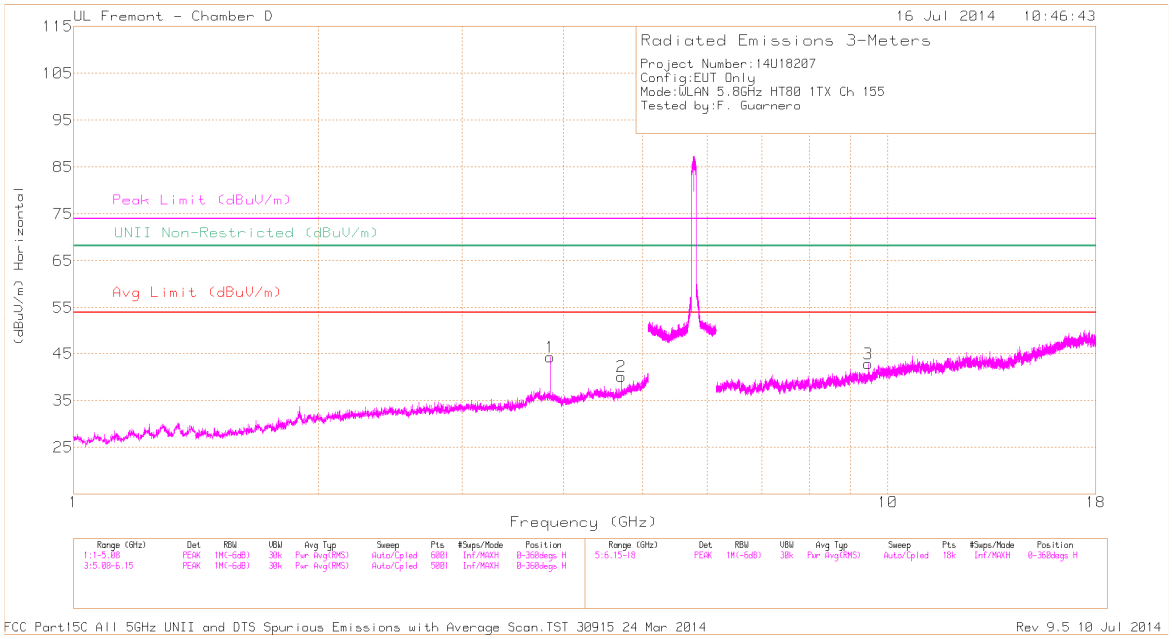
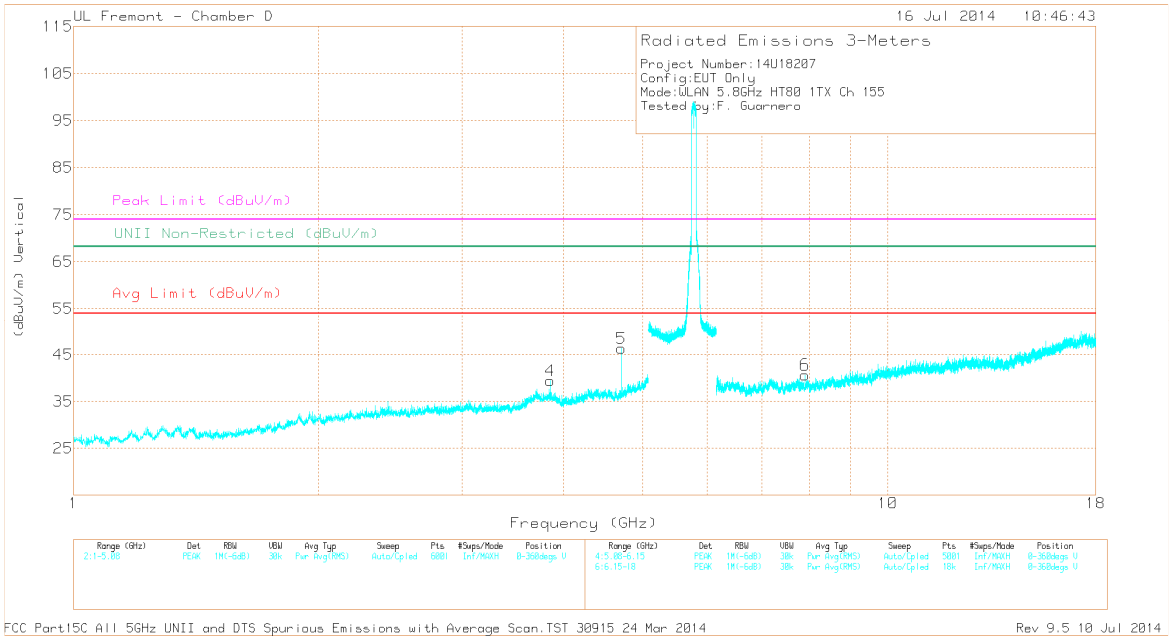
HARMONICS AND SPURIOUS EMISSIONS

CHANNEL 155 HORIZONTAL PLOT



CHANNEL 155 VERTICAL PLOT



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
* 3.85	44.15	PK1	33.5	-28.7	0	48.95	-	-	74	-25.05	-	-	141	107	H
* 3.85	38.02	AD1	33.5	-28.7	.21	43.03	54	-10.97	-	-	-	-	141	107	H
* 4.706	41.61	PK1	34.1	-27.6	0	48.11	-	-	74	-25.89	-	-	198	242	H
* 4.706	33.84	AD1	34.1	-27.6	.21	40.55	54	-13.45	-	-	-	-	198	242	H
* 3.85	40.97	PK1	33.5	-28.7	0	45.77	-	-	74	-28.23	-	-	188	112	V
* 3.85	33.64	AD1	33.5	-28.7	.21	38.65	54	-15.35	-	-	-	-	188	112	V
* 4.705	44.82	PK1	34.1	-27.6	0	51.32	-	-	74	-22.68	-	-	198	320	V
* 4.706	39.79	AD1	34.1	-27.6	.21	46.5	54	-7.5	-	-	-	-	198	320	V
* 9.452	34.44	PK1	36.5	-22	0	48.94	-	-	74	-25.06	-	-	275	182	H
* 9.455	22.87	AD1	36.5	-21.9	.21	37.68	54	-16.32	-	-	-	-	275	182	H
7.908	35.15	PK1	35.8	-24.3	0	46.65	-	-	-	-	68.2	-21.55	281	347	V

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

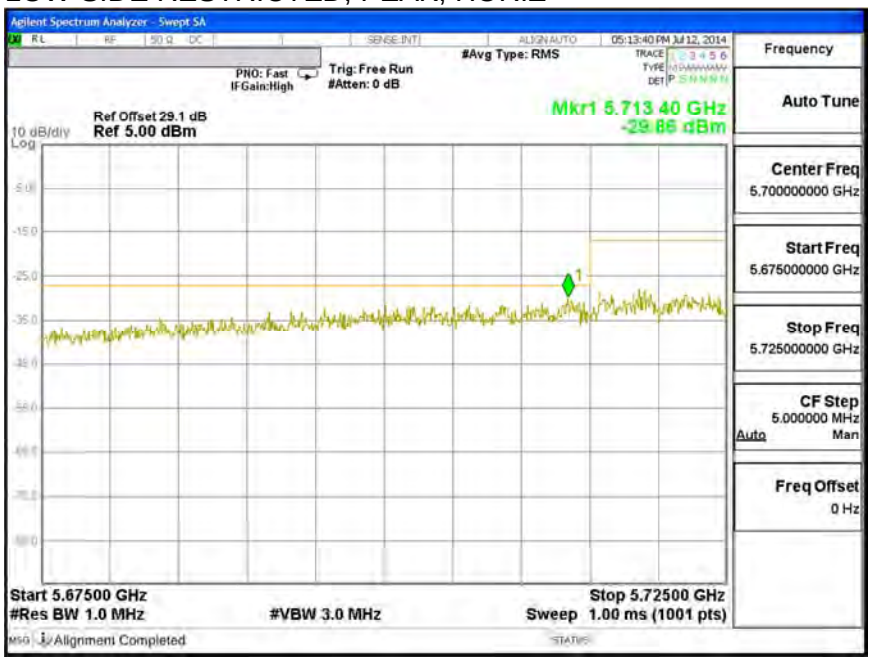
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

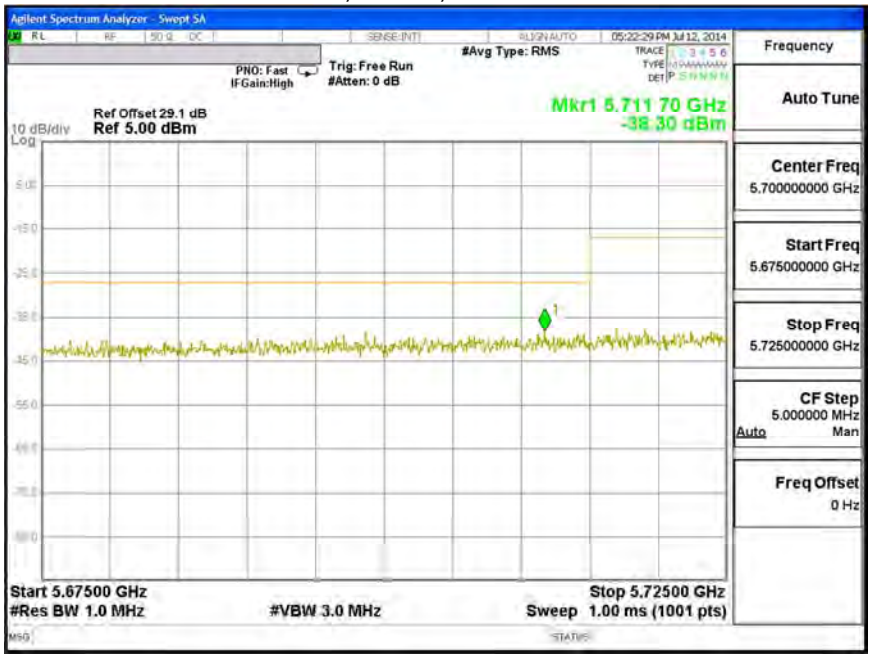
10.25. TX ABOVE 1 GHz 802.11ac 80Mhz 2Tx CDD MODE IN THE 5.8 GHz BAND

RESTRICTED BANDEDGE (LOW SIDE, CH 155)

LOW SIDE RESTRICTED, PEAK, HORIZ

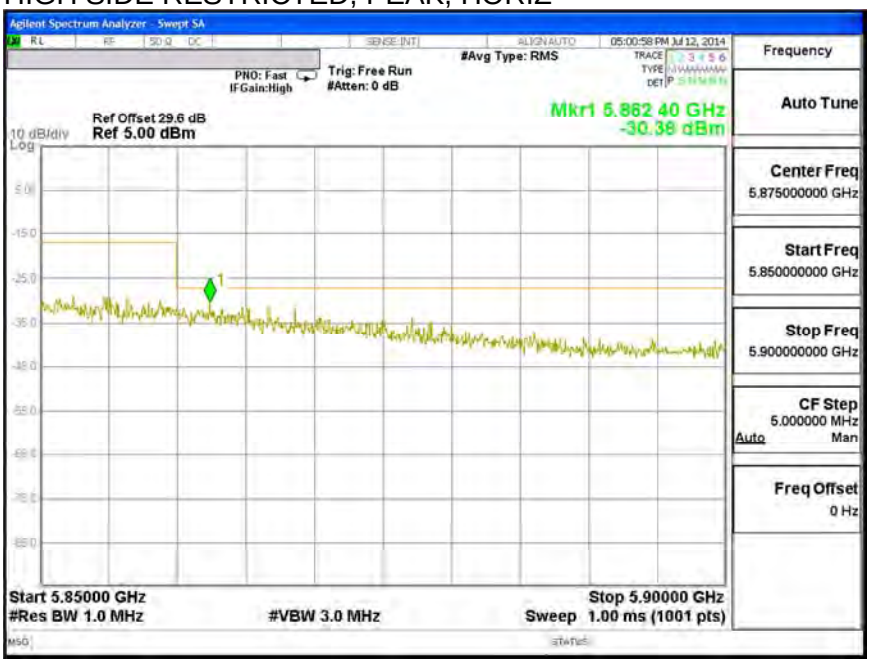


LOW SIDE RESTRICTED, PEAK, VERT

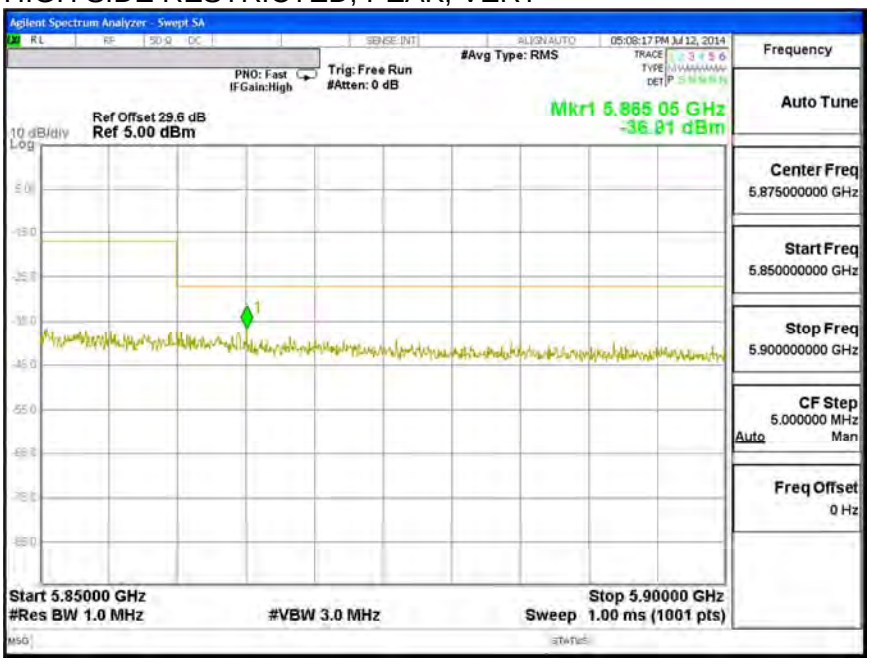


RESTRICTED BANDEDGE (HIGH SIDE, CH 155)

HIGH SIDE RESTRICTED, PEAK, HORIZ

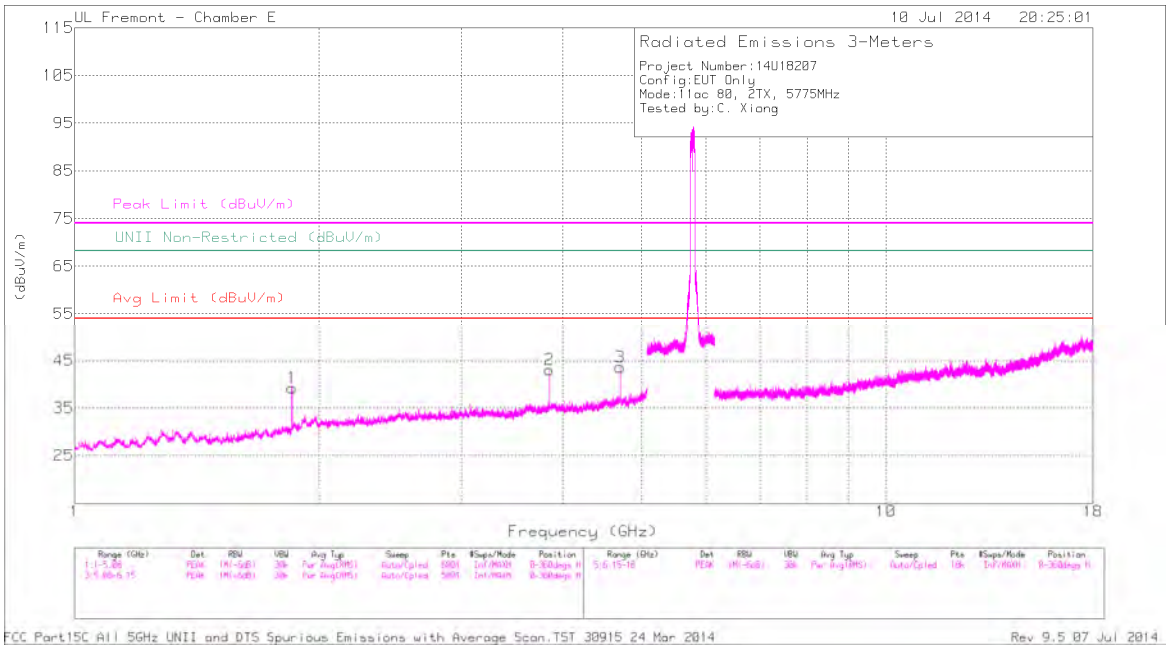


HIGH SIDE RESTRICTED, PEAK, VERT

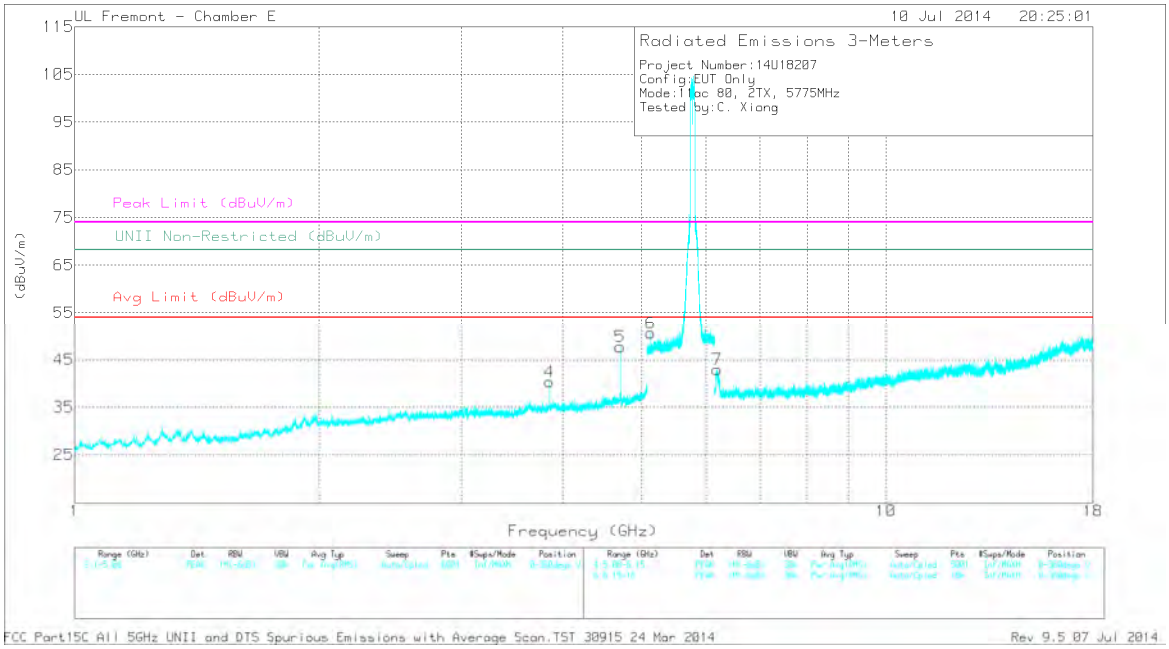


HARMONICS AND SPURIOUS EMISSIONS

CHANNEL 155 HORIZONTAL PLOT



CHANNEL 155 VERTICAL PLOT



DATA

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
* 3.85	47.46	PK1	33.5	-31.1	0	49.86	-	-	74	-24.14	-	-	335	212	H
* 3.85	41.85	AD1	33.5	-31.1	.22	44.47	54	-9.53	-	-	-	-	335	212	H
* 4.705	45.82	PK1	34.2	-30.1	0	49.92	-	-	74	-24.08	-	-	330	247	H
* 4.706	38.87	AD1	34.2	-30.1	.22	43.19	54	-10.81	-	-	-	-	330	247	H
* 3.85	44.79	PK1	33.5	-31.1	0	47.19	-	-	74	-26.81	-	-	294	337	V
* 3.85	38.17	AD1	33.5	-31.1	.22	40.79	54	-13.21	-	-	-	-	294	337	V
* 4.706	49.67	PK1	34.2	-30.1	0	53.77	-	-	74	-20.23	-	-	329	323	V
* 4.706	45.98	AD1	34.2	-30.1	.22	50.3	54	-3.7	-	-	-	-	329	323	V
* 5.134	45.48	PK1	34.2	-21.6	0	58.08	-	-	74	-15.92	-	-	351	203	V
* 5.133	36.01	AD1	34.2	-21.6	.22	48.83	54	-5.17	-	-	-	-	351	203	V
1.855	42.69	PK1	30.6	-33.8	0	39.49	-	-	-	-	68.2	-28.71	77	387	H
6.193	44.99	PK1	35.4	-29.2	0	51.19	-	-	-	-	68.2	-17.01	360	281	V

