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

CERTIFICATION TEST REPORT

FOR

POINT to POINT OUTDOOR INTELLIGENT BACKHAUL RADIO IN 5 GHz UNLICENSED BAND with an 802.11b MANAGEMENT INTERFACE

MODEL NUMBER: IBR-1000-83N with DFS Software Version 1.1.0

FCC ID: 2AAEH-102
IC ID: 11158A-102

REPORT NUMBER: 13U14996-1

ISSUE DATE: SEPTEMBER 30, 2013

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
--	09/30/13	Initial Issue	T. Lee

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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: POINT to POINT OUTDOOR RADIO IN 5 GHz UNLICENSED BAND with an 802.11b MANAGEMENT INTERFACE

MODEL: IBR-100-83N

SERIAL NUMBER: 40313200172

DATE TESTED: SEPTEMBER 25 to 26, 2013

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

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

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

Approved & Released For
UL Verification Services Inc. By:

TIM LEE
WISE PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

DOUG ANDERSON
WISE 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, ANSI C63.10-2009, RSS-GEN Issue 8.

Testing was also conducted in accordance with KDB 176506.

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://www.ccsemc.com.

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

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

5. DYNAMIC FREQUENCY SELECTION

5.1. OVERVIEW

5.1.1. LIMITS

INDUSTRY CANADA

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

RSS-210 Issue 7 A9.4 (b) (ii) **Channel Availability Check Time:** …

Additional requirements for the band 5600-5650 MHz: Until further notice, devices subject to this Section shall not be capable of transmitting in the band 5600-5650 MHz, so that Environment Canada weather radars operating in this band are protected.

RSS-210 Issue 7 A9.4 (b) (iv) **Channel closing time:** the maximum channel closing time is 260 ms.

FCC

§15.407 (h) and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

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
Uniform Spreading	Yes	Not required	Not required

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

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

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 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.		

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period
The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows: For the Short pulse radar Test Signals this instant is the end of the *Burst*. For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated. For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission. The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (Microseconds)	PRI (Microseconds)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
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

Table 6 – Long Pulse Radar Test Signal

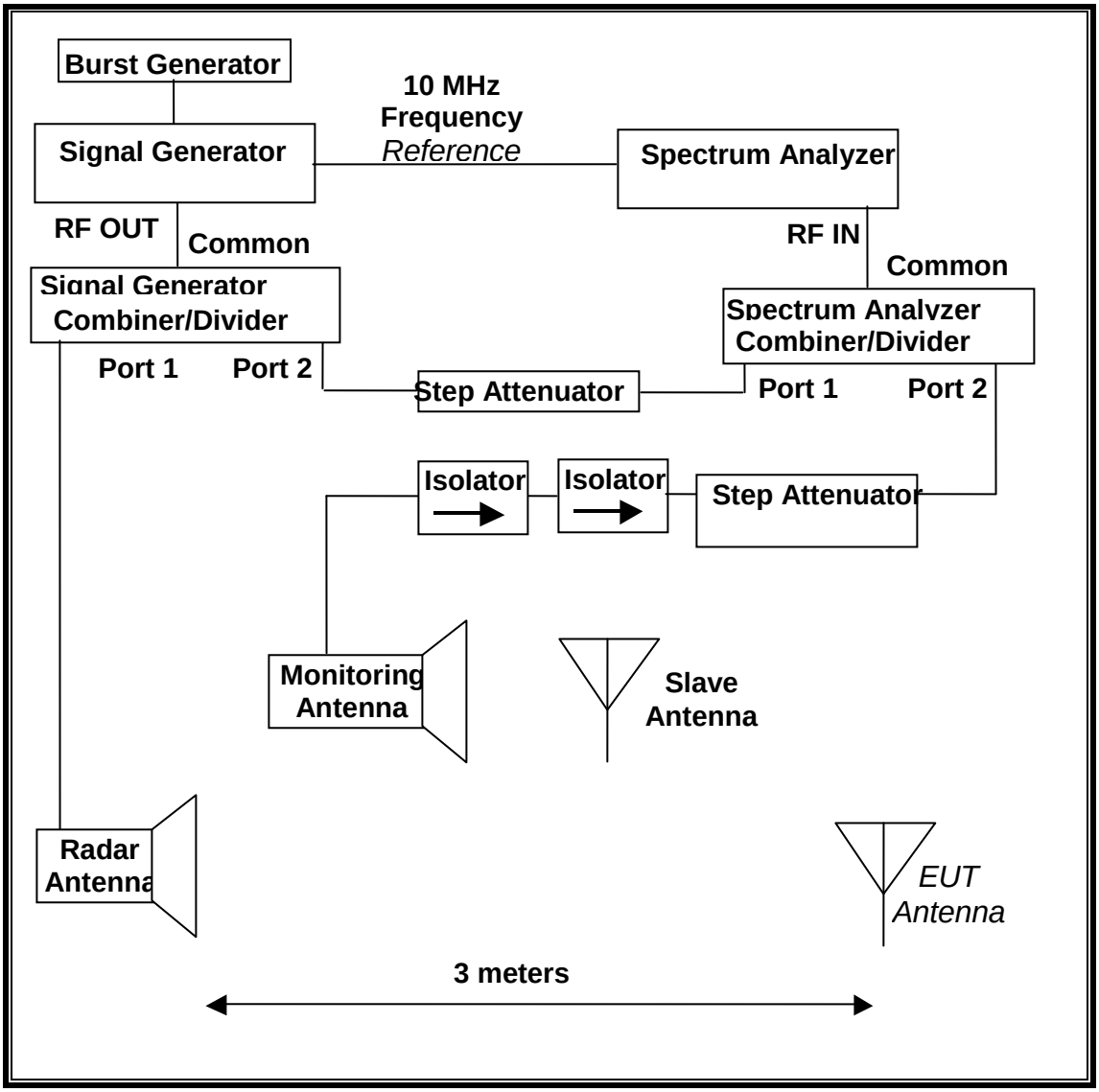
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar Waveform	Pulse Width (µsec)	PRI (µsec)	Burst Length (ms)	Pulses per Hop	Hopping Rate (kHz)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	300	9	.333	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 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 Freqeuncy Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. 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 that mimics normal operating conditions. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

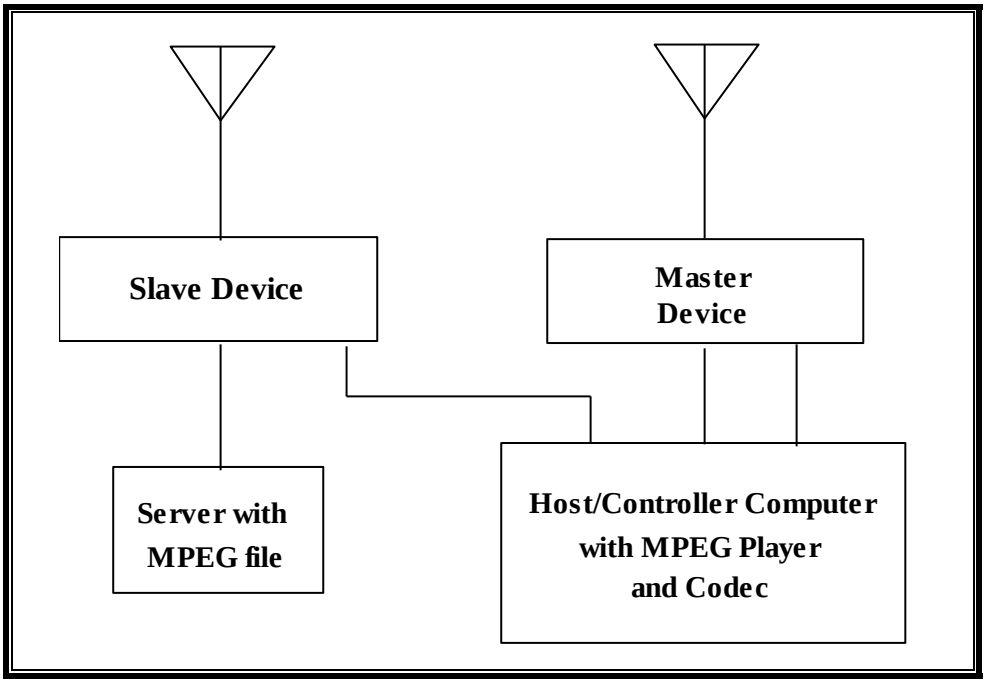
TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset Number**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	09/10/14
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	09/12/14
Arbitrary Waveform Generator	Agilent / HP	33220A	C01146	09/10/14

5.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
P.O.E. Injector (EUT)	Phihong	POE36U-1AT-R	P30300384D1	DoC
Point to Poiny Outdoor Radio (Slave Tx Radio)	Fastback	IBR-1000-38N	403132000193	2AAEH-102
P.O.E. Injector	Phihong	POE36U-1AT-R	P21002705D1	DoC
Notebook PC (Host/Controller)	Lenovo	Type 2359-24U	R9-RY0KF 12/08	DoC
AC Adapter (Host/Controller PC)	Lenovo	92P1156	11S92P1156Z1ZDXN 27S9NS	DoC
Notebook PC (Server)	Lenovo	Type 4276-37U	R9-H8Y3L	DoC
AC Adapter (Server PC)	Lenovo	45N0113	11S45N0113Z1ZHX83 1J5D8	DoC

5.1.4. DESCRIPTION OF EUT

The EUT is a Master Receive only Device employing two DFS sensor radio modules in the 5250-5350 MHz range.

The EUT does not transmit in the 5250-5350 MHz range.

The only DFS antenna assembly utilized with the EUT has a 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/receiver chains connected to the antenna to perform radiated tests.

The Slave transmit device associated with the EUT during these tests does not have radar detection capability.

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

The EUT is a FDD Frame-based system. The Frame timing is set to a listen / talk ratio of 100%.

Three nominal channel bandwidths are implemented: 9 MHz, 18 MHz and 35 MHz.

The EUT always starts using a channel bandwidth of 35 MHz. After it has entered the operational phase, when traffic can be passed, it may select 9 MHz or 18 MHz channel bandwidths depending on channel conditions.

The DFS sensor bandwidth is always wider than the widest nominal channel bandwidth. Therefore, 35 MHz CAC testing covers all nominal channel bandwidths. Furthermore, since the EUT can only start at 35 MHz bandwidth, CAC can only be performed at 35 MHz bandwidth.

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

The software installed in the access point is revision 1.1.0.

UNIFORM CHANNEL SPREADING

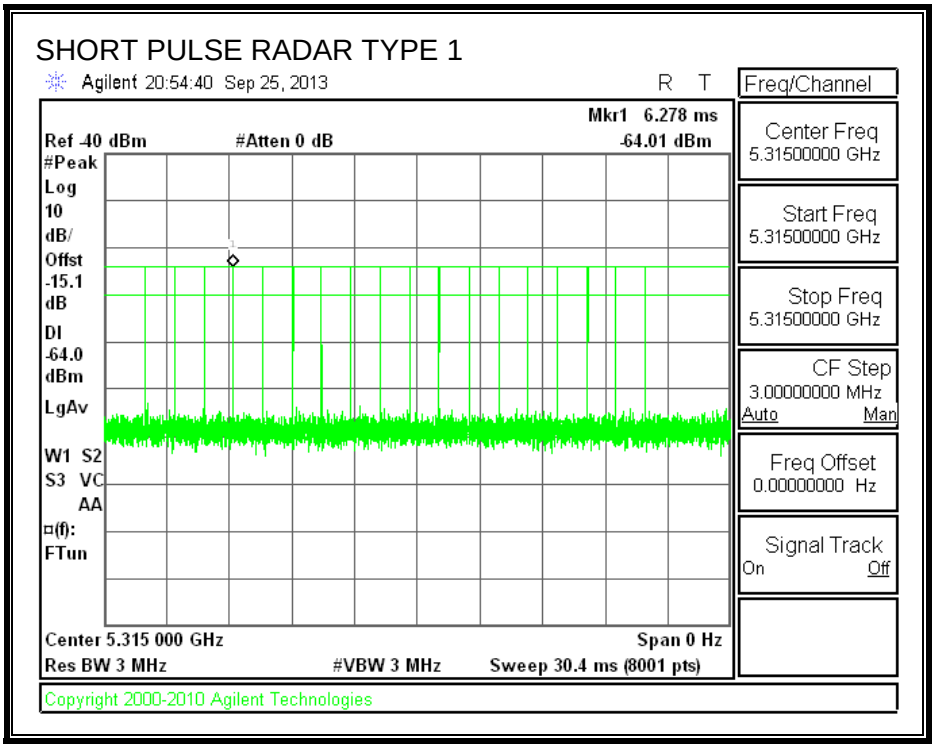
See Manufacturer’s Attestation.

