



**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 2x2 WIRELESS ACCESS POINT

MODEL NUMBER: AP-7522I

FCC ID: UZ7AP7522I

IC: 109AN-AP7522I

REPORT NUMBER: 14U18921-1 REVISION A

ISSUE DATE: DECEMBER 5, 2014

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

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/15/14	Initial Issue	T. Lee
A	12/5/2104	Amend antenna gain information in the DESCRIPTION OF EUT section	C. Cheung

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11a/b/g/n/ac 2x2 WIRELESS ACCESS POINT

MODEL: AP-7522I

SERIAL NUMBER: 14107522201549

DATE TESTED: OCTOBER 08, 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. DYNAMIC FREQUENCY SELECTION

5.1. OVERVIEW

5.1.1. LIMITS

INDUSTRY CANADA

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

RSS-210 Issue 8 A9.3

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

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

FCC

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

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

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

Table 2: Applicability of DFS requirements during normal operation

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

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar DFS	Client (without DFS)
<i>U-NII Detection Bandwidth and Statistical Performance Check</i>	All BW modes must be tested	Not required
<i>Channel Move Time and Channel Closing Transmission Time</i>	Test using widest BW mode available	Test using the widest BW mode available for the link
<i>All other tests</i>	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in all 20 MHz channel blocks and a null frequencies between the bonded 20 MHz channel blocks.		

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

Maximum Transmit Power	Value (see notes)
E.I.R.P. $\geq$ 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
<i>Non-occupancy period</i>	30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds (See Note 1)
<i>Channel Closing Transmission Time</i>	200 milliseconds + approx. 60 milliseconds over remaining 10 second period. (See Notes 1 and 2)
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U- NII 99% transmission power bandwidth. (See Note 3)
Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> 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 <i>U-NII Detection Bandwidth</i> 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: $\{(1/360) \times (19 \times 10^6 \text{ PRI}_{\text{usec}})\}$	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 <i>Detection Bandwidth</i> test, <i>Channel Move Time</i> , and <i>Channel Closing Time</i> 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

SYSTEM OVERVIEW

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 1, 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of KDB 905462 D02. The frequency of the signal generator is incremented in 1 MHz steps from F_L to F_H for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

SYSTEM CALIBRATION

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

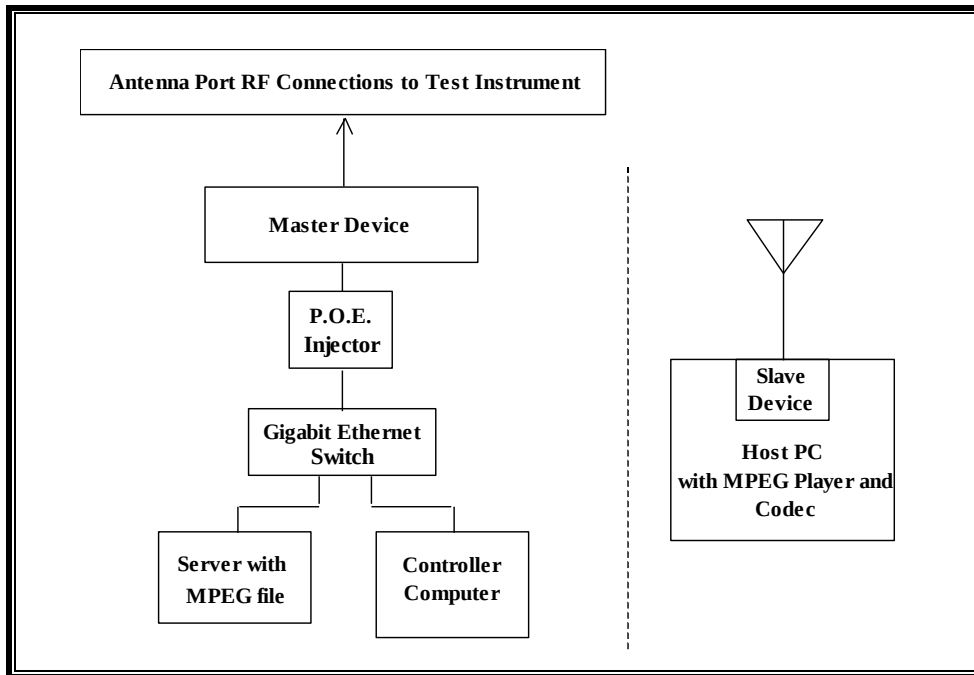
TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset Number	Cal Due
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	09/05/15
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	09/03/15
Arbitrary Waveform Generator	Agilent / HP	33220A	C01146	04/03/15

5.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

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

5.1.4. DESCRIPTION OF EUT

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

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

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

The highest power level within these bands is 29.77 dBm EIRP in the 5250-5350 MHz band and 27.87 dBm EIRP in the 5470-5725 MHz band.

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

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

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 EUT is version 5.7.0.0-203475X.

UNIFORM CHANNEL SPREADING

See Manufacturer's Attestation.

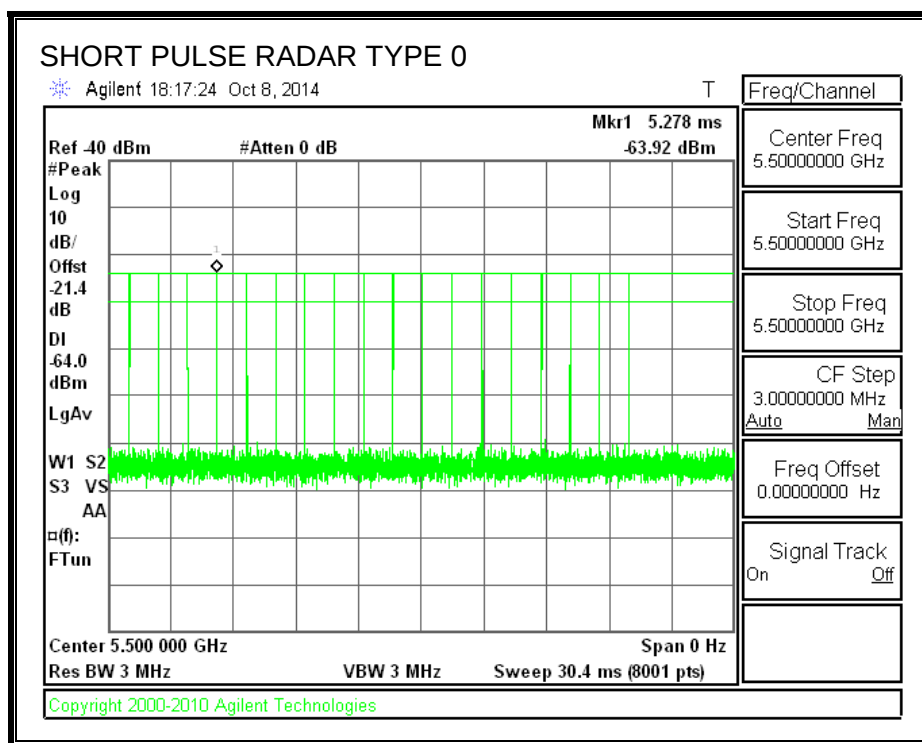
5.2. RESULTS FOR 20 MHz BANDWIDTH

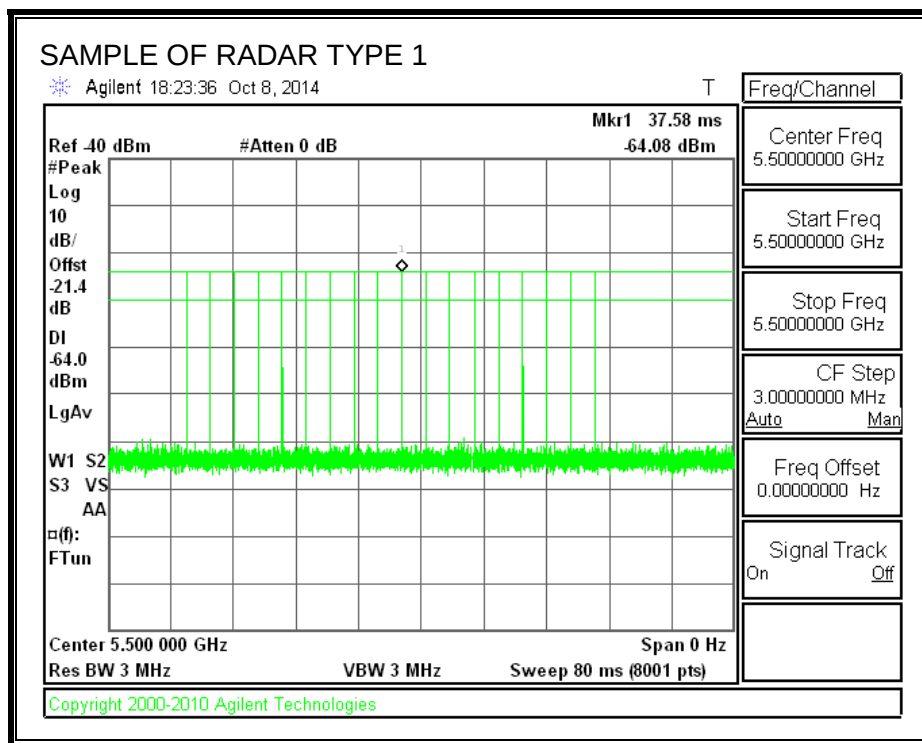
5.2.1. TEST CHANNEL

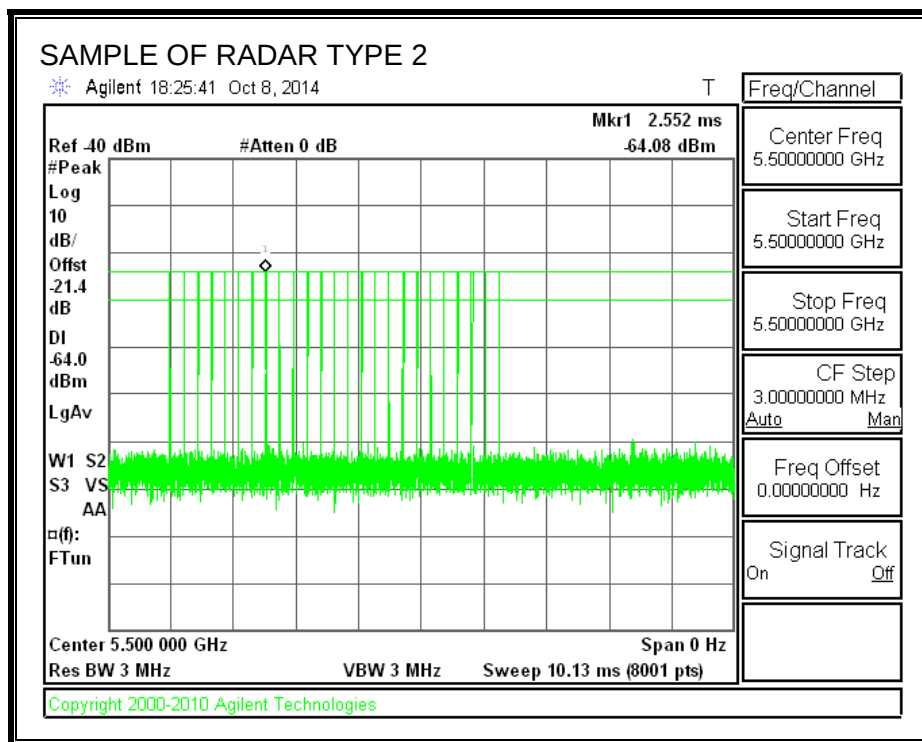
All tests were performed at a channel center frequency of 5500 MHz.

