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

CERTIFICATION TEST REPORT

FOR

802.11 abgn/ac Wireless AP

MODEL NUMBER: MR32-HW

FCC ID: UDX-60031010
IC: 6961A-60031010

REPORT NUMBER: 14U18854-E1 Rev. A

ISSUE DATE: NOVEMBER 21, 2014

Prepared for
CISCO SYSTEMS, INC
170 WEST TASMAN DRIVE
SAN JOSE, CA, 95134, USA

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
--	11/21/14	Initial Issue	C. Cheung
A	12/3/14	Changed Eut Description to "802.11 abgn/ac Wireless AP."	H. Lau

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CISCO SYSTEMS, INC.
170 WEST TASMAN DRIVE
SAN JOSE, CA, 95134, USA

EUT DESCRIPTION: 802.11 abgn/ac Wireless AP

MODEL: MR32-HW

SERIAL NUMBER: Q2JD-38ES-JZZ5

DATE TESTED: OCTOBER 24, 2014 to NOVEMBER 5, 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:

CONAN CHEUNG
PROJECT LEAD
UL Verification Services Inc.

Tested By:

ANGELA WANG
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

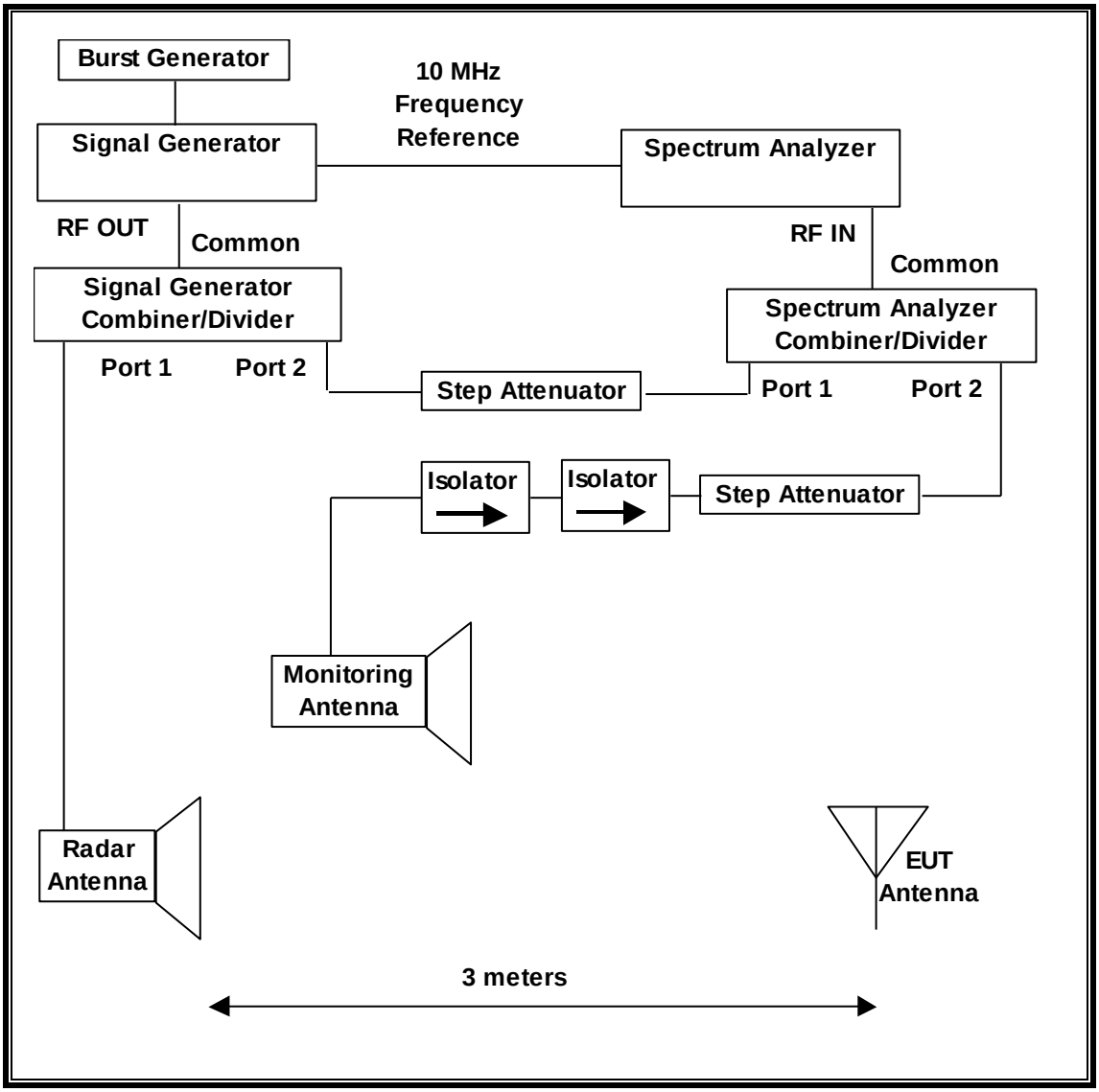
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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.

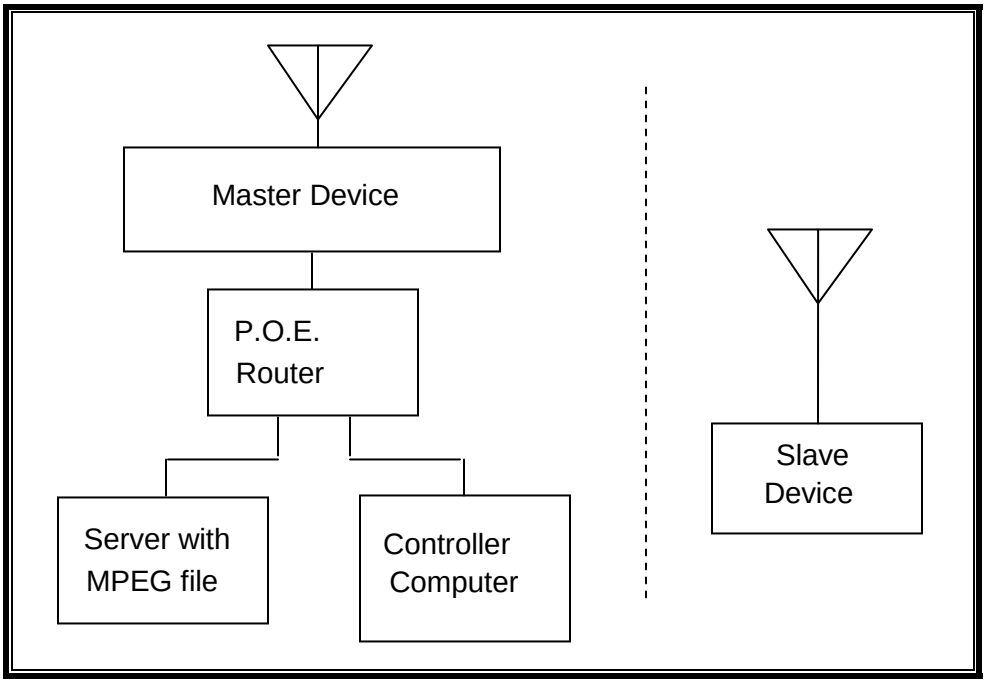
TEST AND MEASUREMENT EQUIPMENT

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)	Powertron Corp.	PA1015-2HU	NONE	DoC
Notebook PC (Console/Server)	Lenovo	Type 20B7-S0A200	PF-02JN9J 14/06	DoC
AC Adapter (Console/Server PC)	Lenovo	ADLX65NCC2A	11S45N0259Z1ZS974594A9	DoC
Notebook PC (Console)	Lenovo	Type 20B7-S0A200	PF-02JN9J 14/06	DoC
AC Adapter (Console)	Lenovo	ADLX65NCC2A	11S45N0319Z1ZLZF345B5X	DoC
Notebook PC (Slave Radio Device)	Apple	A1465	C02KTGMPF5N7	QDS-BRCM1072
AC Adapter (Slave PC)	Delta Electronics	A1435	C04341216J2F288BT	DoC
Gigabit Ethernet Switch	Cisco	MS220-8-HW	Q2GP-PVL6-8BGK	DoC

5.1.4. DESCRIPTION OF EUT

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

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

The EUT is a Master Device.

The highest power level within these bands is 22.08 dBm EIRP in the 5250-5350 MHz band and 29.73 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 4.4 dBi in the 5250-5350 MHz band and 5.75 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 4.06 dBi in the 5250-5350 MHz band and 3.99 dBi in the 5470-5725 MHz band.

The only antenna assembly utilized with the EUT has a gain of 5.5 dBi.

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

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

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

The EUT uses two transmitter/receiver chains and one receive only chain, 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 access point is firmware-venom-arm revision 23-1445646.

UNIFORM CHANNEL SPREADING

This requirement is not applicable to Slave radio devices.

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

The Master Device is a Cisco Access Point, FCC ID: LDK102061. The minimum antenna gain for the Master Device is 3.5 dBi.

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

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

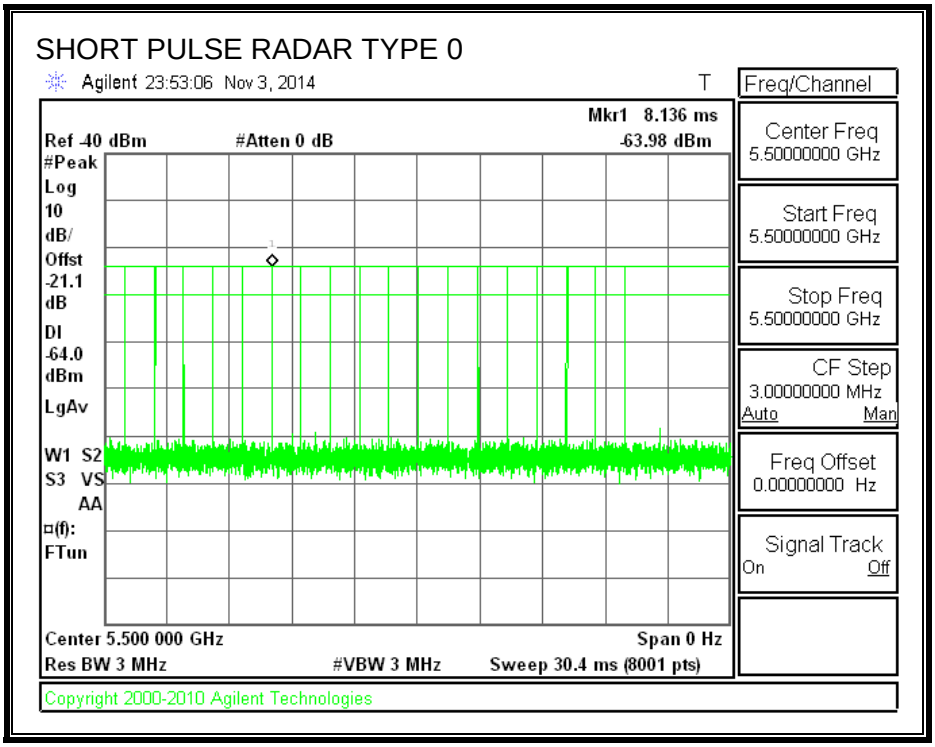
5.2. RESULTS FOR 20 MHz BANDWIDTH

5.2.1. TEST CHANNEL

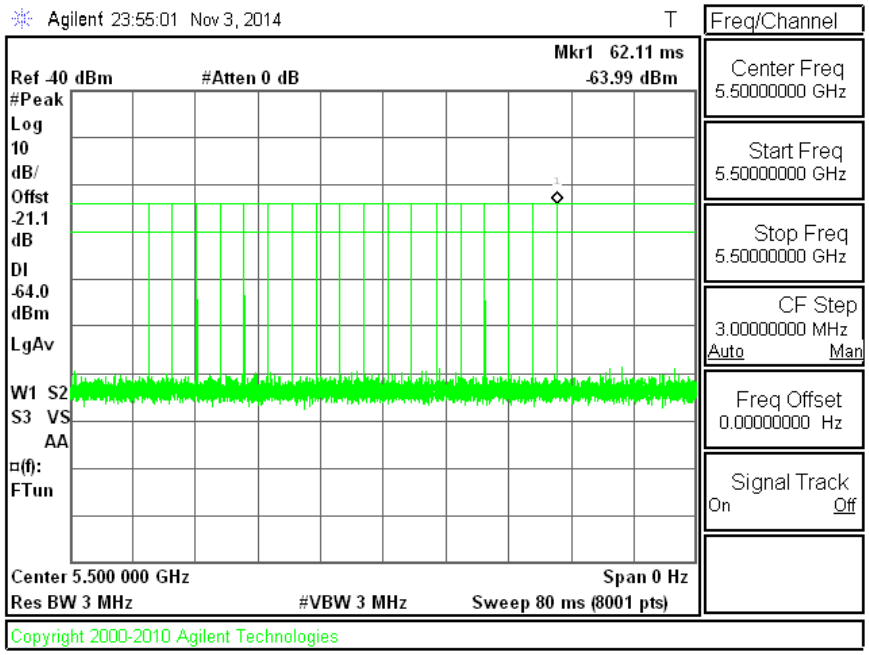
All tests were performed at a channel center frequency of 5500 MHz.

