FCC CFR47 PART 15 SUBPART E
DYNAMIC FREQEUNCY SELECTION

TEST REPORT
FOR

802.11 a/b/g MINI PCI CARD

MODEL NUMBER: WLL4071

FCC ID: H8N-WLL4071

REPORT NUMBER: 06U10725-1

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/20/2006	Initial Issue	MH

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ASKEY COMPUTER CORP.
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EUT DESCRIPTION: 802.11 a/b/g MINI PCI MODULE

MODEL: WLL4071

DATE TESTED: NOVEMBER 30, 2006

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
DFS REQUIREMENTS OF FCC PART 15 SUBPART E	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 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".

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

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
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a MiniPCI 802.11a/b/g transceiver module.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two identical antennas for diversity. The highest gains for each of the DFS bands are as follows:

Tyco TIAN01 antenna, which has a maximum antenna gain of 1.6 dBi (including cable loss) in the 5.2 GHz band.

Hitachi HTL017 antenna, which has a maximum antenna gain of 1.8 dBi (including cable loss) in the 5.5 GHz band.

The lowest gains for each of the DFS bands are as follows:

Hitachi HTL008 antenna, which has a maximum antenna gain of 0.8 dBi (including cable loss) in the 5.5 GHz band.

Tyco TIAN01 antenna, which has a maximum antenna gain of 1.0 dBi (including cable loss) in the 5.5 GHz band.

6. LIMITS AND RESULTS

6.1. DYNAMIC FREQUENCY SELECTION

6.1.1. LIMITS

§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

6.1.2. DESCRIPTION OF EUT

OVERVIEW OF EUT WITH RESPECT TO §15.407 (h) REQUIREMENTS

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges as a Client Device that does not have radar detection capability. The EUT uses one transmitter with two identical antennas for diversity.

The highest gain antenna assembly utilized with the EUT has a gain of 1.6 dBi in the 5250-5350 MHz band and 1.8 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 0.8 dBi in the 5250-5350 MHz band and 1.0 dBi in the 5470-5725 MHz band.

The highest power level is 19.5 dBm EIRP in the 5250-5350 MHz band and 17.39 dBm EIRP in the 5470-5725 MHz band.

Both of the 50-ohm Tx/Rx antenna ports are connected to the test system via a power combiner/divider to perform conducted tests.

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.

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

The EUT utilizes an 802.11a IP based architecture. One nominal channel bandwidth, 20 MHz, is implemented on the channels subject to DFS requirements.

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

The Master Device is an Atheros Access Point, FCC ID: PPD-AR5BAP-00032.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –64 + 4 + 1 = -59 dBm.

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

6.1.3. TEST AND MEASUREMENT SYSTEM

SYSTEM OVERVIEW

The measurement system is based on a conducted test method.

The short pulse and long pulse signal generating system utilizes the NTIA software.

The signal monitoring equipment consists of a spectrum analyzer with the capacity to display 8192 bins on the horizontal axis, to yield a reasonable time-domain resolution. 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.

