



Cascade Networks Model Cyclone Transceiver using the Cyclone Model 900.7H Omni-directional Antenna

For : Cascade Networks
Longview, WA

P.O. No. : 34616

Date Received: August 3, 2004

Date Tested : August 3, 2004

Test Personnel: Richard E. King

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

Test Report By : *Richard E. King*
EMC Engineer

Witnessed by :
Brian Magnuson
Cascade Networks

Approved By : *Raymond J. Klouda*
Raymond J. Klouda
Registered Professional Engineer of
Illinois - 44894



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Measurement of RF Emissions from a model 900-360.7H Cyclone Transmitter

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 model 900-360.7H would meet the FCC requirements when using a Cyclone Model 900.7H omni-directional antenna. The test item is a Motorola Canopy transceiver modified by Cascade Networks. It is designed to transmit in the 902MHz to 924MHz 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 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.

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 2003
- 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 23°C and the relative humidity was 40%.

2.0 TEST ITEM SETUP AND OPERATION:

The test item is a Cascade Networks Cyclone Transciever with external antennas. 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 - The test item was submitted with a Panasonic ToughBook 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 a 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 Powerline Conducted Emissions

4.1.1 Requirements – The conducted emissions were not addressed in the test sequence.

4.2 Radiated Spurious Emissions

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

4.2.2 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 18 GHz. Frequency range 18 to 24 GHz was checked manually but not plotted.

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.

4.2.3 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 the Cascade Model 900.7H Omni antenna, did fully meet the radiated emission in the restricted 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.

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.