5.2.2. RADAR WAVEFORMS AND TRAFFIC

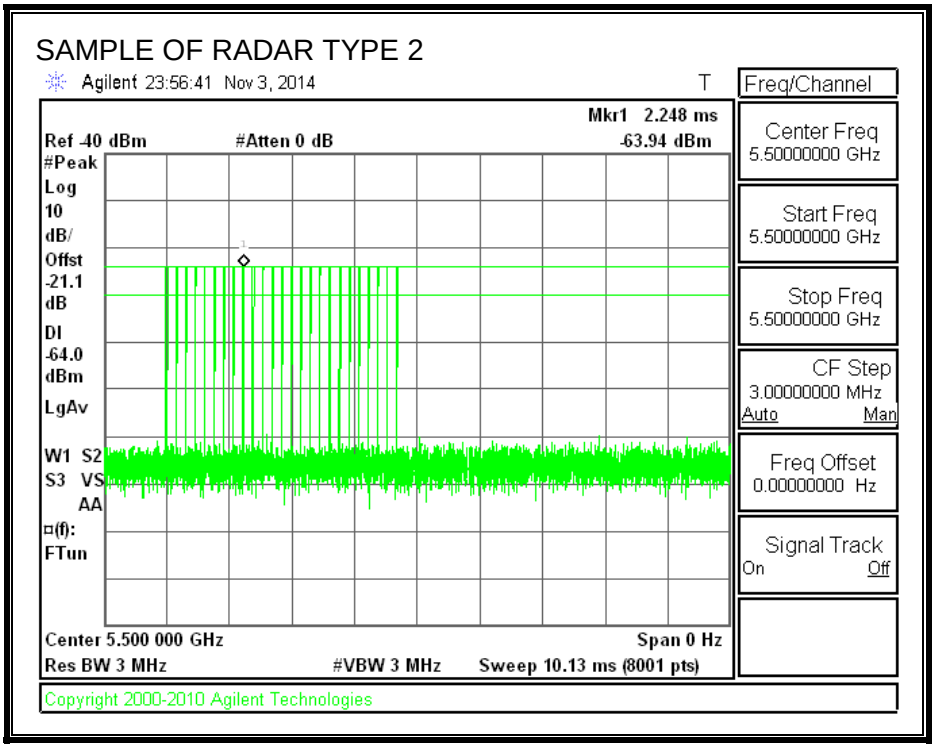
RADAR WAVEFORMS



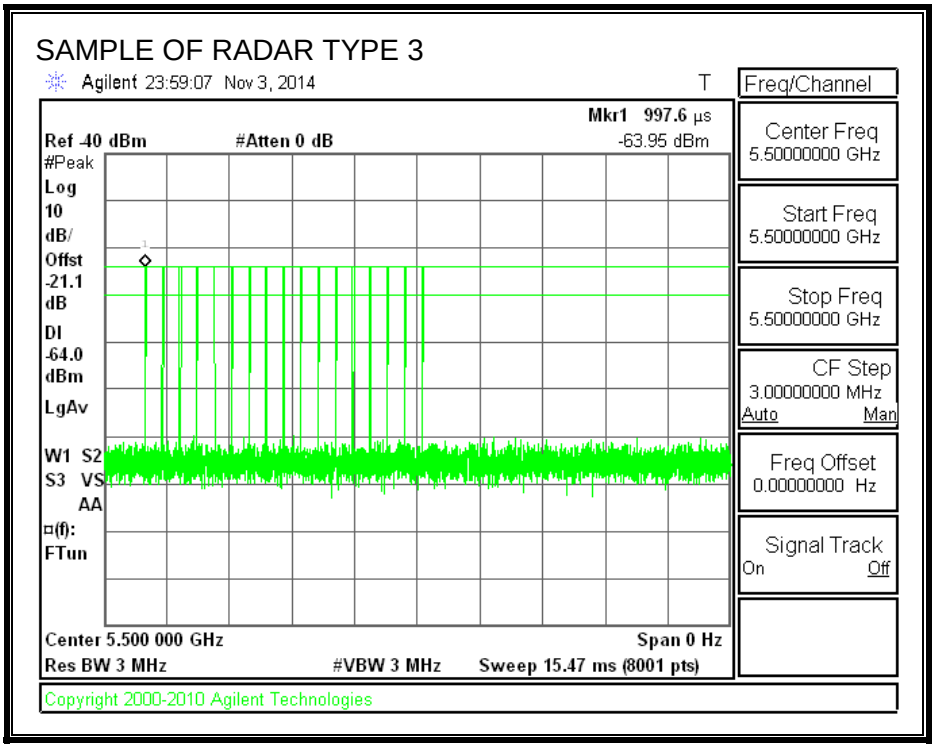
SAMPLE OF RADAR TYPE 1

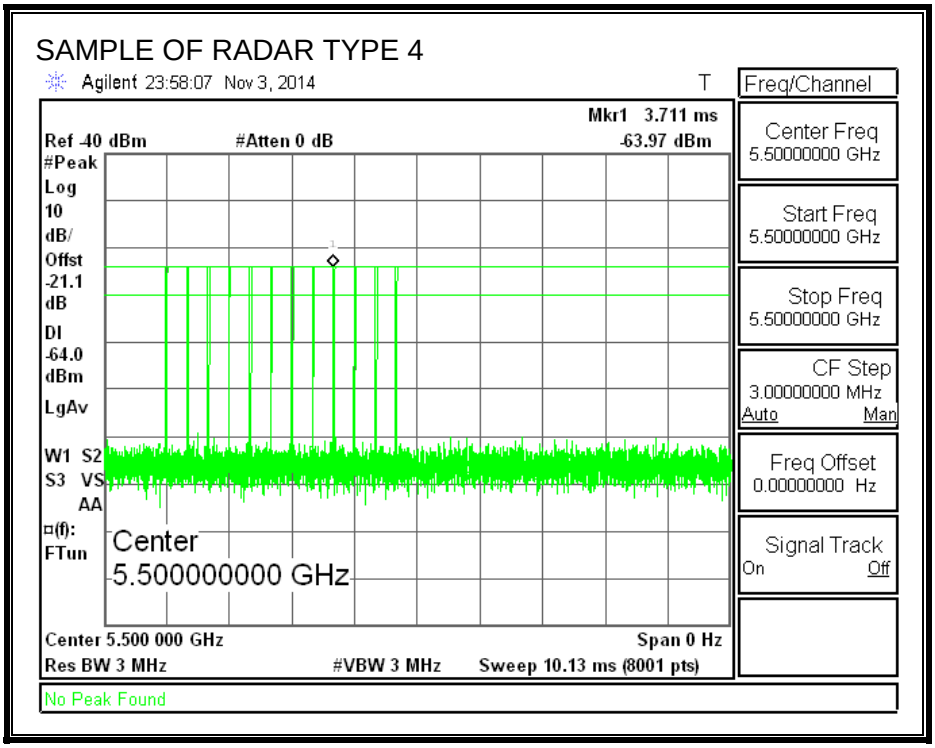


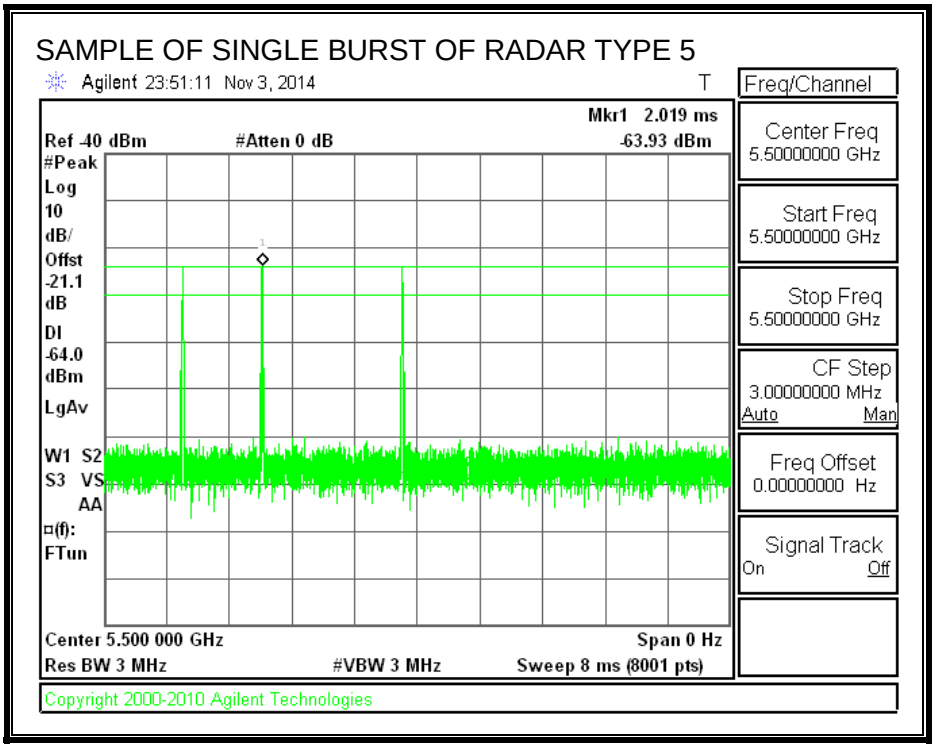
SAMPLE OF RADAR TYPE 2



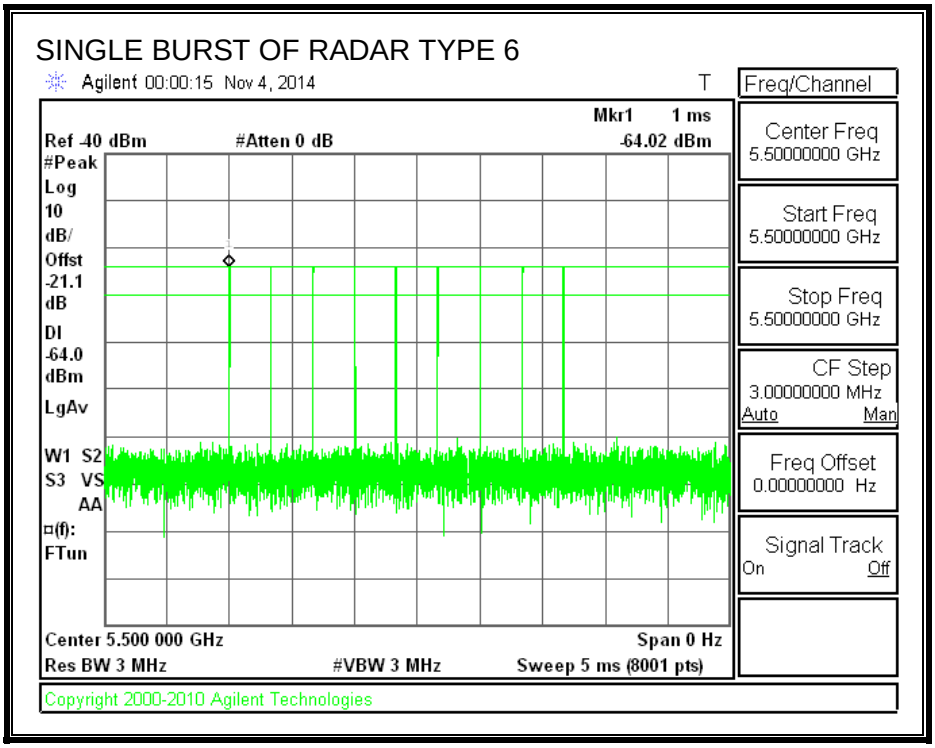
SAMPLE OF RADAR TYPE 3



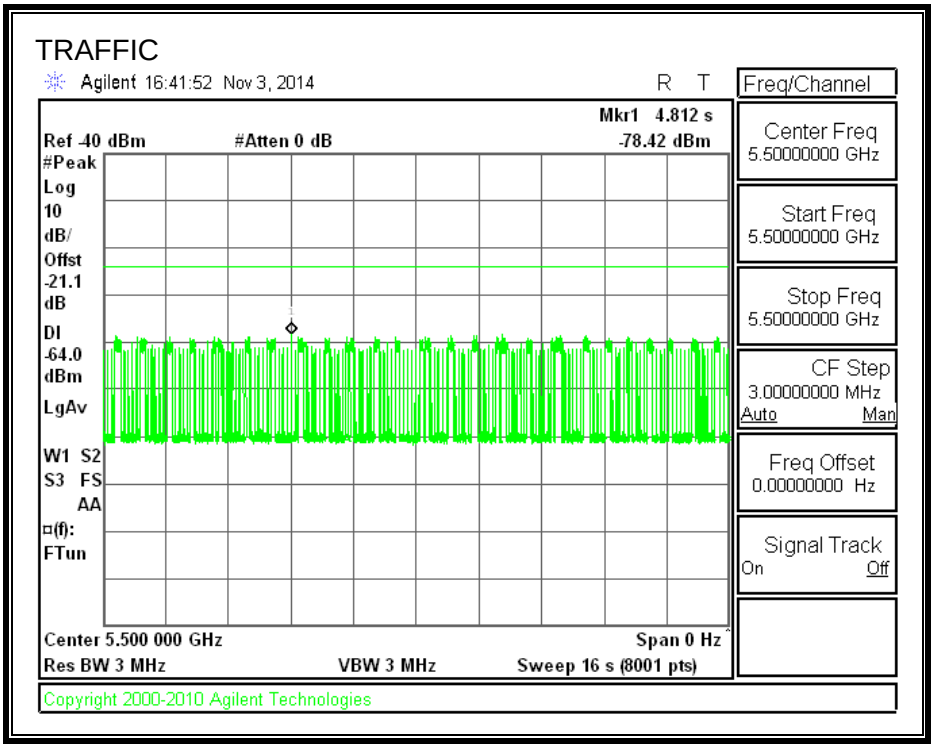




SINGLE BURST OF RADAR TYPE 6



TRAFFIC



5.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
29.74	130.5	100.8	40.8

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.04	73.7	43.6	2.8

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.15	127.4	97.3	56.5

QUALITATIVE RESULTS

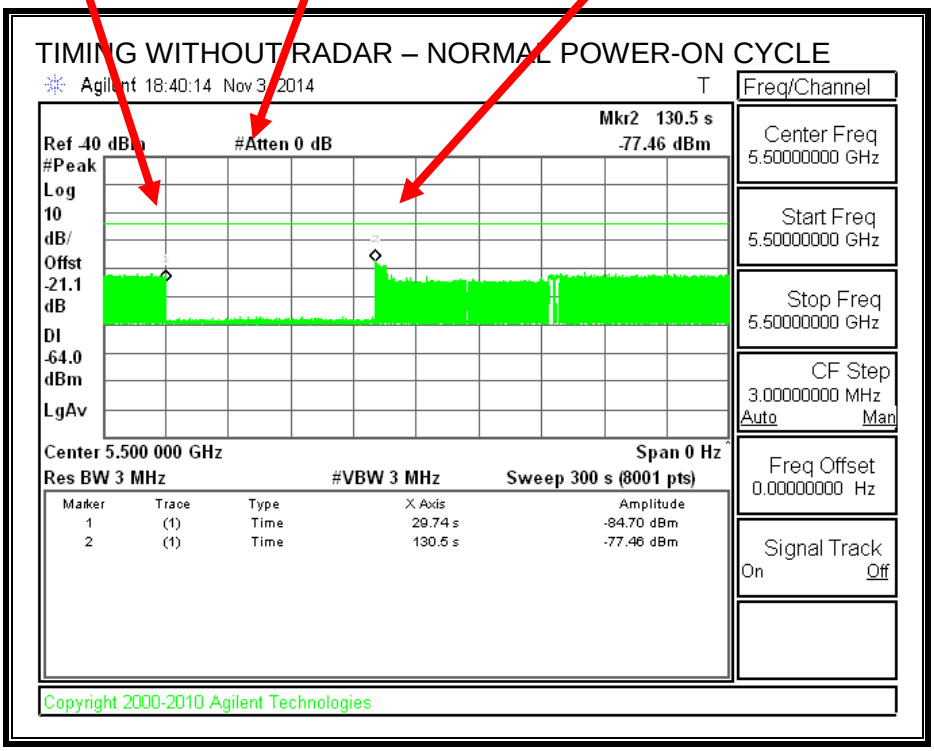
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

TIMING WITHOUT RADAR DURING CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



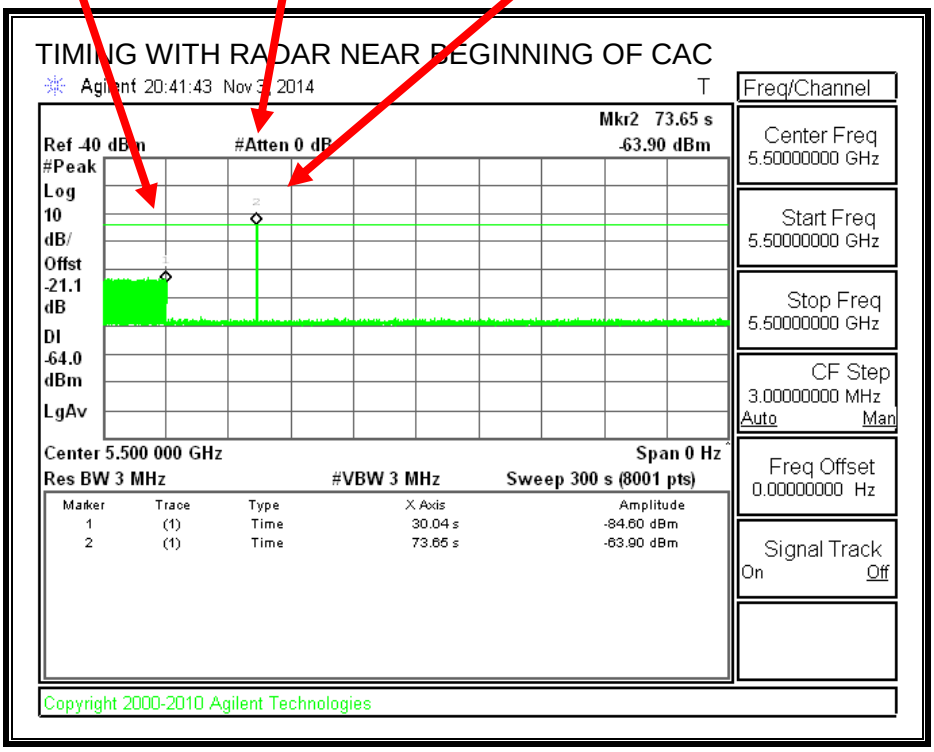
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



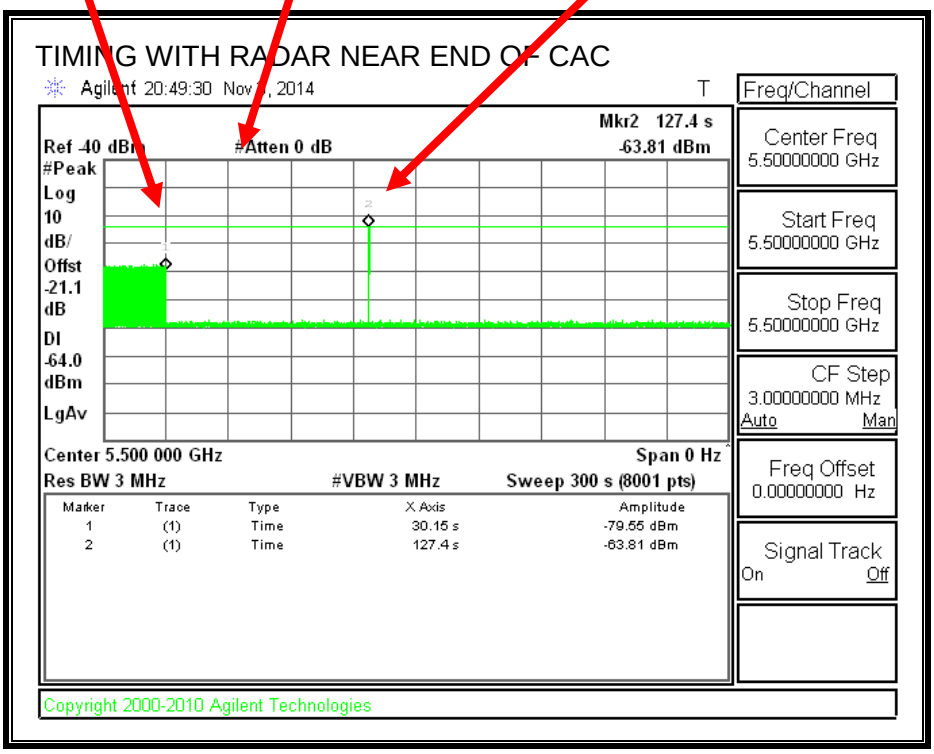
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

5.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

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)

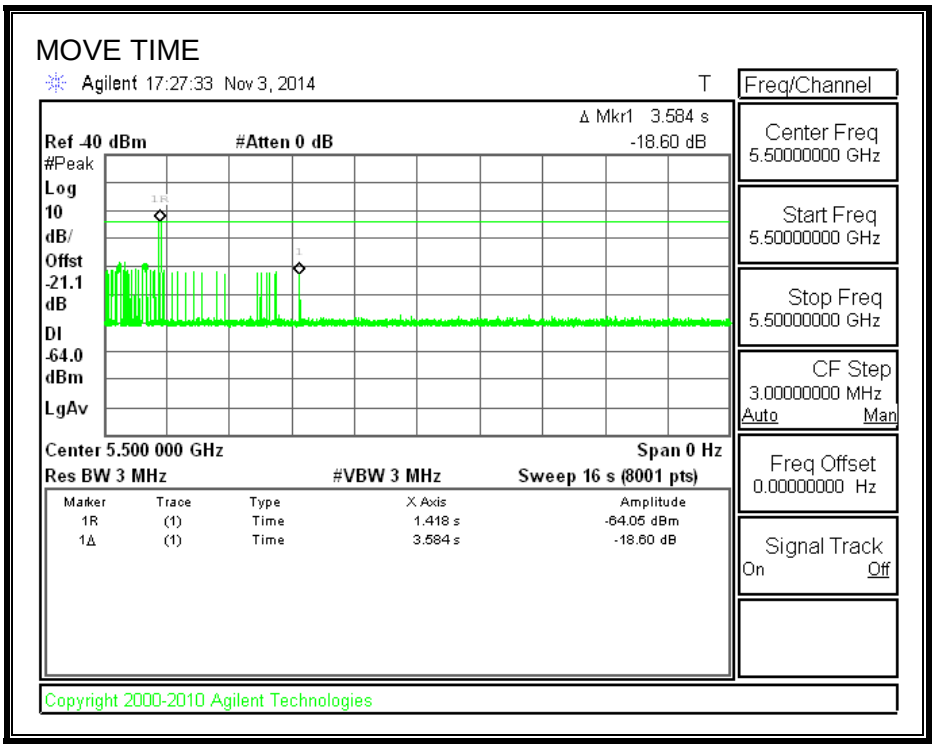
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