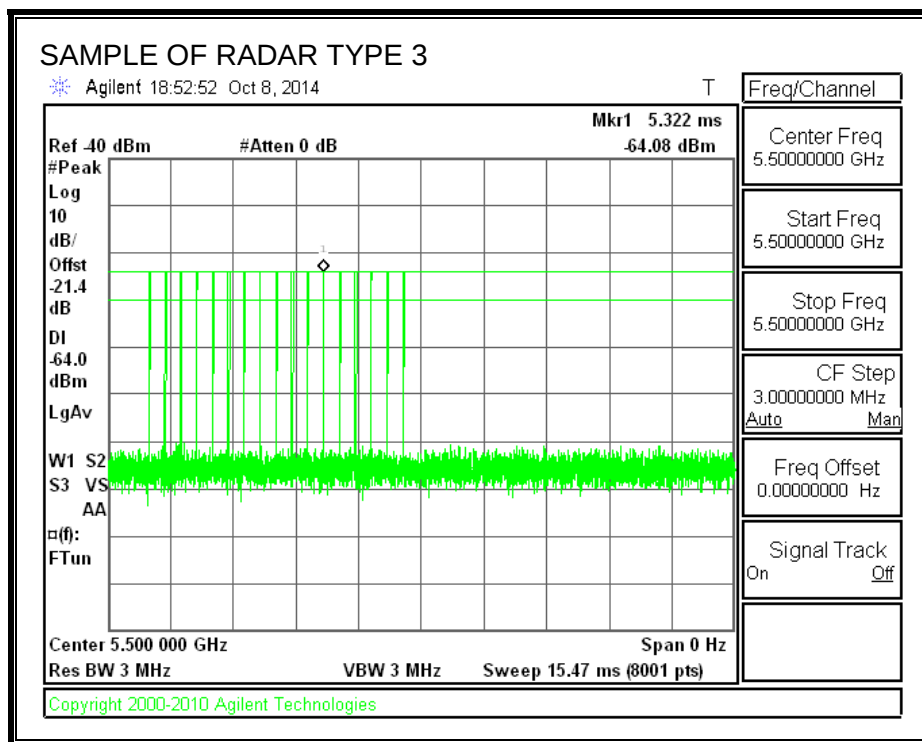
5.2.2. RADAR WAVEFORMS AND TRAFFIC

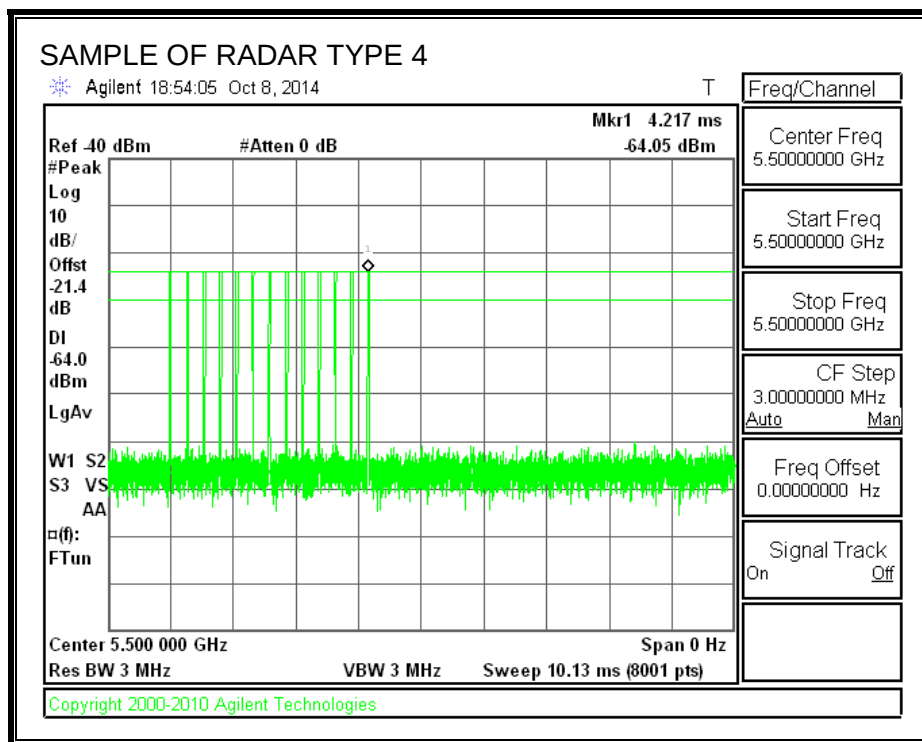
RADAR WAVEFORMS

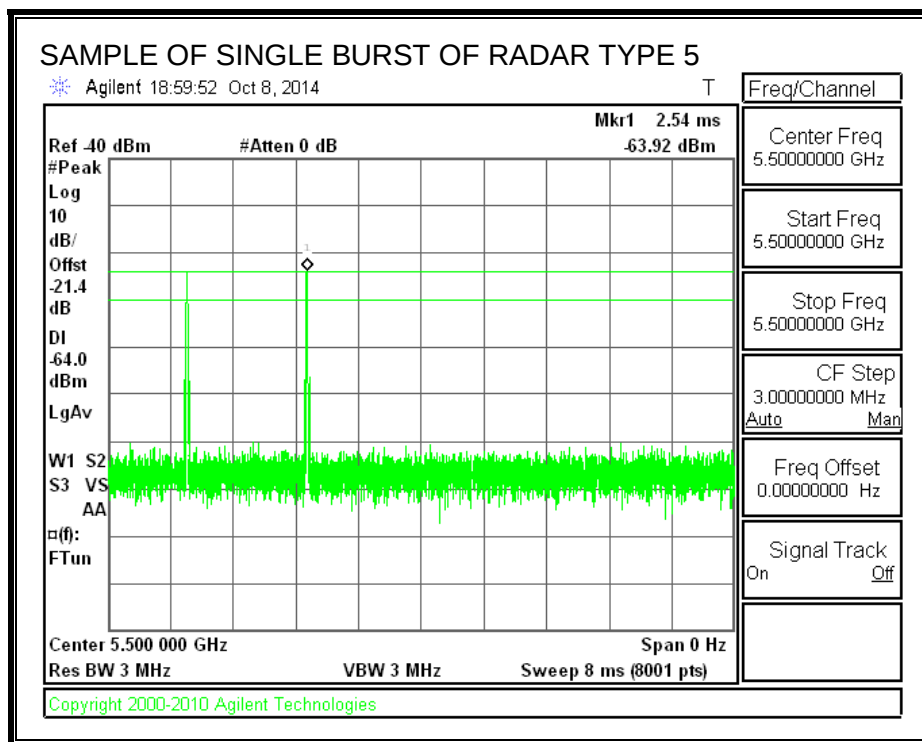


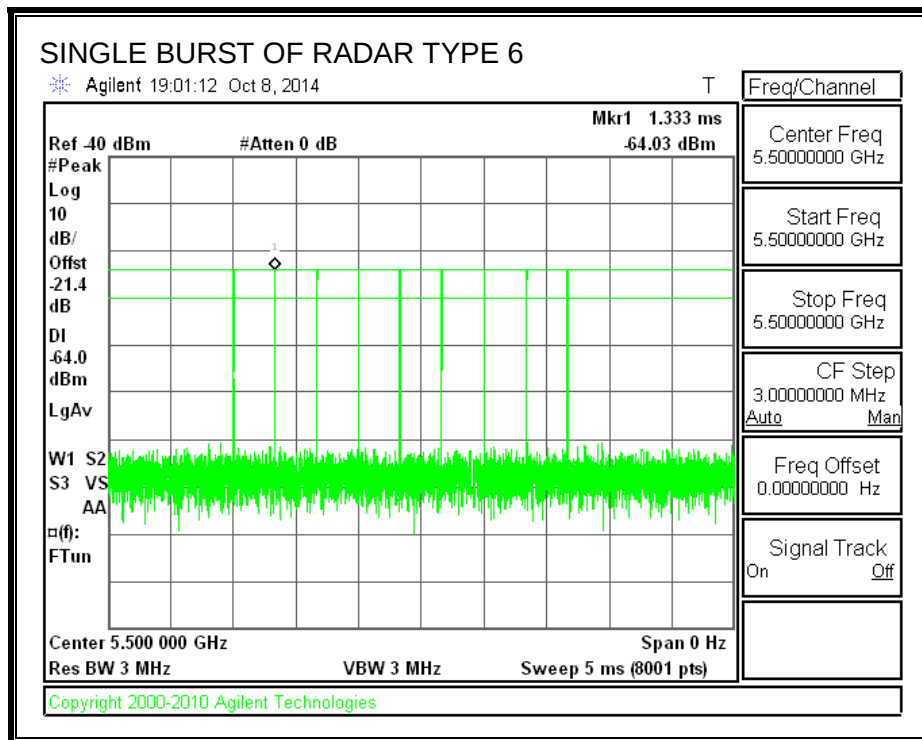




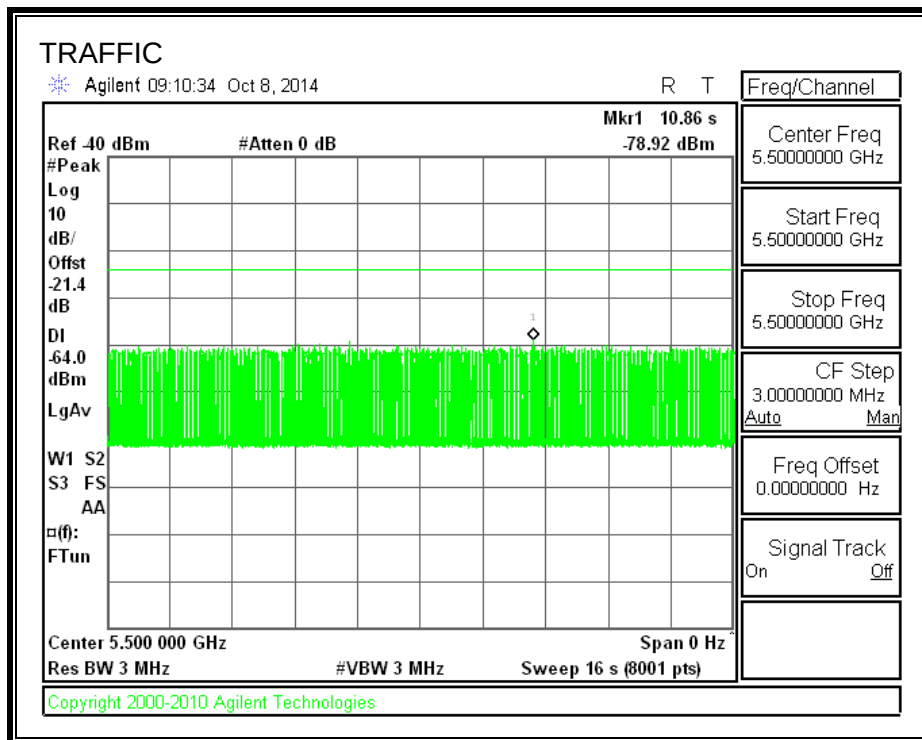








TRAFFIC



5.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

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

PROCEDURE FOR TIMING OF RADAR BURST

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

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

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.69	60.69

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	2.52	2.52

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	57.30	57.30

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)
20:33:23	20:34:23	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)
20:42:06	20:42:09	0:00:03

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
20:50:19	20:51:16	0:00:57

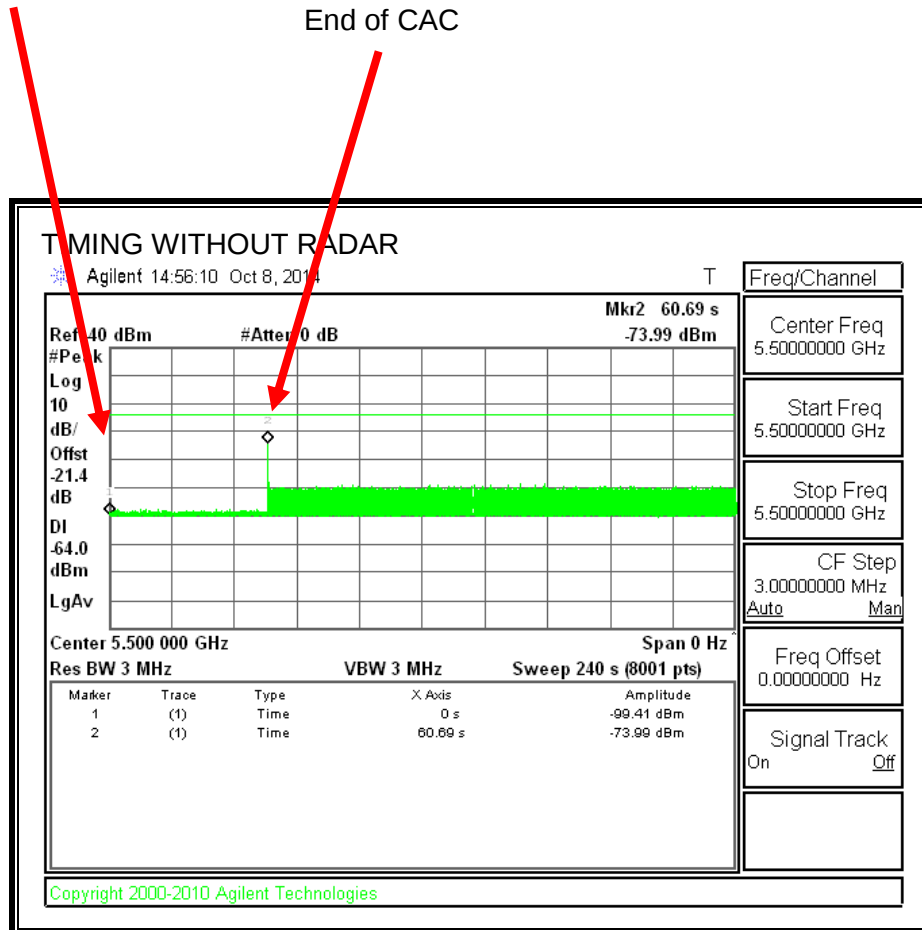
QUALITATIVE RESULTS

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

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

Log File of CAC Timing Without Radar

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

Jan 01 20:33:23 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 100 sys_idx: 3(cfg.c:584)

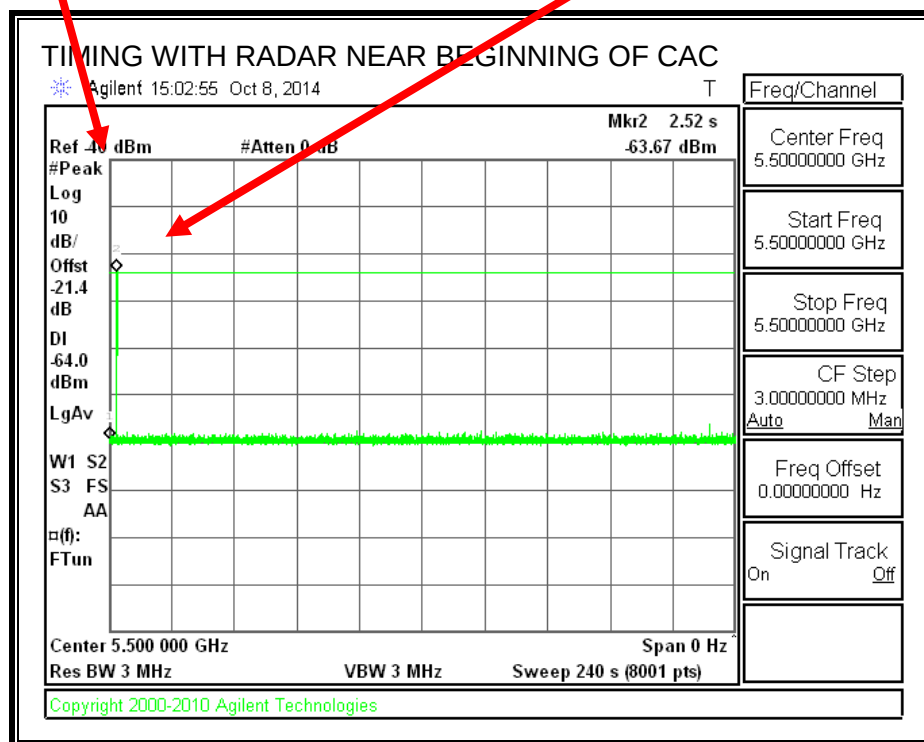
DLS DFS State PRE-ISM Channel Availability Check -> In-Service
Monitoring(ISM)

Jan 01 20:34:23 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> In-Service Monitoring(ISM).

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the Beginning of CAC

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

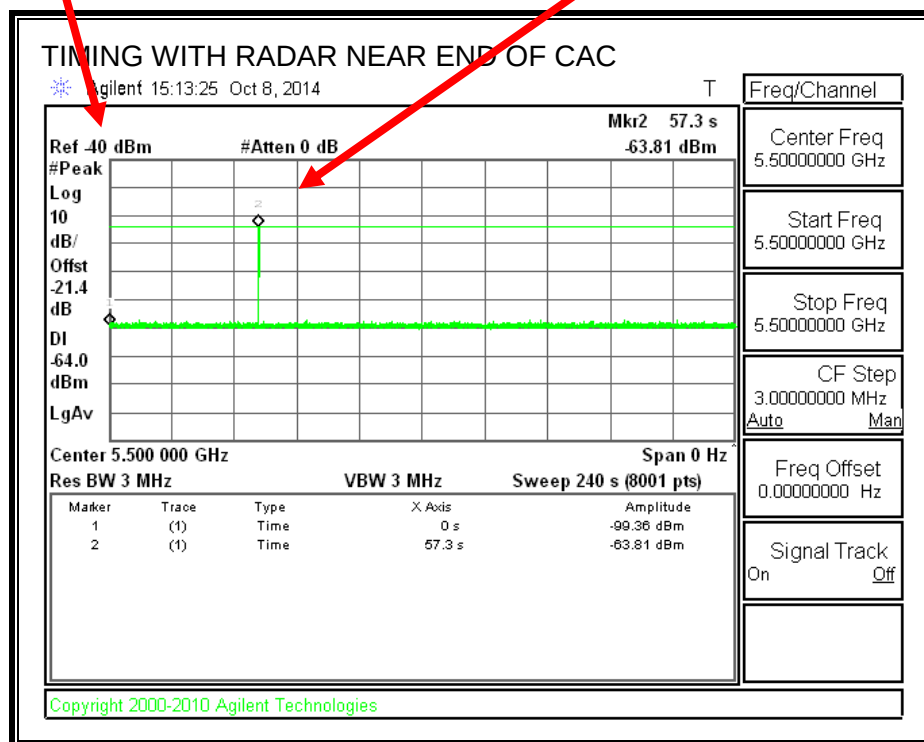
Jan 01 20:42:06 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 3(cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 20:42:09 2014: ap7522-160250 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 100 freq 5500 MHz

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

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

Jan 01 20:50:19 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 3(cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 20:51:16 2014: ap7522-160250 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 100 freq 5500 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).

