DFS PORTION of FCC 47 CFR PART 15 SUBPART E
DFS PORTION of INDUSTRY CANADA RSS-247 ISSUE 1

CERTIFICATION TEST REPORT

FOR

802.11ac MU-MIMO, TRI-RADIO, INT. ANT.

MODEL NUMBER: AP-8533I (RADIO 3)

FCC ID: UZ7AP8533I
IC: 109AN-AP8533I

REPORT NUMBER: 15U2244-E6V1

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Revision History

Rev.	Issue Date	Revisions	Revised By
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ZEBRA TECHNOLOGIES CORP.
6480 VIA DEL ORO DR.
SAN JOSE, CA 95119, U.S.A.

EUT DESCRIPTION: 802.11ac MU-MIMO, TRI-RADIO, INT. ANT.

MODEL: AP-8533I

SERIAL NUMBER: 15285522200142

DATE TESTED: JANUARY 11, 2016 – JANUARY 26, 2016

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
DFS Portion of CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass

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

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

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PROJECT LEAD
UL Verification Services Inc.

Tested By:

HENRY LAU
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 C63.10-2013, RSS-247 Issue 1.

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-247 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

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

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

FCC

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

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

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

Table 2: Applicability of DFS requirements during normal operation

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

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

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

Maximum Transmit Power	Value (see notes)
E.I.R.P. ≥ 200 mill watt	-64 dBm
E.I.R.P. < 200 mill watt and power spectral density < 10 dBm/MHz	-62 dBm
E.I.R.P. < 200 mill watt that do not meet power spectral density requirement	-64 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.
Note 3: E.I.R.P. is based on the highest antenna gain. For MIMO devices refer to KDB publication 662911 D01.

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1)
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period. (See Notes 1 and 2)
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. (See Note 3)

Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.
Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in table 5a	Roundup: {(1/360) x (19 x 10^6 PRI_{usec})}	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 usec. With a minimum increment of 1 usec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the *Detection Bandwidth* test, *Channel Move Time*, and *Channel Closing Time* tests.

Table 6 – Long Pulse Radar Test Signal

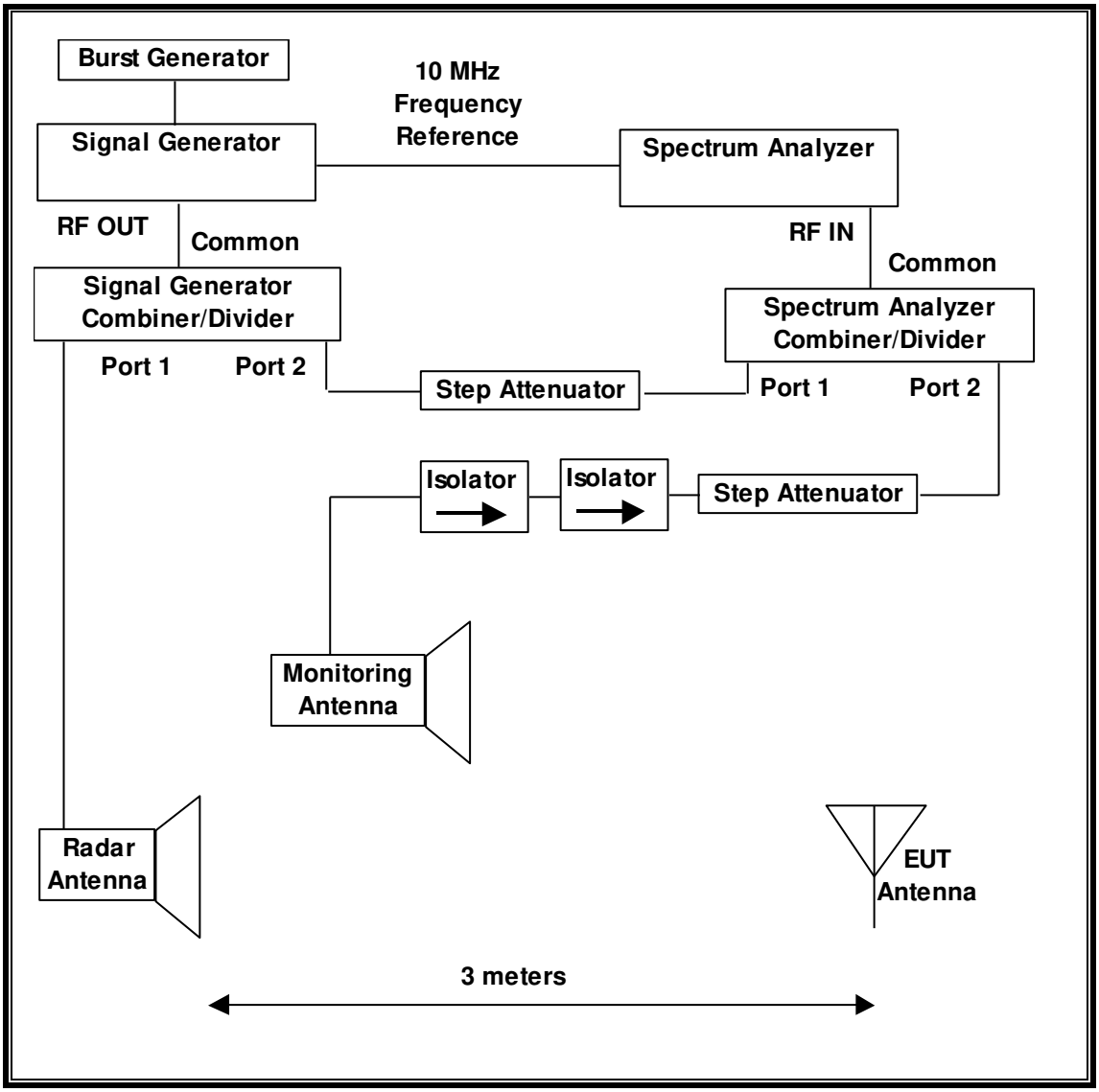
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar Waveform Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	0.333	300	70%	30

5.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



SYSTEM OVERVIEW

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

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

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

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

SYSTEM CALIBRATION

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

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

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

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

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

TEST AND MEASUREMENT EQUIPMENT

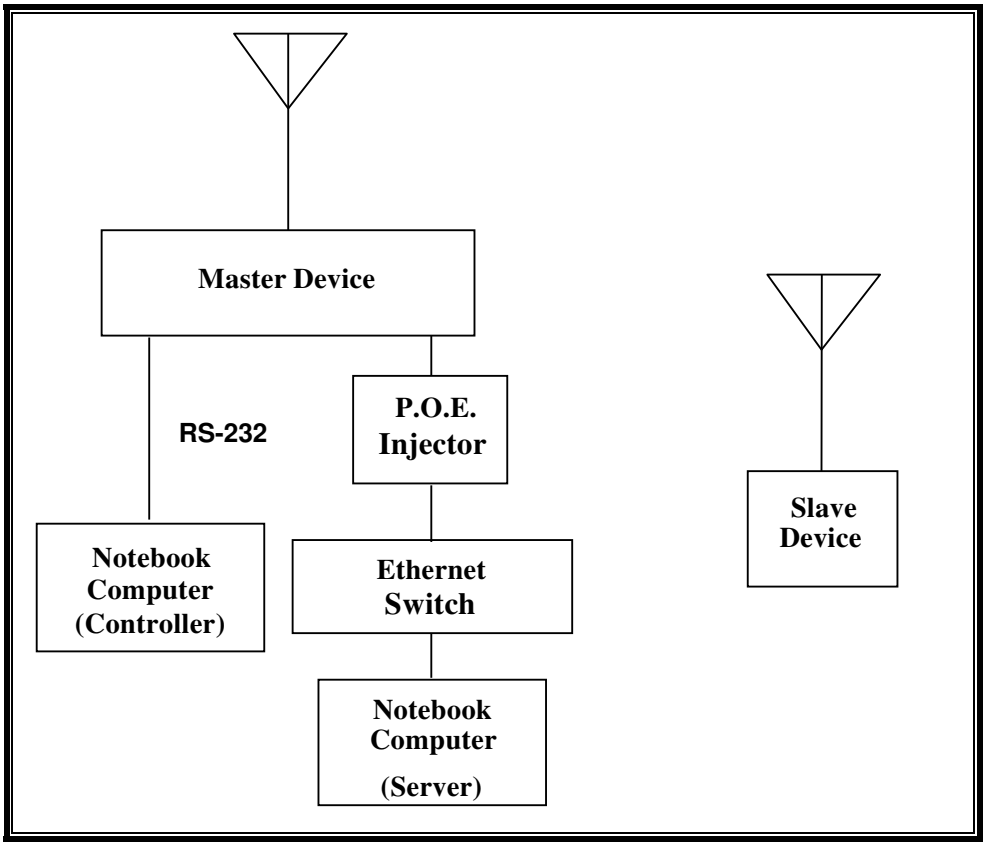
The following test and measurement equipment was utilized for the DFS tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	US51350187	06/01/16
Signal Generator, MXG X-Series RF Vector	Agilent	N5172B	MY51350337	02/17/16
Arbitrary Waveform Generator	Agilent / HP	33220A	MY44037572	04/08/16

5.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP

CONFIGURATION 1: 20 MHz and 40 MHz CHANNEL BANDWIDTH

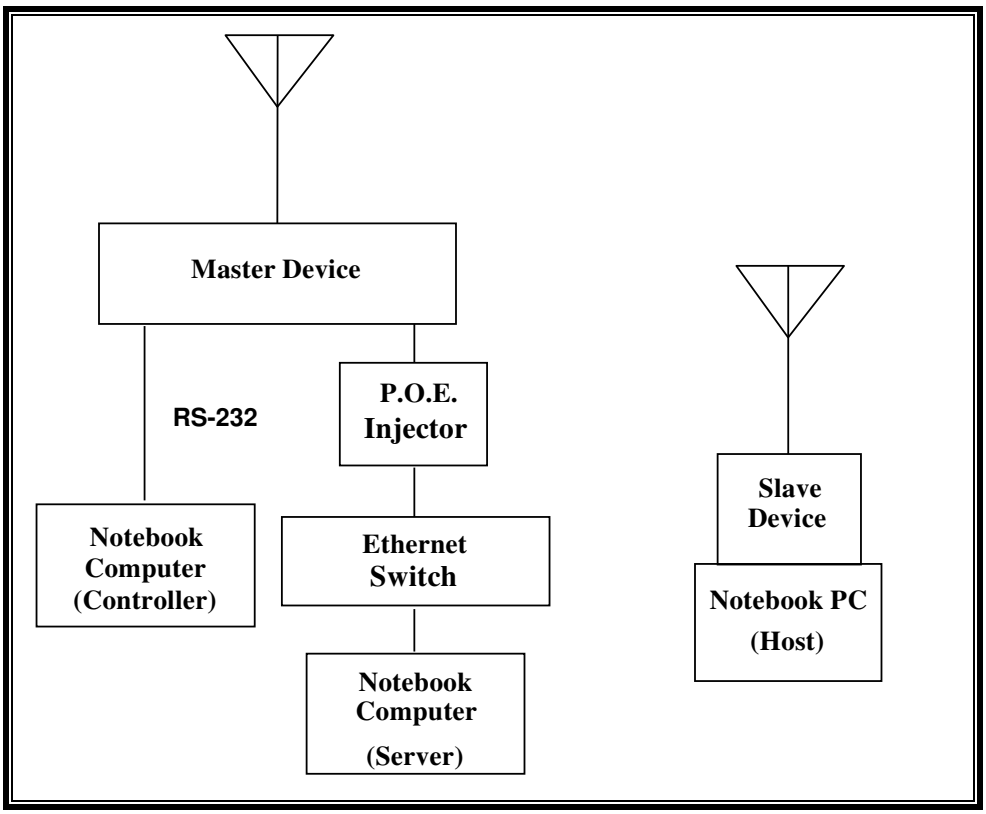


SUPPORT EQUIPMENT

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**
Gigabit P.O.E. Injector	Motorola	PD-7001G	D083164410001A4A01	DoC
Notebook PC (Server)	HP	Elitebook 8470p	CNU251B4RR	DoC
AC Adapter (Server PC)	Lite On Technology	PA-1900-32HT	WBGTK0A1RYQ6IO	DoC
Notebook PC (Controller)	HP	Elitebook 8460p	CNU2032CKJ	DoC
AC Adapter (Controller PC)	Lite On Technology	PA-1650-32HU	WCNXA0C3U3SEGF	DoC
Notebook PC (Slave)	HP	Elitebook 8470p	CNU25193C2	PD962205ANH
AC Adapter (Slave PC)	Lite On Technology	PA-1650-32HU	WCNXA0C4L3QDDL	DoC
Ethernet Switch	D-Link	DGS-100BG	AB202C2006577	DoC
AC Adapter (Switch)	D-Link	AMS47-0501000FU	12020317793	DoC

CONFIGURATION 2: 80 MHz CHANNEL BANDWIDTH



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**
Gigabit P.O.E. Injector	Motorola	PD-7001G	D083164410001A4A01	DoC
Notebook PC (Server)	HP	Elitebook 8470p	CNU251B4RR	DoC
AC Adapter (Server PC)	Lite On Technology	PA-1900-32HT	WBGTK0A1RYQ6IO	DoC
Notebook PC (Controller)	HP	Elitebook 8460p	CNU2032CKJ	DoC
AC Adapter (Controller PC)	Lite On Technology	PA-1650-32HU	WCNXA0C3U3SEGF	DoC
802.11ac USB Converter (Slave)	Cisco	AE6000	12R10602307395	Q87-AE6000
Notebook PC (Slave Host)	HP	Elitebook 8470p	CNU25193C2	PD962205ANH
AC Adapter (Host PC)	Lite On Technology	PA-1650-32HU	WCNXA0C4L3QDDL	DoC
Ethernet Switch	D-Link	DGS-100BG	AB202C2006577	DoC
AC Adapter (Switch)	D-Link	AMS47-0501000FU	12020317793	DoC

5.1.4. DESCRIPTION OF EUT

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

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

The EUT is a Master Device.

The EUT can be configured as a Master Device or a Slave Device without Radar Detection.

The highest power level within these bands is 29.99 dBm EIRP in the 5250-5350 MHz band and 29.99 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly utilized with the EUT has a gain of 6.8 dBi.

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

Four 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 four 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 that meets or exceeds the minimum required loading was generated by transferring a data stream from the Master Device to the Slave Device using iPerf version 2.0.5 software 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 5.8.3.0-232839X.

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

5.2. RESULTS FOR 20 MHz BANDWIDTH

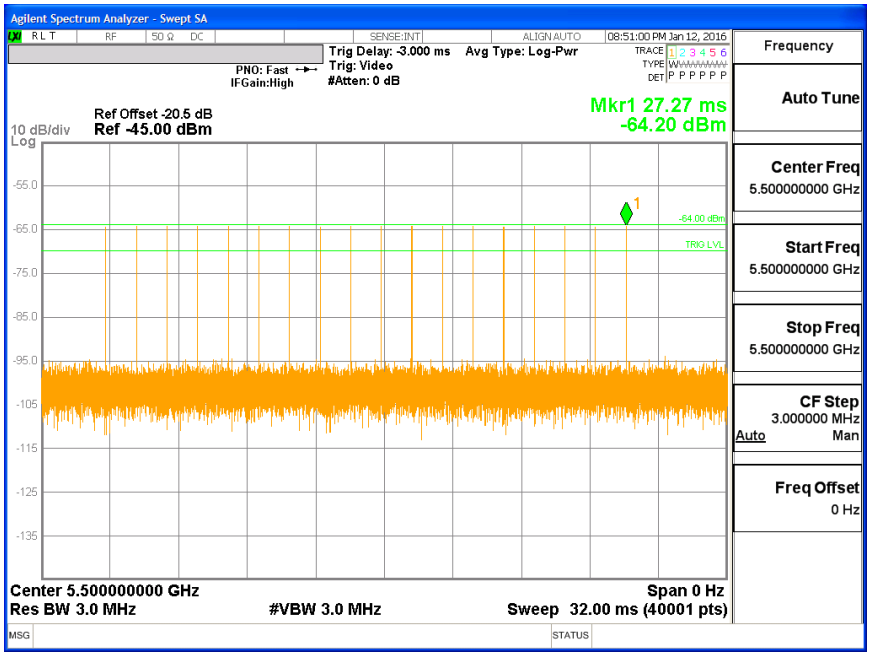
5.2.1. TEST CHANNEL

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

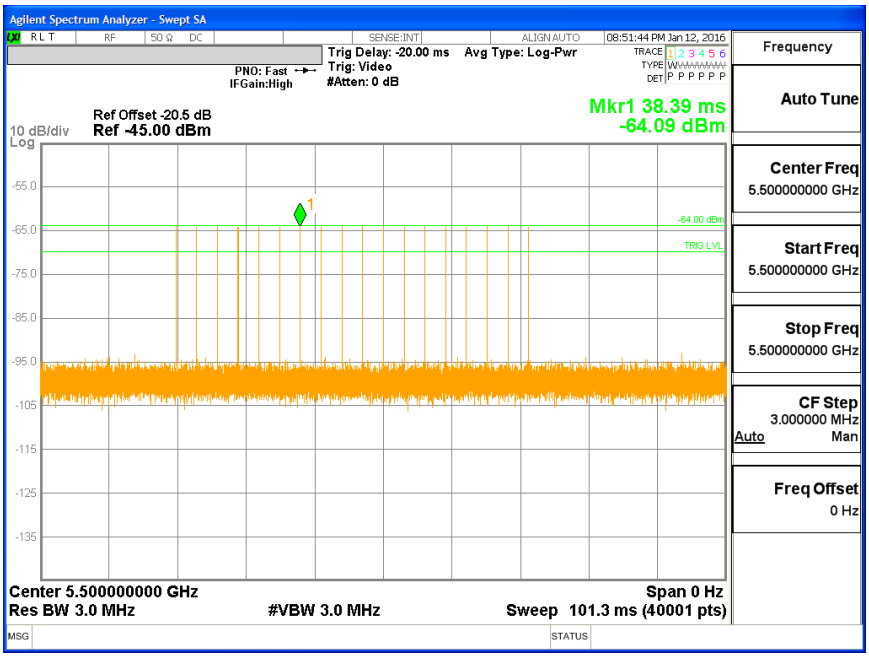
5.2.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

