	33.1	-29.1	35.61	54	-18.39	-	-	-	-	343	298	H
3	* 4.66	40.76	PK1	33.7	-27.8	46.66	-	-	74	-27.34	-	-	55	151	H
	* 4.66	30.97	AD1	33.7	-27.8	36.87	54	-17.13	-	-	-	-	55	151	H
4	* 5.048	42.37	PK1	34	-25.7	50.67	-	-	74	-23.33	-	-	19	202	H
	* 5.048	34.08	AD1	34	-25.7	42.38	54	-11.62	-	-	-	-	19	202	H
2	* 3.883	41.8	PK1	33.1	-29.1	45.8	-	-	74	-28.2	-	-	349	130	V
	* 3.883	33.96	AD1	33.1	-29.1	37.96	54	-16.04	-	-	-	-	349	130	V
5	* 5.048	40.38	PK1	34	-25.6	48.78	-	-	74	-25.22	-	-	129	301	V
	* 5.048	31.1	AD1	34	-25.7	39.4	54	-14.6	-	-	-	-	129	301	V
6	6.213	43.88	PK1	36	-26.7	53.18	-	-	-	-	68.2	-15.02	17	156	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK1 - KDB789033 Method: Peak

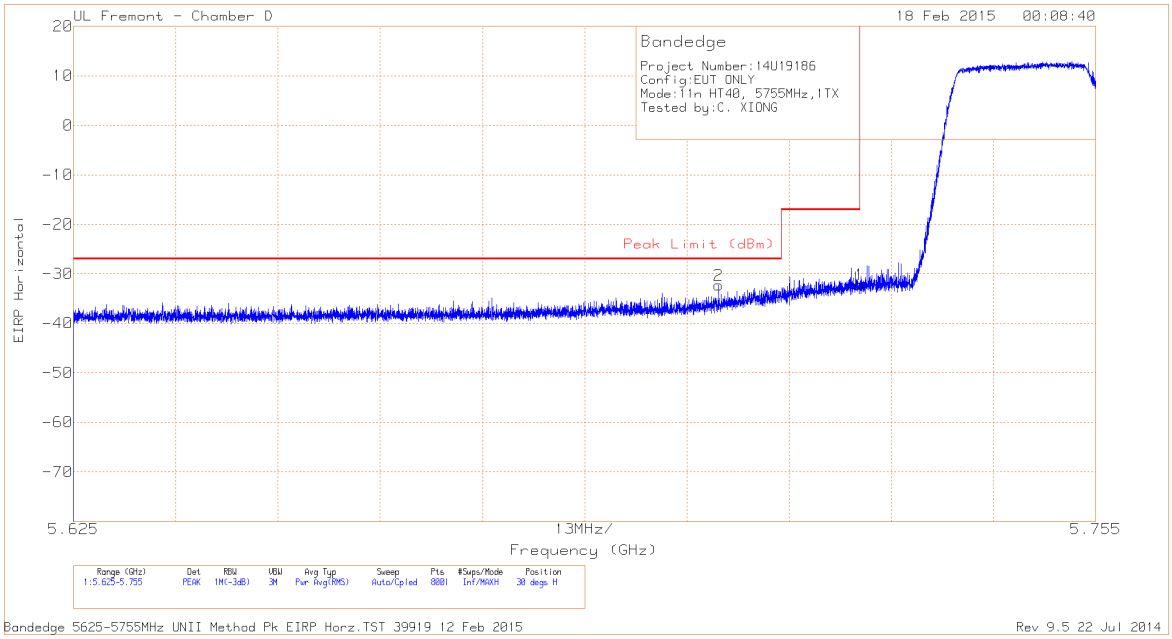
AD1 - KDB789033 Method: AD Primary Power Average

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.22. TX ABOVE 1 GHz 802.11n HT40 1Tx MODE IN THE 5.8 GHz BAND

9.22.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT



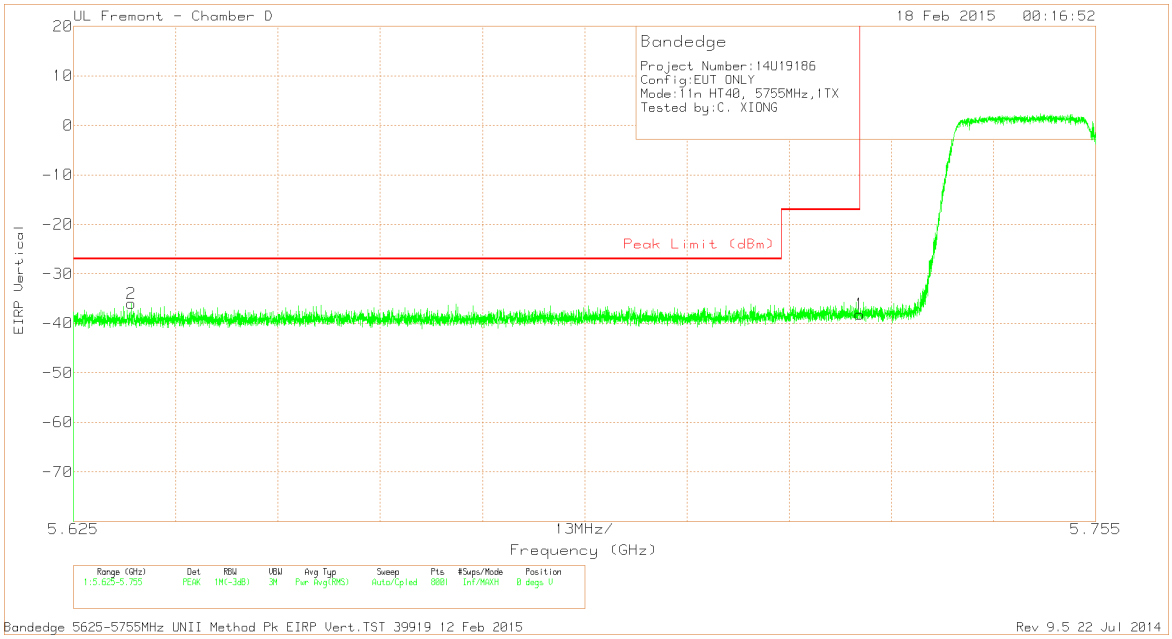
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.707	-61.65	PK	35.2	-17.6	11.8	-32.25	-27	-5.25	30	112	H
1	5.725	-61.51	PK	35.2	-17.6	11.8	-32.11	-17	-15.11	30	112	H

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

LOW CHANNEL VERTICAL PLOT



DATA

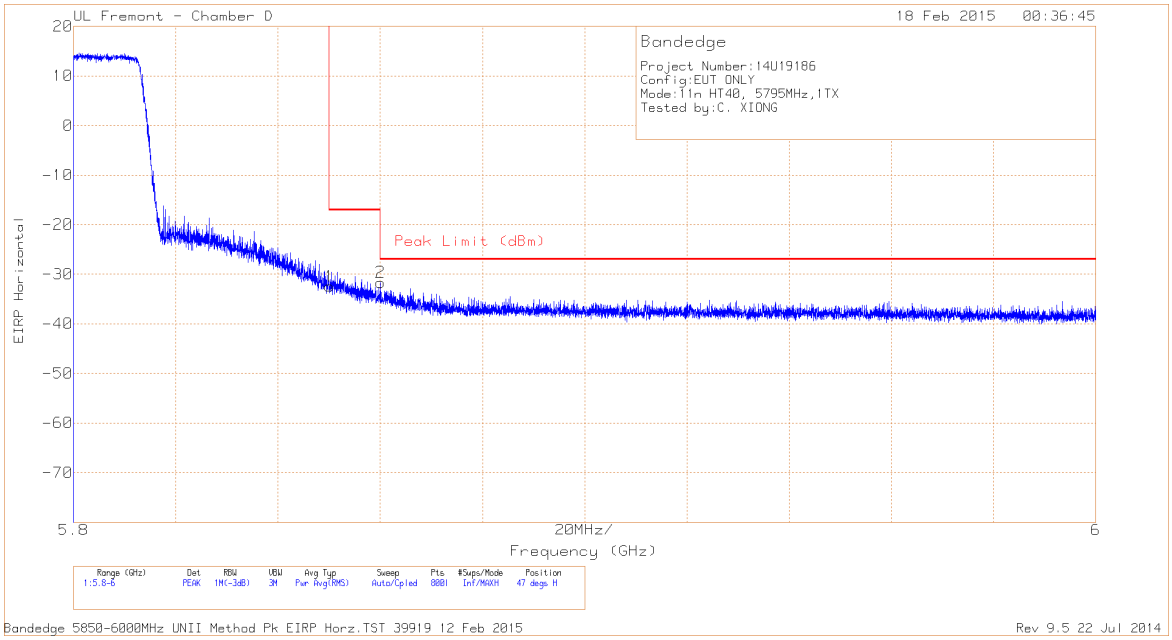
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.632	-65.2	PK	35	-17.6	11.8	-36	-27	-9	0	111	V
1	5.725	-67.52	PK	35.2	-17.6	11.8	-38.12	-17	-21.12	0	111	V

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.22.2. RESTRICTED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL PLOT



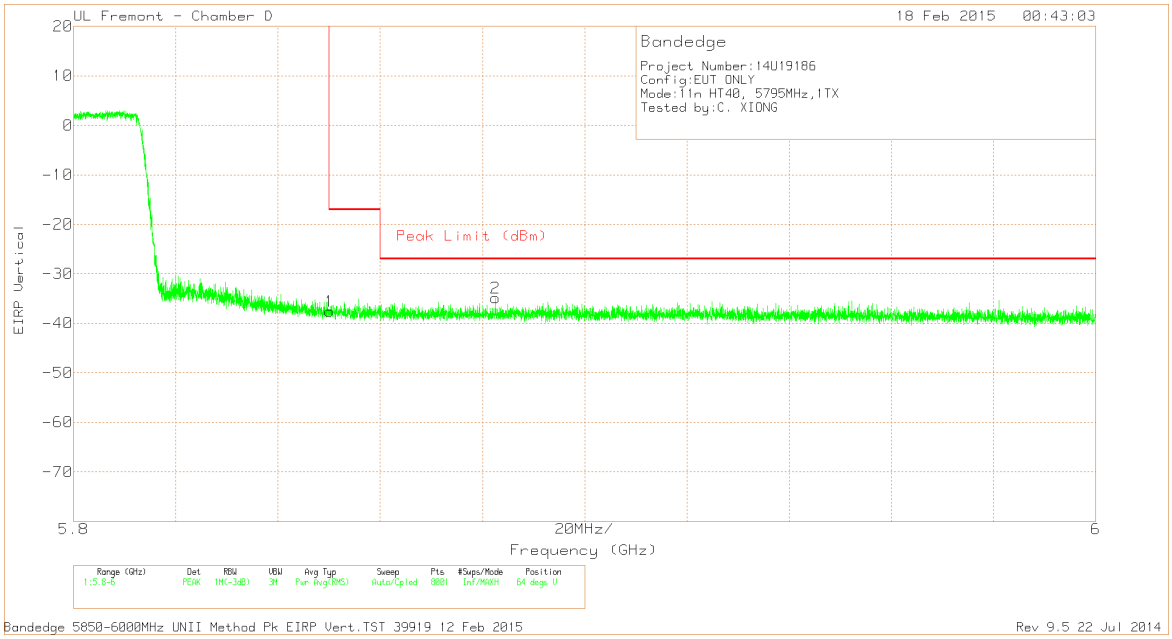
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-61.95	PK	35.4	-17.7	11.8	-32.45	-17	-15.45	47	112	H
2	5.86	-61.21	PK	35.4	-17.6	11.8	-31.61	-27	-4.61	47	112	H

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

HIGH CHANNEL VERTICAL PLOT



DATA

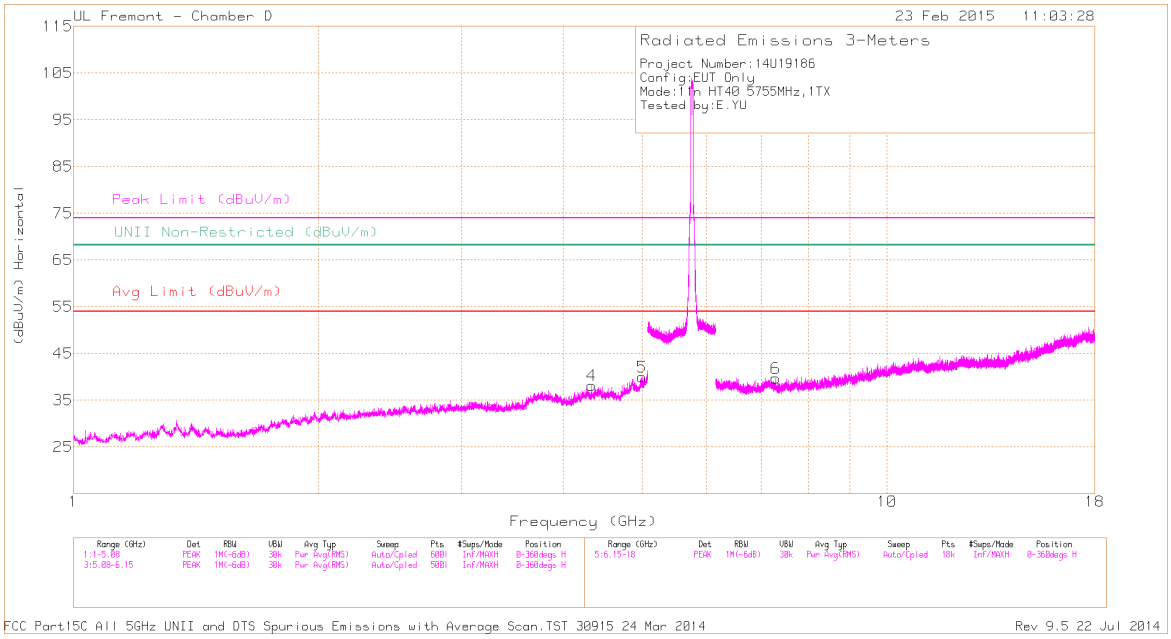
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-67.05	PK	35.4	-17.7	11.8	-37.55	-17	-20.55	64	121	V
2	5.883	-64.51	PK	35.4	-17.5	11.8	-34.81	-27	-7.81	64	121	V

PK - Peak detector

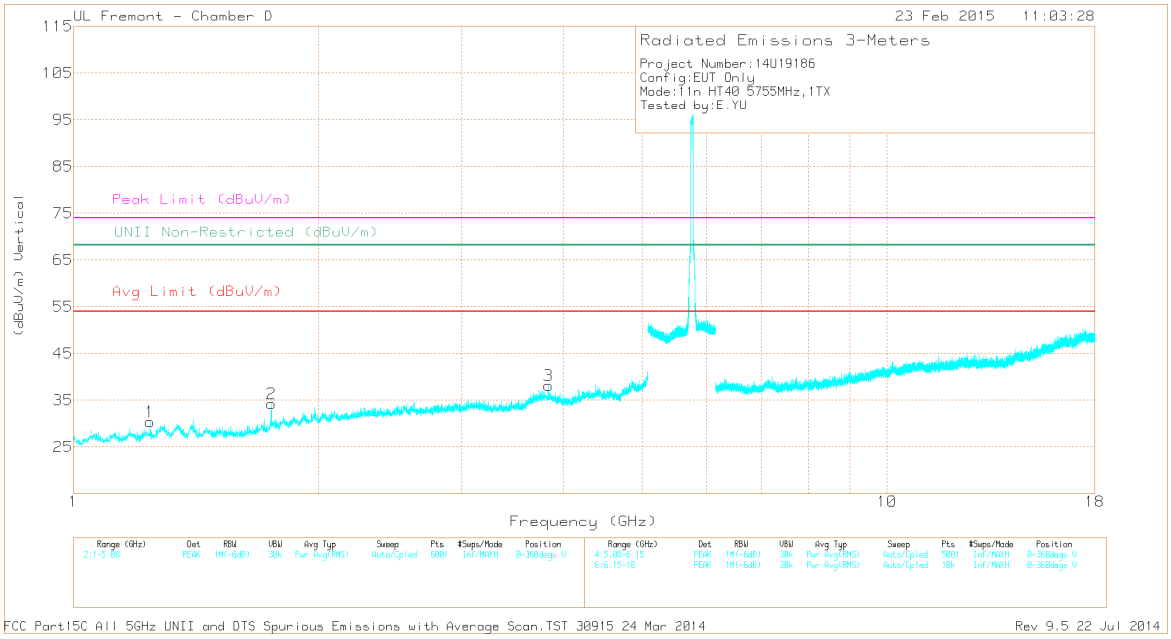
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.22.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 4.331	39.18	PK1	33.7	-28.5	44.38	-	-	74	-29.62	-	-	67	314	H
	* 4.332	26.9	AD1	33.7	-28.5	32.1	54	-21.9	-	-	-	-	67	314	H
5	* 4.994	39.51	PK1	34.3	-26.8	47.01	-	-	74	-26.99	-	-	223	100	H
	* 4.994	28.18	AD1	34.3	-26.8	35.68	54	-18.32	-	-	-	-	223	100	H
1	* 1.243	40.24	PK1	28.5	-32.4	36.34	-	-	74	-37.66	-	-	119	191	V
	* 1.241	28.92	AD1	28.5	-32.4	25.02	54	-28.98	-	-	-	-	119	191	V
3	* 3.837	40.99	PK1	33.4	-28.8	45.59	-	-	74	-28.41	-	-	238	132	V
	* 3.837	31.41	AD1	33.4	-28.8	36.01	54	-17.99	-	-	-	-	238	132	V
6	* 7.299	36.04	PK1	35.5	-25.6	45.94	-	-	74	-28.06	-	-	123	100	H
	* 7.301	25.16	AD1	35.5	-25.6	35.06	54	-18.94	-	-	-	-	123	100	H
2	1.751	40.2	PK1	29.5	-31	38.7	-	-	-	-	68.2	-29.5	157	222	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

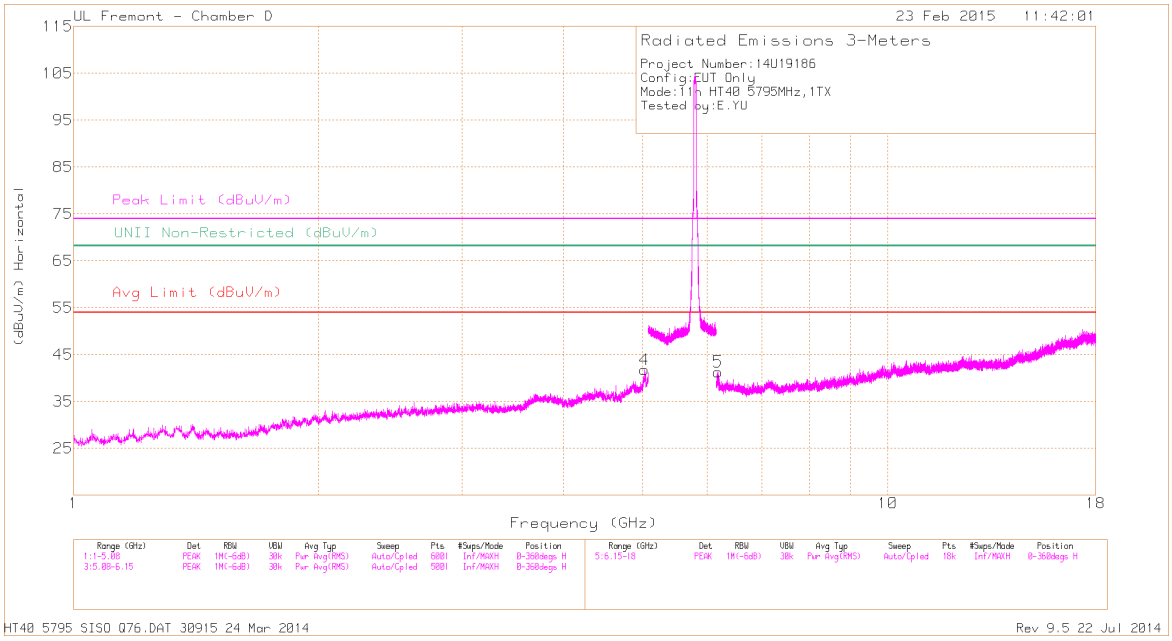
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

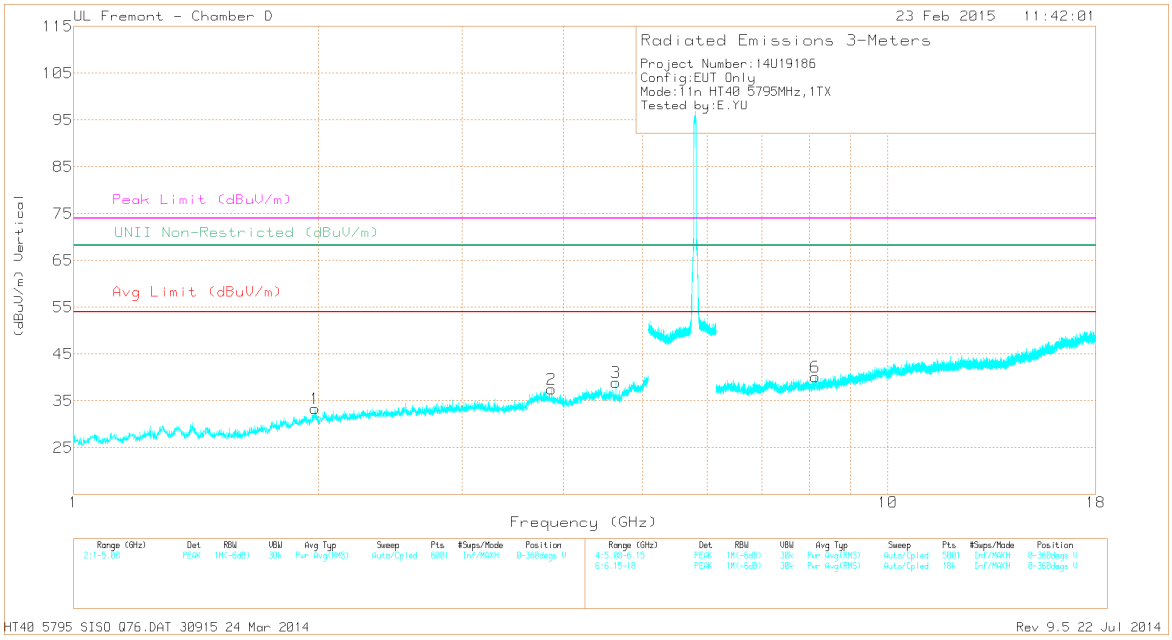
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.22.4. HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 5.023	41.22	PK1	34.3	-26	49.52	-	-	74	-24.48	-	-	59	184	H
	* 5.022	31.52	AD1	34.3	-26	39.82	54	-14.18	-	-	-	-	59	184	H
2	* 3.863	40.56	PK1	33.4	-29	44.96	-	-	74	-29.04	-	-	56	100	V
	* 3.863	31.21	AD1	33.4	-29	35.61	54	-18.39	-	-	-	-	56	100	V
3	* 4.636	39.59	PK1	34.1	-27.1	46.59	-	-	74	-27.41	-	-	10	117	V
	* 4.636	29.26	AD1	34.1	-27.1	36.26	54	-17.74	-	-	-	-	10	117	V
6	* 8.152	35.73	PK1	35.6	-23.9	47.43	-	-	74	-26.57	-	-	183	204	V
	* 8.152	26.08	AD1	35.6	-23.9	37.78	54	16.22	-	-	-	-	183	204	V
1	1.98	41.17	PK1	31	-30.8	41.37	-	-	-	-	68.2	-26.83	183	152	V
5	6.18	37.31	PK1	35.5	-26.4	46.41	-	-	-	-	68.2	-21.79	116	100	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK1 - KDB789033 Method: Peak

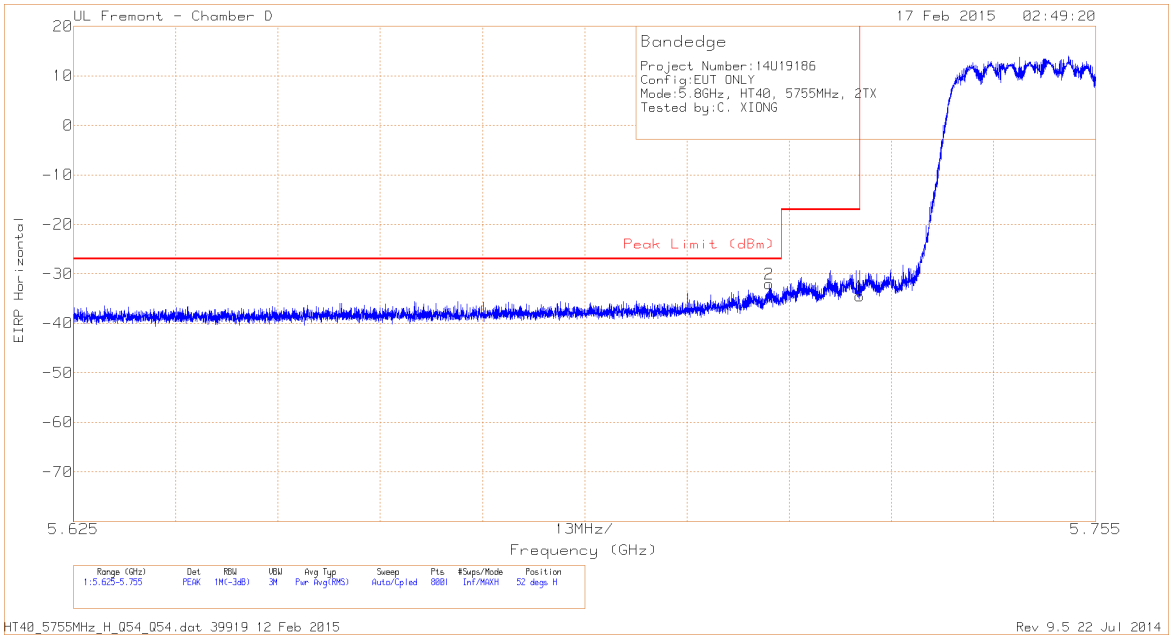
AD1 - KDB789033 Method: AD Primary Power Average

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.23. TX ABOVE 1 GHz 802.11n HT40 2Tx CDD MODE IN THE 5.8 GHz BAND

9.23.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT



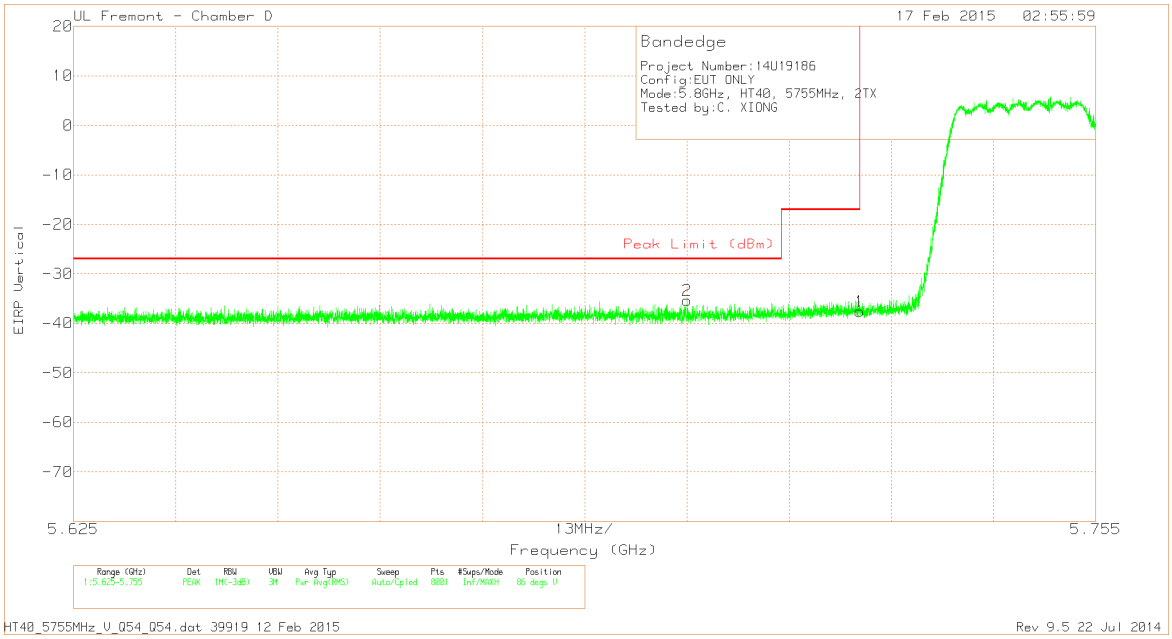
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.713	-61.49	PK	35.2	-17.5	11.8	-31.99	-27	-4.99	52	164	H
1	5.725	-63.86	PK	35.2	-17.6	11.8	-34.46	-17	-17.46	52	164	H

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

LOW CHANNEL VERTICAL PLOT



DATA

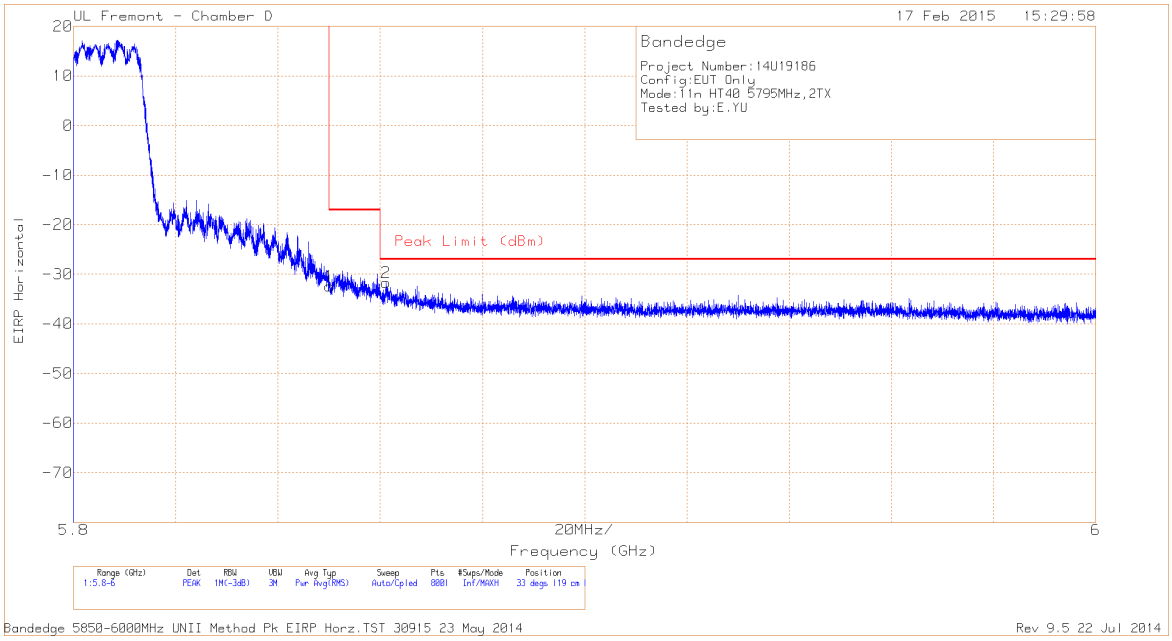
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.703	-64.85	PK	35.2	-17.5	11.8	-35.35	-27	-8.35	86	167	V
1	5.725	-66.92	PK	35.2	-17.6	11.8	-37.52	-17	-20.52	86	167	V

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.23.2. RESTRICTED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL PLOT



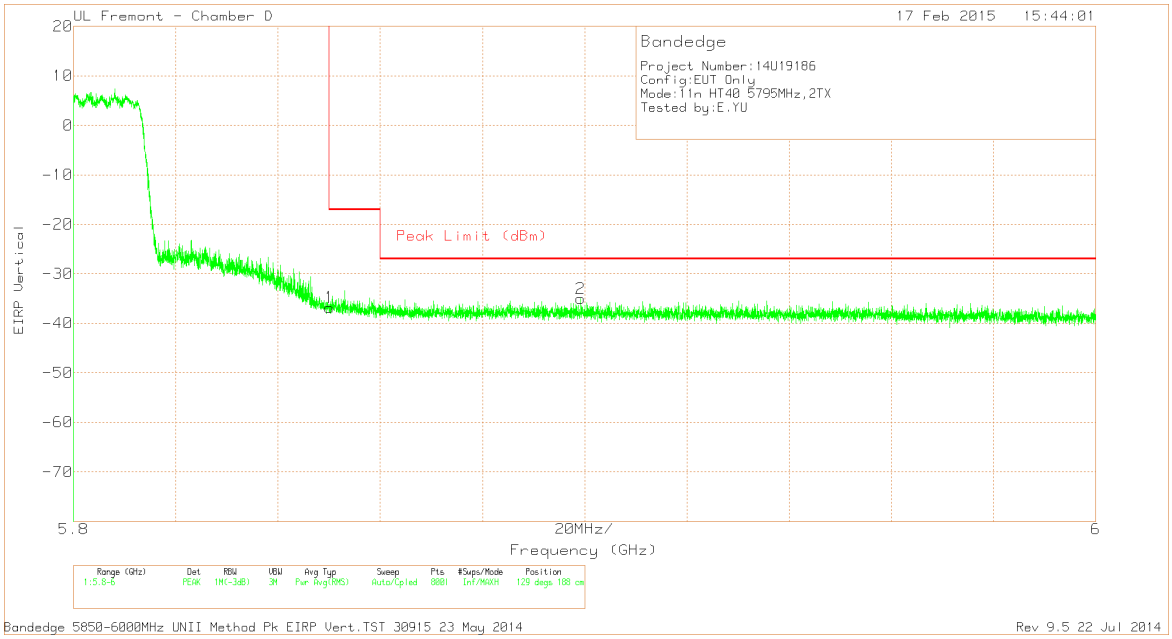
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-61.93	PK	35.4	-17.7	11.8	-32.43	-17	-15.43	33	119	H
2	5.861	-61.27	PK	35.4	-17.6	11.8	-31.67	-27	-4.67	33	119	H

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

HIGH CHANNEL VERTICAL PLOT



DATA

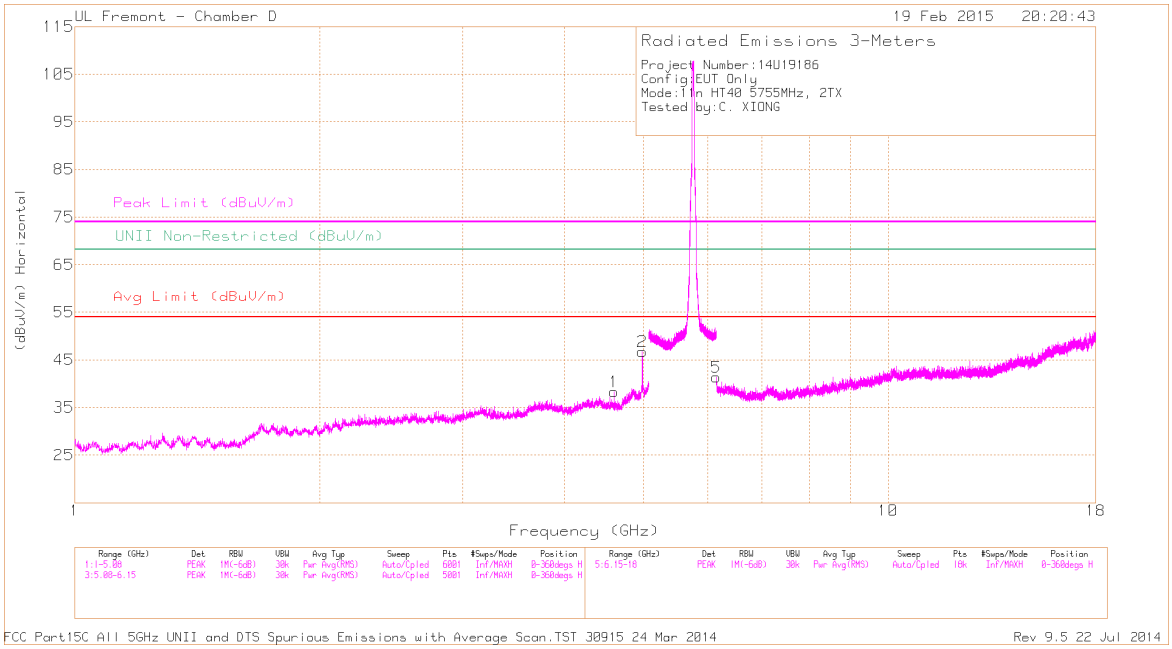
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-66.27	PK	35.4	-17.7	11.8	-36.77	-17	-19.77	129	188	V
2	5.899	-64.84	PK	35.4	-17.4	11.8	-35.04	-27	-8.04	129	188	V

PK - Peak detector

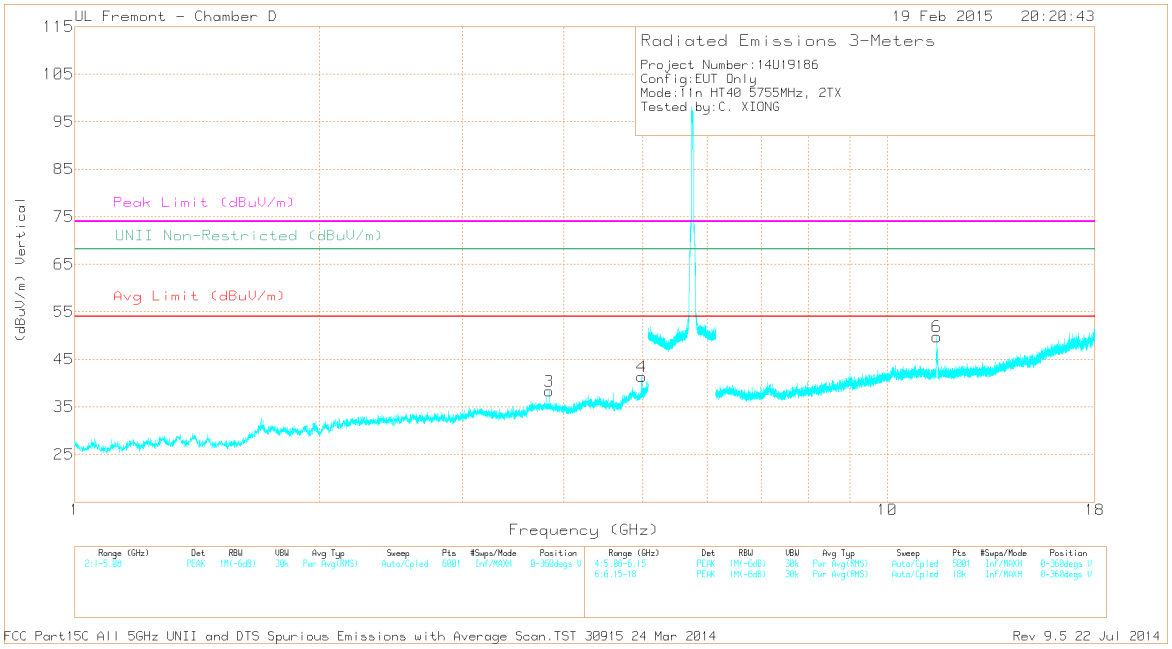
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.23.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.604	39.3	PK1	33.5	-26.9	45.9	-	-	74	-28.1	-	-	7	110	H
	* 4.604	30.74	AD1	33.5	-26.9	37.34	54	-16.66	-	-	-	-	7	110	H
2	* 4.987	44.1	PK1	34	-26.9	51.2	-	-	74	-22.8	-	-	27	184	H
	* 4.988	38.08	AD1	34	-26.9	45.18	54	-8.82	-	-	-	-	27	184	H
3	* 3.837	41.5	PK1	33	-28.8	45.7	-	-	74	-28.3	-	-	8	187	V
	* 3.837	33.53	AD1	33	-28.8	37.73	54	-16.27	-	-	-	-	8	187	V
4	* 4.987	40.78	PK1	34	-26.9	47.88	-	-	74	-26.12	-	-	5	201	V
	* 4.988	32.05	AD1	34	-26.9	39.15	54	-14.85	-	-	-	-	5	201	V
6	* 11.51	42.4	PK1	38.1	-22	58.5	-	-	74	-15.5	-	-	51	107	V
	* 11.51	30.16	AD1	38.1	-22	46.26	54	-7.74	-	-	-	-	51	107	V
5	6.15	41.82	PK1	35.9	-26.5	51.22	-	-	-	-	68.2	-16.98	1	103	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

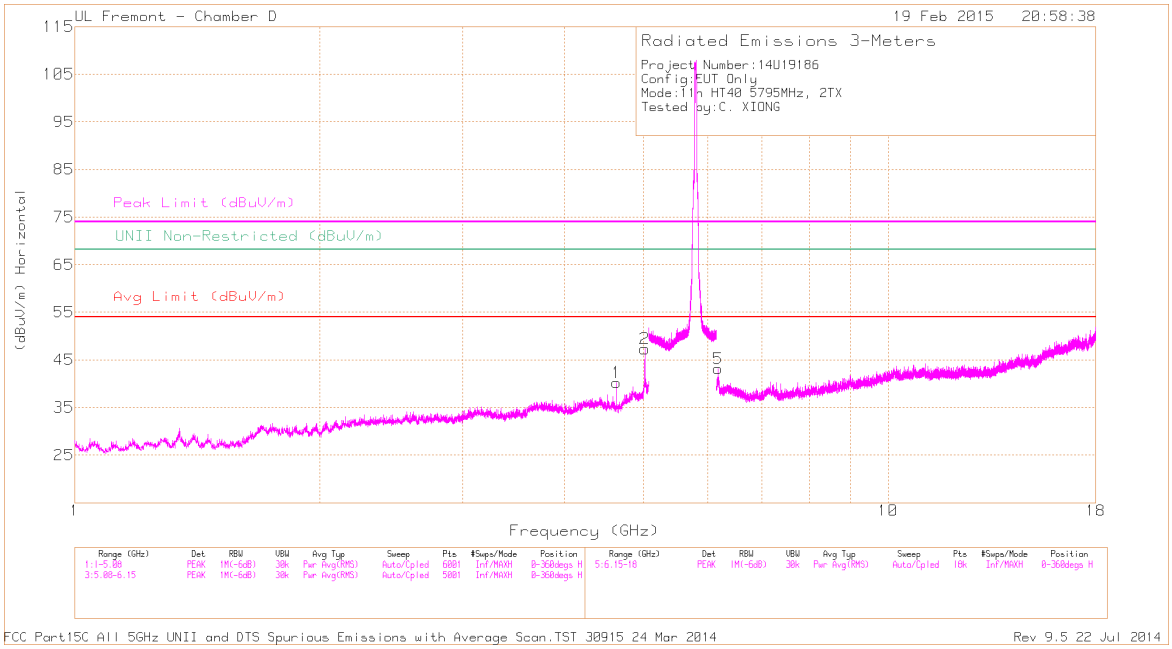
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

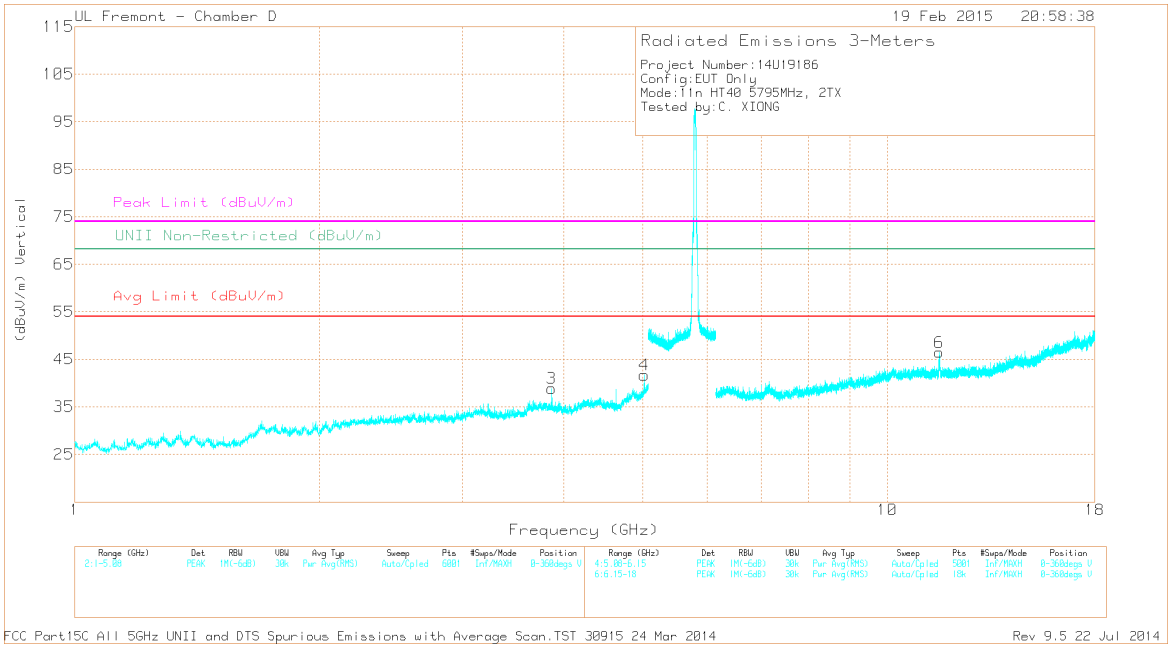
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.23.4. HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.636	40.51	PK1	33.6	-27.1	47.01	-	-	74	-26.99	-	-	26	126	H
	* 4.636	32.06	AD1	33.6	-27.1	38.56	54	-15.44	-	-	-	-	26	126	H
2	* 5.022	43.54	PK1	34	-26	51.54	-	-	74	-22.46	-	-	45	181	H
	* 5.022	37.6	AD1	34	-26	45.6	54	-8.4	-	-	-	-	45	181	H
3	* 3.863	41.93	PK1	33	-29	45.93	-	-	74	-28.07	-	-	3	182	V
	* 3.863	34.07	AD1	33	-29	38.07	54	-15.93	-	-	-	-	3	182	V
4	* 5.022	40.49	PK1	34	-26	48.49	-	-	74	-25.51	-	-	6	197	V
	* 5.022	31.33	AD1	34	-26	39.33	54	-14.67	-	-	-	-	6	197	V
6	* 11.588	40.38	PK1	38.1	-22	56.48	-	-	74	-17.52	-	-	48	153	V
	* 11.588	27.78	AD1	38.1	-22	43.88	54	-10.12	-	-	-	-	48	153	V
5	6.181	42.31	PK1	35.9	-26.5	51.71	-	-	-	-	68.2	-16.49	359	114	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK1 - KDB789033 Method: Peak

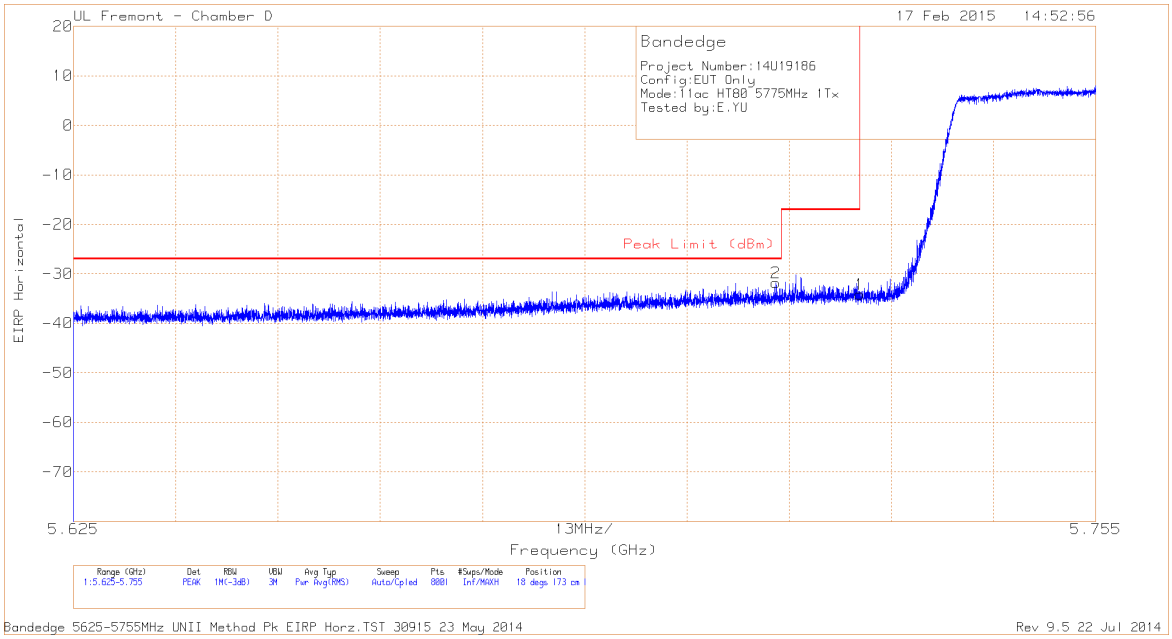
AD1 - KDB789033 Method: AD Primary Power Average

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.24. TX ABOVE 1 GHz 802.11ac 80MHz 1Tx SISO MODE IN THE 5.8 GHz BAND

9.24.1. RESTRICTED BANDEDGE (LOW)

LOW CHANNEL HORIZONTAL PLOT



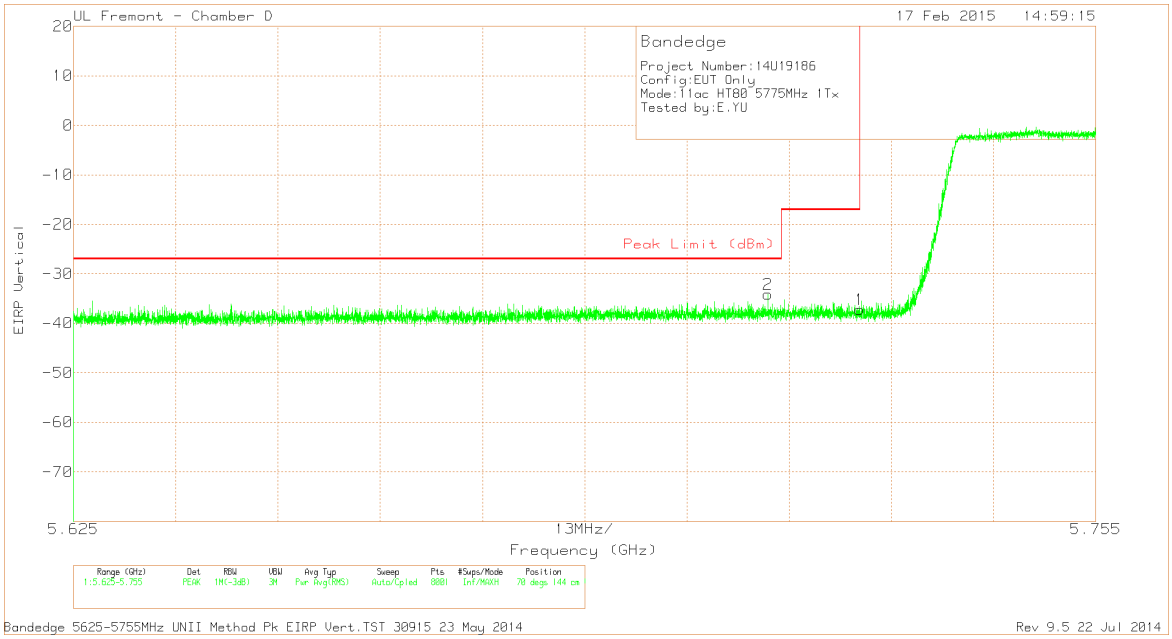
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.714	-61.29	PK	35.2	-17.5	11.8	0	-31.79	-27	-4.79	18	173	H
1	5.725	-63.51	PK	35.2	-17.6	11.8	0	-34.11	-17	-17.11	18	173	H

