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

CERTIFICATION TEST REPORT

FOR

Wireless 802.11 abgn/ac Router

MODEL NUMBER: MX64W-HW

FCC ID: UDX-60032015
IC: 6961A-60032015

REPORT NUMBER: 14U19021-E1

ISSUE DATE: January 20, 2015

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
--	1/20/15	Initial Issue	C. Cheung

TABLE OF CONTENTS

ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Wireless 802.11 abgn/ac Router

MODEL: MX64W-HW

SERIAL NUMBER: Q2MN-9PE4-H36Z

DATE TESTED: JANUARY 9, 13, 2015

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:

HENRY LAU
EMC ENGINEER
UL Verification Services Inc.

1. 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.

2. 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.

3. CALIBRATION AND UNCERTAINTY

3.1. 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.

3.2. 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

3.3. 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%.

4. DYNAMIC FREQUENCY SELECTION

4.1. OVERVIEW

4.1.1. 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 frequency 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 mill watt	-64 dBm
E.I.R.P. < 200 mill watt and power spectral density < 10 dBm/MHz	-62 dBm
E.I.R.P. < 200 mill watt 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

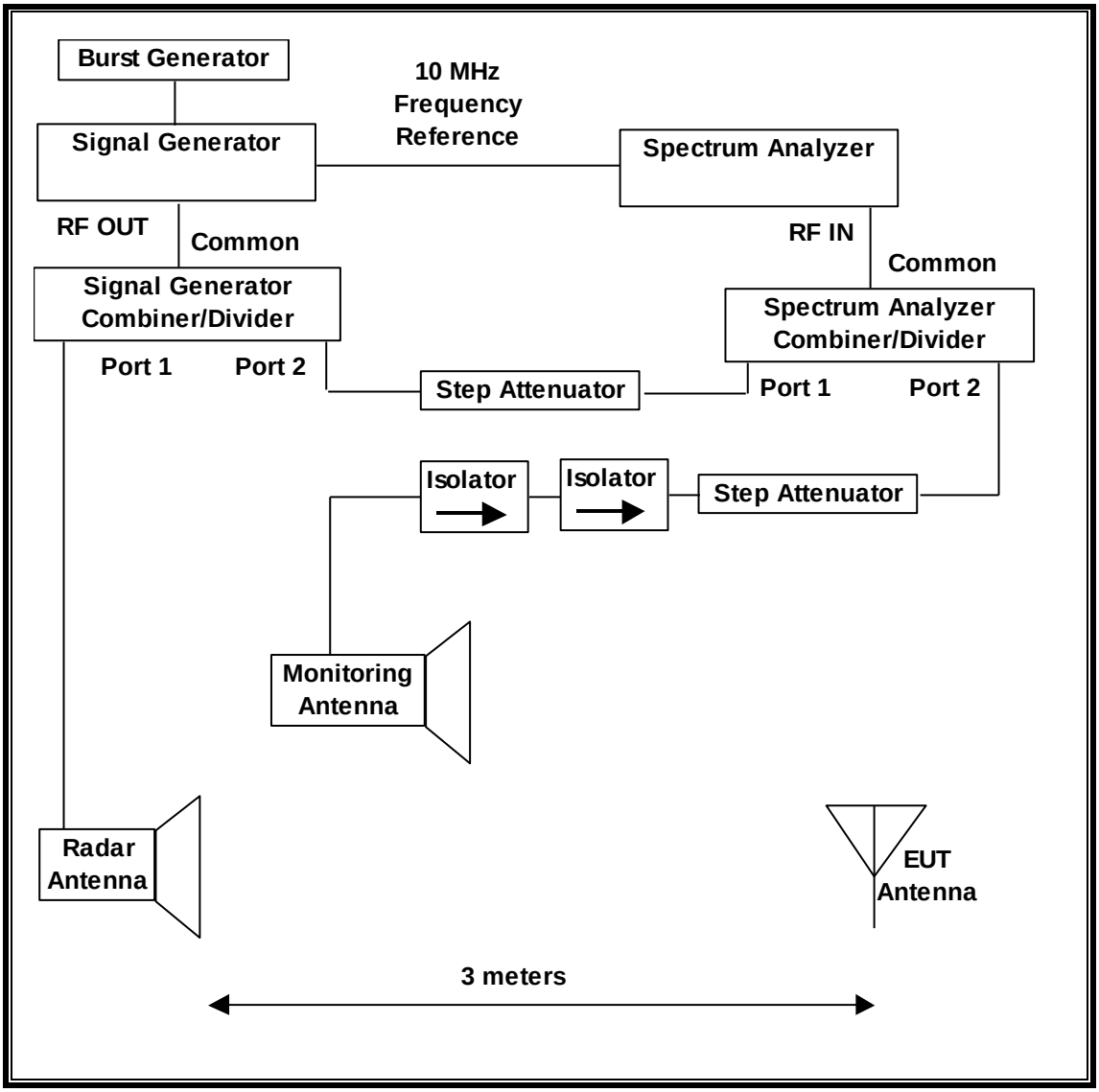
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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

4.1.2. 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.

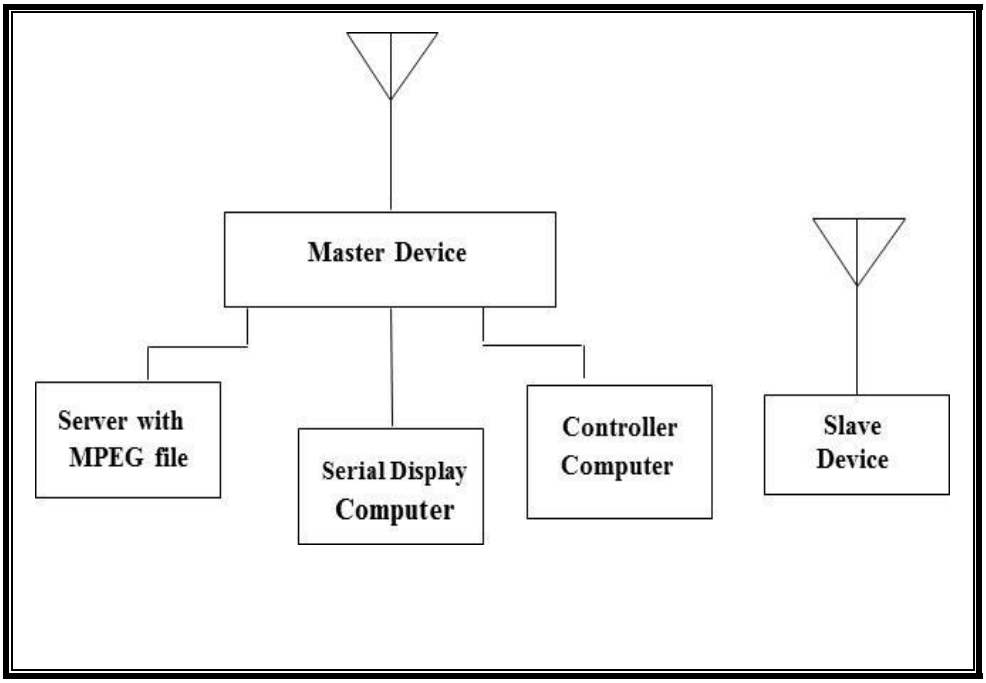
TEST AND MEASUREMENT EQUIPMENT

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

4.1.3. 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**
Notebook PC (Controller)	Lenovo	PA 1015-2HU	None	
Notebook PC (Console)	Lenovo	Type 3249-2HU	R9-AWVWD 11/01	QDS-BRCM1046
Notebook PC (Server)	Lenovo	Type 4287-5TU	R9-PLM9D 12/06	QDS-BRCM1046
Notebook PC (Slave Radio Device)	Apple	A1465	C02KTGMPF5N7	QDS-BRCM1072
AC Adapter (EUT)	Delta Electronics	EADP-30HB B	HEWD4B4032S	None
AC Adapter (Controller)	Lenovo	ADLX65NCC2A	11S45N0263Z1ZSHD41A5JY	None
AC Adapter (Console)	Lenovo	ADLX65NLT2A	11S45N0319Z1ZLZF345B5X	None
AC Adapter (Server)	Lenovo	45N0121	11S45N0121Z1ZHXU213DMG	None
AC Adapter(Slave Radio Device)	Apple	A1435	C04341216J2F288BT	None

4.1.4. 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.

For FCC, highest power level within these bands is 23.98 dBm EIRP in the 5250-5350 MHz band and 23.03 dBm EIRP in the 5470-5725 MHz band.

For IC, highest power level within these bands is 23.98 dBm EIRP in the 5250-5350 MHz band and 23.03 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 3.44 dBi in the 5250-5350 MHz band and 3.76 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 3.36 dBi in the 5250-5350 MHz band and 3.03 dBi in the 5470-5725 MHz band.

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 + 3 = -61 dBm.

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

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

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 W53.mp4 “6 ½ Magic Hours” from the Master to the Slave in full motion video mode using the QuickTime Media Player Version 10.3(727.4).

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

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 _wired_arm_nsp_version wired-10-150615M-jdzzle.
.

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

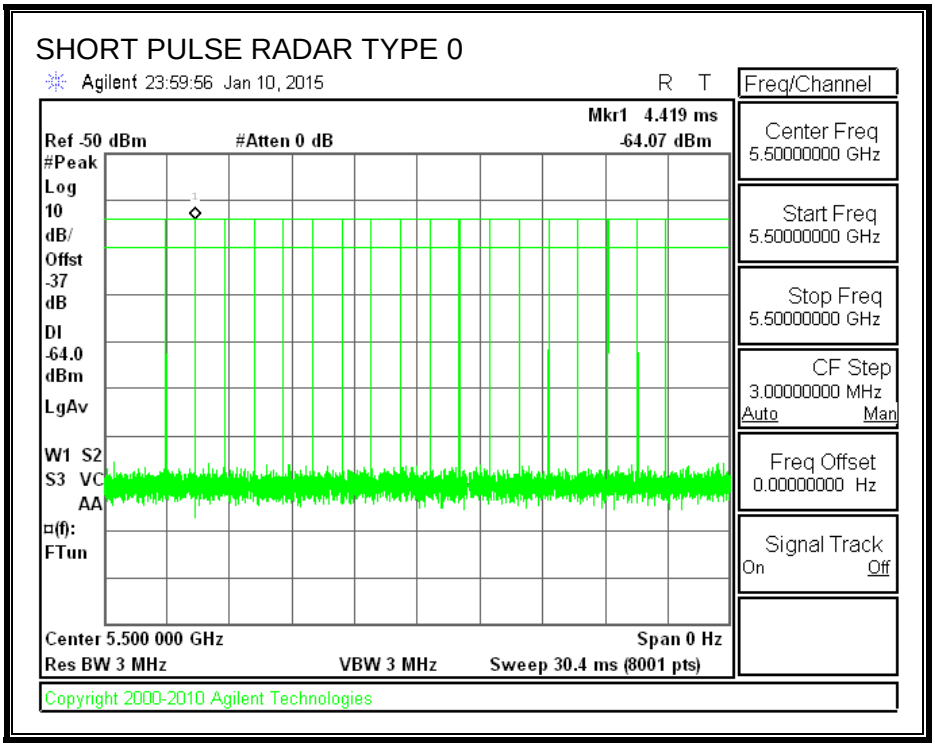
4.2. RESULTS FOR 20 MHz BANDWIDTH

4.2.1. TEST CHANNEL

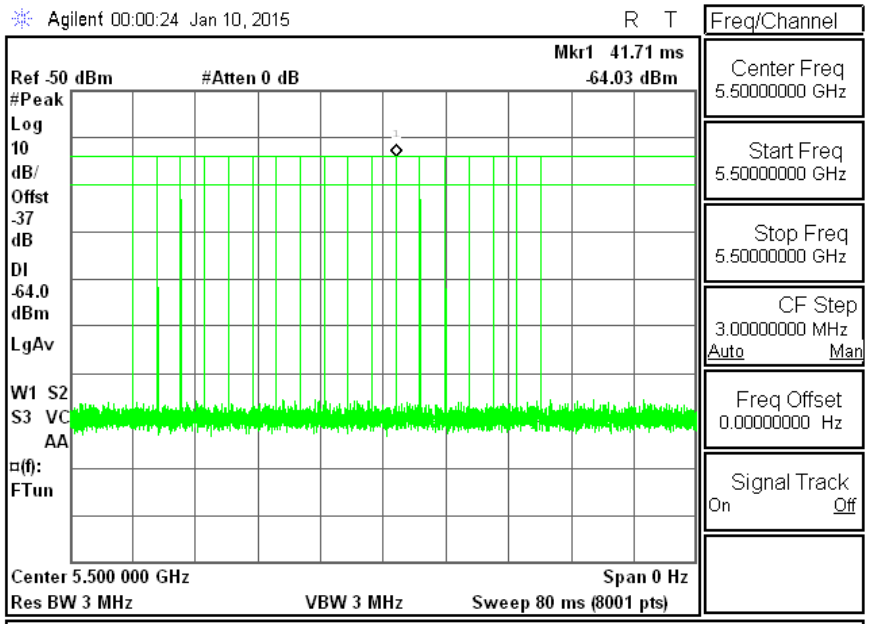
All tests were performed at a channel center frequency of 5500 MHz.

4.2.2. RADAR WAVEFORMS AND TRAFFIC

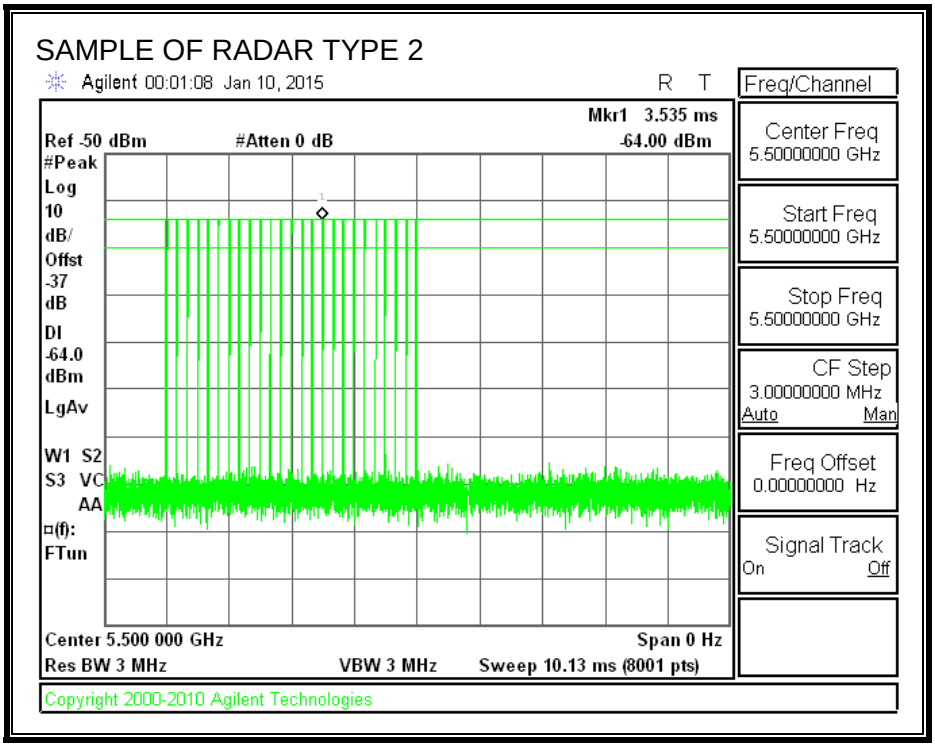
RADAR WAVEFORMS

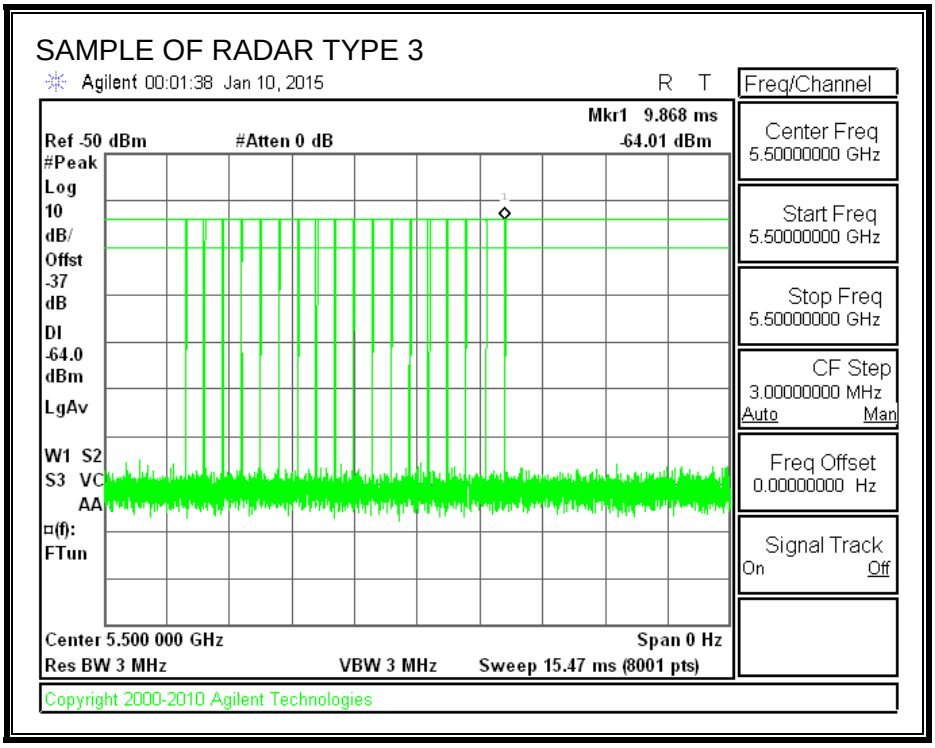


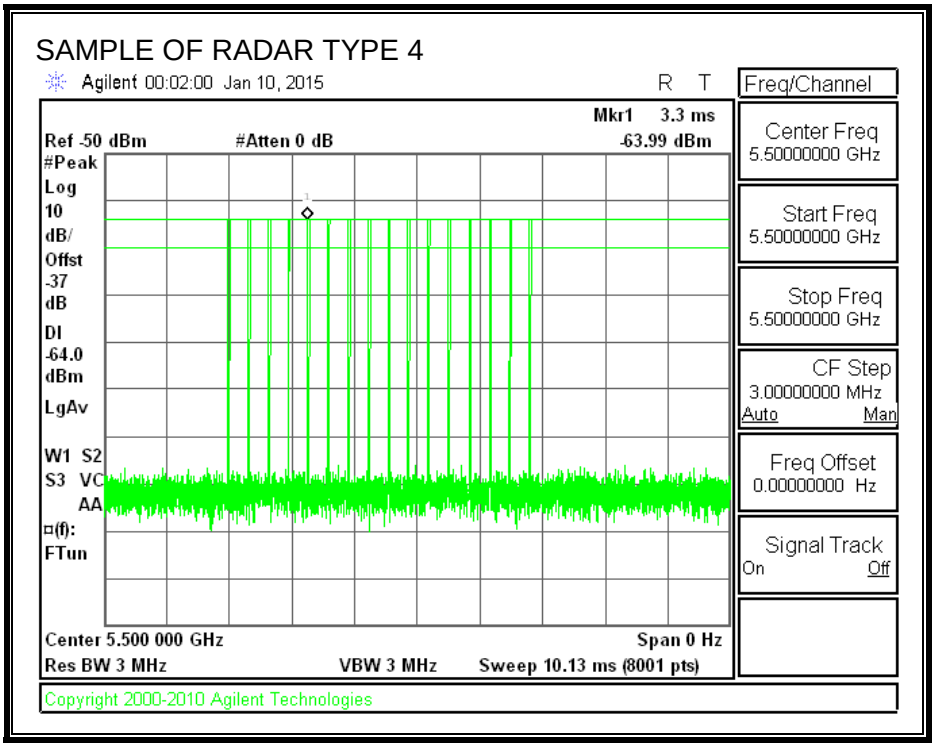
SAMPLE OF RADAR TYPE 1

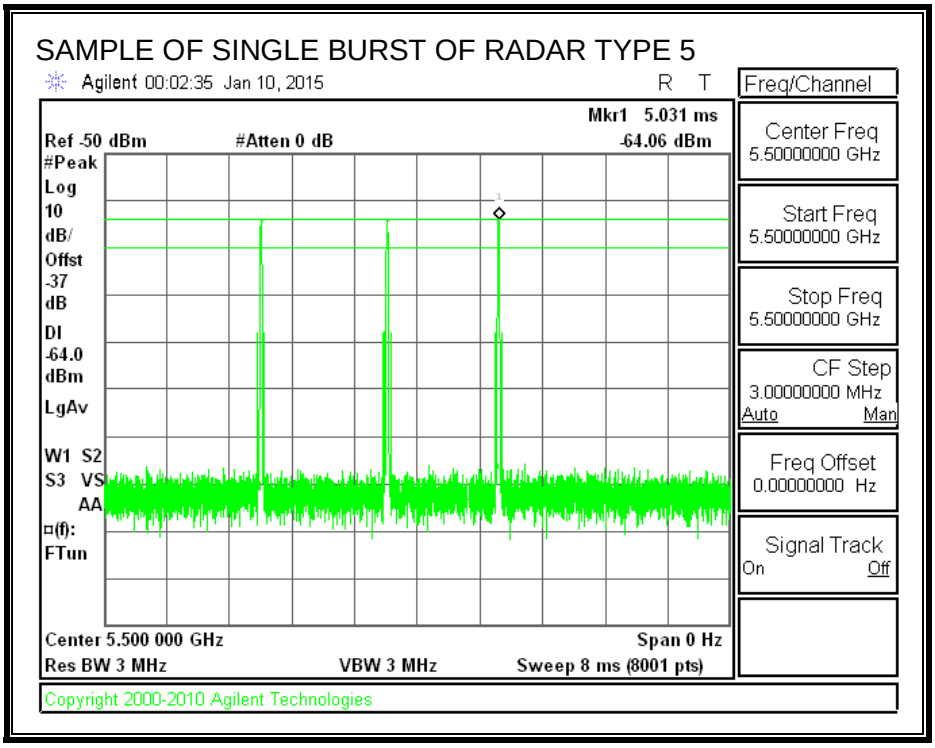


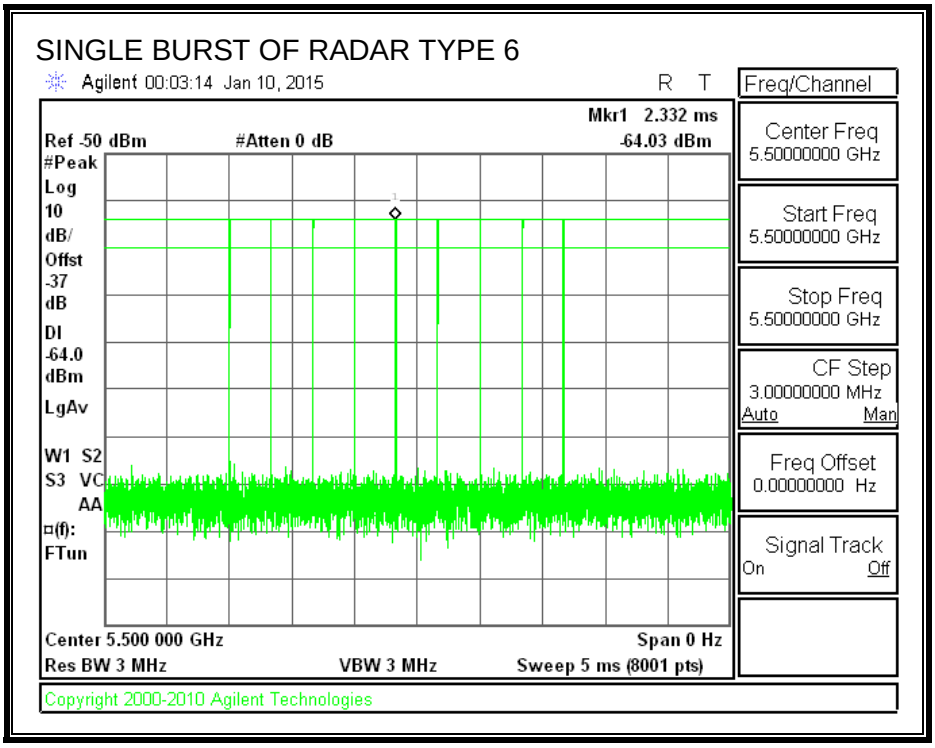
SAMPLE OF RADAR TYPE 2



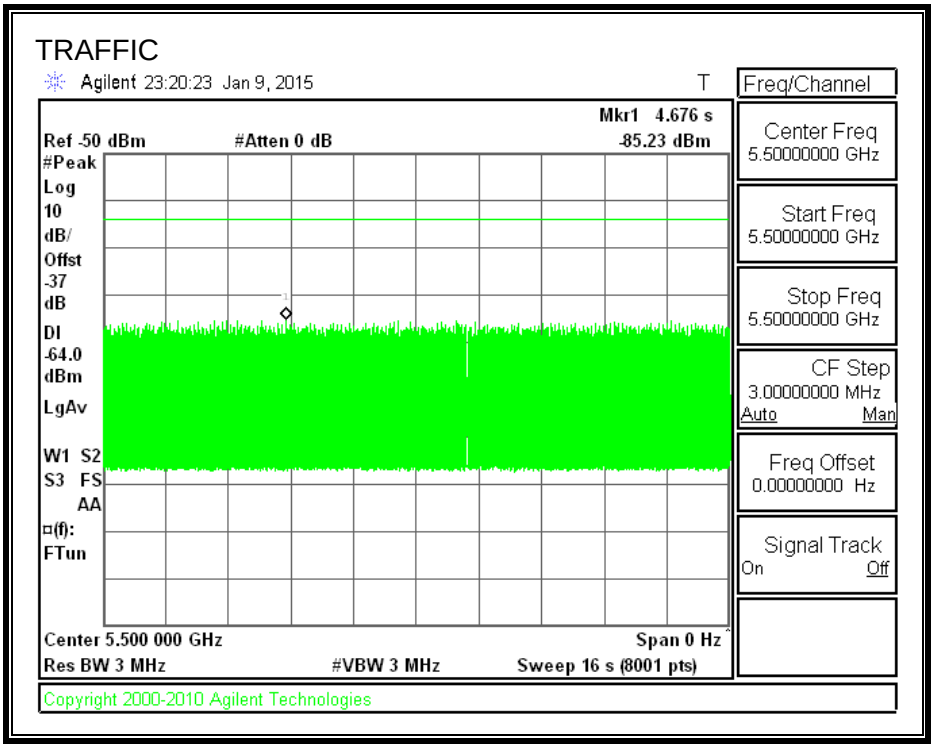








TRAFFIC



4.2.3. 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)
29.7	124.5	94.8	34.8

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)
30.07	66.97	36.9	2.1

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)
28.05	121.7	93.7	58.9

QUALITATIVE RESULTS

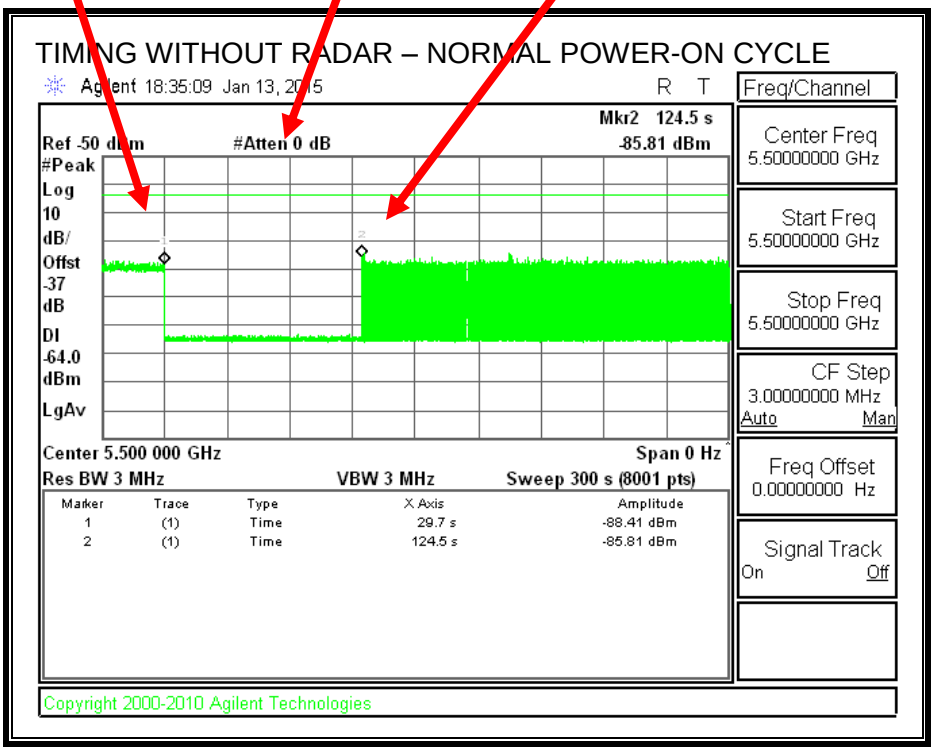
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

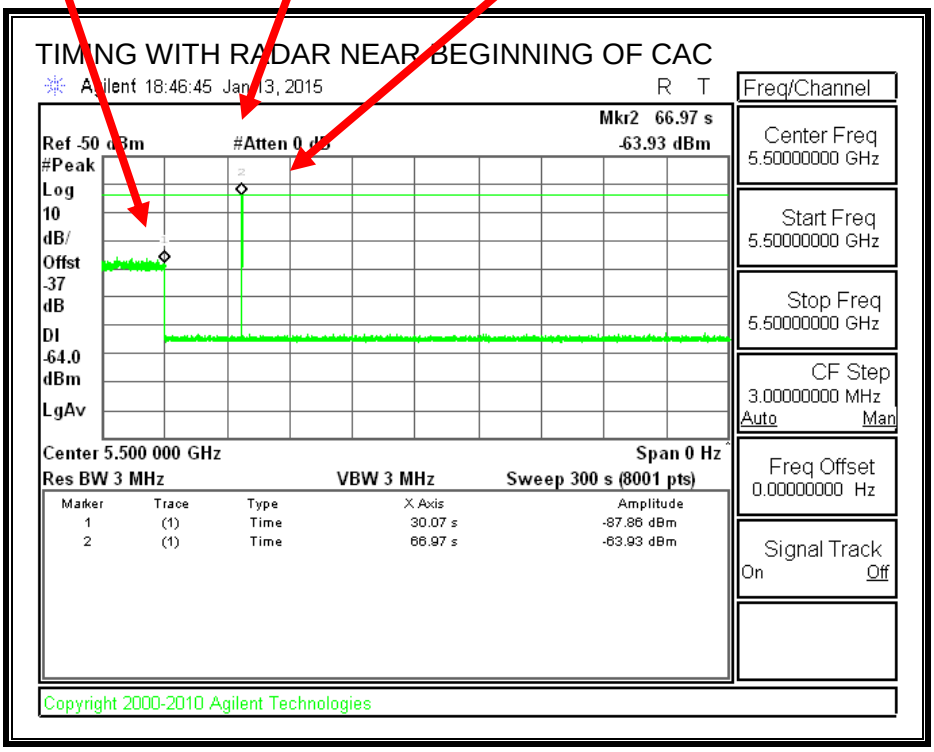
End of CAC
Traffic is Initiated



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



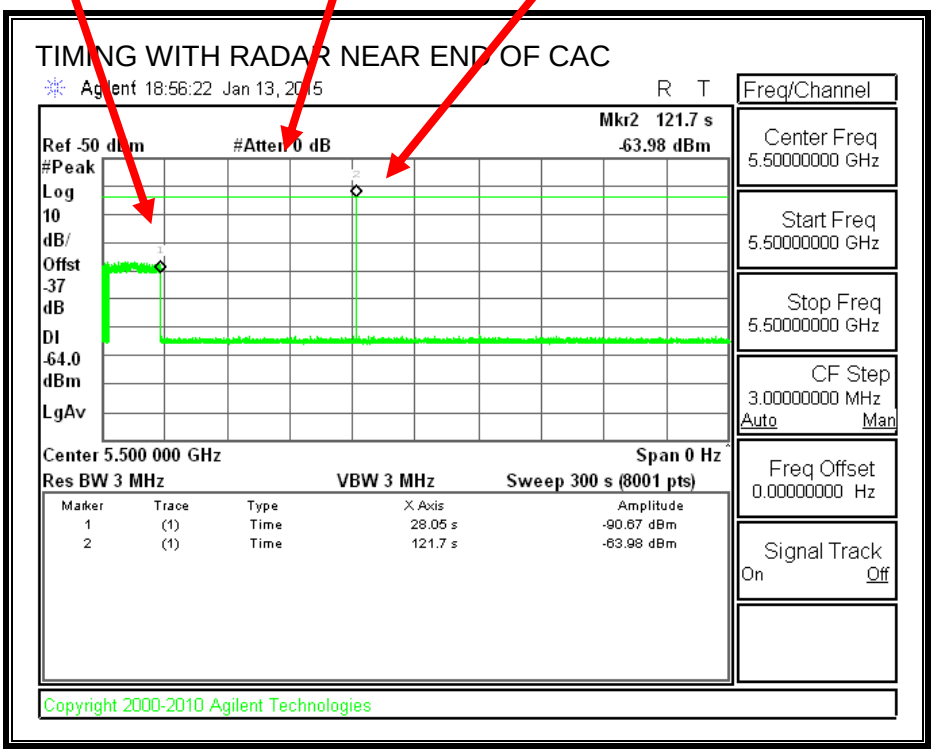
No EUT transmissions were observed after the radar signal.

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.

4.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

4.2.5. 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)

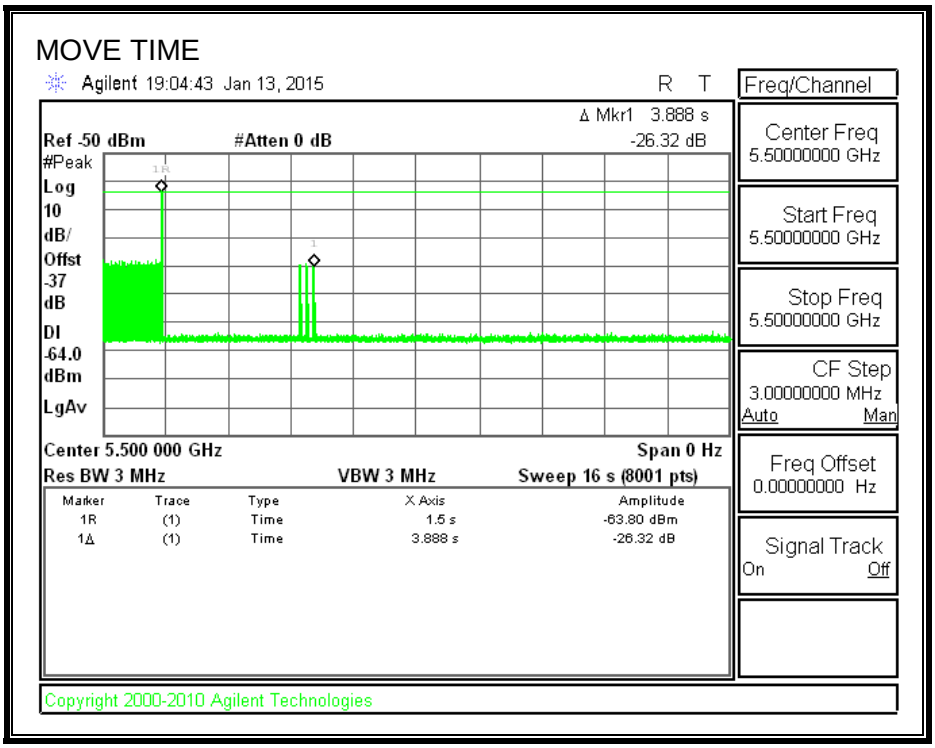
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

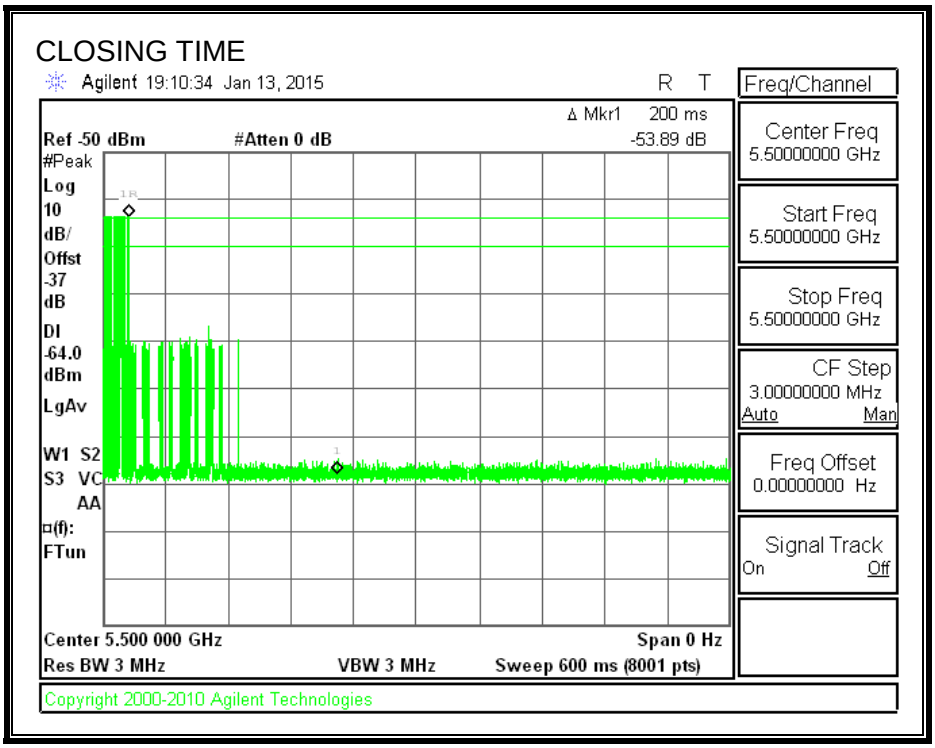
Channel Move Time (sec)	Limit (sec)
3.888	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
58.0	60

MOVE TIME



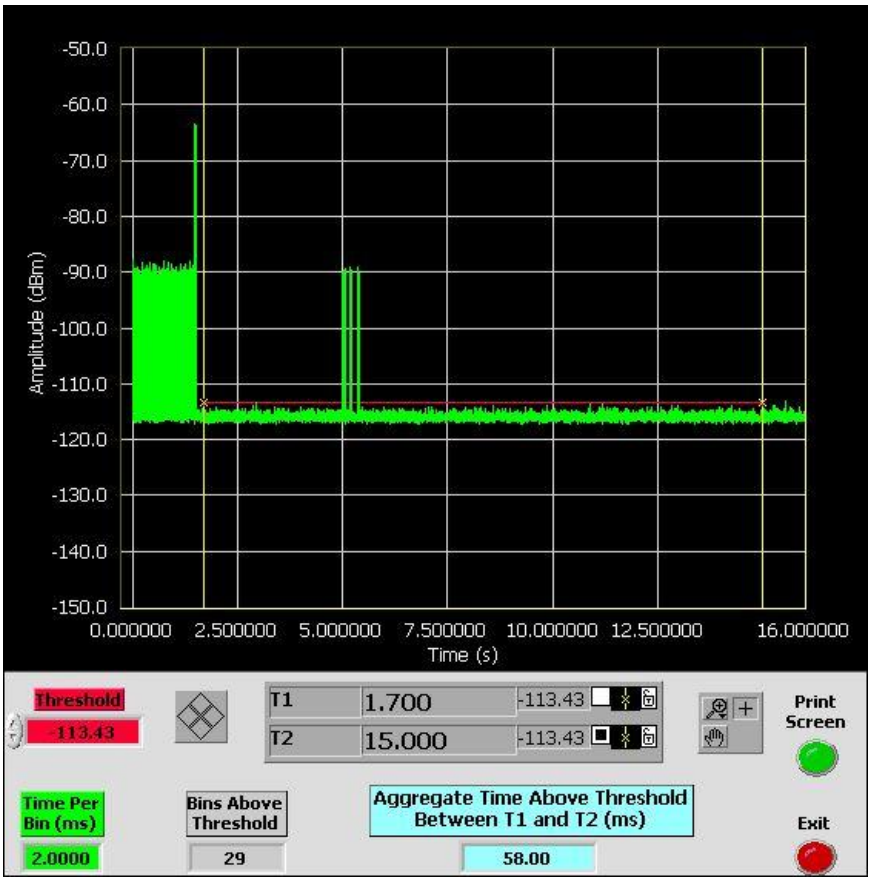
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

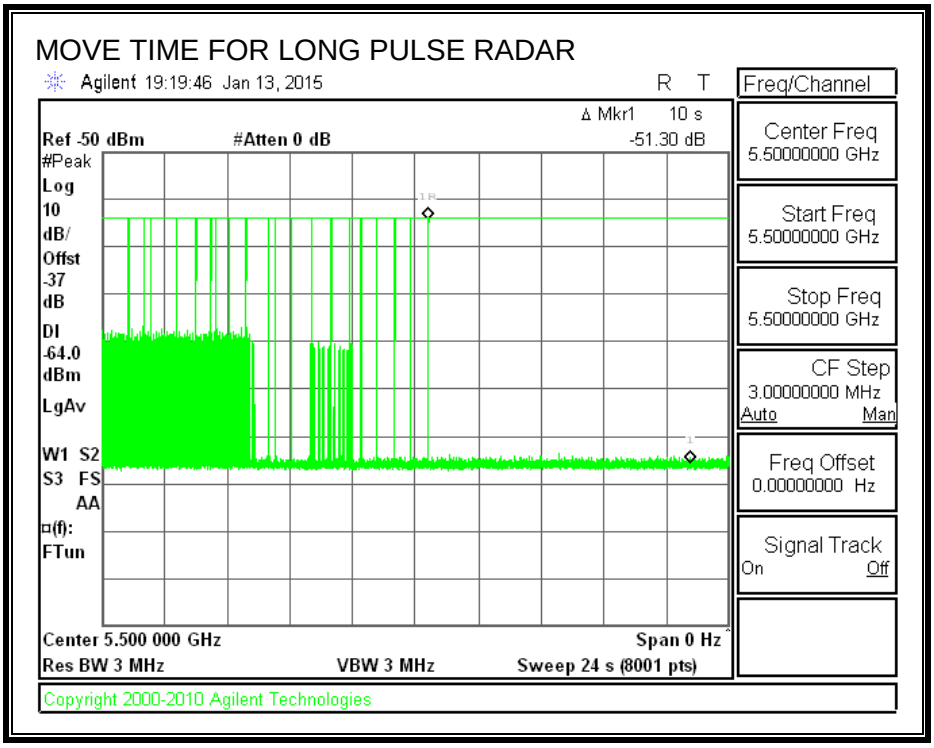
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



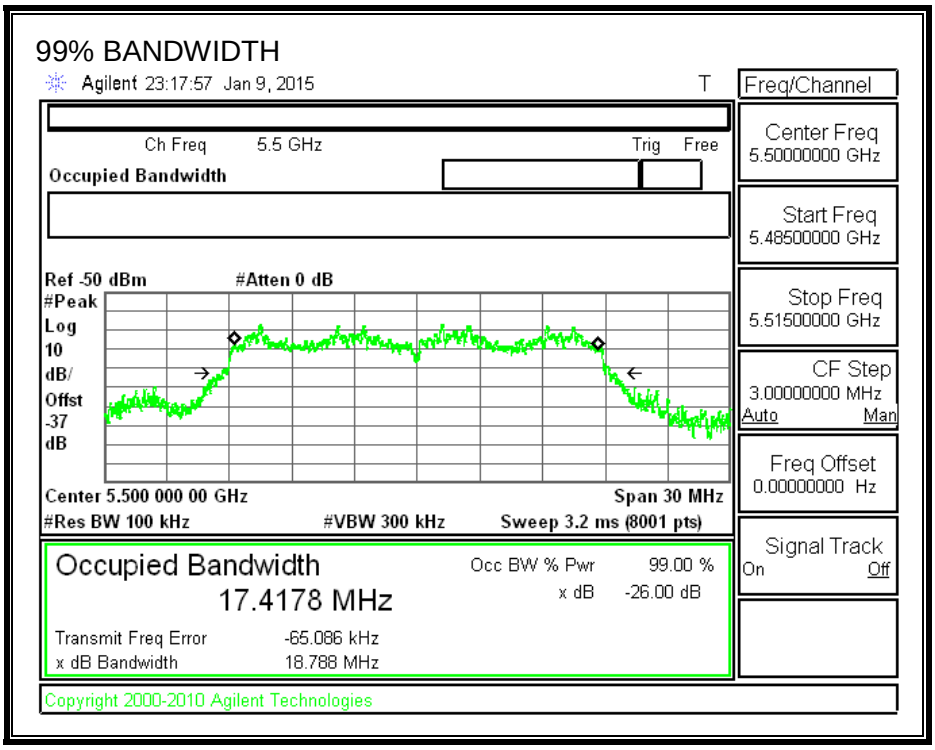
LONG PULSE CHANNEL MOVE TIME

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



4.2.6. 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 (%)
5489	5510	21	17.418	120.6	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
5488	10	0	0	
5489	10	10	100	FL
5490	10	10	100	
5495	10	10	100	
5500	10	9	90	
5505	10	10	100	
5510	10	10	100	FH
5511	10	0	0	

4.2.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	93.33	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		96.67	80	Pass
FCC Long Pulse Type 5	30	93.33	80	Pass
FCC Hopping Type 6	44	93.18	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1				
1 us Pulse Width				
Waveform	PRI (us)	Pulses Per Burst	Test (A/B)	Successful Detection (Yes/No)
1001	3066	18	A	Yes
1002	898	59	A	Yes
1003	938	57	A	Yes
1004	718	74	A	Yes
1005	758	70	A	Yes
1006	798	67	A	Yes
1007	778	68	A	Yes
1008	558	95	A	Yes
1009	918	58	A	Yes
1010	518	102	A	Yes
1011	818	65	A	Yes
1012	638	83	A	Yes
1013	858	62	A	Yes
1014	738	72	A	Yes
1015	538	99	A	Yes
1016	698	76	B	Yes
1017	2159	25	B	Yes
1018	817	65	B	Yes
1019	2233	24	B	Yes
1020	2792	19	B	Yes
1021	2057	26	B	Yes
1022	2010	27	B	Yes
1023	914	58	B	Yes
1024	614	86	B	Yes
1025	1458	37	B	Yes
1026	2191	25	B	Yes
1027	2238	24	B	Yes
1028	943	56	B	Yes
1029	2257	24	B	Yes
1030	1480	36	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	3.5	169.00	25	Yes
2002	2.2	205.00	29	Yes
2003	4.1	181.00	26	Yes
2004	4.7	226.00	25	Yes
2005	1.9	208.00	26	Yes
2006	1	193.00	27	Yes
2007	3.7	185.00	27	Yes
2008	1.8	172.00	28	Yes
2009	2.2	153.00	24	Yes
2010	1.1	208.00	24	Yes
2011	1.2	174.00	23	Yes
2012	1.5	157.00	26	Yes
2013	4.8	223.00	27	Yes
2014	3.1	191.00	26	Yes
2015	1.2	199.00	27	Yes
2016	4.9	222.00	25	Yes
2017	2.8	169.00	23	Yes
2018	2.9	214.00	24	Yes
2019	4.5	158.00	26	No
2020	3.6	162.00	25	Yes
2021	1.6	154.00	29	Yes
2022	4.8	158.00	24	Yes
2023	1.4	185.00	23	No
2024	3.2	178.00	26	Yes
2025	4	176.00	24	Yes
2026	3	228.00	25	Yes
2027	3.6	199.00	29	Yes
2028	4.3	183.00	25	Yes
2029	4	185.00	27	Yes
2030	1.6	227.00	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	8.4	463.00	18	Yes
3002	7.4	459.00	17	Yes
3003	6.4	411.00	18	Yes
3004	9.5	481.00	17	Yes
3005	6.2	456.00	17	Yes
3006	10	271.00	17	Yes
3007	9.6	410.00	17	Yes
3008	8	287.00	17	Yes
3009	6.3	448.00	18	Yes
3010	7.6	344.00	17	Yes
3011	7.1	425.00	16	Yes
3012	5.4	358.00	17	Yes
3013	8.8	367.00	16	Yes
3014	6.3	393.00	18	Yes
3015	9.1	448.00	17	Yes
3016	5.8	419.00	16	Yes
3017	5.7	271.00	17	Yes
3018	6.1	452.00	18	Yes
3019	8.5	312.00	18	Yes
3020	8.7	363.00	17	Yes
3021	6.1	407.00	17	Yes
3022	7	359.00	18	Yes
3023	6.3	432.00	16	Yes
3024	5.3	478.00	17	Yes
3025	7.9	471.00	16	Yes
3026	5.3	324.00	18	Yes
3027	6	392.00	17	Yes
3028	7.4	421.00	17	Yes
3029	5.9	449	17	Yes
3030	8.8	420	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	18.8	325.00	16	Yes
4002	11.7	466.00	12	Yes
4003	10.4	460.00	13	Yes
4004	10.3	435.00	16	Yes
4005	17.5	303.00	13	Yes
4006	18.4	262.00	15	Yes
4007	18.6	324.00	14	Yes
4008	15.9	359.00	16	Yes
4009	19.1	337.00	16	Yes
4010	11.8	447.00	16	Yes
4011	19.9	365.00	14	Yes
4012	19.7	403.00	13	Yes
4013	17.3	444.00	15	Yes
4014	16.9	333.00	14	Yes
4015	16.6	354.00	15	Yes
4016	12.3	362.00	16	Yes
4017	15.7	344.00	14	Yes
4018	19.4	407.00	15	Yes
4019	13.8	479.00	15	No
4020	18	384.00	12	Yes
4021	17.5	489.00	12	Yes
4022	11.5	355.00	15	Yes
4023	20	363.00	16	Yes
4024	12.1	428.00	13	Yes
4025	16.2	375.00	14	No
4026	14.2	250.00	14	Yes
4027	19	359.00	12	Yes
4028	16	432.00	15	Yes
4029	16.2	316.00	13	Yes
4030	16.6	342.00	15	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	No
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	No
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	78	5489	3	No
2	553	5490	7	Yes
3	1028	5491	4	Yes
4	1503	5492	3	Yes
5	1978	5493	4	Yes
6	2453	5494	8	Yes
7	2928	5495	6	Yes
8	3403	5496	1	Yes
9	3878	5497	5	Yes
10	4353	5498	5	Yes
11	4828	5499	5	Yes
12	5303	5500	8	Yes
13	5778	5501	4	No
14	6253	5502	6	Yes
15	6728	5503	3	Yes
16	7203	5504	5	Yes
17	7678	5505	4	Yes
18	8153	5506	3	Yes
19	8628	5507	4	Yes
20	9103	5508	6	Yes
21	9578	5509	4	Yes
22	10053	5510	6	Yes
23	10528	5489	1	No
24	11003	5490	5	Yes
25	11478	5491	5	Yes
26	11953	5492	11	Yes
27	12428	5493	4	Yes
28	12903	5494	6	Yes
29	13378	5495	8	Yes
30	13853	5496	2	Yes
31	14328	5497	4	Yes
32	14803	5498	3	Yes
33	15278	5499	4	Yes
34	15753	5500	3	Yes
35	16228	5501	3	Yes
36	16703	5502	5	Yes
37	17178	5503	4	Yes
38	17653	5504	6	Yes
39	18128	5505	6	Yes
40	18603	5506	4	Yes
41	19078	5507	2	Yes
42	19553	5508	3	Yes
43	20028	5509	5	Yes
44	20503	5510	5	Yes

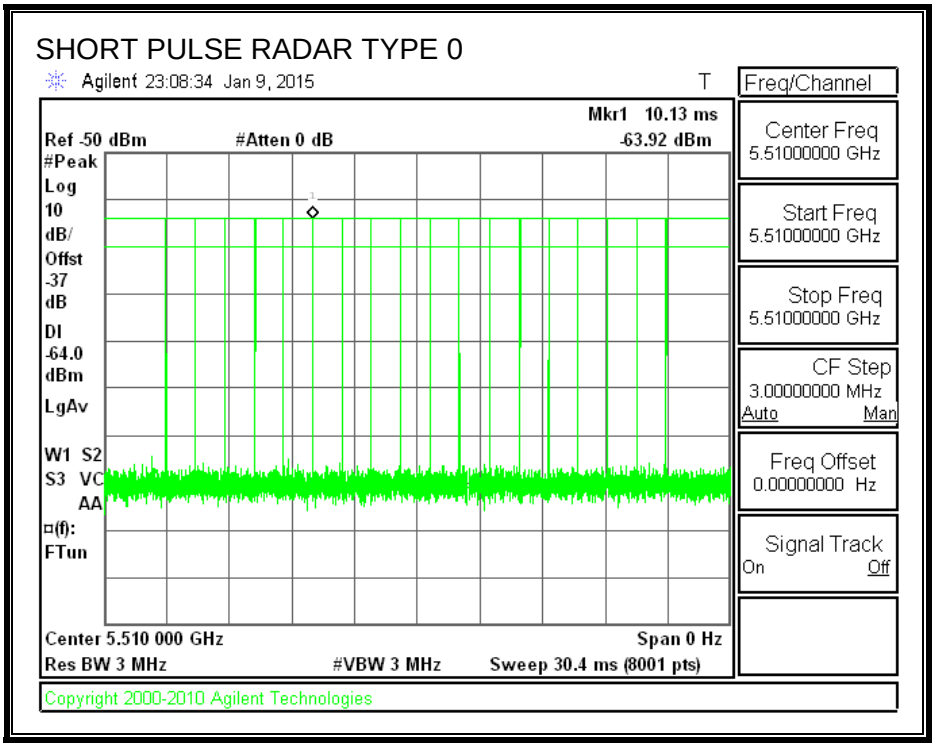
4.3. RESULTS FOR 40 MHz BANDWIDTH

4.3.1. TEST CHANNEL

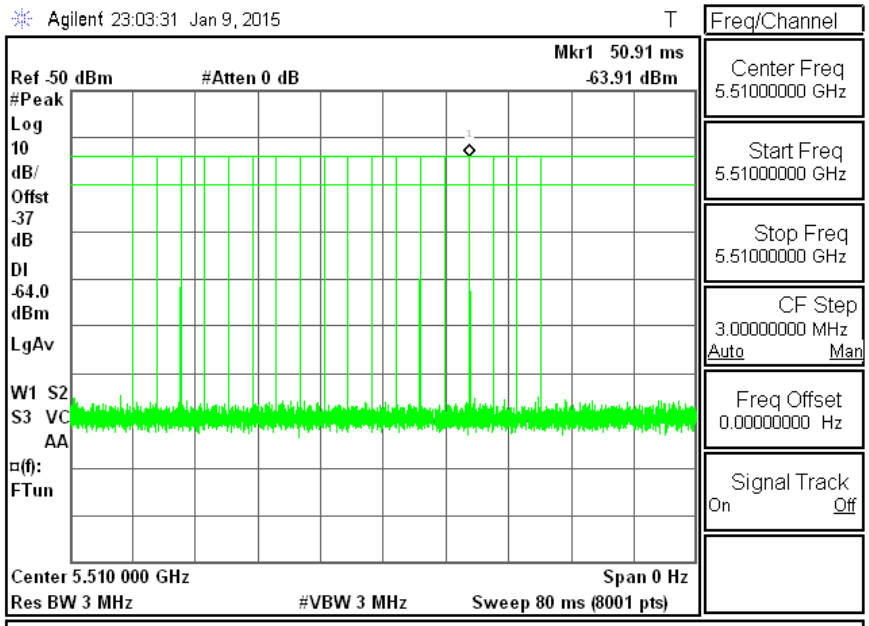
All tests were performed at a channel center frequency of 5510 MHz.

4.3.2. RADAR WAVEFORMS AND TRAFFIC

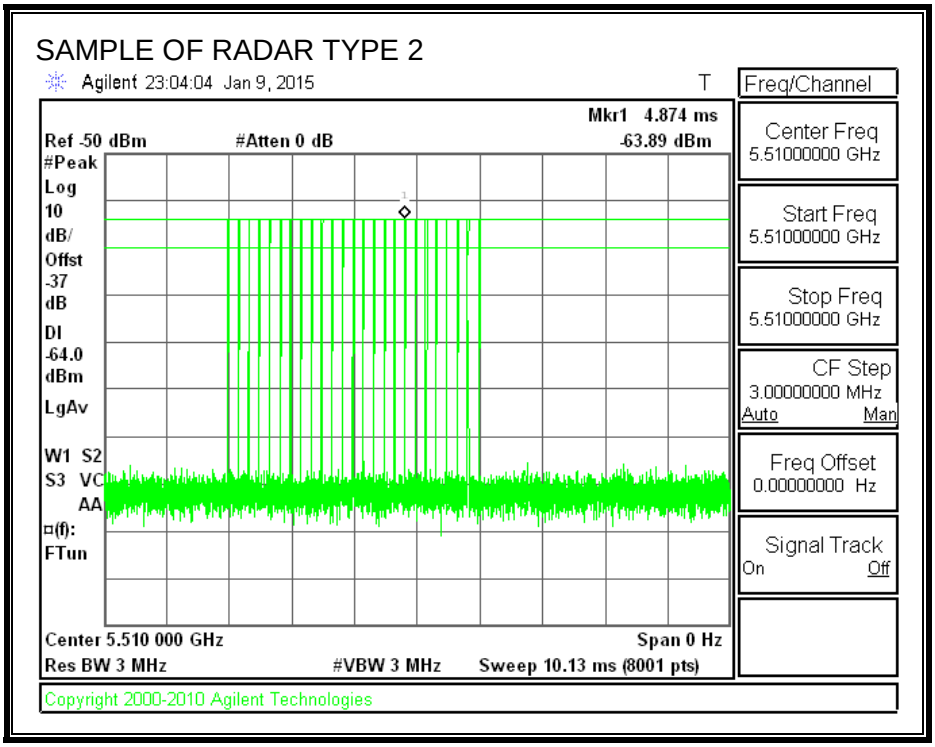
RADAR WAVEFORMS



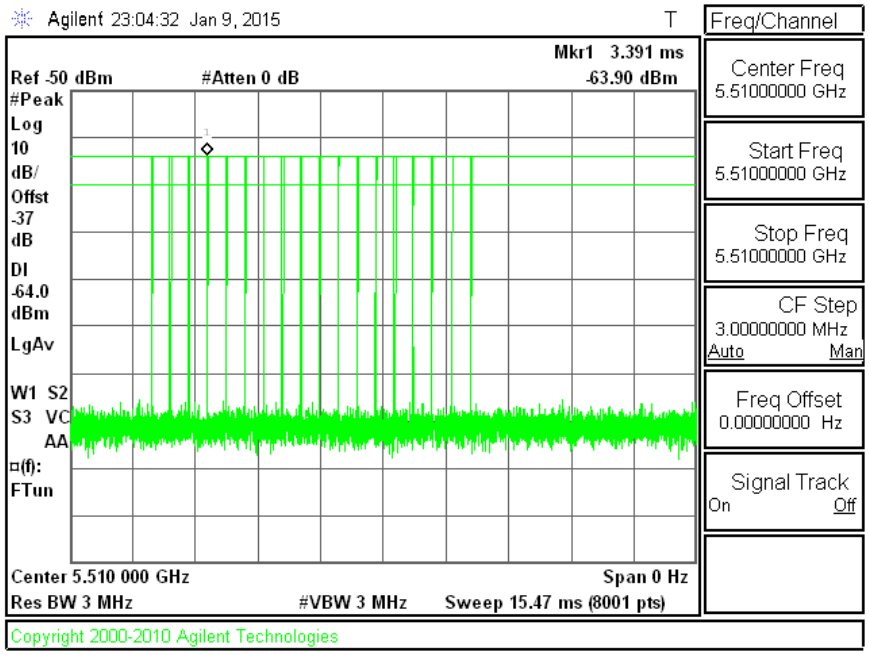
SAMPLE OF RADAR TYPE 1



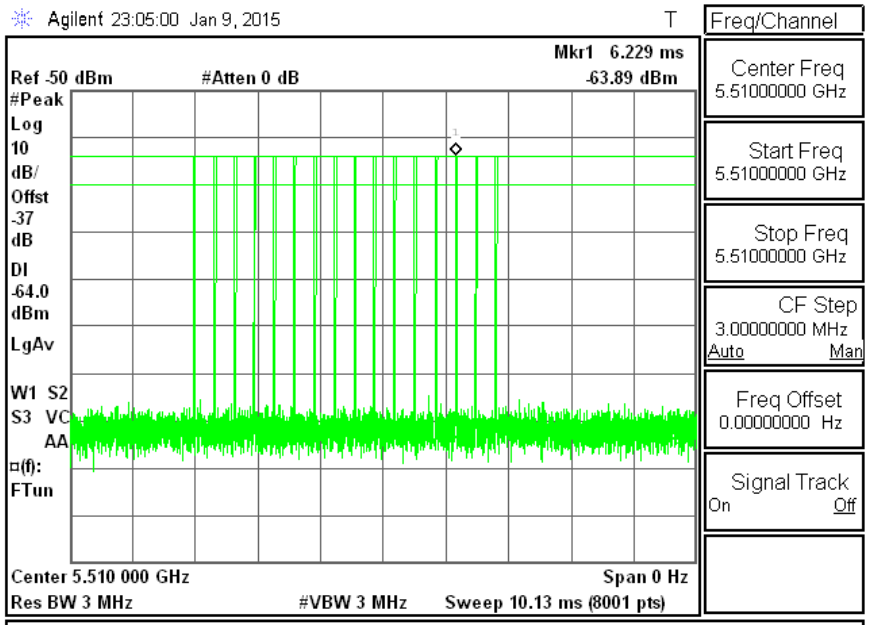
SAMPLE OF RADAR TYPE 2



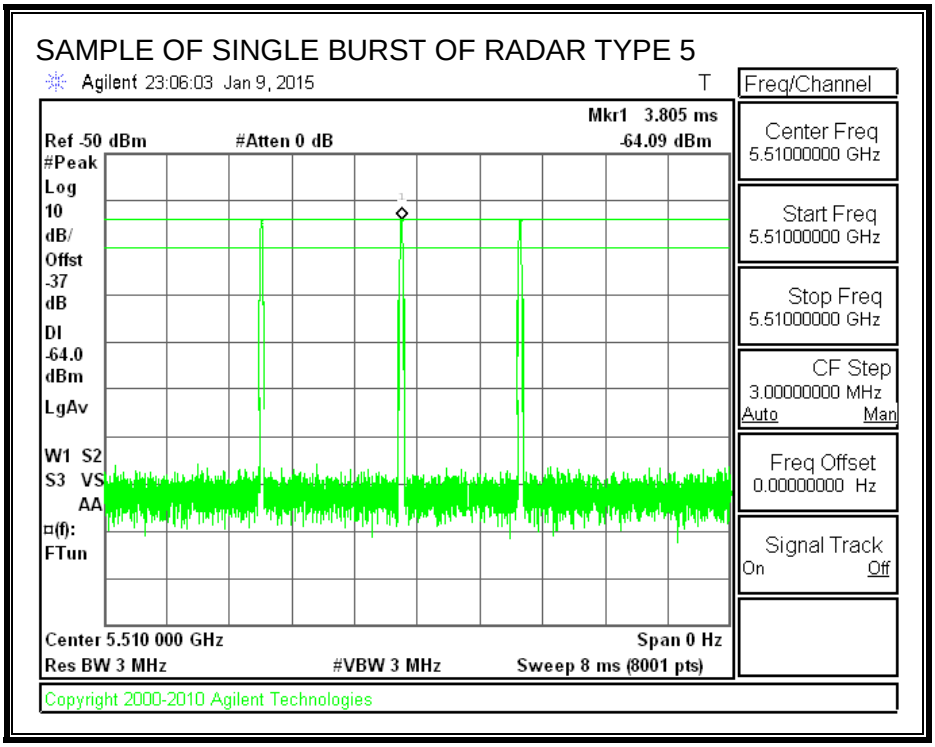
SAMPLE OF RADAR TYPE 3

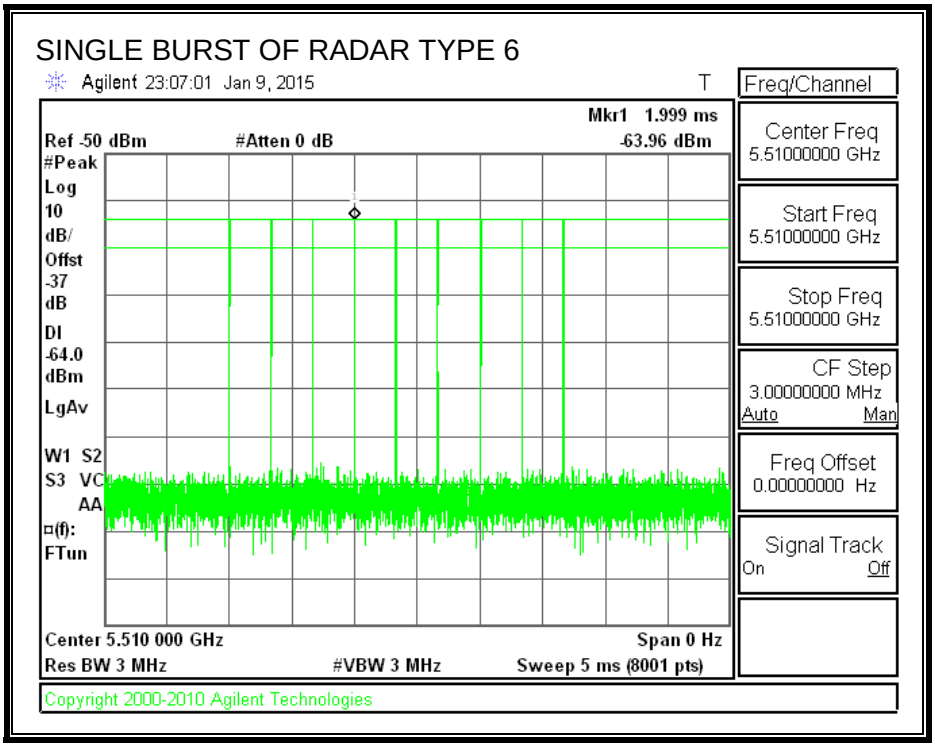


SAMPLE OF RADAR TYPE 4

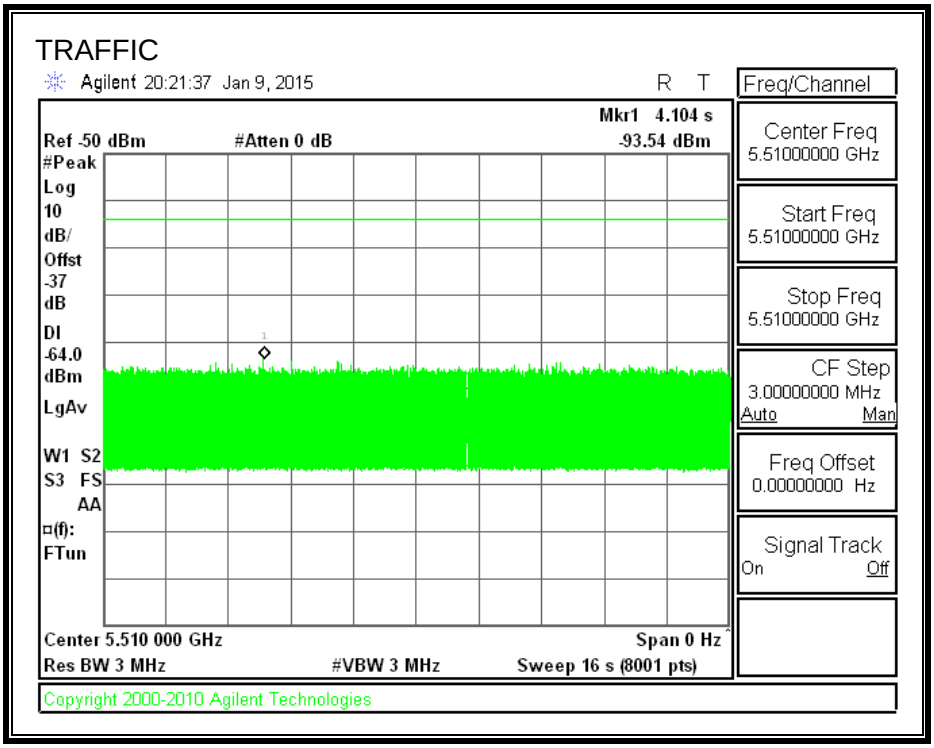


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





TRAFFIC



4.3.3. 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)
29.62	124.6	95.0	35.0

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)
29.36	69.0	39.7	4.7

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)
29.85	123.7	93.9	58.9

QUALITATIVE RESULTS

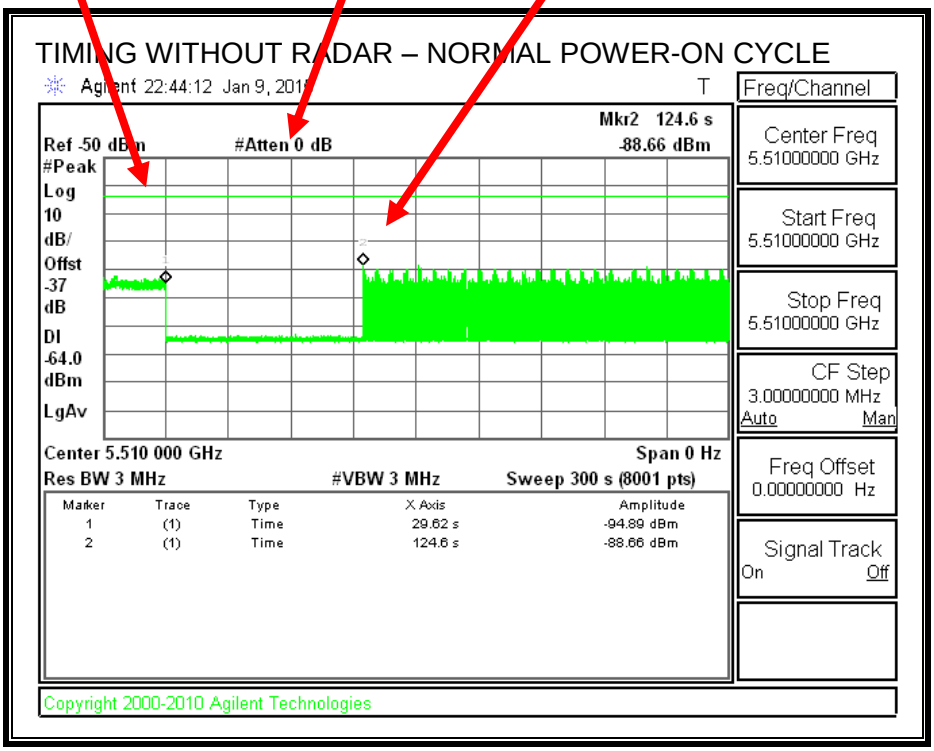
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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



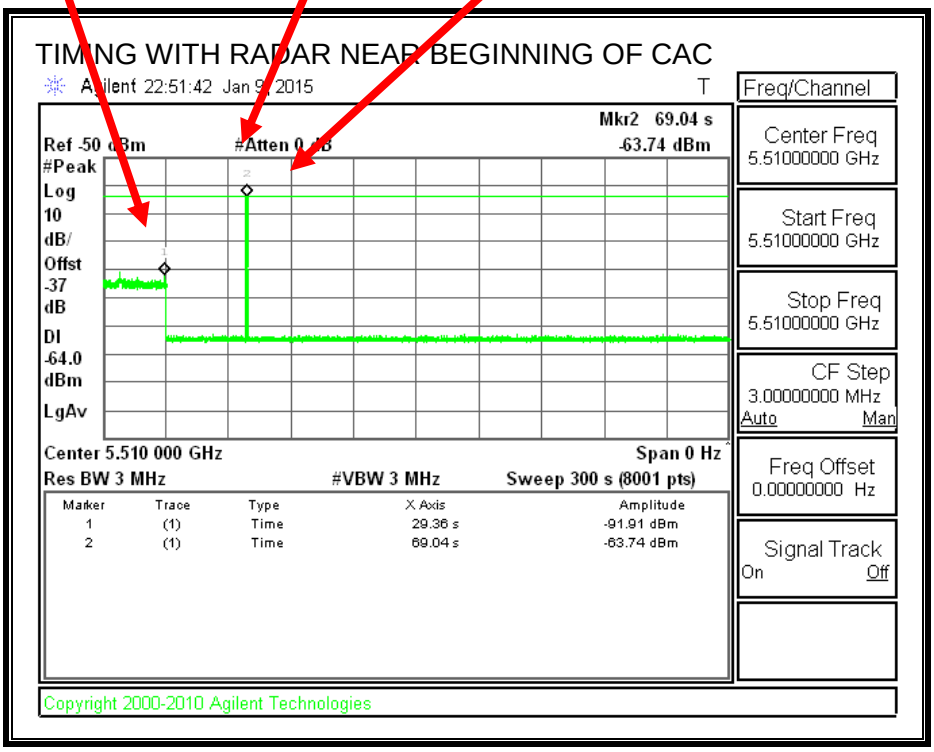
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

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



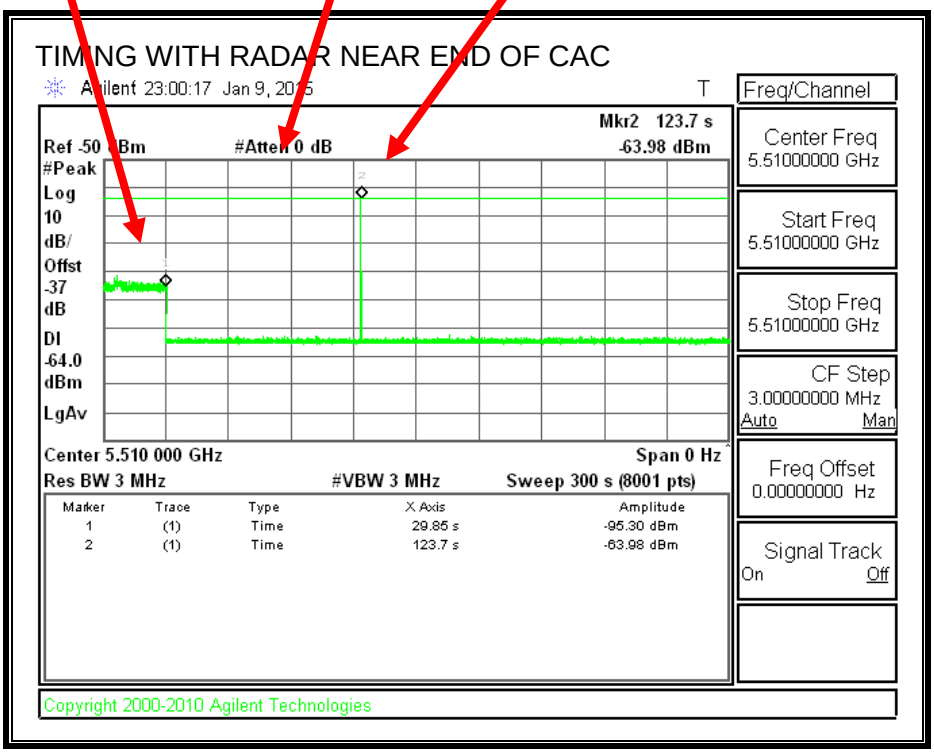
No EUT transmissions were observed after the radar signal.

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.

4.3.1. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

4.3.2. 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)

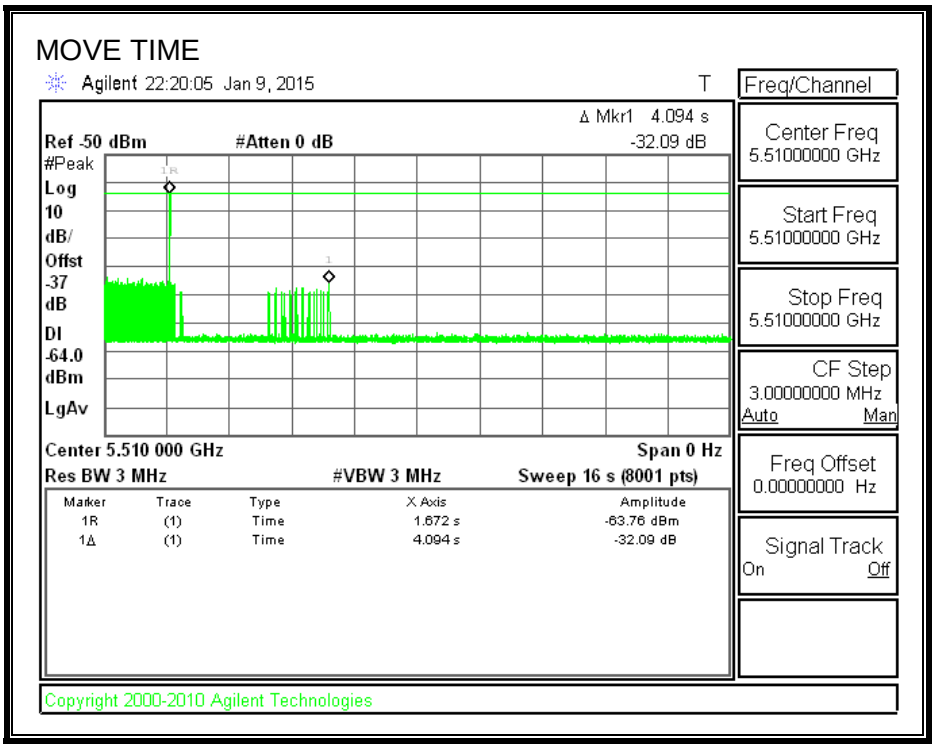
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

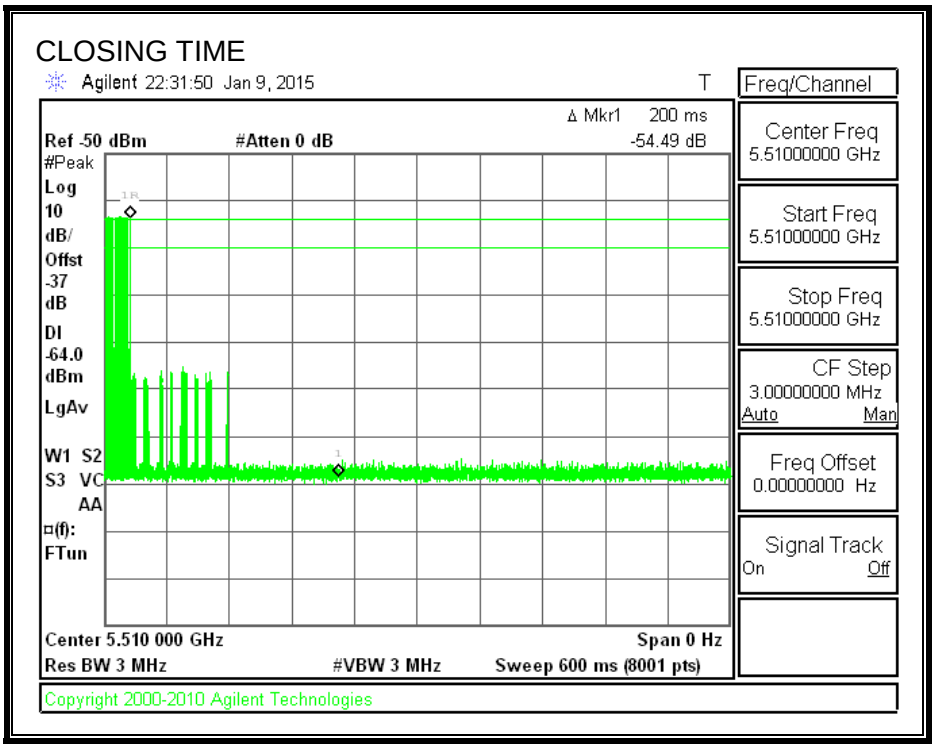
Channel Move Time (sec)	Limit (sec)
4.094	10

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

MOVE TIME



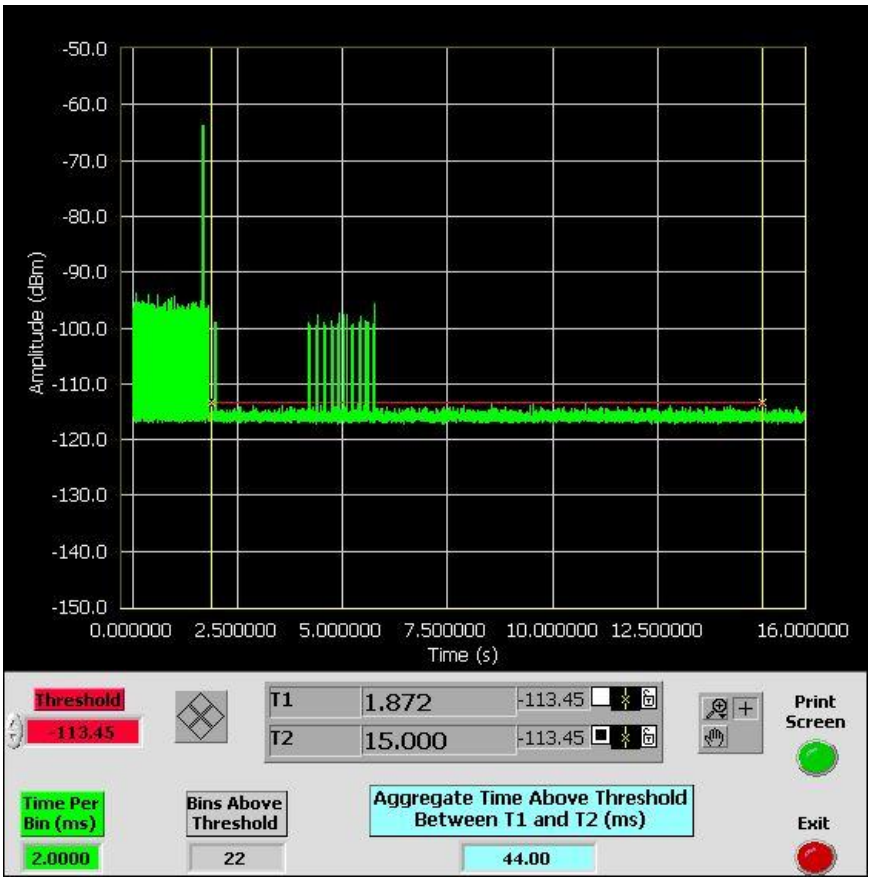
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

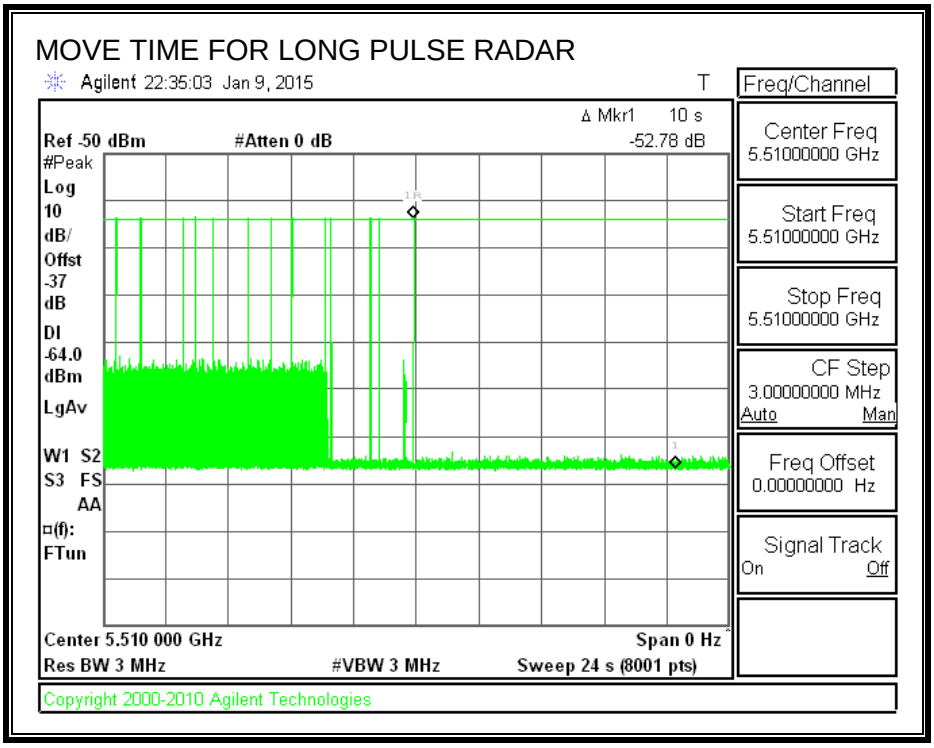
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

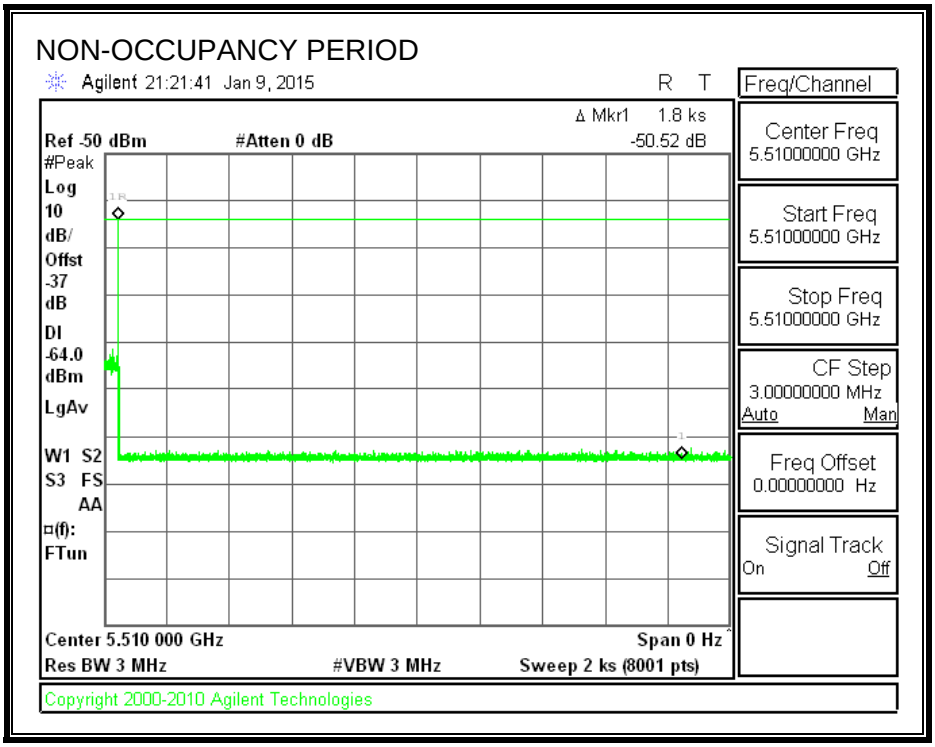
The traffic ceases prior to 10 seconds after the end of the radar waveform.



4.3.1. NON-OCCUPANCY PERIOD

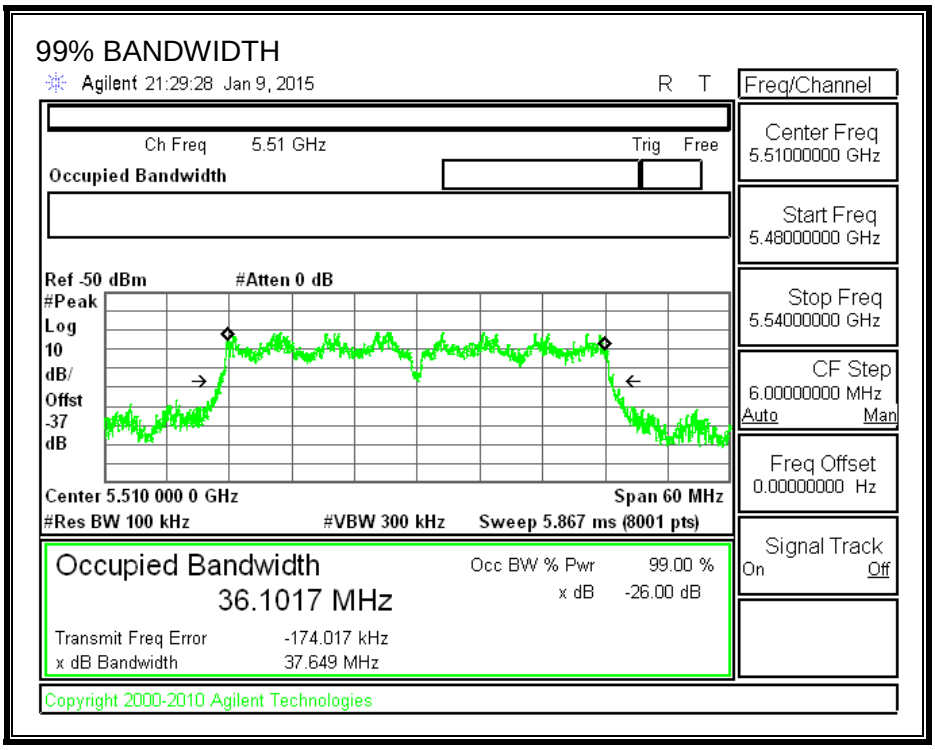
RESULTS

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



4.3.2. 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 (%)
5490	5530	40	36.102	110.8	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
5489	10	6	60	
5490	10	10	100	FL
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	10	9	90	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5530	10	10	100	FH
5531	10	0	0	

4.3.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	100.00	60	Pass
Aggregate		100.00	80	Pass
FCC Long Pulse Type 5	30	86.67	80	Pass
FCC Hopping Type 6	41	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1				
1 us Pulse Width				
Waveform	PRI (us)	Pulses Per Burst	Test (A/B)	Successful Detection (Yes/No)
1001	3066	18	A	Yes
1002	898	59	A	Yes
1003	938	57	A	Yes
1004	718	74	A	Yes
1005	758	70	A	Yes
1006	798	67	A	Yes
1007	778	68	A	Yes
1008	558	95	A	Yes
1009	918	58	A	Yes
1010	518	102	A	Yes
1011	818	65	A	Yes
1012	638	83	A	Yes
1013	858	62	A	Yes
1014	738	72	A	Yes
1015	538	99	A	Yes
1016	698	76	B	Yes
1017	2159	25	B	Yes
1018	817	65	B	Yes
1019	2233	24	B	Yes
1020	2792	19	B	Yes
1021	2057	26	B	Yes
1022	2010	27	B	Yes
1023	914	58	B	Yes
1024	614	86	B	Yes
1025	1458	37	B	Yes
1026	2191	25	B	Yes
1027	2238	24	B	Yes
1028	943	56	B	Yes
1029	2257	24	B	Yes
1030	1480	36	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	3.5	169.00	25	Yes
2002	2.2	205.00	29	Yes
2003	4.1	181.00	26	Yes
2004	4.7	226.00	25	Yes
2005	1.9	208.00	26	Yes
2006	1	193.00	27	Yes
2007	3.7	185.00	27	Yes
2008	1.8	172.00	28	Yes
2009	2.2	153.00	24	Yes
2010	1.1	208.00	24	Yes
2011	1.2	174.00	23	Yes
2012	1.5	157.00	26	Yes
2013	4.8	223.00	27	Yes
2014	3.1	191.00	26	Yes
2015	1.2	199.00	27	Yes
2016	4.9	222.00	25	Yes
2017	2.8	169.00	23	Yes
2018	2.9	214.00	24	Yes
2019	4.5	158.00	26	Yes
2020	3.6	162.00	25	Yes
2021	1.6	154.00	29	Yes
2022	4.8	158.00	24	Yes
2023	1.4	185.00	23	Yes
2024	3.2	178.00	26	Yes
2025	4	176.00	24	Yes
2026	3	228.00	25	Yes
2027	3.6	199.00	29	Yes
2028	4.3	183.00	25	Yes
2029	4	185.00	27	Yes
2030	1.6	227.00	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	8.4	463.00	18	Yes
3002	7.4	459.00	17	Yes
3003	6.4	411.00	18	Yes
3004	9.5	481.00	17	Yes
3005	6.2	456.00	17	Yes
3006	10	271.00	17	Yes
3007	9.6	410.00	17	Yes
3008	8	287.00	17	Yes
3009	6.3	448.00	18	Yes
3010	7.6	344.00	17	Yes
3011	7.1	425.00	16	Yes
3012	5.4	358.00	17	Yes
3013	8.8	367.00	16	Yes
3014	6.3	393.00	18	Yes
3015	9.1	448.00	17	Yes
3016	5.8	419.00	16	Yes
3017	5.7	271.00	17	Yes
3018	6.1	452.00	18	Yes
3019	8.5	312.00	18	Yes
3020	8.7	363.00	17	Yes
3021	6.1	407.00	17	Yes
3022	7	359.00	18	Yes
3023	6.3	432.00	16	Yes
3024	5.3	478.00	17	Yes
3025	7.9	471.00	16	Yes
3026	5.3	324.00	18	Yes
3027	6	392.00	17	Yes
3028	7.4	421.00	17	Yes
3029	5.9	449	17	Yes
3030	8.8	420	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	18.8	325.00	16	Yes
4002	11.7	466.00	12	Yes
4003	10.4	460.00	13	Yes
4004	10.3	435.00	16	Yes
4005	17.5	303.00	13	Yes
4006	18.4	262.00	15	Yes
4007	18.6	324.00	14	Yes
4008	15.9	359.00	16	Yes
4009	19.1	337.00	16	Yes
4010	11.8	447.00	16	Yes
4011	19.9	365.00	14	Yes
4012	19.7	403.00	13	Yes
4013	17.3	444.00	15	Yes
4014	16.9	333.00	14	Yes
4015	16.6	354.00	15	Yes
4016	12.3	362.00	16	Yes
4017	15.7	344.00	14	Yes
4018	19.4	407.00	15	Yes
4019	13.8	479.00	15	Yes
4020	18	384.00	12	Yes
4021	17.5	489.00	12	Yes
4022	11.5	355.00	15	Yes
4023	20	363.00	16	Yes
4024	12.1	428.00	13	Yes
4025	16.2	375.00	14	Yes
4026	14.2	250.00	14	Yes
4027	19	359.00	12	Yes
4028	16	432.00	15	Yes
4029	16.2	316.00	13	Yes
4030	16.6	342.00	15	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	No
6	Yes
7	Yes
8	No
9	Yes
10	Yes
11	Yes
12	No
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	329	5490	6	Yes
2	804	5491	3	Yes
3	1279	5492	10	Yes
4	1754	5493	7	Yes
5	2229	5494	9	Yes
6	2704	5495	6	Yes
7	3179	5496	8	Yes
8	3654	5497	9	Yes
9	4129	5498	7	Yes
10	4604	5499	5	Yes
11	5079	5500	6	Yes
12	5554	5501	6	Yes
13	6029	5502	7	Yes
14	6504	5503	7	Yes
15	6979	5504	9	Yes
16	7454	5505	7	Yes
17	7929	5506	5	Yes
18	8404	5507	8	Yes
19	8879	5508	11	Yes
20	9354	5509	8	Yes
21	9829	5510	7	Yes
22	10304	5511	7	Yes
23	10779	5512	7	Yes
24	11254	5513	11	Yes
25	11729	5514	7	Yes
26	12204	5515	11	Yes
27	12679	5516	13	Yes
28	13154	5517	6	Yes
29	13629	5518	7	Yes
30	14104	5519	11	Yes
31	14579	5520	6	Yes
32	15054	5521	10	Yes
33	15529	5522	9	Yes
34	16004	5523	9	Yes
35	16479	5524	10	Yes
36	16954	5525	6	Yes
37	17429	5526	6	Yes
38	17904	5527	3	Yes
39	18379	5528	6	Yes
40	18854	5529	10	Yes
41	19329	5530	11	Yes

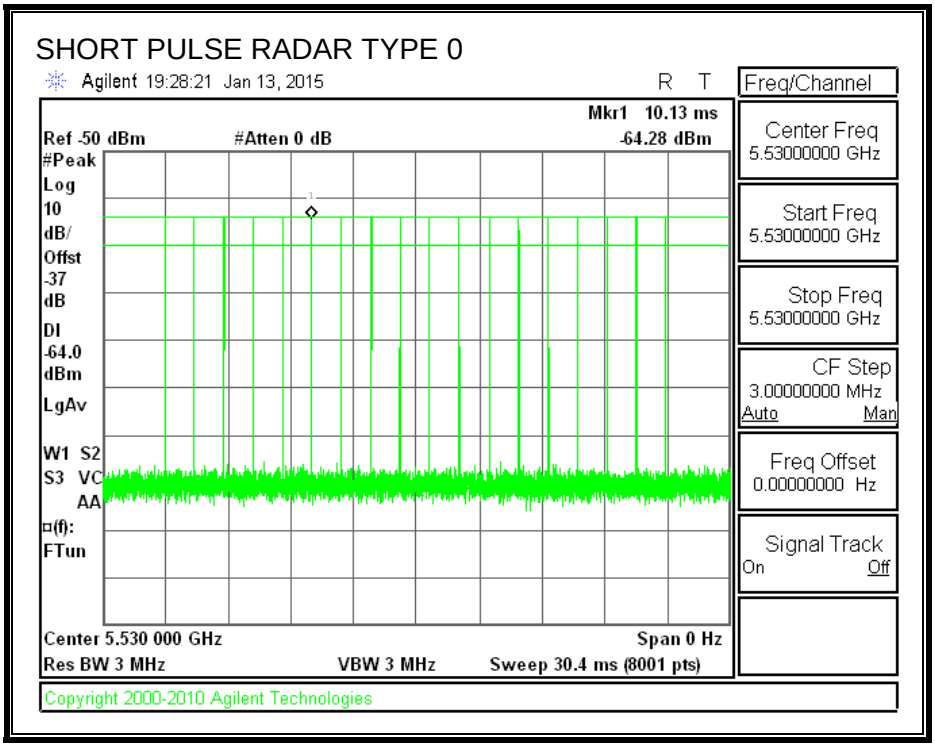
4.4. RESULTS FOR 80 MHz BANDWIDTH

4.4.1. TEST CHANNEL

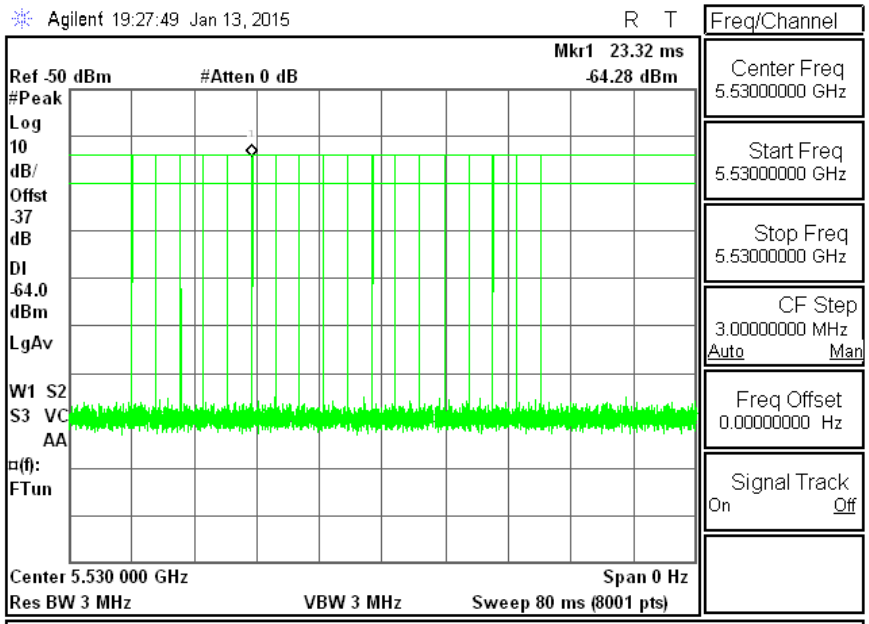
All tests were performed at a channel center frequency of 5530 MHz.

4.4.2. RADAR WAVEFORMS AND TRAFFIC

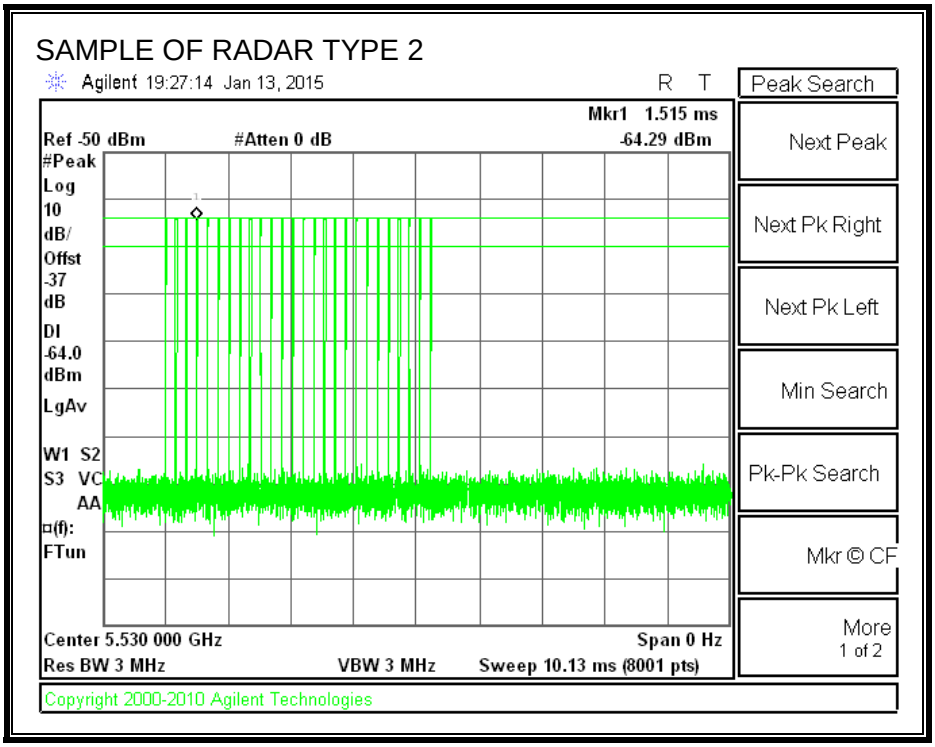
RADAR WAVEFORMS



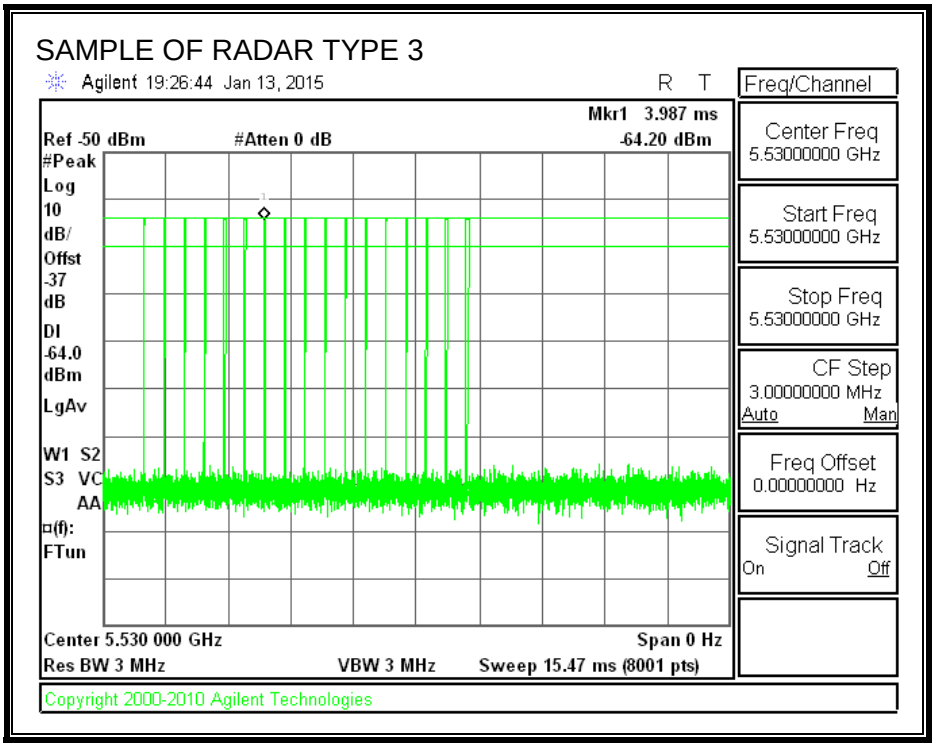
SAMPLE OF RADAR TYPE 1

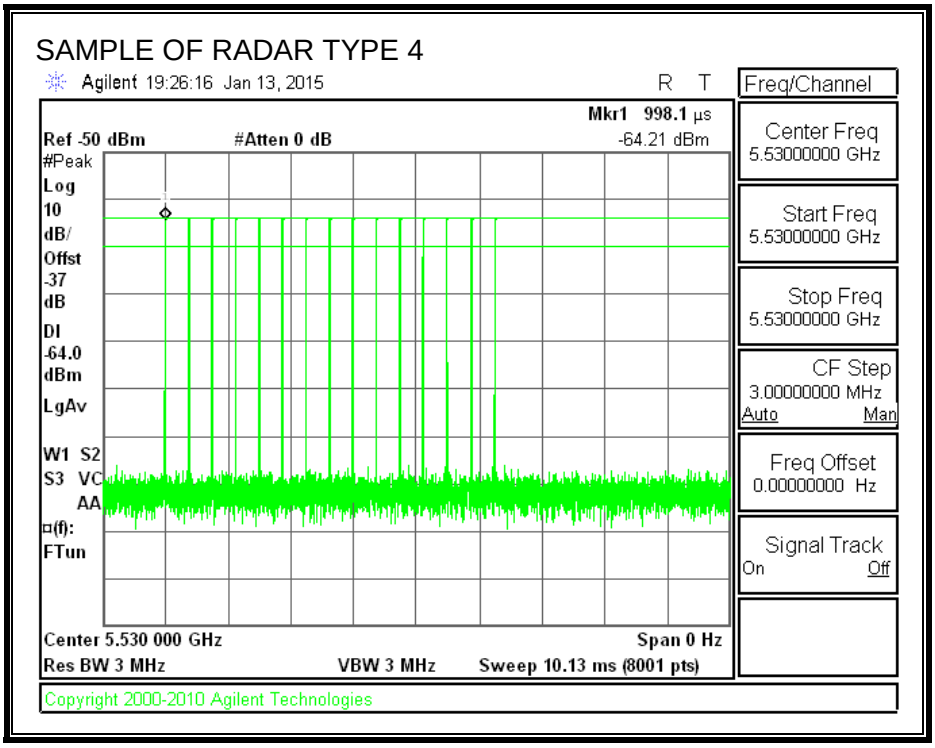


SAMPLE OF RADAR TYPE 2

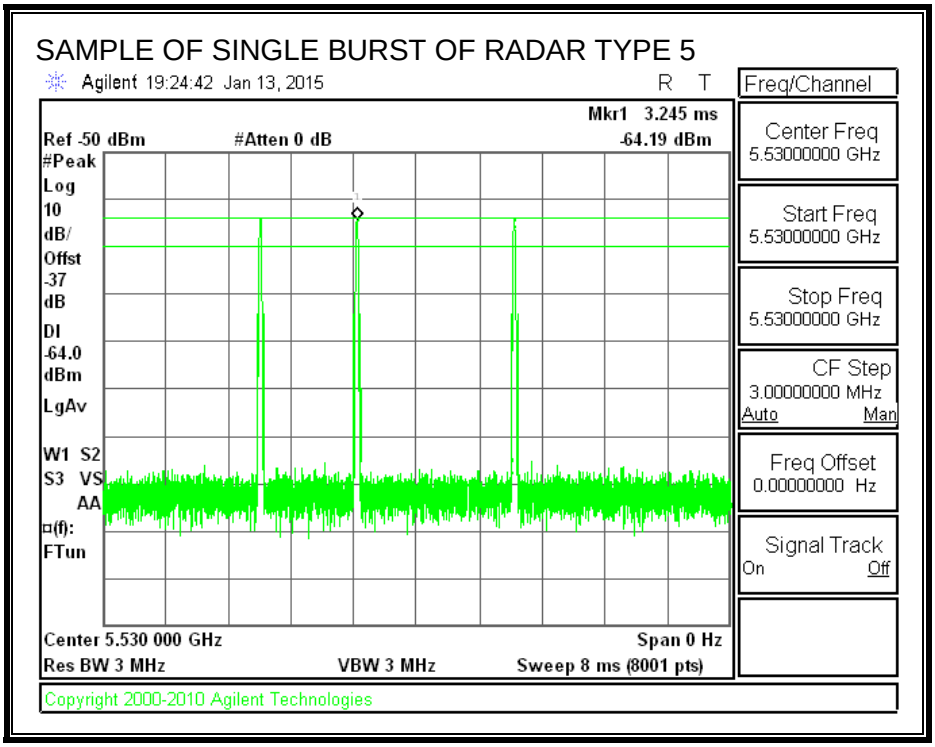


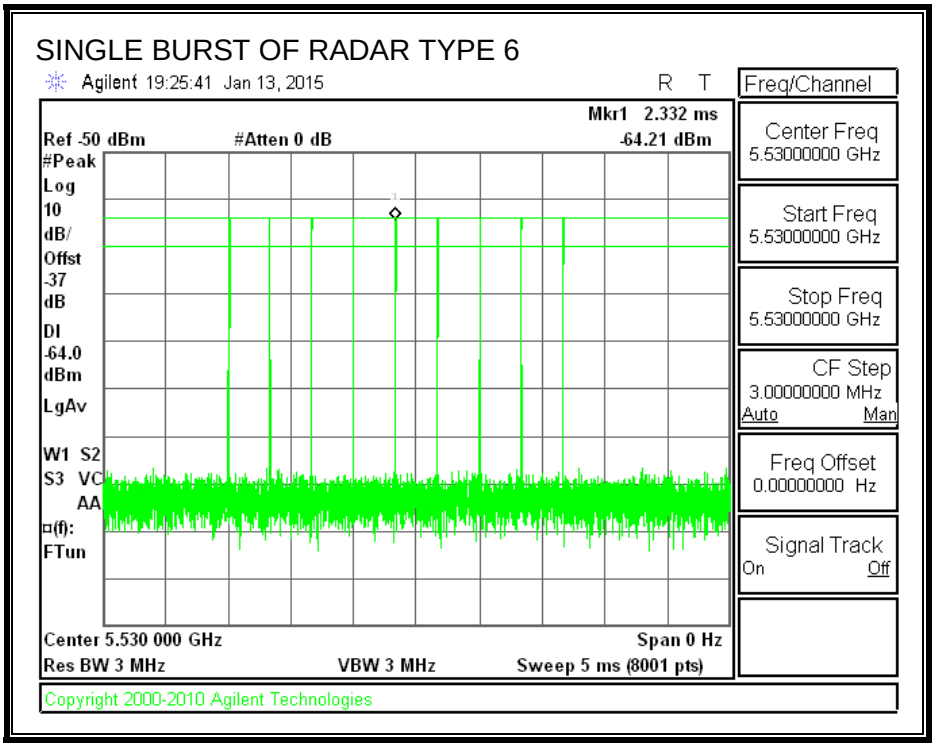
SAMPLE OF RADAR TYPE 3



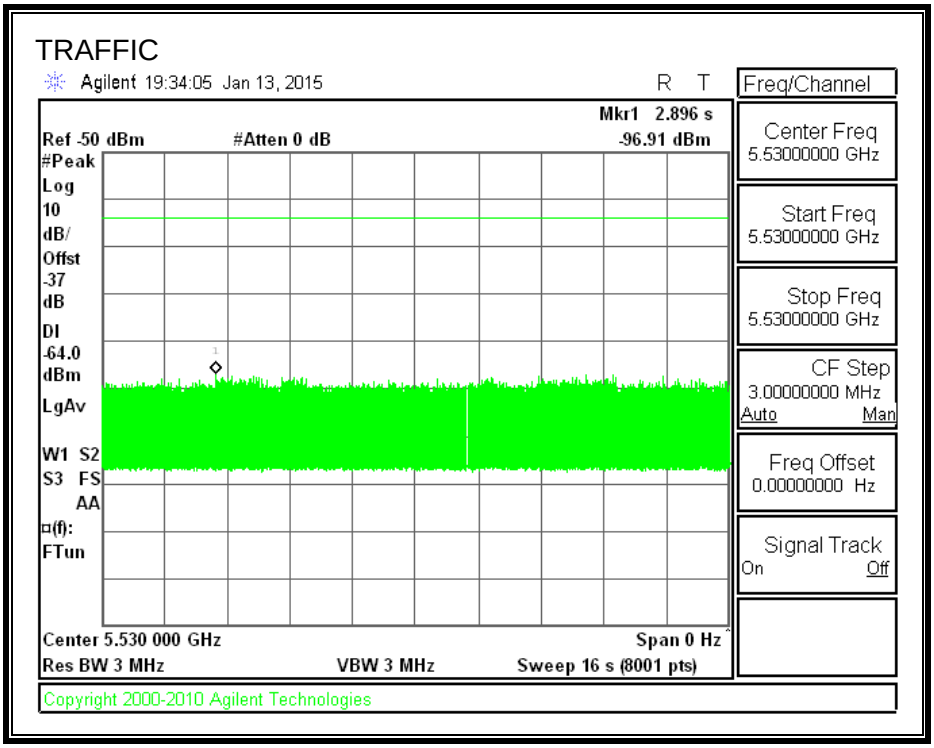


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





TRAFFIC



4.4.1. 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)
29.85	124.6	94.8	34.8

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)
30.86	67.5	36.6	1.9

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)
30.19	123.7	93.5	58.8

QUALITATIVE RESULTS

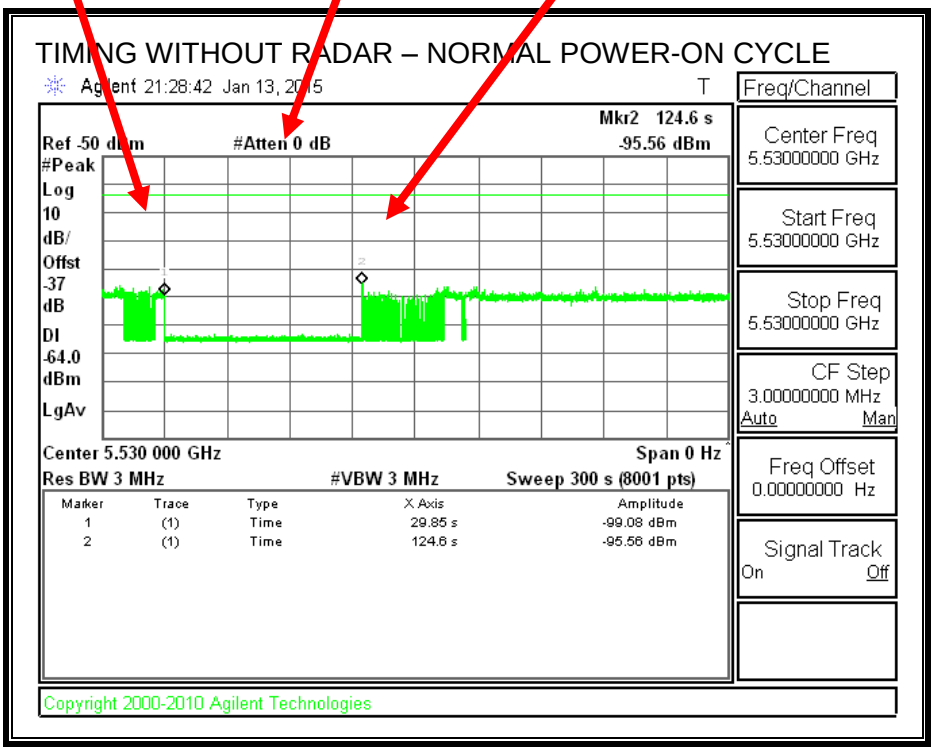
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within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

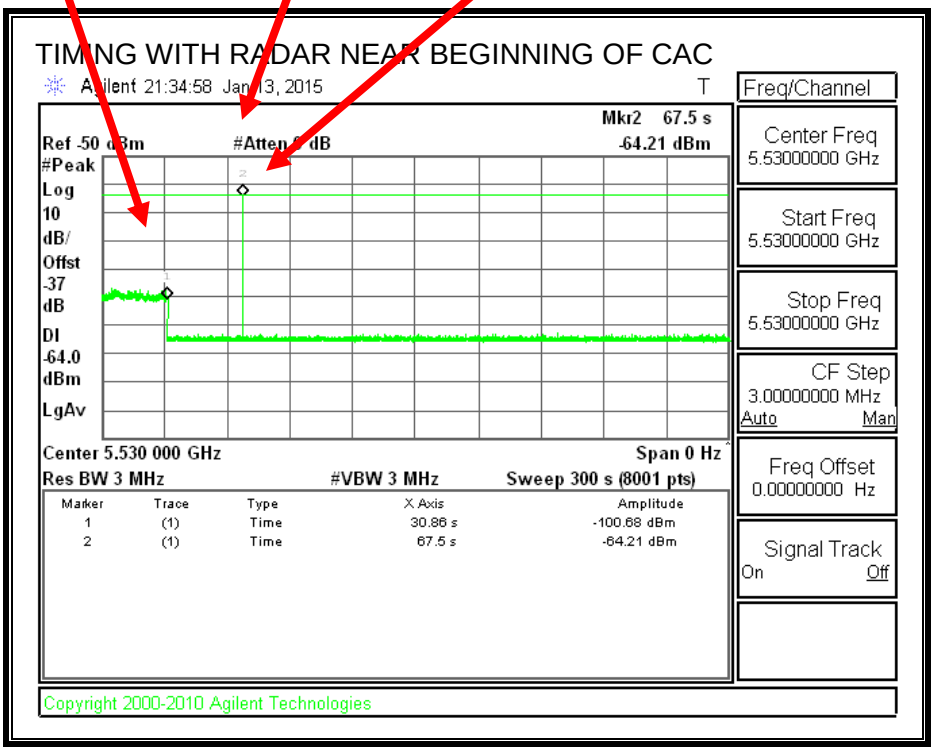
End of CAC
Traffic is Initiated



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



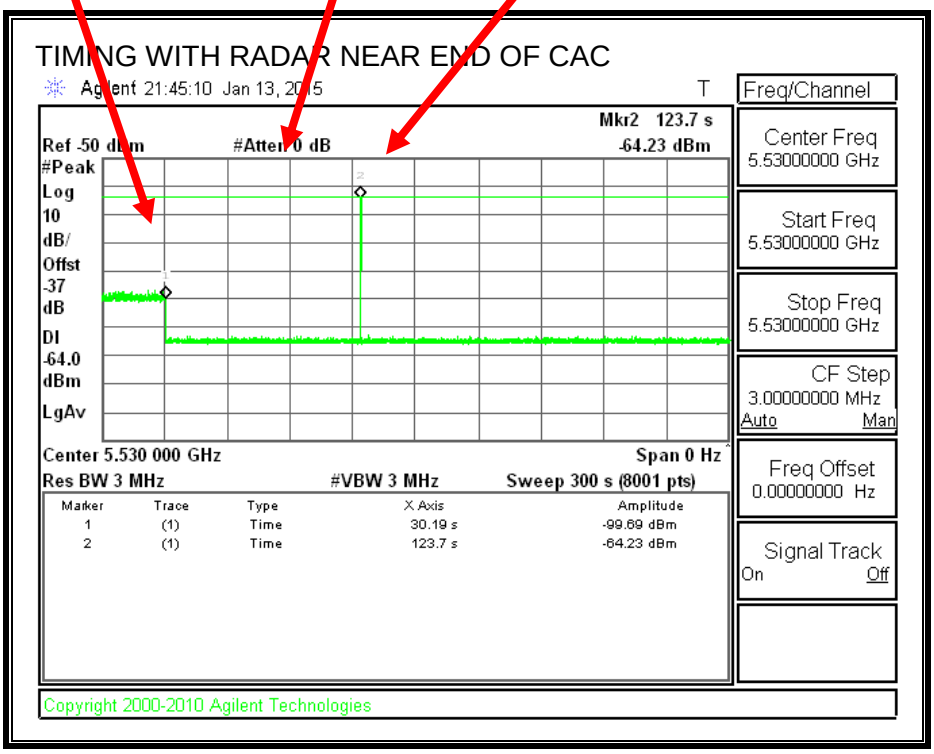
No EUT transmissions were observed after the radar signal.

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.

4.4.2. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

4.4.3. 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)

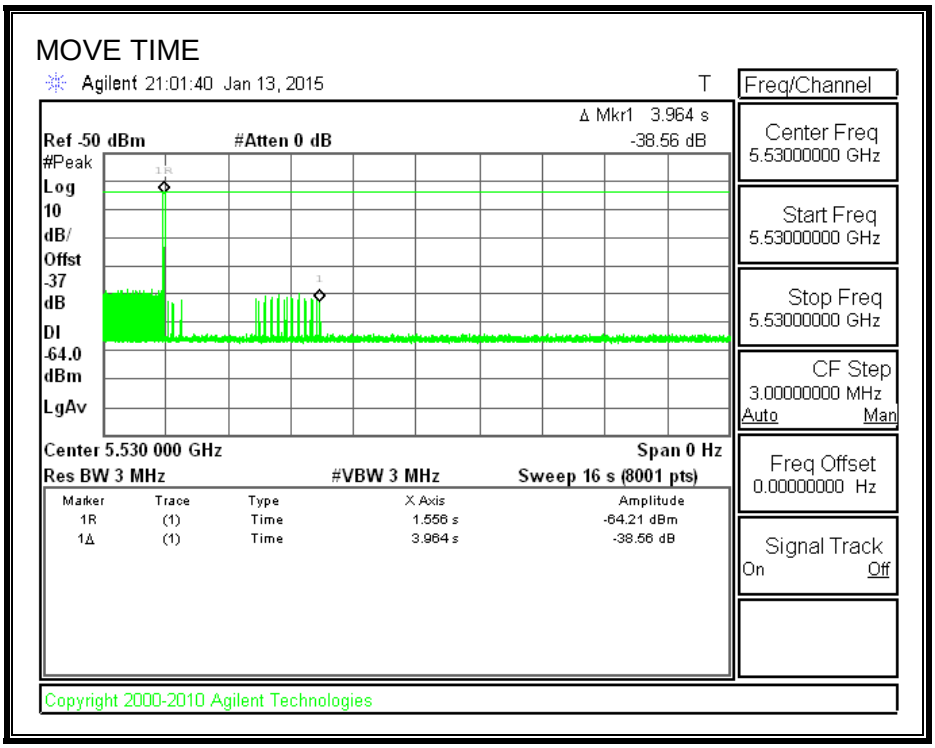
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

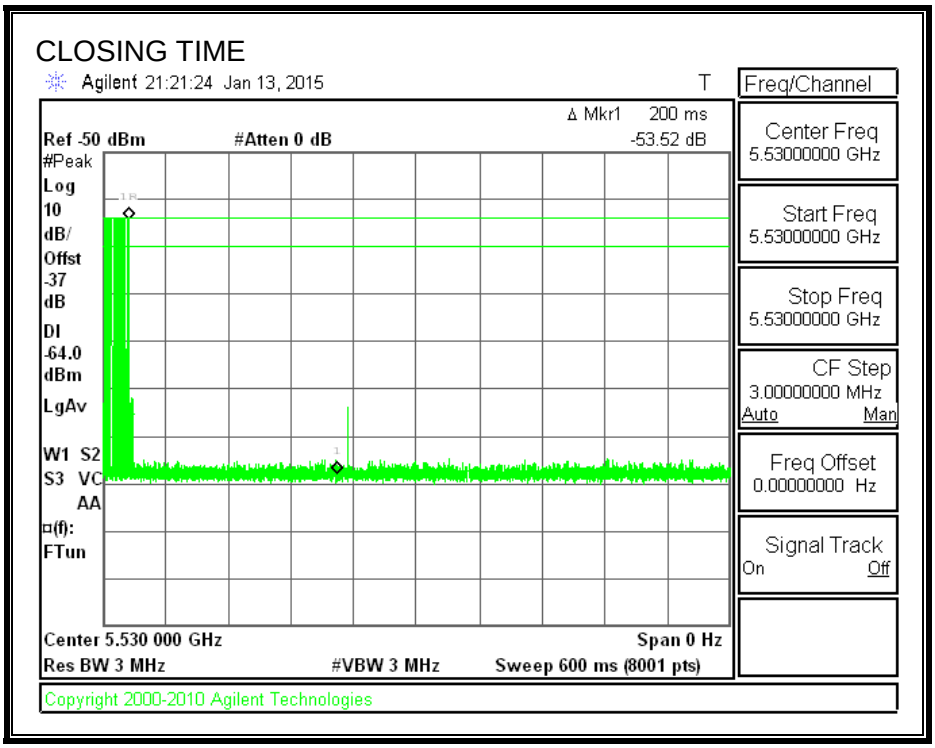
Channel Move Time (sec)	Limit (sec)
3.964	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
46.0	60

MOVE TIME



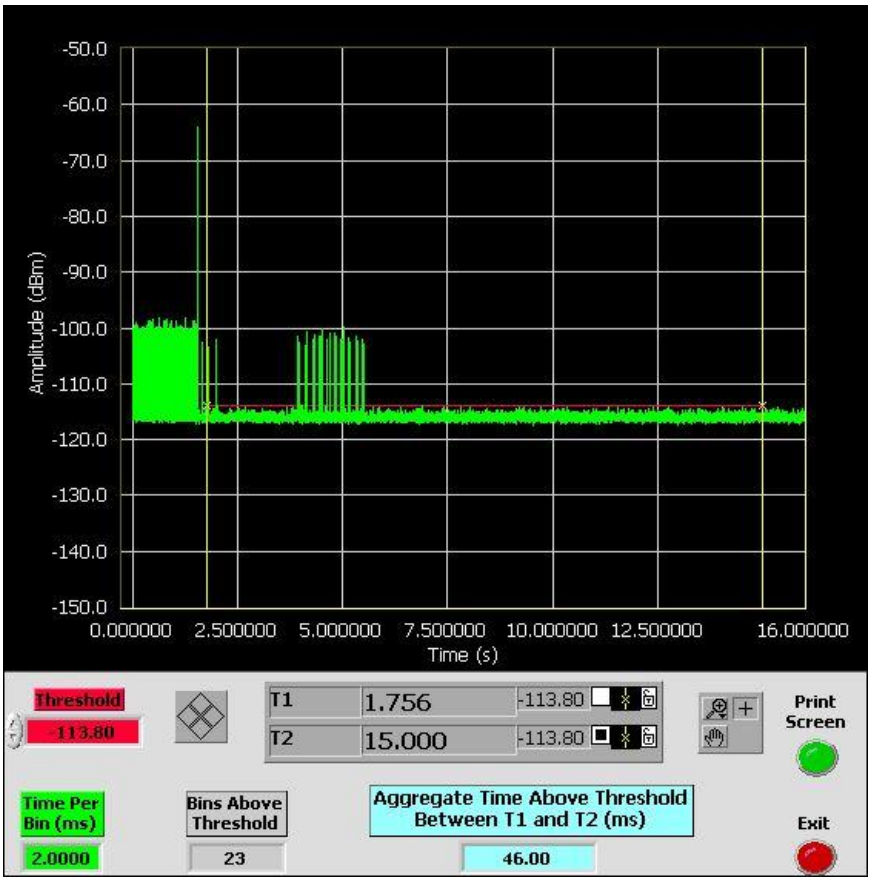
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

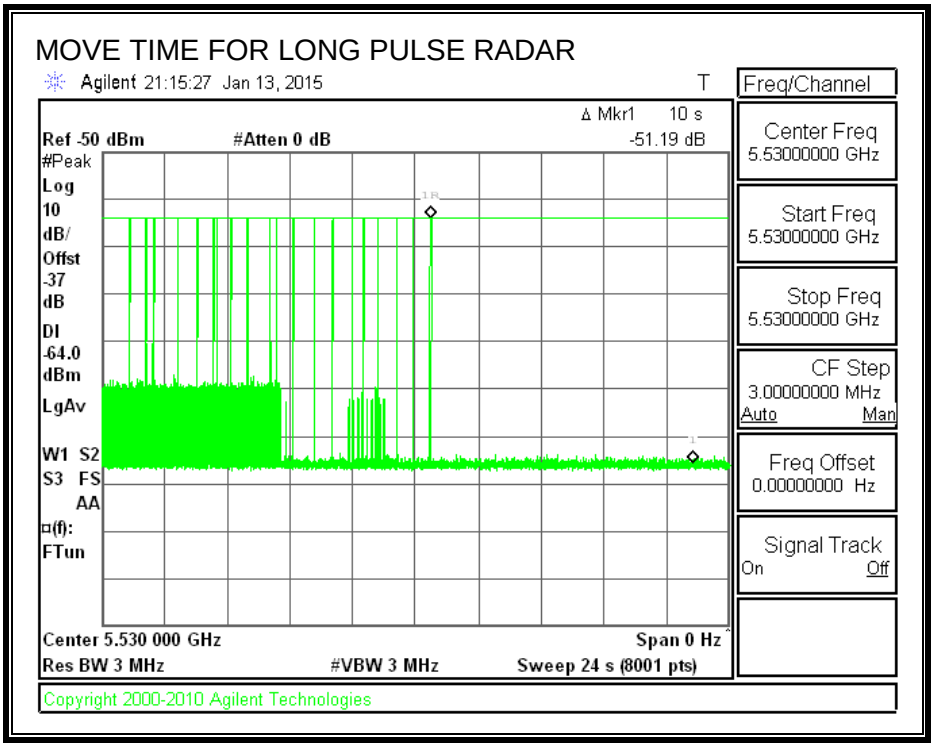
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

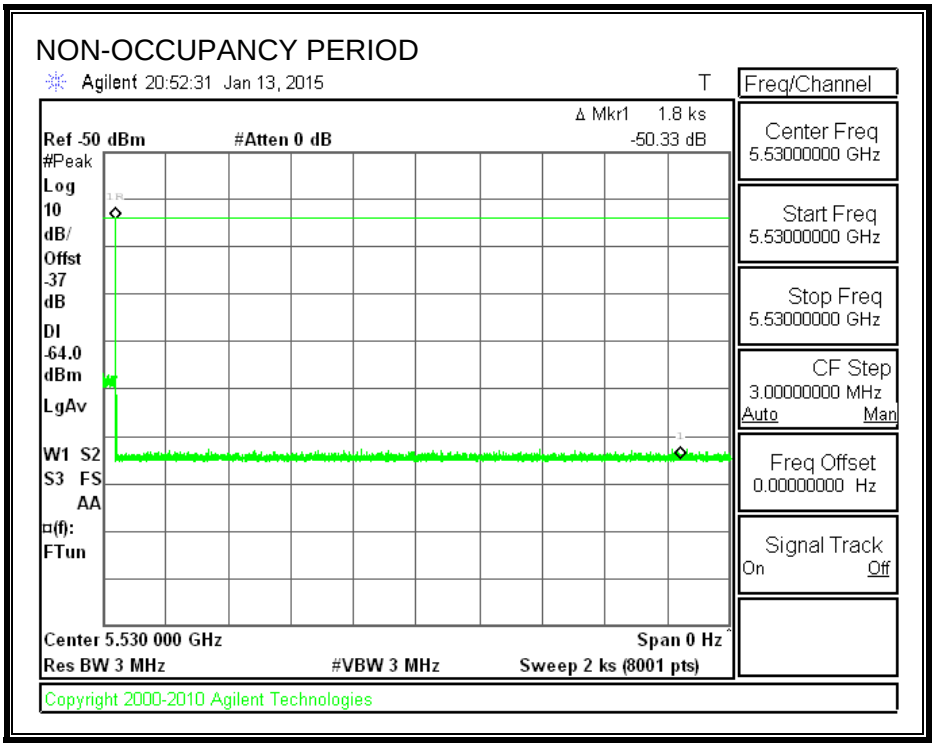
The traffic ceases prior to 10 seconds after the end of the radar waveform.



4.4.1. NON-OCCUPANCY PERIOD

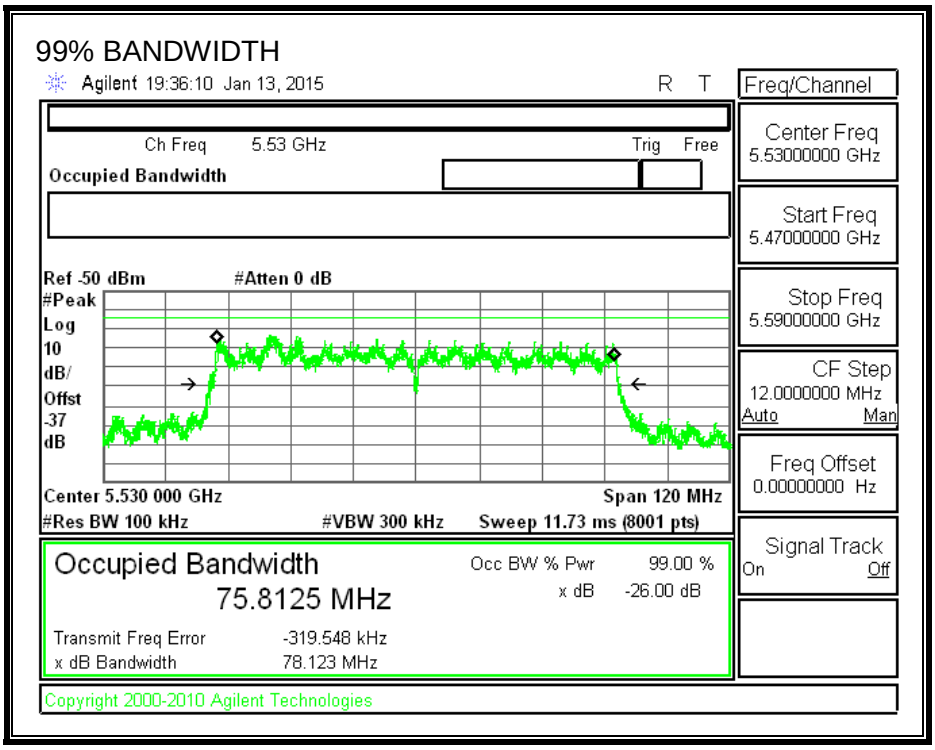
RESULTS

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



4.4.2. 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 (%)
5490	5570	80	75.813	105.5	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
5489	10	0	0	
5490	10	10	100	FL
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	10	10	100	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5530	10	9	90	
5535	10	10	100	
5540	10	10	100	
5545	10	10	100	
5550	10	10	100	
5555	10	10	100	
5560	10	10	100	
5565	10	10	100	
5570	10	10	100	FH
5571	10	0	0	

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	96.67	60	Pass
FCC Short Pulse Type 4	30	90.00	60	Pass
Aggregate		95.83	80	Pass
FCC Long Pulse Type 5	30	90.00	80	Pass
FCC Hopping Type 6	81	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	878	61	A	Yes
1003	718	74	A	Yes
1004	898	59	A	Yes
1005	838	63	A	Yes
1006	658	81	A	Yes
1007	798	67	A	Yes
1008	638	83	A	Yes
1009	698	76	A	Yes
1010	558	95	A	Yes
1011	818	65	A	Yes
1012	738	72	A	Yes
1013	518	102	A	Yes
1014	758	70	A	Yes
1015	938	57	A	Yes
1016	858	62	B	Yes
1017	1305	41	B	Yes
1018	2157	25	B	Yes
1019	1435	37	B	Yes
1020	1108	48	B	Yes
1021	1778	30	B	Yes
1022	1734	31	B	Yes
1023	2527	21	B	Yes
1024	1290	41	B	Yes
1025	1500	36	B	Yes
1026	2481	22	B	Yes
1027	1596	34	B	Yes
1028	829	64	B	Yes
1029	2697	20	B	Yes
1030	1062	50	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	3.2	172.00	26	Yes
2002	2.1	200.00	29	Yes
2003	3.6	153.00	24	Yes
2004	3.2	214.00	25	Yes
2005	1.9	188.00	23	Yes
2006	2.5	159.00	27	Yes
2007	2.1	162.00	25	Yes
2008	1.3	166.00	23	Yes
2009	1.5	152.00	29	Yes
2010	4	199.00	23	Yes
2011	1.2	213.00	26	Yes
2012	1.5	164.00	29	Yes
2013	2.7	158.00	24	Yes
2014	2.2	178.00	26	Yes
2015	3.1	229.00	27	Yes
2016	4.9	212.00	26	Yes
2017	2.7	223.00	23	Yes
2018	1.9	171.00	23	Yes
2019	1.3	197.00	29	Yes
2020	4.7	180.00	24	Yes
2021	1.3	214.00	23	Yes
2022	4.1	160.00	28	Yes
2023	3.1	184.00	29	Yes
2024	1.2	196.00	25	Yes
2025	2.3	230.00	26	Yes
2026	2.6	181.00	27	Yes
2027	4.9	154.00	27	Yes
2028	1.1	156.00	28	Yes
2029	4.1	186.00	24	Yes
2030	2.2	219.00	27	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	9.1	498.00	17	Yes
3002	6.1	458.00	18	Yes
3003	7.1	483.00	17	Yes
3004	5.3	451.00	17	Yes
3005	9.6	349.00	16	Yes
3006	9.6	426.00	18	Yes
3007	6.4	328.00	17	Yes
3008	7.4	316.00	18	Yes
3009	6	423.00	17	Yes
3010	9.6	496.00	17	No
3011	5.8	458.00	18	Yes
3012	5.4	415.00	16	Yes
3013	6.2	279.00	16	Yes
3014	5.4	337.00	18	Yes
3015	7.7	254.00	16	Yes
3016	8.2	326.00	17	Yes
3017	9.1	419.00	16	Yes
3018	8.9	355.00	16	Yes
3019	7.9	293.00	16	Yes
3020	6.4	438.00	18	Yes
3021	7.5	466.00	16	Yes
3022	9.4	316.00	16	Yes
3023	8.9	400.00	18	Yes
3024	7.5	495.00	18	Yes
3025	8.4	320.00	18	Yes
3026	5	404.00	18	Yes
3027	8.6	370.00	18	Yes
3028	9.9	399.00	16	Yes
3029	7.2	369	18	Yes
3030	7.1	430	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	12.8	380.00	15	Yes
4002	10.4	419.00	12	Yes
4003	15.2	404.00	13	Yes
4004	14.5	483.00	12	Yes
4005	12	309.00	16	Yes
4006	10.6	392.00	16	Yes
4007	18.9	266.00	14	No
4008	16.4	282.00	12	Yes
4009	19.2	354.00	12	Yes
4010	15.9	423.00	15	Yes
4011	15.2	298.00	12	Yes
4012	13	371.00	15	Yes
4013	14.1	459.00	12	Yes
4014	15.9	373.00	13	No
4015	15.5	471.00	15	Yes
4016	16.4	342.00	14	Yes
4017	14.9	334.00	15	Yes
4018	15.4	294.00	12	No
4019	18.9	482.00	14	Yes
4020	16.3	290.00	13	Yes
4021	10.6	477.00	13	Yes
4022	12.5	491.00	16	Yes
4023	11.8	361.00	14	Yes
4024	12.8	377.00	16	Yes
4025	13.2	363.00	16	Yes
4026	15.1	300.00	15	Yes
4027	13.6	315.00	14	Yes
4028	19.9	439.00	12	Yes
4029	19.3	350.00	16	Yes
4030	17.9	368.00	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	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	No
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	No
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	258	5490	18	Yes
2	733	5491	18	Yes
3	1208	5492	16	Yes
4	1683	5493	16	Yes
5	2158	5494	12	Yes
6	2633	5495	15	Yes
7	3108	5496	18	Yes
8	3583	5497	15	Yes
9	4058	5498	15	Yes
10	4533	5499	11	Yes
11	5008	5500	17	Yes
12	5483	5501	21	Yes
13	5958	5502	21	Yes
14	6433	5503	13	Yes
15	6908	5504	22	Yes
16	7383	5505	18	Yes
17	7858	5506	22	Yes
18	8333	5507	11	Yes
19	8808	5508	13	Yes
20	9283	5509	14	Yes
21	9758	5510	21	Yes
22	10233	5511	15	Yes
23	10708	5512	14	Yes
24	11183	5513	21	Yes
25	11658	5514	17	Yes
26	12133	5515	17	Yes
27	12608	5516	15	Yes
28	13083	5517	15	Yes
29	13558	5518	15	Yes
30	14033	5519	22	Yes
31	14508	5520	17	Yes
32	14983	5521	14	Yes
33	15458	5522	13	Yes
34	15933	5523	19	Yes
35	16408	5524	20	Yes
36	16883	5525	20	Yes
37	17358	5526	14	Yes
38	17833	5527	17	Yes
39	18308	5528	15	Yes
40	18783	5529	14	Yes

TYPE 6 DETECTION PROBABILITY (CONTINUED)

41	19258	5530	13	Yes
42	19733	5531	23	Yes
43	20208	5532	18	Yes
44	20683	5533	25	Yes
45	21158	5534	18	Yes
46	21633	5535	21	Yes
47	22108	5536	17	Yes
48	22583	5537	24	Yes
49	23058	5538	23	Yes
50	23533	5539	27	Yes
51	24008	5540	14	Yes
52	24483	5541	9	Yes
53	24958	5542	15	Yes
54	25433	5543	16	Yes
55	25908	5544	12	Yes
56	26383	5545	14	Yes
57	26858	5546	15	Yes
58	27333	5547	22	Yes
59	27808	5548	14	Yes
60	28283	5549	22	Yes
61	28758	5550	16	Yes
62	29233	5551	15	Yes
63	29708	5552	19	Yes
64	30183	5553	19	Yes
65	30658	5554	17	Yes
66	31133	5555	13	Yes
67	31608	5556	12	Yes
68	32083	5557	19	Yes
69	32558	5558	14	Yes
70	-32503	5559	16	Yes
71	-32028	5560	23	Yes
72	-31553	5561	14	Yes
73	-31078	5562	16	Yes
74	-30603	5563	15	Yes
75	-30128	5564	17	Yes
76	-29653	5565	22	Yes
77	-29178	5566	16	Yes
78	-28703	5567	19	Yes
79	-28228	5568	14	Yes
80	-27753	5569	20	Yes
81	-27278	5570	21	Yes

5. BRIDGE MODE RESULTS

Per KDB 905462, Section 5.1 (footnote 1):

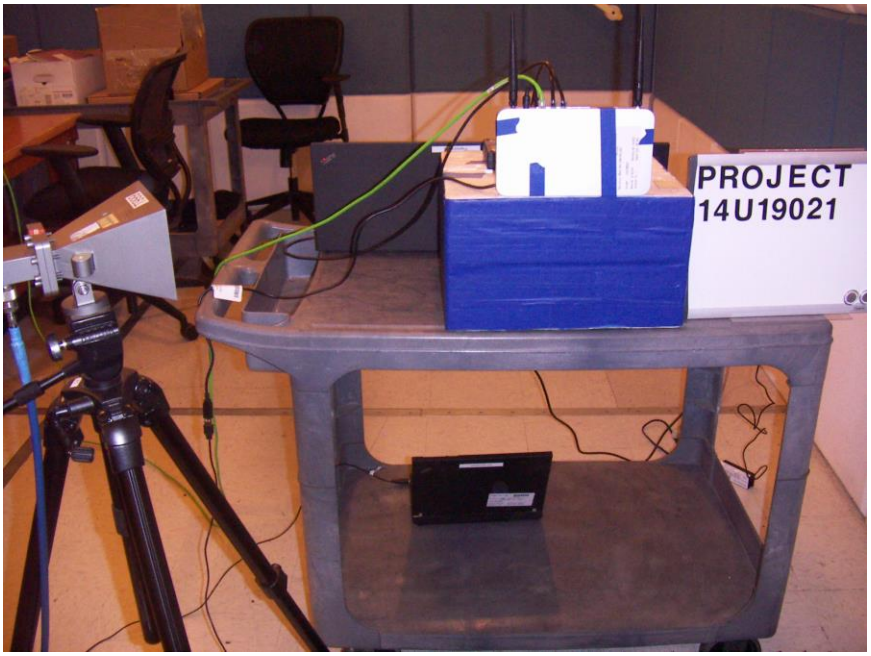
Networks Access Points with Bridge and/or MESH modes of operation are permitted to operate in the DFS bands but must employ a DFS function. The functionality of the Bridge mode as specified in §15.403(a) must be validated in the DFS test report. Devices operating as relays must also employ DFS function. The method used to validate the functionality must be documented and validation data must be documented. Bridge mode can be validated by performing a test statistical performance check (Section 7.8.4) on any one of the radar types. This is an abbreviated test to verify DFS functionality. MESH mode operational methodology must be submitted in the application for certification for evaluation by the FCC.

This device does not support Bridge Mode, therefore this test was not performed.

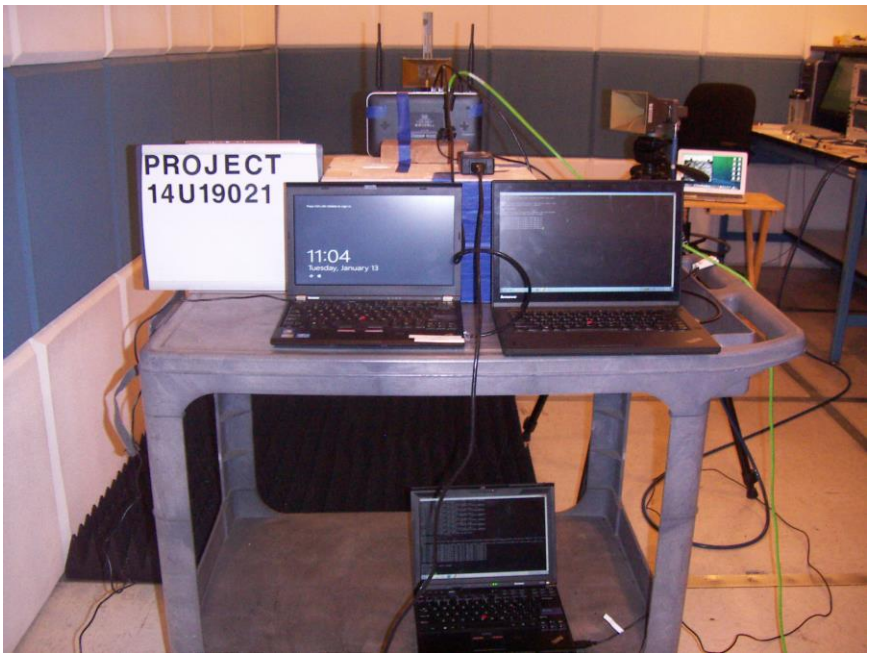
6. SETUP PHOTOS

DYNAMIC FREQUENCY SELECTION MEASUREMENT SETUP

DFS FRONT PHOTO



DFS BACK PHOTO



END OF REPORT