



Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

1250 Peterson Dr., Wheeling, IL 60090

FCC Rules and Regulations / Intentional Radiators

Operational in the 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz Bands

Part 15, Subpart C, Section 15.249

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

Formal Name: Classroom Response System - Renaissance Receiver  
Kind of Equipment: IEEE 802.15.4 transceiver  
Test Configuration: Standalone Tested at 120 vac, 60 Hz  
Model Number(s): REC-1000  
Model(s) Tested: REC-1000  
Serial Number(s): REC-1000.00003  
Date of Tests: July 28, 2005  
Test Conducted For: Renaissance Learning, Inc.  
2911 Peach Street  
Wisconsin Rapids, Wisconsin 54494

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## SIGNATURE PAGE

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Renaissance Learning, Inc.



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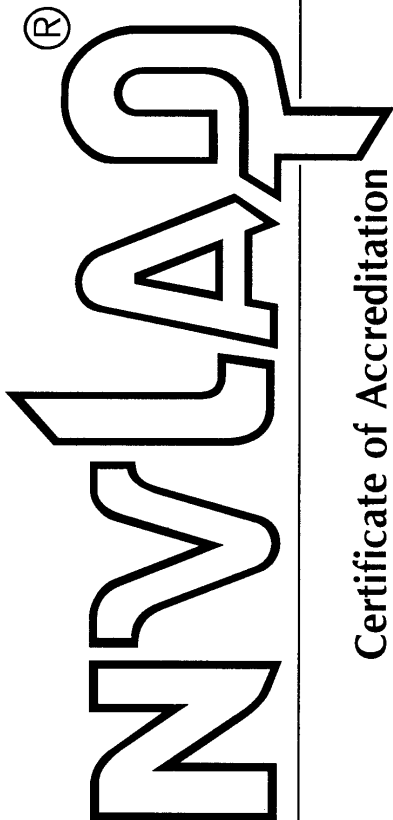
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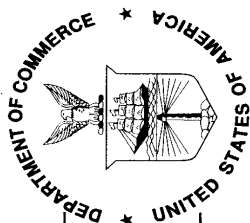
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United States Department of Commerce  
National Institute of Standards and Technology



## 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

Effective through

For the National Institute of Standards and Technology  
NVLAP Lab Code: 100276-0

NVLAP-01C (06-01)



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

1250 Peterson Drive  
Wheeling, IL 60090-6454  
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#### 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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<i>NVLAP Code</i>	<i>Designation / Description</i>
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 $\leq 16$ 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>
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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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**NVLAP Code Designation / Description**

**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 Classroom Response System - Renaissance Receiver, Model Number(s) REC-1000, "**meets**" the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.249 for operational in the 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz Bands.

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

Text: 89

## 2.0 INTRODUCTION

On July 28, 2005, a series of radio frequency interference measurements was performed on Classroom Response System - Renaissance Receiver, Model Number(s) REC-1000, Serial Number: REC-1000.00003. 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 15.35(b), 15.37(d), 15.209 & 15.249 for Intentional Radiators operating in the Bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24-24.25 GHz.



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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). The conducted tests 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, Section 4, (Figure 2).

All radiated emissions tests were performed with the test item placed on a 80 cm high rotating non-conductive table, located in the test room. Equipment normally operated on the floor was placed on a metal covered turntable which is flush with the surrounding conducting ground plane. The ground plane has an electrical isolation layer over its surface approximately 7 mm thick. The EUT is separated from the turntable ground plane by a non-conductive layer. The equipment under test was set up according to ANSI C63.4-2003, 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: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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## 7.0 DESCRIPTION OF TEST SAMPLE: (See also Paragraph 8.0)

### 7.1 Description:

The device will be used in a classroom environment as a "Student Response System". In essence, it will act like a remote control and will send responses to a host and receive questions from the host. The device uses an IEEE 802.15.4 radio (CC2420, manufactured by Chipcon - [www.chipcon.com](http://www.chipcon.com)).

### 7.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

Length: 11 cm Width: 9 cm Height: 3 cm

### 7.3 LINE FILTER USED:

NA

### 7.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

NA

Clock Frequencies:

12, 16 MHz

### 7.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

1. Receiver PCB

PN: PCB-0002 Rev 2



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Model Tested: REC-1000  
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8.0 ADDITIONAL DESCRIPTION OF TEST SAMPLE:  
(See also Paragraph 7.0)

1: Changed RF Power Output to -5 dBm.

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: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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## 9.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 Classroom Response System - Renaissance Receiver

Model Number: REC-1000 Serial Number: REC-1000.00003

Item 1 Shielded USB Cable with Metal Shells. 2m

Item 2 IBM Think Pad Laptop Computer.

Model Number: 26d8 PSU; SN: PLNTP

Item 3 Dell Intel Mouse

Model Number: X06-08477 Serial Number: 8756745-4

Item 4 IBM AC Adapter

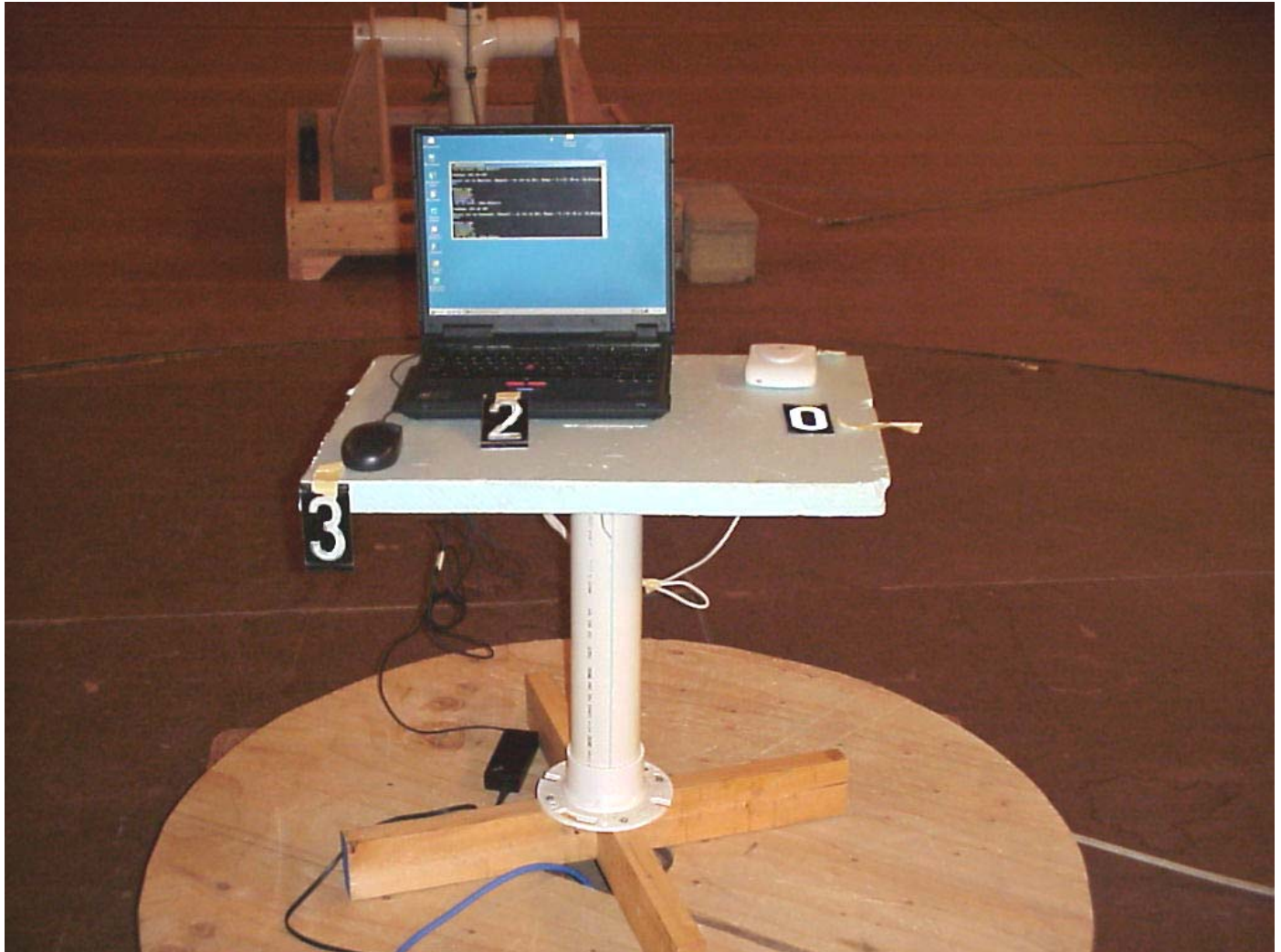
Model Number: 02K6750; SN: 11502k67502



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Model Tested: REC-1000  
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#### 10.0 RADIATED PHOTOS TAKEN DURING TESTING:





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

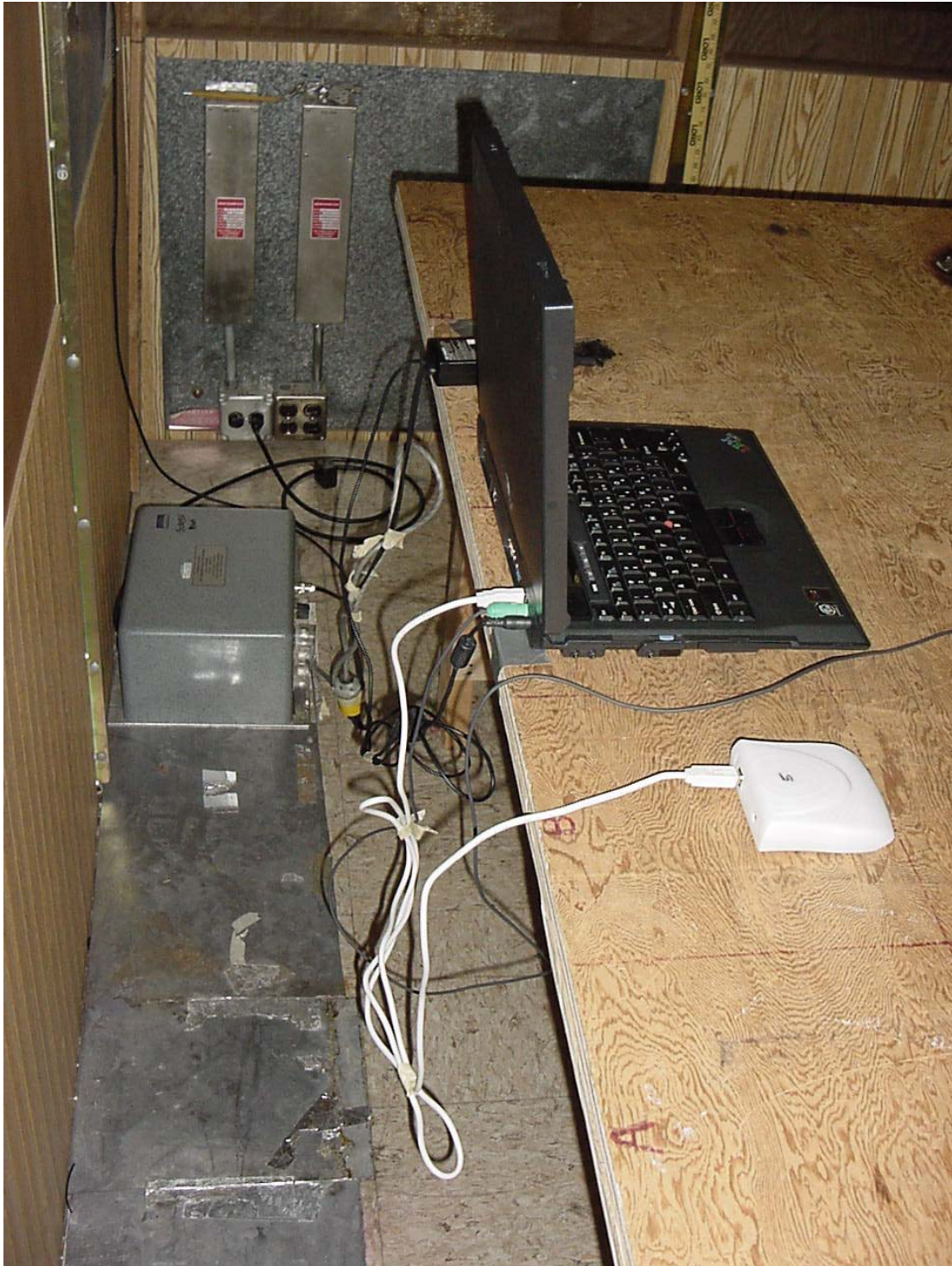




Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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#### 10.0 CONDUCTED PHOTOS TAKEN DURING TESTING:





Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

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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 Classroom Response System - Renaissance Receiver, Model Number(s) REC-1000 "**meets**" the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.249 for operational in the 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz Bands.



Company: Renaissance Learning, Inc.  
 Model Tested: REC-1000  
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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: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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TABLE 1 – EQUIPMENT LIST

<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Frequency Range</b>	<b>Cal Due Dates</b>
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	7/06

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



Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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## APPENDIX A

### TEST PROCEDURE

Part 15, Subpart C, Section 15.249a-e

**OPERATION WITHIN THE BANDS 902-928 MHz, 2400-2483.5 MHz,  
5725-5875 MHz, and 24.0-24.25 GHz MHz**



Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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## APPENDIX A

### 1.0 CONDUCTED EMISSION MEASUREMENTS

Conducted emissions were measured over the frequency range from 150 kHz to 30 MHz in accordance with the power line measurements as specified in FCC Part 15, Subpart C, Section 15.207 & ANSI C63.4-2003. Since the device is operated from the public utility lines, the 120 Vac, 60 Hz power leads, high (hot) and low (neutral) sides, were measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. During the test, the cables were placed and items moved (when appropriate) to maximize emissions. All signals were then recorded. The allowed levels for Intentional Radiators which is designed to connected to the public utility (AC) power line shall not exceed 250 uV (47.96 dBuV) from 150 kHz to 30 MHz

#### **NOTE:**

All test measurements were made at a screen room temperature of **78°F** at **48%** relative humidity.



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Model Tested: REC-1000  
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## APPENDIX A

# CONDUCTED DATA AND GRAPH(S) TAKEN DURING TESTING

## PART 15.207



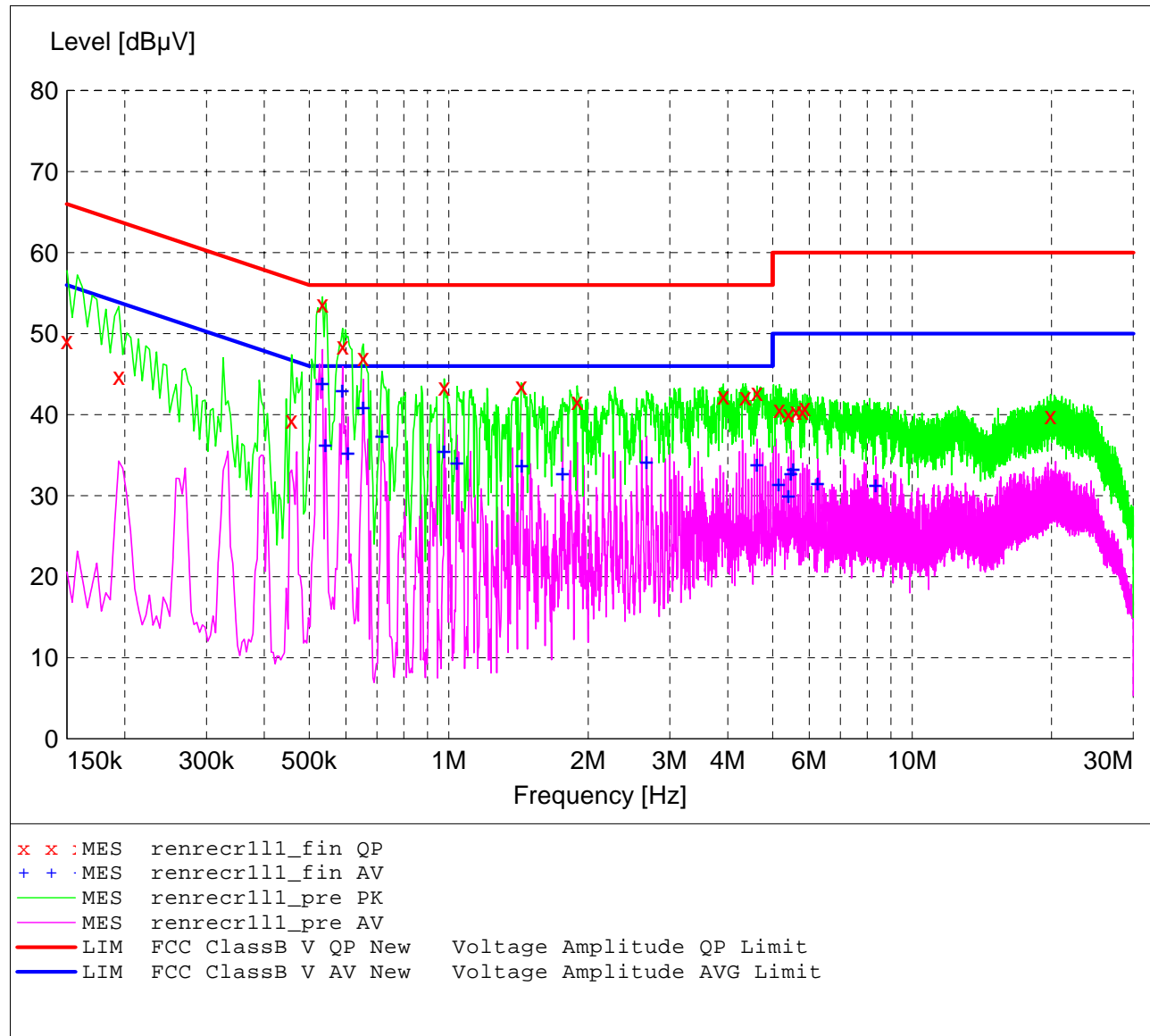
# FCC Part 15 Class B

## Voltage Mains Test

EUT: Renaissance Receiver  
Manufacturer: Renaissance Learning  
Operating Condition: 78 deg. F, 48% R.H.  
Test Site: DLS O.F. Site 1(Screenroom)  
Operator: Jason L  
Test Specification: 120 VAC; 60 Hz - LINE 1  
Comment: Transmit Low Channel  
Date: 07-28-2005

## 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	4.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#126
			Average			



**MEASUREMENT RESULT: "renrecr111\_fin QP"**

7/28/2005 2:47PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.150000	49.20	11.3	66	16.8	---	---
0.194000	44.70	10.8	64	19.1	---	---
0.458000	39.30	10.1	57	17.4	---	---
0.534000	53.70	10.1	56	2.3	---	---
0.590000	48.50	10.2	56	7.5	---	---
0.654000	47.10	10.2	56	8.9	---	---
0.978000	43.40	10.1	56	12.6	---	---
1.434000	43.50	10.2	56	12.5	---	---
1.894000	41.70	10.2	56	14.3	---	---
3.914000	42.30	10.3	56	13.7	---	---
4.370000	42.20	10.3	56	13.8	---	---
4.630000	42.80	10.3	56	13.2	---	---
5.170000	40.70	10.4	60	19.3	---	---
5.414000	40.10	10.3	60	19.9	---	---
5.614000	40.50	10.4	60	19.5	---	---
5.802000	40.40	10.4	60	19.6	---	---
5.870000	40.90	10.4	60	19.1	---	---
19.886000	39.90	10.8	60	20.1	---	---

**MEASUREMENT RESULT: "renrecr111\_fin AV"**

7/28/2005 2:47PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.534000	44.00	10.1	46	2.0	---	---
0.542000	36.40	10.2	46	9.6	---	---
0.590000	43.10	10.2	46	2.9	---	---
0.606000	35.40	10.2	46	10.6	---	---
0.654000	41.00	10.2	46	5.0	---	---
0.718000	37.50	10.2	46	8.5	---	---
0.978000	35.60	10.1	46	10.4	---	---
1.042000	34.20	10.1	46	11.8	---	---
1.438000	33.80	10.2	46	12.2	---	---
1.762000	32.90	10.2	46	13.1	---	---
2.674000	34.30	10.2	46	11.7	---	---
4.630000	33.90	10.3	46	12.1	---	---
5.154000	31.50	10.4	50	18.5	---	---
5.414000	30.10	10.3	50	19.9	---	---
5.478000	32.80	10.3	50	17.2	---	---
5.542000	33.40	10.3	50	16.6	---	---
6.258000	31.60	10.4	50	18.4	---	---
8.346000	31.40	10.5	50	18.6	---	---

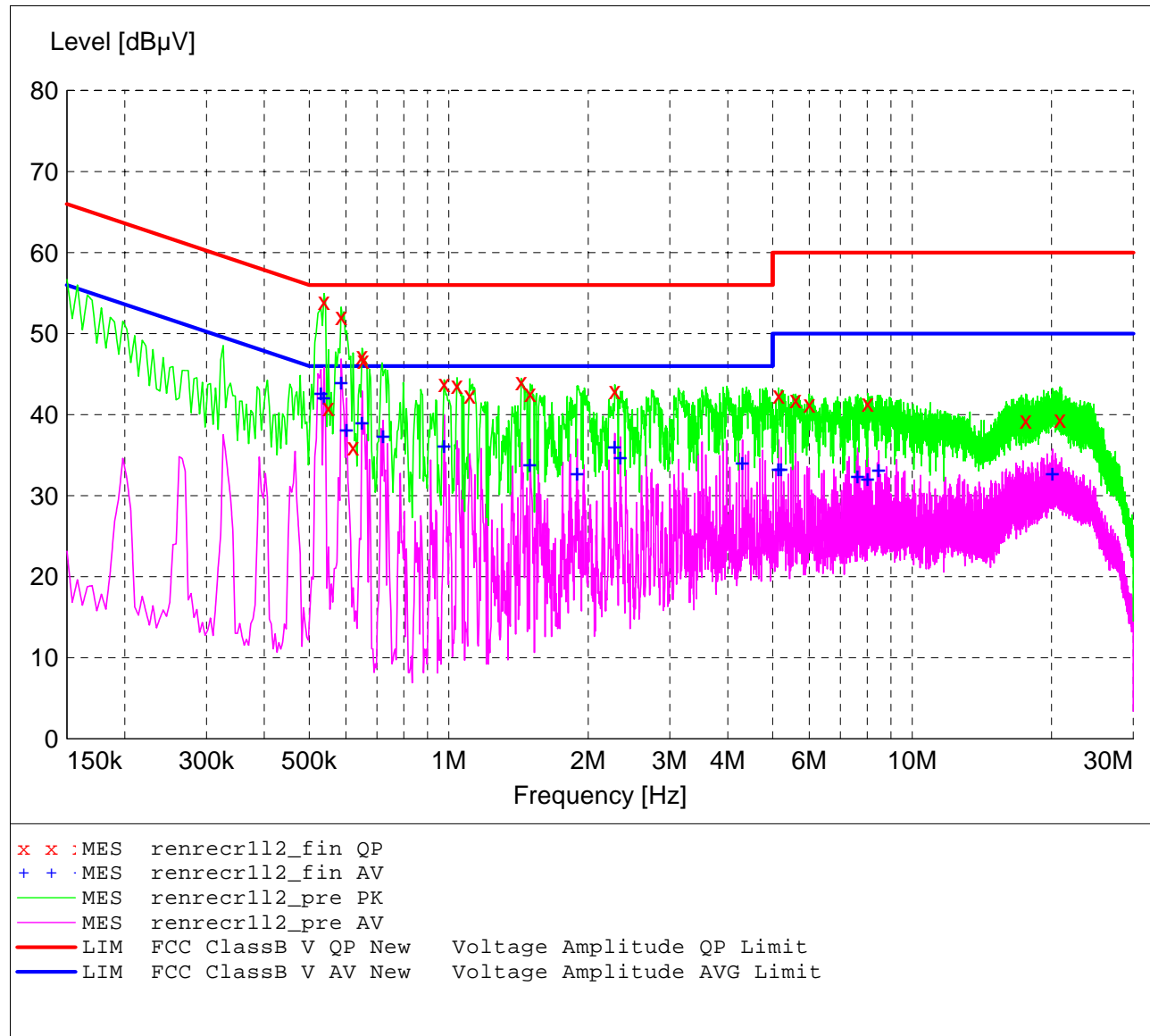
# FCC Part 15 Class B

## Voltage Mains Test

EUT: Renaissance Receiver  
Manufacturer: Renaissance Learning  
Operating Condition: 78 deg. F, 48% R.H.  
Test Site: DLS O.F. Site 1(Screenroom)  
Operator: Jason L  
Test Specification: 120 VAC; 60 Hz - LINE 2  
Comment: Transmit Low Channel  
Date: 07-28-2005

## 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	4.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#126
			Average			



**MEASUREMENT RESULT: "renrecr112\_fin QP"**

7/28/2005 2:54PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.538000	54.00	10.2	56	2.0	---	---
0.550000	40.90	10.2	56	15.1	---	---
0.586000	52.10	10.2	56	3.9	---	---
0.622000	36.00	10.2	56	20.0	---	---
0.650000	47.30	10.2	56	8.7	---	---
0.654000	46.70	10.2	56	9.3	---	---
0.978000	43.90	10.1	56	12.1	---	---
1.042000	43.60	10.1	56	12.4	---	---
1.110000	42.40	10.2	56	13.6	---	---
1.434000	44.10	10.2	56	11.9	---	---
1.498000	42.70	10.2	56	13.3	---	---
2.282000	43.00	10.2	56	13.0	---	---
5.150000	42.40	10.4	60	17.6	---	---
5.606000	41.90	10.4	60	18.1	---	---
5.998000	41.30	10.4	60	18.7	---	---
8.018000	41.40	10.4	60	18.6	---	---
17.598000	39.30	10.9	60	20.7	---	---
20.862000	39.50	10.8	60	20.5	---	---

**MEASUREMENT RESULT: "renrecr112\_fin AV"**

7/28/2005 2:54PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.530000	42.80	10.1	46	3.2	---	---
0.538000	42.20	10.2	46	3.8	---	---
0.586000	44.10	10.2	46	1.9	---	---
0.602000	38.20	10.2	46	7.8	---	---
0.650000	39.10	10.2	46	6.9	---	---
0.722000	37.50	10.2	46	8.5	---	---
0.978000	36.20	10.1	46	9.8	---	---
1.498000	33.90	10.2	46	12.1	---	---
1.894000	32.80	10.2	46	13.2	---	---
2.282000	36.10	10.2	46	9.9	---	---
2.346000	34.80	10.2	46	11.2	---	---
4.302000	34.20	10.3	46	11.8	---	---
5.150000	33.40	10.4	50	16.6	---	---
5.214000	33.40	10.4	50	16.6	---	---
7.626000	32.50	10.4	50	17.5	---	---
8.018000	32.20	10.4	50	17.8	---	---
8.474000	33.30	10.5	50	16.7	---	---
20.078000	32.80	10.8	50	17.2	---	---

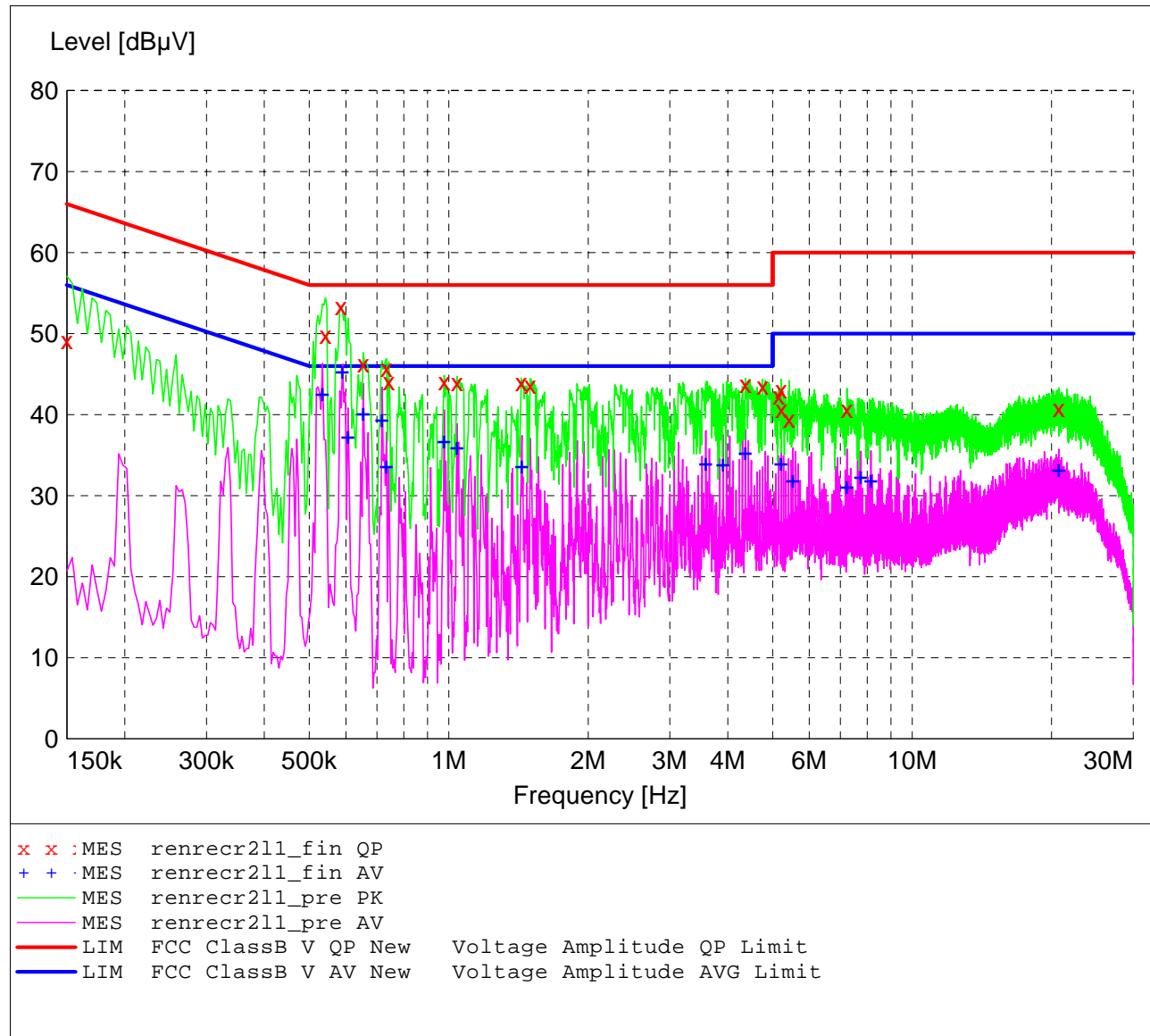
# FCC Part 15 Class B

## Voltage Mains Test

EUT: Renaissance Receiver  
Manufacturer: Renaissance Learning  
Operating Condition: 78 deg. F, 48% R.H.  
Test Site: DLS O.F. Site 1(Screenroom)  
Operator: Jason L  
Test Specification: 120 VAC; 60 Hz - LINE 1  
Comment: Receive Low Channel  
Date: 07-28-2005

### 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	4.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#126
			Average			



**MEASUREMENT RESULT: "renrecr211\_fin QP"**

7/28/2005 3:02PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.150000	49.10	11.3	66	16.9	---	---
0.542000	49.80	10.2	56	6.2	---	---
0.586000	53.40	10.2	56	2.6	---	---
0.654000	46.30	10.2	56	9.7	---	---
0.734000	45.70	10.2	56	10.3	---	---
0.742000	44.10	10.2	56	11.9	---	---
0.978000	44.10	10.1	56	11.9	---	---
1.042000	44.00	10.1	56	12.0	---	---
1.434000	44.00	10.2	56	12.0	---	---
1.498000	43.60	10.2	56	12.4	---	---
4.366000	43.70	10.3	56	12.3	---	---
4.758000	43.50	10.3	56	12.5	---	---
5.150000	42.30	10.4	60	17.7	---	---
5.214000	43.10	10.4	60	16.9	---	---
5.226000	40.70	10.4	60	19.3	---	---
5.430000	39.50	10.3	60	20.5	---	---
7.234000	40.70	10.4	60	19.3	---	---
20.722000	40.80	10.8	60	19.2	---	---

**MEASUREMENT RESULT: "renrecr211\_fin AV"**

7/28/2005 3:02PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.534000	42.70	10.1	46	3.3	---	---
0.590000	45.40	10.2	46	0.6	---	---
0.606000	37.40	10.2	46	8.6	---	---
0.654000	40.20	10.2	46	5.8	---	---
0.718000	39.50	10.2	46	6.5	---	---
0.734000	33.70	10.2	46	12.3	---	---
0.978000	36.80	10.1	46	9.2	---	---
1.042000	36.00	10.1	46	10.0	---	---
1.438000	33.70	10.2	46	12.3	---	---
3.586000	34.00	10.3	46	12.0	---	---
3.910000	33.90	10.3	46	12.1	---	---
4.366000	35.40	10.3	46	10.6	---	---
5.214000	34.00	10.4	50	16.0	---	---
5.538000	32.00	10.3	50	18.0	---	---
7.234000	31.20	10.4	50	18.8	---	---
7.754000	32.40	10.4	50	17.6	---	---
8.146000	31.90	10.5	50	18.1	---	---
20.722000	33.30	10.8	50	16.7	---	---

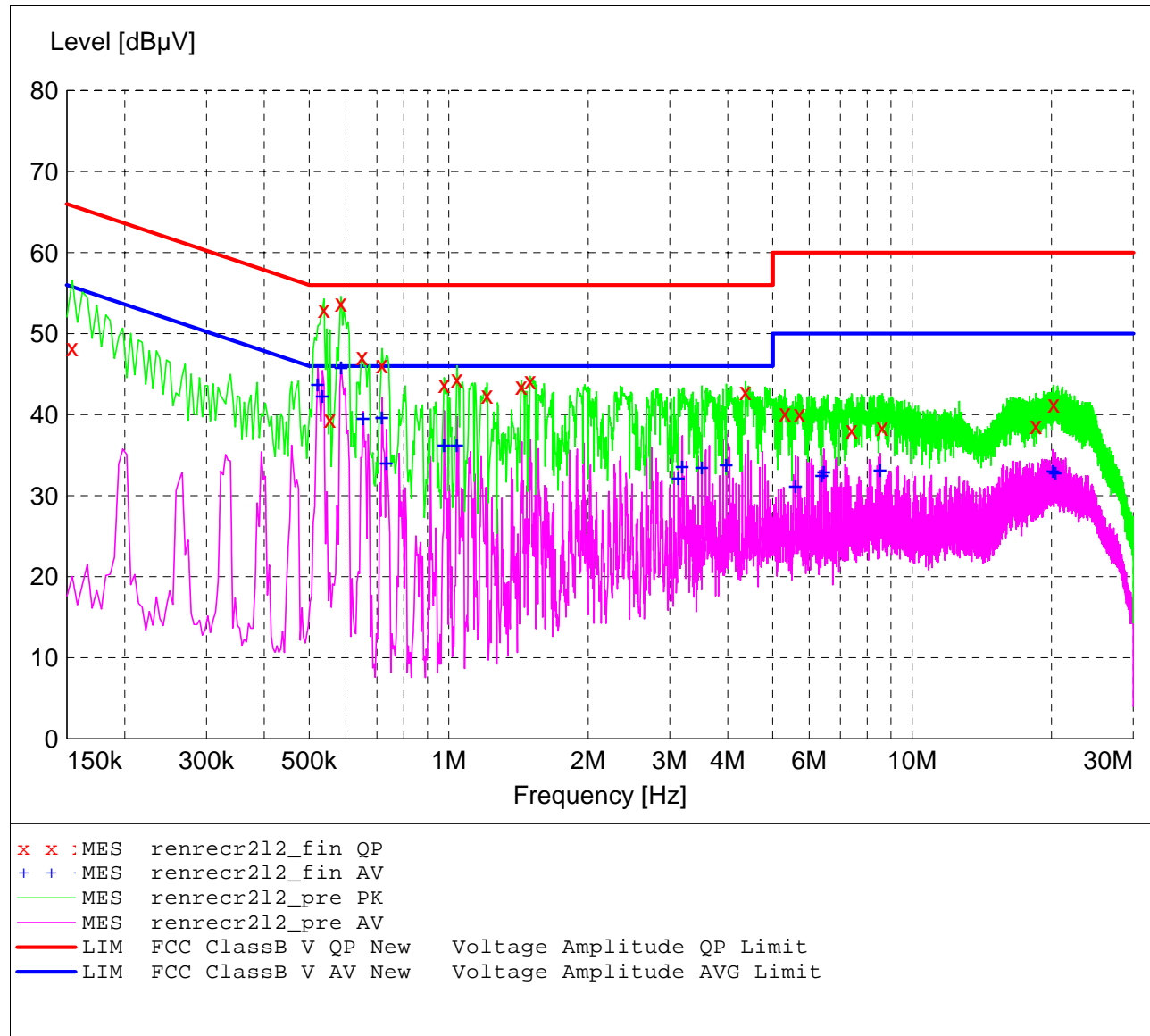
# FCC Part 15 Class B

## Voltage Mains Test

EUT: Renaissance Receiver  
Manufacturer: Renaissance Learning  
Operating Condition: 78 deg. F, 48% R.H.  
Test Site: DLS O.F. Site 1(Screenroom)  
Operator: Jason L  
Test Specification: 120 VAC; 60 Hz - LINE 2  
Comment: Receive Low Channel  
Date: 07-28-2005

## 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	4.0 kHz	MaxPeak	10.0 ms	9 kHz	LISN DLS#126
			Average			



**MEASUREMENT RESULT: "renrecr2l2\_fin QP"**

7/28/2005 3:09PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.154000	48.30	11.3	66	17.5	---	---
0.538000	53.00	10.2	56	3.0	---	---
0.554000	39.40	10.2	56	16.6	---	---
0.586000	53.80	10.2	56	2.2	---	---
0.650000	47.20	10.2	56	8.8	---	---
0.718000	46.20	10.2	56	9.8	---	---
0.978000	43.80	10.1	56	12.2	---	---
1.042000	44.40	10.1	56	11.6	---	---
1.210000	42.40	10.2	56	13.6	---	---
1.434000	43.50	10.2	56	12.5	---	---
1.498000	44.20	10.2	56	11.8	---	---
4.366000	42.90	10.3	56	13.1	---	---
5.314000	40.20	10.3	60	19.8	---	---
5.714000	40.10	10.4	60	19.9	---	---
7.402000	38.10	10.4	60	21.9	---	---
8.626000	38.50	10.5	60	21.5	---	---
18.506000	38.70	10.9	60	21.3	---	---
20.198000	41.30	10.8	60	18.7	---	---

**MEASUREMENT RESULT: "renrecr2l2\_fin AV"**

7/28/2005 3:09PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.522000	43.90	10.1	46	2.1	---	---
0.534000	42.40	10.1	46	3.6	---	---
0.586000	45.90	10.2	46	0.1	---	---
0.654000	39.70	10.2	46	6.3	---	---
0.718000	39.80	10.2	46	6.2	---	---
0.734000	34.20	10.2	46	11.8	---	---
0.978000	36.40	10.1	46	9.6	---	---
1.042000	36.40	10.1	46	9.6	---	---
3.130000	32.30	10.3	46	13.7	---	---
3.194000	33.70	10.3	46	12.3	---	---
3.518000	33.60	10.4	46	12.4	---	---
3.974000	33.90	10.3	46	12.1	---	---
5.606000	31.30	10.4	50	18.7	---	---
6.386000	32.60	10.4	50	17.4	---	---
6.450000	33.10	10.4	50	16.9	---	---
8.534000	33.30	10.5	50	16.7	---	---
20.134000	33.20	10.8	50	16.8	---	---
20.394000	33.00	10.8	50	17.0	---	---





Company: Renaissance Learning, Inc.  
 Model Tested: REC-1000  
 Report Number: 11581

1250 Peterson Dr., Wheeling, IL 60090

## APPENDIX A

### 2.0 BAND EDGE AND RESTRICT BAND COMPLIANCE

The field strength of any emissions appearing outside the 2400 MHz - 2483.5 MHz band shall not exceed the general radiated emissions limits as stated in Section 15.209. The fundamental emission from the Classroom Response System - Renaissance Receiver transmitter shall not fall inside the restrict bands listed below, as stated in Section 15.205a:

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.

See the following page (s) for the graph (s) made showing compliance for Band Edge and Restrict Band: Also see the table of measurements made for the Fundamental and Spurious emissions in paragraph 3, pages 49 to 52 of this appendix.



Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

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## APPENDIX A

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

PART 15.249

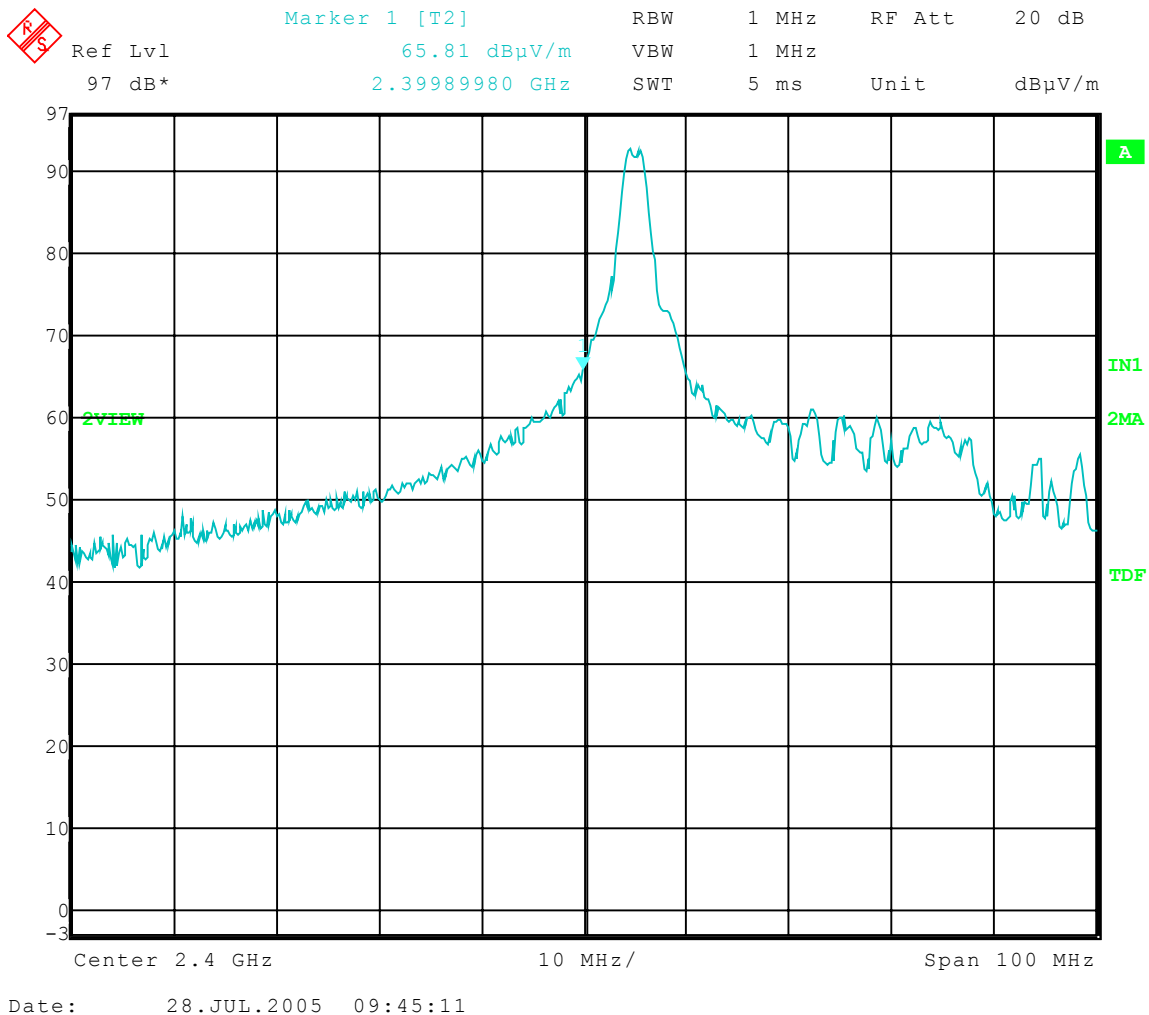


Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

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## APPENDIX A

Test Date: 07-27-2005  
Company: Renaissance Learning, Inc.  
EUT: Renaissance Receiver  
Test: Lower Band-Edge Compliance - Radiated  
Operator: Jason Lauer  
Comment: Low Channel: Frequency – 2.405 GHz  
Worst Case Orientation - Horizontal  
Band-Edge Frequency - 2.400 GHz  
**Peak** Radiated Peak Out of Band Limit = 74 dB $\mu$ V/m @ 3 Meters



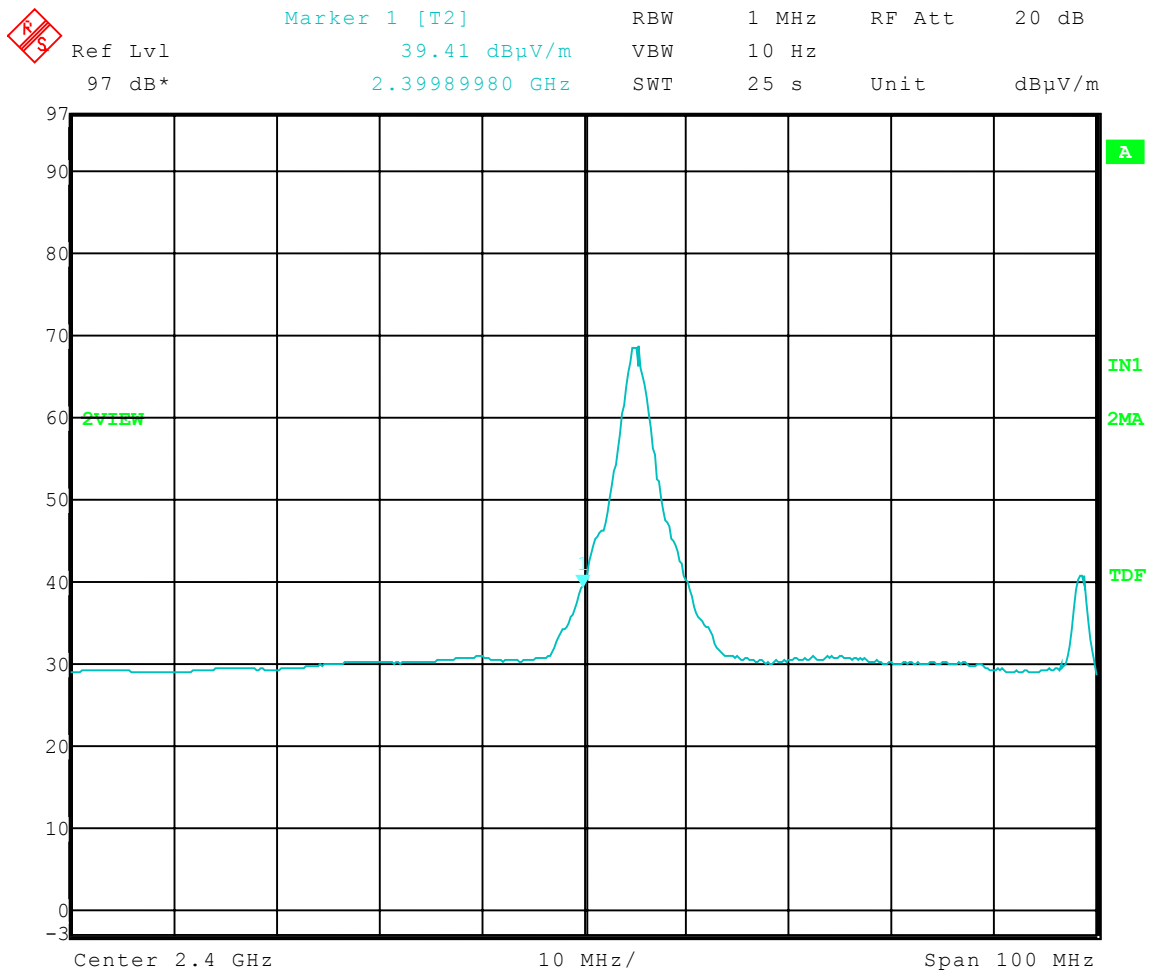


Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

1250 Peterson Dr., Wheeling, IL 60090

## APPENDIX A

Test Date: 07-27-2005  
Company: Renaissance Learning, Inc.  
EUT: Renaissance Receiver  
Test: Lower Band-Edge Compliance - Radiated  
Operator: Jason Lauer  
Comment: Low Channel: Frequency – 2.405 GHz  
Worst Case Orientation - Horizontal  
Band-Edge Frequency - 2.400 GHz  
**Average** Radiated Peak Out of Band Limit = 54 dB $\mu$ V/m @ 3 Meters



Date: 28.JUL.2005 09:47:14

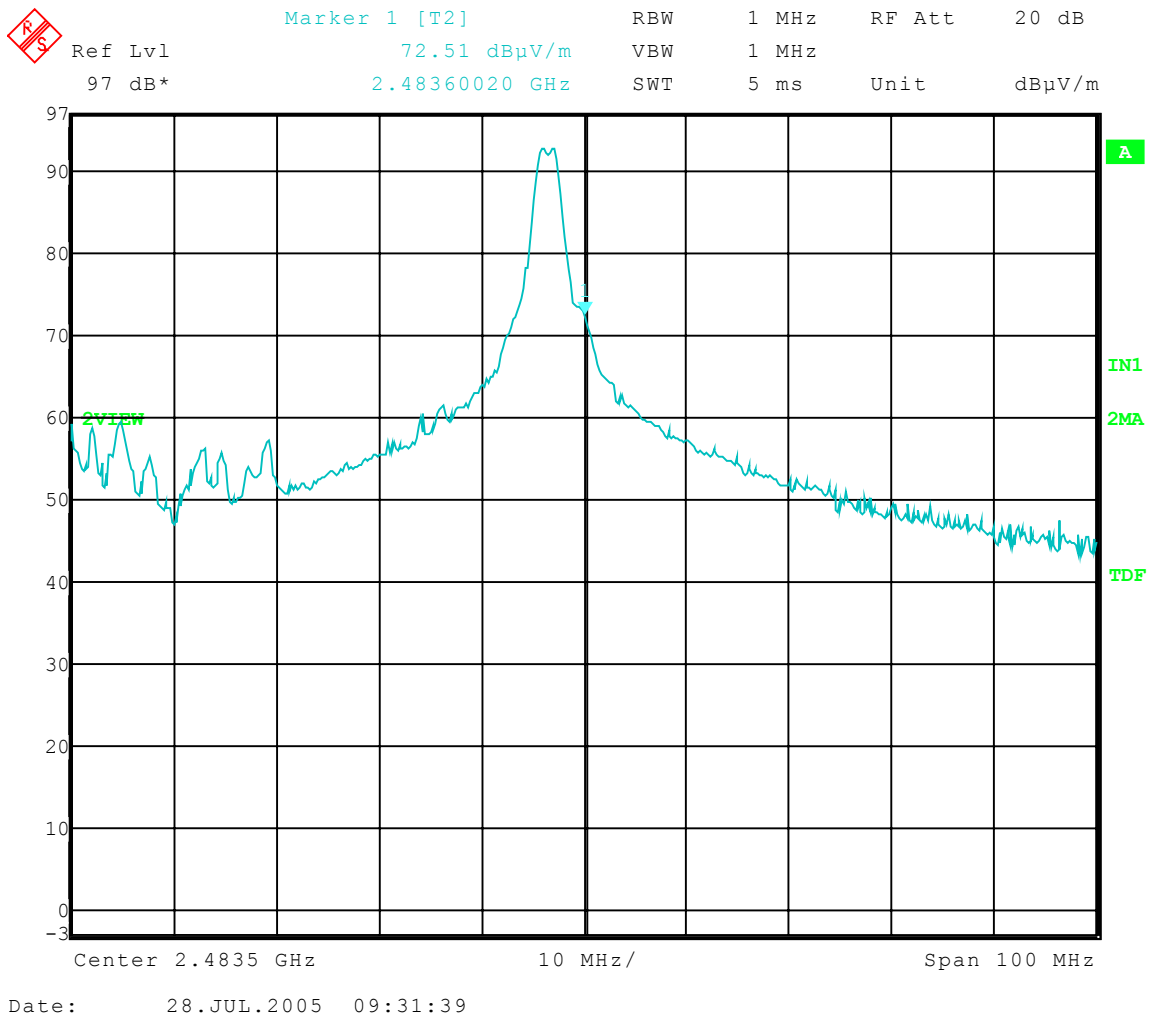


Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

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## APPENDIX A

Test Date: 07-27-2005  
Company: Renaissance Learning, Inc.  
EUT: Renaissance Receiver  
Test: Upper Band-Edge Compliance - Radiated  
Operator: Jason Lauer  
Comment: High Channel: Frequency – 2.480 GHz  
Worst Case Orientation - Horizontal  
Band-Edge Frequency - 2.4835 GHz  
**Peak** Radiated Peak Out of Band Limit = 74 dB $\mu$ V/m @ 3 Meters



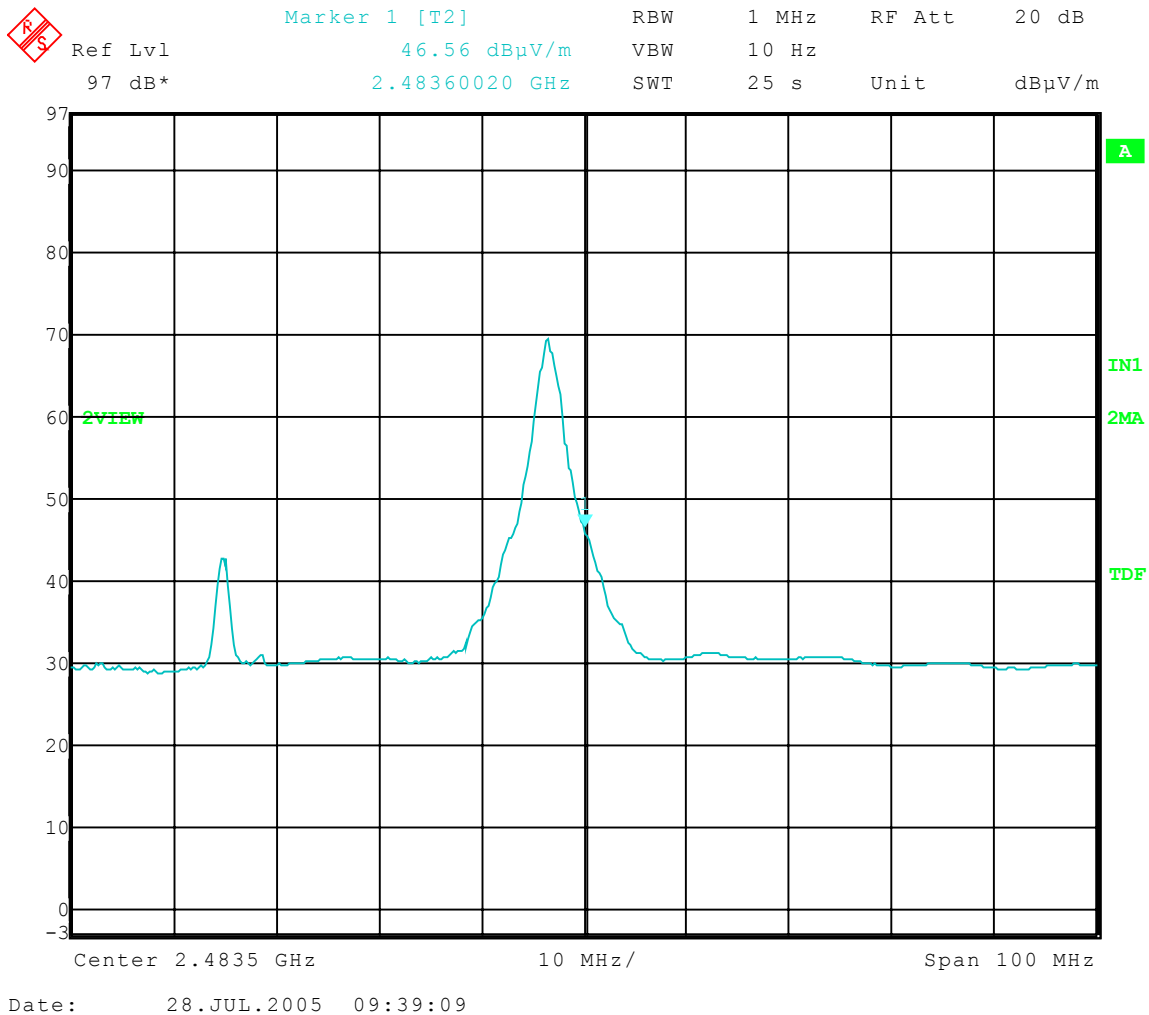


Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

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## APPENDIX A

Test Date: 07-27-2005  
Company: Renaissance Learning, Inc.  
EUT: Renaissance Receiver  
Test: Upper Band-Edge Compliance - Radiated  
Operator: Jason Lauer  
Comment: High Channel: Frequency – 2.480 GHz  
Worst Case Orientation - Horizontal  
Band-Edge Frequency - 2.4835 GHz  
**Average** Radiated Peak Out of Band Limit = 54 dB $\mu$ V/m @ 3 Meters





Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
Report Number: 11581

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## APPENDIX A

### 3.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS (SECTION 15.249a-d)

The radiated measurements made at D.L.S. Electronic Systems, Inc., for the Classroom Response System - Renaissance Receiver, Model Number: REC-1000, are shown in tabulated and graph form. Preliminary radiation measurements were performed at a 3 meter test distance with the limits adjusted linearly when required. The frequency range from 30 MHz to over 960 MHz, depending upon the fundamental frequency as stated in Part 15.33a, was automatically scanned and plotted at various angles.

Measurements for the Classroom Response System - Renaissance Receiver were made up to 1400 MHz, in accordance with Section 15.33a for Intentional Radiators with a fundamental frequency of 2480 MHz. For intentional radiators, the frequency range to be investigated is determined by the lowest radio frequency generated by the device without going below 30 MHz, up to at least the tenth harmonic of the highest fundamental frequency or 10 GHz, whichever is lower. At those frequencies where significant signals were detected, measurements were made over the entire frequency range specified in FCC Part 15, Subpart C, Section 15.249 at the open field test site, located at Genoa City, Wisconsin, FCC file number **31040/SIT**. When required, levels were extrapolated from 10 meters to 3 meters using a linear extrapolation.

All signals in the frequency range of 30 MHz to 2000 MHz were measured with a Biconical Antenna or tuned dipoles and from 200 MHz to 1000 MHz, a Log Periodic or Tuned Dipoles were used. From 1000 MHz to 10 GHz Horn Antennas were used. During the test the equipment was rotated and the antenna was raised and lowered from 1 meter to 4 meters to find the maximum level of emissions. In order to find maximum emissions, the cables were moved through all the positions the equipment would be expected to experience in the field. The EUT, peripheral equipment and cables were configured to meet the conditions in ANSI C63.4-2003, Clauses 6 & 8. Tests were made with the receive antenna(s) in both the horizontal and vertical planes of polarization. In each case, the table was rotated to find the maximum emissions.



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## APPENDIX A

### 3.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS (CON'T)

For operation in the bands 902 to 928 MHz, 2400 to 2483.5 MHz, 5725 to 5875 MHz, and 24.0 to 24.25 GHz the field strength of any emissions within this band shall not exceed the field strength levels specified in the following table as stated in FCC, Part 15, Section 15.249(a).

Frequency range in MHz	Field Strength of Fundamental millivolts/meter	Field Strength of Fundamental dBuV/meter	Field Strength of Harmonics microvolts/meter	Field Strength of Harmonics dBuV/meter
902 to 928	50	93.98	500	53.98
2400 to 2483.5	50	93.98	500	53.98
5725 to 5875	50	93.98	500	53.98
24000 to 24250	250	107.96	2500	67.96

Field strength limits are at a distance of 3 meters. The emission limits shown are based on measurement instrumentation employing an average detector.

Emissions radiated outside of the specified frequency bands, except for harmonics are attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

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

#### **NOTE:**

All radiated emissions measurements were made at a test room temperature of **72°F** at **49%** relative humidity.





Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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## APPENDIX A

# **RADIATED DATA TAKEN FOR FUNDAMENTAL, HARMONIC, & RESTRICTED BAND EMISSION MEASUREMENTS**

PART 15.249



Company: Renaissance Learning, Inc.  
 Model Tested: REC-1000  
 Report Number: 11581

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## APPENDIX A

### Radiated Fundamental and Spurious Emissions – 1 GHz to 25 GHz

#### Tested at a 3 Meter Distance

**EUT:** Renaissance Receiver  
**Manufacturer:** Renaissance Learning  
**Operating Condition:** 72 deg F; 51% R.H.  
**Test Site:** Site 2  
**Operator:** Jason Lauer  
**Test Specification:** FCC Part 15.249 and FCC Part 15.205  
**Comment:** Continuous Transmit – Low Channel  
**Date:** 07/27/2005

**Notes:** (1) The EUT was measured in a tabletop set-up.  
 (2) All other emissions at least 20 dB under the limit.

Frequency (MHz)	Measurement Detector	Ant. Pol.	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Height (m)	EUT Angle (deg)	Comment
2405	Max Peak	Vert	52.27	28.26	2.7	83.3	114.00	30.7	1.0	270	Fundamental
2405	Average	Vert	43.60	28.26	2.7	74.6	94.00	19.4	1.0	270	Fundamental
2405	Max Peak	Horz	61.77	28.26	2.7	92.8	114.00	21.2	1.0	160	Fundamental
2405	Average	Horz	53.38	28.26	2.7	84.4	94.00	9.6	1.0	160	Fundamental
4810	Max Peak	Vert	58.22	32.74	-33.1	57.9	74.00	16.1	1.1	200	Res. Band
4810	Average	Vert	46.56	32.74	-33.1	46.2	54.00	7.8	1.1	200	Res. Band
4810	Max Peak	Horz	62.99	32.74	-33.1	62.6	74.00	11.4	1.1	170	Res. Band
4810	Average	Horz	52.03	32.74	-33.1	51.7	54.00	2.3	1.1	170	Res. Band
7215	Max Peak	Vert	49.20	35.54	-31.7	53.0	74.00	21.0	1.1	200	Harmonic
7215	Average	Vert	35.69	35.54	-31.7	39.5	54.00	14.5	1.1	200	Harmonic
7215	Max Peak	Horz	49.93	35.54	-31.7	53.7	74.00	20.3	1.0	90	Harmonic
7215	Average	Horz	36.06	35.54	-31.7	39.9	54.00	14.1	1.0	90	Harmonic
9620	Max Peak	Vert	51.00	37.74	-32.0	56.8	74.00	17.2	1.1	200	Harmonic
9620	Average	Vert	37.16	37.74	-32.0	42.9	54.00	11.1	1.1	200	Harmonic
9620	Max Peak	Horz	50.33	37.74	-32.0	56.1	74.00	17.9	1.1	170	Harmonic
9620	Average	Horz	37.28	37.74	-32.0	43.1	54.00	10.9	1.1	170	Harmonic



Company: Renaissance Learning, Inc.  
 Model Tested: REC-1000  
 Report Number: 11581

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## APPENDIX A

### Radiated Fundamental and Spurious Emissions – 1 GHz to 25 GHz

#### Tested at a 3 Meter Distance

**EUT:** Renaissance Receiver  
**Manufacturer:** Renaissance Learning  
**Operating Condition:** 72 deg F; 51% R.H.  
**Test Site:** Site 2  
**Operator:** Jason Lauer  
**Test Specification:** FCC Part 15.249 and FCC Part 15.205  
**Comment:** Continuous Transmit – Middle Channel  
**Date:** 07/27/2005

**Notes:** (1) The EUT was measured in a tabletop set-up.  
 (2) All other emissions at least 20 dB under the limit.

Frequency (MHz)	Measurement Detector	Ant. Pol.	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Height (m)	EUT Angle (deg)	Comment
2440	Max Peak	Vert	55.26	28.32	2.8	86.7	114.00	27.3	1.2	200	Fundamental
2440	Average	Vert	47.19	28.32	2.8	78.3	94.00	15.7	1.2	200	Fundamental
2440	Max Peak	Horz	60.99	28.32	2.8	92.1	114.00	21.9	1.0	160	Fundamental
2440	Average	Horz	52.51	28.32	2.8	83.6	94.00	10.4	1.0	160	Fundamental
4880	Max Peak	Vert	59.54	32.88	-32.9	59.5	74.00	14.5	1.2	200	Res. Band
4880	Average	Vert	47.93	32.88	-32.9	47.9	54.00	6.1	1.2	200	Res. Band
4880	Max Peak	Horz	59.94	32.88	-32.9	59.9	74.00	14.1	1.2	45	Res. Band
4880	Average	Horz	48.65	32.88	-32.9	48.6	54.00	5.4	1.2	45	Res. Band
7320	Max Peak	Vert	49.64	35.77	-31.6	53.8	74.00	20.2	1.2	180	Harmonic
7320	Average	Vert	36.35	35.77	-31.6	40.5	54.00	13.5	1.2	180	Harmonic
7320	Max Peak	Horz	48.65	35.77	-31.6	52.8	74.00	20.7	1.2	90	Harmonic
7320	Average	Horz	36.04	35.77	-31.6	40.2	54.00	13.8	1.2	90	Harmonic
9760	Max Peak	Vert	50.07	37.87	-31.8	56.2	74.00	17.6	1.2	200	Harmonic
9760	Average	Vert	37.15	37.87	-31.8	43.3	54.00	10.7	1.2	200	Harmonic
9760	Max Peak	Horz	50.07	37.87	-31.8	56.2	74.00	17.8	1.2	45	Harmonic
9760	Average	Horz	37.13	37.87	-31.8	43.2	54.00	10.8	1.2	45	Harmonic



Company: Renaissance Learning, Inc.  
 Model Tested: REC-1000  
 Report Number: 11581

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## APPENDIX A

### Radiated Fundamental and Spurious Emissions – 1 GHz to 25 GHz

#### Tested at a 3 Meter Distance

**EUT:** Renaissance Responder  
**Manufacturer:** Renaissance Learning  
**Operating Condition:** 72 deg F; 51% R.H.  
**Test Site:** Site 2  
**Operator:** Jason Lauer  
**Test Specification:** FCC Part 15.249 and FCC Part 15.205  
**Comment:** Continuous Transmit – High Channel  
**Date:** 07/27/2005

**Notes:** (1) The EUT was measured in a tabletop set-up.  
 (2) All other emissions at least 20 dB under the limit.

Frequency (MHz)	Measurement Detector	Ant. Pol.	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Height (m)	EUT Angle (deg)	Comment
2480	Max Peak	Vert	51.62	28.40	2.8	82.8	114.00	31.2	1.2	180	Fundamental
2480	Average	Vert	42.56	28.40	2.8	73.8	94.00	20.2	1.2	180	Fundamental
2480	Max Peak	Horz	60.07	28.40	2.8	91.3	114.00	22.7	1.0	160	Fundamental
2480	Average	Horz	51.68	28.40	2.8	82.9	94.00	11.1	1.0	160	Fundamental
4960	Max Peak	Vert	60.46	33.06	-32.8	60.8	74.00	13.2	1.2	200	Res. Band
4960	Average	Vert	48.19	33.06	-32.8	48.5	54.00	5.5	1.2	200	Res. Band
4960	Max Peak	Horz	62.58	33.06	-32.8	62.9	74.00	11.1	1.1	90	Res. Band
4960	Average	Horz	51.46	33.06	-32.8	51.8	54.00	2.2	1.1	90	Res. Band
7440	Max Peak	Vert	49.34	36.04	-31.7	53.7	74.00	20.3	1.2	90	Harmonic
7440	Average	Vert	35.98	36.04	-31.7	40.3	54.00	13.7	1.2	90	Harmonic
7440	Max Peak	Horz	48.91	36.04	-31.7	53.2	74.00	20.8	1.1	90	Harmonic
7440	Average	Horz	35.99	36.04	-31.7	40.3	54.00	13.7	1.1	90	Harmonic
9920	Max Peak	Vert	50.07	38.01	-31.5	56.6	74.00	17.4	1.2	200	Harmonic
9920	Average	Vert	36.57	38.01	-31.5	43.1	54.00	10.9	1.2	200	Harmonic
9920	Max Peak	Horz	49.93	38.01	-31.5	56.5	74.00	17.5	1.1	90	Harmonic
9920	Average	Horz	36.54	38.01	-31.5	43.1	54.00	10.9	1.1	90	Harmonic



Company: Renaissance Learning, Inc.  
Model Tested: REC-1000  
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## APPENDIX A

# **RADIATED DATA AND GRAPH(S) TAKEN FOR**

## **FIELD STRENGTH**

## **SPURIOUS EMISSION MEASUREMENTS**

### **PART 15.209**