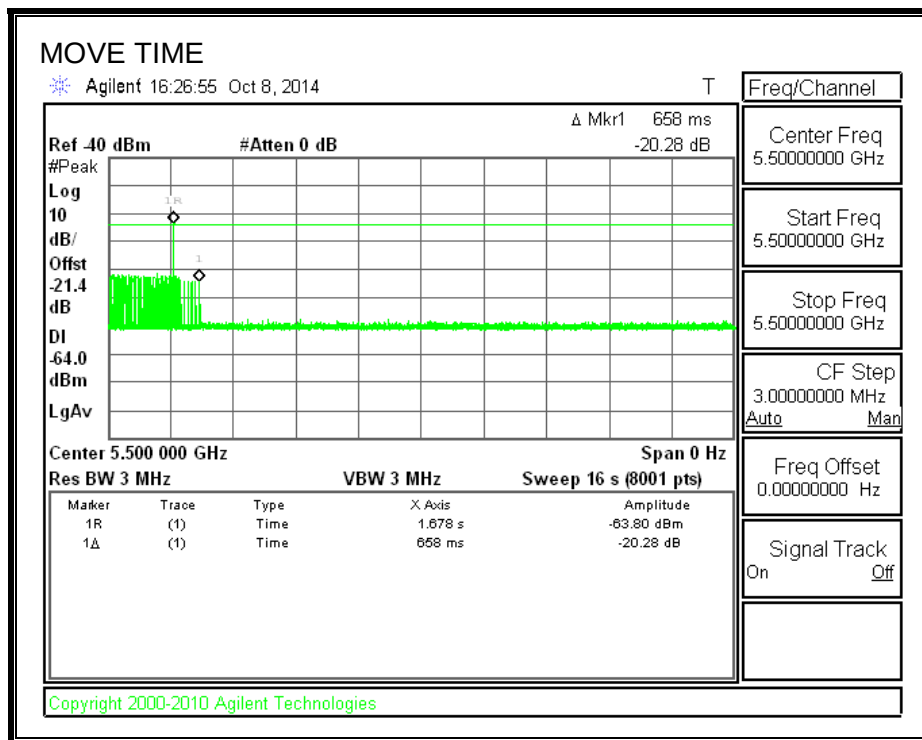
RESULTS

Channel Move Time (sec)	Limit (sec)
0.658	10

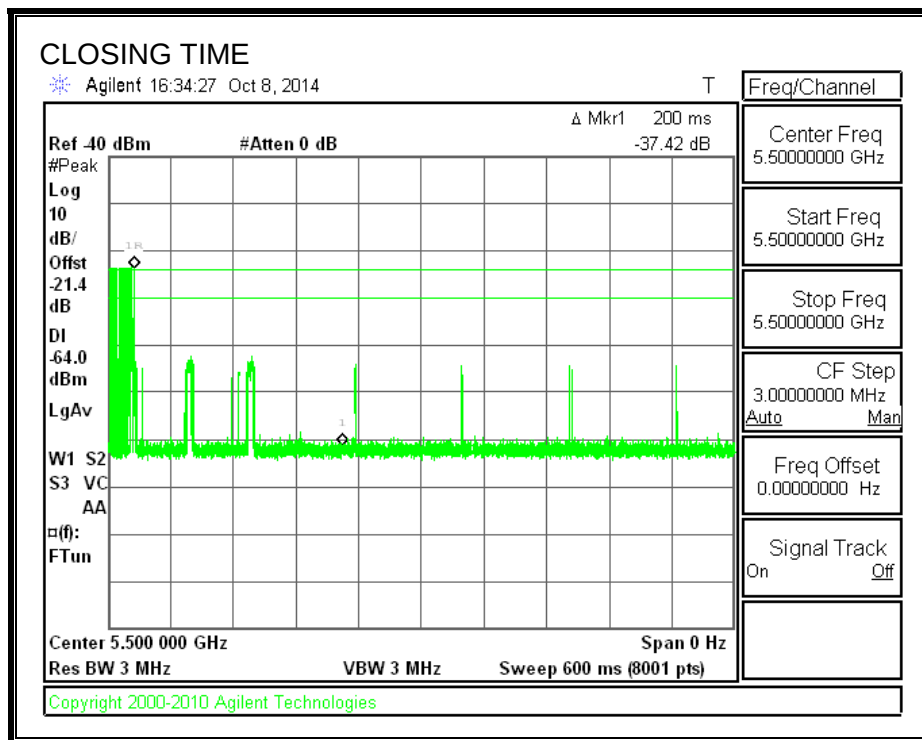
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
14.0	60

MOVE TIME

16 SECOND SWEEP:

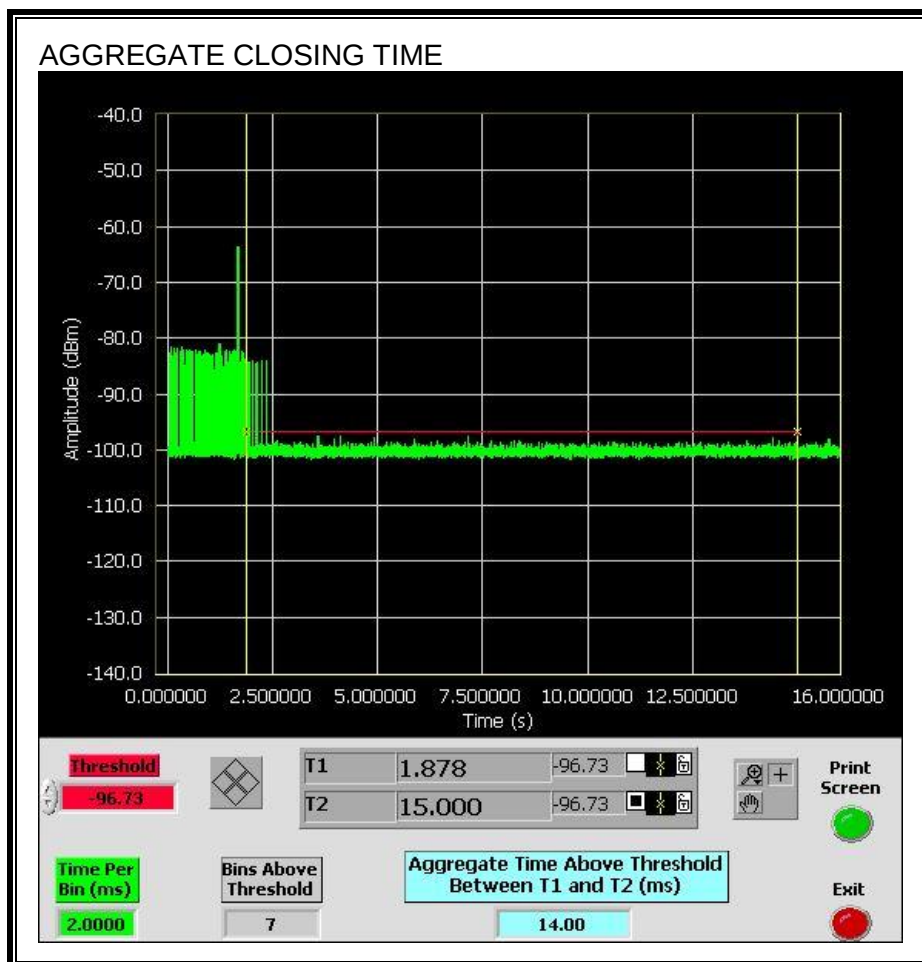


CHANNEL CLOSING TIME



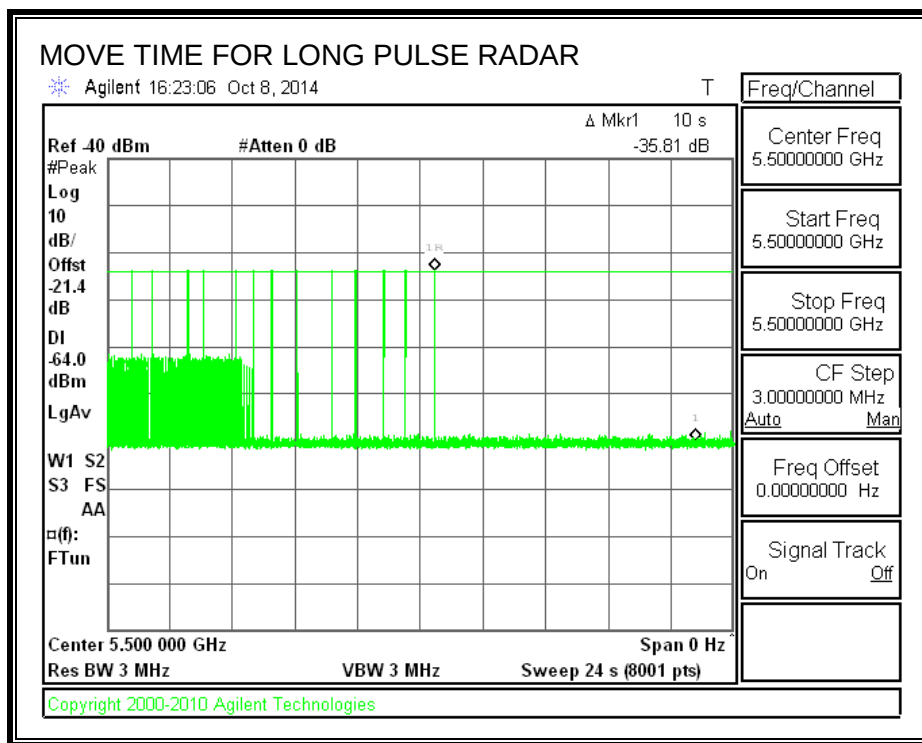
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



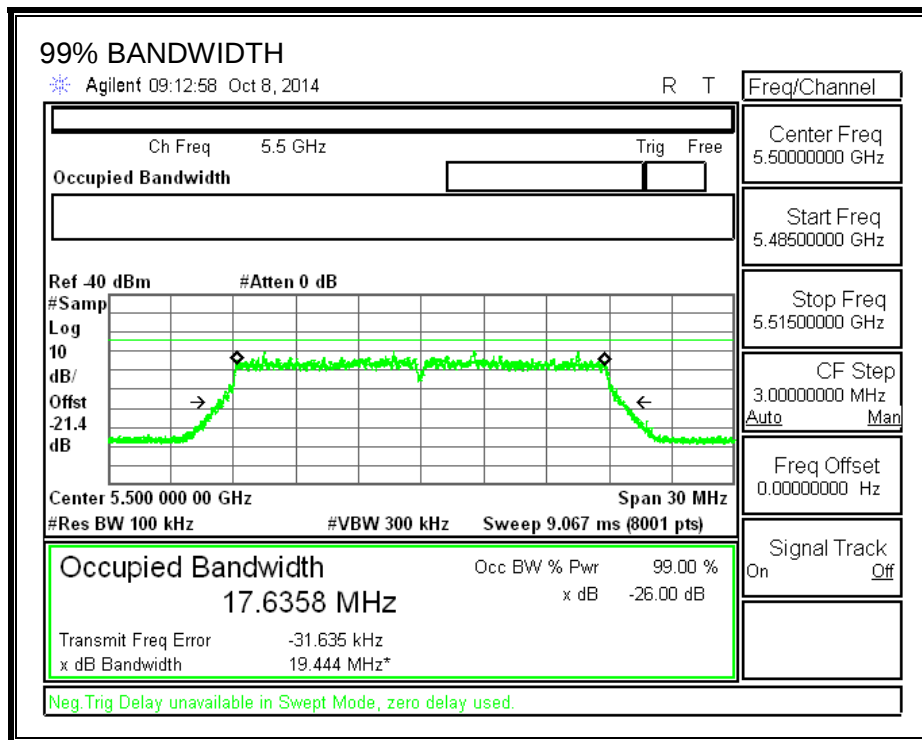
LONG PULSE CHANNEL MOVE TIME

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



5.2.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL	FH	Detection Bandwidth	99% Power Bandwidth	Ratio of Detection BW to 99% Power BW	Minimum Limit
(MHz)	(MHz)	(MHz)	(MHz)	(%)	(%)
5491	5510	19	17.636	107.7	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5491	60	54	90	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5500	10	9	90	
5505	10	10	100	
5510	10	10	100	FH

5.2.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	96.67	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	83.33	60	Pass
Aggregate		95.00	80	Pass
FCC Long Pulse Type 5	30	93.33	80	Pass
FCC Hopping Type 6	40	92.50	70	Pass

TYPE 1 DETECTION PROBABILITY

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

TYPE 2 DETECTION PROBABILITY

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

TYPE 3 DETECTION PROBABILITY

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

TYPE 4 DETECTION PROBABILITY

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

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5	
Trial	Successful Detection (Yes/No)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	No
10	Yes
11	No
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	157	5491	3	No
2	632	5492	6	Yes
3	1107	5493	4	Yes
4	1582	5494	1	Yes
5	2057	5495	4	Yes
6	2532	5496	5	Yes
7	3007	5497	4	Yes
8	3482	5498	4	Yes
9	3957	5499	6	Yes
10	4432	5500	3	Yes
11	4907	5501	7	Yes
12	5382	5502	7	Yes
13	5857	5503	6	Yes
14	6332	5504	3	Yes
15	6807	5505	5	Yes
16	7282	5506	6	Yes
17	7757	5507	6	Yes
18	8232	5508	7	Yes
19	8707	5509	5	Yes
20	9182	5510	5	Yes
21	9657	5491	5	Yes
22	10132	5492	2	No
23	10607	5493	4	Yes
24	11082	5494	5	Yes
25	11557	5495	4	Yes
26	12032	5496	5	Yes
27	12507	5497	5	Yes
28	12982	5498	7	Yes
29	13457	5499	6	Yes
30	13932	5500	2	Yes
31	14407	5501	1	Yes
32	14882	5502	4	Yes
33	15357	5503	5	Yes
34	15832	5504	4	Yes
35	16307	5505	2	No
36	16782	5506	6	Yes
37	17257	5507	4	Yes
38	17732	5508	6	Yes
39	18207	5509	8	Yes
40	18682	5510	5	Yes

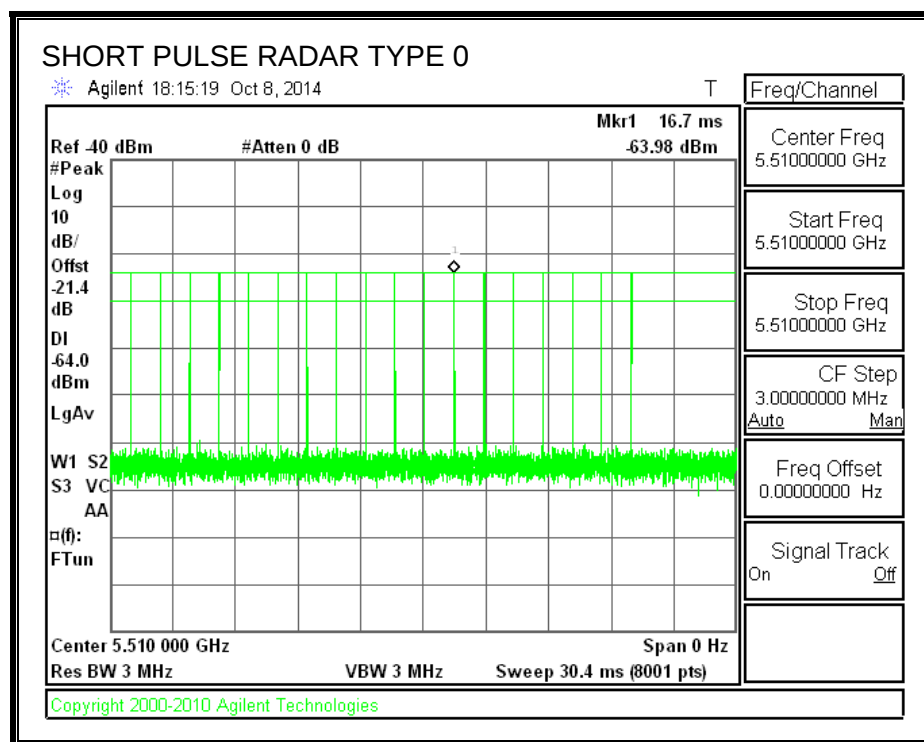
5.3. RESULTS FOR 40 MHz BANDWIDTH

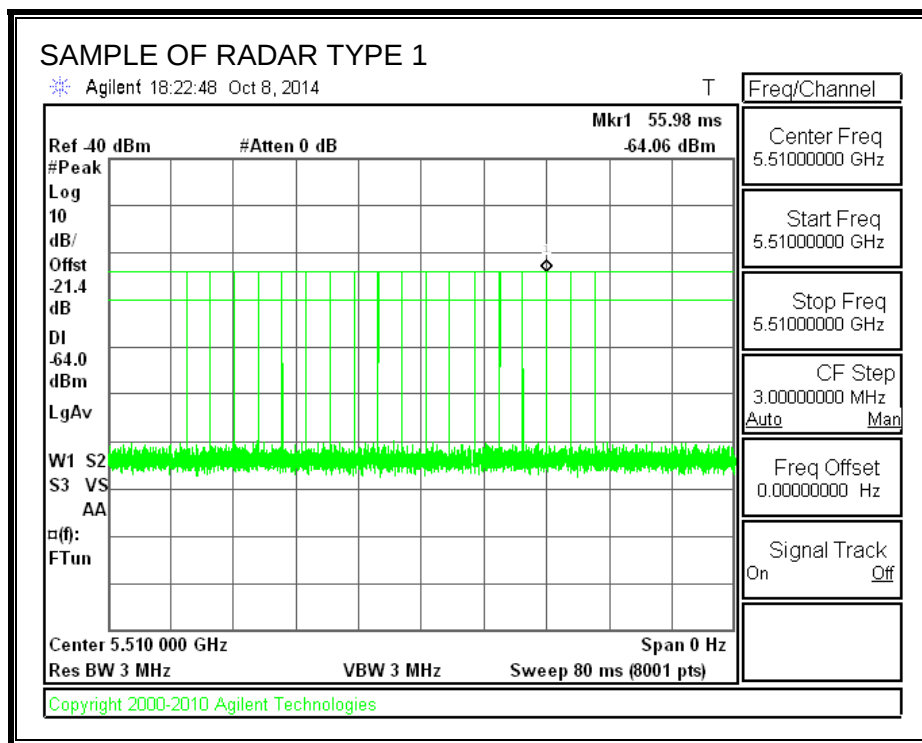
5.3.1. TEST CHANNEL

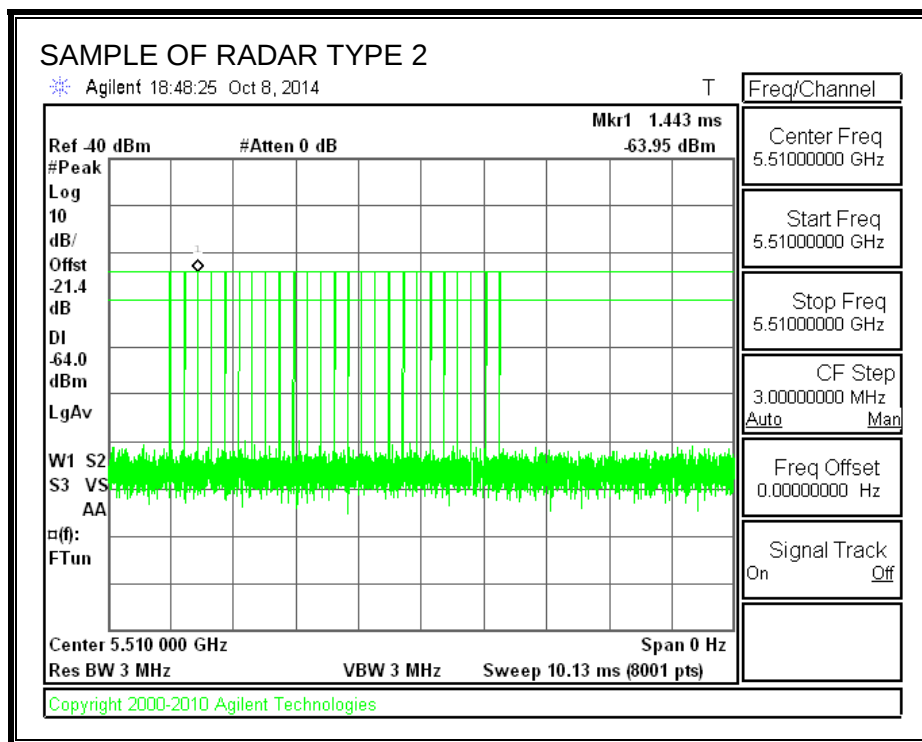
All tests were performed at a channel center frequency of 5510 MHz.