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

PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

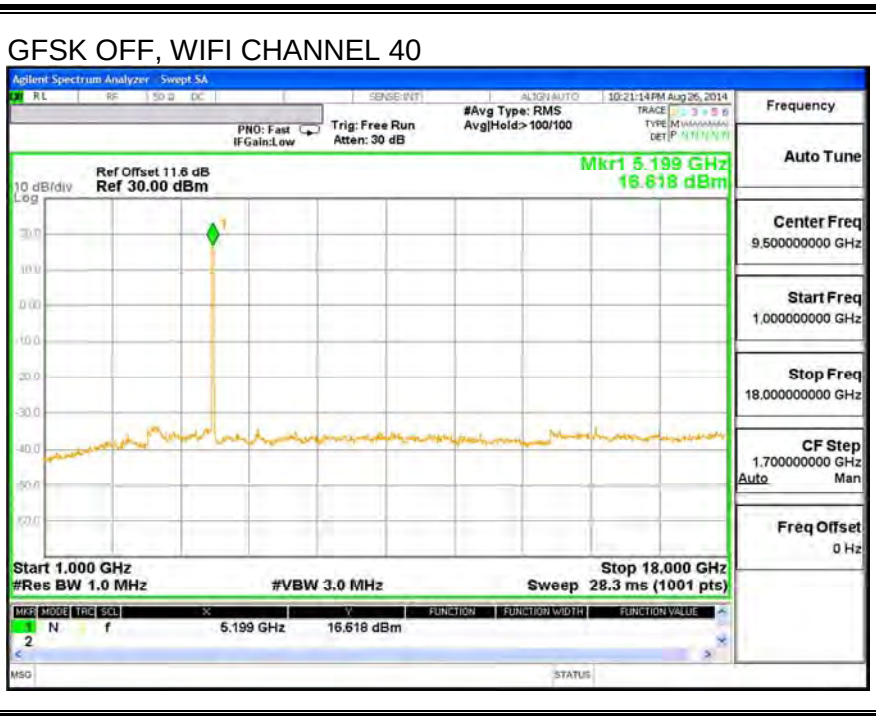
10.26. 2.4GHZ AND 5GHZ BAND CO-LOCATION

BLUETOOTH ON

GFSK, MID CHANNEL

WiFi ON, CHANNEL 40

GFSK OFF, WIFI CHANNEL 40

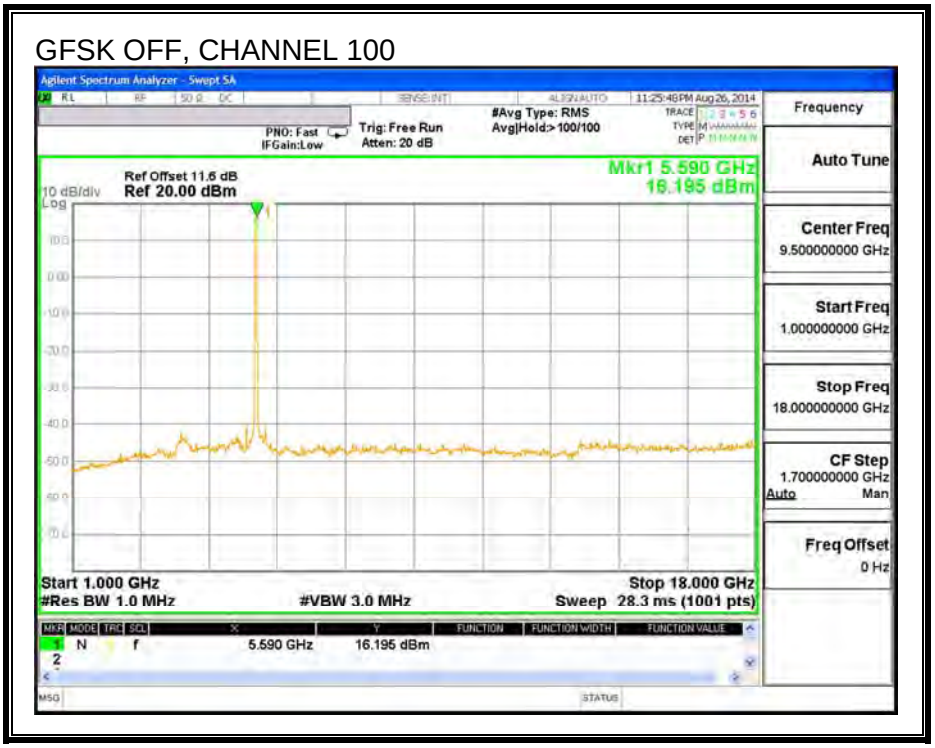


WiFi ON, CHANNEL 60

GFSK OFF, WiFi CHANNEL 60

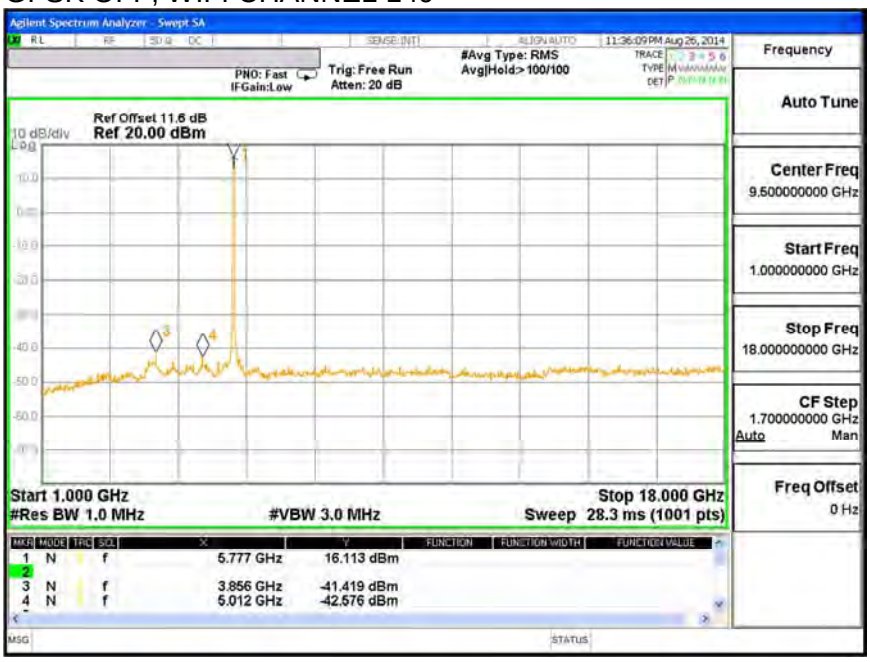
WiFi ON, CHANNEL 100

GFSK OFF, CHANNEL 100



WiFi ON CHANNEL 149

GFSK OFF, WIFI CHANNEL 149



BLUETOOTH ON, WiFi ON

GFSK MID CHANNEL, WiFi CHANNEL 40

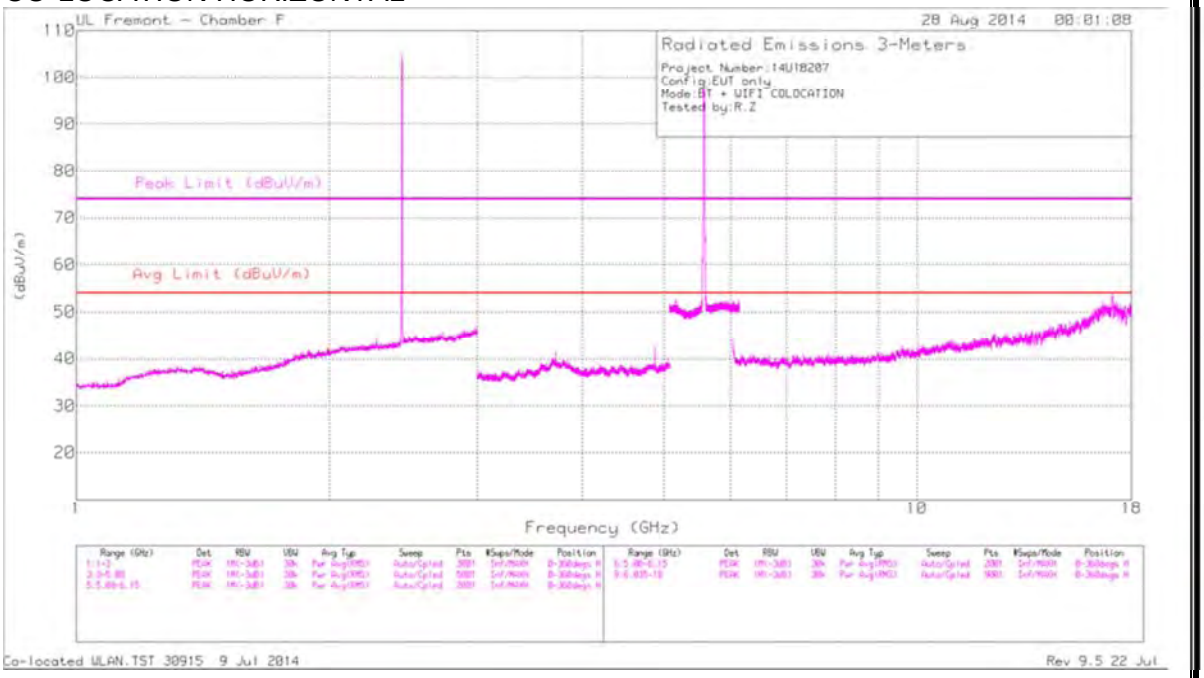
GFSK MID CHANNEL, WiFi CHANNEL 60

GFSK MID CHANNEL, WIFI CHANNEL 100

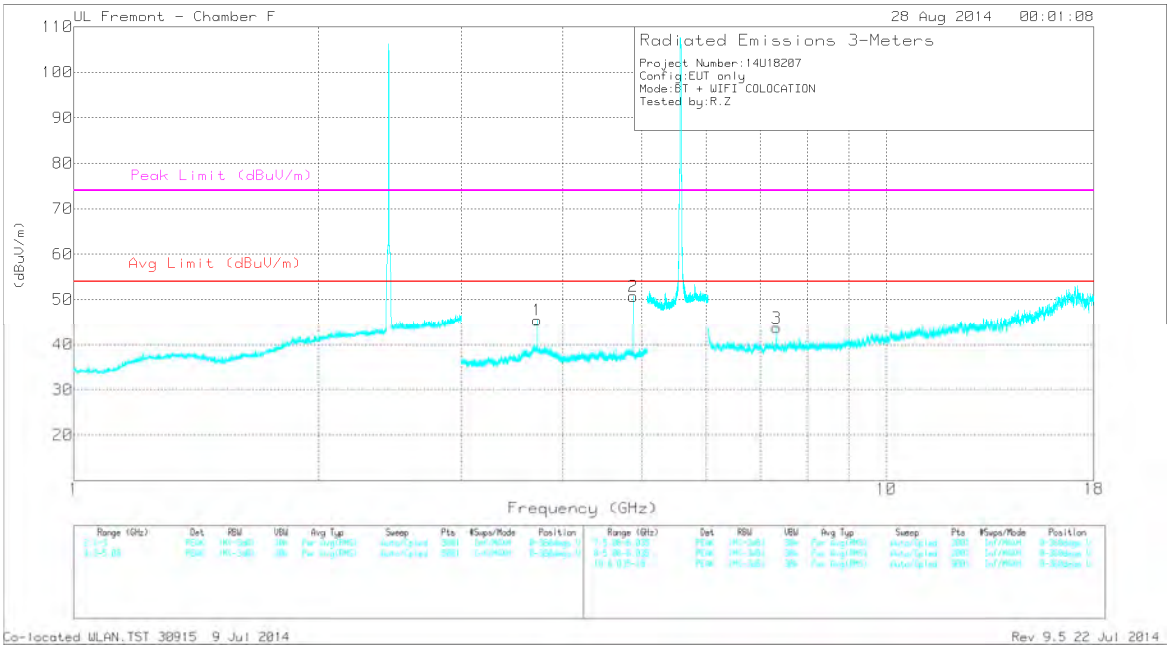
GFSK MID CHANNEL, WiFi CHANNEL 149

HARMONICS AND SPURIOUS EMISSIONS

CO-LOCATION HORIZONTAL



CO-LOCATION VERTICAL



Radiated Emissions
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.72	40.3	PK	34.8	-29.6	45.5	53.97	-8.47	74	-28.5	0-360	201	V
2	* 4.882	44.44	PK	34.2	-27.9	50.74	53.97	-3.23	74	-23.26	0-360	201	V
3	* 7.323	33.34	PK	35.6	-25.2	43.74	53.97	-10.23	74	-30.26	0-360	201	V

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

PK - Peak detector

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.72	43.4	PK1	34.8	-29.6	48.6	53.97	-5.37	74	-25.4	56	194	V
* 3.72	36.8	AD1	34.8	-29.6	42	53.97	-11.97	74	-32	56	194	V
* 4.882	45.1	PK1	34.2	-27.9	51.4	53.97	-2.57	74	-22.6	48	179	V
* 4.882	40.47	AD1	34.2	-27.9	46.77	53.97	-7.2	74	-27.23	48	179	V
* 7.323	39.36	PK1	35.6	-25.1	49.86	53.97	-4.11	74	-24.14	35	208	V
* 7.323	31.31	AD1	35.6	-25.1	41.81	53.97	-12.16	74	-32.19	35	208	V

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

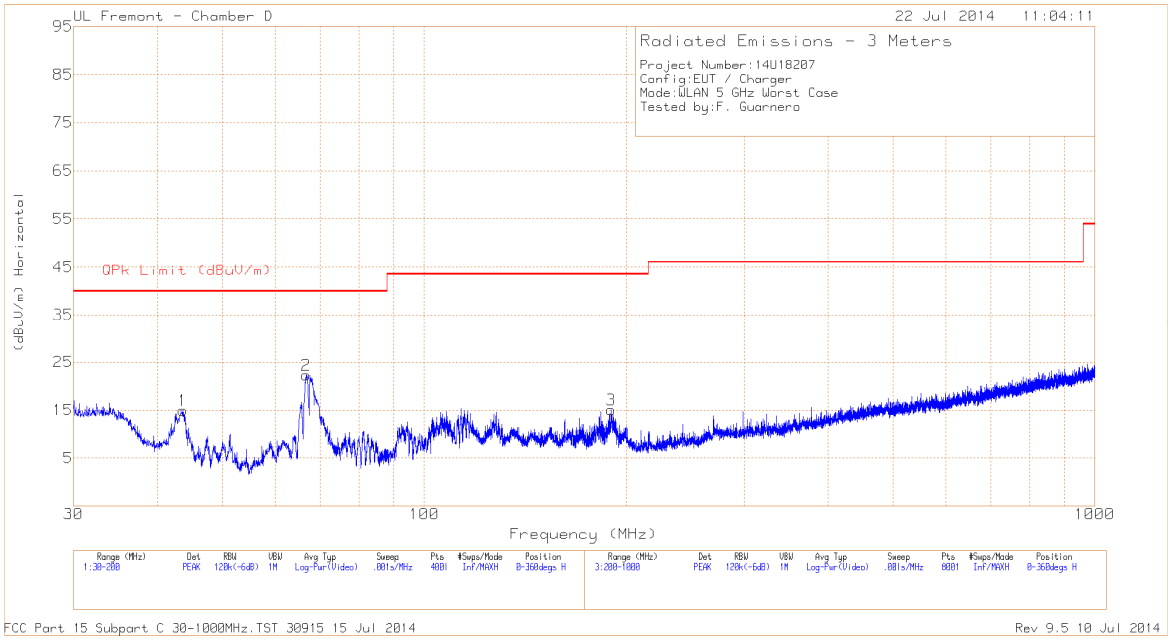
PK1 - KDB789033 Method: Peak

AD1 - KDB789033 Method: AD Primary Power Average

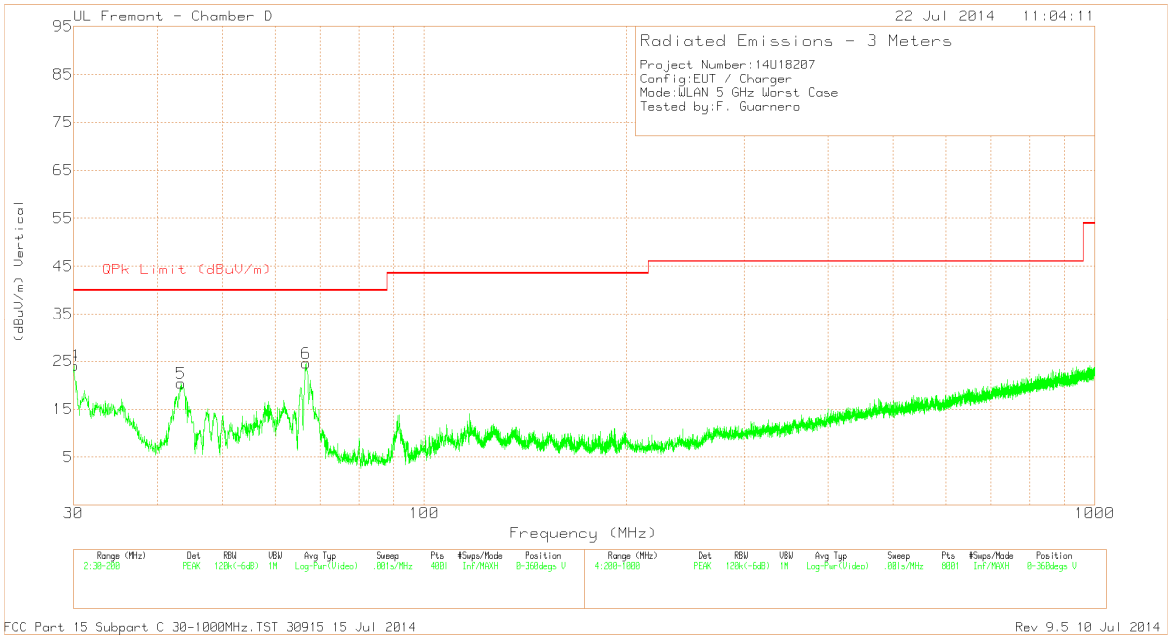
10.27. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