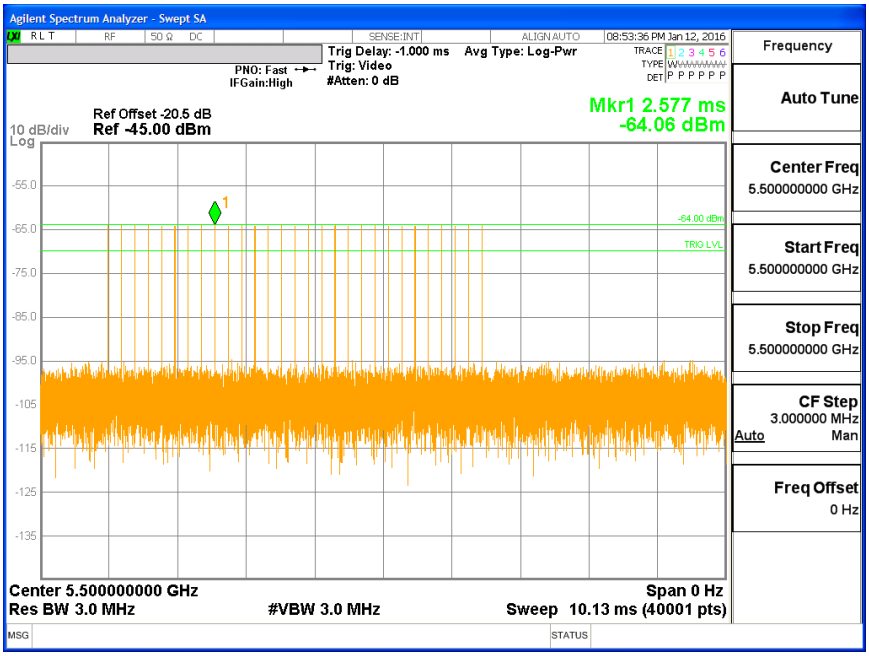
SHORT PULSE RADAR TYPE 0



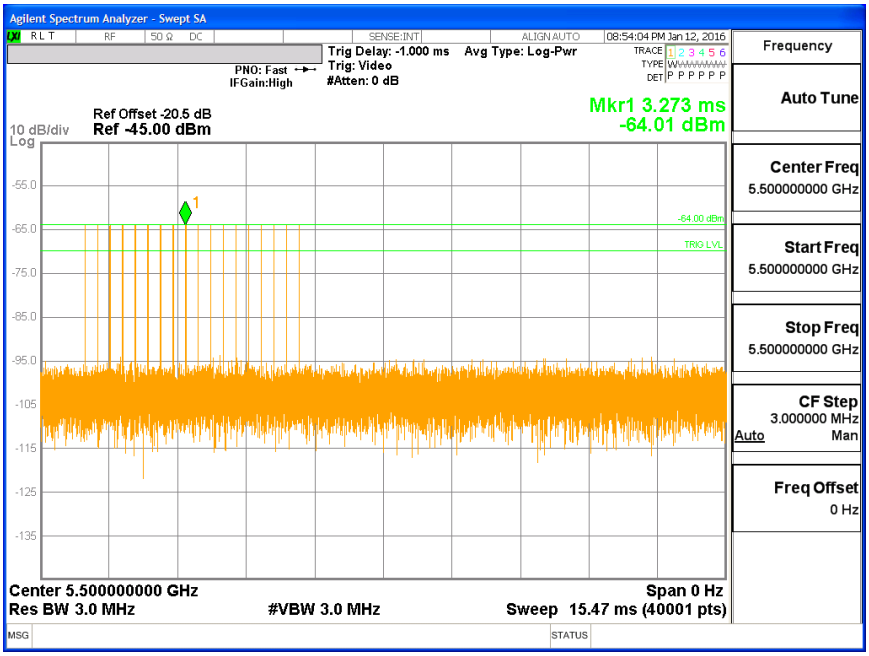
SAMPLE OF RADAR TYPE 1



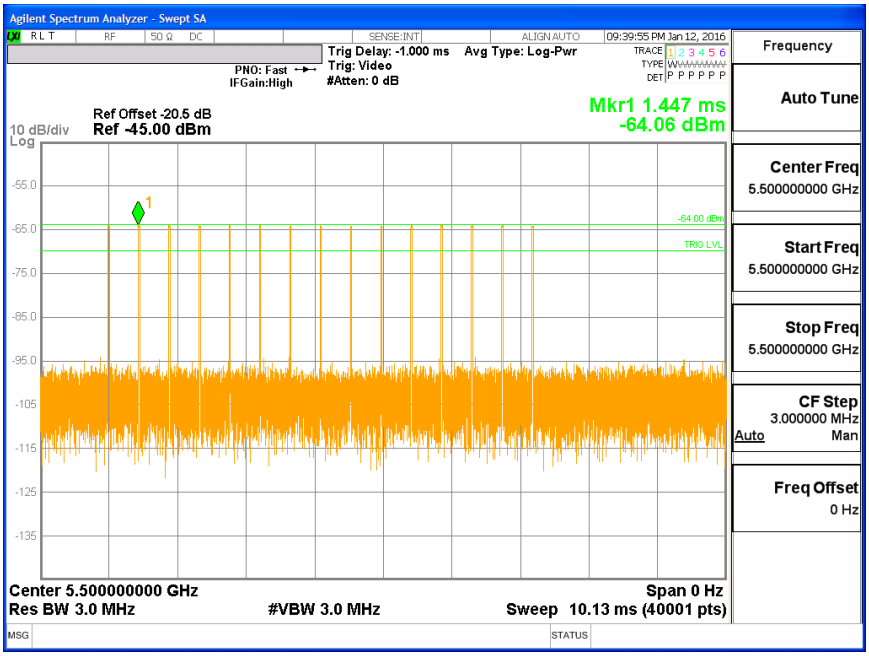
SAMPLE OF RADAR TYPE 2



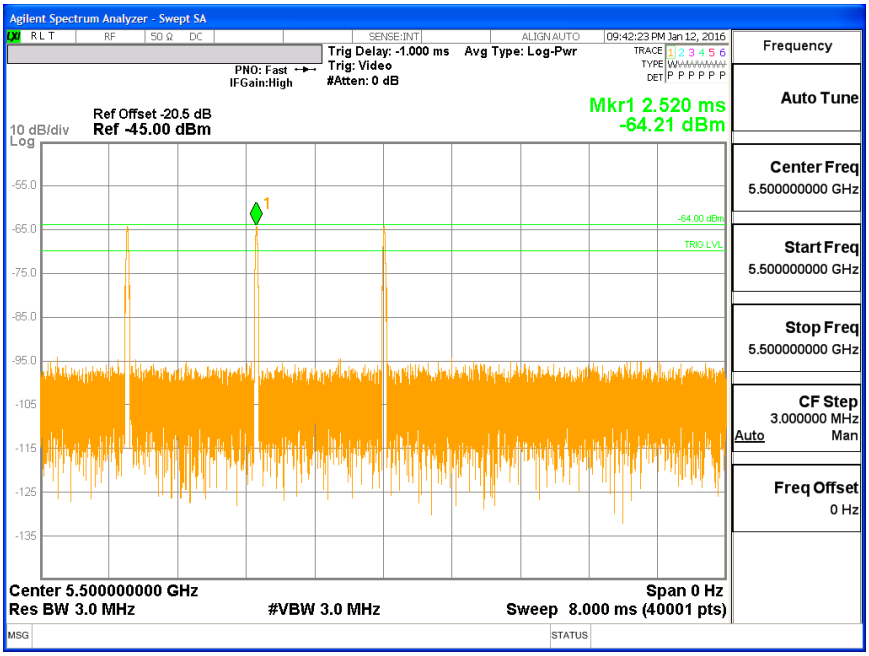
SAMPLE OF RADAR TYPE 3



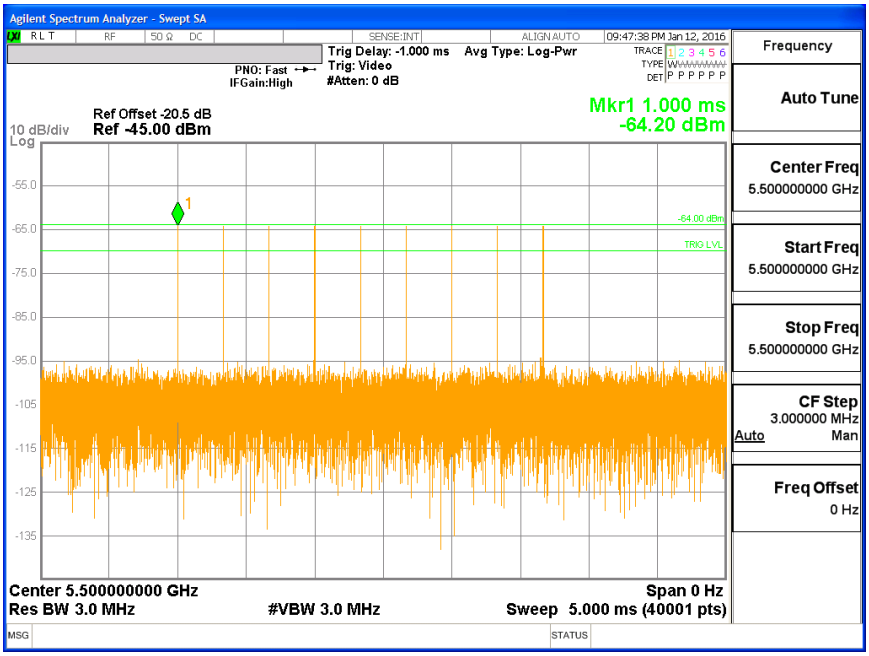
SAMPLE OF RADAR TYPE 4



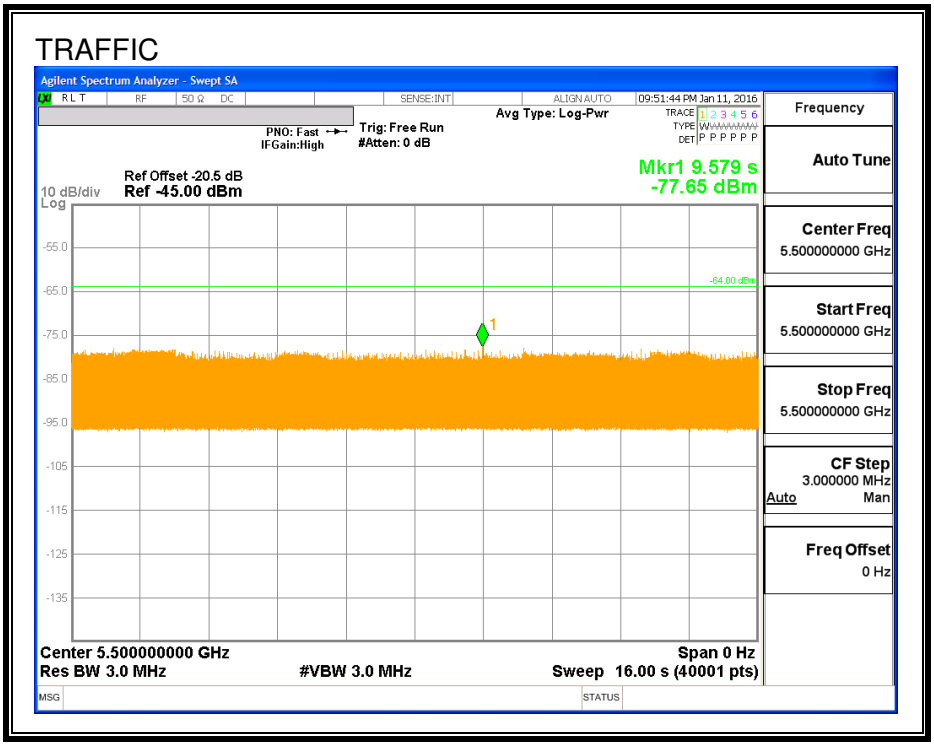
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



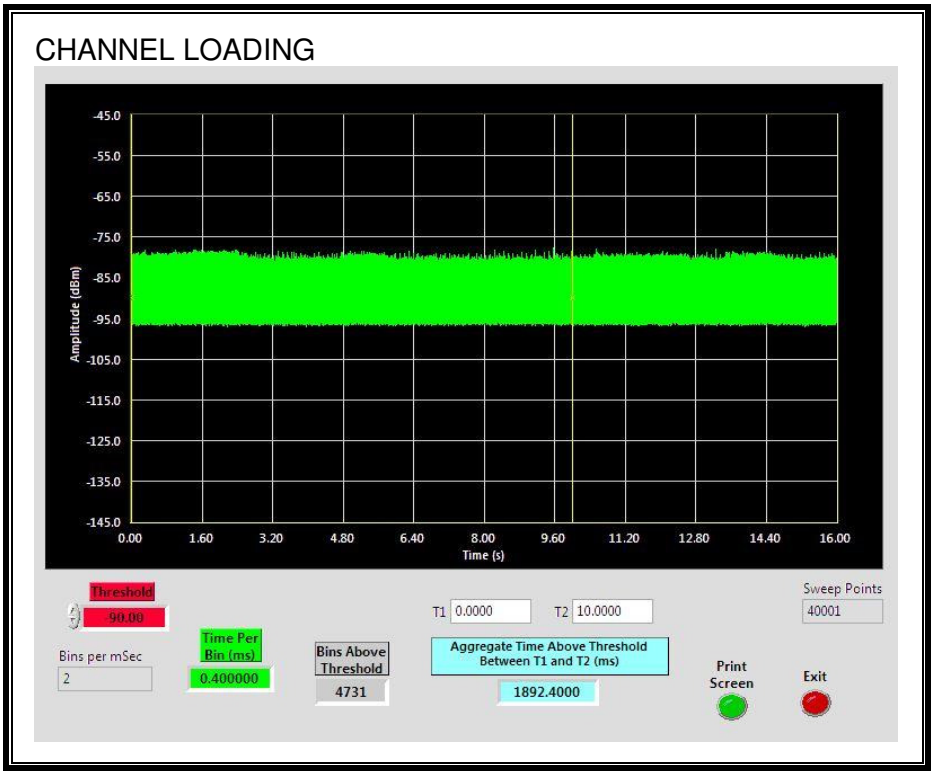
SINGLE BURST OF RADAR TYPE 6



TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 18.924%

5.2.1. 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	64.9	64.9

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	1.583	1.583

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	58.91	58.91

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)
14:39:28	14:40:32	0:01:04

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)
14:49:17	14:49:18	0:00:01

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)
14:59:10	15:00:09	0:00:59

If a radar signal is detected during the channel availability check then the PC controlling the EUT displays a message stating that radar was detected.

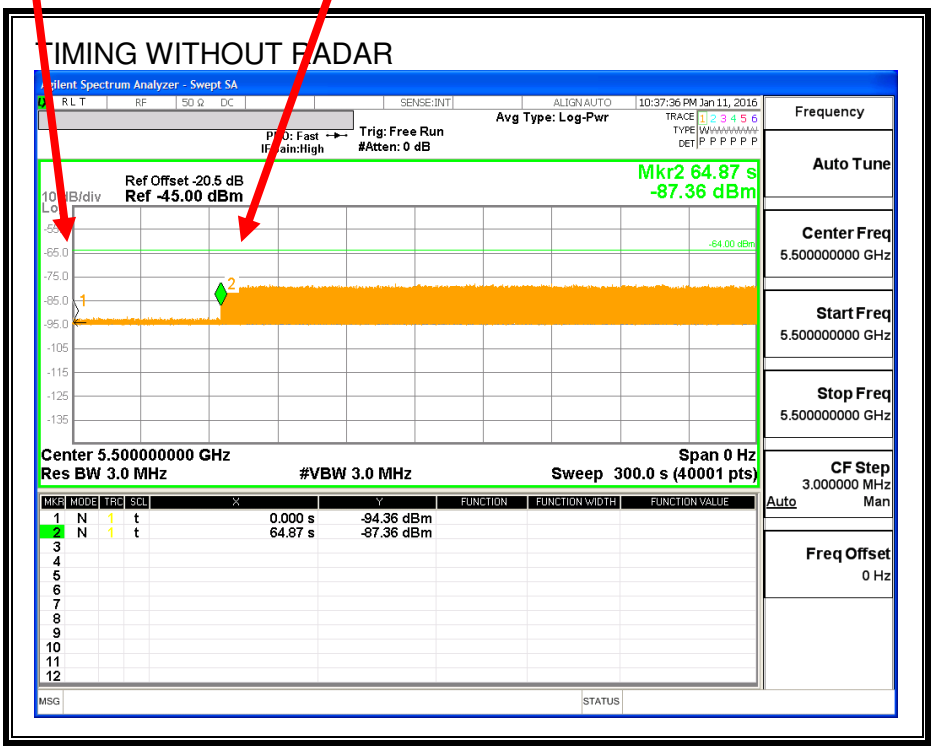
QUALITATIVE RESULTS

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.

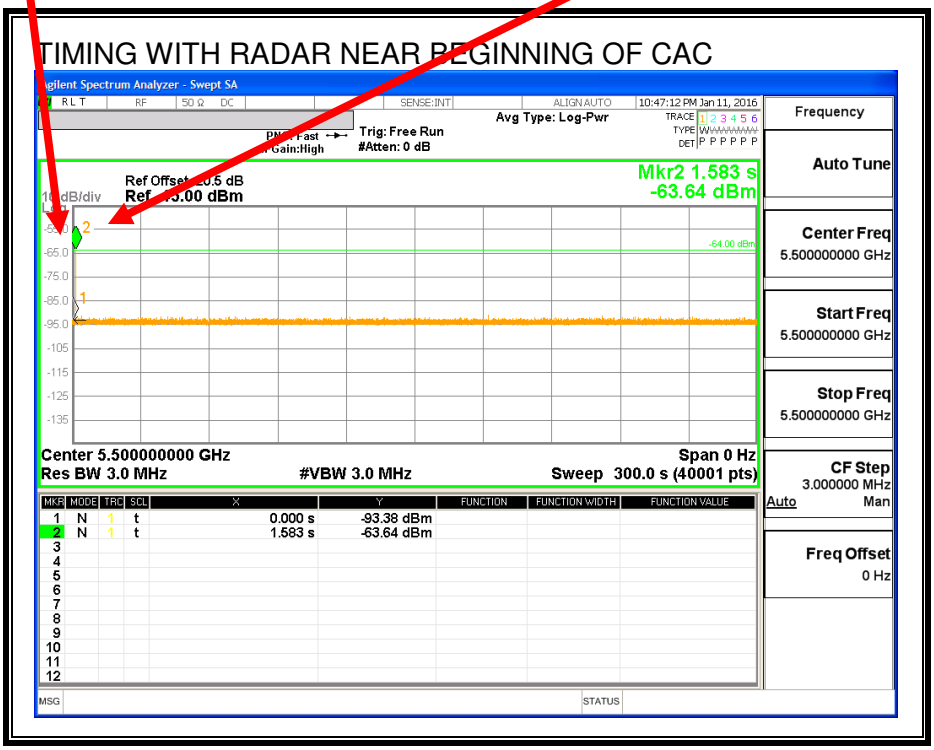
Log File of CAC Timing Without Radar

Jan 01 **14:39:28** 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 14:39:28 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 **14:40:32** 2015: DOT11: %%%%>dfs:DFS evt=in_srvc_monitor,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)

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.

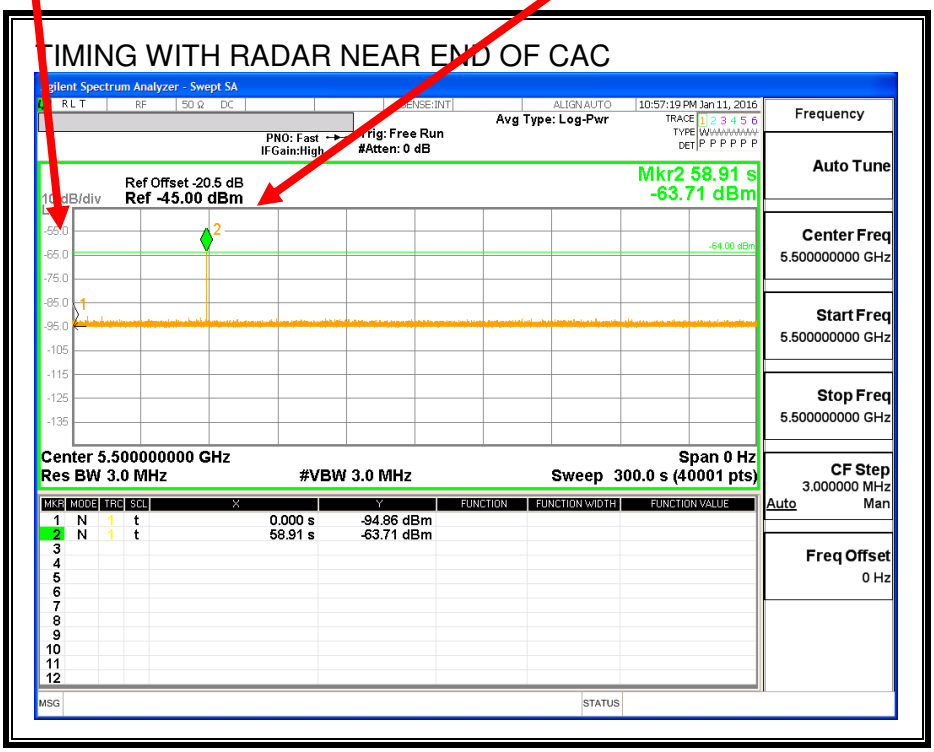
Log File of Radar at the Beginning of CAC

Jan 01 14:49:17 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 **14:49:17** 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 14:49:18 2015: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 100 ########## min_pw=33, subband_result=1, AT 900MS.
Jan 01 14:49:18 2015: KERN: wl1: dfs : state PRE-ISM Channel Availability Check, detected radar in channel 100.
Jan 01 14:49:18 2015: DOT11: %%%%>dfs:DFS evt=radar_seen,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)
Jan 01 14:49:18 2015: DOT11: %%%%>dfs:Radar reported on channel 100 Freq 5500 MHz by radio_idx 1 (dfs.c:298)
Jan 01 14:49:18 2015: DOT11: dfs:Starting resume timer (dfs.c:282)
Jan 01 14:49:18 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=153,ridx=1,curCh=100,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 14:49:18 2015: DOT11: dfs:DFS: driver's ch:153, rim's channel:100, bcmko_next_dfs_chan=153 (dfs.c:335)
Jan 01 14:49:18 2015: DOT11: dfs:DFS: rim's curren_ch=153, new next channel=48, telling dataplane. (dfs.c:343)
Jan 01 14:49:18 2015: DOT11: dfs:DFS_Validate_Power max 36 prtl: 30 (dfs.c:104)
Jan 01 14:49:18 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=153,ridx=1,curCh=153,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 14:49:18 2015: DOT11: dfs:DFS: ignoring duplicate channel change indication (dfs.c:324)
Jan 01 14:49:18 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=153,ridx=1,curCh=153,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 14:49:18 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=153,ridx=1,curCh=153,state=dfs_disabled,prev_state=radar_seen (dfs.c:415)
Jan 01 **14:49:18** 2015: ap8533-06FFB0 : %RADIO-4-RADAR_DETECTED: Radar found on channel 100 width 20 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

Jan 01 14:59:10 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 **14:59:10** 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 15:00:09 2015: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 100 ########## min_pw=33, subband_result=1, AT 54750MS.
Jan 01 15:00:09 2015: KERN: wl1: dfs : state PRE-ISM Channel Availability Check, detected radar in channel 100.
Jan 01 15:00:09 2015: DOT11: %%%%>dfs:DFS evt=radar_seen,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)
Jan 01 15:00:09 2015: DOT11: %%%%>dfs:Radar reported on channel 100 Freq 5500 MHz by radio_idx 1 (dfs.c:298)
Jan 01 15:00:09 2015: DOT11: dfs:Starting resume timer (dfs.c:282)
Jan 01 15:00:09 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=40,ridx=1,curCh=100,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:00:09 2015: DOT11: dfs:DFS: driver's ch:40, rim's channel:100, bcmko_next_dfs_chan=40 (dfs.c:335)
Jan 01 15:00:09 2015: DOT11: dfs:DFS: rim's curren_ch=40, new next channel=36, telling dataplane. (dfs.c:343)
Jan 01 **15:00:09** 2015: ap8533-06FFB0 : %RADIO-4-RADAR_DETECTED: Radar found on channel 100 width 20 freq 5500 MHz

5.2.2. OVERLAPPING CHANNEL TESTS

RESULTS

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

These tests are not applicable.