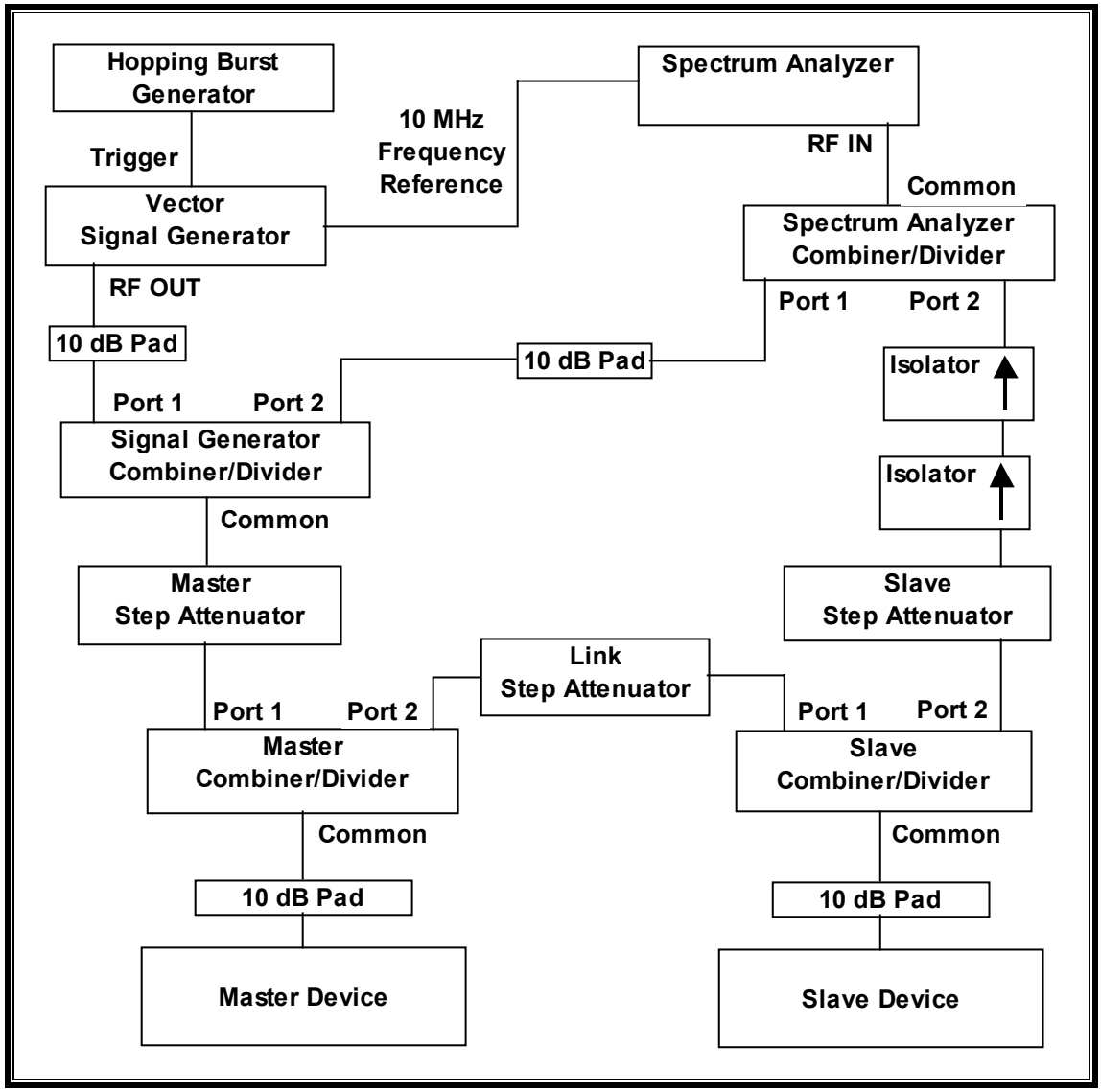
Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), additional combiner/dividers are inserted between the Master Combiner/Divider and the 10 dB pad connected to the Master Device (and/or between the Slave Combiner/Divider and the 10 dB pad connected to the Slave Device). Additional 10 dB pads are connected as needed, such that there is one pad at each RF port on each EUT.

6.1.4. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42070220	11/26/2007
Vector Signal Generator 250kHz-20GHz	Agilent / HP	E8267C	US43320336	11/2/2007

CONDUCTED METHOD SYSTEM BLOCK DIAGRAM



SYSTEM CALIBRATION

Disconnect the spectrum analyzer, master device, and slave device from the test system. Replace the spectrum analyzer and slave devices with 50 ohm loads. Connect the spectrum analyzer to the test system in place of the master device.

Adjust the signal generator and spectrum analyzer to the center frequency of the channel to be measured. Set the signal generator to CW mode. Set the RBW of the spectrum analyzer to 10 kHz and the span to 100 kHz. Adjust the amplitude of the signal generator to yield a measured level of –64 dBm on the spectrum analyzer.

Without changing any of the instrument settings, reconnect the spectrum analyer to the Common port of the Spectrum Analyzer Combiner/Divider and connect a 50 ohm load to the Master Device port of the test system.

