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

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER: AP-7522

FCC ID: UZ7AP7522
IC: 109AN-AP7522

REPORT NUMBER: 14U18416-1

ISSUE DATE: AUGUST 15, 2014

Prepared for
MOTOROLA SOLUTIONS, INC.
6480 VIA DEL ORO DRIVE
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/15/14	Initial Issue	T. Lee

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1. ATTESTATION OF TEST RESULTS

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

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

MODEL: AP-7522

SERIAL NUMBER: 14107522201541

DATE TESTED: JULY 31, 2014

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

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

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

Approved & Released For
UL Verification Services Inc. By:

TIM LEE
PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

DOUG ANDERSON
EMC ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. DYNAMIC FREQUENCY SELECTION

5.1. OVERVIEW

5.1.1. LIMITS

INDUSTRY CANADA

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

RSS-210 Issue 8 A9.3

Note: For the band 5600–5650 MHz, no operation is permitted**.**

Until further notice, devices subject to this annex shall not be capable of transmitting in the band 5600–5650 MHz. This restriction is for the protection of Environment Canada weather radars operating in this band.

FCC

§15.407 (h), FCC KDB 905462 D02 “COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION” and KDB 905462 D03 “U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY”.

Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client (with radar detection)
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode		
	Master	Client **(without DFS)**	Client **(with DFS)**
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

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: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:
-For the Short pulse radar Test Signals this instant is the end of the *Burst*.
-For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.
-For the Long Pulse radar Test Signal this instant is the end of the 12-second period defining the radar waveform.
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 channel changes (an aggregate of approximately 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, any one of radar types 0-4 can be used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. The 99% power bandwidth is measured with 100 kHz resolution bandwidth.

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 shall only be used for the channel availability and detection bandwidth tests. It should be noted that any of the radar test waveforms 0-4 can be used for the channel availability and detection bandwidth tests.

Table 6 – Long Pulse Radar Test Signal

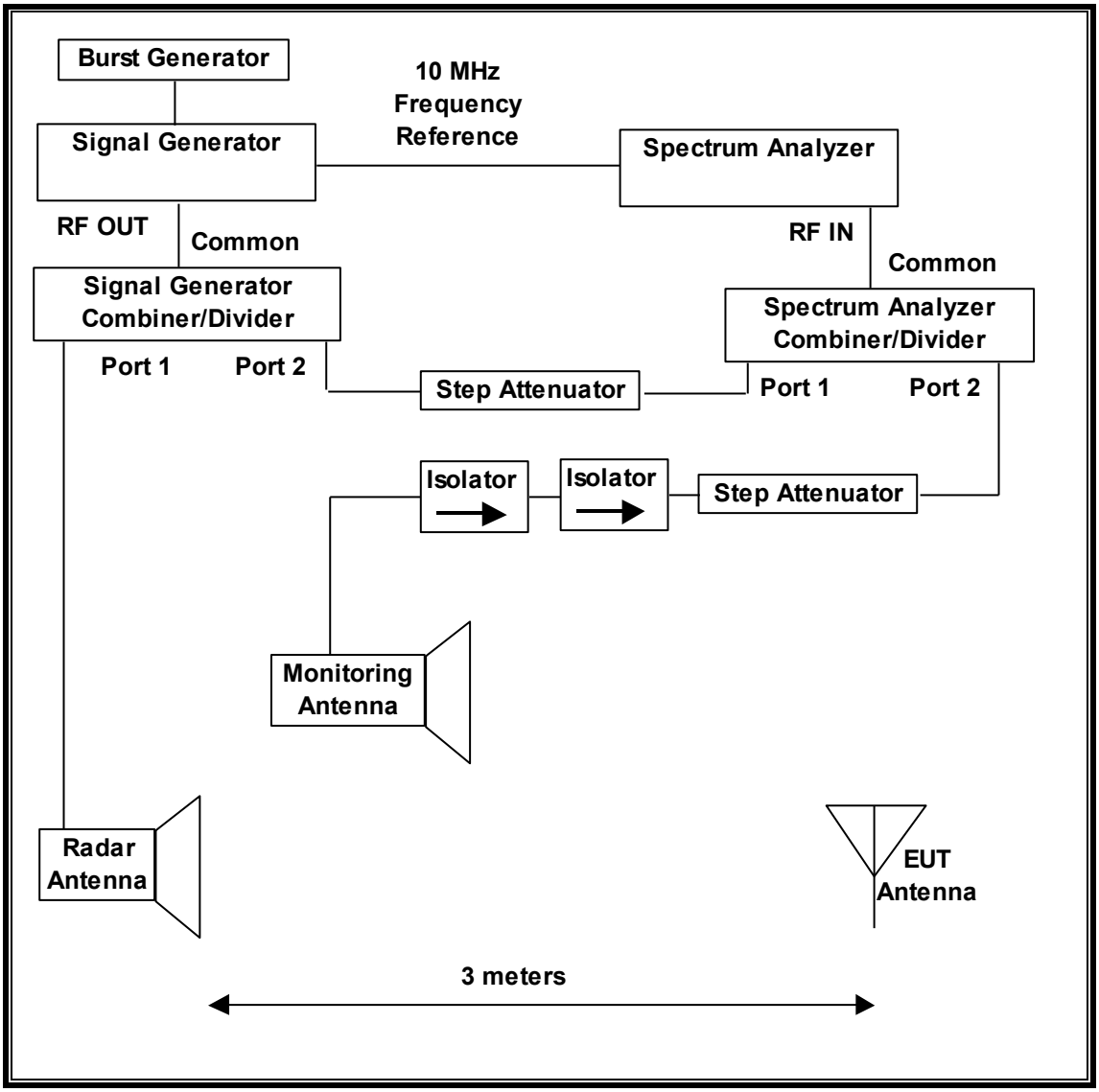
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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.

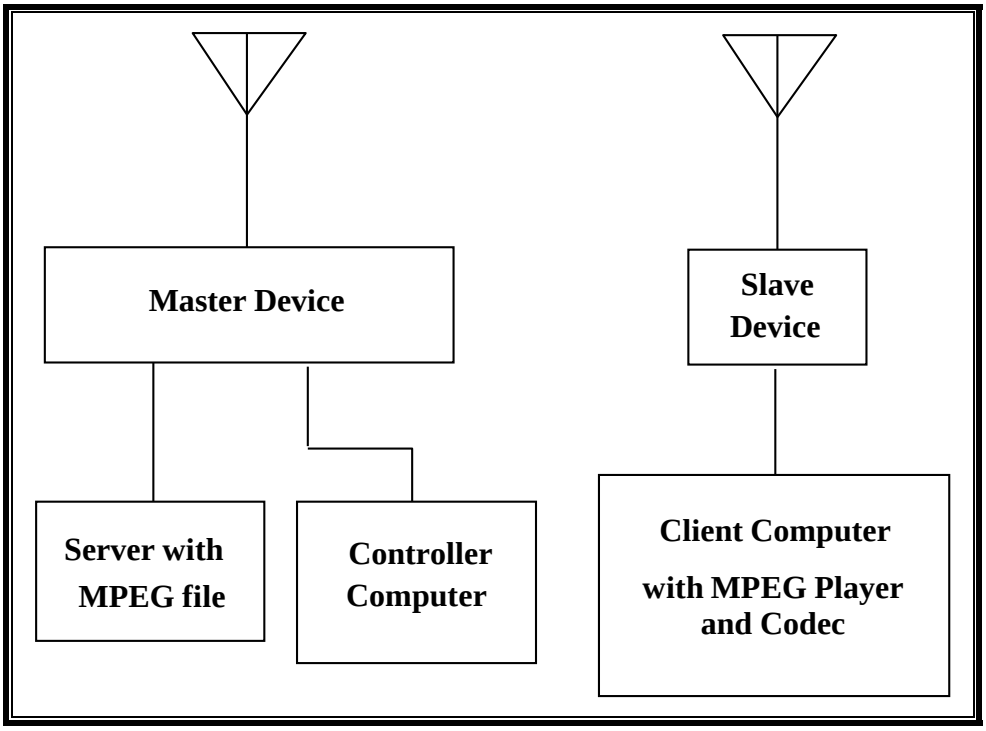
TEST AND MEASUREMENT EQUIPMENT

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

AC Adapter (Controller/Server PC)	HP	PPP012L-E	WBGTK0A1RYQ610	Doc
Note book PC (Server)	HP	Elitebook 8470P	AH050040	Doc
AC Adapter (Server PC)	HP	PPP012L-E	WCNXA0C1R3R8DW	Doc
Note book PC (Controller/Server)	HP	Elitebook 8470P	AH050144	Doc
AC Adapter (Controller/Server PC)	HP	PPP012L-E	WCNXA0C4L3QDDL	Doc
802.11 a/b/g/n/ac USB Wireless Adapter	Cisco	AE6000	12R1060 2307396	Q87-AE6000

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:

AC Adapter (Controller/Server PC)	HP	PPP012L-E	WBGTK0A1RYQ610	Doc
Note book PC (Server)	HP	Elitebook 8470P	AH050040	Doc
AC Adapter (Server PC)	HP	PPP012L-E	WCNXA0C1R3R8DW	Doc
Note book PC (Controller/Server)	HP	Elitebook 8470P	AH050144	Doc
AC Adapter (Controller/Server PC)	HP	PPP012L-E	WCNXA0C4L3QDDL	Doc
802.11 a/b/g/n/ac USB Wireless Adapter	Cisco	AE6000	12R1060 2307396	Q87-AE6000

5.1.4. DESCRIPTION OF EUT

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

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

The EUT supports both Master and Client DFS modes of operation, Client Mode DFS was tested by Sporton see report (FR44180 4-06).

The highest power level within these bands is 27.26 dBm EIRP in the 5250-5350 MHz band and 27.09 dBm EIRP in the 5470-5725 MHz band.

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

The antenna used during testing was the ML-2452-APAG2A1-01 (1.7 dBi Dipole).

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, 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 version 5.7.0.0-203475X.

UNIFORM CHANNEL SPREADING

See Manufacturer’s Attestation.

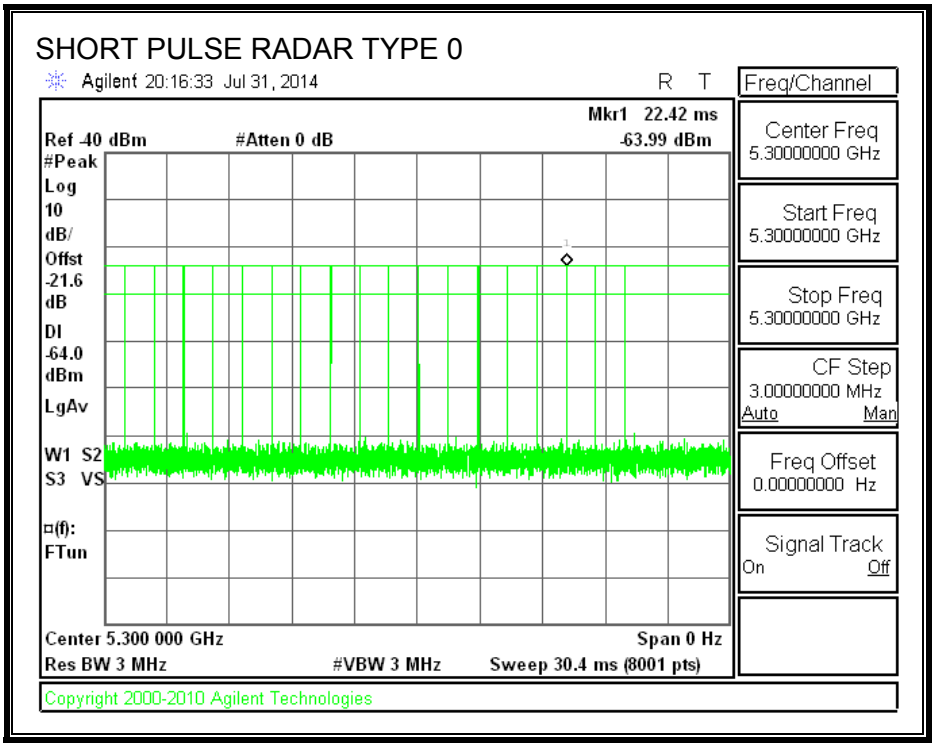
5.2. RESULTS FOR 20 MHz BANDWIDTH

5.2.1. TEST CHANNEL

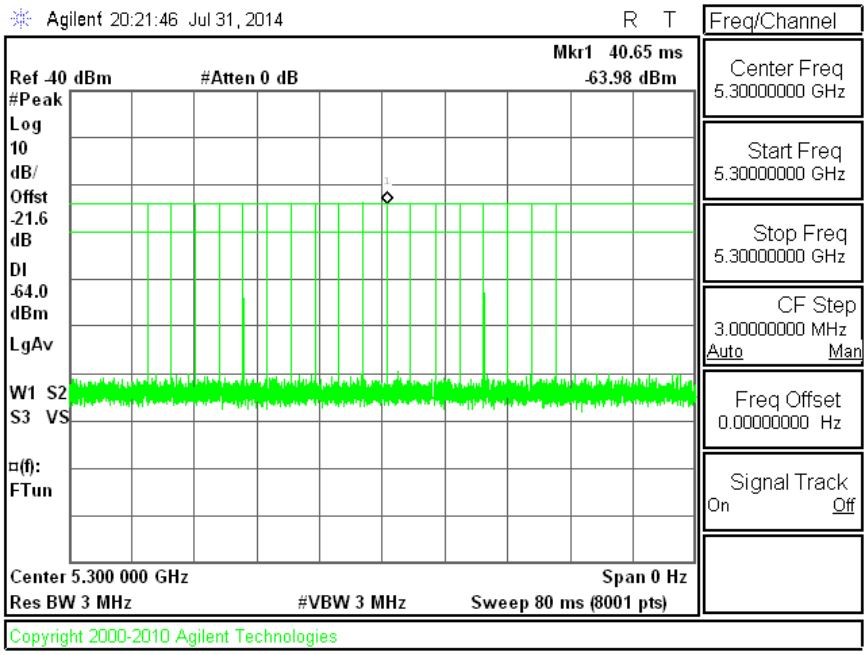
All tests were performed at a channel center frequency of 5300 MHz.