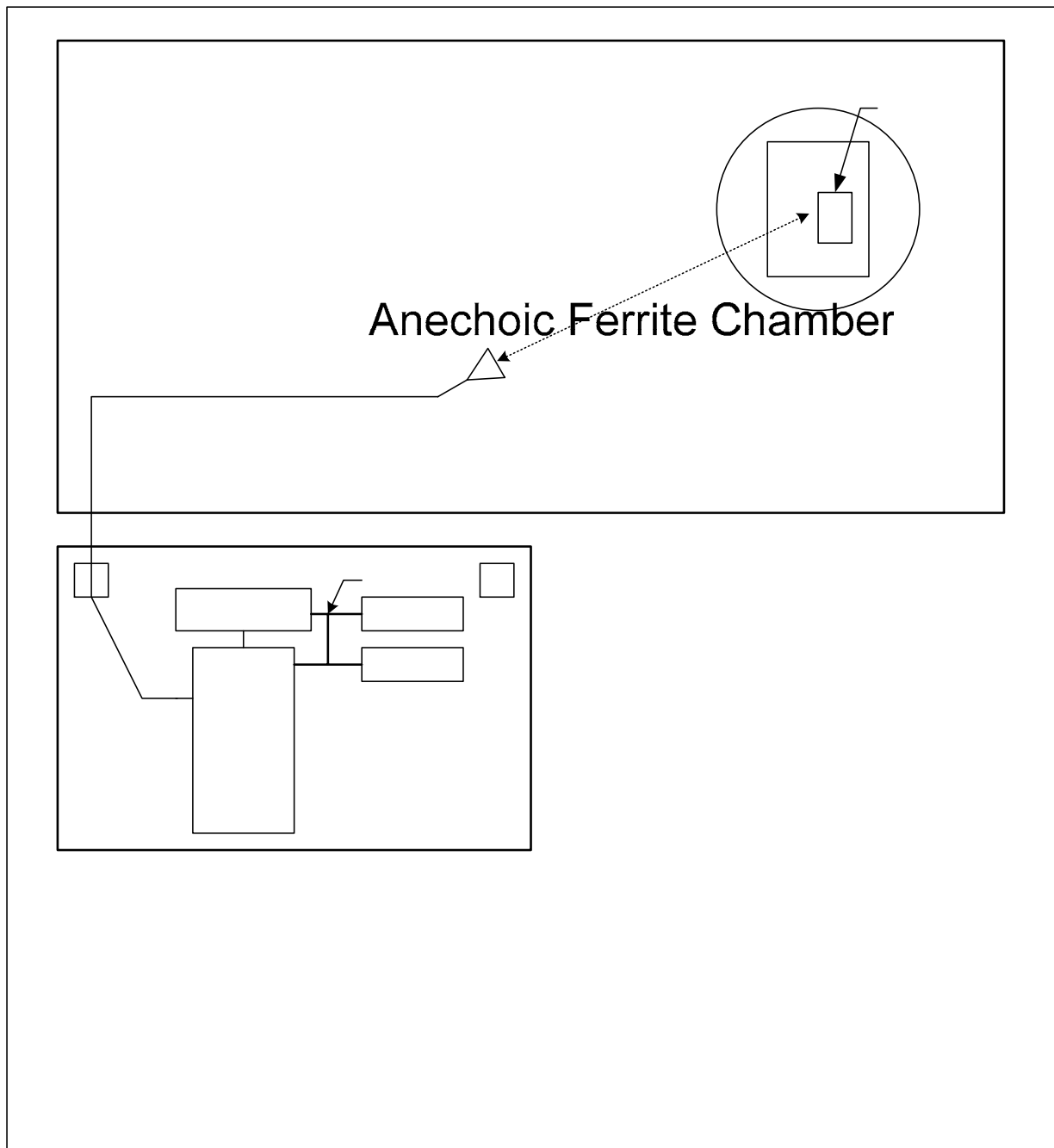


TABLE I: TEST EQUIPMENT LIST

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	07/19/04	12	07/19/05
XZG3	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2421A03059	---		N/A	
Equipment Type: AMPLIFIERS								
APK3	PREAMPLIFIER	AGILENT TECHNOLOGIES	8449B	3008A01593	1-26.5GHZ	05/10/04	12	05/10/05
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		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								
RAC2	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3638A08770	100HZ-22GHZ	02/10/04	12	02/10/05
RACD	RF PRESELECTOR	HEWLETT PACKARD	85685A	3010A01205	20HZ-2GHZ	02/11/04	12	02/11/05
RAF4	QUASIPeak ADAPTER	HEWLETT PACKARD	85650A	2043A00320	0.01-1000MHZ	02/11/04	12	02/11/05

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.