5.2.3. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

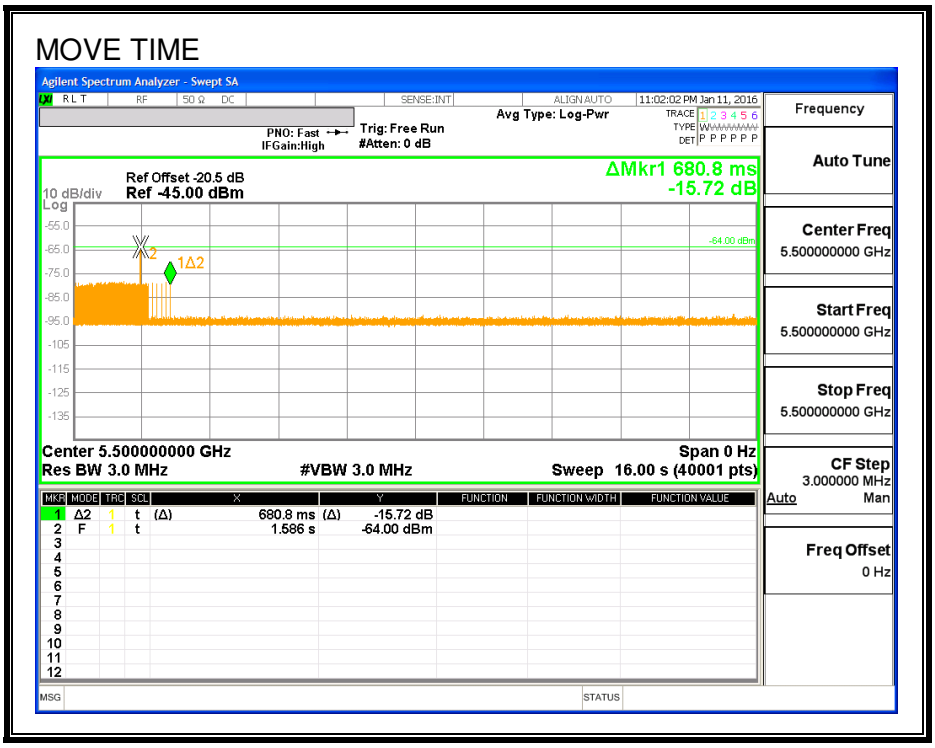
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

Channel Move Time (sec)	Limit (sec)
0.681	10

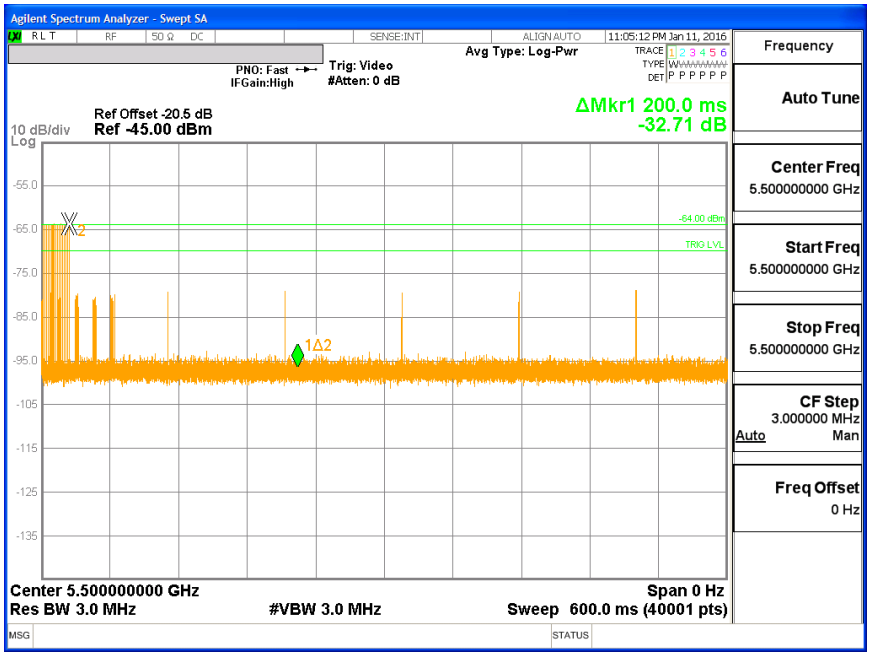
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
4.0	60

MOVE TIME



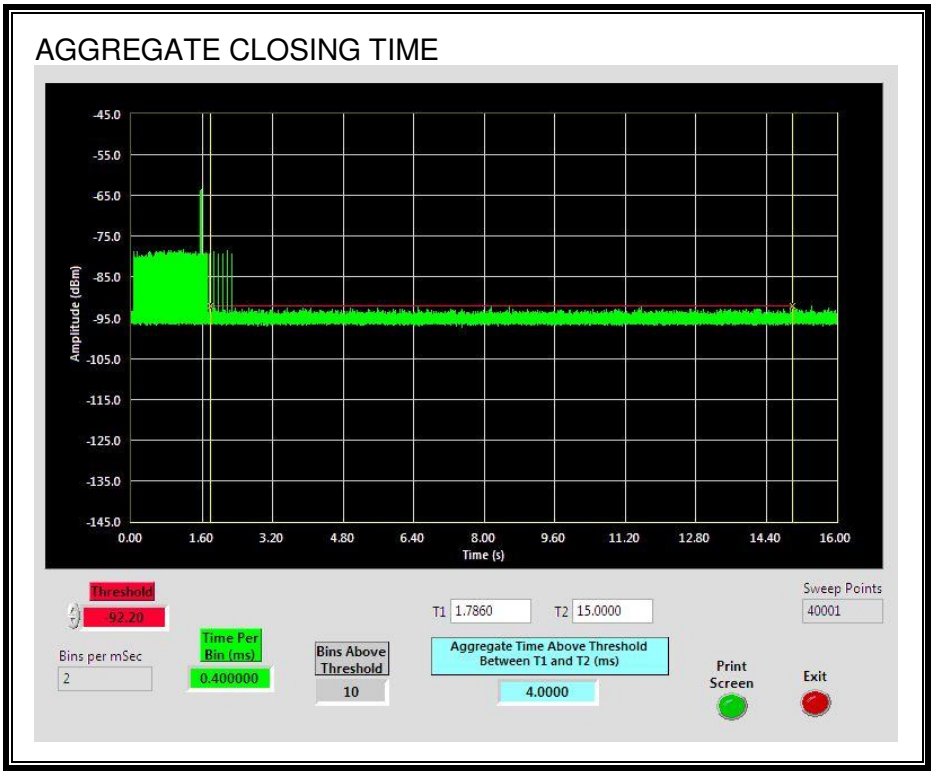
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

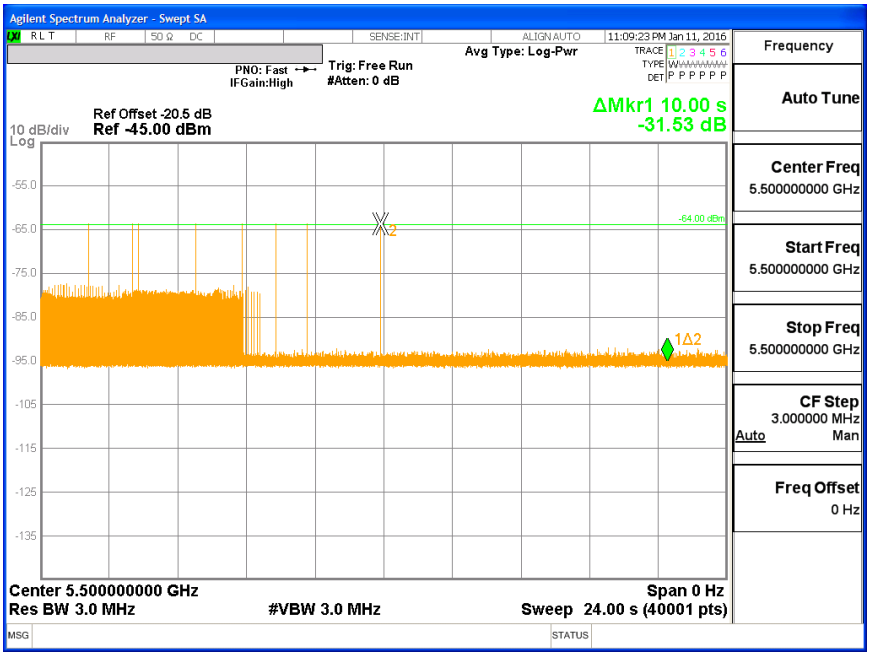
Only intermittent transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

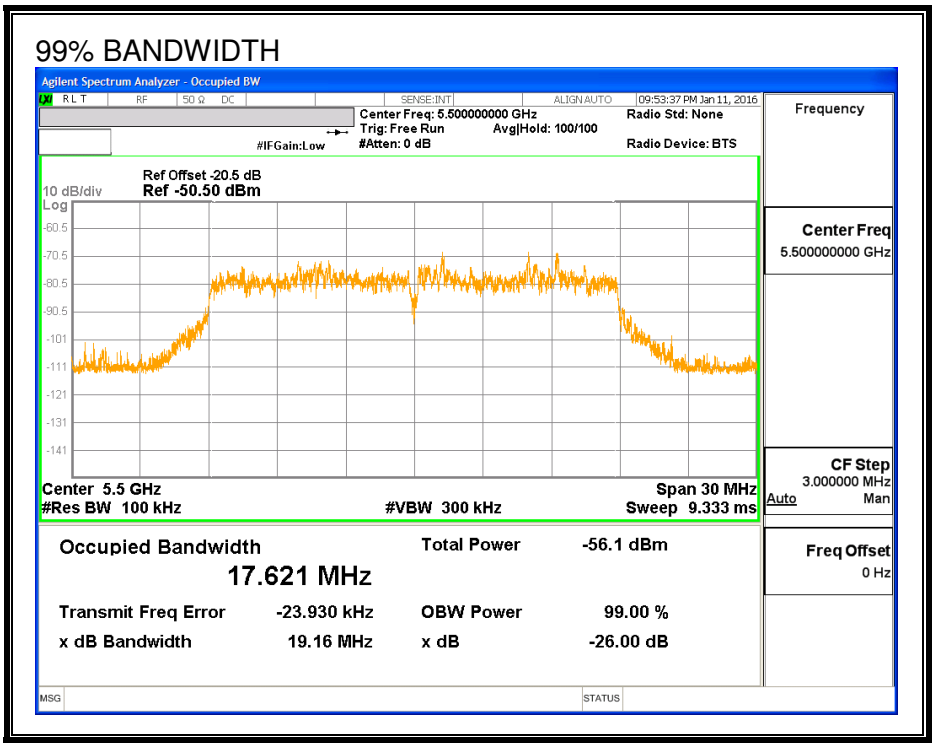
The traffic ceases prior to 10 seconds after the end of the radar waveform.

MOVE TIME FOR LONG PULSE RADAR



5.2.4. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5491	5509	18	17.621	102.2	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5490	2	0	0	
5491	10	10	100	FL
5492	10	10	100	
5493	10	10	100	
5494	10	10	100	
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5506	10	10	100	
5507	10	10	100	
5508	10	10	100	
5509	10	10	100	FH
5510	3	0	0	

5.2.5. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	93.33	60	Pass	5491	5509		
FCC Short Pulse Type 2	30	100.00	60	Pass	5491	5509		
FCC Short Pulse Type 3	30	100.00	60	Pass	5491	5509		
FCC Short Pulse Type 4	30	83.33	60	Pass	5491	5509		
Aggregate		94.17	80	Pass				
FCC Long Pulse Type 5	30	93.33	80	Pass	5491	5509	5493	5507
FCC Hopping Type 6	38	100.00	70	Pass	5491	5509		

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Test (A/B)	Frequency (MHz)	Successful Detection (Yes/No)
1001	1	3066	18	A	5500	No
1002	1	638	83	A	5500	Yes
1003	1	618	86	A	5500	Yes
1004	1	758	70	A	5500	Yes
1005	1	738	72	A	5500	Yes
1006	1	698	76	A	5500	Yes
1007	1	558	95	A	5500	Yes
1008	1	538	99	A	5500	Yes
1009	1	578	92	A	5500	Yes
1010	1	818	65	A	5500	Yes
1011	1	658	81	A	5500	Yes
1012	1	918	58	A	5500	Yes
1013	1	598	89	A	5500	Yes
1014	1	878	61	A	5500	Yes
1015	1	938	57	A	5500	Yes
1016	1	1483	36	B	5500	Yes
1017	1	1116	48	B	5500	Yes
1018	1	1071	50	B	5500	Yes
1019	1	2028	27	B	5500	Yes
1020	1	810	66	B	5500	Yes
1021	1	2378	23	B	5500	Yes
1022	1	2398	23	B	5500	Yes
1023	1	2901	19	B	5500	No
1024	1	3051	18	B	5500	Yes
1025	1	1136	47	B	5500	Yes
1026	1	2769	20	B	5500	Yes
1027	1	983	54	B	5500	Yes
1028	1	1551	35	B	5500	Yes
1029	1	2443	22	B	5500	Yes
1030	1	592	90	B	5500	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
2001	1.9	197	29	5500	Yes
2002	4.2	159	23	5500	Yes
2003	1	153	23	5500	Yes
2004	3.5	162	28	5500	Yes
2005	2.6	160	25	5500	Yes
2006	3.4	173	24	5500	Yes
2007	4.7	218	24	5500	Yes
2008	3.8	155	27	5500	Yes
2009	3.3	166	24	5500	Yes
2010	4.5	187	27	5500	Yes
2011	2.4	202	25	5500	Yes
2012	1.9	190	26	5500	Yes
2013	4	209	27	5500	Yes
2014	3.7	201	24	5500	Yes
2015	2	186	23	5500	Yes
2016	4.1	182	27	5500	Yes
2017	4.7	172	26	5500	Yes
2018	2.9	215	28	5500	Yes
2019	3.8	171	24	5500	Yes
2020	2.2	218	26	5500	Yes
2021	1.3	177	29	5500	Yes
2022	2.1	229	29	5500	Yes
2023	1.5	193	25	5500	Yes
2024	2.5	210	25	5500	Yes
2025	2	221	29	5500	Yes
2026	1.3	161	25	5500	Yes
2027	1.1	177	26	5500	Yes
2028	4.7	164	23	5500	Yes
2029	2.7	184	25	5500	Yes
2030	2.4	175	29	5500	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
3001	7.4	284	18	5500	Yes
3002	7.2	271	17	5500	Yes
3003	8.1	490	16	5500	Yes
3004	5.8	372	16	5500	Yes
3005	6.9	486	18	5500	Yes
3006	7.6	381	16	5500	Yes
3007	8.9	257	18	5500	Yes
3008	9.9	415	17	5500	Yes
3009	9.1	304	16	5500	Yes
3010	5.2	491	18	5500	Yes
3011	9.8	392	17	5500	Yes
3012	8.9	458	16	5500	Yes
3013	8.6	254	16	5500	Yes
3014	8	467	18	5500	Yes
3015	5.6	276	16	5500	Yes
3016	5.2	250	17	5500	Yes
3017	5.7	456	17	5500	Yes
3018	5.6	325	17	5500	Yes
3019	6.4	293	18	5500	Yes
3020	9.3	293	18	5500	Yes
3021	5.3	407	17	5500	Yes
3022	6	302	18	5500	Yes
3023	7.3	428	17	5500	Yes
3024	8.3	336	16	5500	Yes
3025	7.5	357	18	5500	Yes
3026	8.7	411	18	5500	Yes
3027	8.2	312	16	5500	Yes
3028	7.3	261	18	5500	Yes
3029	7	426	18	5500	Yes
3030	6.4	387	17	5500	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
4001	18.1	447	15	5500	Yes
4002	12.6	304	13	5500	Yes
4003	18.4	377	12	5500	Yes
4004	13.4	497	13	5500	Yes
4005	19.8	465	12	5500	No
4006	15.3	347	13	5500	Yes
4007	17.5	327	13	5500	Yes
4008	18.9	473	12	5500	Yes
4009	11.4	349	12	5500	Yes
4010	13.3	390	16	5500	Yes
4011	11.8	278	14	5500	Yes
4012	14.2	332	13	5500	Yes
4013	13.2	484	14	5500	Yes
4014	11.4	433	14	5500	Yes
4015	10.8	346	15	5500	Yes
4016	19.6	308	12	5500	No
4017	14.9	250	13	5500	Yes
4018	19.5	475	14	5500	No
4019	15.2	297	15	5500	Yes
4020	10.2	417	16	5500	Yes
4021	16.6	385	16	5500	Yes
4022	12.1	267	12	5500	Yes
4023	19.6	499	16	5500	No
4024	15.7	394	15	5500	Yes
4025	18.3	269	15	5500	No
4026	10.1	310	14	5500	Yes
4027	18.7	450	12	5500	Yes
4028	11	252	12	5500	Yes
4029	10	404	12	5500	Yes
4030	18.3	353	12	5500	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5502	No
2	5505	Yes
3	5497	Yes
4	5494	Yes
5	5505	Yes
6	5496	Yes
7	5498	Yes
8	5495	Yes
9	5502	Yes
10	5505	Yes
11	5497	Yes
12	5495	Yes
13	5497	Yes
14	5496	Yes
15	5502	Yes
16	5506	Yes
17	5497	Yes
18	5502	Yes
19	5505	Yes
20	5501	No
21	5499	Yes
22	5505	Yes
23	5499	Yes
24	5500	Yes
25	5495	Yes
26	5505	Yes
27	5498	Yes
28	5503	Yes
29	5505	Yes
30	5499	Yes

Note: The Type 5 randomized parameters tested 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	163	5491	3	Yes
2	638	5492	6	Yes
3	1113	5493	2	Yes
4	1588	5494	3	Yes
5	2538	5495	4	Yes
6	3013	5496	3	Yes
7	3488	5497	3	Yes
8	3963	5498	4	Yes
9	4438	5499	2	Yes
10	4913	5500	5	Yes
11	5388	5501	6	Yes
12	5863	5502	5	Yes
13	6338	5503	3	Yes
14	6813	5504	4	Yes
15	7288	5505	5	Yes
16	7763	5506	5	Yes
17	8238	5507	7	Yes
18	8713	5508	4	Yes
19	9188	5509	5	Yes
20	9663	5491	5	Yes
21	10138	5492	2	Yes
22	10613	5493	3	Yes
23	11088	5494	3	Yes
24	11563	5495	4	Yes
25	12038	5496	3	Yes
26	12513	5497	5	Yes
27	12988	5498	5	Yes
28	13463	5499	5	Yes
29	13938	5500	1	Yes
30	14413	5501	1	Yes
31	14888	5502	3	Yes
32	15363	5503	4	Yes
33	15838	5504	3	Yes
34	16313	5505	2	Yes
35	16788	5506	3	Yes
36	17263	5507	5	Yes
37	17738	5508	6	Yes
38	18213	5509	7	Yes

