



**DFS PORTION OF
FCC CFR47 PART 15 SUBPART E
INDUSTRY CANADA RSS-210 ISSUE 7
CLASS II PERMISSIVE CHANGE TEST REPORT
FOR**

802.11 A/B/G MODULE

MODEL NUMBER: AR5BXB6-M

FCC ID: PPD-AR5BXB6-M

REPORT NUMBER: 07U11524-1A

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Prepared for

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NVLAP LAB CODE 200065-0

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ATHEROS COMMUNICATIONS, INC.
5480 GREAT AMERICA PARKWAY
SANTA CLARA, CA 95054, U.S.A.

EUT DESCRIPTION: 802.11 A/B/G MODULE

MODEL: AR5BXB6-M

SERIAL NUMBER: R7400011

DATE TESTED: DECEMBER 13, 2007

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	No Non-Compliance Noted
RSS-210 Issue 7 Annex 9 and RSS-GEN Issue 2	No Non-Compliance Noted

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC MO&O 06-96, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

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

5. DYNAMIC FREQUENCY SELECTION

5.1. OVERVIEW

5.1.1. LIMITS

INDUSTRY CANADA

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

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

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

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

FCC

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

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

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

Table 2: Applicability of DFS requirements during normal operation

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

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

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

Table 4: DFS Response requirement values

Parameter	Value
<i>Non-occupancy period</i>	30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds
<i>Channel Closing Transmission Time</i>	200 milliseconds + approx. 60 milliseconds over remaining 10 second period
The instant that the <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> begins is as follows: For the Short pulse radar Test Signals this instant is the end of the <i>Burst</i>. 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

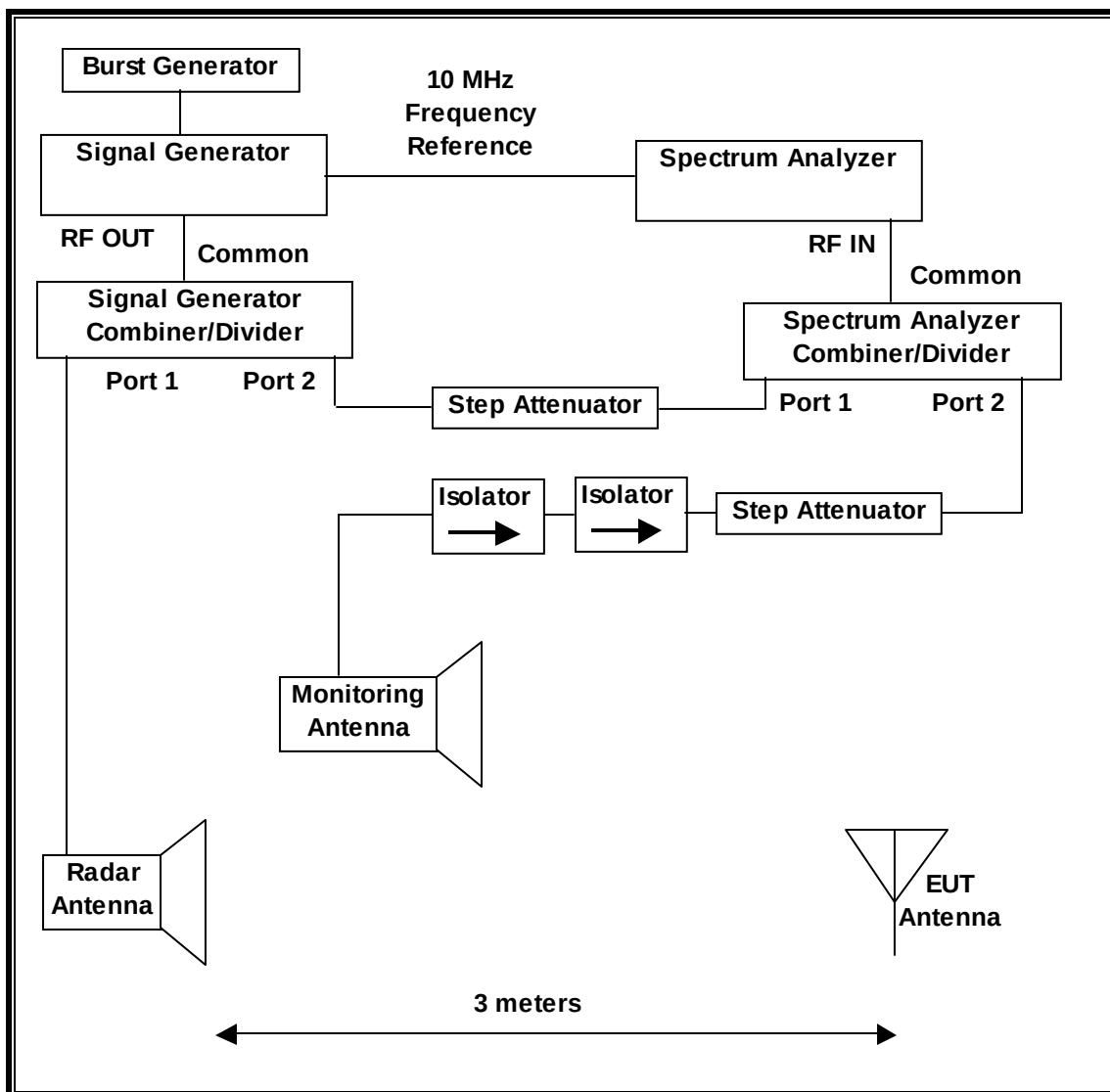
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

