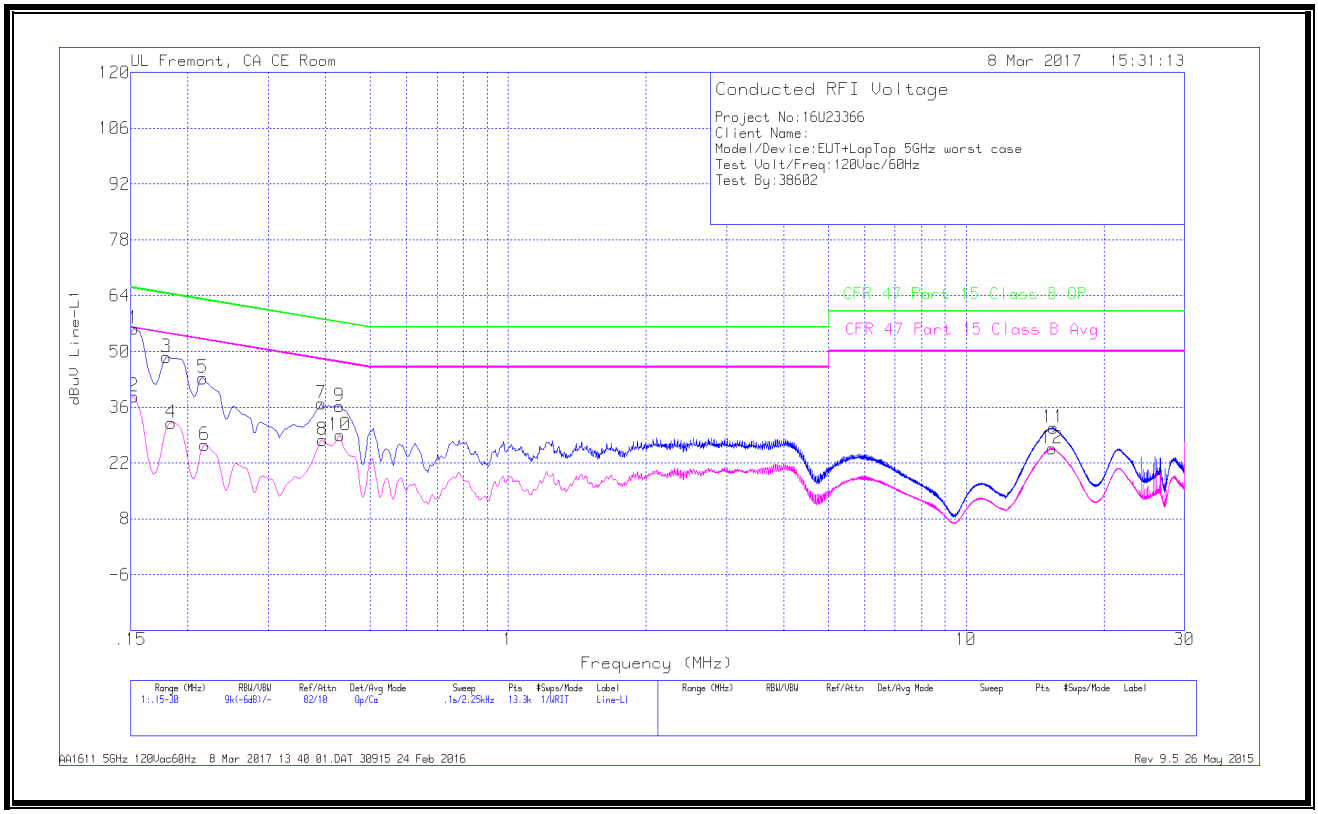
10.2. EUT POWERED BY HOST PC VIA USB CABLE

LINE 1 RESULTS

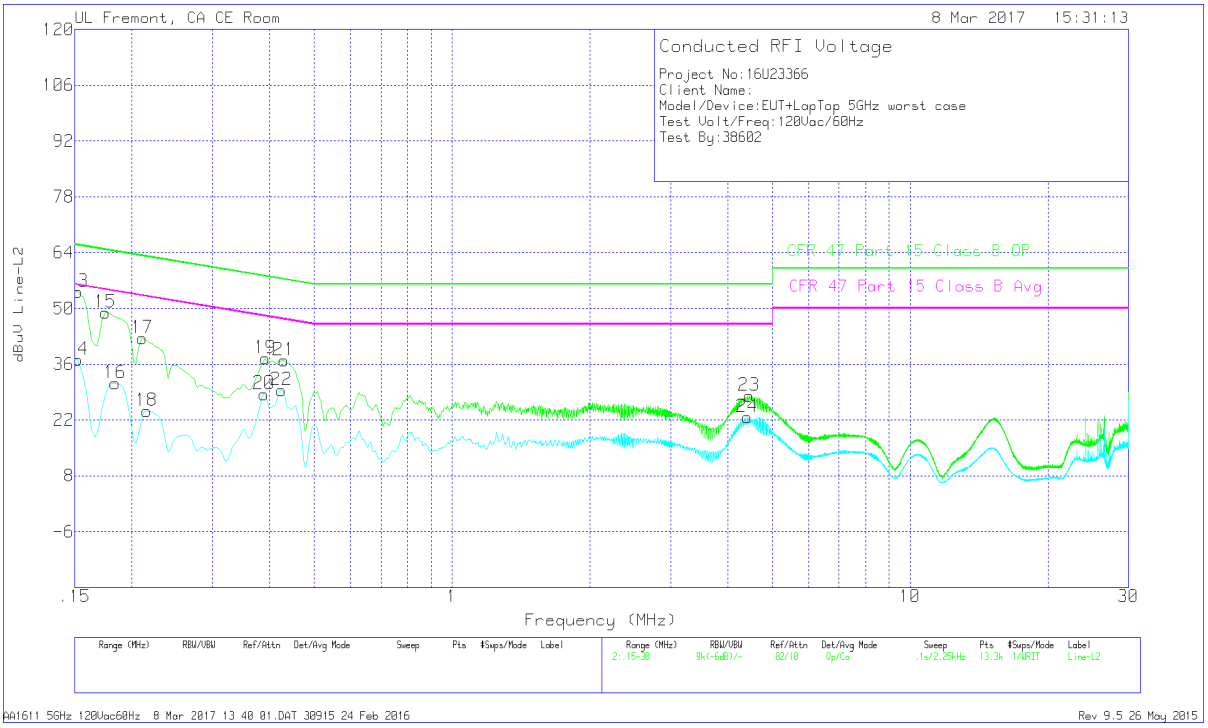


WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.15225	45.39	Qp	.1	.1	10.1	55.69	65.88	-10.19	-	-
2	.15225	28.48	Ca	.1	.1	10.1	38.78	-	-	55.88	-17.1
3	.17925	38.35	Qp	0	.1	10.1	48.55	64.52	-15.97	-	-
4	.18375	21.95	Ca	0	.1	10.1	32.15	-	-	54.31	-22.16
5	.21525	33.11	Qp	0	.1	10.1	43.31	63	-19.69	-	-
6	.2175	16.51	Ca	0	0	10.1	26.61	-	-	52.91	-26.3
7	.39075	26.74	Qp	0	.1	10.1	36.94	58.05	-21.11	-	-
8	.393	17.54	Ca	0	.1	10.1	27.74	-	-	48	-20.26
9	.42787	26.14	Qp	0	.1	10.1	36.34	57.29	-20.95	-	-
10	.429	18.8	Ca	0	.1	10.1	29	-	-	47.27	-18.27
11	15.513	20.46	Qp	0	.2	10.2	30.86	60	-29.14	-	-
12	15.4365	15.24	Ca	0	.2	10.2	25.64	-	-	50	-24.36

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

LINE 2 RESULTS



WORST EMISSIONS

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.15225	44.06	Qp	0	0	10.1	54.16	65.88	-11.72	-	-
14	.15225	26.99	Ca	0	0	10.1	37.09	-	-	55.88	-18.79
15	.17475	38.82	Qp	0	.1	10.1	49.02	64.73	-15.71	-	-
16	.18375	21	Ca	0	.1	10.1	31.2	-	-	54.31	-23.11
17	.21075	32.43	Qp	0	0	10.1	42.53	63.18	-20.65	-	-
18	.21525	14.02	Ca	0	.1	10.1	24.22	-	-	53	-28.78
19	.39075	27.21	Qp	0	.1	10.1	37.41	58.05	-20.64	-	-
20	.3885	18.33	Ca	0	.1	10.1	28.53	-	-	48.1	-19.57
21	.429	26.84	Qp	0	.1	10.1	37.04	57.27	-20.23	-	-
22	.4245	19.32	Ca	0	.1	10.1	29.52	-	-	47.36	-17.84
23	4.4565	17.93	Qp	0	.1	10.1	28.13	56	-27.87	-	-
24	4.416	12.47	Ca	0	.1	10.1	22.67	-	-	46	-23.33

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

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

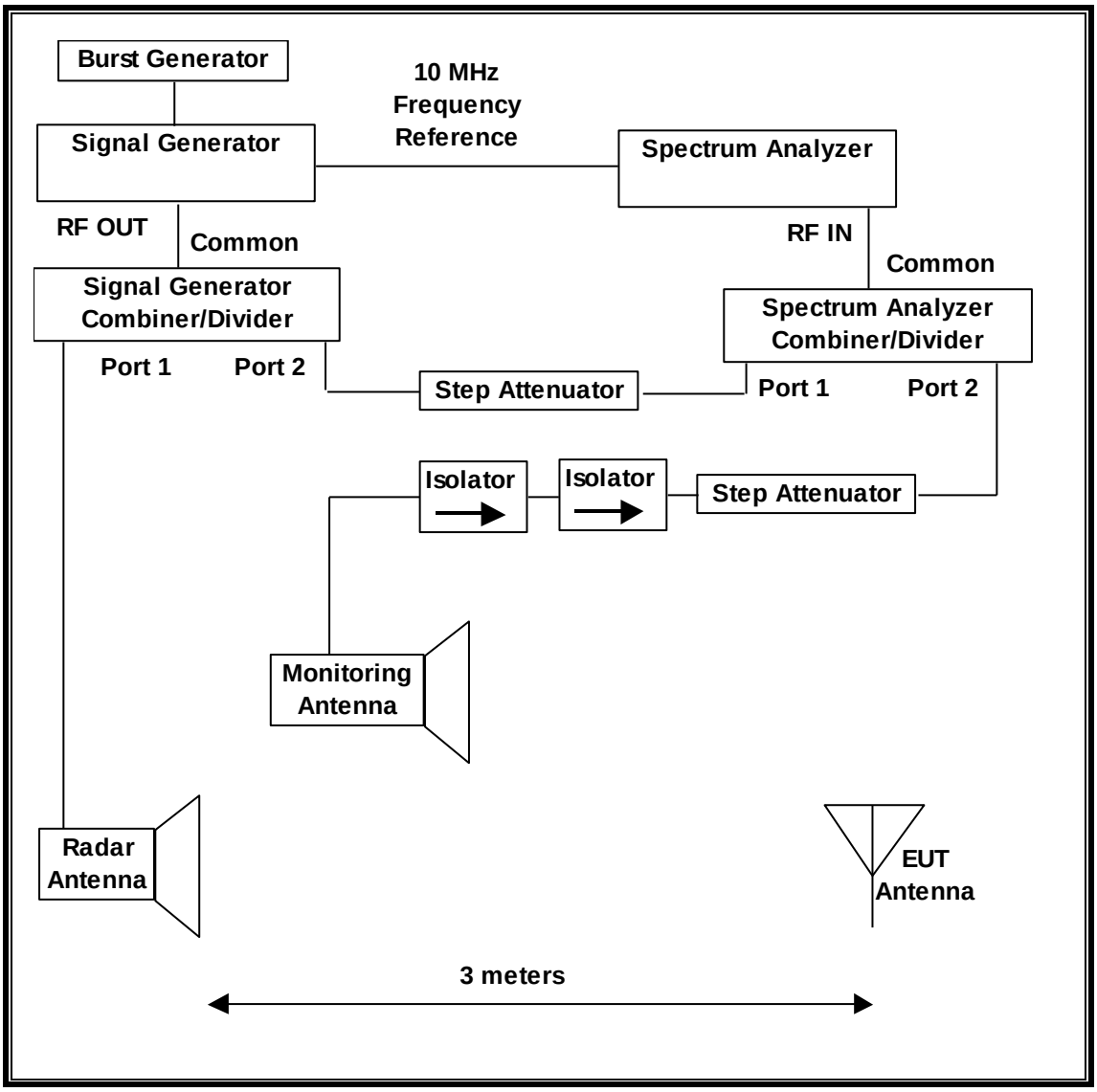
Table 7 – Frequency Hopping Radar Test Signal

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, PXA, 3Hz to 44GHz	Keysight	N9030A	US51350187	06/13/17
Signal Generator, MXG X-Series RF Vector	Agilent	N5182B	MY51350337	04/21/18

11.1.3. TEST ROOM ENVIRONMENT

The test room temperature and humidity shall be maintained within normal temperature of 15~35 °C and normal humidity 20~75% (relative humidity).

ENVIRONMENT CONDITION

Parameter	Value
Temperature	26.3 °C
Humidity	33 %

11.1.4. TEST AND MEASUREMENT SOFTWARE

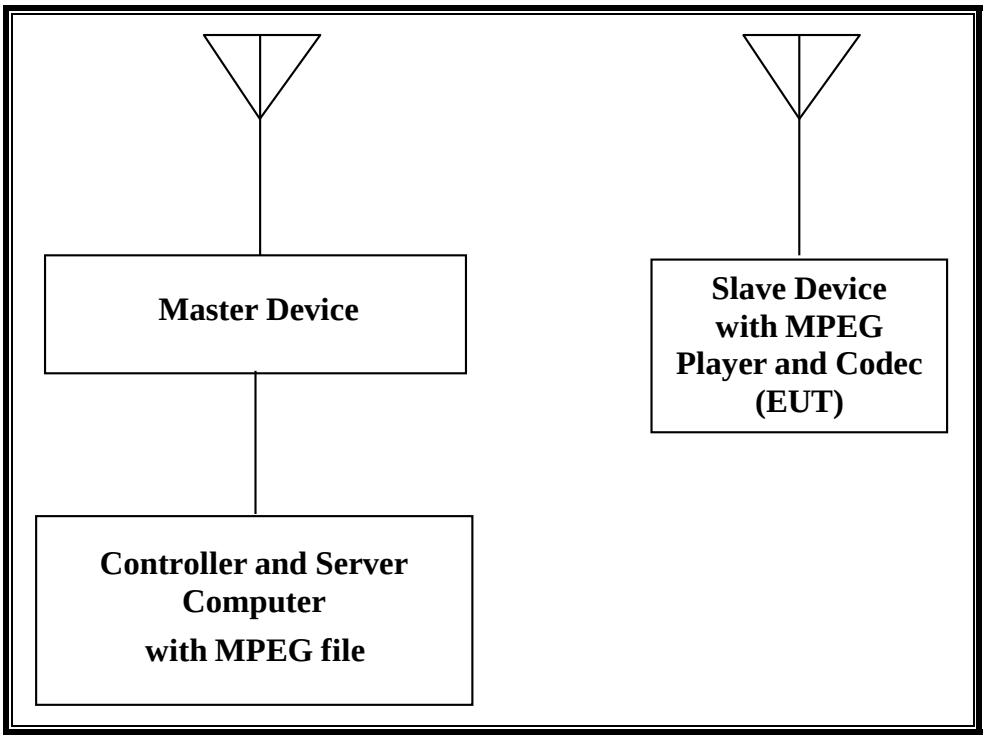
The following test and measurement software was utilized for the tests documented in this report:

TEST SOFTWARE LIST		
Name	**Version**	**Test / Function**
Aggregate Time-PXA	3.0	Channel Loading and Aggregate Closing Time
PXA Read	3.0.0.9	Signal Generator Screen Capture
SGXProject.exe	1.7	Radar Waveform Generation and Download

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

11.1.5. SETUP OF EUT (CLIENT MODE)

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

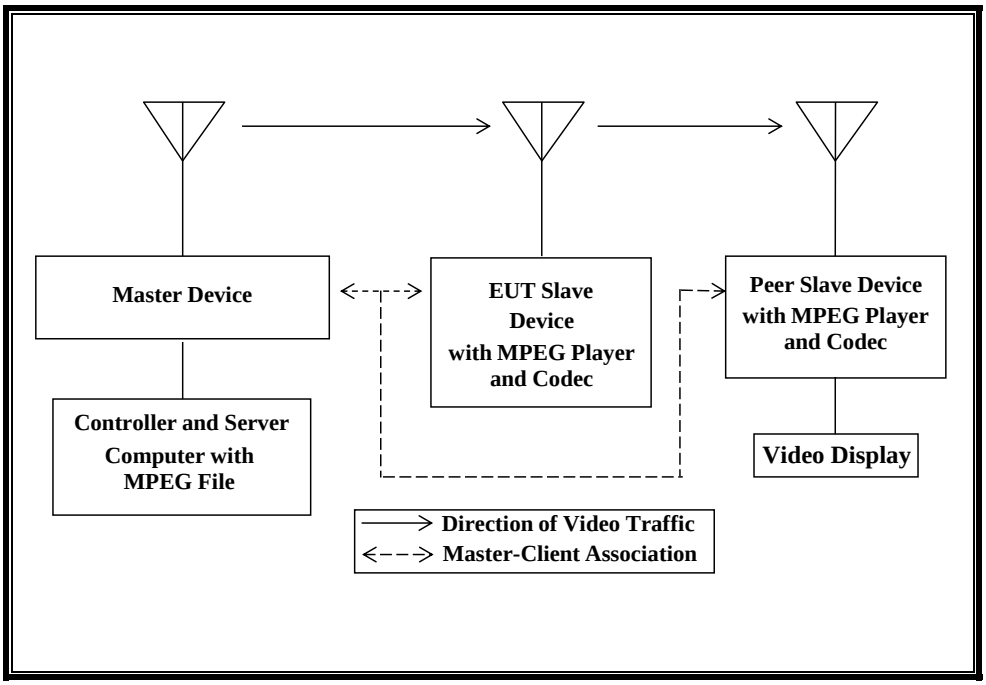
The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
802.11a/b/g/n/ac Wireless Router (Master Device)	Apple	A1521	C86LCE5GFJ1R	BCGA1521
Notebook PC (Controller/Server)	Apple	A1181	4H629022WLV	DoC
AC Adapter (Notebook PC)	Apple	A1343	C0424760BMPF1Y7AB	DoC

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

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

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

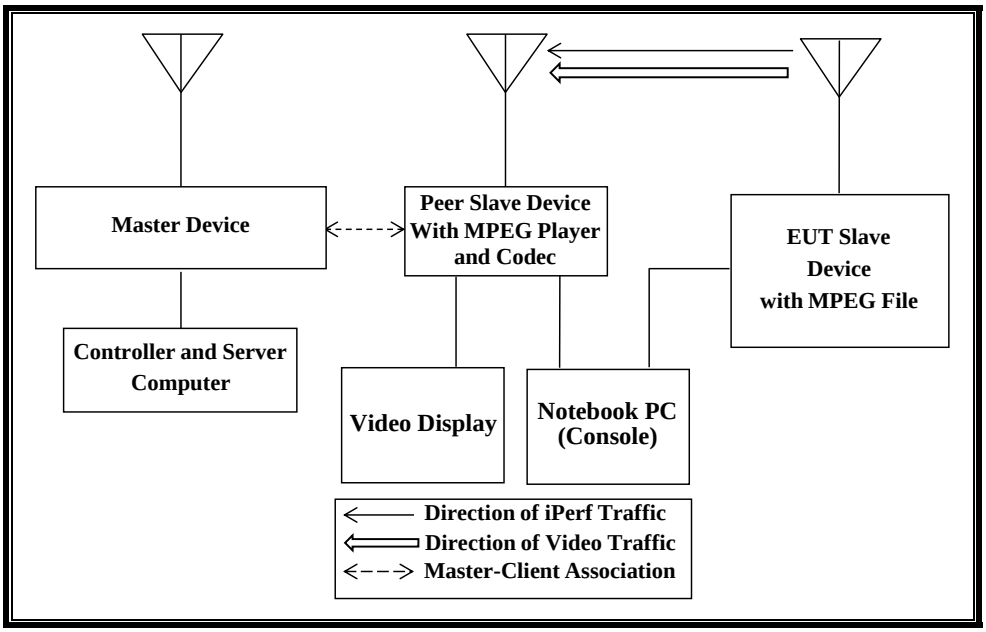
The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
802.11a/b/g/n/ac Wireless Router (Master Device)	Apple	A1521	C86LCE5GFJ1R	BCGA1521
Notebook PC (Controller/Server)	Apple	A1181	4H629022WLV	DoC
AC Adapter (Notebook PC)	Apple	A1343	C0424760BMPF1Y7AB	DoC
Peer Slave Device	Apple	A1625	C07S4033HHFP	BCGA1625
15" LCD TV (Video Display)	Polaroid	TLX-01511C	02006	DoC

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

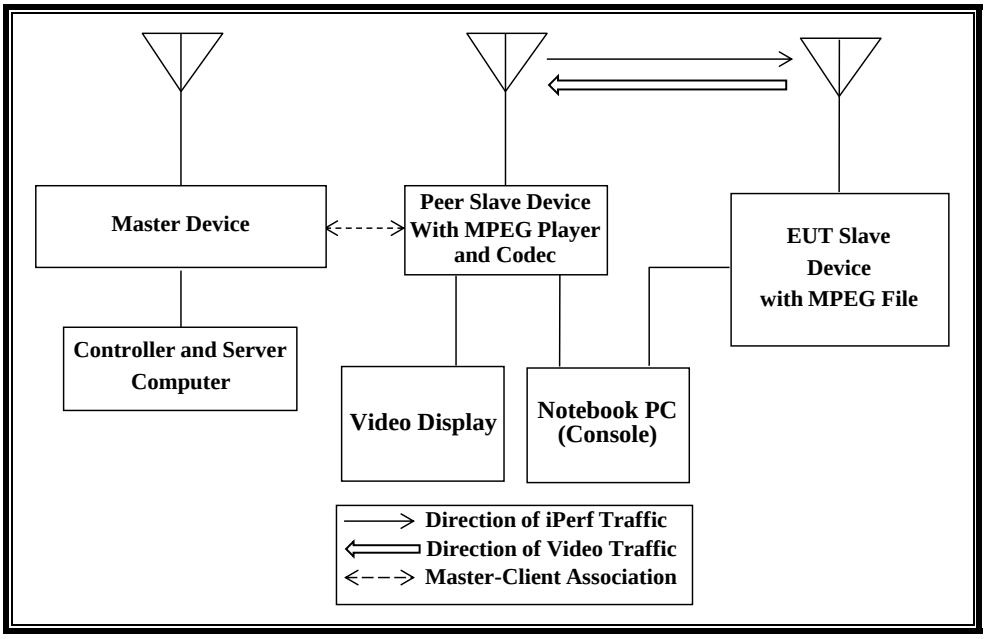
11.1.7. SETUP OF EUT (PEER TO PEER MODE)

RADIATED METHOD EUT TEST SETUP WHEN MONITORING THE EUT



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

RADIATED METHOD EUT TEST SETUP WHEN MONITORING THE PEER SLAVE DEVICE)



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 Router (Master Device)	Apple	A1521	C86LCE5GFJ1R	BCGA1521
Notebook PC (Controller/Server)	Apple	A1181	4H629022WLV	DoC
AC Adapter (Notebook PC)	Apple	A1343	C0424760BMPF1Y7AB	DoC
Apple TV (Peer Slave Device)	Apple	A1625	C07S4033HHFP	BCGA1625
Notebook PC (Peer Console)	Apple	A1466	C2QLN093FKYR	DoC
AC Adapter (Console PC)	Apple	A1424	C06520721HYG6P4AH	DoC
15" LCD TV (Video Display)	Polaroid	TLX-01511C	02006	DoC

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

11.1.8. **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 20.33 dBm EIRP in the 5250-5350 MHz band and 21.67 dBm EIRP in the 5470-5725 MHz band.