5.3. RESULTS FOR 40 MHz BANDWIDTH

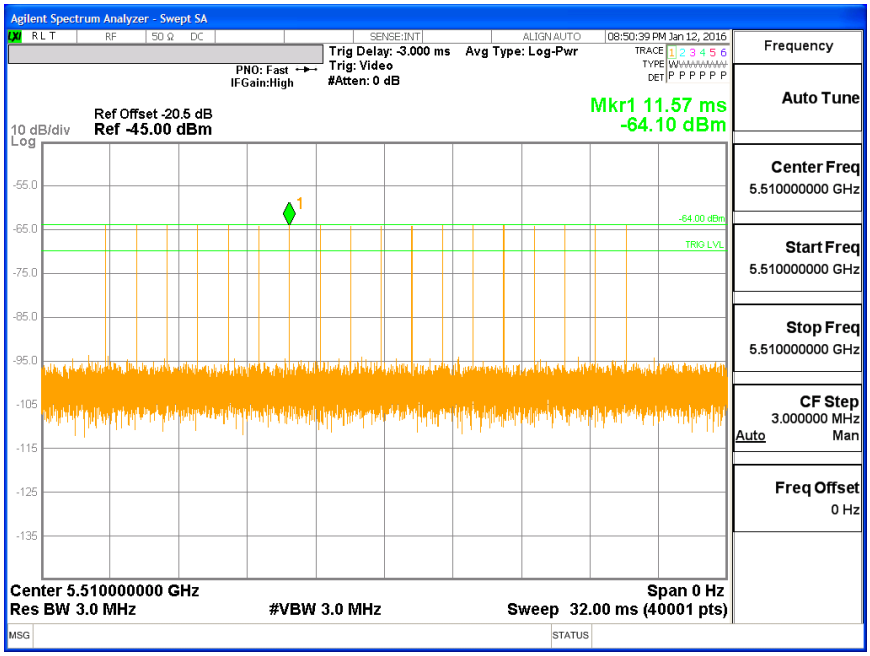
5.3.1. TEST CHANNEL

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

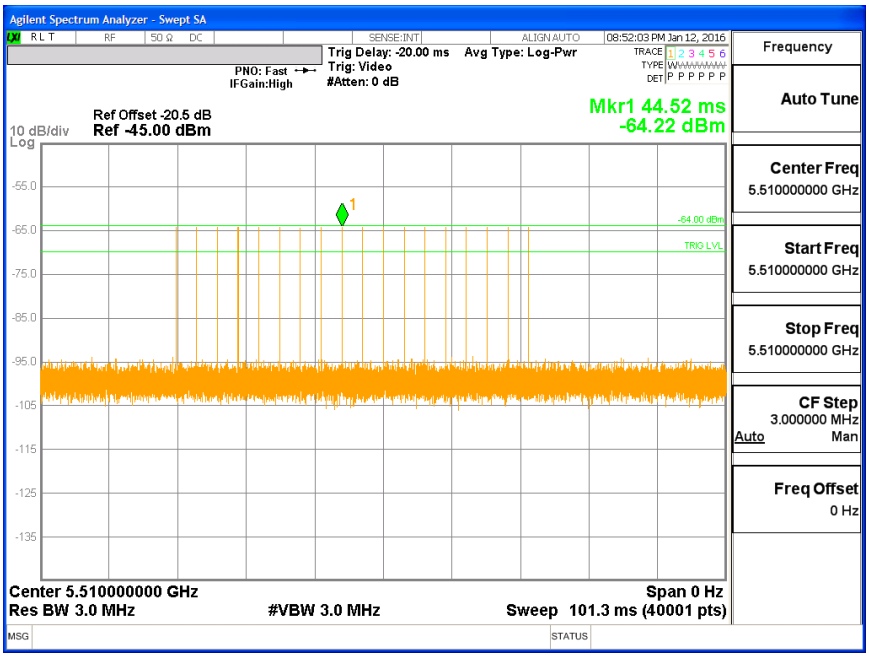
5.3.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

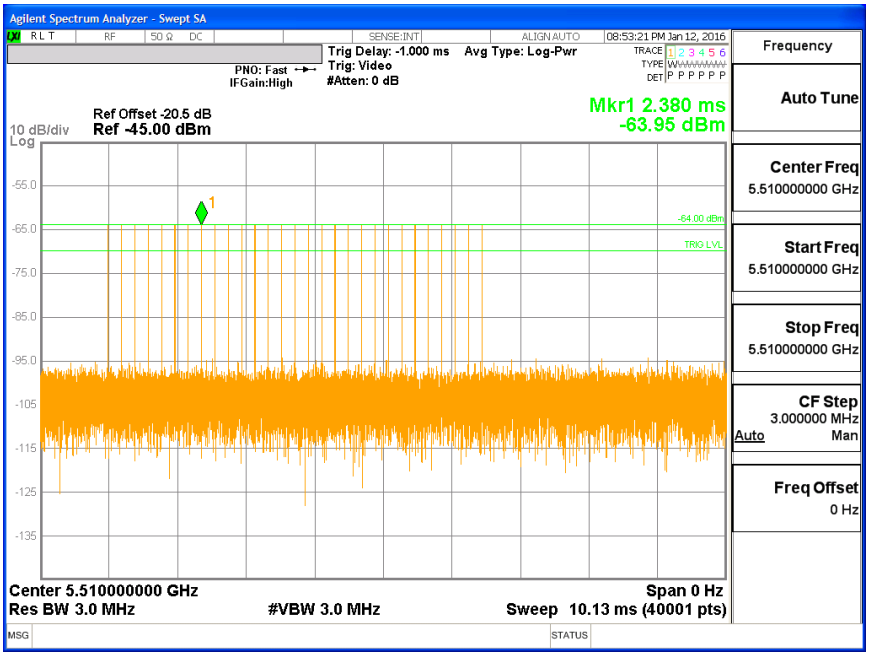
SHORT PULSE RADAR TYPE 0



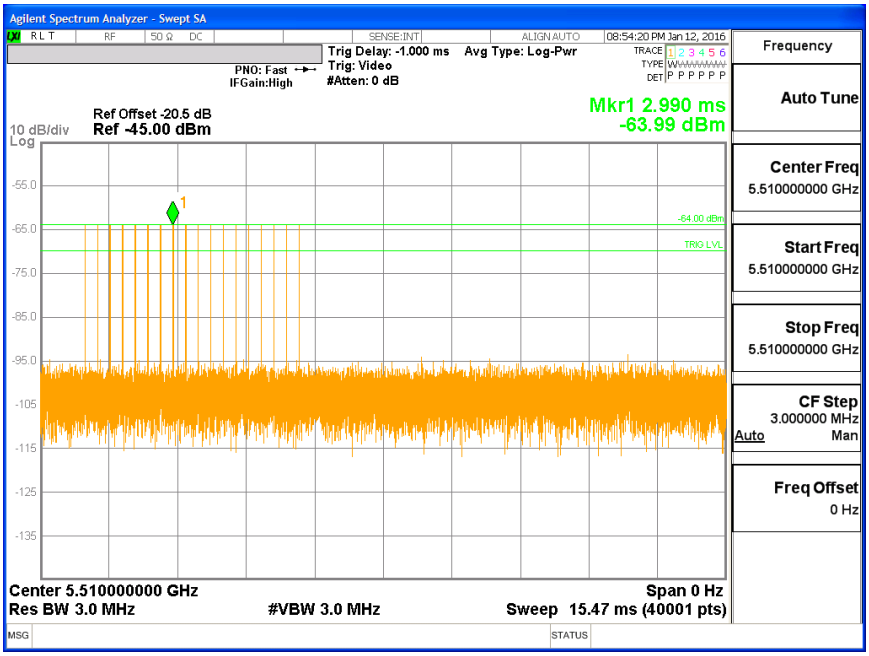
SAMPLE OF RADAR TYPE 1



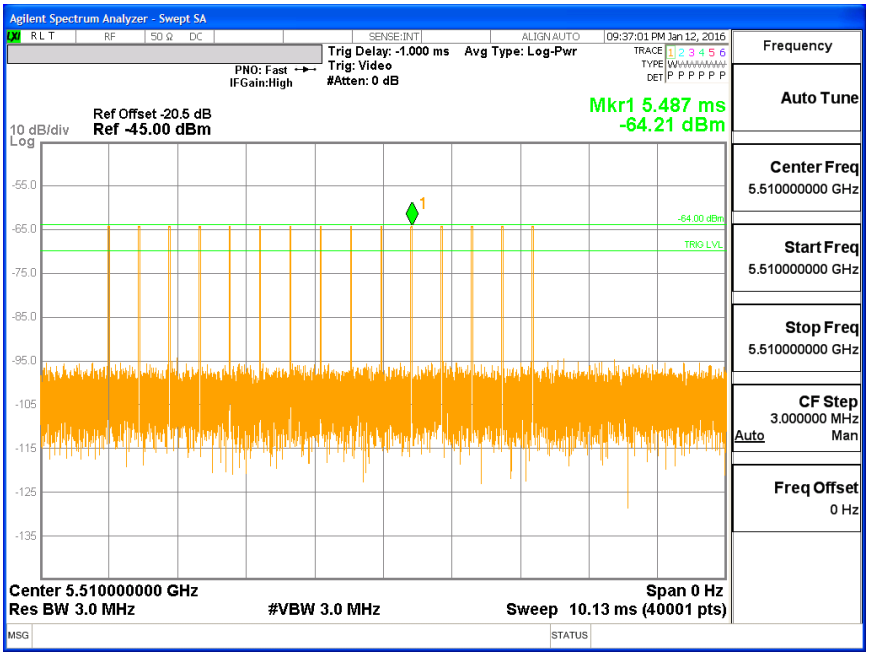
SAMPLE OF RADAR TYPE 2



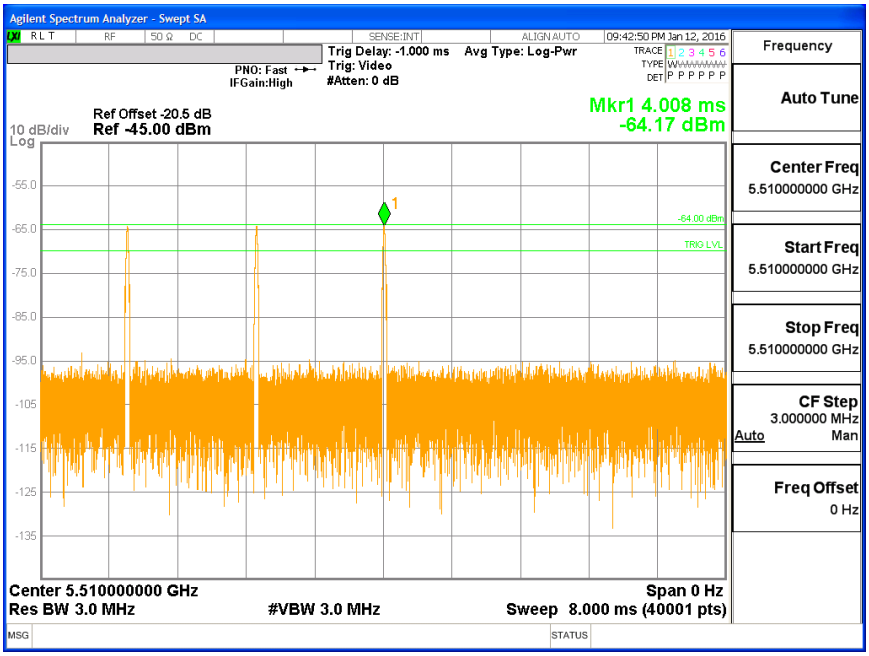
SAMPLE OF RADAR TYPE 3



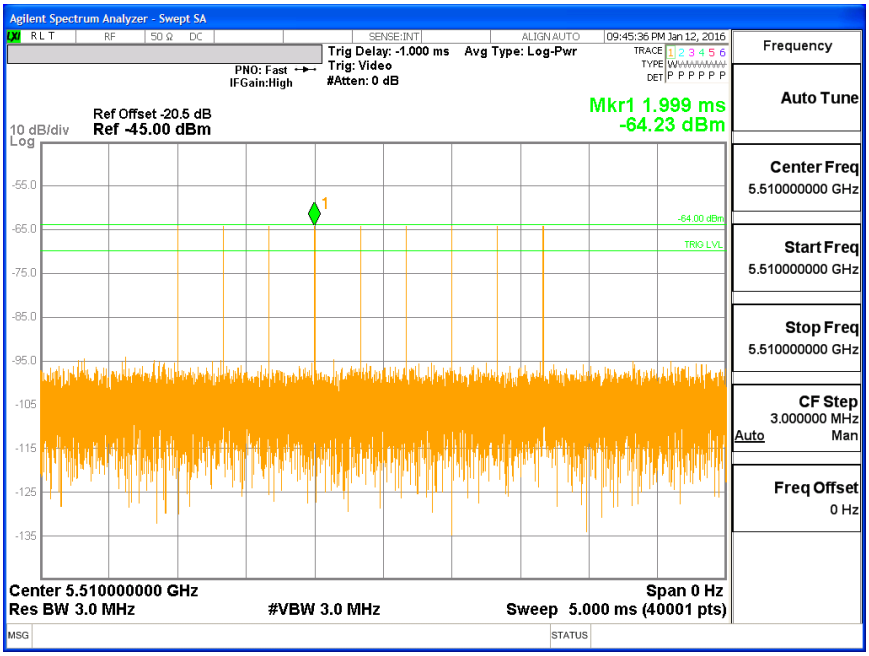
SAMPLE OF RADAR TYPE 4



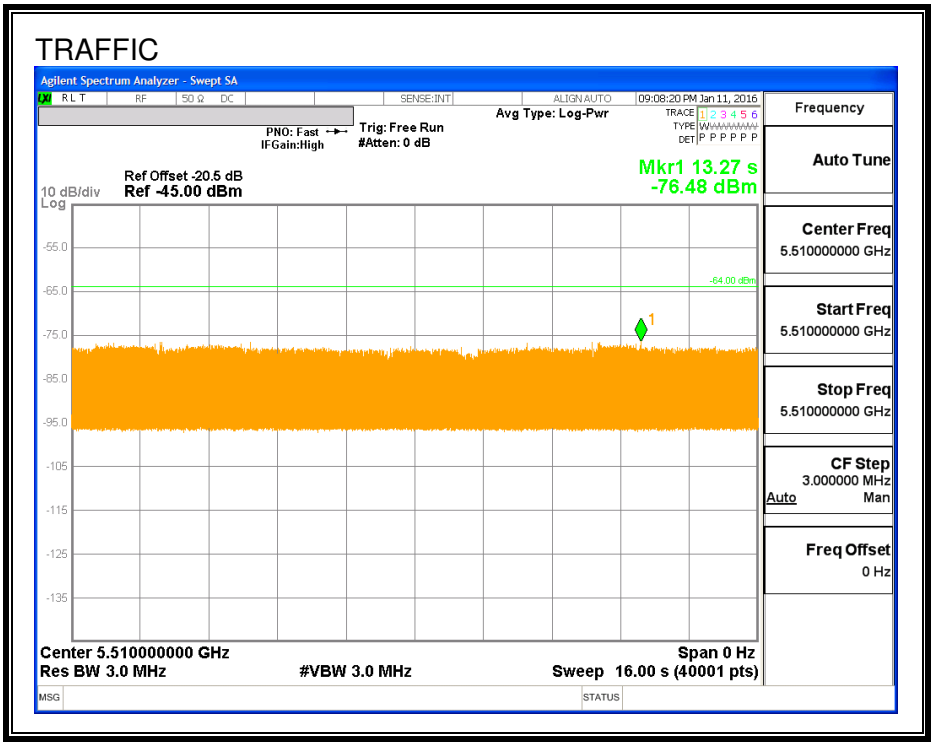
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



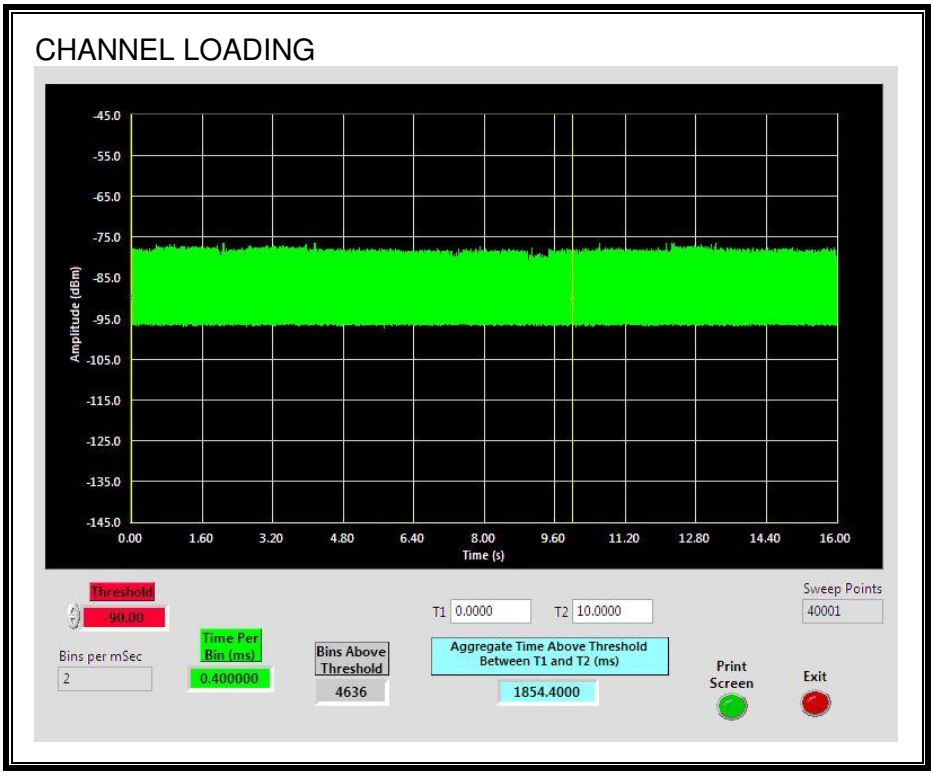
SINGLE BURST OF RADAR TYPE 6



TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 18.544%

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	64.5	64.5

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	0.840	0.840

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	58.85	58.85

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)
15:26:38	15:27:42	0:01:04

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)
15:39:46	15:39:46	0:00:00

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)
15:48:24	15:49:22	0:00:58

If a radar signal is detected during the channel availability check then the PC controlling the EUT displays a message stating that radar was detected.

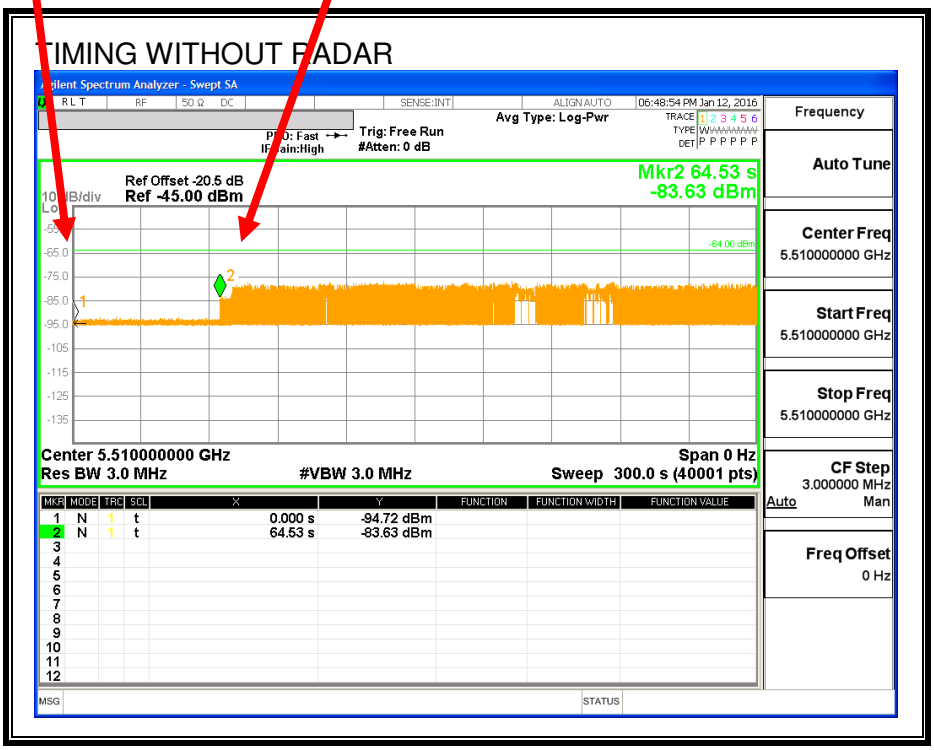
QUALITATIVE RESULTS

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.

