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

CERTIFICATION TEST REPORT

FOR

INTELLIGENT BACKHAUL RADIO with BAND SWITCHING

MODEL NUMBER: IBR-1300-NA (PoE VERSION) and IBR-1301-NA (AC VERSION)

FCC ID: 2AAEH-107
IC: 11158A-107

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Prepared for
CBF NETWORKS INC. dba FASTBACK NETWORKS INC.
2460 N. FIRST STREET, SUITE 200
SAN JOSE CA., 95131, U.S.A.

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/20/16	Initial Issue	Conan Cheung
V2	08/30/16	Add Addendum for Carrier Aggregation Testing Per FCC Guideline Through Manufacturer KDB. See section 8 and 9.	Doug Anderson
V3	09/13/16	Removed a C63.10 Reference	Conan Cheung

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CBF NETWORKS INC. dba FASTBACK NETWORKS INC.
2480 N. FIRST STREET, SUITE 250
SAN JOSE, CA, 95131, U.S.A.

EUT DESCRIPTION: INTELLIGIENT BACKHAUL RADIO with BAND SWITCHING

MODEL: IBR-1300-NA (PoE VERSION) and IBR-1301-NA (AC VERSION)

MODEL TESTED: IBR-1300-NA

SERIAL NUMBER: 50015430057 and 50015470009

DATE TESTED: JANUARY 08 to 19, 2016 and AUGUST 19 to 25, 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.

Approved & Released For
UL Verification Services Inc. By:

CONAN CHEUNG
PROJECT LEAD
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, 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

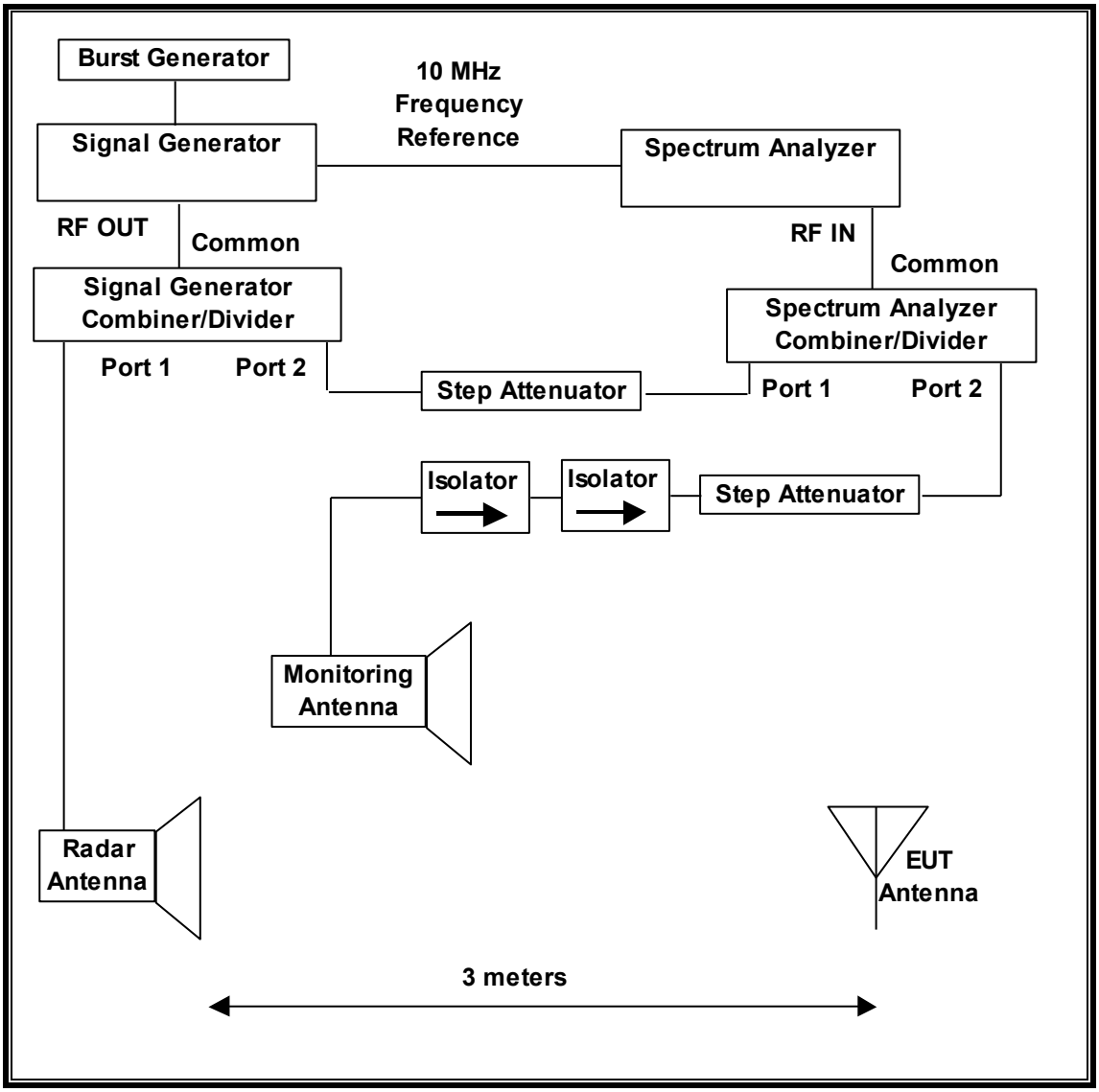
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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

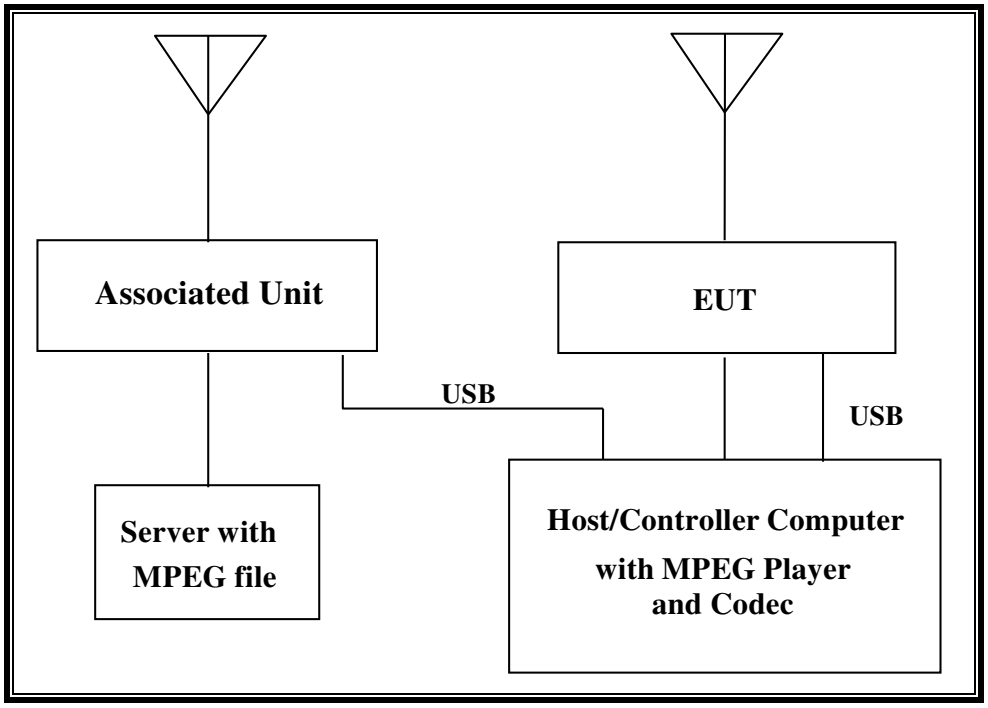
A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, 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 performed from January 08 to 19, 2016 that are documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
P.O.E. Injector (EUT)	Tycon	TP-POE-HP-56G-FBN	152000012ARC00	DoC
Intelligent Backhaul Radio with Band Switching (Associated Unit)	Fastback	IBR-1300-NA	00015430006	2AAEH-107
P.O.E. Injector (Remote Unit)	Tycon	TP-POE-HP-56G-FBN	152000016ARC00	DoC
Notebook PC (Host/Controller)	Lenovo	Type 20BG-0014US	R9-013NYV 14/03 12/08	DoC
AC Adapter (Host/Controller PC)	Lenovo	ADL170NLCZA	11S45N0375Z1ZS 9G41P4H9	DoC
Notebook PC (Server)	Lenovo	Type 4276-37U	R9-CNXZ 11/04	DoC
AC Adapter (Server PC)	Lenovo	45N0113	11S45N0113Z1Z HX82861YD	DoC

5.1.1. RADIATED METHOD EUT SETUP

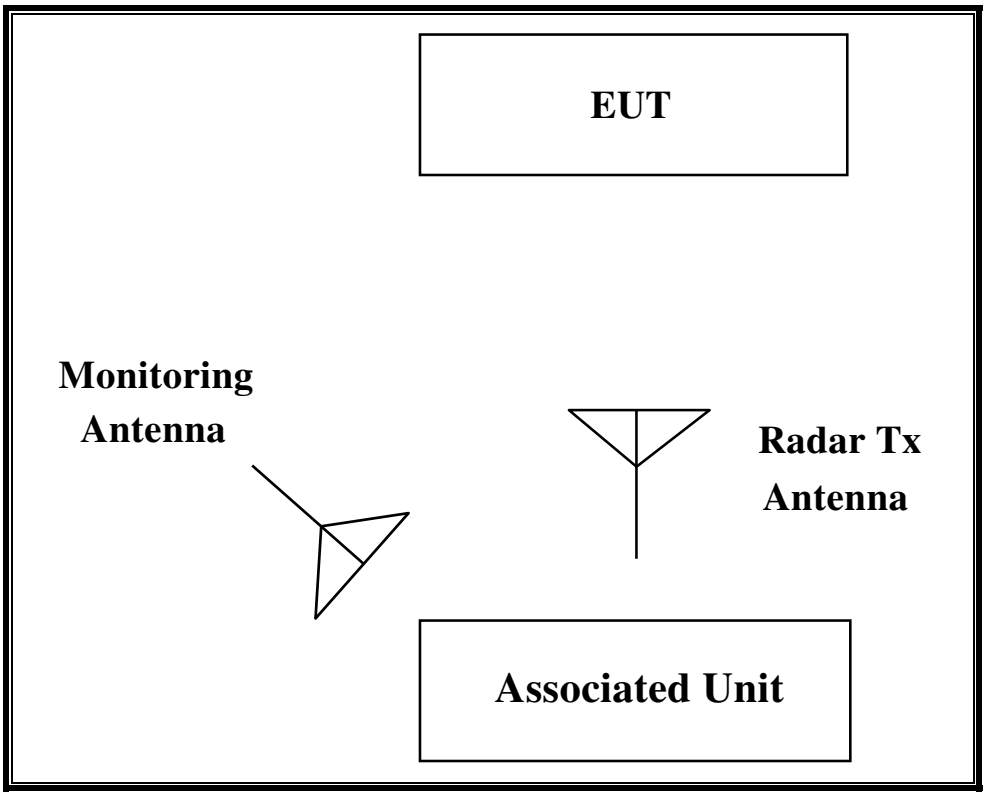


SUPPORT EQUIPMENT

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

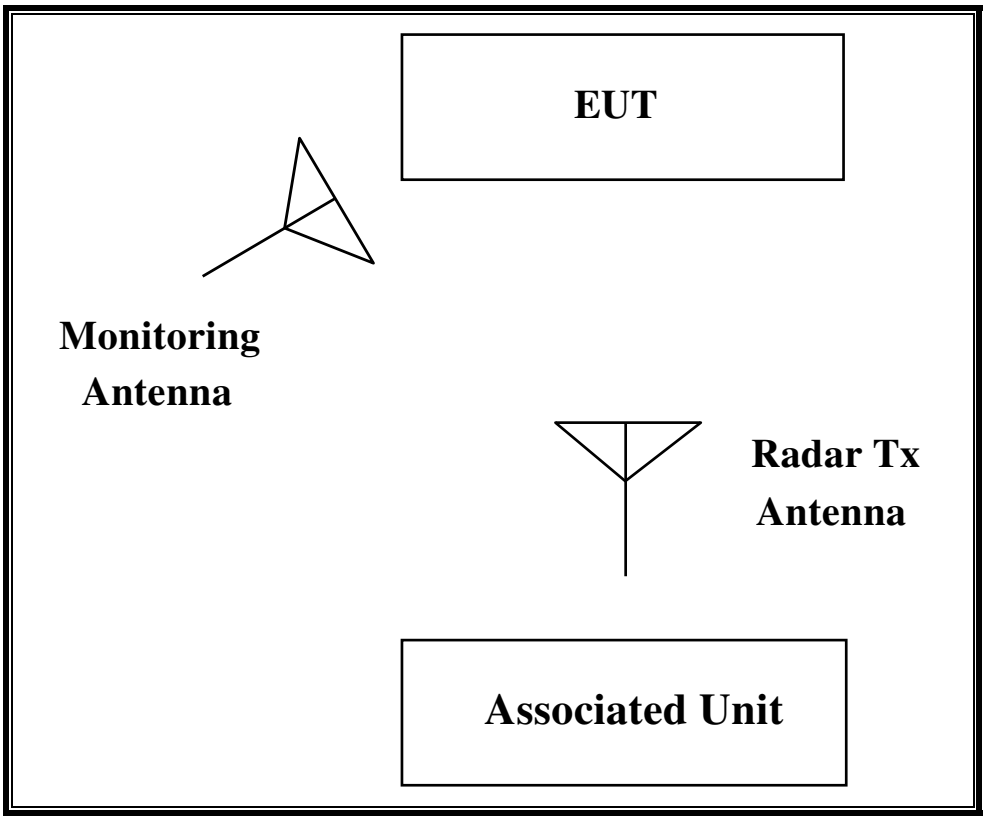
PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
P.O.E. Injector (EUT)	Tycon	TP-POE-HP-56G-FBN	152000012ARC00	DoC
Intelligent Backhaul Radio with Band Switching (Associated Unit)	Fastback	IBR-1300-NA	00015430006	2AAEH-107
P.O.E. Injector (Associated Unit)	Tycon	TP-POE-HP-56G-FBN	152000016ARC00	DoC
Notebook PC (Host/Controller)	Lenovo	Type 20BG-0014US	R9-013NYV 14/03 12/08	DoC
AC Adapter (Host/Controller PC)	Lenovo	ADL170NLCZA	11S45N0375Z1ZS 9G41P4H9	DoC
Notebook PC (Server)	Lenovo	Type 4276-37U	R9-CNXZ 11/04	DoC
AC Adapter (Server PC)	Lenovo	45N0113	11S45N0113Z1Z HX82861YD	DoC

MONITORING CONFIGURATION 1:



Note: Monitoring Configuration 1 was used during Traffic/Channel Loading, Channel Move/Aggregate Time and Non-Occupancy testing.

MONITORING CONFIGURATION 2:



Note: Monitoring Configuration 2 was used during CAC testing.

5.1.2. DESCRIPTION OF EUT

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

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

The EUT is a Master Device.

The only DFS antenna assembly utilized with the EUT has a declared gain of 0 dBi.

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

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

The EUT uses two transmitter chains connected to the antennas to perform radiated tests.

The EUT provides radar detection capability for its associated transmitter.

The EUT is a Frame-based system. The Frame timing is set to a listen / talk ratio of 95%.

WLAN traffic is generated by streaming the video file TestFile.mp2 “6 ½ Magic Hours” from the Slave Transmitter to the Master Receiver 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).

Three nominal channel bandwidths are implemented: 10 MHz, 20 MHz and 40 MHz.

The EUT always starts using a channel bandwidth of 10 MHz. After it has entered the operational phase when traffic can be passed it may select 10 MHz, 20 MHz or 40 MHz channel bandwidths depending on channel conditions.

The DFS sensor bandwidth is always wider than the widest nominal channel bandwidth. Therefore, 40 MHz Detection Bandwidth and CAC testing covers all nominal channel bandwidths.

The In-Service Monitoring tests were performed for each of the operational bandwidths.

The software installed in the access point is revision 1.6.8.

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

6. MASTER DFS TEST RESULTS

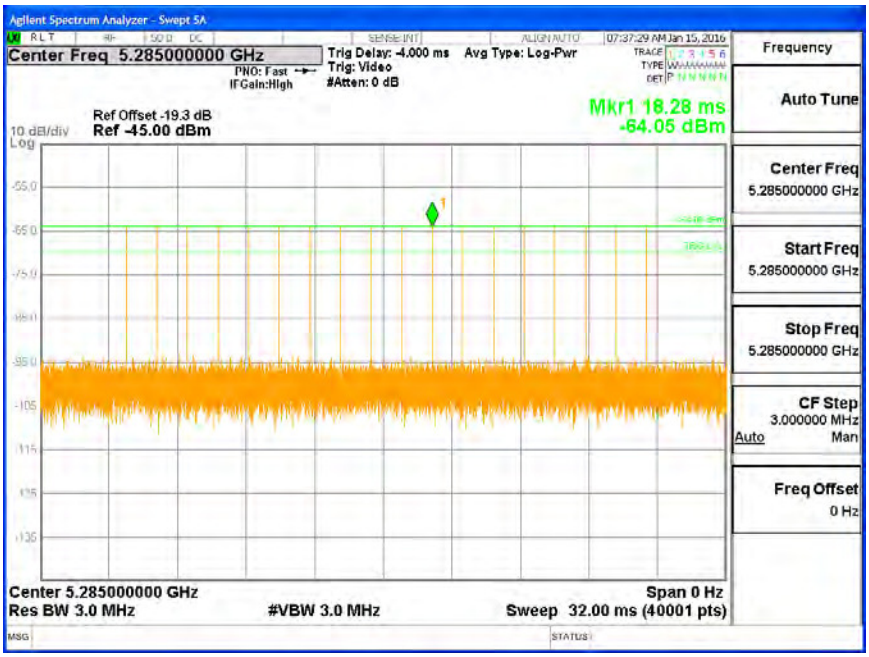
6.1. LOW BAND SENSOR 1 TEST CHANNEL

All tests were performed at a channel center frequency of 5285 MHz.

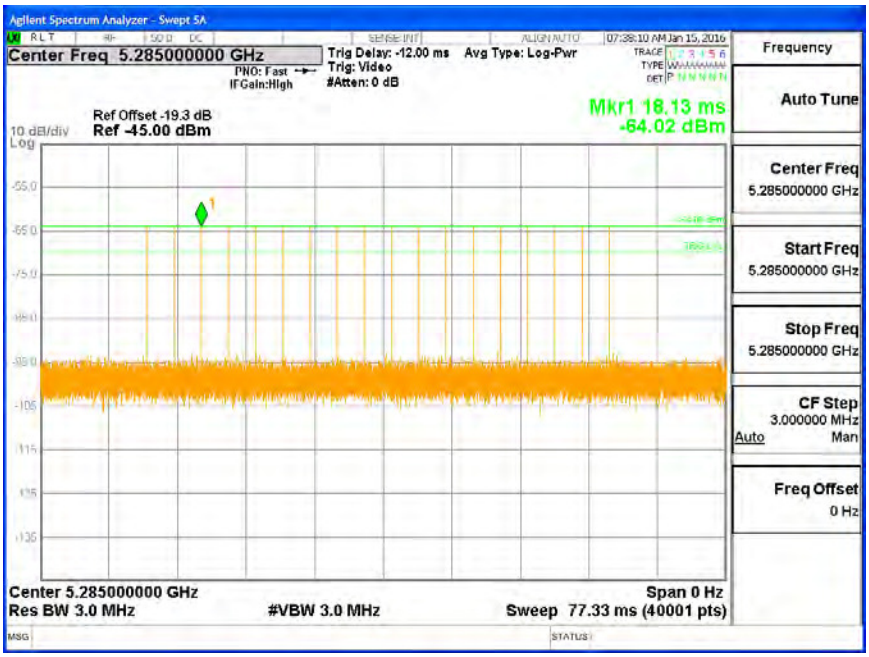
6.2. LOW BAND SENSOR 1 RADAR WAVEFORMS

RADAR WAVEFORMS

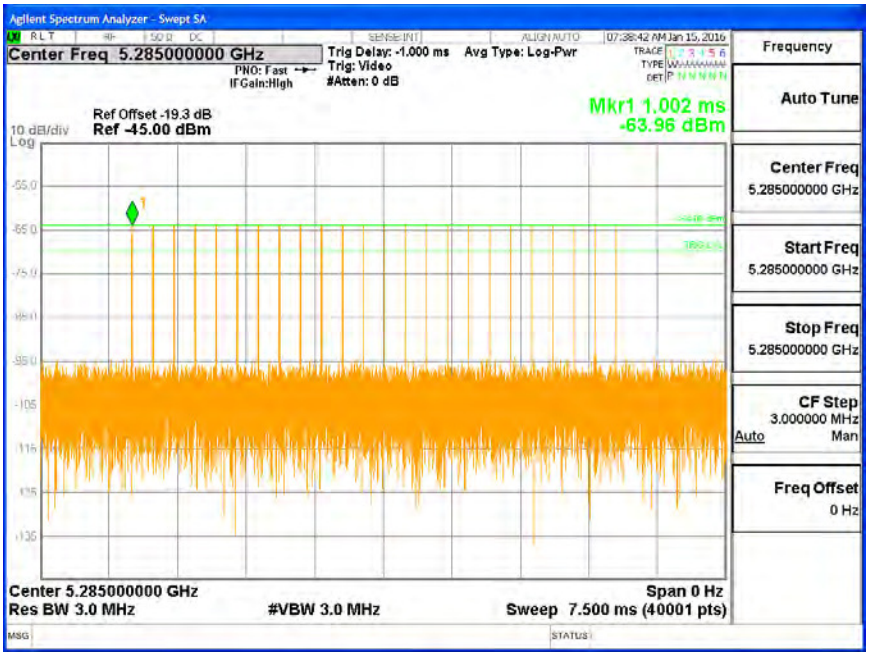
SHORT PULSE RADAR TYPE 0



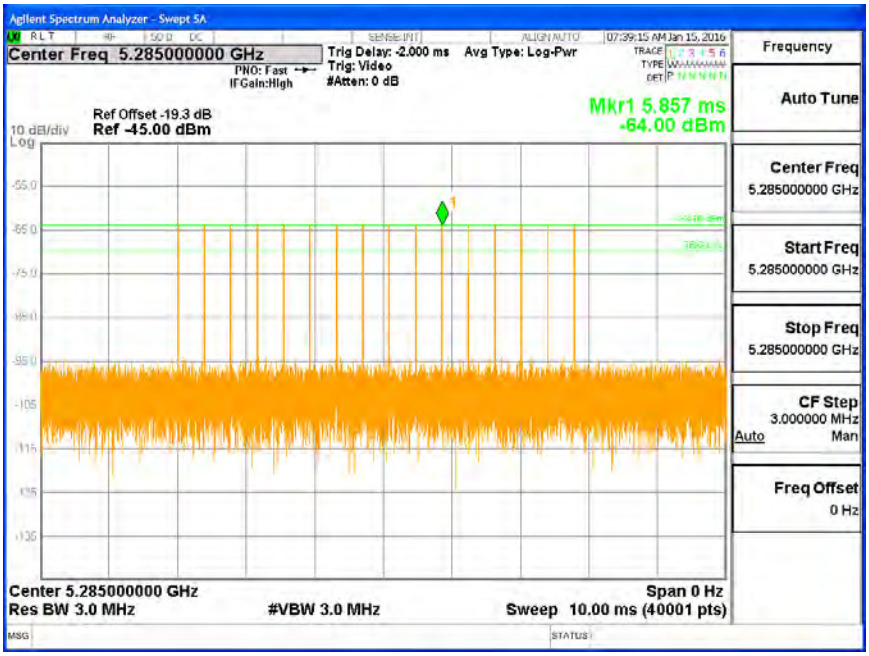
SAMPLE OF RADAR TYPE 1



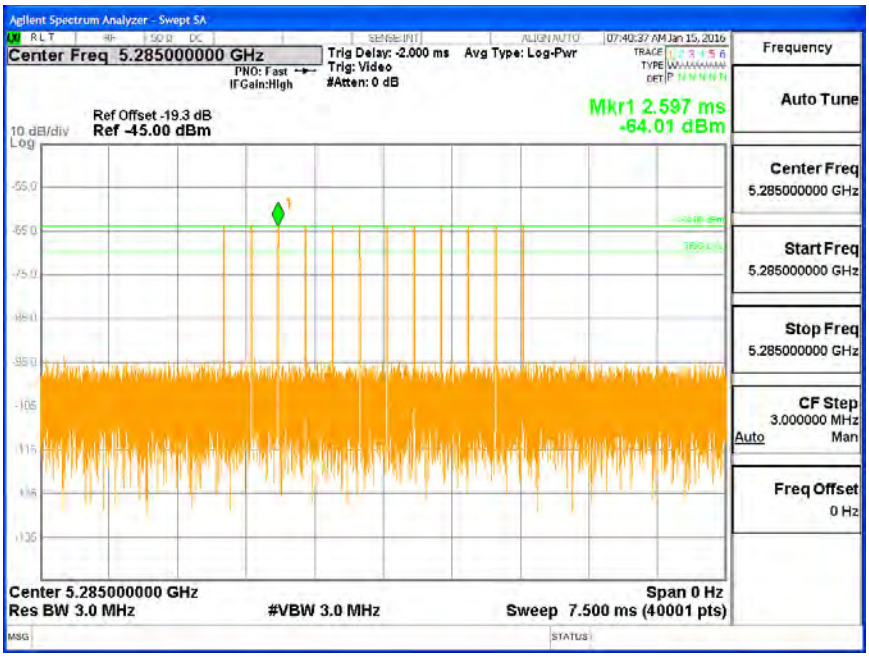
SAMPLE OF RADAR TYPE 2



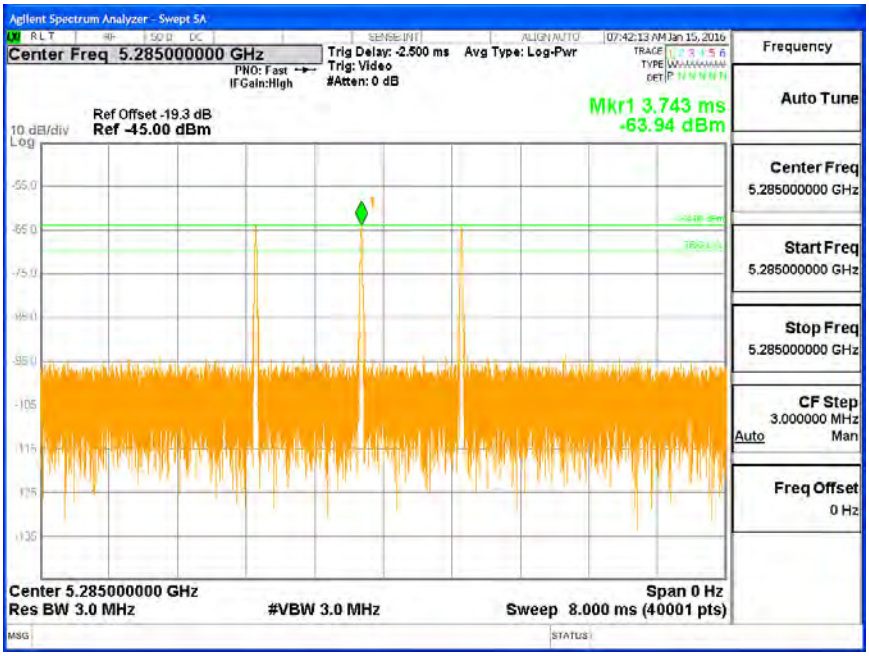
SAMPLE OF RADAR TYPE 3



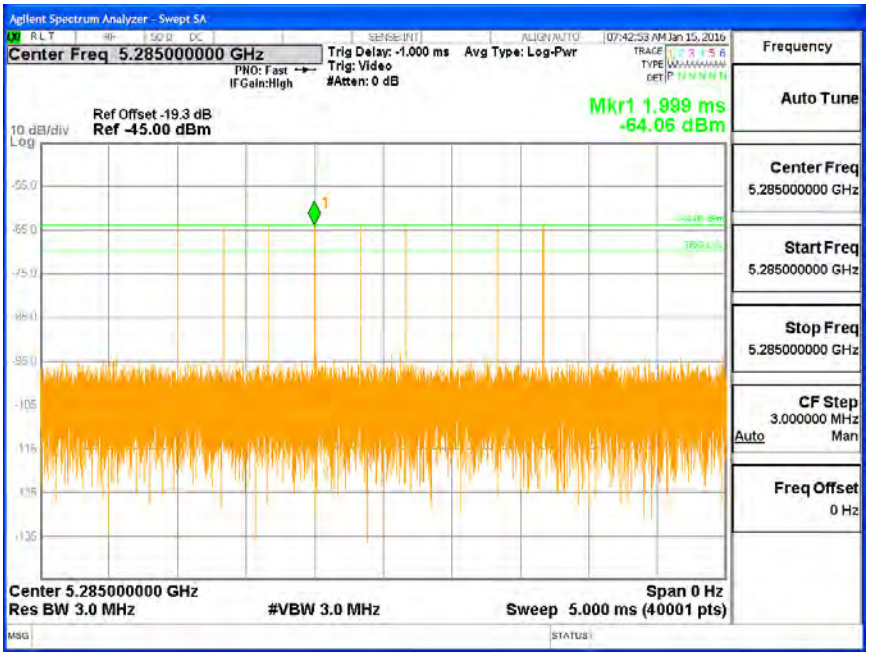
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6

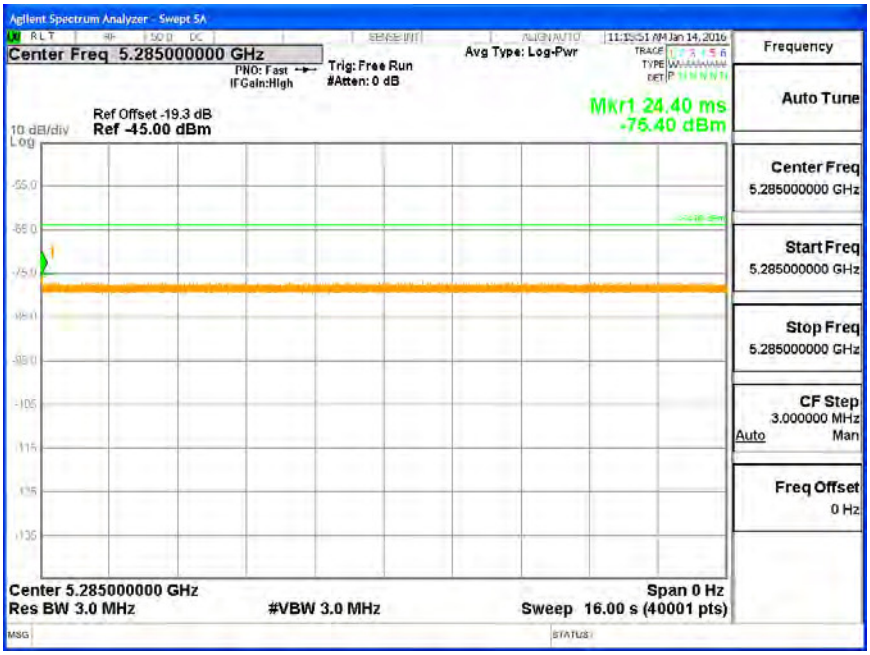


6.3. LOW BAND SENSOR 1 RESULTS FOR 10 MHz BANDWIDTH

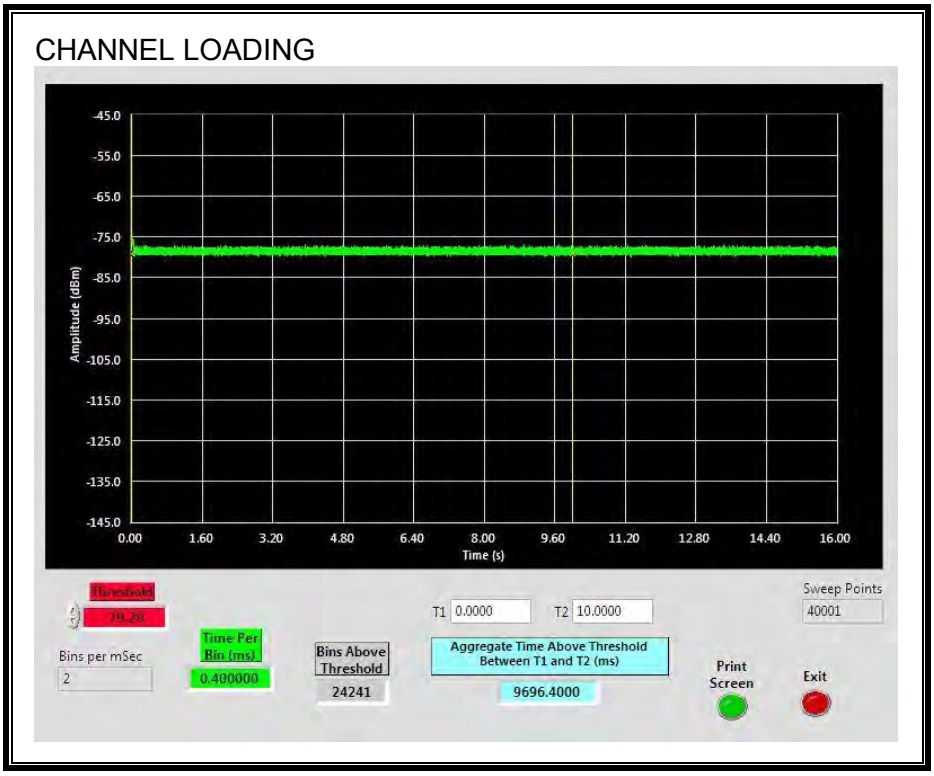
6.3.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 96.86%.

6.3.2. CHANNEL AVAILABILITY CHECK TIME

The DFS sensor bandwidth is always greater than the widest nominal channel bandwidth. Therefore, 40 MHz CAC testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

6.3.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

6.3.4. 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

No Radar Triggered

Start of CAC at 5685 MHz (sec)	End of CAC at 5685 MHz (sec)	CAC Time (sec)
128.4	189.4	61.0

Radar Near Beginning of CAC

Start of CAC at 5685 MHz (sec)	Timing of Radar Burst at 5685 MHz (sec)	Radar Relative to Start of CAC at 5685 MHz (sec)
147.6	151.6	4.0

Radar Near End of CAC

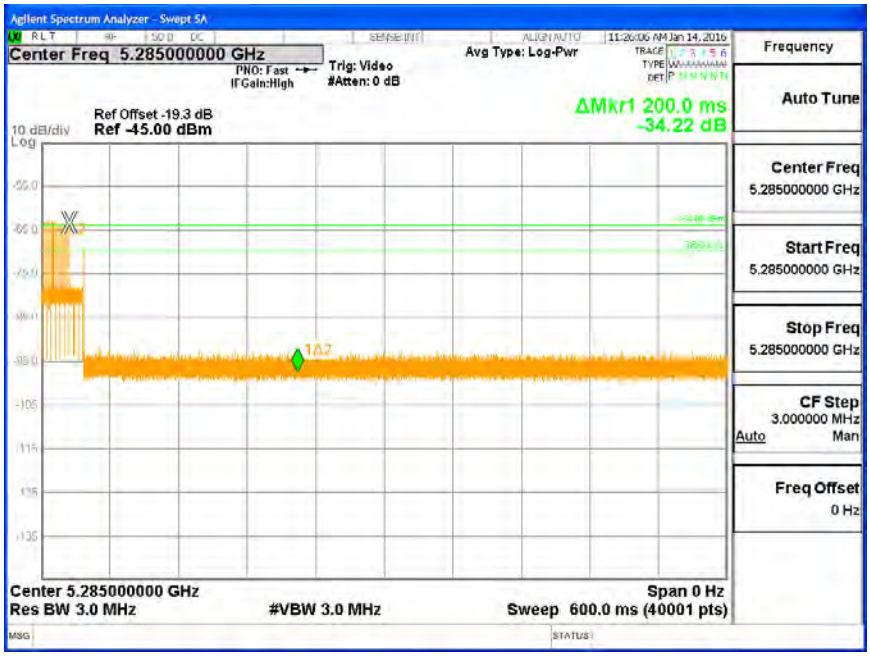
Start of CAC at 5685 MHz (sec)	Timing of Radar Burst at 5685 MHz (sec)	Radar Relative to Start of CAC at 5685 MHz (sec)
		0.0

MOVE TIME

MOVE TIME

CHANNEL CLOSING TIME

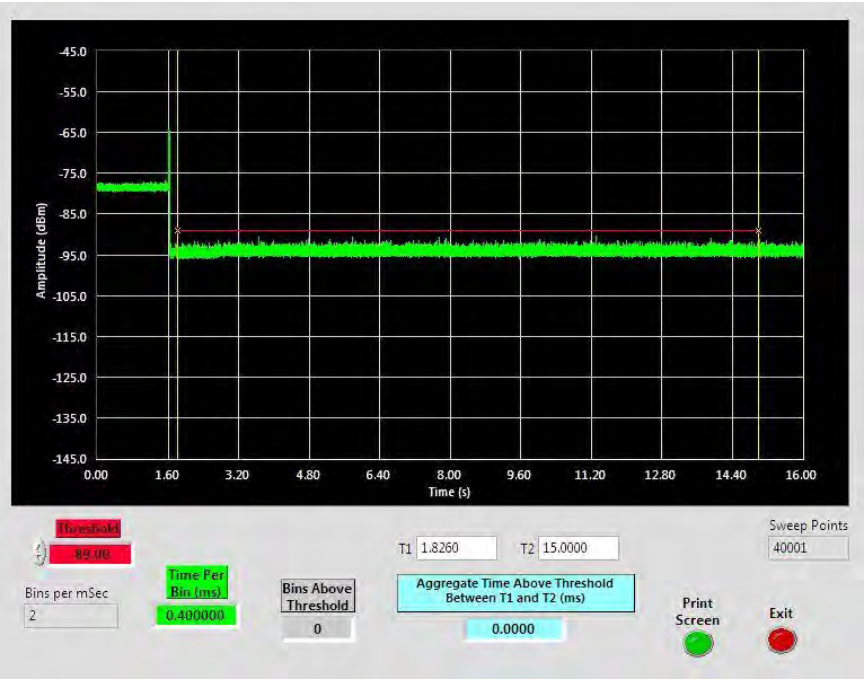
CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

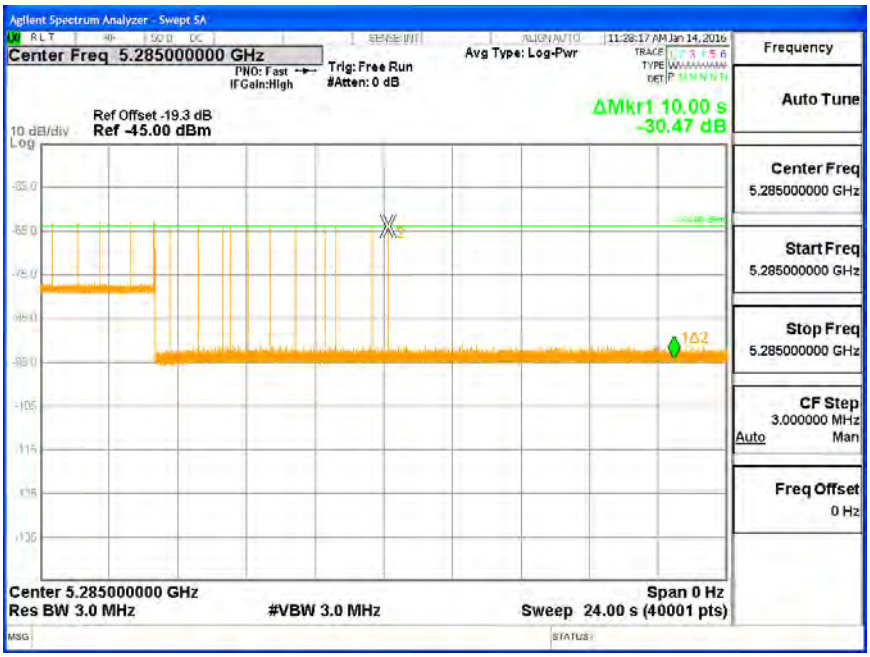
AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

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

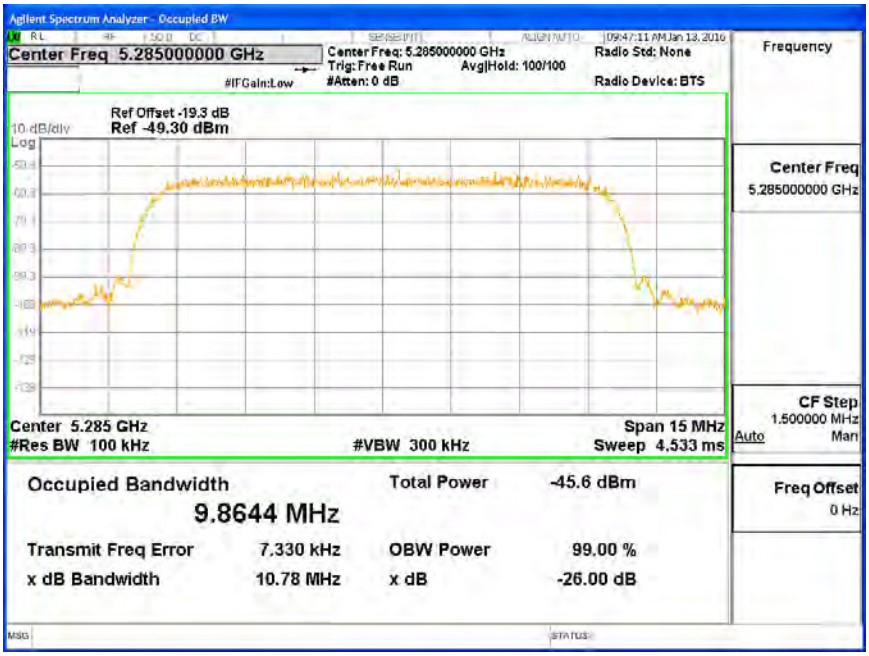
MOVE TIME FOR LONG PULSE RADAR



6.3.5. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

No Radar Triggered

Start of CAC at 5685 MHz (hh:mm:ss)	End of CAC at 5685 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
0:02:18	0:03:19	0:01:01

Radar Near Beginning of CAC

Start of CAC at 5685 MHz (hh:mm:ss)	Radar Detected at 5685 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:18	0:02:22	0:00:04

Radar Near End of CAC

Start of CAC at 5685 MHz (hh:mm:ss)	Radar Detected at 5685 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
		0:00:00

The DFS sensor bandwidth is always greater than the widest nominal channel bandwidth. Therefore, 40 MHz Detection Bandwidth testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

For the purposes of testing In-Service Monitoring at this channel bandwidth the client has chosen to truncate the Detection Bandwidth to 10 MHz.