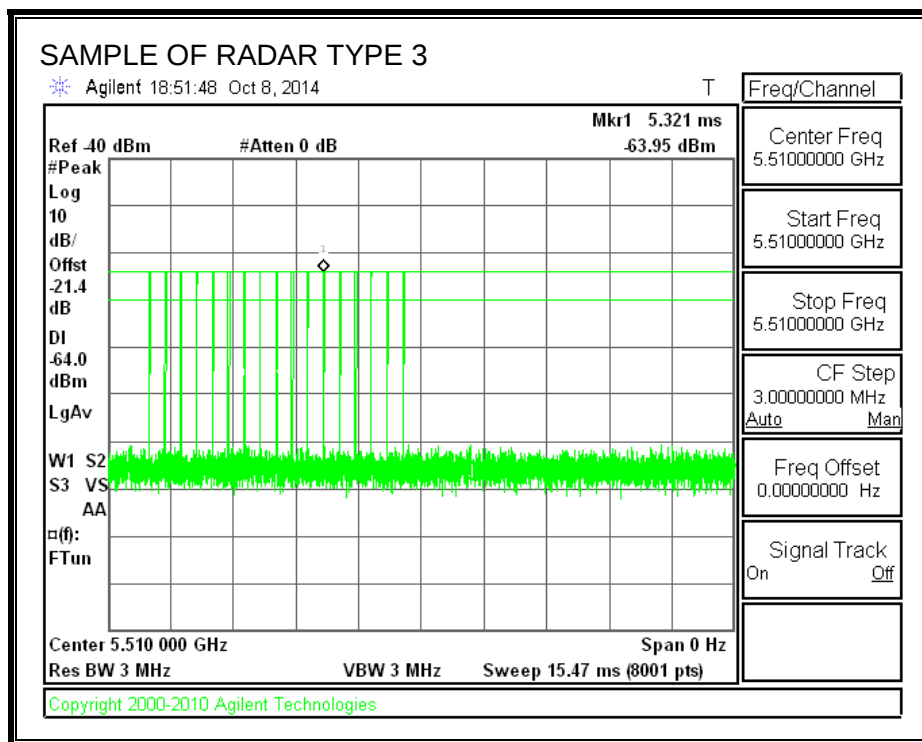
5.3.2. RADAR WAVEFORMS AND TRAFFIC

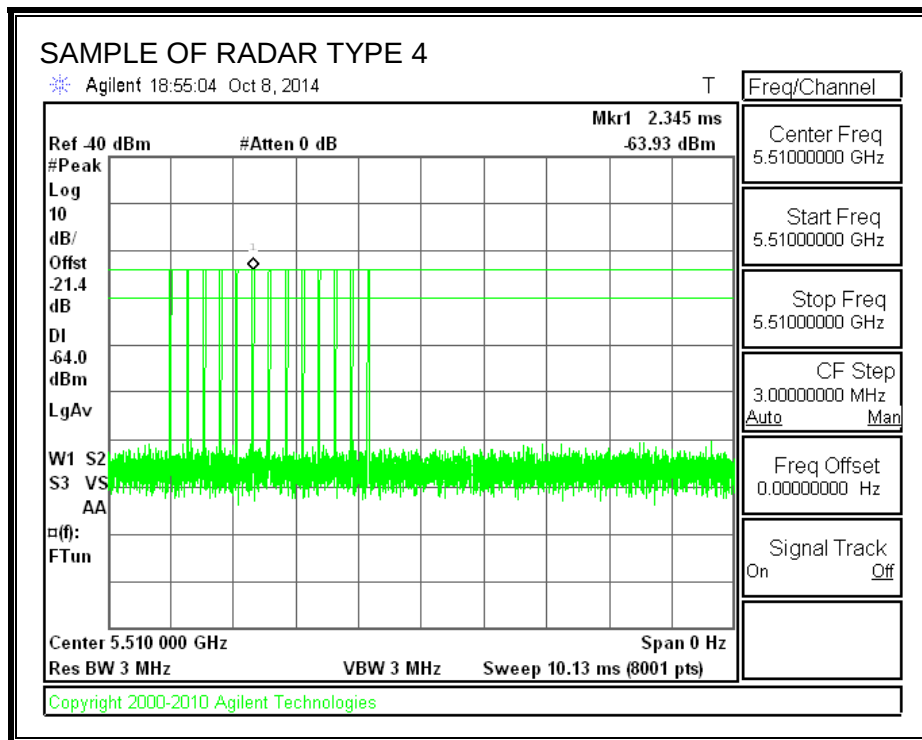
RADAR WAVEFORMS

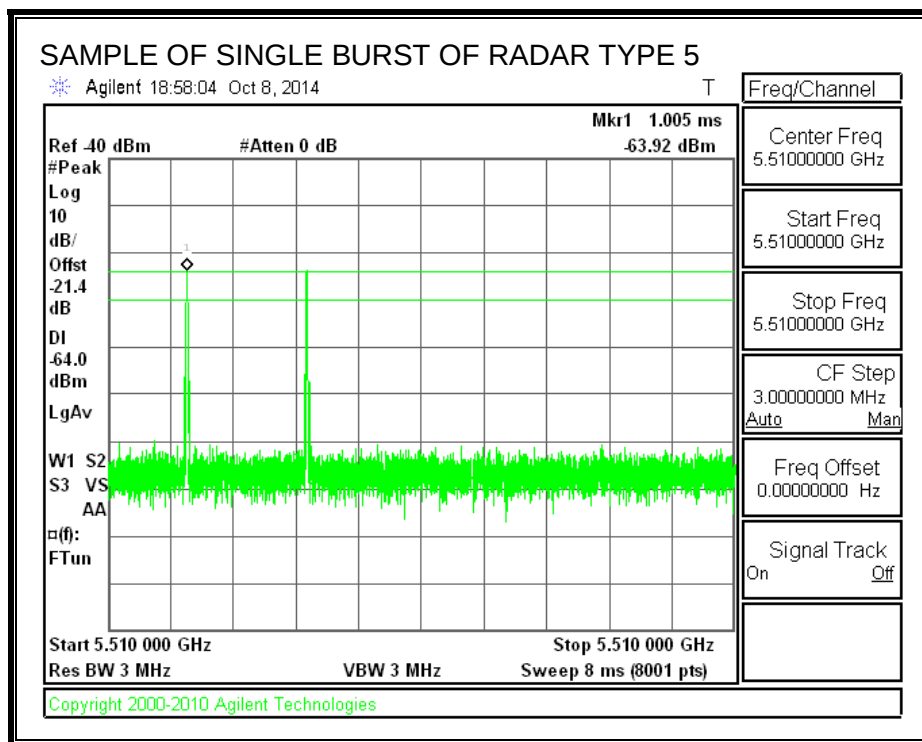


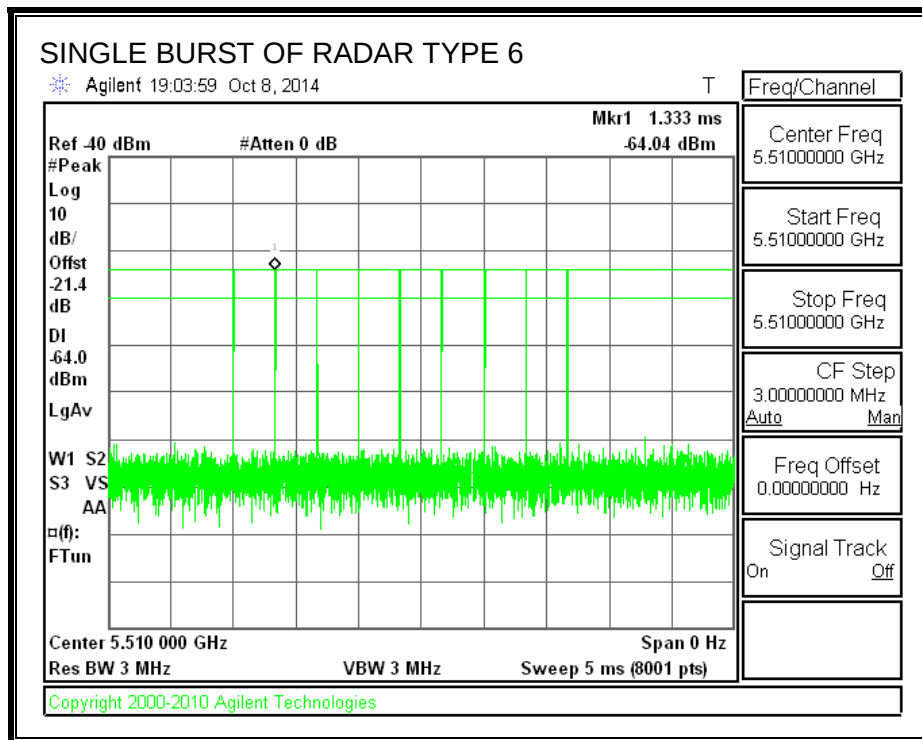




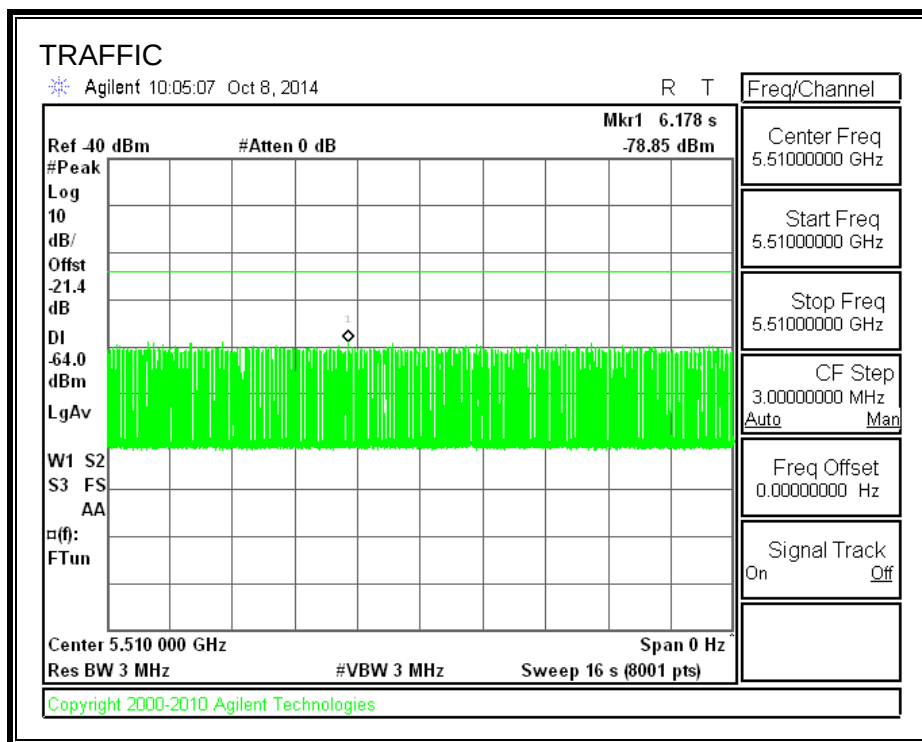








TRAFFIC



5.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

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

PROCEDURE FOR TIMING OF RADAR BURST

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

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

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.7	60.69

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	2.82	2.82

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	57.09	57.09

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)
20:01:23	20:02:23	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)
20:09:51	20:09:53	0:00:02

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
20:18:47	20:19:44	0:00:57

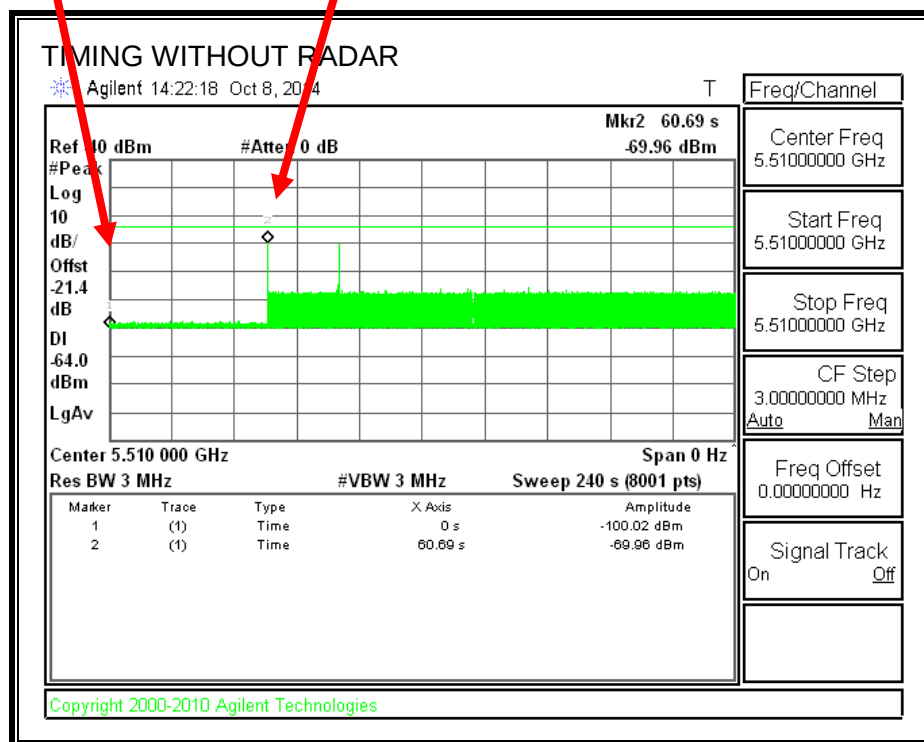
QUALITATIVE RESULTS

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

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

Log File of CAC Timing Without Radar

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

Jan 01 20:01:23 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

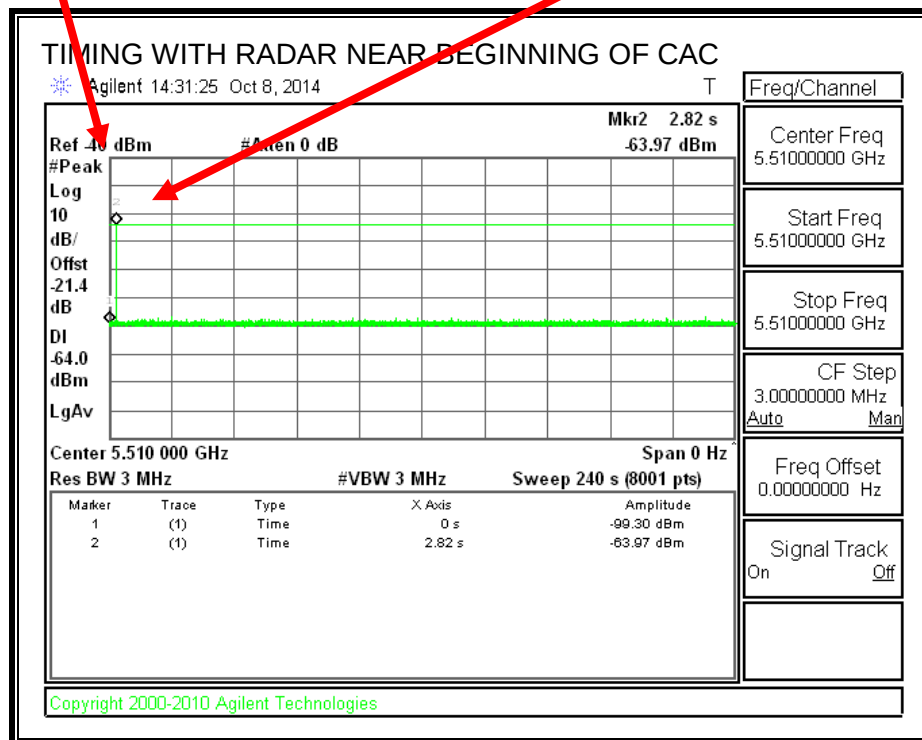
Jan 01 20:01:23 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> PRE-ISM Channel Availability Check.
radio->info.current_channel is 100 sys_idx: 5(cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> In-Service
Monitoring(ISM)

Jan 01 20:02:23 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel
Availability Check -> In-Service Monitoring(ISM).

