



Project: 03RT8964  
File: MC1324  
Report: 030311A  
(Revised June 7, 2004)  
Date: September 30, 2003  
Model: W72 and W73  
Ceiling Fan RF Remote

# **Test Report**

## **On**

# **Electromagnetic Compatibility Testing**

**Hunter Fan Co**  
**Memphis, TN USA**

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## **Test Report Details:**

|                        |                                                                                                                  |
|------------------------|------------------------------------------------------------------------------------------------------------------|
| Tests Performed By:    | <b>Underwriters Laboratories Inc.<br/>12 Laboratory Drive<br/>Research Triangle Park, NC 27709</b>               |
| Tests Performed For:   | <b>Hunter Fan Co<br/>2500 Frisco Avenue<br/>Memphis, TN 38114 USA</b>                                            |
| Applicant Contact:     | <b>Mr. Robert Davis<br/>Safety and Test Engineer - International<br/>(901) 248-2212<br/>(901) 248-2382 - Fax</b> |
| Test Report Number:    | <b>030311A</b>                                                                                                   |
| Test Report Date:      | <b>September 30, 2003 (Revised June 7, 2004)</b>                                                                 |
| Product Type:          | <b>Ceiling Fan RF Remote</b>                                                                                     |
| Model Number:          | <b>W72 and W73</b>                                                                                               |
| Sample Serial Number:  | <b>unserialized, pre-production sample</b>                                                                       |
| Sample Tag Number:     | <b>S03LB27687</b>                                                                                                |
| EUT Category:          | <b>Transmitter - Low Powered</b>                                                                                 |
| EUT Type:              | <b>Hand Held</b>                                                                                                 |
| Sample Receive Date:   | <b>September 25, 2003</b>                                                                                        |
| Testing Start Date:    | <b>September 25, 2003</b>                                                                                        |
| Date Testing Complete: | <b>September 29, 2003</b>                                                                                        |

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## **Summary of Testing:**

| Test # | Test Name<br>Test Requirement/Specification                                                                                            | Comply | Does Not Comply | See Remark |
|--------|----------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------|------------|
| 1      | Radiated Disturbance Emissions - 30 MHz to 3.2 GHz<br>47 CFR Part 15, Subpart C / 47 CFR Part 15, Subpart C, Section 15.209 and 15.231 | X      | -               |            |
| 2      | Radiated Disturbance Emissions - Peak-to-Average Ratio<br>47 CFR Part 15, Subpart C / 47 CFR Part 15, Subpart C, Section 15.231        | N/A    | N/A             |            |
| 3      | Radiated Disturbance Emissions - Occupied Bandwidth<br>47 CFR Part 15, Subpart C / 47 CFR Part 15, Subpart C, Section 15.231           | X      | -               |            |
| 4      | Radiated Disturbance Emissions - Restricted Bands<br>47 CFR Part 15, Subpart C / 47 CFR Part 15, Subpart C, Section 15.205             | X      | -               |            |

## **Remarks:**

- 1) All tests are considered applicable to Canadian requirements as detailed in RSS-210. Emissions test site is registered by Industry Canada as IC-2953.
- 2) This device is a manually operated device. Device was observed to cease transmission immediately upon release of buttons. The word "immediately" represents no noticeable delay as observed with the human eye and can be considered no more than 200 ms. This complies with the 5 second maximum turn-off requirement.
- 3) Device contains an integrated antenna. This antenna is not detachable.
- 4) Per FCC Part 2.1093(c) this device is considered exempt from routine environmental evaluation for RF exposure.
- 5) The following modifications were determined to be required to comply:
  - a. R1 = 270  $\Omega$
  - b. R2 = 510  $\Omega$
  - c. R3 = 91 k $\Omega$
  - d. C2 = 10 pF
  - e. C3 = 1.8 pF
- 6) Emissions Designator for Canada is L1D508k.

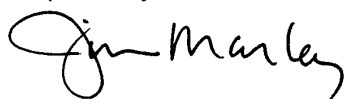
## **Report Revisions:**

June 7, 2004 - Revised to correct sample received date. Revised to state that cease transmission time characterized as "immediately" complies with requirement of less than five seconds.

## **Conclusion:**

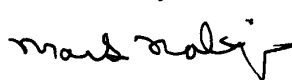
The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

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## **Test Facilities:**

### **Test Location A) 10-Meter Anechoic Chamber (pIndustry Canada - IC 2953, NVLAP - 200246-0, VCCI - R-722)**

Constructed by Lindgren RF Enclosures, this room consists of a 17.9 by 12 by 8.3 m (inside clearance) shielded room lined with TDK absorber material. The walls, floor (conducting ground plane) and ceiling are constructed of double sided galvanized sheet steel supported by 19 mm thick particle board. The interior walls and ceiling are covered with 10 by 10 cm, 4.6 mm thick ferrite tiles and partially covered with polystyrene absorber cones. Removable floor tiles and cones covering the floor between the EUT and antenna are provided when RF immunity testing is performed.

Room is provided with a 4.0 m diameter embedded turntable and a 1.2 by 2.1 m and 2.4 by 2.4 m double knife edge doors for access. Also, the room is fed electrical EUT power via permanently installed filters and is provided with a permanently mounted video surveillance camera. A remotely controllable antenna mast is located in the room for positioning the measuring antenna from 1 to 4 m above the ground plane.

### **Test Location B) Compact Anechoic Chamber**

Constructed by Lindgren RF Enclosures, this room consists of a 6 by 3 by 2.9 m (inside clearance) shielded room lined with TDK absorber material. The walls, floor, and ceiling are constructed of double sided galvanized sheet steel supported by 19 mm thick particle board. The interior walls and ceiling are covered with 10 by 10 cm, 4.6 mm thick ferrite tiles and partially covered with polystyrene absorber cones. Removable floor tiles and cones cover the floor between the EUT and antenna.

Room is provided with a 1.2 by 2.1 m double knife edge door for access. Also, the room is fed electrical EUT power via permanently installed filters and is provided with a video camera.

### **Test Location C) RF Shielded Room (VCCI - C-744, NVLAP - 200246-0)**

Constructed by Lindgren RF Enclosures, this room consists of a 7.3 by 4.3 by 2.7 m (inside clearance) shielded room. The walls, floor (conducting ground plane) and ceiling are constructed of double sided galvanized sheet steel supported by 19 mm thick particle board. Room is provided with a 1.2 by 2.1m double knife edge door for access. Also, the room is fed electrical EUT power via permanently installed filters and is provided with a portable video surveillance camera.

### **Test Location D) Ground Reference Plane # 1 (VCCI - C-742, NVLAP - 200246-0)**

Horizontal floor ground reference plane constructed of double sided galvanized sheet steel supported by 19 mm particle board and measures 3.6 by 3.0 m. It is located and bonded next to one vertical wall of the Control Room and is, therefore, provided with a 3.0 by 3.6 m vertical ground reference plane constructed of the same material. Power filters and LISNs, when required, are placed on top of and bonded to the horizontal floor ground reference plane.

### **Test Location E) Ground Reference Plane # 2 (VCCI - C-743, NVLAP - 200246-0)**

Horizontal floor ground reference plane constructed of double sided galvanized sheet steel supported by 19 mm particle board and measures 4.3 by 5.2 m. It is located and bonded next to one vertical wall of the RFD Shielded Room and is, therefore, provided with a 4.3 by 2.8 m vertical ground reference plane constructed of the same material. Power filters and LISNs, when required, are placed on top of and bonded to the horizontal floor ground reference plane.

### **Test Location F) Ground Reference Plane # 3**

Horizontal floor ground reference plane constructed of galvanized sheet steel measuring 3.0 by 3.6 m x 2.5mm thick.

### **Test Location G) Ground Reference Plane # 4 (Automotive)**

Horizontal floor ground reference plane constructed of double-sided galvanized sheet steel supported by 19 mm particle board and measures 3.6 by 3.0 m.

### **Test Location I) Harmonic Current Test Area - Located in front of Standard Source Impedance Power Supply.**

### **Test Location J) Magnetic Field Ground Reference Plane**

Horizontal floor ground reference plane constructed of 1.5 mm thick aluminum measuring 3.6 by 2.4 m.

### **Test Location P) Ground Reference Plane # 5**

Horizontal floor ground reference plane constructed of double-sided galvanized sheet steel supported by 19 mm particle board and measures 3.6 by 3.0 m.

### **Test Location R) Ground Reference Plane # 6**

Ground reference plane constructed of galvanized sheet steel measuring 3.0 m x 3.6 m x 2.5 mm thick. CDNs, when required, are placed on top of and bonded to the horizontal floor ground reference plane.

### **Test Location Q) CISPR 12 Outdoor Site**

30 meter diameter non-reflective area located behind the UL-RTP EMC Lab. Test area is used for CISPR 12 testing.

### **Test Location X) Other - As described in the Comments Section of Test Results.**

## **EUT Information:**

### **Equipment Used During Test:**

| Use* | Product Type            | Manufacturer   | Model | Comments                                                                               |
|------|-------------------------|----------------|-------|----------------------------------------------------------------------------------------|
| EUT  | Low-Powered Transmitter | Hunter Fan Co. | W73   | Note: W72 transmitter is electrically identical to the W73. W72 eliminates one button. |
|      |                         |                |       |                                                                                        |

\* Use = EUT - Equipment Under Test, ACC - Accessory (Not Subjected to Test), or SIM - Simulator (Not Subjected to Test)

### **Input/Output Ports:**

| Port # | Name      | Type* | Cable Max. >3m | Cable Shielded | Comments |
|--------|-----------|-------|----------------|----------------|----------|
| 0      | Enclosure | N/E   | No             | No             |          |
|        |           |       |                |                |          |

\* AC = AC Power Port      DC = DC Power Port      N/E = Non-Electrical  
I/O = Signal Input or Output Port (Not Involved in Process Control)  
PMC = Process Measurement and Control Port

### **Product Description:**

This product is a low-powered transmitter used to operate a ceiling fan to turn on/off, vary speed, and direction. This device can also control a lamp if included with the ceiling fan. The device operates at 303.5 MHz and is pulse modulated to send the appropriate action and security code to the ceiling fan receiver/controller. Additional information may be found in the FCC/Industry Canada filing exhibits.

**EUT Internal Operating Frequencies:**

| Frequency (MHz)* | Description        | Frequency (MHz)* | Description |
|------------------|--------------------|------------------|-------------|
| 303.5            | Transmit Frequency |                  |             |
|                  |                    |                  |             |

**Power Interface:**

| Mode (#) | Voltage (V) | Current (A) | Power (W) | Frequency (DC/AC-Hz) | Comments                                               |
|----------|-------------|-------------|-----------|----------------------|--------------------------------------------------------|
| Rated    | 12          | -           | -         | DC                   |                                                        |
| 1        | 12          | -           | -         | DC                   | A fresh battery was installed at the start of testing. |
|          |             |             |           |                      |                                                        |

**EUT Operation Modes:**

| Mode # | Description                                                                                                           |
|--------|-----------------------------------------------------------------------------------------------------------------------|
| 1      | Transmitter is positioned flat. A small foam pad is placed under the unit to prevent sliding.                         |
| 2      | Transmitter is positioned on its side. A small foam pad is placed under the unit to prevent sliding.                  |
| 3      | Transmitter is positioned on its end (pointing upward). A small foam pad is placed under the unit to prevent sliding. |
|        |                                                                                                                       |

**EUT Configuration Modes:**

| Mode # | Description                                                                                                                                            |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Transmitter is placed in the center of a 1.5m x 1.0m x 80cm high wooden table. A rubber band continuously depresses one of the buttons during the test |
|        |                                                                                                                                                        |

## Test 1: Radiated Disturbance Emissions - 30 MHz to 1000 MHz

**Test Requirement:** 47 CFR Part 15, Subpart C

**Test Specification:** 47 CFR Part 15, Subpart C, Section 15.209 and 15.231

### Test Procedure:

The test was performed in accordance with the Test Requirement and Specification and configured as noted in the Test Setup. The EUT was placed inside the anechoic chamber with a fresh battery installed. A peak measurement was first made by scanning the entire test frequency range and maximizing the EUT emissions by rotating the EUT and raising the antenna height from 1 to 4 meters above the ground reference plane. Then, a measurement was taken for all peak emissions to verify each were below the Test Limits.

Radiated Disturbance Limits for Manually Operated Transmitters - Section 15.231  
at a measurement distance of 3 meters

| Fundamental Frequency (MHz) | Field Strength of Fundamental ( $\mu\text{V}/\text{m}$ ) | Field Strength of Fundamental ( $\text{dB}\mu\text{V}/\text{m}$ ) | Field Strength of Spurious ( $\mu\text{V}/\text{m}$ ) | Field Strength of Spurious ( $\text{dB}\mu\text{V}/\text{m}$ ) |
|-----------------------------|----------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------|
| 40.66 to 40.70              | 2250                                                     | 67.04                                                             | 225                                                   | 47.04                                                          |
| 70 to 130                   | 1250                                                     | 61.94                                                             | 125                                                   | 41.94                                                          |
| 130 to 174                  | 1250 to 3750                                             | 61.94 to 71.48                                                    | 125 to 375                                            | 41.94 to 51.48                                                 |
| 174 to 260                  | 3750                                                     | 71.48                                                             | 375                                                   | 51.48                                                          |
| 260 to 470                  | 3750 to 12,500                                           | 71.48 to 81.93                                                    | 375 to 1250                                           | 51.48 to 61.93                                                 |
| above 470                   | 12,500                                                   | 81.93                                                             | 1250                                                  | 61.93                                                          |

\*\* Linear Interpolations

### Test Clarifications (Specific Limits for this transmit frequency):

- At fundamental frequency, 303.5 MHz, Average field strength limit = 5562  $\mu\text{V}/\text{m}$  (average) or 74.9  $\text{dB}\mu\text{V}/\text{m}$  (average).
- Harmonic field strength limit = 556.2  $\mu\text{V}/\text{m}$  (average) or 54.9  $\text{dB}\mu\text{V}/\text{m}$  (average).
- Harmonics falling within restricted bands must comply with General Limits in 15.209.
- Per 15.35(b) peak limit is 20 dB above average limit for each frequency.

### Test Deviations:

None

**Test Setup:** Only the following ports were tested. See EUT Information for details.

| Test Item | Port # | Port Name | EUT Operation Mode   | EUT Configuration | Power Interface |
|-----------|--------|-----------|----------------------|-------------------|-----------------|
| A         | 0      | Enclosure | 1 (flat orientation) | 1                 | 1               |
| B         | 0      | Enclosure | 2 (side orientation) | 1                 | 1               |
| C         | 0      | Enclosure | 3 (end orientation)  | 1                 | 1               |
|           |        |           |                      |                   |                 |

**Test 1 - Results:** Radiated Disturbance Emissions - 30 MHz to 1000 MHz

**Test Results Summary:**

| Test Item | Test Location | Humidity (%) | Temperature (°C) | Pressure (kPa) | Pass/Fail (P/F) | Date Completed | Comment # |
|-----------|---------------|--------------|------------------|----------------|-----------------|----------------|-----------|
| A         | A             | 36           | 24               | 101            | P               | 11/10/03       |           |
| B         | A             | 36           | 24               | 101            | P               | 11/10/03       |           |
| C         | A             | 36           | 24               | 101            | P               | 11/10/03       |           |
|           |               |              |                  |                |                 |                |           |

The EUT was considered to **Pass** the Requirements.

**Comments:**

| Comment # | Description                                                                                                                                                    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | Average field strengths are calculated by applying 10.9 dB reduction to peak measurements. Peak-to-average ratio is documented in Test 3.                      |
| 2         | Harmonics falling within restricted band are: 4th harmonic at 1214 MHz, 5th harmonic at 1517.5 MHz, 9th harmonic at 2731.5 MHz, and 10th harmonic at 3035 MHz. |
| 3         | Peak emissions from 30 to 200 MHz are measured in one orientation only. No measureable emission was observed in this band.                                     |
|           |                                                                                                                                                                |

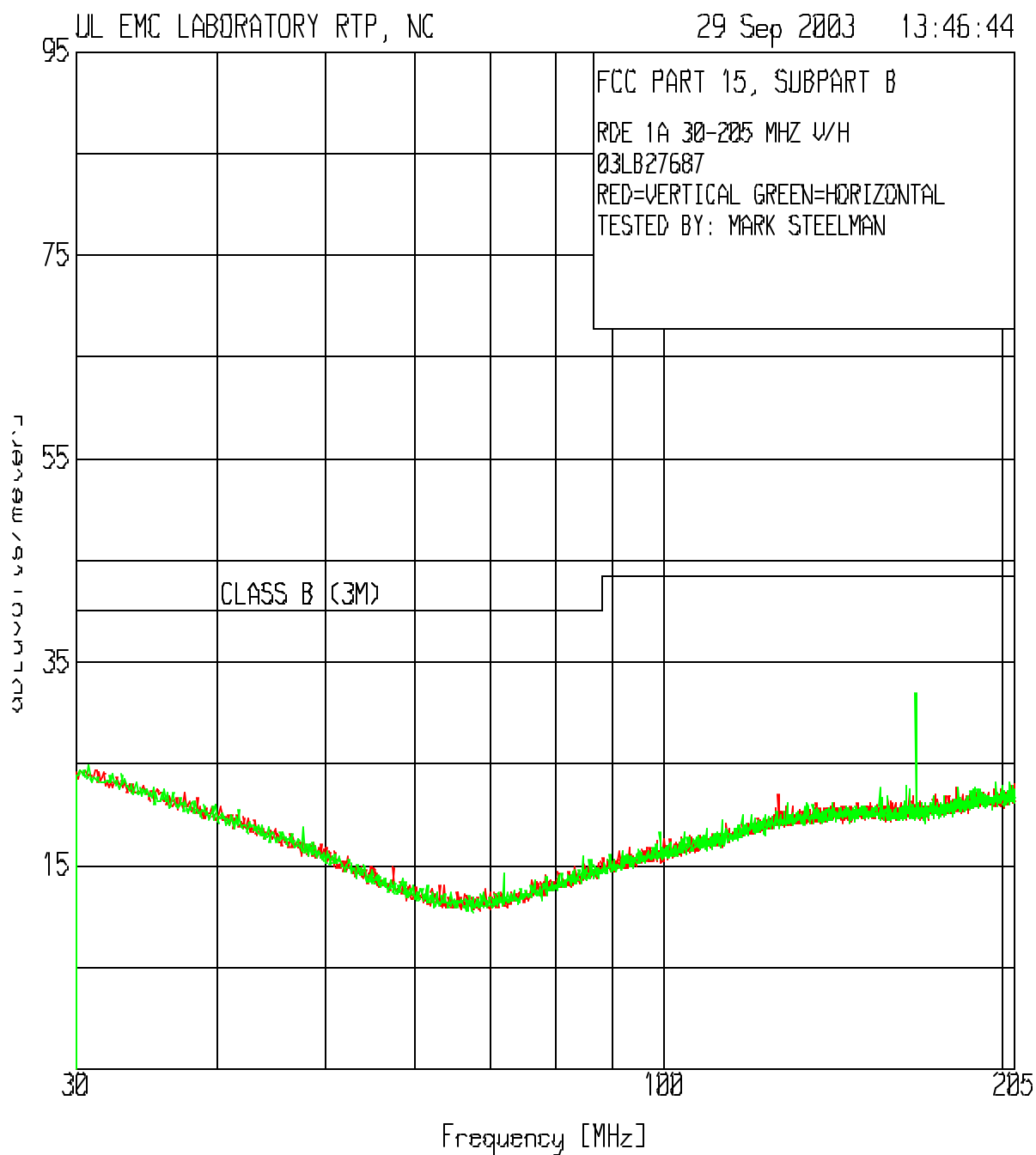
**Test 1 - Test Equipment Used:** Radiated Disturbance Emissions - 30 MHz to 1000 MHz

| Equipment ID | Description                               | Manufacturer     | Model Number         | Last Cal. | Next Cal. |
|--------------|-------------------------------------------|------------------|----------------------|-----------|-----------|
| AT0025       | Biconical Antenna, 30 to 300 MHz          | Schaffner, EMC   | VBA6106A             | 4/8/03    | 4/30/04   |
| AT0030       | Log periodic Antenna, 200 MHz to 1000 MHz | Schaffner, EMC   | 3160-07              | 1/13/03   | 1/31/04   |
| ATA061       | Amplifier, 1 to 1000 MHz                  | Miteq            | AM-3A-000110-N       | 3/20/03   | 3/31/04   |
| ATA084       | Attenuator 6 dB, 2 GHz                    | Pasternack       | PE7002-6             | 3/19/03   | 3/31/04   |
| ATA085       | Attenuator 6 dB, 2 GHz                    | Pasternack       | PE7002-6             | 3/19/03   | 3/31/04   |
| ATA095       | 6 ft, N male - N male                     | Micro-Coax       | Coaxial Cable        | 9/30/03   | 3/31/04   |
| ATA096       | 50 ft, N male - N male                    | Micro-Coax       | Coaxial Cable        | 9/30/03   | 3/31/04   |
| ATA108       | 10 m, N male - N male                     | UL               | RG214                | 3/19/03   | 3/31/04   |
| ATA110       | RF Amplifier, 1 to 1000 MHz               | Miteq            | AM-3A-000110-N       | 3/19/03   | 3/31/04   |
| ATA124       | RF Amplifier, 1 to 1000 MHz               | Miteq            | AM-3A-000110-N       | 3/20/03   | 3/31/04   |
| ATA140       | RG214 Ferrite Cable                       | EMC Eupen        | N/A                  | 3/19/03   | 3/31/04   |
| ATA143       | 6ft., N-male to N-male                    | Micro-Coax       | Coaxial Cable        | 3/19/03   | 3/31/04   |
| SAR002       | Spectrum Analyzer / Receiver              | Hewlett-Packard  | 8566B                | 11/21/02  | 11/30/03  |
| AT0026       | Horn Antenna, 1 to 18 GHz                 | EMC Test Systems | 3115                 | 5/8/03    | 5/31/04   |
| ATA096       | 50 ft, N male - N male                    | Micro-Coax       | Coaxial Cable        | 9/30/03   | 3/31/04   |
| ATA143       | 6ft., N-male to N-male                    | Micro-Coax       | Coaxial Cable        | 3/19/03   | 3/31/04   |
| ATA144       | Amplifier, 0.1 to 18 GHz                  | Miteq            | AFS42-00101800-2     | 3/20/03   | 3/31/04   |
| ATA153       | 27 ft. N male - N male low loss cable     | Micro-Coax       | UFB293C-0-3149-50504 | 2/21/03   | 2/28/04   |

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

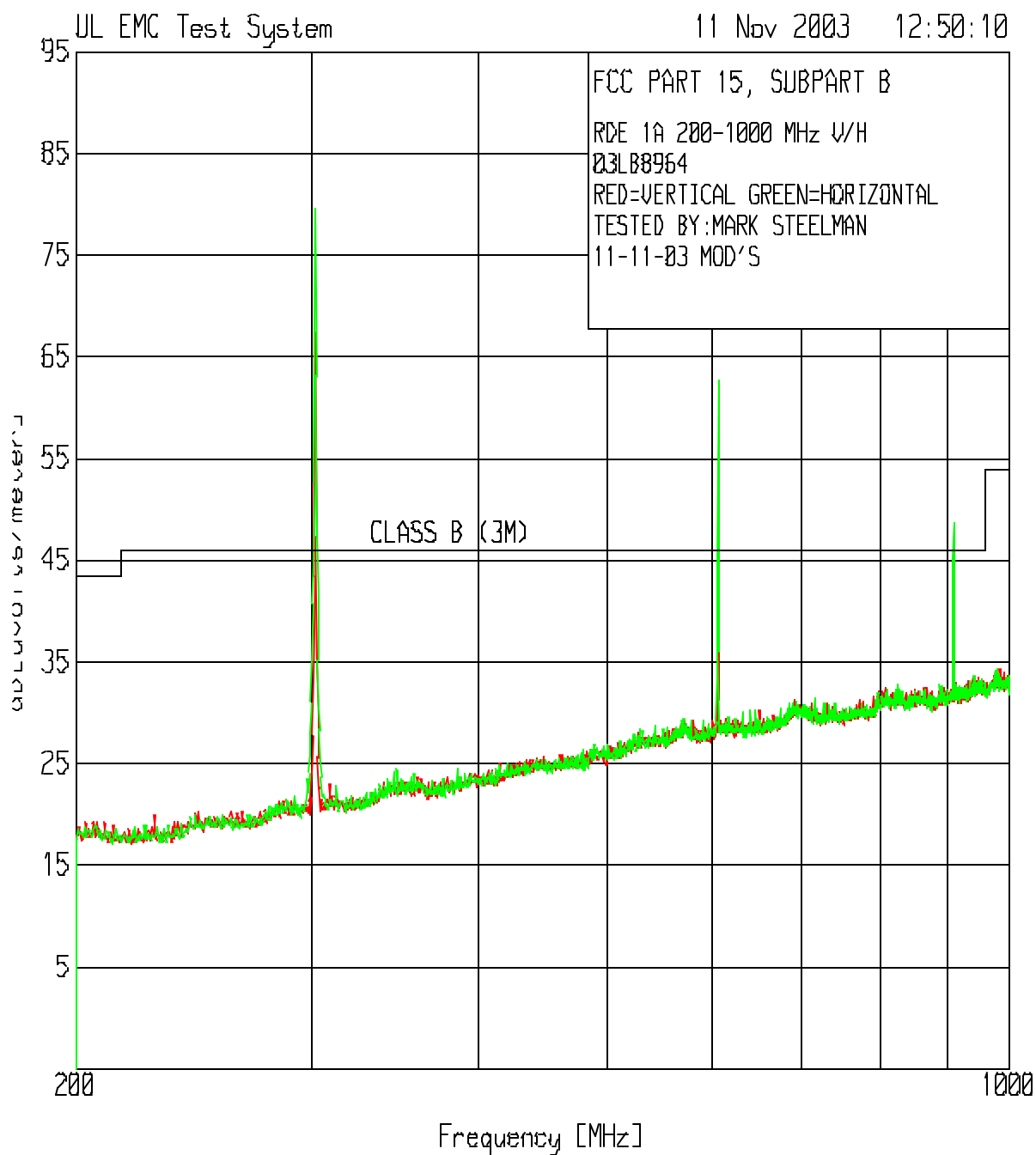
**Test 1, Item A (flat) - Peak Plot (Amplitude in dBuV/m):**

Radiated Disturbance Emissions - 30 MHz to 1000 MHz



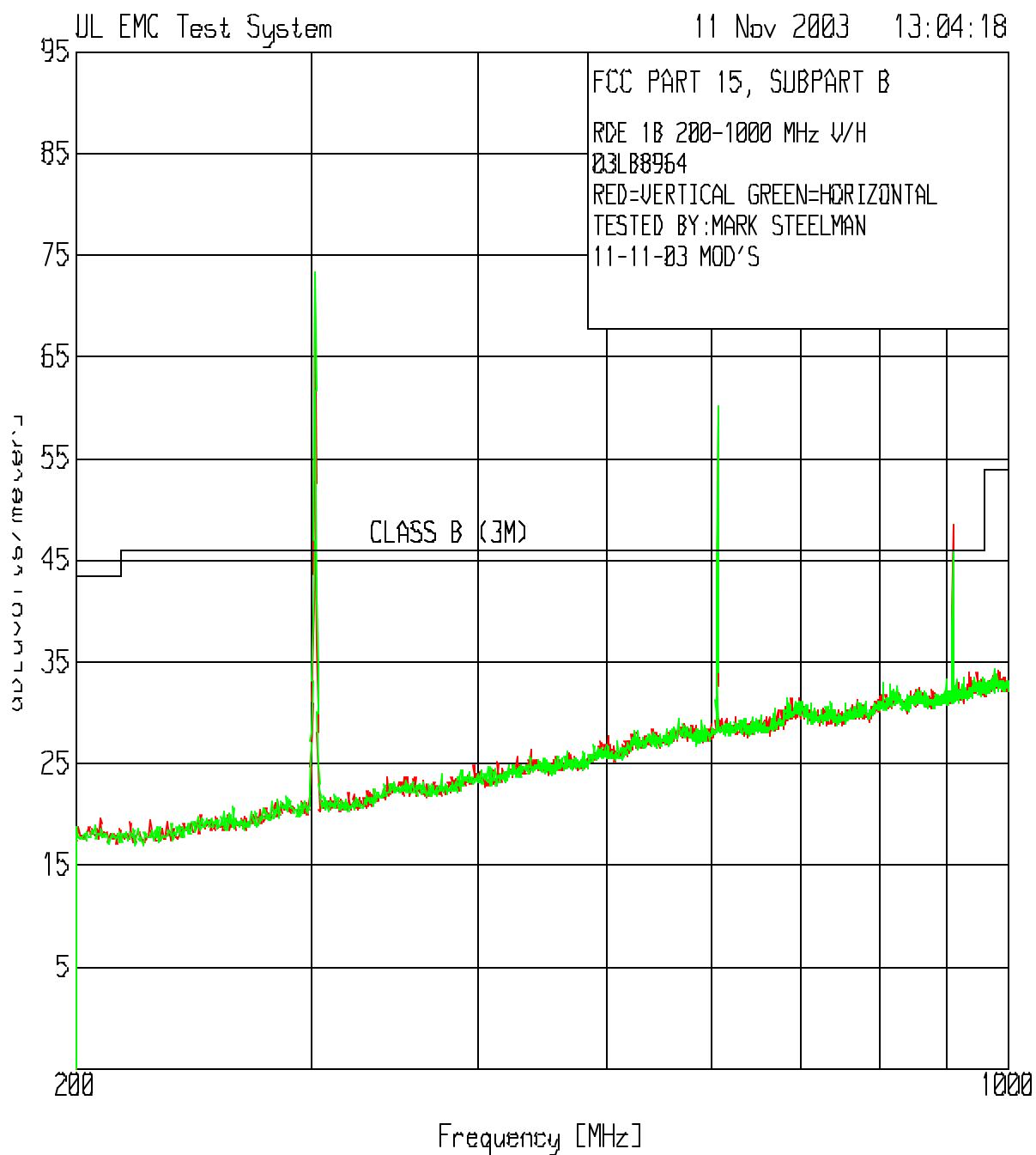
**Test 1, Item A (flat) - Peak Plot (Amplitude in dBuV/m):**

Radiated Disturbance Emissions - 30 MHz to 1000 MHz



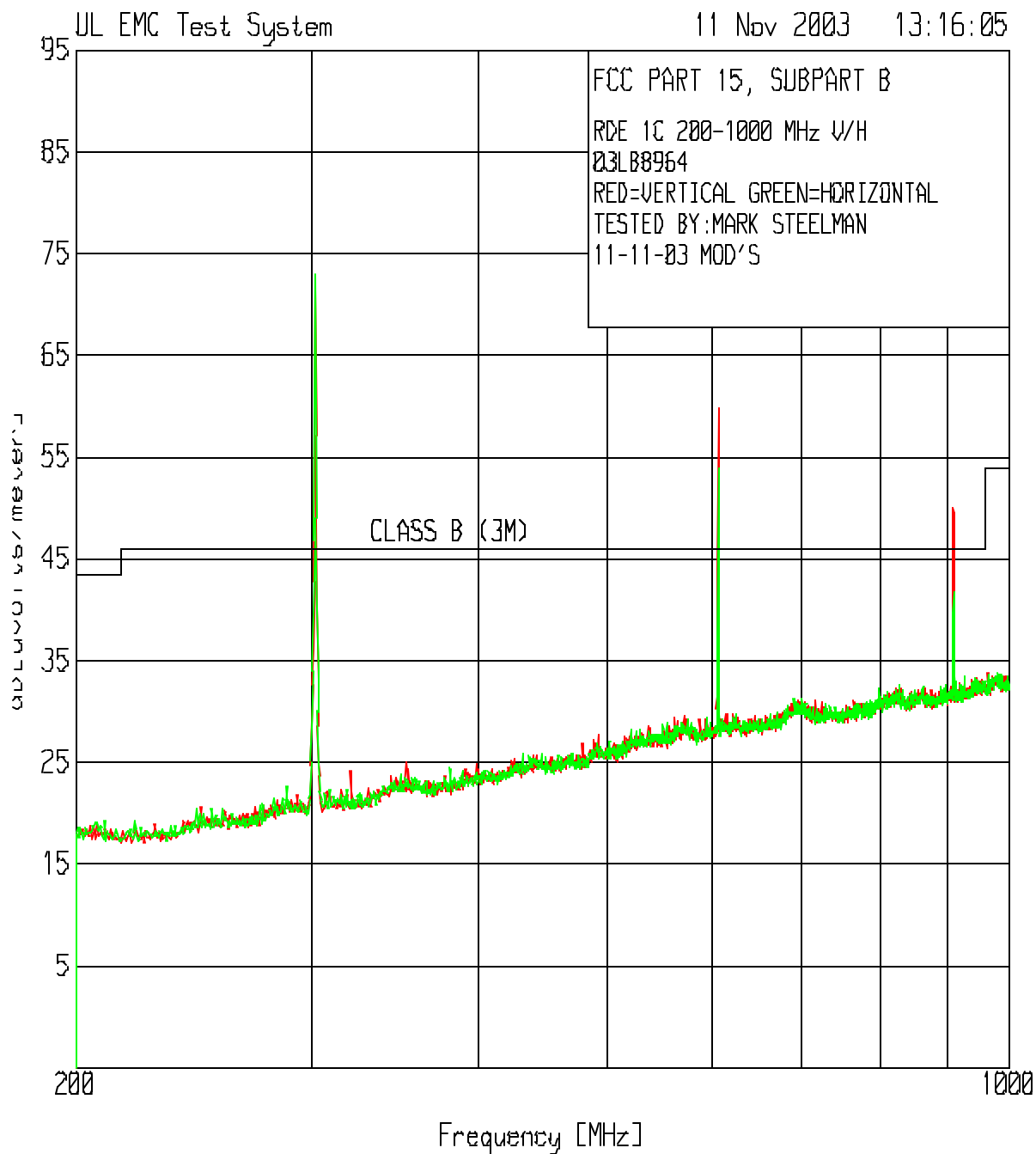
**Test 1, Item B (side) - Peak Plot (Amplitude in dBuV/m):**

Radiated Disturbance Emissions - 30 MHz to 1000 MHz



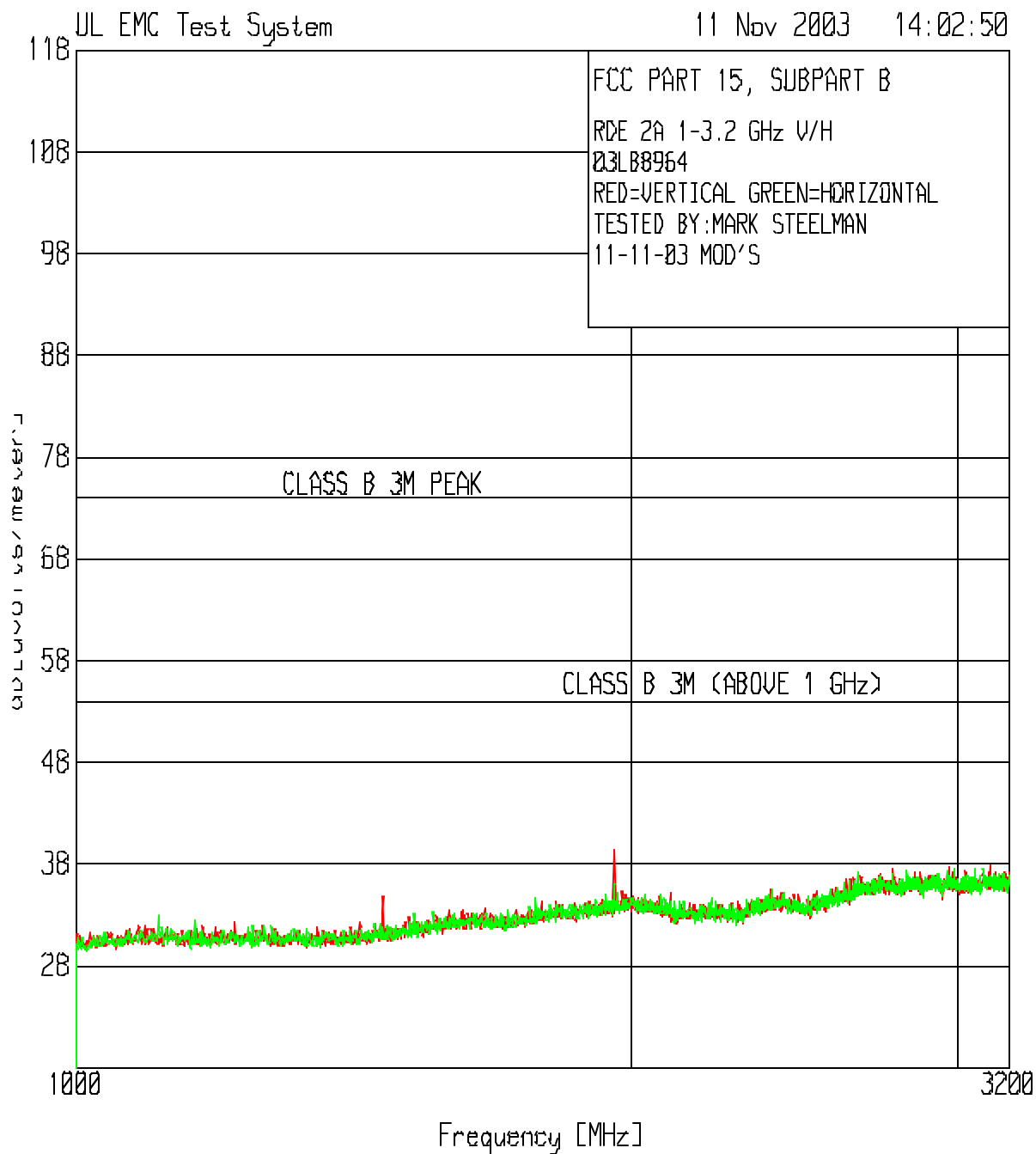
**Test 1, Item C (end) - Peak Plot (Amplitude in dBuV/m):**

Radiated Disturbance Emissions - 30 MHz to 1000 MHz



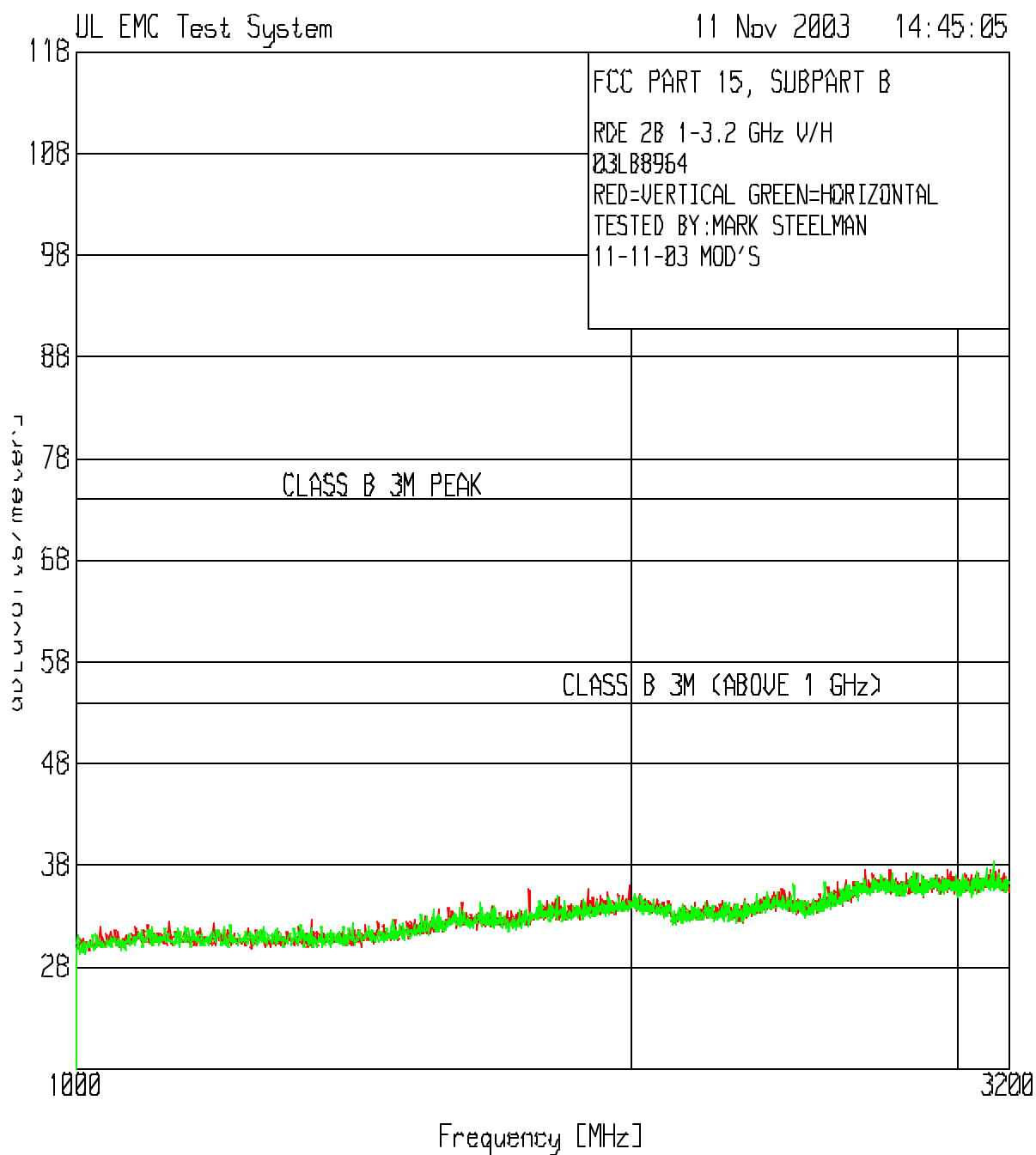
**Test 2, Item A (flat) - Peak Plot (Amplitude in dBuV/m):**

Radiated Disturbance Emissions - Above 1 GHz



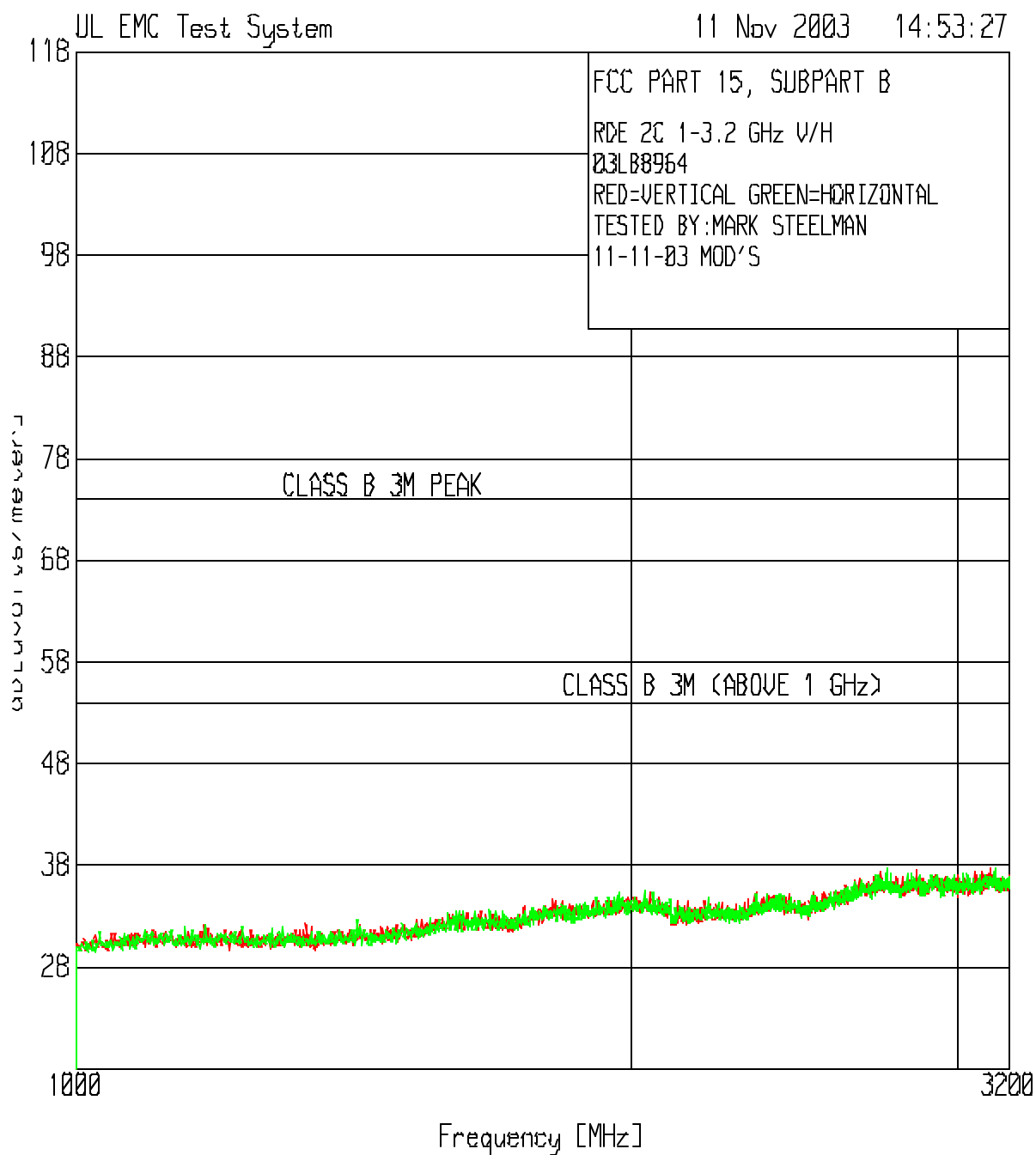
**Test 2, Item B (side) - Peak Plot (Amplitude in dBuV/m):**

Radiated Disturbance Emissions - Above 1 GHz



**Test 2, Item C (end) - Peak Plot (Amplitude in dBuV/m):**

Radiated Disturbance Emissions - Above 1 GHz



**Test 1, Frequency Table:** Radiated Disturbance Emissions - 30 MHz to 1000 MHz

| Test Item (A-Z)         | Detector Type* (P/Q/A) | Antenna Polarity (H/V) | Antenna Distance (m) | Measured Frequency (MHz) | Measured Value (dBuV) | Equip Correction (dB/m) | Corrected Value (dBuV/m) | Specified Limit** (dBuV/m) | Spec Margin (dB) | See Comment (#)*** |
|-------------------------|------------------------|------------------------|----------------------|--------------------------|-----------------------|-------------------------|--------------------------|----------------------------|------------------|--------------------|
| <b>Flat Orientation</b> |                        |                        |                      |                          |                       |                         |                          |                            |                  |                    |
| A                       | P                      | H                      | 3                    | 303.5                    | 93.2                  | -13.7                   | 79.5                     | 94.9                       | -15.4            |                    |
| A                       | A                      | H                      | 3                    | 303.5                    | -                     | -                       | 68.6                     | 74.9                       | -6.3             | 1                  |
| A                       | P                      | H                      | 3                    | 607.0                    | 68.5                  | -5.8                    | 62.7                     | 74.9                       | -12.2            |                    |
| A                       | A                      | H                      | 3                    | 607.0                    | -                     | -                       | 51.8                     | 54.9                       | -3.1             | 2                  |
| A                       | P                      | H                      | 3                    | 910.5                    | 51.1                  | -2.5                    | 48.6                     | 75.9                       | -27.3            |                    |
| A                       | A                      | H                      | 3                    | 910.5                    | -                     | -                       | 37.7                     | 54.9                       | -17.2            |                    |
| A                       | P                      | H                      | 3                    | 1214.0                   | 39.9                  | -7.6                    | 32.3                     | 74.0                       | -41.7            | Restr. Band        |
| A                       | A                      | H                      | 3                    | 1214.0                   | -                     | -                       | 21.4                     | 54.0                       | -32.6            | Restr. Band        |
| A                       | P                      | H                      | 3                    | 1517.5                   | 38.1                  | -6.0                    | 32.1                     | 74.0                       | -41.9            | Restr. Band        |
| A                       | A                      | H                      | 3                    | 1517.5                   | -                     | -                       | 21.2                     | 54.0                       | -31.8            | Restr. Band        |
| A                       | P                      | H                      | 3                    | 1821.0                   | 38.7                  | -4.4                    | 34.3                     | 74.9                       | -39.7            |                    |
| A                       | A                      | H                      | 3                    | 1821.0                   | -                     | -                       | 23.4                     | 54.9                       | -29.6            |                    |
| A                       | P                      | H                      | 3                    | 2124.5                   | 37.8                  | -3.8                    | 34.0                     | 74.9                       | -40.0            |                    |
| A                       | A                      | H                      | 3                    | 2124.5                   | -                     | -                       | 22.9                     | 54.9                       | -30.9            |                    |
| A                       | P                      | H                      | 3                    | 2428.0                   | 37.3                  | -3.2                    | 34.1                     | 74.9                       | -39.9            |                    |
| A                       | A                      | H                      | 3                    | 2428.0                   | -                     | -                       | 23.2                     | 54.9                       | -30.8            |                    |
| A                       | P                      | H                      | 3                    | 2731.5                   | 38.3                  | -2.2                    | 36.1                     | 74.0                       | -37.9            | Restr. Band        |
| A                       | A                      | H                      | 3                    | 2731.5                   | -                     | -                       | 25.2                     | 54.0                       | -28.8            | Restr. Band        |
| A                       | P                      | H                      | 3                    | 3035.0                   | 39.2                  | -1.9                    | 37.3                     | 74.0                       | -36.7            | Restr. Band        |
| A                       | A                      | H                      | 3                    | 3035.0                   | -                     | -                       | 26.4                     | 54.0                       | -27.6            | Restr. Band        |

\* P = Peak, Q = Quasi-Peak, A = Average.

\*\* The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.

\*\*\* # = See Comment Number Under This Test's Comments Section.

Sample Calculation: Corrected Value = Measured Value + Equip Correction

Sample Calculation: Equip Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB, if used)

**Comments:**

| Comment # | Description                                                                                                               |
|-----------|---------------------------------------------------------------------------------------------------------------------------|
| 1         | Highest Emissions (transmit frequency) is 68.6 dBuV/m @ 3 meters. This is equal to 2691 uV/m in linear units.             |
| 2         | Highest Spurious Emission was measured at 607 MHz is 51.8 dBuV/m @ 3 meters. This is equal to 389 dBuV/m in linear units. |

**Test 1, Frequency Table:** Radiated Disturbance Emissions - 30 MHz to 1000 MHz

| Test Item (A-Z)         | Detector Type* (P/Q/A) | Antenna Polarity (H/V) | Antenna Distance (m) | Measured Frequency (MHz) | Measured Value (dBuV) | Equip Correction (dB/m) | Corrected Value (dBuV/m) | Specified Limit** (dBuV/m) | Spec Margin (dB) | See Comment (#)*** |
|-------------------------|------------------------|------------------------|----------------------|--------------------------|-----------------------|-------------------------|--------------------------|----------------------------|------------------|--------------------|
| <b>Side Orientation</b> |                        |                        |                      |                          |                       |                         |                          |                            |                  |                    |
| B                       | P                      | H                      | 3                    | 303.5                    | 87.0                  | -13.7                   | 73.3                     | 94.9                       | -21.6            |                    |
| B                       | A                      | H                      | 3                    | 303.5                    | -                     | -                       | 62.4                     | 74.9                       | -12.5            |                    |
| B                       | P                      | H                      | 3                    | 607.0                    | 65.9                  | -5.8                    | 60.1                     | 74.9                       | -14.8            |                    |
| B                       | A                      | H                      | 3                    | 607.0                    | -                     | -                       | 49.2                     | 54.9                       | -5.7             |                    |
| B                       | P                      | V                      | 3                    | 910.5                    | 51.0                  | -2.5                    | 48.5                     | 75.9                       | -27.4            |                    |
| B                       | A                      | V                      | 3                    | 910.5                    | -                     | -                       | 37.6                     | 54.9                       | -17.3            |                    |

Note: No measurable emissions were observed within 20 dB of the designated limit above 1 GHz.

\* P = Peak, Q = Quasi-Peak, A = Average.

\*\* The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.

\*\*\* # = See Comment Number Under This Test's Comments Section.

Sample Calculation: Corrected Value = Measured Value + Equip Correction

Sample Calculation: Equip Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB, if used)

| Test Item (A-Z)        | Detector Type* (P/Q/A) | Antenna Polarity (H/V) | Antenna Distance (m) | Measured Frequency (MHz) | Measured Value (dBuV) | Equip Correction (dB/m) | Corrected Value (dBuV/m) | Specified Limit** (dBuV/m) | Spec Margin (dB) | See Comment (#)*** |
|------------------------|------------------------|------------------------|----------------------|--------------------------|-----------------------|-------------------------|--------------------------|----------------------------|------------------|--------------------|
| <b>End Orientation</b> |                        |                        |                      |                          |                       |                         |                          |                            |                  |                    |
| C                      | P                      | H                      | 3                    | 303.5                    | 86.6                  | -13.7                   | 72.9                     | 94.9                       | -22.0            |                    |
| C                      | A                      | H                      | 3                    | 303.5                    | -                     | -                       | 62.0                     | 74.9                       | -12.9            |                    |
| C                      | P                      | V                      | 3                    | 607.0                    | 65.6                  | -5.8                    | 59.8                     | 74.9                       | -15.1            |                    |
| C                      | A                      | V                      | 3                    | 607.0                    | -                     | -                       | 48.9                     | 54.9                       | -6.0             |                    |
| C                      | P                      | V                      | 3                    | 910.5                    | 52.5                  | -2.4                    | 50.1                     | 75.9                       | -25.8            |                    |
| C                      | A                      | V                      | 3                    | 910.5                    | -                     | -                       | 39.2                     | 54.9                       | -15.7            |                    |

Note: No measurable emissions were observed within 20 dB of the designated limit above 1 GHz.

\* P = Peak, Q = Quasi-Peak, A = Average.

\*\* The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.

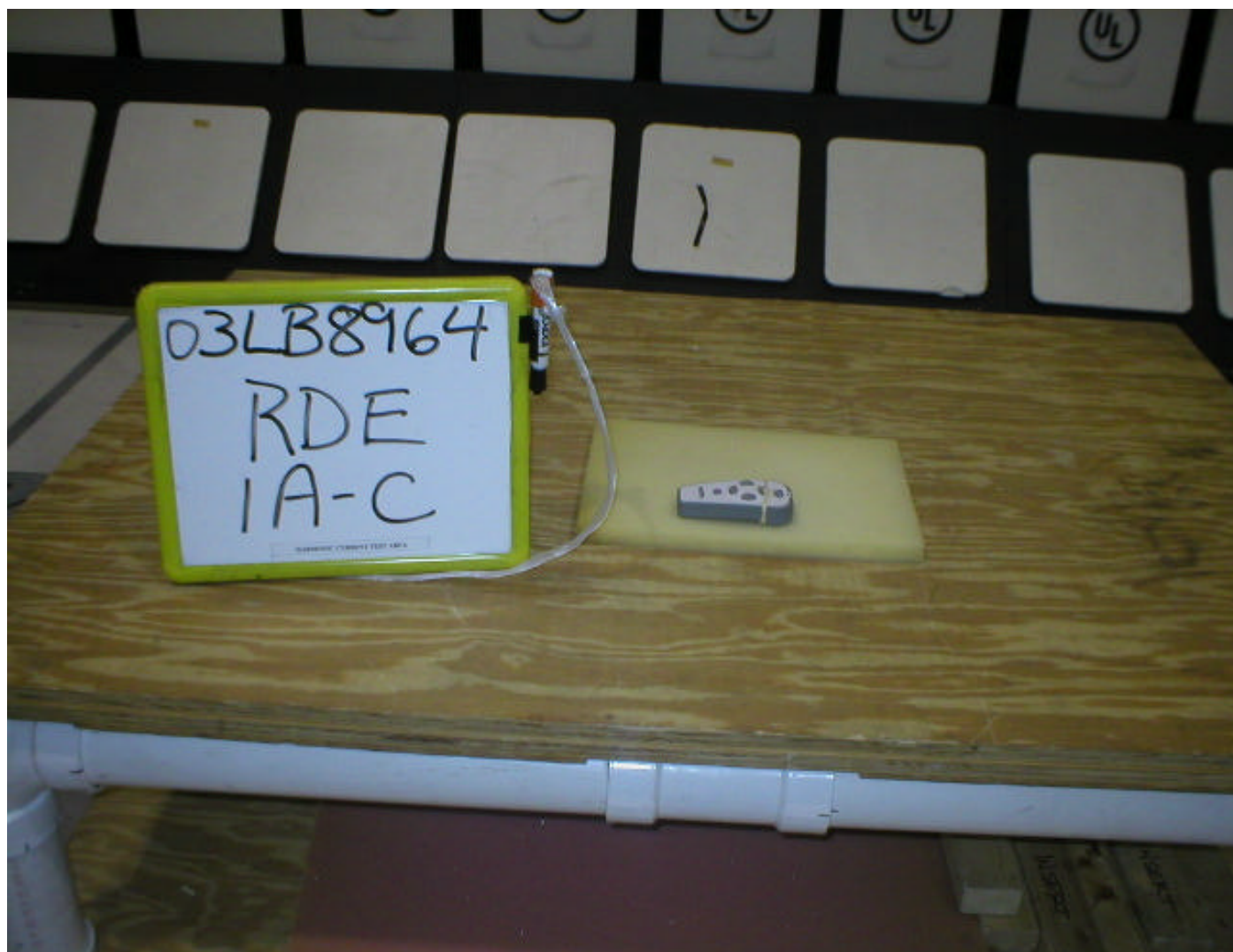
\*\*\* # = See Comment Number Under This Test's Comments Section.

Sample Calculation: Corrected Value = Measured Value + Equip Correction

Sample Calculation: Equip Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB, if used)

**Test 1, Test Set-Up Photo:**

Radiated Disturbance Emissions - 30 MHz to 1000 MHz



## Test 2: Radiated Disturbance Emissions - Peak-to-Average Ratio

**Test Requirement:** 47 CFR Part 15, Subpart C

**Test Specification:** 47 CFR Part 15, Subpart C, Section 15.231

### **Test Procedure:**

The test was performed in accordance with the Test Requirement and Specification and configured as noted in the Test Setup. The EUT was placed inside the anechoic chamber on connected to the proper power supply source. A peak measurement was first made by scanning the entire test frequency range and maximizing the EUT emissions by rotating the EUT and raising the antenna height from 1 to 4 meters above the ground reference plane.

The measurement spectrum analyzer is centered on the EUT's transmit frequency and span is reduced to 0 Hz to obtain a time domain measurement. The period of one complete transmit cycle is recorded. Next each button on the transmitter is depressed in sequence to determine which button produces the largest duty cycle. Address switches are also set to produce the largest number of long pulses. The duration of each length pulse in the cycle is recorded and the percentage of time the EUT is transmitting is calculated.

No limit is expressed in Section 15.231 for this test, however the result of this test is used to calculate average values for emissions measurements.

### **Test Deviations:**

None

**Test Setup:** Only the following ports were tested. See EUT Information for details.

| Test Item | Port # | Port Name | EUT Operation Mode | EUT Configuration | Power Interface |
|-----------|--------|-----------|--------------------|-------------------|-----------------|
| A         | 0      | Enclosure | 1                  | 1                 | 1               |
|           |        |           |                    |                   |                 |

**Test 2 - Results:** Radiated Disturbance Emissions - Peak-to-Average Ratio

**Test Results Summary:**

| Test Item | Test Location | Humidity (%) | Temperature (°C) | Pressure (kPa) | Pass/Fail (P/F) | Date Completed | Comment # |
|-----------|---------------|--------------|------------------|----------------|-----------------|----------------|-----------|
| A         | A             | 39           | 22               | 100            | NA              | 9/29/03        |           |
|           |               |              |                  |                |                 |                |           |

The EUT was considered to **Pass** the Requirements.

**Comments:**

| Comment # | Description |
|-----------|-------------|
|           |             |
|           |             |
|           |             |
|           |             |

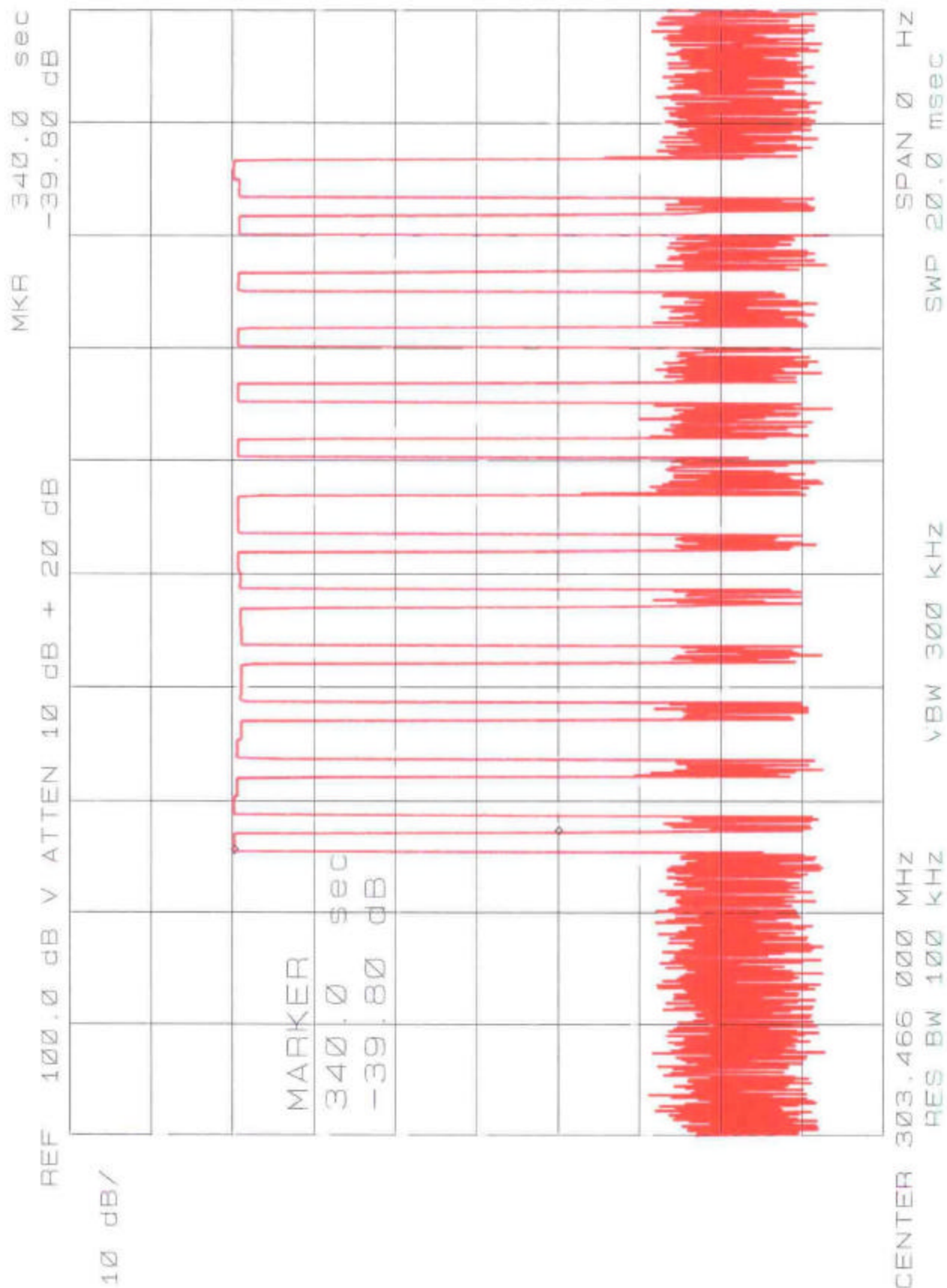
**Test Equipment Used:**

| Equipment ID | Description                               | Manufacturer    | Model Number   | Last Cal. | Next Cal. |
|--------------|-------------------------------------------|-----------------|----------------|-----------|-----------|
| AT0025       | Biconical Antenna, 30 to 300 MHz          | Schaffner, EMC  | VBA6106A       | 4/8/03    | 4/30/04   |
| AT0030       | Log periodic Antenna, 200 MHz to 1000 MHz | Schaffner, EMC  | 3160-07        | 1/13/03   | 1/31/04   |
| ATA061       | Amplifier, 1 to 1000 MHz                  | Miteq           | AM-3A-000110-N | 3/20/03   | 3/31/04   |
| ATA084       | Attenuator 6 dB, 2 GHz                    | Pasternack      | PE7002-6       | 3/19/03   | 3/31/04   |
| ATA085       | Attenuator 6 dB, 2 GHz                    | Pasternack      | PE7002-6       | 3/19/03   | 3/31/04   |
| ATA095       | 6 ft, N male - N male                     | Micro-Coax      | Coaxial Cable  | 9/30/03   | 3/31/04   |
| ATA096       | 50 ft, N male - N male                    | Micro-Coax      | Coaxial Cable  | 9/30/03   | 3/31/04   |
| ATA108       | 10 m, N male - N male                     | UL              | RG214          | 3/19/03   | 3/31/04   |
| ATA124       | RF Amplifier, 1 to 1000 MHz               | Miteq           | AM-3A-000110-N | 3/20/03   | 3/31/04   |
| ATA140       | RG214 Ferrite Cable                       | EMC Eupen       | N/A            | 3/19/03   | 3/31/04   |
| ATA143       | 6ft., N-male to N-male                    | Micro-Coax      | Coaxial Cable  | 3/19/03   | 3/31/04   |
| SAR002       | Spectrum Analyzer / Receiver              | Hewlett-Packard | 8566B          | 11/21/02  | 11/30/03  |
|              |                                           |                 |                |           |           |

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

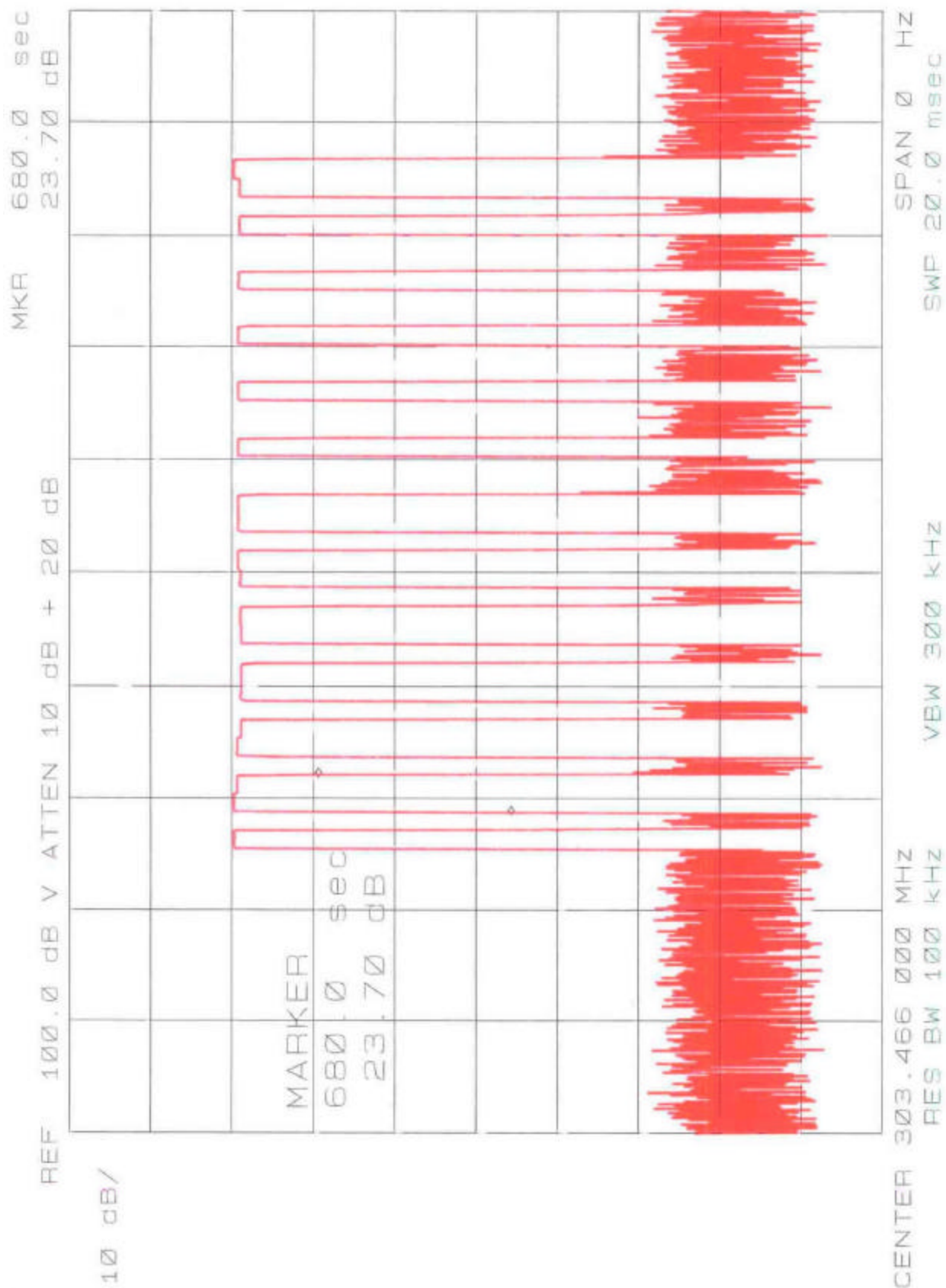
**Test 2, - Peak Plot (Amplitude in dBuV):**

Peak-to-Average Ratio – Duration of Short Pulse



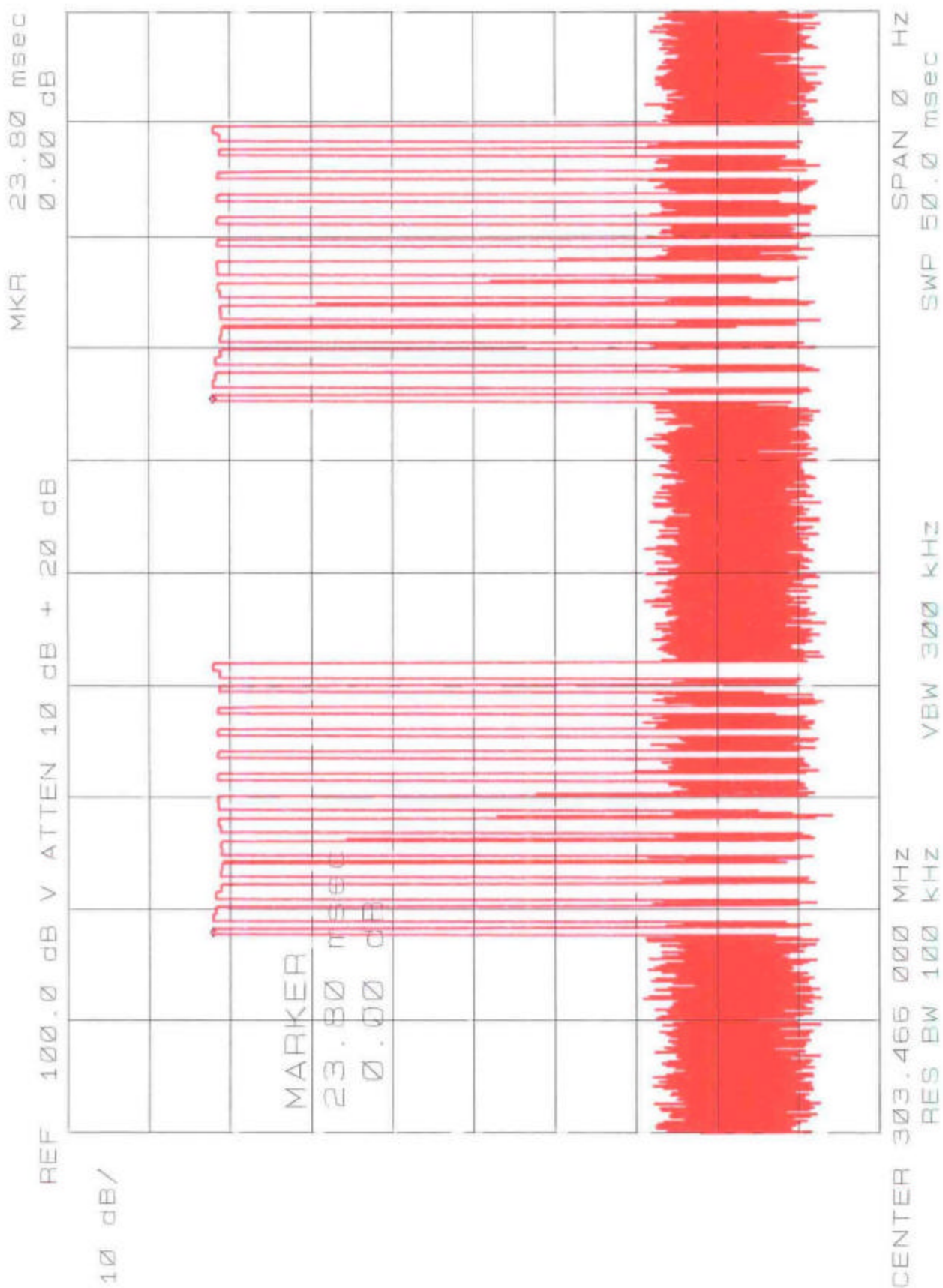
**Test 2, Peak Plot (Amplitude in dBuV):**

Radiated Disturbance Emissions – Duration of Long Pulse



**Test 2. Peak Plot (Amplitude in dBuV):**

Radiated Disturbance Emissions – Duration of 1 period or 100 ms (whichever is less)



**Test 2, Calculation:** Radiated Disturbance Emissions - Peak-to-Average Ratio

| Test Item (A-Z) | Total ON time per transmission (mS)     | Total Period of transmission (mS)* | Duty Cycle (ON time / total period) | Peak-to-Average Ratio (dB)** | See Comment (#)*** |
|-----------------|-----------------------------------------|------------------------------------|-------------------------------------|------------------------------|--------------------|
| A               | 0.34 ms x 6 short +<br>0.68 ms x 7 long | 23.8                               | 28.60%                              | -10.9                        | 1                  |

\* Or 100 milliseconds, whichever is less

\*\* Peak-to-Average Ratio =  $20 * \log(\text{Duty Cycle})$

**Comments:**

| Comment # | Description                                                                                                            |
|-----------|------------------------------------------------------------------------------------------------------------------------|
| 1         | 13 pulses are always produced. The DIP switch address was set to produce the largest number of "long" pulses possible. |
|           |                                                                                                                        |
|           |                                                                                                                        |
|           |                                                                                                                        |

### Test 3: Radiated Disturbance Emissions - Occupied Bandwidth

**Test Requirement:** 47 CFR Part 15, Subpart C

**Test Specification:** 47 CFR Part 15, Subpart C, Section 15.231

**Test Procedure:**

All testing was performed in UL's 10 meter semi-anechoic chamber. The chamber meets the FCC's site attenuation criteria for use as an alternative measurement site. The EUT was tested per ANSI C63.4:1992 test method placed on a non-conductive 1m x 1.5m table 80 cm above the ground plane. The receive antenna used was a log-periodic antenna mounted on an antenna mast. The turntable was rotated from 0° to 360° to determine the worst-case emissions angle for the transmit frequency. The antenna mast was raised and lowered between 1 and 4 meters above the ground plane to determine the worst-case height.

The spectrum analyzer Resolution Bandwidth and Video Bandwidth were set to 10 kHz for the measurement. A plot of the spectrum analyzer display screen is produced with marker points displaying the center frequency and the left and right side points that are 20 dB below the field strength at the center frequency.

Occupied Bandwidth Limit - Manually Operated Transmitter Section 15.231

| Transmit Frequency<br>MHz | Bandwidth Limit<br>(% of fundamental) |
|---------------------------|---------------------------------------|
| 70 to 900                 | .25%                                  |
| Above 900                 | .50%                                  |

**Test Deviations:**

None

**Test Setup:** Only the following ports were tested. See EUT Information for details.

| Test Item | Port # | Port Name | EUT Operation Mode | EUT Configuration | Power Interface |
|-----------|--------|-----------|--------------------|-------------------|-----------------|
| A         | 0      | Enclosure | 1                  | 1                 | 1               |
|           |        |           |                    |                   |                 |

**Test 3 - Results:** Radiated Disturbance Emissions - Occupied Bandwidth

**Test Results Summary:**

| Test Item | Test Location | Humidity (%) | Temperature (°C) | Pressure (kPa) | Pass/Fail (P/F) | Date Completed | Comment # |
|-----------|---------------|--------------|------------------|----------------|-----------------|----------------|-----------|
| A         | A             | 39           | 22               | 100            | P               | 9/29/03        |           |
|           |               |              |                  |                |                 |                |           |

The EUT was considered to **Pass** the Requirements.

**Comments:**

| Comment # | Description |
|-----------|-------------|
|           |             |
|           |             |
|           |             |
|           |             |

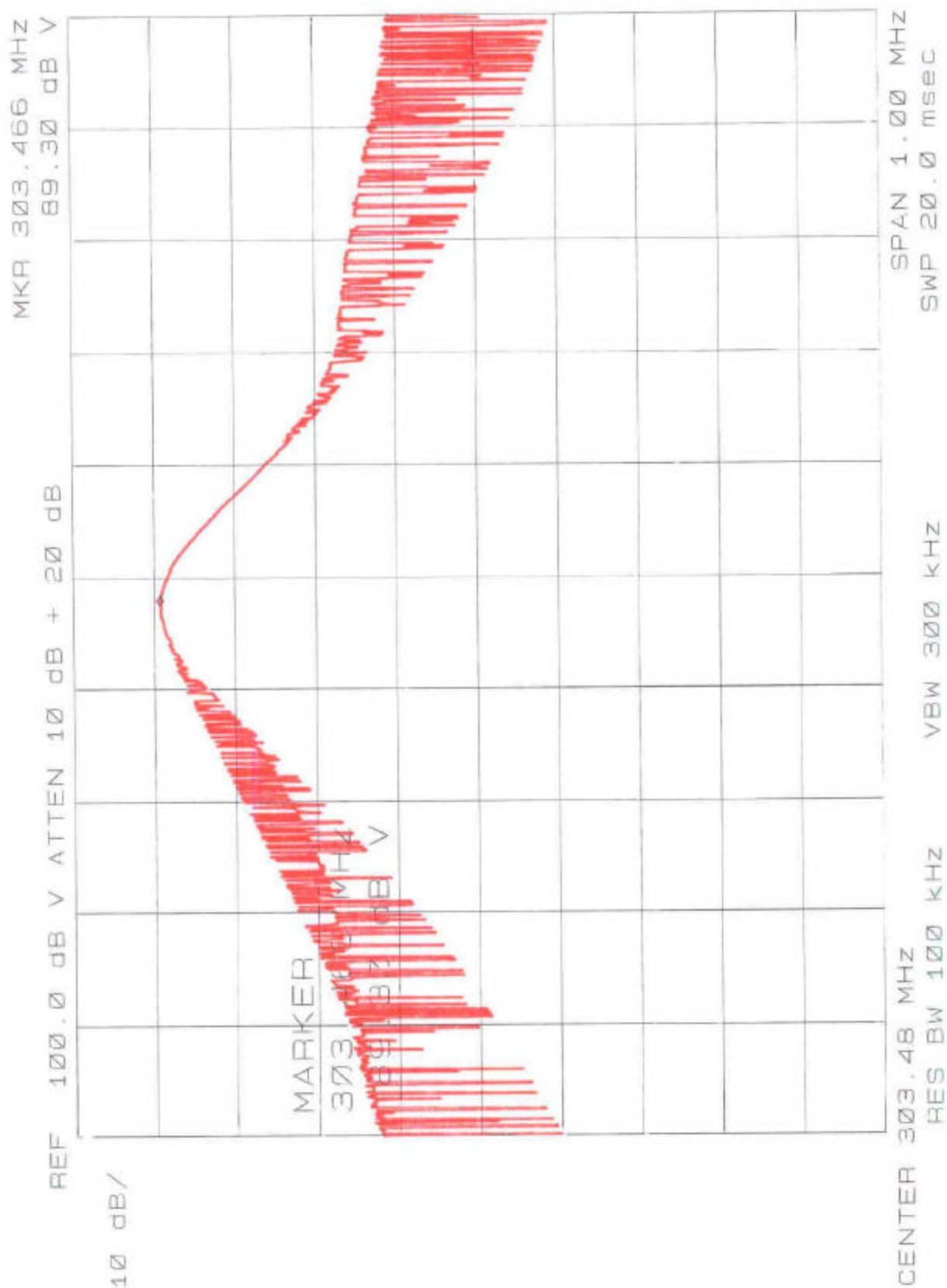
**Test Equipment Used:**

| Equipment ID | Description                               | Manufacturer    | Model Number   | Last Cal. | Next Cal. |
|--------------|-------------------------------------------|-----------------|----------------|-----------|-----------|
| AT0025       | Biconical Antenna, 30 to 300 MHz          | Schaffner, EMC  | VBA6106A       | 4/8/03    | 4/30/04   |
| AT0030       | Log periodic Antenna, 200 MHz to 1000 MHz | Schaffner, EMC  | 3160-07        | 1/13/03   | 1/31/04   |
| ATA061       | Amplifier, 1 to 1000 MHz                  | Miteq           | AM-3A-000110-N | 3/20/03   | 3/31/04   |
| ATA084       | Attenuator 6 dB, 2 GHz                    | Pasternack      | PE7002-6       | 3/19/03   | 3/31/04   |
| ATA085       | Attenuator 6 dB, 2 GHz                    | Pasternack      | PE7002-6       | 3/19/03   | 3/31/04   |
| ATA095       | 6 ft, N male - N male                     | Micro-Coax      | Coaxial Cable  | 9/30/03   | 3/31/04   |
| ATA096       | 50 ft, N male - N male                    | Micro-Coax      | Coaxial Cable  | 9/30/03   | 3/31/04   |
| ATA108       | 10 m, N male - N male                     | UL              | RG214          | 3/19/03   | 3/31/04   |
| ATA124       | RF Amplifier, 1 to 1000 MHz               | Miteq           | AM-3A-000110-N | 3/20/03   | 3/31/04   |
| ATA140       | RG214 Ferrite Cable                       | EMC Eupen       | N/A            | 3/19/03   | 3/31/04   |
| ATA143       | 6ft., N-male to N-male                    | Micro-Coax      | Coaxial Cable  | 3/19/03   | 3/31/04   |
| SAR002       | Spectrum Analyzer / Receiver              | Hewlett-Packard | 8566B          | 11/21/02  | 11/30/03  |
|              |                                           |                 |                |           |           |

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

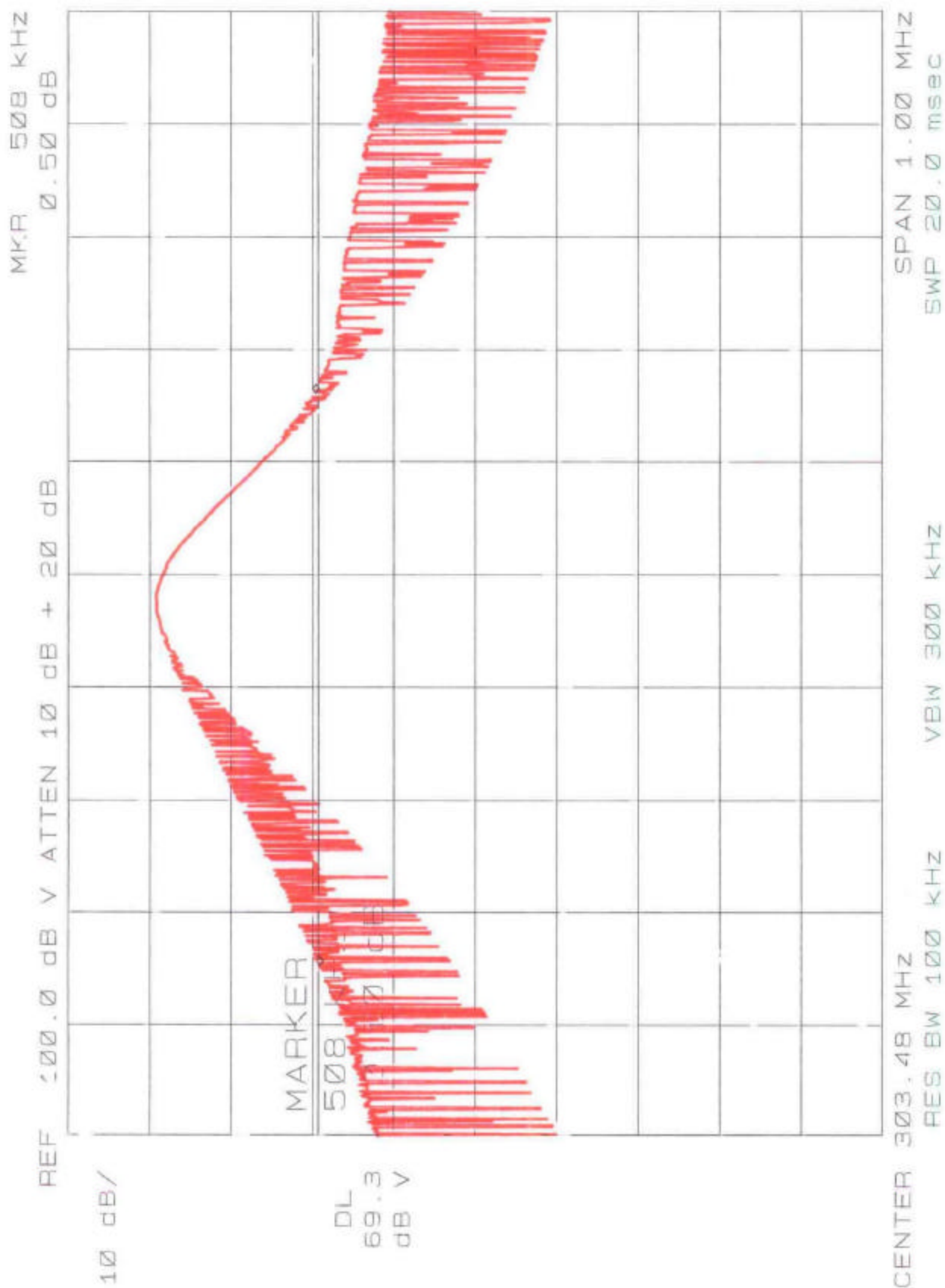
**Test 3, Peak Plot (Amplitude in dBuV):**

Radiated Disturbance Emissions - Center Frequency



**Test 3, Peak Plot (Amplitude in dBuV):**

Radiated Disturbance Emissions - Occupied Bandwidth



**Test 3, Item A - Discrete Data:** Radiated Disturbance Emissions - Occupied Bandwidth

| Test Item (A-Z) | Center Frequency (MHz) | Measured Bandwidth (MHz) | Bandwidth (% of Center Frequency) | Maximum Permitted Bandwidth (% of Center Frequency) | Pass/Fail (P/F) | See Comment (#)* |
|-----------------|------------------------|--------------------------|-----------------------------------|-----------------------------------------------------|-----------------|------------------|
| A               | 303.47                 | 0.508                    | 0.167                             | 0.25                                                | P               |                  |

\* # = See Comment Number Under This Test's Comments Section.

## Test 4: Radiated Disturbance Emissions - Restricted Bands

**Test Requirement:** 47 CFR Part 15, Subpart C

**Test Specification:** 47 CFR Part 15, Subpart C, Section 15.205

### **Test Procedure:**

The EUT is verified to produce only spurious emissions in the bands listed below. Where spurious emissions exist they must comply with the general limits from 47 CFR Part 15, Section 15.209.

Results from measurements are examined to ensure that no spurious emission in a restricted band (below) exceeds the general limits in Section 15.209. The restricted bands from Section 15.205 are:

| MHz                 | MHz                   | MHz             | GHz           |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 - 0.110       | 16.42 - 16.423        | 608 - 614       | 4.5 - 5.15    |
| 0.495 - 0.505       | 16.69475 - 16.69525   | 960 - 1240      | 5.35 - 5.46   |
| 2.1735 - 2.1905     | 16.80425 - 16.80475   | 1300 - 1427     | 7.25 - 7.75   |
| 4.125 - 4.128       | 25.5 - 25.67          | 1435 - 1626.5   | 8.025 - 8.5   |
| 4.17725 - 4.17775   | 37.5 - 38.25          | 1645.5 - 1646.5 | 9.0 - 9.2     |
| 4.20725 - 4.20775   | 73 - 74.6             | 1660 - 1710     | 9.3 - 9.5     |
| 6.215 - 6.218       | 74.8 - 75.2           | 1718.8 - 1722.2 | 10.6 - 12.7   |
| 6.26775 - 6.26825   | 108 - 121.94          | 2200 - 2300     | 13.25 - 13.4  |
| 6.31175 - 6.31225   | 123 - 138             | 2310 - 2390     | 14.47 - 14.5  |
| 8.291 - 8.294       | 149.9 - 150.05        | 2483.5 - 2500   | 15.35 - 16.2  |
| 8.362 - 8.366       | 156.52475 - 156.52525 | 2655 - 2900     | 17.7 - 21.4   |
| 8.37625 - 8.38675   | 156.7 - 156.9         | 3260 - 3267     | 22.01 - 23.12 |
| 8.41425 - 8.41475   | 162.0125 - 167.17     | 3332 - 3339     | 23.6 - 24.0   |
| 12.29 - 12.293      | 127.72 - 167.17       | 3345.8 - 3358   | 31.2 - 31.8   |
| 12.51975 - 12.52025 | 240 - 285             | 3600 - 4400     | 36.43 - 36.5  |
| 12.57675 - 12.57725 | 332 - 335.4           |                 | Above 38.6    |
| 13.36 - 13.41       | 399.9 - 410           |                 |               |

All spurious emissions, including harmonics falling within restricted bands were observed to meet the general limits of 15.209.

### **Test Deviations:**

None

**Test Setup:** Only the following ports were tested. See EUT Information for details.

| Test Item | Port # | Port Name | EUT Operation Mode | EUT Configuration | Power Interface |
|-----------|--------|-----------|--------------------|-------------------|-----------------|
| A         | 0      | Enclosure | 1                  | 1                 | 1               |
|           |        |           |                    |                   |                 |

**Test 4 - Results:** Radiated Disturbance Emissions - Restricted Bands

**Test Results Summary:**

| Test Item | Test Location | Humidity (%) | Temperature (°C) | Pressure (kPa) | Pass/Fail (P/F) | Date Completed | Comment # |
|-----------|---------------|--------------|------------------|----------------|-----------------|----------------|-----------|
| A         | A             | NA           | NA               | NA             | P               | 9/29/03        | 1         |
|           |               |              |                  |                |                 |                |           |

The EUT was considered to **Pass** the Requirements.

**Comments:**

| Comment # | Description                                                                              |
|-----------|------------------------------------------------------------------------------------------|
| 1         | Compliance with general limits in restricted bands is determined from results in Test 1. |
|           |                                                                                          |
|           |                                                                                          |
|           |                                                                                          |

**Accreditation Certificates:**

National Institute of Standards and Technology **NVLAP**® National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999  
ISO 9002:1994

**Scope of Accreditation**

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ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS NVLAP LAB CODE 200246-0

UNDERWRITERS LABORATORIES, INC.  
12 Laboratory Drive  
Research Triangle Park, NC 27709  
Mr. Rick A. Titus  
Phone: 847-272-8800 x43281 Fax: 847-509-6321  
E-Mail: Rick.A.Titus@us.ul.com  
URL: http://www.ul.com

**NVLAP Code Designation / Description**

**Emissions Test Methods:**

|           |                                                                                                                                                                                                              |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12/CIS14  | CISPR 14-1 (March 30, 2000): Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus - Part 1: Emissions |
| 12/CIS14a | EN 55014-1 (1993) with Amendments A1 (1997) & A2 (1999)                                                                                                                                                      |
| 12/CIS14b | AS/NZS 1044 (1995)                                                                                                                                                                                           |
| 12/CIS22  | IEC/CISPR 22 (1997) and EN 55022 (1998): Limits and methods of measurement of radio disturbance characteristics of information technology equipment                                                          |
| 12/CIS22a | IEC/CISPR 22 (1993): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1:1995, and Amendment 2:1996                                      |
| 12/CIS22b | CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment                                                                                |

June 30, 2004  
Effective through

*C.D. Laison*  
For the National Institute of Standards and Technology

National Institute of Standards and Technology **NVLAP**® National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999  
ISO 9002:1994

**Scope of Accreditation**

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ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS NVLAP LAB CODE 200246-0

UNDERWRITERS LABORATORIES, INC.

**NVLAP Code Designation / Description**

|         |                                                                                                                                           |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 12/F01  | ANSI C63.4 (2001) - cited in FCC Method - 47 CFR Part 15 - Digital Devices                                                                |
| 12/F01a | Conducted Emissions, Power Lines, 150 KHz to 30 MHz                                                                                       |
| 12/F01b | Radiated Emissions                                                                                                                        |
| 12/T51  | AS/NZS CISPR (2002) and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment |

**Immunity Test Methods:**

|        |                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------|
| 12/I01 | IEC 61000-4-2 (1995) and Amendment 1 (1998) and EN 61000-4-2: Electrostatic Discharge Immunity Test                         |
| 12/I02 | IEC 61000-4-3 (1995) and Amendment 1 (1998) and EN 61000-4-3: Radiated, Radio-Frequency Electromagnetic Field Immunity Test |
| 12/I03 | IEC 61000-4-4 (1995) and EN 61000-4-4: Electrical Fast Transient/Burst Immunity Test                                        |
| 12/I04 | IEC 61000-4-5 (1995) and EN 61000-4-5: Surge Immunity Test                                                                  |
| 12/I05 | IEC 61000-4-6 (1996) and EN 61000-4-6: Immunity to Conducted Disturbances, Induced Radio-Frequency Fields                   |

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National Institute of Standards and Technology **NVLAP**® National Voluntary Laboratory Accreditation Program

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ISO 9002:1994

**Scope of Accreditation**

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ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS NVLAP LAB CODE 200246-0

UNDERWRITERS LABORATORIES, INC.

**NVLAP Code Designation / Description**

|        |                                                                                                |
|--------|------------------------------------------------------------------------------------------------|
| 12/I06 | IEC 61000-4-8 (1993): Power Frequency Magnetic Field Immunity Test                             |
| 12/I07 | IEC 61000-4-11 (1994): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests |

**Safety Test Methods:**

|        |                                                                                                 |
|--------|-------------------------------------------------------------------------------------------------|
| 12/T41 | AC/ACIF S001:2001: Safety Requirements for Customer Equipment                                   |
| 12/T50 | AS/NZS 3260: Safety of Information Technology Equipment Including Electrical Business Equipment |

June 30, 2004  
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### **Measurement Uncertainty Statement**

| <b>Test</b>                                                                                                                                                   | <b>Expanded Estimate<br/>of Uncertainty</b><br>(k = 2, for 95% of a normal distribution) | <b>Units</b>               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------|
| Radiated Disturbance Emissions: <ul style="list-style-type: none"><li>• 3 and 10 meter measurement distances</li><li>• 1 meter measurement distance</li></ul> | +/- 3.8 dB<br>+/- 2.3 dB                                                                 | Volts/meter<br>Volts/meter |
| Conducted Disturbance Emissions<br>(9 kHz – 30 MHz):                                                                                                          | +/- 3.4 dB                                                                               | Volts                      |
| Electrostatic Discharge                                                                                                                                       | +/- 2.2 %                                                                                | Volts                      |
| Radiated RF Immunity (Chamber):                                                                                                                               | +/- 2.7 dB                                                                               | Volts/meter                |
| Electrical Fast Transients/Bursts Immunity                                                                                                                    | +/- 4.6 %                                                                                | Volts                      |
| Surge Immunity                                                                                                                                                | +/- 4.6 %                                                                                | Volts                      |
| Conducted RF Immunity                                                                                                                                         | +/- 2.8 dB                                                                               | Volts                      |
| Power Frequency Magnetic Field Immunity                                                                                                                       | +/-13.6 %                                                                                | Amps/meter                 |
| Voltage Dips and Short Interrupts                                                                                                                             | +/-4.2 %                                                                                 | Volts                      |
| Radiated RF Immunity (Tri-plate)                                                                                                                              | +/-3.2 %                                                                                 | Volts/meter                |
| Disturbance Power (30 – 300 MHz)                                                                                                                              | +/-3.5%                                                                                  | Volts                      |

### **CISPR 16-4:2000 Statement**

The UL-RTP estimate of expanded measurement uncertainty listed above for Conducted Disturbance (+/- 3.4 dB), Disturbance Power (+/- 3.5 dB), and Radiated Disturbance (+/-3.8 dB) are less than the Values of  $U_{\text{CISPR}}$  as listed in Table 1 of CISPR 16-4. Therefore:

- Compliance is deemed to occur if no measured disturbance reported exceeds the disturbance limits.
- Non-compliance is deemed to occur if any measured disturbance reported exceeds the disturbance limits.