DFS PORTION OF FCC CFR47 PART 15 SUBPART E
DFS PORTION OF INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

SUMMIT SWM908 MASTER MODULE WITH INTEGRATED ANTENNAS (GLENWOOD)

MODEL NUMBER: 444-2216

FCC ID: UA9500
IC: 9129A-500

REPORT NUMBER: 12U14366-4

ISSUE DATE: JULY 26, 2012

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/26/12	Initial Issue	M. Heckrotte

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Summit Semiconductor LLC
22867 NW Bennett St. Suite 200
Hillsboro, Oregon 97124, U.S.A

EUT DESCRIPTION: Summit SWM908 Master Module with Integrated Antennas (Glenwood)

MODEL: 444-2216

SERIAL NUMBER: 02 EA 06 00 00 5A

DATE TESTED: July 16 to 17, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
DFS Portion of CFR 47 Part 15 Subpart E	Pass
DFS Portion of INDUSTRY CANADA RSS-210 Issue 8 Annex 9	Pass

UL CCS 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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 CCS By:

MICHAEL HECKROTTE
DIRECTOR OF ENGINEERING
UL CCS

Tested By:

DOUG ANDERSON
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, ANSI C63.10-2009, RSS-GEN Issue 3, and RSS-210 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 CCS 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 OVERVIEW

5.1. 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

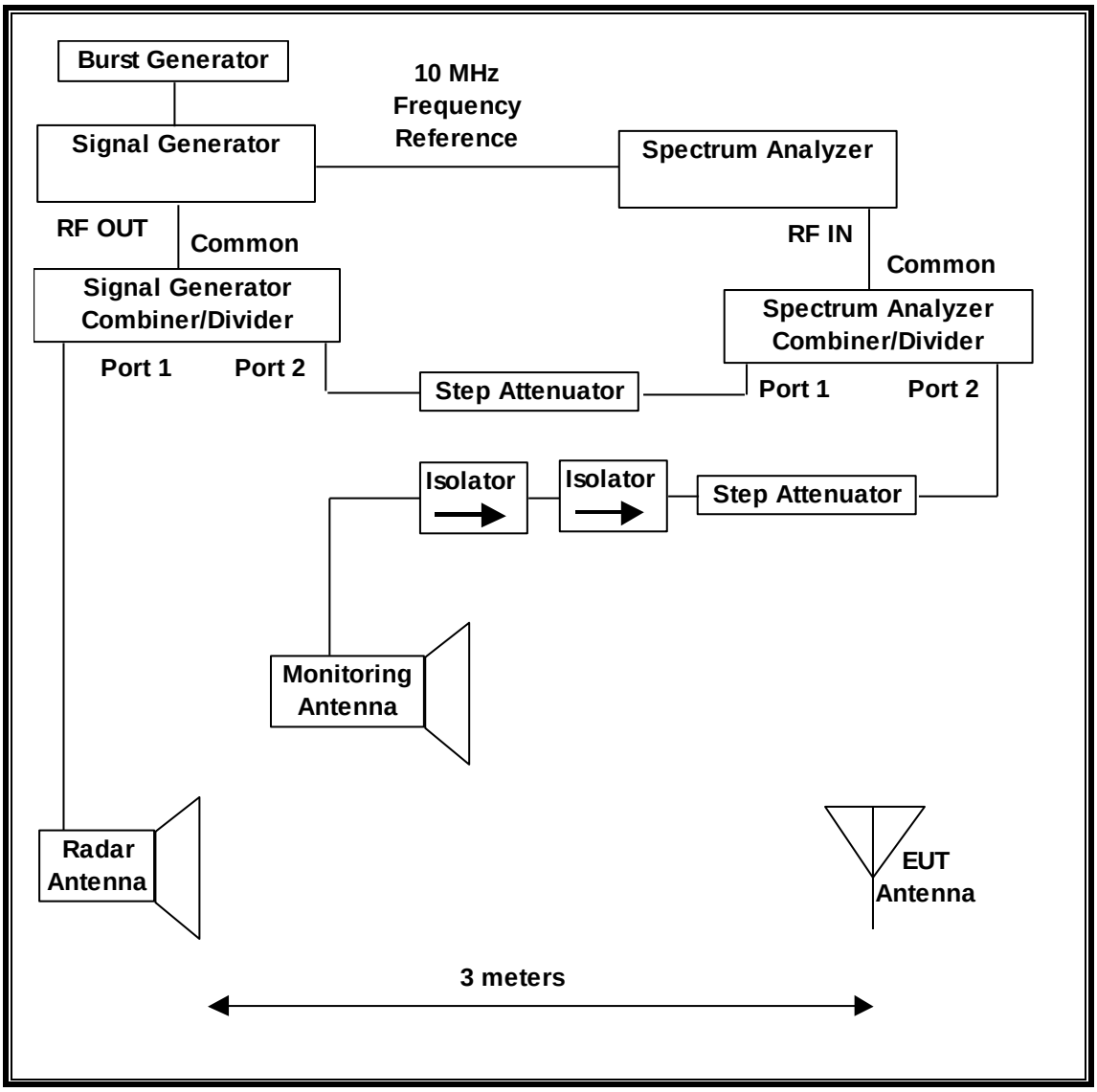
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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

5.2. TEST AND MEASUREMENT SYSTEM

5.2.1. RADIATED METHOD SYSTEM BLOCK DIAGRAM



5.2.2. 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.

5.2.3. 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.

5.2.4. 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.

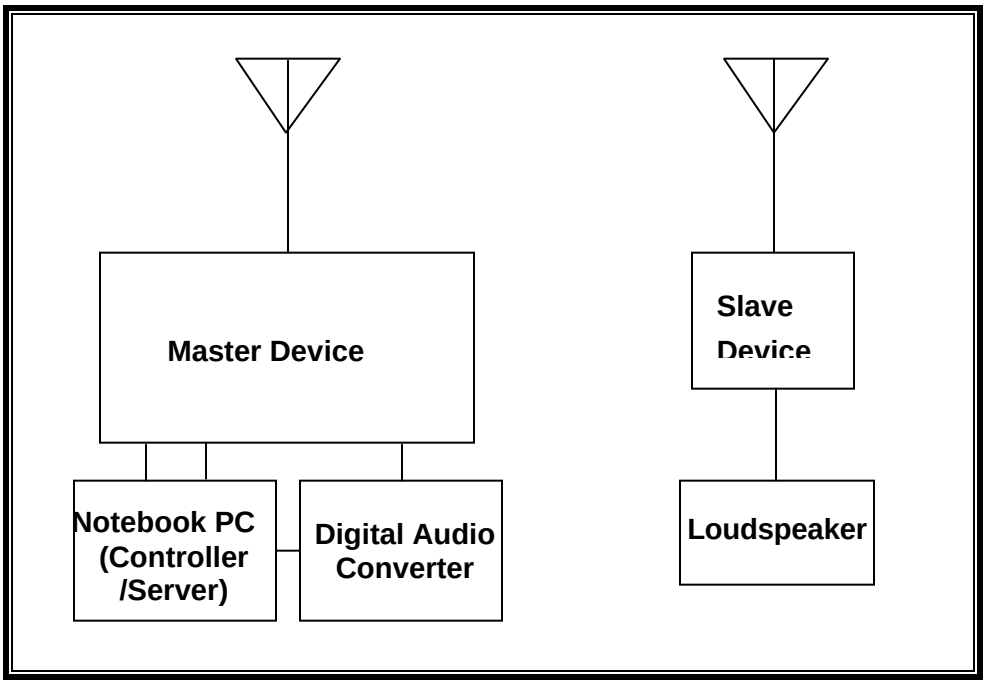
5.2.5. TEST AND MEASUREMENT EQUIPMENT

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	08/15/12
Vector Signal Generator, 20GHz	Agilent / HP	E8267C	C01066	11/17/12
Arbitrary Waveform Generator	Agilent / HP	33220A	C01146	09/16/12

5.3. SETUP OF EUT

5.3.1. RADIATED METHOD EUT TEST SETUP



5.3.2. SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter (EUT)	Condor	STD-1836P	03030	DoC
Notebook PC (Controller/Server)	Dell	PP18L	34220464525	DoC
AC Adapter (Notebook PC)	Lite On Technology	LA90PS0-00	CN-0DF266-71615-71P-096D	DoC
Digital Audio Converter	Empirical Audio	Off-Ramp 3	03032	DoC
AC Adapter (Digital Audio Converter)	Group west	57D-12-2000	03008	DoC
Development Kit (Slave Device)	Summit Semiconductor	Lagrande Amplifier with Ice Axe Wireless Module	03010	UA9400
AC Adapter (Slave Device)	EDAC Power Electronics	EA1060B	03012	DoC
Loudspeaker	Audio Source	Not Marked	03014	DoC

5.4. DESCRIPTION OF EUT

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges, excluding operation in the 5600 to 5650 MHz band.

The EUT is a Master Device, consisting of a Working Radio, Monitor Radio and Control System. The Monitor Radio is a receive-only device incorporating CAC and In-Service Monitoring. The Working Radio is a transceiver incorporating In-Service Monitoring. Operational DFS functions such as Channel selection and Non-Occupancy are managed by the Control System.

By design the minimum frequency separation between the Monitor Radio and the Working Radio is 40 MHz (2 channels) to prevent Working Radio transmissions from overloading or saturating the Monitor Radio.

The highest power level within these bands is 15.73 dBm EIRP in the 5250-5350 MHz band and 15.75 dBm EIRP in the 5470-5725 MHz band.

The only antenna assembly gain utilized with the EUT has a gain of 1.0 dBi.

The Working Radio and Monitor Radio utilize identical antennas.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is –62 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is -62 + 1 = -61 dBm.

The Working Radio uses one transmitter/receiver chain, connected to an integrated printed circuit board assembly antenna to perform radiated tests.

The Monitor Radio uses one receive-only chain, connected to an integrated printed circuit board assembly antenna to perform radiated tests.

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

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes a proprietary frame-based architecture. One nominal channel bandwidth, 20 MHz, is implemented.

Four network frame rates are implemented, corresponding to audio sampling rates of 32, 44.1, 48, and 96 kHz. The worst-case network frame rate with respect to the talk/listen ratio is with an audio sampling rate of 96 kHz.

Traffic is generated by streaming the audio file “5_GHz_Audio_Test_file.WAV” from the Master to the Slave. This WAV file is based on a 44.1 kHz sampling rate. The digital audio signal generator is used to convert the sampling rate to generate audio at the 48 kHz sampling rate.

The DFS software installed in the radio is DFS Firmware Version 1.0.

UNIFORM CHANNEL SPREADING

This statement is in a separate document.

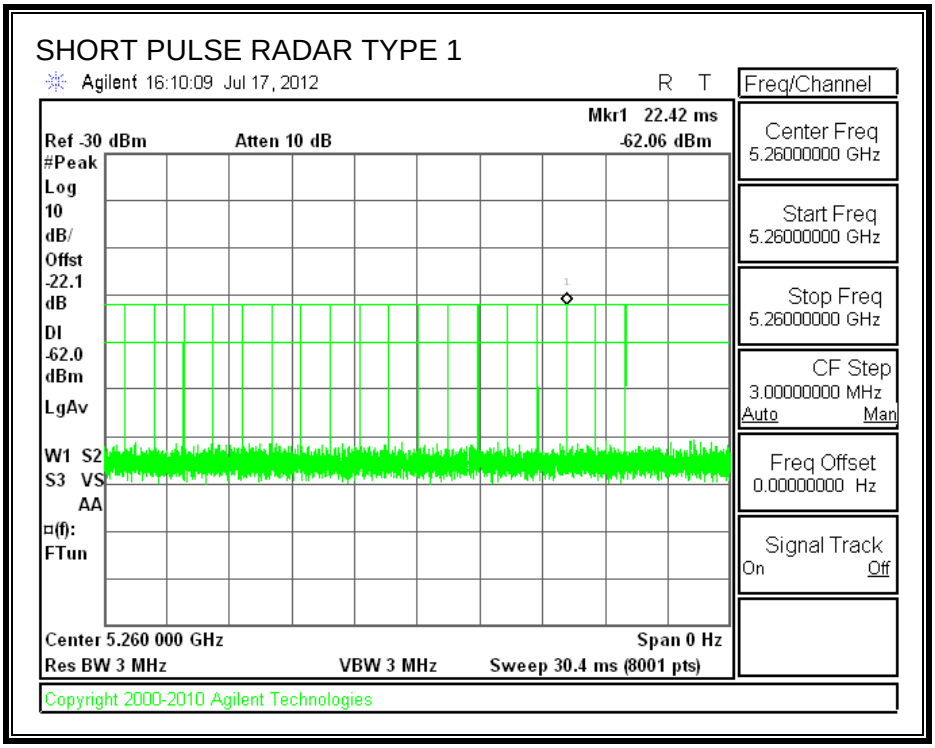
6. MONITOR RADIO TEST RESULTS

6.1. TEST CHANNEL

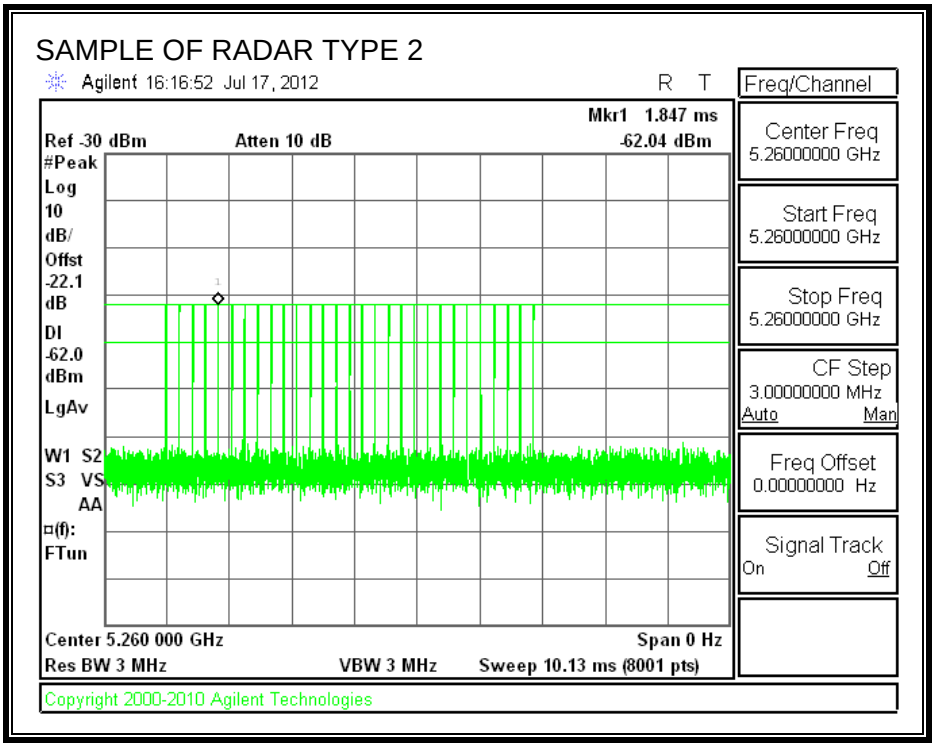
All Monitoring Radio tests were performed at a channel center frequency of 5260 MHz.