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the Beginning of CAC

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

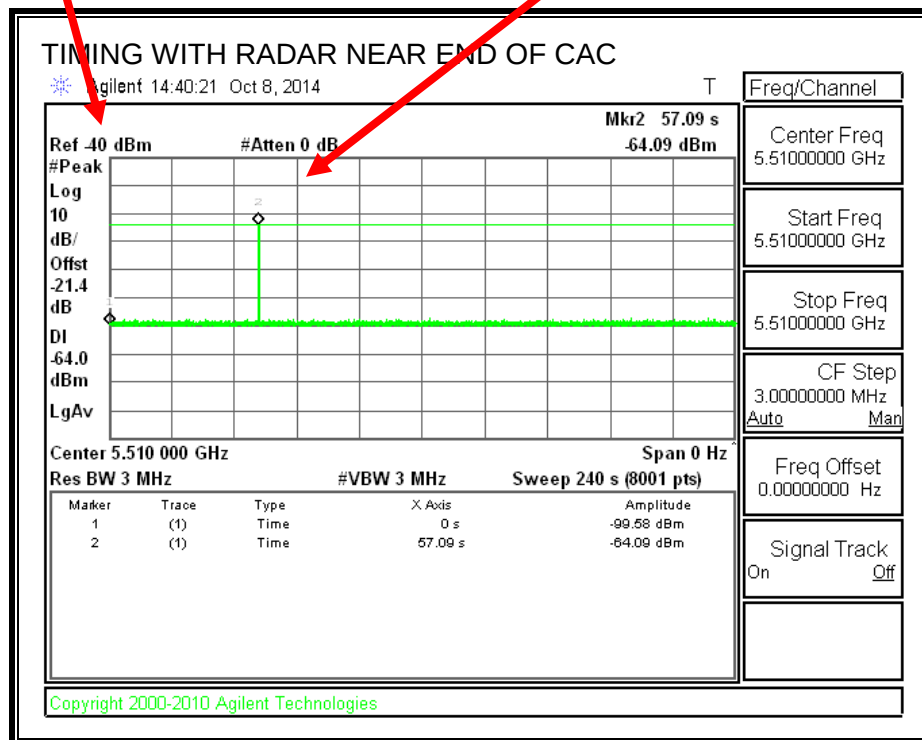
Jan 01 20:09:51 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 5(cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 20:09:53 2014: ap7522-160250 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 100 freq 5500 MHz

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

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

Jan 01 20:18:47 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 5(cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 20:19:44 2014: ap7522-160250 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 100 freq 5500 MHz

5.3.1. OVERLAPPING CHANNEL TESTS

RESULTS

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

5.3.2. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

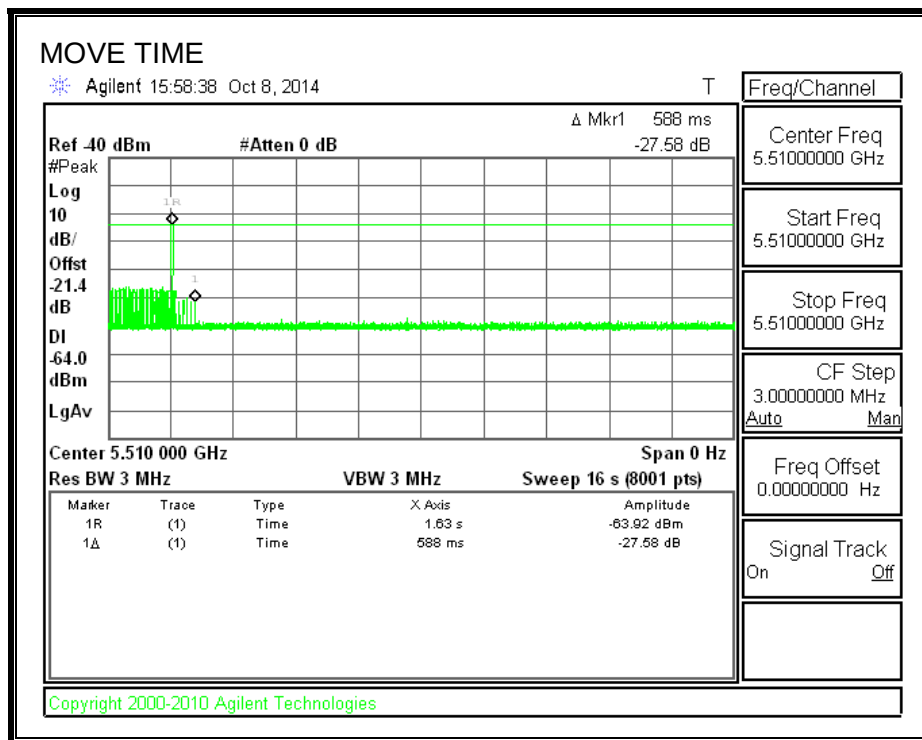
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

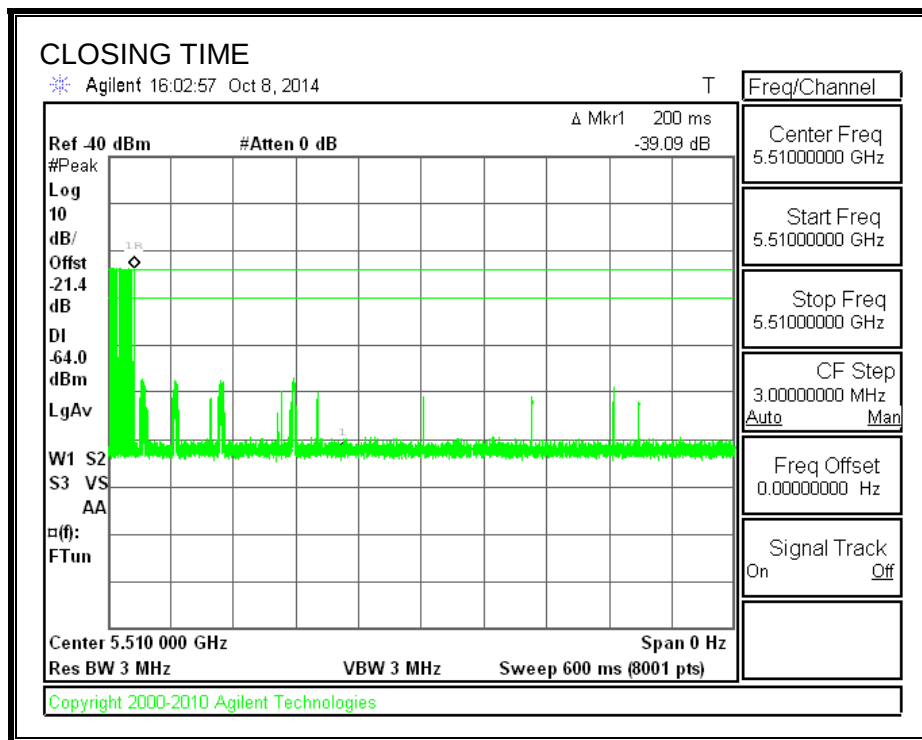
Channel Move Time (sec)	Limit (sec)
0.588	10

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

MOVE TIME

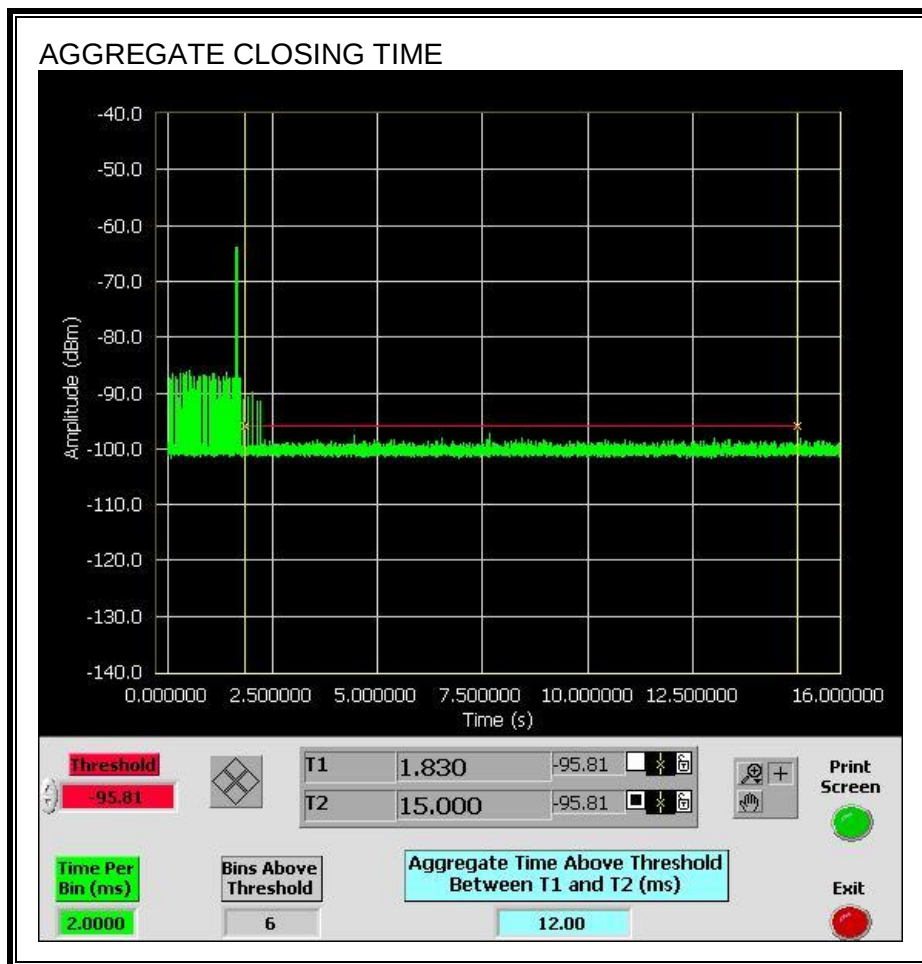


CHANNEL CLOSING TIME



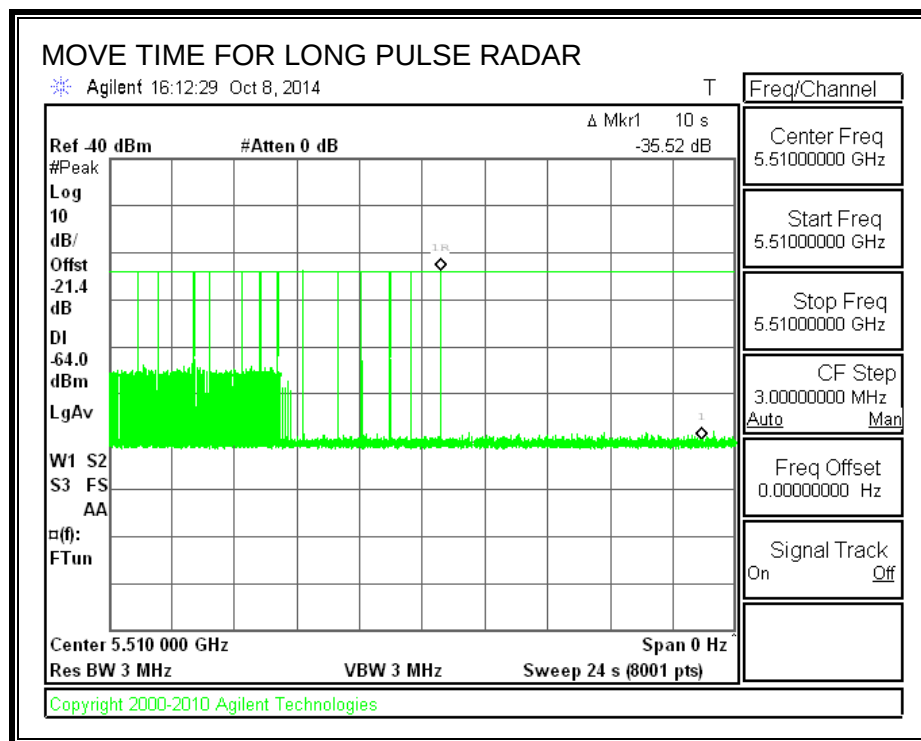
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

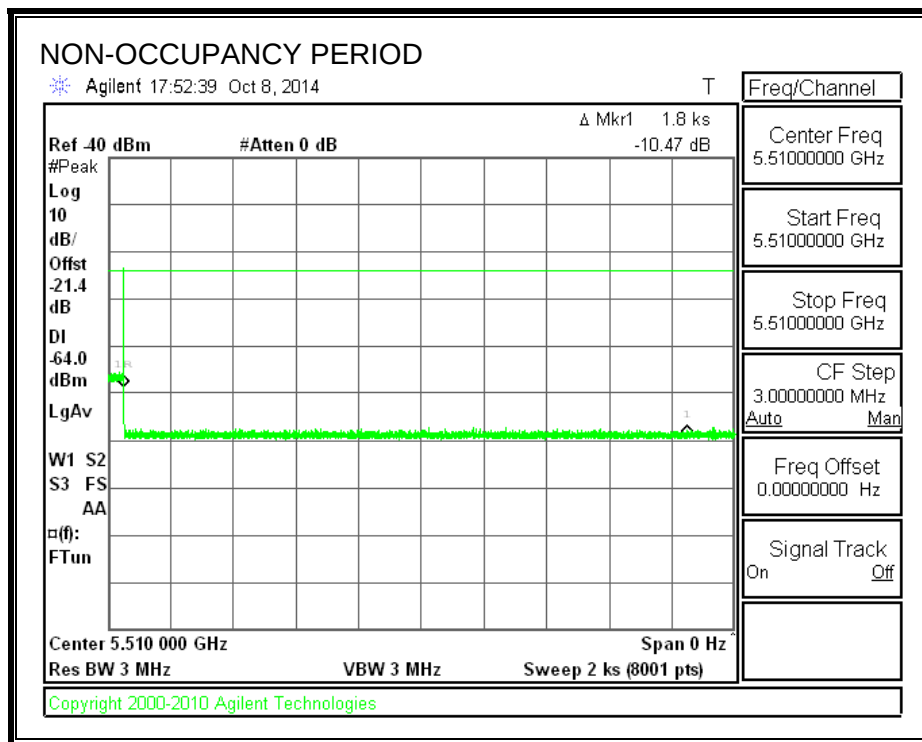
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.3.1. NON-OCCUPANCY PERIOD