5.2.2. RADAR WAVEFORMS AND TRAFFIC

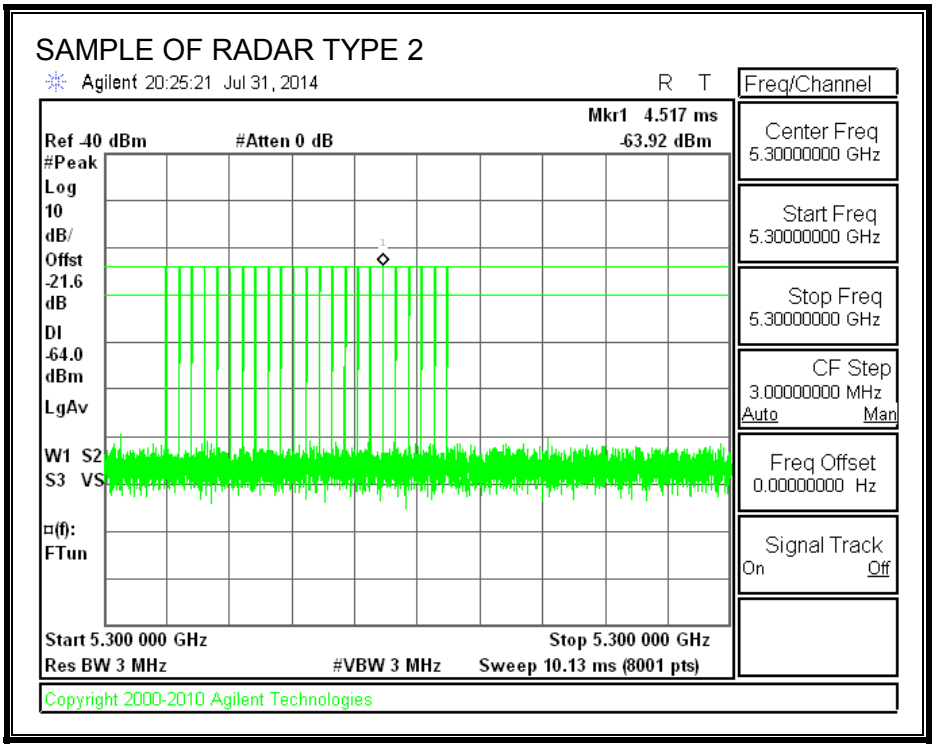
RADAR WAVEFORMS

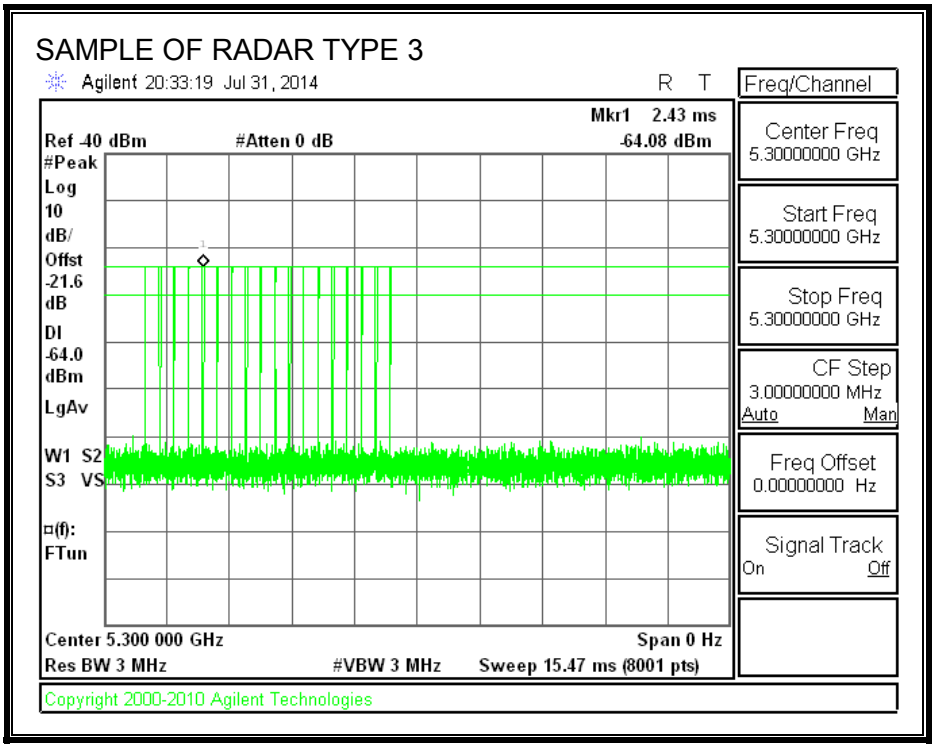


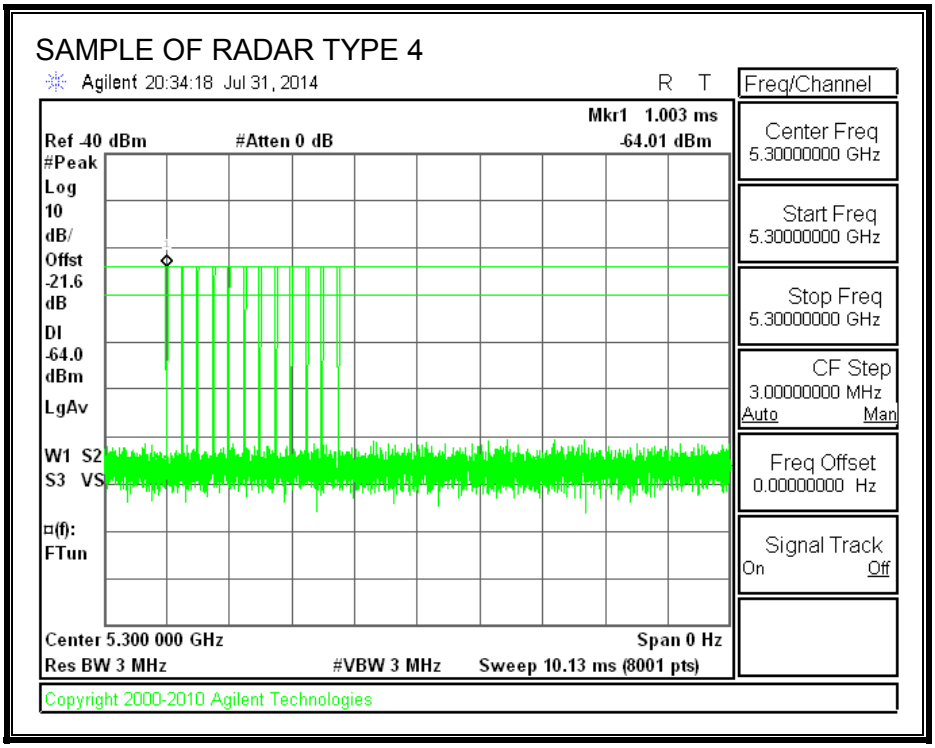
SAMPLE OF RADAR TYPE 1



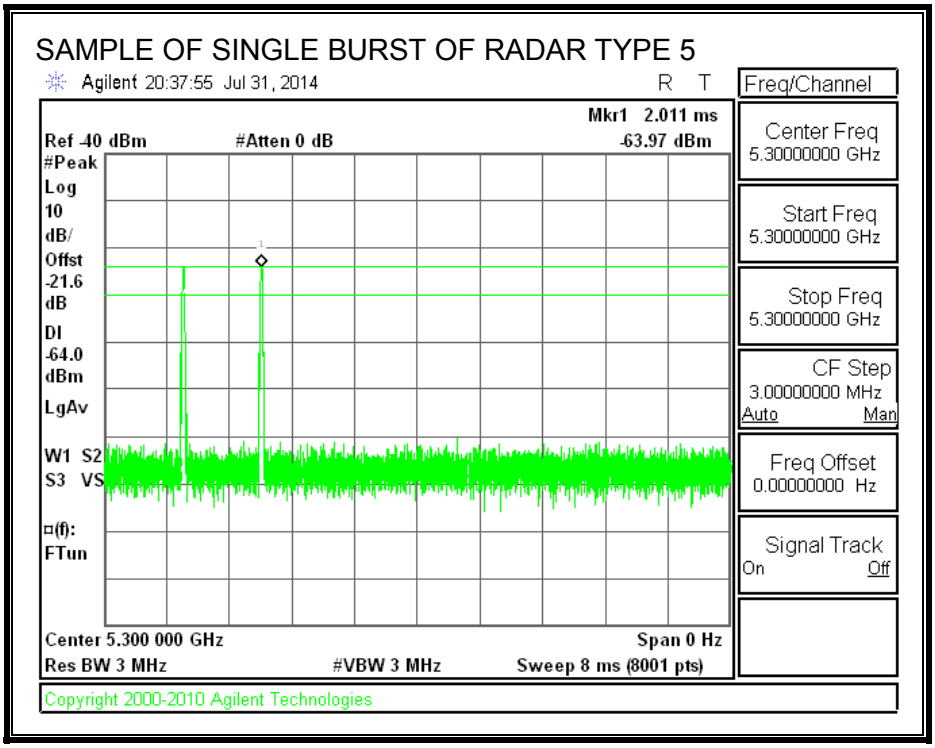
SAMPLE OF RADAR TYPE 2

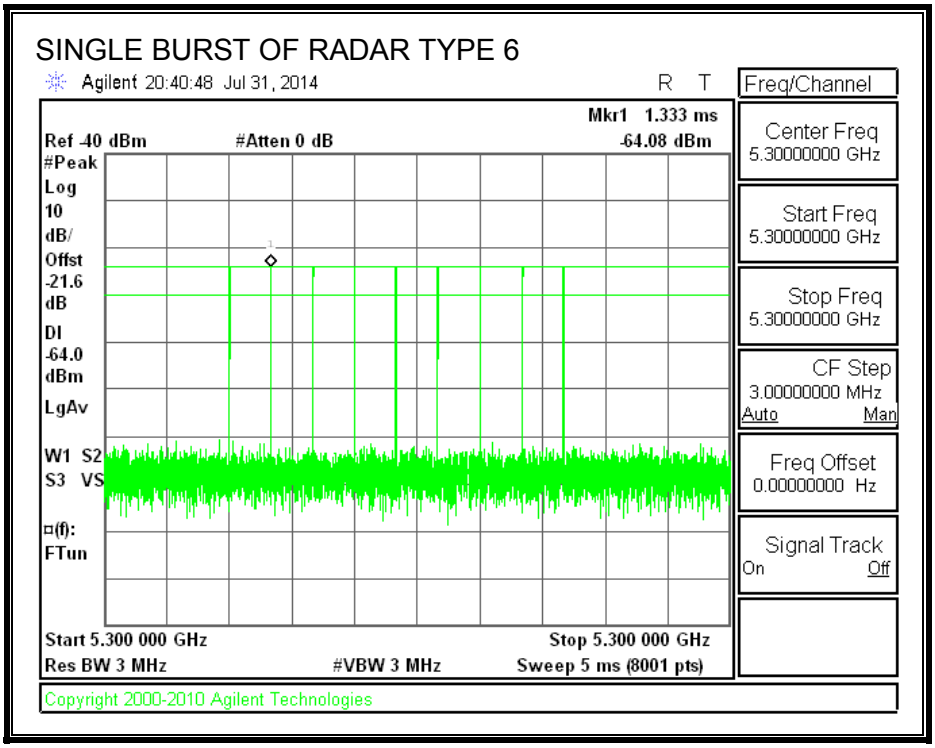




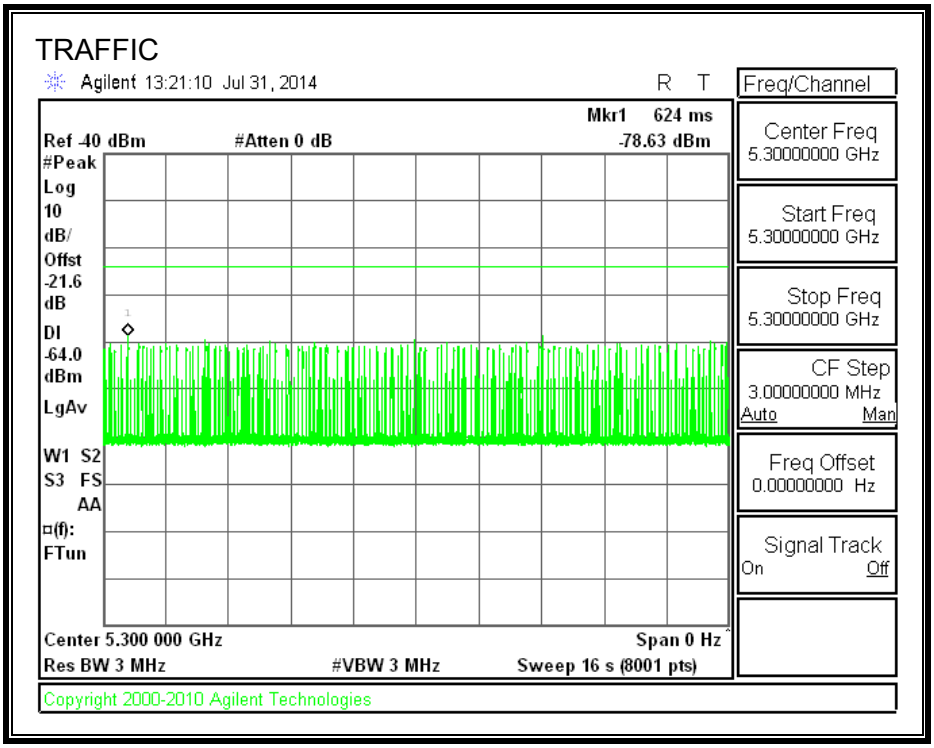


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





TRAFFIC



5.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5300 MHz and commence a CAC period. The time to the re-initialization of traffic was measured as the time required for the EUT to complete the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5300 MHz and commence a CAC period. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5300 MHz and commence a CAC period. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.6	60.6

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	4.775	4.775

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	55.4	55.4

QUANTITATIVE RESULTS BASED ON LOG FILE TIME STAMPS

No Radar Triggered

Beginning of CAC (hh:mm:ss)	End of CAC (hh:mm:ss)	CAC Time (hh:mm:ss)
6:04:18	6:05:18	0:01:00

Radar Near Beginning of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
6:21:26	6:21:30	0:00:04

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
6:36:09	6:37:04	0:00:55

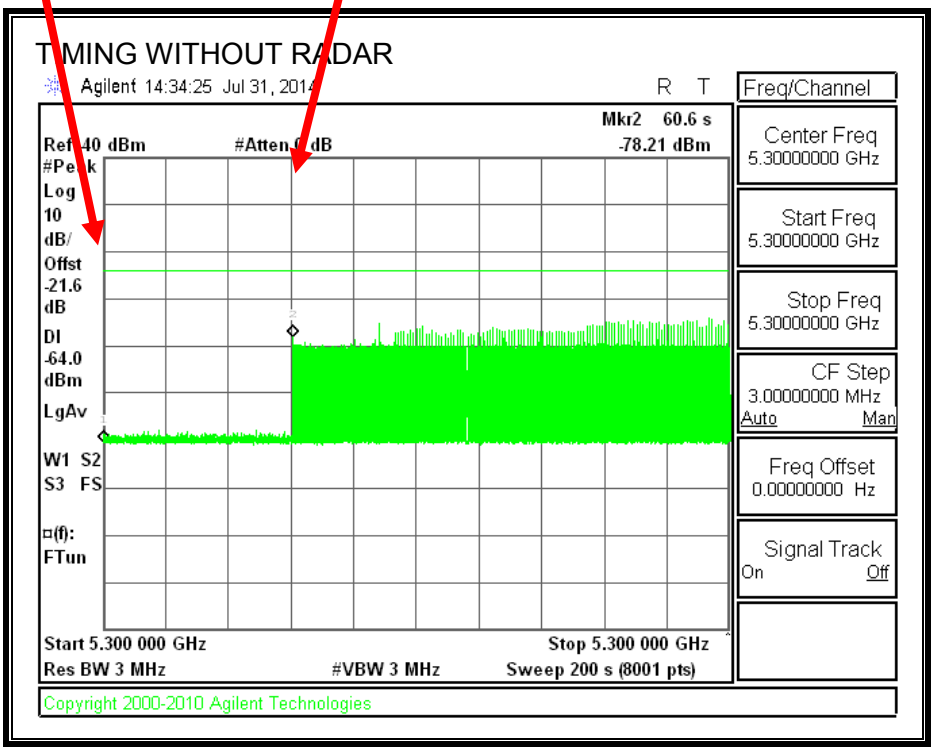
QUALITATIVE RESULTS

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

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

Log File of CAC Timing Without Radar

Jan 01 06:04:18 2014: %KERN-4-WARNING:
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

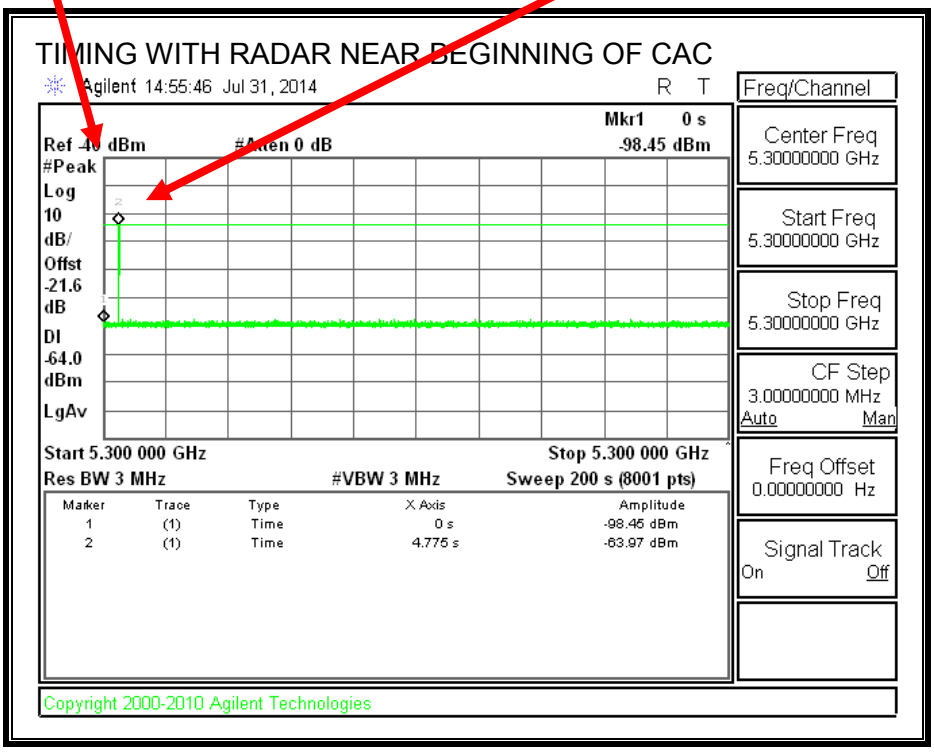
DLS DFS State PRE-ISM Channel Availability Check -> In-Service Monitoring(ISM)

Jan 01 06:05:18 2014: %KERN-4-WARNING:
DLS DFS State PRE-ISM Channel Availability Check -> In-Service Monitoring(ISM).

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the Beginning of CAC

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

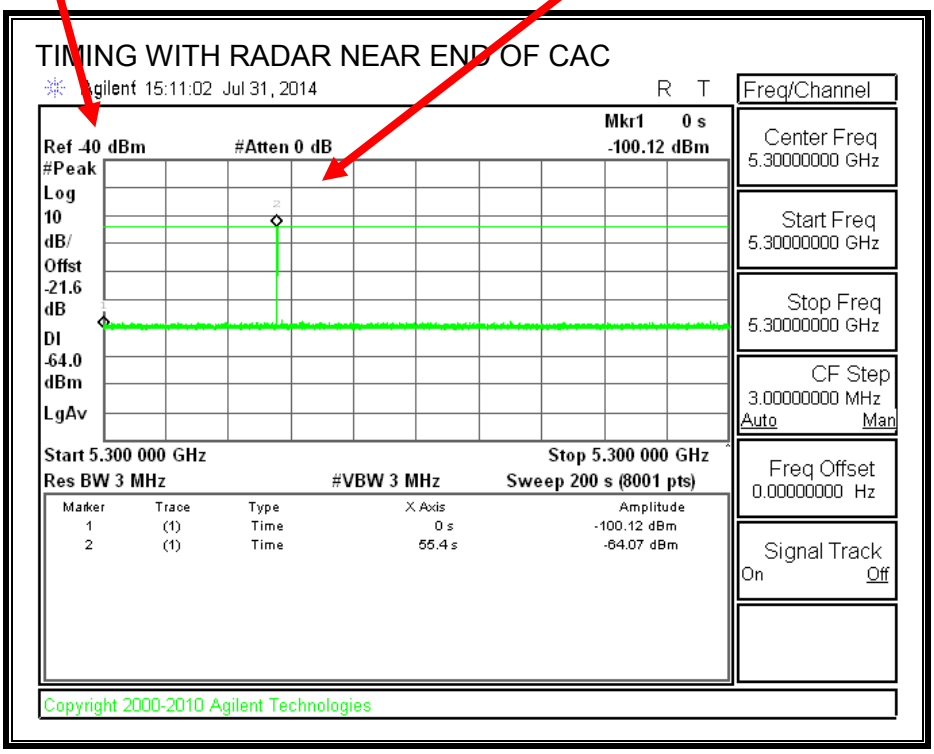
Jan 01 06:21:26 2014: %KERN-4-WARNING:
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

Jan 01 06:21:30 2014: ap7522-160230 : %RADIO-4-RADAR_DETECTED: Radar found on channel 60 freq 5300 MHz

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

Jan 01 06:36:09 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

Jan 01 06:37:04 2014: ap7522-160230 : %RADIO-4-RADAR_DETECTED: Radar found on channel 60 freq 5300 MHz

5.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

5.2.5. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

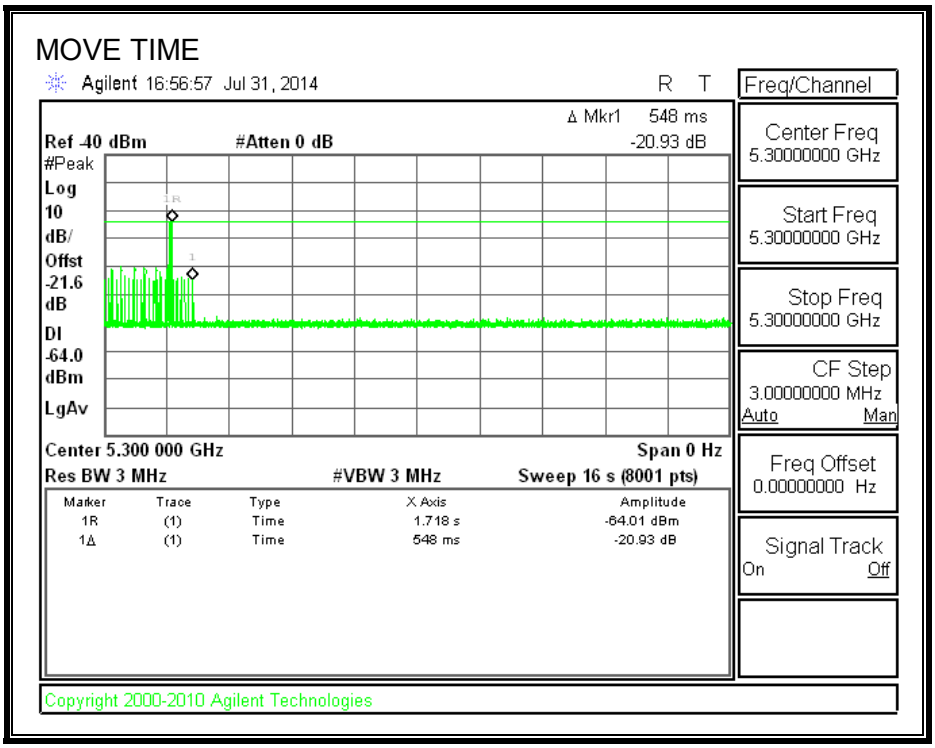
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