6.2. RADAR WAVEFORMS

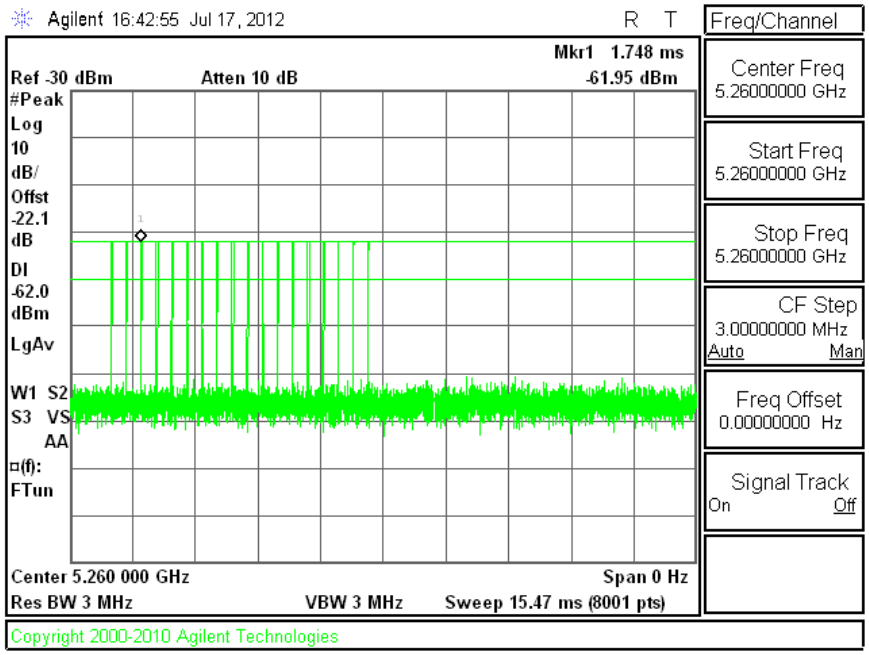
RADAR WAVEFORMS



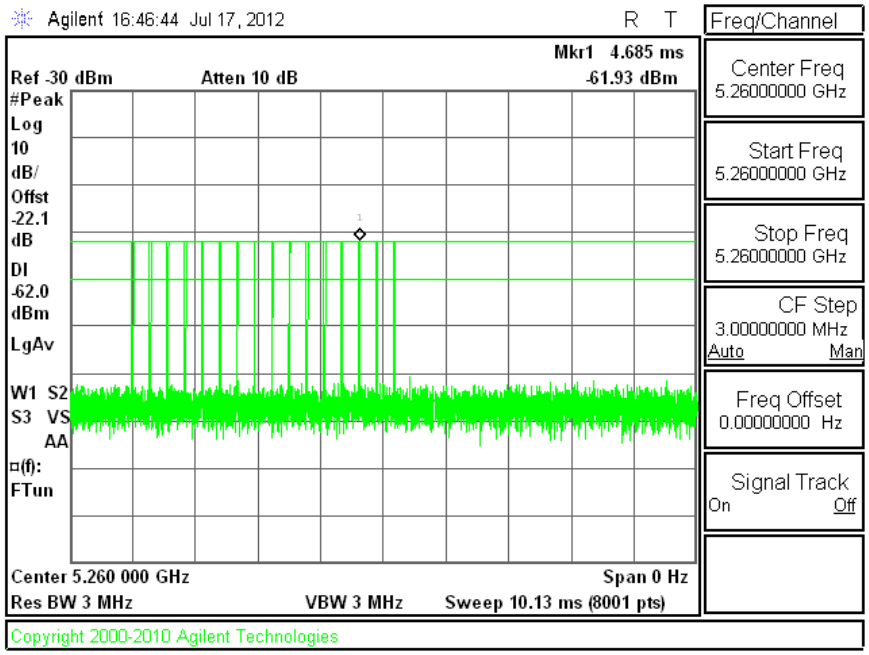
SAMPLE OF RADAR TYPE 2



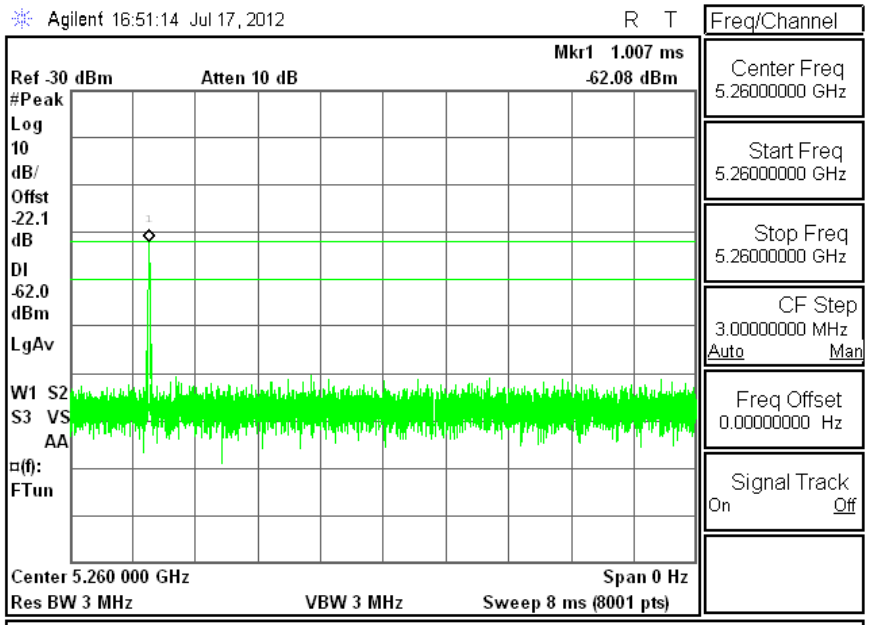
SAMPLE OF RADAR TYPE 3

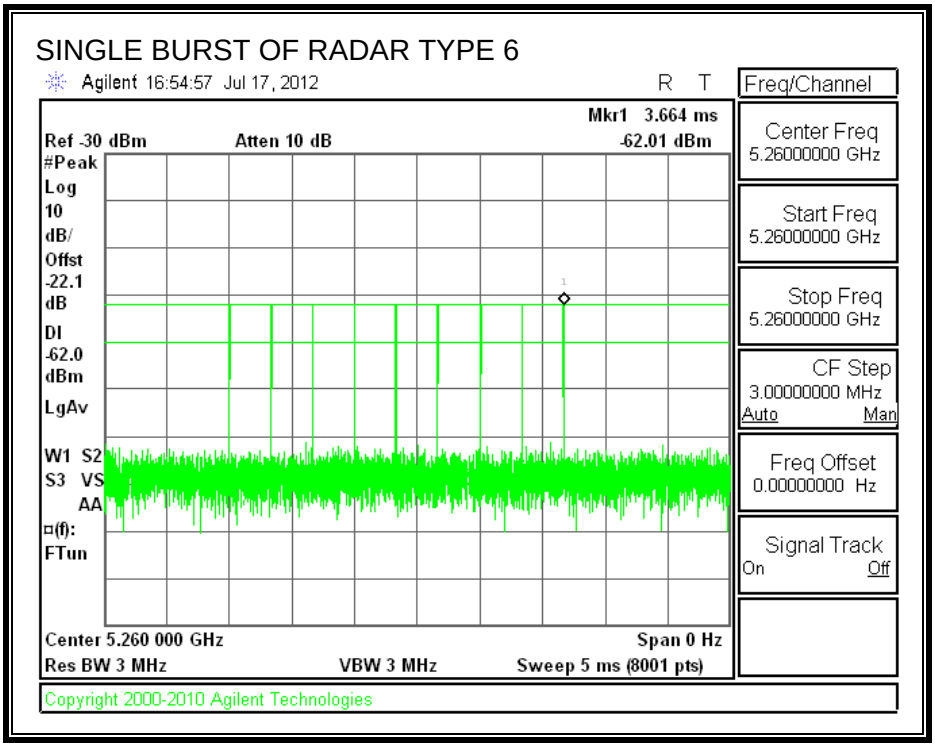


SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5

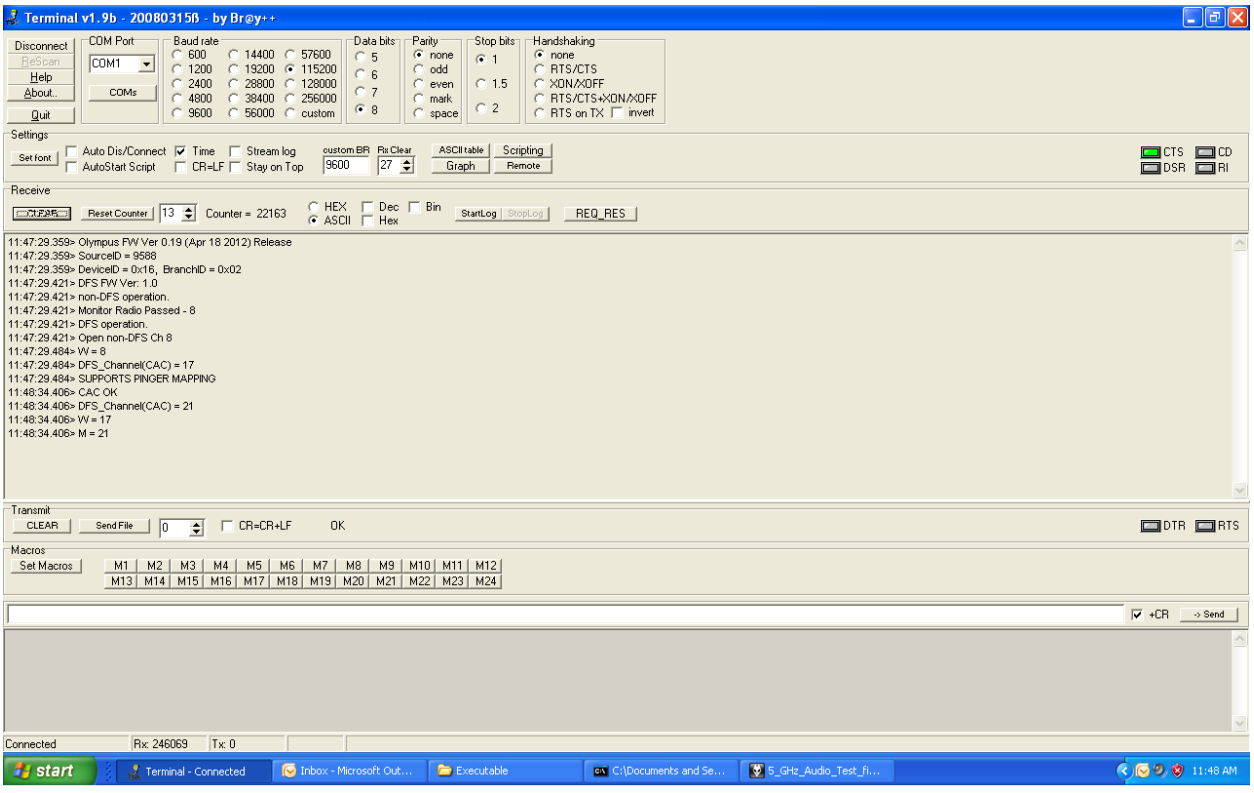




6.3. MONITOR RADIO FUNCTIONAL CHECK

EUT TEST MODE LOG FILE FOR FUNCTIONAL OPERATIONAL CONDITION

The EUT operates normally during this functional check.

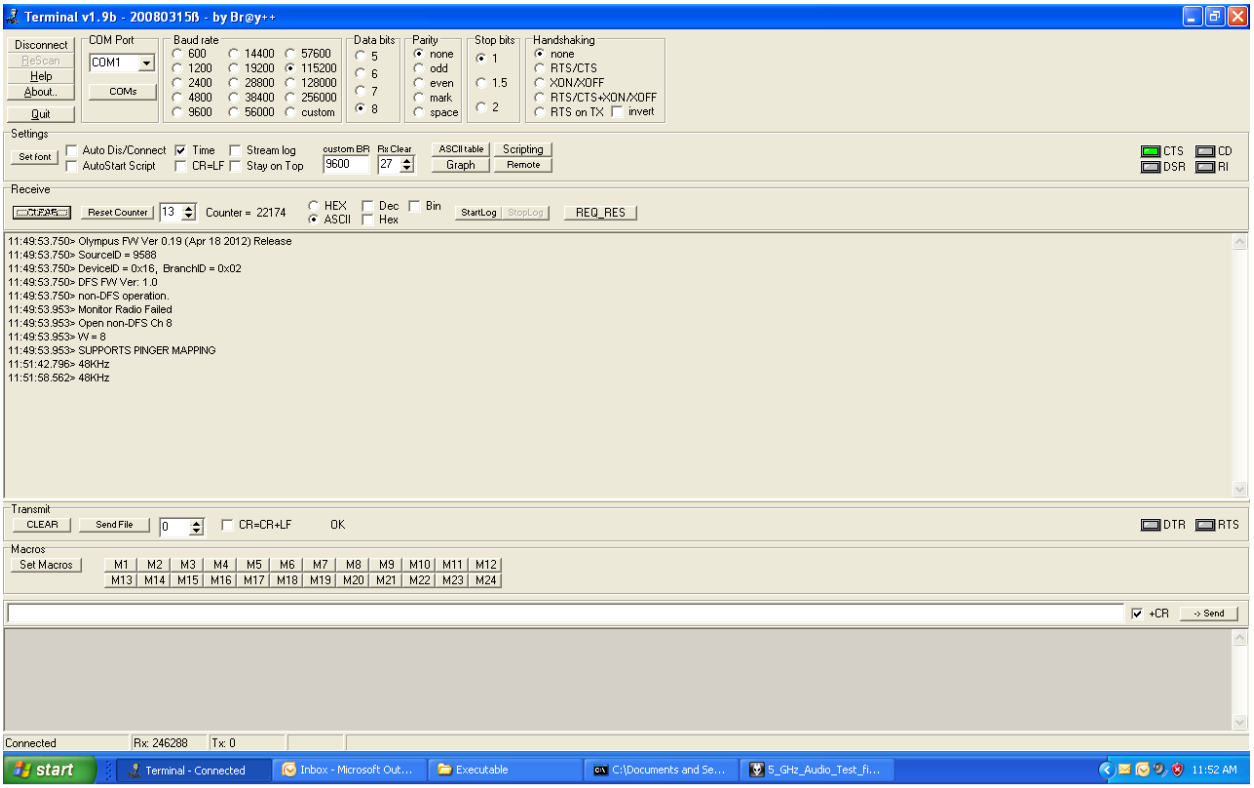


Time stamp 11:47:29.421 shows that the functional check was performed on a non-DFS channel and was successful. While the Monitor Radio was performing a CAC on Ch 17 (5300 MHz) the Working Radio was tuned to Ch 8 (5180 MHz).

At 11:48:34.406 the CAC on 5300 MHz is completed and the Working Radio network is moved to Ch 17 (5300 MHz); then the Monitor Radio begins a CAC on Ch 21 (5540 MHz).

EUT TEST MODE LOG FILE FOR NON-FUNCTIONAL OPERATIONAL CONDITION

The Working Radio RF output and Monitor Radio RF input are temporarily degraded by disconnecting both antennas during this functional check to simulate a problem with the Monitor Radio.



Time stamp 11:49:53.953 shows that the functional check is performed on a non-DFS channel and is not successful. The Working Radio establishes a network on Ch 8 (5180 MHz).

Since the functional test indicated a problem with the Monitor Radio, nothing else happens: the Monitor Radio neither tunes to a DFS channel nor starts a CAC, and no further entries would normally be made in the log file. Some commands were issued a few minutes later and time stamps at and later than 11:51:58.562 show that the log file would record any events if they were to occur. All events that did occur in response to the deliberate commands were on non-DFS channels.

6.4. MONITOR RADIO TEST RESULTS AT 48 kHz AUDIO RATE

6.4.1. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE NEW CHANNEL CYCLE TIME

The Monitor Radio completes a CAC on an initial channel, at which time the Working Radio establishes a network on the initial channel and the Monitor Radio starts a CAC on the intended channel.

Within a few seconds of the Monitor Radio completing the CAC on the initial channel a radar signal was triggered on the initial channel. In response the Working Radio moves the network to a non-DFS channel. These actions will force the network to move to the intended channel upon successful completion of the CAC on the intended channel.

The time from the radar burst on the intended channel to the initialization of traffic (by the Working Radio) on the intended channel was measured as the approximate New Channel Cycle Time. The approximation is a function of the actual time between the completion of the CAC on the initial channel and the timing of the two radar bursts (initial channel and intended channel); only the burst on the intended channel is displayed on the spectrum analyzer.

The EUT Test Mode Log File also records the timing of these events. The time from the detection of radar (by the Working Radio) on the initial channel to the initialization of traffic (by the Working Radio) on the intended channel was measured as the New Channel Cycle Time.

PROCEDURE FOR TIMING OF RADAR BURST

The Monitor Radio completes a CAC on an initial channel, at which time the Working Radio establishes a network on this initial channel and the Monitor Radio starts a CAC on the intended channel.

Within a few seconds of the Monitor Radio completing the CAC on the initial channel a radar signal was triggered on the initial channel. In response the Working Radio moves the network to a non-DFS channel. These actions will force the network to move to the intended channel upon successful completion of the CAC on the intended channel.

A radar signal was triggered on the intended channel within 0 to 6 seconds after the beginning of the CAC on the intended channel and transmissions on the intended channel were monitored on the spectrum analyzer.

The time from the radar burst on the initial channel to the radar burst on the intended channel was measured as the approximate relative time from the start of the CAC. The approximation is a function of the actual time between the completion of the CAC on the initial channel and the timing of the two radar bursts (initial channel and intended channel); only the burst on the intended channel is displayed on the spectrum analyzer.

The EUT Test Mode Log File also records the timing of these events. The time from the beginning of the CAC (by the Monitor Radio) on the intended channel to the detection of the radar burst on the intended channel (by the Monitor Radio) was measured as the timing of the radar burst.

The above procedure was repeated for the 54 to 60 second window time.

APPROXIMATE QUANTITATIVE RESULTS BASED ON RF MARKERS

NO RADAR TRIGGERED ON INTENDED CHANNEL

The time from the radar burst on the initial channel to the initialization of traffic (by the Working Radio) on the intended channel was measured as the approximate New Channel Cycle Time.

RADAR TRIGGERED ON INTENDED CHANNEL

The time from the radar burst on the initial channel to the radar burst on the intended channel was measured as the approximate relative time from the start of the CAC.

No Radar Triggered

Start of CAC on 5260 MHz (sec)	Start of Traffic on 5260 MHz (sec)	CAC Time (sec)
64.9	129.30	64.40

Radar Near Beginning of CAC

Start of CAC on 5260 MHz (sec)	Timing of Radar Burst on 5260 MHz (sec)	Radar Relative to Start of CAC on 5260 MHz (sec)
65.03	65.78	0.75

Radar Near End of CAC

Start of CAC on 5260 MHz (sec)	Timing of Radar Burst on 5260 MHz (sec)	Radar Relative to Start of CAC on 5260 MHz (sec)
65.1	123.70	58.60

PRECISE QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start CAC on 5260 MHz (hh:mm:ss)	Start of Traffic on 5260 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
10:57:56.812	10:59:01.171	00:01:04.359

Radar Near Beginning of CAC

Start CAC on 5260 MHz (hh:mm:ss)	Radar Detected on 5260 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
11:17:19.906	11:17:20.656	00:00:00.750

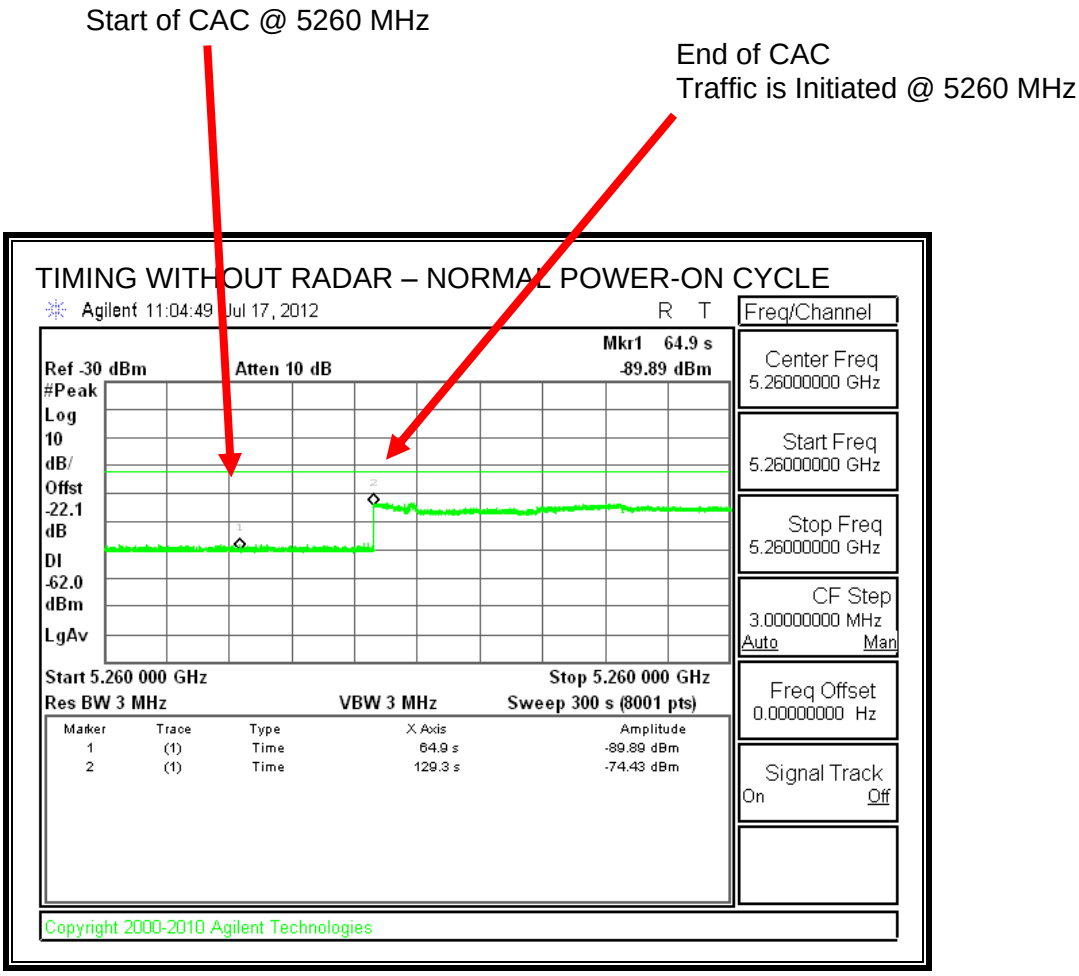
Radar Near End of CAC

Start CAC on 5260 MHz (hh:mm:ss)	Radar Detected on 5260 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
11:25:10.109	11:26:08.781	00:00:58.672

QUALITATIVE RESULTS

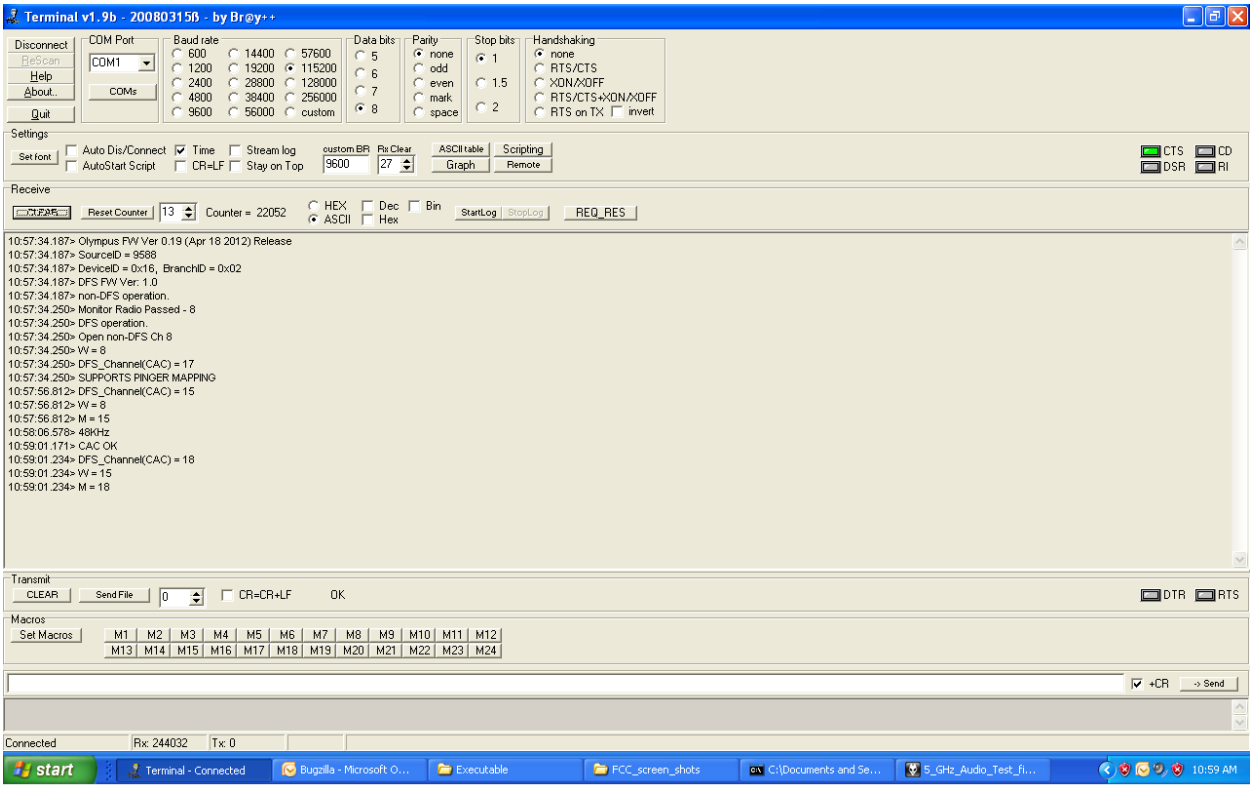
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT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

TIMING WITHOUT RADAR DURING CAC

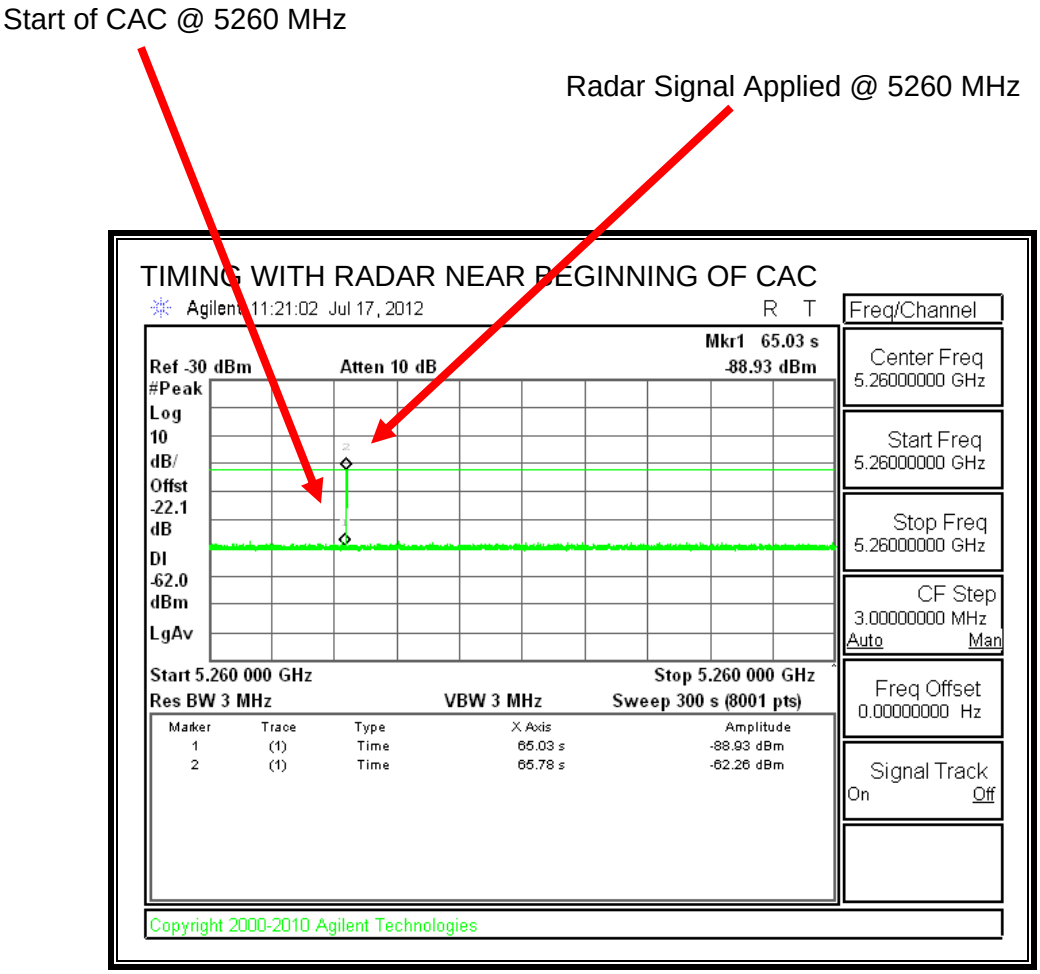


Transmissions begin on intended channel after completion of CAC.

