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

MODEL NUMBER: IBR-1A with DFS Software Version 1.5.0

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

REPORT NUMBER: 14U18437-5

ISSUE DATE: SEPTEMBER 19, 2014

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/19/14	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-1A

SERIAL NUMBER: 40313200146

DATE TESTED: SEPTEMBER 15, 2014

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

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

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

Approved & Released For
UL Verification Services Inc. By:

TIM LEE
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.

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

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.

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

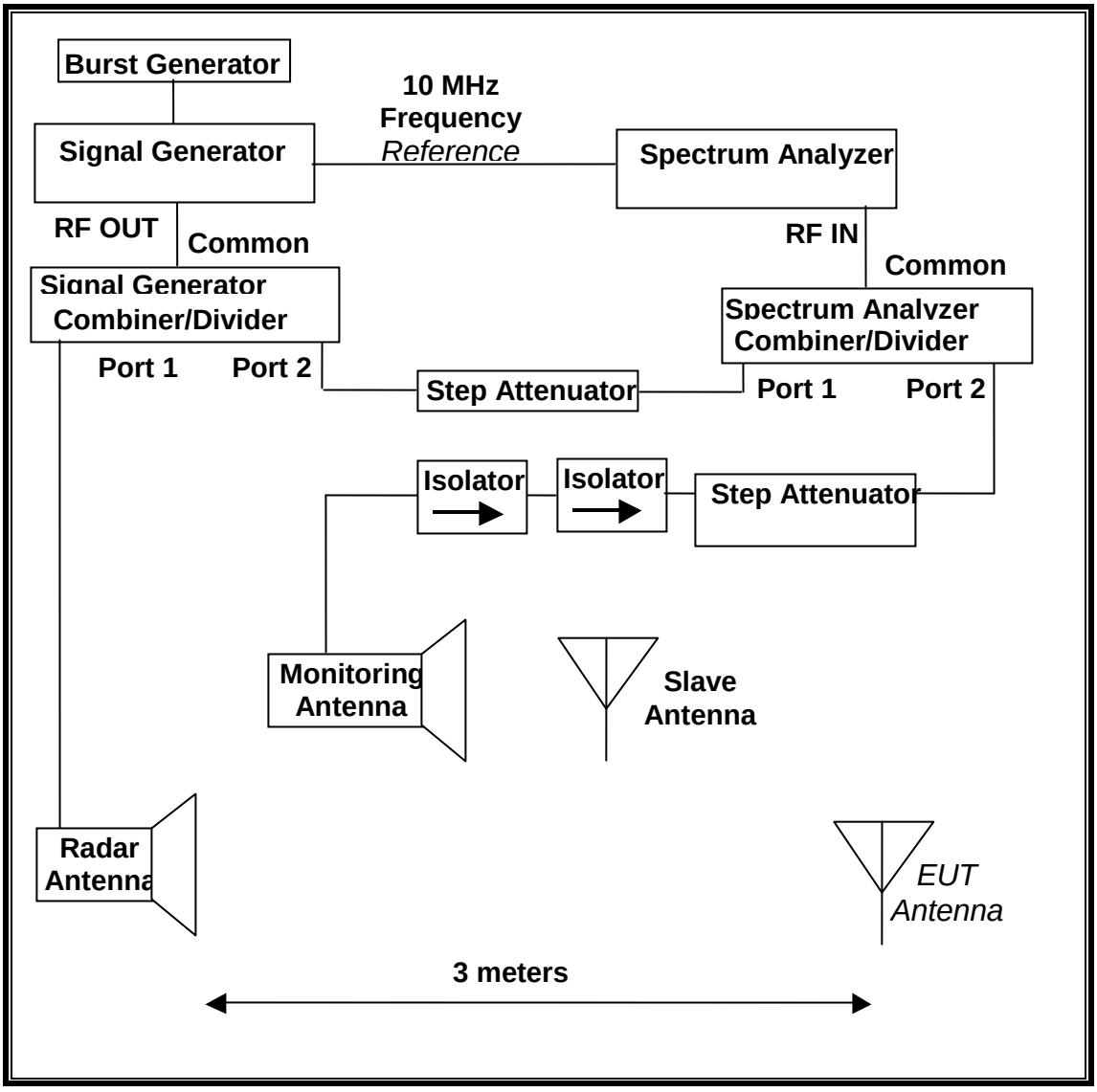
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

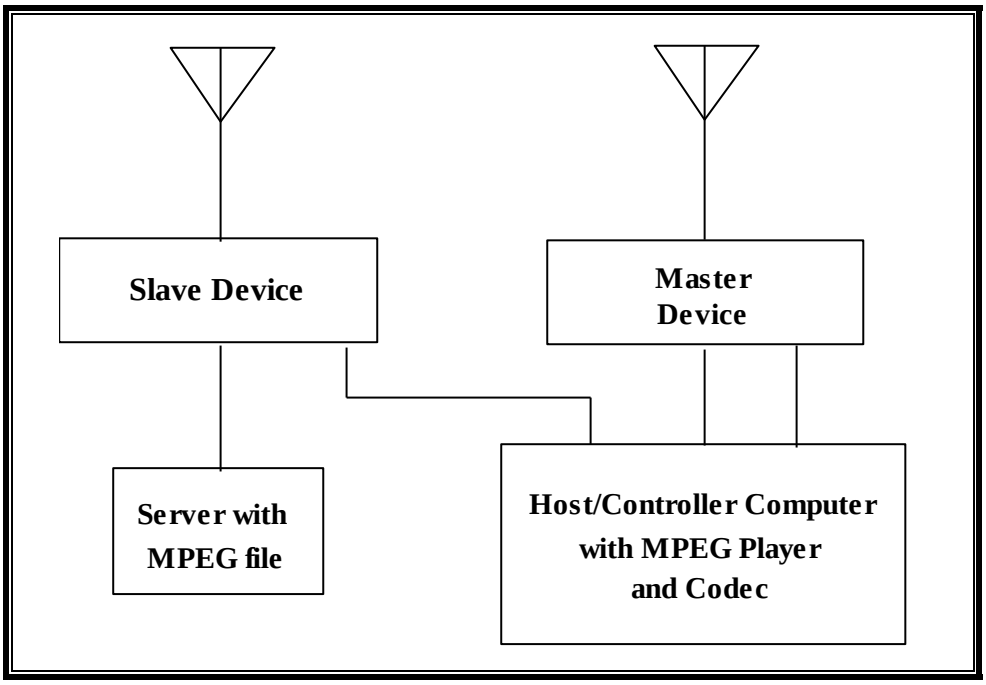
TEST AND MEASUREMENT EQUIPMENT

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

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

5.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
P.O.E. Injector (EUT)	Phihong	POE36U-1AT-R	P30300380D1	DoC
Point to Poiny Outdoor Radio (Slave Radio)	Fastback	IBR-1000-38N	40313200193	2AAEH-102
P.O.E. Injector (Slave)	Phihong	POE36U-1AT-R	P21301087D1	DoC
Notebook PC (Host/Controller)	Lenovo	Type 20BG-0014US	R9-013NYV 14/03 12/08	DoC
AC Adapter (Host/Controller PC)	Lenovo	ADL170NLCZA	11S45N0375Z1ZS9G4 1P4H9	DoC
Notebook PC (Server)	Lenovo	Type 4276-37U	R9-CNXZ 11/04	DoC
AC Adapter (Server PC)	Lenovo	45N0113	11S45N0113Z1ZHX82 861YD	DoC

5.1.4. DESCRIPTION OF EUT

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

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

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

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 or equal to the widest nominal channel bandwidth. Therefore, 40 MHz CAC testing covers all nominal channel bandwidths.

Only the following tests were performed at 40 MHz channel bandwidth per KDB 982609.

The software installed in the access point is revision 1.5.0.

UNIFORM CHANNEL SPREADING

See Manufacturer’s Attestation.

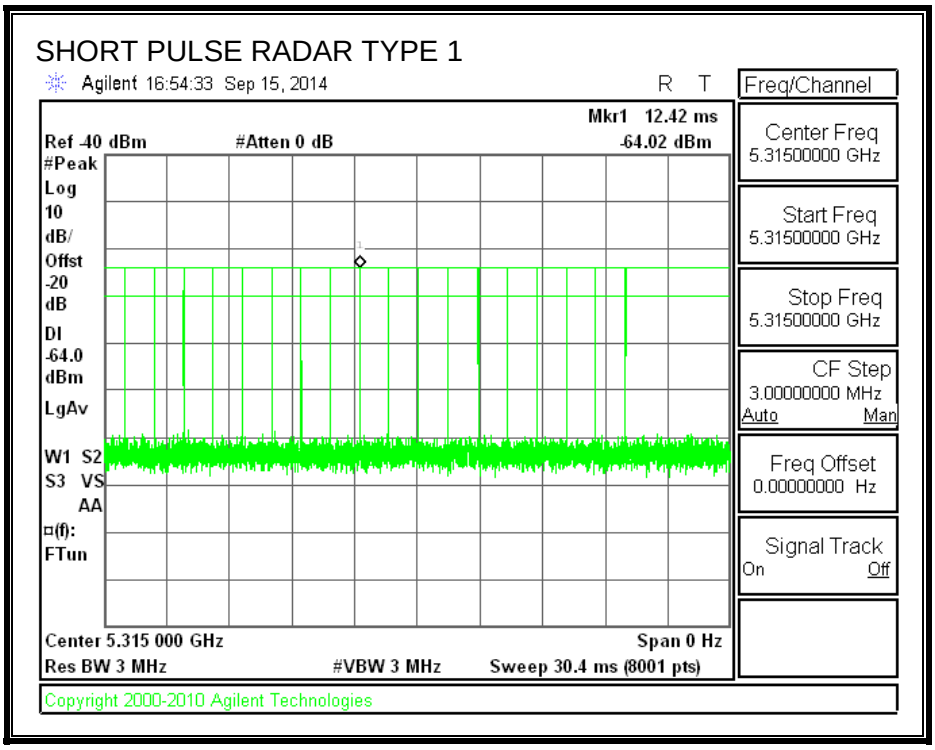
5.2. PRIMARY SENSOR RESULTS AT 40 MHz BANDWIDTH

