

Underwriters Laboratories Inc.  
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**Report of Measurements  
of Electromagnetic Compatibility Testing**

Test Report File No.: **NC2219** Date of issue: 11/5/02  
Applicant: Lutron Electronics Co. Inc.  
Model: HRD-5KP  
Product Type: Wireless Wall Keypad  
Power Supply: 120Vac, 60Hz  
Manufacturer: Same As Applicant  
License holder: Same As Applicant  
Address: 7200 Sutron Road  
Coopersburg, PA 18036  
Test Type:  **Compliance Investigation**  
 **Manufacturer's Specification**  
Test Project Number: 02ME20017  
References(s): FCC ID: JPZ0020

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## 1.0 G E N E R A L - Product Description

**Device Function:** The HRD-5KP is a wall-mounted keypad. It contains a FM transceiver and an antenna, which is not accessible to the user. It is used as part of an integrated lighting control system. The purpose of the RF communication is to transmit and receive command signals. Transmitted commands allow the triggering of system events. Received commands allow for updating of control indicator status.

**RF Function:** The receiver down converts a 431-437MHz-carrier frequency using a 420.3-426.3MHz voltage-controlled oscillator producing a 10.7MHz IF signal. The signal is further processed to decode data. The transmitter uses the voltage-controlled oscillator, which is frequency modulated, and power amplifier to produce the modulated carrier. The HRD-5KP contains a micro controller running at 32MHz to ensure that all transmissions stop within 5 seconds of a button release or within 5 seconds on the beginning of a transmission. A transmission shall automatically cease within 5 seconds after activation. The ceasing of the transmission is accomplished via the micro controller. Modulation is FM, sometimes referred to as Frequency Shift Keyed (FSK), data at 62.5kbps. The antenna is permanently attached and cannot be modified or replaced by the user since it is underneath the plastic enclosure, which is secured by several odd screws, unit labels that prevent the plastic from being pried open, and plastic snap features.

**Analog Function:** The HRD-5KP obtains power through standard household wiring. The power supply and voltage regulator produces a 5Vdc output, which is used to power all analog and micro controller activities.

## 1.1 Device Configuration During Test

The device under test was tested in normal orientation that represents the worst-case orientation.

The device was tested in two modes of operation:

1. Continuously transmitting an intentional radio frequency in Continuous Wave (CW).
2. Standby mode (Receive). The device is waiting to receive a signal source.

The manufacturer configured the device.

The device was powered with 120VAC, 60Hz.

Device	Manufacturer	Model Number	Serial Number	FCC ID
Wireless Wall Keypad	Lutron	HRD-5KP	N/A	JPZ0020
Cable	-----	Standard wire gauge	-----	-----

"The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report"

## 1.2 Deviations from ANSI C63.4

Not applicable, the ANSI C63.4 test measurements procedures were employed.

As described below:

### 1.3 Device Modifications Necessary for Compliance

N/A

As described below:

### 1.4 Test Summary

Test	Basic Standard	Considered	Tested	In Compliance
Conducted Voltage Emissions (Continuous Data Transmit Mode)	FCC Part 15 Subpart B, Class B. Paragraph 15.205	✓	✓	✓
Radiated Emissions	FCC Part 15 Subpart C, Class B, Intentional Radiators, Paragraph 15.209	✓	✓	✓
Radiated Emissions	FCC Part 15 Subpart B, Class B, Un-Intentional Radiators, Paragraph 15.109	✓	✓	✓
Cease Operation < 5 seconds	FCC Part 15 Subpart C, Paragraph 15.231	✓	✓	✓
Occupied Bandwidth	FCC Part 15 Subpart C, Paragraph 15.231	✓	✓	✓

## **2.0 EMISSIONS TEST REGULATIONS**

FCC Part 15, Subpart B, Paragraph 15.107 & 15.109  
FCC Part 15 Subpart C, Paragraph 15.205, 15.207, 15.209 & 15.231

### **2.1 EUT OPERATION MODE - EMISSIONS TESTS**

- Standby
- Test program (H-Pattern)
- Test program (color bar)
- Test program (customer specific)
- Practice operation
- Normal operation Mode:
- As per manufacturer's instructions: Continuous Data Transmit for Conducted Emissions, Constant (Continuous) Wave Transmit and Receive modes for all other tests

File Number: NC2219  
Project Number: 02ME20017  
Model Number: HRD-5KP  
FCC ID: JPZ0020

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## 2.1.1 Conducted Emissions Tests

**Test Applicable**       **Test Not Applicable**

Temperature:                      21.1°C  
Humidity:                         40%RH  
Pressure:                         1035milbar  
Date test performed:         18 Oct 02

Mode: "Continuous Data Transmit" @ 437 MHz was determined worst-case emissions.

**Frequency range on each side of line.**

**Measurement Point**

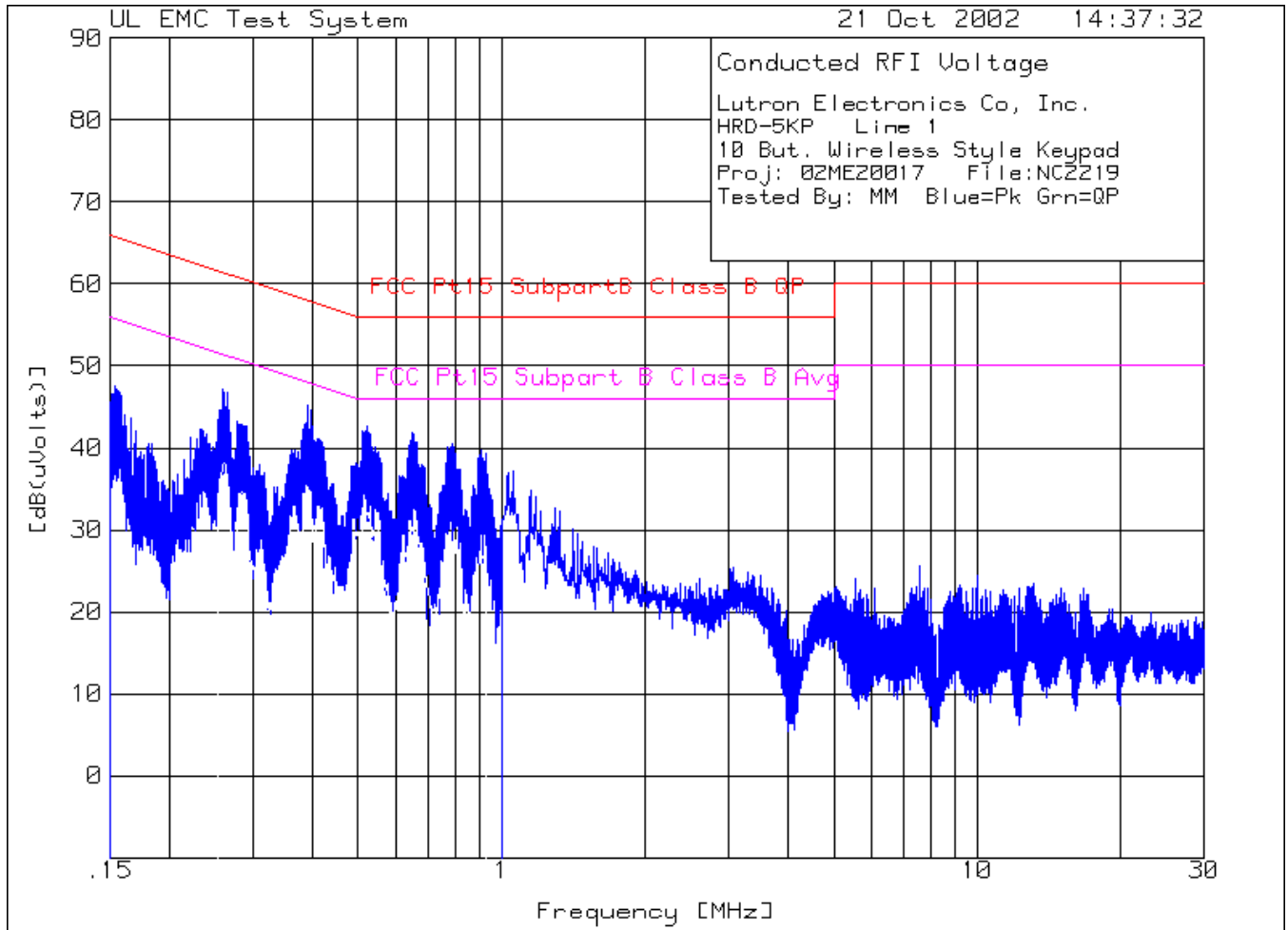
150kHz to 30MHz       Voltage  Current       Mains       I/O Lines

**Test equipment used for conducted emissions:**

**ES126**                      **Rhode & Schwartz**      **EMI Receiver**                      **Equipment No.: ME5B-081**  
Range: 150KHz – 30MHz Last Calibration Date: 20 August 02 Calibration Due Date: 20 August 03

**Test Accessories for Conducted Emissions:**

<input checked="" type="checkbox"/> <b>11947A</b>	<b>Hewlett Packard</b>	<b>Transient Limiter</b>	<b>Equipment No.: ME5A-443</b>
Last Calibration Date: 16 Jan 02		Calibration Due Date: 16 Jan 03	
<input checked="" type="checkbox"/> <b>9252-50-R-24-BNC</b>	<b>Solar Electronics</b>	<b>LISN</b>	<b>Equipment No.: ME5A-637</b>
Last Calibration Date: 4 April 02		Calibration Due Date: 4 April 03	
<input checked="" type="checkbox"/> <b>Temp/Pressure</b>	<b>Oakton</b>	<b>Barometer</b>	<b>Equipment No.: ME4-263</b>
Range: 950-1045	Last Calibration Date: 2 April 02	Calibration Due Date: 2 April 03	
<input checked="" type="checkbox"/> <b>453320</b>	<b>Ex-Tech</b>	<b>Hydro-Thermometer</b>	<b>Equipment No.: ME4-264</b>
Range:0-80%	Last Calibration Date: 2 April 02	Calibration Due Date: 2 April 03	



Transmit at 437 MHz



File Number: NC2219  
 Project Number: 02ME20017  
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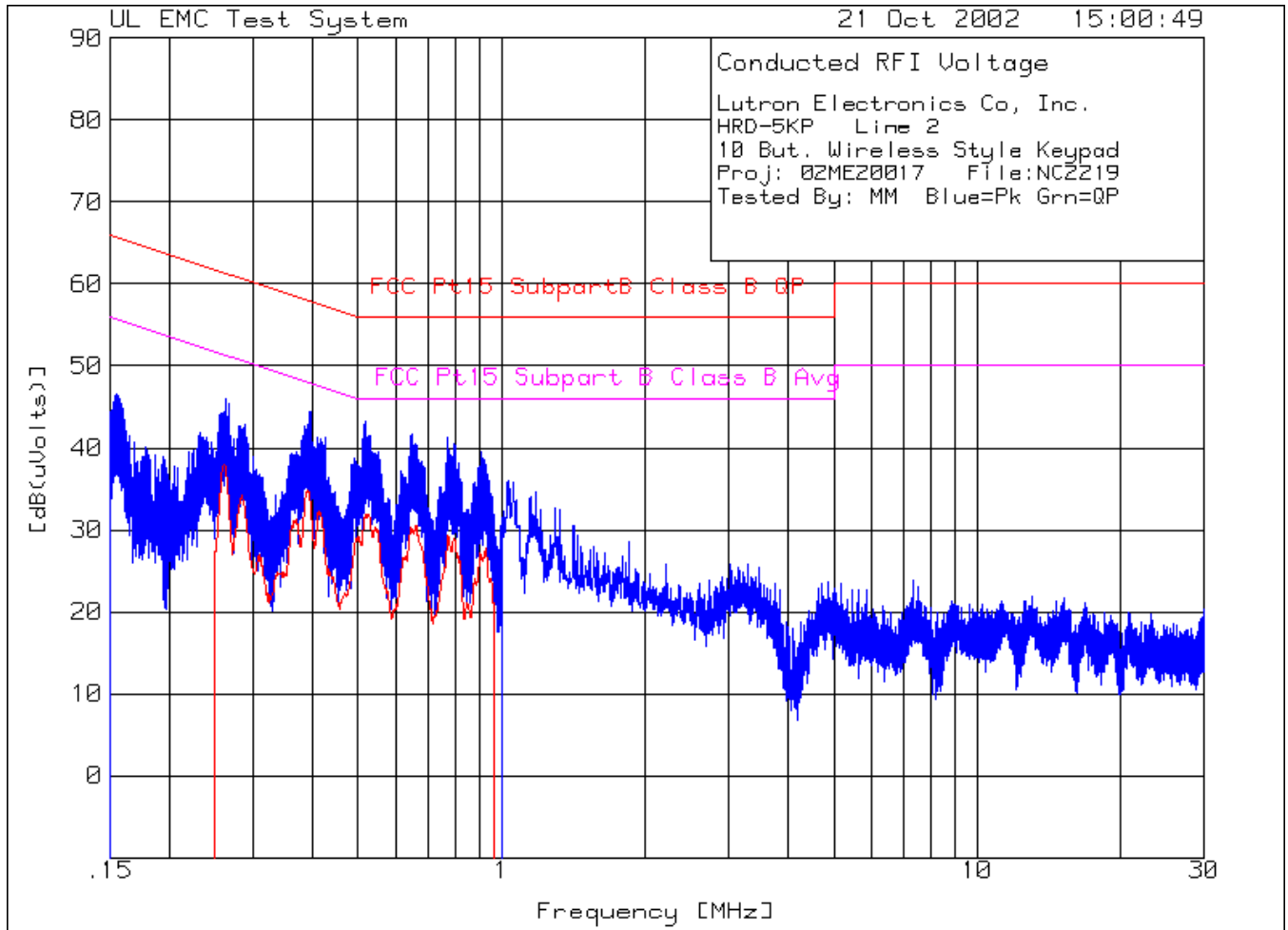
Issued: 11/5/02

Lutron Electronics Co, Inc.  
 HRD-5KP Line 1  
 10 But. Wireless Style Keypad  
 Proj: 02ME20017 File:NC2219  
 Tested By: MM Blue=Pk Grn=QP

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB (uVolts)]	Limit:1	2
=====							
Range: 1 .15 - 1MHz -----							
1	.2607	27.9 avem	10.3	0	38.2	61.4	51.4
				Margin [dB]		-23.2	-13.2
2	.2857	24.31 avem	10.3	0	34.61	60.6	50.6
				Margin [dB]		-25.99	-15.99
3	.3897	24.6 avem	10.3	0	34.9	58.1	48.1
				Margin [dB]		-23.2	-13.2
4	.5237	21.83 avem	10.3	0	32.13	56	46
				Margin [dB]		-23.87	-13.87
5	.6627	20.2 avem	10.3	0	30.5	56	46
				Margin [dB]		-25.5	-15.5
6	.7947	19.15 avem	10.3	0	29.45	56	46
				Margin [dB]		-26.55	-16.55

LIMIT 1: FCC Pt15 SubpartB Class B QP  
 LIMIT 2: FCC Pt15 Subpart B Class B Avg  
 LIMIT 3: NONE  
 LIMIT 4: NONE  
 LIMIT 5: NONE  
 LIMIT 6: NONE

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 avem - denotes EMI average detection  
 tm - Trace Math Result



Transmit at 437MHz

File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

Issued: 11/5/02

Lutron Electronics Co, Inc.  
 HRD-5KP Line 2  
 10 But. Wireless Style Keypad  
 Proj: 02ME20017 File:NC2219  
 Tested By: MM Blue=Pk Grn=QP

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB (uVolts)]	Limit:1	2
=====							
Range: 1 .15 - 1MHz -----							
1	.2608	27.64	avem	10.3	0	37.94	61.4
					Margin [dB]	-23.46	-13.46
2	.3918	24.42	avem	10.3	0	34.72	58
					Margin [dB]	-23.28	-13.28
3	.5198	21.57	avem	10.3	0	31.87	56
					Margin [dB]	-24.13	-14.13
4	.6628	20.21	avem	10.3	0	30.51	56
					Margin [dB]	-25.49	-15.49
5	.7728	19.02	avem	10.3	0	29.32	56
					Margin [dB]	-26.68	-16.68
6	.9268	17.4	avem	10.3	0	27.7	56
					Margin [dB]	-28.3	-18.3

LIMIT 1: FCC Pt15 SubpartB Class B QP  
 LIMIT 2: FCC Pt15 Subpart B Class B Avg

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 avem - denotes EMI average detection  
 tm - Trace Math Result



Conducted Emission Test Set-Up 0.150 to 30MHz

## 2.1.2 Cease Operation Within 5 Seconds

Test Applicable       Test Not Applicable

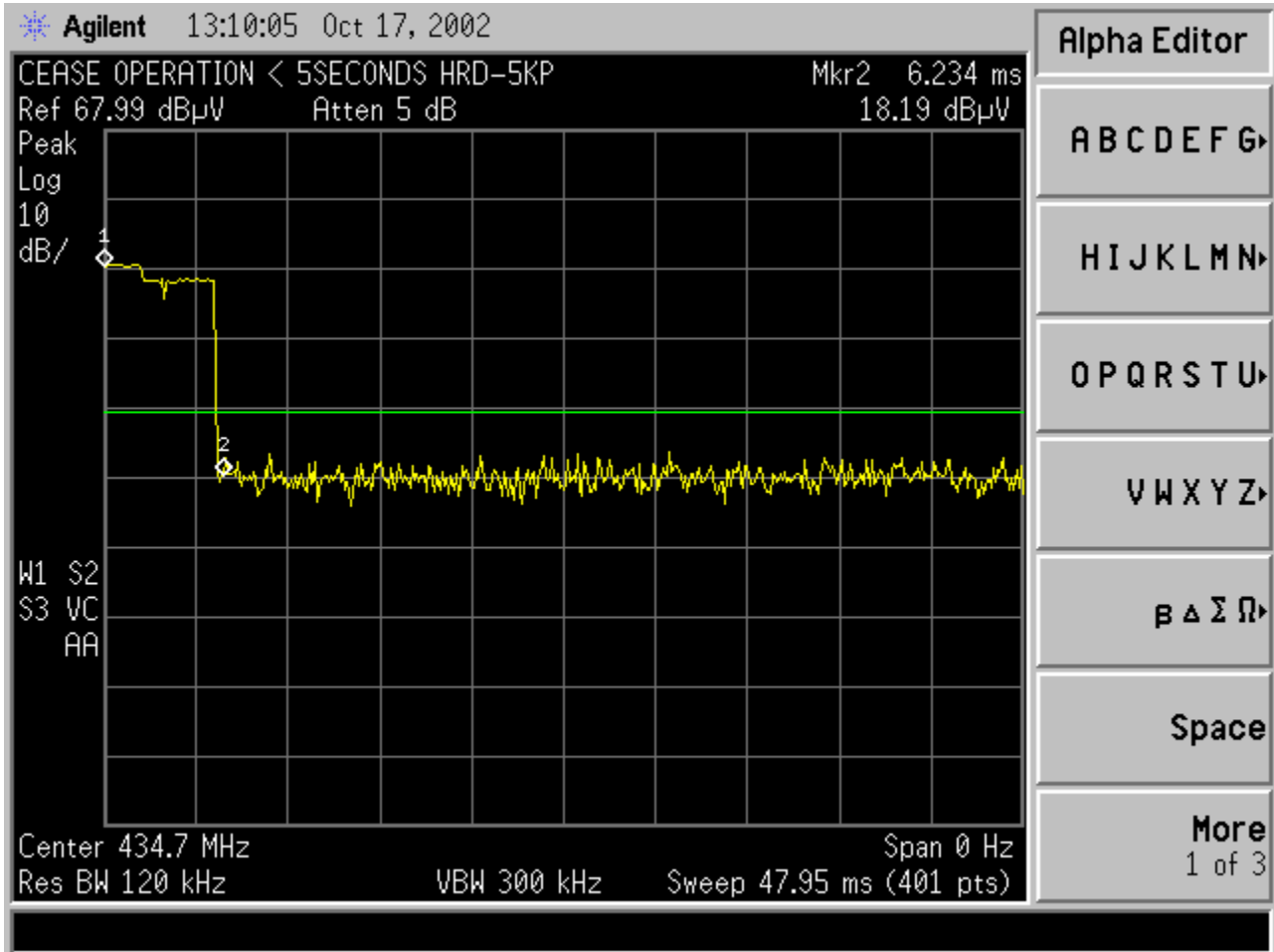
Temperature:                      21.2°C  
Humidity:                         42%RH  
Pressure:                         1025 milbar  
Date test performed:         17 October 2002

Test Procedure:

This test is performed one time at any frequency band. A manual operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

<b>E7402A</b>	<b>Agilent</b>	<b>EMC Analyzer</b>	<b>Equipment No.: 5B-123</b>
Last Calibration Date: 17 Sept. 2002		Calibration Due Date: 17 September 2003	
<input checked="" type="checkbox"/> <b>Temp/Pressure</b>	<b>Oakton</b>	<b>Barometer</b>	<b>Equipment No.: ME4-263</b>
Range:950-1045	Last Calibration Date: 2 April 02	Calibration Due Date:2 April 03	
<input checked="" type="checkbox"/> <b>45320</b>	<b>Ex-Tech</b>	<b>Hydro-Thermometer</b>	<b>Equipment No.: ME4-264</b>
Range:0-80%	Last Calibration Date:2 April 02	Calibration Due Date:2 April 03	



HRD-5KP < 5 Seconds (total activation time 6.234ms)

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Project Number: 02ME20017  
Model Number: HRD-5KP  
FCC ID: JPZ0020

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Test Set-Up Cease Operation < 5 seconds

### 2.1.3 Radiated Emissions Test (10 Meter Semi-Anechoic Chamber)

Test Applicable       Test Not Applicable

Temperature:                      22.1°C  
Humidity:                         44%RH  
Pressure:                         1030milbar  
Date test performed:         16 Oct. 2002

The EUT (equipment under test) was tested in 3 orthogonal axes and the orientation depicted in the Radiated Emission test set-up was deemed worst case.

Mode: "Constant Wave Transmit"

Measurement distance:         3 intentional Radiator    10 meters un-intentional radiator

Frequency Range:

30MHz - 5000MHz

Electric Intentional @ low band 431MHz & High band 437MHz

30MHz - 2000MHz

Electric Unintentional @ low band 431MHz & High band 437MHz

#### Paragraph 15.35 :

When the Radiated Limits are expressed in terms of the average value of the emissions, and pulse operation is employed, the pulse measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds (100ms) or in cases where the pulse train exceeds 0.1seconds the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.



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Model Number: HRD-5KP  
FCC ID: JPZ0020

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**Test equipment used for final radiated emissions tests:**

**HP 8574A**                      **Hewlett-Packard**                      **EMI Receiver,**                      **Equipment No.: ME5A-461**  
Range:30-1000MHz      Last Calibration Date:25 Jan 02                      Calibration Due Date: 25 Jan 03

**Consisting of:**

<b>HP - 8566B</b>	<b>Hewlett-Packard</b>	<b>Spectrum Analyzer,</b>
<b>Resolution BW:</b>	<b>100kHz</b>	<b>9kHz to 30 MHz</b>
	<b>1MHz</b>	<b>30MHz to 1000 MHz</b>
<b>Video BW:</b>	<b>100kHz</b>	<b>9kHz to 30 MHz</b>
	<b>1MHz</b>	<b>30MHz TO 1000MHz</b>
<b>HP - 85662A</b>	<b>Hewlett-Packard</b>	<b>Analyzer Display</b>
<b>HP - 85650A</b>	<b>Hewlett-Packard</b>	<b>Quasi-Peak Adapter,</b>
<b>Quasi Peak BW:</b>	<b>200Hz</b>	<b>9kHz to 150kHz</b>
	<b>9kHz</b>	<b>150kHz to 30MHz</b>
	<b>120kHz</b>	<b>30 to 1000 MHz</b>
<b>HP - 85685A</b>	<b>Hewlett-Packard</b>	<b>Preselector</b>

**For Measurements above 1GHz:**

**HP - 8566B**                      **Hewlett-Packard**                      **Spectrum Analyzer,**                      **Equipment No.: ME5A-461**  
**Resolution BW: 1MHz**  
**Video BW: 1MHz**

Range: 1- 2 GHz      Last Calibration Date:30 April 02      Calibration Due Date: 30 April 03

**HP - 85662A**                      **Hewlett-Packard**                      **Analyzer Display**                      **Equipment No. ME5A-461**  
Last Calibration Date:30 April 02                      Calibration Due Date: 30 April 03

**Test Accessories for Radiated Emissions:**

**94455-1**                      **Ailtech**                      **Biconnical Antenna**                      **Equipment No.: ME5-439**  
Last Calibration Date:16 Oct 02                      Calibration Due Date: 16 Oct 03

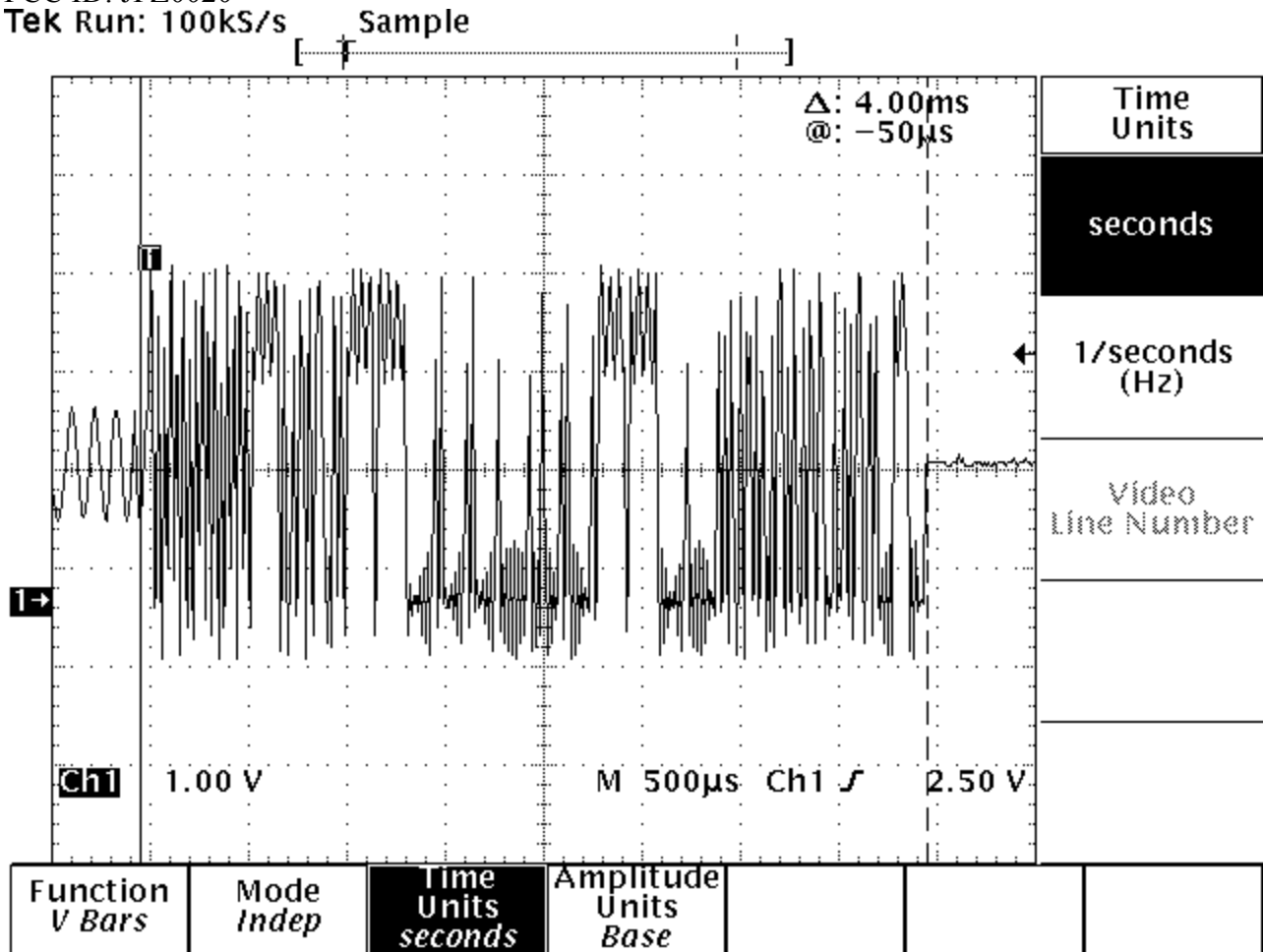
**3146**                      **EMCO**                      **Log Periodic Antenna**                      **Equipment No.: ME5-451**  
Last Calibration Date:15 Oct 02                      Calibration Due Date: 15 Oct 03

**Temp/Pressure**                      **Oakton**                      **Barometer**                      **Equipment No.: ME4-263**  
Range:950-1045      Last Calibration Date: 2 April 02                      Calibration Due Date:2 April 03

**453320**                      **Ex-Tech**                      **Hydro-Thermometer**                      **Equipment No.: ME4-264**  
Range:0-80%      Last Calibration Date:2 April 02                      Calibration Due Date:2 April

File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020  
 Tek Run: 100kS/s

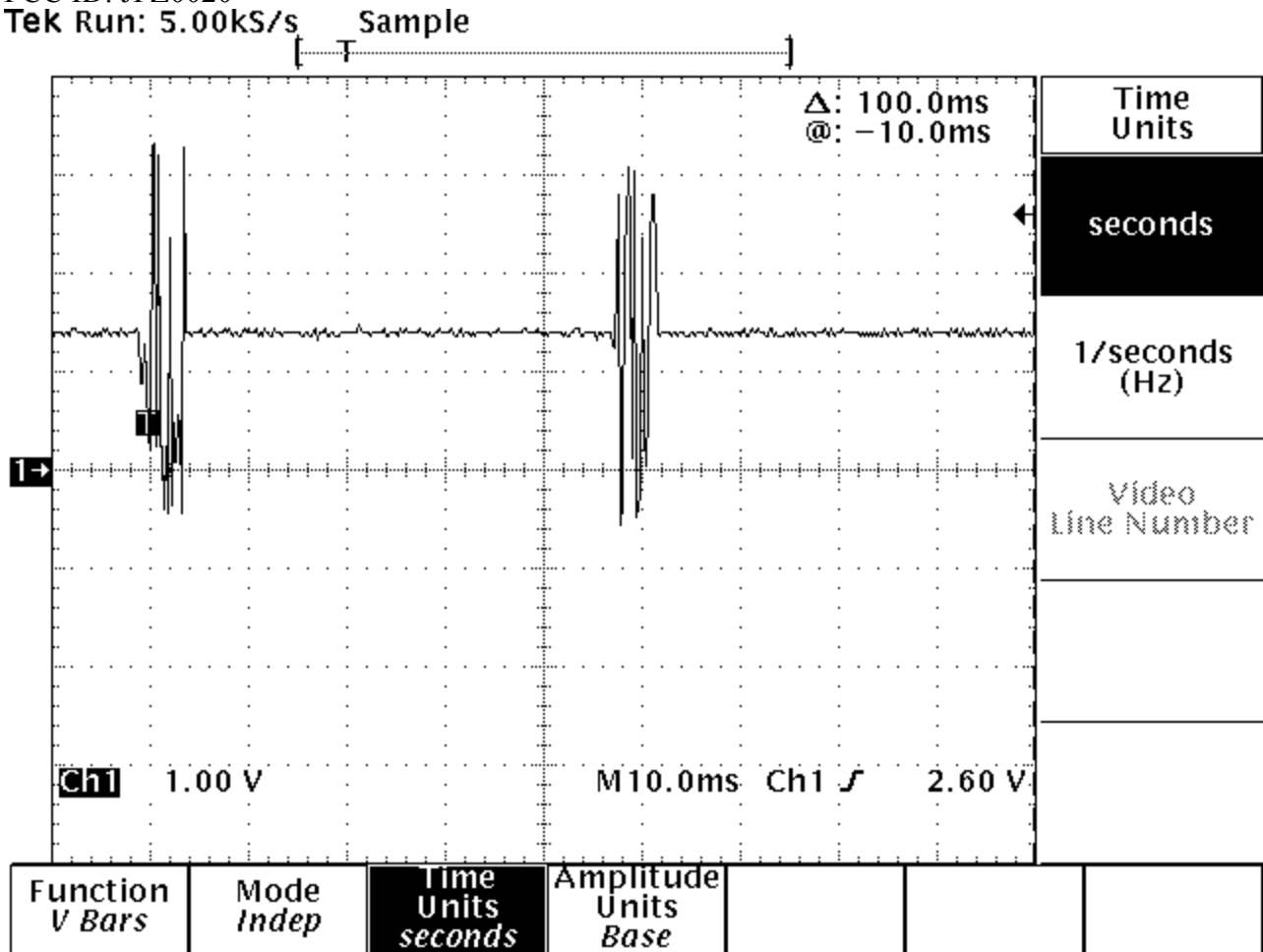
Issued: 11/5/02



HRD -5KP One Complete Pulse Train 8ms expanded view profile

File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020  
 Tek Run: 5.00kS/s

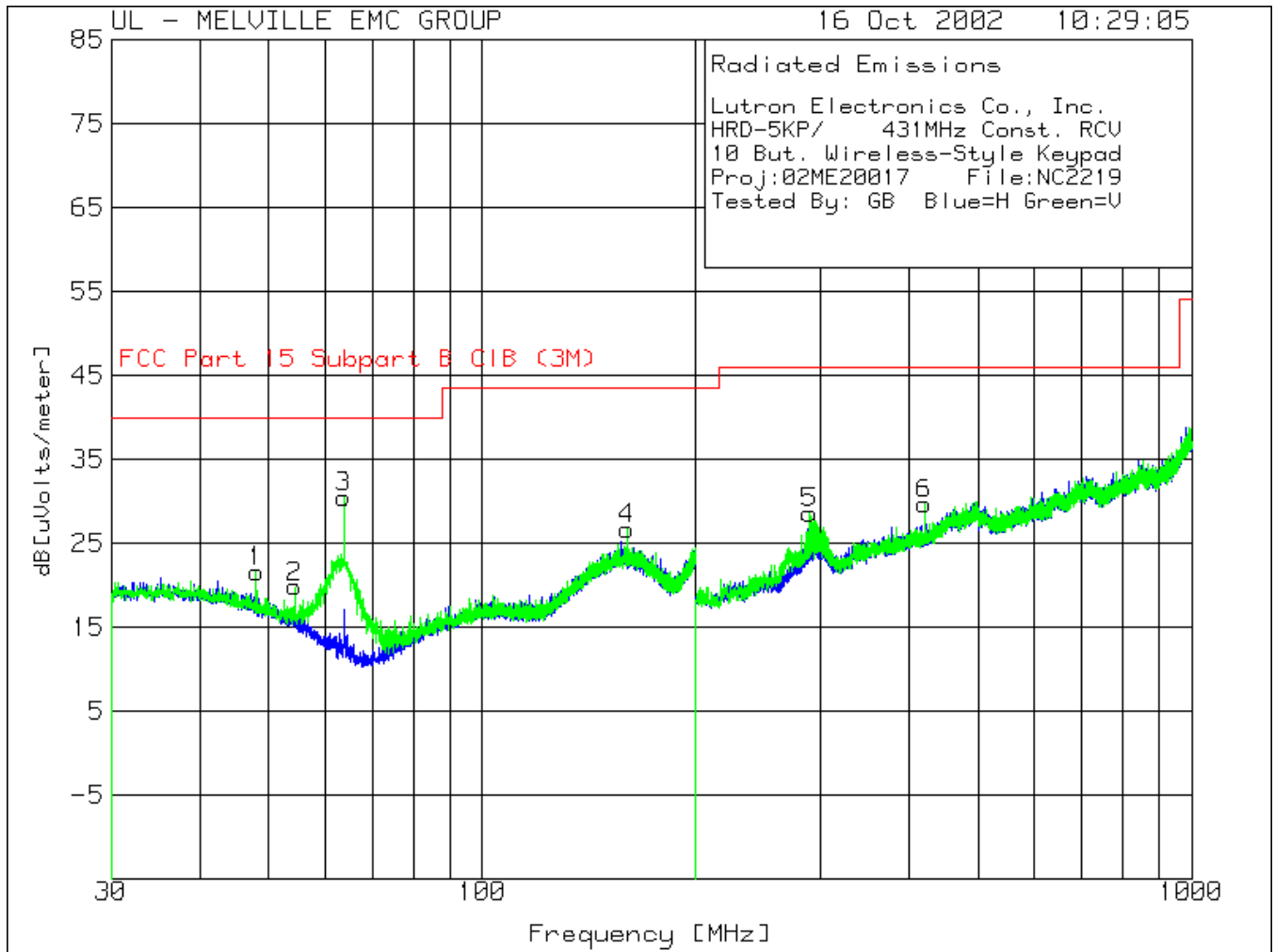
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HRD-5KP One Complete Pulse Train < 100ms wide profile



Pulse Train Test Set-Up



File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

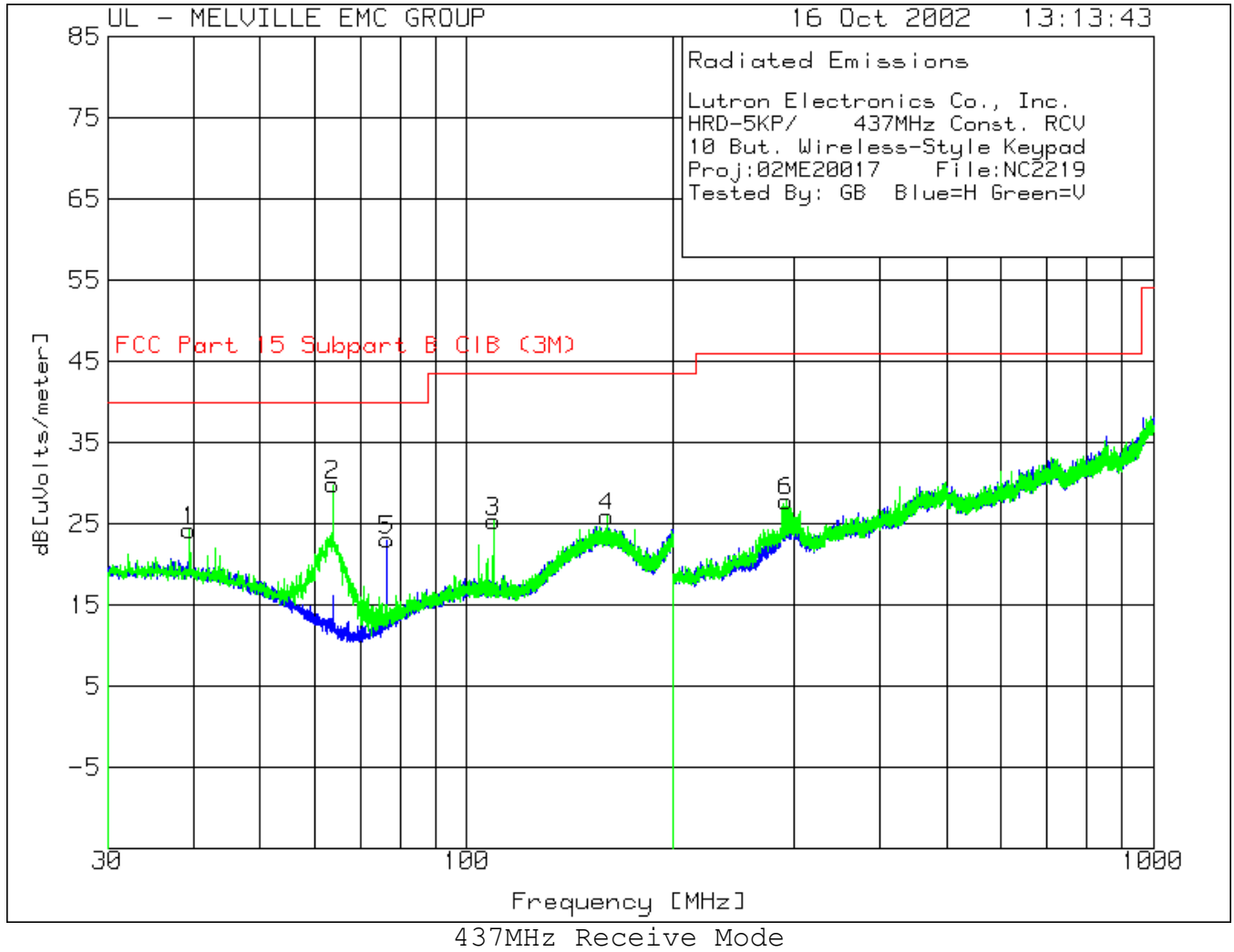
Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP/ 431MHz Const. RCV  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB [uVolts/meter]	Limit:1
Range: 2 30 - 200MHz -----						
1	48.0065	8.39 pk	1.01	12.2	21.6	40
	Azimuth:258	Height:100	Vert	Margin [dB]		-18.4
2	54.3767	8.45 pk	1.05	10.3	19.8	40
	Azimuth:309	Height:100	Vert	Margin [dB]		-20.2
3	63.8046	22.78 pk	1.12	6.6	30.5	40
	Azimuth:105	Height:100	Vert	Margin [dB]		-9.5
4	159.9525	8 pk	1.8	16.9	26.7	43.5
	Azimuth:0	Height:100	Vert	Margin [dB]		-16.8
Range: 4 200 - 1000MHz -----						
5	289.3922	10.53 pk	2.29	15.78	28.6	46
	Azimuth:330	Height:100	Vert	Margin [dB]		-17.4
6	420.0833	10.5 pk	3.1	16.1	29.7	46
	Azimuth:340	Height:100	Vert	Margin [dB]		-16.3

LIMIT 1: FCC Part 15 Subpart B ClB (3M)  
 LIMIT 2: NONE  
 LIMIT 3: NONE  
 LIMIT 4: NONE  
 LIMIT 5: NONE  
 LIMIT 6: NONE

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result



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 Model Number: HRD-5KP  
 FCC ID: JPZ0020

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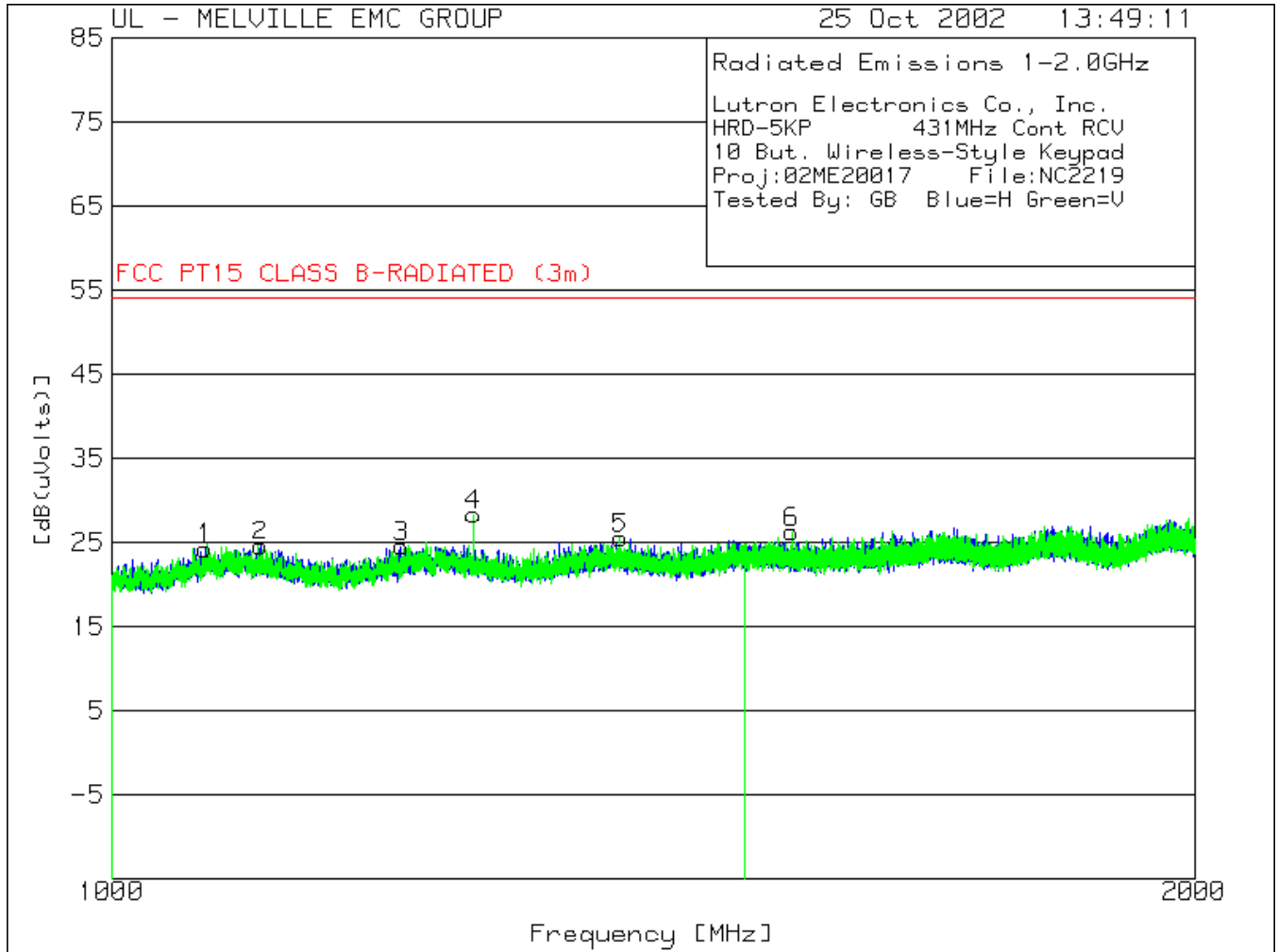
Lutron Electronics Co., Inc.  
 HRD-5KP/ 437MHz Const. RCV  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1
-----						
Range: 1 30 - 200MHz -----						
5	76.5026	14.42 pk	1.25	7.33	23	40
	Azimuth:242	Height:200	Horz	Margin [dB]		-17
-----						
Range: 2 30 - 200MHz -----						
1	39.4279	9.5 pk	.9	13.8	24.2	40
	Azimuth:255	Height:101	Vert	Margin [dB]		-15.8
2	63.7622	22.08 pk	1.12	6.6	29.8	40
	Azimuth:204	Height:101	Vert	Margin [dB]		-10.2
3	109.2456	12.83 pk	1.46	11.01	25.3	43.5
	Azimuth:20	Height:101	Vert	Margin [dB]		-18.2
4	159.9525	7.2 pk	1.8	16.9	25.9	43.5
	Azimuth:306	Height:101	Vert	Margin [dB]		-17.6
-----						
Range: 4 200 - 1000MHz -----						
6	292.0566	9.51 pk	2.29	16	27.8	46
	Azimuth:90	Height:101	Vert	Margin [dB]		-18.2

LIMIT 1: FCC Part 15 Subpart B ClB (3M)  
 LIMIT 2: NONE  
 LIMIT 3: NONE  
 LIMIT 4: NONE  
 LIMIT 5: NONE  
 LIMIT 6: NONE

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result





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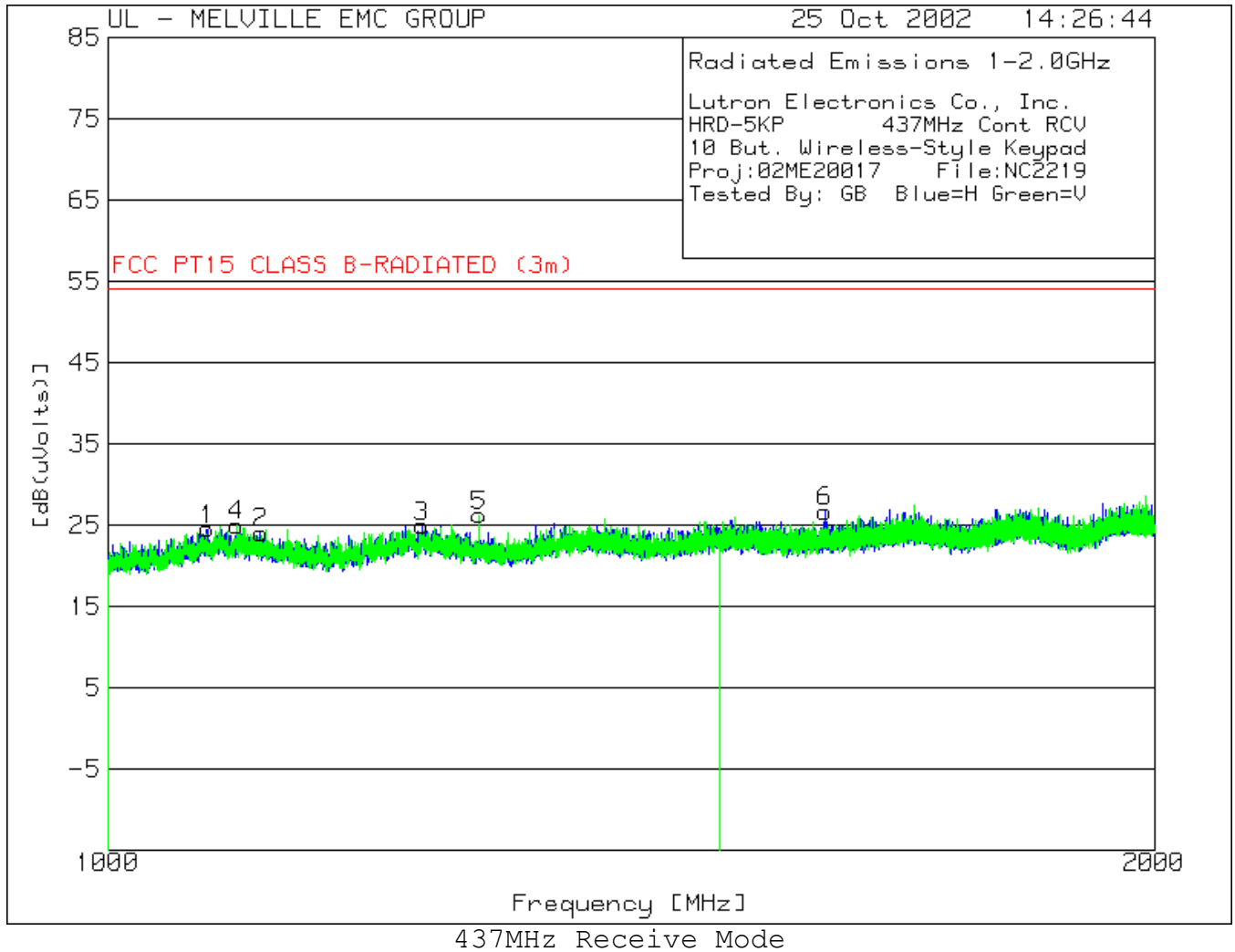
Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP 431MHz Cont RCV  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1
-----						
Range: 1 1000 - 1500MHz -----						
1	1061.699	32.71 pk	-33.53	25.12	24.3	54
	Azimuth:352	Height:200	Horz	Margin [dB]		-29.7
2	1100.167	32.77 pk	-33.43	25.26	24.6	54
	Azimuth:33	Height:101	Horz	Margin [dB]		-29.4
3	1203.497	32.02 pk	-33.15	25.63	24.5	54
	Azimuth:156	Height:200	Horz	Margin [dB]		-29.5
-----						
Range: 3 1000 - 1500MHz -----						
4	1260.866	35.46 pk	-33	25.84	28.3	54
	Azimuth:167	Height:100	Vert	Margin [dB]		-25.7
5	1384.679	31.88 pk	-32.66	26.28	25.5	54
	Azimuth:16	Height:100	Vert	Margin [dB]		-28.5
-----						
Range: 4 1500 - 2000MHz -----						
6	1545.523	31.5 pk	-32.2	26.9	26.2	54
	Azimuth:102	Height:200	Vert	Margin [dB]		-27.8

LIMIT 1: FCC PT15 CLASS B-RADIATED (3m)  
 LIMIT 2: NONE  
 LIMIT 3: NONE  
 LIMIT 4: NONE  
 LIMIT 5: NONE  
 LIMIT 6: NONE

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result



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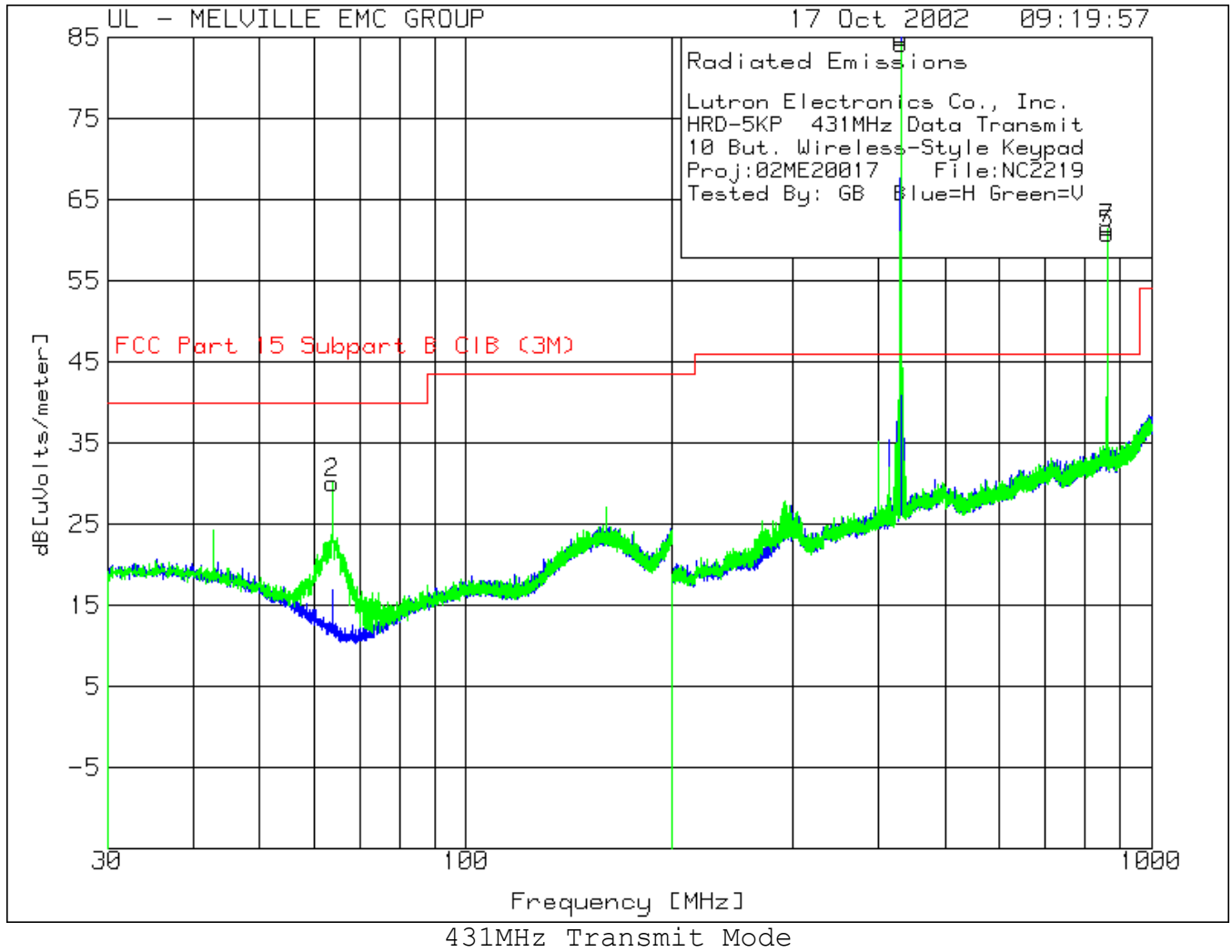
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 HRD-5KP 437MHz Cont RCV  
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 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1
-----						
Range: 1 1000 - 1500MHz -----						
1	1068.193	32.87 pk	-33.52	25.15	24.5	54
	Azimuth:355	Height:199	Horz	Margin [dB]		-29.5
2	1106.411	32.23 pk	-33.41	25.28	24.1	54
	Azimuth:33	Height:100	Horz	Margin [dB]		-29.9
3	1231.474	32.25 pk	-33.08	25.73	24.9	54
	Azimuth:223	Height:199	Horz	Margin [dB]		-29.1
-----						
Range: 2 1500 - 2000MHz -----						
6	1608.468	31.52 pk	-32	27.18	26.7	54
	Azimuth:137	Height:200	Horz	Margin [dB]		-27.3
-----						
Range: 3 1000 - 1500MHz -----						
4	1089.176	33.24 pk	-33.46	25.22	25	54
	Azimuth:103	Height:100	Vert	Margin [dB]		-29
5	1278.768	33.25 pk	-32.95	25.9	26.2	54
	Azimuth:183	Height:100	Vert	Margin [dB]		-27.8

LIMIT 1: FCC PT15 CLASS B-RADIATED (3m)  
 LIMIT 2: NONE  
 LIMIT 3: NONE  
 LIMIT 4: NONE  
 LIMIT 5: NONE  
 LIMIT 6: NONE

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result



File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP 431MHz Data Transmit  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level	Limit:1 dB[uVolts/meter]	Limit2
-----							
Range: 2 30 - 200MHz -----							
2	63.8896	22.4 pk	1.12	6.58	30.1	N/A	40
	Azimuth:96	Height:100	Vert	Margin [dB]			-9.9
-----							
Range: 3 200 - 1000MHz -----							
4	430.8743	65.29 pk	3.17	16.44	84.9	80.7	
	Azimuth:358	Height:199	Horz	Margin [dB]		4.2	
5	861.3156	33.26 pk	4.41	23.13	60.8	60.7	
	Azimuth:341	Height:100	Horz	Margin [dB]		0.1	
-----							
Range: 4 200 - 1000MHz -----							
6	430.741	64.6 pk	3.16	16.44	84.2	80.7	
	Azimuth:201	Height:200	Vert	Margin [dB]		3.5	
7	861.3156	33.96 pk	4.41	23.13	61.5	60.7	
	Azimuth:287	Height:100	Vert	Margin [dB]		0.8	

LIMIT 1: FCC Part 15 Subpart C-Section 15.231  
 LIMIT 2: FCC Part 15 Subpart B ClB (3M)

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result

File Number: NC2219  
Project Number: 02ME20017  
Model Number: HRD-5KP  
FCC ID: JPZ0020

Issued: 11/5/02

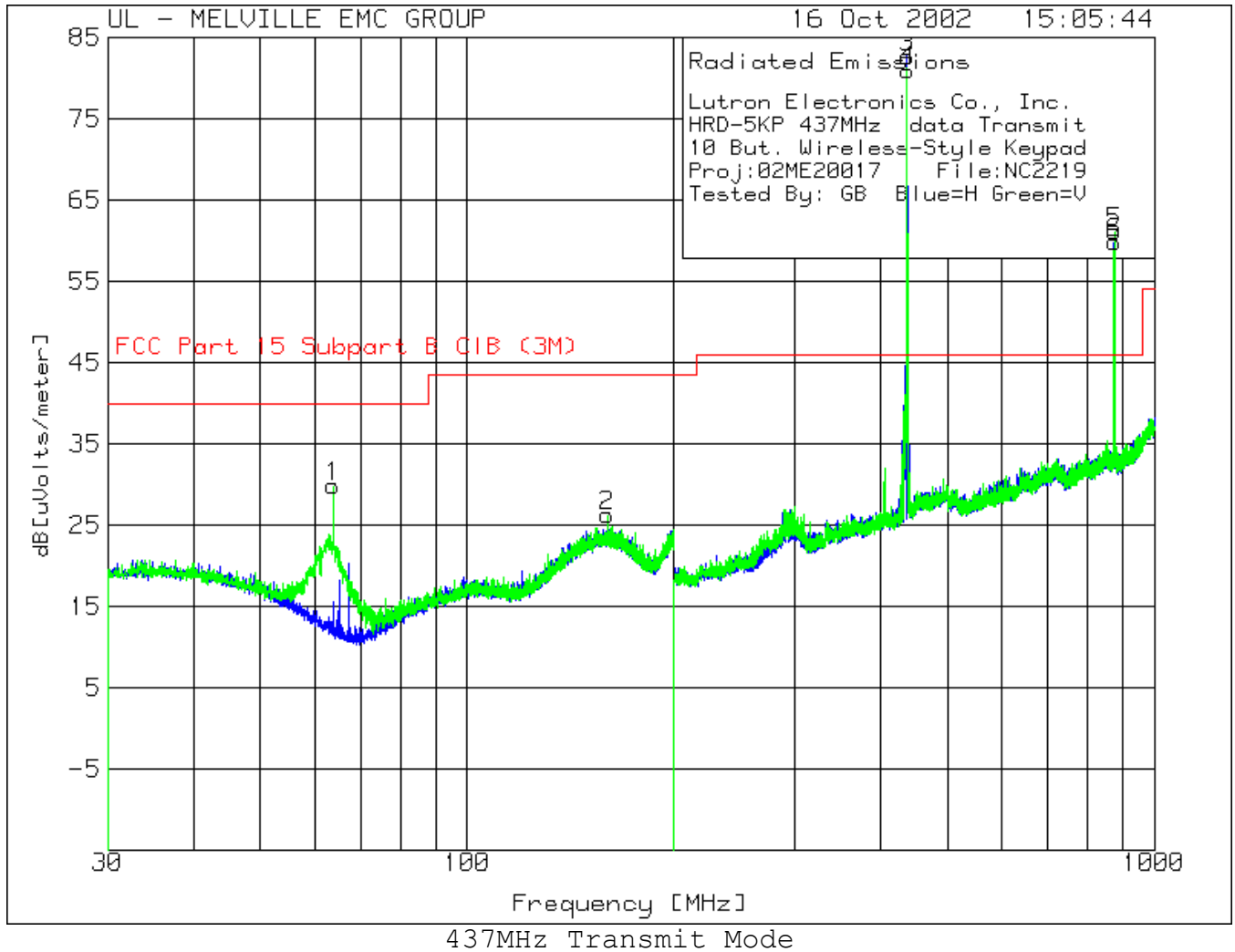
Lutron Electronics Co., Inc.  
HRD-5KP 431MHz Data Transmit  
10 But. Wireless-Style Keypad  
Proj:02ME20017 File:NC2219  
Tested By: GB Blue=H Green=V

Test	Meter	Gain/Loss	Transducer	Level	Limit:1	Limit2
Frequency [MHz]	Reading [dB(uV)]	Factor [dB]	Factor [dB]	dB[uVolts/meter]		
=====						
Range: 3 200 - 1000MHz						
430.9904	*44.67 av	3.17	16.45	*64.29	80.7	
Azimuth: 60	Height:102	Horz		Margin [dB]:	-16.41	
861.9887	32.39 av	4.41	23.1	59.9	60.7	
Azimuth: 80	Height:119	Horz		Margin [dB]:	-0.8	

LIMIT 1: FCC Part 15 Subpart C-Section 15.231  
LIMIT 2: FCC Part 15 Subpart B ClB (3M)

pk - Peak detector  
qp - Quasi-Peak detector  
av - Average detector  
avlg - Average log detector

**\* Duty Cycle correction factor of -21.9 added to Average level.**





File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP 437MHz data Transmit  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level	Limit:1	Limit2
Range: 2 30 - 200MHz -----							
1	63.7622	22.08 pk	1.12	6.6	29.8	N/A	40
	Azimuth:21	Height:100	Vert	Margin [dB]			-10.2
2	159.995	7.51 pk	1.8	16.89	26.2	N/A	43.5
	Azimuth:75	Height:100	Vert	Margin [dB]			-17.3
Range: 3 200 - 1000MHz -----							
3	436.8693	62.56 pk	3.2	16.84	82.6	80.9	
	Azimuth:168	Height:100	Horz	Margin [dB]		1.7	
6	873.9717	31.95 pk	4.45	23.4	59.8	60.9	
	Azimuth:44	Height:100	Horz	Margin [dB]		1.1	
Range: 4 200 - 1000MHz -----							
4	436.8693	60.86 pk	3.2	16.84	80.9	80.9	
	Azimuth:171	Height:101	Vert	Margin [dB]		0.0	
5	874.5046	33.19 pk	4.46	23.45	61.1	60.9	
	Azimuth:212	Height:101	Vert	Margin [dB]		0.2	

LIMIT 1: FCC Part 15 Subpart C-Section 15.231  
 LIMIT 2: FCC Part 15 Subpart B ClB (3M)

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result

File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

Issued: 11/5/02

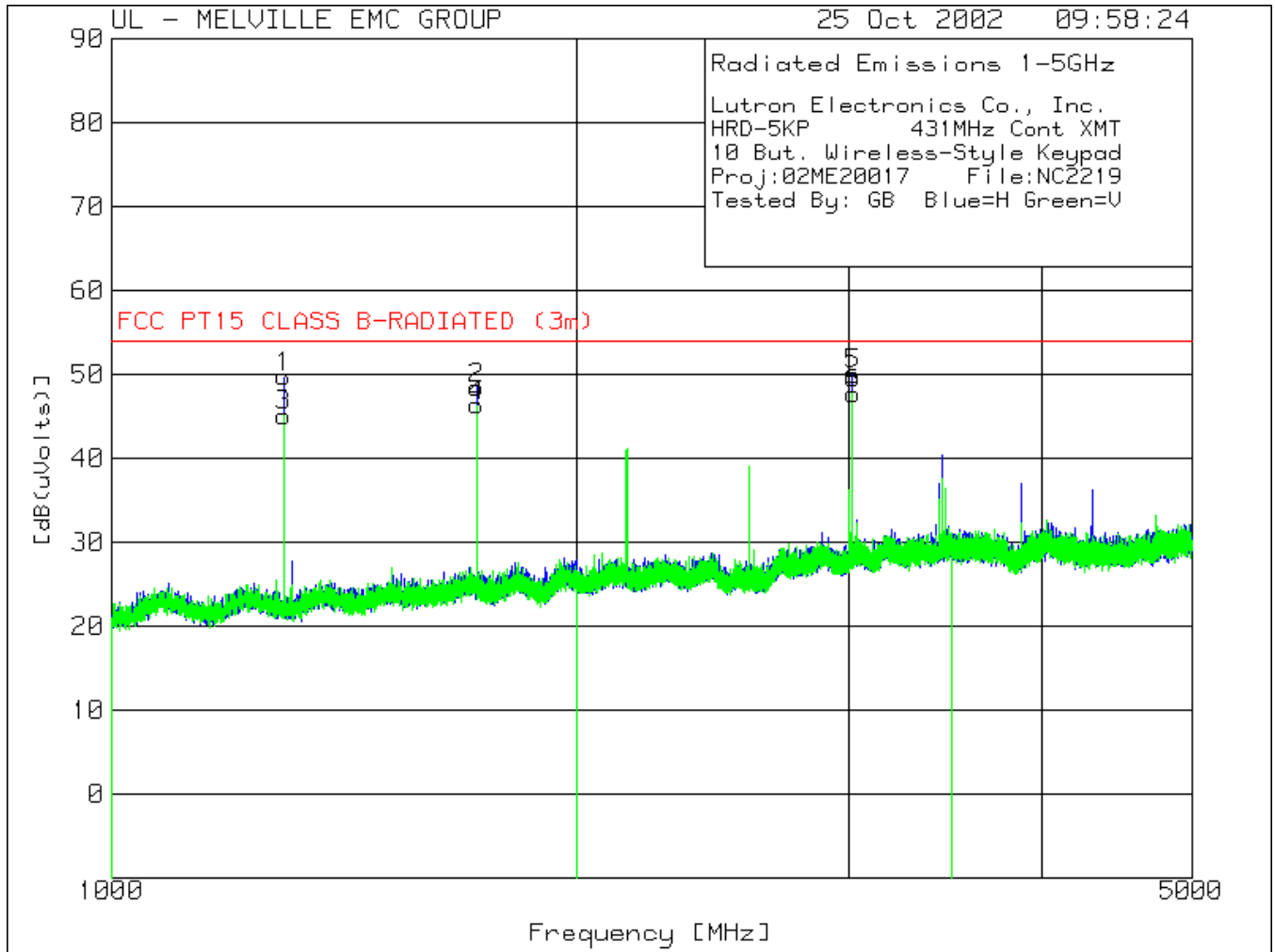
Lutron Electronics Co., Inc.  
 HRD-5KP 437MHz data Transmit  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level	Limit:1	Limit2
				dB[uVolts/meter]		
=====						
Range: 3 200 - 1000MHz						
873.9797	31.19 av	4.45	23.4	59.04	60.9	
Azimuth: 72 Height:100 Horz				Margin [dB]:	-1.86	
437.03	*42.67 av	3.2	16.85	*62.72	80.9	
Azimuth: 179 Height:121 Horz				Margin [dB]:	-18.18	
Range: 4 200 - 1000MHz						
873.9795	31.95 av	4.45	23.4	59.8	60.9	
Azimuth: 66 Height:136 Vert				Margin [dB]:	-1.1	
437.03	*48.32av	3.2	16.85	*68.37	80.9	
Azimuth: 137 Height:101 Vert				Margin [dB]:	-12.53	

LIMIT 1: FCC Part 15 Subpart C-Section 15.231  
 LIMIT 2: FCC Part 15 Subpart B ClB (3M)

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - Average log detector

**\* Duty Cycle correction factor of -21.9 added to Average level.**



File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP 431MHz Cont XMT  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1
Range: 1 1000 - 2000MHz -----						
1	1292.756	56.66 pk	-32.91	25.95	49.7	60.7
	Azimuth:76	Height:101	Horz	Margin [dB]		-11
2	1724.063	52.34 pk	-31.63	27.69	48.4	60.7
	Azimuth:310	Height:199	Horz	Margin [dB]		-12.3
Range: 2 2000 - 3500MHz -----						
5	3016.86	47.59 pk	-29.13	31.54	50	60.7
	Azimuth:146	Height:100	Horz	Margin [dB]		-10.7
Range: 5 1000 - 2000MHz -----						
3	1292.756	52.06 pk	-32.91	25.95	45.1	60.7
	Azimuth:358	Height:100	Vert	Margin [dB]		-15.6
4	1724.063	50.24 pk	-31.63	27.69	46.3	60.7
	Azimuth:154	Height:100	Vert	Margin [dB]		-14.4
Range: 6 2000 - 3500MHz -----						
6	3016.86	45.29 pk	-29.13	31.54	47.7	60.7
	Azimuth:10	Height:199	Vert	Margin [dB]		-13.0

LIMIT 1: FCC Part 15 Subpart C-Section 15.231

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result

File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

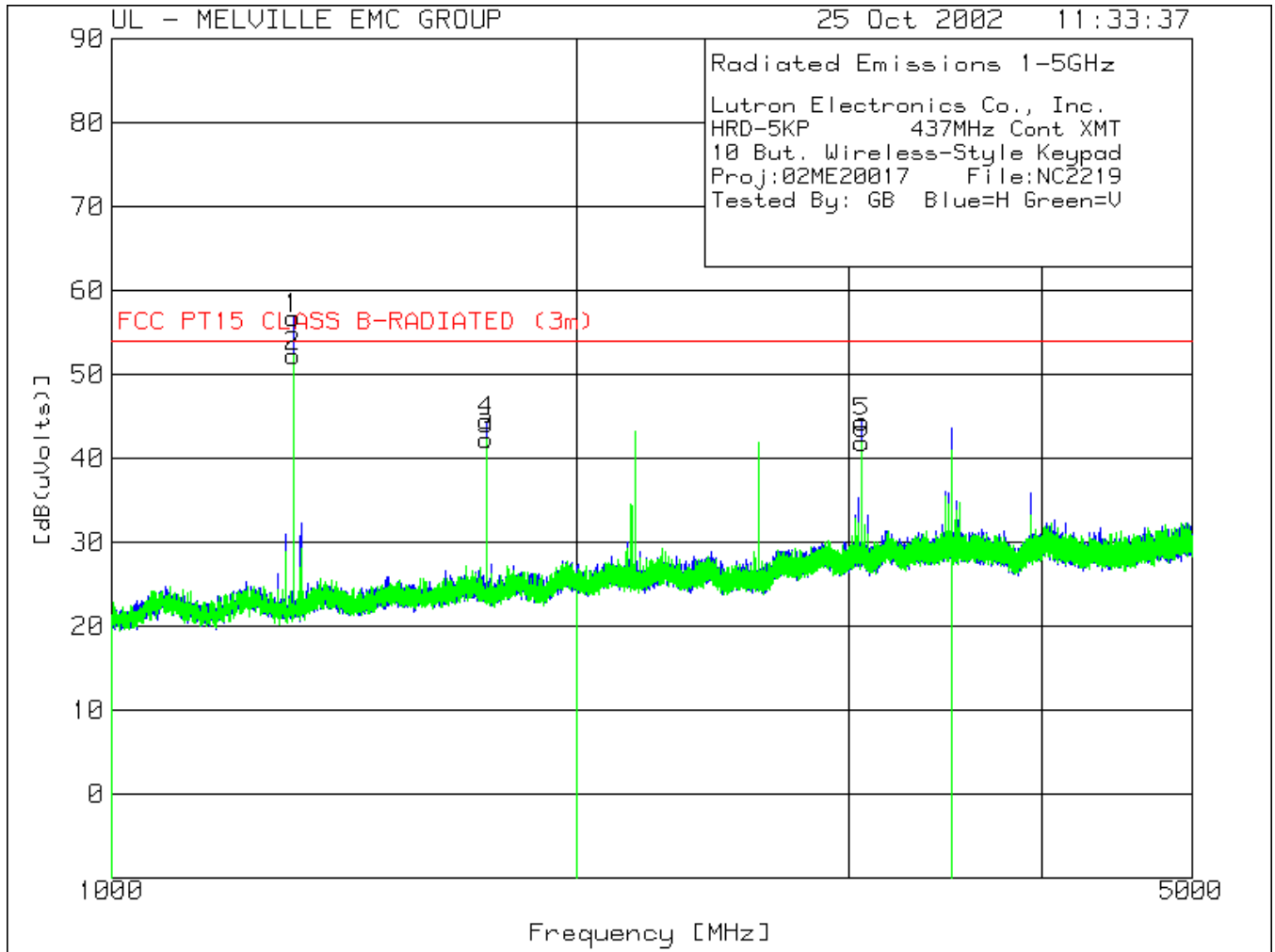
Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP 431MHz Cont XMT  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1
Range: 1 1000 - 2000MHz					
1292.982	50.34 av	-32.91	25.95	43.38	60.7
Azimuth: 81	Height:131	Horz		Margin [dB]:	-17.38
1723.966	47.92 av	-31.63	27.69	43.98	60.7
Azimuth: 216	Height:122	Horz		Margin [dB]:	-16.72
Range: 2 2000 - 3500MHz					
3016.92	40.62 av	-29.13	31.54	43.03	60.7
Azimuth: 18	Height:151	Horz		Margin [dB]:	-17.67
Range: 5 1000 - 2000MHz					
1292.998	51.19 pk	-32.91	25.95	44.23	60.7
Azimuth: 0	Height:120	Vert		Margin [dB]:	-16.47
1723.977	48.12 av	-31.63	27.69	44.18	60.7
Azimuth: 40	Height:188	Vert		Margin [dB]:	-16.52
Range: 6 2000 - 3500MHz					
3016.94	48.2 av	-29.13	31.54	50.61	60.7
Azimuth: 0	Height:188	Vert		Margin [dB]:	-10.09

LIMIT 1: FCC Part 15 Subpart C-Section 15.231

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - Average log detector



437MHz Transmit Mode

File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP 437MHz Cont XMT  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1
Range: 1 1000 - 2000MHz -----						
1	1310.741	63.54 pk	-32.86	26.02	56.7	60.9
	Azimuth:97	Height:100	Horz	Margin [dB]		-4.2
4	1748.043	48.17 pk	-31.56	27.79	44.4	60.9
	Azimuth:347	Height:200	Horz	Margin [dB]		-16.5
Range: 2 2000 - 3500MHz -----						
5	3058.824	41.6 pk	-28.95	31.65	44.3	60.9
	Azimuth:228	Height:199	Horz	Margin [dB]		-16.6
Range: 5 1000 - 2000MHz -----						
2	1310.741	59.04 pk	-32.86	26.02	52.2	60.9
	Azimuth:95	Height:199	Vert	Margin [dB]		-8.7
3	1748.043	46.07 pk	-31.56	27.79	42.3	60.9
	Azimuth:202	Height:100	Vert	Margin [dB]		-18.6
Range: 6 2000 - 3500MHz -----						
6	3058.824	39.1 pk	-28.95	31.65	41.8	60.9
	Azimuth:260	Height:199	Vert	Margin [dB]		-19.1

LIMIT 1: FCC Part 15 Subpart C-Section 15.231

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - denotes average log detection  
 tm - Trace Math Result

File Number: NC2219  
 Project Number: 02ME20017  
 Model Number: HRD-5KP  
 FCC ID: JPZ0020

Issued: 11/5/02

Lutron Electronics Co., Inc.  
 HRD-5KP 437MHz Cont XMT  
 10 But. Wireless-Style Keypad  
 Proj:02ME20017 File:NC2219  
 Tested By: GB Blue=H Green=V

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1
Range: 1 1000 - 2000MHz					
1310.98	60.67 av	-32.86	26.02	53.83	60.9
Azimuth: 75		Height:132	Horz	Margin [dB]:	-7.07
1747.956	47.77 av	-31.56	27.79	44	60.9
Azimuth: 334		Height:199	Horz	Margin [dB]:	-16.9
Range: 2 2000 - 3500MHz					
3058.932	42.32 av	-28.95	31.65	45.02	60.9
Azimuth: 246		Height:172	Horz	Margin [dB]:	-15.88
Range: 5 1000 - 2000MHz					
1310.976	62.72 av	-32.86	26.02	55.88	60.9
Azimuth: 97		Height:119	Vert	Margin [dB]:	-5.02
1747.96	44.48 av	-31.56	27.79	40.71	60.9
Azimuth: 226		Height:167	Vert	Margin [dB]:	-20.19
Range: 6 2000 - 3500MHz					
3058.98	36.38 av	-28.95	31.65	39.08	60.9
Azimuth: 246		Height:146	Vert	Margin [dB]:	-21.82

LIMIT 1: FCC Part 15 Subpart C-Section 15.231

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - Average log detector

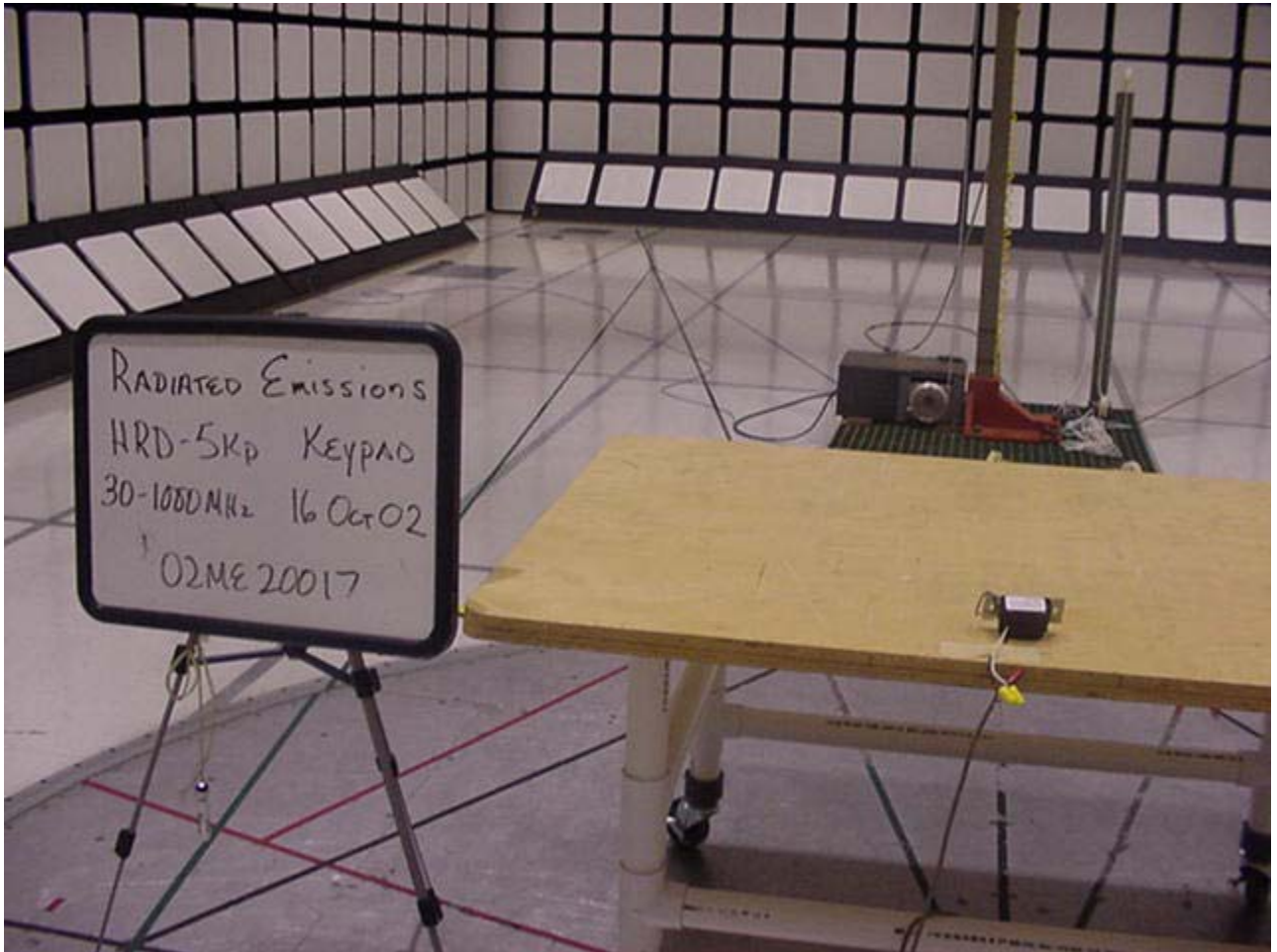


File Number: NC2219  
Project Number: 02ME20017  
Model Number: HRD-5KP  
FCC ID: JPZ0020

Issued: 11/5/02



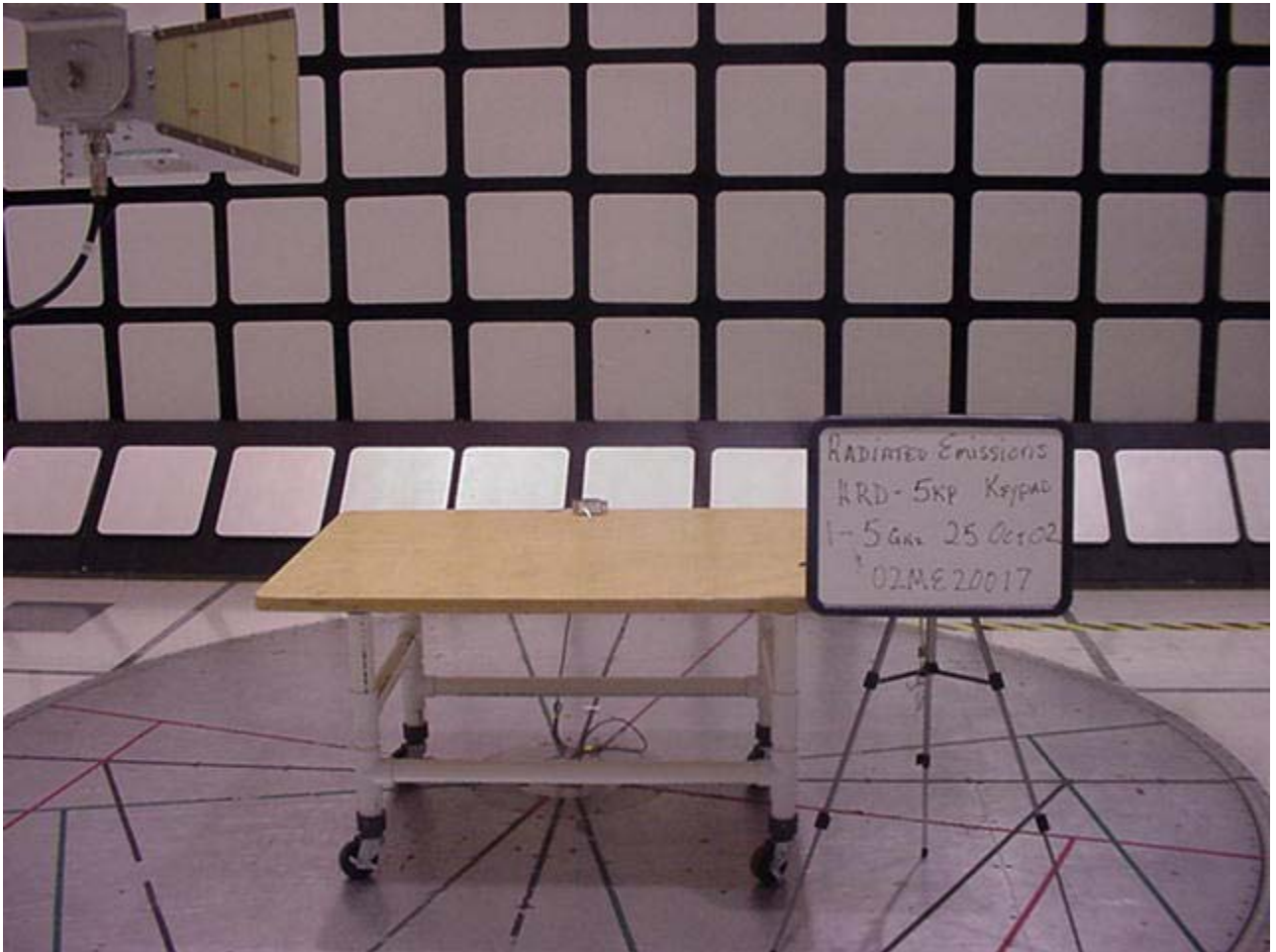
Radiated Emission Test-Set-Up



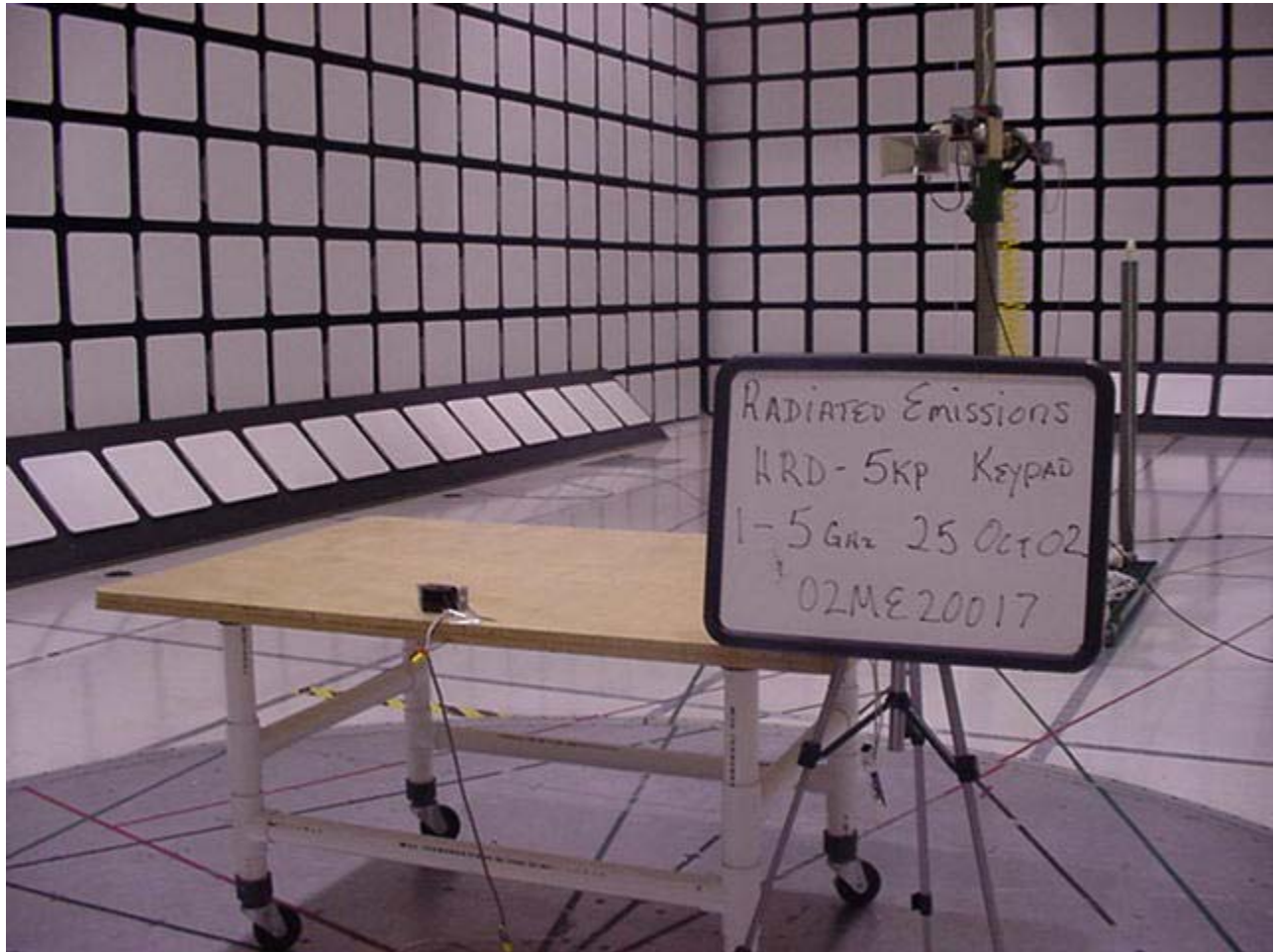
Radiated Emission Test-Set-Up 30-1000MHz



Radiated Emission Test-Set-Up 1000-5000MHz



Radiated Emission Test-Set-Up 1000-5000MHz



Radiated Emission Test-Set-Up 1000-5000MHz

File Number: NC2219  
Project Number: 02ME20017  
Model Number: HRD-5KP  
FCC ID: JPZ0020

Issued: 11/5/02

### 2.1.4 Occupied Bandwidth

Temperature: 20.8 °C  
Humidity: 69%RH  
Pressure: 1040mbar  
Date test performed: 24 Oct 2002

The bandwidth of the emissions shall be no wider than 0.25% of the center frequency for the devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

431MHz and 437MHz

Bandwidth = 0.25% of 431MHz = 1.0775MHz

Bandwidth = 0.25% of 437MHz = 1.09255MHz

#### Test equipment used for Occupied Bandwidth Measurements:

**ESI**                      **Rhode & Swartz**                      **EMI Test Receiver,**                      **Equipment No.: 5B-081**  
Range: 20Hz -26.5GHz    Last Calibration Date: 20 August 02    Calibration Due Date: 20 August 03

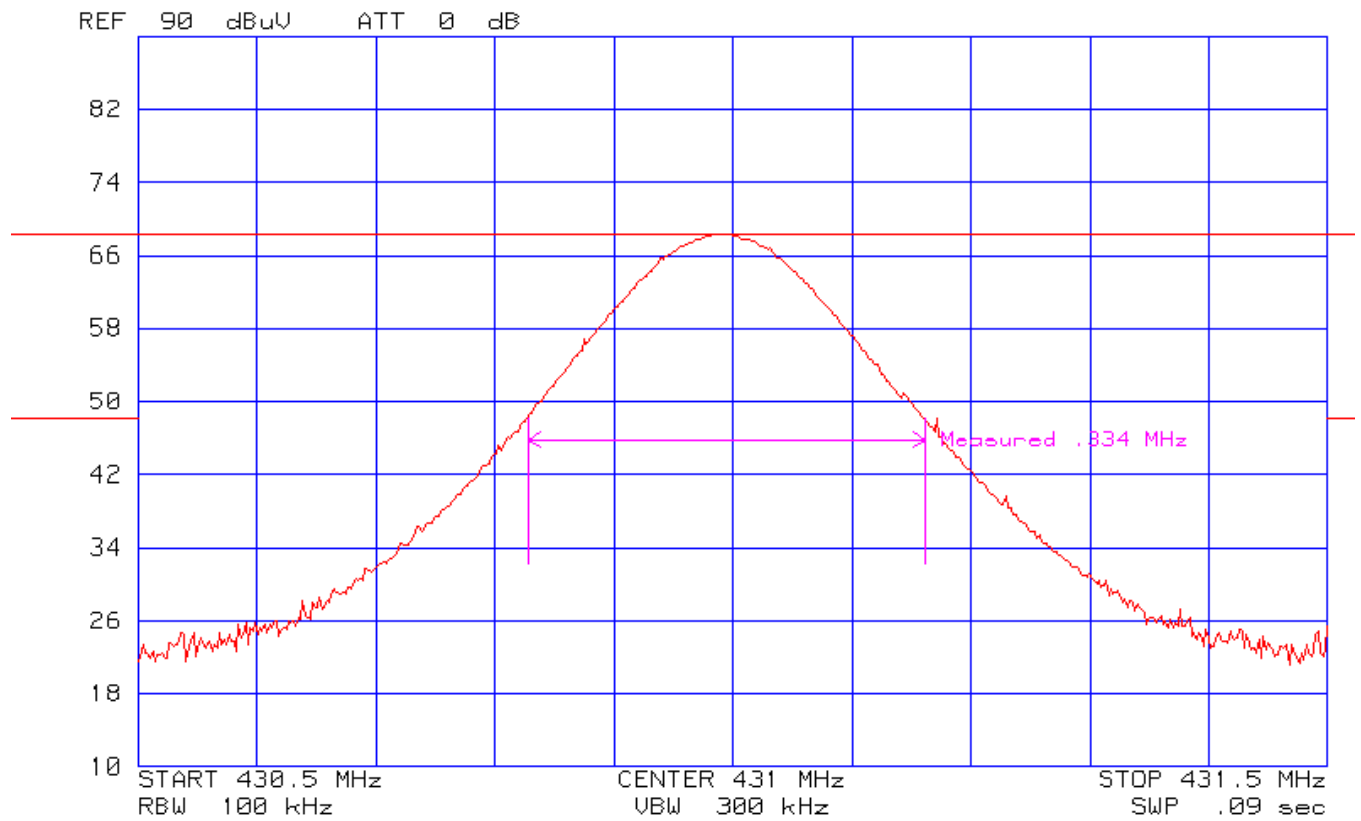
#### Consisting of:

<b>HP - 8566B</b>	<b>Hewlett-Packard</b>	<b>Spectrum Analyzer,</b>
	<b>Resolution BW: 1MHz</b>	
	<b>Video BW: 1MHz</b>	
<b>HP - 85662A</b>	<b>Hewlett-Packard</b>	<b>Analyzer Display</b>
<b>HP - 85650A</b>	<b>Hewlett-Packard</b>	<b>Quasi-Peak Adapter,</b>
	<b>BW: 120kHz</b>	
<b>HP - 85685A</b>	<b>Hewlett-Packard</b>	<b>Preselector</b>

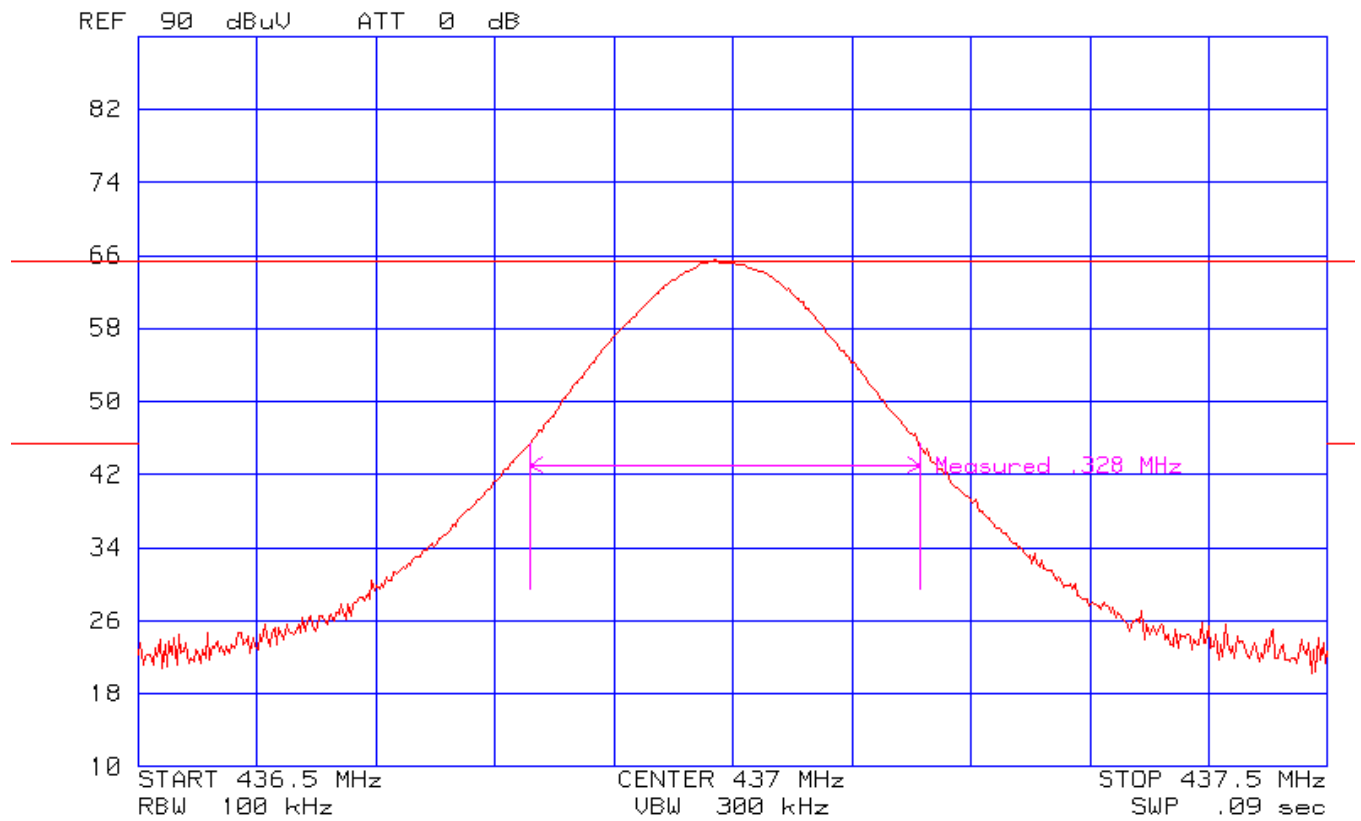
**3121C**                      **The Electro Mechanics**                      **Dipole ANTenna**                      **Equipment No.:**  
Last Calibration Date: 10 Dec.01    Calibration Due Date: 10 DEC 02

**Temp/Pressure**                      **Oakton**                      **Barometer**                      **Equipment No.: ME4-263**  
Range: 950-1045                      Last Calibration Date: 2 April 02                      Calibration Due Date: 2 April 03

**453320**                      **Ex-Tech**                      **Hydro-Thermometer**                      **Equipment No.: ME4-264**  
Range: 0-80%                      Last Calibration Date: 2 April 02                      Calibration Due Date: 2 April 03



431MHz Occupied Bandwidth @ 20 db = 0.334MHz



437MHz Occupied Bandwidth @ 20 db = 0.328MHz





Occupied Bandwidth Test Set-Up HRD-5KP

## 2.1.5 Fundamental Frequency and Spurious Emissions Measurement Limit Calculations

### Limit Calculation

Fundamental Frequency is 431MHz

From table in section 15.231

$$\text{Limit} = 41.6667(431) - 7083.3333$$

$$\text{Limit} = 10846.3\mu\text{V}$$

$$\text{Limit} = \text{Log } 10846.3(20)$$

$$\text{Limit} = 80.7\text{dBuV}$$

$$\text{Limit for Spurious Emissions} = 20\text{dB lower then fundamental} = 60.7\text{dBuV/m}$$

Fundamental Frequency is 437MHz

From table in section 15.231

$$\text{Limit} = 41.6667(437) - 7083.3333$$

$$\text{Limit} = 11125.018\mu\text{V}$$

$$\text{Limit} = \text{Log } 11125.018 (20)$$

$$\text{Limit} = 80.9\text{dBuV}$$

$$\text{Limit for Spurious Emissions} = 20\text{dB lower then fundamental} = 60.9\text{dBuV/m}$$

### ***Radiated Emissions Limit conversion from $\mu\text{V/m}$ to $\text{dB}\mu\text{V/m}$ (accordance with paragraph 15.109)***

$$\text{Radiated Emissions Limit (dB}\mu\text{V/m)} = 20 * \log (\mu\text{V/m})$$

$$\text{Radiated Emissions Limit (dB}\mu\text{V/m)} = 20 * \log (90)$$

$$\text{Radiated Emissions Limit (dB}\mu\text{V/m)} = 39.1$$

### ***Radiated Emissions test data obtained during measurements.***

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{Measured field strength(dB}\mu\text{V/m)} + \text{Antenna Factor(dB)} + \text{Cable Factor(dB)}$$

$$\text{Field Strength (dB}\mu\text{V/m)} = 19.7\text{dB}\mu\text{V/m} + 12.5\text{dB} + 0.3\text{dB}$$

$$\text{Field Strength (dB}\mu\text{V/m)} = 32.5$$

### **Duty Cycle factor calculation.**

Total number of pulses counted in 100ms.

Total time on = 4ms

$$\text{Duty cycle correction factor} = 20 \log (4\text{ms} / 50\text{ms})$$

$$= 20 \log (0.08)$$

$$= - 21.9$$

The correction factor is added to the measured field strength in dBuV/m

File Number: NC2219  
Project Number: 02ME20017  
Model Number: HRD-5KP  
FCC ID: JPZ0020

Issued: 11/5/02

### 3.0 SUMMARY:

The equipment under test has

met the technical requirements as defined under section(s)  2.0 and  3.0

not met the technical requirements as defined under section(s)  2.0 and  3.0

Test Start Date: 10/16/02

Test Completion Date: 10/28/02

#### - UNDERWRITERS LABORATORIES, INC. -

Project Engineer

Reviewer



Joseph Danisi (Ext.23055)  
Senior Engineering Associate  
International EMC Services  
Conformity Assessment Services-3014AMEL

Corey Hyatt (Ext.22511)  
Associate Manager  
International EMC Services  
Conformity Assessment Services -3014AMEL