Only UAT 2 and LAT 3 assemblies are utilized with the EUT has a gain of -3.74 dBi and -1.09 dBi in the 5250-5350 MHz band and -0.75 dBi and -0.96 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 two transmitter/receiver chains, each 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 streaming the compressed version of the video test file “6 ½ Magic Hours” from the Master to the Slave.

In **Client to Client mode** WLAN traffic is generated by streaming the compressed version of the video test file “6 ½ Magic Hours” from the Master to the Slave and then on to the peer slave device in full motion video mode using QuickTime media player and embedded proprietary AirPlay software.

In **Peer to Peer mode while monitoring the EUT**, WLAN traffic is generated with the combination of streaming the compressed version of the video test file “6 ½ Magic Hours” from the EUT to the Peer Slave Device in full motion video mode using QuickTime media player and embedded proprietary AirPlay software and Iperf from the EUT to the Peer Slave Device.

In **Peer to Peer mode while monitoring the Peer Slave Device**, WLAN traffic is generated with the combination of streaming the compressed version of the video test file “6 ½ Magic Hours” from the EUT to the Peer Slave Device in full motion video mode using QuickTime media player and embedded proprietary AirPlay software and Iperf from the Peer Slave Device to the EUT.

While performing Peer to Peer Mode testing only the Peer Slave Device is associated to the Master Device.

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.

The Peer to Peer mode has been reviewed and approved as compliant with the DFS requirements for client devices by the FCC via KDB enquiry. The enquiry confirmed that the test cases used adequately demonstrate compliance with DFS requirements for client devices.

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 access point is revision 7.7.4 f0 dev.

The software installed in the EUT is 11.0 (15A282).

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 revision 7.7.4 f0 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

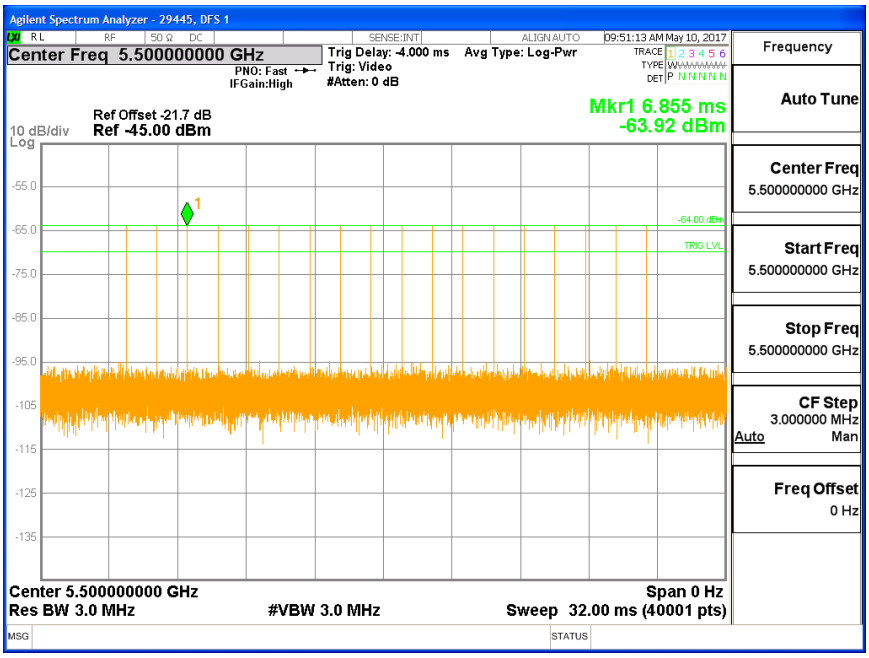
11.2.1. TEST CHANNEL

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

11.2.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

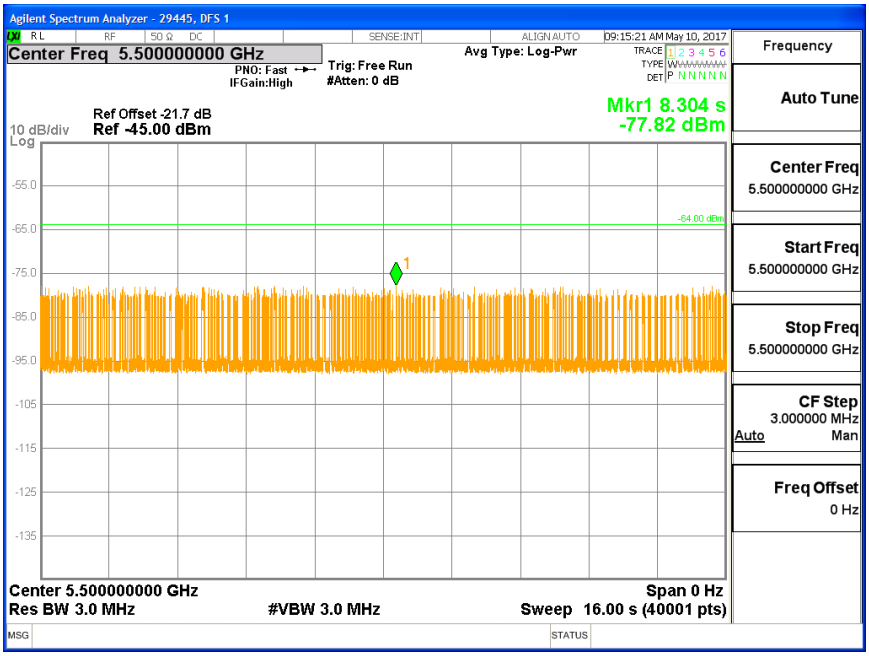
SHORT PULSE RADAR TYPE 0 AT MASTER



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

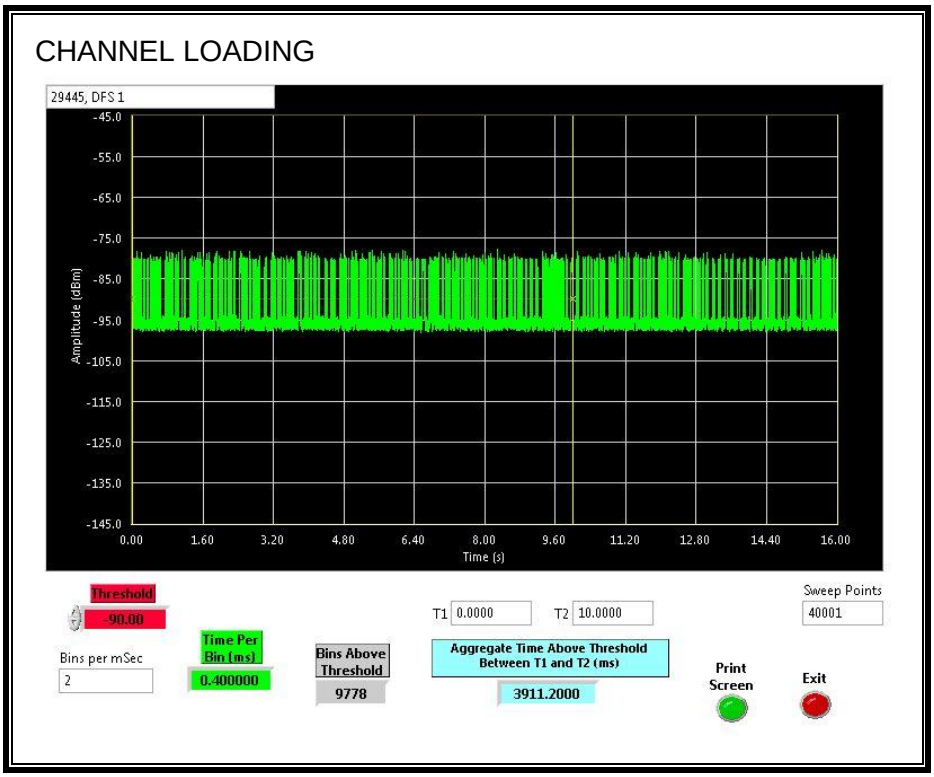
TRAFFIC

SLAVE 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 39.11%

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).

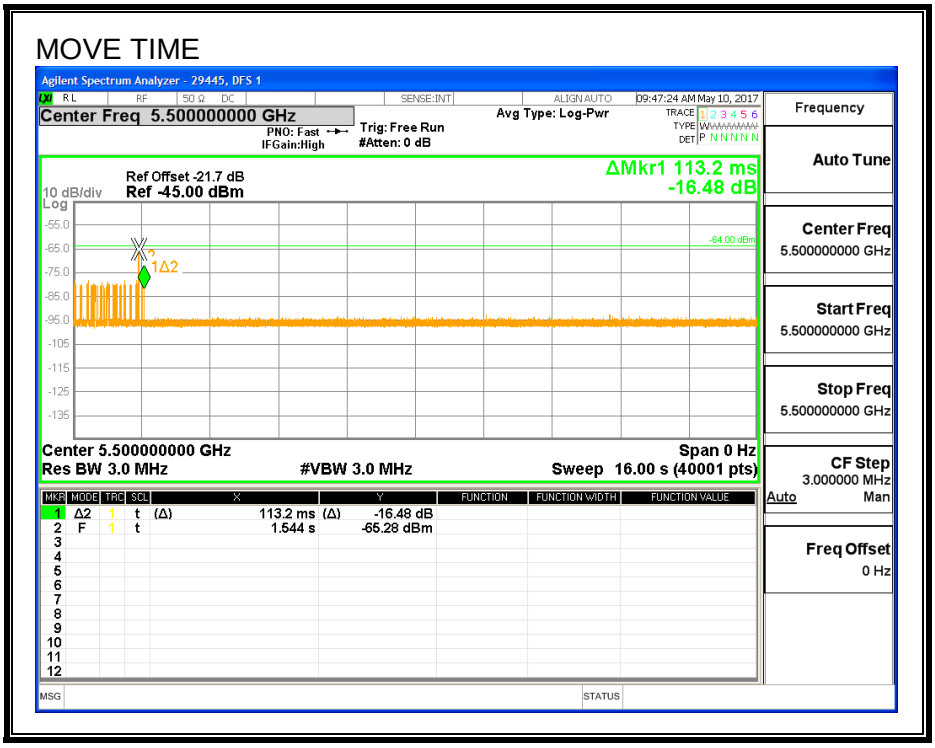
RESULTS

Channel Move Time (sec)	Limit (sec)
0.1132	10

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

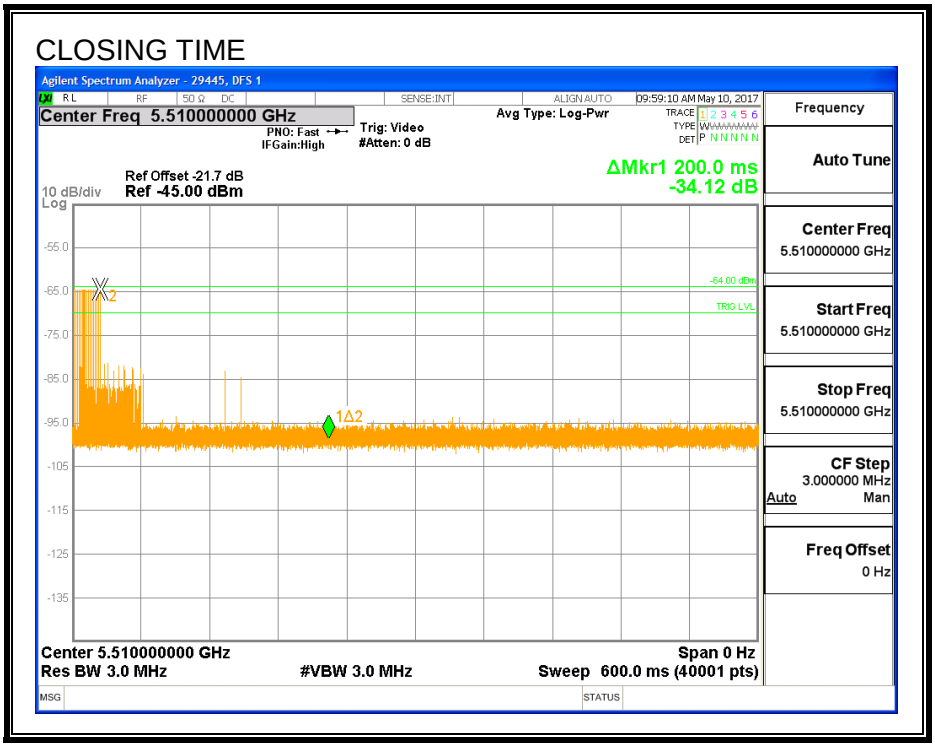
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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

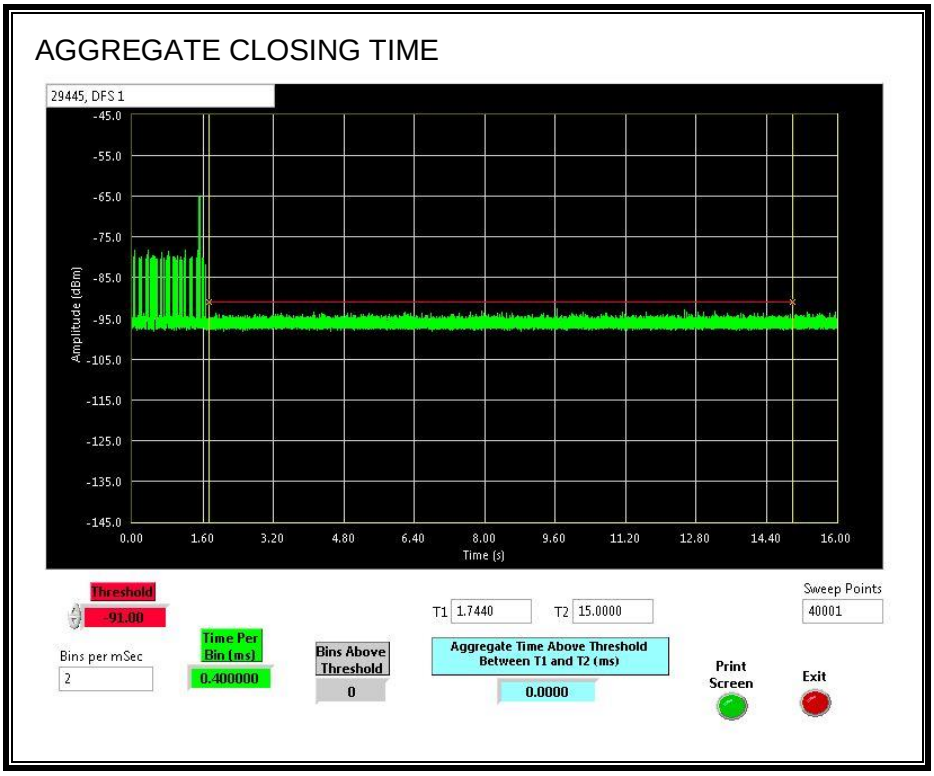
CHANNEL CLOSING TIME



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

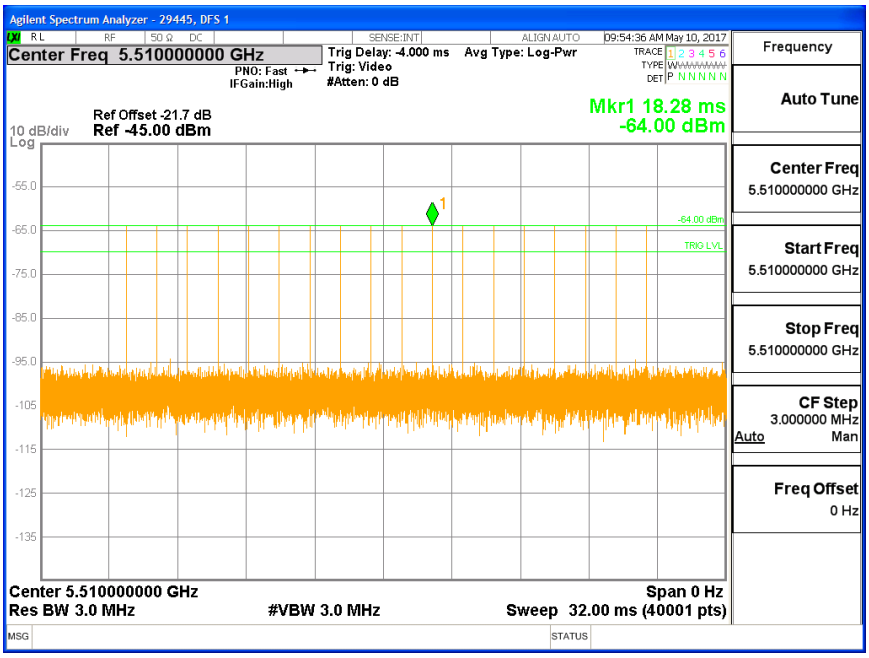
11.3.1. TEST CHANNEL

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

11.3.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

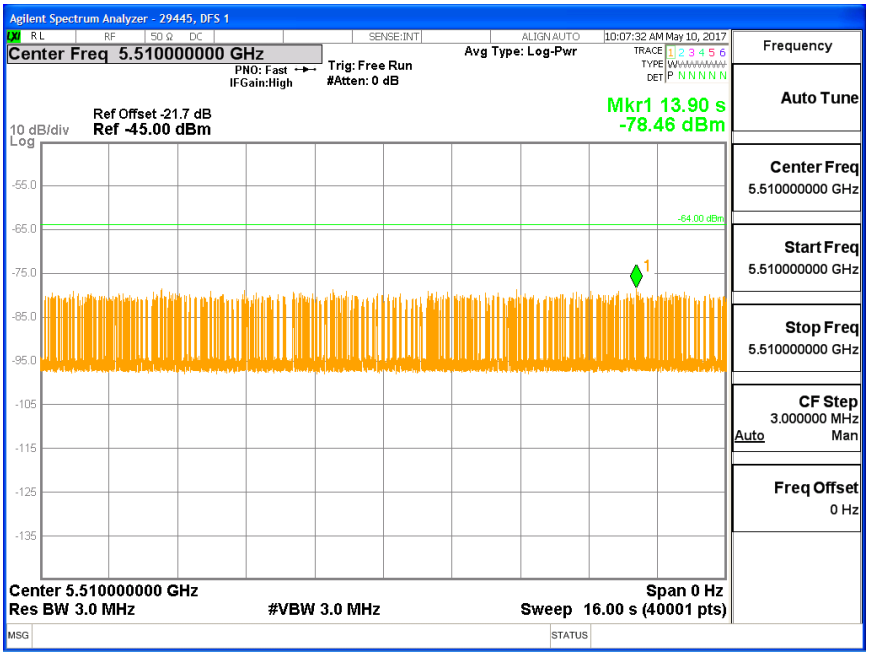
SHORT PULSE RADAR TYPE 0 AT MASTER



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

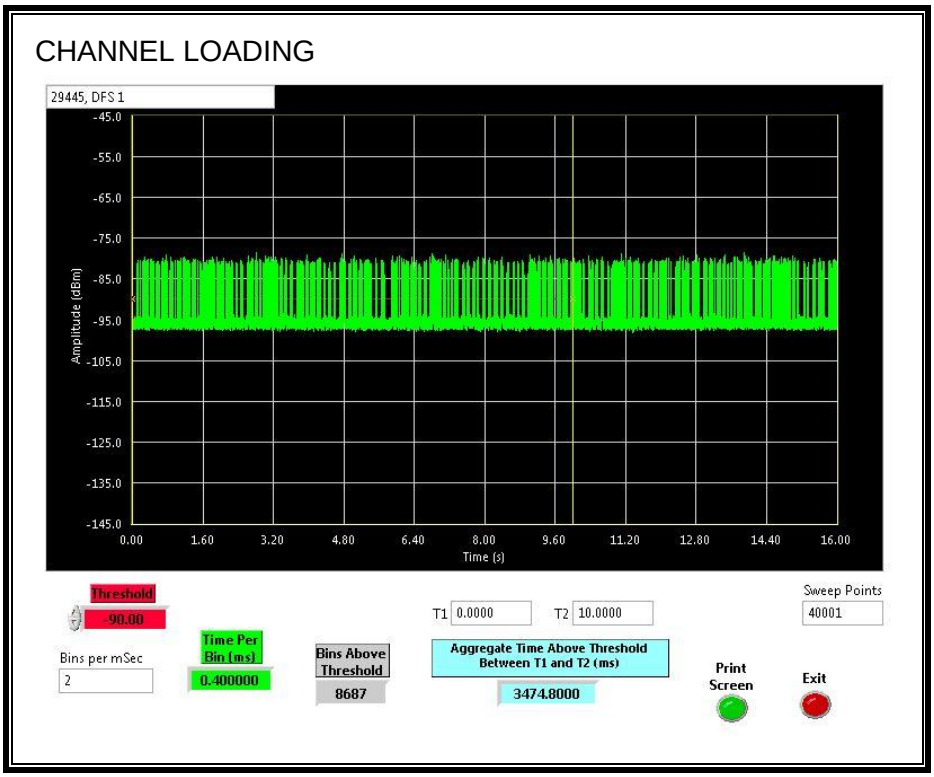
TRAFFIC

SLAVE 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 34.74%

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).