EUT TEST MODE LOG FILE - CAC TIMING WITHOUT RADAR

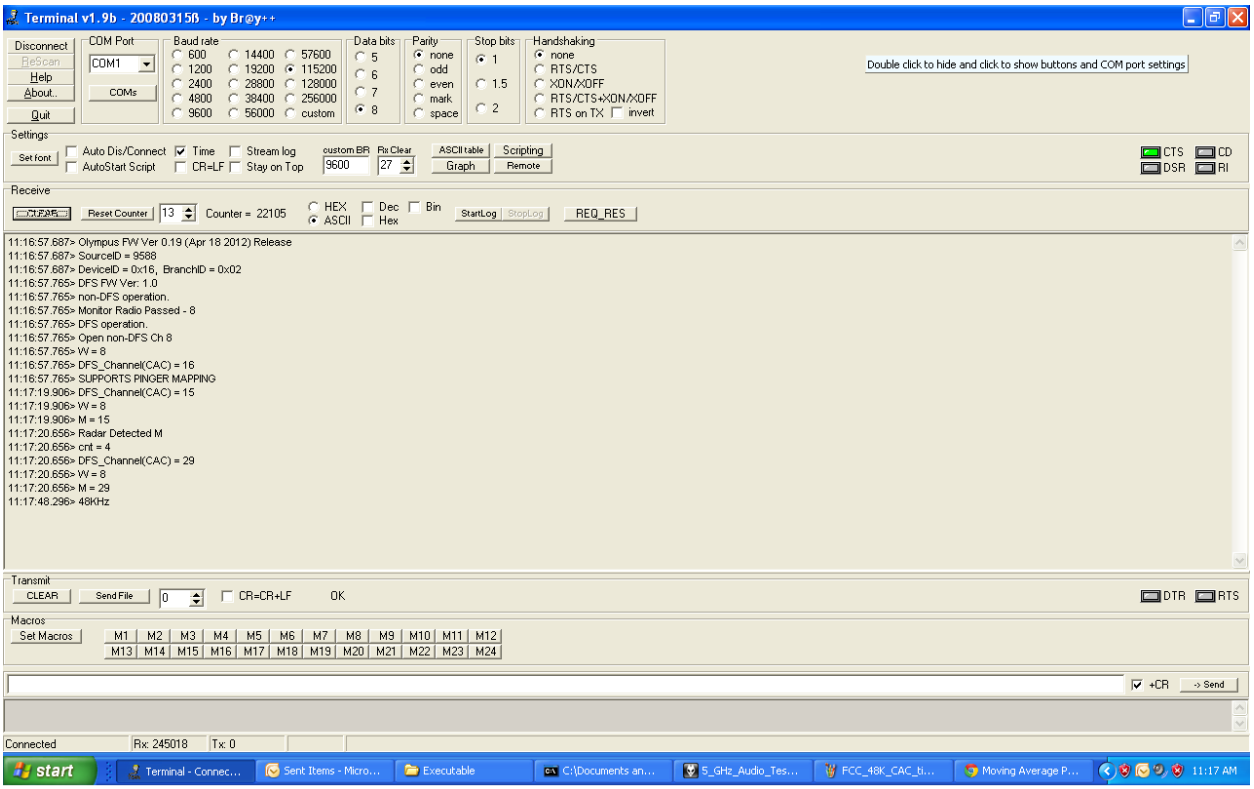


TIMING WITH RADAR NEAR BEGINNING OF CAC

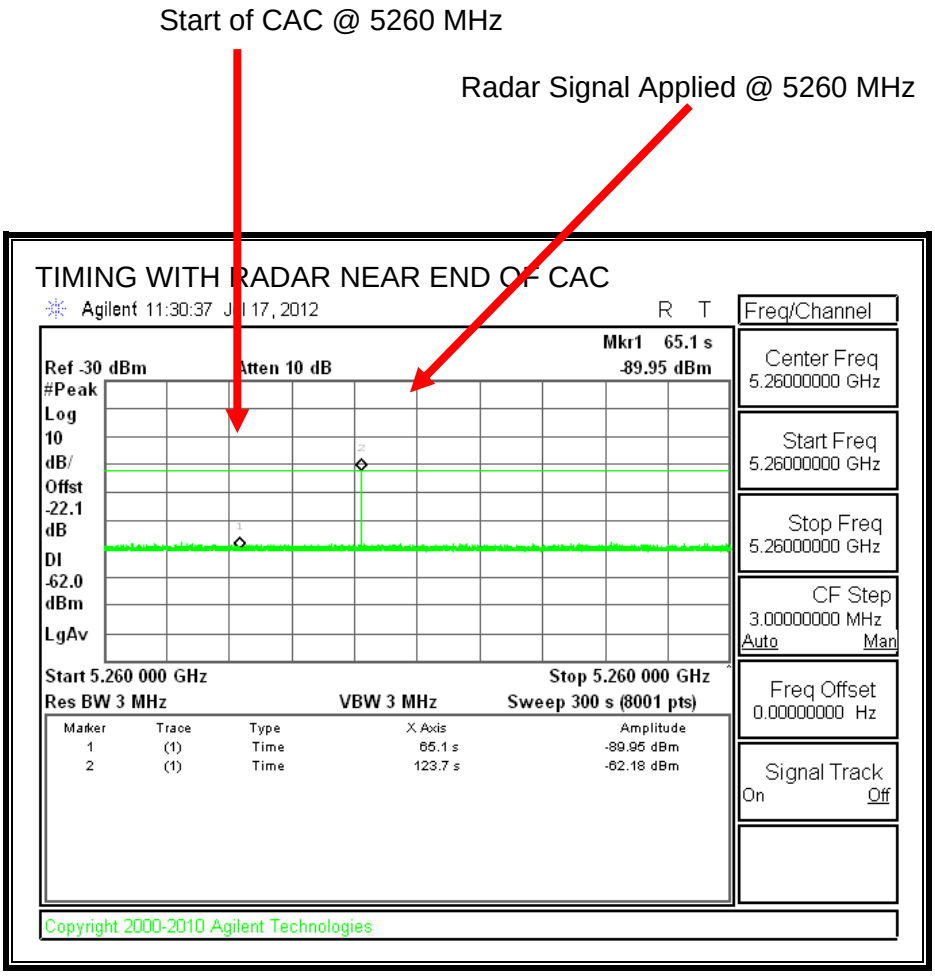


No EUT transmissions on the intended channel were observed.

EUT TEST MODE LOG FILE - BEGINNING OF CAC

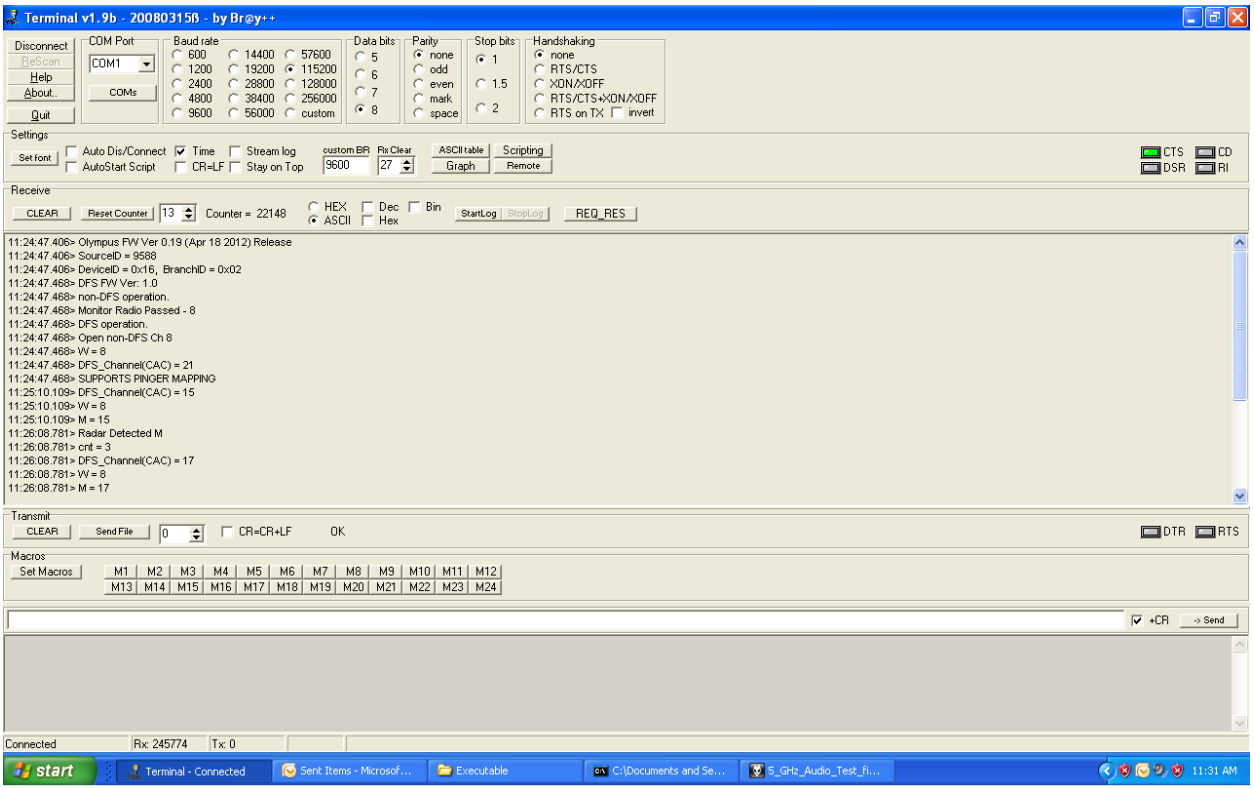


TIMING WITH RADAR NEAR END OF CAC



No EUT transmissions on the intended channel were observed.

EUT TEST MODE LOG FILE - END OF CAC



6.4.2. OVERLAPPING CHANNEL TESTS

RESULTS

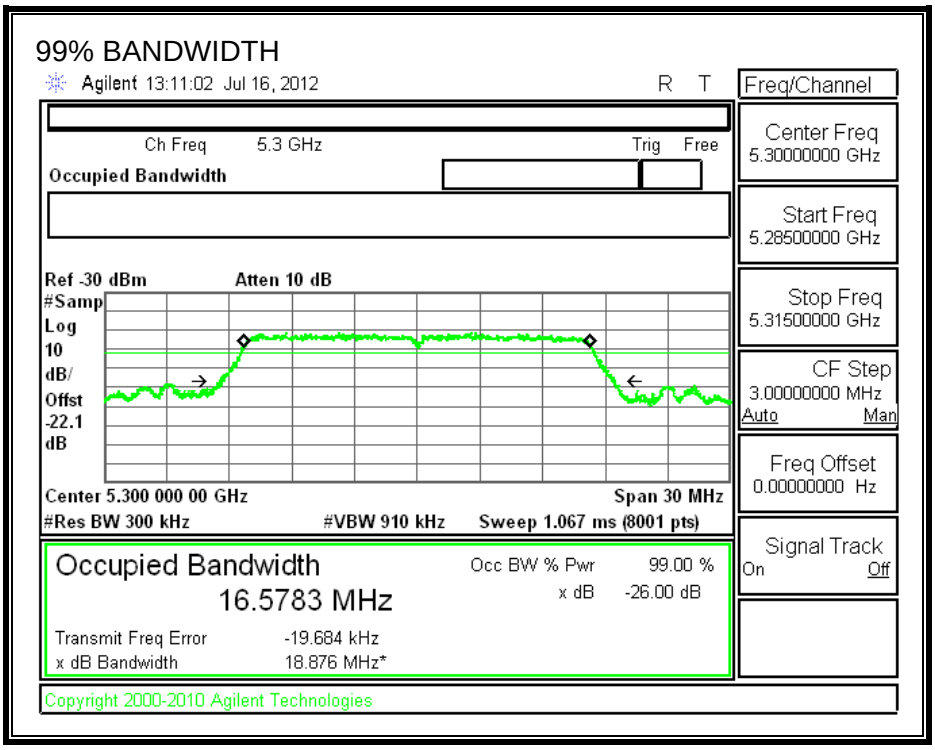
These tests are not applicable.

6.4.3. CHANNEL AND NETWORK CONFIGURATION FOR DETECTION TESTS

All Detection Bandwidth and In-Service Monitoring tests were performed on the Monitor Radio at a channel center frequency of 5260 MHz, with a fully operational link established between the Working Radio and the Slave Devices at a channel center frequency of 5300 MHz, thus the channel separation between the Working and Monitor Radios was at the design minimum in accordance with KDB 437887.

6.4.4. 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 (%)
5252	5268	16	16.578	96.5	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
5252	10	10	100	FL
5253	10	10	100	
5254	10	10	100	
5255	10	10	100	
5256	10	10	100	
5257	10	10	100	
5258	10	10	100	
5259	10	10	100	
5260	10	10	100	
5261	10	10	100	
5262	10	10	100	
5263	10	10	100	
5264	10	10	100	
5265	10	10	100	
5266	10	10	100	
5267	10	10	100	
5268	10	10	100	FH

6.4.5. 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	90.00	60	Pass
FCC Short Pulse Type 3	30	96.67	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		95.00	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	34	97.06	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	212.00	29	Yes
2002	4.8	220.00	29	Yes
2003	1.2	177.00	26	Yes
2004	1.6	216.00	24	Yes
2005	4.3	167.00	27	Yes
2006	2.7	194.00	28	Yes
2007	3.3	190.00	28	Yes
2008	4.7	172.00	29	Yes
2009	3.9	190.00	25	Yes
2010	4.2	167.00	24	Yes
2011	3.5	153.00	28	No
2012	3.1	165.00	24	Yes
2013	2.1	155.00	24	Yes
2014	2.2	152.00	29	No
2015	3.3	166.00	24	Yes
2016	3.3	181.00	29	Yes
2017	4.4	192.00	28	Yes
2018	3.1	168.00	24	Yes
2019	3.4	191.00	27	Yes
2020	4.1	181.00	29	Yes
2021	1.5	186.00	25	Yes
2022	2.3	162.00	24	Yes
2023	2.3	207.00	25	Yes
2024	2.9	170.00	25	Yes
2025	3	157.00	29	Yes
2026	3.2	206.00	28	Yes
2027	4.8	192.00	23	No
2028	4.5	164.00	28	Yes
2029	2.4	210.00	24	Yes
2030	4.1	154.00	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	7.4	375.00	18	Yes
3002	5.9	286.00	16	Yes
3003	5.4	424.00	18	Yes
3004	5.9	395.00	17	Yes
3005	8	279.00	17	Yes
3006	6.4	328.00	16	Yes
3007	9.3	371.00	16	Yes
3008	9.5	359.00	17	Yes
3009	5.3	261.00	16	Yes
3010	6.1	454.00	16	Yes
3011	6.3	316.00	18	Yes
3012	8.1	415.00	17	Yes
3013	7.6	272.00	17	Yes
3014	7.8	453.00	16	Yes
3015	9.6	427.00	18	Yes
3016	6.4	342.00	17	Yes
3017	8.4	471.00	16	Yes
3018	6.8	395.00	16	Yes
3019	9.3	260.00	16	Yes
3020	8.5	456.00	16	Yes
3021	5.7	271.00	18	Yes
3022	8.9	465.00	16	Yes
3023	5.7	321.00	16	Yes
3024	8.9	285.00	18	Yes
3025	8.2	496.00	17	Yes
3026	8.6	391.00	16	No
3027	8.3	475.00	16	Yes
3028	5.9	266.00	17	Yes
3029	5.3	395	18	Yes
3030	7	409	17	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	10.7	283.00	16	Yes
4002	17.2	496.00	12	Yes
4003	10.9	472.00	12	Yes
4004	16.7	391.00	12	Yes
4005	14.9	354.00	16	Yes
4006	11.9	444.00	14	Yes
4007	19.5	387.00	15	Yes
4008	17	486.00	13	Yes
4009	19.5	460.00	14	Yes
4010	10.9	377.00	14	Yes
4011	10.2	403.00	16	Yes
4012	13.5	316.00	12	Yes
4013	14	493.00	13	No
4014	17.4	329.00	13	Yes
4015	18.4	472.00	16	Yes
4016	12.9	381.00	15	Yes
4017	18.6	498.00	16	Yes
4018	19.3	454.00	16	Yes
4019	15.6	285.00	14	Yes
4020	14	492.00	15	Yes
4021	13.9	384.00	14	Yes
4022	12.5	409.00	14	Yes
4023	10.4	483.00	15	Yes
4024	18.1	456.00	13	Yes
4025	10	253.00	12	Yes
4026	16.5	394.00	15	Yes
4027	14.4	291.00	15	Yes
4028	16.5	481.00	13	No
4029	15	347.00	13	Yes
4030	10.7	307.00	13	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	337	5252	5	Yes
2	812	5253	3	Yes
3	1287	5254	1	Yes
4	1762	5255	4	Yes
5	2237	5256	3	Yes
6	2712	5257	2	Yes
7	3187	5258	2	No
8	3662	5259	2	Yes
9	4137	5260	6	Yes
10	4612	5261	4	Yes
11	5087	5262	3	Yes
12	5562	5263	6	Yes
13	6037	5264	4	Yes
14	6512	5265	2	Yes
15	6987	5266	3	Yes
16	7462	5267	2	Yes
17	7937	5268	4	Yes
18	8412	5252	4	Yes
19	8887	5253	3	Yes
20	9362	5254	2	Yes
21	9837	5255	1	Yes
22	10312	5256	3	Yes
23	10787	5257	1	Yes
24	11262	5258	6	Yes
25	11737	5259	5	Yes
26	12212	5260	4	Yes
27	12687	5261	6	Yes
28	13162	5262	4	Yes
29	13637	5263	4	Yes
30	14112	5264	2	Yes
31	14587	5265	7	Yes
32	15062	5266	3	Yes
33	15537	5267	2	Yes
34	16012	5268	5	Yes

6.5. MONITOR RADIO TEST RESULTS AT 96 kHz AUDIO RATE

6.5.1. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE NEW CHANNEL CYCLE TIME

The Monitor Radio completes a CAC on an initial channel, at which time the Working Radio establishes a network on the initial channel and the Monitor Radio starts a CAC on the intended channel.

Within a few seconds of the Monitor Radio completing the CAC on the initial channel a radar signal was triggered on the initial channel. In response the Working Radio moves the network to a non-DFS channel. These actions will force the network to move to the intended channel upon successful completion of the CAC on the intended channel.

The time from the radar burst on the intended channel to the initialization of traffic (by the Working Radio) on the intended channel was measured as the approximate New Channel Cycle Time. The approximation is a function of the actual time between the completion of the CAC on the initial channel and the timing of the two radar bursts (initial channel and intended channel); only the burst on the intended channel is displayed on the spectrum analyzer.

The EUT Test Mode Log File also records the timing of these events. The time from the detection of radar (by the Working Radio) on the initial channel to the initialization of traffic (by the Working Radio) on the intended channel was measured as the New Channel Cycle Time.

PROCEDURE FOR TIMING OF RADAR BURST

The Monitor Radio completes a CAC on an initial channel, at which time the Working Radio establishes a network on this initial channel and the Monitor Radio starts a CAC on the intended channel.

Within a few seconds of the Monitor Radio completing the CAC on the initial channel a radar signal was triggered on the initial channel. In response the Working Radio moves the network to a non-DFS channel. These actions will force the network to move to the intended channel upon successful completion of the CAC on the intended channel.

A radar signal was triggered on the intended channel within 0 to 6 seconds after the beginning of the CAC on the intended channel and transmissions on the intended channel were monitored on the spectrum analyzer.

The time from the radar burst on the initial channel to the radar burst on the intended channel was measured as the approximate relative time from the start of the CAC. The approximation is a function of the actual time between the completion of the CAC on the initial channel and the timing of the two radar bursts (initial channel and intended channel); only the burst on the intended channel is displayed on the spectrum analyzer.

The EUT Test Mode Log File also records the timing of these events. The time from the beginning of the CAC (by the Monitor Radio) on the intended channel to the detection of the radar burst on the intended channel (by the Monitor Radio) was measured as the timing of the radar burst.

The above procedure was repeated for the 54 to 60 second window time.

APPROXIMATE QUANTITATIVE RESULTS BASED ON RF MARKERS

NO RADAR TRIGGERED ON INTENDED CHANNEL

The time from the radar burst on the initial channel to the initialization of traffic (by the Working Radio) on the intended channel was measured as the approximate New Channel Cycle Time.

RADAR TRIGGERED ON INTENDED CHANNEL

The time from the radar burst on the initial channel to the radar burst on the intended channel was measured as the approximate relative time from the start of the CAC.

