

PCTEST ENGINEERING LABORATORY, INC.

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CERTIFICATE OF COMPLIANCE

MANUFACTURER NAME & ADDRESS:

AST, INC.
4150 Grange Hall Rd.
Holly, MI 48442

DATE & LOCATION OF TESTING:

Date(s) of Tests: November 11, 2003
Test Report S/N: 15.231110561.RO4
Test Site: PCTEST Lab, Columbia, MD

FCC ID:: RO4AST-UDI650-00

APPLICANT: AST, INC.

SUMMARY:

Model No.: UDI-650
Equipment EUT Type: Portable Data Terminal w/ WLAN PC Module
Max. Output Power: 0.097 W EIRP
Frequency Range: 2412 - 2462 MHz
FCC Classification: FCC Part 15 Digital Transmission System (DTS)
FCC Rule Part(s): Parts 15.247; ANSI C-63.4-2001
Test Device Serial No.: S/N: 6000610

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C-63.4-2001.

I authorize and attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

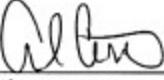

Alfred Cirwitzian
Vice President Engineering



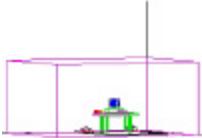
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Attestation Statements

FCC Measurement Report				Reviewed by: Quality Manager
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MEASUREMENT REPORT

A. General Information

APPLICANT	AST, INC.			
APPLICANT ADDRESS	4150 Grange Hall Rd. Holly, MI 48442			
TEST SITE	PCTEST ENGINEERING LABORATORY, INC.			
TEST SITE ADDRESS	6660-B Dobbin Road, Columbia, MD 21045 USA			
FCC RULE PART(S)	Parts 15.247; ANSI C-63.4-2001			
MODEL NAME	UDI-650			
Test Device Serial No.:	S/N: 6000610	<input type="checkbox"/> Production	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Engineering
FCC CLASSIFICATION	FCC Part 15 Digital Transmission System (DTS)			
DATE(S) OF TEST	November 11, 2003			
TESTS REPORT S/N:	15.231110561.RO4			

A.1 Test Facility / NVLAP Accreditation

Measurements were performed at PCTEST Engineering Lab in Columbia, MD 21045, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC 2451).
- PCTEST Lab is accredited by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) in EMC, Telecommunication, and FCC for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. (NVLAP Lab code: 100431-0).
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules.
- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.

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1.0 INTRODUCTION

1.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2001) and FCC Public Notice dated July 12, 1995 entitled "Guidance on Measurement for Direct Sequence Spread Spectrum System" were used in the measurement of **AST Portable Data Terminal w/ WLAN PC Module**.

1.2 Scope

Measurement & determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

1.3 PCTEST Test Location

The map at the right shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity are, the Baltimore-Washington Intert'l (BWI) airport, the city of Baltimore and the Washington, DC area. (see Figure 1.2-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N

latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 2002.

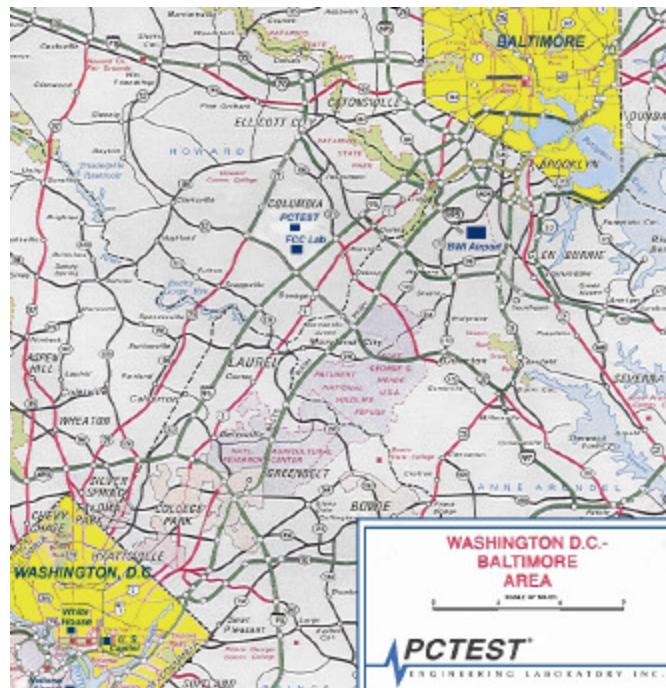


Figure 1.3-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **AST Portable Data Terminal w/ WLAN PC Module**. The EUT consisted of the following component(s):

Table 2-1. EUT Equipment Description

Manufacturer / Model / Description	Serial Number
AST / Portable Data Terminal w/ WLAN PC Module	6000610

2.2 Operation Mode

The WLAN was installed in the AST Portable Data Terminal. All operational modes are controlled via software supplied by Motorola.

2.3 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing.

- none

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3.0 DESCRIPTION OF TEST

3.1 Conducted Emissions

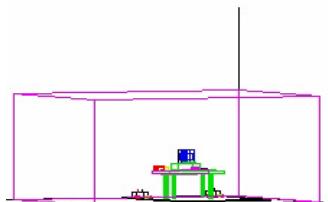


Figure 3.1-1. Shielded Enclosure Line-Conducted Test Facility

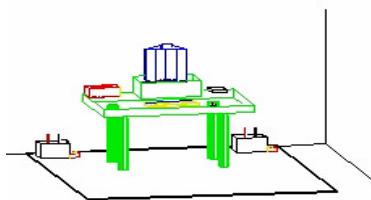


Figure 3.1-2. Line Conducted Emission Test Set-Up

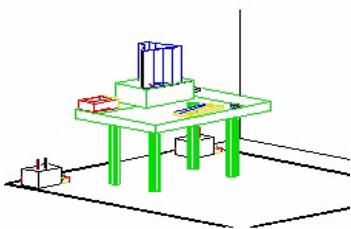


Figure 3.1-3. Wooden Table & Bonded LISNs

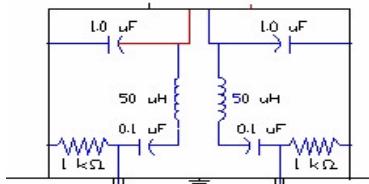


Figure 3.1-4. LISN Schematic Diagram

The line-conducted facility is located inside a 16'x20'x10' shielded enclosure. It is manufactured by Ray Proof Series 81 (see Figure 3.1-1). The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the sidewall of the shielded room (see Figure 3.1-2). Solar Electronics and EMCO Model 3725/2 (10kHz-30MHz) 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room (See Figure 3.1-3). The EUT is powered from the Solar LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by a high-current high-insertion loss Ray Proof power line filters (100dB 14Hz-10GHz). The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with an inner diameter of 1/2". If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the Solar LISN. The LISN schematic diagram is shown (See Figure 3.1-4). All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1-meter length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT. The spectrum was scanned from 150kHz to 30Mhz with a 20msec. sweep time. The frequencies producing the maximum level were re-examined using an EMI/Field Intensity Meter and Quasi-Peak adapter. The detector function was set to CISPR quasi-peak and average mode. The bandwidth of the receiver was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H patter to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Exhibit M. Each EME reported was calibrated using the HP8640B signal generator.