6.3.6. 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	5280	5290		
FCC Short Pulse Type 2	30	100.00	60	Pass	5280	5290		
FCC Short Pulse Type 3	30	100.00	60	Pass	5280	5290		
FCC Short Pulse Type 4	30	100.00	60	Pass	5280	5290		
Aggregate		99.17	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5280	5290	5281	5289
FCC Hopping Type 6	33	100.00	70	Pass	5280	5290		

TYPE 1 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	12	297	12	5285	Yes
4002	16.6	404	15	5285	Yes
4003	12.4	477	14	5285	Yes
4004	17.5	346	15	5285	Yes
4005	13.8	314	14	5285	Yes
4006	19.4	447	15	5285	Yes
4007	11.4	428	15	5285	Yes
4008	12.8	323	14	5285	Yes
4009	15.5	449	14	5285	Yes
4010	17.4	490	13	5285	Yes
4011	15.8	379	16	5285	Yes
4012	18.2	432	15	5285	Yes
4013	17.2	333	16	5285	Yes
4014	15.4	282	16	5285	Yes
4015	14.9	447	12	5285	Yes
4016	13.6	408	14	5285	Yes
4017	18.9	351	15	5285	Yes
4018	13.4	325	16	5285	Yes
4019	19.3	398	12	5285	Yes
4020	14.3	267	13	5285	Yes
4021	10.6	486	13	5285	Yes
4022	16.2	368	14	5285	Yes
4023	13.6	348	13	5285	Yes
4024	19.7	494	12	5285	Yes
4025	12.3	370	12	5285	Yes
4026	14.2	411	16	5285	Yes
4027	12.6	299	14	5285	Yes
4028	15.1	353	14	5285	Yes
4029	14	254	14	5285	Yes
4030	12.2	454	14	5285	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	3.6	230	24	5285	Yes
2002	1.8	192	26	5285	Yes
2003	2.6	186	25	5285	Yes
2004	1	195	24	5285	Yes
2005	4.3	192	27	5285	Yes
2006	1	206	27	5285	Yes
2007	2.2	170	27	5285	Yes
2008	1.3	187	23	5285	Yes
2009	5	198	27	5285	Yes
2010	2.1	220	23	5285	Yes
2011	4	154	28	5285	Yes
2012	3.5	222	28	5285	Yes
2013	1.6	161	23	5285	Yes
2014	1.3	152	27	5285	Yes
2015	3.7	219	26	5285	Yes
2016	1.6	215	23	5285	Yes
2017	2.3	204	29	5285	Yes
2018	4.6	166	24	5285	Yes
2019	1.3	203	27	5285	Yes
2020	3.8	169	29	5285	Yes
2021	3	210	25	5285	Yes
2022	3.8	180	24	5285	Yes
2023	3.1	225	28	5285	Yes
2024	4.1	161	27	5285	Yes
2025	3.7	172	25	5285	Yes
2026	3	194	28	5285	Yes
2027	2.7	209	29	5285	Yes
2028	2.2	197	26	5285	Yes
2029	4.4	216	28	5285	Yes
2030	4.1	208	25	5285	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	9.4	385	16	5285	Yes
3002	9.3	372	18	5285	Yes
3003	5	340	17	5285	Yes
3004	7.8	473	17	5285	Yes
3005	8.9	336	16	5285	Yes
3006	9.6	481	17	5285	Yes
3007	5.9	357	16	5285	Yes
3008	6.8	265	18	5285	Yes
3009	6	404	17	5285	Yes
3010	7.3	340	17	5285	Yes
3011	6.7	492	18	5285	Yes
3012	5.8	308	17	5285	Yes
3013	5.6	355	17	5285	Yes
3014	10	316	16	5285	Yes
3015	7.6	376	17	5285	Yes
3016	7.2	350	16	5285	Yes
3017	7.8	306	18	5285	Yes
3018	7.7	426	16	5285	Yes
3019	8.5	394	16	5285	Yes
3020	6.2	393	16	5285	Yes
3021	7.3	256	18	5285	Yes
3022	8	402	16	5285	Yes
3023	9.4	278	18	5285	Yes
3024	5.2	436	17	5285	Yes
3025	9.5	458	16	5285	Yes
3026	5.7	261	16	5285	Yes
3027	5.1	413	17	5285	Yes
3028	9.3	361	16	5285	Yes
3029	9.1	275	16	5285	Yes
3030	8.4	488	18	5285	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	12	297	12	5285	Yes
4002	16.6	404	15	5285	Yes
4003	12.4	477	14	5285	Yes
4004	17.5	346	15	5285	Yes
4005	13.8	314	14	5285	Yes
4006	19.4	447	15	5285	Yes
4007	11.4	428	15	5285	Yes
4008	12.8	323	14	5285	Yes
4009	15.5	449	14	5285	Yes
4010	17.4	490	13	5285	Yes
4011	15.8	379	16	5285	Yes
4012	18.2	432	15	5285	Yes
4013	17.2	333	16	5285	Yes
4014	15.4	282	16	5285	Yes
4015	14.9	447	12	5285	Yes
4016	13.6	408	14	5285	Yes
4017	18.9	351	15	5285	Yes
4018	13.4	325	16	5285	Yes
4019	19.3	398	12	5285	Yes
4020	14.3	267	13	5285	Yes
4021	10.6	486	13	5285	Yes
4022	16.2	368	14	5285	Yes
4023	13.6	348	13	5285	Yes
4024	19.7	494	12	5285	Yes
4025	12.3	370	12	5285	Yes
4026	14.2	411	16	5285	Yes
4027	12.6	299	14	5285	Yes
4028	15.1	353	14	5285	Yes
4029	14	254	14	5285	Yes
4030	12.2	454	14	5285	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5284	Yes
2	5286	Yes
3	5282	Yes
4	5287	Yes
5	5282	Yes
6	5283	Yes
7	5284	Yes
8	5282	Yes
9	5285	Yes
10	5283	Yes
11	5282	Yes
12	5281	Yes
13	5288	Yes
14	5286	Yes
15	5285	Yes
16	5285	Yes
17	5282	Yes
18	5288	Yes
19	5288	Yes
20	5289	Yes
21	5281	Yes
22	5287	Yes
23	5283	Yes
24	5287	Yes
25	5286	Yes
26	5288	Yes
27	5287	Yes
28	5286	Yes
29	5286	Yes
30	5289	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

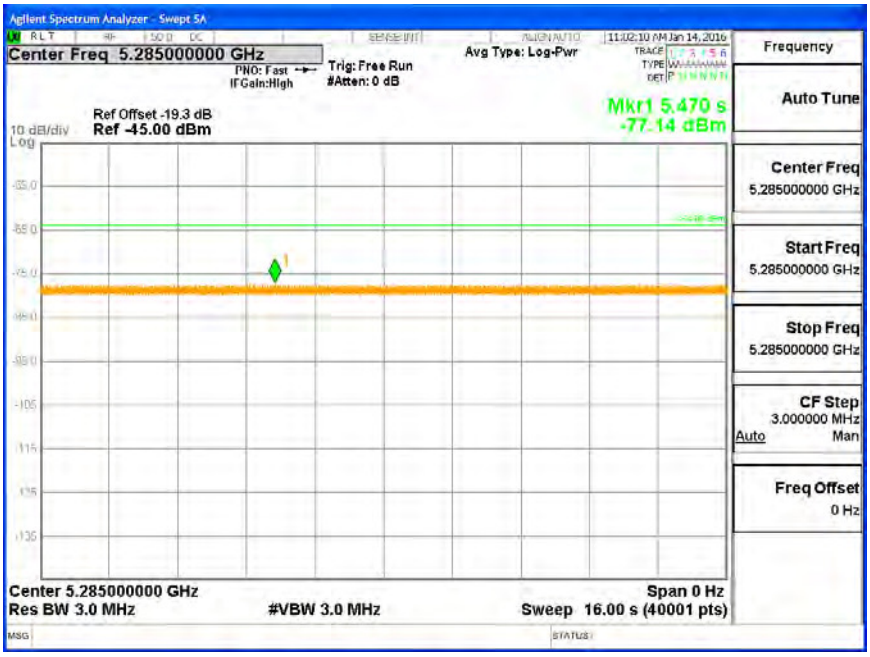
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	314	5280	3	Yes
2	789	5281	4	Yes
3	1264	5282	4	Yes
4	1739	5283	3	Yes
5	2689	5284	2	Yes
6	3164	5285	2	Yes
7	3639	5286	3	Yes
8	4114	5287	2	Yes
9	4589	5288	1	Yes
10	5064	5289	1	Yes
11	5539	5290	1	Yes
12	6014	5280	2	Yes
13	6489	5281	2	Yes
14	6964	5282	2	Yes
15	7439	5283	4	Yes
16	7914	5284	2	Yes
17	8389	5285	2	Yes
18	8864	5286	2	Yes
19	9339	5287	2	Yes
20	9814	5288	1	Yes
21	10289	5289	3	Yes
22	10764	5290	2	Yes
23	11714	5280	2	Yes
24	12189	5281	3	Yes
25	12664	5282	1	Yes
26	13139	5283	1	Yes
27	13614	5284	1	Yes
28	14089	5285	1	Yes
29	14564	5286	3	Yes
30	15989	5287	3	Yes
31	16464	5288	2	Yes
32	16939	5289	3	Yes
33	17414	5290	2	Yes

6.4. LOW BAND SENSOR 1 RESULTS FOR 20 MHz BANDWIDTH

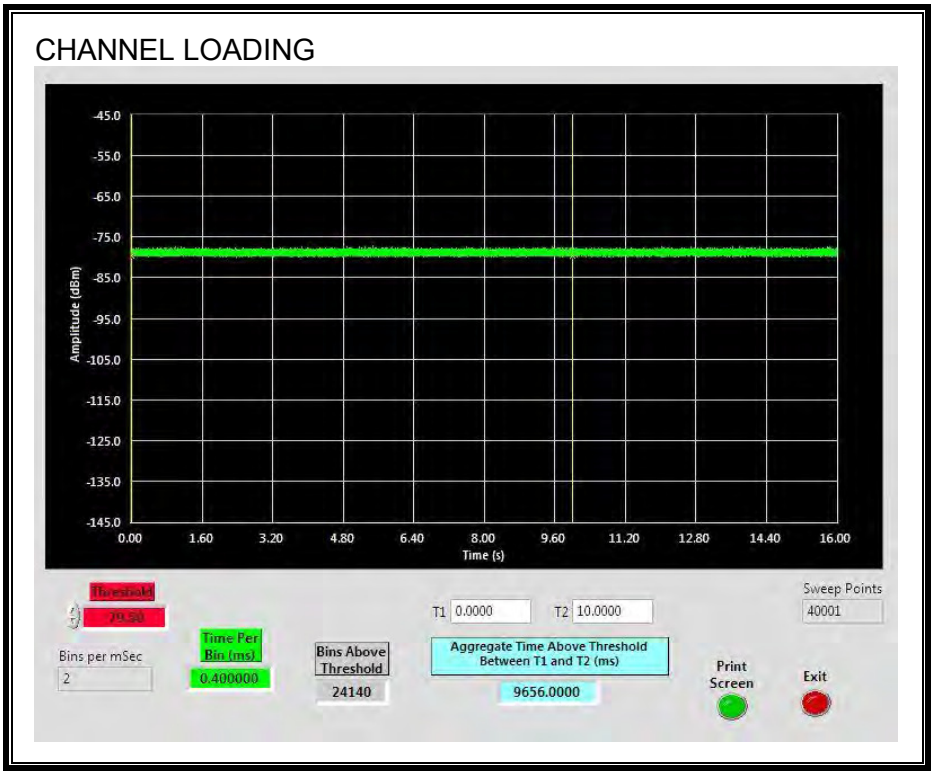
6.4.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 96.56%

6.4.2. CHANNEL AVAILABILITY CHECK TIME

The DFS sensor bandwidth is always equal to or greater than the widest nominal channel bandwidth. Therefore, 40 MHz CAC testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

6.4.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

6.4.4. 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)
0.0004	10

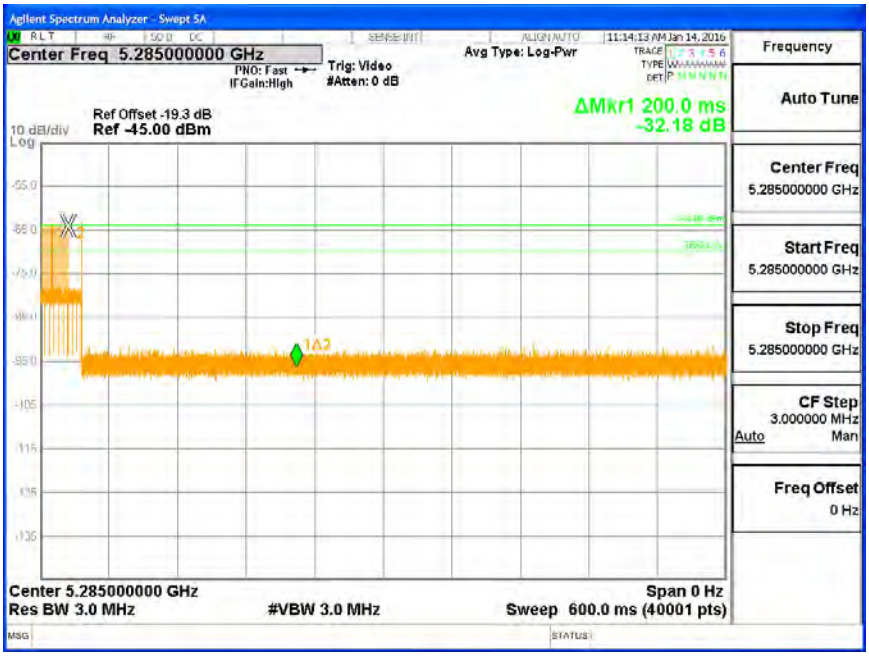
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

CHANNEL CLOSING TIME

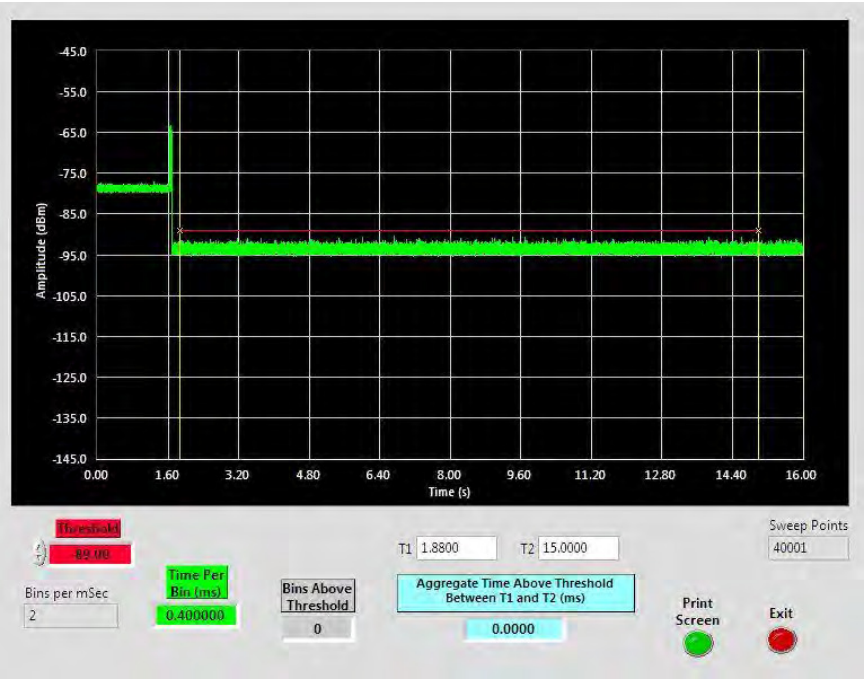
CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.

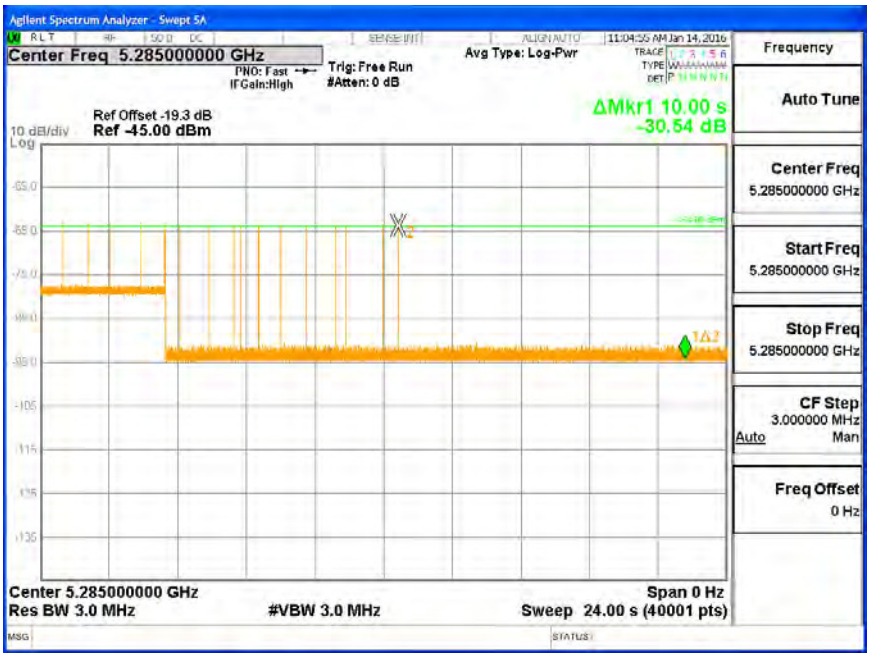
AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

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

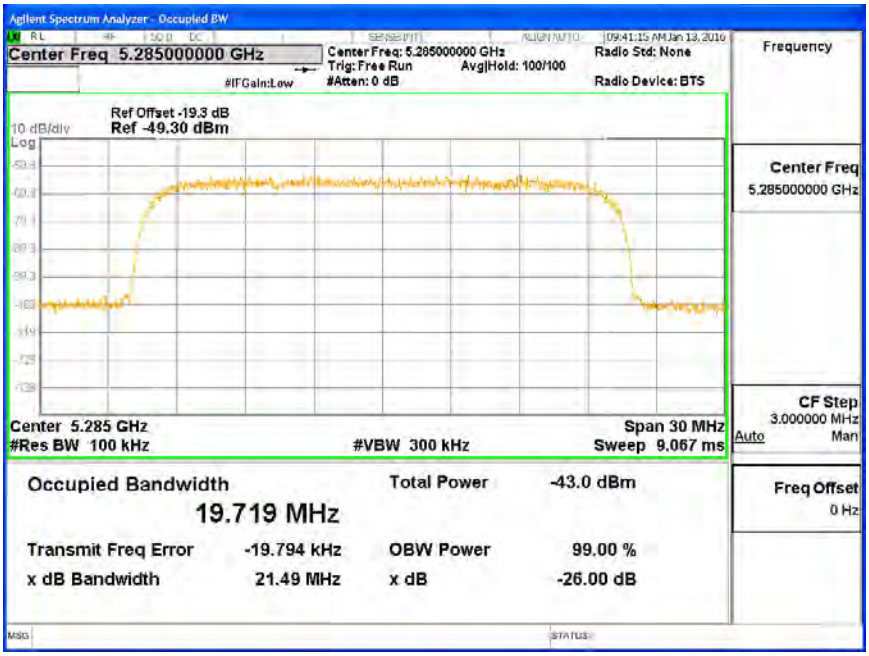
MOVE TIME FOR LONG PULSE RADAR



6.4.5. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5275	5295	20	19.719	101.4	100

The DFS sensor bandwidth is always greater than the widest nominal channel bandwidth. Therefore, 40 MHz Detection Bandwidth testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

For the purposes of testing In-Service Monitoring at this channel bandwidth the client has chosen to truncate the Detection Bandwidth to 20 MHz.

6.4.6. 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	100.00	60	Pass	5275	5295		
FCC Short Pulse Type 2	30	100.00	60	Pass	5275	5295		
FCC Short Pulse Type 3	30	100.00	60	Pass	5275	5295		
FCC Short Pulse Type 4	30	100.00	60	Pass	5275	5295		
Aggregate		100.00	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5275	5295	5277	5293
FCC Hopping Type 6	42	100.00	70	Pass	5275	5295		

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	5285	Yes
1002	1	678	78	A	5285	Yes
1003	1	698	76	A	5285	Yes
1004	1	798	67	A	5285	Yes
1005	1	658	81	A	5285	Yes
1006	1	778	68	A	5285	Yes
1007	1	878	61	A	5285	Yes
1008	1	598	89	A	5285	Yes
1009	1	718	74	A	5285	Yes
1010	1	818	65	A	5285	Yes
1011	1	838	63	A	5285	Yes
1012	1	518	102	A	5285	Yes
1013	1	898	59	A	5285	Yes
1014	1	618	86	A	5285	Yes
1015	1	738	72	A	5285	Yes
1016	1	1664	32	B	5285	Yes
1017	1	2491	22	B	5285	Yes
1018	1	1252	43	B	5285	Yes
1019	1	2209	24	B	5285	Yes
1020	1	1099	49	B	5285	Yes
1021	1	990	54	B	5285	Yes
1022	1	2559	21	B	5285	Yes
1023	1	2579	21	B	5285	Yes
1024	1	1729	31	B	5285	Yes
1025	1	684	78	B	5285	Yes
1026	1	1317	41	B	5285	Yes
1027	1	2950	18	B	5285	Yes
1028	1	1164	46	B	5285	Yes
1029	1	2926	19	B	5285	Yes
1030	1	2623	21	B	5285	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	3.6	230	24	5285	Yes
2002	1.8	192	26	5285	Yes
2003	2.6	186	25	5285	Yes
2004	1	195	24	5285	Yes
2005	4.3	192	27	5285	Yes
2006	1	206	27	5285	Yes
2007	2.2	170	27	5285	Yes
2008	1.3	187	23	5285	Yes
2009	5	198	27	5285	Yes
2010	2.1	220	23	5285	Yes
2011	4	154	28	5285	Yes
2012	3.5	222	28	5285	Yes
2013	1.6	161	23	5285	Yes
2014	1.3	152	27	5285	Yes
2015	3.7	219	26	5285	Yes
2016	1.6	215	23	5285	Yes
2017	2.3	204	29	5285	Yes
2018	4.6	166	24	5285	Yes
2019	1.3	203	27	5285	Yes
2020	3.8	169	29	5285	Yes
2021	3	210	25	5285	Yes
2022	3.8	180	24	5285	Yes
2023	3.1	225	28	5285	Yes
2024	4.1	161	27	5285	Yes
2025	3.7	172	25	5285	Yes
2026	3	194	28	5285	Yes
2027	2.7	209	29	5285	Yes
2028	2.2	197	26	5285	Yes
2029	4.4	216	28	5285	Yes
2030	4.1	208	25	5285	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	9.4	385	16	5285	Yes
3002	9.3	372	18	5285	Yes
3003	5	340	17	5285	Yes
3004	7.8	473	17	5285	Yes
3005	8.9	336	16	5285	Yes
3006	9.6	481	17	5285	Yes
3007	5.9	357	16	5285	Yes
3008	6.8	265	18	5285	Yes
3009	6	404	17	5285	Yes
3010	7.3	340	17	5285	Yes
3011	6.7	492	18	5285	Yes
3012	5.8	308	17	5285	Yes
3013	5.6	355	17	5285	Yes
3014	10	316	16	5285	Yes
3015	7.6	376	17	5285	Yes
3016	7.2	350	16	5285	Yes
3017	7.8	306	18	5285	Yes
3018	7.7	426	16	5285	Yes
3019	8.5	394	16	5285	Yes
3020	6.2	393	16	5285	Yes
3021	7.3	256	18	5285	Yes
3022	8	402	16	5285	Yes
3023	9.4	278	18	5285	Yes
3024	5.2	436	17	5285	Yes
3025	9.5	458	16	5285	Yes
3026	5.7	261	16	5285	Yes
3027	5.1	413	17	5285	Yes
3028	9.3	361	16	5285	Yes
3029	9.1	275	16	5285	Yes
3030	8.4	488	18	5285	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	12	297	12	5285	Yes
4002	16.6	404	15	5285	Yes
4003	12.4	477	14	5285	Yes
4004	17.5	346	15	5285	Yes
4005	13.8	314	14	5285	Yes
4006	19.4	447	15	5285	Yes
4007	11.4	428	15	5285	Yes
4008	12.8	323	14	5285	Yes
4009	15.5	449	14	5285	Yes
4010	17.4	490	13	5285	Yes
4011	15.8	379	16	5285	Yes
4012	18.2	432	15	5285	Yes
4013	17.2	333	16	5285	Yes
4014	15.4	282	16	5285	Yes
4015	14.9	447	12	5285	Yes
4016	13.6	408	14	5285	Yes
4017	18.9	351	15	5285	Yes
4018	13.4	325	16	5285	Yes
4019	19.3	398	12	5285	Yes
4020	14.3	267	13	5285	Yes
4021	10.6	486	13	5285	Yes
4022	16.2	368	14	5285	Yes
4023	13.6	348	13	5285	Yes
4024	19.7	494	12	5285	Yes
4025	12.3	370	12	5285	Yes
4026	14.2	411	16	5285	Yes
4027	12.6	299	14	5285	Yes
4028	15.1	353	14	5285	Yes
4029	14	254	14	5285	Yes
4030	12.2	454	14	5285	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5283	Yes
2	5292	Yes
3	5290	Yes
4	5292	Yes
5	5280	Yes
6	5283	Yes
7	5291	Yes
8	5293	Yes
9	5289	Yes
10	5283	Yes
11	5293	Yes
12	5288	Yes
13	5280	Yes
14	5285	Yes
15	5284	Yes
16	5280	Yes
17	5278	Yes
18	5287	Yes
19	5283	Yes
20	5286	Yes
21	5290	Yes
22	5286	Yes
23	5278	Yes
24	5277	Yes
25	5283	Yes
26	5290	Yes
27	5277	Yes
28	5282	Yes
29	5287	Yes
30	5291	Yes

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

TYPE 6 DETECTION PROBABILITY

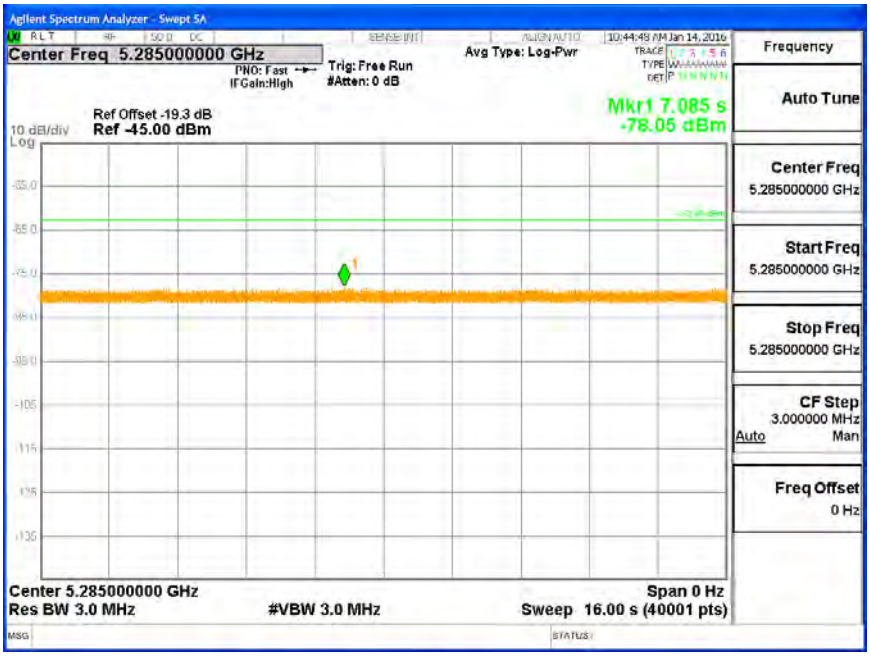
Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	85	5275	3	Yes
2	560	5276	2	Yes
3	1035	5277	3	Yes
4	1510	5278	4	Yes
5	1985	5279	3	Yes
6	2460	5280	4	Yes
7	2935	5281	8	Yes
8	3410	5282	6	Yes
9	3885	5283	8	Yes
10	4360	5284	6	Yes
11	4835	5285	1	Yes
12	5785	5286	4	Yes
13	6260	5287	4	Yes
14	6735	5288	4	Yes
15	7210	5289	6	Yes
16	7685	5290	5	Yes
17	8160	5291	4	Yes
18	8635	5292	3	Yes
19	9110	5293	4	Yes
20	9585	5294	6	Yes
21	10060	5295	5	Yes
22	10535	5275	4	Yes
23	11010	5276	7	Yes
24	11485	5277	4	Yes
25	11960	5278	7	Yes
26	12435	5279	1	Yes
27	12910	5280	2	Yes
28	13385	5281	5	Yes
29	13860	5282	5	Yes
30	14335	5283	6	Yes
31	14810	5284	7	Yes
32	15285	5285	6	Yes
33	15760	5286	6	Yes
34	16235	5287	6	Yes
35	16710	5288	7	Yes
36	17185	5289	5	Yes
37	17660	5290	8	Yes
38	18135	5291	4	Yes
39	18610	5292	7	Yes
40	19085	5293	6	Yes
41	19560	5294	5	Yes
42	20035	5295	5	Yes

6.5. LOW BAND SENSOR 1 RESULTS FOR 40 MHz BANDWIDTH

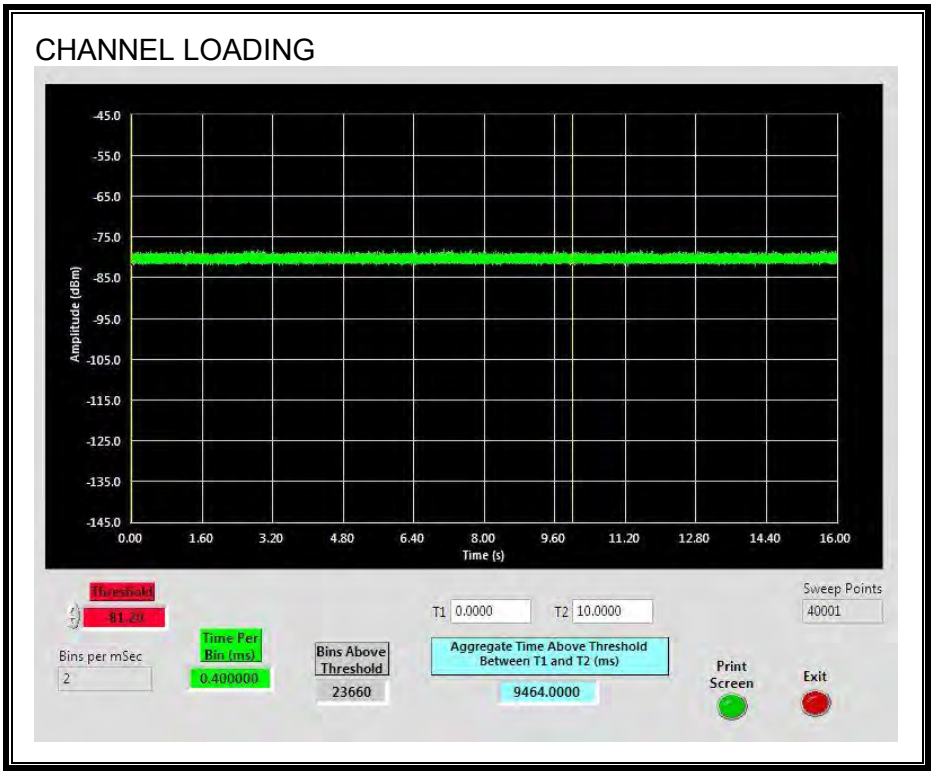
6.5.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 94.64%

6.5.2. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE TEST CHANNEL CYCLE TIME

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5285 MHz) and a log file was generated. Upon completion of the CAC period on both the test channel in 5.3 GHz and the downlink 5.6 GHz, the downlink (which includes the 5.6 GHz DFS band) begins a “discovery phase” and In-Service Monitoring continues on both the 5.3 GHz and the 5.6 GHz DFS bands. The DFS channel enables are passed through the non-DFS connections until a link is established. When the 5.8 GHz downlink connects, the 5.3 GHz Uplink Transmitter is enabled. The 5.2/5.3 GHz Receive Radio then associates to the 5.2/5.3 GHz Transmit Radio. The 5.6/5.8 Receive Radio then associates to the 5.6/5.8 GHz Transmit Radio. After the association process was complete, transmissions began on the test channel. The elapsed time between the end of the CAC period and the start of transmissions on the test channel is the discovery time and association period. This reference measurement and the time stamps within the log file were used to determine when radar bursts were to be triggered at the beginning and end of the CAC period.

Note: The beginning of the CAC period is designated as the initialization of DFS sensor 2 (“RRC DFS[2]:sensor init”) in the log file. Two DFS sensors are initialized in sequence but CAC does not begin until the timestamp on the second initialization.

PROCEDURE FOR TIMING OF RADAR BURST

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5285 MHz) and a log file was generated. A radar signal was triggered on the test channel between 0 to 6 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The AC power was then again toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5285 MHz) and a log file was generated. A radar signal was triggered on the test channel between 54 to 60 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The log file recorded the timing of these events. The time from the beginning of the CAC on the test channel to the detection of the radar burst on the test channel was measured.

APPROXIMATE QUANTITATIVE RESULTS BASED ON RF MARKERS

NO RADAR TRIGGERED ON THE TEST CHANNEL

The time between the beginning of the CAC period and the start of transmissions on the test channel minus the elapsed time for the Receive Radio to associate to the Transmit Radio is the CAC time.

RADAR TRIGGERED ON THE TEST CHANNEL

The time from the beginning of the CAC period to the radar burst on the test channel was measured as the approximate relative time from the start of the CAC.

No Radar Triggered

Start of CAC at 5285 MHz (sec)	End of CAC at 5285 MHz (sec)	CAC Time (sec)
144.3	205.3	61.0

Radar Near Beginning of CAC

Start of CAC at 5285 MHz (sec)	Timing of Radar Burst at 5285 MHz (sec)	Radar Relative to Start of CAC at 5285 MHz (sec)
148.5	153.5	5.0

Radar Near End of CAC

Start of CAC at 5285 MHz (sec)	Timing of Radar Burst at 5285 MHz (sec)	Radar Relative to Start of CAC at 5285 MHz (sec)
146.5	204.5	58.0

QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start of CAC at 5285 MHz (hh:mm:ss)	End of CAC at 5285 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
0:02:17	0:03:18	0:01:01

Radar Near Beginning of CAC

Start of CAC at 5285 MHz (hh:mm:ss)	Radar Detected at 5285 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:19	0:02:24	0:00:05

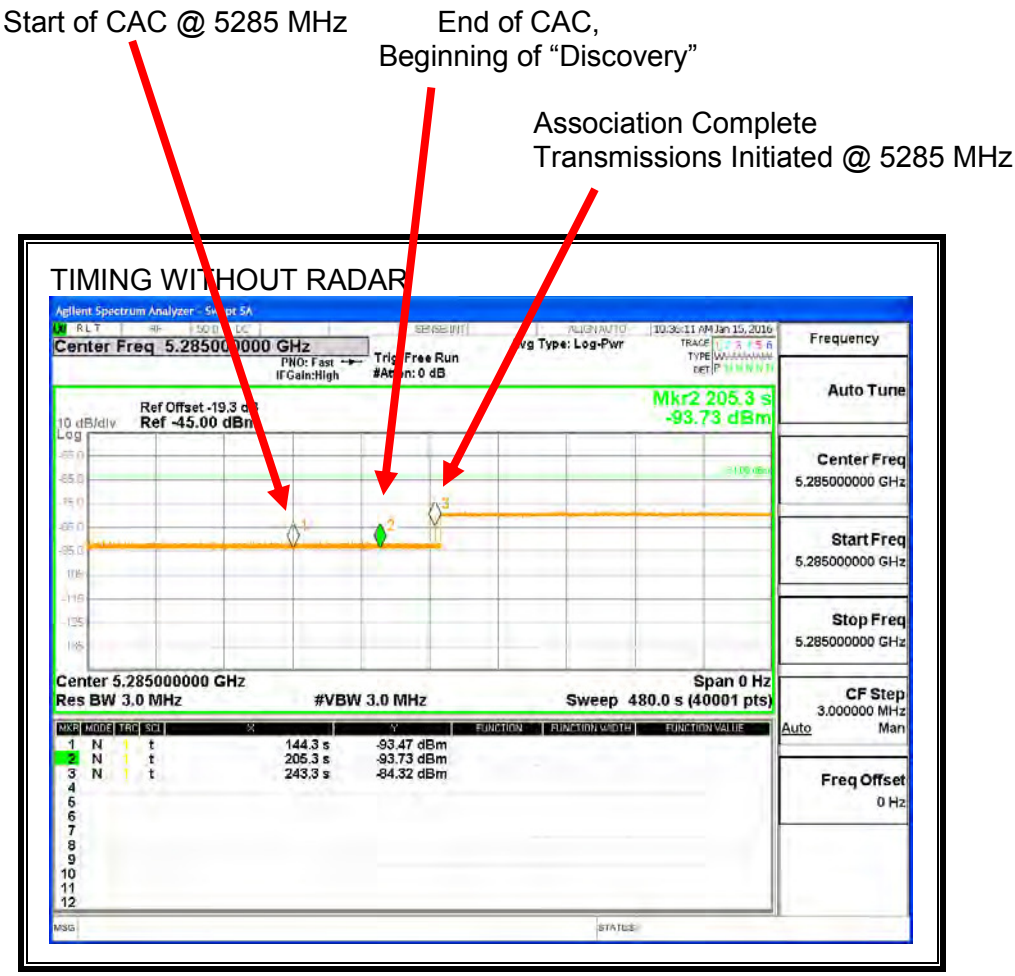
Radar Near End of CAC

Start of CAC at 5285 MHz (hh:mm:ss)	Radar Detected at 5285 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:17	0:03:15	0:00:58

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 the completion of the association period following 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



Transmissions begin on intended channel after completion of CAC.