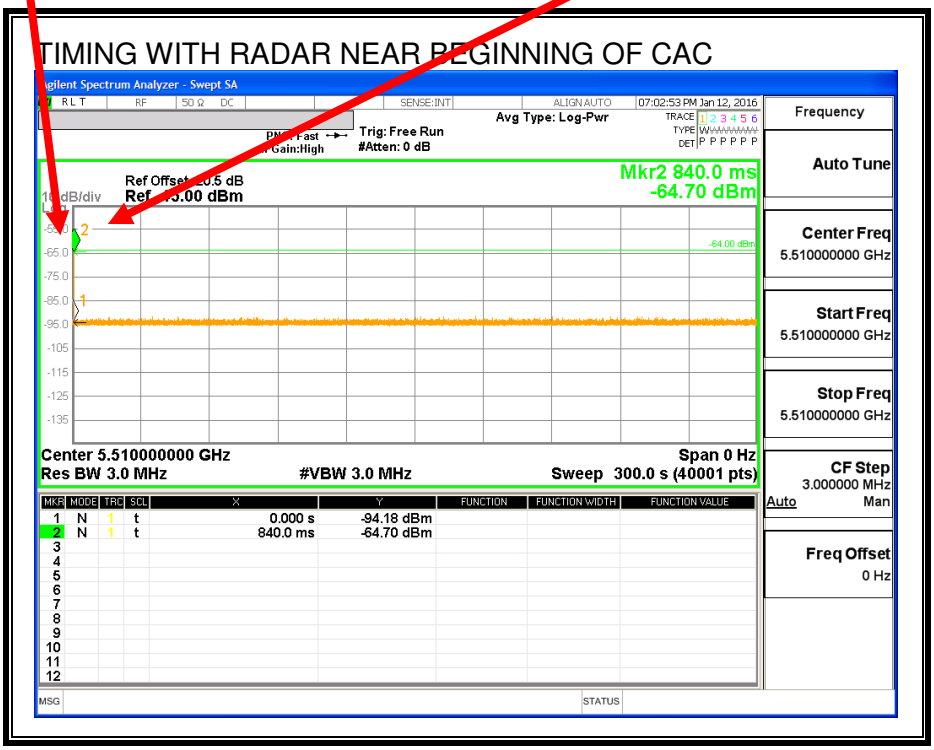
Log File of CAC Timing Without Radar

Jan 01 15:26:38 2015: DOT11: %%%%>dfs:DFS
evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor
(dfs.c:415)
Jan 01 **15:26:38** 2015: DOT11: %%%%>dfs:DFS
evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor
(dfs.c:415)
Jan 01 **15:27:42** 2015: DOT11: %%%%>dfs:DFS
evt=in_srvc_monitor,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled
(dfs.c:415)

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.

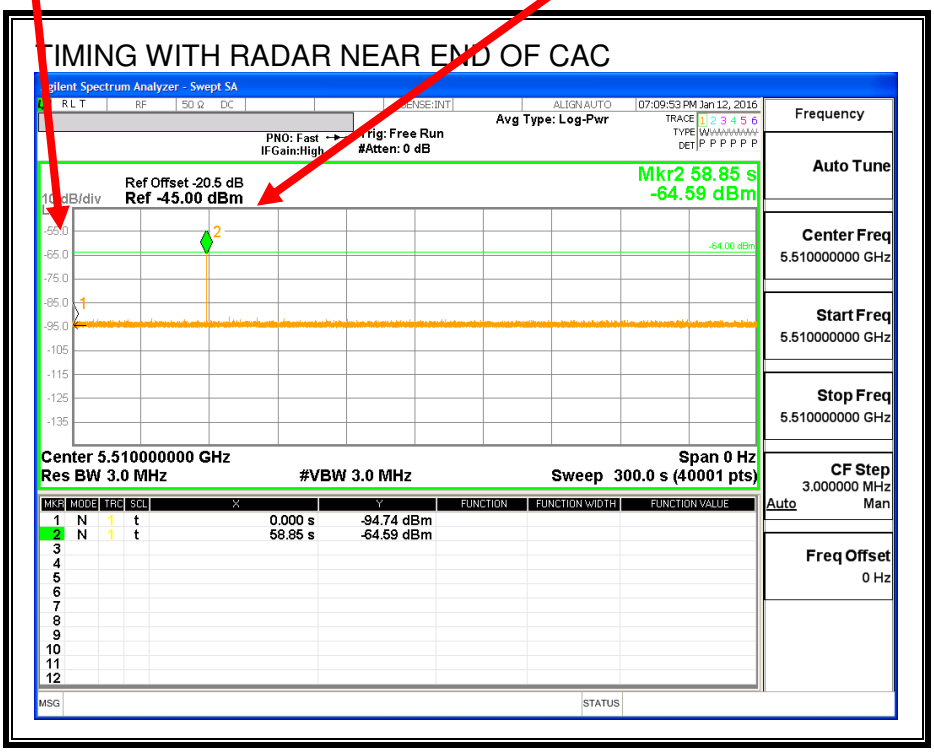
Log File of Radar at the Beginning of CAC

Jan 01 15:39:46 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 **15:39:46** 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 15:39:46 2015: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 100l ########## min_pw=32, subband_result=3, AT 300MS.
Jan 01 15:39:46 2015: KERN: wl1: dfs : state PRE-ISM Channel Availability Check, detected radar in channel 102.
Jan 01 15:39:46 2015: DOT11: %%%%>dfs:DFS evt=radar_seen,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)
Jan 01 15:39:46 2015: DOT11: %%%%>dfs:Radar reported on channel 100 Freq 5500 MHz by radio_idx 1 (dfs.c:298)
Jan 01 15:39:46 2015: DOT11: dfs:Starting resume timer (dfs.c:282)
Jan 01 15:39:46 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=40,ridx=1,curCh=100,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:39:46 2015: DOT11: dfs:DFS: driver's ch:40, rim's channel:100, bcmko_next_dfs_chan=40 (dfs.c:335)
Jan 01 15:39:46 2015: DOT11: dfs:DFS: rim's curren_ch=40, new next channel=44, telling dataplane. (dfs.c:343)
Jan 01 15:39:46 2015: DOT11: dfs:DFS_Validate_Power max 36 prtl: 30 (dfs.c:104)
Jan 01 15:39:46 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=40,ridx=1,curCh=40,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:39:46 2015: DOT11: dfs:DFS: ignoring duplicate channel change indication (dfs.c:324)
Jan 01 15:39:46 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=40,ridx=1,curCh=40,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:39:46 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=40,ridx=1,curCh=40,state=dfs_disabled,prev_state=radar_seen (dfs.c:415)
Jan 01 **15:39:46** 2015: ap8533-06FFB0 : %RADIO-4-RADAR_DETECTED: Radar found on channel 100 width 40 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

Jan 01 15:48:24 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 **15:48:24** 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:49:22 2015: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 100l ########## min_pw=32, subband_result=3, AT 54600MS.
Jan 01 15:49:22 2015: KERN: wl1: dfs : state PRE-ISM Channel Availability Check, detected radar in channel 102.
Jan 01 15:49:22 2015: DOT11: %%%%>dfs:DFS evt=radar_seen,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)
Jan 01 15:49:22 2015: DOT11: %%%%>dfs:Radar reported on channel 100 Freq 5500 MHz by radio_idx 1 (dfs.c:298)
Jan 01 15:49:22 2015: DOT11: dfs:Starting resume timer (dfs.c:282)
Jan 01 15:49:22 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=36,ridx=1,curCh=100,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:49:22 2015: DOT11: dfs:DFS: driver's ch:36, rim's channel:100, bcmko_next_dfs_chan=36 (dfs.c:335)
Jan 01 15:49:22 2015: DOT11: dfs:DFS: rim's curren_ch=36, new next channel=165, telling dataplane. (dfs.c:343)
Jan 01 15:49:22 2015: DOT11: dfs:DFS_Validate_Power max 36 prtl: 30 (dfs.c:104)
Jan 01 15:49:22 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=36,ridx=1,curCh=36,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:49:22 2015: DOT11: dfs:DFS: ignoring duplicate channel change indication (dfs.c:324)
Jan 01 15:49:22 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=36,ridx=1,curCh=36,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 15:49:22 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=36,ridx=1,curCh=36,state=dfs_disabled,prev_state=radar_seen (dfs.c:415)
Jan 01 **15:49:22** 2015: ap8533-06FFB0 : %RADIO-4-RADAR_DETECTED: Radar found on channel 100 width 40 freq 5500 MHz

5.3.4. OVERLAPPING CHANNEL TESTS

RESULTS

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

These tests are not applicable.

5.3.5. 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)

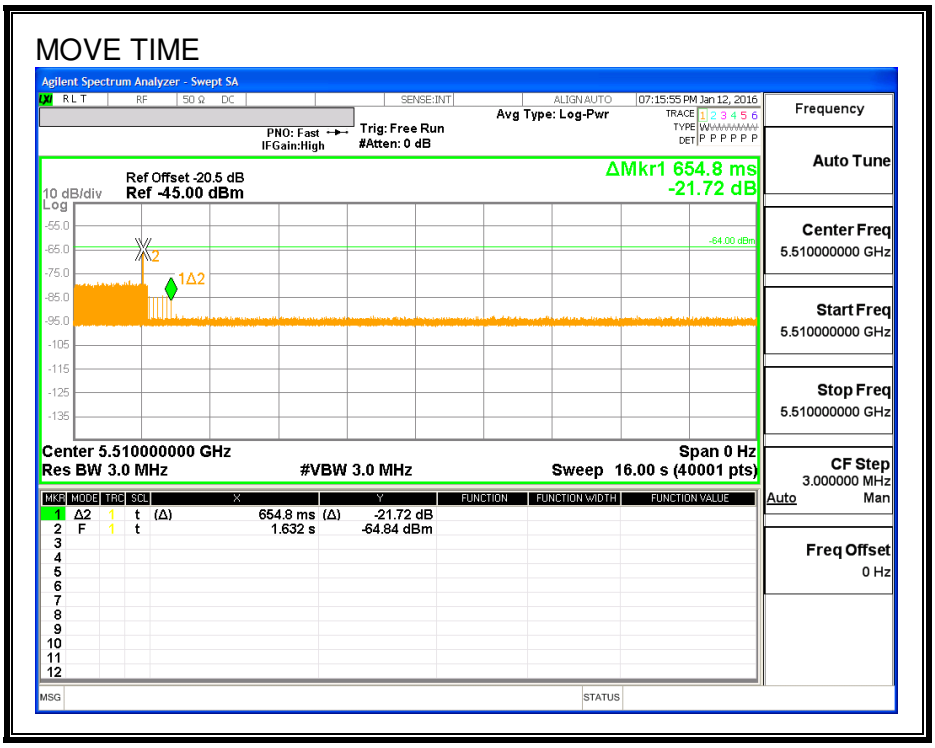
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

Channel Move Time (sec)	Limit (sec)
0.655	10

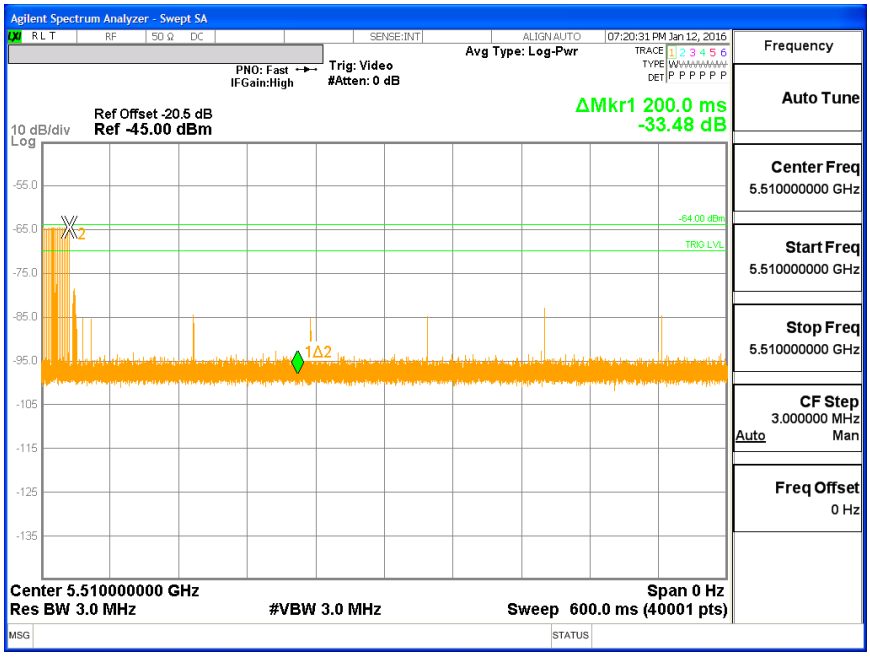
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
4.0	60

MOVE TIME



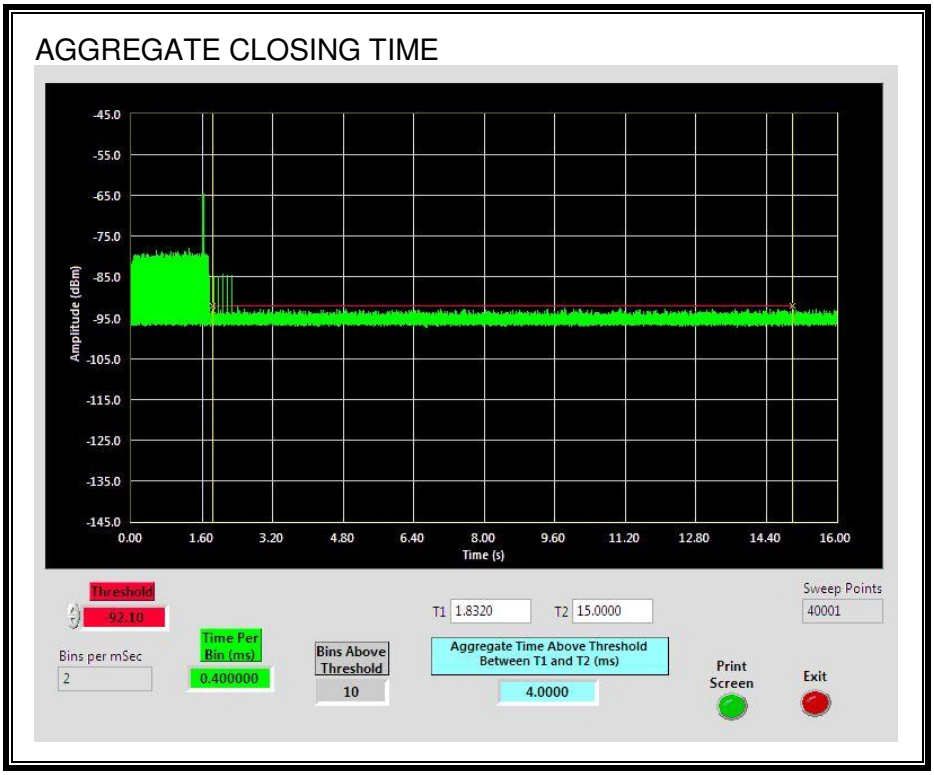
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

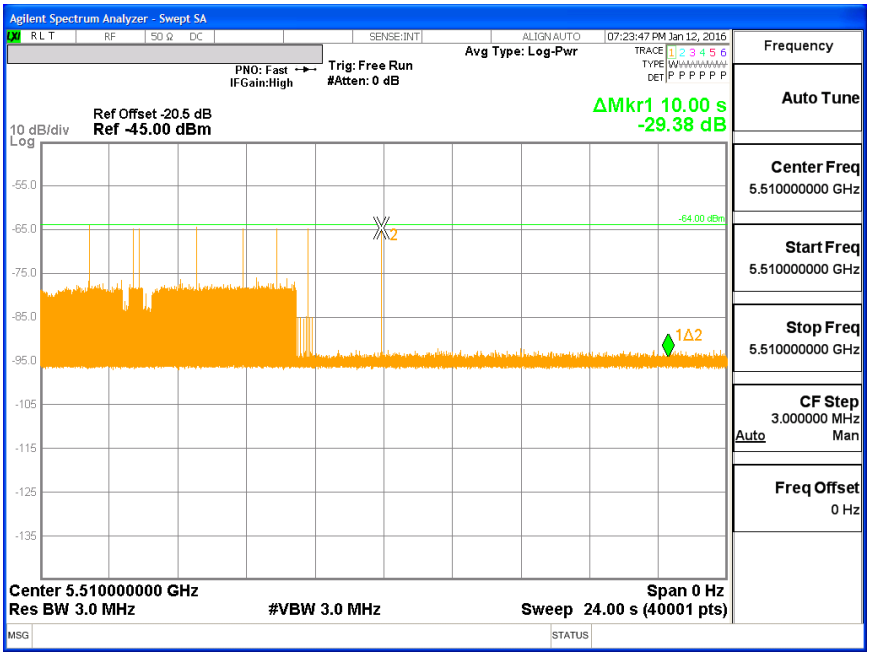
Only intermittent transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

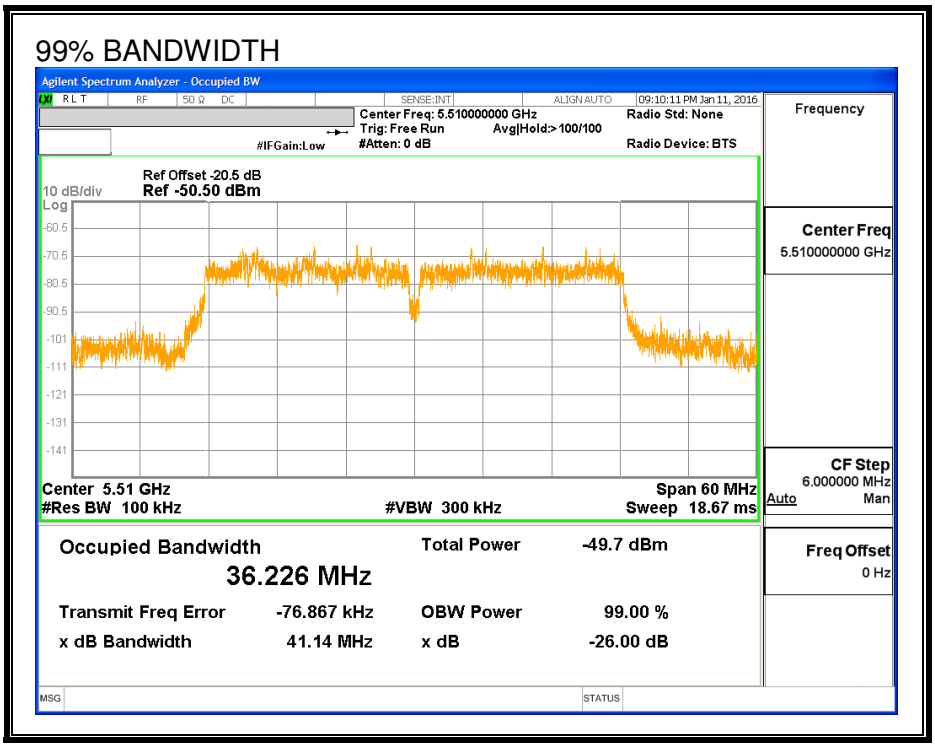
The traffic ceases prior to 10 seconds after the end of the radar waveform.