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3.2 Radiated Emissions

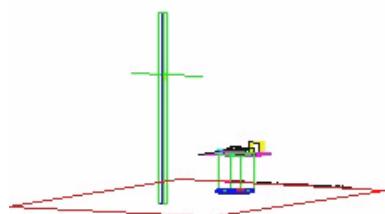


Figure 3.2-1. Meter Test Site

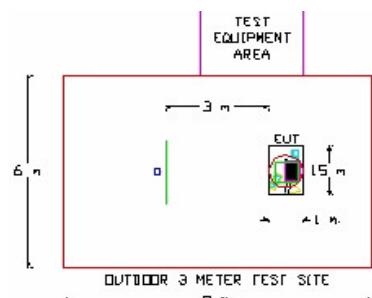


Figure 3.2-2. Dimensions of Outdoor Test Site

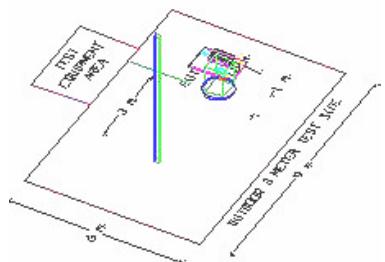


Figure 3.2-3. Turtable and System Setup

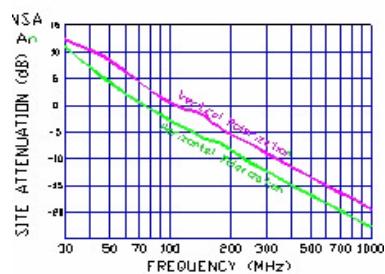


Figure 3.2-4. Normalized Site Attenuation Curves (H&V)

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was noted for each frequency found. The spectrum was scanned from 30 to 200 MHz using biconical antenna and from 200 to 1000 MHz using log-spiral antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3 meter test range using Roberts™ Dipole antennas or horn antenna (see Figure 3.2-1). The test equipment was placed on a wooden and plastic bench situated on a 1.5 x 2 meter area adjacent to the measurement area (see Figure 3.2-2). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter and Quasi-Peak Adapter. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100kHz or 1 MHz depending on the frequency or type of signal. Above 1GHz the detector function was set to CISPR average mode (RBW = 1MHz, VBW = 10Hz).

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table (see Figure 3.2-3). The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Exhibit E-G. Each EME reported was calibrated using the HP8640B signal generator. The Theoretical Normalized Site Attenuation Curves for both horizontal and vertical polarization are shown in Figure 3.2-4.

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4.0 ANTENNA REQUIREMENTS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of a permanently attached antennas or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

The antennas are **permanently attached antennas**.

There are no provisions for connection to an external antenna.

Conclusion:

The **AST RO4AST-UDI650-00** unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

5.0 Frequency/ Channel Operations

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

TYPE	MODEL	CAL. DUE DATE	CAL. INTERVAL	SERIAL No.
Microwave Spectrum Analyzer	HP 8566 (100Hz-22GHz)	12/05/03	Annual	3638A08713
Microwave Spectrum Analyzer	HP 8566 (100Hz-22GHz)	04/17/04	Annual	2542A11898
Spectrum Analyzer/Tracking Generator	HP 8591A (9kHz-1.8GHz)	06/02/04	Annual	3144A02458
Spectrum Analyzer	HP 8591A (9kHz-1.8GHz)	10/15/04	Annual	3108A02053
Spectrum Analyzer	HP 8594A (9kHz-2.9GHz)	11/02/04	Annual	3051A00187
Signal Generator	HP 8650B (500Hz-1GHz)	06/02/04	Annual	2232A19558
Signal Generator	HP 8640B (500Hz-1GHz)	06/02/04	Annual	1851A09816
Signal Generator	Rohde & Schwarz (0.1-1GHz)	09/22/04	Annual	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30MHz-1GHz)	04/12/04	Annual	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30MHz-1GHz)	03/11/04	Annual	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/04	Annual	0608-03241
Quasi-Peak Adapter	HP 85650A	08/09/04	Annual	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	03/11/04	Annual	0194-04082
RG58 Coax Test Cable	No.167			n/a
Harmonic/Flicker Test System	HP 6841A (IEC 555-2/3)			3531A00115
Broadband Amplifier (2)	HP 8447D			1145A00470, 1937A03348
Broadband Amplifier	HP 8447F			2443A03784
Transient Limiter	HP 11947A (9kHz-200MHz)			2820A00300
Horn Antenna (2)	EMCO Model 3115 (1-18GHz)			9704-5182, 9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)			9203-2178
Biconical Antenna (3)	Eaton 94455-1			1295, 1332, 1277
Log-Spiral Antenna (2)	Ailtech/Eaton 93490-1			0227, 1104
Log-Spiral Antenna	Singer 93490-1			147
Roberts Dipoles	Compliance Design (1 set) A100			5118
Ailtech Dipoles	DM-105A (1set)			33448-111
EMCO LISN (3)	3816/2, 3816/2, 3725/2			1077, 1079, 2099
50-ohm Terminator	n/a			n/a
Microwave Preamp 40dB Gain	HP 83017A (0.5-26.5GHz)			3123A00181
Microwave Cables	MicroCoax (1.0-26.5GHz)			n/a
Ailtech/Eaton Receiver	NM37/57A-SL			0792-03271
Spectrum Analyzer	HP 8591A			3034A01395
Modulation Analyzer	HP 8901A			2432A03467
NTSC Pattern Generator	Leader 408			0377433
Noise Figure Meter	HP 8970B, Ailtech 7510			3106A02189, TE31700
Noise Generator	Ailtech 7010			1473
Microwave Survey Meter	Holaday Model 1501 (2.45GHz)			80931
Digital Thermometer	Extech Instruments 421305			426966
Attenuator	HP 8495A (0-70dB) DC-4GHz			
Bi-Directional Coax Coupler	Narda 3020A (50-1000MHz)			
Shielded Screen Room	RF Lindgren Model 26-2/2-0			6710 (PCT270)
Shielded Semi-Anechoic Chamber	Ray Proof Model S81			R2437 (PCT278)
Environmental Chamber	Associated Systems 1025			PCT285
OATS	n/a	12/31/2004	Tri-annual	

Table 5-1. Annual Test Equipment Calibration Schedule

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EXHIBIT A – Test Results

Summary

The intentional radiator has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

The radio was transmitting at full power on the specified channels and at a data rate(s) specified above. The channels tested are high, middle and low of the allocated bands.

Final system data was gathered in a mode that tended to maximize emissions by varying the orientation of the EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Test Date(s):	November 11, 2003		
Test Engineer:	Steve Liu		
Method/System:	DTS		
Data Rate(s) Tested:	1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps		

FCC Part Section(s)	RSS 210 Section	Test Description	Test Limit	Test Condition
<u>TRANSMITTER MODE (TX)</u>				
15.247(a)(2)	5.9.1	6dB Bandwidth	> 500kHz	RADIATED
15.247(b)	6.22(o)(a3)	Transmitter Output Power	< 1 Watt	
15.247(d)	6.2.2(o)(b)	Transmitter Power Spectral Density	< 8dBm / 3kHz	
15.247(c)	5.9.1 6.2.2(o) (e1)	Occupied Band Width Out-of-Band Emissions (Band Width at 20dB below)	Radiated <20dBc. Emissions in restricted bands must meet the radiated limits detailed in 15.209	
15.205 15.209	6.2.1 6.3	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits or < RSS-210 table 3 limits Emissions in restricted bands must meet the radiated limits detailed in 15.209	RADIATED (30MHz-1GHz) (1-25 GHz)
15.207	6.6	AC Conducted Emissions 150kHz – 30MHz	EN55022	Line Conducted
<u>RECEIVER MODE (RX)</u>				
15.207	7.4	AC Conducted Emissions 150kHz – 30MHz	EN55022	Line Conducted
15.209	7.3	General Field Strength Limits (Restricted Bands and Radiated Emissions Limits)	< FCC 15.209 limits or < RSS-210 table 3 limits	Radiated (30MHz-1GHz) (1-25 GHz)
<u>RF EXPOSURE (SAR or MPE)</u>				
2.1093/2.1091	RSS-102	SAR Test or MPE	1.6 W/kg or mw/cm ²	3 Channels

Table A-1. Summary of Test Results

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EXHIBIT A – Test Results (Cont.)