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

LOW CHANNEL VERTICAL PLOT



DATA

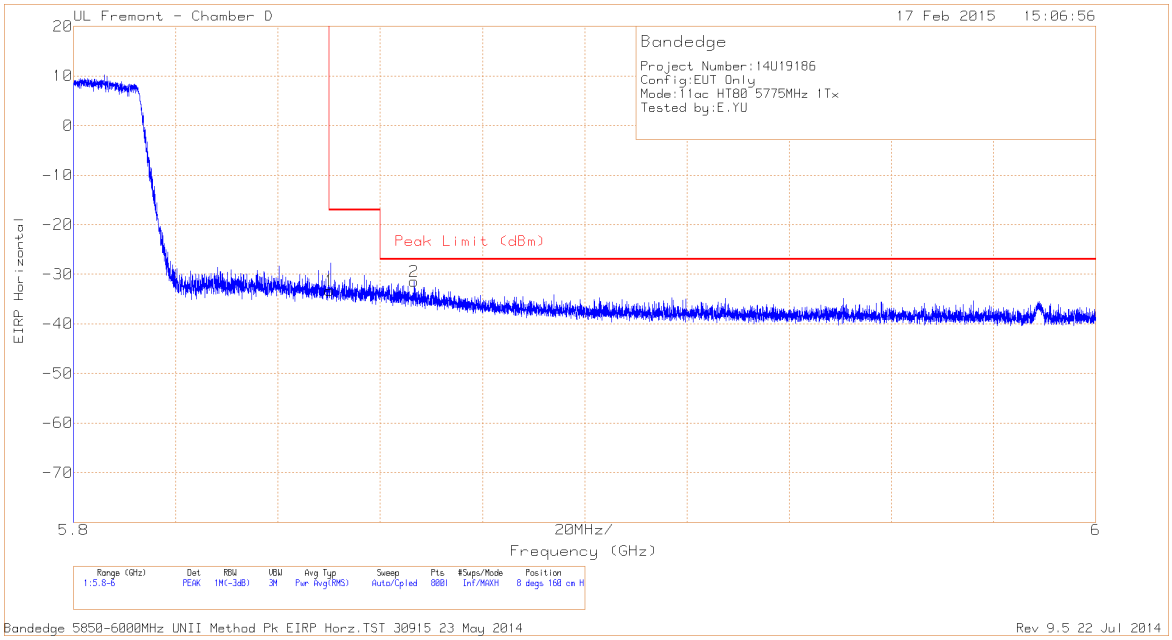
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.713	-63.61	PK	35.2	-17.5	11.8	0	-34.11	-27	-7.11	70	144	V
1	5.725	-66.63	PK	35.2	-17.6	11.8	0	-37.23	-17	-20.23	70	144	V

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.24.2. RESTRICTED BANDEDGE (HIGH)

HIGH CHANNEL HORIZONTAL PLOT



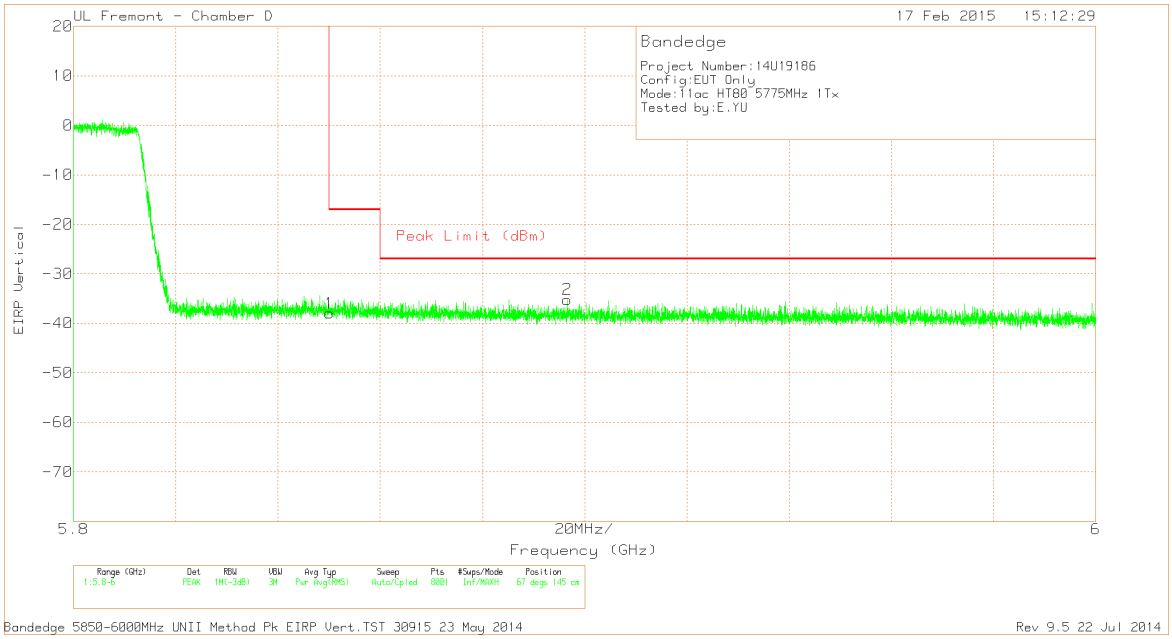
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-62.78	PK	35.4	-17.7	11.8	0	-33.28	-17	-16.28	8	160	H
2	5.867	-61.04	PK	35.4	-17.6	11.8	0	-31.44	-27	-4.44	8	160	H

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

HIGH CHANNEL VERTICAL PLOT



DATA

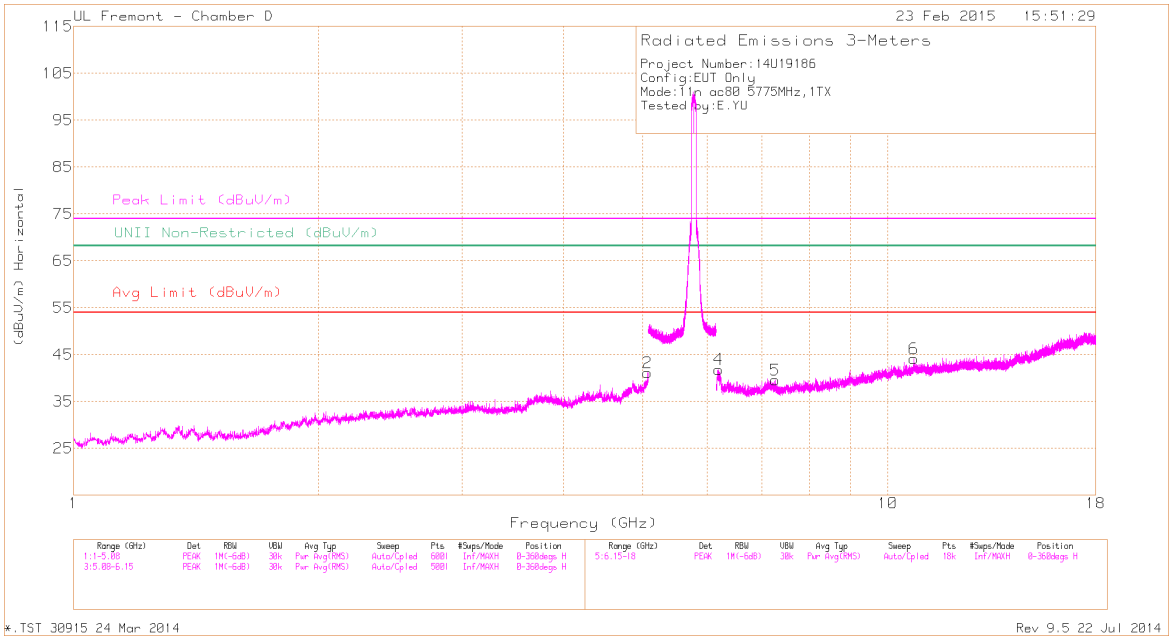
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-67.4	PK	35.4	-17.7	11.8	0	-37.9	-17	-20.9	67	145	V
2	5.897	-64.97	PK	35.4	-17.4	11.8	0	-35.17	-27	-8.17	67	145	V

PK - Peak detector

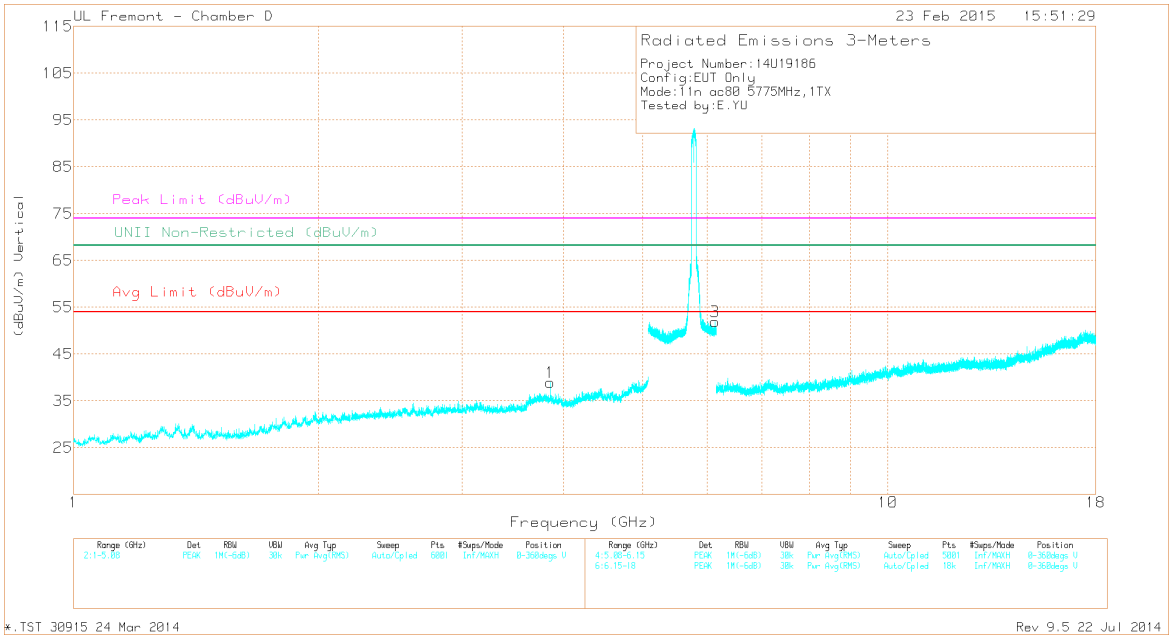
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.24.3. HARMONICS AND SPURIOUS EMISSIONS

CHANNEL 155 HORIZONTAL PLOT



CHANNEL 155 VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 5.071	38.9	PK1	34.2	-25.5	0	47.6	-	-	74	-26.4	-	-	0	239	H
	* 5.07	27.15	AD1	34.2	-25.6	.16	35.96	54	-18.04	-	-	-	-	0	239	H
1	* 3.85	41.16	PK1	33.4	-28.9	0	45.66	-	-	74	-28.34	-	-	169	114	V
	* 3.85	32.96	AD1	33.4	-28.9	.16	37.67	54	-16.33	-	-	-	-	169	114	V
5	* 7.275	35.85	PK1	35.5	-25	0	46.35	-	-	74	-27.65	-	-	65	152	H
	* 7.277	24.69	AD1	35.5	-25.1	.16	35.3	54	-18.7	-	-	-	-	65	152	H
6	* 10.765	33.96	PK1	37.9	-20.9	0	50.96	-	-	74	-23.04	-	-	142	204	H
	* 10.766	22.82	AD1	37.9	-20.9	.16	40.03	54	-13.97	-	-	-	-	142	204	H
3	6.13	40.82	PK1	35.6	-17.6	0	58.82	-	-	-	-	68.2	-9.38	226	205	V
4	6.23	41.13	PK1	35.4	-26.7	0	49.83	-	-	-	-	68.2	-18.37	140	231	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK1 - KDB789033 Method: Peak

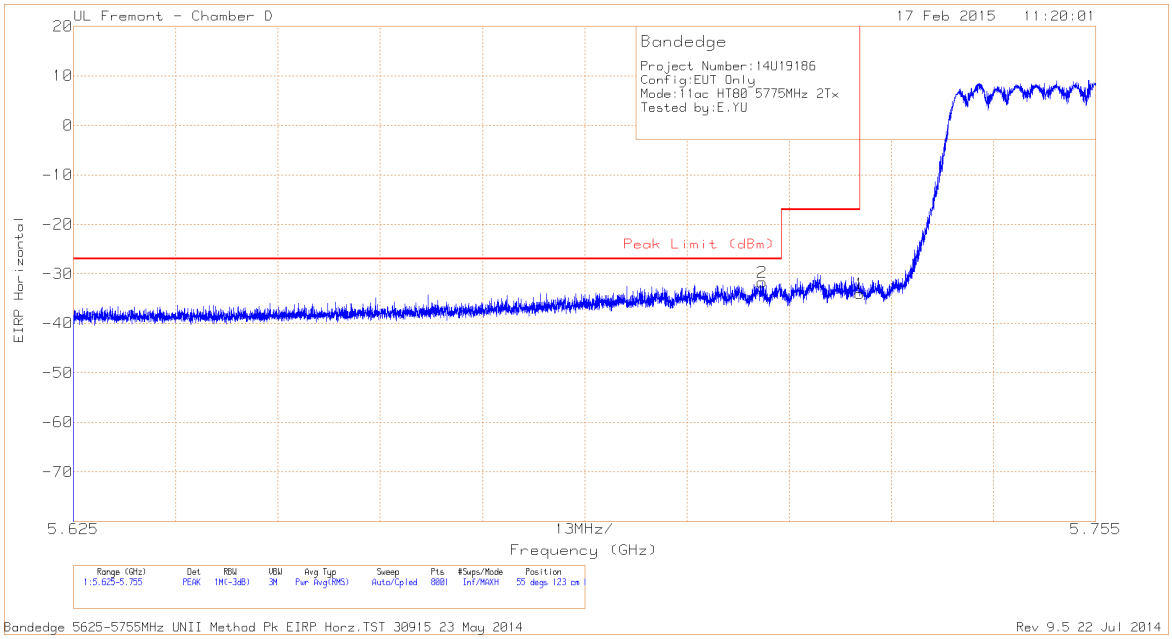
AD1 - KDB789033 Method: AD Primary Power Average

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.25. TX ABOVE 1 GHz 802.11ac 80Mhz 2Tx CDD MODE IN THE 5.8 GHz BAND

9.25.1. RESTRICTED BANDEDGE (LOW)

LOW CHANNEL HORIZONTAL PLOT



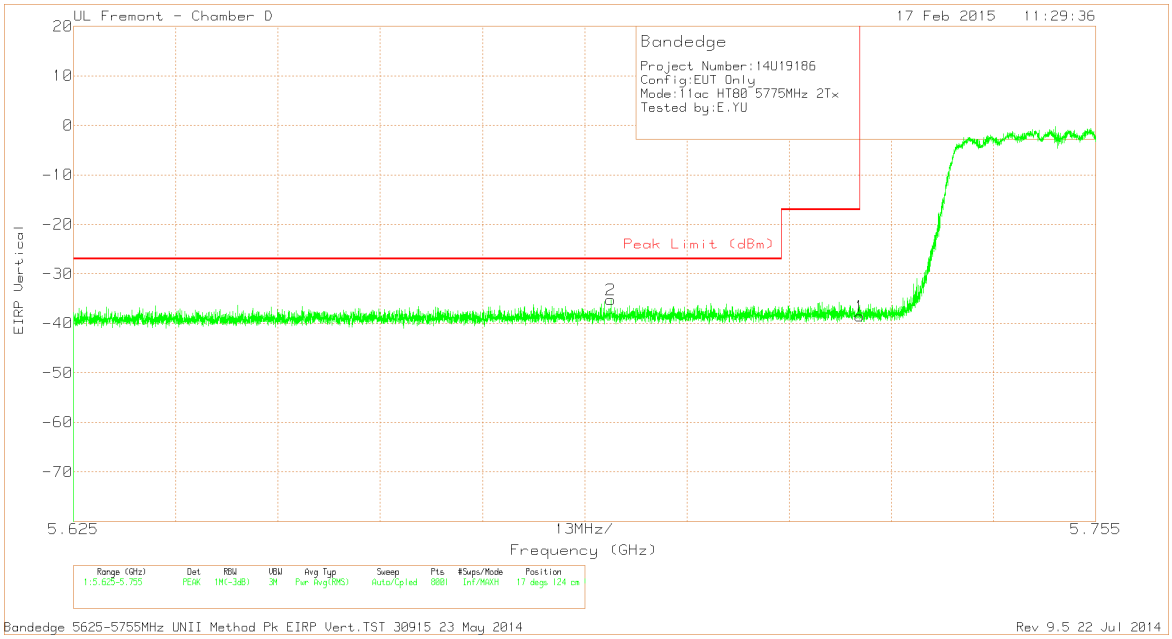
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.713	-61.21	PK	35.2	-17.5	11.8	0	-31.71	-27	-4.71	55	123	H
1	5.725	-63.39	PK	35.2	-17.6	11.8	0	-33.99	-17	-16.99	55	123	H

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

LOW CHANNEL VERTICAL PLOT



DATA

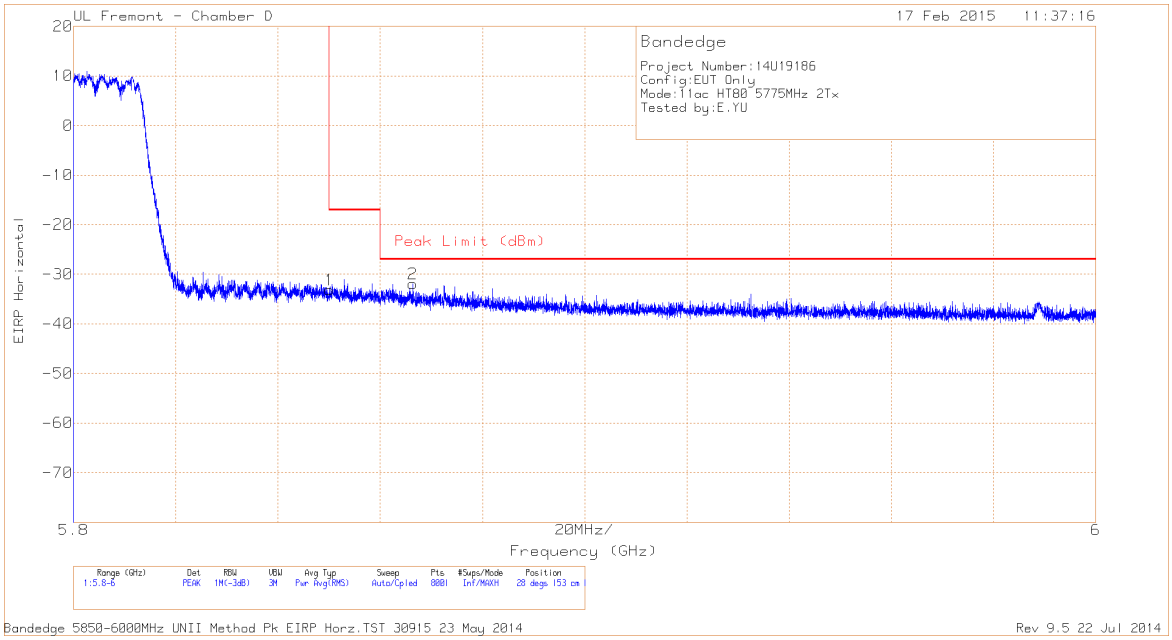
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.693	-64.88	PK	35.1	-17.3	11.8	0	-35.28	-27	-8.28	17	124	V
1	5.725	-67.98	PK	35.2	-17.6	11.8	0	-38.58	-17	-21.58	17	124	V

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.25.2. RESTRICTED BANDEDGE (HIGH)

HIGH CHANNEL HORIZONTAL PLOT



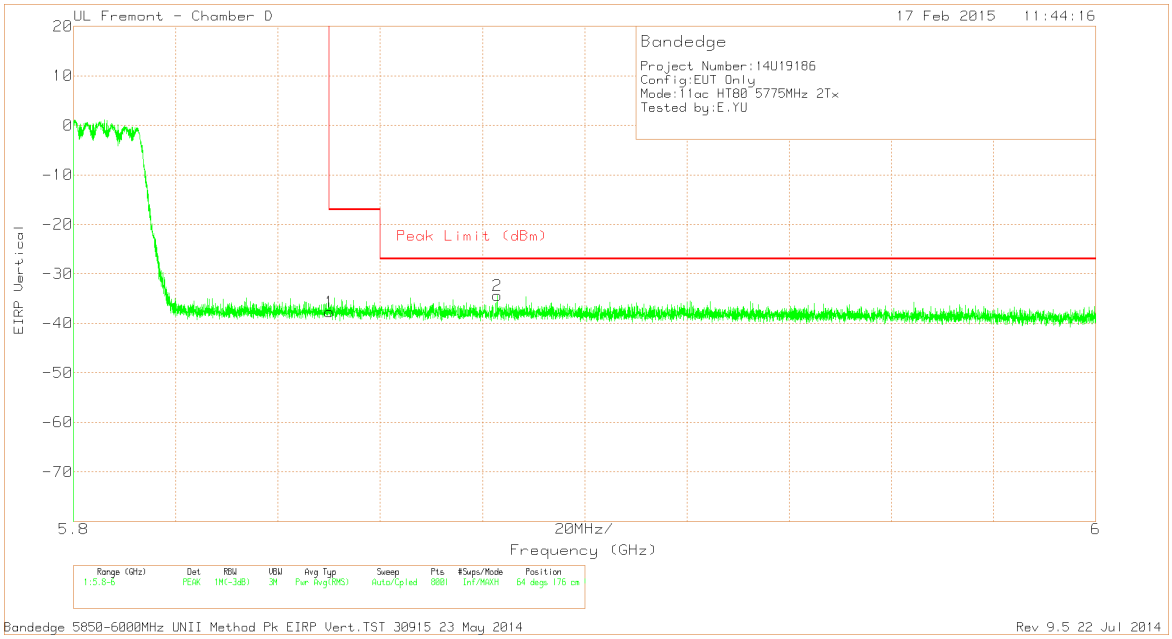
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-62.59	PK	35.4	-17.7	11.8	0	-33.09	-17	-16.09	28	153	H
2	5.866	-61.48	PK	35.4	-17.6	11.8	0	-31.88	-27	-4.88	28	153	H

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

HIGH CHANNEL VERTICAL PLOT



DATA

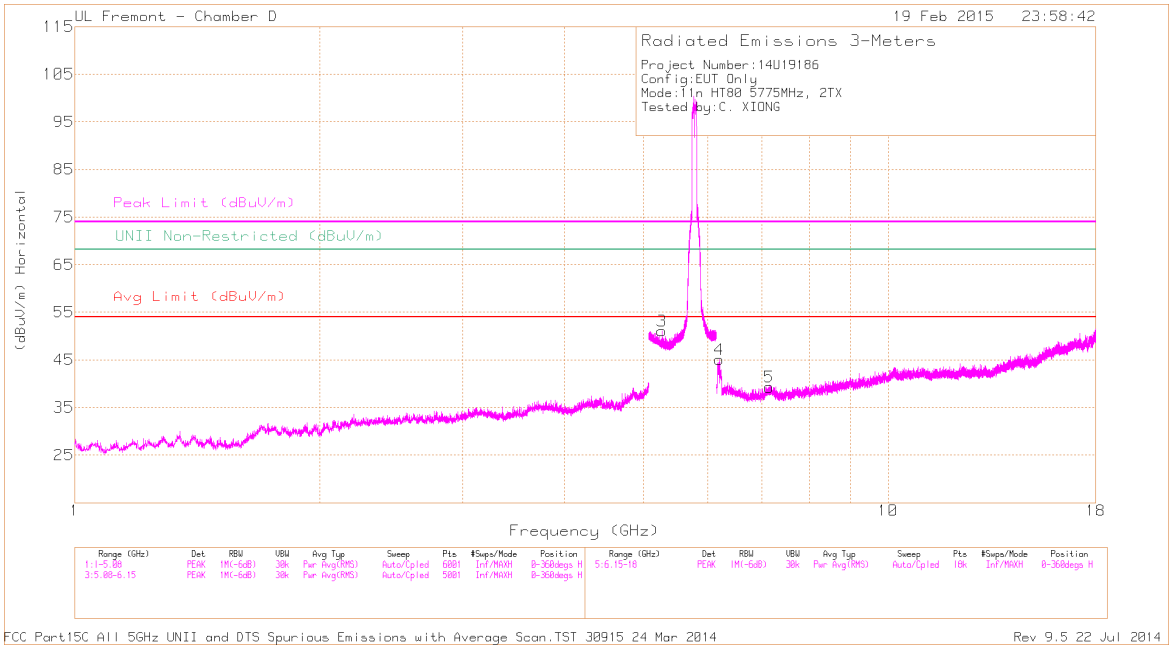
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-67.22	PK	35.4	-17.7	11.8	0	-37.72	-17	-20.72	64	176	V
2	5.883	-64.03	PK	35.4	-17.5	11.8	0	-34.33	-27	-7.33	64	176	V

PK - Peak detector

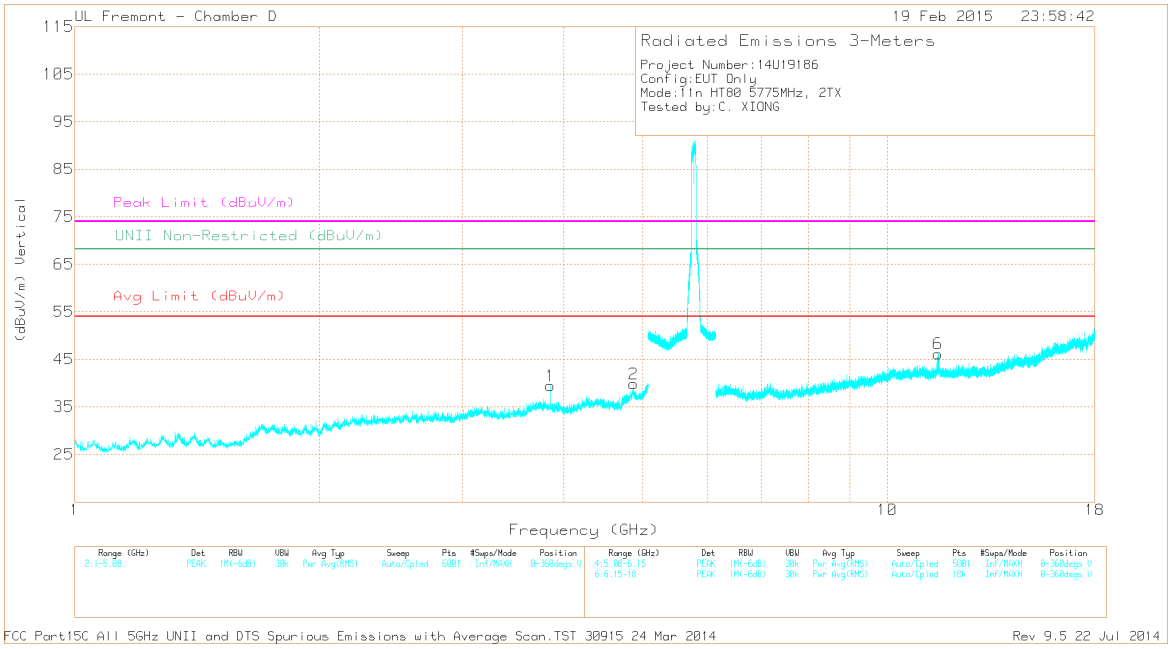
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.25.3. HARMONICS AND SPURIOUS EMISSIONS