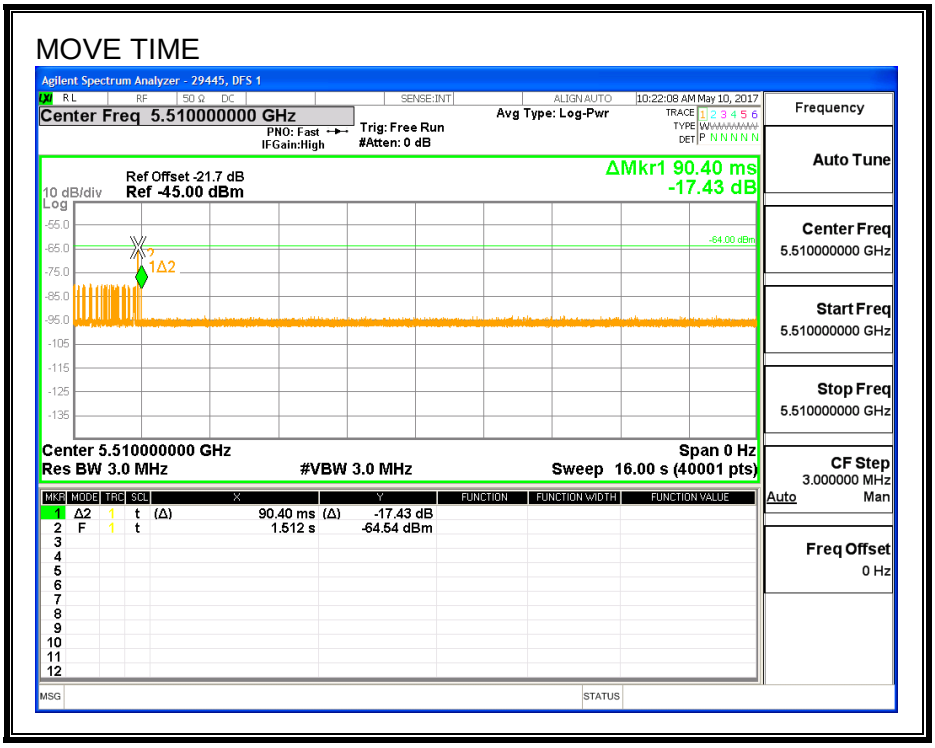
RESULTS

Channel Move Time (sec)	Limit (sec)
0.0904	10

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

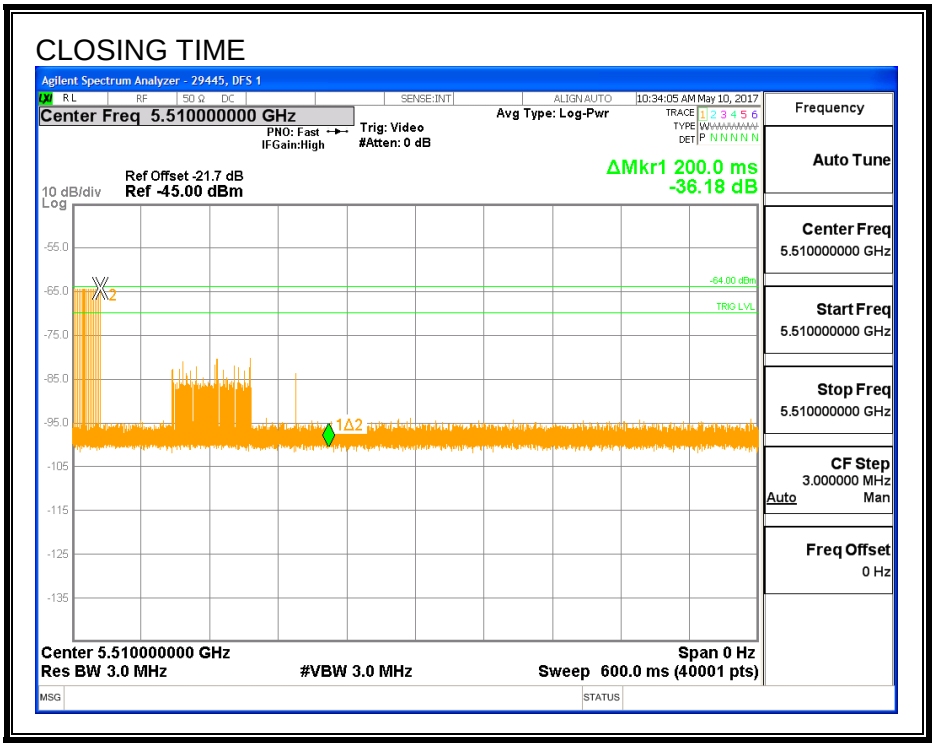
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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.

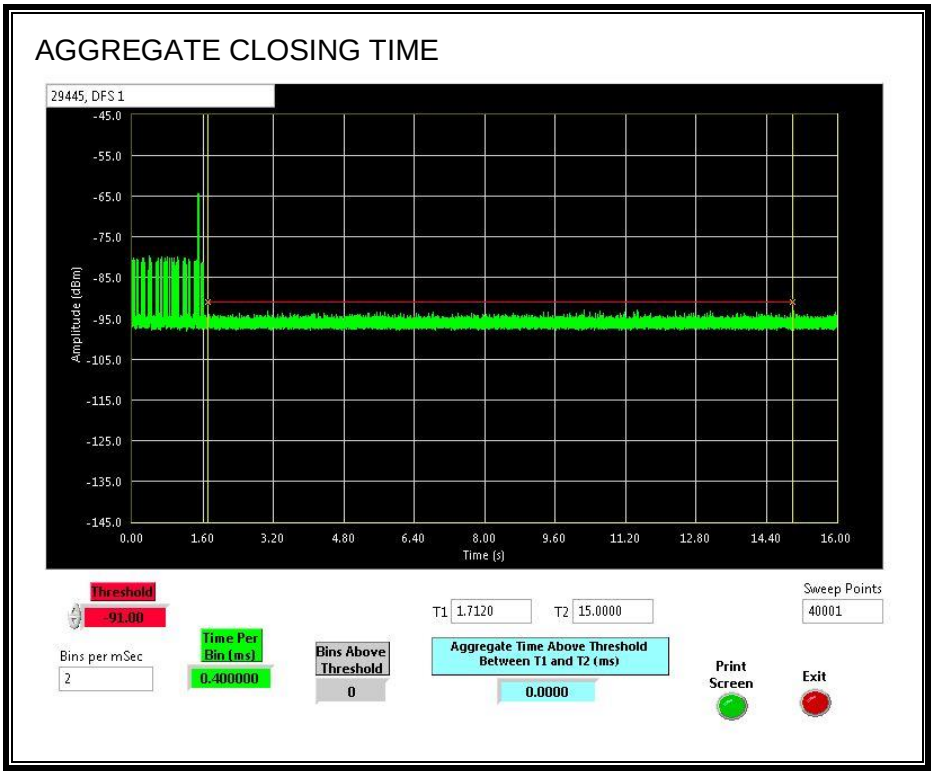
CHANNEL CLOSING TIME



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

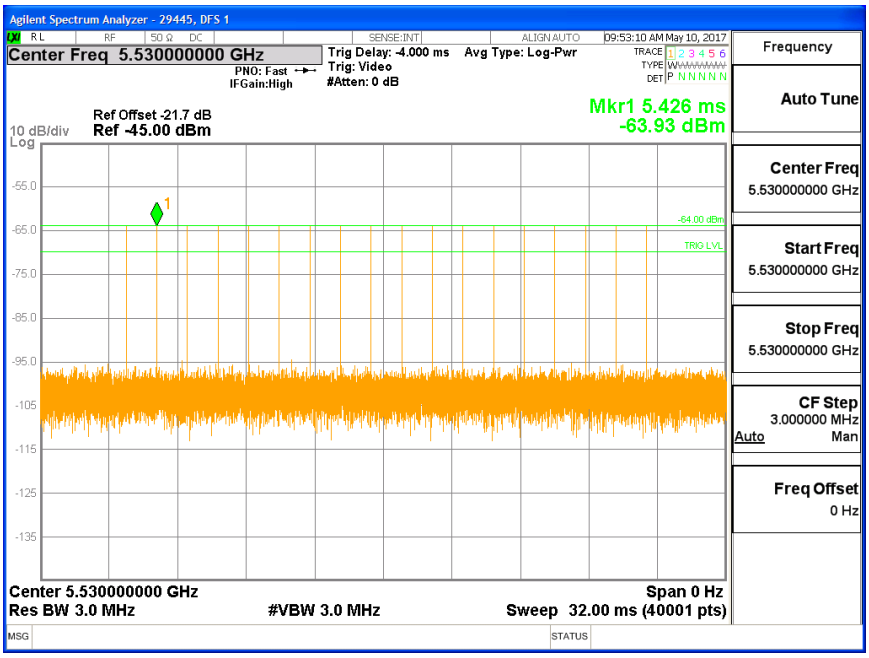
11.4.1. TEST CHANNEL

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

11.4.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

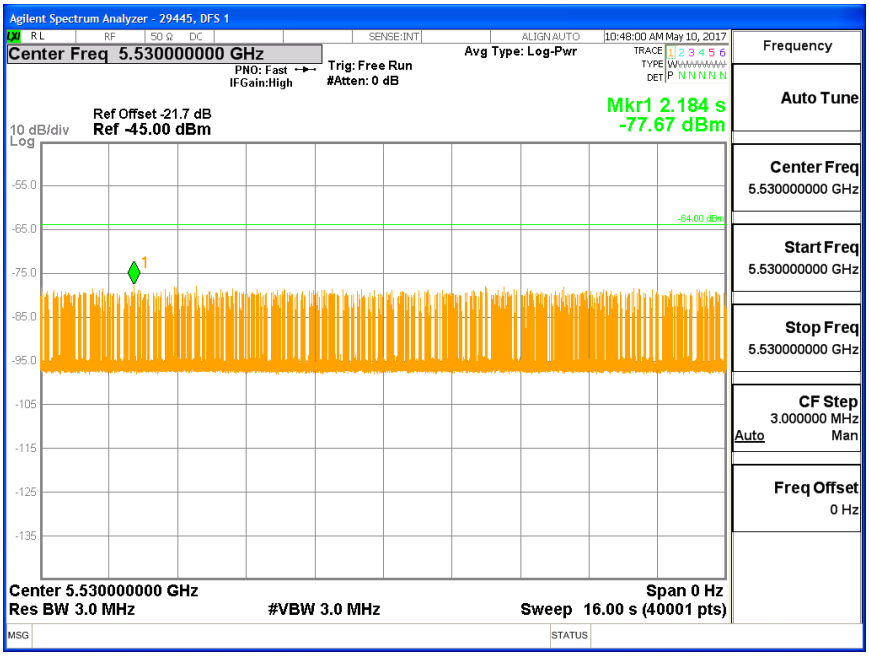
SHORT PULSE RADAR TYPE 0 AT MASTER



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

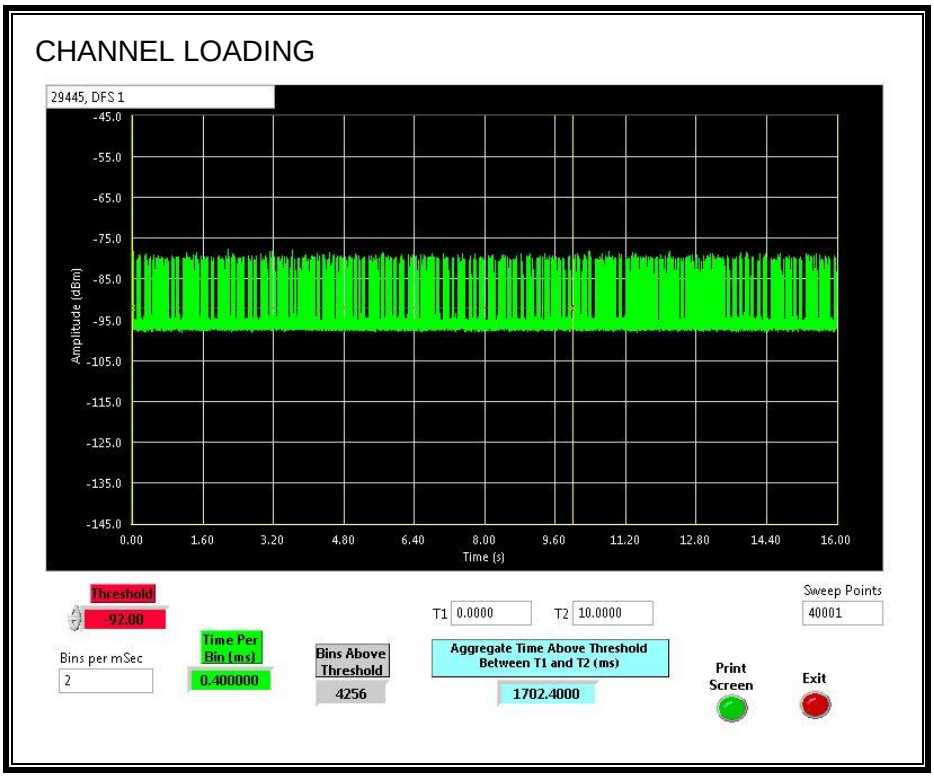
TRAFFIC

SLAVE 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 17.02%

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).

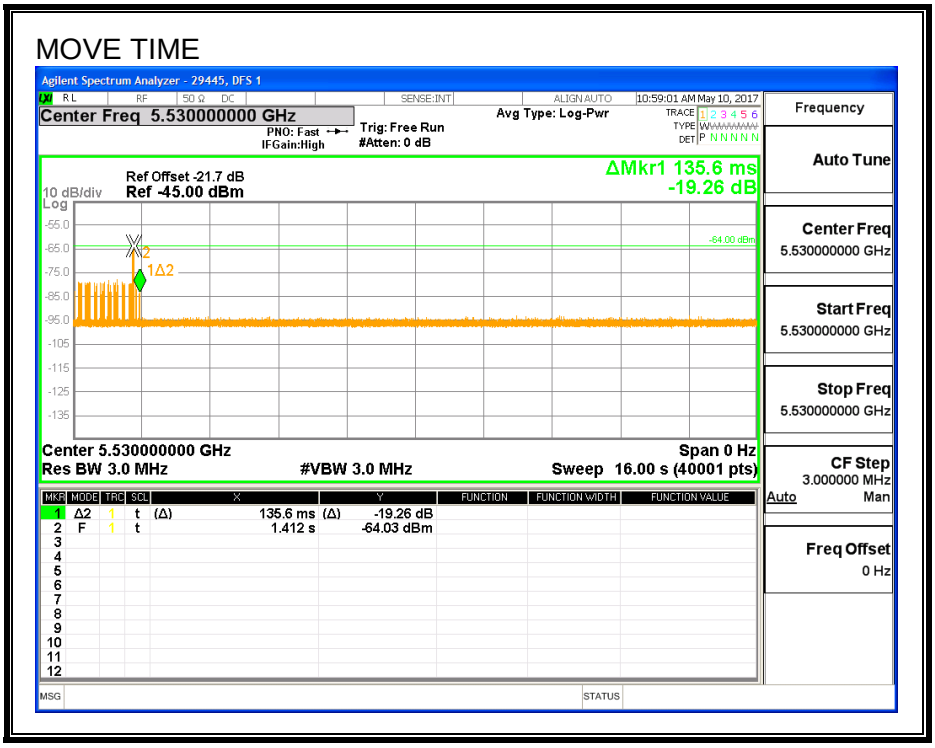
RESULTS

Channel Move Time (sec)	Limit (sec)
0.1356	10

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

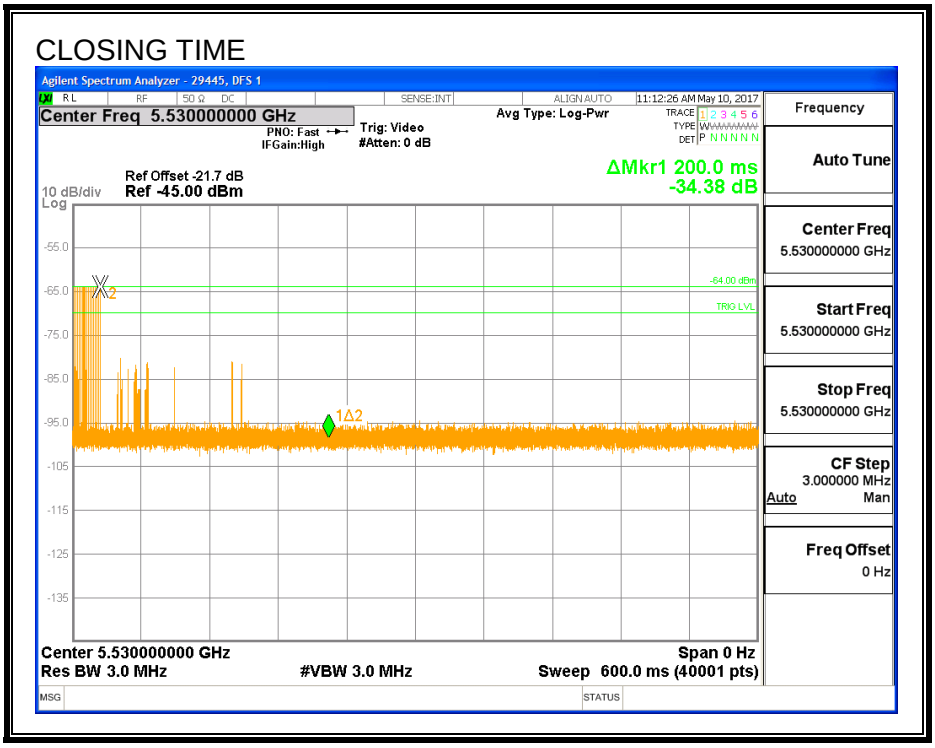
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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

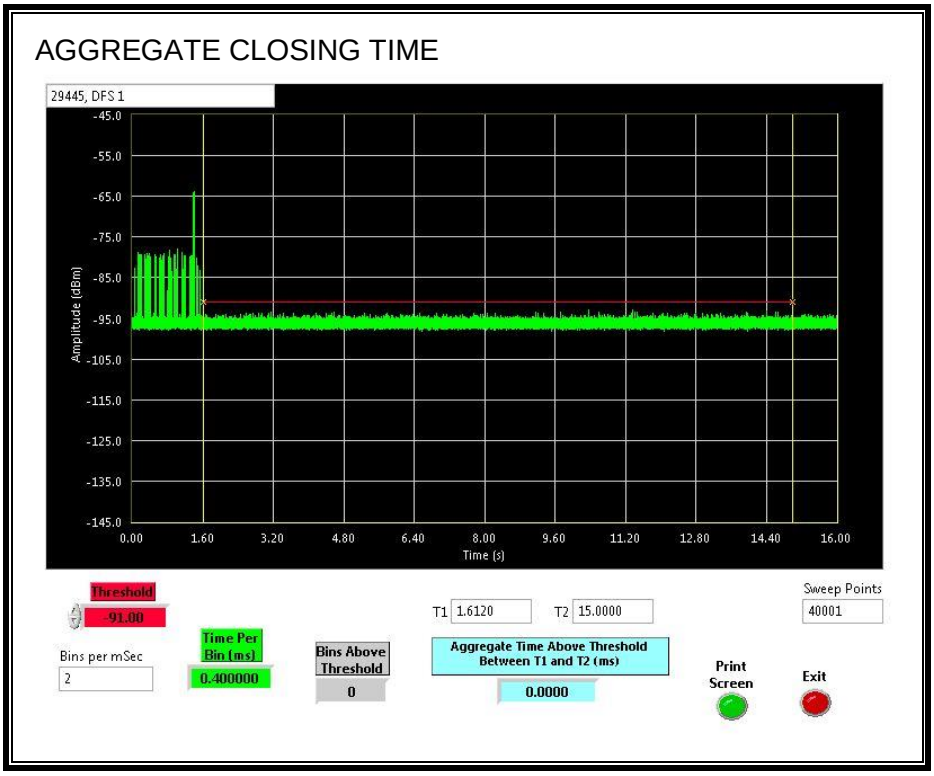
CHANNEL CLOSING TIME



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.



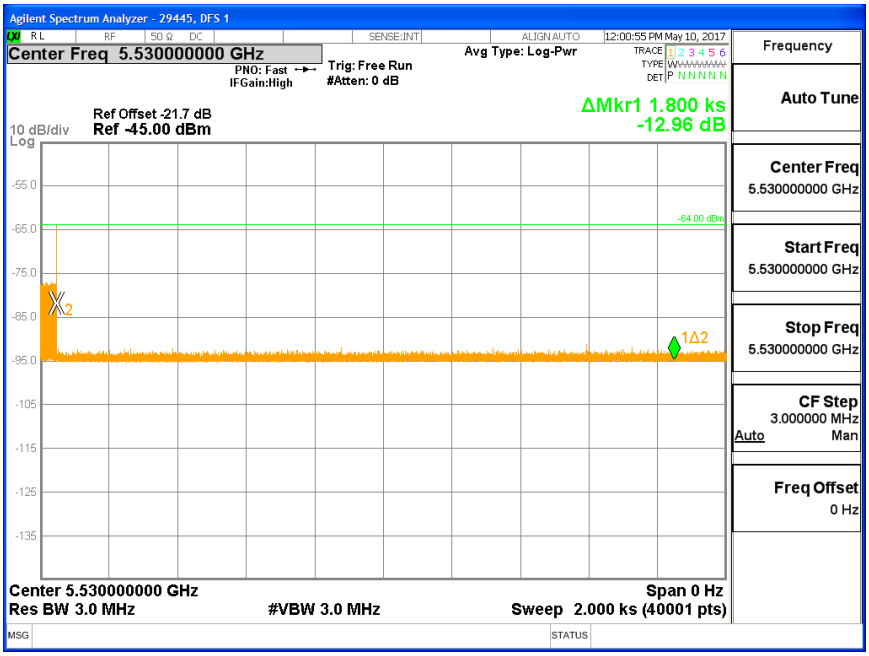
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.4.5. **30-MINUTE NON-OCCUPANCY PERIOD**

