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-7532

FCC ID: UZ7AP7532
IC: 109AN-AP7532

REPORT NUMBER: 14U18922-1

ISSUE DATE: DECEMBER 8, 2014

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

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/09/14	Initial Issue	T. Lee
A	12/8/14	Update Product Model Number	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-7532

SERIAL NUMBER: 14106522200877

DATE TESTED: OCTOBER 02, 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.

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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

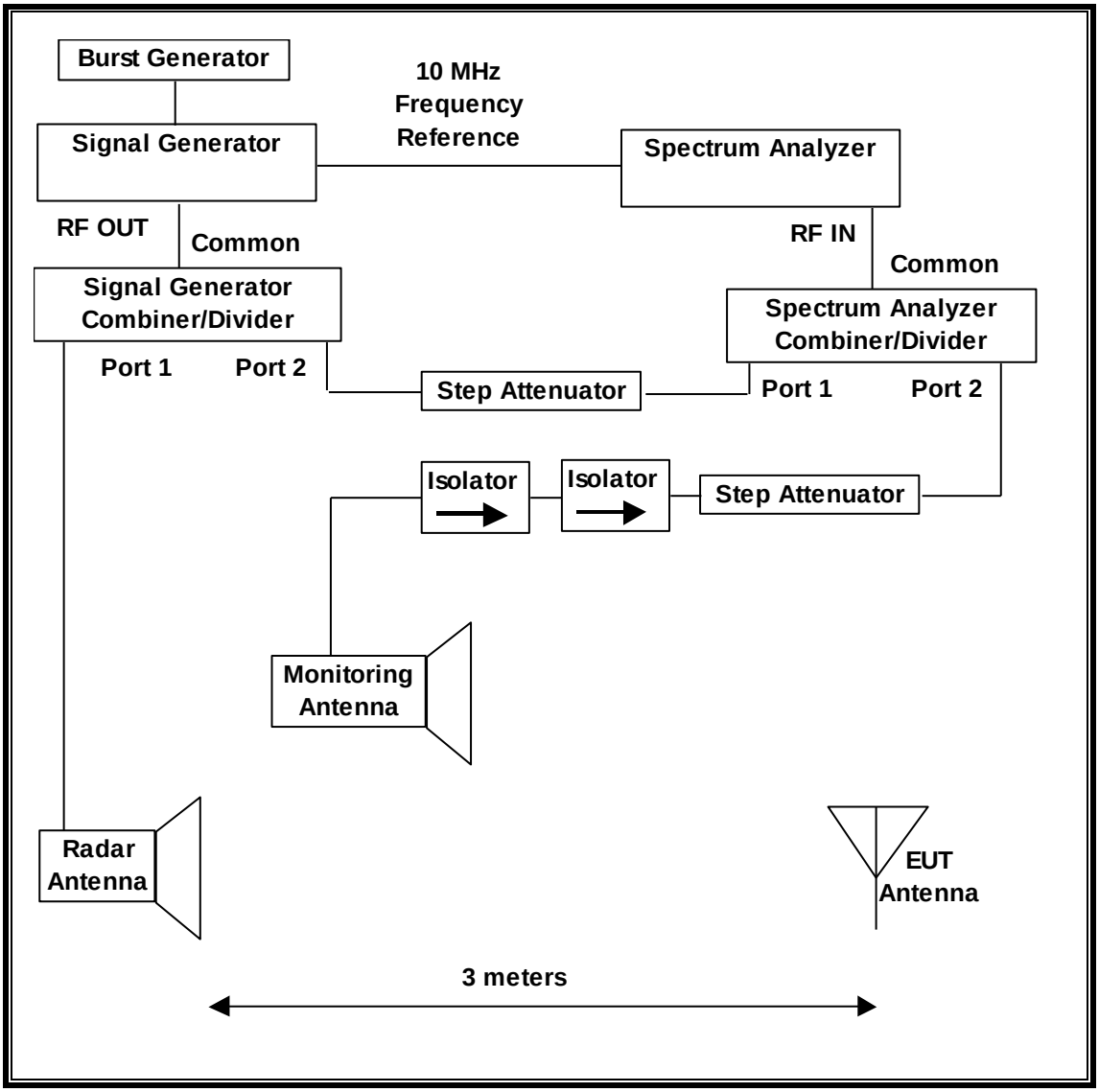
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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.

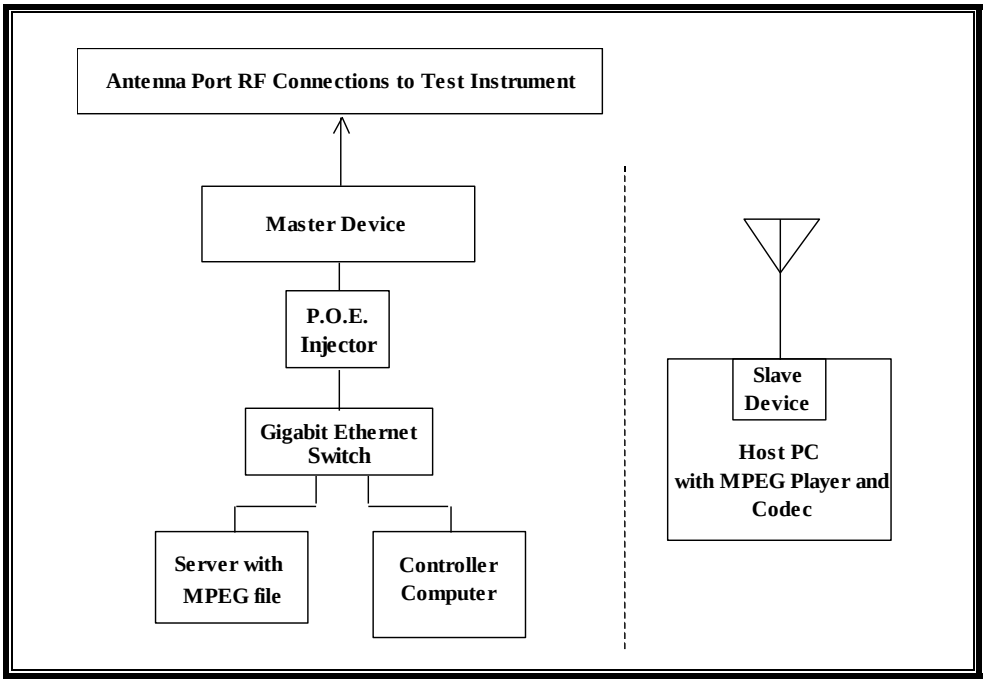
TEST AND MEASUREMENT EQUIPMENT

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 4-06).

The highest power level within these bands is 27.31 dBm EIRP in the 5250-5350 MHz band and 28.61 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 antenna used during testing was the ML-2452-APAG2A1-01 (1.7 dBi Dipole).

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.

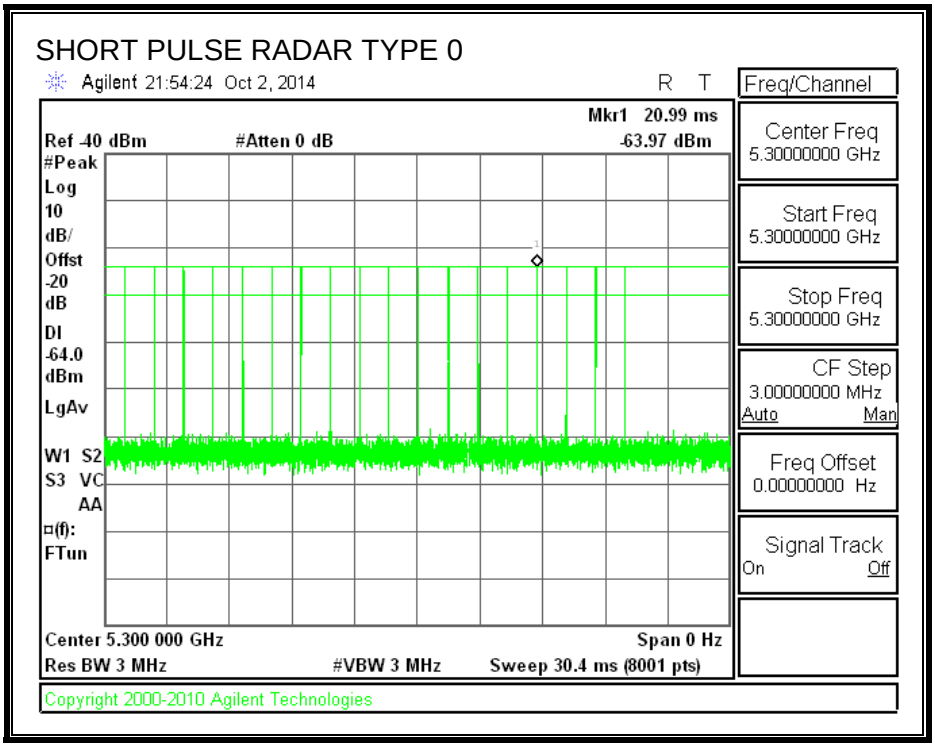
5.2. RESULTS FOR 20 MHz BANDWIDTH

5.2.1. TEST CHANNEL

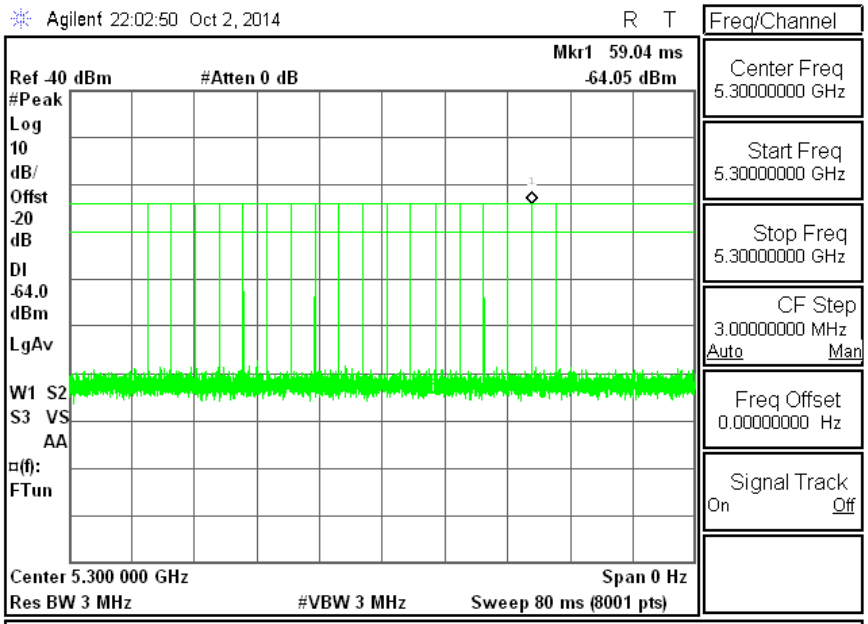
All tests were performed at a channel center frequency of 5300 MHz.

