DFS PORTION of FCC 47 CFR PART 15 SUBPART E
DFS PORTION of INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

802.11a/b/g/n/ac WIRELESS ACCESS POINT

MODEL NUMBER: AP-7532I

FCC ID: UZ7AP7532I
IC: 109AN-AP7532I

REPORT NUMBER: 14U18923-1 REVISION A

ISSUE DATE: DECEMBER 5, 2014

Prepared for
MOTOROLA SOLUTIONS, INC.
6480 VIA DEL ORO DRIVE
SAN JOSE, CA 95119, U.S.A.

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/14/14	Initial Issue	T. Lee
A	12/5/14	Amend antenna gain information in the DESCRPTION OF EUT section	C. Cheung

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MOTOROLA SOLUTIONS, INC.
6480 VIA DEL ORO DRIVE
SAN JOSE, CA. 95119, U.S.A.

EUT DESCRIPTION: 802.11a/b/g/n/ac WIRELESS ACCESS POINT

MODEL: AP-7532I

SERIAL NUMBER: 14175522202867

DATE TESTED: OCTOBER 7, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
DFS Portion of CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-GEN Issue 8	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

TIM LEE
PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

DOUG ANDERSON
EMC ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the DFS portion of FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, KDB 905462 D02 and D03, ANSI C63.10-2009, RSS-GEN Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services, Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

5. DYNAMIC FREQUENCY SELECTION

5.1. OVERVIEW

5.1.1. LIMITS

INDUSTRY CANADA

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

RSS-210 Issue 8 A9.3

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”.

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 frequencies between the bonded 20 MHz channel blocks.		

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

Maximum Transmit Power	Value (see notes)
E.I.R.P. ≥ 200 milliwatt	-64 dBm
E.I.R.P. < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
E.I.R.P. < 200 milliwatt that do not meet power spectral density requirement	-64 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.
Note 3: E.I.R.P. is based on the highest antenna gain. For MIMO devices refer to KDB publication 662911 D01.

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1)
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period. (See Notes 1 and 2)
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. (See Note 3)

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

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in table 5a	Roundup: {(1/360) x (19 x 10^6 PRI_{usec})}	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 usec. With a minimum increment of 1 usec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the *Detection Bandwidth* test, *Channel Move Time*, and *Channel Closing Time* tests.

Table 6 – Long Pulse Radar Test Signal

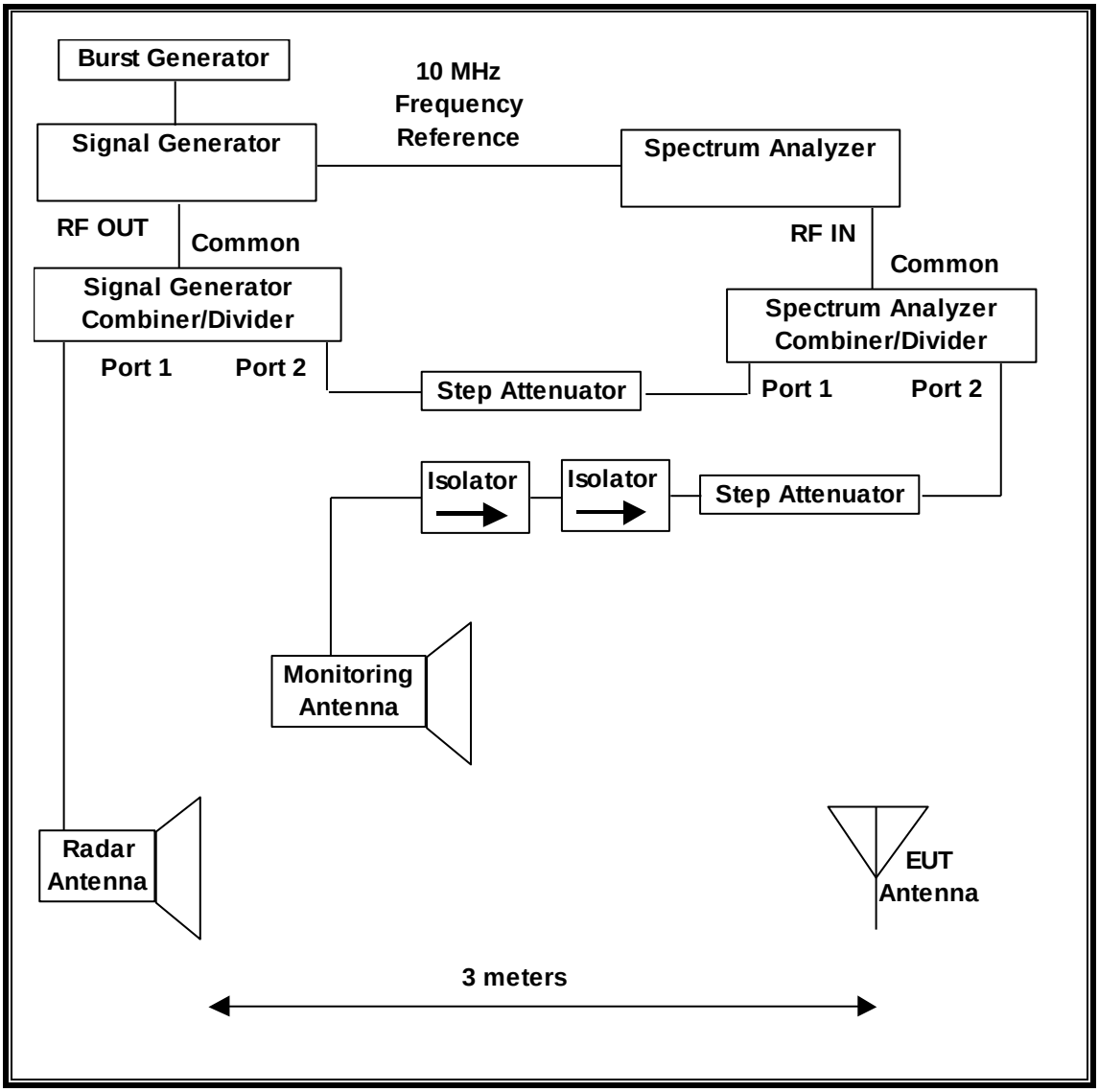
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7 – Frequency Hopping Radar Test Signal

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

5.1.2. 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 1, 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.

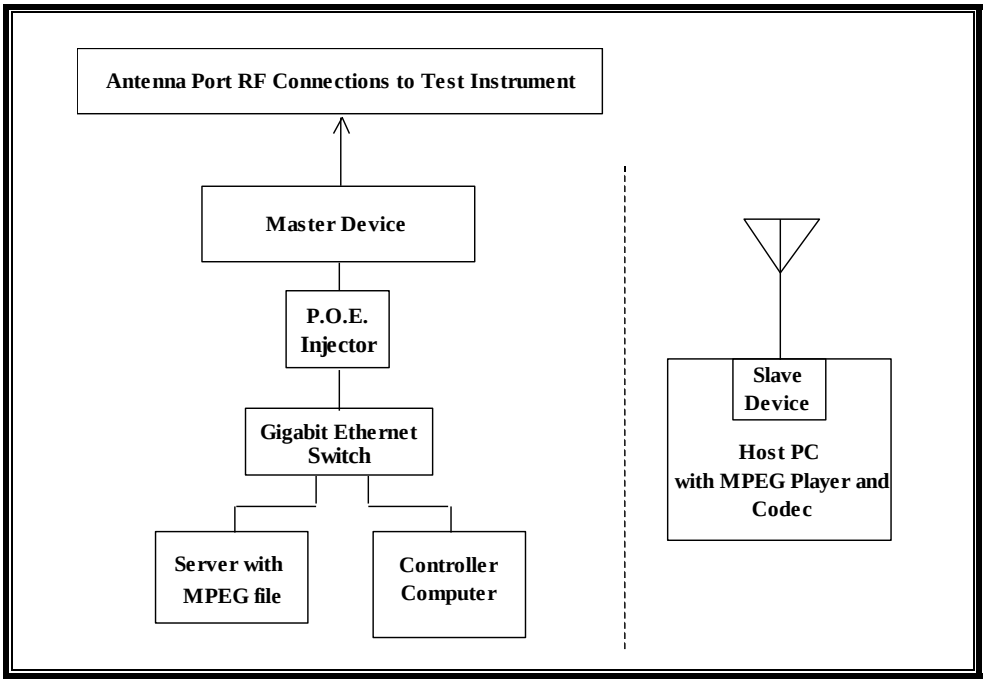
TEST AND MEASUREMENT EQUIPMENT

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	09/05/15
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	09/03/15
Arbitrary Waveform Generator	Agilent / HP	33220A	C01146	04/03/15

5.1.3. SETUP OF EUT

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**
AC Adapter (EUT)	PowerDsine	9001G	D094565000006C7A00	DoC
Notebook PC (Controller/Server)	HP	8470P	CNU25193B6	DoC
AC Adapter (Controller/Server PC)	HP	PPP009L-E	WCNXA0C3U3SEGF	DoC
Notebook PC (Console)	HP	8460P	CNU2032CKJ	DoC
AC Adapter (Console)	HP	PPP009L-E	WCNXA0C3U3SEGF	DoC
Notebook PC (Slave Radio Host)	HP	8470P	CNU25193C2	DoC
AC Adapter (Slave Host PC)	HP	PPP09L-E	WCNXA0C1R3R8DW	DoC
802.11a/b/g/n/ac USB Converter (Slave Radio Device)	Cisco	AE600	12R10602307395	QB7-AE6000
Gigabit Ethernet Switch	Netgear	GS108	1DR1773V01EE3	DoC
P.O.E. Injector	Netgear	DV-1280-3	No Serial Number	DoC

5.1.4. DESCRIPTION OF EUT

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

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

The EUT supports both Master and Client DFS modes of operation, Client Mode DFS was tested by Sporton see report (FR44180 4-05).

The highest power level within these bands is 28.99 dBm EIRP in the 5250-5350 MHz band and 29.8 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 6 dBi in the 5250-5350 MHz band and 6 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 1.7 dBi in the 5250-5350 MHz band and 1.7 dBi in the 5470-5725 MHz band.

The device has built in 5.92 dBi PIFA antenna(s).

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

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

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

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

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

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

TPC is required since the maximum EIRP is greater than 500 mW (27 dBm).

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

The software installed in the EUT is version 5.7.0.0-203475X.

UNIFORM CHANNEL SPREADING

See Manufacturer’s Attestation.

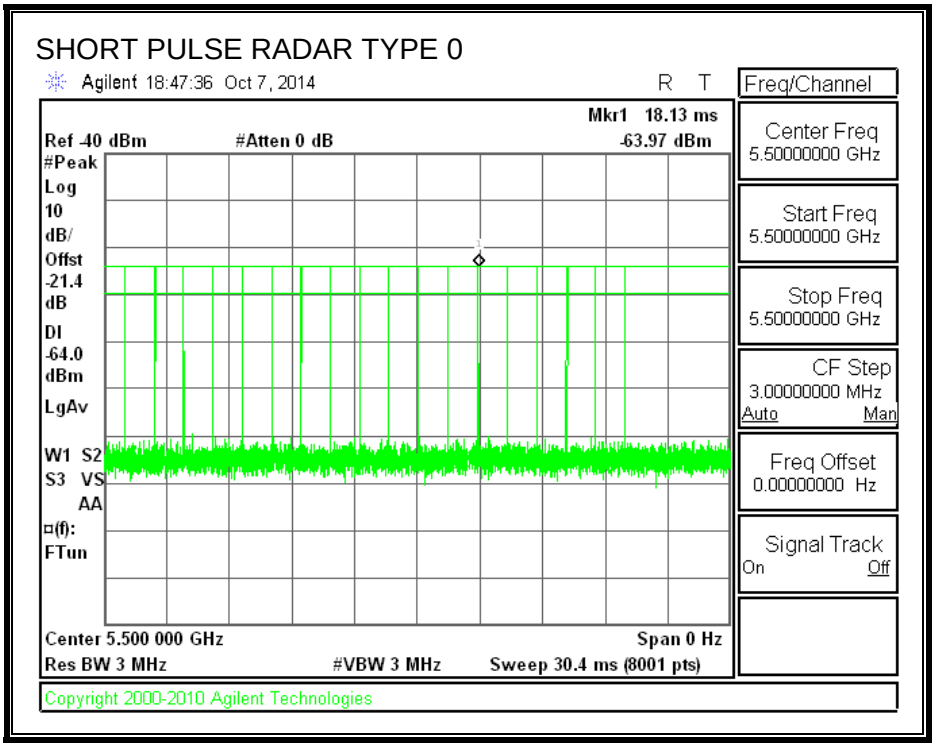
5.2. RESULTS FOR 20 MHz BANDWIDTH

5.2.1. TEST CHANNEL

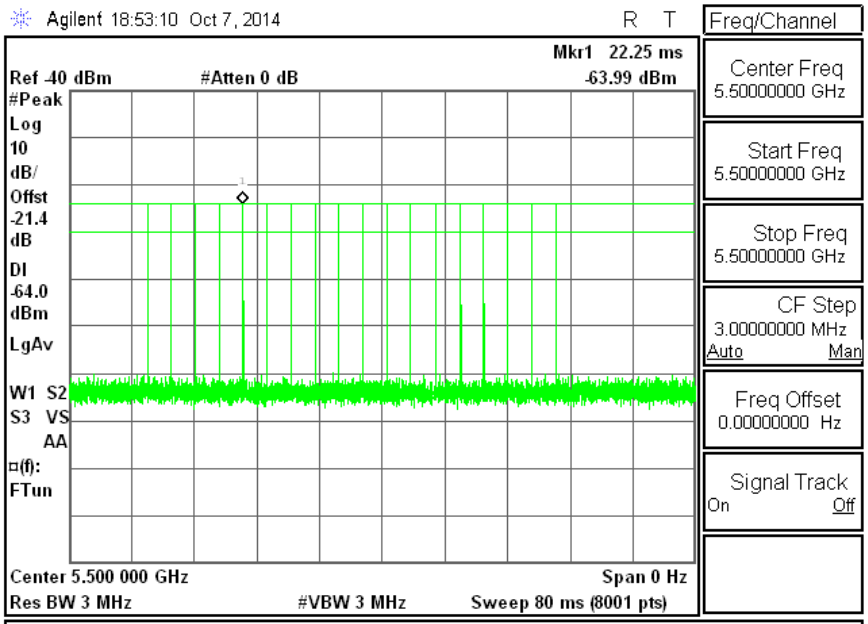
All tests were performed at a channel center frequency of 5500 MHz.

5.2.2. RADAR WAVEFORMS AND TRAFFIC

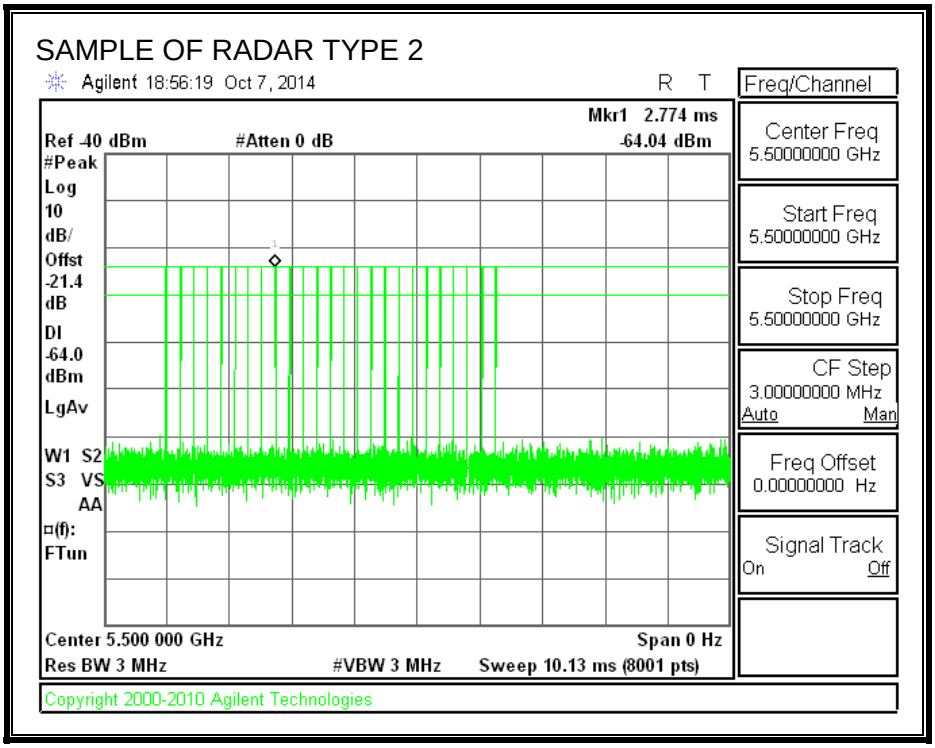
RADAR WAVEFORMS



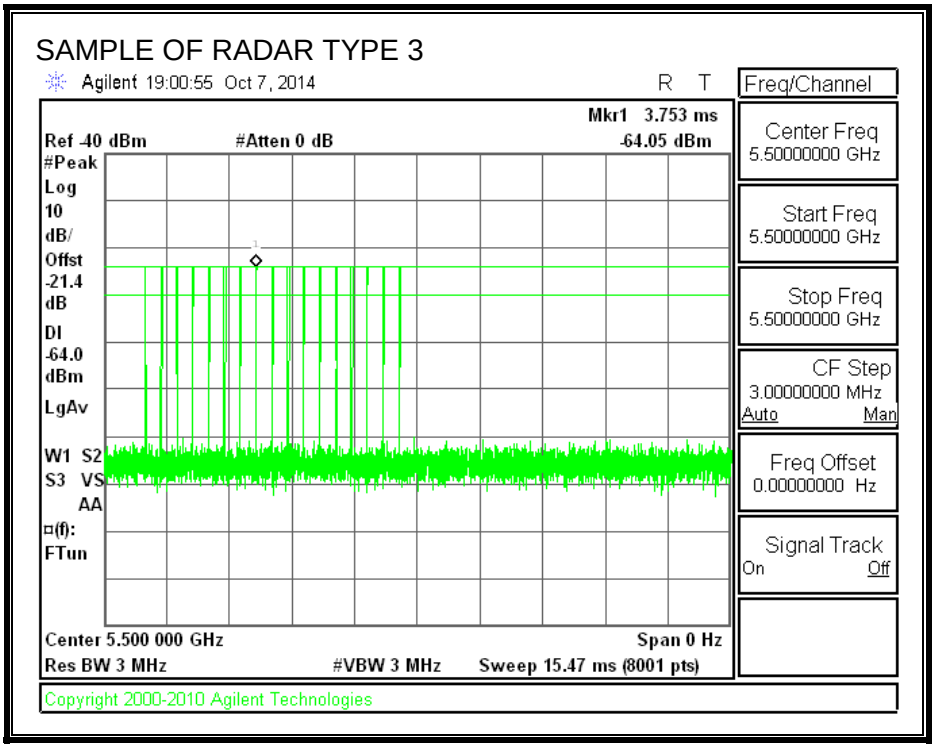
SAMPLE OF RADAR TYPE 1



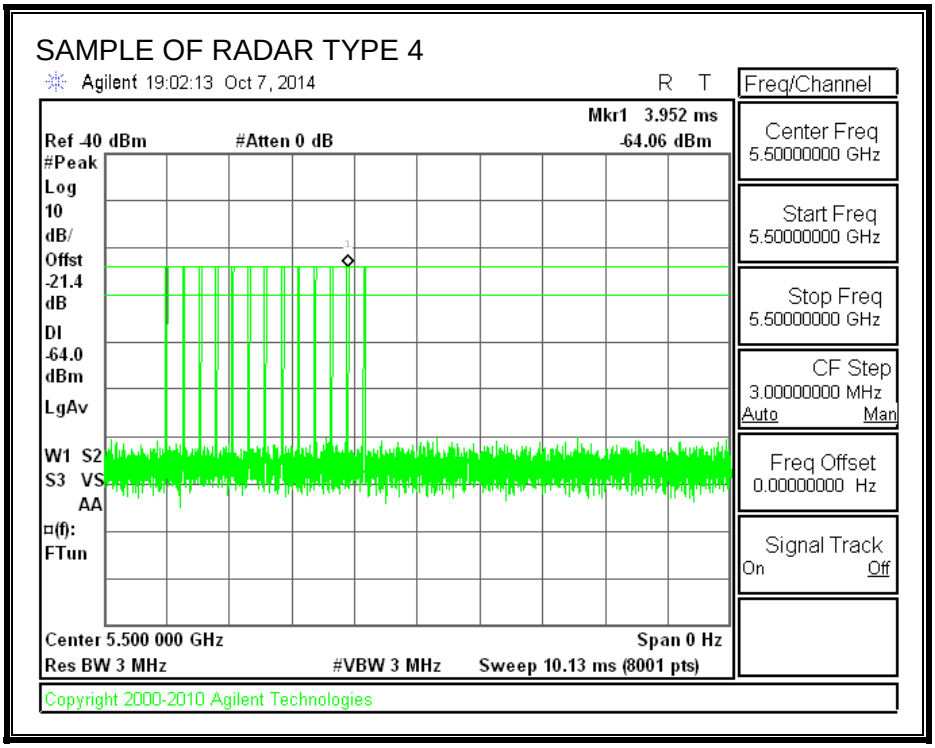
SAMPLE OF RADAR TYPE 2



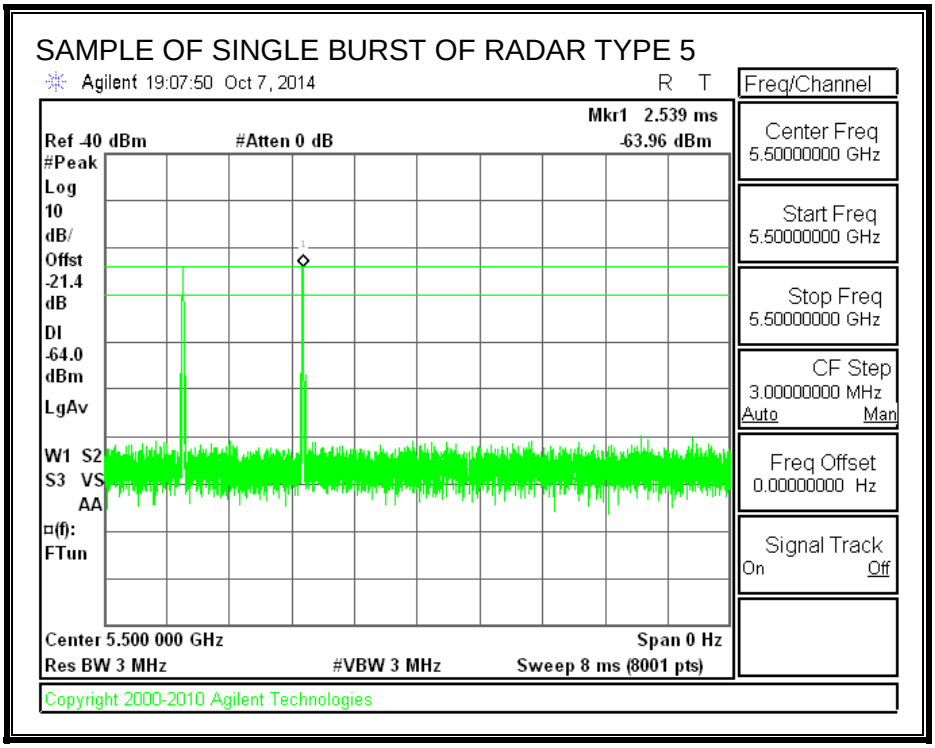
SAMPLE OF RADAR TYPE 3



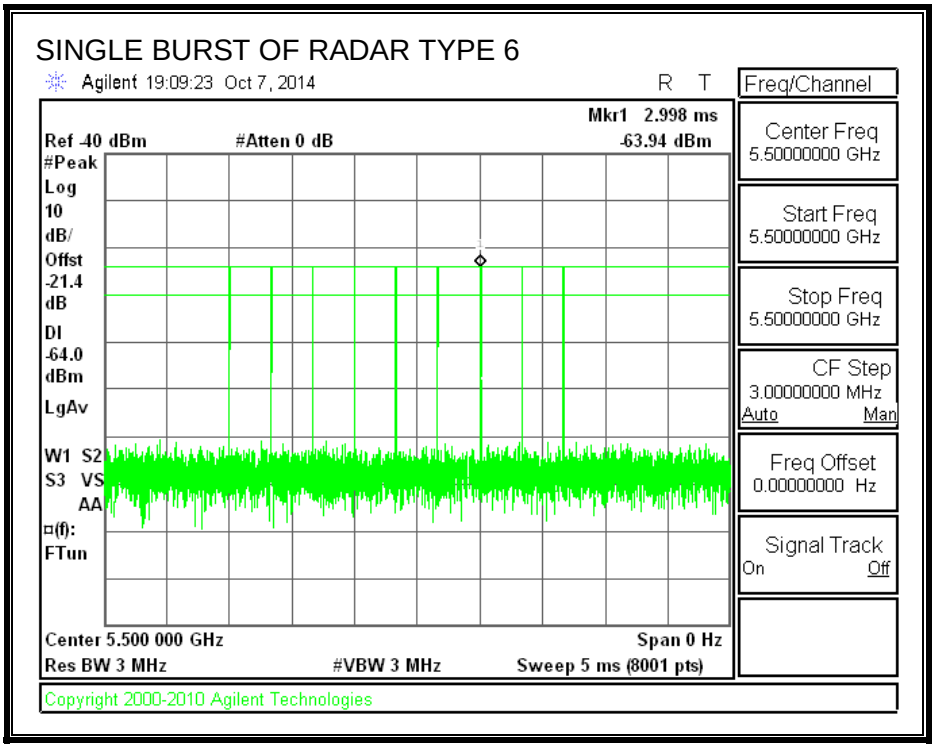
SAMPLE OF RADAR TYPE 4



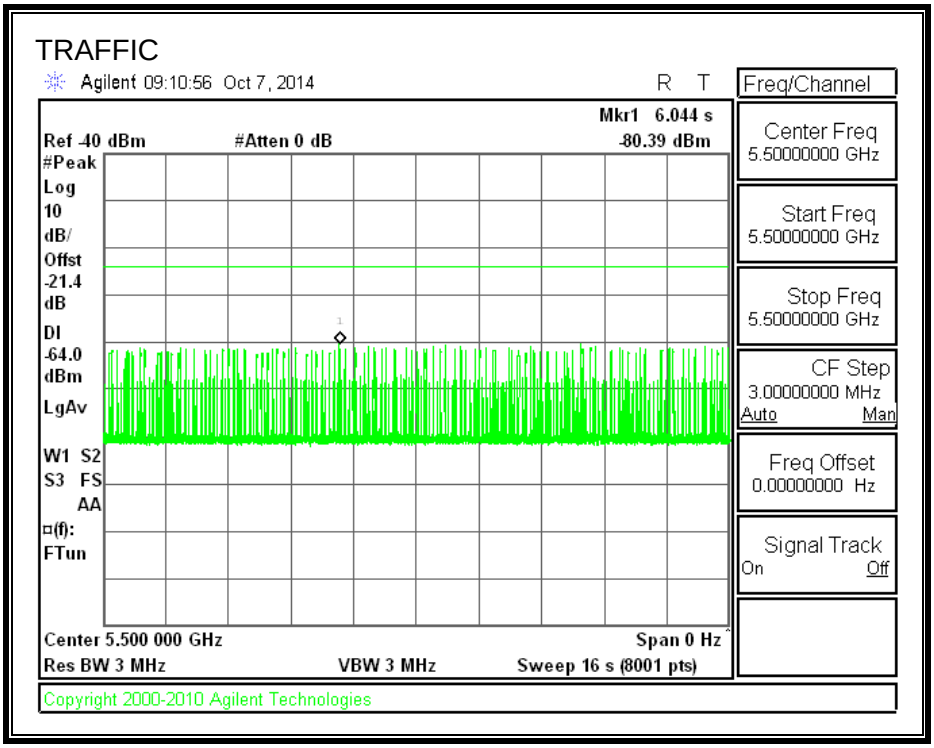
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6



TRAFFIC



5.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5500 MHz and commence a CAC period. The time to the re-initialization of traffic was measured as the time required for the EUT to complete the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5500 MHz and commence a CAC period. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5500 MHz and commence a CAC period. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.63	60.63

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	4.23	4.23

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	56.97	56.97

QUANTITATIVE RESULTS BASED ON LOG FILE TIME STAMPS

No Radar Triggered

Beginning of CAC (hh:mm:ss)	End of CAC (hh:mm:ss)	CAC Time (hh:mm:ss)
7:16:12	7:17:12	0:01:00

Radar Near Beginning of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
7:24:11	7:24:15	0:00:04

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
7:31:21	7:32:17	0:00:56

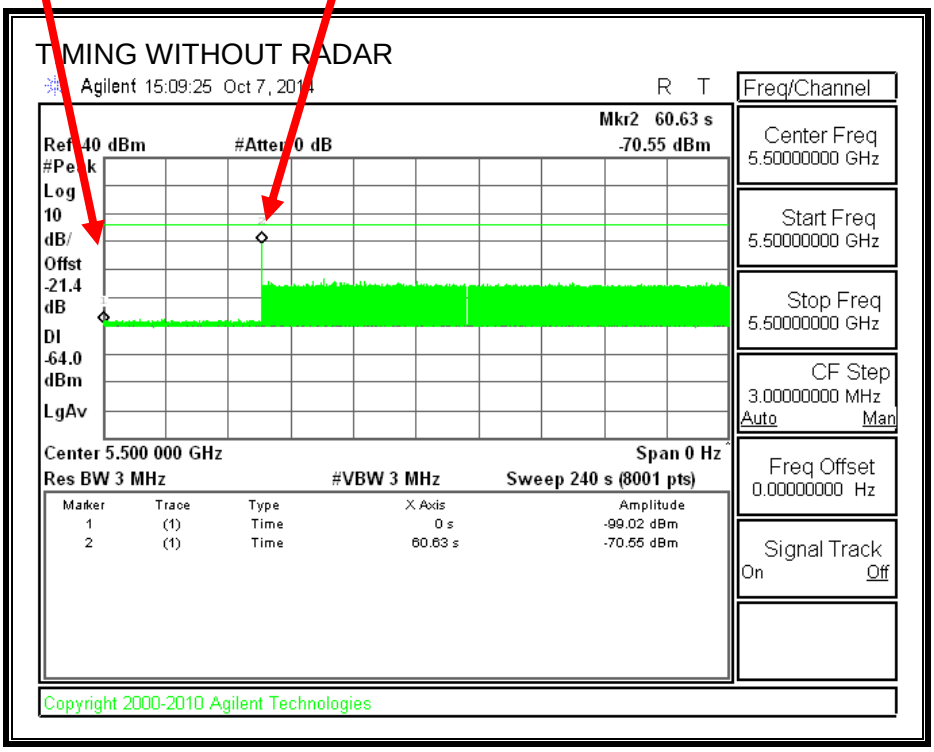
QUALITATIVE RESULTS

Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

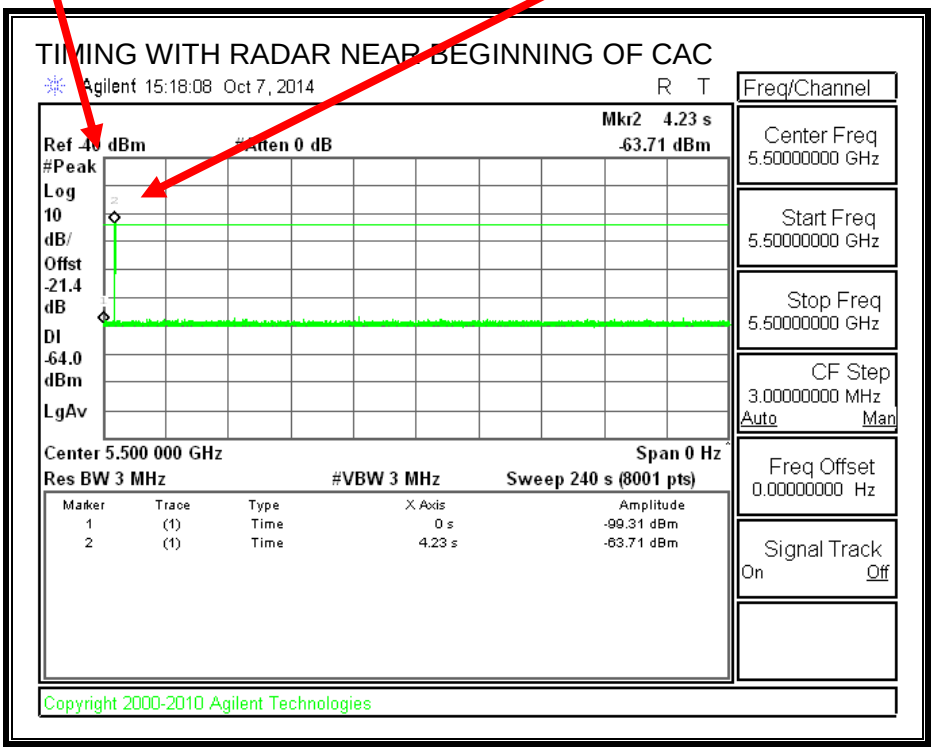
Log File of CAC Timing Without Radar

```
DLS DFS State IDLE -> PRE-ISM Channel Availability Check
width is 20 (cfg.c:555)

Jan 01 07:16:12 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 3(cfg.c:584)

DLS DFS State PRE-ISM Channel Availability Check -> In-Service
Monitoring(ISM)
Jan 01 07:17:12 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> In-Service Monitoring(ISM).
```

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

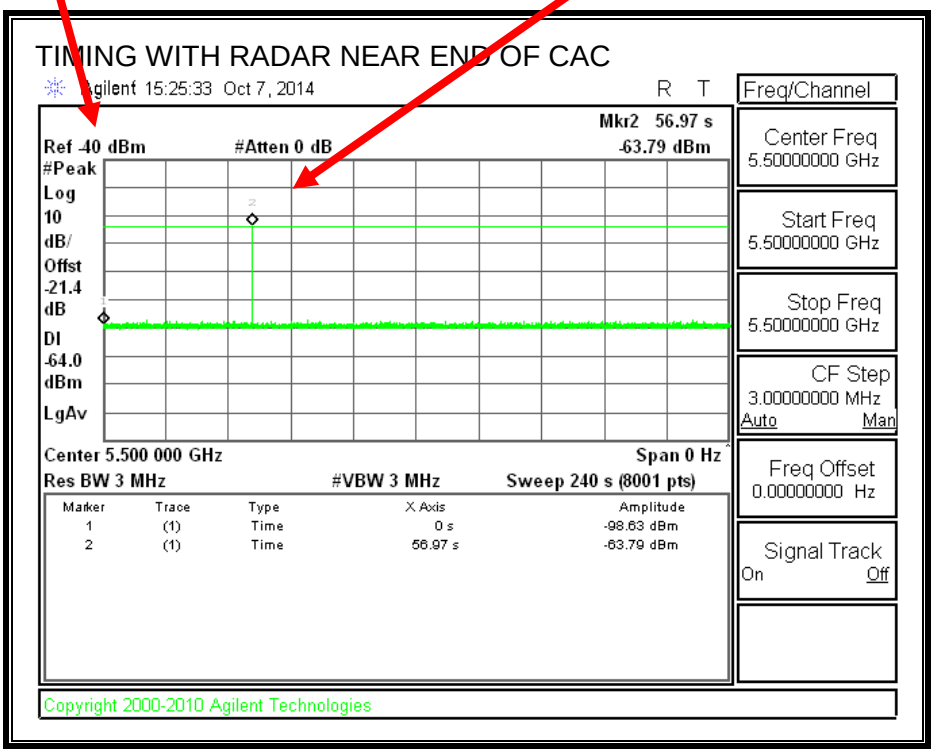
Log File of Radar at the Beginning of CAC

```
DLS DFS State IDLE -> PRE-ISM Channel Availability Check
Jan 01 07:24:11 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
width is 20 (cfg.c:555)
radio->info.current_channel is 100 sys_idx: 3 (cfg.c:584)

RADAR_DETECTED: Radar found on channel 100 freq 5500 MHz

Jan 01 07:24:15 2014: KERN: wl1: dfs : state PRE-ISM Channel Availability
Check, detected radar in channel 100.
```

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

```
Jan 01 07:31:21 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
eradio->info.current_channel is 100 sys_idx: 3(cfg.c:584)

Jan 01 07:32:17 2014: KERN: wl1: dfs : state PRE-ISM Channel Availability
Check, detected radar in channel 100.
```

5.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

The channel spacing is not less than the channel bandwidth therefore the EUT does not have an overlapping channel plan.

5.2.5. 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).

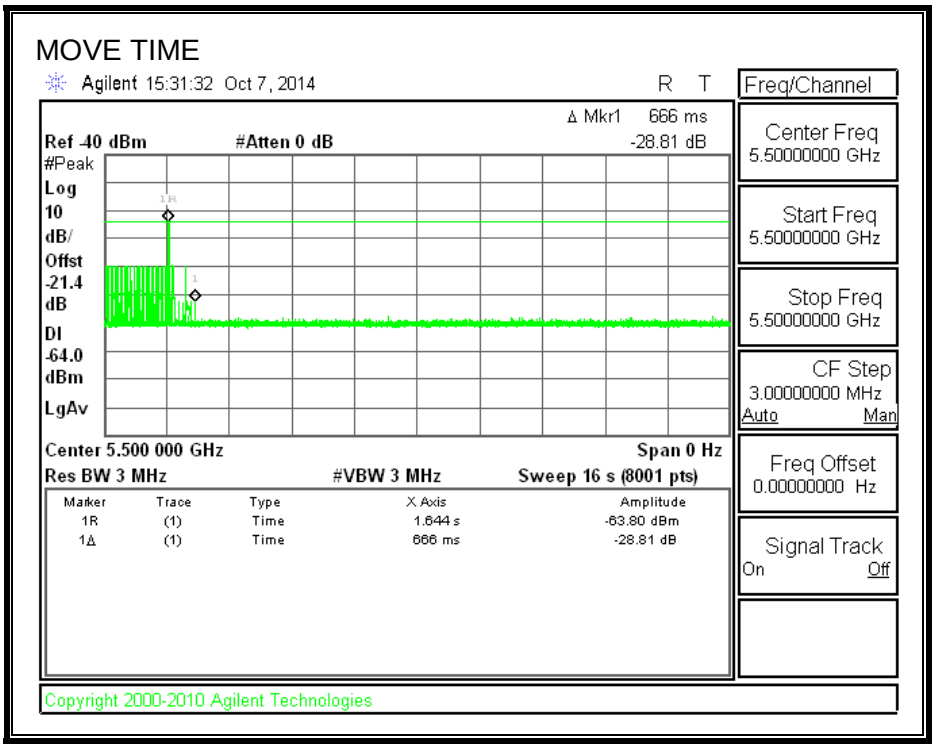
RESULTS

Channel Move Time (sec)	Limit (sec)
0.596	10

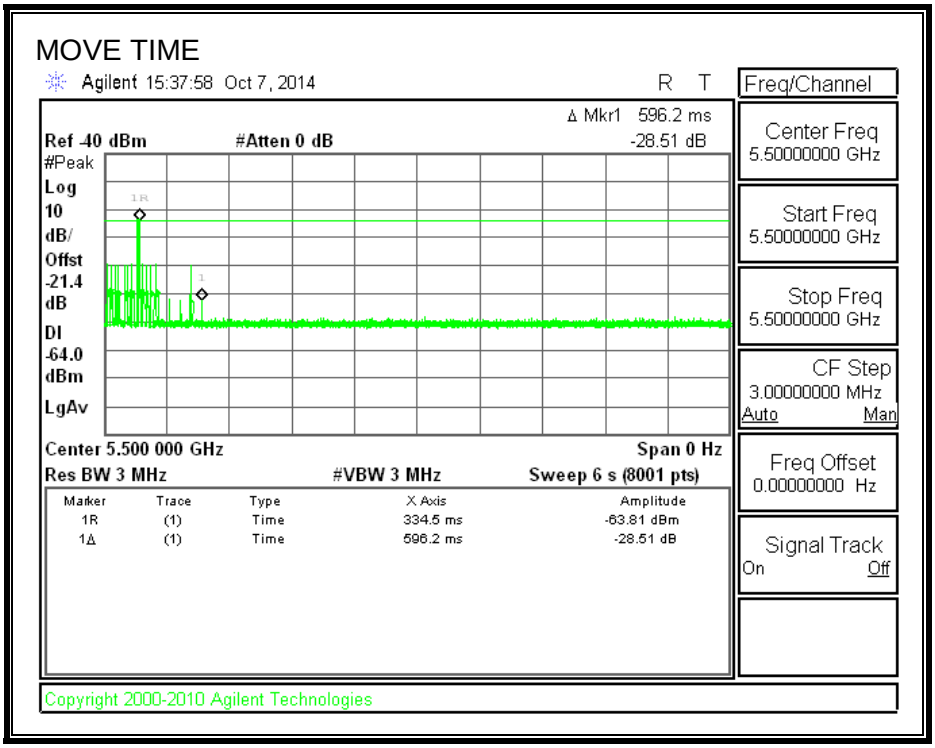
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
10.5	60

MOVE TIME

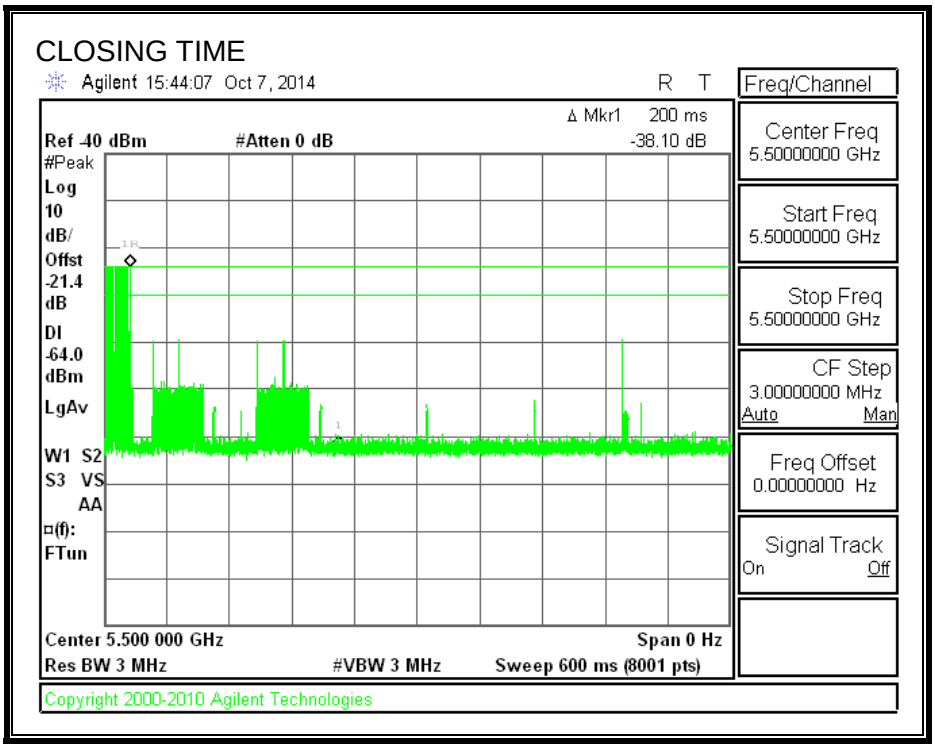
16 SECOND SWEEP:



6 SECOND SWEEP:



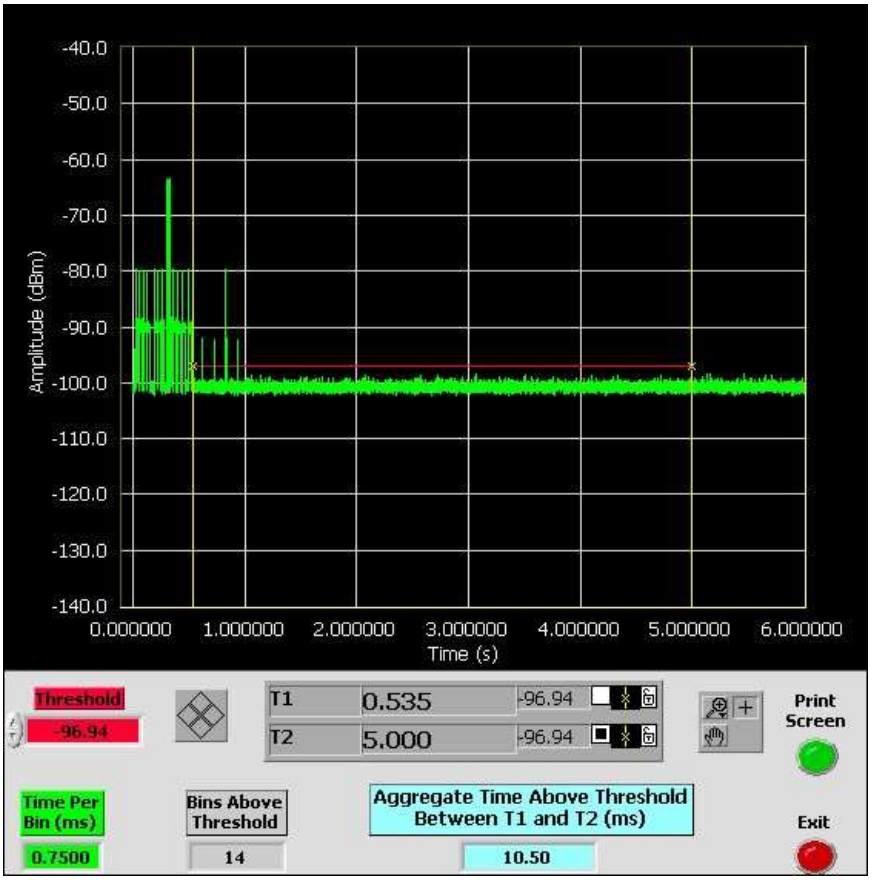
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

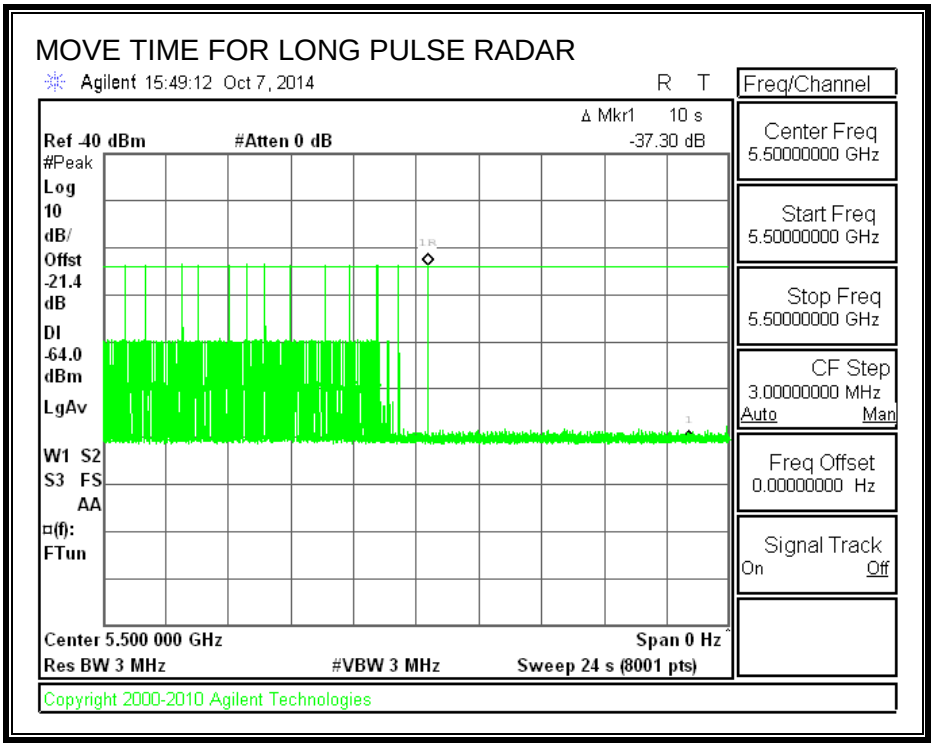
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



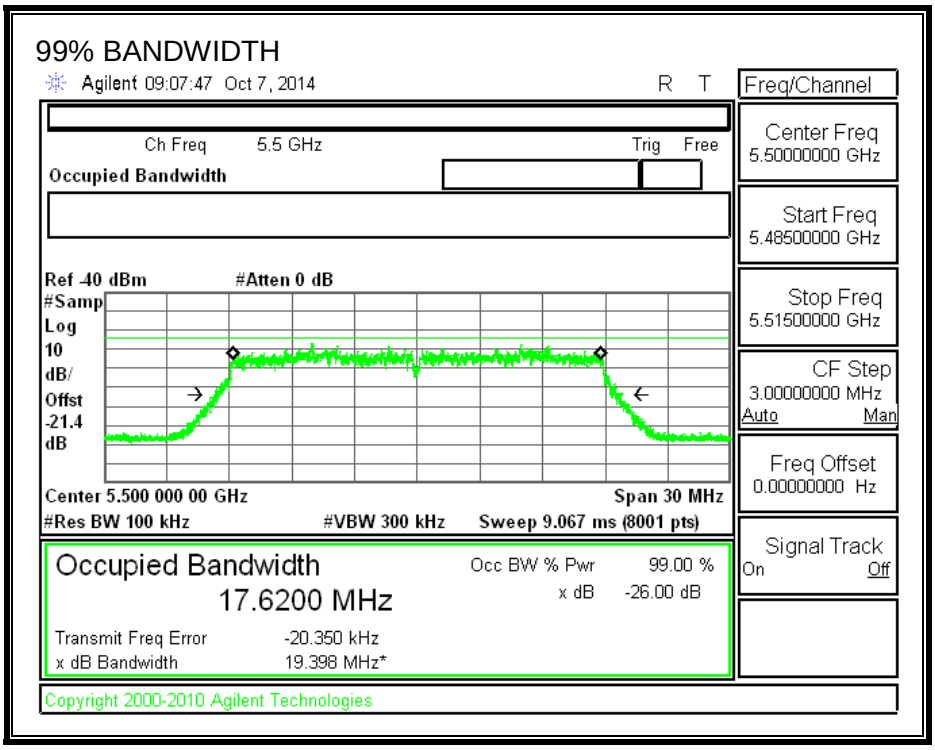
LONG PULSE CHANNEL MOVE TIME

The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.2.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5491	5509	18	17.620	102.2	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5491	10	10	100	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5500	10	10	100	
5505	10	9	90	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	
5509	10	10	100	FH

5.2.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	96.67	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	96.67	60	Pass
Aggregate		98.33	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	38	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1				
1 us Pulse Width				
Waveform	PRI (us)	Pulses Per Burst	Test (A/B)	Successful Detection (Yes/No)
1001	3066	18	A	No
1002	698	76	A	Yes
1003	858	62	A	Yes
1004	618	86	A	Yes
1005	778	68	A	Yes
1006	798	67	A	Yes
1007	918	58	A	Yes
1008	838	63	A	Yes
1009	638	83	A	Yes
1010	658	81	A	Yes
1011	898	59	A	Yes
1012	578	92	A	Yes
1013	598	89	A	Yes
1014	518	102	A	Yes
1015	878	61	A	Yes
1016	558	95	B	Yes
1017	1536	35	B	Yes
1018	2734	20	B	Yes
1019	1914	28	B	Yes
1020	2380	23	B	Yes
1021	1709	31	B	Yes
1022	1017	52	B	Yes
1023	834	64	B	Yes
1024	2808	19	B	Yes
1025	1473	36	B	Yes
1026	2773	20	B	Yes
1027	1047	51	B	Yes
1028	1534	35	B	Yes
1029	674	79	B	Yes
1030	2552	21	B	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1.1	222.00	25	Yes
2002	2.4	166.00	27	Yes
2003	4.4	218.00	23	Yes
2004	4.5	171.00	25	Yes
2005	1.8	155.00	27	Yes
2006	2.3	225.00	29	Yes
2007	1.4	199.00	23	Yes
2008	2.9	210.00	29	Yes
2009	2	202.00	27	Yes
2010	3	168.00	26	Yes
2011	3.3	203.00	29	Yes
2012	4.6	176.00	27	Yes
2013	4.4	180.00	26	Yes
2014	1.9	155.00	28	Yes
2015	2.7	194.00	28	Yes
2016	4.9	203.00	27	Yes
2017	2.1	192.00	29	Yes
2018	3.5	183.00	27	Yes
2019	1.9	186.00	26	Yes
2020	4.2	168.00	24	Yes
2021	3	168.00	27	Yes
2022	3.6	158.00	25	Yes
2023	1	181.00	24	Yes
2024	2	205.00	29	Yes
2025	4.2	184.00	23	Yes
2026	5	200.00	28	Yes
2027	2.9	225.00	25	Yes
2028	2.5	184.00	29	Yes
2029	4.1	164.00	28	Yes
2030	1.4	180.00	23	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.2	393.00	17	Yes
3002	6.3	279.00	18	Yes
3003	6.8	459.00	16	Yes
3004	6.4	412.00	16	Yes
3005	9.3	291.00	16	Yes
3006	7.9	330.00	16	Yes
3007	5.3	300.00	18	Yes
3008	6.4	466.00	16	Yes
3009	8.6	460.00	16	Yes
3010	7.9	477.00	17	Yes
3011	9.1	267.00	16	Yes
3012	7.8	296.00	18	Yes
3013	7.3	451.00	16	Yes
3014	8	335.00	16	Yes
3015	8	396.00	18	Yes
3016	8.3	271.00	17	Yes
3017	5.2	268.00	18	Yes
3018	5.6	476.00	16	Yes
3019	6.8	290.00	18	Yes
3020	9	445.00	17	Yes
3021	5.3	474.00	18	Yes
3022	9.4	385.00	16	Yes
3023	8.8	451.00	17	Yes
3024	5.4	296.00	18	Yes
3025	7.2	385.00	17	Yes
3026	9.4	427.00	16	Yes
3027	6.6	488.00	16	Yes
3028	9.1	262.00	16	Yes
3029	7.1	498	16	Yes
3030	8	460	16	Yes

TYPE 4 DETECTION PROBABILITY

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	20	267.00	13	Yes
4002	12	320.00	15	Yes
4003	13.9	396.00	15	Yes
4004	11.5	302.00	14	Yes
4005	11.1	315.00	12	Yes
4006	18.5	344.00	14	Yes
4007	14.8	360.00	16	No
4008	16.4	322.00	16	Yes
4009	15.3	332.00	16	Yes
4010	16.6	357.00	12	Yes
4011	12.7	312.00	15	Yes
4012	16.9	445.00	12	Yes
4013	14.9	266.00	12	Yes
4014	15.8	403.00	12	Yes
4015	16.4	492.00	13	Yes
4016	11	320.00	16	Yes
4017	12.9	434.00	13	Yes
4018	14.4	439.00	13	Yes
4019	16.7	457.00	14	Yes
4020	15.4	346.00	15	Yes
4021	16.7	472.00	13	Yes
4022	17.4	450.00	13	Yes
4023	16.4	463.00	12	Yes
4024	11.8	352.00	14	Yes
4025	15.8	327.00	16	Yes
4026	13.7	443.00	14	Yes
4027	19.3	407.00	15	Yes
4028	12.8	378.00	12	Yes
4029	16.2	307.00	15	Yes
4030	18.1	280.00	14	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5	
Trial	Successful Detection (Yes/No)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

Note: The Type 5 randomized parameters are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	238	5491	7	Yes
2	713	5492	3	Yes
3	1188	5493	2	Yes
4	1663	5494	2	Yes
5	2138	5495	6	Yes
6	3088	5496	6	Yes
7	3563	5497	4	Yes
8	4038	5498	4	Yes
9	4513	5499	6	Yes
10	4988	5500	3	Yes
11	5463	5501	7	Yes
12	5938	5502	1	Yes
13	6413	5503	3	Yes
14	6888	5504	5	Yes
15	7363	5505	5	Yes
16	7838	5506	4	Yes
17	8313	5507	4	Yes
18	8788	5508	2	Yes
19	9263	5509	1	Yes
20	9738	5491	3	Yes
21	10213	5492	2	Yes
22	10688	5493	5	Yes
23	11163	5494	2	Yes
24	11638	5495	4	Yes
25	12113	5496	1	Yes
26	12588	5497	3	Yes
27	13063	5498	5	Yes
28	13538	5499	2	Yes
29	14013	5500	4	Yes
30	14488	5501	5	Yes
31	14963	5502	3	Yes
32	15438	5503	5	Yes
33	15913	5504	5	Yes
34	16388	5505	3	Yes
35	16863	5506	4	Yes
36	17338	5507	4	Yes
37	17813	5508	4	Yes
38	18288	5509	4	Yes

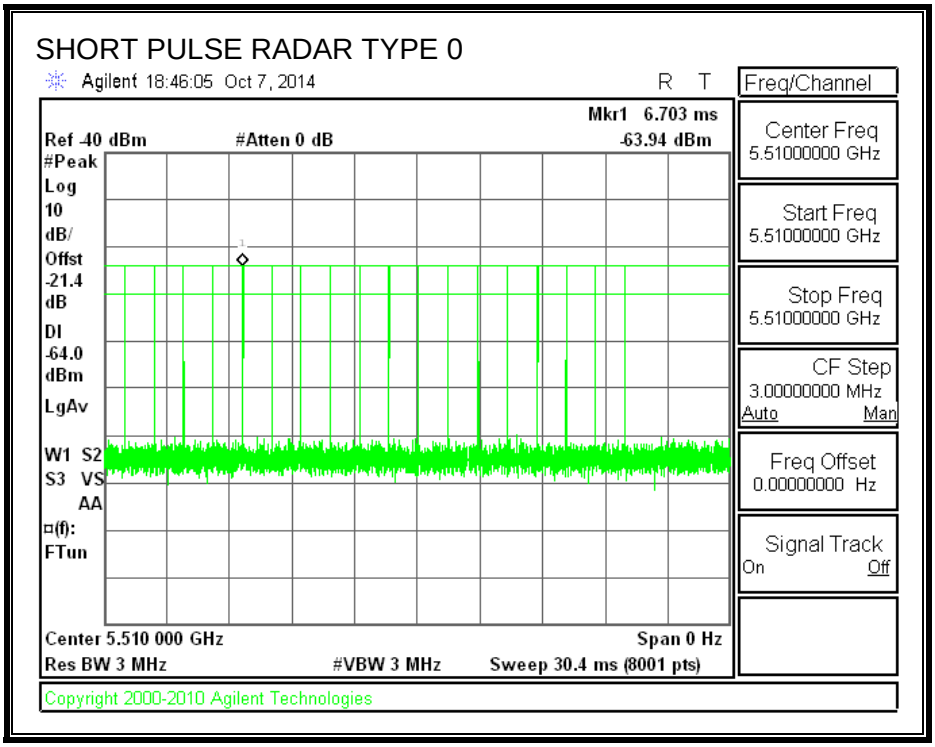
5.3. RESULTS FOR 40 MHz BANDWIDTH

5.3.1. TEST CHANNEL

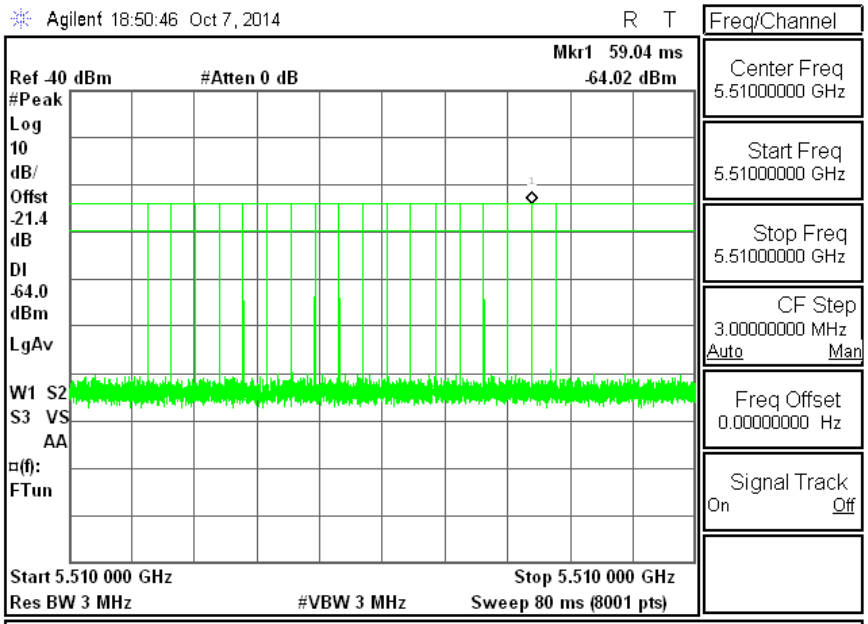
All tests were performed at a channel center frequency of 5510 MHz.

5.3.2. RADAR WAVEFORMS AND TRAFFIC

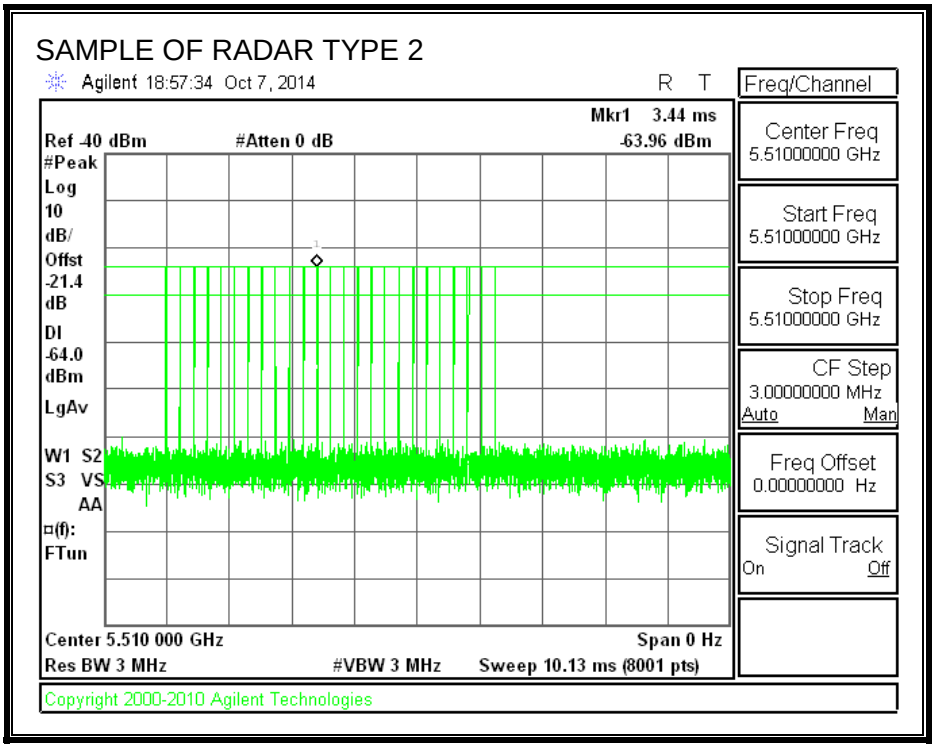
RADAR WAVEFORMS



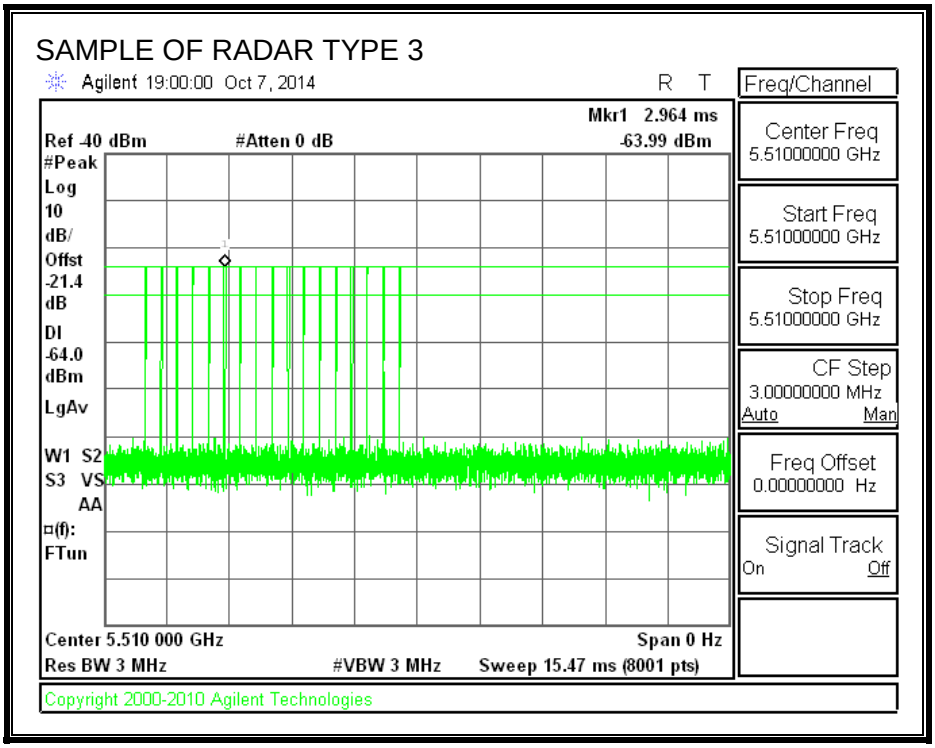
SAMPLE OF RADAR TYPE 1



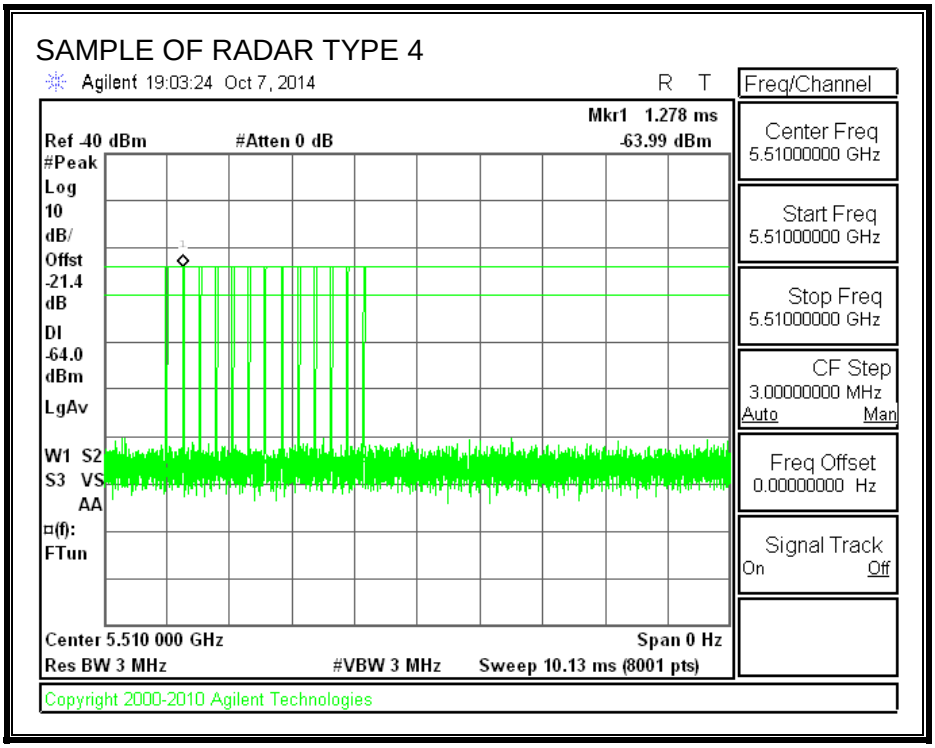
SAMPLE OF RADAR TYPE 2



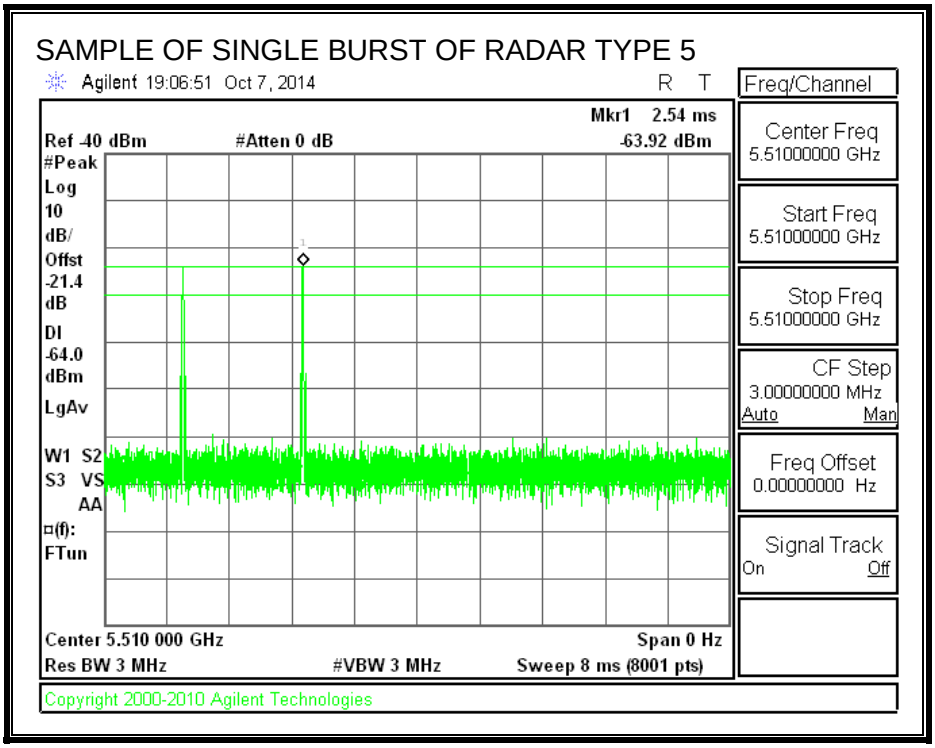
SAMPLE OF RADAR TYPE 3

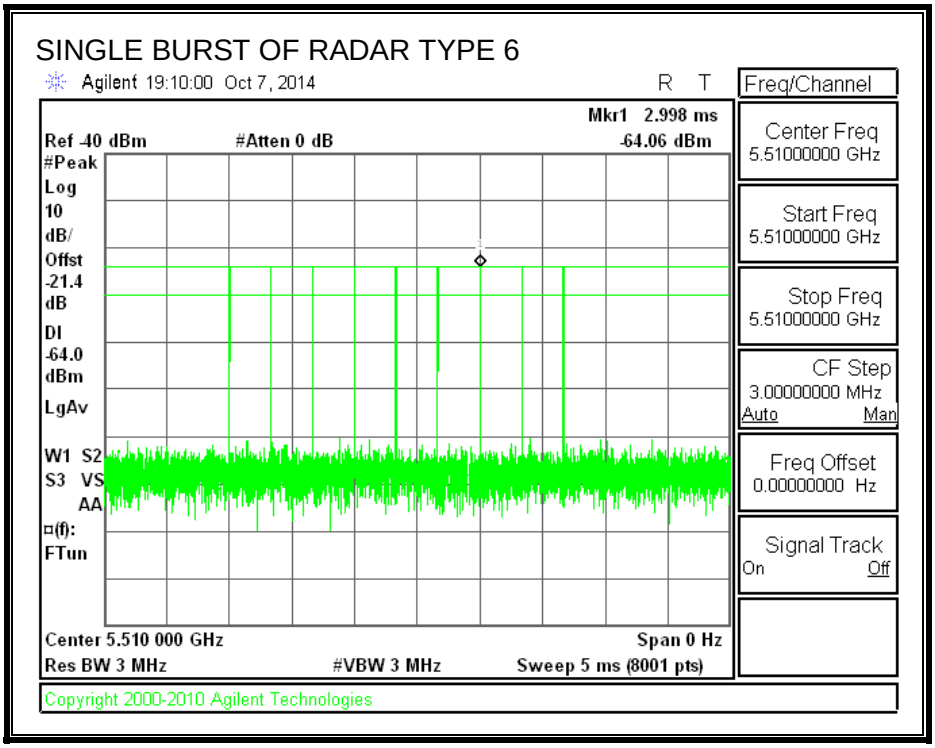


SAMPLE OF RADAR TYPE 4

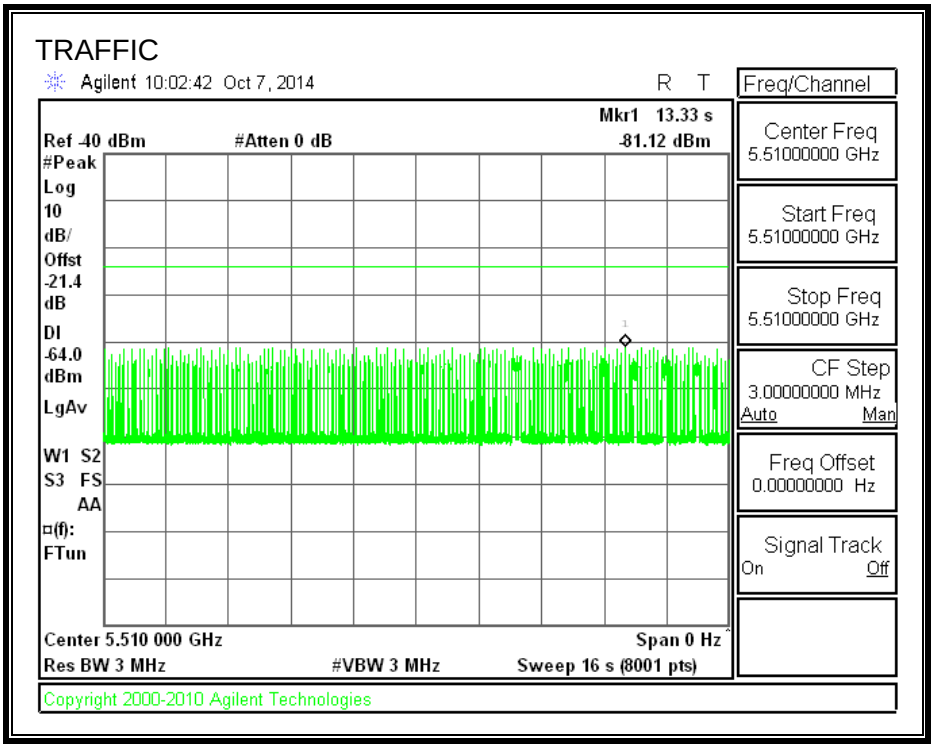


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





TRAFFIC



5.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5510 MHz and commence a CAC period. The time to the re-initialization of traffic was measured as the time required for the EUT to complete the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5510 MHz and commence a CAC period. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5510 MHz and commence a CAC period. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.93	60.93

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	5.31	5.31

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	56.76	56.76

QUANTITATIVE RESULTS BASED ON LOG FILE TIME STAMPS

No Radar Triggered

Beginning of CAC (hh:mm:ss)	End of CAC (hh:mm:ss)	CAC Time (hh:mm:ss)
5:46:24	5:47:24	0:01:00

Radar Near Beginning of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
6:56:05	6:56:10	0:00:05