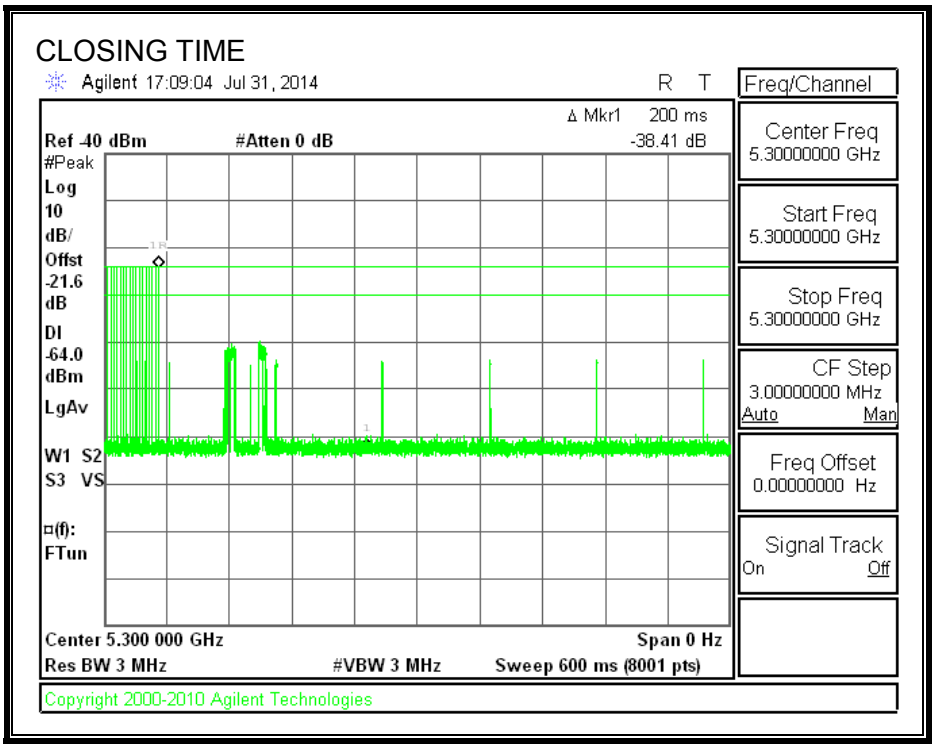
Channel Move Time (sec)	Limit (sec)
0.548	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
10.0	60

MOVE TIME



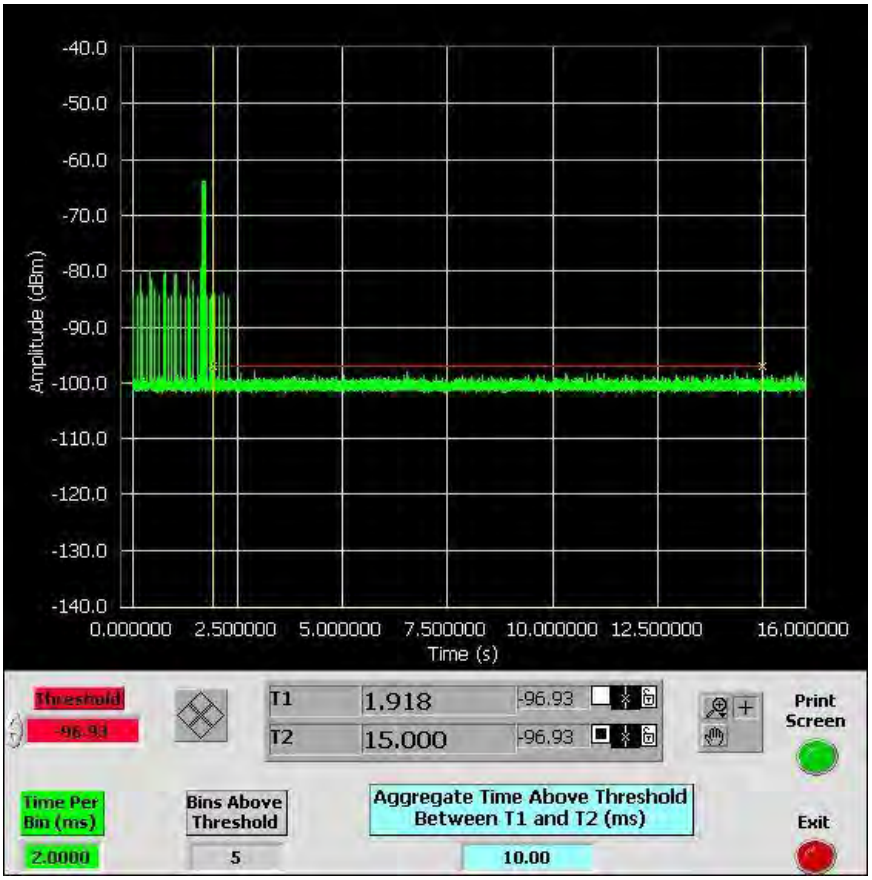
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

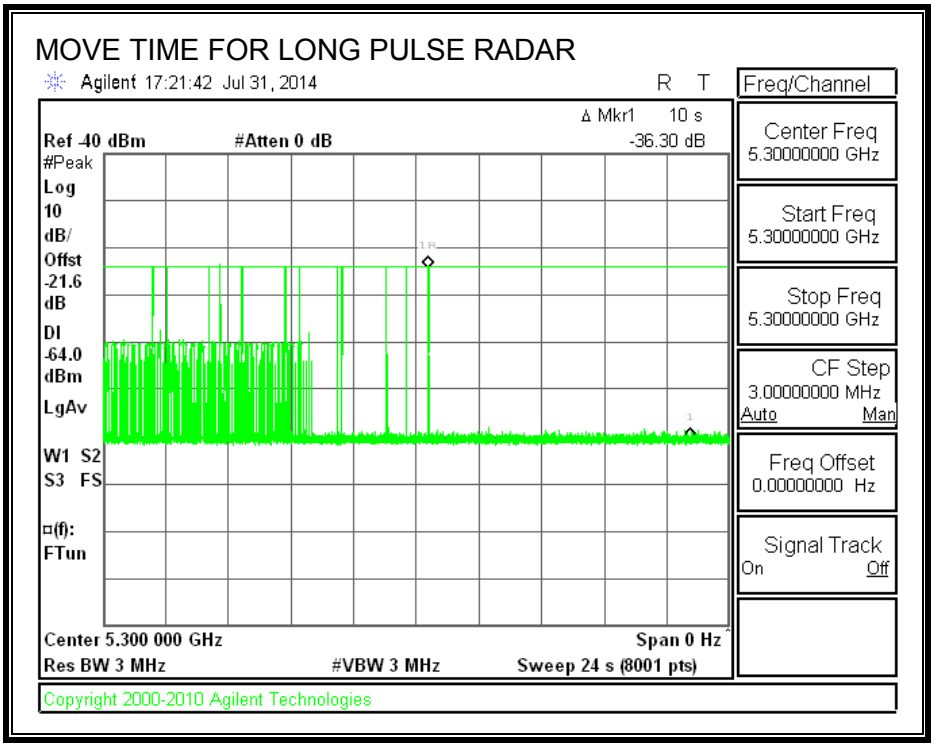
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



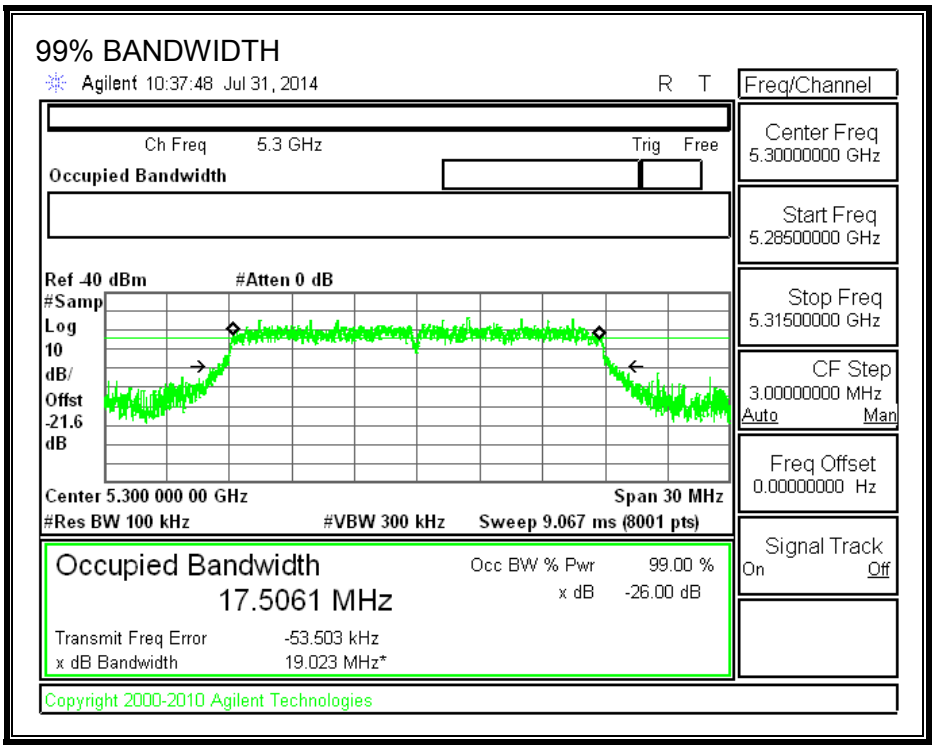
LONG PULSE CHANNEL MOVE TIME

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 (%)
5290	5310	20	17.506	114.2	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
5289	10	0	0	
5290	10	10	100	FL
5295	10	10	100	
5300	10	10	100	
5305	10	10	100	
5310	10	9	90	FH
5311	10	0	0	

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	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	93.33	60	Pass
FCC Short Pulse Type 4	30	96.67	60	Pass
Aggregate		97.50	80	Pass
FCC Long Pulse Type 5	30	93.33	80	Pass
FCC Hopping Type 6	42	80.95	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	818	65	A	Yes
1003	618	86	A	Yes
1004	938	57	A	Yes
1005	798	67	A	Yes
1006	738	72	A	Yes
1007	678	78	A	Yes
1008	758	70	A	Yes
1009	858	62	A	Yes
1010	578	92	A	Yes
1011	658	81	A	Yes
1012	718	74	A	Yes
1013	518	102	A	Yes
1014	778	68	A	Yes
1015	918	58	A	Yes
1016	558	95	B	Yes
1017	853	62	B	Yes
1018	2517	21	B	Yes
1019	1170	46	B	Yes
1020	1386	39	B	Yes
1021	2584	21	B	Yes
1022	2163	25	B	Yes
1023	2684	20	B	Yes
1024	1058	50	B	Yes
1025	1028	52	B	Yes
1026	2768	20	B	Yes
1027	863	62	B	Yes
1028	3026	18	B	Yes
1029	774	69	B	Yes
1030	1798	30	B	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1.5	207.00	23	Yes
2002	3.4	182.00	24	Yes
2003	3.9	230.00	24	Yes
2004	4.4	172.00	24	Yes
2005	1.5	181.00	27	Yes
2006	3.4	205.00	24	Yes
2007	2.1	186.00	23	Yes
2008	5	166.00	25	Yes
2009	1.1	151.00	29	Yes
2010	2	223.00	23	Yes
2011	4.5	221.00	28	Yes
2012	4.3	169.00	25	Yes
2013	1.6	204.00	26	Yes
2014	1.6	224.00	26	Yes
2015	1.7	172.00	24	Yes
2016	1.8	210.00	25	Yes
2017	4.8	219.00	27	Yes
2018	1.3	224.00	27	Yes
2019	4.9	170.00	25	Yes
2020	3	212.00	27	Yes
2021	4.3	176.00	28	Yes
2022	4.2	214.00	26	Yes
2023	5	221.00	27	Yes
2024	2.2	193.00	23	Yes
2025	4.6	220.00	26	Yes
2026	1.8	168.00	26	Yes
2027	4.4	186.00	23	Yes
2028	4.6	178.00	28	Yes
2029	1.8	220.00	29	Yes
2030	1.5	209.00	29	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	8.9	357.00	18	Yes
3002	9.2	328.00	18	Yes
3003	9.9	301.00	18	No
3004	6.8	374.00	16	No
3005	9.3	318.00	16	Yes
3006	5.6	312.00	17	Yes
3007	7.1	432.00	18	Yes
3008	6.1	474.00	18	Yes
3009	7.4	341.00	17	Yes
3010	7.7	381.00	16	Yes
3011	9.4	314.00	16	Yes
3012	7.2	356.00	16	Yes
3013	8.9	254.00	17	Yes
3014	8.9	317.00	16	Yes
3015	6.9	373.00	16	Yes
3016	8.8	413.00	16	Yes
3017	9.5	334.00	17	Yes
3018	9.5	265.00	18	Yes
3019	9.9	451.00	16	Yes
3020	6.8	278.00	16	Yes
3021	6.6	456.00	16	Yes
3022	9.2	265.00	18	Yes
3023	9.2	306.00	18	Yes
3024	5.2	474.00	18	Yes
3025	7.3	370.00	16	Yes
3026	5	479.00	17	Yes
3027	6.9	263.00	16	Yes
3028	6.2	297.00	18	Yes
3029	5.6	313	16	Yes
3030	10	468	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	17	252.00	12	Yes
4002	13.3	278.00	15	Yes
4003	10.4	487.00	13	No
4004	11.4	309.00	16	Yes
4005	15.5	343.00	15	Yes
4006	11.1	259.00	15	Yes
4007	15.2	348.00	16	Yes
4008	11.2	419.00	16	Yes
4009	18	467.00	15	Yes
4010	17.9	263.00	15	Yes
4011	14.9	337.00	15	Yes
4012	10.3	280.00	12	Yes
4013	19.8	499.00	16	Yes
4014	15.5	432.00	16	Yes
4015	13.2	299.00	12	Yes
4016	11.9	464.00	16	Yes
4017	18	497.00	12	Yes
4018	10.8	450.00	13	Yes
4019	16.1	291.00	16	Yes
4020	16.6	362.00	16	Yes
4021	15.4	494.00	16	Yes
4022	13.9	313.00	13	Yes
4023	16.3	380.00	15	Yes
4024	12.6	284.00	15	Yes
4025	13.4	279.00	13	Yes
4026	17.8	339.00	14	Yes
4027	17.7	441.00	16	Yes
4028	16.8	268.00	12	Yes
4029	18.6	439.00	16	Yes
4030	11.8	429.00	13	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	No
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	194	5290	6	Yes
2	669	5291	2	Yes
3	1144	5292	7	Yes
4	1619	5293	5	Yes
5	2094	5294	6	Yes
6	2569	5295	6	Yes
7	3044	5296	6	Yes
8	3519	5297	5	Yes
9	3994	5298	5	No
10	4469	5299	4	Yes
11	4944	5300	2	Yes
12	5419	5301	1	No
13	5894	5302	6	No
14	6369	5303	3	No
15	6844	5304	2	Yes
16	7319	5305	7	Yes
17	7794	5306	5	Yes
18	8269	5307	7	Yes
19	8744	5308	3	Yes

TYPE 6 DETECTION PROBABILITY (CONT.)

20	9219	5309	5	Yes
21	9694	5310	1	Yes
22	10169	5290	2	Yes
23	10644	5291	5	Yes
24	11119	5292	4	Yes
25	11594	5293	4	Yes
26	12069	5294	4	Yes
27	12544	5295	5	Yes
28	13019	5296	6	Yes
29	13494	5297	3	Yes
30	13969	5298	5	No
31	14444	5299	6	No
32	14919	5300	6	Yes
33	15394	5301	4	No
34	15869	5302	5	No
35	16344	5303	3	Yes
36	16819	5304	4	Yes
37	17294	5305	4	Yes
38	17769	5306	4	Yes
39	18244	5307	4	Yes
40	18719	5308	7	Yes
41	19194	5309	3	Yes
42	19669	5310	8	Yes

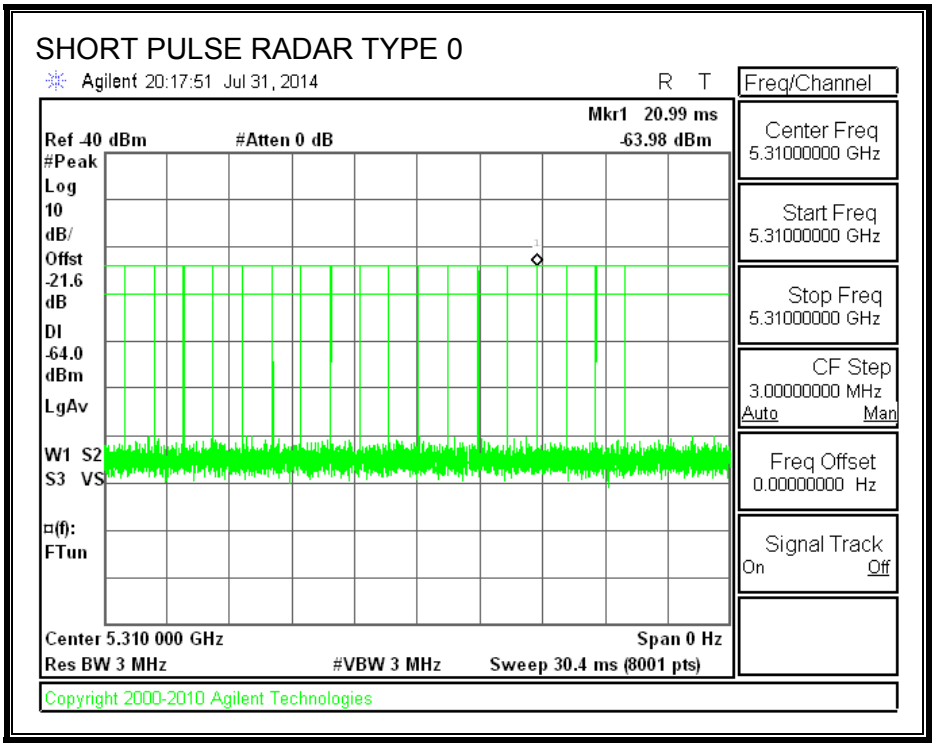
5.3. RESULTS FOR 40 MHz BANDWIDTH

5.3.1. TEST CHANNEL

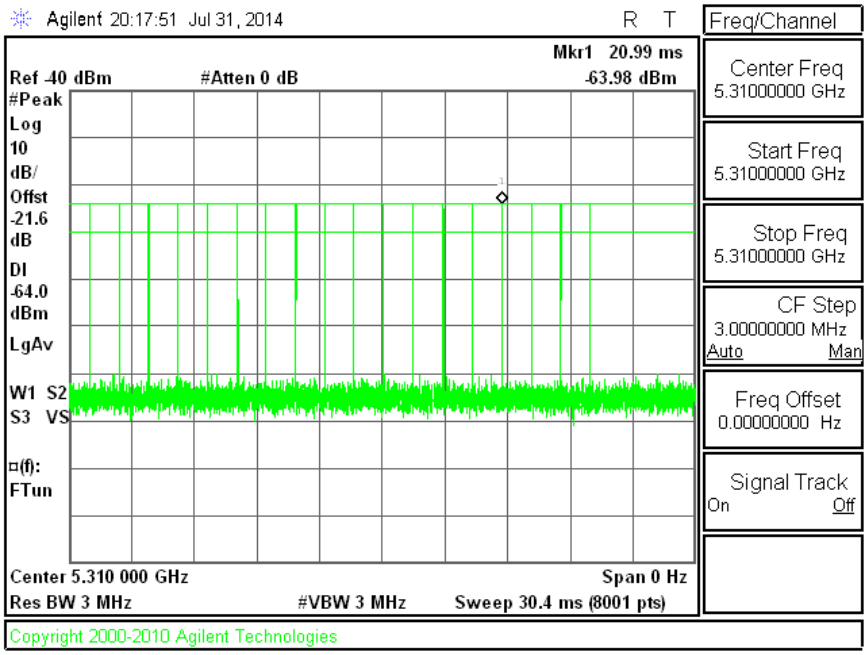
All tests were performed at a channel center frequency of 5310 MHz.

5.3.2. RADAR WAVEFORMS AND TRAFFIC

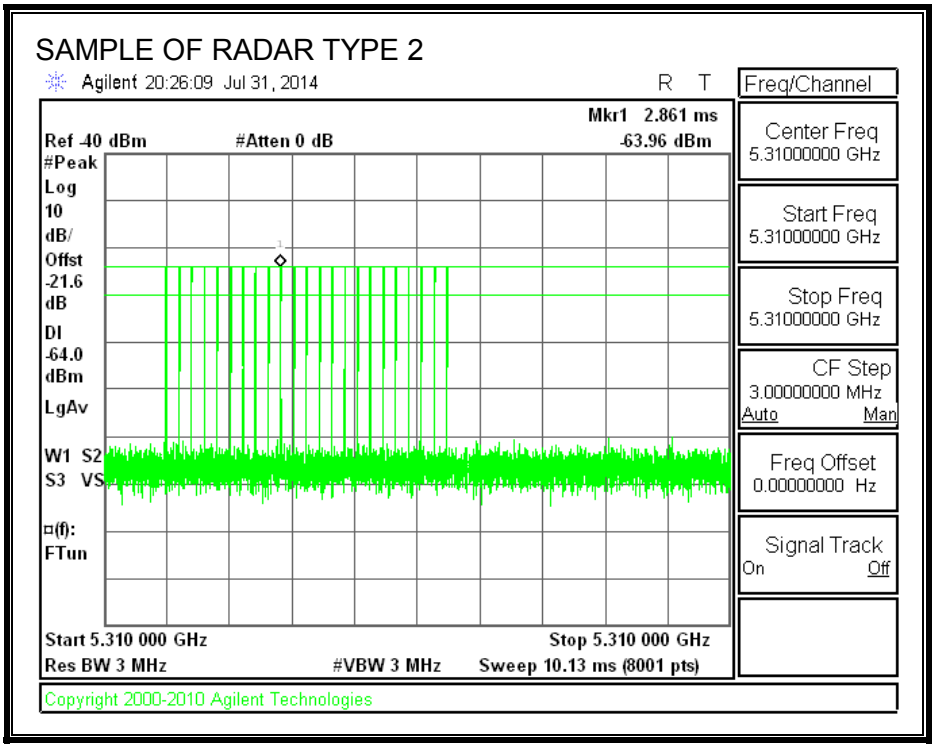
RADAR WAVEFORMS



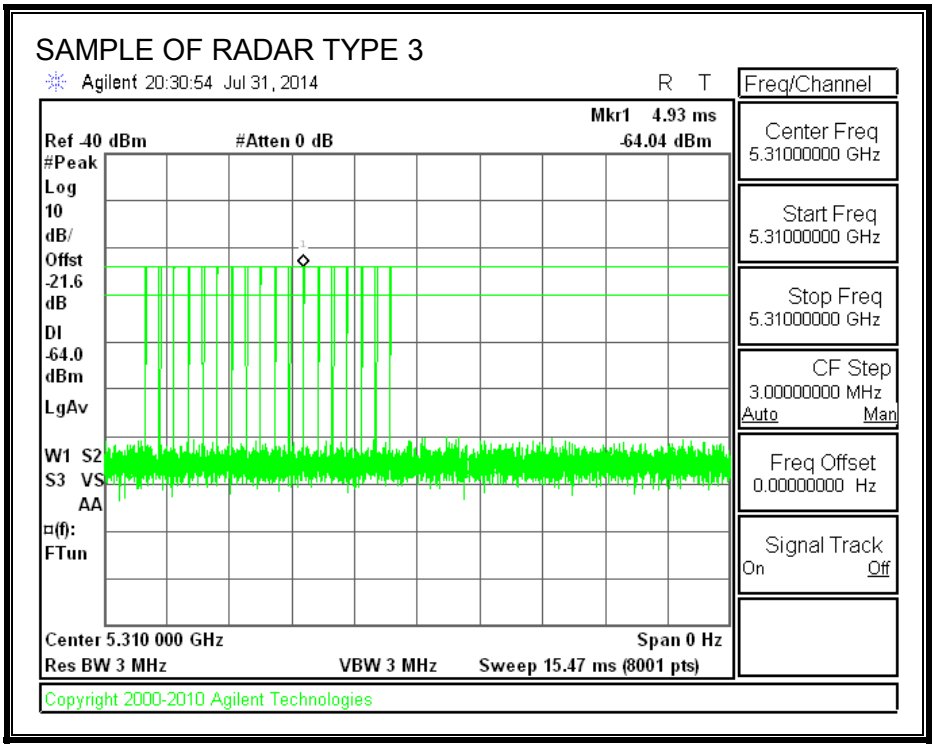
SAMPLE OF RADAR TYPE 1



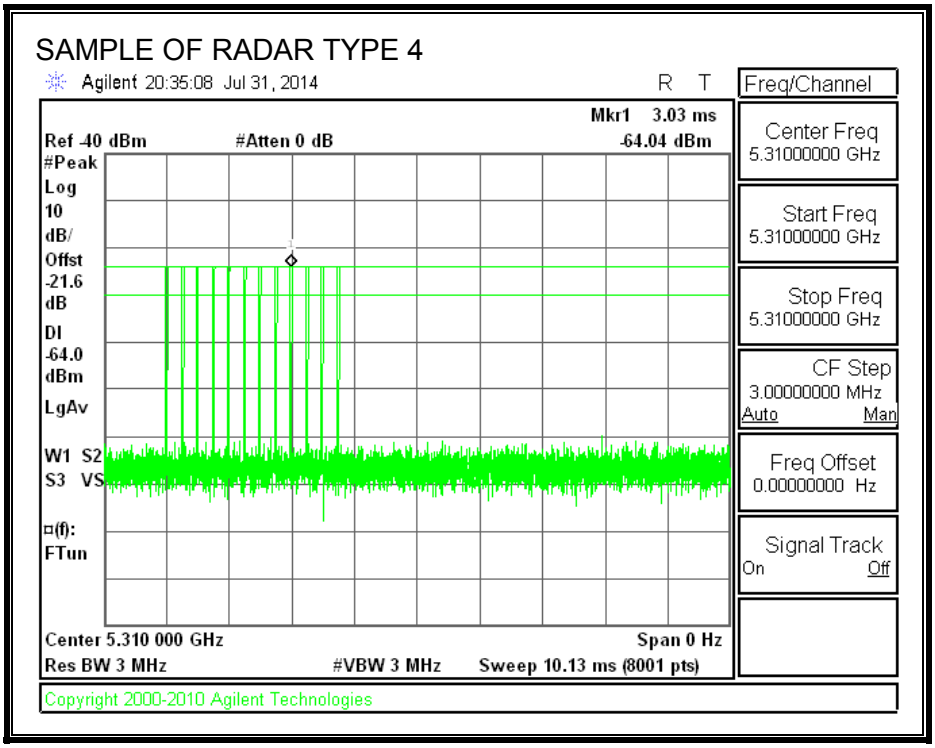
SAMPLE OF RADAR TYPE 2



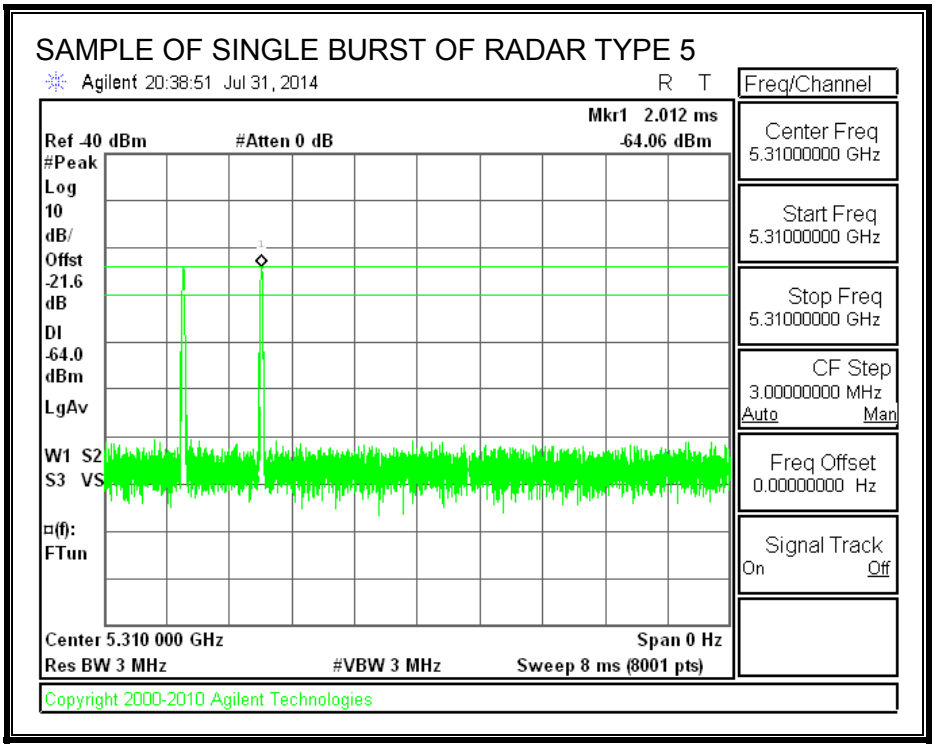
SAMPLE OF RADAR TYPE 3

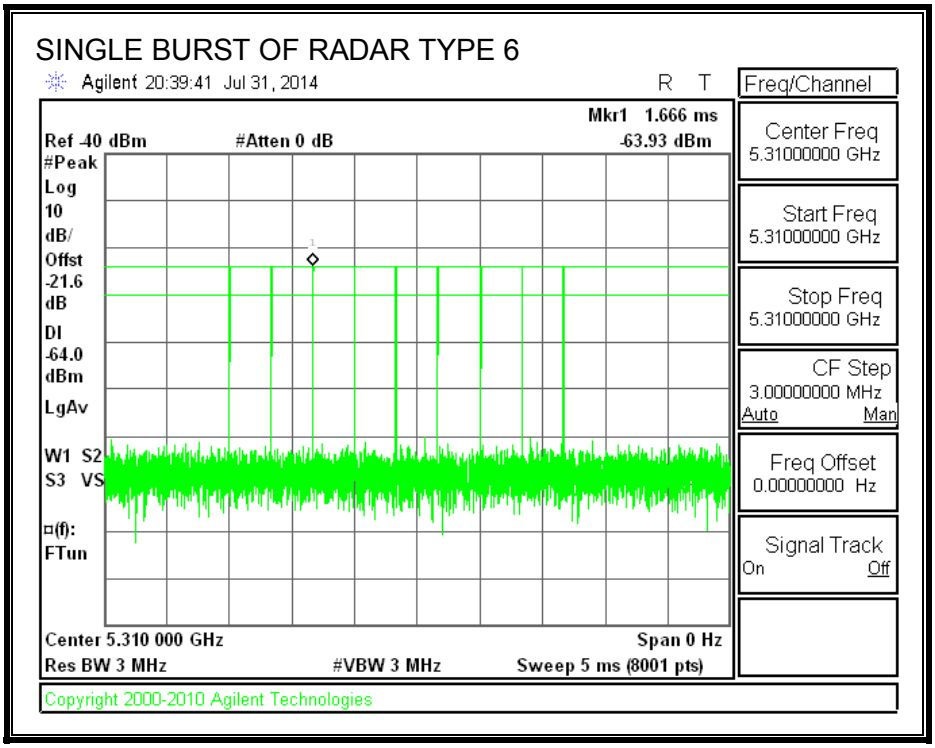


SAMPLE OF RADAR TYPE 4

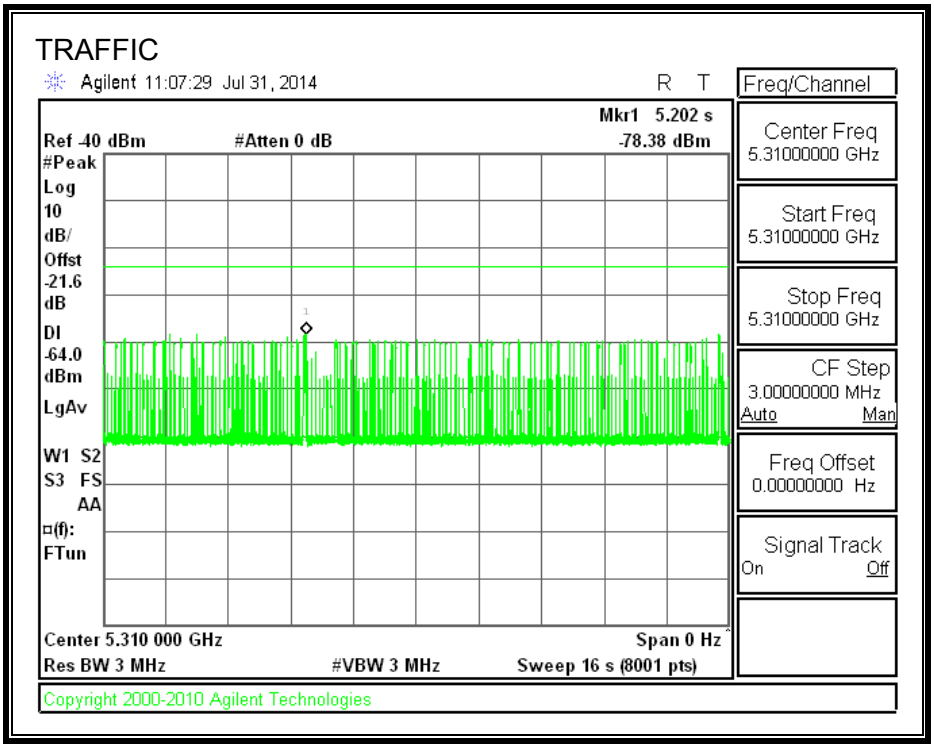


SAMPLE OF SINGLE BURST OF RADAR TYPE 5





TRAFFIC



5.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5310 MHz and commence a CAC period. The time to the re-initialization of traffic was measured as the time required for the EUT to complete the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5310 MHz and commence a CAC period. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5310 MHz and commence a CAC period. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.45	60.45

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	4.925	4.925

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	55.0	55.0

QUANTITATIVE RESULTS BASED ON LOG FILE TIME STAMPS

No Radar Triggered

Beginning of CAC (hh:mm:ss)	End of CAC (hh:mm:ss)	CAC Time (hh:mm:ss)
6:54:56	6:55:56	0:01:00

Radar Near Beginning of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
7:13:40	7:13:44	0:00:04

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
7:28:30	7:29:25	0:00:55

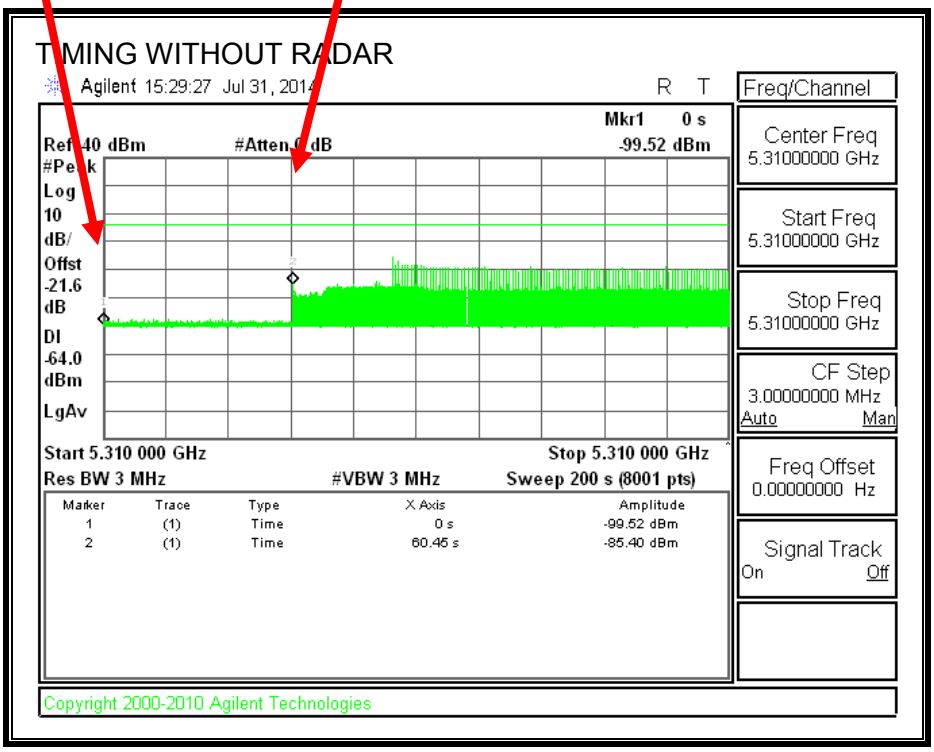
QUALITATIVE RESULTS

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

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

Log File of CAC Timing Without Radar

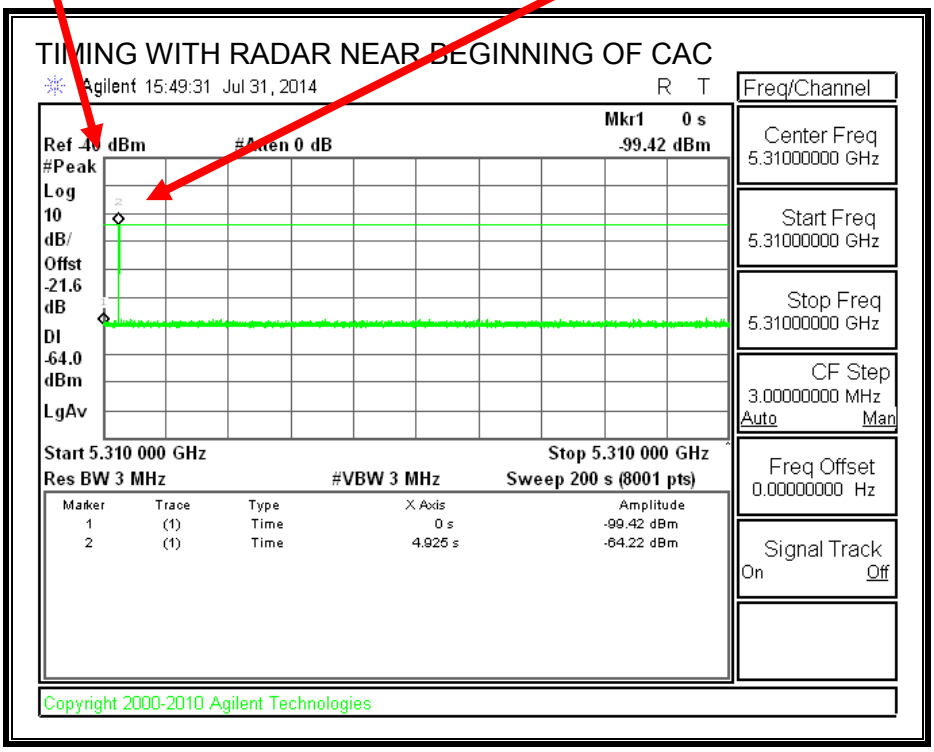
Jan 01 06:54:56 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check width is 40
radio->info.current_channel is 60 sys_idx: 1

Jan 01 06:55:56 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> In-Service Monitoring(ISM).

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the Beginning of CAC

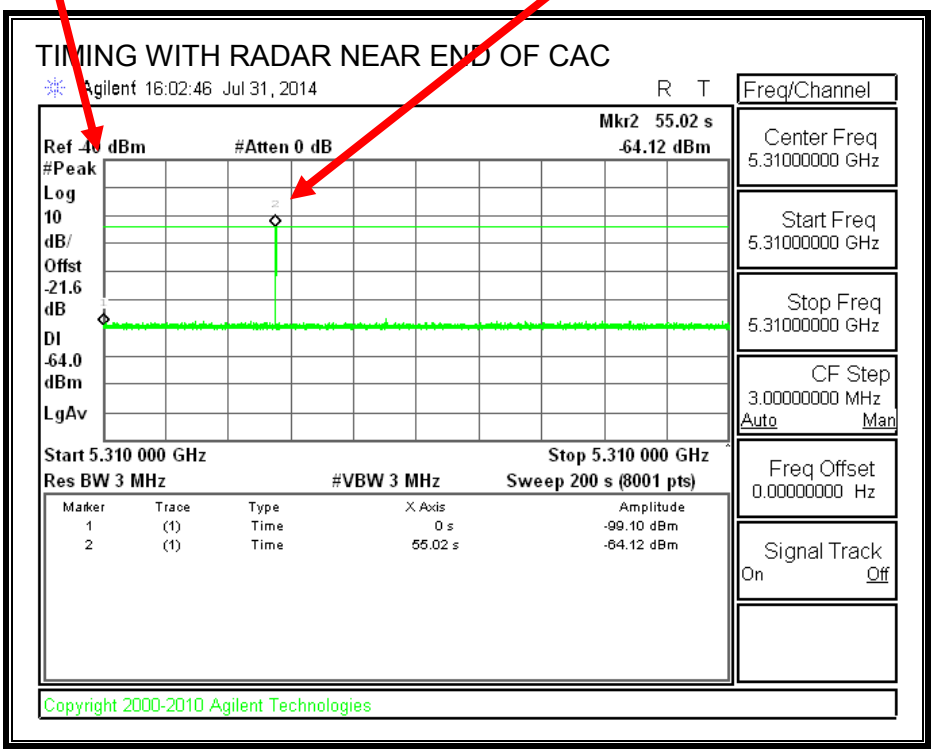
Jan 01 07:13:40 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

Jan 01 07:13:44 2014: KERN: wl1: dfs : state PRE-ISM Channel Availability Check, detected radar in channel 62.

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

Jan 01 07:28:30 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check width is 40. radio->info.current_channel is 60

Jan 01 07:29:25 2014: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 60l ########## Intv=28559, min_pw=28, AT 5.

5.3.1. OVERLAPPING CHANNEL TESTS

RESULTS

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

1.2.2 MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

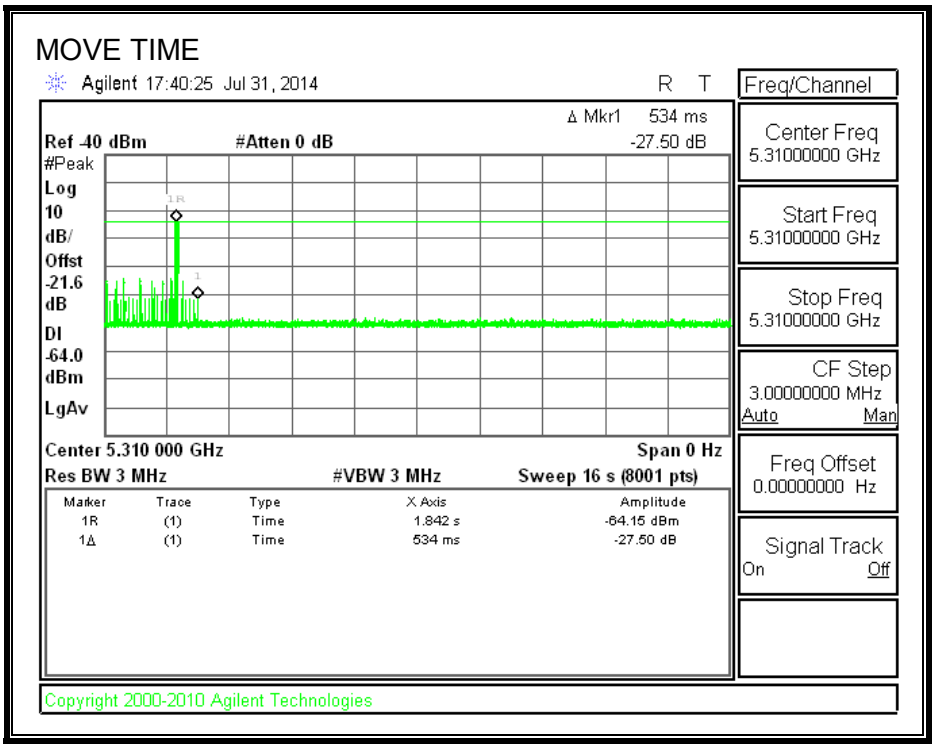
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

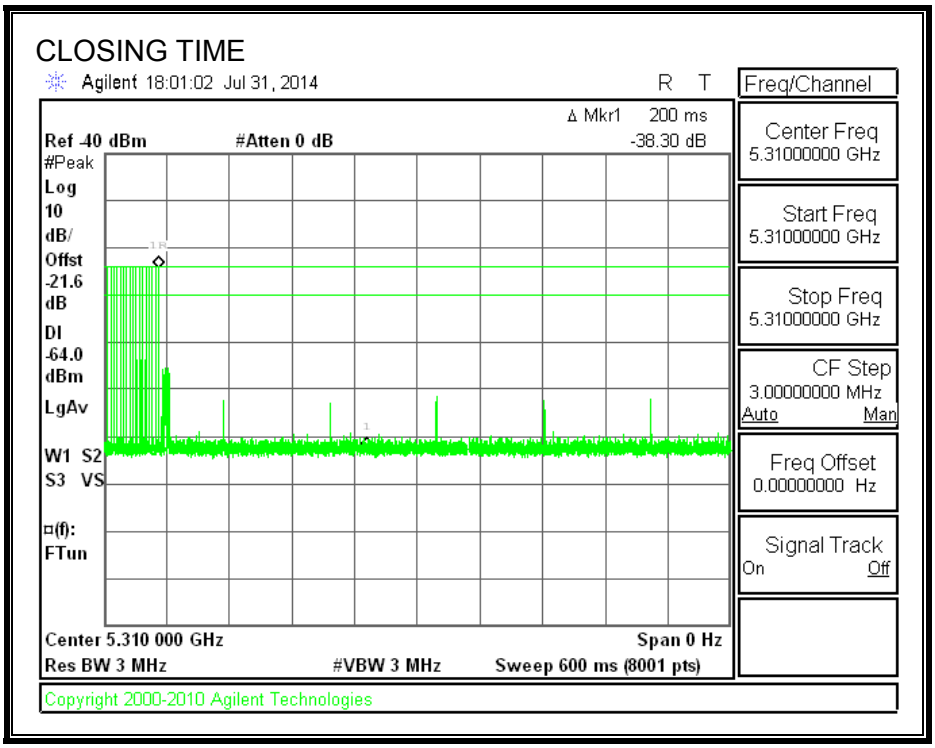
Channel Move Time (sec)	Limit (sec)
0.534	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
10.0	60

MOVE TIME



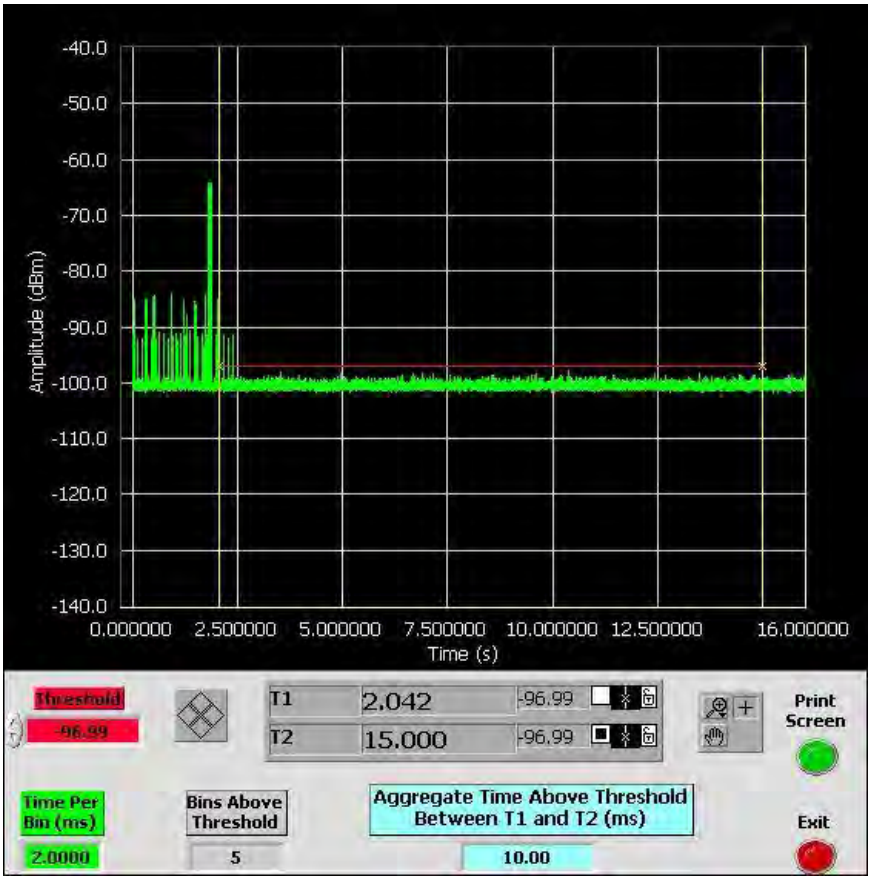
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

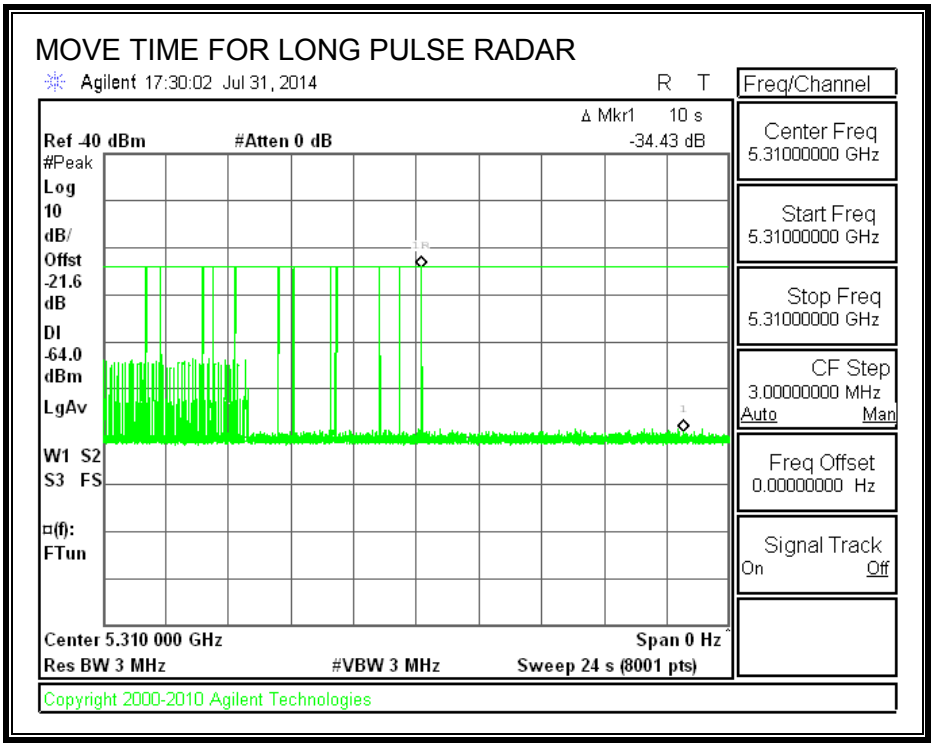
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

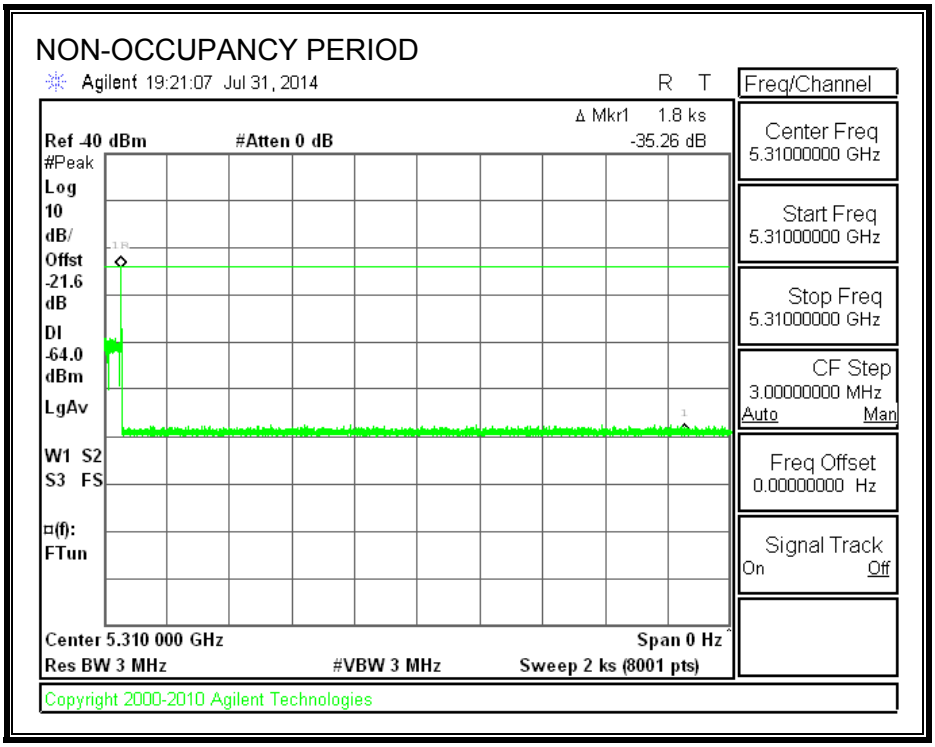
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.3.1. NON-OCCUPANCY PERIOD

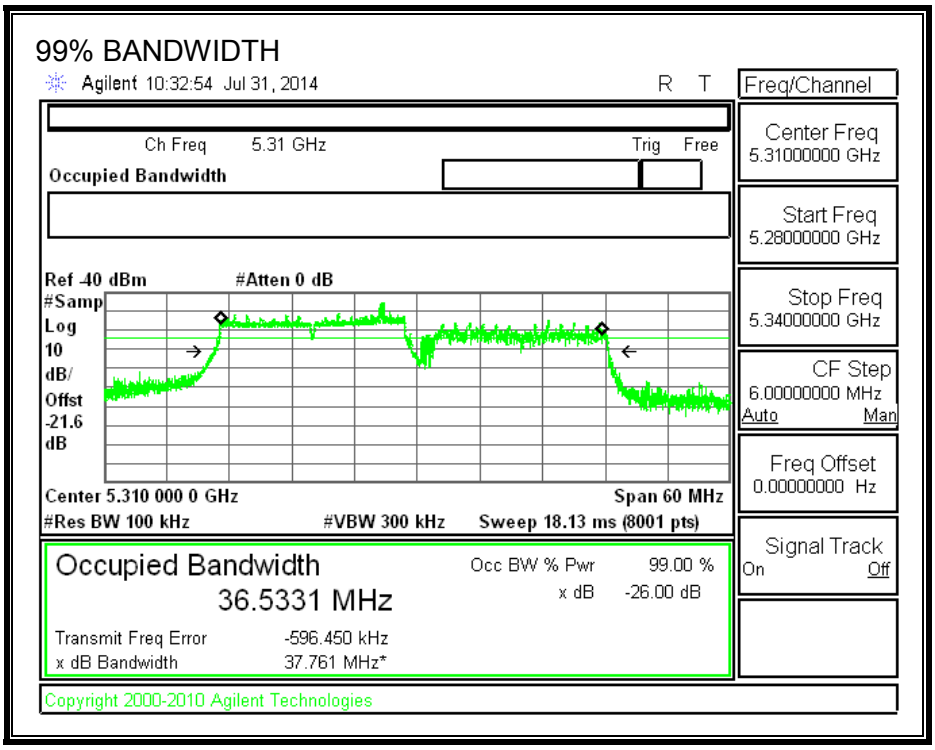
RESULTS

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



5.3.2. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5291	5329	38	36.533	104.0	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5290	10	0	0	
5291	10	10	100	FL
5292	10	10	100	
5293	10	10	100	
5294	10	10	100	
5295	10	10	100	
5300	10	10	100	
5305	10	10	100	
5310	10	10	100	
5315	10	10	100	
5320	10	10	100	
5325	10	10	100	
5326	10	10	100	
5327	10	10	100	
5328	10	10	100	
5329	10	10	100	FH
5330	10	1	10	

5.3.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	86.67	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		95.00	80	Pass
FCC Long Pulse Type 5	30	96.67	80	Pass
FCC Hopping Type 6	39	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1				
1 us Pulse Width				
Waveform	PRI (us)	Pulses Per Burst	Test (A/B)	Successful Detection (Yes/No)
1001	3066	18	A	Yes
1002	818	65	A	Yes
1003	618	86	A	Yes
1004	938	57	A	Yes
1005	798	67	A	Yes
1006	738	72	A	Yes
1007	678	78	A	Yes
1008	758	70	A	Yes
1009	858	62	A	Yes
1010	578	92	A	Yes
1011	658	81	A	Yes
1012	718	74	A	Yes
1013	518	102	A	Yes
1014	778	68	A	Yes
1015	918	58	A	Yes
1016	558	95	B	Yes
1017	853	62	B	Yes
1018	2517	21	B	Yes
1019	1170	46	B	Yes
1020	1386	39	B	Yes
1021	2584	21	B	Yes
1022	2163	25	B	Yes
1023	2684	20	B	Yes
1024	1058	50	B	Yes
1025	1028	52	B	Yes
1026	2768	20	B	Yes
1027	863	62	B	Yes
1028	3026	18	B	Yes
1029	774	69	B	Yes
1030	1798	30	B	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1.5	207.00	23	Yes
2002	3.4	182.00	24	Yes
2003	3.9	230.00	24	Yes
2004	4.4	172.00	24	Yes
2005	1.5	181.00	27	Yes
2006	3.4	205.00	24	Yes
2007	2.1	186.00	23	Yes
2008	5	166.00	25	Yes
2009	1.1	151.00	29	Yes
2010	2	223.00	23	No
2011	4.5	221.00	28	Yes
2012	4.3	169.00	25	Yes
2013	1.6	204.00	26	No
2014	1.6	224.00	26	Yes
2015	1.7	172.00	24	Yes
2016	1.8	210.00	25	Yes
2017	4.8	219.00	27	Yes
2018	1.3	224.00	27	Yes
2019	4.9	170.00	25	Yes
2020	3	212.00	27	Yes
2021	4.3	176.00	28	Yes
2022	4.2	214.00	26	Yes
2023	5	221.00	27	No
2024	2.2	193.00	23	Yes
2025	4.6	220.00	26	Yes
2026	1.8	168.00	26	Yes
2027	4.4	186.00	23	Yes
2028	4.6	178.00	28	Yes
2029	1.8	220.00	29	No
2030	1.5	209.00	29	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	8.9	357.00	18	Yes
3002	9.2	328.00	18	Yes
3003	9.9	301.00	18	Yes
3004	6.8	374.00	16	Yes
3005	9.3	318.00	16	Yes
3006	5.6	312.00	17	Yes
3007	7.1	432.00	18	Yes
3008	6.1	474.00	18	Yes
3009	7.4	341.00	17	Yes
3010	7.7	381.00	16	Yes
3011	9.4	314.00	16	Yes
3012	7.2	356.00	16	Yes
3013	8.9	254.00	17	Yes
3014	8.9	317.00	16	Yes
3015	6.9	373.00	16	Yes
3016	8.8	413.00	16	Yes
3017	9.5	334.00	17	Yes
3018	9.5	265.00	18	Yes
3019	9.9	451.00	16	Yes
3020	6.8	278.00	16	Yes
3021	6.6	456.00	16	Yes
3022	9.2	265.00	18	Yes
3023	9.2	306.00	18	Yes
3024	5.2	474.00	18	Yes
3025	7.3	370.00	16	Yes
3026	5	479.00	17	Yes
3027	6.9	263.00	16	Yes
3028	6.2	297.00	18	Yes
3029	5.6	313	16	Yes
3030	10	468	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	17	252.00	12	No
4002	13.3	278.00	15	Yes
4003	10.4	487.00	13	Yes
4004	11.4	309.00	16	Yes
4005	15.5	343.00	15	Yes
4006	11.1	259.00	15	Yes
4007	15.2	348.00	16	Yes
4008	11.2	419.00	16	Yes
4009	18	467.00	15	Yes
4010	17.9	263.00	15	Yes
4011	14.9	337.00	15	Yes
4012	10.3	280.00	12	Yes
4013	19.8	499.00	16	Yes
4014	15.5	432.00	16	Yes
4015	13.2	299.00	12	Yes
4016	11.9	464.00	16	Yes
4017	18	497.00	12	Yes
4018	10.8	450.00	13	Yes
4019	16.1	291.00	16	Yes
4020	16.6	362.00	16	Yes
4021	15.4	494.00	16	Yes
4022	13.9	313.00	13	Yes
4023	16.3	380.00	15	Yes
4024	12.6	284.00	15	Yes
4025	13.4	279.00	13	Yes
4026	17.8	339.00	14	Yes
4027	17.7	441.00	16	Yes
4028	16.8	268.00	12	No
4029	18.6	439.00	16	Yes
4030	11.8	429.00	13	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	No
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

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

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	113	5291	8	Yes
2	588	5292	6	Yes
3	1063	5293	8	Yes
4	1538	5294	5	Yes
5	2013	5295	6	Yes
6	2488	5296	12	Yes
7	2963	5297	10	Yes
8	3438	5298	10	Yes
9	3913	5299	15	Yes
10	4388	5300	6	Yes
11	4863	5301	12	Yes
12	5338	5302	7	Yes
13	5813	5303	6	Yes
14	6288	5304	9	Yes
15	6763	5305	9	Yes
16	7238	5306	8	Yes
17	7713	5307	8	Yes
18	8188	5308	4	Yes
19	8663	5309	7	Yes
20	9138	5310	7	Yes
21	9613	5311	11	Yes
22	10088	5312	8	Yes
23	10563	5313	9	Yes
24	11038	5314	13	Yes
25	11513	5315	6	Yes
26	11988	5316	14	Yes
27	12463	5317	6	Yes
28	12938	5318	7	Yes
29	13413	5319	12	Yes
30	13888	5320	12	Yes
31	14363	5321	10	Yes
32	14838	5322	9	Yes
33	15313	5323	8	Yes
34	15788	5324	6	Yes
35	16263	5325	8	Yes
36	16738	5326	10	Yes
37	17213	5327	6	Yes
38	17688	5328	9	Yes
39	18163	5329	7	Yes

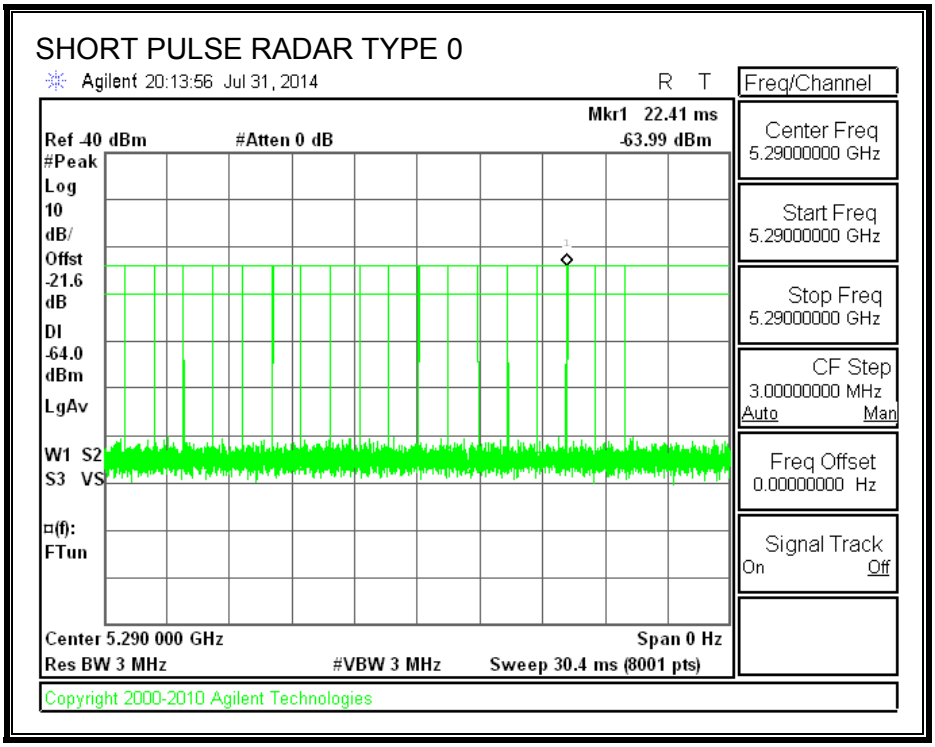
5.4. RESULTS FOR 80 MHz BANDWIDTH

5.4.1. TEST CHANNEL

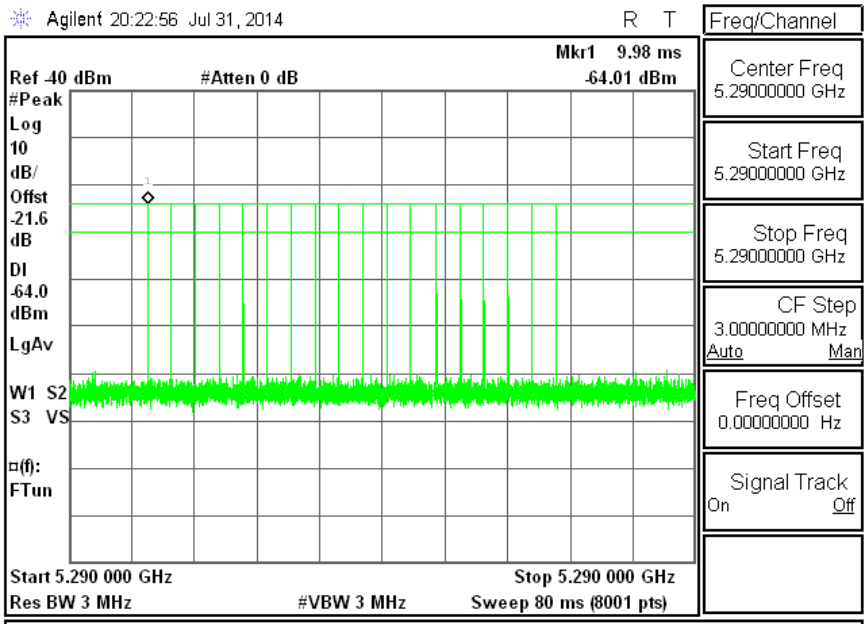
All tests were performed at a channel center frequency of 5290 MHz.

5.4.2. RADAR WAVEFORMS AND TRAFFIC

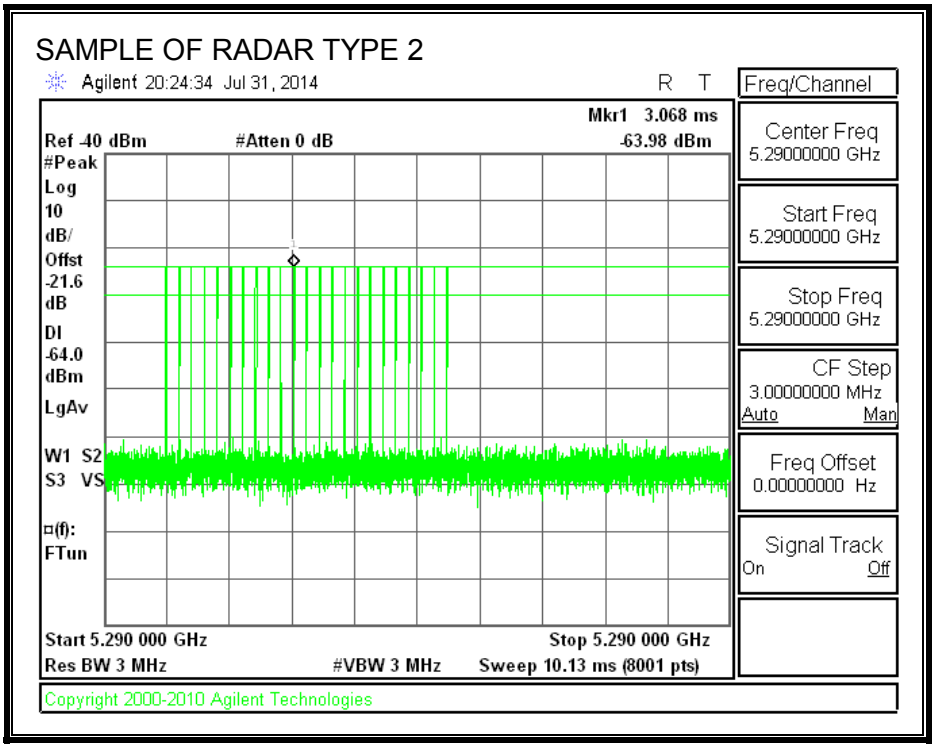
RADAR WAVEFORMS



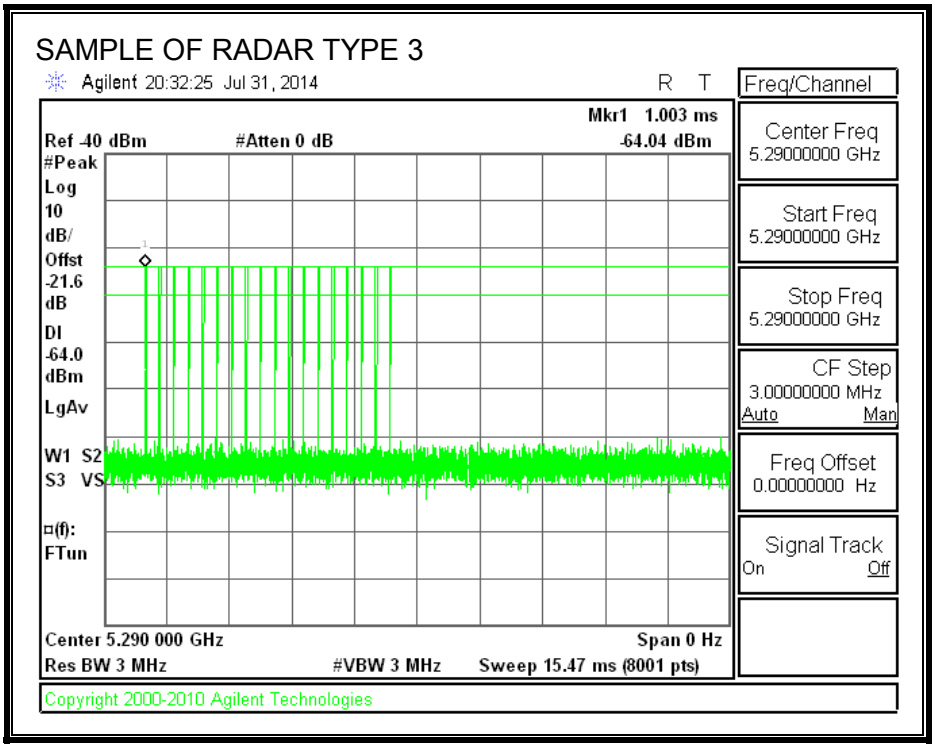
SAMPLE OF RADAR TYPE 1

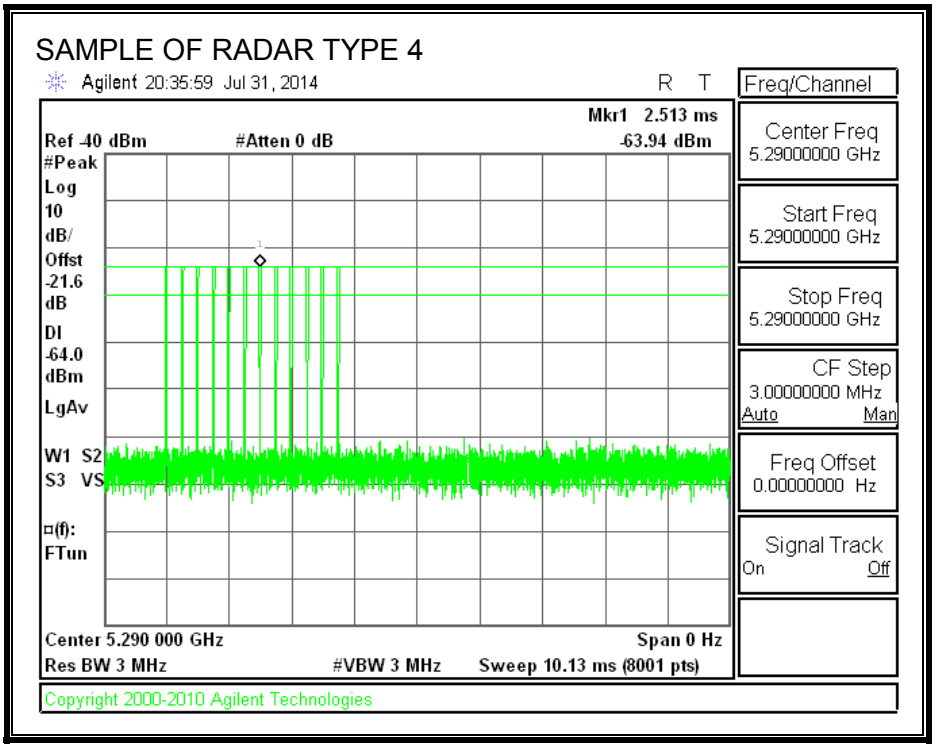


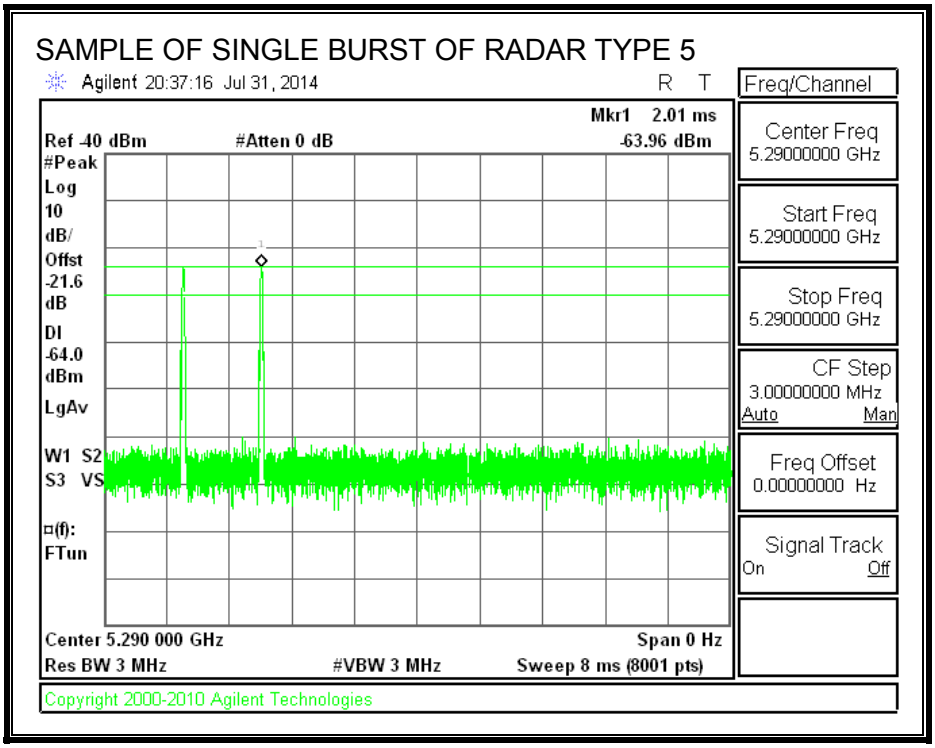
SAMPLE OF RADAR TYPE 2

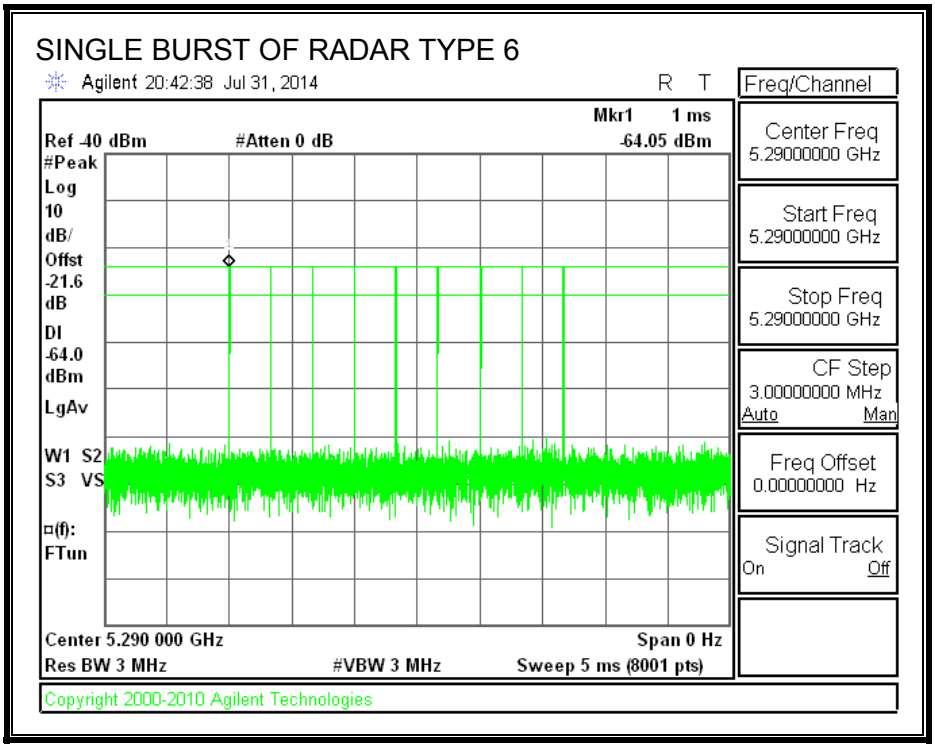


SAMPLE OF RADAR TYPE 3

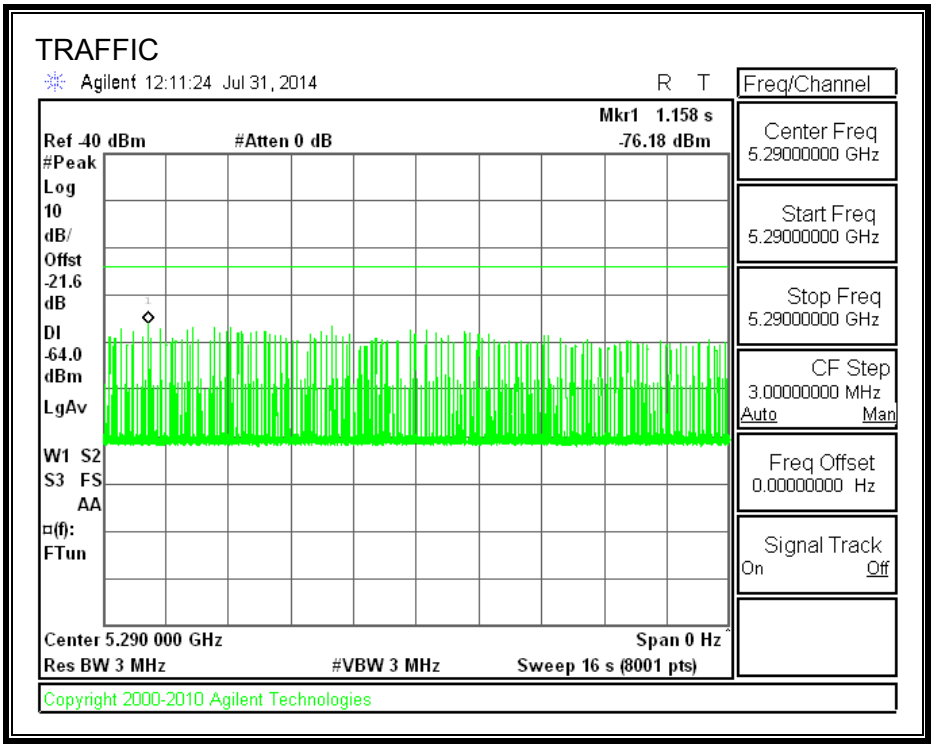








TRAFFIC



5.4.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5290 MHz and commence a CAC period. The time to the re-initialization of traffic was measured as the time required for the EUT to complete the CAC period.

PROCEDURE FOR TIMING OF RADAR BURST

A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5290 MHz and commence a CAC period. A radar signal was triggered within 0 to 6 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. A sweep was started on the spectrum analyzer when a software command was issued to the EUT to change to 5290 MHz and commence a CAC period. A radar signal was triggered within 54 to 60 seconds after the beginning of the CAC period and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.5	60.5

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	5.025	5.025

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	56.42	56.42

QUANTITATIVE RESULTS BASED ON LOG FILE TIME STAMPS

No Radar Triggered

Beginning of CAC (hh:mm:ss)	End of CAC (hh:mm:ss)	CAC Time (hh:mm:ss)
7:39:11	7:40:11	0:01:00

Radar Near Beginning of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
7:48:57	7:49:02	0:00:05

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
8:06:58	8:07:54	0:00:56

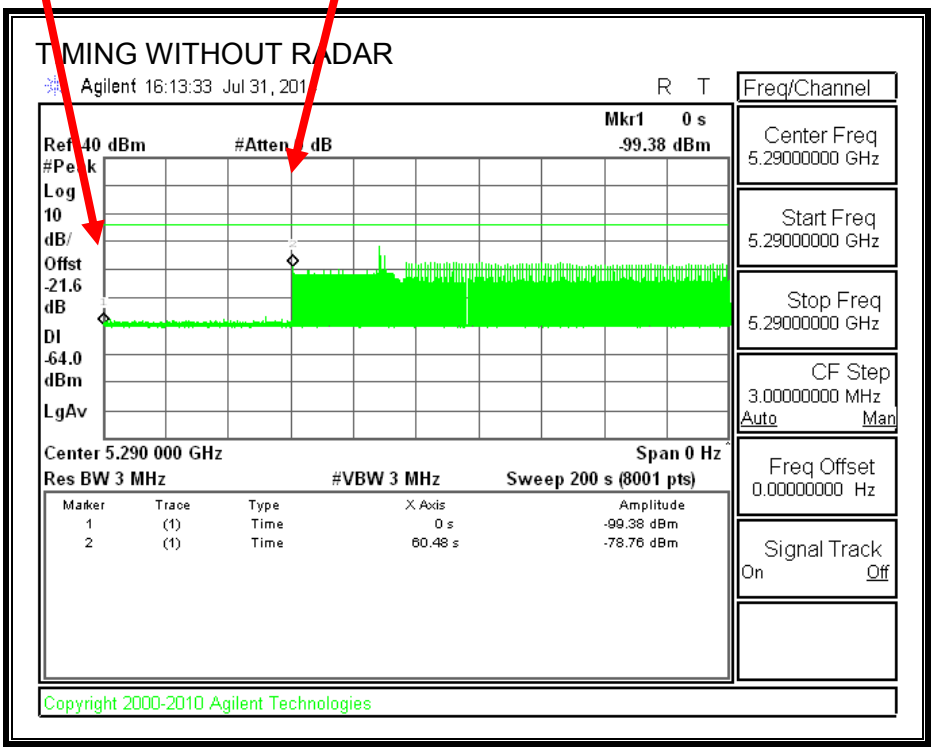
QUALITATIVE RESULTS

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

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

Log File of CAC Timing Without Radar

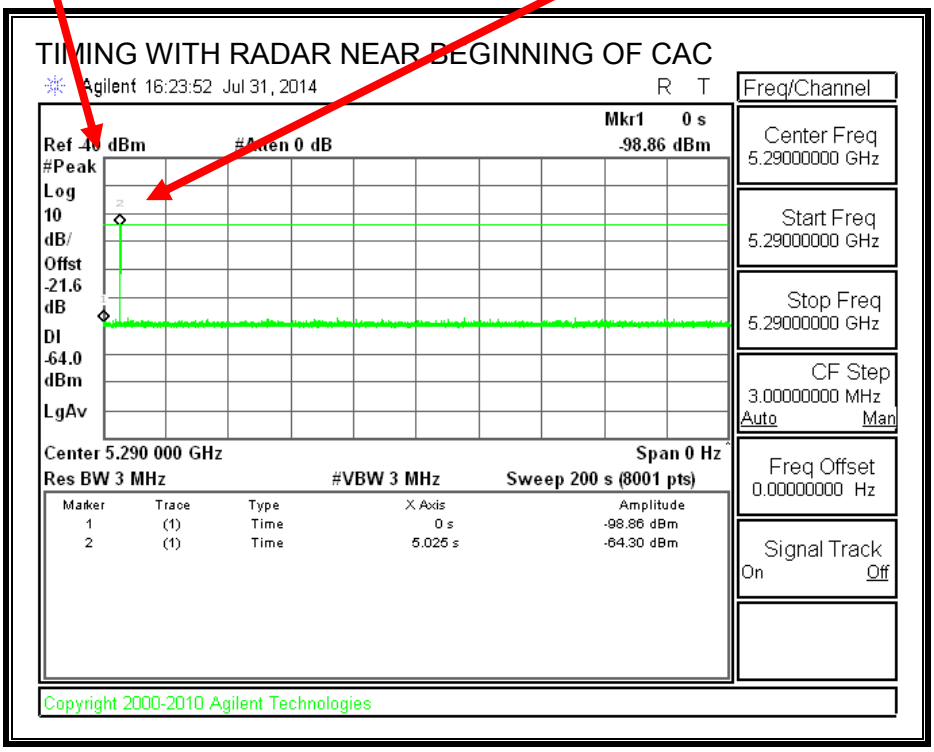
Jan 01 07:39:11 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

DLS DFS State PRE-ISM Channel Availability Check -> In-Service Monitoring(ISM)
Jan 01 07:40:11 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the Beginning of CAC

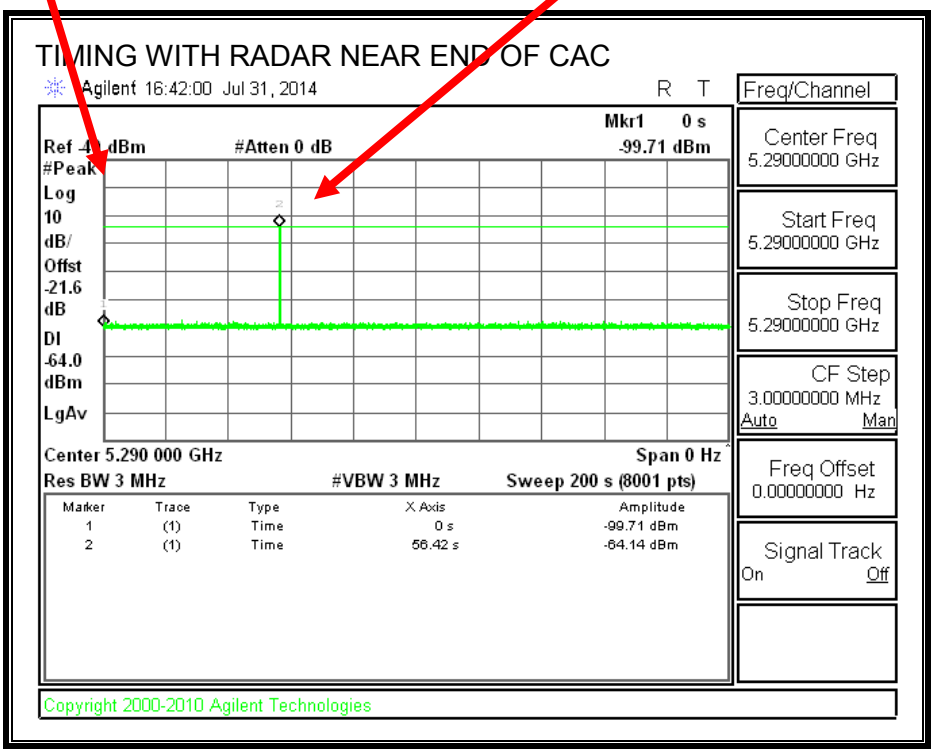
Jan 01 07:48:57 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

Jan 01 07:49:02 2014: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 60/80 ########## Intv=28560, min_pw=46, AT.

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

Jan 01 08:06:58 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

Jan 01 08:07:54 2014: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 60/80 ########## Intv=28560, min_pw=46, AT.

5.4.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

5.4.5. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

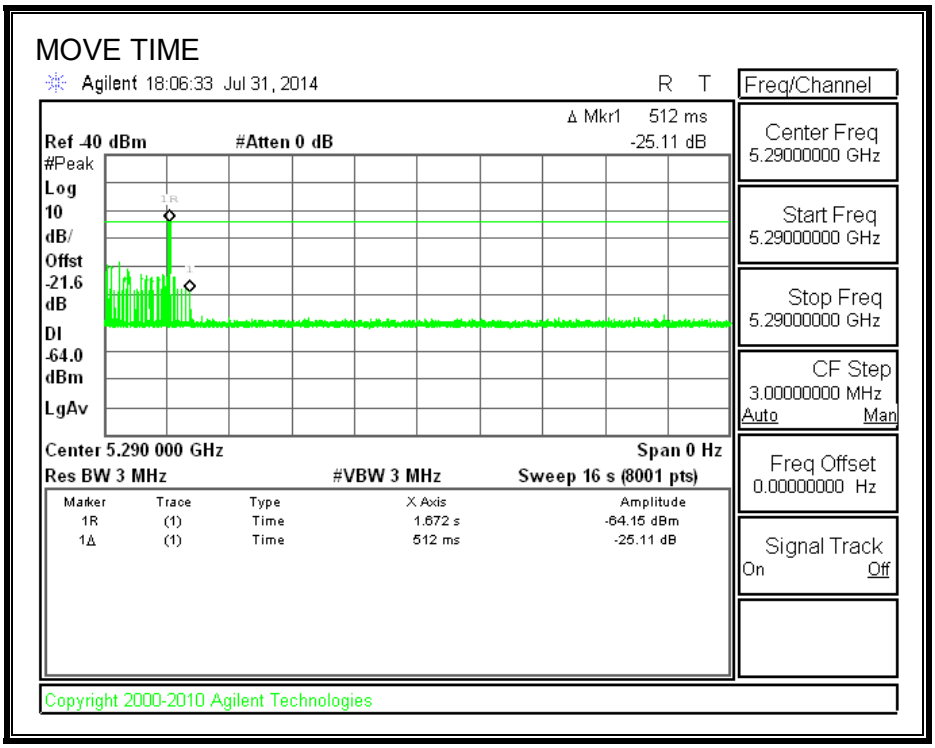
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

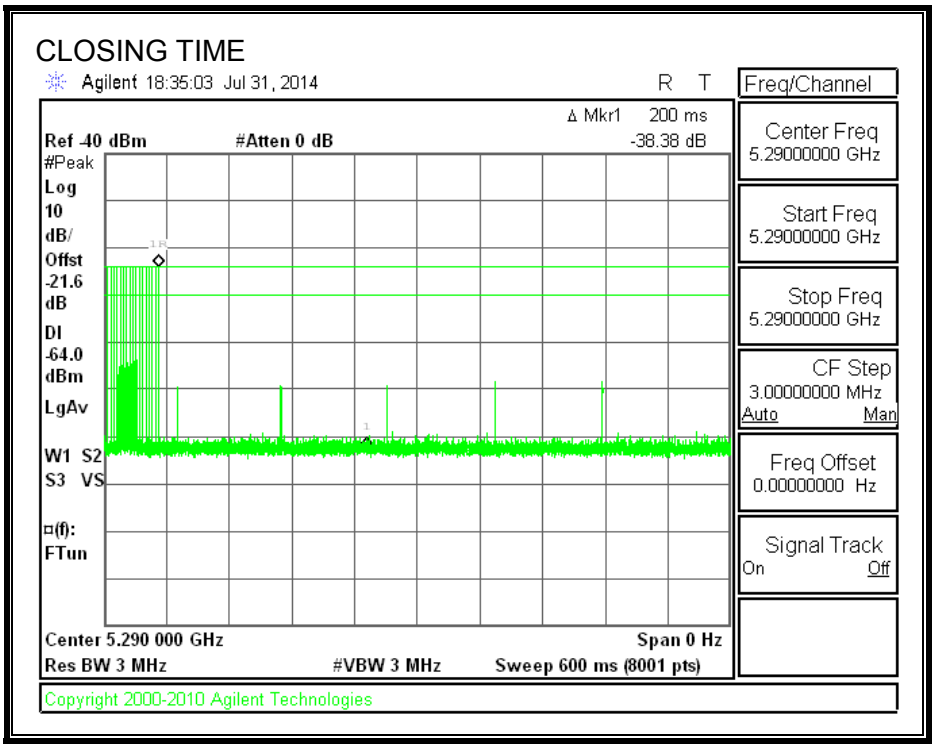
Channel Move Time (sec)	Limit (sec)
0.512	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
10.0	60

MOVE TIME



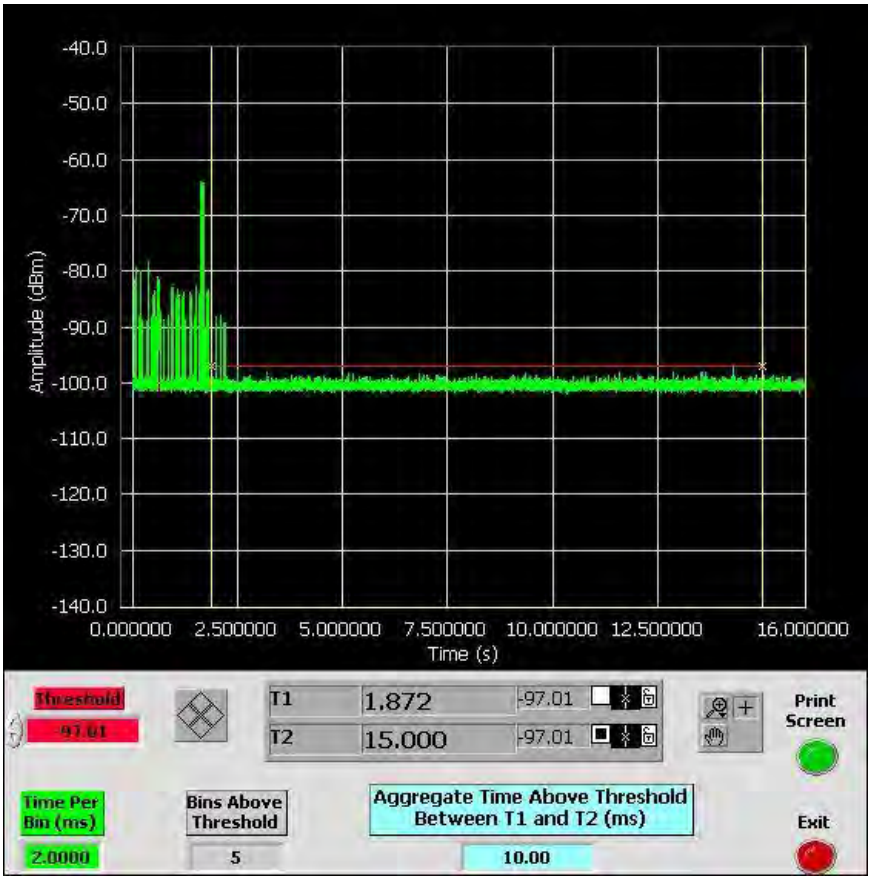
CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

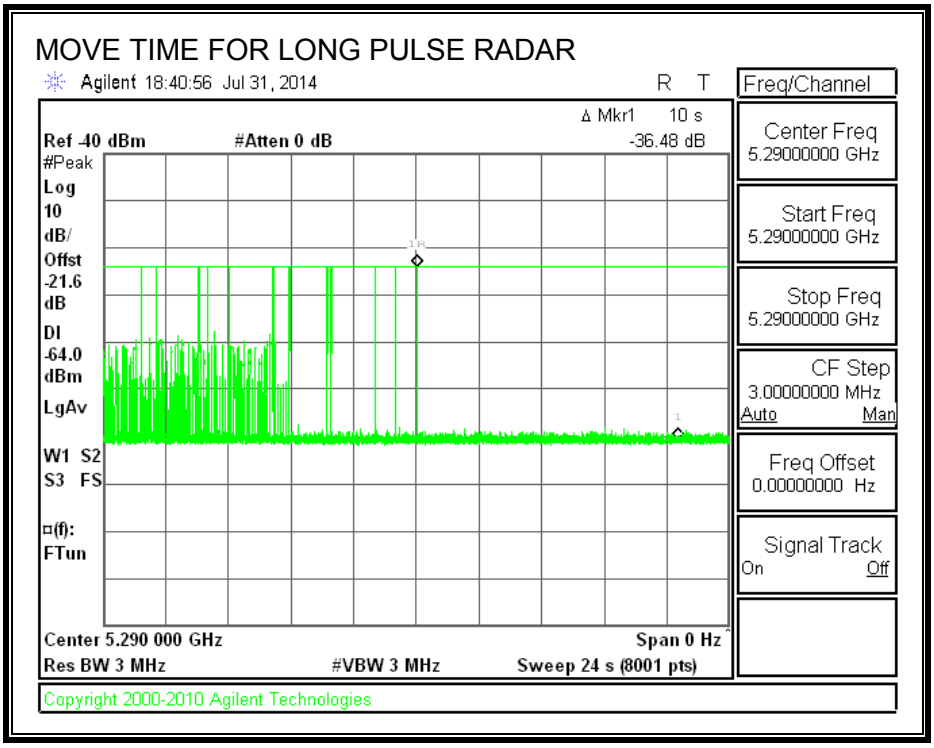
Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

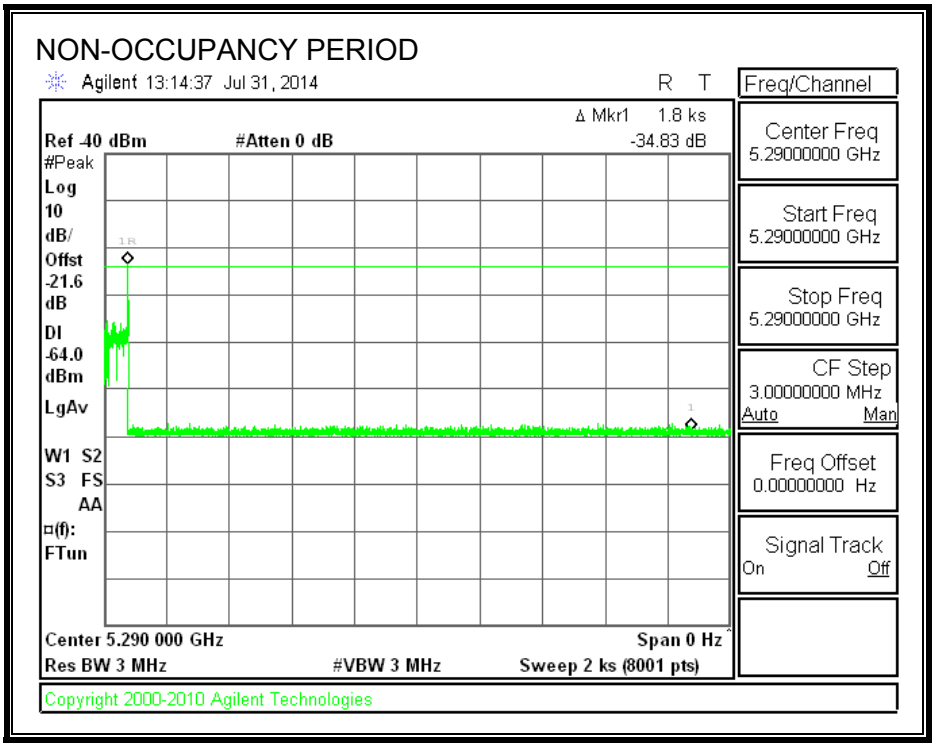
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.4.1. NON-OCCUPANCY PERIOD

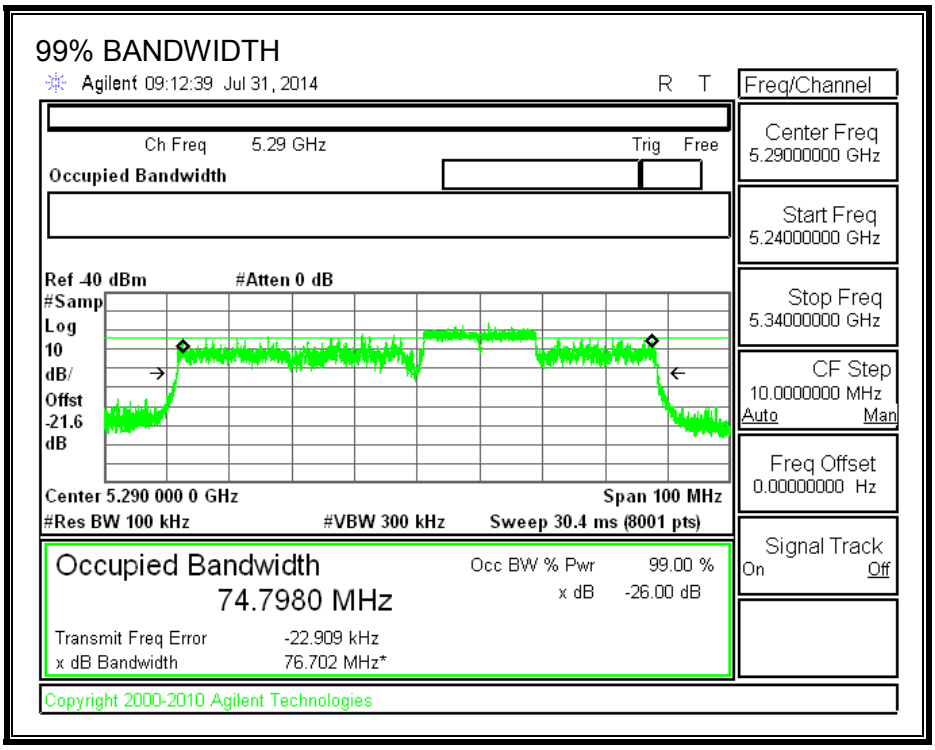
RESULTS

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 (%)
5244	5339	95	74.798	127.0	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5243	20	6	30	
5244	10	10	100	FL
5245	10	10	100	
5250	10	10	100	
5255	10	9	90	
5260	10	10	100	
5265	10	10	100	
5270	10	10	100	
5275	10	10	100	
5280	10	10	100	
5285	20	18	90	
5290	10	10	100	
5295	10	10	100	
5300	10	10	100	
5305	10	10	100	
5310	10	10	100	
5315	10	10	100	
5320	10	10	100	
5325	10	10	100	
5330	10	10	100	
5335	10	9	90	
5336	10	10	100	
5337	10	10	100	
5338	10	10	100	
5339	10	10	100	FH
5340	10	8	80	

5.4.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	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	96.67	80	Pass
FCC Hopping Type 6	96	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	818	65	A	Yes
1003	618	86	A	Yes
1004	938	57	A	Yes
1005	798	67	A	Yes
1006	738	72	A	Yes
1007	678	78	A	Yes
1008	758	70	A	Yes
1009	858	62	A	Yes
1010	578	92	A	Yes
1011	658	81	A	Yes
1012	718	74	A	Yes
1013	518	102	A	Yes
1014	778	68	A	Yes
1015	918	58	A	Yes
1016	558	95	B	Yes
1017	853	62	B	Yes
1018	2517	21	B	Yes
1019	1170	46	B	Yes
1020	1386	39	B	Yes
1021	2584	21	B	Yes
1022	2163	25	B	Yes
1023	2684	20	B	Yes
1024	1058	50	B	Yes
1025	1028	52	B	Yes
1026	2768	20	B	Yes
1027	863	62	B	Yes
1028	3026	18	B	Yes
1029	774	69	B	Yes
1030	1798	30	B	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	1.5	207.00	23	Yes
2002	3.4	182.00	24	Yes
2003	3.9	230.00	24	Yes
2004	4.4	172.00	24	Yes
2005	1.5	181.00	27	No
2006	3.4	205.00	24	Yes
2007	2.1	186.00	23	Yes
2008	5	166.00	25	Yes
2009	1.1	151.00	29	Yes
2010	2	223.00	23	Yes
2011	4.5	221.00	28	Yes
2012	4.3	169.00	25	Yes
2013	1.6	204.00	26	Yes
2014	1.6	224.00	26	Yes
2015	1.7	172.00	24	Yes
2016	1.8	210.00	25	Yes
2017	4.8	219.00	27	Yes
2018	1.3	224.00	27	Yes
2019	4.9	170.00	25	Yes
2020	3	212.00	27	No
2021	4.3	176.00	28	Yes
2022	4.2	214.00	26	Yes
2023	5	221.00	27	Yes
2024	2.2	193.00	23	Yes
2025	4.6	220.00	26	Yes
2026	1.8	168.00	26	Yes
2027	4.4	186.00	23	Yes
2028	4.6	178.00	28	Yes
2029	1.8	220.00	29	Yes
2030	1.5	209.00	29	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	8.9	357.00	18	Yes
3002	9.2	328.00	18	Yes
3003	9.9	301.00	18	Yes
3004	6.8	374.00	16	Yes
3005	9.3	318.00	16	Yes
3006	5.6	312.00	17	Yes
3007	7.1	432.00	18	Yes
3008	6.1	474.00	18	Yes
3009	7.4	341.00	17	Yes
3010	7.7	381.00	16	Yes
3011	9.4	314.00	16	Yes
3012	7.2	356.00	16	Yes
3013	8.9	254.00	17	Yes
3014	8.9	317.00	16	Yes
3015	6.9	373.00	16	Yes
3016	8.8	413.00	16	Yes
3017	9.5	334.00	17	Yes
3018	9.5	265.00	18	Yes
3019	9.9	451.00	16	Yes
3020	6.8	278.00	16	Yes
3021	6.6	456.00	16	Yes
3022	9.2	265.00	18	Yes
3023	9.2	306.00	18	Yes
3024	5.2	474.00	18	Yes
3025	7.3	370.00	16	Yes
3026	5	479.00	17	Yes
3027	6.9	263.00	16	Yes
3028	6.2	297.00	18	Yes
3029	5.6	313	16	Yes
3030	10	468	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	17	252.00	12	Yes
4002	13.3	278.00	15	Yes
4003	10.4	487.00	13	Yes
4004	11.4	309.00	16	Yes
4005	15.5	343.00	15	Yes
4006	11.1	259.00	15	Yes
4007	15.2	348.00	16	Yes
4008	11.2	419.00	16	Yes
4009	18	467.00	15	Yes
4010	17.9	263.00	15	Yes
4011	14.9	337.00	15	Yes
4012	10.3	280.00	12	Yes
4013	19.8	499.00	16	Yes
4014	15.5	432.00	16	Yes
4015	13.2	299.00	12	Yes
4016	11.9	464.00	16	Yes
4017	18	497.00	12	Yes
4018	10.8	450.00	13	No
4019	16.1	291.00	16	Yes
4020	16.6	362.00	16	Yes
4021	15.4	494.00	16	Yes
4022	13.9	313.00	13	Yes
4023	16.3	380.00	15	Yes
4024	12.6	284.00	15	Yes
4025	13.4	279.00	13	Yes
4026	17.8	339.00	14	Yes
4027	17.7	441.00	16	Yes
4028	16.8	268.00	12	Yes
4029	18.6	439.00	16	No
4030	11.8	429.00	13	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5	
Trial	Successful Detection (Yes/No)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	No
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	228	5244	18	Yes
2	703	5245	15	Yes
3	1178	5246	16	Yes
4	1653	5247	17	Yes
5	2128	5248	18	Yes
6	2603	5249	22	Yes
7	3078	5250	27	Yes
8	3553	5251	19	Yes
9	4028	5252	21	Yes
10	4503	5253	20	Yes
11	4978	5254	12	Yes
12	5453	5255	7	Yes
13	5928	5256	20	Yes
14	6403	5257	17	Yes
15	6878	5258	16	Yes
16	7353	5259	17	Yes
17	7828	5260	15	Yes
18	8303	5261	18	Yes
19	8778	5262	24	Yes
20	9253	5263	19	Yes
21	9728	5264	19	Yes
22	10203	5265	14	Yes
23	10678	5266	19	Yes
24	11153	5267	22	Yes
25	11628	5268	20	Yes
26	12103	5269	17	Yes
27	12578	5270	18	Yes
28	13053	5271	17	Yes
29	13528	5272	22	Yes
30	14003	5273	17	Yes

TYPE 6 DETECTION PROBABILITY (CONT.)

31	14478	5274	25	Yes
32	14953	5275	21	Yes
33	15428	5276	13	Yes
34	15903	5277	18	Yes
35	16378	5278	17	Yes
36	16853	5279	17	Yes
37	17328	5280	16	Yes
38	17803	5281	14	Yes
39	18278	5282	19	Yes
40	18753	5283	21	Yes
41	19228	5284	17	Yes
42	19703	5285	16	Yes
43	20178	5286	21	Yes
44	20653	5287	21	Yes
45	21128	5288	22	Yes
46	21603	5289	22	Yes
47	22078	5290	19	Yes
48	22553	5291	21	Yes
49	23028	5292	15	Yes
50	23503	5293	18	Yes
51	23978	5294	21	Yes
52	24453	5295	24	Yes
53	24928	5296	26	Yes
54	25403	5297	17	Yes
55	25878	5298	15	Yes
56	26353	5299	18	Yes
57	26828	5300	18	Yes
58	27303	5301	22	Yes
59	27778	5302	20	Yes
60	28253	5303	20	Yes
61	28728	5304	16	Yes

TYPE 6 DETECTION PROBABILITY (CONT.)

62	29203	5305	15	Yes
63	29678	5306	18	Yes
64	30153	5307	16	Yes
65	30628	5308	11	Yes
66	31103	5309	20	Yes
67	31578	5310	23	Yes
68	32053	5311	17	Yes
69	32528	5312	23	Yes
70	-32533	5313	16	Yes
71	-32058	5314	20	Yes
72	-31583	5315	16	Yes
73	-31108	5316	21	Yes
74	-30633	5317	21	Yes
75	-30158	5318	16	Yes
76	-29683	5319	24	Yes
77	-29208	5320	15	Yes
78	-28733	5321	19	Yes
79	-28258	5322	18	Yes
80	-27783	5323	12	Yes
81	-27308	5324	18	Yes
82	-26833	5325	22	Yes
83	-26358	5326	20	Yes
84	-25883	5327	19	Yes
85	-25408	5328	24	Yes
86	-24933	5329	16	Yes
87	-24458	5330	22	Yes
88	-23983	5331	19	Yes
89	-23508	5332	30	Yes
90	-23033	5333	14	Yes
91	-22558	5334	14	Yes
92	-22083	5335	13	Yes
93	-21608	5336	18	Yes
94	-21133	5337	18	Yes
95	-20658	5338	12	Yes
96	-20183	5339	19	Yes