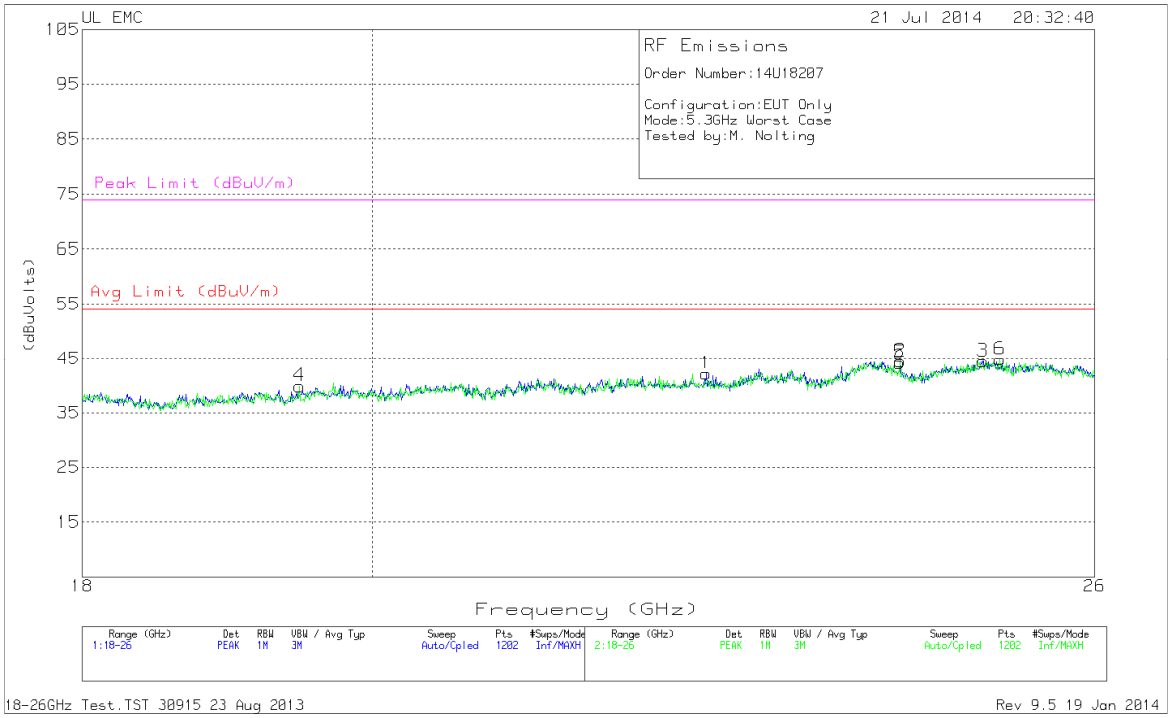
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	30.0425	34.32	PK	21.5	-31.7	24.12	40	-15.88	0-360	100	V
5	43.3875	40.73	PK	11.5	-31.8	20.43	40	-19.57	0-360	100	V
1	43.6425	35.19	PK	11.4	-31.7	14.89	40	-25.11	0-360	401	H
2	66.635	45.75	PK	8.2	-31.6	22.35	40	-17.65	0-360	301	H
6	66.635	48.01	PK	8.2	-31.6	24.61	40	-15.39	0-360	100	V
3	189.97	34.89	PK	11.3	-31.1	15.09	43.52	-28.43	0-360	201	H

PK - Peak detector

10.28. WORST-CASE ABOVE 18 - 26 GHz

SPURIOUS EMISSIONS 18 Ghz TO 26 GHz (WORST-CASE CONFIGURATION)

HORIZONTAL AND VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

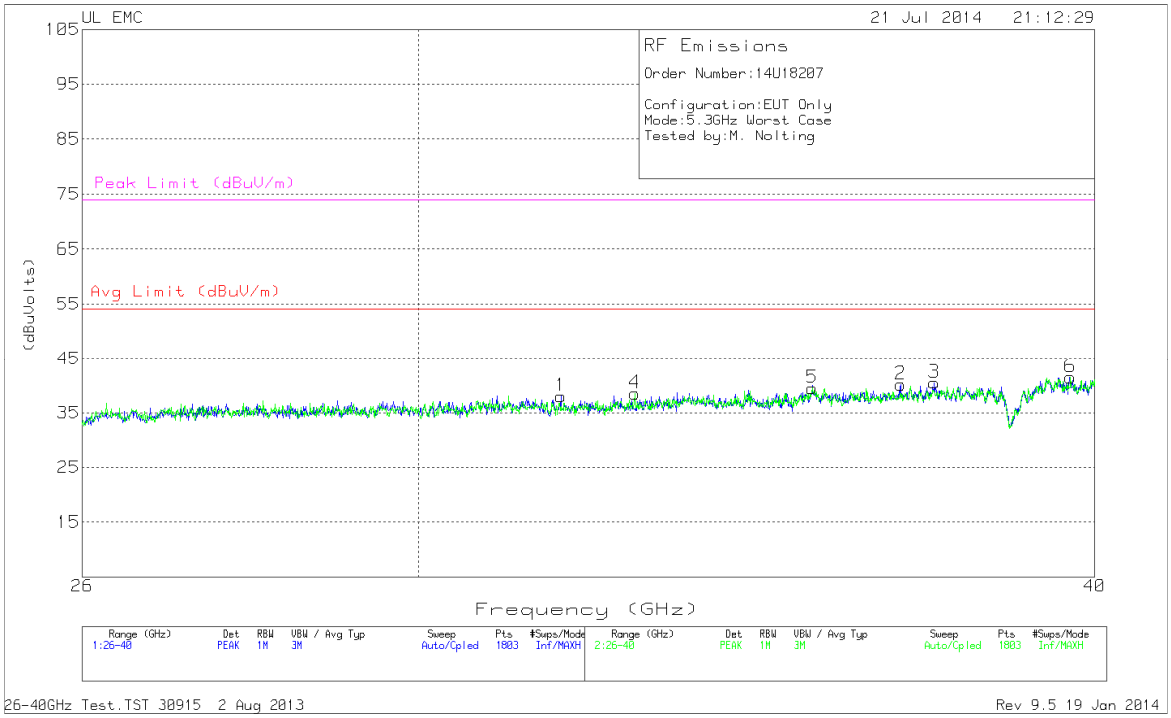
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T89 (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	22.576	41.47	PK	33.4	-23.2	-9.5	42.2	54.0	-11.8	74.0	-31.8
2	24.228	42.90	PK	33.7	-22.6	-9.5	44.5	54.0	-9.5	74.0	-29.5
3	24.964	42.80	PK	34.0	-22.8	-9.5	44.5	54.0	-9.5	74.0	-29.5
4	19.479	41.03	PK	32.5	-24.2	-9.5	39.8	54.0	-14.2	74.0	-34.2
5	24.221	42.57	PK	33.7	-22.6	-9.5	44.2	54.0	-9.8	74.0	-29.8
6	25.121	43.53	PK	33.9	-23.1	-9.5	44.8	54.0	-9.2	74.0	-29.2

PK - Peak detector

10.29. WORST-CASE ABOVE 26 - 40 GHz

SPURIOUS EMISSIONS 18 Ghz TO 26 GHz (WORST-CASE CONFIGURATION)

HORIZONTAL AND 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 (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	31.873	47.50	PK	36.3	-36.3	-9.5	38.0	54.0	-16.0	74.0	-36.0
2	36.830	50.77	PK	37.1	-38.2	-9.5	40.2	54.0	-13.8	74.0	-33.8
3	37.358	50.40	PK	37.3	-37.7	-9.5	40.5	54.0	-13.5	74.0	-33.5
4	32.891	47.60	PK	36.6	-36.2	-9.5	38.5	54.0	-15.5	74.0	-35.5
5	35.471	48.40	PK	37.9	-37.3	-9.5	39.5	54.0	-14.5	74.0	-34.5
6	39.588	49.20	PK	37.3	-35.5	-9.5	41.5	54.0	-12.5	74.0	-32.5

PK - Peak detector

11. 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

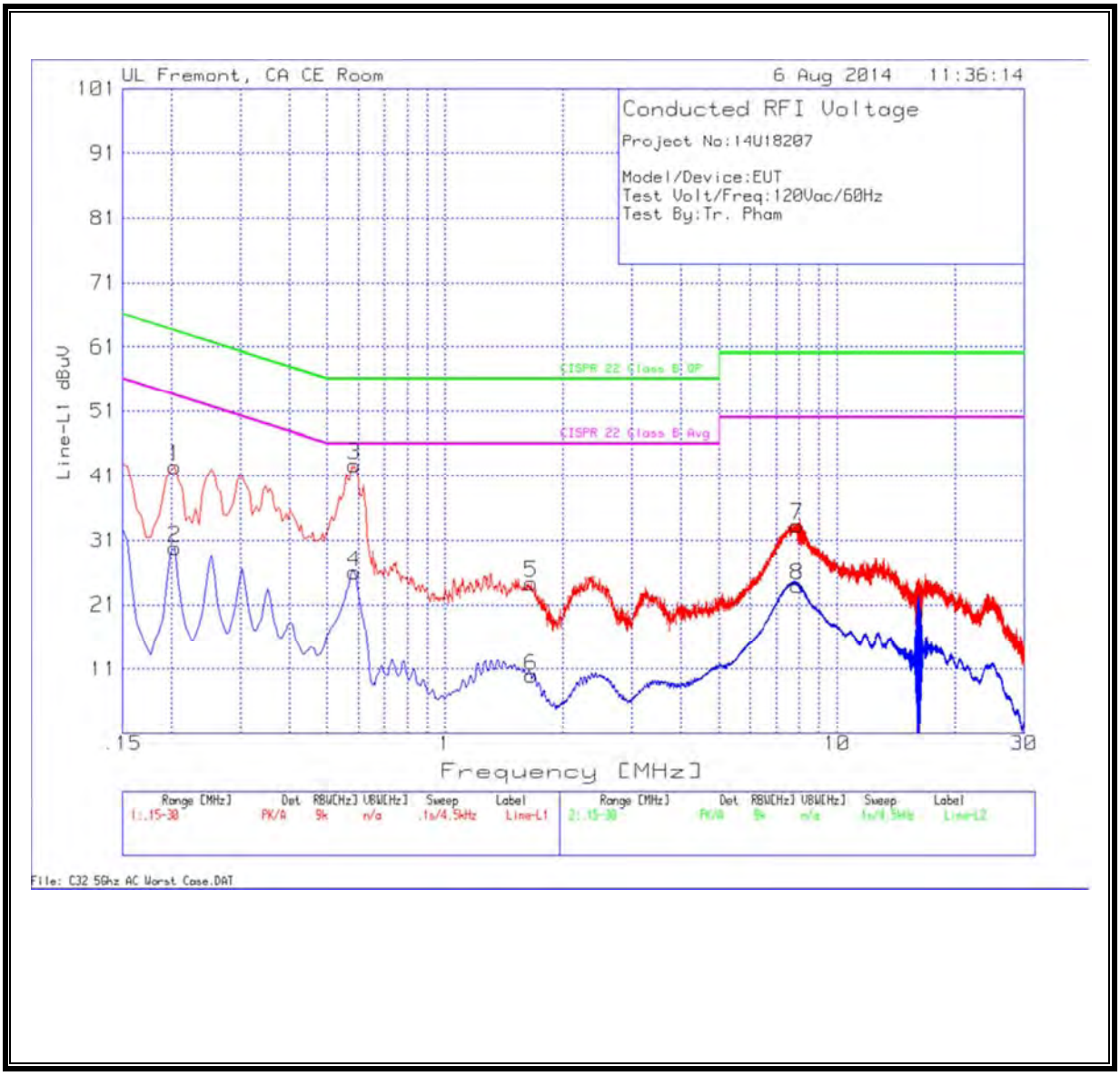
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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

LINE 1 RESULTS



PK - Peak detector

Av - average detection

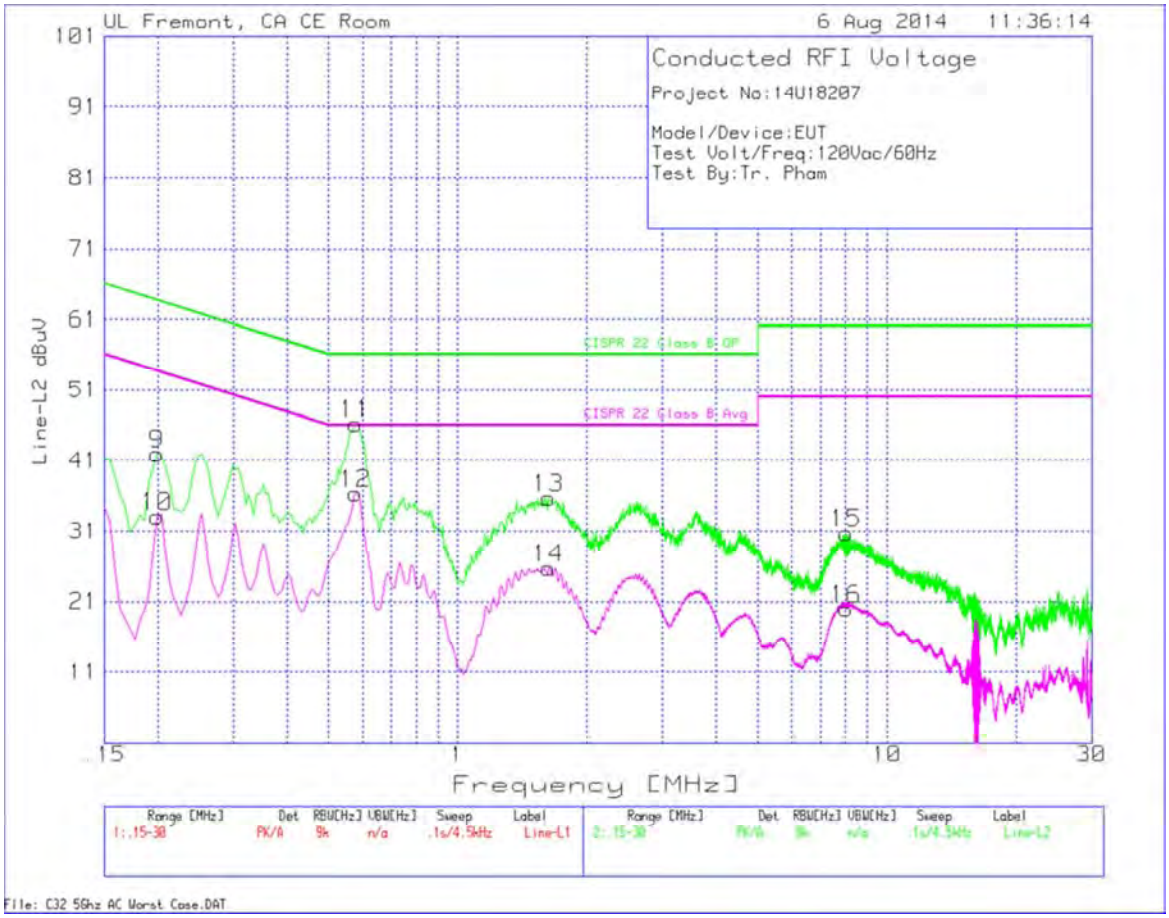
WORST EMISSIONS

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.204	41.6	PK	.9	0	42.5	63.4	-20.9	-	-
2	.204	28.95	Av	.9	0	29.85	-	-	53.4	-23.55
3	.5865	42.48	PK	.3	0	42.78	56	-13.22	-	-
4	.5865	25.67	Av	.3	0	25.97	-	-	46	-20.03
5	1.6575	23.96	PK	.2	.1	24.26	56	-31.74	-	-
6	1.6575	9.62	Av	.2	.1	9.92	-	-	46	-36.08
7	7.917	33.04	PK	.2	.1	33.34	60	-26.66	-	-
8	7.917	23.57	Av	.2	.1	23.87	-	-	50	-26.13

LINE 2 RESULTS



WORST EMISSIONS

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
9	.1995	41	PK	1	0	42	63.6	-21.6	-	-
10	.1995	32	Av	1	0	33	-	-	53.6	-20.6
11	.5775	45.96	PK	.3	0	46.26	56	-9.74	-	-
12	.5775	35.98	Av	.3	0	36.28	-	-	46	-9.72
13	1.6305	35.35	PK	.2	.1	35.65	56	-20.35	-	-
14	1.6305	25.46	Av	.2	.1	25.76	-	-	46	-20.24
15	8.043	30.45	PK	.2	.1	30.75	60	-29.25	-	-
16	8.043	19.67	Av	.2	.1	19.97	-	-	50	-30.03

PK - Peak detector

Av - average detection

12. DYNAMIC FREQUENCY SELECTION

12.1. OVERVIEW

12.1.1. LIMITS

INDUSTRY CANADA

IC RSS-210 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

RSS-210 Issue 7 A9.4 (b) (ii) **Channel Availability Check Time:** …

Additional requirements for the band 5600-5650 MHz: Until further notice, devices subject to this Section shall not be capable of transmitting in the band 5600-5650 MHz, so that Environment Canada weather radars operating in this band are protected.

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

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: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:
-For the Short pulse radar Test Signals this instant is the end of the *Burst*.
-For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.
-For the Long Pulse radar Test Signal this instant is the end of the 12-second period defining the radar waveform.
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 channel changes (an aggregate of approximately 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, any one of radar types 0-4 can be used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. The 99% power bandwidth is measured with 100 kHz resolution bandwidth.

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 shall only be used for the channel availability and detection bandwidth tests. It should be noted that any of the radar test waveforms 0-4 can be used for the channel availability and detection bandwidth tests.