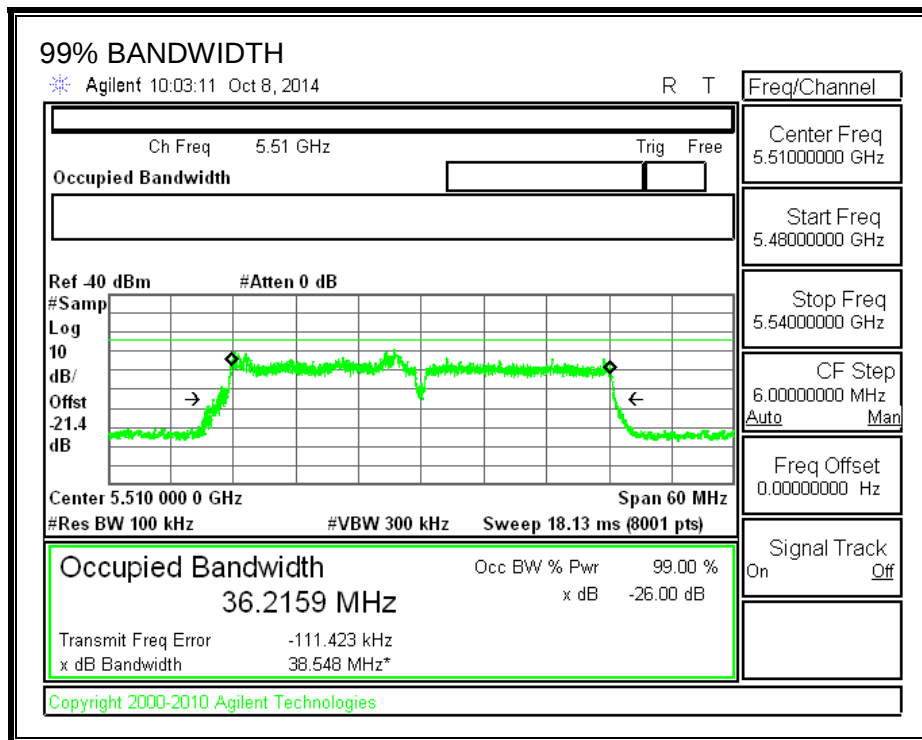
RESULTS

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	FH	Detection Bandwidth	99% Power Bandwidth	Ratio of Detection BW to 99% Power BW	Minimum Limit
(MHz)	(MHz)	(MHz)	(MHz)	(%)	(%)
5489	5529	40	36.216	110.4	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	9	90	FL
5490	10	9	90	
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	
5526	10	10	100	
5527	10	10	100	
5528	10	10	100	
5529	10	10	100	FH

5.3.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	96.67	60	Pass
FCC Short Pulse Type 2	30	96.67	60	Pass
FCC Short Pulse Type 3	30	86.67	60	Pass
FCC Short Pulse Type 4	30	90.00	60	Pass
Aggregate		92.50	80	Pass
FCC Long Pulse Type 5	30	96.67	80	Pass
FCC Hopping Type 6	41	97.56	70	Pass

TYPE 1 DETECTION PROBABILITY

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

TYPE 2 DETECTION PROBABILITY

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

TYPE 3 DETECTION PROBABILITY

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

TYPE 4 DETECTION PROBABILITY

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

TYPE 5 DETECTION PROBABILITY

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

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

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	215	5489	10	Yes
2	690	5490	9	Yes
3	1165	5491	10	Yes
4	1640	5492	4	Yes
5	2115	5493	7	Yes
6	2590	5494	11	Yes
7	3065	5495	10	No
8	3540	5496	8	Yes
9	4015	5497	7	Yes
10	4490	5498	13	Yes
11	4965	5499	9	Yes
12	5440	5500	12	Yes
13	5915	5501	7	Yes
14	6390	5502	8	Yes
15	6865	5503	7	Yes
16	7340	5504	8	Yes
17	7815	5505	12	Yes
18	8290	5506	9	Yes
19	8765	5507	7	Yes
20	9240	5508	4	Yes
21	9715	5509	9	Yes
22	10190	5510	9	Yes
23	10665	5511	8	Yes
24	11140	5512	5	Yes
25	11615	5513	12	Yes
26	12090	5514	6	Yes
27	12565	5515	6	Yes
28	13040	5516	9	Yes
29	13515	5517	3	Yes
30	13990	5518	11	Yes
31	14465	5519	9	Yes
32	14940	5520	6	Yes
33	15415	5521	10	Yes
34	15890	5522	9	Yes
35	16365	5523	7	Yes
36	16840	5524	8	Yes
37	17315	5525	8	Yes
38	17790	5526	7	Yes
39	18265	5527	4	Yes
40	18740	5528	8	Yes
41	19215	5529	8	Yes

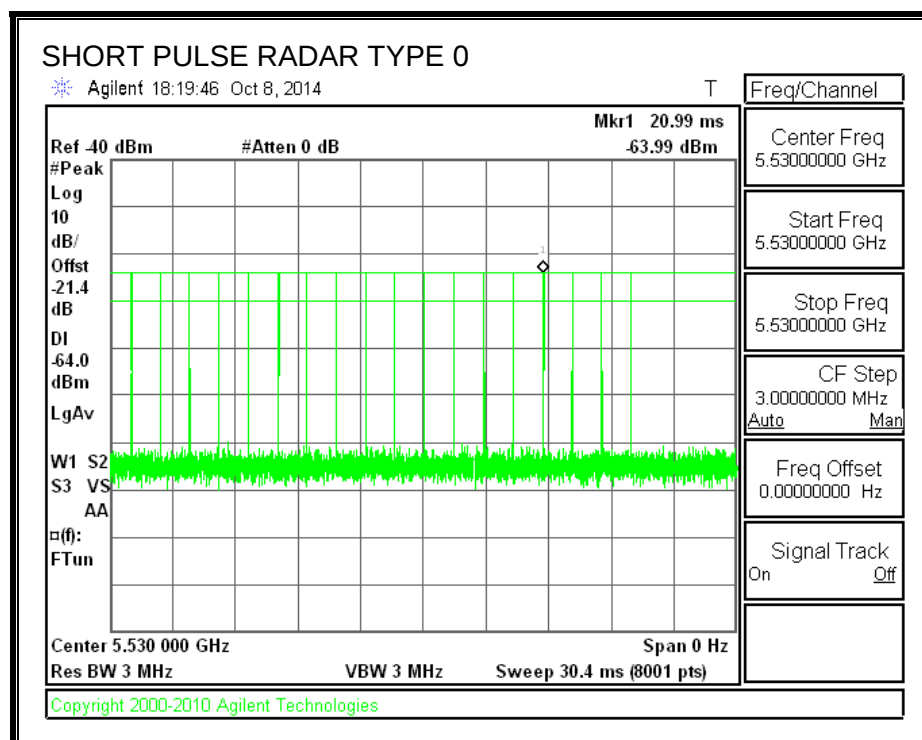
5.4. RESULTS FOR 80 MHz BANDWIDTH

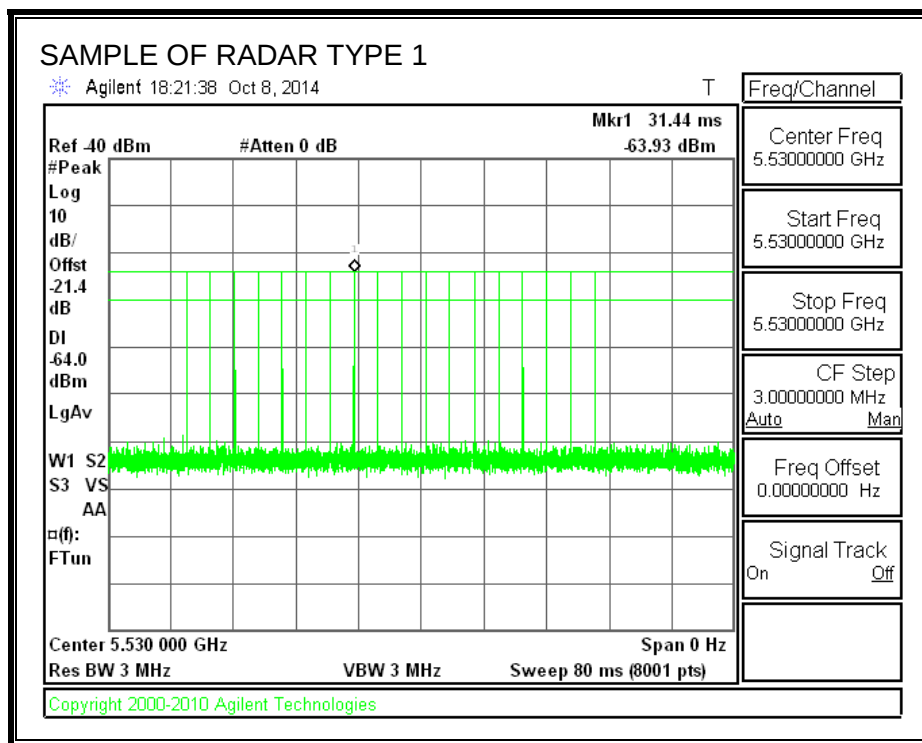
5.4.1. TEST CHANNEL

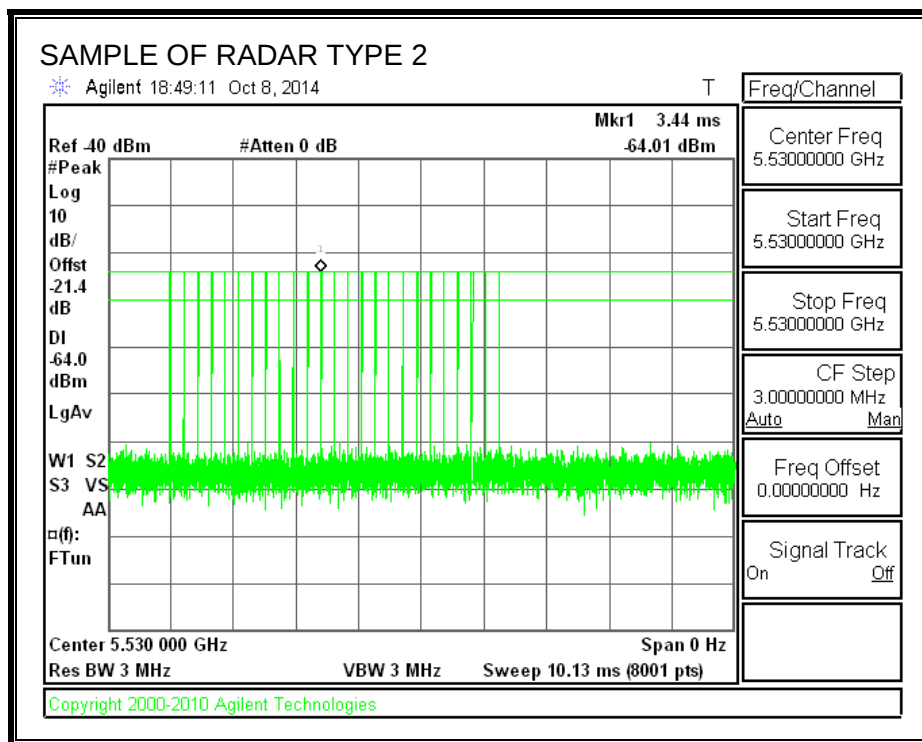
All tests were performed at a channel center frequency of 5530 MHz.