5.2. TEST CHANNEL

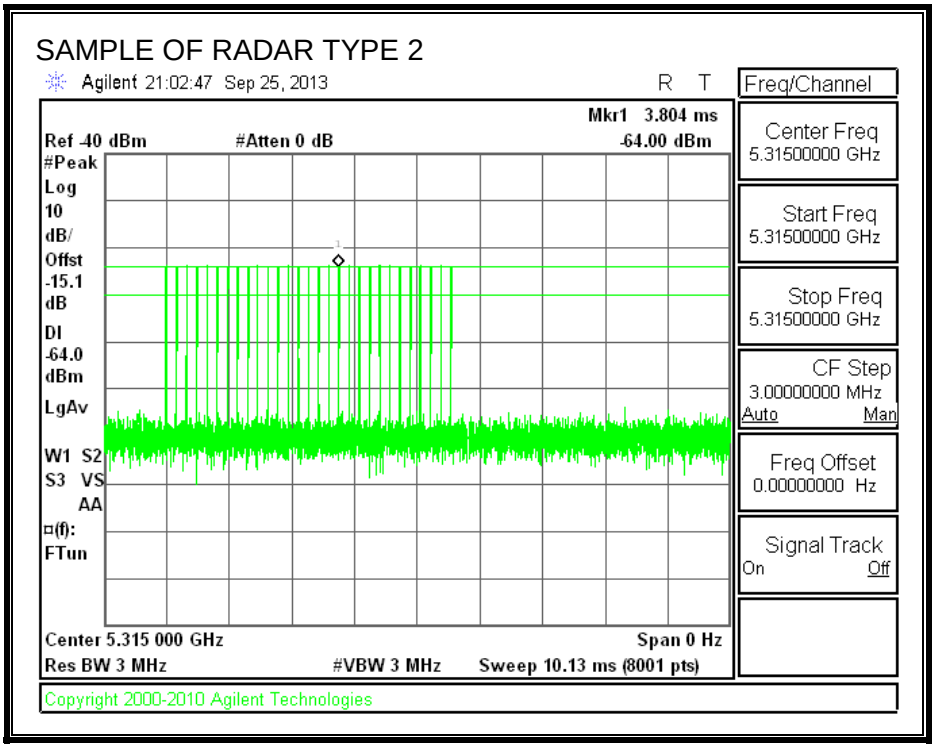
All tests were performed at a channel center frequency of 5315 MHz.

5.2.1. RADAR WAVEFORMS

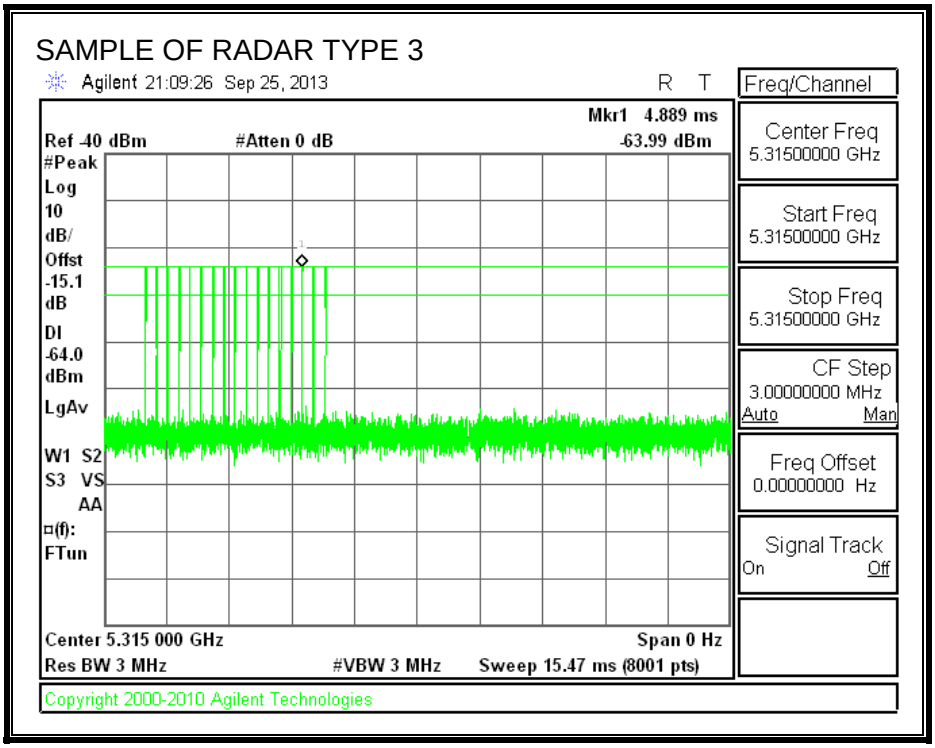
RADAR WAVEFORMS

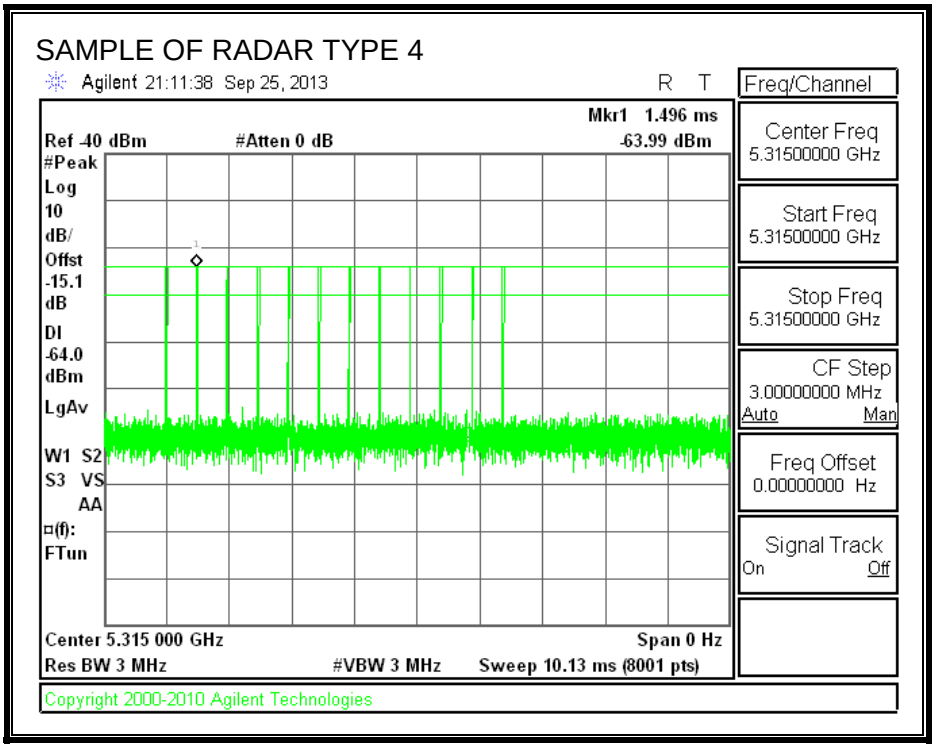


SAMPLE OF RADAR TYPE 2

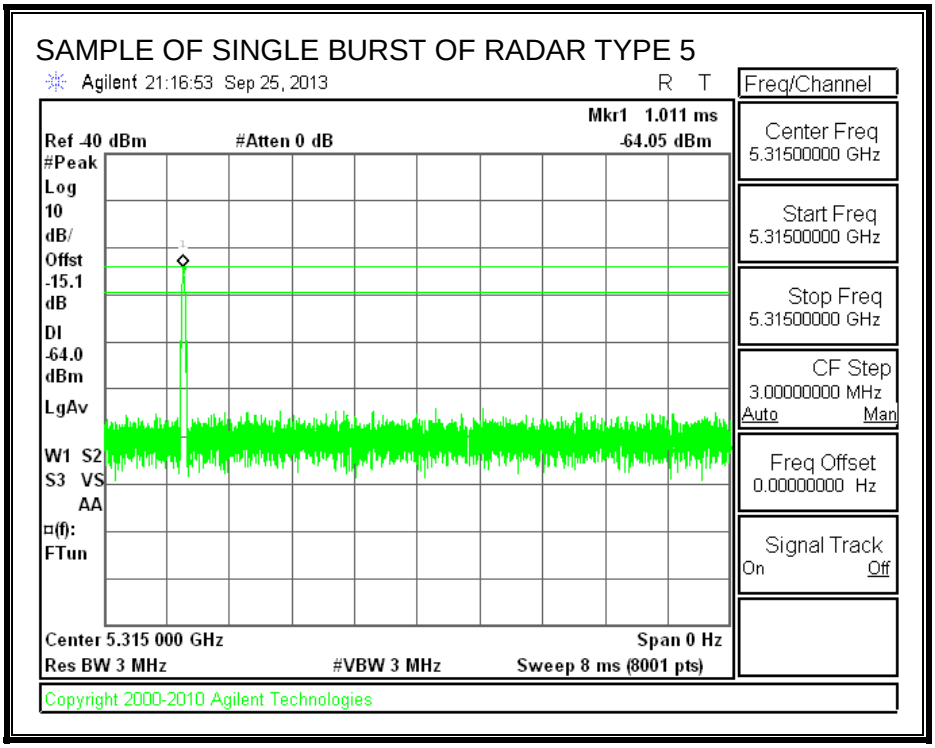


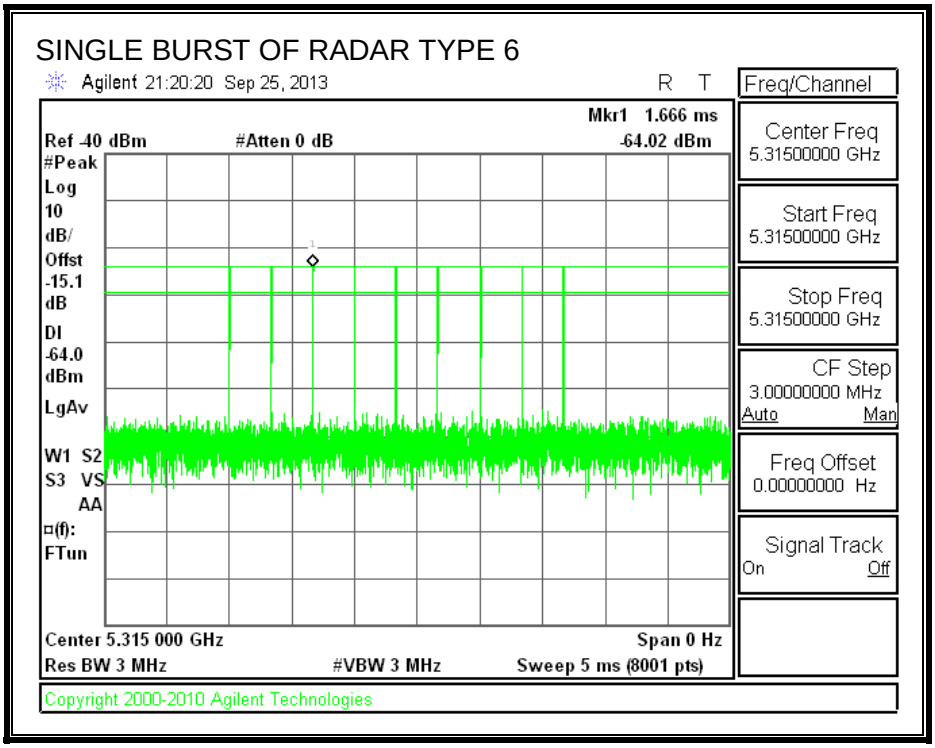
SAMPLE OF RADAR TYPE 3





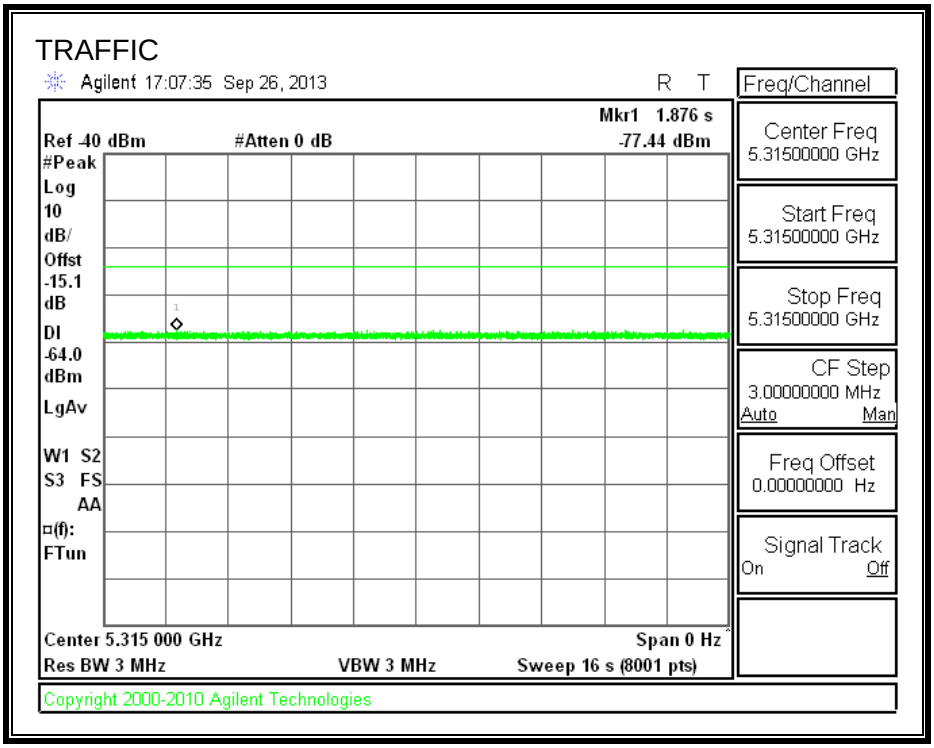
SAMPLE OF SINGLE BURST OF RADAR TYPE 5





5.3. RESULTS FOR 9 MHz BANDWIDTH

5.3.1. TRAFFIC



5.3.2. CHANNEL AVAILABILITY CHECK TIME

The DFS sensor bandwidth is always wider than the widest nominal channel bandwidth. Therefore, 35 MHz CAC testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth. Furthermore, since the EUT can only start at 35 MHz bandwidth, CAC can only be performed at 35 MHz bandwidth.