5.2.1. TEST CHANNEL

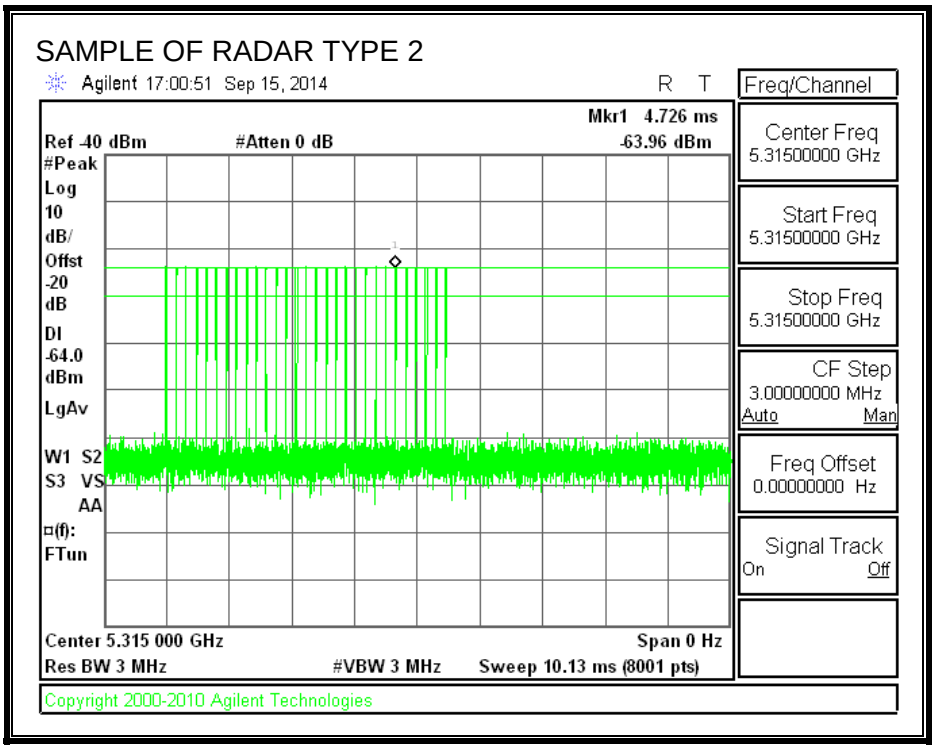
All tests were performed at a channel center frequency of 5315 MHz.