5.2.2. RADAR WAVEFORMS AND TRAFFIC

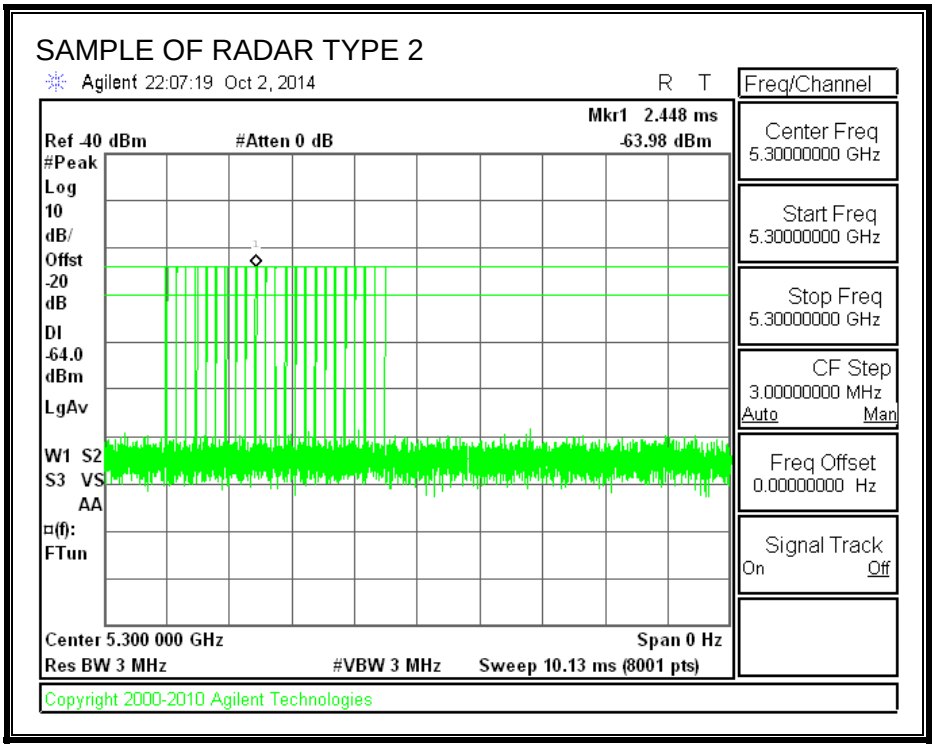
RADAR WAVEFORMS



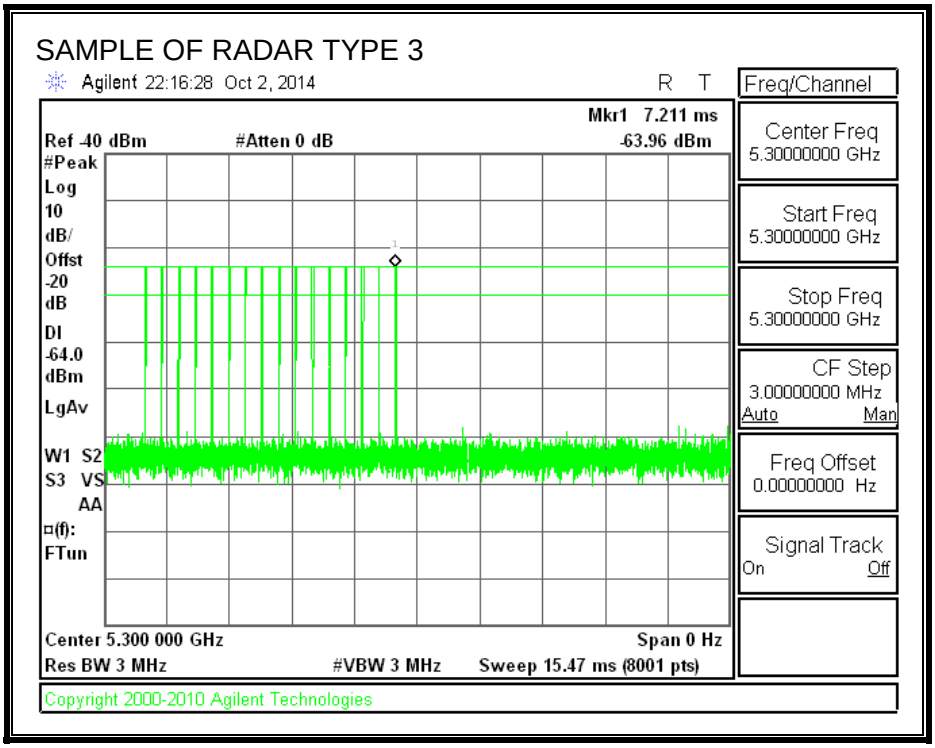
SAMPLE OF RADAR TYPE 1



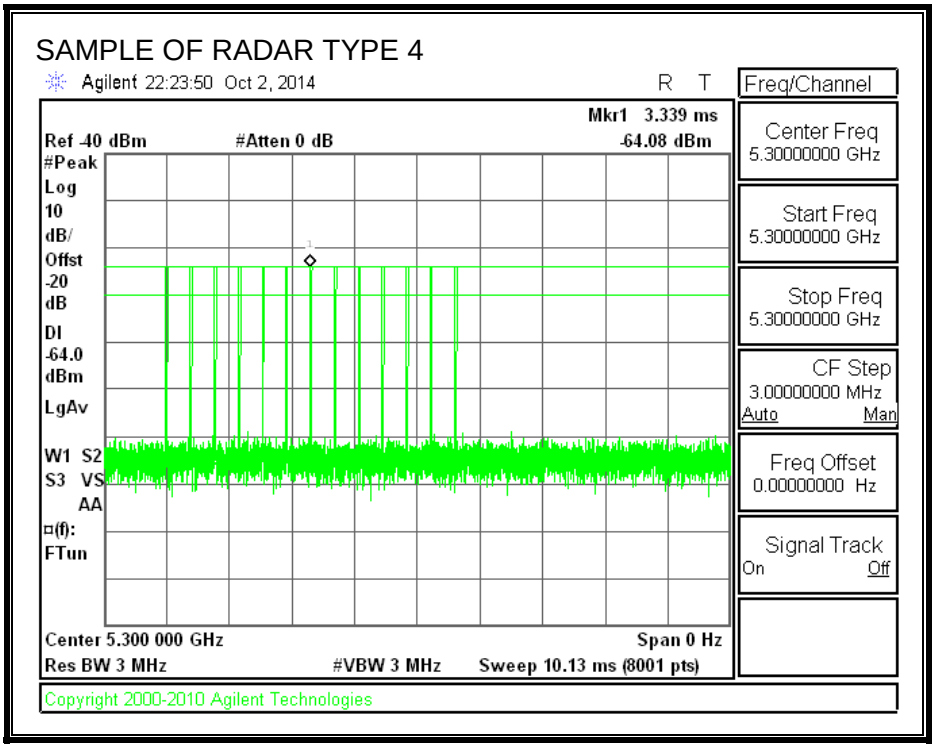
SAMPLE OF RADAR TYPE 2



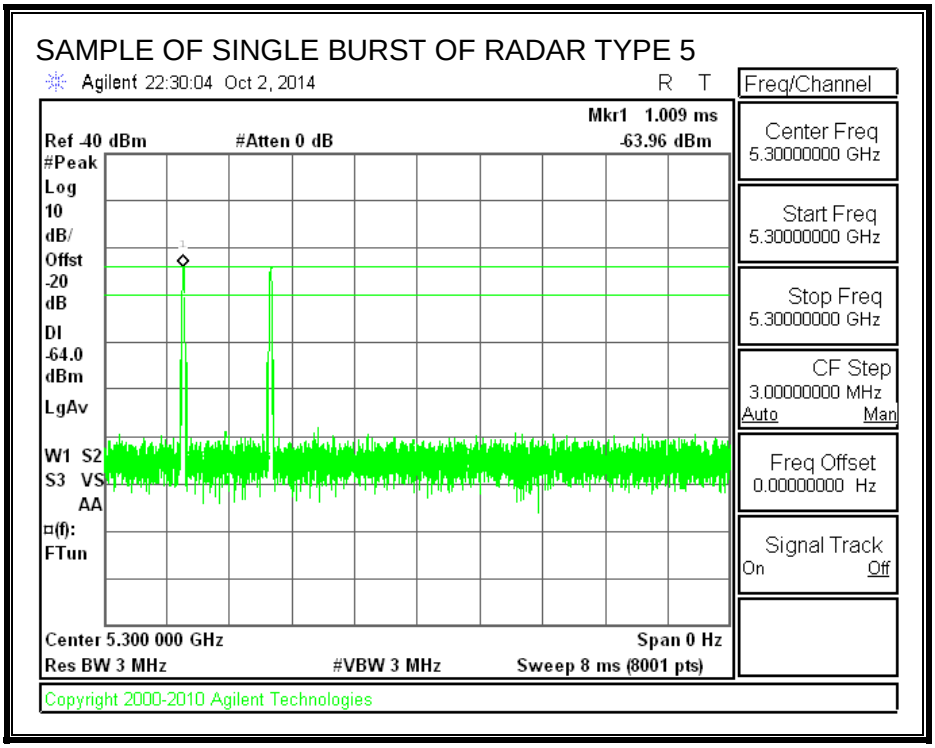
SAMPLE OF RADAR TYPE 3

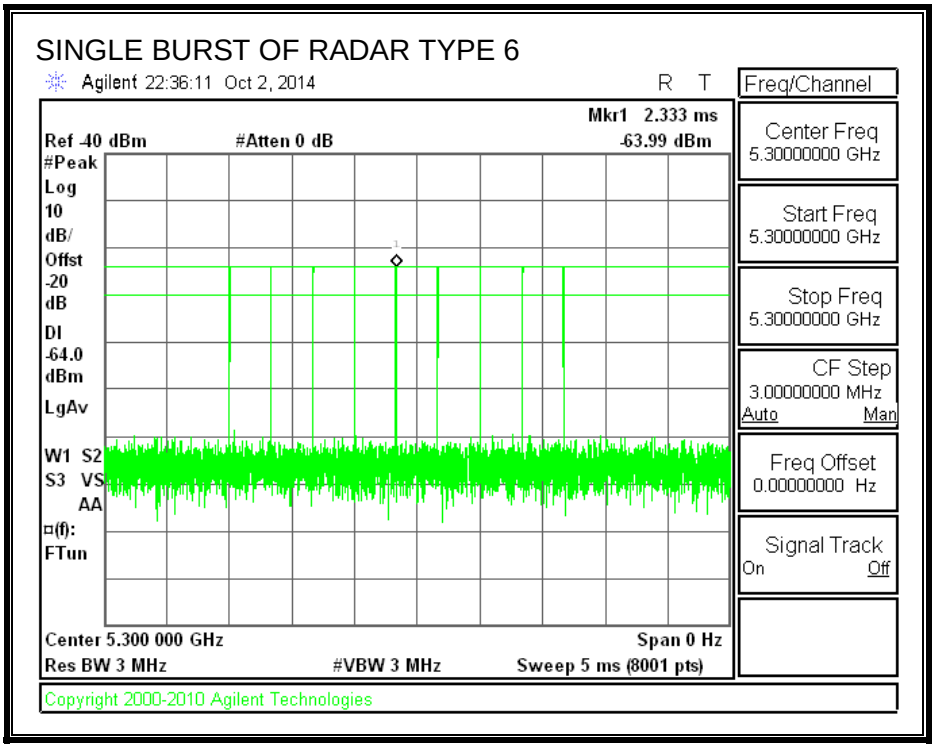


SAMPLE OF RADAR TYPE 4

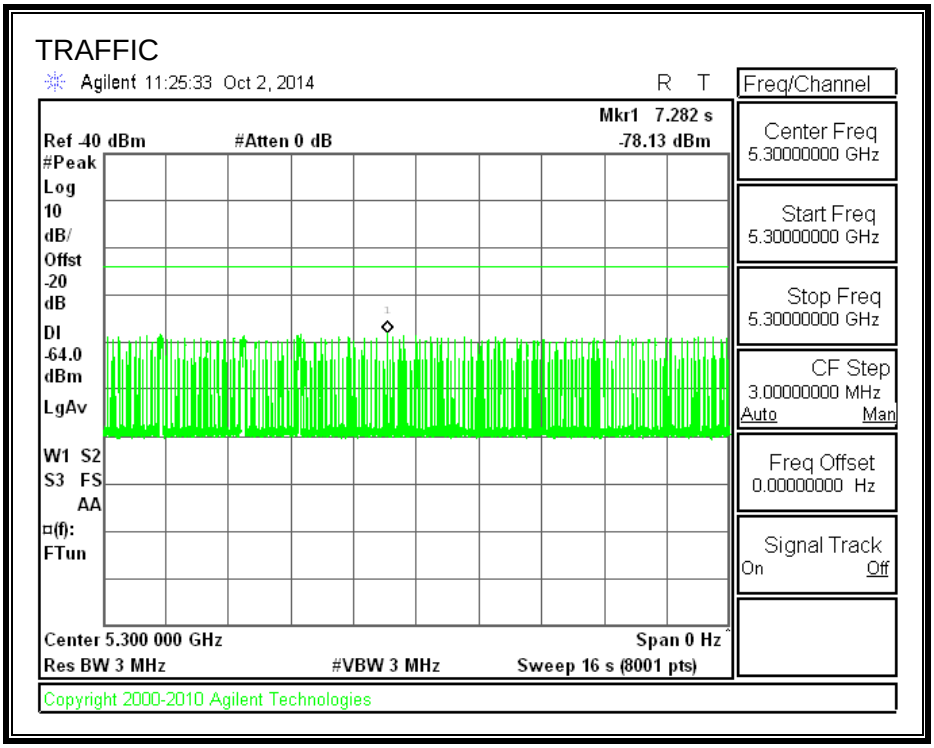


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





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 5300 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 5300 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 5300 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	60.75	60.75

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	2.550	2.550

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	59.67	59.67

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)
22:28:09	22:29:09	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)
22:36:45	22:36:47	0:00:02

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)
22:51:20	22:52:19	0:00:59

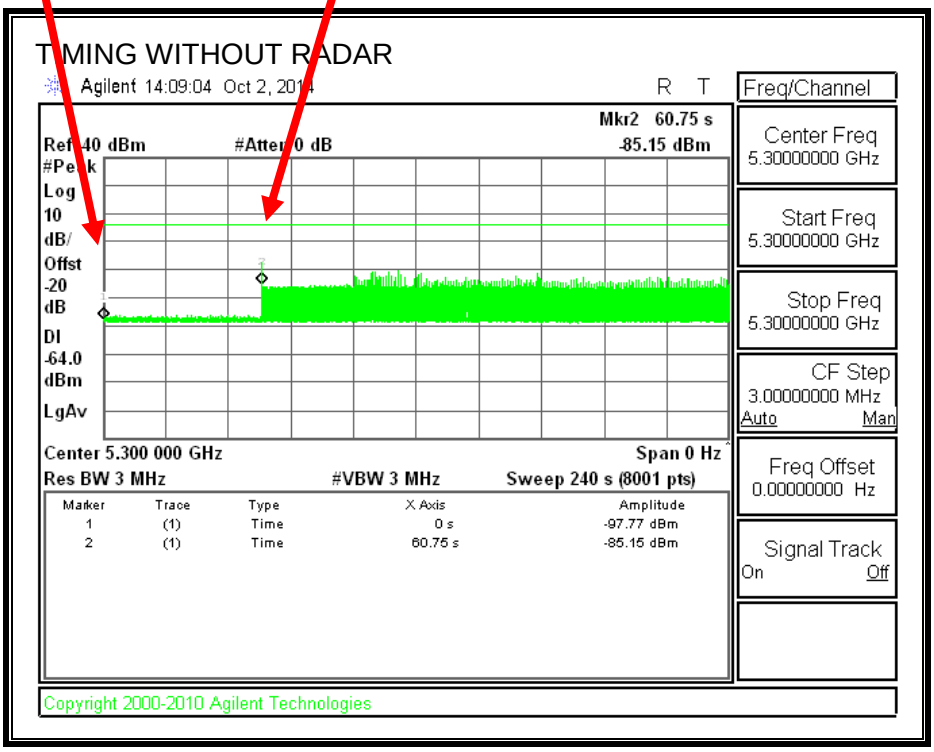
QUALITATIVE RESULTS

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.

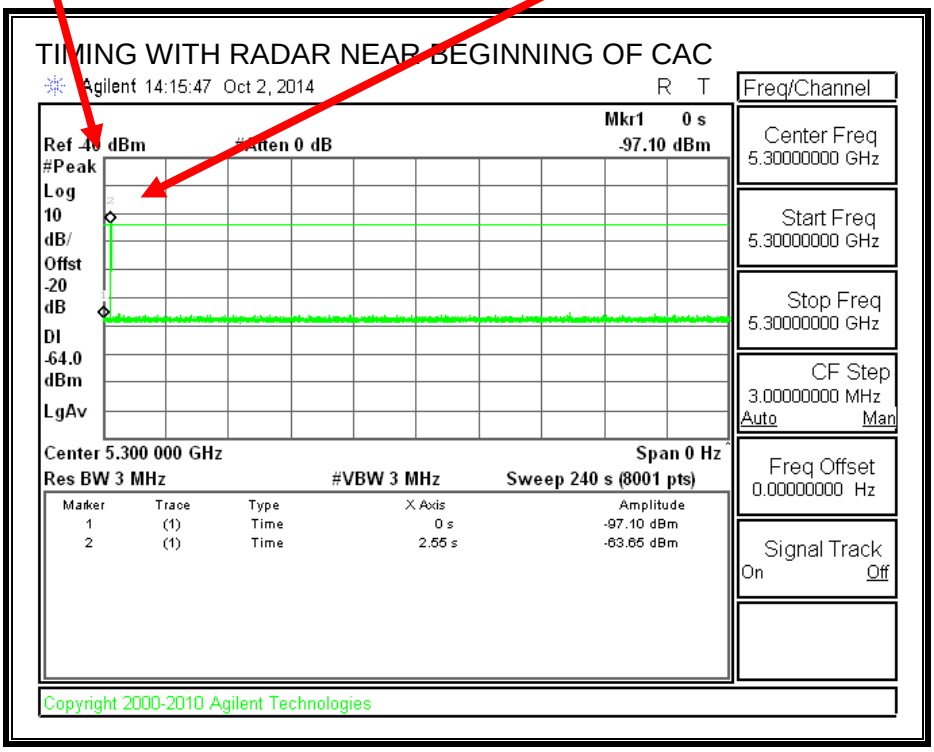
Log File of CAC Timing Without Radar

```
Jan 06 22:28:09 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 60 sys_idx: 0
 (cfg.c:584)

Jan 06 22:28:10 2014: ap7532-15E794 : %DOT11-6-CLIENT_ASSOCIATED: Client '00-
23-14-04-9B-34' associated to wlan '1' ssid '7532' on radio 'ap7532-
15E794:R2'

Total number of radios displayed: 2
ap7532-15E794(config-device-84-24-8D-15-E7-94-if-radio2)#DLS DFS State PRE-
ISM Channel Availability Check -> In-Service Monitoring(ISM)

Jan 06 22:29:09 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.

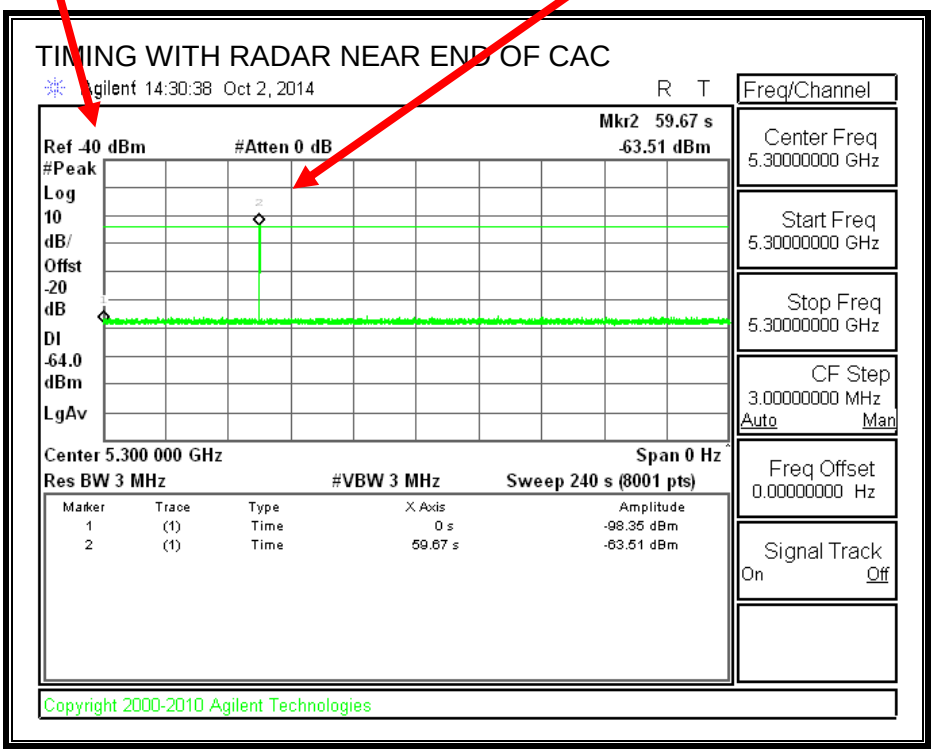
Log File of Radar at the Beginning of CAC

```
Jan 06 22:36:45 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 60 sys_idx: 0
 (cfg.c:584)

Jan 06 22:36:47 2014: ap7532-15E794 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 60 freq 5300 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

```
Jan 06 22:51:20 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 60 sys_idx: 0
 (cfg.c:584)

Jan 06 22:52:19 2014: ap7532-15E794 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 60 freq 5300 MHz
```

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)

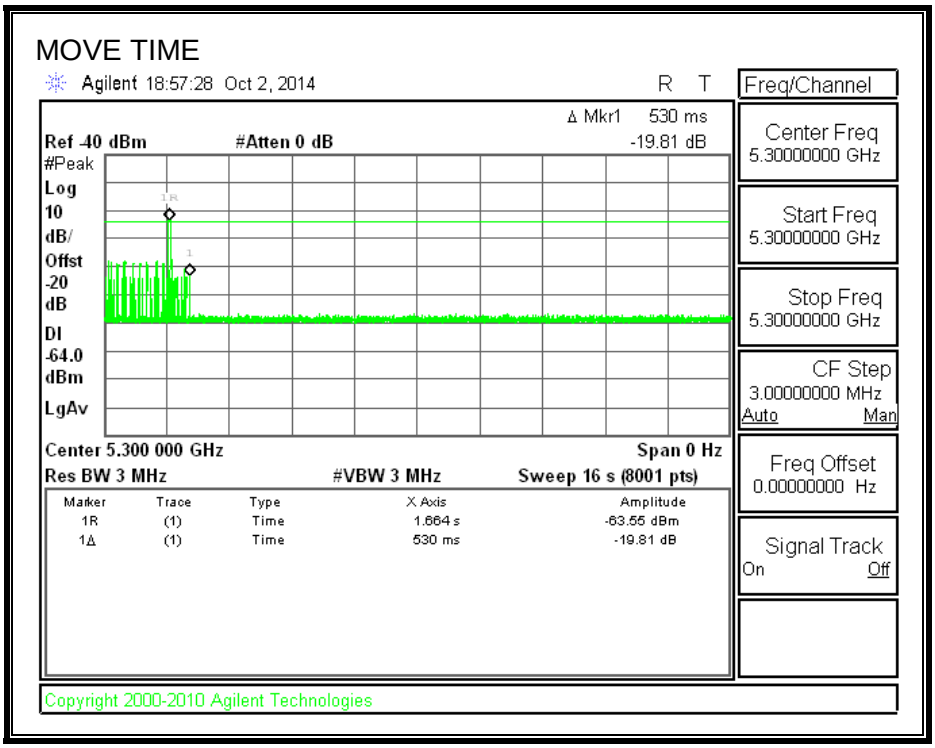
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

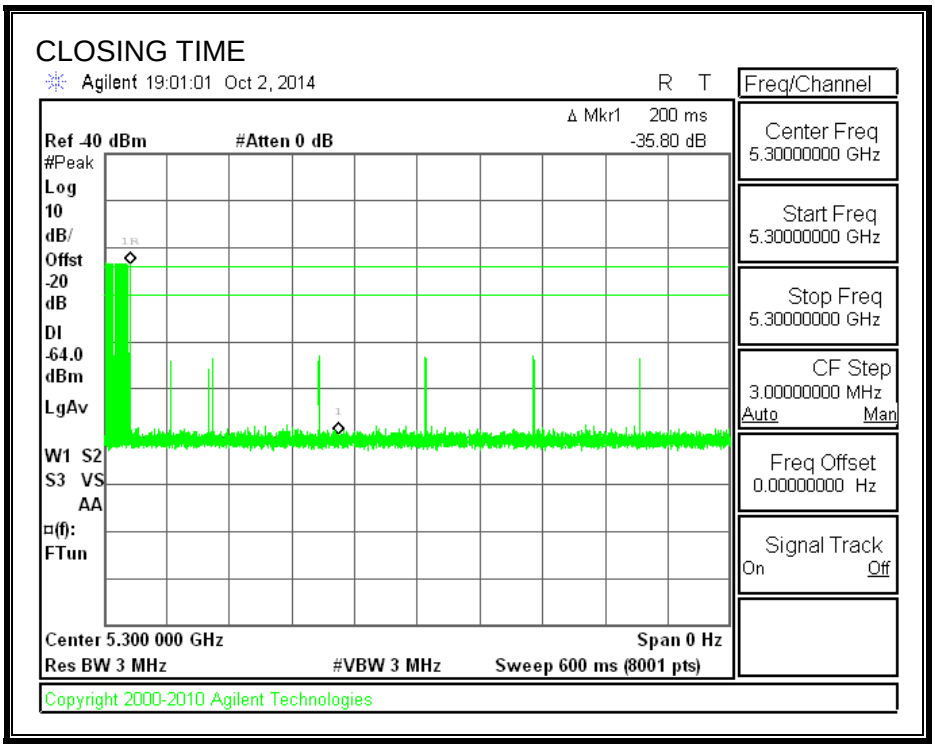
Channel Move Time (sec)	Limit (sec)
0.530	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
12.0	60