MOVE TIME FOR LONG PULSE RADAR



5.3.6. 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 (%)
5490	5530	40	36.226	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	0	0	
5490	10	10	100	FL
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	10	10	100	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5530	10	10	100	FH
5531	10	0	0	

5.3.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	96.67	60	Pass	5490	5530		
FCC Short Pulse Type 2	30	96.67	60	Pass	5490	5530		
FCC Short Pulse Type 3	30	100.00	60	Pass	5490	5530		
FCC Short Pulse Type 4	30	70.00	60	Pass	5490	5530		
Aggregate		90.83	80	Pass				
FCC Long Pulse Type 5	30	86.67	80	Pass	5490	5530	5494	5526
FCC Hopping Type 6	41	100.00	70	Pass	5490	5530		

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Test (A/B)	Frequency (MHz)	Successful Detection (Yes/No)
1001	1	3066	18	A	5510	No
1002	1	638	83	A	5510	Yes
1003	1	618	86	A	5510	Yes
1004	1	758	70	A	5510	Yes
1005	1	738	72	A	5510	Yes
1006	1	698	76	A	5510	Yes
1007	1	558	95	A	5510	Yes
1008	1	538	99	A	5510	Yes
1009	1	578	92	A	5510	Yes
1010	1	818	65	A	5510	Yes
1011	1	658	81	A	5510	Yes
1012	1	918	58	A	5510	Yes
1013	1	598	89	A	5510	Yes
1014	1	878	61	A	5510	Yes
1015	1	938	57	A	5510	Yes
1016	1	1483	36	B	5510	Yes
1017	1	1116	48	B	5510	Yes
1018	1	1071	50	B	5510	Yes
1019	1	2028	27	B	5510	Yes
1020	1	810	66	B	5510	Yes
1021	1	2378	23	B	5510	Yes
1022	1	2398	23	B	5510	Yes
1023	1	2901	19	B	5510	Yes
1024	1	3051	18	B	5510	Yes
1025	1	1136	47	B	5510	Yes
1026	1	2769	20	B	5510	Yes
1027	1	983	54	B	5510	Yes
1028	1	1551	35	B	5510	Yes
1029	1	2443	22	B	5510	Yes
1030	1	592	90	B	5510	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
2001	1.9	197	29	5510	Yes
2002	4.2	159	23	5510	Yes
2003	1	153	23	5510	No
2004	3.5	162	28	5510	Yes
2005	2.6	160	25	5510	Yes
2006	3.4	173	24	5510	Yes
2007	4.7	218	24	5510	Yes
2008	3.8	155	27	5510	Yes
2009	3.3	166	24	5510	Yes
2010	4.5	187	27	5510	Yes
2011	2.4	202	25	5510	Yes
2012	1.9	190	26	5510	Yes
2013	4	209	27	5510	Yes
2014	3.7	201	24	5510	Yes
2015	2	186	23	5510	Yes
2016	4.1	182	27	5510	Yes
2017	4.7	172	26	5510	Yes
2018	2.9	215	28	5510	Yes
2019	3.8	171	24	5510	Yes
2020	2.2	218	26	5510	Yes
2021	1.3	177	29	5510	Yes
2022	2.1	229	29	5510	Yes
2023	1.5	193	25	5510	Yes
2024	2.5	210	25	5510	Yes
2025	2	221	29	5510	Yes
2026	1.3	161	25	5510	Yes
2027	1.1	177	26	5510	Yes
2028	4.7	164	23	5510	Yes
2029	2.7	184	25	5510	Yes
2030	2.4	175	29	5510	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
3001	7.4	284	18	5510	Yes
3002	7.2	271	17	5510	Yes
3003	8.1	490	16	5510	Yes
3004	5.8	372	16	5510	Yes
3005	6.9	486	18	5510	Yes
3006	7.6	381	16	5510	Yes
3007	8.9	257	18	5510	Yes
3008	9.9	415	17	5510	Yes
3009	9.1	304	16	5510	Yes
3010	5.2	491	18	5510	Yes
3011	9.8	392	17	5510	Yes
3012	8.9	458	16	5510	Yes
3013	8.6	254	16	5510	Yes
3014	8	467	18	5510	Yes
3015	5.6	276	16	5510	Yes
3016	5.2	250	17	5510	Yes
3017	5.7	456	17	5510	Yes
3018	5.6	325	17	5510	Yes
3019	6.4	293	18	5510	Yes
3020	9.3	293	18	5510	Yes
3021	5.3	407	17	5510	Yes
3022	6	302	18	5510	Yes
3023	7.3	428	17	5510	Yes
3024	8.3	336	16	5510	Yes
3025	7.5	357	18	5510	Yes
3026	8.7	411	18	5510	Yes
3027	8.2	312	16	5510	Yes
3028	7.3	261	18	5510	Yes
3029	7	426	18	5510	Yes
3030	6.4	387	17	5510	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
4001	18.1	447	15	5510	Yes
4002	12.6	304	13	5510	Yes
4003	18.4	377	12	5510	Yes
4004	13.4	497	13	5510	Yes
4005	19.8	465	12	5510	No
4006	15.3	347	13	5510	Yes
4007	17.5	327	13	5510	Yes
4008	18.9	473	12	5510	Yes
4009	11.4	349	12	5510	Yes
4010	13.3	390	16	5510	Yes
4011	11.8	278	14	5510	Yes
4012	14.2	332	13	5510	Yes
4013	13.2	484	14	5510	Yes
4014	11.4	433	14	5510	Yes
4015	10.8	346	15	5510	Yes
4016	19.6	308	12	5510	No
4017	14.9	250	13	5510	Yes
4018	19.5	475	14	5510	No
4019	15.2	297	15	5510	Yes
4020	10.2	417	16	5510	Yes
4021	16.6	385	16	5510	Yes
4022	12.1	267	12	5510	Yes
4023	19.6	499	16	5510	No
4024	15.7	394	15	5510	No
4025	18.3	269	15	5510	No
4026	10.1	310	14	5510	No
4027	18.7	450	12	5510	Yes
4028	11	252	12	5510	No
4029	10	404	12	5510	Yes
4030	18.3	353	12	5510	No

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5524	No
2	5521	Yes
3	5510	Yes
4	5506	No
5	5496	Yes
6	5498	Yes
7	5508	Yes
8	5517	Yes
9	5519	Yes
10	5497	Yes
11	5510	Yes
12	5497	Yes
13	5498	Yes
14	5516	Yes
15	5520	Yes
16	5525	No
17	5506	Yes
18	5512	Yes
19	5496	Yes
20	5511	Yes
21	5516	Yes
22	5503	Yes
23	5506	Yes
24	5526	Yes
25	5496	Yes
26	5496	Yes
27	5506	Yes
28	5509	No
29	5498	Yes
30	5512	Yes

Note: The Type 5 randomized parameters tested 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	246	5490	9	Yes
2	721	5491	10	Yes
3	1196	5492	10	Yes
4	1671	5493	5	Yes
5	2146	5494	3	Yes
6	2621	5495	10	Yes
7	3096	5496	11	Yes
8	3571	5497	6	Yes
9	4046	5498	6	Yes
10	4521	5499	9	Yes
11	4996	5500	6	Yes
12	5471	5501	12	Yes
13	5946	5502	6	Yes
14	6421	5503	7	Yes
15	6896	5504	10	Yes
16	7371	5505	8	Yes
17	7846	5506	13	Yes
18	8321	5507	8	Yes
19	8796	5508	6	Yes
20	9271	5509	4	Yes
21	9746	5510	14	Yes
22	10221	5511	10	Yes
23	10696	5512	9	Yes
24	11171	5513	7	Yes
25	11646	5514	11	Yes
26	12121	5515	6	Yes
27	12596	5516	5	Yes
28	13071	5517	9	Yes
29	13546	5518	2	Yes
30	14021	5519	11	Yes
31	14496	5520	8	Yes
32	14971	5521	7	Yes
33	15446	5522	8	Yes
34	15921	5523	8	Yes
35	16396	5524	8	Yes
36	16871	5525	8	Yes
37	17346	5526	9	Yes
38	17821	5527	11	Yes
39	18296	5528	4	Yes
40	18771	5529	5	Yes
41	19246	5530	9	Yes

5.4. RESULTS FOR 80 MHz BANDWIDTH

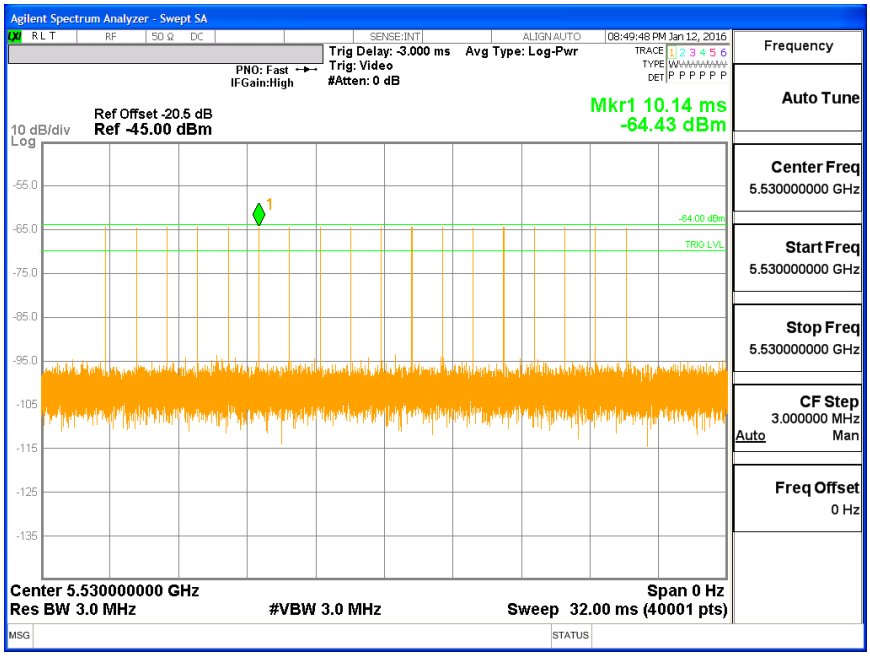
5.4.1. TEST CHANNEL

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

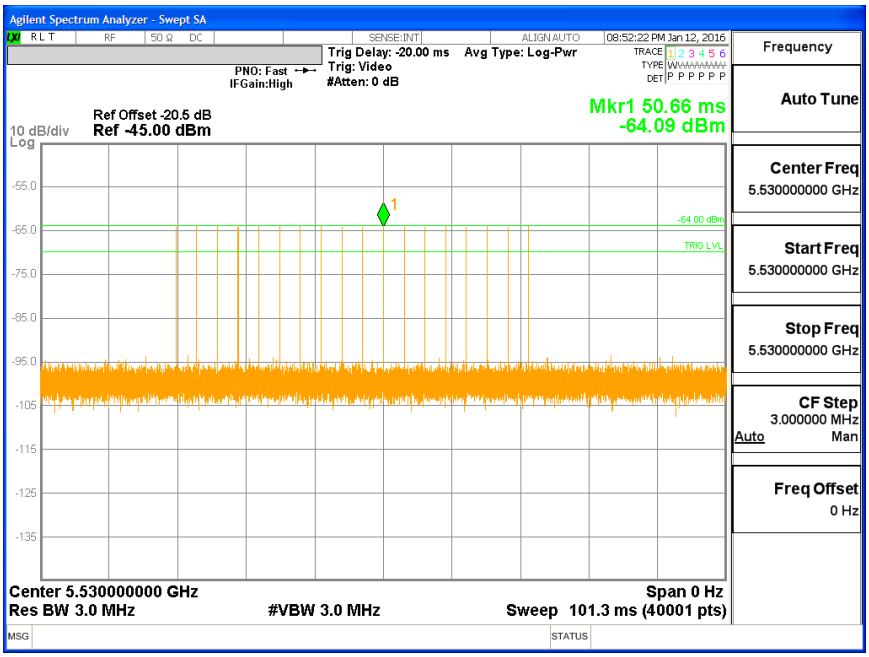
5.4.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

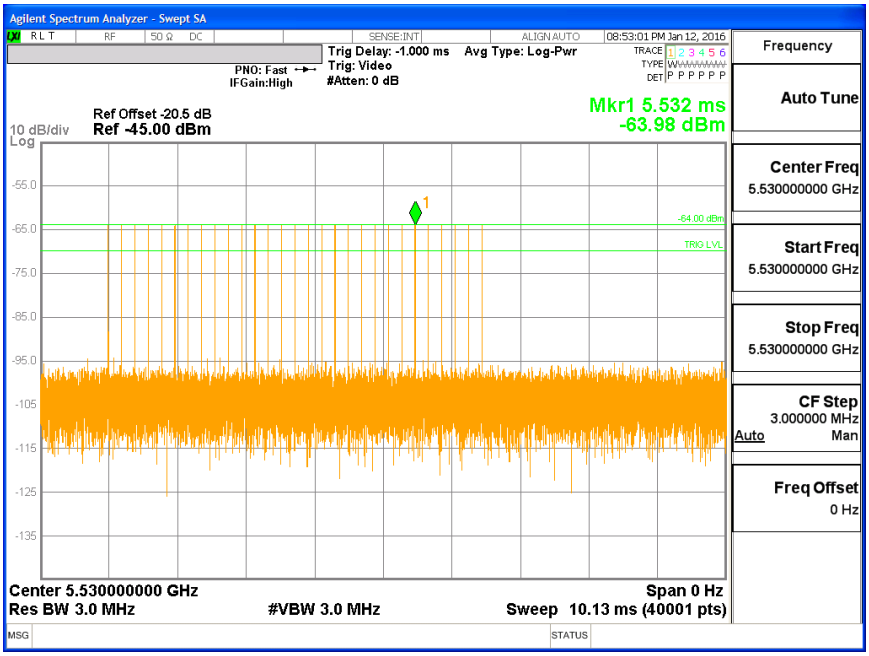
SHORT PULSE RADAR TYPE 0



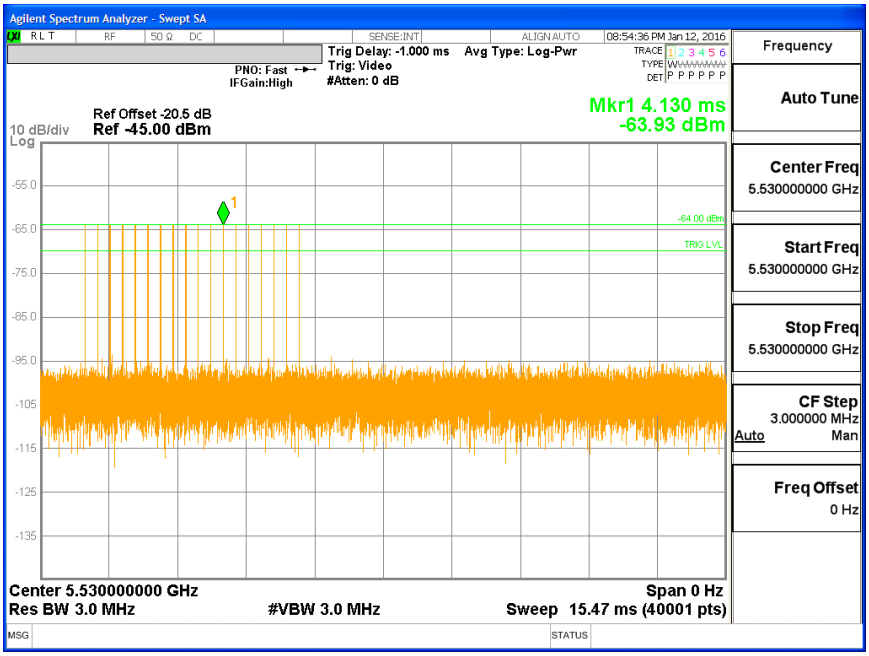
SAMPLE OF RADAR TYPE 1



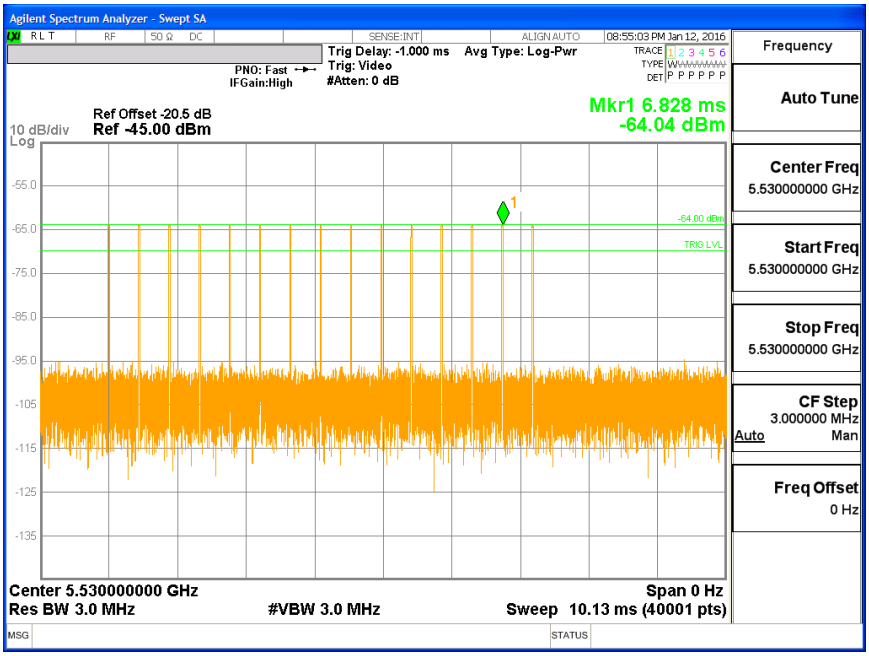
SAMPLE OF RADAR TYPE 2



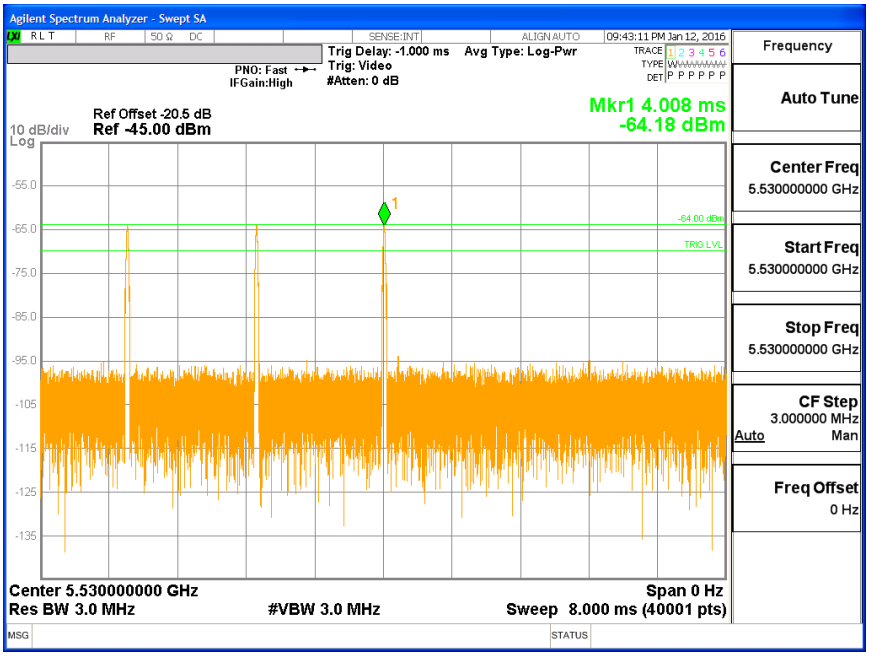
SAMPLE OF RADAR TYPE 3



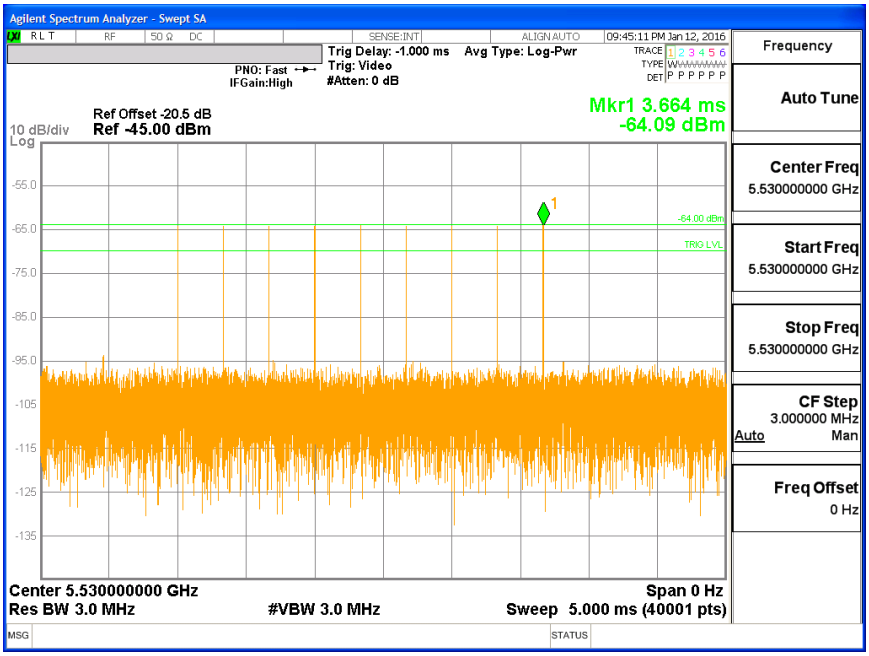
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5