EUT RADAR EVENTS LOG FILE - CAC TIMING WITHOUT RADAR

Jan 1 00:02:14 IBR daemon.alert mgd: DFS_DCM_FE_CAC

Jan 1 00:02:14 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(16725)

Jan 1 00:02:17 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5645-5725 MHz: ts(19485)

Jan 1 00:03:18 IBR daemon.alert mgd: RRC DFS: TStamp = 80485 msec, CAC DONE

Jan 1 00:03:18 IBR daemon.alert mgd: VLB:msc 123720 Cnt 0 Rx 5820 MHz Tx 5240 MHz Ant_combo=1234

Jan 1 00:03:56 IBR daemon.notice mgd: Tx Frequency change: From [5240] / To [5285]

Jan 1 00:03:56 IBR daemon.notice mgd: Transmit side fast XS complete

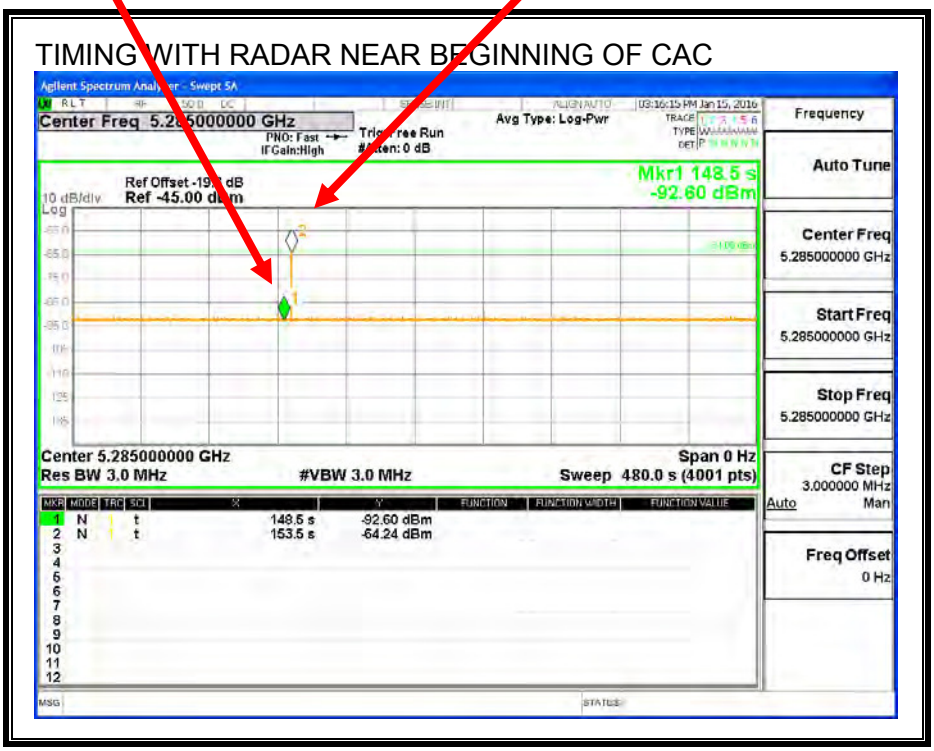
Jan 1 00:03:56 IBR daemon.info mgd: TRAP: 13|Radio Link Operational

Jan 1 00:03:56 IBR daemon.alert mgd: TX_T10 : Rx[5820 MHz] Tx[5285 MHz] CIR = 0

TIMING WITH RADAR NEAR BEGINNING OF CAC

Start of CAC @ 5285 MHz

Radar Signal Applied @ 5285 MHz



No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - BEGINNING OF CAC

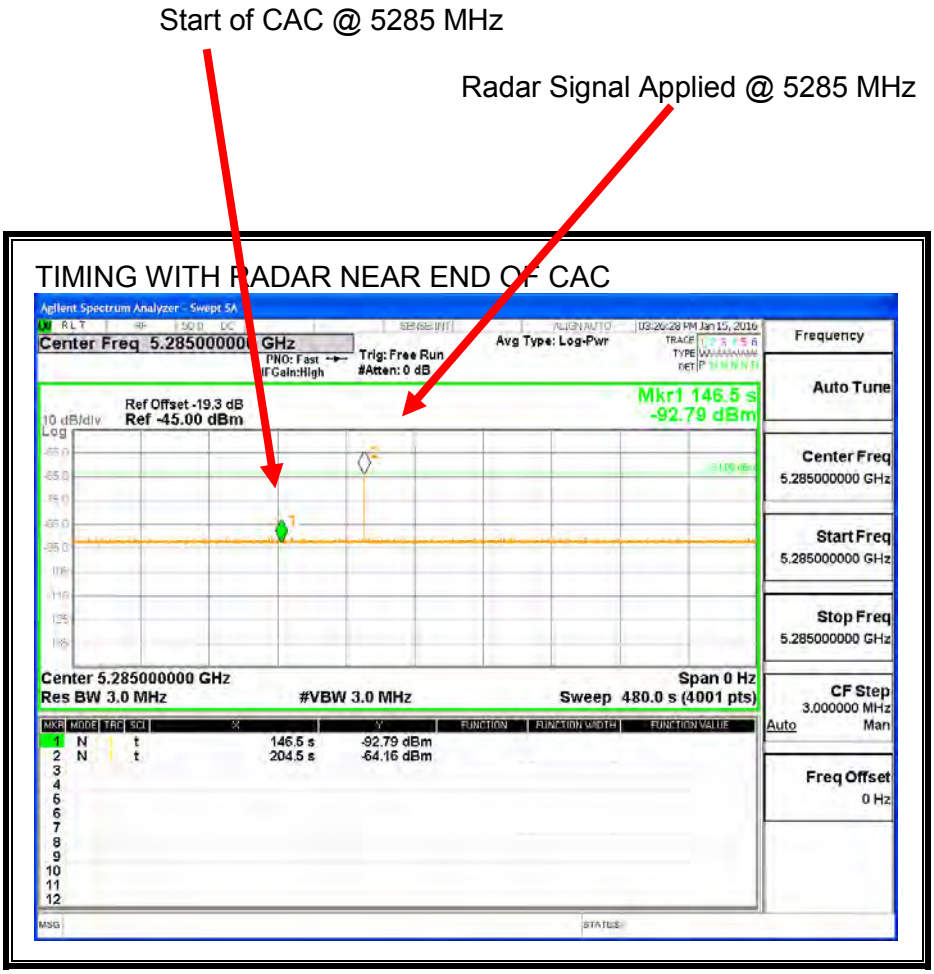
Jan 1 00:02:17 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(18253)

Jan 1 00:02:19 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5645-5725 MHz: ts(20922)

Jan 1 00:02:24 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5265),oe(5305),as(5265),ae(5305)

Jan 1 00:02:24 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:02:24 IBR daemon.alert mgd: 5250 Mhz: 00:00 00:00 00:00 31:00
Jan 1 00:02:24 IBR daemon.alert mgd: 5270 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:02:24 IBR daemon.alert mgd: 5290 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:02:24 IBR daemon.alert mgd: 5310 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:24 IBR daemon.alert mgd: 5330 Mhz: 00:00 00:00 00:00 00:00

TIMING WITH RADAR NEAR END OF CAC



No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - END OF CAC

Jan 1 00:02:15 IBR daemon.alert mgd: DFS_DCM_FE_CAC

Jan 1 00:02:15 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(15577)

Jan 1 00:02:17 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5645-5725 MHz: ts(18109)

Jan 1 00:03:15 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5265),oe(5305),as(5265),ae(5305)

Jan 1 00:03:15 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:03:15 IBR daemon.alert mgd: 5250 Mhz: 00:00 00:00 00:00 31:00
Jan 1 00:03:15 IBR daemon.alert mgd: 5270 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:03:15 IBR daemon.alert mgd: 5290 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:03:15 IBR daemon.alert mgd: 5310 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:15 IBR daemon.alert mgd: 5330 Mhz: 00:00 00:00 00:00 00:00

6.5.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

6.5.4. 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)
0.000	10

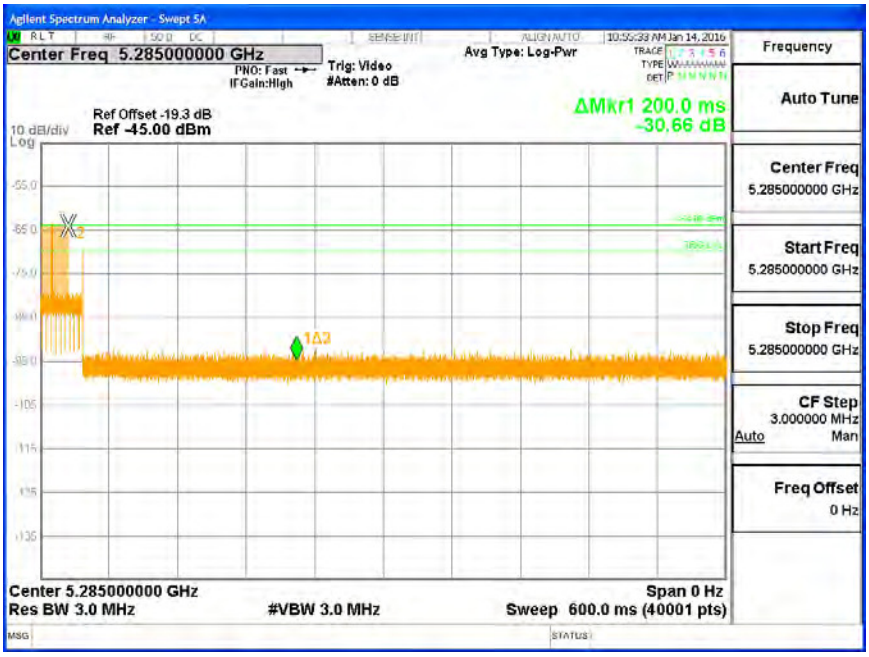
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

CHANNEL CLOSING TIME

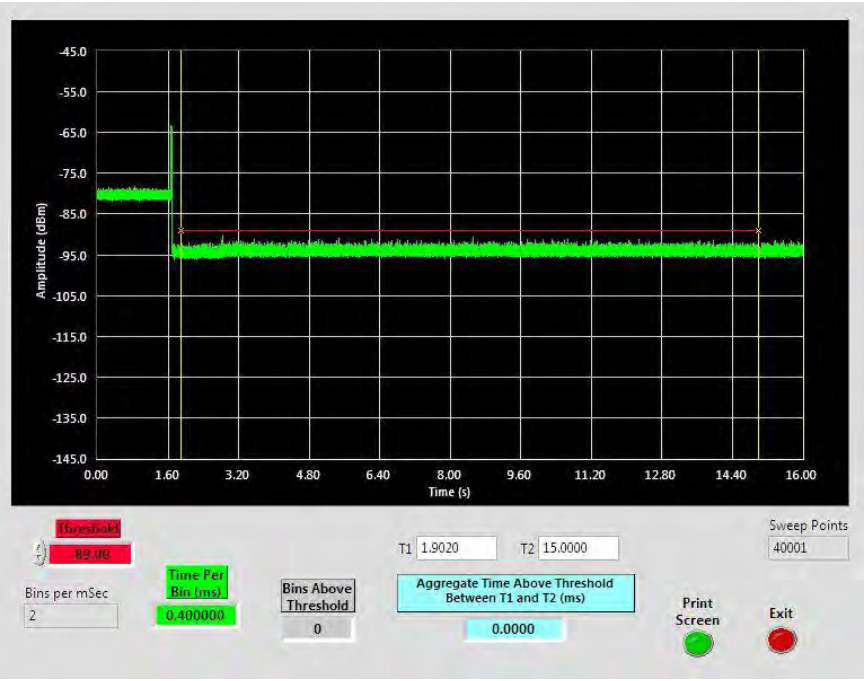
CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.

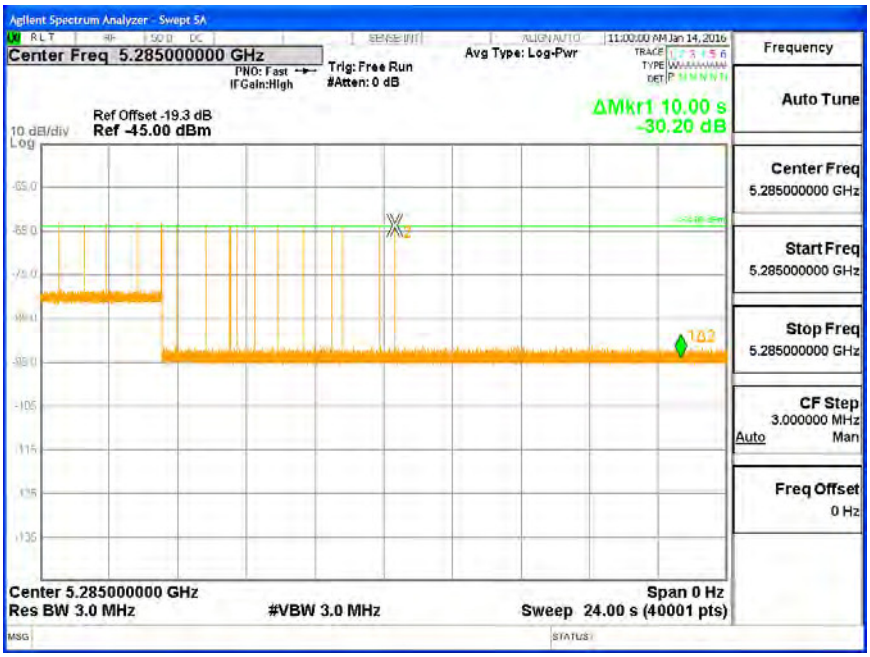
AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

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

MOVE TIME FOR LONG PULSE RADAR

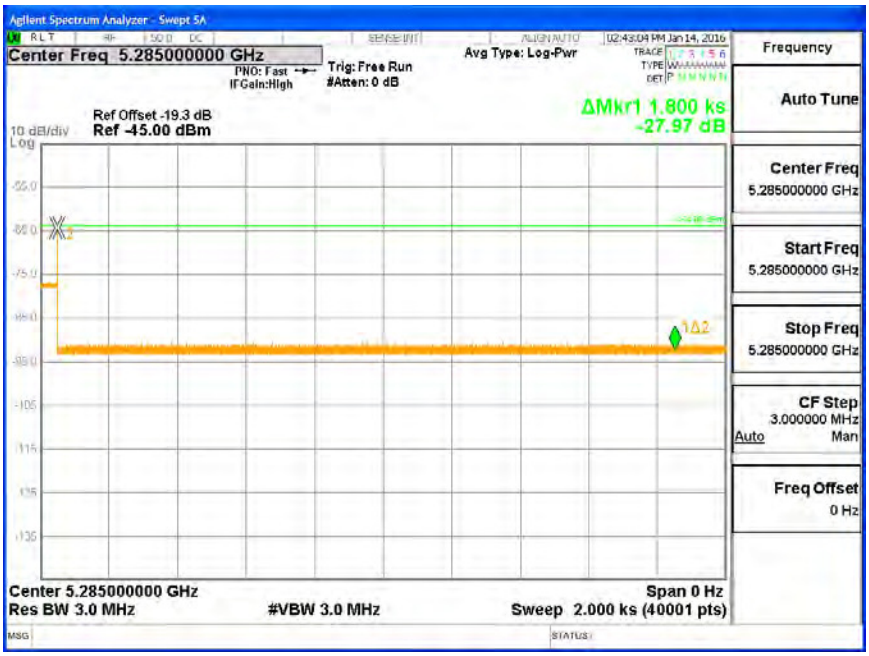


6.5.5. NON-OCCUPANCY PERIOD

RESULTS

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

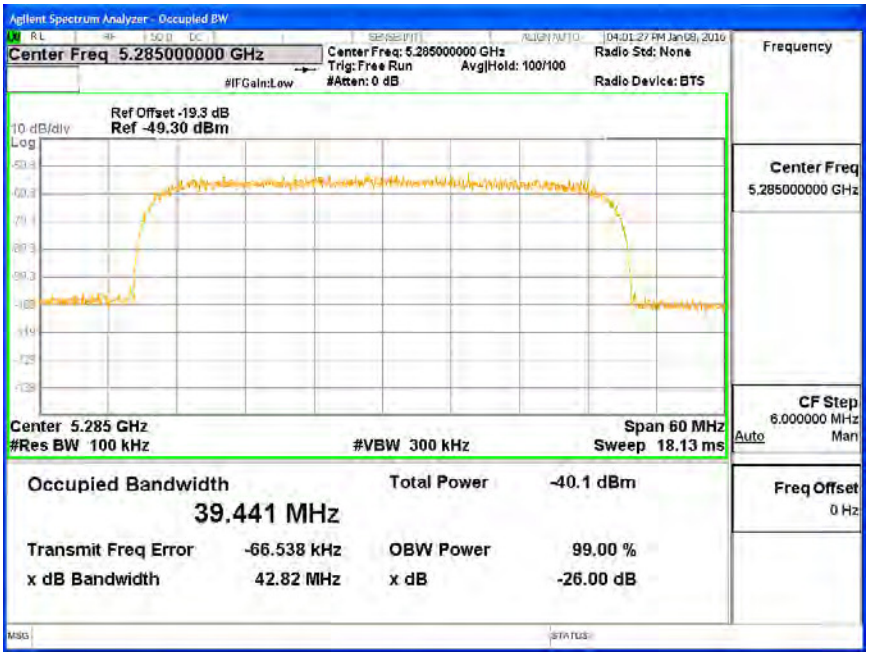
NON-OCCUPANCY PERIOD



6.5.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5265	5305	40	39.441	101.4	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
5265	10	10	100	FL
5270	10	10	100	
5275	10	10	100	
5280	10	10	100	
5285	10	10	100	
5290	10	10	100	
5295	10	10	100	
5300	10	10	100	
5305	10	10	100	FH

6.5.7. 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	100.00	60	Pass	5265	5305		
FCC Short Pulse Type 2	30	100.00	60	Pass	5265	5305		
FCC Short Pulse Type 3	30	100.00	60	Pass	5265	5305		
FCC Short Pulse Type 4	30	100.00	60	Pass	5265	5305		
Aggregate		100.00	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5265	5305	5269	5301
FCC Hopping Type 6	41	100.00	70	Pass	5265	5305		

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	5285	Yes
1002	1	678	78	A	5285	Yes
1003	1	698	76	A	5285	Yes
1004	1	798	67	A	5285	Yes
1005	1	658	81	A	5285	Yes
1006	1	778	68	A	5285	Yes
1007	1	878	61	A	5285	Yes
1008	1	598	89	A	5285	Yes
1009	1	718	74	A	5285	Yes
1010	1	818	65	A	5285	Yes
1011	1	838	63	A	5285	Yes
1012	1	518	102	A	5285	Yes
1013	1	898	59	A	5285	Yes
1014	1	618	86	A	5285	Yes
1015	1	738	72	A	5285	Yes
1016	1	1664	32	B	5285	Yes
1017	1	2491	22	B	5285	Yes
1018	1	1252	43	B	5285	Yes
1019	1	2209	24	B	5285	Yes
1020	1	1099	49	B	5285	Yes
1021	1	990	54	B	5285	Yes
1022	1	2559	21	B	5285	Yes
1023	1	2579	21	B	5285	Yes
1024	1	1729	31	B	5285	Yes
1025	1	684	78	B	5285	Yes
1026	1	1317	41	B	5285	Yes
1027	1	2950	18	B	5285	Yes
1028	1	1164	46	B	5285	Yes
1029	1	2926	19	B	5285	Yes
1030	1	2623	21	B	5285	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	3.6	230	24	5285	Yes
2002	1.8	192	26	5285	Yes
2003	2.6	186	25	5285	Yes
2004	1	195	24	5285	Yes
2005	4.3	192	27	5285	Yes
2006	1	206	27	5285	Yes
2007	2.2	170	27	5285	Yes
2008	1.3	187	23	5285	Yes
2009	5	198	27	5285	Yes
2010	2.1	220	23	5285	Yes
2011	4	154	28	5285	Yes
2012	3.5	222	28	5285	Yes
2013	1.6	161	23	5285	Yes
2014	1.3	152	27	5285	Yes
2015	3.7	219	26	5285	Yes
2016	1.6	215	23	5285	Yes
2017	2.3	204	29	5285	Yes
2018	4.6	166	24	5285	Yes
2019	1.3	203	27	5285	Yes
2020	3.8	169	29	5285	Yes
2021	3	210	25	5285	Yes
2022	3.8	180	24	5285	Yes
2023	3.1	225	28	5285	Yes
2024	4.1	161	27	5285	Yes
2025	3.7	172	25	5285	Yes
2026	3	194	28	5285	Yes
2027	2.7	209	29	5285	Yes
2028	2.2	197	26	5285	Yes
2029	4.4	216	28	5285	Yes
2030	4.1	208	25	5285	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	9.4	385	16	5285	Yes
3002	9.3	372	18	5285	Yes
3003	5	340	17	5285	Yes
3004	7.8	473	17	5285	Yes
3005	8.9	336	16	5285	Yes
3006	9.6	481	17	5285	Yes
3007	5.9	357	16	5285	Yes
3008	6.8	265	18	5285	Yes
3009	6	404	17	5285	Yes
3010	7.3	340	17	5285	Yes
3011	6.7	492	18	5285	Yes
3012	5.8	308	17	5285	Yes
3013	5.6	355	17	5285	Yes
3014	10	316	16	5285	Yes
3015	7.6	376	17	5285	Yes
3016	7.2	350	16	5285	Yes
3017	7.8	306	18	5285	Yes
3018	7.7	426	16	5285	Yes
3019	8.5	394	16	5285	Yes
3020	6.2	393	16	5285	Yes
3021	7.3	256	18	5285	Yes
3022	8	402	16	5285	Yes
3023	9.4	278	18	5285	Yes
3024	5.2	436	17	5285	Yes
3025	9.5	458	16	5285	Yes
3026	5.7	261	16	5285	Yes
3027	5.1	413	17	5285	Yes
3028	9.3	361	16	5285	Yes
3029	9.1	275	16	5285	Yes
3030	8.4	488	18	5285	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	12	297	12	5285	Yes
4002	16.6	404	15	5285	Yes
4003	12.4	477	14	5285	Yes
4004	17.5	346	15	5285	Yes
4005	13.8	314	14	5285	Yes
4006	19.4	447	15	5285	Yes
4007	11.4	428	15	5285	Yes
4008	12.8	323	14	5285	Yes
4009	15.5	449	14	5285	Yes
4010	17.4	490	13	5285	Yes
4011	15.8	379	16	5285	Yes
4012	18.2	432	15	5285	Yes
4013	17.2	333	16	5285	Yes
4014	15.4	282	16	5285	Yes
4015	14.9	447	12	5285	Yes
4016	13.6	408	14	5285	Yes
4017	18.9	351	15	5285	Yes
4018	13.4	325	16	5285	Yes
4019	19.3	398	12	5285	Yes
4020	14.3	267	13	5285	Yes
4021	10.6	486	13	5285	Yes
4022	16.2	368	14	5285	Yes
4023	13.6	348	13	5285	Yes
4024	19.7	494	12	5285	Yes
4025	12.3	370	12	5285	Yes
4026	14.2	411	16	5285	Yes
4027	12.6	299	14	5285	Yes
4028	15.1	353	14	5285	Yes
4029	14	254	14	5285	Yes
4030	12.2	454	14	5285	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5276	Yes
2	5301	Yes
3	5286	Yes
4	5291	Yes
5	5287	Yes
6	5272	Yes
7	5296	Yes
8	5284	Yes
9	5275	Yes
10	5278	Yes
11	5281	Yes
12	5292	Yes
13	5296	Yes
14	5279	Yes
15	5278	Yes
16	5296	Yes
17	5289	Yes
18	5288	Yes
19	5280	Yes
20	5270	Yes
21	5288	Yes
22	5271	Yes
23	5288	Yes
24	5294	Yes
25	5281	Yes
26	5293	Yes
27	5286	Yes
28	5270	Yes
29	5297	Yes
30	5291	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	344	5265	10	Yes
2	819	5266	13	Yes
3	1294	5267	8	Yes
4	1769	5268	7	Yes
5	2244	5269	10	Yes
6	2719	5270	11	Yes
7	3194	5271	5	Yes
8	3669	5272	10	Yes
9	4144	5273	7	Yes
10	4619	5274	12	Yes
11	5094	5275	11	Yes
12	5569	5276	10	Yes
13	6044	5277	8	Yes
14	6519	5278	11	Yes
15	6994	5279	8	Yes
16	7469	5280	11	Yes
17	7944	5281	9	Yes
18	8419	5282	7	Yes
19	8894	5283	5	Yes
20	9369	5284	7	Yes
21	9844	5285	8	Yes
22	10319	5286	9	Yes
23	10794	5287	8	Yes
24	11269	5288	6	Yes
25	11744	5289	12	Yes
26	12219	5290	10	Yes
27	12694	5291	7	Yes
28	13169	5292	6	Yes
29	13644	5293	8	Yes
30	14119	5294	6	Yes
31	14594	5295	7	Yes
32	15069	5296	7	Yes
33	15544	5297	12	Yes
34	16019	5298	11	Yes
35	16494	5299	8	Yes
36	16969	5300	8	Yes
37	17444	5301	5	Yes
38	17919	5302	6	Yes
39	18394	5303	13	Yes
40	18869	5304	5	Yes
41	19344	5305	10	Yes

6.6. LOW BAND CAC DUAL SENSOR BAND BLOCKING VERIFICATION

6.6.1. TEST PROCEDURE

The spectrum analyzer is tuned to 5270 MHz and the log file from the EUT records the events.

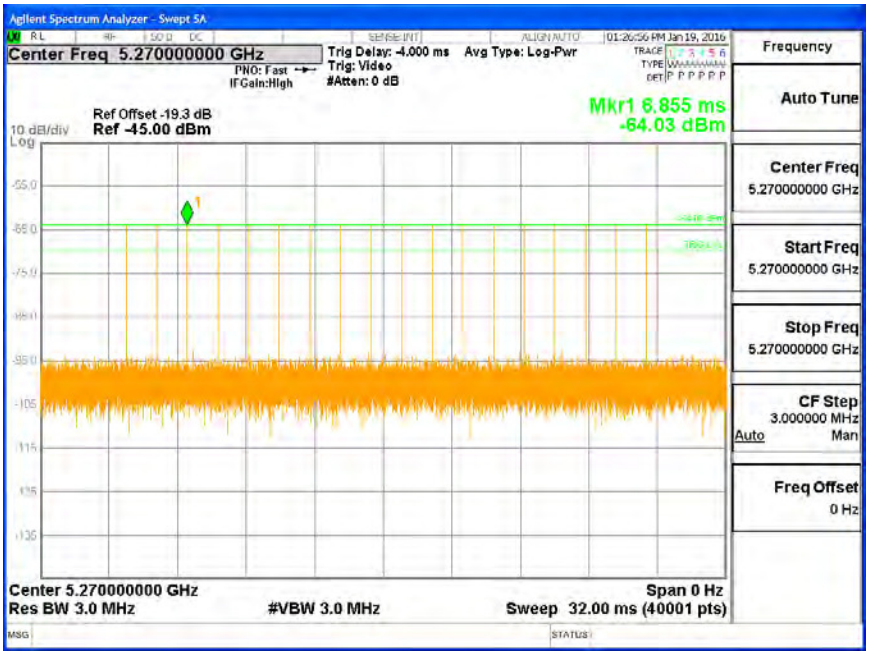
The power to the EUT is cycled and a sweep is concurrently started on the spectrum analyzer. After the EUT boots-up a CAC period is simultaneously performed on 5270 MHz and 5310 MHz.

A radar burst is triggered on 5270 MHz approximately 5 seconds into the CAC period. In response to this the EUT places 5270 MHz on the blocked channel list. A radar burst is then triggered approximately 52 seconds later on 5310 MHz. After the second detection the EUT places 5305 MHz on the blocked channel list and removes itself from service in the 5.3 GHz band.

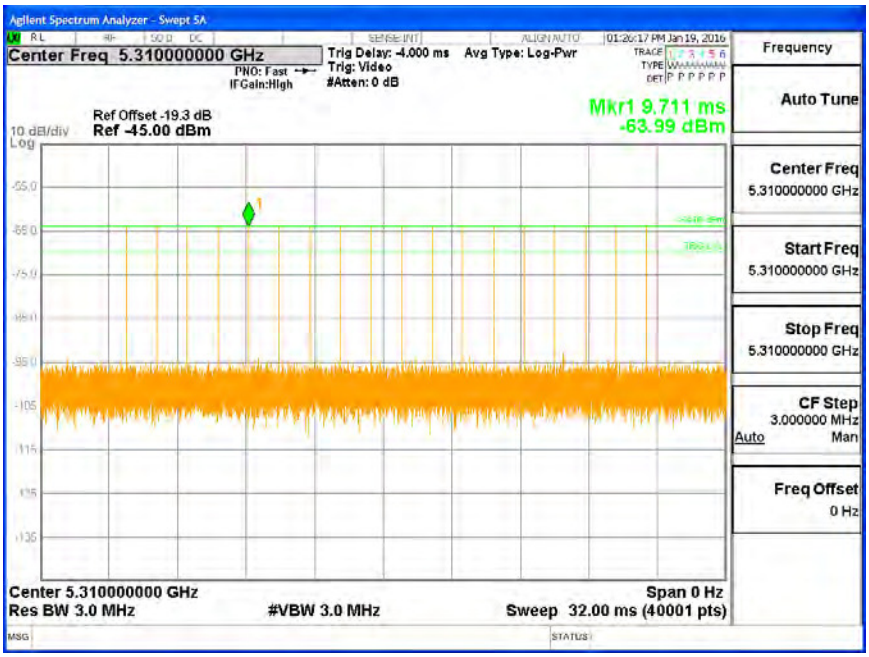
Once the non-occupancy period is complete on 5270 MHz the channel is cleared from the blocked channel list. A CAC period is performed on the cleared channel and upon successful completion the EUT enters service.

6.6.2. RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 0 AT 5270 MHz



SHORT PULSE RADAR TYPE 0 AT 5310 MHz



6.6.3. TEST RESULTS

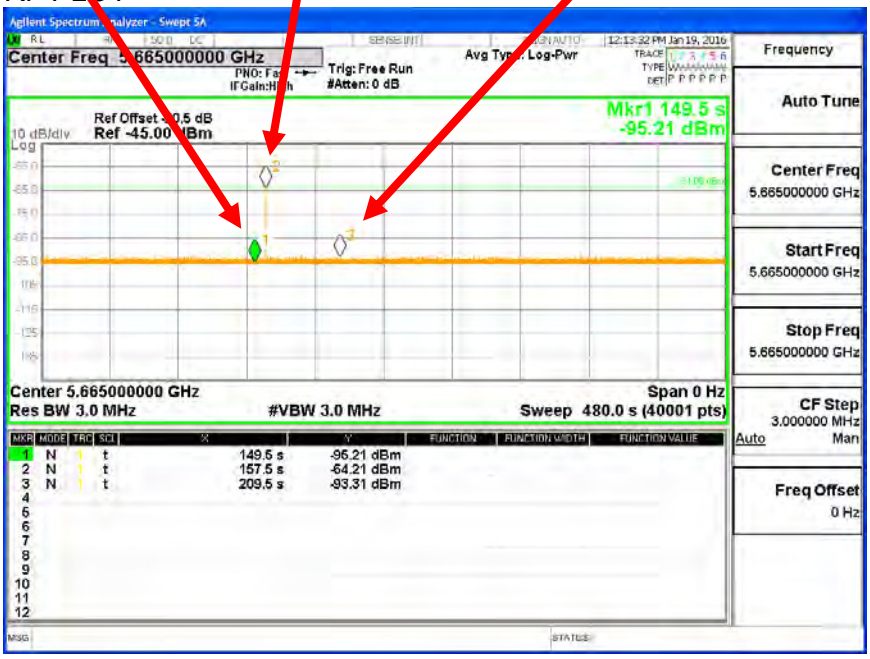
RF PLOT

CAC @ 5270 MHz and 5310 MHz

Radar @ 5270 MHz

Radar @ 5310 MHz

RF PLOT



LOG FILE

Jan 1 00:02:15 IBR daemon.alert mgd: RRC_DFS: l_lbe(5250), l_ube(5329), h_lbe(5645), h_ube(5724)

Jan 1 00:02:15 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel change request, Fc = 5290, BW = 80

Jan 1 00:02:15 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel change request, Fc = 5685, BW = 80

Jan 1 00:02:15 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(17537)

Jan 1 00:02:18 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5645-5725 MHz: ts(20210)

Jan 1 00:02:23 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5249),oe(5289),as(5250),ae(5289)

Jan 1 00:02:23 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:02:23 IBR daemon.alert mgd: 5250 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:02:23 IBR daemon.alert mgd: 5270 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:02:23 IBR daemon.alert mgd: 5290 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:23 IBR daemon.alert mgd: 5310 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:23 IBR daemon.alert mgd: 5330 Mhz: 00:00 00:00 00:00 00:00

Jan 1 00:02:23 IBR daemon.alert mgd: RRC_DFS_RADAR_DET: start(5250),end(5289),tb(0),ctb(0),rs(2),mm(8),g_x(0)
Jan 1 00:03:15 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5289),oe(5329),as(5289),ae(5329)

Jan 1 00:03:15 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:03:15 IBR daemon.alert mgd: 5250 Mhz: 30:08 30:08 30:08 30:08
Jan 1 00:03:15 IBR daemon.alert mgd: 5270 Mhz: 30:08 30:08 30:08 30:08
Jan 1 00:03:15 IBR daemon.alert mgd: 5290 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:03:15 IBR daemon.alert mgd: 5310 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:03:15 IBR daemon.alert mgd: 5330 Mhz: 00:00 00:00 00:00 00:00

Jan 1 00:03:15 IBR daemon.alert mgd: RRC_DFS_RADAR_DET: start(5289),end(5329),tb(0),ctb(0),rs(2),mm(8),g_x(0)
Jan 1 00:03:15 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5289),oe(5329),as(5289),ae(5329)

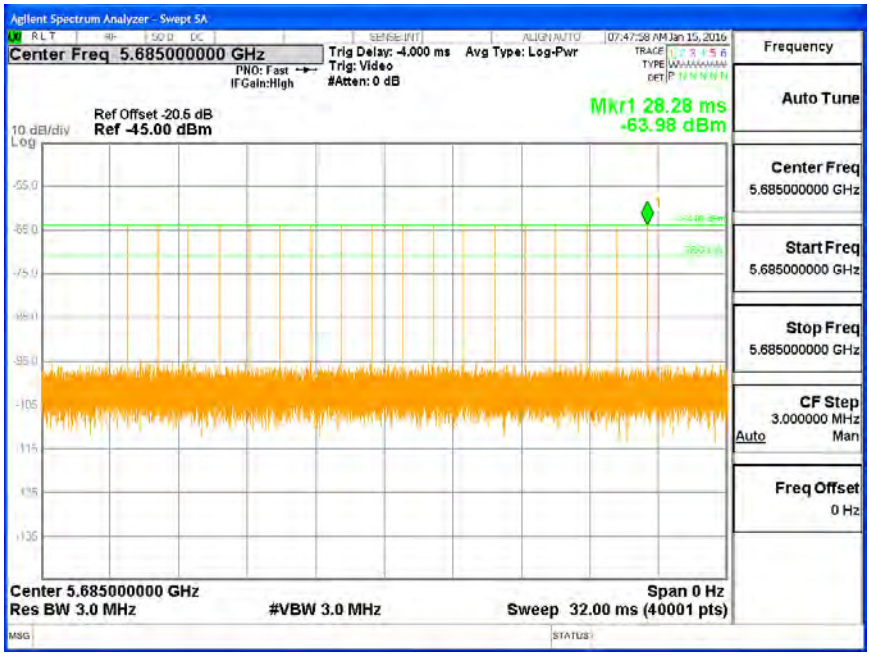
6.7. HIGH BAND SENSOR 2 TEST CHANNEL

All tests were performed at a channel center frequency of 5685 MHz.

6.8. HIGH BAND SENSOR 2 RADAR WAVEFORMS

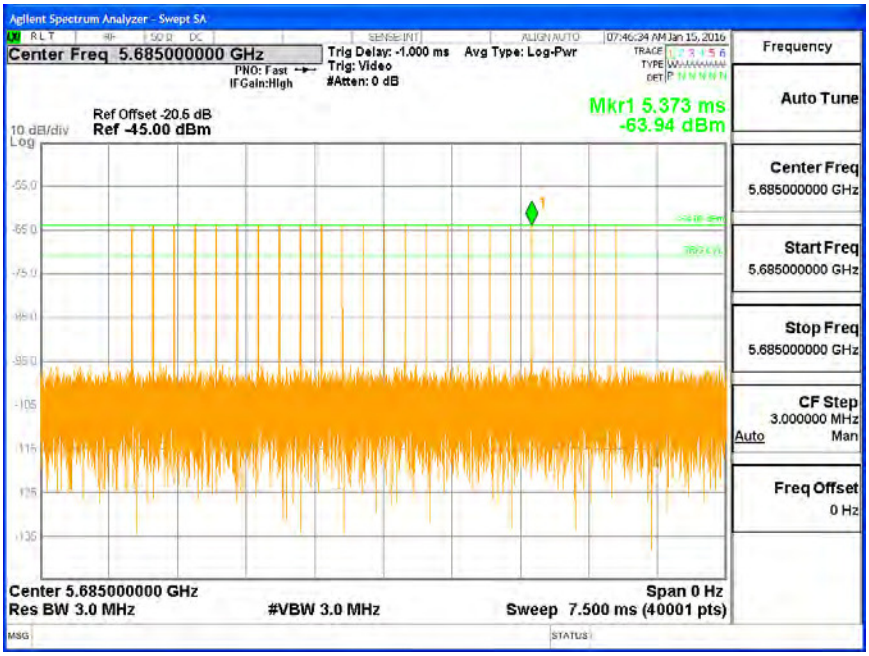
RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 0

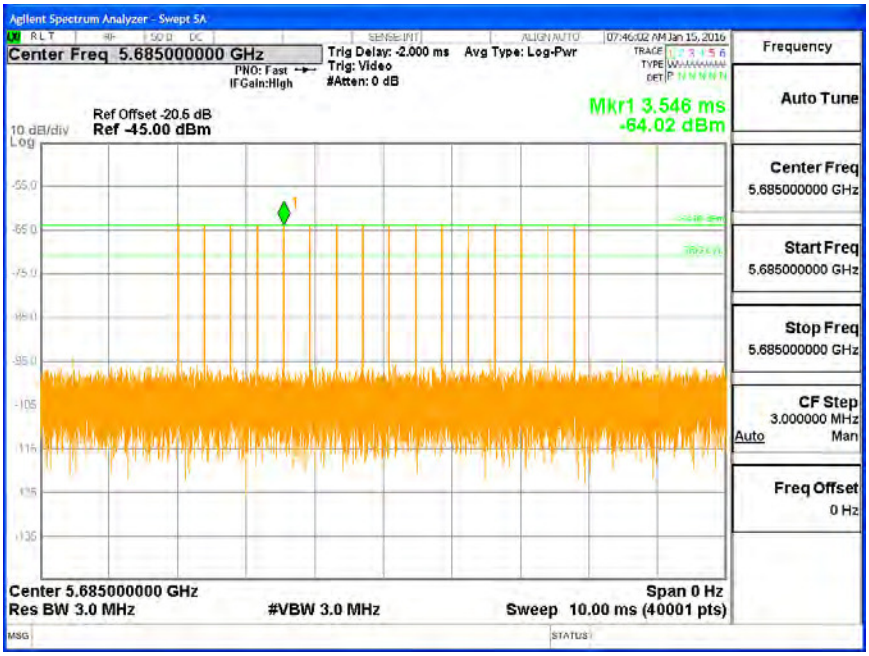


SAMPLE OF RADAR TYPE 1

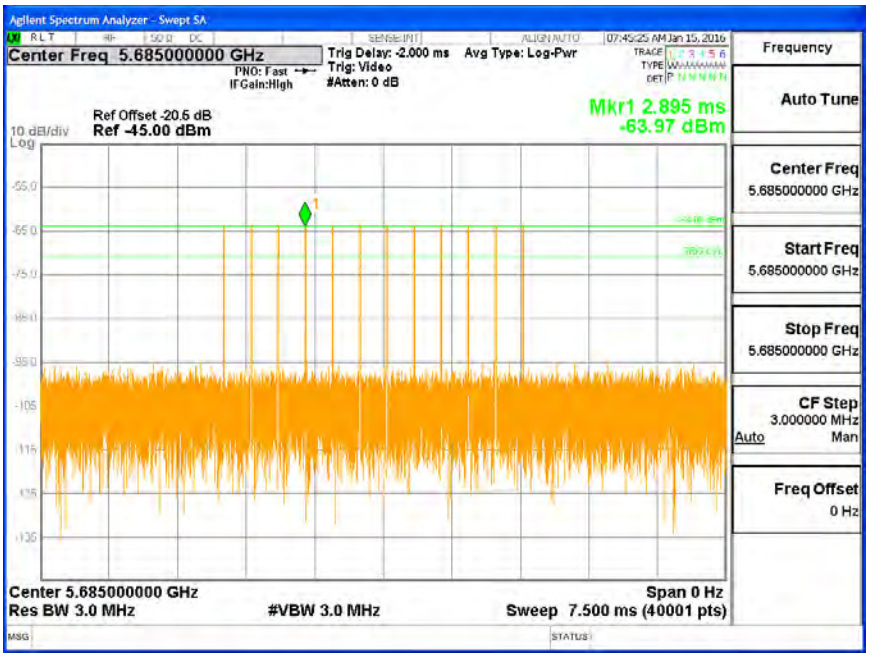
SAMPLE OF RADAR TYPE 2



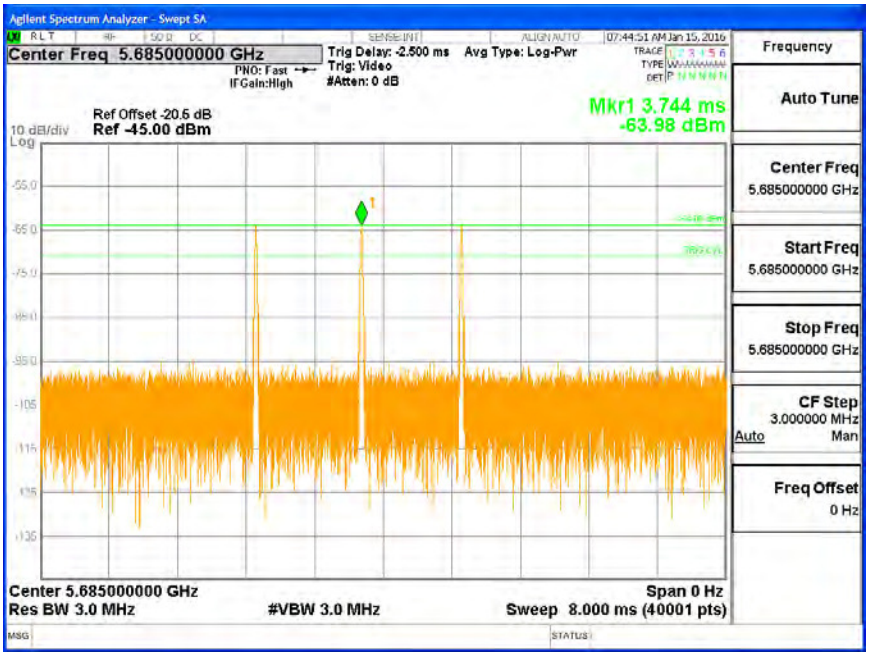
SAMPLE OF RADAR TYPE 3



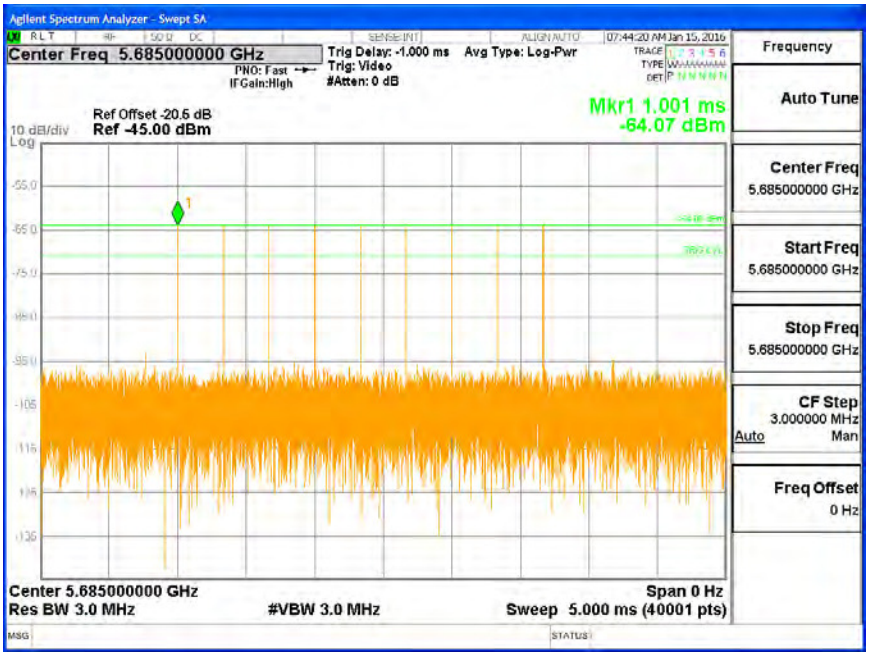
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6