RESULTS

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

30-MINUTE NON-OCCUPANCY PERIOD



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

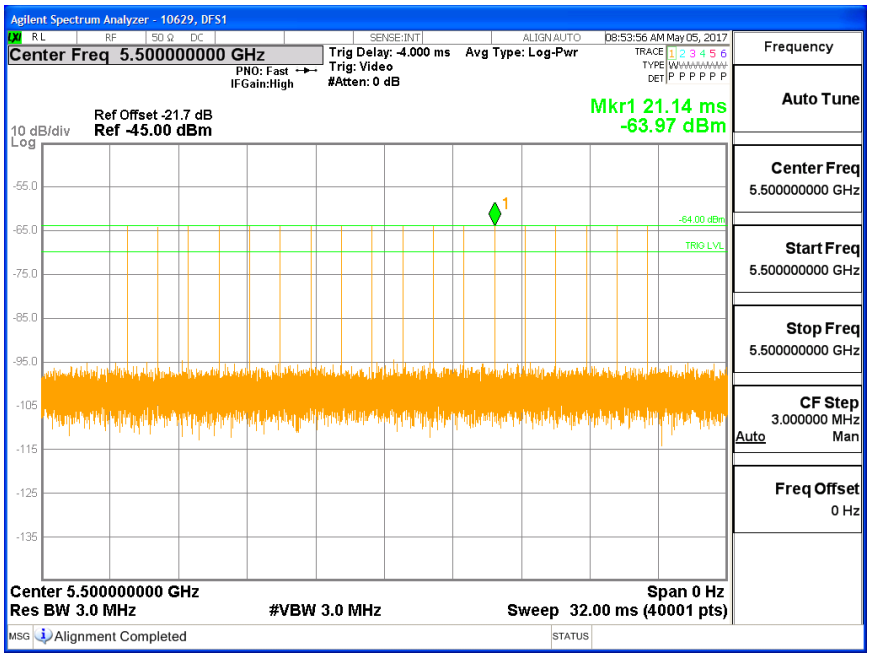
11.5.1. TEST CHANNEL

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

11.5.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

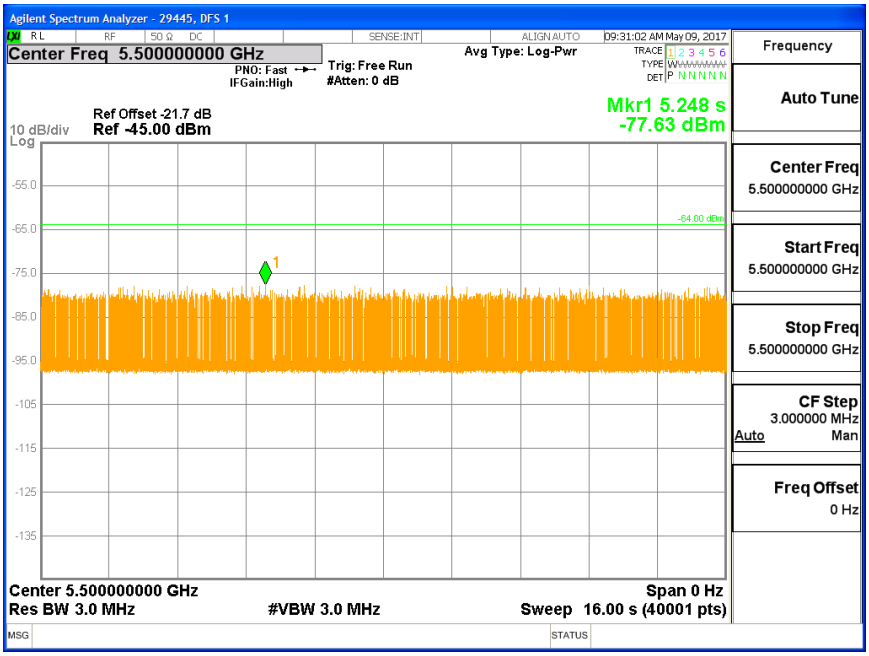
SHORT PULSE RADAR TYPE 0 AT MASTER



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

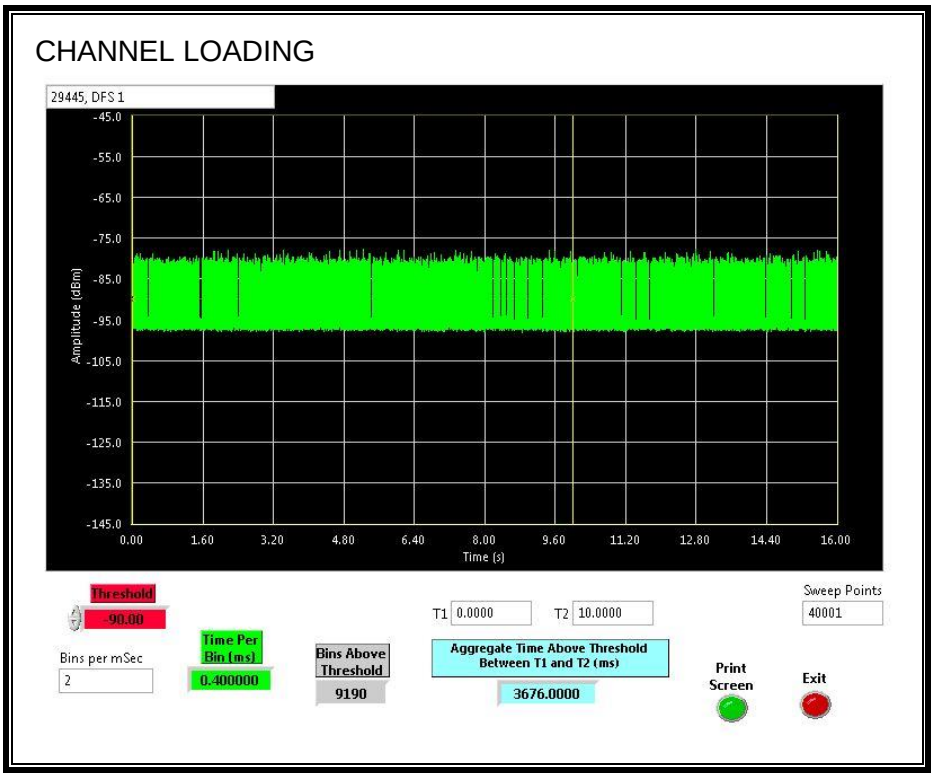
TRAFFIC

SLAVE 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 36.76%

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).

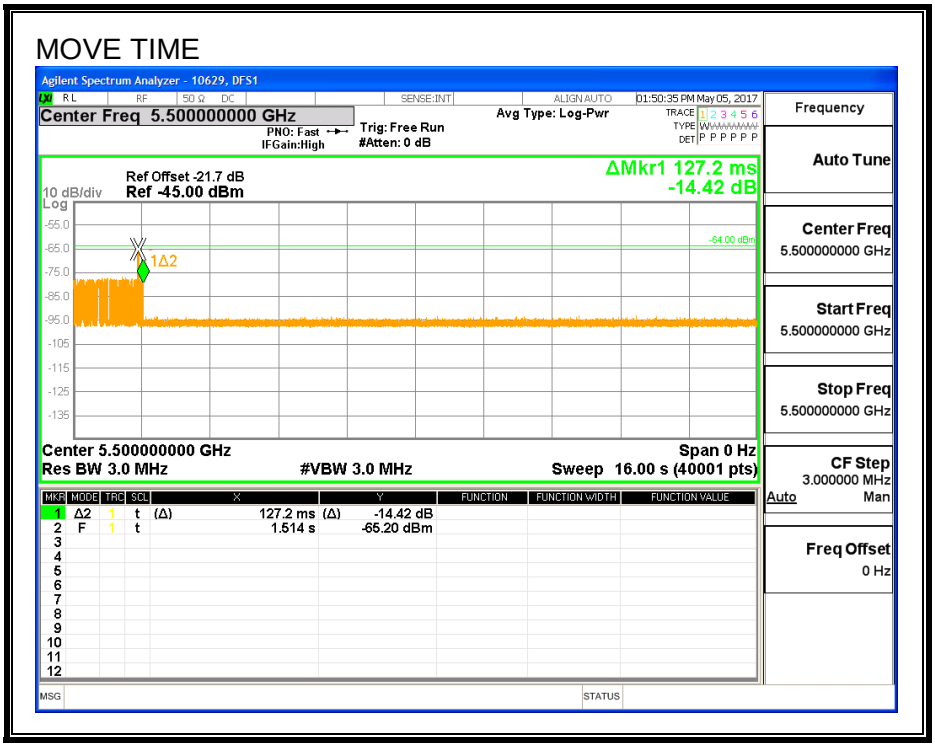
RESULTS

Channel Move Time (sec)	Limit (sec)
0.1272	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.00	60

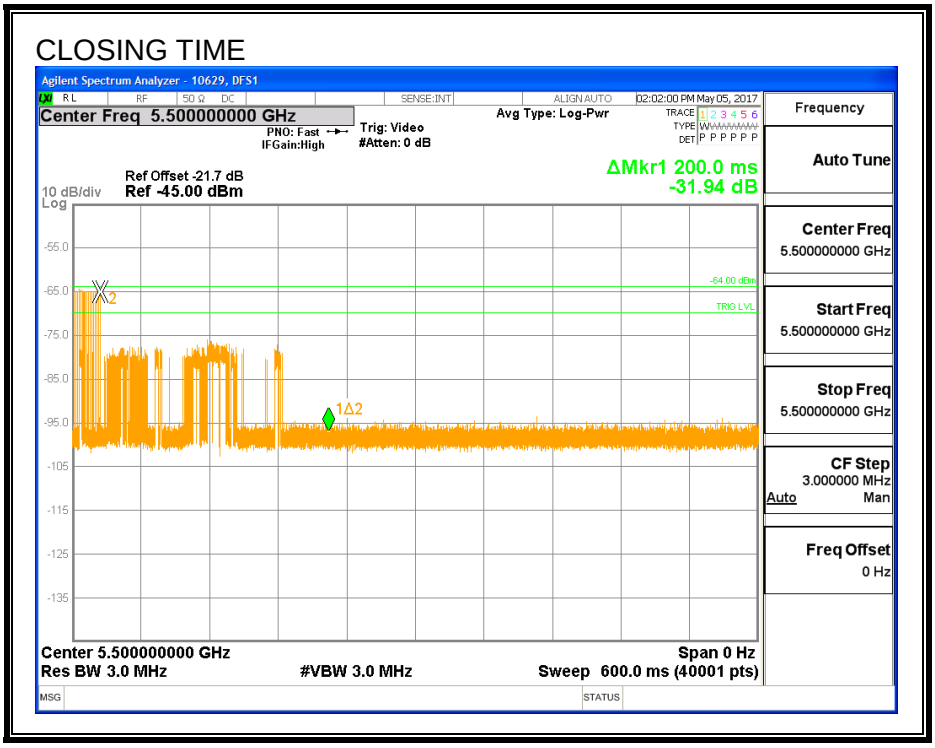
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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

CHANNEL CLOSING TIME

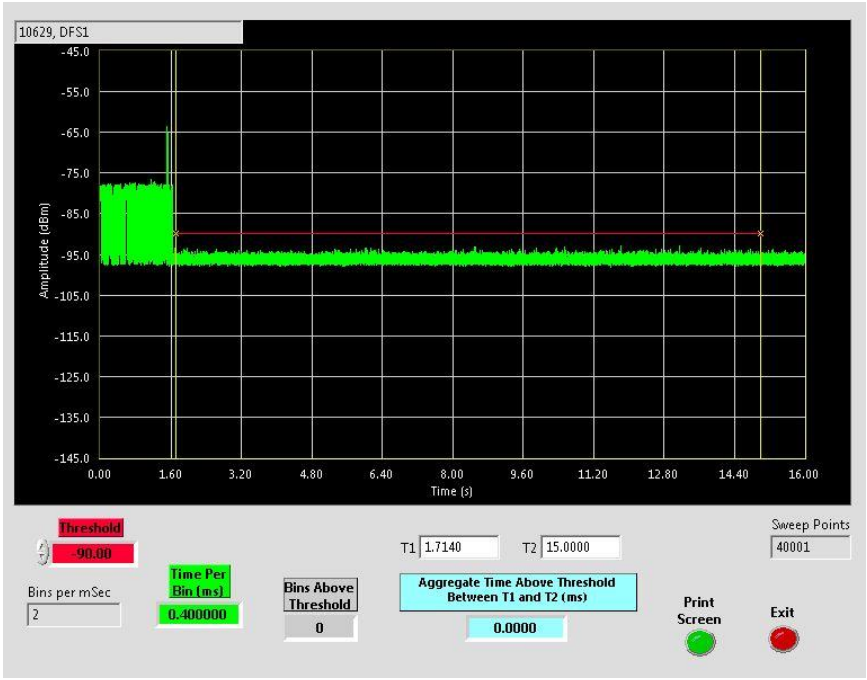


UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701J
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



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

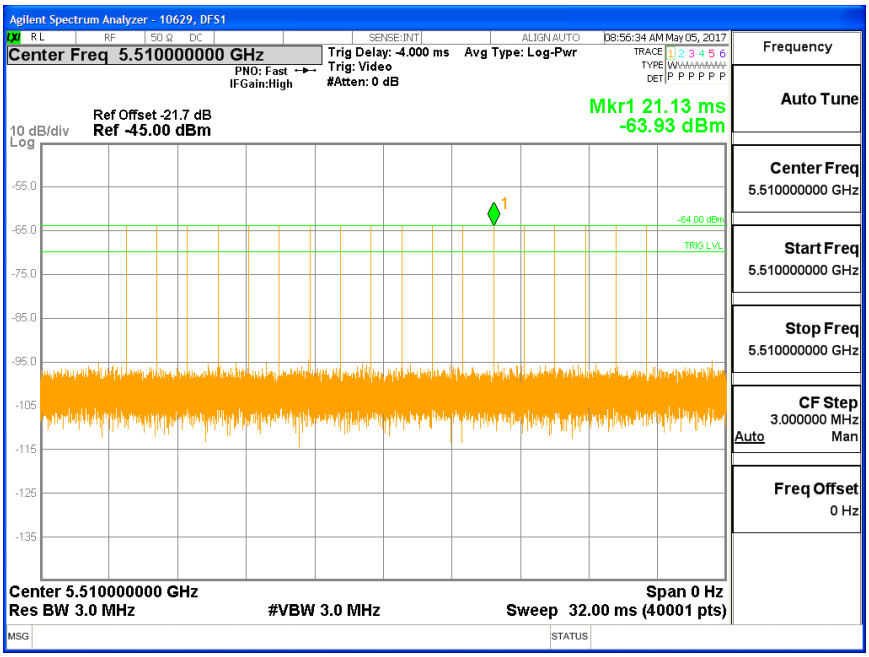
11.6.1. TEST CHANNEL

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

11.6.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

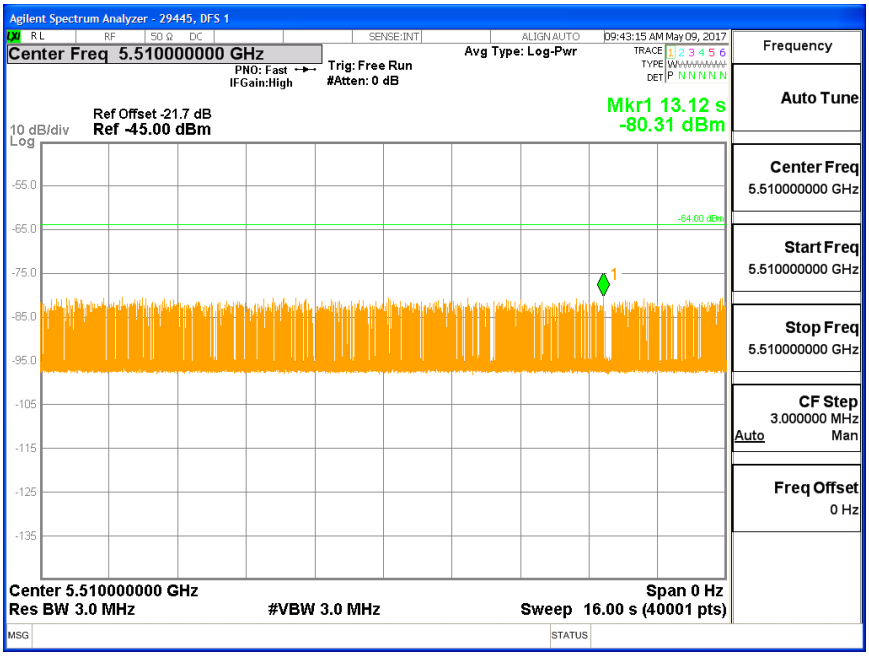
SHORT PULSE RADAR TYPE 0 AT MASTER



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

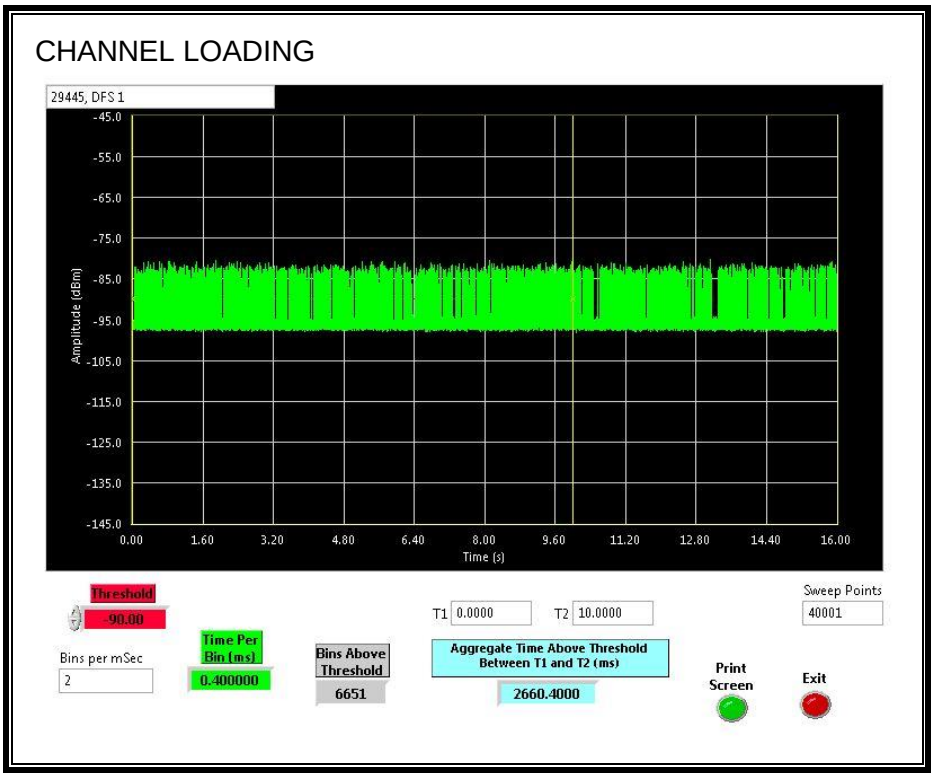
TRAFFIC

SLAVE 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 26.6%

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).

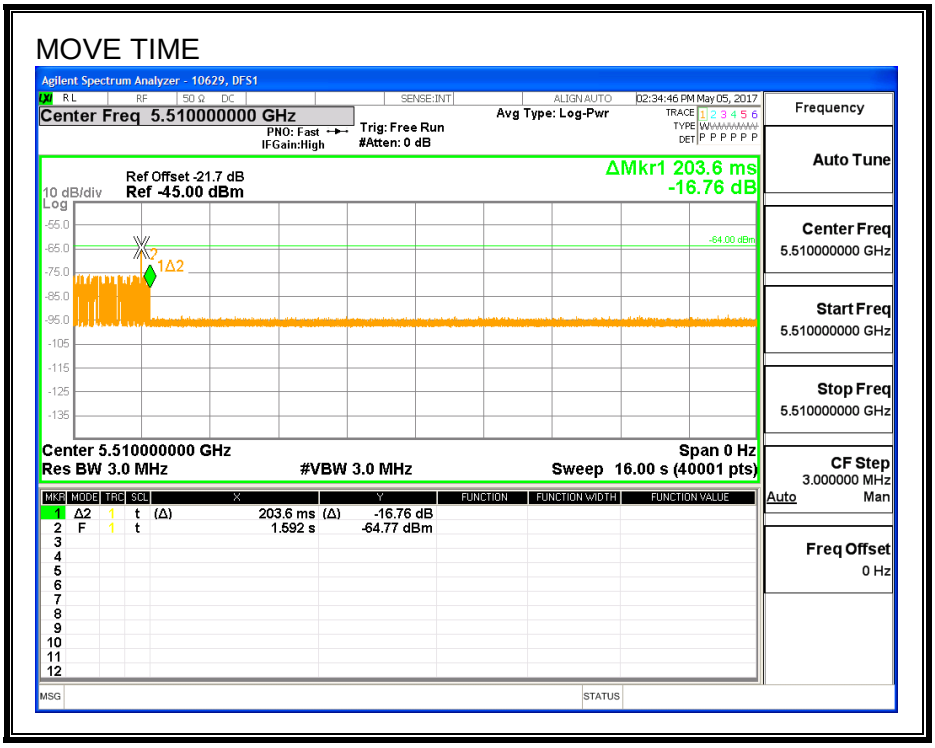
RESULTS

Channel Move Time (sec)	Limit (sec)
0.204	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
1.6	60

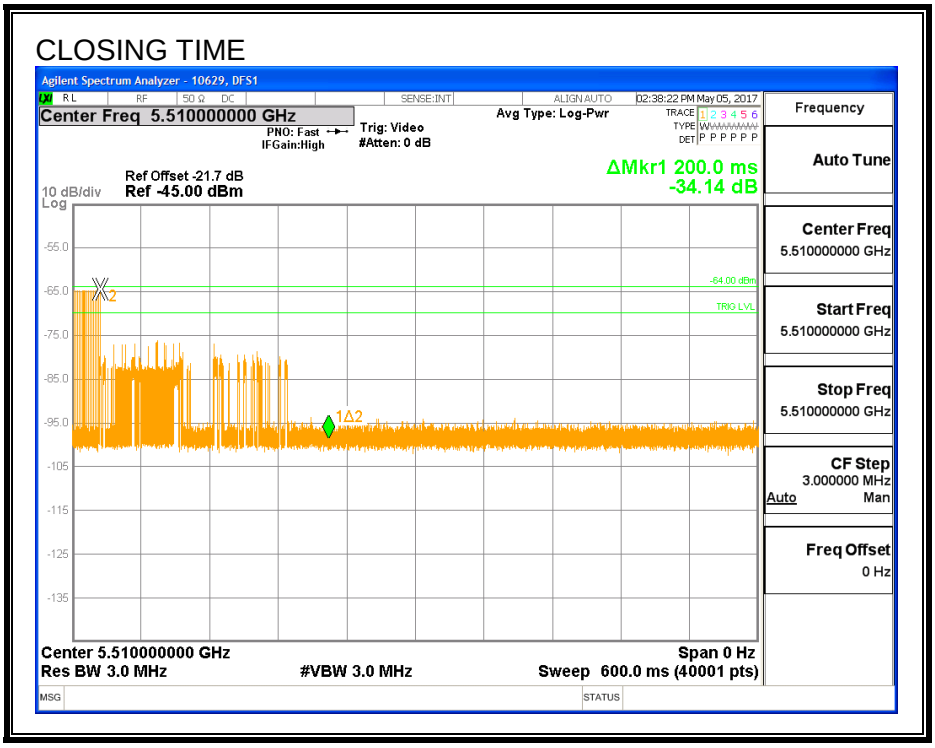
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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