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

CONDUCTED 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 Frequency 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 set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. 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.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), additional combiner/dividers are inserted between the Master Combiner/Divider and the pad connected to the Master Device (and/or between the Slave Combiner/Divider and the pad connected to the Slave Device). Additional pads are utilized such that there is one pad at each RF port on each EUT.

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. Measure the amplitude and calculate the difference from -64 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference.

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.

Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

Establish a link between the Master and Slave, adjusting the distance between the units as needed to provide a suitable received level at the Master and Slave devices. Stream the video test file to generate WLAN traffic. Confirm that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold. For Master Device testing confirm that the displayed traffic does not include Slave Device traffic. For Slave Device testing confirm that the displayed traffic does not include Master Device traffic.

If a different setting of the Step Attenuators are required to meet the above conditions, perform a new System Calibration for the new Step Attenuator settings.

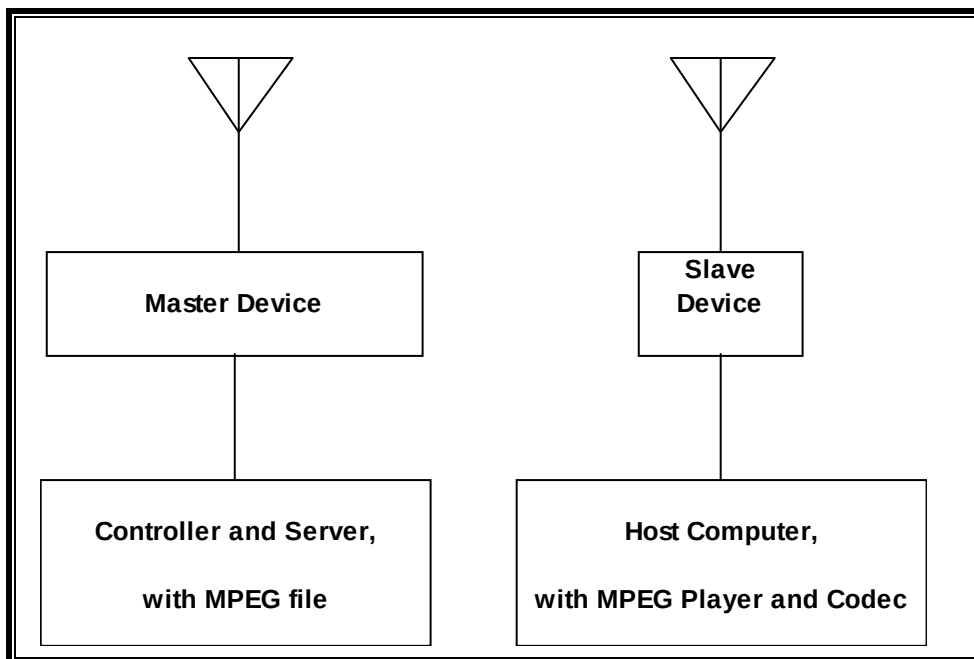
TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	MY43360112	3/3/2009
Signal Generator, 10 MHz ~ 20 GHz	Agilent / HP	83732B	US34490599	7/5/2008
Function/Arbitrary Waveform Generator	Agilent / HP	33220A	MY44026694	5/2/2008