Measure the amplitude and calculate the difference from –64 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference. Confirm that the signal is displayed at –64 dBm. Readjust the RBW and VBW to 3 MHz, set the span to 10 MHz, and confirm that the signal is still displayed at –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.

The Link Step Attenuator and Slave Step Attenuator settings may be changed without affecting the System Calibration. The System Calibration process must be repeated for different settings of the Master Step Attenuator to determine the Reference Level Offset associated with each Master Step Attenuator setting.

INTERFERENCE DETECTION THRESHOLD ADJUSTMENT

Set the signal generator to produce the specified radar waveform, trigger a burst manually and measure the amplitude 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.

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

Establish a link between the Master and Slave, adjusting the Link Step Attenuator as needed to provide an adequate received level at the Master and Slave devices. Stream the video test file to generate WLAN traffic. Adjust the Slave Step Attenuator so that the WLAN traffic level from the Slave, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

Confirm that the displayed traffic is from the Slave Device by changing the setting of the Slave Step Attenuator and verifying that the displayed traffic level changes accordingly. Confirm that the displayed traffic does not include Master Device traffic by changing the setting of the Master Step Attenuator and the Link Step Attenuator and verifying that the displayed traffic level does not change. Reset all Step Attenuators to their previous settings.

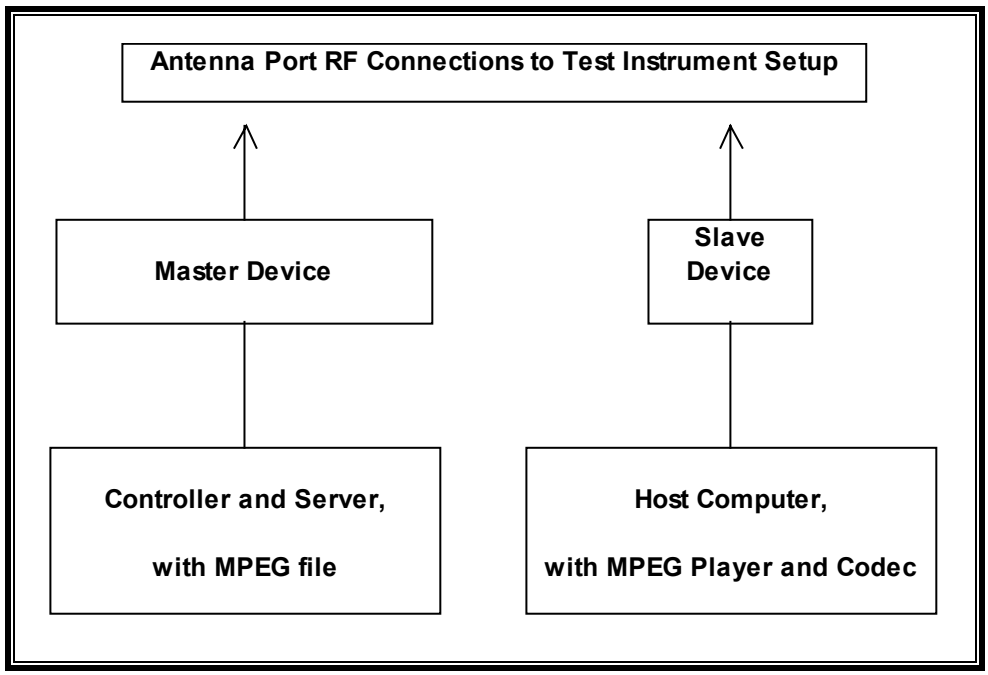
If the above conditions cannot be met, use a different setting of the Master Step Attenuator, performing a new System Calibration and Interference Detection Threshold Adjsutment as required for the new Master Step Attenuator setting.