Table 6 – Long Pulse Radar Test Signal

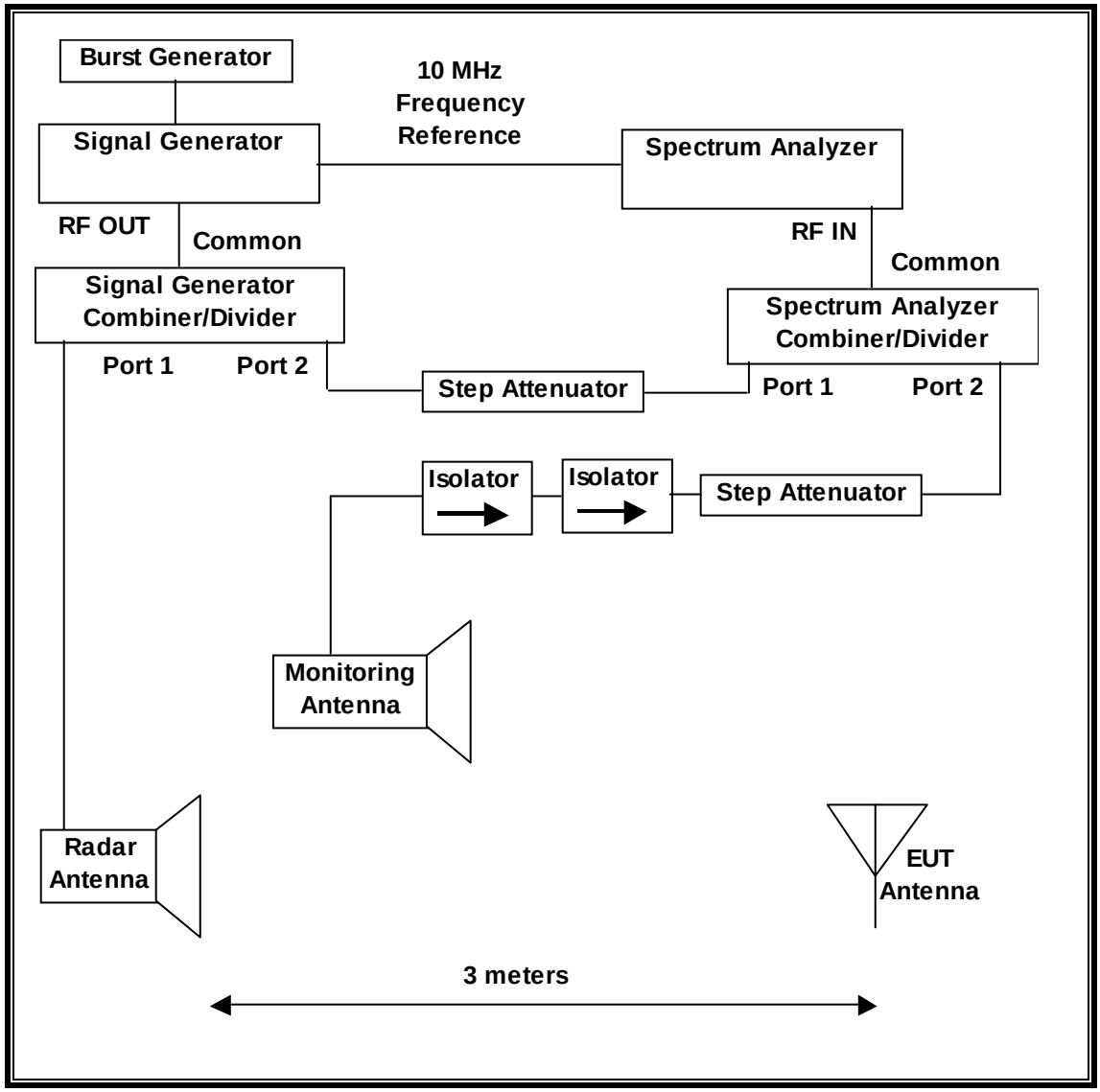
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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

12.1.2. 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.

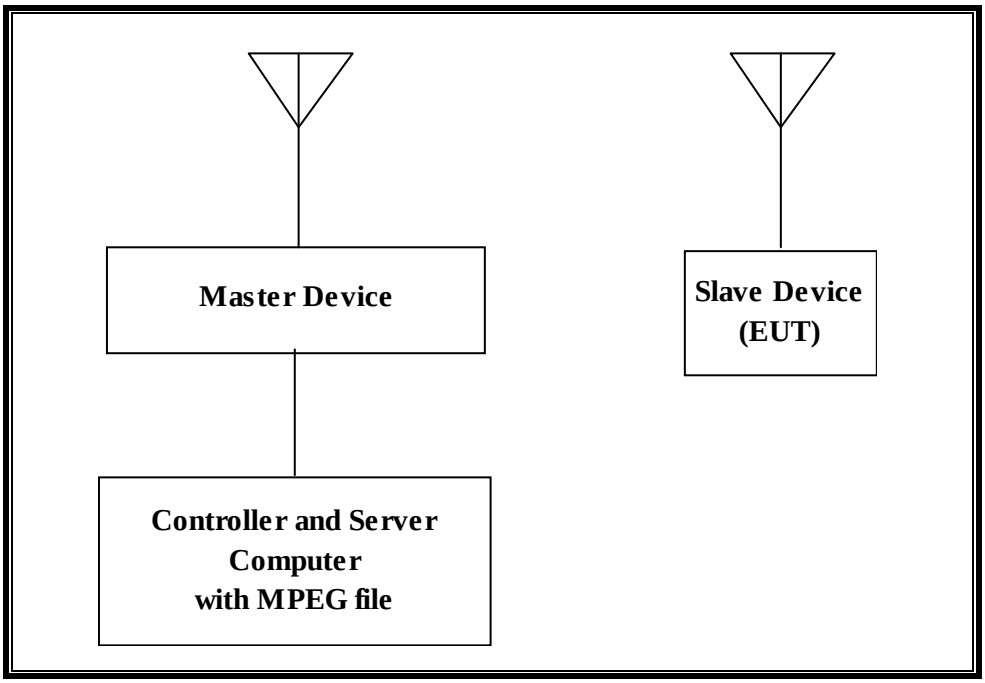
TEST AND MEASUREMENT EQUIPMENT

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, 26.5 GHz	Agilent / HP	E4440A	C01178	09/10/14
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	09/12/14

12.1.3. SETUP OF EUT (CLIENT MODE)

RADIATED METHOD EUT TEST SETUP



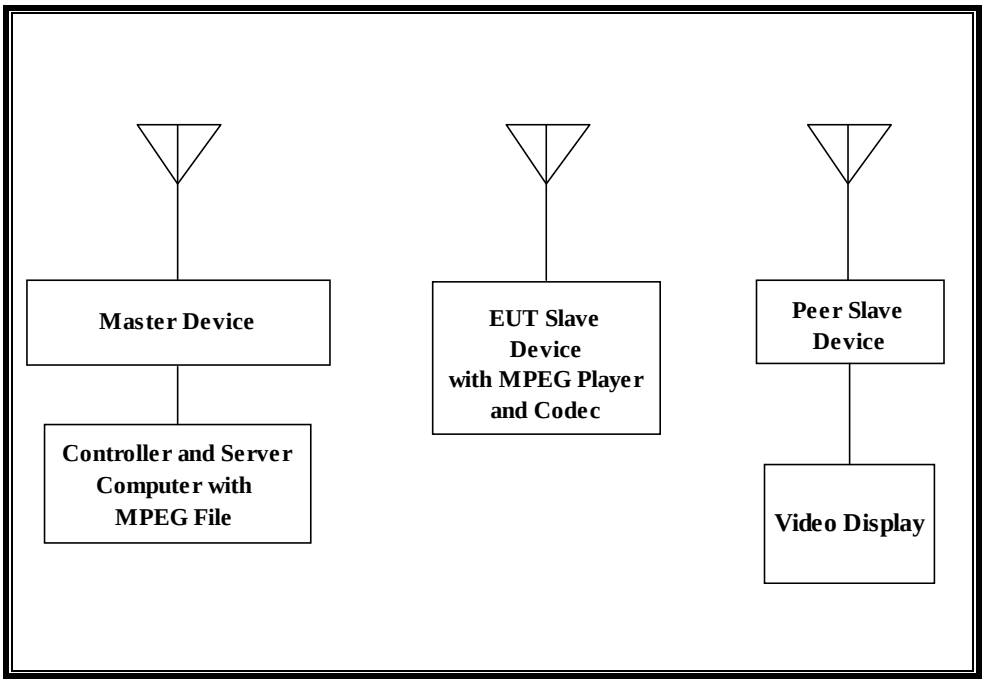
SUPPORT EQUIPMENT

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 2 (Master Device)	Apple	A1470	C86KX6B5FJ1R	BCGA1470
Notebook PC (Controller/Server)	Apple	MacBook A1181	W865101LWGK	DoC
AC Adapter (Controller/Server PC)	Delta Electronics	A1244	MV01000FD9DYA	DoC

12.1.4. 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 2 (Master Device)	Apple	A1470	C86KX6B5FJ1R	BCGA1470
Notebook PC (Controller/Server)	Apple	MacBook A1181	W865101LWGK	DoC
AC Adapter (Controller/Server PC)	Delta Electronics	A1244	MV01000FD9DYA	DoC
Apple TV (Peer Slave Device)	Apple	A1469	V07JV1Z7FF54	BCGA1469
Video Display	Dell	U2410f	CN-0FJ525N-72872-1B5-AGAL	DoC

12.1.5. DESCRIPTION OF EUT

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 24.22 dBm EIRP in the 5250-5350 MHz band and 25.16 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly utilized with the EUT has individual gain of 2.17 dBi and -0.06 dBi in the 5250-5350 MHz band and 3 dBi and 0.16 dBi in the 5470-5725 MHz band.

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 one transmitter/receiver chain connected to an antenna to perform radiated tests.

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 Safari web browser.

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

In Client-to-Client Communications Mode the EUT utilizes the 802.11ac architecture between the EUT and the Master Device 2 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. Therefore, pursuant to FCC KDB Publication 905462 D03, “Client devices with 80 MHz BW mode can be tested with an approved master operating in 40 MHz BW mode”. Therefore, 80MHz BW DFS testing in Client-to-Client Communications Mode was not performed and has been excluded from this report.

The software revision of the master AP is **7.7.3d**

The software revision of the EUT is **7.16.126.2**

UNIFORM CHANNEL SPREADING

This requirement is not applicable to Slave radio 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 7.7D3.

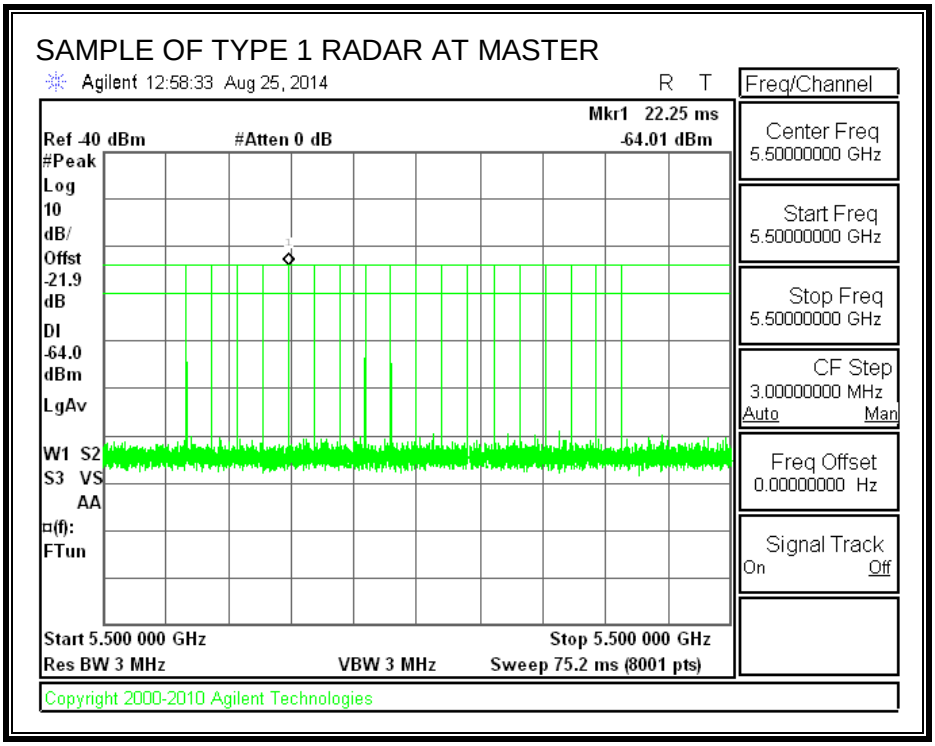
12.2. CLIENT MODE RESULTS FOR 20 MHz BANDWIDTH

12.2.1. TEST CHANNEL

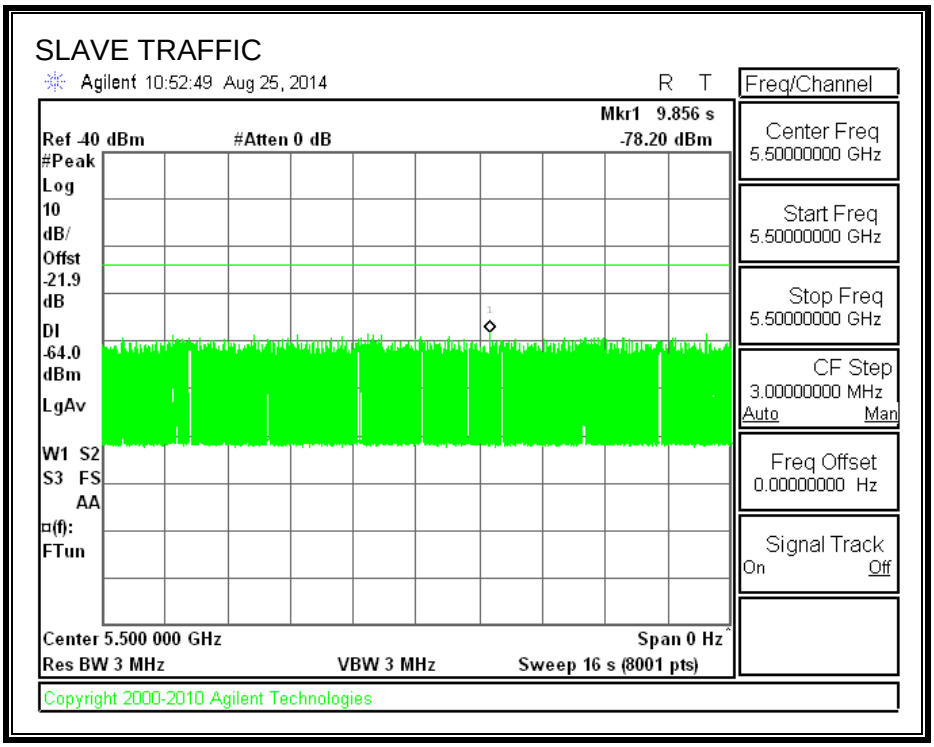
All tests were performed at a channel center frequency of 5500 MHz.

12.2.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



12.2.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

12.2.4. 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).

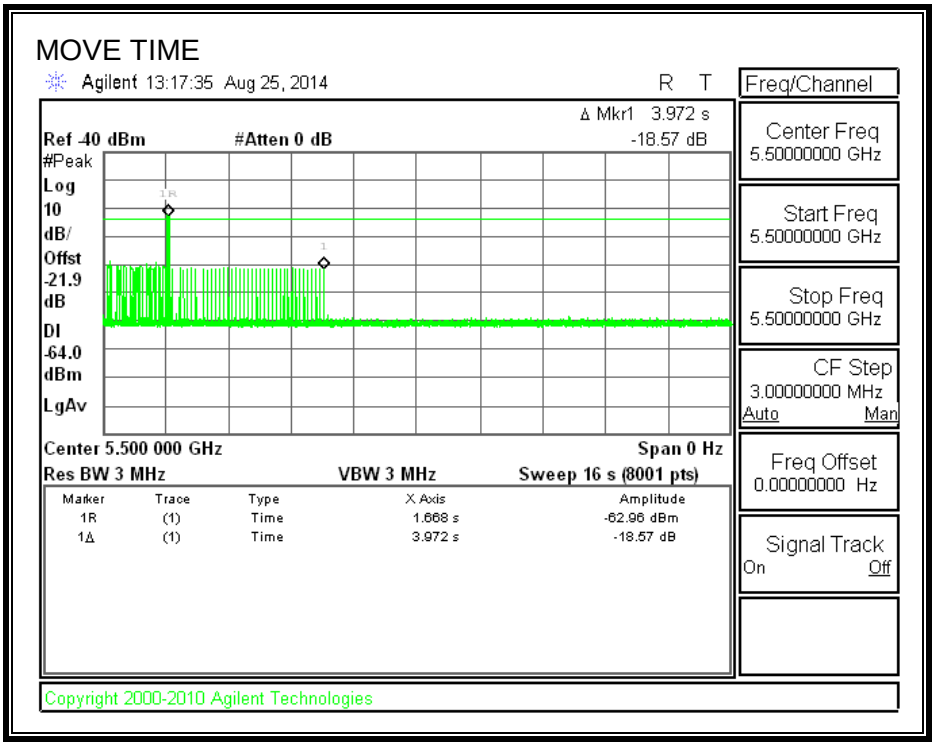
RESULTS

Channel Move Time (sec)	Limit (sec)
3.926	10

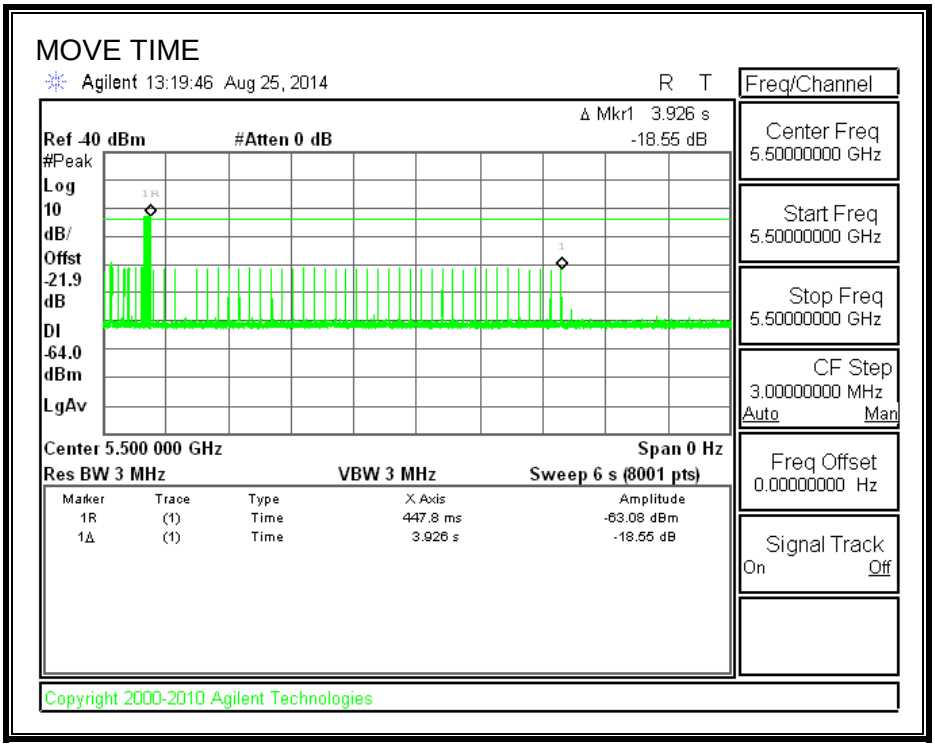
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
30.0	60

