TEST REPORT

Covering the
DYNAMIC FREQUENCY SELECTION (DFS)
REQUIREMENTS
OF

MIC Table No. 45 Test Methods for Radio Equipment Listed in Certification Regulations Article 2 Paragraph 1 Items 19-3 and 19-3-2

Summit Data Communication
Model(s): 802.11abg MSD30AG

COMPANY: Summit Data Communication
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TEST SITE: Elliott Laboratories
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REPORT DATE: May 3, 2010

FINAL TEST DATE: April 12, 2010

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ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev #	Date	Comments	Modified By
-	May 3, 2010	Initial release	-

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SCOPE

Tests have been performed on the Summit Data Communication model 802.11abg MSD30AG in accordance with the Dynamic Frequency Selection (DFS) requirements of the following standard(s):

- Japanese MIC Table No. 45 Test Methods for Radio Equipment Listed in Certification Regulations Article 2 Paragraph 1 Items 19-3 and 19-3-2

Tests were performed in accordance with these standards together with the current published versions of the basic standards referenced therein as outlined in Elliott Laboratories test procedures.

The test results recorded herein are based on a single type test of the Summit Data Communication model 802.11abg MSD30AG and therefore apply only to the tested sample. The sample was selected and prepared by Ron Seide of Summit Data Communication.

OBJECTIVE

The objective of the manufacturer is to comply with the standards identified in the previous section. In order to demonstrate compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards. Compliance with some DFS features is covered through a manufacturer statement or through observation of the device.

STATEMENT OF COMPLIANCE

The tested sample of Summit Data Communication model 802.11abg MSD30AG complied with the DFS requirements of MIC Table 45 Certification Regulations Article 2 Paragraph 1 Items 19-3, 19-3-2

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARD

No deviations were made from the test methods and requirements covered by the scope of this report.

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Summit Data Communication model 802.11abg MSD30AG is a 802.11abg wireless LAN radio module, which is designed to send and receive wireless data communication. It is a client-only device and is not capable of operating in an ad-hoc network in the 5GHz bands. Channel access uses the IP-based 802.11a protocol. In Japan use is limited to channels in the frequency range 5180-5320MHz.

The sample was received on March 30, 2010 and tested on April 12, 2010. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number
Summit Communication Data	MSD30AG	802.11 abg	

ENCLOSURE

The EUT has no enclosure. It is designed to be installed within the enclosure of a host computer.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the requirements of the standard(s) referenced in this test report.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for testing:

Manufacturer	Model	Description	Serial Number	FCC ID
Cisco Systems	*Aironet 1131AG Series*	*Access Point*	*FTX1040T17J*	*LDK102054E*
HP	iPAQ	PDA	2CK5510K22	X11-21264

The italicized device was the master device.

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length (m)
None	-	-	-	-

EUT OPERATION

The EUT was operating with the following software. The software is secured by binary encryption to prevent the user from disabling the DFS function.

Client Device: V3.01.13 SCU: V2.03.42

The channel loading was achieved by transferring a large .mpg file from the master device to the laptop using an ftp protocol at the slowest data rate available (6Mb/s). A plot showing the channel utilization is included in the appendices of the report and shows an approximate utilization of 15%. This was the maximum that could be achieved given the hardware limitations of the EUT, which only supported 16-bit operation and could not support high throughput for any prolonged period of time

RADAR WAVEFORMS

Table 1 Japan Fixed Radar Parameters – W53 Band (5250-5350 MHz)

Radar test signal	Pulse width W [μs]	Pulse repetition frequency PRF [pps]	Pulses / burst	Detection probability
Fixed Pulse 1	1.0	700	18	See note below
Fixed Pulse 2	2.5	260	18	
Device passes if it detects at least 15 of the first 20 trials or at least 11 times in the first 20 trials and at least 24 times in 40 trials.				

