



Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

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: ULX1 Wireless Microphone Transmitter
Kind of Equipment: Wireless Microphone Transmitter
Test Configuration: It is only connected to a supplied microphone. (Tested at 9 vdc)
Model Number(s): ULX1-G3
Model(s) Tested: ULX1-G3
Serial Number(s): NA
Emission Designator: 88.6KF3E
Date of Tests: October 15, 16 & 17, 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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SIGNATURE PAGE

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Test Engineer
EMC-001375-NE

Reviewed By:

William Stumpf
OATS Manager

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Brian Mattson
General Manager



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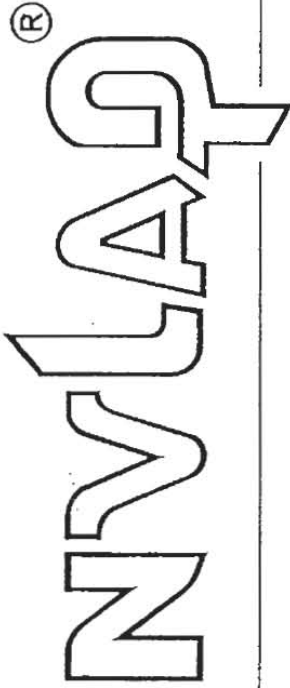
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United States Department of Commerce
 National Institute of Standards and Technology



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 ULX1 Wireless Microphone Transmitter, Model Number(s) ULX1-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 ULX1 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 October 15, 16 & 17, 2007, a series of radio frequency interference measurements was performed on ULX1 Wireless Microphone Transmitter, Model Number(s) ULX1-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 ULX1 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 UXL1-G3 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: 26mm Width: 64mm Height: 83mm

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: 90-11417, Rev 00

2. Unpopulated PCB

PN: 34A11418, Rev 00



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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 ULX1 Wireless Microphone Transmitter
Model Number: ULX1-G3, Serial Number: NA

Item 1 Shure Microphone Cable



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11.0 RADIATED PHOTOS TAKEN DURING TESTING



RADIATED X



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11.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



RADIATED Y



Company: Shure Inc.
Model Tested: ULX1-G3
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11.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



RADIATED Z



Company: Shure Inc.
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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 ULX1 Wireless Microphone Transmitter, Model Number(s) ULX1-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 ULX1 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



Company: Shure Inc.
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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 ULX1 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:

14.17 dBm Measured output of the transmitter

14.17 dBm equals 0.02612 watt(s)

LIMIT:

Manufacturer's rated output power = 30 mW maximum

MARGIN:

$.25 - 0.02612 = 0.22388$ 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

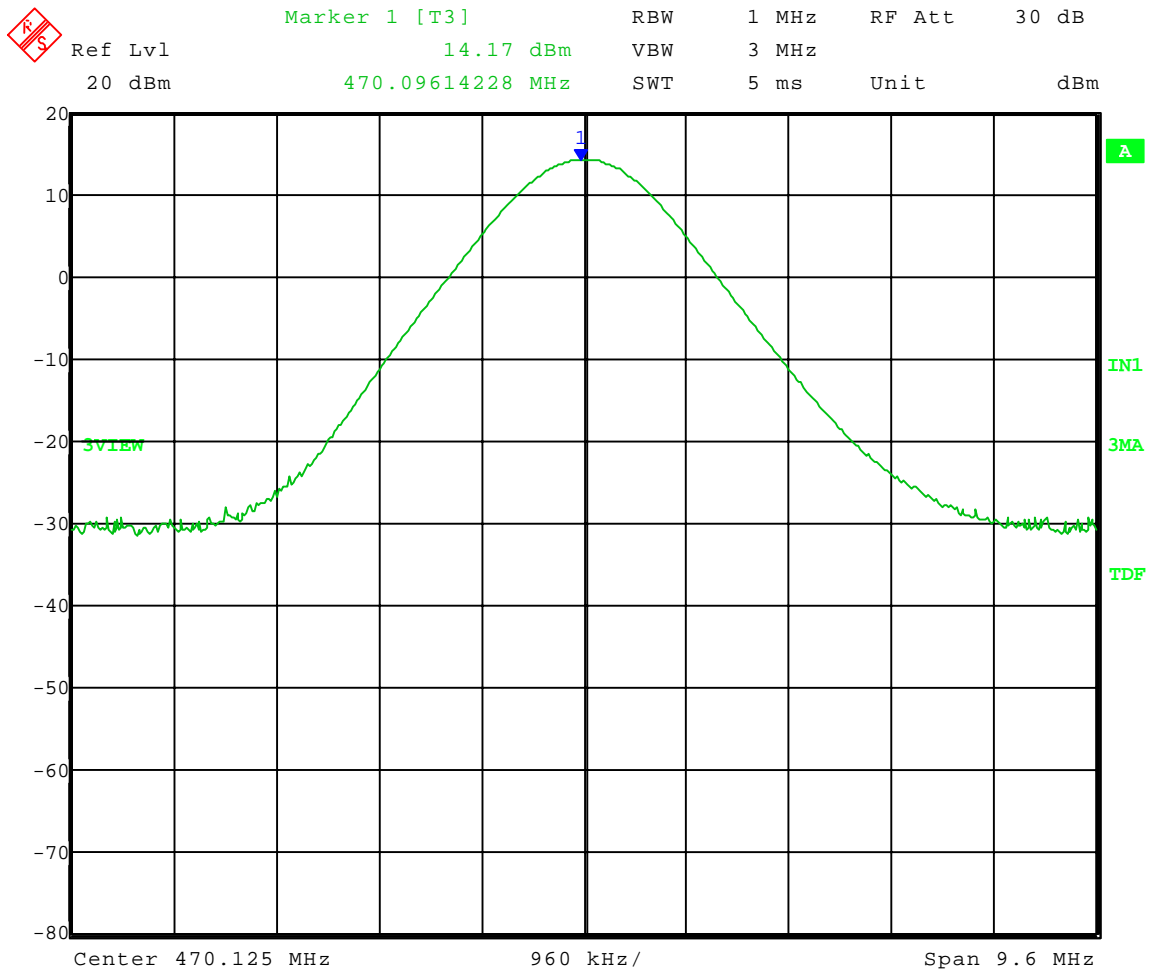


Company: Shure Inc.
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Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-G3
Test: Peak Power Output - Conducted
Rule part: FCC Part 74; FCC Part 2.1046
Operator: Craig B
Comment: Channel: 470.125 MHz

Peak Output Power = 14.17 dBm = 26.12 mW



Date: 16.OCT.2007 13:01:32

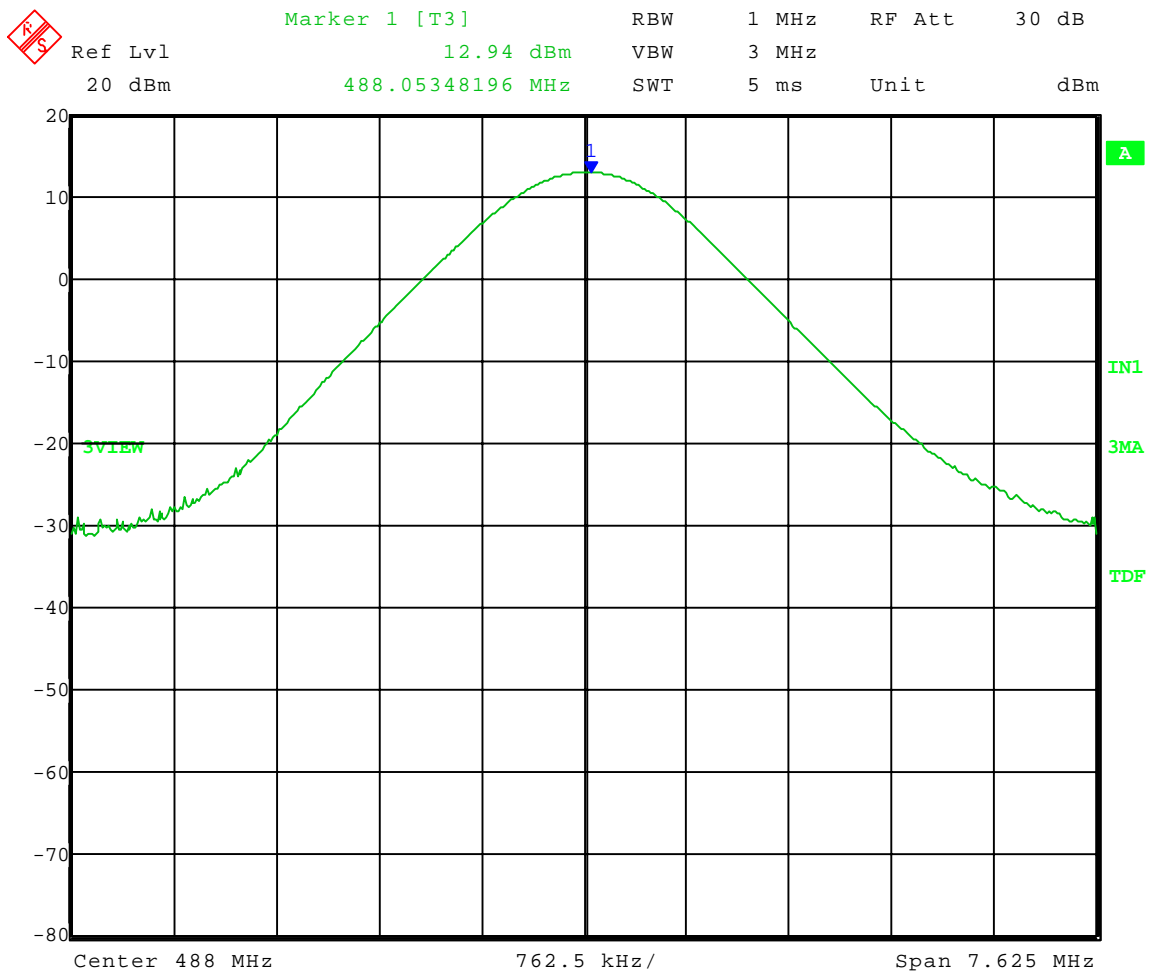


Company: Shure Inc.
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Report Number: 13582

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Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-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 = 12.94 dBm = 19.68 mW



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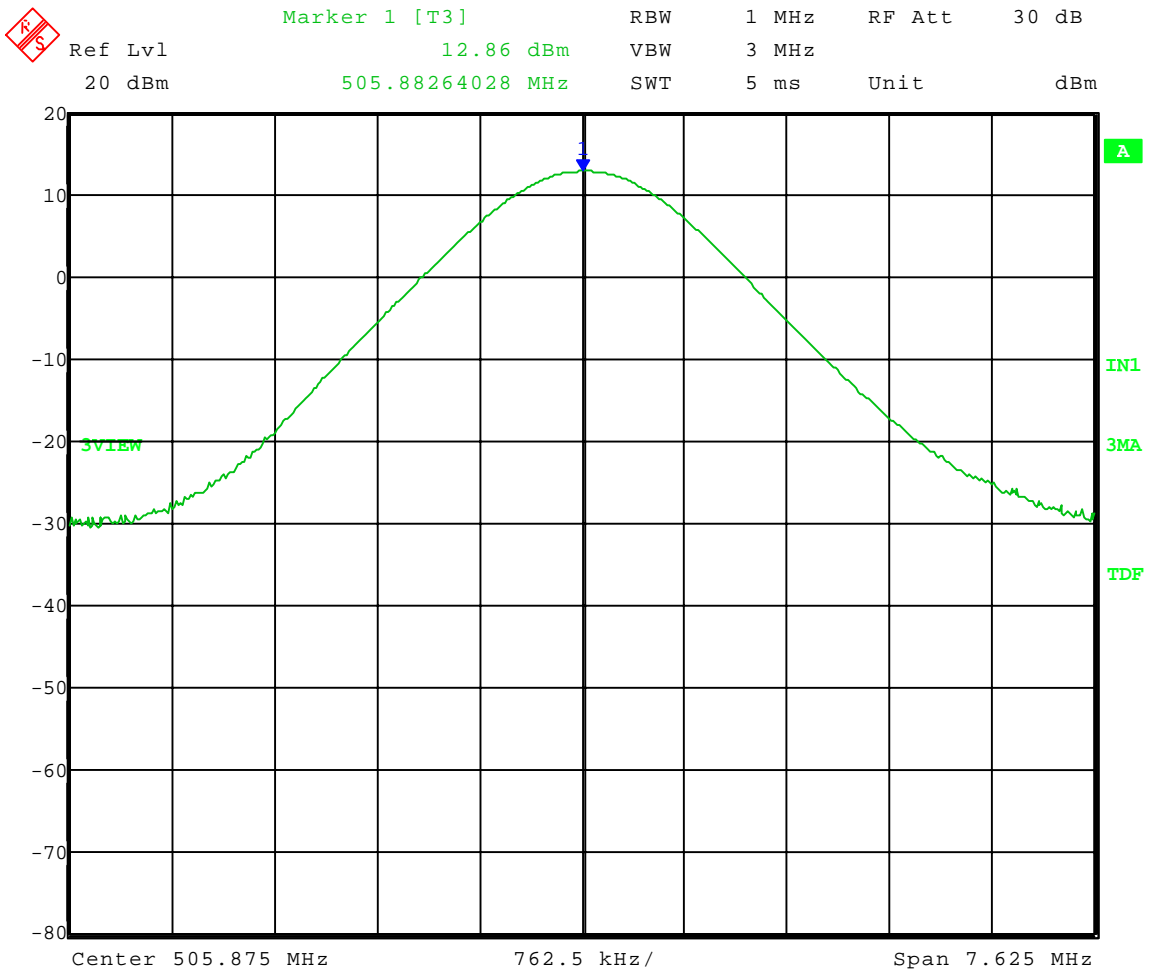


Company: Shure Inc.
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Test Date: 10-16-2007
 Company: Shure, Inc.
 EUT: ULX1-G3
 Test: Peak Power Output - Conducted
 Rule part: FCC Part 74; FCC Part 2.1046
 Operator: Craig B
 Comment: Channel: 505.875 MHz

Peak Output Power = 12.86 dBm = 19.32 mW



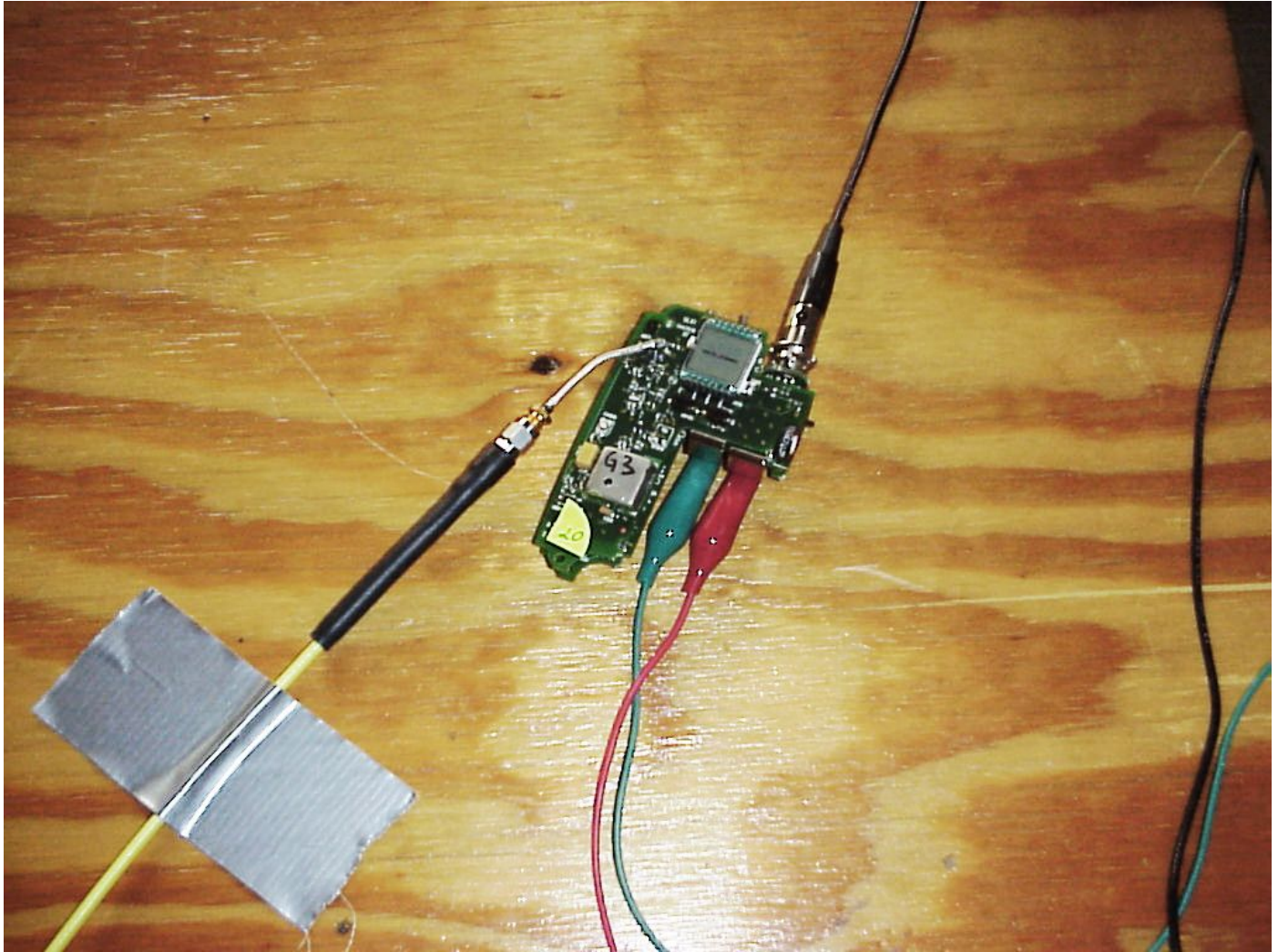
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Company: Shure Inc.
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3.0 RF POWER OUTPUT PHOTOS TAKEN DURING TESTING





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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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GRAPH(S) TAKEN SHOWING THE FREQUENCY
RESPONSE OF THE
AUDIO MODULATING CIRCUIT

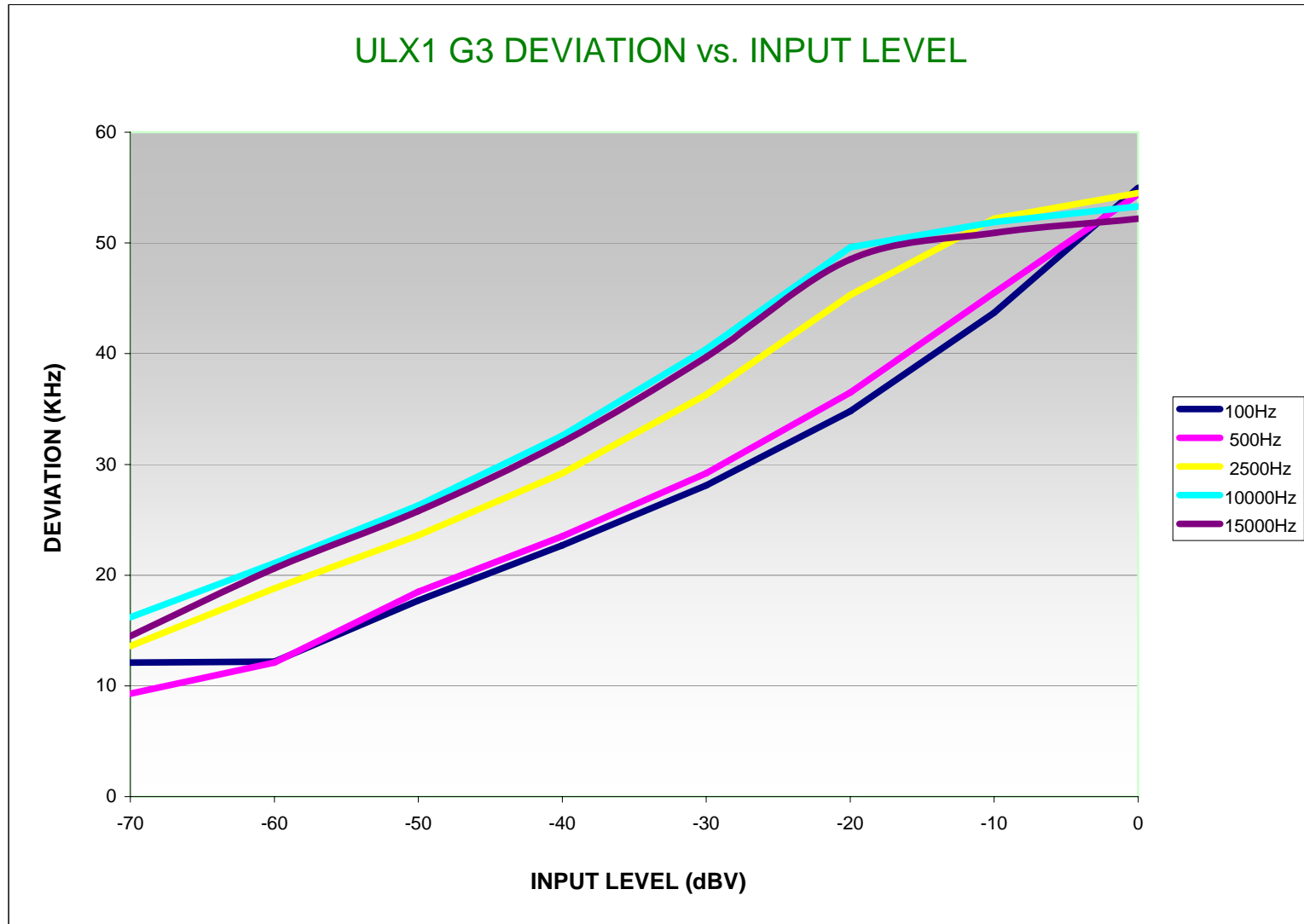
EIA /TIA-603-C:2004, SECTION 2.2.3

PART 2.1047



Company: Shure Inc.
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Report Number: 13582

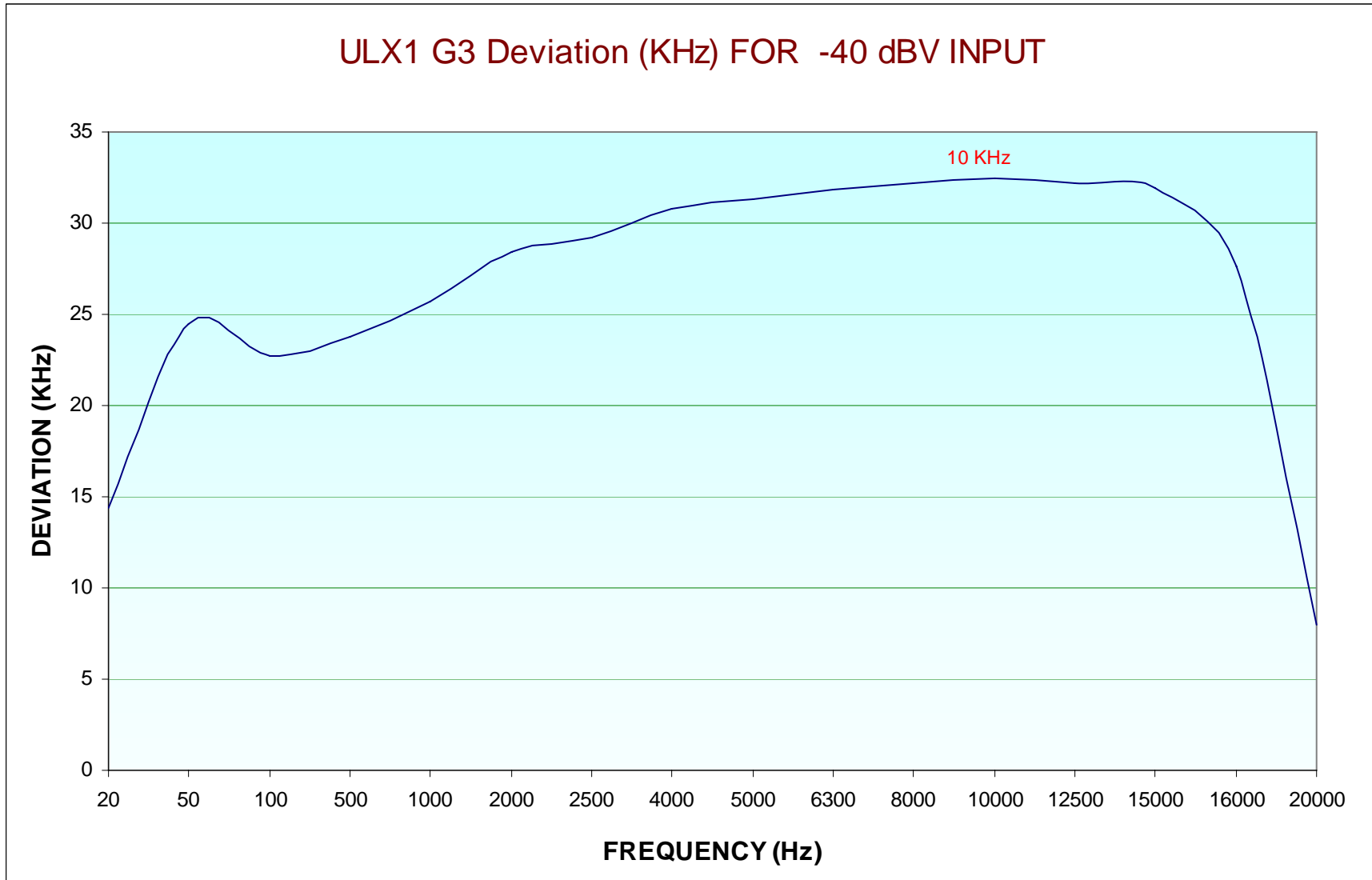
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ULX1 G3

Notes: ULX1 has input attenuator been set at 0 dB during testing
 Unit set to Group 1 Ch 10 - 482.925MHz

Audio Limiting

| DEVIATION (KHz) AT | | | | | | |
|--------------------|--------------|-------------|--------------|--------------|--------------|--|
| LEVEL INPUT | 100Hz | 500Hz | 2500Hz | 10000Hz | 15000Hz | |
| dBV | | | | | | |
| -70 | 12.10 | 9.3 | 13.60 | 16.20 | 14.50 | |
| -60 | 12.20 | 12.1 | 18.80 | 21.10 | 20.60 | |
| -50 | 17.70 | 18.5 | 23.60 | 26.30 | 25.80 | |
| -40 | 22.70 | 23.5 | 29.20 | 32.60 | 32.00 | |
| -30 | 28.10 | 29.2 | 36.30 | 40.40 | 39.70 | |
| -20 | 34.80 | 36.5 | 45.30 | 49.60 | 48.50 | |
| -10 | 43.70 | 45.5 | 52.20 | 51.90 | 50.90 | |
| 0 | 55.00 | 54.4 | 54.50 | 53.30 | 52.20 | |

Audio Frequency Response

| ULX1 | INPUT : -40dBV | |
|----------------|-----------------|-----------------|
| FREQUENCY (Hz) | DEVIATION (KHz) | |
| 20 | 14.4 | |
| 50 | 24.5 | |
| 100 | 22.7 | |
| 500 | 23.8 | |
| 1000 | 25.7 | |
| 2000 | 28.4 | |
| 2500 | 29.2 | |
| 4000 | 30.8 | |
| 5000 | 31.3 | |
| 6300 | 31.8 | |
| 8000 | 32.2 | |
| 10000 | 32.5 | MAX Dev. |
| 12500 | 32.2 | |
| 15000 | 31.9 | |
| 16000 | 27.6 | |
| 20000 | 8 | |



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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



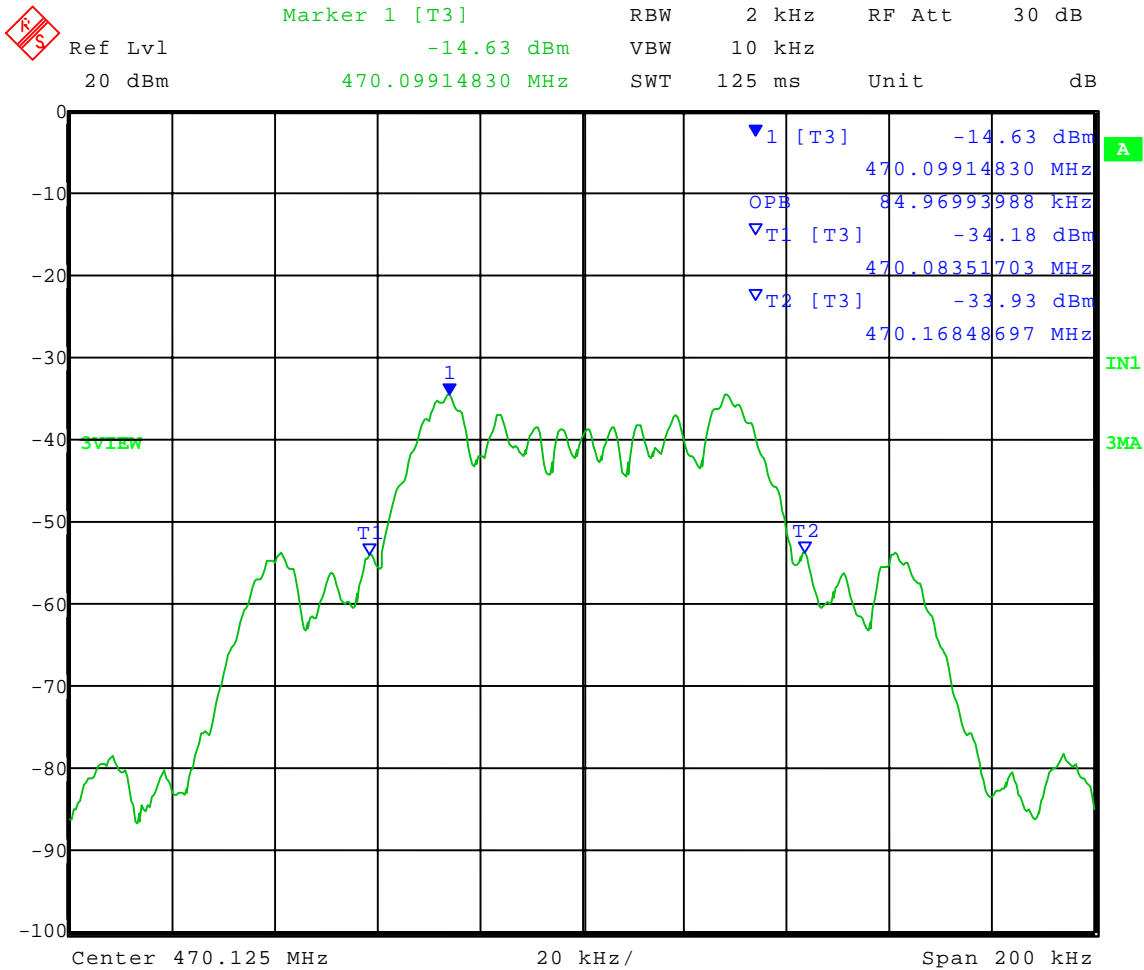
Company: Shure Inc.
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 Report Number: 13582

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Test Date: 10-16-2007
 Company: Shure, Inc.
 EUT: ULX1-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 = 84.97 kHz



Date: 16.OCT.2007 12:51:44



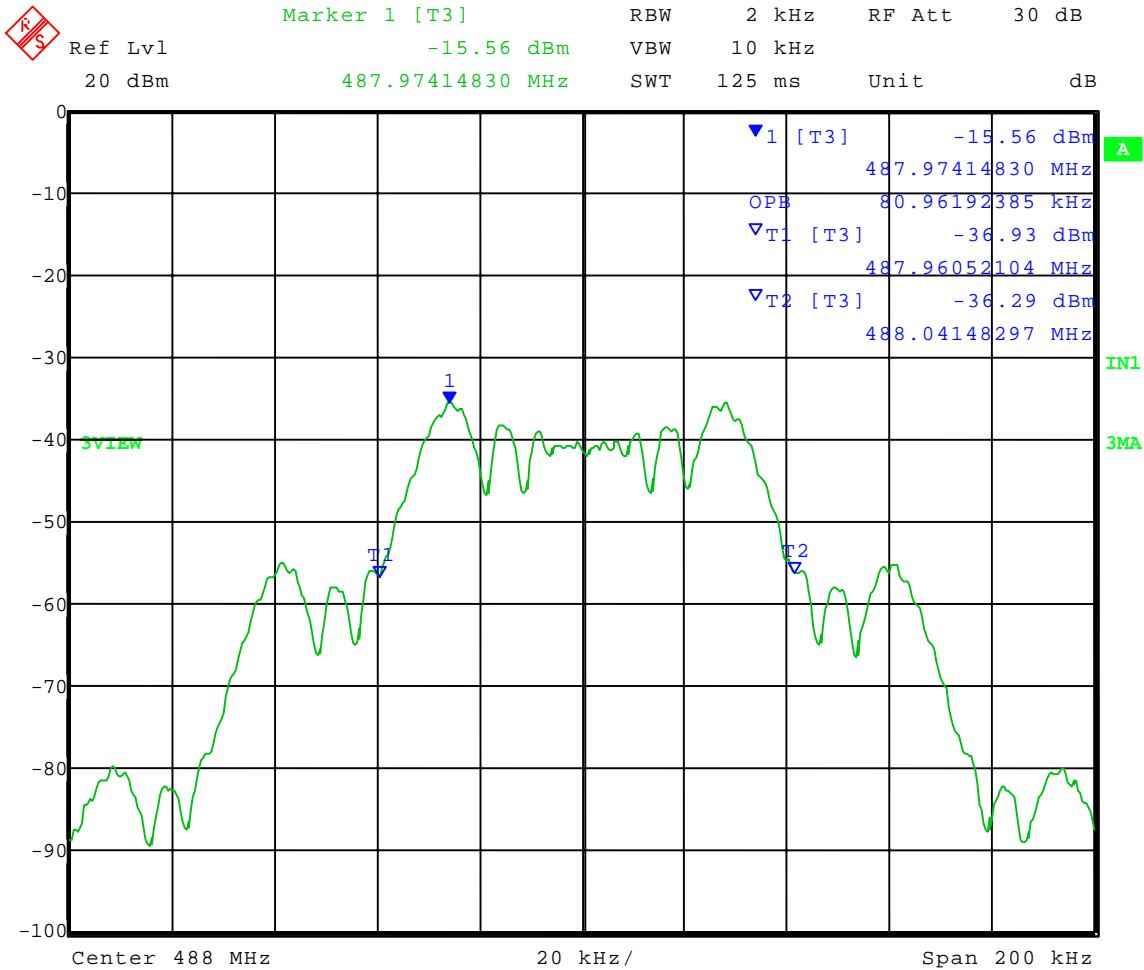
Company: Shure Inc.
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Test Date: 10-16-2007
 Company: Shure, Inc.
 EUT: ULX1-G3
 Test: Occupied Bandwidth; 99% bandwidth
 Rule part: FCC Part 74; FCC Part 2.1049
 Operator: Craig B

Frequency: 488 MHz

99% power bandwidth = 88.6 kHz



Date: 16.OCT.2007 12:53:50



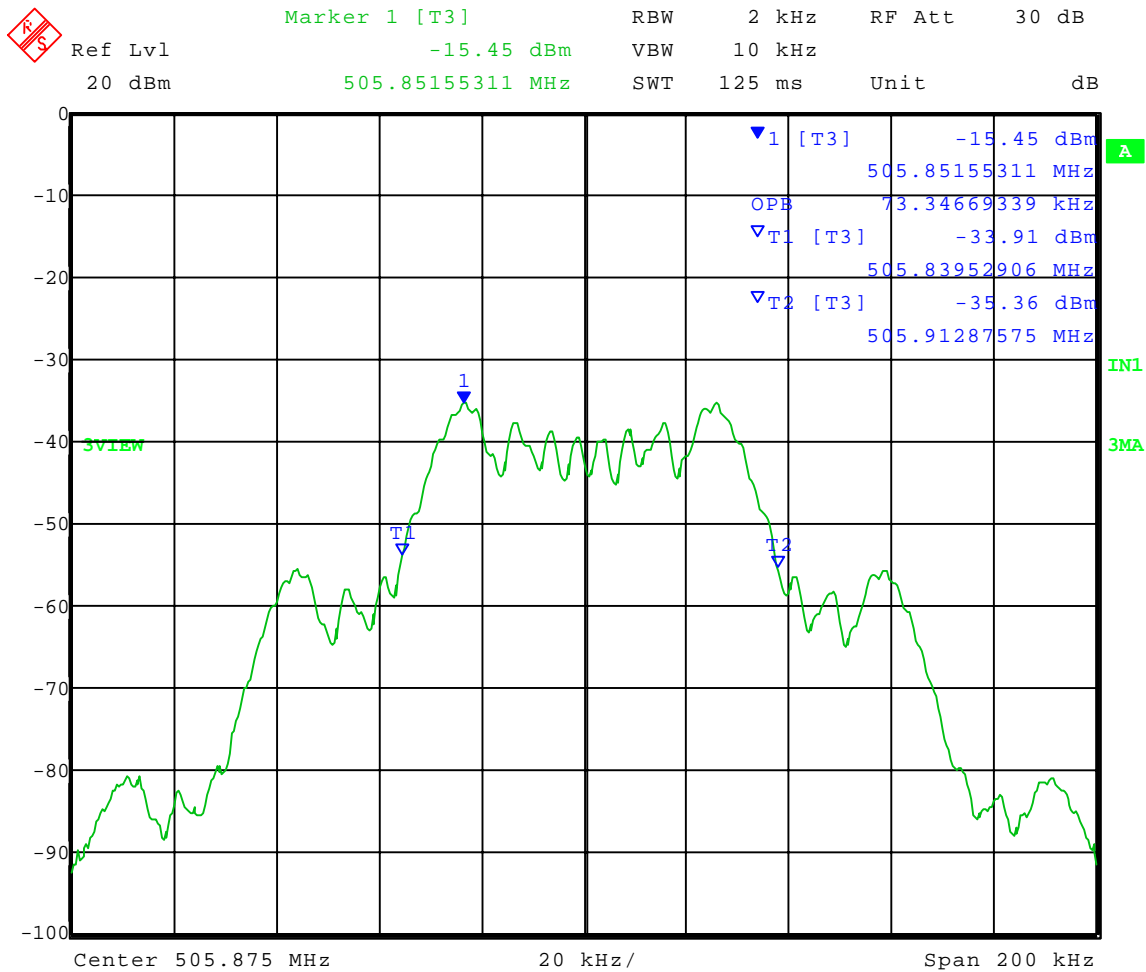
Company: Shure Inc.
 Model Tested: ULX1-G3
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Test Date: 10-16-2007
 Company: Shure, Inc.
 EUT: ULX1-G3
 Test: Occupied Bandwidth; 99% bandwidth
 Rule part: FCC Part 74; FCC Part 2.1049
 Operator: Craig B

Frequency: 505.875 MHz

99% power bandwidth = 73.35 kHz



Date: 16.OCT.2007 12:49:41



1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

DATA AND GRAPH(S) TAKEN OF THE EMISSION MASK

Part 74.861(d)(3) & PART 2.1049

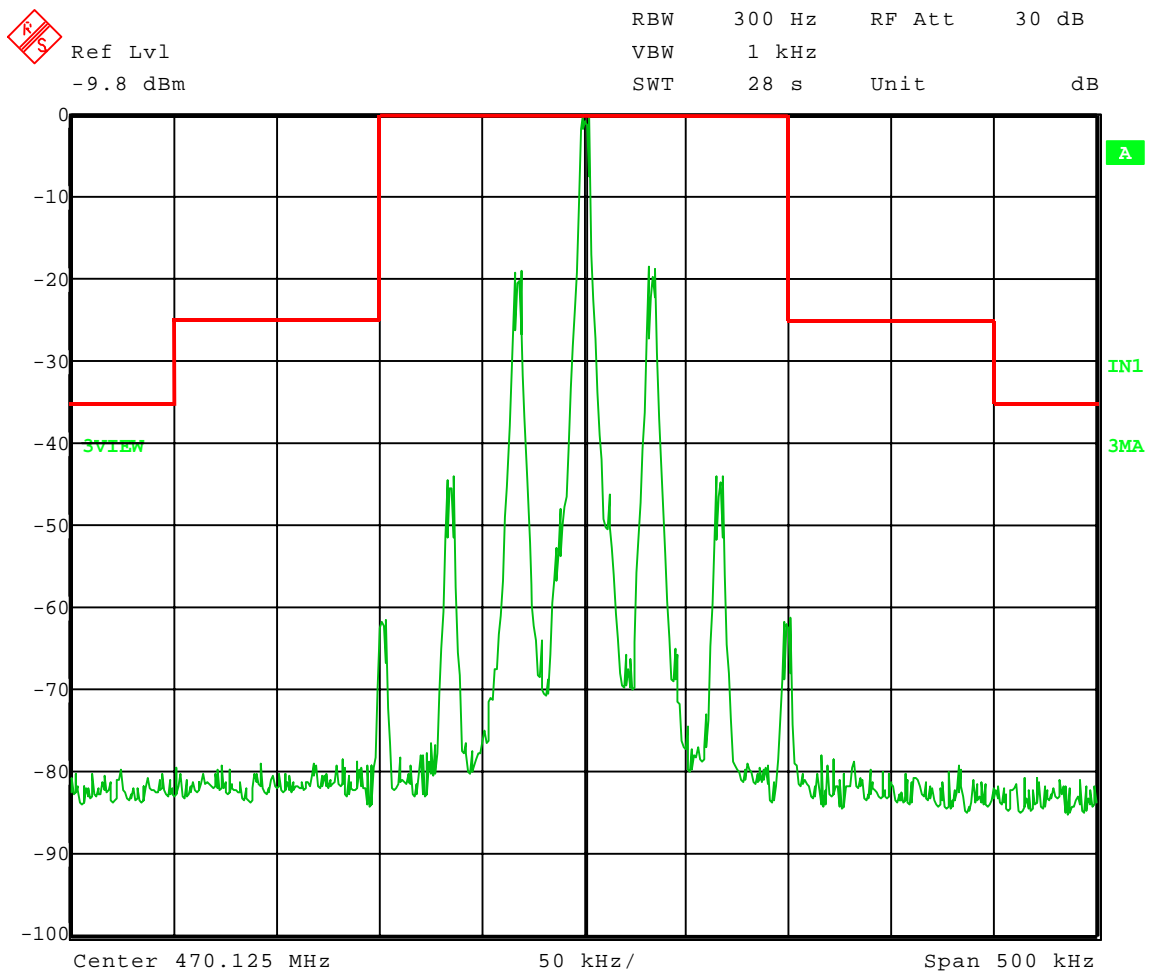


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 470.125 MHz
Unmodulated



Date: 16.OCT.2007 11:59:46

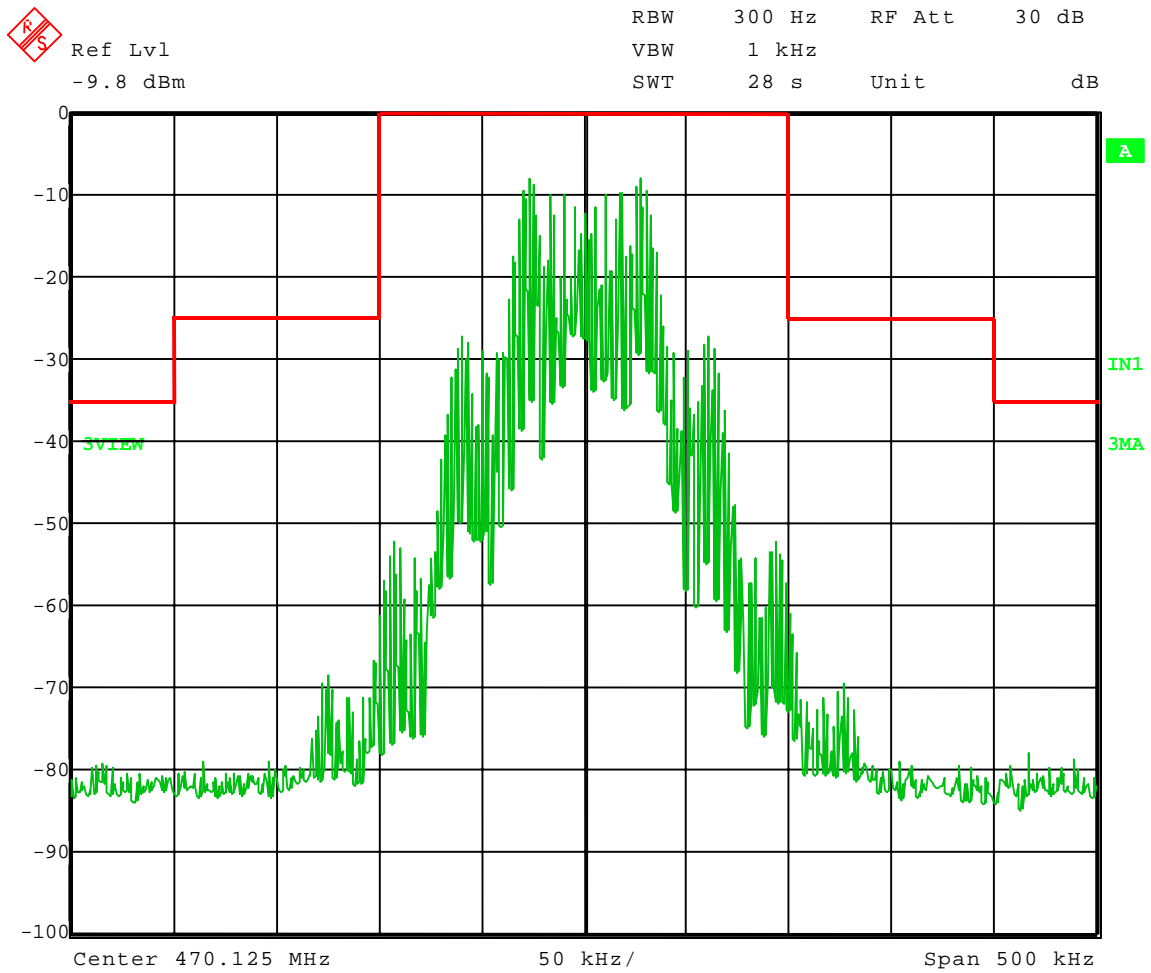


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-G3
Test: Emission Mask
Operator: Craig B

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



Date: 16.OCT.2007 12:01:24

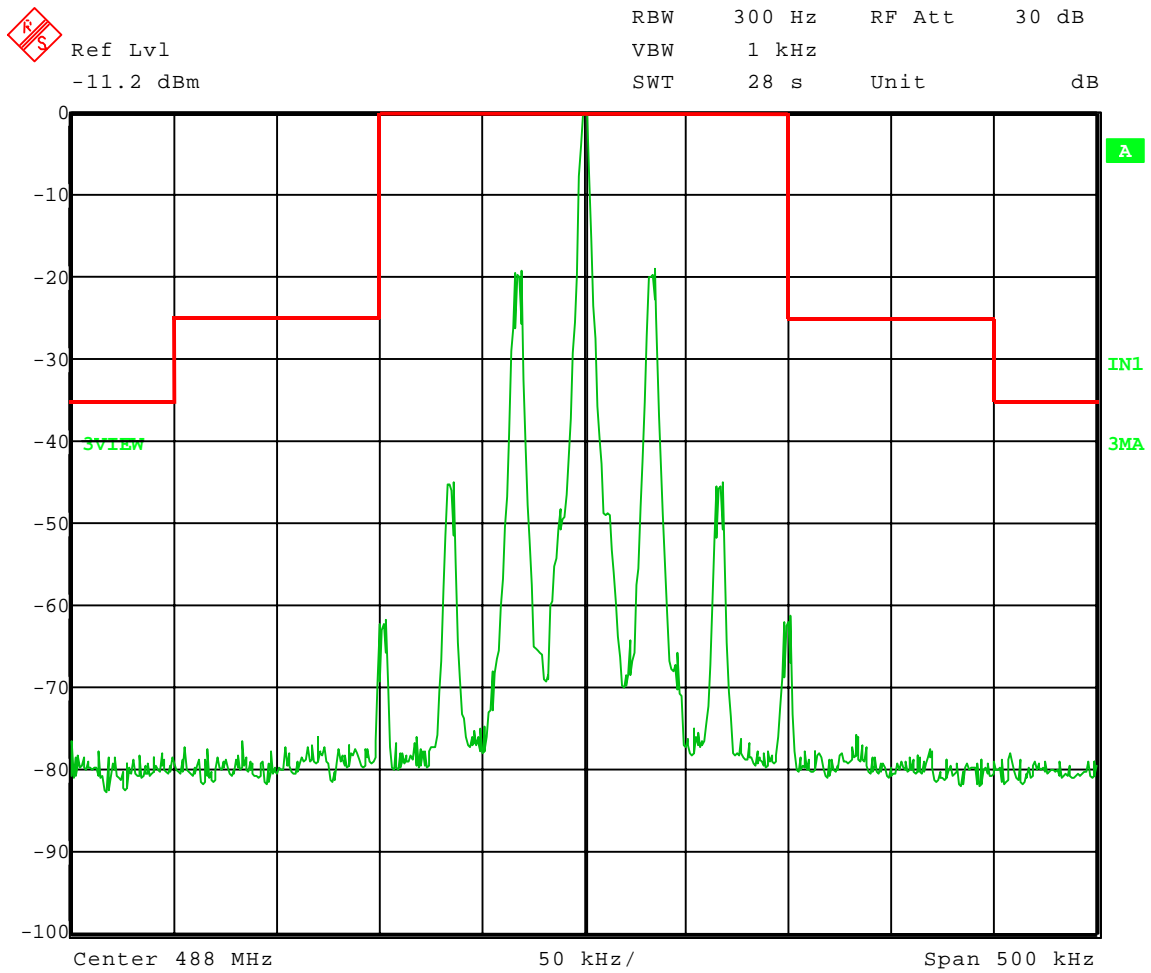


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 488 MHz
Unmodulated



Date: 16.OCT.2007 12:08:35

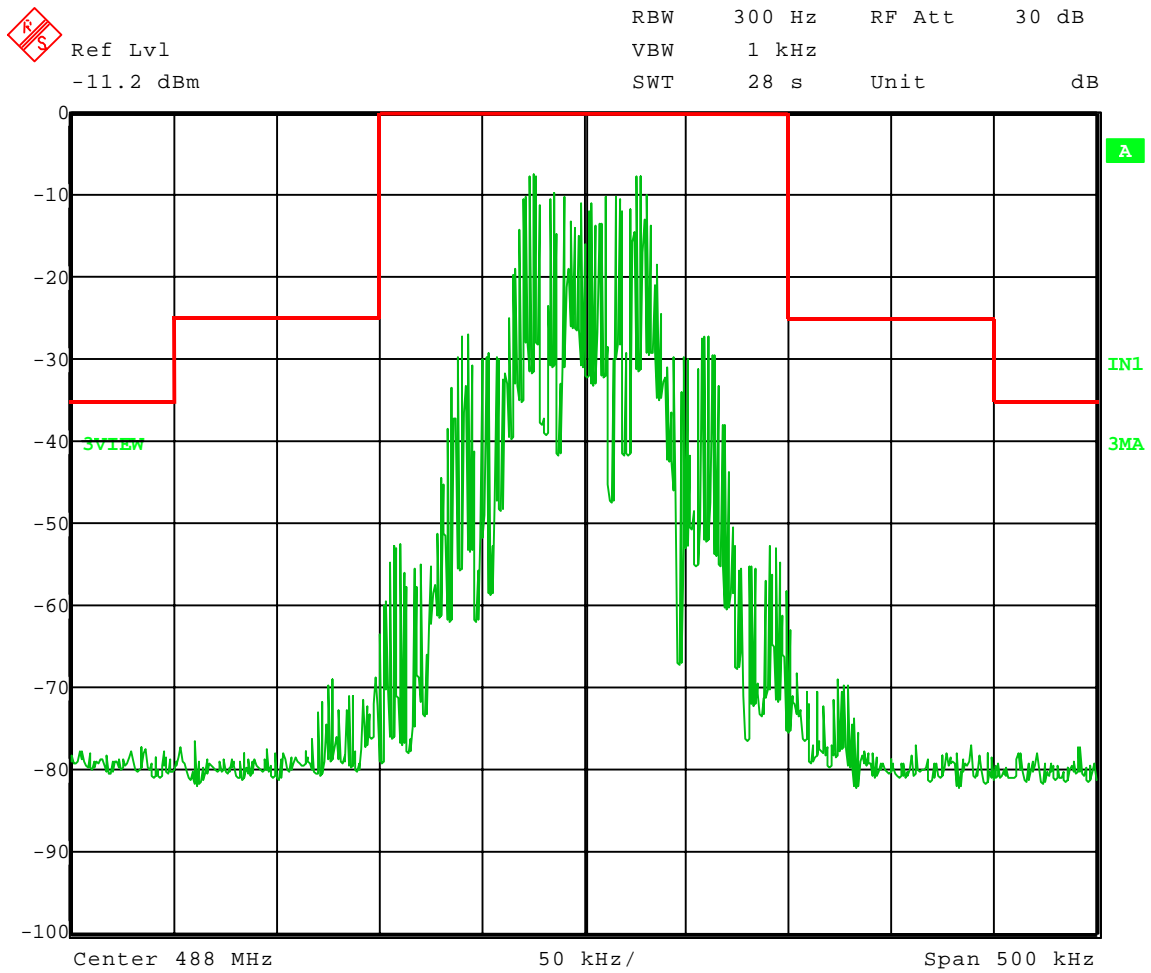


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-G3
Test: Emission Mask
Operator: Craig B

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



Date: 16.OCT.2007 12:10:17

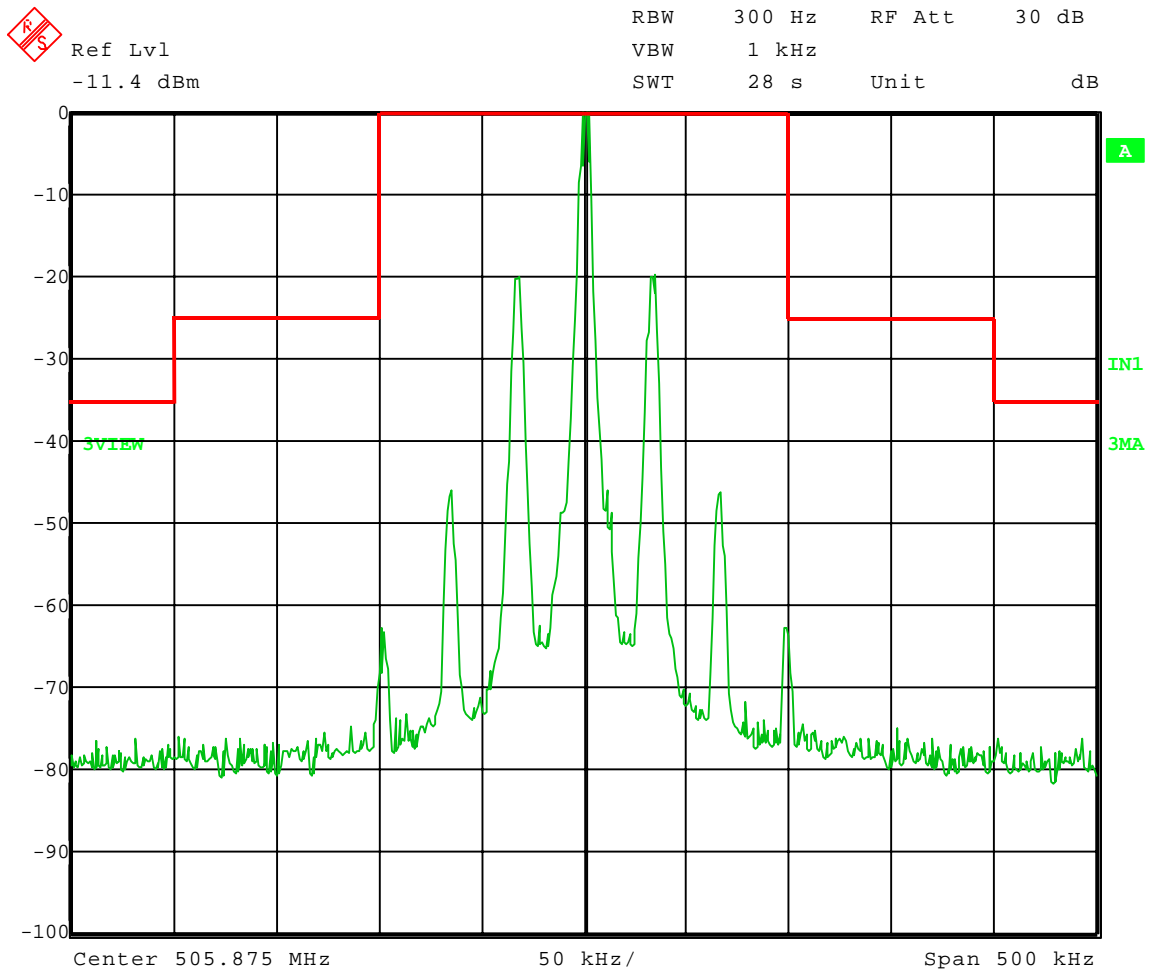


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-G3
Test: Emission Mask
Operator: Craig B

Nominal Frequency: 505.875 MHz
Unmodulated



Date: 16.OCT.2007 12:44:36

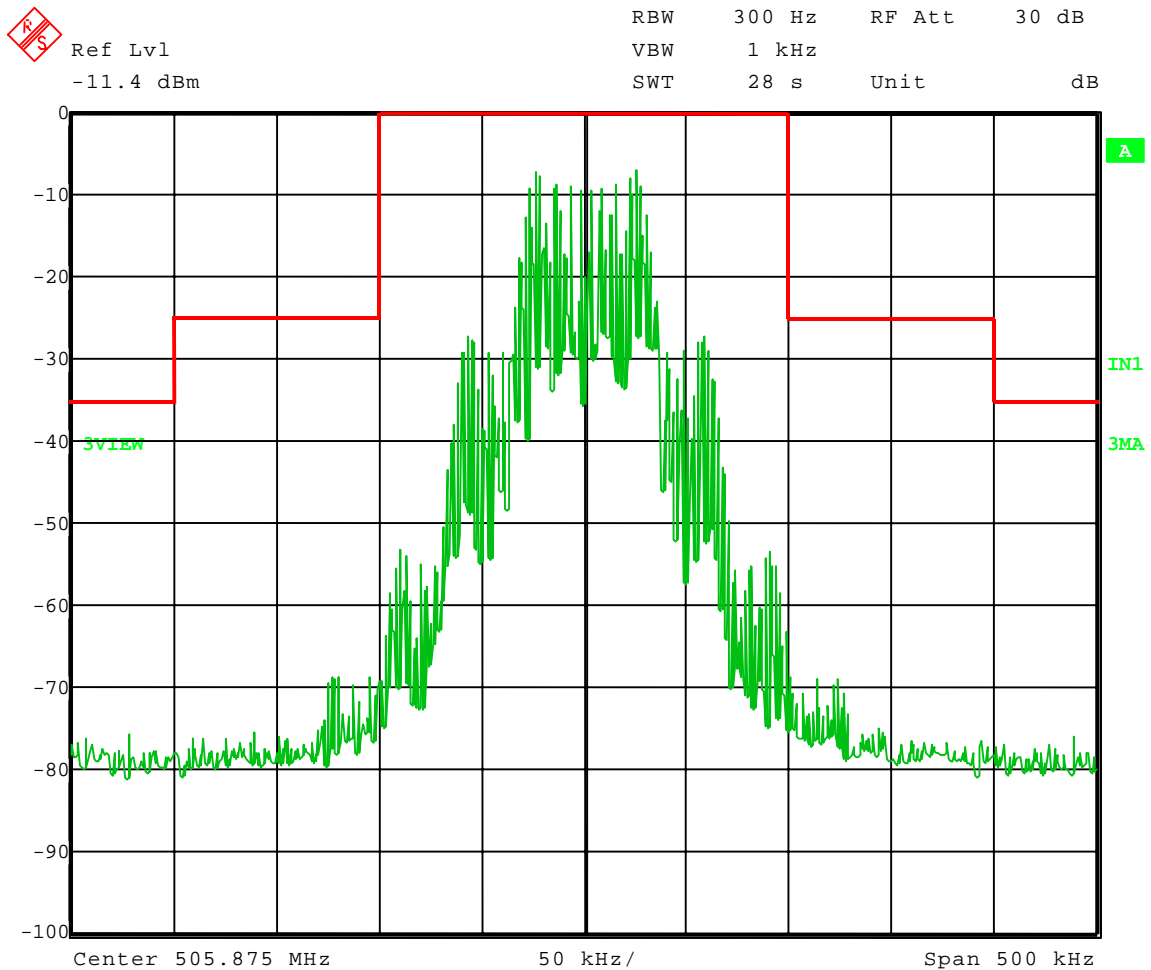


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-G3
Test: Emission Mask
Operator: Craig B

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



Date: 16.OCT.2007 12:46:23

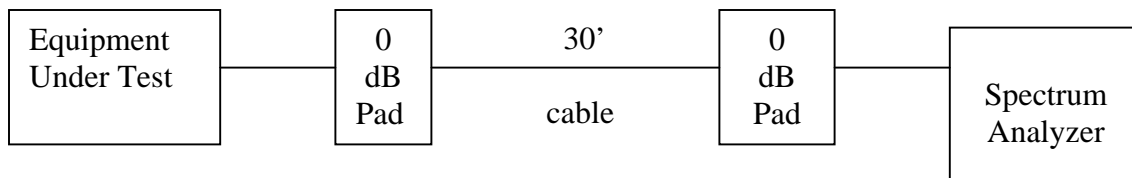


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

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 ULX1 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 ULX1 Wireless Microphone Transmitter uses a permanently attached Antenna preventing any connection to the Antenna Port, therefore this test was not run.



1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

DATA AND GRAPH(S) TAKEN OF THE

BAND EDGE COMPLIANCE

Part 74.861(e) & PART 2.1051

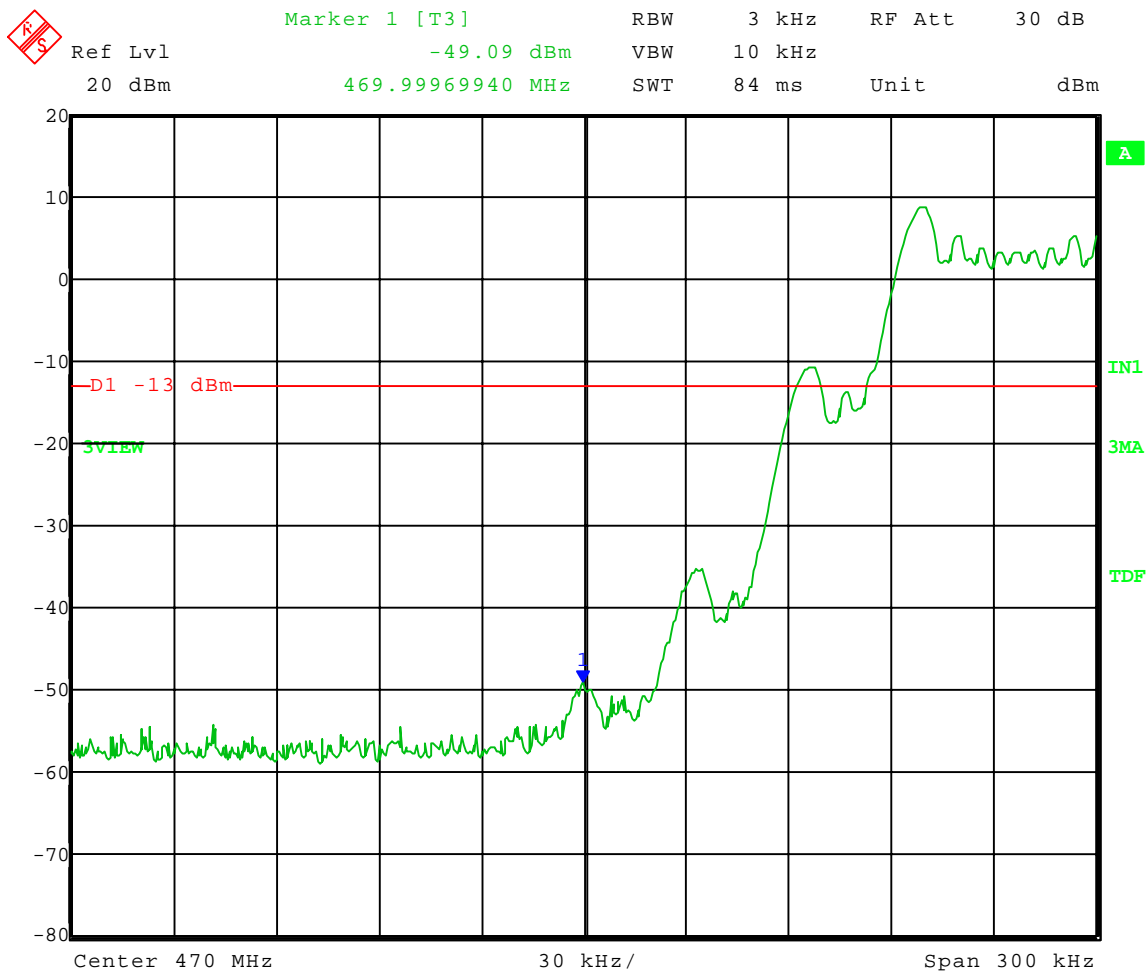


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

Test Date: 10-16-2007
Company: Shure, Inc.
EUT: ULX1-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: 16.OCT.2007 12:58:24



Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

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 ULX1 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 ULX1 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: ULX1-G3
 Report Number: 13582

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

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

$$20 * \text{Log}(404969.1) = 112.1484 \text{ dBuV}$$

Therefore, the Fundamental at three meters equals 112.1484 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:

112.1484 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: ULX1-G3
Report Number: 13582

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: ULX1-G3
 Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 10-15-2007
 Temperature: 72 deg. F
 Humidity: 50% R.H.

Rated Power = 30 mW = 14.77 dBm

Output Power - ERP - Substitution Method

| Model: ULX1-G3 | | | | | | | | |
|----------------------------------|--|---|---|------------------------------|----------------------------------|-------------|-------------|---------------------------------|
| Channel: Low; 470.125 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) |
| 470.125 vertical | 112.0 | 20.2 | 7.56 | 2.15 | 12.64 | 24 | 11.36 | 18.37 |
| 470.125 horizontal | 111.6 | 19.6 | 7.56 | 2.15 | 12.04 | 24 | 11.96 | 16.00 |

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to ½λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



Company: Shure Inc.
 Model Tested: ULX1-G3
 Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 10-15-2007
 Temperature: 72 deg. F
 Humidity: 50% R.H.

Rated Power = 30 mW = 14.77 dBm

Output Power - ERP - Substitution Method

| Model: ULX1-G3 | | | | | | | | |
|----------------------------------|--|---|---|------------------------------|----------------------------------|-------------|-------------|---------------------------------|
| Channel: Mid; 488.000 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) |
| 488.000 vertical | 109.8 | 17.8 | 7.64 | 2.15 | 10.16 | 24 | 13.84 | 10.38 |
| 488.000 horizontal | 109.0 | 18.3 | 7.64 | 2.15 | 10.66 | 24 | 13.34 | 11.64 |

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to ½λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



Company: Shure Inc.
 Model Tested: ULX1-G3
 Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 10-15-2007
 Temperature: 72 deg. F
 Humidity: 50% R.H.

Rated Power = 30 mW = 14.77 dBm

Output Power - ERP - Substitution Method

| Model: ULX1-G3 | | | | | | | | |
|-----------------------------------|--|---|---|------------------------------|----------------------------------|-------------|-------------|---------------------------------|
| Channel: High; 505.875 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) |
| 505.875 vertical | 111.6 | 19.8 | 7.97 | 2.15 | 11.83 | 24 | 12.17 | 15.24 |
| 505.875 horizontal | 110.1 | 18.9 | 7.97 | 2.15 | 10.93 | 24 | 13.07 | 12.39 |

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to ½λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



1250 Peterson Dr., Wheeling, IL 60090

Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

RADIATED EMISSION DATA

TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS

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

PART 2.1053



Company: Shure Inc.
 Model Tested: ULX1-G3
 Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 10-15-2007
 Temperature: 72 deg. F.
 Humidity: 50% R.H.

| Radiated Spurious Emissions (e.r.p. substitution method) FCC Part 74; FCC Part 2.1053 | | | | | | | | |
|---|-----------------------------------|--------------------------------|---------------------|--------------|--------------|------------------------------------|-------------------------------|----------------------------------|
| Model: ULX1-G3 Transmit Frequency: 470.125 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) |
| 0.94025 | 64.2 | 98.3 | -34.1 | -13 | 21.1 | Horizontal | 0 | 1.4 |
| 1.41040 | 62.9 | 100.0 | -37.1 | -13 | 24.1 | Horizontal | 350 | 1.1 |
| 1.88050 | 71.1 | 99.8 | -28.7 | -13 | 15.7 | Horizontal | 350 | 1.6 |
| 2.35060 | 69.4 | 101.0 | -31.6 | -13 | 18.6 | Horizontal | 290 | 1.1 |
| 2.82075 | 54.4 | 101.5 | -47.1 | -13 | 34.1 | Horizontal | 10 | 1.7 |
| 3.29090 | 56.5 | 100.9 | -44.4 | -13 | 31.4 | Horizontal | 20 | 1.0 |
| 3.76100 | 49.8 | 100.9 | -51.1 | -13 | 38.1 | Horizontal | 0 | 1.0 |
| 5.17140 | 50.8 | 100.2 | -49.4 | -13 | 36.4 | Horizontal | 0 | 1.0 |
| 5.64150 | 53.9 | 100.7 | -46.8 | -13 | 33.8 | Horizontal | 340 | 1.1 |
| 0.94025 | 63.1 | 99.1 | -36.0 | -13 | 23.0 | Vertical | 350 | 1.0 |
| 1.41040 | 62.7 | 101.0 | -38.3 | -13 | 25.3 | Vertical | 315 | 1.0 |
| 1.88050 | 71.1 | 98.9 | -27.8 | -13 | 14.8 | Vertical | 0 | 1.0 |
| 2.35060 | 68.5 | 100.5 | -32.0 | -13 | 19.0 | Vertical | 20 | 1.2 |
| 2.82075 | 53.9 | 100.9 | -47.0 | -13 | 34.0 | Vertical | 30 | 1.1 |
| 3.29090 | 51.8 | 99.1 | -47.3 | -13 | 34.3 | Vertical | 350 | 1.1 |



Company: Shure Inc.
 Model Tested: ULX1-G3
 Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 10-15-2007
 Temperature: 72 deg. F.
 Humidity: 50% R.H.

| Radiated Spurious Emissions (e.r.p. substitution method) FCC Part 74; FCC Part 2.1053 | | | | | | | | |
|---|-----------------------------------|--------------------------------|---------------------|--------------|--------------|------------------------------------|-------------------------------|----------------------------------|
| Model: ULX1-G3 Transmit Frequency: 488.000 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) |
| 0.97600 | 63.9 | 98.4 | -34.5 | -13 | 21.5 | Horizontal | 0 | 1.3 |
| 1.46400 | 65.0 | 100.3 | -35.3 | -13 | 22.3 | Horizontal | 0 | 1.1 |
| 1.95200 | 76.9 | 100.3 | -23.4 | -13 | 10.4 | Horizontal | 350 | 1.1 |
| 2.44000 | 65.5 | 101.5 | -36.0 | -13 | 23.0 | Horizontal | 180 | 1.0 |
| 2.92800 | 54.1 | 101.4 | -47.3 | -13 | 34.3 | Horizontal | 0 | 1.2 |
| 3.41600 | 59.6 | 100.7 | -41.1 | -13 | 28.1 | Horizontal | 40 | 1.0 |
| 4.39200 | 50.2 | 99.9 | -49.7 | -13 | 36.7 | Horizontal | 0 | 1.0 |
| 4.88000 | 57.3 | 99.4 | -42.1 | -13 | 29.1 | Horizontal | 60 | 1.1 |
| 5.85600 | 57.7 | 100.4 | -42.7 | -13 | 29.7 | Horizontal | 45 | 1.0 |
| 0.97600 | 63.6 | 97.9 | -34.3 | -13 | 21.3 | Vertical | 340 | 0.0 |
| 1.46400 | 63.9 | 101.5 | -37.6 | -13 | 24.6 | Vertical | 340 | 1.3 |
| 1.95200 | 76.4 | 99.1 | -22.7 | -13 | 9.7 | Vertical | 0 | 1.2 |
| 2.44000 | 65.6 | 99.8 | -34.2 | -13 | 21.2 | Vertical | 0 | 1.4 |
| 2.92800 | 52.4 | 100.6 | -48.2 | -13 | 35.2 | Vertical | 30 | 1.1 |
| 3.41600 | 55.3 | 100.4 | -45.1 | -13 | 32.1 | Vertical | 290 | 1.0 |
| 3.90400 | 54.8 | 100.6 | -45.8 | -13 | 32.8 | Vertical | 350 | 1.1 |
| 4.88000 | 57.9 | 100.1 | -42.2 | -13 | 29.2 | Vertical | 0 | 1.0 |



Company: Shure Inc.
 Model Tested: ULX1-G3
 Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 10-16-2007
 Temperature: 70 deg. F.
 Humidity: 57% R.H.

| Radiated Spurious Emissions (e.r.p. substitution method) FCC Part 74; FCC Part 2.1053 | | | | | | | | |
|---|-----------------------------------|--------------------------------|---------------------|--------------|--------------|------------------------------------|-------------------------------|----------------------------------|
| Model: ULX1-G3 Transmit Frequency: 505.875 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) |
| 1.01170 | 61.9 | 100.8 | -38.9 | -13 | 25.9 | Horizontal | 190 | 1.2 |
| 1.51760 | 63.9 | 101.0 | -37.1 | -13 | 24.1 | Horizontal | 0 | 1.1 |
| 2.02350 | 81.9 | 101.1 | -19.2 | -13 | 6.2 | Horizontal | 340 | 1.0 |
| 2.52940 | 68.1 | 101.7 | -33.6 | -13 | 20.6 | Horizontal | 10 | 1.2 |
| 3.03520 | 53.9 | 101.3 | -47.4 | -13 | 34.4 | Horizontal | 0 | 1.1 |
| 3.54120 | 58.0 | 101.1 | -43.1 | -13 | 30.1 | Horizontal | 40 | 1.1 |
| 4.04700 | 54.4 | 101.2 | -46.8 | -13 | 33.8 | Horizontal | 0 | 1.1 |
| 4.55290 | 51.0 | 99.2 | -48.2 | -13 | 35.2 | Horizontal | 270 | 1.1 |
| 5.56460 | 50.6 | 100.4 | -49.8 | -13 | 36.8 | Horizontal | 45 | 1.1 |
| 6.07050 | 54.6 | 99.2 | -44.6 | -13 | 31.6 | Horizontal | 10 | 1.1 |
| 6.57640 | 51.8 | 99.5 | -47.7 | -13 | 34.7 | Horizontal | 0 | 1.0 |
| 1.01170 | 60.8 | 101.1 | -40.3 | -13 | 27.3 | Vertical | 90 | 1.3 |
| 1.51760 | 64.5 | 101.1 | -36.6 | -13 | 23.6 | Vertical | 330 | 1.4 |
| 2.02350 | 81.5 | 99.8 | -18.3 | -13 | 5.3 | Vertical | 0 | 1.1 |
| 2.52940 | 67.7 | 100.2 | -32.5 | -13 | 19.5 | Vertical | 315 | 1.7 |
| 3.03520 | 52.8 | 100.1 | -47.3 | -13 | 34.3 | Vertical | 20 | 1.0 |
| 3.54120 | 56.0 | 100.6 | -44.6 | -13 | 31.6 | Vertical | 330 | 1.7 |
| 4.04700 | 57.3 | 101.3 | -44.0 | -13 | 31.0 | Vertical | 0 | 1.0 |
| 4.55290 | 53.2 | 100.0 | -46.8 | -13 | 33.8 | Vertical | 340 | 1.0 |
| 5.05870 | 53.4 | 99.8 | -46.4 | -13 | 33.4 | Vertical | 0 | 1.0 |
| 6.07050 | 54.9 | 99.4 | -44.5 | -13 | 31.5 | Vertical | 0 | 1.1 |
| 6.57640 | 51.6 | 100.2 | -48.6 | -13 | 35.6 | Vertical | 45 | 1.1 |



Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

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: ULX1-G3
Report Number: 13582

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: ULX1-G3
 Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Shure, Inc.
 Operator: Craig B
 Date of test: 10-17-2007

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) |
| ULX1-G3 | 470.125 | 470.124669 | -0.331 | 470.124729 | -0.271 | 470.125090 | 0.090 | 470.125691 | 0.691 | 470.126533 | 1.533 |
| ULX1-G3 | 488.000 | 487.999729 | -0.271 | 487.999669 | -0.331 | 488.000090 | 0.090 | 488.000451 | 0.451 | 488.001533 | 1.533 |
| ULX1-G3 | 505.875 | 505.874729 | -0.271 | 505.874669 | -0.331 | 505.875090 | 0.090 | 505.875391 | 0.391 | 505.876653 | 1.653 |

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) | 7.0 Volts | Error (kHz) |
| ULX1-G3 | 470.125 | 470.126413 | 1.413 | 470.125391 | 0.391 | 470.124008 | -0.992 | 470.120762 | -4.238 | 470.125511 | 0.511 |
| ULX1-G3 | 488.000 | 488.001413 | 1.413 | 488.000631 | 0.631 | 487.998707 | -1.293 | 487.995341 | -4.659 | 488.000451 | 0.451 |
| ULX1-G3 | 505.875 | 505.876473 | 1.473 | 505.875812 | 0.812 | 505.873467 | -1.533 | 505.870521 | -4.479 | 505.875391 | 0.391 |

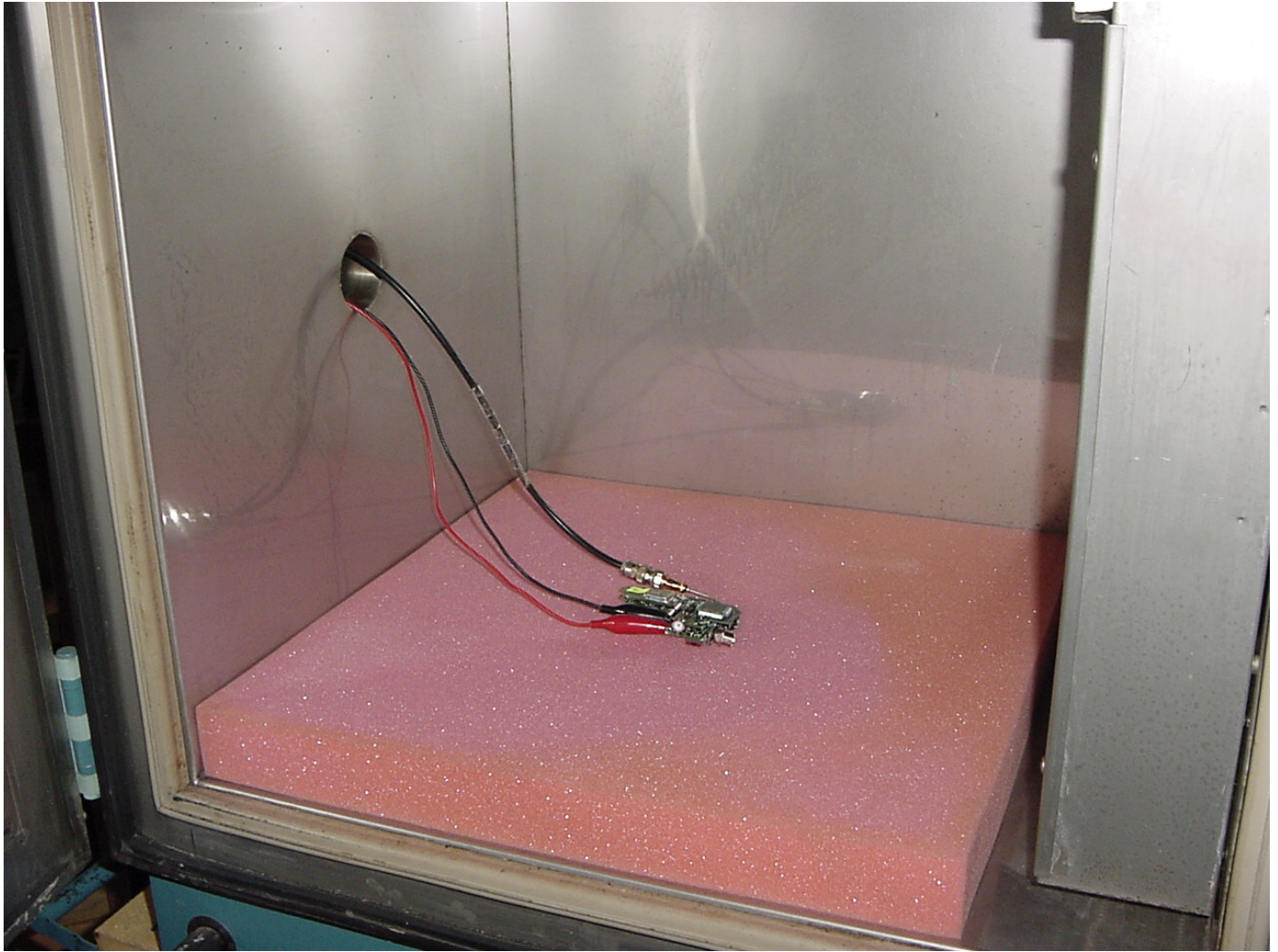


Company: Shure Inc.
Model Tested: ULX1-G3
Report Number: 13582

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

12.0 FREQUENCY STABILITY and Band edge PHOTOS TAKEN DURING TESTING



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