MOVE TIME

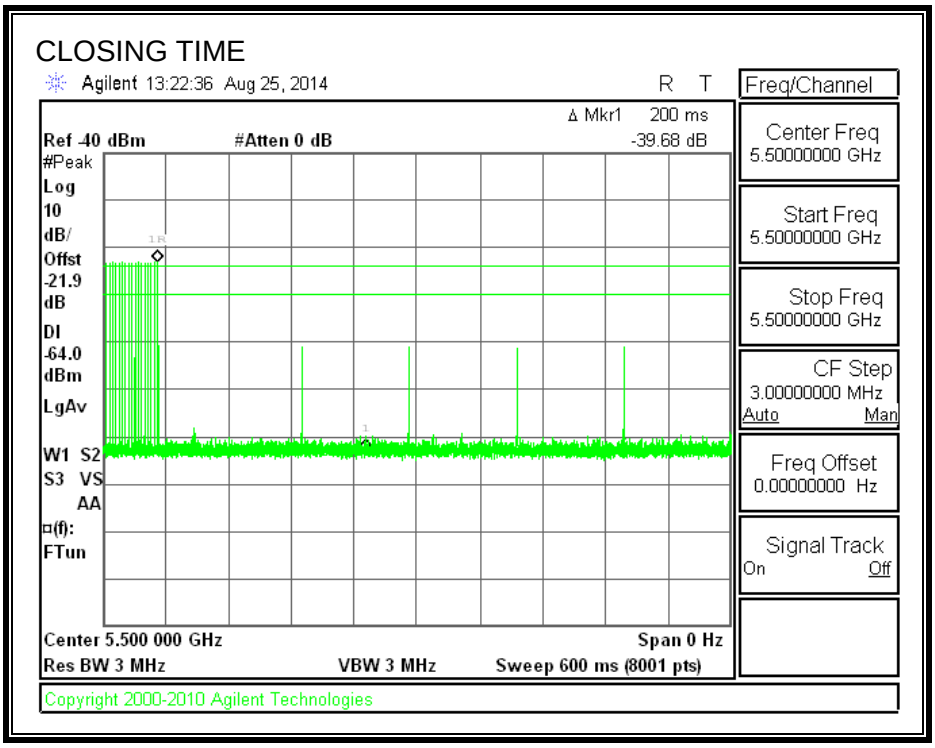
16 SECOND SWEEP:



6 SECOND SWEEP:



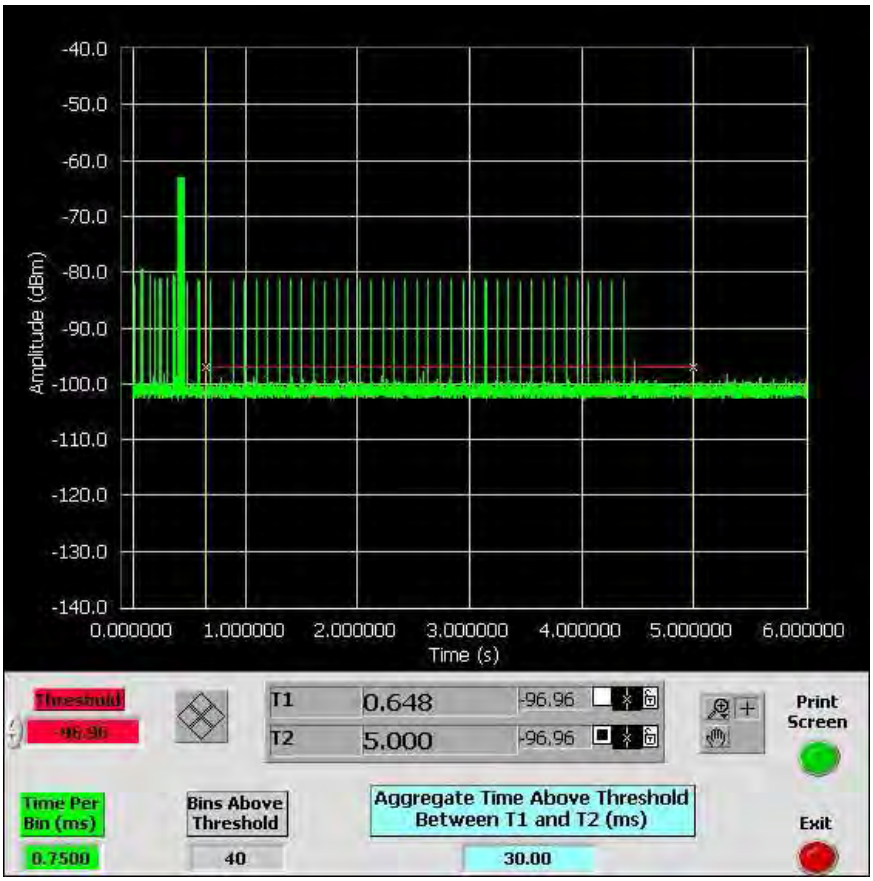
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



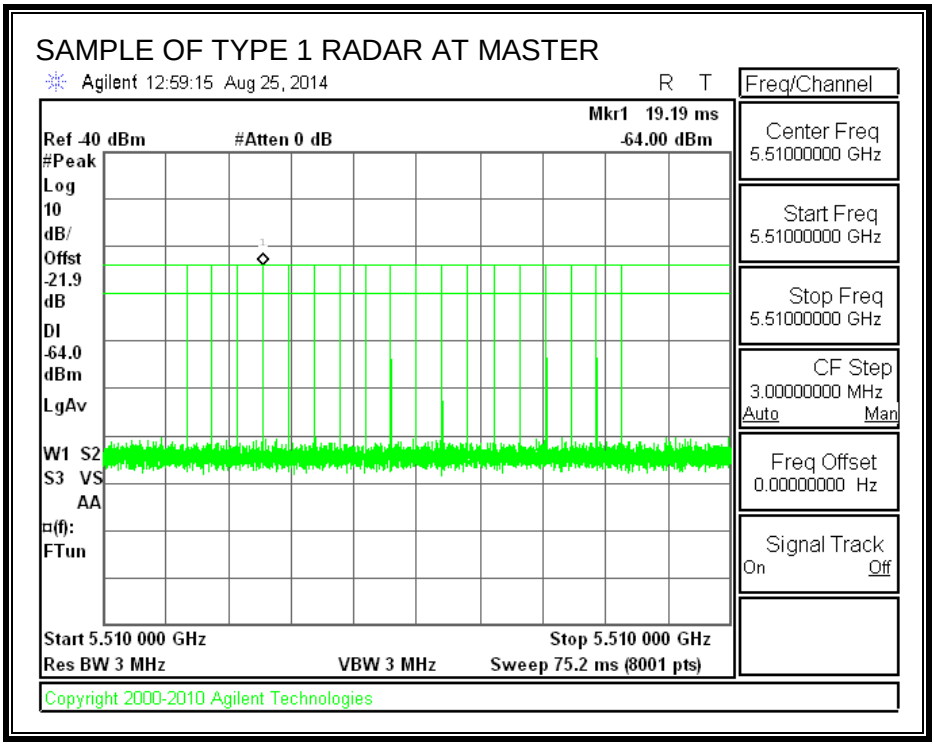
12.3. CLIENT MODE RESULTS FOR 40 MHz BANDWIDTH

12.3.1. TEST CHANNEL

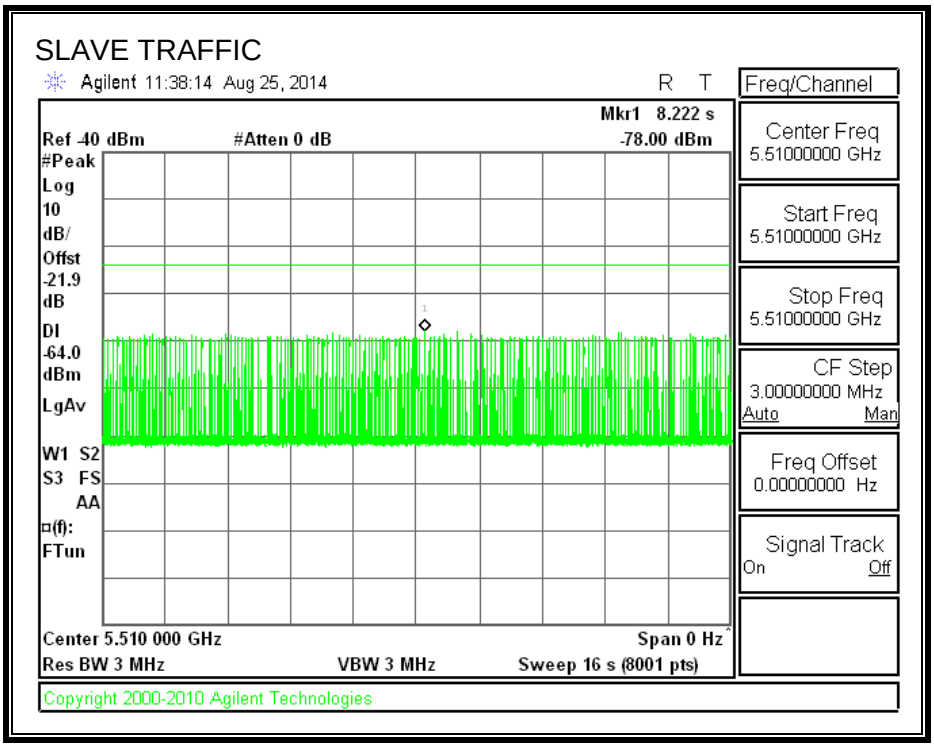
All tests were performed at a channel center frequency of 5510 MHz.

12.3.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



12.3.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

12.3.4. 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).

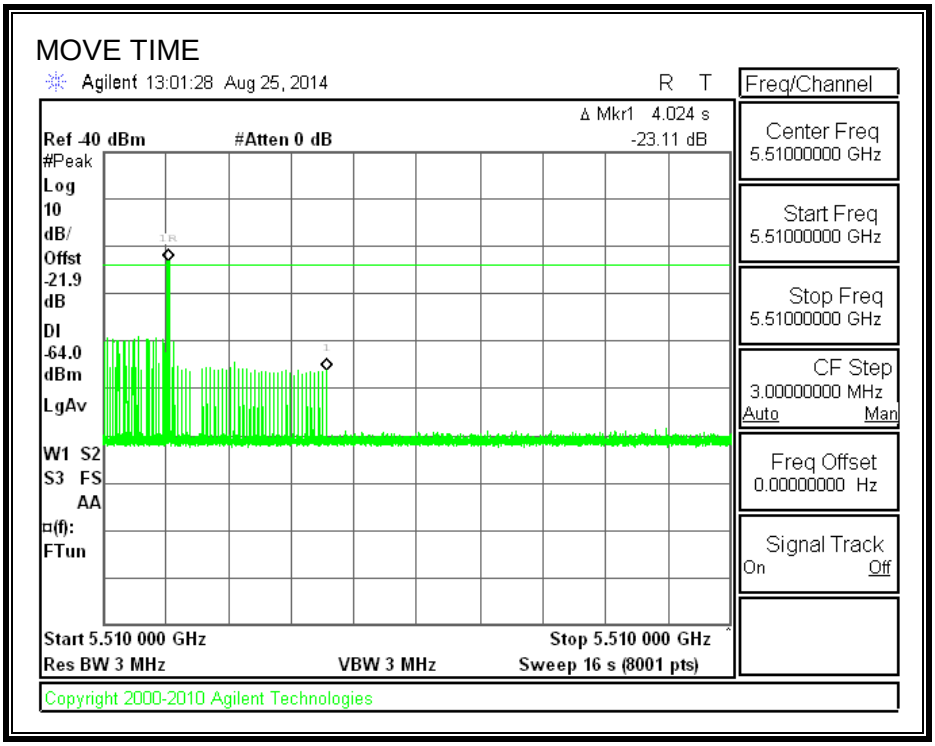
RESULTS

Channel Move Time (sec)	Limit (sec)
4.045	10

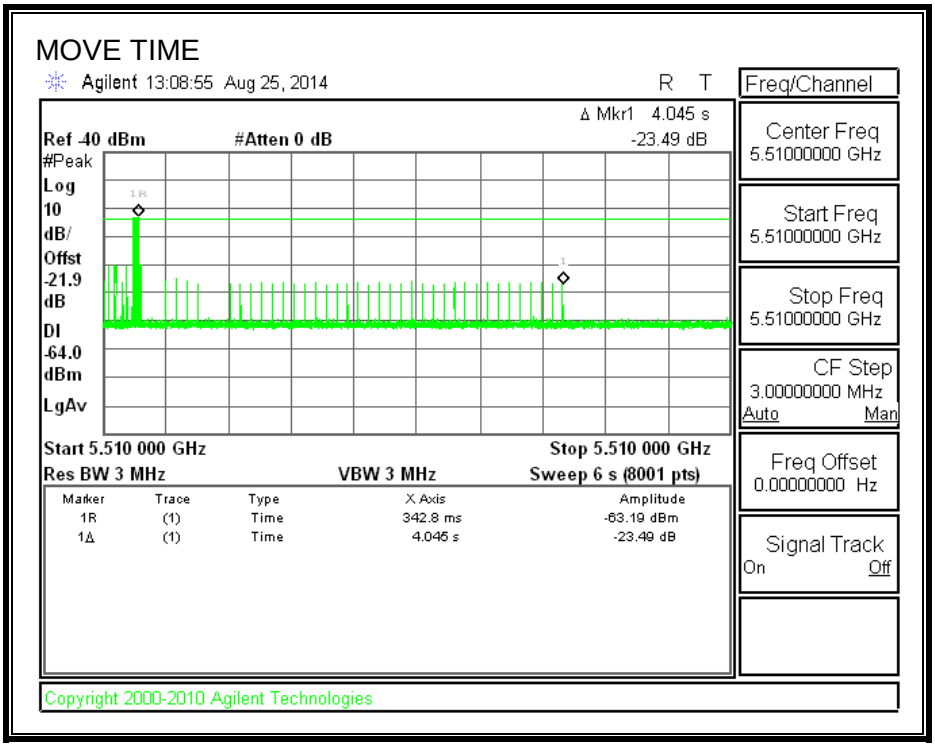
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
28.5	60

MOVE TIME

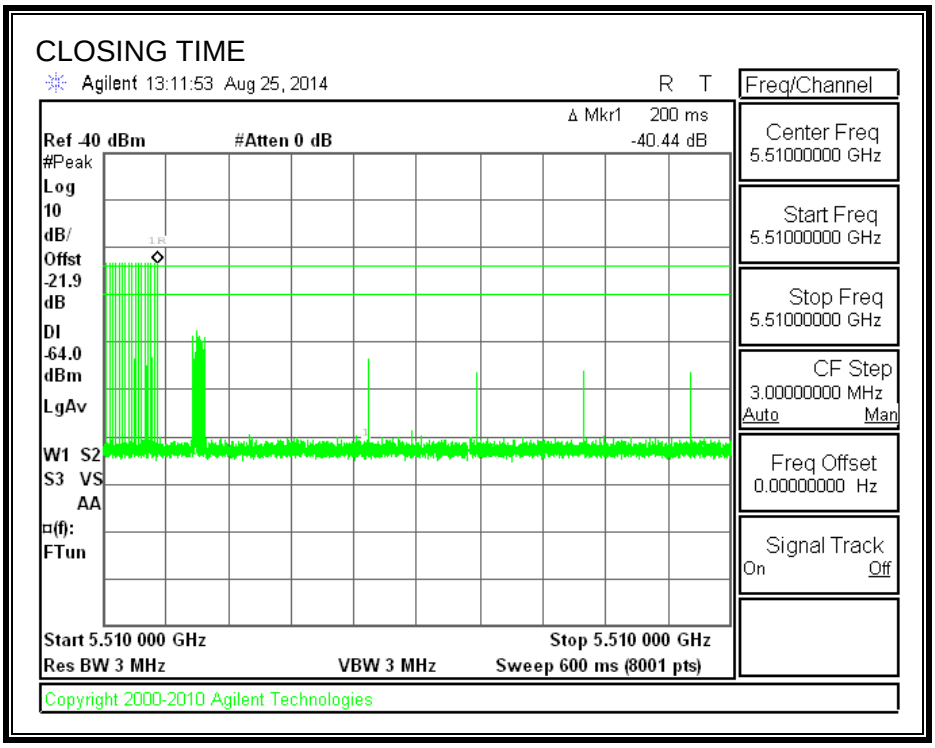
16 SECOND SWEEP:



6 SECOND SWEEP:



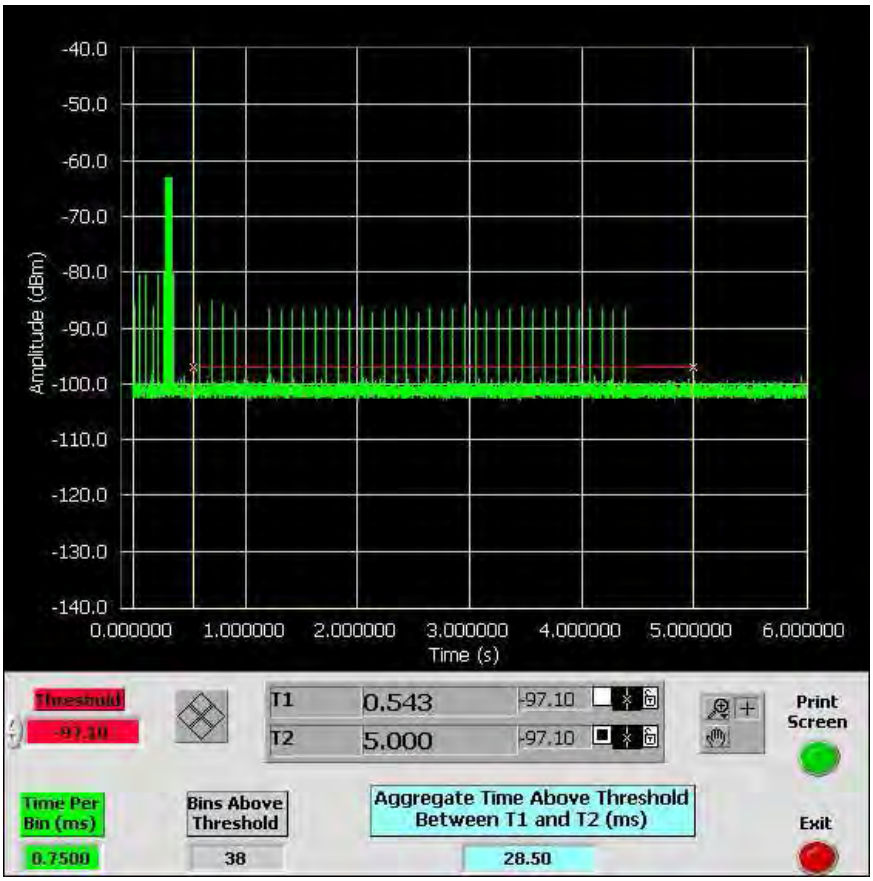
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