Hpib cbl

Turn Table & Mast
Controller

Computer

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Printer

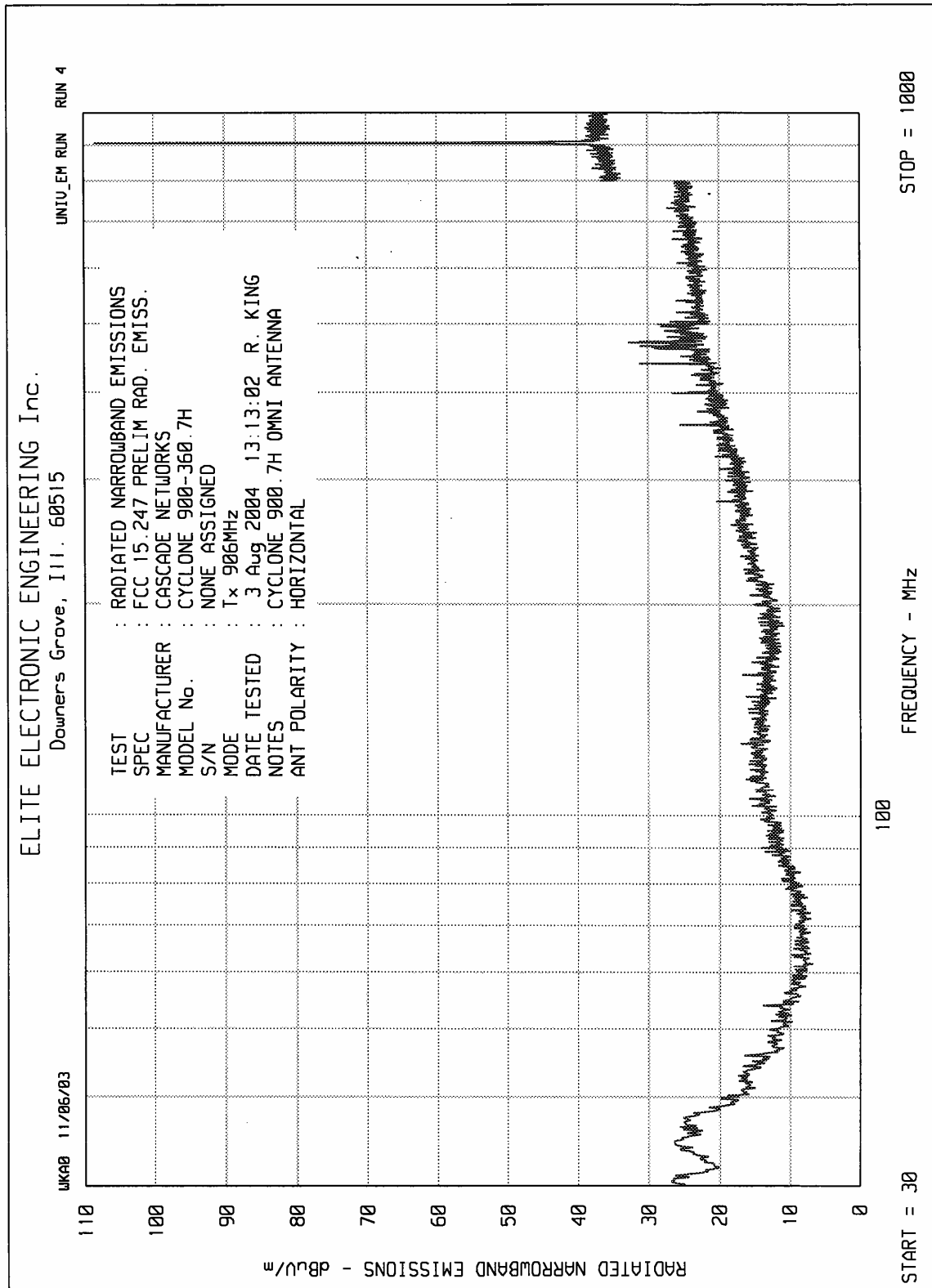
Figure 2