5.2.2. RADAR WAVEFORMS AND TRAFFIC

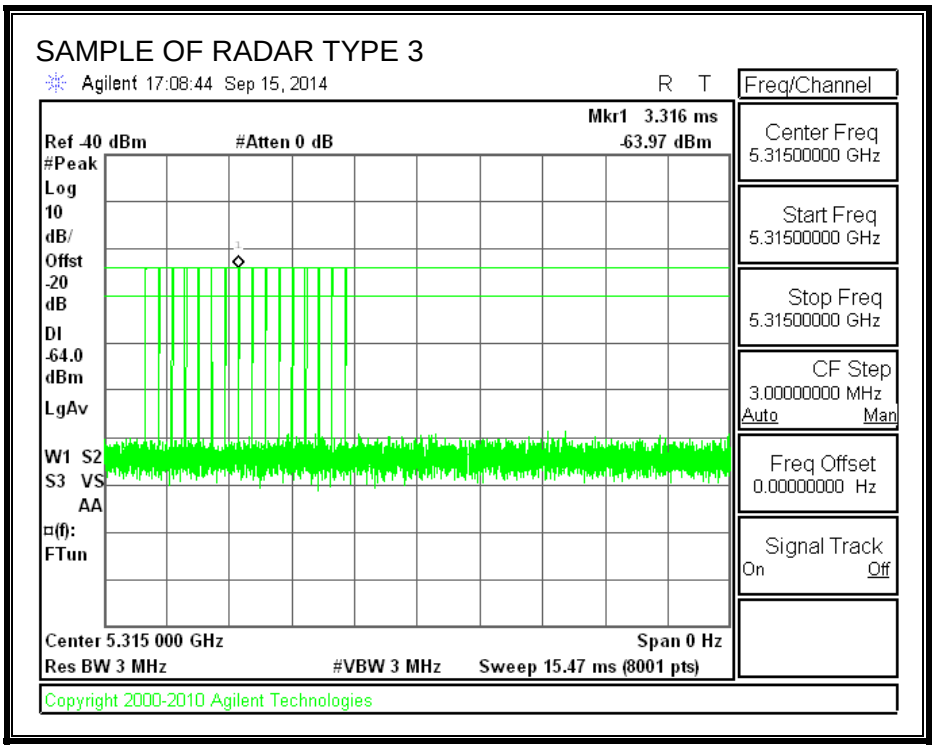
RADAR WAVEFORMS



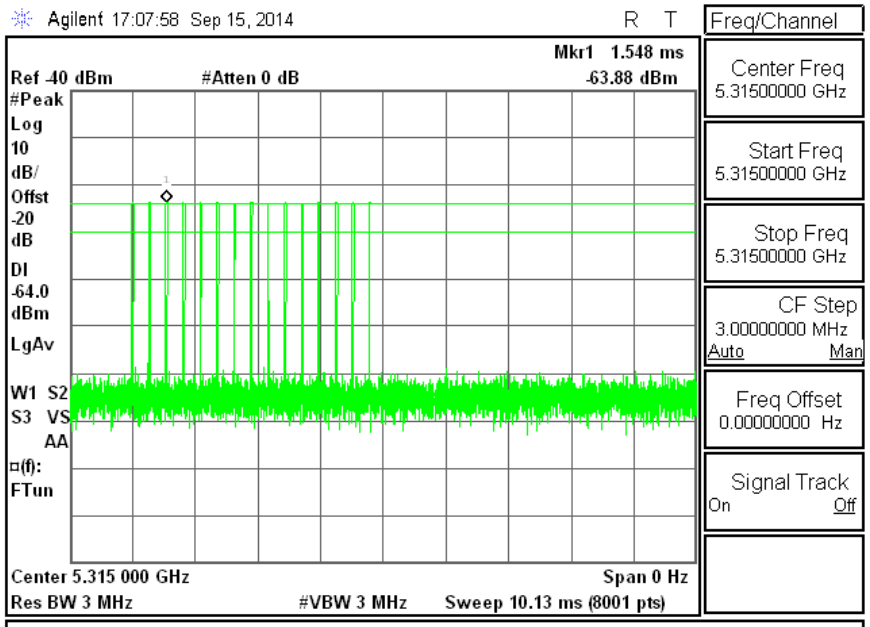
SAMPLE OF RADAR TYPE 2



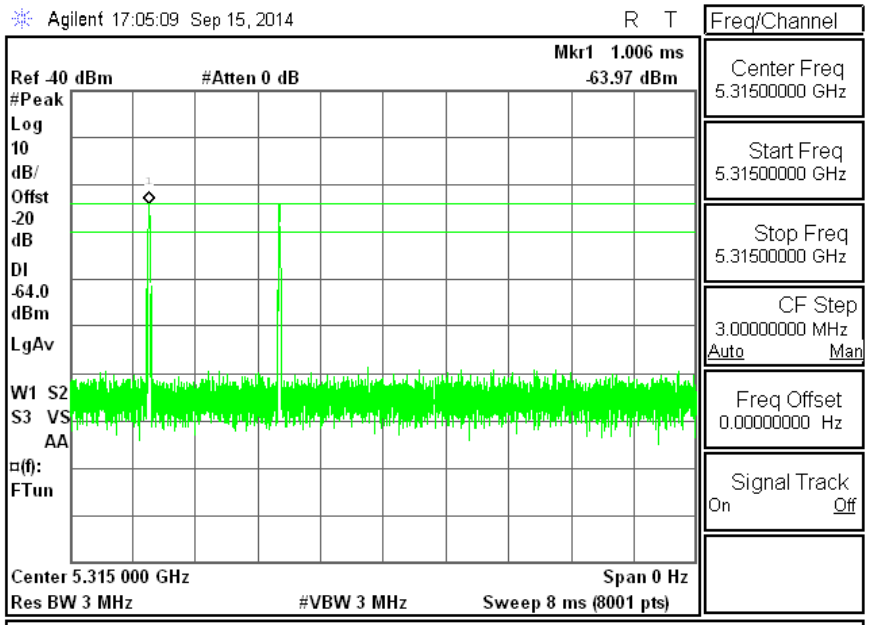
SAMPLE OF RADAR TYPE 3



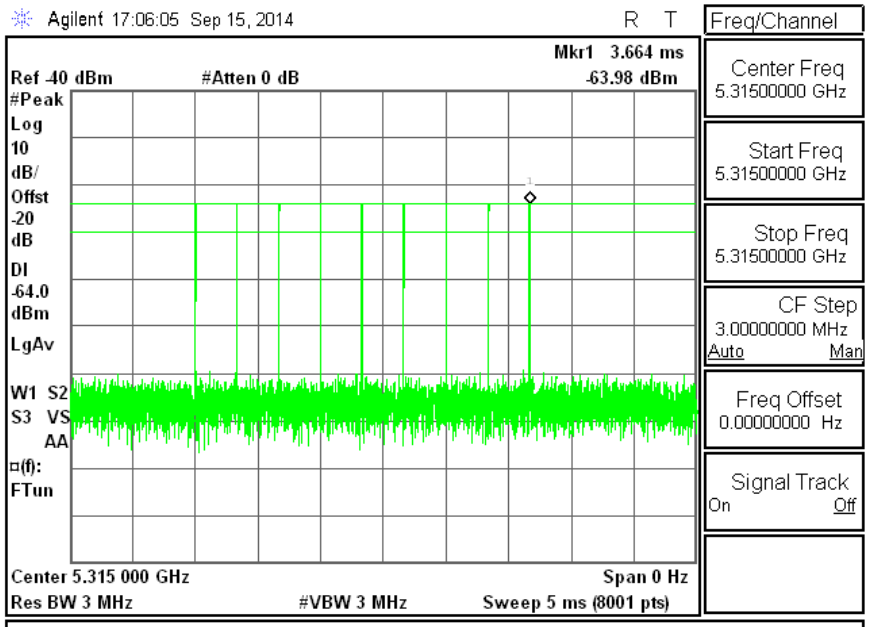
SAMPLE OF RADAR TYPE 4



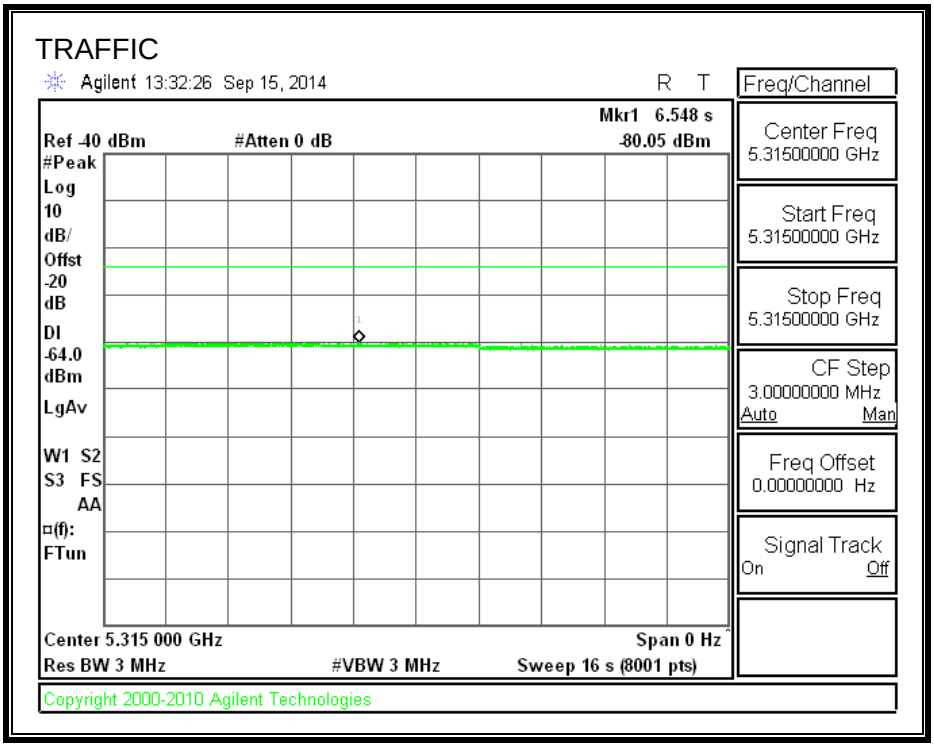
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6



TRAFFIC



5.2.3. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

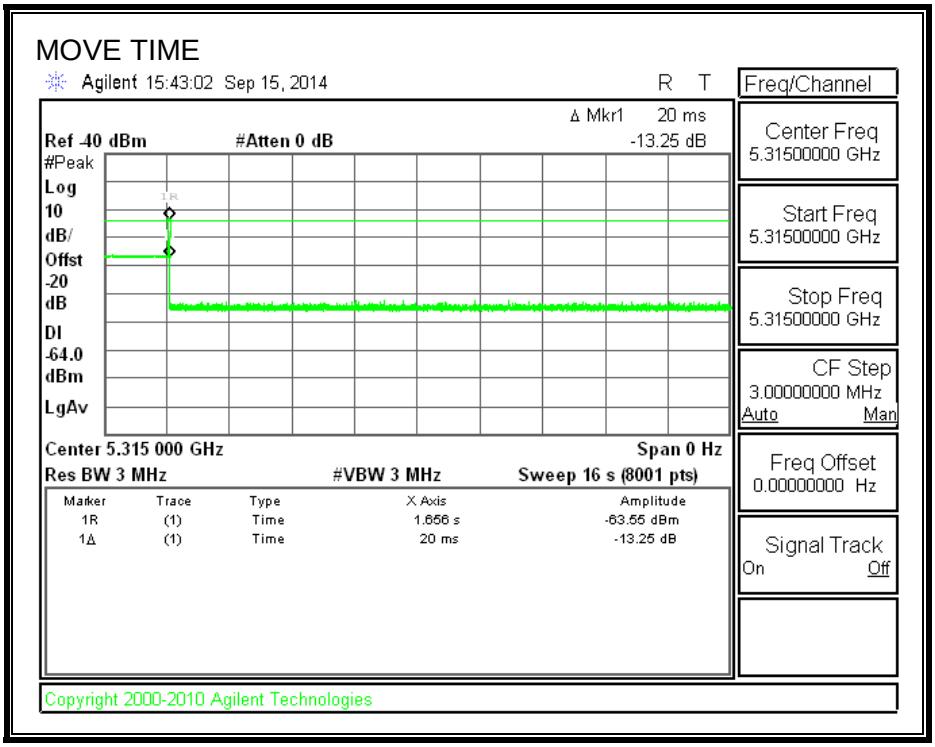
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

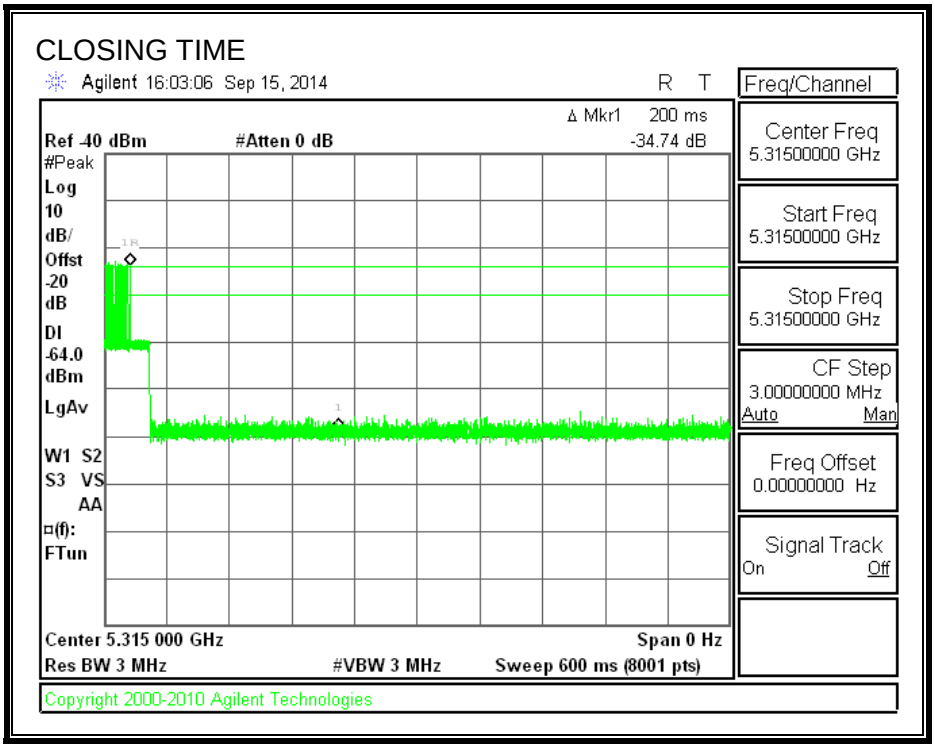
Channel Move Time (sec)	Limit (sec)
0.020	10