TEST RESULTS

TEST RESULTS– JAPAN CLIENT DEVICE

Table 2 Japan Client Device Test Result Summary W56 Band (5250-5350 MHz)

Description	Channel Closing Time		Channel Move Time		Test Data	Status
	Measured	Required	Measured	Requirement		
Fixed Pulse 1	6.8ms	260ms	3.5s	10s	Appendix B	PASS
Fixed Pulse 2	1.6ms		3.6s		Appendix B	PASS

Table 3 Japan Client Device Test Result Summary – Non Occupancy

Description	Channel Closing Time		Channel Move Time		Test Data	Status
	Measured	Required	Measured	Requirement		
W53 Band	Occupancy period applies to master devices, however it was confirmed that in the 30 minutes immediately following the channel move neither client, nor master, initiated communications on the closed channel.				Appendix B	PASS

Notes:

1) Tests were performed using the radiated test method.
2) Channel availability check, detection threshold and non-occupancy period are not applicable to client devices.

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level, with a coverage factor (k=2) and were calculated in accordance with UKAS document LAB 34.

Measurement	Measurement Unit	Expanded Uncertainty
Timing (Channel move time, aggregate transmission time)	ms	Timing resolution +/- 0.24%
Timing (non occupancy period)	seconds	5 seconds
DFS Threshold (radiated)	dBm	1.6
DFS Threshold (conducted)	dBm	1.2

DFS TEST METHODS

RADIATED TEST METHOD

The combination of master and slave devices is located in an anechoic chamber. The simulated radar waveform is transmitted from a directional horn antenna (typically an EMCO 3115) toward the unit performing the radar detection (radar detection device, RDD). Every effort is made to ensure that the main beam of the EUT's antenna is aligned with the radar-generating antenna.