CHANNEL 155 HORIZONTAL PLOT



CHANNEL 155 VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

DATA

	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.85	41.93	PK1	33	-28.9	0	46.03	-	-	74	-27.97	-	-	0	211	V
	* 3.85	34.71	AD1	33	-28.9	.21	39.02	54	-14.98	-	-	-	-	0	211	V
2	* 4.866	37.62	PK1	33.9	-25.3	0	46.22	-	-	74	-27.78	-	-	9	165	V
	* 4.863	26.87	AD1	33.9	-25.4	.21	35.58	54	-18.42	-	-	-	-	9	165	V
6	* 11.561	38.75	PK1	38.1	-22	0	54.85	-	-	74	-19.15	-	-	44	166	V
	* 11.56	27.26	AD1	38.1	-22	.21	43.57	54	-10.43	-	-	-	-	44	166	V
3	5.273	40.66	PK1	34.3	-18.1	0	56.86	-	-	-	-	68.2	-11.34	41	145	H
4	6.193	42.93	PK1	35.9	-26.6	0	52.23	-	-	-	-	68.2	-15.97	4	101	H
5	7.141	35.69	PK1	35.6	-24.1	0	47.19	-	-	-	-	68.2	-21.01	36	136	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK1 - KDB789033 Method: Peak

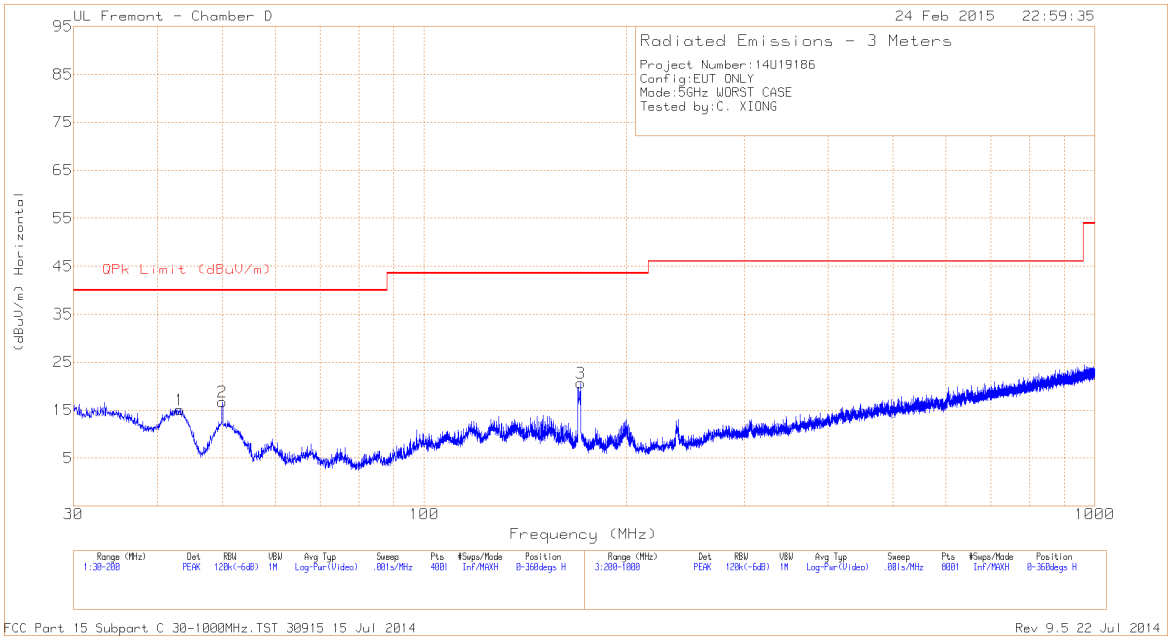
AD1 - KDB789033 Method: AD Primary Power Average

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

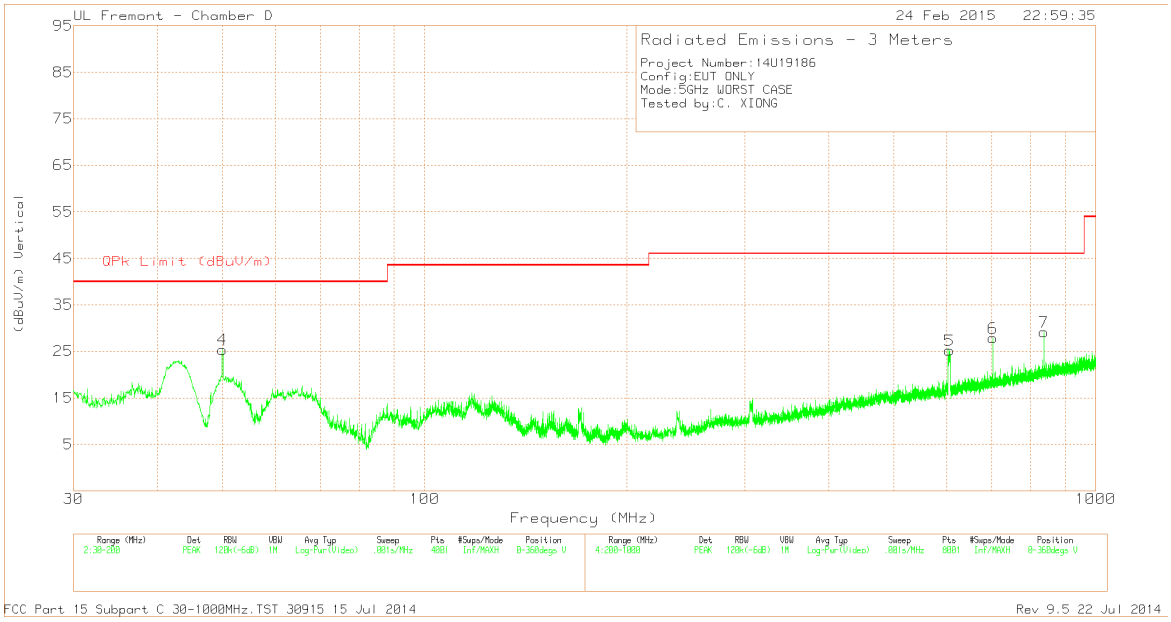
9.26. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)

HORIZONTAL PLOT



VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

HORIZONTAL AND VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 171.0575	39.91	PK	11.7	-31	20.61	43.52	-22.91	0-360	98	H
1	43.175	35.21	PK	11.7	-31.8	15.11	40	-24.89	0-360	301	H
2	50.0175	40.46	PK	7.9	-31.7	16.66	40	-23.34	0-360	301	H
4	50.0175	49.21	PK	7.9	-31.7	25.41	40	-14.59	0-360	100	V
5	605.3	36.33	PK	18.5	-29.6	25.23	46.02	-20.79	0-360	100	V
6	703	36.95	PK	20.2	-29.3	27.85	46.02	-18.17	0-360	201	V
7	836.6	36.18	PK	21.8	-28.8	29.18	46.02	-16.84	0-360	301	V

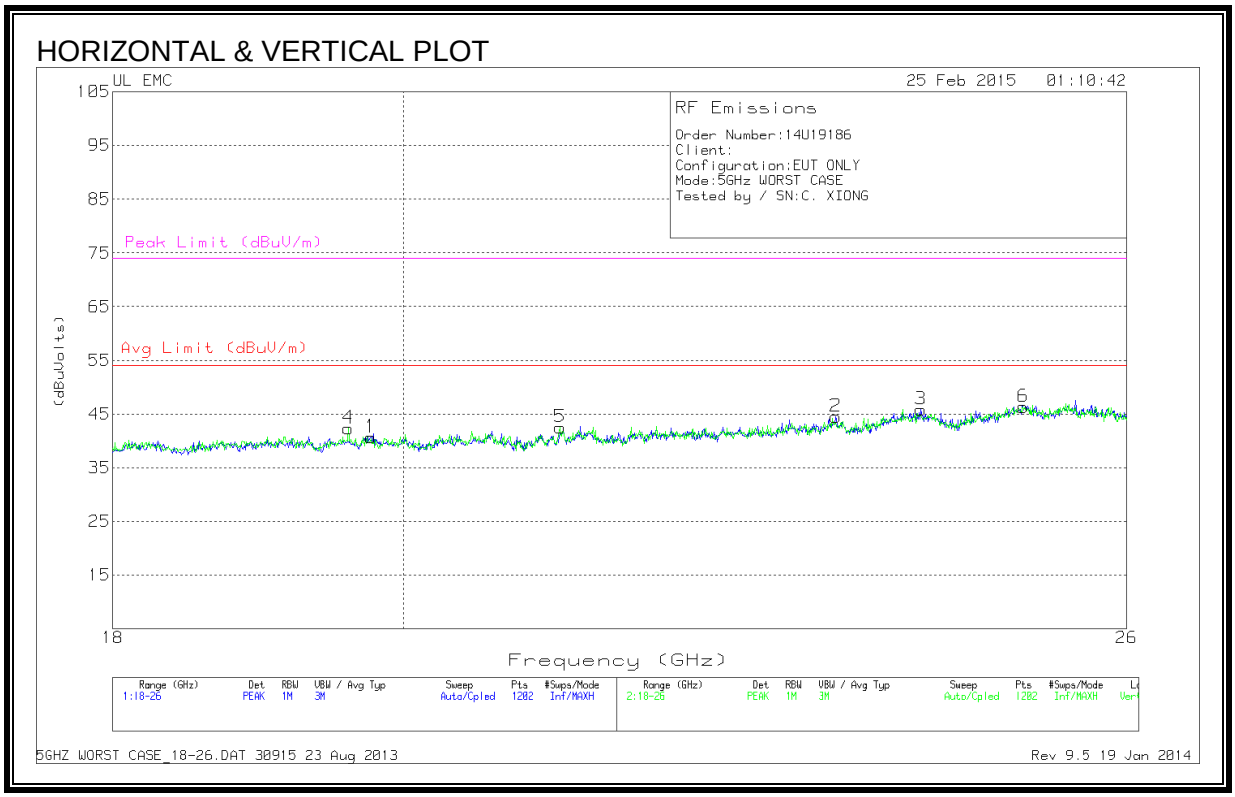
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

9.27. WORST-CASE ABOVE 18 GHz

SPURIOUS EMISSIONS 18000 TO 26000 MHz (WORST-CASE CONFIGURATION)



HORIZONTAL AND VERTICAL DATA

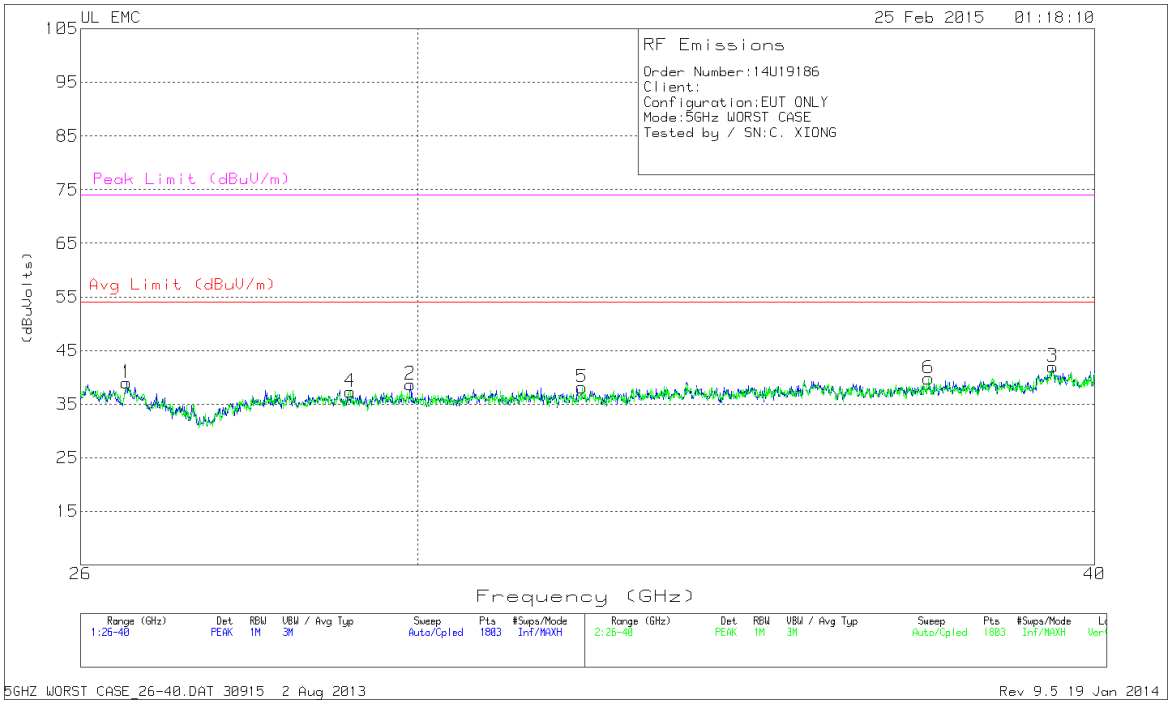
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.765	41.37	PK	33	-24.2	-9.5	40.666	54	-13.333	74	-33.333
2	23.396	42.6	PK	34	-22.6	-9.5	44.5	54	-9.5	74	-29.5
3	24.128	43.83	PK	34.2	-22.7	-9.5	45.833	54	-8.166	74	-28.166
4	19.605	42.83	PK	32.9	-23.9	-9.5	42.333	54	-11.666	74	-31.666
5	21.171	42.4	PK	33.3	-23.7	-9.5	42.5	54	-11.5	74	-31.5
6	25.041	43.93	PK	34.5	-22.6	-9.5	46.333	54	-7.666	74	-27.666

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

SPURIOUS EMISSIONS 26000 TO 40000 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL & VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T90 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	26.513	46.4	PK	35.5	-33.4	-9.5	39	54	-15	74	-35
2	29.908	48.77	PK	36	-36.6	-9.5	38.666	54	-15.333	74	-35.333
3	39.293	48.9	PK	38.4	-35.8	-9.5	42	54	-12	74	-32
4	29.15	47.13	PK	35.9	-36.2	-9.5	37.333	54	-16.666	74	-36.666
5	32.169	48.17	PK	36.4	-36.9	-9.5	38.166	54	-15.833	74	-35.833
6	37.273	51.03	PK	37.3	-39	-9.5	39.833	54	-14.166	74	-34.166

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

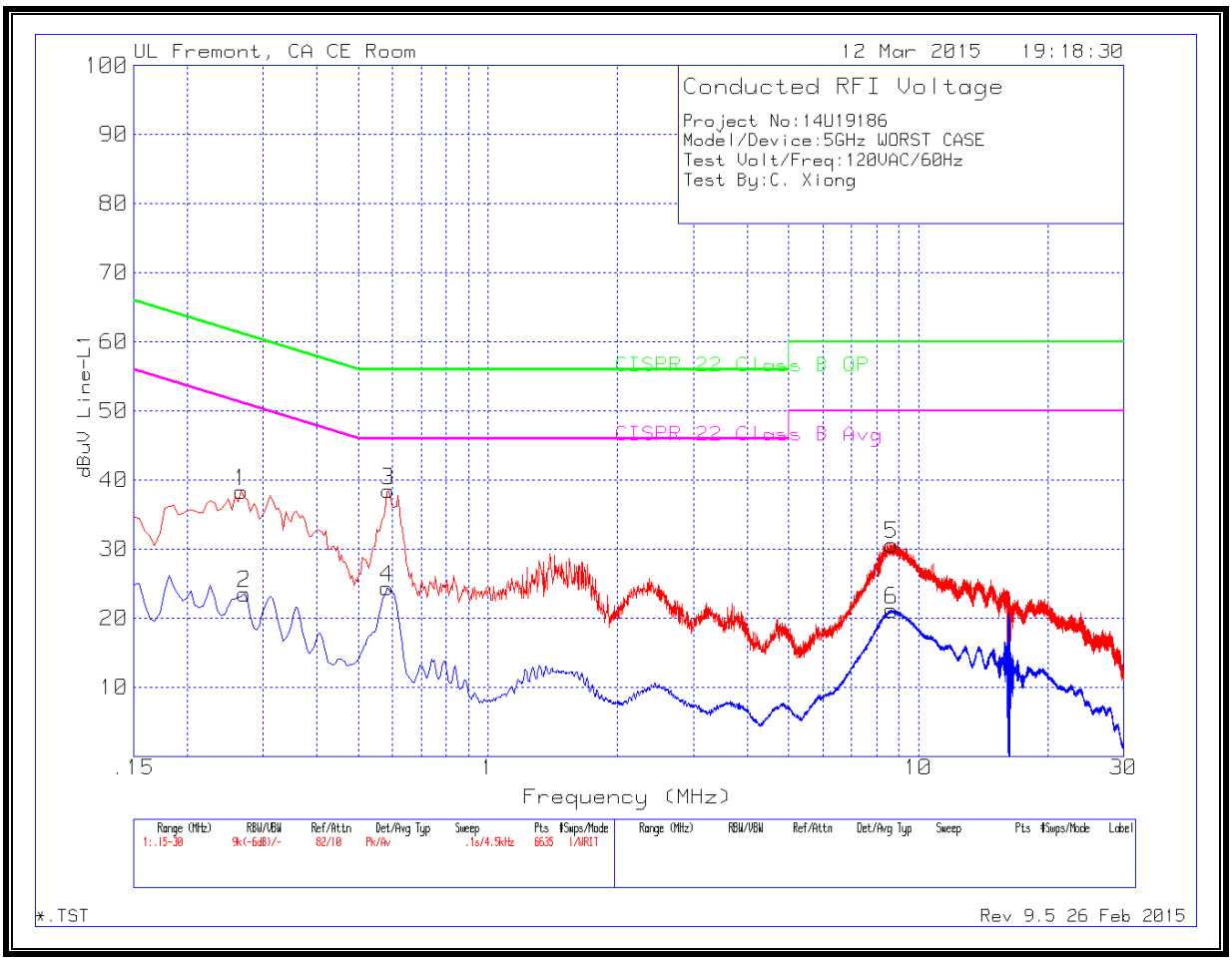
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

LINE 1 RESULTS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

WORST EMISSIONS

Line-L1 .15 - 30MHz

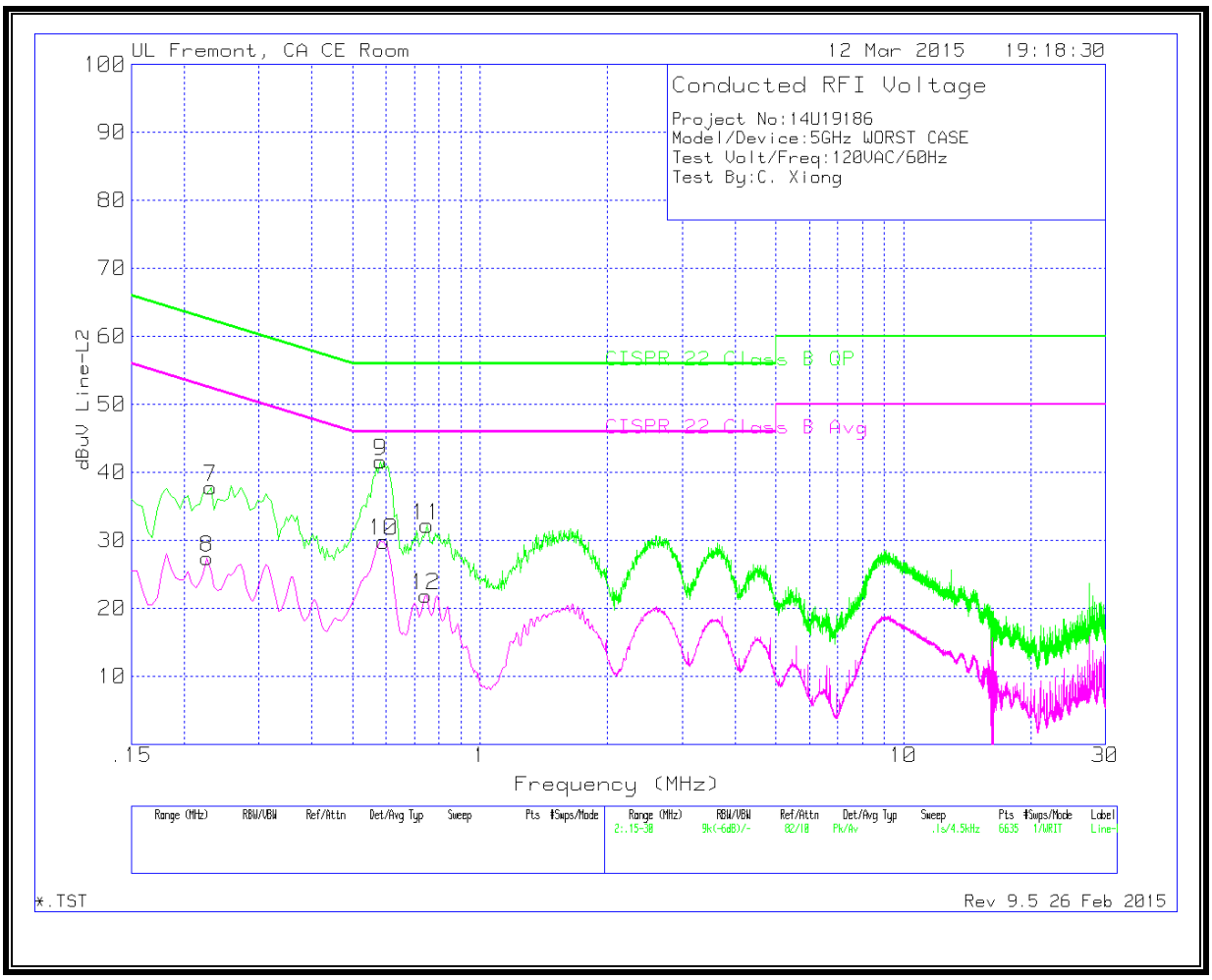
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.267	37.78	Pk	.6	0	38.38	61.21	-22.83	51.21	-12.83
2	.2715	22.96	Av	.6	0	23.56	61.07	-37.51	51.07	-27.51
3	.5865	38.18	Pk	.3	0	38.48	56	-17.52	46	-7.52
4	.582	24.1	Av	.3	0	24.4	56	-31.6	46	-21.6
5	8.6685	30.36	Pk	.2	.1	30.66	60	-29.34	50	-19.34
6	8.664	20.88	Av	.2	.1	21.18	60	-38.82	50	-28.82

Pk - Peak detector

Av - Average detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

LINE 2 RESULTS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

WORST EMISSIONS

Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
7	.231	37	Pk	.8	0	37.8	62.41	-24.61	52.41	-14.61
8	.2265	26.54	Av	.9	0	27.44	62.58	-35.14	52.58	-25.14
9	.582	41.31	Pk	.3	0	41.61	56	-14.39	46	-4.39
10	.591	29.57	Av	.3	0	29.87	56	-26.13	46	-16.13
11	.7485	31.91	Pk	.3	0	32.21	56	-23.79	46	-13.79
12	.744	21.61	Av	.3	0	21.91	56	-34.09	46	-24.09

Pk - Peak detector

Av - Average detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11. DYNAMIC FREQUENCY SELECTION

11.1. OVERVIEW

11.1.1. LIMITS

INDUSTRY CANADA

IC RSS-247 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

RSS-247 Issue 1

Note: For the band 5600–5650 MHz, no operation is permitted.

Until further notice, devices subject to this annex shall not be capable of transmitting in the band 5600–5650 MHz. This restriction is for the protection of Environment Canada weather radars operating in this band.

FCC

§15.407 (h), FCC 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”.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

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	Client **(without DFS)**	Client **(with DFS)**
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar DFS	Client (without DFS)
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 all 20 MHz channel blocks and a null frequency between the bonded 20 MHz channel blocks.		

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

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

Maximum Transmit Power	Value (see notes)
E.I.R.P. ≥ 200 milliwatt	-64 dBm
E.I.R.P. < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
E.I.R.P. < 200 milliwatt that do not meet 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.
Note 3: E.I.R.P. 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	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1)
Channel Closing Transmission Time	200 milliseconds + approx. 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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in table 5a	Roundup: {(1/360) x (19 x 10^6 PRI_{usec})}	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 usec. With a minimum increment of 1 usec, 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 Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

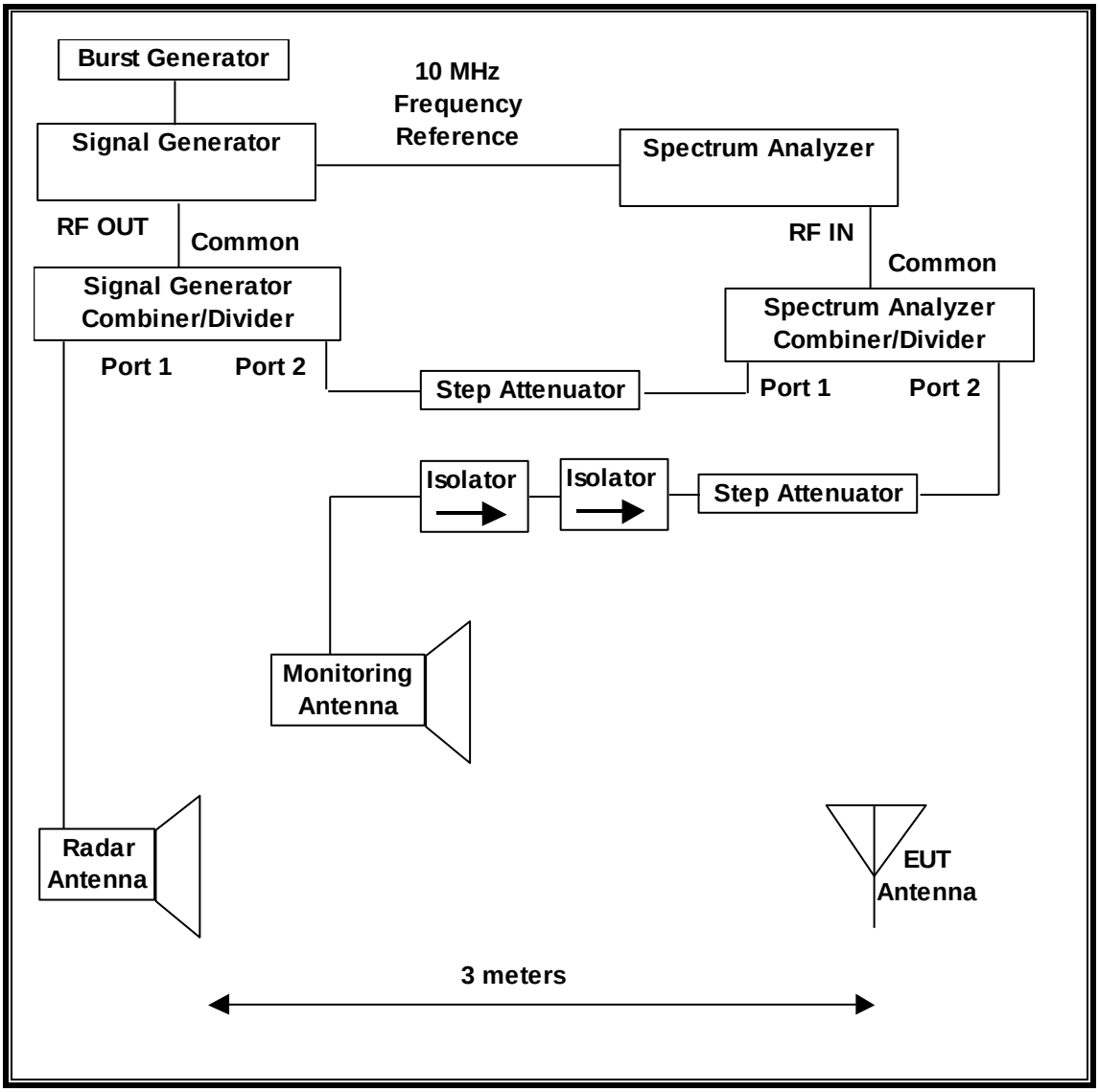
Table 7 – Frequency Hopping Radar Test Signal

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

SYSTEM OVERVIEW

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 KDB 905462 D02. The frequency of the signal generator is incremented in 1 MHz steps from F_L to F_H 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. 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.