5.3.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

5.3.4. 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 FCC aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

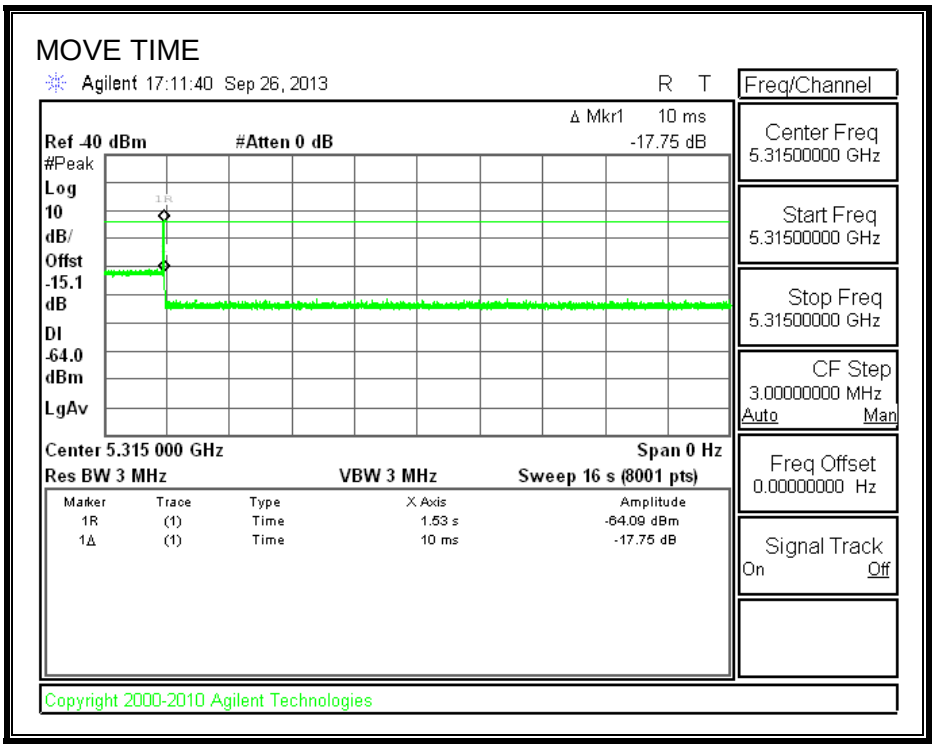
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

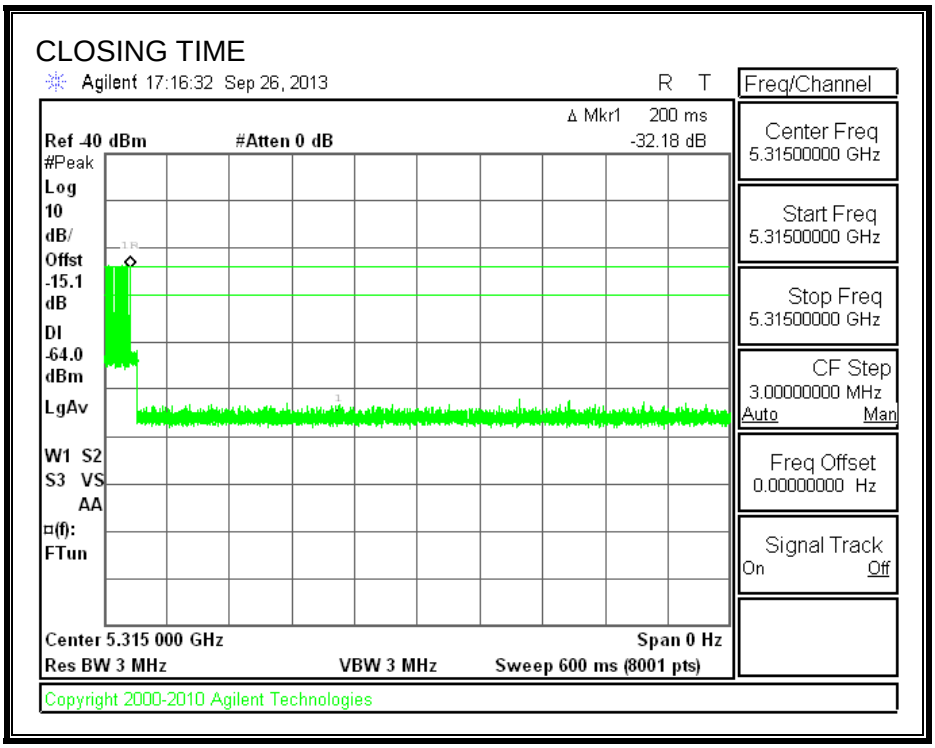
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.010	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	0.0	60
IC	10.0	260

MOVE TIME

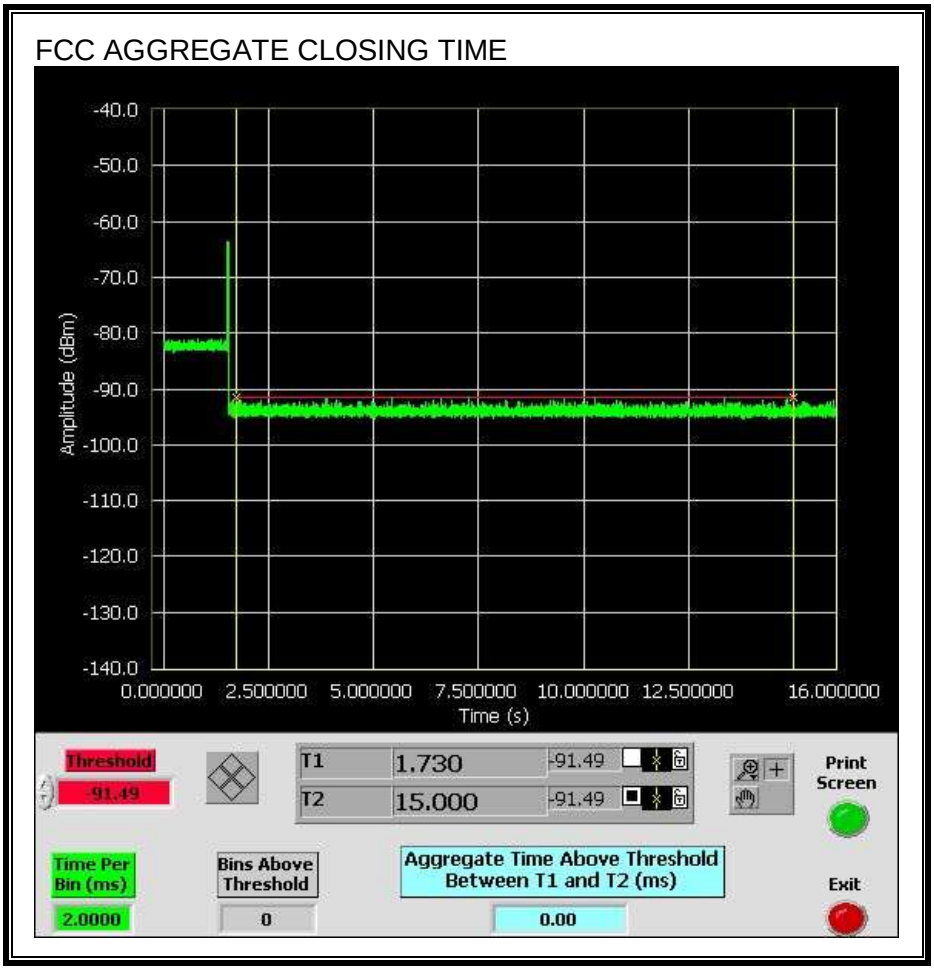


CHANNEL CLOSING TIME

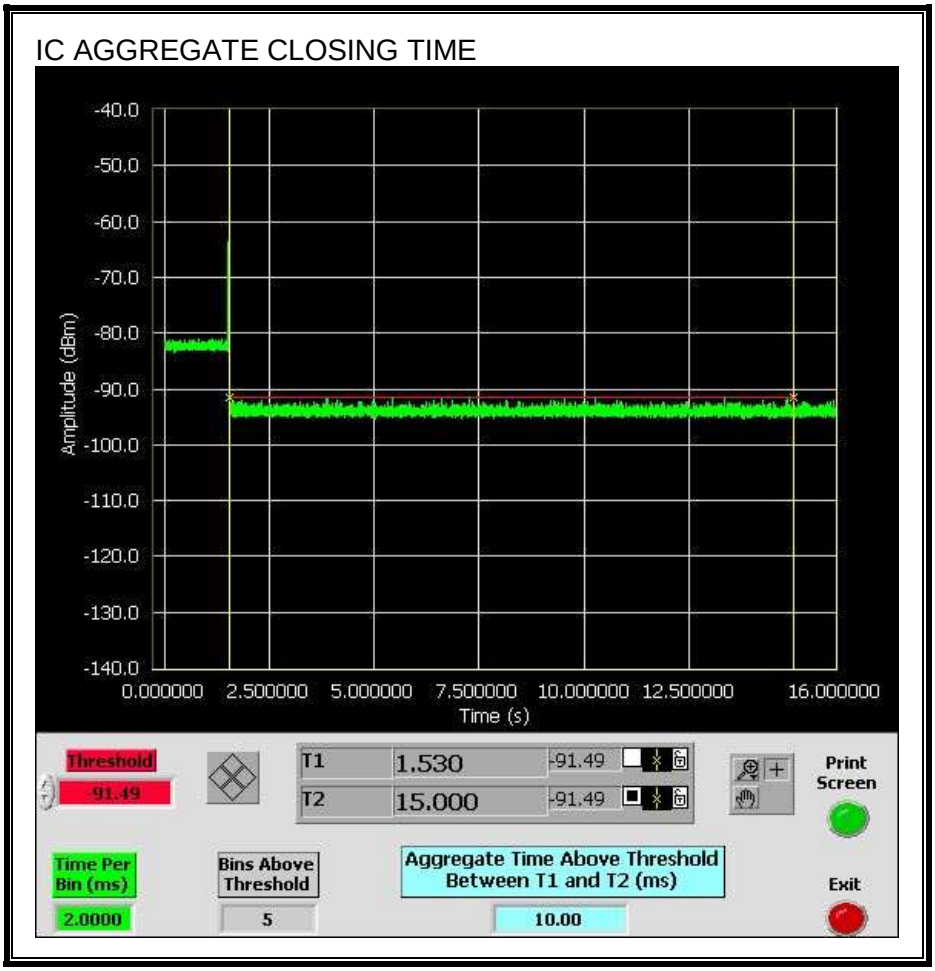


AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.

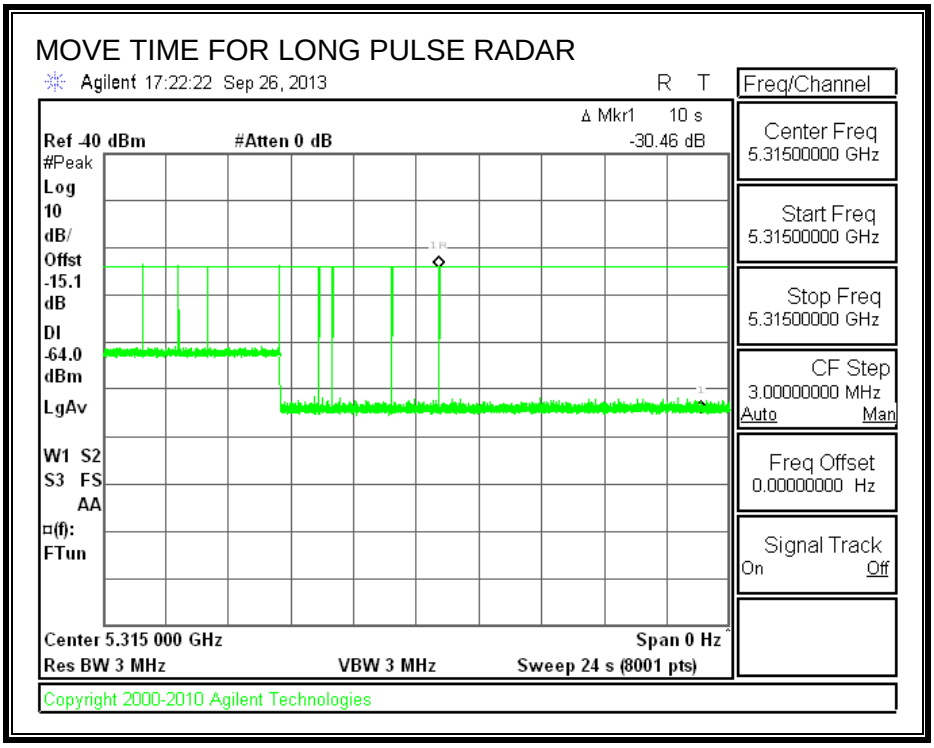


Only intermittent transmissions are observed during the ICC aggregate monitoring period.