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
7:03:36	7:04:32	0:00:56

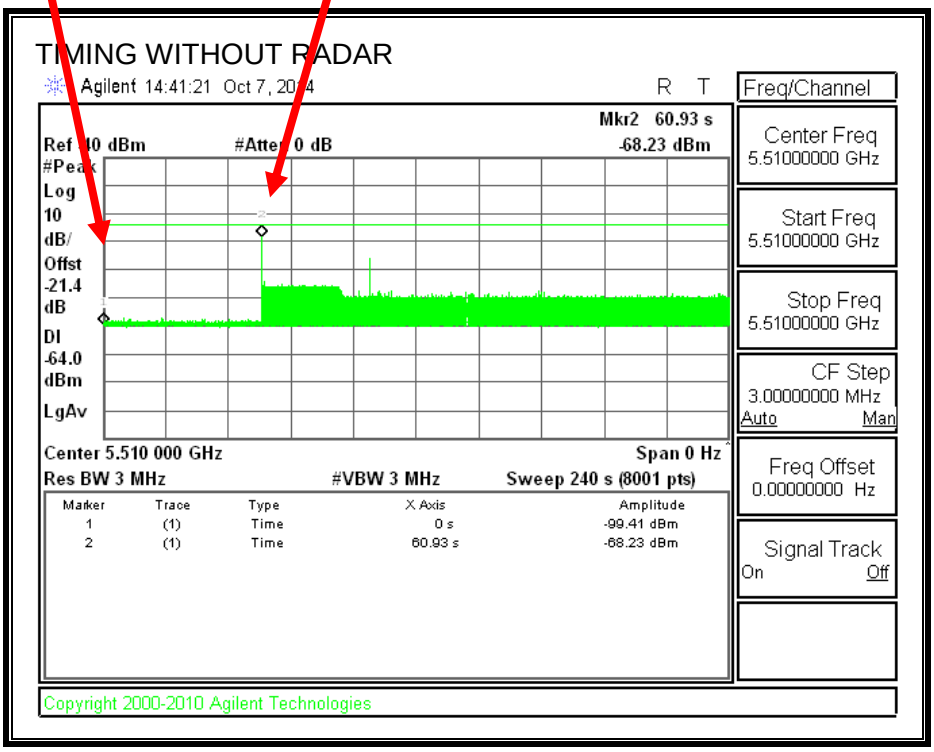
QUALITATIVE RESULTS

Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

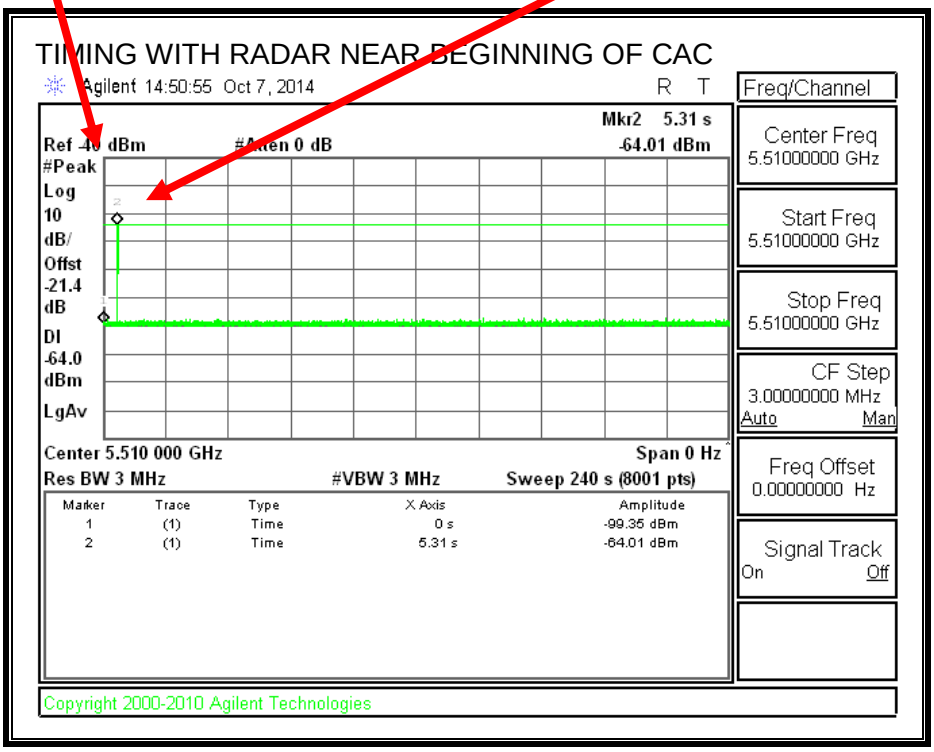
Log File of CAC Timing Without Radar

```
Jan 01 06:46:24 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 5 cfg.c:584)

Jan 01 06:47:24 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> In-Service Monitoring(ISM).
```

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

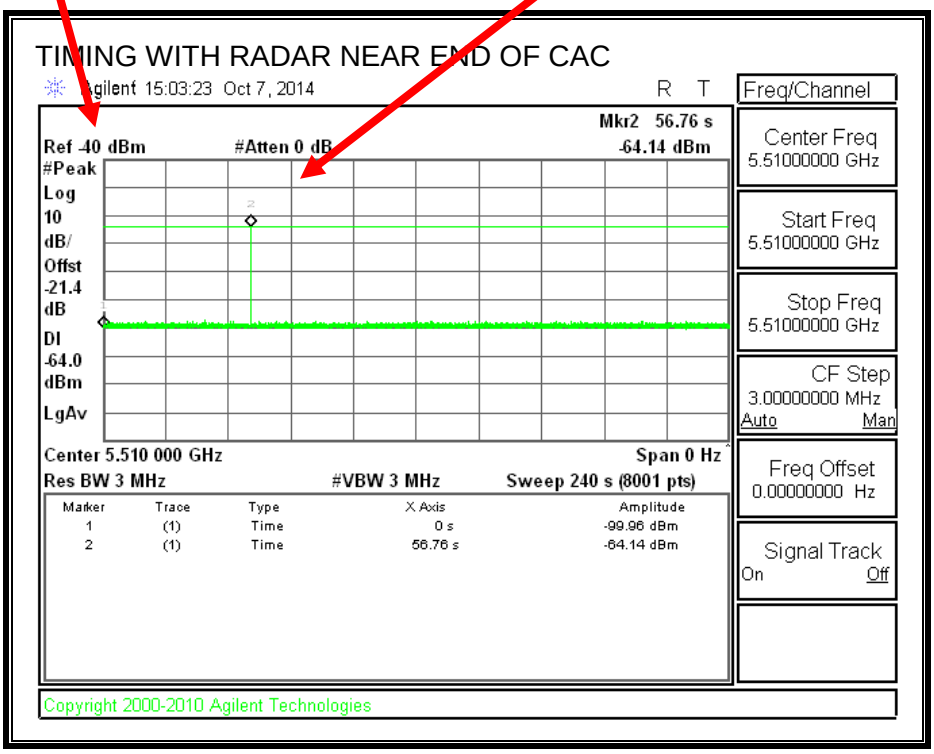
Log File of Radar at the Beginning of CAC

```
Jan 01 06:56:05 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 100 sys_idx: 5 (cfg.c:584)

Jan 01 06:56:10 2014: ap7532-188474 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 100 freq 5500 MHz
```

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

```
DLS DFS State IDLE -> PRE-ISM Channel Availability Check
width is 40
 (cfg.c:565)

Jan 01 07:03:36 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 07:04:32 2014: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected
on channel 100l ########## Intv=28559, min_pw=27,.
```

5.3.1. OVERLAPPING CHANNEL TESTS

RESULTS

The channel spacing is not less than the channel bandwidth therefore the EUT does not have an overlapping channel plan.

5.3.2. 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)

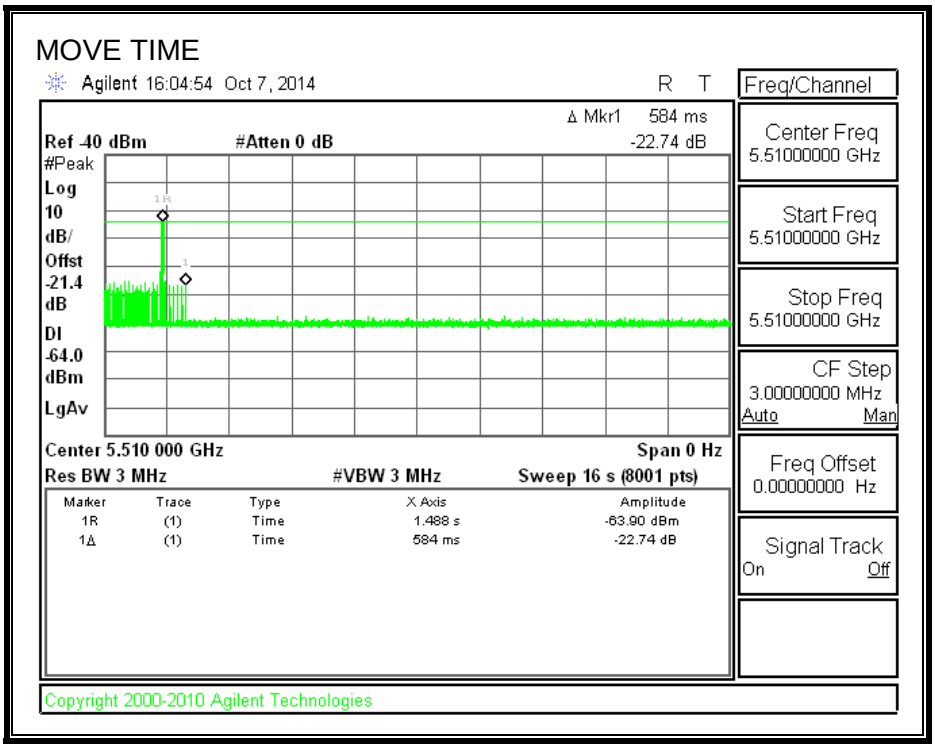
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

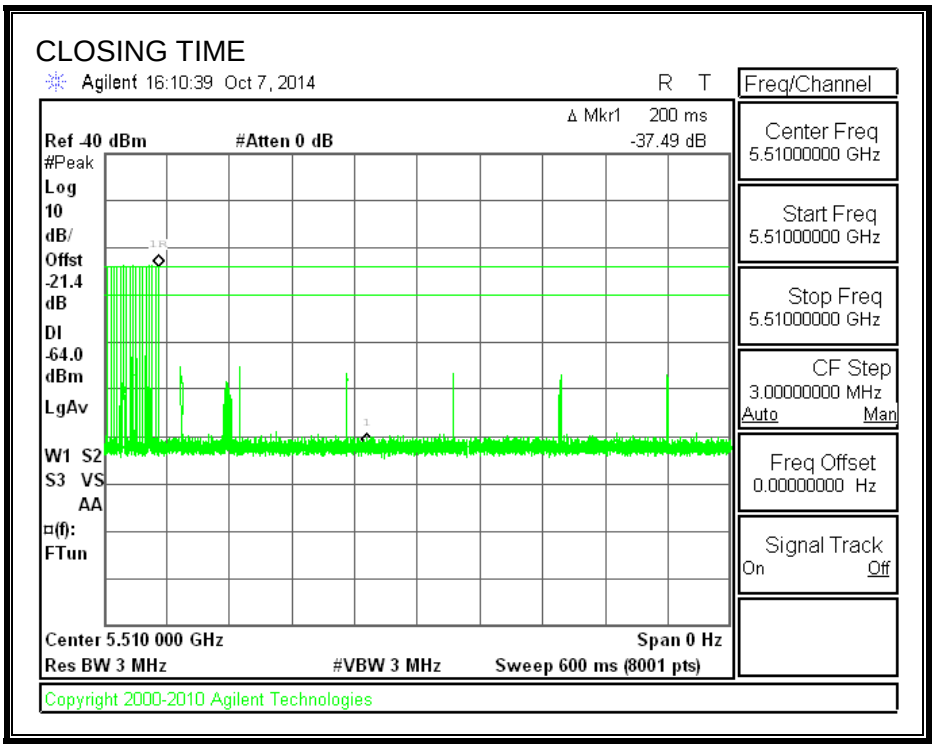
Channel Move Time (sec)	Limit (sec)
0.584	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
14.0	60

MOVE TIME



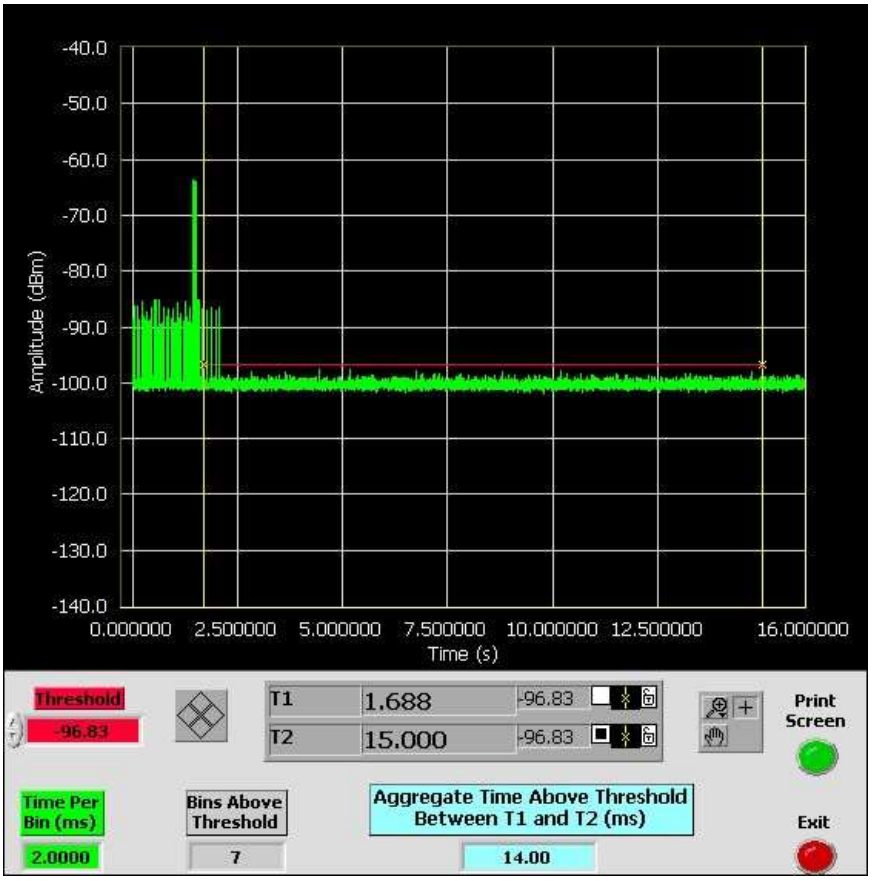
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

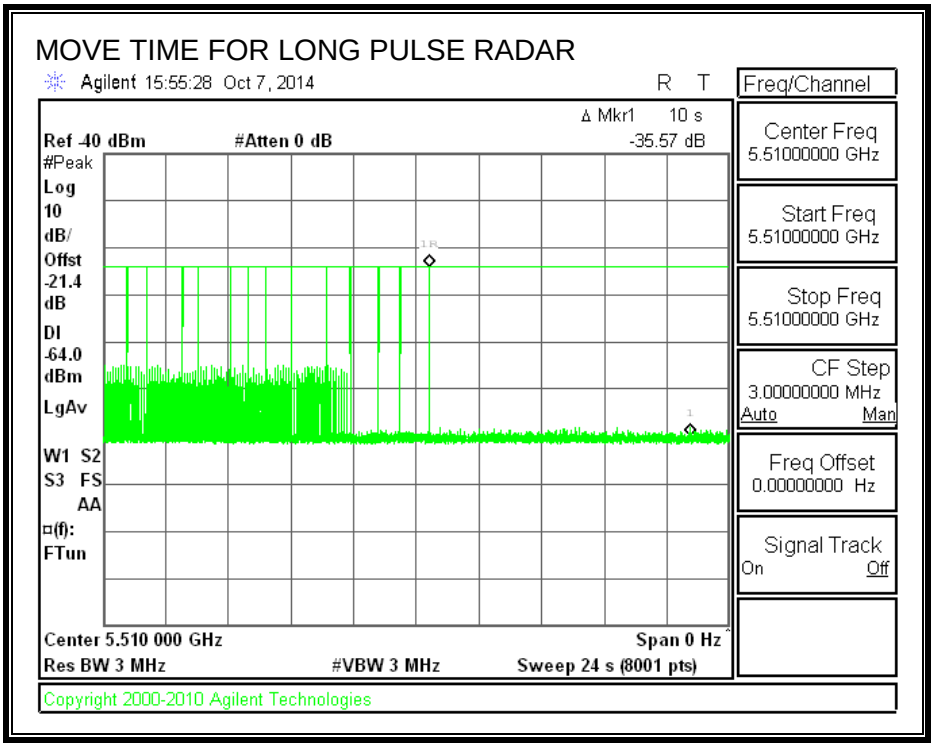
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

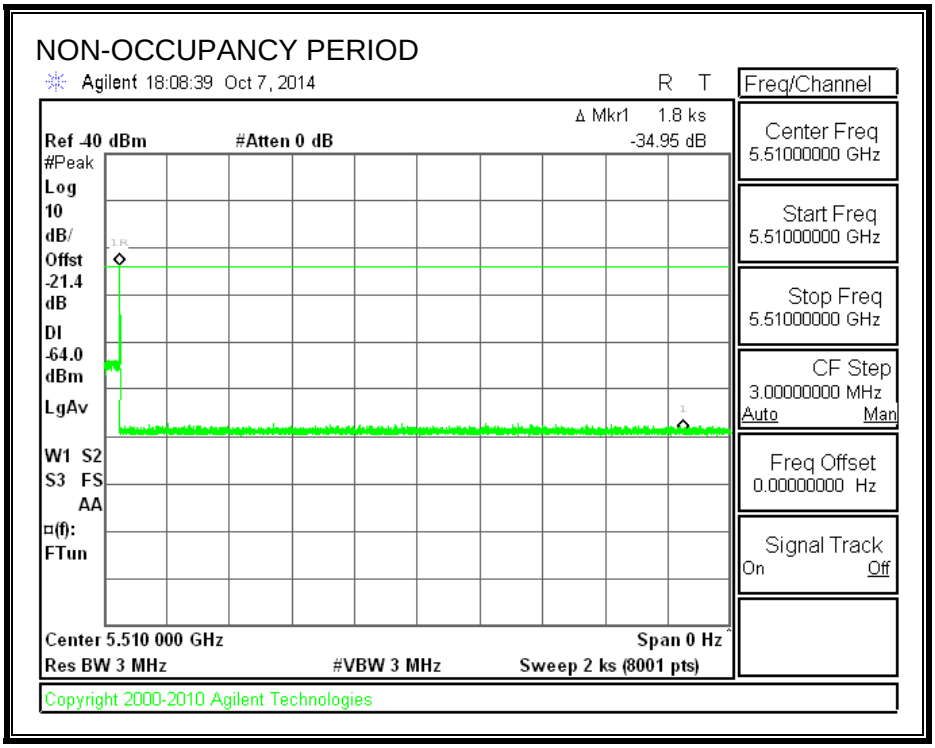
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.3.1. NON-OCCUPANCY PERIOD