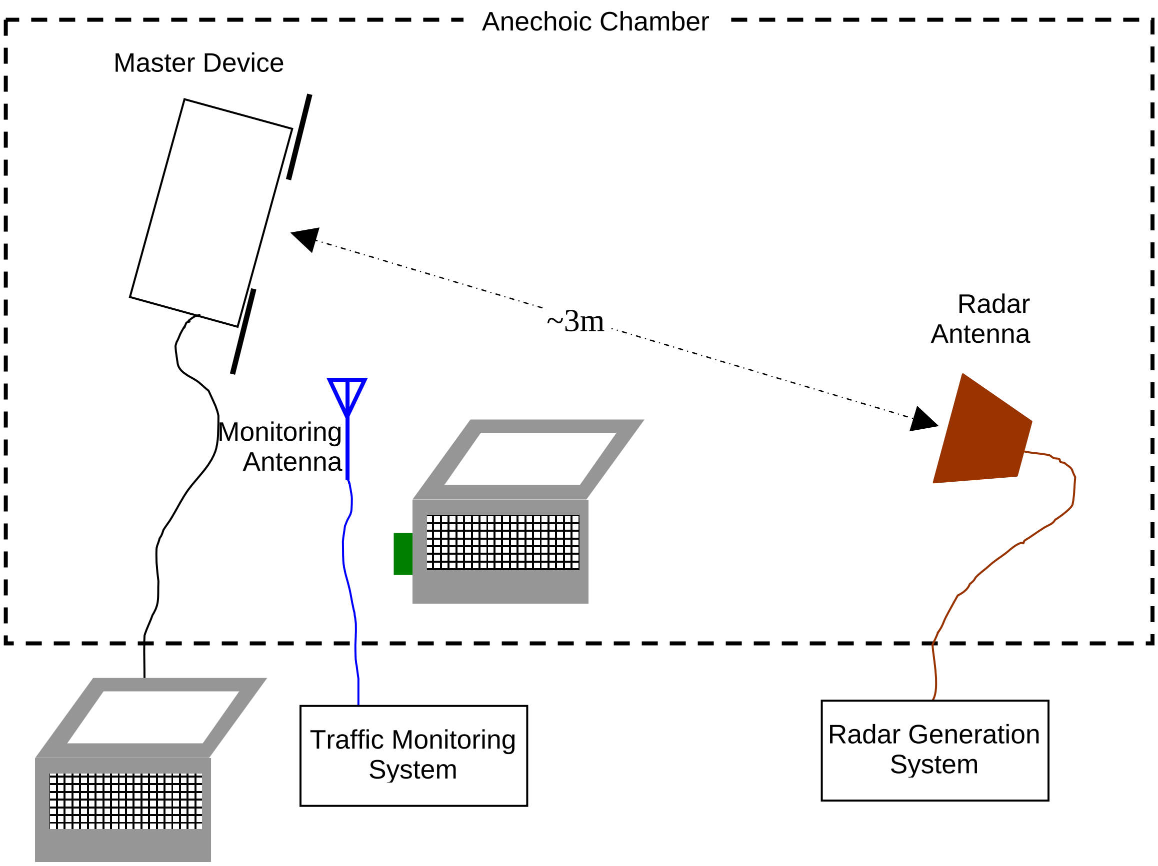

Figure 1 Test Configuration for radiated Measurement Method

The signal level of the simulated waveform is set to a reference level equal to the threshold level (plus 1dB if testing against FCC requirements). Lower levels may also be applied on request of the manufacturer. The level reported is the level at the RDD antenna and so it is not corrected for the RDD's antenna gain. The RDD is configured with the lowest gain antenna assembly intended for use with the device.

The signal level is verified by measuring the CW signal level from the radar generation system using a reference antenna of gain G (dBi). The radar signal level is calculated from the measured level, R (dBm), and any cable loss, L (dB), between the reference antenna and the measuring instrument:

Applied level (dBm) = R – GREF + L

If both master and client devices have radar detection capability then the device not under test is positioned with absorbing material between its antenna and the radar generating antenna, and the radar level at the non RDD is verified to be at least 20dB below the threshold level to ensure that any responses are due to the RDD detecting radar.

The antenna connected to the channel monitoring subsystem is positioned to allow both master and client transmissions to be observed, with the level of the EUT's transmissions between 6 and 10dB higher than those from the other device.

DFS MEASUREMENT INSTRUMENTATION

RADAR GENERATION SYSTEM

An Agilent PSG is used as the radar-generating source. The integral arbitrary waveform generators are programmed using Agilent's "Pulse Building" software and Elliott custom software to produce the required waveforms, with the capability to produce both un-modulated and modulated (FM Chirp) pulses. Where there are multiple values for a specific radar parameter then the software selects a value at random and, for FCC tests, the software verifies that the resulting waveform is truly unique.

With the exception of the hopping waveforms required by the FCC's rules (see below), the radar generator is set to a single frequency within the radar detection bandwidth of the EUT. The frequency is varied from trial to trial by stepping in 5MHz steps.

Frequency hopping radar waveforms are simulated using a time domain model. A randomly hopping sequence algorithm (which uses each channel in the hopping radar's range once in a hopping sequence) generates a hop sequence. A segment of the first 100 elements of the hop sequence are then examined to determine if it contains one or more frequencies within the radar detection bandwidth of the EUT. If it does not then the first element of the segment is discarded and the next frequency in the sequence is added. The process repeats until a valid segment is produced. The radar system is then programmed to produce bursts at time slots coincident with the frequencies within the segment that fall in the detection bandwidth. The frequency of the generator is stepped in 1 MHz increments across the EUT's detection range.

The radar signal level is verified during testing using a CW signal with the AGC function switched on. Correction factors to account for the fact that pulses are generated with the AGC functions switched off are measured annually and an offset is used to account for this in the software.

The generator output is connected to the coupling port of the conducted set-up or to the radar-generating antenna.