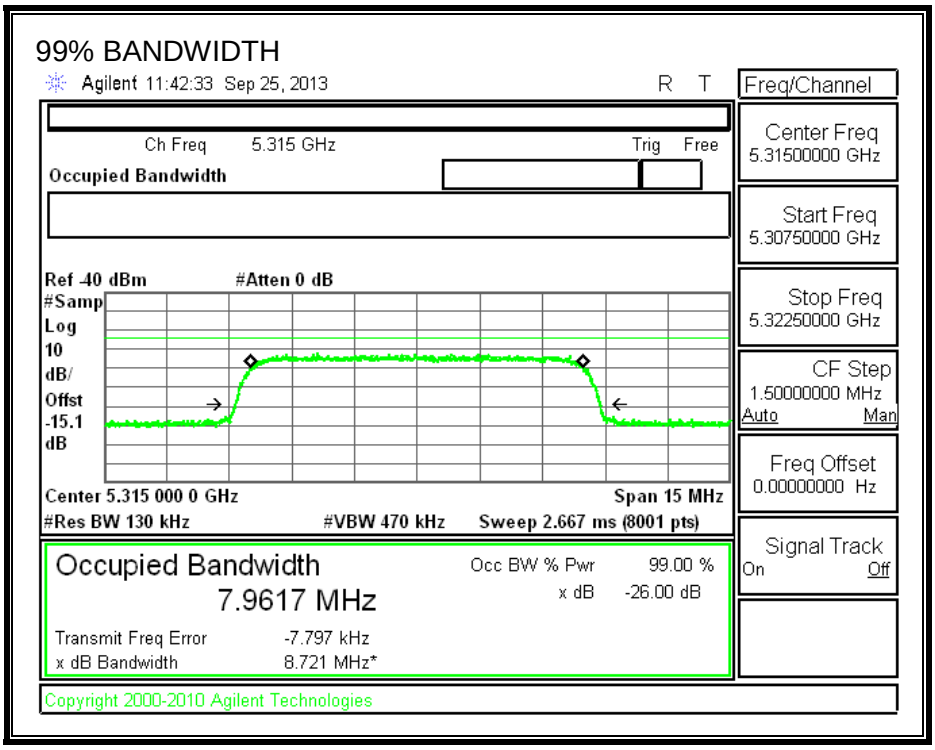
LONG PULSE CHANNEL MOVE TIME

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



5.3.5. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5311	5319	8	7.962	100.5	80

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5311	10	10	100	FL
5312	10	10	100	
5313	10	10	100	
5314	10	10	100	
5315	10	10	100	
5316	10	10	100	
5317	10	10	100	
5318	10	10	100	
5319	10	10	100	FH

5.3.1. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	100.00	60	Pass
Aggregate		100.00	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	36	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1	
1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst	
Trial	Successful Detection (Yes/No)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	4.7	197.00	25	Yes
2002	4	167.00	28	Yes
2003	2.2	188.00	24	Yes
2004	2.2	229.00	27	Yes
2005	2.8	225.00	28	Yes
2006	4.4	182.00	26	Yes
2007	2.7	184.00	28	Yes
2008	1.6	211.00	27	Yes
2009	3.9	171.00	23	Yes
2010	3.5	214.00	23	Yes
2011	3.4	169.00	23	Yes
2012	3.2	165.00	27	Yes
2013	1.9	223.00	25	Yes
2014	1.8	191.00	26	Yes
2015	1	219.00	29	Yes
2016	2.6	205.00	28	Yes
2017	3.6	158.00	28	Yes
2018	4.1	178.00	23	Yes
2019	2.2	182.00	25	Yes
2020	4.8	219.00	29	Yes
2021	1.8	214.00	24	Yes
2022	2.3	220.00	29	Yes
2023	2.1	228.00	24	Yes
2024	5	193.00	26	Yes
2025	3.5	212.00	23	Yes
2026	2.8	220.00	23	Yes
2027	4	168.00	29	Yes
2028	2.5	210.00	28	Yes
2029	1.2	159.00	24	Yes
2030	1.8	206.00	29	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	6	346.00	16	Yes
3002	5.1	265.00	18	Yes
3003	6.9	273.00	18	Yes
3004	6.8	466.00	18	Yes
3005	9.7	402.00	16	Yes
3006	7.3	447.00	18	Yes
3007	5	333.00	16	Yes
3008	5.6	419.00	17	Yes
3009	7.8	422.00	17	Yes
3010	6.1	425.00	18	Yes
3011	8	357.00	16	Yes
3012	8.3	387.00	16	Yes
3013	5.8	253.00	17	Yes
3014	7.5	399.00	17	Yes
3015	7.5	422.00	18	Yes
3016	9.5	316.00	16	Yes
3017	8	282.00	16	Yes
3018	8.9	494.00	16	Yes
3019	7.3	253.00	16	Yes
3020	7.5	395.00	18	Yes
3021	5.1	321.00	16	Yes
3022	8.2	449.00	17	Yes
3023	5.5	361.00	18	Yes
3024	7	315.00	16	Yes
3025	5.7	278.00	17	Yes
3026	8.1	426.00	16	Yes
3027	5.7	328.00	18	Yes
3028	7.9	353.00	17	Yes
3029	6.2	367	16	Yes
3030	9.9	339	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	19	479.00	13	Yes
4002	18.4	256.00	12	Yes
4003	17.9	430.00	12	Yes
4004	18.9	309.00	13	Yes
4005	15.8	263.00	13	Yes
4006	18.8	484.00	13	Yes
4007	11.1	387.00	13	Yes
4008	13.9	433.00	15	Yes
4009	14.5	412.00	13	Yes
4010	18.1	481.00	12	Yes
4011	12.7	492.00	12	Yes
4012	14.6	412.00	15	Yes
4013	18.7	449.00	12	Yes
4014	19.5	466.00	16	Yes
4015	18.7	267.00	14	Yes
4016	14.3	331.00	15	Yes
4017	16.7	445.00	12	Yes
4018	19.2	253.00	16	Yes
4019	15	308.00	15	Yes
4020	18.4	482.00	15	Yes
4021	11.8	457.00	12	Yes
4022	19.1	375.00	16	Yes
4023	10.3	320.00	16	Yes
4024	10.5	404.00	16	Yes
4025	15.7	349.00	14	Yes
4026	12.7	409.00	15	Yes
4027	13.3	347.00	12	Yes
4028	10.8	345.00	13	Yes
4029	10.1	452.00	14	Yes
4030	11.4	422.00	14	Yes

TYPE 5 DETECTION PROBABILITY

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

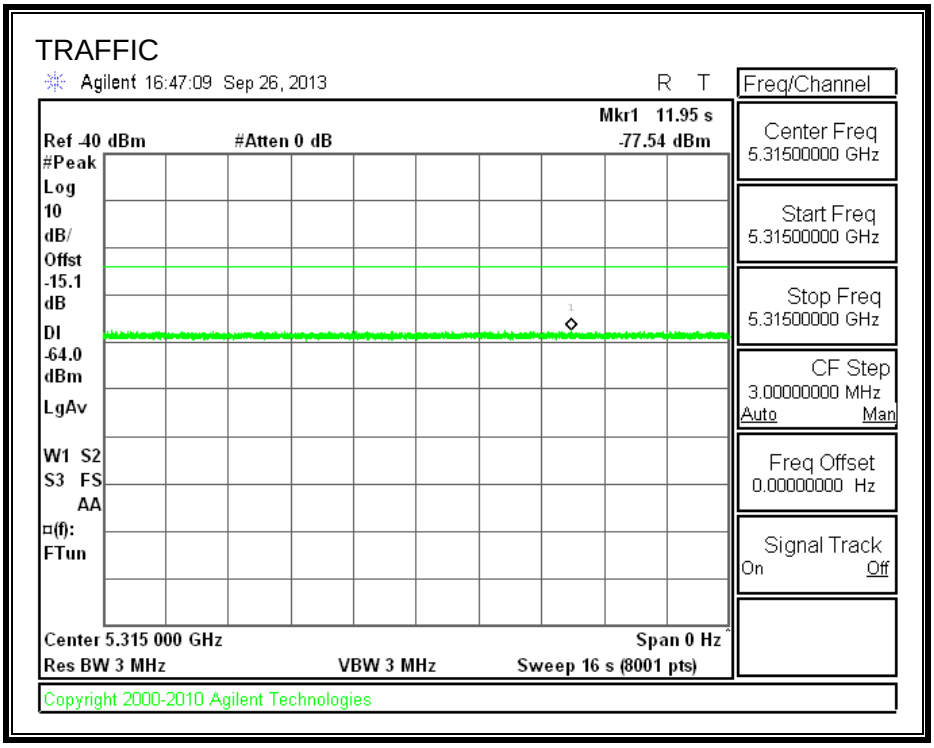
Note: The Type 5 randomized parameters are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	185	5311	1	Yes
2	660	5312	1	Yes
3	1135	5313	1	Yes
4	1610	5314	1	Yes
5	2085	5315	1	Yes
6	2560	5316	3	Yes
7	3035	5317	1	Yes
8	3510	5318	1	Yes
9	3985	5319	1	Yes
10	4460	5311	1	Yes
11	4935	5312	1	Yes
12	5410	5313	1	Yes
13	5885	5314	1	Yes
14	6360	5315	4	Yes
15	6835	5316	4	Yes
16	7310	5317	1	Yes
17	7785	5318	2	Yes
18	8260	5319	3	Yes
19	8735	5311	2	Yes
20	9210	5312	1	Yes
21	9685	5313	2	Yes
22	10635	5314	1	Yes
23	11110	5315	2	Yes
24	11585	5316	2	Yes
25	12060	5317	3	Yes
26	12535	5318	2	Yes
27	13485	5319	2	Yes
28	13960	5311	1	Yes
29	14435	5312	4	Yes
30	14910	5313	1	Yes
31	15385	5314	2	Yes
32	15860	5315	3	Yes
33	16335	5316	1	Yes
34	16810	5317	1	Yes
35	17285	5318	3	Yes
36	17760	5319	1	Yes

5.4. RESULTS FOR 18 MHz BANDWIDTH

5.4.1. TRAFFIC



5.4.2. CHANNEL AVAILABILITY CHECK TIME

The DFS sensor bandwidth is always wider than the widest nominal channel bandwidth. Therefore, 35 MHz CAC testing covers all nominal channel bandwidths and this test was not performed for this channel bandwidth. Furthermore, since the EUT can only start at 35 MHz bandwidth, CAC can only be performed at 35 MHz bandwidth.

5.4.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

5.4.4. 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 FCC aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

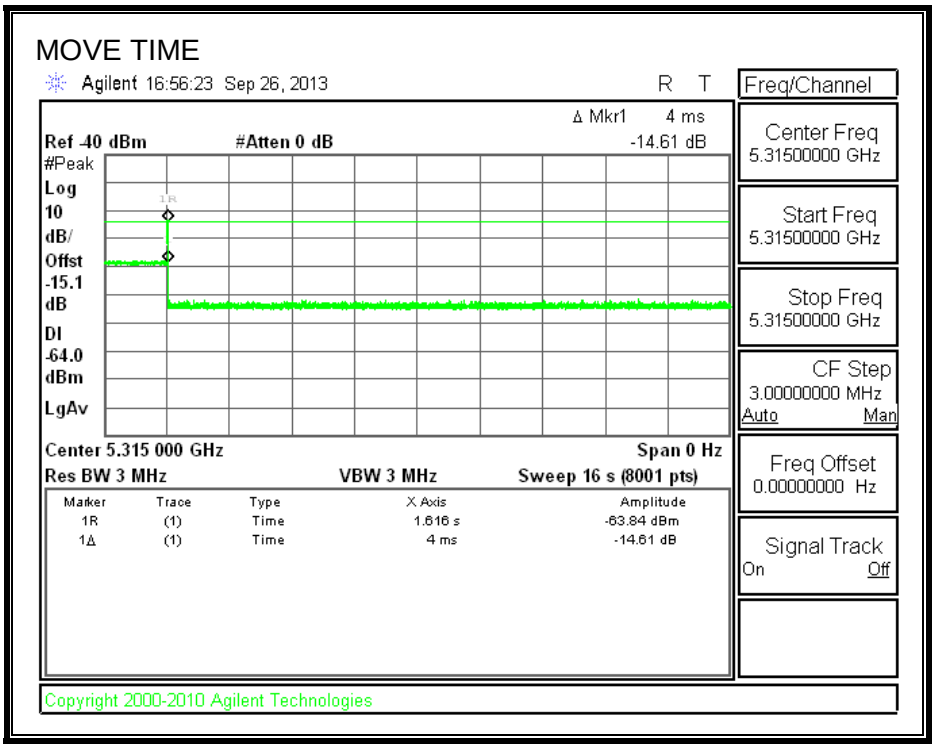
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

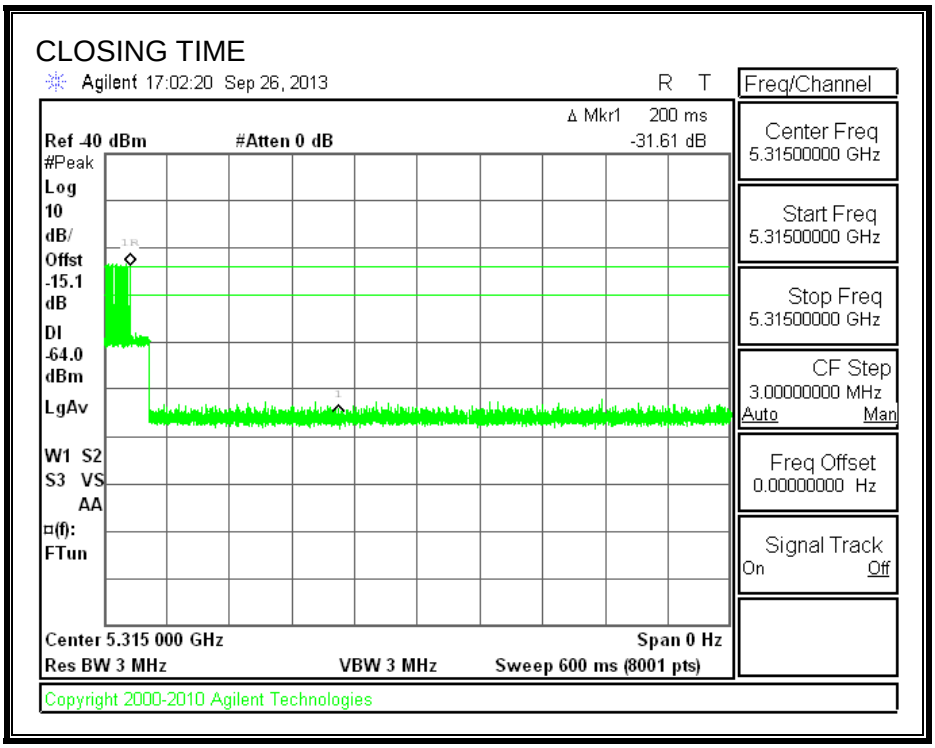
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.004	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	0.0	60
IC	4.0	260