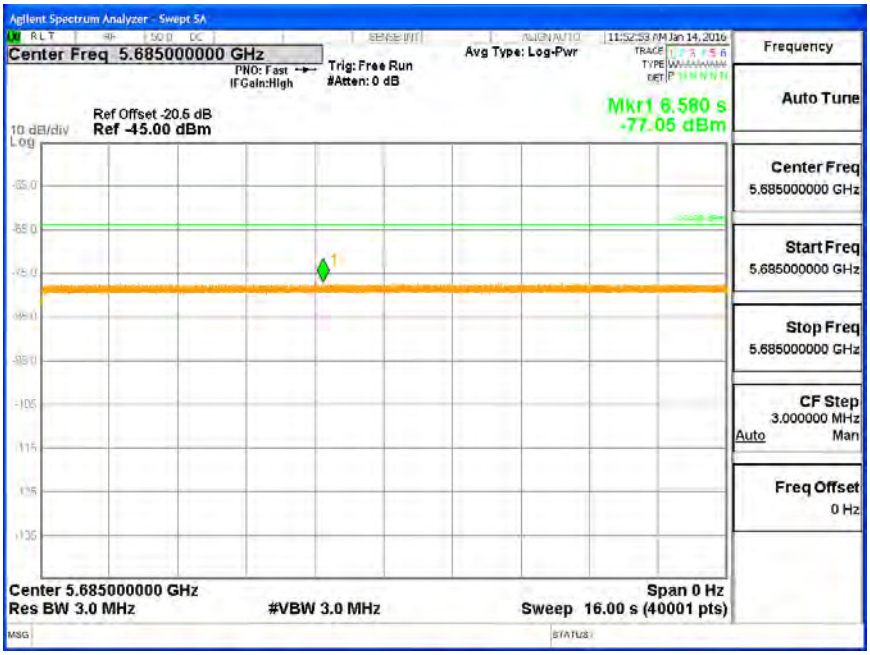


6.9. HIGH BAND SENSOR 2 RESULTS FOR 10 MHz BANDWIDTH

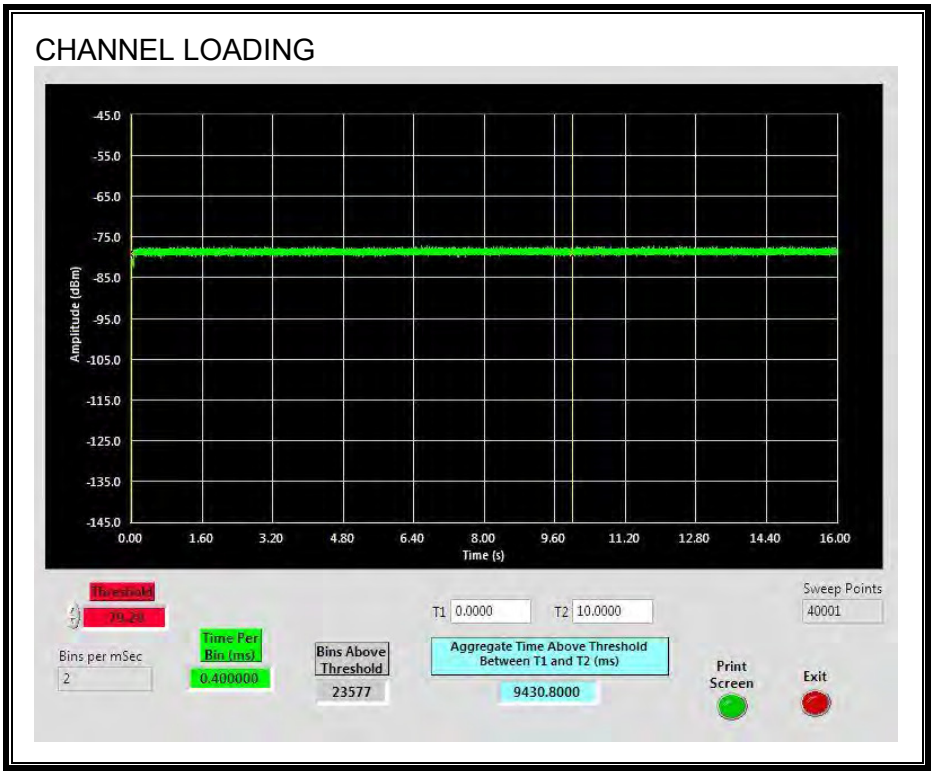
6.9.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 94.3%

6.9.2. CHANNEL AVAILABILITY CHECK TIME

The DFS sensor bandwidth is always equal to or greater than the widest nominal channel bandwidth. Therefore, 40 MHz CAC testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

6.9.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

6.9.4. 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)
0.0128	10

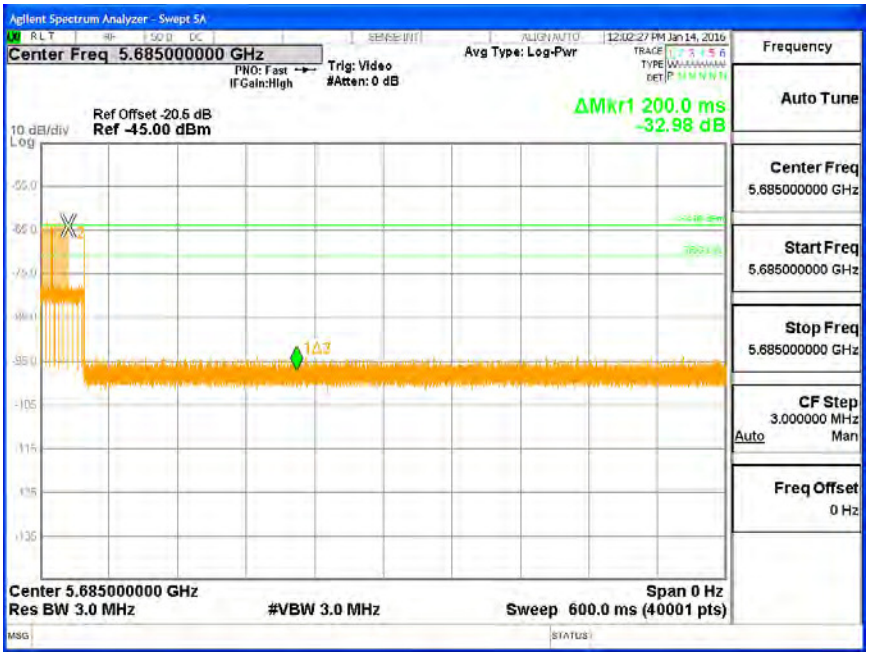
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

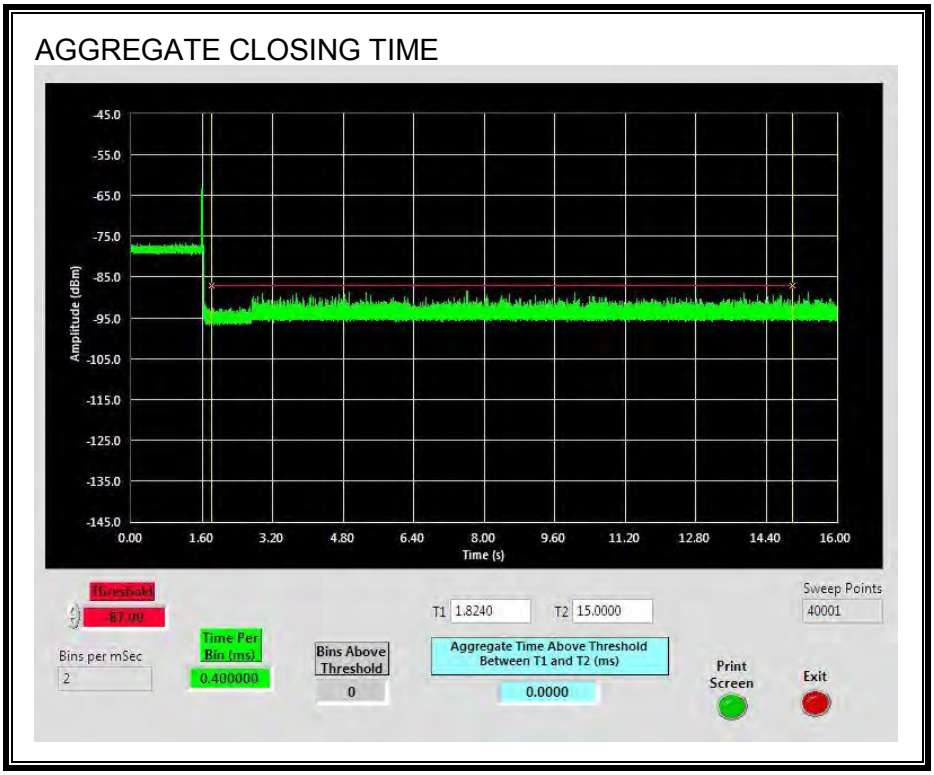
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

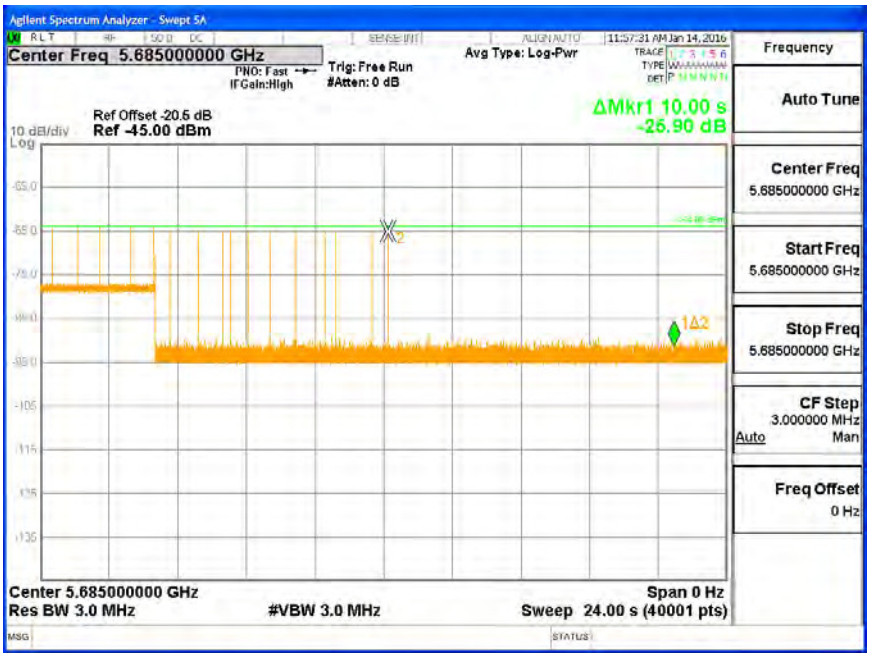
No transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

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

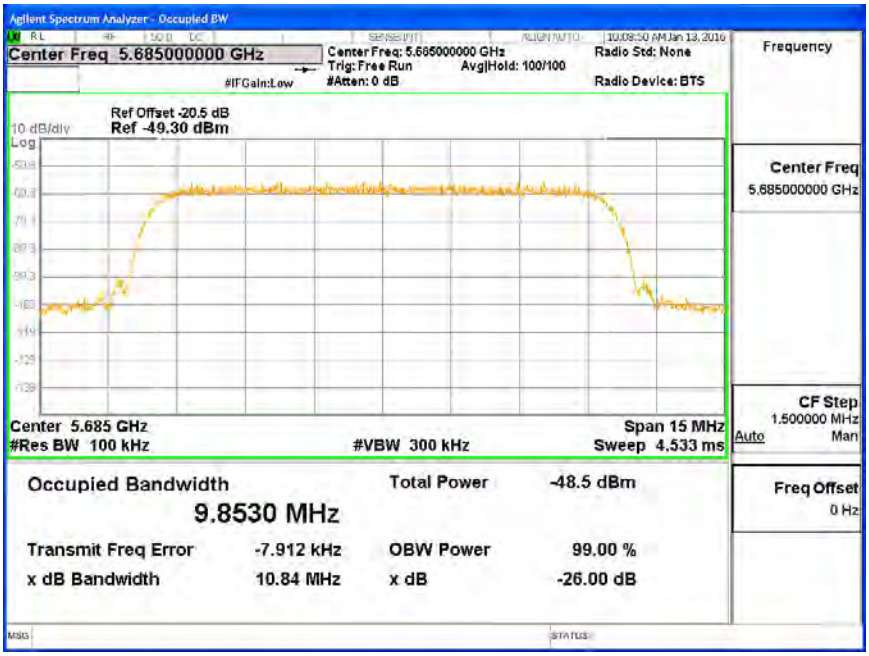
MOVE TIME FOR LONG PULSE RADAR



6.9.5. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5680	5690	10	9.853	101.5	100

The DFS sensor bandwidth is always greater than the widest nominal channel bandwidth. Therefore, 40 MHz Detection Bandwidth testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

For the purposes of testing In-Service Monitoring at this channel bandwidth the client has chosen to truncate the Detection Bandwidth to 10 MHz.

6.9.6. 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	100.00	60	Pass	5680	5690		
FCC Short Pulse Type 2	30	100.00	60	Pass	5680	5690		
FCC Short Pulse Type 3	30	96.67	60	Pass	5680	5690		
FCC Short Pulse Type 4	30	100.00	60	Pass	5680	5690		
Aggregate		99.17	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5680	5690	5681	5689
FCC Hopping Type 6	33	93.94	70	Pass	5680	5690		

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	5685	Yes
1002	1	678	78	A	5685	Yes
1003	1	698	76	A	5685	Yes
1004	1	798	67	A	5685	Yes
1005	1	658	81	A	5685	Yes
1006	1	778	68	A	5685	Yes
1007	1	878	61	A	5685	Yes
1008	1	598	89	A	5685	Yes
1009	1	718	74	A	5685	Yes
1010	1	818	65	A	5685	Yes
1011	1	838	63	A	5685	Yes
1012	1	518	102	A	5685	Yes
1013	1	898	59	A	5685	Yes
1014	1	618	86	A	5685	Yes
1015	1	738	72	A	5685	Yes
1016	1	1664	32	B	5685	Yes
1017	1	2491	22	B	5685	Yes
1018	1	1252	43	B	5685	Yes
1019	1	2209	24	B	5685	Yes
1020	1	1099	49	B	5685	Yes
1021	1	990	54	B	5685	Yes
1022	1	2559	21	B	5685	Yes
1023	1	2579	21	B	5685	Yes
1024	1	1729	31	B	5685	Yes
1025	1	684	78	B	5685	Yes
1026	1	1317	41	B	5685	Yes
1027	1	2950	18	B	5685	Yes
1028	1	1164	46	B	5685	Yes
1029	1	2926	19	B	5685	Yes
1030	1	2623	21	B	5685	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	3.6	230	24	5685	Yes
2002	1.8	192	26	5685	Yes
2003	2.6	186	25	5685	Yes
2004	1	195	24	5685	Yes
2005	4.3	192	27	5685	Yes
2006	1	206	27	5685	Yes
2007	2.2	170	27	5685	Yes
2008	1.3	187	23	5685	Yes
2009	5	198	27	5685	Yes
2010	2.1	220	23	5685	Yes
2011	4	154	28	5685	Yes
2012	3.5	222	28	5685	Yes
2013	1.6	161	23	5685	Yes
2014	1.3	152	27	5685	Yes
2015	3.7	219	26	5685	Yes
2016	1.6	215	23	5685	Yes
2017	2.3	204	29	5685	Yes
2018	4.6	166	24	5685	Yes
2019	1.3	203	27	5685	Yes
2020	3.8	169	29	5685	Yes
2021	3	210	25	5685	Yes
2022	3.8	180	24	5685	Yes
2023	3.1	225	28	5685	Yes
2024	4.1	161	27	5685	Yes
2025	3.7	172	25	5685	Yes
2026	3	194	28	5685	Yes
2027	2.7	209	29	5685	Yes
2028	2.2	197	26	5685	Yes
2029	4.4	216	28	5685	Yes
2030	4.1	208	25	5685	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	9.4	385	16	5685	Yes
3002	9.3	372	18	5685	Yes
3003	5	340	17	5685	Yes
3004	7.8	473	17	5685	Yes
3005	8.9	336	16	5685	Yes
3006	9.6	481	17	5685	Yes
3007	5.9	357	16	5685	Yes
3008	6.8	265	18	5685	Yes
3009	6	404	17	5685	Yes
3010	7.3	340	17	5685	Yes
3011	6.7	492	18	5685	Yes
3012	5.8	308	17	5685	Yes
3013	5.6	355	17	5685	Yes
3014	10	316	16	5685	Yes
3015	7.6	376	17	5685	Yes
3016	7.2	350	16	5685	Yes
3017	7.8	306	18	5685	Yes
3018	7.7	426	16	5685	Yes
3019	8.5	394	16	5685	Yes
3020	6.2	393	16	5685	Yes
3021	7.3	256	18	5685	Yes
3022	8	402	16	5685	Yes
3023	9.4	278	18	5685	Yes
3024	5.2	436	17	5685	Yes
3025	9.5	458	16	5685	No
3026	5.7	261	16	5685	Yes
3027	5.1	413	17	5685	Yes
3028	9.3	361	16	5685	Yes
3029	9.1	275	16	5685	Yes
3030	8.4	488	18	5685	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	12	297	12	5685	Yes
4002	16.6	404	15	5685	Yes
4003	12.4	477	14	5685	Yes
4004	17.5	346	15	5685	Yes
4005	13.8	314	14	5685	Yes
4006	19.4	447	15	5685	Yes
4007	11.4	428	15	5685	Yes
4008	12.8	323	14	5685	Yes
4009	15.5	449	14	5685	Yes
4010	17.4	490	13	5685	Yes
4011	15.8	379	16	5685	Yes
4012	18.2	432	15	5685	Yes
4013	17.2	333	16	5685	Yes
4014	15.4	282	16	5685	Yes
4015	14.9	447	12	5685	Yes
4016	13.6	408	14	5685	Yes
4017	18.9	351	15	5685	Yes
4018	13.4	325	16	5685	Yes
4019	19.3	398	12	5685	Yes
4020	14.3	267	13	5685	Yes
4021	10.6	486	13	5685	Yes
4022	16.2	368	14	5685	Yes
4023	13.6	348	13	5685	Yes
4024	19.7	494	12	5685	Yes
4025	12.3	370	12	5685	Yes
4026	14.2	411	16	5685	Yes
4027	12.6	299	14	5685	Yes
4028	15.1	353	14	5685	Yes
4029	14	254	14	5685	Yes
4030	12.2	454	14	5685	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5686	Yes
2	5683	Yes
3	5684	Yes
4	5685	Yes
5	5684	Yes
6	5688	Yes
7	5684	Yes
8	5687	Yes
9	5687	Yes
10	5687	Yes
11	5687	Yes
12	5689	Yes
13	5683	Yes
14	5686	Yes
15	5682	Yes
16	5686	Yes
17	5682	Yes
18	5689	Yes
19	5683	Yes
20	5689	Yes
21	5684	Yes
22	5688	Yes
23	5686	Yes
24	5681	Yes
25	5685	Yes
26	5688	Yes
27	5685	Yes
28	5685	Yes
29	5688	Yes
30	5685	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

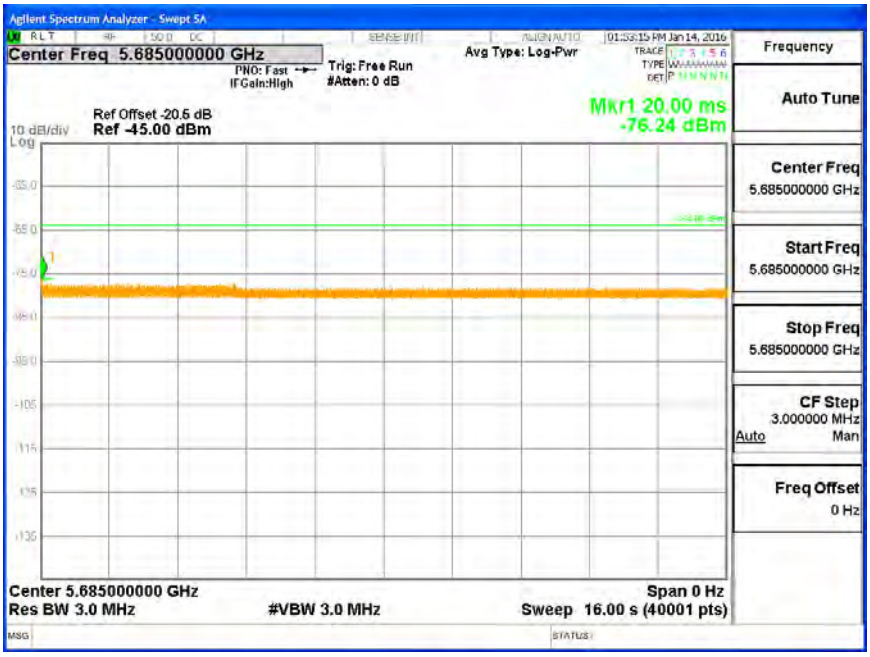
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	183	5680	2	Yes
2	658	5681	2	Yes
3	1608	5682	3	Yes
4	2083	5683	1	No
5	2558	5684	5	Yes
6	3033	5685	3	Yes
7	3508	5686	3	Yes
8	3983	5687	3	Yes
9	4458	5688	2	Yes
10	4933	5689	3	Yes
11	5408	5690	1	Yes
12	5883	5680	4	Yes
13	6358	5681	2	Yes
14	6833	5682	1	Yes
15	7308	5683	4	Yes
16	7783	5684	2	Yes
17	8258	5685	4	Yes
18	8733	5686	2	Yes
19	9208	5687	1	Yes
20	10633	5688	1	Yes
21	11583	5689	4	Yes
22	12058	5690	2	Yes
23	12533	5680	1	Yes
24	13008	5681	3	Yes
25	13483	5682	1	No
26	13958	5683	1	Yes
27	14433	5684	2	Yes
28	15383	5685	3	Yes
29	15858	5686	2	Yes
30	16333	5687	1	Yes
31	16808	5688	2	Yes
32	17283	5689	2	Yes
33	17758	5690	3	Yes

6.10. HIGH BAND SENSOR 2 RESULTS FOR 20 MHz BANDWIDTH

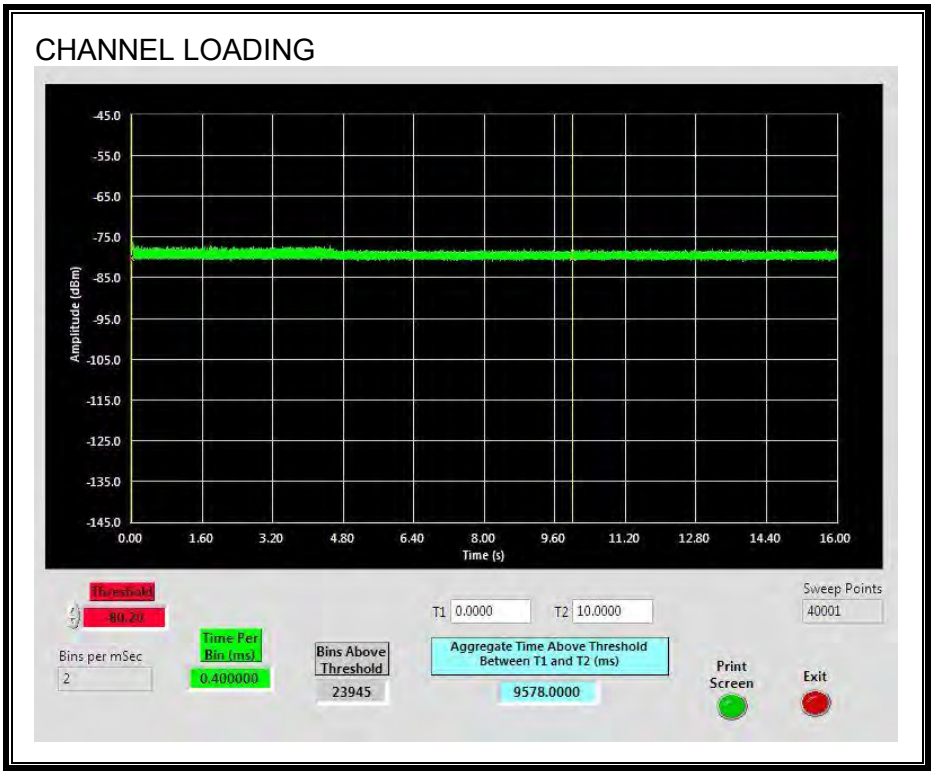
6.10.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 95.78%

6.10.2. CHANNEL AVAILABILITY CHECK TIME

The DFS sensor bandwidth is always equal to or greater than the widest nominal channel bandwidth. Therefore, 40 MHz CAC testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

6.10.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

6.10.4. 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)
0.0132	10

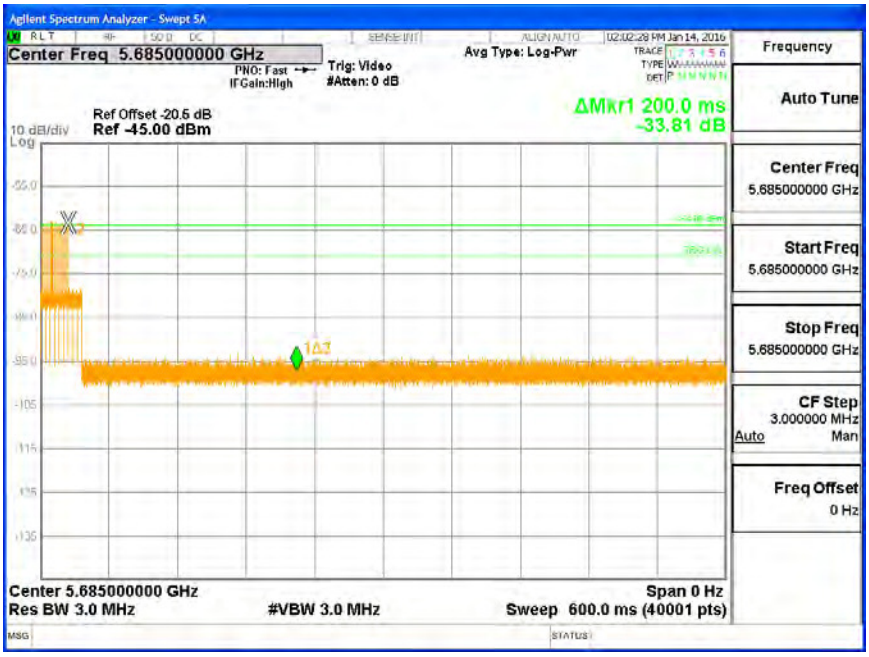
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

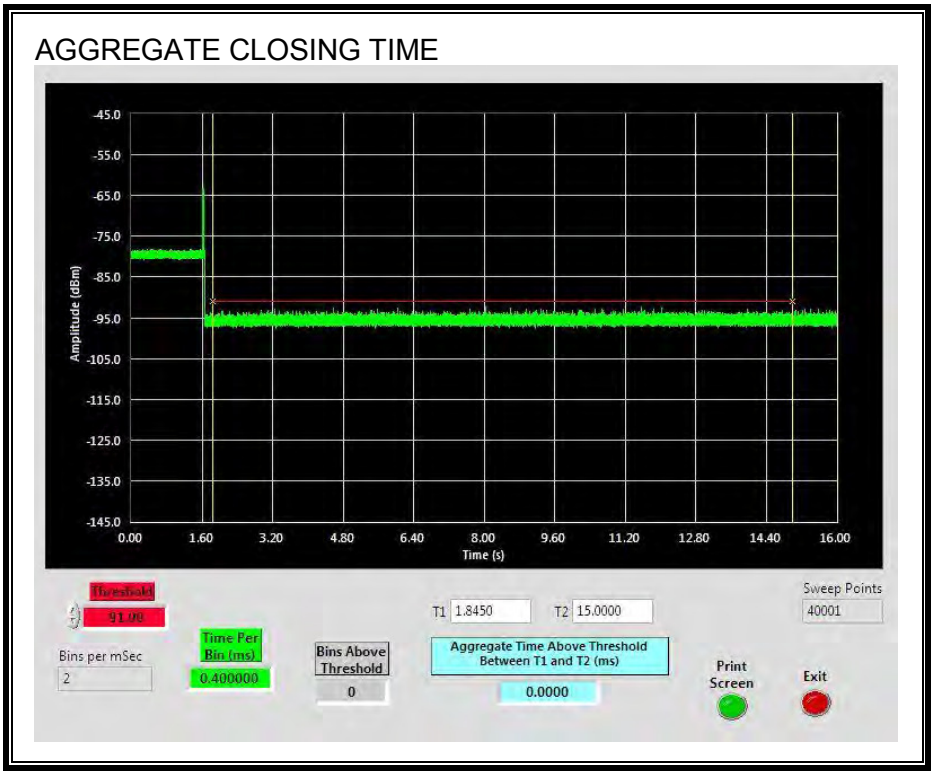
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

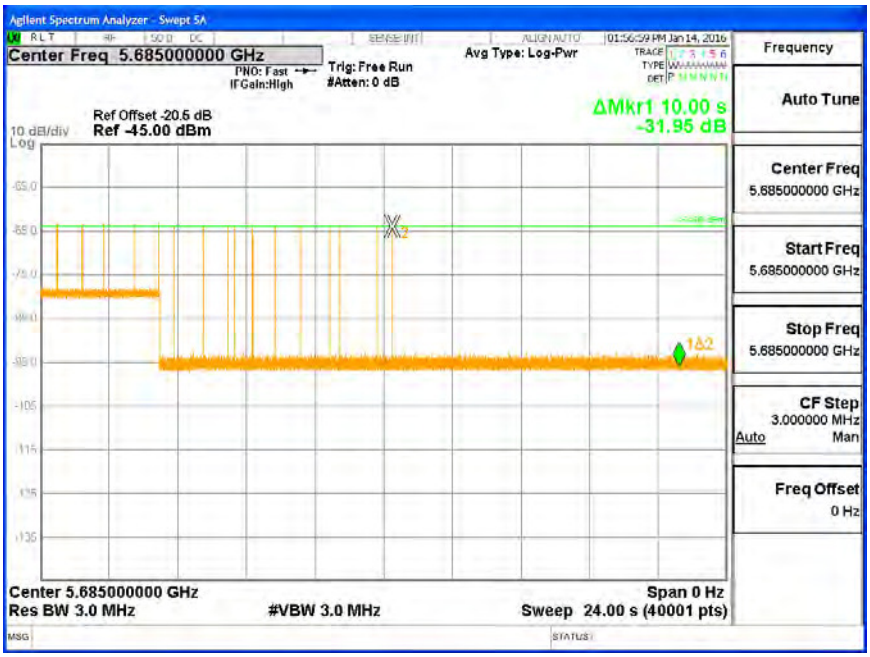
No transmissions are observed during the aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

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

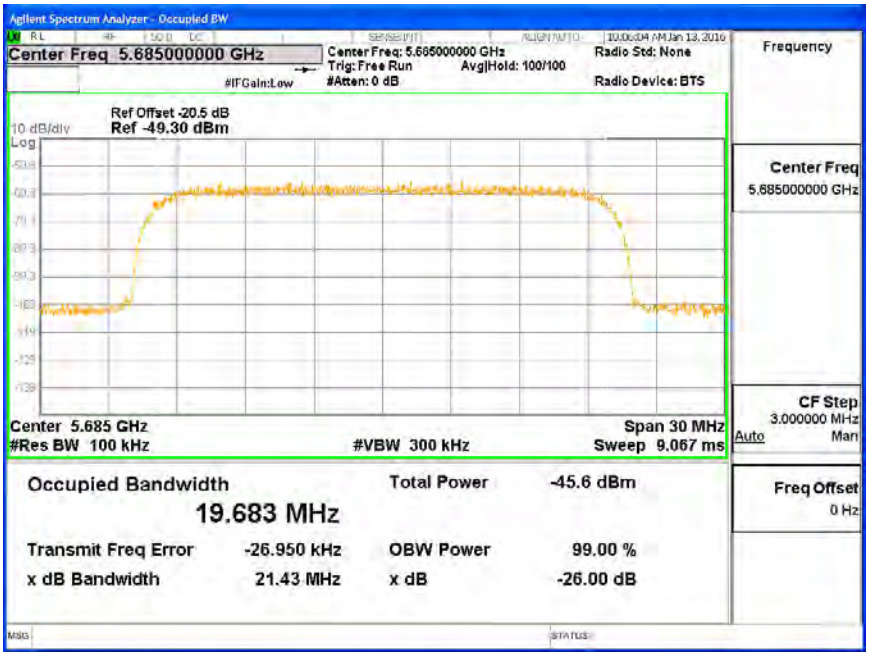
MOVE TIME FOR LONG PULSE RADAR



6.10.5. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5675	5695	20	19.683	101.6	100

The DFS sensor bandwidth is always greater than the widest nominal channel bandwidth. Therefore, 40 MHz Detection Bandwidth testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth.

For the purposes of testing In-Service Monitoring at this channel bandwidth the client has chosen to truncate the Detection Bandwidth to 20 MHz.

6.10.6. 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	100.00	60	Pass	5675	5695		
FCC Short Pulse Type 2	30	93.33	60	Pass	5675	5695		
FCC Short Pulse Type 3	30	96.67	60	Pass	5675	5695		
FCC Short Pulse Type 4	30	93.33	60	Pass	5675	5695		
Aggregate		95.83	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5675	5695	5677	5693
FCC Hopping Type 6	42	100.00	70	Pass	5675	5695		

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	5685	Yes
1002	1	678	78	A	5685	Yes
1003	1	698	76	A	5685	Yes
1004	1	798	67	A	5685	Yes
1005	1	658	81	A	5685	Yes
1006	1	778	68	A	5685	Yes
1007	1	878	61	A	5685	Yes
1008	1	598	89	A	5685	Yes
1009	1	718	74	A	5685	Yes
1010	1	818	65	A	5685	Yes
1011	1	838	63	A	5685	Yes
1012	1	518	102	A	5685	Yes
1013	1	898	59	A	5685	Yes
1014	1	618	86	A	5685	Yes
1015	1	738	72	A	5685	Yes
1016	1	1664	32	B	5685	Yes
1017	1	2491	22	B	5685	Yes
1018	1	1252	43	B	5685	Yes
1019	1	2209	24	B	5685	Yes
1020	1	1099	49	B	5685	Yes
1021	1	990	54	B	5685	Yes
1022	1	2559	21	B	5685	Yes
1023	1	2579	21	B	5685	Yes
1024	1	1729	31	B	5685	Yes
1025	1	684	78	B	5685	Yes
1026	1	1317	41	B	5685	Yes
1027	1	2950	18	B	5685	Yes
1028	1	1164	46	B	5685	Yes
1029	1	2926	19	B	5685	Yes
1030	1	2623	21	B	5685	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	3.6	230	24	5685	Yes
2002	1.8	192	26	5685	No
2003	2.6	186	25	5685	Yes
2004	1	195	24	5685	Yes
2005	4.3	192	27	5685	Yes
2006	1	206	27	5685	No
2007	2.2	170	27	5685	Yes
2008	1.3	187	23	5685	Yes
2009	5	198	27	5685	Yes
2010	2.1	220	23	5685	Yes
2011	4	154	28	5685	Yes
2012	3.5	222	28	5685	Yes
2013	1.6	161	23	5685	Yes
2014	1.3	152	27	5685	Yes
2015	3.7	219	26	5685	Yes
2016	1.6	215	23	5685	Yes
2017	2.3	204	29	5685	Yes
2018	4.6	166	24	5685	Yes
2019	1.3	203	27	5685	Yes
2020	3.8	169	29	5685	Yes
2021	3	210	25	5685	Yes
2022	3.8	180	24	5685	Yes
2023	3.1	225	28	5685	Yes
2024	4.1	161	27	5685	Yes
2025	3.7	172	25	5685	Yes
2026	3	194	28	5685	Yes
2027	2.7	209	29	5685	Yes
2028	2.2	197	26	5685	Yes
2029	4.4	216	28	5685	Yes
2030	4.1	208	25	5685	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	9.4	385	16	5685	Yes
3002	9.3	372	18	5685	Yes
3003	5	340	17	5685	Yes
3004	7.8	473	17	5685	Yes
3005	8.9	336	16	5685	Yes
3006	9.6	481	17	5685	Yes
3007	5.9	357	16	5685	Yes
3008	6.8	265	18	5685	Yes
3009	6	404	17	5685	Yes
3010	7.3	340	17	5685	Yes
3011	6.7	492	18	5685	Yes
3012	5.8	308	17	5685	Yes
3013	5.6	355	17	5685	Yes
3014	10	316	16	5685	Yes
3015	7.6	376	17	5685	Yes
3016	7.2	350	16	5685	Yes
3017	7.8	306	18	5685	Yes
3018	7.7	426	16	5685	Yes
3019	8.5	394	16	5685	Yes
3020	6.2	393	16	5685	Yes
3021	7.3	256	18	5685	Yes
3022	8	402	16	5685	Yes
3023	9.4	278	18	5685	Yes
3024	5.2	436	17	5685	No
3025	9.5	458	16	5685	Yes
3026	5.7	261	16	5685	Yes
3027	5.1	413	17	5685	Yes
3028	9.3	361	16	5685	Yes
3029	9.1	275	16	5685	Yes
3030	8.4	488	18	5685	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	12	297	12	5685	No
4002	16.6	404	15	5685	Yes
4003	12.4	477	14	5685	Yes
4004	17.5	346	15	5685	Yes
4005	13.8	314	14	5685	Yes
4006	19.4	447	15	5685	Yes
4007	11.4	428	15	5685	Yes
4008	12.8	323	14	5685	Yes
4009	15.5	449	14	5685	Yes
4010	17.4	490	13	5685	Yes
4011	15.8	379	16	5685	Yes
4012	18.2	432	15	5685	Yes
4013	17.2	333	16	5685	Yes
4014	15.4	282	16	5685	Yes
4015	14.9	447	12	5685	Yes
4016	13.6	408	14	5685	Yes
4017	18.9	351	15	5685	Yes
4018	13.4	325	16	5685	Yes
4019	19.3	398	12	5685	Yes
4020	14.3	267	13	5685	Yes
4021	10.6	486	13	5685	Yes
4022	16.2	368	14	5685	Yes
4023	13.6	348	13	5685	Yes
4024	19.7	494	12	5685	Yes
4025	12.3	370	12	5685	No
4026	14.2	411	16	5685	Yes
4027	12.6	299	14	5685	Yes
4028	15.1	353	14	5685	Yes
4029	14	254	14	5685	Yes
4030	12.2	454	14	5685	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5683	Yes
2	5681	Yes
3	5684	Yes
4	5682	Yes
5	5690	Yes
6	5688	Yes
7	5678	Yes
8	5678	Yes
9	5679	Yes
10	5692	Yes
11	5688	Yes
12	5686	Yes
13	5686	Yes
14	5692	Yes
15	5692	Yes
16	5690	Yes
17	5684	Yes
18	5691	Yes
19	5680	Yes
20	5691	Yes
21	5679	Yes
22	5682	Yes
23	5685	Yes
24	5681	Yes
25	5692	Yes
26	5680	Yes
27	5678	Yes
28	5679	Yes
29	5687	Yes
30	5692	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

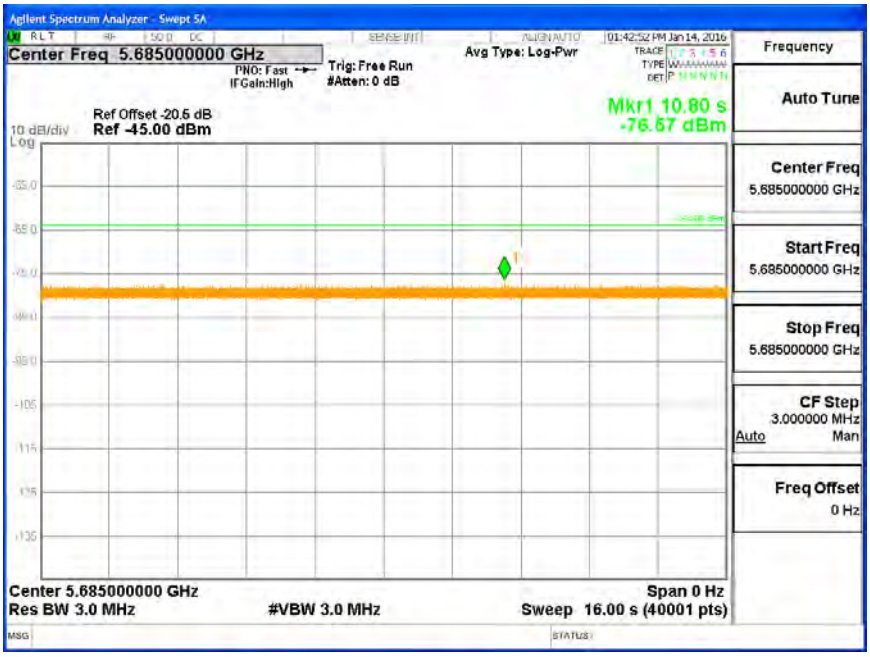
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	251	5675	2	Yes
2	726	5676	3	Yes
3	1201	5677	3	Yes
4	1676	5678	5	Yes
5	2151	5679	4	Yes
6	2626	5680	10	Yes
7	3101	5681	5	Yes
8	3576	5682	3	Yes
9	4051	5683	1	Yes
10	4526	5684	8	Yes
11	5001	5685	5	Yes
12	5476	5686	3	Yes
13	5951	5687	5	Yes
14	6426	5688	5	Yes
15	6901	5689	6	Yes
16	7376	5690	6	Yes
17	7851	5691	4	Yes
18	8326	5692	6	Yes
19	8801	5693	4	Yes
20	9276	5694	3	Yes
21	9751	5695	3	Yes
22	10226	5675	4	Yes
23	10701	5676	2	Yes
24	11176	5677	1	Yes
25	11651	5678	4	Yes
26	12126	5679	5	Yes
27	12601	5680	6	Yes
28	13076	5681	5	Yes
29	13551	5682	5	Yes
30	14026	5683	2	Yes
31	14501	5684	6	Yes
32	15451	5685	5	Yes
33	15926	5686	5	Yes
34	16876	5687	2	Yes
35	17351	5688	5	Yes
36	17826	5689	6	Yes
37	18301	5690	2	Yes
38	18776	5691	6	Yes
39	19726	5692	6	Yes
40	20201	5693	6	Yes
41	20676	5694	7	Yes
42	21151	5695	7	Yes

6.11. HIGH BAND SENSOR 2 RESULTS FOR 40 MHz BANDWIDTH

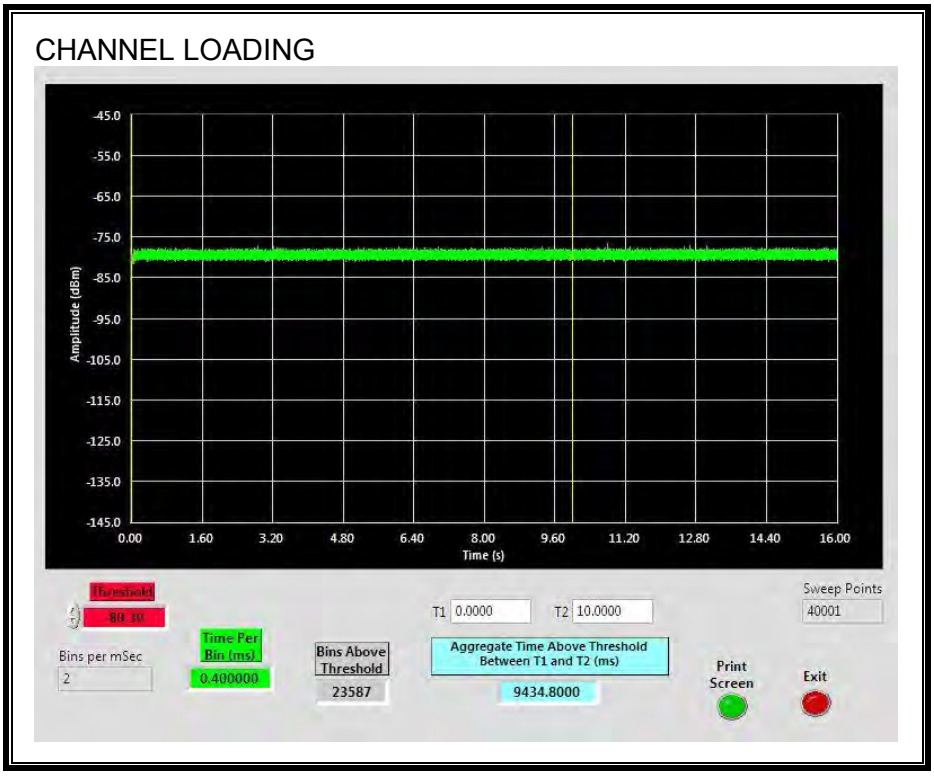
6.11.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 94.34%

6.11.2. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE TEST CHANNEL CYCLE TIME

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5685 MHz) and a log file was generated. Upon completion of the CAC period on both the test channel in 5.6 GHz and the uplink 5.3 GHz, the downlink (which includes the 5.6 GHz DFS band) begins a “discovery phase” and In-Service Monitoring continues on both the 5.3 GHz and the 5.6 GHz DFS bands. The DFS channel enables are passed through the non-DFS connections until a link is established. When the 5.8 GHz downlink connects, the 5.3 GHz Uplink Transmitter is enabled. The 5.2/5.3 GHz Receive Radio then associates to the 5.2/5.3 GHz Transmit Radio. The 5.6/5.8 Receive Radio then associates to the 5.6/5.8 GHz Transmit Radio. After the association process was complete, transmissions began on the test channel. The elapsed time between the end of the CAC period and the start of transmissions on the test channel is the discovery time and association period. This reference measurement and the time stamps within the log file were used to determine when radar bursts were to be triggered at the beginning and end of the CAC period.