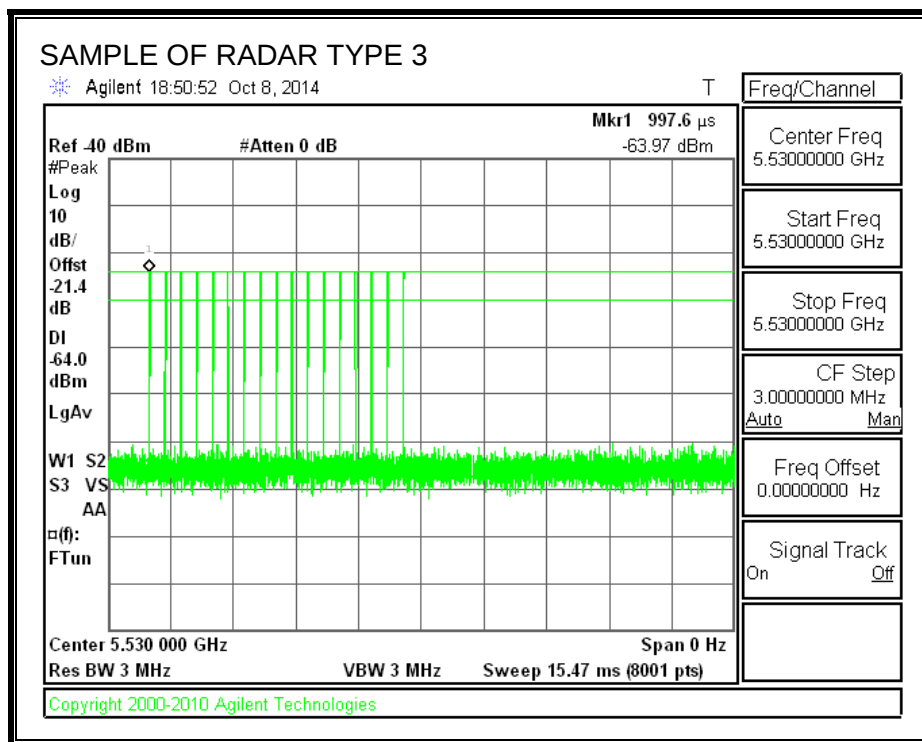
5.4.2. RADAR WAVEFORMS AND TRAFFIC

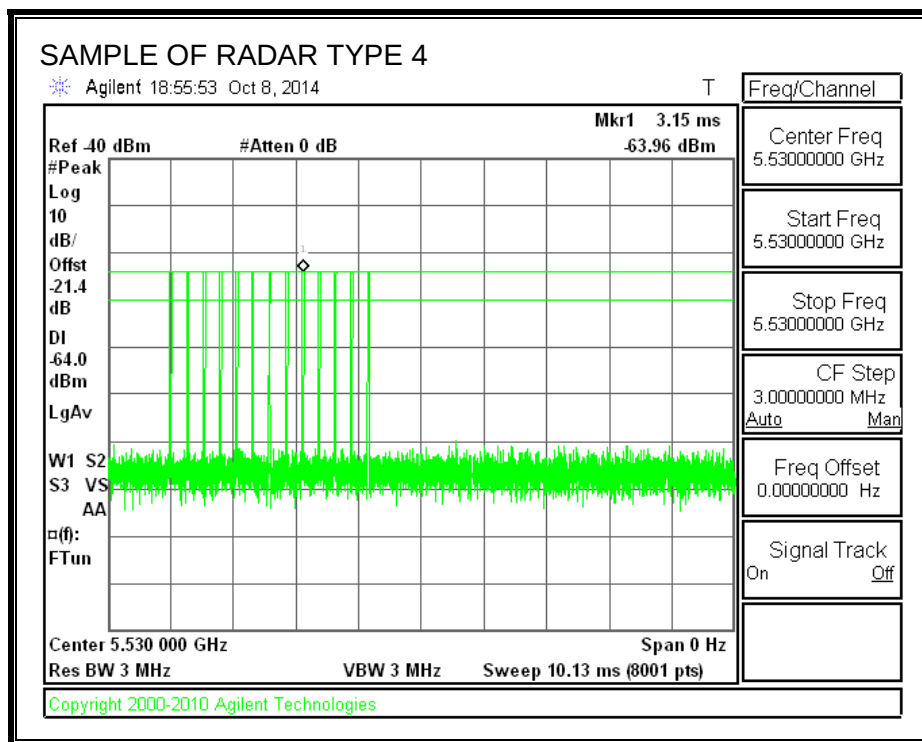
RADAR WAVEFORMS

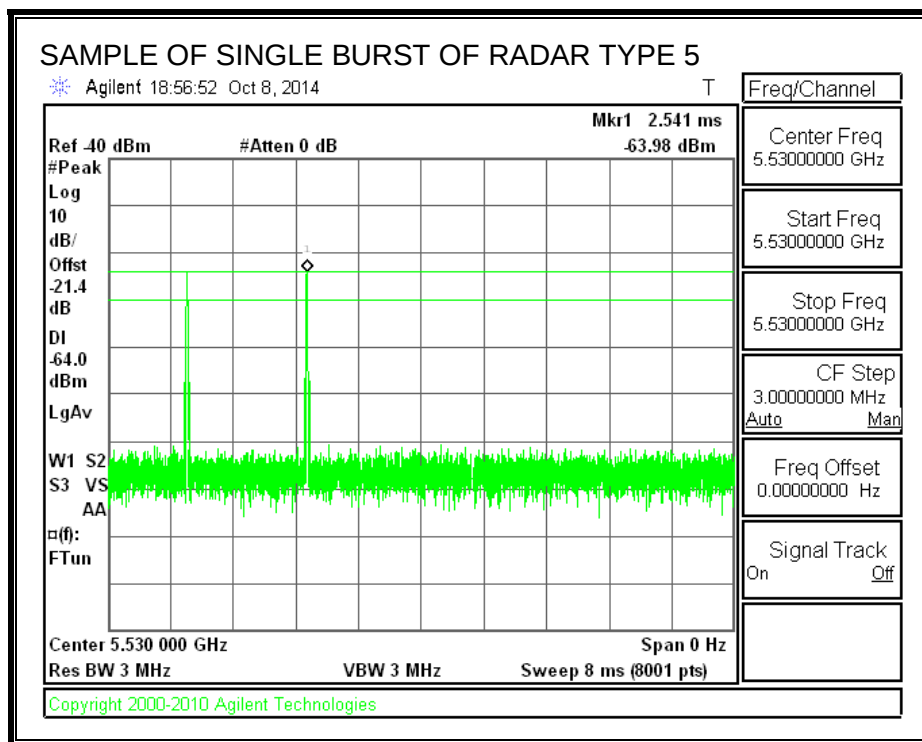


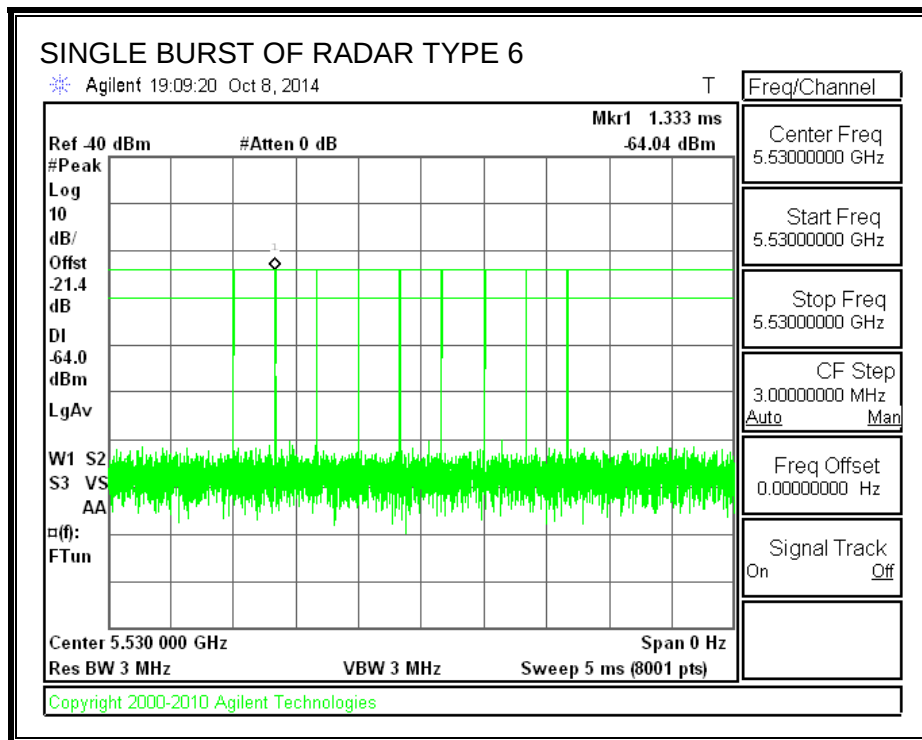




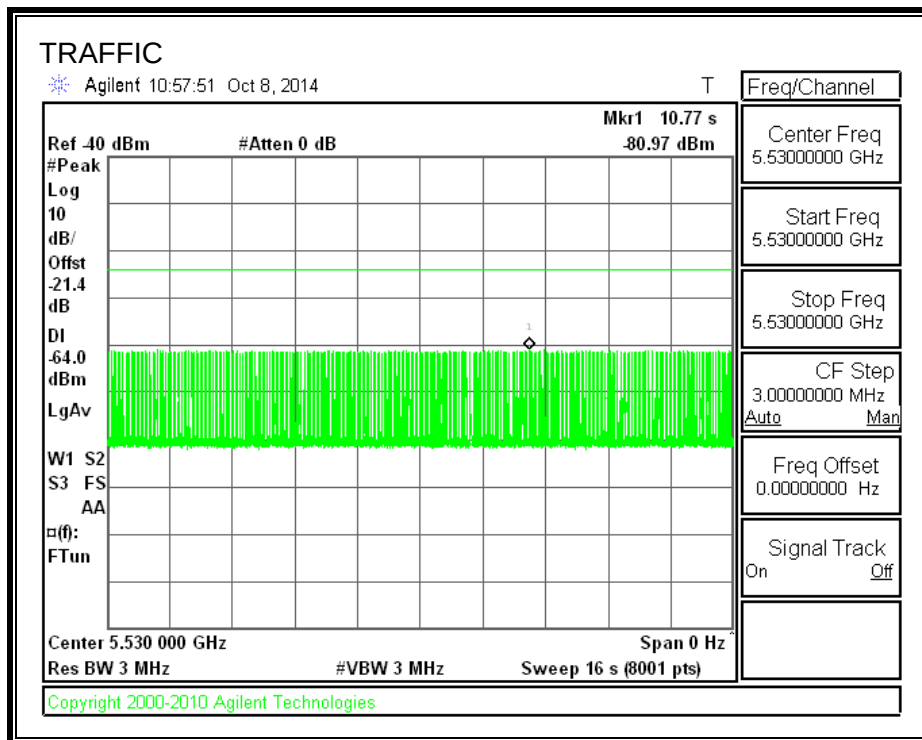








TRAFFIC



5.4.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

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

PROCEDURE FOR TIMING OF RADAR BURST

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

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

QUANTITATIVE RESULTS BASED UPON SPECTRUM ANALYZER PLOTS

No Radar Triggered

Beginning of CAC (sec)	Timing of Start of Traffic (sec)	CAC Period Time (sec)
0	60.5	60.48

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	2.37	2.37

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	56.88	56.88

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)
19:24:20	19:25:20	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)
19:33:04	19:33:06	0:00:02

Radar Near End of CAC

Beginning of CAC (hh:mm:ss)	Radar Detected (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
19:46:11	19:47:07	0:00:56

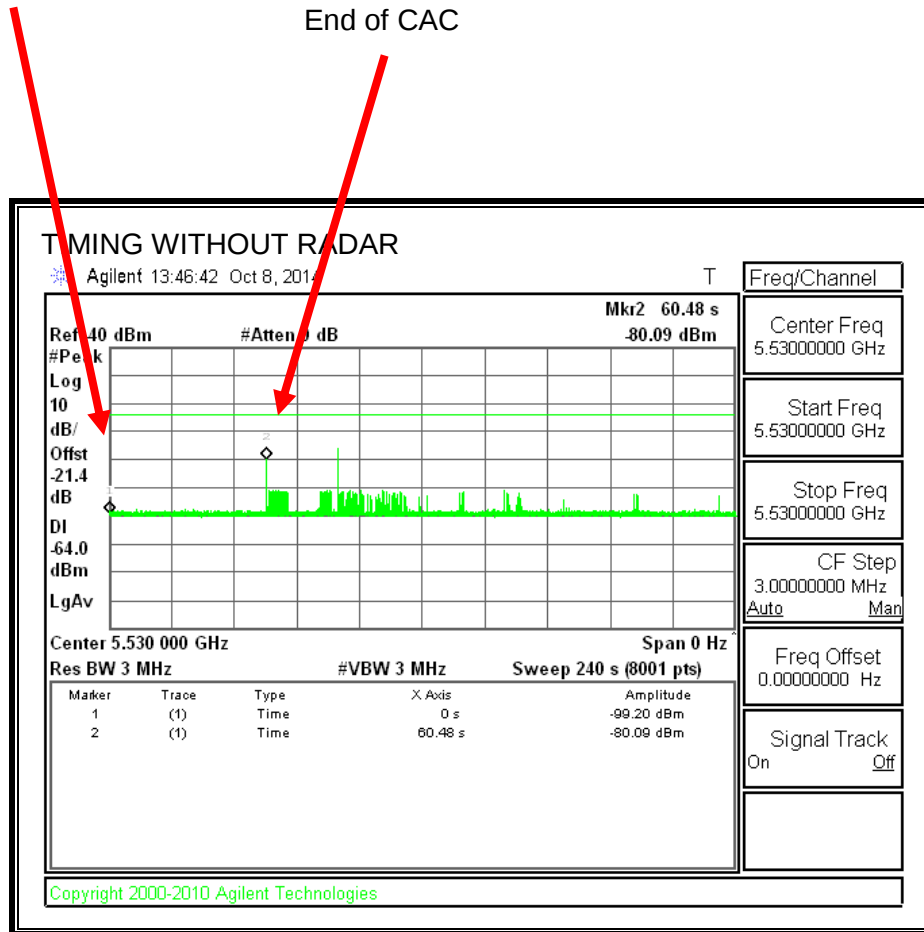
QUALITATIVE RESULTS

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

TIMING WITHOUT RADAR DURING CAC

Command to
Switch Channels
Start of CAC

End of CAC



Transmissions begin on channel after completion of the CAC period.

Log File of CAC Timing Without Radar

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

Jan 01 19:24:20 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel Availability Check.

width is 80(cfg.c:572)

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

Jan 01 19:24:20 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel Availability Check.

radio->info.current_channel is 100 sys_idx: 6(cfg.c:584)

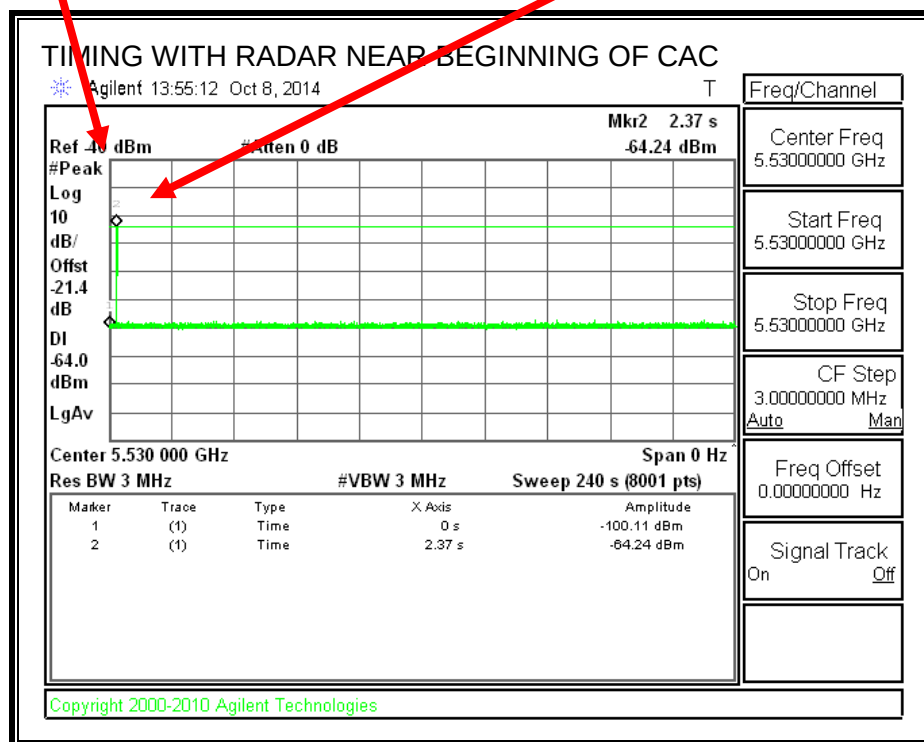
DLS DFS State PRE-ISM Channel Availability Check -> In-Service Monitoring(ISM)

Jan 01 19:25:20 2014: %KERN-4-WARNING: DLS DFS State PRE-ISM Channel Availability Check -> In-Service Monitoring(ISM).

TIMING WITH RADAR NEAR BEGINNING OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the Beginning of CAC

DLS DFS State IDLE -> PRE-ISM Channel Availability Check
width is 80 (cfg.c:572)

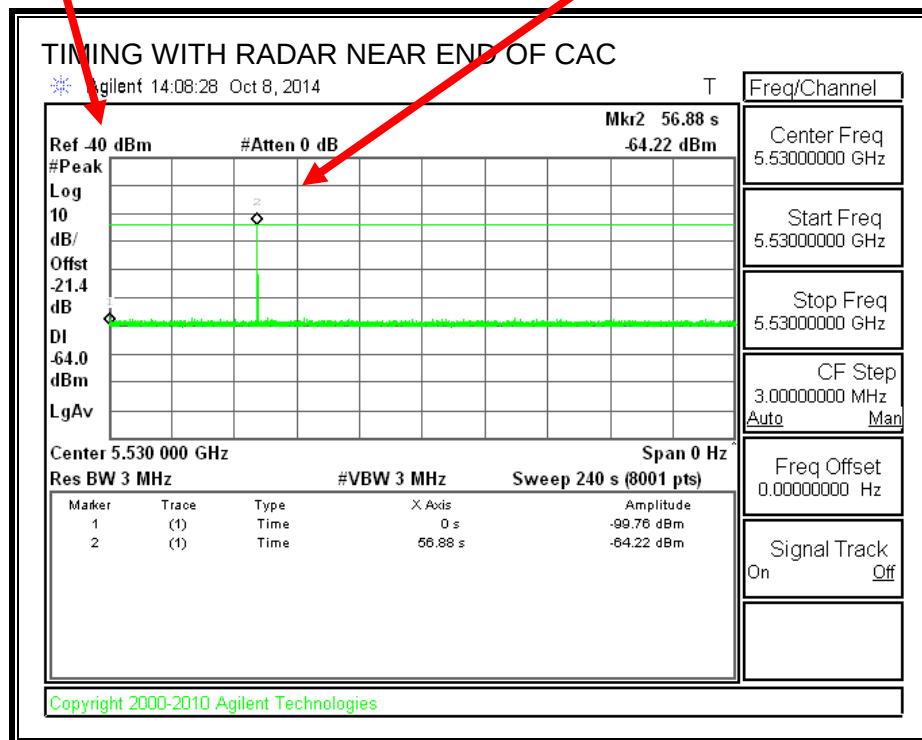
Jan 01 19:33:04 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 6 (cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 19:33:06 2014: KERN: WL1: DFS: UNCLASSIFIED ##### radar detected
on channel 100/80 ##### Intv=57120, min_pw=6, AT 1950MS.

TIMING WITH RADAR NEAR END OF CAC

Command to
Switch Channels
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

Log File of Radar at the End of CAC

DLS DFS State IDLE -> PRE-ISM Channel Availability Check
width is 80 (cfg.c:572)

Jan 01 19:46:11 2014: %KERN-4-WARNING: DLS DFS State IDLE -> PRE-ISM Channel
Availability Check.
radio->info.current_channel is 100 sys_idx: 6 (cfg.c:584)
DLS DFS State PRE-ISM Channel Availability Check -> PRE-ISM Channel
Availability Check

Jan 01 19:47:07 2014: ap7522-160250 : %RADIO-4-RADAR_DETECTED: Radar found on
channel 100 freq 5500 MHz

5.4.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

5.4.5. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

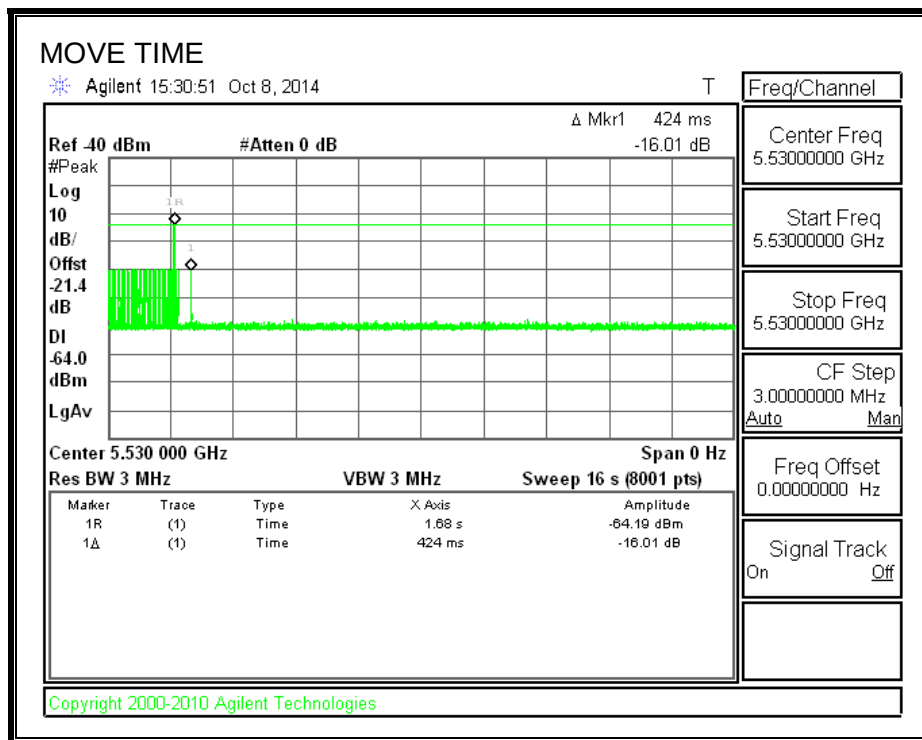
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

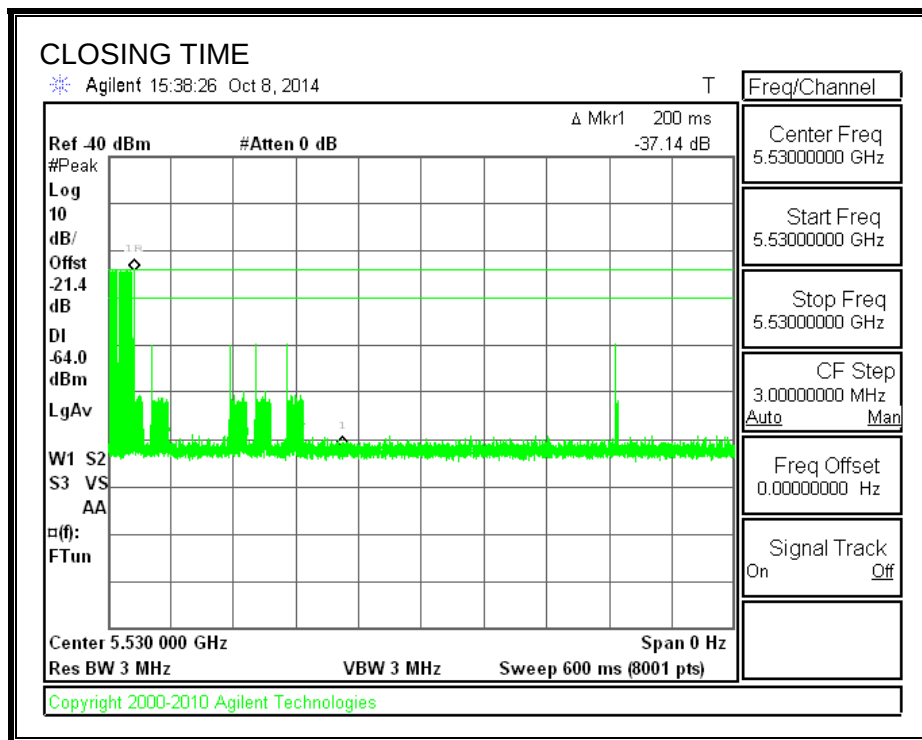
Channel Move Time (sec)	Limit (sec)
0.424	10

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

MOVE TIME

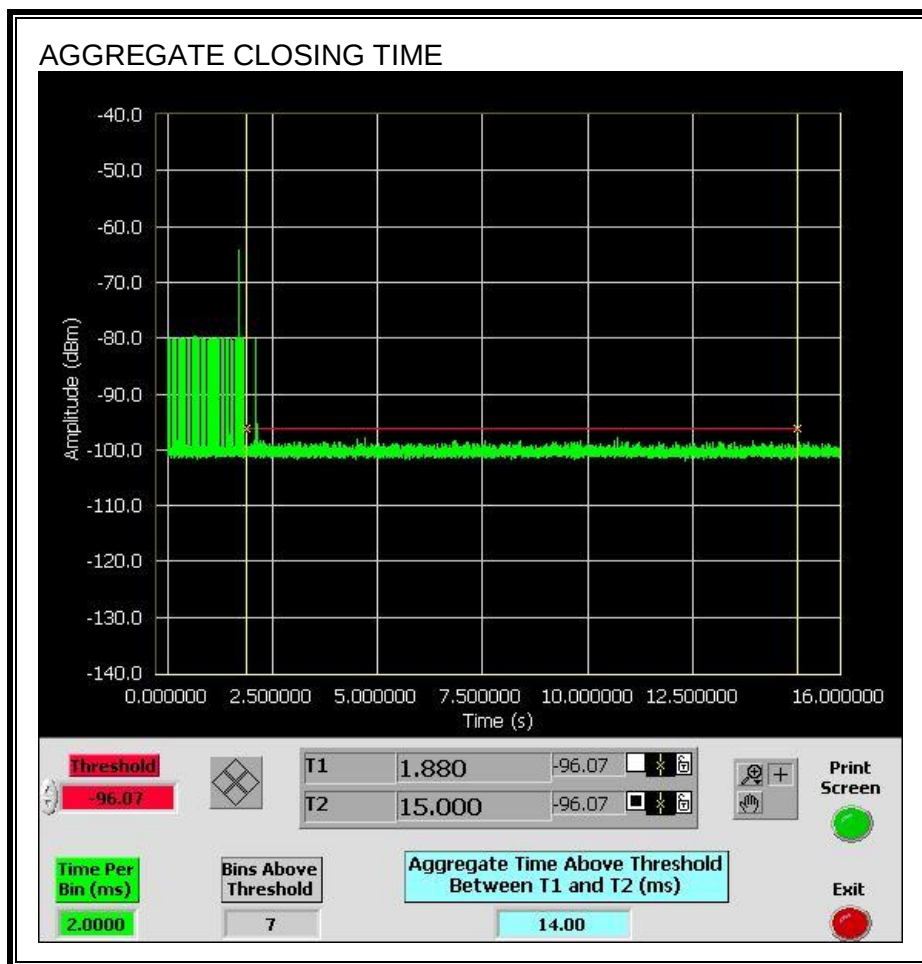


CHANNEL CLOSING TIME



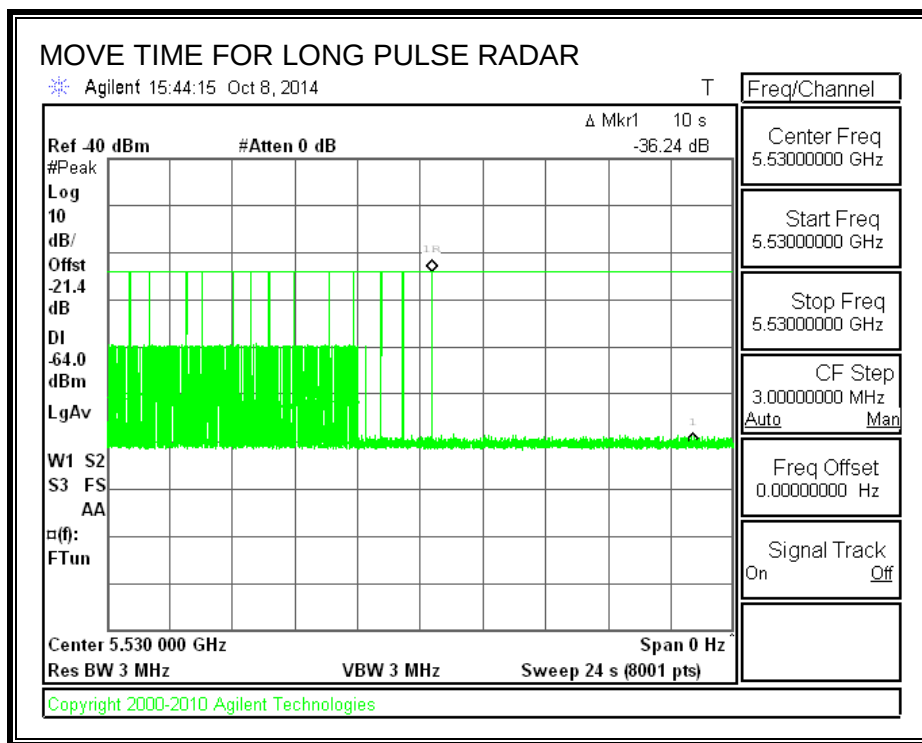
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

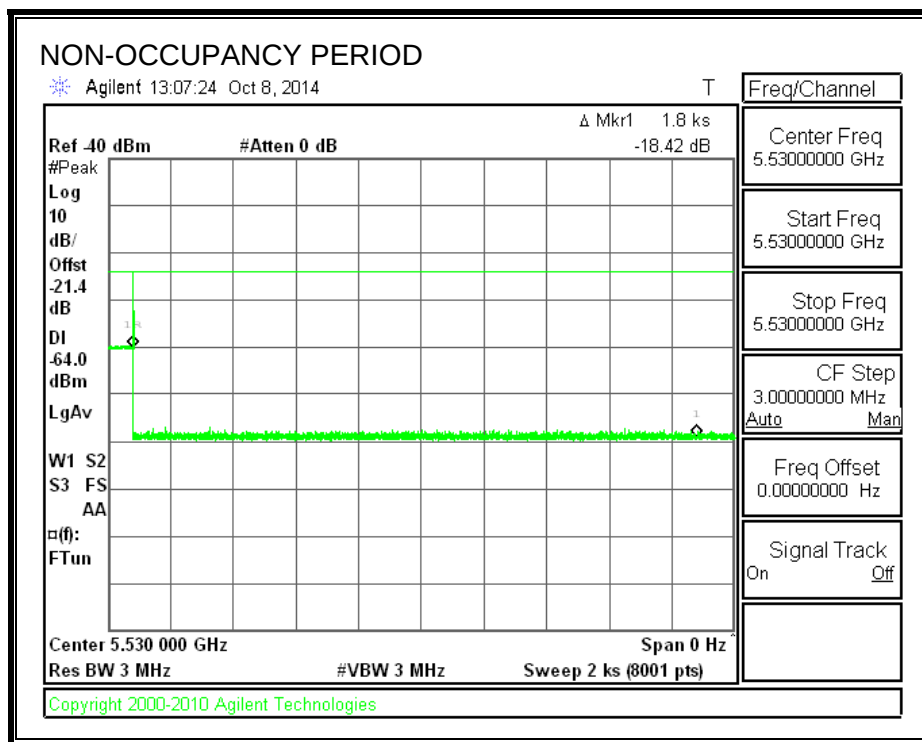
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.4.1. NON-OCCUPANCY PERIOD

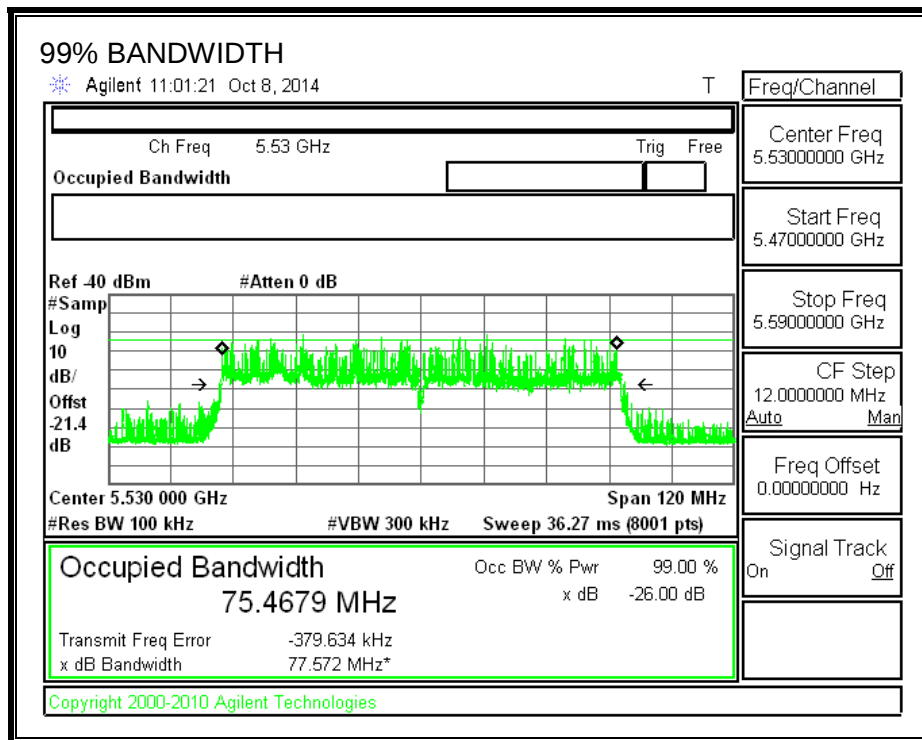
RESULTS

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	FH	Detection Bandwidth	99% Power Bandwidth	Ratio of Detection BW to 99% Power BW	Minimum Limit
(MHz)	(MHz)	(MHz)	(MHz)	(%)	(%)
5490	5570	80	75.468	106.0	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
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	10	100	
5535	10	10	100	
5540	10	10	100	
5545	10	10	100	
5550	10	10	100	
5555	10	10	100	
5560	10	10	100	
5565	10	10	100	
5570	10	10	100	FH

5.4.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	96.67	60	Pass
Aggregate		99.17	80	Pass
FCC Long Pulse Type 5	30	100.00	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	Yes
1002	698	76	A	Yes
1003	858	62	A	Yes
1004	618	86	A	Yes
1005	778	68	A	Yes
1006	798	67	A	Yes
1007	918	58	A	Yes
1008	838	63	A	Yes
1009	638	83	A	Yes
1010	658	81	A	Yes
1011	898	59	A	Yes
1012	578	92	A	Yes
1013	598	89	A	Yes
1014	518	102	A	Yes
1015	878	61	A	Yes
1016	558	95	B	Yes
1017	1536	35	B	Yes
1018	2734	20	B	Yes
1019	1914	28	B	Yes
1020	2380	23	B	Yes
1021	1709	31	B	Yes
1022	1017	52	B	Yes
1023	834	64	B	Yes
1024	2808	19	B	Yes
1025	1473	36	B	Yes
1026	2773	20	B	Yes
1027	1047	51	B	Yes
1028	1534	35	B	Yes
1029	674	79	B	Yes
1030	2552	21	B	Yes

TYPE 2 DETECTION PROBABILITY

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

TYPE 3 DETECTION PROBABILITY

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

TYPE 4 DETECTION PROBABILITY

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

TYPE 5 DETECTION PROBABILITY

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

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

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	249	5490	13	Yes
2	724	5491	10	Yes
3	1199	5492	12	Yes
4	1674	5493	7	Yes
5	2149	5494	4	Yes
6	2624	5495	11	Yes
7	3099	5496	12	Yes
8	3574	5497	8	Yes
9	4049	5498	10	Yes
10	4524	5499	10	Yes
11	4999	5500	10	Yes
12	5474	5501	13	Yes
13	5949	5502	7	Yes
14	6424	5503	8	Yes
15	6899	5504	14	Yes
16	7374	5505	11	Yes
17	7849	5506	17	Yes
18	8324	5507	10	Yes
19	8799	5508	9	Yes
20	9274	5509	5	Yes
21	9749	5510	16	Yes
22	10224	5511	11	Yes
23	10699	5512	12	Yes
24	11174	5513	9	Yes
25	11649	5514	13	Yes
26	12124	5515	10	Yes
27	12599	5516	7	Yes
28	13074	5517	10	Yes
29	13549	5518	5	Yes
30	14024	5519	13	Yes
31	14499	5520	10	Yes
32	14974	5521	9	Yes
33	15449	5522	9	Yes
34	15924	5523	11	Yes
35	16399	5524	12	Yes
36	16874	5525	10	Yes
37	17349	5526	11	Yes
38	17824	5527	12	Yes
39	18299	5528	6	Yes

TYPE 6 DETECTION PROBABILITY (CONTINUED)

40	18774	5529	7	Yes
41	19249	5530	12	Yes
42	19724	5531	14	Yes
43	20199	5532	12	Yes
44	20674	5533	11	Yes
45	21149	5534	11	Yes
46	21624	5535	13	Yes
47	22099	5536	13	Yes
48	22574	5537	14	Yes
49	23049	5538	14	Yes
50	23524	5539	15	Yes
51	23999	5540	7	Yes
52	118	5541	6	Yes
53	593	5542	8	Yes
54	1068	5543	4	Yes
55	1543	5544	9	Yes
56	2018	5545	3	Yes
57	2493	5546	8	Yes
58	2968	5547	4	Yes
59	3443	5548	9	Yes
60	3918	5549	5	Yes
61	4393	5550	7	Yes
62	4868	5551	3	Yes
63	5343	5552	5	Yes
64	5818	5553	6	Yes
65	6293	5554	9	Yes
66	6768	5555	6	Yes
67	7243	5556	4	Yes
68	7718	5557	5	Yes
69	8193	5558	7	Yes
70	8668	5559	7	Yes
71	9143	5560	9	Yes
72	9618	5561	7	Yes
73	10093	5562	1	Yes
74	10568	5563	9	Yes
75	11043	5564	4	Yes
76	11518	5565	6	Yes
77	11993	5566	3	Yes
78	12468	5567	8	Yes
79	12943	5568	8	Yes
80	13418	5569	3	Yes
81	13893	5570	7	Yes