MOVE TIME

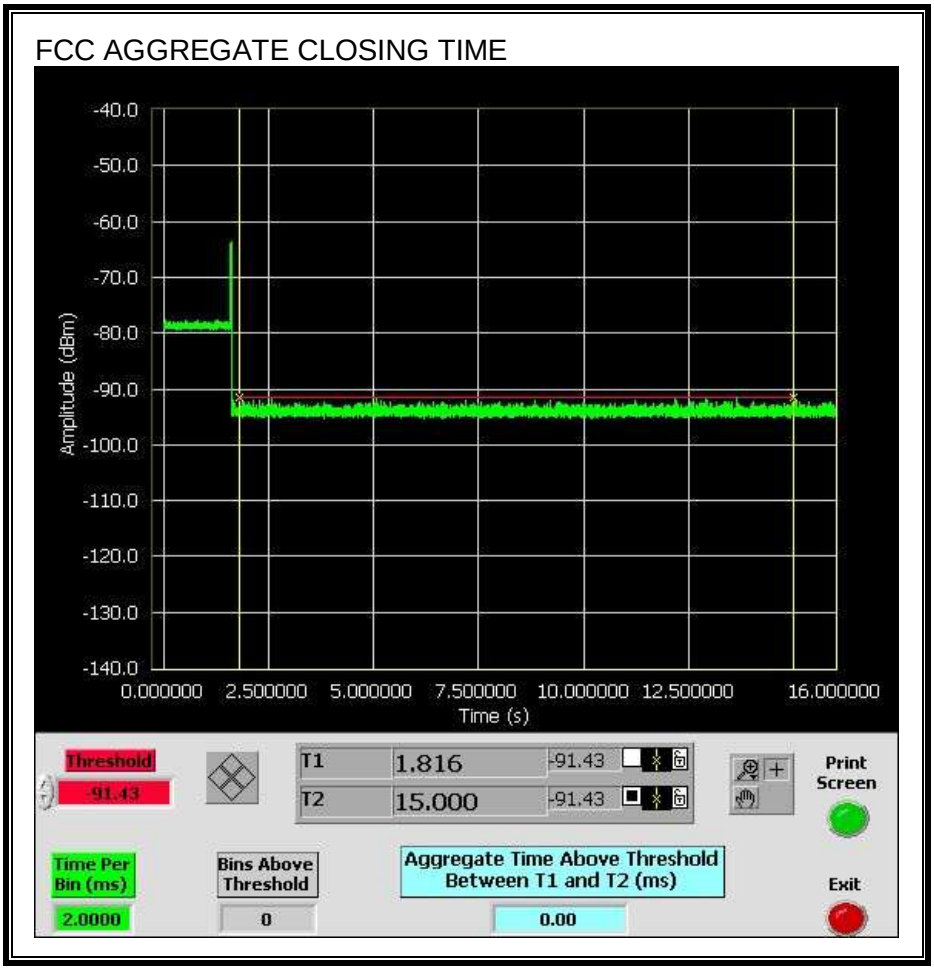


CHANNEL CLOSING TIME



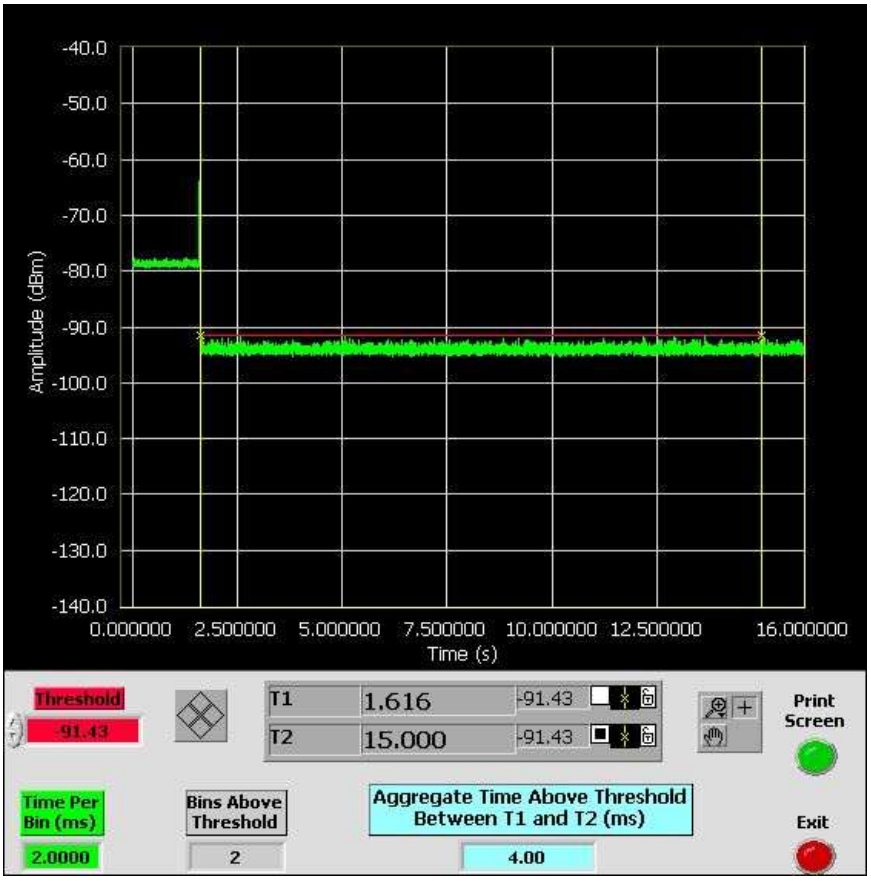
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



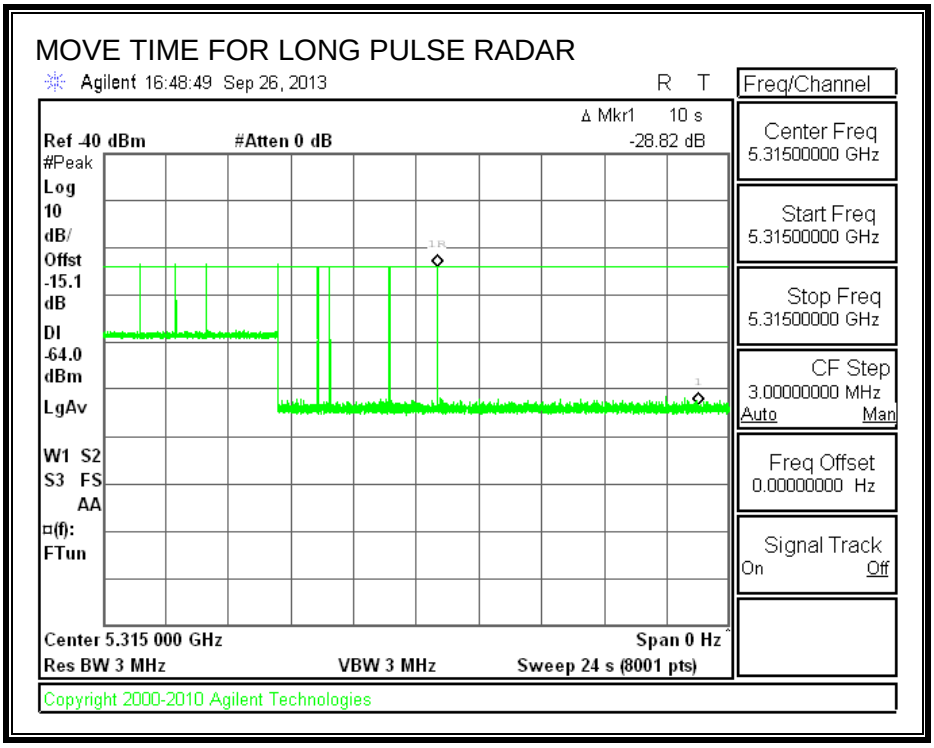
Only intermittent transmissions are observed during the ICC aggregate monitoring period.

IC AGGREGATE CLOSING TIME



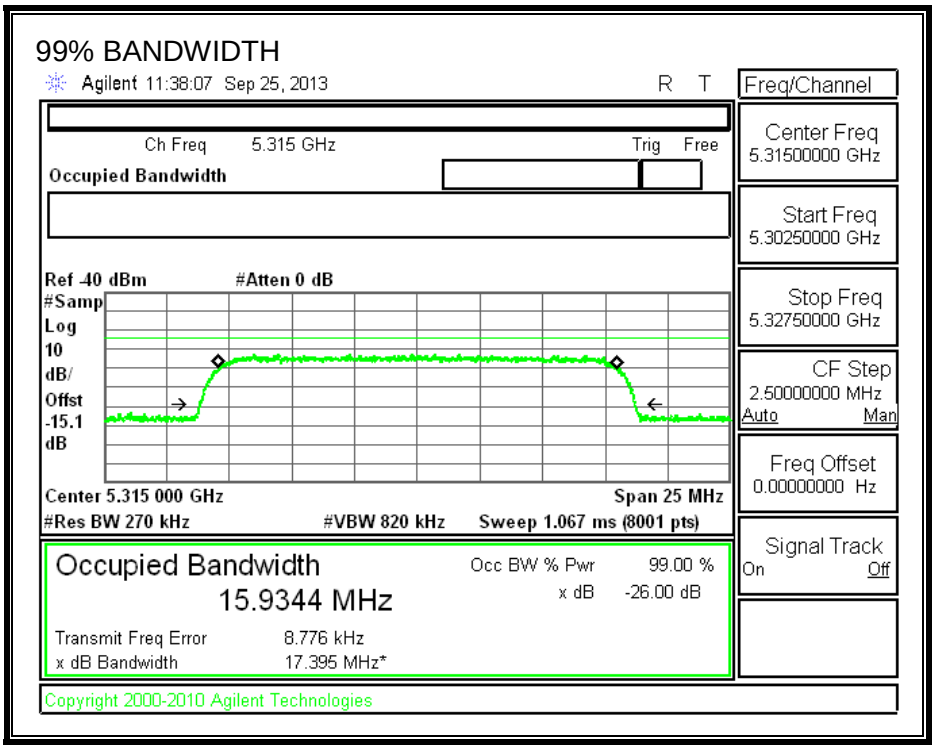
LONG PULSE CHANNEL MOVE TIME

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



5.4.5. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5307	5323	16	15.934	100.4	80

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5307	10	10	100	FL
5308	10	10	100	
5309	10	10	100	
5310	10	10	100	
5311	10	10	100	
5312	10	10	100	
5313	10	10	100	
5314	10	10	100	
5315	10	10	100	
5316	10	10	100	
5317	10	10	100	
5318	10	10	100	
5319	10	10	100	
5320	10	10	100	
5321	10	10	100	
5322	10	10	100	
5323	10	10	100	FH

5.4.6. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	76.67	60	Pass
FCC Short Pulse Type 3	30	93.33	60	Pass
FCC Short Pulse Type 4	30	100.00	60	Pass
Aggregate		92.50	80	Pass
FCC Long Pulse Type 5	30	96.67	80	Pass
FCC Hopping Type 6	34	100.00	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst	
Trial	**Successful Detection (Yes/No)**
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	4.7	197.00	25	No
2002	4	167.00	28	No
2003	2.2	188.00	24	Yes
2004	2.2	229.00	27	Yes
2005	2.8	225.00	28	Yes
2006	4.4	182.00	26	No
2007	2.7	184.00	28	Yes
2008	1.6	211.00	27	Yes
2009	3.9	171.00	23	No
2010	3.5	214.00	23	No
2011	3.4	169.00	23	No
2012	3.2	165.00	27	No
2013	1.9	223.00	25	Yes
2014	1.8	191.00	26	Yes
2015	1	219.00	29	Yes
2016	2.6	205.00	28	Yes
2017	3.6	158.00	28	Yes
2018	4.1	178.00	23	Yes
2019	2.2	182.00	25	Yes
2020	4.8	219.00	29	Yes
2021	1.8	214.00	24	Yes
2022	2.3	220.00	29	Yes
2023	2.1	228.00	24	Yes
2024	5	193.00	26	Yes
2025	3.5	212.00	23	Yes
2026	2.8	220.00	23	Yes
2027	4	168.00	29	Yes
2028	2.5	210.00	28	Yes
2029	1.2	159.00	24	Yes
2030	1.8	206.00	29	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	6	346.00	16	No
3002	5.1	265.00	18	No
3003	6.9	273.00	18	Yes
3004	6.8	466.00	18	Yes
3005	9.7	402.00	16	Yes
3006	7.3	447.00	18	Yes
3007	5	333.00	16	Yes
3008	5.6	419.00	17	Yes
3009	7.8	422.00	17	Yes
3010	6.1	425.00	18	Yes
3011	8	357.00	16	Yes
3012	8.3	387.00	16	Yes
3013	5.8	253.00	17	Yes
3014	7.5	399.00	17	Yes
3015	7.5	422.00	18	Yes
3016	9.5	316.00	16	Yes
3017	8	282.00	16	Yes
3018	8.9	494.00	16	Yes
3019	7.3	253.00	16	Yes
3020	7.5	395.00	18	Yes
3021	5.1	321.00	16	Yes
3022	8.2	449.00	17	Yes
3023	5.5	361.00	18	Yes
3024	7	315.00	16	Yes
3025	5.7	278.00	17	Yes
3026	8.1	426.00	16	Yes
3027	5.7	328.00	18	Yes
3028	7.9	353.00	17	Yes
3029	6.2	367	16	Yes
3030	9.9	339	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	19	479.00	13	Yes
4002	18.4	256.00	12	Yes
4003	17.9	430.00	12	Yes
4004	18.9	309.00	13	Yes
4005	15.8	263.00	13	Yes
4006	18.8	484.00	13	Yes
4007	11.1	387.00	13	Yes
4008	13.9	433.00	15	Yes
4009	14.5	412.00	13	Yes
4010	18.1	481.00	12	Yes
4011	12.7	492.00	12	Yes
4012	14.6	412.00	15	Yes
4013	18.7	449.00	12	Yes
4014	19.5	466.00	16	Yes
4015	18.7	267.00	14	Yes
4016	14.3	331.00	15	Yes
4017	16.7	445.00	12	Yes
4018	19.2	253.00	16	Yes
4019	15	308.00	15	Yes
4020	18.4	482.00	15	Yes
4021	11.8	457.00	12	Yes
4022	19.1	375.00	16	Yes
4023	10.3	320.00	16	Yes
4024	10.5	404.00	16	Yes
4025	15.7	349.00	14	Yes
4026	12.7	409.00	15	Yes
4027	13.3	347.00	12	Yes
4028	10.8	345.00	13	Yes
4029	10.1	452.00	14	Yes
4030	11.4	422.00	14	Yes