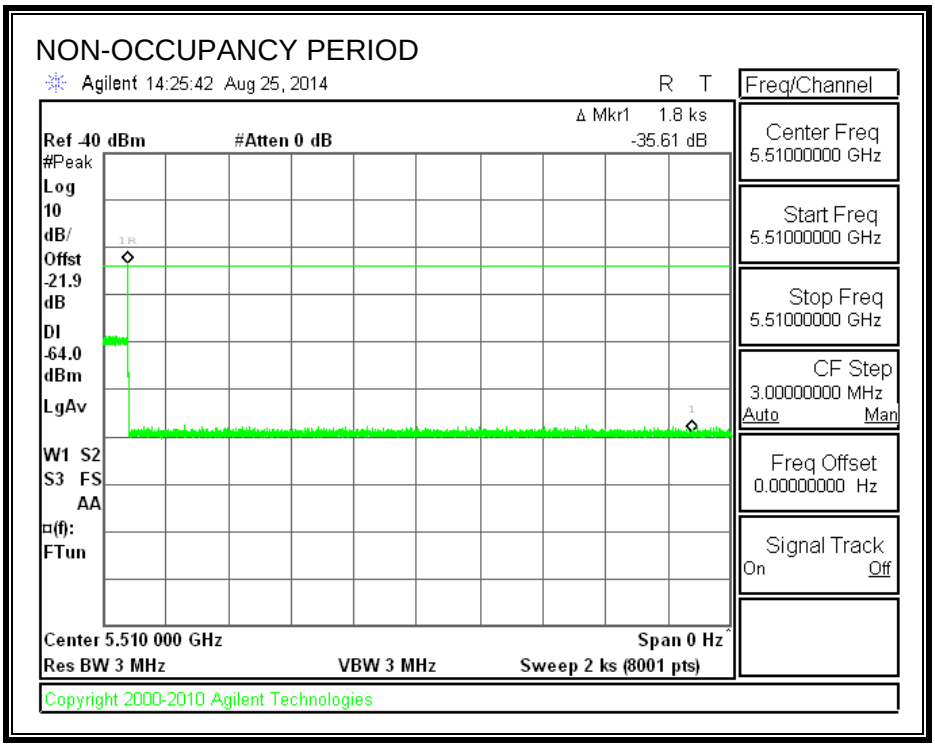
AGGREGATE CLOSING TIME



12.3.5. NON-OCCUPANCY PERIOD

RESULTS

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



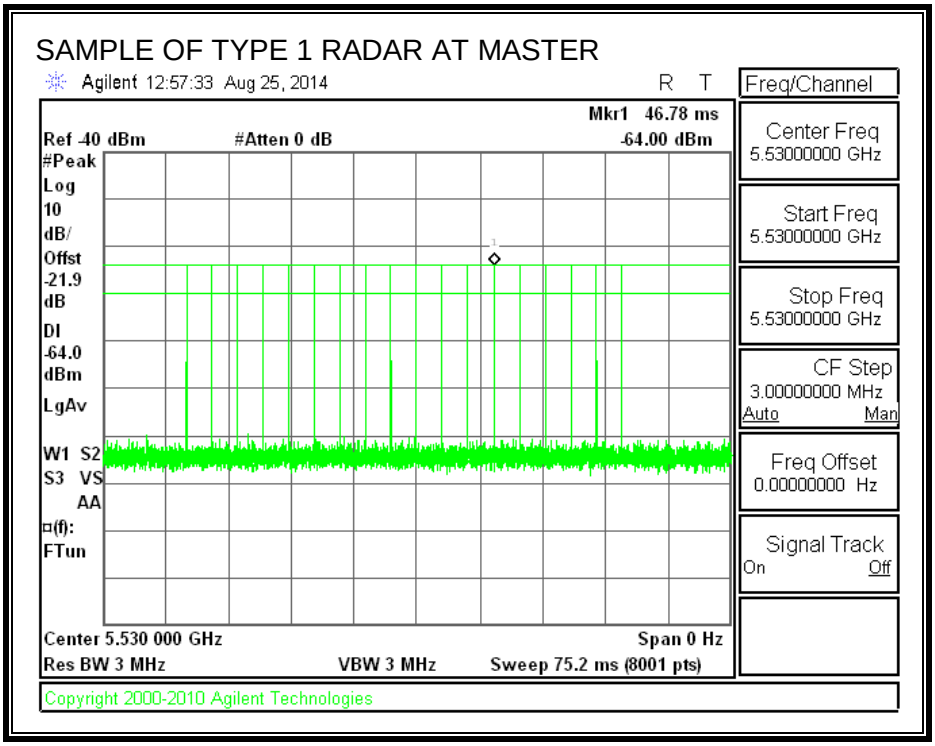
12.4. CLIENT MODE RESULTS FOR 80 MHz BANDWIDTH

12.4.1. TEST CHANNEL

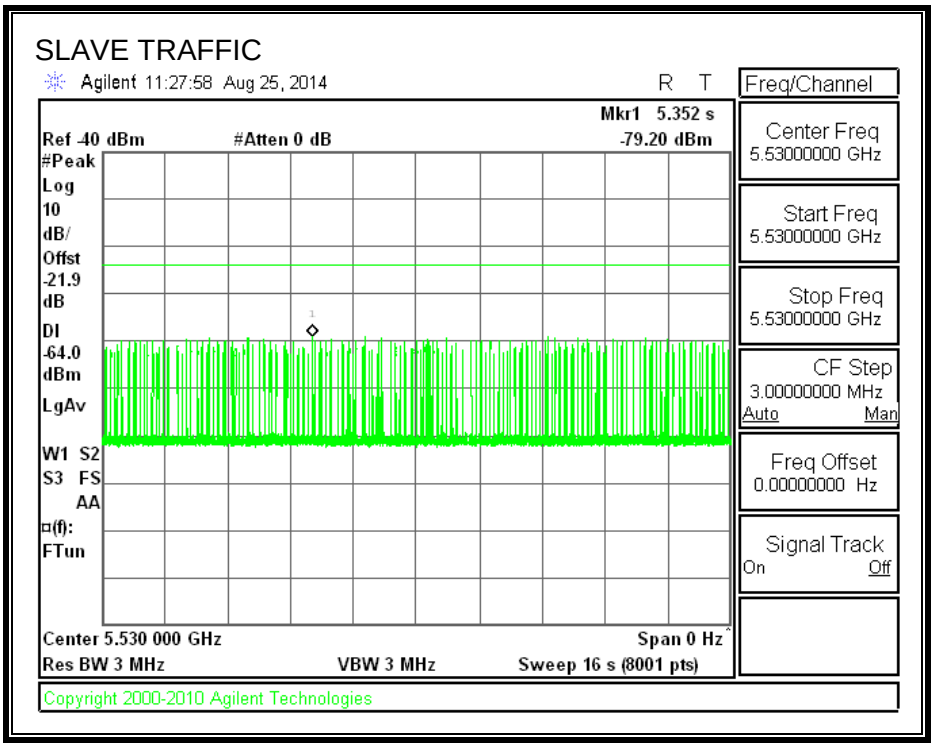
All tests were performed at a channel center frequency of 5530 MHz.

12.4.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



12.4.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

12.4.4. 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).

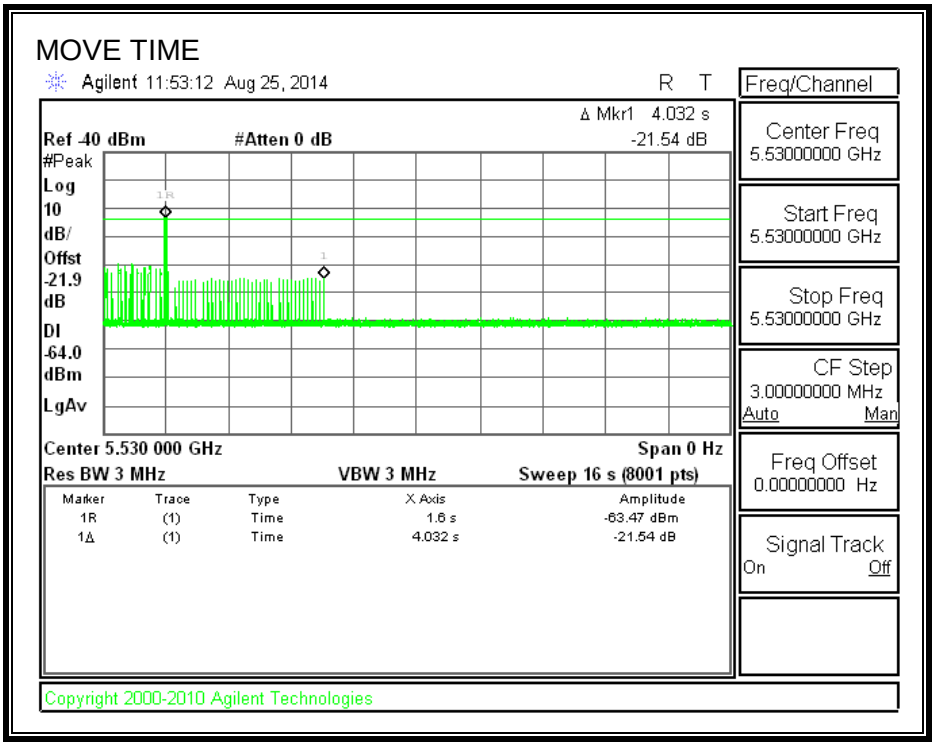
RESULTS

Channel Move Time (sec)	Limit (sec)
3.966	10

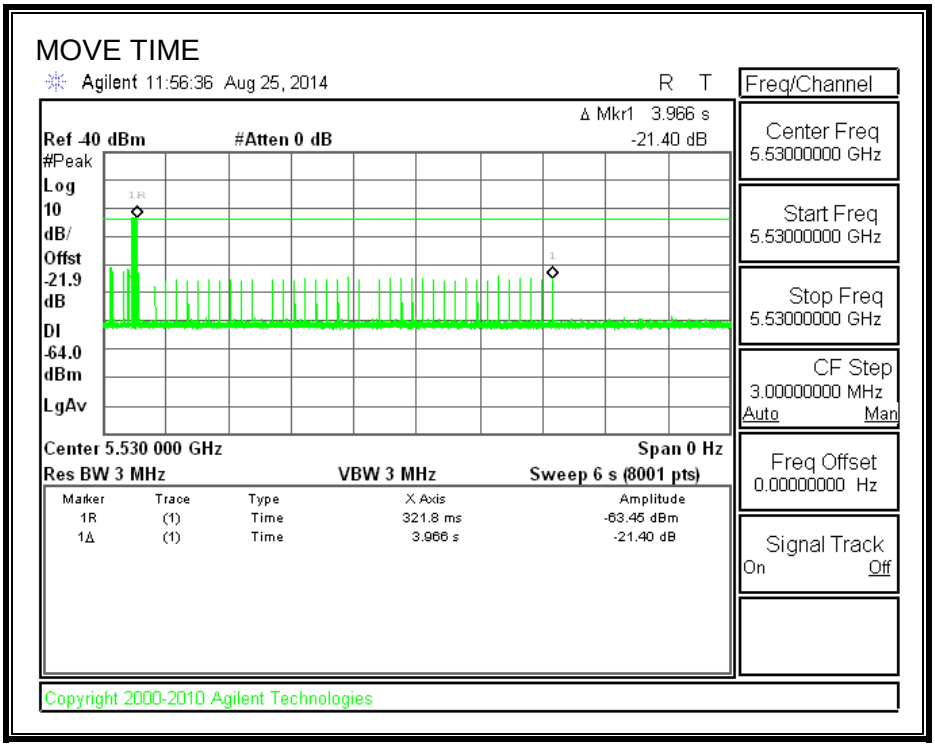
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
27.0	60

MOVE TIME

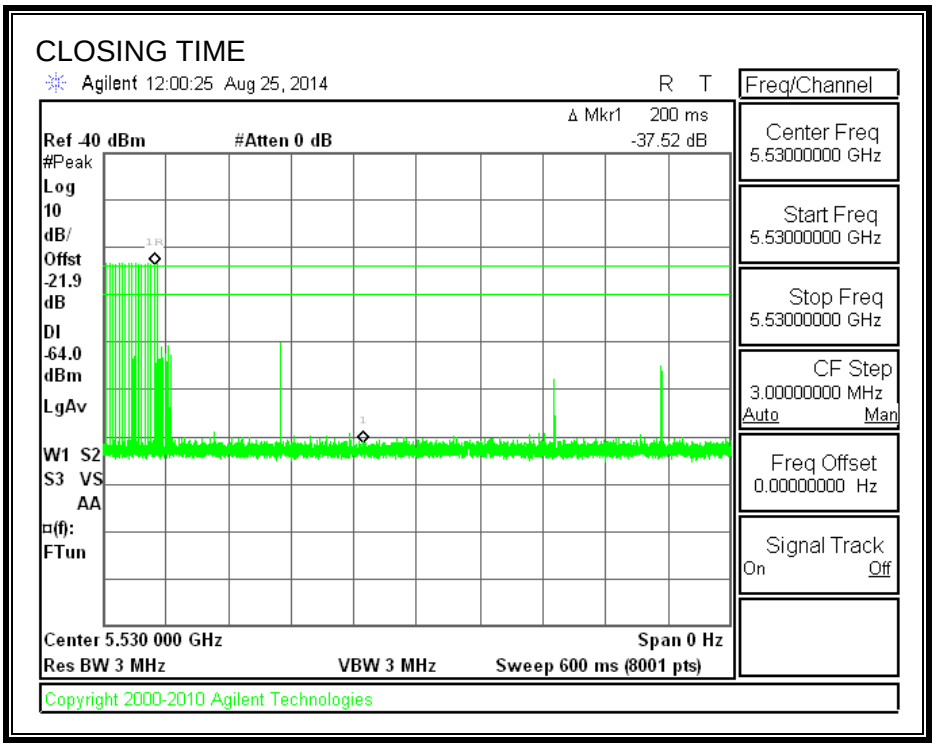
16 SECOND SWEEP:



6 SECOND SWEEP:



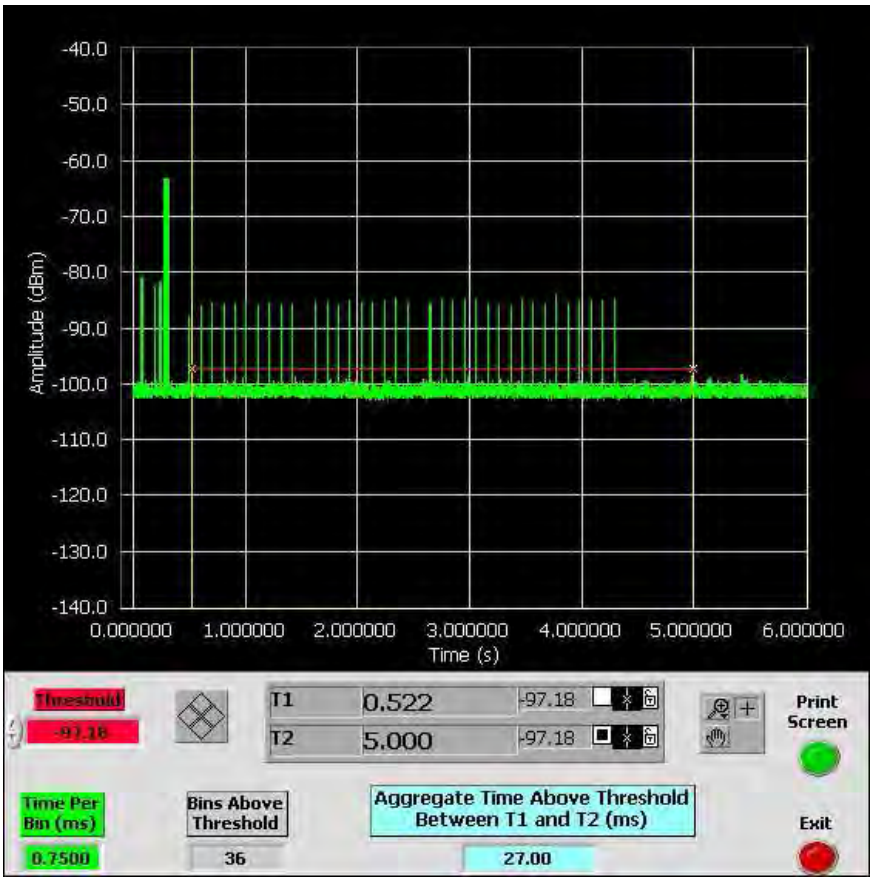
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

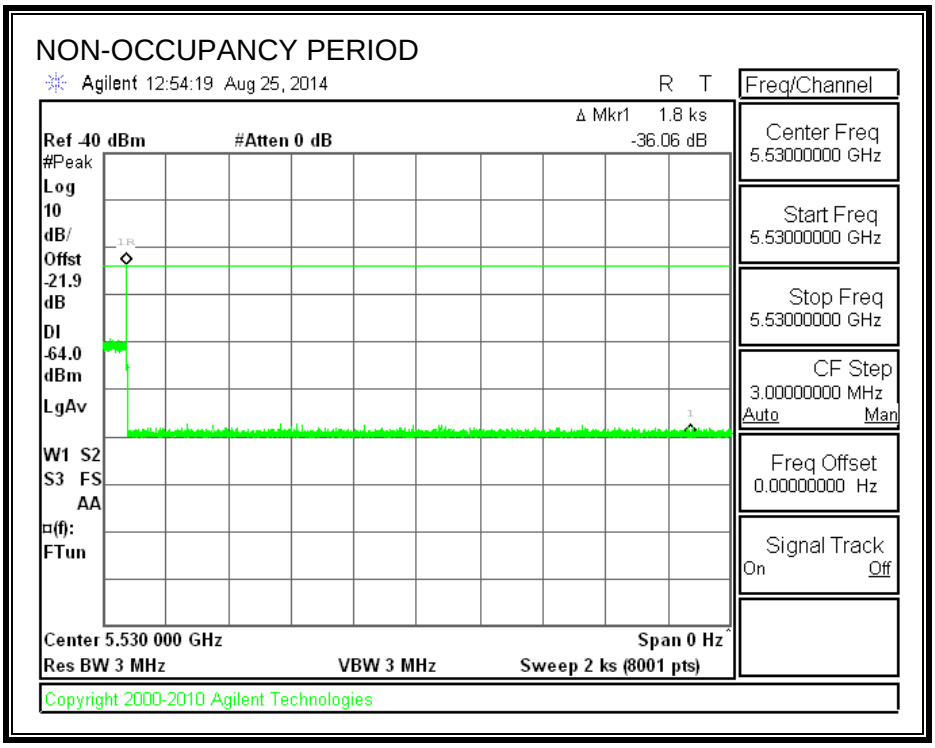
AGGREGATE CLOSING TIME



12.4.5. NON-OCCUPANCY PERIOD

RESULTS

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



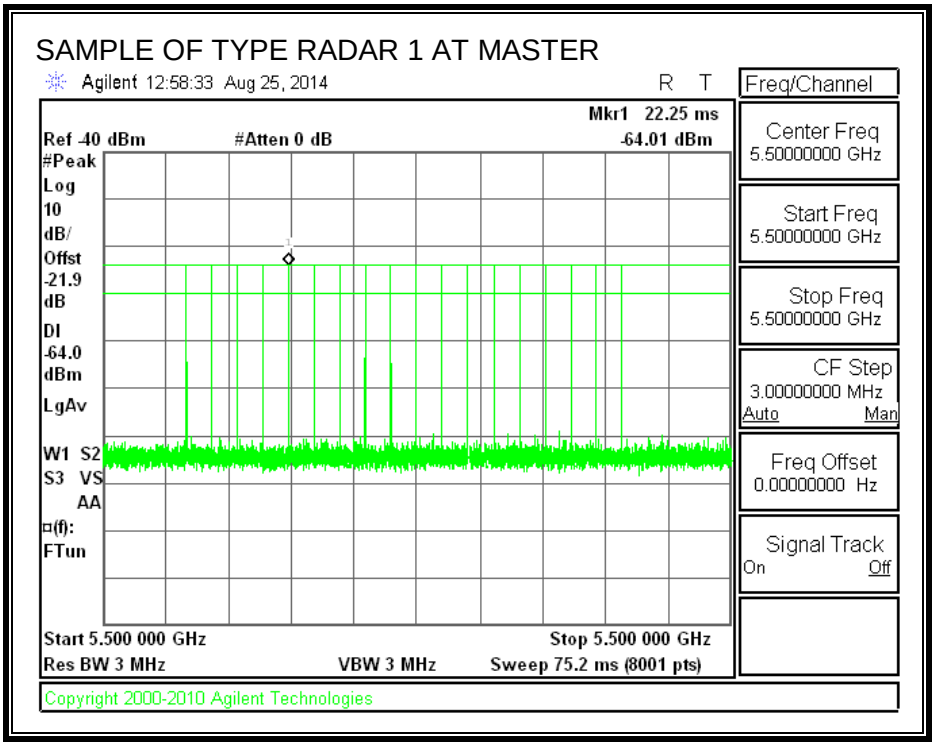
12.5. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 20 MHz BANDWIDTH