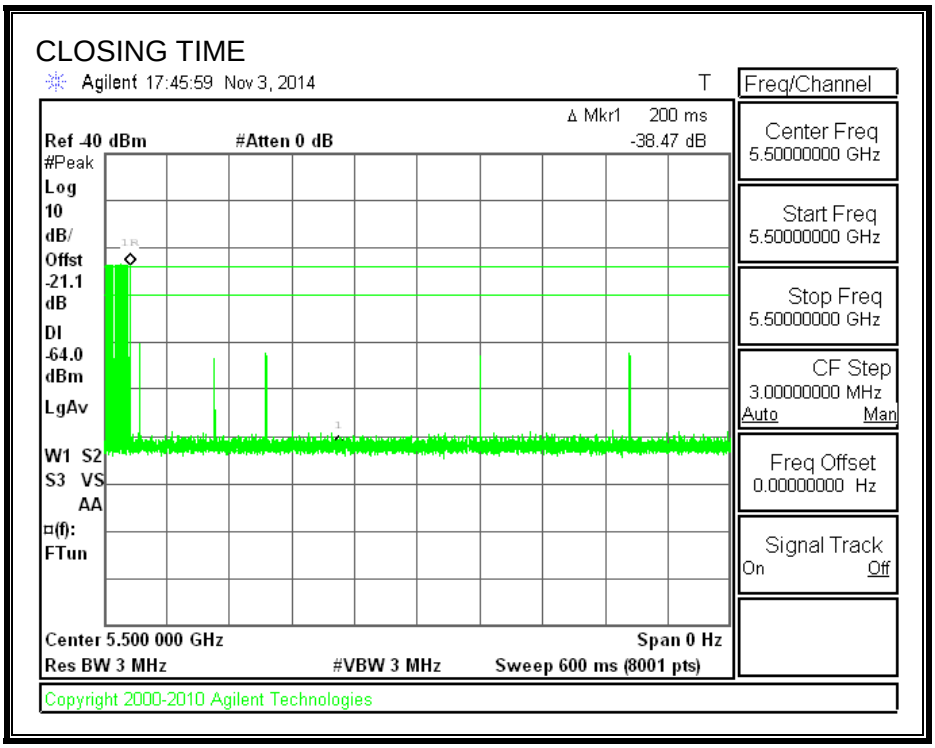
Channel Move Time (sec)	Limit (sec)
3.584	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
36.0	60

MOVE TIME



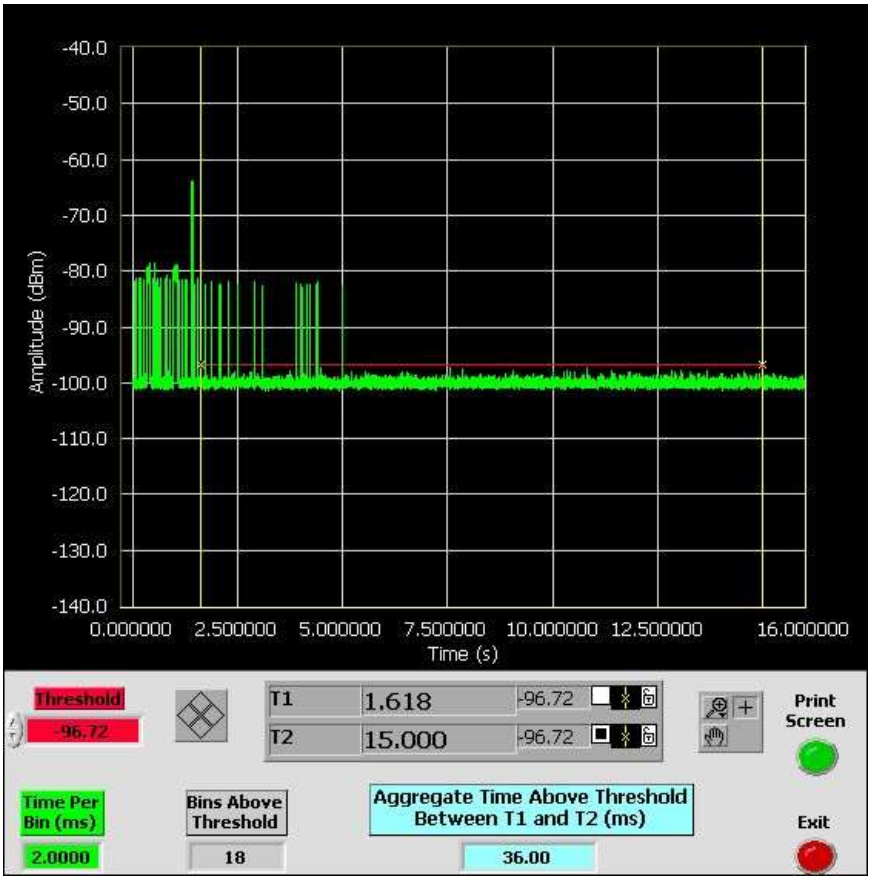
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

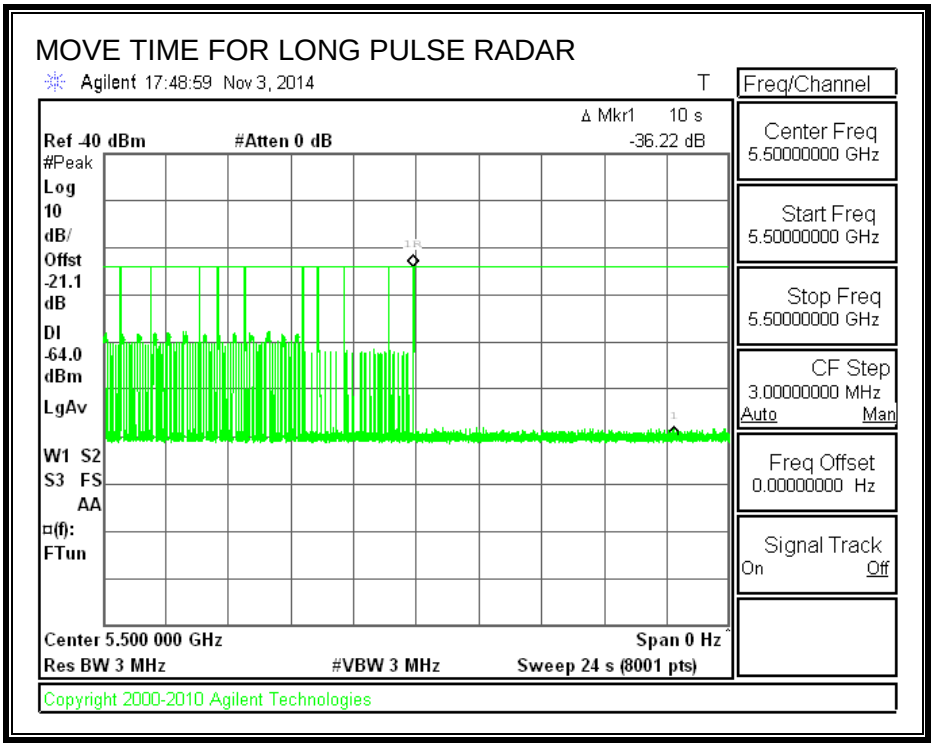
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



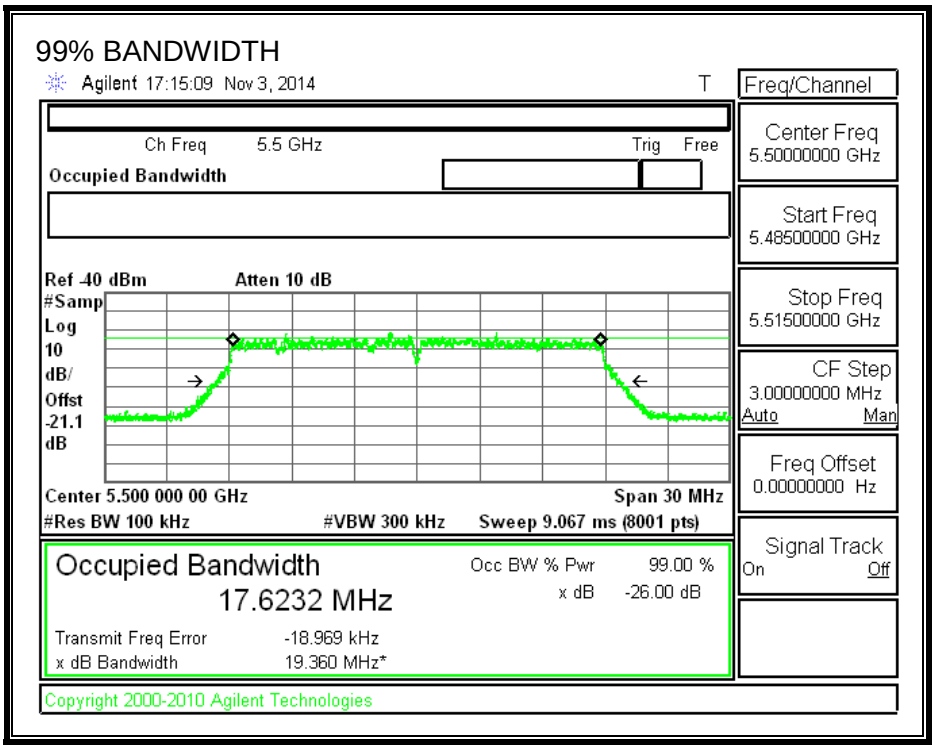
LONG PULSE CHANNEL MOVE TIME

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 (%)
5491	5509	18	17.607	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	9	100	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5496	10	10	100	
5497	10	10	100	
5498	10	10	100	
5499	10	10	100	
5500	40	36	90	
5501	10	10	100	
5502	10	10	100	
5503	10	10	100	
5504	10	10	100	
5505	10	10	100	
5506	10	10	100	
5507	10	9	90	
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	93.33	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	76.67	60	Pass
FCC Short Pulse Type 4	30	90.00	60	Pass
Aggregate		90.00	80	Pass
FCC Long Pulse Type 5	30	93.33	80	Pass
FCC Hopping Type 6	34	94.12	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst	
Trial	Successful Detection (Yes/No)
1	No
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	No
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	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	2.7	156.00	25	Yes
2002	2.1	172.00	23	Yes
2003	1.8	189.00	27	Yes
2004	1.5	218.00	27	Yes
2005	1.5	179.00	28	Yes
2006	1.6	215.00	24	Yes
2007	3	196.00	28	Yes
2008	4.2	225.00	28	Yes
2009	3.3	154.00	25	Yes
2010	4.4	229.00	28	Yes
2011	4.2	175.00	28	Yes
2012	4.5	169.00	29	Yes
2013	4.6	182.00	28	Yes
2014	4.1	159.00	23	Yes
2015	4.1	226.00	24	Yes
2016	1.8	180.00	23	Yes
2017	3.2	225.00	24	Yes
2018	4.8	154.00	28	Yes
2019	1.6	162.00	26	Yes
2020	2.7	212.00	25	Yes
2021	2.5	206.00	25	Yes
2022	4.4	197.00	27	Yes
2023	3.8	169.00	25	Yes
2024	2.7	159.00	23	Yes
2025	1.2	182.00	26	Yes
2026	1.4	212.00	28	Yes
2027	3.2	159.00	29	Yes
2028	2	220.00	27	Yes
2029	3.9	218.00	27	Yes
2030	4.4	227.00	25	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	7.6	429.00	17	No
3002	9	443.00	17	No
3003	7.2	342.00	18	No
3004	9.8	321.00	18	No
3005	8.2	498.00	16	Yes
3006	8	417.00	18	Yes
3007	5.1	448.00	16	No
3008	8.9	463.00	16	Yes
3009	6.2	256.00	18	Yes
3010	9.3	258.00	16	Yes
3011	6.7	490.00	18	Yes
3012	7.6	478.00	16	Yes
3013	6.7	377.00	18	Yes
3014	8.8	308.00	18	No
3015	8	291.00	17	Yes
3016	7.3	267.00	16	Yes
3017	8.4	413.00	17	No
3018	9.8	267.00	16	Yes
3019	9.3	296.00	18	Yes
3020	5.2	347.00	17	Yes
3021	5.3	252.00	17	Yes
3022	6	385.00	16	Yes
3023	6.1	251.00	17	Yes
3024	6.6	277.00	16	Yes
3025	9.7	439.00	17	Yes
3026	7.6	401.00	17	Yes
3027	9.5	466.00	18	Yes
3028	6.4	473.00	16	Yes
3029	9.7	380	16	Yes
3030	6.3	405	17	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	12.5	339.00	12	Yes
4002	12	454.00	15	No
4003	14.7	473.00	12	Yes
4004	17.6	252.00	15	No
4005	18.9	361.00	14	No
4006	19.4	263.00	15	Yes
4007	17.1	422.00	16	Yes
4008	11	349.00	15	Yes
4009	16.7	366.00	16	Yes
4010	11.6	436.00	15	Yes
4011	18	422.00	13	Yes
4012	17.9	424.00	16	Yes
4013	15.4	342.00	12	Yes
4014	11.9	325.00	16	Yes
4015	12.4	486.00	12	Yes
4016	19.3	304.00	16	Yes
4017	16.6	266.00	16	Yes
4018	16	394.00	14	Yes
4019	10.2	459.00	13	Yes
4020	11.8	336.00	15	Yes
4021	15.5	353.00	12	Yes
4022	19.3	372.00	16	Yes
4023	18.9	439.00	15	Yes
4024	17.2	453.00	14	Yes
4025	17.9	309.00	12	Yes
4026	14.7	363.00	12	Yes
4027	10.5	452.00	15	Yes
4028	16.3	472.00	12	Yes
4029	18.6	439.00	14	Yes
4030	18.4	270.00	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	No
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	No
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	103	5492	1	No
2	578	5493	3	Yes
3	1053	5494	3	Yes
4	1528	5495	2	No
5	2003	5496	4	Yes
6	2478	5497	5	Yes
7	2953	5498	6	Yes
8	3428	5499	1	Yes
9	3903	5500	3	Yes
10	4378	5501	4	Yes
11	4853	5502	6	Yes
12	5328	5503	5	Yes
13	5803	5504	3	Yes
14	6278	5505	7	Yes
15	6753	5506	5	Yes
16	7228	5507	1	Yes
17	7703	5508	2	Yes
18	8178	5492	5	Yes
19	8653	5493	3	Yes
20	9128	5494	2	Yes
21	9603	5495	6	Yes
22	10078	5496	4	Yes
23	10553	5497	2	Yes
24	11028	5498	4	Yes
25	11503	5499	4	Yes
26	11978	5500	10	Yes
27	12453	5501	3	Yes
28	12928	5502	8	Yes
29	13403	5503	5	Yes
30	13878	5504	2	Yes
31	14353	5505	4	Yes
32	14828	5506	3	Yes
33	15303	5507	4	Yes
34	15778	5508	4	Yes

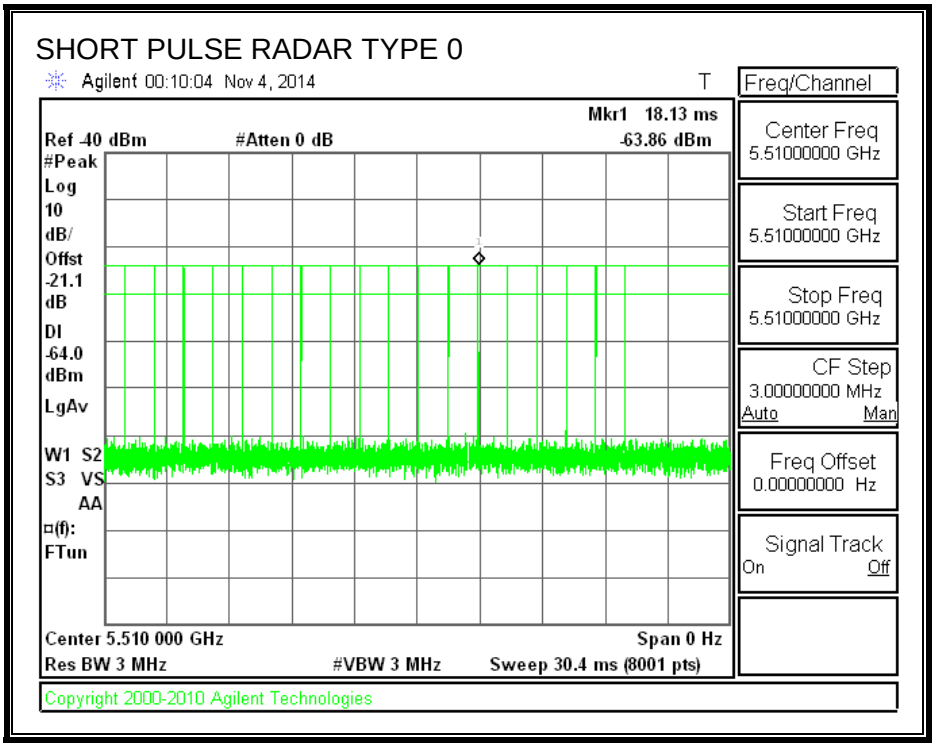
5.3. RESULTS FOR 40 MHz BANDWIDTH

5.3.1. TEST CHANNEL

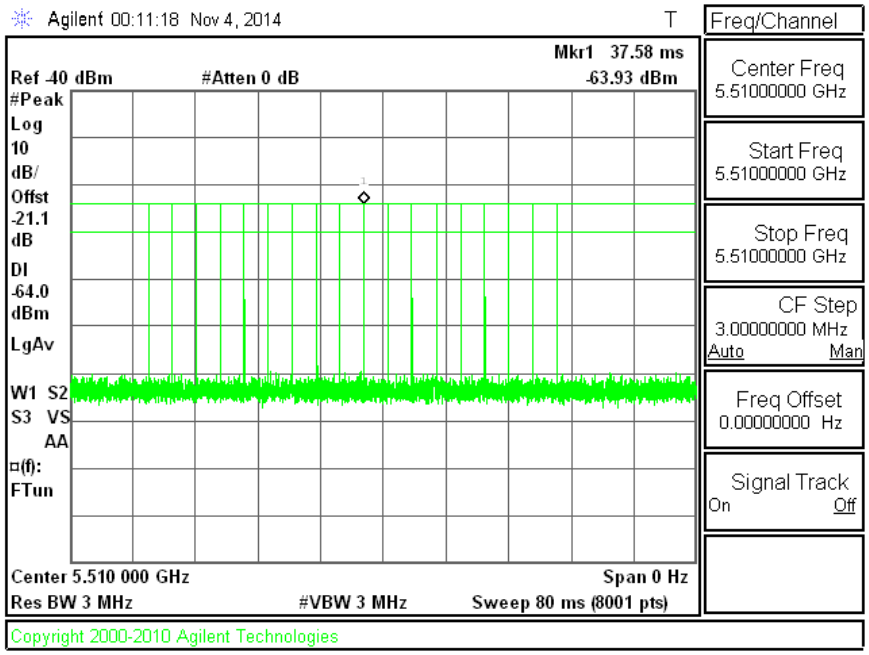
All tests were performed at a channel center frequency of 5510 MHz.