5.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Access Point	Cisco Systems	AIR-AP1242AG-A-K9	FTX1042B5E0	LDK102056
AC Adapter	Delta Electronics	ADP-18PB	PZT0628359656	DoC
Laptop	Compaq	PP2160	CNU327025L	DoC
AC Adapter	Compaq	PA-1900-05H	3300371601	DoC

5.1.4. DESCRIPTION OF EUT

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

The EUT is a Slave Device without Radar Detection capabilities.

WLAN traffic is generated by streaming the video file TestFile.mp2 "6 ½ Magic Hours" from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

The EUT utilizes the 802.11a architecture. One nominal channel bandwidth, 20 MHz, is implemented.

OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS

The Master Device is a Cisco Access Point, FCC ID: LDK102056. The DFS software installed in the Master Device is revision 6.00.1. The minimum antenna gain for the Master Device is 3.5 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm.

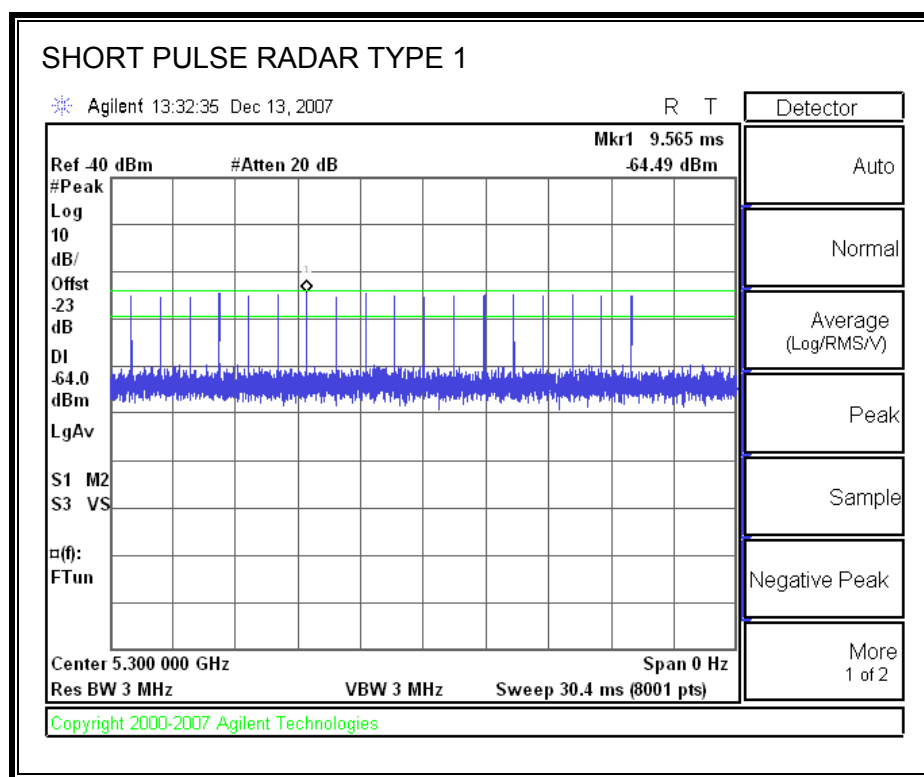
5.2. RESULTS

5.2.1. TEST CHANNEL

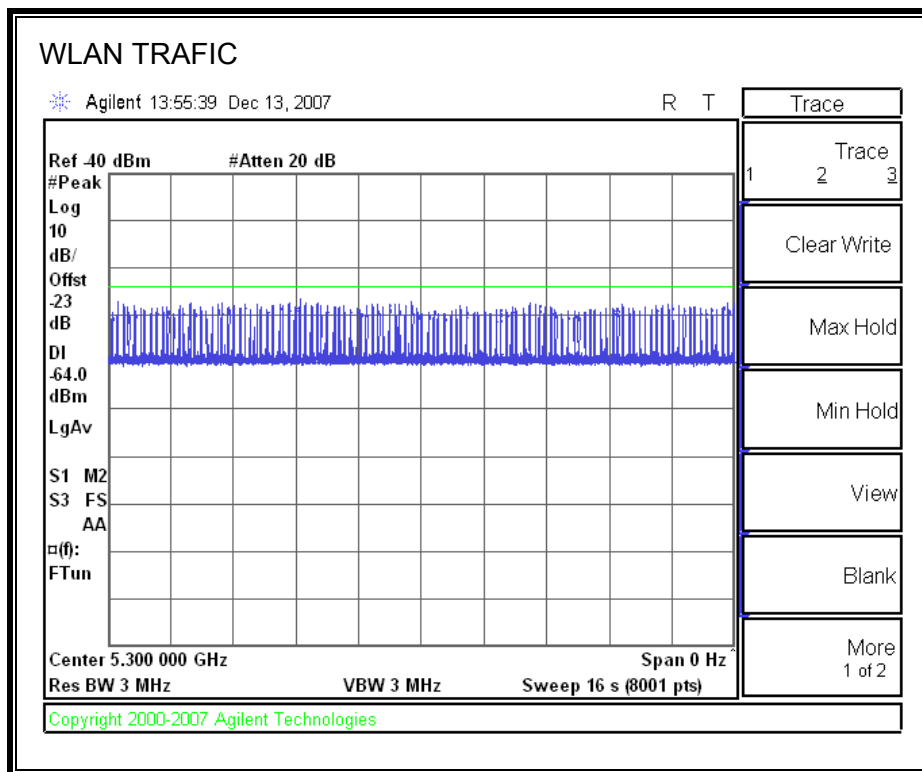
All tests were performed at a channel center frequency of 5300 MHz. Measurements were performed using conducted test methods.

5.2.2. PLOTS OF RADAR WAVEFORM AND WLAN TRAFFIC

PLOTS OF RADAR WAVEFORM



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

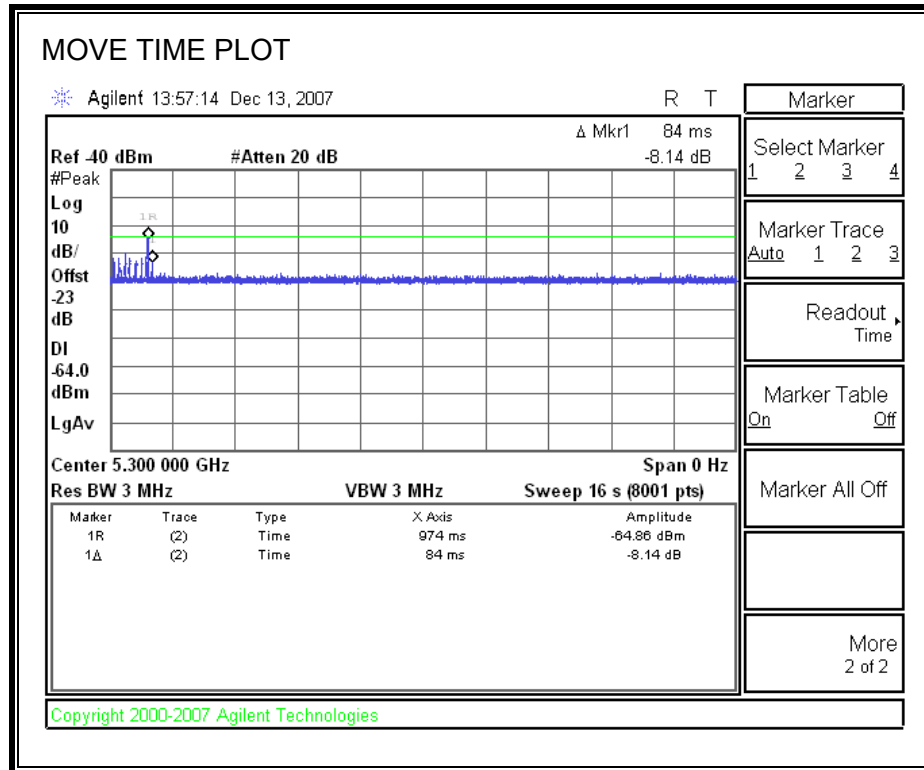
The observation period over which the IC aggregate time is calculated begins at (Reference Marker) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