MOVE TIME



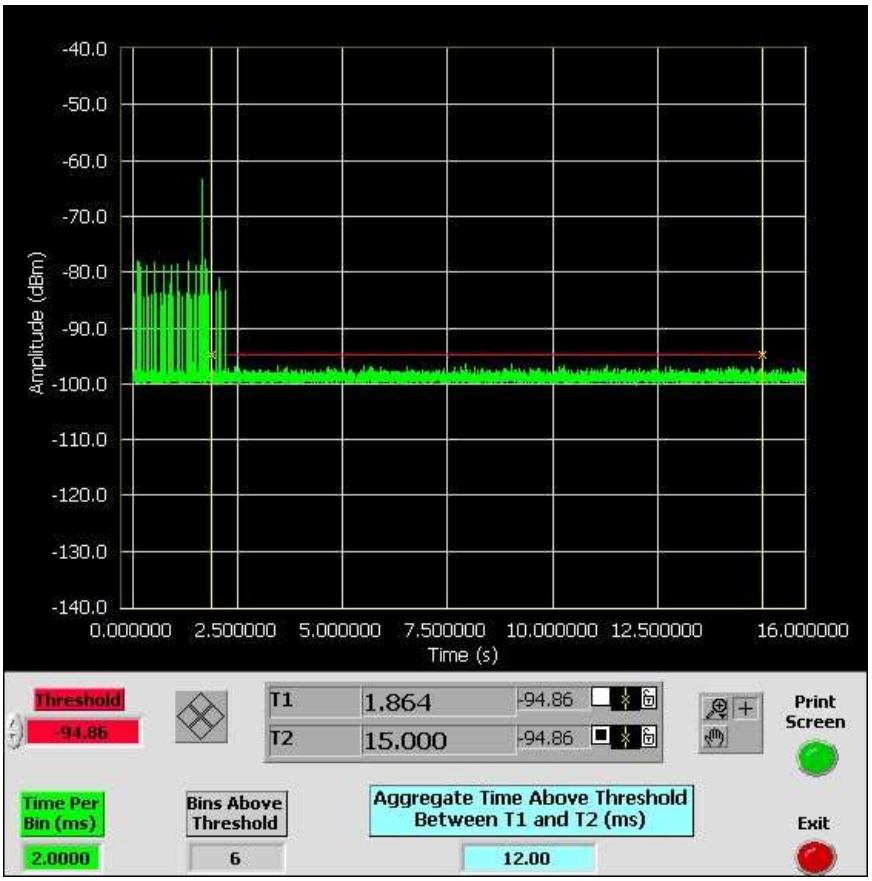
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

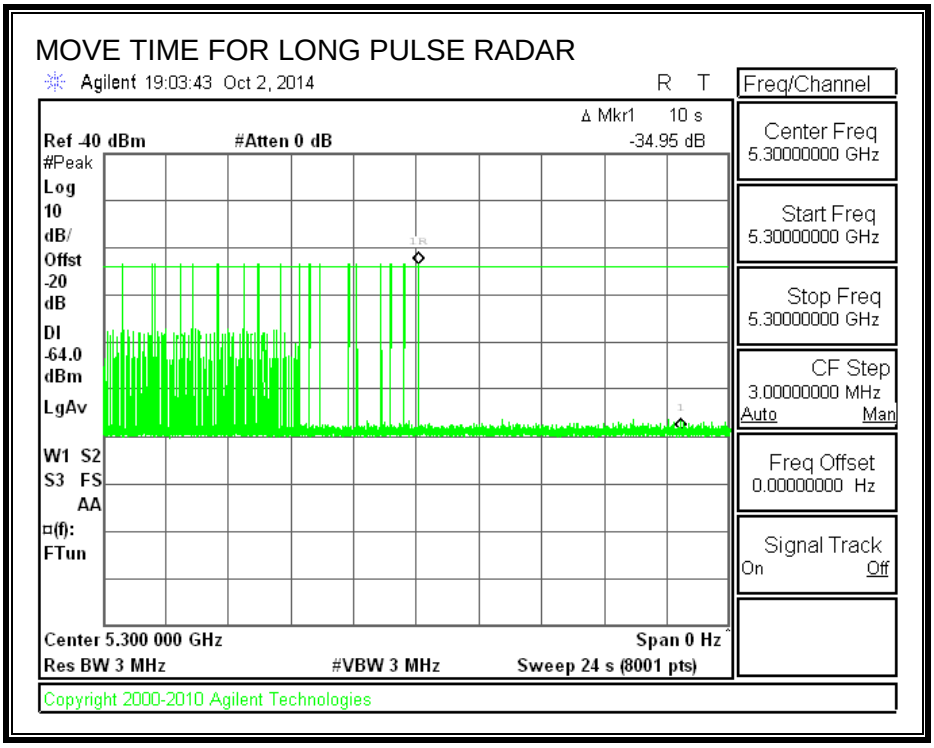
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



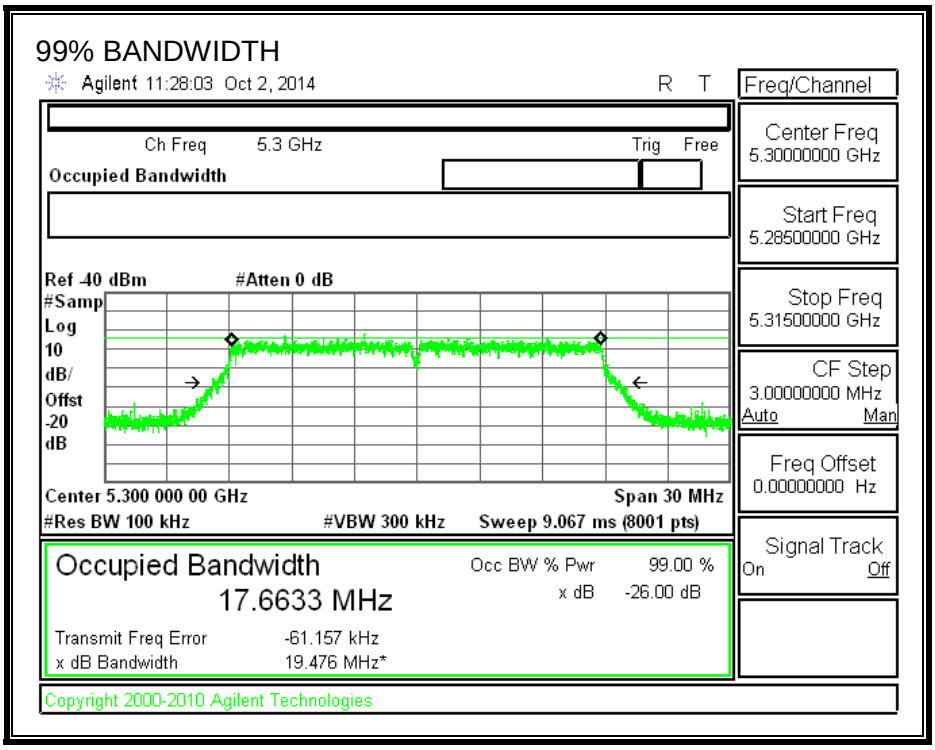
LONG PULSE CHANNEL MOVE TIME

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



5.2.6. 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 (%)
5291	5309	18	17.663	101.9	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
5291	10	10	100	FL
5292	10	10	100	
5293	10	10	100	
5294	10	10	100	
5295	10	10	100	
5300	10	10	100	
5305	10	10	100	
5306	10	10	100	
5307	10	10	100	
5308	10	10	100	
5309	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	93.33	60	Pass
Aggregate		97.50	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	858	62	A	Yes
1003	798	67	A	Yes
1004	578	92	A	Yes
1005	898	59	A	Yes
1006	758	70	A	Yes
1007	538	99	A	Yes
1008	618	86	A	Yes
1009	598	89	A	Yes
1010	658	81	A	Yes
1011	818	65	A	Yes
1012	518	102	A	Yes
1013	878	61	A	Yes
1014	938	57	A	Yes
1015	778	68	A	Yes
1016	678	78	B	Yes
1017	2994	18	B	Yes
1018	2392	23	B	Yes
1019	1657	32	B	Yes
1020	1180	45	B	Yes
1021	610	87	B	Yes
1022	2876	19	B	Yes
1023	724	73	B	Yes
1024	2465	22	B	Yes
1025	552	96	B	Yes
1026	887	60	B	Yes
1027	2021	27	B	Yes
1028	557	95	B	Yes
1029	652	81	B	Yes
1030	2452	22	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	4.9	161.00	23	Yes
2002	3.9	178.00	24	Yes
2003	1.4	230.00	29	Yes
2004	4.5	219.00	25	Yes
2005	2.1	172.00	24	Yes
2006	2.5	210.00	29	Yes
2007	1.5	172.00	28	Yes
2008	3.5	152.00	28	Yes
2009	1.5	160.00	25	Yes
2010	4.3	177.00	28	Yes
2011	4.7	159.00	25	Yes
2012	4.1	229.00	28	Yes
2013	4.5	189.00	28	Yes
2014	1.9	213.00	24	Yes
2015	2	230.00	27	Yes
2016	4.1	152.00	23	Yes
2017	4	174.00	24	Yes
2018	1.1	224.00	27	Yes
2019	4.3	184.00	23	Yes
2020	1	216.00	28	Yes
2021	4.6	214.00	24	Yes
2022	2.9	188.00	27	Yes
2023	2	175.00	29	Yes
2024	3.7	187.00	27	Yes
2025	1.5	193.00	23	Yes
2026	4.9	200.00	29	Yes
2027	2.6	230.00	28	Yes
2028	2.1	229.00	28	Yes
2029	1.4	222.00	28	Yes
2030	1.6	157.00	28	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	8.2	414.00	16	Yes
3002	7.6	398.00	17	Yes
3003	6	433.00	18	Yes
3004	5.2	356.00	16	Yes
3005	7.8	411.00	16	Yes
3006	6.8	428.00	17	Yes
3007	10	475.00	18	Yes
3008	8.9	344.00	18	Yes
3009	9.7	325.00	18	Yes
3010	7.5	311.00	18	Yes
3011	5.4	271.00	16	Yes
3012	8.5	426.00	16	Yes
3013	8	296.00	16	Yes
3014	9.3	390.00	17	Yes
3015	9.7	357.00	16	Yes
3016	9.2	303.00	16	Yes
3017	9.6	454.00	16	Yes
3018	9.2	271.00	16	Yes
3019	5	286.00	16	Yes
3020	7.6	279.00	16	Yes
3021	5.3	405.00	16	Yes
3022	9.6	404.00	16	Yes
3023	6.5	420.00	18	Yes
3024	5.4	416.00	17	Yes
3025	6.4	425.00	17	Yes
3026	6.1	296.00	18	Yes
3027	9.9	333.00	17	Yes
3028	5.5	422.00	18	Yes
3029	7.7	487	17	Yes
3030	5.2	309	18	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	18	390.00	13	No
4002	16.1	457.00	12	Yes
4003	17.9	428.00	16	Yes
4004	19.5	375.00	12	Yes
4005	15	328.00	13	Yes
4006	10.9	369.00	15	Yes
4007	14.2	372.00	12	Yes
4008	12.1	497.00	13	Yes
4009	14.6	371.00	16	Yes
4010	14.9	452.00	13	Yes
4011	18.1	497.00	16	Yes
4012	16.2	389.00	15	Yes
4013	18.6	393.00	15	Yes
4014	10.1	354.00	12	Yes
4015	18.1	273.00	13	Yes
4016	12	360.00	14	Yes
4017	14.6	290.00	13	Yes
4018	19	302.00	13	Yes
4019	11.3	293.00	15	Yes
4020	18.7	400.00	16	Yes
4021	16.2	327.00	15	Yes
4022	18.6	343.00	14	Yes
4023	10.9	403.00	14	Yes
4024	17.2	482.00	14	Yes
4025	17.2	298.00	12	Yes
4026	13.1	300.00	16	Yes
4027	15.7	411.00	12	Yes
4028	16.7	328.00	15	Yes
4029	10.4	347.00	13	Yes
4030	19.6	378.00	12	No

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	79	5291	3	Yes
2	554	5292	4	Yes
3	1029	5293	3	Yes
4	1504	5294	3	Yes
5	1979	5295	5	Yes
6	2929	5296	5	Yes
7	3404	5297	4	Yes
8	3879	5298	6	Yes
9	4354	5299	3	Yes
10	4829	5300	4	Yes
11	5304	5301	4	Yes
12	5779	5302	2	Yes
13	6254	5303	2	Yes
14	6729	5304	5	Yes
15	7204	5305	4	Yes
16	7679	5306	2	Yes
17	8154	5307	1	Yes
18	8629	5308	5	Yes
19	9104	5309	2	Yes
20	9579	5291	5	Yes
21	10054	5292	2	Yes
22	10529	5293	3	Yes
23	11004	5294	5	Yes
24	11479	5295	4	Yes
25	11954	5296	3	Yes
26	12429	5297	4	Yes
27	12904	5298	5	Yes
28	13379	5299	8	Yes
29	13854	5300	6	Yes
30	14329	5301	4	Yes
31	14804	5302	4	Yes
32	15279	5303	4	Yes
33	15754	5304	4	Yes
34	16229	5305	5	Yes
35	16704	5306	3	Yes
36	17179	5307	2	Yes
37	17654	5308	4	Yes
38	18129	5309	4	Yes

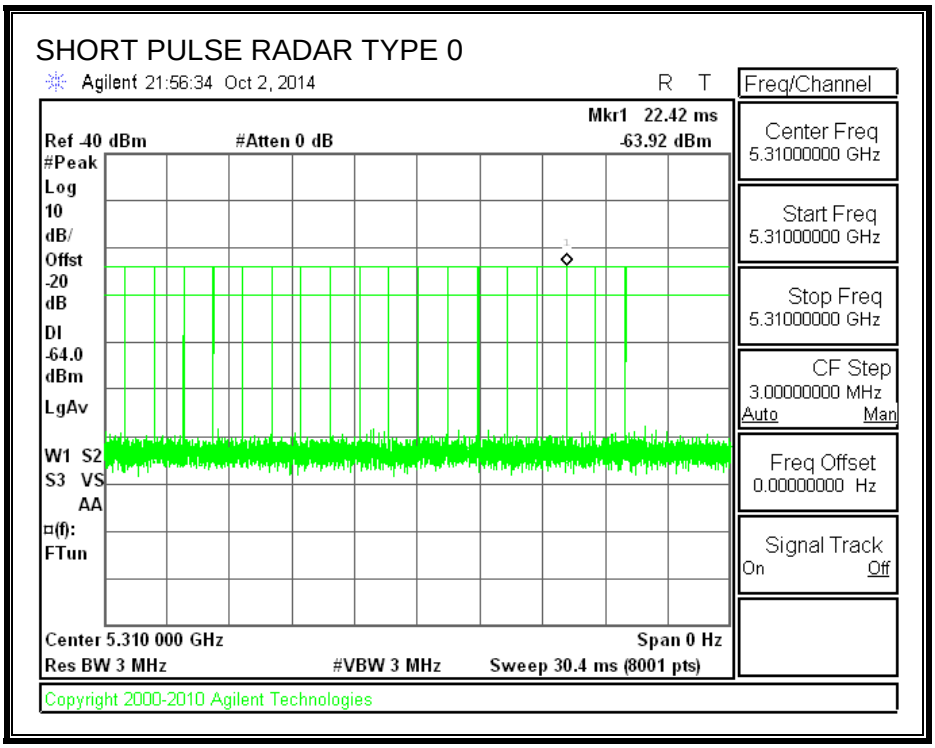
5.3. RESULTS FOR 40 MHz BANDWIDTH

5.3.1. TEST CHANNEL

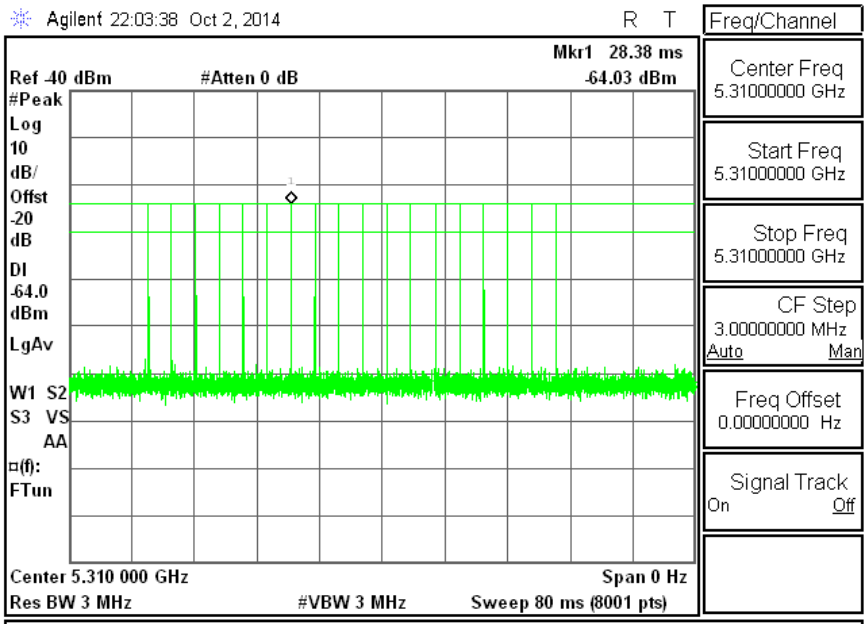
All tests were performed at a channel center frequency of 5310 MHz.