6.1.5. SETUP OF EUT AND SUPPORT EQUIPMENT

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Access Point	Atheros	AP 30	AP 30-50-D7323	PPD-AR5BAP-00032
AC Adapter	CUI	DSA-0151A	4403	DoC
Laptop	Compaq	Thinkpad T42	ZZ-27004	DoC
AC Adapter	Compaq	08K8204	85910TF	DoC
Laptop	IBM	Thinkpad BW2-C2	1S2222222XX00026	DoC
AC Adapter	Lenovo	92P1105	1105Z1ZBW96622DX	DoC

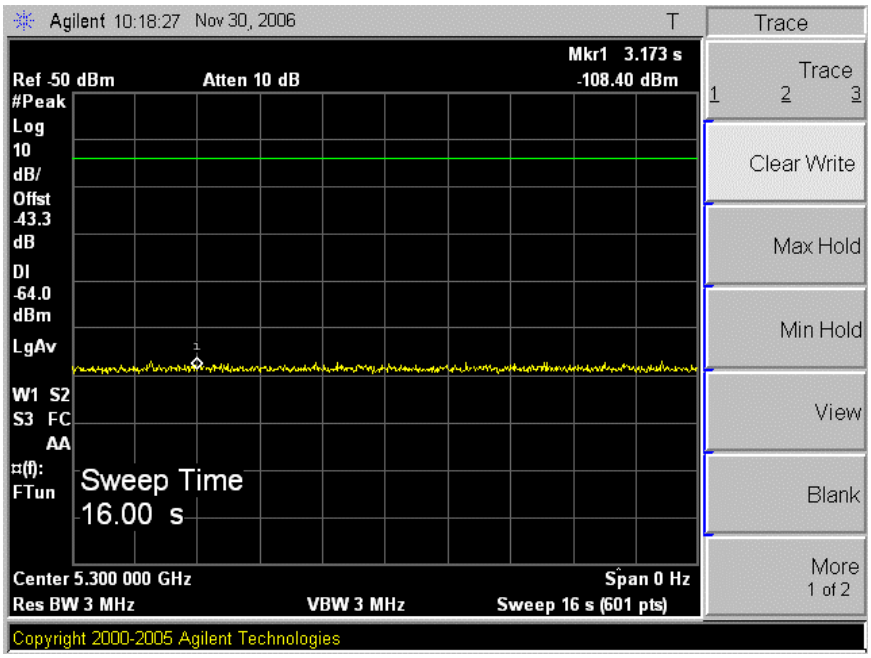
TEST SETUP



6.1.6. PLOTS OF NOISE, RADAR WAVEFORMS, AND WLAN SIGNALS

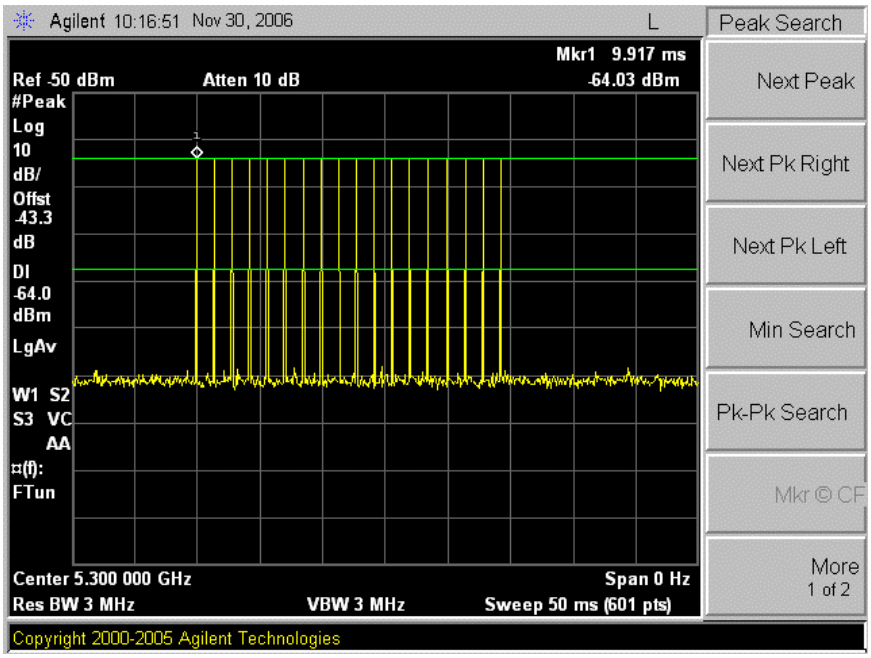
PLOT OF SYSTEM NOISE FLOOR

NOISE FLOOR



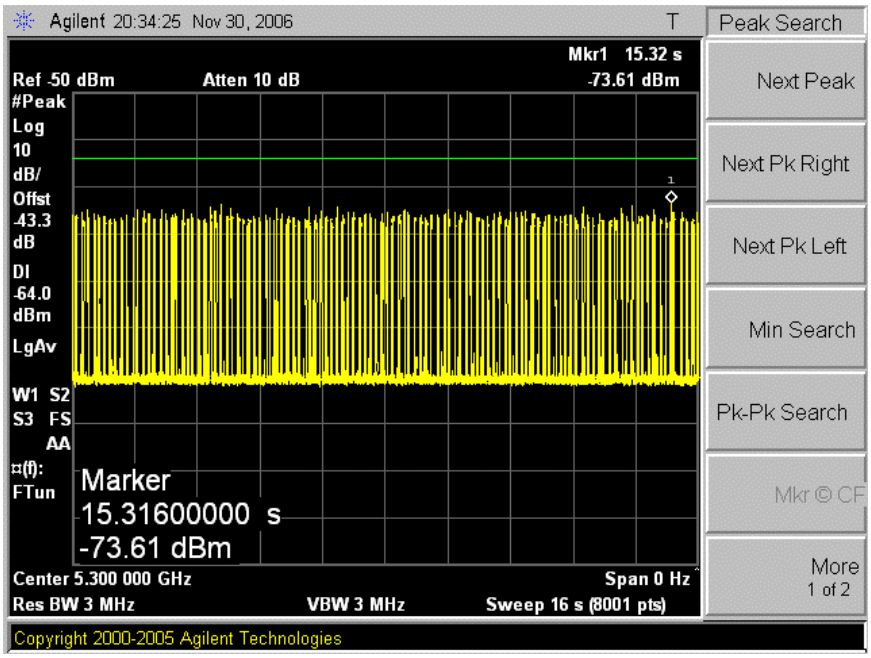