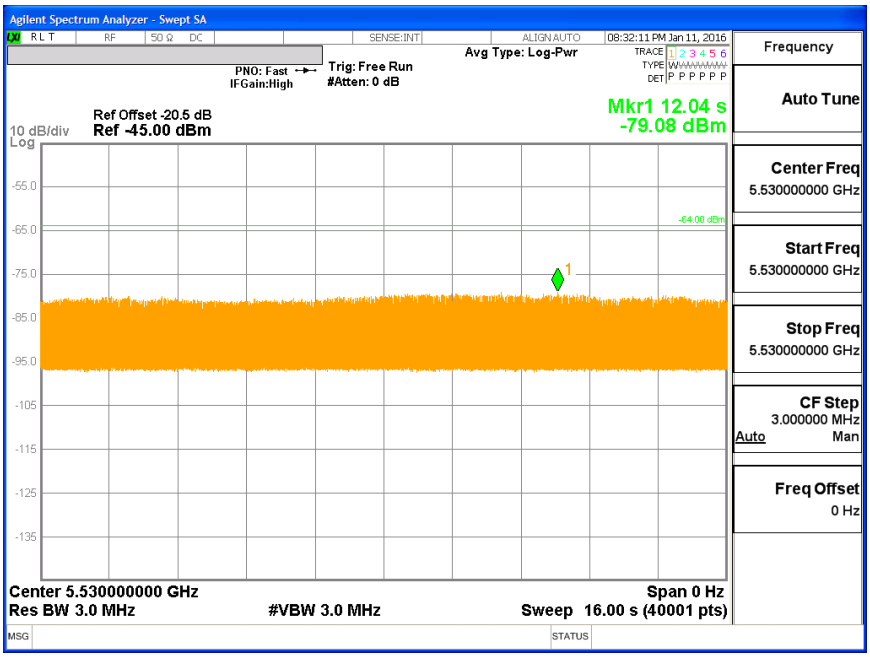


SINGLE BURST OF RADAR TYPE 6

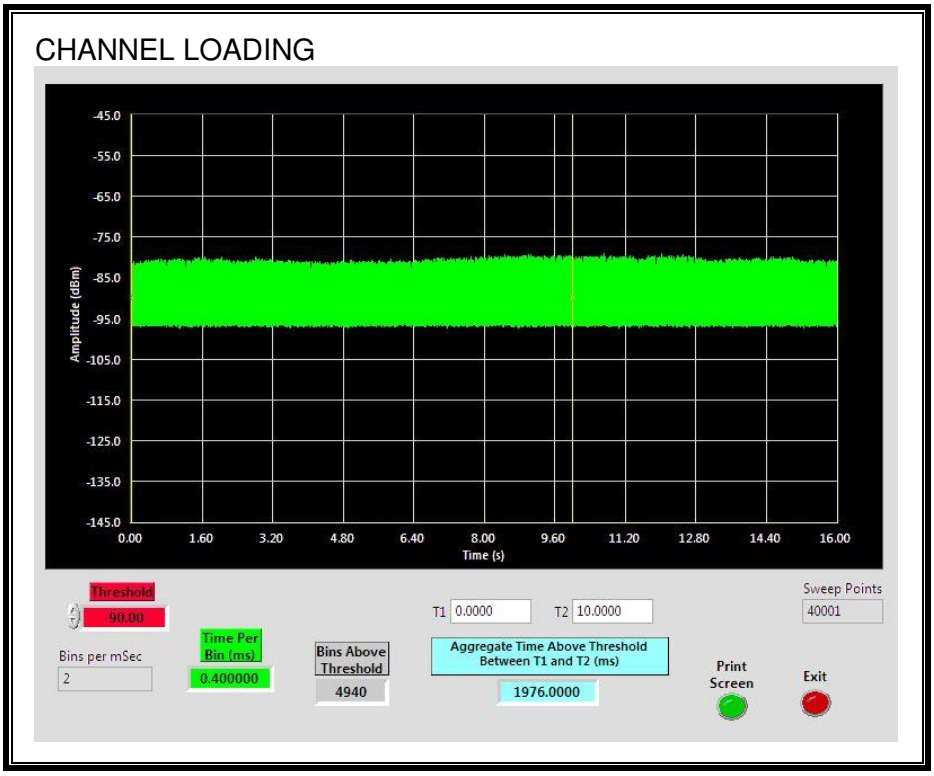


TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 19.76%

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	64.9	64.9

Radar Near Beginning of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	1.290	1.290

Radar Near End of CAC

Beginning of CAC (sec)	Timing of Radar Burst (sec)	Radar Relative to Start of CAC (sec)
0	58.90	58.90

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)
16:26:12	16:27:16	0:01:04

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)
16:32:41	16:32:42	0:00:01

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)
16:41:34	16:42:32	0:00:58

If a radar signal is detected during the channel availability check then the PC controlling the EUT displays a message stating that radar was detected.

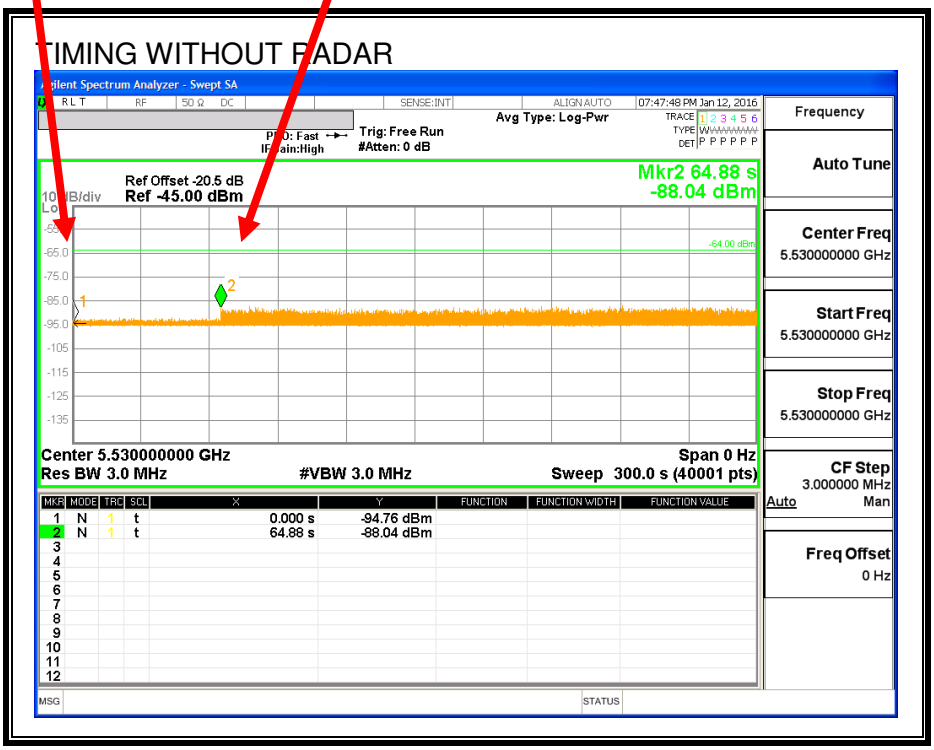
QUALITATIVE RESULTS

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.

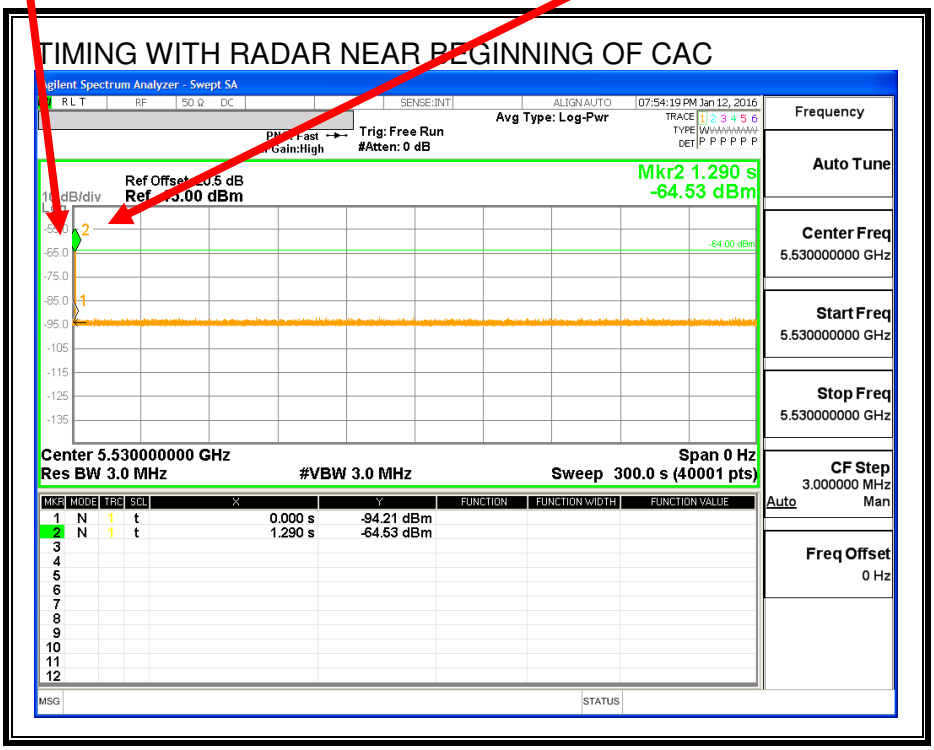
Log File of CAC Timing Without Radar

Jan 01 **16:26:12** 2015: ap8533-06FFB0 : %DIAG-6-NEW_LED_STATE: LED state message RADIO_2_52G_LED_ON from module DOT11
Jan 01 16:26:12 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 16:26:12 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 **16:27:16** 2015: DOT11: %%%%>dfs:DFS evt=in_srvc_monitor,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)

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.

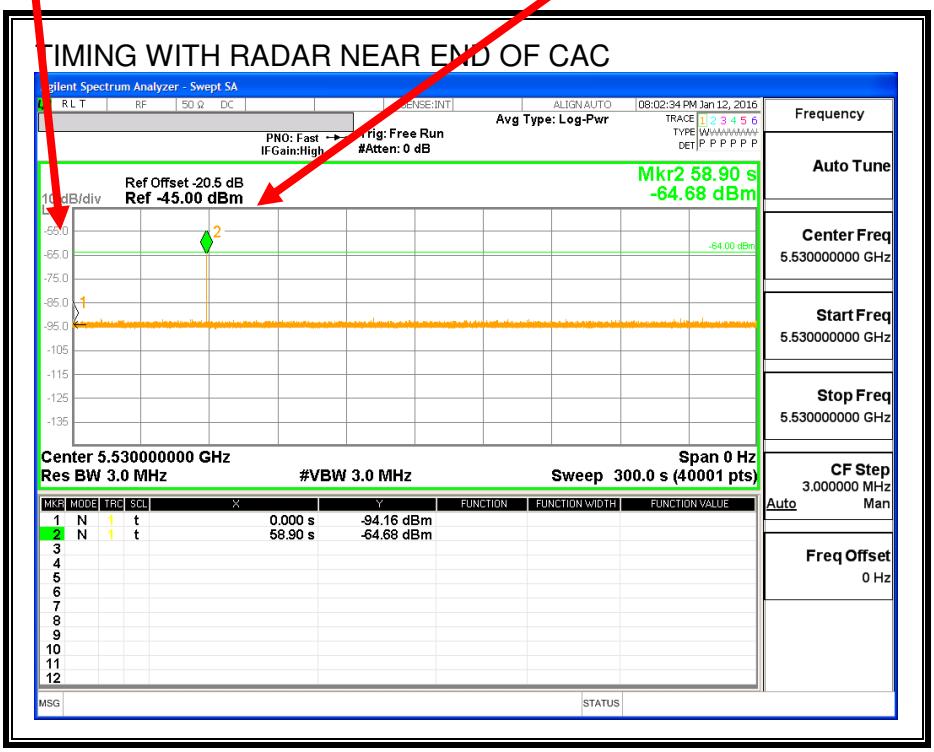
Log File of Radar at the Beginning of CAC

Jan 01 16:32:41 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 **16:32:41** 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=in_srvc_monitor (dfs.c:415)
Jan 01 16:32:42 2015: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 100/80 ########## min_pw=31, subband_result=6, AT 750MS.
Jan 01 16:32:42 2015: KERN: wl1: dfs : state PRE-ISM Channel Availability Check, detected radar in channel 106.
Jan 01 16:32:42 2015: DOT11: %%%%>dfs:DFS evt=radar_seen,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)
Jan 01 16:32:42 2015: DOT11: %%%%>dfs:Radar reported on channel 100 Freq 5500 MHz by radio_idx 1 (dfs.c:298)
Jan 01 16:32:42 2015: DOT11: dfs:Starting resume timer (dfs.c:282)
Jan 01 16:32:42 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=165,ridx=1,curCh=100,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 16:32:42 2015: DOT11: dfs:DFS: driver's ch:165, rim's channel:100, bcmko_next_dfs_chan=165 (dfs.c:335)
Jan 01 16:32:42 2015: DOT11: dfs:DFS: rim's curren_ch=165, new next channel=44, telling dataplane. (dfs.c:343)
Jan 01 16:32:42 2015: DOT11: dfs:DFS_Validate_Power max 36 prtl: 30 (dfs.c:104)
Jan 01 16:32:42 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=165,ridx=1,curCh=165,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 16:32:42 2015: DOT11: dfs:DFS: ignoring duplicate channel change indication (dfs.c:324)
Jan 01 16:32:42 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=165,ridx=1,curCh=165,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 16:32:42 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=165,ridx=1,curCh=165,state=dfs_disabled,prev_state=radar_seen (dfs.c:415)
Jan 01 **16:32:42** 2015: ap8533-06FFB0 : %RADIO-4-RADAR_DETECTED: Radar found on channel 100 width 80 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

Jan 01 16:41:34 2015: DOT11: %%%%>dfs:DFS evt=dfs_disabled,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 **16:41:34** 2015: DOT11: %%%%>dfs:DFS evt=chan_avail_chk,ch=100,ridx=1,curCh=100,state=dfs_disabled,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 16:42:32 2015: KERN: WL1: DFS: UNCLASSIFIED ########## radar detected on channel 100/80 ########## min_pw=31, subband_result=6, AT 54450MS.
Jan 01 16:42:32 2015: KERN: wl1: dfs : state PRE-ISM Channel Availability Check, detected radar in channel 106.
Jan 01 16:42:32 2015: DOT11: %%%%>dfs:DFS evt=radar_seen,ch=100,ridx=1,curCh=100,state=chan_avail_chk,prev_state=dfs_disabled (dfs.c:415)
Jan 01 16:42:32 2015: DOT11: %%%%>dfs:Radar reported on channel 100 Freq 5500 MHz by radio_idx 1 (dfs.c:298)
Jan 01 16:42:32 2015: DOT11: dfs:Starting resume timer (dfs.c:282)
Jan 01 16:42:32 2015: DOT11: %%%%>dfs:DFS evt=chan_chngd,ch=36,ridx=1,curCh=100,state=radar_seen,prev_state=chan_avail_chk (dfs.c:415)
Jan 01 16:42:32 2015: DOT11: dfs:DFS: driver's ch:36, rim's channel:100, bcmko_next_dfs_chan=36 (dfs.c:335)
Jan 01 16:42:32 2015: DOT11: dfs:DFS: rim's curren_ch=36, new next channel=44, telling dataplane. (dfs.c:343)
Jan 01 16:42:32 2015: DOT11: dfs:DFS_Validate_Power max 36 prtl: 30 (dfs.c:104)
Jan 01 **16:42:32** 2015: ap8533-06FFB0 : %RADIO-4-RADAR_DETECTED: Radar found on channel 100 width 80 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.

These tests are not applicable.

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)

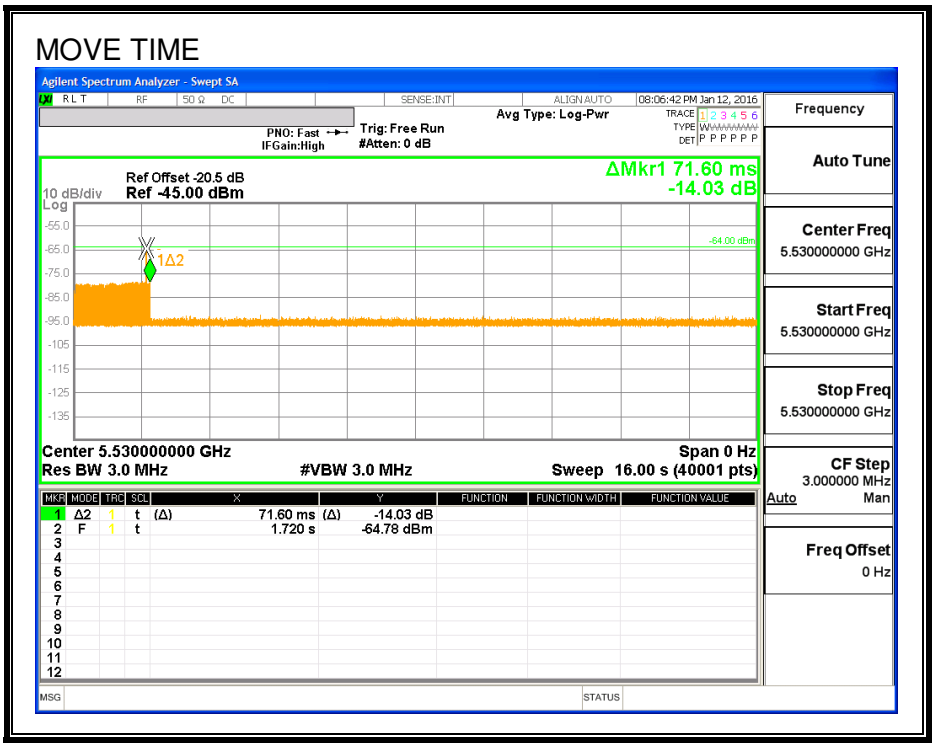
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

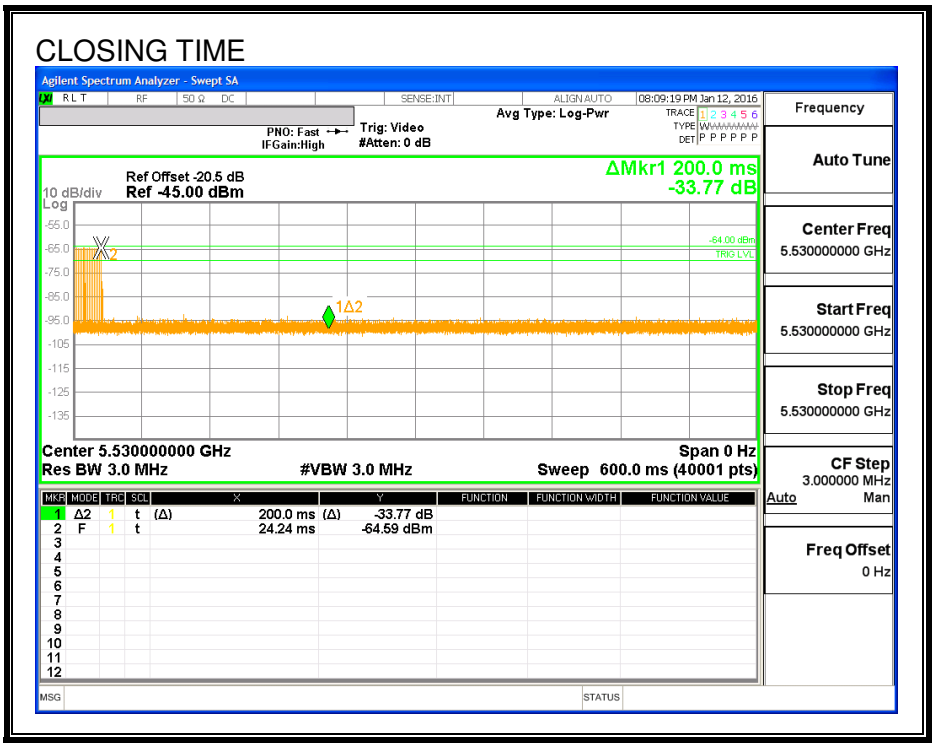
Channel Move Time (sec)	Limit (sec)
0.072	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