Note: The beginning of the CAC period is designated as the initialization of DFS sensor 2 (“RRC DFS[2]:sensor init”) in the log file. Two DFS sensors are initialized in sequence but CAC does not begin until the timestamp on the second initialization.

PROCEDURE FOR TIMING OF RADAR BURST

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5685 MHz) and a log file was generated. A radar signal was triggered on the test channel between 0 to 6 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The AC power was then again toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5685 MHz) and a log file was generated. A radar signal was triggered on the test channel between 54 to 60 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The log file recorded the timing of these events. The time from the beginning of the CAC on the test channel to the detection of the radar burst on the test channel was measured.

APPROXIMATE QUANTITATIVE RESULTS BASED ON RF MARKERS

NO RADAR TRIGGERED ON THE TEST CHANNEL

The time between the beginning of the CAC period and the start of transmissions on the test channel minus the elapsed time for the Receive Radio to associate to the Transmit Radio is the CAC time.

RADAR TRIGGERED ON THE TEST CHANNEL

The time from the beginning of the CAC period to the radar burst on the test channel was measured as the approximate relative time from the start of the CAC.

No Radar Triggered

Start of CAC at 5685 MHz (sec)	End of CAC at 5685 MHz (sec)	CAC Time (sec)
130.2	191.2	61.0

Radar Near Beginning of CAC

Start of CAC at 5685 MHz (sec)	Timing of Radar Burst at 5685 MHz (sec)	Radar Relative to Start of CAC at 5685 MHz (sec)
157.5	159.5	2.0

Radar Near End of CAC

Start of CAC at 5685 MHz (sec)	Timing of Radar Burst at 5685 MHz (sec)	Radar Relative to Start of CAC at 5685 MHz (sec)
157.3	215.3	58.0

QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start of CAC at 5685 MHz (hh:mm:ss)	End of CAC at 5685 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
0:02:18	0:03:19	0:01:01

Radar Near Beginning of CAC

Start of CAC at 5685 MHz (hh:mm:ss)	Radar Detected at 5685 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:28	0:02:30	0:00:02

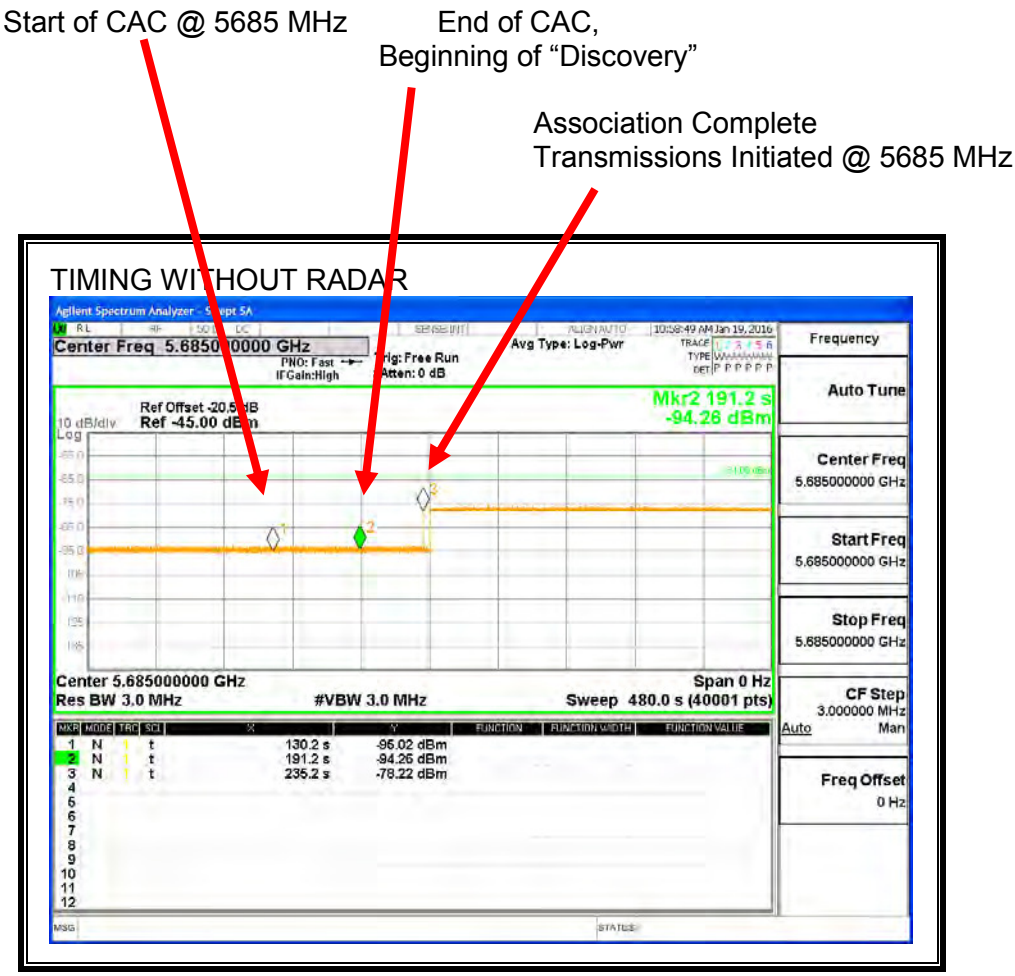
Radar Near End of CAC

Start of CAC at 5685 MHz (hh:mm:ss)	Radar Detected at 5685 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:28	0:03:26	0:00:58

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 the completion of the association period following 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



Transmissions begin on intended channel after completion of CAC.

EUT RADAR EVENTS LOG FILE - CAC TIMING WITHOUT RADAR

Jan 1 00:02:15 IBR daemon.alert mgd: RRC_DFS: l_lbe(5250), l_ube(5329), h_lbe(5630), h_ube(5709)

Jan 1 00:02:15 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel change request, Fc = 5290, BW = 80

Jan 1 00:02:15 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel change request, Fc = 5670, BW = 80

Jan 1 00:02:15 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(17791)

Jan 1 00:02:18 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5630-5710 MHz: ts(20460)

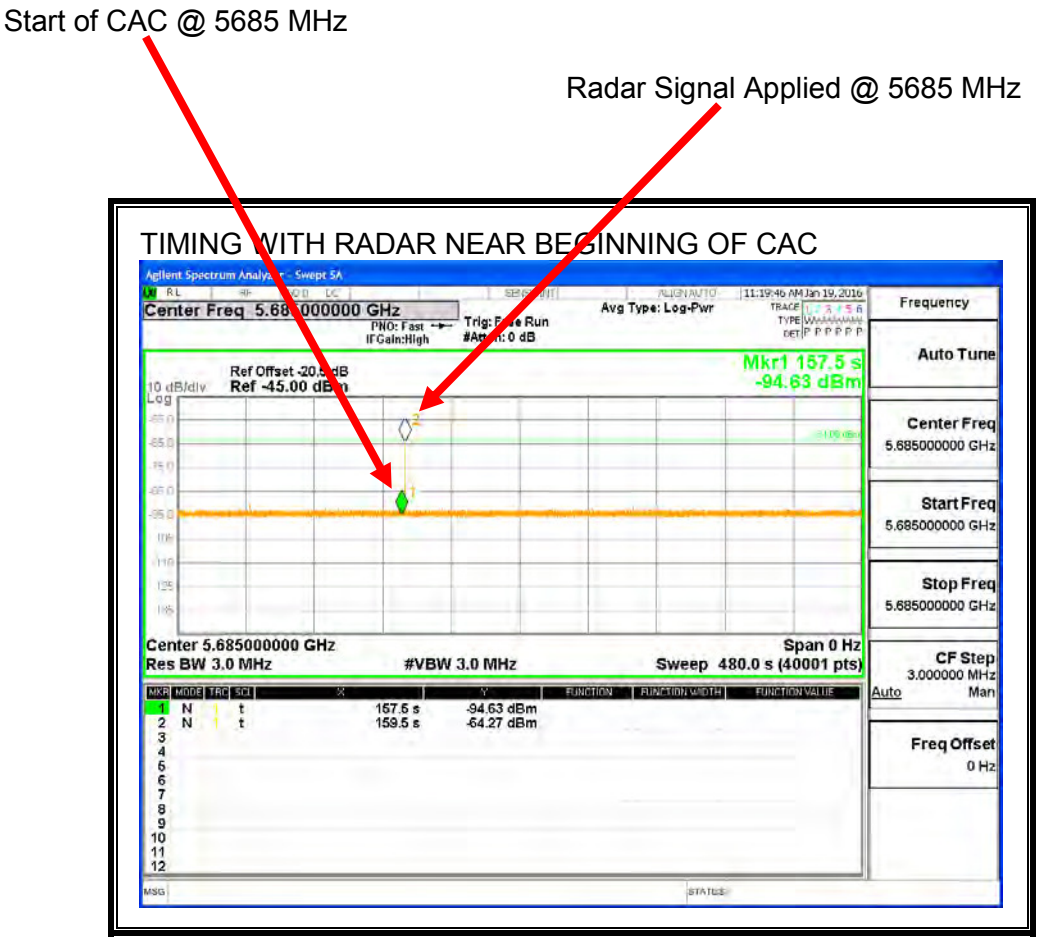
Jan 1 00:03:19 IBR daemon.alert mgd: RRC DFS: TStamp = 81460 msec, CAC DONE

Jan 1 00:03:50 IBR daemon.notice mgd: Tx Frequency change: From [5810] / To [5685]

Jan 1 00:04:04 IBR daemon.alert mgd: TX_T10 : Rx[5210 MHz] Tx[5685 MHz] CIR = 0

Jan 1 00:04:03 IBR daemon.info mgd: TRAP: 13|Radio Link Operational

TIMING WITH RADAR NEAR BEGINNING OF CAC



No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - BEGINNING OF CAC

Jan 1 00:02:28 IBR daemon.alert mgd: RRC_DFS: l_lbe(5250), l_ube(5329), h_lbe(5630), h_ube(5709)

Jan 1 00:02:28 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel change request, Fc = 5290, BW = 80

Jan 1 00:02:28 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel change request, Fc = 5670, BW = 80

Jan 1 00:02:28 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(13236)

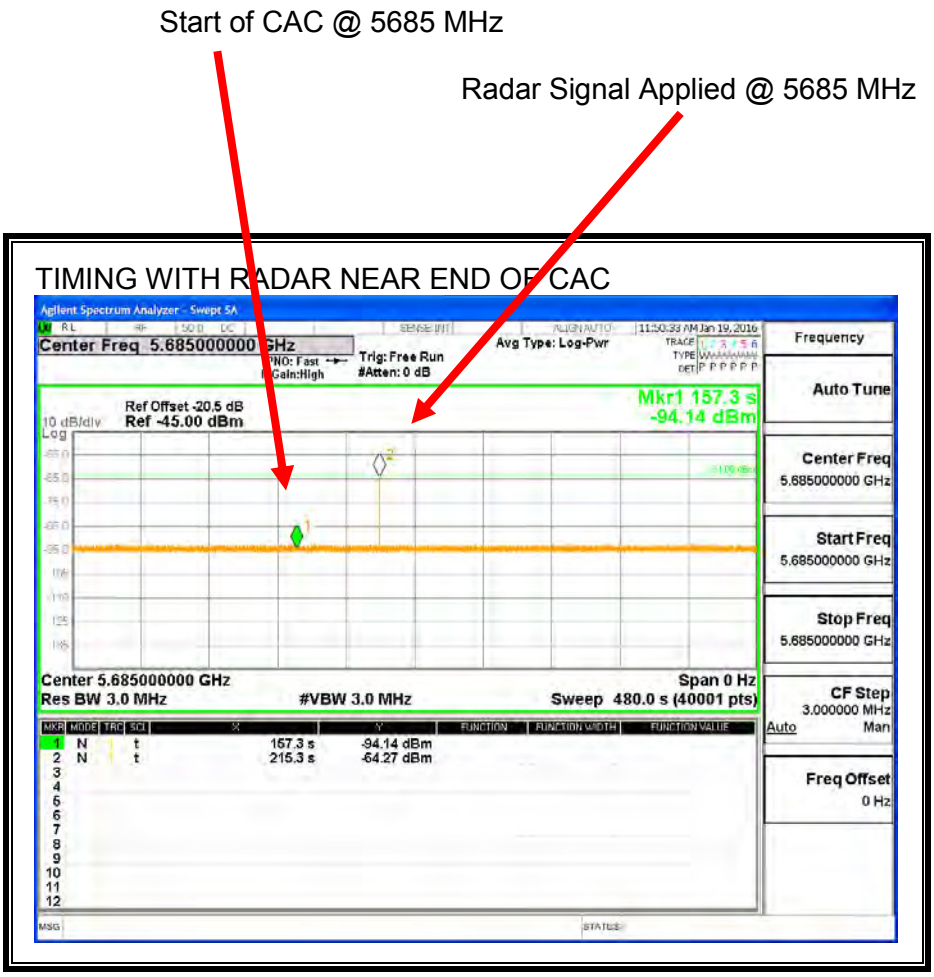
Jan 1 00:02:28 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5630-5710 MHz: ts(15996)

Jan 1 00:02:30 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5665),oe(5705),as(5665),ae(5705)

Jan 1 00:02:30 IBR daemon.alert mgd: RRC_DFS_RADAR_DET: start(5665),end(5705),tb(1),ctb(1),rs(2),mm(8),g_x(0)

Jan 1 00:02:30 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:02:30 IBR daemon.alert mgd: 5470 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5490 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5510 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5530 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5550 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5570 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5590 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5610 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5630 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5650 Mhz: 00:00 00:00 00:00 31:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5670 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5690 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:02:30 IBR daemon.alert mgd: 5710 Mhz: 00:00 00:00 00:00 00:00

TIMING WITH RADAR NEAR END OF CAC



No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - END OF CAC

Jan 1 00:02:25 IBR daemon.alert mgd: RRC_DFS: l_lbe(5250), l_ube(5329), h_lbe(5630), h_ube(5709)

Jan 1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel change request, Fc = 5290, BW = 80

Jan 1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel change request, Fc = 5670, BW = 80

Jan 1 00:02:26 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(14648)

Jan 1 00:02:28 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5630-5710 MHz: ts(17321
)
Jan 1 00:03:26 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5665),oe(5705),as(5665),ae(5705)

Jan 1 00:03:26 IBR daemon.alert mgd: RRC_DFS_RADAR_DET: start(5665),end(5705),tb(1),ctb(1),rs(2),mm(8),g_x(0)

Jan 1 00:03:26 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:03:26 IBR daemon.alert mgd: 5470 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5490 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5510 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5530 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5550 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5570 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5590 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5610 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5630 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5650 Mhz: 00:00 00:00 00:00 31:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5670 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5690 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:03:26 IBR daemon.alert mgd: 5710 Mhz: 00:00 00:00 00:00 00:00

6.11.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

6.11.4. 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)
0.012	10

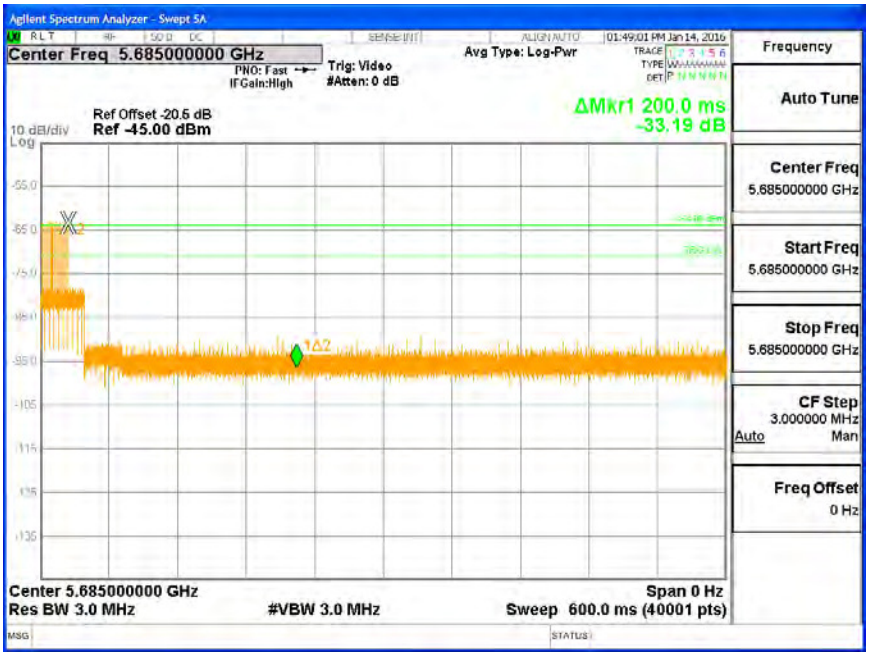
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

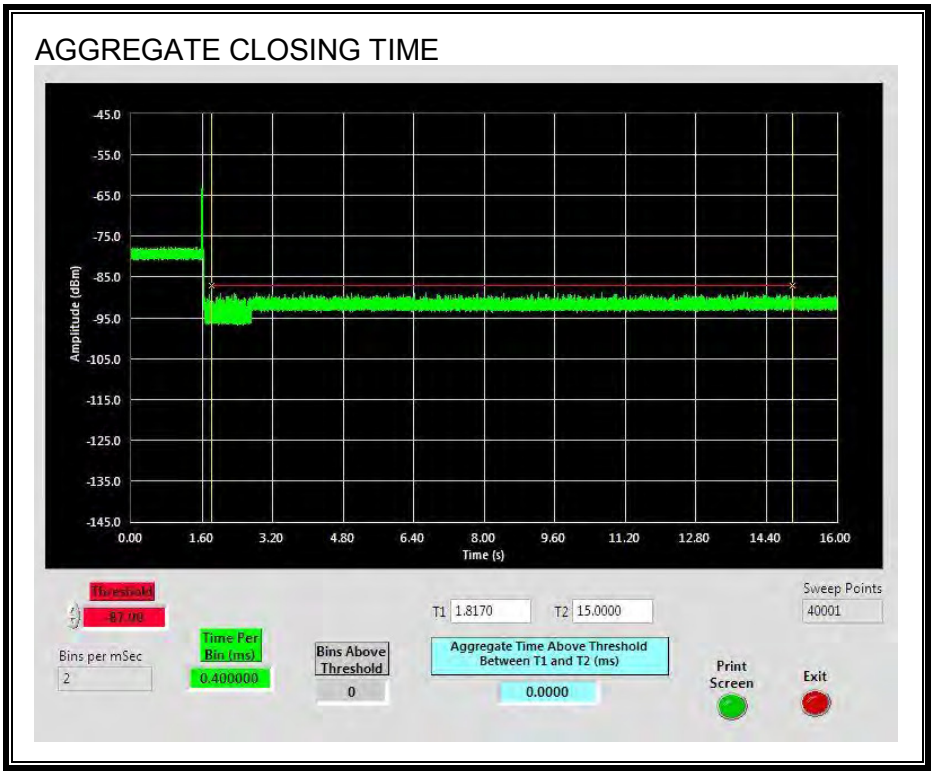
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

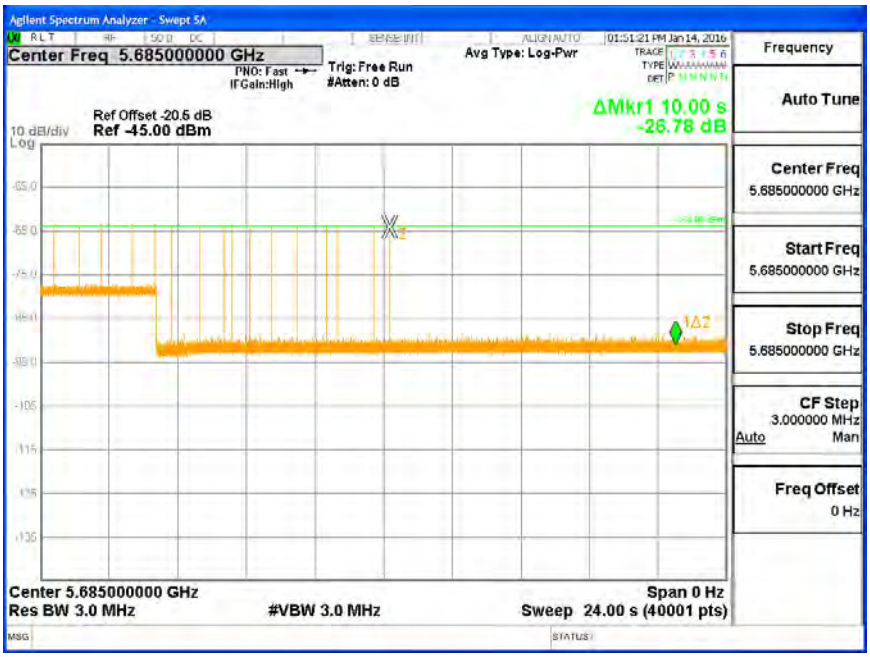
No transmissions are observed during the aggregate monitoring period.



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

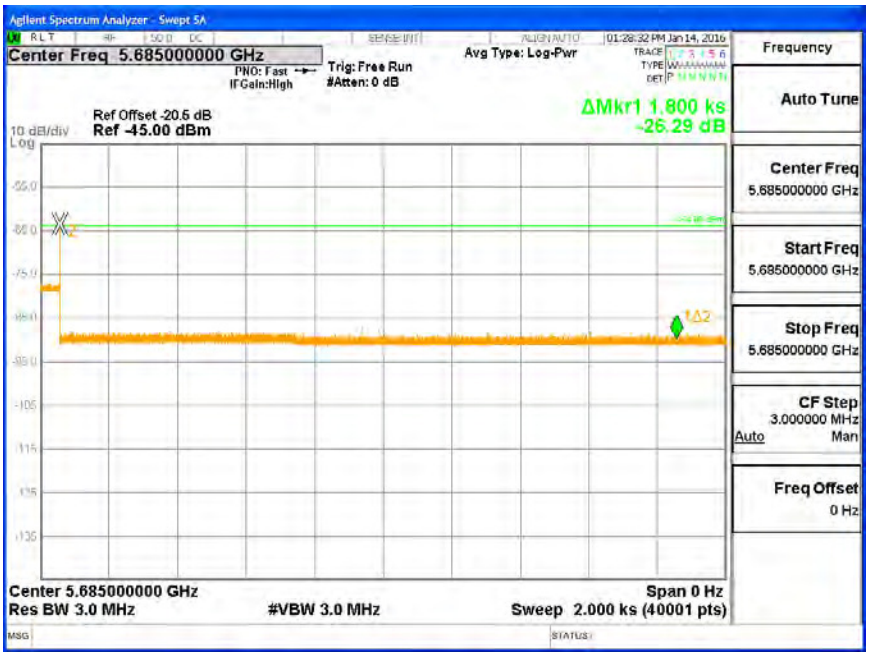


6.11.5. NON-OCCUPANCY PERIOD

RESULTS

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

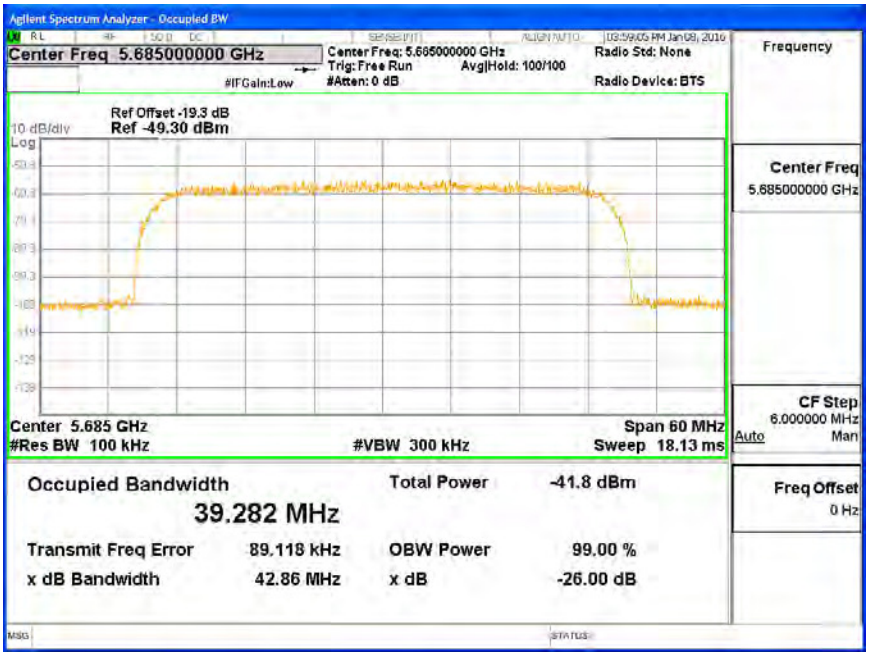
NON-OCCUPANCY PERIOD



6.11.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5665	5705	40	39.282	101.8	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5665	10	10	100	FL
5670	10	10	100	
5675	10	10	100	
5680	10	10	100	
5685	10	10	100	
5690	10	10	100	
5695	10	10	100	
5700	10	10	100	
5705	10	10	100	FH

6.11.7. 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	90.00	60	Pass	5665	5705		
FCC Short Pulse Type 2	30	90.00	60	Pass	5665	5705		
FCC Short Pulse Type 3	30	96.67	60	Pass	5665	5705		
FCC Short Pulse Type 4	30	93.33	60	Pass	5665	5705		
Aggregate		92.50	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5665	5705	5669	5701
FCC Hopping Type 6	41	95.12	70	Pass	5665	5705		

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	5685	No
1002	1	678	78	A	5685	Yes
1003	1	698	76	A	5685	No
1004	1	798	67	A	5685	Yes
1005	1	658	81	A	5685	Yes
1006	1	778	68	A	5685	Yes
1007	1	878	61	A	5685	Yes
1008	1	598	89	A	5685	No
1009	1	718	74	A	5685	Yes
1010	1	818	65	A	5685	Yes
1011	1	838	63	A	5685	Yes
1012	1	518	102	A	5685	Yes
1013	1	898	59	A	5685	Yes
1014	1	618	86	A	5685	Yes
1015	1	738	72	A	5685	Yes
1016	1	1664	32	B	5685	Yes
1017	1	2491	22	B	5685	Yes
1018	1	1252	43	B	5685	Yes
1019	1	2209	24	B	5685	Yes
1020	1	1099	49	B	5685	Yes
1021	1	990	54	B	5685	Yes
1022	1	2559	21	B	5685	Yes
1023	1	2579	21	B	5685	Yes
1024	1	1729	31	B	5685	Yes
1025	1	684	78	B	5685	Yes
1026	1	1317	41	B	5685	Yes
1027	1	2950	18	B	5685	Yes
1028	1	1164	46	B	5685	Yes
1029	1	2926	19	B	5685	Yes
1030	1	2623	21	B	5685	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	3.6	230	24	5685	Yes
2002	1.8	192	26	5685	Yes
2003	2.6	186	25	5685	Yes
2004	1	195	24	5685	No
2005	4.3	192	27	5685	Yes
2006	1	206	27	5685	No
2007	2.2	170	27	5685	Yes
2008	1.3	187	23	5685	Yes
2009	5	198	27	5685	Yes
2010	2.1	220	23	5685	No
2011	4	154	28	5685	Yes
2012	3.5	222	28	5685	Yes
2013	1.6	161	23	5685	Yes
2014	1.3	152	27	5685	Yes
2015	3.7	219	26	5685	Yes
2016	1.6	215	23	5685	Yes
2017	2.3	204	29	5685	Yes
2018	4.6	166	24	5685	Yes
2019	1.3	203	27	5685	Yes
2020	3.8	169	29	5685	Yes
2021	3	210	25	5685	Yes
2022	3.8	180	24	5685	Yes
2023	3.1	225	28	5685	Yes
2024	4.1	161	27	5685	Yes
2025	3.7	172	25	5685	Yes
2026	3	194	28	5685	Yes
2027	2.7	209	29	5685	Yes
2028	2.2	197	26	5685	Yes
2029	4.4	216	28	5685	Yes
2030	4.1	208	25	5685	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	9.4	385	16	5685	Yes
3002	9.3	372	18	5685	Yes
3003	5	340	17	5685	Yes
3004	7.8	473	17	5685	Yes
3005	8.9	336	16	5685	Yes
3006	9.6	481	17	5685	Yes
3007	5.9	357	16	5685	Yes
3008	6.8	265	18	5685	Yes
3009	6	404	17	5685	Yes
3010	7.3	340	17	5685	Yes
3011	6.7	492	18	5685	Yes
3012	5.8	308	17	5685	Yes
3013	5.6	355	17	5685	No
3014	10	316	16	5685	Yes
3015	7.6	376	17	5685	Yes
3016	7.2	350	16	5685	Yes
3017	7.8	306	18	5685	Yes
3018	7.7	426	16	5685	Yes
3019	8.5	394	16	5685	Yes
3020	6.2	393	16	5685	Yes
3021	7.3	256	18	5685	Yes
3022	8	402	16	5685	Yes
3023	9.4	278	18	5685	Yes
3024	5.2	436	17	5685	Yes
3025	9.5	458	16	5685	Yes
3026	5.7	261	16	5685	Yes
3027	5.1	413	17	5685	Yes
3028	9.3	361	16	5685	Yes
3029	9.1	275	16	5685	Yes
3030	8.4	488	18	5685	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	12	297	12	5685	Yes
4002	16.6	404	15	5685	No
4003	12.4	477	14	5685	Yes
4004	17.5	346	15	5685	Yes
4005	13.8	314	14	5685	Yes
4006	19.4	447	15	5685	Yes
4007	11.4	428	15	5685	Yes
4008	12.8	323	14	5685	Yes
4009	15.5	449	14	5685	Yes
4010	17.4	490	13	5685	Yes
4011	15.8	379	16	5685	No
4012	18.2	432	15	5685	Yes
4013	17.2	333	16	5685	Yes
4014	15.4	282	16	5685	Yes
4015	14.9	447	12	5685	Yes
4016	13.6	408	14	5685	Yes
4017	18.9	351	15	5685	Yes
4018	13.4	325	16	5685	Yes
4019	19.3	398	12	5685	Yes
4020	14.3	267	13	5685	Yes
4021	10.6	486	13	5685	Yes
4022	16.2	368	14	5685	Yes
4023	13.6	348	13	5685	Yes
4024	19.7	494	12	5685	Yes
4025	12.3	370	12	5685	Yes
4026	14.2	411	16	5685	Yes
4027	12.6	299	14	5685	Yes
4028	15.1	353	14	5685	Yes
4029	14	254	14	5685	Yes
4030	12.2	454	14	5685	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5701	Yes
2	5673	Yes
3	5683	Yes
4	5677	Yes
5	5687	Yes
6	5689	Yes
7	5696	Yes
8	5685	Yes
9	5695	Yes
10	5679	Yes
11	5671	Yes
12	5699	Yes
13	5698	Yes
14	5680	Yes
15	5695	Yes
16	5689	Yes
17	5689	Yes
18	5669	Yes
19	5680	Yes
20	5693	Yes
21	5673	Yes
22	5686	Yes
23	5687	Yes
24	5696	Yes
25	5697	Yes
26	5696	Yes
27	5681	Yes
28	5694	Yes
29	5689	Yes
30	5676	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	45	5665	9	Yes
2	520	5666	5	Yes
3	995	5667	10	Yes
4	1470	5668	5	Yes
5	1945	5669	8	Yes
6	2420	5670	3	Yes
7	2895	5671	9	Yes
8	3370	5672	9	Yes
9	3845	5673	10	Yes
10	4320	5674	8	Yes
11	4795	5675	6	Yes
12	5270	5676	13	Yes
13	5745	5677	9	Yes
14	6220	5678	9	Yes
15	6695	5679	6	Yes
16	7170	5680	7	Yes
17	7645	5681	11	Yes
18	8120	5682	6	Yes
19	8595	5683	8	Yes
20	9070	5684	13	Yes
21	9545	5685	11	Yes
22	10020	5686	10	Yes
23	10495	5687	15	Yes
24	10970	5688	10	Yes
25	11445	5689	10	Yes
26	11920	5690	3	Yes
27	12395	5691	4	Yes
28	12870	5692	8	Yes
29	13345	5693	6	Yes
30	13820	5694	8	Yes
31	14295	5695	10	Yes
32	14770	5696	7	Yes
33	15245	5697	12	Yes
34	15720	5698	14	Yes
35	16195	5699	9	No
36	16670	5700	5	No
37	17145	5701	9	Yes
38	17620	5702	6	Yes
39	18095	5703	9	Yes
40	18570	5704	10	Yes
41	19045	5705	9	Yes

6.12. HIGH BAND CAC DUAL SENSOR BAND BLOCKING VERIFICATION

6.12.1. TEST PROCEDURE

The spectrum analyzer is tuned to 5665 MHz and the log file from the EUT records the events.

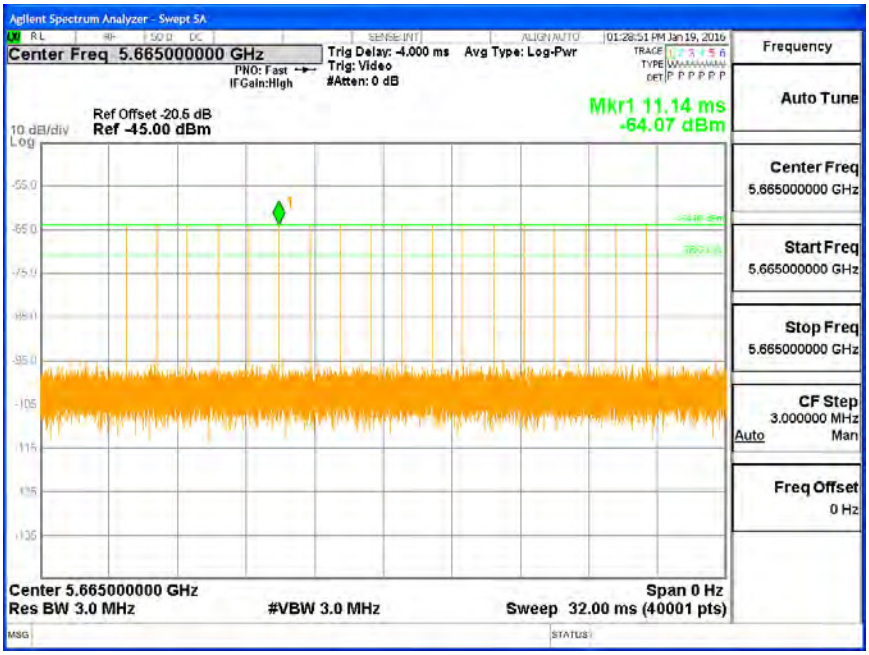
The power to the EUT is cycled and a sweep is concurrently started on the spectrum analyzer. After the EUT boots-up a CAC period is simultaneously performed on 5665 MHz and 5705 MHz.

A radar burst is triggered on 5665 MHz approximately 8 seconds into the CAC period. In response to this the EUT places 5665 MHz on the blocked channel list. A radar burst is then triggered approximately 52 seconds later on 5705 MHz. After the second detection the EUT places 5705 MHz on the blocked channel list and removes itself from service in the 5.7 GHz band.

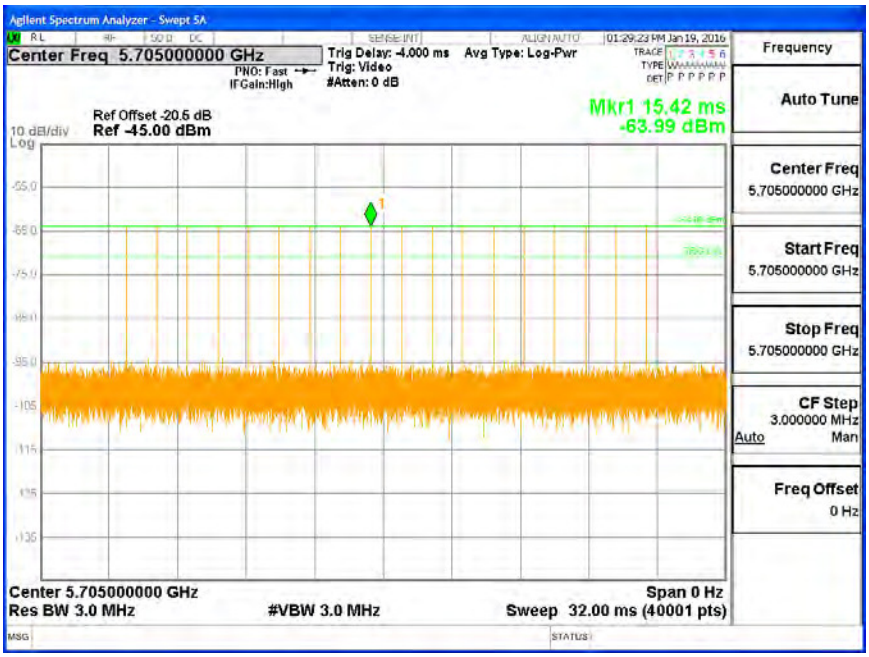
Once the non-occupancy period is complete on 5665 MHz the channel is cleared from the blocked channel list. A CAC period is performed on the cleared channel and upon successful completion the EUT enters service.