CHANNEL MONITORING SYSTEM

Channel monitoring is achieved using a spectrum analyzer and digital storage oscilloscope. The analyzer is configured in a zero-span mode, center frequency set to the radar waveform's frequency or the center frequency of the EUT's operating channel. The IF output of the analyzer is connected to one input of the oscilloscope.

A signal generator output is set to send either the modulating signal directly or a pulse gate with an output pulse co-incident with each radar pulse. This output is connected to a second input on the oscilloscope and the oscilloscope displays both the channel traffic (via the if input) and the radar pulses on its display.

For in service monitoring tests the analyzer sweep time is set to > 20 seconds and the oscilloscope is configured with a data record length of 10 seconds for the short duration and frequency hopping waveforms, 20 seconds for the long duration waveforms. Both instruments are set for a single acquisition sequence. The analyzer is triggered 500ms before the start of the waveform and the oscilloscope is triggered directly by the modulating pulse train. Timing measurements for aggregate channel transmission time and channel move time are made from the oscilloscope data, with the end of the waveform clearly identified by the pulse train on one trace. The analyzer trace data is used to confirm that the last transmission occurred within the 10-second record of the oscilloscope. If necessary the record length of the oscilloscope is expanded to capture the last transmission on the channel prior to the channel move.

Channel availability check time timing plots are made using the analyzer. The analyzer is triggered at start of the EUT's channel availability check and used to verify that the EUT does not transmit when radar is applied during the check time.

The analyzer detector and oscilloscope sampling mode is set to peak detect for all plots.

DFS MEASUREMENT METHODS

DFS – CHANNEL CLOSING TRANSMISSION TIME AND CHANNEL MOVE TIME

Channel clearing and closing times are measured by applying a burst of radar with the device configured to change channel and by observing the channel for transmissions. The time between the end of the applied radar waveform and the final transmission on the channel is the channel move time.

The aggregate transmission closing time is measured in one of two ways:

FCC – the total time of all individual transmissions from the EUT that are observed starting 200ms at the end of the last radar pulse in the waveform. This value is required to be less than 60ms.

ETSI[1] – the total time of all individual transmissions from the EUT that are observed from the end of the last radar pulse in the waveform. This value is required to be less than 260ms.

Japanese timing requirements are based on the FCC method.

DFS – CHANNEL NON-OCCUPANCY AND VERIFICATION OF PASSIVE SCANNING

The channel that was in use prior to radar detection by the master is additionally monitored for 30 minutes to ensure no transmissions on the vacated channel over the required non-occupancy period. This is achieved by tuning the spectrum analyzer to the vacated channel in zero-span mode and connecting the IF output to an oscilloscope. The oscilloscope is triggered by the radar pulse and set to provide a single sweep (in peak detect mode) that lasts for at least 30 minutes after the end of the channel move time.

DFS CHANNEL AVAILABILITY CHECK TIME

It is preferred that the EUT report when it starts the radar channel availability check. If the EUT does not report the start of the check time, then the time to start transmitting on a channel after switching the device on is measured to approximate the time from power-on to the end of the channel availability check. The start of the channel availability check is assumed to be 60 seconds prior to the first transmission on the channel.

To evaluate the channel availability check, a single burst of each radar type is applied at random periods during the 60-second channel availability check and it is verified that the device does not use the channel by continuing to monitor the channel for a period of at least 60 seconds. The test is performed a total of four times for each radar type.

TRANSMIT POWER CONTROL (TPC)

Compliance with the transmit power control requirements for devices is demonstrated through measurements showing multiple power levels and manufacturer statements explaining how the power control is implemented.

