



Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

FCC Rules and Regulations / Intentional Radiators

Low Power Auxiliary Stations

Part 74, Subpart H, Sections 74.801 - 74.882

Part 74.861 (e) TV Broadcasting

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

Formal Name: ULX2 Wireless Microphone Transmitter
Kind of Equipment: Wireless Microphone Transmitter
Test Configuration: It is not connected to any other product. (Tested at 9 vdc)
Model Number(s): ULX2-G3
Model(s) Tested: ULX2-G3
Serial Number(s): NA
Emission Designator: 89+KF3E
Date of Tests: June 28 & August 2, 2007
Test Conducted For: Shure Inc.
5800 Touhy Avenue
Niles, Illinois 60714

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.

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Company: Shure Inc.
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SIGNATURE PAGE

Report By:

Arnorn C. Rowe
Test Engineer
EMC-001375-NE

Reviewed By:

William Stumpf
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Brian Mattson
General Manager



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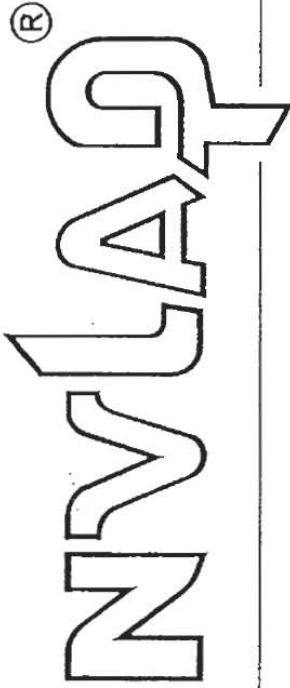
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United States Department of Commerce
 National Institute of Standards and Technology



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

Dolly S. Bruce

For the National Institute of Standards and Technology



Company: Shure Inc.
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1.0 SUMMARY OF TEST REPORT

It was found that the ULX2 Wireless Microphone Transmitter, Model Number(s) ULX2-G3, **meets** the radio interference radiated emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Section 74.861 (e), for low power auxiliary stations. The AC Power Line conducted emissions test was not required because the ULX2 Wireless Microphone Transmitter is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.

2.0 INTRODUCTION

On June 28 & August 2, 2007, a series of radio frequency interference measurements was performed on ULX2 Wireless Microphone Transmitter, Model Number(s) ULX2-G3, Serial Number: NA. 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

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 (e), 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 C63.4-2003. 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.



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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 C63.4-2003.

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.



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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 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. These methods are performed to the specifications in ANSI C63.4: 2003.

7.0 AC POWER LINE CONDUCTED EMISSION MEASUREMENTS – Part 15.207

The ULX2 Wireless Microphone Transmitter is powered from a D.C. power source and will not at any time be directly plugged into the public utility lines, therefore the conducted emissions test was not performed.



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8.0 DESCRIPTION OF TEST SAMPLE:

8.1 Description:

The UXL2 is a wireless microphone transmitter. It operates in the 470 MHz to 506 MHz band. It is powered by an internal 9 volt battery.

8.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

Length: 241mm Width: 51mm Height: mm

8.3 LINE FILTER USED:

None

8.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

N/A

Clock Frequencies:

32.768 kHz and 16.0 MHz

8.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

1. Populated PCB

PN: 90-10568 Ver 2.0

2. Unpopulated PCB

PN: 34A10569 Ver1.0



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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.

NOTE:

The EUT was tested in the following modes:

Transmit Low, Mid & High Channels



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10.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 ULX2 Wireless Microphone Transmitter
Model Number: ULX2-G3, Serial Number: NA



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11.0 RADIATED PHOTOS TAKEN DURING TESTING



RADIATED VERT



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11.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



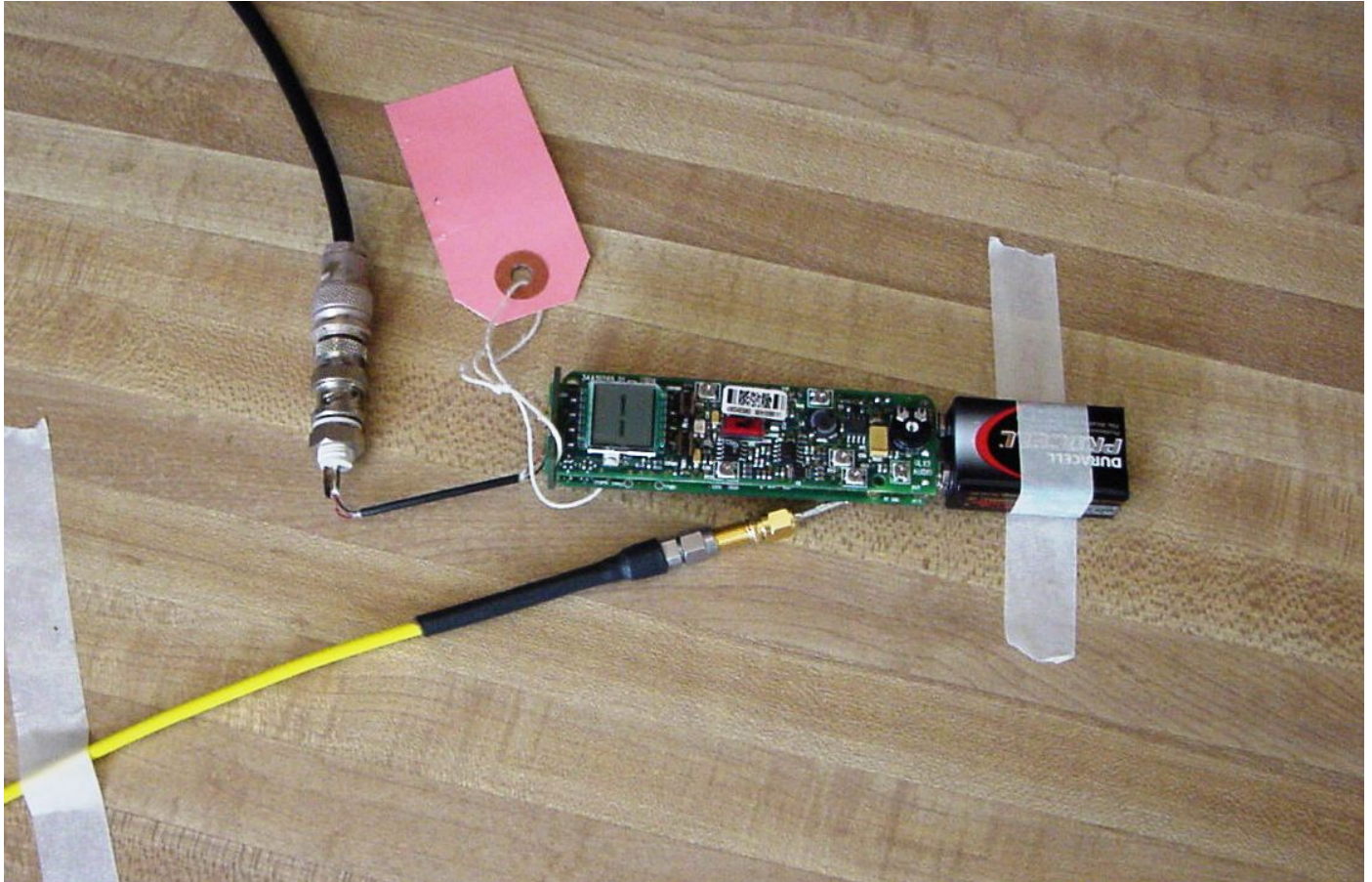
RADIATED HORZ



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11.0 RF CONDUCTED PHOTOS TAKEN DURING TESTING



RF CONDUCTED



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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 ULX2 Wireless Microphone Transmitter, Model Number(s) ULX2-G3 **meets** the radio interference radiated emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Section 74.861 (e), for low power auxiliary stations. The AC Power Line conducted emissions test was not required because the ULX2 Wireless Microphone Transmitter is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.



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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	11/07
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	12/07
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	12/07
Antenna	EMCO	3104C	00054891	20 MHz – 200 MHz	2/08
Antenna	Electrometrics	LPA-25	1114	200 MHz – 1 GHz	3/08
Antenna	EMCO	3104C	00054892	20 MHz – 200 MHz	3/08
Antenna	Electrometrics	3146	1205	200 MHz – 1 GHz	3/08
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	2/08
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	3/08
Antenna	EMCO	3115	2479	1 GHz – 18 GHz	5/08
Antenna	EMCO	3115	99035731	1 GHz – 18 GHz	6/08
Antenna	Rohde & Schwarz	HUF-Z1	829381001	20 MHz – 1 GHz	2/08
Antenna	Rohde & Schwarz	HUF-Z1	829381005	20 MHz – 1 GHz	8/08

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



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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
LISN	Solar	8012-50-R-24-BNC	8305116	10 MHz – 30 MHz	8/08
LISN	Solar	8012-50-R-24-BNC	814548	10 MHz – 30 MHz	8/08
LISN	Solar	9252-50-R-24-BNC	961019	10 MHz – 30 MHz	12/07
LISN	Solar	9252-50-R-24-BNC	971612	10 MHz – 30 MHz	10/08
LISN	Solar	9252-50-R-24-BNC	92710620	10 MHz – 30 MHz	7/08

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



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APPENDIX A

TEST PROCEDURE

SUBPART H

LOW POWER AUXILIARY STATIONS



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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 of the ULX2 Wireless Microphone Transmitter was connected to a Spectrum Analyzer through suitable attenuation. All cables, connectors, and attenuators were calibrated prior to testing. The RF output power was measured using the following test method:

Actual Measurements Taken:

15.66 dBm Measured output of the transmitter

15.66 dBm equals 0.0368 watt(s)

LIMIT:

Manufacturer's rated output power = 30 mW maximum

MARGIN:

$.25 - 0.0368 = 0.2132$ watt(s)



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DATA TAKEN OF THE RF POWER OUTPUT MEASUREMENT

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

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

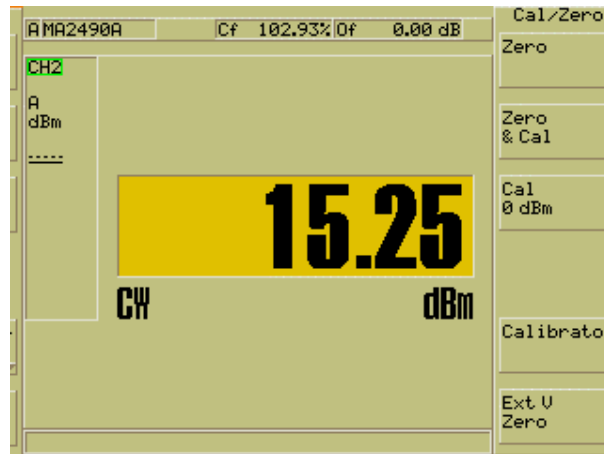


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Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Peak Power Output - Conducted
Rule part: FCC Part 74; FCC Part 2.1046
Operator: Craig B
Comment: Channel: 470.125 MHz

Peak Output Power = 15.25 dBm = 33.5 mW



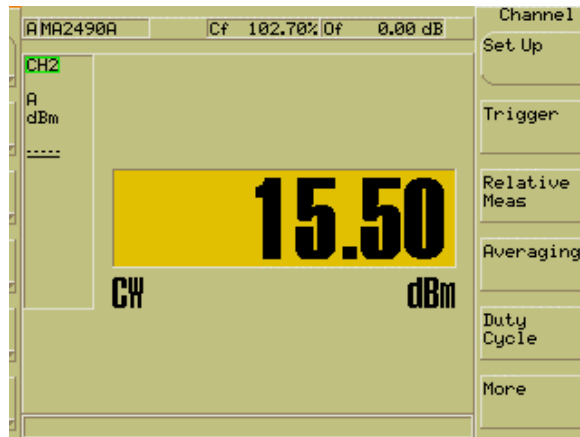


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

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Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Peak Power Output - Conducted
Rule part: FCC Part 74; FCC Part 2.1046
Operator: Craig B
Comment: Channel: 488 MHz

Peak Output Power = 15.5 dBm = 35.5 mW



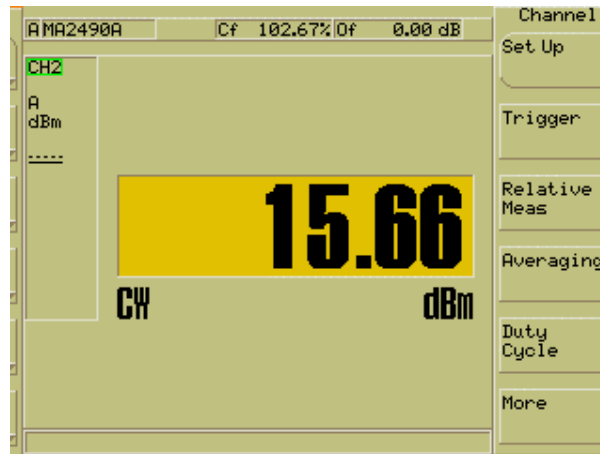


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

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Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Peak Power Output - Conducted
Rule part: FCC Part 74; FCC Part 2.1046
Operator: Craig B
Comment: Channel: 505.875 MHz

Peak Output Power = 15.66 dBm = 36.8 mW

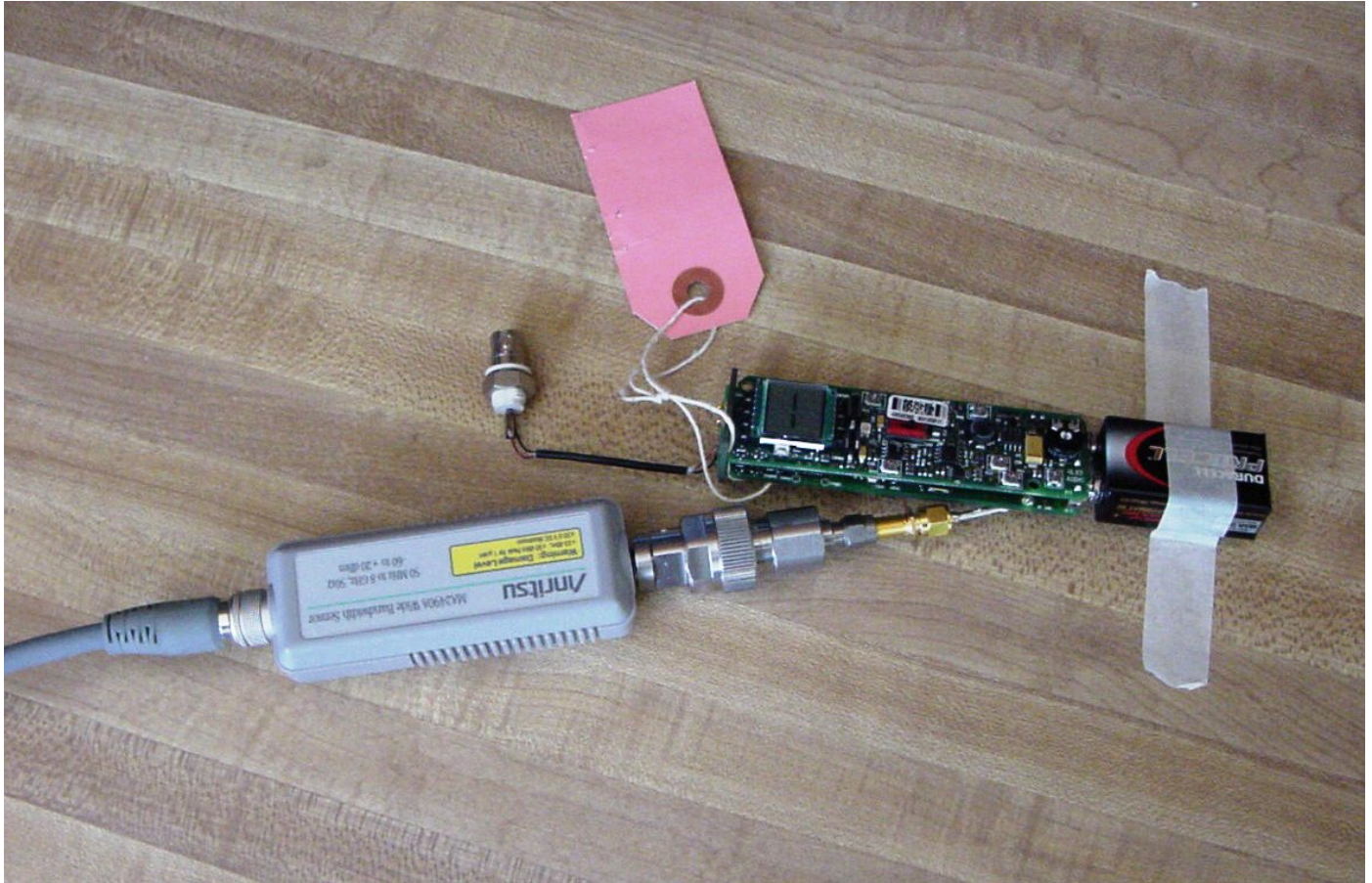




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3.0 RF POWER OUTPUT PHOTOS TAKEN DURING TESTING



CONDUCTED POWER



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

a. Voice modulated communication equipment.

A curve showing the frequency response of the audio modulating circuit over a range of 25 Hz to 15 kHz ± 2 dB 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.



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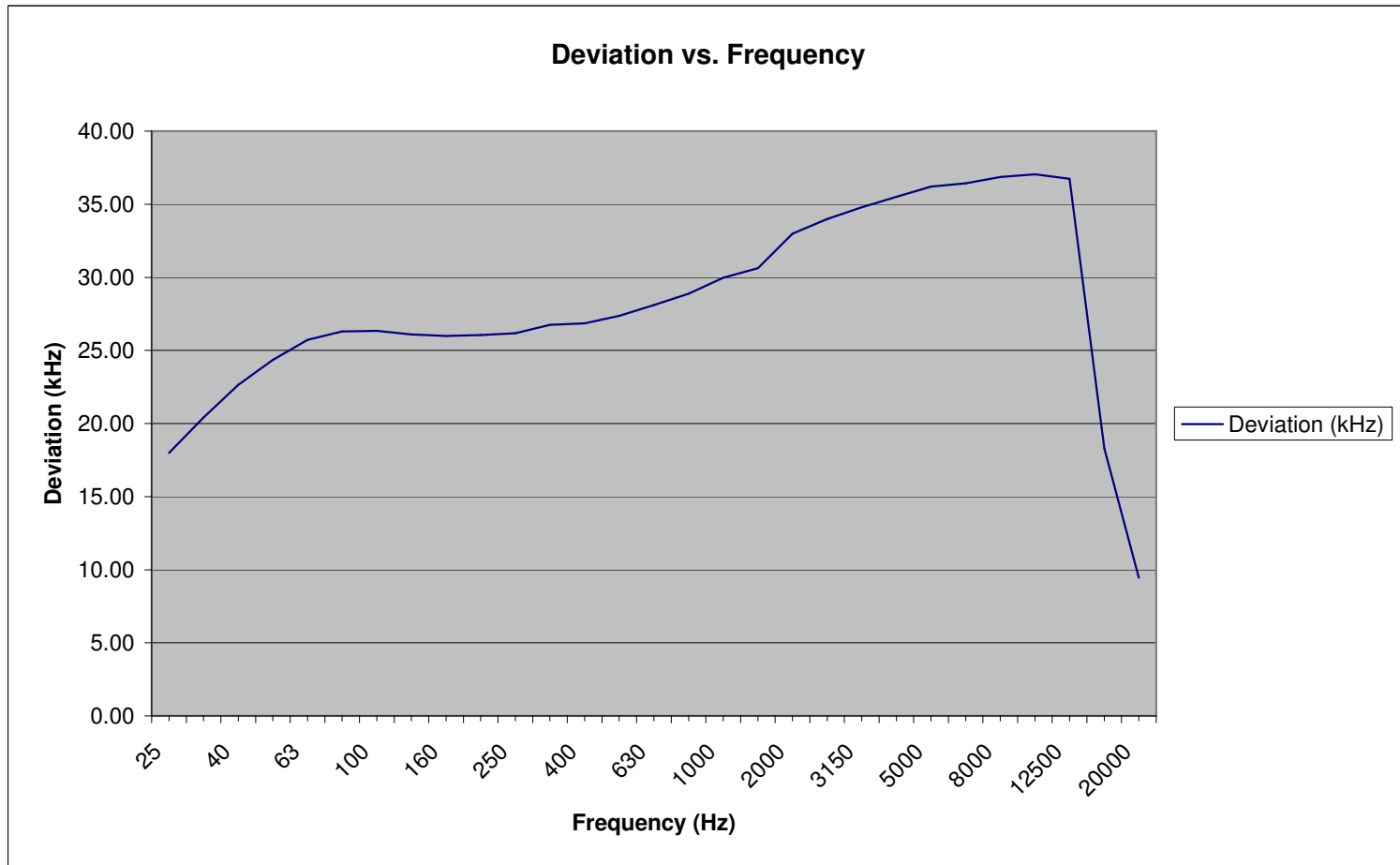
Company: Shure Inc.
Model Tested: ULX2-G3
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GRAPH(S) TAKEN SHOWING THE FREQUENCY
RESPONSE OF THE
AUDIO MODULATING CIRCUIT

EIA /TIA-603-C:2004, SECTION 2.2.3

PART 2.1047

Freq (Hz)	Deviation (kHz)
25	18.00
31	20.42
40	22.65
50	24.35
63	25.72
80	26.30
100	26.34
125	26.09
160	26.00
200	26.06
250	26.17
315	26.75
400	26.85
500	27.36
630	28.11
800	28.89
1000	29.96
1250	30.62
2000	32.98
2500	34.00
3150	34.79
4000	35.50
5000	36.20
6300	36.44
8000	36.87
10000	37.05 max
12500	36.74
16000	18.30
20000	9.46



Audio input level = -30dBu
 Frequency of Maximum Response: 10kHz



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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)

$$B_n = 2M + 2DK, \quad K=1$$

B_n = Bandwidth

$$M = 15 \text{ kHz,}$$

M = Maximum Modulating Frequency

$$D = 45 \text{ kHz,}$$

D = Peak Deviation

$$B_n = 2(15) + 2(45)(1) = 120 \text{ kHz}$$



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DATA AND GRAPH(S) TAKEN OF THE

99% OCCUPIED BANDWIDTH

Part 74.861(d)(3) & PART 2.1049



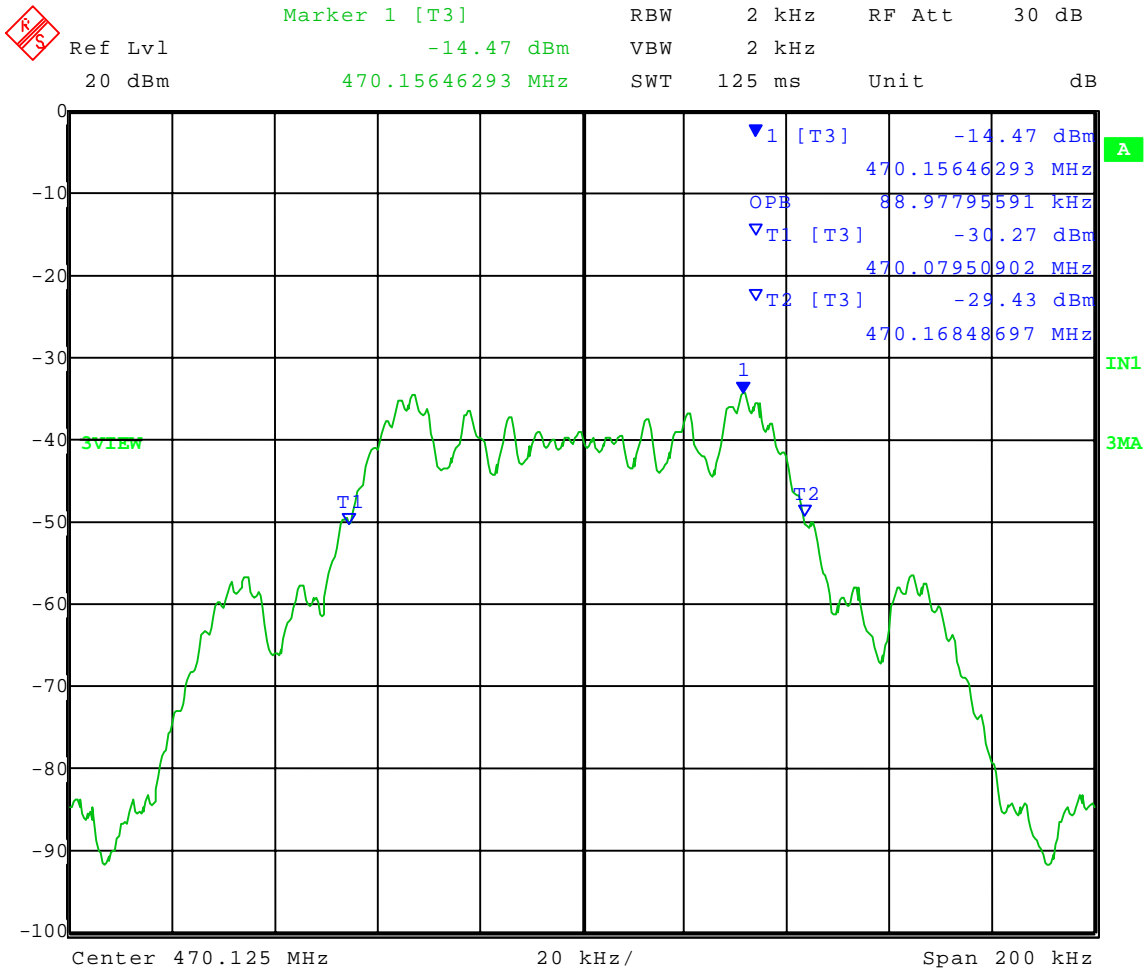
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Test Date: 08-02-2007
 Company: Shure, Inc.
 EUT: ULX2-G3
 Test: Occupied Bandwidth; 99% bandwidth
 Rule part: FCC Part 74; FCC Part 2.1049
 Operator: Craig B

Frequency: 470.125 MHz

99% power bandwidth = 89.0 kHz



Date: 2.AUG.2007 13:08:09



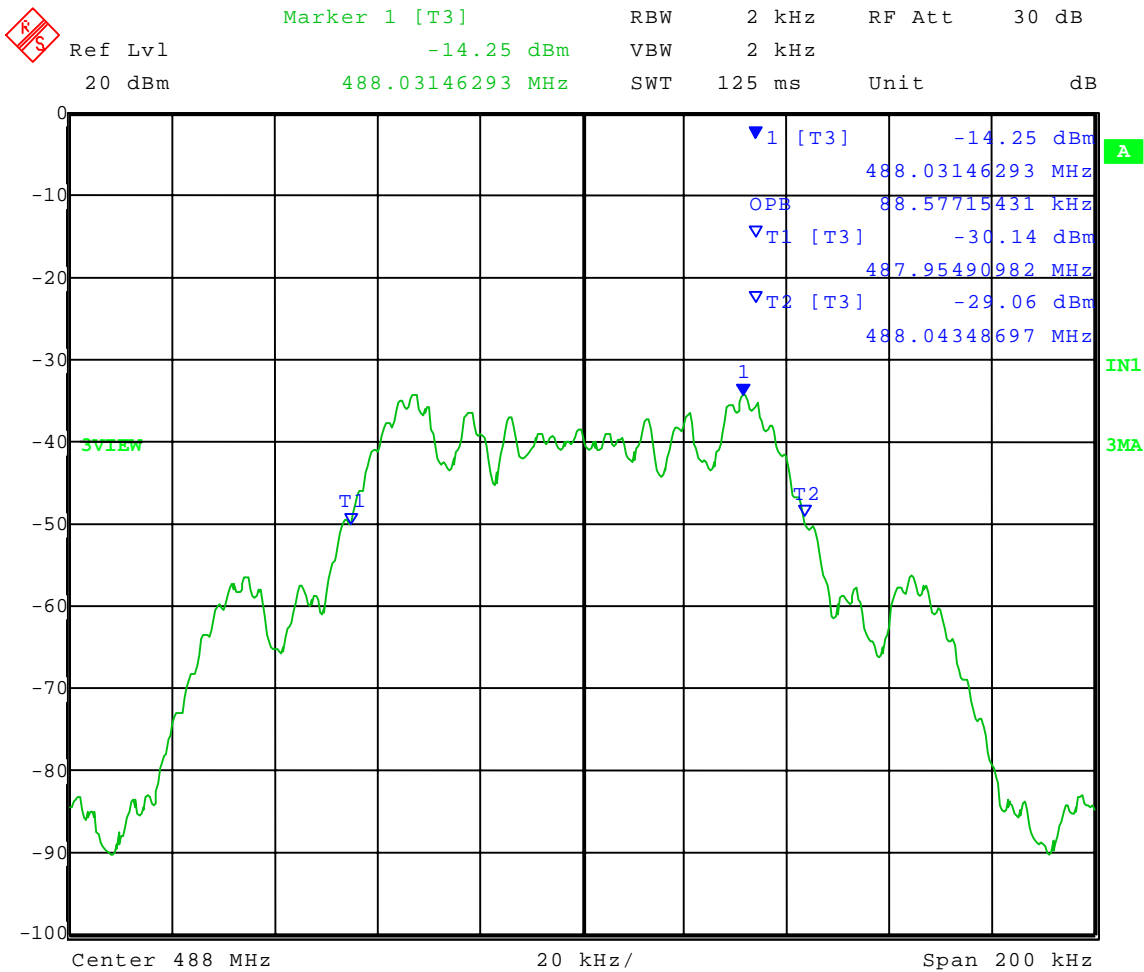
Company: Shure Inc.
 Model Tested: ULX2-G3
 Report Number: 13584

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Test Date: 08-02-2007
 Company: Shure, Inc.
 EUT: ULX2-G3
 Test: Occupied Bandwidth; 99% bandwidth
 Rule part: FCC Part 74; FCC Part 2.1049
 Operator: Craig B

Frequency: 488 MHz

99% power bandwidth = 88.6 kHz



Date: 2.AUG.2007 13:13:58



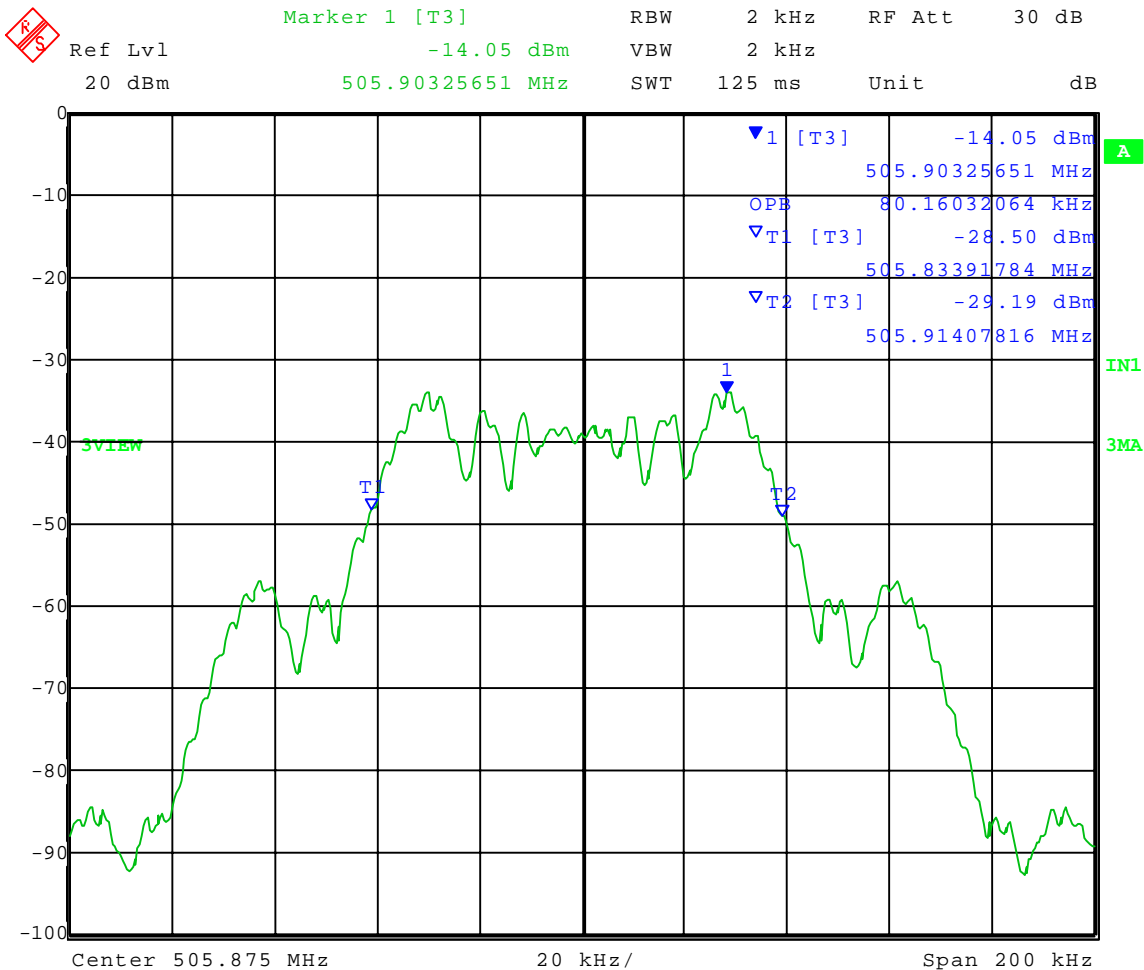
Company: Shure Inc.
 Model Tested: ULX2-G3
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Test Date: 08-02-2007
 Company: Shure, Inc.
 EUT: ULX2-G3
 Test: Occupied Bandwidth; 99% bandwidth
 Rule part: FCC Part 74; FCC Part 2.1049
 Operator: Craig B

Frequency: 505.875 MHz

99% power bandwidth = 80.2 kHz



Date: 2.AUG.2007 13:17:14



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DATA AND GRAPH(S) TAKEN OF THE EMISSION MASK

Part 74.861(d)(3) & PART 2.1049

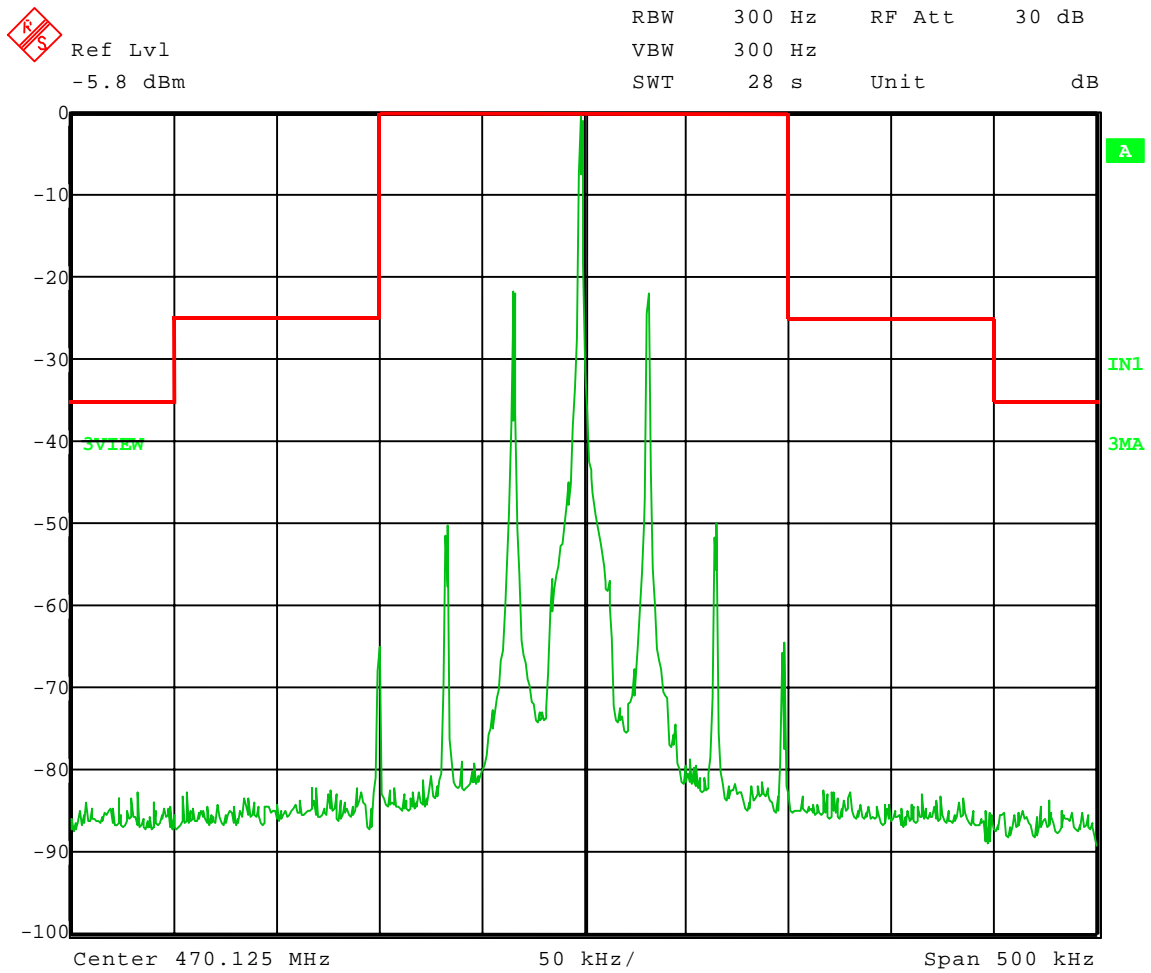


Company: Shure Inc.
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Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 470.125 MHz
Unmodulated



Date: 2.AUG.2007 12:09:07

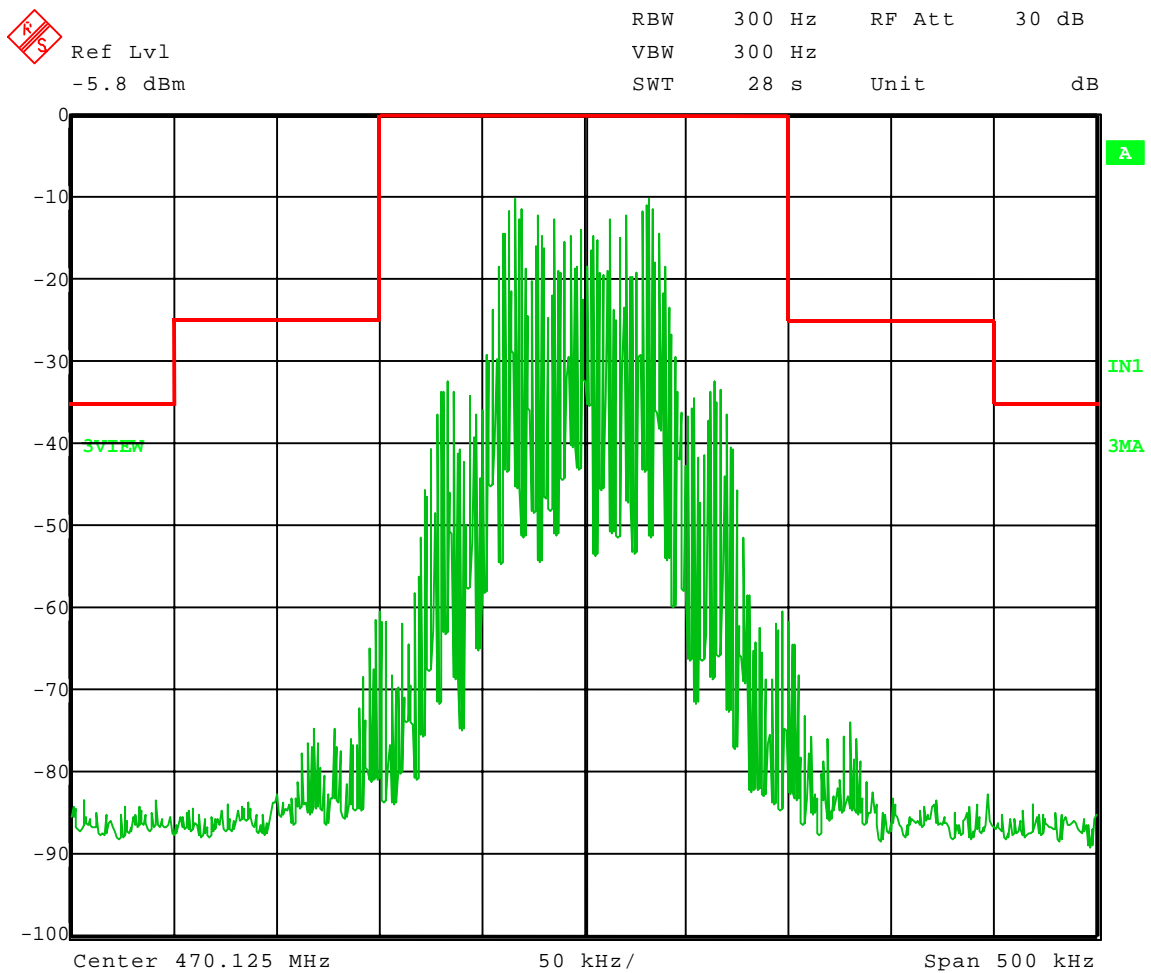


Company: Shure Inc.
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Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 470.125 MHz
2500 Hz 16 dB > 50% modulated



Date: 2.AUG.2007 12:40:44

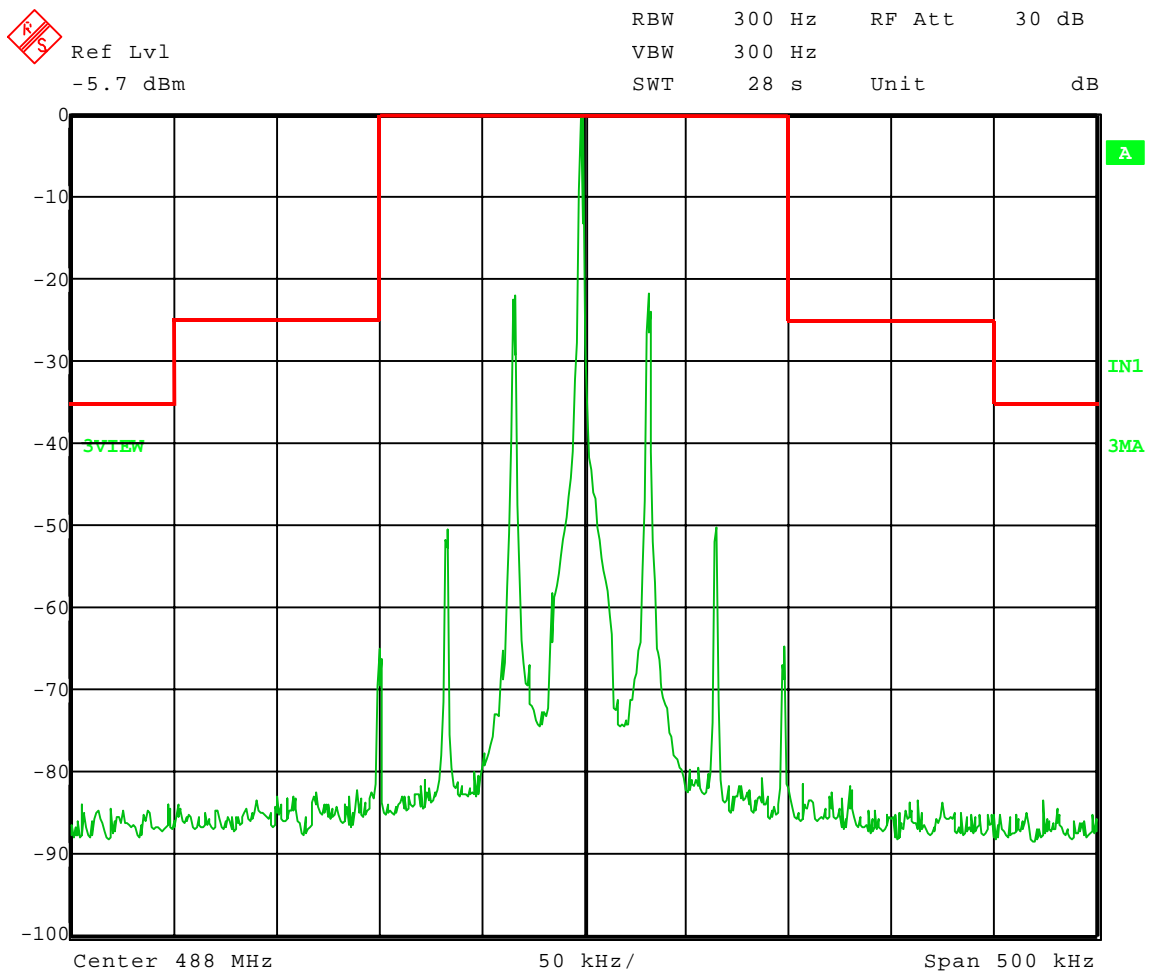


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Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 488 MHz
Unmodulated



Date: 2.AUG.2007 12:46:16

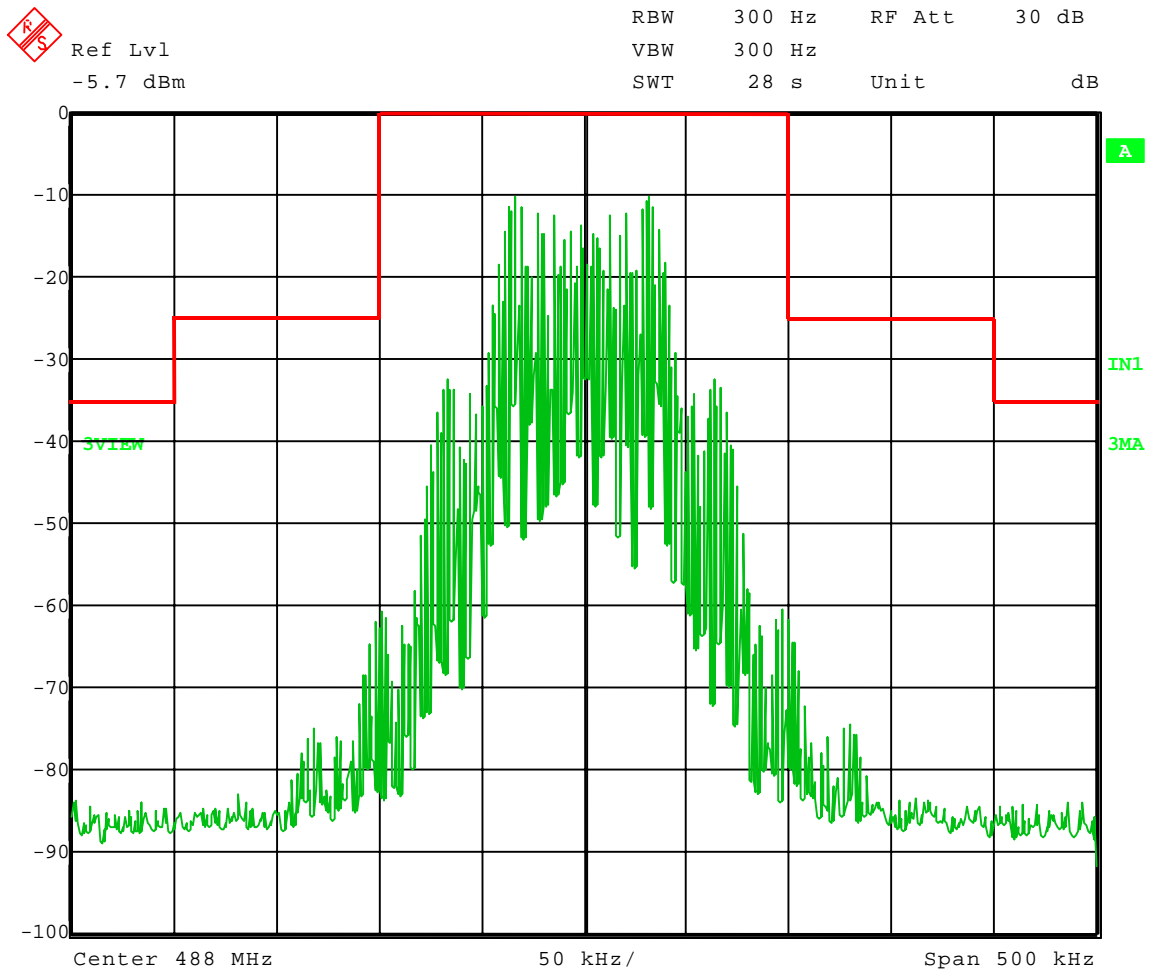


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 488 MHz
2500 Hz 16 dB > 50% modulated



Date: 2.AUG.2007 12:47:57

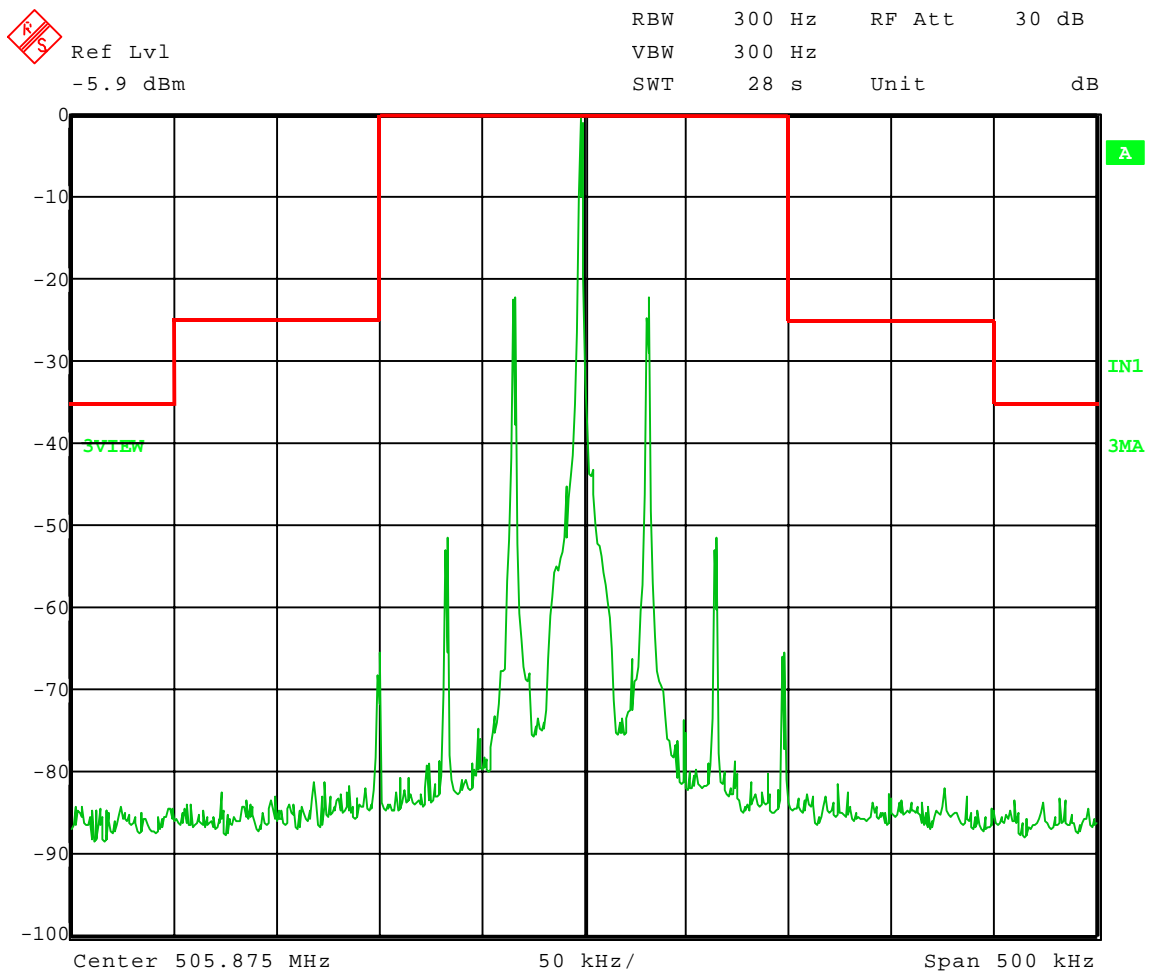


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 505.875 MHz
Unmodulated



Date: 2.AUG.2007 12:52:21

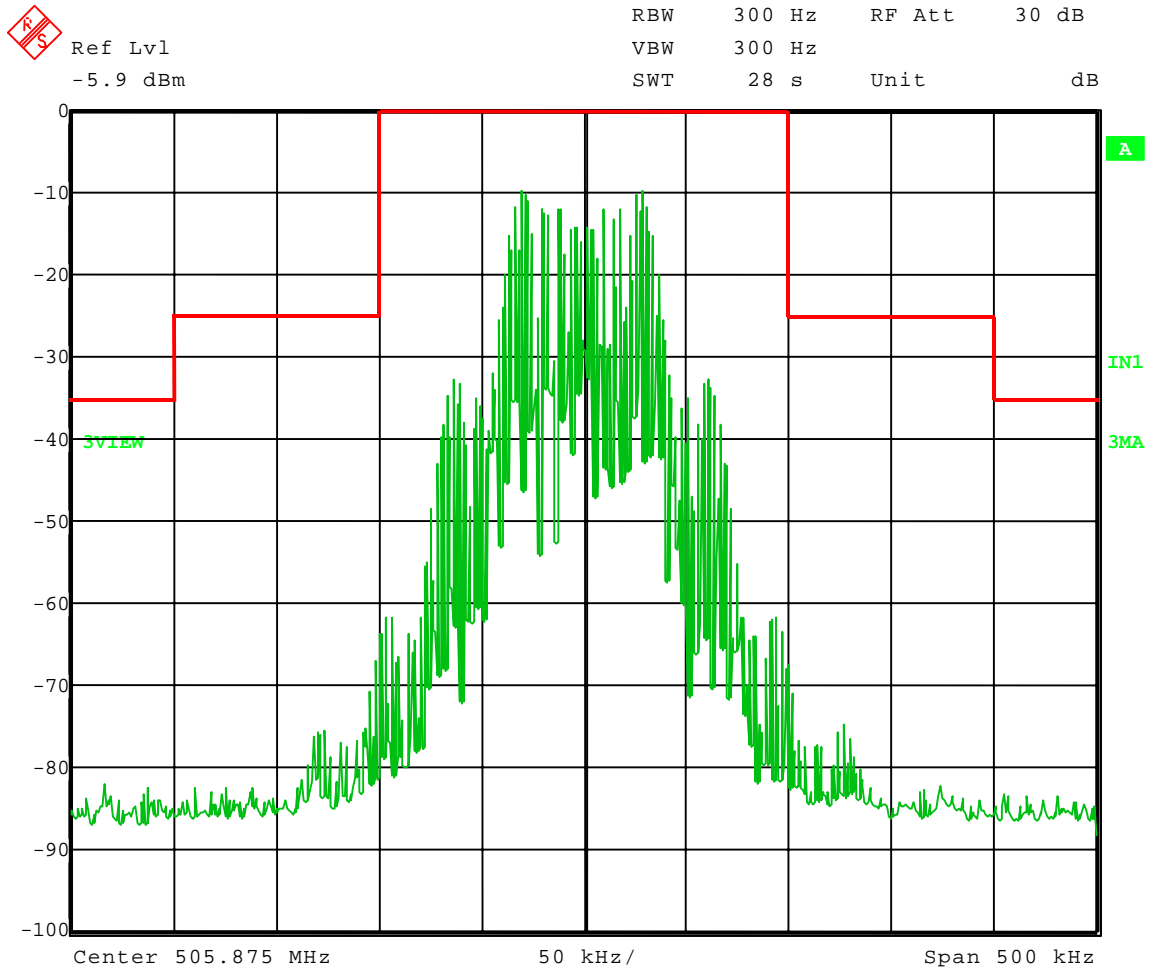


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 505.875 MHz
2500 Hz 16 dB > 50% modulated



Date: 2.AUG.2007 12:54:46

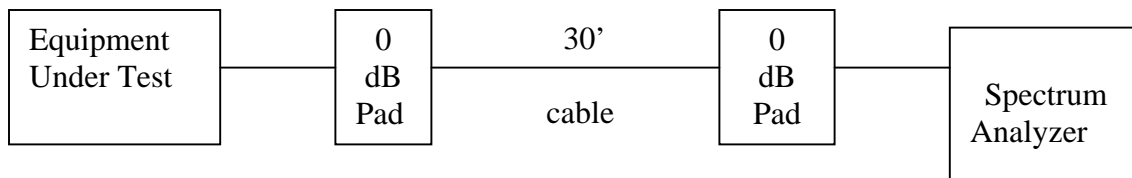


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

7.0 SPURIOUS EMISSIONS AT THE 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 470 MHz - 506 MHz bands for ULX2 Wireless Microphone Transmitter 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 $43 + 10 \log_{10}$ (mean output power in watts) dB.

NOTE:

The ULX2 Wireless Microphone Transmitter uses the internal 9 volt battery as the antenna.



1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

DATA AND GRAPH(S) TAKEN OF THE

BAND EDGE COMPLIANCE

Part 74.861(e) & PART 2.1051

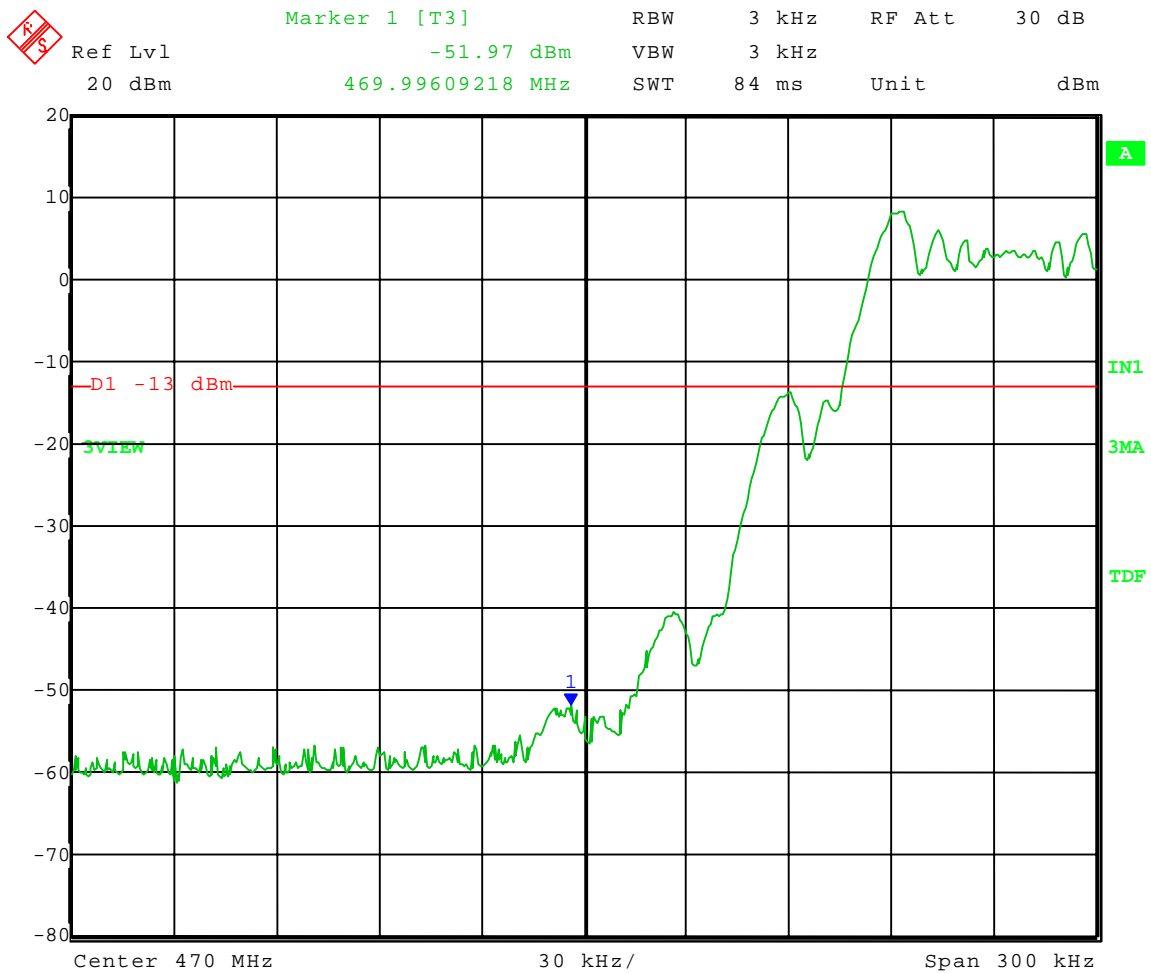


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 08-02-2007
Company: Shure, Inc.
EUT: ULX2-G3
Test: Band-Edge Compliance - Conducted
Rule part: FCC Part 74; FCC Part 2.1051
Operator: Craig B
Comment: Channel; 470.125 MHz

Band-Edge Frequency = 470 MHz
Band-Edge limit = -13 dBm



Date: 2.AUG.2007 13:04:02



Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

9.0 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 10th harmonic of the fundamental frequency.

For the ULX2 Wireless Microphone Transmitter, the highest fundamental frequency is 704 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 470 MHz - 506 MHz bands for ULX2 Wireless Microphone Transmitter 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 $43 + 10 \log_{10}$ (mean output power in watts) dB.



Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

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

As stated in Part 74, Section 74.861 (e-1 ii) the limit is 250 mW in the frequency range 470 MHz - 506 MHz.

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

Mean output power in watts:

Manufacturer's rated wattage = **30 mW maximum Watt(s)**
(See Paragraph 2.0, page 2 of this Appendix)

Free Space Formula

Convert to 3 meter test distance using the Free Space Formula

$$\frac{\sqrt{49.2 * \text{rated wattage}}}{\text{Distance}} = 0.4049691 \text{ volts/meter} = 404969.1 \text{ uV/m}$$

$$20 * \text{Log}(404969.1) = 112.1844 \text{ dBuV}$$

Therefore, the Fundamental at three meters equals 112.1844 dBuV,

The emissions must be reduced by:

$$43 + 10 * \text{LOG}_{10}(0.03 \text{ watts}) = 27.77121 \text{ dB}$$

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

112.1844 dBuV extrapolated level for 0.03 watts
-27.77121 dB required reduction below the unmodulated fundamental
84.37723 dBuV maximum spurious emissions allowed



1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

RADIATED EMISSION DATA TAKEN
FOR FUNDAMENTAL EMISSIONS
USING THE SUBSTITUTION METHOD
EIA /TIA-603-C:2004, SECTION 2.2.12



Company: Shure Inc.
 Model Tested: ULX2-G3
 Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 06-28-2007
 Temperature: 73 deg. F
 Humidity: 57% R.H.

Spurious Emissions - ERP - Substitution Method

Model: ULX2-G3								
Channels: 470.150 MHz, 490.650 MHz, and 505.300 MHz								
Frequency and Polarization (MHz)	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 subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [ERP] (dBm)	Limit (dBm)	Margin (dB)	Strength of emission [ERP] (mW)
470.15 vertical	103.2	13.3	7.6	2.15	5.8	24.0	18.3	3.76
470.15 horizontal	105.3	15.5	7.6	2.15	8.0	24.0	16.1	6.24
490.65 vertical	101.8	12.0	7.7	2.15	4.3	24.0	19.7	2.72
490.65 horizontal	102.3	12.5	7.7	2.15	4.8	24.0	19.2	3.05
505.300 vertical	100.6	10.8	7.7	2.15	3.1	24.0	20.9	2.04
505.300 horizontal	103.4	13.6	7.7	2.15	5.9	24.0	18.1	3.88

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

RADIATED EMISSION DATA AND GRAPH(S)

TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS

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

PART 2.1053



Company: Shure Inc.
 Model Tested: ULX2-G3
 Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 06-28-2007
 Temperature: 73 deg. F.
 Humidity: 57% R.H.

Radiated Spurious Emissions (e.r.p. substitution method) FCC Part 74; FCC Part 2.1053								
Model: ULX2-G3 Transmit Frequency: 470.150 MHz								
Frequency GHz	Field Strength Level dBuV/m	Factor to Convert to dBm	Power ERP dBm	Limit dBm	Margin dB	Receive Antenna Polarization	EUT Antenna Orientation	Receive Antenna Height (m)
0.94030	72.3	100.8	-28.5	-13	15.5	Horizontal	315	1.1
1.41045	52.3	100.0	-47.7	-13	34.7	Horizontal	180	2.3
1.88060	57.7	99.8	-42.1	-13	29.1	Horizontal	250	2.1
2.35075	57.8	101.0	-43.2	-13	30.2	Horizontal	135	1.0
2.82090	50.2	101.5	-51.3	-13	38.3	Horizontal	270	1.1
3.29105	62.3	100.9	-38.6	-13	25.6	Horizontal	225	1.1
3.76120	57.9	100.9	-43.0	-13	30.0	Horizontal	180	1.1
4.23135	59.4	100.4	-41.0	-13	28.0	Horizontal	225	1.1
4.70150	61.2	100.1	-38.9	-13	25.9	Horizontal	180	1.3
0.94030	68.3	101.1	-32.8	-13	19.8	Vertical	180	2.0
1.41045	52.4	101.0	-48.6	-13	35.6	Vertical	180	2.0
1.88060	54.7	98.9	-44.2	-13	31.2	Vertical	40	1.0
2.35075	55.0	100.0	-45.0	-13	32.0	Vertical	180	1.5
2.82090	49.5	100.9	-51.4	-13	38.4	Vertical	0	2.0
3.29105	57.8	99.1	-41.3	-13	28.3	Vertical	200	1.0
3.76120	56.6	100.0	-43.4	-13	30.4	Vertical	180	1.0
4.23135	58.5	100.3	-41.8	-13	28.8	Vertical	180	1.0
4.70150	58.7	100.5	-41.8	-13	28.8	Vertical	190	1.2



Company: Shure Inc.
 Model Tested: ULX2-G3
 Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 06-28-2007
 Temperature: 73 deg. F.
 Humidity: 57% R.H.

Radiated Spurious Emissions (e.r.p. substitution method) FCC Part 74; FCC Part 2.1053								
Model: ULX2-G3 Transmit Frequency: 490.650 MHz								
Frequency GHz	Field Strength Level dBuV/m	Factor to Convert to dBm	Power ERP dBm	Limit dBm	Margin dB	Receive Antenna Polarization	EUT Antenna Orientation	Receive Antenna Height (m)
0.98130	67.4	100.8	-33.4	-13	20.4	Horizontal	30	1.1
1.47195	59.9	100.3	-40.4	-13	27.4	Horizontal	190	1.2
1.96260	59.4	100.3	-40.9	-13	27.9	Horizontal	160	2.0
2.45325	56.0	101.5	-45.5	-13	32.5	Horizontal	180	1.1
2.94390	55.4	100.9	-45.5	-13	32.5	Horizontal	20	1.4
3.43455	49.2	100.2	-51.0	-13	38.0	Horizontal	180	1.3
3.92520	53.1	100.6	-47.5	-13	34.5	Horizontal	190	1.1
4.41585	55.2	99.8	-44.6	-13	31.6	Horizontal	180	1.0
4.90650	54.4	99.4	-45.0	-13	32.0	Horizontal	100	1.2
0.98130	61.6	101.1	-39.5	-13	26.5	Vertical	290	1.8
1.47195	60.9	101.5	-40.6	-13	27.6	Vertical	200	1.0
1.96260	58.3	99.1	-40.8	-13	27.8	Vertical	200	1.0
2.45325	54.0	99.8	-45.8	-13	32.8	Vertical	190	1.3
2.94390	48.8	100.5	-51.7	-13	38.7	Vertical	170	1.6
3.43455	45.5	100.1	-54.6	-13	41.6	Vertical	280	1.7
3.92520	50.6	100.5	-49.9	-13	36.9	Vertical	180	1.0
4.41585	49.0	100.0	-51.0	-13	38.0	Vertical	290	1.2
4.90650	51.6	99.9	-48.3	-13	35.3	Vertical	170	1.6



Company: Shure Inc.
 Model Tested: ULX2-G3
 Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 06-28-2007
 Temperature: 73 deg. F.
 Humidity: 57% R.H.

Radiated Spurious Emissions (e.r.p. substitution method) FCC Part 74; FCC Part 2.1053								
Model: ULX2-G3 Transmit Frequency: 505.300 MHz								
Frequency GHz	Field Strength Level dBuV/m	Factor to Convert to dBm	Power ERP dBm	Limit dBm	Margin dB	Receive Antenna Polarization	EUT Antenna Orientation	Receive Antenna Height (m)
1.01060	61.3	100.8	-39.5	-13	26.5	Horizontal	330	1.3
1.51590	62.0	101.0	-39.0	-13	26.0	Horizontal	150	2.2
2.02120	63.1	101.1	-38.0	-13	25.0	Horizontal	170	1.1
2.526.5	63.1	100.9	-37.8	-13	24.8	Horizontal	225	1.1
3.03180	60.4	101.3	-40.9	-13	27.9	Horizontal	135	1.0
3.53710	54.3	101.1	-46.8	-13	33.8	Horizontal	100	1.1
4.042.4	61.0	101.2	-40.2	-13	27.2	Horizontal	180	1.2
4.54770	63.4	99.2	-35.8	-13	22.8	Horizontal	180	1.0
5.05300	60.8	99.7	-38.9	-13	25.9	Horizontal	90	1.6
1.01060	57.8	101.1	-43.3	-13	30.3	Vertical	190	2.2
1.51590	62.4	101.1	-38.7	-13	25.7	Vertical	200	1.4
2.02120	61.8	99.8	-38.0	-13	25.0	Vertical	200	1.4
2.526.5	58.0	99.3	-41.3	-13	28.3	Vertical	0	1.4
3.03180	57.0	100.1	-43.1	-13	30.1	Vertical	180	2.0
3.53710	54.5	100.6	-46.1	-13	33.1	Vertical	180	1.1
4.042.4	52.8	101.3	-48.5	-13	35.5	Vertical	225	1.2
4.54770	62.6	100.0	-37.4	-13	24.4	Vertical	190	2.1
5.05300	56.2	99.8	-43.6	-13	30.6	Vertical	180	1.2



Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

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

The frequency stability was measured from -30° to $+50^{\circ}$ 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 Microphone Transmitter oscillator circuitry to stabilize.

See the following page for the data taken during testing.

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

The frequency stability of Wireless Microphone Transmitter was measured by reducing the primary supply voltage to the battery end point specified by the manufacturer.

See the following page for the data taken during testing.



1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

DATA TAKEN FOR FREQUENCY

STABILITY WHEN VARYING THE TEMPERATURE

AND

PRIMARY SUPPLY VOLTAGE VARIATION

PART 2.1055a(1) & PART 2.1055d(d2)



Company: Shure Inc.
 Model Tested: ULX2-G3
 Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 08-03-2007

Limit = 23.5 kHz (0.005% of 470 MHz)

Frequency Stability FCC Part 74; FCC Part 2.1055

Model	Nominal Frequency (MHz)	Measured Frequency									
		+50 deg. C	Error (kHz)	+40 deg. C	Error (kHz)	+30 deg. C	Error (kHz)	+20 deg. C	Error (kHz)	+10 deg. C	Error (kHz)
ULX2-G3	470.125	470.121944	-3.056	470.122645	-2.355	470.123747	-1.253	470.123848	-1.152	470.125451	0.451
ULX2-G3	488.000	487.996944	-3.056	487.997545	-2.455	487.998547	-1.453	487.998747	-1.253	488.000351	0.351
ULX2-G3	505.875	505.871743	-3.257	505.872545	-2.455	505.873447	-1.553	505.874148	-0.852	505.875351	0.351

Frequency Stability FCC Part 74; FCC Part 2.1055

Model	Nominal Frequency (MHz)	Measured Frequency									
		0 deg. C	Error (kHz)	-10 deg. C	Error (kHz)	-20 deg. C	Error (kHz)	-30 deg. C	Error (kHz)	7.1 Volts	Error (kHz)
ULX2-G3	470.125	470.126553	1.553	470.126553	1.553	470.125451	0.451	470.125451	0.451	470.123948	-1.052
ULX2-G3	488.000	488.001553	1.553	488.001553	1.553	488.001253	1.253	488.000451	0.451	487.998747	-1.253
ULX2-G3	505.875	505.876653	1.653	505.876653	1.653	505.876253	1.253	505.875752	0.751	505.873948	-1.052

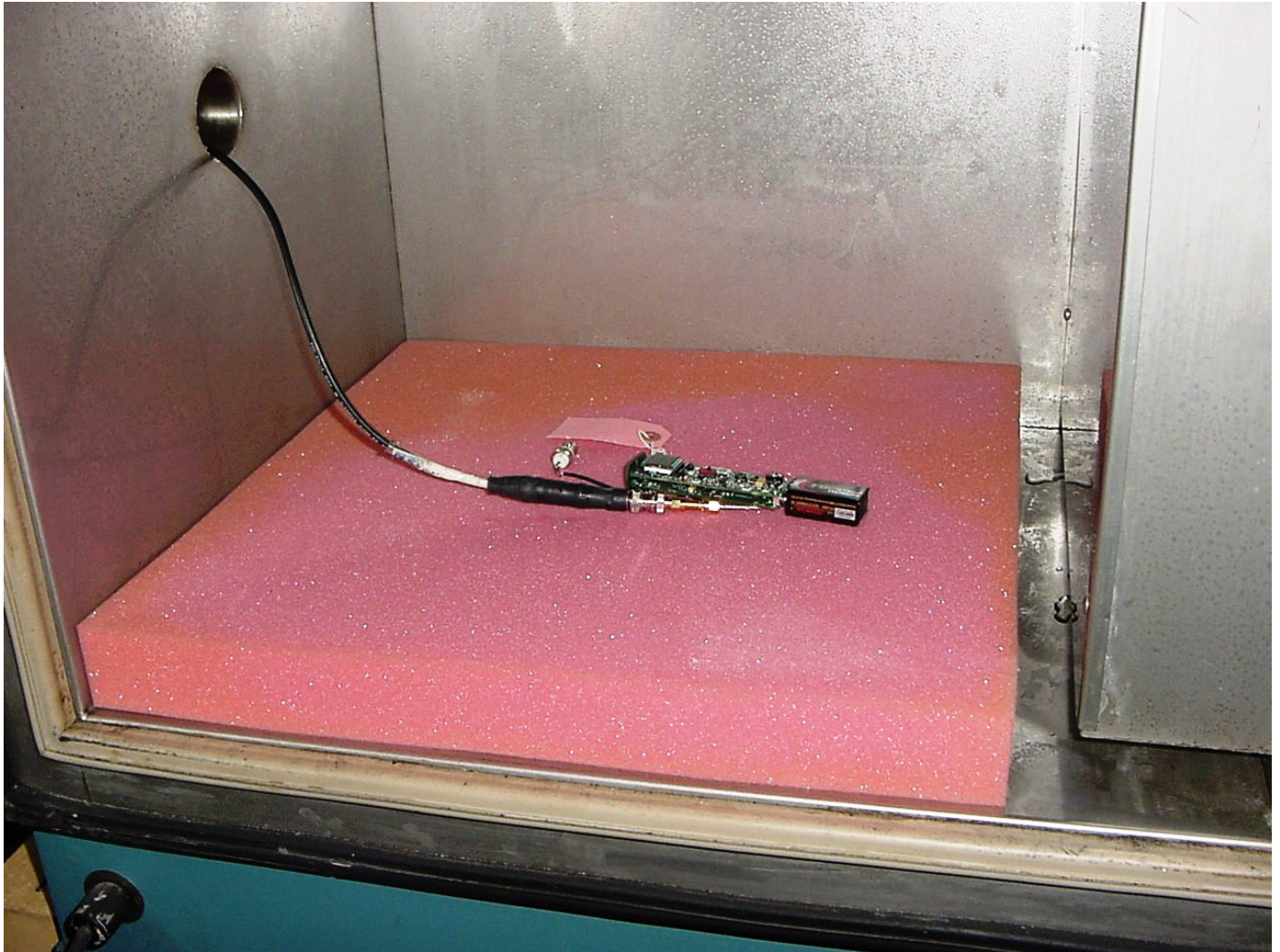


Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

12.0 FREQUENCY TEMPERATURE STABILITY PHOTOS TAKEN DURING TESTING





Company: Shure Inc.
Model Tested: ULX2-G3
Report Number: 13584

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

12.0 FREQUENCY VOLTAGE STABILITY PHOTOS TAKEN DURING TESTING