6.12.2. RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 0 AT 5665 MHz



SHORT PULSE RADAR TYPE 0 AT 5705 MHz



6.12.3. TEST RESULTS

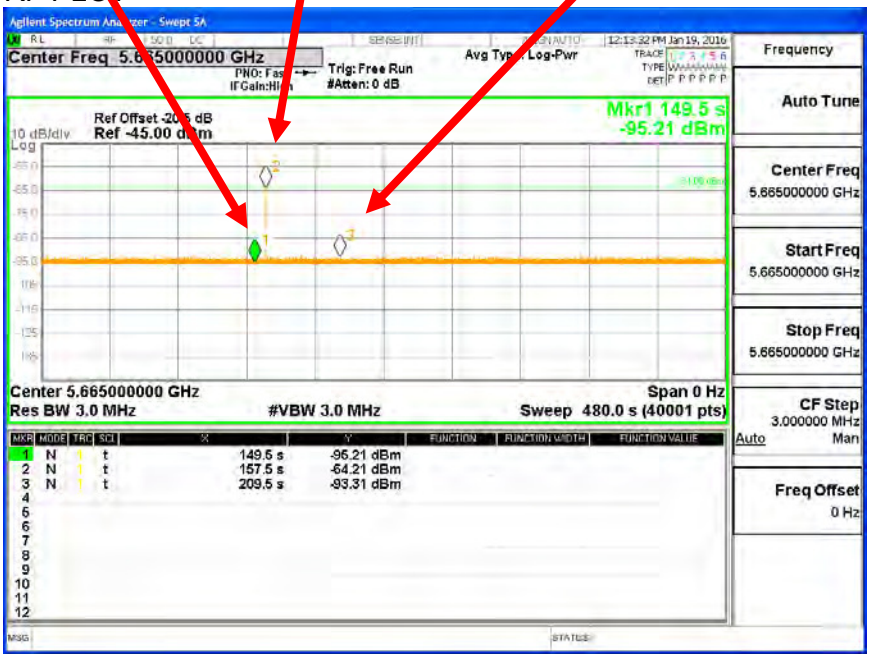
RF PLOT

CAC @ 5665 MHz and 5705 MHz

Radar @ 5665 MHz

Radar @ 5705 MHz

RF PLOT



LOG FILE

Jan 1 00:02:17 IBR daemon.alert mgd: RRC_DFS: l_lbe(5250), l_ube(5329), h_lbe(5645), h_ube(5724)

Jan 1 00:02:17 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel change request, Fc = 5290, BW = 80

Jan 1 00:02:17 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel change request, Fc = 5685, BW = 80

Jan 1 00:02:17 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq band 5250-5330 MHz: ts(17593)

Jan 1 00:02:20 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq band 5645-5725 MHz: ts(20266)

Jan 1 00:02:28 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5644),oe(5684),as(5644),ae(5684)

Jan 1 00:02:28 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:02:28 IBR daemon.alert mgd: 5470 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5490 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5510 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5530 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5550 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5570 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5590 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5610 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5630 Mhz: 00:00 00:00 31:00 31:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5650 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5670 Mhz: 31:00 31:00 31:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5690 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:02:28 IBR daemon.alert mgd: 5710 Mhz: 00:00 00:00 00:00 00:00

Jan 1 00:02:28 IBR daemon.alert mgd: RRC_DFS_RADAR_DET: start(5644),end(5684),tb(1),ctb(1),rs(2),mm(8),g_x(0)

Jan 1 00:02:28 IBR daemon.alert mgd: RRC_DFS:RADAR DETECTED trigger soft_reset

Jan 1 00:03:20 IBR daemon.alert mgd: RRC_DFS_RADAR:os(5686),oe(5726),as(5686),ae(5725)

Jan 1 00:03:20 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan 1 00:03:20 IBR daemon.alert mgd: 5470 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5490 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5510 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5530 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5550 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5570 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5590 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5610 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5630 Mhz: 00:00 00:00 30:08 30:08
Jan 1 00:03:20 IBR daemon.alert mgd: 5650 Mhz: 30:08 30:08 30:08 30:08
Jan 1 00:03:20 IBR daemon.alert mgd: 5670 Mhz: 30:08 30:08 30:08 31:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5690 Mhz: 31:00 31:00 31:00 31:00
Jan 1 00:03:20 IBR daemon.alert mgd: 5710 Mhz: 31:00 31:00 31:00 31:00

Jan 1 00:03:20 IBR daemon.alert mgd: RRC_DFS_RADAR_DET:
start(5686),end(5725),tb(1),ctb(1),rs(2),mm(8),g_x(0)

Jan 1 00:03:20 IBR daemon.alert mgd: RRC_DFS:RADAR DETECTED trigger soft_reset

Jan 1 00:03:20 IBR daemon.alert mgd:
RRC_DFS_RADAR:os(5684),oe(5724),as(5684),ae(5724)

8. ADDENDUM: CLIENT DIRECTED 5 GHz BAND CARRIER AGGREGATION TESTING PER FCC GUIDELINE THROUGH MANUFACTURER KDB

8.1. INTRODUCTION

8.1.1. MANUFACTURER DIRECTED TEST

The tests in section 9 were directed by manufacturer based on their interpretation of the FCC guidelines through manufacturer KDB.

8.1.2. LIMITS

INDUSTRY CANADA

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

RSS-247 Issue 1

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

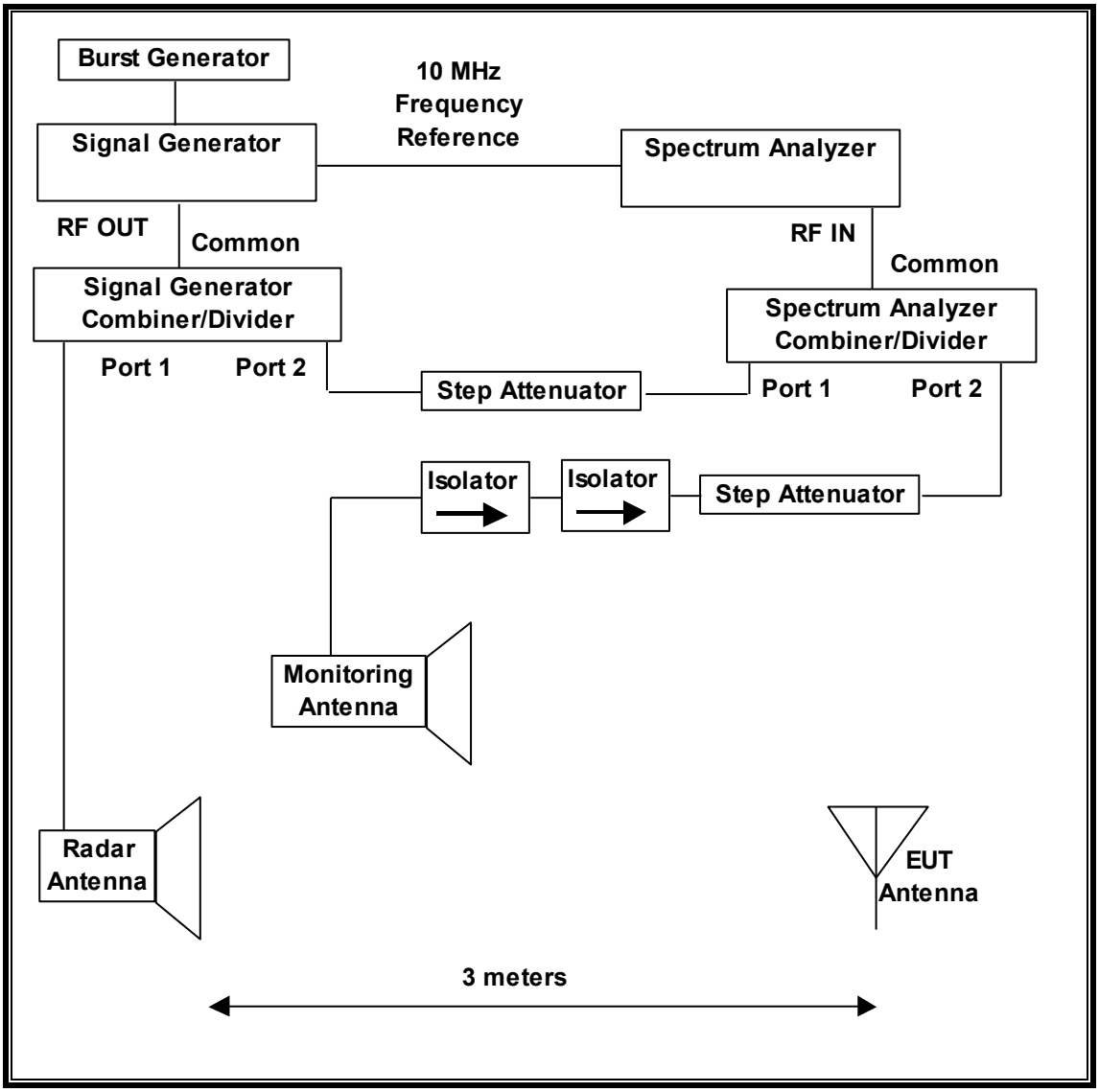
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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

8.1.3. 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 performed from August 19 to 25, 2016 that are documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	US51350187	06/13/17
Signal Generator, MXG X-Series RF Vector	Agilent	N5182B	MY51350337	03/11/17
Arbitrary Waveform Generator	Agilent / HP	33220A	MY44037572	04/11/17

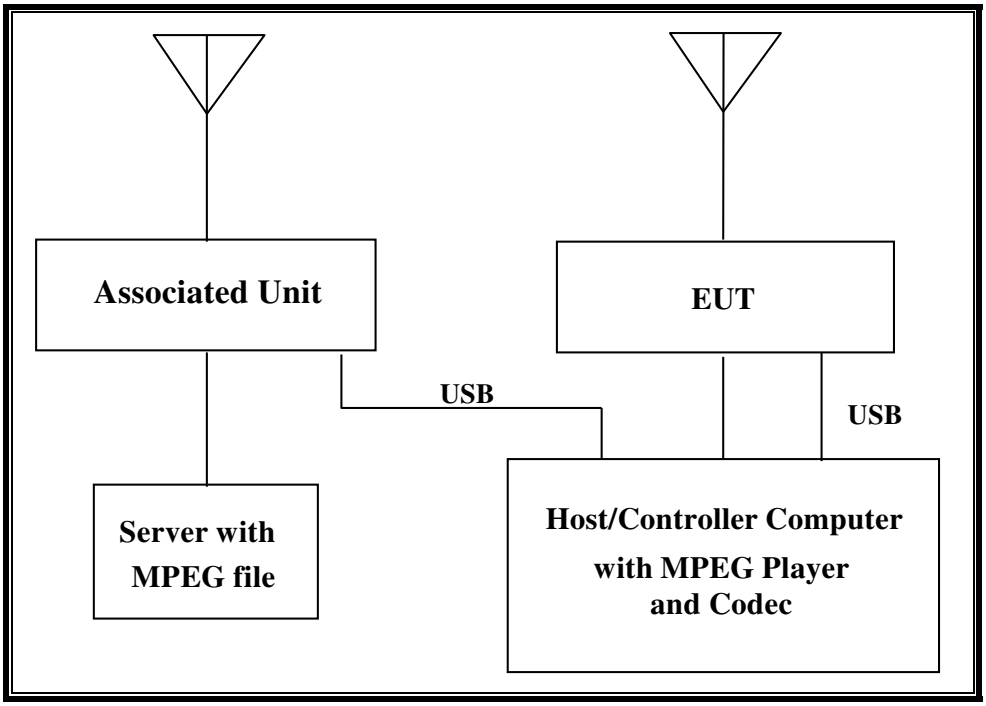
8.1.4. TEST AND MEASUREMENT SOFTWARE

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

TEST SOFTWARE LIST		
Name	**Version**	**Test / Function**
Aggregate Time-PXA	3.0	Channel Loading and Aggregate Closing Time
In Service Monitoring-PXA	3.0	In-Service Monitoring (Probability of Detection)
PXA Read	3.0.0.9	Signal Generator Screen Capture
SGXProject.exe	1.7	Radar Waveform Generation and Download

8.1.5. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP

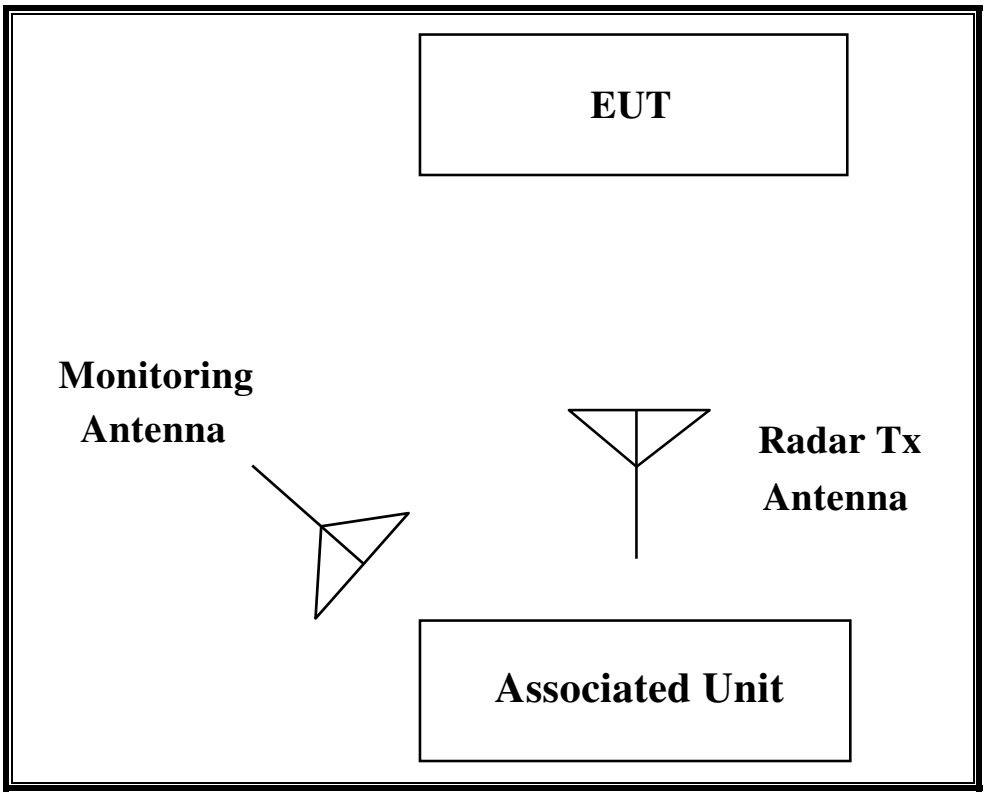


SUPPORT EQUIPMENT

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

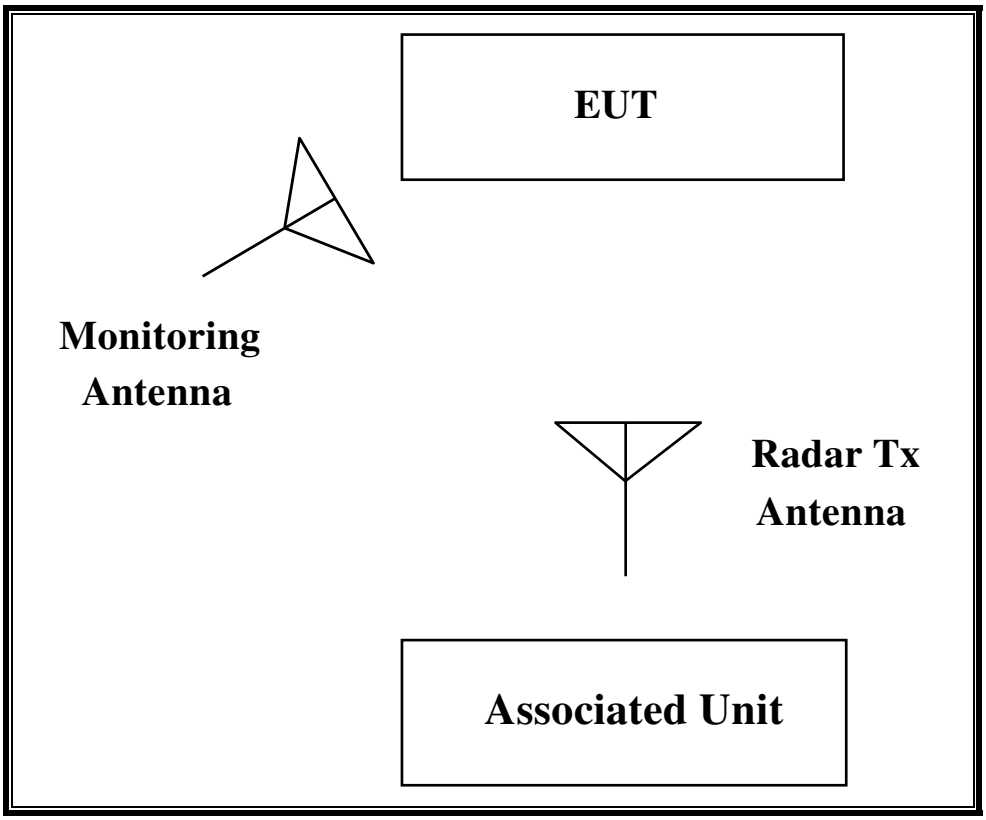
PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
P.O.E. Injector (EUT)	Tycon	TP-POE-HP-56G-FBN	14C000074ARC00	DoC
Intelligent Backhaul Radio with Band Switching (Associated Unit)	Fastback	IBR-1300-NA	50015470006	2AAEH-107
P.O.E. Injector (Associated Unit)	Tycon	TP-POE-HP-56G-FBN	152000012ARC00	DoC
Notebook PC (Host/Controller)	Lenovo	Type 4276-37U	R9-H8Y3C 11/10	DoC
AC Adapter (Host/Controller PC)	Lenovo	45N0113	11S45N0113Z1ZHX8	DoC
Notebook PC (Server)	Lenovo	Type 2438-52U	RPK-03WNR 13/07	DoC
AC Adapter (Server PC)	Lenovo	45N0113	11S45N0113Z1ZHX8	DoC

MONITORING CONFIGURATION 1:



Note: Monitoring Configuration 1 was used during Traffic/Channel Loading, Channel Move/Aggregate Time and Non-Occupancy testing.

MONITORING CONFIGURATION 2:



Note: Monitoring Configuration 2 was used during CAC testing.

8.1.6. DESCRIPTION OF EUT

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

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

The EUT is a Master Device.

The only DFS antenna assembly utilized with the EUT has a declared gain of 0 dBi.

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

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

The EUT uses two transmitter chains connected to the antennas to perform radiated tests.

The EUT provides radar detection capability for its associated transmitter.

The EUT is a Frame-based system. The Frame timing is set to a listen / talk ratio of 95%.

WLAN traffic is generated by streaming the video file TestFile.mp2 “6 ½ Magic Hours” from the Slave Transmitter to the Master Receiver 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).

Three nominal channel bandwidths are implemented: 10 MHz, 20 MHz and 40 MHz.

The EUT always starts using a channel bandwidth of 10 MHz. After it has entered the operational phase when traffic can be passed it may select 10 MHz, 20 MHz or 40 MHz channel bandwidths depending on channel conditions.

The DFS sensor bandwidth is always wider than the widest nominal channel bandwidth. Therefore, 40 MHz Detection Bandwidth and CAC testing covers all nominal channel bandwidths.

The In-Service Monitoring tests were performed for each of the operational bandwidths.

The software installed in the access point is revision 1.8.0

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

9. CLIENT DIRECTED CARRIER AGGREGATION MASTER DFS TEST RESULTS

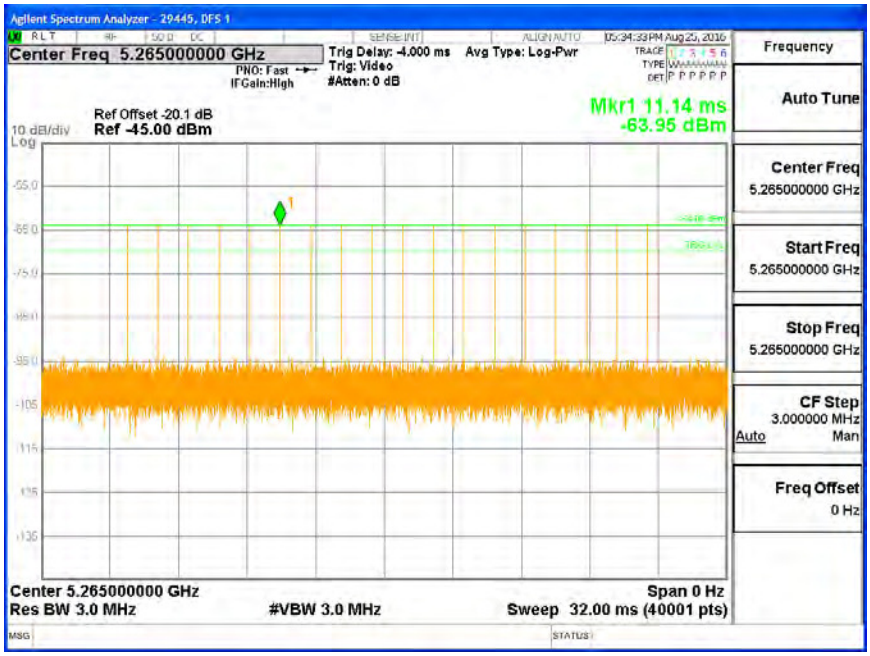
9.1. LOW BAND TEST CHANNEL 1

All tests were performed at a channel center frequency of 5265 MHz.

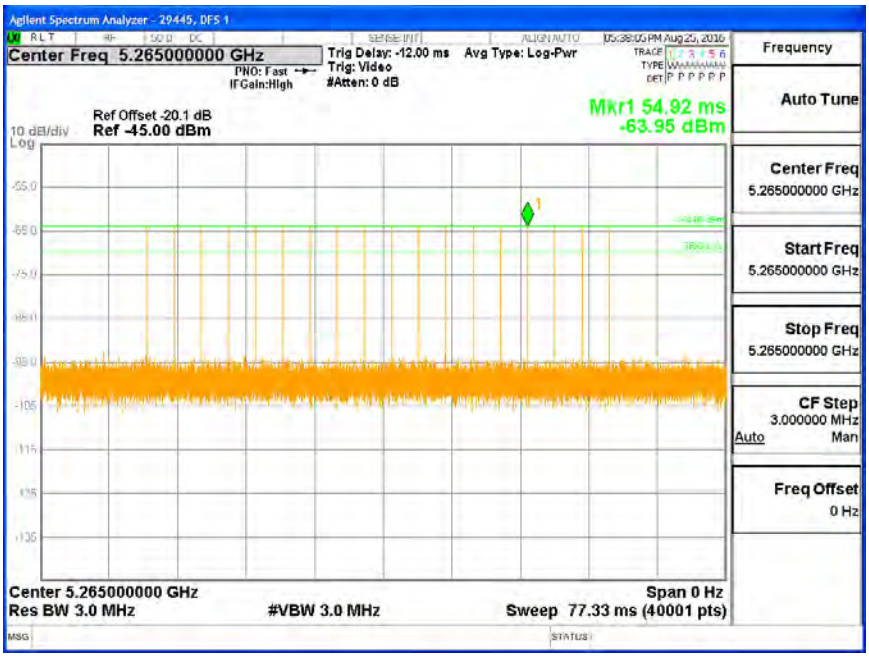
9.1.1. LOW BAND SENSOR 1 RADAR WAVEFORMS

RADAR WAVEFORMS

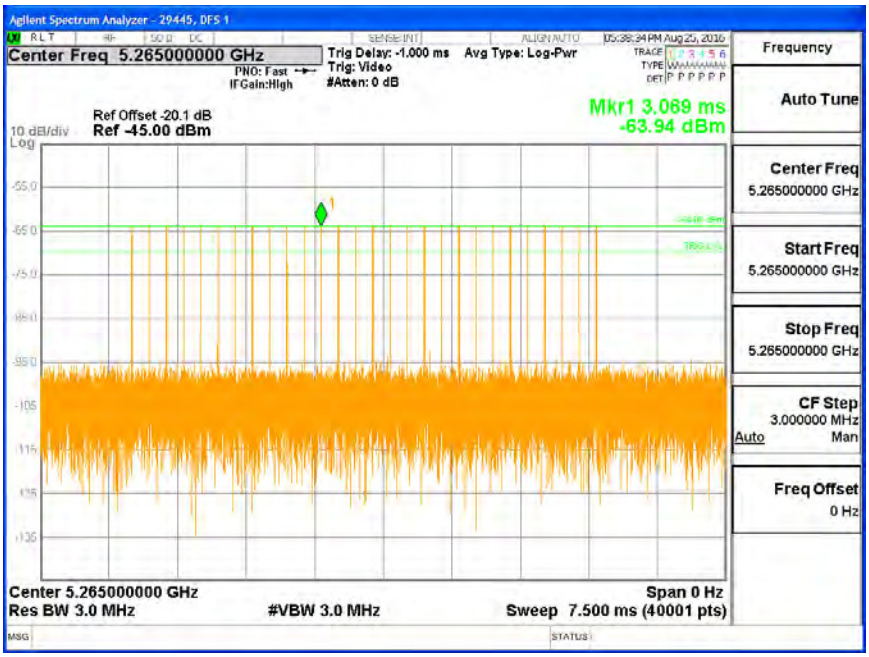
SHORT PULSE RADAR TYPE 0



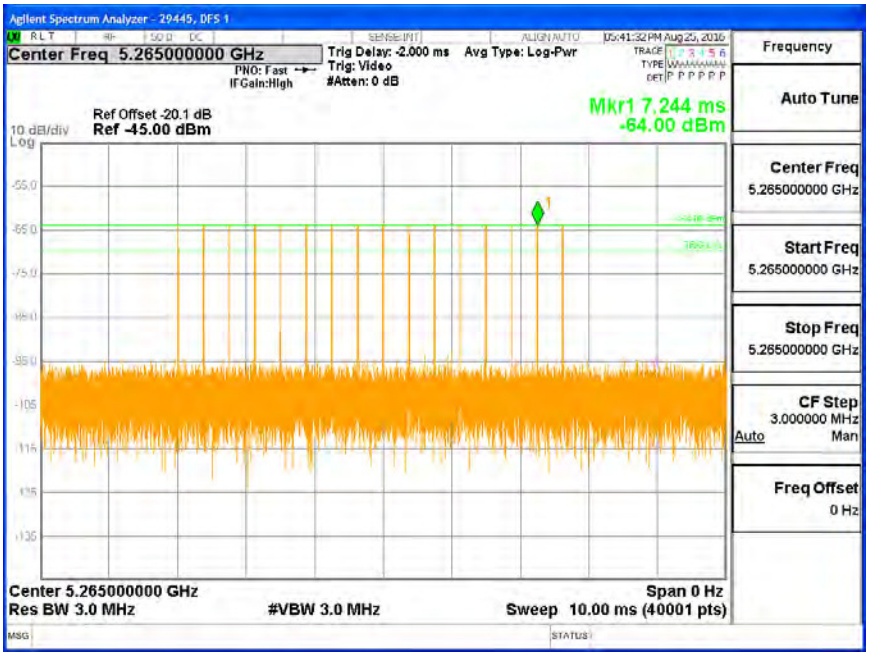
SAMPLE OF RADAR TYPE 1



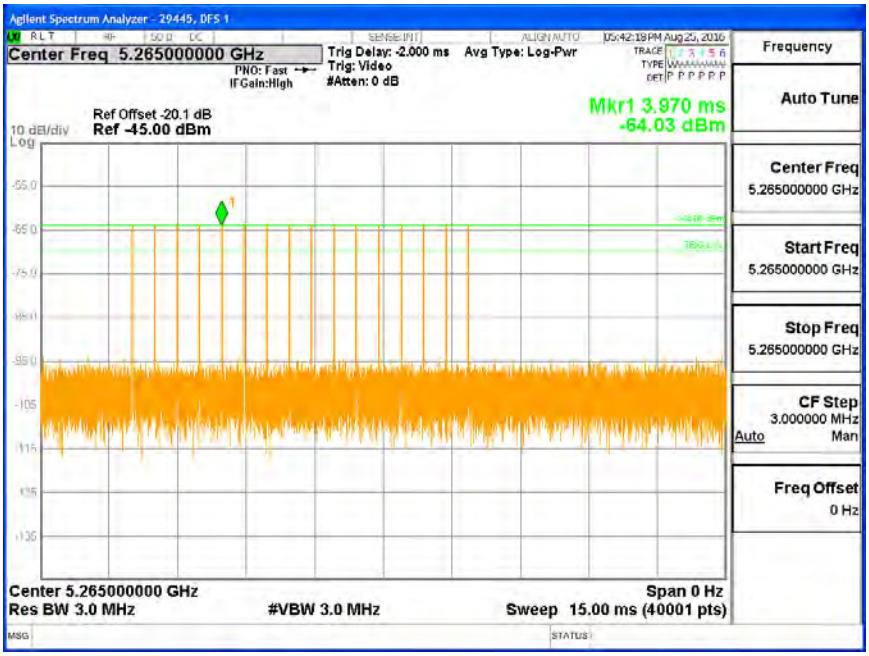
SAMPLE OF RADAR TYPE 2



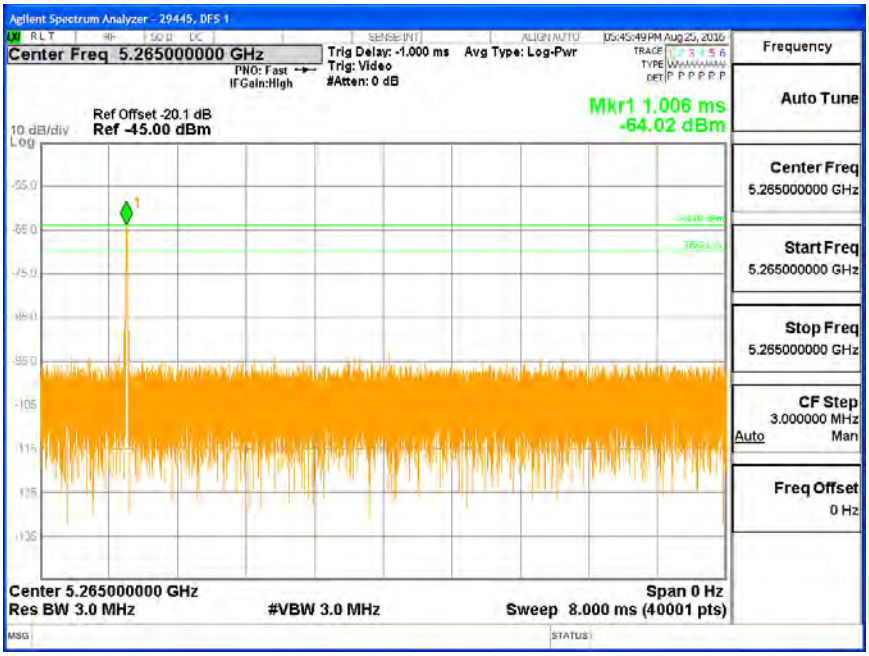
SAMPLE OF RADAR TYPE 3



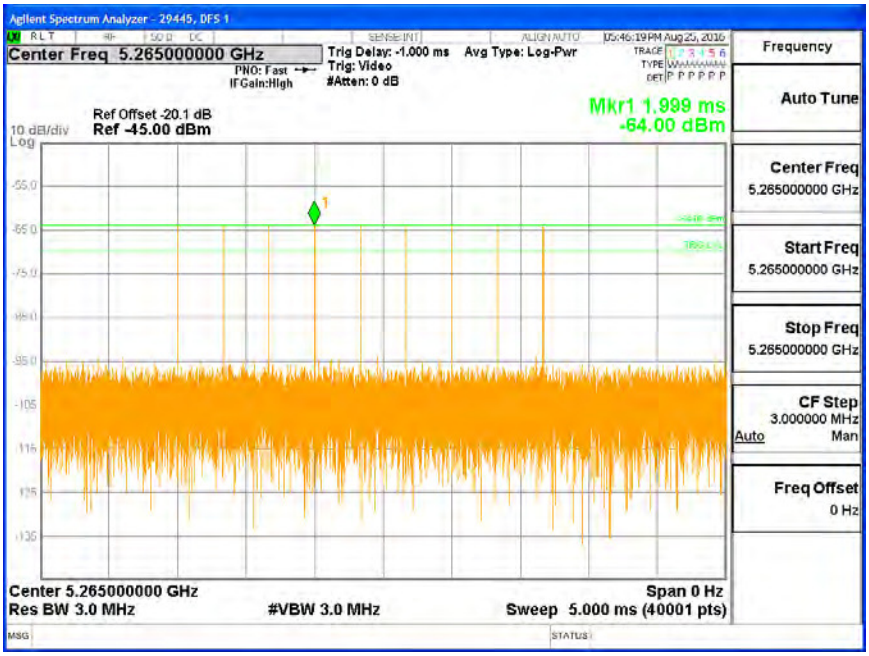
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6

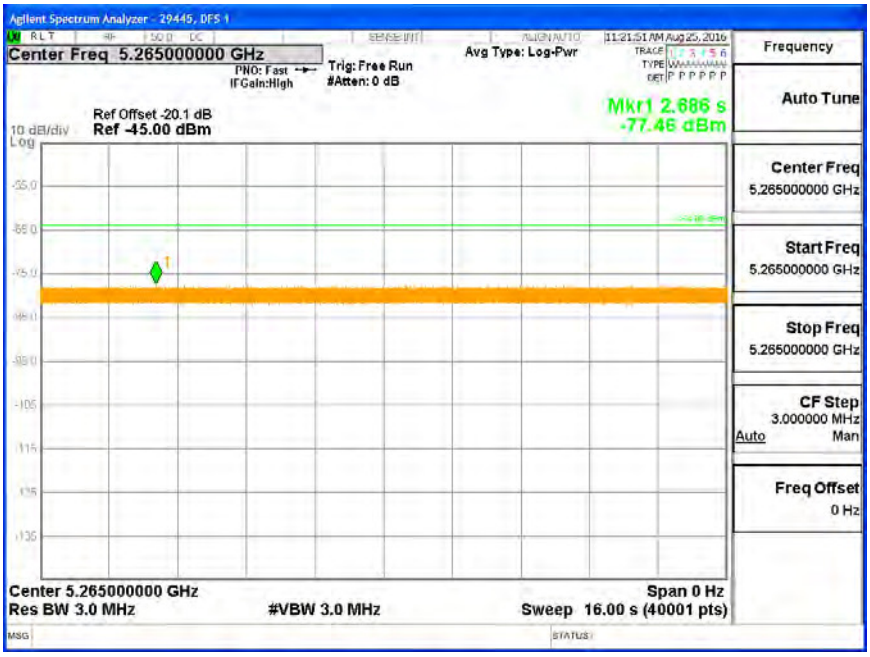


9.2. LOW BAND TEST CHANNEL 1 RESULTS FOR 40 MHz BANDWIDTH

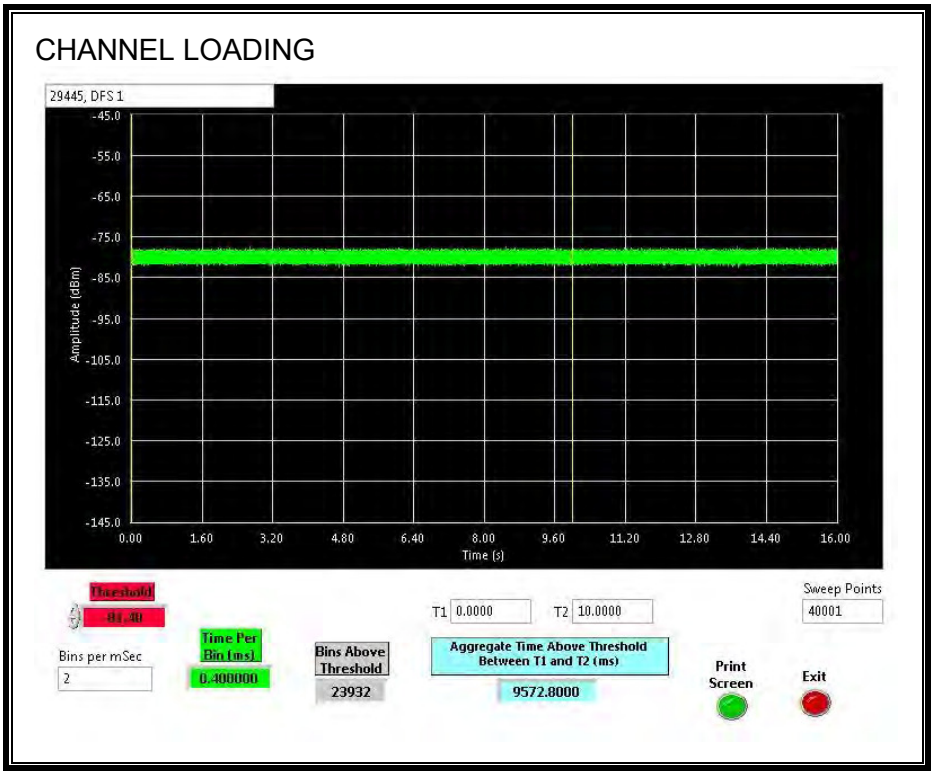
9.2.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 95.72%

9.2.2. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE TEST CHANNEL CYCLE TIME

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5265 MHz) and a log file was generated. Upon completion of the CAC period on both the test channel in 5.3 GHz and the downlink 5.6 GHz, the downlink (which includes the 5.6 GHz DFS band) begins a “discovery phase” and In-Service Monitoring continues on both the 5.3 GHz and the 5.6 GHz DFS bands. The DFS channel enables are passed through the non-DFS connections until a link is established. When the 5.8 GHz downlink connects, the 5.3 GHz Uplink Transmitter is enabled. The 5.2/5.3 GHz Receive Radio then associates to the 5.2/5.3 GHz Transmit Radio. The 5.6/5.8 Receive Radio then associates to the 5.6/5.8 GHz Transmit Radio. After the association process was complete, transmissions began on the test channel. The elapsed time between the end of the CAC period and the start of transmissions on the test channel is the discovery time and association period. This reference measurement and the time stamps within the log file were used to determine when radar bursts were to be triggered at the beginning and end of the CAC period.

Note: The beginning of the CAC period is designated as the initialization of DFS sensor 2 (“RRC DFS[2]:sensor init”) in the log file. Two DFS sensors are initialized in sequence but CAC does not begin until the timestamp on the second initialization.

PROCEDURE FOR TIMING OF RADAR BURST

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5265 MHz) and a log file was generated. A radar signal was triggered on the test channel between 0 to 6 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The AC power was then again toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5265 MHz) and a log file was generated. A radar signal was triggered on the test channel between 54 to 60 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The log file recorded the timing of these events. The time from the beginning of the CAC on the test channel to the detection of the radar burst on the test channel was measured.

APPROXIMATE QUANTITATIVE RESULTS BASED ON RF MARKERS

NO RADAR TRIGGERED ON THE TEST CHANNEL

The time between the beginning of the CAC period and the start of transmissions on the test channel minus the elapsed time for the Receive Radio to associate to the Transmit Radio is the CAC time.

RADAR TRIGGERED ON THE TEST CHANNEL

The time from the beginning of the CAC period to the radar burst on the test channel was measured as the approximate relative time from the start of the CAC.