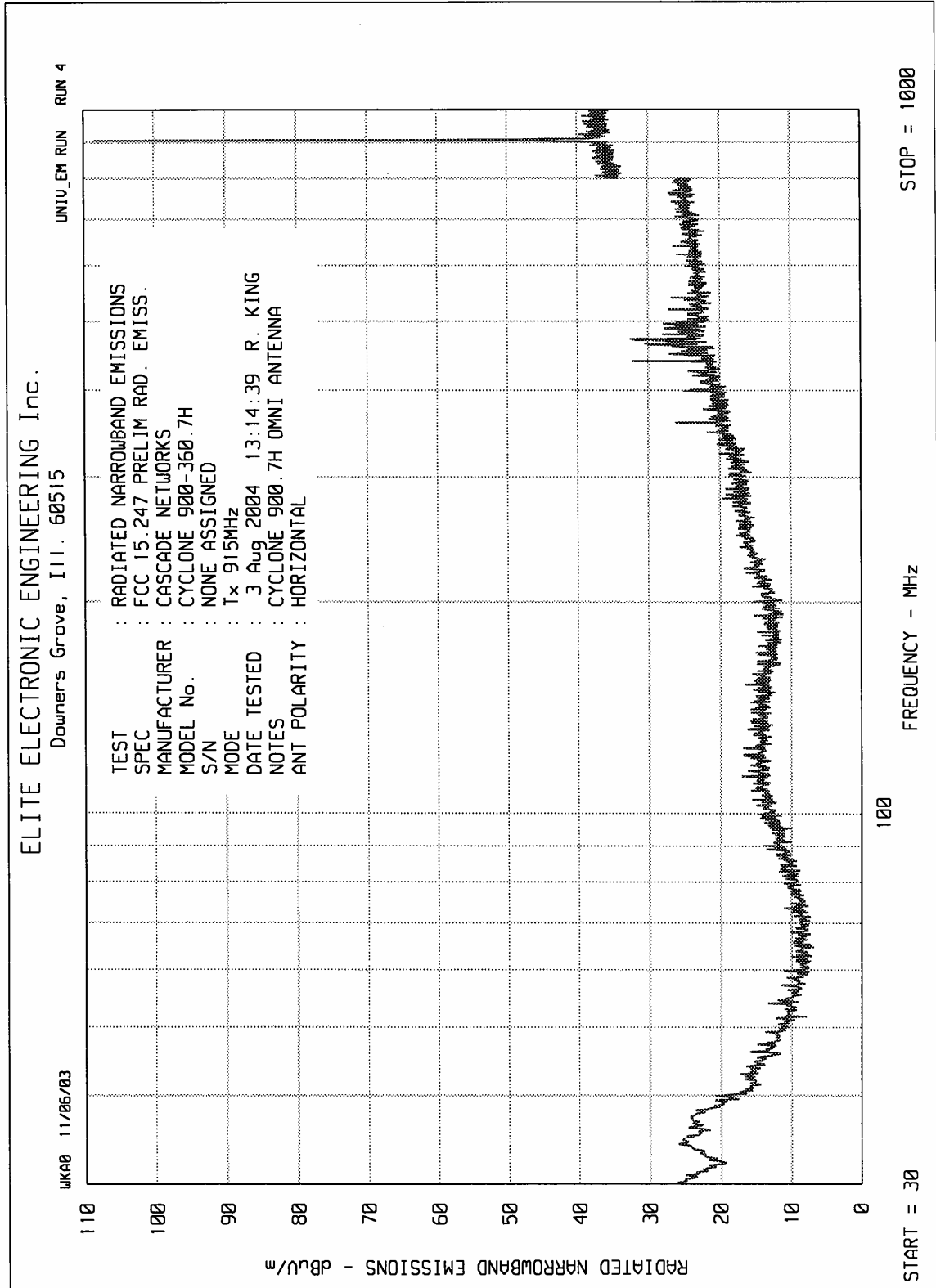


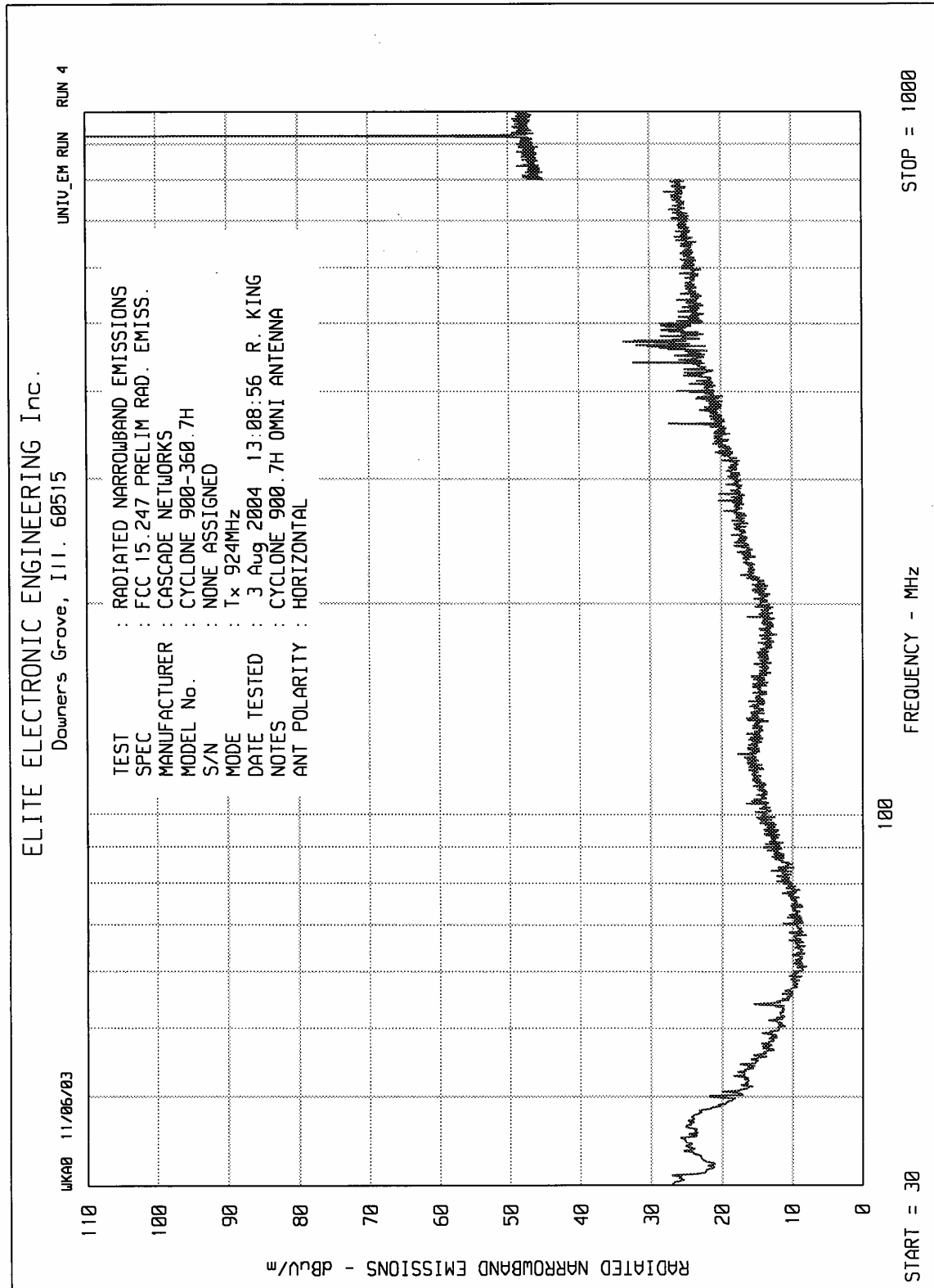
Test Setup For Measurement of Radiated Emissions Cyclone 900.7H Omni-directional Antenna
Vertical Polarity