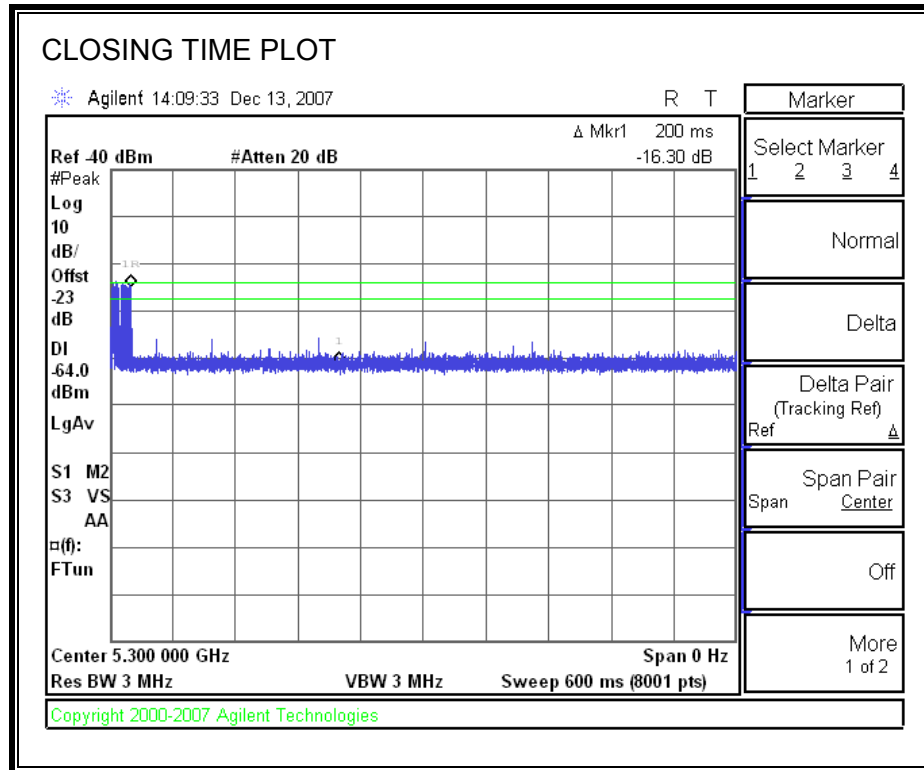
Agency	Channel Move Time (sec)	Limit (sec)
FCC / IC	0.084	10

Agency	Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
FCC	0.0	60
IC	2.0	260