No Radar Triggered

Start of CAC at 5265 MHz (sec)	End of CAC at 5265 MHz (sec)	CAC Time (sec)
147.6	208.6	61.0

Radar Near Beginning of CAC

Start of CAC at 5265 MHz (sec)	Timing of Radar Burst at 5265 MHz (sec)	Radar Relative to Start of CAC at 5265 MHz (sec)
169.1	173.1	4.0

Radar Near End of CAC

Start of CAC at 5265 MHz (sec)	Timing of Radar Burst at 5265 MHz (sec)	Radar Relative to Start of CAC at 5265 MHz (sec)
165.7	223.7	58.0

QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start of CAC at 5265 MHz (hh:mm:ss)	End of CAC at 5265 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
0:02:36	0:03:37	0:01:01

Radar Near Beginning of CAC

Start of CAC at 5265 MHz (hh:mm:ss)	Radar Detected at 5265 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:39	0:02:43	0:00:04

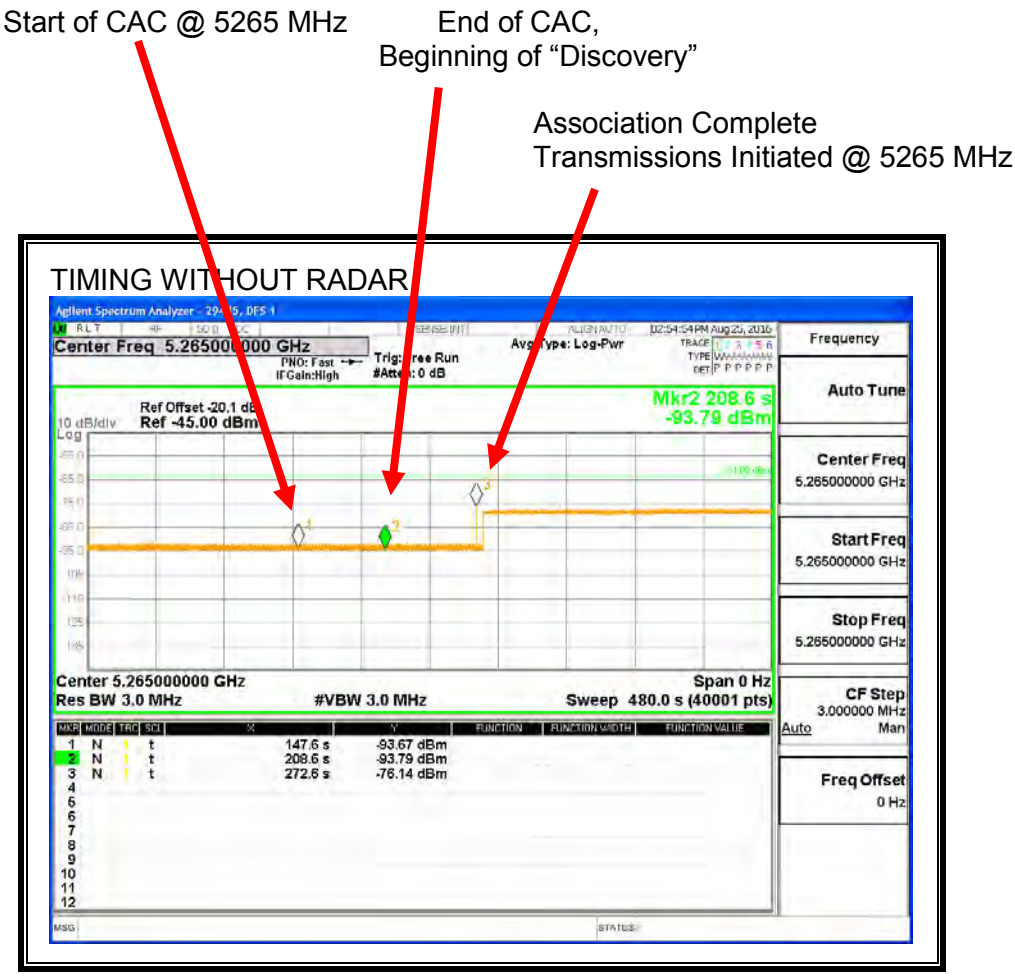
Radar Near End of CAC

Start of CAC at 5265 MHz (hh:mm:ss)	Radar Detected at 5265 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:36	0:03:34	0:00:58

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 the completion of the association period following 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

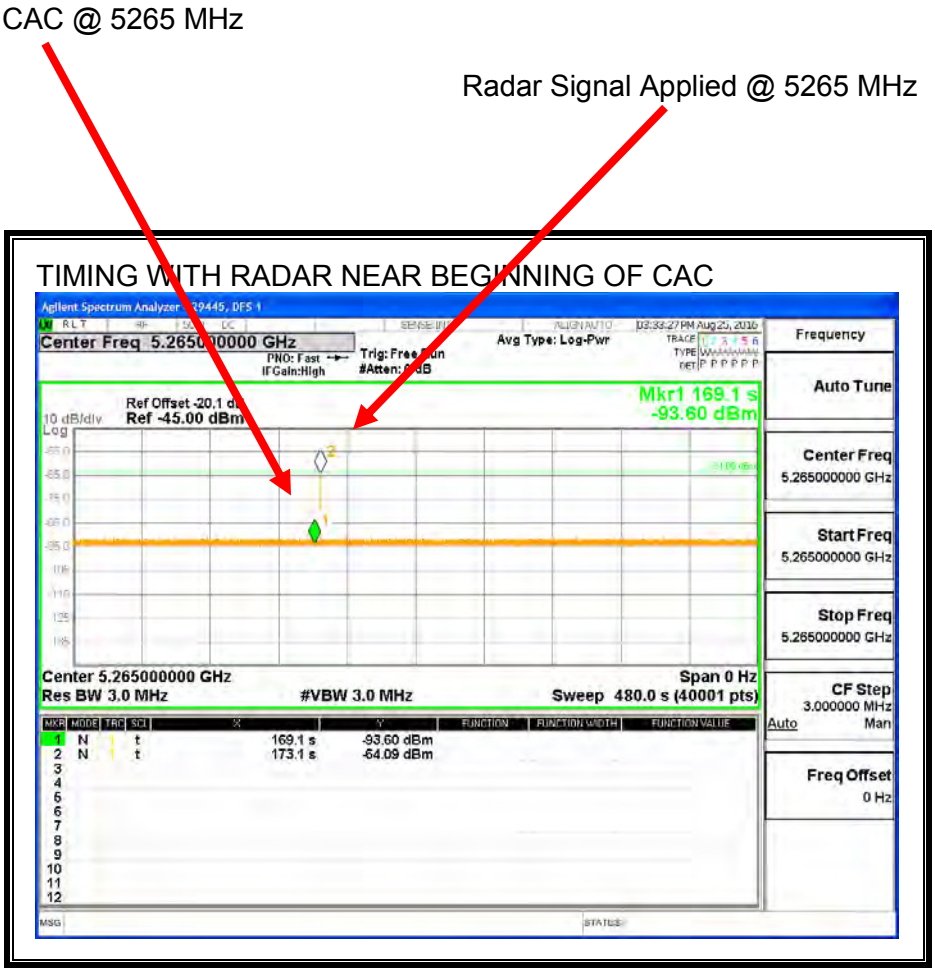


Transmissions begin on intended channel after completion of CAC.

EUT RADAR EVENTS LOG FILE - CAC TIMING WITHOUT RADAR

```
Jan  1 00:02:26 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel
change request, Fc = 5290, BW = 80

Jan  1 00:02:26 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel
change request, Fc = 5685, BW = 80

Jan  1 00:02:32 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq
band 5250-5330 MHz: ts(15326)

Jan  1 00:02:36 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq
band 5645-5725 MHz: ts(18862)

Jan  1 00:03:37 IBR daemon.alert mgd: RRC DFS: TStamp = 79862 msec,
CAC DONE


Jan  1 00:04:41 IBR daemon.notice mgd: Setting rx status to
MMODE_ACTIVE! CIRthresh = 87
```

TIMING WITH RADAR NEAR BEGINNING OF CAC

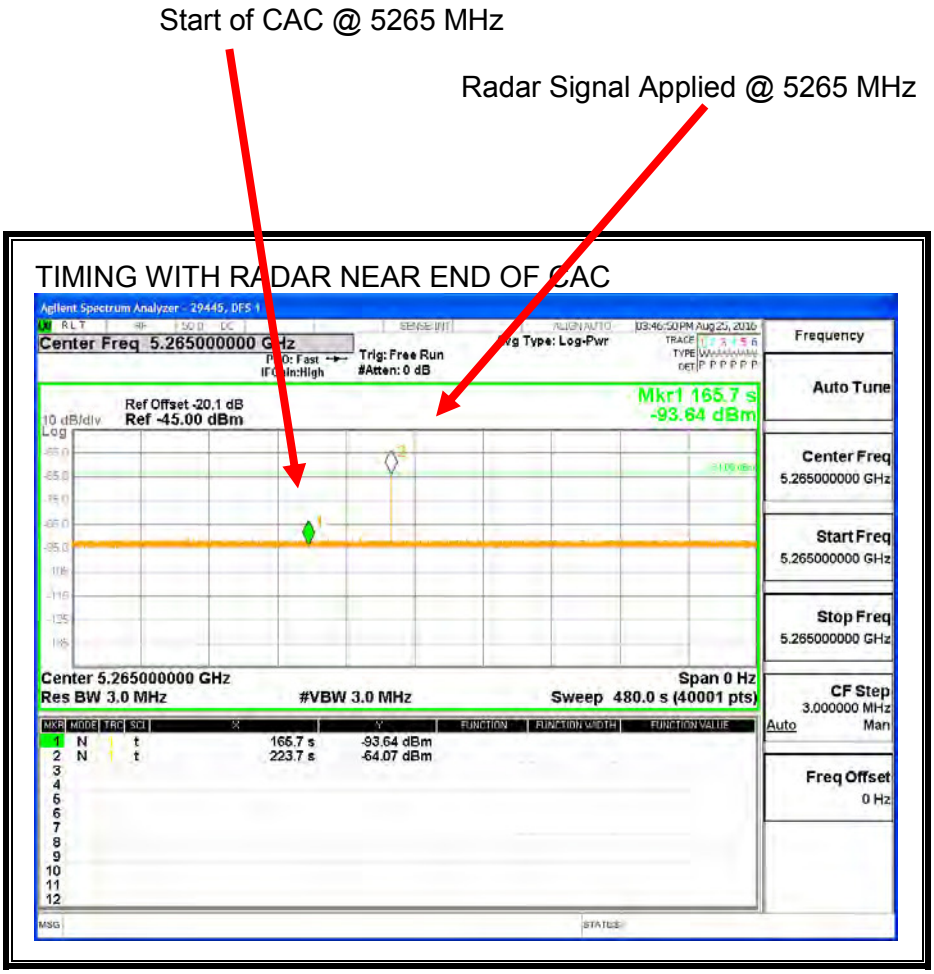


No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - BEGINNING OF CAC

```
Jan  1 00:02:28 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel
change request, Fc = 5290, BW = 80

Jan  1 00:02:28 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel
change request, Fc = 5685, BW = 80

Jan  1 00:02:35 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq
band 5250-5330 MHz: ts(19046)

Jan  1 00:02:39 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq
band 5645-5725 MHz: ts(22582)

Jan  1 00:02:43 IBR daemon.alert mgd:
RRC_DFS_RADAR:os(5245),oe(5285),as(5250),ae(5285
)
Jan  1 00:02:43 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan  1 00:02:43 IBR daemon.alert mgd:    5250 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:02:43 IBR daemon.alert mgd:    5270 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:02:43 IBR daemon.alert mgd:    5290 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:02:43 IBR daemon.alert mgd:    5310 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:02:43 IBR daemon.alert mgd:    5330 Mhz:      00:00   00:00
00:00   00:00

Jan  1 00:02:43 IBR daemon.alert mgd: RRC_DFS_RADAR_DET:
start(5250),end(5285),tb(0),ctb(0),rs(2),mm(8),g_x(0)
```

TIMING WITH RADAR NEAR END OF CAC



No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - END OF CAC

```
Jan  1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel
change request, Fc = 5290, BW = 80

Jan  1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel
change request, Fc = 5685, BW = 80

Jan  1 00:02:32 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq
band 5250-5330 MHz: ts(15857)

Jan  1 00:02:36 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq
band 5645-5725 MHz: ts(19288)

Jan  1 00:03:34 IBR daemon.alert mgd:
RRC_DFS_RADAR:os(5245),oe(5285),as(5250),ae(5285)

Jan  1 00:03:34 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan  1 00:03:34 IBR daemon.alert mgd:    5250 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:03:34 IBR daemon.alert mgd:    5270 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:03:34 IBR daemon.alert mgd:    5290 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:03:34 IBR daemon.alert mgd:    5310 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:03:34 IBR daemon.alert mgd:    5330 Mhz:      00:00   00:00
00:00   00:00

Jan  1 00:03:34 IBR daemon.alert mgd: RRC_DFS_RADAR_DET:
start(5250),end(5285),tb(0),ctb(0),rs(2),mm(8),g_x(0)
```

9.2.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

9.2.4. 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)
0.1816	10

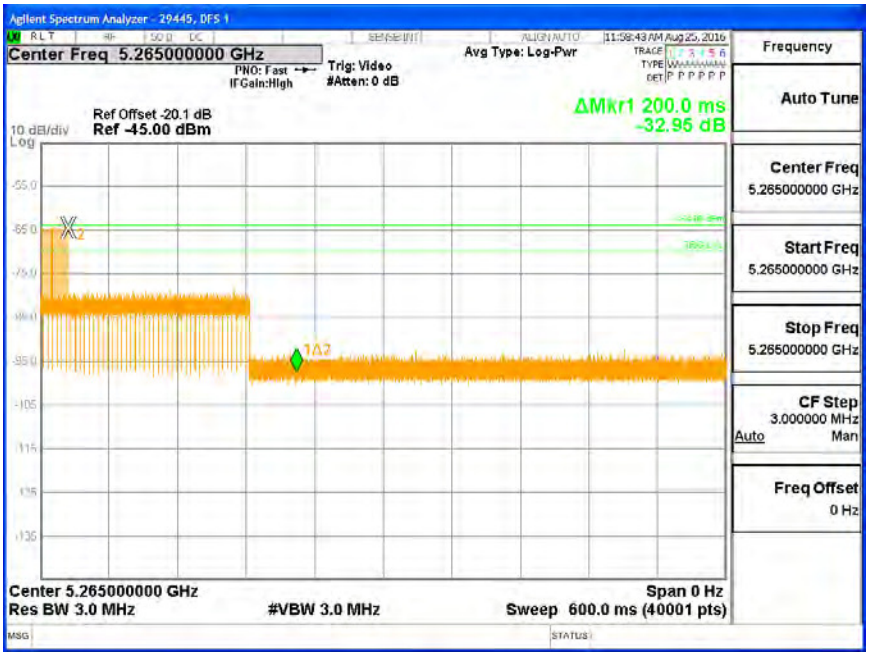
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

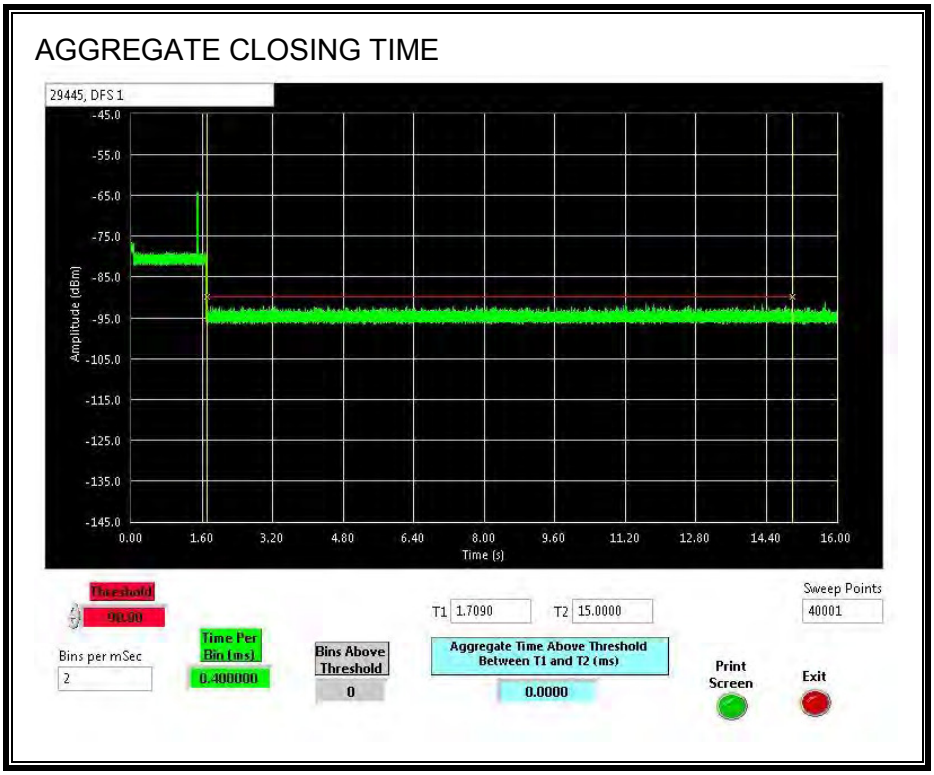
CHANNEL CLOSING TIME

CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

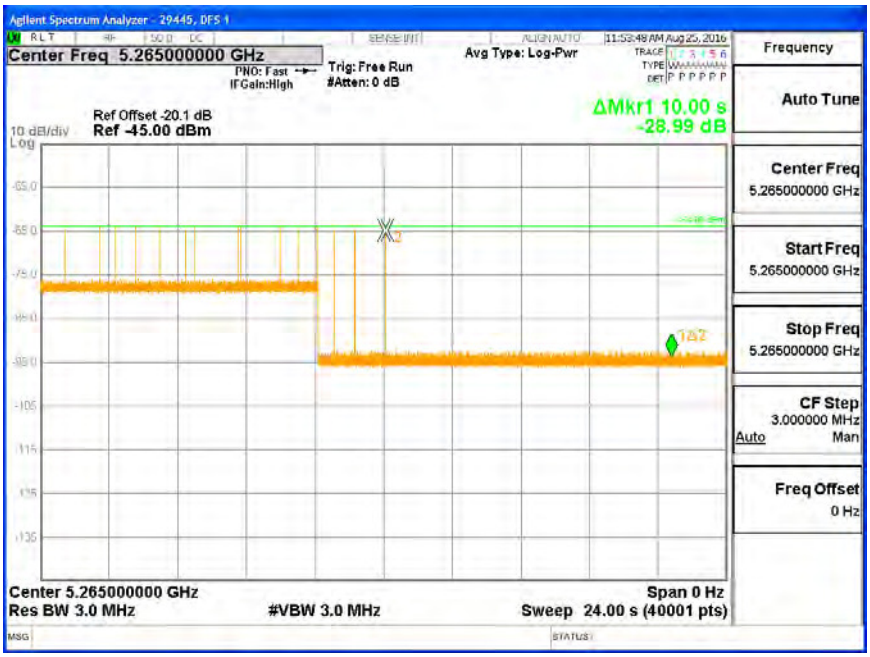
No transmissions are observed during the aggregate monitoring period.



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



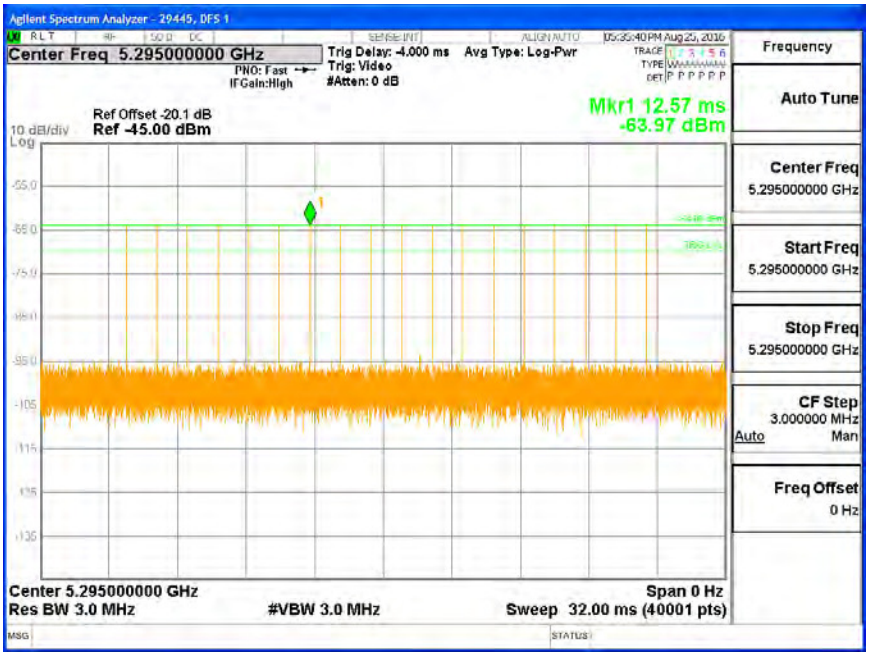
9.3. LOW BAND TEST CHANNEL 2

All tests were performed at a channel center frequency of 5295 MHz.

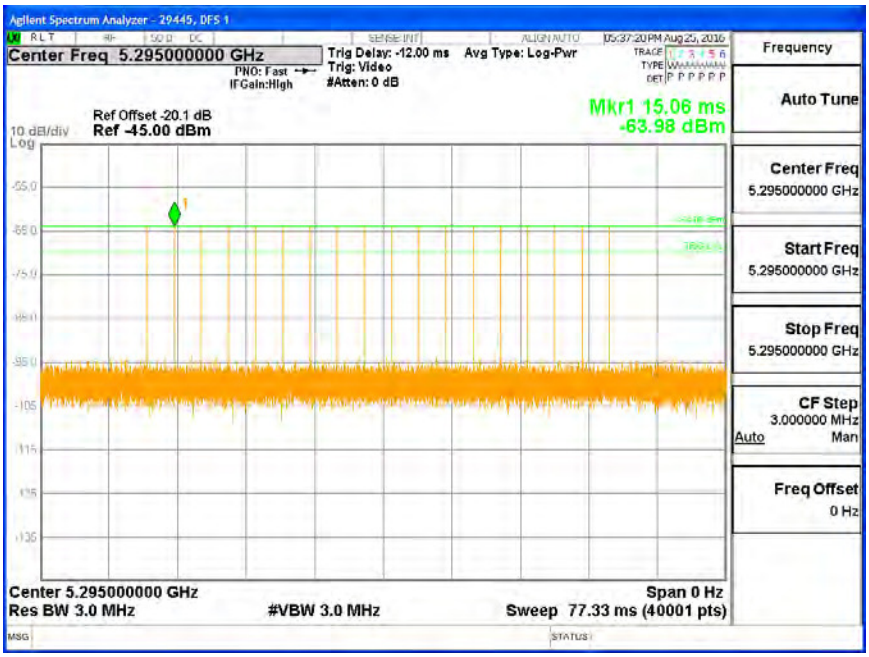
9.3.1. LOW BAND SENSOR 2 RADAR WAVEFORMS

RADAR WAVEFORMS

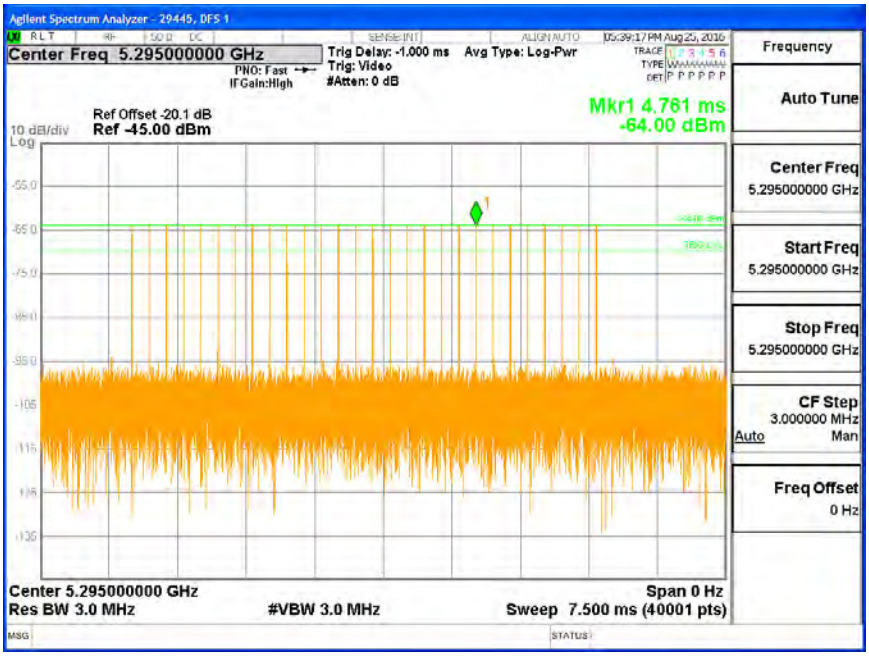
SHORT PULSE RADAR TYPE 0



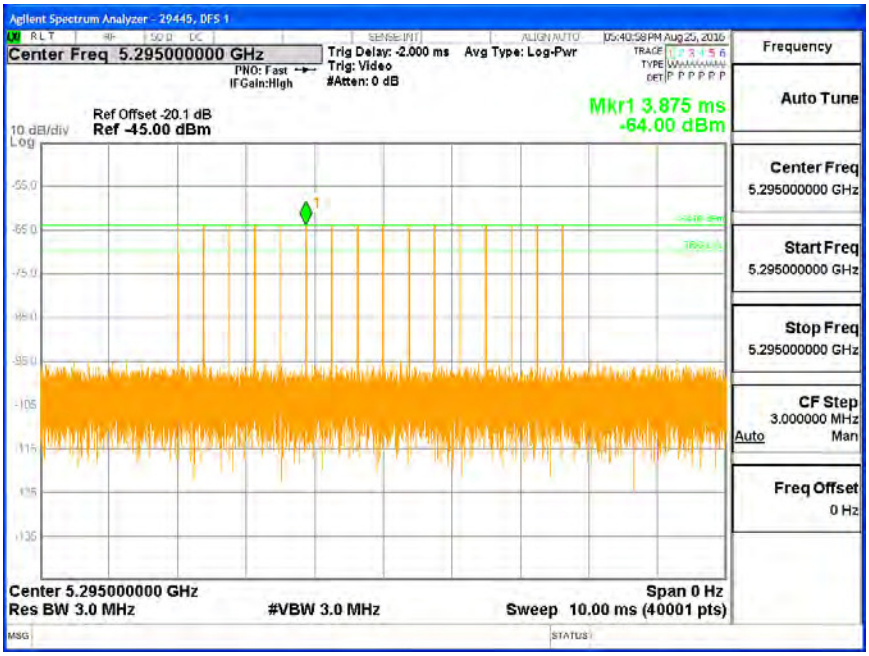
SAMPLE OF RADAR TYPE 1



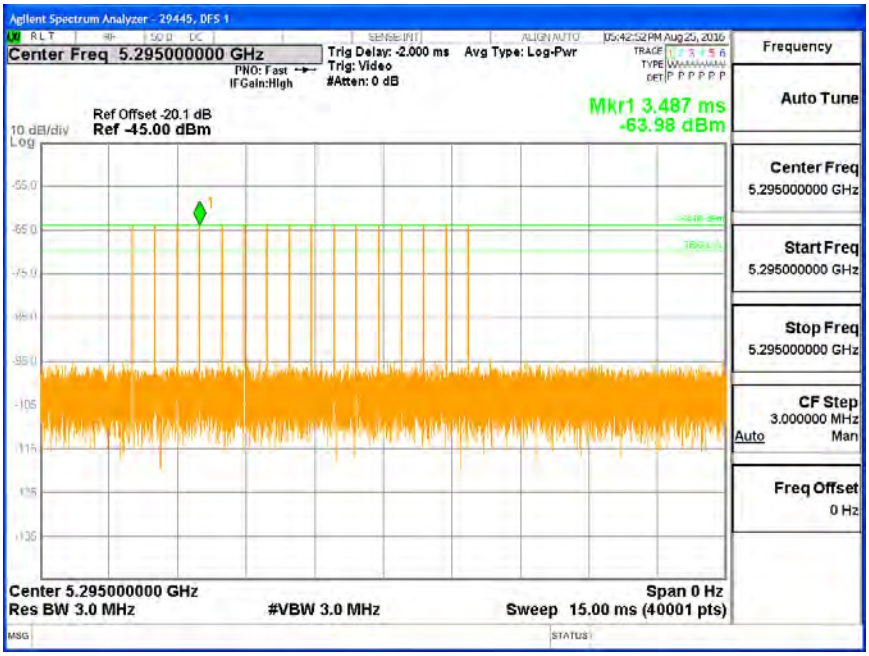
SAMPLE OF RADAR TYPE 2



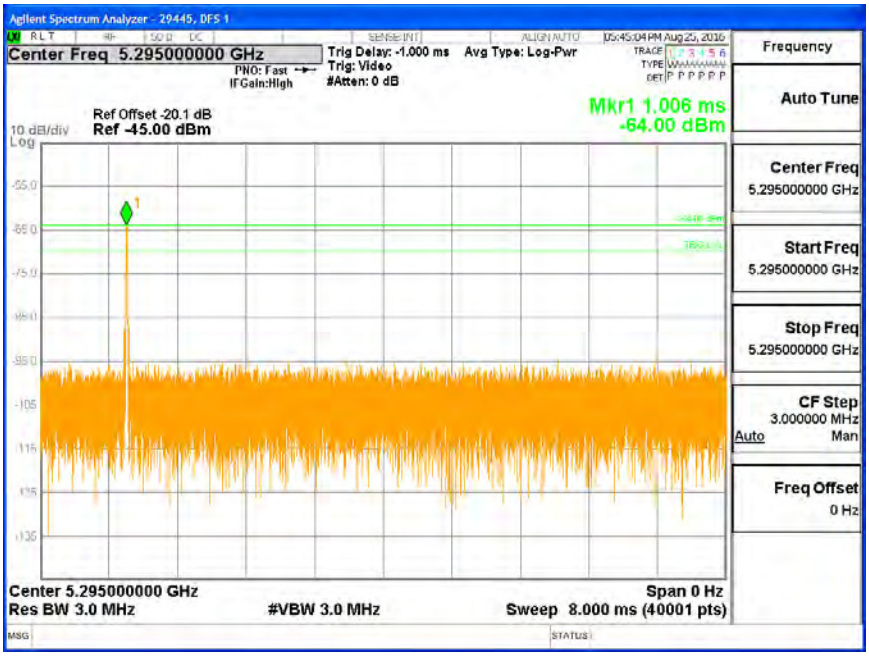
SAMPLE OF RADAR TYPE 3



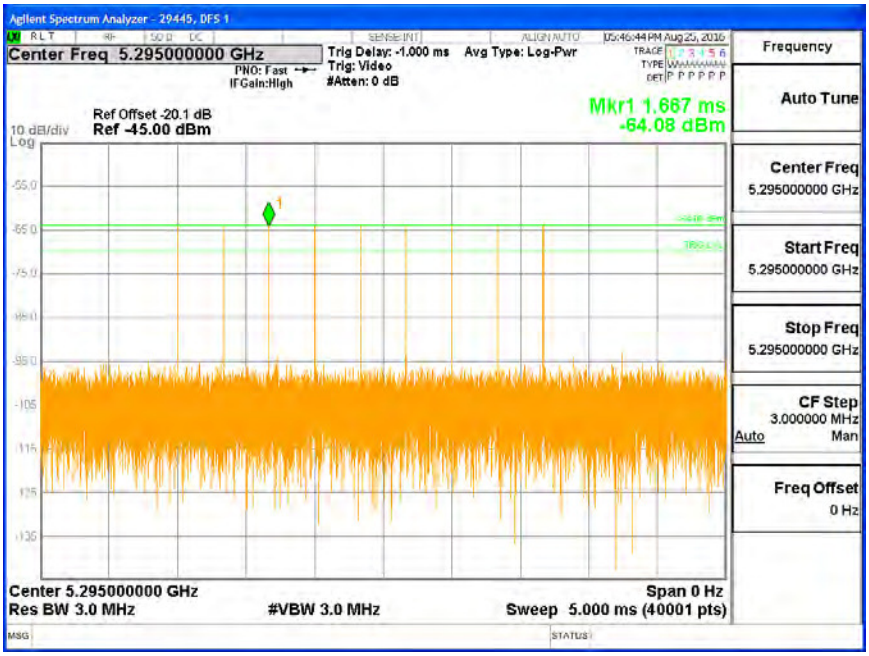
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6

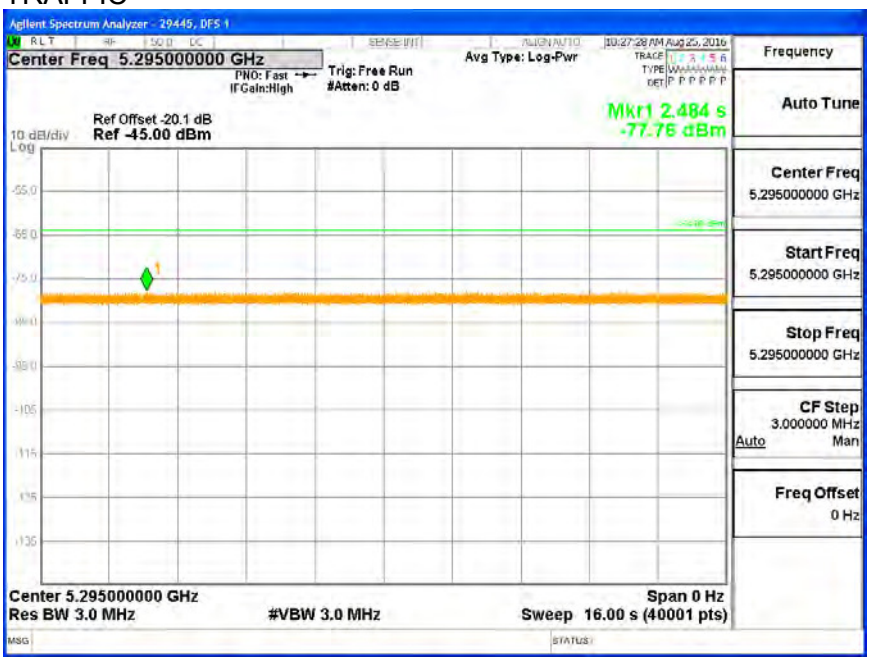


9.4. LOW BAND TEST CHANNEL 2 RESULTS FOR 10 MHz BANDWIDTH

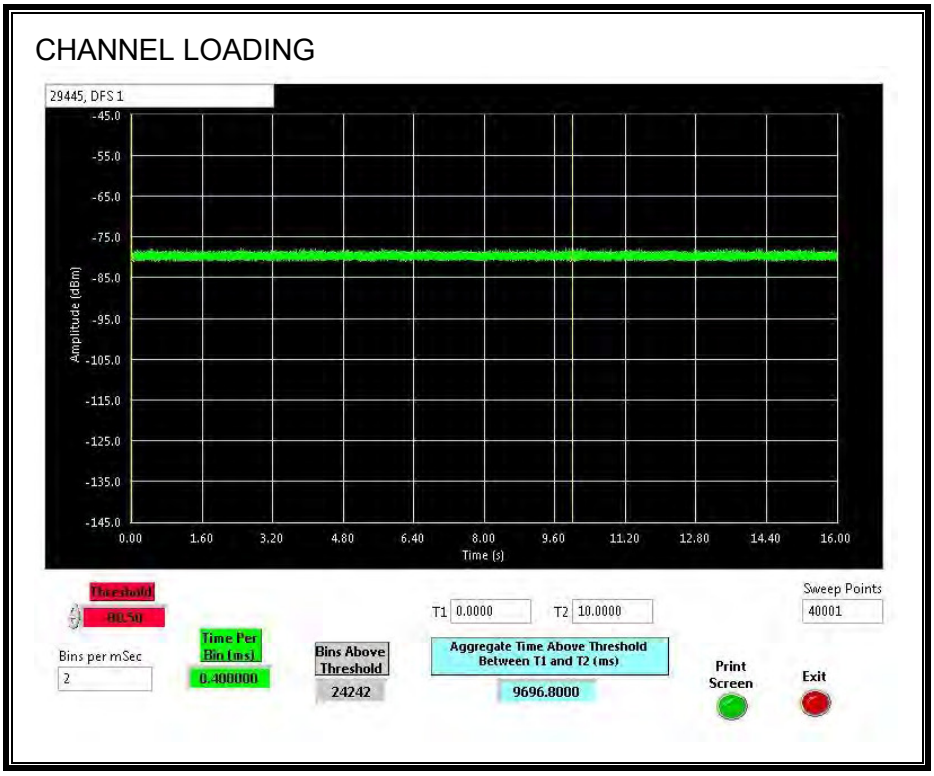
9.4.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 96.96%

9.4.2. DETECTION BANDWIDTH

Low DFS band sensor 99% Occupied Bandwidth and Detection Bandwidth figures of 9.8644 MHz and 10 MHz for this channel bandwidth were determined during previous testing on 01/13/16.

9.4.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW		OBW	Test Location	Employee Number	In-Service Monitoring Version
					FL	FH	FL5	FH5				
FCC Long Pulse Type 5	30	100.00	80	Pass	5290	5300	5287	5303	9.86	DFS 1	29445	Version 3.0

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5295	Yes
2	5295	Yes
3	5295	Yes
4	5295	Yes
5	5295	Yes
6	5295	Yes
7	5295	Yes
8	5295	Yes
9	5295	Yes
10	5295	Yes
11	5293	Yes
12	5296	Yes
13	5293	Yes
14	5296	Yes
15	5298	Yes
16	5293	Yes
17	5296	Yes
18	5293	Yes
19	5295	Yes
20	5297	Yes
21	5296	Yes
22	5298	Yes
23	5296	Yes
24	5298	Yes
25	5296	Yes
26	5292	Yes
27	5296	Yes
28	5295	Yes
29	5297	Yes
30	5296	Yes

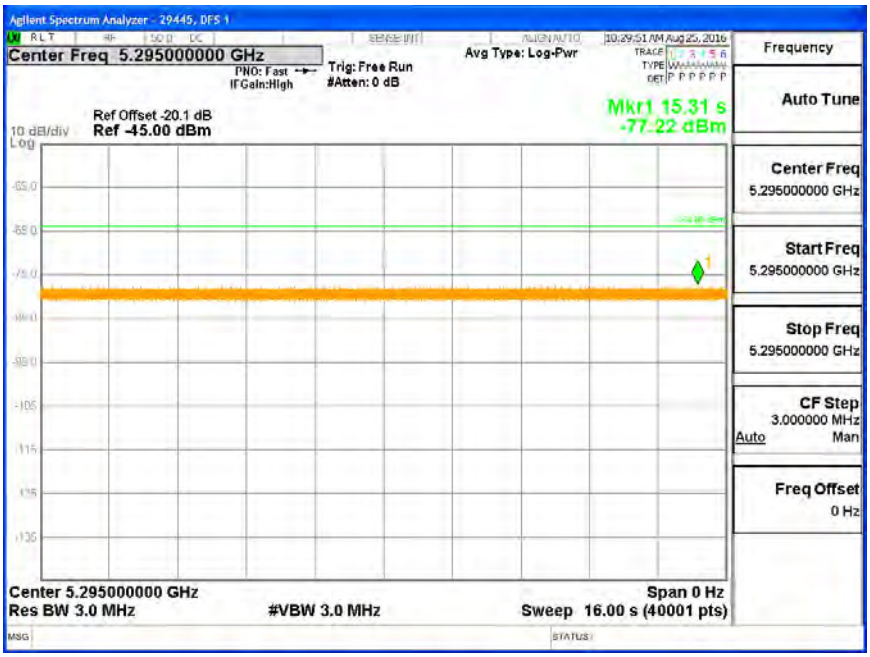
Note: The Type 5 randomized parameters tested are shown in a separate document.

9.5. LOW BAND TEST CHANNEL 2 RESULTS FOR 20 MHz BANDWIDTH

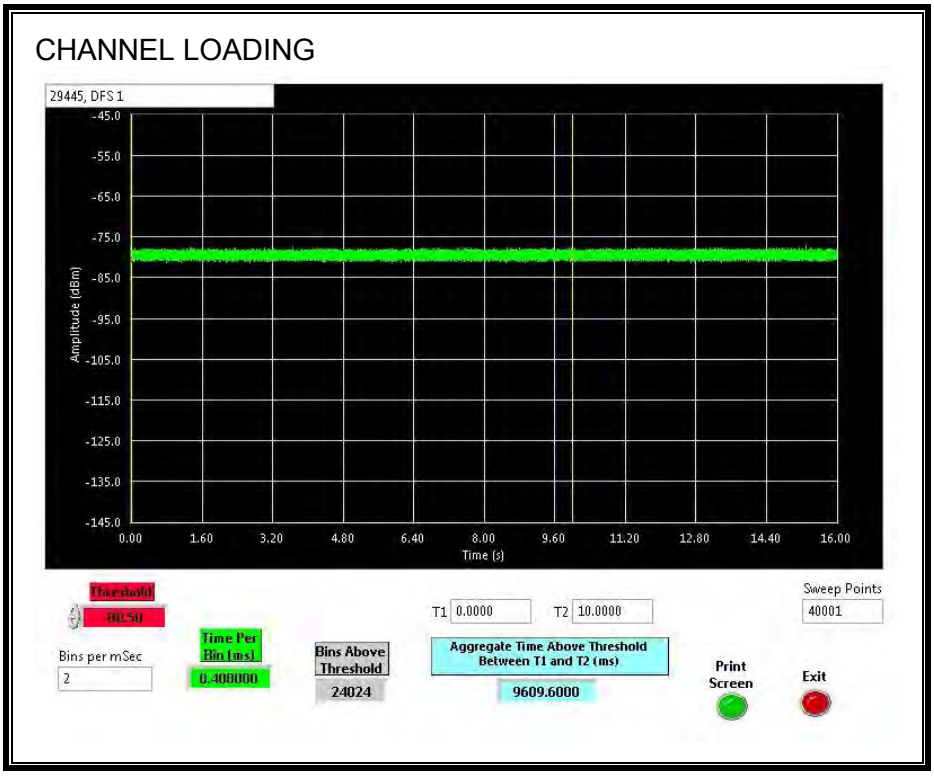
9.5.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 96.09%

9.5.2. DETECTION BANDWIDTH

Low DFS band sensor 99% Occupied Bandwidth and Detection Bandwidth figures of 19.719 MHz and 20 MHz for this channel bandwidth were determined during previous testing on 01/13/16.

9.5.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW		OBW	Test Location	Employee Number	In-Service Monitoring Version
					FL	FH	FL5	FH5				
FCC Long Pulse Type 5	30	100.00	80	Pass	5285	5305	5287	5303	19.72	DFS 1	29445	Version 3.0

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5295	Yes
2	5295	Yes
3	5295	Yes
4	5295	Yes
5	5295	Yes
6	5295	Yes
7	5295	Yes
8	5295	Yes
9	5295	Yes
10	5295	Yes
11	5288	Yes
12	5291	Yes
13	5288	Yes
14	5291	Yes
15	5293	Yes
16	5288	Yes
17	5291	Yes
18	5288	Yes
19	5290	Yes
20	5292	Yes
21	5301	Yes
22	5302	Yes
23	5301	Yes
24	5302	Yes
25	5301	Yes
26	5296	Yes
27	5300	Yes
28	5300	Yes
29	5302	Yes
30	5301	Yes

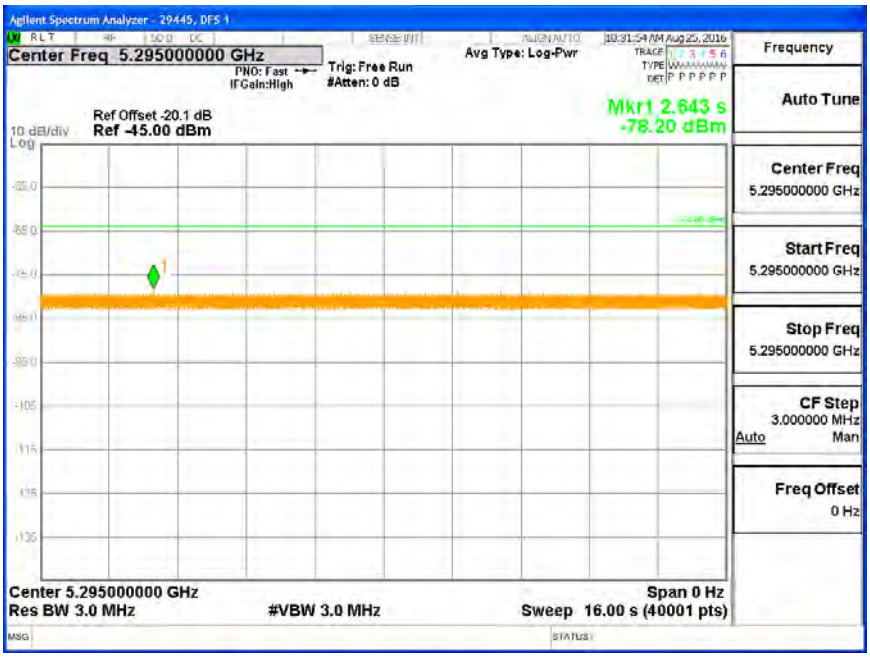
Note: The Type 5 randomized parameters tested are shown in a separate document.