5.3.2. RADAR WAVEFORMS AND TRAFFIC

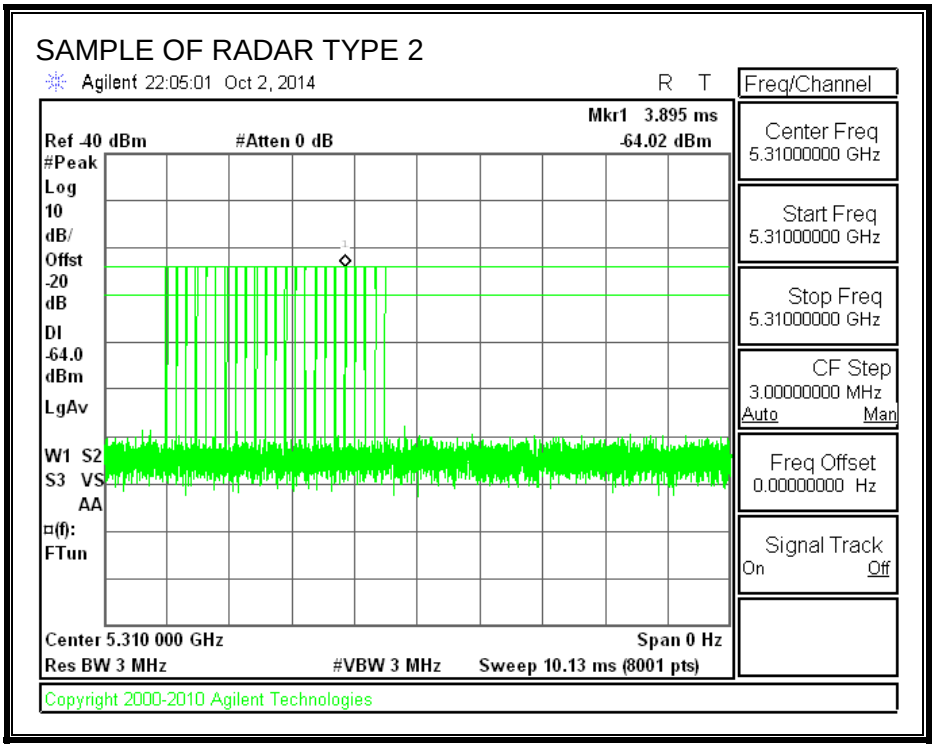
RADAR WAVEFORMS

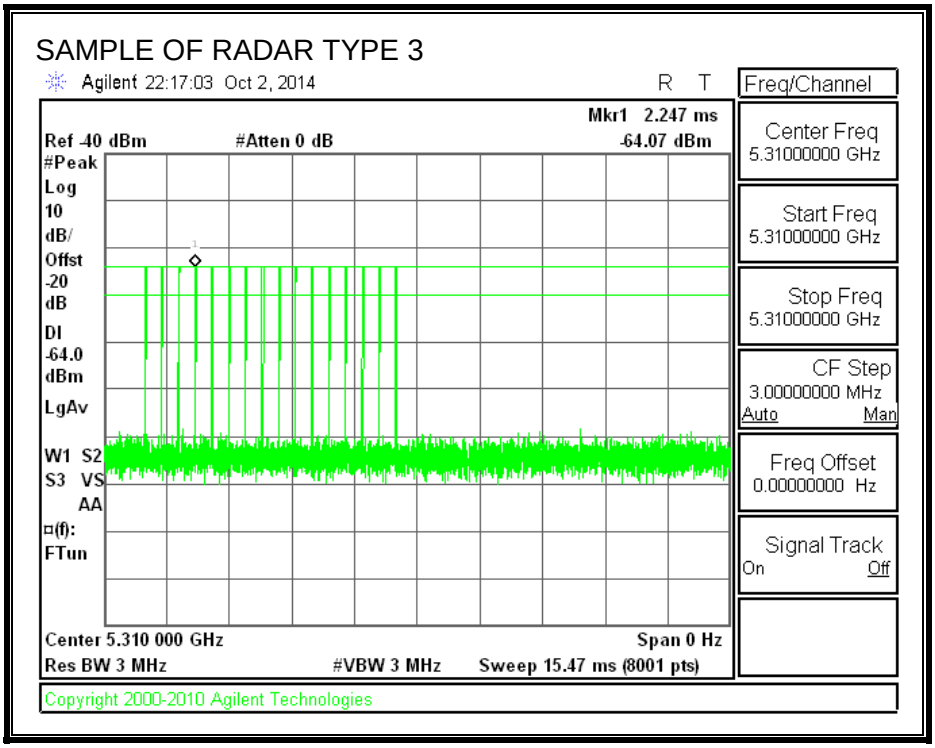


SAMPLE OF RADAR TYPE 1

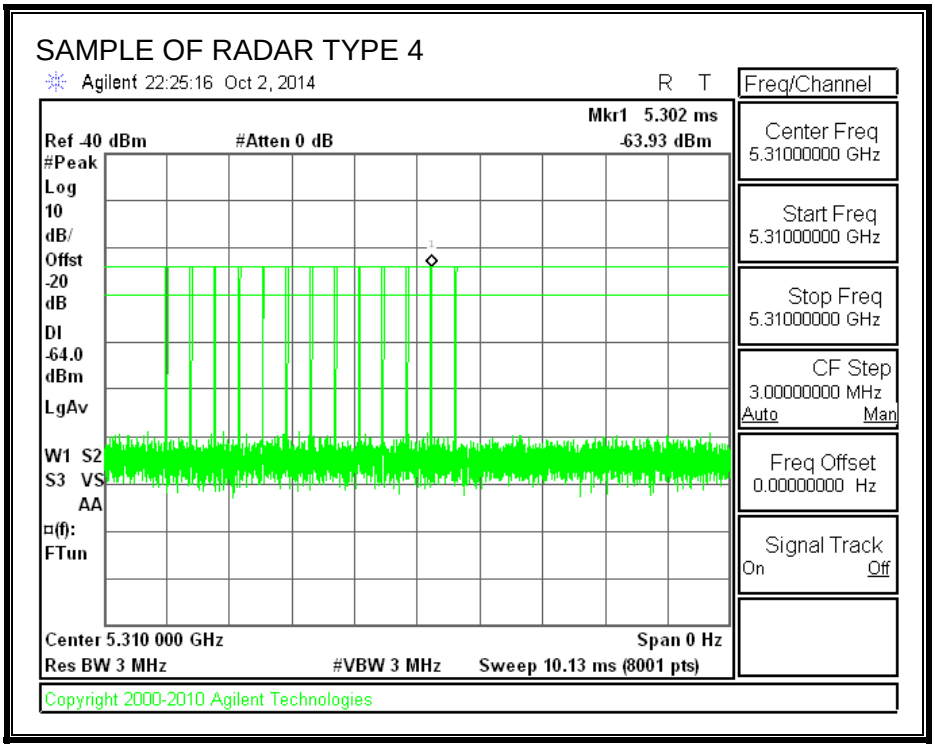


SAMPLE OF RADAR TYPE 2

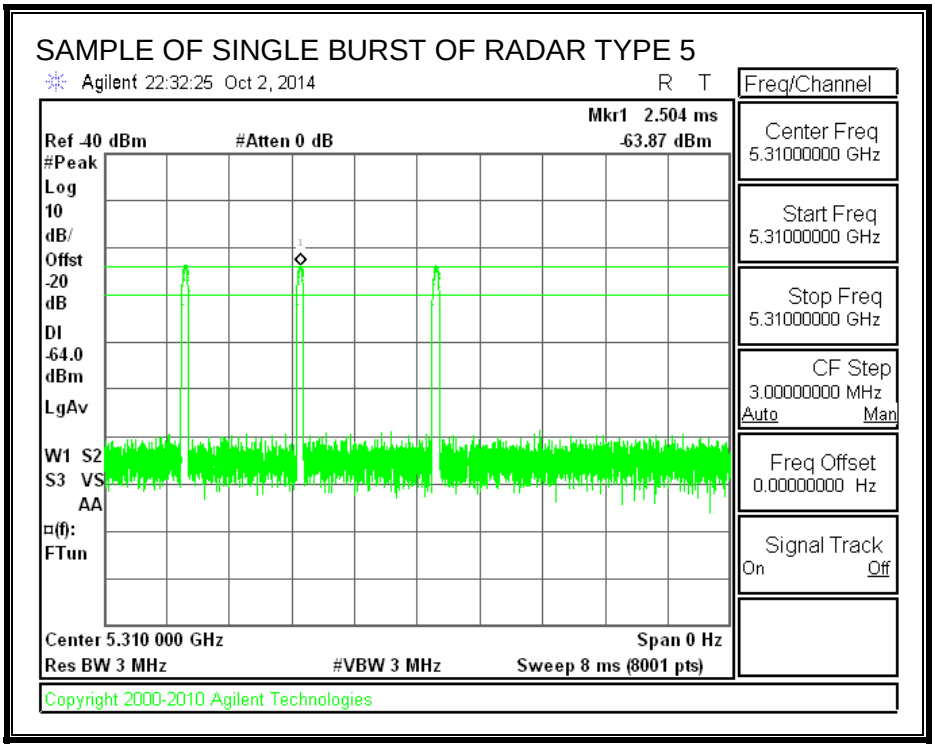


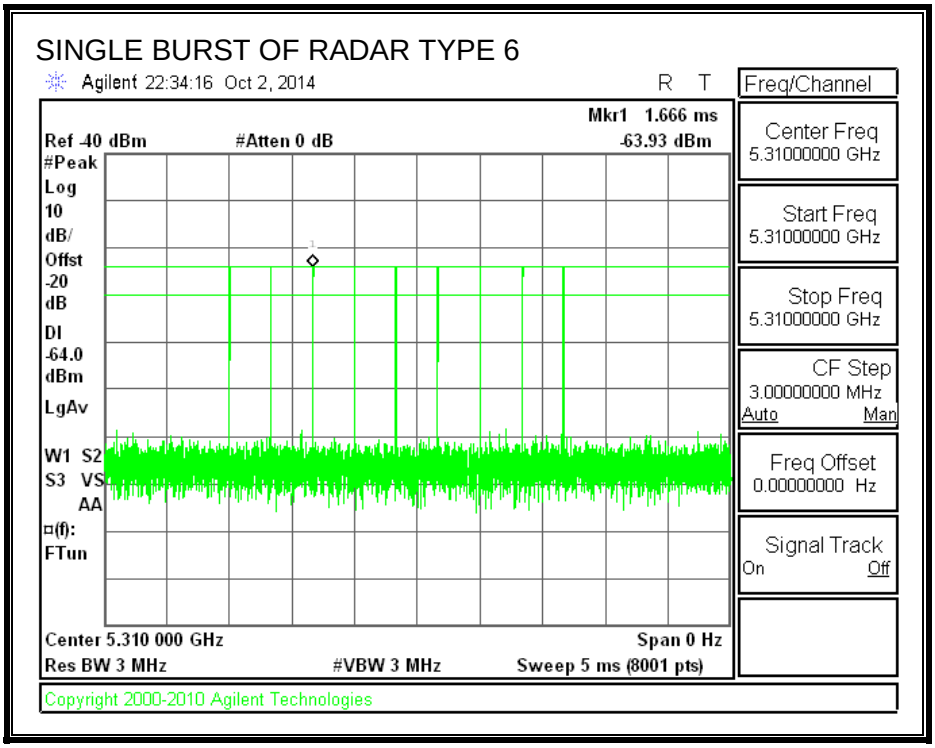


SAMPLE OF RADAR TYPE 4

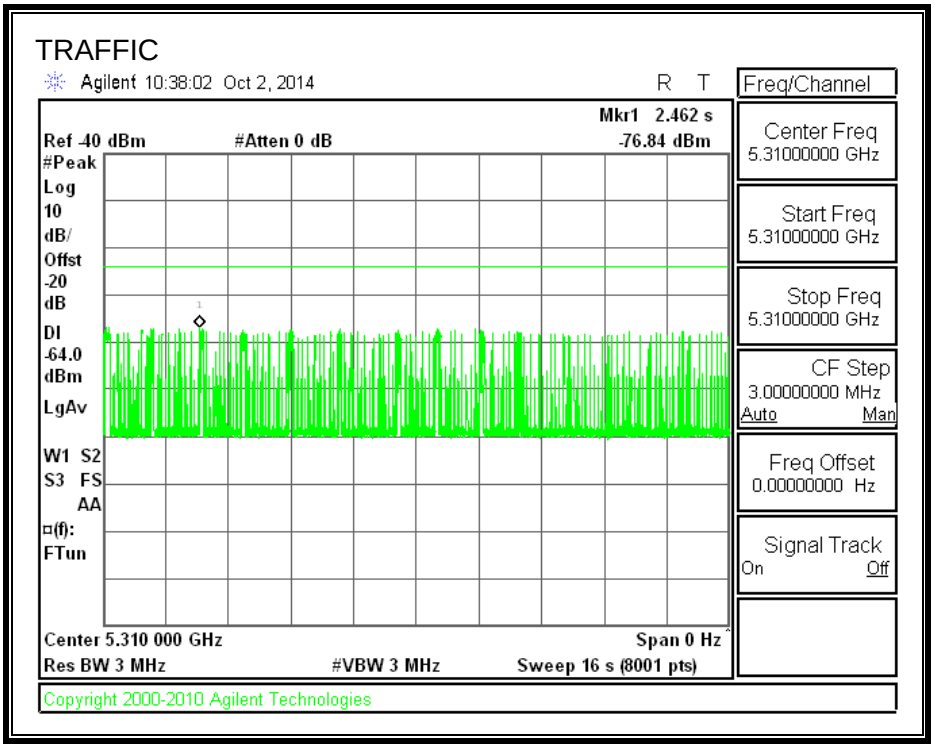


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





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 5310 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 5310 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 5310 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	60.78	60.78

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	4.83	4.83

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	56.94	56.94

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)
23:03:58	23:04:58	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)
0:08:17	0:08:22	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)
23:53:56	23:54:53	0:00:57

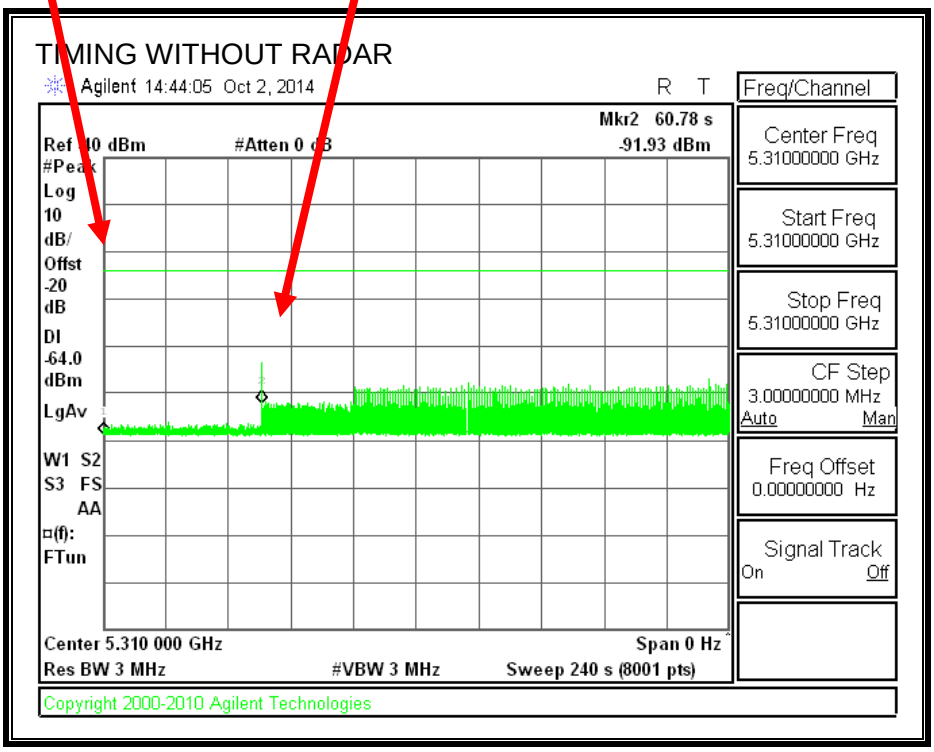
QUALITATIVE RESULTS

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.