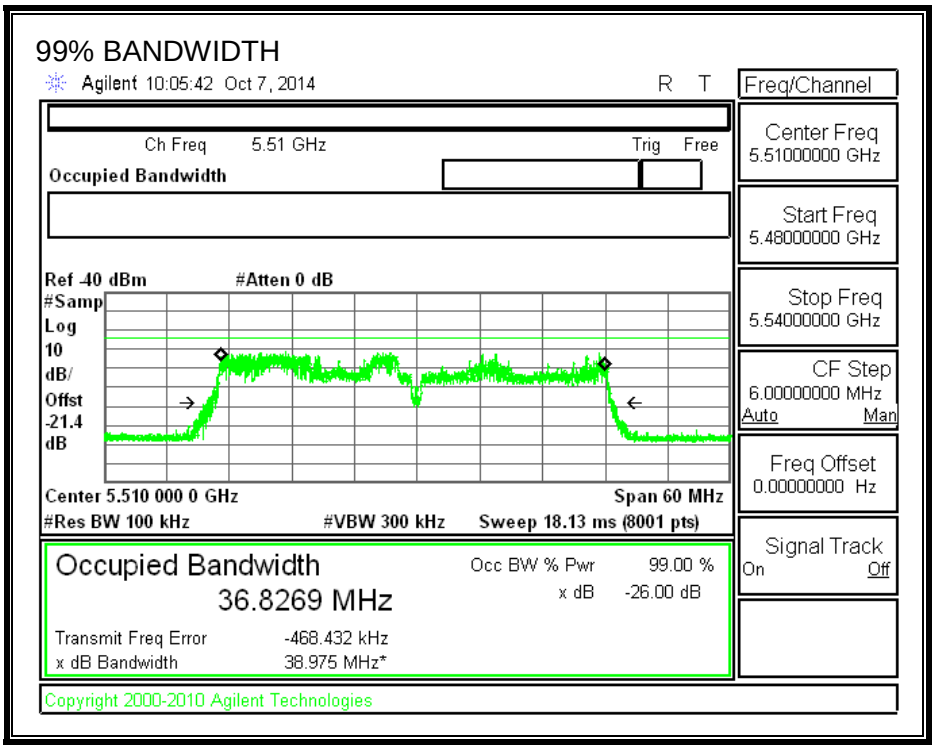
RESULTS

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



5.3.2. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5491	5529	38	36.827	103.2	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5491	10	10	100	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5500	10	9	90	
5505	10	10	100	
5510	10	10	100	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5526	10	10	100	
5527	10	10	100	
5528	10	10	100	
5529	10	10	100	FH

5.3.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	90.00	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		95.83	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	39	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1				
1 us Pulse Width				
Waveform	PRI (us)	Pulses Per Burst	Test (A/B)	Successful Detection (Yes/No)
1001	3066	18	A	Yes
1002	698	76	A	Yes
1003	858	62	A	Yes
1004	618	86	A	Yes
1005	778	68	A	Yes
1006	798	67	A	Yes
1007	918	58	A	Yes
1008	838	63	A	Yes
1009	638	83	A	Yes
1010	658	81	A	Yes
1011	898	59	A	Yes
1012	578	92	A	Yes
1013	598	89	A	Yes
1014	518	102	A	Yes
1015	878	61	A	Yes
1016	558	95	B	Yes
1017	1536	35	B	Yes
1018	2734	20	B	Yes
1019	1914	28	B	Yes
1020	2380	23	B	Yes
1021	1709	31	B	Yes
1022	1017	52	B	Yes
1023	834	64	B	Yes
1024	2808	19	B	Yes
1025	1473	36	B	Yes
1026	2773	20	B	Yes
1027	1047	51	B	Yes
1028	1534	35	B	Yes
1029	674	79	B	Yes
1030	2552	21	B	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1.1	222.00	25	Yes
2002	2.4	166.00	27	Yes
2003	4.4	218.00	23	Yes
2004	4.5	171.00	25	Yes
2005	1.8	155.00	27	Yes
2006	2.3	225.00	29	Yes
2007	1.4	199.00	23	Yes
2008	2.9	210.00	29	Yes
2009	2	202.00	27	Yes
2010	3	168.00	26	Yes
2011	3.3	203.00	29	Yes
2012	4.6	176.00	27	Yes
2013	4.4	180.00	26	Yes
2014	1.9	155.00	28	Yes
2015	2.7	194.00	28	Yes
2016	4.9	203.00	27	Yes
2017	2.1	192.00	29	Yes
2018	3.5	183.00	27	Yes
2019	1.9	186.00	26	Yes
2020	4.2	168.00	24	Yes
2021	3	168.00	27	Yes
2022	3.6	158.00	25	Yes
2023	1	181.00	24	Yes
2024	2	205.00	29	Yes
2025	4.2	184.00	23	Yes
2026	5	200.00	28	Yes
2027	2.9	225.00	25	Yes
2028	2.5	184.00	29	Yes
2029	4.1	164.00	28	Yes
2030	1.4	180.00	23	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.2	393.00	17	Yes
3002	6.3	279.00	18	Yes
3003	6.8	459.00	16	No
3004	6.4	412.00	16	No
3005	9.3	291.00	16	Yes
3006	7.9	330.00	16	Yes
3007	5.3	300.00	18	Yes
3008	6.4	466.00	16	Yes
3009	8.6	460.00	16	Yes
3010	7.9	477.00	17	Yes
3011	9.1	267.00	16	Yes
3012	7.8	296.00	18	Yes
3013	7.3	451.00	16	Yes
3014	8	335.00	16	Yes
3015	8	396.00	18	Yes
3016	8.3	271.00	17	No
3017	5.2	268.00	18	Yes
3018	5.6	476.00	16	Yes
3019	6.8	290.00	18	Yes
3020	9	445.00	17	Yes
3021	5.3	474.00	18	Yes
3022	9.4	385.00	16	Yes
3023	8.8	451.00	17	Yes
3024	5.4	296.00	18	Yes
3025	7.2	385.00	17	Yes
3026	9.4	427.00	16	Yes
3027	6.6	488.00	16	Yes
3028	9.1	262.00	16	Yes
3029	7.1	498	16	Yes
3030	8	460	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	20	267.00	13	Yes
4002	12	320.00	15	Yes
4003	13.9	396.00	15	Yes
4004	11.5	302.00	14	Yes
4005	11.1	315.00	12	Yes
4006	18.5	344.00	14	Yes
4007	14.8	360.00	16	Yes
4008	16.4	322.00	16	Yes
4009	15.3	332.00	16	Yes
4010	16.6	357.00	12	Yes
4011	12.7	312.00	15	Yes
4012	16.9	445.00	12	Yes
4013	14.9	266.00	12	Yes
4014	15.8	403.00	12	Yes
4015	16.4	492.00	13	Yes
4016	11	320.00	16	Yes
4017	12.9	434.00	13	Yes
4018	14.4	439.00	13	Yes
4019	16.7	457.00	14	Yes
4020	15.4	346.00	15	Yes
4021	16.7	472.00	13	Yes
4022	17.4	450.00	13	Yes
4023	16.4	463.00	12	No
4024	11.8	352.00	14	Yes
4025	15.8	327.00	16	Yes
4026	13.7	443.00	14	No
4027	19.3	407.00	15	Yes
4028	12.8	378.00	12	Yes
4029	16.2	307.00	15	Yes
4030	18.1	280.00	14	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5	
Trial	Successful Detection (Yes/No)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

Note: The Type 5 randomized parameters are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	122	5491	5	Yes
2	597	5492	11	Yes
3	1072	5493	5	Yes
4	1547	5494	9	Yes
5	2022	5495	5	Yes
6	2497	5496	8	Yes
7	2972	5497	9	Yes
8	3447	5498	7	Yes
9	3922	5499	4	Yes
10	4397	5500	7	Yes
11	4872	5501	10	Yes
12	5347	5502	8	Yes
13	5822	5503	8	Yes
14	6297	5504	7	Yes
15	6772	5505	7	Yes
16	7247	5506	8	Yes
17	7722	5507	7	Yes
18	8197	5508	11	Yes
19	8672	5509	8	Yes
20	9147	5510	11	Yes
21	9622	5511	9	Yes
22	10097	5512	7	Yes
23	10572	5513	6	Yes
24	11047	5514	9	Yes
25	11522	5515	10	Yes
26	11997	5516	10	Yes
27	12472	5517	9	Yes
28	12947	5518	14	Yes
29	13422	5519	14	Yes
30	13897	5520	3	Yes
31	14372	5521	9	Yes
32	14847	5522	8	Yes
33	15322	5523	10	Yes
34	15797	5524	7	Yes
35	16272	5525	5	Yes
36	16747	5526	8	Yes
37	17222	5527	5	Yes
38	17697	5528	8	Yes
39	18172	5529	15	Yes

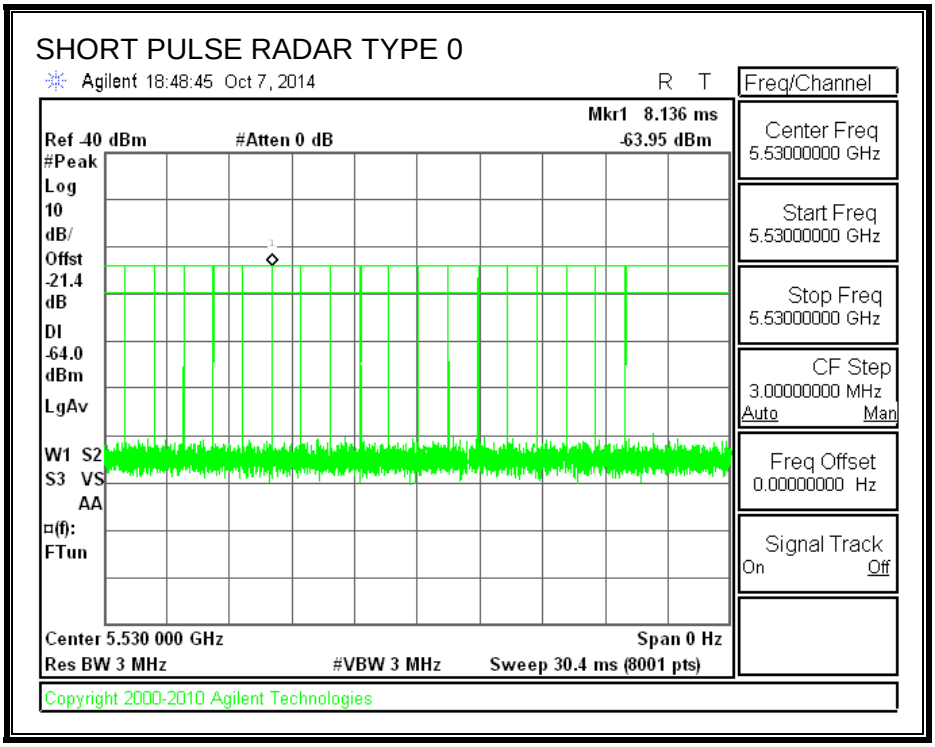
5.4. RESULTS FOR 80 MHz BANDWIDTH

5.4.1. TEST CHANNEL

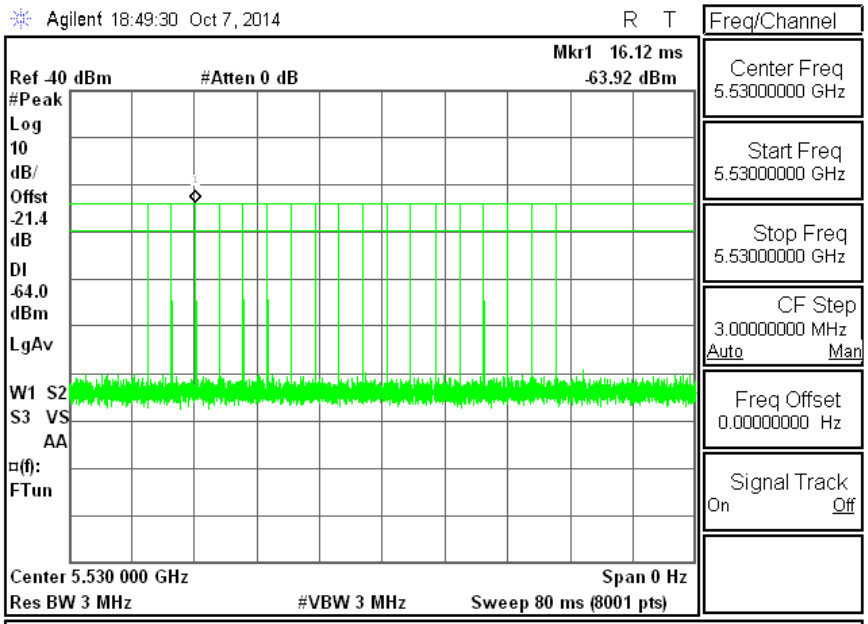
All tests were performed at a channel center frequency of 5530 MHz.