MOVE TIME

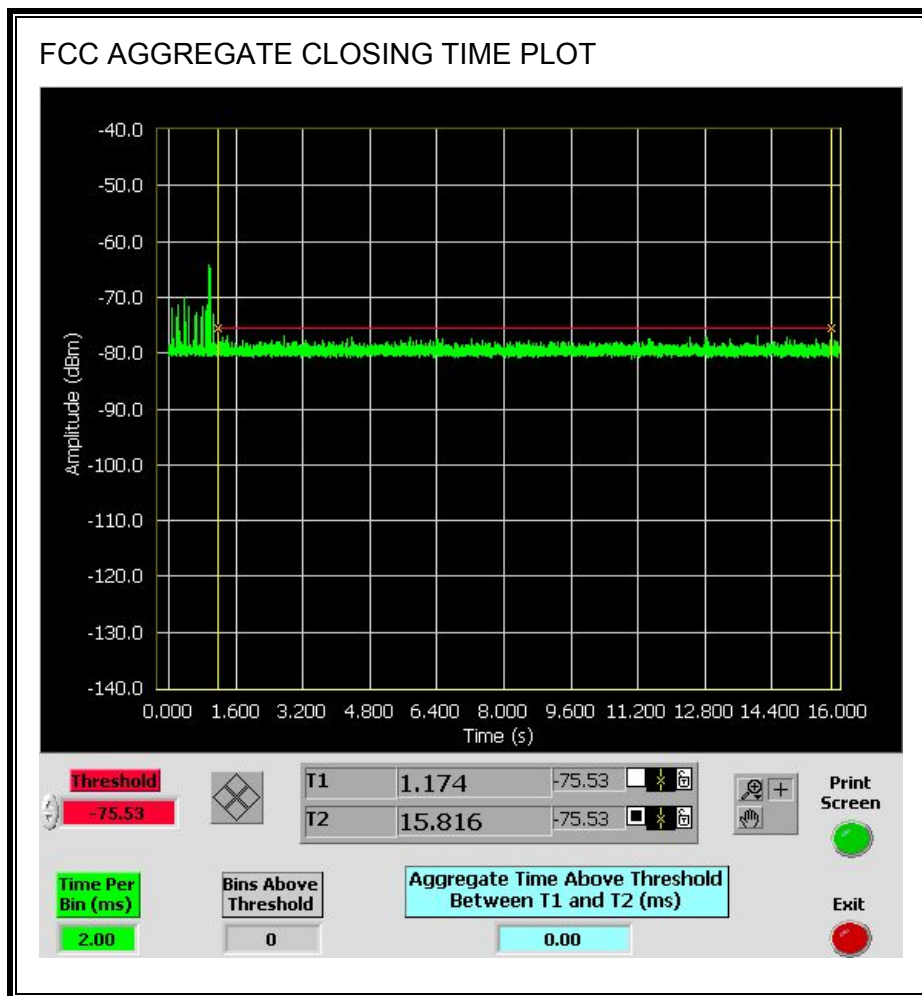


CHANNEL CLOSING TIME



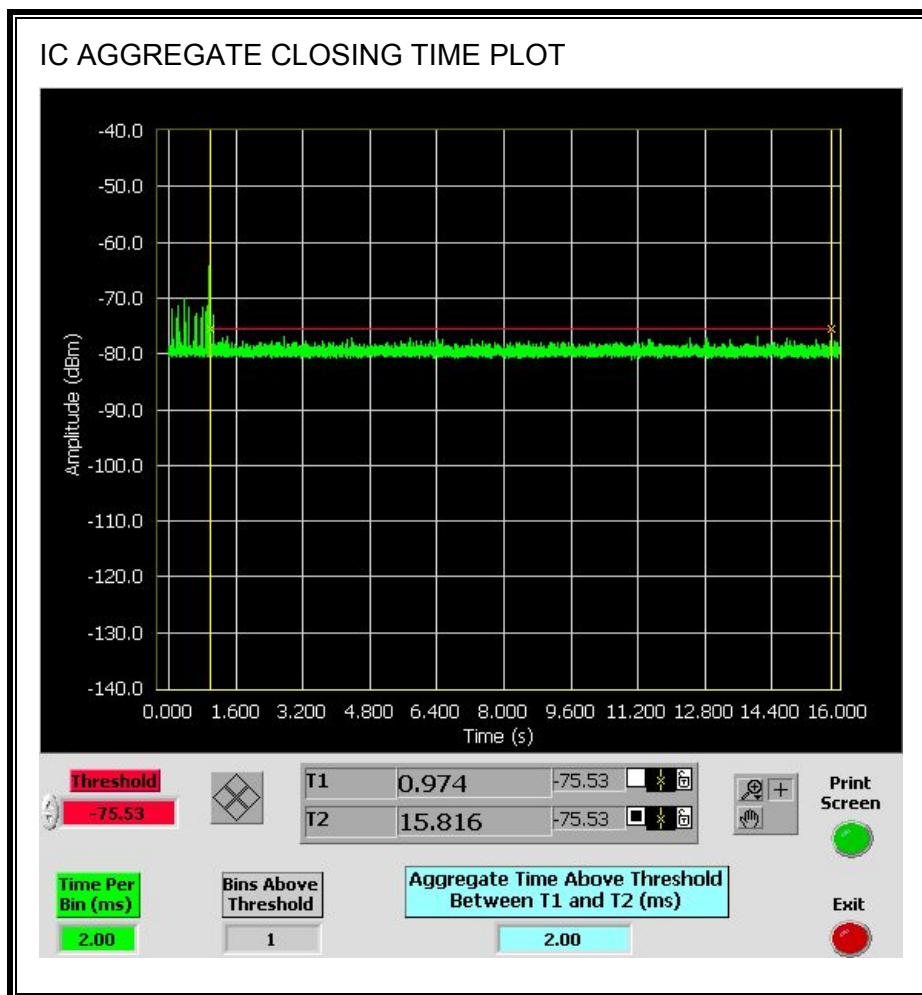
FCC AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