CHANNEL CLOSING TIME

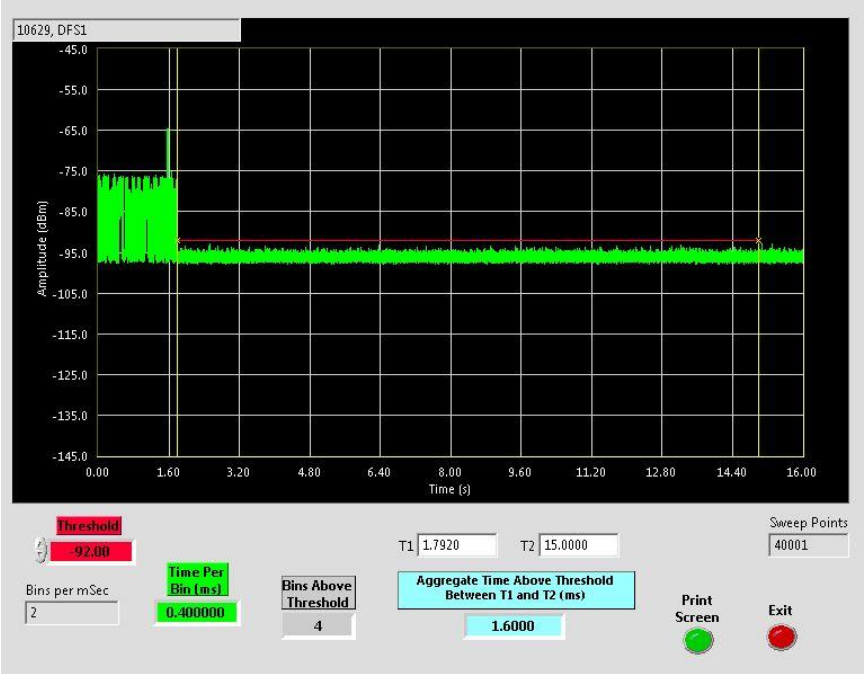


This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



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

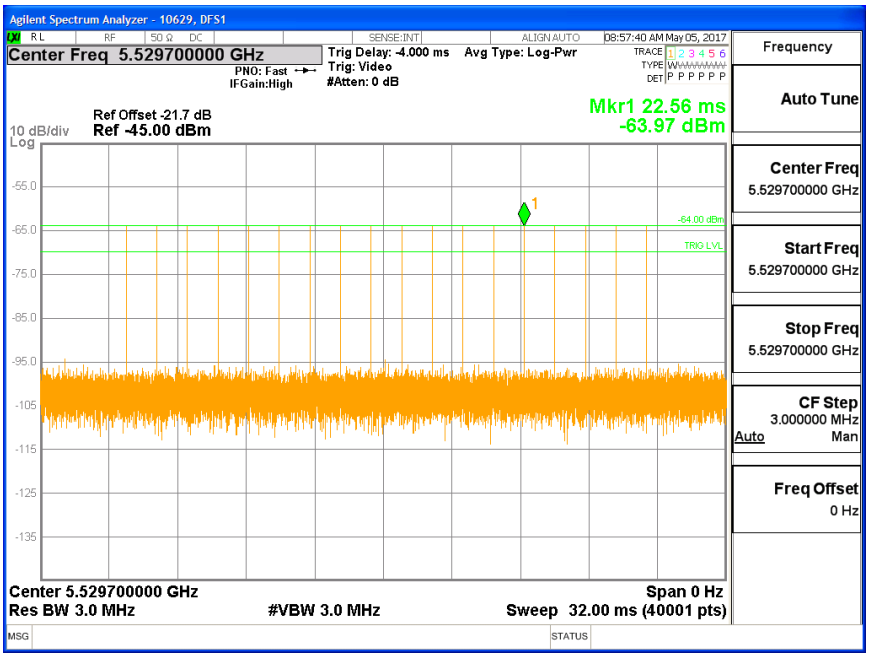
11.7.1. TEST CHANNEL

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

11.7.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

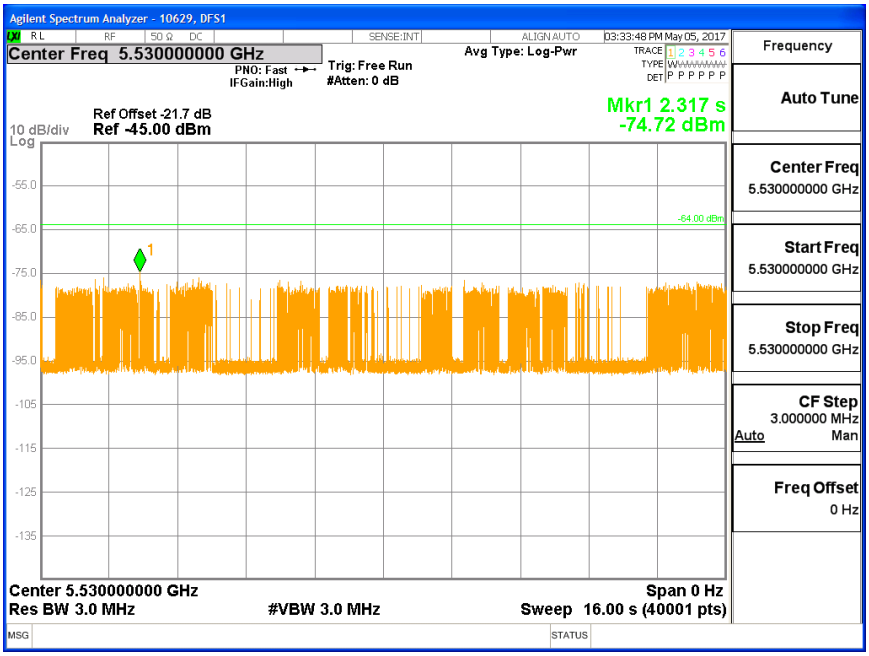
SHORT PULSE RADAR TYPE 0 AT MASTER



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

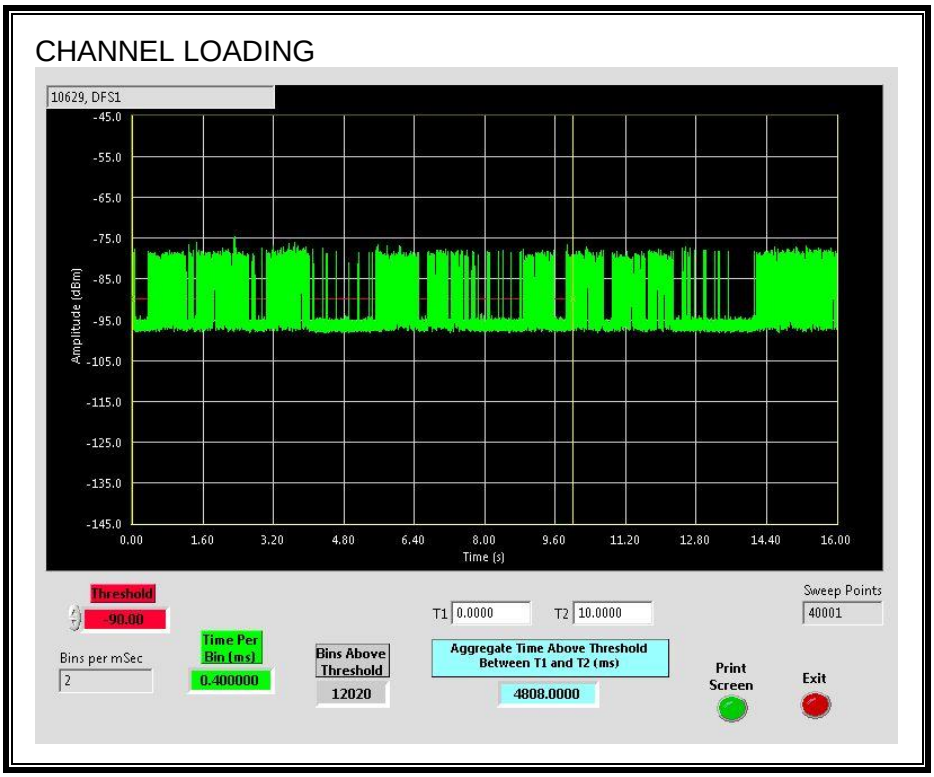
TRAFFIC

SLAVE 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 48.08%

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).

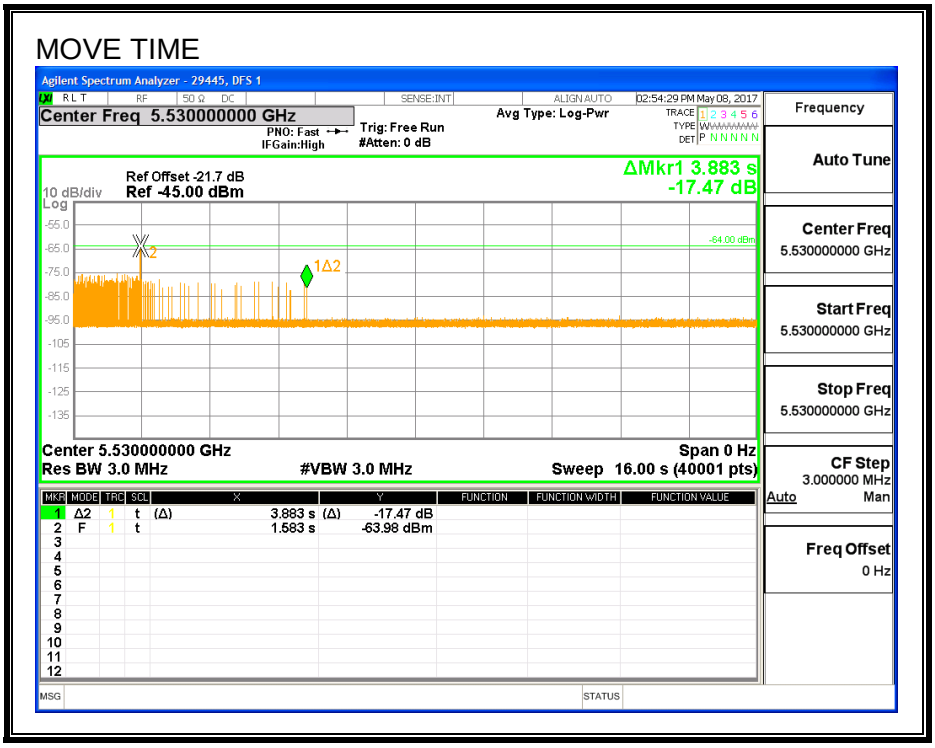
RESULTS

Channel Move Time (sec)	Limit (sec)
1.583	**10**

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
17.6	**60**

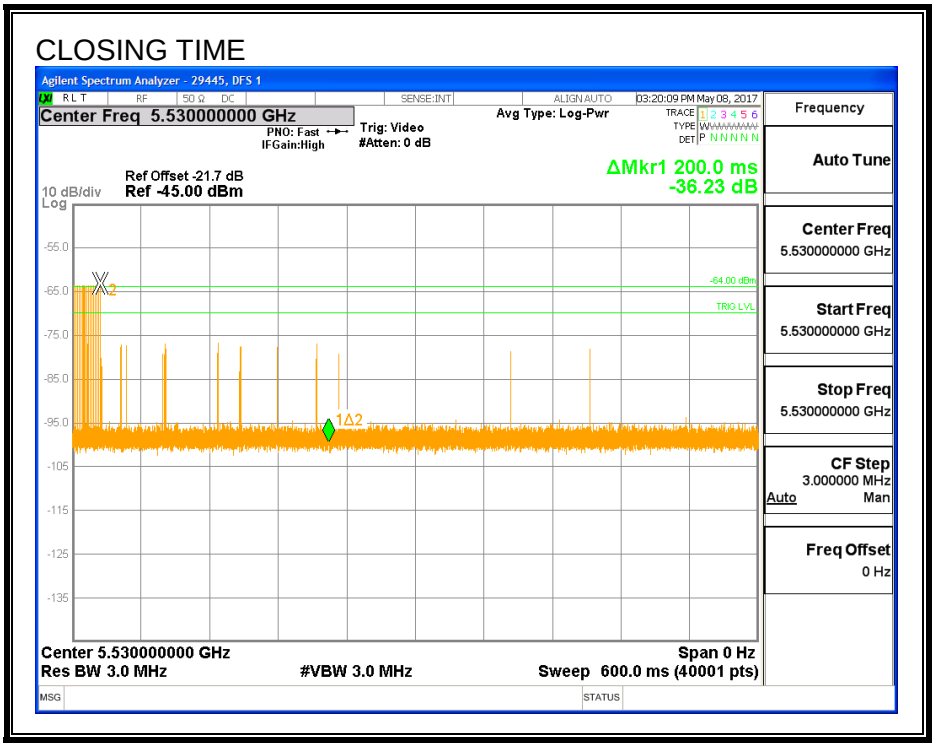
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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

CHANNEL CLOSING TIME

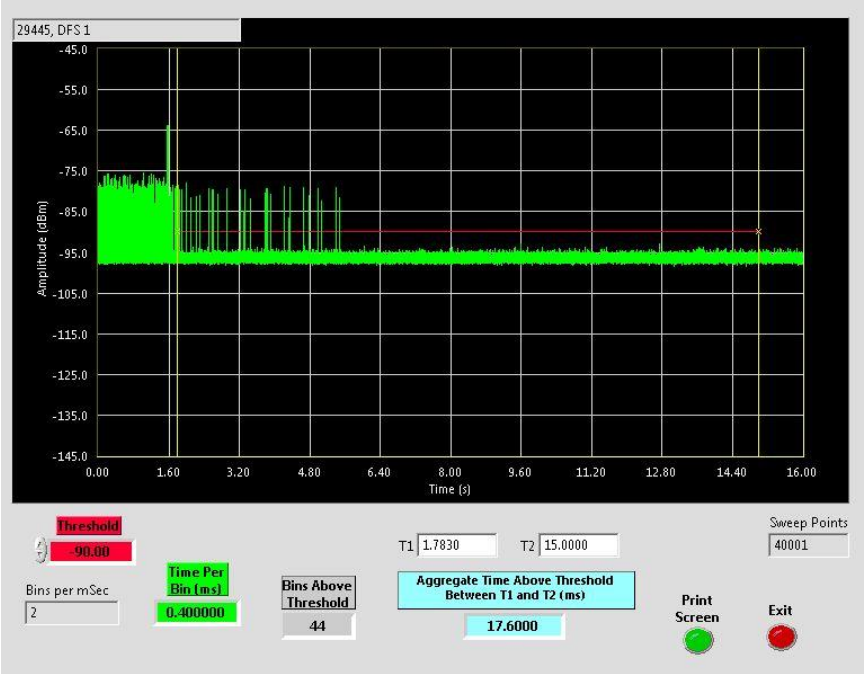


This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



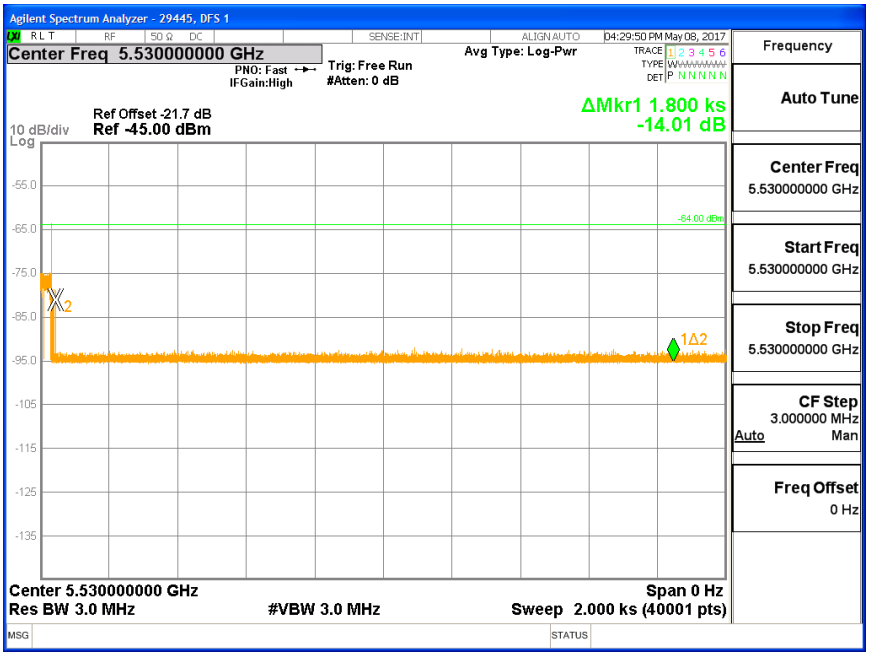
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.7.5. 30-MINUTE NON-OCCUPANCY PERIOD

RESULTS

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

30-MINUTE NON-OCCUPANCY PERIOD



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

11.8. PEER TO PEER MODE EUT RESULTS FOR 20 MHz BANDWIDTH

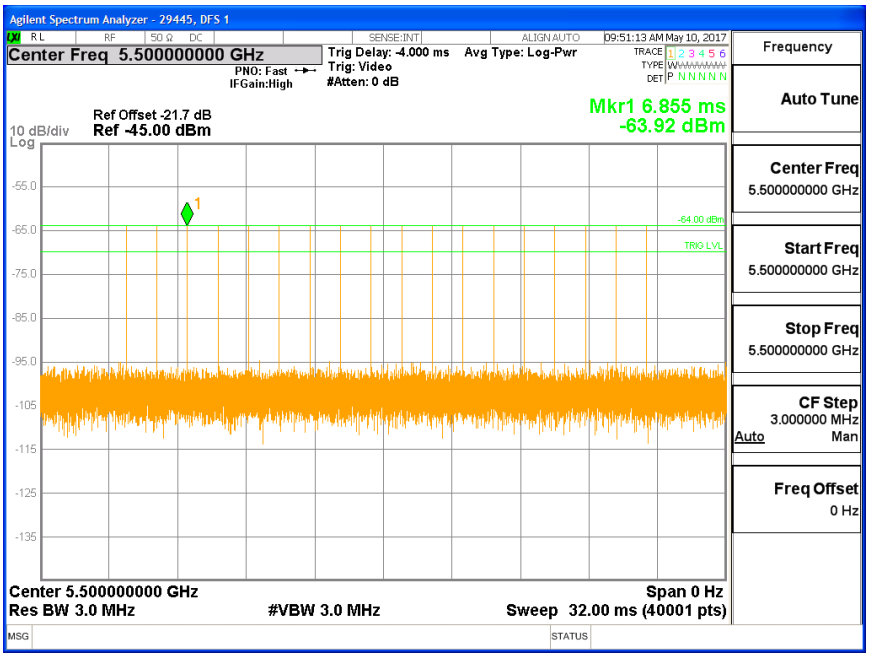
11.8.1. TEST CHANNEL

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

11.8.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

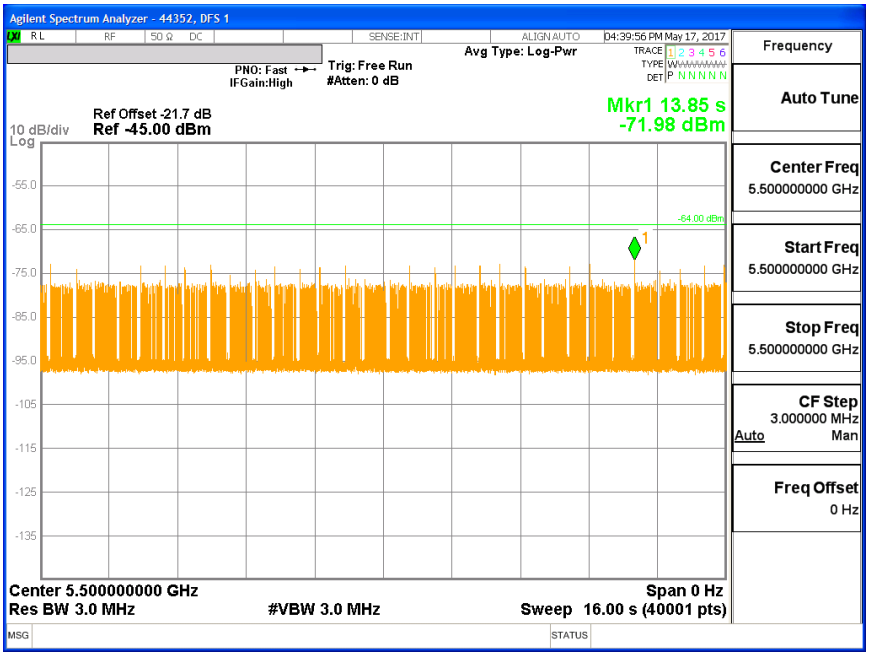
SHORT PULSE RADAR TYPE 0 AT MASTER



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

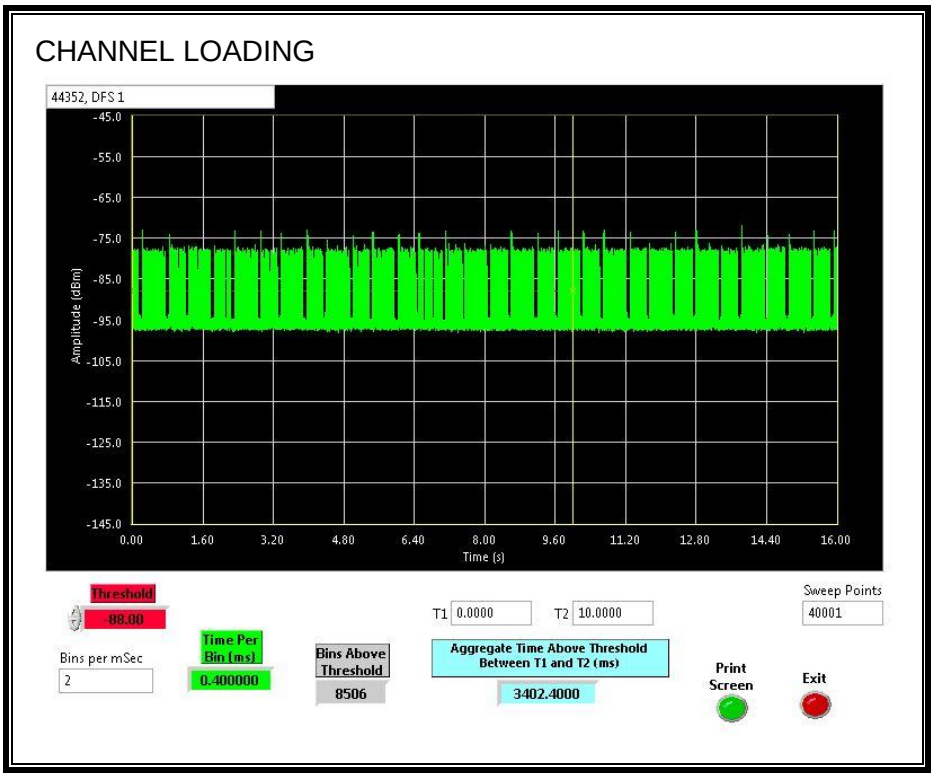
TRAFFIC

SLAVE TRAFFIC



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.

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 34.024%

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

11.8.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.8.4. 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).