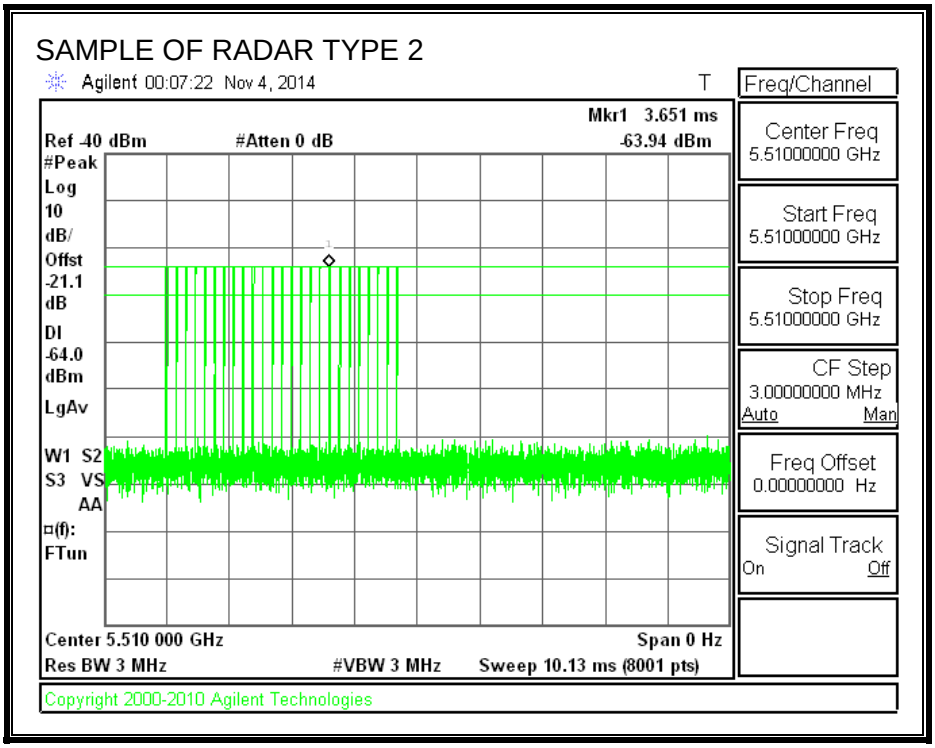
5.3.2. RADAR WAVEFORMS AND TRAFFIC

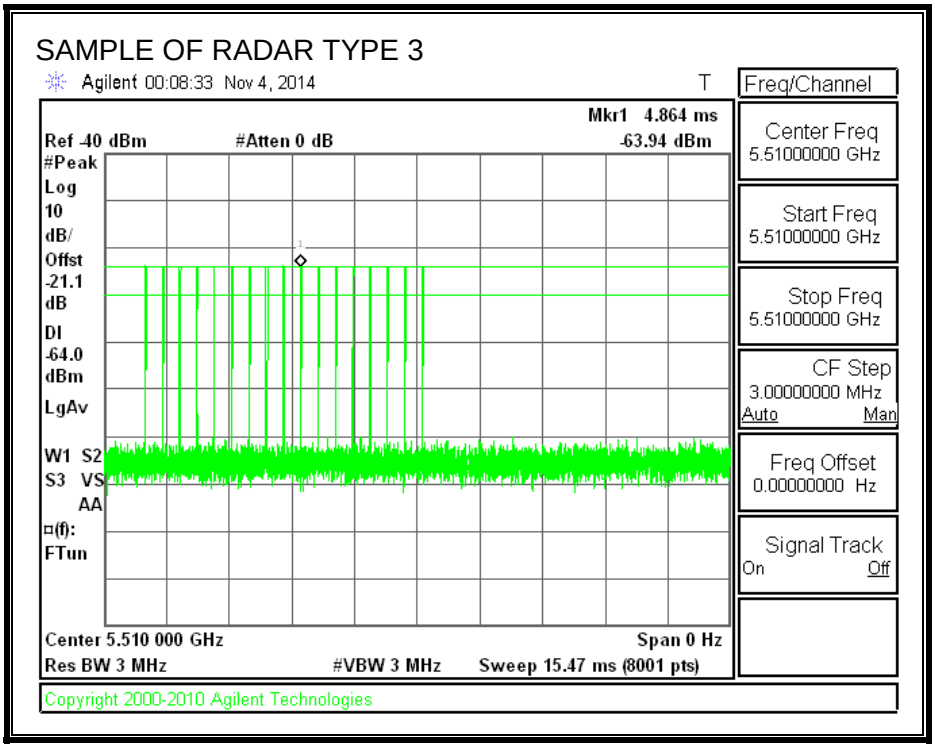
RADAR WAVEFORMS

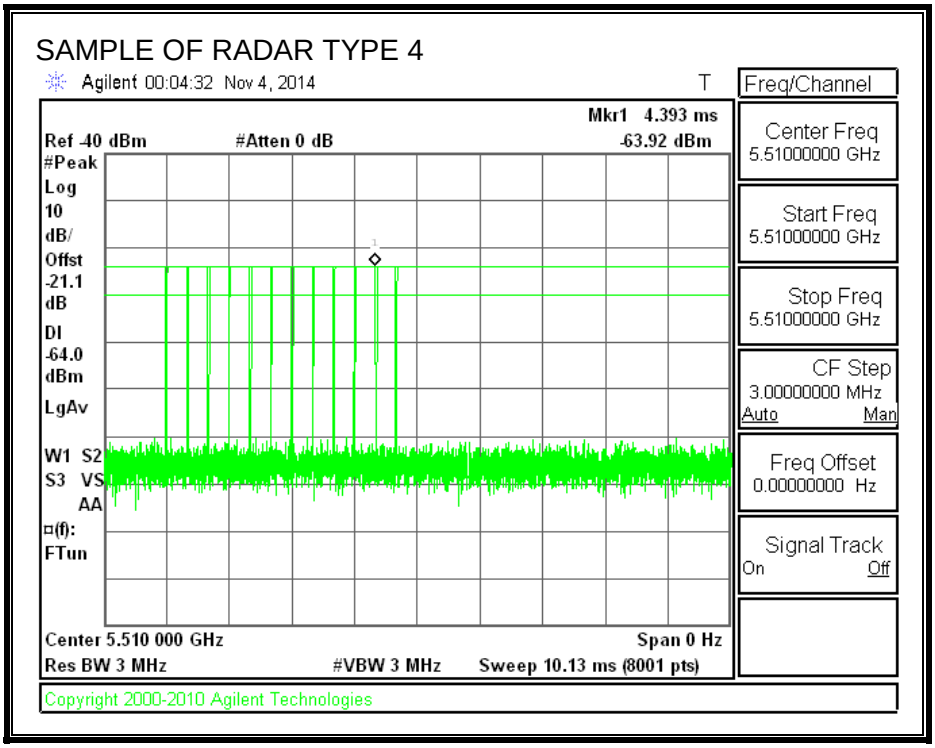


SAMPLE OF RADAR TYPE 1

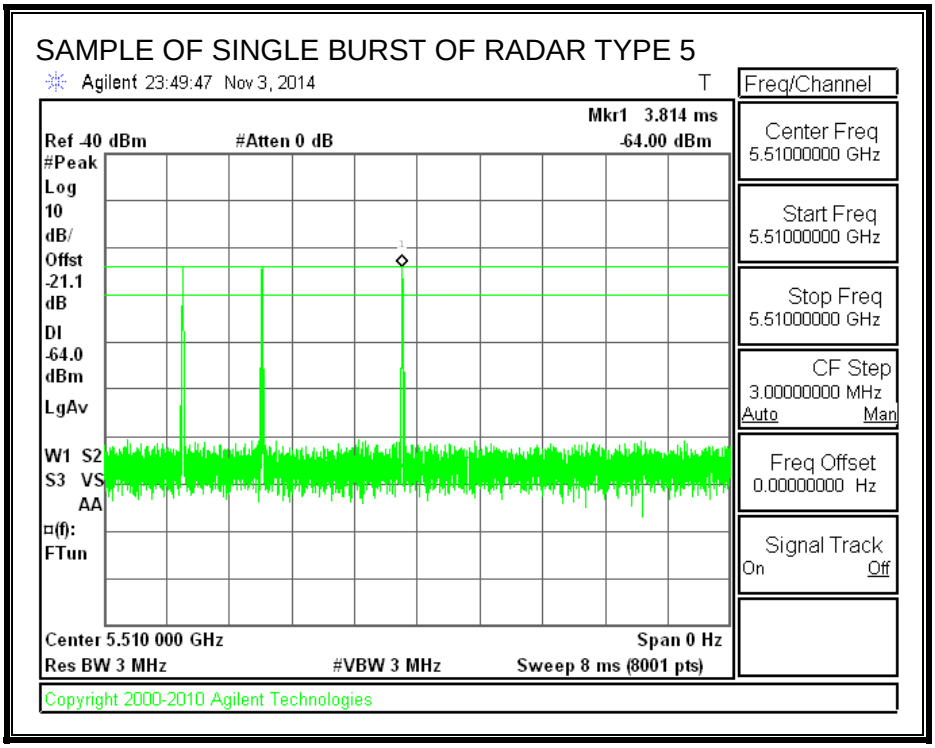




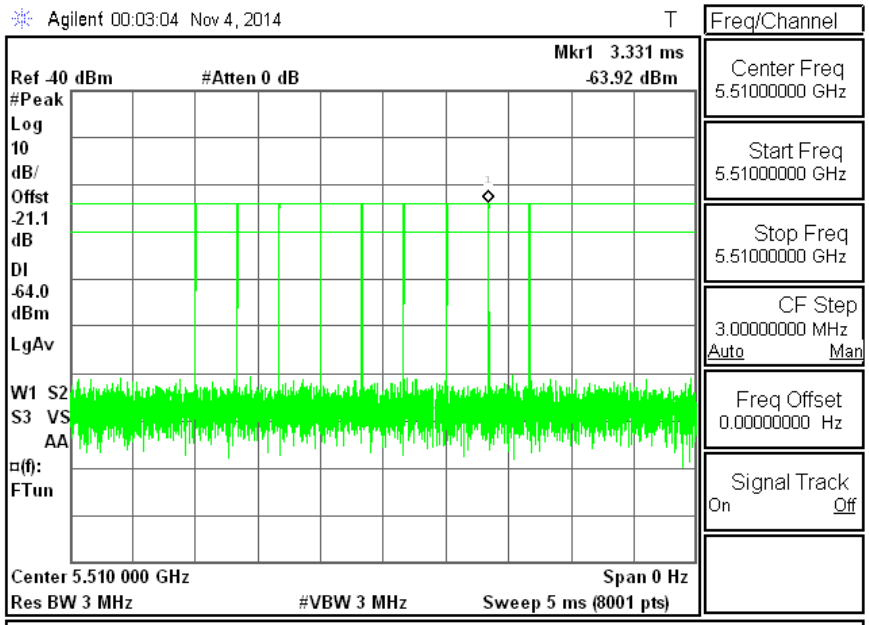




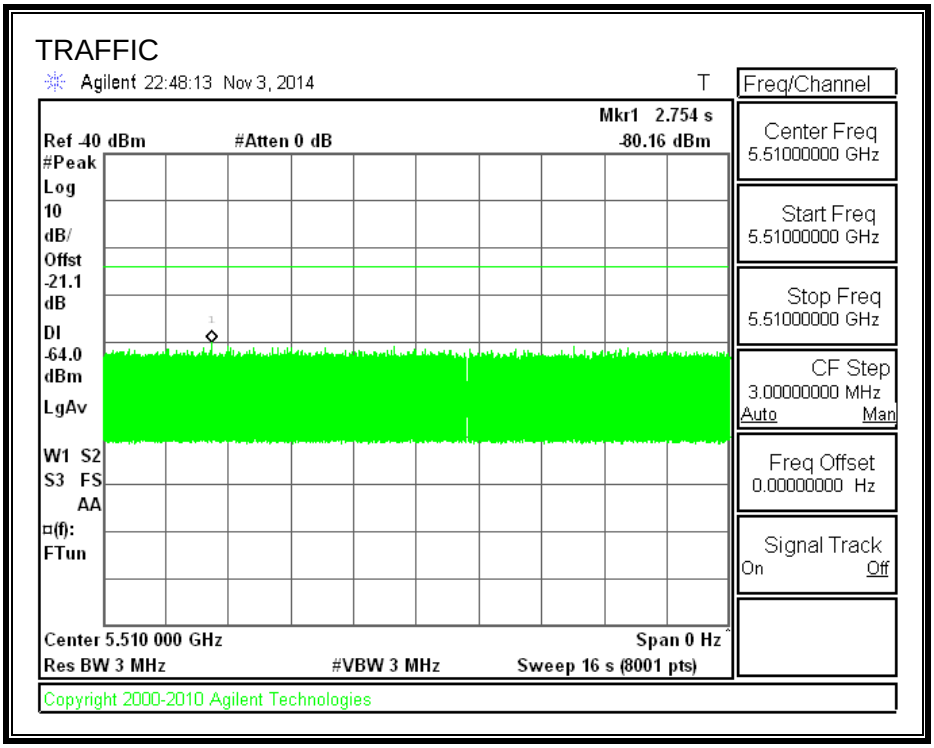
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6



TRAFFIC



5.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.26	131.1	100.8	40.8

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.15	74.7	44.6	3.7

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
29.89	128.9	99.0	58.2

QUALITATIVE RESULTS

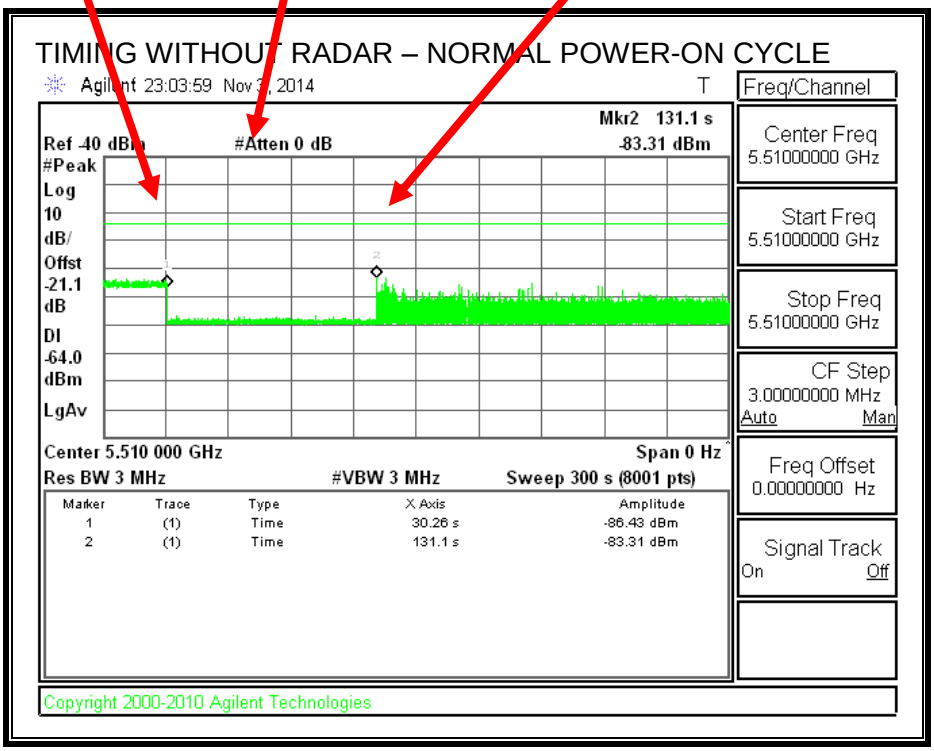
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

TIMING WITHOUT RADAR DURING CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