No Radar Triggered

Start of CAC on 5260 MHz (sec)	Start of Traffic on 5260 MHz (sec)	CAC Time (sec)
65	130.00	65.00

Radar Near Beginning of CAC

Start of CAC on 5260 MHz (sec)	Timing of Radar Burst on 5260 MHz (sec)	Radar Relative to Start of CAC on 5260 MHz (sec)
65.35	66.15	0.80

Radar Near End of CAC

Start of CAC on 5260 MHz (sec)	Timing of Radar Burst on 5260 MHz (sec)	Radar Relative to Start of CAC on 5260 MHz (sec)
65.2	124.20	59.00

PRECISE QUANTITATIVE RESULTS BASED ON EUT TEST MODE LOG FILE TIME STAMPS

No Radar Triggered

Start CAC on 5260 MHz (hh:mm:ss)	Start of Traffic on 5260 MHz (hh:mm:ss)	CAC Time (hh:mm:ss)
09:50:21.546	09:51:26.421	00:01:04.875

Radar Near Beginning of CAC

Start CAC on 5260 MHz (hh:mm:ss)	Radar Detected on 5260 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
10:10:24.906	10:10:25.718	00:00:00.812

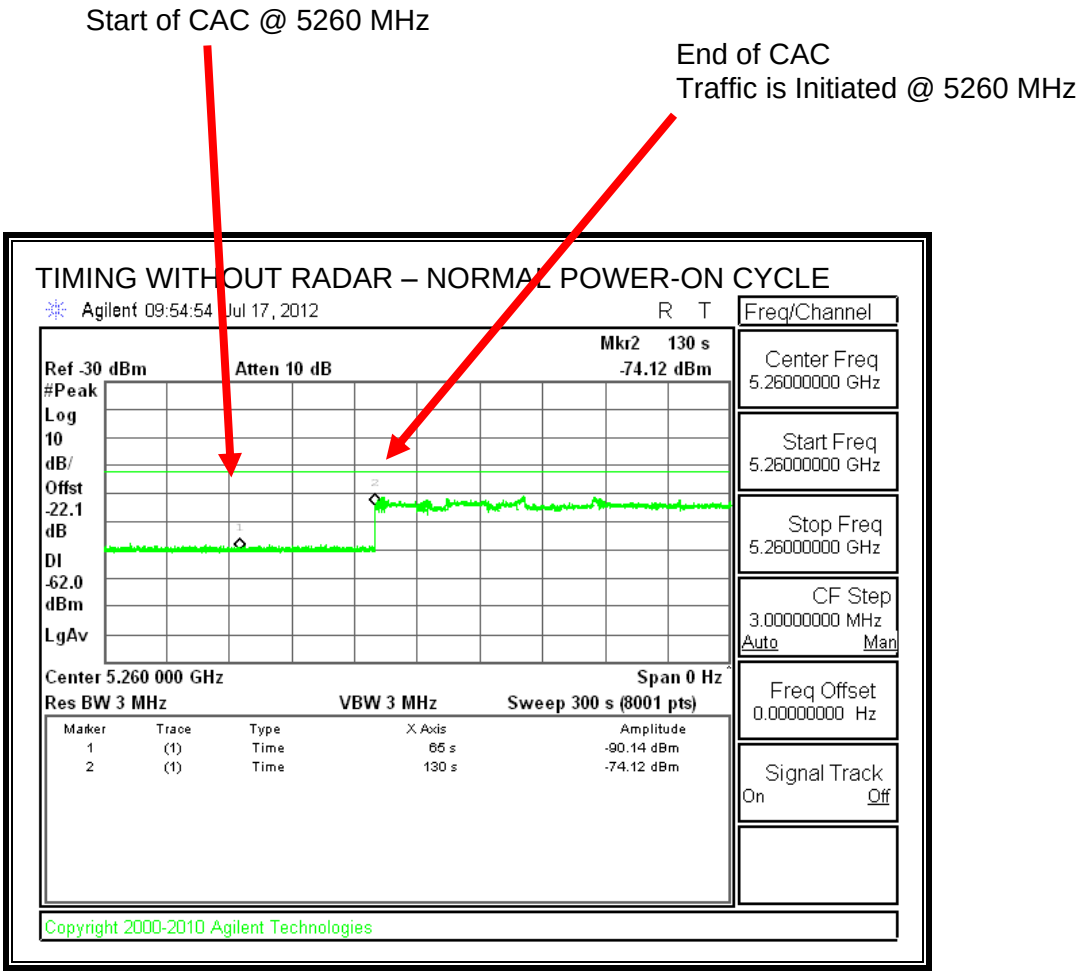
Radar Near End of CAC

Start CAC on 5260 MHz (hh:mm:ss)	Radar Detected on 5260 MHz (hh:mm:ss)	Radar Relative to Start of CAC (hh:mm:ss)
10:18:47.937	10:19:46.984	00:00:59.047

QUALITATIVE RESULTS

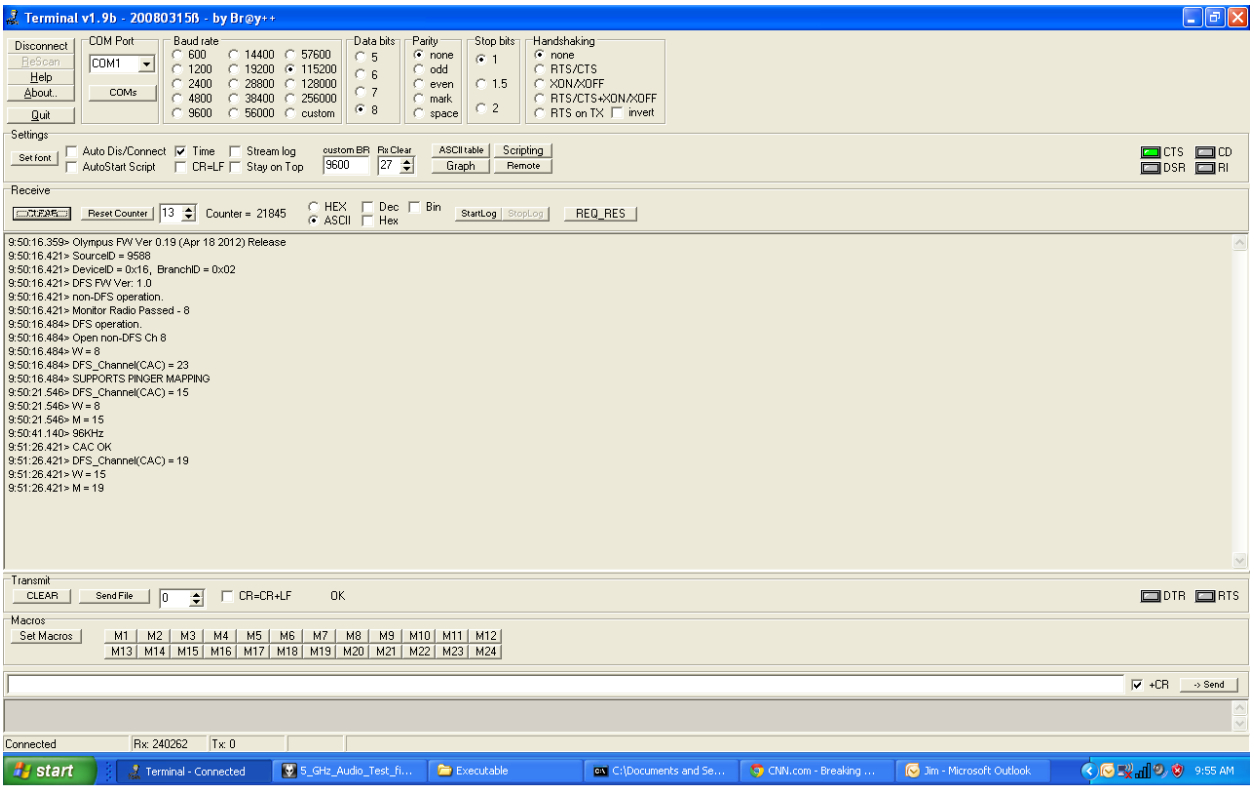
Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT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

TIMING WITHOUT RADAR DURING CAC

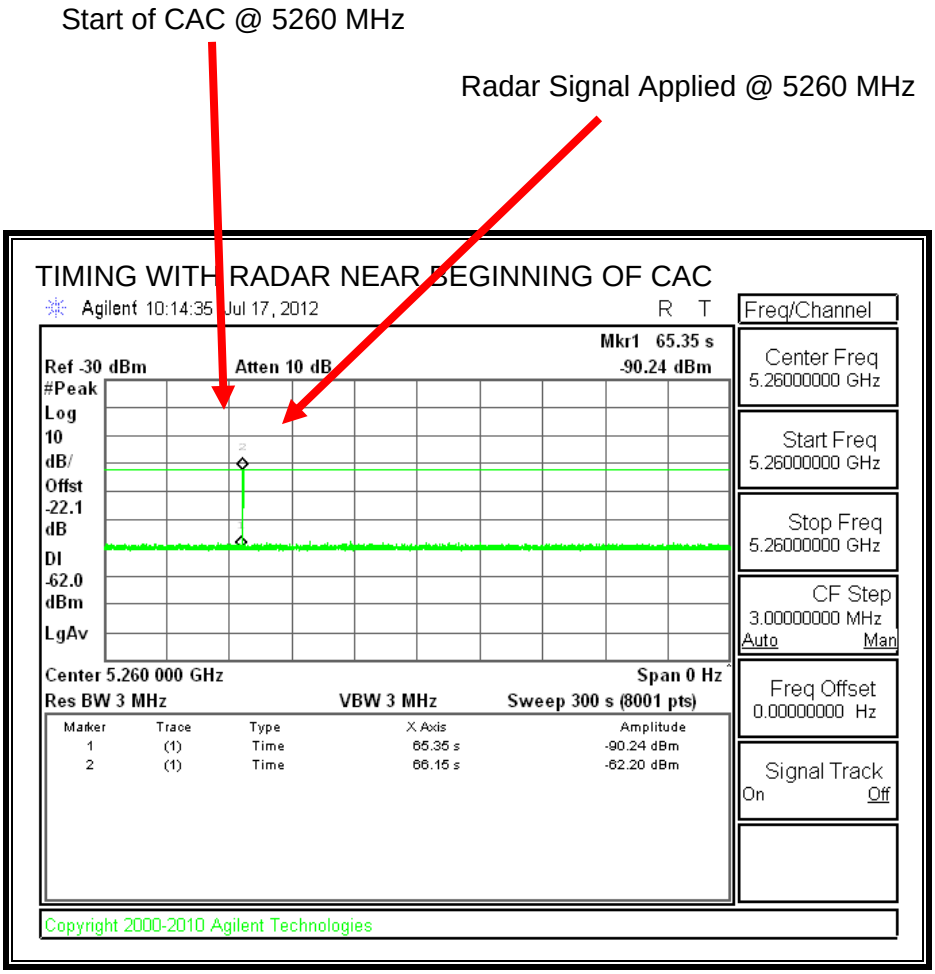


Transmissions begin on intended channel after completion of CAC.

EUT TEST MODE LOG FILE - CAC TIMING WITHOUT RADAR

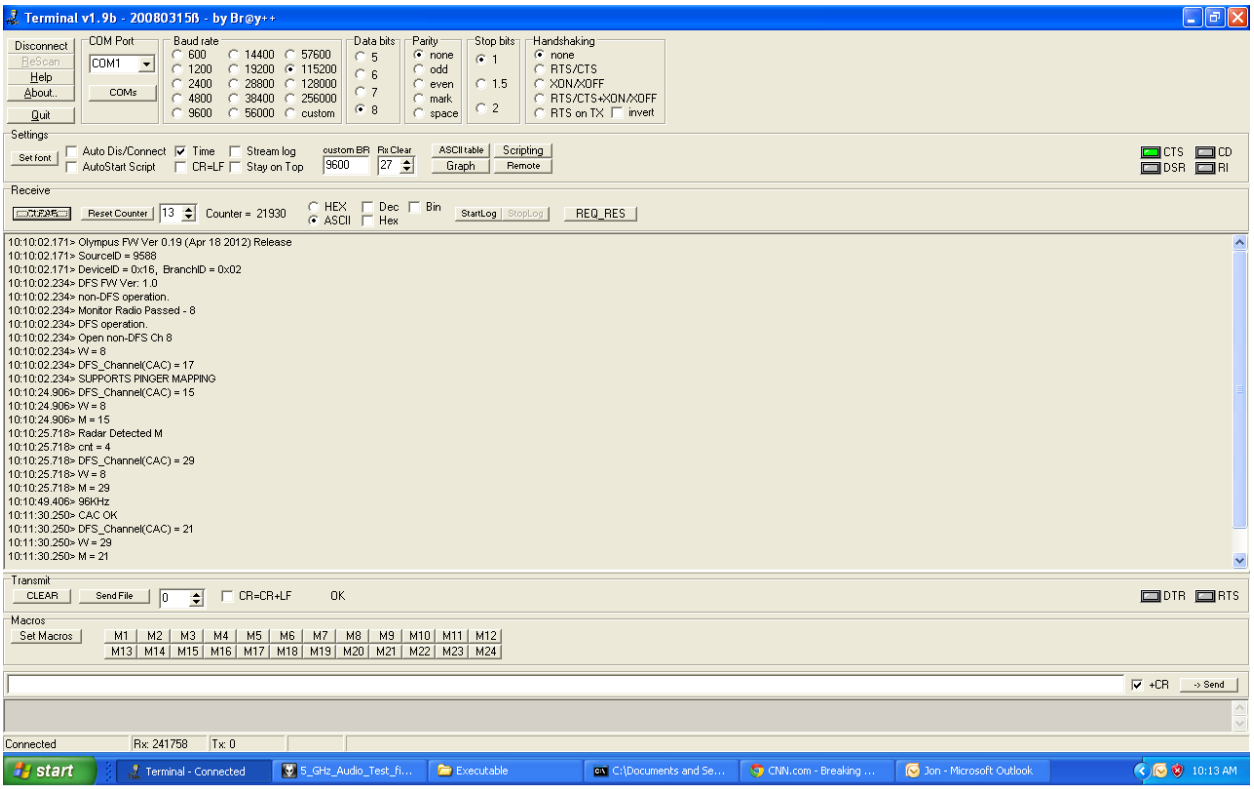


TIMING WITH RADAR NEAR BEGINNING OF CAC

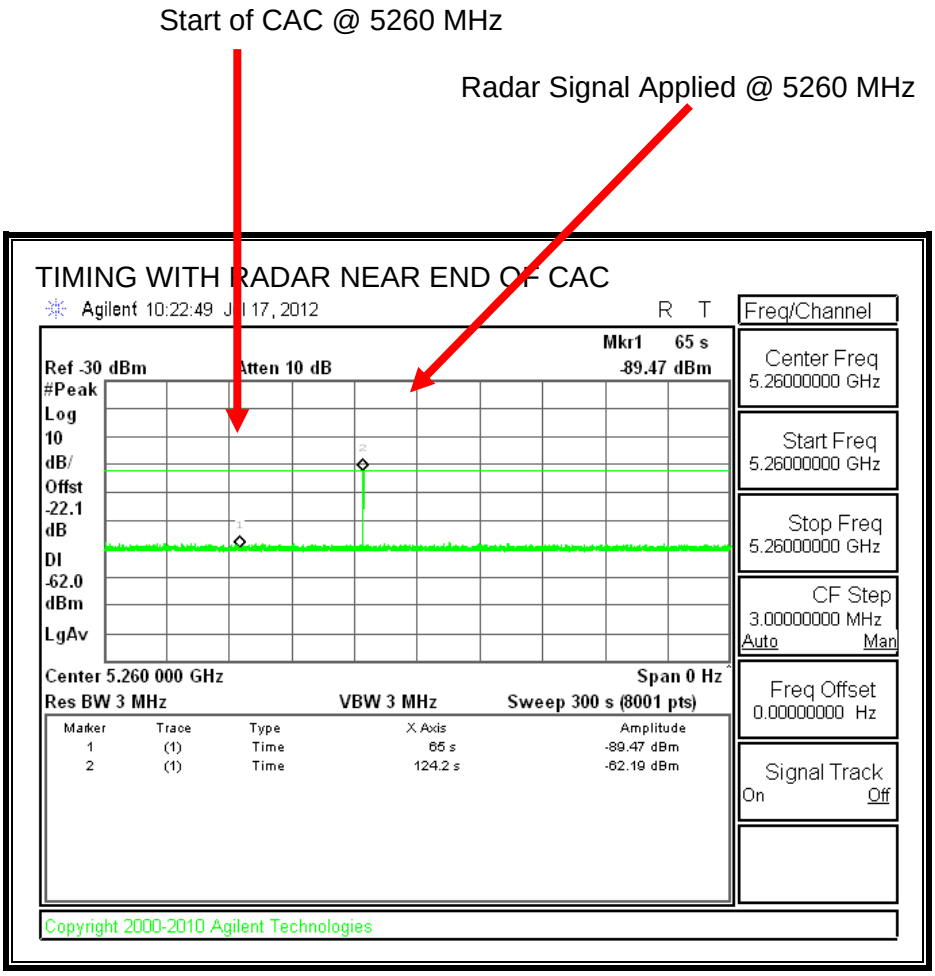


No EUT transmissions on the intended channel were observed.

EUT TEST MODE LOG FILE - BEGINNING OF CAC

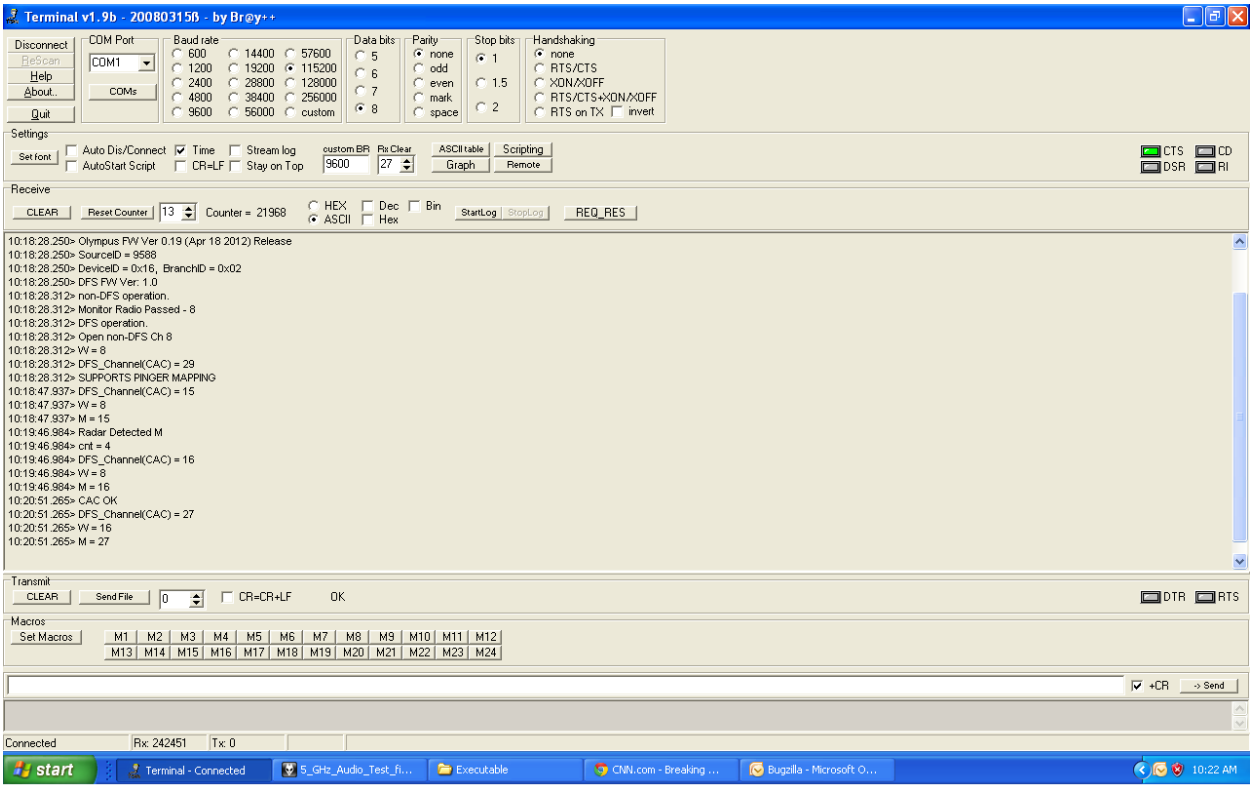


TIMING WITH RADAR NEAR END OF CAC



No EUT transmissions on the intended channel were observed.

EUT TEST MODE LOG FILE - END OF CAC



6.5.2. OVERLAPPING CHANNEL TESTS

RESULTS

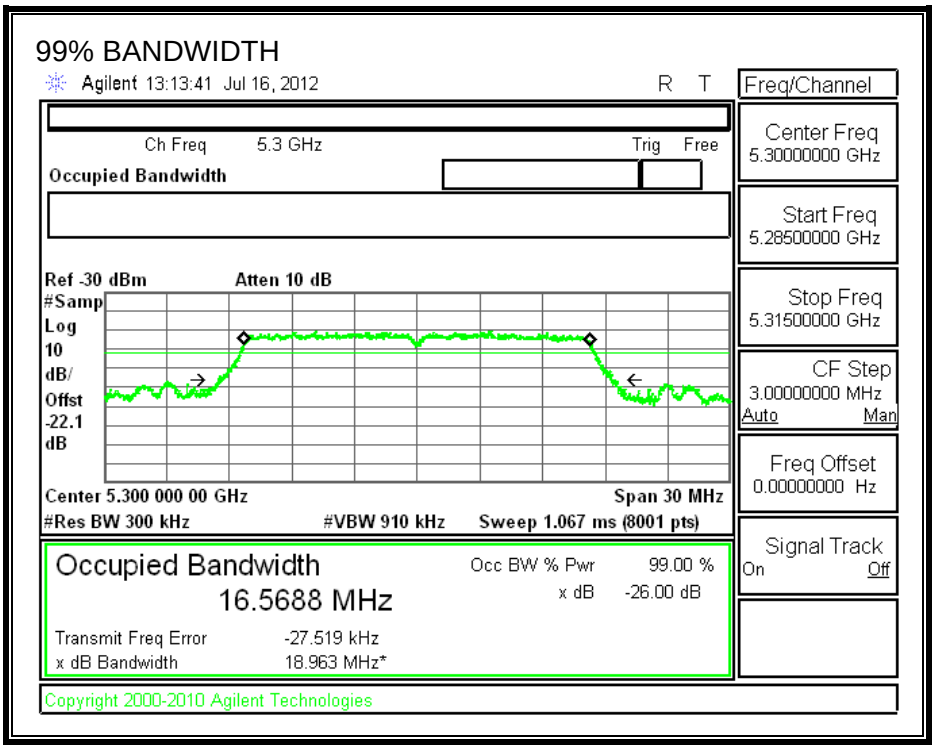
These tests are not applicable.

6.5.3. CHANNEL AND NETWORK CONFIGURATION FOR DETECTION TESTS

All Detection Bandwidth and In-Service Monitoring tests were performed on the Monitor Radio at a channel center frequency of 5260 MHz, with a fully operational link established between the Working Radio and the Slave Devices at a channel center frequency of 5300 MHz, thus the channel separation between the Working and Monitor Radios was at the design minimum in accordance with KDB 437887.