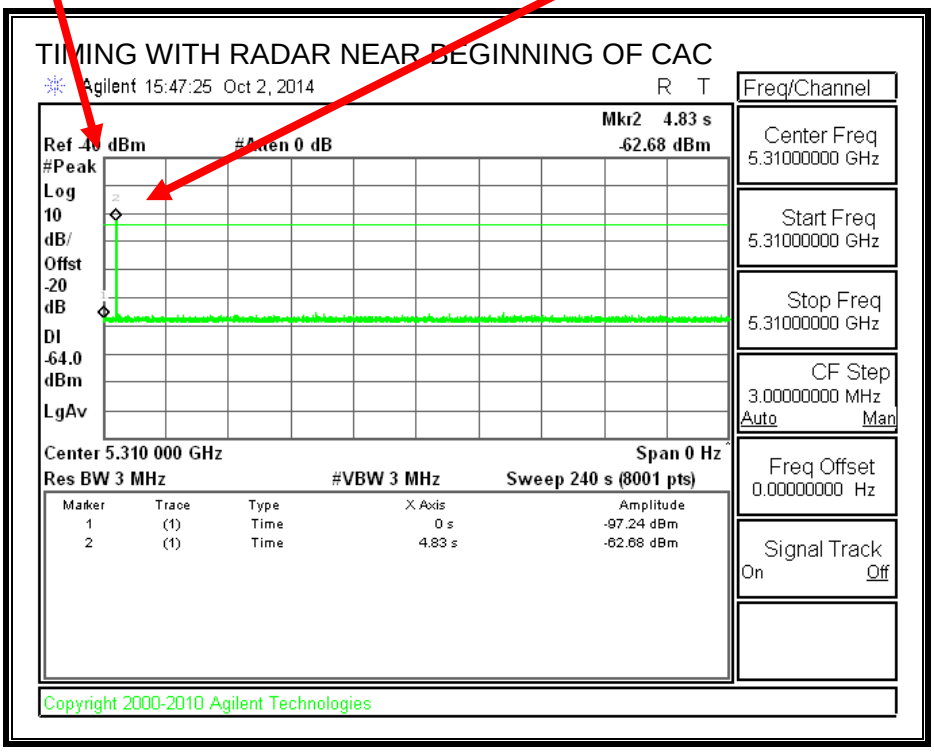
Log File of CAC Timing Without Radar

```
Jan 06 23:03:58 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 60 sys_idx: 1
 (cfg.c:584)

Jan 06 23:03:58 2014: ap7532-15E794 : %DOT11-6-CLIENT_ASSOCIATED: Client '00-
23-14-04-9B-34' associated to wlan '1' ssid '7532' on radio 'ap7532-
15E794:R2'
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check
Jan 06 23:03:58 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
DLS DFS State PRE-ISM Channel Availability Check -> In-Service
Monitoring(ISM)

Jan 06 23:04:58 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.

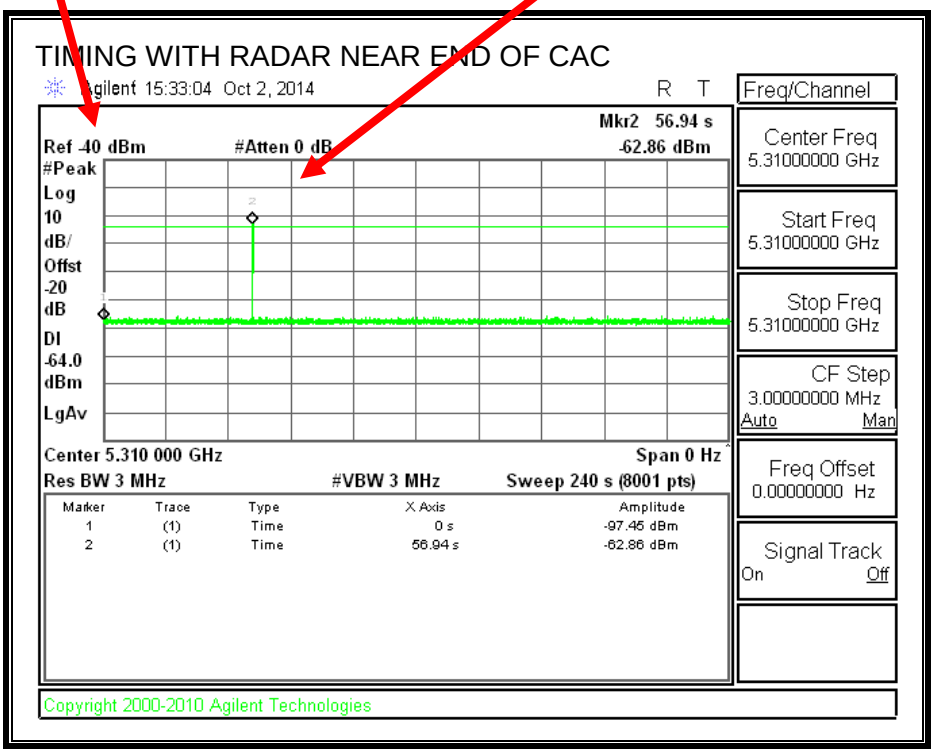
Log File of Radar at the Beginning of CAC

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

Jan 07 00:08:17 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 60 sys_idx: 1
 (cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 07 00:08:22 2014: ap7532-15E794 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 60 freq 5300 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 06 23:53:56 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.

radio->info.current_channel is 60 sys_idx: 1 cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 06 23:53:56 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.

ap7532-15E794#Type 7 Radar Detection. Detected pulse index=0 fm_min=0
fm_max=0 nconsecq_pulses=4. Time from last detection = 394, = 6min 34sec
DLS - time to delete the timer
DLS DFS State PRE-ISM Channel Availability Check -> IDLE

Jan 06 23:54:53 2014: %KERN-4-WARNING: Type 7 Radar Detection. Detected pulse
index=0 fm_min=0 fm_max=0 nconsecq_pulses=4. Time from last detection = 394,
= 6min 34sec .
```

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.

These tests are not applicable.

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)

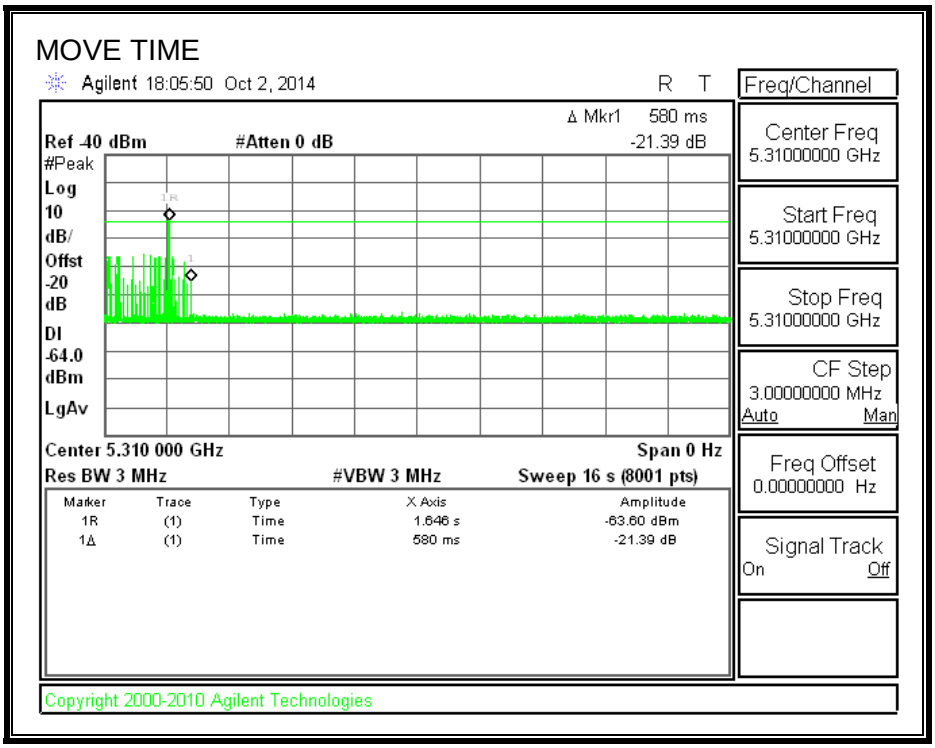
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

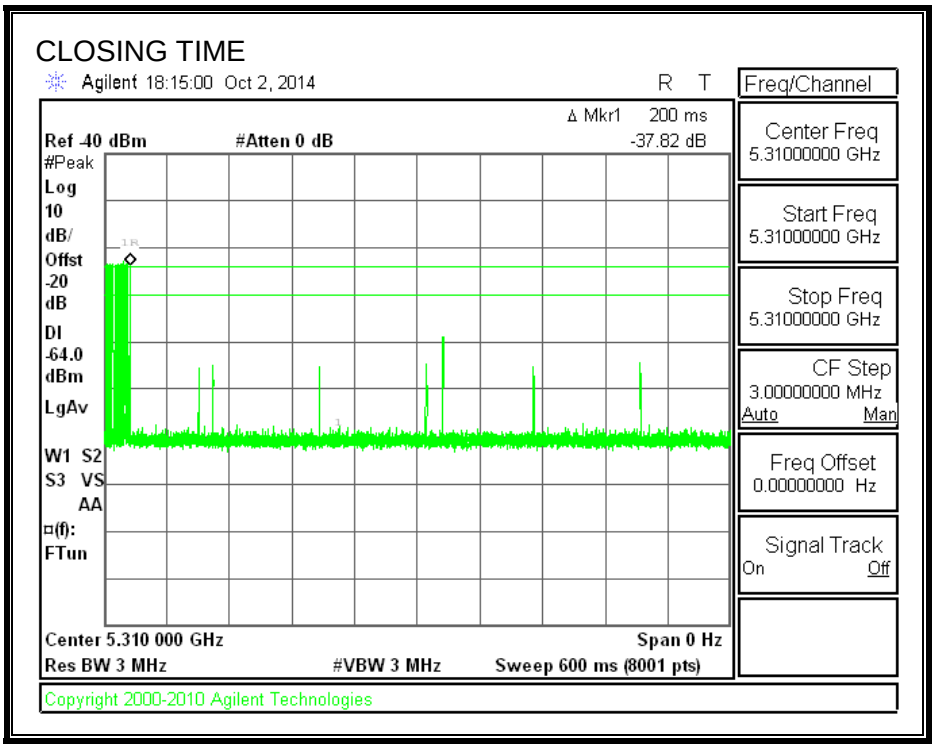
Channel Move Time (sec)	Limit (sec)
0.580	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
12.0	60

MOVE TIME

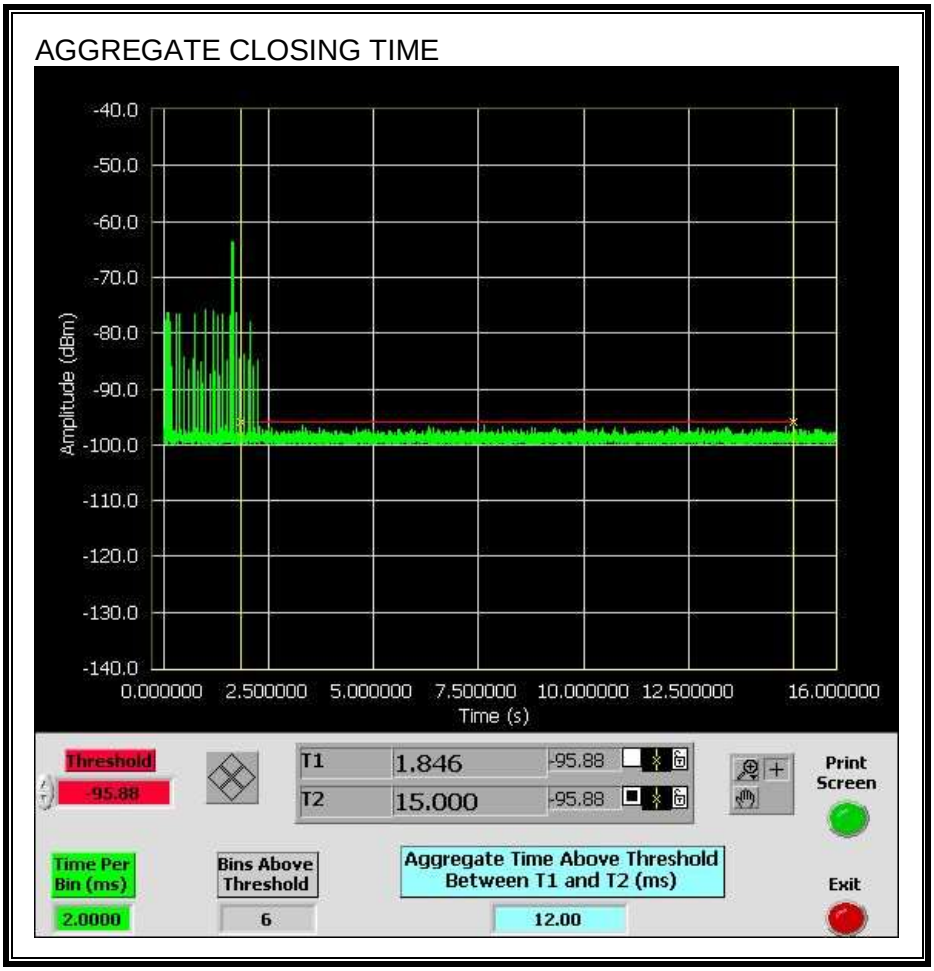


CHANNEL CLOSING TIME



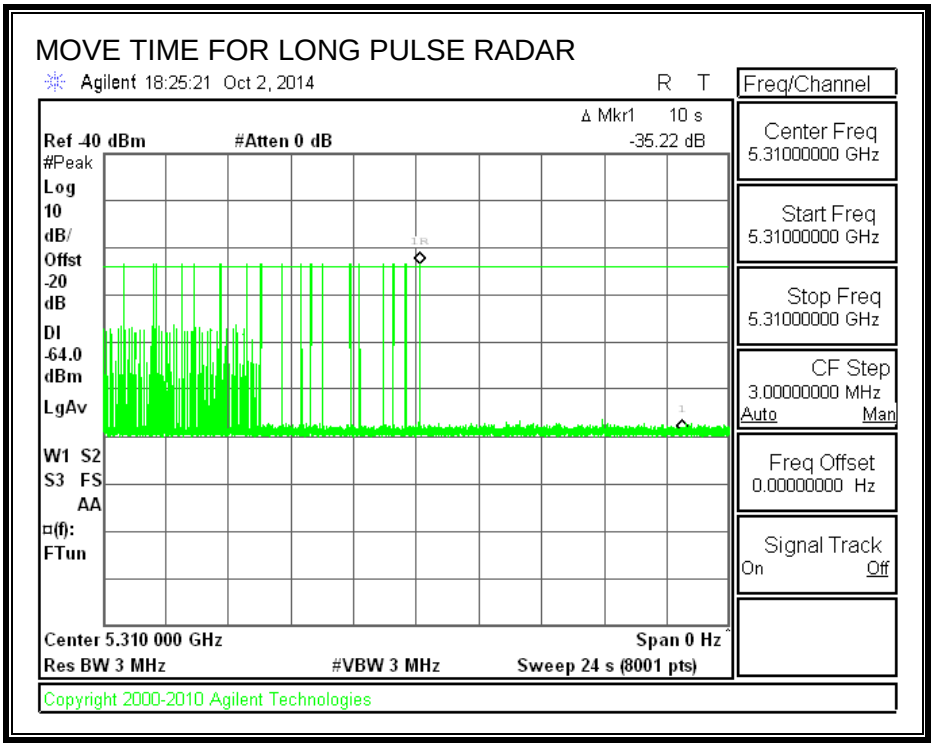
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

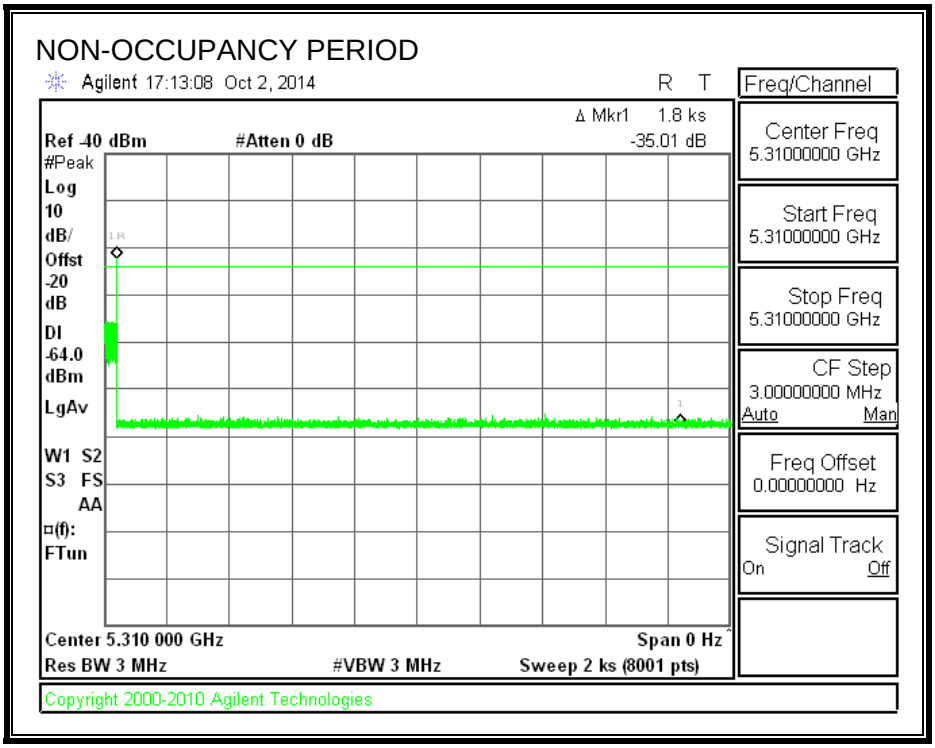
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.3.3. NON-OCCUPANCY PERIOD

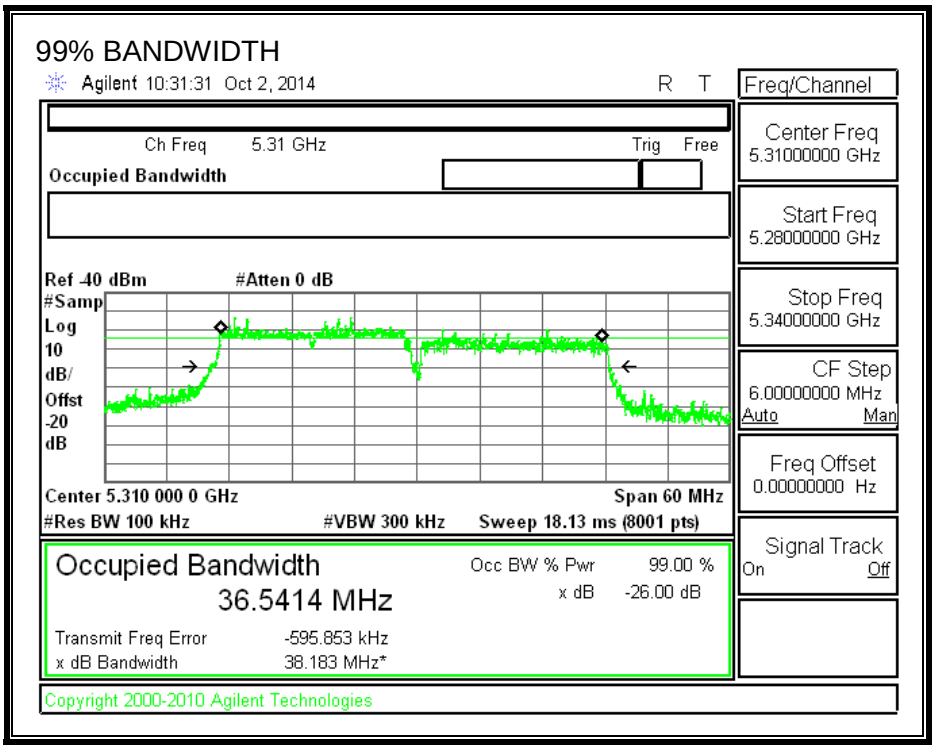
RESULTS

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



5.3.4. 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 (%)
5291	5329	38	36.541	104.0	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
5291	10	10	100	FL
5292	10	10	100	
5293	10	10	100	
5294	10	10	100	
5295	10	10	100	
5300	10	10	100	
5305	10	10	100	
5310	10	9	90	
5315	10	10	100	
5320	10	10	100	
5325	10	10	100	
5326	10	10	100	
5327	10	10	100	
5328	10	10	100	
5329	10	10	100	FH

5.3.5. 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	100.00	60	Pass
Aggregate		99.17	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	No
1002	858	62	A	Yes
1003	798	67	A	Yes
1004	578	92	A	Yes
1005	898	59	A	Yes
1006	758	70	A	Yes
1007	538	99	A	Yes
1008	618	86	A	Yes
1009	598	89	A	Yes
1010	658	81	A	Yes
1011	818	65	A	Yes
1012	518	102	A	Yes
1013	878	61	A	Yes
1014	938	57	A	Yes
1015	778	68	A	Yes
1016	678	78	B	Yes
1017	2994	18	B	Yes
1018	2392	23	B	Yes
1019	1657	32	B	Yes
1020	1180	45	B	Yes
1021	610	87	B	Yes
1022	2876	19	B	Yes
1023	724	73	B	Yes
1024	2465	22	B	Yes
1025	552	96	B	Yes
1026	887	60	B	Yes
1027	2021	27	B	Yes
1028	557	95	B	Yes
1029	652	81	B	Yes
1030	2452	22	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	4.9	161.00	23	Yes
2002	3.9	178.00	24	Yes
2003	1.4	230.00	29	Yes
2004	4.5	219.00	25	Yes
2005	2.1	172.00	24	Yes
2006	2.5	210.00	29	Yes
2007	1.5	172.00	28	Yes
2008	3.5	152.00	28	Yes
2009	1.5	160.00	25	Yes
2010	4.3	177.00	28	Yes
2011	4.7	159.00	25	Yes
2012	4.1	229.00	28	Yes
2013	4.5	189.00	28	Yes
2014	1.9	213.00	24	Yes
2015	2	230.00	27	Yes
2016	4.1	152.00	23	Yes
2017	4	174.00	24	Yes
2018	1.1	224.00	27	Yes
2019	4.3	184.00	23	Yes
2020	1	216.00	28	Yes
2021	4.6	214.00	24	Yes
2022	2.9	188.00	27	Yes
2023	2	175.00	29	Yes
2024	3.7	187.00	27	Yes
2025	1.5	193.00	23	Yes
2026	4.9	200.00	29	Yes
2027	2.6	230.00	28	Yes
2028	2.1	229.00	28	Yes
2029	1.4	222.00	28	Yes
2030	1.6	157.00	28	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	8.2	414.00	16	Yes
3002	7.6	398.00	17	Yes
3003	6	433.00	18	Yes
3004	5.2	356.00	16	Yes
3005	7.8	411.00	16	Yes
3006	6.8	428.00	17	Yes
3007	10	475.00	18	Yes
3008	8.9	344.00	18	Yes
3009	9.7	325.00	18	Yes
3010	7.5	311.00	18	Yes
3011	5.4	271.00	16	Yes
3012	8.5	426.00	16	Yes
3013	8	296.00	16	Yes
3014	9.3	390.00	17	Yes
3015	9.7	357.00	16	Yes
3016	9.2	303.00	16	Yes
3017	9.6	454.00	16	Yes
3018	9.2	271.00	16	Yes
3019	5	286.00	16	Yes
3020	7.6	279.00	16	Yes
3021	5.3	405.00	16	Yes
3022	9.6	404.00	16	Yes
3023	6.5	420.00	18	Yes
3024	5.4	416.00	17	Yes
3025	6.4	425.00	17	Yes
3026	6.1	296.00	18	Yes
3027	9.9	333.00	17	Yes
3028	5.5	422.00	18	Yes
3029	7.7	487	17	Yes
3030	5.2	309	18	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	18	390.00	13	Yes
4002	16.1	457.00	12	Yes
4003	17.9	428.00	16	Yes
4004	19.5	375.00	12	Yes
4005	15	328.00	13	Yes
4006	10.9	369.00	15	Yes
4007	14.2	372.00	12	Yes
4008	12.1	497.00	13	Yes
4009	14.6	371.00	16	Yes
4010	14.9	452.00	13	Yes
4011	18.1	497.00	16	Yes
4012	16.2	389.00	15	Yes
4013	18.6	393.00	15	Yes
4014	10.1	354.00	12	Yes
4015	18.1	273.00	13	Yes
4016	12	360.00	14	Yes
4017	14.6	290.00	13	Yes
4018	19	302.00	13	Yes
4019	11.3	293.00	15	Yes
4020	18.7	400.00	16	Yes
4021	16.2	327.00	15	Yes
4022	18.6	343.00	14	Yes
4023	10.9	403.00	14	Yes
4024	17.2	482.00	14	Yes
4025	17.2	298.00	12	Yes
4026	13.1	300.00	16	Yes
4027	15.7	411.00	12	Yes
4028	16.7	328.00	15	Yes
4029	10.4	347.00	13	Yes
4030	19.6	378.00	12	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	257	5291	10	Yes
2	732	5292	7	Yes
3	1207	5293	6	Yes
4	1682	5294	7	Yes
5	2157	5295	9	Yes
6	2632	5296	8	Yes
7	3107	5297	7	Yes
8	3582	5298	3	Yes
9	4057	5299	12	Yes
10	4532	5300	9	Yes
11	5007	5301	6	Yes
12	5482	5302	7	Yes
13	5957	5303	9	Yes
14	6432	5304	11	Yes
15	6907	5305	6	Yes
16	7382	5306	11	Yes
17	7857	5307	10	Yes
18	8332	5308	10	Yes
19	8807	5309	8	Yes
20	9282	5310	9	Yes
21	9757	5311	5	Yes
22	10232	5312	9	Yes
23	10707	5313	9	Yes
24	11182	5314	8	Yes
25	11657	5315	10	Yes
26	12132	5316	5	Yes
27	12607	5317	12	Yes
28	13082	5318	7	Yes
29	13557	5319	8	Yes
30	14032	5320	3	Yes
31	14507	5321	9	Yes
32	14982	5322	7	Yes
33	15457	5323	6	Yes
34	15932	5324	7	Yes
35	16407	5325	5	Yes
36	16882	5326	9	Yes
37	17357	5327	10	Yes
38	17832	5328	6	Yes
39	18307	5329	10	Yes

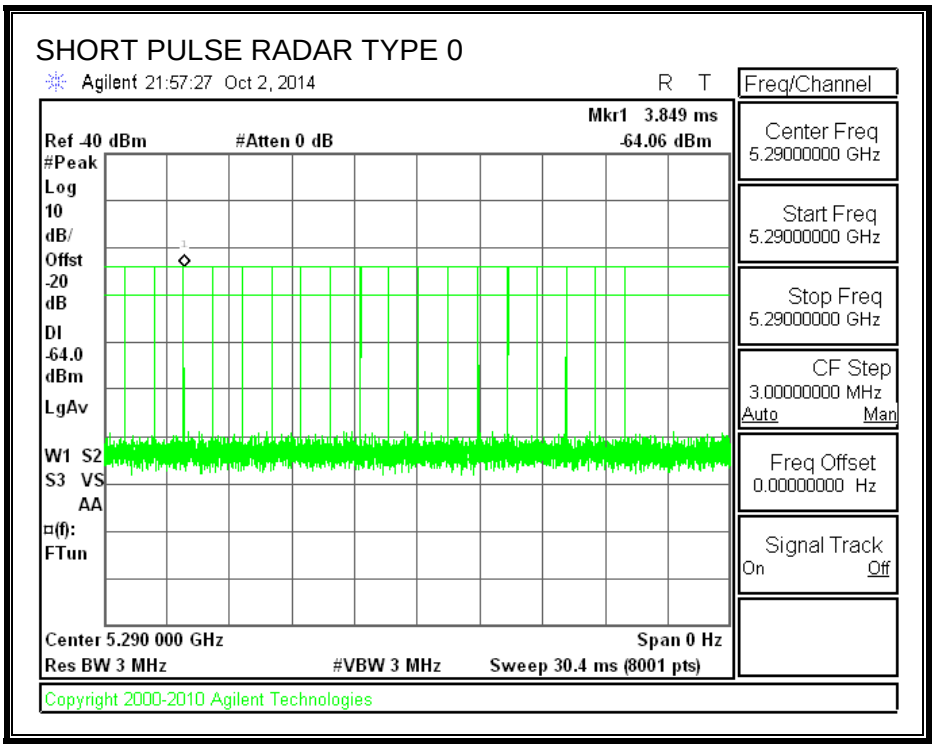
5.4. RESULTS FOR 80 MHz BANDWIDTH

5.4.1. TEST CHANNEL

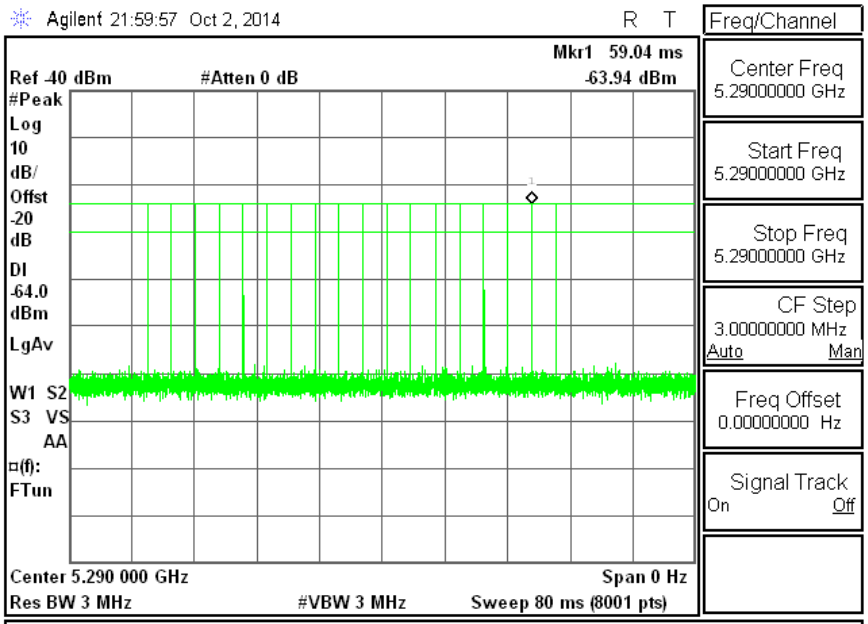
All tests were performed at a channel center frequency of 5290 MHz.

5.4.2. RADAR WAVEFORMS AND TRAFFIC

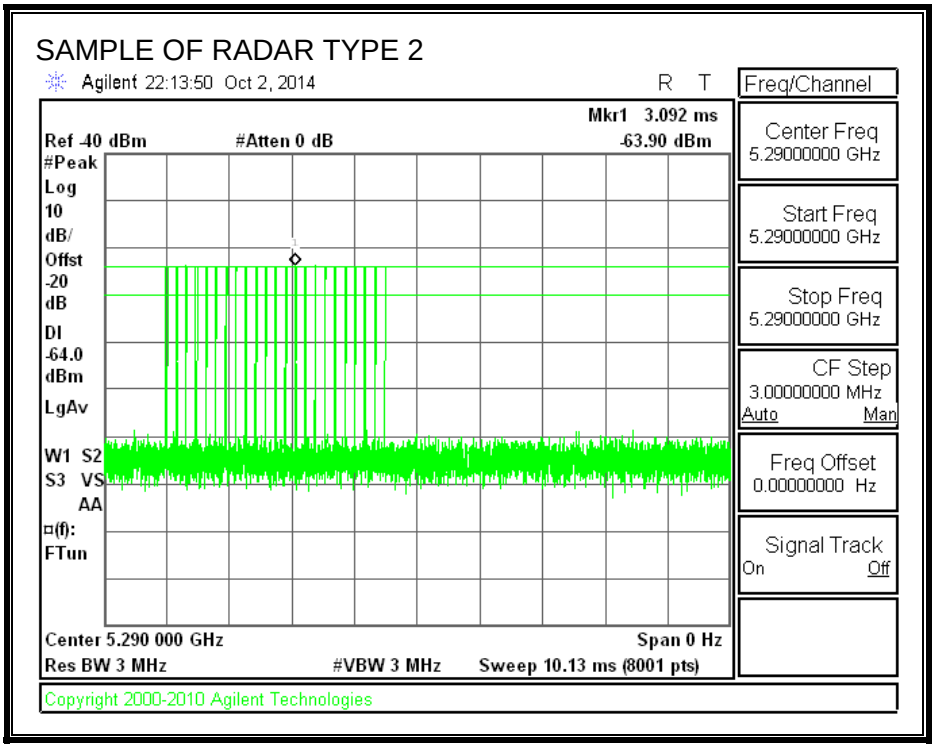
RADAR WAVEFORMS



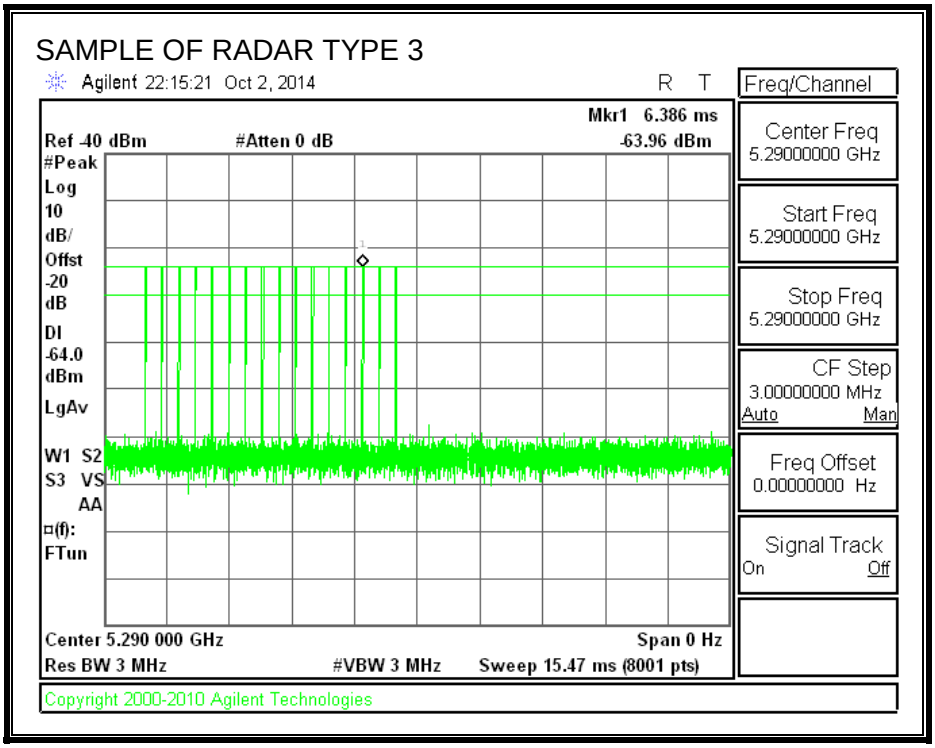
SAMPLE OF RADAR TYPE 1



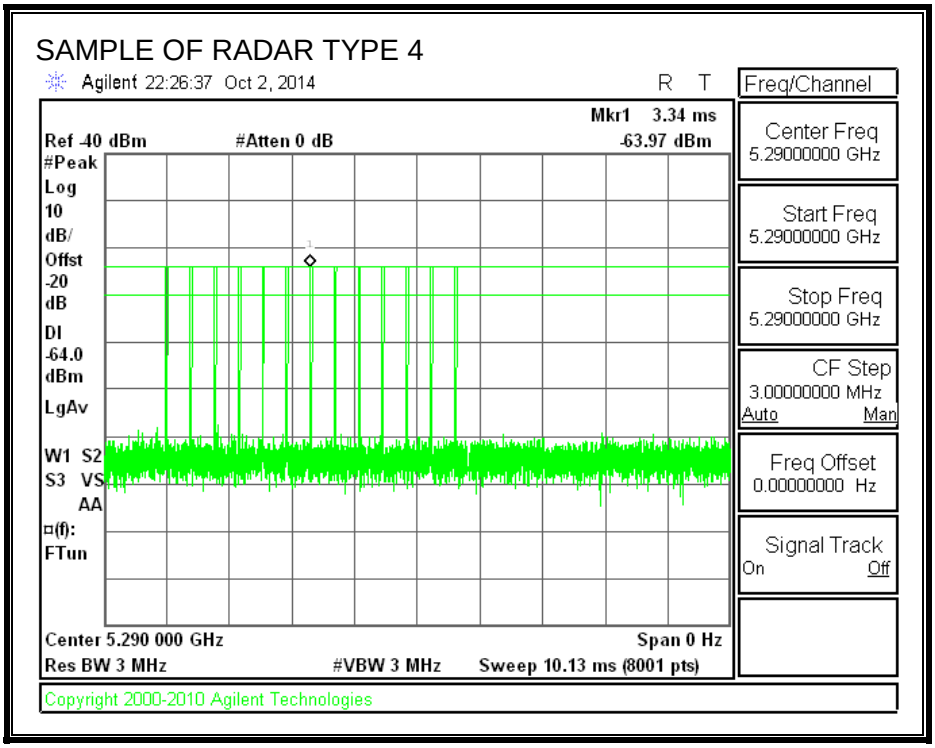
SAMPLE OF RADAR TYPE 2



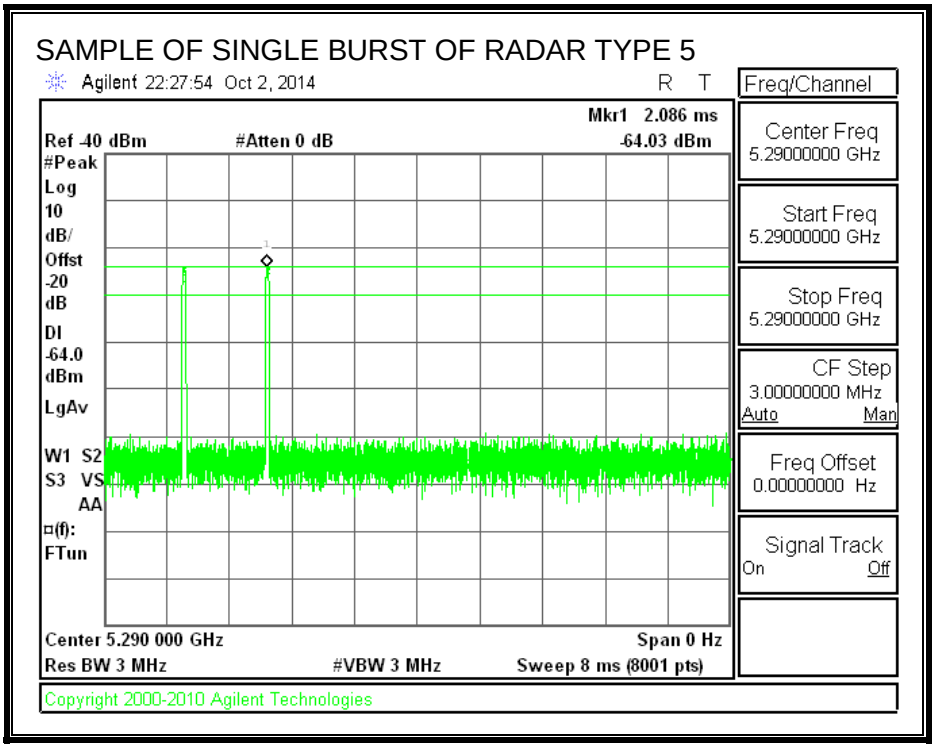
SAMPLE OF RADAR TYPE 3

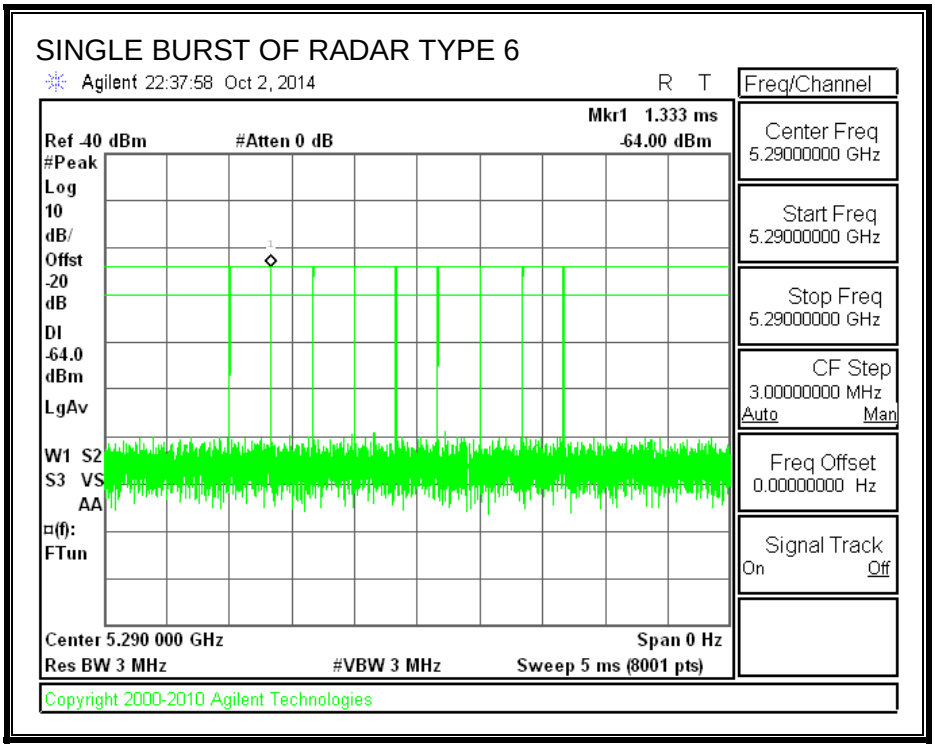


SAMPLE OF RADAR TYPE 4

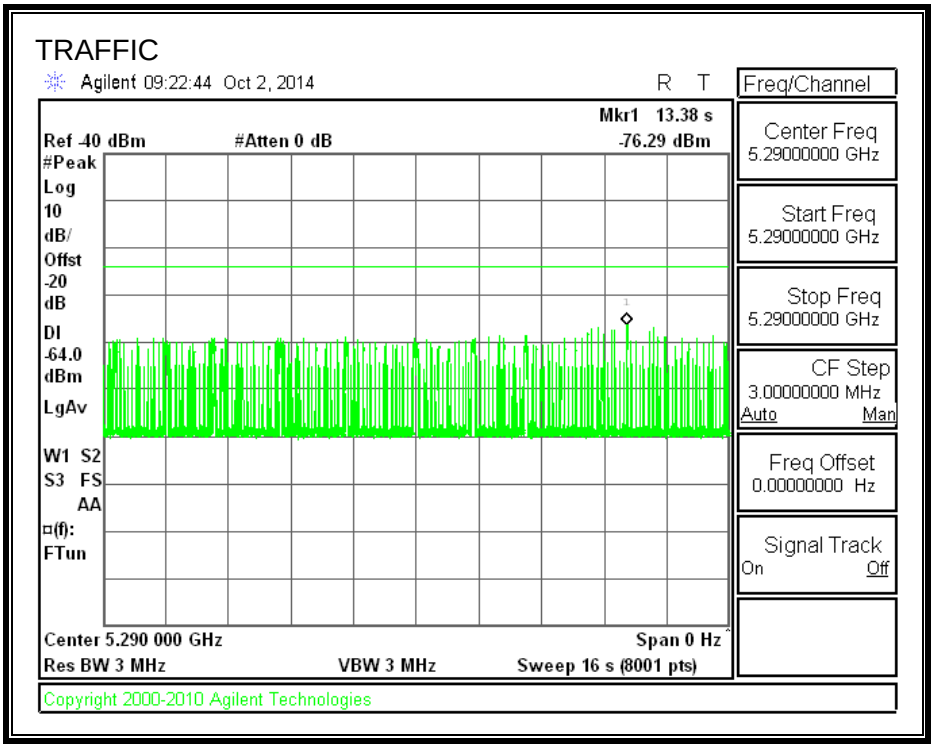


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





TRAFFIC



5.4.3. 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 5290 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 5290 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 5290 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	60.7

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	2.73	2.730

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	56.82	56.82

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)
23:25:52	23:26:52	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)
23:34:32	23:34:34	0:00:02

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)
23:43:08	23:44:05	0:00:57

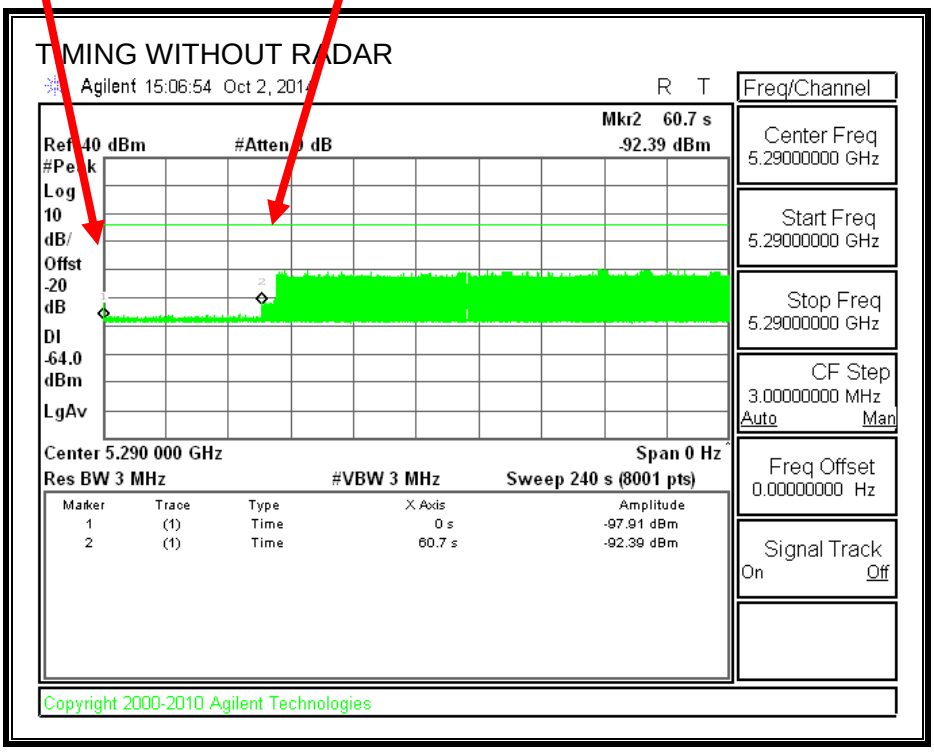
QUALITATIVE RESULTS

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.

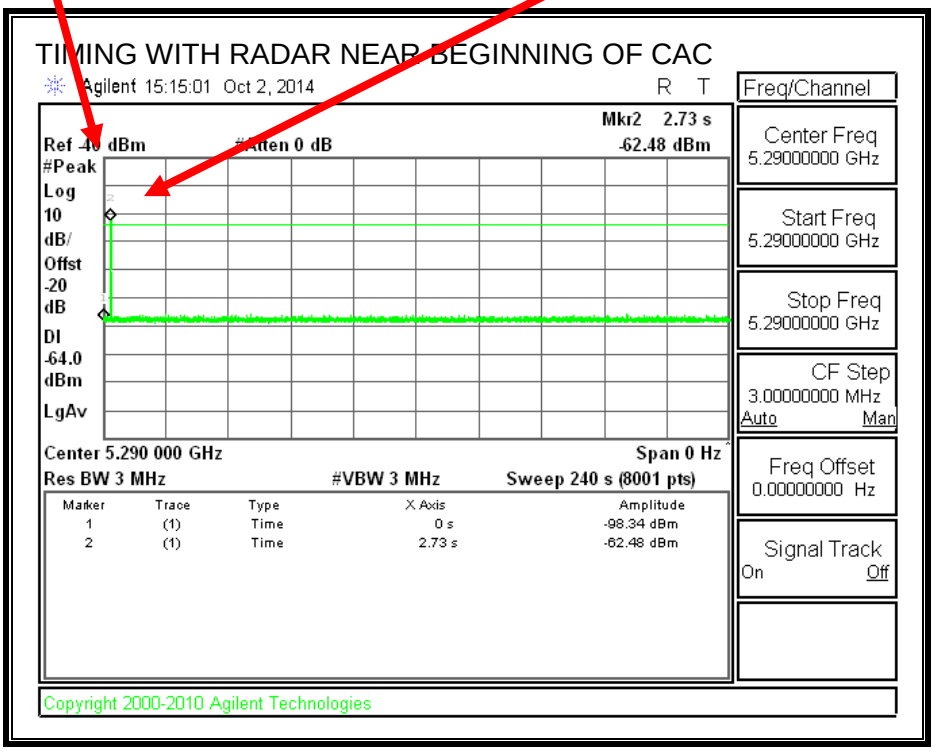
Log File of CAC Timing Without Radar

```
Jan 06 23:25:52 2014: %KERN-4-WARNING: DLS DFS State In-Service
Monitoring(ISM) -> PRE-ISM Channel Availability Check.
DLS - calling wlu_iovar_setint with wl_set_dfs_test_mode (wl.c:724)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 06 23:25:52 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
width is 80

Jan 06 23:26:52 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.

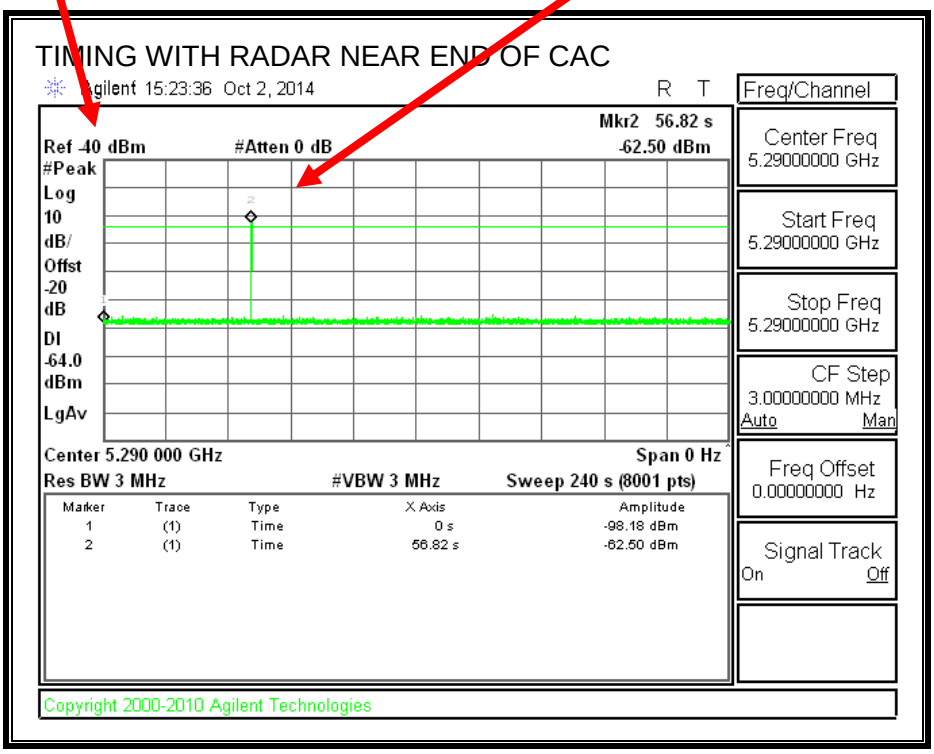
Log File of Radar at the Beginning of CAC

```
DLS - calling wlu_iovar_setint with wl_set_dfs_test_mode (wl.c:724)
DLS DFS State IDLE -> PRE-ISM Channel Availability Check
width is 80
 (cfg.c:572)

Jan 06 23:34:32 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 60 sys_idx: 2
 (cfg.c:584)

Type 7 Radar Detection. Detected pulse index=0 fm_min=0 fm_max=0
nconsecq_pulses=4. Time from last detection = 874, = 14min 34sec
DLS - time to delete the timer
DLS DFS State PRE-ISM Channel Availability Check -> IDLE

Jan 06 23:34:34 2014: ap7532-15E794 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 60 freq 5300 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 80
 (cfg.c:572)

Jan 06 23:43:08 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 06 23:43:08 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 60 sys_idx: 2
 (cfg.c:584)

ap7532-15E794(config-device-84-24-8D-15-E7-94-if-radio2)#Type 7 Radar
Detection. Detected pulse index=0 fm_min=0 fm_max=0 nconsecq_pulses=4. Time
from last de
DLS - time to delete the timer
DLS DFS State PRE-ISM Channel Availability Check -> IDLE

Jan 06 23:44:05 2014: ap7532-15E794 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 60 freq 5300 MHz
```

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)

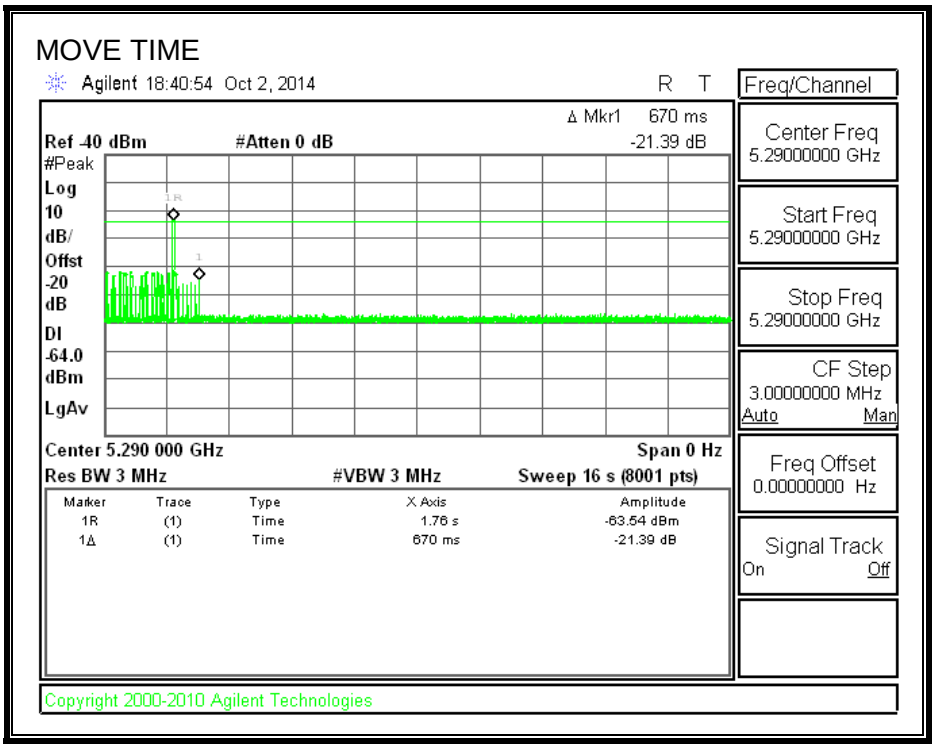
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

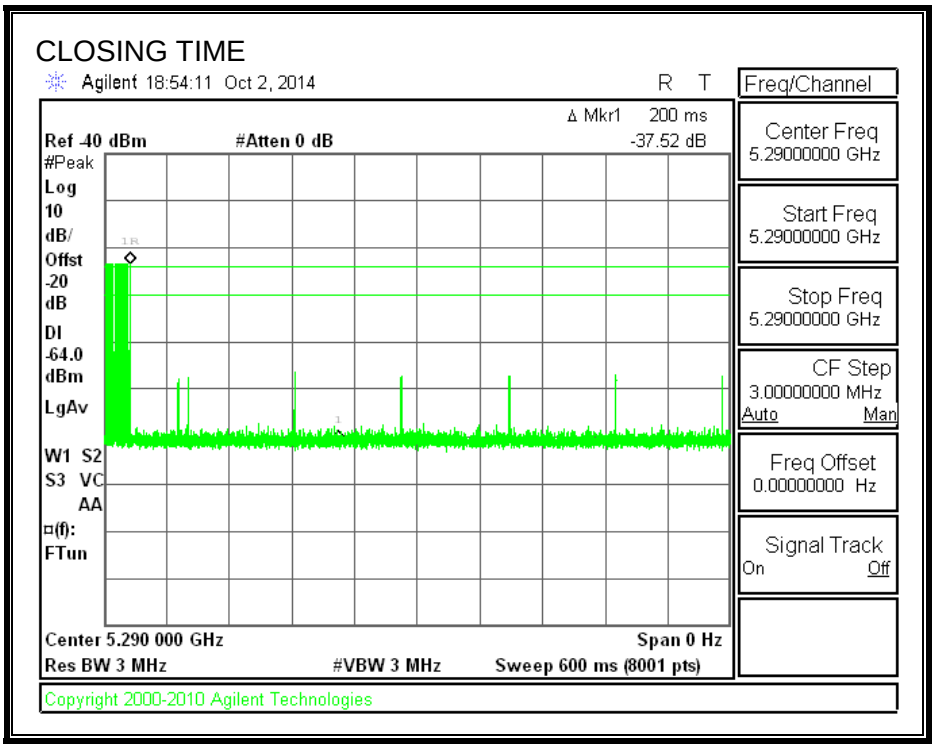
Channel Move Time (sec)	Limit (sec)
0.067	10

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

MOVE TIME



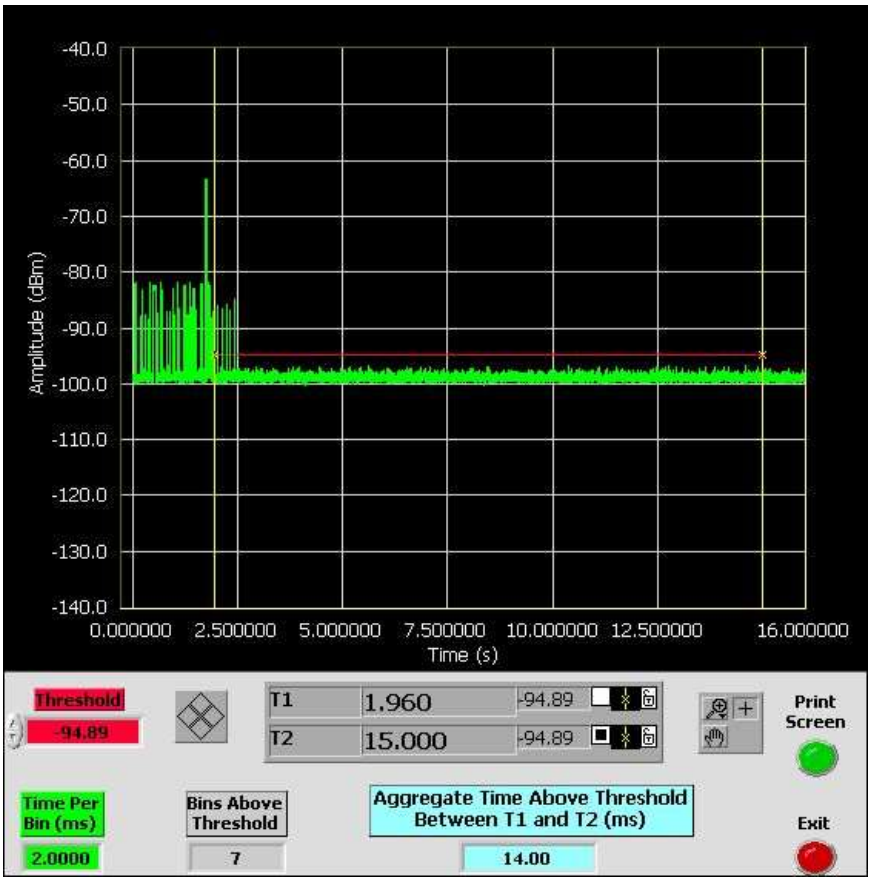
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

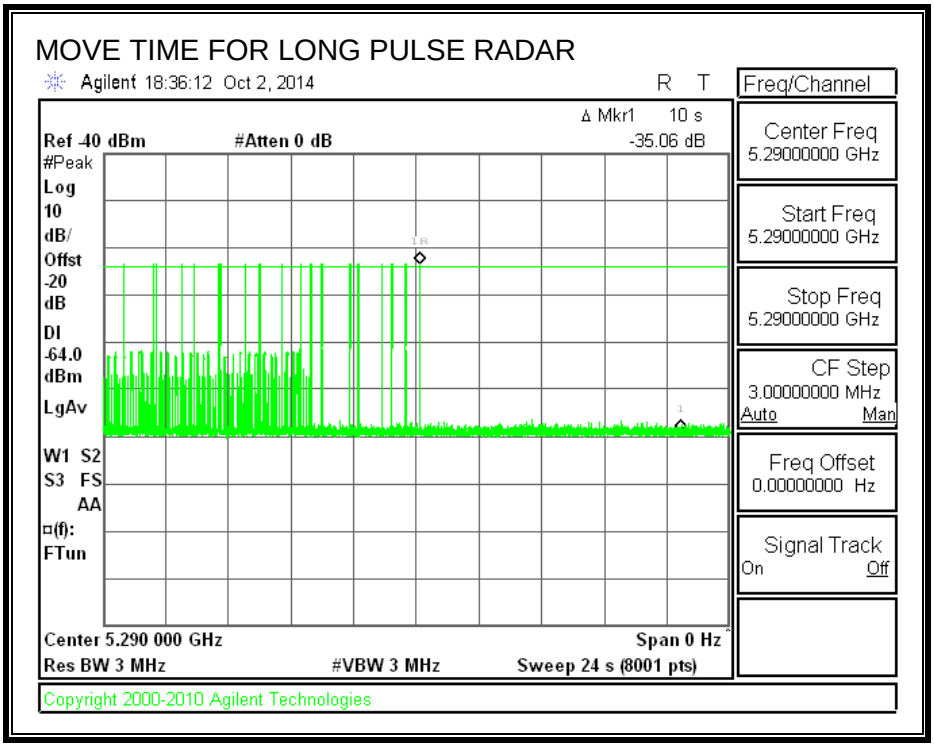
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

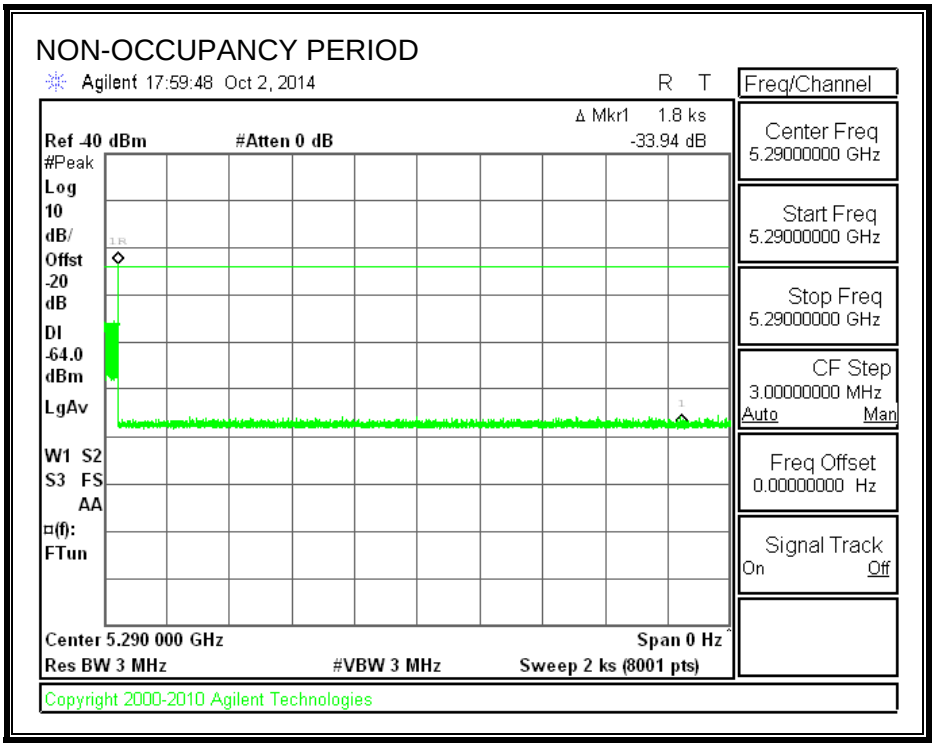
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.4.6. NON-OCCUPANCY PERIOD

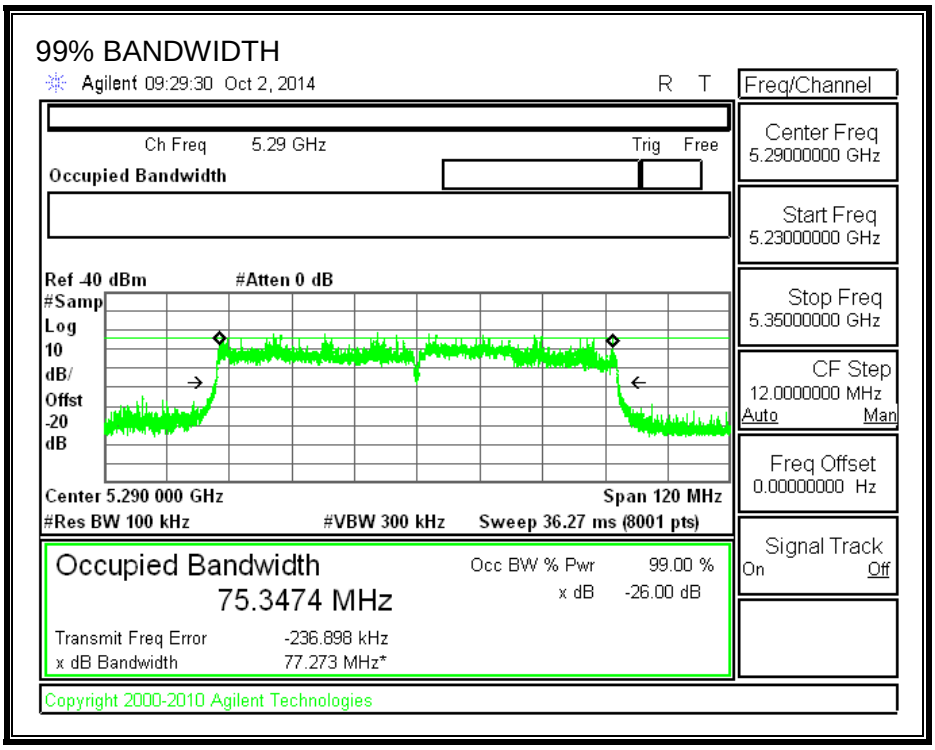
RESULTS

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



5.4.7. 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 (%)
5247	5330	83	75.347	110.2	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
5247	10	10	100	FL
5248	10	10	100	
5249	10	10	100	
5250	10	10	100	
5255	10	10	100	
5260	10	10	100	
5265	10	10	100	
5270	10	10	100	
5275	10	10	100	
5280	10	10	100	
5285	10	10	100	
5290	10	10	100	
5295	10	10	100	
5300	10	10	100	
5305	10	10	100	
5310	10	10	100	
5315	10	10	100	
5320	10	10	100	
5325	10	10	100	
5330	10	10	100	FH

5.4.8. 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	93.33	60	Pass
Aggregate		97.50	80	Pass
FCC Long Pulse Type 5	30	96.67	80	Pass
FCC Hopping Type 6	84	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	858	62	A	Yes
1003	798	67	A	Yes
1004	578	92	A	Yes
1005	898	59	A	Yes
1006	758	70	A	Yes
1007	538	99	A	Yes
1008	618	86	A	Yes
1009	598	89	A	Yes
1010	658	81	A	Yes
1011	818	65	A	Yes
1012	518	102	A	Yes
1013	878	61	A	Yes
1014	938	57	A	Yes
1015	778	68	A	Yes
1016	678	78	B	Yes
1017	2994	18	B	Yes
1018	2392	23	B	Yes
1019	1657	32	B	Yes
1020	1180	45	B	Yes
1021	610	87	B	Yes
1022	2876	19	B	Yes
1023	724	73	B	Yes
1024	2465	22	B	Yes
1025	552	96	B	Yes
1026	887	60	B	Yes
1027	2021	27	B	Yes
1028	557	95	B	Yes
1029	652	81	B	Yes
1030	2452	22	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	4.9	161.00	23	Yes
2002	3.9	178.00	24	Yes
2003	1.4	230.00	29	Yes
2004	4.5	219.00	25	Yes
2005	2.1	172.00	24	Yes
2006	2.5	210.00	29	Yes
2007	1.5	172.00	28	Yes
2008	3.5	152.00	28	Yes
2009	1.5	160.00	25	Yes
2010	4.3	177.00	28	Yes
2011	4.7	159.00	25	Yes
2012	4.1	229.00	28	Yes
2013	4.5	189.00	28	Yes
2014	1.9	213.00	24	Yes
2015	2	230.00	27	Yes
2016	4.1	152.00	23	Yes
2017	4	174.00	24	Yes
2018	1.1	224.00	27	Yes
2019	4.3	184.00	23	Yes
2020	1	216.00	28	Yes
2021	4.6	214.00	24	Yes
2022	2.9	188.00	27	Yes
2023	2	175.00	29	Yes
2024	3.7	187.00	27	Yes
2025	1.5	193.00	23	Yes
2026	4.9	200.00	29	Yes
2027	2.6	230.00	28	Yes
2028	2.1	229.00	28	Yes
2029	1.4	222.00	28	Yes
2030	1.6	157.00	28	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	8.2	414.00	16	Yes
3002	7.6	398.00	17	Yes
3003	6	433.00	18	Yes
3004	5.2	356.00	16	Yes
3005	7.8	411.00	16	Yes
3006	6.8	428.00	17	Yes
3007	10	475.00	18	Yes
3008	8.9	344.00	18	Yes
3009	9.7	325.00	18	Yes
3010	7.5	311.00	18	Yes
3011	5.4	271.00	16	Yes
3012	8.5	426.00	16	Yes
3013	8	296.00	16	Yes
3014	9.3	390.00	17	Yes
3015	9.7	357.00	16	Yes
3016	9.2	303.00	16	Yes
3017	9.6	454.00	16	Yes
3018	9.2	271.00	16	Yes
3019	5	286.00	16	Yes
3020	7.6	279.00	16	Yes
3021	5.3	405.00	16	Yes
3022	9.6	404.00	16	Yes
3023	6.5	420.00	18	Yes
3024	5.4	416.00	17	Yes
3025	6.4	425.00	17	Yes
3026	6.1	296.00	18	Yes
3027	9.9	333.00	17	Yes
3028	5.5	422.00	18	Yes
3029	7.7	487	17	Yes
3030	5.2	309	18	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	18	390.00	13	Yes
4002	16.1	457.00	12	Yes
4003	17.9	428.00	16	No
4004	19.5	375.00	12	Yes
4005	15	328.00	13	Yes
4006	10.9	369.00	15	Yes
4007	14.2	372.00	12	Yes
4008	12.1	497.00	13	Yes
4009	14.6	371.00	16	Yes
4010	14.9	452.00	13	Yes
4011	18.1	497.00	16	Yes
4012	16.2	389.00	15	Yes
4013	18.6	393.00	15	Yes
4014	10.1	354.00	12	Yes
4015	18.1	273.00	13	Yes
4016	12	360.00	14	Yes
4017	14.6	290.00	13	Yes
4018	19	302.00	13	Yes
4019	11.3	293.00	15	Yes
4020	18.7	400.00	16	Yes
4021	16.2	327.00	15	No
4022	18.6	343.00	14	Yes
4023	10.9	403.00	14	Yes
4024	17.2	482.00	14	Yes
4025	17.2	298.00	12	Yes
4026	13.1	300.00	16	Yes
4027	15.7	411.00	12	Yes
4028	16.7	328.00	15	Yes
4029	10.4	347.00	13	Yes
4030	19.6	378.00	12	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	No
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	186	5247	18	Yes
2	661	5248	15	Yes
3	1136	5249	16	Yes
4	1611	5250	18	Yes
5	2086	5251	14	Yes
6	2561	5252	16	Yes
7	3036	5253	16	Yes
8	3511	5254	12	Yes
9	3986	5255	17	Yes
10	4461	5256	16	Yes
11	4936	5257	13	Yes
12	5411	5258	8	Yes
13	5886	5259	17	Yes
14	6361	5260	18	Yes
15	6836	5261	18	Yes
16	7311	5262	15	Yes
17	7786	5263	16	Yes
18	8261	5264	25	Yes
19	8736	5265	22	Yes
20	9211	5266	13	Yes
21	9686	5267	17	Yes
22	10161	5268	10	Yes
23	10636	5269	24	Yes
24	11111	5270	18	Yes
25	11586	5271	17	Yes
26	12061	5272	19	Yes
27	12536	5273	14	Yes
28	13011	5274	20	Yes
29	13486	5275	17	Yes
30	13961	5276	21	Yes
31	14436	5277	23	Yes
32	14911	5278	17	Yes
33	15386	5279	16	Yes
34	15861	5280	18	Yes
35	16336	5281	13	Yes
36	16811	5282	17	Yes
37	17286	5283	17	Yes
38	17761	5284	9	Yes
39	18236	5285	13	Yes

TYPE 6 DETECTION PROBABILITY (CONTINUED)

40	18711	5286	18	Yes
41	19186	5287	12	Yes
42	19661	5288	16	Yes
43	20136	5289	15	Yes
44	20611	5290	21	Yes
45	21086	5291	19	Yes
46	21561	5292	15	Yes
47	22036	5293	21	Yes
48	22511	5294	16	Yes
49	22986	5295	12	Yes
50	23461	5296	15	Yes
51	23936	5297	20	Yes
52	24411	5298	18	Yes
53	24886	5299	24	Yes
54	25361	5300	15	Yes
55	25836	5301	7	Yes
56	26311	5302	11	Yes
57	26786	5303	16	Yes
58	27261	5304	18	Yes
59	27736	5305	16	Yes
60	28211	5306	19	Yes
61	28686	5307	19	Yes
62	29161	5308	20	Yes
63	29636	5309	13	Yes
64	30111	5310	18	Yes
65	30586	5311	14	Yes
66	31061	5312	20	Yes
67	31536	5313	17	Yes
68	32011	5314	16	Yes
69	32486	5315	18	Yes
70	-32575	5316	14	Yes
71	-32100	5317	20	Yes
72	-31625	5318	17	Yes
73	-31150	5319	18	Yes
74	-30675	5320	20	Yes
75	-30200	5321	21	Yes
76	-29725	5322	22	Yes
77	-29250	5323	13	Yes
78	-28775	5324	7	Yes
79	-28300	5325	22	Yes
80	-27825	5326	16	Yes
81	-27350	5327	18	Yes
82	-26875	5328	19	Yes
83	-26400	5329	25	Yes
84	-25925	5330	22	Yes