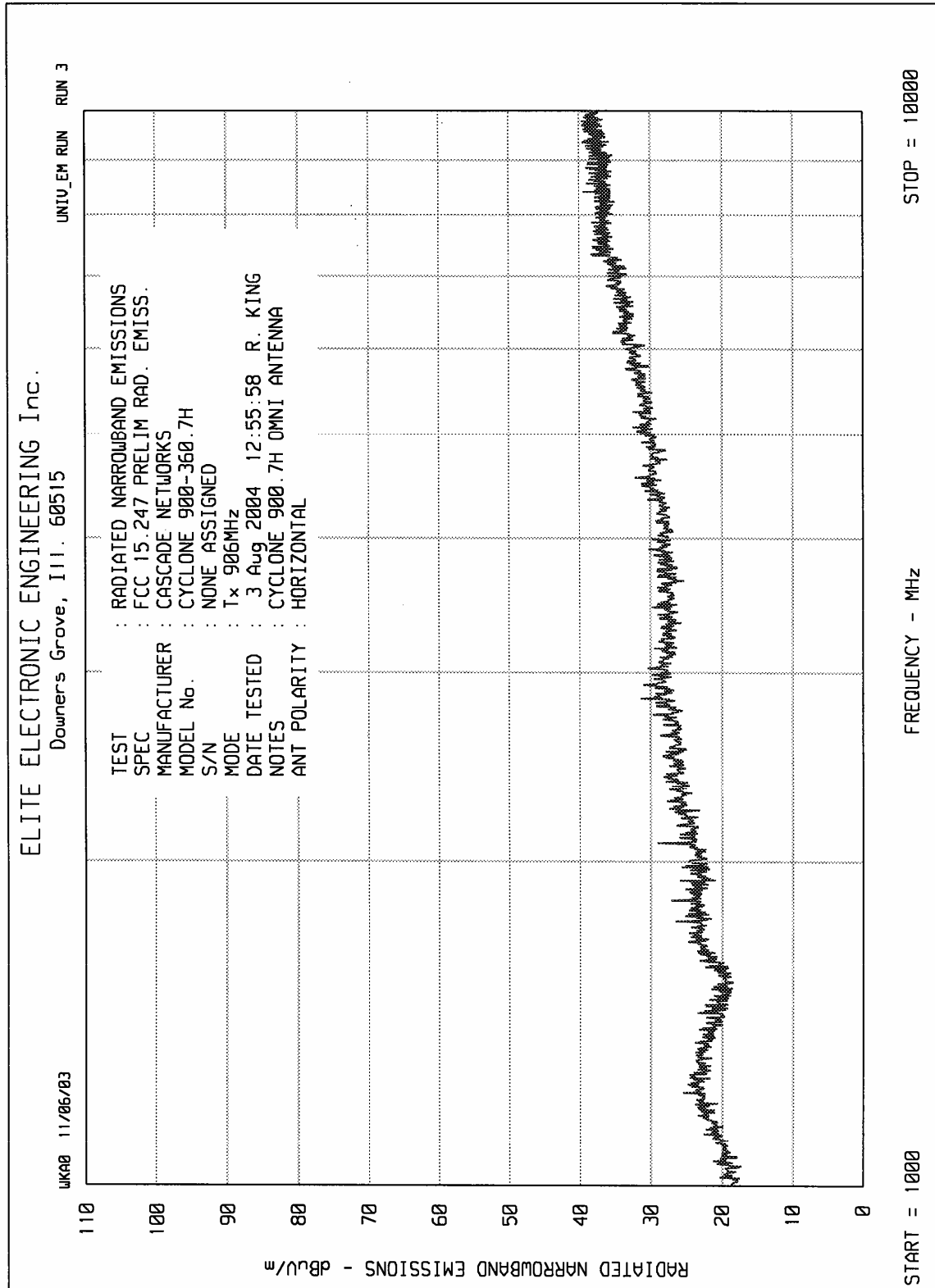


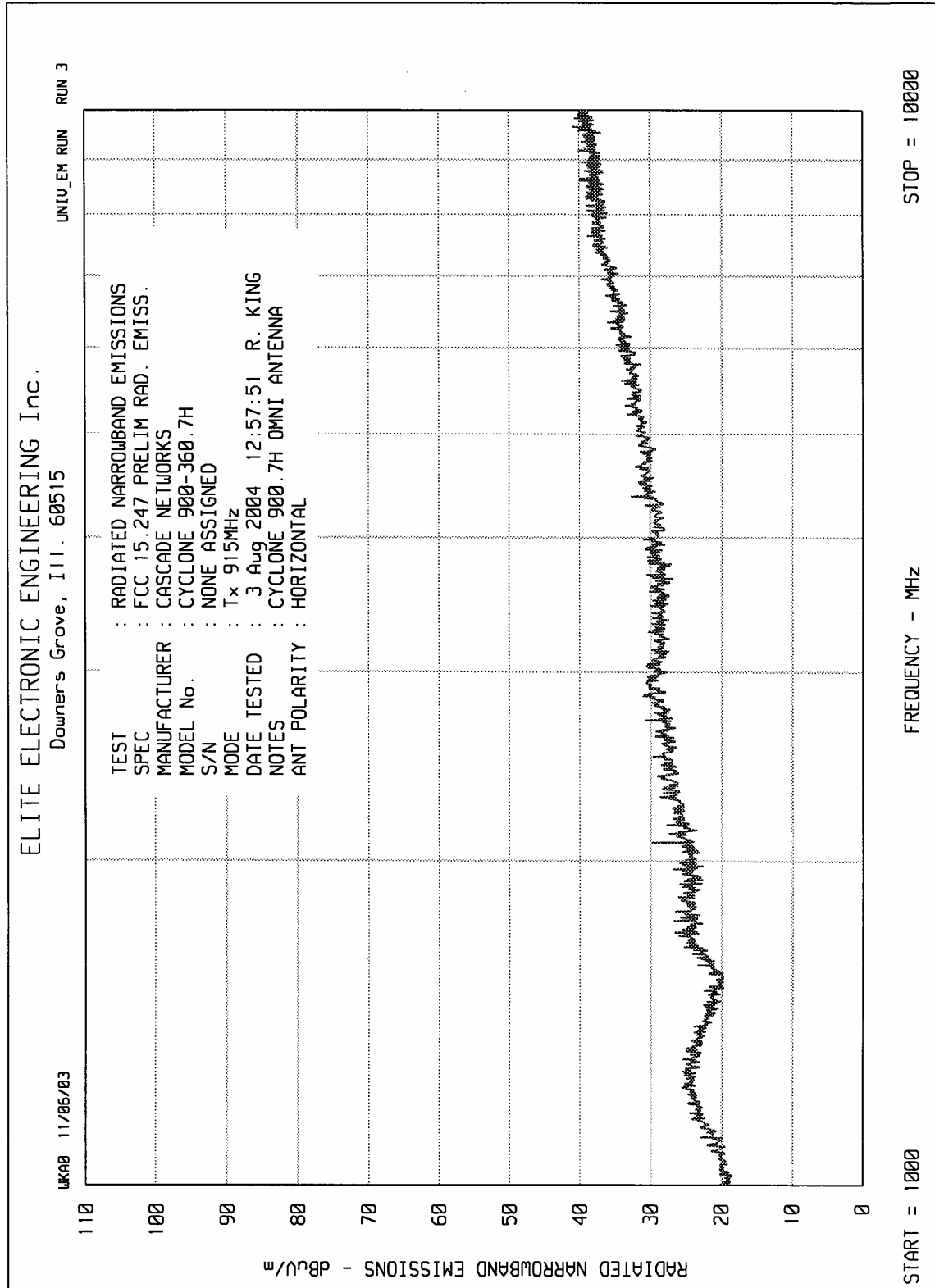
Test Setup For Measurement of Radiated Emissions Cyclone 900.7H Omni-directional Antenna
Horizontal Polarity

