



Company: Roku  
Model Tested: M1001  
Report Number: 11433

1250 Peterson Dr., Wheeling, IL 60090

FCC Rules and Regulations / Intentional Radiators

Operational in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz, Bands

Part 15, Subpart C, Section 15.247

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

Formal Name: SoundBridge M1001

Kind of Equipment: Networked Music Player

Test Configuration: Connected to stereo via analog RCA cables, and a SPDIF Digital RCA cable.  
Also connected via Ethernet to a computer with iTunes software running.  
(Tested at 120 vac, 60 Hz)

Model Number(s): M1001

Model(s) Tested: M1001

Serial Number(s): 55D001008AH

Date of Tests: May 11 and June 1 & 8, 2005

Test Conducted For: Roku  
399 Sherman  
Palo Alto, California 94306

**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. This report must not be reproduced (except in full), without the approval of D.L.S. Electronic Systems.



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Model Tested: M1001  
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SIGNATURE PAGE

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Test Engineer  
EMC-001375-NE

Reviewed By:

William Stumpf  
OATS Manager

Approved By:

Brian Mattson  
General Manager

Company Official:

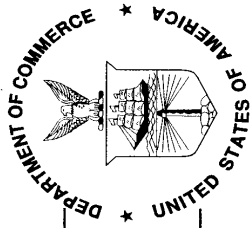
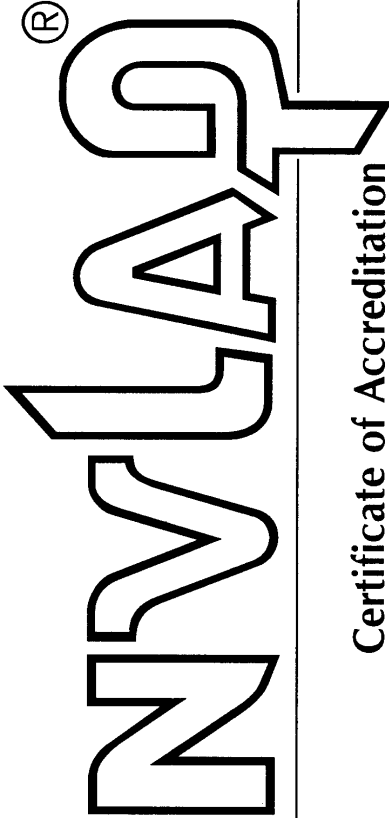
Roku



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United States Department of Commerce  
National Institute of Standards and Technology



**Certificate of Accreditation**

ISO/IEC 17025:1999  
ISO 9002:1994

**D.L.S. ELECTRONIC SYSTEMS, INC.**  
WHEELING, IL

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

**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

September 30, 2005

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NVLAP Lab Code: 100276-0

NVLAP-01C (06-01)



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**D.L.S. ELECTRONIC SYSTEMS, INC.**

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URL: <http://www.dlsemc.com>

**NVLAP Code Designation / Description**

**Emissions Test Methods:**

- |            |   |
|------------|---|
| 12/160D21  | RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 21 - Emission of Radio Frequency Energy  |
| 12/300220a | EN 300 220-1 V1.3.1 (2000-09): Electromagnetic compatibility and Radio spectrum Matters; Short Range Devices; Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods |
| 12/300386a | EN 300 386 V.1.2.1: Electromagnetic compatibility and radio spectrum matter (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements  |
| 12/C63.17  | ANSI C63.17-1998: American National Standard for Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices  |

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12/C6317a	ANSI C63.17-1998: American National Standard for Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices
12/CIS11	IEC/CISPR 11 + A1 (1997), EN 55011 (1998), AS/NZS CISPR 11 (2002), and CNS 13803 (1997): Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical Radio-Frequency Equipment
12/CIS13	IEC/CISPR 13 (2001-04), EN 55013 (2001), AS/NZS CISPR 13 (2003), and CNS 13439 (2001): Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and Methods of Measurement of Radio interference Characteristics of Household Electrical Appliances, Portable Tools and Similiar Electrical Apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993), A1 (1997), A2 (1999):
12/CIS14d	IEC/CISPR 14-1 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emissions
12/CIS14e	EN 55014-1 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission

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12/CIS14f	AS/NZS 1044 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS14g	CNS 13783-1 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS15	IEC/CISPR 15 (2000) + A1 (2001): Limits and methods of measurements of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS15a	AS/NZS CISPR 15 (2002): Limits and methods of measurements of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS15b	CNS 13439 (2000) + A1 (2001): Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS15c	EN 55015 (2000) + A1 (2001): Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS22	IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)

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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/EM02a	IEC 61000-3-2, Edition 2.1 (2001-10), EN 61000-3-2 (2000), and AS/NZS 2279.1 (2000): Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A)
12/EM03	IEC 61000-3-3(1995); EN 61000-3-3(1995); AS/NZS 2279.3(1995): EMC - Part 3: Limits - Section 3. Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to 16A
12/F18	FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)
12/FCC15b	ANSI C63.4 (2001) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators
12/FCC15c	ANSI C63.4 (2001) with FCC Method 47 CFR Part 15, Subpart C: Intentional Radiators
12/FCC15d	ANSI C63.4(2001) with FCC Method 47 CFR Part 15, Subpart D: Unlicensed Personal Communications Service Devices

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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/FCC15e	ANSI C63.4 (2001) with FCC Method 47 CFR Part 15, Subpart E: Unlicensed National Information Infrastructure Service Devices
12/T51	AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment
12/VCCIa	Agreement of Voluntary Control Council for Interference by Information Technology Equipment - Technical Requirements: V-3/02.04

**Immunity Test Methods:**

12/1089a	GR-1089-CORE, Issue 3, October 2002: Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment (sections 2, 3.3, and 3.5)
12/160D16	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 16 - Power Input
12/160D17	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 17 - Voltage Spike
12/160D18	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 18 - Audio Frequency Conducted Susceptibility - Power Inputs

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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/160D19	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 19 - Induced Signal Susceptibility
12/160D20	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 20 - Radio Frequency Susceptibility (Radiated and Conducted)
12/160D22	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 22 - Lightning Induced Transient Susceptibility
12/160D25	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 25 - Electrostatic Discharge (ESD)
12/I01	IEC 61000-4-2, Ed. 2.1 (2001), A1, A2; EN 61000-4-2: Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3, Ed. 2.0 (2002-03); EN 61000-4-3 (2002): Radiated Radio-Frequency Electromagnetic Field Immunity Test
12/I03	IEC 61000-4-4(1995), A1(2000), A2(2001); EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test
12/I04	IEC 61000-4-5, Ed. 1.1 (2001-04); EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test

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- 12/I05            IEC 61000-4-6, Ed. 2.0 (2003-05); EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
- 12/I06            IEC 61000-4-8, Ed. 1.1 (2001); EN 61000-4-8: Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
- 12/I07            IEC 61000-4-11, Ed. 1.1 (2001-03); EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
- 12/J111324       SAE J1113/24: Immunity to radiated electromagnetic fields; 10 kHz to 200 MHz - Crawford TEM cell and 10 kHz to 5 GHz - Wideband TEM cell
- 12/J111341       SAE J1113/41 (1995-07): Limits and methods of measurement of radio disturbance characteristics of components and modules for the protection of receivers used on board vehicles

**Radio Test Methods**

- 12/RSS119       RSS-119, Issue 6 (March 25, 2000): Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz
- 12/RSS123       RSS-123, Issue 1, Rev. 2 (November 6, 1999): Low Power Licensed Radiocommunication Devices

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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/RSS125	RSS-125 (March 25, 2000): Land Mobile and Fixed Radio Transmitters and Receivers, 1.705 to 50.0 MHz, Primarily Amplitude Modulated
12/RSS131	RSS-131, Issue 2 (July 2003): Zone Enhancers for the Land Mobile Service
12/RSS132	RSS-132, Issue 1 (August 2002): 800 MHz Cellular Telephones Employing New Technologies
12/RSS133	RSS-133, Issue 2, Rev. 1 (November 6, 1999): 2GHz Personal Communications Services
12/RSS134	RSS-134, Issue 1, Rev. 1 (March 25, 2000): 900 MHz Narrowband Personal Communication Service
12/RSS135	RSS-135, Issue 1 (October 26, 1996): Digital Scanner Receivers
12/RSS136	RSS-136, Issue 5 (October 2002): Land and Mobile Station Radiotelephone Transmitters and Receivers Operating in the 26.960 - 27.410 MHz General Radio Service Band
12/RSS137	RSS-137, Issue 1, Rev. 1 (September 25, 1999): Location and Monitoring Service (902 - 928 MHz)
12/RSS139	RSS-139, Issue 1 (February 5, 2000): Licensed Radiocommunications Devices in the Band 2400 - 2483.5 MHz

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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/RSS141	RSS-141, Issue 1 (July 2003): Aeronautical Radiocommunication Equipment in the Frequency Band 117.975 - 137 MHz
12/RSS142	RSS-142, Issue 2 (August 2002): Narrowband Multipoint Communication Systems in the 1,427 - 1,430 MHz and 1,493.5 - 1,496.5 MHz Bands
12/RSS170	RSS-170, Issue 1, Rev. 1 (November 6, 1999): Satellite Mobile Earth Stations
12/RSS191	RSS-191, Issue 2 (August 2002): Local Multipoint Communication Systems in the 28 GHz Band; Point-to-Point and Point-to-Multipoint Broadband Communication Systems in the 24 GHz and 38 GHz Bands
12/RSS192	RSS-192, Issue 1 (November 6, 1999): Fixed Wireless Access Systems in the Band 3400 - 3700 MHz
12/RSS193	RSS-193, Issue 1 (July 2003): Multipoint and Point-to-Point Communication Systems (MCS) in the Fixed Service Operating in the 2,150 - 2,160 MHz, 2,500 - 2,596 MHz and 2,686 - 2,690 MHz Bands
12/RSS210	RSS-210, Issue 5 (November 2001): Low Power Licence-Exempt Radiocommunication Devices
12/RSS212	RSS-212, Issue 1 (February 27, 1999): Test Facilities and Test Methods for Radio Equipment

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*NVLAP Code Designation / Description*

12/RSS213 RSS-213, Issue 1 (April 24, 1999): 2 GHz Licence-Exempt Personal Communications Service Devices (PCS)

12/RSS215 RSS-215, Issue 1 (November 6, 1999): Analogue Scanner Receivers

**Telecommunications Test Methods:**

12/FCC2a2 TIA/EIA 603A (2001) with 47 CFR Part 2: Public Mobile Services in 47 CFR Part 22

12/FCC2b2 TIA/EIA 603A (2001) with 47 CFR Part 2: Private Land Mobile Radio Services in 47 CFR Part 90

12/FCC2d1 TIA/EIA 603A (2001) with 47 CFR Part 2: Experimental Radio, Auxiliary, Special Broadcast and Other Program Distributional Services in 47 CFR Part 74

12/FCC2e1 TIA/EIA 603A (2001) with 47 CFR Part 2: International Fixed Public Radiocommunication Services in 47 CFR Part 23

12/CIS15c EN 55015 (2000) + A1 (2001): Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

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**MIL-STD-462 : Conducted Emissions:**

- 12/A13 MIL-STD-462 Version D Method CE101
- 12/A14 MIL-STD-462 Version D Method CE102
- 12/A16 MIL-STD-461 Version E Method CE101
- 12/A17 MIL-STD-461 Version E Method CE102
- 12/A18 MIL-STD-461 Version E Method CE106

**MIL-STD-462 : Conducted Susceptibility:**

- 12/B12 MIL-STD-462 Version D Method CS101
- 12/B13 MIL-STD-462 Version D Method CS103
- 12/B25 MIL-STD-461 Version E Method CS114
- 12/B26 MIL-STD-461 Version E Method CS115
- 12/B27 MIL-STD-461 Version E Method CS116

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*NVLAP Code Designation / Description*

**MIL-STD-462 : Radiated Emissions:**

12/D04	MIL-STD-462 Version D Method RE101
12/D05	MIL-STD-462 Version D Method RE102
12/D06	MIL-STD-462 Version D Method RE103

**MIL-STD-462 : Radiated Susceptibility:**

12/E08	MIL-STD-462 Version D Method RS101
12/E09	MIL-STD-462 Version D Method RS103

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## 1.0 SUMMARY OF TEST REPORT

It was found that the SoundBridge M1001, Model Number(s) M1001, "**meets**" the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.247 for operational in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz, Bands.

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

Text: 167

## 2.0 INTRODUCTION

On May 11 and June 1 & 8, 2005, a series of radio frequency interference measurements was performed on SoundBridge M1001, Model Number(s) M1001, Serial Number: 55D001008AH. The tests were performed according to the procedures of the FCC as stated in the "Methods of Measurement of Radio-Noise Emissions for Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" found in the American National Standards Institute, ANSI C63.4-2003. Tests were performed by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

## 3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Sections 15.205, 15.209 & 15.247 for Intentional Radiators operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.



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#### 4.0 TEST SET-UP

All emission tests were performed at D.L.S. Electronic Systems, Inc. and set up according to the American National Standards Institute, ANSI C63.4-2003, Section 8, (Figures 11a and 11b).

All radiated emissions tests were performed with the test item placed on a 80 cm high rotating non-conductive table, located in the test room. Equipment normally operated on the floor was placed on a metal covered turntable which is flush with the surrounding conducting ground plane. The ground plane has an electrical isolation layer over its surface approximately 7 mm thick. The EUT is separated from the turntable ground plane by a non-conductive layer. The equipment under test was set up according to ANSI C63.4-2003, Sections 6 and 8.



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## 5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data below 1000 MHz was automatically plotted using the HP Spectrum Analyzer or ESI 26/40 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 26/40 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 26/40 Fixed Tuned Receiver as required. Above 1000 MHz, final data was taken using the Average Detector on the Spectrum Analyzer.

The bandwidths shown below are specified by ANSI C63.4-2003, Section 4.2.

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

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



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## 6.0 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 emissions that have the highest amplitude relative to the limit. These methods are performed to the specifications in MP-5 or ANSI C63.4-2003, as appropriate.



Company: Roku  
Model Tested: M1001  
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7.0 DESCRIPTION OF TEST SAMPLE: (See also Paragraph 8.0)

7.1 Description:

SoundBridge will play digitized music from a PC running music software, typically iTunes. SoundBridge is connected to the PC via wired or wireless Ethernet. SoundBridge is connected to a stereo via either Analog, digital coax, or optical coax.

7.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

Length: 10" x Width: 3" x Height: 3"

7.3 LINE FILTER USED:

NA

7.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

67kHz

Clock Frequencies:

20, 24.576, 25, 133.33, 400 MHz

7.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

- |                                  |                       |
|----------------------------------|-----------------------|
| 1. SoundBridge M1001 main board  | PN: M1001 MAIN REV 9  |
| 2. SoundBridge M1001 Spdif board | PN: M1001 SPDIV REV 9 |



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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8.0 ADDITIONAL DESCRIPTION OF TEST SAMPLE:  
(See also Paragraph 7.0)

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

I certify that the above, as described in paragraph 7.0, describes the equipment tested and will be manufactured as stated.

By: \_\_\_\_\_  
Signature Title

For: \_\_\_\_\_  
Company Date



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## 9.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 SoundBridge M1001

Model Number: M1001 Serial Number: 55D001008AH

Item 1 Power Supply

Model Number: SCP0501500P

Item 2 Shielded Digital Coaxial Cable with Metal Shells. 3'

Item 3 Shielded Line Level Audio Cable with Metal Shells. 6'

Item 4 Sony Speaker

Model Number: SS-MSP66SR, Serial Number 8926099

Non-shielded Sony Speaker Cable with Metal Shells. 15'

Item 5 Sony Speaker

Model Number: SS-MSP66SR, Serial Number 8126099

Non-shielded Sony Speaker Cable with Metal Shells. 15'

Item 6 Sony Digital Audio Center

Model Number: STR-K660P, Serial Number 8902053

Item 7 Non-shielded Category 5 Ethernet Cable with Plastic Shells. 50'

Runs to External Computer.





Company: Roku  
Model Tested: M1001  
Report Number: 11433

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### 10.0 RADIATED PHOTOS TAKEN DURING TESTING



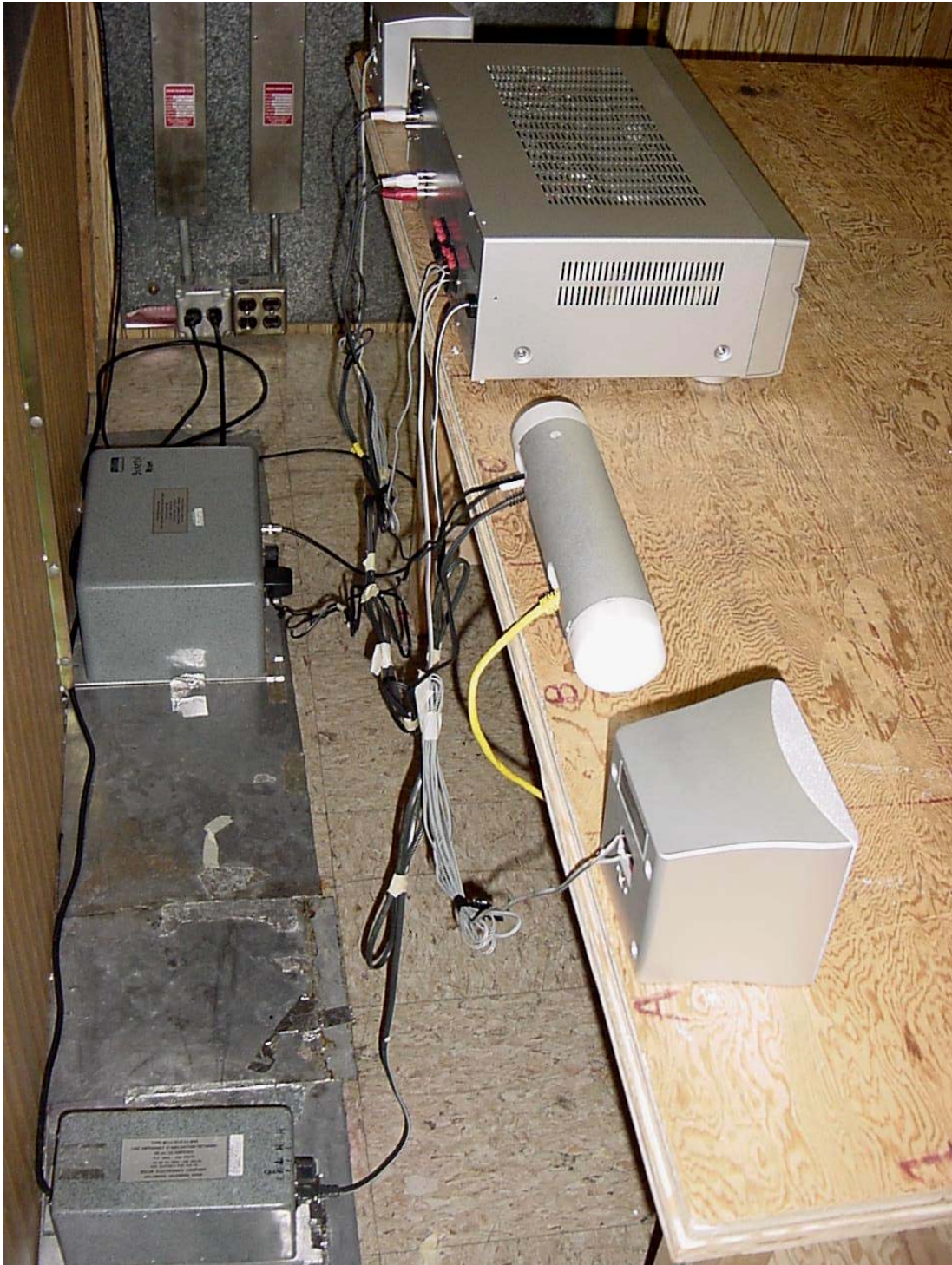
1250 Peterson Dr., Wheeling, IL 60090

10.0 RADIATED PHOTOS TAKEN DURING TESTING: (CON'T)



1250 Peterson Dr., Wheeling, IL 60090

10.0 CONDUCTED PHOTOS TAKEN DURING TESTING





Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## 11.0 RESULTS OF TESTS

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

## 12.0 CONCLUSION

It was found that the SoundBridge M1001, Model Number(s) M1001 "**meets**" the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.247 for operational in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz, Bands.



Company: Roku  
 Model Tested: M1001  
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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	11/05
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	12/05
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	12/05
Antenna	EMCO	3104C	00054891	20 MHz – 200 MHz	2/06
Antenna	Electrometrics	LPA-25	1114	200 MHz – 1 GHz	3/06
Antenna	EMCO	3104C	00054892	20 MHz – 200 MHz	3/06
Antenna	Electrometrics	3146	1205	200 MHz – 1 GHz	3/06
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	2/06
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	3/06
Antenna	EMCO	3115	2479	1 GHz – 18 GHz	8/05
Antenna	EMCO	3115	99035731	1 GHz – 18 GHz	4/06
Antenna	Rohde & Schwarz	HUF-Z1	829381001	20 MHz – 1 GHz	2/06
Antenna	Rohde & Schwarz	HUF-Z1	829381005	20 MHz – 1 GHz	8/05

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



Company: Roku  
 Model Tested: M1001  
 Report Number: 11433

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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Antenna	Electrometrics	3146	1205	200 MHz – 1 GHz	3/06
LISN	Solar	8012-50-R-24-BNC	8305116	10 MHz – 30 MHz	8/05
LISN	Solar	8012-50-R-24-BNC	814548	10 MHz – 30 MHz	8/05
LISN	Solar	9252-50-R-24-BNC	961019	10 MHz – 30 MHz	12/05
LISN	Solar	9252-50-R-24-BNC	971612	10 MHz – 30 MHz	10/05
LISN	Solar	9252-50-R-24-BNC	92710620	10 MHz – 30 MHz	7/05

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



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## APPENDIX A

# TEST PROCEDURE

Part 15, Subpart C, Section 15.247 (a-h)

**OPERATION WITHIN THE BAND 902-928 MHz, 2400-2483.5 MHz  
AND 5725-5857 MHz**



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## APPENDIX A

### 1.0 CONDUCTED EMISSION MEASUREMENTS

If applicable, the conducted emissions were measured over the frequency range from 150 kHz to 30 MHz in accordance with the power line measurements as specified in the American National Standards Institute, ANSI C63.4-2003, Section 12. Since the device is operated from the public utility lines, the 115 Vac 60 Hz power leads, high and low sides, were to be measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. All signals were then recorded. The allowed levels for Intentional Radiators cannot exceed 250 uV (47.96 dBuV) at any frequency between 150 kHz and 30 MHz, as stated in Section 15.207a.

All conducted emissions measurements were made at a test room temperature of 72°F at 46% relative humidity.





Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## APPENDIX A

# DATA AND GRAPH(S) TAKEN DURING TESTING

## PART 15.207

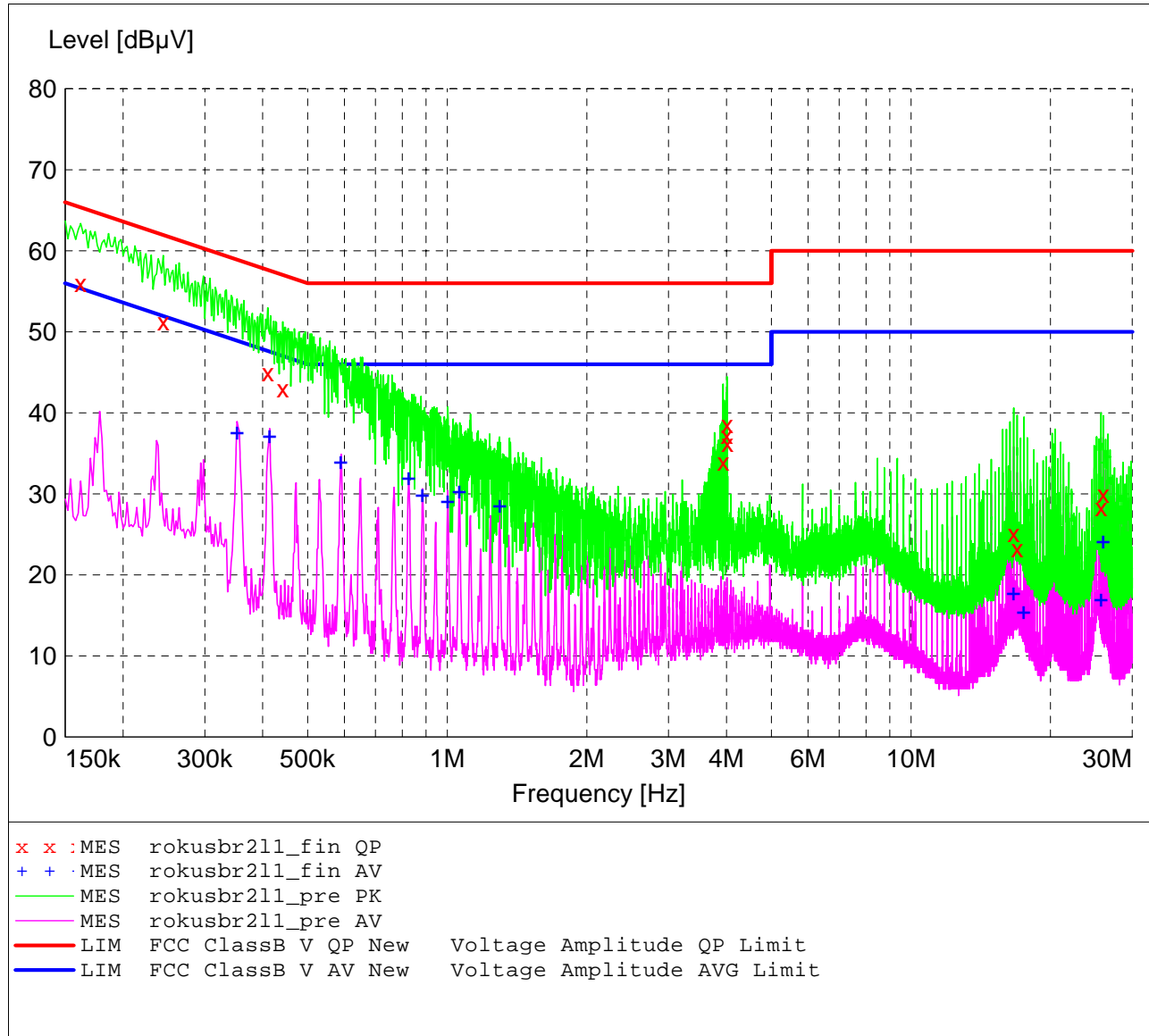
**FCC Part 15 Class B**

**Voltage Mains Test**

EUT: Sound Bridge M1000 w\ SCP0501500P CM Pwr Supply  
 Manufacturer: Roku  
 Operating Condition: 72 deg. F, 46% R.H.  
 Test Site: DLS O.F. Site 1(Screenroom)  
 Operator: Jason L  
 Test Specification: 120 VAC; 60 Hz  
 Comment: Line 1  
 Date: 06-1-2005

**SCAN TABLE: "FCC ClassB Voltage"**

Short Description:			FCC Class B Voltage			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	2.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#128
Average						



**MEASUREMENT RESULT: "rokusbr211\_fin QP"**

6/1/2005 10:27AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.162000	56.00	11.3	65	9.4	---	---
0.244000	51.20	10.7	62	10.7	---	---
0.410000	45.00	10.3	58	12.6	---	---
0.442000	43.00	10.3	57	14.0	---	---
3.936000	33.90	10.4	56	22.1	---	---
4.010000	37.20	10.4	56	18.8	---	---
4.014000	38.60	10.4	56	17.4	---	---
4.020000	36.20	10.4	56	19.8	---	---
16.648000	25.10	10.9	60	34.9	---	---
16.940000	23.30	10.9	60	36.7	---	---
25.708000	28.30	11.1	60	31.7	---	---
26.002000	30.00	11.1	60	30.0	---	---

**MEASUREMENT RESULT: "rokusbr211\_fin AV"**

6/1/2005 10:27AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.352000	37.70	10.4	49	11.2	---	---
0.414000	37.20	10.3	48	10.4	---	---
0.590000	34.00	10.3	46	12.0	---	---
0.826000	32.10	10.3	46	13.9	---	---
0.884000	30.00	10.3	46	16.0	---	---
1.002000	29.20	10.2	46	16.8	---	---
1.062000	30.40	10.3	46	15.6	---	---
1.298000	28.60	10.3	46	17.4	---	---
16.648000	17.90	10.9	50	32.1	---	---
17.524000	15.50	10.9	50	34.5	---	---
25.706000	17.10	11.1	50	32.9	---	---
26.000000	24.20	11.1	50	25.8	---	---

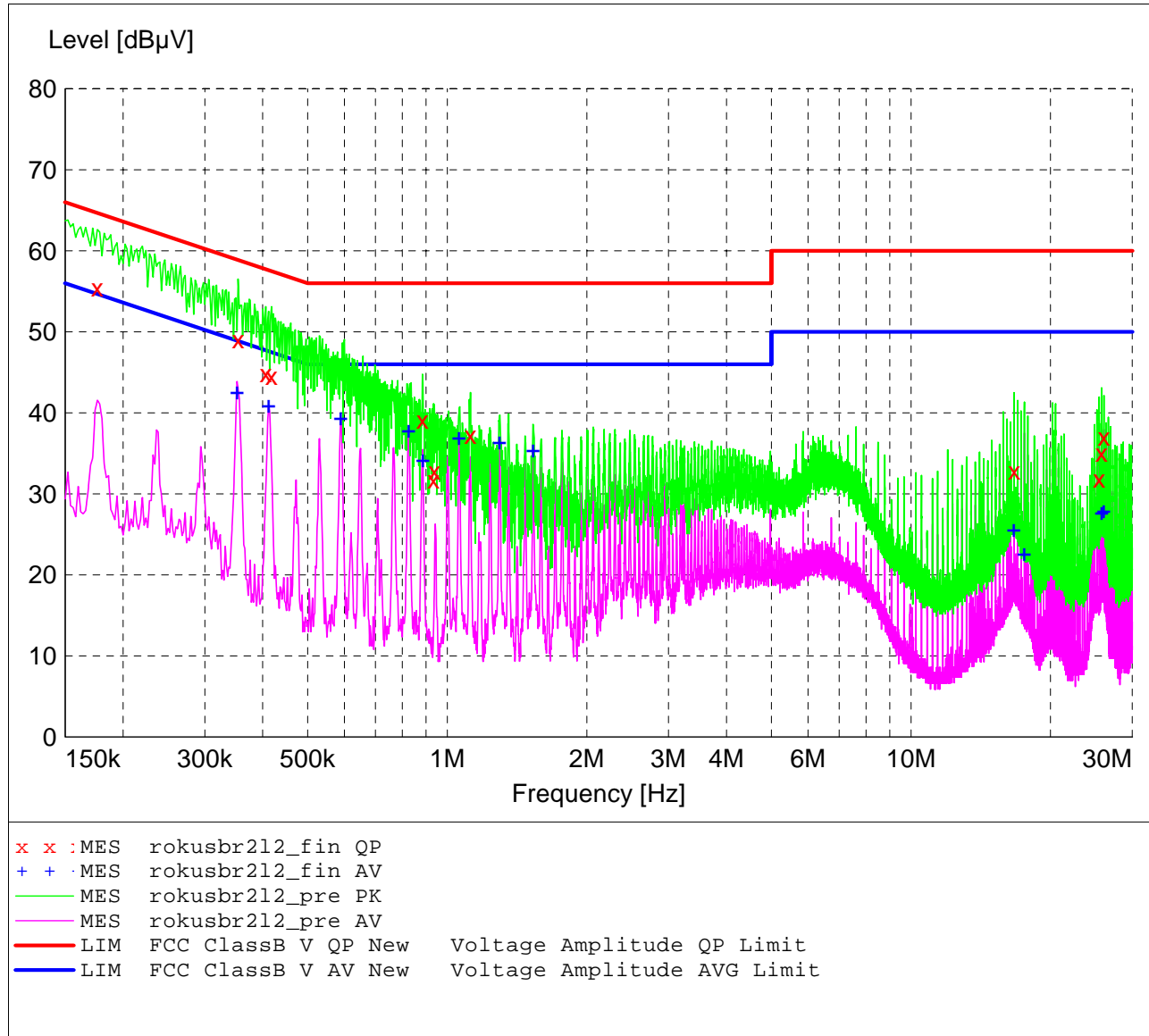
**FCC Part 15 Class B**

**Voltage Mains Test**

EUT: Sound Bridge M1000 w\ SCP0501500P CM Pwr Supply  
 Manufacturer: Roku  
 Operating Condition: 72 deg. F, 46% R.H.  
 Test Site: DLS O.F. Site 1(Screenroom)  
 Operator: Jason L  
 Test Specification: 120 VAC; 60 Hz  
 Comment: Line 2  
 Date: 06-1-2005

**SCAN TABLE: "FCC ClassB Voltage"**

Short Description:			FCC Class B Voltage			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	2.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#128
Average						



**MEASUREMENT RESULT: "rokusbr212\_fin QP"**

6/1/2005 10:35AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.176000	55.40	11.1	65	9.2	---	---
0.354000	49.00	10.4	59	9.9	---	---
0.406000	44.90	10.3	58	12.8	---	---
0.418000	44.50	10.3	58	13.0	---	---
0.884000	39.10	10.3	56	16.9	---	---
0.934000	31.70	10.3	56	24.3	---	---
0.938000	32.90	10.3	56	23.1	---	---
1.122000	37.30	10.3	56	18.7	---	---
16.688000	32.90	10.9	60	27.1	---	---
25.474000	31.80	11.1	60	28.2	---	---
25.768000	35.10	11.1	60	24.9	---	---
26.064000	37.00	11.1	60	23.0	---	---

**MEASUREMENT RESULT: "rokusbr212\_fin AV"**

6/1/2005 10:35AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.352000	42.70	10.4	49	6.2	---	---
0.412000	41.00	10.3	48	6.6	---	---
0.590000	39.40	10.3	46	6.6	---	---
0.826000	37.90	10.3	46	8.1	---	---
0.886000	34.30	10.3	46	11.7	---	---
1.060000	37.00	10.3	46	9.0	---	---
1.296000	36.50	10.3	46	9.5	---	---
1.532000	35.50	10.3	46	10.5	---	---
16.688000	25.70	10.9	50	24.3	---	---
17.566000	22.70	10.9	50	27.3	---	---
25.768000	27.80	11.1	50	22.2	---	---
26.062000	28.00	11.1	50	22.0	---	---

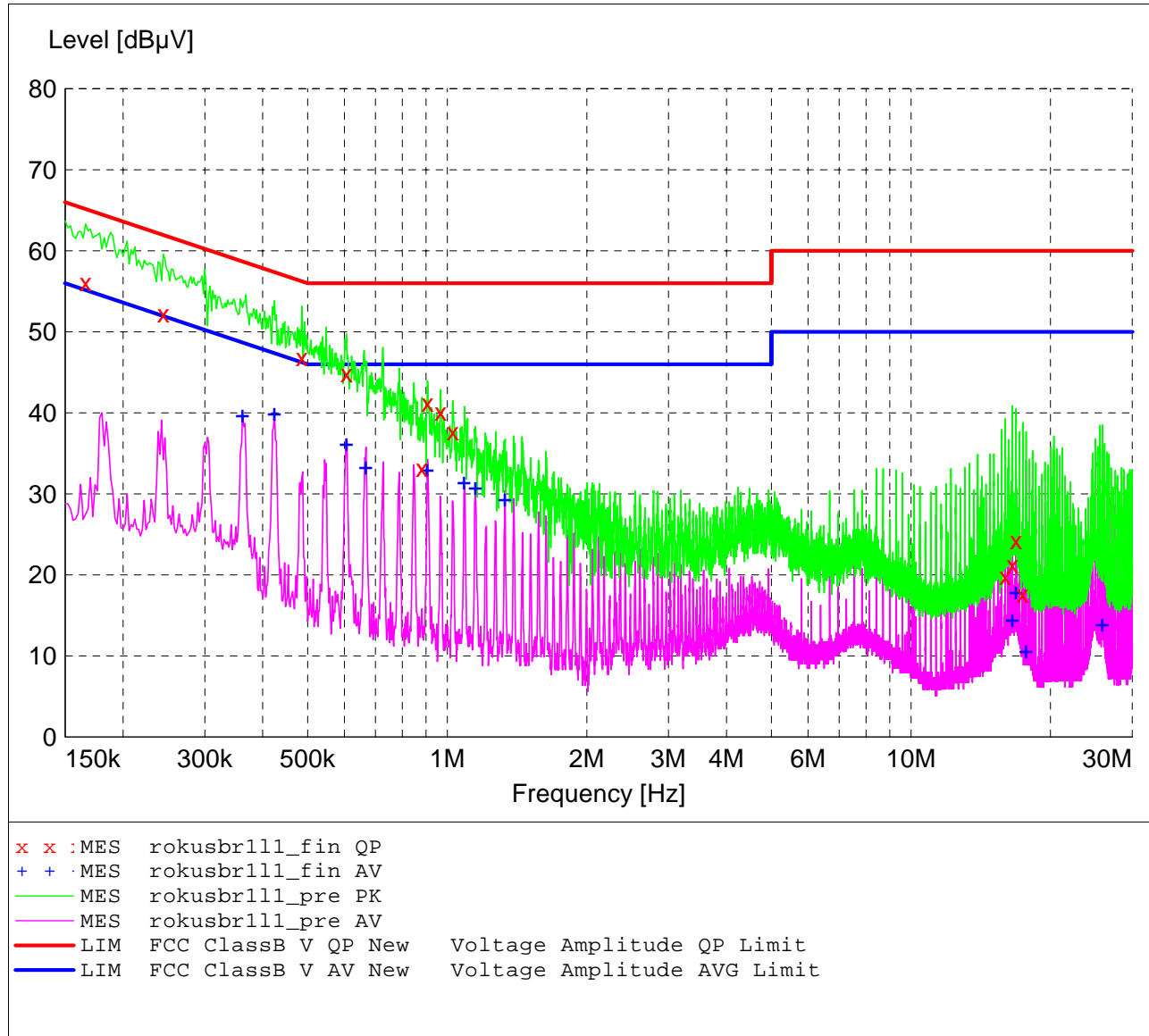
**FCC Part 15 Class B**

**Voltage Mains Test**

EUT: Sound Bridge M1000 w\ SCP0501500PU Pwr Supply  
 Manufacturer: Roku  
 Operating Condition: 72 deg. F, 46% R.H.  
 Test Site: DLS O.F. Site 1(Screenroom)  
 Operator: Jason L  
 Test Specification: 120 VAC; 60 Hz  
 Comment: Line 1  
 Date: 06-1-2005

**SCAN TABLE: "FCC ClassB Voltage"**

Short Description:			FCC Class B Voltage			
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
150.0 kHz	30.0 MHz	2.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#128
			Average			



**MEASUREMENT RESULT: "rokusbr111\_fin QP"**

6/1/2005 10:09AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.166000	56.10	11.2	65	9.1	---	---
0.244000	52.20	10.7	62	9.7	---	---
0.486000	46.80	10.2	56	9.4	---	---
0.606000	44.90	10.3	56	11.1	---	---
0.882000	33.20	10.3	56	22.8	---	---
0.906000	41.20	10.3	56	14.8	---	---
0.968000	40.10	10.2	56	15.9	---	---
1.028000	37.70	10.2	56	18.3	---	---
15.972000	19.80	10.8	60	40.2	---	---
16.552000	21.30	10.9	60	38.7	---	---
16.842000	24.20	10.9	60	35.8	---	---
17.424000	17.60	10.9	60	42.4	---	---

**MEASUREMENT RESULT: "rokusbr111\_fin AV"**

6/1/2005 10:09AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.362000	39.80	10.4	49	8.9	---	---
0.424000	40.00	10.3	47	7.4	---	---
0.606000	36.20	10.3	46	9.8	---	---
0.668000	33.40	10.3	46	12.6	---	---
0.906000	33.10	10.3	46	12.9	---	---
1.088000	31.50	10.3	46	14.5	---	---
1.150000	30.90	10.3	46	15.1	---	---
1.332000	29.40	10.3	46	16.6	---	---
16.552000	14.50	10.9	50	35.5	---	---
16.842000	18.00	10.9	50	32.0	---	---
17.714000	10.70	10.9	50	39.3	---	---
25.856000	14.00	11.1	50	36.0	---	---

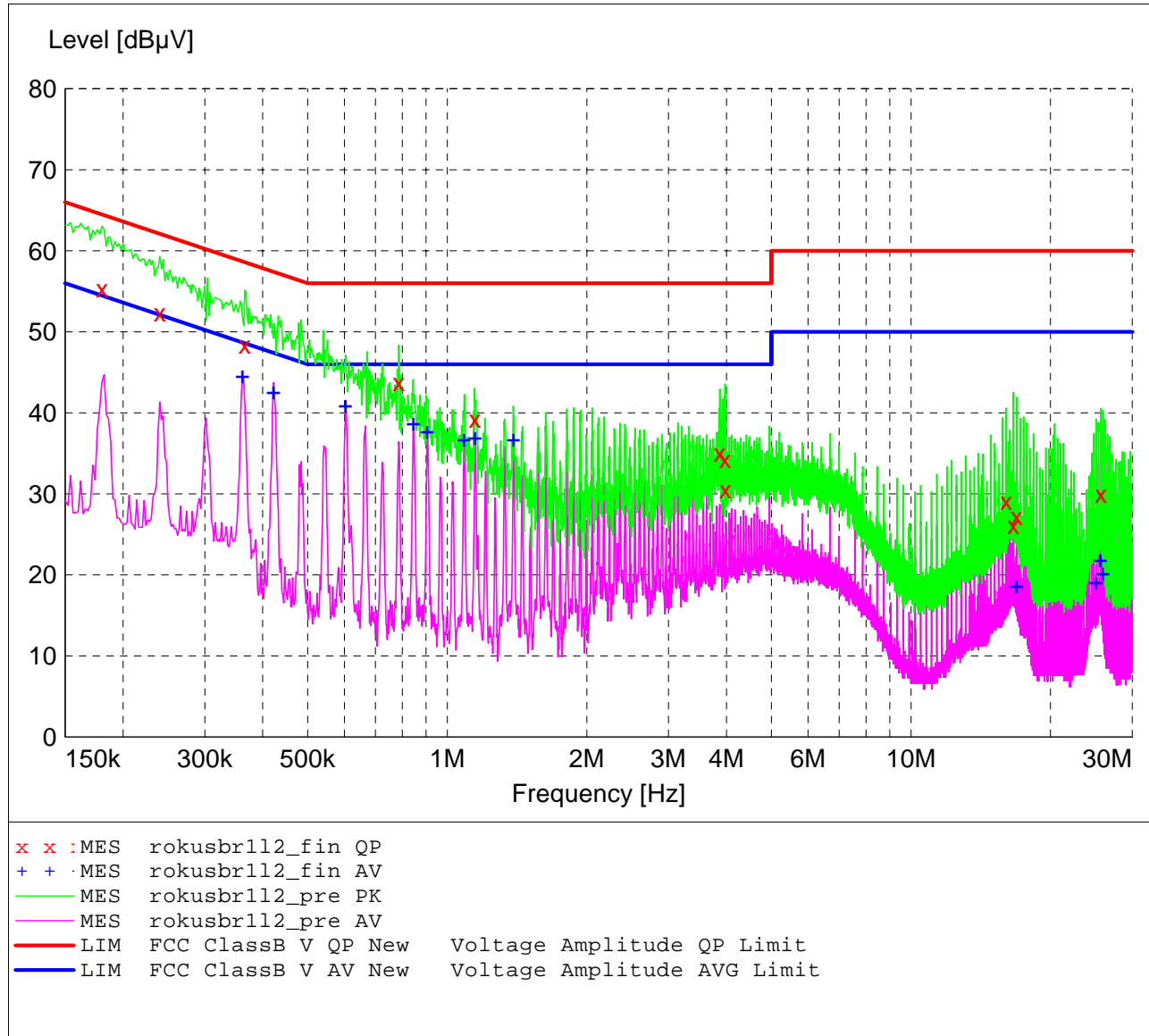
**FCC Part 15 Class B**

**Voltage Mains Test**

EUT: Sound Bridge M1000 w\ SCP0501500PU Pwr Supply  
 Manufacturer: Roku  
 Operating Condition: 72 deg. F, 46% R.H.  
 Test Site: DLS O.F. Site 1(Screenroom)  
 Operator: Jason L  
 Test Specification: 120 VAC; 60 Hz  
 Comment: Line 2  
 Date: 06-1-2005

**SCAN TABLE: "FCC ClassB Voltage"**

Short Description:			FCC Class B Voltage			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	2.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#128
			Average			





**MEASUREMENT RESULT: "rokusbr112\_fin QP"**

6/1/2005 10:17AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.180000	55.30	11.1	65	9.2	---	---
0.240000	52.30	10.7	62	9.8	---	---
0.366000	48.40	10.4	59	10.2	---	---
0.786000	43.80	10.3	56	12.2	---	---
1.146000	39.20	10.3	56	16.8	---	---
3.870000	35.00	10.4	56	21.0	---	---
3.972000	34.30	10.4	56	21.7	---	---
3.980000	30.50	10.4	56	25.5	---	---
16.036000	29.10	10.8	60	30.9	---	---
16.616000	26.10	10.9	60	33.9	---	---
16.910000	27.20	10.9	60	32.8	---	---
25.660000	30.00	11.1	60	30.0	---	---

**MEASUREMENT RESULT: "rokusbr112\_fin AV"**

6/1/2005 10:17AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.362000	44.60	10.4	49	4.1	---	---
0.422000	42.60	10.3	47	4.8	---	---
0.604000	41.00	10.3	46	5.0	---	---
0.846000	38.80	10.3	46	7.2	---	---
0.906000	37.80	10.3	46	8.2	---	---
1.088000	36.80	10.3	46	9.2	---	---
1.148000	37.00	10.3	46	9.0	---	---
1.390000	36.80	10.3	46	9.2	---	---
16.908000	18.70	10.9	50	31.3	---	---
25.076000	19.20	11.1	50	30.8	---	---
25.660000	21.90	11.1	50	28.1	---	---
25.952000	20.30	11.1	50	29.7	---	---



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## APPENDIX A

### 2.0 SPURIOUS EMISSIONS AT ANTENNA TERMINALS – PART 15.247(c)

Spurious conducted emissions were measured at the antenna terminals. Plots were made showing the amplitude of each harmonic emission with the equipment operated. As shown by the radiated charts there was no reason to believe that there were any spurious emissions other than the harmonics that were than individually investigated when doing the conducted test at the antenna terminals. Measurements were made up to the 10<sup>th</sup> harmonic of the fundamental.

The allowed emissions for transmitters operating in the 2400 MHz to 2483.5 MHz bands for SoundBridge M1001 equipment are found under Part 15, Section 15.247(c). This paragraph states that in any 100 kHz bandwidth outside the frequency band which the spread spectrum intentional radiator is operating, the radio frequency power produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

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



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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APPENDIX A

CONDUCTED EMISSION DATA AND GRAPH(S) TAKEN FOR  
SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

PART 15.247(c)

LOW CHANNEL TRANSMIT / **2412 MHz**





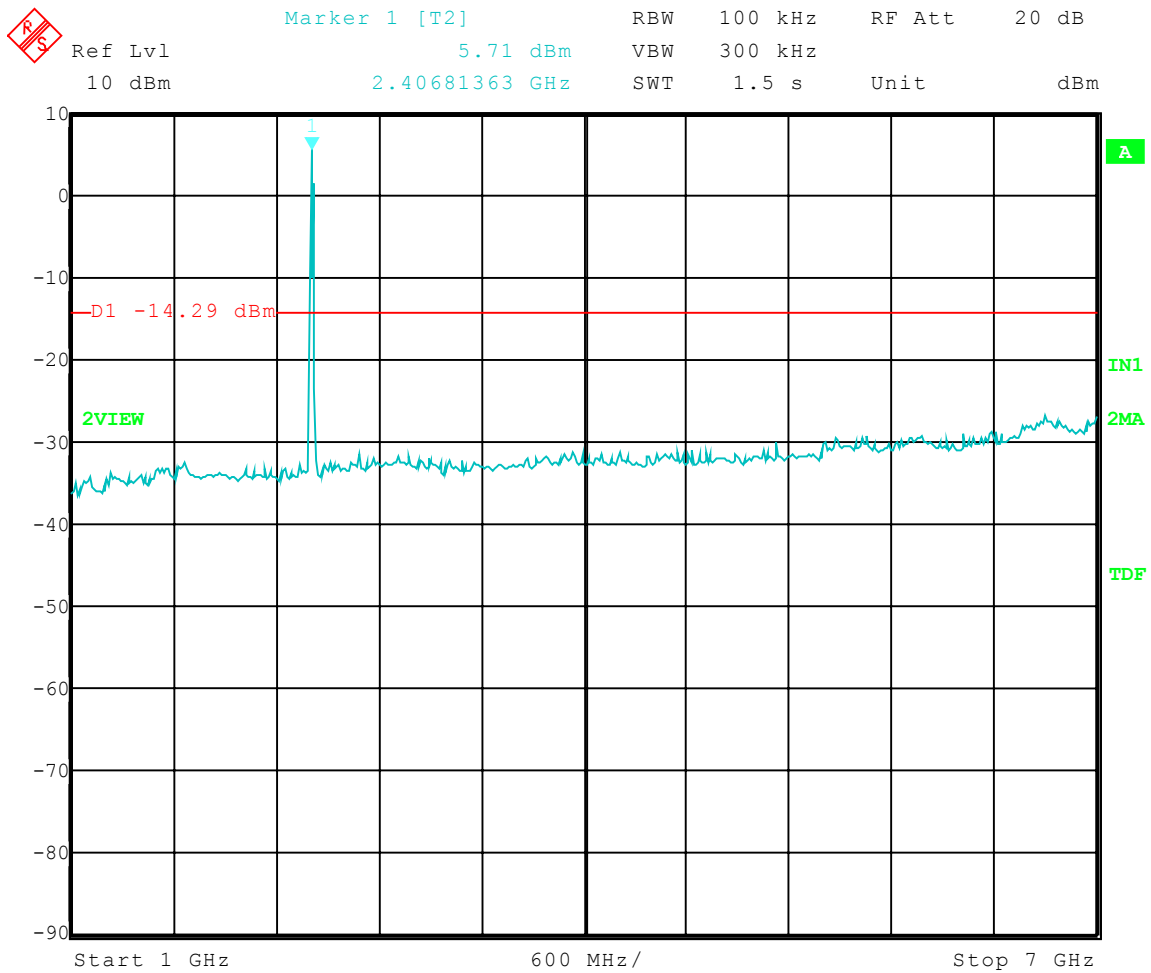
Company: Roku  
Model Tested: M1001  
Report Number: 11433

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### APPENDIX A

Test Date: 6-8-05  
Company: Roku Labs  
EUT: SoundBridge M1000  
Test: Spurious Emissions - Conducted  
Operator: Jason L.  
Comment: Low Channel Transmit = 2.412 GHz  
Frequency Range: 1 to 7 GHz  
Limit = -14.29 dBm

All Spurious Emissions at Least 20 dB below Peak Level of In Band Frequency



Date: 8.JUN.2005 11:33:21











Company: Roku  
Model Tested: M1001  
Report Number: 11433

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APPENDIX A

CONDUCTED EMISSION DATA AND GRAPH(S) TAKEN FOR  
SPURIOUS EMISSION MEASUREMENTS MADE  
AT THE ANTENNA TERMINALS

PART 15.247(c)

MIDDLE CHANNEL TRANSMIT / **2437 MHz**





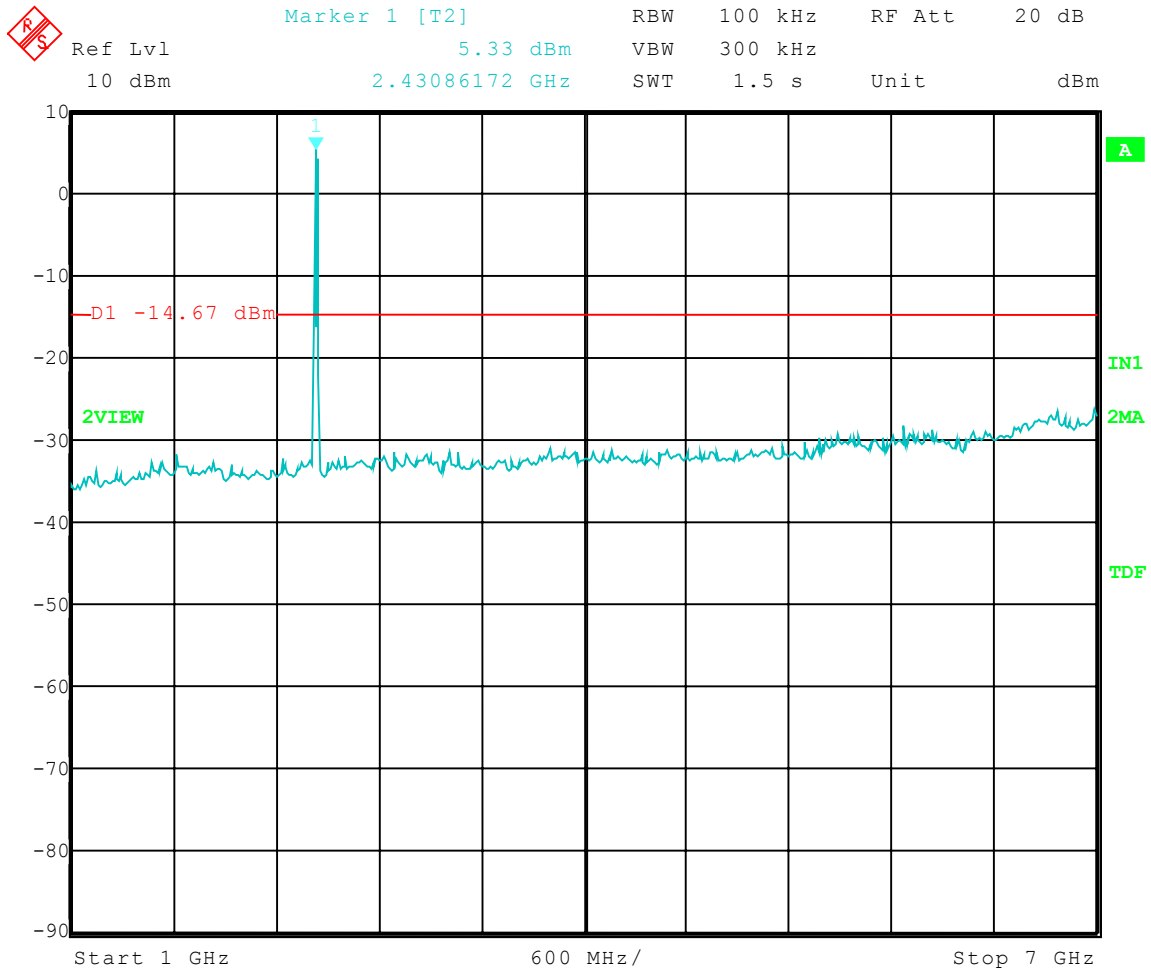
Company: Roku  
Model Tested: M1001  
Report Number: 11433

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### APPENDIX A

Test Date: 6-8-05  
Company: Roku Labs  
EUT: SoundBridge M1000  
Test: Spurious Emissions - Conducted  
Operator: Jason L.  
Comment: Middle Channel Transmit = 2.437 GHz  
Frequency Range: 1 to 7 GHz  
Limit = -14.67 dBm

All Spurious Emissions at Least 20 dB below Peak Level of In Band Frequency



Date: 8.JUN.2005 11:45:04





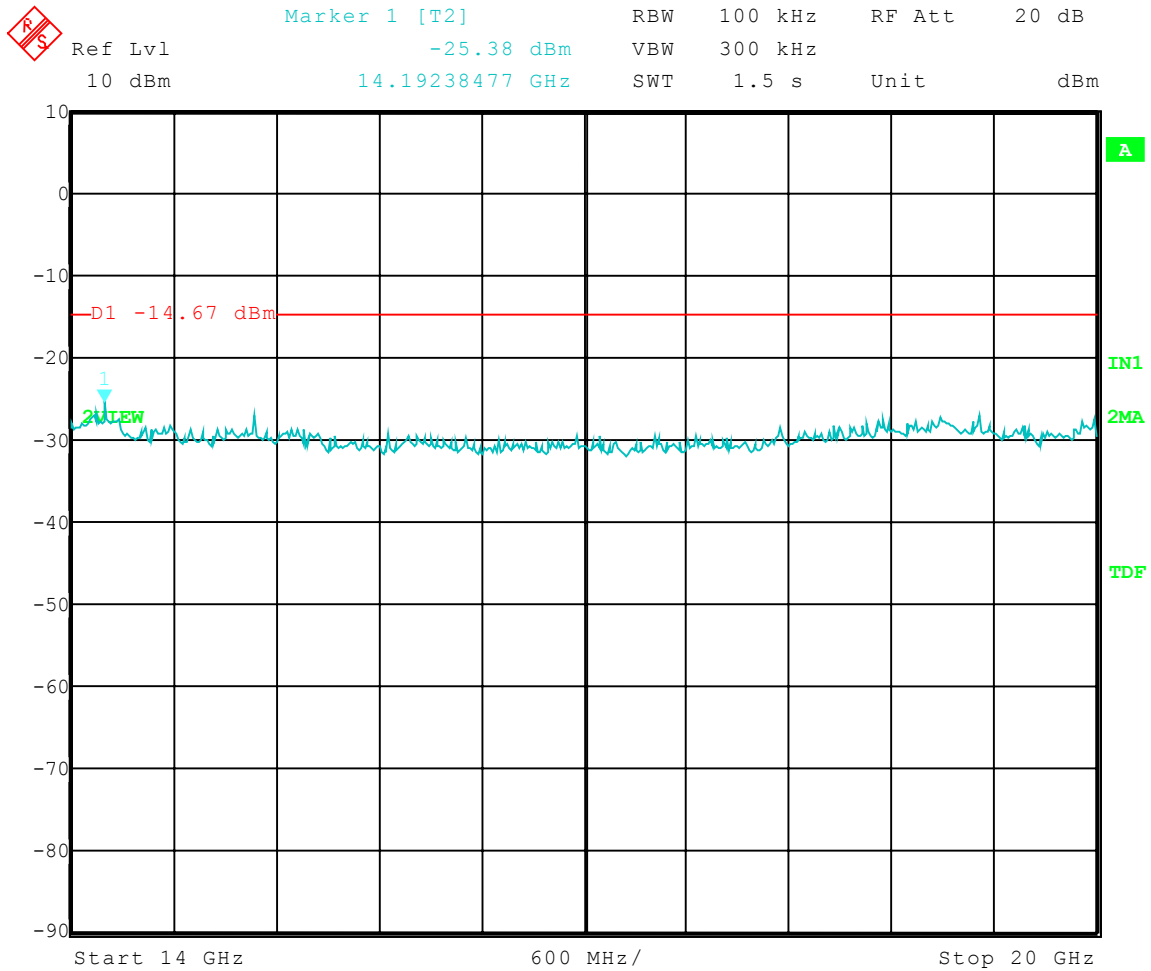
Company: Roku  
Model Tested: M1001  
Report Number: 11433

1250 Peterson Dr., Wheeling, IL 60090

### APPENDIX A

Test Date: 6-8-05  
Company: Roku Labs  
EUT: SoundBridge M1000  
Test: Spurious Emissions - Conducted  
Operator: Jason L.  
Comment: Middle Channel Transmit = 2.437 GHz  
Frequency Range: 14 to 20 GHz  
Limit = -14.67 dBm

All Spurious Emissions at Least 20 dB below Peak Level of In Band Frequency



Date: 8.JUN.2005 11:51:06



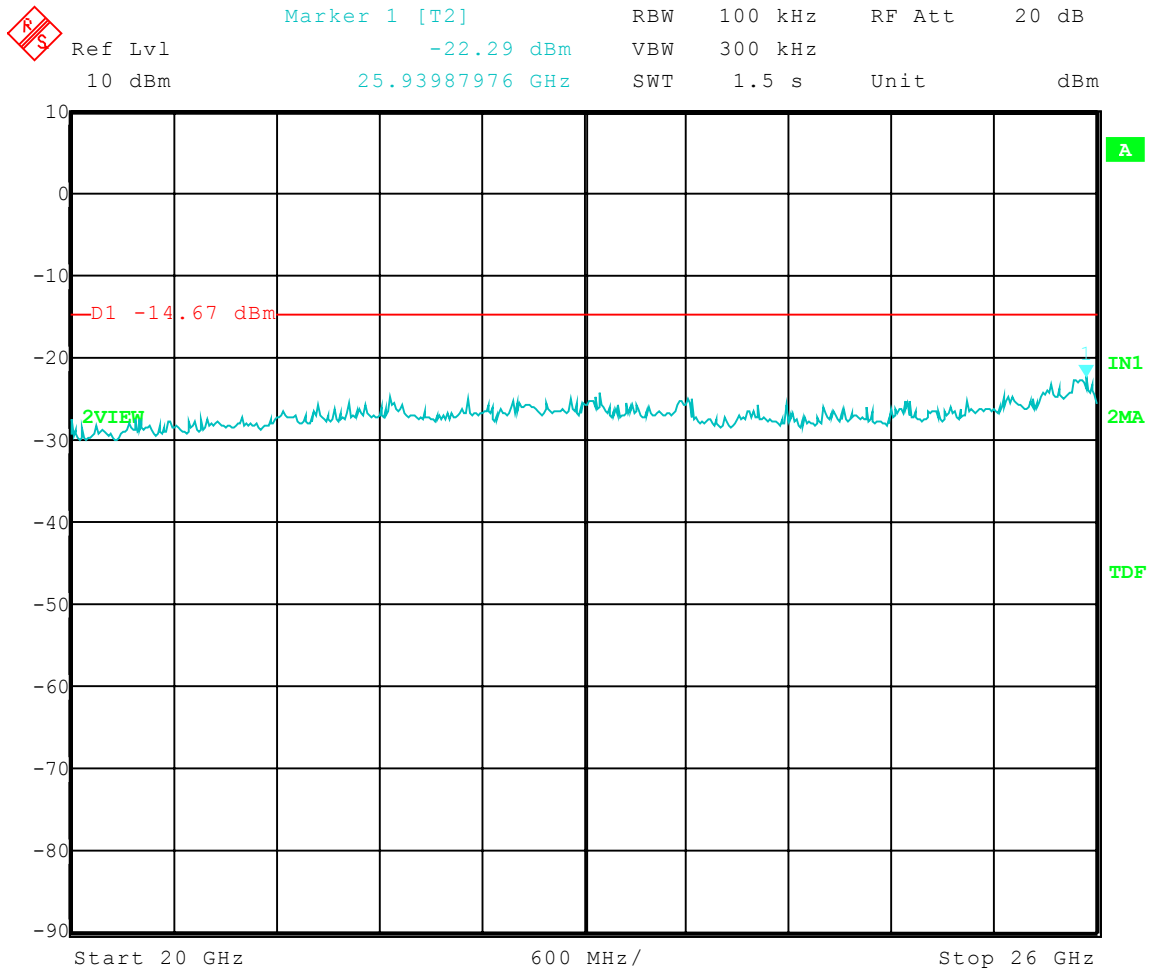
Company: Roku  
Model Tested: M1001  
Report Number: 11433

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### APPENDIX A

Test Date: 6-8-05  
Company: Roku Labs  
EUT: SoundBridge M1000  
Test: Spurious Emissions - Conducted  
Operator: Jason L.  
Comment: Middle Channel Transmit = 2.437 GHz  
Frequency Range: 20 to 26 GHz  
Limit = -14.67 dBm

All Spurious Emissions at Least 20 dB below Peak Level of In Band Frequency



Date: 8.JUN.2005 11:52:12



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## APPENDIX A

# CONDUCTED EMISSION DATA AND GRAPH(S) TAKEN FOR SPURIOUS EMISSION MEASUREMENTS MADE AT THE ANTENNA TERMINALS

PART 15.247(c)

HIGH CHANNEL TRANSMIT / **2462 MHz**















Company: Roku  
Model Tested: M1001  
Report Number: 11433

1250 Peterson Dr., Wheeling, IL 60090

### APPENDIX A

### 3.0 CONDUCTED EMISSIONS (ANTENNA TERMINAL) PHOTOS TAKEN DURING TESTING





Company: Roku  
 Model Tested: M1001  
 Report Number: 11433

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APPENDIX A

4.0 RESTRICTED BANDS

As stated in Section 15.205a, the fundamental emission from the SoundBridge M1001 shall not fall within any of the bands listed below:

Frequency in MHz	Frequency in MHz	Frequency in MHz	Frequency in GHz
.0900 to .1100	162.0125 to 167.17	2310.0 to 2390	9.30 to 9.50
.4900 to .5100	167.7200 to 173.20	2483.5 to 2500	10.60 to 12.70
2.1735 to 2.1905	240.000 to 285.00	2655.0 to 2900	13.25 to 13.40
8.362 to 8.3660	322.200 to 335.40	3260.0 to 3267	14.47 to 14.50
13.36 to 13.410	399.900 to 410.00	3332.0 to 3339	15.35 to 16.20
25.50 to 25.670	608.000 to 614.00	3345.8 to 3358	17.70 to 21.40
37.50 to 38.250	960.000 to 1240.00	3600.0 to 4400	22.01 to 23.13
73.00 to 75.500	1300.000 to 1427.00	4500.0 to 5250	23.60 to 24.00
108.00 to 121.94	1435.000 to 1626.50	5350.0 to 5450	31.20 to 31.80
123.00 to 138.00	1660.000 to 1710.00	7250.0 to 7750	36.43 to 36.50
149.90 to 150.00	1718.800 to 1722.20	8025.0 to 8500	ABOVE 38.60
156.70 to 156.90	2200.000 to 2300.00	9000.0 to 9200	

**NOTE:**

The noise floor within the Restricted Bands for the EMC Receiver and HP Spectrum Analyzer will typically lay 20 dB below the limit.

5.0 BAND EDGE AND RESTRICT BAND COMPLIANCE

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the attenuation below the general limits specified in 15.209 is not required.

The field strength of any **radiated emissions** which fall within the restricted bands shall not exceed the general radiated emissions limits as stated Section 15.209.

**NOTE:** See the following page(s) for the graph(s) made showing compliance for Band Edge and Restrict Band:



Company: Roku  
Model Tested: M1001  
Report Number: 11433

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## APPENDIX A

# DATA AND GRAPH(S) TAKEN SHOWING THE BAND EDGE AND RESTRICT BAND COMPLIANCE

## PART 15.247(c)



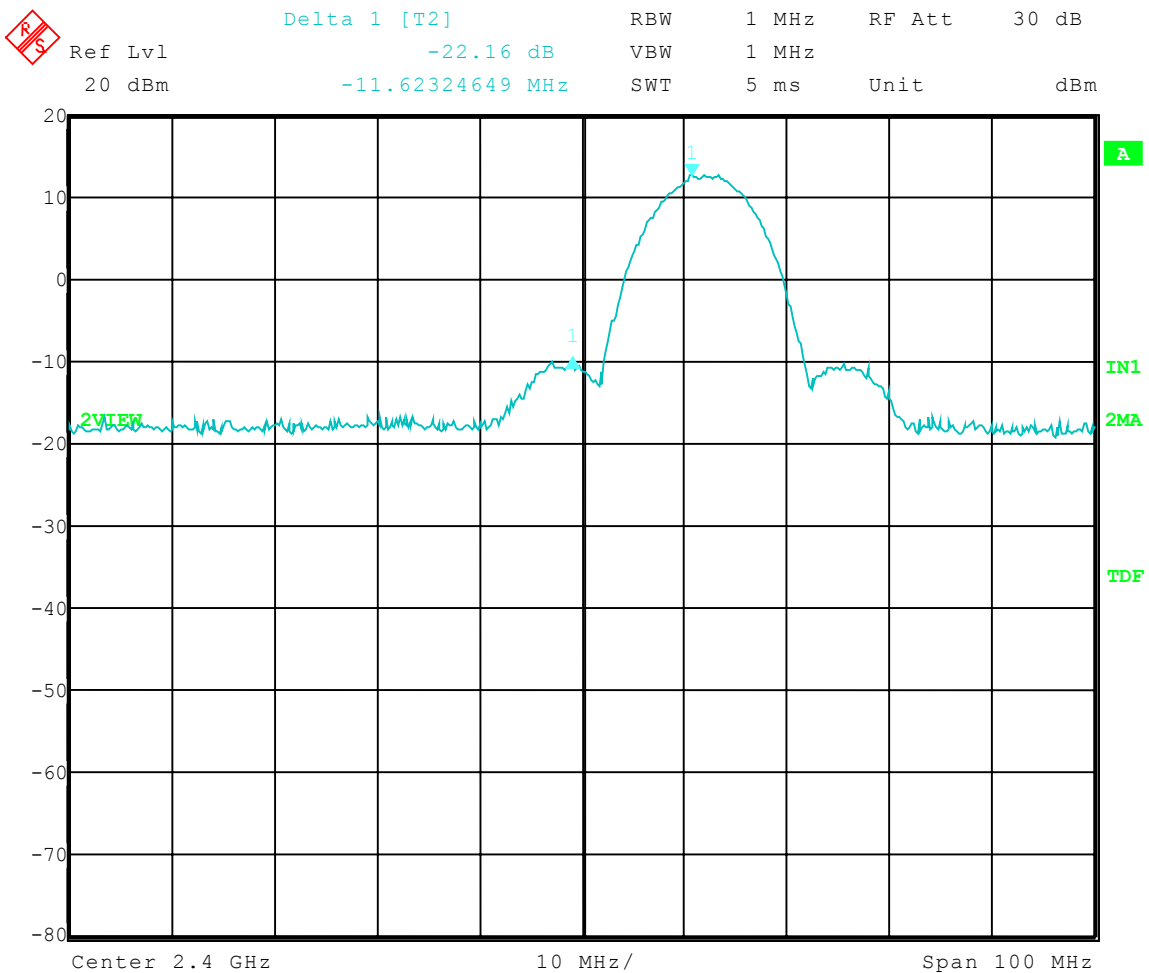
Company: Roku  
 Model Tested: M1001  
 Report Number: 11433

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

Test Date: 6-8-05  
 Company: Roku Labs  
 EUT: SoundBridge M1000  
 Test: Low Band-Edge Compliance - Conducted  
 Operator: Jason L.  
 Comment: Low Channel: Frequency – 2.412 GHz

Band-Edge Frequency = 2.4 GHz  
 Band-Edge > 20 dB Below Peak In-Band Emission



Date: 8.JUN.2005 10:49:25





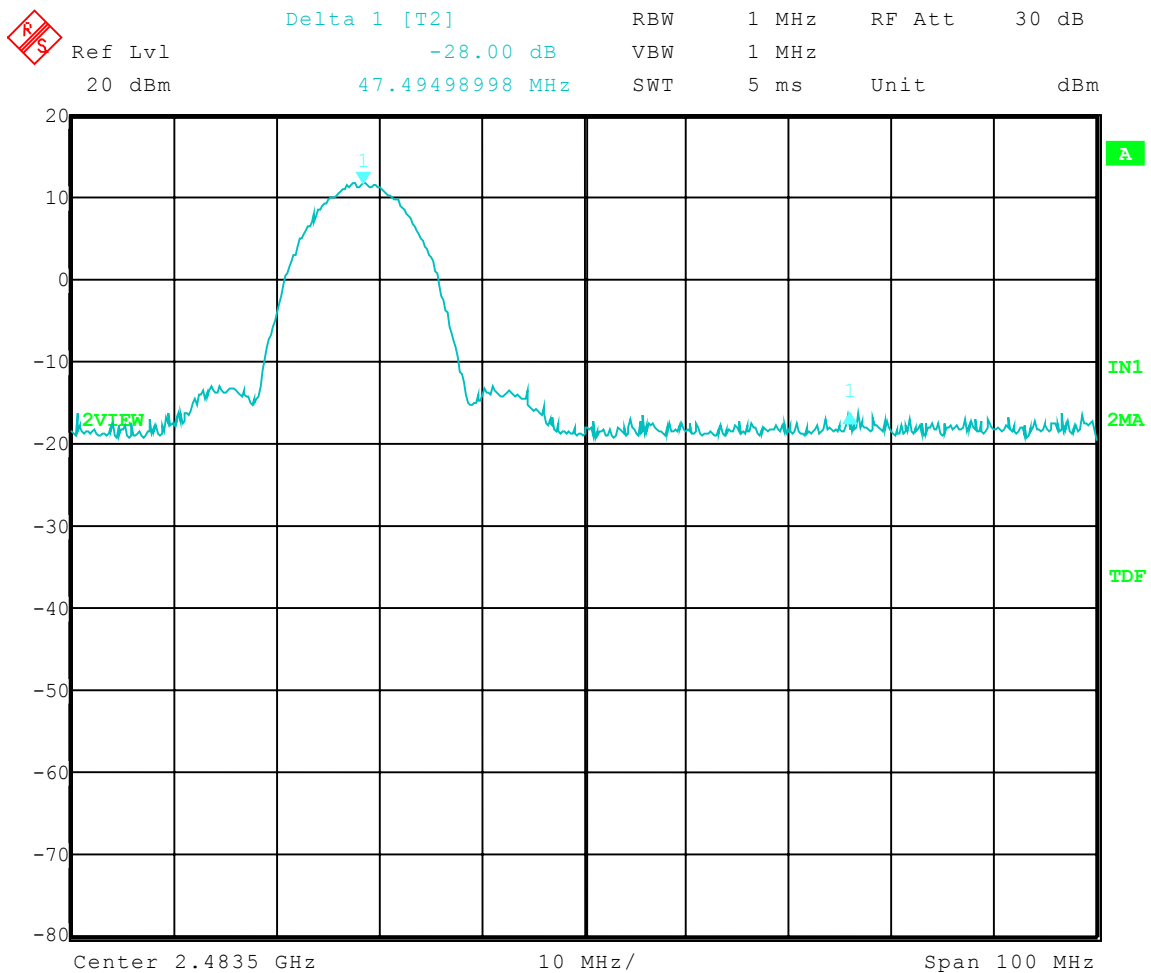
Company: Roku  
Model Tested: M1001  
Report Number: 11433

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### APPENDIX A

Test Date: 6-8-05  
Company: Roku Labs  
EUT: SoundBridge M1000  
Test: Upper Band-Edge Compliance - Conducted  
Operator: Jason L.  
Comment: High Channel: Frequency – 2.462 GHz

Band-Edge Frequency = 2.4835 GHz  
Band-Edge > 20 dB Below Peak In-Band Emission



Date: 8.JUN.2005 10:54:39