6.5.4. 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 (%)
5252	5268	16	16.569	96.6	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
5252	10	10	100	FL
5253	10	10	100	
5254	10	10	100	
5255	10	10	100	
5256	10	10	100	
5257	10	10	100	
5258	10	10	100	
5259	10	10	100	
5260	10	10	100	
5261	10	10	100	
5262	10	10	100	
5263	10	10	100	
5264	10	10	100	
5265	10	10	100	
5266	10	10	100	
5267	10	10	100	
5268	10	10	100	FH

6.5.5. 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	96.67	60	Pass
FCC Short Pulse Type 3	30	90.00	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		95.00	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	34	94.12	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	212.00	29	Yes
2002	4.8	220.00	29	Yes
2003	1.2	177.00	26	Yes
2004	1.6	216.00	24	Yes
2005	4.3	167.00	27	No
2006	2.7	194.00	28	Yes
2007	3.3	190.00	28	Yes
2008	4.7	172.00	29	Yes
2009	3.9	190.00	25	Yes
2010	4.2	167.00	24	Yes
2011	3.5	153.00	28	Yes
2012	3.1	165.00	24	Yes
2013	2.1	155.00	24	Yes
2014	2.2	152.00	29	Yes
2015	3.3	166.00	24	Yes
2016	3.3	181.00	29	Yes
2017	4.4	192.00	28	Yes
2018	3.1	168.00	24	Yes
2019	3.4	191.00	27	Yes
2020	4.1	181.00	29	Yes
2021	1.5	186.00	25	Yes
2022	2.3	162.00	24	Yes
2023	2.3	207.00	25	Yes
2024	2.9	170.00	25	Yes
2025	3	157.00	29	Yes
2026	3.2	206.00	28	Yes
2027	4.8	192.00	23	Yes
2028	4.5	164.00	28	Yes
2029	2.4	210.00	24	Yes
2030	4.1	154.00	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	7.4	375.00	18	Yes
3002	5.9	286.00	16	Yes
3003	5.4	424.00	18	Yes
3004	5.9	395.00	17	Yes
3005	8	279.00	17	Yes
3006	6.4	328.00	16	Yes
3007	9.3	371.00	16	Yes
3008	9.5	359.00	17	Yes
3009	5.3	261.00	16	Yes
3010	6.1	454.00	16	Yes
3011	6.3	316.00	18	Yes
3012	8.1	415.00	17	Yes
3013	7.6	272.00	17	Yes
3014	7.8	453.00	16	Yes
3015	9.6	427.00	18	Yes
3016	6.4	342.00	17	Yes
3017	8.4	471.00	16	Yes
3018	6.8	395.00	16	Yes
3019	9.3	260.00	16	Yes
3020	8.5	456.00	16	Yes
3021	5.7	271.00	18	Yes
3022	8.9	465.00	16	Yes
3023	5.7	321.00	16	Yes
3024	8.9	285.00	18	No
3025	8.2	496.00	17	No
3026	8.6	391.00	16	Yes
3027	8.3	475.00	16	No
3028	5.9	266.00	17	Yes
3029	5.3	395	18	Yes
3030	7	409	17	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	10.7	283.00	16	Yes
4002	17.2	496.00	12	No
4003	10.9	472.00	12	Yes
4004	16.7	391.00	12	Yes
4005	14.9	354.00	16	Yes
4006	11.9	444.00	14	Yes
4007	19.5	387.00	15	Yes
4008	17	486.00	13	Yes
4009	19.5	460.00	14	Yes
4010	10.9	377.00	14	Yes
4011	10.2	403.00	16	Yes
4012	13.5	316.00	12	Yes
4013	14	493.00	13	Yes
4014	17.4	329.00	13	Yes
4015	18.4	472.00	16	Yes
4016	12.9	381.00	15	Yes
4017	18.6	498.00	16	No
4018	19.3	454.00	16	Yes
4019	15.6	285.00	14	Yes
4020	14	492.00	15	Yes
4021	13.9	384.00	14	Yes
4022	12.5	409.00	14	Yes
4023	10.4	483.00	15	Yes
4024	18.1	456.00	13	Yes
4025	10	253.00	12	Yes
4026	16.5	394.00	15	Yes
4027	14.4	291.00	15	Yes
4028	16.5	481.00	13	Yes
4029	15	347.00	13	Yes
4030	10.7	307.00	13	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	374	5252	5	Yes
2	849	5253	6	Yes
3	1324	5254	4	Yes
4	1799	5255	6	Yes
5	2274	5256	4	No
6	2749	5257	1	Yes
7	3224	5258	2	Yes
8	3699	5259	3	Yes
9	4174	5260	3	Yes
10	4649	5261	7	Yes
11	5124	5262	3	Yes
12	5599	5263	4	Yes
13	6074	5264	5	Yes
14	6549	5265	4	Yes
15	7024	5266	2	Yes
16	7499	5267	3	Yes
17	7974	5268	6	Yes
18	8449	5252	4	Yes
19	8924	5253	3	Yes
20	9399	5254	4	Yes
21	9874	5255	3	Yes
22	10349	5256	5	Yes
23	10824	5257	3	Yes
24	11299	5258	7	Yes
25	11774	5259	1	Yes
26	12249	5260	3	Yes
27	12724	5261	7	Yes
28	13199	5262	3	Yes
29	13674	5263	2	Yes
30	14149	5264	1	Yes
31	14624	5265	6	Yes
32	15099	5266	6	Yes
33	15574	5267	1	Yes
34	16049	5268	3	No

7. WORKING RADIO RESULTS

7.1. CHANNEL AND NETWORK CONFIGURATION FOR SHUTDOWN AND DETECTION TESTS

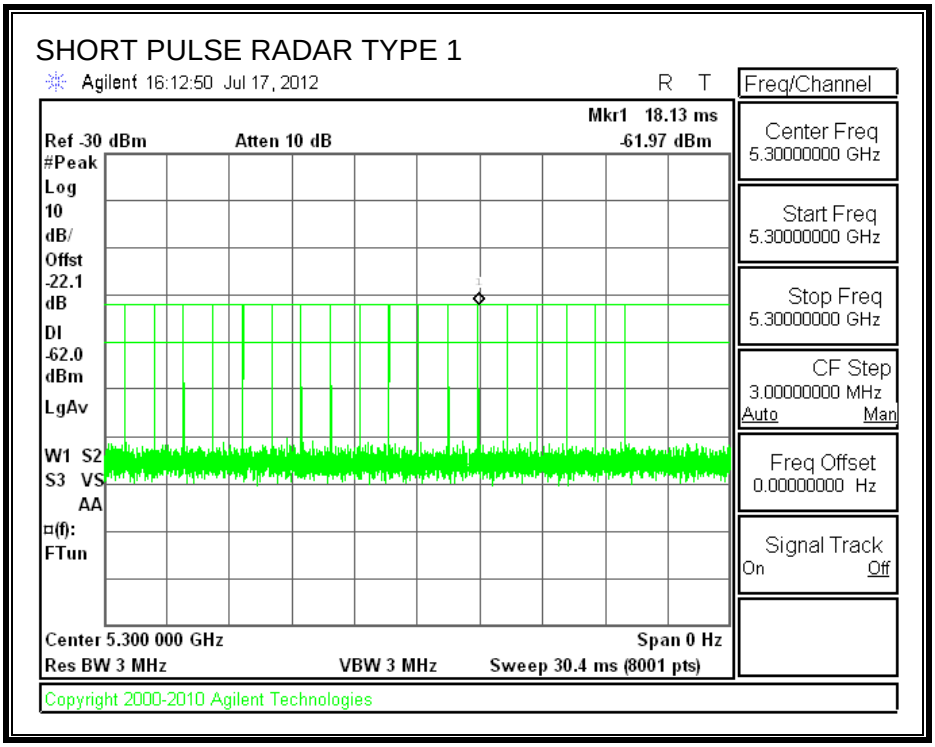
All Channel Shutdown, Detection Bandwidth and In-Service Monitoring tests were performed on the Working Radio at a channel center frequency of 5300 MHz, with a fully operational link established between the Working Radio and the Slave Devices.

7.2. TEST CHANNEL

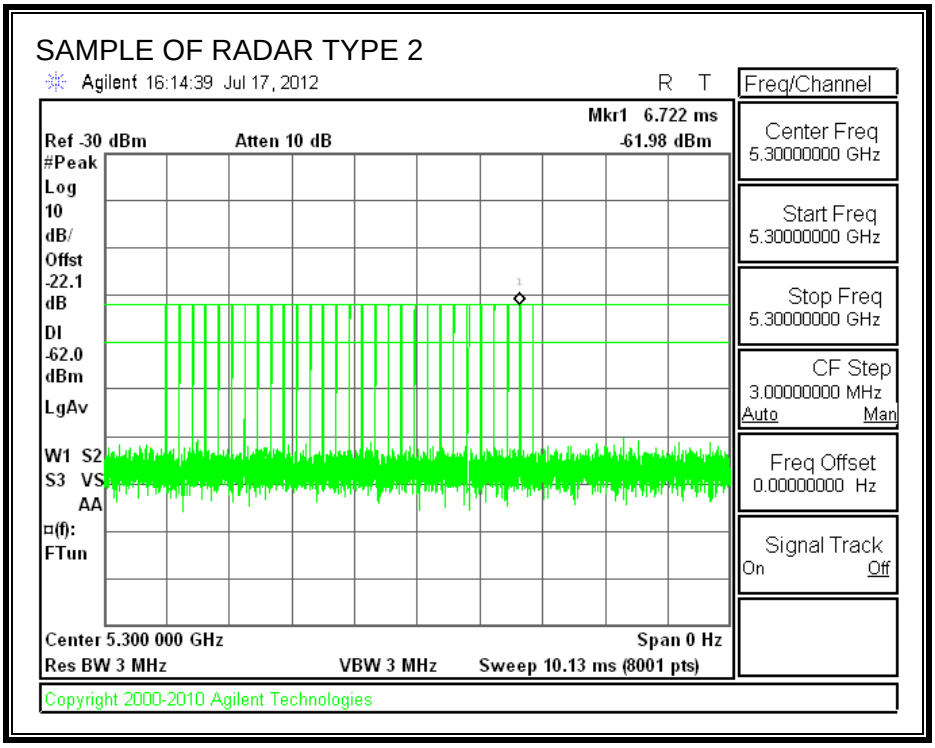
All tests were performed at a channel center frequency of 5300 MHz.

7.3. RADAR WAVEFORMS

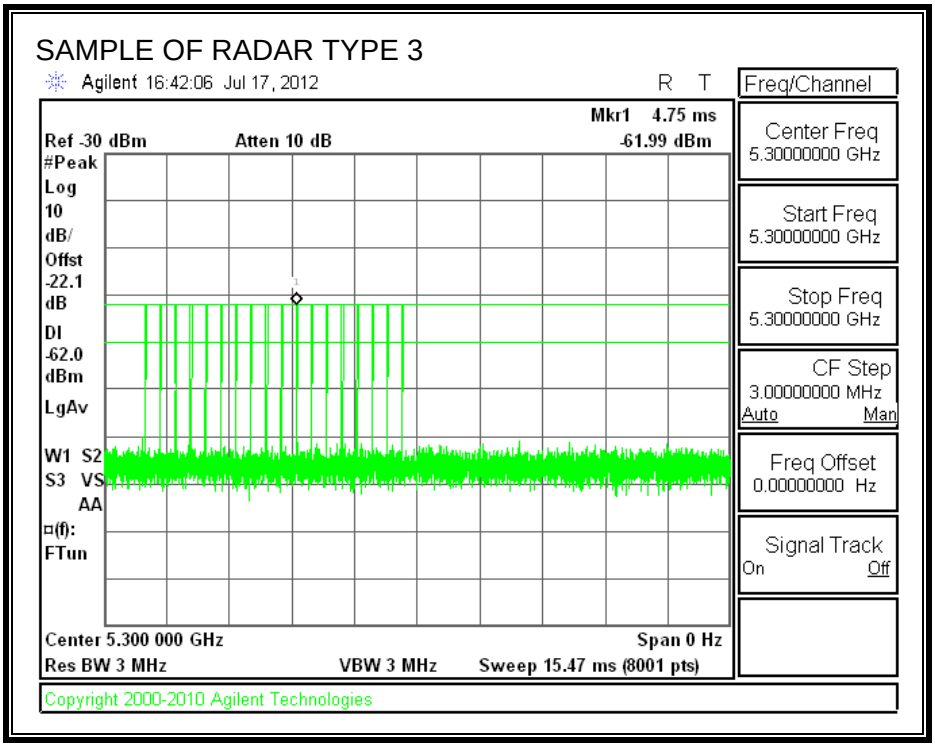
RADAR WAVEFORMS



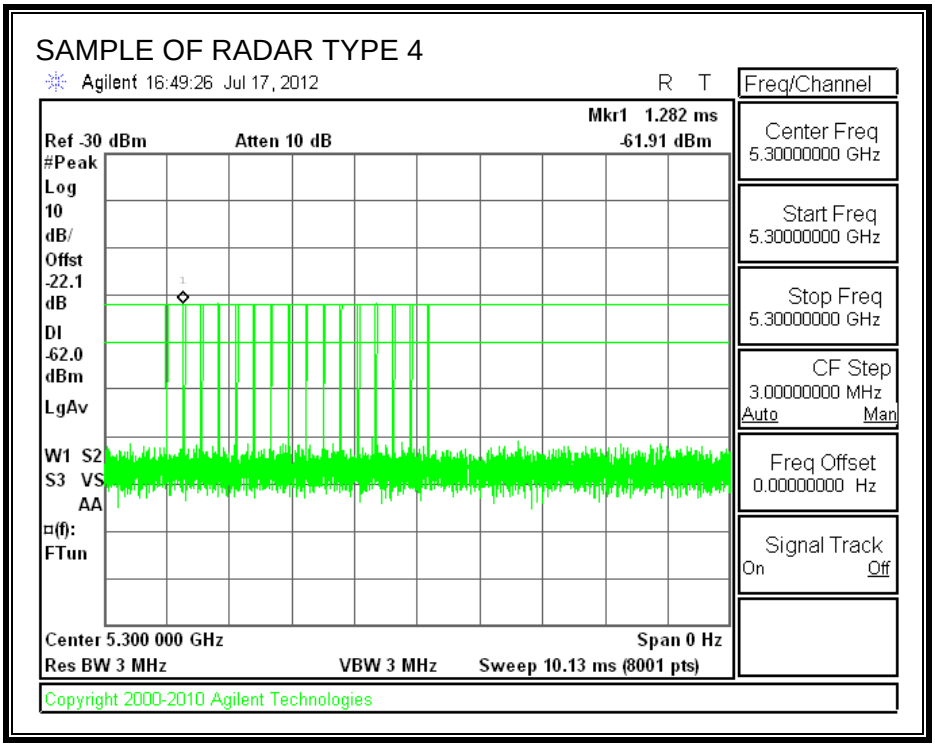
SAMPLE OF RADAR TYPE 2

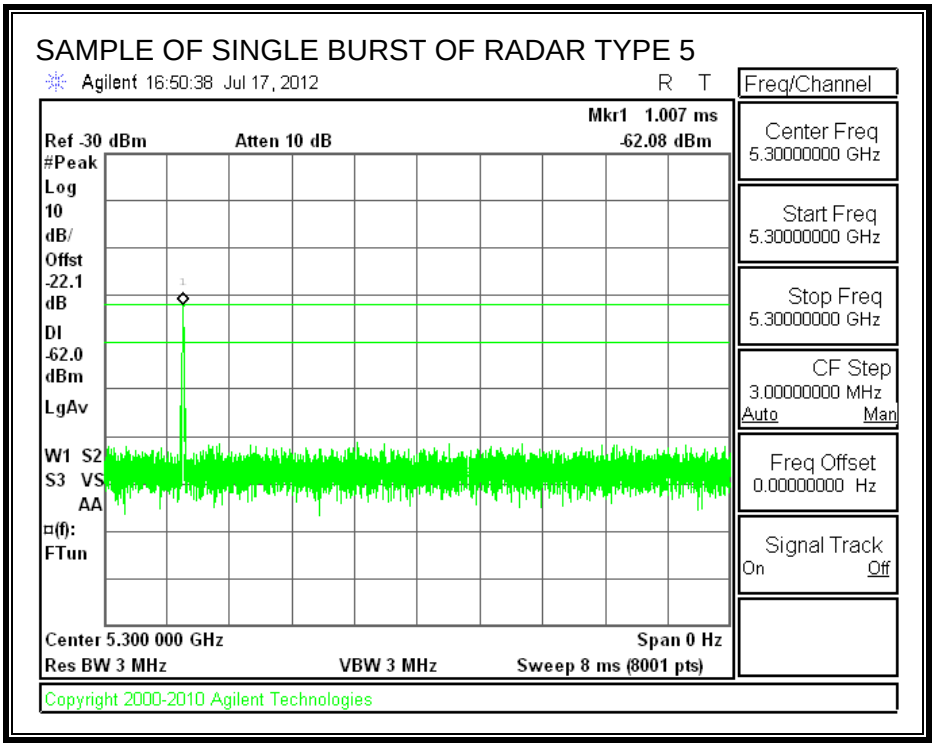


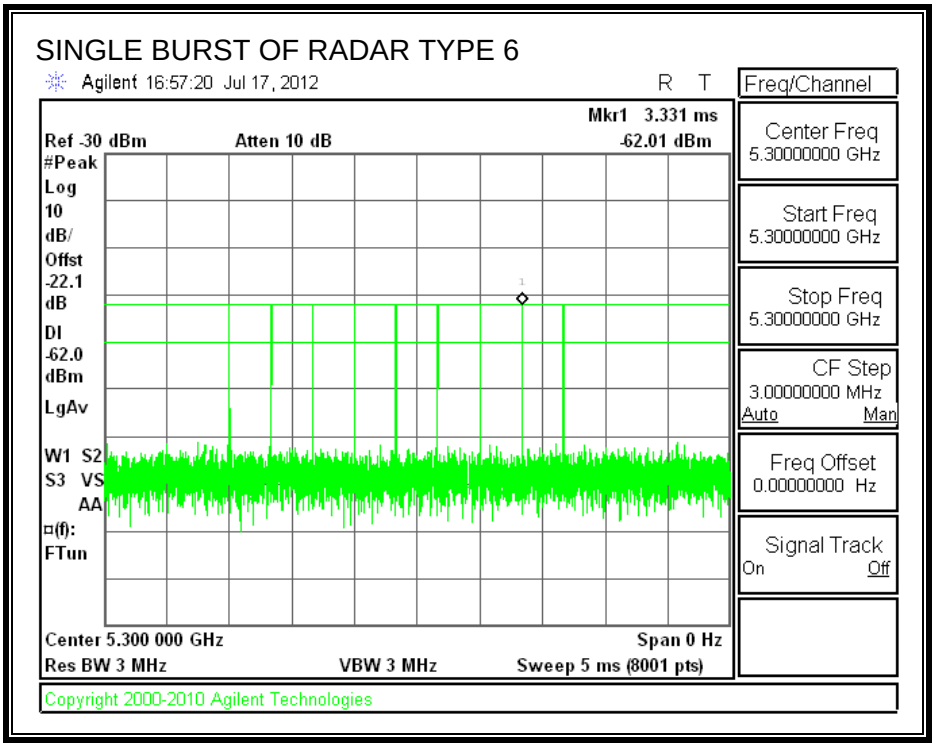
SAMPLE OF RADAR TYPE 3



SAMPLE OF RADAR TYPE 4

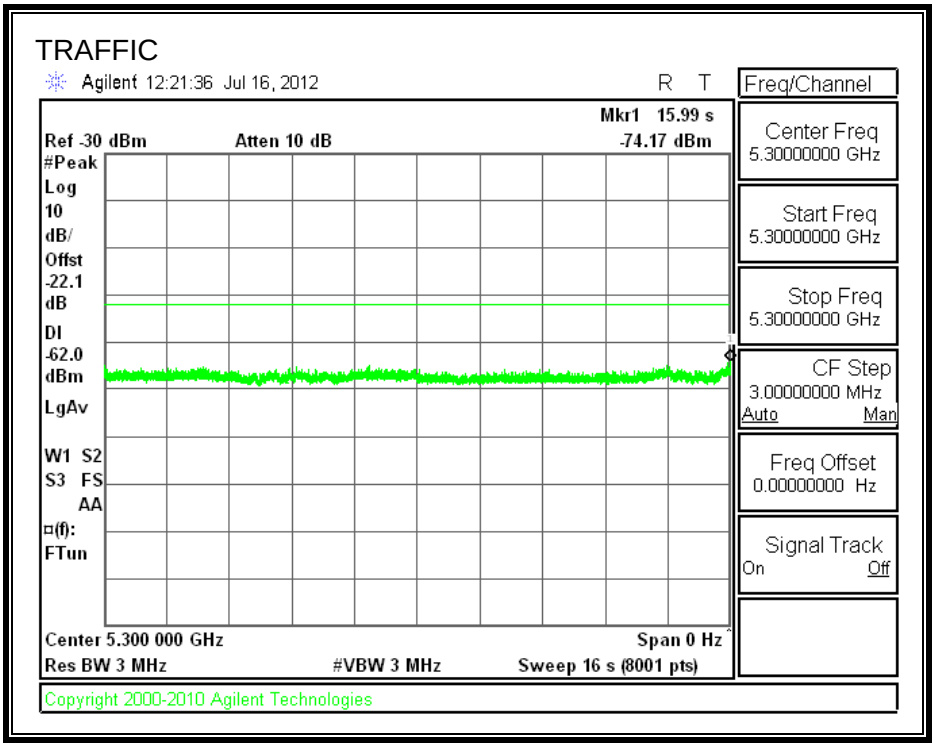






7.4. WORKING RADIO TEST RESULTS AT 48 kHz AUDIO RATE

7.4.1. TRAFFIC



7.4.2. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

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

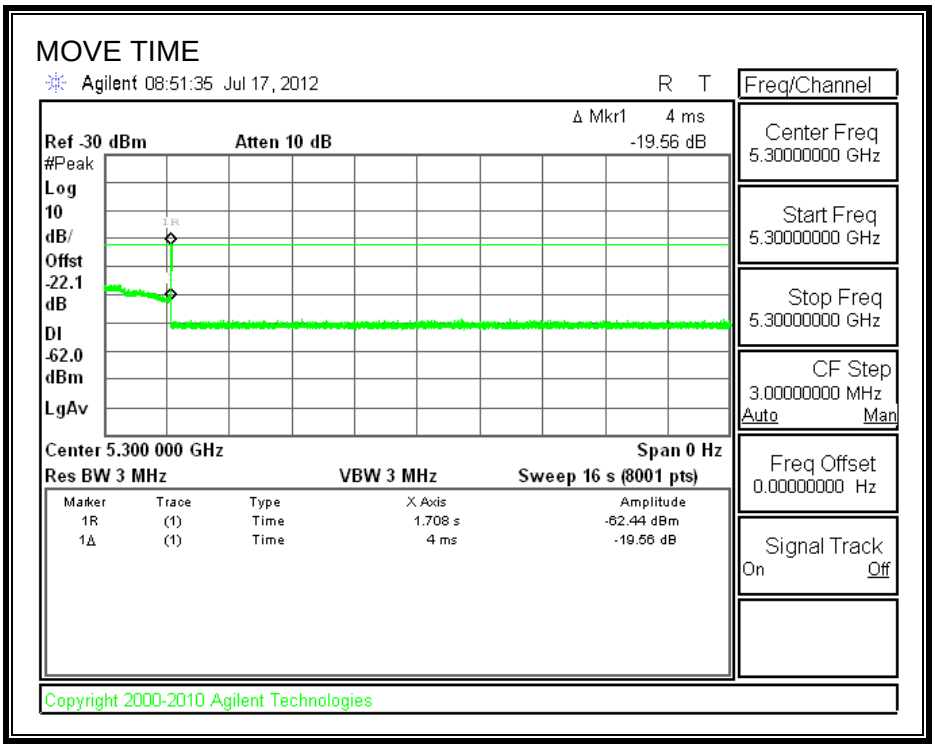
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