[1] This measurement method is used for MIC Table No. 45.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Spectrum Analyzer	8595EM	1319	19-Aug-10
Tektronix	Digital Oscilloscope	TDS 5104	20408	28-Sep-10
Agilent Technologies	PSG Vector Signal Generator	E8267C	1877	24-Mar-11
EMCO	1-18GHz Horn Antenna	3115	1561	10-Jun-10
ETS Lindgren	1-18GHz Horn Antenna	3117	1662	04-Nov-10

Appendix B Test Data Tables and Plots for Channel Closing

Japan Channel Closing Measurement

Table 4 Japan Channel Closing Test Results – W53 Band (5250-5350 MHz)					
Waveform Type	Channel Closing Transmission Time [1]		Channel Move Time		Result
	Measured	Limit	Measured	Limit	
Fixed Pulse 1	6.8ms	260 ms	3.5s	10s	PASS
Fixed Pulse 2	1.6ms	260 ms	3.6s	10s	PASS

After the final channel closing test the channel was monitored for a further 30 minutes. No transmissions occurred on the channel.

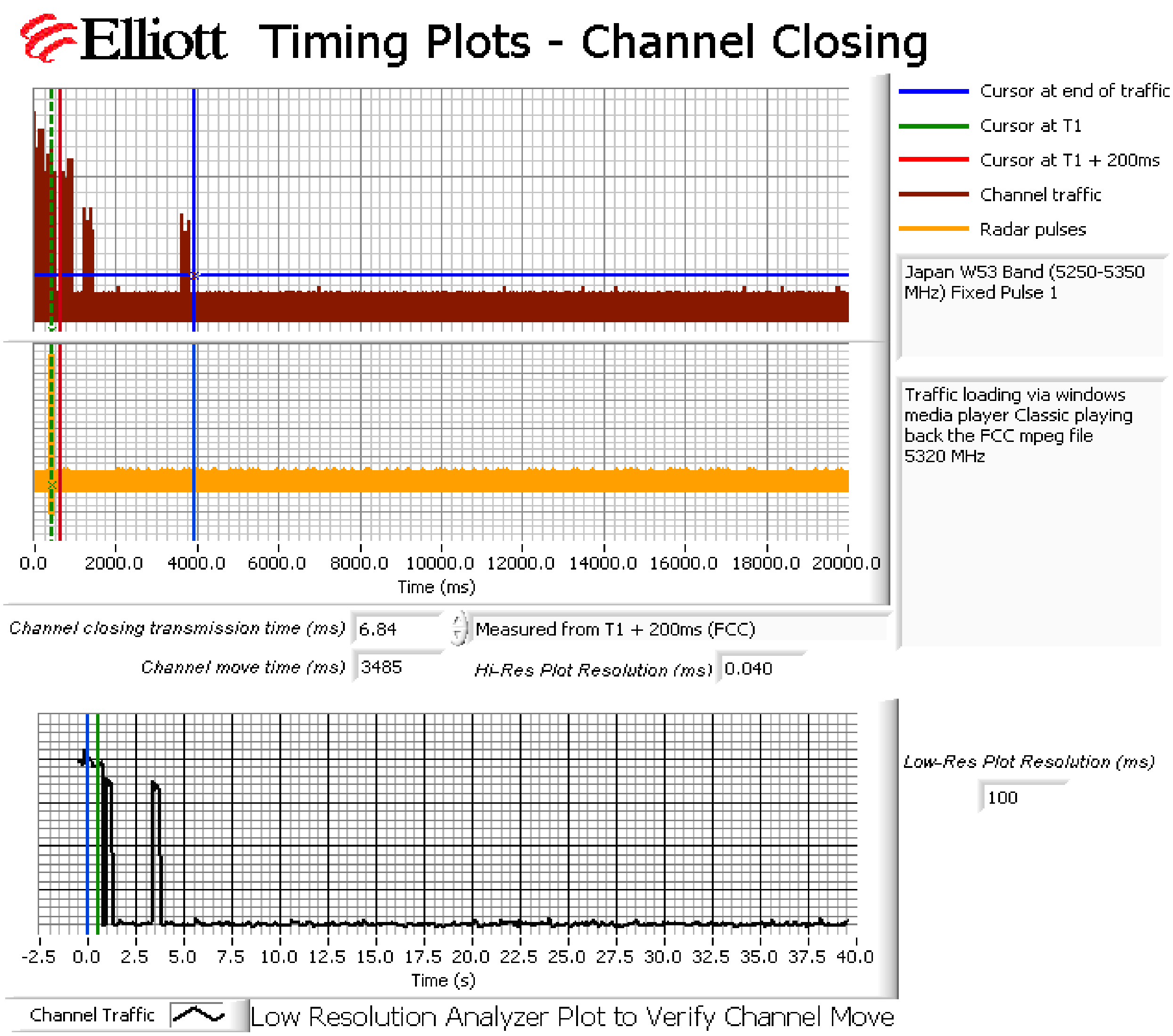

Figure 2 Channel Closing Time and Channel Move Time, W53 Fixed Pulse 1

[1] Channel closing time is the aggregate transmission time starting from the end of the radar signal to the completion of the channel move.

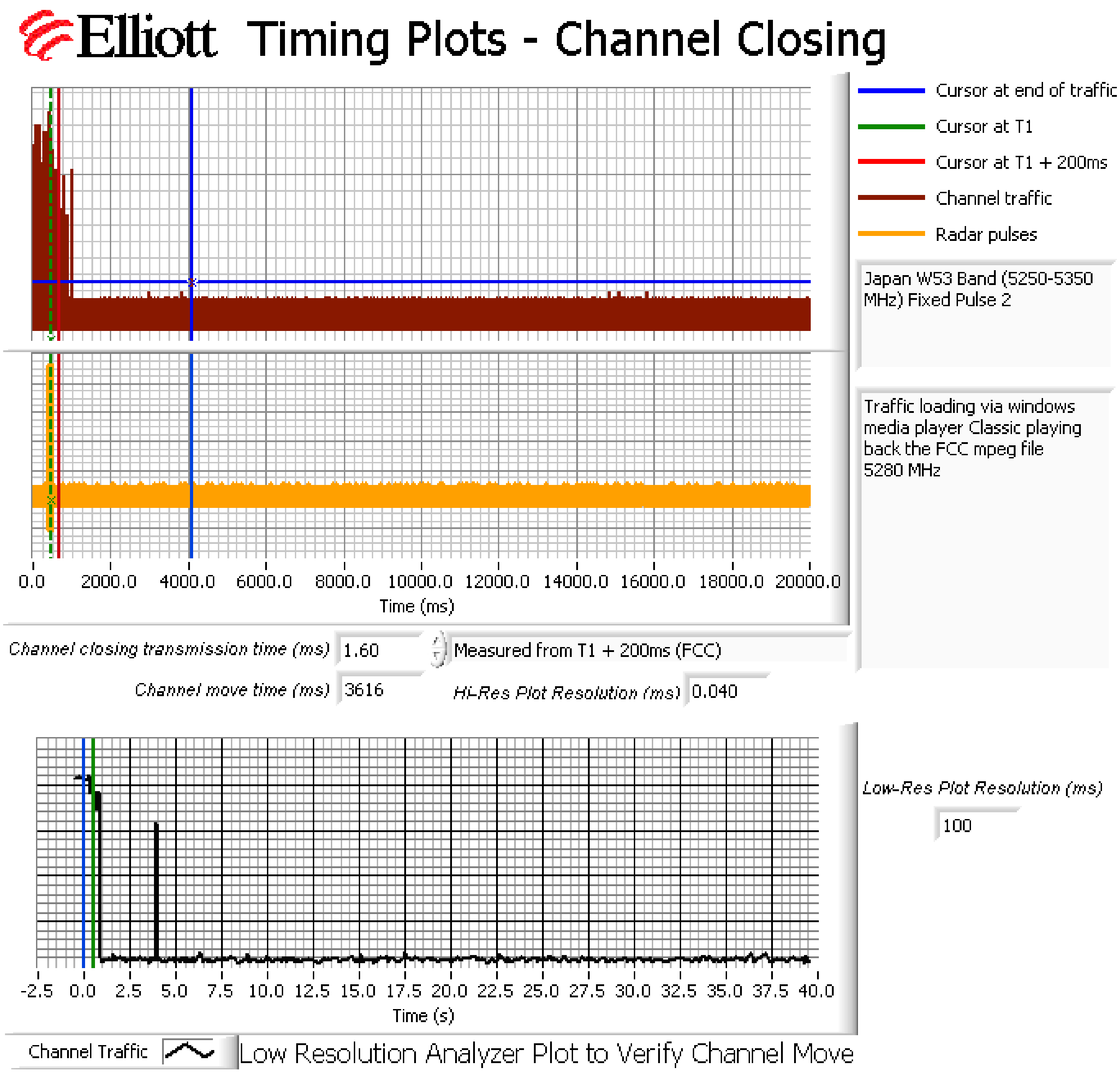

Figure 3 Channel Closing Time and Channel Move Time, W53 Fixed Pulse 2

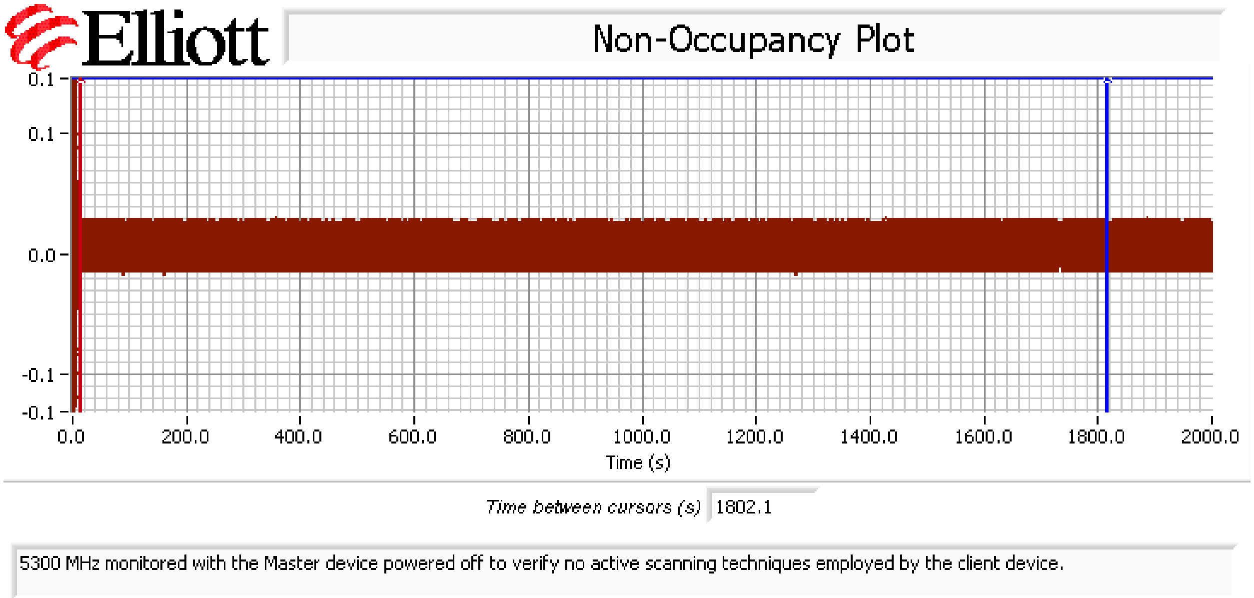

Figure 4 Radar Channel Non-Occupancy Plot

The non-occupancy plot was made over a 30-minute time period following the channel move time with the analyzer IF output connected to the scope and tuned to the vacated channel. No transmissions were observed after the channel move had been completed.

Appendix C Test Configuration Photographs