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

MOVE TIME

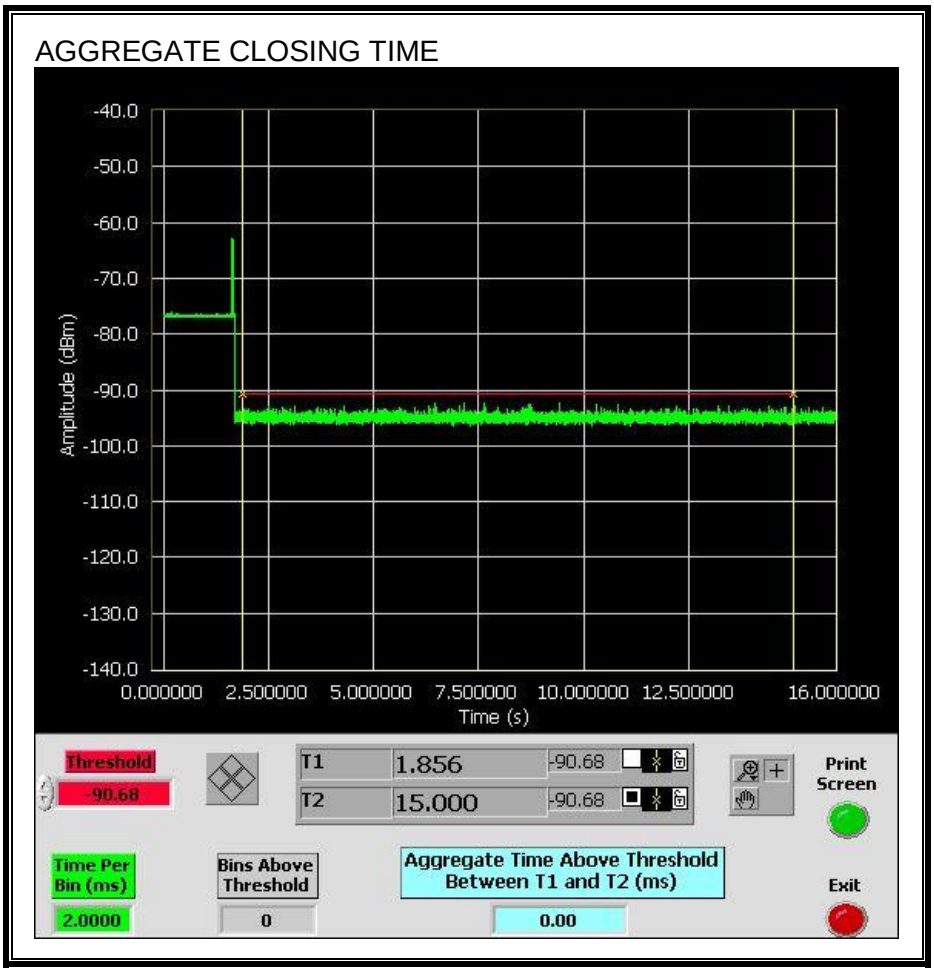


CHANNEL CLOSING TIME



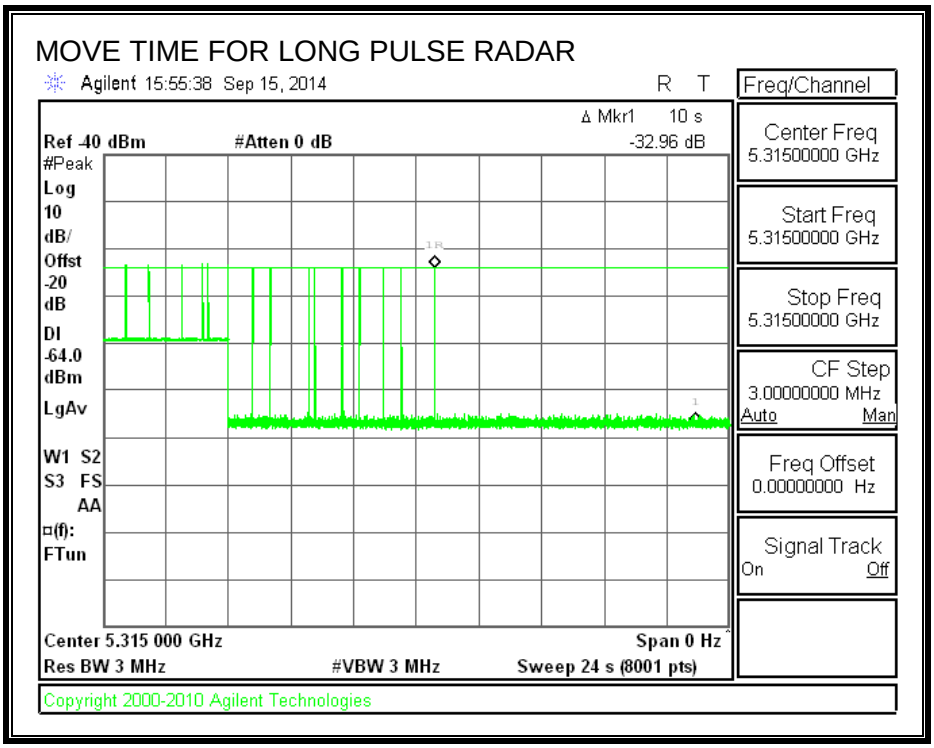
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



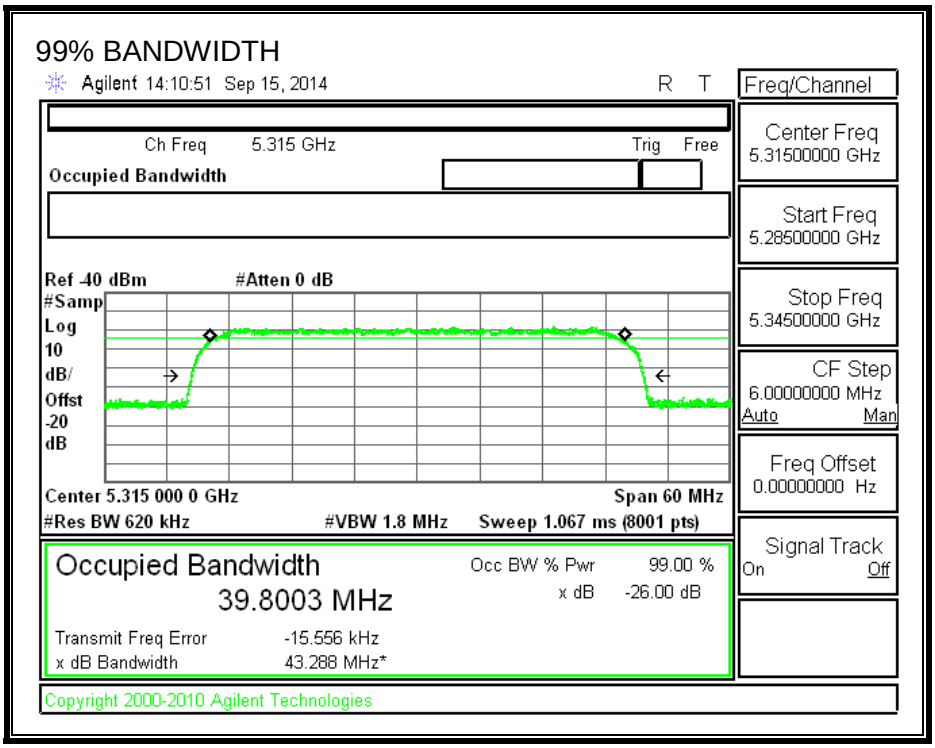
LONG PULSE CHANNEL MOVE TIME

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



5.2.4. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5298	5332	34	39.800	85.4	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
5298	10	10	100	FL
5299	10	10	100	
5300	10	10	100	
5301	10	10	100	
5302	10	9	90	
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	9	90	
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	9	90	
5331	10	10	100	
5332	10	10	100	FH