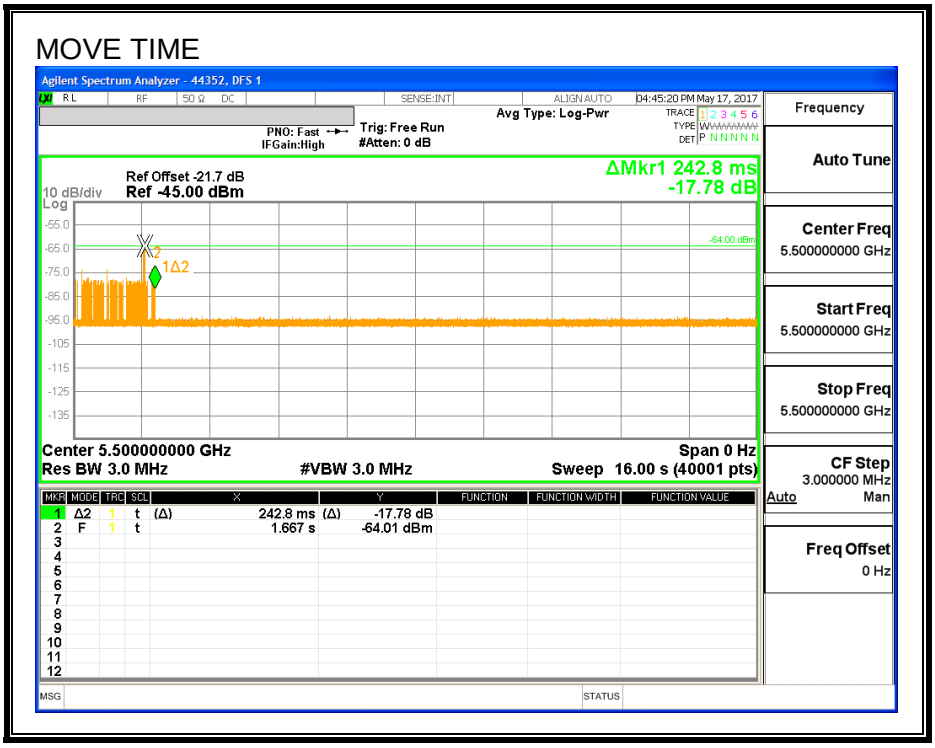
RESULTS

Channel Move Time (sec)	Limit (sec)
0.243	**10**

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
13.2	**60**

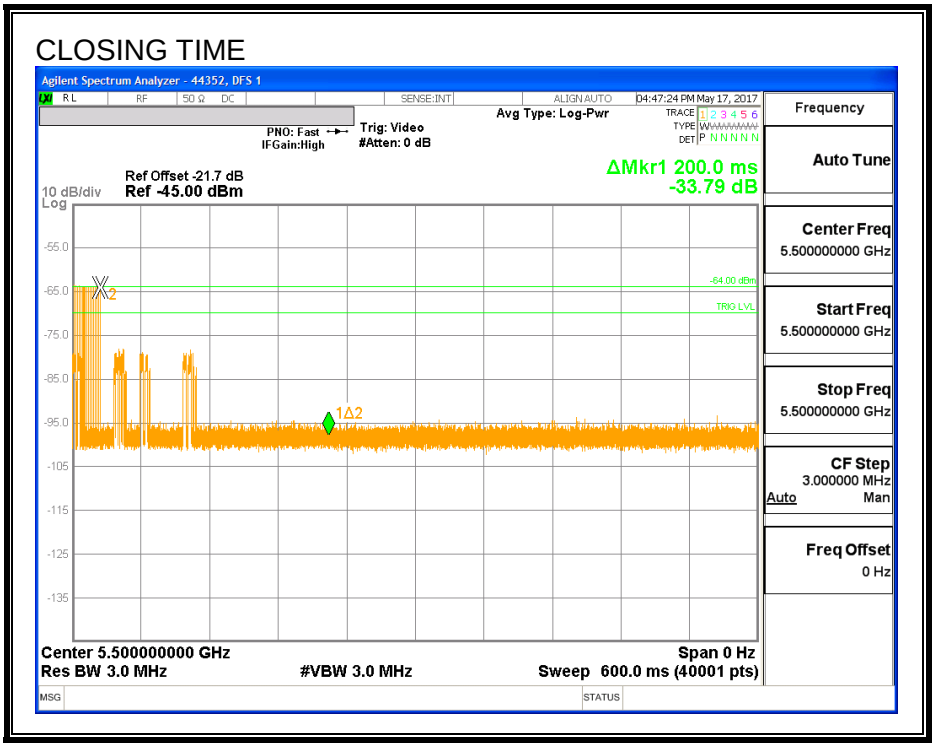
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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.

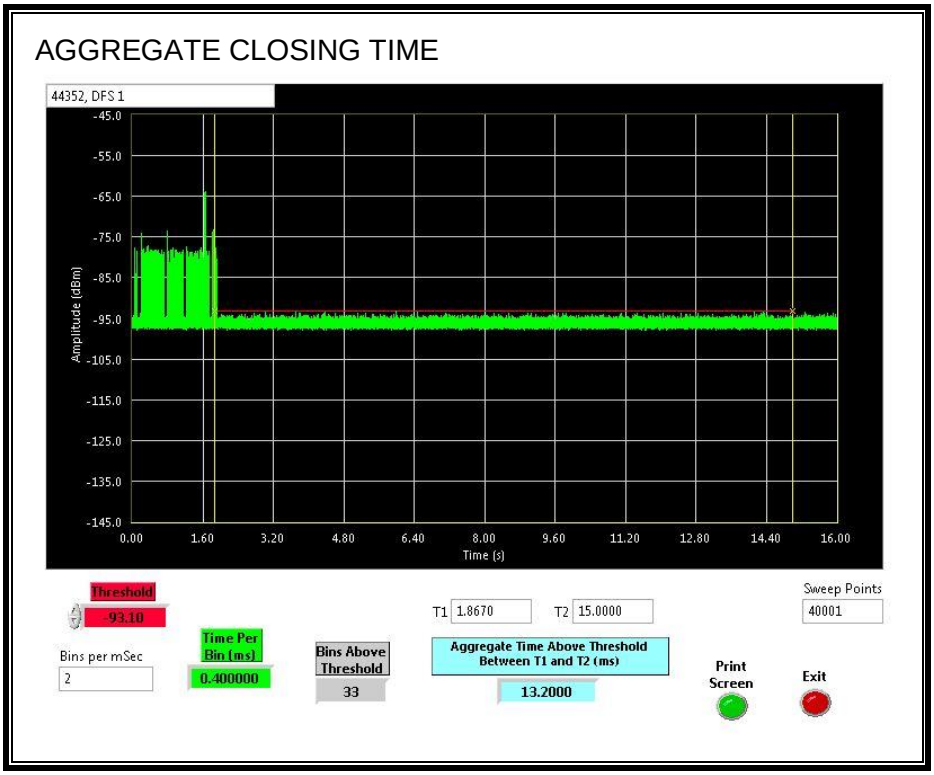
CHANNEL CLOSING TIME



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.

11.9. PEER TO PEER MODE EUT RESULTS FOR 40 MHz BANDWIDTH

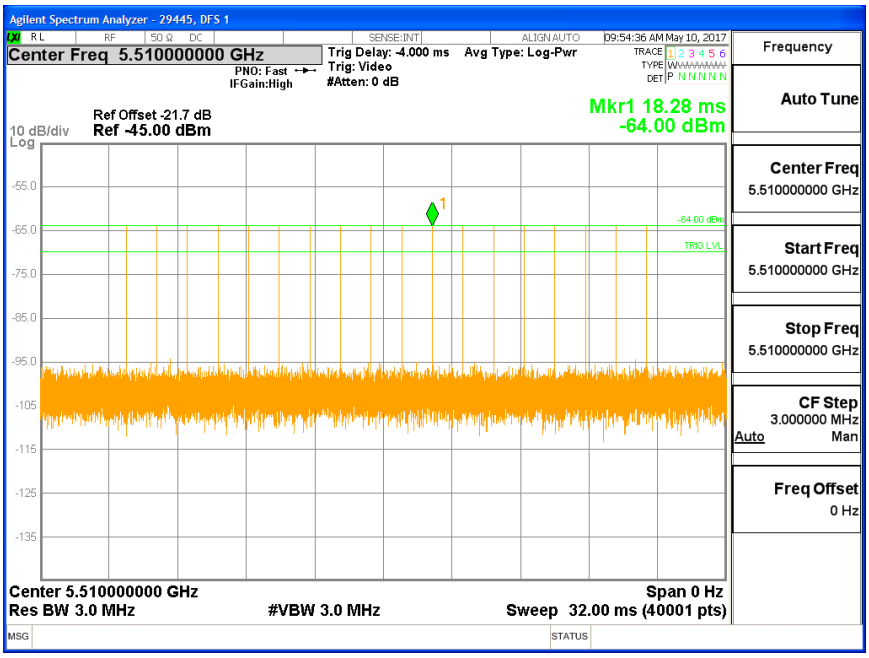
11.9.1. TEST CHANNEL

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

11.9.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

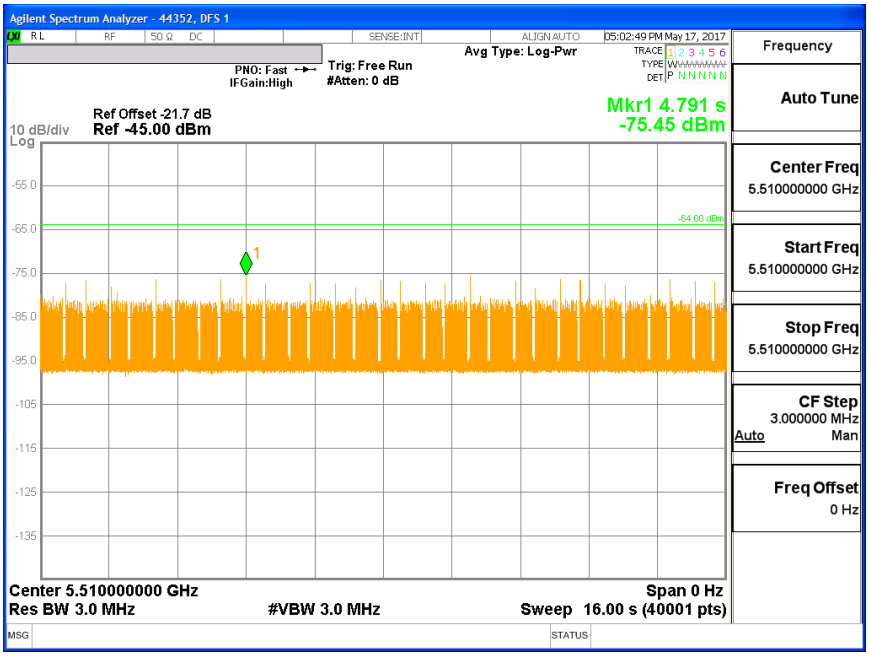
SHORT PULSE RADAR TYPE 0 AT MASTER



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

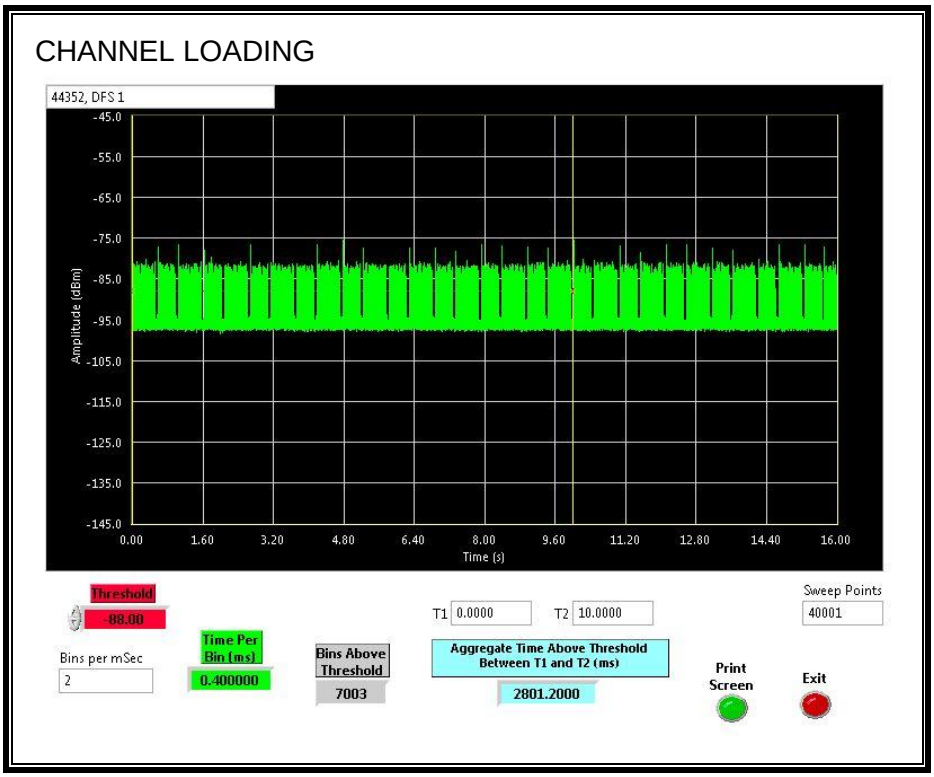
TRAFFIC

SLAVE TRAFFIC



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.

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 28.012%

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

11.9.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.9.4. 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).

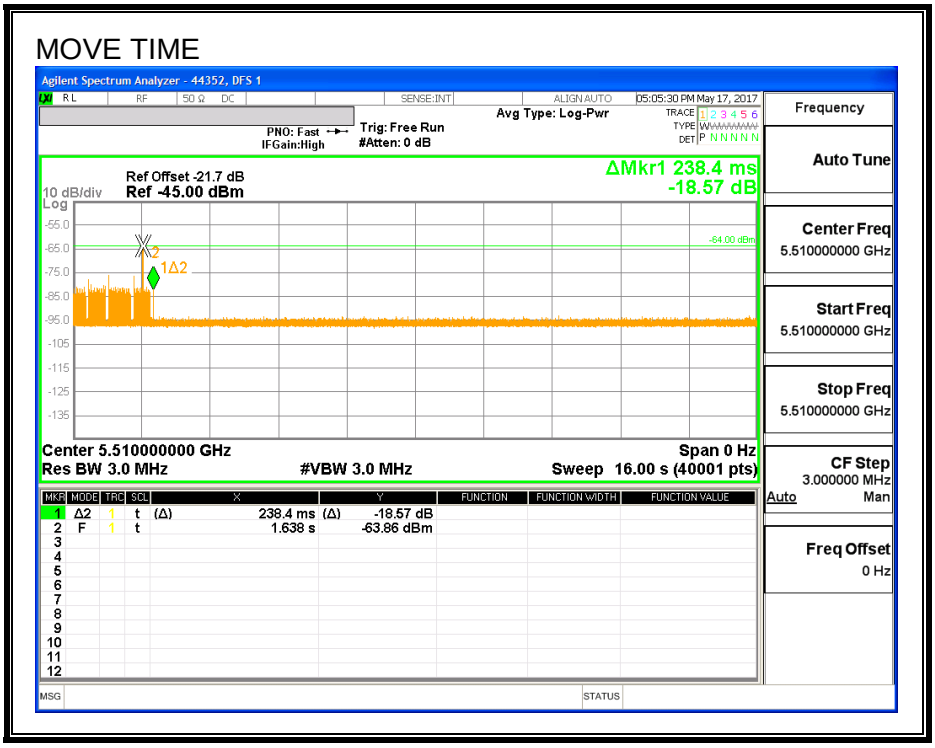
RESULTS

Channel Move Time (sec)	Limit (sec)
0.238	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
3.6	60

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

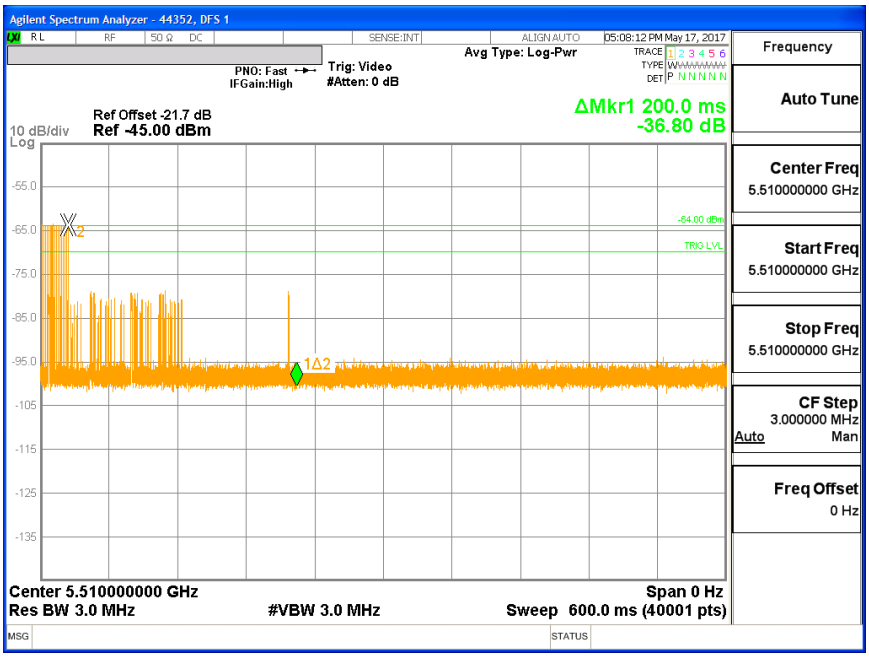
MOVE TIME



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.

CHANNEL CLOSING TIME

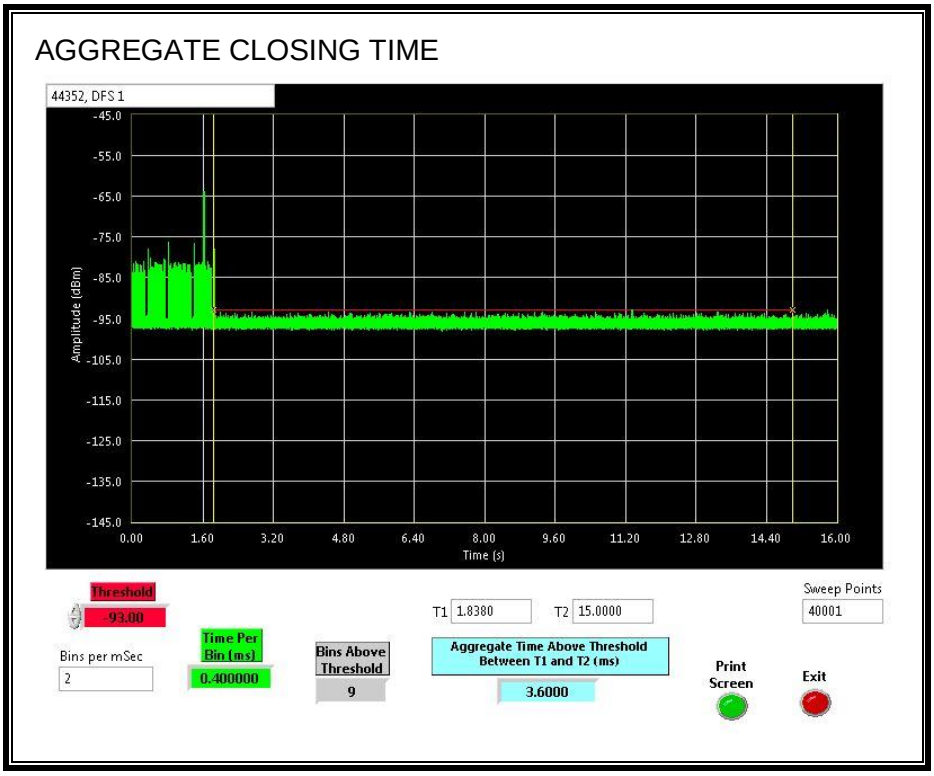
CLOSING TIME



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.

11.10. PEER TO PEER MODE EUT RESULTS FOR 80 MHz BANDWIDTH

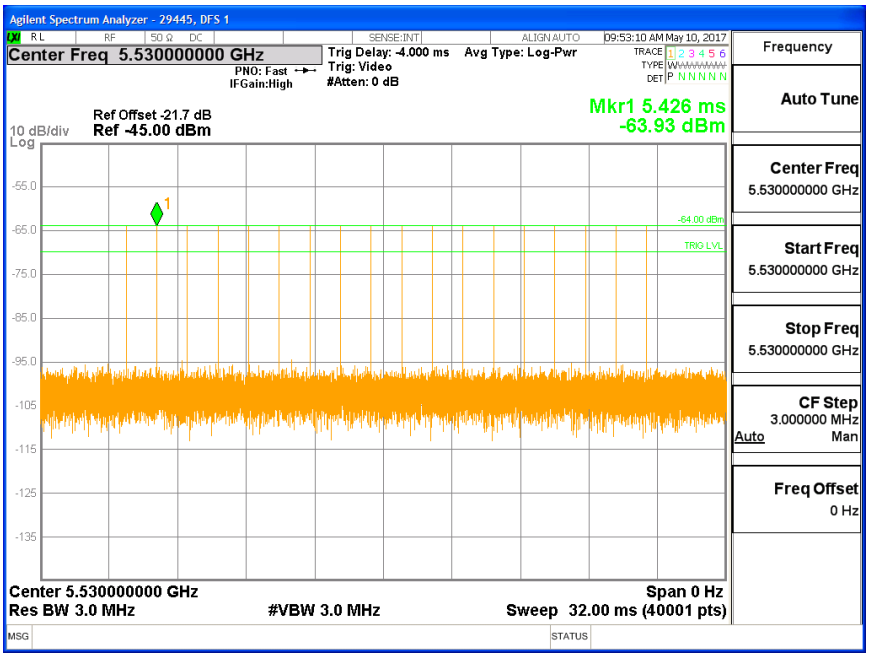
11.10.1. TEST CHANNEL

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

11.10.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

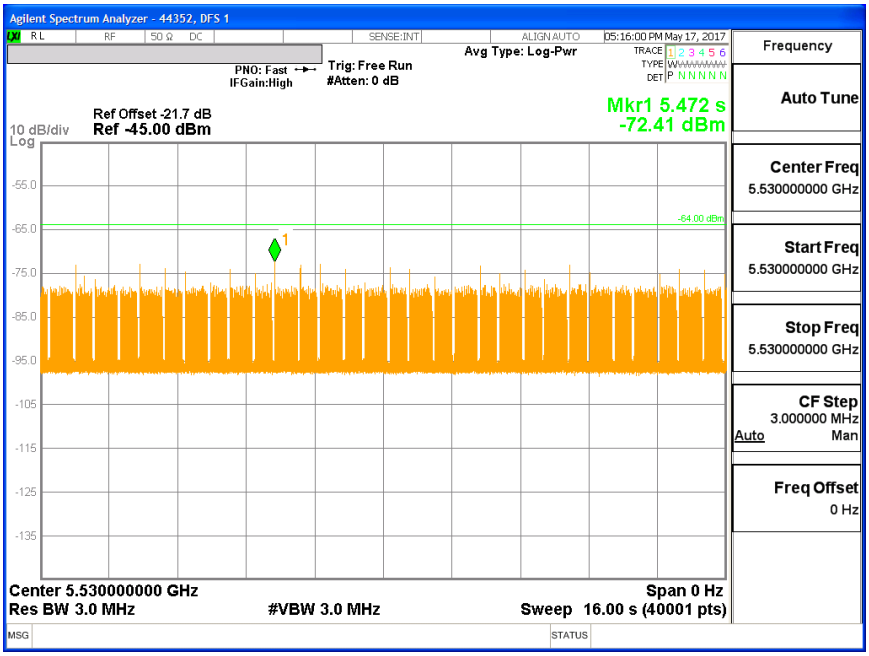
SHORT PULSE RADAR TYPE 0 AT MASTER



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

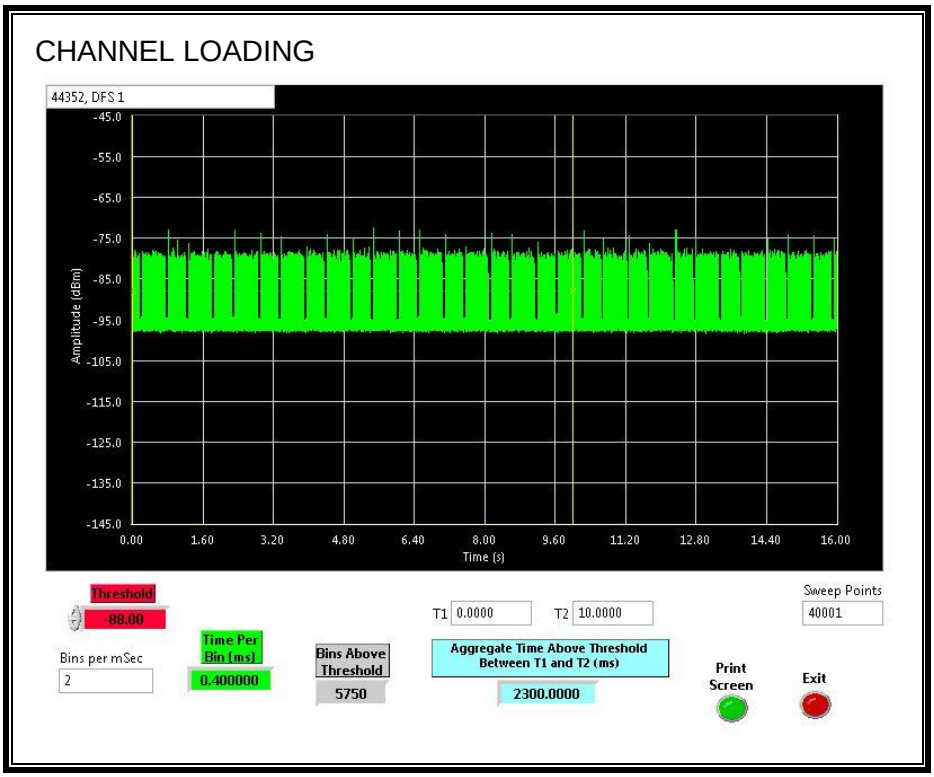
TRAFFIC

SLAVE TRAFFIC



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.

