



L.S. Compliance, Inc.

W66 N220 Commerce Court
Cedarburg, WI 53012
262-375-4400 Fax: 262-375-4248

Compliance Testing of:

HP 6777 Wireless Headphone

Prepared For:

**Mr. Narain Daryanani
ADY Technologies, Ltd.
Room 1302, Perfect Commercial Building
20 Austin Avenue
TSIM SHA TSUI
Kowloon, Hong Kong**

Test Report Number:

302343 TX Revision 1

Test Dates:

September 10th, 11th, 16th and 17th, 2002

All results of this report relate only to the items that were tested. This report may not be reproduced, except in full, without written approval of L.S. Compliance, Inc.

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1. L.S. Compliance in Review

L. S. Compliance, Inc. is located in Cedarburg, Wisconsin – United States.

We may be contacted by:

Mail: L. S. Compliance, Inc.
W66 N220 Commerce Court
Cedarburg, Wisconsin 53102

Phone: 262-375-4400
Fax: 262-375-4248
E-Mail: eng@lsr.com

As an EMC testing laboratory, our accreditation and assessments are recognized through the following:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2001

With electrical (EMC) Scope of Accreditation

A2LA Certificate Number: **1255.01**

U.S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U.S. conformity assessment Body operating under the U.S./EU, Mutual Recognition Agreement (MRA) operating under the European Union EMC Directive 89/336/EEC, Article 10.2

Date of Validation: **January 16, 2001**

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948

FCC Registration Number: **90756**

Listing of 3 and 10 Meter OATS based on 47CFR 2.948

FCC Registration Number: **90757**

Industry Canada

On-file, 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948

File Number: **IC 3088**

On-file 3 and 10 meter OATS based on RSS-210

File Number: **IC 3088-A**

2. A2LA Certificate of Accreditation



3. A2LA Scope of Accreditation

	
American Association for Laboratory Accreditation	
<u>SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999</u>	
L.S. COMPLIANCE, INC. W66 N220 Commerce Court Cedarburg, WI 53012 James Blaha Phone: 262 375 4400	
ELECTRICAL (EMC)	
Valid to: January 31, 2003	Certificate Number: 1255-01
In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:	
<u>Test</u>	<u>Test Method(s)</u>
Conducted Emissions Continuous/Discontinuous	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11, 22; CNS 13438
Radiated Emissions	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11, 22; CNS 13438
Conducted Immunity Fast Transients/Burst	IEC: 1000-4-4, 801-4; EN: 61000-4-4, 50082-1, 50082-2
Surge	IEC: 1000-4-5, 801-5; ENV 50142; EN: 61000-4-5, 50082-1, 50082-2
RF Fields	IEC: 1000-4-6, 801-6; ENV 50141; EN: 61000-4-6, 50082-1, 50082-2
Voltage Dips/Interruptions	IEC 1000-4-11; EN: 61000-4-11, 50082-1, 50082-2
Radiated Immunity RF Fields	IEC: 801-3, 1000-4-3; ENV 50140; EN: 61000-4-3, 50082-1, 50082-2
RF Fields (50 Hz)	IEC 1000-4-8; EN 61000-4-8
RF Fields (Pulse Mode)	EN: 50082-1, 50082-2; ENV 50204
Electrostatic Discharge (ESD)	IEC: 1000-4-2, 801-2; BSEN 60801-2; EN: 61000-4-2, 50082-1, 50082-2
(A2LA Cert. No. 1255.01) 06/26/01	
5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644-3248 • Fax: 301-662 2974	
	
Page 1 of 1	
	

4. Validation Letter – U.S. Competent Body for EMC Directive 89/336/EEC



January 16, 2001



UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

Mr. James J. Blaha
L.S. Compliance Inc.
W66 N220 Commerce Court
Cedarburg, WI 53012-2636

Dear Mr. Blaha:

I am pleased to inform you that the European Commission has validated your organization's nomination as a U.S. Conformity Assessment Body (CAB) for the following checked (✓) sectoral annex(es) of the U.S.-EU Mutual Recognition Agreement (MRA).

- (✓) Electromagnetic Compatibility-Council Directive 89/336/EEC, Article 10(2)
- () Telecommunication Equipment-Council Directive 98/13/EC, Annex III
- () Telecommunication Equipment-Council Directive 98/13/EC, Annex III and IV
Identification Number:
- () Telecommunication Equipment-Council Directive 98/13/EC, Annex V
Identification Number:

This validation is only for the location noted in the address block, unless otherwise indicated below.

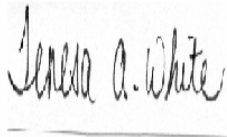
- (✓) Only the facility noted in the address block above has been approved.
- () Additional EMC facilities:
- () Additional R&TTE facilities:

Please note that an organization's validations for various sectors of the MRA are listed on our web site at <http://ts.nist.gov/mra>. You may now participate in the conformity assessment activities for the operational period of the MRA as described in the relevant sectoral annex or annexes of the U.S.-EU MRA document.

NIST will continue to work with you throughout the operational period. All CABs validated for the operational phase of the Agreement must sign and return the enclosed CAB declaration form, which states that each CAB is responsible for notifying NIST of any relevant changes such as accreditation status, liability insurance, and key staff involved with projects under the MRA. Please be sure that you fully understand the terms under which you are obligated to operate as a condition of designation as a CAB. As a designating authority, NIST is responsible for monitoring CAB performance to ensure continued competence under the terms of the MRA.

NIST

5. Signature Page

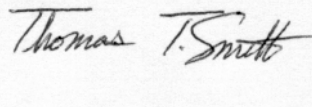


September 19, 2002

Prepared By:

Teresa A. White, Document Coordinator

Date

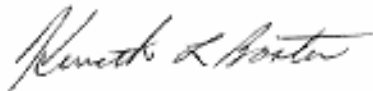


September 19, 2002

Tested By:

Thomas T. Smith, EMC Engineer

Date



September 19, 2002

Approved By:

Kenneth L. Boston, EMC Lab Manager
PE #31926 Licensed Professional Engineer
Registered in the State of Wisconsin, United States

Date

6. Product and General Information

Manufacturer:	ADY Technologies, Ltd.
Model Number:	HP 6777
Serial Number:	Engineering Unit
Frequency Range:	Dual Frequency; 903.0 MHz and 904.0 MHz
Test Voltage:	120VAC/60Hz

Environmental Conditions in the Test Lab:

Temperature: 20-25° C
Atmospheric Pressure: 86kPa-106kPa
Humidity: 30-60%

7. Introduction

On September 10th, 11th, 16th and 17th, 2002 a series of Radiated Emissions tests were performed on the ADY Model #HP 6777 Transmitter. This product is powered by 120VAC/60Hz.

These tests were performed using the test procedure outlined in ANSI C63.4, 2001 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.249, for a manually operated transmitter.

8. Purpose

The above-mentioned tests were performed in order to determine the compliance of the equipment under test (EUT), with limits contained in various provisions of Title 47CFR, FCC Part 15, including: 15.205, 15.207, 15.209 and 15.249.

All radiated emission tests were performed to measure the emissions in the frequency bands described in Section 12i of this report, and to determine whether said emissions are below the limits established by the sections above.

These tests were performed in accordance with the procedures described in the American National Standard for methods of measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4, 2001).

Also used as a reference, for the EMI Receiver specification, is the International Special Committee on Radio Interference – CISPR 16-1, 1999.

9. Product Description

The HP 6777 is a 900 MHz stereo wireless headphone using two discreet radio carriers rather than the conventional FM multiplex system. Transmit carriers are generated by directly modulated frequency synthesizers controlled by a small microprocessor. The transmitter may be either battery powered or AC line powered. The audio signals are connected via line level audio input jacks on the rear of the unit.

10. Test Requirements

The EUT was to be tested for radiated emissions, and compliance with the limits set forth by 47 CFR, Parts 15.205, 15.207, 15.209 and 15.249, for low power transmitters.

11. Summary of Test Report

The EUT was found to **MEET** the requirements as described within the specifications of Title 47 CFR, Part 15.249.

12. Radiated Emission Test

12a. Test Setup

The equipment under test (EUT) was operated within the 3 Meter FCC listed Semi-Anechoic Chamber, located at L.S. Compliance, Inc., Cedarburg, Wisconsin. The EUT was placed on an 80cm high pedestal, which was centered on the flush-mounted 2m diameter metal turntable. The test sample was operated in continuous transmit CW mode for the radiated emissions measurements, and in a normal mode for all other measurements.

12b. Test Procedure

The fundamental and spurious (harmonic) emissions of the transmitter were tested for compliance to Title 47CFR, FCC Part 15.249 limits for a low power transmitter in the ISM bands.

The EUT was tested from the lowest frequency generated by the transmitter (without going below 9kHz) to the 10th harmonic of the fundamental frequency generated by the device. The appropriate limits were also observed when spurious signals were located within any of the restricted bands as described in Part 15.205a.

The EUT was placed on an 80 cm high pedestal, with the Antenna Mast placed 3 m from the EUT. A Bi-conical Antenna was used to measure emissions from 30 MHz to 300 MHz, a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz, and a Double Ridged Waveguide Horn Antenna was used to measure emissions above 1 GHz.

The EUT was modified to produce a continuous CW signal. The resultant signals from the fundamental, harmonics, and spurious signals were maximized by rotating the turntable 360 degrees, and by raising and lowering the Antenna between 1 and 4 meters. The EUT was also given different orientations to determine the maximum signal levels, using both horizontal and vertical antenna polarities.

12c. Test Results

The unit was scanned for emissions, over the range of 30 to 10,000 MHz to establish compliance with Parts 15.249 and 15.205 while in continuous transmit mode. At frequencies below the fundamental, no spurious signals, other than the noise floor of the system could be found within 20dB of the limits. A numeric list of measured emissions appears in Section 12i of this report.

12d. Occupied Bandwidth

Operating a transmitter under the FCC Part 15.249 guidelines does not require a measurement of the occupied bandwidth.

12e. Test Equipment Utilized, Radiated Emissions

A list of the test equipment used for the tests can be found in Appendix B. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All antenna calibrations were performed at a N.I.S.T. traceable site, and the resultant correction factors were entered into the HP8546A EMI Receiver software base.

The connecting cables used were also measured for loss using a calibrated Signal Generator and the HP8546A EMI Receiver. The resulting loss factors were entered into the HP8546A EMI Receiver database. This allowed for automatic change in the antenna correction factor. The resulting data taken from the HP8546A EMI Receiver is an actual reading and can be entered into the database as a corrected meter reading.

The resultant reading can then be compared to the appropriate limit in order to determine compliance with the EMC directive. The HP8546A EMI Receiver was operated with a bandwidth of 120 kHz when receiving signals below 1 GHz, and with a bandwidth of 1 MHz when receiving signals above 1 GHz, in accordance with CISPR 16.

The Peak, Quasi-Peak and Average detector functions were all used.

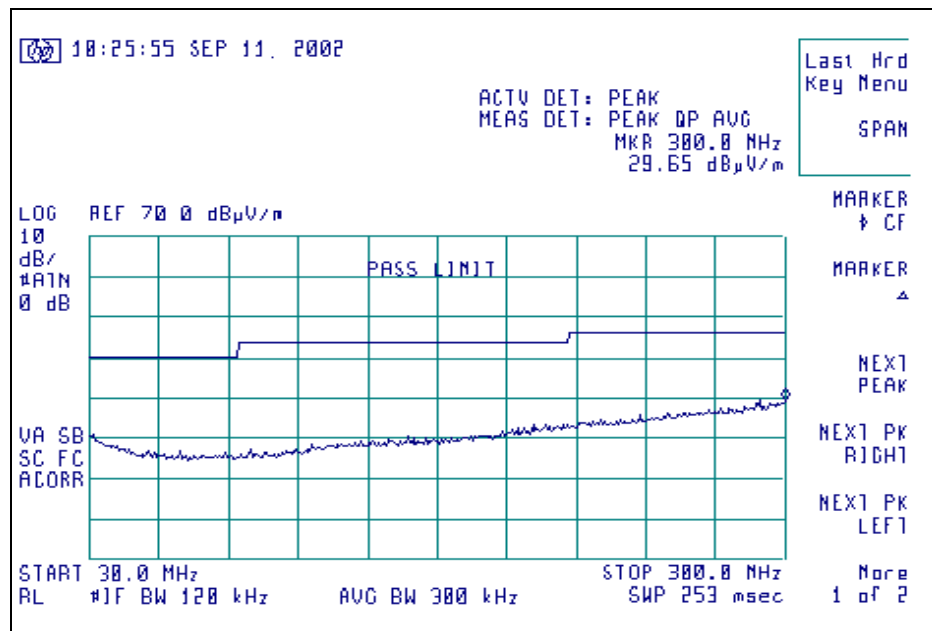
12f. Photo of Setup for Radiated Emissions Test

In the 3 Meter Semi-Anechoic Chamber



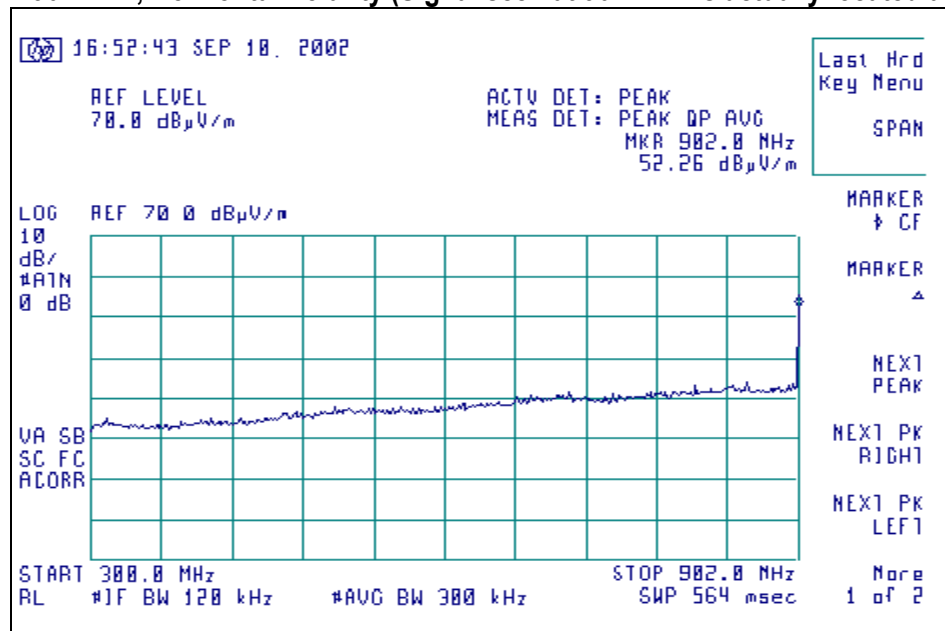
12g. Signature Scans – Radiated Emissions

Signature Scan of Radiated Emissions 30 MHz – 300 MHz, Vertical Polarity

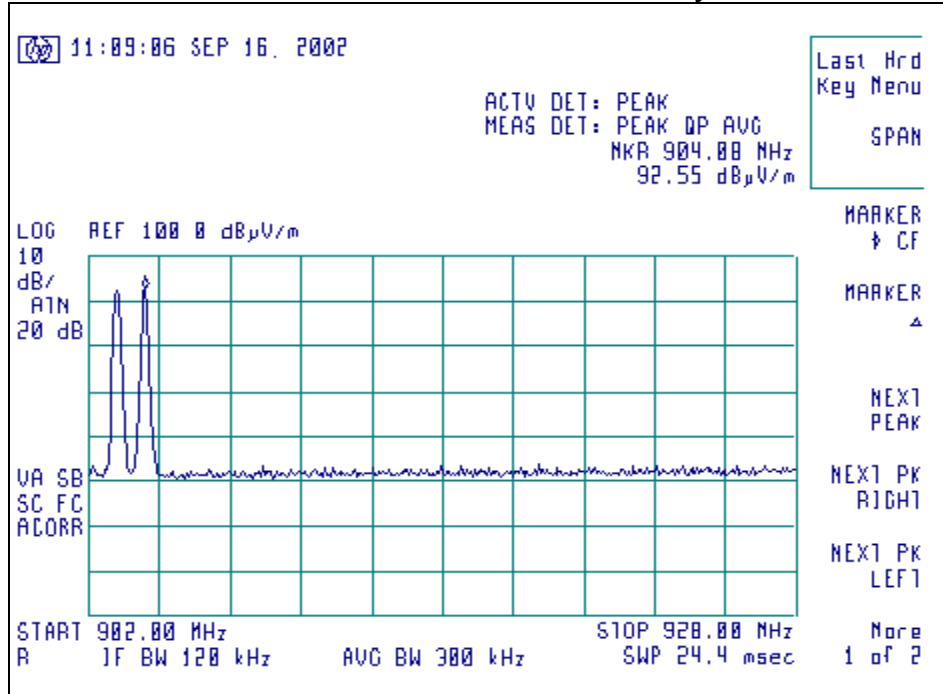


Signature Scan of Radiated Emissions

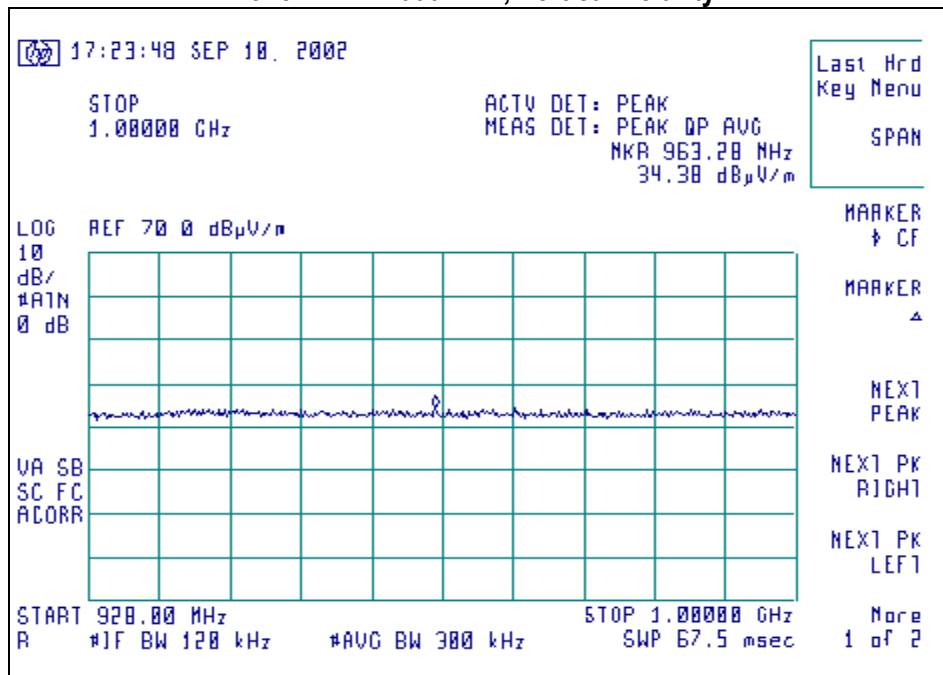
300 MHz – 902 MHz, Horizontal Polarity (Signal seen at 902 MHz is actually located at 903 MHz)



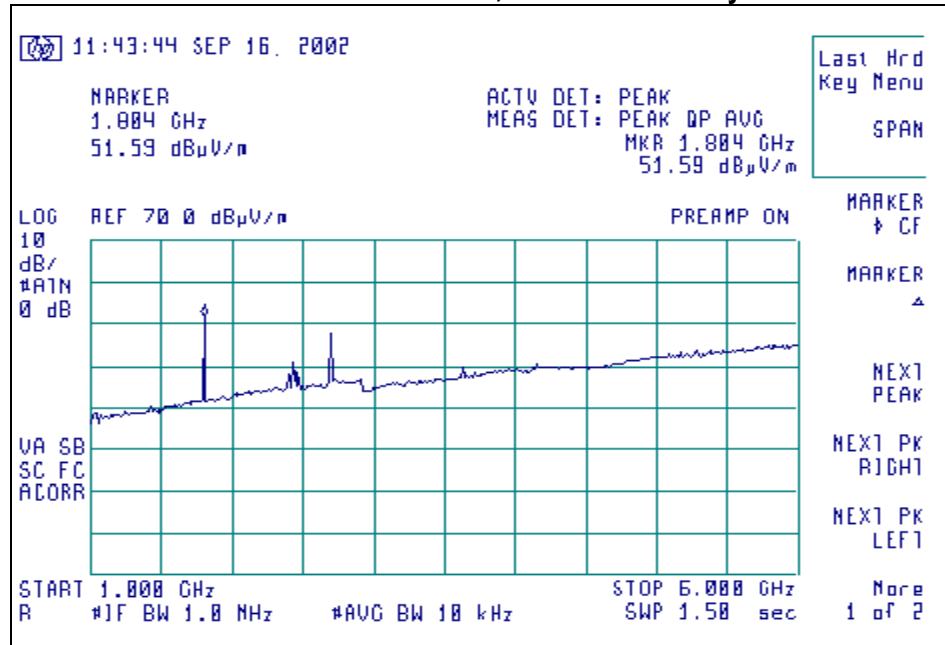
Signature Scan of Radiated Emissions 902 MHz – 928 MHz, Vertical Polarity



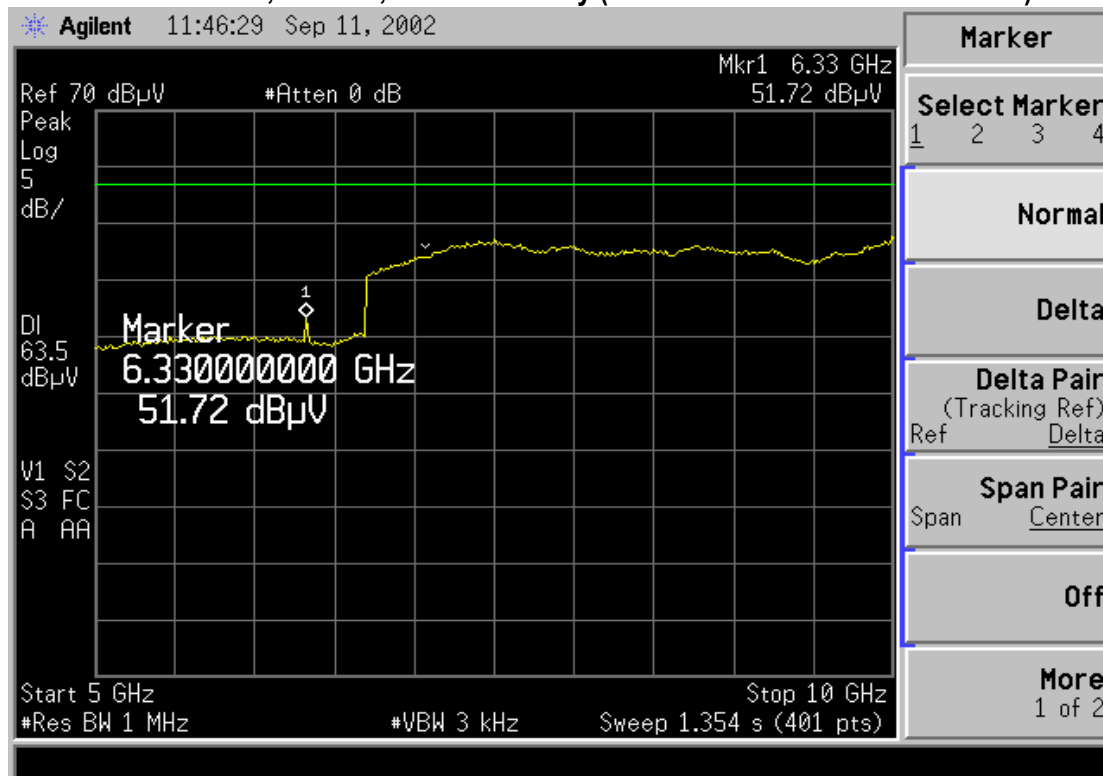
Signature Scan of Radiated Emissions 928 MHz – 1000 MHz, Vertical Polarity



Signature Scan of Radiated Emissions 1000 MHz – 6000 MHz, Horizontal Polarity



Signature Scan of Radiated Emissions 5000 MHz – 10,000 MHz, Vertical Polarity (Measurement distance of 1 meter)



12i. Measurement of Electromagnetic Radiated Emission
Within the 3 Meter Semi-Anechoic FCC Listed Chamber

Manufacturer: ADY Technologies, Ltd.
Date of Test: September 10th, 11th, 16th and 17, 2002
Model: HP 6777
Serial: Engineering Unit
Test Specifications: FCC Parts 15.205, 15.209 and 15.249

Distance: 3 Meters, 1 Meter			Frequency Range Inspected: 30 to 10,000 MHz			
Configuration: Continuous Data Transmit						
Detector(s) Used:	√	Peak	√	Quasi-Peak	√	Average

Test Equipment Used:

EMI Receiver: HP 8546A	Log Periodic Antenna: EMCO 93146
Double-Ridged Horn Antenna: EMCO 3115	Biconical Antenna: EMCO 93110B
Microwave Spectrum Analyzer: HP E4407	

The following tables depict the level of significant fundamental and harmonic emissions found.

Frequency (MHz)	Antenna Polarity	Height (Meters)	Azimuth (0°-360°)	Average EMI Meter Reading (dBμV/m)	Average Limits per 15.249, 15.209 (dBμV/m)	Average Margin (dB)
901.9	V	1.0	83	38.4 *	46	7.6
903.0	V	1.12	90	93.5 *	94	0.5
904.0	V	1.12	90	93.8 *	94	0.2
1.806	V	1.23	154	51.5	54	2.5
1.808	V	1.25	114	51.2	54	2.8
2.709	V	1.0	70	46.0	54	8.0
2.712	V	1.0	17	47.7	54	6.3
1.806	H	1.10	33	51.8	54	2.2
1.808	H	1.09	262	48.3	54	5.7
2.709	H	1.12	315	50.1	54	3.9
2.712	H	1.12	0	49.3	54	4.7

*** Quasi-Peak Detector used for these three measurements.**

Note: Line voltage was varied between 85% and 115% (98V-132V) with 0.1 dB difference in fundamental output.

12j. Test Results

The unit was scanned for emissions, over the range of 30 MHz to 10,000 MHz to establish compliance with Parts 15.205, 15.207, 15.209 and 15.249, while in continuous transmit mode. At frequencies below the fundamental, no spurious signals, other than the noise floor of the system could be found within 20dB of the limits.

12k. Test Equipment Utilized

A list of the test equipment and antennas used for the tests can be found in Appendix B. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All antenna calibrations were performed at a N.I.S.T. traceable site, and the resultant correction factors were entered into the HP8546A EMI Receiver software database.

The connecting cables used were also measured for loss using a calibrated Signal Generator and the HP8546A EMI Receiver. The resulting loss factors were entered into the HP8546A database. The resulting data taken from the HP8546A EMI Receiver is an actual reading and can be entered into the database as a corrected meter reading.

The resulting reading was then compared to the appropriate limit in order to determine compliance with the EMC directive. The HP8546A EMI Receiver was operated with a bandwidth of 120 kHz when receiving signals below 1 GHz, and with a bandwidth of 1 MHz when receiving signals above 1 GHz, in accordance with CISPR 16 standards. An Agilent EE4407B microwave spectrum analyzer was used above 6 GHz

The Peak, Quasi-Peak and Average detector functions were all used.

13. Conducted Emissions Test

Test Setup

The Conducted Emissions test was performed within the Shielded Room, located at L.S. Compliance, Inc. in Cedarburg, Wisconsin. The test area and setup are in accordance with ANSI C63.4-2001 and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210). The EUT was placed on a pedestal, with a height of 80 cm above the reference ground plane. The EUT's power supply was plugged into a 50 Ω (ohm), 50/250 μ H Line Impedance Stabilization Network (LISN). The AC power supply of 120V was fed into the Shielded Room via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup in the Shielded Room and connected to the LISN, the RF Sampling Port of the LISN was cabled to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMCO LISN used has the ability to terminate the unused port with a 50 Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

Test Procedure

The appropriate frequency range and bandwidths were entered into the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (1993), Section 1, Table 1, and using a Quasi-Peak detector in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is found in Appendix B. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for malfunction. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

Test Results

The EUT was found to MEET the Conducted Emission requirements of FCC Part 15.209, Conducted Emissions for a low power transmitter. See the Data Charts and Graphs for more details of the test results.

Notes:

Measurement of Electromagnetic Conducted Emission
In the Shielded Room

Frequency Range Inspected: 0.15 MHz to 30.0 MHz

Manufacturer: ADY Technologies, Ltd.

Date of Test: September 10th, 11th, 16th and 17th, 2002

Model No.: HP 6777

Serial No.: Engineering Unit

Test Requirements: FCC Part 15.107

Distance: N/A				Frequency Range Inspected: 0.45 to 30 MHz		
Configuration: Continuous Display						
Detector(s) Used:	√	Peak	√	Quasi-Peak	√	Average

Test Equipment Used:

EMI Receiver: HP 8546A	Biconical Antenna: EMCO 3110
Double-Ridged Wave Guide/Horn Antenna: EMCO 3115	Log Periodic Antenna: EMCO 43146A

Frequency (MHz)	Line	Q-Peak Reading (dBμV/m)	Q-Peak Limit (dBμV/m)	Q-Peak Margin (dB)
0.388	L1	39.3	58.0	18.7
0.431	L1	38.9	57.2	18.3
0.455	L1	38.2	56.8	18.6
0.493	L1	37.2	56.2	19.0
0.443	L2	37.1	57.0	19.9
0.486	L2	36.4	56.2	19.8

All average detector readings were greater than 20 dB below the limit.

Photos Taken During Conducted Emission Testing

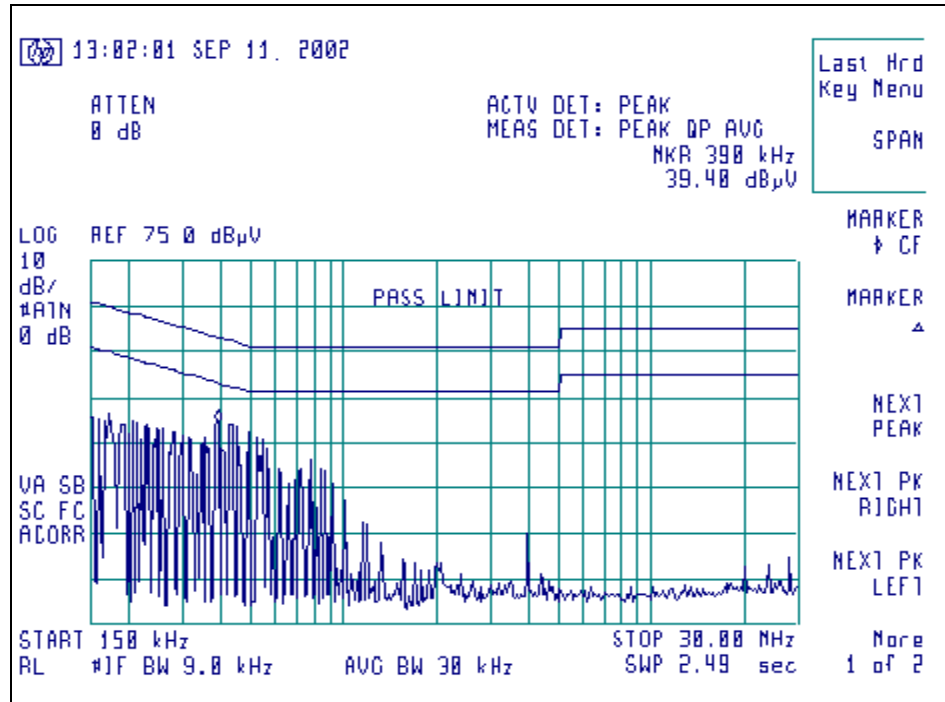
Setup for the Conducted Emissions Test



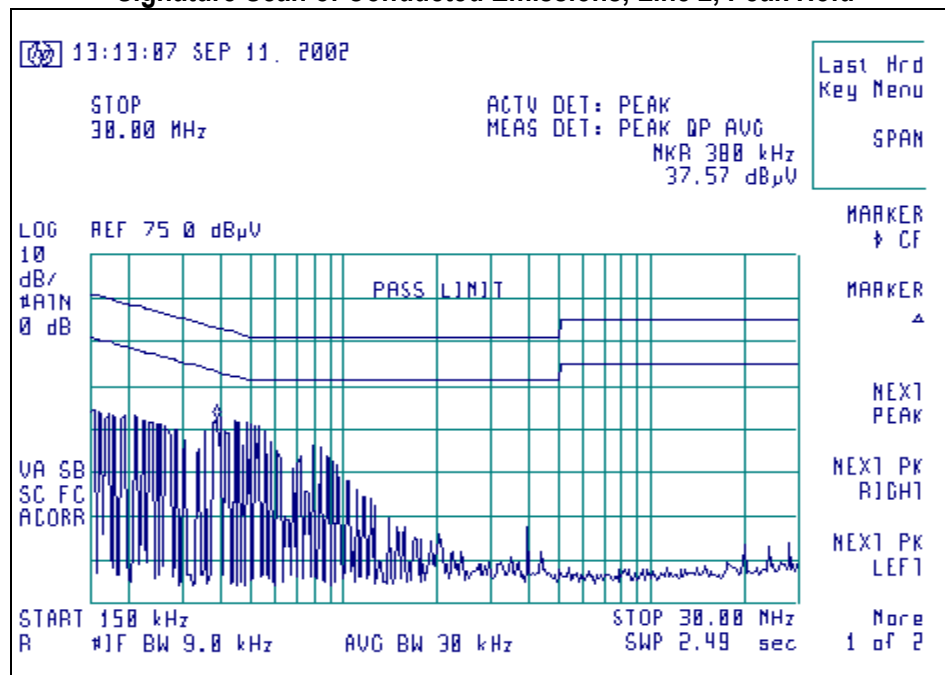
View of the EUT during Conducted Emissions Testing

Graphs made during Conducted Emission Testing

Signature Scan of Conducted Emissions, Line 1, Peak Hold



Signature Scan of Conducted Emissions, Line 2, Peak Hold



APPENDIX A

Calculations

Manufacturer: ADY Technologies, Ltd.

Model: HP 6777

Serial: Engineering Unit

CALCULATION OF RADIATED EMISSIONS LIMITS FOR FCC PART 15.209, and 15.249 (260-470 MHz)

FIELD STRENGTH OF FUNDAMENTAL FREQUENCIES:

The fundamental emissions for a 916 MHz transmitter, operating under the FCC Part 15.249 limits, must have a field strength no greater than 50 mV/m at 3 meters, and a harmonic field strength no greater than 500 μ V/m at 3 meters.

FIELD STRENGTH OF SPURIOUS/HARMONIC FREQUENCIES:

Spurious emissions outside the 902-928 MHz band shall be attenuated by at least 50 dB below the level of the fundamental, or meet the limits expressed in FCC Parts 15.205 and 15.209, under the general emission limits.

Where f_o = 903 MHz and 904 MHz

Fundamental: $20 \text{ Log } (50\text{mV}/1\mu\text{V}) = 93.97 \text{ dB}\mu\text{V/m @ 3m}$

Harmonic: $20 \text{ Log } (500\mu\text{V}/1\mu\text{V}) = 53.97 \text{ dB}\mu\text{V/m @3m}$

Frequency (MHz)	Fundamental Limit (μV/m @ 3m)	Fundamental Limit (dBμV/m @ 3m)	Harmonic Limit (μV/m @ 3m)	Harmonic Limit (dBμV/m @ 3m)
902-928	50,000	94.0	500	54.0

APPENDIX B

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Calibration Information	
					Date	Due Date
AA960007	EMCO	3115	9311-4138	Horn Antenna	09-19-02	09-19-03
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization	09-19-02	09-19-03
AA960014	Fischer	FCC-801-M3-25	148	Coupler-De-Coupler Network	10-06-01	10-06-02
AA960023	Werlatone	C3910	5167	Directional Coupler 40dB	06-19-01	Note 1*
AA960024	Pasternack	100 Watts	PE 7021-6	DC-1.5 GHz Attenuator	I/O	Note 1*
AA960050	Chase	BiCBL6140A	Bilog 1106	Bilog Antenna	06-19-01	Note 1*
AA960054	Giga-Tronics	80301A	1830164	Power Sensor	05-02-02	05-02-03
AA960074	Fischer	F2031-32mm	361	EM Injection Clamp	06-22-01	N/A
AA960076	Fischer	F201-32mm	347	Absorbing Clamp	11-29-01	11-29-02
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	09-19-02	09-19-03
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	09-19-02	09-19-03
CC00181C	HP	33120A	US36013549	Signal Generator	09-29-00	N/A
CC00221C	Agilent	E4407B	US39160256	Spectrum analyzer	09-24-01	09-24-02
EE960003	Amplifier Research	100W 1000M1A	19821	100 Watts Amp	06-19-01	Note 1*
EE960005	Giga-Tronics	8542C	1831450	Dual Channel Power Meter	09-19-02	09-19-03
EE960006	Haefely Trench	PESD 1600	H604079	ESD Gun	11-09-01	11-09-02
EE960007	Haefely Trench	P-line 1610	083732-19	Line Fluctuation Generator	11-03-01	11-03-02
EE960010	Haefely Trench	P-Surge-4	083061-08	Power Surge Generator	11-04-01	11-04-02
EE960011	Haefely Trench	PEFT 4010	083180-21	EFT/Burst Generator	11-02-01	11-02-02
EE960013	HP	8546A	3617A00320	Receiver RF Section	11-02-01	11-02-02
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	11-02-01	11-02-02
EE960015	HP	6843A	3531A-00145	AC Power Source/Analyzer	10-22-00	N/A
EE960016	Marconi	2024	112120/044	Signal Generator	09-19-02	09-19-03
EE960055	Amplifier Research	75A250	21952	75 Watts Amp	06-22-01	Note 1*

Note 1* - Equipment calibrated within a traceable system.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uc Value in Appropriate Units
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V