No transmissions are observed during the FCC aggregate monitoring period.



FCC AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

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



5.2.4. SLAVE NON-OCCUPANCY

TEST PROCEDURE

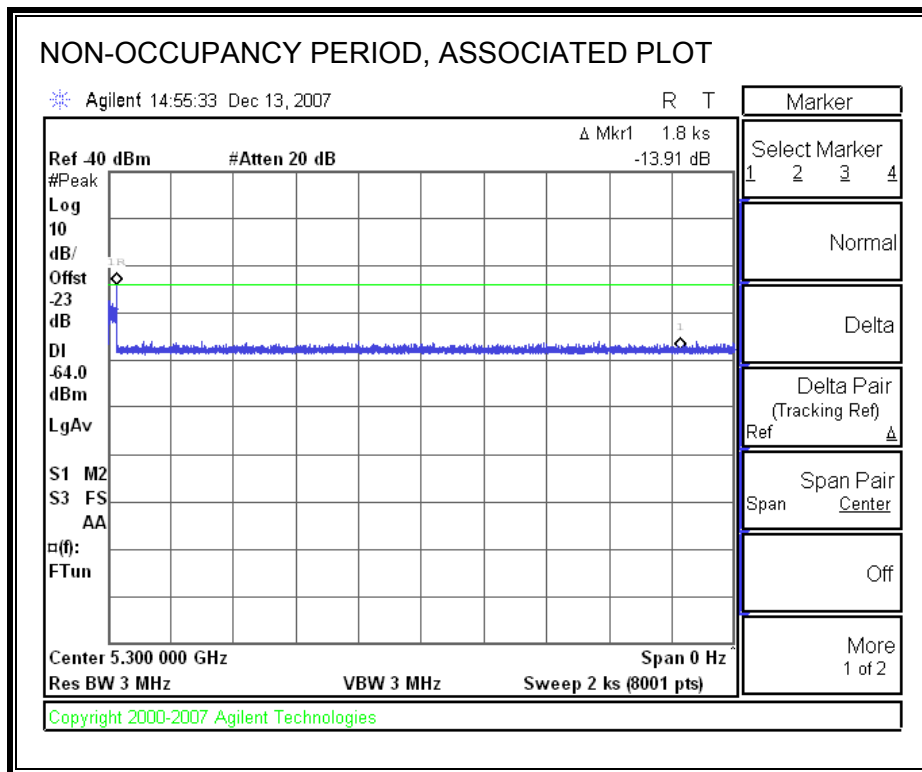
The spectrum analyzer is monitoring the emissions from the Slave.

The AP and Slave are linked in a 20 MHz bandwidth mode, with streaming video. The spectrum analyzer trace is started, then the radar is triggered, and the channel is monitored for > 30 minutes.

Then the AP is powered down. The spectrum analyzer trace is started, then the Slave is rebooted, and the channel is monitored for > 30 minutes.