5.2.5. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary				
Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail
FCC Short Pulse Type 1	30	96.67	60	Pass
FCC Short Pulse Type 2	30	96.67	60	Pass
FCC Short Pulse Type 3	30	100.00	60	Pass
FCC Short Pulse Type 4	30	100.00	60	Pass
Aggregate		98.33	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	35	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	No
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	2.5	162.00	29	Yes
2002	3	177.00	24	Yes
2003	3.9	158.00	29	Yes
2004	3.1	182.00	26	Yes
2005	3.6	195.00	23	Yes
2006	4.8	207.00	27	Yes
2007	2.1	151.00	24	Yes
2008	1.1	192.00	29	Yes
2009	1.9	212.00	24	Yes
2010	3.8	200.00	28	Yes
2011	1.7	194.00	28	Yes
2012	1.6	201.00	27	Yes
2013	3.4	180.00	29	Yes
2014	4.2	205.00	29	Yes
2015	2.1	196.00	23	Yes
2016	4.2	221.00	27	Yes
2017	3.6	191.00	23	Yes
2018	2.9	161.00	25	Yes
2019	3.2	158.00	24	Yes
2020	4.3	202.00	29	Yes
2021	2.6	165.00	24	No
2022	4.5	195.00	27	Yes
2023	2.7	166.00	25	Yes
2024	1.4	154.00	29	Yes
2025	4.3	209.00	25	Yes
2026	1.2	207.00	26	Yes
2027	1.2	159.00	23	Yes
2028	1.5	216.00	29	Yes
2029	1.6	205.00	28	Yes
2030	4.8	230.00	24	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.1	331.00	16	Yes
3002	8.1	476.00	16	Yes
3003	5.5	489.00	17	Yes
3004	9.9	480.00	17	Yes
3005	6.3	368.00	18	Yes
3006	8.3	412.00	16	Yes
3007	9.6	493.00	17	Yes
3008	8.4	271.00	16	Yes
3009	9	462.00	17	Yes
3010	5.7	317.00	18	Yes
3011	5.5	310.00	16	Yes
3012	9.9	368.00	17	Yes
3013	7.5	498.00	16	Yes
3014	7.6	452.00	18	Yes
3015	7.5	372.00	17	Yes
3016	7.9	372.00	16	Yes
3017	5.1	451.00	16	Yes
3018	5.6	260.00	18	Yes
3019	6.1	296.00	16	Yes
3020	9.5	365.00	16	Yes
3021	6.7	328.00	17	Yes
3022	7.1	311.00	16	Yes
3023	7.2	340.00	16	Yes
3024	6.2	388.00	16	Yes
3025	9.1	264.00	17	Yes
3026	6.7	447.00	18	Yes
3027	5.8	365.00	17	Yes
3028	5.1	475.00	16	Yes
3029	9.1	474	16	Yes
3030	7.8	276	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	16.1	275.00	15	Yes
4002	19	291.00	14	Yes
4003	15.5	261.00	13	Yes
4004	14.2	250.00	14	Yes
4005	19.2	418.00	16	Yes
4006	13.7	439.00	12	Yes
4007	17.8	455.00	12	Yes
4008	15.3	305.00	13	Yes
4009	16.7	384.00	13	Yes
4010	16.6	454.00	14	Yes
4011	17.1	316.00	14	Yes
4012	18.7	306.00	12	Yes
4013	14.5	358.00	15	Yes
4014	16.7	305.00	15	Yes
4015	13.9	454.00	12	Yes
4016	12.6	486.00	12	Yes
4017	15.4	371.00	13	Yes
4018	11.1	438.00	14	Yes
4019	19.5	483.00	16	Yes
4020	13	369.00	16	Yes
4021	18.1	300.00	12	Yes
4022	15.4	304.00	16	Yes
4023	10.9	392.00	16	Yes
4024	19.1	393.00	15	Yes
4025	15.1	470.00	12	Yes
4026	17.7	407.00	14	Yes
4027	10.2	380.00	13	Yes
4028	10.8	410.00	15	Yes
4029	11.6	335.00	12	Yes
4030	10.7	396.00	16	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	26	5298	6	Yes
2	501	5299	8	Yes
3	976	5300	11	Yes
4	1451	5301	5	Yes
5	1926	5302	10	Yes
6	2401	5303	9	Yes
7	2876	5304	10	Yes
8	3351	5305	13	Yes
9	3826	5306	5	Yes
10	4301	5307	6	Yes
11	4776	5308	8	Yes
12	5251	5309	6	Yes
13	5726	5310	7	Yes
14	6201	5311	5	Yes
15	6676	5312	9	Yes
16	7151	5313	6	Yes
17	7626	5314	8	Yes
18	8101	5315	9	Yes
19	8576	5316	6	Yes
20	9051	5317	5	Yes
21	9526	5318	5	Yes
22	10001	5319	7	Yes
23	10476	5320	8	Yes
24	10951	5321	8	Yes
25	11426	5322	5	Yes
26	11901	5323	7	Yes
27	12376	5324	9	Yes
28	12851	5325	9	Yes
29	13326	5326	12	Yes
30	13801	5327	10	Yes
31	14276	5328	3	Yes
32	14751	5329	7	Yes
33	15226	5330	12	Yes
34	15701	5331	5	Yes
35	16176	5332	8	Yes

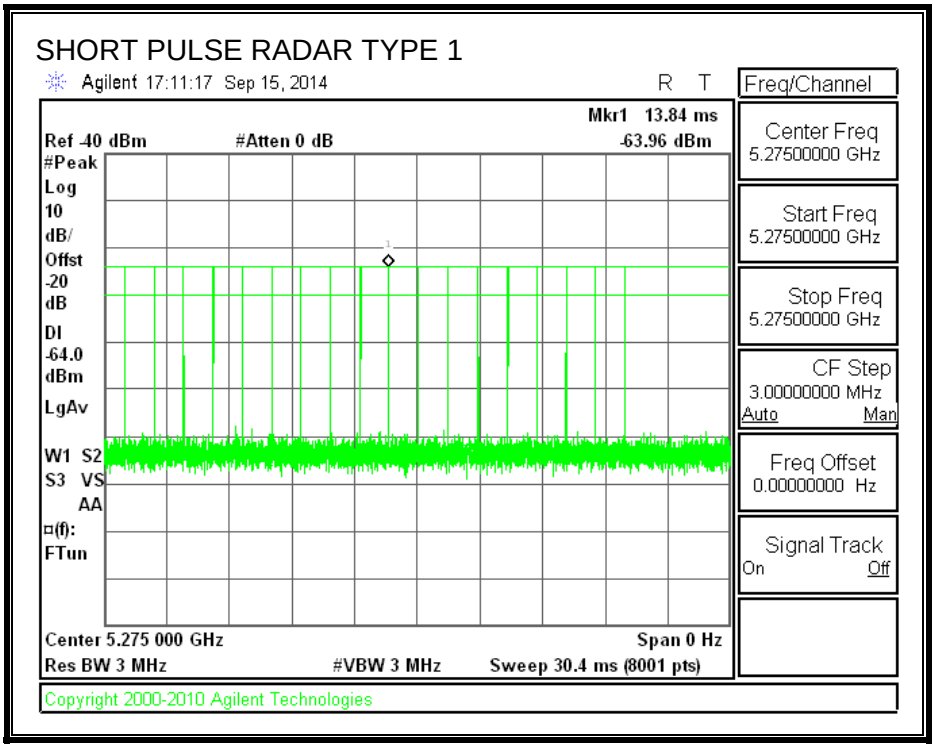
5.3. SECONDARY SENSOR RESULTS AT 40 MHz BANDWIDTH

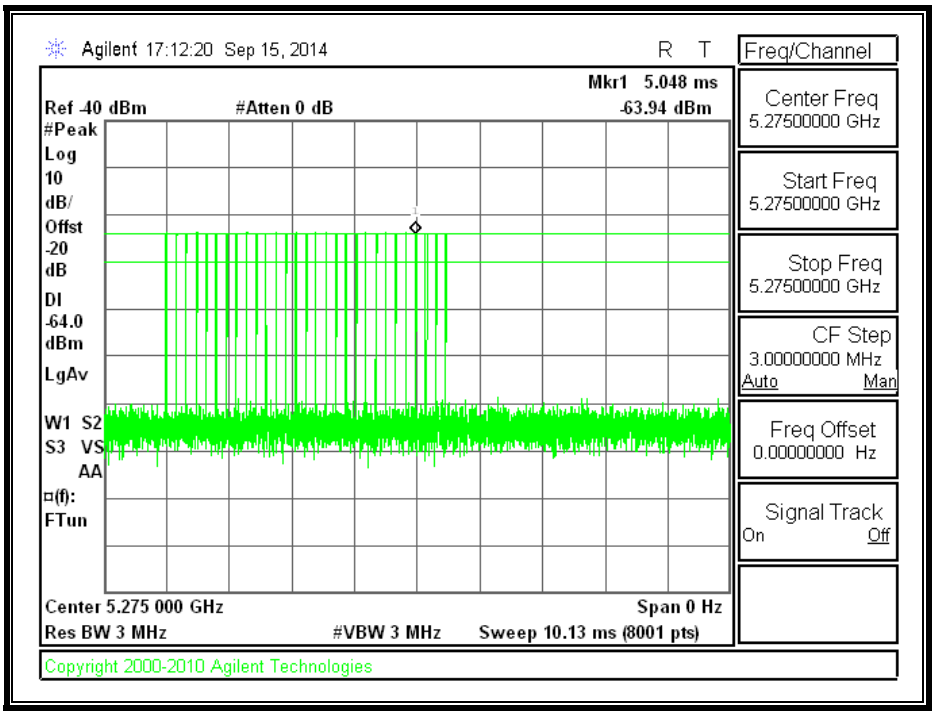
5.3.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5275 MHz.