TYPE 5 DETECTION PROBABILITY

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

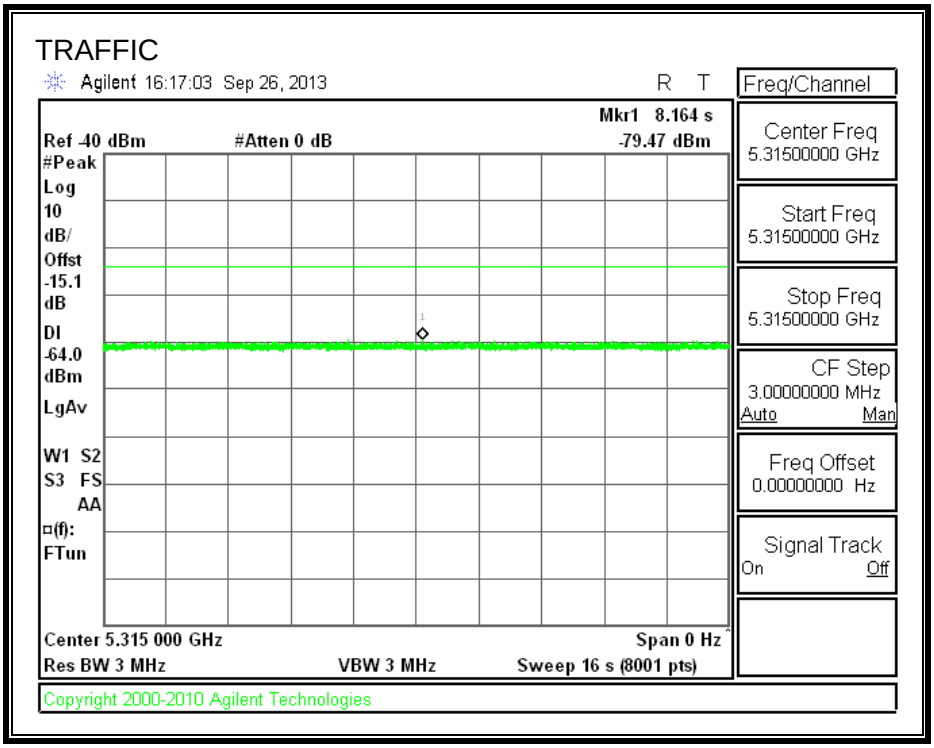
Note: The Type 5 randomized parameters are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	10	5307	4	Yes
2	485	5308	4	Yes
3	960	5309	6	Yes
4	1435	5310	4	Yes
5	1910	5311	4	Yes
6	2385	5312	6	Yes
7	2860	5313	4	Yes
8	3335	5314	4	Yes
9	3810	5315	4	Yes
10	4285	5316	4	Yes
11	4760	5317	2	Yes
12	5235	5318	3	Yes
13	5710	5319	3	Yes
14	6185	5320	5	Yes
15	7135	5321	4	Yes
16	7610	5322	3	Yes
17	8085	5323	4	Yes
18	8560	5307	6	Yes
19	9035	5308	5	Yes
20	9510	5309	2	Yes
21	9985	5310	3	Yes
22	10460	5311	5	Yes
23	10935	5312	4	Yes
24	11410	5313	5	Yes
25	11885	5314	4	Yes
26	12360	5315	5	Yes
27	12835	5316	4	Yes
28	13310	5317	4	Yes
29	13785	5318	8	Yes
30	14260	5319	3	Yes
31	14735	5320	6	Yes
32	15210	5321	7	Yes
33	15685	5322	3	Yes
34	16160	5323	2	Yes

5.5. RESULTS FOR 35 MHz BANDWIDTH

5.5.1. TRAFFIC



5.5.2. 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 (5315 MHz) and a log file was generated. Upon completion of the CAC period the 5.8 GHz downlink begins a “discovery phase” while 5.3GHz In-Service Monitoring continues. When the 5.8 GHz downlink connects the 5.3 GHz Uplink Transmitter is enabled. The 5.3 GHz Receive Radio then associates to the 5.3 Ghz Transimit 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.

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 (5315 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 (5315 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 5315 MHz (sec)	End of CAC at 5315 MHz (sec)	CAC Time (sec)
205.6	265.60	60.00

Radar Near Beginning of CAC

Start of CAC at 5315 MHz (sec)	Timing of Radar Burst at 5315 MHz (sec)	Radar Relative to Start of CAC at 5315 MHz (sec)
248.4	250.40	2.00

Radar Near End of CAC

Start of CAC at 5315 MHz (sec)	Timing of Radar Burst at 5315 MHz (sec)	Radar Relative to Start of CAC at 5315 MHz (sec)
211.5	269.50	58.00

QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start of CAC at 5315 MHz (hh:mm:ss)	End of CAC at 5315 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
0:03:11	0:04:11	0:01:00

Radar Near Beginning of CAC

Start of CAC at 5315 MHz (hh:mm:ss)	Radar Detected at 5315 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:03:54	0:03:56	0:00:02

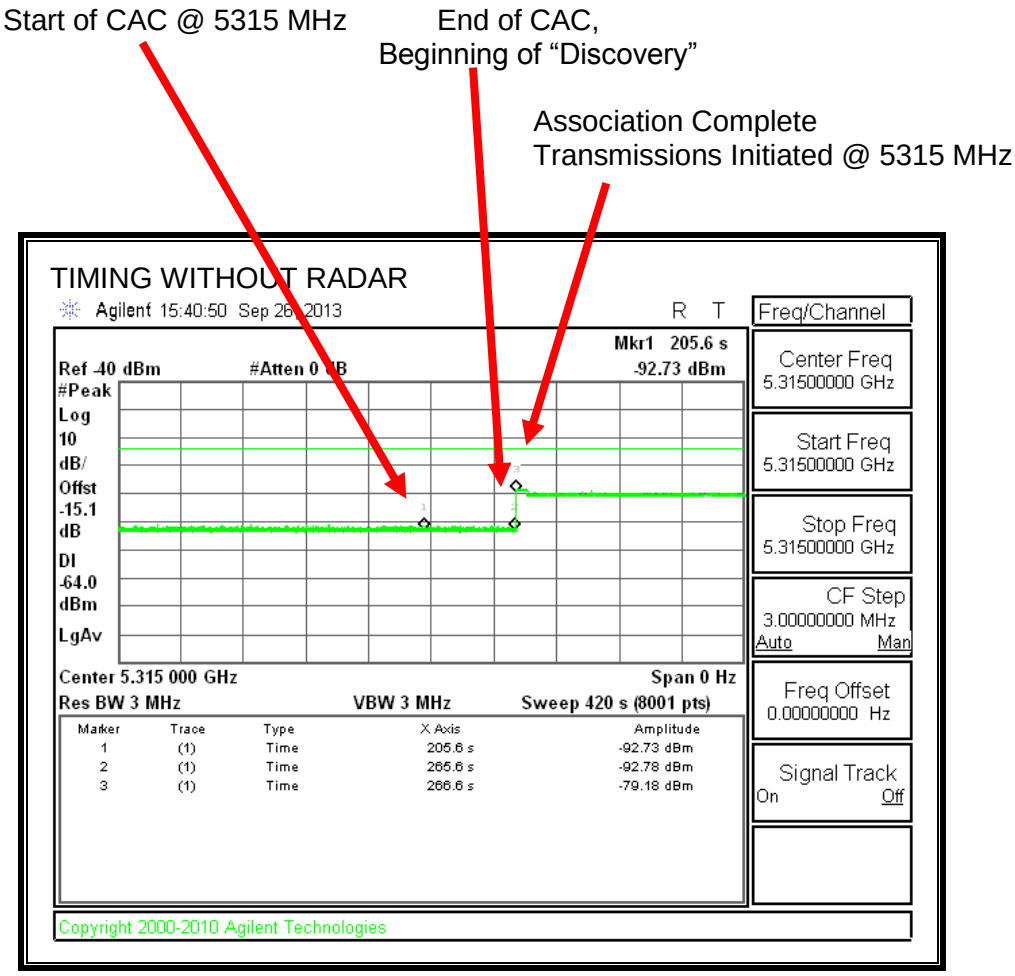
Radar Near End of CAC

Start of CAC at 5315 MHz (hh:mm:ss)	Radar Detected at 5315 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
0:03:17	0:04:15	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 00:03:11 IBR daemon.notice mgd: RRC DFS: CAC Started, Wait for 60-secs, Time Stamp = 121345 msec

Jan 1 00:04:11 IBR daemon.notice mgd: RRC DFS: CAC Complete, Time Stamp = 181345 msec

Jan 1 00:04:11 IBR daemon.notice mgd: RRC M_COLD_START: ENTER -> STATE_WAIT_SYNCH

Jan 1 00:04:11 IBR daemon.notice mgd: Freq change to 5750

Jan 1 00:04:11 IBR daemon.debug mgd: PWR CNTL => No mode change (stream mask = 3)

Jan 1 00:04:11 IBR daemon.notice mgd: Tx Frequency change: From [5800] / To [5750]

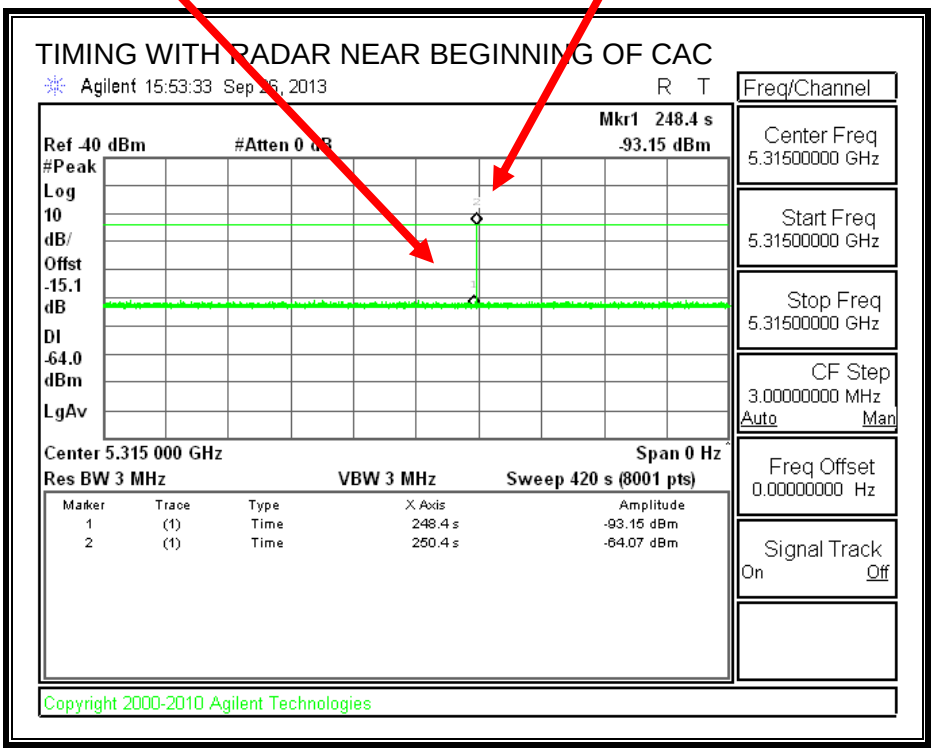
Jan 1 00:04:11 IBR daemon.notice mgd: wait_for_quick_synch Tx = 5750 MHz, Rx = 5315 MHz, Ants = 2378

Jan 1 00:04:12 IBR daemon.notice mgd: Link-Up : Sync Locked Rx[5315 MHz] Tx[5750 MHz], Ant combo = 2378

TIMING WITH RADAR NEAR BEGINNING OF CAC

Start of CAC @ 5315 MHz

Radar Signal Applied @ 5315 MHz

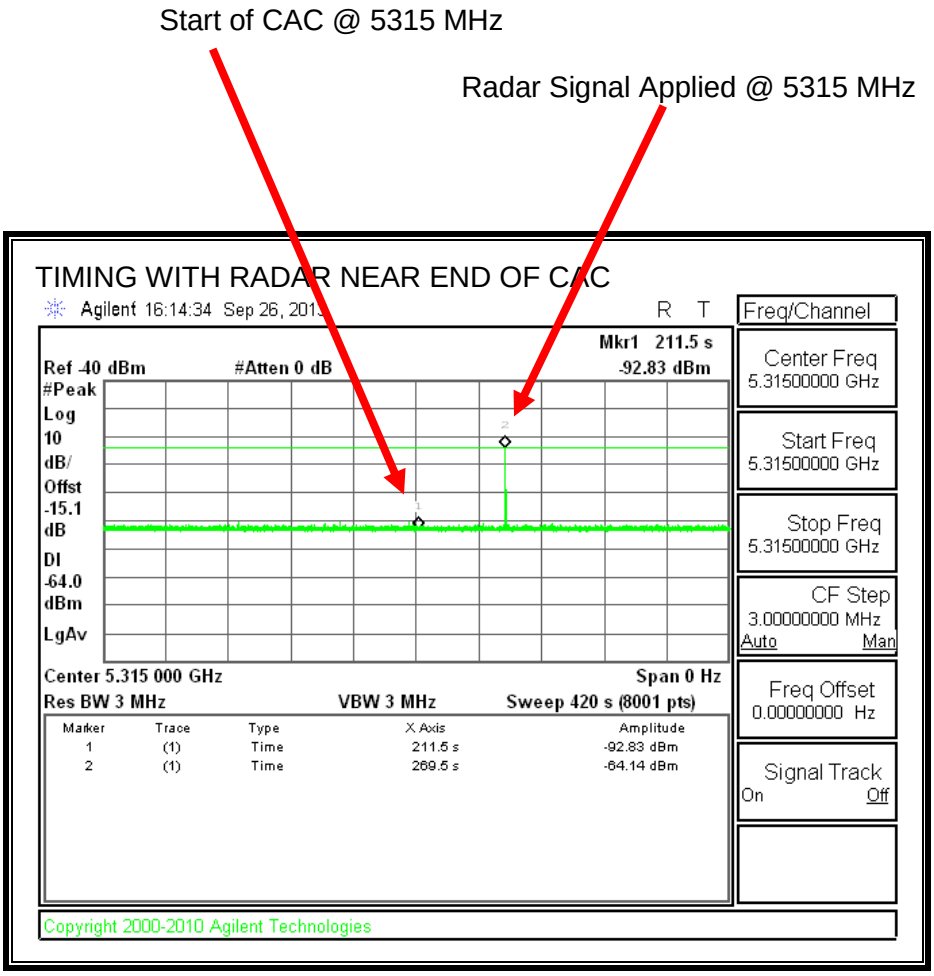


No EUT transmissions on the intended channel were observed.