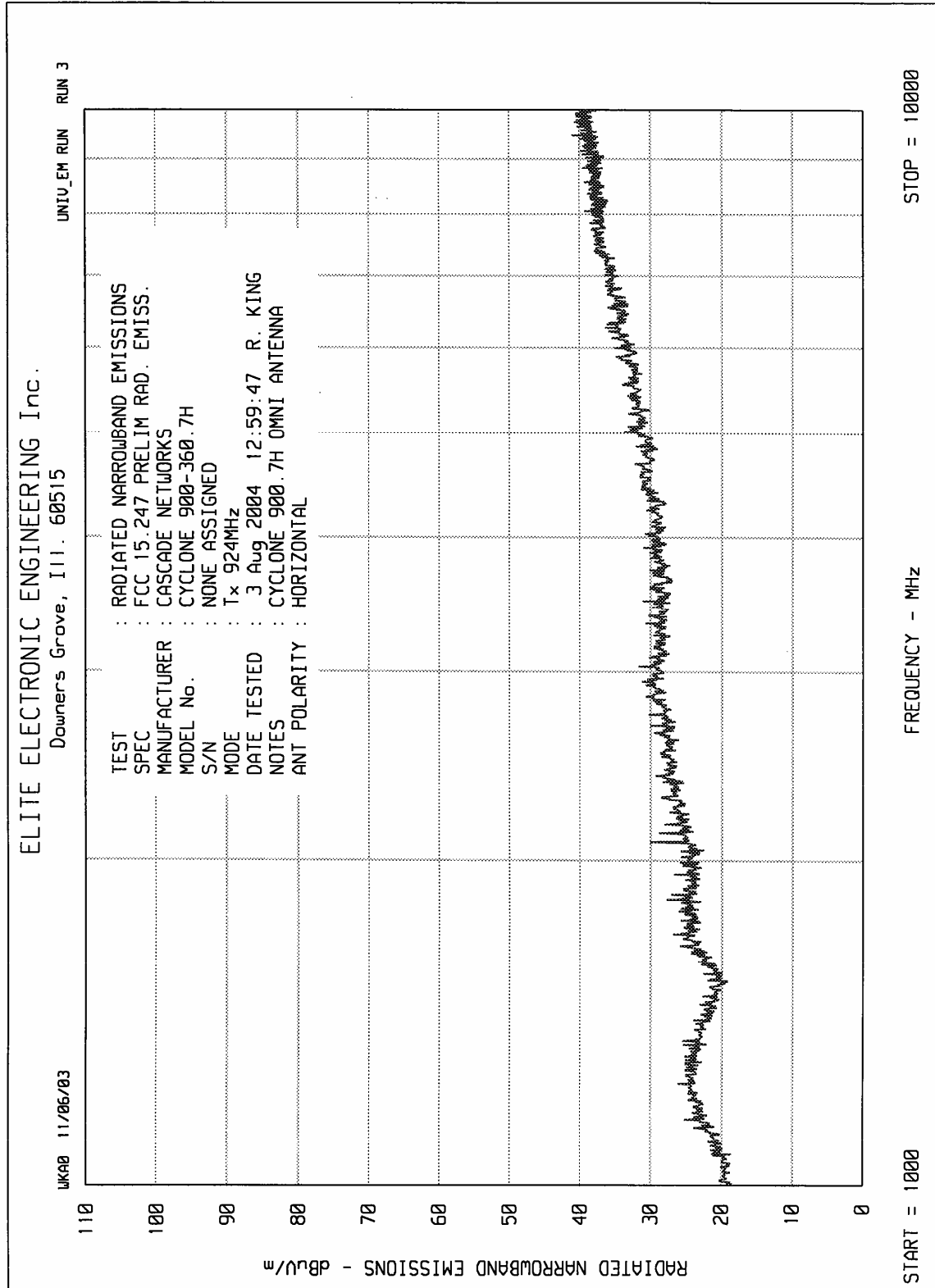














MANUFACTURER : Cascade Networks
MODEL : Cyclone 900-360.7H Transceiver
ANTENNA : Cyclone 900.7H Omni Antenna
S/N : None given
SPECIFICATION : FCC-15C Radiated Emissions
MODE : Transmitting at 906 MHz
DATE : August 3, 2004
NOTES :