PLOTS OF RADAR WAVEFORM

SHORT PULSE RADAR TYPE 1



PLOT OF WLAN TRAFFIC FROM SLAVE

WLAN TRAFIC



6.1.7. TEST CHANNEL AND METHOD

All tests were performed at a channel center frequency of 5300 MHz utilizing a conducted test method.

6.1.8. CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

GENERAL 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)

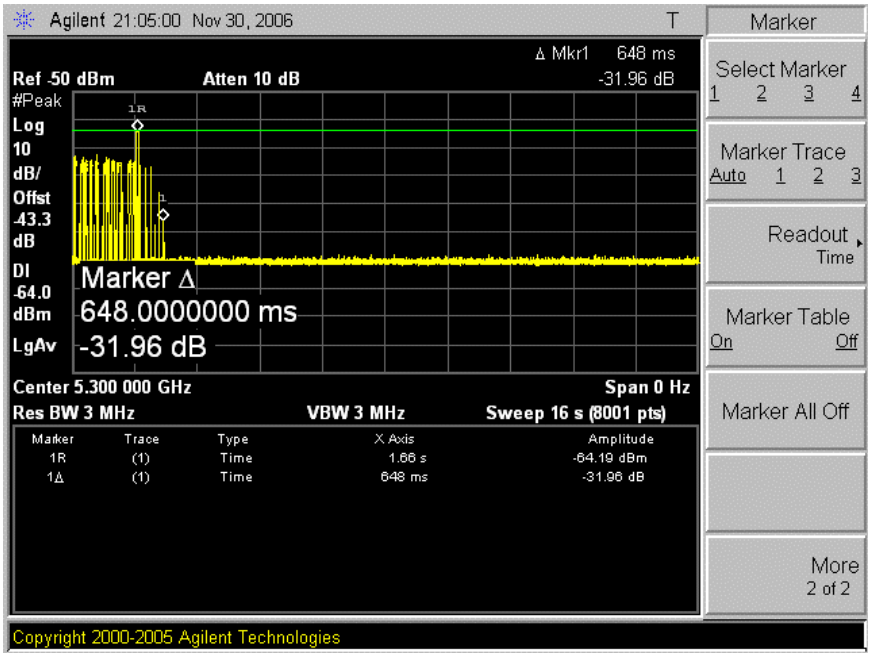
The observation period over which the aggregate time is calculated
Begins at (Reference Marker + 200 msec)
and
Ends no earlier than (Reference Marker + 10 sec).