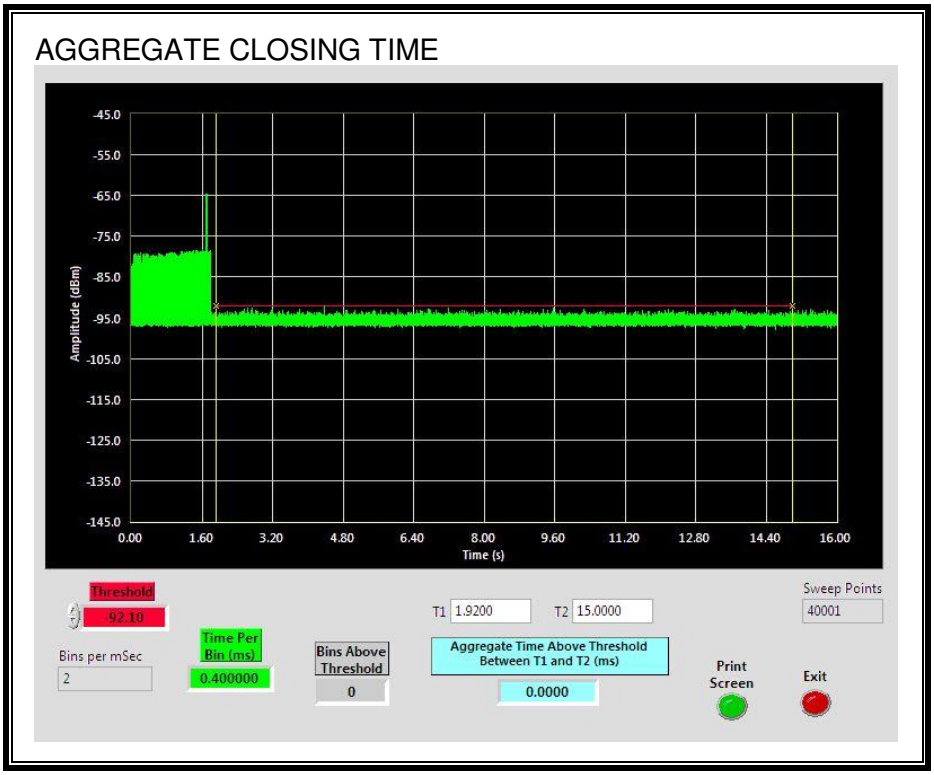


CHANNEL CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

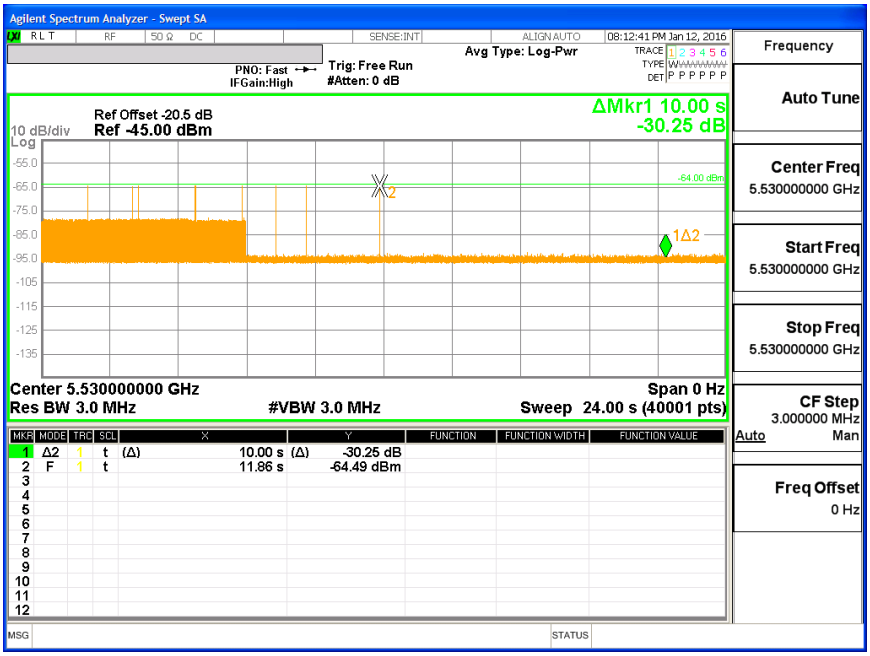
No transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

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

MOVE TIME FOR LONG PULSE RADAR

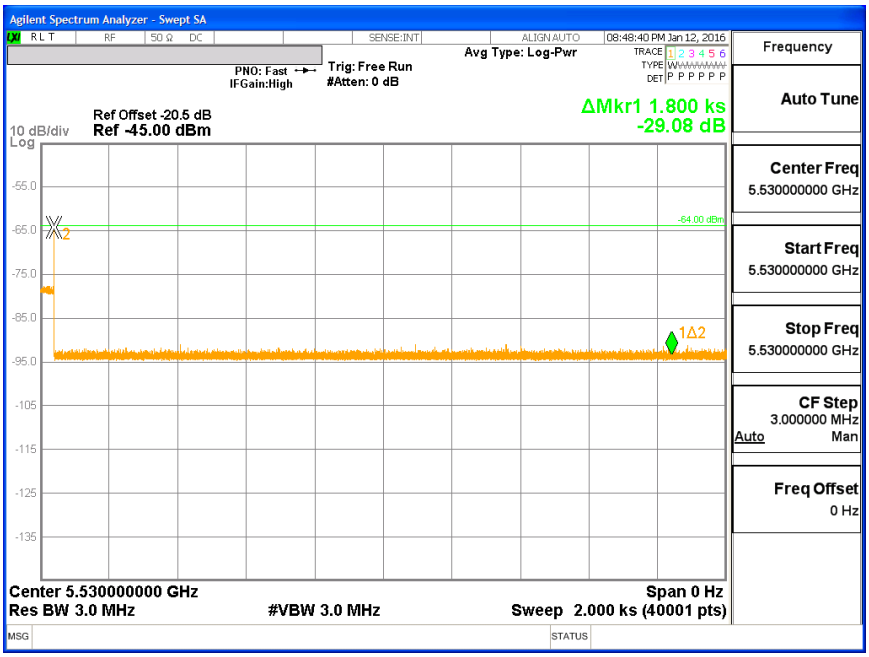


5.4.6. NON-OCCUPANCY PERIOD

RESULTS

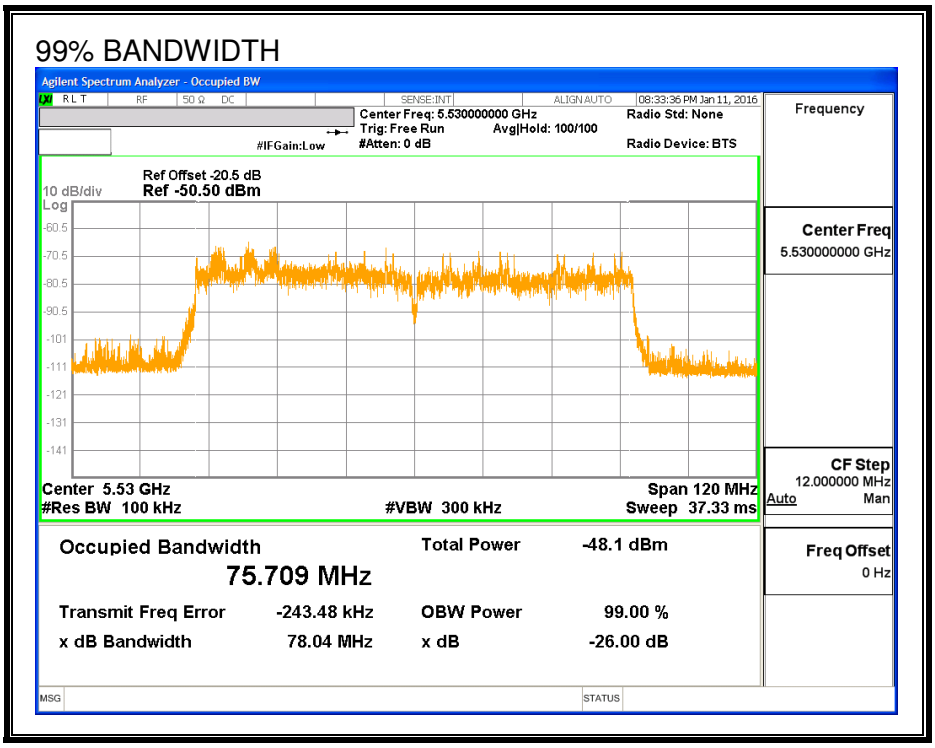
No EUT transmissions were observed on the test channel during the 30-minute observation time.

NON-OCCUPANCY PERIOD



5.4.7. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5490	5570	80	75.709	105.7	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
5489	10	0	0	
5490	10	10	100	FL
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	10	10	100	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5530	10	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
5571	10	0	0	

5.4.8. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	96.67	60	Pass	5490	5570		
FCC Short Pulse Type 2	30	100.00	60	Pass	5490	5570		
FCC Short Pulse Type 3	30	100.00	60	Pass	5490	5570		
FCC Short Pulse Type 4	30	80.00	60	Pass	5490	5570		
Aggregate		94.17	80	Pass				
FCC Long Pulse Type 5	30	93.33	80	Pass	5490	5570	5498	5562
FCC Hopping Type 6	81	100.00	70	Pass	5490	5570		

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Test (A/B)	Frequency (MHz)	Successful Detection (Yes/No)
1001	1	3066	18	A	5530	No
1002	1	638	83	A	5530	Yes
1003	1	618	86	A	5530	Yes
1004	1	758	70	A	5530	Yes
1005	1	738	72	A	5530	Yes
1006	1	698	76	A	5530	Yes
1007	1	558	95	A	5530	Yes
1008	1	538	99	A	5530	Yes
1009	1	578	92	A	5530	Yes
1010	1	818	65	A	5530	Yes
1011	1	658	81	A	5530	Yes
1012	1	918	58	A	5530	Yes
1013	1	598	89	A	5530	Yes
1014	1	878	61	A	5530	Yes
1015	1	938	57	A	5530	Yes
1016	1	1483	36	B	5530	Yes
1017	1	1116	48	B	5530	Yes
1018	1	1071	50	B	5530	Yes
1019	1	2028	27	B	5530	Yes
1020	1	810	66	B	5530	Yes
1021	1	2378	23	B	5530	Yes
1022	1	2398	23	B	5530	Yes
1023	1	2901	19	B	5530	Yes
1024	1	3051	18	B	5530	Yes
1025	1	1136	47	B	5530	Yes
1026	1	2769	20	B	5530	Yes
1027	1	983	54	B	5530	Yes
1028	1	1551	35	B	5530	Yes
1029	1	2443	22	B	5530	Yes
1030	1	592	90	B	5530	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
2001	1.9	197	29	5530	Yes
2002	4.2	159	23	5530	Yes
2003	1	153	23	5530	Yes
2004	3.5	162	28	5530	Yes
2005	2.6	160	25	5530	Yes
2006	3.4	173	24	5530	Yes
2007	4.7	218	24	5530	Yes
2008	3.8	155	27	5530	Yes
2009	3.3	166	24	5530	Yes
2010	4.5	187	27	5530	Yes
2011	2.4	202	25	5530	Yes
2012	1.9	190	26	5530	Yes
2013	4	209	27	5530	Yes
2014	3.7	201	24	5530	Yes
2015	2	186	23	5530	Yes
2016	4.1	182	27	5530	Yes
2017	4.7	172	26	5530	Yes
2018	2.9	215	28	5530	Yes
2019	3.8	171	24	5530	Yes
2020	2.2	218	26	5530	Yes
2021	1.3	177	29	5530	Yes
2022	2.1	229	29	5530	Yes
2023	1.5	193	25	5530	Yes
2024	2.5	210	25	5530	Yes
2025	2	221	29	5530	Yes
2026	1.3	161	25	5530	Yes
2027	1.1	177	26	5530	Yes
2028	4.7	164	23	5530	Yes
2029	2.7	184	25	5530	Yes
2030	2.4	175	29	5530	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
3001	7.4	284	18	5530	Yes
3002	7.2	271	17	5530	Yes
3003	8.1	490	16	5530	Yes
3004	5.8	372	16	5530	Yes
3005	6.9	486	18	5530	Yes
3006	7.6	381	16	5530	Yes
3007	8.9	257	18	5530	Yes
3008	9.9	415	17	5530	Yes
3009	9.1	304	16	5530	Yes
3010	5.2	491	18	5530	Yes
3011	9.8	392	17	5530	Yes
3012	8.9	458	16	5530	Yes
3013	8.6	254	16	5530	Yes
3014	8	467	18	5530	Yes
3015	5.6	276	16	5530	Yes
3016	5.2	250	17	5530	Yes
3017	5.7	456	17	5530	Yes
3018	5.6	325	17	5530	Yes
3019	6.4	293	18	5530	Yes
3020	9.3	293	18	5530	Yes
3021	5.3	407	17	5530	Yes
3022	6	302	18	5530	Yes
3023	7.3	428	17	5530	Yes
3024	8.3	336	16	5530	Yes
3025	7.5	357	18	5530	Yes
3026	8.7	411	18	5530	Yes
3027	8.2	312	16	5530	Yes
3028	7.3	261	18	5530	Yes
3029	7	426	18	5530	Yes
3030	6.4	387	17	5530	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
4001	18.1	447	15	5530	Yes
4002	12.6	304	13	5530	Yes
4003	18.4	377	12	5530	Yes
4004	13.4	497	13	5530	Yes
4005	19.8	465	12	5530	No
4006	15.3	347	13	5530	Yes
4007	17.5	327	13	5530	Yes
4008	18.9	473	12	5530	No
4009	11.4	349	12	5530	Yes
4010	13.3	390	16	5530	Yes
4011	11.8	278	14	5530	Yes
4012	14.2	332	13	5530	Yes
4013	13.2	484	14	5530	Yes
4014	11.4	433	14	5530	Yes
4015	10.8	346	15	5530	Yes
4016	19.6	308	12	5530	No
4017	14.9	250	13	5530	Yes
4018	19.5	475	14	5530	No
4019	15.2	297	15	5530	Yes
4020	10.2	417	16	5530	Yes
4021	16.6	385	16	5530	Yes
4022	12.1	267	12	5530	Yes
4023	19.6	499	16	5530	No
4024	15.7	394	15	5530	Yes
4025	18.3	269	15	5530	Yes
4026	10.1	310	14	5530	Yes
4027	18.7	450	12	5530	Yes
4028	11	252	12	5530	No
4029	10	404	12	5530	Yes
4030	18.3	353	12	5530	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5533	No
2	5523	Yes
3	5498	Yes
4	5524	No
5	5514	Yes
6	5545	Yes
7	5559	Yes
8	5503	Yes
9	5538	Yes
10	5510	Yes
11	5541	Yes
12	5530	Yes
13	5513	Yes
14	5534	Yes
15	5558	Yes
16	5543	Yes
17	5522	Yes
18	5512	Yes
19	5511	Yes
20	5544	Yes
21	5515	Yes
22	5505	Yes
23	5540	Yes
24	5506	Yes
25	5552	Yes
26	5531	Yes
27	5529	Yes
28	5518	Yes
29	5550	Yes
30	5500	Yes

Note: The Type 5 randomized parameters tested 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	123	5490	17	Yes
2	598	5491	22	Yes
3	1073	5492	11	Yes
4	1548	5493	19	Yes
5	2023	5494	9	Yes
6	2498	5495	20	Yes
7	2973	5496	17	Yes
8	3448	5497	20	Yes
9	3923	5498	9	Yes
10	4398	5499	17	Yes
11	4873	5500	17	Yes
12	5348	5501	16	Yes
13	5823	5502	17	Yes
14	6298	5503	16	Yes
15	6773	5504	16	Yes
16	7248	5505	15	Yes
17	7723	5506	13	Yes
18	8198	5507	21	Yes
19	8673	5508	17	Yes
20	9148	5509	24	Yes
21	9623	5510	19	Yes
22	10098	5511	11	Yes
23	10573	5512	18	Yes
24	11048	5513	14	Yes
25	11523	5514	16	Yes
26	11998	5515	17	Yes
27	12473	5516	18	Yes
28	12948	5517	27	Yes
29	13423	5518	18	Yes
30	13898	5519	10	Yes
31	14373	5520	16	Yes
32	14848	5521	17	Yes
33	15323	5522	19	Yes
34	15798	5523	16	Yes
35	16273	5524	13	Yes
36	16748	5525	19	Yes
37	17223	5526	15	Yes
38	17698	5527	16	Yes
39	18173	5528	25	Yes

TYPE 6 DETECTION PROBABILITY (CONTINUED)

40	18648	5529	17	Yes
41	19123	5530	20	Yes
42	19598	5531	11	Yes
43	20073	5532	23	Yes
44	20548	5533	17	Yes
45	21023	5534	16	Yes
46	21498	5535	17	Yes
47	21973	5536	18	Yes
48	22448	5537	21	Yes
49	22923	5538	17	Yes
50	23398	5539	11	Yes
51	23873	5540	16	Yes
52	24348	5541	22	Yes
53	24823	5542	17	Yes
54	25298	5543	16	Yes
55	25773	5544	22	Yes
56	26248	5545	16	Yes
57	26723	5546	16	Yes
58	27198	5547	12	Yes
59	27673	5548	13	Yes
60	28148	5549	16	Yes
61	28623	5550	20	Yes
62	29098	5551	10	Yes
63	29573	5552	14	Yes
64	30048	5553	19	Yes
65	30523	5554	16	Yes
66	30998	5555	15	Yes
67	31473	5556	22	Yes
68	31948	5557	12	Yes
69	32423	5558	16	Yes
70	32898	5559	16	Yes
71	33373	5560	9	Yes
72	33848	5561	12	Yes
73	34323	5562	14	Yes
74	34798	5563	17	Yes
75	35273	5564	16	Yes
76	35748	5565	11	Yes
77	36223	5566	23	Yes
78	36698	5567	21	Yes
79	37173	5568	18	Yes
80	37648	5569	14	Yes
81	38123	5570	14	Yes

6. BRIDGE MODE RESULTS

Per KDB 905462, Section 5.1 (footnote 1):

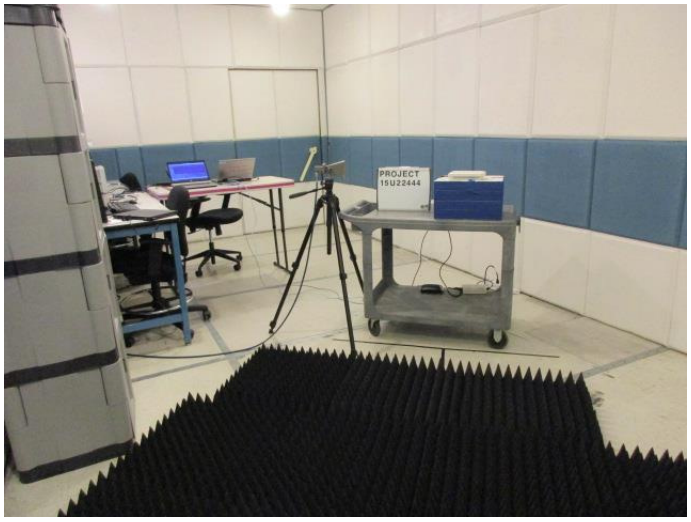
Networks Access Points with Bridge and/or MESH modes of operation are permitted to operate in the DFS bands but must employ a DFS function. The functionality of the Bridge mode as specified in §15.403(a) must be validated in the DFS test report. Devices operating as relays must also employ DFS function.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

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

7. SETUP PHOTOS

DYNAMIC FREQUENCY SELECTION MEASUREMENT SETUP

DFS FRONT PHOTO



DFS BACK PHOTO

END OF REPORT