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 23%

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

11.10.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.10.4. 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).

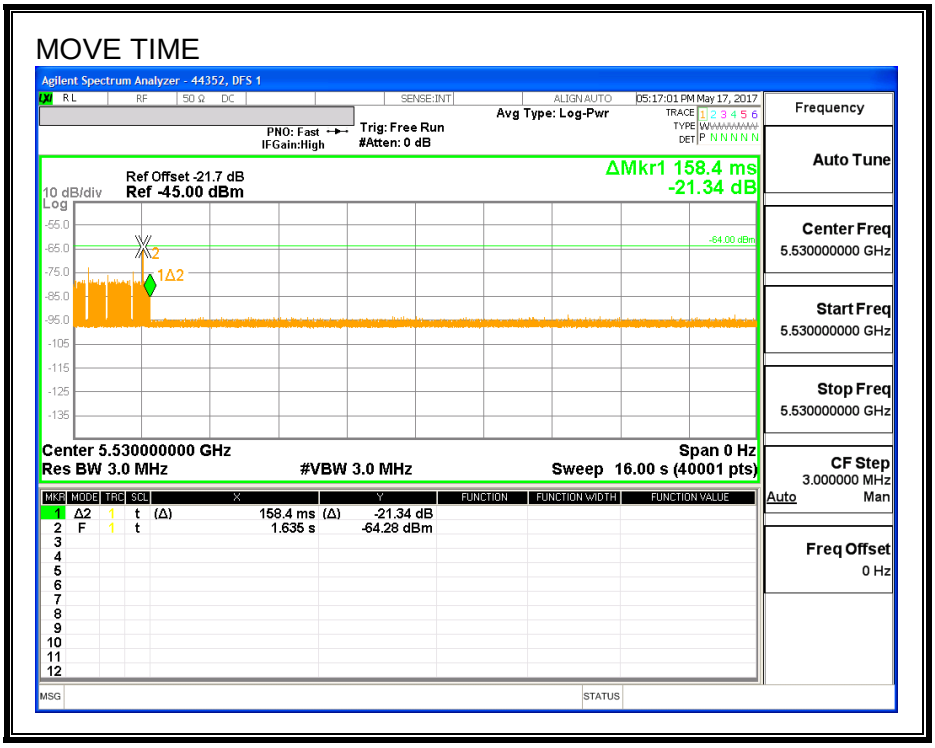
RESULTS

Channel Move Time (sec)	Limit (sec)
0.158	10

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

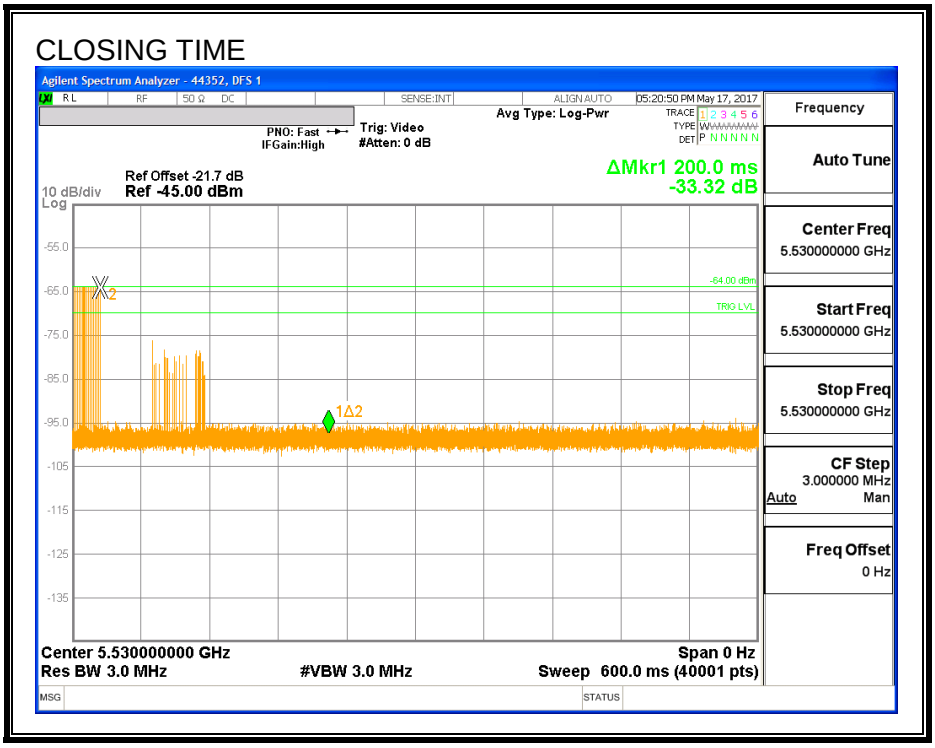
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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

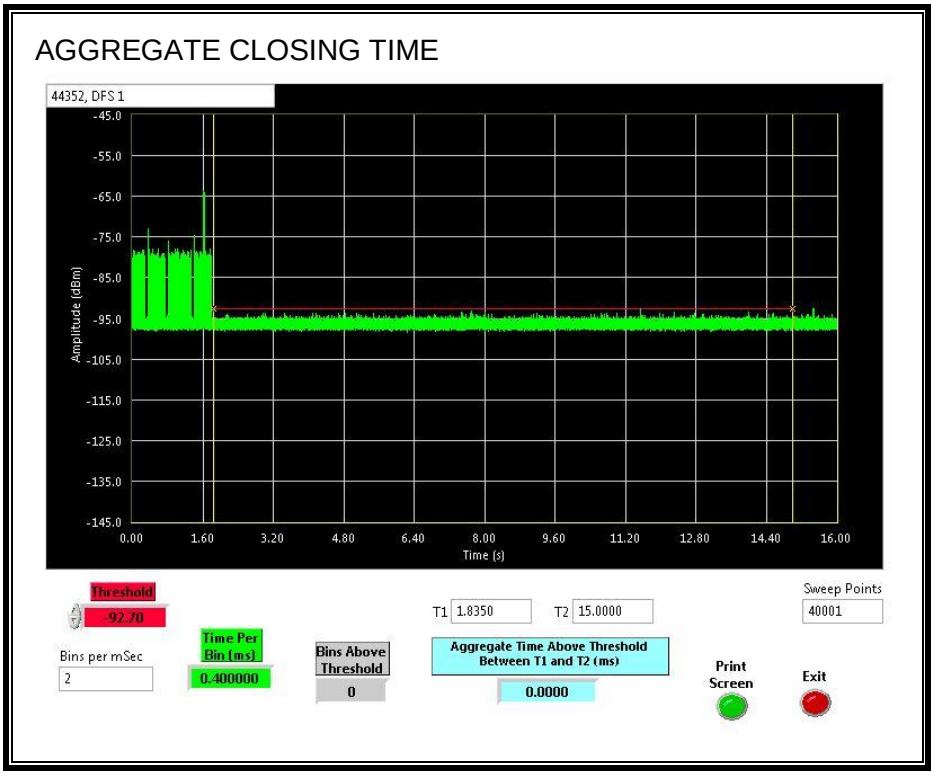
CHANNEL CLOSING TIME



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.



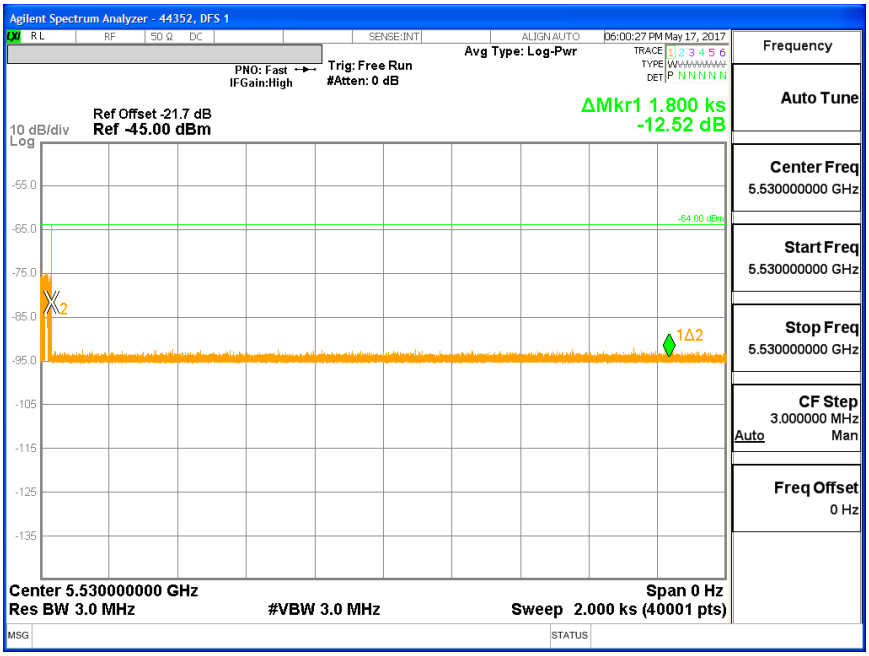
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

11.10.5. 30-MINUTE NON-OCCUPANCY PERIOD

RESULTS

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

30-MINUTE NON-OCCUPANCY PERIOD



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

11.11. PEER TO PEER MODE PEER DEVICE RESULTS FOR 20 MHz BANDWIDTH

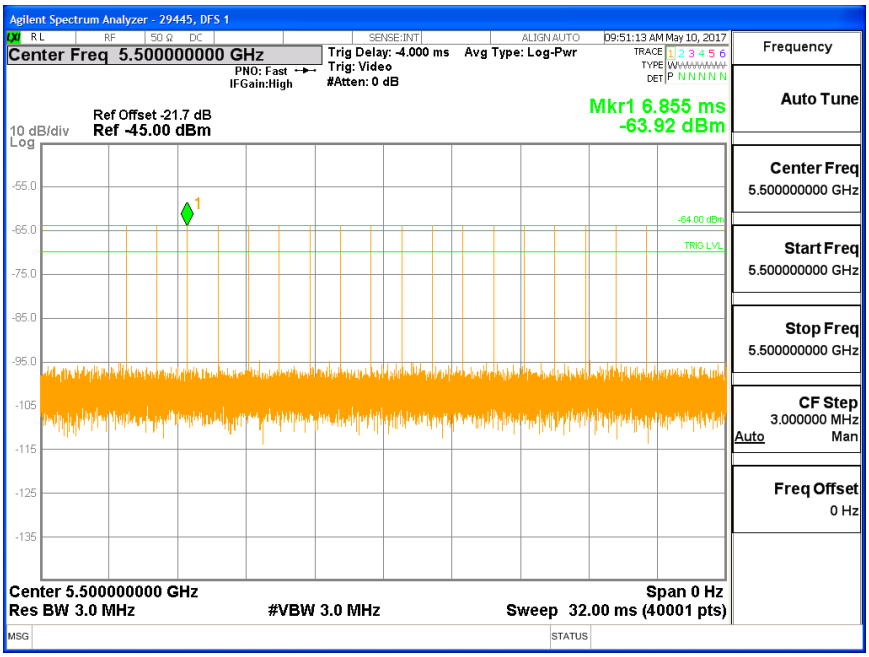
11.11.1. TEST CHANNEL

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

11.11.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

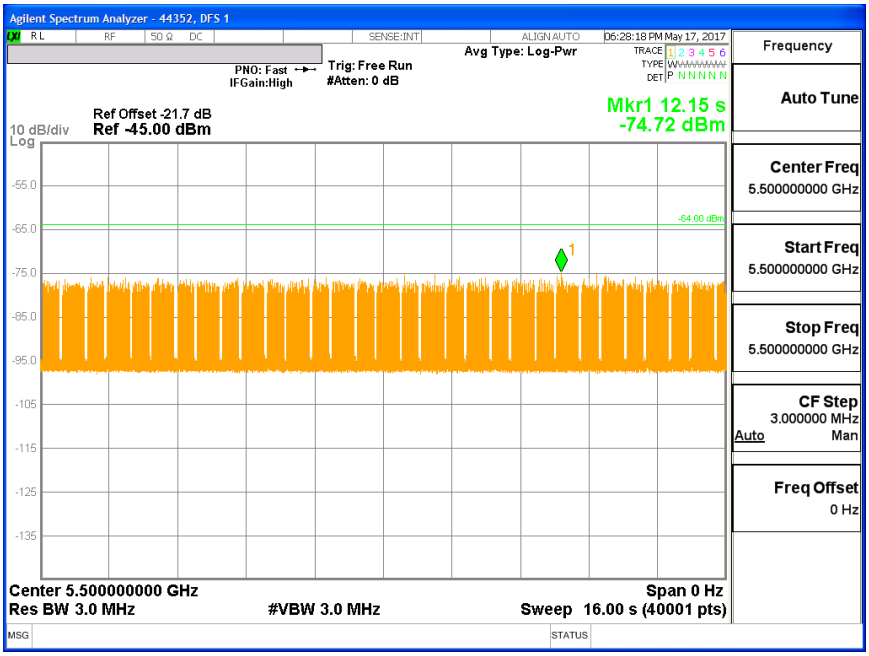
SHORT PULSE RADAR TYPE 0 AT MASTER



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

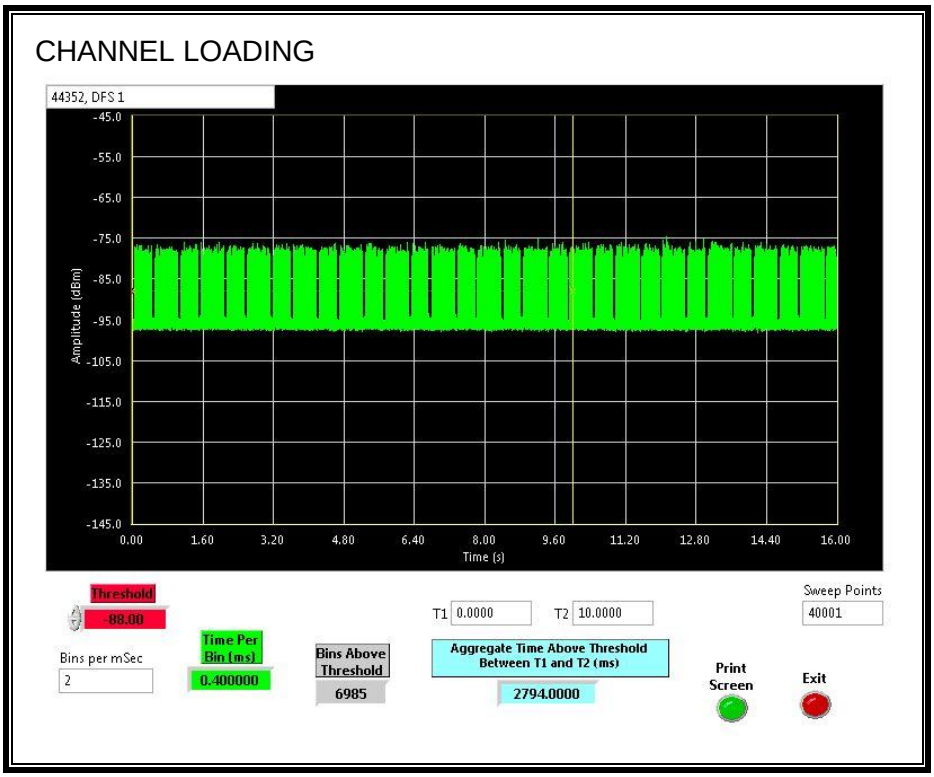
TRAFFIC

SLAVE 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 27.94%

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

11.11.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.11.4. 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).

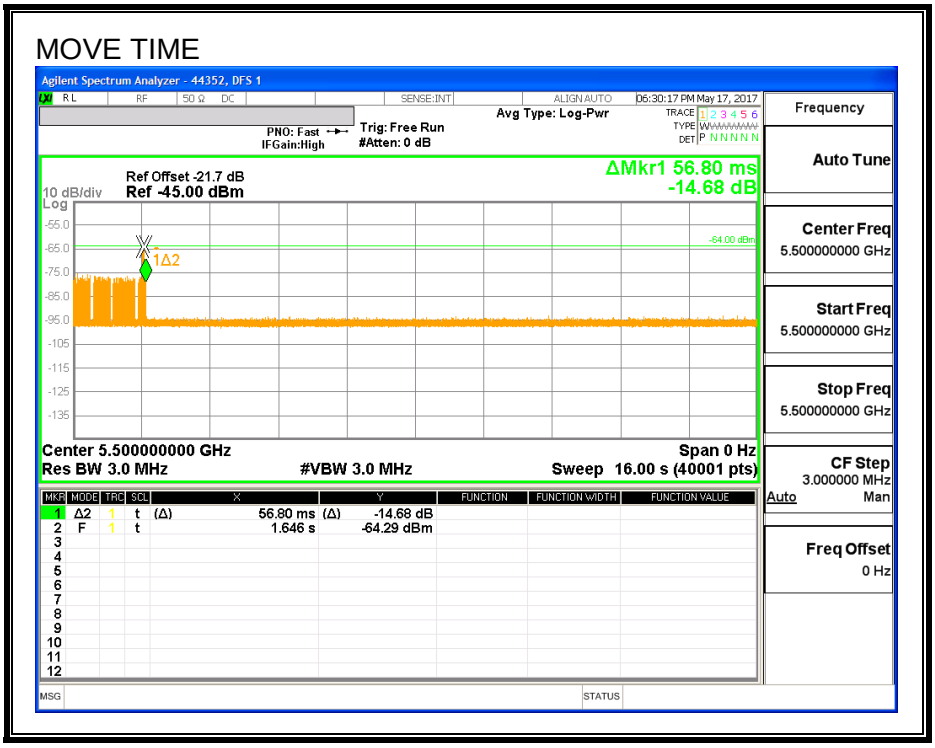
RESULTS

Channel Move Time (sec)	Limit (sec)
0.057	10

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

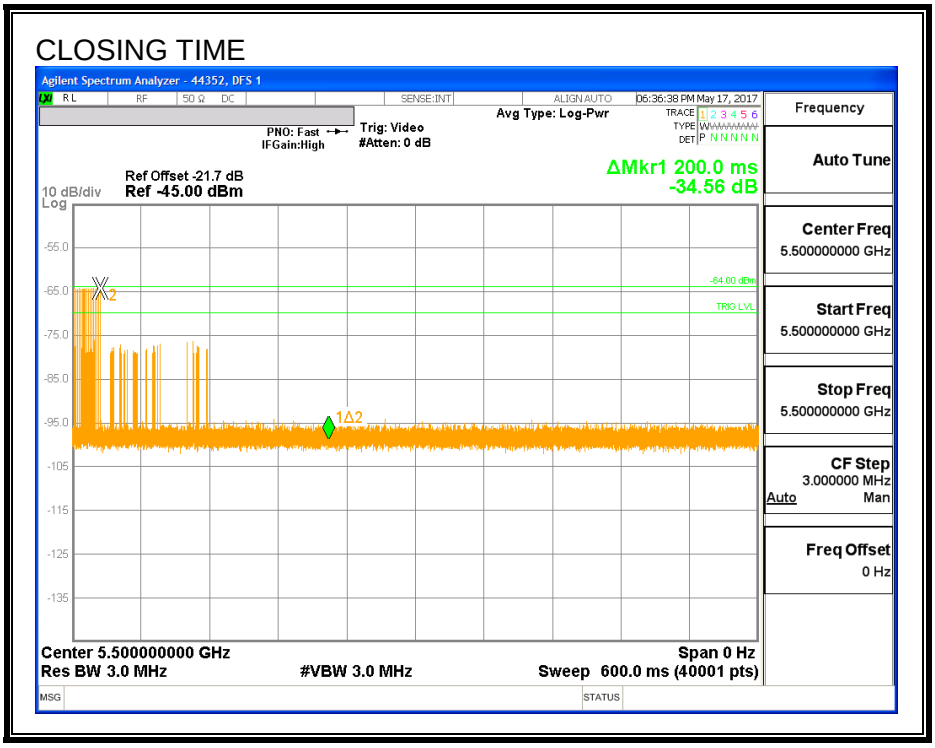
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MOVE TIME



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

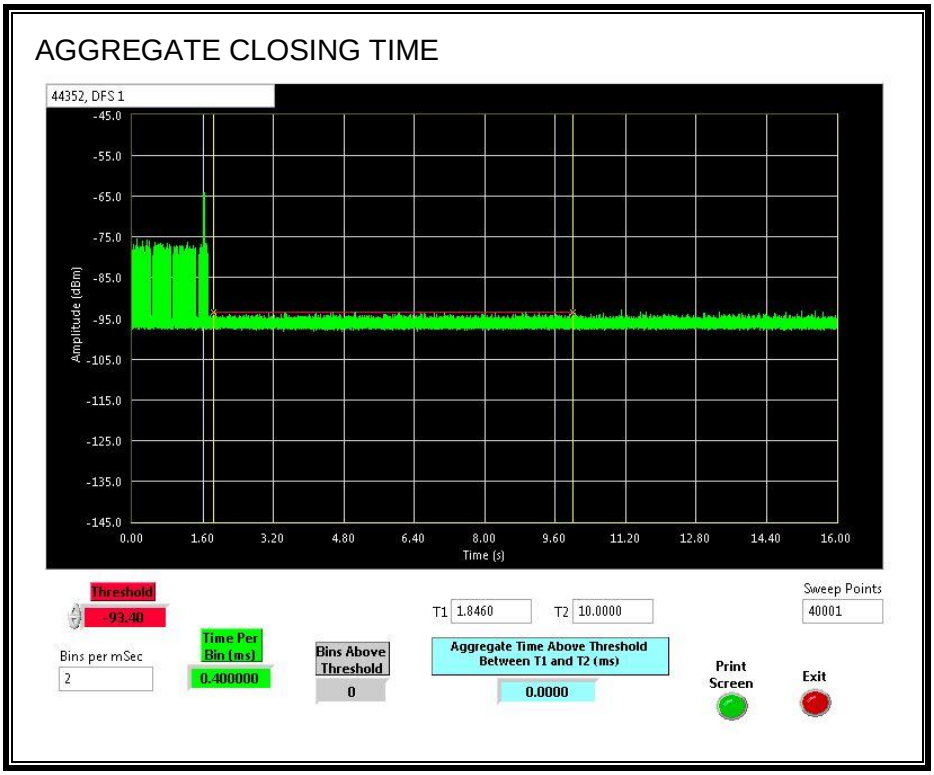
CHANNEL CLOSING TIME



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.