9.6. LOW BAND TEST CHANNEL 2 RESULTS FOR 40 MHz BANDWIDTH

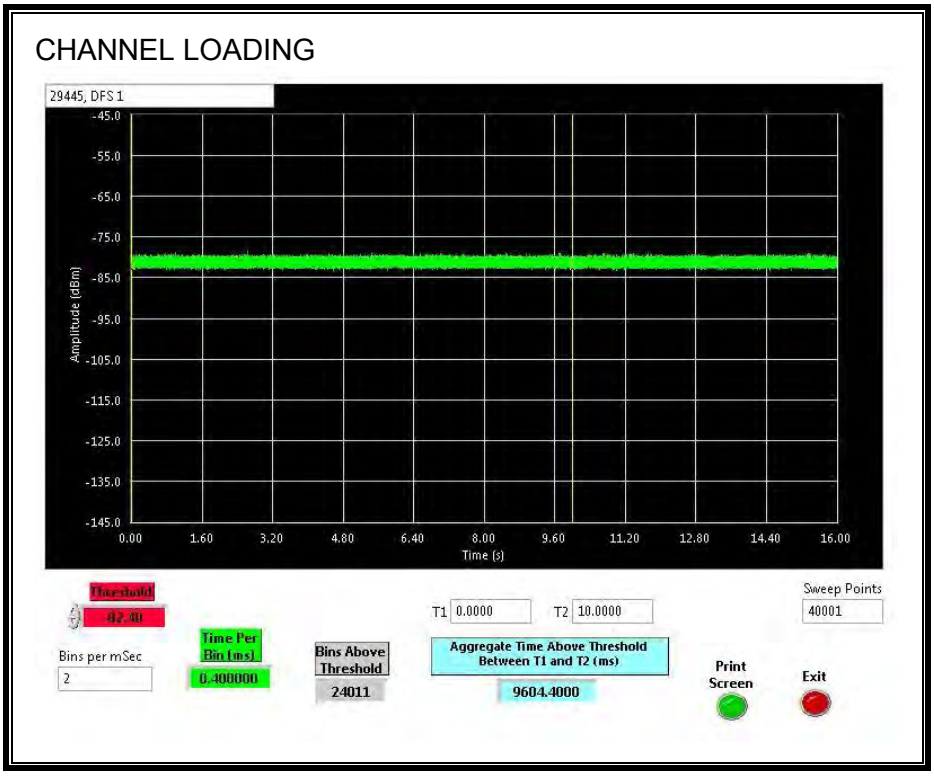
9.6.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 96.04%

9.6.2. DETECTION BANDWIDTH

Low DFS band sensor 99% Occupied Bandwidth and Detection Bandwidth figures of 39.441 MHz and 40 MHz for this channel bandwidth were determined during previous testing on 01/08/16.

9.6.3. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW		OBW	Test Location	Employee Number	In-Service Monitoring Version
					FL	FH	FL5	FH5				
FCC Long Pulse Type 5	30	100.00	80	Pass	5275	5315	5279	5311	39.44	DFS 1	29445	Version 3.0

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5295	Yes
2	5295	Yes
3	5295	Yes
4	5295	Yes
5	5295	Yes
6	5295	Yes
7	5295	Yes
8	5295	Yes
9	5295	Yes
10	5295	Yes
11	5278	Yes
12	5281	Yes
13	5278	Yes
14	5281	Yes
15	5283	Yes
16	5278	Yes
17	5281	Yes
18	5278	Yes
19	5280	Yes
20	5282	Yes
21	5311	Yes
22	5312	Yes
23	5311	Yes
24	5312	Yes
25	5311	Yes
26	5306	Yes
27	5310	Yes
28	5310	Yes
29	5312	Yes
30	5311	Yes

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

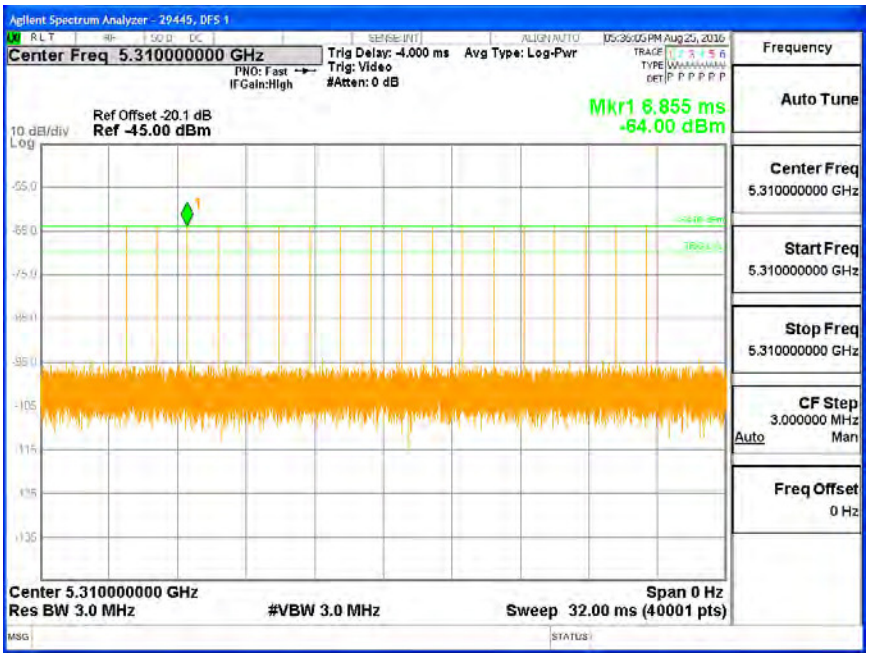
9.7. LOW BAND TEST CHANNEL 3

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

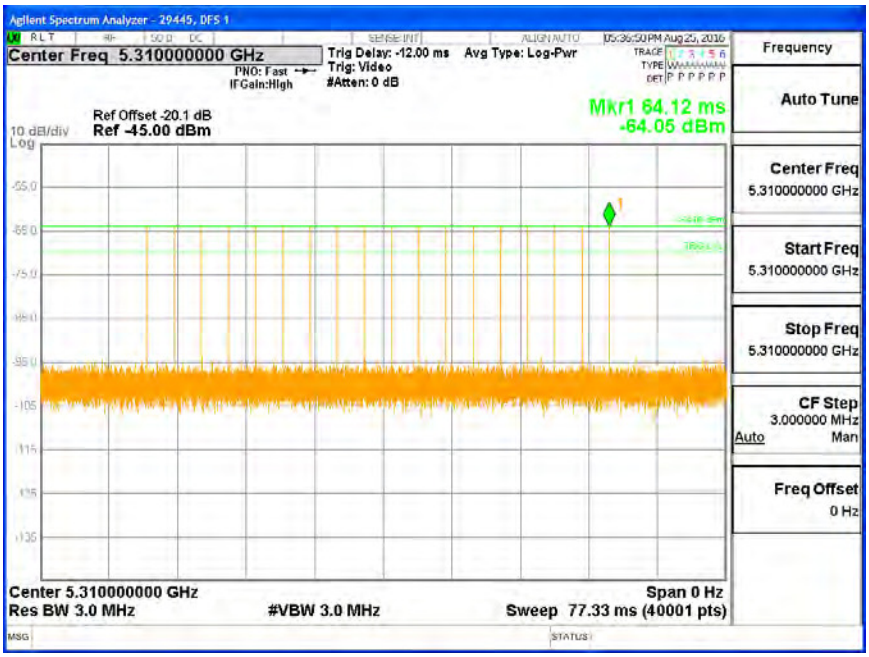
9.7.1. LOW BAND TEST CHANNEL 3 RADAR WAVEFORMS

RADAR WAVEFORMS

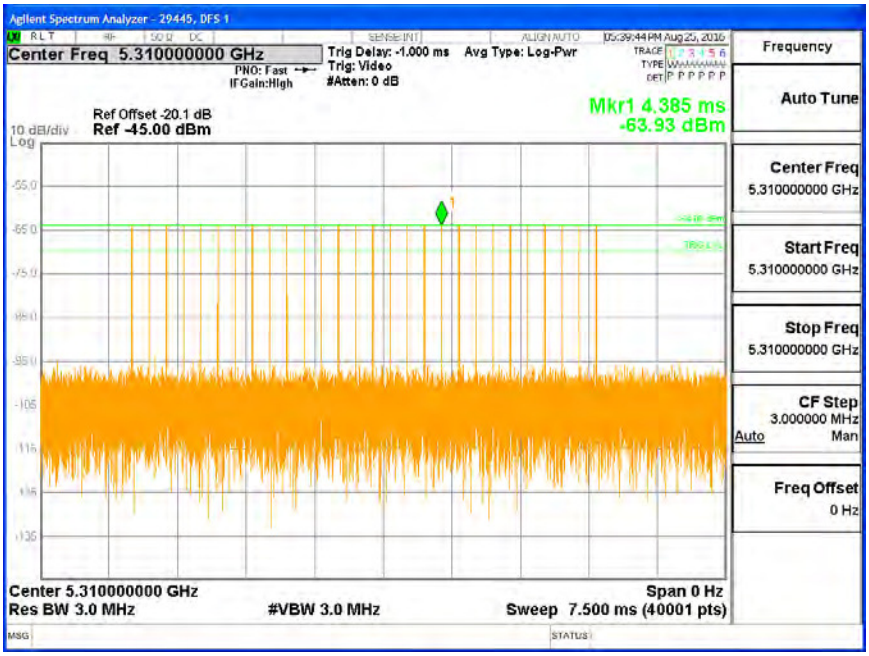
SHORT PULSE RADAR TYPE 0



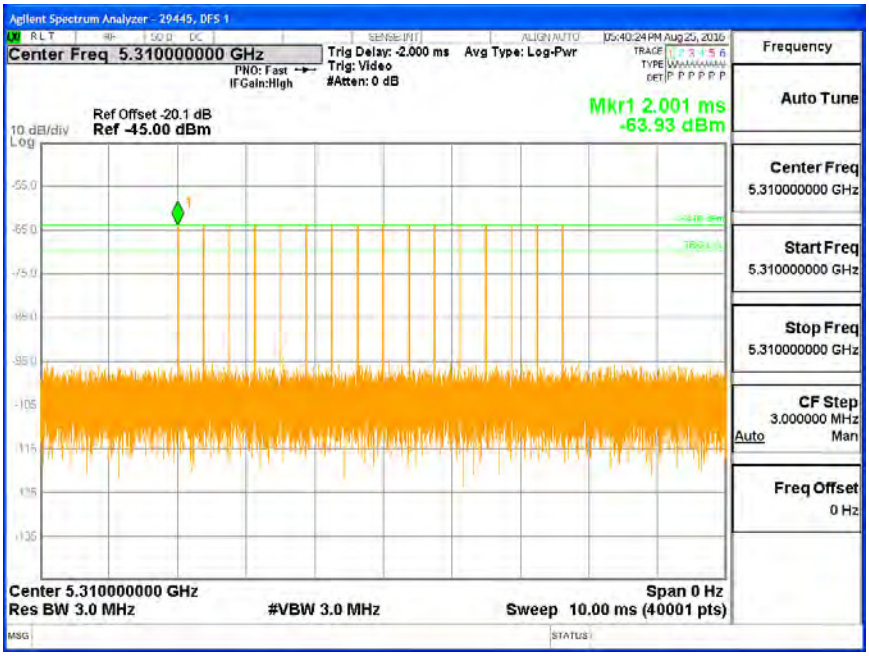
SAMPLE OF RADAR TYPE 1



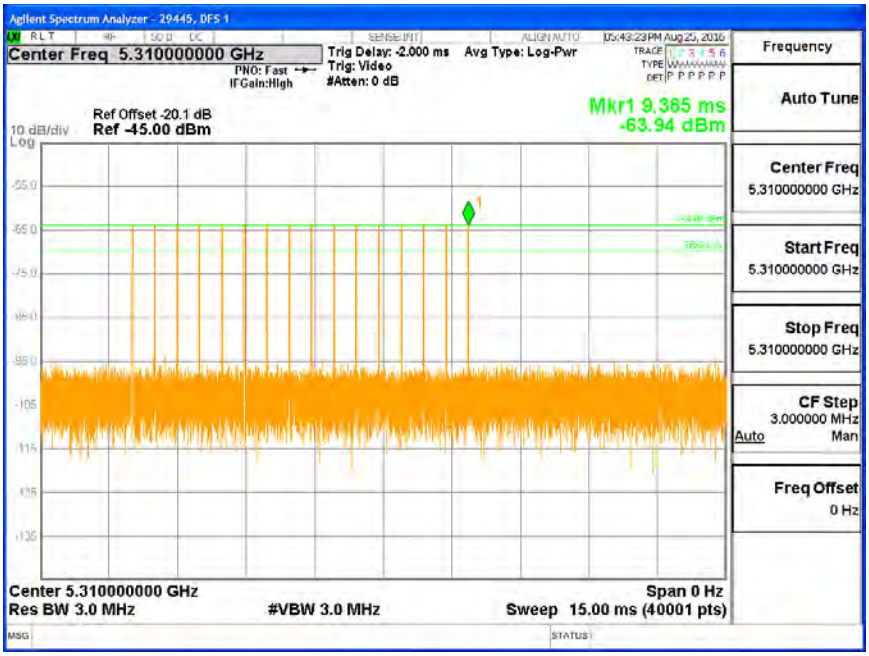
SAMPLE OF RADAR TYPE 2



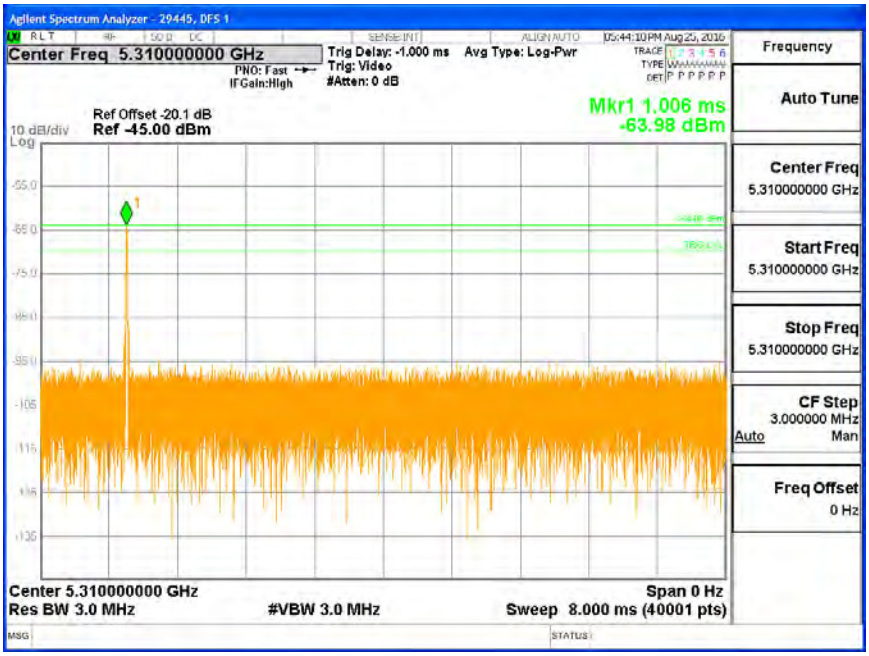
SAMPLE OF RADAR TYPE 3



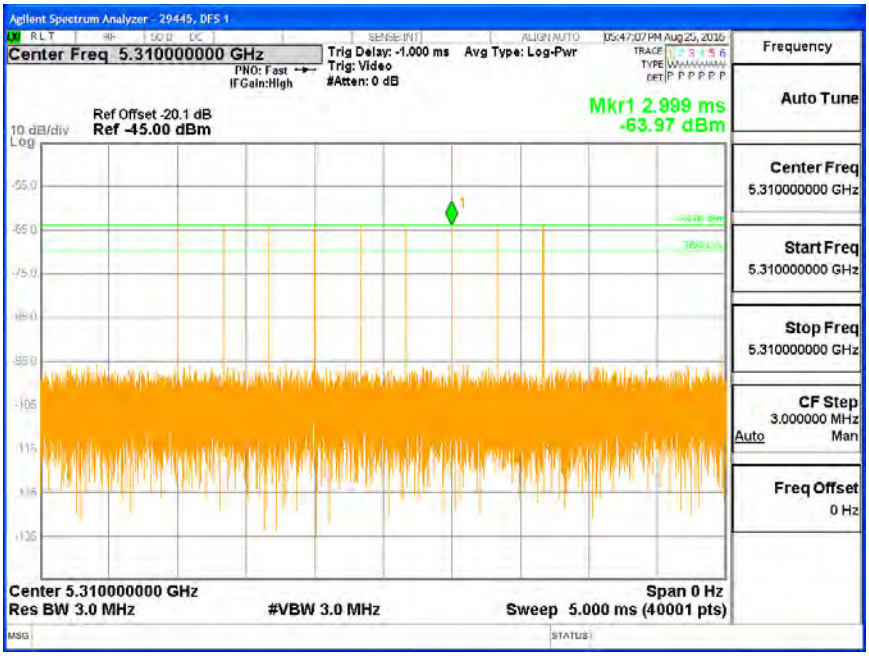
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6

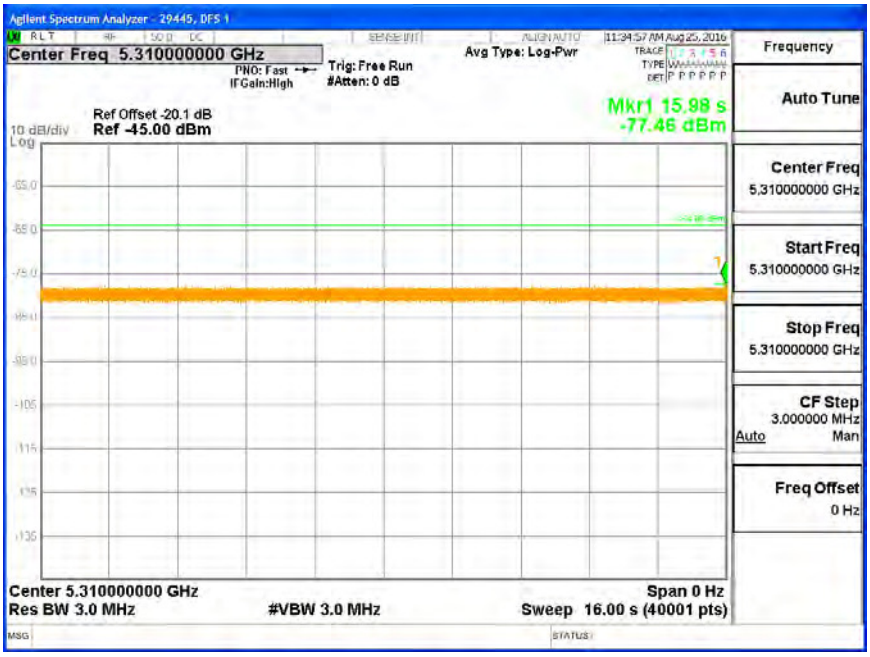


9.8. LOW BAND TEST CHANNEL 3 RESULTS FOR 40 MHz BANDWIDTH

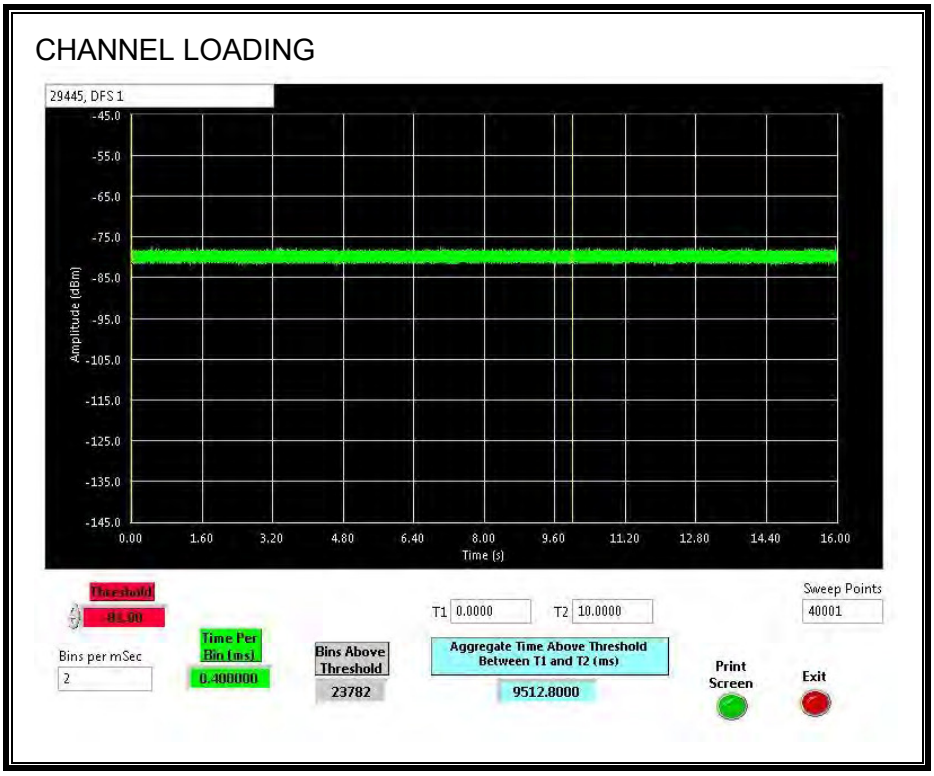
9.8.1. TRAFFIC AND CHANNEL LOADING

TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 95.12%

9.8.2. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE TEST CHANNEL CYCLE TIME

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5310 MHz) and a log file was generated. Upon completion of the CAC period on both the test channel in 5.3 GHz and the downlink 5.6 GHz, the downlink (which includes the 5.6 GHz DFS band) begins a “discovery phase” and In-Service Monitoring continues on both the 5.3 GHz and the 5.6 GHz DFS bands. The DFS channel enables are passed through the non-DFS connections until a link is established. When the 5.8 GHz downlink connects, the 5.3 GHz Uplink Transmitter is enabled. The 5.2/5.3 GHz Receive Radio then associates to the 5.2/5.3 GHz Transmit Radio. The 5.6/5.8 Receive Radio then associates to the 5.6/5.8 GHz Transmit Radio. After the association process was complete, transmissions began on the test channel. The elapsed time between the end of the CAC period and the start of transmissions on the test channel is the discovery time and association period. This reference measurement and the time stamps within the log file were used to determine when radar bursts were to be triggered at the beginning and end of the CAC period.

Note: The beginning of the CAC period is designated as the initialization of DFS sensor 2 (“RRC DFS[2]:sensor init”) in the log file. Two DFS sensors are initialized in sequence but CAC does not begin until the timestamp on the second initialization.

PROCEDURE FOR TIMING OF RADAR BURST

The AC power was toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5310 MHz) and a log file was generated. A radar signal was triggered on the test channel between 0 to 6 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The AC power was then again toggled off and then on to re-boot the EUT while a spectrum analyzer sweep was started to monitor the test channel (5310 MHz) and a log file was generated. A radar signal was triggered on the test channel between 54 to 60 seconds after the beginning of the CAC period and transmissions on the test channel were monitored on the spectrum analyzer.

The log file recorded the timing of these events. The time from the beginning of the CAC on the test channel to the detection of the radar burst on the test channel was measured.

APPROXIMATE QUANTITATIVE RESULTS BASED ON RF MARKERS

NO RADAR TRIGGERED ON THE TEST CHANNEL

The time between the beginning of the CAC period and the start of transmissions on the test channel minus the elapsed time for the Receive Radio to associate to the Transmit Radio is the CAC time.

RADAR TRIGGERED ON THE TEST CHANNEL

The time from the beginning of the CAC period to the radar burst on the test channel was measured as the approximate relative time from the start of the CAC.

No Radar Triggered

Start of CAC at 5310 MHz (sec)	End of CAC at 5310 MHz (sec)	CAC Time (sec)
164.3	225.3	61.0

Radar Near Beginning of CAC

Start of CAC at 5310 MHz (sec)	Timing of Radar Burst at 5310 MHz (sec)	Radar Relative to Start of CAC at 5310 MHz (sec)
165.3	169.3	4.0

Radar Near End of CAC

Start of CAC at 5310 MHz (sec)	Timing of Radar Burst at 5310 MHz (sec)	Radar Relative to Start of CAC at 5310 MHz (sec)
167.2	226.2	59.0

QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start of CAC at 5310 MHz (hh:mm:ss)	End of CAC at 5310 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
0:02:35	0:03:36	0:01:01

Radar Near Beginning of CAC

Start of CAC at 5310 MHz (hh:mm:ss)	Radar Detected at 5310 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:35	0:02:39	0:00:04

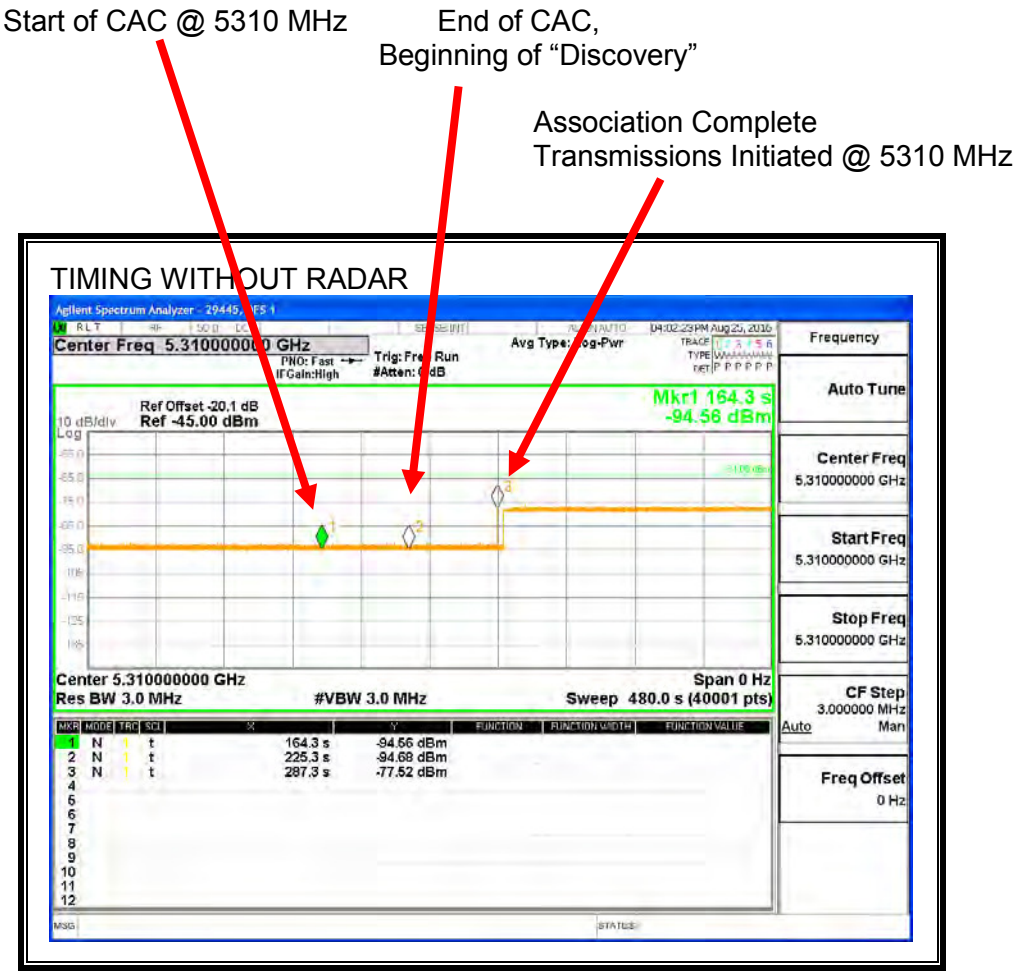
Radar Near End of CAC

Start of CAC at 5310 MHz (hh:mm:ss)	Radar Detected at 5310 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:02:37	0:03:36	0:00:59

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 the completion of the association period following 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



Transmissions begin on intended channel after completion of CAC.

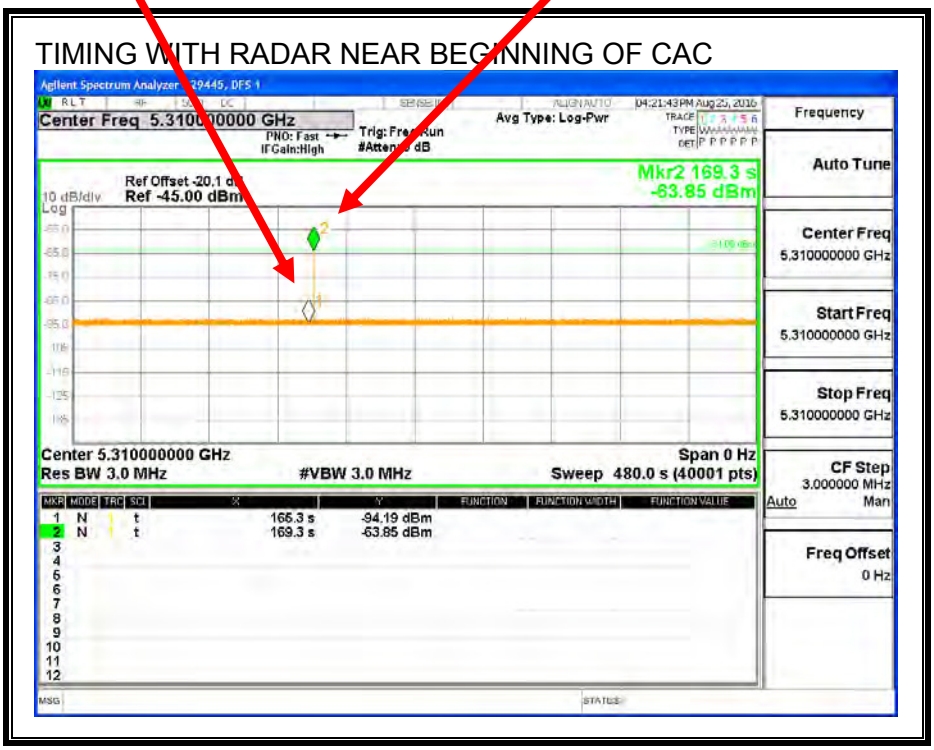
EUT RADAR EVENTS LOG FILE - CAC TIMING WITHOUT RADAR

```
Jan  1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel
change request, Fc = 5290, BW = 80

Jan  1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel
change request, Fc = 5685, BW = 80

Jan  1 00:02:25 IBR daemon.notice mgd: RRC CLIENT :ENTER-
>STATE_DFS_CAC,TB(0),@ msc 60011

Jan  1 00:02:25 IBR daemon.notice mgd: RRC-DFS state -> SET_CHAN

Jan  1 00:02:32 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq
band 5250-5330 MHz: ts(16542)

Jan  1 00:02:35 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq
band 5645-5725 MHz: ts(20082)

Jan  1 00:03:36 IBR daemon.alert mgd: RRC DFS: TStamp = 81082 msec,
CAC DONE

Jan  1 00:04:38 IBR daemon.notice mgd: Setting rx status to
MMODE_ACTIVE! CIRthresh = 87
```

TIMING WITH RADAR NEAR BEGINNING OF CAC

Start of CAC @ 5310 MHz

Radar Signal Applied @ 5310 MHz

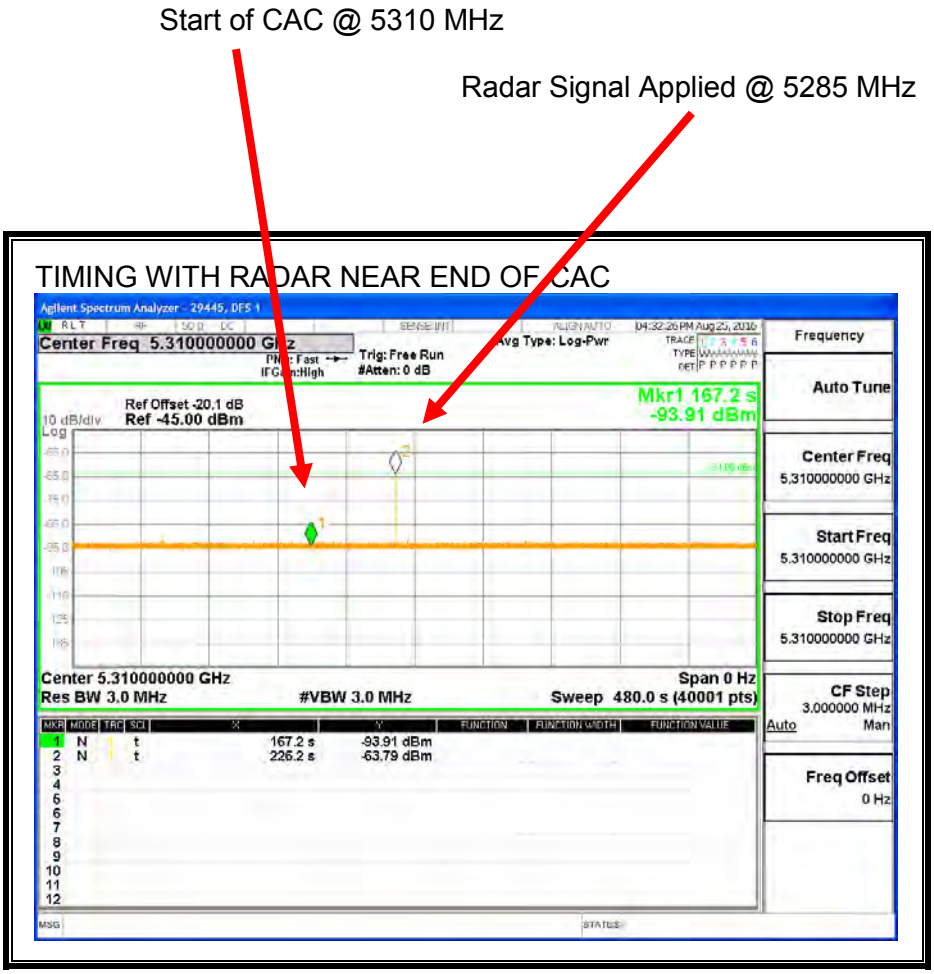


No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - BEGINNING OF CAC

```
Jan  1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel
change request, Fc = 5290, BW = 80

Jan  1 00:02:25 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel
change request, Fc = 5685, BW = 80

Jan  1 00:02:32 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq
band 5250-5330 MHz: ts(16237)

Jan  1 00:02:35 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq
band 5645-5725 MHz: ts(19777)

Jan  1 00:02:39 IBR daemon.alert mgd:
RRC_DFS_RADAR:os(5291),oe(5331),as(5291),ae(5331)

Jan  1 00:02:39 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan  1 00:02:39 IBR daemon.alert mgd:    5250 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:02:39 IBR daemon.alert mgd:    5270 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:02:39 IBR daemon.alert mgd:    5290 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:02:39 IBR daemon.alert mgd:    5310 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:02:39 IBR daemon.alert mgd:    5330 Mhz:      31:00   00:00
00:00   00:00

Jan  1 00:02:39 IBR daemon.alert mgd: RRC_DFS:RADAR DETECTED trigger
soft_reset
```

TIMING WITH RADAR NEAR END OF CAC



No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - END OF CAC

```
Jan  1 00:02:27 IBR daemon.alert mgd: RRC_DFS: DFS device 1 channel
change request, Fc = 5290, BW = 80

Jan  1 00:02:27 IBR daemon.alert mgd: RRC_DFS: DFS device 2 channel
change request, Fc = 5685, BW = 80

Jan  1 00:02:33 IBR daemon.alert mgd: RRC DFS[1]:sensor init on freq
band 5250-5330 MHz: ts(16569)

Jan  1 00:02:37 IBR daemon.alert mgd: RRC DFS[2]:sensor init on freq
band 5645-5725 MHz: ts(20109)

Jan  1 00:03:36 IBR daemon.alert mgd:
RRC_DFS_RADAR:os(5291),oe(5331),as(5291),ae(5331)

Jan  1 00:03:36 IBR daemon.alert mgd: DFS Blackout Table: st(3)
Jan  1 00:03:36 IBR daemon.alert mgd:    5250 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:03:36 IBR daemon.alert mgd:    5270 Mhz:      00:00   00:00
00:00   00:00
Jan  1 00:03:36 IBR daemon.alert mgd:    5290 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:03:36 IBR daemon.alert mgd:    5310 Mhz:      31:00   31:00
31:00   31:00
Jan  1 00:03:36 IBR daemon.alert mgd:    5330 Mhz:      31:00   00:00
00:00   00:00

Jan  1 00:03:36 IBR daemon.alert mgd: RRC_DFS:RADAR DETECTED trigger
soft_reset
```

9.8.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

9.8.4. 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)
0.1824	10

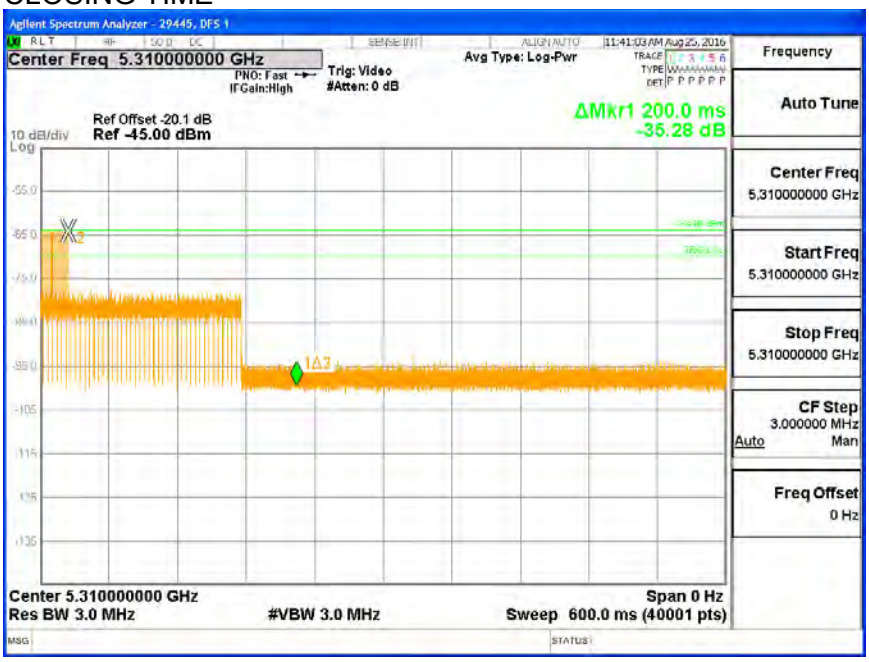
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
0.0	60

MOVE TIME

MOVE TIME

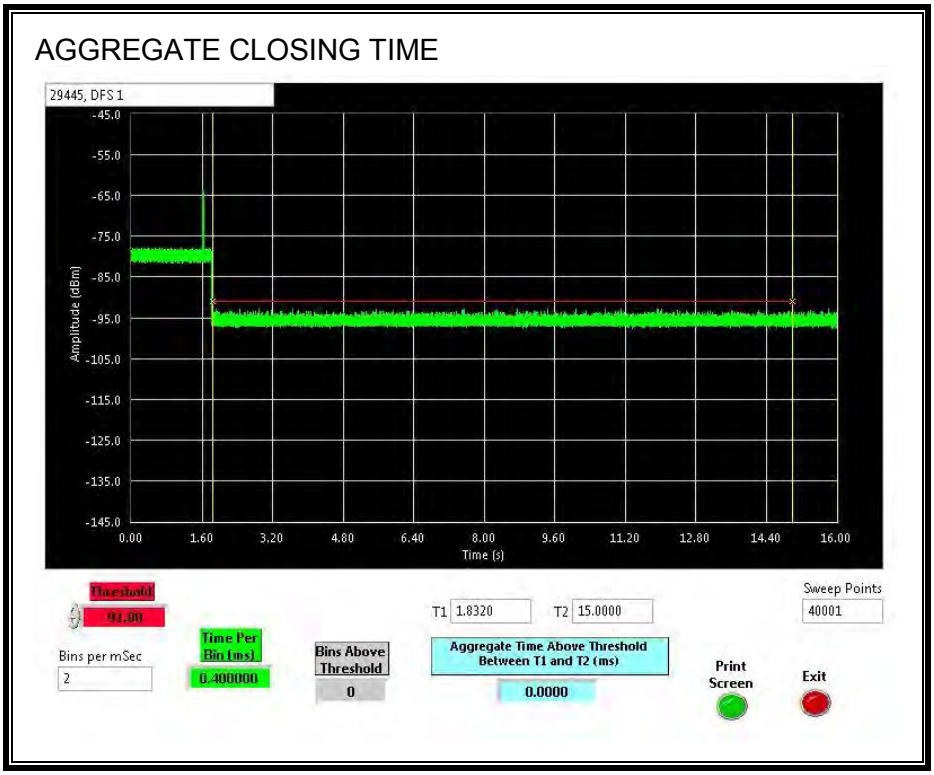
CHANNEL CLOSING TIME

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