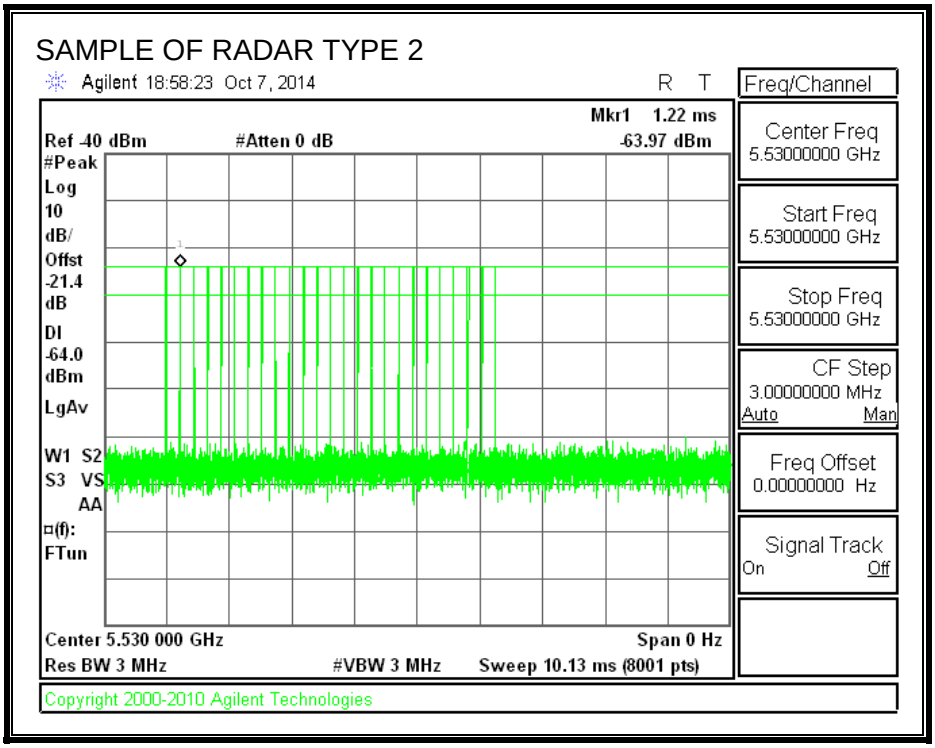
5.4.2. RADAR WAVEFORMS AND TRAFFIC

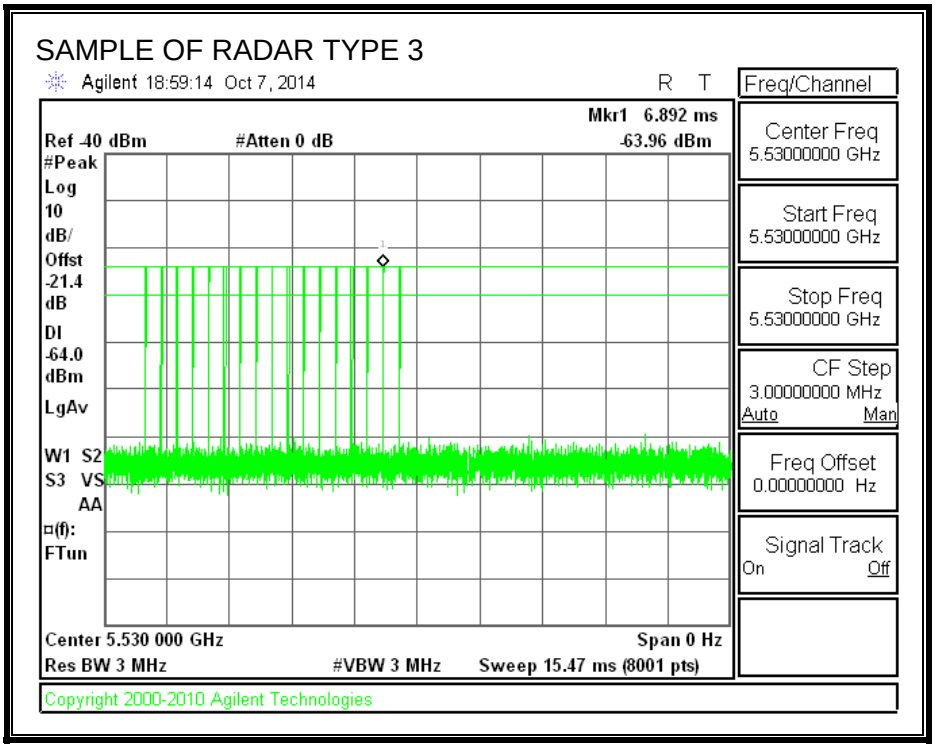
RADAR WAVEFORMS



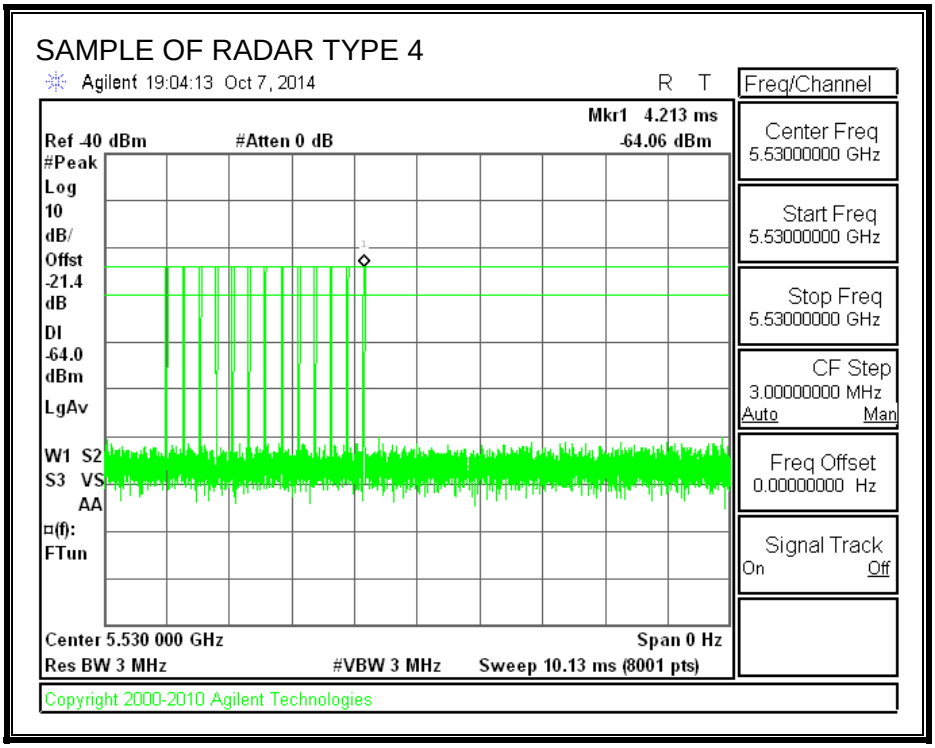
SAMPLE OF RADAR TYPE 1

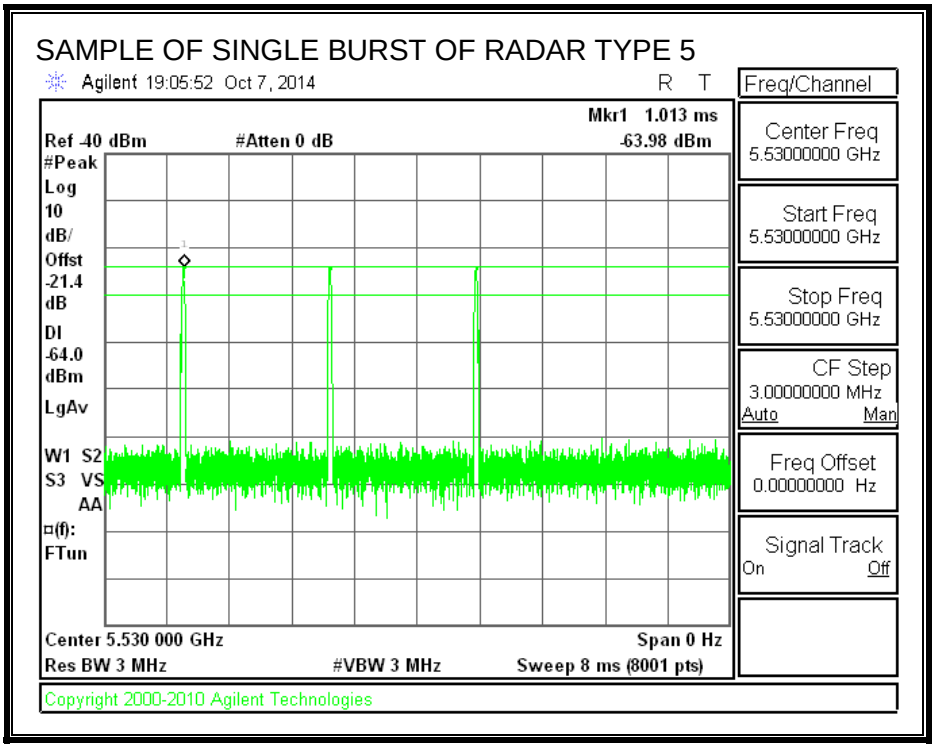




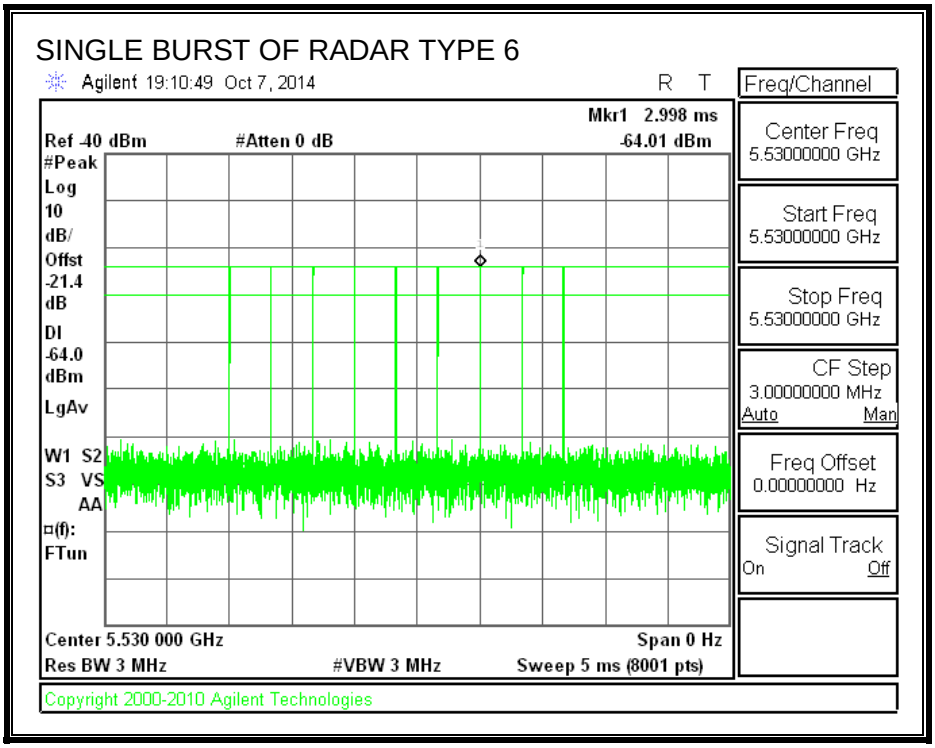


SAMPLE OF RADAR TYPE 4

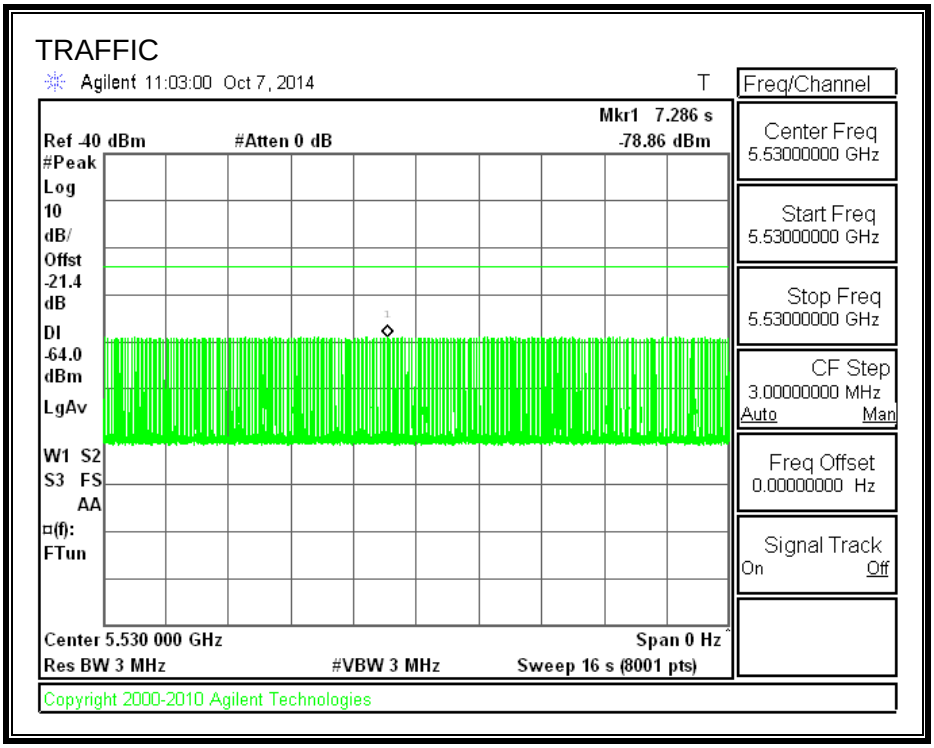




SINGLE BURST OF RADAR TYPE 6



TRAFFIC



5.4.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5530 MHz and commence a CAC period. The time to the re-initialization of traffic was measured as the time required for the EUT to complete the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5530 MHz and commence a CAC period. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5530 MHz and commence a CAC period. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.7	60.67

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	2.85	2.85

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	56.91	56.91

QUANTITATIVE RESULTS BASED ON LOG FILE TIME STAMPS

No Radar Triggered

Beginning of CAC (hh:mm:ss)	End of CAC (hh:mm:ss)	CAC Time (hh:mm:ss)
5:56:38	5:57:38	0:01:00

Radar Near Beginning of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
5:09:20	5:09:23	0:00:03

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
5:35:34	5:36:31	0:00:57

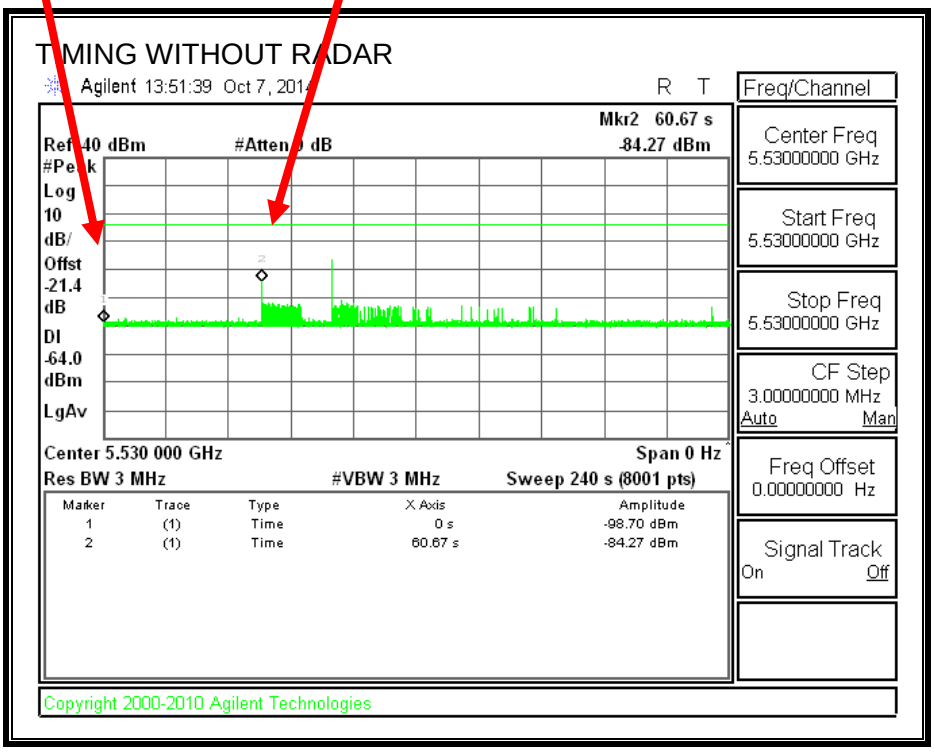
QUALITATIVE RESULTS

Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

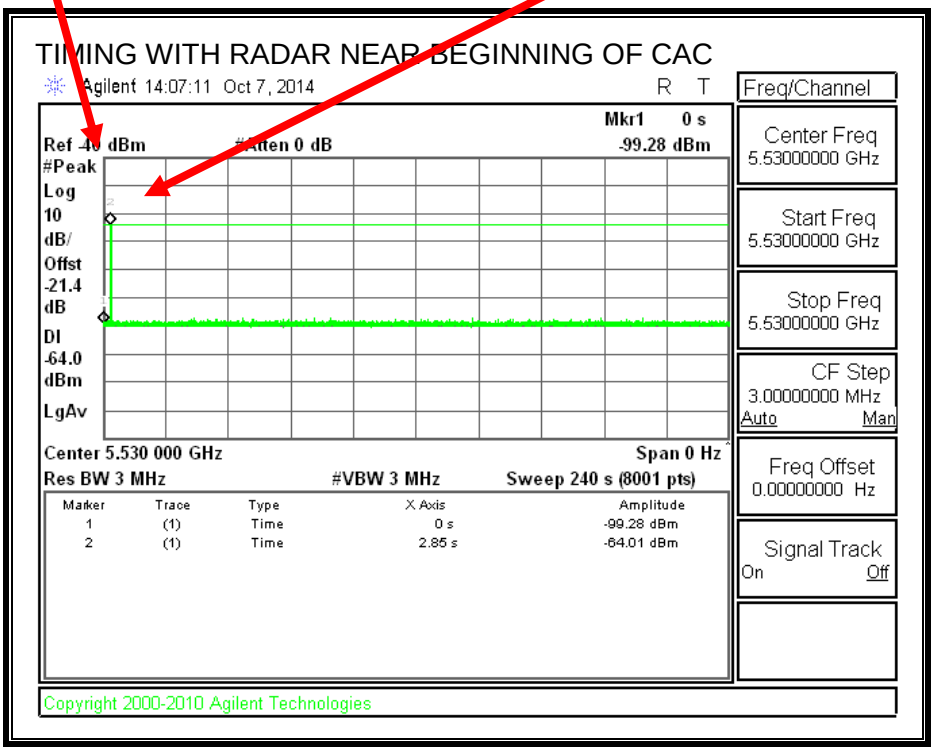
Log File of CAC Timing Without Radar

```
Jan 01 05:56:38 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 100 sys_idx: 6  (cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> In-Service
Monitoring(ISM)

Jan 01 05:57:38 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> In-Service Monitoring(ISM).
```

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

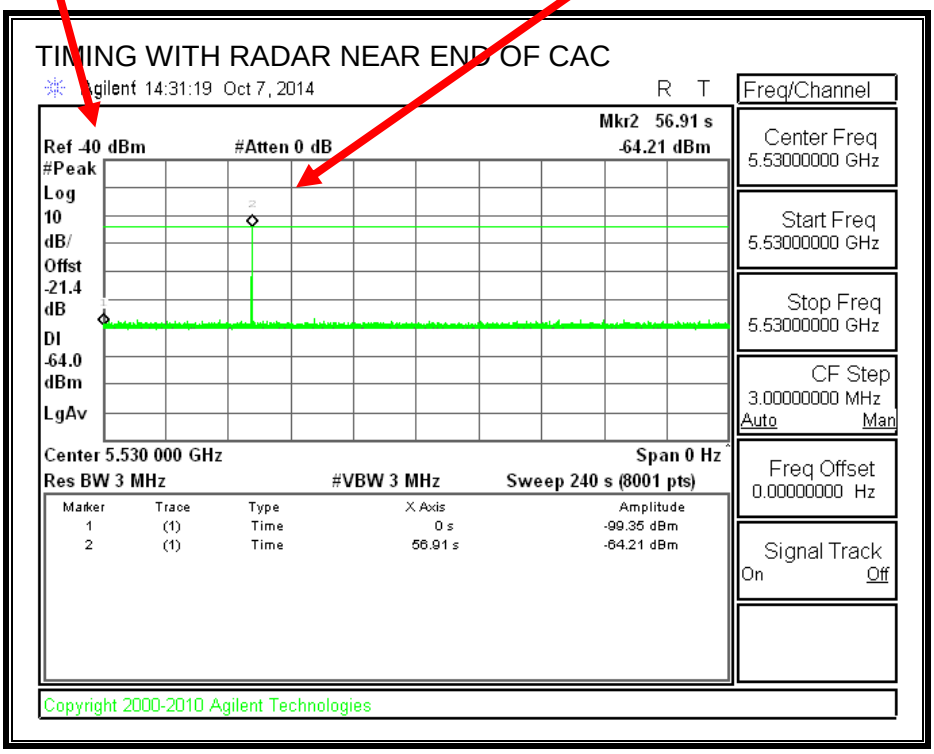
Log File of Radar at the Beginning of CAC

```
Jan 01 06:09:20 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability.
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 06:09:20 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -.
radio->info.current_channel is 100 sys_idx: 6
 (cfg.c:584)
wl -i eth1 radarthrs 0x6a1 0x30 0x6a2 0x30 0x69c 0x30 0x674 0x30 0x6a5 0
x30 0x6a6 0x18 /root # Type 7 Radar Detection. Detected pulse index=0
fm_min=0
fm_max=0 nconsecq_pulses= DLS - time to delete the timer
DLS DFS State PRE-ISM Channel Availability Check -> IDLE

Jan 01 06:09:23 2014: ap7532-188474 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 100
```

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

```
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 06:35:34 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 100 sys_idx: 6 (cfg.c:584)

Jan 01 06:36:31 2014: %KERN-4-WARNING: Type 7 Radar Detection. Detected pulse
index=0 fm_min=0 fm_max=0 nconsecq_pulses=4. Tim.
```

5.4.4. OVERLAPPING CHANNEL TESTS

RESULTS

The channel spacing is not less than the channel bandwidth therefore the EUT does not have an overlapping channel plan.

5.4.5. 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)

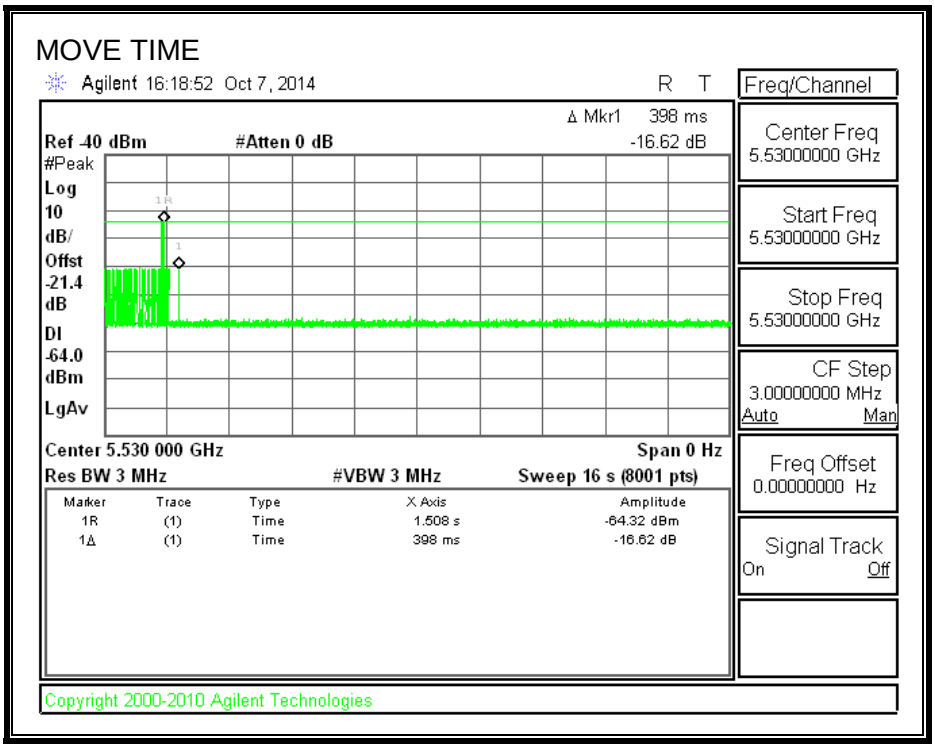
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

