DLS ELECTRONIC SYSTEMS, INC.
NVLAP 100276-0

1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: PA821
Report Number: 10185

FCC Rules and Regulations / Intentional Radiators

Low Power Auxiliary Stations

Part 74, Subpart H, Sections 74.801 - 74.882

THE FOLLOWING **"MEETS"** THE ABOVE TEST SPECIFICATION

Formal Name:	PSM Antenna Combiner
Kind of Equipment:	Antenna Combiner
Test Configuration:	BNC to BNC (Tested at 120 vac, 60 Hz)
Model Number(s):	PA821
Model(s) Tested:	PA821
Serial Number(s):	DM007
Date of Tests:	May 6, 8 & 14, 2003
Test Conducted For:	Shure Inc. 222 Hartrey Avenue Evanston, Illinois 60202

1250 Peterson Dr., Wheeling, IL 60090

SIGNATURE PAGE

Report By:

Arnom C. Rowe
Test Engineer
EMC-001375-NE

Reviewed By:

William Stumpf
OATS Manager

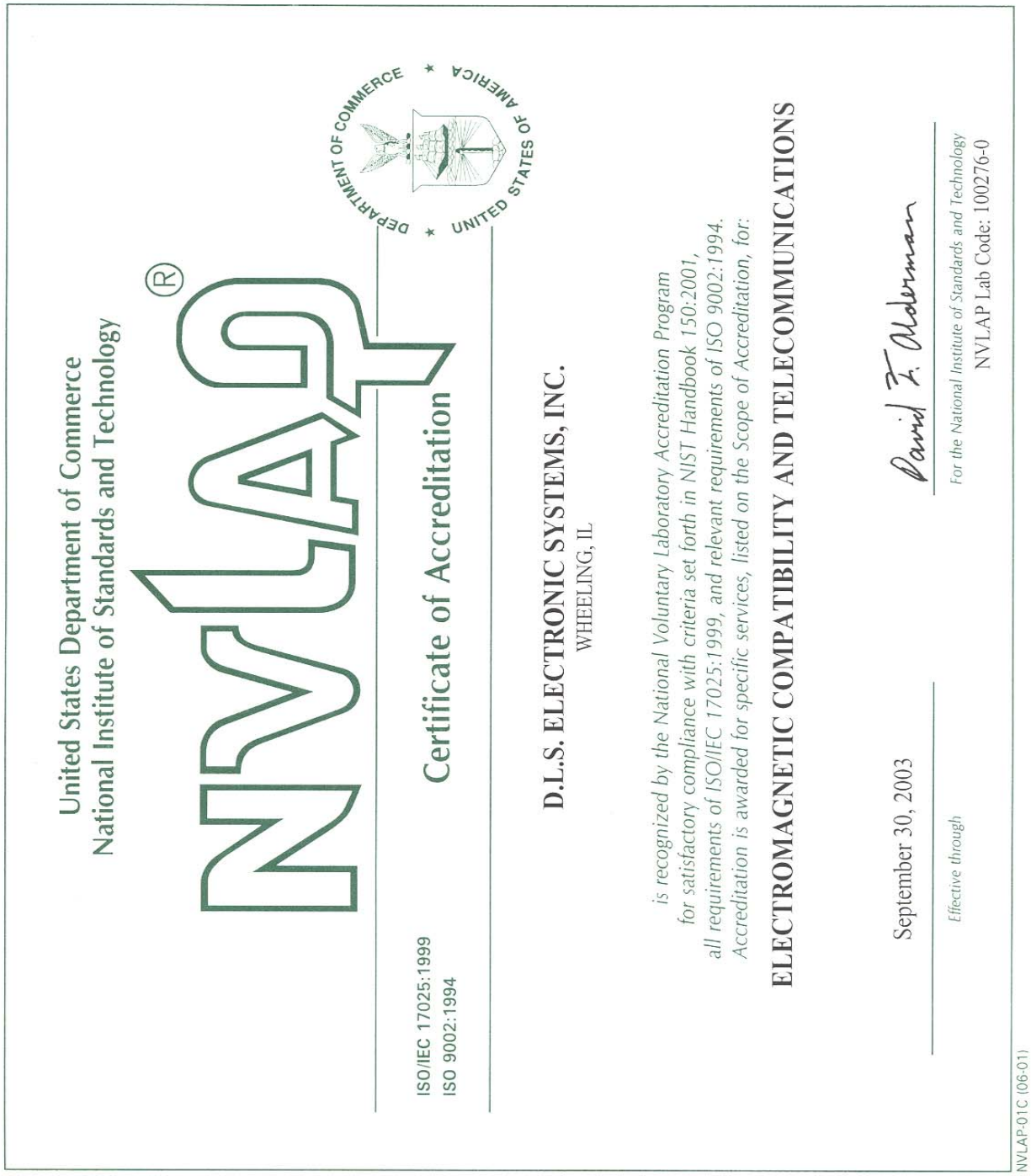
Approved By:

Brian Mattson
General Manager

Company Official:

Shure Inc.

1250 Peterson Dr., Wheeling, IL 60090



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation

ISO/IEC 17025:1999
ISO 9002:1994

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WHEELING, IL

is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

September 30, 2003
Effective through

David F. Alderman
For the National Institute of Standards and Technology

NVLAP Lab Code: 100276-0

NVLAP-01C (06-01)

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Scope of Accreditation

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

D.L.S. ELECTRONIC SYSTEMS, INC.
1250 Peterson Drive
Wheeling, IL 60090-6454
Mr. Brian J. Mattson
Phone: 847-537-6400 Fax: 847-537-6488
E-Mail: bmattson@dlsemc.com
URL: http://www.dlsemc.com

NVLAP Code	*Designation / Description*
Emissions Test Methods:	
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993) with Amendments A1 (1997) & A2 (1999)
12/CIS14b	AS/NZS 1044 (1995)
12/CIS14c	CNS 13783-1
12/CIS22	IEC/CISPR 22 (1997) and EN 55022 (1998): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1:1995, and Amendment 2:1996.

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NVLAP Code	*Designation / Description*
12/CIS22b	CNS 13438:1997: Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/F01	ANSI C63.4 (2001) - cited in FCC Method - 47 CFR Part 15 - Digital Devices
12/F01a	Conducted Emissions, Power Lines, 150 KHz to 30 MHz
12/F01b	Radiated Emissions
12/T51	AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

Immunity Test Methods:

12/I01	IEC 61000-4-2 (1995) and Amendment 1 (1998): Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3 (1995) and Amendment 1 (1998): Radiated, Radio-Frequency Electromagnetic Field Immunity Test
12/I03	IEC 61000-4-4 (1995): Electrical Fast Transient/Burst Immunity Test
12/I04	IEC 61000-4-5 (1995): Surge Immunity Test
12/I05	IEC 61000-4-6 (1996): Immunity to Conducted Disturbances, Induced Radio-Frequency Fields

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D.L.S. ELECTRONIC SYSTEMS, INC.

NVLAP Code	*Designation / Description*
12/I06	IEC 61000-4-8 (1993): Power Frequency Magnetic Field Immunity Test
12/I07	IEC 61000-4-11 (1994): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

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NVLAP-01S (06-01)

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1250 Peterson Dr., Wheeling, IL 60090

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ELECTRONIC SYSTEMS, INC.
1250 Peterson Dr., Wheeling, IL 60090

1.0 SUMMARY OF TEST REPORT

It was found that the PSM Antenna Combiner, Model Number(s) PA821, **"meets"** the radio interference emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Section 74.861, for low power auxiliary stations.

This test report relates only to the items tested and contains the following number of pages.

Text:	93
Charts:	25

2.0 INTRODUCTION

On May 6, 8 & 14, 2003, a series of radio frequency interference measurements was performed on PSM Antenna Combiner, Model Number(s) PA821, Serial Number: DM007. The tests were performed according to the procedures of the FCC as stated in Part 2 - Frequency Allocations and Radio Treaty Matters: General Rules and Regulations, Subpart J, Equipment Authorization Procedures of the Code of Federal Regulations 47. Tests were performed by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency interference requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Section 74.861, for low power auxiliary stations.

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4.0 TEST SET-UP

All tests were performed at D.L.S. Electronic Systems, Inc. and set up according to the American National Standards Institute, ANSI C63.4-1992, Section 7, (Figures 9a, 9b, 9c and 9d). The conducted tests if required were performed with the test item placed on a non-conductive table (table top equipment), located in the test room. Equipment normally operated on the floor was tested by placing it on the metal ground plane. The ground plane has an electrical isolation layer over its surface approximately 7mm thick. The power line supplied was connected to a dual line impedance stabilization network electrically bonded to the ground plane, located on the floor. The networks were constructed per the requirements of the American National Standards Institute, ANSI C63.4-1992, Section 4, (Figure 2).

All radiated emissions tests were performed with the test item placed on a 80 cm high rotating non-conductive table, located in the test room. Equipment normally operated on the floor was placed on a metal covered turntable, which is flush with the surrounding conducting ground plane. The ground plane has an electrical isolation layer over its surface approximately 7 mm thick. The EUT is separated from the turntable ground plane by a non-conductive layer. The equipment under test was set up according to ANSI C63.4-1992, Sections 6 and 8.

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5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data below 1000 MHz was automatically plotted using the HP Spectrum Analyzer or ESI 26/ESI 40 Fixed Tuned Receiver. The data was taken using Peak, Quasi-Peak or the Average Detector Functions as required. This information was then used to determine the frequencies of maximum emissions. Above 1000 MHz, final data was taken using the Average Detector.

Below 1000 MHz, final data was taken using the HP Spectrum Analyzer and or ESI 26/ESI 40 fixed tuned receiver. These plots were made using the Peak or Quasi-Peak Detector functions, with manual measurements performed on the questionable frequencies using the Quasi-Peak or the Average Detector Function of the Analyzer or ESI 26/ESI 40 Receiver as required. Above 1000 MHz, final data was taken using the Average Detector on the ESI 26/ESI 40 fixed tuned receiver.

The bandwidths shown below are specified by ANSI C63.4-2000, Section 4.2.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

A list of the equipment used can be found in Table 1. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

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6.0 CONDUCTED EMISSION MEASUREMENTS

NOTE:

The AC power line conducted emissions are not required for low power auxiliary stations.

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7.0 RADIATED EMISSION MEASUREMENTS

Preliminary radiation measurements were performed at a 3 meter test distance. The frequency range from 30 MHz to 1000 MHz was automatically scanned and plotted at various angles.

After preliminary measurements were taken, the EUT was taken to one of our 3 meter open field test sites located at Genoa City, Wisconsin, FCC File No. 31040/SIT, where final radiated emissions measurements were made over the entire frequency range.

For signals in the frequency range of 30 to 200 MHz were measured with a Biconical Antenna or Tuned Dipole as the pickup device. From 200 MHz, a Log Periodic Antenna or a Tuned Dipole was used and above 1000 MHz a Double Ridge Horn Antenna was used.

During the test for frequencies below 1000 MHz, the equipment was rotated and the antenna was raised and lowered from 1 meter to 4 meters to find the maximum level of emissions. For frequencies greater than 1000 MHz the Double Ridge Horn Antenna was set at 1 or 3 meters from the EUT with the antenna height varied from 1 to 4 meters above the ground plane. Tests were made in both horizontal and vertical planes of polarization. The EUT, peripheral equipment and cables were configured to meet the conditions in ANSI C63.4-1992, Sections 6 & 8.

NOTE:

All radiated emissions measurements were made at a test room temperature of **70°F** at **41%** relative humidity.

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8.0 DESCRIPTION OF TEST SAMPLE: (See also Paragraph 9.0)

8.1 Description:

The Shure PA821 Antenna Combiner actively combines antenna outputs from up to eight PSM wireless transmitters to a single antenna, improving RF performance and reducing rack clutter.

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8.0 DESCRIPTION OF TEST SAMPLE: (CON'T)

8.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

Length: 285.2mm Width: 398.8mm Height: 43.4mm

8.3 LINE FILTER USED:

NA

8.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

100 kHz

Clock Frequencies:

NA

8.0 DESCRIPTION OF TEST SAMPLE: (CON'T)

8.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

1. Populated Circuit Board PN: 190A018 Rev. 2

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9.0 ADDITIONAL DESCRIPTION OF TEST SAMPLE:
(See also Paragraph 8.0)

1: There were no additional descriptions noted at the time of test.

I certify that the above, as described in paragraph 8.0, describes the equipment tested and will be manufactured as stated.

By: _____ _____
Signature Title

For: _____ _____
Company Date

1250 Peterson Dr., Wheeling, IL 60090

10.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 PSM Antenna Combiner
Model Number: PA821 Serial Number: DM007

Item 1 Three 100mW P7T Shure Transmitters (not EUT).

Item 2 FP33 Shure Mixer L10-01-09

Item 3 Shielded "A" In and "B" In Coax Cables with BNC Metal Shells and terminations. .7m

Item 4 Shielded "AB" Out Coax Cable with BNC Metal Shells and termination. .7m

Item 5 Non-Shielded AC Power Cord. 2m

Item 6 Five shielded Input Coax Cables with BNC Metal Shells and terminations. .7m

Item 7 Three shielded Input Coax Cables to Transmitters with BNC Metal Shells and terminations. .7m

Item 8 Three non-shielded transmitter AC Power Line Cords. 2m

Item 9 Three Cables from Transmitter to Mixer.

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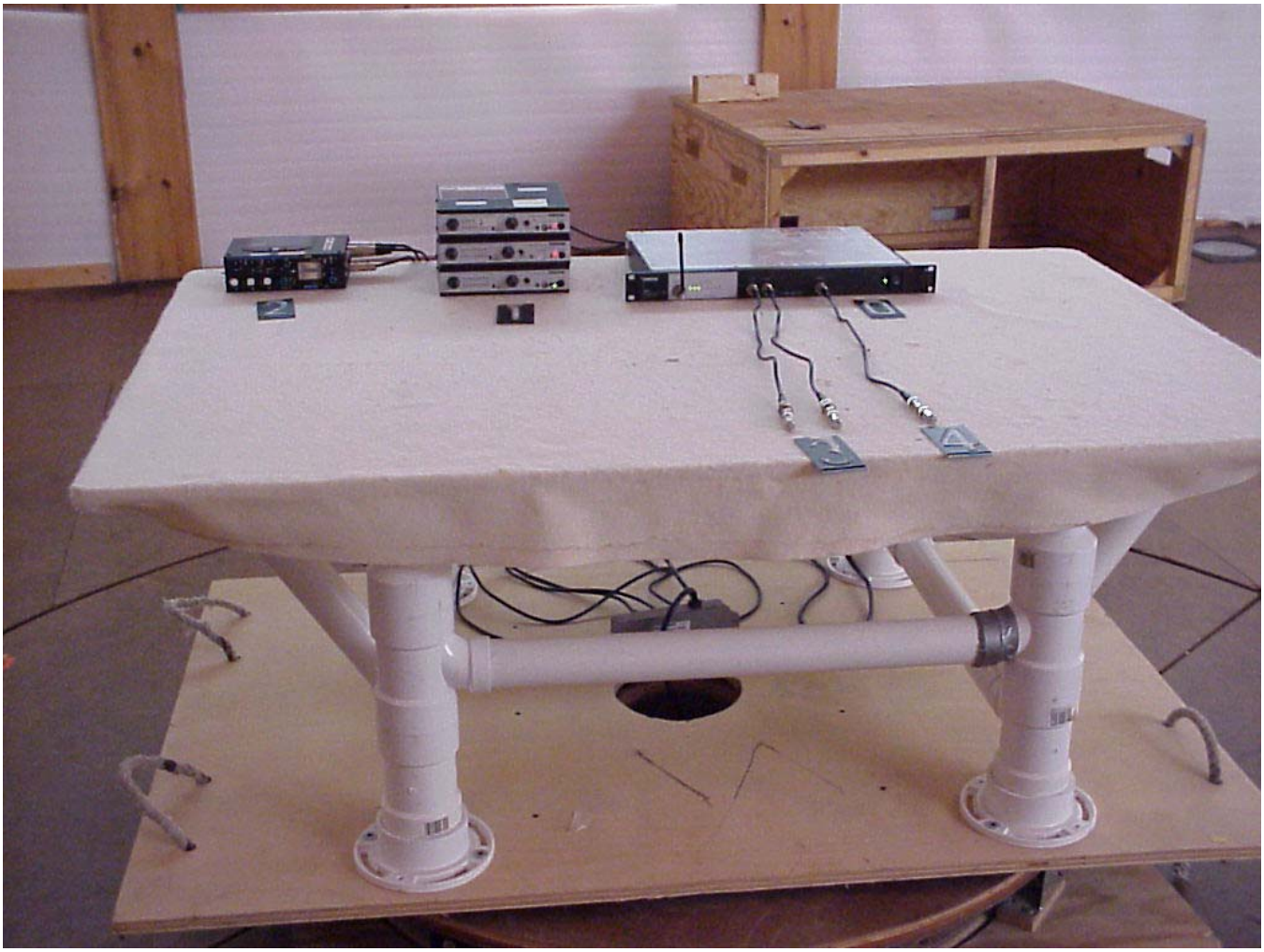
11.0 RADIATED PHOTOS TAKEN DURING TESTING



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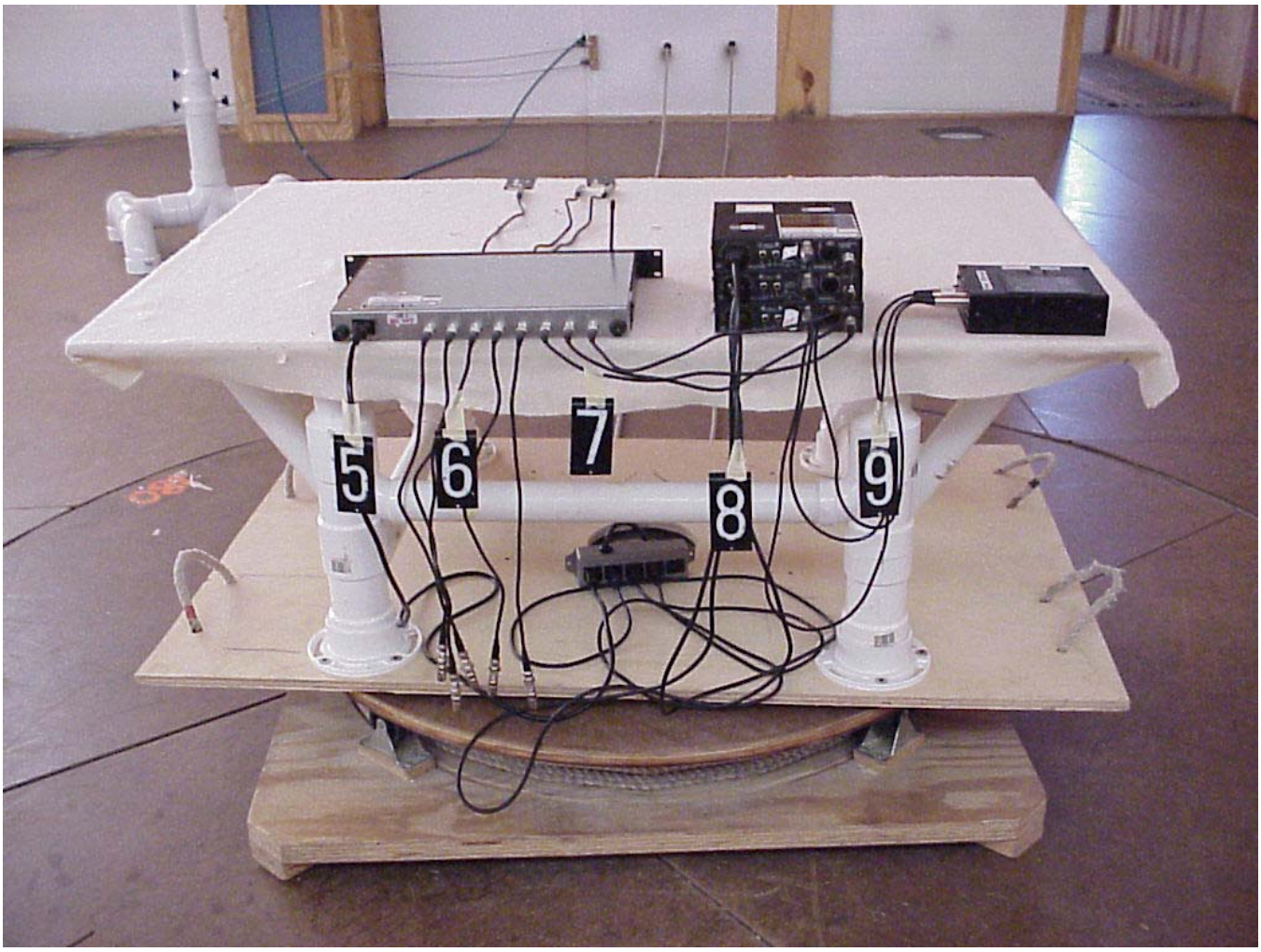
11.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



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12.0 RESULTS OF TESTS

The radio interference emission charts results can be seen on the pages at the end of this report. Data sheets indicating the test measurements taken during testing can also be found at the end of this report. Those points on the emission charts shown with a yellow mark are background frequencies that were verified during testing.

13.0 CONCLUSION

It was found that the PSM Antenna Combiner, Model Number(s) PA821 **"meets"** the radio interference emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Section 74.861, for low power auxiliary stations.

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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Spectrum Analyzer	Hewlett/ Packard	8566B	2240A002041	100 Hz – 22 GHz	10/03
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A00121	10 kHz – 1 GHz	10/03
Spectrum Analyzer	Hewlett/ Packard	8566B	2421A00452	100 Hz – 22 GHz	2/04
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A00450	10 kHz – 1 GHz	2/04
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	11/03
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	12/03
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	2/04
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	3/04
Antenna	EMCO	3115	6204	1 GHz – 18 GHz	5/04
Antenna	EMCO	3115	99035731	1 GHz – 18 GHz	4/04
Antenna	Rohde & Schwarz	HUF-Z1	829381001	20 MHz – 1 GHz	2/04
Antenna	Rohde & Schwarz	HUF-Z1	829381005	20 MHz – 1 GHz	8/03
LISN	Solar	9252-50-R-24-BNC	971612	10 MHz – 30 MHz	10/03

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

1.0 TEST SET-UP

All radiated emission tests were performed at D.L.S. Electronic Systems, Inc. The radiated tests were made with the test item placed on a non-conductive turntable located in the Test Room with the receive antenna placed three or one meter(s) from the device under test.

2.0 RF-POWER OUTPUT – PART 2.1046

As stated in PART 74.861 (e)(1), the RF output power should not exceed 0.250 watts. The RF output power was measured at the RF output terminal of the transmitter with the transmitter unmodulated. The RF output power was measured using the following test method:

The RF output of the **PSM Antenna Combiner** was connected to a Spectrum Analyzer through suitable attenuation. All cables, connectors, and attenuators were calibrated prior to testing.

Actual Measurements Taken:

87.75 dBuV Measured output of the transmitter
+41.10 dB includes measured pads & cable loss
128.85 dBuV equals 0.1534 milliwatts

LIMIT:

Manufacturer's rated output power = **.1 watt per signal (unity gain)** watts

MARGIN:

0.1– 0.1534= 99.8466 milliwatts

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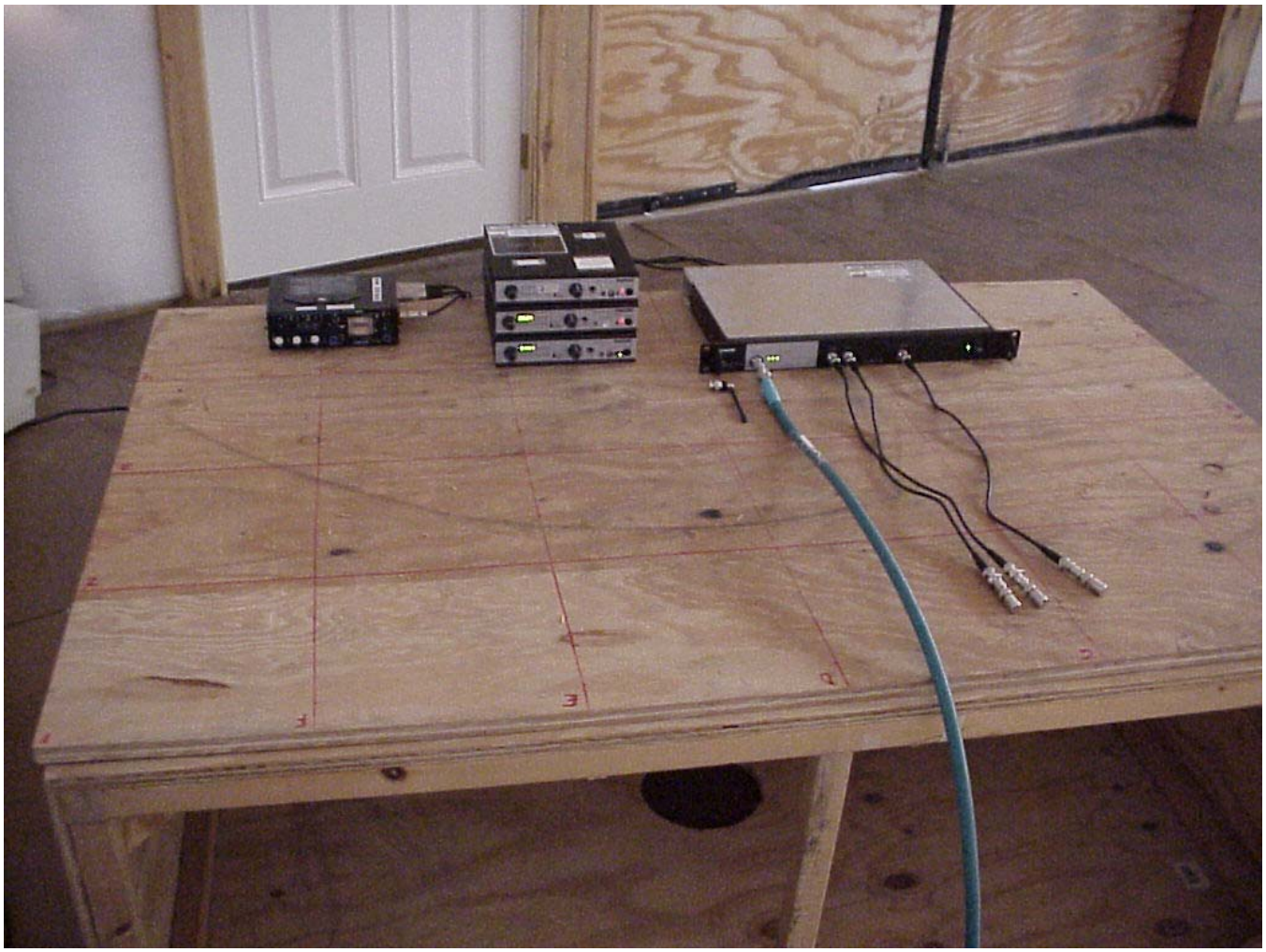
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

2.0 RF POWER OUTPUT PHOTOS TAKEN DURING TESTING



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

GRAPH(S) TAKEN OF THE RF POWER

OUTPUT MEASUREMENT

SIGNAL IN VERSUS SIGNAL OUT

PART 2.1046

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APPENDIX A

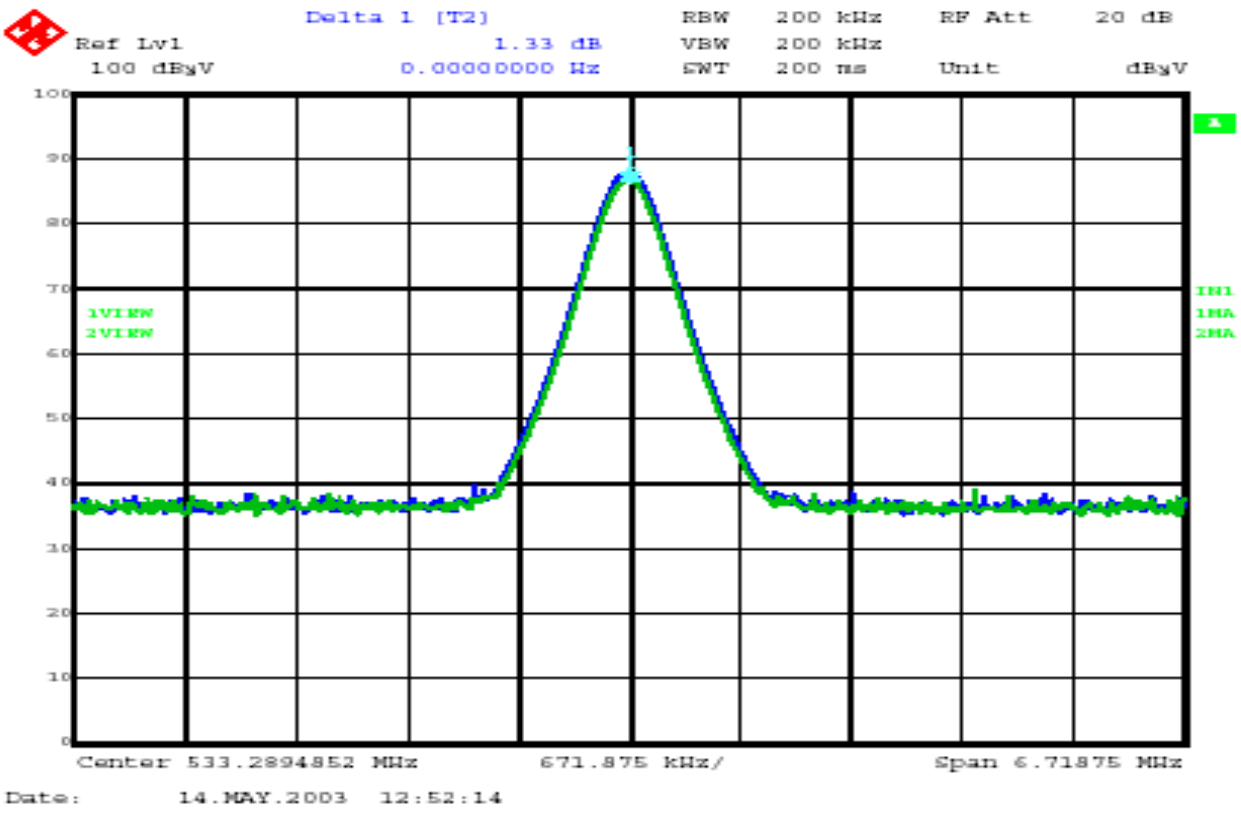
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Output Power
Operator: Craig Brandt

Frequency = 533 MHz
Green = Input
Blue = Output



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DLS Electronic Systems, Inc.

Company: Shure, Inc.
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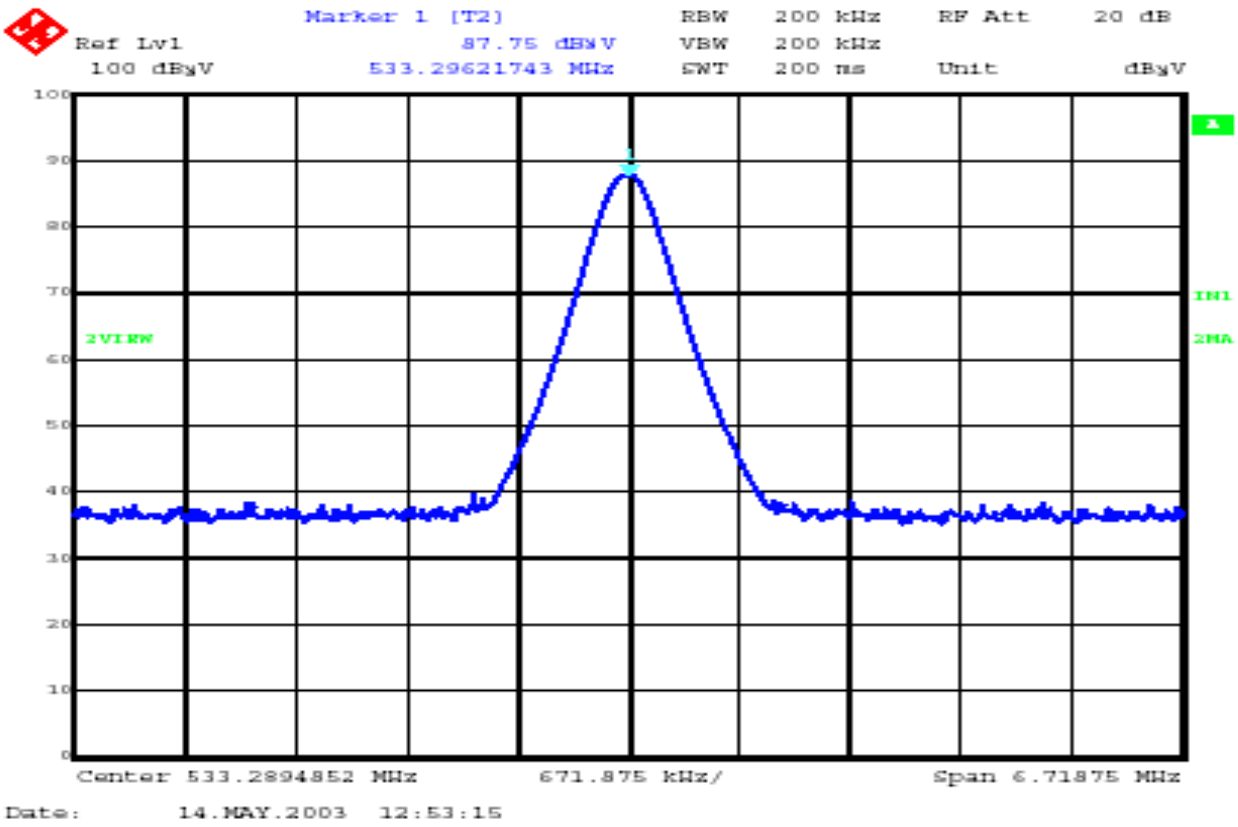
Date: 5-14-03
Test: Output Power
Operator: Craig Brandt

Frequency = 533 MHz
Blue = Output



Output Power = 87.75 dBµV + 1.0 dB cable loss + 40.10 external atten. = 128.85 dBµV = **153.4 mW**

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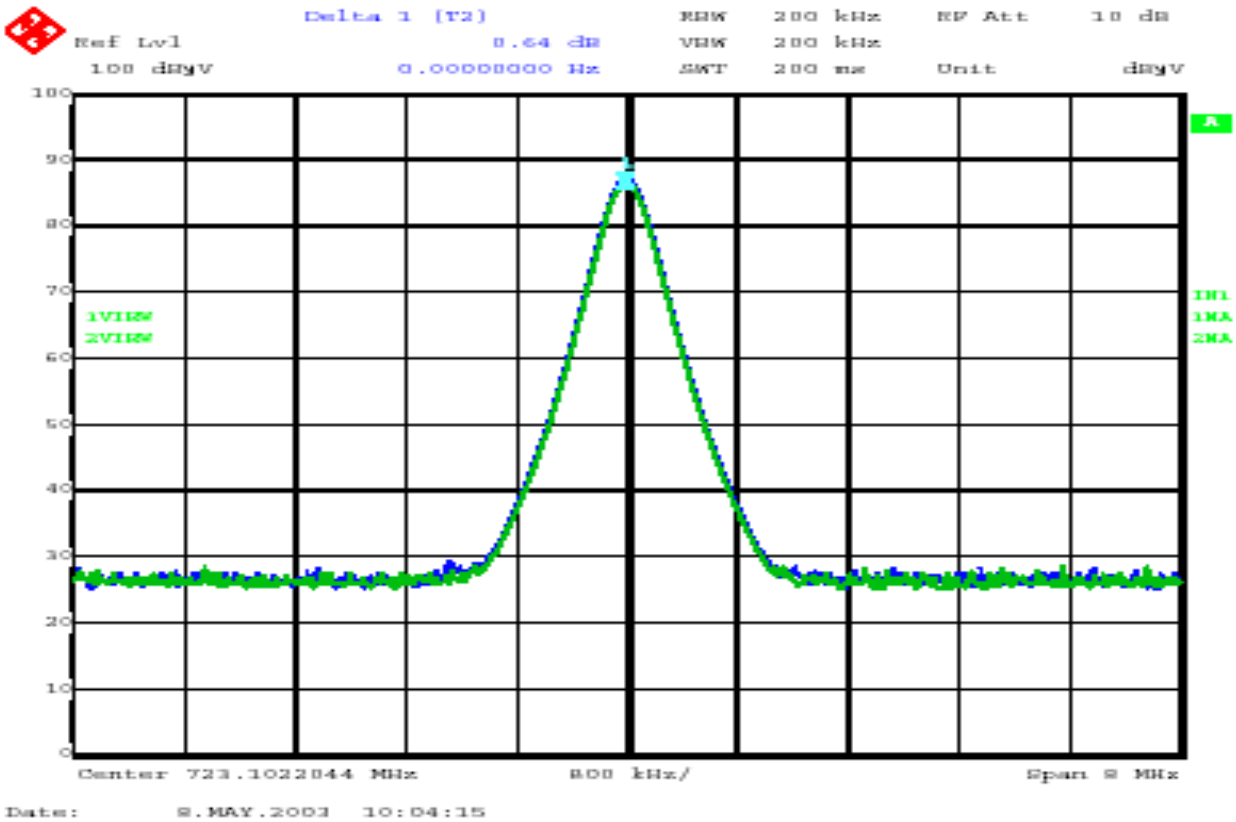
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-8-03
Test: Output Power
Operator: Craig Brandt

Frequency = 724 MHz
Green = Input
Blue = Output



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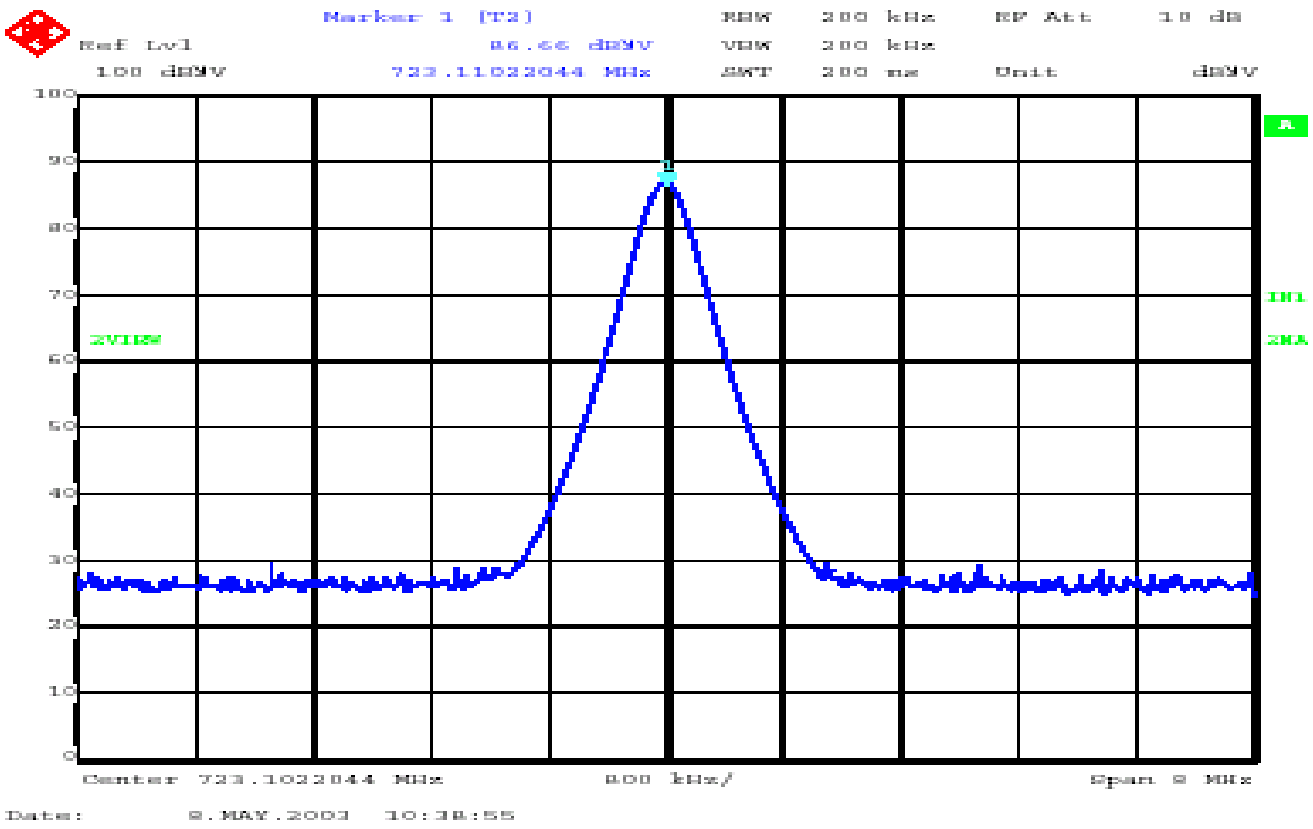
ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-8-03
Test: Output Power
Operator: Craig Brandt

Frequency = 724 MHz
Blue = Output



Output Power = 86.66 dBµV + 1.0 dB cable loss + 40.11 external atten. = 127.77 dBµV = 119.7 mW

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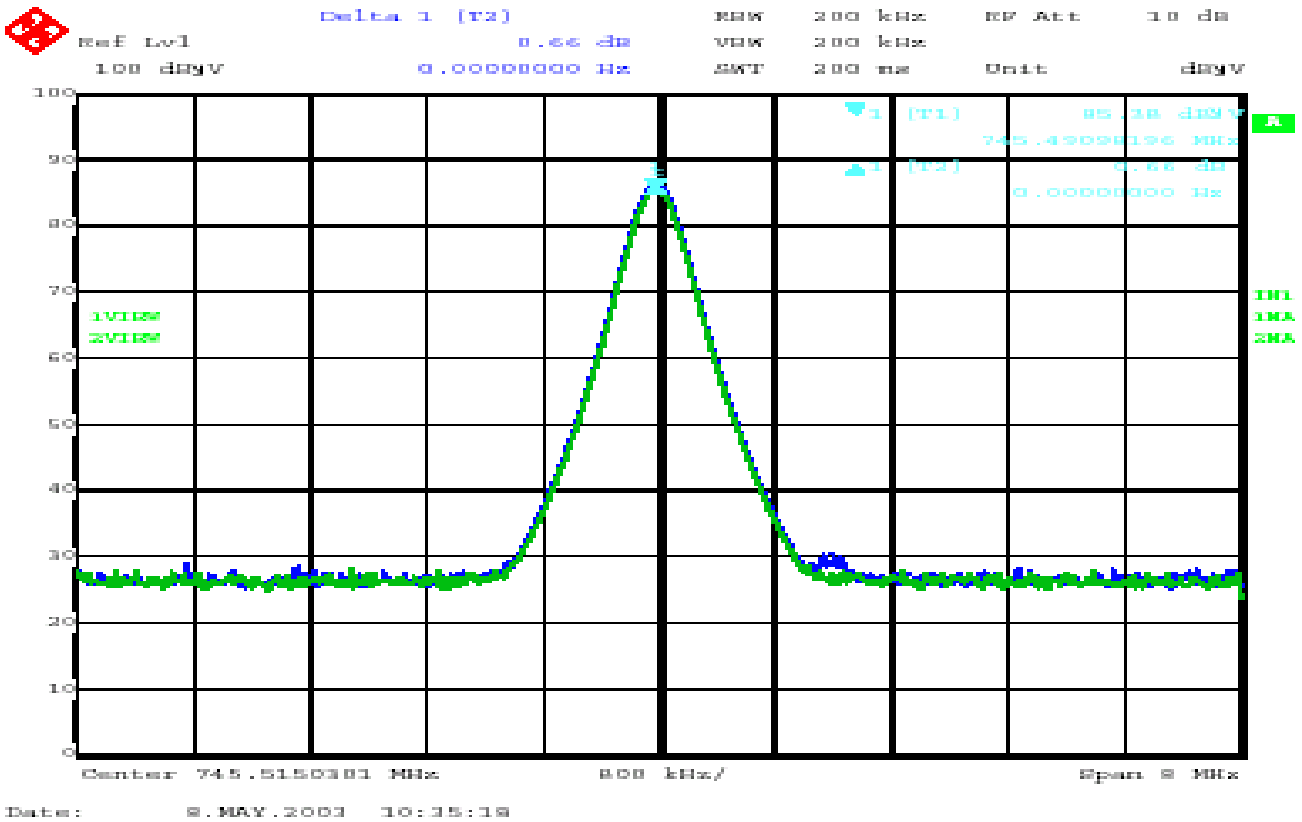
ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-8-03
Test: Output Power
Operator: Craig Brandt

Frequency = 746 MHz
Green = Input
Blue = Output



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APPENDIX A

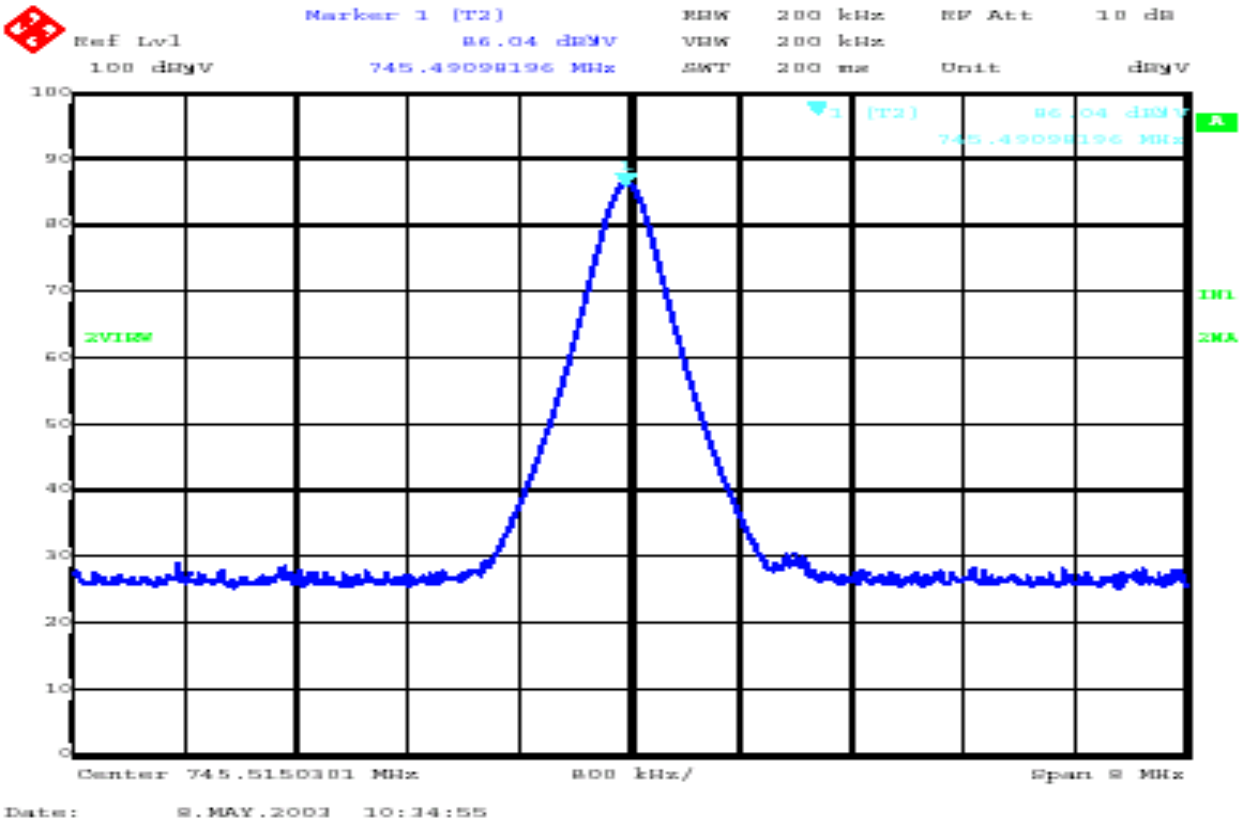
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-8-03
Test: Output Power
Operator: Craig Brandt

Frequency = 746 MHz
Blue = Output



Output Power = 86.04 dBµV + 1.0 dB cable loss + 40.10 external atten. = 127.1 dBµV = **102.5 mW**

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TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

3.0 MODULATION CHARACTERISTICS – PART 2.1047

a. Voice modulated communication equipment.

A curve showing the frequency response of the audio modulating circuit over a range of Hz is submitted with this report.

b. Equipment which employs modulation limiting

A family of curves showing the percentage of modulation versus the modulation input voltage with sufficient information showing the modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

NOTE:

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

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TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

GRAPH(S) TAKEN SHOWING THE FREQUENCY

RESPONSE OF THE

AUDIO MODULATING CIRCUIT

PART 2.1047

NOTE:

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

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TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

4.0 OCCUPIED BANDWIDTH - PART 2.1049

The occupied bandwidth is that between the lower and upper limits of the signal where the mean power is 99.0% of the total mean power and measured under the following conditions:

For low power auxiliary stations operating in the bands other than those allocated for TV broadcasting, the occupied bandwidth shall not be greater than that necessary for satisfactory transmission and emissions appearing on any discrete frequency outside the authorize band shall be attenuated $43+10 \log_{10}$ (mean output power, in watts) dB below the mean output power of the transmitting unit (device under test).

For low power auxiliary stations operating in the bands allocated for TV broadcasting, any form of modulation may be used. A maximum of ±75 kHz is permitted when frequency modulation is used. The operating bandwidth shall not exceed 200 kHz.

Carson's Rule:

Section 2.202 (g)

Bn = 2M+2DK, K=1	Bn = Bandwidth
M = 15 kHz,	M = Maximum Modulating Frequency
D = 45 kHz,	D = Peak Deviation

Bn = 2(15) + 2(45)(1) = 120 kHz

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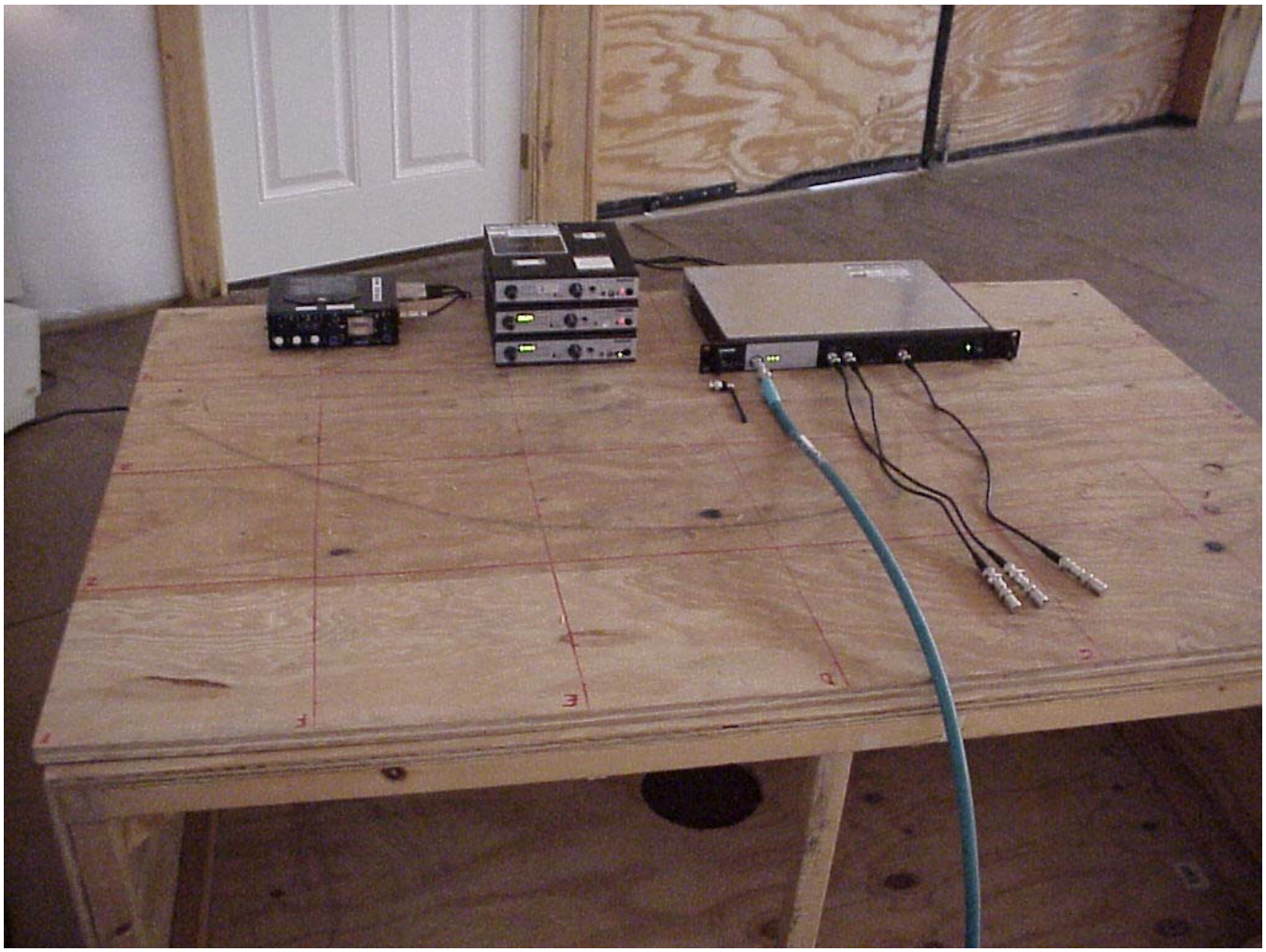
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

4.0 OCCUPIED BANDWIDTH PHOTOS TAKEN DURING TESTING



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TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

GRAPH(S) TAKEN OF THE OCCUPIED BANDWIDTH

SIGNAL IN VERSUS SIGNAL OUT

PART 2.1049

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APPENDIX A

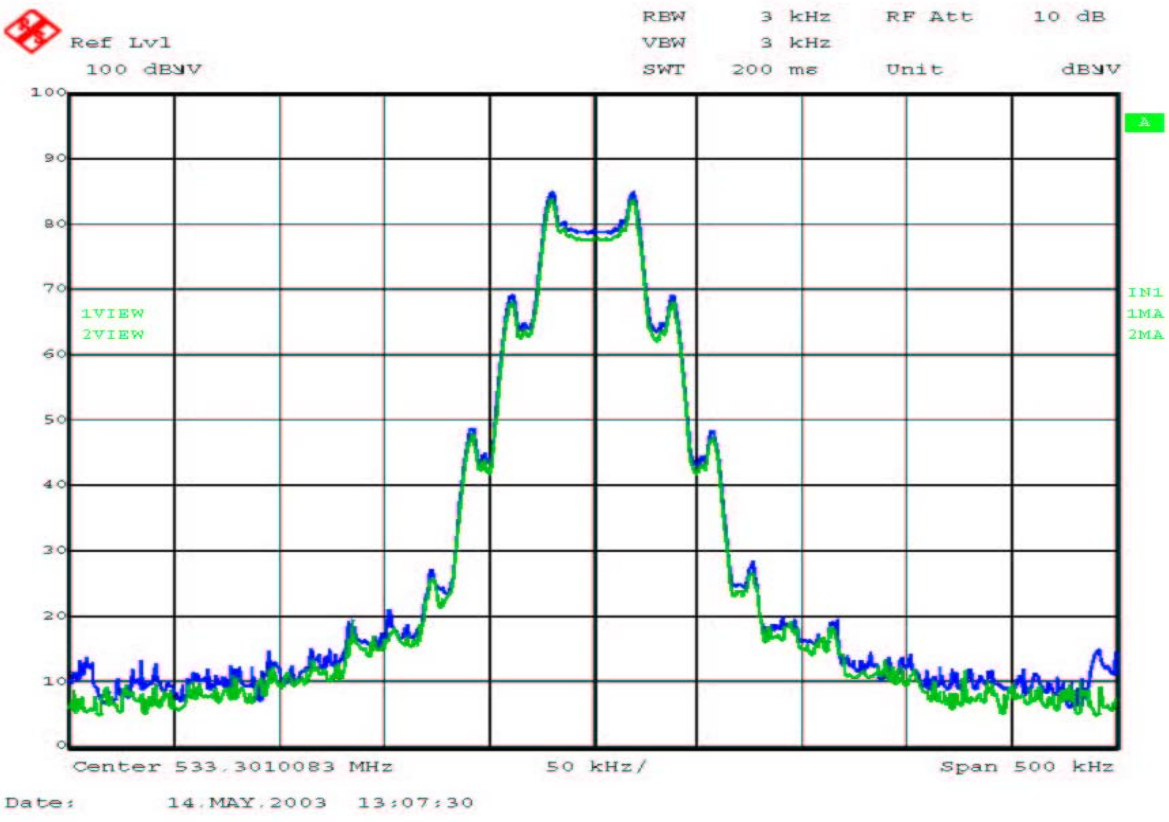
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Bandwidth
Operator: Craig Brandt

Frequency = 533 MHz
Green = Input
Blue = Output



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APPENDIX A

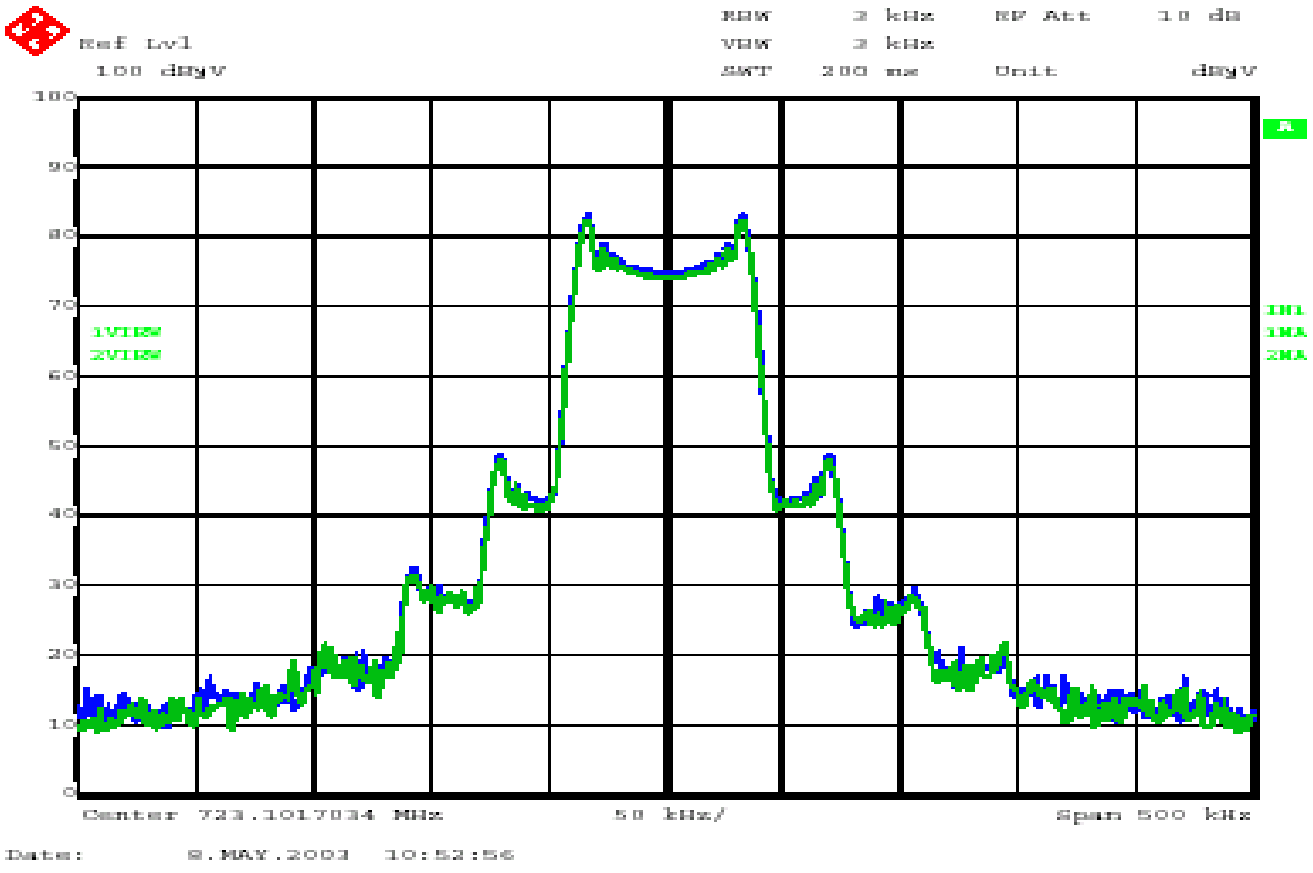
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-8-03
Test: Bandwidth
Operator: Craig Brandt

Frequency = 724 MHz
Green = Input
Blue = Output



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APPENDIX A

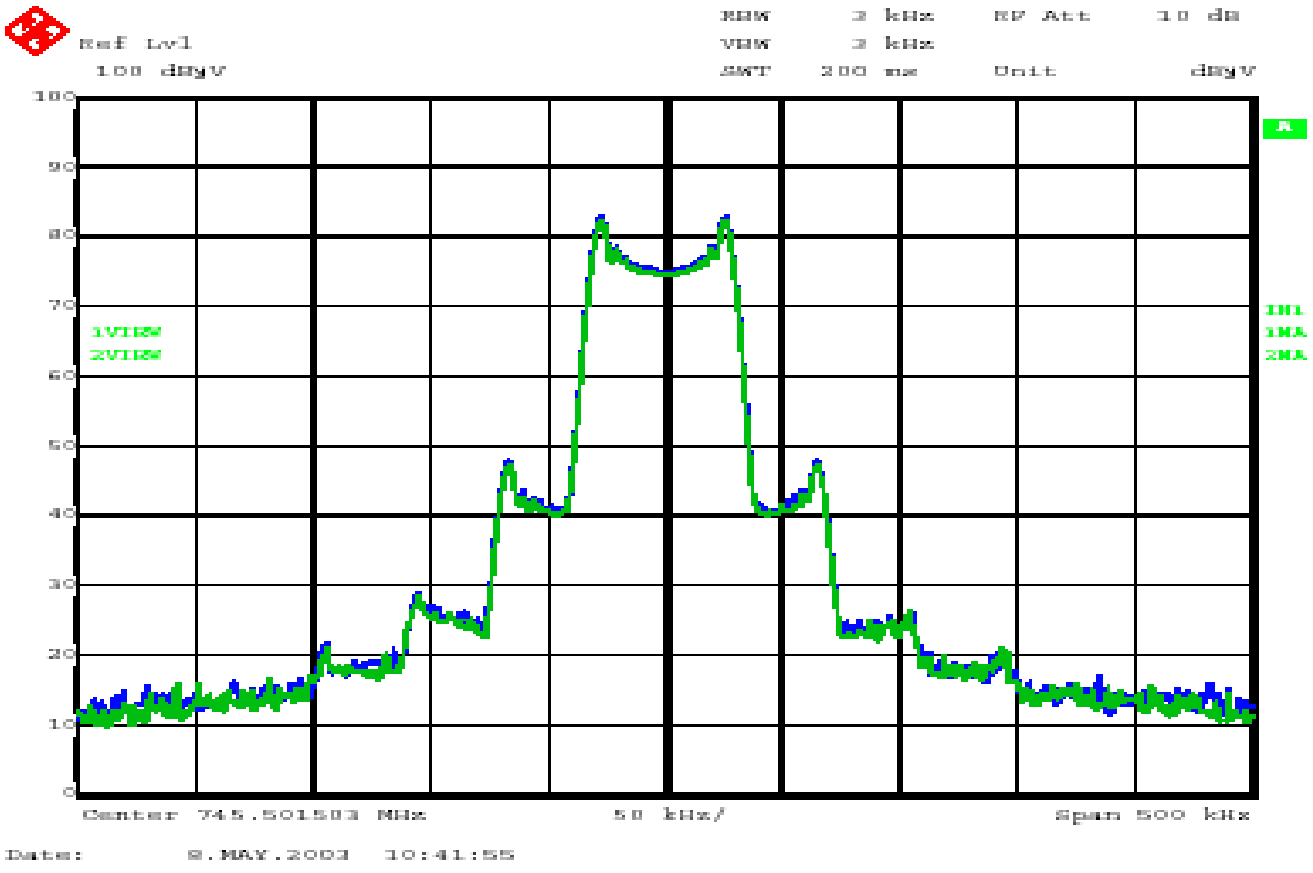
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-8-03
Test: Bandwidth
Operator: Craig Brandt

Frequency = 746 MHz
Green = Input
Blue = Output



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

5.0 FREQUENCY DEVIATION AND TOLERANCE - PART 74.861

Paragraph e-3 states that the maximum authorized deviation shall be 75 kHz for all frequency modulation emissions in the frequency bands .

Paragraph e-4 states that the **frequency tolerance** of the transmitter shall be **.005 percent.**

NOTE:

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

GRAPHS TAKEN OF THE FREQUENCY DEVIATION

WITH MODULATION

PART 2.1049

NOTE:

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

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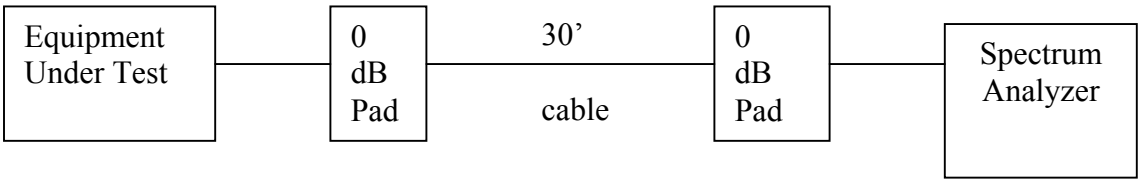
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

6.0 SPURIOUS EMISSIONS AT ANTENNA TERMINALS – PART 2.1051

Spurious conducted emissions were measured at the antenna terminals using an artificial load. Plots were made showing the amplitude of each harmonic emission with the equipment operated as specified in 2.989. As shown by the radiated charts there was no reason to believe that there were any spurious emissions other than the harmonics that were than individually investigated when doing the conducted test at the antenna terminals. Measurements were made up to the 10^{th} harmonic of the fundamental. The following setup was used showing placement of the attenuators:



The allowed emissions for transmitters operating in the bands for PSM Antenna Combiner equipment are found under Part 74, Section 74.861, Paragraph e-6 for Low Power Auxiliary Stations. This paragraph states the mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43+10Log10 (mean output power in watts) dB.

NOTE: See the following pages for the data ad graphs of the actual measurements made:

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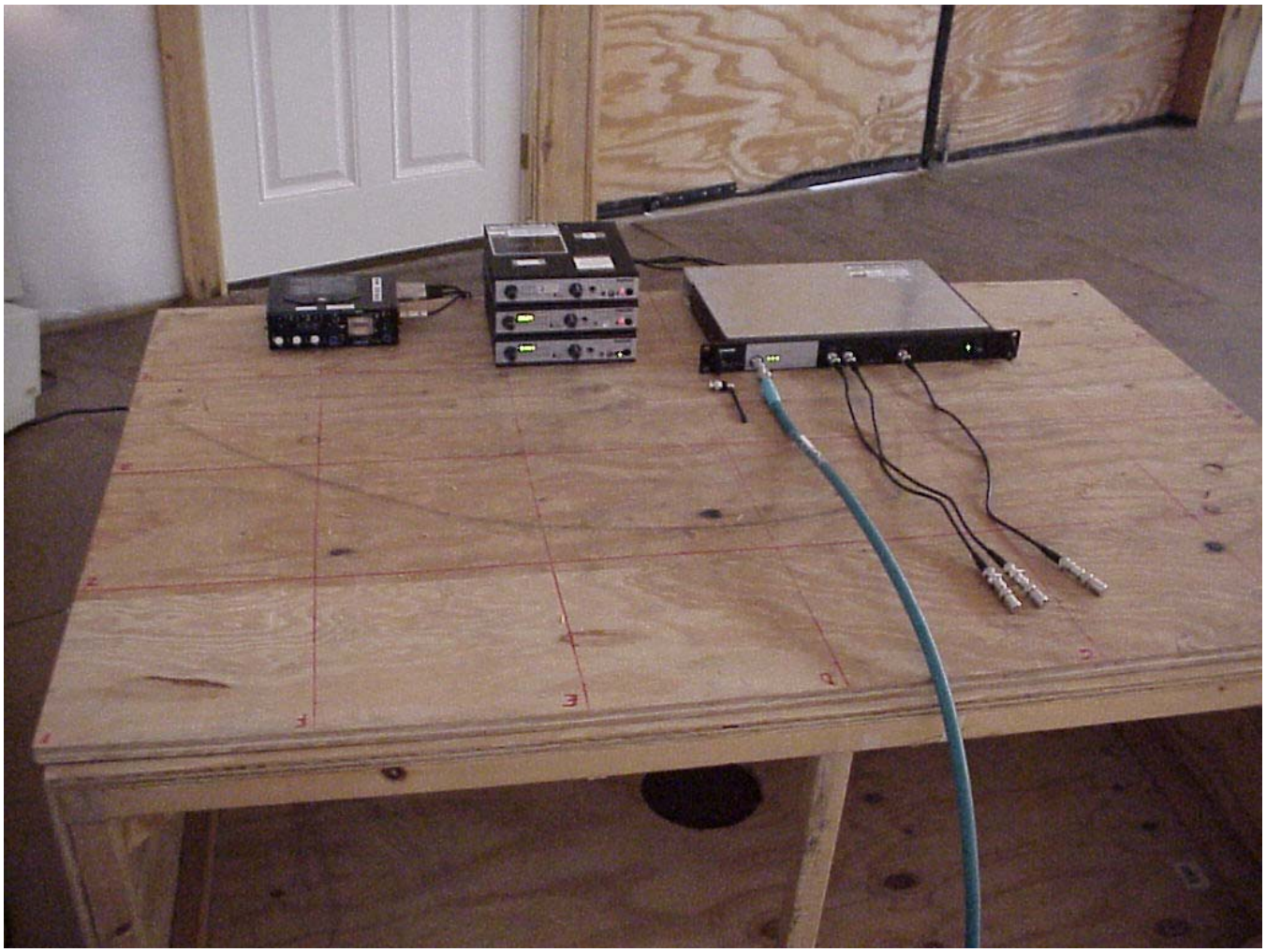
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

6.0 CONDUCTED EMISSIONS PHOTOS TAKEN DURING TESTING



ELECTRONIC SYSTEMS, INC.
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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

INTER-MODULATION (IM) DATA & CHARTS TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

PART 2.1051

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APPENDIX A

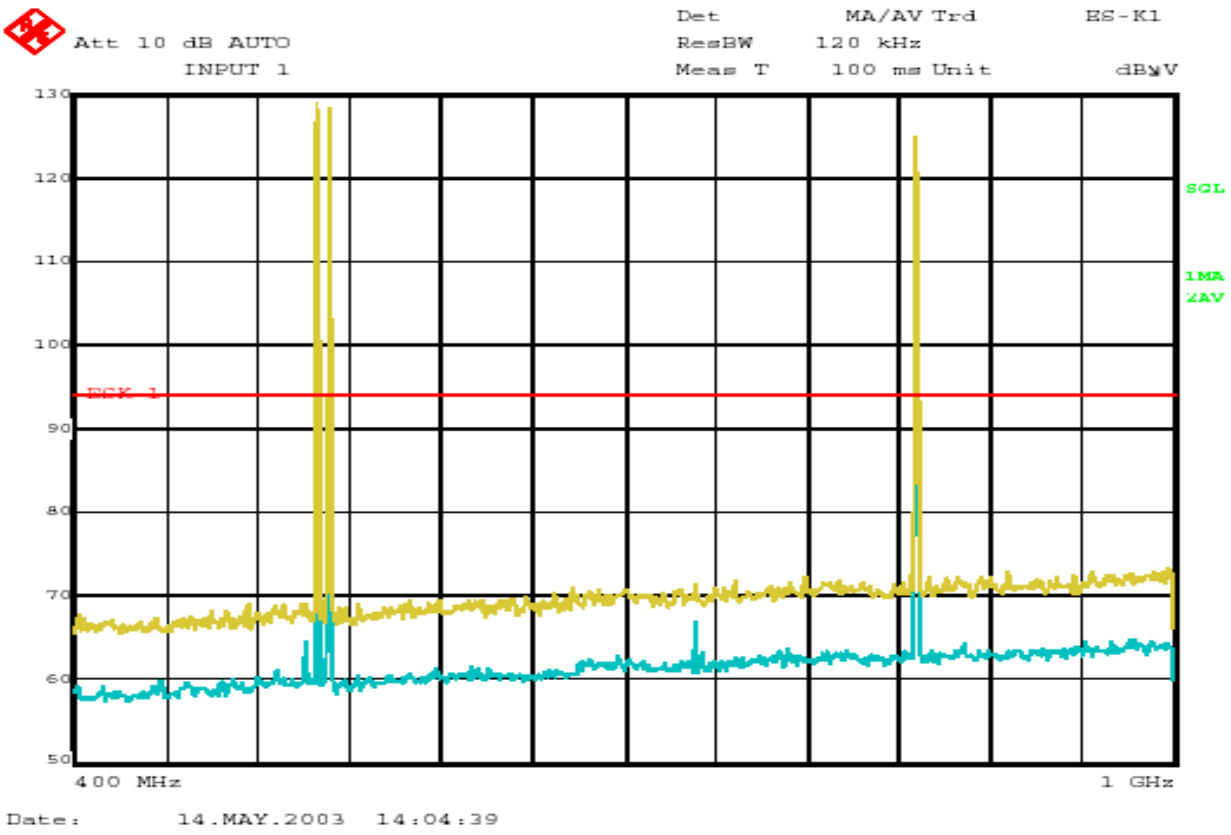
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Inter-Modulation
Operator: Craig Brandt

Frequencies = 533 MHz, 540 MHz, 860 MHz
Outputs = 100 mW



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APPENDIX A

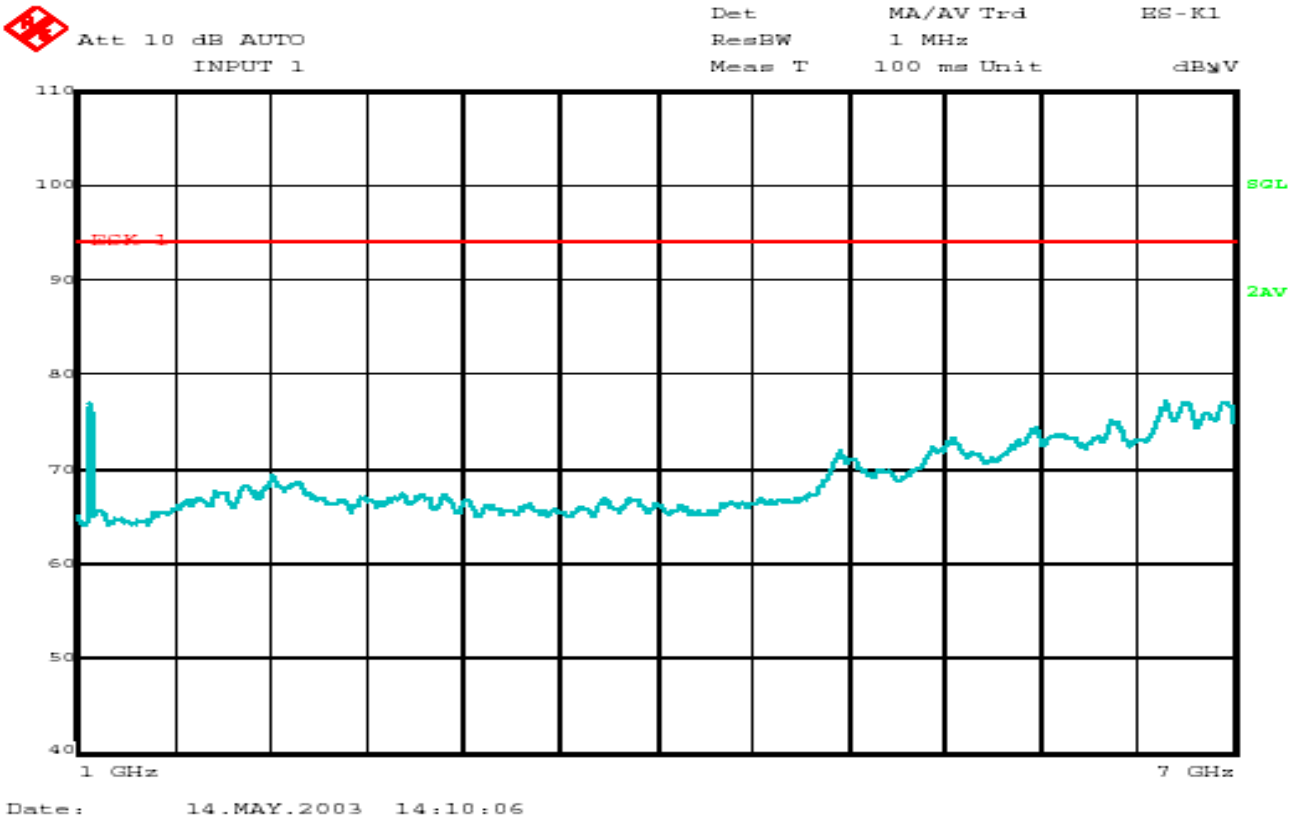
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Inter-Modulation
Operator: Craig Brandt

Frequencies = 533 MHz, 540 MHz, 860 MHz
Outputs = 100 mW



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APPENDIX A

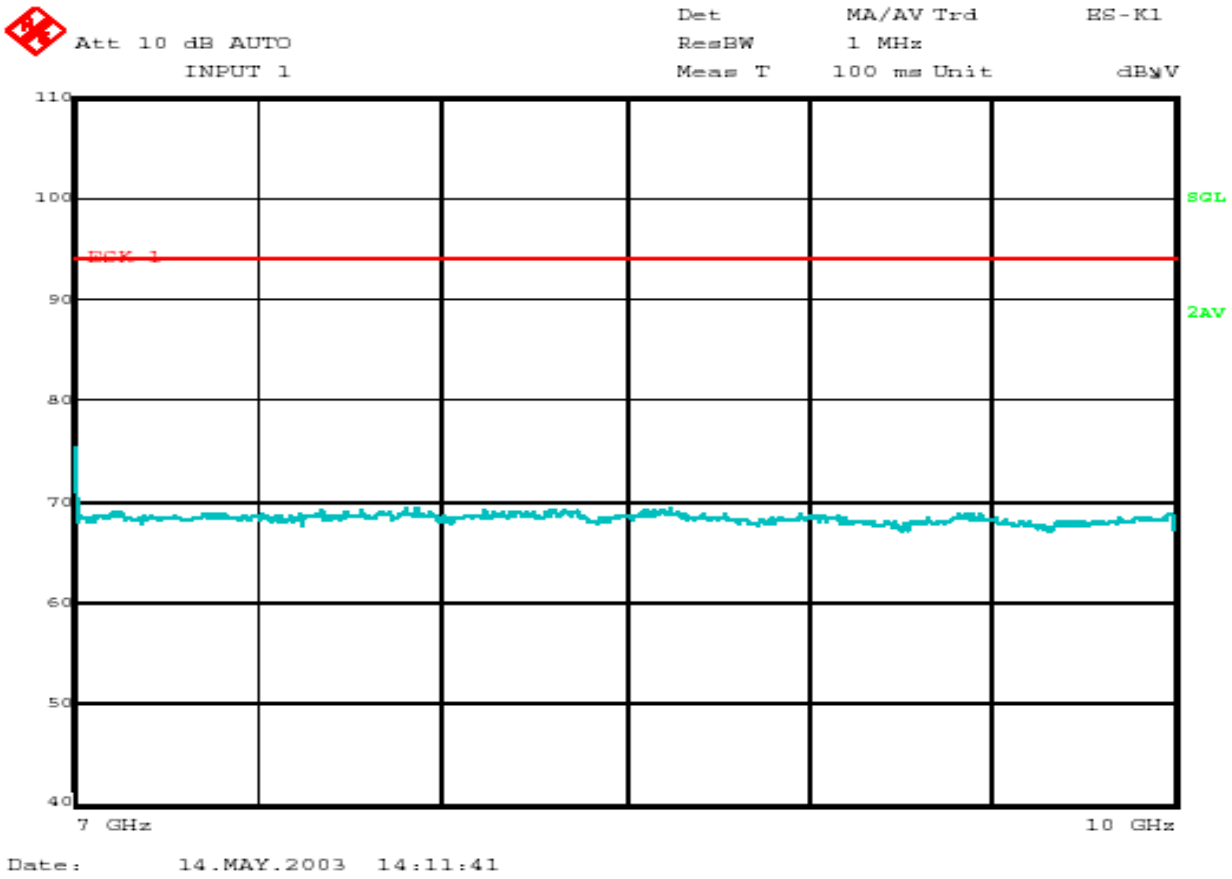
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Inter-Modulation
Operator: Craig Brandt

Frequencies = 533 MHz, 540 MHz, 860 MHz
Outputs = 100 mW



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APPENDIX A

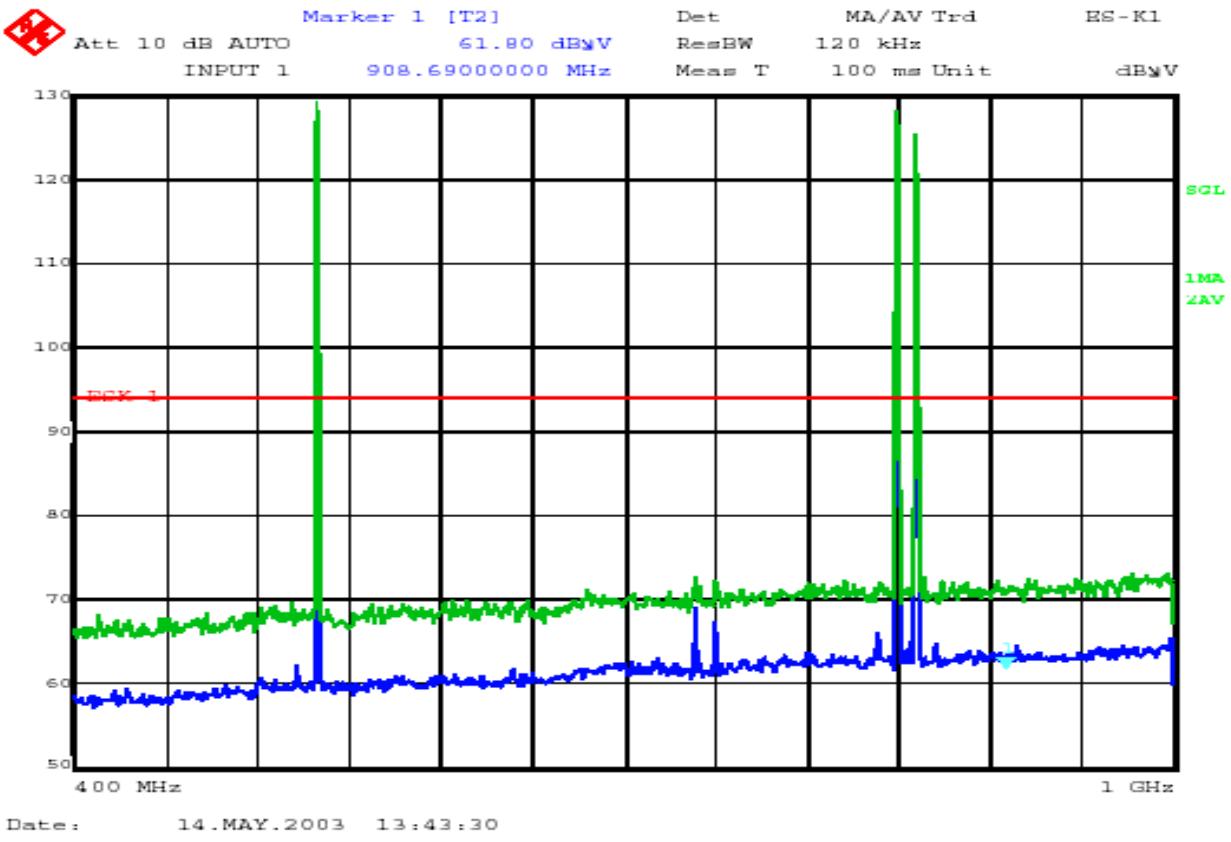
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Inter-Modulation
Operator: Craig Brandt

Frequencies = 533 MHz, 855 MHz, 860 MHz
Outputs = 100 mW



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APPENDIX A

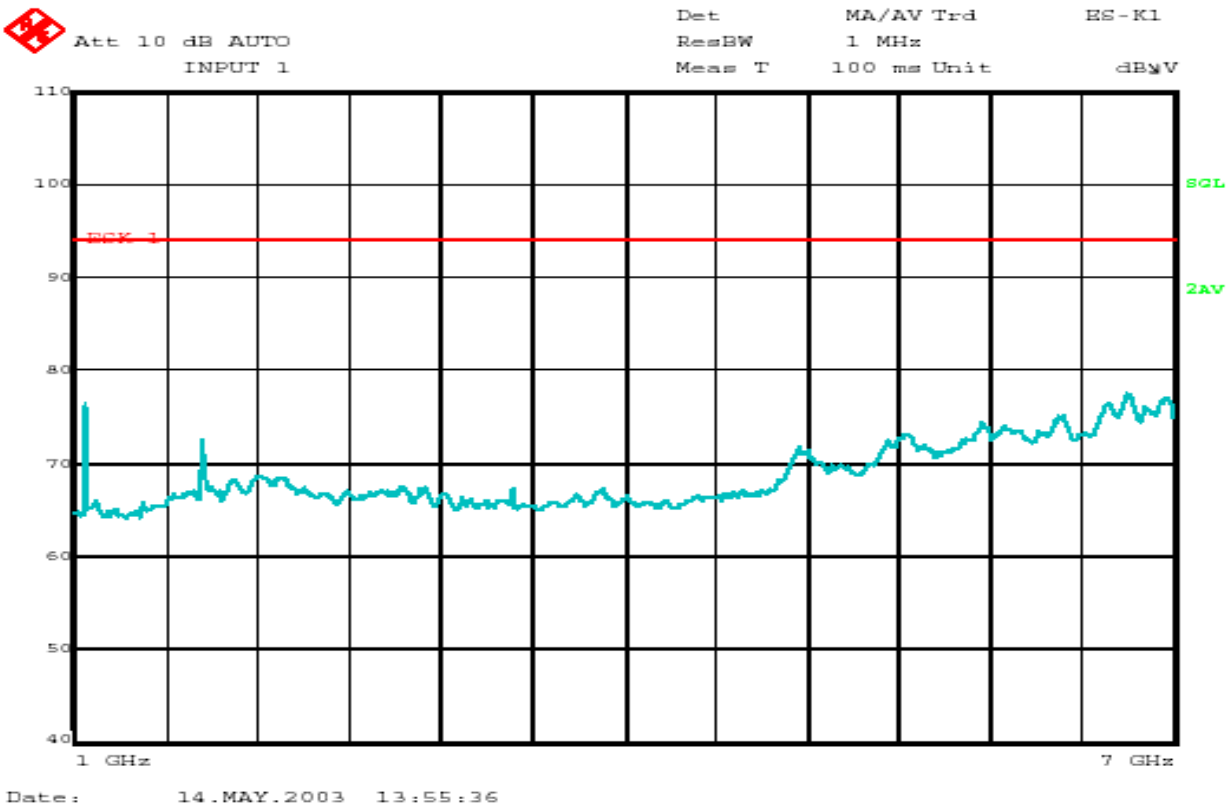
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Inter-Modulation
Operator: Craig Brandt

Frequencies = 533 MHz, 855 MHz, 860 MHz
Outputs = 100 mW



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APPENDIX A

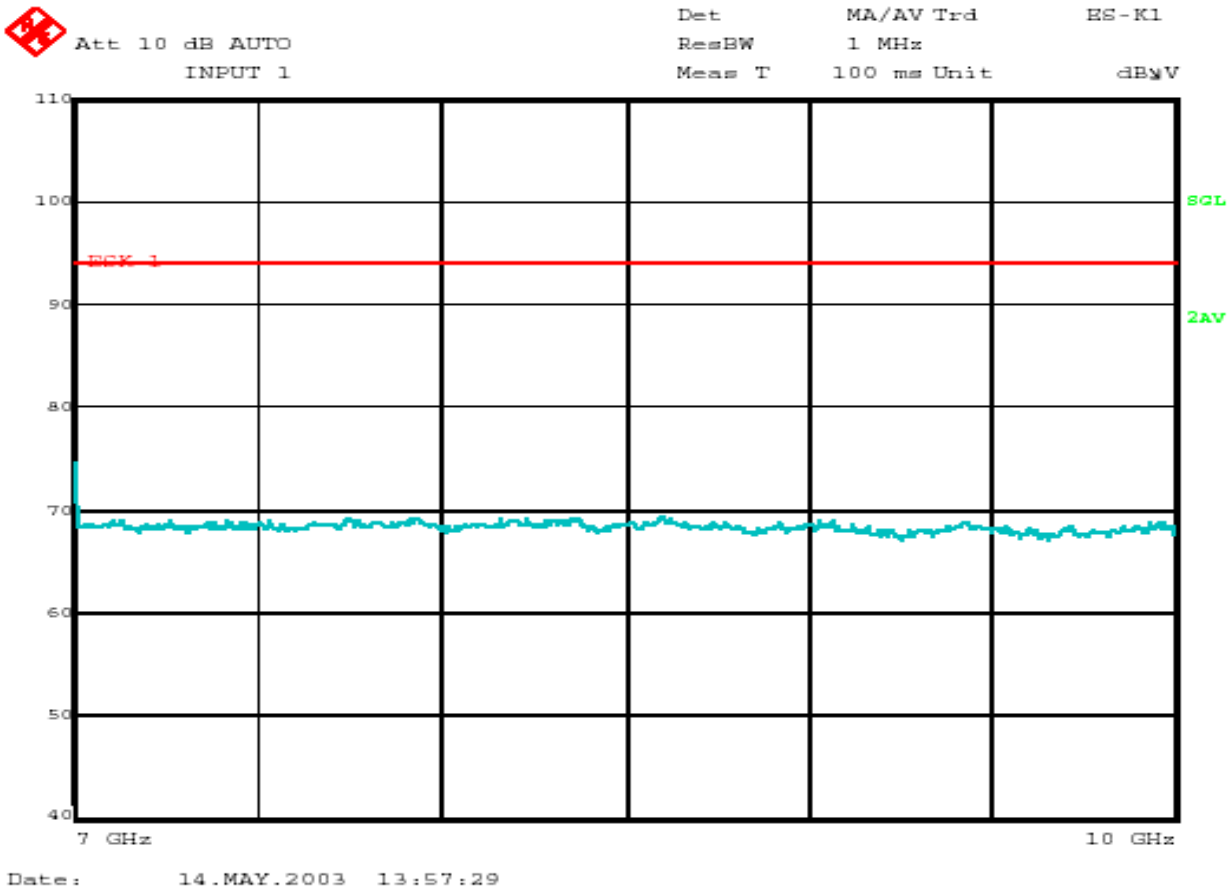
TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Model: PA821
Date: 5-14-03
Test: Inter-Modulation
Operator: Craig Brandt

Frequencies = 533 MHz, 855 MHz, 860 MHz
Outputs = 100 mW



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Inter-Modulation test

EUT:	PA821
Manufacturer:	Shure, Inc.
Operating Condition:	72 deg F; 46% R.H.
Test Site:	Site 3
Operator:	Craig Brandt
Test Specification:	120 V 60 Hz
Comment:	533 MHz, 540 MHz, 860 MHz inputs, each 100 mW
	Date: 5/14/2003

TEXT: "RF Conducted"

Short Description: Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837809/005

TEST SET-UP: RF output connected to receiver through 40 dB attenuator.

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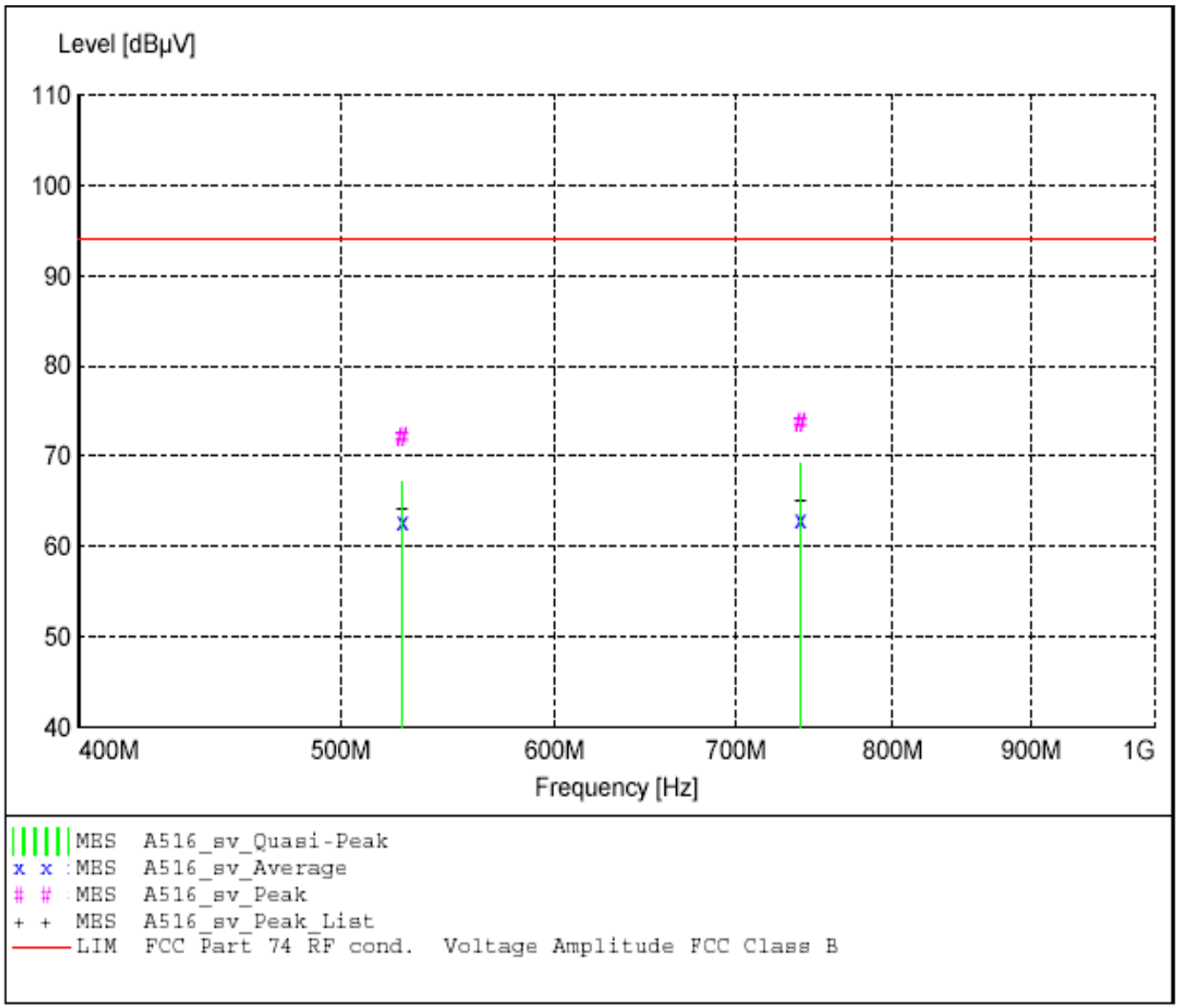
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A516_sv_Final"

5/14/2003 2:04PM

Frequency MHz	Level dBµV	Antenna Factor dBµV	System Loss dB	Total Level dBµV	Limit dBµV	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
739.460000	27.43	0.00	46.3	74	94	20.3	0.00	0	MAX PEAK	None
526.690000	26.78	0.00	45.2	72	94	22.0	0.00	0	MAX PEAK	None
739.460000	22.82	0.00	46.3	69	94	24.9	0.00	0	QUASI-PEAK	None
526.690000	21.94	0.00	45.2	67	94	26.8	0.00	0	QUASI-PEAK	None
739.460000	16.68	0.00	46.3	63	94	31.1	0.00	0	AVERAGE	None
526.690000	17.43	0.00	45.2	63	94	31.3	0.00	0	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Inter-Modulation test

EUT: PA821
Manufacturer: Shure, Inc.
Operating Condition: 72 deg F; 46% R.H.
Test Site: Site 3
Operator: Craig Brandt
Test Specification: 120 V 60 Hz
Comment: 533 MHz, 540 MHz, 960 MHz inputs, each 100 mW
Date: 5/14/2003

TEXT: "RF Conducted"

Short Description: Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837808/005

TEST SET-UP: RF output connected to receiver through 40 dB attenuator.

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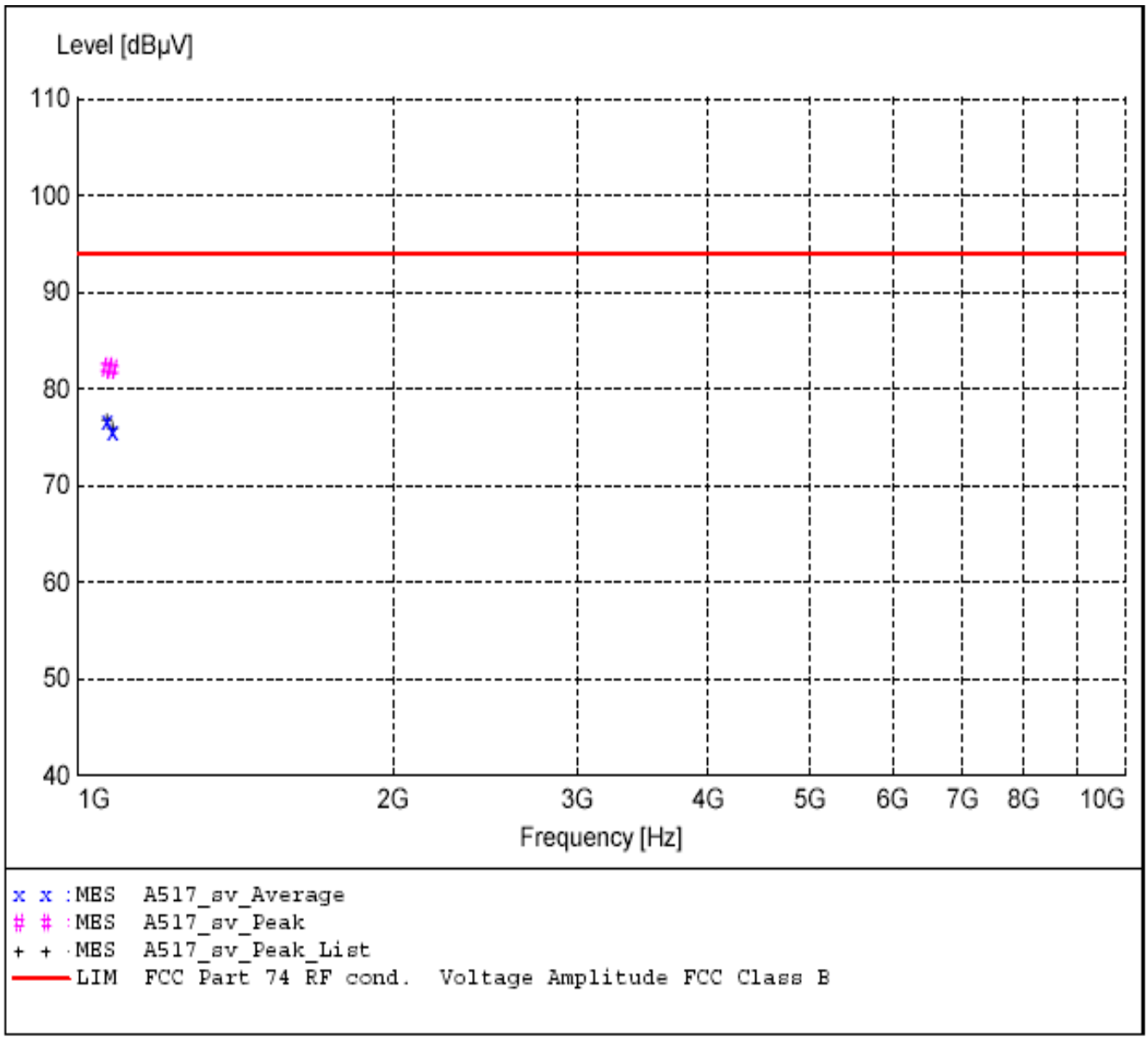
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A517_sv_Final"

5/14/2003 2:11PM

Frequency MHz	Level dBµV	Antenna Factor dBµV	System Loss dB	Total Level dBµV	Limit dBµV	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
1066.650000	40.88	0.00	41.2	82	94	11.9	0.00	0	MAX PEAK	None
1079.700000	40.63	0.00	41.2	82	94	12.2	0.00	0	MAX PEAK	None
1066.650000	35.41	0.00	41.2	77	94	17.4	0.00	0	AVERAGE	None
1079.700000	34.26	0.00	41.2	75	94	18.5	0.00	0	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Inter-Modulation test

EUT:	PA821
Manufacturer:	Shure, Inc.
Operating Condition:	72 deg F; 46% R.H.
Test Site:	Site 3
Operator:	Craig Brandt
Test Specification:	120 V 60 Hz
Comment:	533 MHz, 855 MHz, 860 MHz inputs, each 100 mW
	Date: 5/14/2003

TEXT: "RF Conducted"

Short Description: Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837808/005

TEST SET-UP: RF output connected to receiver through 40 dB attenuator.

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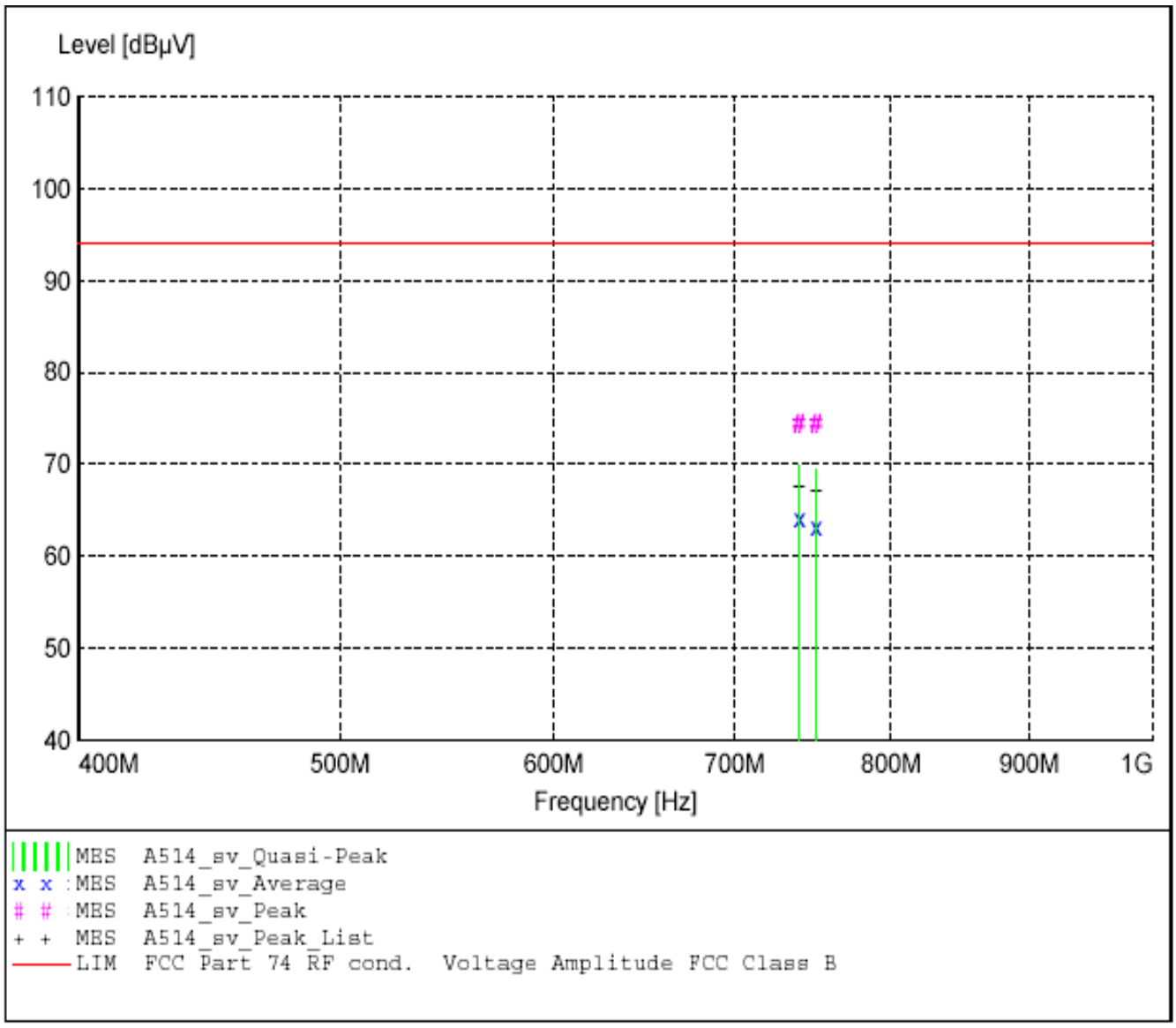
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A514_sv_Final"

5/14/2003 1:43PM

Frequency MHz	Level dBµV	Antenna Factor dBµV	System Loss dB	Total Level dBµV	Limit dBµV	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
750.240000	28.18	0.00	46.3	74	94	19.5	0.00	0	MAX PEAK	None
739.500000	28.18	0.00	46.3	74	94	19.6	0.00	0	MAX PEAK	None
739.500000	23.62	0.00	46.3	70	94	24.1	0.00	0	QUASI-PEAK	None
750.240000	23.12	0.00	46.3	69	94	24.6	0.00	0	QUASI-PEAK	None
739.500000	17.81	0.00	46.3	64	94	29.9	0.00	0	AVERAGE	None
750.240000	16.88	0.00	46.3	63	94	30.8	0.00	0	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Inter-Modulation test

EUT:	PA821
Manufacturer:	Shure, Inc.
Operating Condition:	72 deg F; 46% R.H.
Test Site:	Site 3
Operator:	Craig Brandt
Test Specification:	120 V 60 Hz
Comment:	533 MHz, 855 MHz, 860 MHz inputs, each 100 mW
	Date: 5/14/2003

TEXT: "RF Conducted"

Short Description: Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 937808/005

TEST SET-UP: RF output connected to receiver through 40 dB attenuator.

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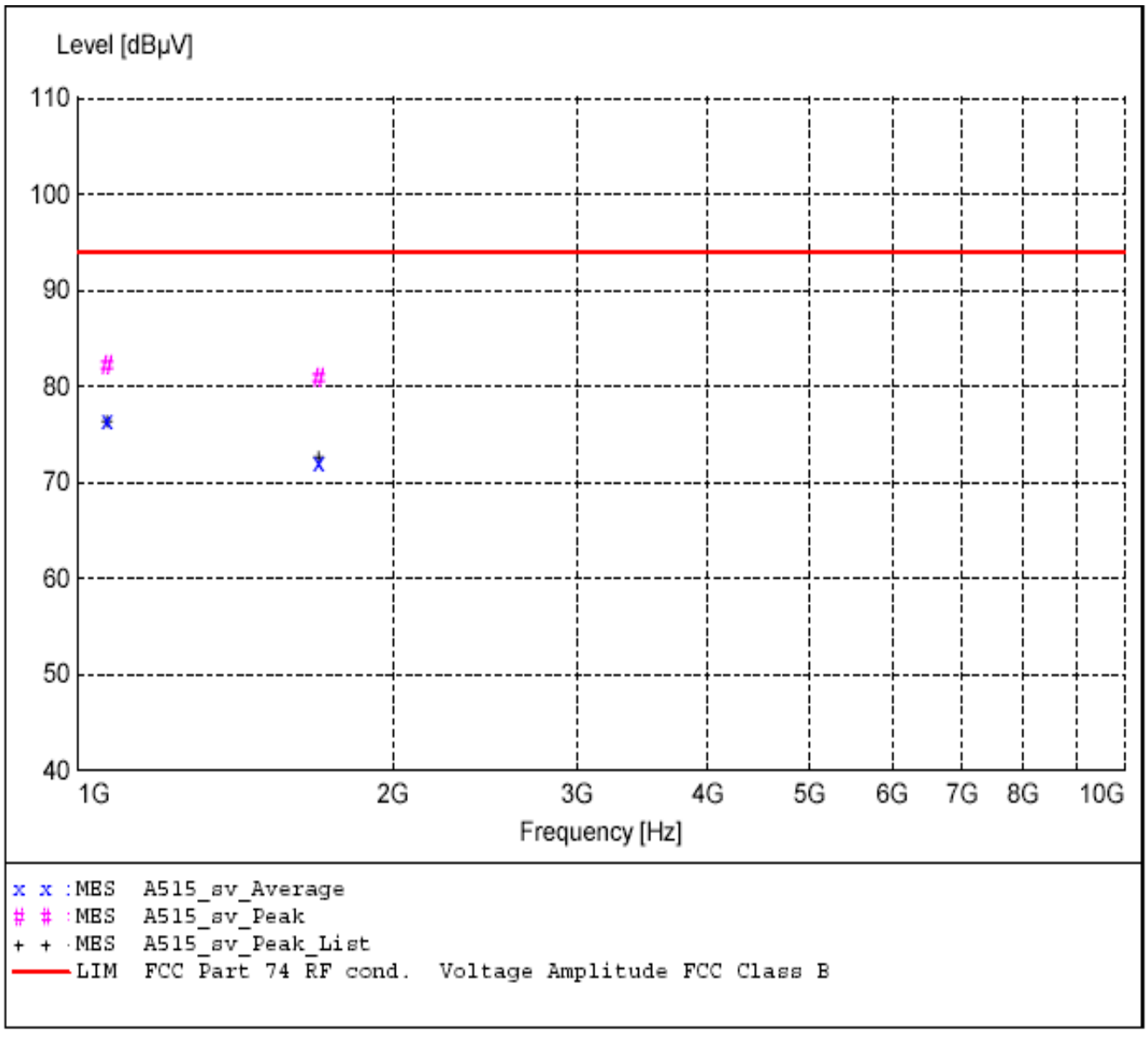
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A515_sv_Final"

5/14/2003 1:57PM

Frequency MHz	Level dBµV	Antenna Factor dBµV	System Loss dB	Total Level dBµV	Limit dBµV	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
1066.600000	41.00	0.00	41.2	82	94	11.8	0.00	0	MAX PEAK	None
1699.350000	39.29	0.00	41.5	81	94	13.2	0.00	0	MAX PEAK	None
1066.600000	35.28	0.00	41.2	76	94	17.5	0.00	0	AVERAGE	None
1699.350000	30.50	0.00	41.5	72	94	22.0	0.00	0	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

CONDUCTED EMISSION DATA & CHARTS TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

PART 2.1051

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Electric Field Strength

EUT:	PA821
Manufacturer:	Shure, Inc.
Operating Condition:	72 deg F; 46% R.H.
Test Site:	Site 3
Operator:	Craig Brandt
Test Specification:	120 V 60 Hz
Comment:	724 MHz, 533 MHz, 746 MHz inputs, each 100 mW
	Date: 5/6/2003

TEXT: "RF Conducted"

Short Description: Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837808/005

TEST SET-UP: RF output connected to receiver through 40 dB attenuator.

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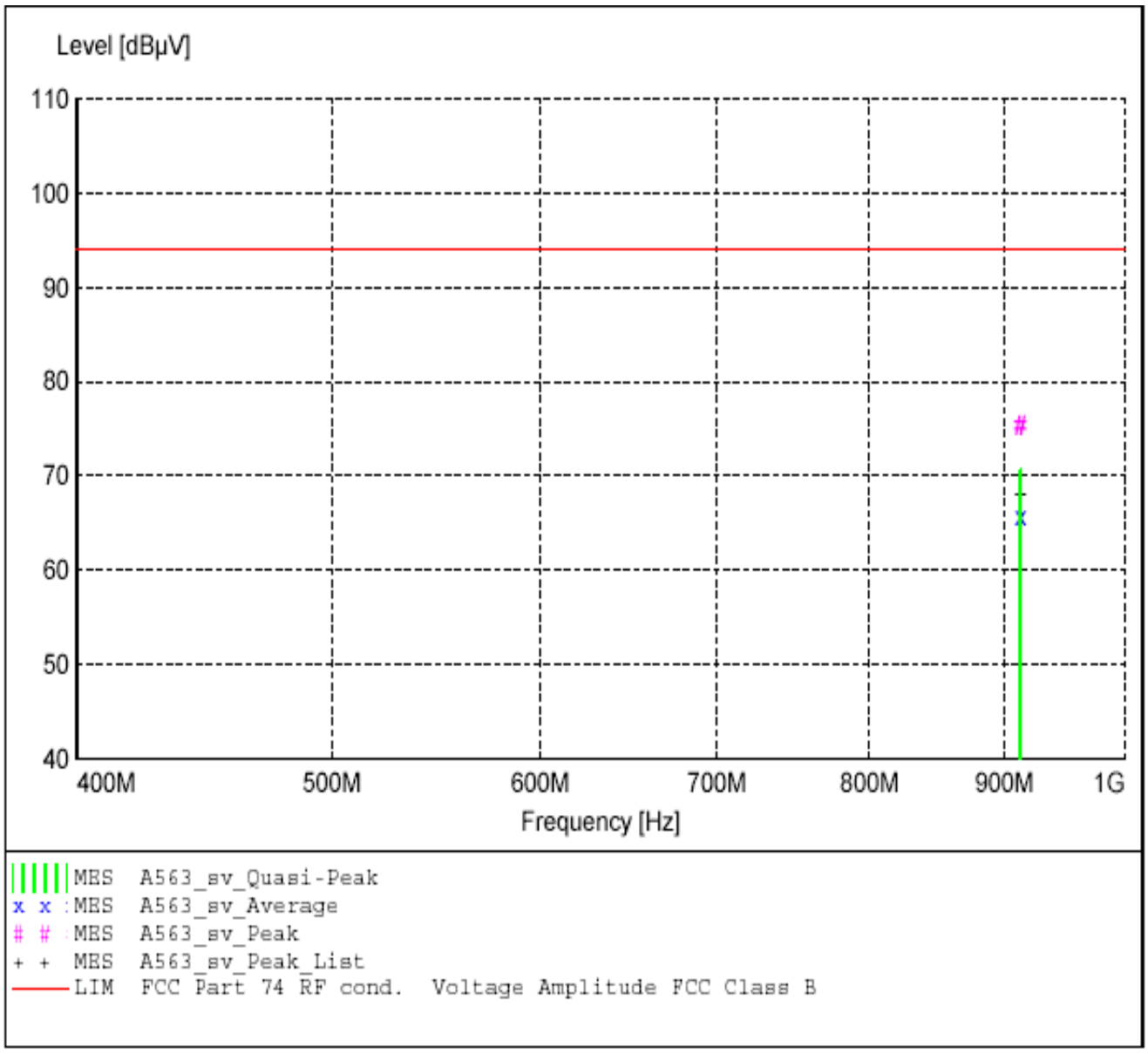
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A563_sv_Final"

5/6/2003 2:56PM

Frequency	Level	Antenna Factor	System Loss	Total Level	Limit	Margin	Height Ant.	EuT Angle	Final Detector	Comment
MHz	dBµV	dBµV	dB	dBµV	dBµV	dB	m	deg		
912.880000	28.35	0.00	47.0	75	94	18.6	0.00	0	MAX PEAK	None
912.880000	23.62	0.00	47.0	71	94	23.3	0.00	0	QUASI-PEAK	None
912.880000	18.65	0.00	47.0	66	94	28.3	0.00	0	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Electric Field Strength

EUT:	PA821
Manufacturer:	Shure, Inc.
Operating Condition:	72 deg F; 46% R.H.
Test Site:	Site 3
Operator:	Craig Brandt
Test Specification:	120 V 60 Hz
Comment:	724 MHz, 533 MHz, 746 MHz inputs, each 100 mW
	Date: 5/6/2003

TEXT: "RF Conducted"

Short Description: Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837809/005

TEST SET-UP: RF output connected to receiver through 40 dB attenuator.

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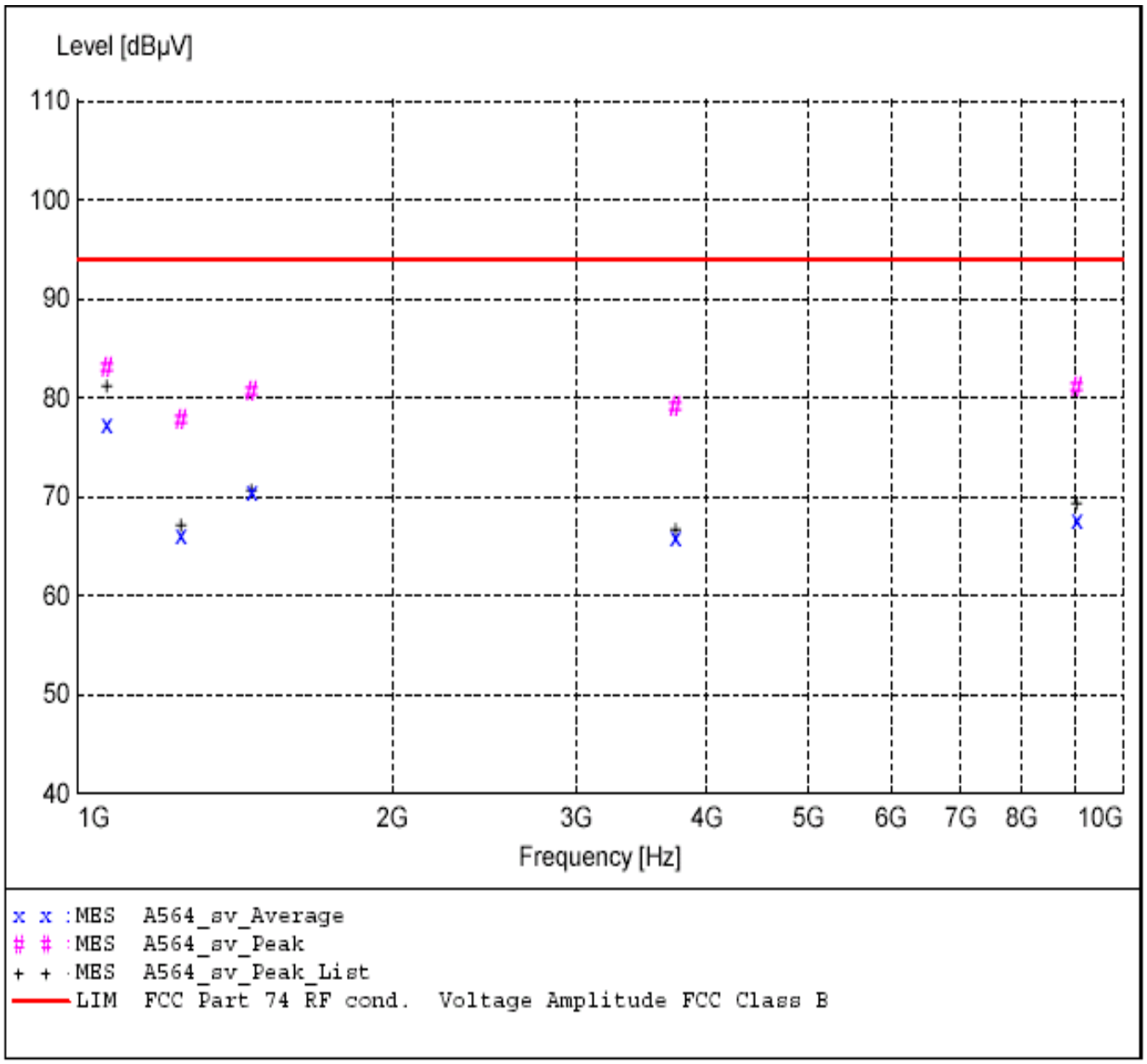
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A564_sv_Final"

5/6/2003 3:23PM

Frequency MHz	Level dBµV	Antenna Factor dBµV	System Loss dB	Total Level dBµV	Limit dBµV	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
1066.600000	41.80	0.00	41.2	83	94	11.0	0.00	0	MAX PEAK	None
9035.900000	37.55	0.00	43.4	81	94	13.0	0.00	0	MAX PEAK	Noise Floor
1468.100000	39.21	0.00	41.4	81	94	13.4	0.00	0	MAX PEAK	None
3732.000000	36.91	0.00	42.2	79	94	14.9	0.00	0	MAX PEAK	Noise Floor
1256.350000	36.51	0.00	41.2	78	94	16.2	0.00	0	MAX PEAK	None
1066.600000	36.13	0.00	41.2	77	94	16.6	0.00	0	AVERAGE	None
1468.100000	29.24	0.00	41.4	71	94	23.4	0.00	0	AVERAGE	None
9035.900000	24.37	0.00	43.4	68	94	26.2	0.00	0	AVERAGE	Noise Floor
1256.350000	24.86	0.00	41.2	66	94	27.9	0.00	0	AVERAGE	None
3732.000000	23.60	0.00	42.2	66	94	28.2	0.00	0	AVERAGE	Noise Floor

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ELECTRONIC SYSTEMS, INC.
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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

7.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS – PART 2.1053

Radiated measurements were performed at a 1 or 3 meter test distance automatically scanning the frequency range from 200 MHz to 10000 MHz, depending upon the fundamental frequency.

For the PSM Antenna Combiner, the highest fundamental frequency is 746 MHz so the scans were made up to 10000 MHz, to cover the tenth harmonic.

All signals in the frequency range of 30 MHz to 200 MHz were measured with a Biconical Antenna and from 200 MHz to 1000 MHz a Log Periodic Antenna was used as the pickup devices. From 1000 MHz to 10000 MHz, a Double Ridge Horn Antenna was used. The cables and equipment were placed and moved within the range of positions likely to find their maximum emissions. Tests were made in both the horizontal and vertical planes of polarization.

The allowed emissions for transmitters operating in the bands for PSM Antenna Combiner are found under Part 74, Section 74.861, Paragraph e-6 for Low Power Auxiliary Stations. This paragraph states the mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43+10Log10 (mean output power in watts) dB.

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

7.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS (CON'T) – PART 2.1053

As stated in Part 74, Section 74.861 (e-1 iii) the limit is 250 mW in the frequency range .

To determine the **LIMIT** for Spurious Emissions the following method was used:

Mean output power in watts:

Manufacturer's rated wattage = **.1 watt per signal (unity gain) Watts**
(See Paragraph 2.0, page 2 of this Appendix)

Free Space Formula

Convert to 3 meter test distance using the Free Space Formula

$$\frac{\sqrt{49.2 * \textit{rated wattage}}}{\text{Distance}} = 0.7393691 \text{ volts/meter} = 739369.1 \text{ uV/m}$$

20*Log(739369.1) = 117.3772 dBuV/m

Therefore, the Fundamental at three meters equals 117.3772 dBuV,

The emissions must be reduced by:

43 + 10*LOG100.1 watts) = 33 dB

Therefore, the **LIMIT** at three meters equals:

117.38 dBuV/m extrapolated level for 0.1 watts
-33 00dB required reduction below the unmodulated fundamental
84.38 dBuV/M maximum spurious emissions allowed

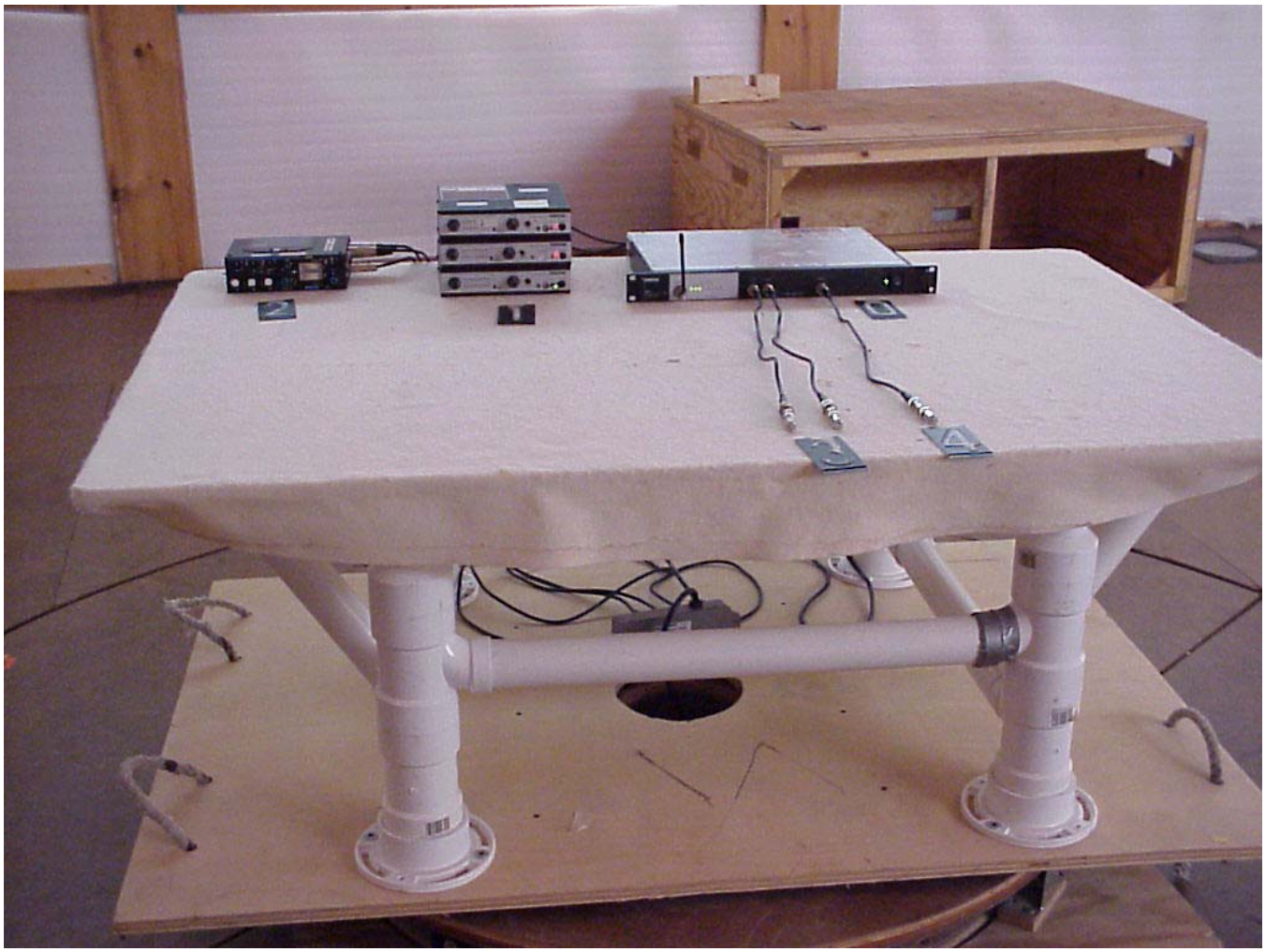
1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

7.0 RADIATED EMISSIONS PHOTOS TAKEN DURING TESTING



ELECTRONIC SYSTEMS, INC.
1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

RADIATED EMISSION DATA TAKEN

FOR SPURIOUS EMISSIONS

USING THE SUBSTITUTION METHOD

ANSI/TIA/EIA-603-1992 SECTION 2.2.12

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure Inc.
Operator: Craig Brandt
Date of test: 5-6-03

Field Strength of Spurious Radiation - Substitution Method Limit = -13 dBm

Model: **PA821** **Vertical**

Frequency (MHz) & Polarization	Max. Field Strength of EUT @ 3 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and antenna (dB)	Gain of antenna (dBi)	Strength of emission [ERP] (dBm)	Margin (dB)
511.4	58.7	-36.9	1.0	2.1	-37.9	24.9
555.2	60.8	-32.4	1.0	2.1	-33.4	20.4
1066.6	67.2	-40.6	1.6	5.0	-39.3	26.3
1446.2	55.6	-51.4	1.8	6.5	-48.8	23.8
2234.9	61.5	-46.1	2.4	8.3	-42.3	29.3
2666.5	52.8	-53.7	2.5	9.0	-49.3	36.3
2979.9	61.7	-44.4	2.7	9.4	-39.8	26.8
3724.9	57.6	-48.5	3.1	9.5	-44.2	31.2
5959.8	55.5	-51.9	4.0	10.9	-47.1	34.1

EIRP = Signal generator output - cable loss + antenna gain

$ERP_{(ref.\ to\ \frac{1}{2}\lambda\ dipole)}$ = Signal generator output - cable loss + antenna gain - 2.1

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

DLS Electronic Systems, Inc.

Company: Shure Inc.
Operator: Craig Brandt
Date of test: 5-6-03

Field Strength of Spurious Radiation - Substitution Method Limit = -13 dBm

Model: **PA821** **Horizontal**

Frequency (MHz) & Polarization	Max. Field Strength of EUT @ 3 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and antenna (dB)	Gain of antenna (dBi)	Strength of emission [ERP] (dBm)	Margin (dB)
511.4	58.6	-40.1	1.0	2.1	-41.1	28.1
555.2	61.8	-34.9	1.0	2.1	-35.9	22.9
912.9	60.9	-34.1	1.2	2.1	-35.3	22.3
1066.6	58.7	-48.6	1.6	5.0	-47.3	34.3
1446.2	54.8	-50.7	1.8	6.5	-48.1	35.1
2235.0	58.6	-49.9	2.4	8.3	-46.1	33.1
2979.9	58.1	-48.8	2.7	9.4	-44.2	31.2
3724.9	58.9	-47.6	3.1	9.5	-43.3	30.3
5959.8	53.6	-52.2	4.0	10.9	-47.4	34.4

EIRP = Signal generator output - cable loss + antenna gain

$ERP_{(ref.\ to\ \frac{1}{2}\lambda\ dipole)}$ = Signal generator output - cable loss + antenna gain - 2.1

ELECTRONIC SYSTEMS, INC.
1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

RADIATED EMISSION DATA AND GRAPH(S) TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS

PART 2.1053

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Electric Field Strength

```
EUT:                    PA821
Manufacturer:           Shure, Inc.
Operating Condition:    70 deg F; 41% R.H.
Test Site:              Site 3
Operator:               Craig Brandt
Test Specification:     120 V  60 Hz
Comment:                724 MHz, 533 MHz, 746 MHz inputs, each 100 mW
                        Date: 5/6/2003
```

TEXT: "Site 3 MidV 3M"

```
  Short Description:              Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 26 SN: 837491/010

                Antennas ---
                Biconical    -- EMCO 3104C SN: 9701-4785
                Log Periodic -- EMCO 3146  SN: 9702-4895

                Pre-Amp  --- Rohde&Schwarz TS-PR10 SN: 032001/005

TEST SET-UP:    EuT Measured at 3 Meters with VERTICAL Antenna Polarisation
```

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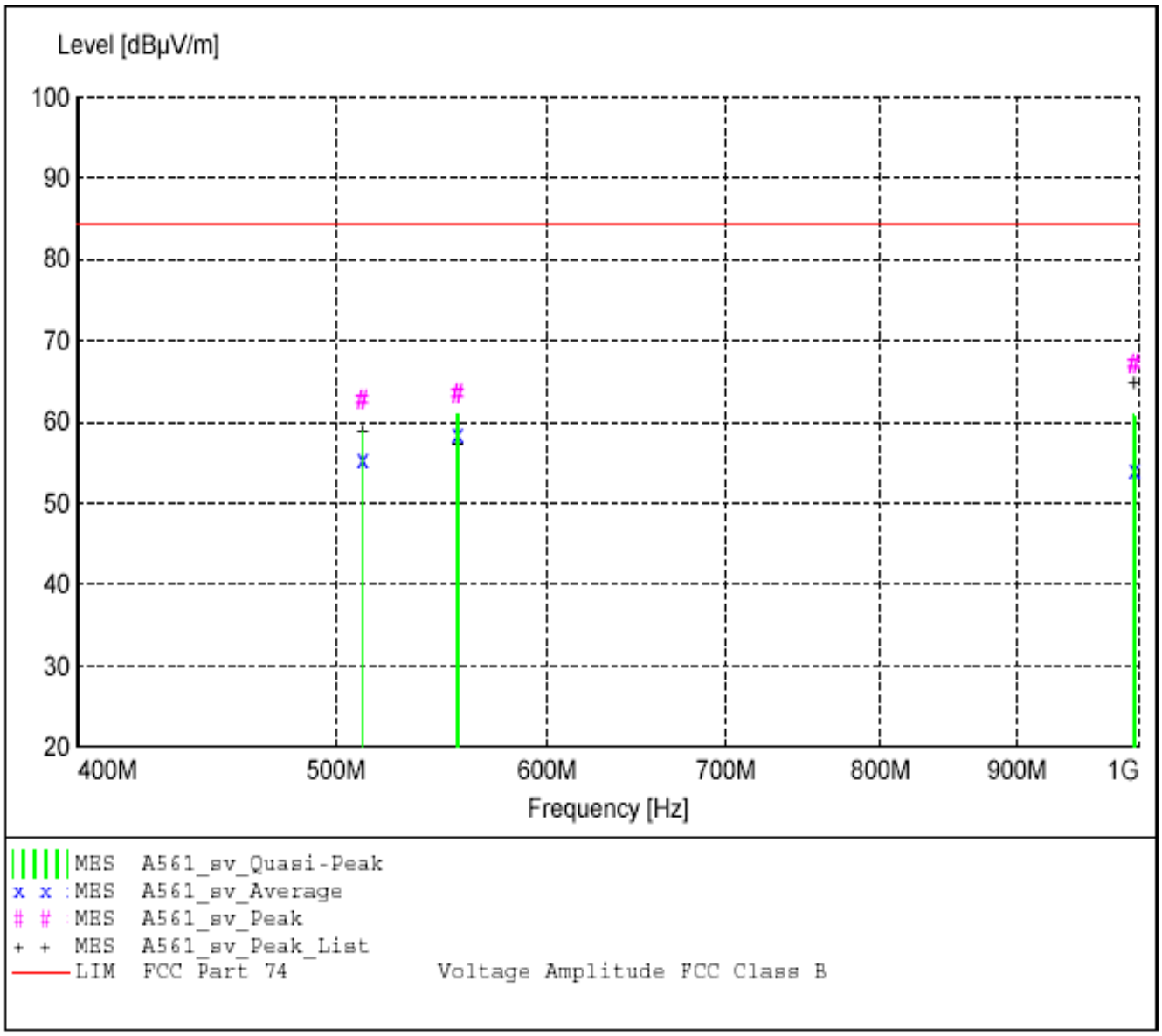
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A561_sv_Final"

5/6/2003 10:46AM

Frequency MHz	Level dBµV	Antenna Factor dBµV/m	System Loss dB	Total Level dBµV/m	Limit dBµV/m	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
995.770000	16.05	24.06	27.0	67.1	84.4	17.2	1.00	0	MAX PEAK	Noise Floor
555.200000	20.25	18.21	25.1	63.6	84.4	20.8	1.10	90	MAX PEAK	
511.400000	19.57	18.30	24.8	62.7	84.4	21.7	1.40	90	MAX PEAK	
555.200000	17.48	18.21	25.1	60.8	84.4	23.6	1.10	90	QUASI-PEAK	
995.770000	9.68	24.06	27.0	60.8	84.4	23.6	1.00	0	QUASI-PEAK	Noise Floor
511.400000	15.58	18.30	24.8	58.7	84.4	25.6	1.40	90	QUASI-PEAK	
555.200000	15.13	18.21	25.1	58.5	84.4	25.9	1.10	90	AVERAGE	
511.400000	12.30	18.30	24.8	55.4	84.4	28.9	1.40	90	AVERAGE	
995.770000	2.91	24.06	27.0	54.0	84.4	30.4	1.00	0	AVERAGE	Noise Floor

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1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Electric Field Strength

```
EUT:                  PA821
Manufacturer:         Shure, Inc.
Operating Condition:  70 deg F; 41% R.H.
Test Site:            Site 3
Operator:             Craig Brandt
Test Specification:
Comment:              724 MHz, 533 MHz, 746 MHz inputs, each 100 mW
                      Date: 5/6/2003
```

TEXT: "Site 3 6204&184 V3M"

```
  Short Description:            Test Set-up Vert1GHz-
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837808/006

                Horn Antenna --- ETS 3115 SN: 6204

                Pre-Amps ---
                               1 - 10 GHz  -- Miteq AMF-6D-010100-50 SN: 682425
                               10 - 18 GHz -- Miteq AMF-6F-100200-50-10P SN: 668382

TEST SET-UP:    EuT Measured at 3 Meters with VERTICAL Antenna Polarisation
```

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```

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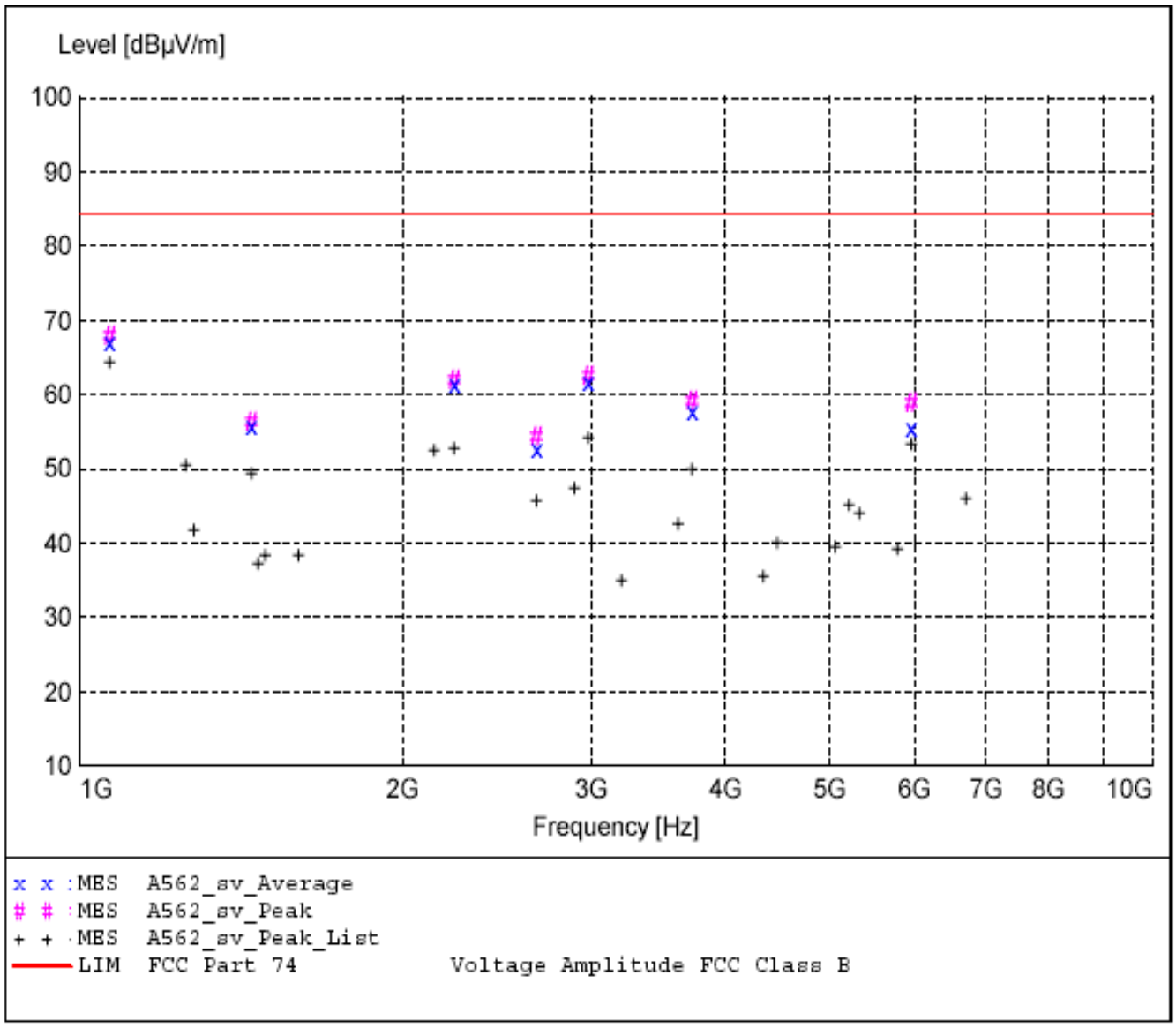
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A562_sv_Final"

5/6/2003 11:47AM

Frequency MHz	Level dBµV	Antenna Factor dBµV/m	System Loss dB	Total Level dBµV/m	Limit dBµV/m	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
1066.600000	75.46	24.78	-32.2	68.0	84.4	16.3	1.10	135	MAX PEAK	None
1066.600000	74.62	24.78	-32.2	67.2	84.4	17.2	1.10	135	AVERAGE	None
2979.900000	70.80	31.66	-40.0	62.5	84.4	21.9	2.20	180	MAX PEAK	None
2234.950000	72.19	29.70	-39.8	62.0	84.4	22.3	1.10	45	MAX PEAK	None
2979.900000	70.02	31.66	-40.0	61.7	84.4	22.7	2.20	180	AVERAGE	None
2234.950000	71.60	29.70	-39.8	61.5	84.4	22.9	1.10	45	AVERAGE	None
3724.950000	64.15	33.63	-38.6	59.1	84.4	25.2	1.30	45	MAX PEAK	None
5959.800000	59.56	36.73	-37.4	58.8	84.4	25.5	1.10	45	MAX PEAK	None
3724.950000	62.62	33.63	-38.6	57.6	84.4	26.8	1.30	45	AVERAGE	None
1446.200000	70.06	26.37	-40.1	56.3	84.4	28.1	1.20	180	MAX PEAK	None
1446.200000	69.39	26.37	-40.1	55.6	84.4	28.7	1.20	180	AVERAGE	None
5959.800000	56.18	36.73	-37.4	55.5	84.4	28.9	1.10	45	AVERAGE	None
2666.500000	63.49	30.97	-40.0	54.5	84.4	29.9	1.20	180	MAX PEAK	None
2666.500000	61.79	30.97	-40.0	52.8	84.4	31.6	1.20	180	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Electric Field Strength

```
EUT:                    PA821
Manufacturer:           Shure, Inc.
Operating Condition:    70 deg F; 41% R.H.
Test Site:              Site 3
Operator:               Craig Brandt
Test Specification:     120 V  60 Hz
Comment:                724 MHz, 533 MHz, 746 MHz inputs, each 100 mW
                        Date: 5/6/2003
```

TEXT: "Site 3 MidH 3M"

```
  Short Description:              Test Set-up Horz30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837808/006

                Antennas ---
                Biconical     -- EMCO 3104C SN: 9701-4785
                Log Periodic  -- EMCO 3146  SN: 9702-4895

                Pre-Amp   --- Rohde&Schwarz TS-PR10 SN: 032001/005

TEST SET-UP:    EuT Measured at 3 Meters with HORIZONTAL Antenna Polarisation
```

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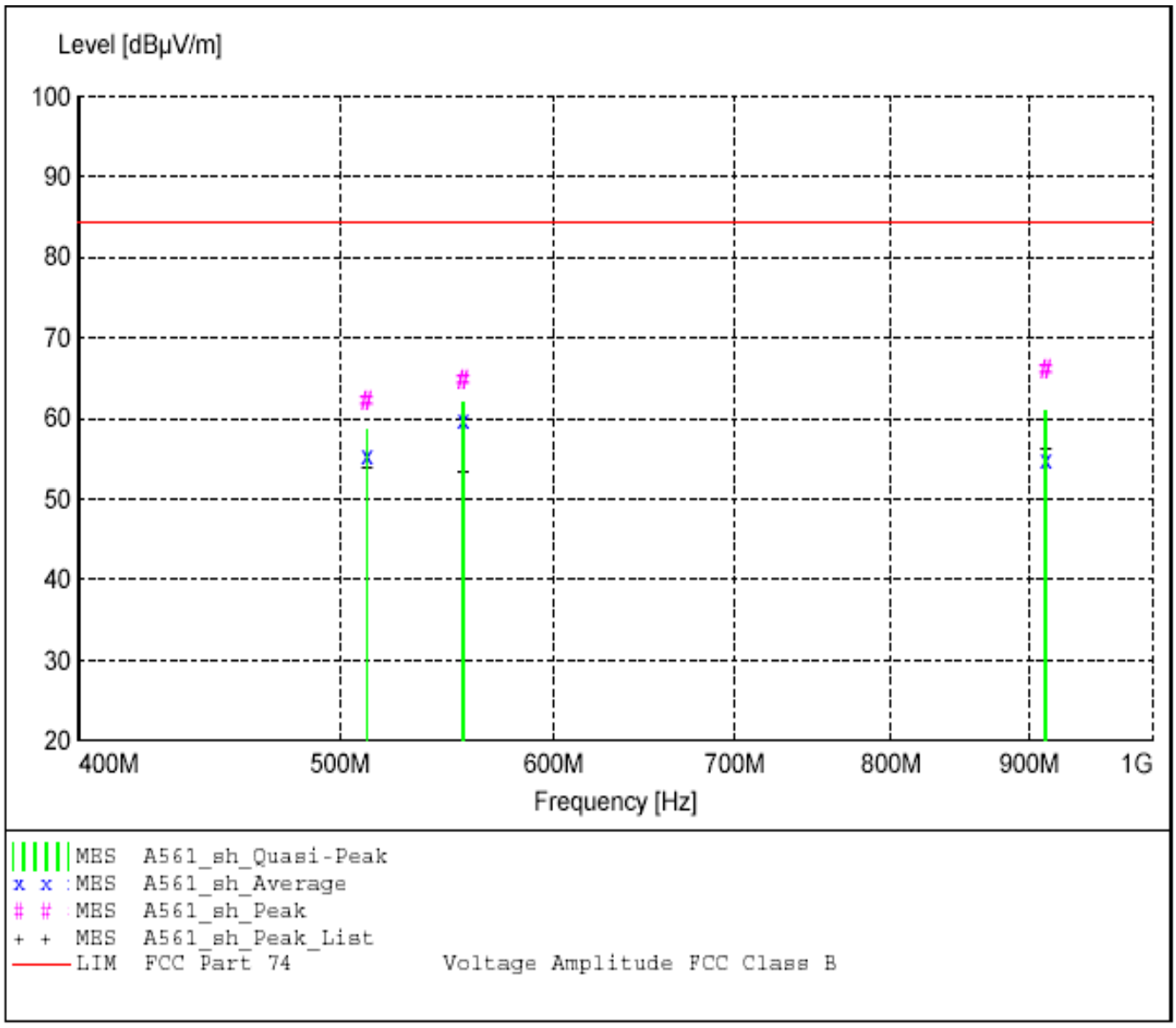
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A561_sh_Final"

5/6/2003 10:54AM

Frequency MHz	Level dBµV	Antenna Factor dBµV/m	System Loss dB	Total Level dBµV/m	Limit dBµV/m	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
912.930000	16.98	22.34	26.8	66.1	84.4	18.3	1.00	315	MAX PEAK	None
555.160000	21.37	18.21	25.1	64.7	84.4	19.7	2.00	340	MAX PEAK	None
511.410000	19.09	18.30	24.8	62.2	84.4	22.1	1.00	225	MAX PEAK	None
555.160000	18.52	18.21	25.1	61.8	84.4	22.5	2.00	340	QUASI-PEAK	None
912.930000	11.82	22.34	26.8	60.9	84.4	23.5	1.00	315	QUASI-PEAK	None
555.160000	16.48	18.21	25.1	59.8	84.4	24.6	2.00	340	AVERAGE	None
511.410000	15.49	18.30	24.8	58.6	84.4	25.7	1.00	225	QUASI-PEAK	None
511.410000	12.25	18.30	24.8	55.4	84.4	29.0	1.00	225	AVERAGE	None
912.930000	5.80	22.34	26.8	54.9	84.4	29.5	1.00	315	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

FCC Part 74

Electric Field Strength

```
EUT:                  PA821
Manufacturer:         Shure, Inc.
Operating Condition:  70 deg F; 41% R.H.
Test Site:            Site 3
Operator:             Craig Brandt
Test Specification:
Comment:              724 MHz, 533 MHz, 746 MHz inputs, each 100 mW
                      Date: 5/6/2003
```

TEXT: "Site 3 6204&184 H3M"

```
  Short Description:            Test Set-up Horz1GHz-
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837808/006

                Horn Antenna --- ETS 3115 SN: 6204

                Pre-Amps ---
                               1 - 10 GHz  -- Miteq AMF-6D-010100-50 SN: 682425
                               10 - 18 GHz -- Miteq AMF-6F-100200-50-10P SN: 668382

TEST SET-UP:    EuT Measured at 3 Meters with HORIZONTAL Antenna Polarisation
```

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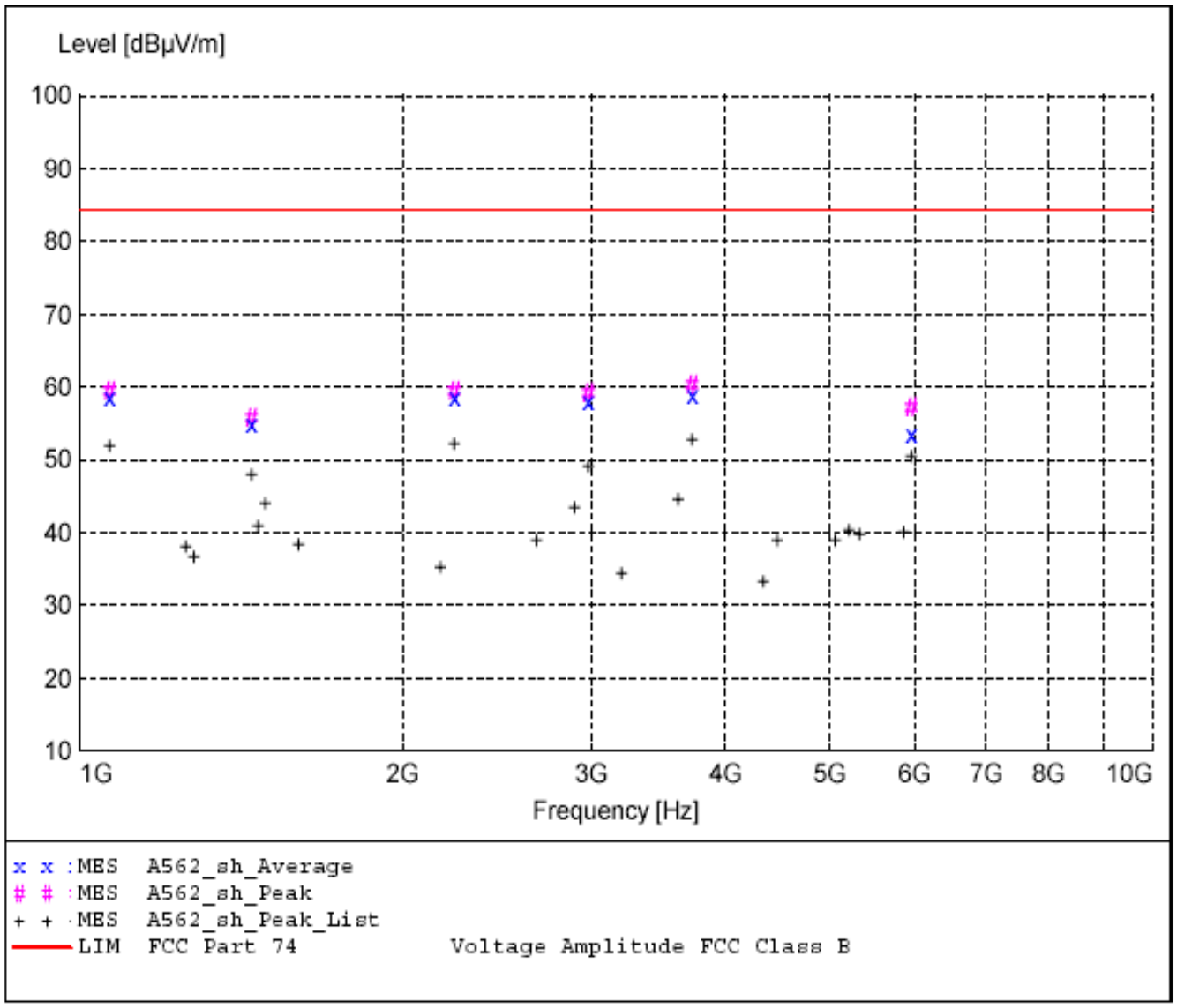
APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

MEASUREMENT RESULT: "A562_sh_Final"

5/6/2003 12:50PM

Frequency MHz	Level dBµV	Antenna Factor dBµV/m	System Loss dB	Total Level dBµV/m	Limit dBµV/m	Margin dB	Height Ant. m	EuT Angle deg	Final Detector	Comment
3724.900000	65.33	33.63	-38.6	60.3	84.4	24.1	1.00	225	MAX PEAK	None
2235.000000	69.69	29.70	-39.8	59.5	84.4	24.8	1.30	225	MAX PEAK	None
1066.600000	66.98	24.78	-32.2	59.5	84.4	24.8	1.00	45	MAX PEAK	None
2979.900000	67.59	31.66	-40.0	59.3	84.4	25.1	1.30	225	MAX PEAK	None
3724.900000	63.88	33.63	-38.6	58.9	84.4	25.5	1.00	225	AVERAGE	None
1066.600000	66.11	24.78	-32.2	58.7	84.4	25.7	1.00	45	AVERAGE	None
2235.000000	68.76	29.70	-39.8	58.6	84.4	25.8	1.30	225	AVERAGE	None
2979.900000	66.46	31.66	-40.0	58.1	84.4	26.2	1.30	225	AVERAGE	None
5959.850000	57.73	36.73	-37.4	57.0	84.4	27.4	1.30	270	MAX PEAK	None
1446.200000	69.44	26.37	-40.1	55.7	84.4	28.7	1.50	45	MAX PEAK	None
1446.200000	68.60	26.37	-40.1	54.8	84.4	29.5	1.50	45	AVERAGE	None
5959.850000	54.28	36.73	-37.4	53.6	84.4	30.8	1.30	270	AVERAGE	None

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

8.0 FREQUENCY STABILITY (TEMPERATURE)– PART 2.1055(a1)

The frequency stability was measured from -30° to +50° centigrade at intervals of 10° centigrade throughout the range. Prior to each frequency measurement, the equipment was left alone for a sufficient period of time (approximately 30 minutes or more) to allow the components of the PSM Antenna Combiner oscillator circuitry to stabilize. The following information was taken:

FREQUENCY STABILITY FOR TEMPERATURE VARIATION IN MHz:

-30°	0
-20°	0
-10°	0
0°	0
+10°	0
+20°	0
+30°	0
+40°	0
+50°	0

Worst Case Variance:

0 Hz

As stated in Part 74, Section 74.861 e-4 the Frequency Tolerance and Margin for this range are as follows:

Frequency Tolerance: = **0**

Assigned Frequency: = **0 Hz**

Limit = 0 * 0.005% = **0 Hz**

NOTE:

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

GRAPH(S) TAKEN FOR FREQUENCY

STABILITY WHEN VARYING THE TEMPERATURE

PART 2.1055a

NOTE:

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

ELECTRONIC SYSTEMS, INC.
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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

9.0 FREQUENCY STABILITY (VOLTAGE VARIATION)– PART 2.1055(d1)

The frequency stability of PSM Antenna Combiner was measured by varying the primary supply voltage from 85% to 115% of nominal value for all equipment **other than hand carried battery equipment.**

FREQUENCY STABILITY FOR VOLTAGE VARIATION:

85%	0
100%	0
115%	0

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

FREQUENCY STABILITY FOR HAND HELD DEVICES:

For **hand carried, battery powered equipment**, the supply voltage was reduced to the battery operating end point specified by the manufacturer. Readings were taken at the reduced end point and with a fresh battery:

Fresh Battery verses Battery end point:

Frequency #1	0
Frequency #2	0
Frequency #3	0

Worst Case Variance: = **0**

As stated in Part 74, Section 74.861 e-4 the Frequency Tolerance and Margin for this range are as follows:

Frequency Tolerance: = **0.005%**

Limit: = **0**

NOTE: This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.

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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

GRAPH(S) TAKEN FOR FREQUENCY

STABILITY WHEN VARYING THE

PRIMARY SUPPLY VOLTAGE

PART 2.1055d

This test is not required because the PSM Antenna Combiner is an amplifier which does not generate a fundamental frequency.