FREQ	ANT	MTR		ANT	CABLE	PRE	TOTAL	LIMIT
MHz	POL	RDG dBuV	BW	FAC	LOSS	AMP	uV/m	uV
2718.0	H	30.9	1M/10	28.0	3.2	-36.6	18.9	500.0
	V	30.9	1M/10	28.0	3.2	-36.6	18.8	500.0
3624.0	H	30.0	1M/10	32.7	4.3	-36.5	33.6	500.0
	V	30.0	1M/10	32.7	4.3	-36.5	33.5	500.0
4530.0	H	27.3	1M/10	33.5	4.3	-36.4	27.2	500.0
	V	27.3	1M/10	33.5	4.3	-36.4	27.2	500.0
5436.0	H	27.9	1M/10	35.2	5.4	-36.0	42.2	500.0
	V	27.9	1M/10	35.2	5.4	-36.0	42.2	500.0
8154.0	H	30.6	1M/10	37.9	7.6	-36.3	97.3	500.0
	V	30.6	1M/10	37.9	7.6	-36.3	97.3	500.0
9060.0	H	30.7	1M/10	38.4	7.6	-36.7	100.0	500.0
	V	30.7	1M/10	38.4	7.6	-36.7	100.0	500.0

Checked BY :

RICHARD E. KING

Richard E. King



MANUFACTURER : Cascade Networks
MODEL : Cyclone 900-360.7H Transceiver
ANTENNA : Cyclone 900.7H Omni Antenna
S/N : None given
SPECIFICATION : FCC-15C Radiated Emissions
MODE : Transmitting at 915 MHz
DATE : August 3, 2004
NOTES :

FREQ	ANT	MTR		ANT	CABLE	PRE	TOTAL	LIMIT
MHz	POL	RDG dBuV	BW	FAC	LOSS	AMP	uV/m	uV
2745.0	H	31.0	1M/10	28.0	3.2	-36.6	19.1	500.0
	V	31.0	1M/10	28.0	3.2	-36.6	19.1	500.0
3660.0	H	30.4	1M/10	32.7	4.3	-36.5	35.2	500.0
	V	30.4	1M/10	32.7	4.3	-36.5	35.1	500.0
4575.0	H	27.5	1M/10	33.5	4.3	-36.4	27.9	500.0
	V	27.5	1M/10	33.5	4.3	-36.4	27.9	500.0
7320.0	H	29.0	1M/10	37.4	6.5	-36.3	67.6	500.0
	V	29.0	1M/10	37.4	6.5	-36.3	67.6	500.0
8235.0	H	30.9	1M/10	37.9	7.6	-36.3	100.7	500.0
	V	30.9	1M/10	37.9	7.6	-36.3	100.7	500.0
9150.0	H	31.1	1M/10	38.4	7.6	-36.7	104.7	500.0
	V	31.1	1M/10	38.4	7.6	-36.7	104.7	500.0

Checked BY :

Richard E. King

Richard E. King



MANUFACTURER : Cascade Networks
MODEL : Cyclone 900-360.7H Transceiver
ANTENNA : Cyclone 900.7H Omni Antenna
S/N : None given
SPECIFICATION : FCC-15C Radiated Emissions
MODE : Transmitting at 924 MHz
DATE : August 3, 2004
NOTES :

FREQ	ANT	MTR		ANT	CABLE	PRE	TOTAL	LIMIT
MHz	POL	RDG dBuV	BW	FAC	LOSS	AMP	uV/m	uV
2772.0	H	31.0	1M/10	28.0	3.2	-36.6	19.1	500.0
	V	31.0	1M/10	28.0	3.2	-36.6	19.1	500.0
3696.0	H	30.5	1M/10	32.7	4.3	-36.5	35.6	500.0
	V	30.5	1M/10	32.7	4.3	-36.5	35.5	500.0
4620.0	H	27.6	1M/10	33.5	4.3	-36.4	28.2	500.0
	V	27.6	1M/10	33.5	4.3	-36.4	28.2	500.0
7392.0	H	28.9	1M/10	37.4	6.5	-36.3	66.8	500.0
	V	28.9	1M/10	37.4	6.5	-36.3	66.8	500.0
8316.0	H	30.9	1M/10	37.9	7.6	-36.3	100.7	500.0
	V	30.9	1M/10	37.9	7.6	-36.3	100.7	500.0

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