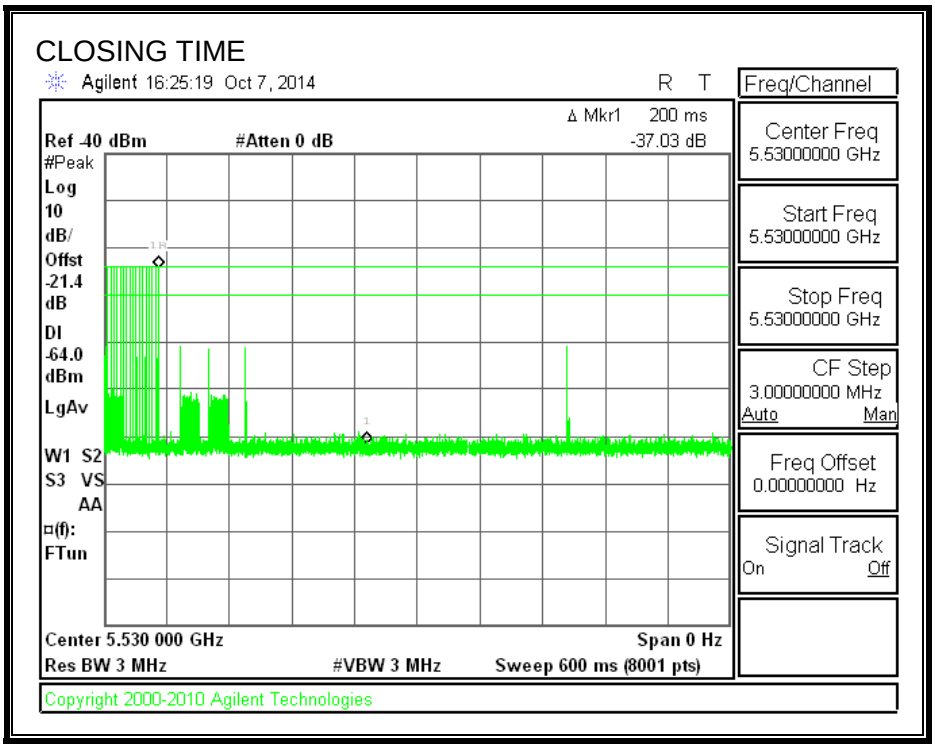
Channel Move Time (sec)	Limit (sec)
0.398	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
6.0	60

MOVE TIME



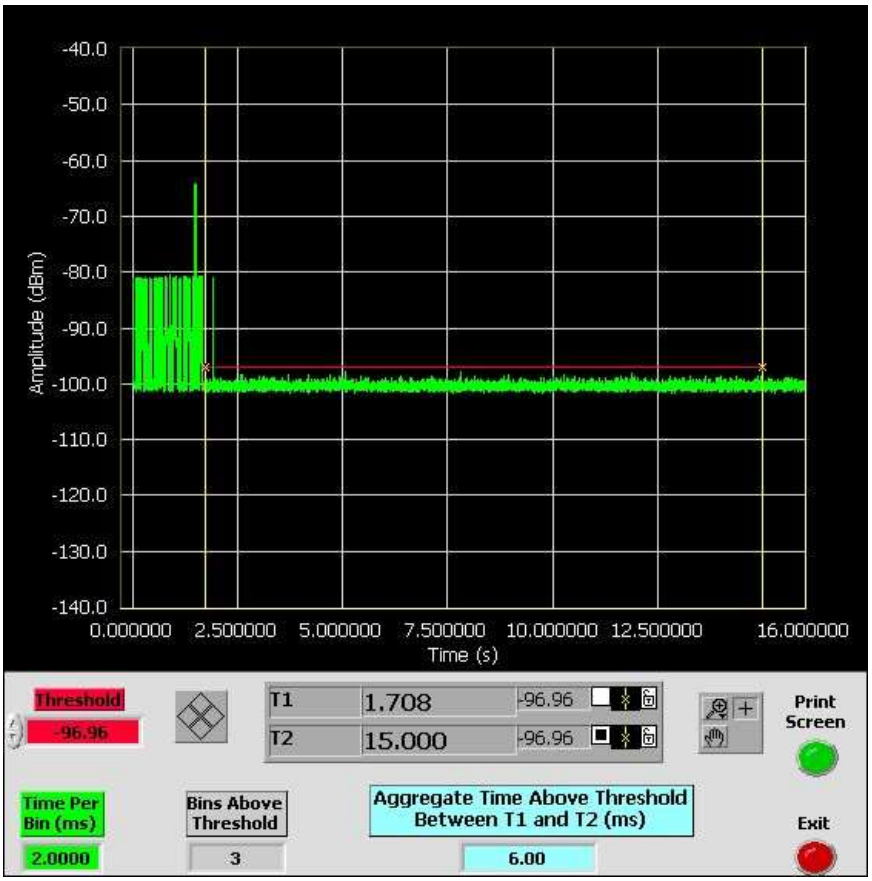
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

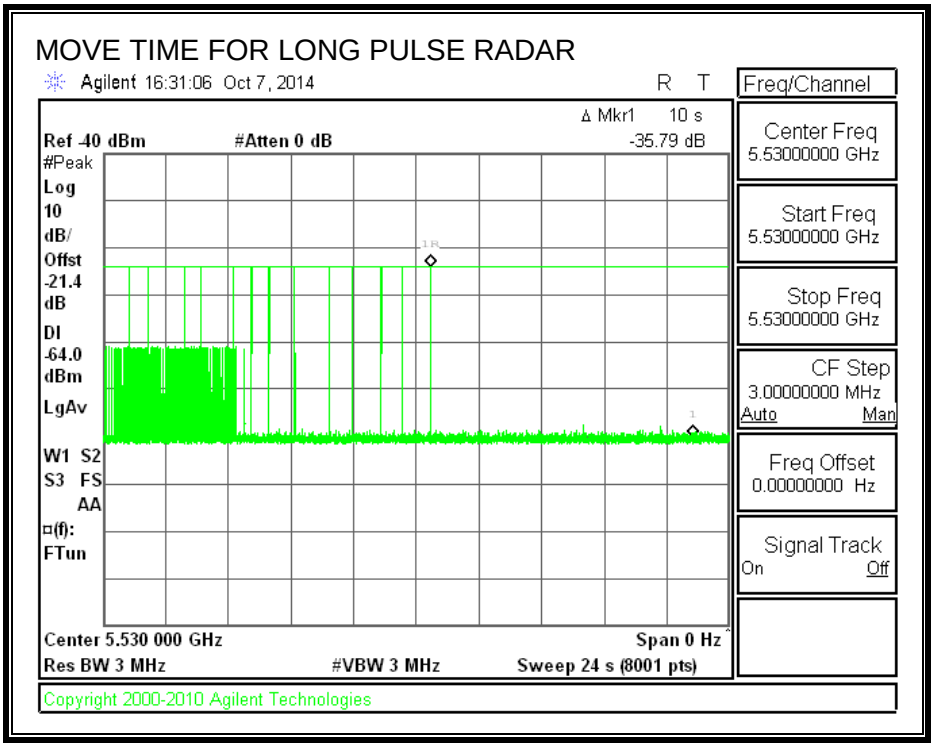
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

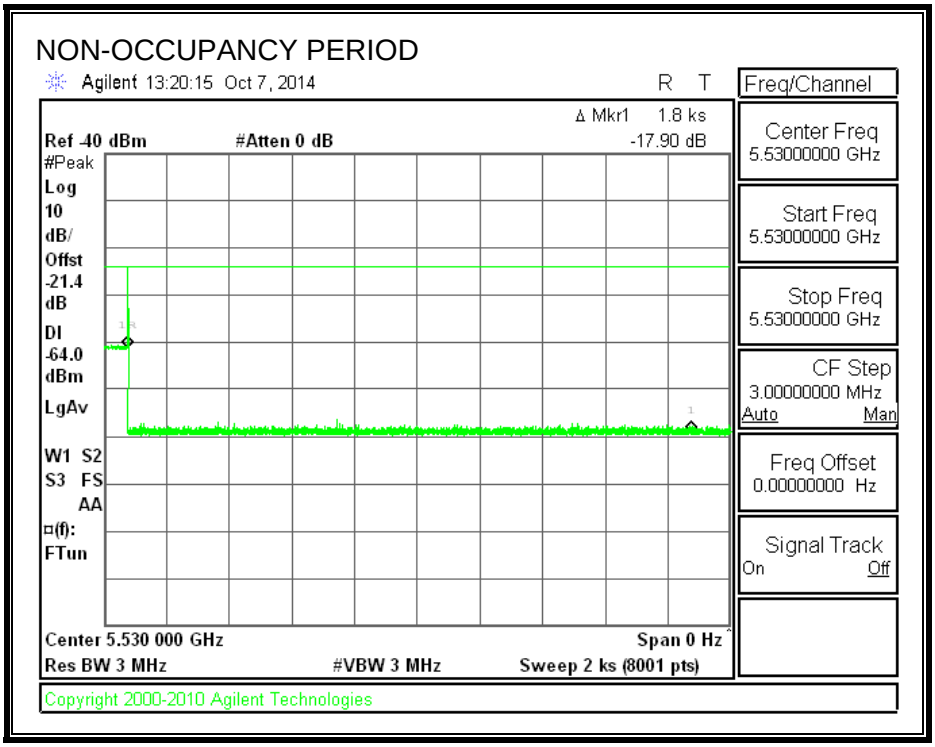
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.4.1. NON-OCCUPANCY PERIOD

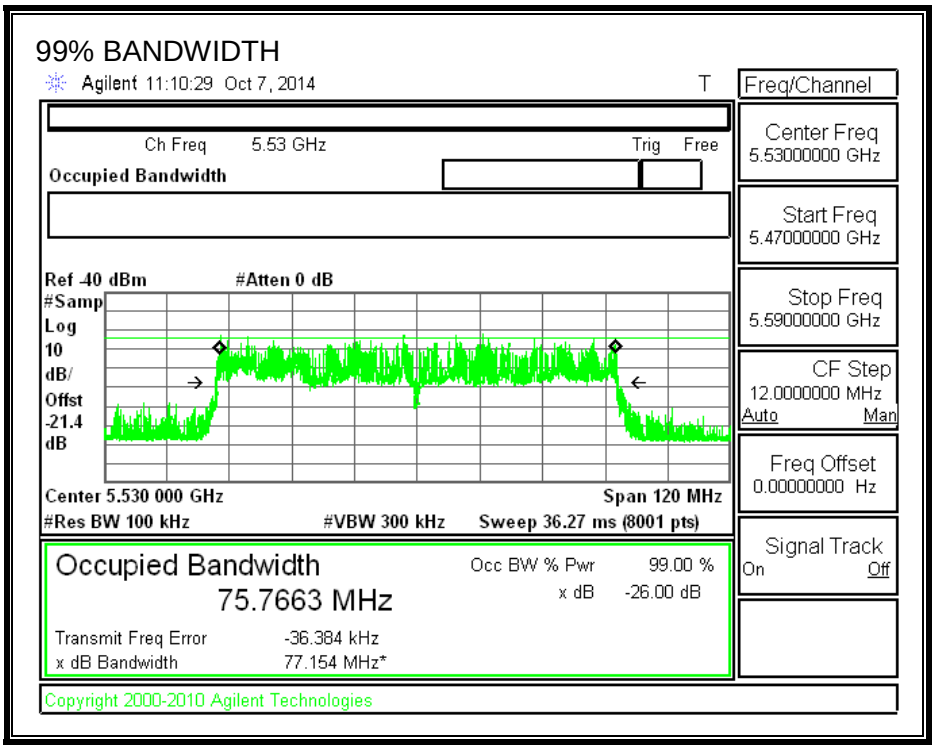
RESULTS

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



5.4.2. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5491	5569	78	75.766	102.9	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5491	10	10	100	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	10	10	100	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5530	10	10	100	
5535	10	10	100	
5540	10	10	100	
5545	10	10	100	
5550	10	10	100	
5555	10	10	100	
5560	10	10	100	
5565	10	10	100	
5566	10	10	100	
5567	10	10	100	
5568	10	10	100	
5569	10	10	100	FH

5.4.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	90.00	60	Pass
Aggregate		97.50	80	Pass
FCC Long Pulse Type 5	30	93.33	80	Pass
FCC Hopping Type 6	79	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1				
1 us Pulse Width				
Waveform	PRI (us)	Pulses Per Burst	Test (A/B)	Successful Detection (Yes/No)
1001	3066	18	A	Yes
1002	698	76	A	Yes
1003	858	62	A	Yes
1004	618	86	A	Yes
1005	778	68	A	Yes
1006	798	67	A	Yes
1007	918	58	A	Yes
1008	838	63	A	Yes
1009	638	83	A	Yes
1010	658	81	A	Yes
1011	898	59	A	Yes
1012	578	92	A	Yes
1013	598	89	A	Yes
1014	518	102	A	Yes
1015	878	61	A	Yes
1016	558	95	B	Yes
1017	1536	35	B	Yes
1018	2734	20	B	Yes
1019	1914	28	B	Yes
1020	2380	23	B	Yes
1021	1709	31	B	Yes
1022	1017	52	B	Yes
1023	834	64	B	Yes
1024	2808	19	B	Yes
1025	1473	36	B	Yes
1026	2773	20	B	Yes
1027	1047	51	B	Yes
1028	1534	35	B	Yes
1029	674	79	B	Yes
1030	2552	21	B	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1.1	222.00	25	Yes
2002	2.4	166.00	27	Yes
2003	4.4	218.00	23	Yes
2004	4.5	171.00	25	Yes
2005	1.8	155.00	27	Yes
2006	2.3	225.00	29	Yes
2007	1.4	199.00	23	Yes
2008	2.9	210.00	29	Yes
2009	2	202.00	27	Yes
2010	3	168.00	26	Yes
2011	3.3	203.00	29	Yes
2012	4.6	176.00	27	Yes
2013	4.4	180.00	26	Yes
2014	1.9	155.00	28	Yes
2015	2.7	194.00	28	Yes
2016	4.9	203.00	27	Yes
2017	2.1	192.00	29	Yes
2018	3.5	183.00	27	Yes
2019	1.9	186.00	26	Yes
2020	4.2	168.00	24	Yes
2021	3	168.00	27	Yes
2022	3.6	158.00	25	Yes
2023	1	181.00	24	Yes
2024	2	205.00	29	Yes
2025	4.2	184.00	23	Yes
2026	5	200.00	28	Yes
2027	2.9	225.00	25	Yes
2028	2.5	184.00	29	Yes
2029	4.1	164.00	28	Yes
2030	1.4	180.00	23	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.2	393.00	17	Yes
3002	6.3	279.00	18	Yes
3003	6.8	459.00	16	Yes
3004	6.4	412.00	16	Yes
3005	9.3	291.00	16	Yes
3006	7.9	330.00	16	Yes
3007	5.3	300.00	18	Yes
3008	6.4	466.00	16	Yes
3009	8.6	460.00	16	Yes
3010	7.9	477.00	17	Yes
3011	9.1	267.00	16	Yes
3012	7.8	296.00	18	Yes
3013	7.3	451.00	16	Yes
3014	8	335.00	16	Yes
3015	8	396.00	18	Yes
3016	8.3	271.00	17	Yes
3017	5.2	268.00	18	Yes
3018	5.6	476.00	16	Yes
3019	6.8	290.00	18	Yes
3020	9	445.00	17	Yes
3021	5.3	474.00	18	Yes
3022	9.4	385.00	16	Yes
3023	8.8	451.00	17	Yes
3024	5.4	296.00	18	Yes
3025	7.2	385.00	17	Yes
3026	9.4	427.00	16	Yes
3027	6.6	488.00	16	Yes
3028	9.1	262.00	16	Yes
3029	7.1	498	16	Yes
3030	8	460	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	20	267.00	13	No
4002	12	320.00	15	No
4003	13.9	396.00	15	Yes
4004	11.5	302.00	14	Yes
4005	11.1	315.00	12	Yes
4006	18.5	344.00	14	Yes
4007	14.8	360.00	16	Yes
4008	16.4	322.00	16	Yes
4009	15.3	332.00	16	Yes
4010	16.6	357.00	12	Yes
4011	12.7	312.00	15	Yes
4012	16.9	445.00	12	Yes
4013	14.9	266.00	12	Yes
4014	15.8	403.00	12	Yes
4015	16.4	492.00	13	Yes
4016	11	320.00	16	Yes
4017	12.9	434.00	13	Yes
4018	14.4	439.00	13	No
4019	16.7	457.00	14	Yes
4020	15.4	346.00	15	Yes
4021	16.7	472.00	13	Yes
4022	17.4	450.00	13	Yes
4023	16.4	463.00	12	Yes
4024	11.8	352.00	14	Yes
4025	15.8	327.00	16	Yes
4026	13.7	443.00	14	Yes
4027	19.3	407.00	15	Yes
4028	12.8	378.00	12	Yes
4029	16.2	307.00	15	Yes
4030	18.1	280.00	14	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5	
Trial	Successful Detection (Yes/No)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	No
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	No
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

Note: The Type 5 randomized parameters are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	308	5491	14	Yes
2	783	5492	14	Yes
3	1258	5493	21	Yes
4	1733	5494	19	Yes
5	2208	5495	14	Yes
6	2683	5496	13	Yes
7	3158	5497	14	Yes
8	3633	5498	9	Yes
9	4108	5499	16	Yes
10	4583	5500	10	Yes
11	5058	5501	9	Yes
12	5533	5502	16	Yes
13	6008	5503	13	Yes
14	6483	5504	16	Yes
15	6958	5505	20	Yes
16	7433	5506	18	Yes
17	7908	5507	20	Yes
18	8383	5508	15	Yes
19	8858	5509	23	Yes
20	9333	5510	15	Yes
21	9808	5511	19	Yes
22	10283	5512	19	Yes
23	10758	5513	17	Yes
24	11233	5514	19	Yes
25	11708	5515	12	Yes
26	12183	5516	16	Yes
27	12658	5517	22	Yes
28	13133	5518	14	Yes
29	13608	5519	13	Yes
30	14083	5520	18	Yes
31	14558	5521	14	Yes
32	15033	5522	15	Yes
33	15508	5523	17	Yes
34	15983	5524	16	Yes
35	16458	5525	16	Yes
36	16933	5526	11	Yes
37	17408	5527	11	Yes
38	17883	5528	14	Yes
39	18358	5529	16	Yes

TYPE 6 DETECTION PROBABILITY (CONTINUED)

40	18833	5530	18	Yes
41	19308	5531	19	Yes
42	19783	5532	21	Yes
43	20258	5533	20	Yes
44	20733	5534	14	Yes
45	21208	5535	24	Yes
46	21683	5536	21	Yes
47	22158	5537	16	Yes
48	22633	5538	18	Yes
49	23108	5539	16	Yes
50	23583	5540	15	Yes
51	24058	5541	10	Yes
52	24533	5542	10	Yes
53	25008	5543	13	Yes
54	25483	5544	18	Yes
55	25958	5545	12	Yes
56	26433	5546	14	Yes
57	26908	5547	16	Yes
58	27383	5548	25	Yes
59	27858	5549	17	Yes
60	28333	5550	22	Yes
61	28808	5551	19	Yes
62	29283	5552	16	Yes
63	29758	5553	13	Yes
64	30233	5554	19	Yes
65	30708	5555	14	Yes
66	31183	5556	15	Yes
67	31658	5557	13	Yes
68	32133	5558	21	Yes
69	32608	5559	13	Yes
70	-32453	5560	18	Yes
71	-31978	5561	23	Yes
72	-31503	5562	18	Yes
73	-31028	5563	14	Yes
74	-30553	5564	24	Yes
75	-30078	5565	18	Yes
76	-29603	5566	23	Yes
77	-29128	5567	18	Yes
78	-28653	5568	19	Yes
79	-28178	5569	17	Yes