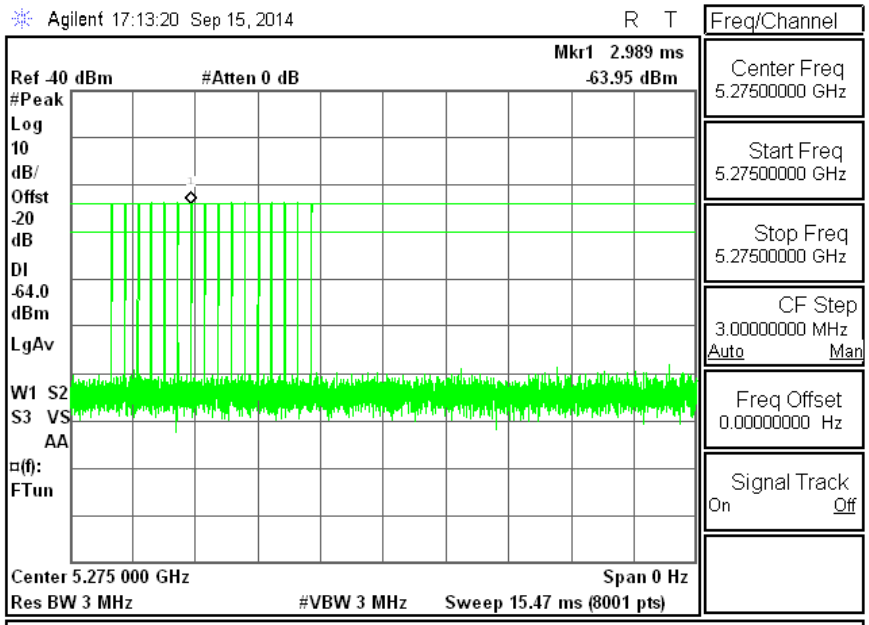
5.3.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

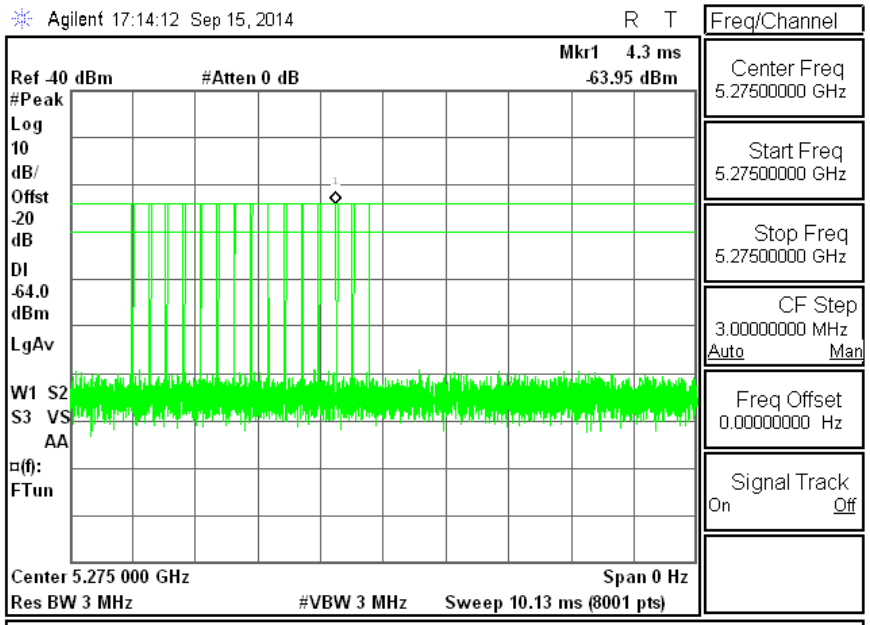




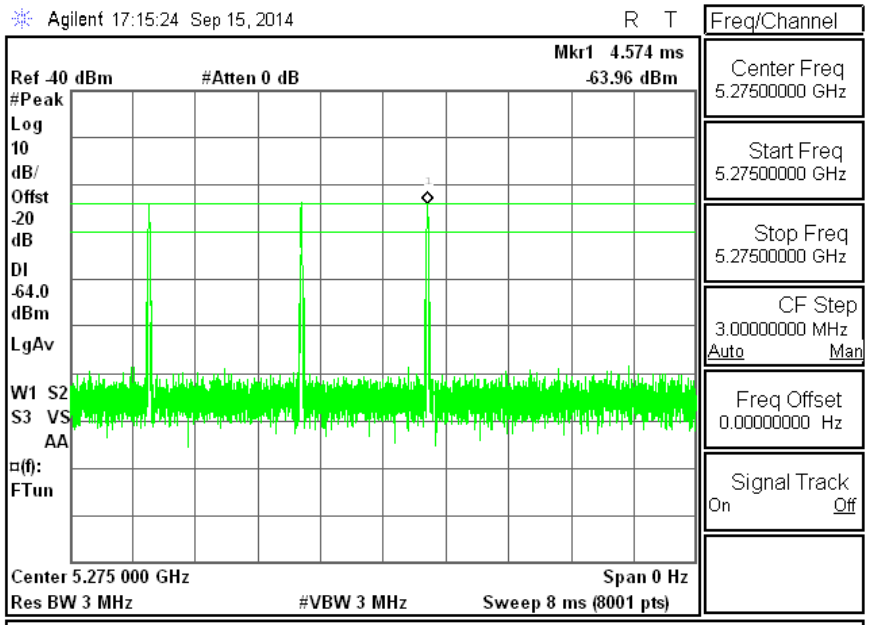
SAMPLE OF RADAR TYPE 3



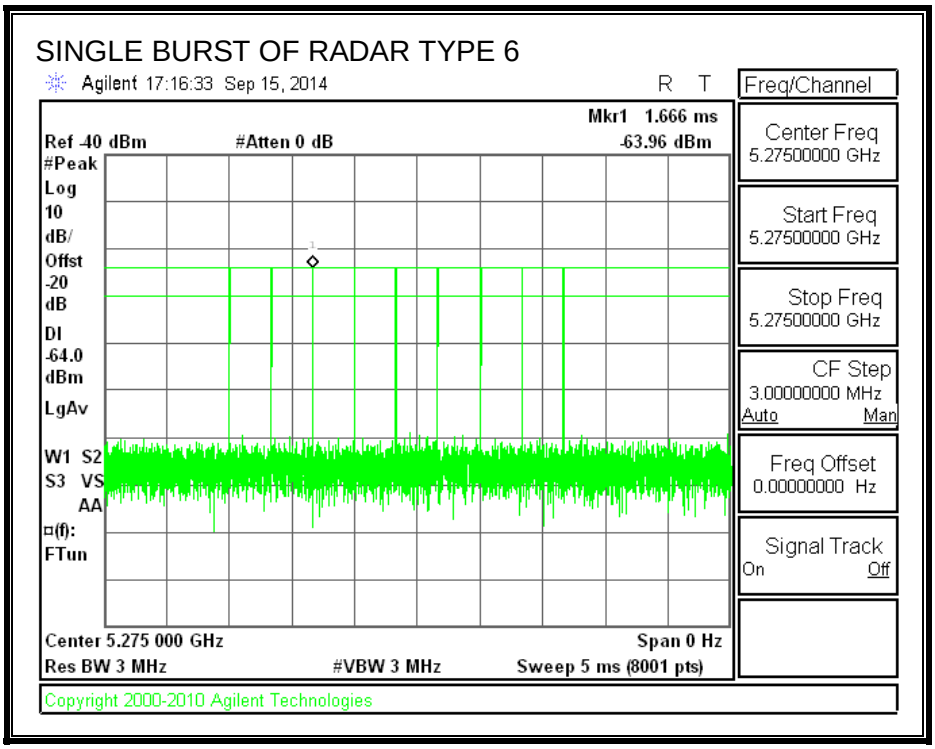
SAMPLE OF RADAR TYPE 4



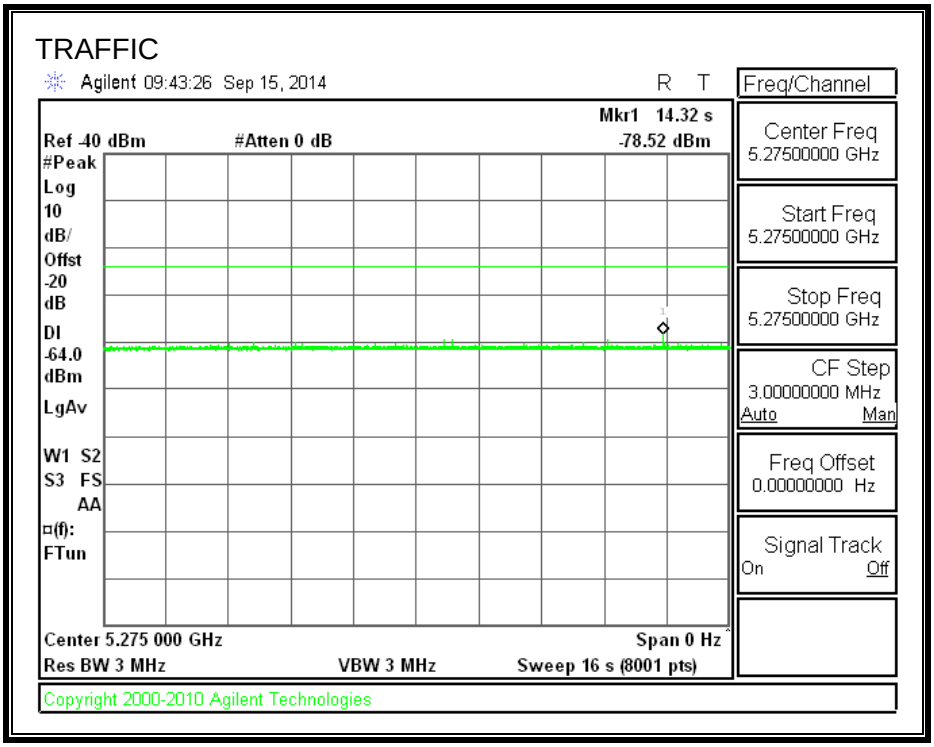
SAMPLE OF SINGLE BURST OF RADAR TYPE 5



SINGLE BURST OF RADAR TYPE 6



TRAFFIC



5.3.3. MOVE AND CLOSING TIME

REPORTING NOTES

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

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

The aggregate channel closing transmission time is calculated as follows:

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

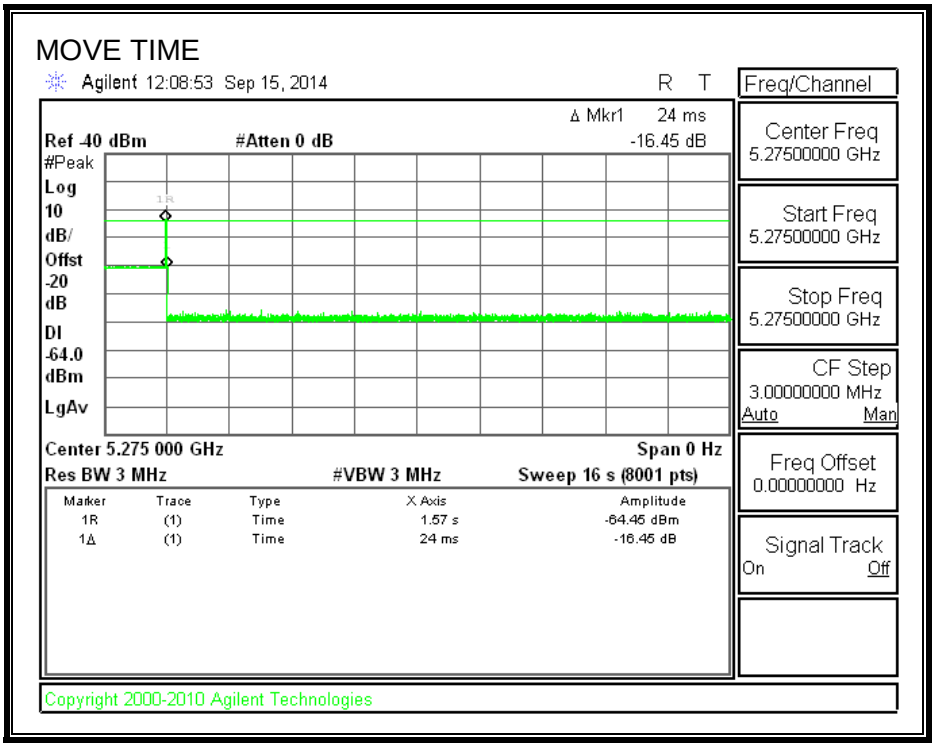
The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

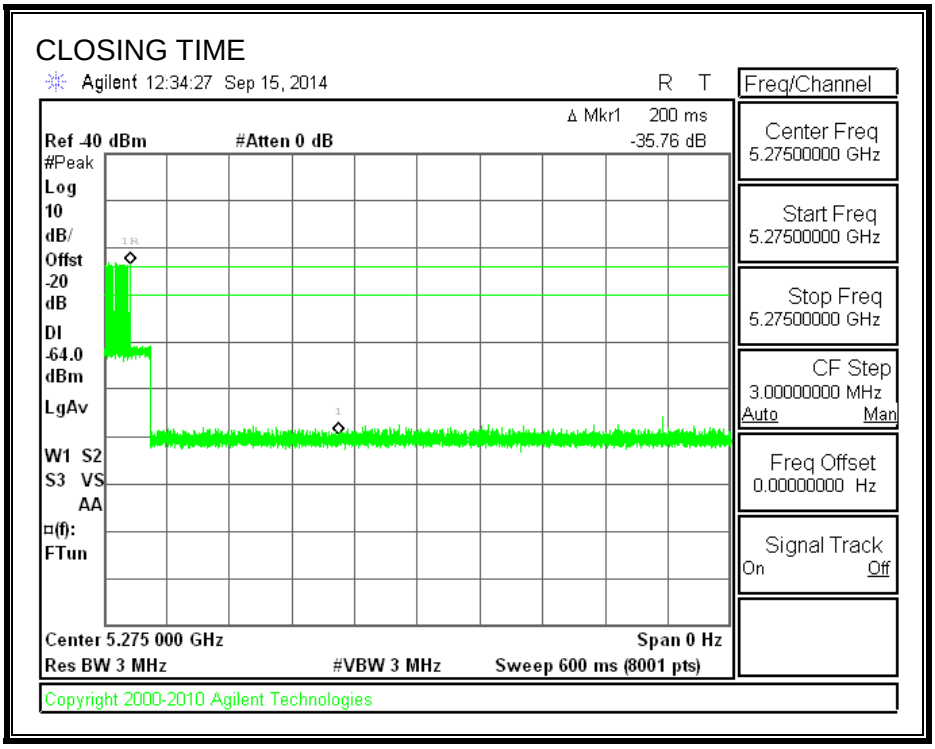
Channel Move Time (sec)	Limit (sec)
0.024	10

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

MOVE TIME

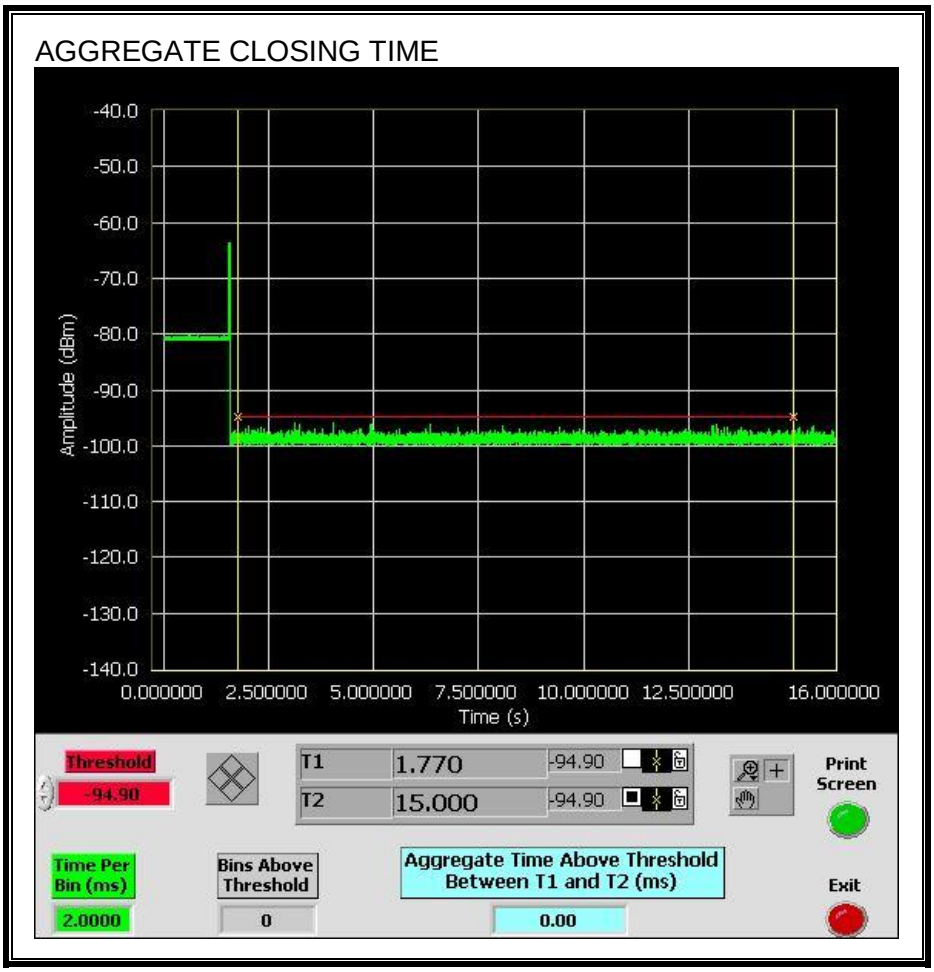


CHANNEL CLOSING TIME



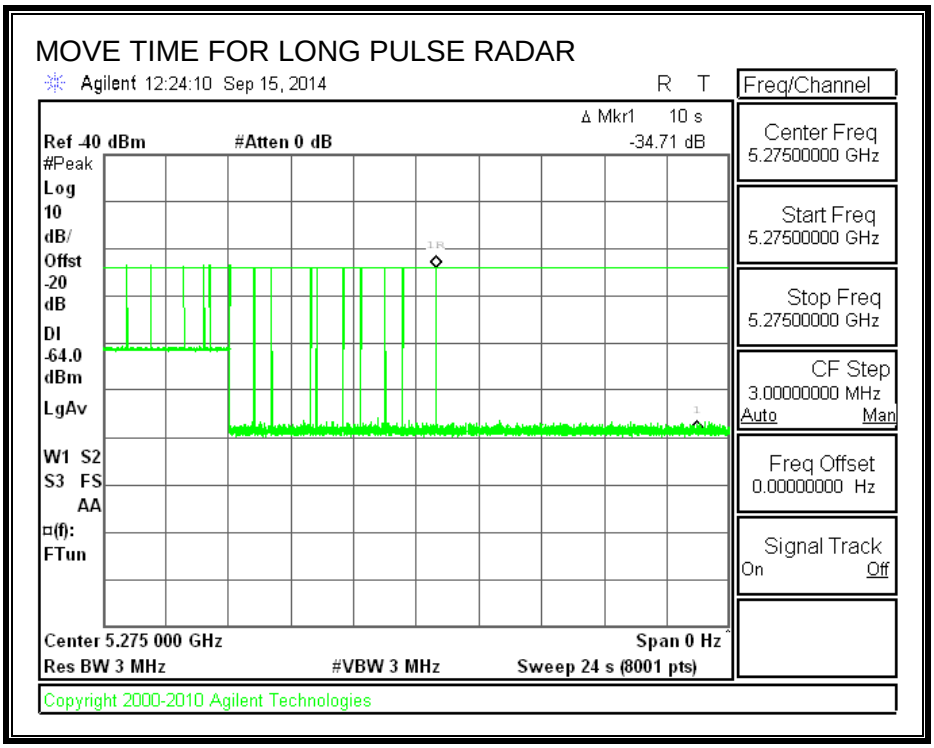
AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the aggregate monitoring period.