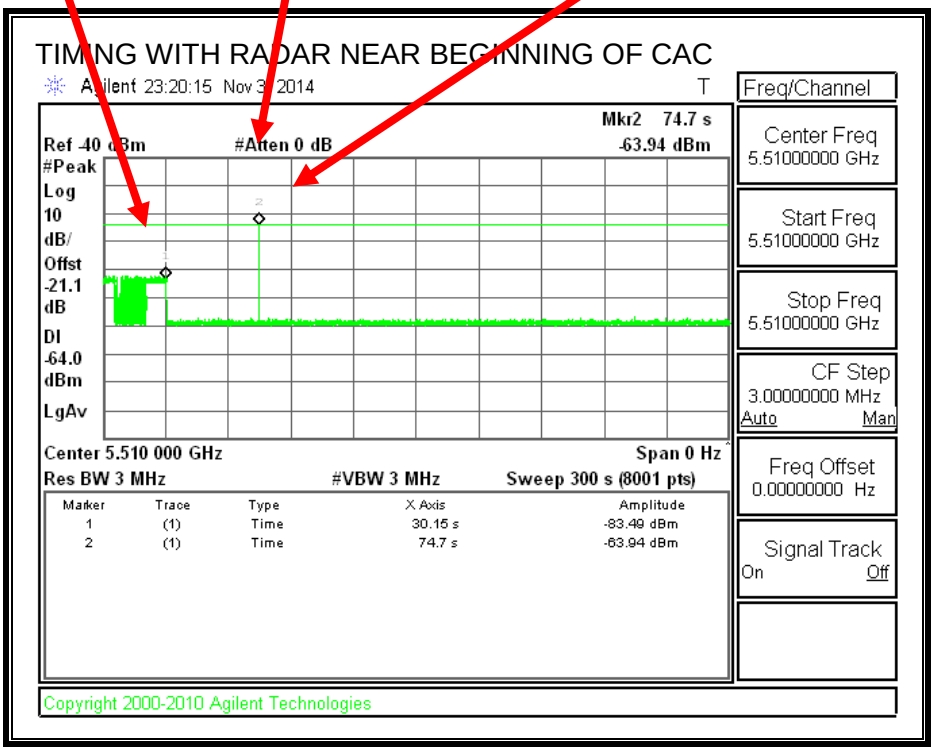
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



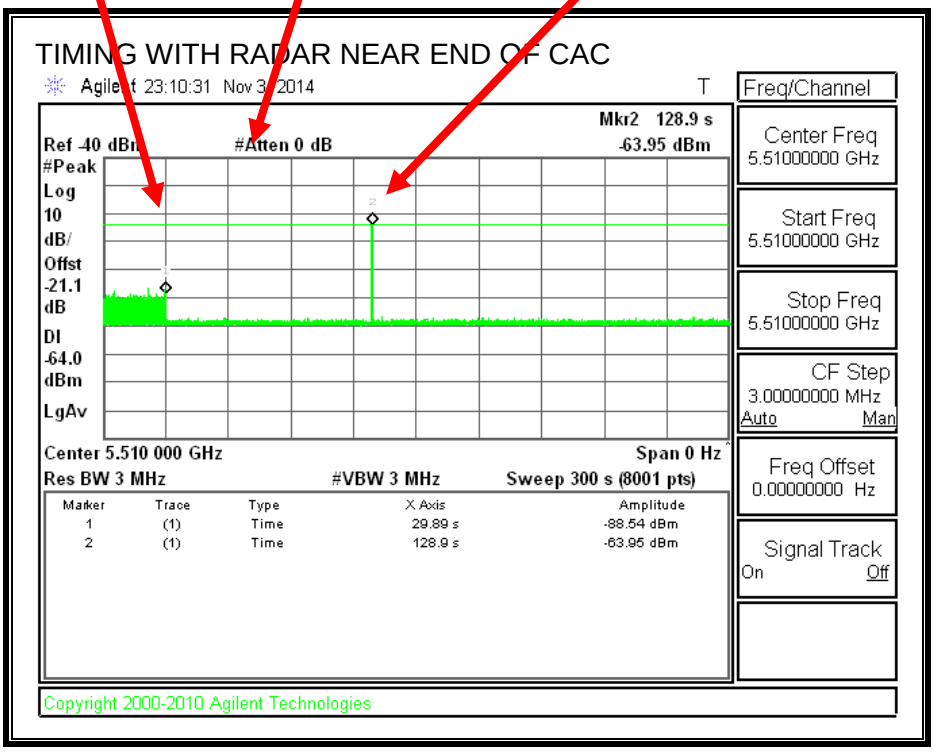
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

5.3.1. OVERLAPPING CHANNEL TESTS

RESULTS

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)

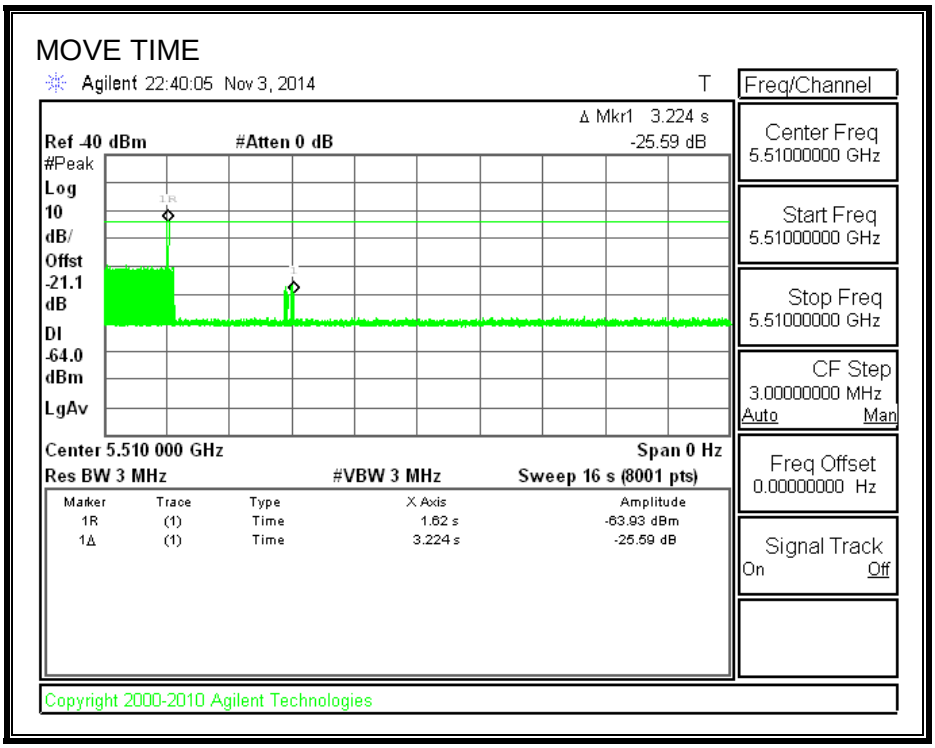
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

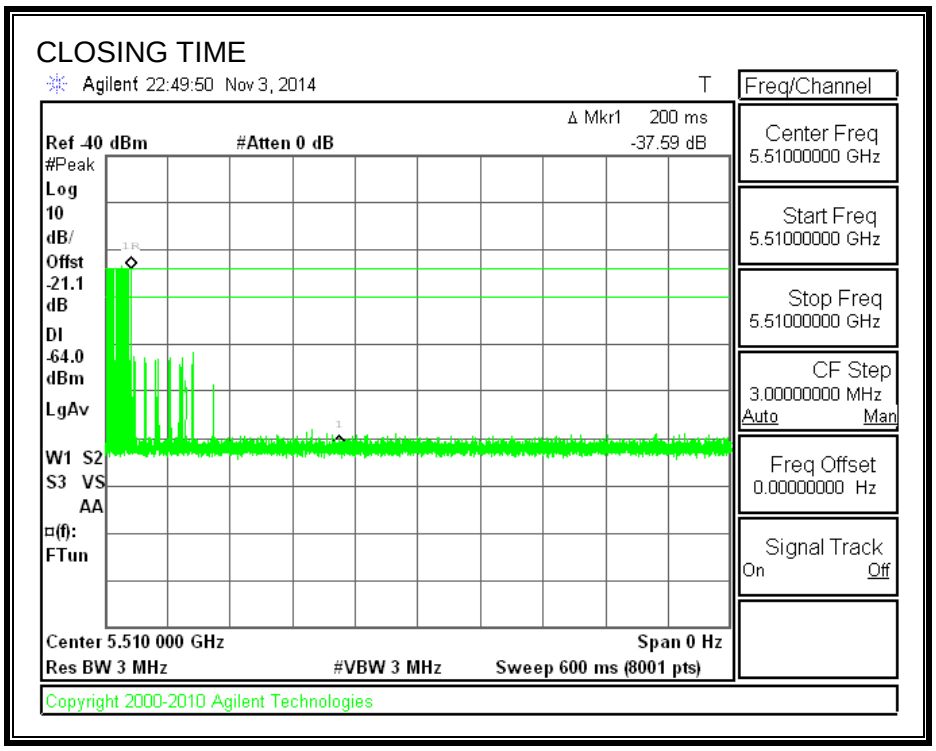
Channel Move Time (sec)	Limit (sec)
3.224	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
44.0	60

MOVE TIME

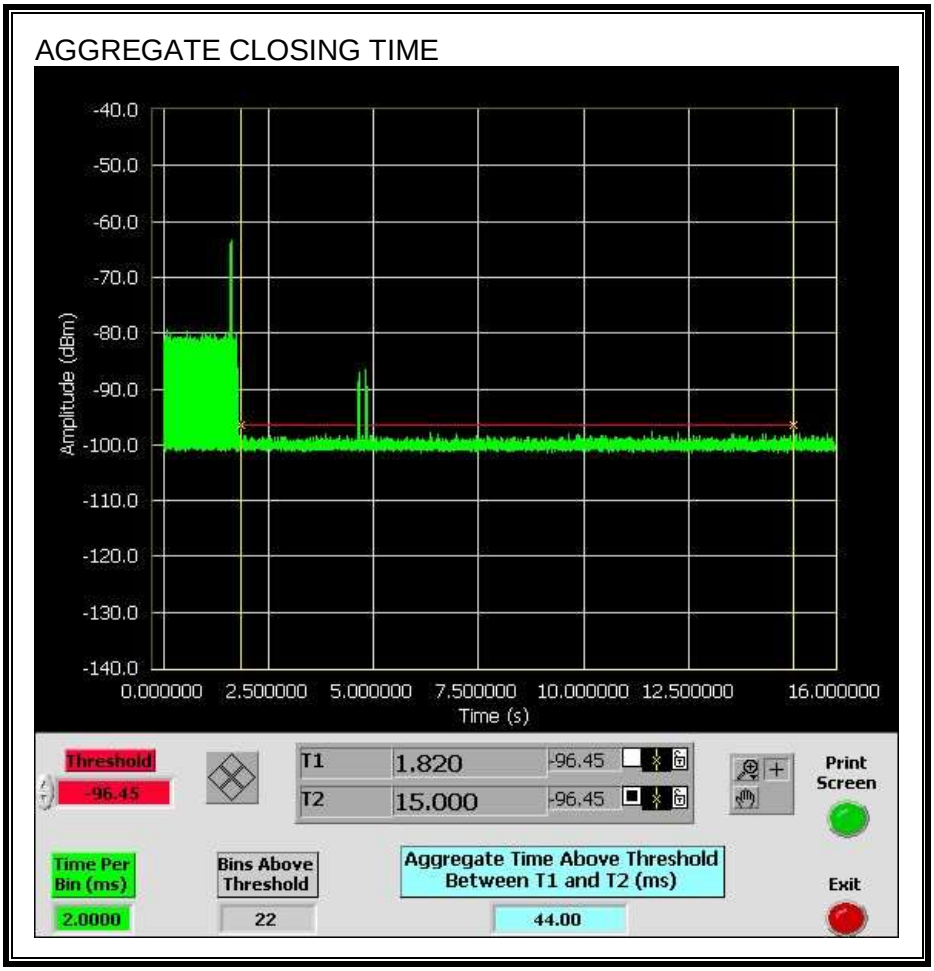


CHANNEL CLOSING TIME



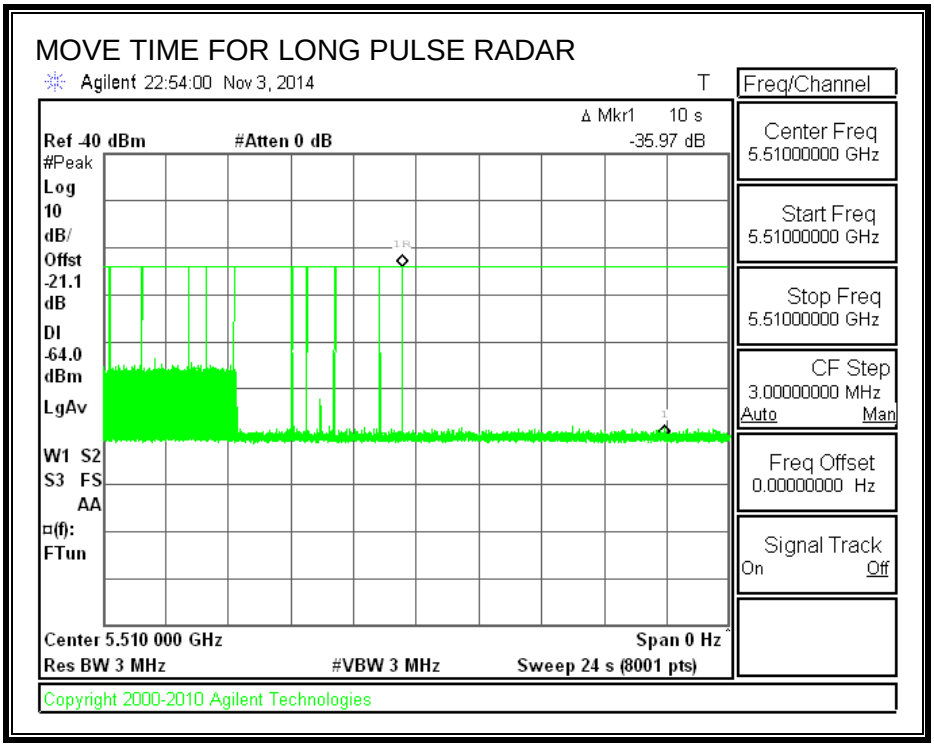
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

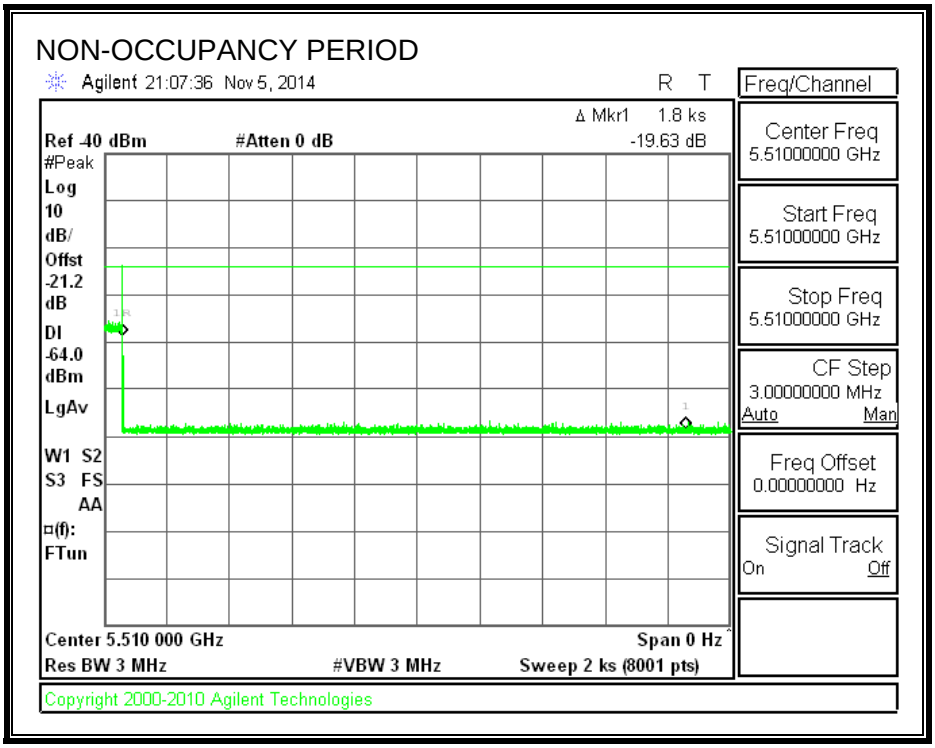
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.3.1. NON-OCCUPANCY PERIOD

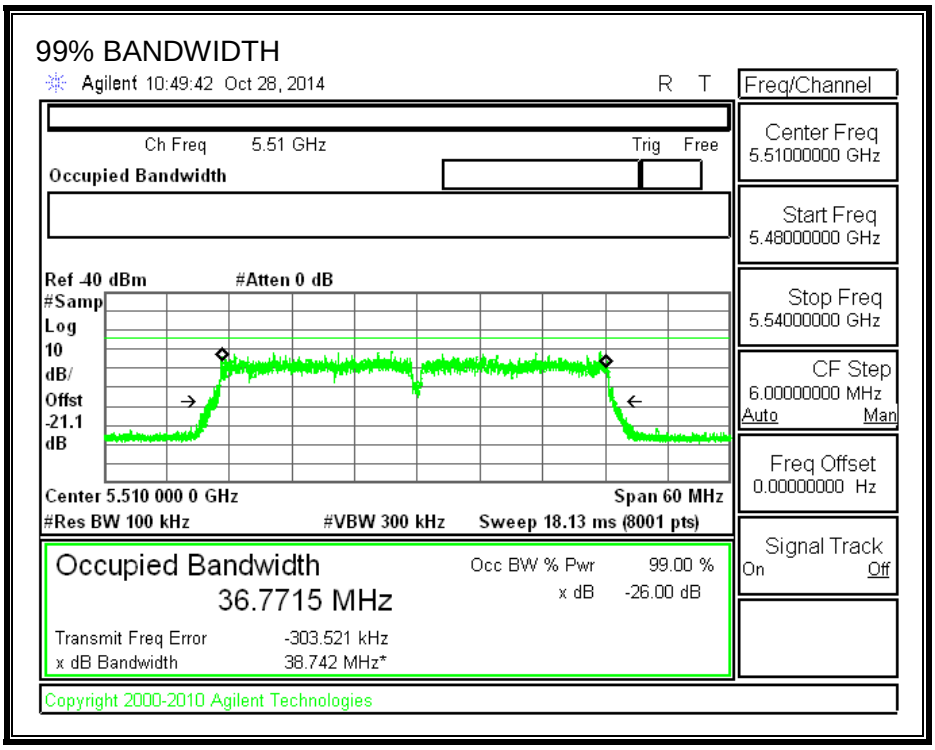
RESULTS

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 (%)
5492	5529	37	36.772	100.6	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
5492	70	63	90	FL
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5500	10	10	100	
5505	10	9	90	
5510	10	9	90	
5515	10	10	100	
5520	10	9	90	
5521	10	10	100	
5522	10	10	100	
5523	10	9	90	
5524	10	10	100	
5525	10	10	100	
5526	10	9	90	
5527	10	9	90	
5528	10	9	90	
5529	20	18	90	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	96.67	60	Pass
FCC Short Pulse Type 2	30	90.00	60	Pass
FCC Short Pulse Type 3	30	76.67	60	Pass
FCC Short Pulse Type 4	30	86.67	60	Pass
Aggregate		87.50	80	Pass
FCC Long Pulse Type 5	30	93.33	80	Pass
FCC Hopping Type 6	37	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst	
Trial	**Successful Detection (Yes/No)**
1	No
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

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	2.7	156.00	25	Yes
2002	2.1	172.00	23	Yes
2003	1.8	189.00	27	Yes
2004	1.5	218.00	27	Yes
2005	1.5	179.00	28	Yes
2006	1.6	215.00	24	Yes
2007	3	196.00	28	Yes
2008	4.2	225.00	28	Yes
2009	3.3	154.00	25	Yes
2010	4.4	229.00	28	No
2011	4.2	175.00	28	Yes
2012	4.5	169.00	29	Yes
2013	4.6	182.00	28	No
2014	4.1	159.00	23	Yes
2015	4.1	226.00	24	Yes
2016	1.8	180.00	23	Yes
2017	3.2	225.00	24	Yes
2018	4.8	154.00	28	Yes
2019	1.6	162.00	26	Yes
2020	2.7	212.00	25	Yes
2021	2.5	206.00	25	Yes
2022	4.4	197.00	27	Yes
2023	3.8	169.00	25	Yes
2024	2.7	159.00	23	Yes
2025	1.2	182.00	26	No
2026	1.4	212.00	28	Yes
2027	3.2	159.00	29	Yes
2028	2	220.00	27	Yes
2029	3.9	218.00	27	Yes
2030	4.4	227.00	25	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	7.6	429.00	17	No
3002	9	443.00	17	Yes
3003	7.2	342.00	18	Yes
3004	9.8	321.00	18	Yes
3005	8.2	498.00	16	Yes
3006	8	417.00	18	Yes
3007	5.1	448.00	16	Yes
3008	8.9	463.00	16	Yes
3009	6.2	256.00	18	Yes
3010	9.3	258.00	16	Yes
3011	6.7	490.00	18	Yes
3012	7.6	478.00	16	Yes
3013	6.7	377.00	18	No
3014	8.8	308.00	18	No
3015	8	291.00	17	No
3016	7.3	267.00	16	Yes
3017	8.4	413.00	17	Yes
3018	9.8	267.00	16	Yes
3019	9.3	296.00	18	Yes
3020	5.2	347.00	17	No
3021	5.3	252.00	17	Yes
3022	6	385.00	16	Yes
3023	6.1	251.00	17	Yes
3024	6.6	277.00	16	Yes
3025	9.7	439.00	17	Yes
3026	7.6	401.00	17	Yes
3027	9.5	466.00	18	Yes
3028	6.4	473.00	16	No
3029	9.7	380	16	Yes
3030	6.3	405	17	No

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	12.5	339.00	12	Yes
4002	12	454.00	15	Yes
4003	14.7	473.00	12	Yes
4004	17.6	252.00	15	Yes
4005	18.9	361.00	14	Yes
4006	19.4	263.00	15	No
4007	17.1	422.00	16	Yes
4008	11	349.00	15	Yes
4009	16.7	366.00	16	Yes
4010	11.6	436.00	15	Yes
4011	18	422.00	13	Yes
4012	17.9	424.00	16	Yes
4013	15.4	342.00	12	No
4014	11.9	325.00	16	Yes
4015	12.4	486.00	12	Yes
4016	19.3	304.00	16	Yes
4017	16.6	266.00	16	Yes
4018	16	394.00	14	Yes
4019	10.2	459.00	13	Yes
4020	11.8	336.00	15	Yes
4021	15.5	353.00	12	Yes
4022	19.3	372.00	16	No
4023	18.9	439.00	15	Yes
4024	17.2	453.00	14	Yes
4025	17.9	309.00	12	Yes
4026	14.7	363.00	12	Yes
4027	10.5	452.00	15	Yes
4028	16.3	472.00	12	No
4029	18.6	439.00	14	Yes
4030	18.4	270.00	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	No
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	No
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	175	5492	6	Yes
2	650	5493	10	Yes
3	1125	5494	8	Yes
4	1600	5495	4	Yes
5	2075	5496	6	Yes
6	2550	5497	7	Yes
7	3025	5498	5	Yes
8	3500	5499	9	Yes
9	3975	5500	5	Yes
10	4450	5501	9	Yes
11	4925	5502	9	Yes
12	5400	5503	10	Yes
13	5875	5504	8	Yes
14	6350	5505	5	Yes
15	6825	5506	9	Yes
16	7300	5507	11	Yes
17	7775	5508	12	Yes
18	8250	5509	7	Yes
19	8725	5510	9	Yes
20	9200	5511	9	Yes
21	9675	5512	9	Yes
22	10150	5513	6	Yes
23	10625	5514	4	Yes
24	11100	5515	6	Yes
25	11575	5516	7	Yes
26	12050	5517	4	Yes
27	12525	5518	8	Yes
28	13000	5519	9	Yes
29	13475	5520	7	Yes
30	13950	5521	4	Yes
31	14425	5522	8	Yes
32	14900	5523	11	Yes
33	15375	5524	9	Yes
34	15850	5525	6	Yes
35	16325	5526	5	Yes
36	16800	5527	5	Yes
37	17275	5528	5	Yes

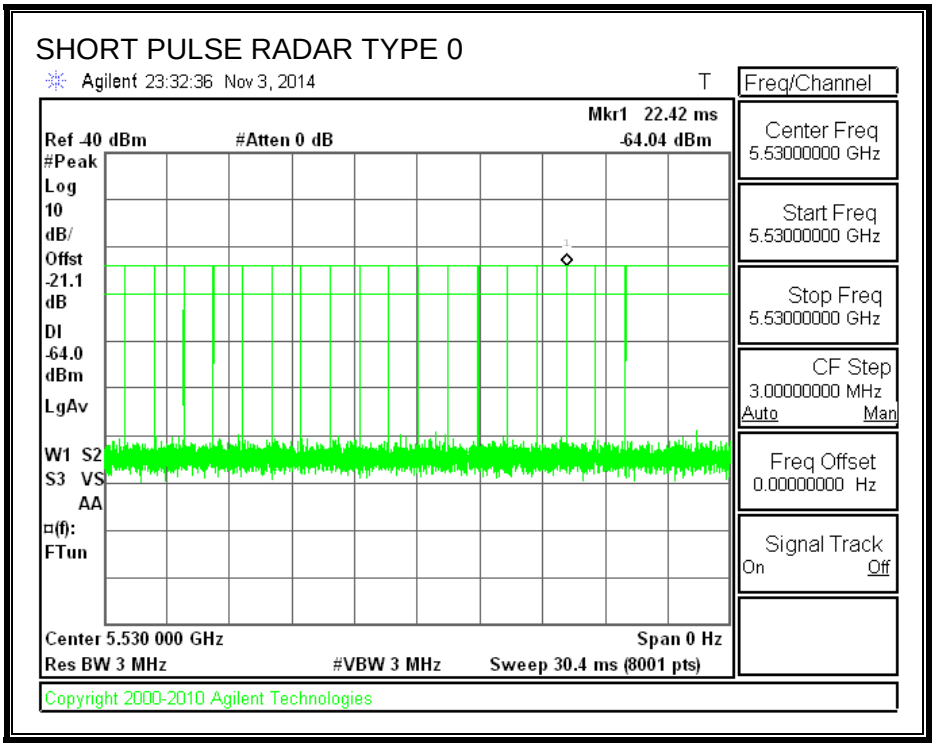
5.4. RESULTS FOR 80 MHz BANDWIDTH

5.4.1. TEST CHANNEL

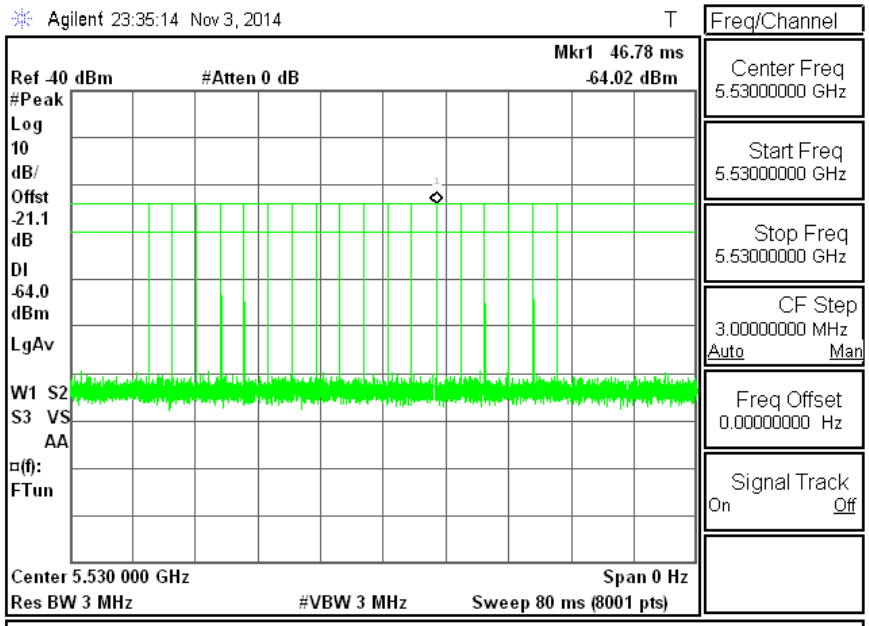
All tests were performed at a channel center frequency of 5530 MHz.

5.4.2. RADAR WAVEFORMS AND TRAFFIC

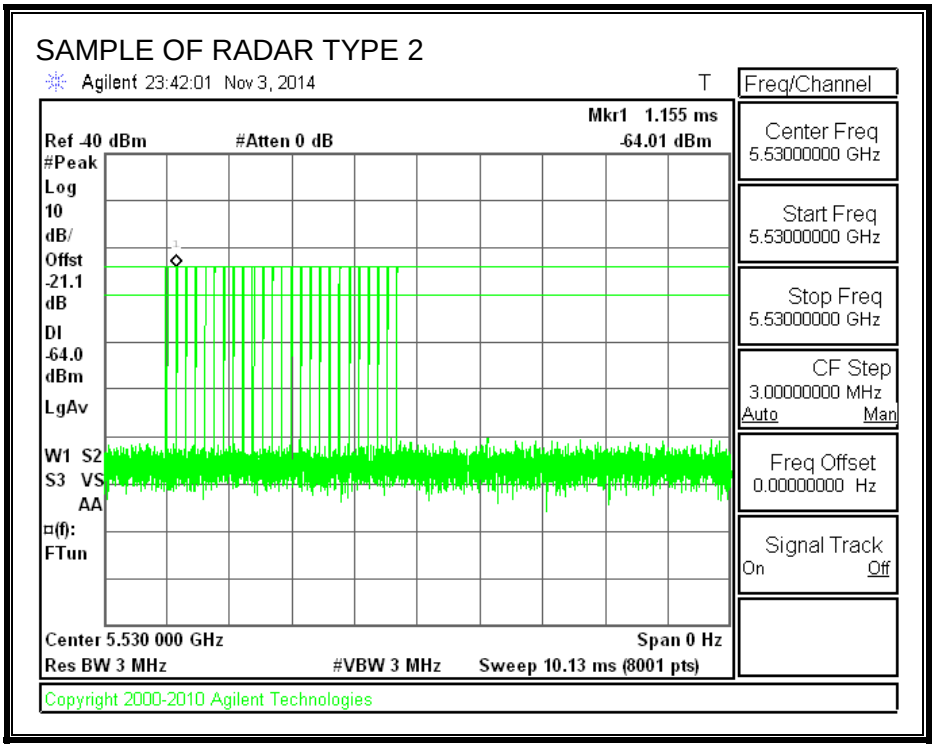
RADAR WAVEFORMS



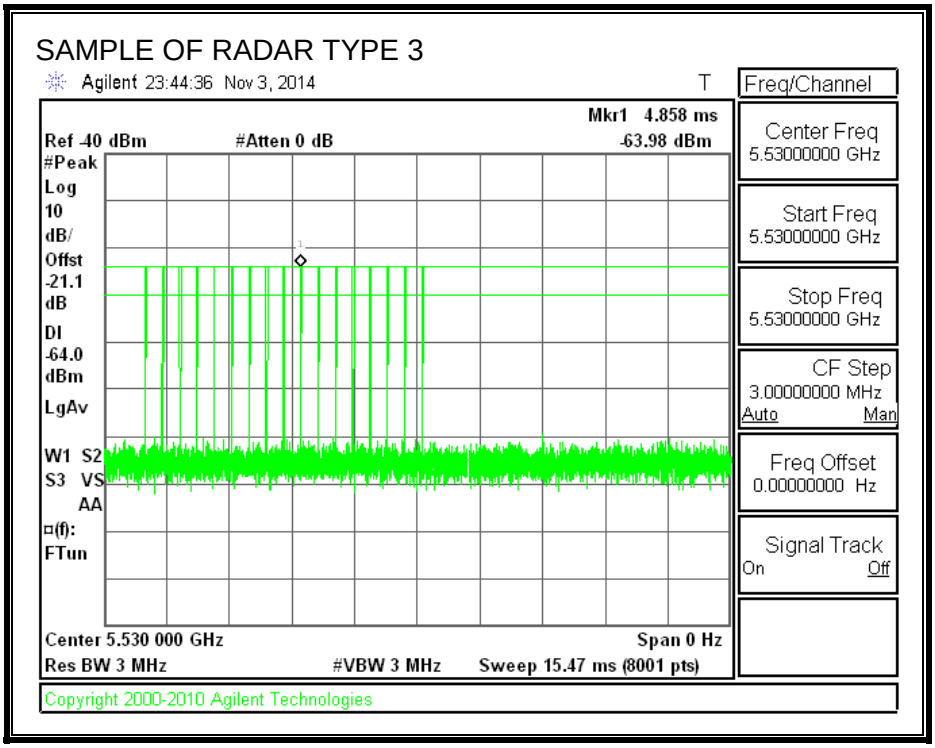
SAMPLE OF RADAR TYPE 1

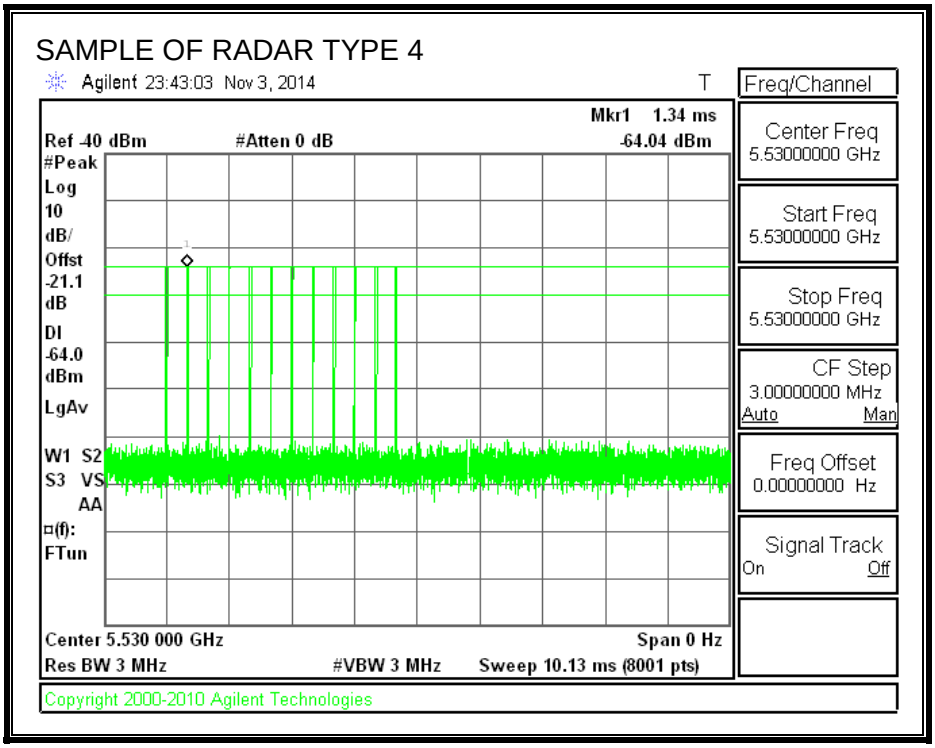


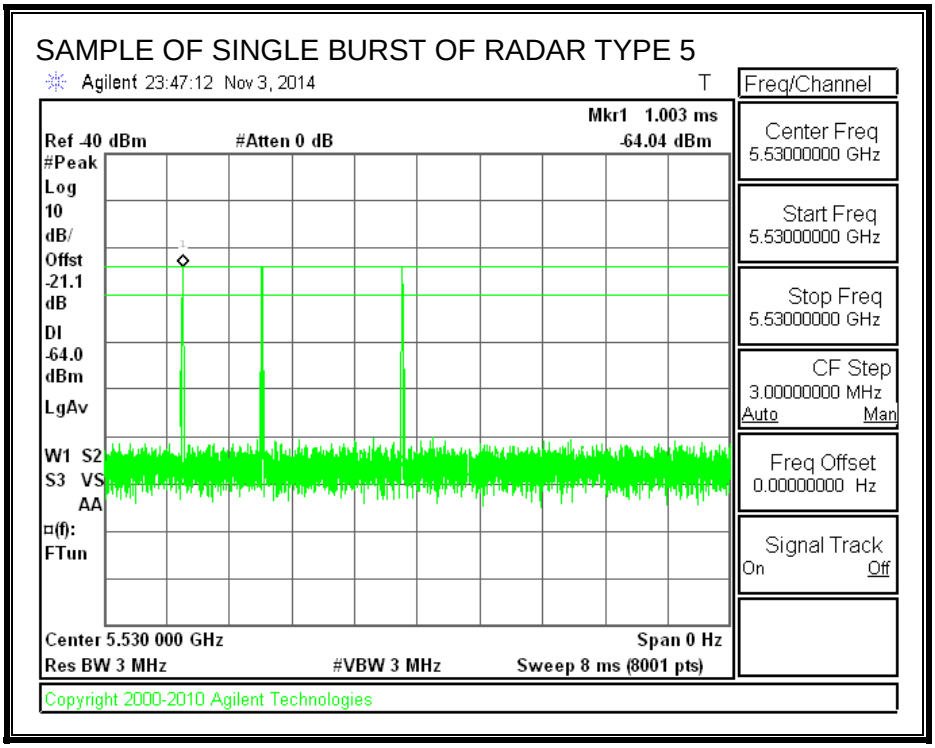
SAMPLE OF RADAR TYPE 2



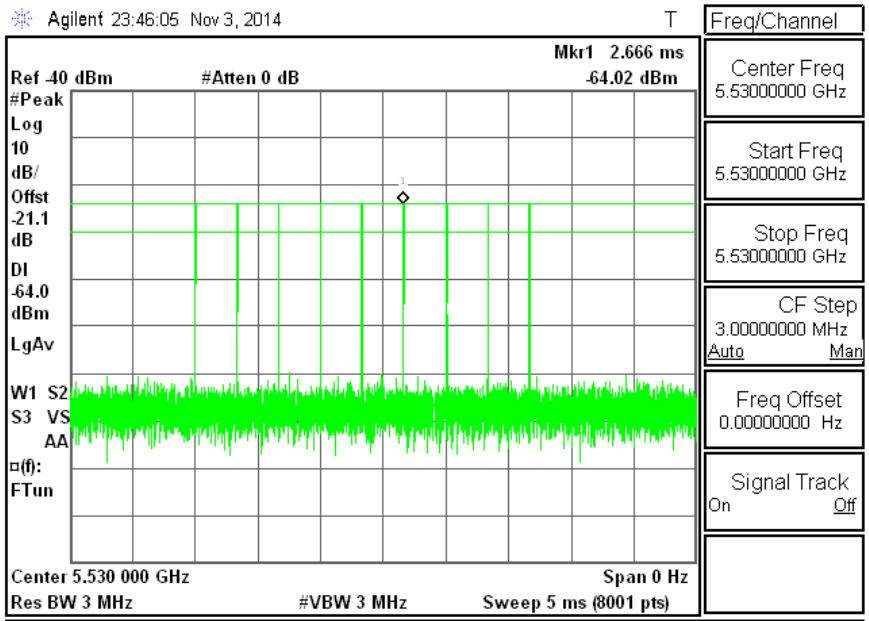
SAMPLE OF RADAR TYPE 3



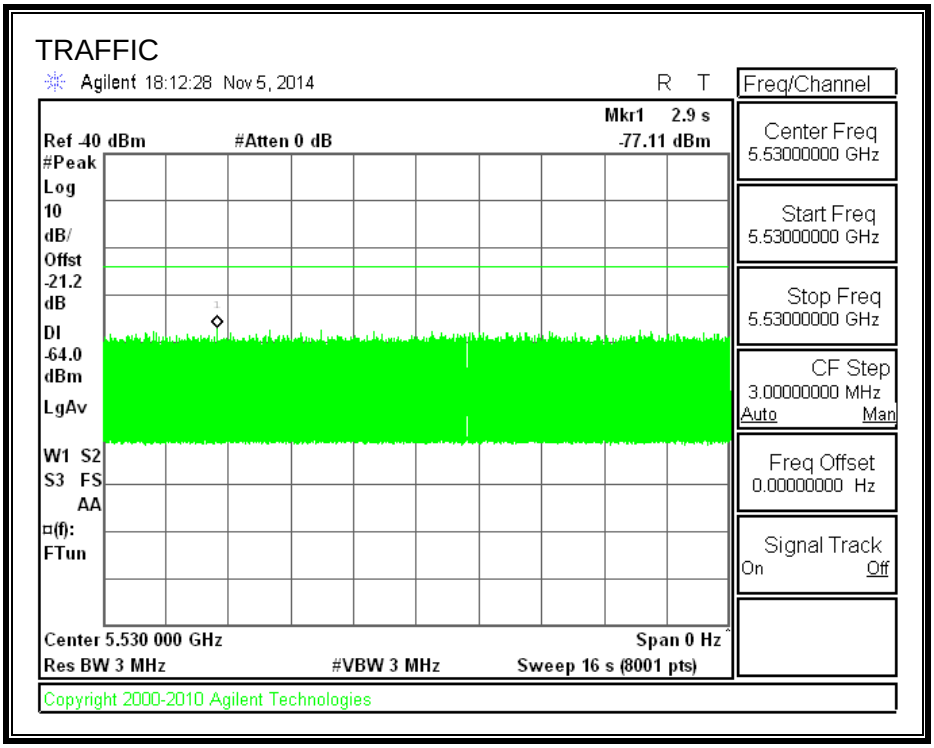




SINGLE BURST OF RADAR TYPE 6



TRAFFIC



5.4.1. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.07	130.8	100.7	40.7

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
29.62	73.76	44.1	3.4

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.112	128.0	97.9	57.1

QUALITATIVE RESULTS

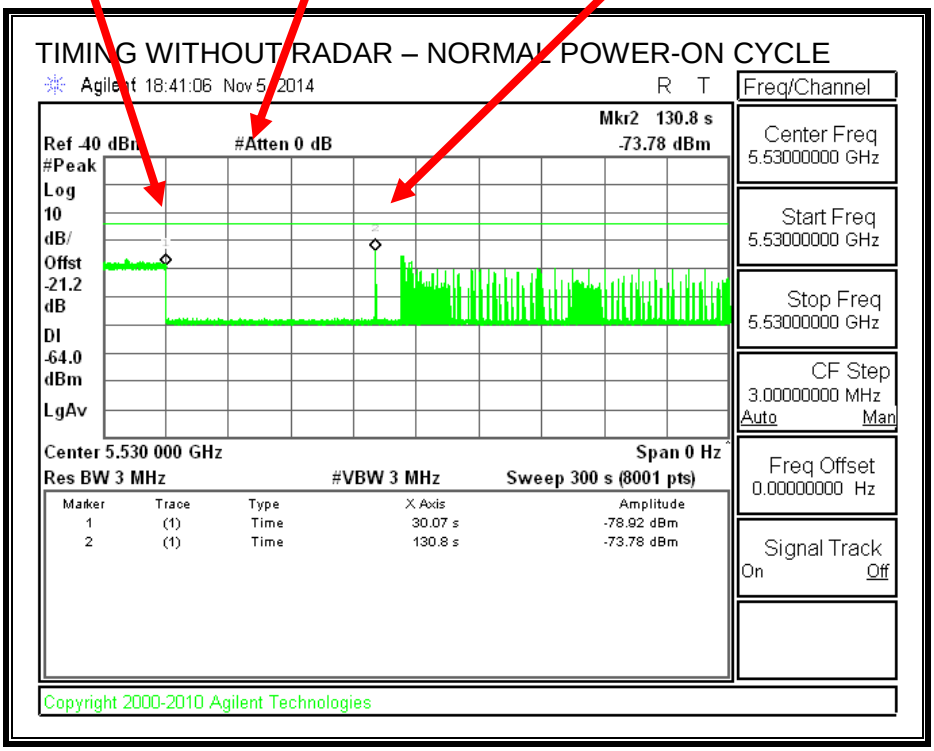
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

TIMING WITHOUT RADAR DURING CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated



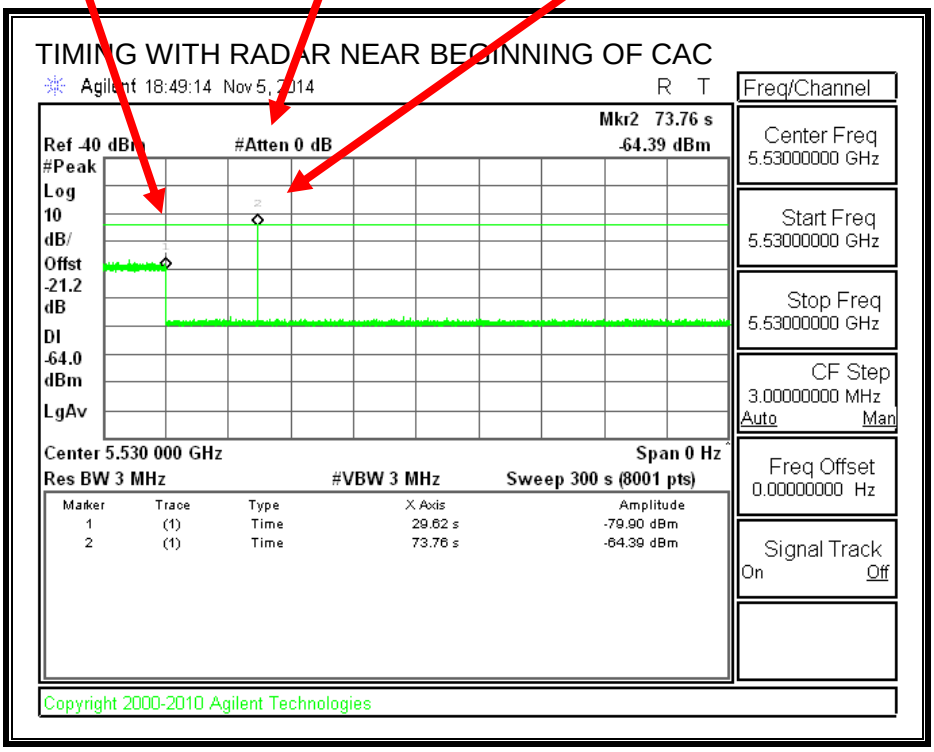
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



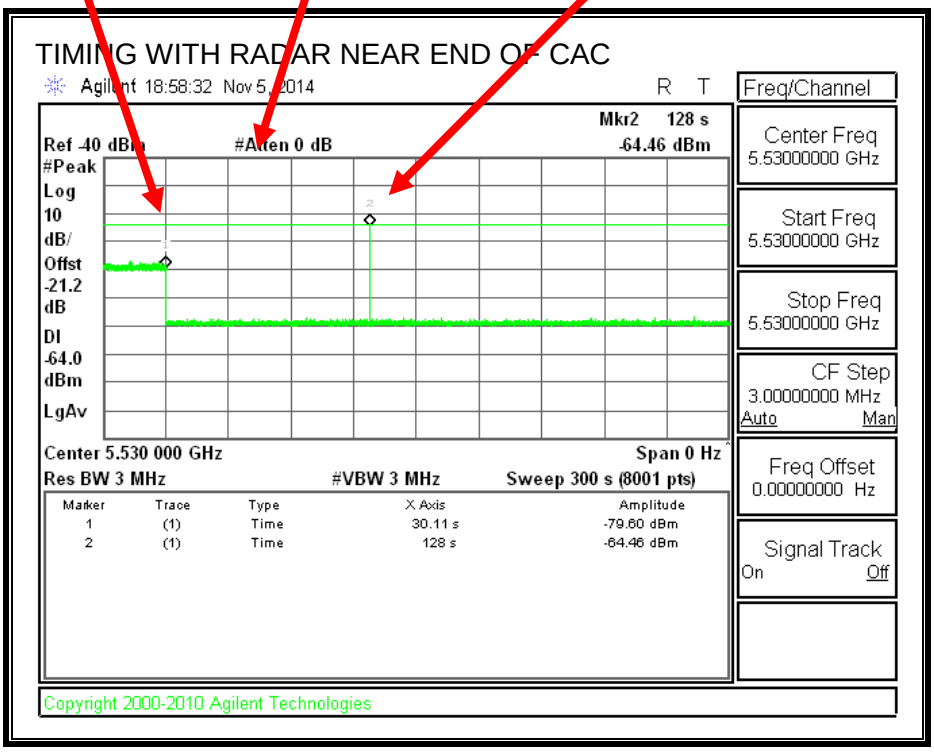
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

5.4.2. 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.

5.4.3. MOVE AND CLOSING TIME

REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =
(Number of analyzer bins showing transmission) * (dwell time per bin)

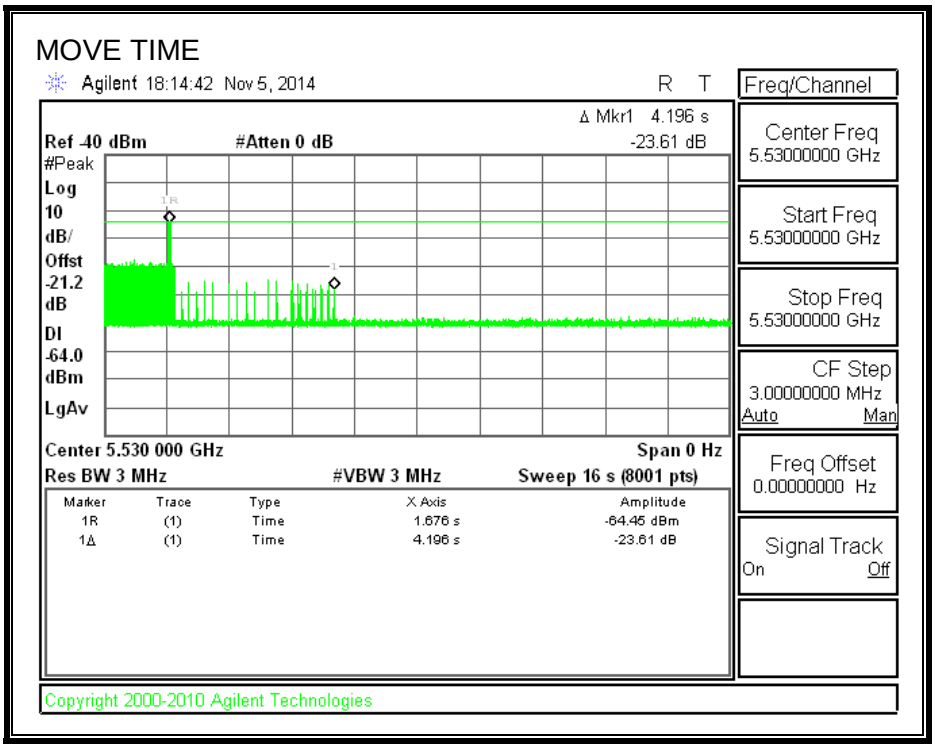
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

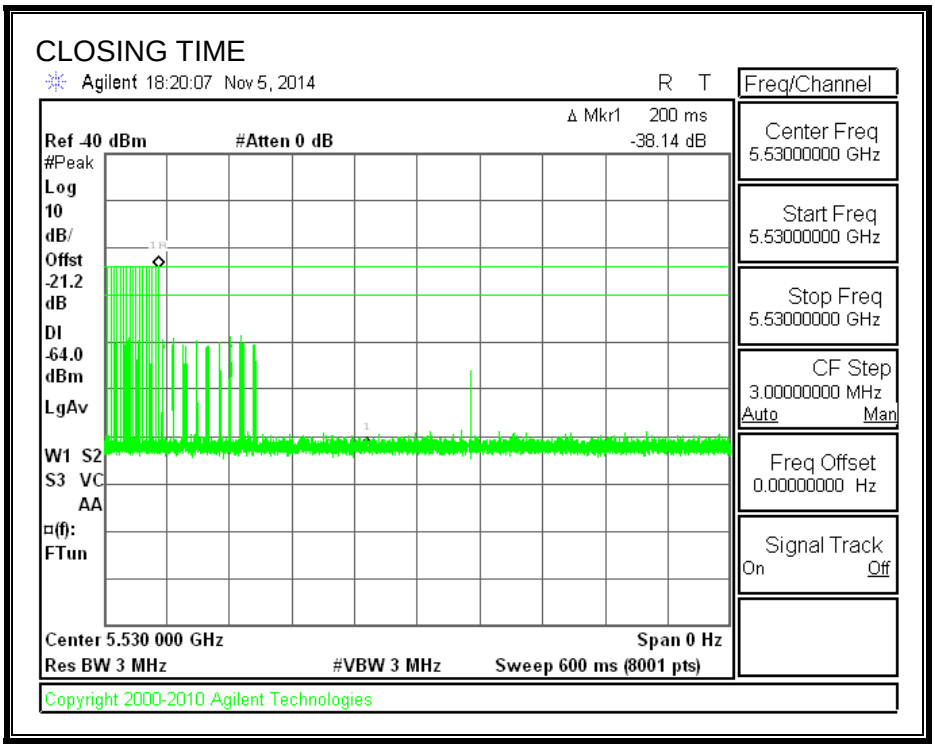
Channel Move Time (sec)	Limit (sec)
4.196	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
50.0	60

MOVE TIME



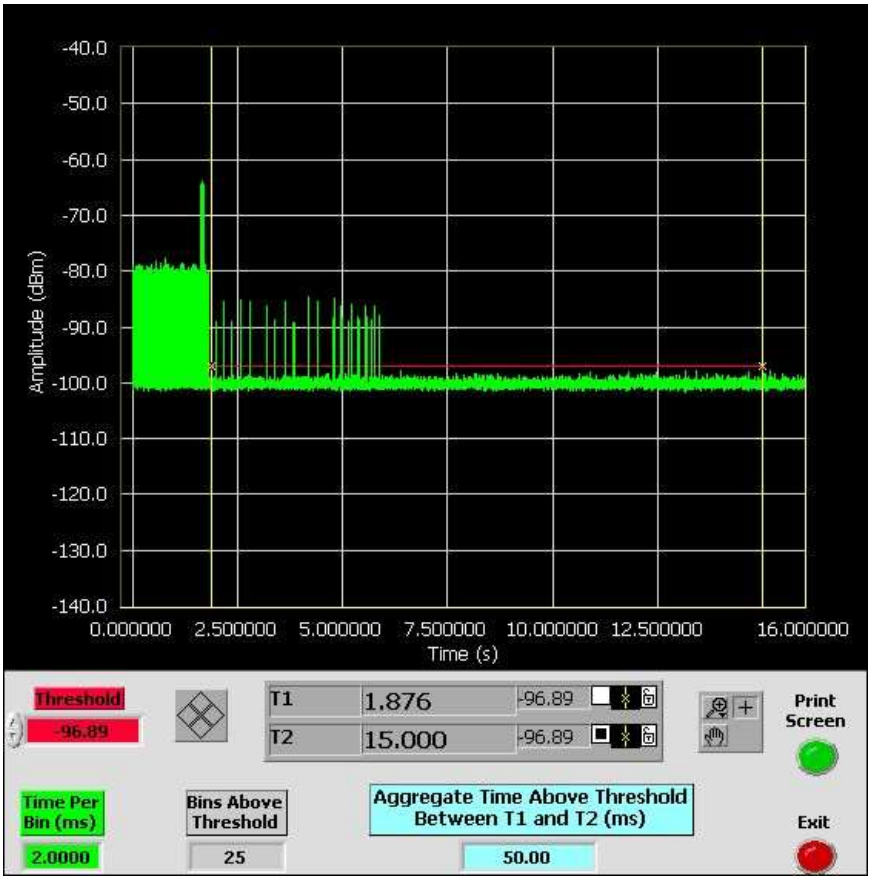
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

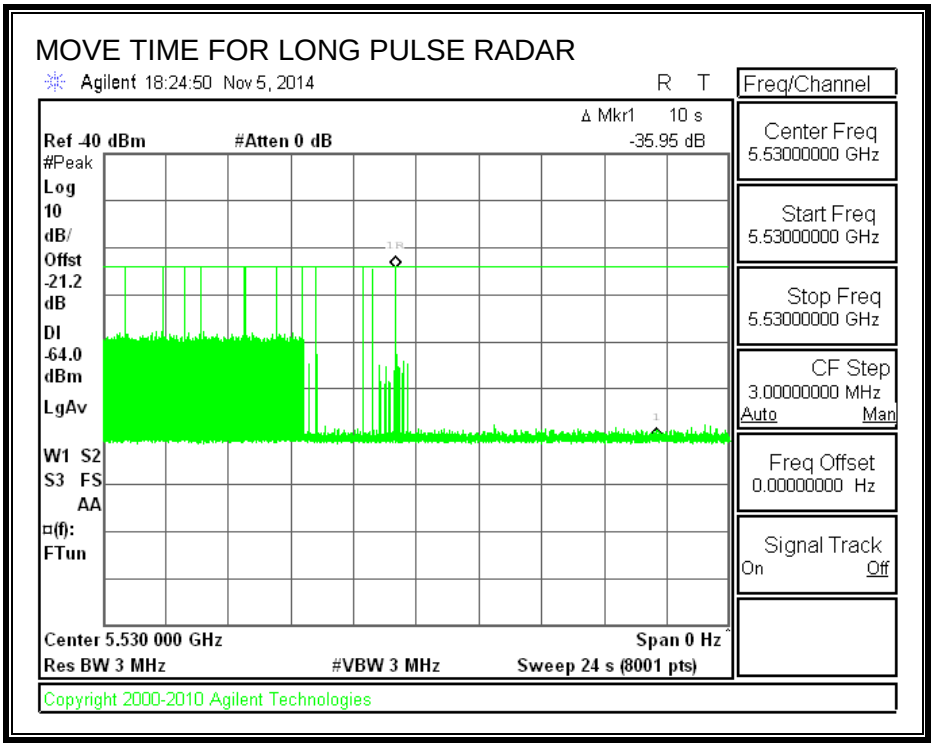
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

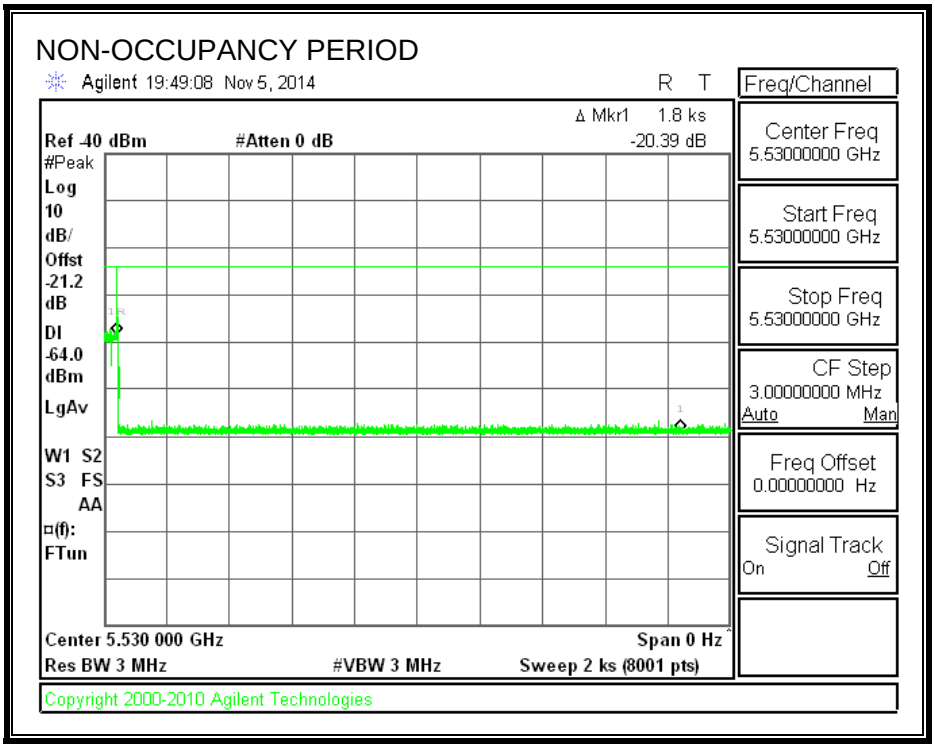
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.4.1. NON-OCCUPANCY PERIOD

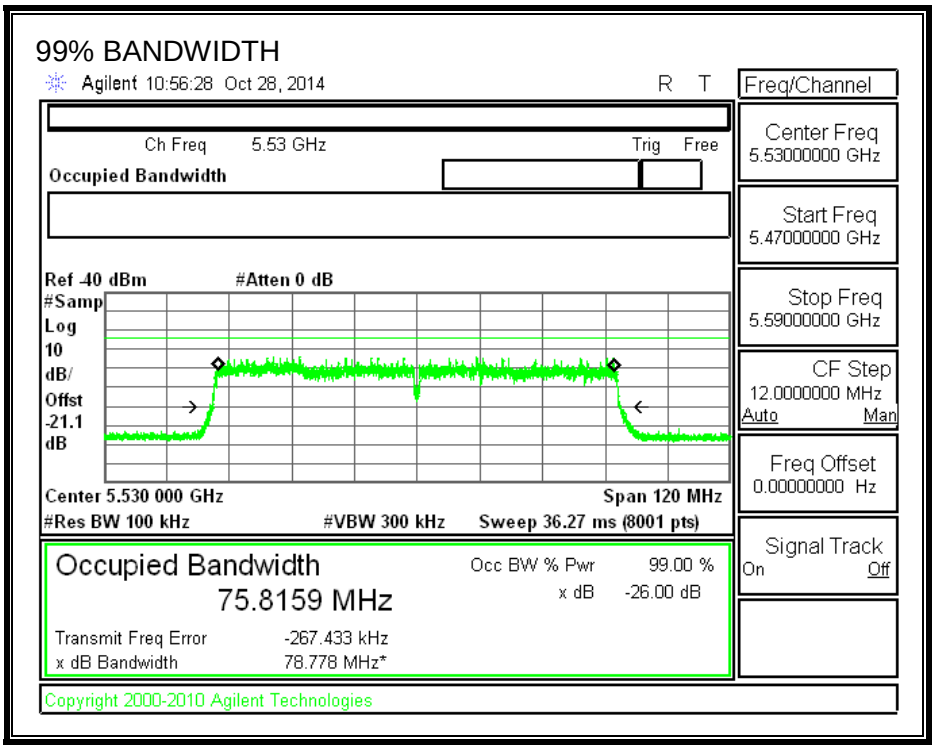
RESULTS

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	75.816	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
5490	10	0	0	
5491	10	10	100	FL
5492	10	9	90	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5496	10	10	100	
5497	10	10	100	
5498	10	10	100	
5499	10	10	100	
5500	10	10	100	
5501	10	10	100	
5502	10	10	100	
5503	10	10	100	
5504	10	10	100	
5505	10	10	100	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	
5509	10	10	100	
5510	10	10	100	
5511	10	10	100	
5512	10	10	100	
5513	10	10	100	
5514	10	10	100	
5515	10	10	100	
5516	10	10	100	
5517	10	10	100	
5518	10	10	100	
5519	10	10	100	
5520	10	10	100	
5521	10	10	100	
5522	10	10	100	
5523	10	10	100	
5524	10	10	100	
5525	10	10	100	
5526	10	10	100	
5527	10	10	100	
5528	10	10	100	
5529	10	10	100	
5530	10	9	90	

DETECTION BANDWIDTH PROBABILITY (CONTINUED)

DETECTION BANDWIDTH PROBABILITY RESULTS

5531	10	10	100	
5532	10	10	100	
5533	10	10	100	
5534	10	10	100	
5535	10	10	100	
5536	10	10	100	
5537	10	10	100	
5538	10	10	100	
5539	10	10	100	
5540	10	10	100	
5541	10	10	100	
5542	10	10	100	
5543	10	10	100	
5544	10	10	100	
5545	10	10	100	
5546	10	10	100	
5547	10	10	100	
5548	10	10	100	
5549	10	10	100	
5550	10	10	100	
5551	10	10	100	
5552	10	10	100	
5553	10	10	100	
5554	10	10	100	
5555	10	10	100	
5556	10	10	100	
5557	10	10	100	
5558	10	10	100	
5559	10	10	100	
5560	10	10	100	
5561	10	10	100	
5562	10	10	100	
5563	10	10	100	
5564	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	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	93.33	80	Pass
FCC Hopping Type 6	77	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst	
Trial	Successful Detection (Yes/No)
1	No
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

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	3.9	183.00	28	Yes
2002	2.1	211.00	24	Yes
2003	3.3	185.00	28	Yes
2004	4.7	211.00	26	Yes
2005	1.1	203.00	24	Yes
2006	1.6	151.00	24	Yes
2007	3.3	174.00	25	Yes
2008	1.7	218.00	29	Yes
2009	4.5	196.00	29	Yes
2010	1.9	193.00	25	Yes
2011	2.4	171.00	23	Yes
2012	3.9	162.00	23	Yes
2013	4.8	194.00	26	Yes
2014	1.5	207.00	29	Yes
2015	1.6	178.00	29	Yes
2016	4.1	191.00	27	Yes
2017	4.3	165.00	27	Yes
2018	2.5	213.00	23	Yes
2019	1.1	199.00	28	Yes
2020	2	176.00	27	Yes
2021	1.4	156.00	26	Yes
2022	4.6	166.00	28	Yes
2023	3.8	179.00	28	Yes
2024	1.8	222.00	29	Yes
2025	2.1	173.00	28	Yes
2026	4.2	203.00	23	Yes
2027	2.7	172.00	28	Yes
2028	1.5	230.00	23	Yes
2029	4.9	166.00	24	Yes
2030	4.2	192.00	26	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	7.7	278.00	18	Yes
3002	6.5	388.00	18	Yes
3003	7.8	341.00	18	Yes
3004	6.4	372.00	18	Yes
3005	5	285.00	18	Yes
3006	8.1	303.00	16	Yes
3007	6.9	346.00	18	Yes
3008	8.7	349.00	16	Yes
3009	5.8	283.00	17	Yes
3010	5.1	277.00	16	Yes
3011	5.5	500.00	16	Yes
3012	7.7	393.00	18	Yes
3013	7.7	432.00	17	Yes
3014	5	380.00	17	Yes
3015	5.9	388.00	16	Yes
3016	8.2	394.00	18	Yes
3017	5.8	313.00	16	Yes
3018	7.8	496.00	16	Yes
3019	6.2	392.00	18	Yes
3020	6.3	385.00	18	Yes
3021	6.2	366.00	18	Yes
3022	8.4	495.00	16	Yes
3023	5.8	460.00	18	Yes
3024	7.1	299.00	18	Yes
3025	9.3	416.00	17	Yes
3026	8.1	403.00	16	Yes
3027	6.7	491.00	17	Yes
3028	5.8	472.00	16	Yes
3029	5.8	295	17	Yes
3030	7.6	271	17	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	14.4	397.00	12	Yes
4002	10	269.00	16	Yes
4003	19.4	383.00	16	Yes
4004	18.8	307.00	16	Yes
4005	17.8	324.00	15	Yes
4006	16.2	340.00	12	Yes
4007	16	349.00	16	Yes
4008	16.9	269.00	16	Yes
4009	16.9	283.00	15	Yes
4010	11.9	361.00	12	Yes
4011	16	316.00	13	Yes
4012	17.1	266.00	15	Yes
4013	17.6	263.00	12	Yes
4014	15.6	271.00	12	Yes
4015	10.8	276.00	13	Yes
4016	12.5	489.00	16	Yes
4017	12	499.00	13	Yes
4018	16.4	469.00	15	Yes
4019	17.9	495.00	13	Yes
4020	17.6	363.00	13	Yes
4021	11.4	406.00	15	Yes
4022	15.1	443.00	16	Yes
4023	14.7	410.00	13	Yes
4024	14.5	366.00	12	Yes
4025	19.8	304.00	15	Yes
4026	14.4	406.00	12	Yes
4027	19.1	416.00	15	Yes
4028	19.4	470.00	15	Yes
4029	12.7	483.00	12	Yes
4030	14.3	407.00	16	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	No
14	Yes
15	No
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	149	5492	20	Yes
2	624	5493	19	Yes
3	1099	5494	12	Yes
4	1574	5495	13	Yes
5	2049	5496	14	Yes
6	2524	5497	16	Yes
7	2999	5498	16	Yes
8	3474	5499	17	Yes
9	3949	5500	12	Yes
10	4424	5501	20	Yes
11	4899	5502	16	Yes
12	5374	5503	16	Yes
13	5849	5504	15	Yes
14	6324	5505	14	Yes
15	6799	5506	17	Yes
16	7274	5507	16	Yes
17	7749	5508	15	Yes
18	8224	5509	18	Yes
19	8699	5510	15	Yes
20	9174	5511	27	Yes
21	9649	5512	16	Yes
22	10124	5513	9	Yes
23	10599	5514	13	Yes
24	11074	5515	15	Yes
25	11549	5516	18	Yes
26	12024	5517	16	Yes
27	12499	5518	15	Yes
28	12974	5519	24	Yes
29	13449	5520	16	Yes
30	13924	5521	8	Yes
31	14399	5522	22	Yes
32	14874	5523	22	Yes
33	15349	5524	14	Yes
34	15824	5525	14	Yes
35	16299	5526	15	Yes
36	16774	5527	14	Yes

TYPE 6 DETECTION PROBABILITY (CONTINUED)

37	17249	5528	16	Yes
38	17724	5529	18	Yes
39	18199	5530	22	Yes
40	18674	5531	14	Yes
41	19149	5532	17	Yes
42	19624	5533	14	Yes
43	20099	5534	23	Yes
44	20574	5535	14	Yes
45	21049	5536	12	Yes
46	21524	5537	15	Yes
47	21999	5538	15	Yes
48	22474	5539	22	Yes
49	22949	5540	15	Yes
50	23424	5541	11	Yes
51	23899	5542	13	Yes
52	24374	5543	16	Yes
53	24849	5544	19	Yes
54	25324	5545	14	Yes
55	25799	5546	22	Yes
56	26274	5547	17	Yes
57	26749	5548	19	Yes
58	27224	5549	9	Yes
59	27699	5550	14	Yes
60	28174	5551	18	Yes
61	28649	5552	17	Yes
62	29124	5553	18	Yes
63	29599	5554	12	Yes
64	30074	5555	17	Yes
65	30549	5556	18	Yes
66	31024	5557	16	Yes
67	31499	5558	18	Yes
68	31974	5559	12	Yes
69	32449	5560	14	Yes
70	-32612	5561	17	Yes
71	-32137	5562	9	Yes
72	-31662	5563	11	Yes
73	-31187	5564	16	Yes
74	-30712	5565	17	Yes
75	-30237	5566	16	Yes
76	-29762	5567	11	Yes
77	-29287	5568	25	Yes