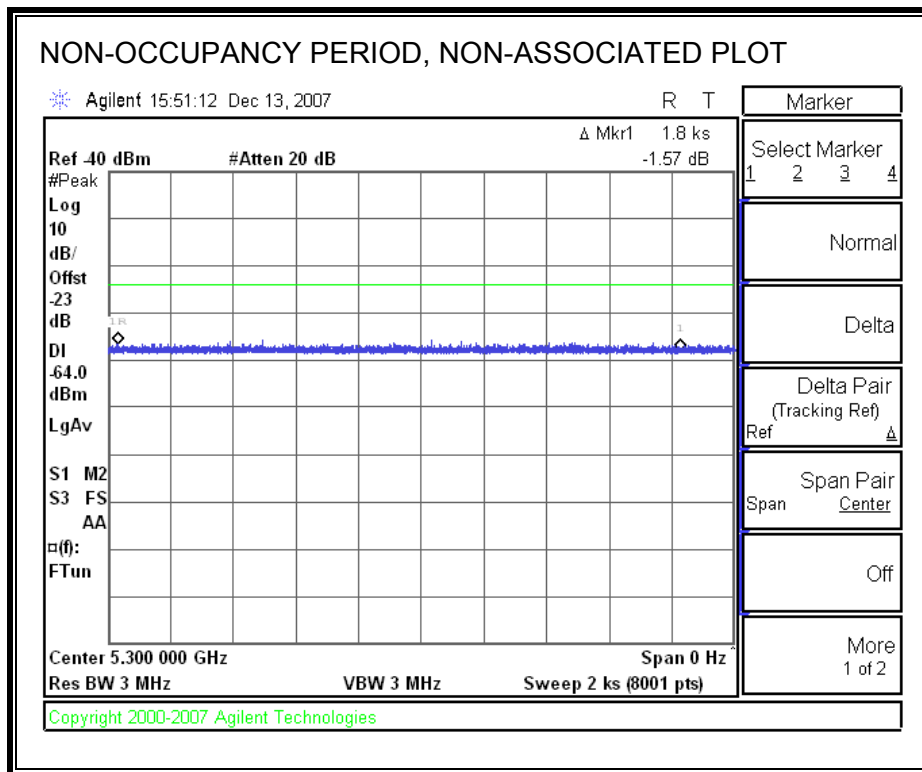
ASSOCIATED TEST RESULTS

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



NON-ASSOCIATED TEST RESULTS

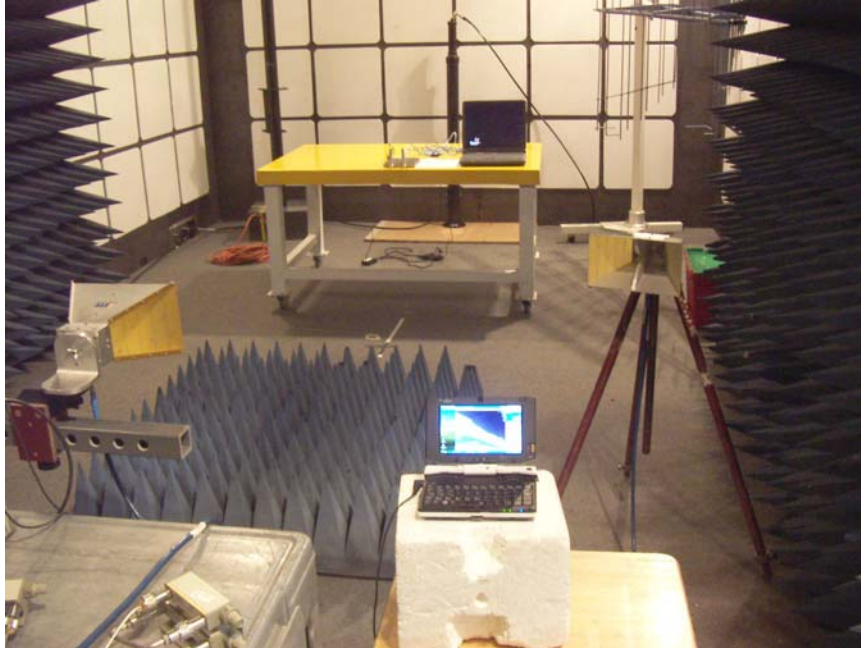
No EUT transmissions were observed on the test channel during the 30-minute observation time.



6. SETUP PHOTOS

DYNAMIC FREQUENCY SELECTION MEASUREMENT SETUP

DFS FRONT PHOTO



DFS BACK PHOTO



END OF REPORT