12.5.1. TEST CHANNEL

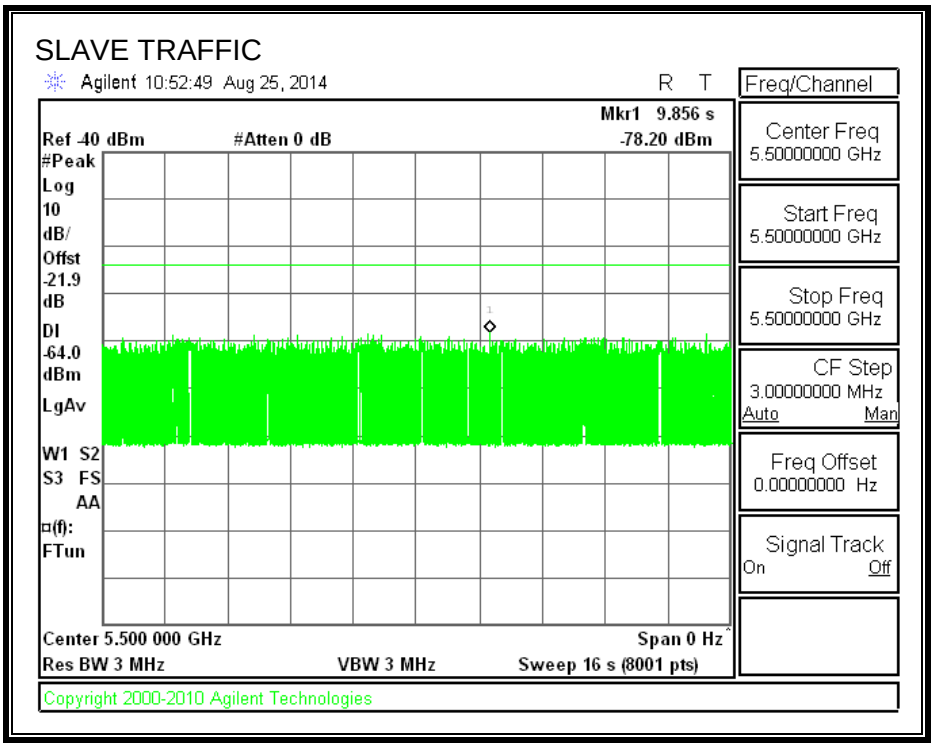
All tests were performed at a channel center frequency of 5500 MHz.

12.5.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



12.5.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

12.5.4. 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).

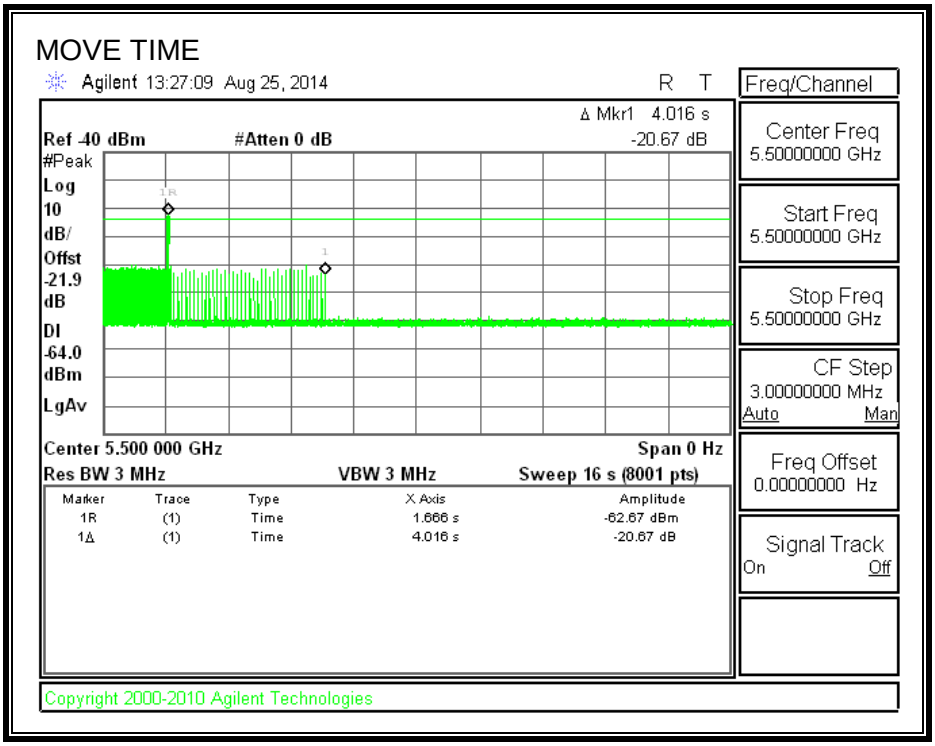
RESULTS

Channel Move Time (sec)	Limit (sec)
3.994	10

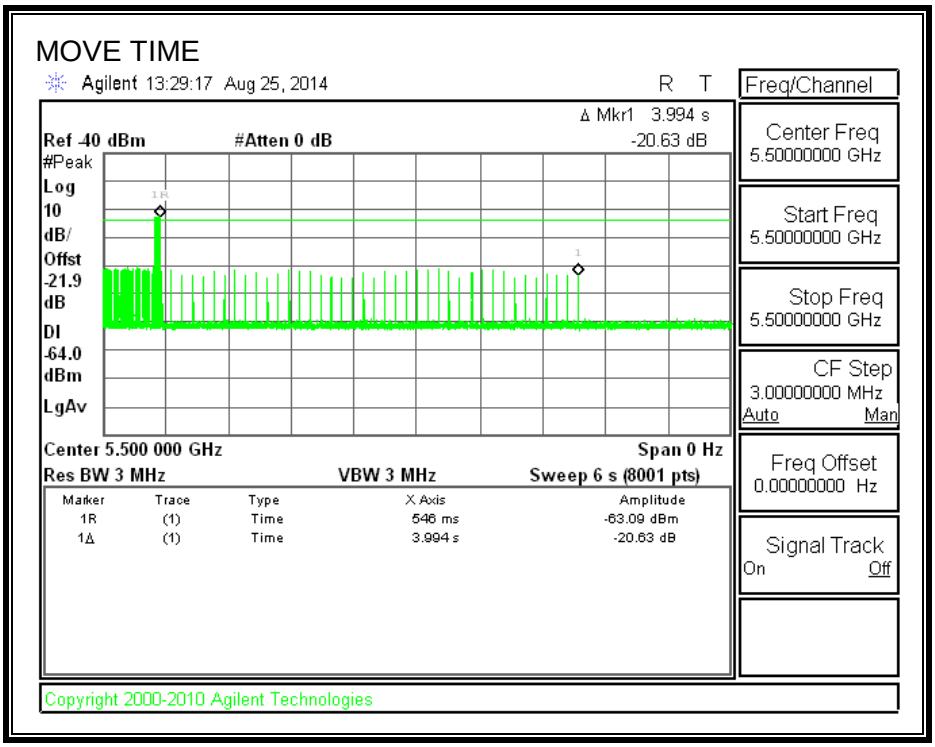
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
38.3	60

MOVE TIME

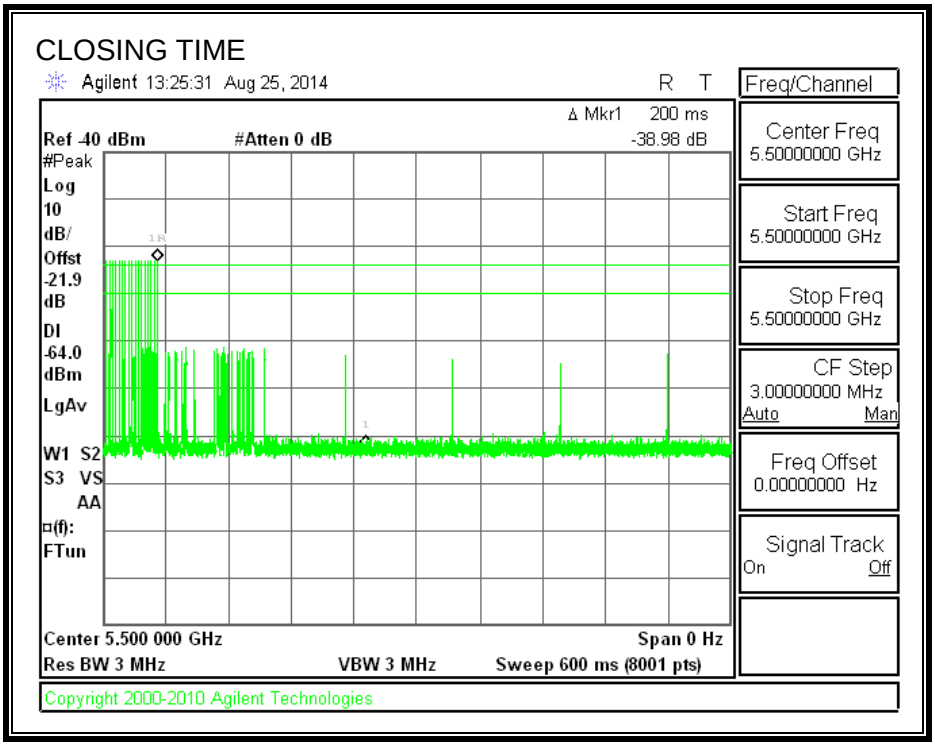
16 SECOND SWEEP:



6 SECOND SWEEP:



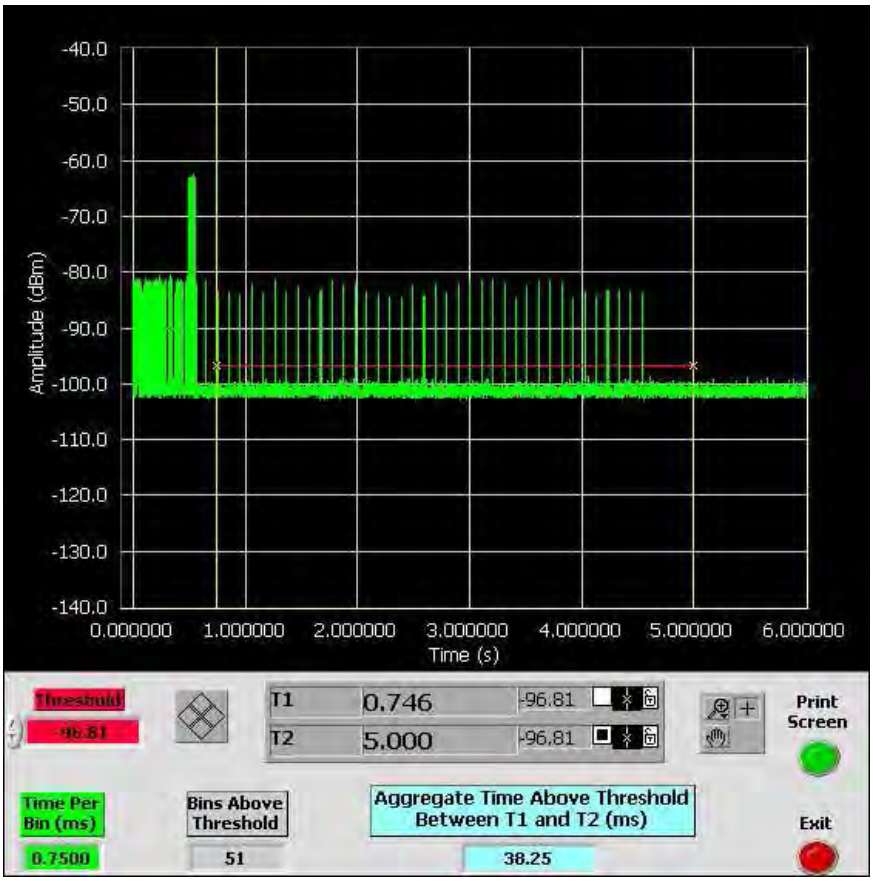
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



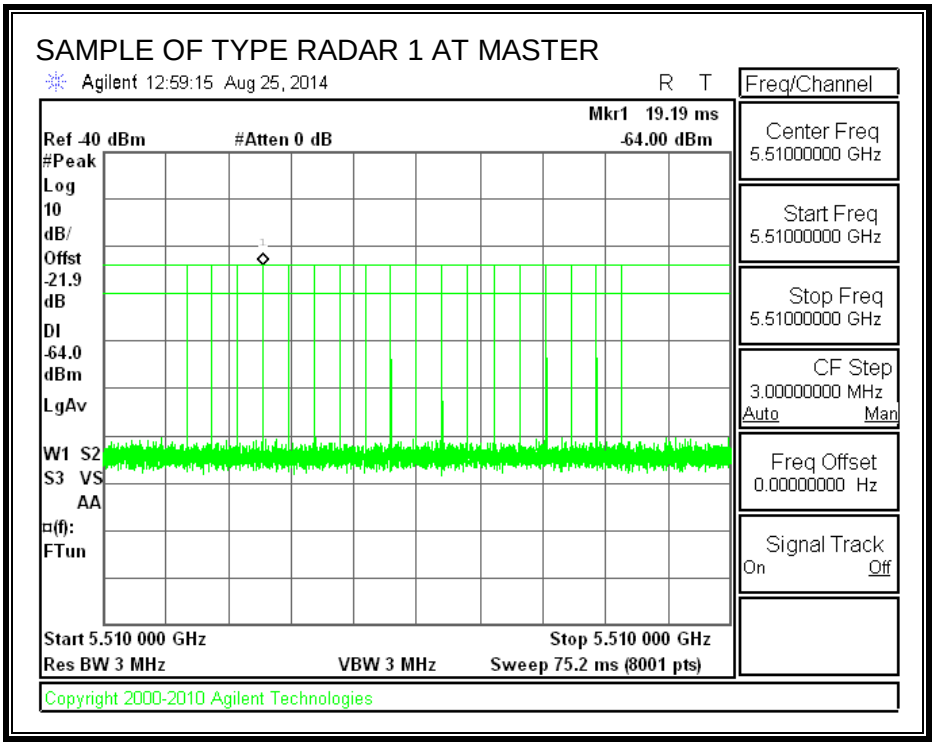
12.6. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 40 MHz BANDWIDTH

12.6.1. TEST CHANNEL

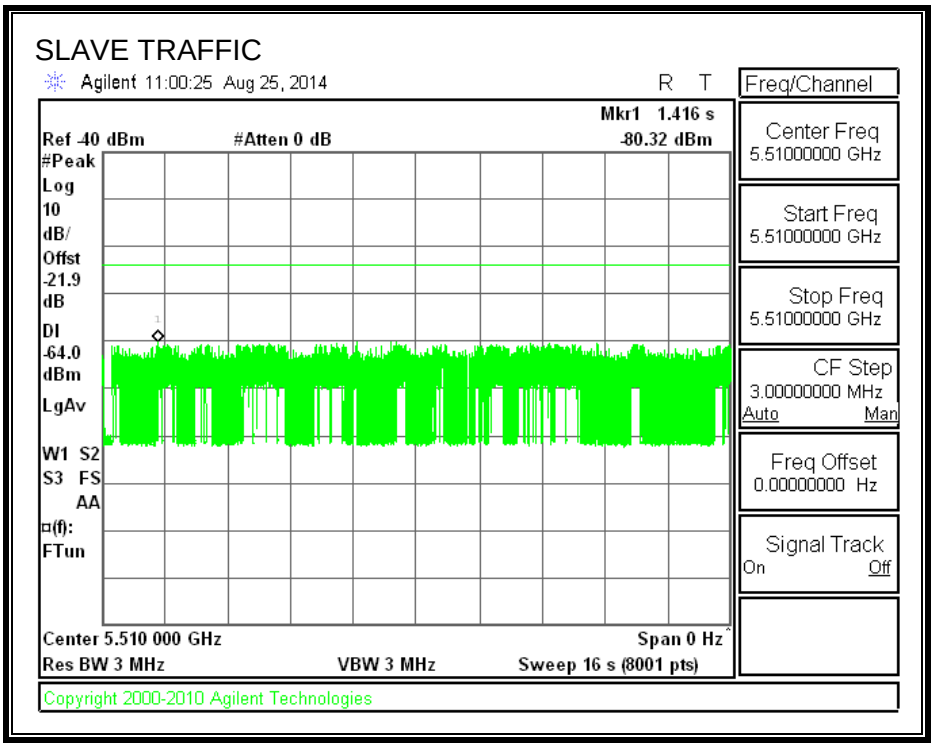
All tests were performed at a channel center frequency of 5510 MHz.

12.6.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



12.6.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

12.6.4. 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).