TYPE 1 CHANNEL MOVE TIME RESULTS

No non-compliance noted:

Channel Move Time (s)	Limit (s)
0.648	10

MOVE TIME PLOT FOR SHORT PULSE TYPE 1 RADAR



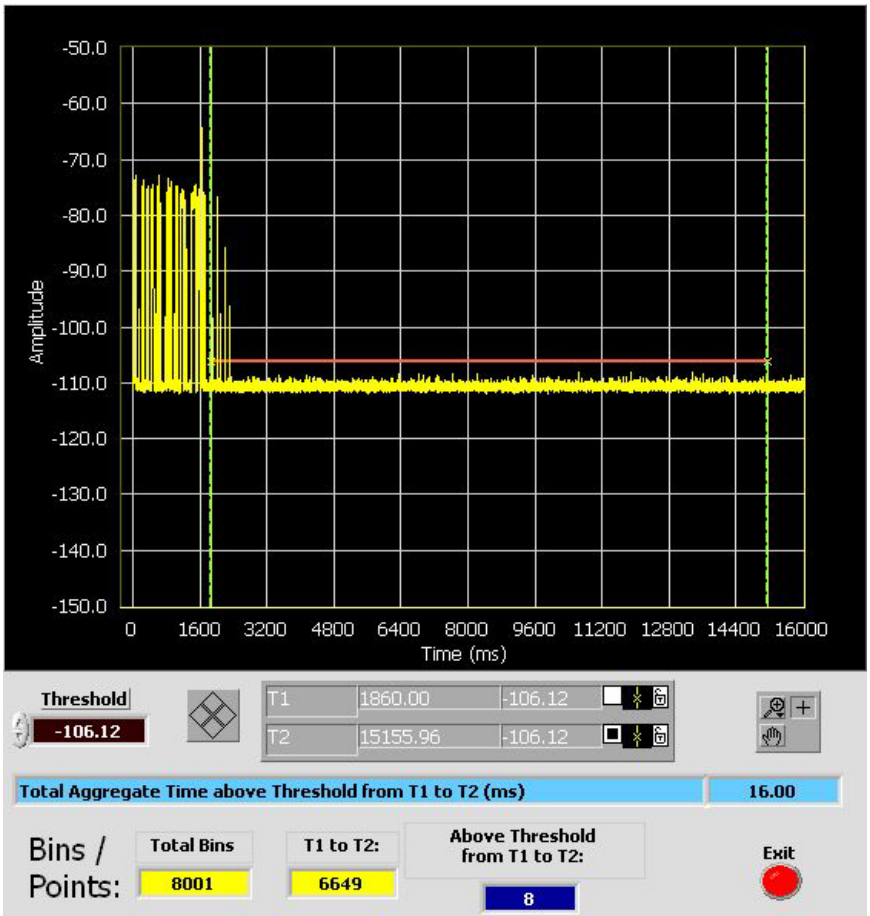
TYPE 1 CHANNEL CLOSING TRANSMISSION TIME RESULTS

No non-compliance noted:

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
16.00	60	44.00

Only intermittent transmissions are observed during the aggregate monitoring period.

AGGREGATE CLOSING TIME PLOT



7. SETUP PHOTOS

DFS MEASUREMENT SETUP

FRONT PHOTO

BACK PHOTO

END OF REPORT