EUT RADAR EVENTS LOG FILE - BEGINNING OF CAC

Jan 1 00:03:54 IBR daemon.notice mgd: RRC DFS: CAC Started, Wait for 60-secs, Time Stamp = 147036 msec
Jan 1 00:03:56 IBR daemon.notice mgd: SUART: Port - 1 selected
Jan 1 00:03:56 IBR daemon.notice mgd: SUART: Port - 1 selected
Jan 1 00:03:56 IBR daemon.notice mgd: RRC DFS[1]: Msg Rcvd 3, chan = 65, Freq = 5325 MHz, msec = 28842, wr_idx = 2
Jan 1 00:03:56 IBR daemon.notice mgd: RRC DFS: local radar det, chan = 65, lbe = 59, ube = 66
Jan 1 00:03:56 IBR daemon.notice mgd: RRC DFS: lbe = 59 ube = 66, lbe_idx = 9 ube_idx = 16, first = 50
Jan 1 00:03:56 IBR daemon.notice mgd: DFS Blackout Table
Jan 1 00:03:56 IBR daemon.notice mgd: 5250 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:56 IBR daemon.notice mgd: 5270 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:03:56 IBR daemon.notice mgd: 5290 Mhz: 00:00 30:00 30:00 30:00
Jan 1 00:03:56 IBR daemon.notice mgd: 5310 Mhz: 30:00 30:00 30:00 30:00
Jan 1 00:03:56 IBR daemon.notice mgd: 5330 Mhz: 30:00 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 00:03:17 IBR daemon.notice mgd: RRC DFS: CAC Started, Wait for 60-secs, Time Stamp = 121222 msec
Jan 1 00:04:15 IBR daemon.notice mgd: SUART: Port - 1 selected
Jan 1 00:04:15 IBR daemon.notice mgd: SUART: Port - 1 selected
Jan 1 00:04:15 IBR daemon.notice mgd: RRC DFS[1]: Msg Rcvd 3, chan = 65, Freq = 5325 MHz, msec = 84202, wr_idx = 1
Jan 1 00:04:15 IBR daemon.notice mgd: RRC DFS: local radar det, chan = 65, lbe = 59, ube = 66
Jan 1 00:04:15 IBR daemon.notice mgd: RRC DFS: lbe = 59 ube = 66, lbe_idx = 9 ube_idx = 16, first = 50
Jan 1 00:04:15 IBR daemon.notice mgd: DFS Blackout Table
Jan 1 00:04:15 IBR daemon.notice mgd: 5250 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:04:15 IBR daemon.notice mgd: 5270 Mhz: 00:00 00:00 00:00 00:00
Jan 1 00:04:15 IBR daemon.notice mgd: 5290 Mhz: 00:00 30:00 30:00 30:00
Jan 1 00:04:15 IBR daemon.notice mgd: 5310 Mhz: 30:00 30:00 30:00 30:00
Jan 1 00:04:15 IBR daemon.notice mgd: 5330 Mhz: 30:00 00:00 00:00 00:00

5.5.3. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

5.5.4. 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 FCC aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

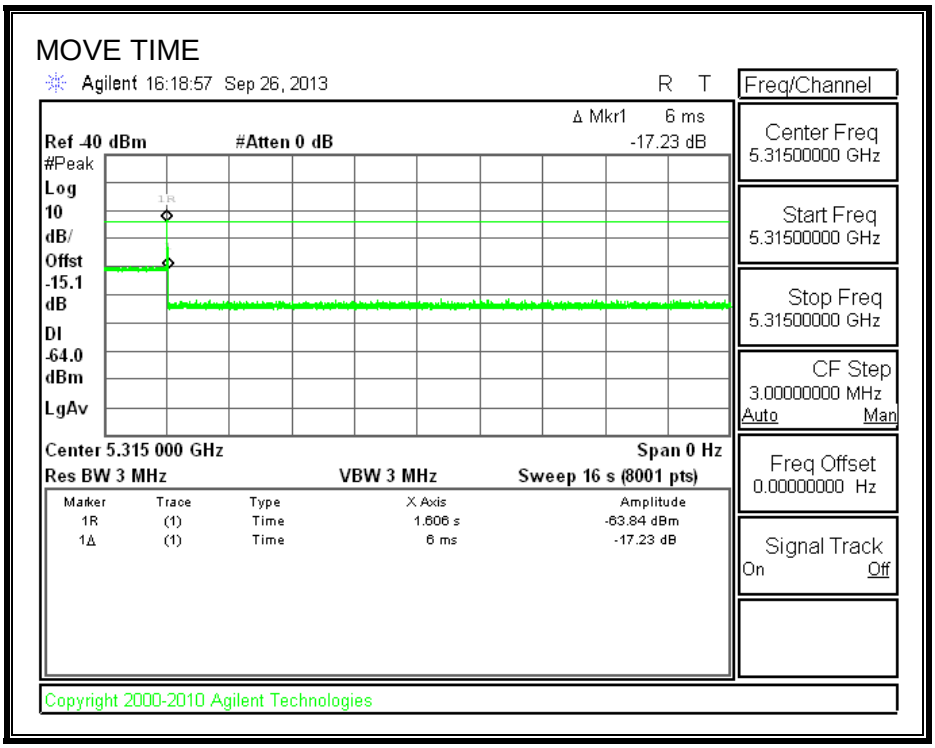
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

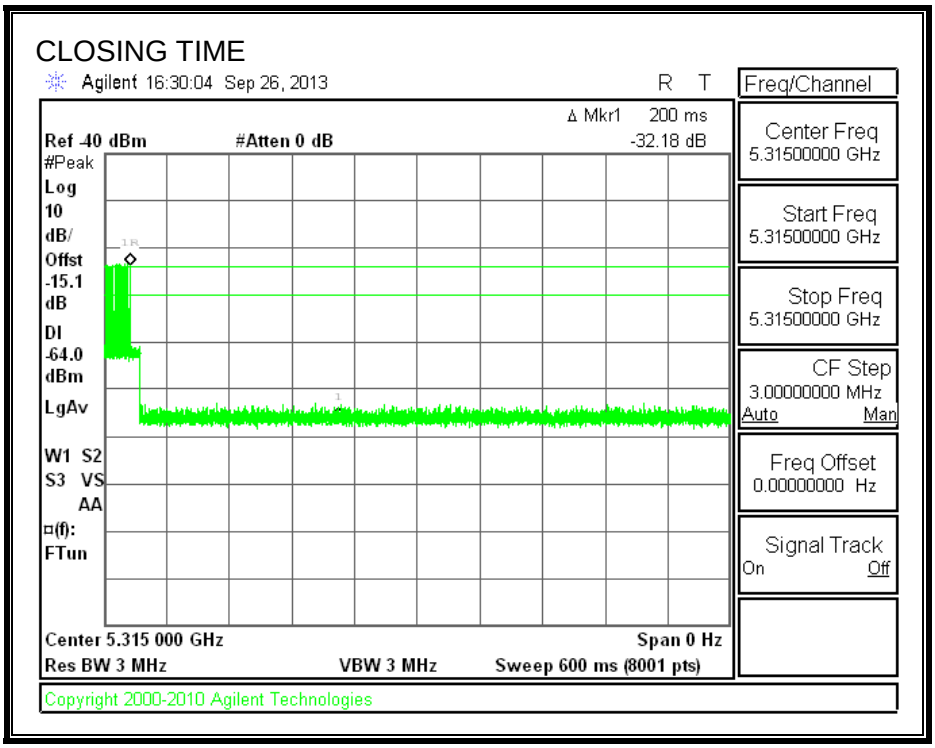
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.006	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	0.0	60
IC	6.0	260

MOVE TIME

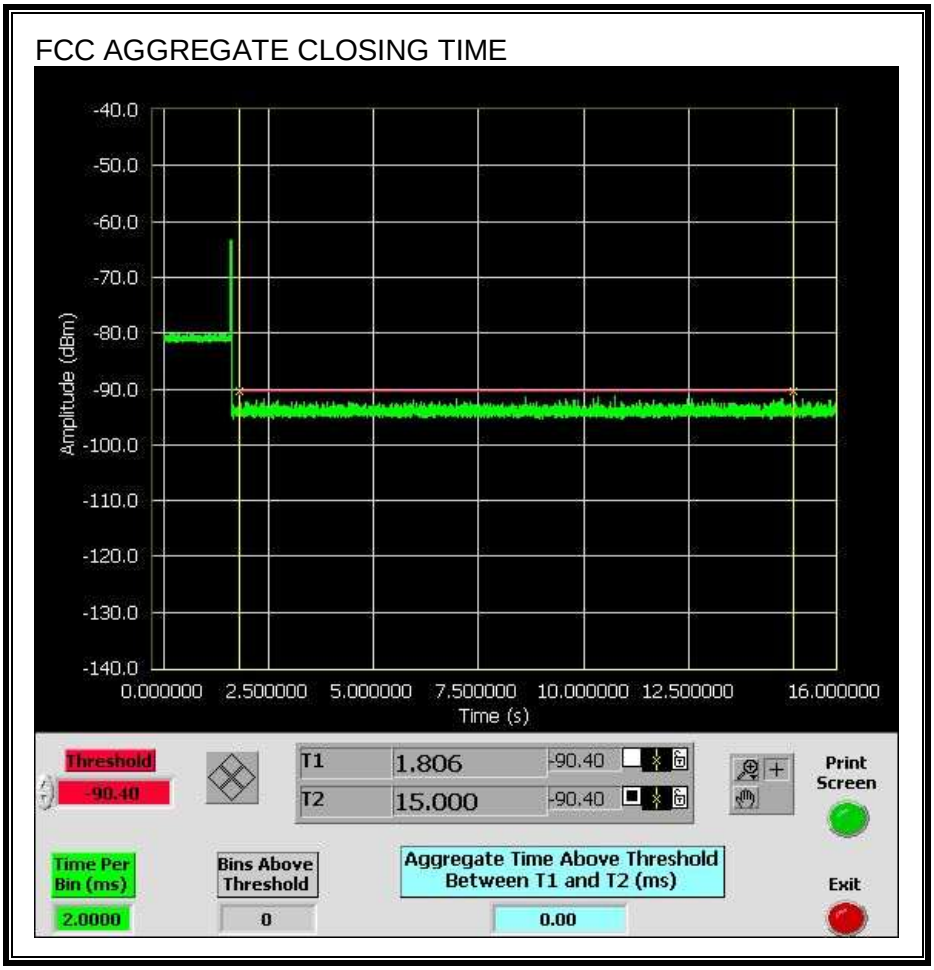


CHANNEL CLOSING TIME



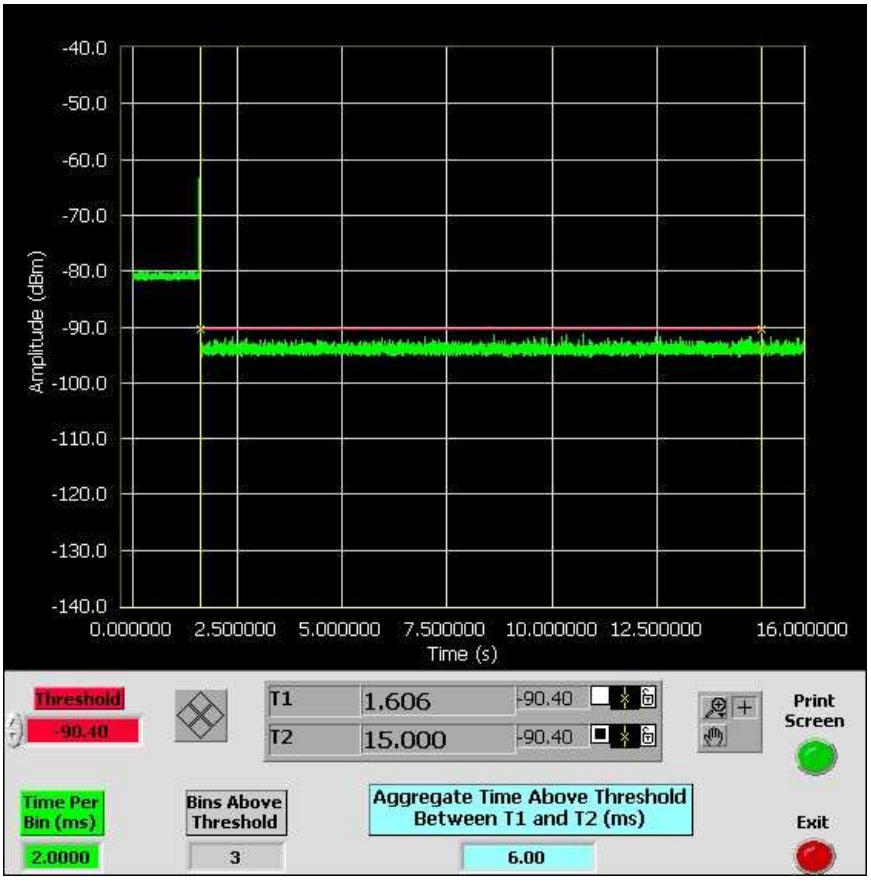
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