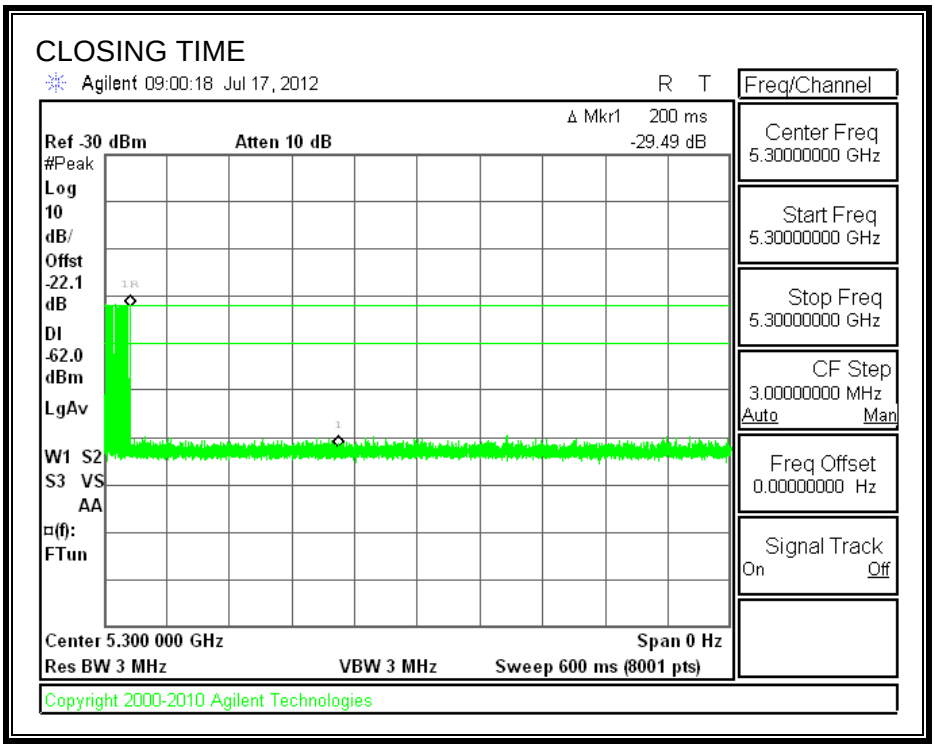
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.004	10

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

MOVE TIME

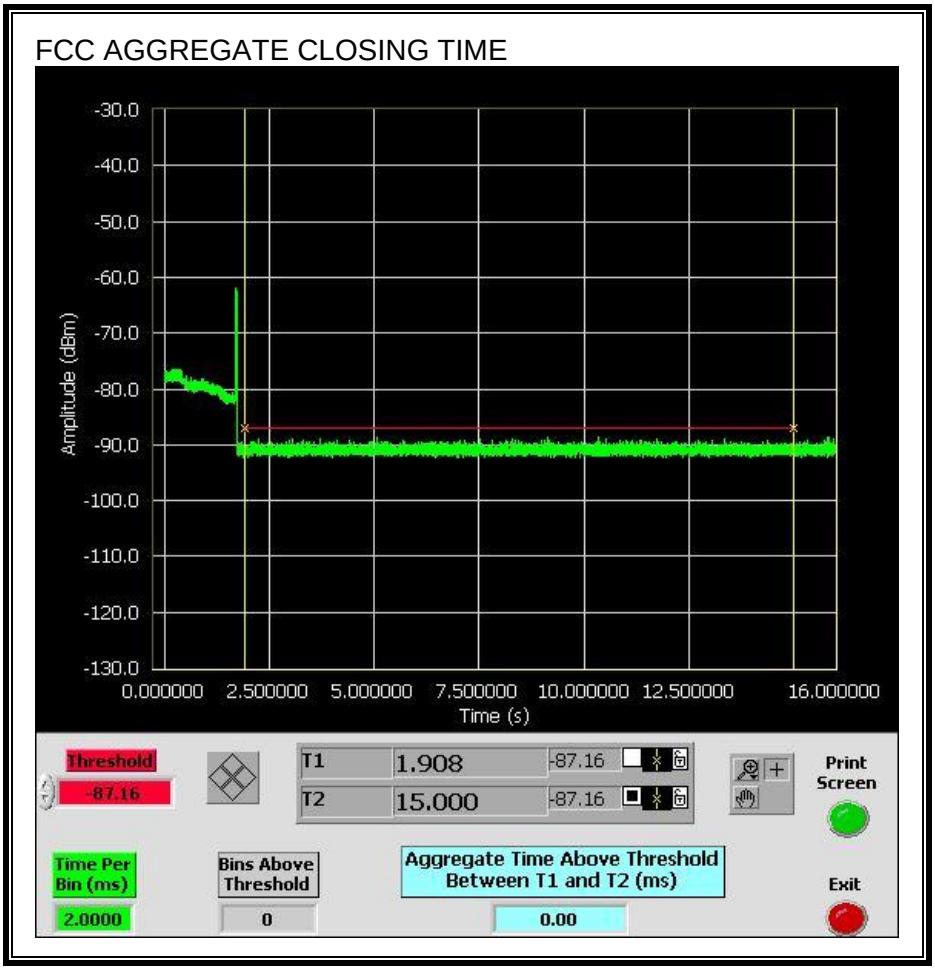


CHANNEL CLOSING TIME

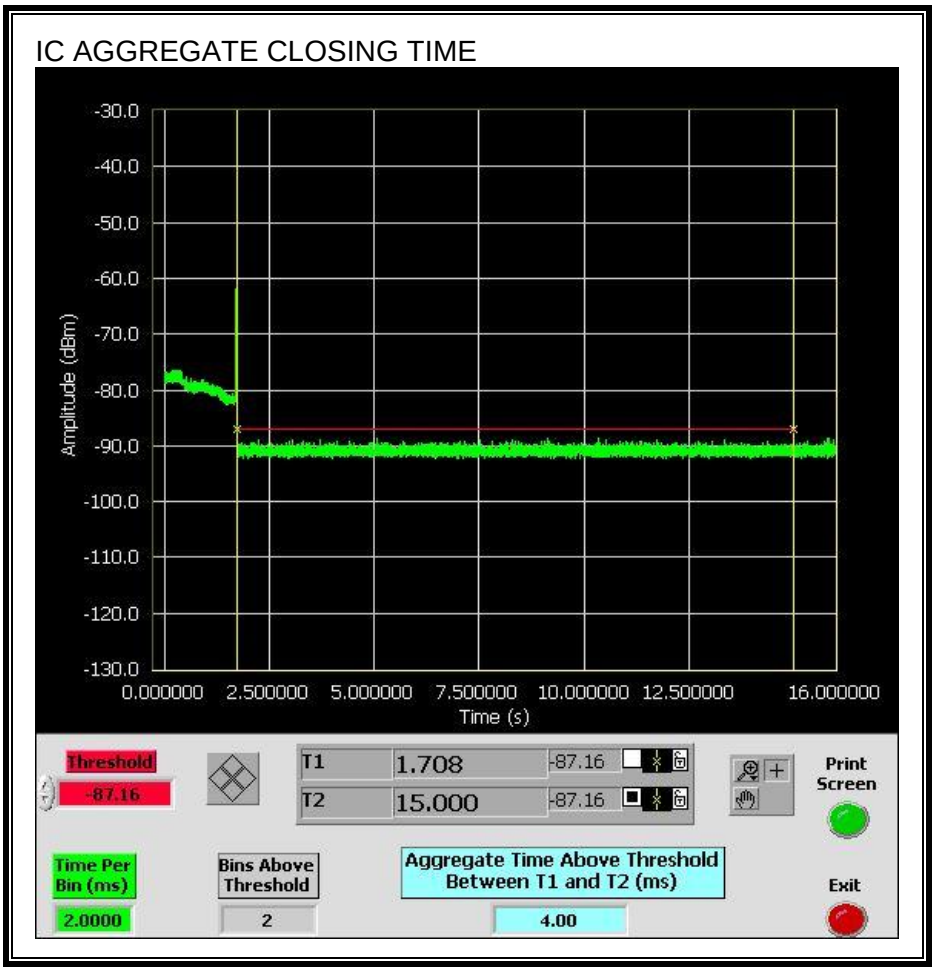


AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the FCC aggregate monitoring period.

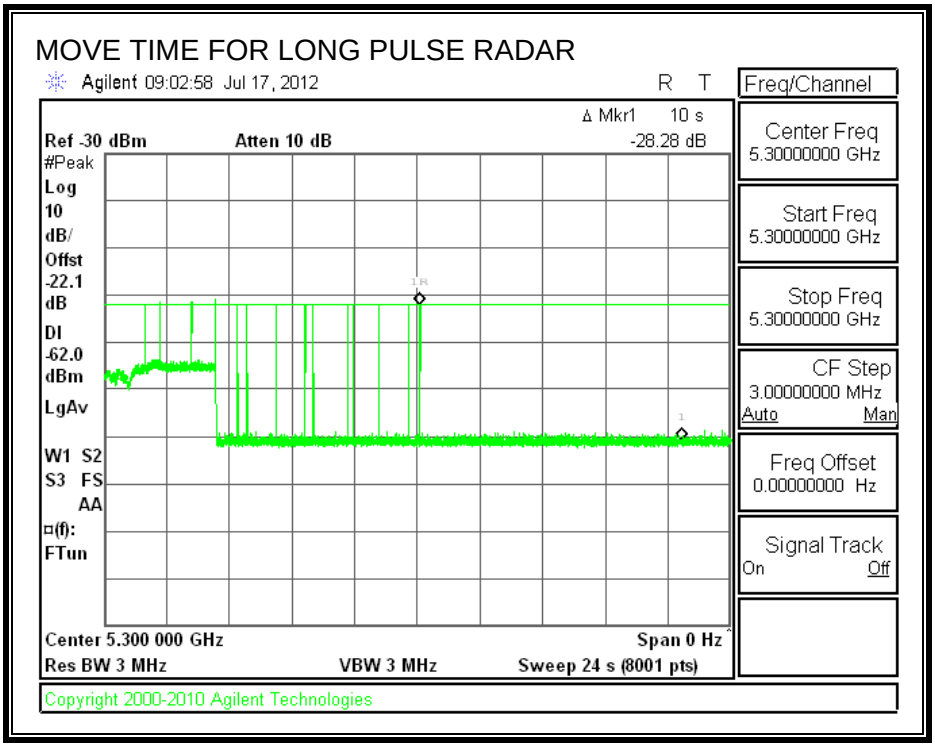


Only intermittent transmissions are observed during the IC aggregate monitoring period.



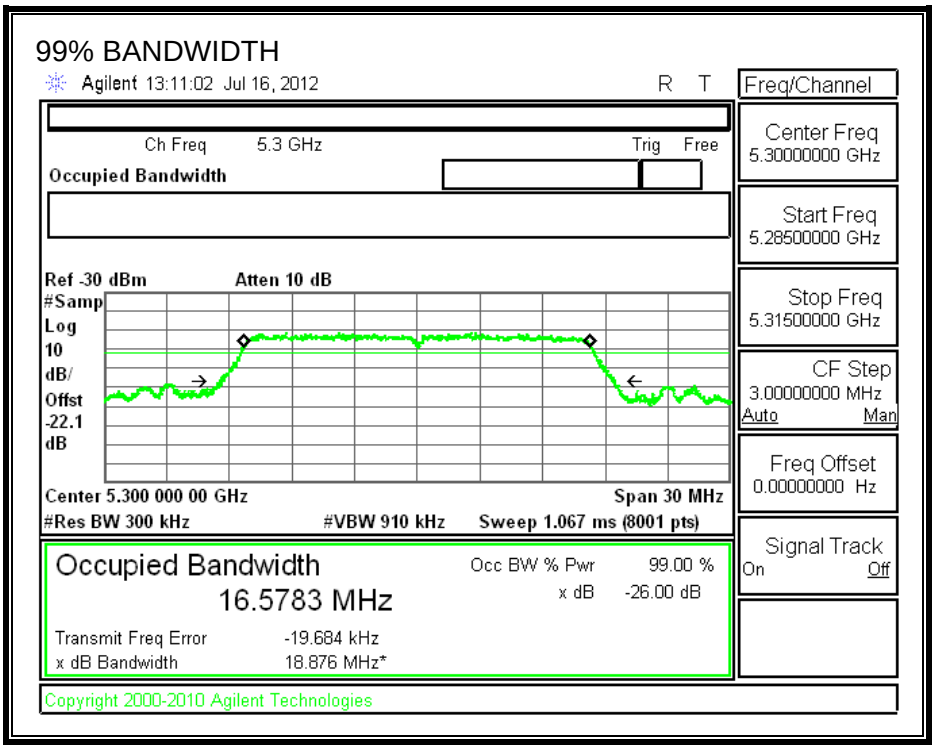
LONG PULSE CHANNEL MOVE TIME

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



7.4.4. 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 (%)
5292	5308	16	16.578	96.5	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
5292	10	10	100	FL
5293	10	10	100	
5294	10	10	100	
5295	10	10	100	
5296	10	10	100	
5297	10	10	100	
5298	10	10	100	
5299	10	10	100	
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	FH

7.4.5. 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	83.33	60	Pass
FCC Short Pulse Type 3	30	96.67	60	Pass
FCC Short Pulse Type 4	30	93.33	60	Pass
Aggregate		93.33	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	34	97.06	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	212.00	29	No
2002	4.8	220.00	29	Yes
2003	1.2	177.00	26	Yes
2004	1.6	216.00	24	Yes
2005	4.3	167.00	27	Yes
2006	2.7	194.00	28	Yes
2007	3.3	190.00	28	Yes
2008	4.7	172.00	29	No
2009	3.9	190.00	25	Yes
2010	4.2	167.00	24	Yes
2011	3.5	153.00	28	Yes
2012	3.1	165.00	24	Yes
2013	2.1	155.00	24	Yes
2014	2.2	152.00	29	No
2015	3.3	166.00	24	Yes
2016	3.3	181.00	29	Yes
2017	4.4	192.00	28	Yes
2018	3.1	168.00	24	Yes
2019	3.4	191.00	27	Yes
2020	4.1	181.00	29	No
2021	1.5	186.00	25	Yes
2022	2.3	162.00	24	Yes
2023	2.3	207.00	25	Yes
2024	2.9	170.00	25	Yes
2025	3	157.00	29	Yes
2026	3.2	206.00	28	Yes
2027	4.8	192.00	23	Yes
2028	4.5	164.00	28	Yes
2029	2.4	210.00	24	Yes
2030	4.1	154.00	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	7.4	375.00	18	Yes
3002	5.9	286.00	16	Yes
3003	5.4	424.00	18	Yes
3004	5.9	395.00	17	Yes
3005	8	279.00	17	Yes
3006	6.4	328.00	16	Yes
3007	9.3	371.00	16	Yes
3008	9.5	359.00	17	Yes
3009	5.3	261.00	16	Yes
3010	6.1	454.00	16	Yes
3011	6.3	316.00	18	Yes
3012	8.1	415.00	17	Yes
3013	7.6	272.00	17	Yes
3014	7.8	453.00	16	Yes
3015	9.6	427.00	18	Yes
3016	6.4	342.00	17	Yes
3017	8.4	471.00	16	Yes
3018	6.8	395.00	16	Yes
3019	9.3	260.00	16	Yes
3020	8.5	456.00	16	Yes
3021	5.7	271.00	18	Yes
3022	8.9	465.00	16	Yes
3023	5.7	321.00	16	Yes
3024	8.9	285.00	18	Yes
3025	8.2	496.00	17	No
3026	8.6	391.00	16	Yes
3027	8.3	475.00	16	Yes
3028	5.9	266.00	17	Yes
3029	5.3	395	18	Yes
3030	7	409	17	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	10.7	283.00	16	Yes
4002	17.2	496.00	12	No
4003	10.9	472.00	12	Yes
4004	16.7	391.00	12	Yes
4005	14.9	354.00	16	Yes
4006	11.9	444.00	14	Yes
4007	19.5	387.00	15	Yes
4008	17	486.00	13	Yes
4009	19.5	460.00	14	Yes
4010	10.9	377.00	14	Yes
4011	10.2	403.00	16	Yes
4012	13.5	316.00	12	Yes
4013	14	493.00	13	Yes
4014	17.4	329.00	13	Yes
4015	18.4	472.00	16	Yes
4016	12.9	381.00	15	Yes
4017	18.6	498.00	16	Yes
4018	19.3	454.00	16	Yes
4019	15.6	285.00	14	Yes
4020	14	492.00	15	No
4021	13.9	384.00	14	Yes
4022	12.5	409.00	14	Yes
4023	10.4	483.00	15	Yes
4024	18.1	456.00	13	Yes
4025	10	253.00	12	Yes
4026	16.5	394.00	15	Yes
4027	14.4	291.00	15	Yes
4028	16.5	481.00	13	Yes
4029	15	347.00	13	Yes
4030	10.7	307.00	13	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

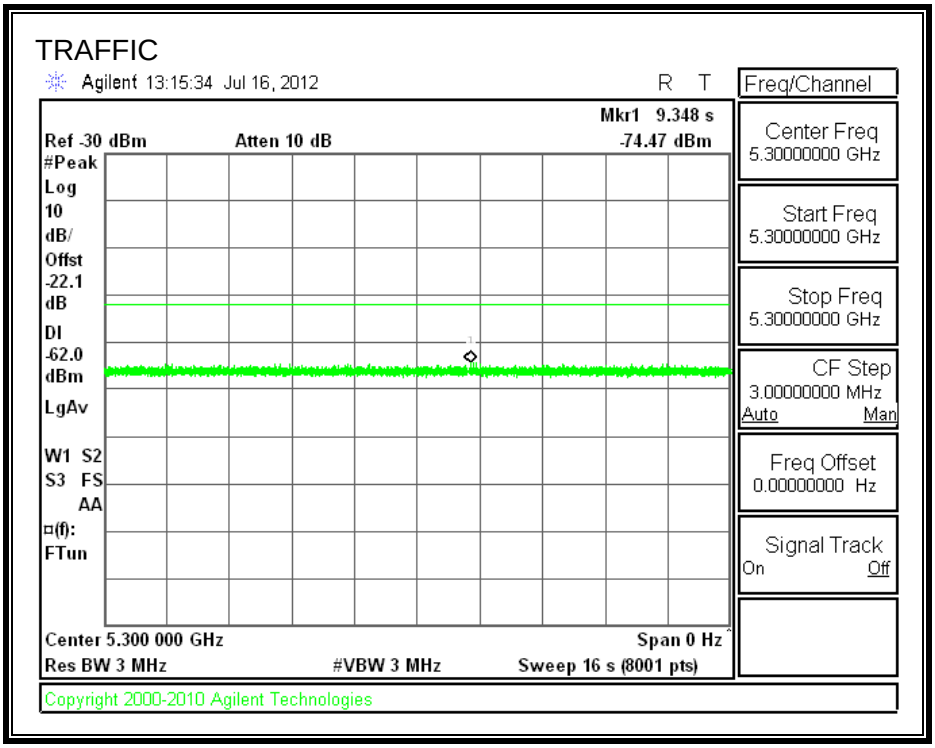
Note: The Type 5 randomized parameters are shown in a separate document.

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	188	5292	4	Yes
2	663	5293	2	Yes
3	1138	5294	6	Yes
4	1613	5295	4	Yes
5	2088	5296	5	Yes
6	2563	5297	5	Yes
7	3038	5298	3	Yes
8	3513	5299	4	Yes
9	3988	5300	5	Yes
10	4463	5301	4	Yes
11	4938	5302	3	Yes
12	5413	5303	1	No
13	5888	5304	5	Yes
14	6363	5305	3	Yes
15	6838	5306	2	Yes
16	7313	5307	5	Yes
17	7788	5308	4	Yes
18	8263	5292	6	Yes
19	8738	5293	3	Yes
20	9213	5294	5	Yes
21	9688	5295	1	Yes
22	10163	5296	2	Yes
23	10638	5297	5	Yes
24	11113	5298	2	Yes
25	11588	5299	4	Yes
26	12063	5300	3	Yes
27	12538	5301	5	Yes
28	13013	5302	4	Yes
29	13488	5303	2	Yes
30	13963	5304	5	Yes
31	14438	5305	6	Yes
32	14913	5306	6	Yes
33	15388	5307	4	Yes
34	15863	5308	3	Yes

7.5. WORKING RADIO RESULTS AT 96 kHz AUDIO RATE

7.5.1. TRAFFIC



7.5.2. OVERLAPPING CHANNEL TESTS

RESULTS

These tests are not applicable.