SYSTEM CALIBRATION

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 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 –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

TEST AND MEASUREMENT EQUIPMENT

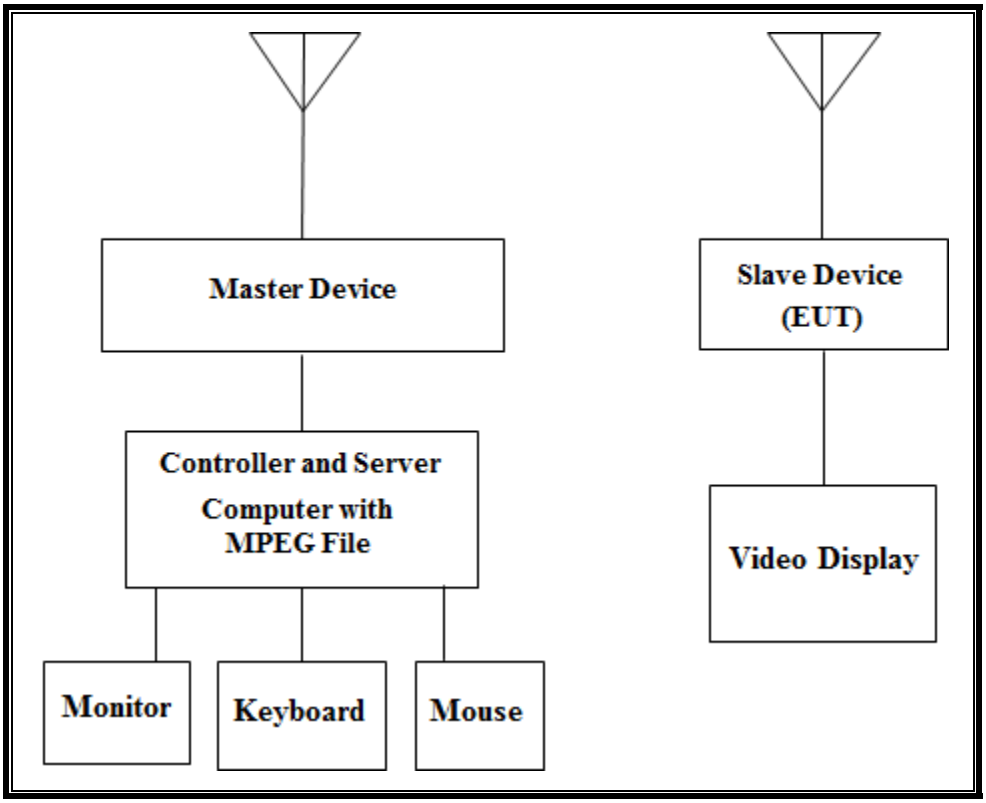
The following test and measurement equipment was utilized for the DFS tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset Number**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	09/05/15
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	09/03/15

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.1.3. SETUP OF EUT (CLIENT MODE)

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

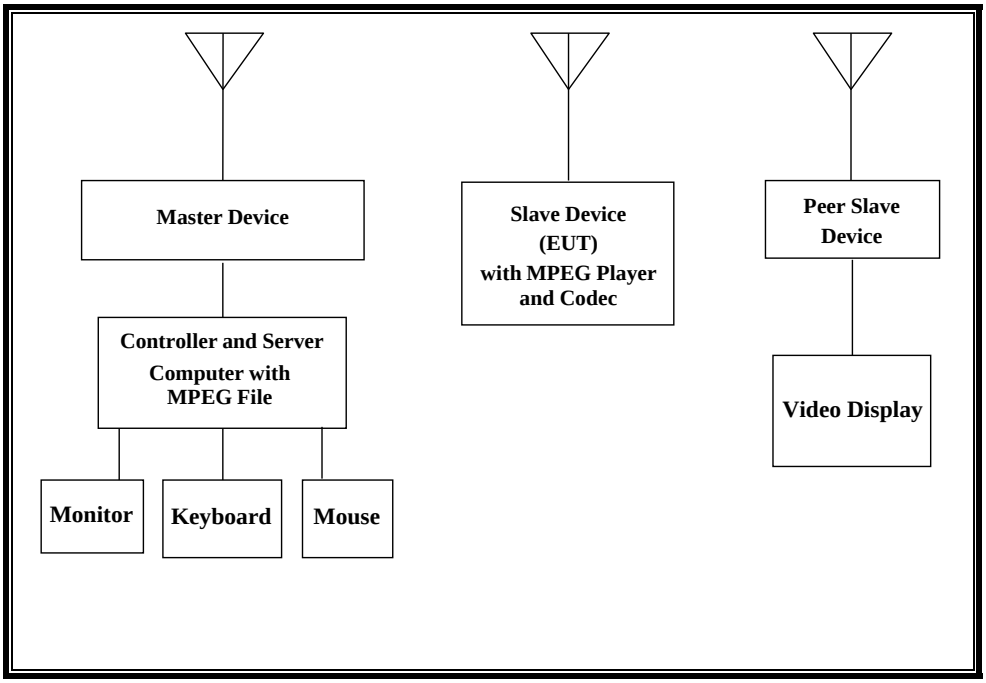
The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
802.11a/b/g/n/ac Wireless Access Point (Master Device)	Apple	A1521	CB6KX6B5FJIR	BCGA1521
Personal Computer (Controller/Server)	Apple	Mac Mini A1347	DZHJV02WDTCL	DoC
Monitor (Controller/Server PC)	Samsung	LN19B360C5D	AZA134NS302514T	DoC
Keyboard (Controller/Server PC)	Apple	A1243	CC232520MQQDPQVAL	DoC
Mouse (Controller/Server PC)	Apple	A1152	CC2251307MQDNYA3	DoC
Video Display	Dell	U2410f	CN-0FJ525N-72872-1B5-AGAL	DoC

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.1.4. SETUP OF EUT (CLIENT-TO-CLIENT COMMUNICATIONS MODE)

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
802.11a/b/g/n/ac Wireless Access Point (Master Device)	Apple	A1521	CB6KX6B5FJIR	BCGA1521
Personal Computer (Controller/Server)	Apple	A1347	DZHJV02WDTCL	DoC
Monitor (Controller/Server PC)	Samsung	LN19B360C5D	AZA134NS302514T	DoC
Keyboard (Controller/Server PC)	Apple	A1243	CC232520MQQDPQVAL	DoC
Mouse (Controller/Server PC)	Apple	A1152	CC2251307MQDNYA3	DoC
Apple TV (Peer Slave Device)	Apple	A1469	C07JVIZ7FF54	BCGA1469
Video Display	Dell	U2410f	CN-0FJ525N-72872-1B5-AGAL	DoC

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.1.5. DESCRIPTION OF EUT

For FCC the EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

The EUT is a Slave Device without Radar Detection.

The highest power level within these bands is 22.55 dBm EIRP in the 5250-5350 MHz band and 22.25 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 4.1 dBi in the 5250-5350 MHz band and 4.8 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 3.1 dBi in the 5250-5350 MHz band and 3.2 dBi in the 5470-5725 MHz band.

Two antennas are utilized to meet the diversity and MIMO operational requirements.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is –64 + 1 = -63 dBm.

The calibrated radiated DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The EUT uses two transmitter/receiver chains, each connected to an antenna to perform radiated tests.

WLAN traffic is generated by streaming the compressed video file TestFile.mp2 “6 ½ Magic Hours” from the Master to the Slave in full motion video mode using OPlayerHD Lite media player.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11ac architecture. Three nominal channel bandwidths are implemented: 20 MHz, 40 MHz and 80 MHz.

The software installed in the EUT is 12H49.

The software installed in the Master Device is 7.7.2C0 dev.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS

The Master Device is an Apple, Inc. Access Point, FCC ID: BCGA1521. The minimum antenna gain for the Master Device is 1.4 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is –64 + 1 = -63 dBm.

The calibrated radiated DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The software installed in the access point is 7.7.2C0 dev.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

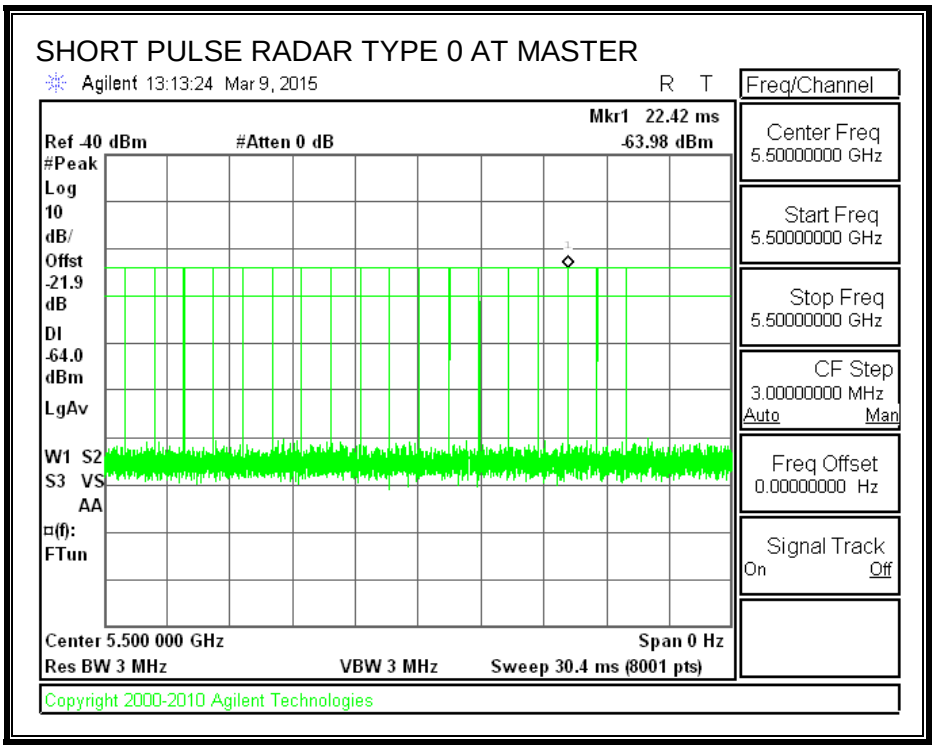
11.2. CLIENT MODE RESULTS FOR 20 MHz BANDWIDTH

11.2.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5500 MHz.

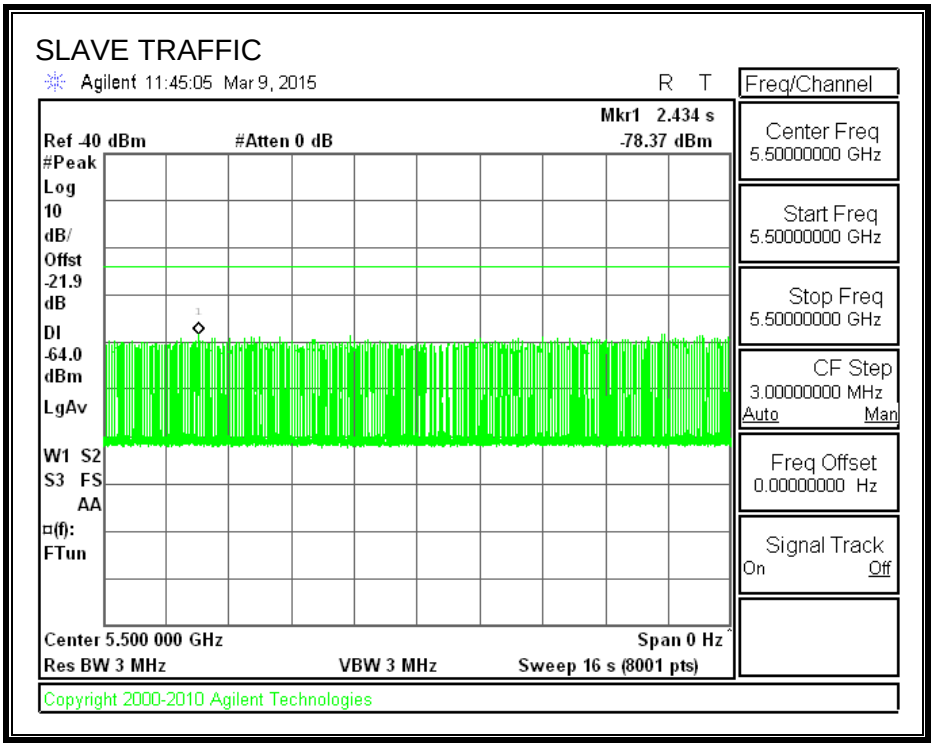
11.2.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



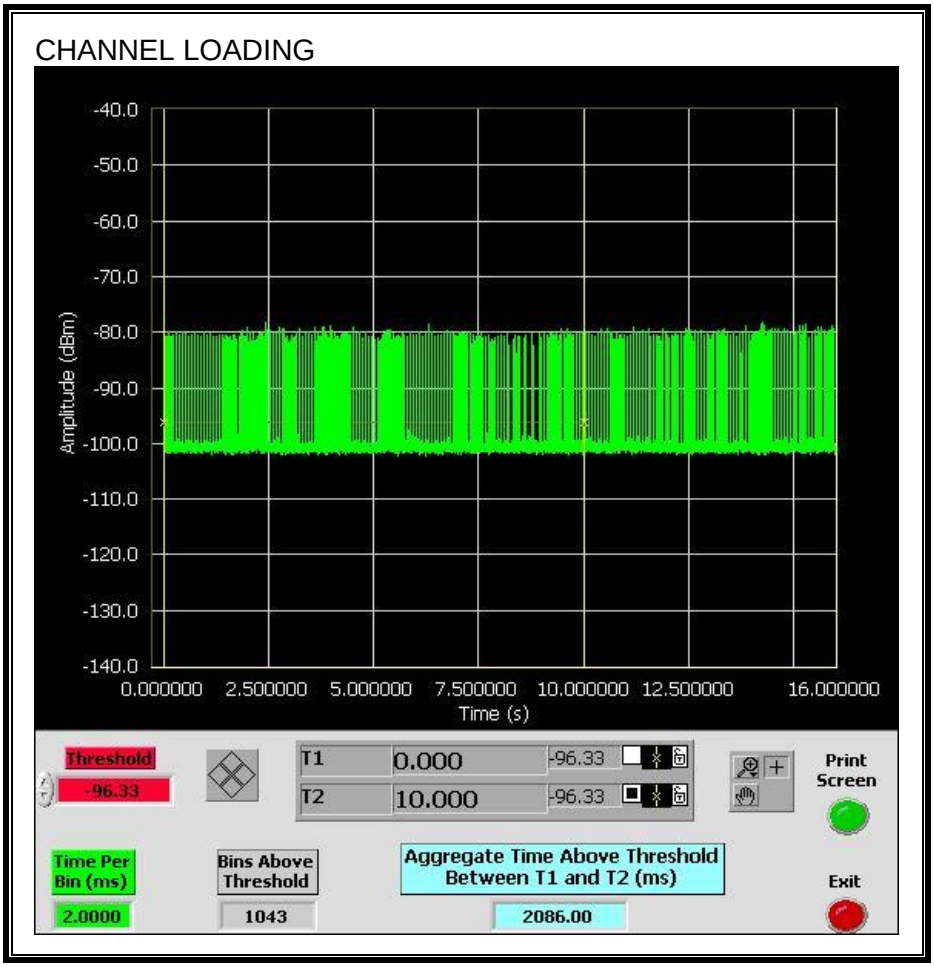
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

TRAFFIC



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 20.86%

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.2.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.2.4. MOVE AND CLOSING TIME

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).

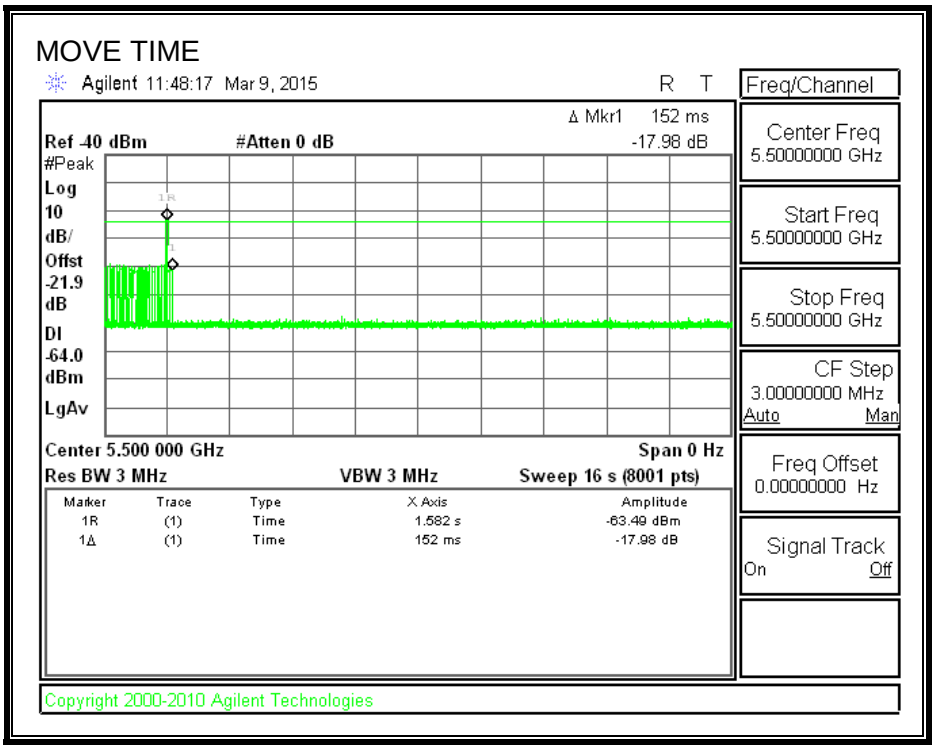
RESULTS

Channel Move Time (sec)	Limit (sec)
0.152	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

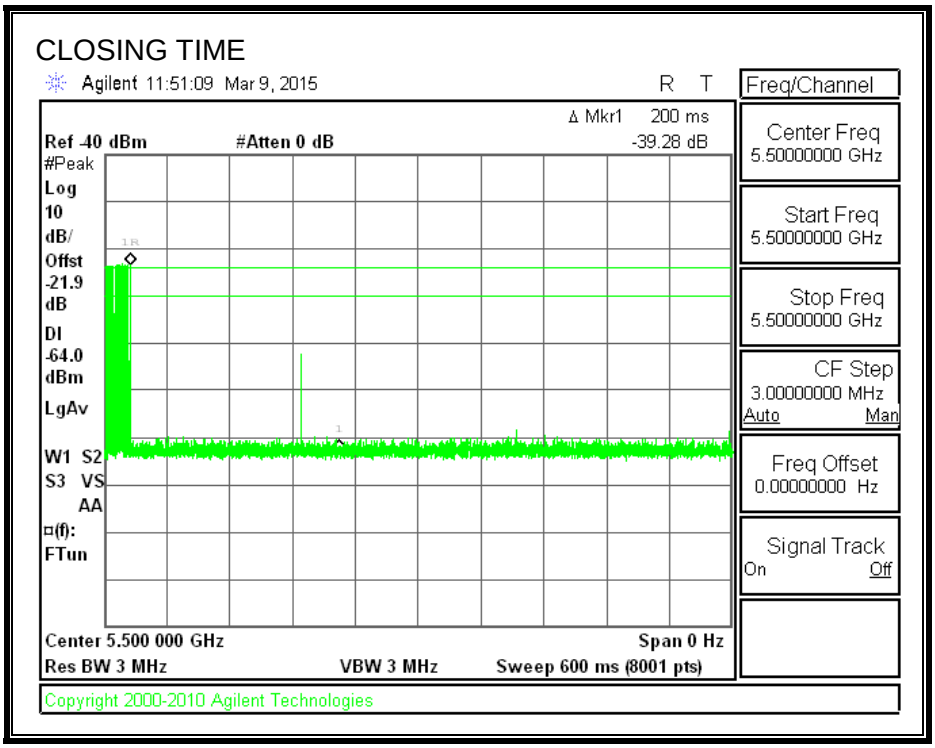
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

MOVE TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

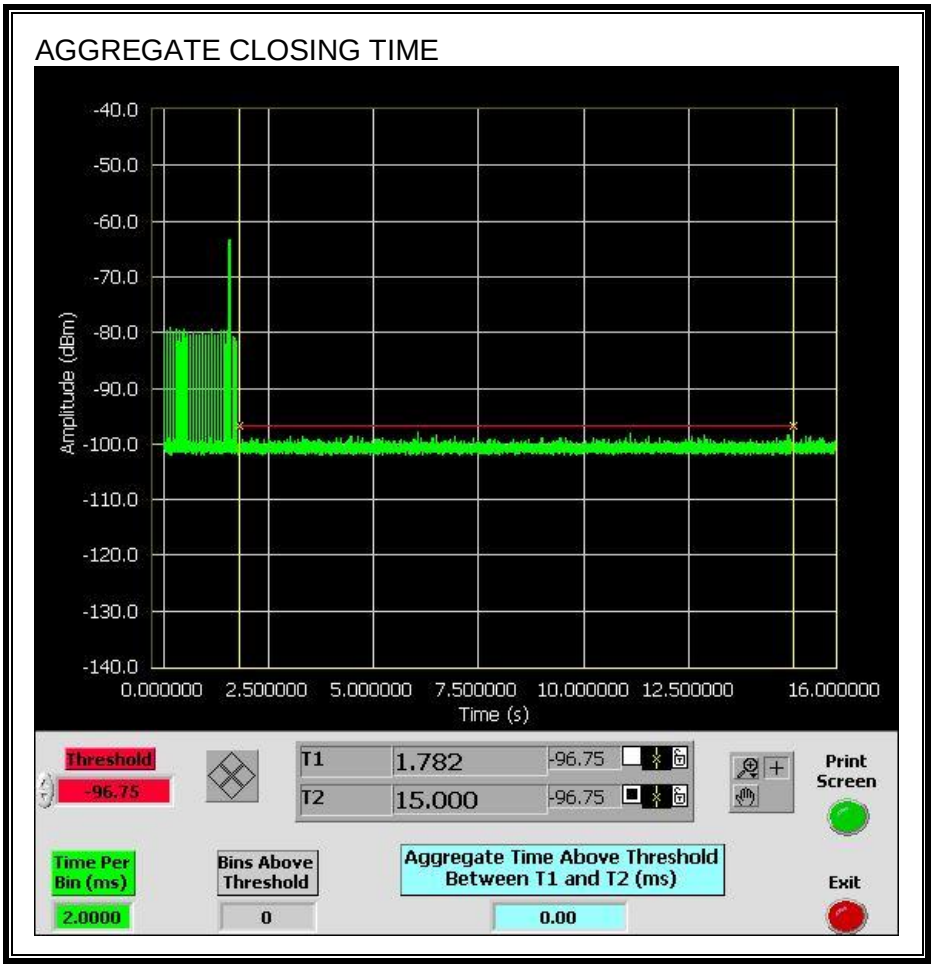
CHANNEL CLOSING TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

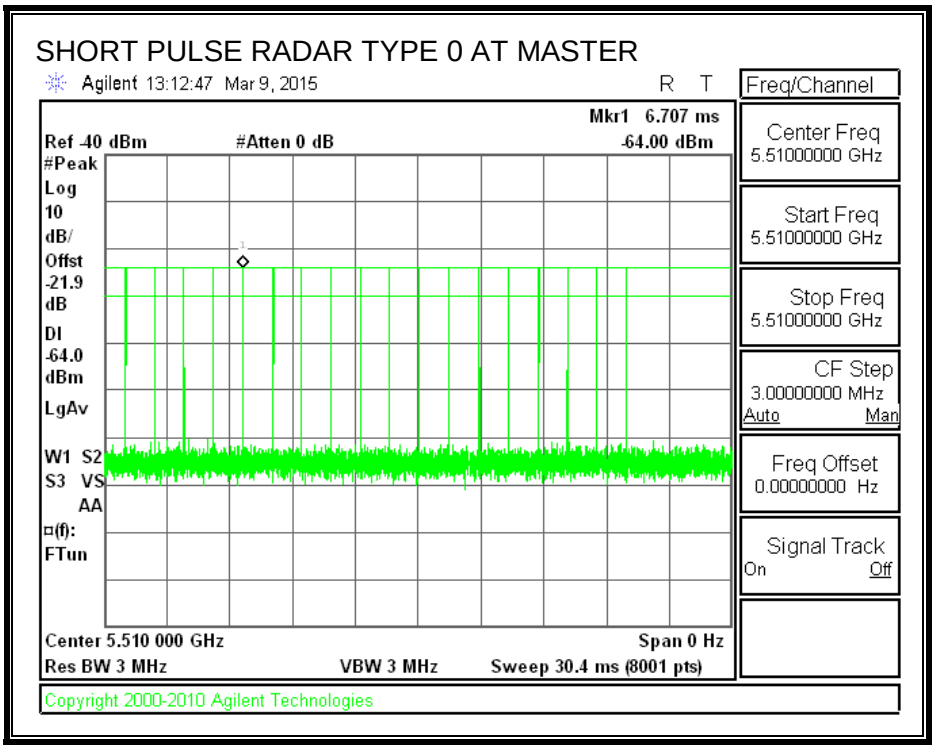
11.3. CLIENT MODE RESULTS FOR 40 MHz BANDWIDTH

11.3.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5510 MHz.

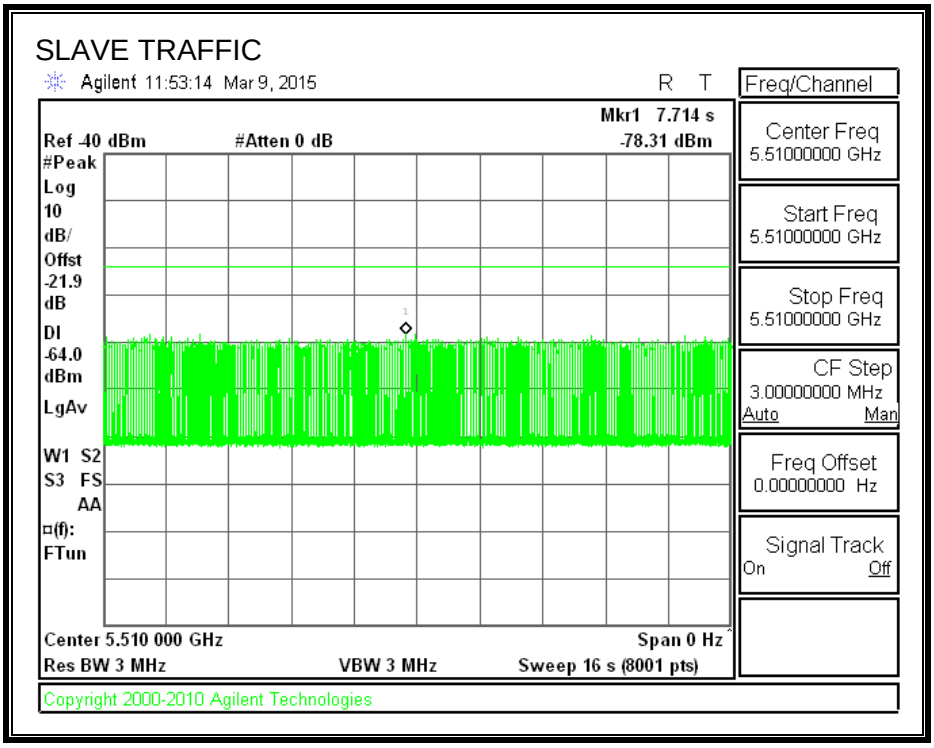
11.3.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



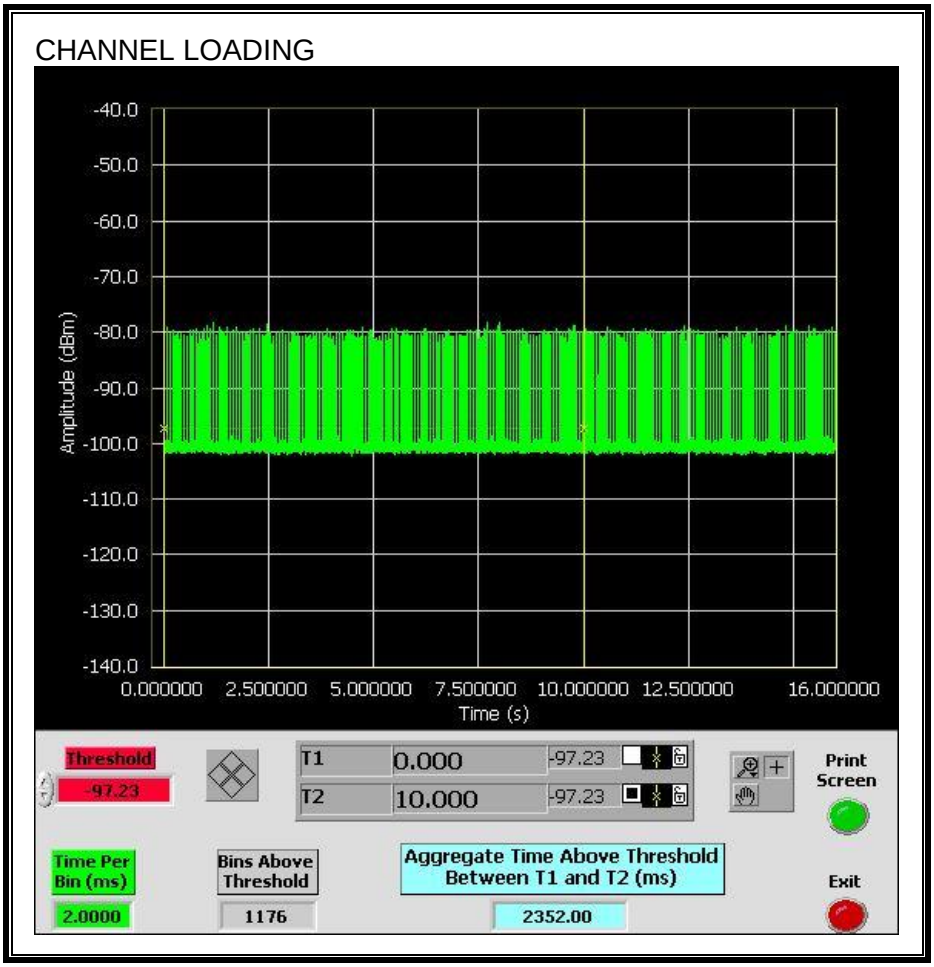
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

TRAFFIC



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 23.52%

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.3.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.3.4. MOVE AND CLOSING TIME

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).

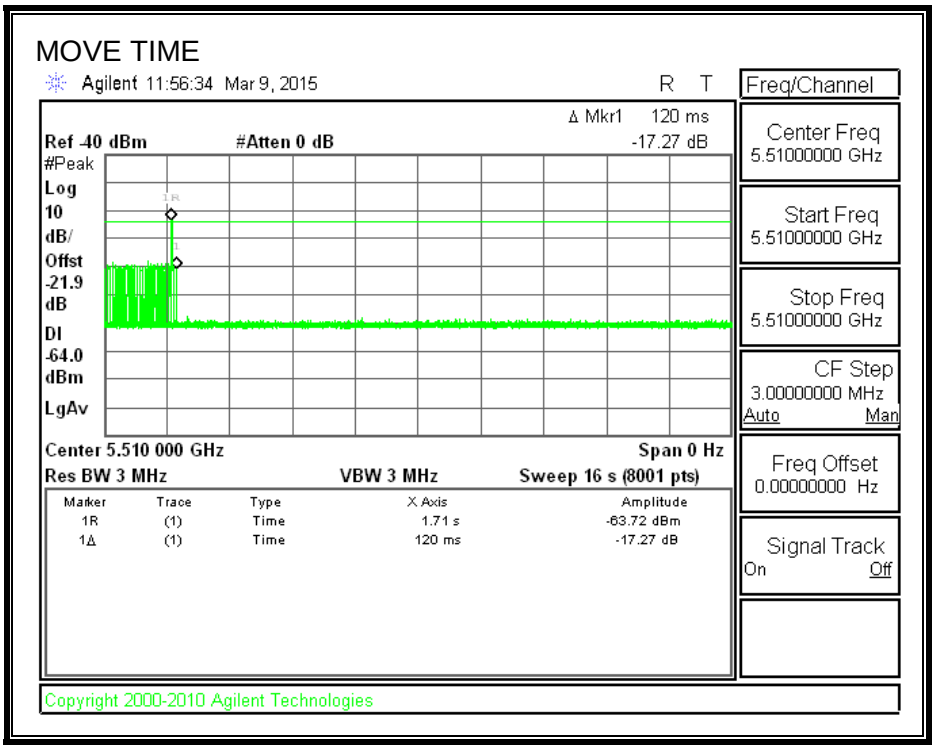
RESULTS

Channel Move Time (sec)	Limit (sec)
0.120	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

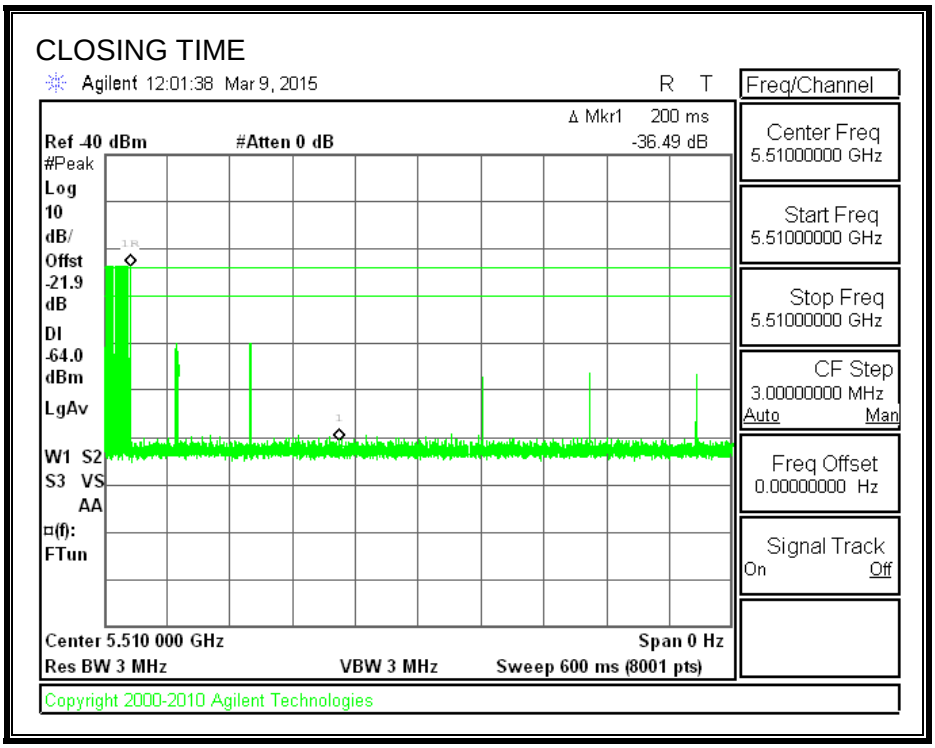
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

MOVE TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

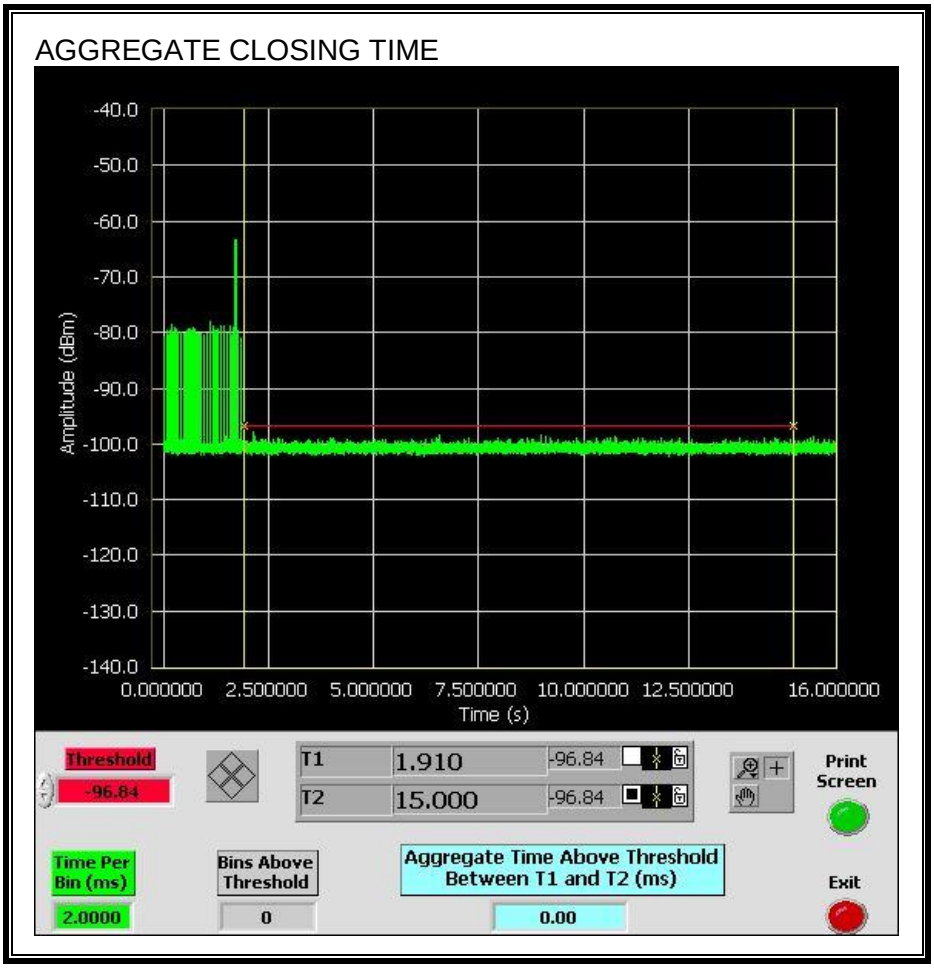
CHANNEL CLOSING TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

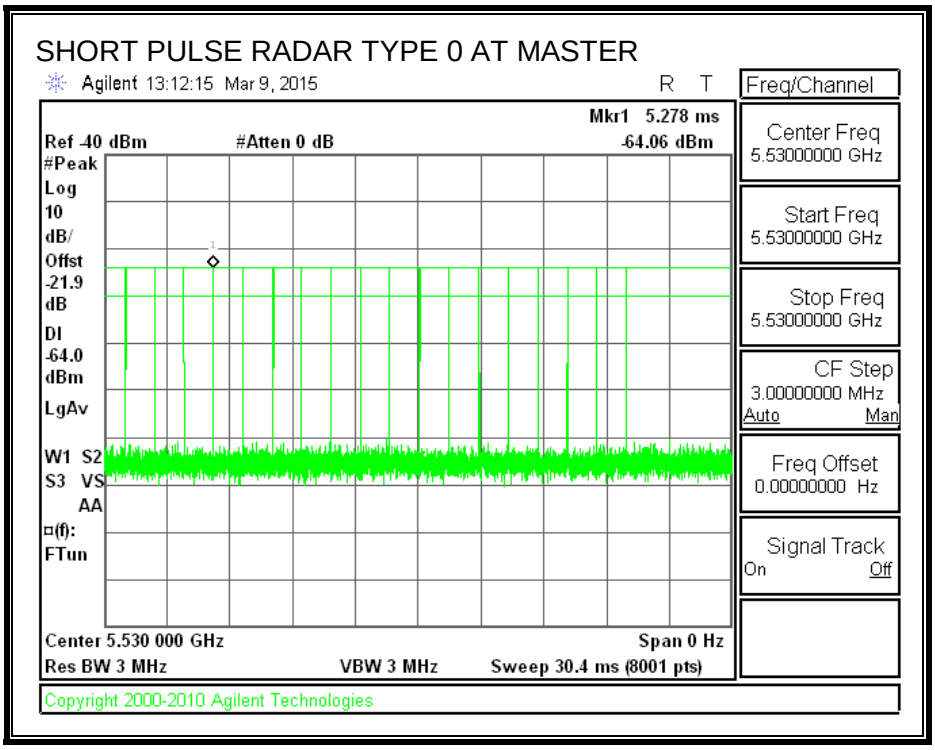
11.4. CLIENT MODE RESULTS FOR 80 MHz BANDWIDTH

11.4.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5530 MHz.

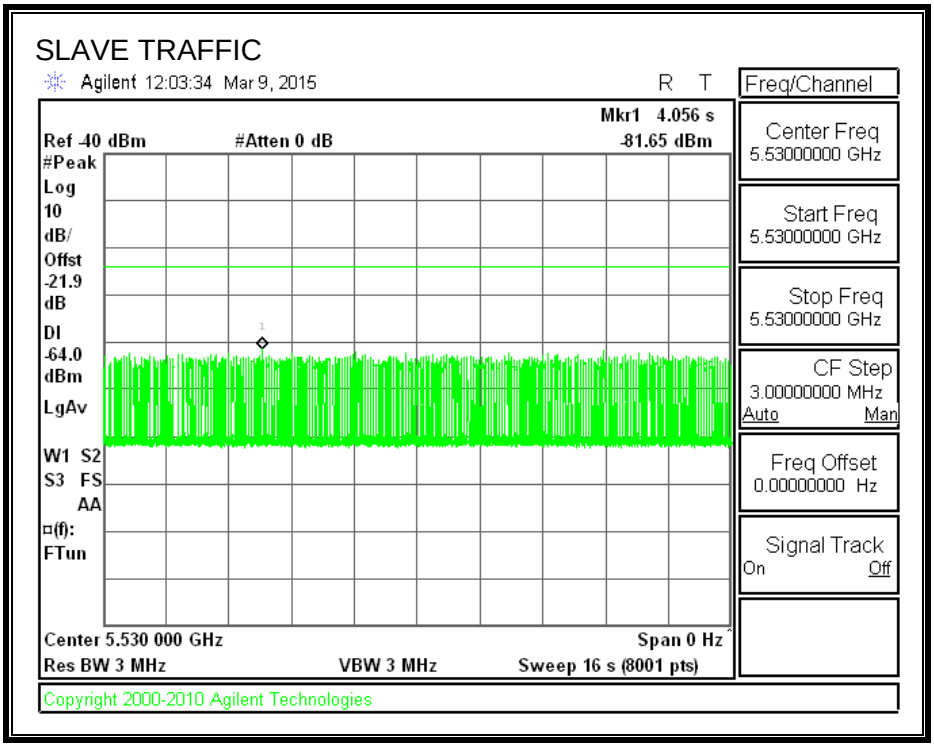
11.4.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



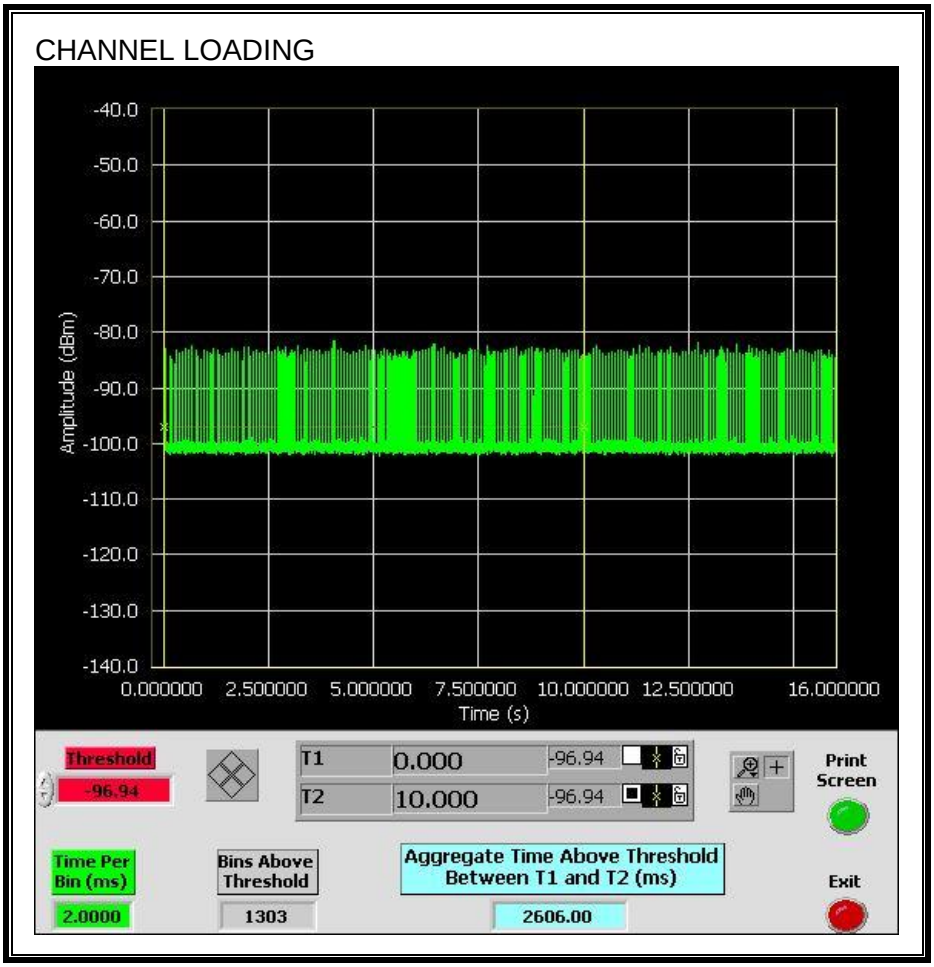
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

TRAFFIC



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 26.06%

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.4.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.4.4. MOVE AND CLOSING TIME

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).

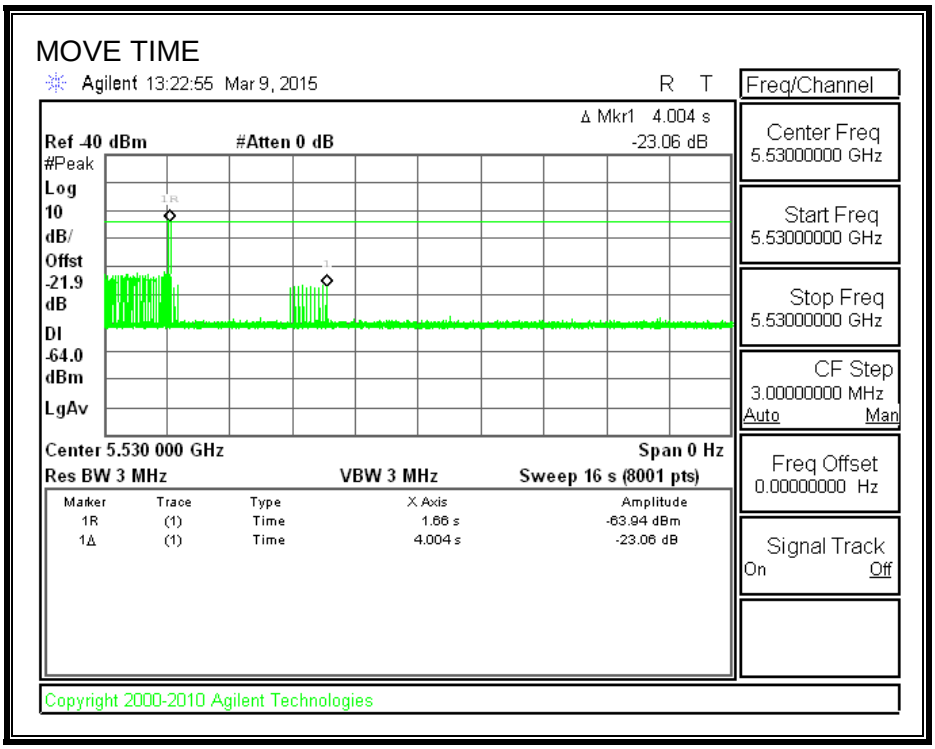
RESULTS

Channel Move Time (sec)	Limit (sec)
4.004	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
22.0	60

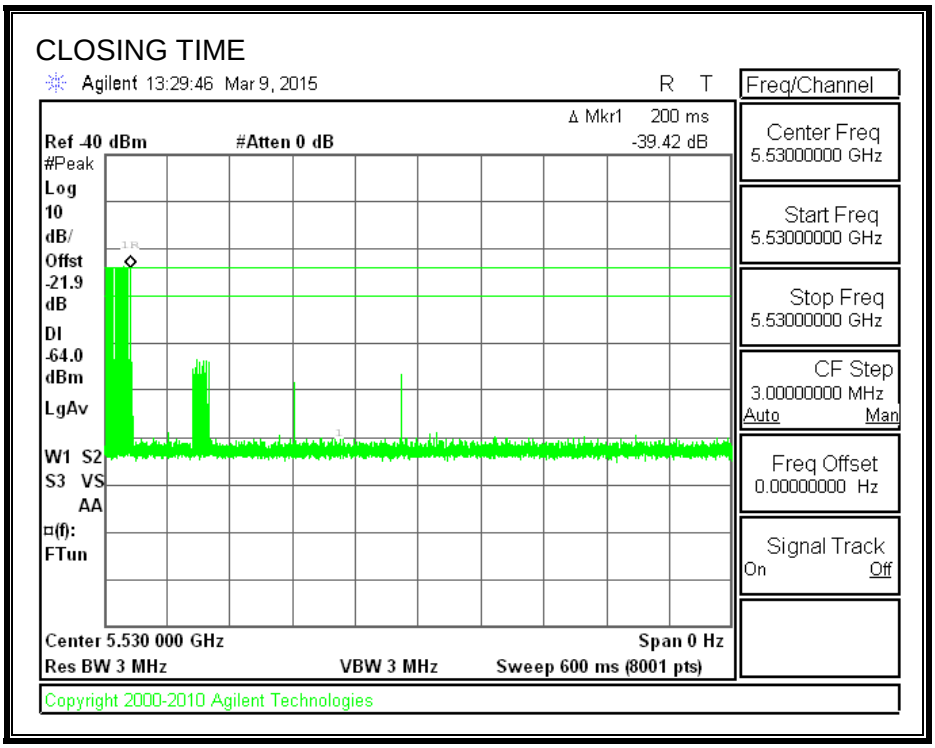
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

MOVE TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

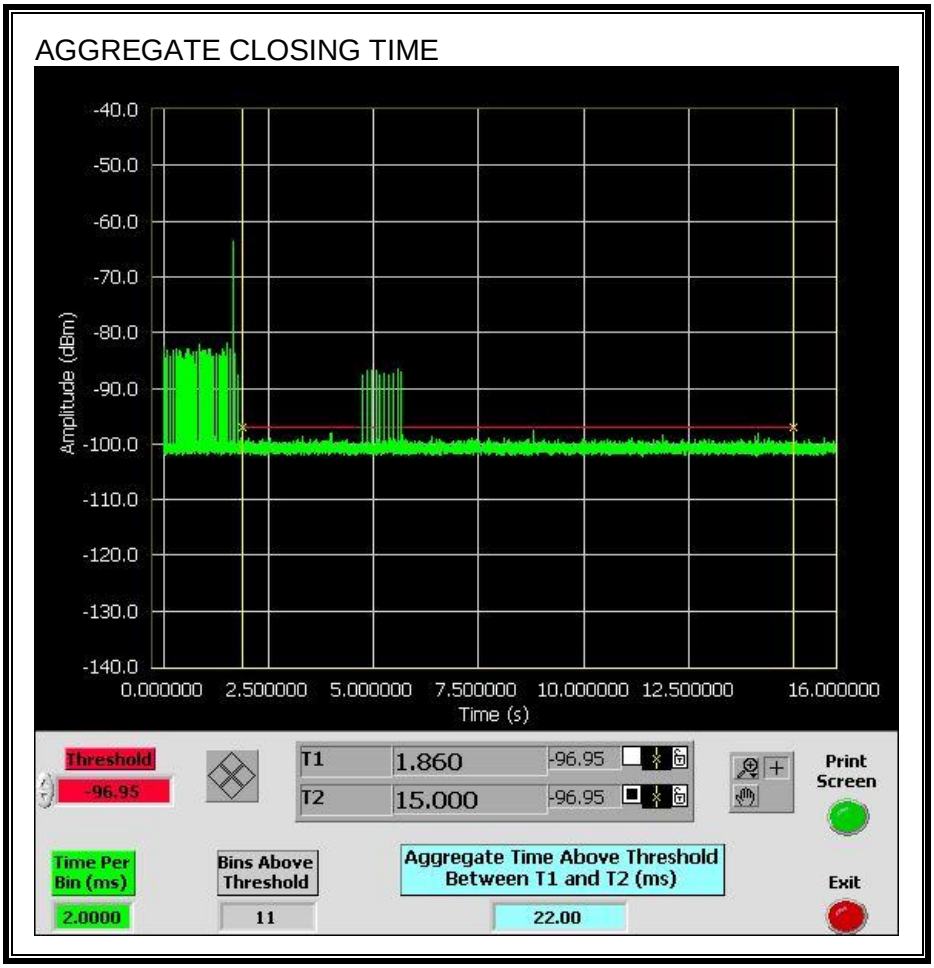
CHANNEL CLOSING TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

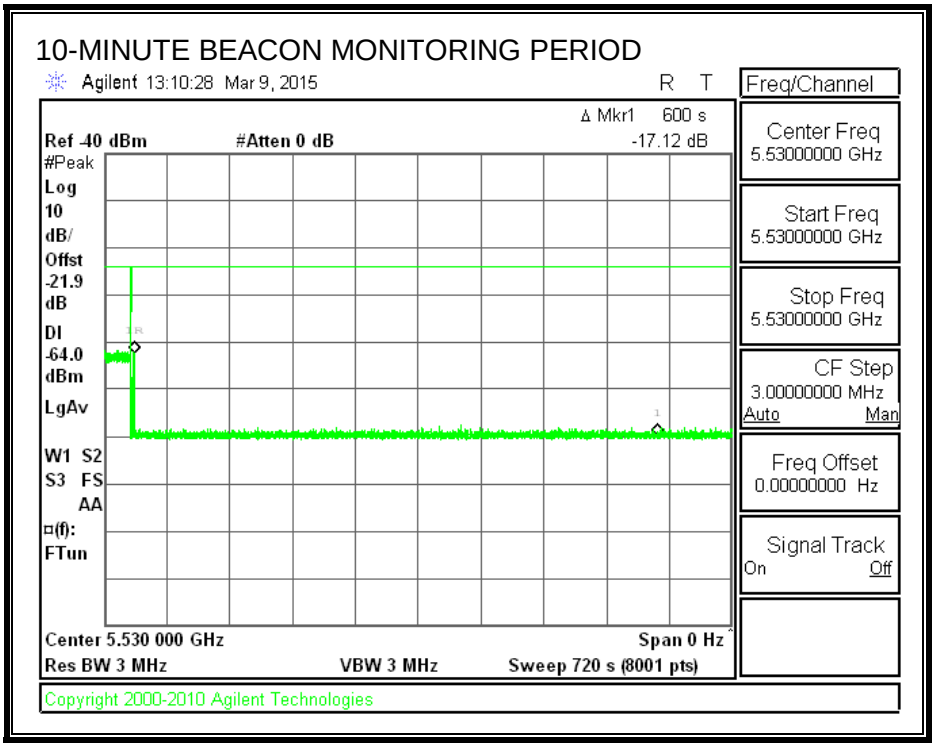


This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.4.5. 10-MINUTE BEACON MONITORING PERIOD

RESULTS

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



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

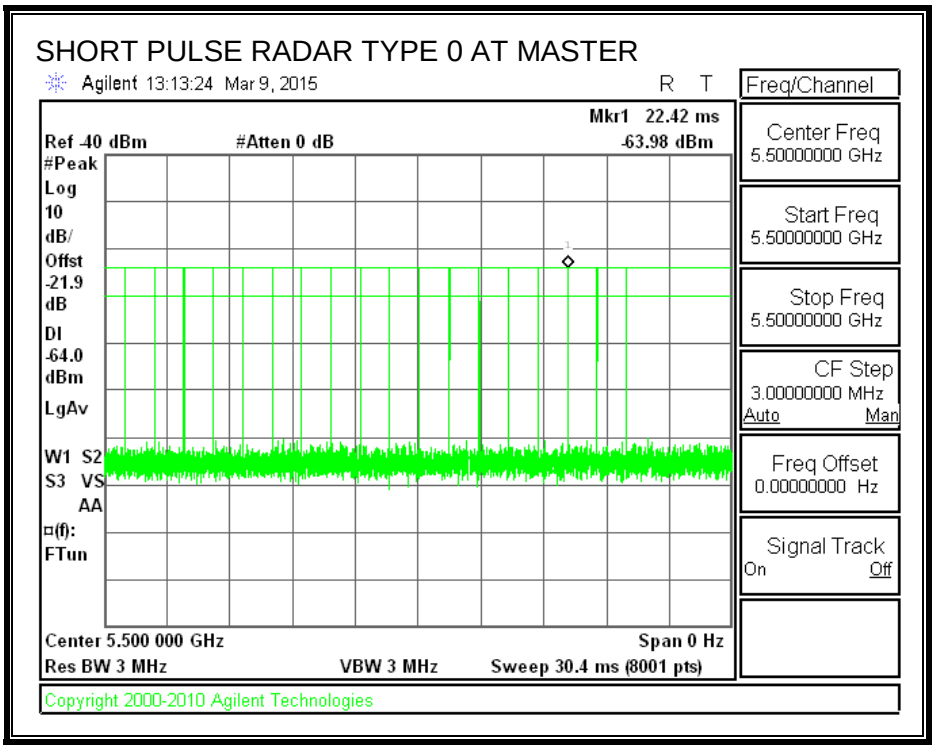
11.5. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 20 MHz BANDWIDTH

11.5.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5500 MHz.

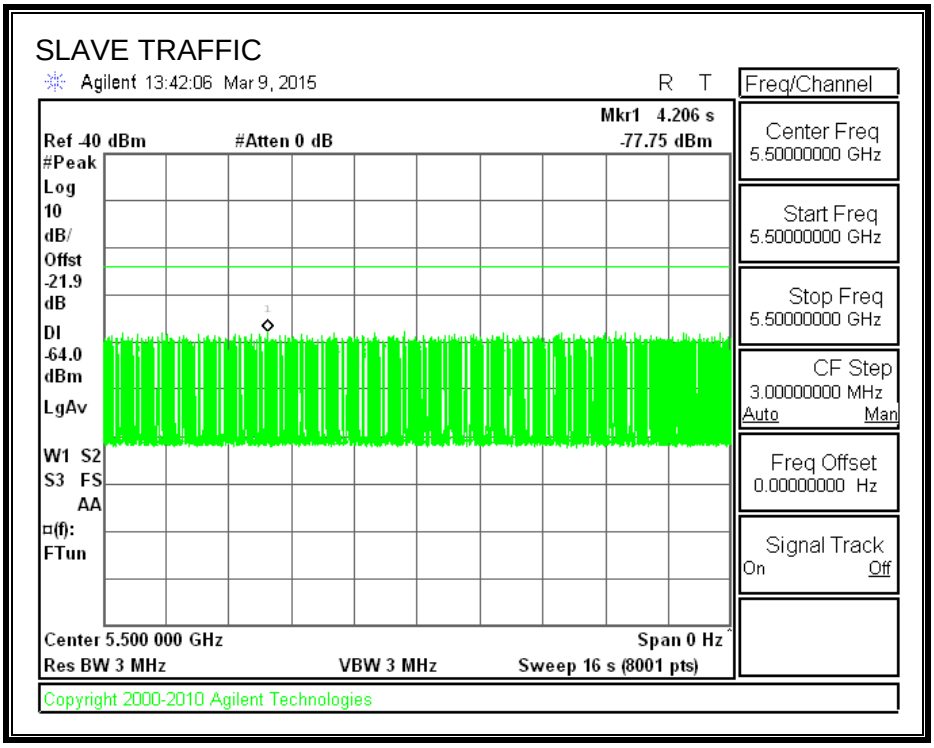
11.5.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



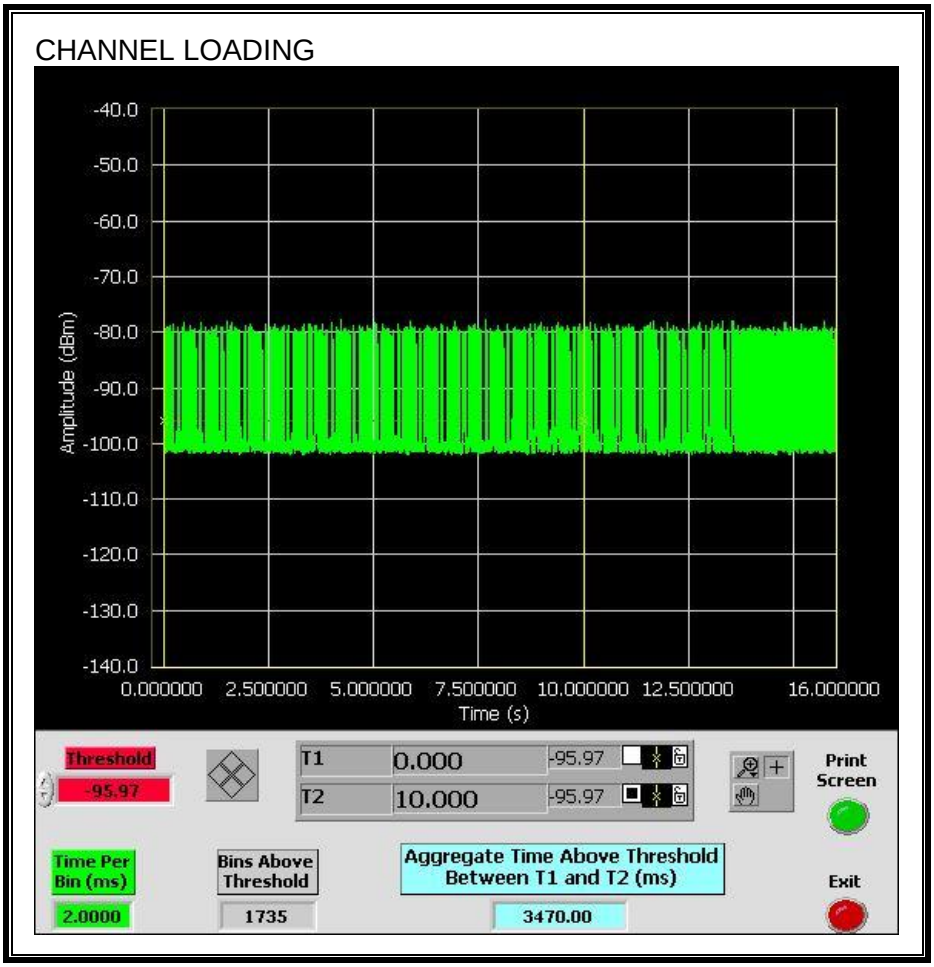
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

TRAFFIC



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 34.7%

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.5.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.5.4. MOVE AND CLOSING TIME

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).

RESULTS

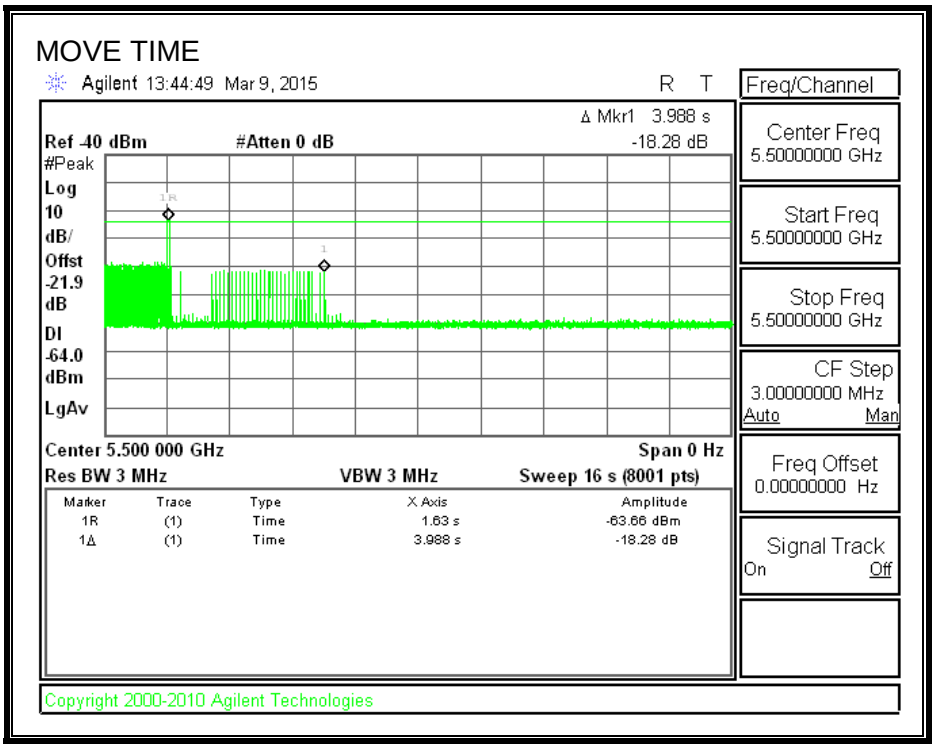
Channel Move Time (sec)	Limit (sec)
3.995	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
21.0	60

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

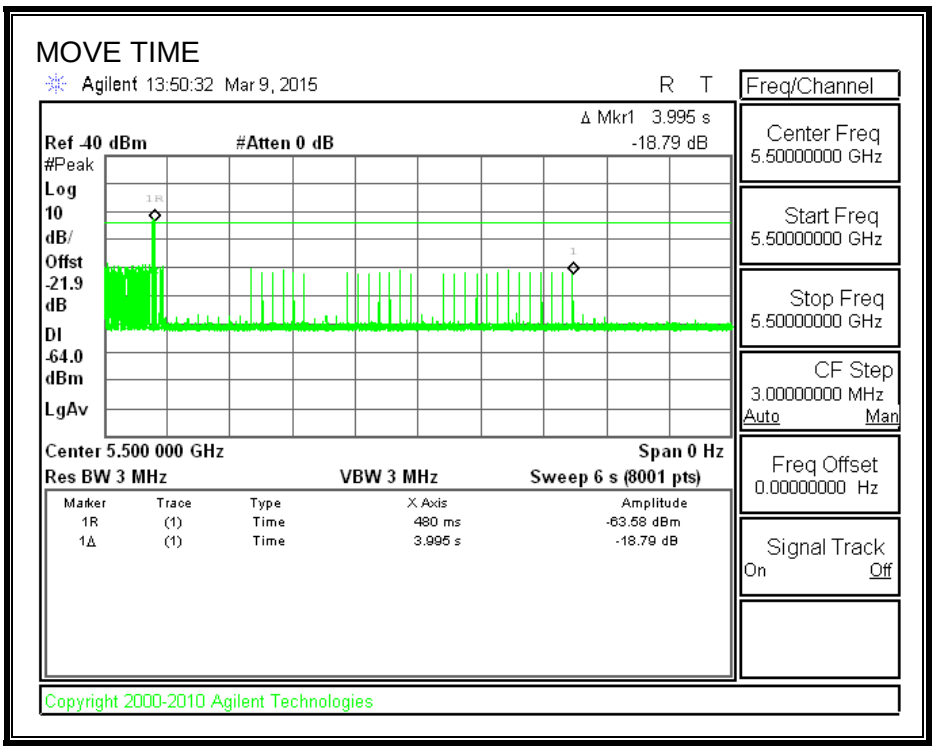
MOVE TIME

16 SECOND SWEEP:



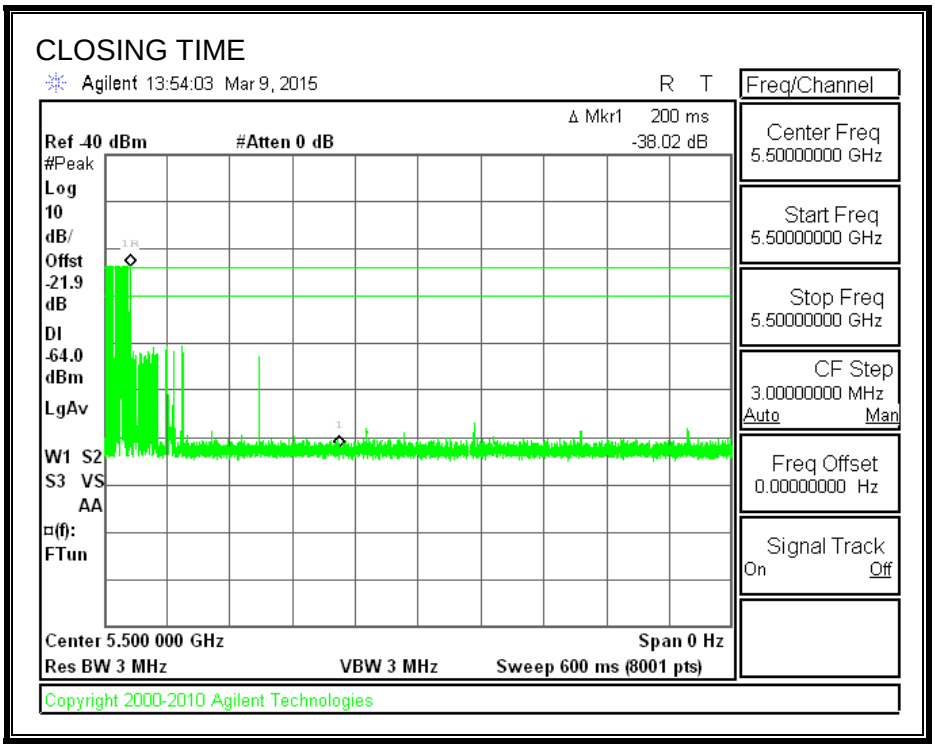
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

6 SECOND SWEEP:



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

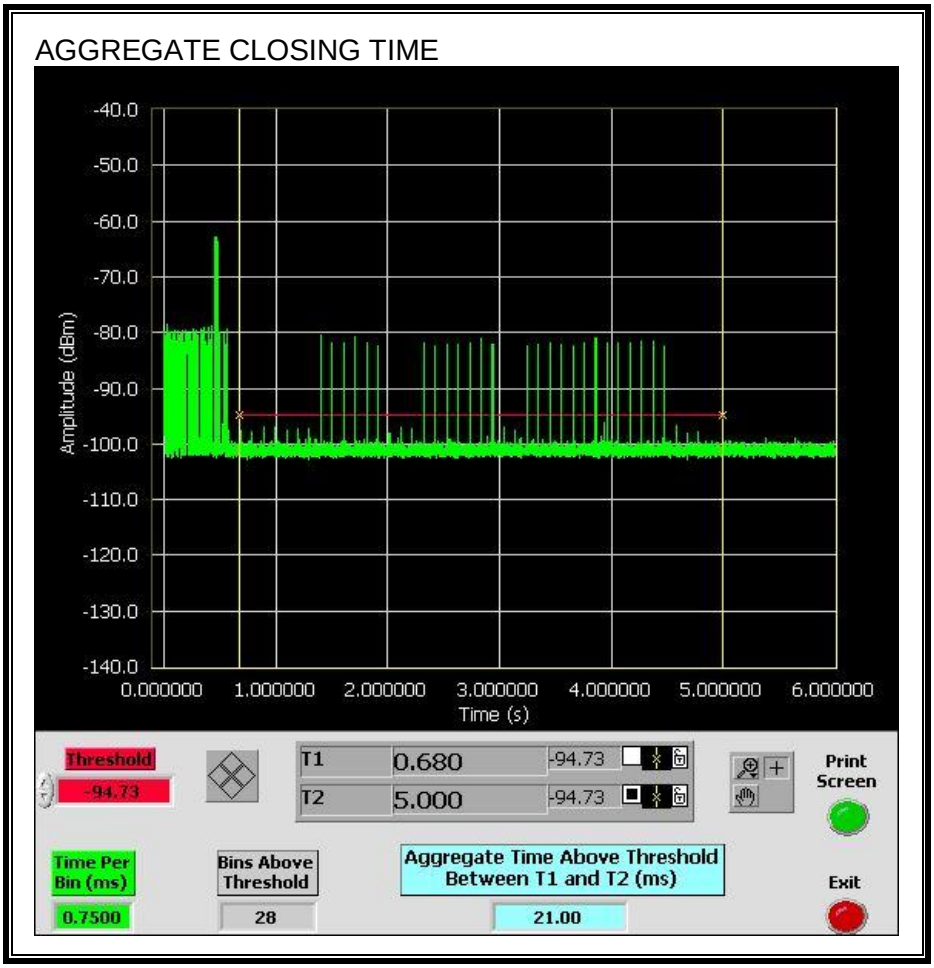
CHANNEL CLOSING TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

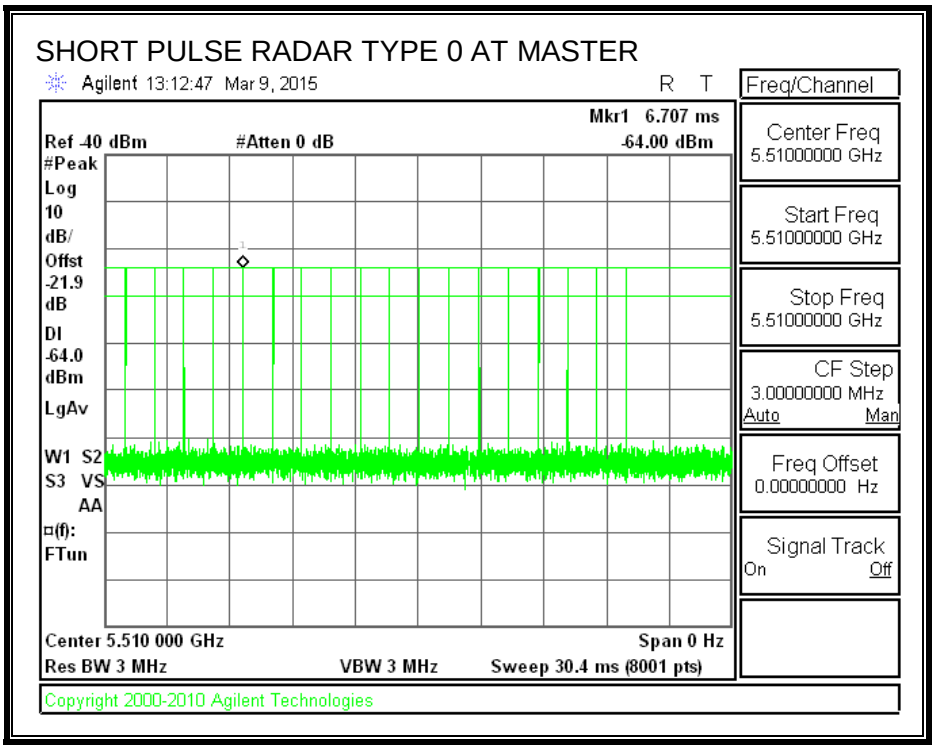
11.6. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 40 MHz BANDWIDTH

11.6.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5510 MHz.

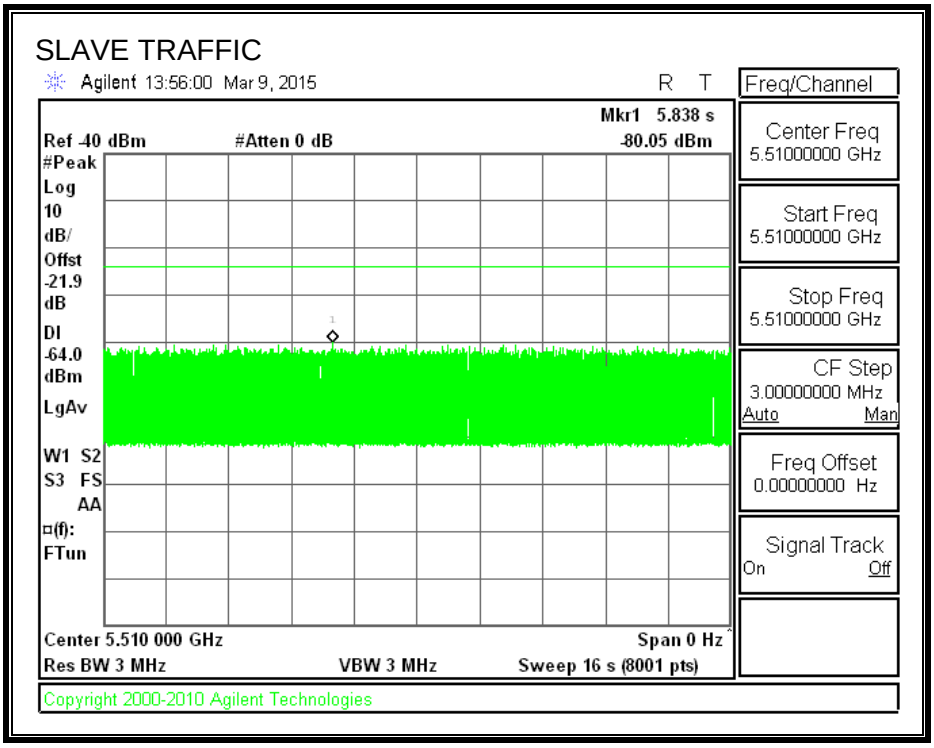
11.6.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



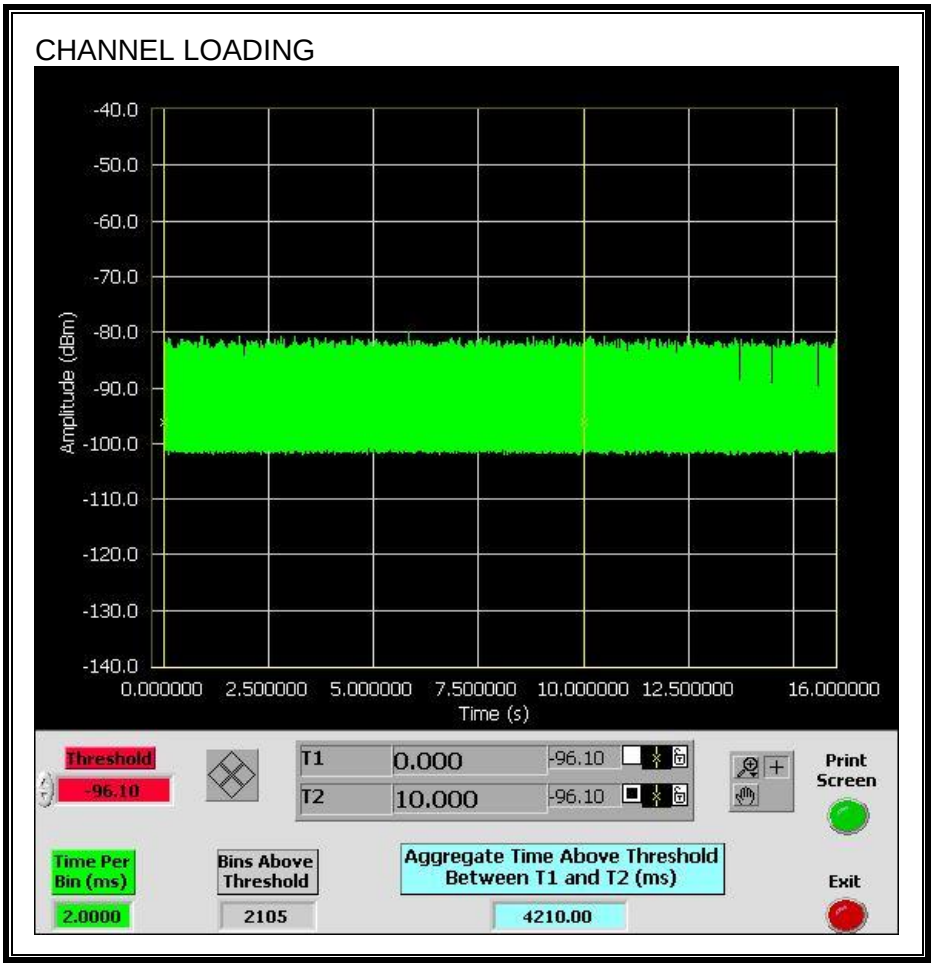
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

TRAFFIC



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 42.1%

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.6.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.6.4. MOVE AND CLOSING TIME

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).

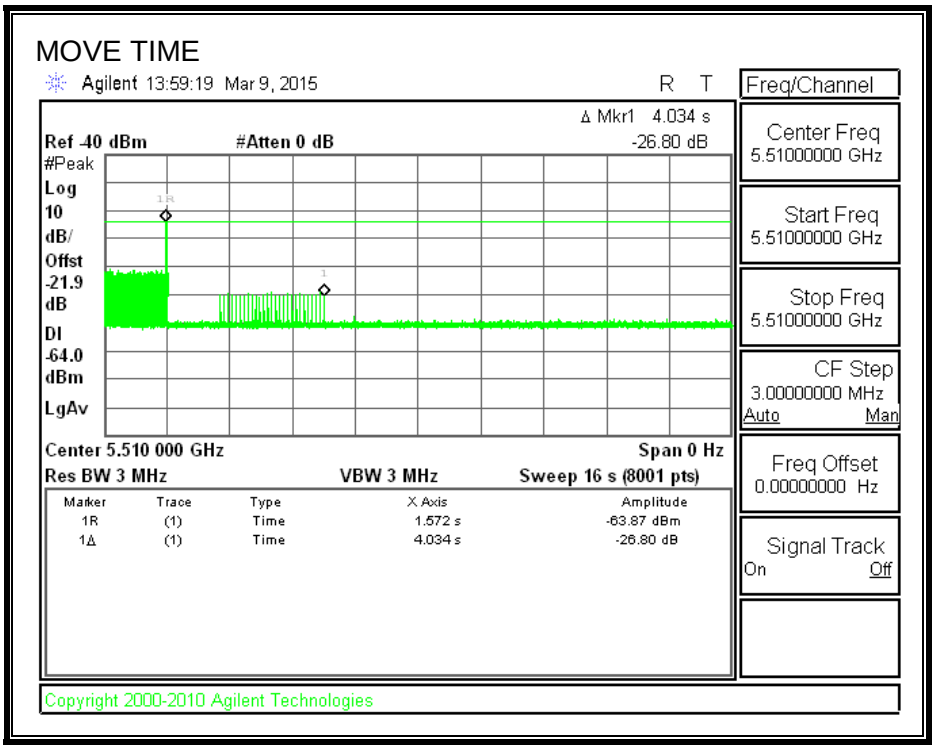
RESULTS

Channel Move Time (sec)	Limit (sec)
4.034	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
54.0	60

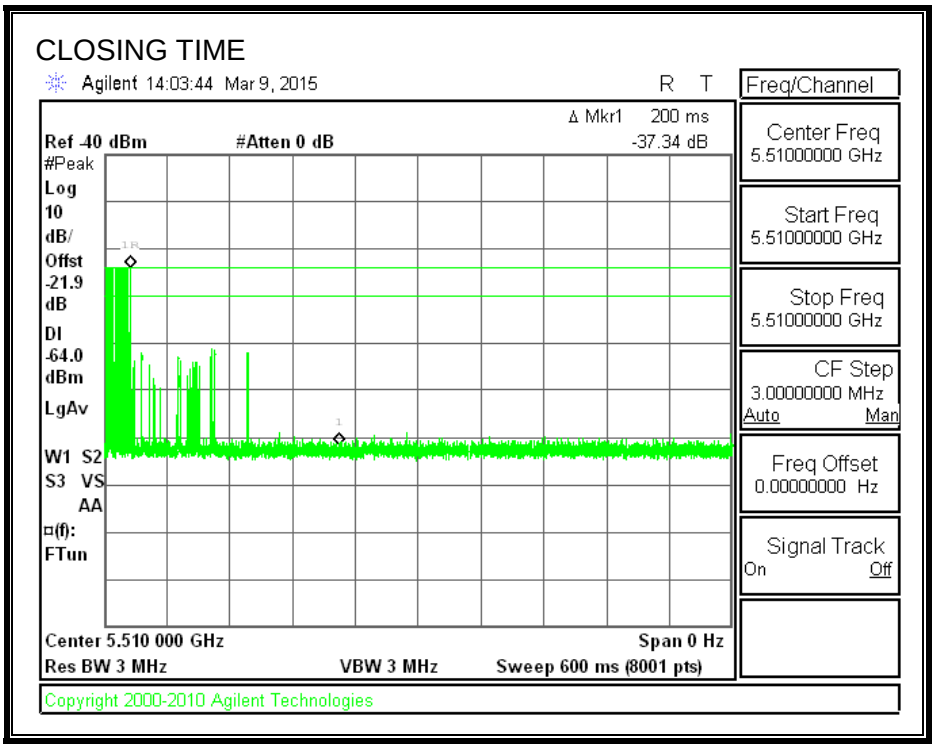
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

MOVE TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

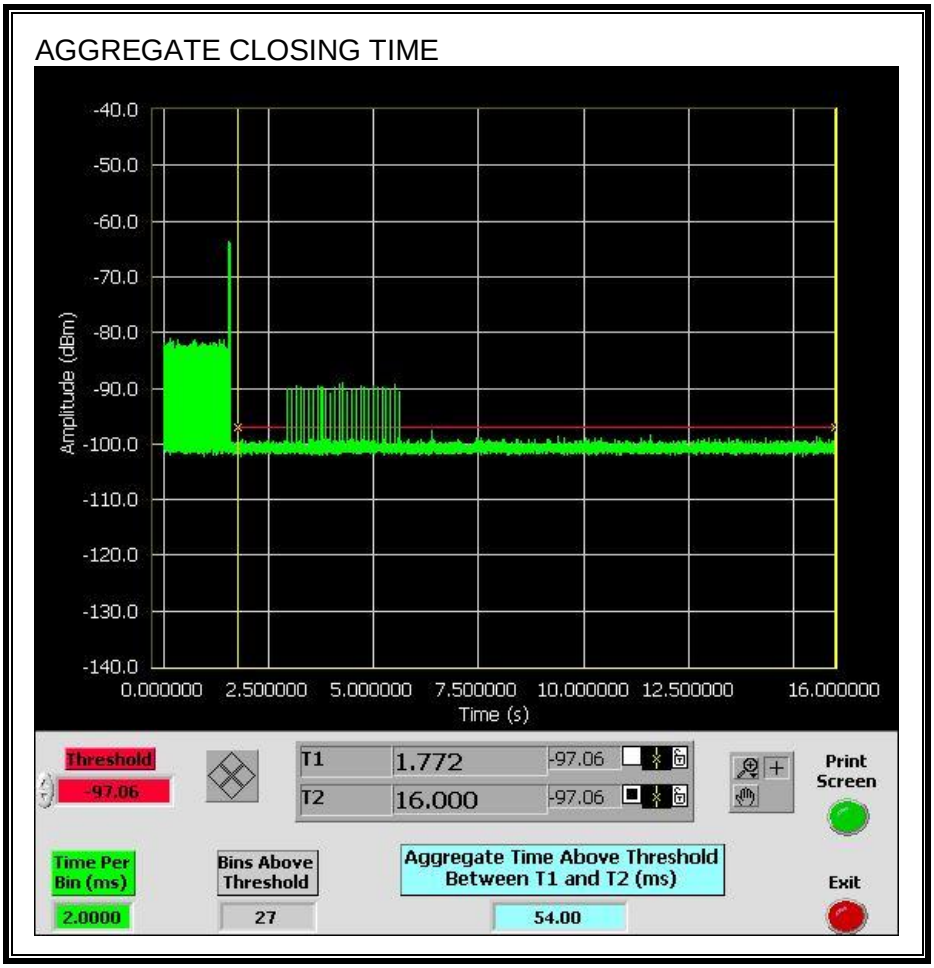
CHANNEL CLOSING TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

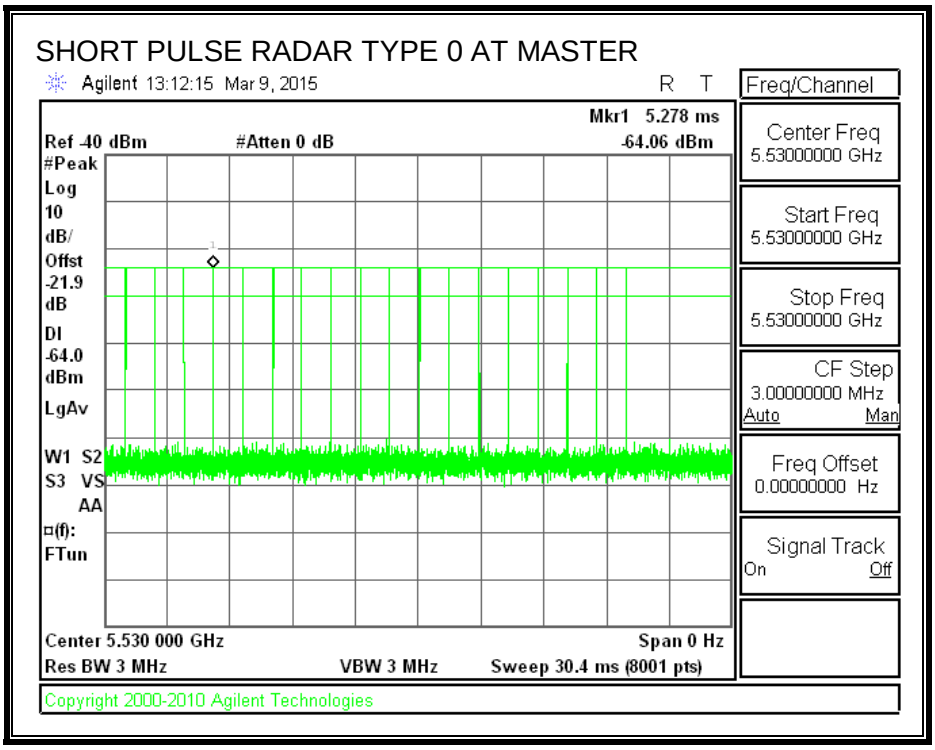
11.7. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 80 MHz BANDWIDTH

11.7.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5530 MHz.

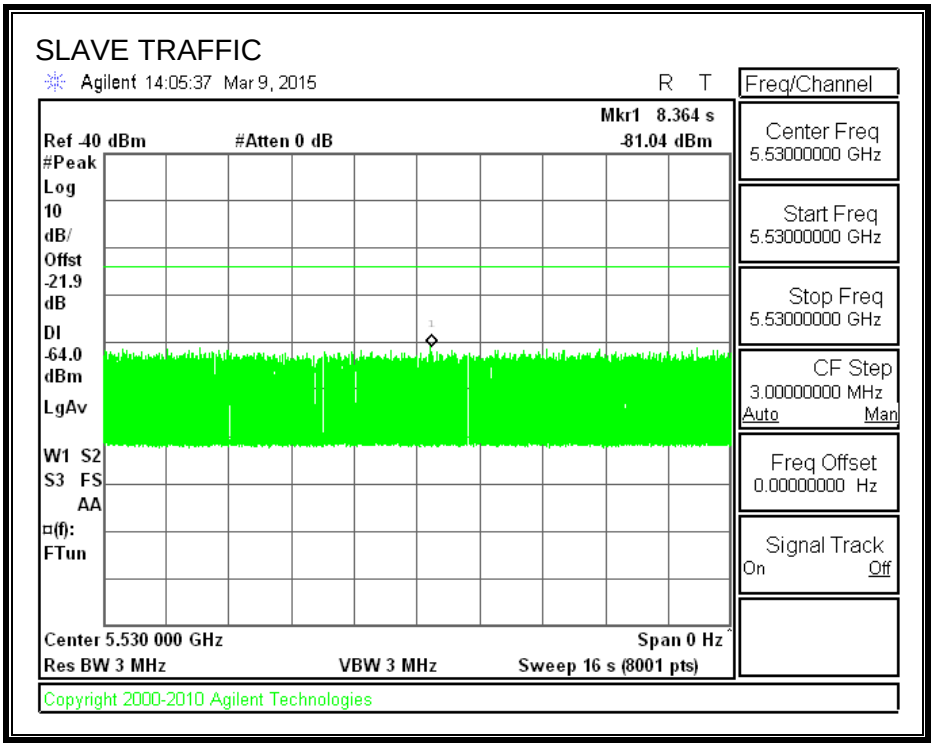
11.7.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



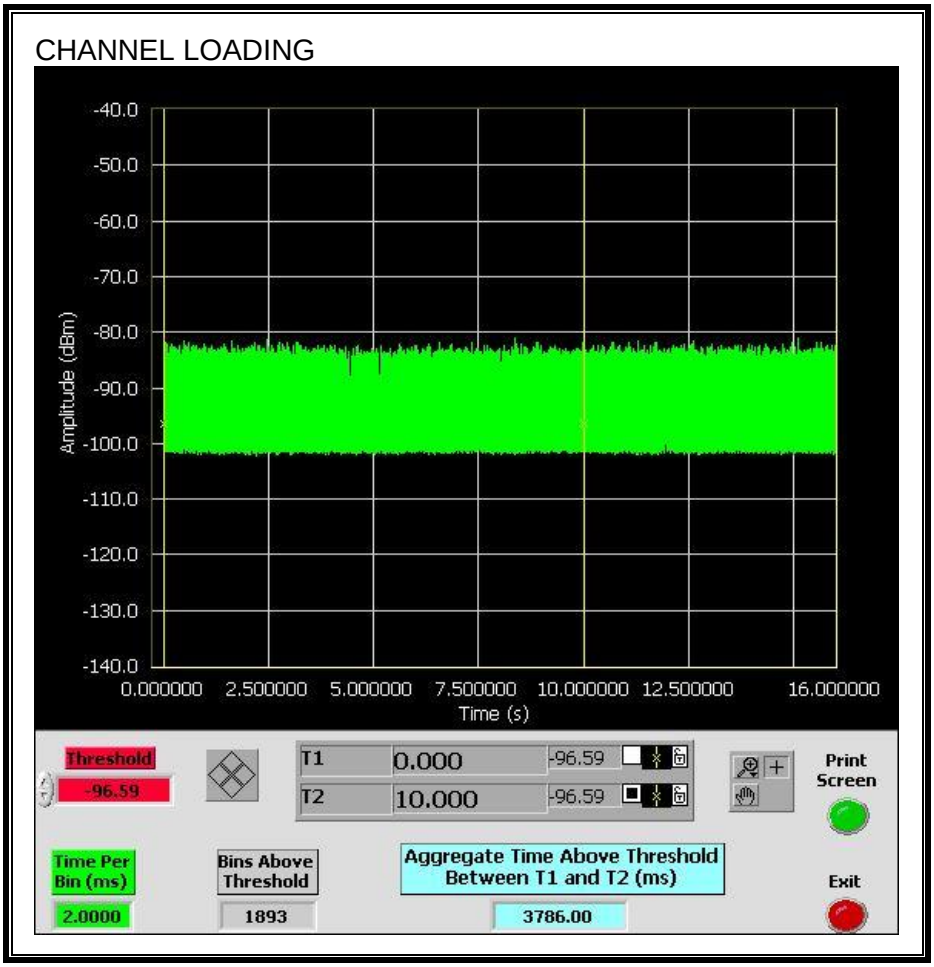
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

TRAFFIC



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 37.86%

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.7.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.7.4. MOVE AND CLOSING TIME

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).

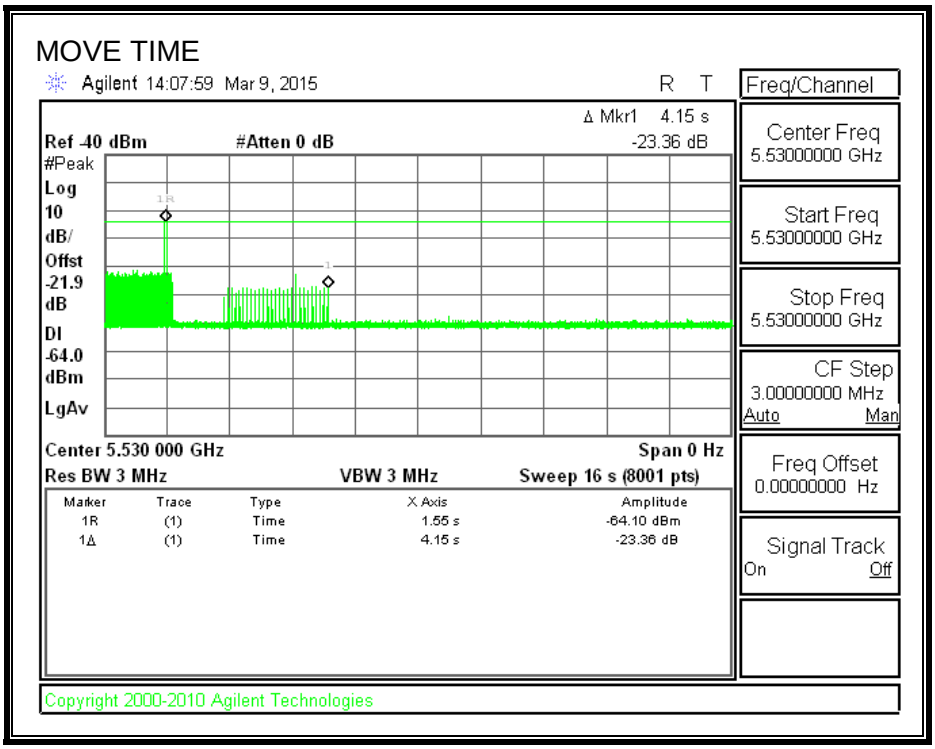
RESULTS

Channel Move Time (sec)	Limit (sec)
4.150	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
56.0	60

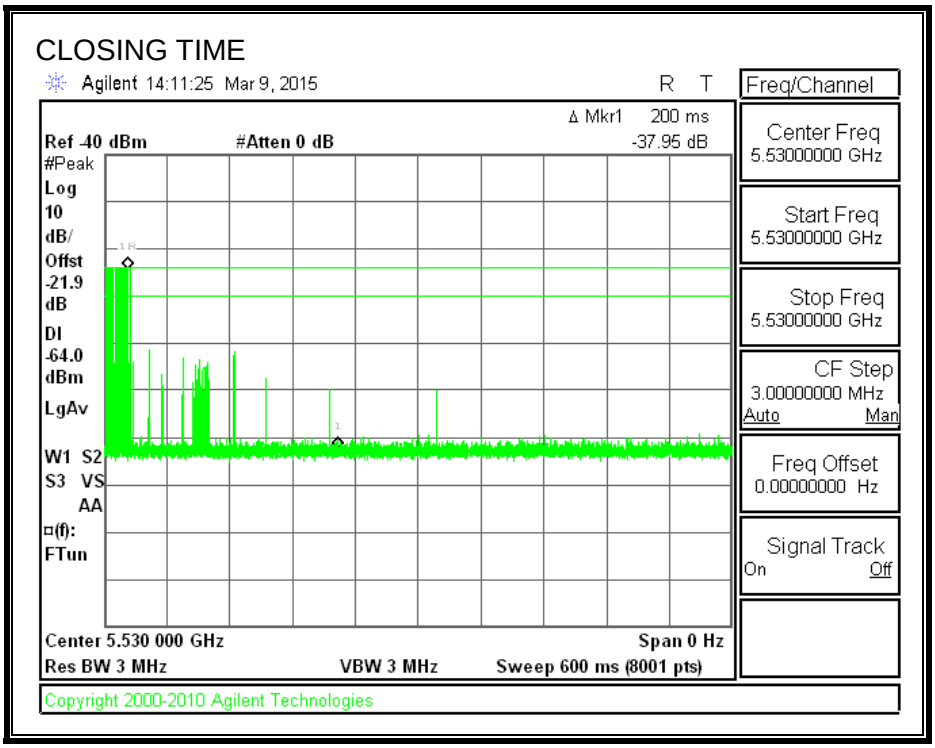
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

MOVE TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

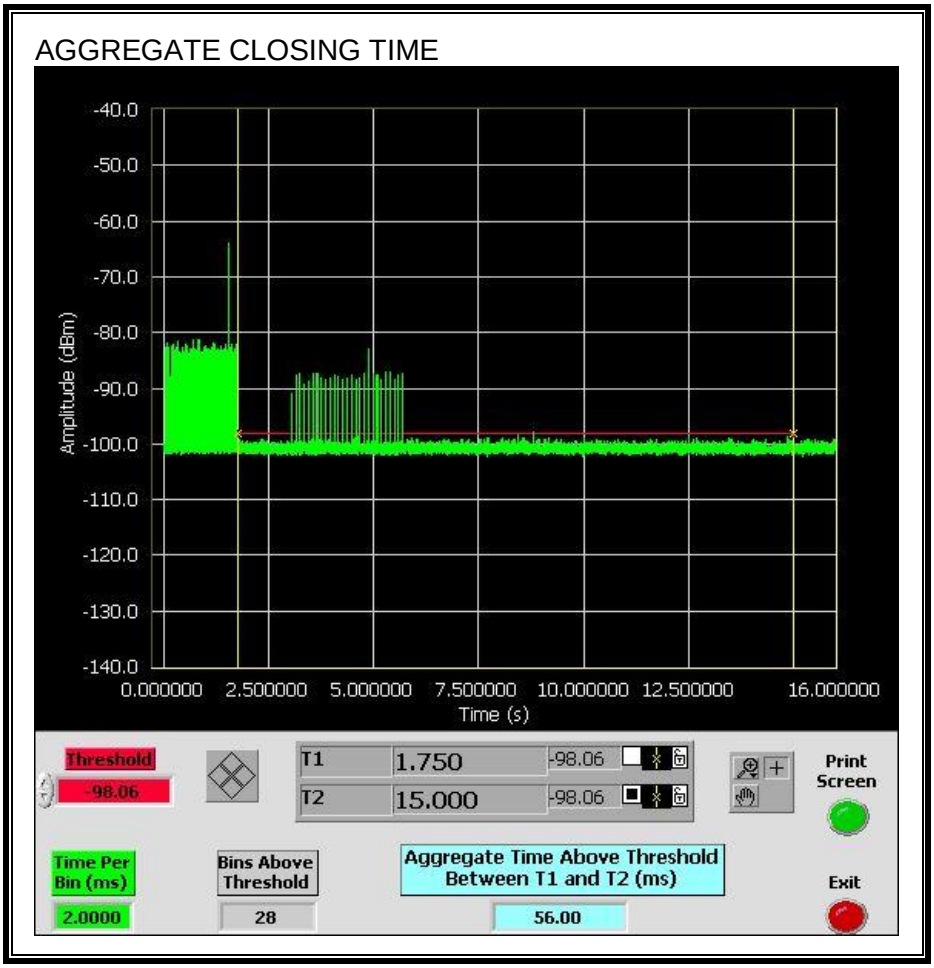
CHANNEL CLOSING TIME



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

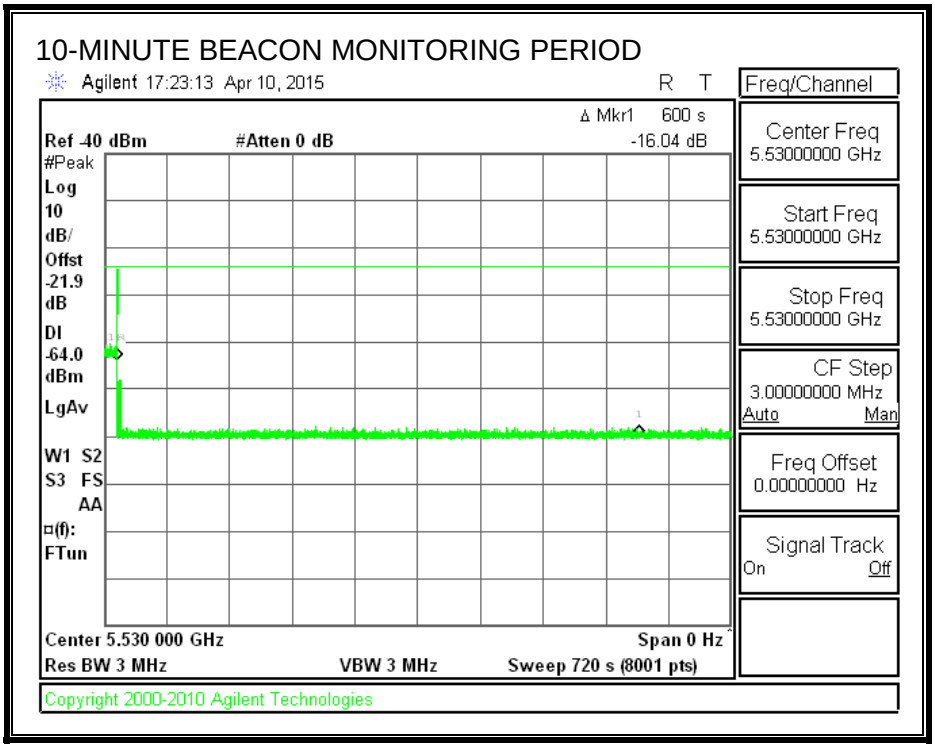


This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .

11.7.5. 10-MINUTE BEACON MONITORING PERIOD

RESULTS

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



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc. .