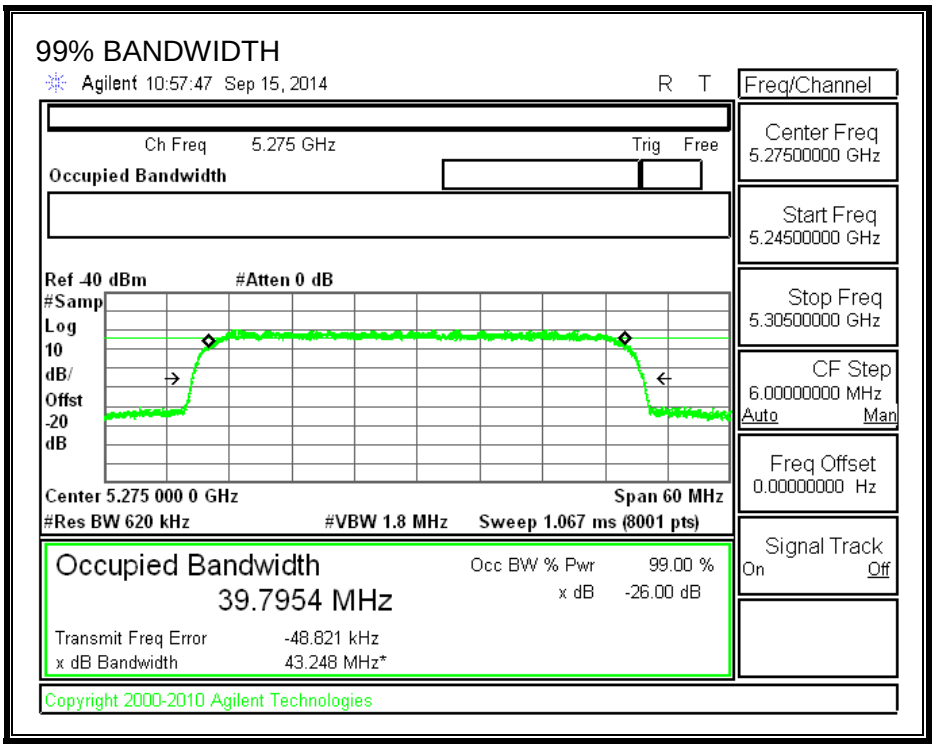
LONG PULSE CHANNEL MOVE TIME

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



5.3.4. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5258	5292	34	39.795	85.4	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
5258	10	10	100	FL
5259	10	10	100	
5260	10	10	100	
5261	10	9	90	
5262	50	45	90	
5263	10	10	100	
5264	10	10	100	
5265	10	10	100	
5266	10	9	90	
5267	10	10	100	
5268	10	10	100	
5269	10	9	90	
5270	10	10	100	
5271	10	10	100	
5272	10	10	100	
5273	10	10	100	
5274	10	10	100	
5275	10	10	100	
5276	10	10	100	
5277	10	10	100	
5278	10	10	100	
5279	10	10	100	
5280	10	10	100	
5281	10	10	100	
5282	10	10	100	
5283	10	10	100	
5284	10	10	100	
5285	10	10	100	
5286	10	10	100	
5287	10	10	100	
5288	10	10	100	
5289	10	10	100	
5290	10	10	100	
5291	10	10	100	
5292	10	10	100	FH

5.3.5. 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	73.33	60	Pass
FCC Short Pulse Type 3	30	93.33	60	Pass
FCC Short Pulse Type 4	30	96.67	60	Pass
Aggregate		90.83	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	35	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	2.5	162.00	29	Yes
2002	3	177.00	24	Yes
2003	3.9	158.00	29	Yes
2004	3.1	182.00	26	No
2005	3.6	195.00	23	Yes
2006	4.8	207.00	27	Yes
2007	2.1	151.00	24	Yes
2008	1.1	192.00	29	Yes
2009	1.9	212.00	24	Yes
2010	3.8	200.00	28	Yes
2011	1.7	194.00	28	Yes
2012	1.6	201.00	27	Yes
2013	3.4	180.00	29	Yes
2014	4.2	205.00	29	No
2015	2.1	196.00	23	Yes
2016	4.2	221.00	27	Yes
2017	3.6	191.00	23	Yes
2018	2.9	161.00	25	No
2019	3.2	158.00	24	Yes
2020	4.3	202.00	29	No
2021	2.6	165.00	24	Yes
2022	4.5	195.00	27	No
2023	2.7	166.00	25	No
2024	1.4	154.00	29	Yes
2025	4.3	209.00	25	Yes
2026	1.2	207.00	26	Yes
2027	1.2	159.00	23	Yes
2028	1.5	216.00	29	Yes
2029	1.6	205.00	28	No
2030	4.8	230.00	24	No

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3				
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Successful Detection (Yes/No)
3001	7.1	331.00	16	Yes
3002	8.1	476.00	16	Yes
3003	5.5	489.00	17	Yes
3004	9.9	480.00	17	Yes
3005	6.3	368.00	18	Yes
3006	8.3	412.00	16	Yes
3007	9.6	493.00	17	Yes
3008	8.4	271.00	16	Yes
3009	9	462.00	17	Yes
3010	5.7	317.00	18	Yes
3011	5.5	310.00	16	Yes
3012	9.9	368.00	17	Yes
3013	7.5	498.00	16	Yes
3014	7.6	452.00	18	Yes
3015	7.5	372.00	17	Yes
3016	7.9	372.00	16	No
3017	5.1	451.00	16	Yes
3018	5.6	260.00	18	Yes
3019	6.1	296.00	16	Yes
3020	9.5	365.00	16	No
3021	6.7	328.00	17	Yes
3022	7.1	311.00	16	Yes
3023	7.2	340.00	16	Yes
3024	6.2	388.00	16	Yes
3025	9.1	264.00	17	Yes
3026	6.7	447.00	18	Yes
3027	5.8	365.00	17	Yes
3028	5.1	475.00	16	Yes
3029	9.1	474	16	Yes
3030	7.8	276	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	16.1	275.00	15	Yes
4002	19	291.00	14	Yes
4003	15.5	261.00	13	Yes
4004	14.2	250.00	14	Yes
4005	19.2	418.00	16	Yes
4006	13.7	439.00	12	Yes
4007	17.8	455.00	12	Yes
4008	15.3	305.00	13	Yes
4009	16.7	384.00	13	Yes
4010	16.6	454.00	14	Yes
4011	17.1	316.00	14	Yes
4012	18.7	306.00	12	Yes
4013	14.5	358.00	15	Yes
4014	16.7	305.00	15	Yes
4015	13.9	454.00	12	Yes
4016	12.6	486.00	12	Yes
4017	15.4	371.00	13	No
4018	11.1	438.00	14	Yes
4019	19.5	483.00	16	Yes
4020	13	369.00	16	Yes
4021	18.1	300.00	12	Yes
4022	15.4	304.00	16	Yes
4023	10.9	392.00	16	Yes
4024	19.1	393.00	15	Yes
4025	15.1	470.00	12	Yes
4026	17.7	407.00	14	Yes
4027	10.2	380.00	13	Yes
4028	10.8	410.00	15	Yes
4029	11.6	335.00	12	Yes
4030	10.7	396.00	16	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	42	5258	6	Yes
2	517	5259	10	Yes
3	992	5260	9	Yes
4	1467	5261	6	Yes
5	1942	5262	7	Yes
6	2417	5263	7	Yes
7	2892	5264	11	Yes
8	3367	5265	12	Yes
9	3842	5266	8	Yes
10	4317	5267	11	Yes
11	4792	5268	7	Yes
12	5267	5269	8	Yes
13	5742	5270	8	Yes
14	6217	5271	7	Yes
15	6692	5272	6	Yes
16	7167	5273	8	Yes
17	7642	5274	7	Yes
18	8117	5275	7	Yes
19	8592	5276	7	Yes
20	9067	5277	7	Yes
21	9542	5278	8	Yes
22	10017	5279	10	Yes
23	10492	5280	8	Yes
24	10967	5281	4	Yes
25	11442	5282	5	Yes
26	11917	5283	12	Yes
27	12392	5284	9	Yes
28	12867	5285	7	Yes
29	13342	5286	4	Yes
30	13817	5287	8	Yes
31	14292	5288	8	Yes
32	14767	5289	9	Yes
33	15242	5290	5	Yes
34	15717	5291	6	Yes
35	16192	5292	6	Yes