6dB Bandwidth Measurement

§15.247(a)(2)

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard – The transmitter shall have a minimum 6dB bandwidth of 500kHz (0.5MHz)

The spectrum analyzer is set to:

RBW = 100 kHz (7dB/div)

VBW = 100 kHz

Span = 30 MHz

Ref. Level = -40.85 dBm

Sweep = 3.64 ms

Frequency (MHz)	Channel No.	Test Results	
		6dB Bandwidth (MHz)	Pass/Fail
2412	1	11.10	Pass
2437	6	10.00	Pass
2462	11	10.00	Pass

– See next pages for actual measured spectrum plots

Table A-2. Bandwidth Measurements

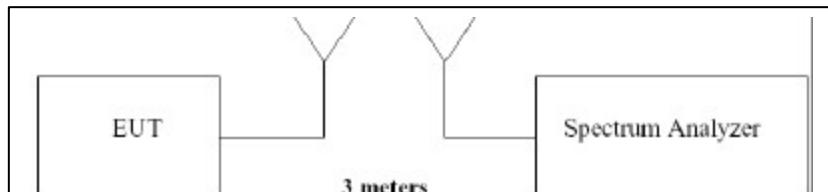
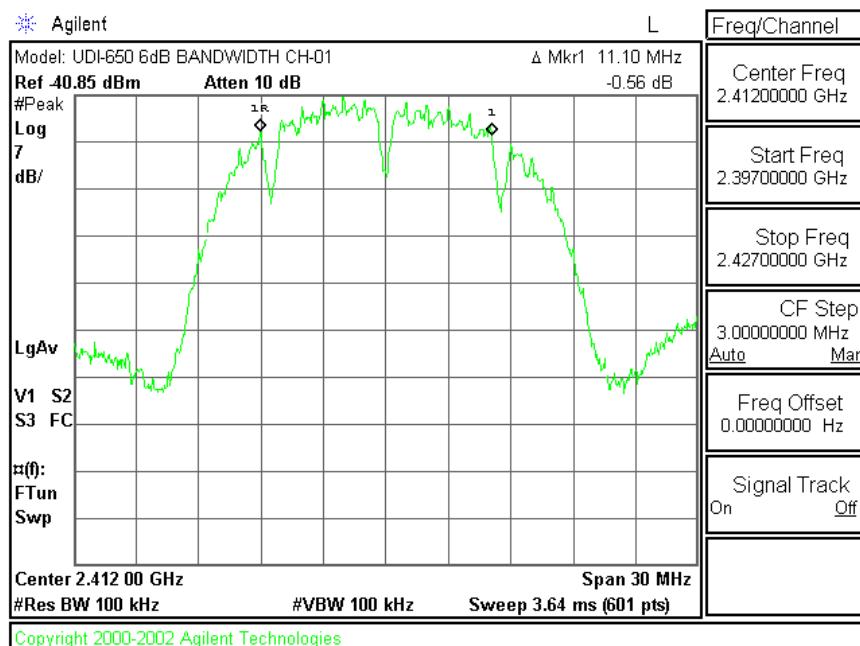
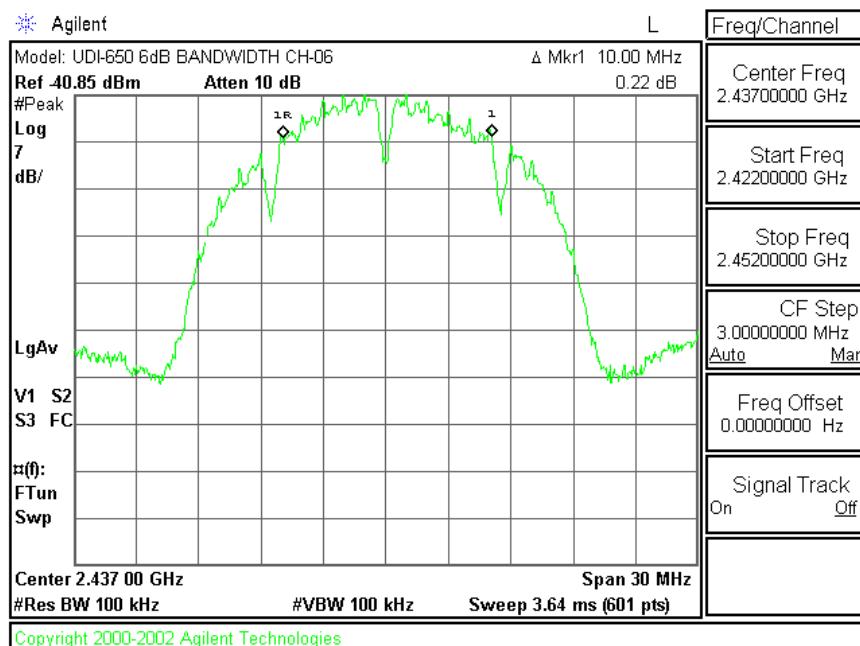


Figure A-1. Test Instrument & Measurement Setup

PCTEST LAB TEST REPORT 15.247		FCC Measurement Report		Reviewed by: Quality Manager
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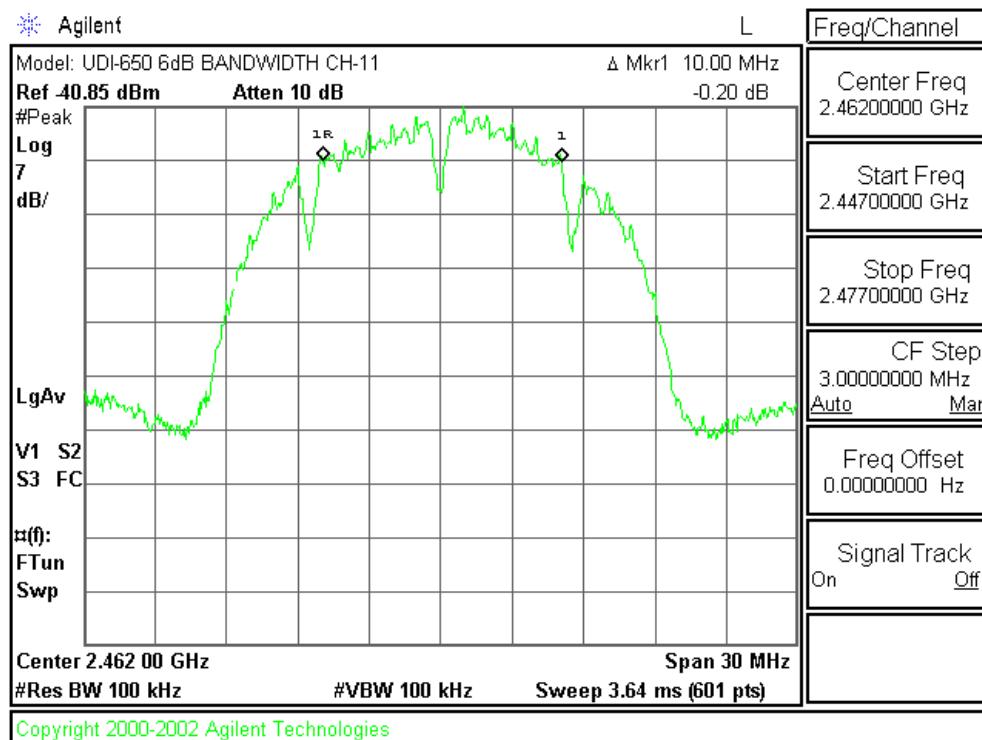


Plot A-1. 6dB Bandwidth Plot – Ch. 01



Plot A-2. 6dB Bandwidth Plot – Ch. 06

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Plot A-3. 6dB Bandwidth Plot – Ch. 11

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EXHIBIT A – Test Results (Cont.)

Output Power Measurement

§15.247(b)

Measurement is made while the EUT is operating in continuous wave (CW) transmission mode at the appropriate frequencies.

Minimum Standard – The transmitter peak output power shall not exceed 1 watt.

Frequency (MHz)	Channel No.	Test Results			
		Power Output (dBm)	Margin (dB)	Limit	Power Output (W)
2412	1	19.901	10.1	+ 30 dBm	0.098
2437	6	18.231	11.8	+ 30 dBm	0.066
2462	11	17.331	12.7	+ 30 dBm	0.054

See next pages for spectrum plots.

Table A-3. Radiated Output Power Measurements

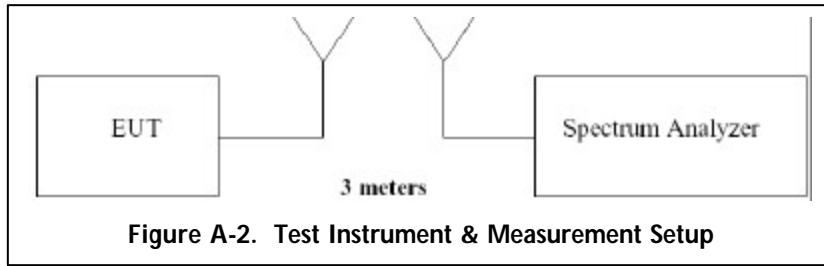


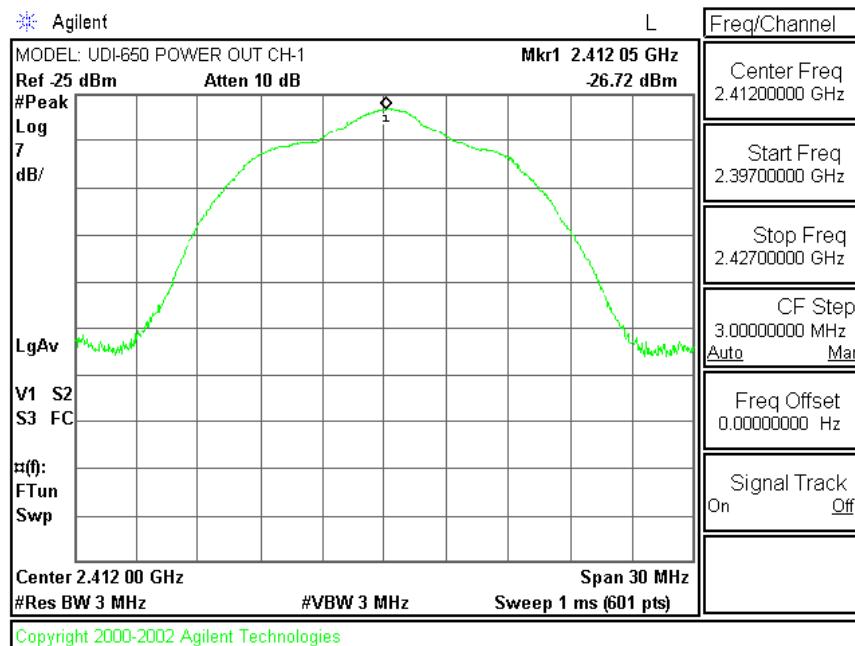
Figure A-2. Test Instrument & Measurement Setup

Sample calculation for Channel 1:

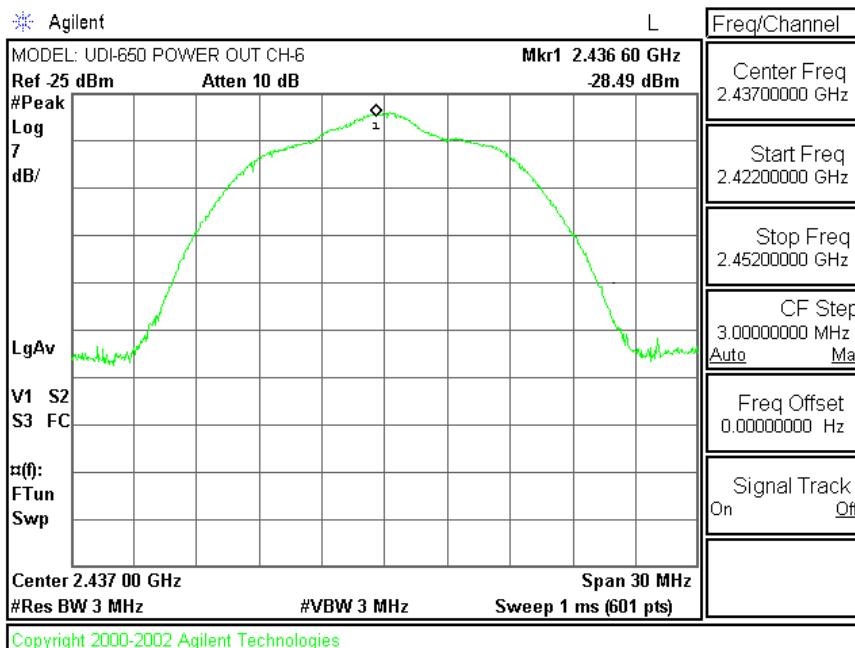
The 3 meter reading was -26.72 dBm or 80.28 dBuV. AFCL at 2412 MHz is 34.8 dB. Therefore the 3 meter reading was 115.08 dBuV/m or 567544.6 uV/m. With 0 dBi gain, Using the equation:

$P = (E^2 d) / (30G)$, the power yeilds 19.85 dBm.

PCTEST LAB TEST REPORT 15.247		FCC Measurement Report	Reviewed by: Quality Manager
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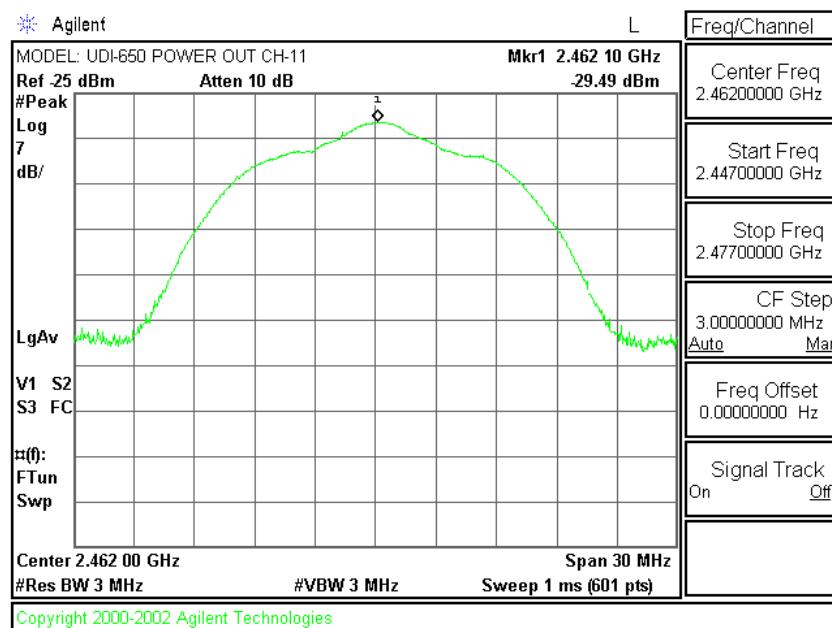


Plot A-4. Max. Output Power Plot – Ch. 01



Plot A-5. Max. Output Power Plot – Ch. 06

PCTEST LAB TEST REPORT 15.247	PCTEST Engineering Laboratory, Inc.	FCC Measurement Report		Reviewed by: Quality Manager
Filename: 15.231110561.R04	Test Dates: November 11, 2003	EUT Type: Portable Data Terminal w/ WLAN PC Module	FCC ID: RO4AST-UDI650-00	Page 14 of 36



Plot A-6. Max. Output Power Plot – Ch. 11

PCTEST LAB TEST REPORT 15.247	PCTEST Engineering Laboratory, Inc.	FCC Measurement Report		Reviewed by: Quality Manager
Filename: 15.231110561.RO4	Test Dates: November 11, 2003	EUT Type: Portable Data Terminal w/ WLAN PC Module	FCC ID: RO4AST-UDI650-00	Page 15 of 36

EXHIBIT A – Test Results (Cont.)

Power Spectral Density

§15.247(d)

The peak power density is measured with a spectrum analyzer connected to the receiving antenna while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard – The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

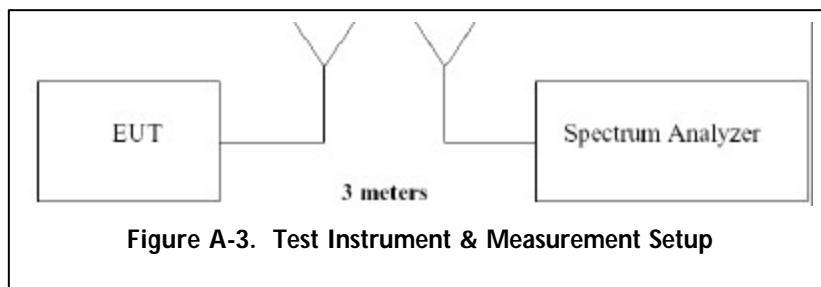
The spectrum analyzer is set to:

RBW = 3 kHz (7dB/div)
VBW = 3 kHz
Span = 30 MHz
Ref. Level = -40.85 dBm
Sweep = 1000 sec

Frequency (MHz)	Channel No.	Test Results		
		Power Density (dBm)	Limit	Margin (dBm)
2412	1	-11.50	+ 8 dBm	-19.50
2437	6	-10.70	+ 8 dBm	-18.70
2462	11	-11.38	+ 8 dBm	-19.38

See next pages for actual measured spectrum plots

Table A-4. Power Density Measurements

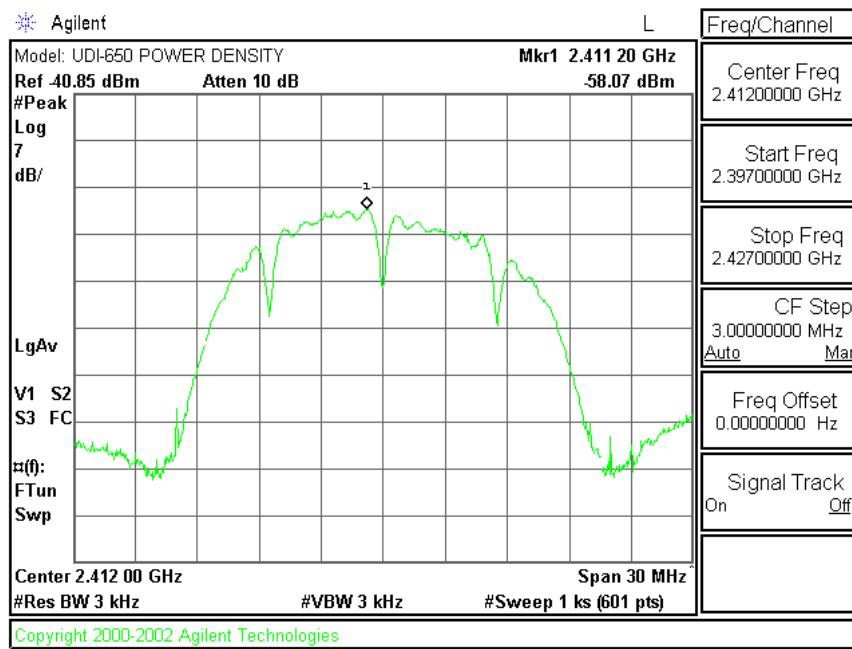


Sample calculation for Channel 1:

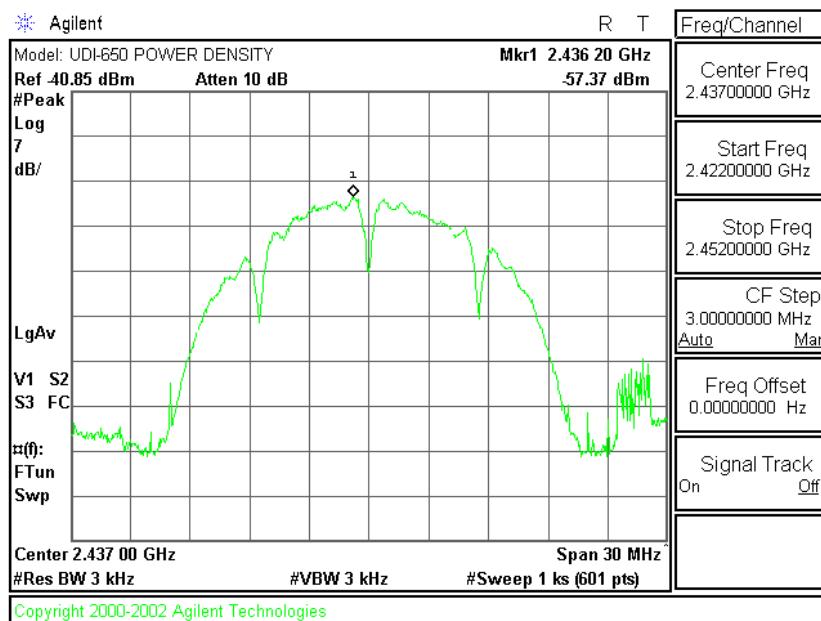
The 3 meter reading was -58.07 dBm. AFCL at 2412 MHz is 34.8 dB. Therefore the 3 meter reading was 83.73 dBuV/m or 15363.8 uV/m. With 0 dBi gain, Using the equation:

$$P = (E^*d)^2/30G, \text{ the power density yeilds } -11.5 \text{ dBm.}$$

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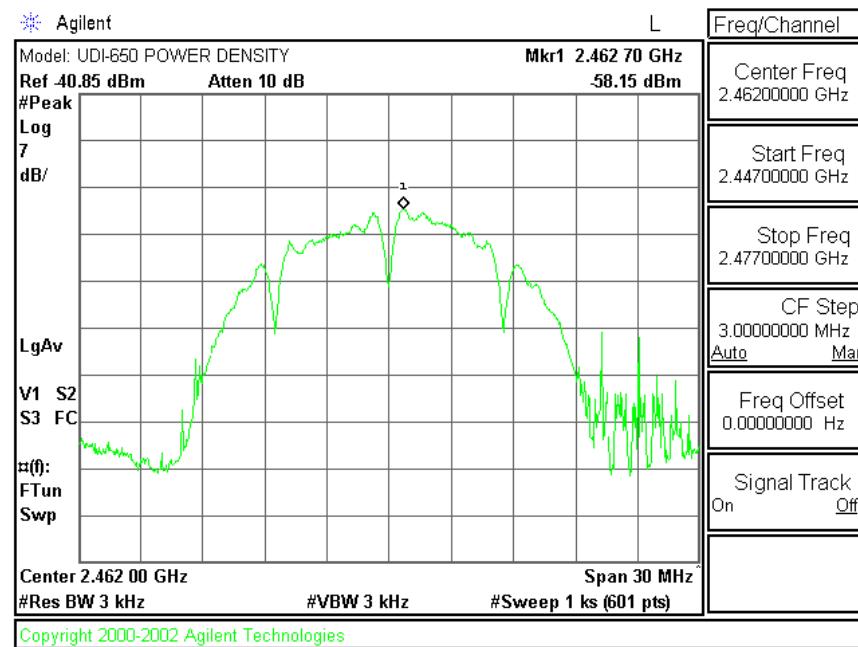


Plot A-7. Max. Power Density Plot – Ch. 01



Plot A-8. Max. Power Density Plot – Ch. 6

PCTEST LAB TEST REPORT 15.247	PCTEST Engineering Laboratory, Inc.	FCC Measurement Report		Reviewed by: Quality Manager
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Plot A-9. Max. Power Density Plot – Ch. 11

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EXHIBIT A – Test Results (Cont.)

Occupied BandEdge /BandEdge at 20dB below, & Out of Band Emissions

§15.247(c)

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard – All emissions in any 100kHz bandwidth outside of the spread spectrum band must be at least 20dB lower than the highest in-band spectral density.

The spectrum analyzer is set to:

RBW = 100 kHz (7dB/div)

VBW = 100 kHz

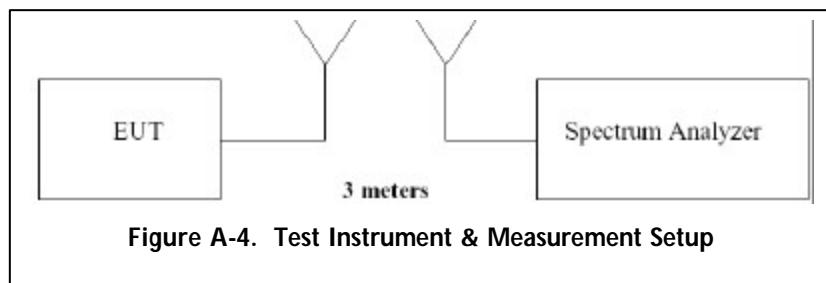
Span = 50 MHz

Ref. Level = 30 dBm

Sweep = Suitable duration based on the EUT specification

Data Transfer Rate: 11Mbps

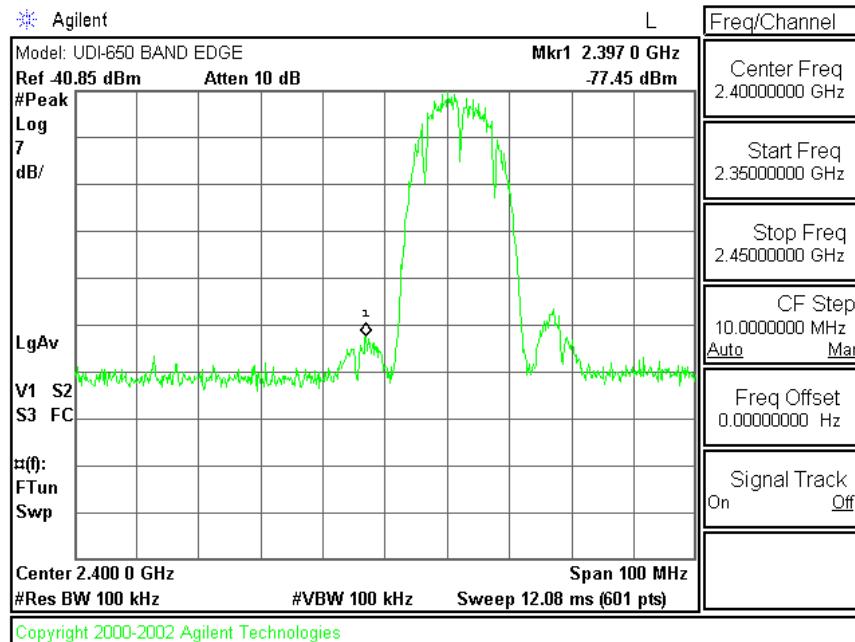
– See next pages for actual measured spectrum plots



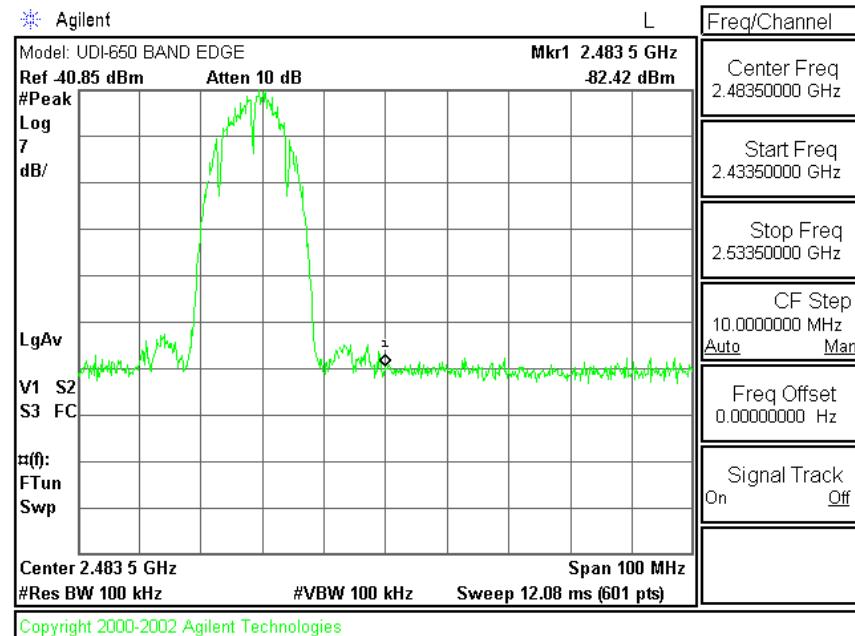
PCTEST LAB TEST REPORT 15.247		FCC Measurement Report			Reviewed by: Quality Manager
Filename: 15.231110561.RO4	Test Dates: November 11, 2003	EUT Type: Portable Data Terminal w/ WLAN PC Module	FCC ID: RO4AST-UDI650-00	Page 19 of 36	

EXHIBIT A – Test Results (Cont.)

Occupied BandEdge /BandEdge at 20dB below, & Out of Band Emissions



Plot A-10. 36 Mbps Occupied Band Edge Plot – Ch. 01



Plot A-11. 36 Mbps Occupied Band Edge Plot – Ch. 11

PCTEST LAB TEST REPORT 15.247	PCTEST Engineering Laboratory, Inc.	FCC Measurement Report		Reviewed by: Quality Manager
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EXHIBIT A – Test Results (Cont.)

Radiated Measurements

§15.247(b) / §15.205 & §15.209

Transfer Rate: 5.5 Mbps

Distance of Measurements: 3 Meters

Channel: 01

Frequency (MHz)	Level (dBm)	AFCL (dB)	POL (H/V)	Peak F/S (dB _m V/m)	Peak F/S (mV/m)	Margin (dB)
4824	-99.2	40.39	V	48.19	257	-5.81
7236	-107.5	47.42	V	46.92	222	-7.08
9648	-120	50.3	V	37.3	73	-16.7
12060	-135	53.7	V	25.7	19	-28.3

Table A-5. Radiated Measurements @ 3 meters

NOTES:

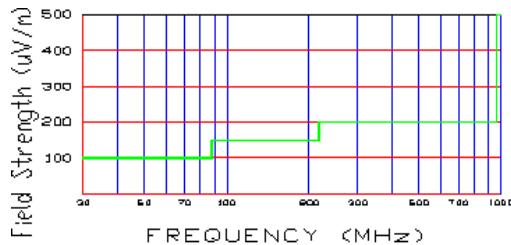


Figure A-5. Radiated limits at 3 meters.

1. All harmonics in the restricted bands specified in §15.205 are below the limit shown in Table G-1. (Note: * = Restricted Band measured frequency)
2. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz
3. Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz
4. The peak emissions above 1 GHz are not more than 20 dB above the average limit.
5. The antenna is manipulated through typical positions, polarity and length during the tests.
6. The EUT is supplied with nominal AC voltage or/and a new/fully-recharged battery.
7. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
8. < -135 dBm are below the analyzer floor level.
9. Above 1 GHz, the limit is 500 μV/m (54dB_μ/m) at 3 meters radiated.

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EXHIBIT A – Test Results (Cont.)

Radiated Measurements (Cont.)

§15.247(b) / §15.205 & §15.209

Transfer Rate: 5.5Mbps

Distance of Measurements: 3 Meters

Channel: 06

Frequency (MHz)	Level (dBm)	AFCL (dB)	POL (H/V)	Peak F/S (dBmV/m)	Peak F/S (mV/m)	Margin (dB)
4874	-99.1	40.5	V	48.4	263	-5.6
7311	-108	48	V	47	224	-7
9748	-114	50.3	V	43.3	146	-10.7
12185	-135	53.7	V	25.7	19	-28.3

Table A-6. Radiated Measurements @ 3 meters

NOTES:

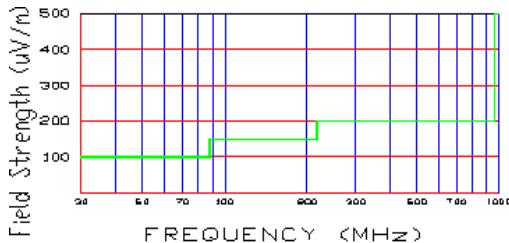


Figure A-6. Radiated limits at 3 meters.

1. All harmonics in the restricted bands specified in §15.205 are below the limit shown in Table G-1. (Note: * = Restricted Band measured frequency)
2. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz
3. Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz
4. The peak emissions above 1 GHz are not more than 20 dB above the average limit.
5. The antenna is manipulated through typical positions, polarity and length during the tests.
6. The EUT is supplied with nominal AC voltage or/and a new/fully-recharged battery.
7. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
8. < -135 dBm are below the analyzer floor level.
9. Above 1 GHz, the limit is 500 μV/m (54dBμ/m) at 3 meters radiated.

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EXHIBIT A – Test Results (Cont.)

Radiated Measurements (Cont.)

§15.247(b) / §15.205 & §15.209

Transfer Rate: 5.5 Mbps

Distance of Measurements: 3 Meters

Channel: 11

Frequency (MHz)	Level (dBm)	AFCL (dB)	POL (H/V)	Peak F/S (dBmV/m)	Peak F/S (mV/m)	Margin (dB)
4924	-101.6	40.7	V	46.1	202	-7.9
7386	-110.5	48.2	V	44.7	172	-9.3
9848	-119.7	50.4	V	37.7	77	-16.3
12310	-135	53.8	V	25.8	19	-28.2

Table A-7. Radiated Measurements @ 3 meters

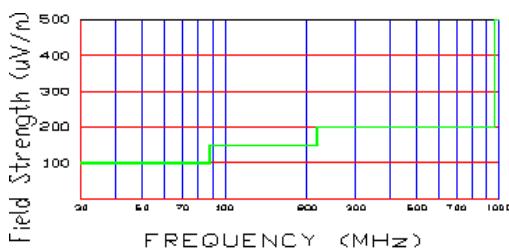


Figure A-7. Radiated limits at 3 meters.

NOTES:

1. All harmonics in the restricted bands specified in §15.205 are below the limit shown in Table G-1. (Note: * = Restricted Band measured frequency)
2. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz
3. Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz
4. The peak emissions above 1 GHz are not more than 20 dB above the average limit.
5. The antenna is manipulated through typical positions, polarity and length during the tests.
6. The EUT is supplied with nominal AC voltage or/and a new/fully-recharged battery.
7. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
8. < -135 dBm are below the analyzer floor level.
9. Above 1 GHz, the limit is 500 µV/m (54dBµ/m) at 3 meters radiated.

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EXHIBIT A – Test Results (Cont.)

Radiated Spurious Measurements – Receiver Mode

[§15.205](#) / [§15.209](#)

Distance of Measurements: 3 Meters

FREQ (MHz)	Level (dBm)	AFCL (dB/m)	POL (H/V)	Height (m)	Azimuth (° angle)	F/S (uV/M)	Margin (dB)
54.9	-82.5	4.0	H	2.8	30	26.7	-11.5
153.6	-84.6	13.9	H	2.5	190	65.3	-7.2
175.5	-84.5	13.5	V	2.3	190	63.3	-7.5
187.5	-86.9	15.9	H	1.6	170	63.2	-7.5
434.9	-94.8	24.5	V	1.3	180	68.4	-9.3
473.0	-97.4	25.5	H	1.1	200	56.7	-10.9

Table A-8. Radiated Measurements at 3-meters

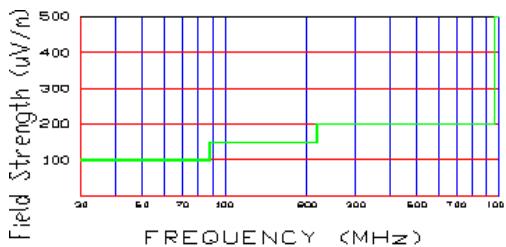


Figure A-17. Radiated limits at 3 meters

NOTES:

1. All emissions were investigated and the worst-case emissions are reported.
2. For hand-held devices, the EUT is rotated through three orthogonal axes to determine which configuration produces the maximum emissions.
3. The EUT is supplied with the minimal AC voltage or/and a new/fully re-charged battery.
4. The EUT was tested up to the 10th harmonic (25GHz) and no significant emission was found.
5. Above 1 GHz the limit is 500 μ V/m at 3 meters radiated.

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EXHIBIT A – Test Results (Cont.)

Radiated Restricted Band Measurements

§15.205 / §15.209

Special attention is made for the EUT's harmonic and spurious radiated emission in the restricted bands of operations. The EUT was tested from 9kHz and up to the tenth harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHZ. Above 1 GHz, average measurement was used, using RBW 1MHz – VBW 10Hz and linearly polarized horn antennas. All harmonics/spurs are at least 20dB below the highest emission in the authorized band using RBW = 100kHz. In addition, peak measurements were taken to ensure that the peak levels are not more than 20dB above the average limit. All out of band emissions, other than those created by the spreading sequence, data sequence, and the carrier modulation must not exceed the limits show in Table G-1 per Section 15.209.

Frequency	F/S (mV/m)	Measured Distance (Meters)
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table A-9. Restricted Band Limits

TEST MEASUREMENT EQUIPMENT

Agilent E4448A	PSA Spectrum Analyzer 3 Hz - 50GHz
HP 8566B	Spectrum Analyzer 100Hz – 22GHz
HP 83017A	Microwave Analyzer 40dB Gain (0.5 – 26.5GHz)
HP 3784A	Digital Transmission Analyzer
EMCO 3115	Horn Antenna (1 – 18GHz)
HP 8495A	20dB Attenuator (DC-40GHz) 0 –70dB
HP 8493B	10dB Attenuator
MicroCoax Cables	Low Loss Microwave Cables (1 – 26.5GHz)
CDI Dipoles	Dipole Antennas (30 – 1000MHz)
EMCO 3116	Horn Antenna (18 – 40GHz)

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EXHIBIT A – Test Results (Cont.)

Radiated Restricted Band Measurements (Cont.)

§15.205 /§15.209 courtesy

Operating Frequency (Tx Mode): 2462 MHz

Distance of Measurements: 3 Meters

FREQ (MHz)	Level (dBm)	AFCL (dB/m)	POL (H/V)	Peak F/S (dB μ V/m)	Peak F/S (uV/M)	Margin (dB)
2483.9	-91.0	33.0	V	50.0	316.2	-4.0
2484.5	-107.5	33.0	V	33.5	47.3	-20.4
2484.6	-100.5	33.1	V	40.6	107.2	-13.4
2485.1	-101.2	33.1	V	39.7	96.6	-14.3
2493.0	-101.3	33.2	V	39.9	98.9	-14.1
2496.0	-101.4	33.2	V	39.8	97.7	-8.8

Table A-10. Radiated Restricted Band Measurements at 3-meters

NOTES:

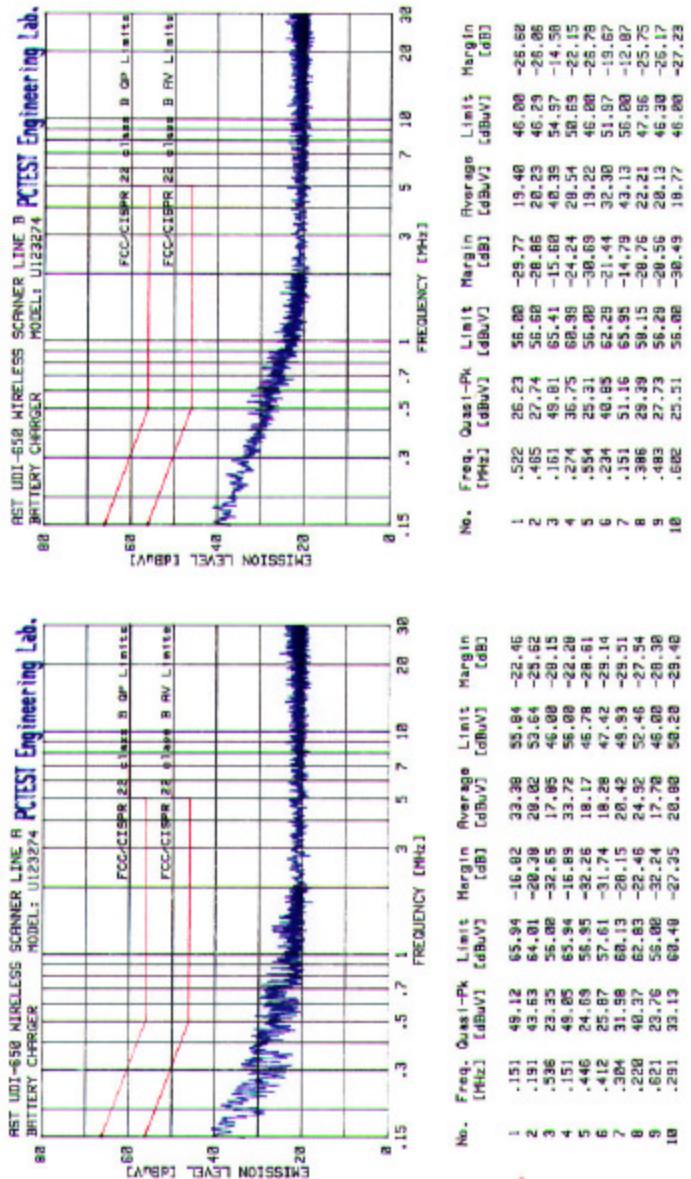
1. The antenna is manipulated through typical positions, polarity and length during the testing.
2. The EUT is supplied with the minimal AC voltage or/and a new/fully recharged battery.
3. The spectrum is measured from 9kHz up to the 10th harmonic and the worst-case emissions are reported.
4. The limits are shown on Figure A-14. Above 1 GHz the limit is 500 μ V/m.
5. < -135 dBm is below the analyzer measurement floor level.

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EXHIBIT A – Test Results (Cont.)

Line-Conducted Test Data

§15.207



Notes:

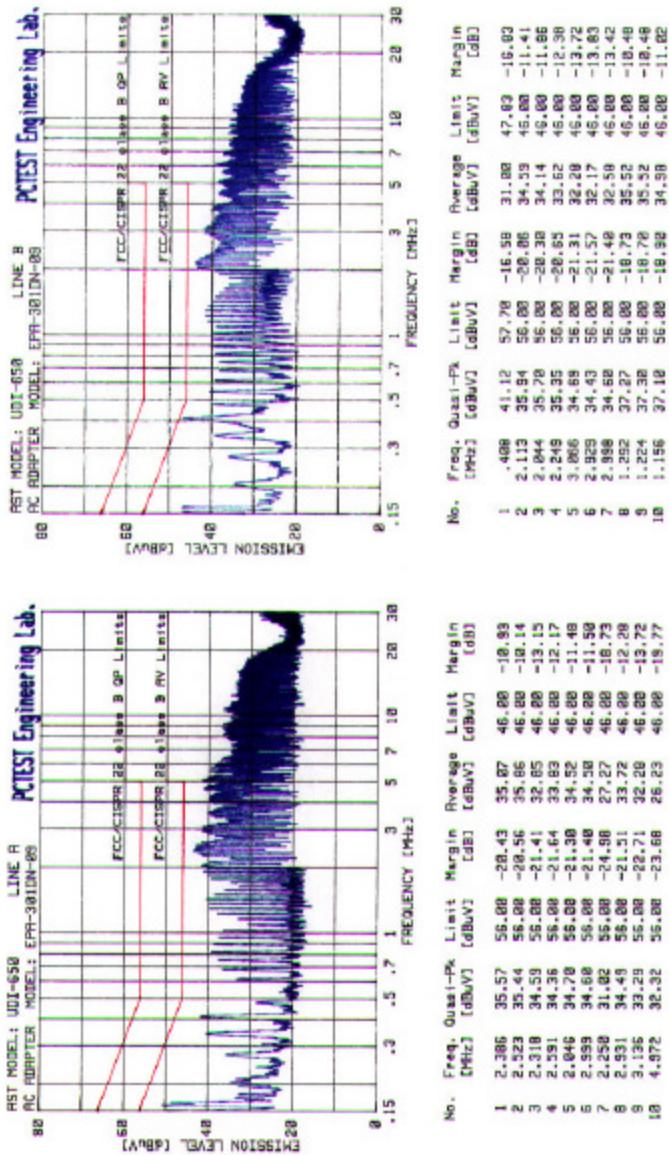
1. All Modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are Specified in EN55022.
3. Line A = Phase; Line B = Neutral
4. Deviations to the Specifications: **None.**

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EXHIBIT A – Test Results (Cont.)

Line-Conducted Test Data

§15.207



Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are Specified in EN55022.
3. Line A = Phase; Line B = Neutral
4. Deviations to the Specifications: **None.**

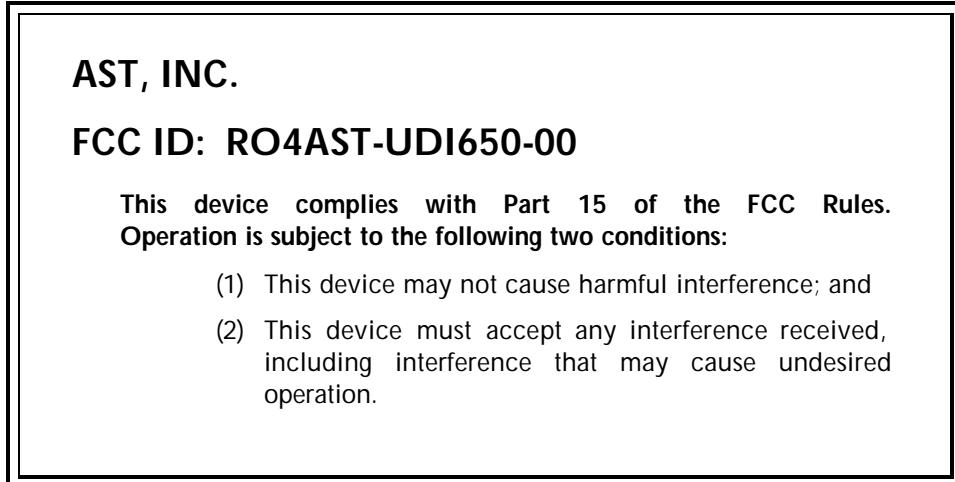
PCTEST LAB TEST REPORT 15.247	 FCC Measurement Report	Reviewed by: Quality Manager		
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EXHIBIT B – Labeling Requirements**Sample Label & Location**

New Labeling Requirements

Per 2.1074 & 15.19: Docket 95-19

The sample label shown below shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name, FCC ID, and the FCC logo must be displayed on the device per Section 15.19 (b)(2).



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EXHIBIT B – Labeling Requirements (Cont.)

Sample Label & Location



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EXHIBIT C – Block Diagram/Schematics

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EXHIBIT D – Parts List

PCTEST LAB TEST REPORT 15.247		FCC Measurement Report		Reviewed by: Quality Manager
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EXHIBIT E – Operational Description

PCTEST LAB TEST REPORT 15.247		FCC Measurement Report		Reviewed by: Quality Manager
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EXHIBIT F – Test Setup Photographs

The Line-Conducted and Radiated Test Pictures show the worst-case configuration and cable placement with a minimum margin to the specifications.

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EXHIBIT G – EUT External/Internal Photographs

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EXHIBIT H – User's Manual

PCTEST LAB TEST REPORT 15.247		FCC Measurement Report		Reviewed by: Quality Manager
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