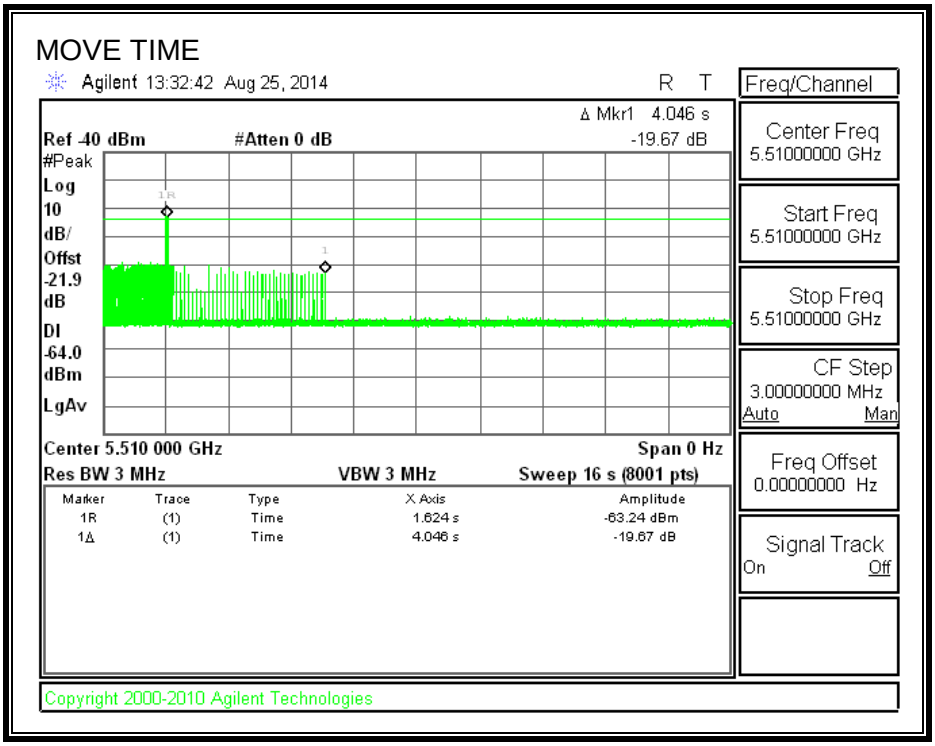
RESULTS

Channel Move Time (sec)	Limit (sec)
4.047	10

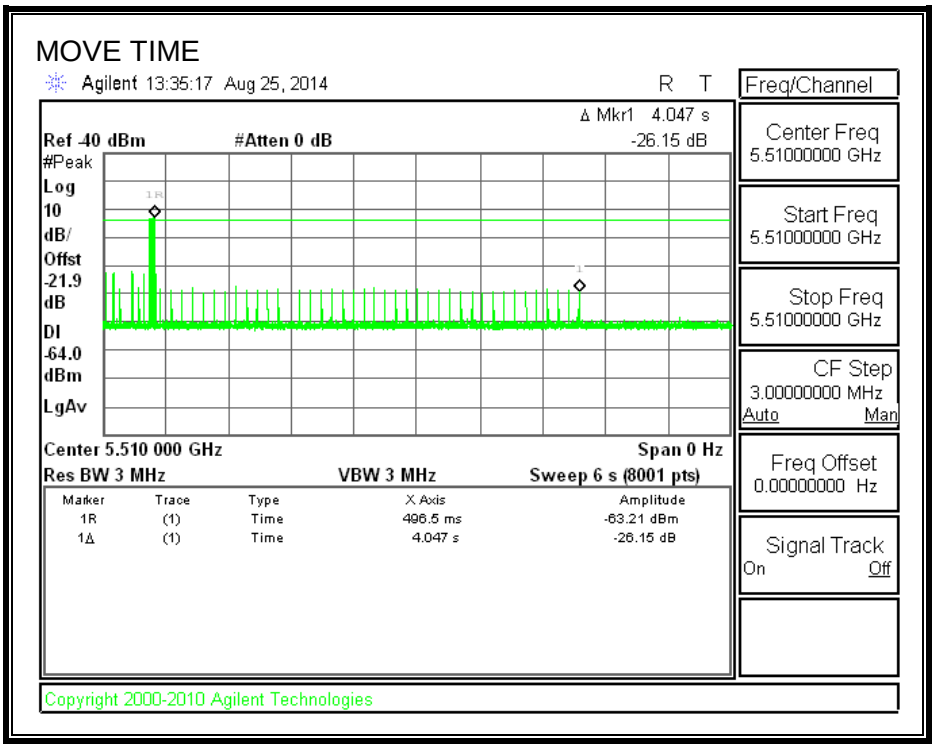
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
28.50	60

MOVE TIME

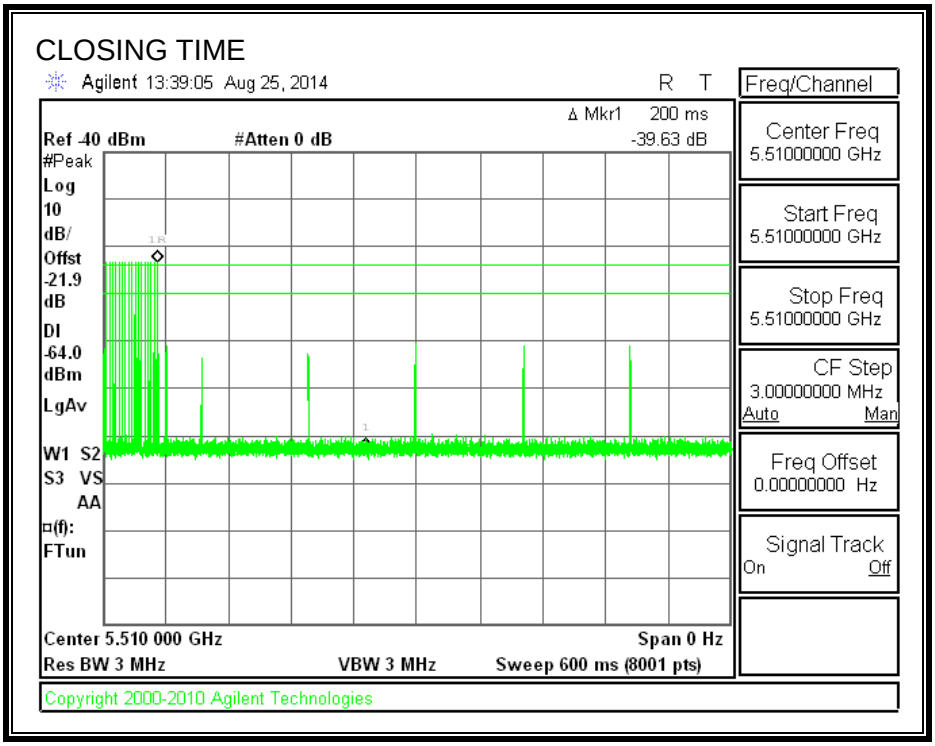
16 SECOND SWEEP:



6 SECOND SWEEP:



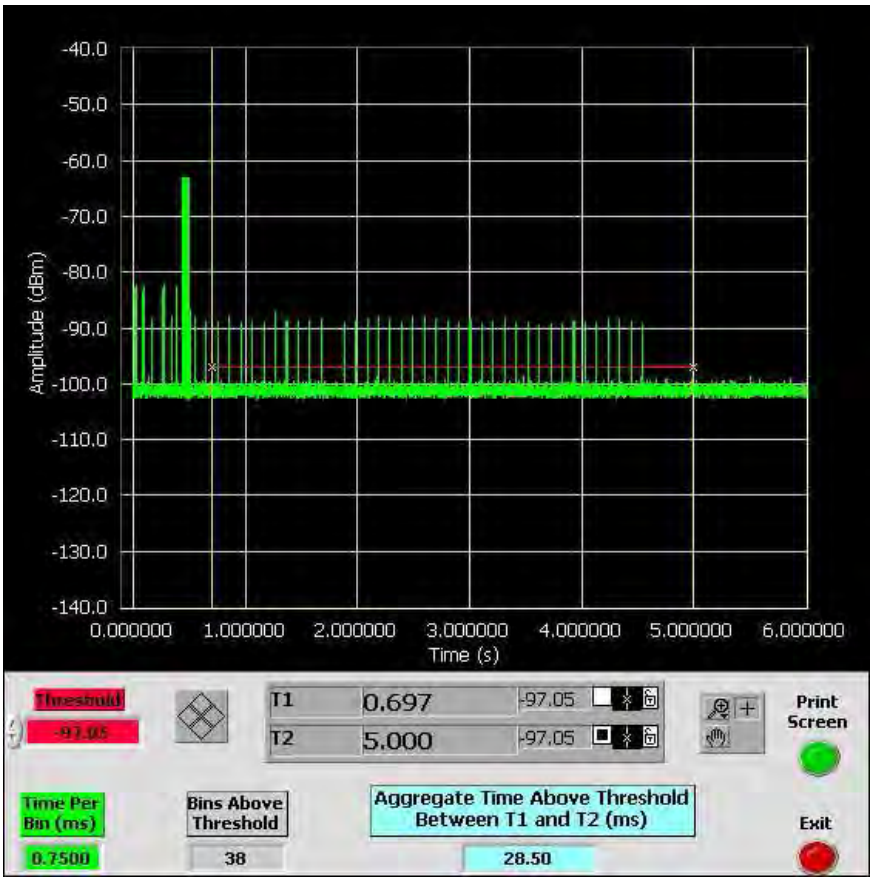
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



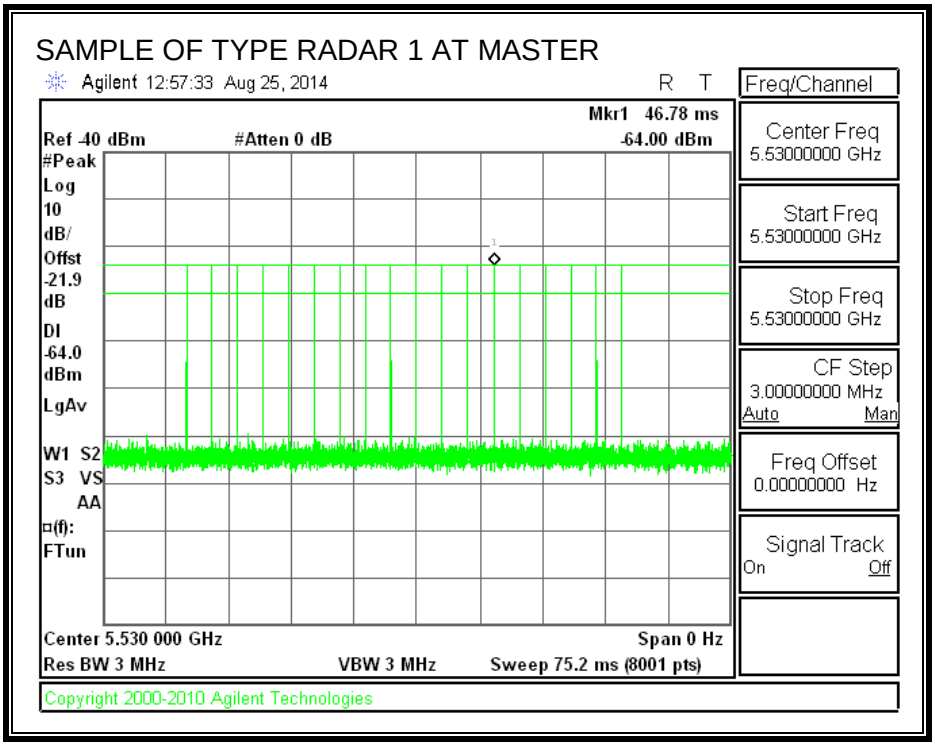
12.7. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 80 MHz BANDWIDTH

12.7.1. TEST CHANNEL

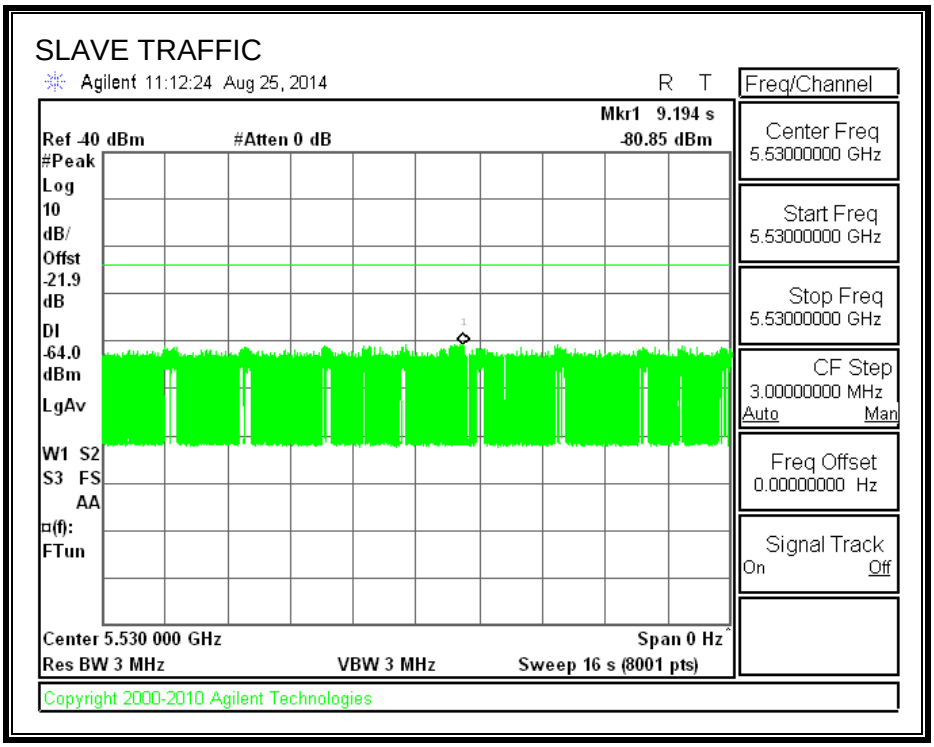
All tests were performed at a channel center frequency of 5530 MHz.

12.7.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM



TRAFFIC



12.7.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

12.7.4. 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).

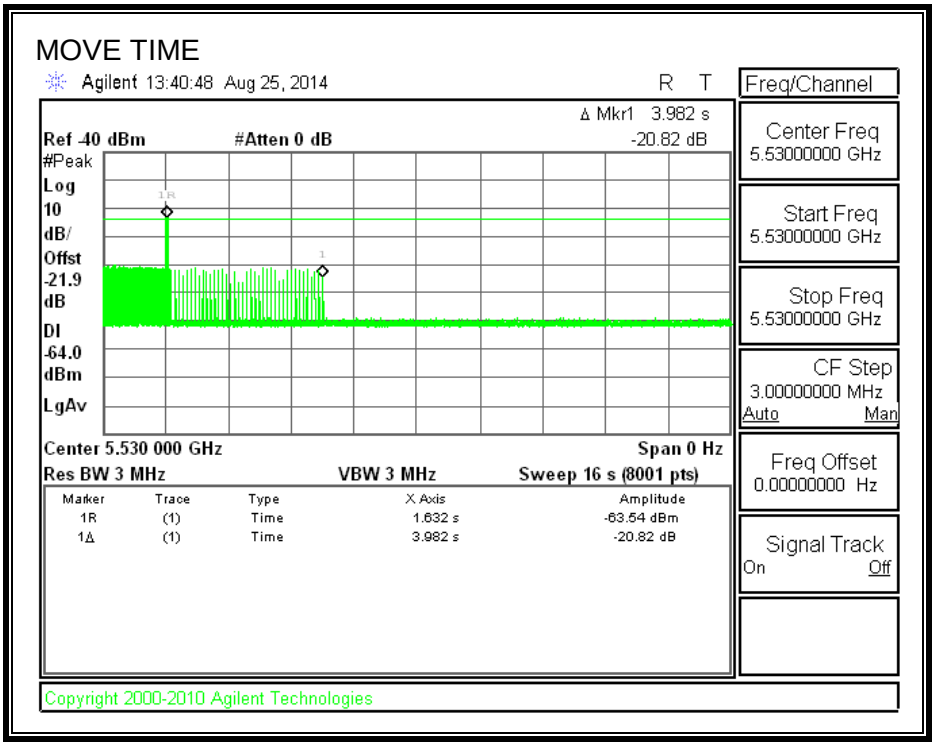
RESULTS

Channel Move Time (sec)	Limit (sec)
3.933	10

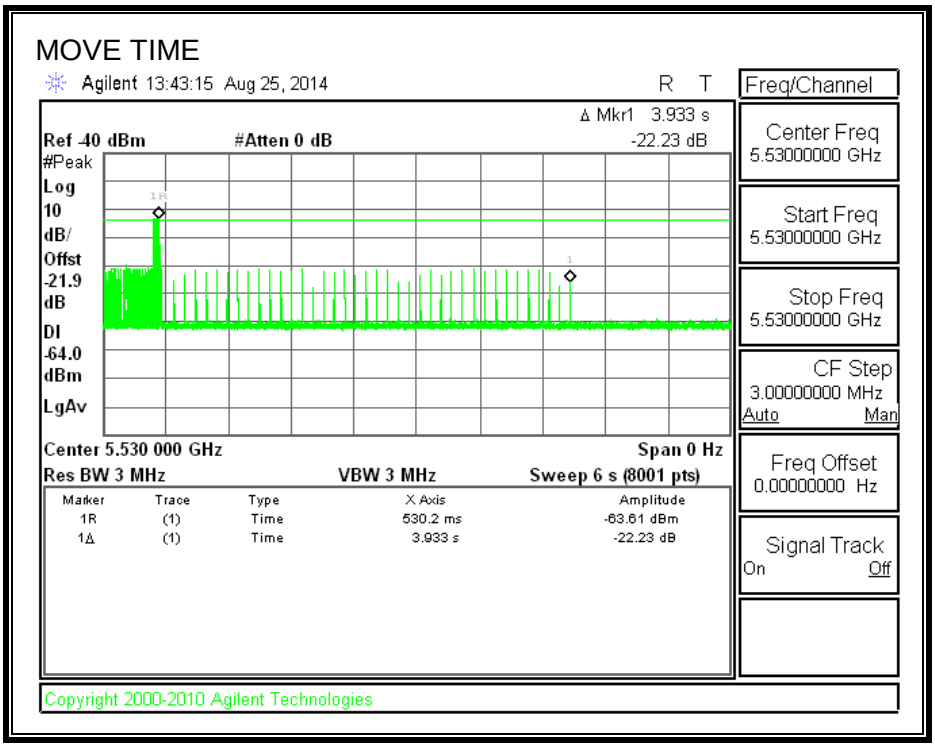
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
33.75	60

MOVE TIME

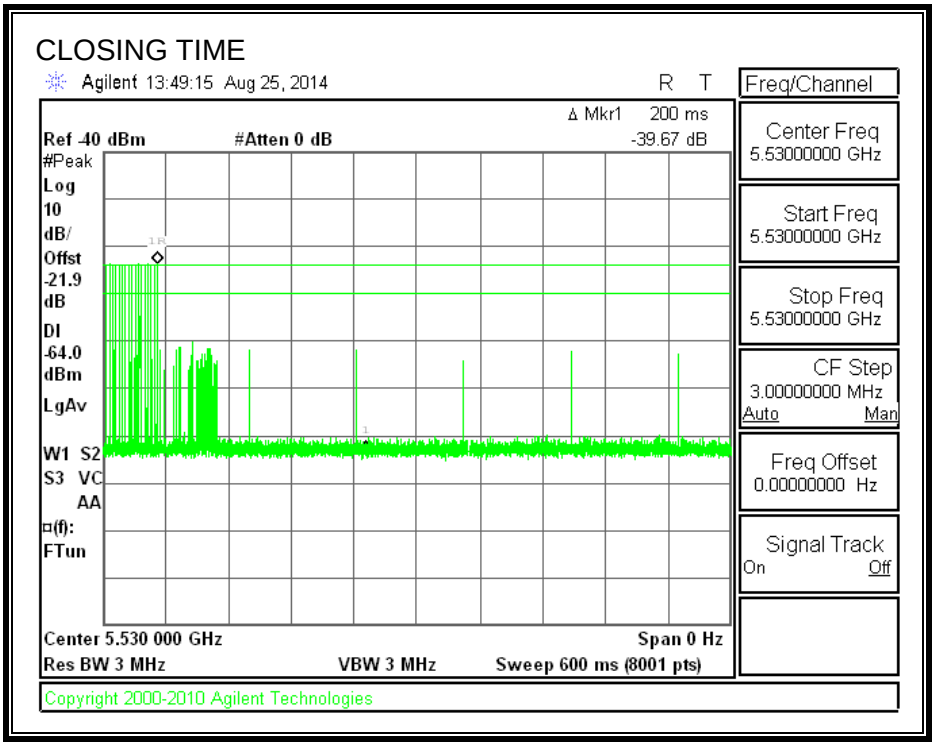
16 SECOND SWEEP:



6 SECOND SWEEP:



CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME