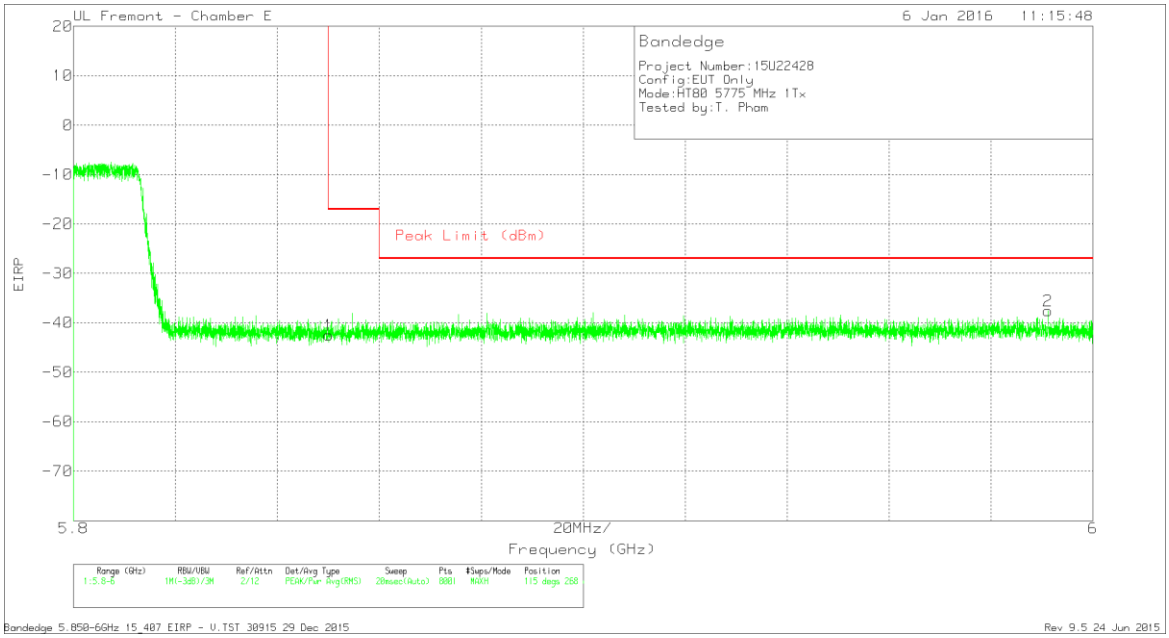
HIGH CHANNEL VERTICAL PLOT



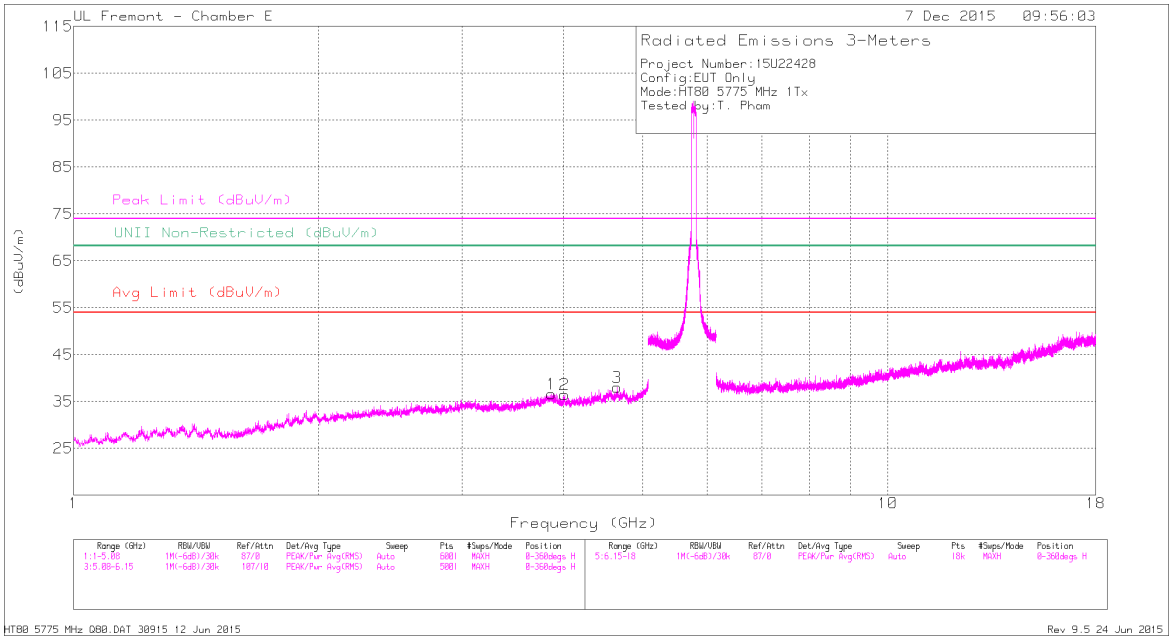
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-69.17	Pk	34.9	-20	0	11.8	-42.47	-17	-25.47	115	268	V
2	5.991	-65.14	Pk	35.1	-19.3	0	11.8	-37.54	-27	-10.54	115	268	V

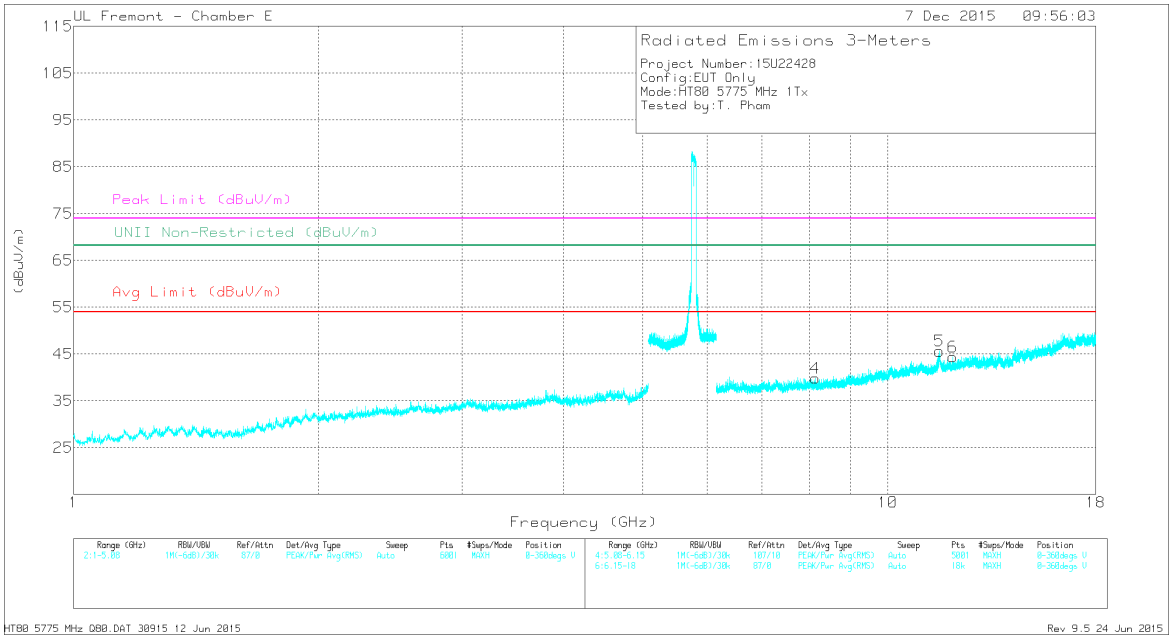
Pk - Peak detector

CHANNEL 155 HARMONICS AND SPURIOUS EMISSIONS

CHANNEL 155 HORIZONTAL PLOT



CHANNEL 155 VERTICAL PLOT



DATA

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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	* 3.863	40.79	PK-U	33.5	-29.9	0	44.39	-	-	74	-29.61	-	-	157	150	H
	* 3.861	29.71	ADR	33.5	-29.9	.16	33.47	54	-20.53	-	-	-	-	157	150	H
2	* 4.007	40.18	PK-U	33.4	-29.9	0	43.68	-	-	74	-30.32	-	-	235	152	H
	* 4.009	29.22	ADR	33.4	-29.8	.16	32.98	54	-21.02	-	-	-	-	235	152	H
3	* 4.653	40.52	PK-U	34.1	-30	0	44.62	-	-	74	-29.38	-	-	226	170	H
	* 4.654	29.62	ADR	34.1	-30	.16	33.88	54	-20.12	-	-	-	-	226	170	H
4	* 8.15	37.87	PK-U	35.7	-26.5	0	47.07	-	-	74	-26.93	-	-	213	160	V
	* 8.148	26.78	ADR	35.7	-26.5	.16	36.14	54	-17.86	-	-	-	-	213	160	V
5	* 11.564	38.17	PK-U	38.1	-22.3	0	53.97	-	-	74	-20.03	-	-	226	170	V
	* 11.564	26.31	ADR	38.1	-22.3	.16	42.27	54	-11.73	-	-	-	-	226	170	V
6	* 12.004	36.35	PK-U	38.6	-24.1	0	50.85	-	-	74	-23.15	-	-	213	160	V
	* 12.002	25.71	ADR	38.6	-24.1	.16	40.37	54	-13.63	-	-	-	-	213	160	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

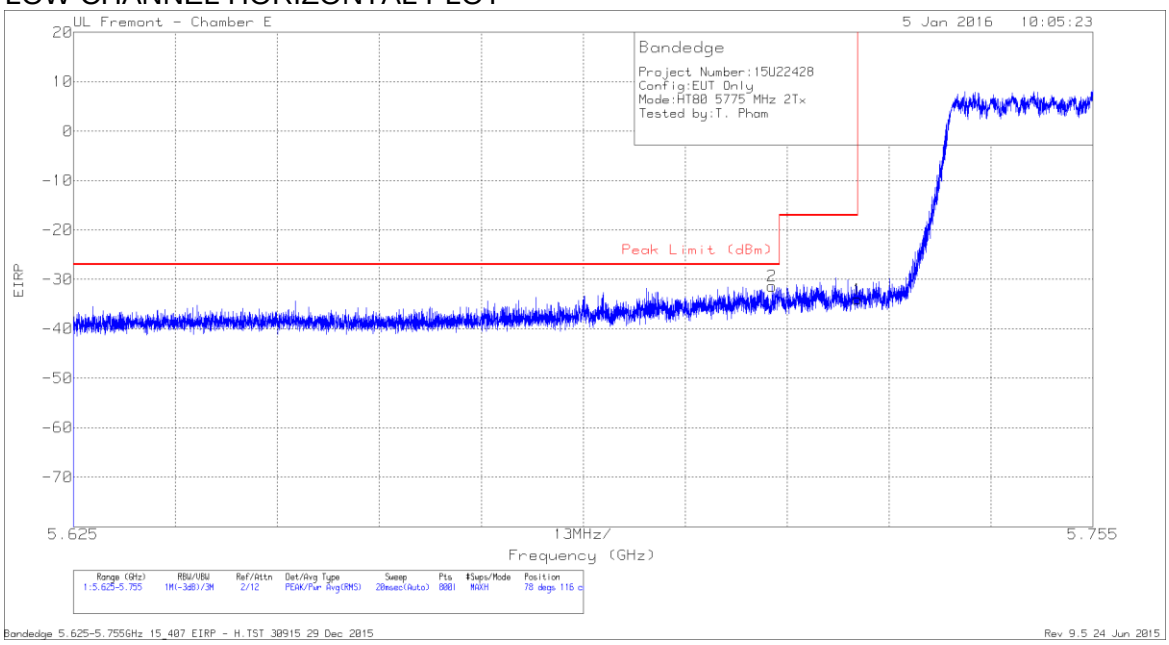
PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

9.25. 802.11ac VHT80 2Tx CDD MODE IN THE 5.8 GHz BAND

RESTRICTED BANDEDGE (LOW)

LOW CHANNEL HORIZONTAL PLOT

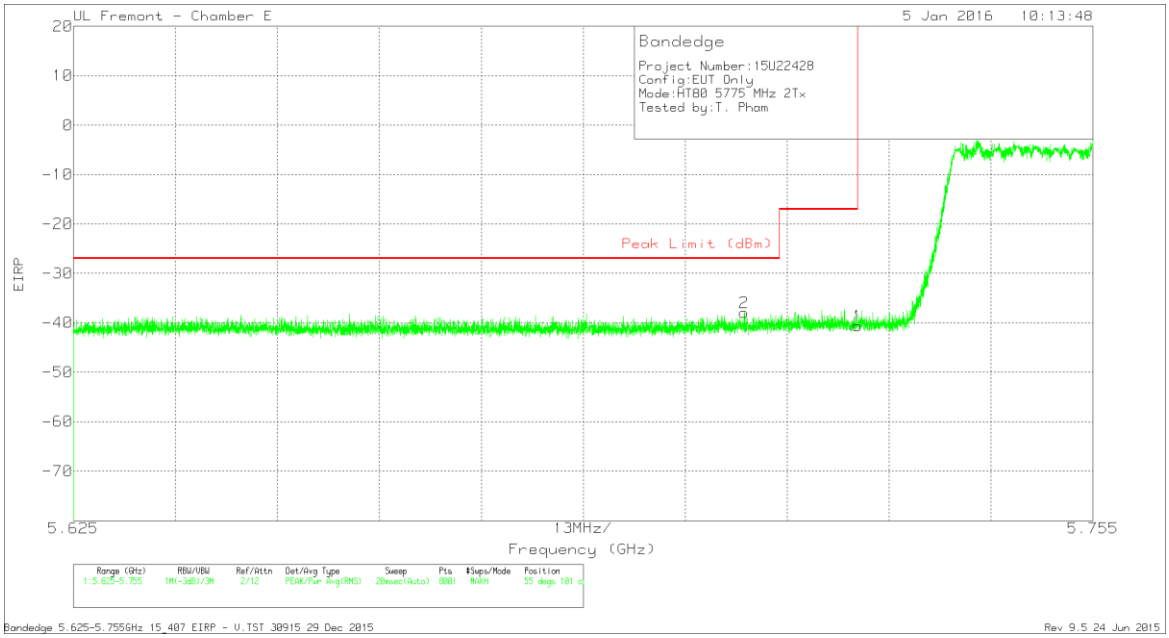


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (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	5.714	-58.06	Pk	34.7	-19.8	11.8	-31.36	-27	-4.36	78	116	H
1	5.725	-60.71	Pk	34.7	-19.8	11.8	-34.01	-17	-17.01	78	116	H

Pk - Peak detector

LOW CHANNEL VERTICAL PLOT



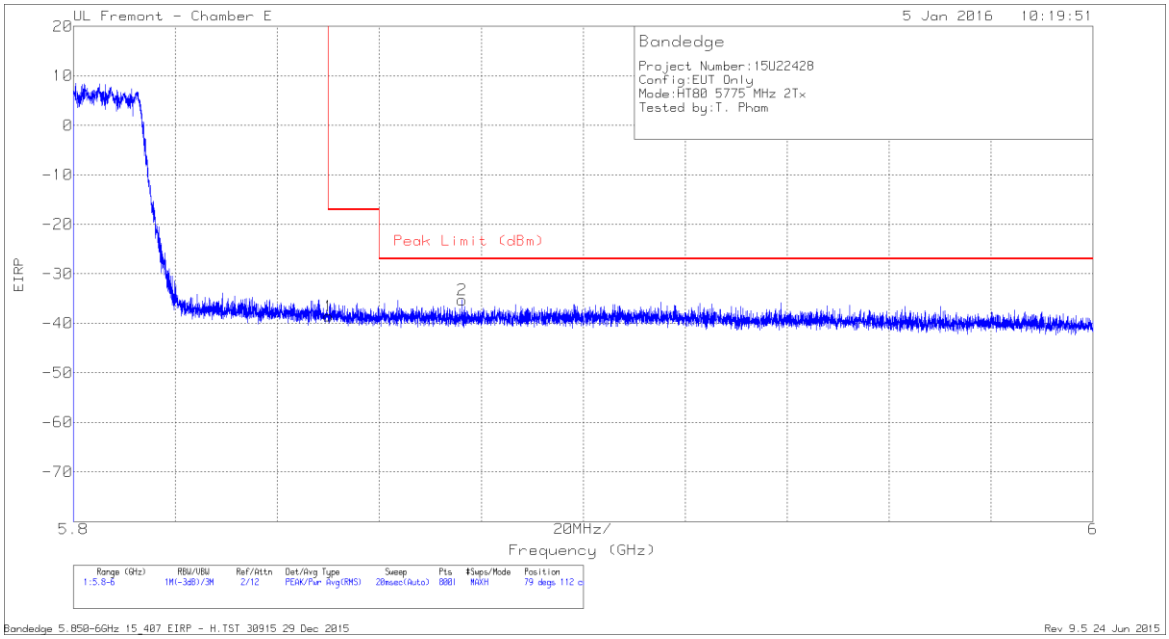
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (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	5.711	-64.63	Pk	34.7	-19.8	11.8	-37.93	-27	-10.93	55	101	V
1	5.725	-67.33	Pk	34.7	-19.8	11.8	-40.63	-17	-23.63	55	101	V

Pk - Peak detector

RESTRICTED BANDEDGE (HIGH)

HIGH CHANNEL HORIZONTAL PLOT

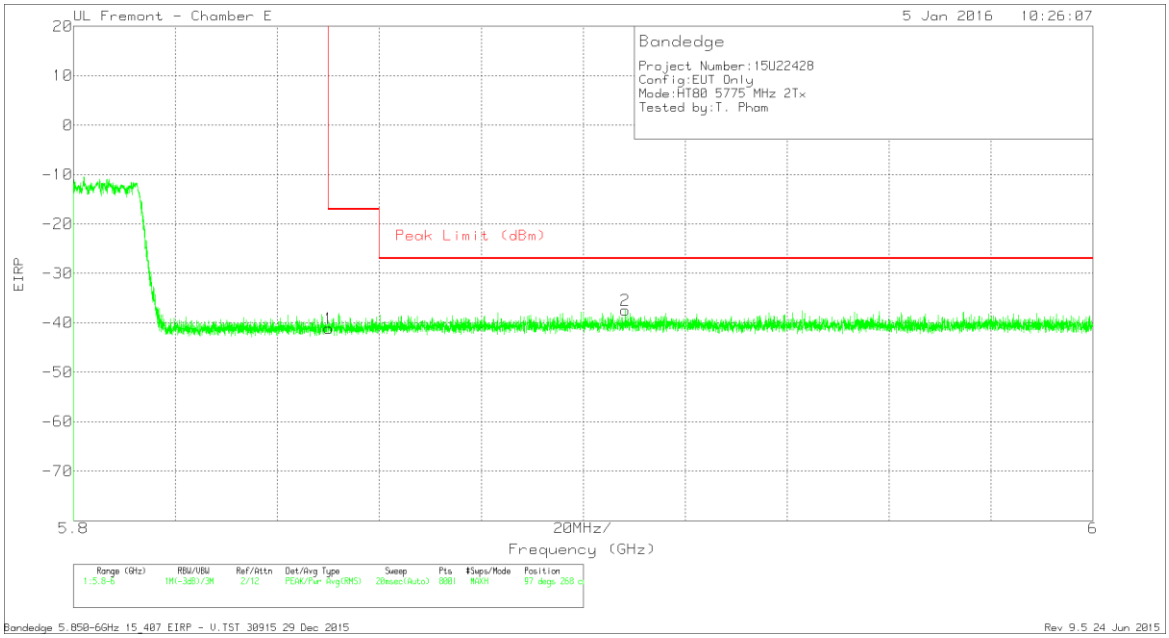


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (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	-65.21	Pk	34.9	-20	11.8	-38.51	-17	-21.51	79	112	H
2	5.876	-62.19	Pk	34.9	-19.8	11.8	-35.29	-27	-8.29	79	112	H

Pk - Peak detector

HIGH CHANNEL VERTICAL PLOT



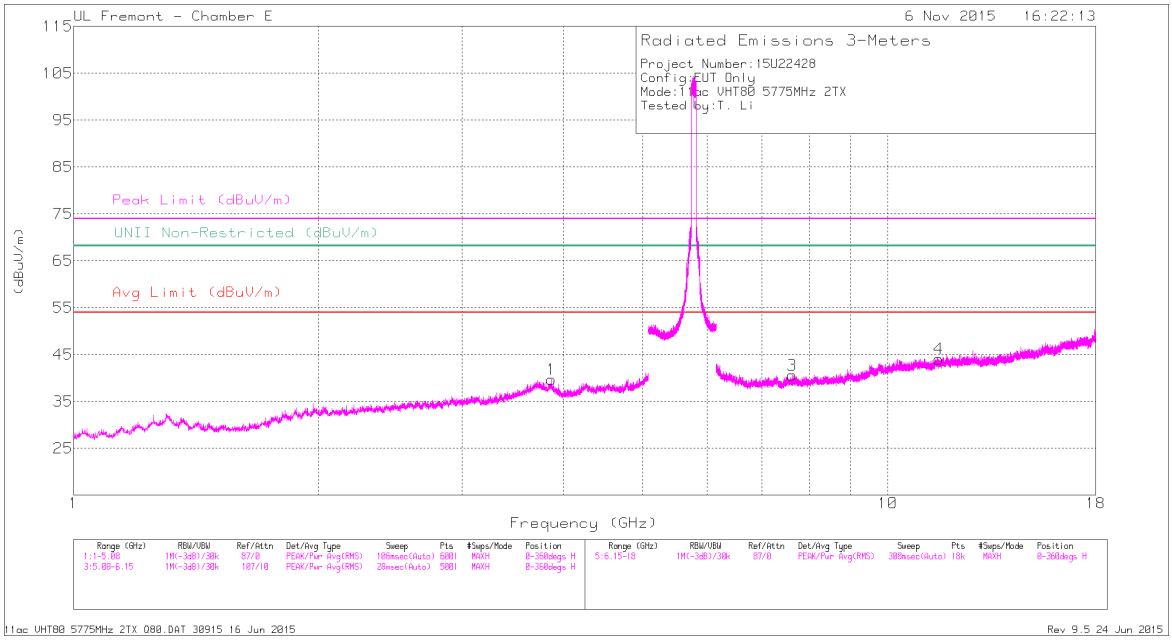
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (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	-67.88	Pk	34.9	-20	11.8	-41.18	-17	-24.18	97	268	V
2	5.908	-64.64	Pk	34.9	-19.5	11.8	-37.44	-27	-10.44	97	268	V

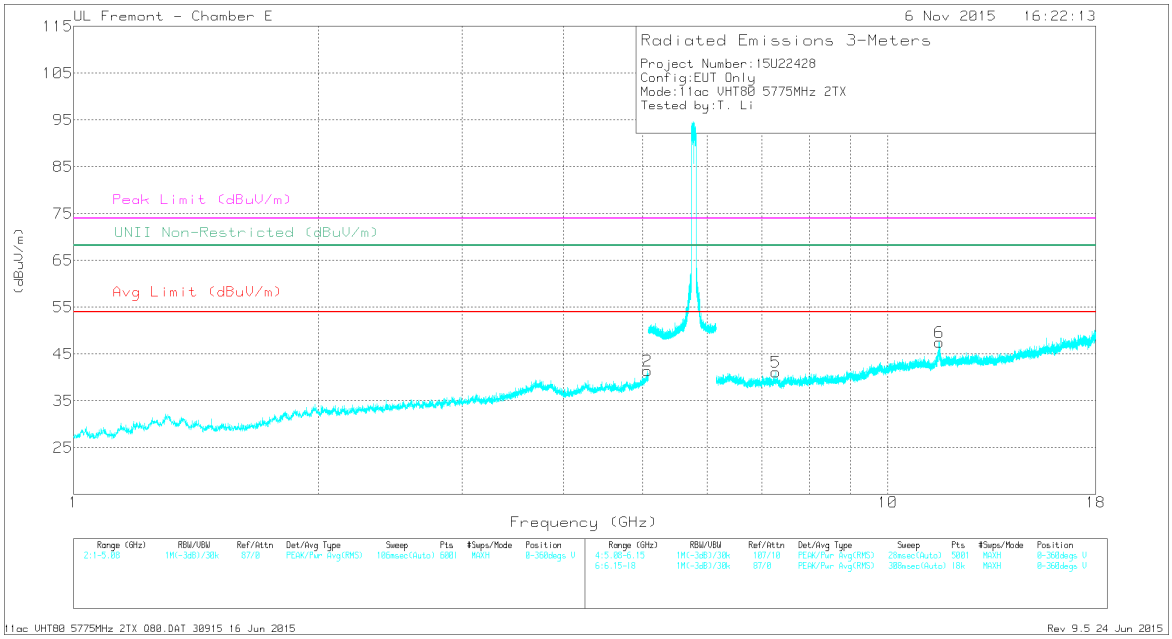
Pk - Peak detector

CHANNEL 155 HARMONICS AND SPURIOUS EMISSIONS

CHANNEL 155 HORIZONTAL PLOT



CHANNEL 155 VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 3.863	39.13	PK-U	33.9	-28.6	0	44.43	-	-	74	-29.57	-	-	97	129	H
	* 3.863	27.53	ADR	33.9	-28.6	.2	33.03	54	-20.97	-	-	-	-	97	129	H
2	* 5.073	38.65	PK-U	34.2	-26.3	0	46.55	-	-	74	-27.45	-	-	299	346	V
	* 5.074	27.32	ADR	34.2	-26.3	.2	35.42	54	-18.58	-	-	-	-	299	346	V
3	* 7.635	36.82	PK-U	35.8	-25.6	0	47.02	-	-	74	-26.98	-	-	176	209	H
	* 7.635	25.24	ADR	35.8	-25.6	.2	35.64	54	-18.36	-	-	-	-	176	209	H
4	* 11.545	35.89	PK-U	38.6	-22.6	0	51.89	-	-	74	-22.11	-	-	261	276	H
	* 11.545	23.61	ADR	38.6	-22.6	.2	39.81	54	-14.19	-	-	-	-	261	276	H
5	* 7.281	36.26	PK-U	35.7	-25.4	0	46.56	-	-	74	-27.44	-	-	194	177	V
	* 7.283	25.62	ADR	35.7	-25.5	.2	36.02	54	-17.98	-	-	-	-	194	177	V
6	* 11.571	39.13	PK-U	38.6	-22.8	0	54.93	-	-	74	-19.07	-	-	131	139	V
	* 11.571	27.08	ADR	38.6	-22.8	.2	43.08	54	-10.92	-	-	-	-	131	139	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

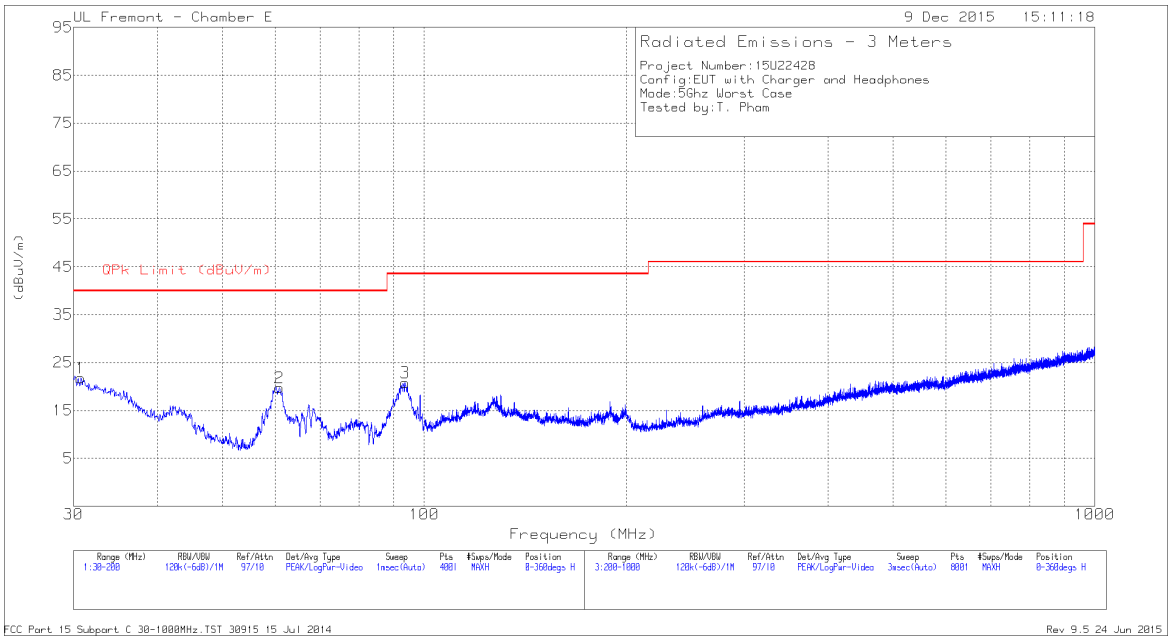
PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

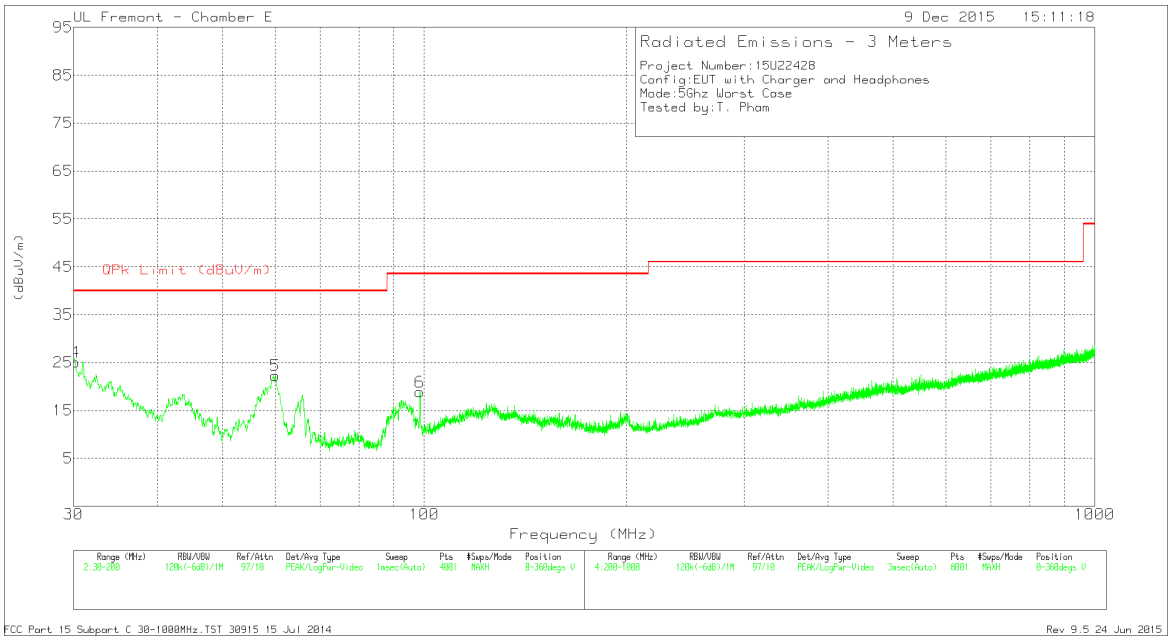
9.26. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

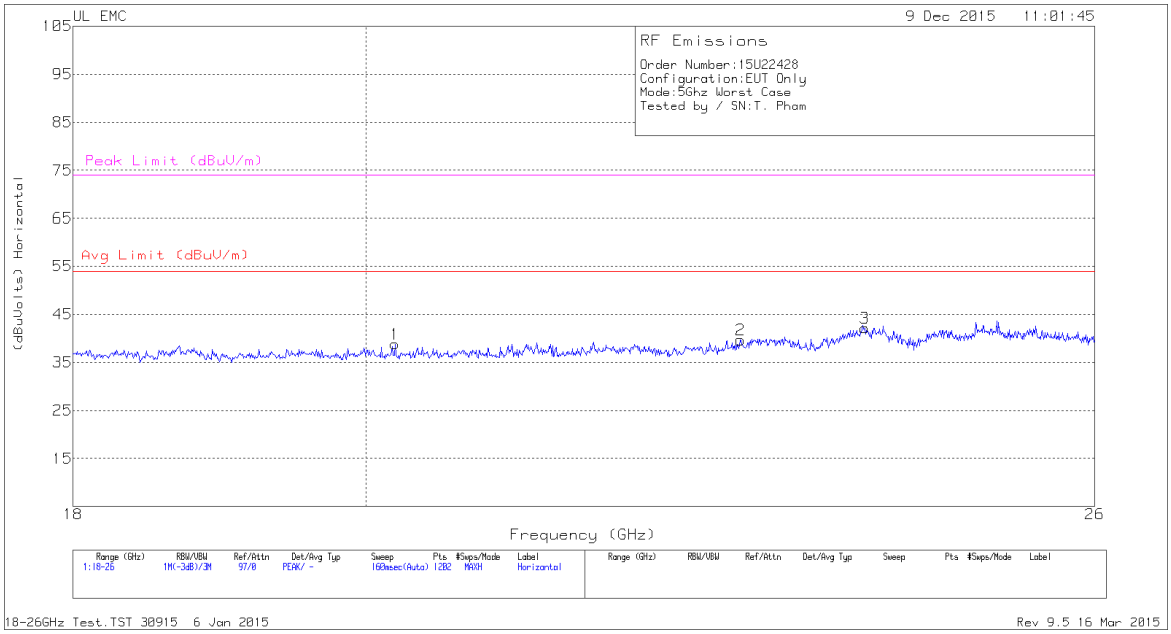
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	30.17	31.83	Pk	25.1	-31.8	25.13	40	-14.87	0-360	100	V
1	30.765	28.94	Pk	24.6	-31.8	21.74	40	-18.26	0-360	301	H
5	60.005	42.46	Pk	11.4	-31.6	22.26	40	-17.74	0-360	100	V
2	60.8125	39.86	Pk	11.5	-31.6	19.76	40	-20.24	0-360	401	H
3	93.6225	39.84	Pk	12.4	-31.4	20.84	43.52	-22.68	0-360	301	H
6	98.5525	36.53	Pk	13.8	-31.4	18.93	43.52	-24.59	0-360	100	V

Pk - Peak detector

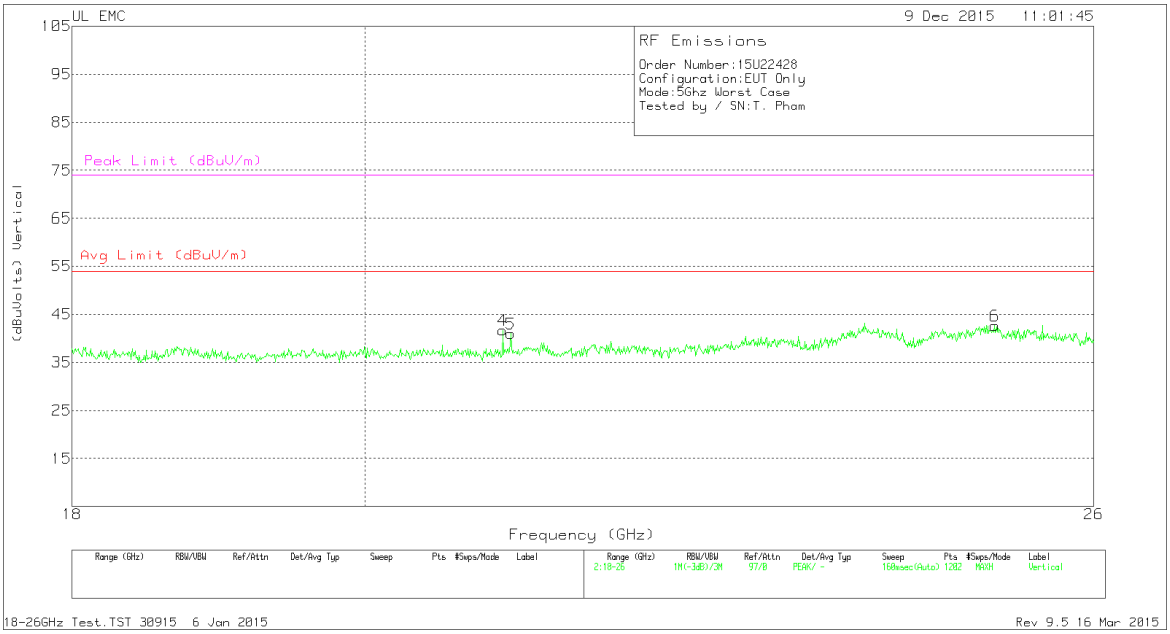
9.27. WORST-CASE ABOVE 18 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



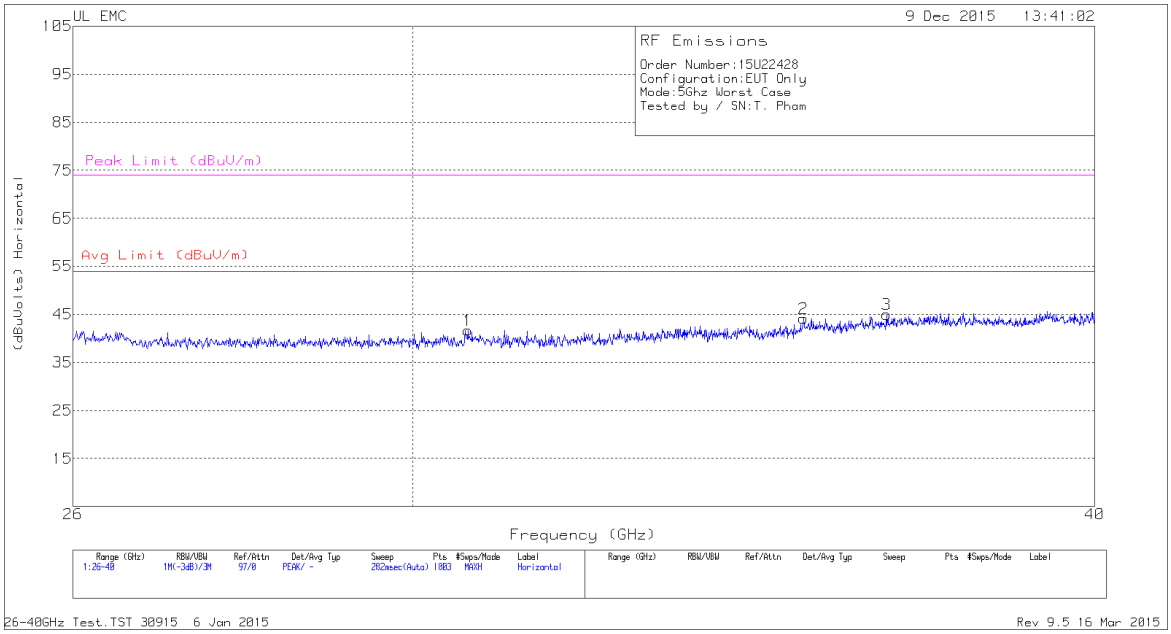
HORIZONTAL AND VERTICAL DATA

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	20.211	41.03	Pk	32.6	-25.3	-9.5	38.833	54	-15.167	74	-35.167
2	22.886	40.67	Pk	33.4	-24.9	-9.5	39.667	54	-14.3333	74	-34.333
3	23.935	42.37	Pk	33.4	-24.1	-9.5	42.167	54	-11.833	74	-31.833
4	21.017	44.27	Pk	32.4	-25.5	-9.5	41.667	54	-12.333	74	-32.333
5	21.077	43.2	Pk	32.6	-25.3	-9.5	41	54	-13	74	-33
6	25.087	42.67	Pk	34	-24.5	-9.5	42.667	54	-11.333	74	-31.333

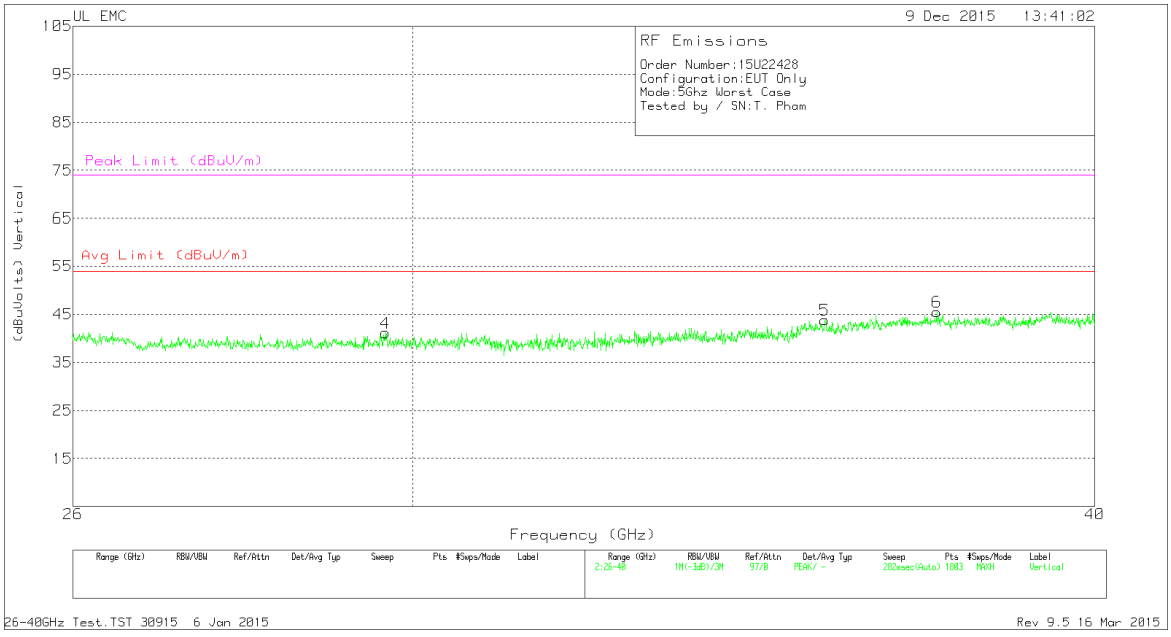
Pk - Peak detector

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

HORIZONTAL PLOT



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	30.708	47.67	Pk	36.1	-32.6	-9.5	41.667	54	-12.333	74	-32.333
2	35.377	49.27	Pk	37.8	-33.4	-9.5	44.167	54	-9.833	74	-29.833
3	36.636	50.5	Pk	37.1	-33.1	-9.5	45	54	-9	74	-29
4	29.659	46.97	Pk	36	-32.3	-9.5	41.167	54	-12.833	74	-32.833
5	35.696	49.23	Pk	37.4	-33.3	-9.5	43.833	54	-10.167	74	-30.167
6	37.421	50.8	Pk	37.3	-33.1	-9.5	45.5	54	-8.5	74	-28.5

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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 C63.10-2013

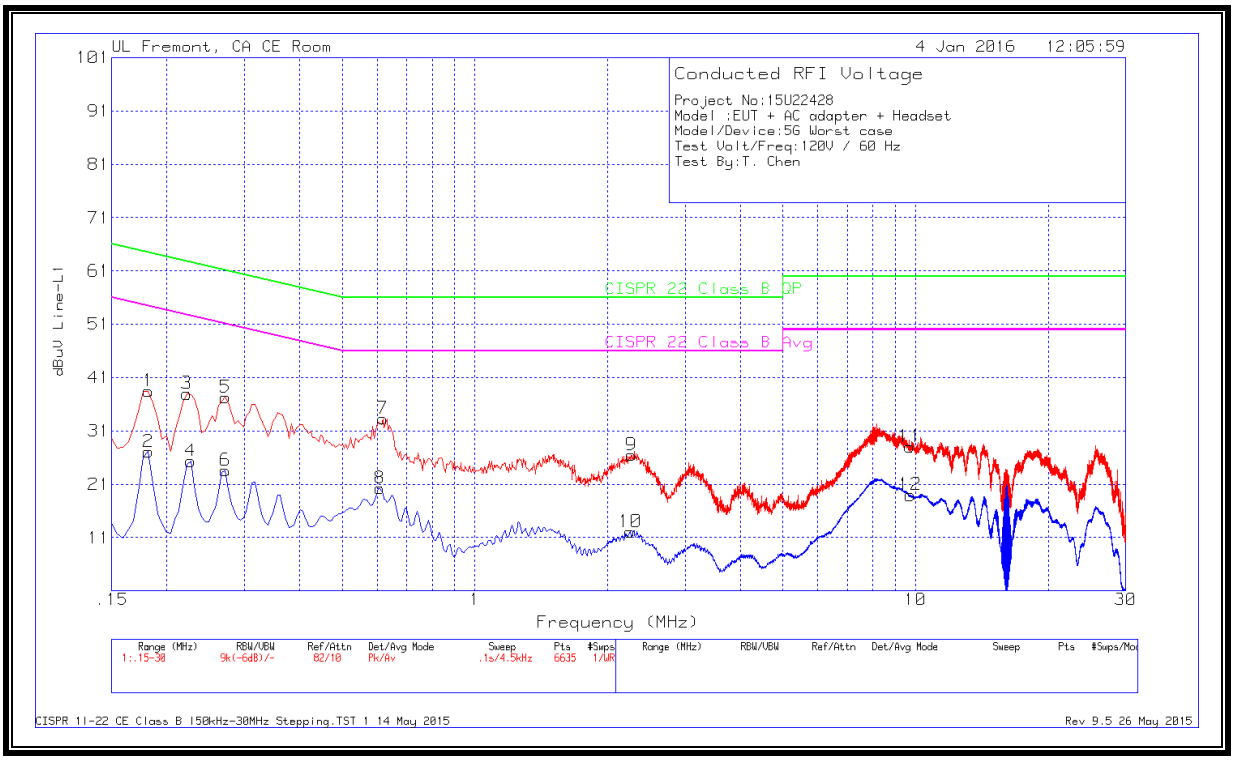
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

10.1. EUT POWERED BY AC ADAPTER

LINE 1 RESULTS

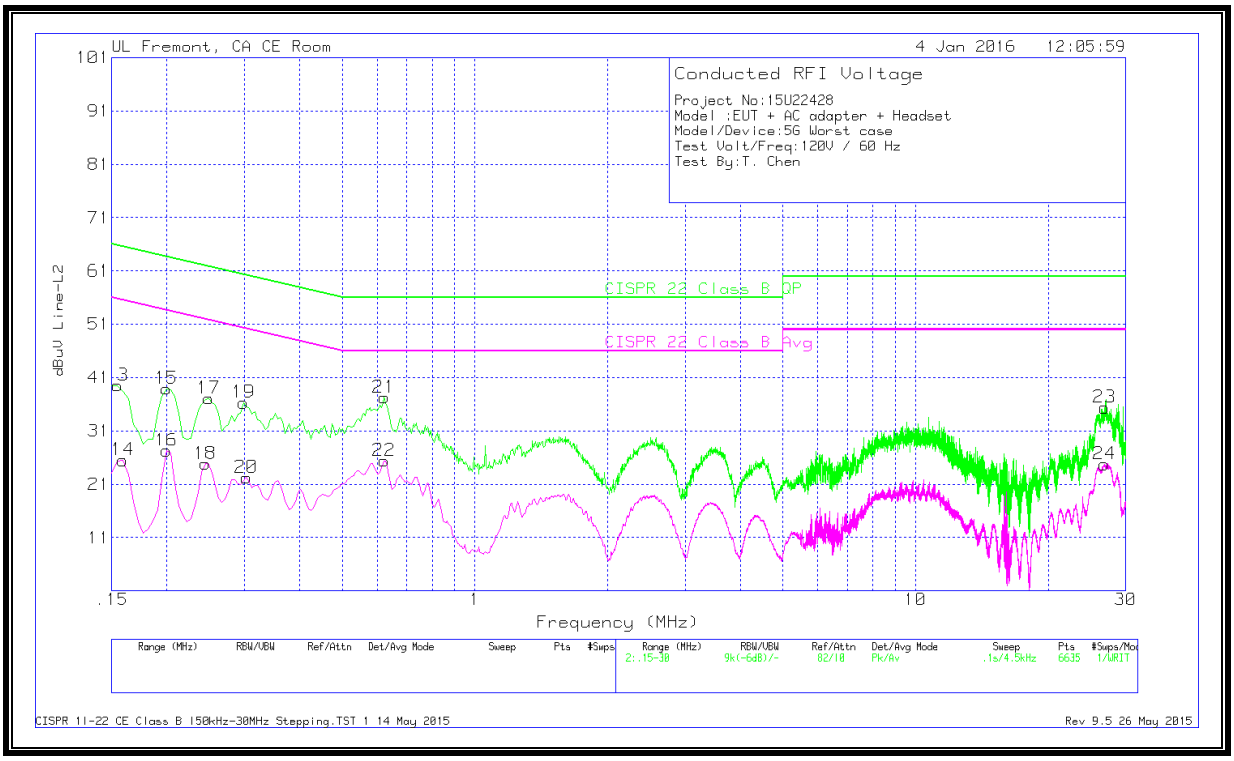


WORST EMISSIONS

Range 1: 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	.1815	37.37	Pk	1.1	0	38.47	64.42	-25.95	-	-
2	.1815	26	Av	1.1	0	27.1	-	-	54.42	-27.32
3	.222	37.16	Pk	.8	0	37.96	62.74	-24.78	-	--
4	.2265	24.53	Av	.8	0	25.33	-	-	52.58	-27.25
5	.2715	36.7	Pk	.6	0	37.3	61.07	-23.77	-	-
6	.2715	22.95	Av	.6	0	23.55	-	-	51.07	-27.52
7	.618	32.97	Pk	.3	0	33.27	56	-22.73	-	-
8	.609	19.93	Av	.3	0	20.23	-	-	46	-25.77
9	2.265	26.13	Pk	.2	.1	26.43	56	-29.57	-	-
10	2.2515	11.77	Av	.2	.1	12.07	-	-	46	-33.93
11	9.717	27.62	Pk	.2	.2	28.02	60	-31.98	-	-
12	9.7305	18.57	Av	.2	.2	18.97	-	-	50	-31.03

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS



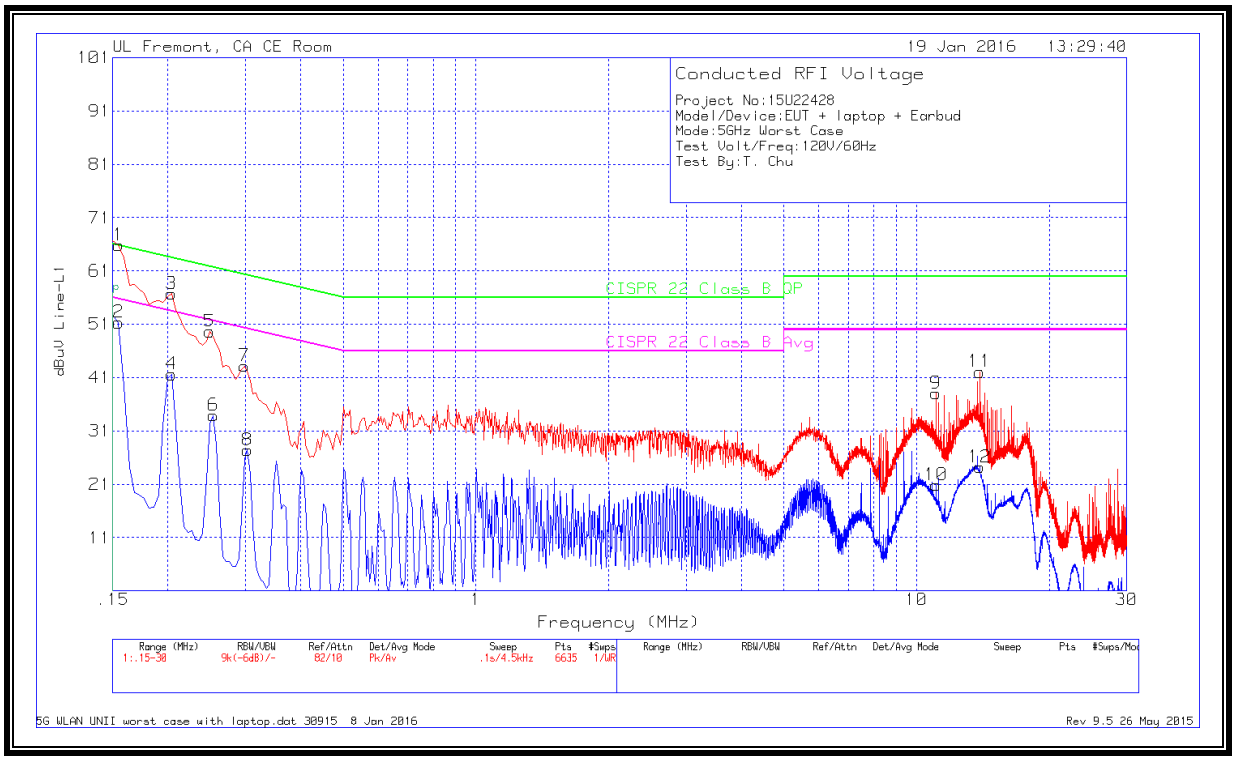
WORST EMISSIONS

Range 2: 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)
13	.1545	38.1	Pk	1.4	0	39.5	65.75	-26.25	-	-
14	.159	24.1	Av	1.4	0	25.5	-	-	55.52	-30.02
15	.1995	37.93	Pk	1	0	38.93	63.63	-24.7	-	-
16	.1995	26.3	Av	1	0	27.3	-	-	53.63	-26.33
17	.249	36.37	Pk	.7	0	37.07	61.79	-24.72	-	-
18	.2445	24.03	Av	.8	0	24.83	-	-	51.94	-27.11
19	.2985	35.68	Pk	.6	0	36.28	60.28	-24	-	-
20	.303	21.67	Av	.6	0	22.27	-	-	50.16	-27.89
21	.6225	36.97	Pk	.3	0	37.27	56	-18.73	-	-
22	.6225	25.11	Av	.3	0	25.41	-	-	46	-20.59
23	26.862	34.78	Pk	.3	.3	35.38	60	-24.62	-	-
24	26.8215	24.13	Av	.3	.3	24.73	-	-	50	-25.27

Pk - Peak detector
Av - Average detection

10.2. EUT POWERED BY HOST PC VIA USB CABLE

LINE 1 RESULTS

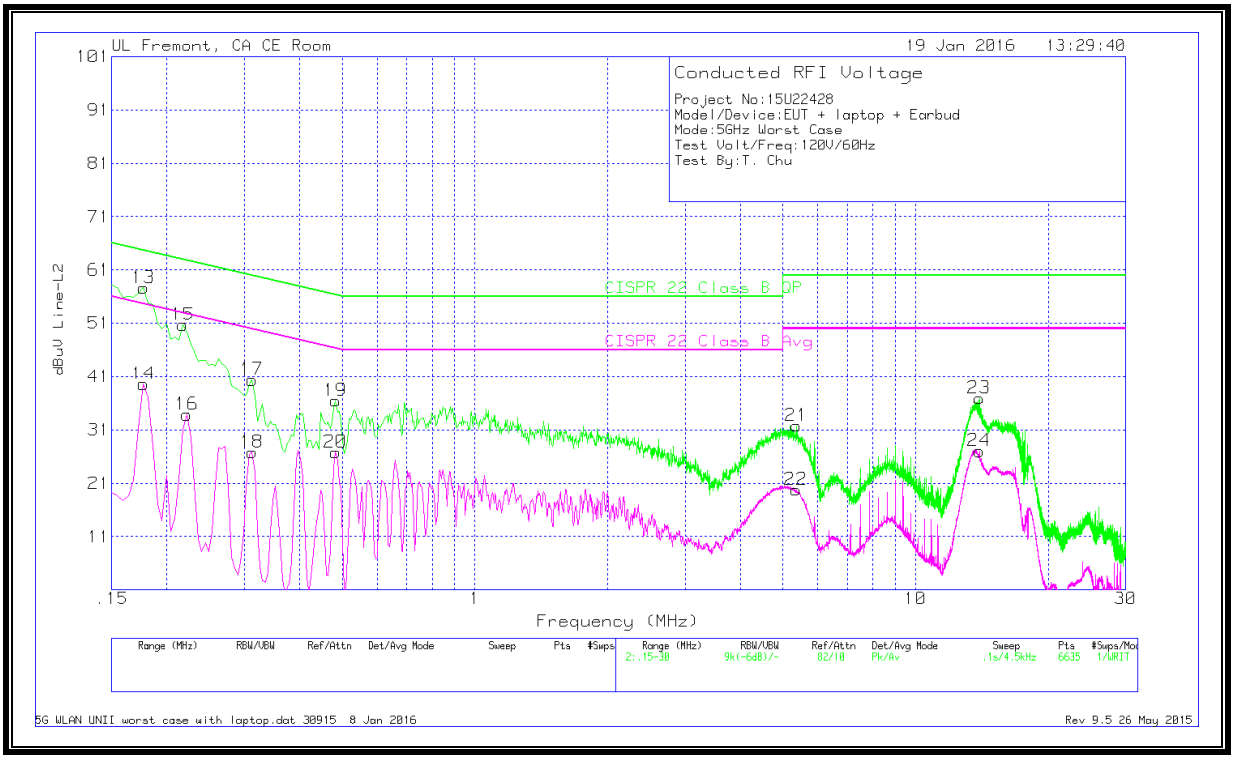


WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T1310 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.15	56.9	Qp	.1	0	57	66	-9	-	-
2	.1545	51.32	Av	0	0	51.32	-	-	55.75	-4.43
3	.204	56.72	Pk	0	0	56.72	63.45	-6.73	-	-
4	.204	41.59	Av	0	0	41.59	-	-	53.45	-11.86
5	.249	49.63	Pk	0	0	49.63	61.79	-12.16	-	-
6	.2535	33.91	Av	0	0	33.91	-	-	51.64	-17.73
7	.2985	43.18	Pk	0	0	43.18	60.28	-17.1	-	-
8	.303	27.39	Av	0	0	27.39	-	-	50.16	-22.77
9	11.0805	37.83	Pk	0	.2	38.03	60	-21.97	-	-
10	11.0805	20.62	Av	0	.2	20.82	-	-	50	-29.18
11	13.92	41.76	Pk	.1	.2	42.06	60	-17.94	-	-
12	13.92	23.91	Av	.1	.2	24.21	-	-	50	-25.79

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

LINE 2 RESULTS



WORST EMISSIONS

Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T1310 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
13	.177	57.63	Pk	0	0	57.63	64.63	-7	-	-
14	.177	39.61	Av	0	0	39.61	-	-	54.63	-15.02
15	.2175	50.7	Pk	0	0	50.7	62.91	-12.21	-	-
16	.222	33.85	Av	0	0	33.85	-	-	52.74	-18.89
17	.312	40.38	Pk	0	0	40.38	59.92	-19.54	-	-
18	.312	26.81	Av	0	0	26.81	-	-	49.92	-23.11
19	.483	36.46	Pk	0	0	36.46	56.29	-19.83	-	-
20	.483	26.81	Av	0	0	26.81	-	-	46.29	-19.48
21	5.37	31.65	Pk	0	.1	31.75	60	-28.25	-	-
22	5.3565	19.68	Av	0	.1	19.78	-	-	50	-30.22
23	13.956	36.65	Pk	.1	.2	36.95	60	-23.05	-	-
24	13.956	26.72	Av	.1	.2	27.02	-	-	50	-22.98

Pk - Peak detector
Av - Average detection

11. DYNAMIC FREQUENCY SELECTION

11.1. OVERVIEW

11.1.1. LIMITS

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”.

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.		

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.

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

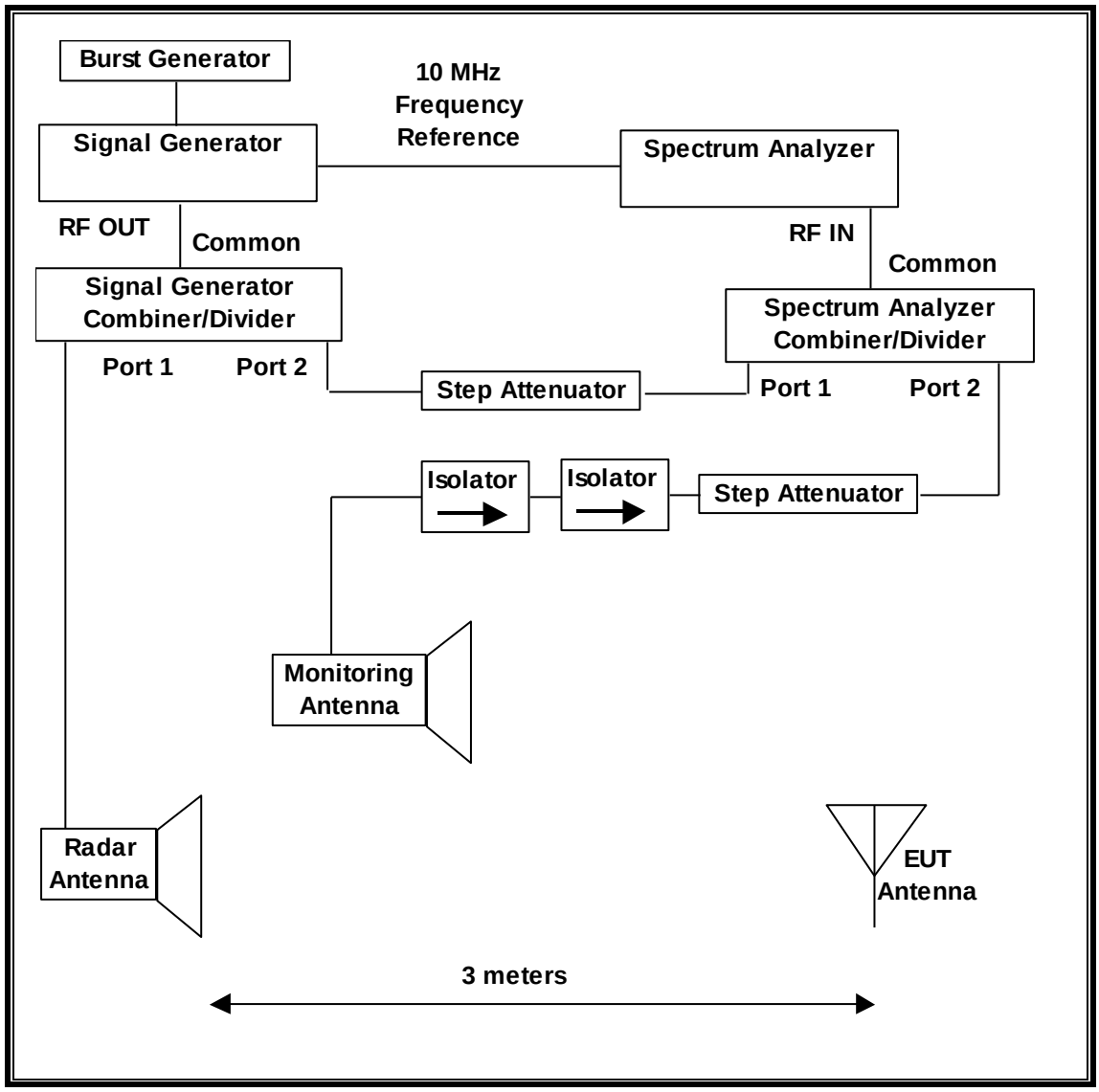
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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

11.1.1. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



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.

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.

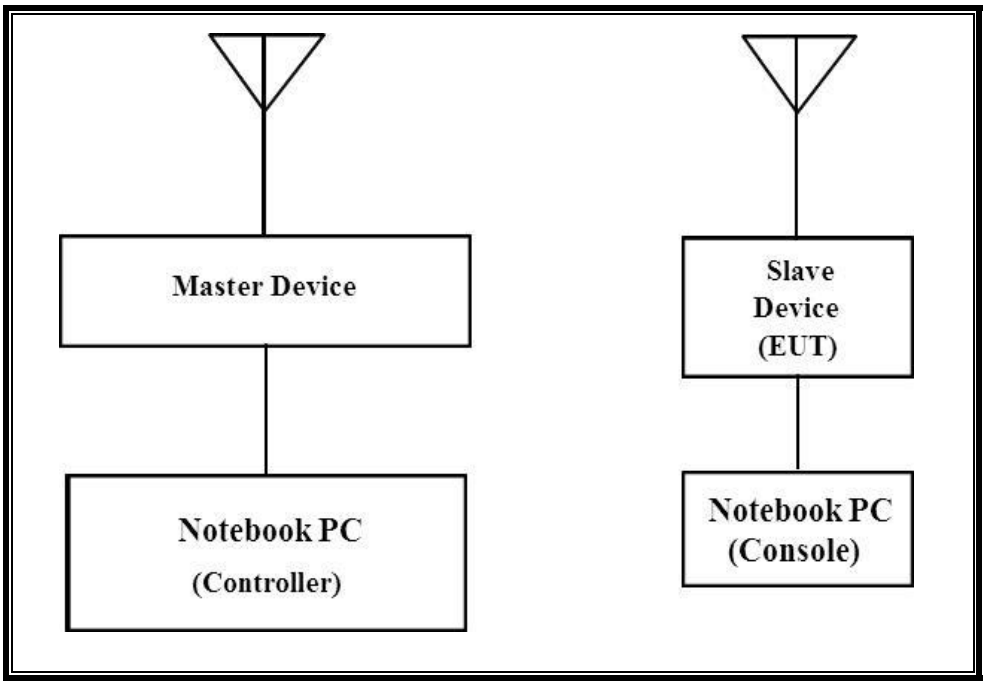
TEST AND MEASUREMENT EQUIPMENT

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, PXA, 3Hz to 44GHz	Keysight	N9030A	US51350187	06/01/16
Signal Generator, MXG X-Series RF Vector	Agilent	N5172B	MY51350337	02/17/16

11.1.2. SETUP OF EUT (CLIENT MODE)

RADIATED METHOD EUT TEST SETUP



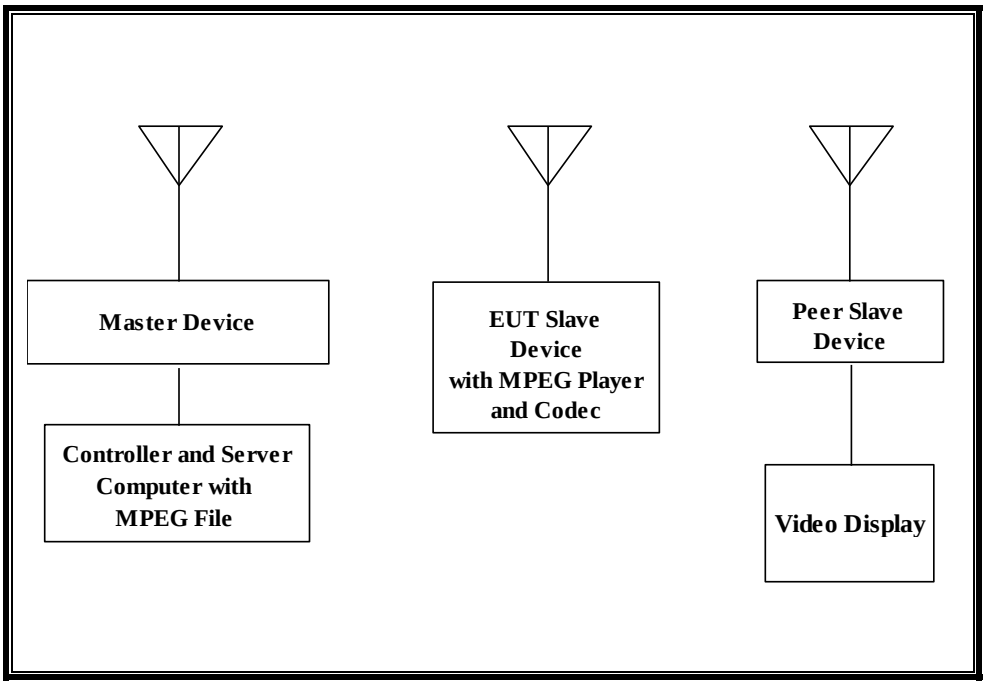
SUPPORT EQUIPMENT

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**
3X3 mimo Base Station (Master Device)	Apple	A1521	C86LCE5GFJ1R	BCGA1470
Notebook PC (Controller)	Apple	A1278	C02HJ0A7DTY4	DoC
Notebook PC (Console)	Apple	A1502	C02LRLKYFH00	DoC

11.1.3. 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**
3x3 MIMO Base Station (Master Device)	Apple	A1521	C86LCE5GFJ1R	BCGA1470
Notebook PC (Controller/Server)	Apple	A1278	C02HJ0A7DTY4	DoC
AC Adapter (Controller/Server PC)	Dongguan Samsung Electro Mechanics	A1344	RR008012YAL3A	DoC
Apple TV (Peer Slave Device)	Apple	A1469	C07K202CFFF1	BCGA1469
Video Display	Polaroid	TLX-01511C	02006	DoC

11.1.4. DESCRIPTION OF EUT

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

For IC the EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges, excluding the 5600-5650 MHz range.

The EUT is a Slave Device without Radar Detection.

The highest power level within these bands is 22.58 dBm EIRP in the 5250-5350 MHz band and 22.73 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 3.02 dBi in the 5250-5350 MHz band and 4.03 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 2.23 dBi in the 5250-5350 MHz band and 2.83 dBi in the 5470-5725 MHz band.

Two identical 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 chain connected to an antenna to perform radiated tests.

In Standard Client Mode WLAN traffic that meets or exceeds the minimum required loading was generated by transferring a data stream from the controller PC to the EUT using iPerf version 2.0.5 software package.

In Client to Client Communications Mode, 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 OPlayer HD Lite media player.

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

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

In Client-to-Client Communications Mode the EUT utilizes the 802.11ac architecture between the EUT and the Master Device where three nominal channel bandwidths are implemented: 20 MHz, 40 MHz and 80 MHz. However, 802.11a/n architecture is utilized between the EUT and the Peer Slave Device in Client-to Client Communications Mode where only two nominal channel bandwidths are implemented: 20 MHz and 40 MHz. .

The software installed in the EUT is 13E146.

UNIFORM CHANNEL SPREADING

This requirement is not applicable to Slave Devices.

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

The Master Device is an Apple, Inc. Access Point, FCC ID: BCGA1470. 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 D2.dev.

11.2. CLIENT MODE RESULTS FOR 20 MHz BANDWIDTH

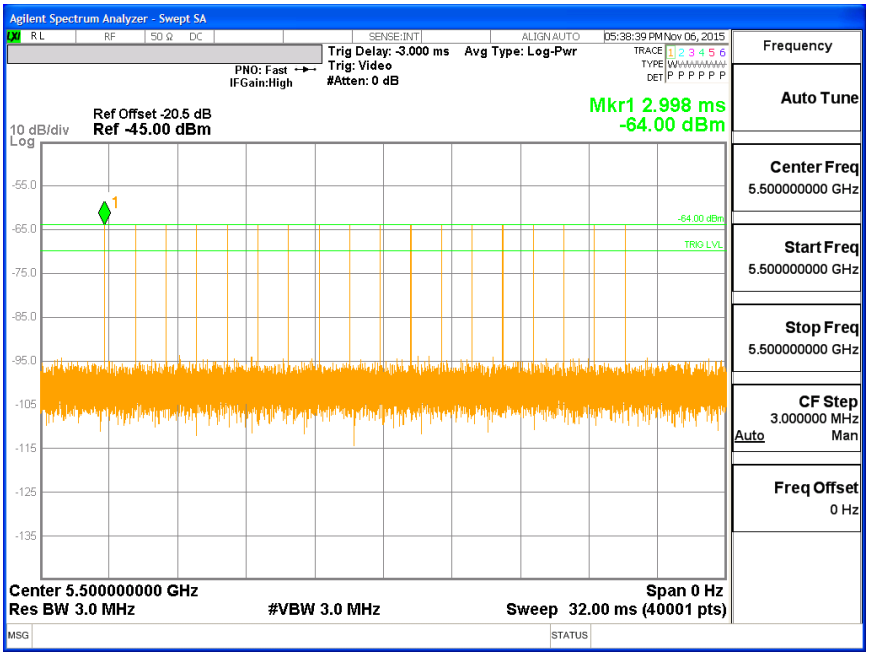
11.2.1. TEST CHANNEL

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

11.2.2. RADAR WAVEFORM AND TRAFFIC

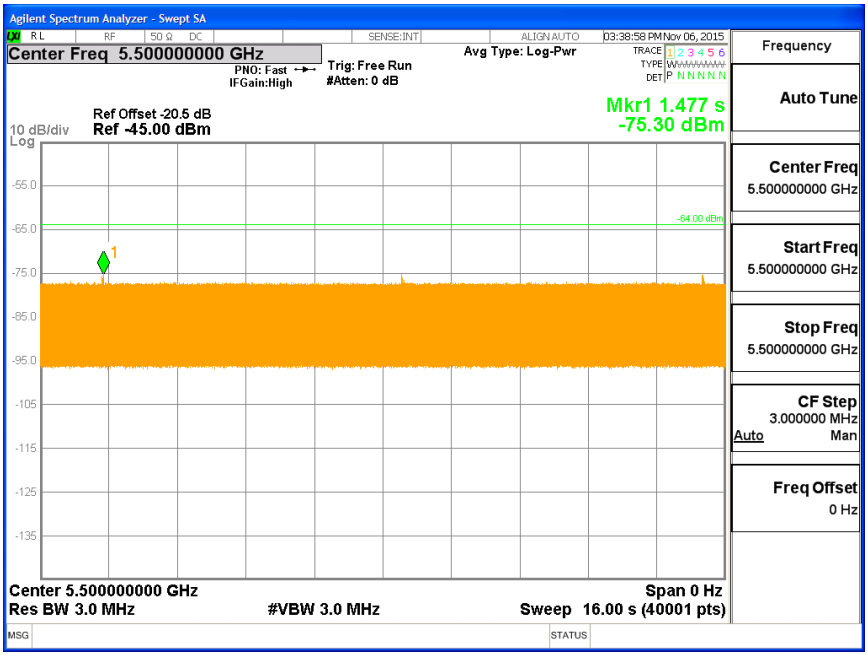
RADAR WAVEFORM

SHORT PULSE RADAR TYPE 0 AT MASTER

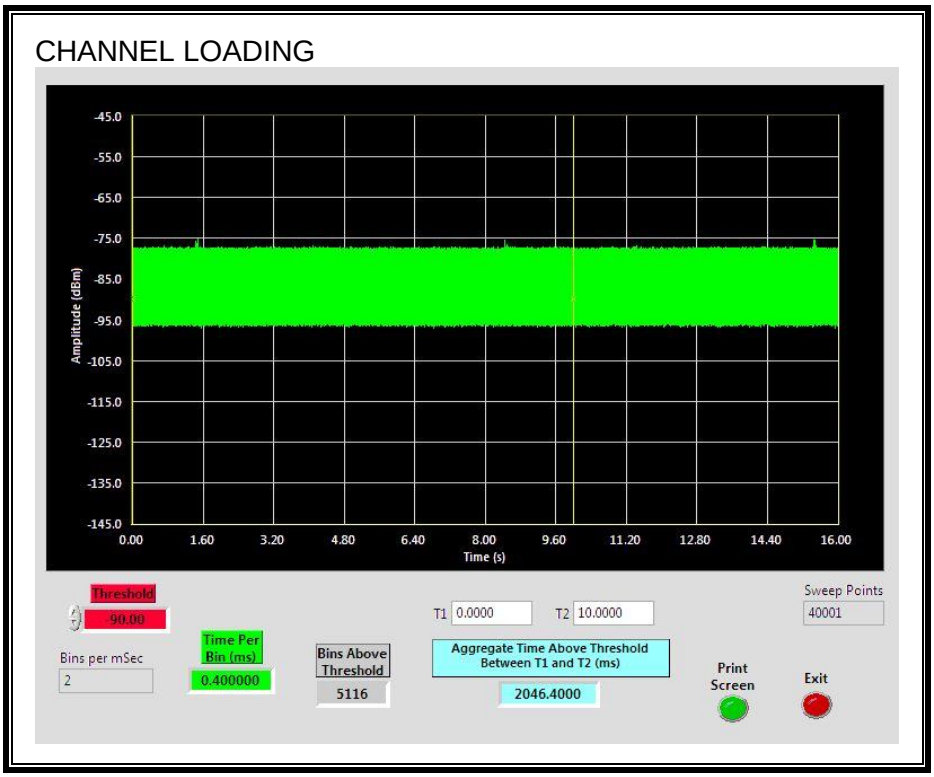


TRAFFIC

SLAVE TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 20.46%

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)
0.1324	10

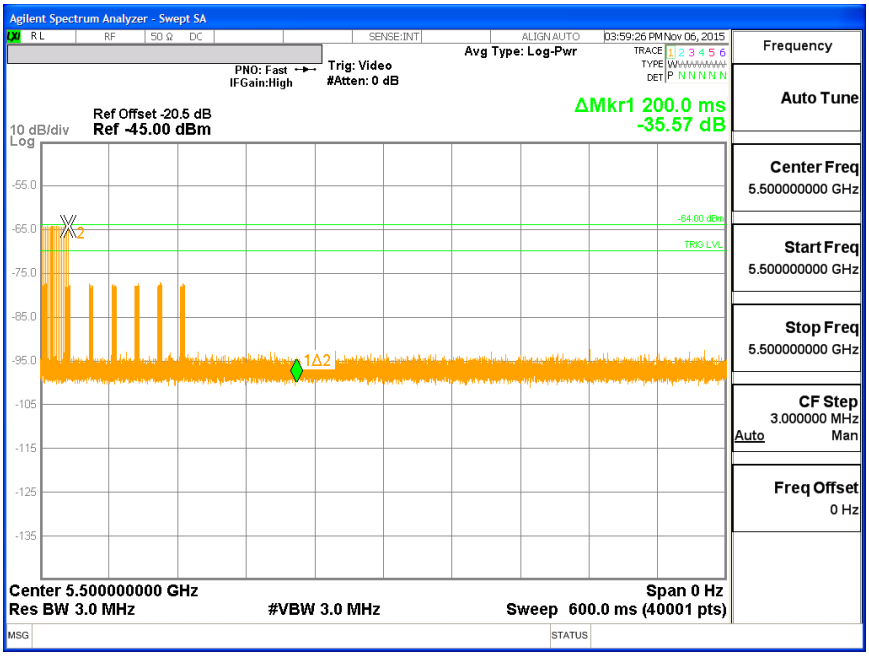
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

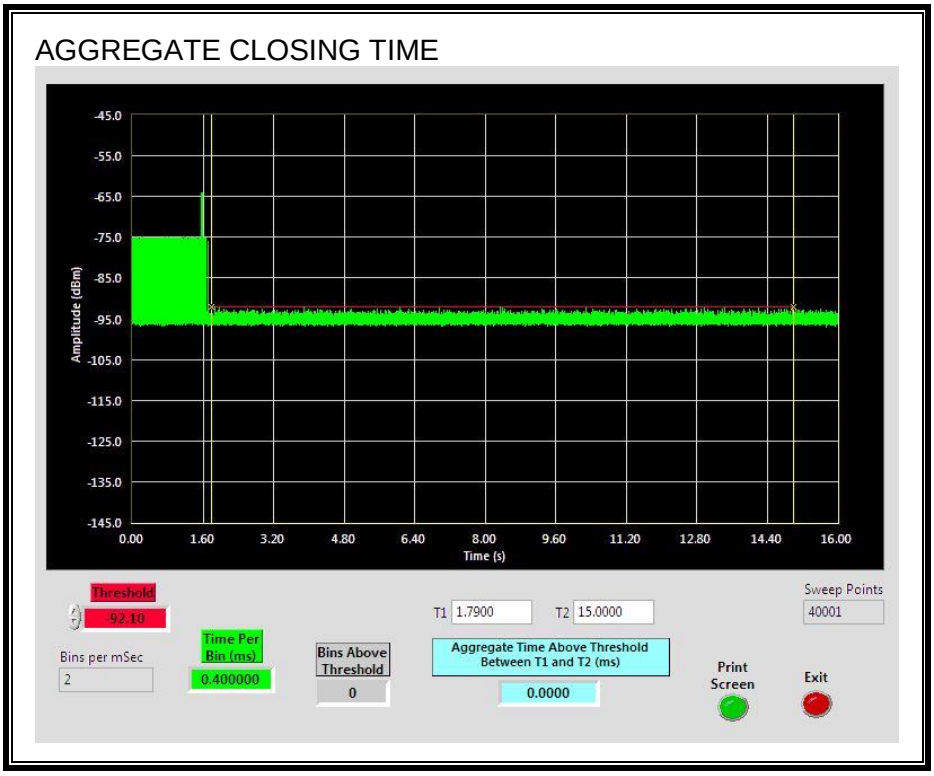
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



11.3. CLIENT MODE RESULTS FOR 40 MHz BANDWIDTH

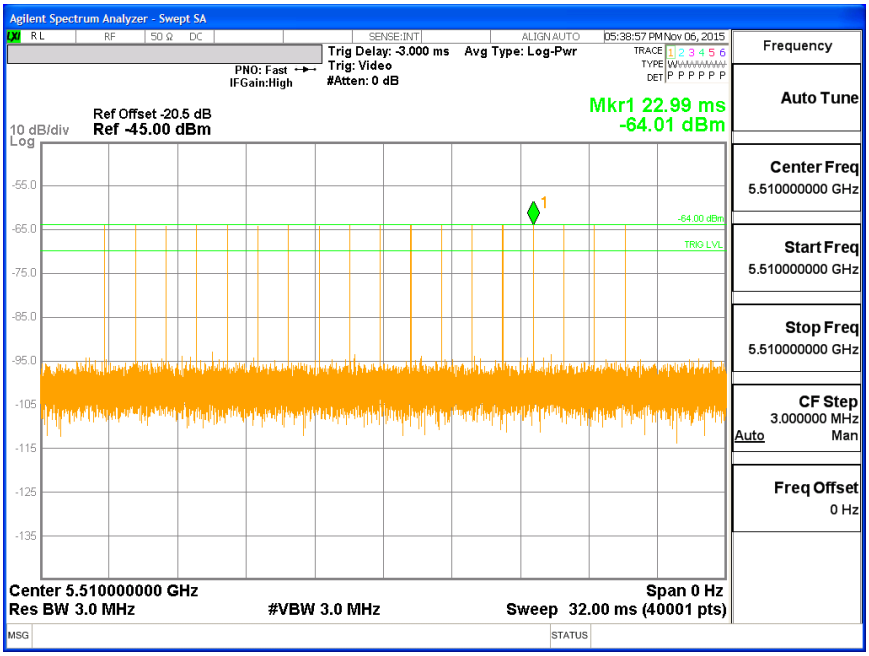
11.3.1. TEST CHANNEL

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

11.3.2. RADAR WAVEFORM AND TRAFFIC

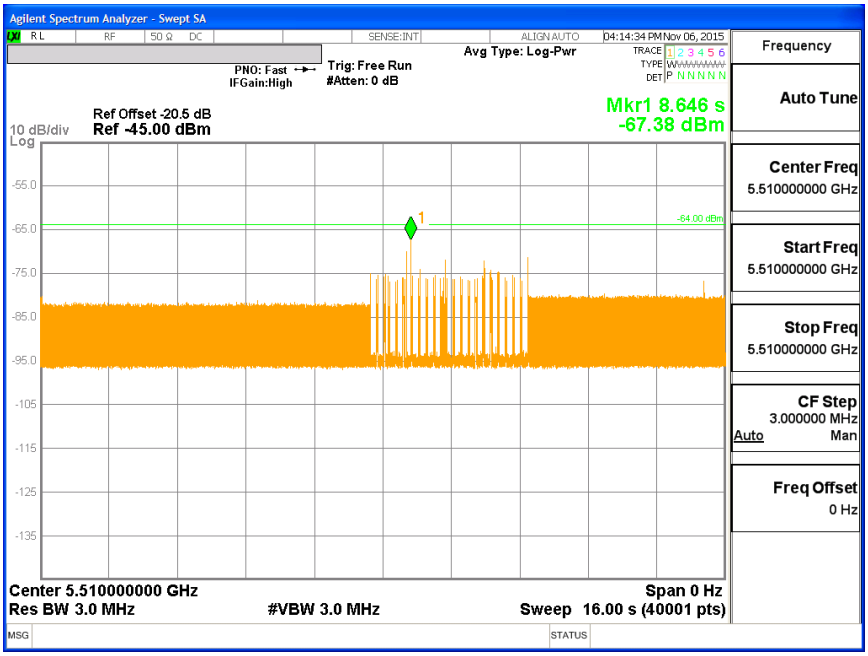
RADAR WAVEFORM

SHORT PULSE RADAR TYPE 0 AT MASTER

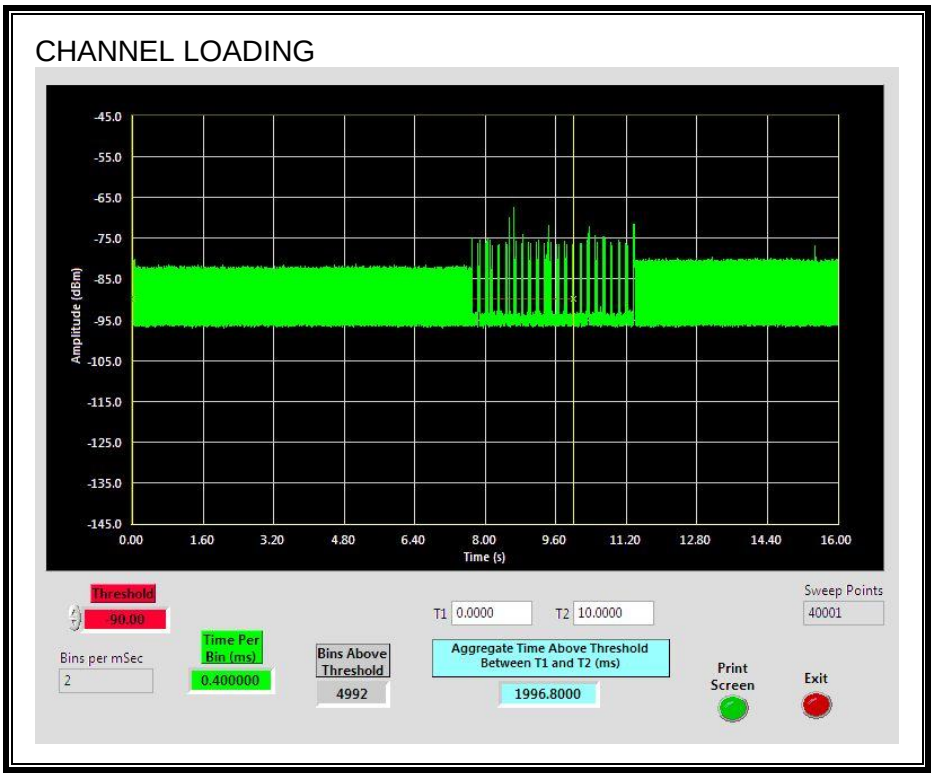


TRAFFIC

SLAVE TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 19.968%

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).

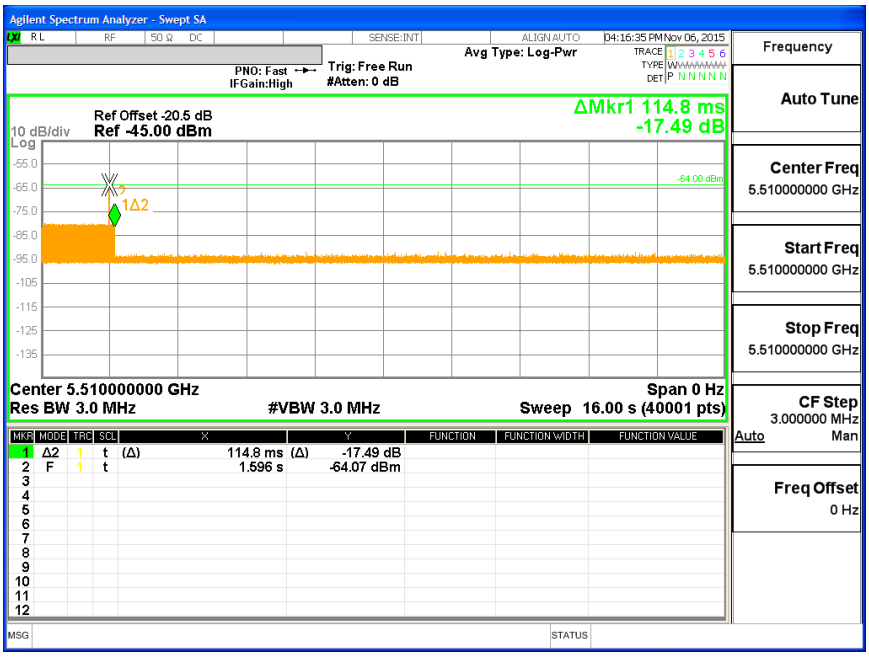
RESULTS

Channel Move Time (sec)	Limit (sec)
0.115	10

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

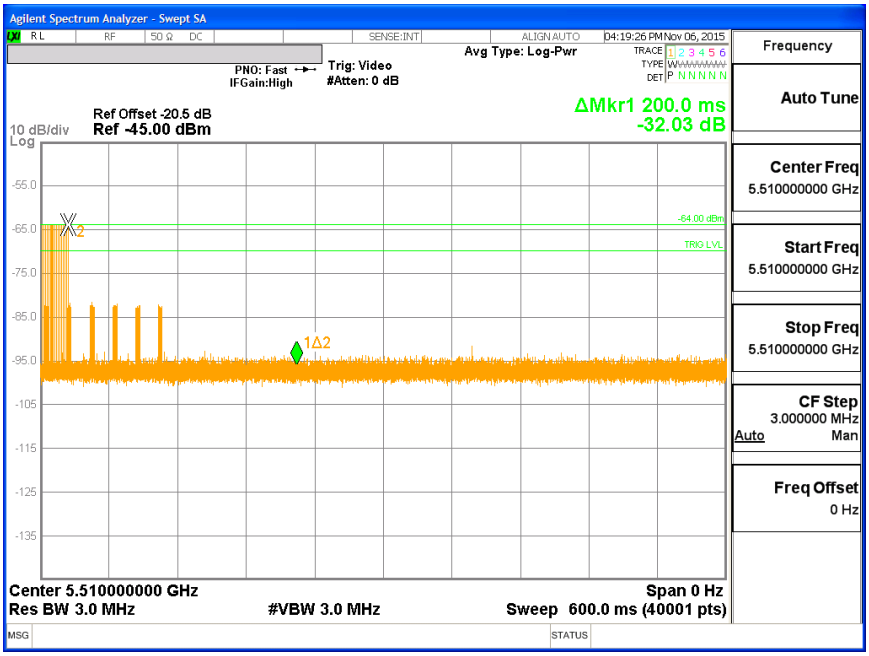
MOVE TIME

MOVE TIME



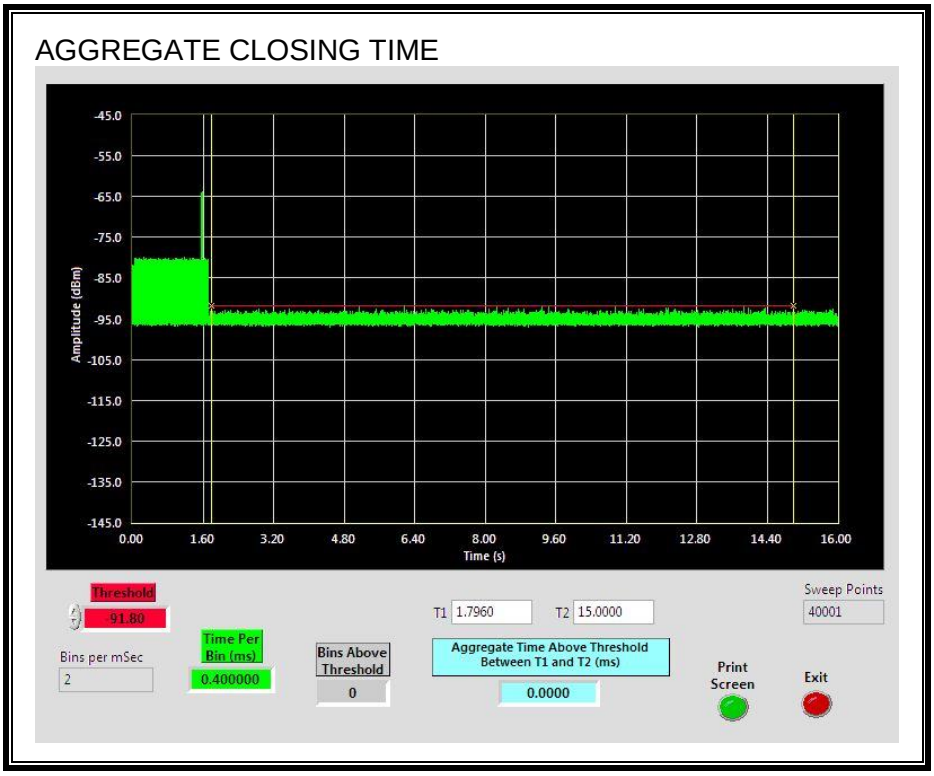
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



11.4. CLIENT MODE RESULTS FOR 80 MHz BANDWIDTH

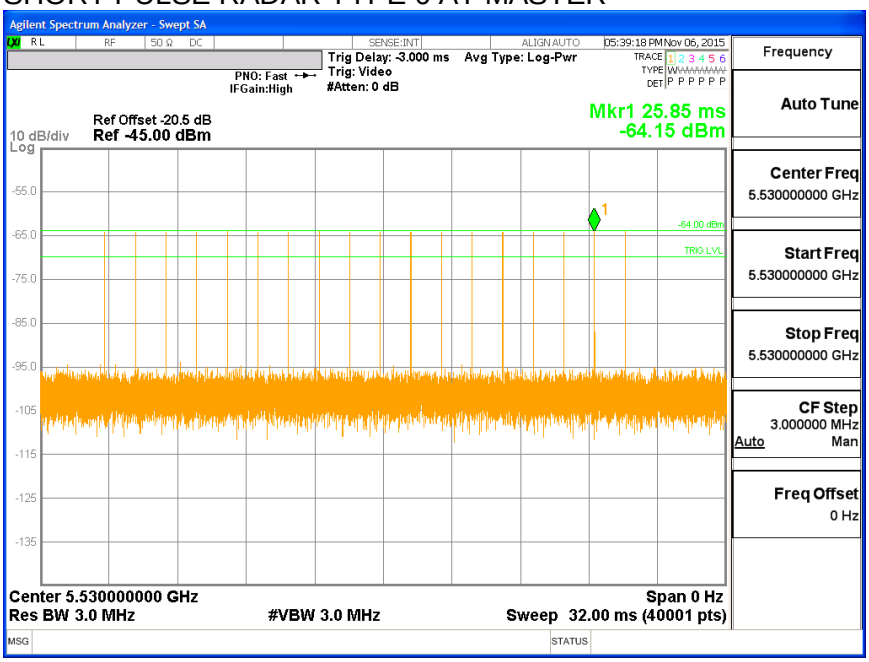
11.4.1. TEST CHANNEL

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

11.4.2. RADAR WAVEFORM AND TRAFFIC

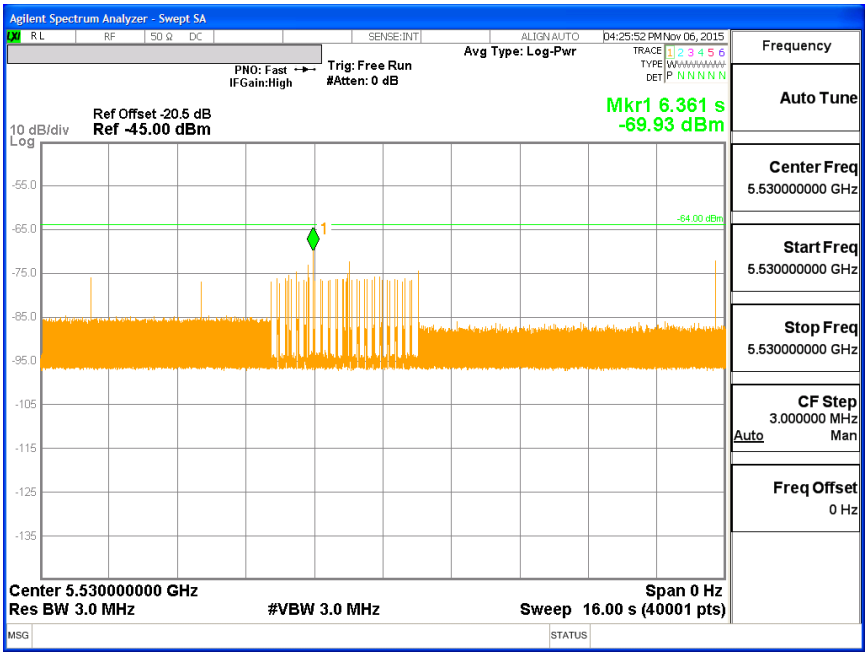
RADAR WAVEFORM

SHORT PULSE RADAR TYPE 0 AT MASTER

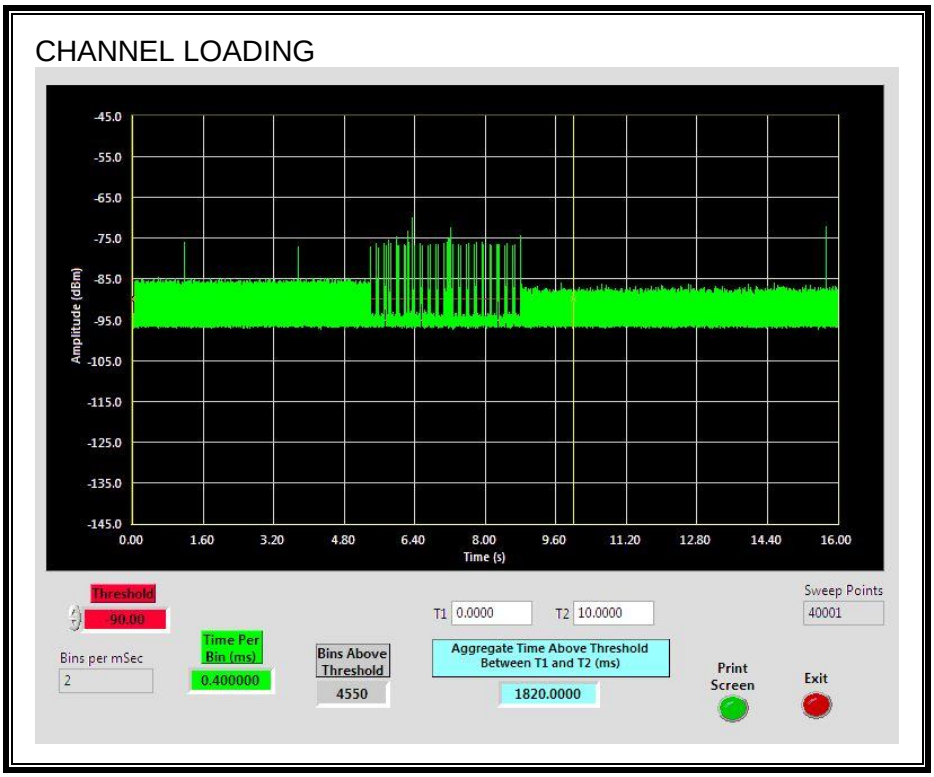


TRAFFIC

SLAVE TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 18.2%

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)
0.137	10

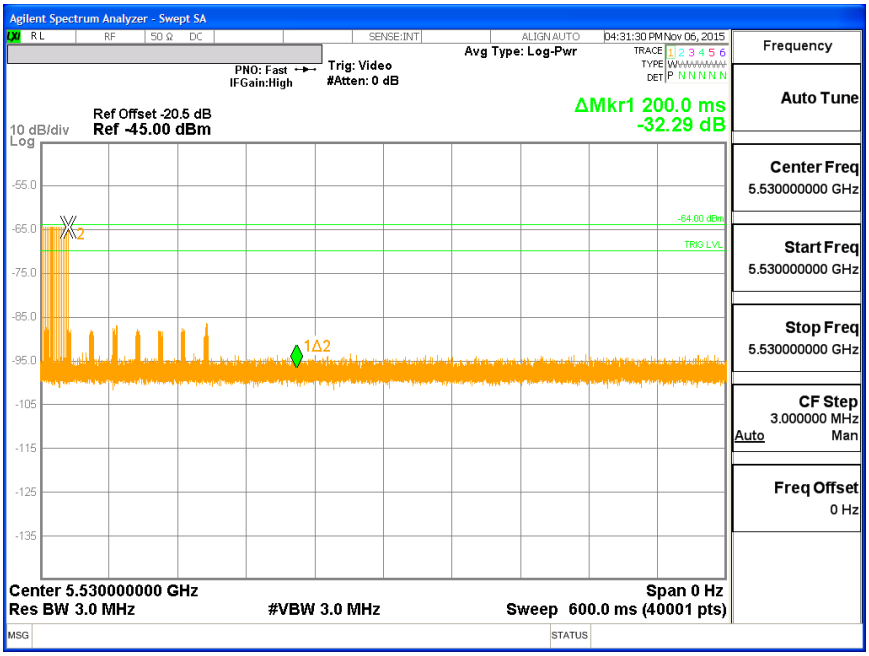
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

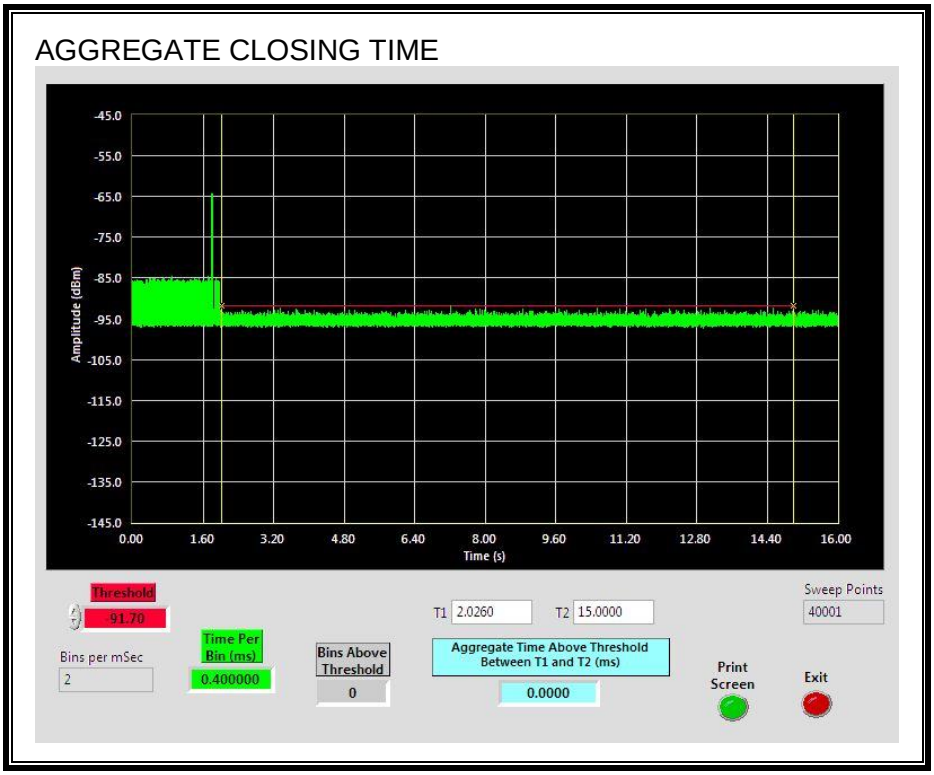
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.

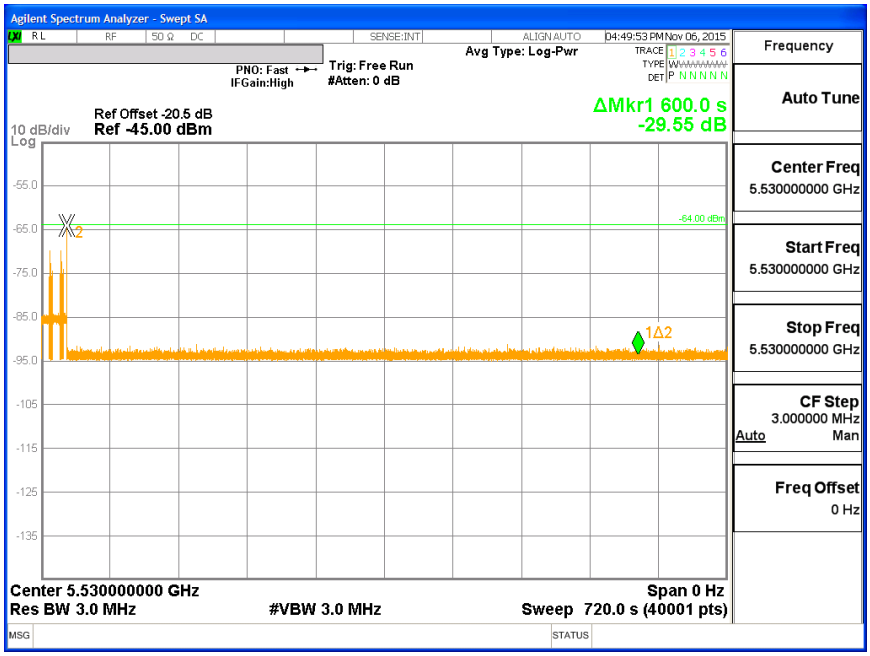


11.4.5. 10-MINUTE CLIENT Tx MONITORING PERIOD

RESULTS

No EUT transmissions were observed on the test channel during the 10-minute observation time.

10-MINUTE CLIENT Tx MONITORING PERIOD



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

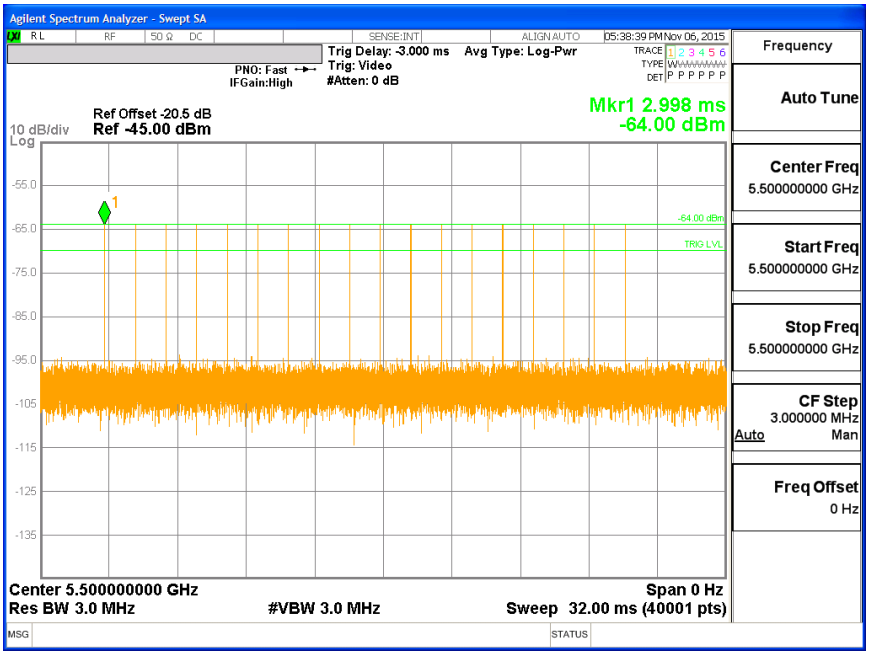
11.5.1. TEST CHANNEL

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

11.5.2. RADAR WAVEFORM AND TRAFFIC

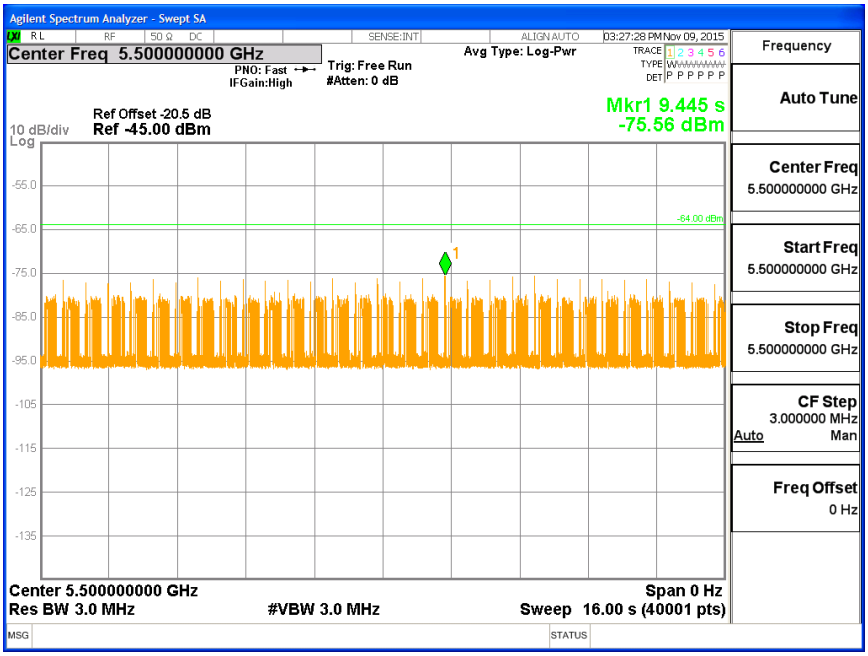
RADAR WAVEFORM

SHORT PULSE RADAR TYPE 0 AT MASTER

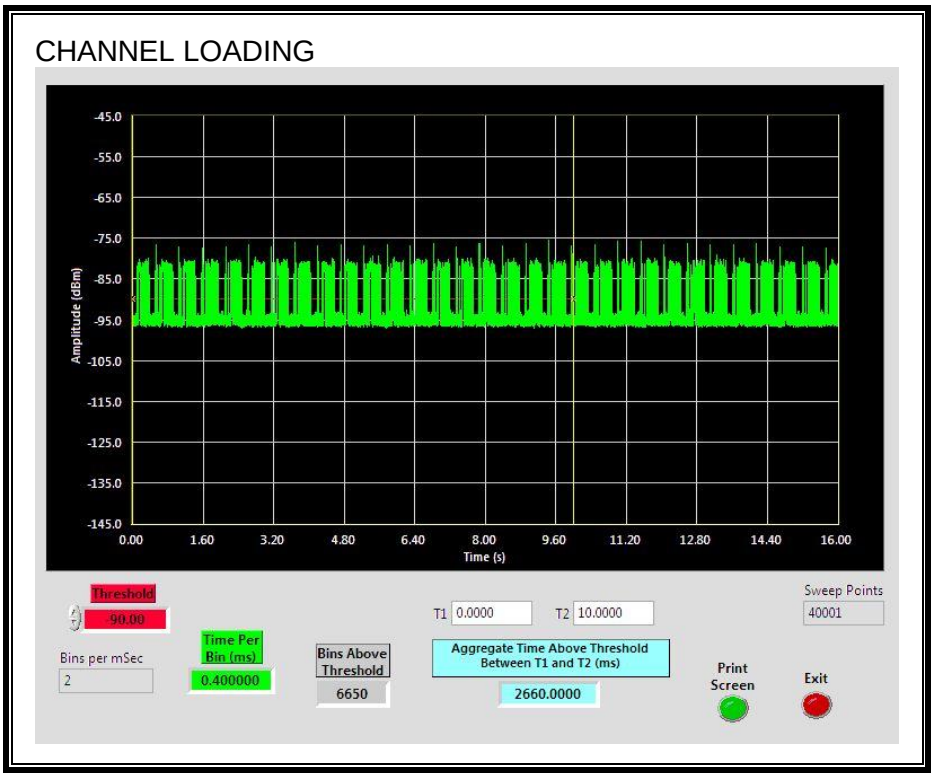


TRAFFIC

SLAVE TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 26.6%

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).

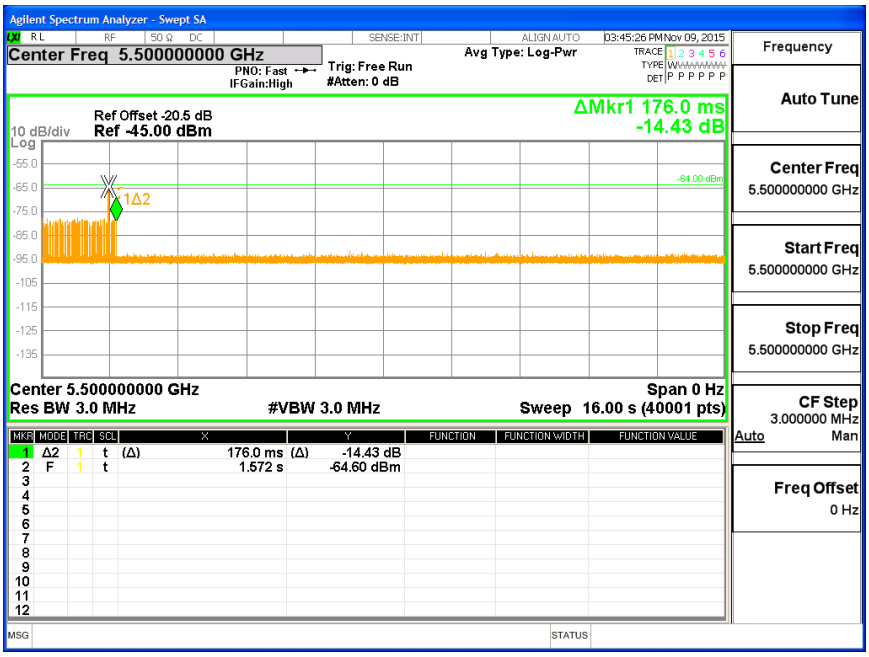
RESULTS

Channel Move Time (sec)	Limit (sec)
0.176	10

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

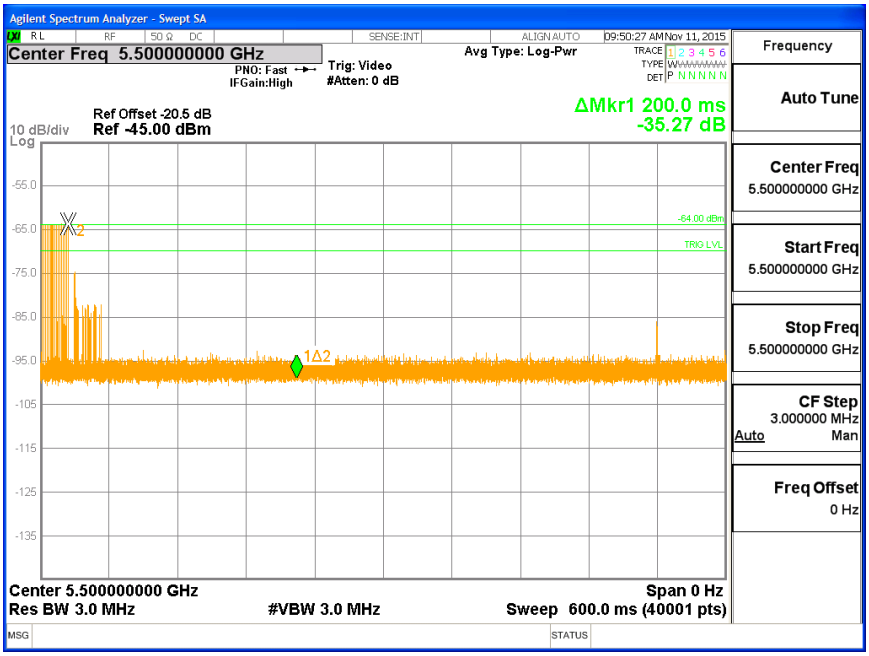
MOVE TIME

MOVE TIME



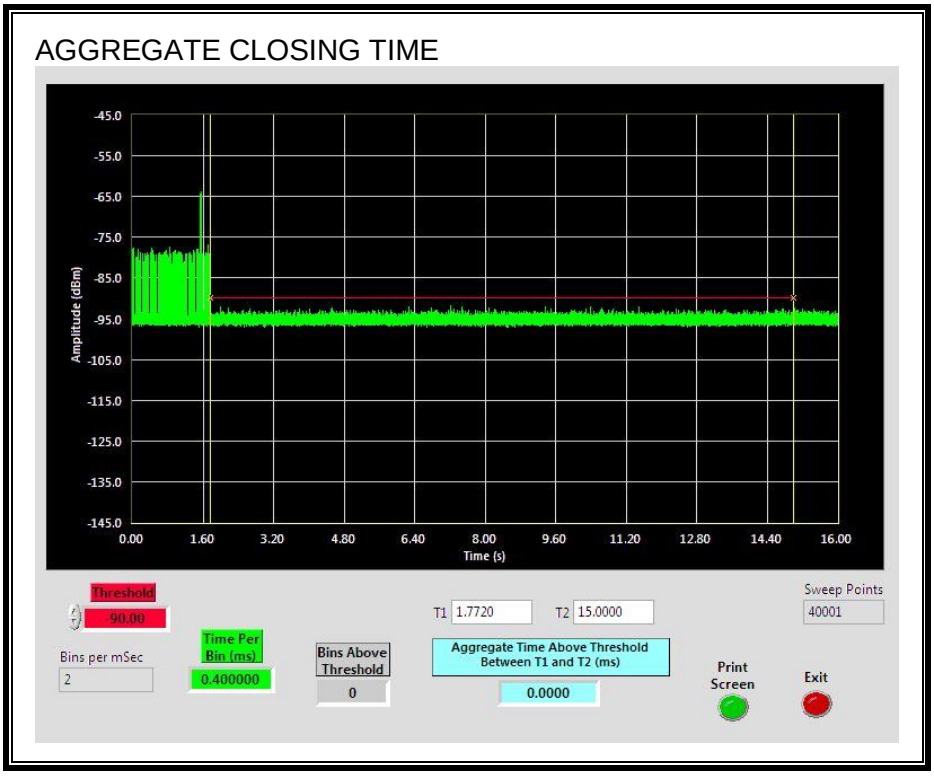
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



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

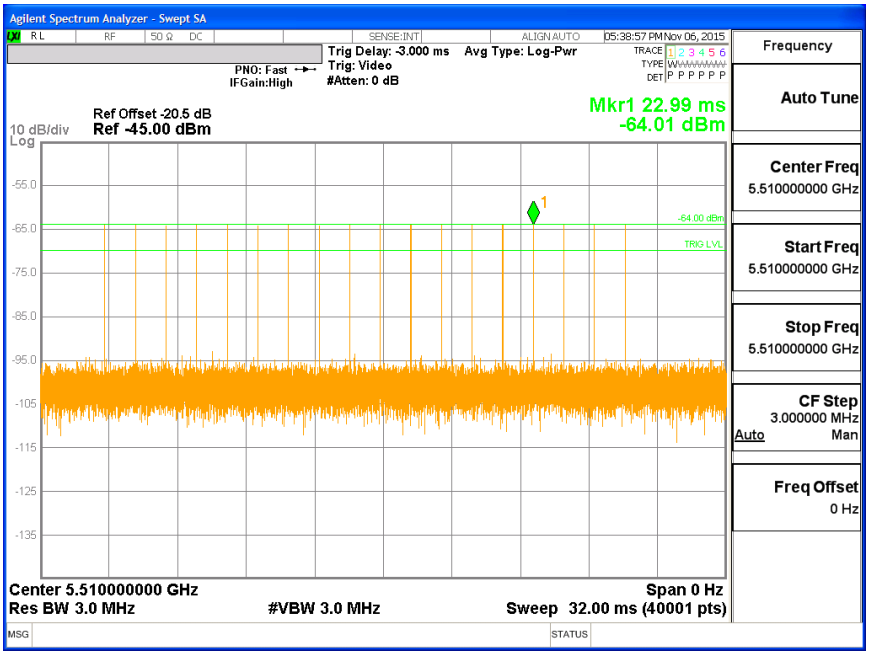
11.6.1. TEST CHANNEL

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

11.6.2. RADAR WAVEFORM AND TRAFFIC

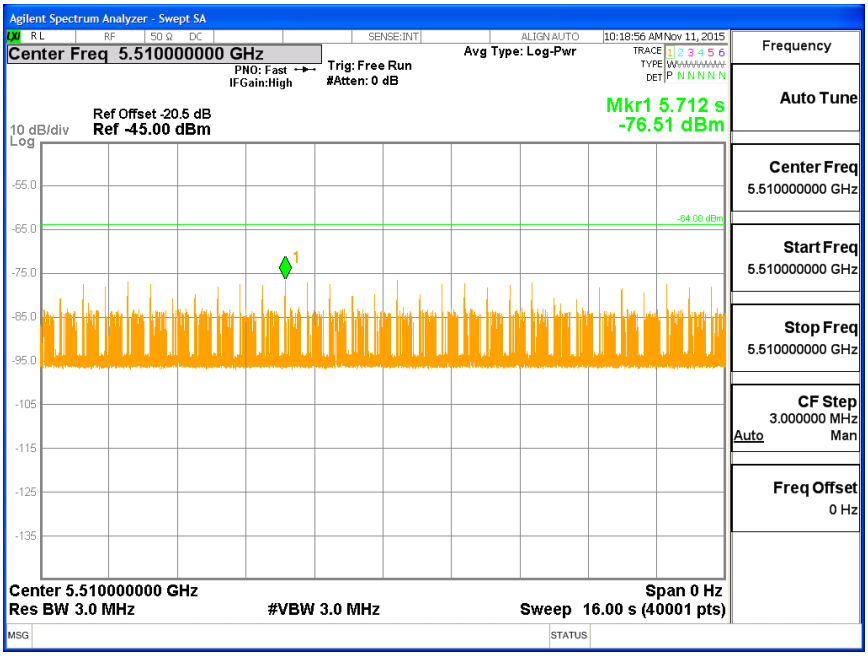
RADAR WAVEFORM

SHORT PULSE RADAR TYPE 0 AT MASTER

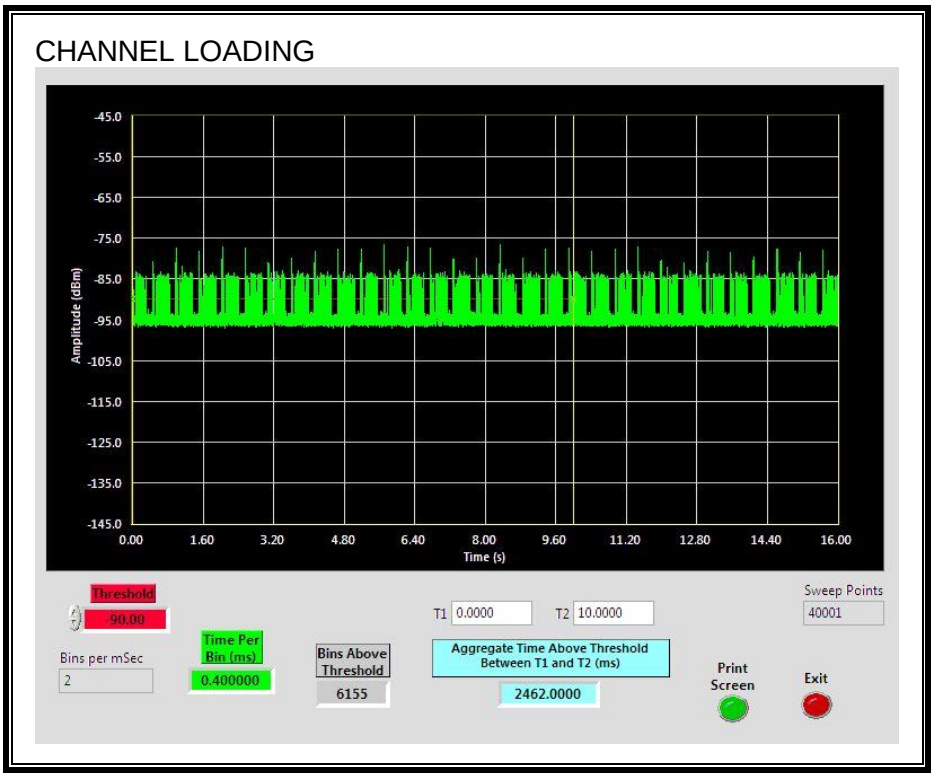


TRAFFIC

SLAVE TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 24.62%

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).

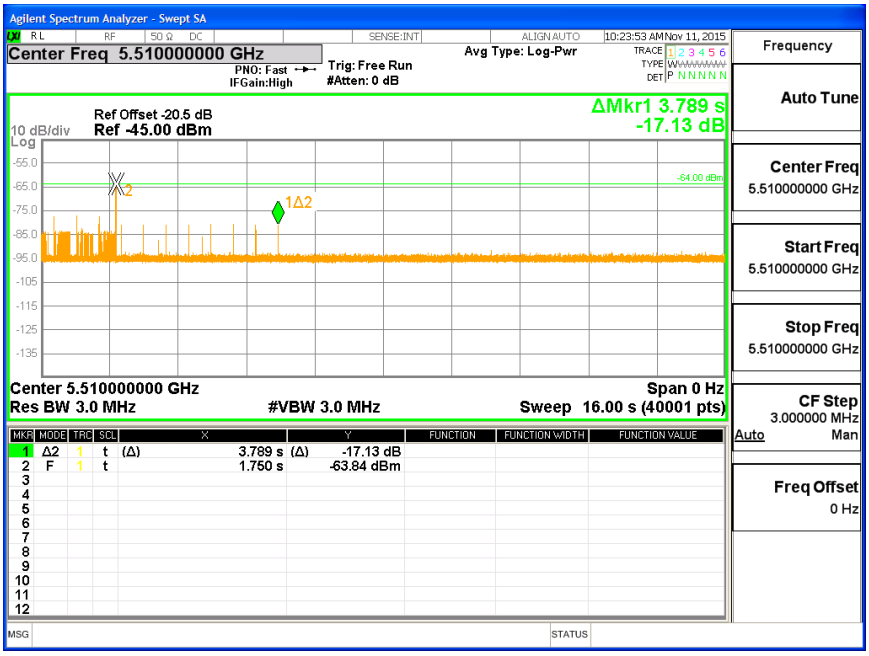
RESULTS

Channel Move Time (sec)	Limit (sec)
3.789	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
7.6	60

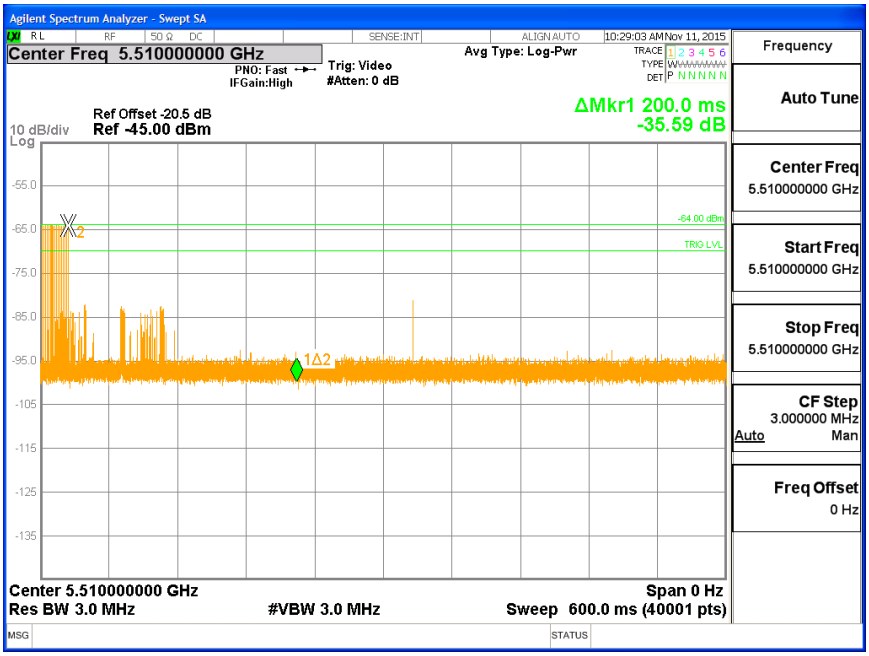
MOVE TIME

MOVE TIME



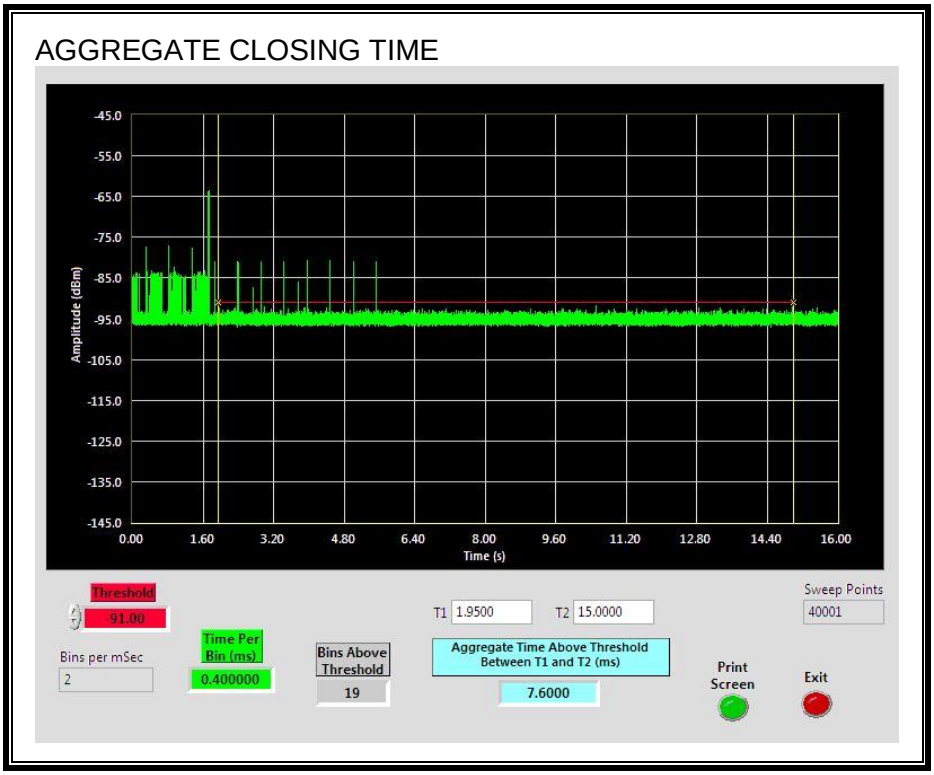
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

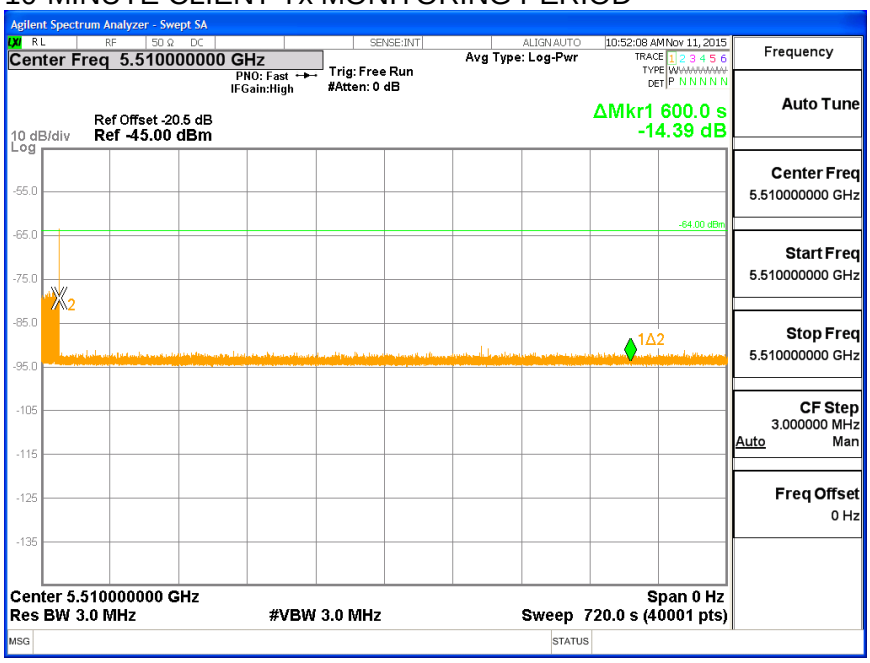


11.6.5. 10-MINUTE CLIENT Tx MONITORING PERIOD

RESULTS

No EUT transmissions were observed on the test channel during the 10-minute observation time.

10-MINUTE CLIENT Tx MONITORING PERIOD



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

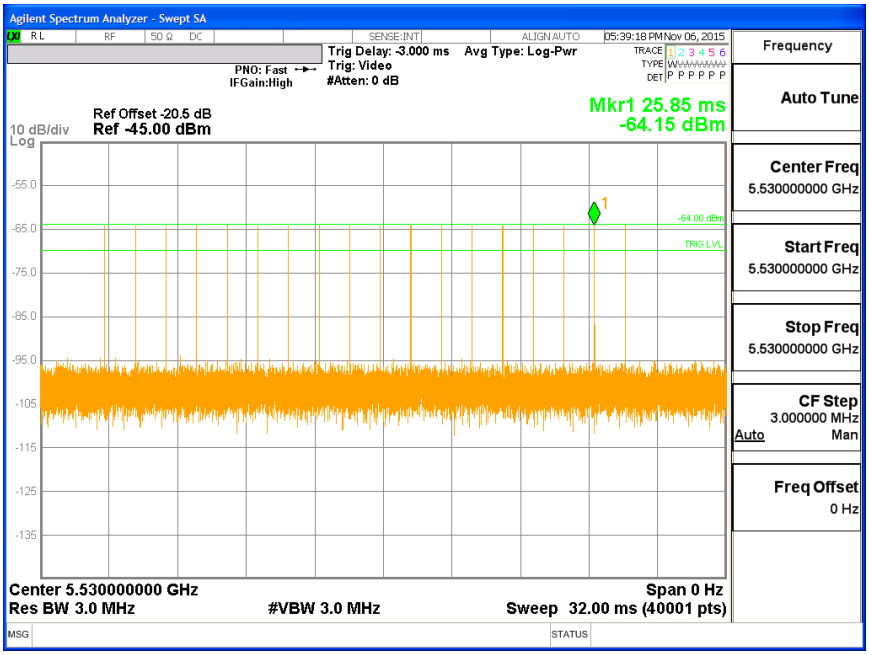
11.7.1. TEST CHANNEL

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

11.7.2. RADAR WAVEFORM AND TRAFFIC

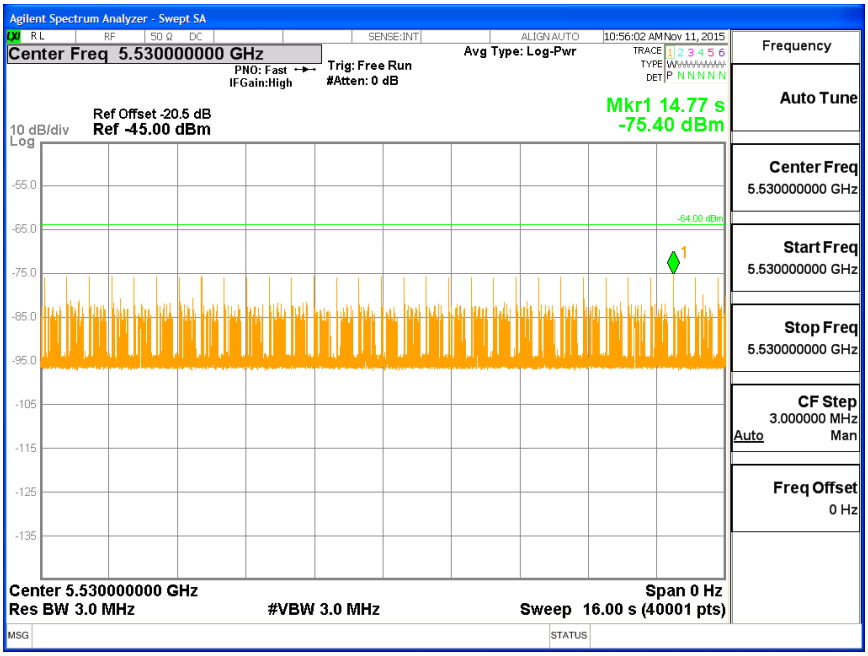
RADAR WAVEFORM

SHORT PULSE RADAR TYPE 0 AT MASTER

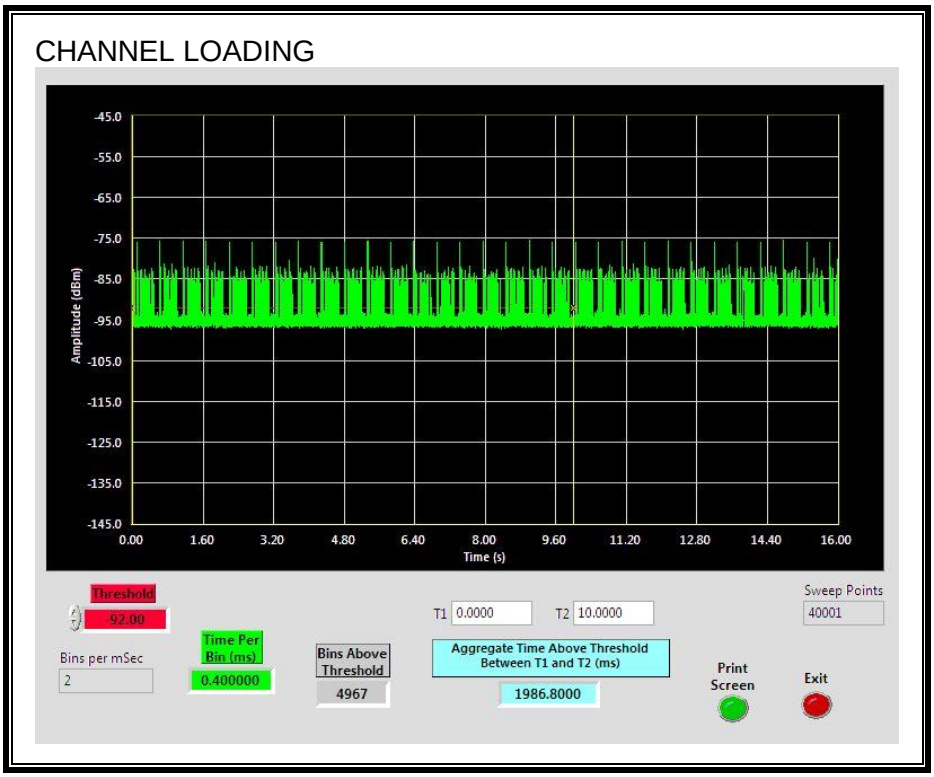


TRAFFIC

SLAVE TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 19.86%

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).

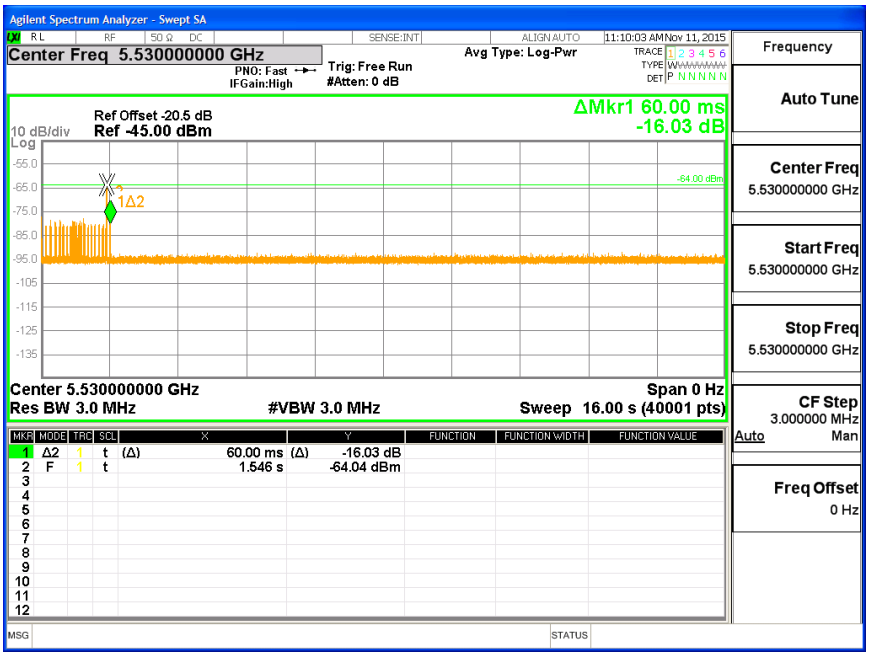
RESULTS

Channel Move Time (sec)	Limit (sec)
0.060	10

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

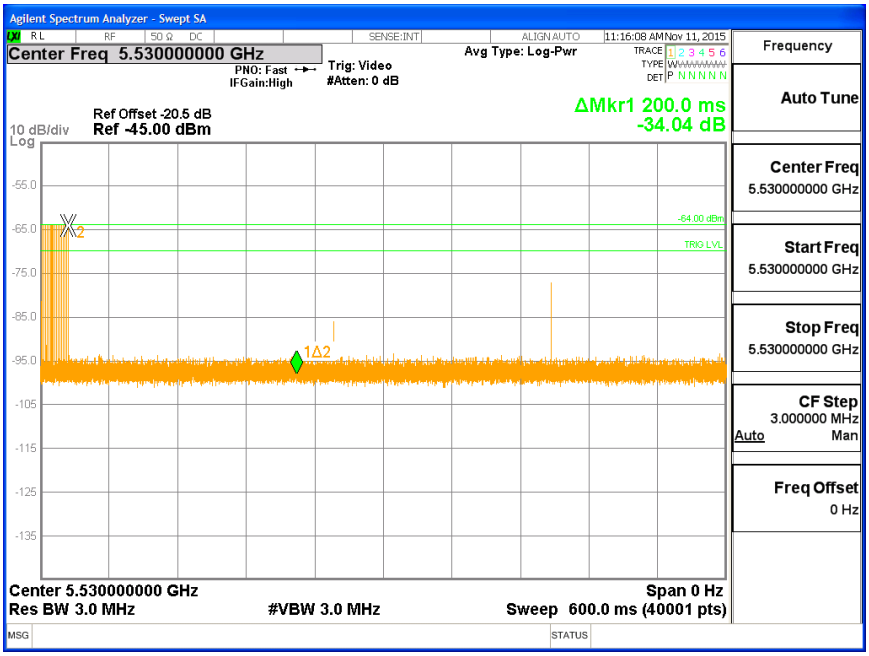
MOVE TIME

MOVE TIME



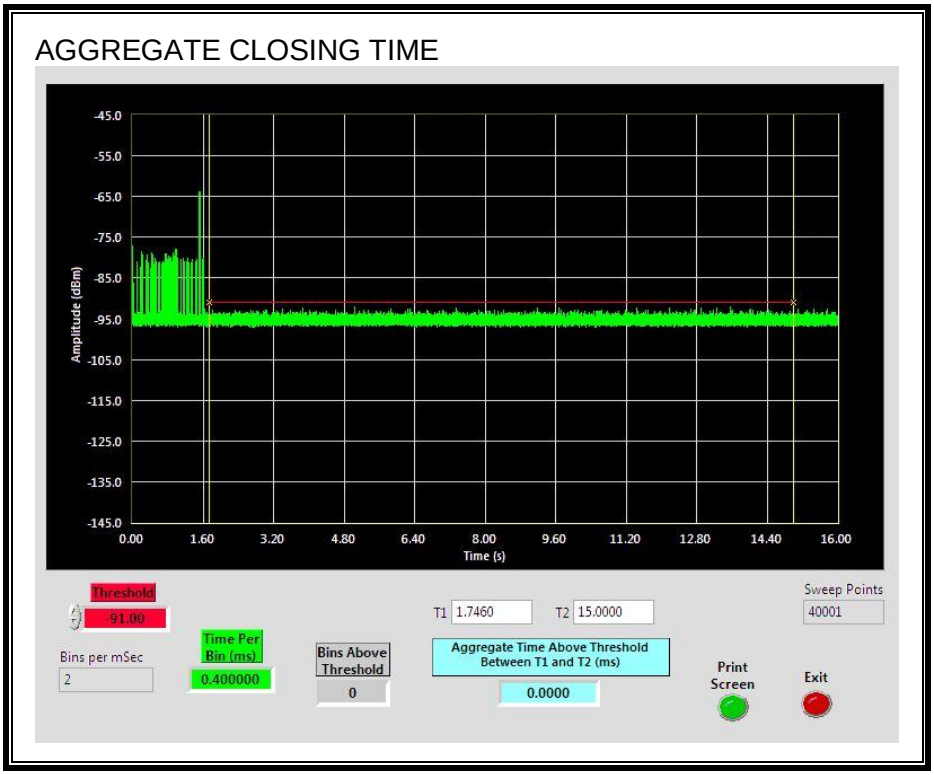
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



11.7.5. 10-MINUTE CLIENT Tx MONITORING PERIOD

RESULTS

No EUT transmissions were observed on the test channel during the 10-minute observation time.

10-MINUTE CLIENT Tx MONITORING PERIOD