11.12. PEER TO PEER MODE PEER DEVICE RESULTS FOR 40 MHz BANDWIDTH

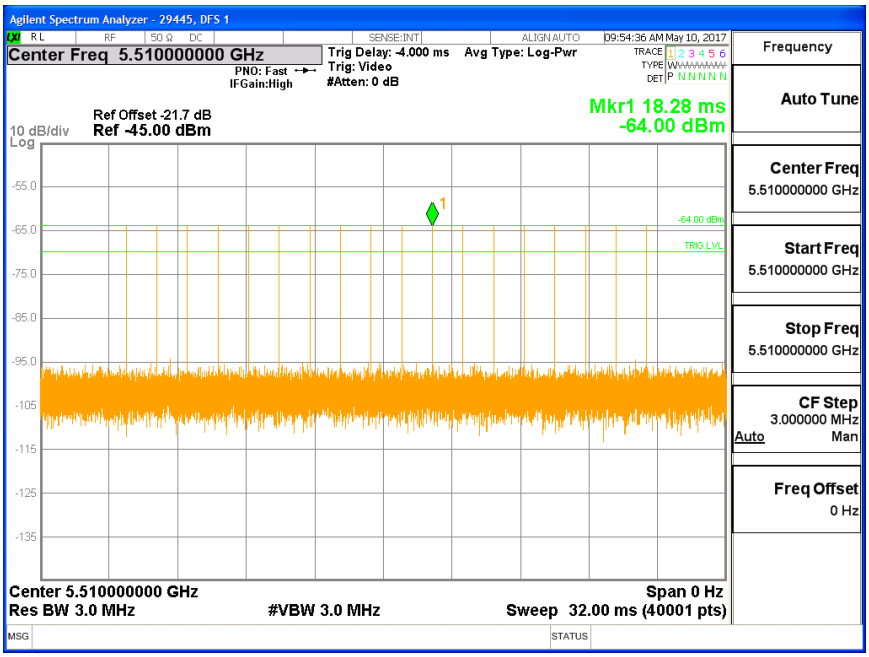
11.12.1. TEST CHANNEL

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

11.12.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

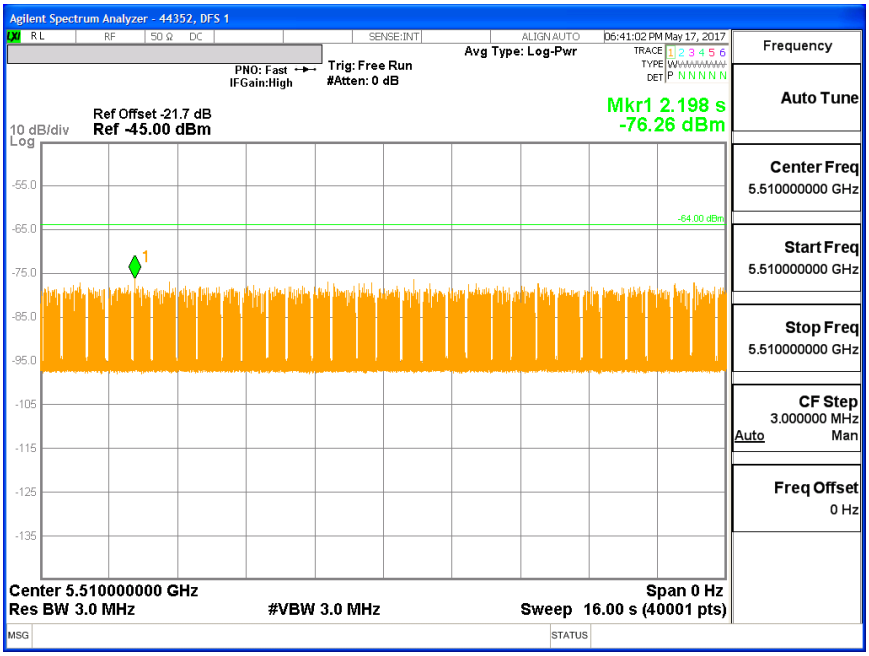
SHORT PULSE RADAR TYPE 0 AT MASTER



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

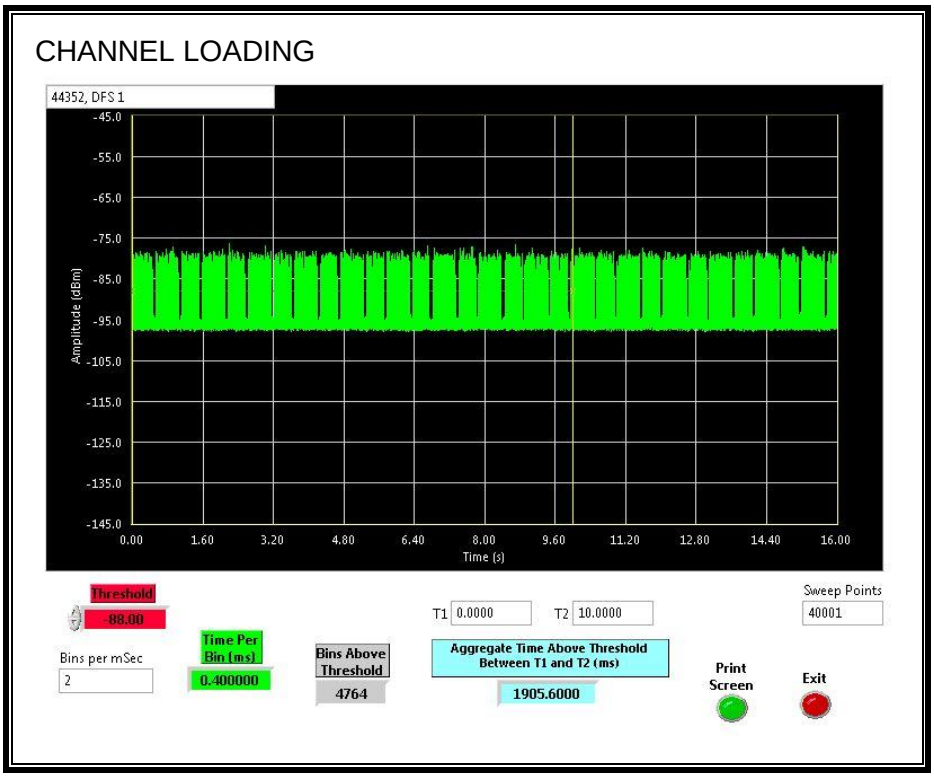
TRAFFIC

SLAVE TRAFFIC



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.

CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 19.056%

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

11.12.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.12.4. 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).

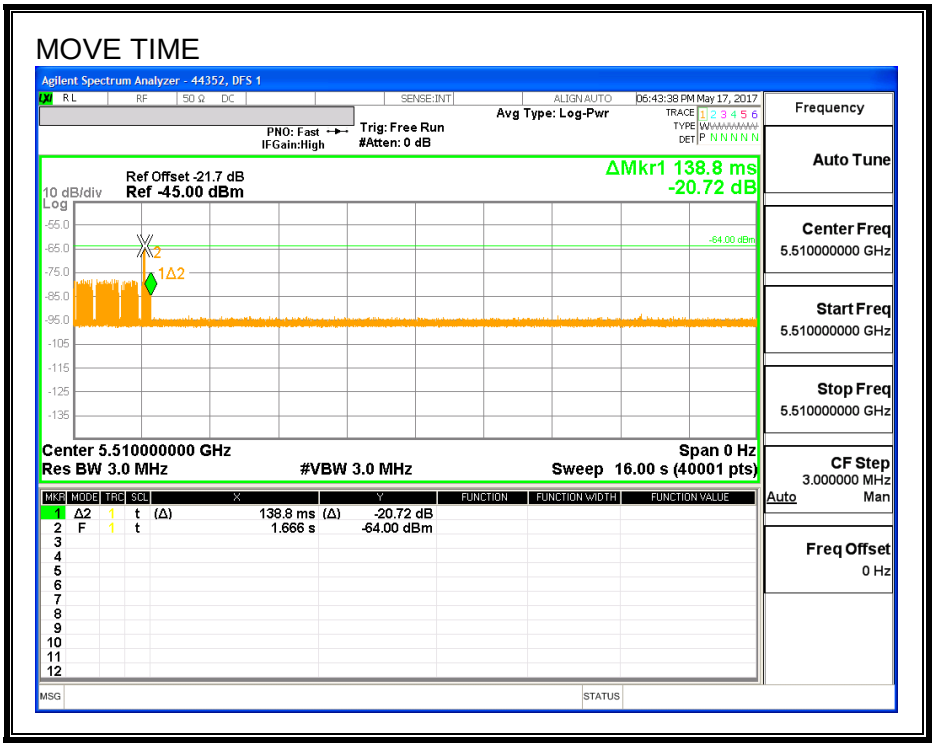
RESULTS

Channel Move Time (sec)	Limit (sec)
0.139	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.

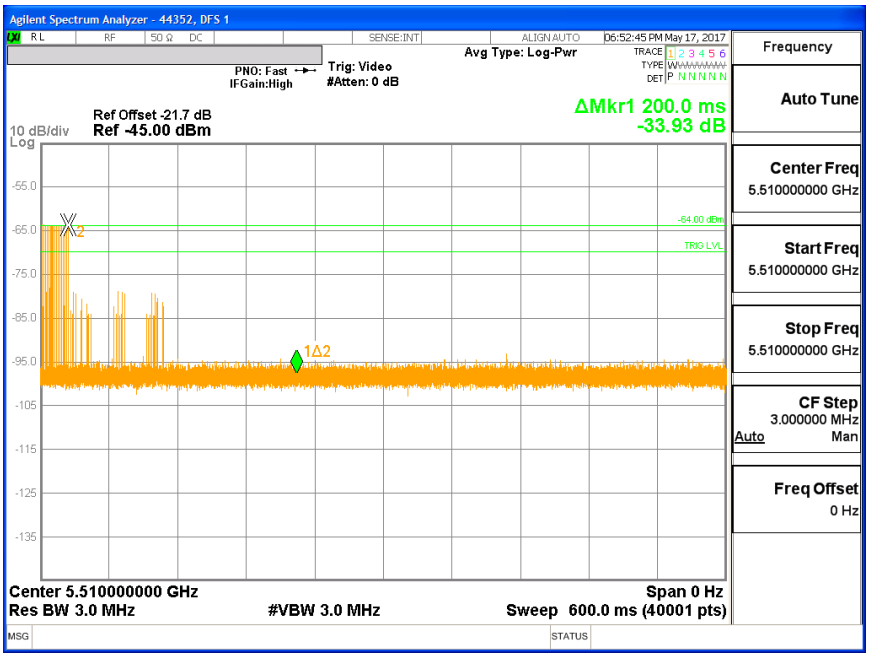
MOVE TIME



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

CHANNEL CLOSING TIME

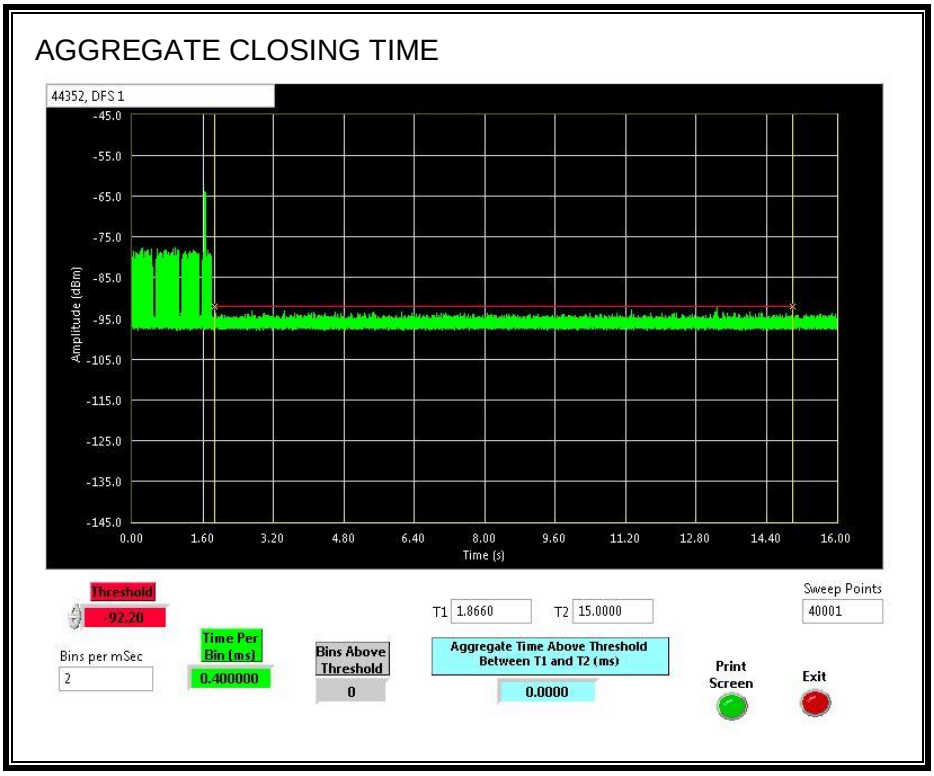
CLOSING TIME



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.

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.

11.13. PEER TO PEER MODE PEER DEVICE RESULTS FOR 80 MHz BANDWIDTH

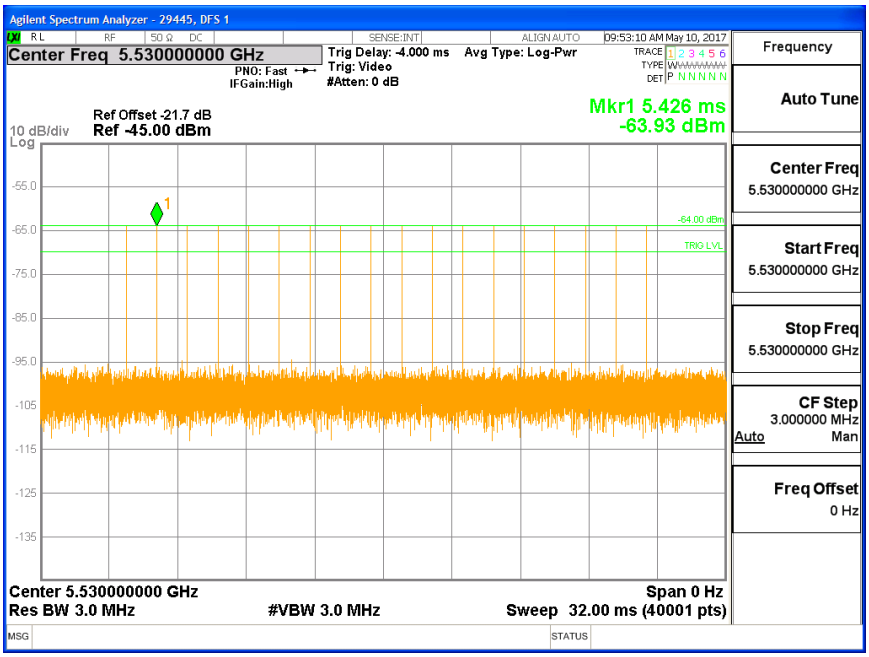
11.13.1. TEST CHANNEL

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

11.13.2. RADAR WAVEFORM AND TRAFFIC

RADAR WAVEFORM

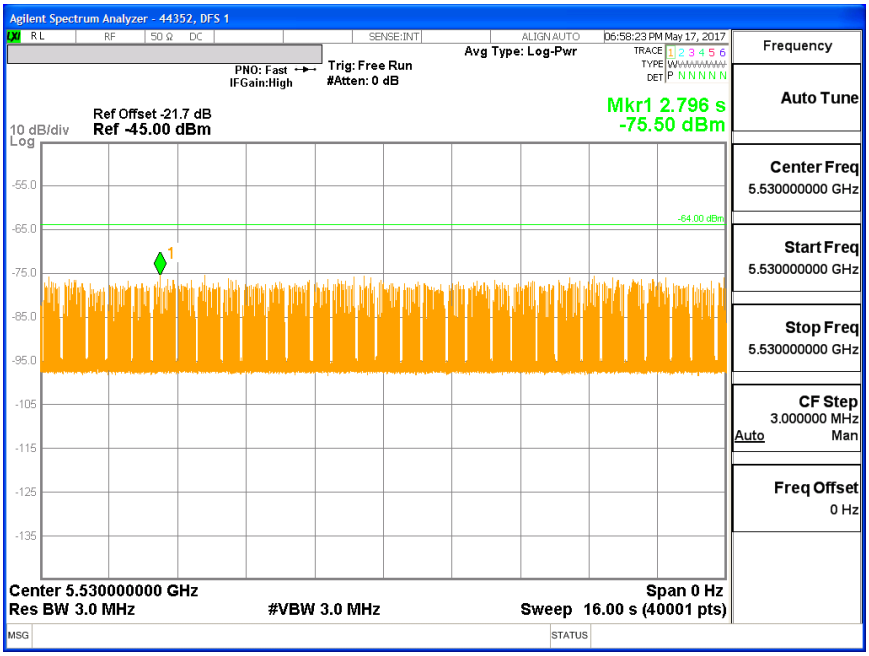
SHORT PULSE RADAR TYPE 0 AT MASTER



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

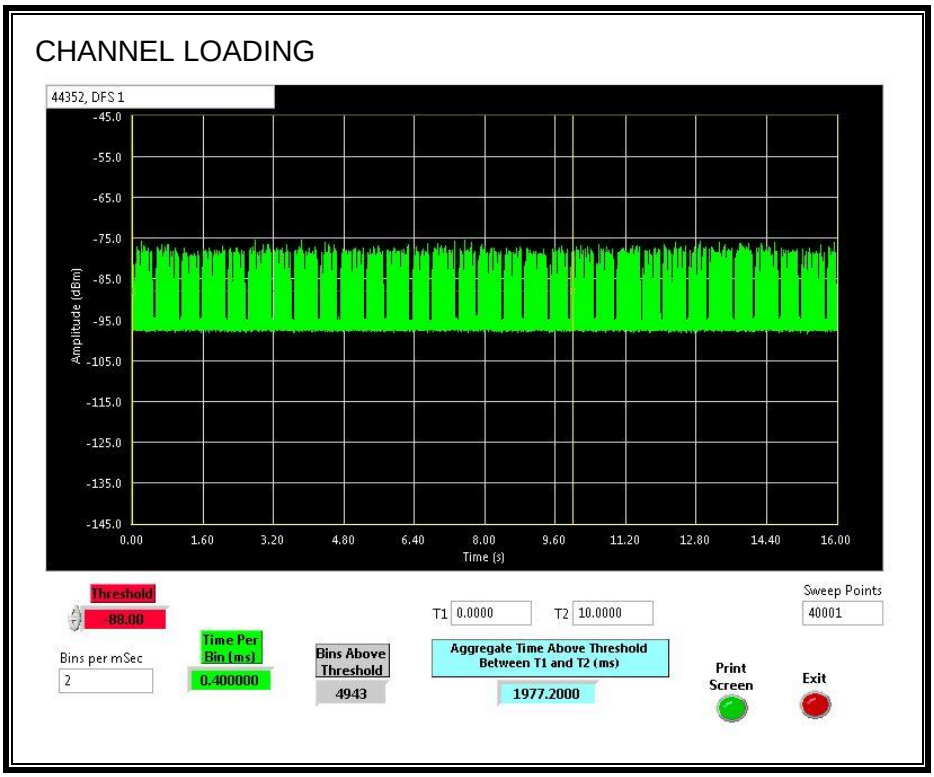
TRAFFIC

SLAVE 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 19.772%

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

11.13.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

11.13.4. 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).

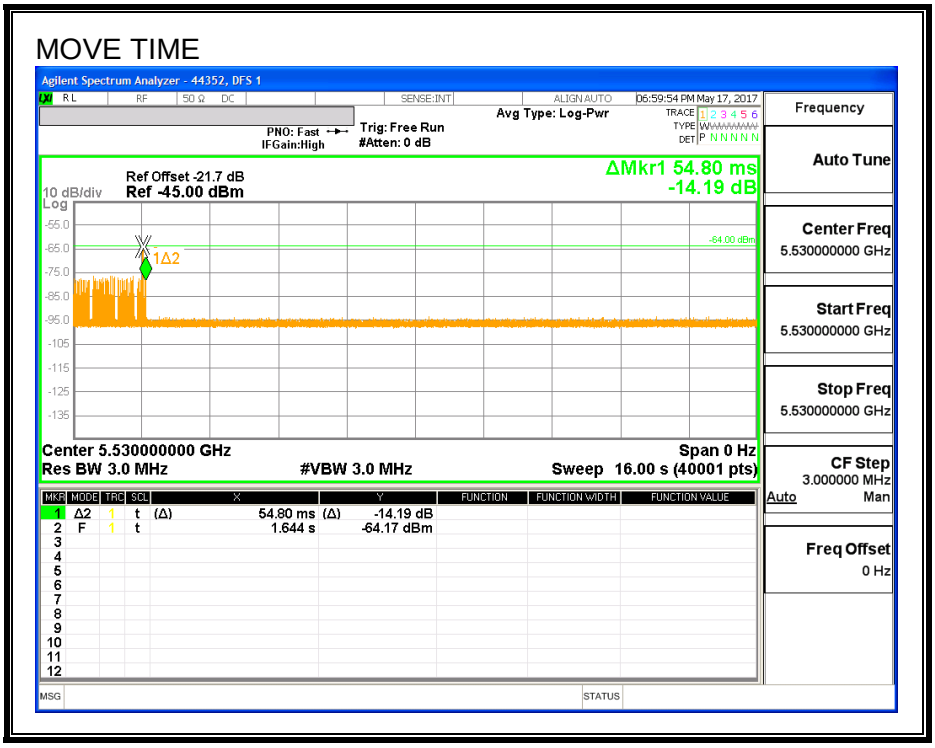
RESULTS

Channel Move Time (sec)	Limit (sec)
0.055	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.