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

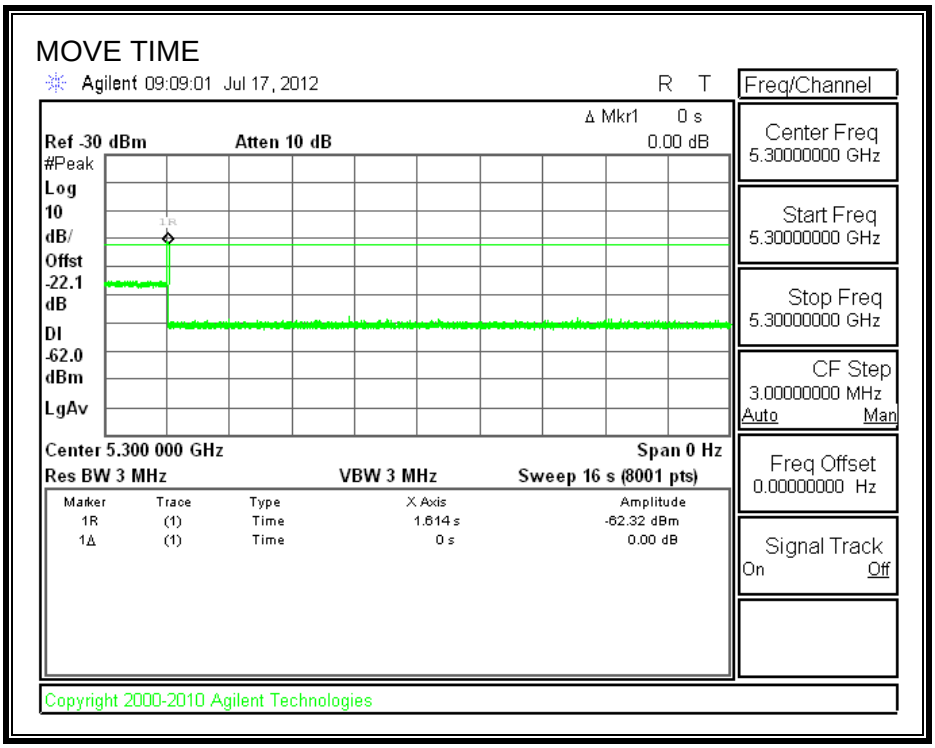
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

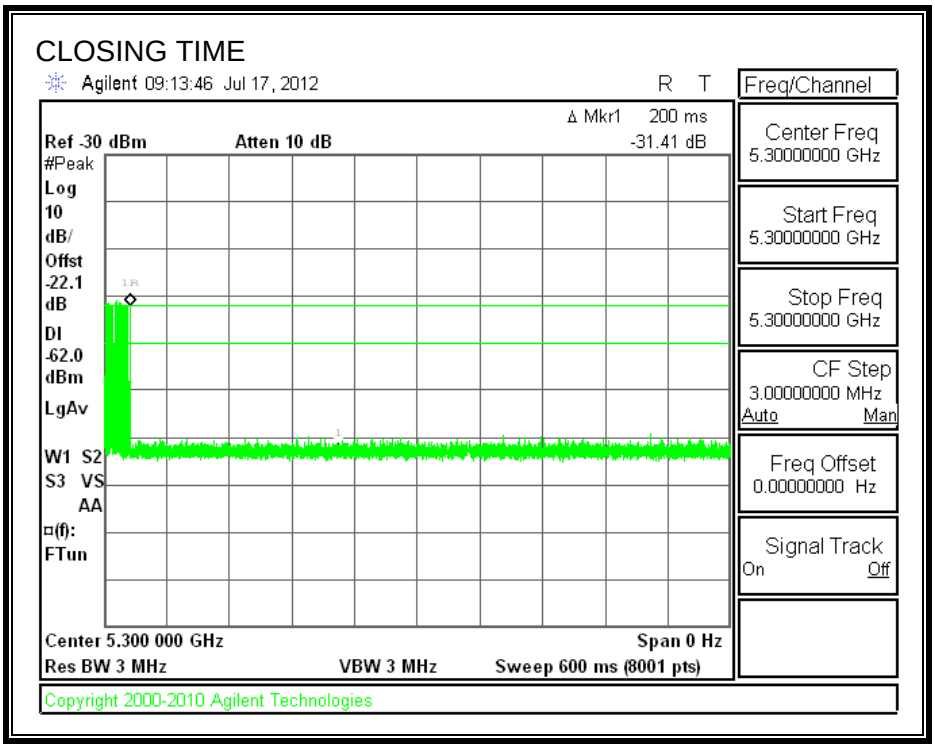
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.000	10

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

MOVE TIME

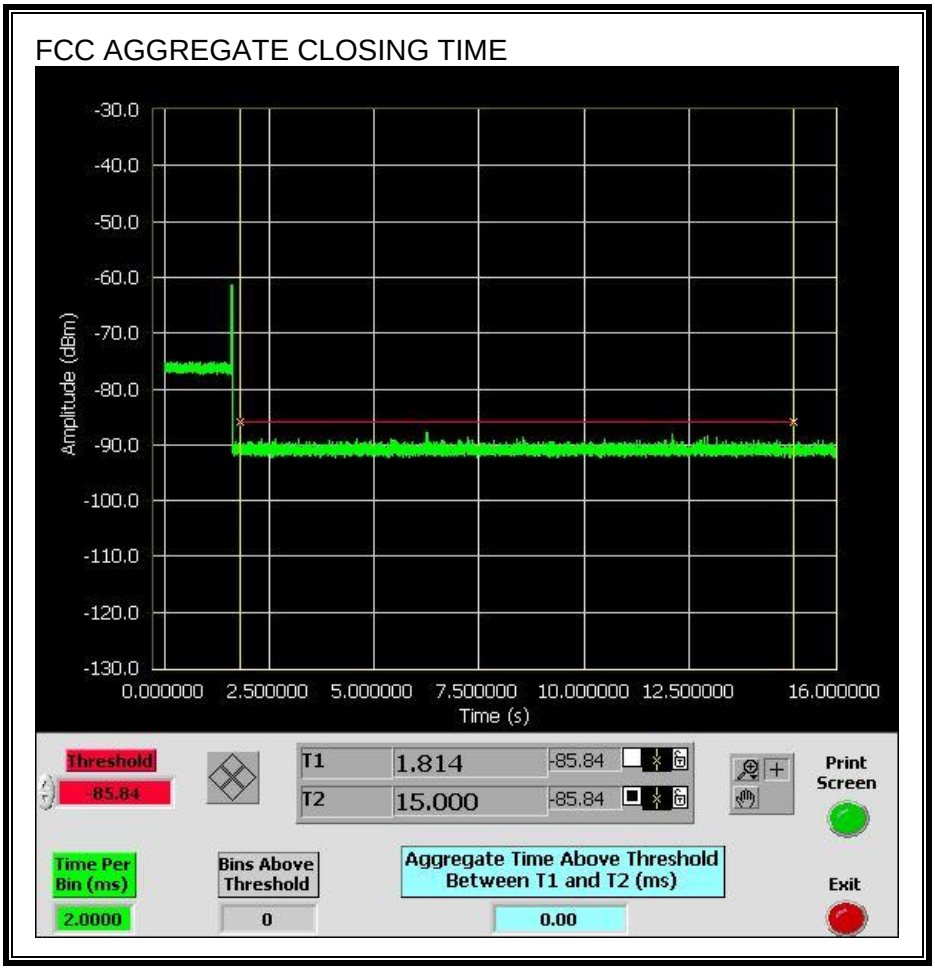


CHANNEL CLOSING TIME

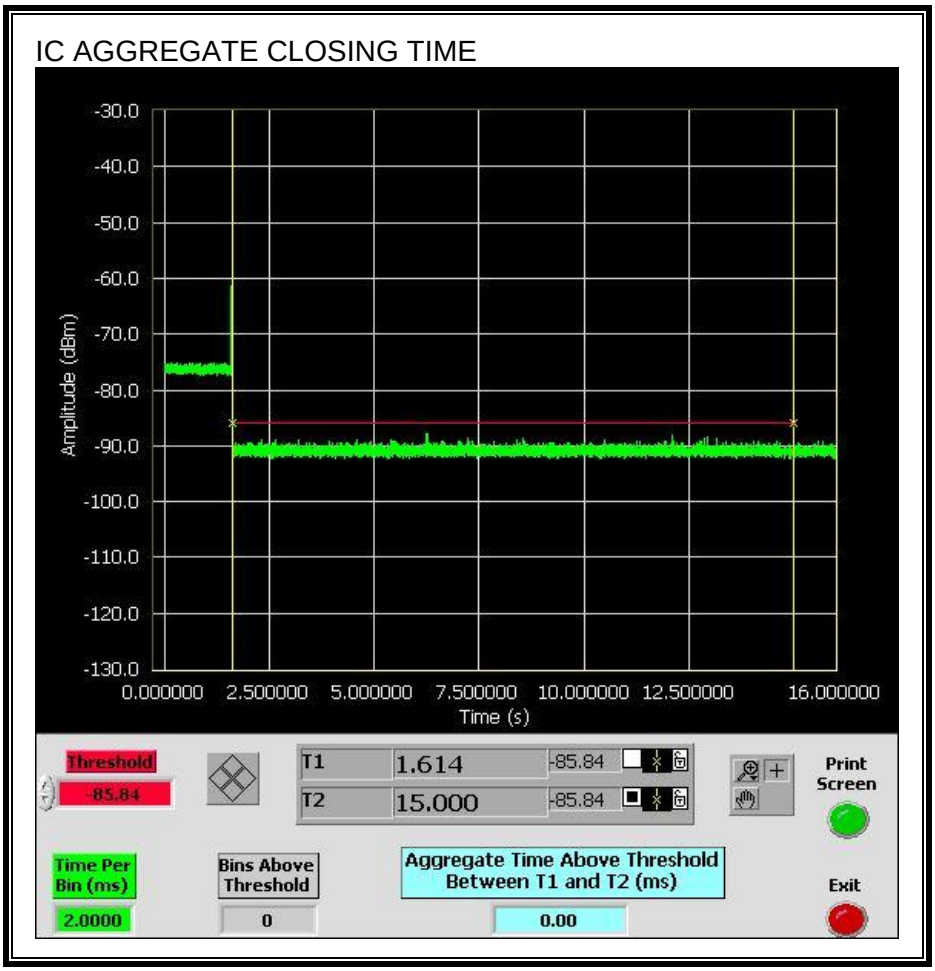


AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the FCC aggregate monitoring period.

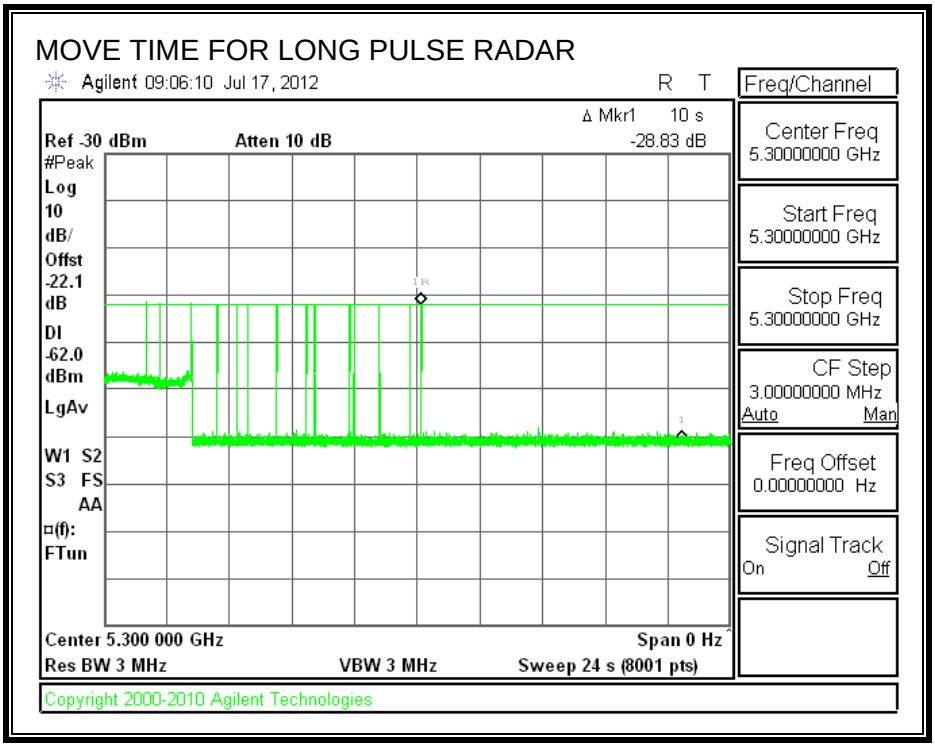


No transmissions are observed during the IC aggregate monitoring period.



LONG PULSE CHANNEL MOVE TIME

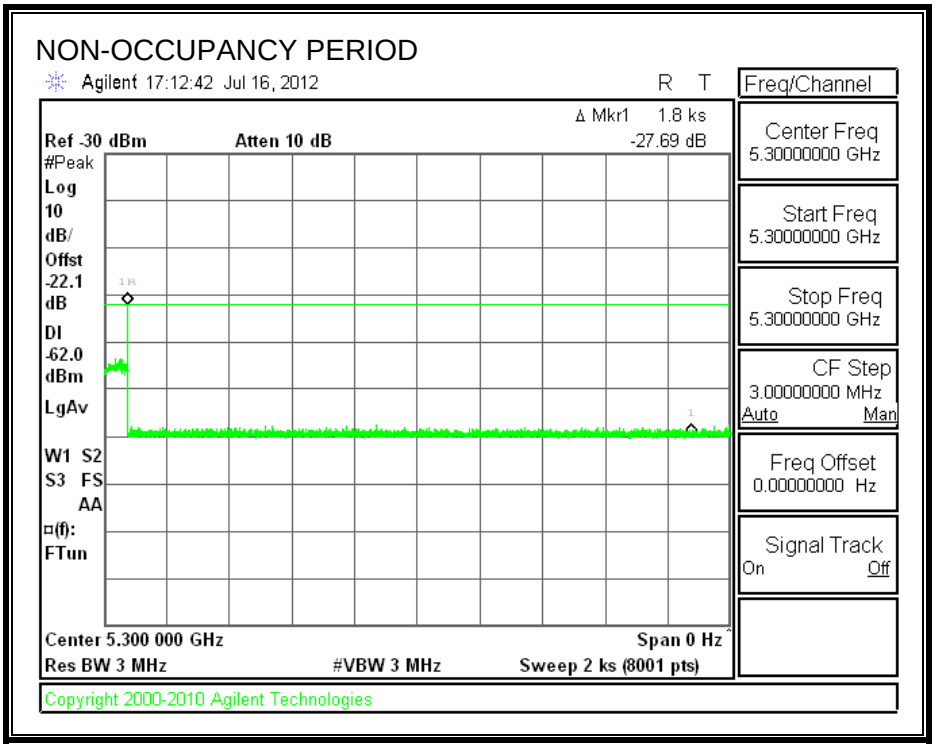
The traffic ceases prior to 10 seconds after the end of the radar waveform.



7.5.4. NON-OCCUPANCY PERIOD

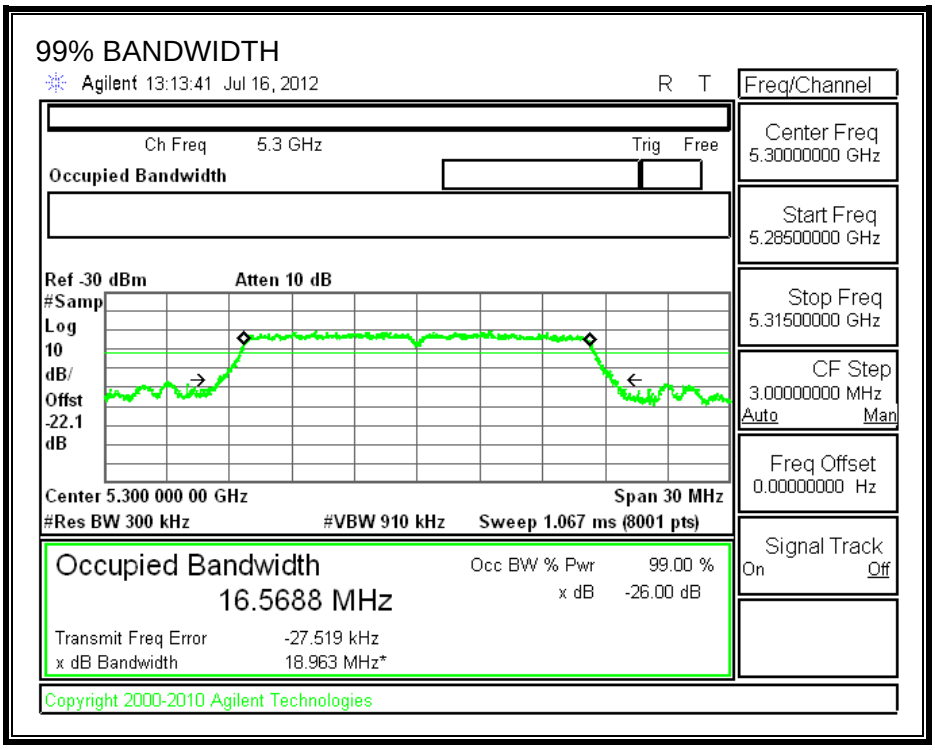
RESULTS

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



7.5.5. 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 (%)
5292	5308	16	16.569	96.6	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
5292	10	10	100	FL
5293	10	10	100	
5294	10	10	100	
5295	10	10	100	
5296	10	10	100	
5297	10	10	100	
5298	10	10	100	
5299	10	10	100	
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	FH

7.5.6. 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	96.67	60	Pass
FCC Short Pulse Type 3	30	96.67	60	Pass
FCC Short Pulse Type 4	30	86.67	60	Pass
Aggregate		95.00	80	Pass
FCC Long Pulse Type 5	30	100.00	80	Pass
FCC Hopping Type 6	34	94.12	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	212.00	29	Yes
2002	4.8	220.00	29	Yes
2003	1.2	177.00	26	Yes
2004	1.6	216.00	24	Yes
2005	4.3	167.00	27	Yes
2006	2.7	194.00	28	No
2007	3.3	190.00	28	Yes
2008	4.7	172.00	29	Yes
2009	3.9	190.00	25	Yes
2010	4.2	167.00	24	Yes
2011	3.5	153.00	28	Yes
2012	3.1	165.00	24	Yes
2013	2.1	155.00	24	Yes
2014	2.2	152.00	29	Yes
2015	3.3	166.00	24	Yes
2016	3.3	181.00	29	Yes
2017	4.4	192.00	28	Yes
2018	3.1	168.00	24	Yes
2019	3.4	191.00	27	Yes
2020	4.1	181.00	29	Yes
2021	1.5	186.00	25	Yes
2022	2.3	162.00	24	Yes
2023	2.3	207.00	25	Yes
2024	2.9	170.00	25	Yes
2025	3	157.00	29	Yes
2026	3.2	206.00	28	Yes
2027	4.8	192.00	23	Yes
2028	4.5	164.00	28	Yes
2029	2.4	210.00	24	Yes
2030	4.1	154.00	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	7.4	375.00	18	Yes
3002	5.9	286.00	16	Yes
3003	5.4	424.00	18	Yes
3004	5.9	395.00	17	No
3005	8	279.00	17	Yes
3006	6.4	328.00	16	Yes
3007	9.3	371.00	16	Yes
3008	9.5	359.00	17	Yes
3009	5.3	261.00	16	Yes
3010	6.1	454.00	16	Yes
3011	6.3	316.00	18	Yes
3012	8.1	415.00	17	Yes
3013	7.6	272.00	17	Yes
3014	7.8	453.00	16	Yes
3015	9.6	427.00	18	Yes
3016	6.4	342.00	17	Yes
3017	8.4	471.00	16	Yes
3018	6.8	395.00	16	Yes
3019	9.3	260.00	16	Yes
3020	8.5	456.00	16	Yes
3021	5.7	271.00	18	Yes
3022	8.9	465.00	16	Yes
3023	5.7	321.00	16	Yes
3024	8.9	285.00	18	Yes
3025	8.2	496.00	17	Yes
3026	8.6	391.00	16	Yes
3027	8.3	475.00	16	Yes
3028	5.9	266.00	17	Yes
3029	5.3	395	18	Yes
3030	7	409	17	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	10.7	283.00	16	Yes
4002	17.2	496.00	12	No
4003	10.9	472.00	12	Yes
4004	16.7	391.00	12	Yes
4005	14.9	354.00	16	Yes
4006	11.9	444.00	14	Yes
4007	19.5	387.00	15	Yes
4008	17	486.00	13	No
4009	19.5	460.00	14	Yes
4010	10.9	377.00	14	Yes
4011	10.2	403.00	16	Yes
4012	13.5	316.00	12	Yes
4013	14	493.00	13	No
4014	17.4	329.00	13	Yes
4015	18.4	472.00	16	Yes
4016	12.9	381.00	15	Yes
4017	18.6	498.00	16	Yes
4018	19.3	454.00	16	Yes
4019	15.6	285.00	14	Yes
4020	14	492.00	15	Yes
4021	13.9	384.00	14	Yes
4022	12.5	409.00	14	Yes
4023	10.4	483.00	15	Yes
4024	18.1	456.00	13	Yes
4025	10	253.00	12	Yes
4026	16.5	394.00	15	Yes
4027	14.4	291.00	15	Yes
4028	16.5	481.00	13	No
4029	15	347.00	13	Yes
4030	10.7	307.00	13	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	156	5292	4	Yes
2	631	5293	2	Yes
3	1106	5294	5	Yes
4	1581	5295	6	Yes
5	2056	5296	1	Yes
6	2531	5297	6	Yes
7	3006	5298	4	Yes
8	3481	5299	3	Yes
9	3956	5300	3	Yes
10	4431	5301	3	Yes
11	4906	5302	4	Yes
12	5381	5303	2	Yes
13	5856	5304	3	Yes
14	6331	5305	2	Yes
15	6806	5306	2	Yes
16	7281	5307	4	Yes
17	7756	5308	1	Yes
18	8231	5292	5	Yes
19	8706	5293	4	Yes
20	9181	5294	3	Yes
21	9656	5295	2	Yes
22	10131	5296	1	Yes
23	10606	5297	5	Yes
24	11081	5298	8	Yes
25	11556	5299	1	No
26	12031	5300	5	No
27	12506	5301	3	Yes
28	12981	5302	4	Yes
29	13456	5303	6	Yes
30	13931	5304	8	Yes
31	14406	5305	7	Yes
32	14881	5306	5	Yes
33	15356	5307	7	Yes
34	15831	5308	6	Yes

7.6. MASTER SYSTEM TEST RESULTS

7.6.1. NON-OCCUPANCY PERIOD

A network is established on an initial channel and the Monitor Radio starts a CAC on the test channel. A radar burst is triggered on the initial channel prior to the end of the CAC on the test channel. These actions start the internal NOP counter for the initial channel and force the Working Radio to move the network to a non-DFS channel.

A radar burst is then triggered on the test channel, also prior to the end of the CAC on the test channel.

The above sequence of actions prevents the Working Radio from moving the network to the test channel, starts the internal NOP counter for the test channel, and the Monitor Radio starts a CAC on an alternate channel.

