1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: PA421SWB
Report Number: 14457

FCC Rules and Regulations / Intentional Radiators

Low Power Auxiliary Stations

Part 74, Subpart H, Sections 74.801 - 74.882

Part 74.861 (d) Other than TV Broadcasting

AND

Part 74.861 (e) TV Broadcasting

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

Formal Name:	PA421SWB Antenna Combiner
Kind of Equipment:	Antenna Combiner for Wireless Transmitters
Frequency Range:	470 MHz - 697 MHz and 944 MHz - 952 MHz
Test Configuration:	Combines the antenna outputs of 4 PSM transmitters into one output via shielded coaxial cables. (Tested at 120 vac, 60 Hz)
Model Number(s):	PA421SWB
Model(s) Tested:	PA421SWB
Serial Number(s):	5
Emission Designator:	81KF3E
Date of Tests:	July 22 & 23, 2008
Test Conducted For:	Shure Inc. 5800 W. Touhy Avenue Niles, Illinois 60714-4608

NOTICE: "This report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government". Please see the "Additional Description of Equipment Under Test" page listed inside of this report.

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

1250 Peterson Dr., Wheeling, IL 60090

TABLE OF CONTENTS

1250 Peterson Dr., Wheeling, IL 60090

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

D.L.S. Electronic Systems, Inc.

Wheeling, IL

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated 18 June 2005).

2007-10-01 through 2008-09-30

Effective dates

For the National Institute of Standards and Technology

NVI AP-01C (REV 2006-09-13)

1250 Peterson Dr., Wheeling, IL 60090

1.0 SUMMARY OF TEST REPORT

It was found that the PA421SWB Antenna Combiner, Model Number(s) PA421SWB, **meets** the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Section 74.861 (d) and Section 74.861 (e) for low power auxiliary stations.

2.0 INTRODUCTION

On July 22 & 23, 2008, a series of radio frequency interference measurements was performed on PA421SWB Antenna Combiner, Model Number(s) PA421SWB, Serial Number: 5. 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.

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO Guide 17025. NVLAP Certificate and Scope can be viewed at http://www.dlsemc.com/certificate. Our facilities are registered with the FCC, Industry Canada, and VCCI. All immunity tests were performed by personnel of D.L.S. Electronic Systems, Inc. at the following location(s):

Main Test Facility:
D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, Illinois 60090

O.A.T.S. Test Facility:
D.L.S. Electronic Systems, Inc.
166 S. Carter Street
Genoa City, Wisconsin 53128

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 (d), for low power auxiliary stations.

1250 Peterson Dr., Wheeling, IL 60090

4.0 TEST SET-UP

All tests were performed at D.L.S. Electronic Systems, Inc. and set up according to the FCC and TIA-603C regulations. 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 C63.4-2003.

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 TIA Standard, TIA-603-C:2004, Section 2.2.12.

1250 Peterson Dr., Wheeling, IL 60090

5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data below 1000 MHz was automatically plotted using the 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 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 C63.4-2003.

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.

6.0 AMBIENT MEASUREMENTS

For emissions measurements, broadband antennas and an EMI Test Receiver with a panoramic spectrum display are used. First the frequency range is scanned and displayed on the test receiver display. Next the scanned frequency range is divided into smaller ranges, and then it is manually tuned through to determine the emissions from the EUT. A headset or loudspeaker is connected to the test receiver's AM/FM demodulated output as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT. If there is any doubt as to the source of the emission, it is further investigated by rotating the EUT, or by disconnecting the power from the EUT.

The EUT is set up in its typical configuration and operated in its various modes. For tabletop systems, cables are manipulated within the range of likely configurations. For floor-standing equipment, the cables or are located in the same manner as the user would install them and no further manipulation is made. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions. For each mode of operation, the frequency spectrum is monitored. Variations in antenna height, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) are explored to produce the emission that has the highest amplitude relative to the limit.

1250 Peterson Dr., Wheeling, IL 60090

7.0 AC POWER LINE CONDUCTED EMISSION MEASUREMENTS – Part 15.207

Conducted emissions were measured over the frequency range from 150 kHz to 30 MHz in accordance with the power line measurements as specified in FCC Part 15, Subpart C, Section 15.207 & ANSI C63.4-2003. Since the device is operated from the public utility lines, the 120 Vac, 60 Hz power leads, high (hot) and low (neutral) sides, were measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. During the test, the cables were placed and items moved (when appropriate) to maximize emissions. All signals were then recorded. The allowed levels for Intentional Radiators which is designed to connected to the public utility (AC) power line cannot exceed the following:

Frequency of Emissions (MHz)	Conducted Limits (dBuV)	
	Quasi Peak	Average
.15 to .5	66 to 56	56 to 46
.5 to 5	56	46
5 to 30	60	50

NOTE:

All test measurements were made at a screen room temperature of **74°F** at **52%** relative humidity.

1250 Peterson Dr., Wheeling, IL 60090

8.0 DESCRIPTION OF TEST SAMPLE:

8.1 Description:

The PA421SWB Antenna Combiner allows up to four Shure PSM transmitters to use a single antenna. The transmitters may be from any PSM model series and any frequency between 470 and 952 MHz. The unit takes inputs from the transmitters and outputs them to a single antenna, eliminating stage clutter and significantly improving intermodulation distortion performance. This Antenna Combiner is designed to meet the needs of users with multiple systems, and will generally be rack-mounted. This combiner will also provide 4 DC power outputs rated at 15VDC/660mA (10W) to power 4 individual PSM400 or PSM500 transmitters.

The first three main inputs of the EUT will be connected to the antenna outputs of three PSM400 transmitters representing the lowest, middle and highest PSM400 transmitter frequencies. The transmitters will be driven by a Shure FP33 mixer producing a 1kHz tone. The remaining input of the EUT will be loaded by a PSM400 transmitter with no input signal applied. The output of the EUT will be terminated by a 50 ohm load.

FCC: Tested with 3 modulated transmitter inputs (524.2 MHz, 661.575 MHz, and 951.8 MHz), and 1 unmodulated transmitter input (634.8 MHz).

8.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

Length: 331.47mm x Width: 401.32mm x Height: 43.3832mm

8.3 LINE FILTER USED:

N/A

8.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

100.0 kHz

Clock Frequencies:

N/A

8.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

1. PC Board Assy. PN: 190-12050

1250 Peterson Dr., Wheeling, IL 60090

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

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

NOTE:

FCC: Tested with 3 modulated transmitter inputs (524.2 MHz, 661.575 MHz, and 951.8 MHz), and 1 unmodulated transmitter inputs (634.8 MHz).

Radiated and RF conducted testing using P7T inputs (higher transmit power than P4T).

AC line conducted testing using P4T inputs. (P4Ts get power directly from EUT = higher load on EUT power supply.

10.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 PA421SWB Antenna Combiner
Model Number: PA421SWB, Serial Number: 5

Item 1 Two-Meter Non-Shielded AC Power Cord. 2m

Item 2 Four 0.6-Meter Shielded Metal DC Output Cables (Unterminated For Radiated Testing; Powering Four P4T Transmitters For Line Conducted Testing). .6m

Item 3 Four 0.6-Meter Shielded Metal Transmitter Input Cables. .6m

Item 4 Four Shure Model P7T (Radiated & RF Cond.); P4T (AC Line Cord) Transmitters.

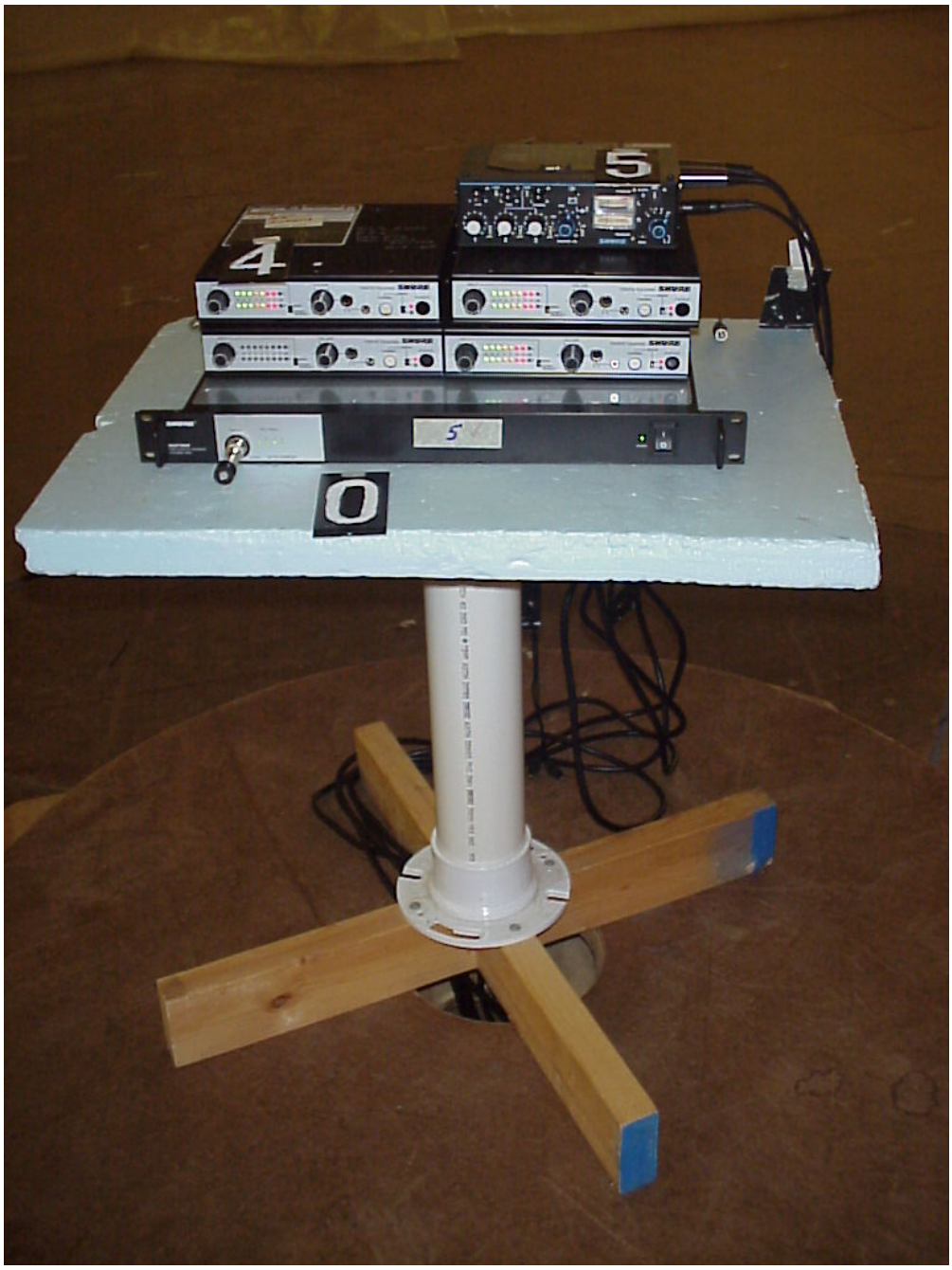
Item 5 Model FP33 Shure Mixer, S/N 0007333 4276.

Item 6 Four Two-Meter Non-Shielded AC Power Cords For P7T Transmitters. 2m

Item 7 Three 1.1-Meter Metal Audio Cables From Mixer To Transmitters. 1.1m

1250 Peterson Dr., Wheeling, IL 60090

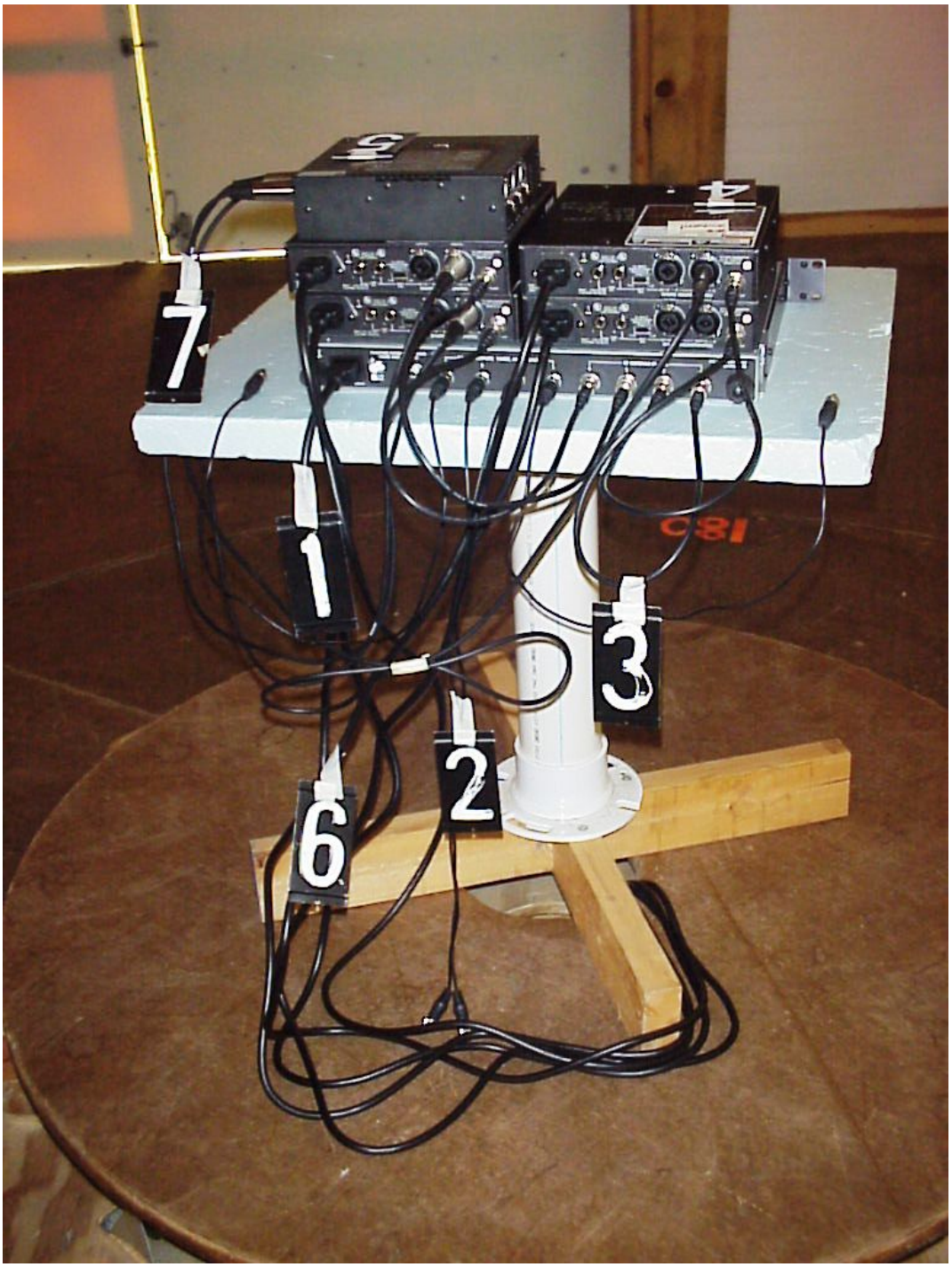
11.0 RADIATED PHOTOS TAKEN DURING TESTING



RADIATED FRONT

1250 Peterson Dr., Wheeling, IL 60090

11.0 RADIATED PHOTOS TAKEN DURING TESTING



RADIATED BACK

1250 Peterson Dr., Wheeling, IL 60090

11.0 AC POWER LINE CONDUCTED PHOTOS TAKEN DURING TESTING

1250 Peterson Dr., Wheeling, IL 60090

12.0 RESULTS OF TESTS

The radio interference emission charts 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.

13.0 CONCLUSION

It was found that the PA421SWB Antenna Combiner, Model Number(s) PA421SWB **meets** the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Section 74.861 (d) and Section 74.861 (e) for low power auxiliary stations.

1250 Peterson Dr., Wheeling, IL 60090

TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Receiver, RF, Tuned	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	12/27/2008
Receiver, RF, Tuned	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	7/10/2009
Preamp, RF	Miteq	AMF-6D-100200-50	313936	1-10 GHz	5/8/2009
Preamp, RF	Rohde & Schwarz	TS-PR10	032001/005	1 GHz-10 GHz	3/10/2009
Biconical Antenna	EMCO	3104C	9701-4785	20-220 MHz	4/21/2009
Log Periodic Antenna,	EMCO	3146	9702-4895	200 MHz-1 GHz	4/21/2009
Horn Antenna	EMCO	3115	9903-5731	1-18 GHz	6/12/2009
LISN	Solar Electronics Co.	9252-50-R-24-BNC	961019	N/A	7/18/2009
Limiter, Transient, RF	Electro-Metrics	EM7600	706	N/A	1/9/2009

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

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

TEST PROCEDURE

SUBPART H

OPERATING IN THE BANDS OTHER THAN THOSE ALLOCATED FOR TV BROADCASTING

AND

LOW POWER AUXILIARY STATIONS OPERATING IN THE BANDS ALLOCATED FOR TV BROADCASTING

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

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 and EIA /TIA-603-C:2004, SECTION 2.2.17

As stated in PART 74.861 (e)(1)(ii), the RF output power should not exceed .25 watt(s). The RF output power was measured with the transmitter unmodulated. The RF output power was measured using the substitution method because there is no antenna port for a direct connection. The RF output power was measured using the following test method:

Actual Measurements Taken:

19.54 dBm Measured output of the transmitter

19.54 dBm equals 0.092 watt(s)

LIMIT:

Manufacturer's rated output power = 250mW (Unity Gain. Output = Input or less)

MARGIN:

.25 - 0.092 = .158 watt(s)

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

DATA TAKEN OF THE RF POWER

OUTPUT MEASUREMENT

EIA /TIA-603-C:2004, SECTION 2.2.17

FCC Part 74.861 (d)(1), (e)(1) & PART 2.1046

SIGNAL IN VERSUS SIGNAL OUT

1250 Peterson Dr., Wheeling, IL 60090

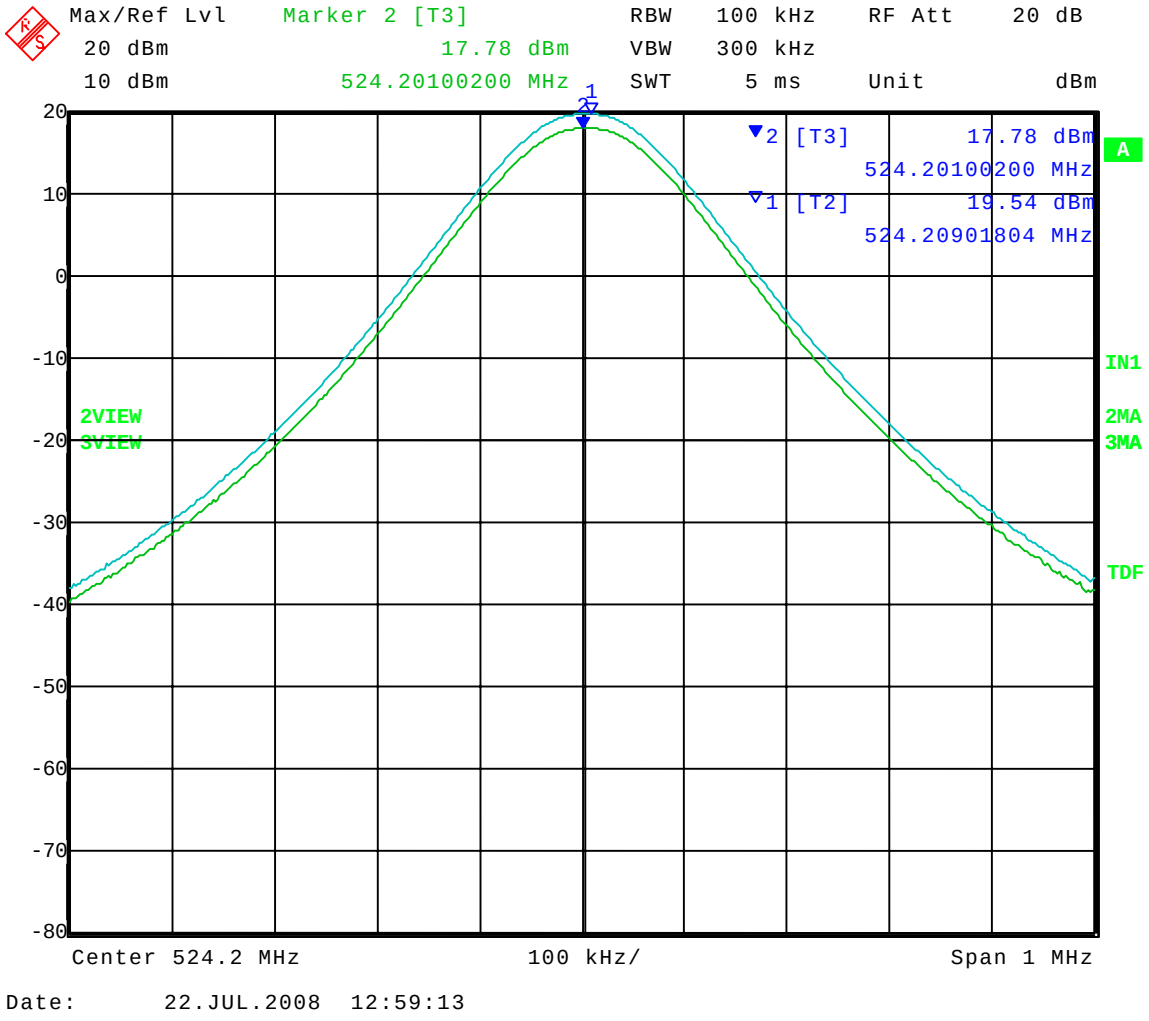
Company: Shure Inc.
Model Tested: PA421SWB
Report Number: 14457

APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Peak Power Output - Conducted
Rule part: FCC Part 74; FCC Part 2.1046
Operator: Craig B
Comment: Channel: 524.2 MHz

Blue = Input = 19.54 dBm
Green = Output = 17.78 dBm

Change in Output Power = -1.76 dBm



1250 Peterson Dr., Wheeling, IL 60090

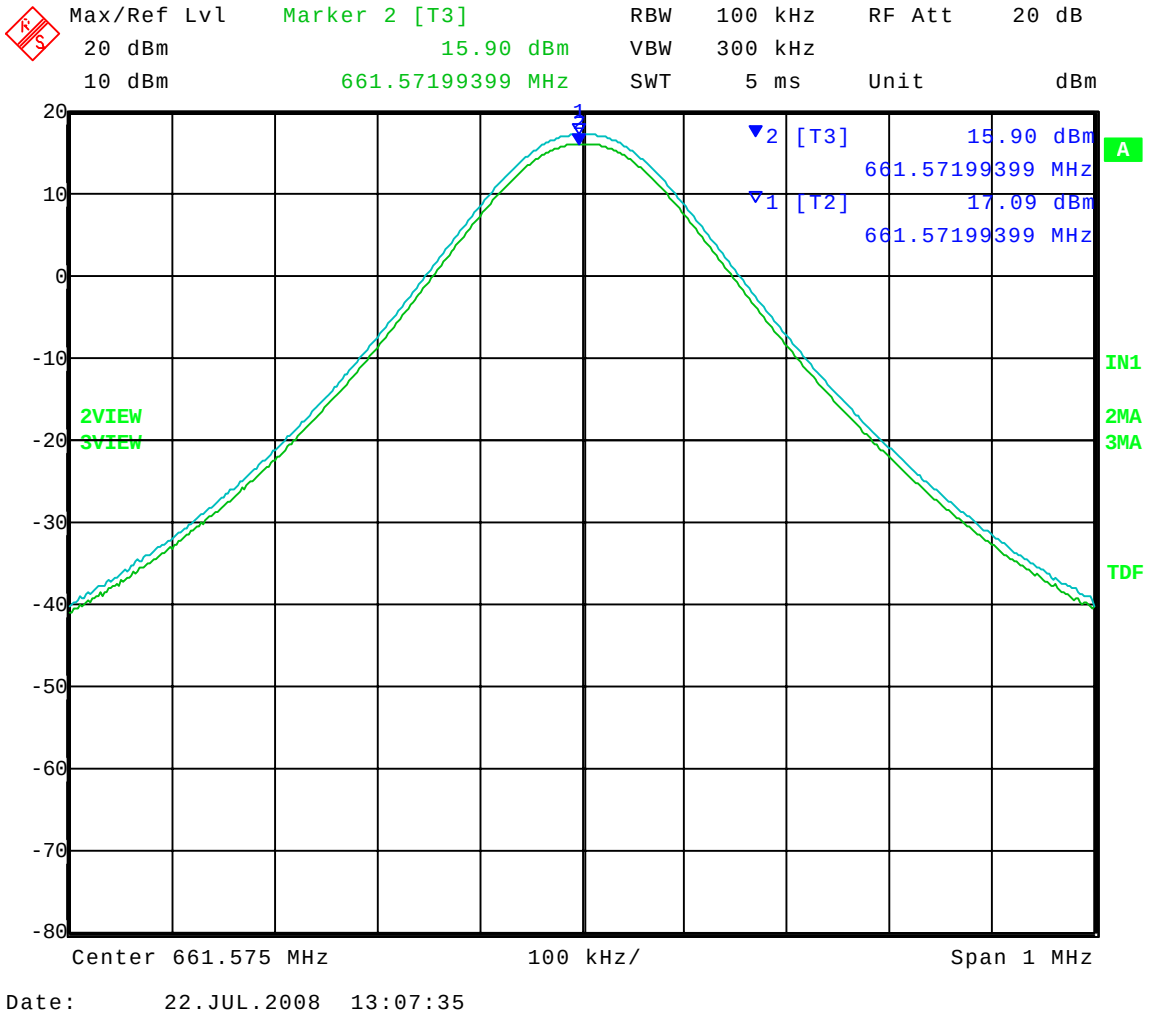
Company: Shure Inc.
Model Tested: PA421SWB
Report Number: 14457

APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Peak Power Output - Conducted
Rule part: FCC Part 74; FCC Part 2.1046
Operator: Craig B
Comment: Channel: 661.575 MHz

Blue = Input = 17.09 dBm
Green = Output = 15.90 dBm

Change in Output Power = -1.19 dBm



1250 Peterson Dr., Wheeling, IL 60090

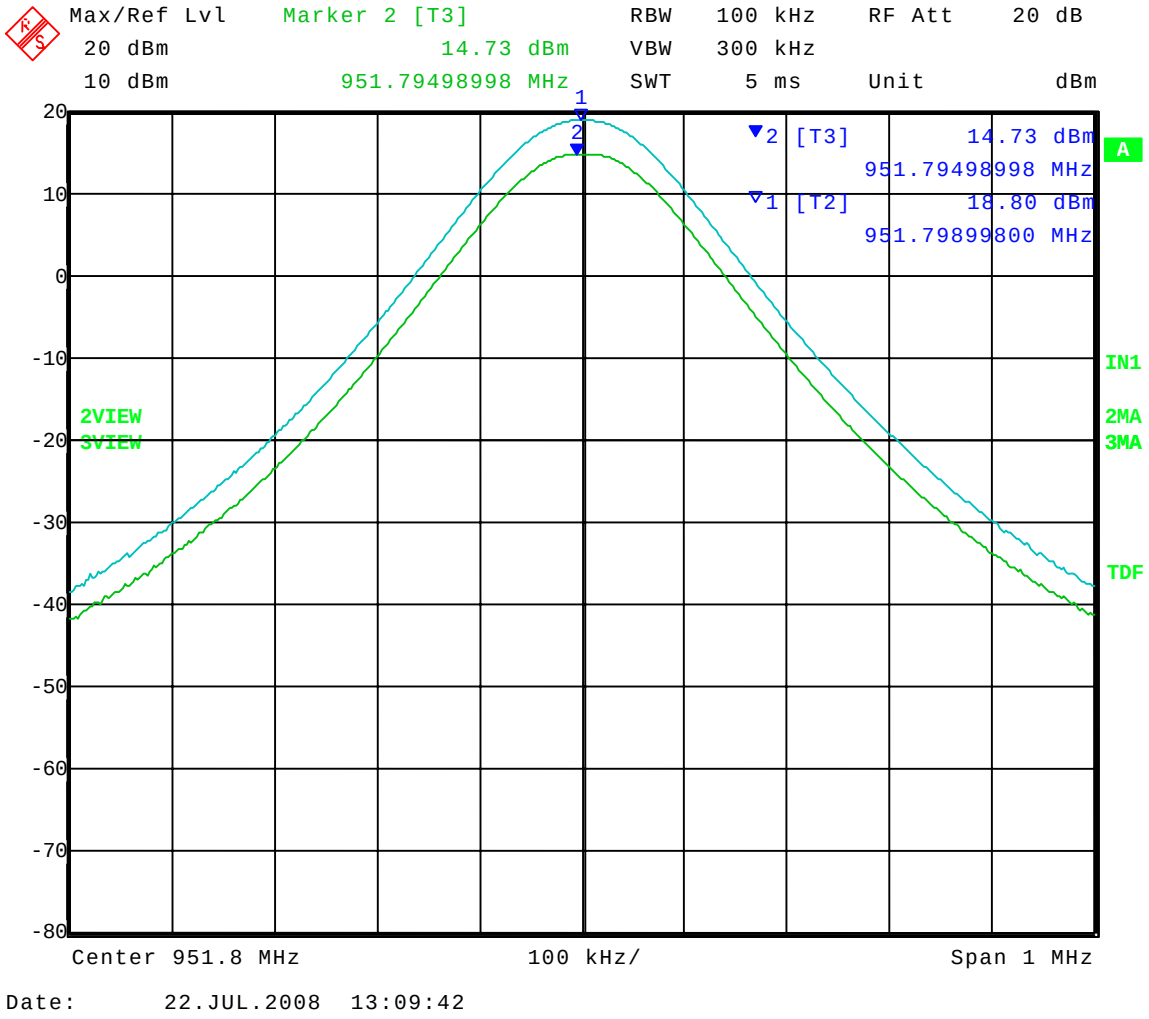
Company: Shure Inc.
Model Tested: PA421SWB
Report Number: 14457

APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Peak Power Output - Conducted
Rule part: FCC Part 74; FCC Part 2.1046
Operator: Craig B
Comment: Channel: 951.8 MHz

Blue = Input = 18.80 dBm
Green = Output = 14.73 dBm

Change in Output Power = -4.07 dBm



1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

3.0 RF POWER OUTPUT PHOTOS TAKEN DURING TESTING

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

4.0 MODULATION CHARACTERISTICS – PART 2.1047 and EIA /TIA-603-C:2004, SECTION 2.2.3

a. Voice modulated communication equipment.

b. Equipment which employs modulation limiting

NOTE:

This test is not required because the PA821SWB is a Antenna Combiner, which does not generate a fundamental frequency.

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

5.0 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

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

DATA AND GRAPH(S) TAKEN OF THE

99% OCCUPIED BANDWIDTH

Part 74.861 (d)(3), (e)(5) & PART 2.1049

SIGNAL IN VERSUS SIGNAL OUT

1250 Peterson Dr., Wheeling, IL 60090

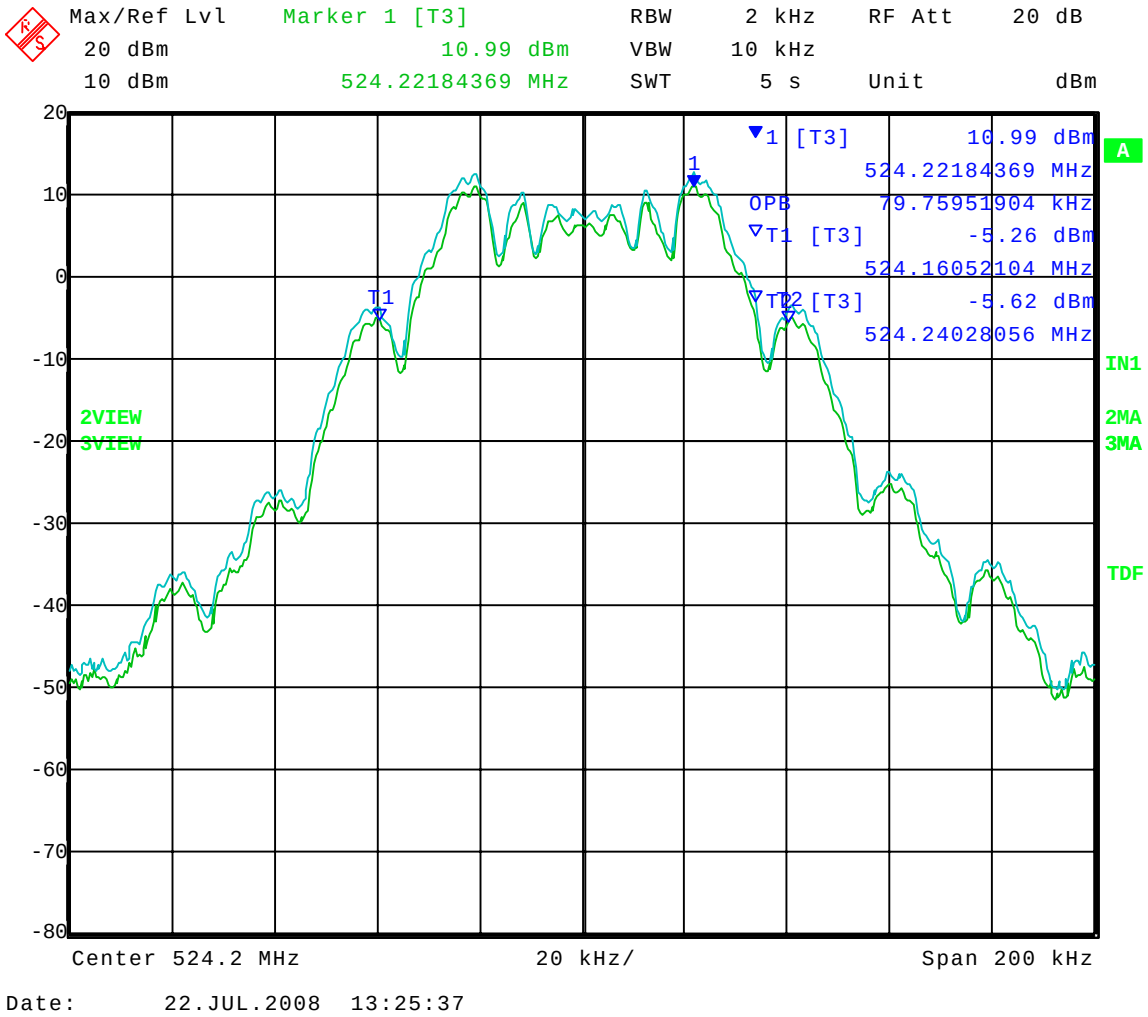
APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Occupied Bandwidth; 99% bandwidth
Rule part: FCC Part 74; FCC Part 2.1049
Operator: Craig B

Frequency: 524.2 MHz

Blue = INPUT
Green = OUTPUT

99% power bandwidth = 79.76 kHz
Input = Output



1250 Peterson Dr., Wheeling, IL 60090

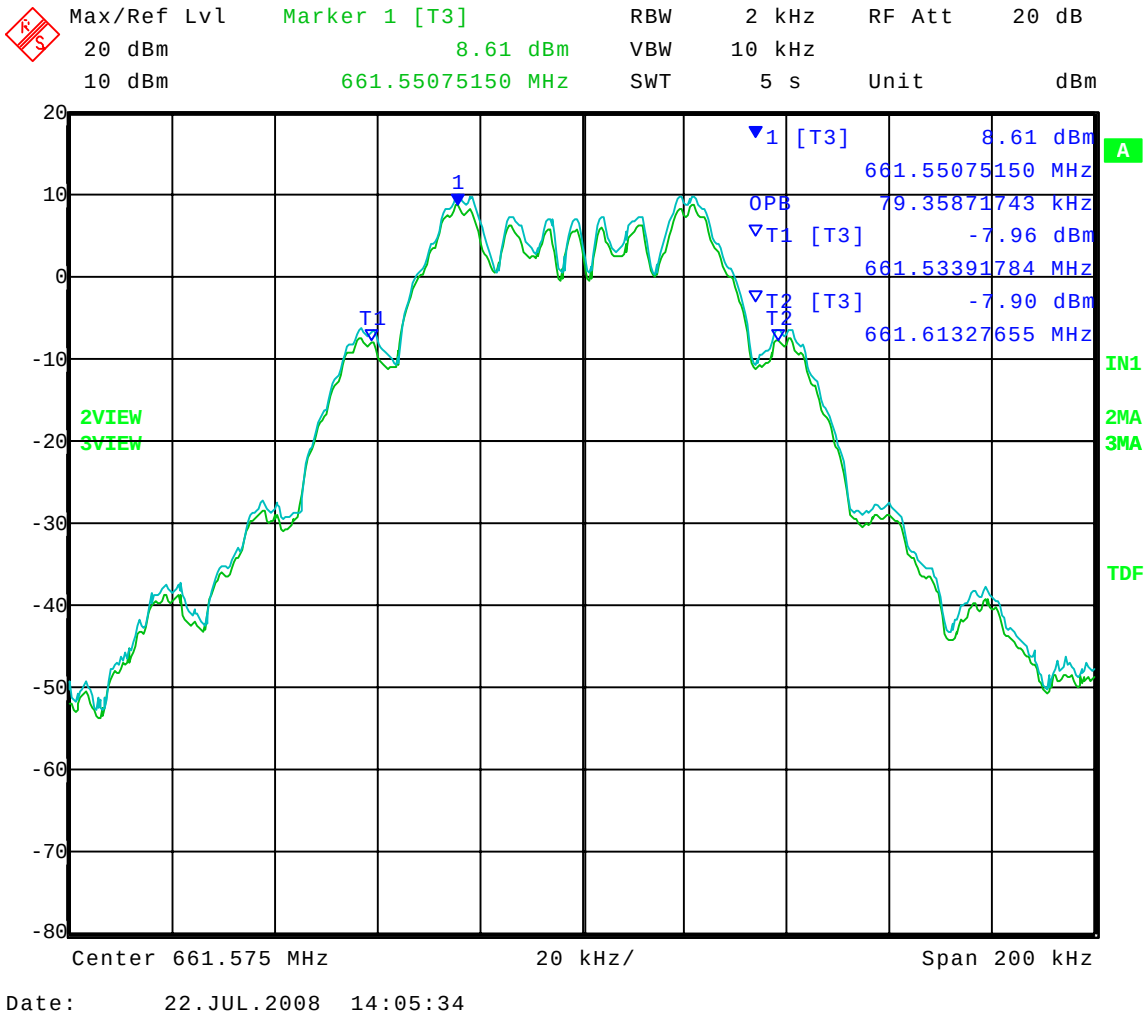
APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Occupied Bandwidth; 99% bandwidth
Rule part: FCC Part 74; FCC Part 2.1049
Operator: Craig B

Frequency: 661.575 MHz

Blue = INPUT
Green = OUTPUT

99% power bandwidth = 79.36 kHz
Input = Output



1250 Peterson Dr., Wheeling, IL 60090

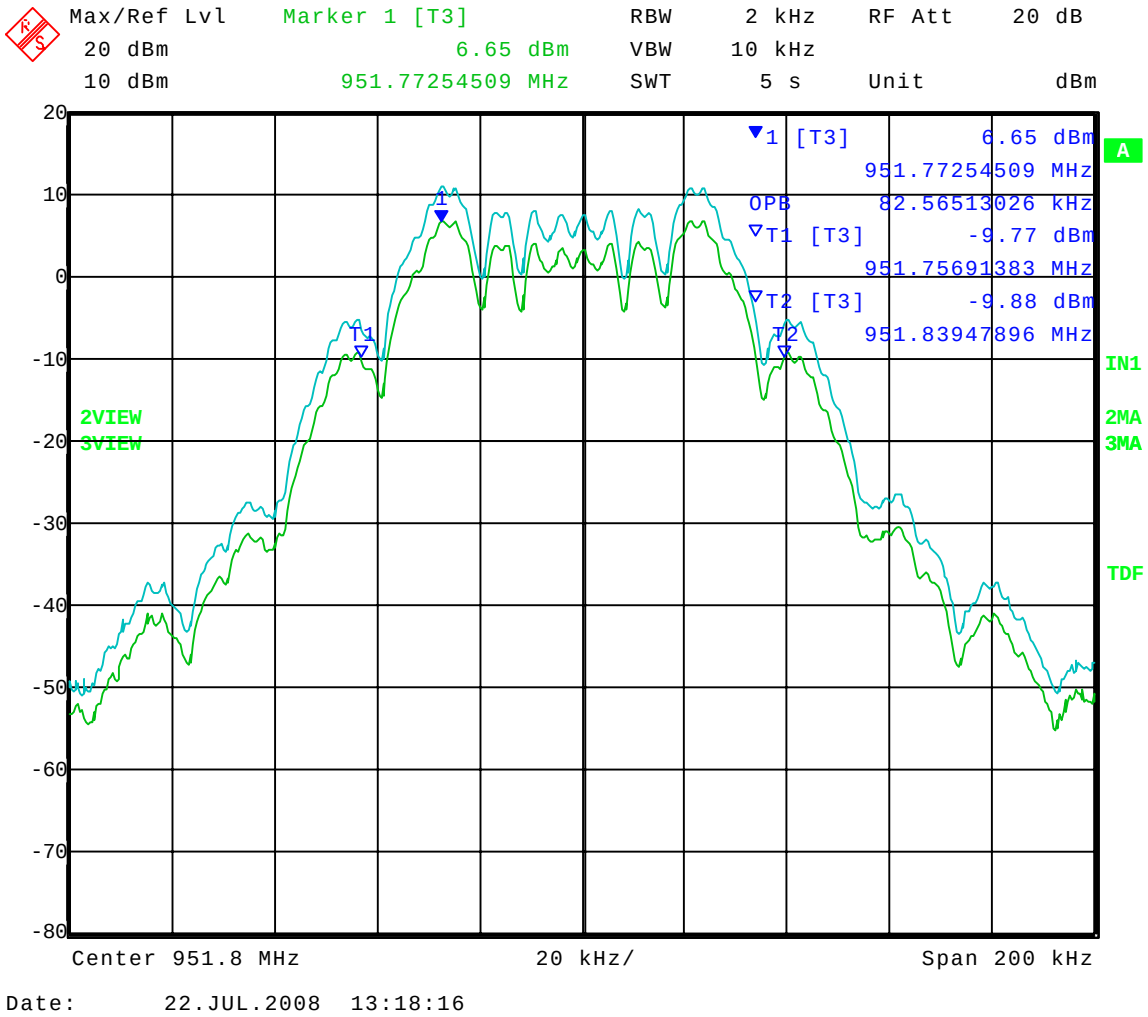
APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Occupied Bandwidth; 99% bandwidth
Rule part: FCC Part 74; FCC Part 2.1049
Operator: Craig B

Frequency: 951.8 MHz

Blue = INPUT
Green = OUTPUT

99% power bandwidth = 82.57 kHz
Input = Output

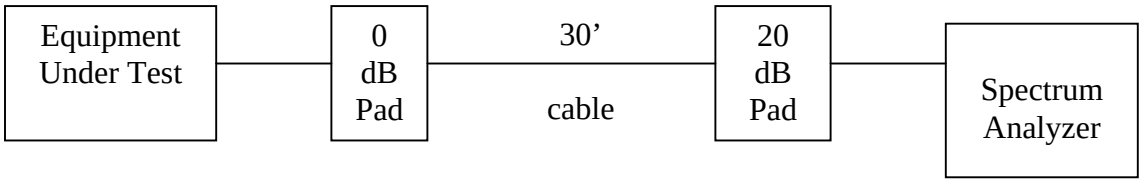


1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

6.0 SPURIOUS EMISSIONS AT ANTENNA TERMINALS – PART 2.1051 and EIA /TIA-603-C:2004, SECTION 2.2.13

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. Measurements were made up to the 10th harmonic of the fundamental. The following setup was used showing placement of the attenuators:



The allowed emissions for transmitters operating in the 608 MHz – 614 MHz & 944 MHz – 952 MHz bands for PA421SWB Antenna Combiner equipment are found under Part 74, Section 74.861, Paragraph d-3 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) any discrete frequency outside the authorized band shall be attenuated, at least, $43+10\text{Log}^{10}$ (mean output power, in watts) dB below the mean output power of the transmitting unit.

The allowed emissions for transmitters operating in the 470 MHz - 608 MHz and 614 MHz – 806 MHz bands for PA421SWB 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 and graphs of the actual measurements made:

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

CONDUCTED EMISSION DATA & CHARTS

TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

EIA /TIA-603-C:2004, SECTION 2.2.13

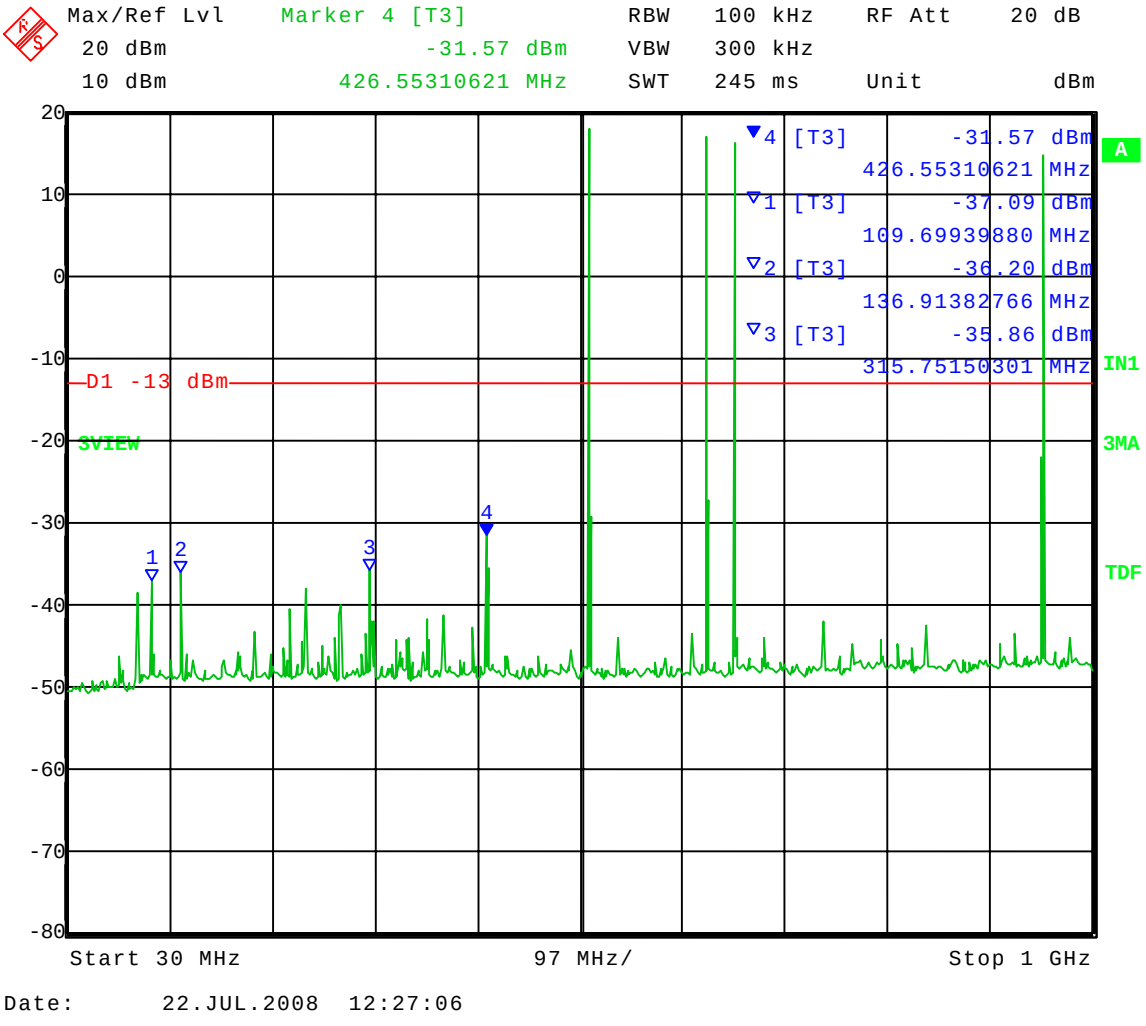
PART 2.1051

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Spurious Emissions - Conducted
Rule part: FCC Part 74; FCC Part 2.1051
Operator: Craig B
Comment: Inputs: 524.2 MHz
661.575 MHz
951.8 MHz
Other inputs: 634.8 MHz

Frequency Range: 30 to 1000 MHz
Limit = -13 dBm

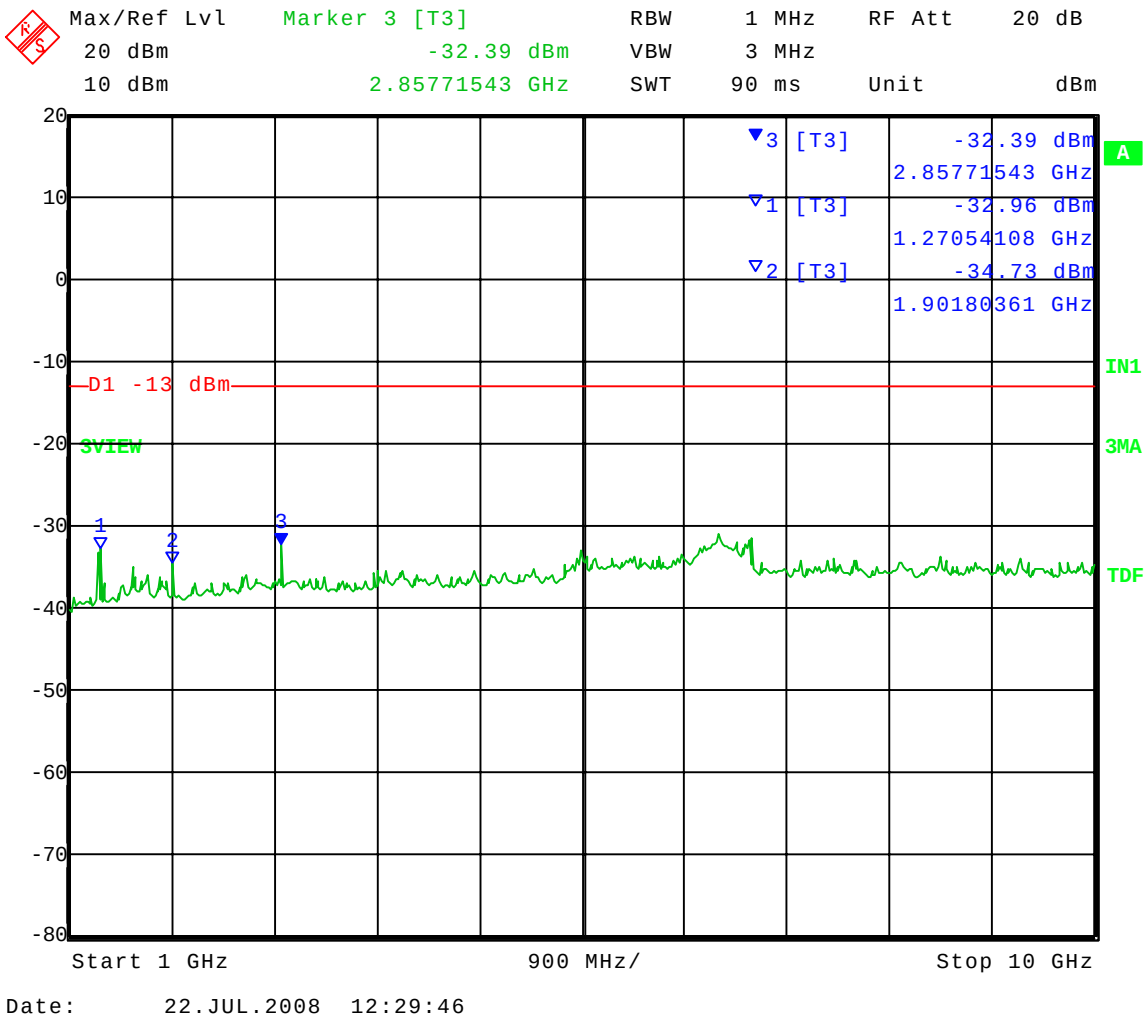


1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Spurious Emissions - Conducted
Rule part: FCC Part 74; FCC Part 2.1051
Operator: Craig B
Comment: Inputs: 524.2 MHz
661.575 MHz
951.8 MHz
Other inputs: 634.8 MHz

Frequency Range: 1 to 10 GHz
Limit = -13 dBm



1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

CONDUCTED EMISSION DATA & CHARTS

TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS

EIA /TIA-603-C:2004, SECTION 2.2.13

PART 2.1051

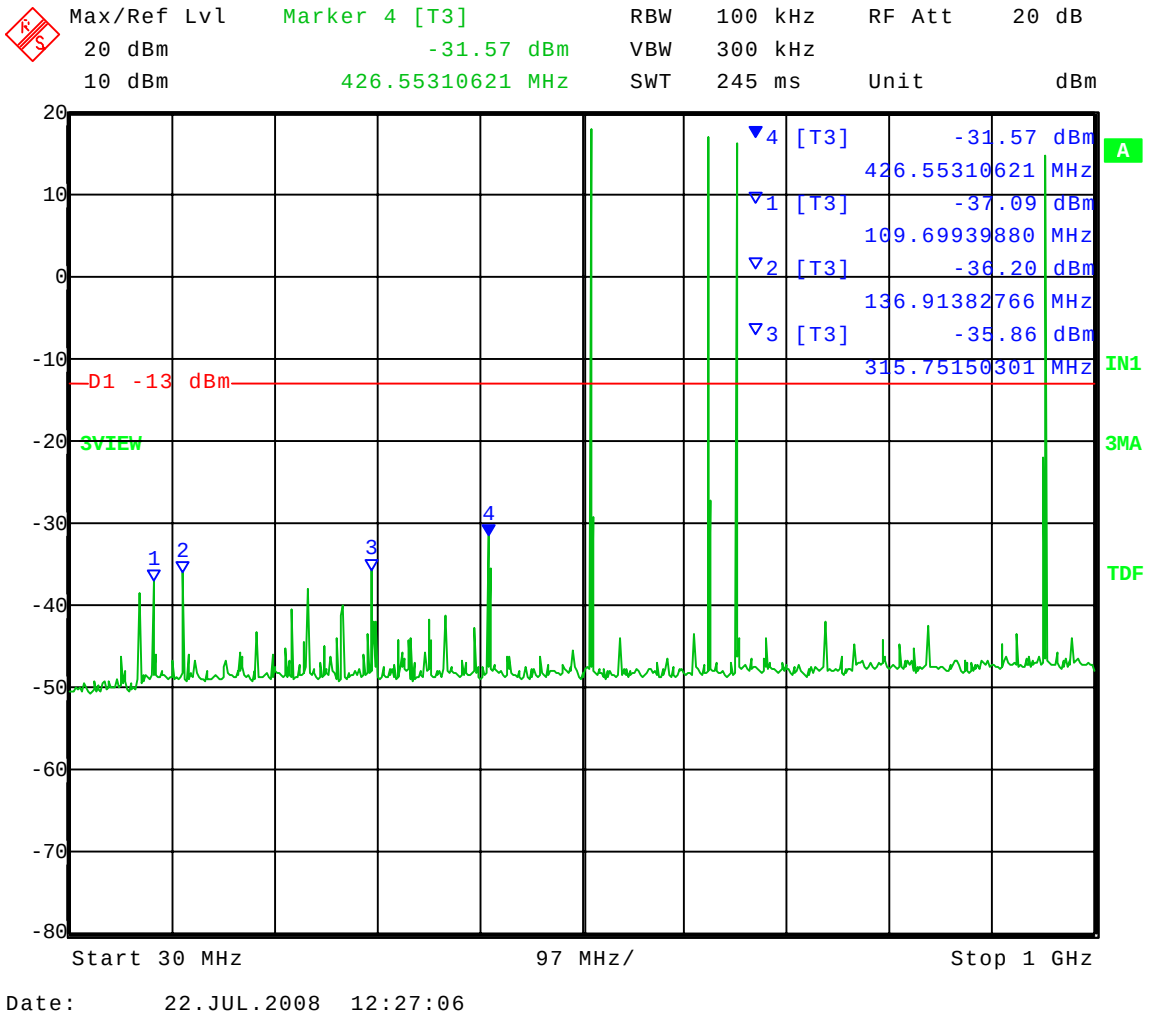
Intermodulation – 3 signal test

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Intermodulation – 3 signal test.
Rule part: FCC Part 74; FCC Part 2.1051
Operator: Craig B
Comment: Inputs: 524.2 MHz
944.2 MHz
951.8 MHz

Frequency Range: 30 to 1000 MHz
Limit = -13 dBm

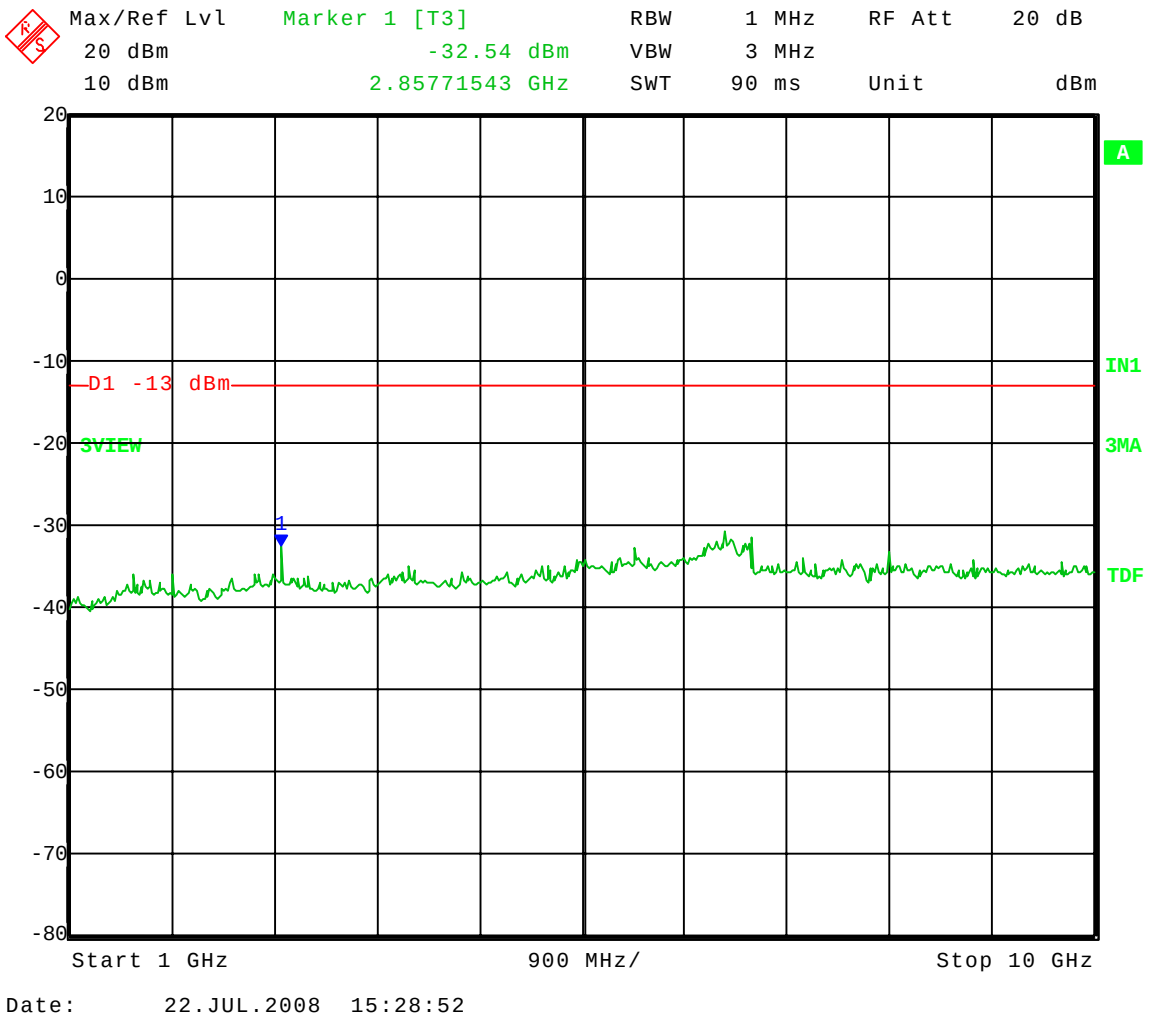


1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

Test Date: 07-22-2008
Company: Shure, Inc.
EUT: PA421SWB Antenna Combiner
Test: Intermodulation – 3 signal test.
Rule part: FCC Part 74; FCC Part 2.1051
Operator: Craig B
Comment: Inputs: 524.2 MHz
944.2 MHz
951.8 MHz

Frequency Range: 1 to 10 GHz
Limit = -13 dBm



1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

7.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS – PART 2.1053 and EIA /TIA-603-C:2004, SECTION 2.2.12

Radiated measurements were performed scanning the frequency range from 200 MHz to at least the 10^{th} harmonic of the fundamental frequency.

For the PA421SWB Antenna Combiner, the highest fundamental frequency is N/A 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 470 MHz - 952 MHz bands for PA421SWB Antenna Combiner are found under Part 74, Section 74.861, Paragraph e-6 for Low Power Auxiliary Stations. This paragraph states that 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.

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

RADIATED EMISSION DATA AND GRAPH(S)

TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS

USING THE SUBSTITUTION METHOD

EIA /TIA-603-C:2004, SECTION 2.2.12

PART 2.1053

NOTE:

This test is not required because the PA421SWB is a Antenna Combiner, which does not generate a fundamental frequency.

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

RADIATED EMISSION DATA AND GRAPH(S)

TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS

USING THE SUBSTITUTION METHOD

EIA /TIA-603-C:2004, SECTION 2.2.12

PART 2.1053

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

DLS Electronic Systems, Inc.

Company: Shure, Inc.
Operator: Adam A
Date of test: 07-22-2008
Temperature: 73 deg. F.
Humidity: 59% R.H.

Radiated Spurious Emissions 470 MHz to 10 GHz (e.r.p. substitution method) FCC Part 74; FCC Part 2.1053

Model: **PA421SWB** Transmit Frequencies: 524.2, 634.8, 661.575, and 951.8 MHz

Frequency GHz	Field Strength Level dBuV/m	Factor to Convert to dBm	Power ERP dBm	Limit dBm	Margin dB	Receive Antenna Polarization	EUT Orientation (degrees)	Receive Antenna Height (m)
1.90360	65.7	99.9	-34.2	-13	21.2	Horizontal	180	1.0
2.85540	53.2	100.7	-47.5	-13	34.5	Horizontal	150	1.0
3.80720	56.4	100.5	-44.1	-13	31.1	Horizontal	150	1.0
4.75900	55.3	100.0	-44.7	-13	31.7	Horizontal	180	1.0
5.71080	54.2	100.3	-46.1	-13	33.1	Horizontal	150	1.0
7.61440	66.0	100.7	-34.7	-13	21.7	Horizontal	180	1.0
1.90360	65.8	99.6	-33.8	-13	20.8	Vertical	180	1.0
2.41520	51.4	99.6	-48.2	-13	35.2	Vertical	180	1.0
2.64640	44.0	100.0	-56.0	-13	43.0	Vertical	150	1.0
2.85540	51.2	101.1	-49.9	-13	36.9	Vertical	210	1.0
3.80720	52.6	100.3	-47.7	-13	34.7	Vertical	210	1.0
5.71080	55.2	100.8	-45.6	-13	32.6	Vertical	150	1.0
6.66280	51.0	100.0	-49.0	-13	36.0	Vertical	180	1.0
7.61420	58.6	101.9	-43.3	-13	30.3	Vertical	210	1.0
9.51800	54.6	101.1	-46.5	-13	33.5	Vertical	150	1.0

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

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 Wireless Boundary Microphone oscillator circuitry to stabilize.

See the following page for the data taken during testing.

NOTE:

This test is not required because the PA421SWB is a Antenna Combiner, which does not generate a fundamental frequency.

9.0 FREQUENCY STABILITY (VOLTAGE VARIATION)– PART 2.1055(d2)

The frequency stability of PA421SWB Antenna Combiner was measured by reducing the primary supply voltage to the battery end point specified by the manufacturer**.**

NOTE:

This test is not required because the PA421SWB is a Antenna Combiner, which does not generate a fundamental frequency.

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

APPENDIX B

AC LINE CONDUCTED DATA

AND

CHARTS TAKEN DURING TESTING

FCC Part 15 Class B

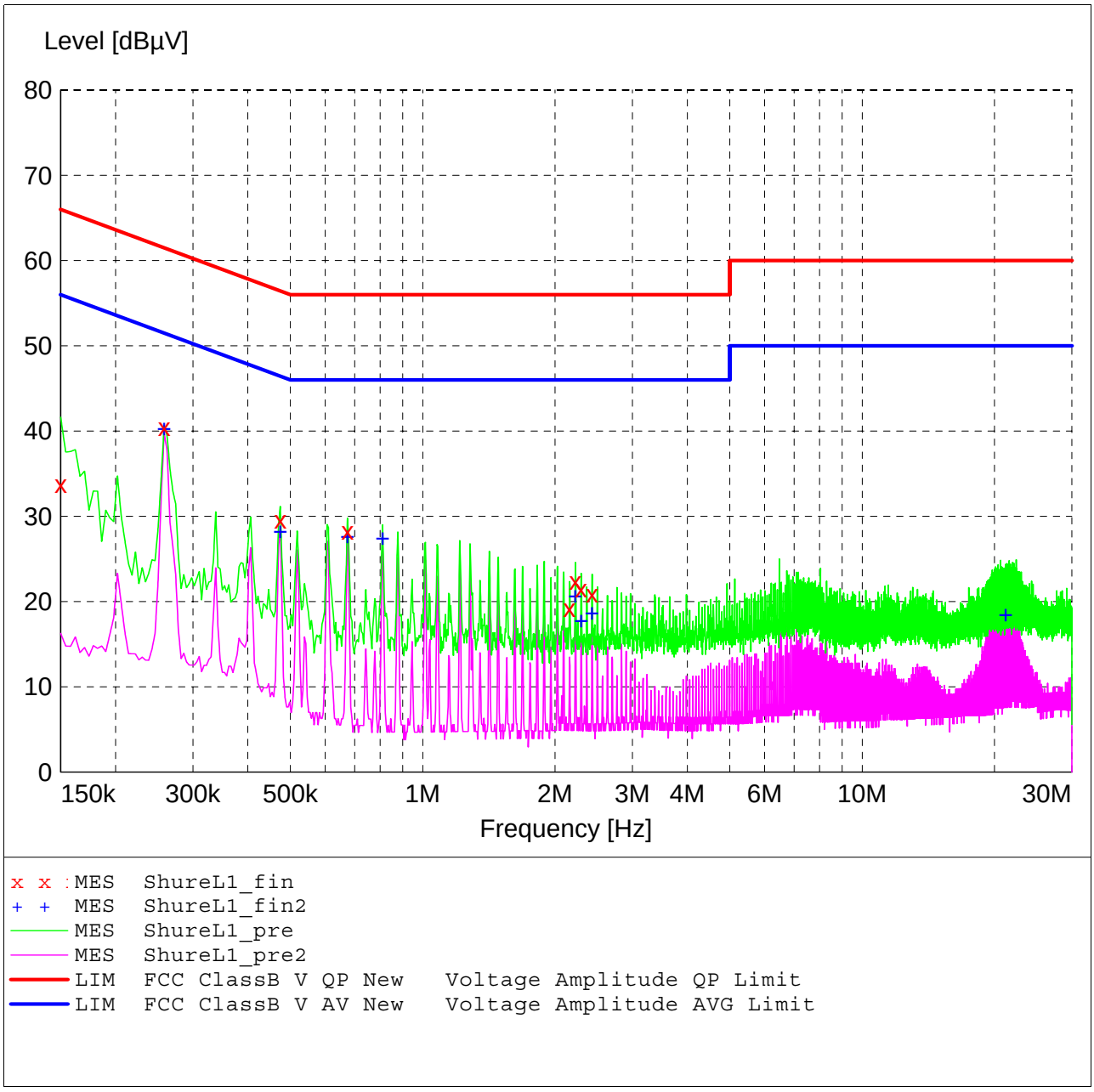
Voltage Mains Test

EUT: PA421SWB Antenna Combiner
Manufacturer: Shure, Inc.
Operating Condition: 74 deg. F, 50% R.H.
Test Site: DLS O.F. Site 1 (Screenroom)
Operator: Adam A
Test Specification: 120 V, 60 Hz
Comment: Line 1
Date: 07-23-2008

SCAN TABLE: "Line Cond Scrn RmFin"

Short Description: Line Conducted Emissions

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak CISPR AV	2.0 s	9 kHz	LISN DLS#128



MEASUREMENT RESULT: "ShureL1_fin"

7/23/2008 2:25PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	33.80	11.5	66	32.2	QP	---	---
0.258000	40.50	10.7	62	21.0	QP	---	---
0.474000	29.60	10.3	56	26.8	QP	---	---
0.674000	28.30	10.2	56	27.7	QP	---	---
2.158000	19.20	10.4	56	36.8	QP	---	---
2.226000	22.40	10.4	56	33.6	QP	---	---
2.294000	21.50	10.4	56	34.5	QP	---	---
2.430000	20.90	10.4	56	35.1	QP	---	---

MEASUREMENT RESULT: "ShureL1_fin2"

7/23/2008 2:25PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.258000	40.20	10.7	52	11.3	CAV	---	---
0.474000	28.20	10.3	46	18.2	CAV	---	---
0.674000	27.60	10.2	46	18.4	CAV	---	---
0.810000	27.40	10.2	46	18.6	CAV	---	---
2.226000	20.60	10.4	46	25.4	CAV	---	---
2.294000	17.70	10.4	46	28.3	CAV	---	---
2.430000	18.60	10.4	46	27.4	CAV	---	---
21.190000	18.40	11.5	50	31.6	CAV	---	---

FCC Part 15 Class B

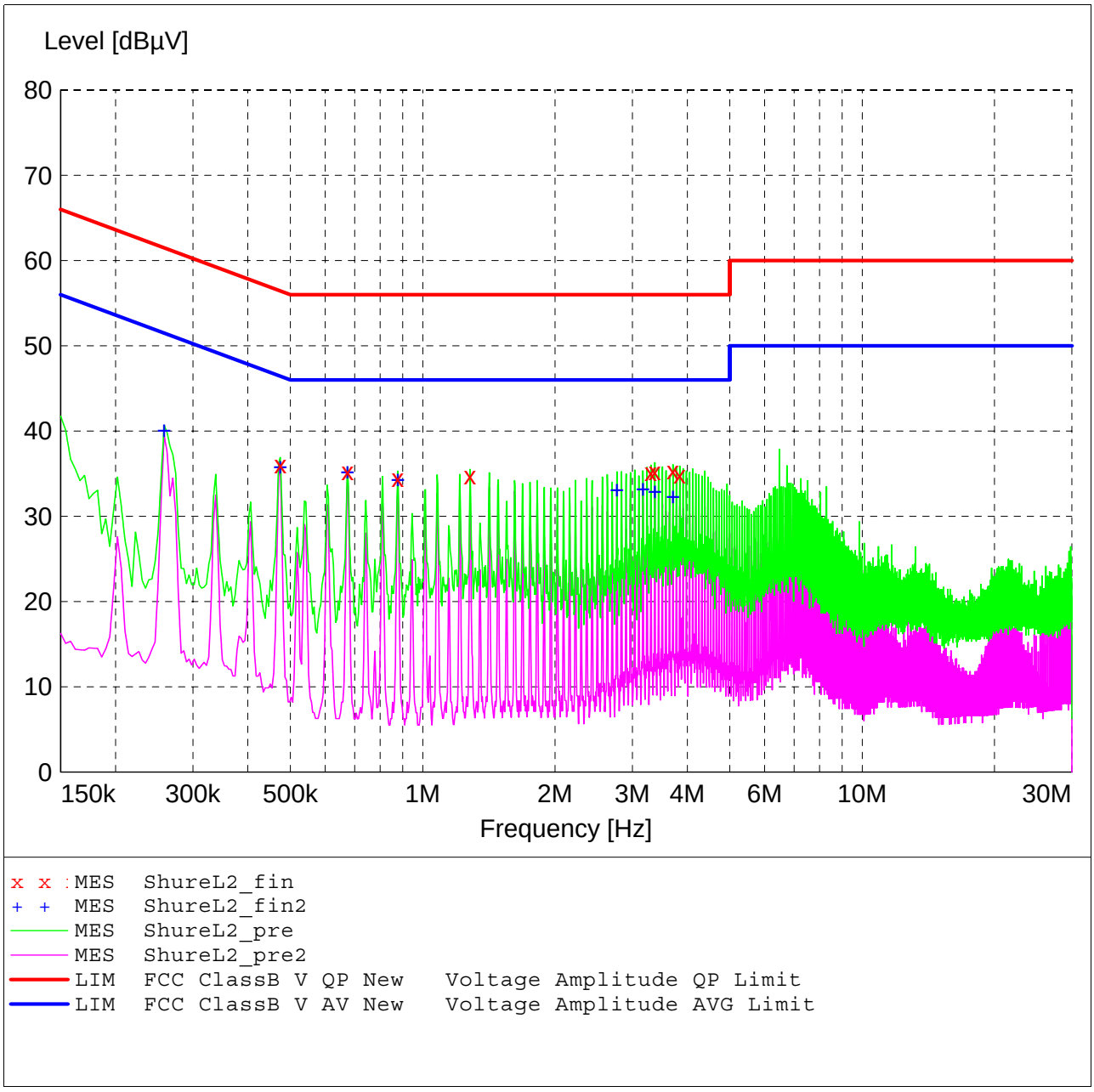
Voltage Mains Test

EUT:	PA421SWB Antenna Combiner
Manufacturer:	Shure, Inc.
Operating Condition:	74 deg. F, 50% R.H.
Test Site:	DLS O.F. Site 1 (Screenroom)
Operator:	Adam A
Test Specification:	120 V, 60 Hz
Comment:	Line 2
	Date: 07-23-2008

SCAN TABLE: "Line Cond Scrn RmFin"

Short Description: Line Conducted Emissions

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak CISPR AV	2.0 s	9 kHz	LISN DLS#128



MEASUREMENT RESULT: "ShureL2_fin"

7/23/2008 2:31PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.474000	36.00	10.3	56	20.4	QP	---	---
0.674000	35.30	10.2	56	20.7	QP	---	---
0.878000	34.50	10.3	56	21.5	QP	---	---
1.282000	34.80	10.3	56	21.2	QP	---	---
3.306000	35.20	10.5	56	20.8	QP	---	---
3.374000	35.30	10.5	56	20.7	QP	---	---
3.710000	35.40	10.4	56	20.6	QP	---	---
3.846000	34.90	10.4	56	21.1	QP	---	---

MEASUREMENT RESULT: "ShureL2_fin2"

7/23/2008 2:31PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.258000	40.00	10.7	52	11.5	CAV	---	---
0.474000	35.80	10.3	46	10.6	CAV	---	---
0.674000	35.20	10.2	46	10.8	CAV	---	---
0.878000	34.30	10.3	46	11.7	CAV	---	---
2.766000	33.10	10.4	46	12.9	CAV	---	---
3.170000	33.20	10.6	46	12.8	CAV	---	---
3.374000	32.90	10.5	46	13.1	CAV	---	---
3.710000	32.30	10.4	46	13.7	CAV	---	---