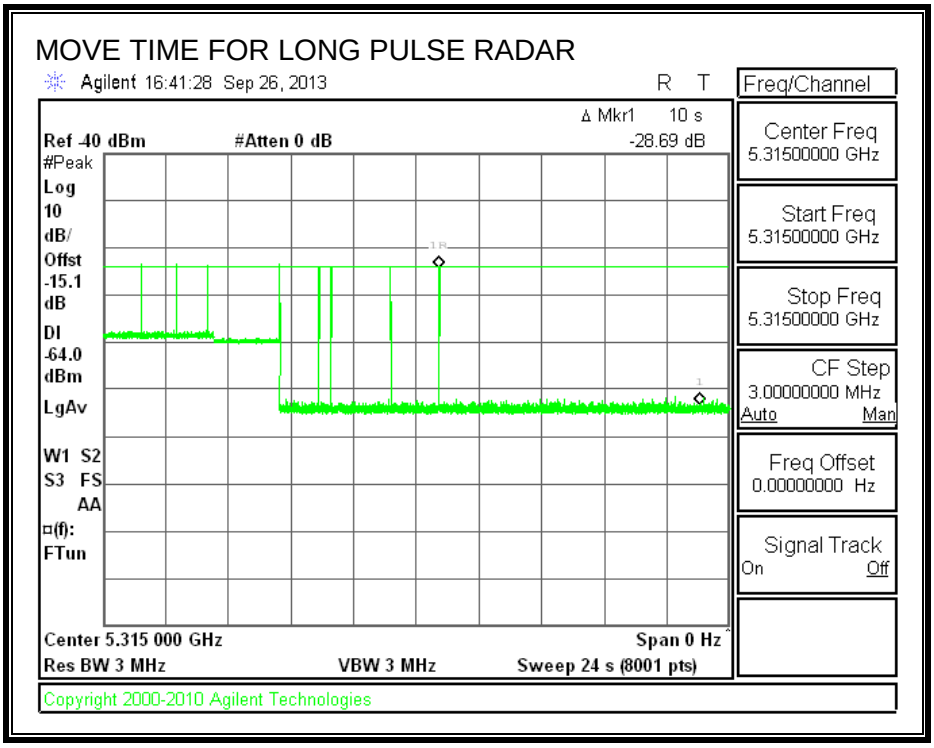
Only intermittent transmissions are observed during the ICC aggregate monitoring period.

IC AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

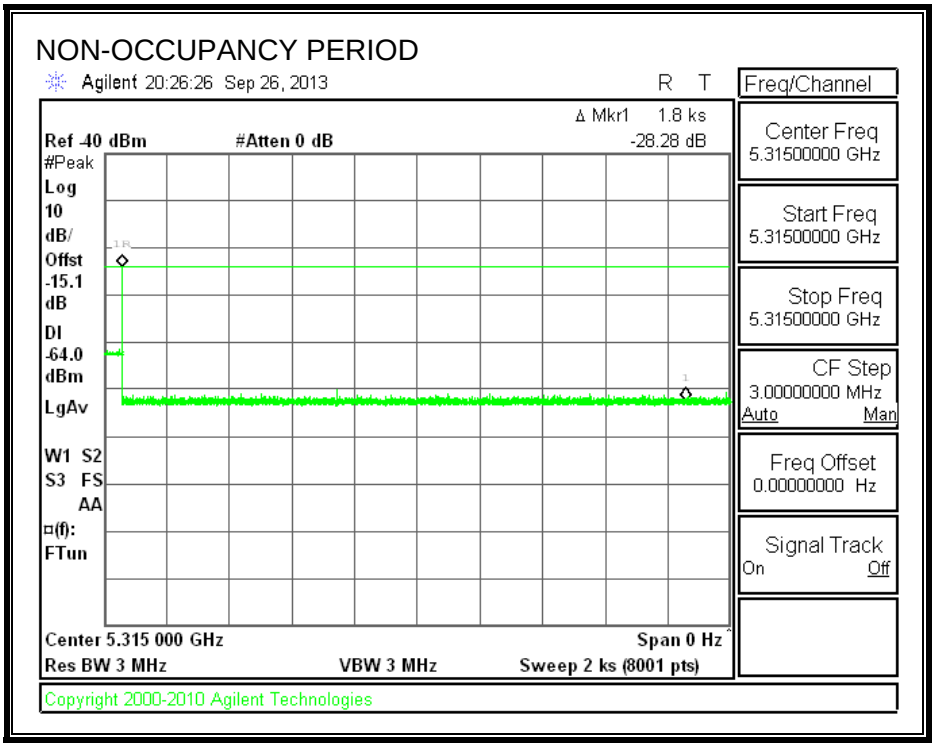
The traffic ceases prior to 10 seconds after the end of the radar waveform.



5.5.5. NON-OCCUPANCY PERIOD

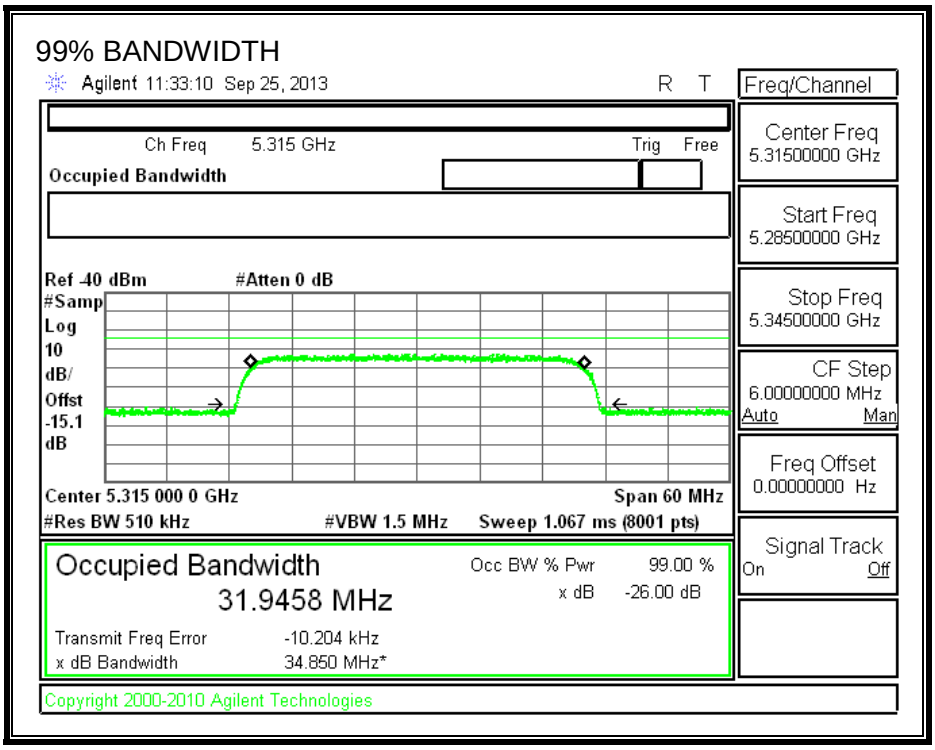
RESULTS

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



5.5.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5299	5331	32	31.946	100.2	80

DETECTION BANDWIDTH PROBABILITY

DE

Detection Bandwidth Test Results				
FCC Type 1 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5299	10	10	100	FL
5300	10	10	100	
5301	10	10	100	
5302	10	10	100	
5303	10	10	100	
5304	10	10	100	
5305	10	10	100	
5306	10	10	100	
5307	10	10	100	
5308	10	10	100	
5309	10	10	100	
5310	10	10	100	
5311	10	10	100	
5312	10	10	100	
5313	10	10	100	
5314	10	10	100	
5315	10	10	100	
5316	10	10	100	
5317	10	10	100	
5318	10	10	100	
5319	10	10	100	
5320	10	10	100	
5321	10	10	100	
5322	10	10	100	
5323	10	10	100	
5324	10	10	100	
5325	10	10	100	
5326	10	10	100	
5327	10	10	100	
5328	10	10	100	
5329	10	10	100	
5330	10	10	100	
5331	10	10	100	FH

IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	100.00	60	Pass
FCC Short Pulse Type 2	30	100.00	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	100.00	60	Pass
Aggregate		100.00	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	33	90.91	70	Pass

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst	
Trial	Successful Detection (Yes/No)
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
2001	4.7	197.00	25	Yes
2002	4	167.00	28	Yes
2003	2.2	188.00	24	Yes
2004	2.2	229.00	27	Yes
2005	2.8	225.00	28	Yes
2006	4.4	182.00	26	Yes
2007	2.7	184.00	28	Yes
2008	1.6	211.00	27	Yes
2009	3.9	171.00	23	Yes
2010	3.5	214.00	23	Yes
2011	3.4	169.00	23	Yes
2012	3.2	165.00	27	Yes
2013	1.9	223.00	25	Yes
2014	1.8	191.00	26	Yes
2015	1	219.00	29	Yes
2016	2.6	205.00	28	Yes
2017	3.6	158.00	28	Yes
2018	4.1	178.00	23	Yes
2019	2.2	182.00	25	Yes
2020	4.8	219.00	29	Yes
2021	1.8	214.00	24	Yes
2022	2.3	220.00	29	Yes
2023	2.1	228.00	24	Yes
2024	5	193.00	26	Yes
2025	3.5	212.00	23	Yes
2026	2.8	220.00	23	Yes
2027	4	168.00	29	Yes
2028	2.5	210.00	28	Yes
2029	1.2	159.00	24	Yes
2030	1.8	206.00	29	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	6	346.00	16	Yes
3002	5.1	265.00	18	Yes
3003	6.9	273.00	18	Yes
3004	6.8	466.00	18	Yes
3005	9.7	402.00	16	Yes
3006	7.3	447.00	18	Yes
3007	5	333.00	16	Yes
3008	5.6	419.00	17	Yes
3009	7.8	422.00	17	Yes
3010	6.1	425.00	18	Yes
3011	8	357.00	16	Yes
3012	8.3	387.00	16	Yes
3013	5.8	253.00	17	Yes
3014	7.5	399.00	17	Yes
3015	7.5	422.00	18	Yes
3016	9.5	316.00	16	Yes
3017	8	282.00	16	Yes
3018	8.9	494.00	16	Yes
3019	7.3	253.00	16	Yes
3020	7.5	395.00	18	Yes
3021	5.1	321.00	16	Yes
3022	8.2	449.00	17	Yes
3023	5.5	361.00	18	Yes
3024	7	315.00	16	Yes
3025	5.7	278.00	17	Yes
3026	8.1	426.00	16	Yes
3027	5.7	328.00	18	Yes
3028	7.9	353.00	17	Yes
3029	6.2	367	16	Yes
3030	9.9	339	16	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
4001	19	479.00	13	Yes
4002	18.4	256.00	12	Yes
4003	17.9	430.00	12	Yes
4004	18.9	309.00	13	Yes
4005	15.8	263.00	13	Yes
4006	18.8	484.00	13	Yes
4007	11.1	387.00	13	Yes
4008	13.9	433.00	15	Yes
4009	14.5	412.00	13	Yes
4010	18.1	481.00	12	Yes
4011	12.7	492.00	12	Yes
4012	14.6	412.00	15	Yes
4013	18.7	449.00	12	Yes
4014	19.5	466.00	16	Yes
4015	18.7	267.00	14	Yes
4016	14.3	331.00	15	Yes
4017	16.7	445.00	12	Yes
4018	19.2	253.00	16	Yes
4019	15	308.00	15	Yes
4020	18.4	482.00	15	Yes
4021	11.8	457.00	12	Yes
4022	19.1	375.00	16	Yes
4023	10.3	320.00	16	Yes
4024	10.5	404.00	16	Yes
4025	15.7	349.00	14	Yes
4026	12.7	409.00	15	Yes
4027	13.3	347.00	12	Yes
4028	10.8	345.00	13	Yes
4029	10.1	452.00	14	Yes
4030	11.4	422.00	14	Yes

TYPE 5 DETECTION PROBABILITY

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

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

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6				
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop				
NTIA August 2005 Hopping Sequence				
Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	164	5299	4	Yes
2	639	5300	2	Yes
3	1114	5301	8	Yes
4	1589	5302	9	Yes
5	2064	5303	3	Yes
6	2539	5304	8	Yes
7	3014	5305	5	Yes
8	3489	5306	7	Yes
9	3964	5307	10	Yes
10	4439	5308	10	Yes
11	4914	5309	5	Yes
12	5389	5310	5	Yes
13	5864	5311	8	Yes
14	6339	5312	10	Yes
15	6814	5313	10	Yes
16	7289	5314	8	Yes
17	7764	5315	4	Yes
18	8239	5316	7	Yes
19	8714	5317	10	Yes
20	9189	5318	4	Yes
21	9664	5319	4	Yes
22	10139	5320	4	Yes
23	10614	5321	6	Yes
24	11089	5322	10	Yes
25	11564	5323	8	Yes
26	12039	5324	8	Yes
27	12514	5325	3	Yes
28	12989	5326	9	Yes
29	13464	5327	4	Yes
30	13939	5328	8	Yes
31	14414	5329	12	No
32	14889	5330	9	No
33	15364	5331	8	No