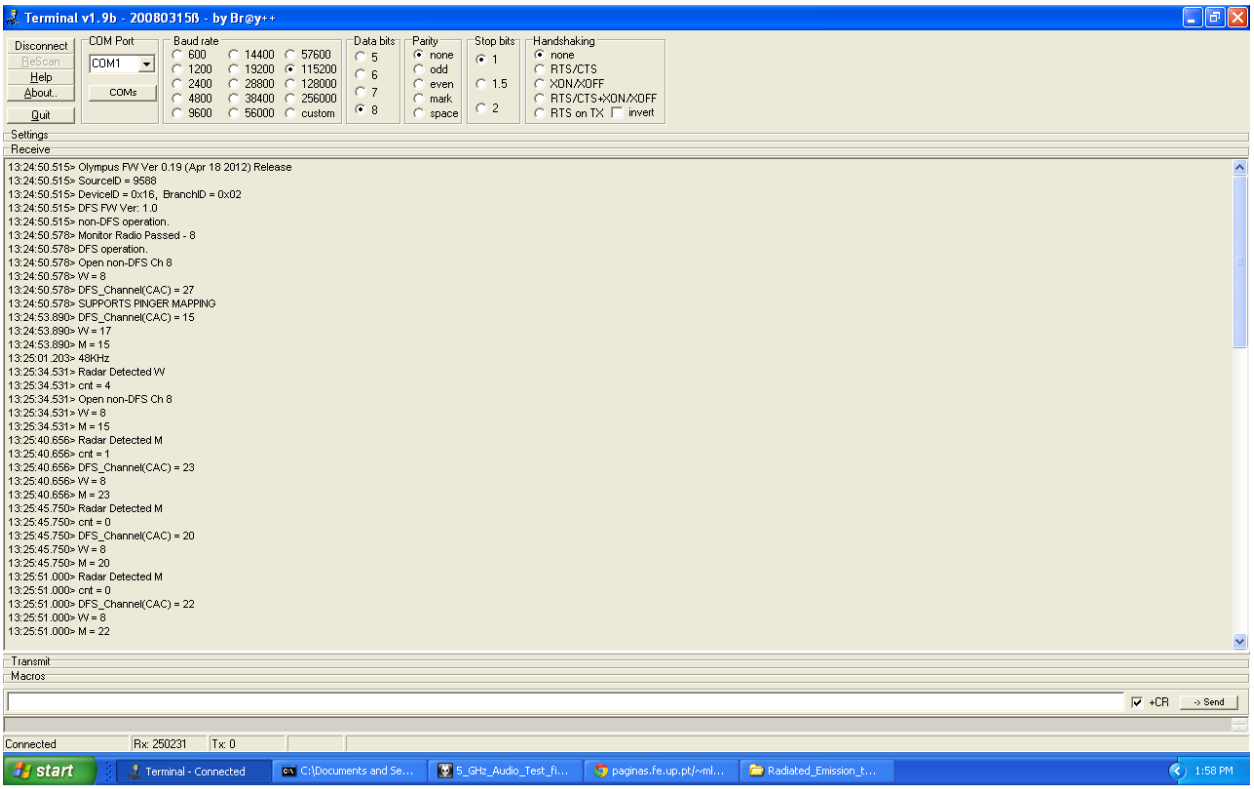
For each new alternate channel selected by the Monitor Radio, a radar burst is triggered prior to the end of the CAC on that channel. This process is repeated until a radar burst has been triggered on all DFS channels.

When all DFS channels have been blocked, NOP counters for each DFS channel are stored internally. These counters decrement. When a counter reaches zero for a particular channel, a CAC is started on that channel if appropriate for normal system operation. Given the above sequence of actions, the first NOP counter to reach zero will be the one for the initial channel.

When the NOP counter for the initial channel reaches zero the Monitor Radio will start a CAC on the initial channel. Upon completion of this CAC, the Working Radio will move the network to the initial channel.

The second NOP counter to reach zero will be the one for the alternate channel. Given the initial sequence of actions to force the Working Radio to a non-DFS channel, this counter will reach zero during the CAC of the initial channel. Therefore, upon completion of the CAC on the initial channel, the Monitor Radio will start a CAC on the test channel.

EUT TEST MODE LOG FILE (FIRST SCREEN)

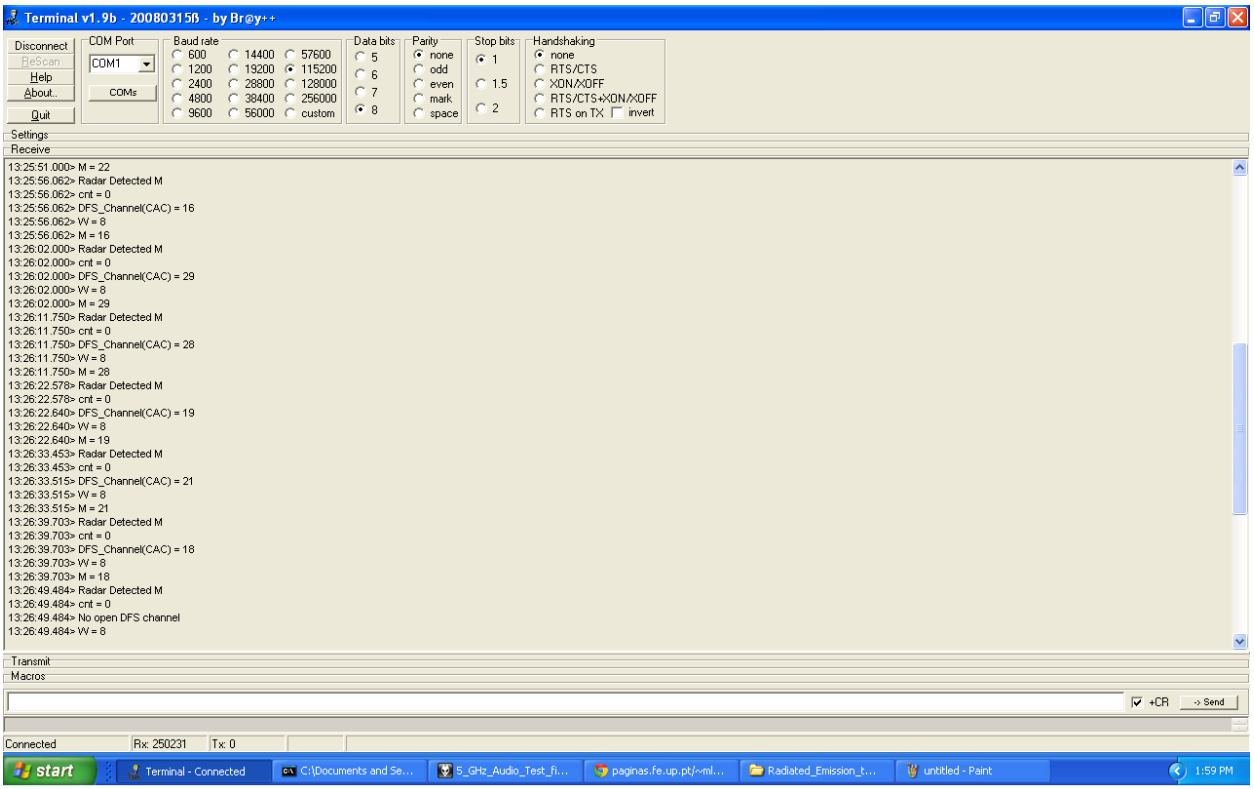


At time stamp 13:24:53.890 a network was established on initial channel Ch 17 (5300 MHz) after the conclusion of the CAC. A radar burst was triggered on 5300 MHz, prior to the end of the CAC on test channel Ch 15 (5260 MHz), forcing the network to a non-DFS frequency.

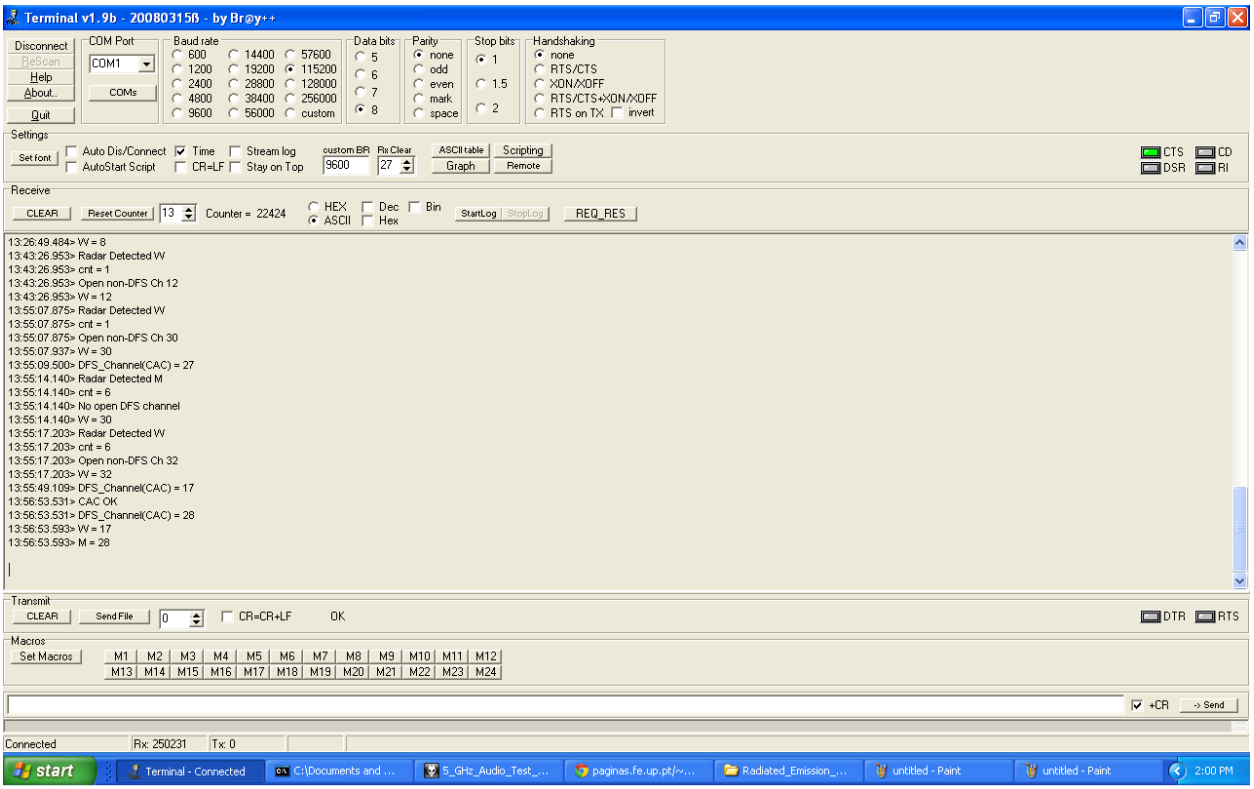
The time stamp at 13:25:34.531 shows the detection of radar on Ch 17 (5300 MHz) and the beginning of the Non-Occupancy period for 5300 MHz.

A radar burst was then triggered during the CAC period for each of the remaining channels in the DFS bands, to block all DFS channels.

EUT TEST MODE LOG FILE (SECOND SCREEN)



EUT TEST MODE LOG FILE (THIRD SCREEN)



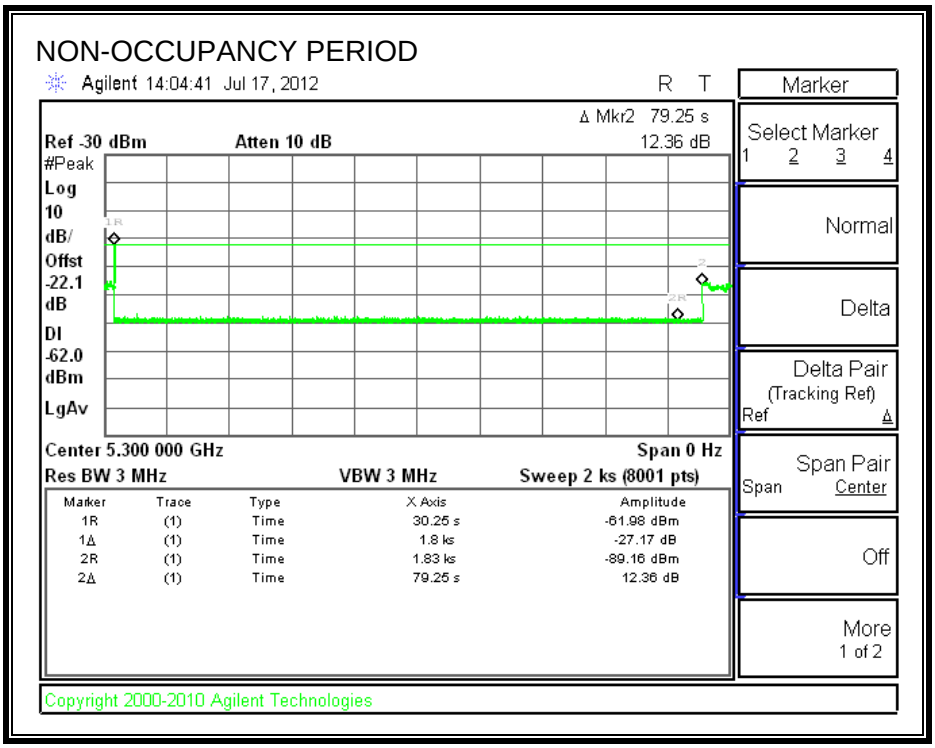
The time stamps at 13:55:14.140 shows that all DFS channels are blocked.

The time stamp at 13:55:49.109 shows the end of the non-occupancy period for the initial channel and the beginning of the subsequent CAC on the initial channel Ch 17 (5300 MHz).

The time stamp at 13:56:53.531 shows the end of the CAC for the initial channel.

RF PLOT OF INITIAL CHANNEL NON-OCCUPANCY

No EUT transmissions were observed on the initial channel during the non-occupancy period plus subsequent CAC time. Upon finding the initial channel clear of radar during the subsequent CAC the network was re-established on the initial channel after a total of 1909.50 seconds.



7.6.2. 60-SECOND IN-SERVICE MONITORING FUNCTION TEST PROCEDURE

This test is performed in accordance with KDB 437887.

The spectrum analyzer is tuned to 5260 MHz and the log file from the EUT records the events.

A fully operational Working Radio network is established on 5300 MHz and the Monitor Radio is performing continuous monitoring on 5260 MHz.

A radar burst is triggered on 5300 MHz and the Working Radio network is expected to move to 5260 MHz. In response to this the Monitor Radio is expected to start a CAC on a new channel.

Prior to the end of the CAC on the new channel a radar burst is triggered on 5260 MHz. In response to this the Working Radio network is expected to move to a non-DFS channel.

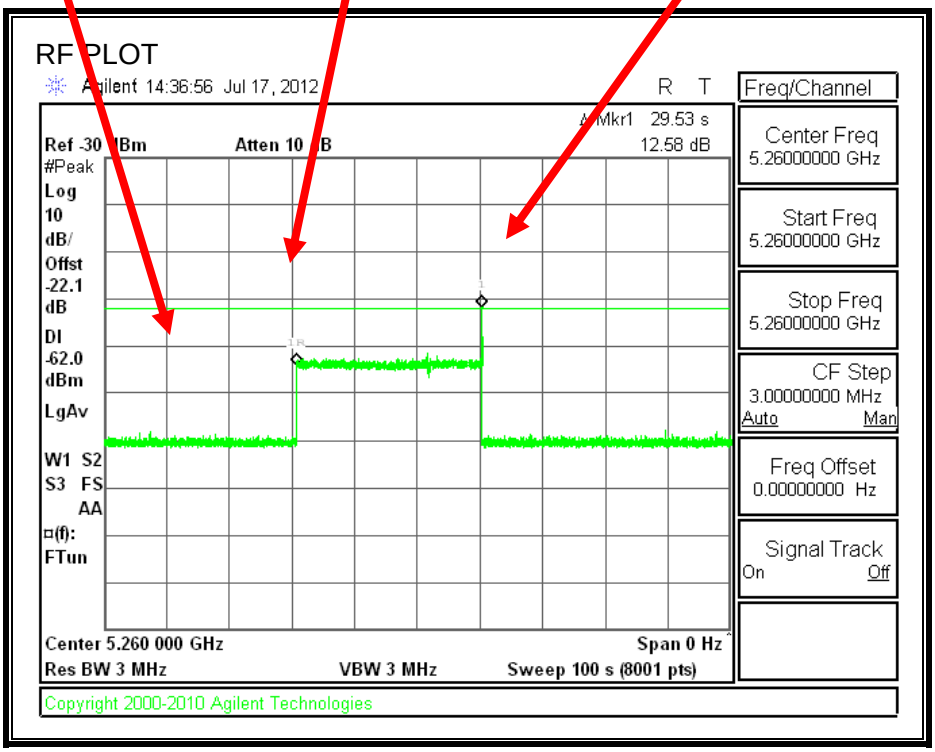
7.6.3. 60-SECOND IN-SERVICE MONITORING FUNCTION TEST RESULTS

RF PLOT

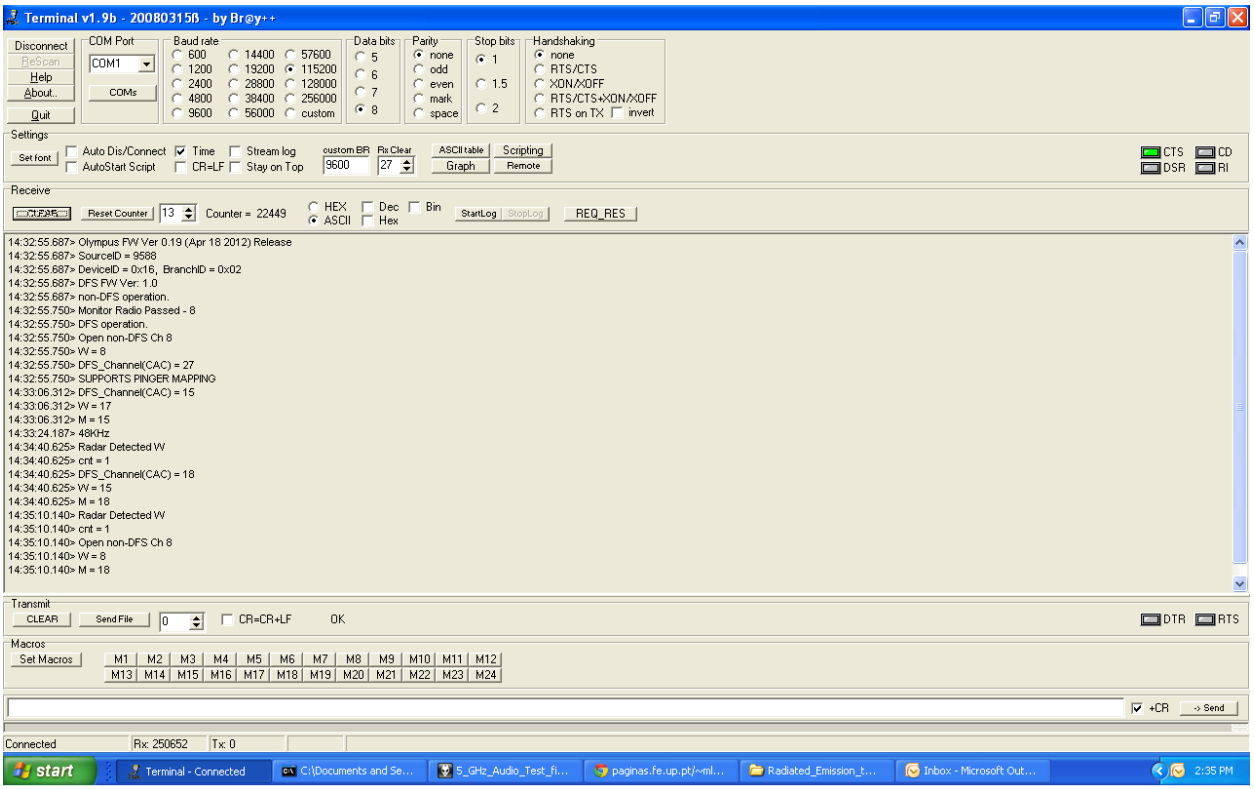
Traffic @ 5300 MHz

Radar @ 5300 MHz
End of Traffic @ 5300 MHz
Begin Traffic @ 5260 MHz

Radar @ 5260 MHz
End of Traffic @ 5260 MHz
Traffic is Initiated @ 5180 MHz



LOG FILE

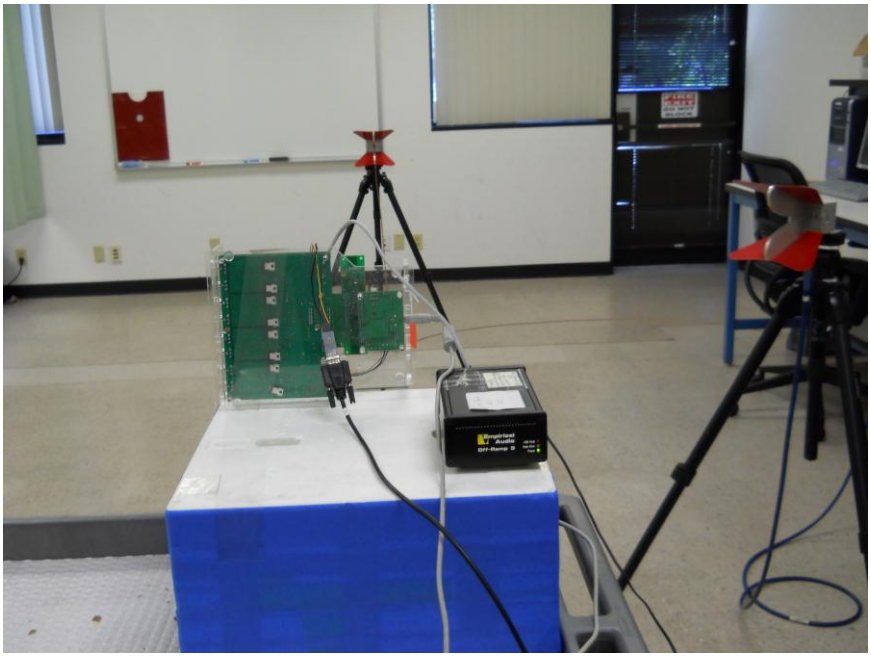


8. SETUP PHOTOS

DYNAMIC FREQUENCY SELECTION MEASUREMENT SETUP

DFS FRONT PHOTO

DFS BACK PHOTO



END OF REPORT