



Measurement of RF Emissions from The Cascade Networks Cyclone Transceiver With A TEL-TEK Model TA-926VH-8-120 Antenna

For : Cascade Networks
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P.O. No. : 36513

Date Received : May 4, 2006

Date Tested : May 4, 2006

Test Personnel: Daniel E. Crowder

Specification : FCC "Code of Federal Regulations" Title 47 Part 15,
Subpart C, Section 15.247 for Spread Spectrum
Intentional Radiators Operating within the 902-928MHz
band.

Test Report By


Daniel E. Crowder

Approved By


Raymond J. Klouda
Registered Professional Engineer of
Illinois - 44894

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**THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE
WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INCORPORATED.**

Measurement of RF Emissions from The Cyclone Transceiver With A TEL-TEK Model TA-926VH-8-120 Antenna

1.0 INTRODUCTION:

1.1 Description of Test Item - This document presents the results of tests performed to determine if the Cascade Networks Cyclone Transceiver with a TEL-TEK model TA-926VH-8-120 Antenna would meet the FCC requirements. The test item is a Motorola Canopy transceiver modified by Cascade Networks. It is designed to transmit in the 902MHz to 928MHz band. The tests were performed for Cascade Networks Inc, of Longview, Washington.

1.2 Purpose - The test series was performed to determine if the test item meets the requirements a Class II permissive change requirements for radiated RF emission requirements in the restricted bands per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.247 for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2003. The reasoning for the Class II permissive change is the addition of a new antenna type.

1.3 Deviations, Additions and Exclusions - There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4 Applicable Documents - The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, dated 1 October 2005
- FCC "Guidance on Measurements for Digital Transmission Systems Section 15.247"
- ANSI C63.4-2003, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

1.5 Subcontractor Identification - This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

1.6 Laboratory Conditions The temperature at the time of the test was 21°C and the relative humidity was 36%.

2.0 TEST ITEM SETUP AND OPERATION:

The test item is a Cascade Networks Cyclone Transciever with TEL-TEK model TA-926VH-8-120 Antenna. The antenna is dual polarized 120 degree sectoral, with a gain of 11dBD. A block diagram of the test item setup is shown as Figure 1.

2.1 Power Input - The test item was powered with 24VDC from a Motorola model SADB-1129 transformer via the 45 feet of CAT 5 ethernet cable.

2.2 Grounding - The test item was grounded via the 45 feet of CAT 5 ethernet cable to the transformer.

2.3 Peripheral Equipment - A Sony Viao laptop that was used to power and communicate with the test item via one 45 foot long CAT 5 ethernet cable.

2.4 Interconnect Cables - The test item was connected to the laptop via a 45 foot long CAT 5 ethernet cable.

2.5 Operational Mode - For all tests the test item was placed on an 80cm high non-conductive stand. The test item and all peripheral equipment were energized.

For all tests, the test item was controlled and powered by the laptop computer. Through the computer the test item was set to transmit continuously in a continuous wave mode. The tests were performed with the test item transmitting at 906MHz, 915MHz and 924MHz.

3.0 TEST EQUIPMENT:

3.1 Test Equipment List - A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

3.2 Calibration Traceability - Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 Radiated Spurious Emissions

4.1.1 Requirement – Per section 15.247(c), the radiated emissions which fall in the restricted bands must meet the general limits of 15.209.

4.1.2 Procedures – The radiated tests were performed in a 32ft. x 20ft. x 18ft. hybrid absorber lined semi-anechoic test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. The floor of the chamber is used as the ground plane. The chamber complies with ANSI 63.4 and CISPR 16 requirements for site

attenuation.

Preliminary radiated measurements are performed to determine the frequencies where the significant emissions might be found. With the test item at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using peak detection with 100 kHz BW. This data was then automatically plotted up through 10 GHz

Next, the harmonic or spurious emissions falling in the restricted bands were measured up through the 10th harmonic. For these measurements, the measurement bandwidths were set to 1 MHz RBW. The analyzer was set to **linear mode** with 10 Hz VBW in order to simulate an average detector. A pre-amplifier was used to increase the receiver sensitivity.

4.1.3 Results - The preliminary emissions levels were plotted. These plots are presented on pages 10 through 15. The harmonics and any other emissions that fall in the restricted frequency bands were then re-measured manually. This data is shown in the tables on pages 16 through 18. The field intensities levels for the harmonics in the restricted band were within the general limit.

A block diagram of the test item orientation position is shown in Figure 2.

5.0 CONCLUSIONS:

It was determined that the Cascade Networks Cyclone Transciever tested with a TEL-TEK model TA-926VH-8-120 Antenna, did fully meet the radiated emission in the restricted bands requirements of the FCC "Code of Federal Regulations" Title 47, Part 15.247, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.4-2003. The test item does meet the criteria for a Class II permissive change.

6.0 CERTIFICATION:

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the test item at the test date as operated by Cascade Networks personnel. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.



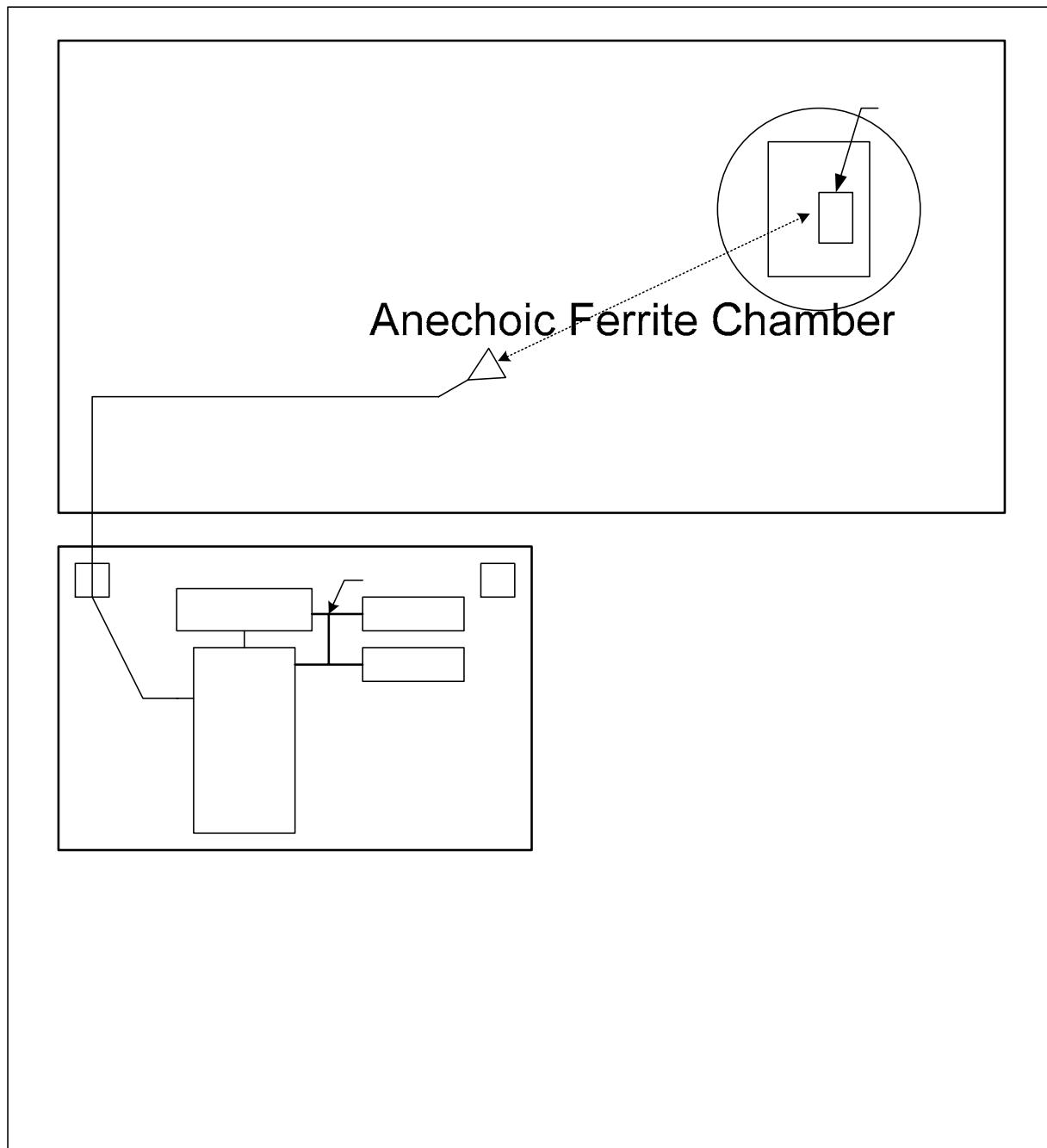
7.0 ENDORSEMENT DISCLAIMER:

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.



TABLE I: TEST EQUIPMENT LIST

| ELITE ELECTRONIC ENG. INC. | | | | | | | Page: 1 | |
|---|--------------------------|-----------------|-------------------------|------------|-----------------|----------|---------|----------|
| Eq ID | Equipment Description | Manufacturer | Model No. | Serial No. | Frequency Range | Cal Date | Cal Inv | Due Date |
| Equipment Type: ACCESSORIES, MISCELLANEOUS | | | | | | | | |
| XPQ0 | HIGH PASS FILTER | K&L MICROWAVE | 4IH30-1804/T 001 | | 1.8-10GHZ | 07/27/05 | 12 | 07/27/06 |
| XZGO | ATTENUATOR/SWITCH DRIVER | HEWLETT PACKARD | 11713A | 3439A02724 | --- | | | N/A |
| Equipment Type: AMPLIFIERS | | | | | | | | |
| APK0 | PRE-AMPLIFIER | HEWLETT PACKARD | 8449B | 3008A00662 | 1-26.5GHZ | 03/06/06 | 12 | 03/06/07 |
| Equipment Type: ANTENNAS | | | | | | | | |
| NWF0 | RIDGED WAVE GUIDE | EMCO | 3105 | 2035 | 1-12.4GHZ | 10/01/05 | 12 | 10/01/06 |
| Equipment Type: CONTROLLERS | | | | | | | | |
| CDS2 | COMPUTER | GATEWAY | MFATXPNT NMZ 0028483108 | | 1.8GHZ | | | N/A |
| CMA0 | MULTI-DEVICE CONTROLLER | EMCO | 2090 | 9701-1213 | --- | | | N/A |
| Equipment Type: PRINTERS AND PLOTTERS | | | | | | | | |
| HRE1 | LASER JET 5P | HEWLETT PACKARD | C3150A | USHB061052 | --- | | | N/A |
| Equipment Type: RECEIVERS | | | | | | | | |
| RAC1 | SPECTRUM ANALYZER | HEWLETT PACKARD | 85660B | 3407A08369 | 100HZ-22GHZ | 02/13/06 | 12 | 02/13/07 |
| RACB | RF PRESELECTOR | HEWLETT PACKARD | 85685A | 3506A01491 | 20HZ-2GHZ | 02/13/06 | 12 | 02/13/07 |
| RAF3 | QUASIEPEAK ADAPTER | HEWLETT PACKARD | 85650A | 3303A01775 | 0.01-1000MHZ | 02/13/06 | 12 | 02/13/07 |
| <hr/> | | | | | | | | |
| Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable | | | | | | | | |
| Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument. | | | | | | | | |



Hpi8 cbl

Turn Table & Mast
Controller

Computer

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Printer

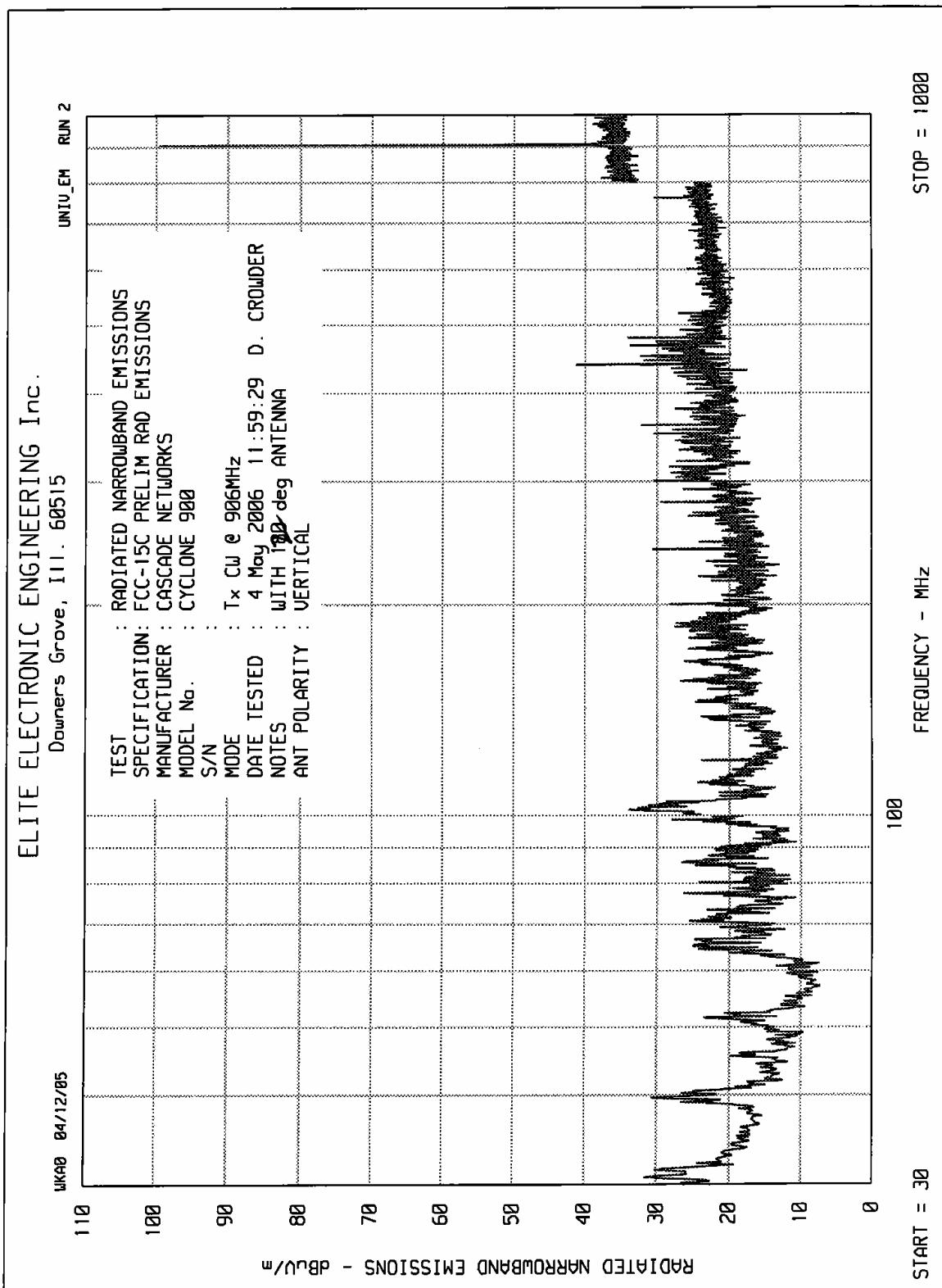
Figure 2

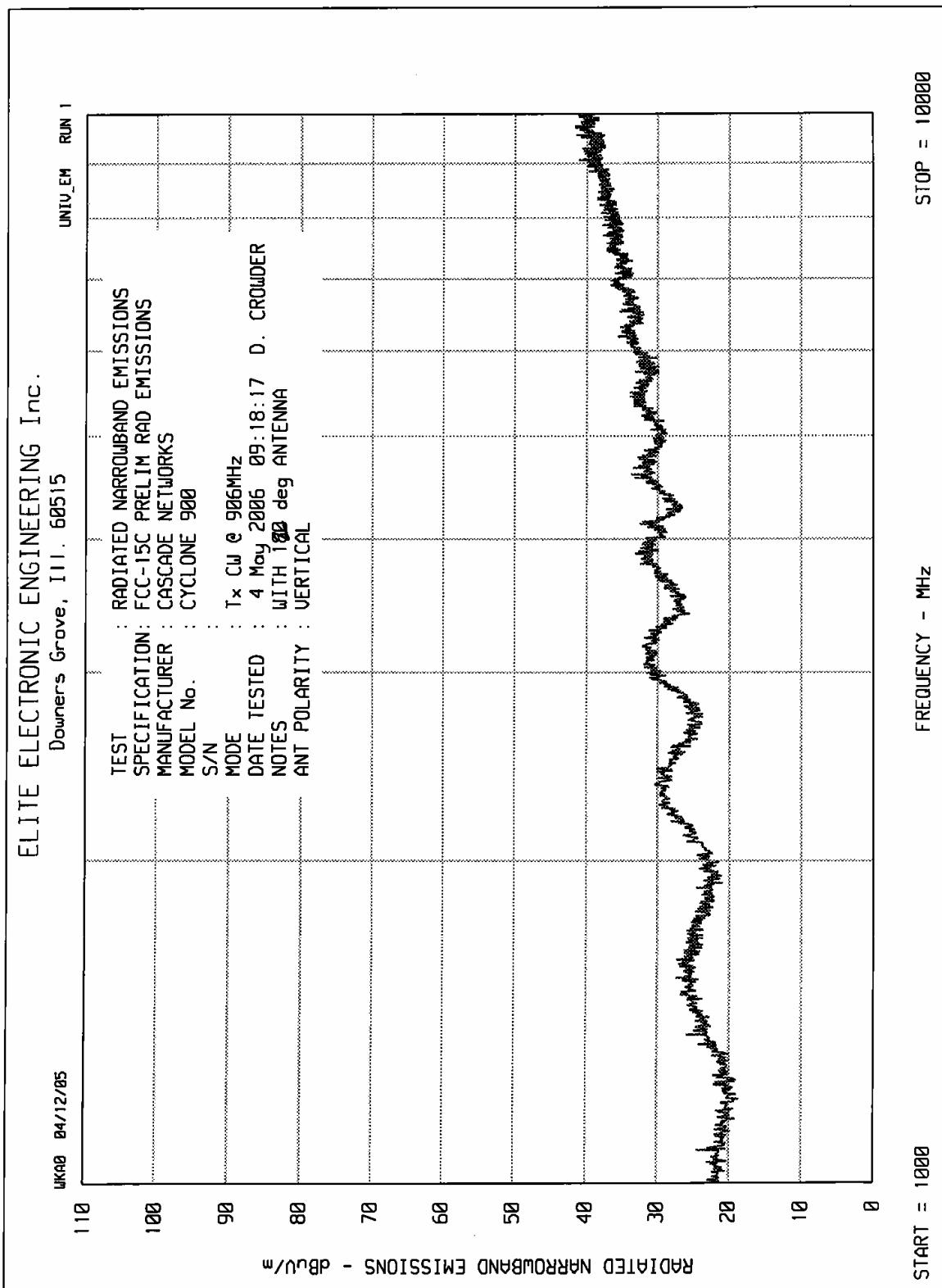


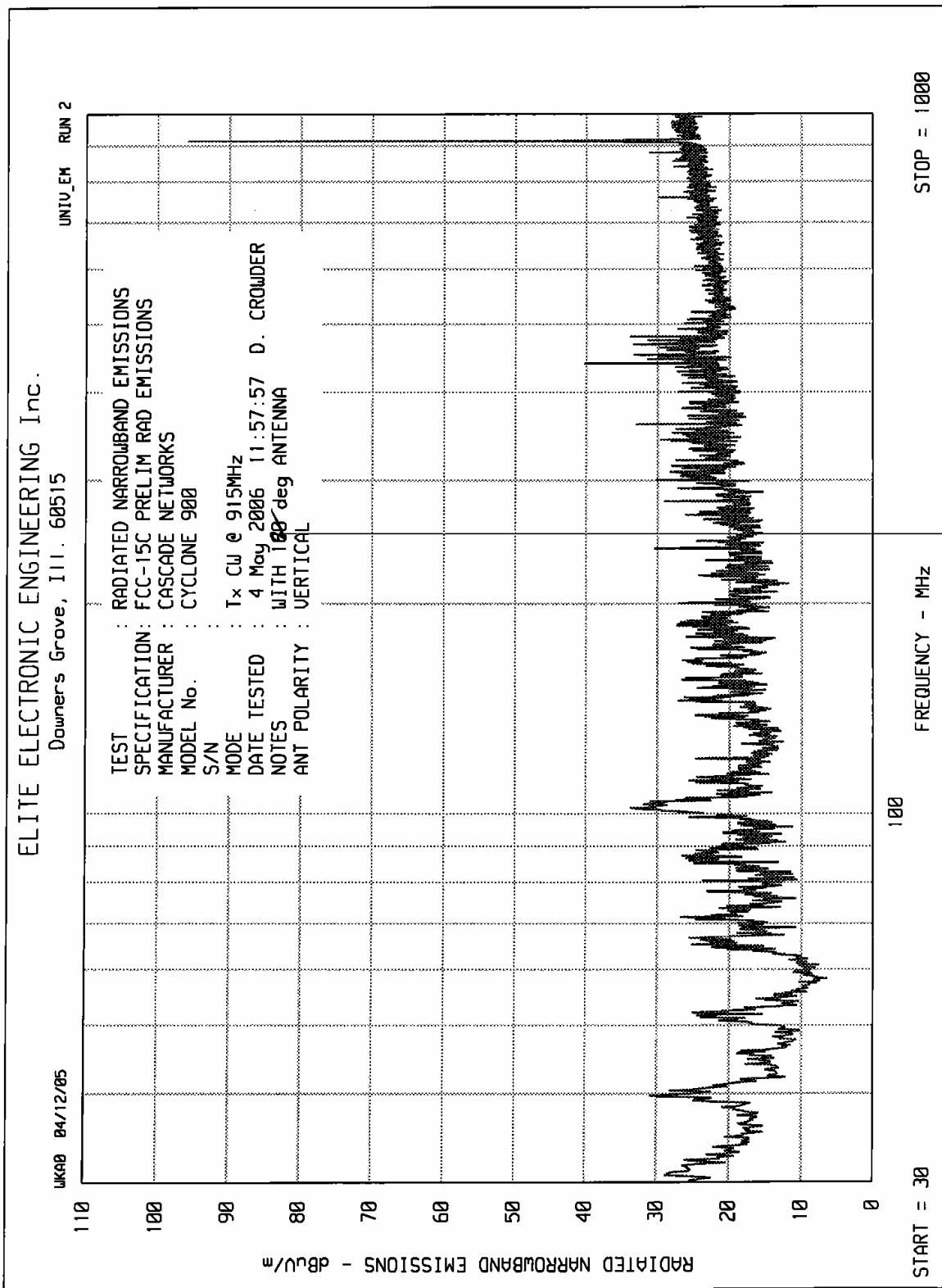
Test Setup For Measurement of Radiated Emissions
Vertical Polarity

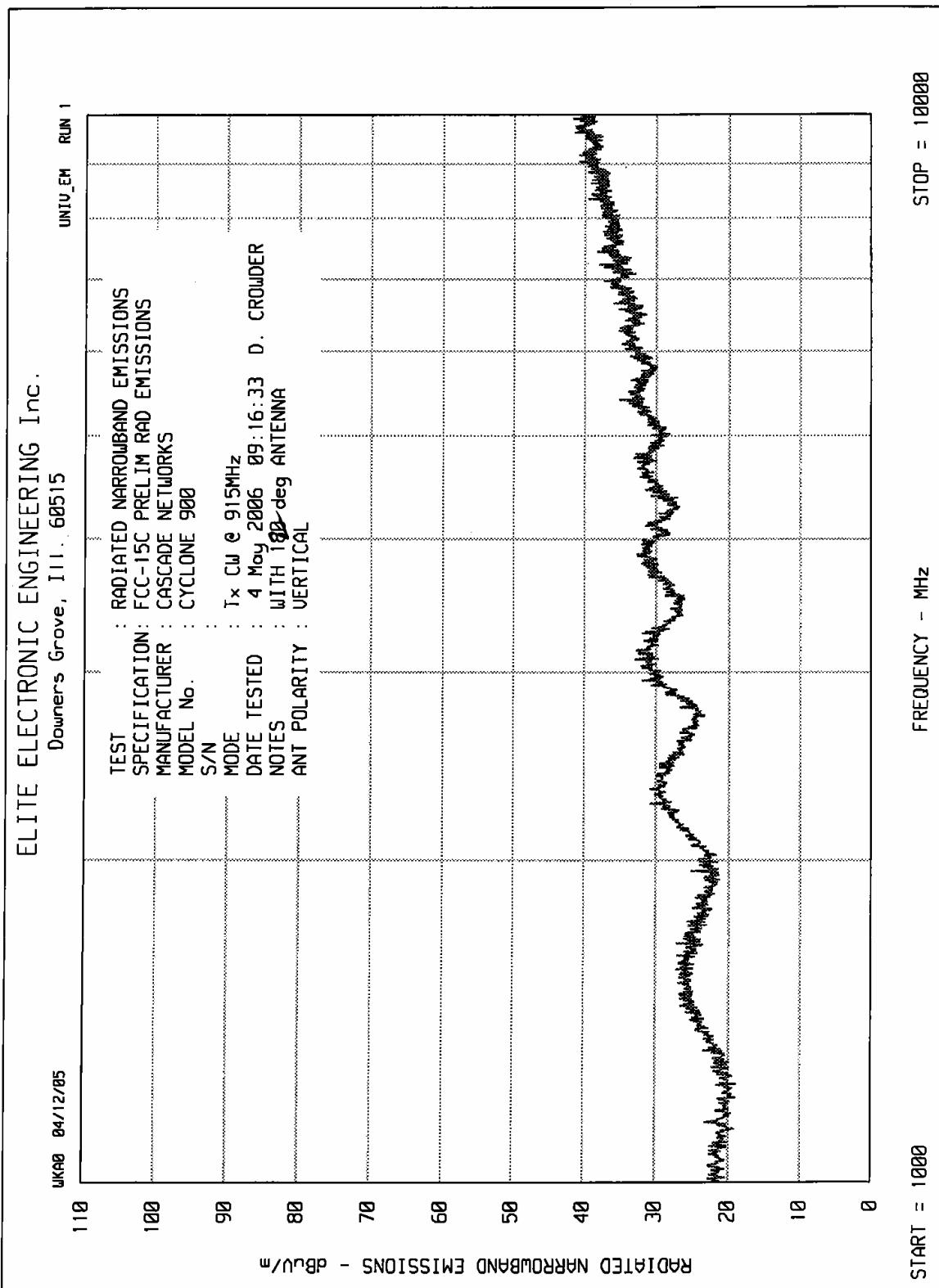


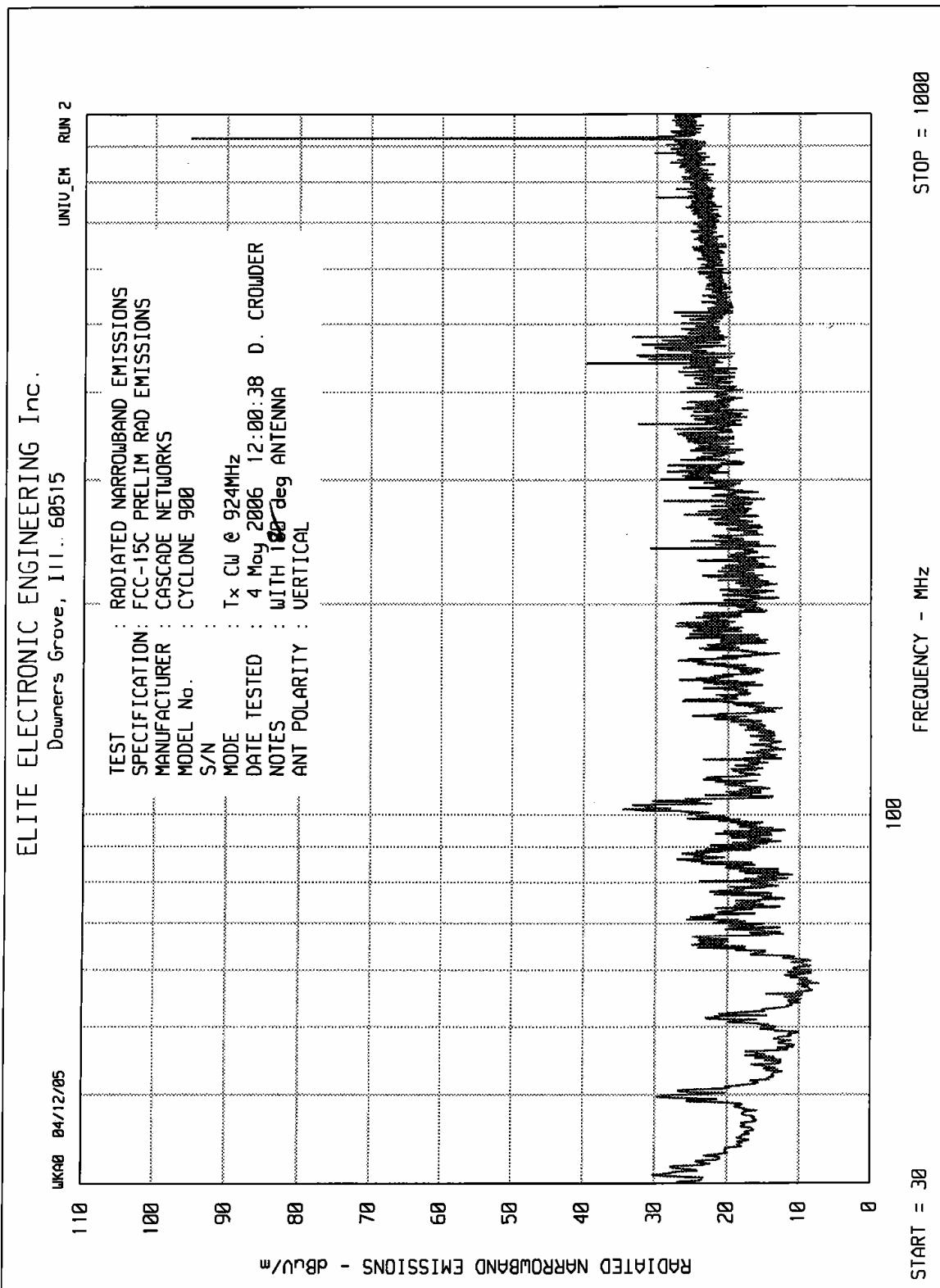
Test Setup For Measurement of Radiated Emissions
Horizontal Polarity

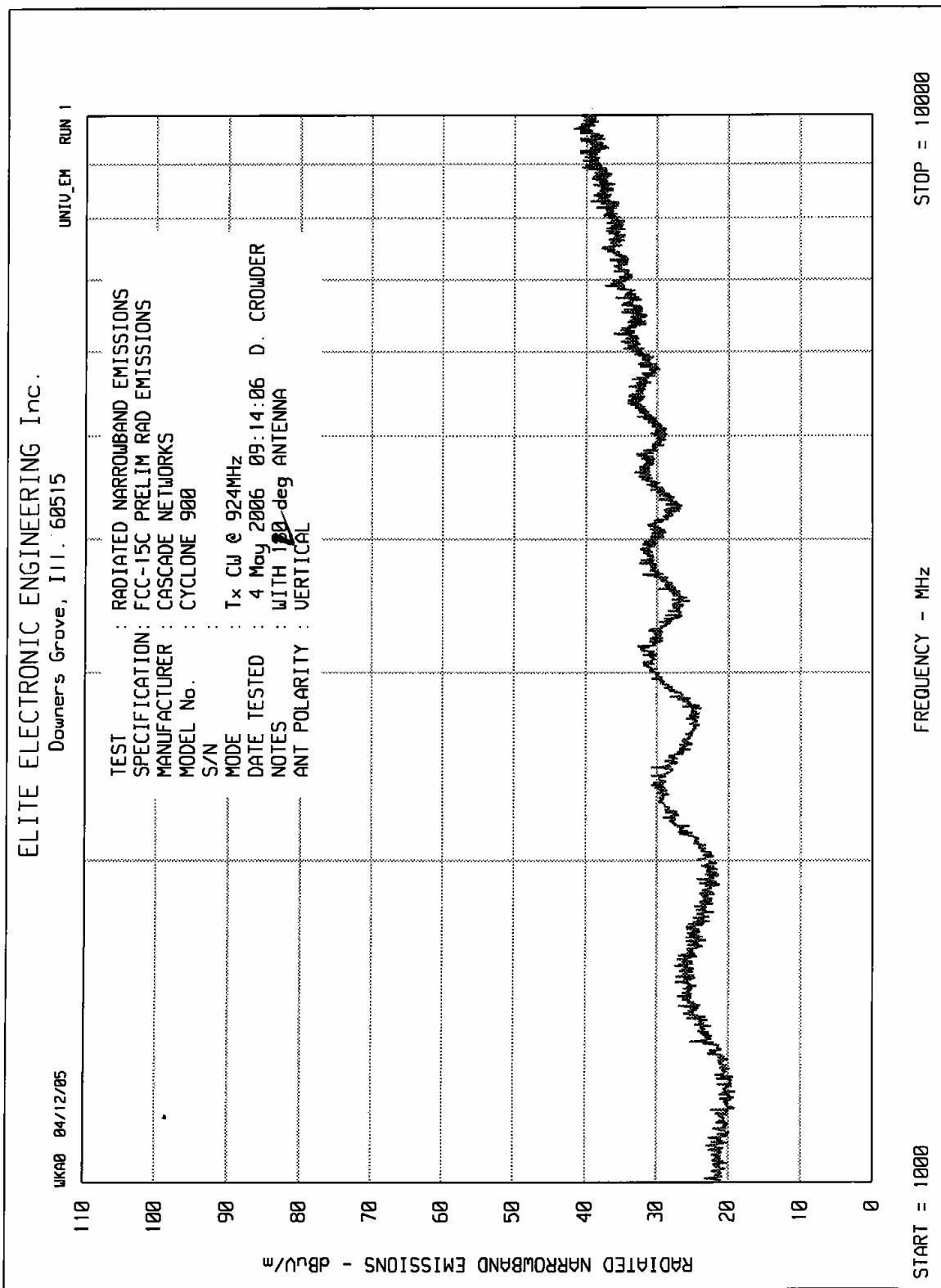












MANUFACTURER : Cascade Networks**MODEL :** Cyclone Transceiver**ANTENNA :** TEL-TEK model TA-926VH-8-120 Antenna**S/N :** None given**SPECIFICATION :** FCC-15C Radiated Emissions**MODE :** Transmitting at 906 MHz**DATE :** May 4, 2006**NOTES :**

| FREQ MHz | ANT POL | MTR RDG dBuV | BW Hz | ANT FAC | CABLE LOSS | PRE AMP | TOTAL uV/m | LIMIT uV |
|-------------|------------|-----------------|----------|------------|---------------|------------|---------------|-------------|
| 2718.0 | H | 37.9 | 1M/10 | 28.0 | 3.2 | -36.6 | 42.4 | 500.0 |
| | V | 39.5 | 1M/10 | 28.0 | 3.2 | -36.6 | 50.7 | 500.0 |
| 3624.0 | H | 41.5 | 1M/10 | 32.7 | 4.3 | -36.5 | 126.2 | 500.0 |
| | V | 41.3 | 1M/10 | 32.7 | 4.3 | -36.5 | 123.0 | 500.0 |
| 4530.0 | H | 42.4 | 1M/10 | 33.5 | 4.3 | -36.4 | 154.9 | 500.0 |
| | V | 42.8 | 1M/10 | 33.5 | 4.3 | -36.4 | 162.2 | 500.0 |
| 5436.0 | H | 41.9 | 1M/10 | 35.2 | 5.4 | -36.0 | 211.3 | 500.0 |
| | V | 41.2 | 1M/10 | 35.2 | 5.4 | -36.0 | 195.0 | 500.0 |
| 8154.0 | H | 41.5 | 1M/10 | 37.9 | 7.6 | -36.3 | 341.2 | 500.0 |
| | V | 42.2 | 1M/10 | 37.9 | 7.6 | -36.3 | 369.8 | 500.0 |
| 9060.0 | H | 42.9 | 1M/10 | 38.4 | 7.6 | -36.7 | 407.4 | 500.0 |
| | V | 43.1 | 1M/10 | 38.4 | 7.6 | -36.7 | 416.9 | 500.0 |

Checked By:



MANUFACTURER : Cascade Networks**MODEL :** Cyclone Transceiver**ANTENNA :** TEL-TEK model TA-926VH-8-120 Antenna**S/N :** None given**SPECIFICATION :** FCC-15C Radiated Emissions**MODE :** Transmitting at 915 MHz**DATE :** May 4, 2006**NOTES :**

| FREQ MHz | ANT POL | MTR RDG dBuV | BW Hz | ANT FAC | CABLE LOSS | PRE AMP | TOTAL uV/m | LIMIT uV |
|-------------|------------|-----------------|----------|------------|---------------|------------|---------------|-------------|
| 2745.0 | H | 38.7 | 1M/10 | 28.0 | 3.2 | -36.6 | 46.5 | 500.0 |
| | V | 38.8 | 1M/10 | 28.0 | 3.2 | -36.6 | 46.8 | 500.0 |
| 3660.0 | H | 41.9 | 1M/10 | 32.7 | 4.3 | -36.5 | 132.1 | 500.0 |
| | V | 41.5 | 1M/10 | 32.7 | 4.3 | -36.5 | 125.9 | 500.0 |
| 4575.0 | H | 43.3 | 1M/10 | 33.5 | 4.3 | -36.4 | 171.8 | 500.0 |
| | V | 43.1 | 1M/10 | 33.5 | 4.3 | -36.4 | 167.9 | 500.0 |
| 7320.0 | H | 40.4 | 1M/10 | 37.4 | 6.5 | -36.3 | 251.2 | 500.0 |
| | V | 40.6 | 1M/10 | 37.4 | 6.5 | -36.3 | 257.0 | 500.0 |
| 8235.0 | H | 41.8 | 1M/10 | 37.9 | 7.6 | -36.3 | 353.2 | 500.0 |
| | V | 41.4 | 1M/10 | 37.9 | 7.6 | -36.3 | 337.3 | 500.0 |
| 9150.0 | H | 43.5 | 1M/10 | 38.4 | 7.6 | -36.7 | 436.5 | 500.0 |
| | V | 43.6 | 1M/10 | 38.4 | 7.6 | -36.7 | 441.6 | 500.0 |

Checked By:



MANUFACTURER : Cascade Networks**MODEL :** Cyclone Transceiver**ANTENNA :** TEL-TEK model TA-926VH-8-120 Antenna**S/N :** None given**SPECIFICATION :** FCC-15C Radiated Emissions**MODE :** Transmitting at 924 MHz**DATE :** May 4, 2006**NOTES :**

| FREQ MHz | ANT POL | MTR RDG dBuV | BW Hz | ANT FAC | CABLE LOSS | PRE AMP | TOTAL uV/m | LIMIT uV |
|-------------|------------|-----------------|----------|------------|---------------|------------|---------------|-------------|
| 2772.0 | H | 39.8 | 1M/10 | 28.0 | 3.2 | -36.6 | 52.7 | 500.0 |
| | V | 39.0 | 1M/10 | 28.0 | 3.2 | -36.6 | 47.9 | 500.0 |
| 3696.0 | H | 42.1 | 1M/10 | 32.7 | 4.3 | -36.5 | 135.2 | 500.0 |
| | V | 43.8 | 1M/10 | 32.7 | 4.3 | -36.5 | 164.1 | 500.0 |
| 4620.0 | H | 42.7 | 1M/10 | 33.5 | 4.3 | -36.4 | 160.3 | 500.0 |
| | V | 42.7 | 1M/10 | 33.5 | 4.3 | -36.4 | 160.3 | 500.0 |
| 7392.0 | H | 41.3 | 1M/10 | 37.4 | 6.5 | -36.3 | 278.6 | 500.0 |
| | V | 41.0 | 1M/10 | 37.4 | 6.5 | -36.3 | 269.2 | 500.0 |
| 8316.0 | H | 43.2 | 1M/10 | 37.9 | 7.6 | -36.3 | 415.0 | 500.0 |
| | V | 42.2 | 1M/10 | 37.9 | 7.6 | -36.3 | 369.8 | 500.0 |

Checked By:

