

ELITE ELECTRONIC ENGINEERING INCORPORATED  
1516 CENTRE CIRCLE  
DOWNERS GROVE, ILLINOIS 60515-1082

ELITE PROJECT: 28525

DATES TESTED: February 29, 2000 and  
April 3, 2000

TEST PERSONNEL: Daniel E. Crowder, Mark E. Longinotti, Robert Olajos

TEST SPECIFICATION: FCC "Code of Federal Regulations" Title 47  
Part 15, Subpart C, Para. 15.231 and Part  
15, Subpart B for Receivers

ENGINEERING TEST REPORT NO. 22580

MEASUREMENT OF RF EMISSIONS

FROM A MODEL SHORT RANGE PROGRAMMER

TRANSCEIVER


FOR: American Meter Co.  
Scott Depot, West Virginia

PURCHASE ORDER NO.: 5916/6023

Report By:

  
Robert Olajos

Approved By:

  
Craig W. Fanning  
NARTE Certified:

EMC-000296-NT and ATL-0188-E

ENGINEERING TEST REPORT NO. 22580

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

**DESCRIPTION OF TEST ITEM:** Transceiver

**MODEL NO:** Short Range Programmer

**SERIAL NOS:** 050103 (tx),  
050106 (tx),  
050107 (rx)

**MANUFACTURER:** American Meter Co.

**APPLICABLE SPECIFICATIONS:** FCC "Code of Federal Regulations"  
Title 47, Part 15, Subpart C  
paragraph 15.231 and Part 15,  
Subpart B for Receivers

**QUANTITY OF ITEMS TESTED:** Three (3)

**TEST PERFORMED BY:** ELITE ELECTRONIC ENGINEERING COMPANY  
Radio Interference Consultants  
Downers Grove, Illinois 60515

**DATES TESTED:** February 29 and April 3, 2000

**PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):**

**CUSTOMER:** No American Meter Co. personnel were present.

**ELITE ELECTRONIC:** Daniel E. Crowder, Mark E. Longinotti,  
Robert Olajos

**ELITE JOB NO.:** 28525

**ABSTRACT:** The model Short Range Programmer Transceiver, does meet the technical requirements of the FCC "Code of Federal Regulations", Title 47, Part 15, Subpart C paragraphs 15.231 and Part 15, Subpart B for Receivers.

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

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ENGINEERING TEST REPORT NO. 22580  
MEASUREMENT OF RF EMISSIONS  
FROM A MODEL SHORT RANGE PROGRAMMER  
TRANSCEIVER

**1.0 INTRODUCTION:**

**1.1 DESCRIPTION OF TEST ITEM:** A series of radio interference measurements were performed on a model Short Range Programmer Transceiver, (hereinafter referred to as the test item). The test item transmits at approximately 451 MHz and receives at approximately 415 MHz from an internal antenna. The receive L.O. is 403.55 MHz. The test item is battery operated using an internal 2.4 VDC rechargeable battery. The battery can be recharged using an AC adapter. The tests were performed for American Meter Co. of Scott Depot, West Virginia.

**1.2 PURPOSE:** The test series was performed to determine if the test item meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Para. 15.231(a) for Intentional Radiators and Part 15, Subpart B for Receivers. Testing was performed in accordance with ANSI C63.4-1992.

**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 1999
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart B for unintentional radiators, dated 1 October 1999

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- ANSI C63.4-1992, "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 20°C and the relative humidity was 55%.

**2.0 TEST ITEM SETUP AND OPERATION:**

Three separate units were provided for the tests.

S/N 050103 was programmed to transmit normally and used for the occupied bandwidth, duty cycle and periodic emissions measurements. When activated, it sends out an RF burst of approximately 1.5 seconds long. No further transmission takes place until the transmit button is again depressed.

The second, S/N 050106 was programmed to transmit continuously and used for the conducted and radiated emission measurements for the transmitter mode tests. When turned on, the test item transmitted continuously at 451 MHz.

The third unit, S/N 050107 was programmed for continuous receive mode and used for the receiver mode testing.

For the line conducted emissions and radiated emissions tests, the test item was placed on a 0.8 meter high non-conductive stand. For the line conducted emission tests, the test item was operated in the charging mode using the AC adapter. It was ungrounded.

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The battery voltage was periodically checked to ensure proper operation at maximum level. The tests were performed with the test item transmitting at 451MHz and receiving at 415 MHz (LO=403.55MHz).

### 3.0 TEST SITE AND INSTRUMENTATION:

**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 TEST INSTRUMENTATION:** 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. All open field measurements below 1000MHz were made with a bilog antenna. All measurements above 1000MHz were made with a ridged waveguide antenna.

The fundamental, harmonics and forbidden bands were measured with a spectrum analyzer. The spectrum analyzer readings were corrected to average readings using a duty cycle factor. Receiver bandwidths were 9kHz for the 450kHz to 30MHz conducted emissions data, 120kHz for the 30MHz to 1000MHz radiated emissions data and 1MHz for the radiated emissions data above 1GHz.

**3.3 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).

**3.4 MEASUREMENT UNCERTAINTY:** All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

The measurement uncertainty budgets were based on guidelines in "ISO Guide to the Expression of Uncertainty in Measurements" and NAMAS NIS81 "The Treatment of Uncertainty in EMC Measurements".

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The measurement uncertainty for these tests is presented below:

Conducted Emission Measurements:

Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1

Radiated Emission Measurements:

Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

**4.0 REQUIREMENTS, PROCEDURES AND RESULTS:**

**4.1 POWERLINE CONDUCTED EMISSIONS:**

**4.1.1 REQUIREMENTS:** All radio frequency voltages on the power lines of an unintentional and intentional radiator shall be below 250uV (quasi-peak) over the frequency range from 0.45MHz to 30MHz. It is also to be noted that if emitted levels in the peak detector function do not exceed the above limits, the test item does meet the intent of these requirements.

**4.1.2 PROCEDURES:** The interference on each power lead was measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. The meter terminal of the LISN not under test was terminated with 50 ohms. Measurements were first made over the entire frequency range from 450kHz through 30MHz with a peak detector and the results were automatically plotted. The data thus obtained was then searched by the computer for the highest levels. Quasi-peak measurements were automatically performed at the frequencies selected from the highest peak measurements, and the results printed.

The conducted emissions were performed twice, once with the test item transmitting and again with the test item receiving.

**4.1.3 RESULTS:** The plots of the peak preliminary conducted voltage levels on each power line are presented on data pages 22 through 25. The conducted limit is shown as a reference. The final

quasi-peak results are presented on data pages 26 through 29.

The emissions level closest to the limit (worst case) occurred at 0.455MHz. The emissions level at this frequency was 15.2 dB within the limit. Photographs of the test configuration which yielded the highest, or worst case, conducted emission levels are shown on Figure 1.

#### 4.2 RADIATED EMISSIONS FOR THE TRANSMITTER:

**4.2.1 REQUIREMENTS:** The test item must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Para. 15.231(e).

Paragraph 15.231(e) has the following radiated emission limits:

Fundamental Frequency MHz	Field Intensity uV/m @ 3 meters	Field Strength Harmonics and Spurious @ 3 meters
260 to 470	1,500 to 5,000*	150 to 500*

\* - Linear Interpolation

For 451 MHz, the limit at the fundamental is 4,690uV/m @ 3m and the limit on the harmonics is 469uV/m @ 3m up to 960 MHz and 500 uV/m at frequencies above 960 MHz.

In addition, paragraph 15.205(a) imposes the paragraph 15.209 emissions levels in the Restricted Bands of operation.

**4.2.2 PROCEDURES:** Duty cycle measurements were performed on the test item. The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the signal.

With the transmitter set up to transmit, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero span width with 10msec/div. The amplitude setting are adjusted



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so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at beginning and end of a word period. If the word period exceeds 100 msec the word period is set to 100 msec. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the (On-time/ word period) where the word period = (On-time + Off-time).

For radiated emissions the test item was placed on a 0.8 meter high non-conductive stand, the test distance was 3 meters. Figures 2a, 2b, 2c and 2d are photographs of the test setup.

Radiated emissions tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 1992 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions measurements were first performed using a peak detector and automatically plotted. The frequencies where significant emission levels were noted and then remeasured with either a quasi-peak detector or an average detector.

With the broadband measuring antenna positioned at a 3 meter distance from the test item, the frequency range from 30MHz to 2GHz was investigated using a peak detector function and a bi-log antenna.

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Final radiated emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

- 1) Measurements, from 30MHz to 2GHz, were made using a quasi-peak detector and a broadband bi-log antenna. Measurements above 1GHz were made using an average detector (10Hz video bandwidth and 1MHz resolution bandwidth).
- 2) To ensure that maximum, or worst case, emission levels were measured, the following steps were taken:
  - (a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
  - (b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
  - (c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

With the broadband measuring antennas positioned at a 3 meter distance from the test item, the frequency range from 2GHz to 5GHz was investigated using a peak detector function with a broadband double-ridged waveguide antenna.

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

- 1) Measurements were made using an average detector (10Hz video bandwidth and 1MHz resolution bandwidth) and a broadband double-ridged waveguide antenna.
- 2) To ensure that maximum, or worst case, emission levels were measured, the following steps were taken:
  - (a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
  - (b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
  - (c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize

the readings.

**4.2.3 RESULTS:** For the duty cycle factor test, the resulting plot is presented on data page 21. As can be seen by this plot, the transmitter is not pulse modulated and the the maximum ON time for the RF was greater than the 100 millisecond period. Therefore, no duty cycle factor is applied.

Preliminary radiated emission test results with the test item transmitting at 451 MHz are presented on data pages 30 and 31. Only the fundamental and some harmonics were detected.

The data for the final measurements with the test item transmitting at 451MHz is presented on data page 32. As can be seen, no excessive readings were detected. The radiated emissions level closest to the limit occurred at 451.4MHz. The emissions level at this frequency was 0.5dB within the limit. The test item complies with requirements.

Photographs of the test configurations which yielded the highest radiated emission levels are shown on Figures 2a,2b,2c, and 2d.

#### **4.3 OCCUPIED BANDWIDTH MEASUREMENTS:**

**4.3.1 REQUIREMENTS:** In accordance with paragraph 15.231(c), all emissions within 20dB of the peak amplitude level of the center frequency are required to be within a band less than 0.25% of the center frequency wide.

**4.3.2 PROCEDURES:** The spectrum analyzer's center frequency had been set for the fundamental frequency of the transmitter with a frequency span of 2MHz. Also, the resolution bandwidth was set at 30kHz with a 100kHz visual bandwidth. An antenna was positioned nearby the test item and the emissions were displayed on the spectrum analyzer. The frequency spectrum was then plotted.

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**4.3.3 RESULTS:** The plot of the emissions near the fundamental frequency of 451 MHz are presented on data page 33. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

**4.4 PERIODIC OPERATION:**

**4.4.1 REQUIREMENTS:** In accordance with paragraph 15.231(a), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

**4.4.2 PROCEDURE:** The transmission button was momentarily depressed and released. A nearby probe antenna monitored RF activity in the vicinity of the transmit frequency.

**4.4.3 RESULTS:** A plot of the RF output after momentary activation is shown on data page 34. Transmission ceases after 1.5 seconds. The transmitter complies with this requirement.

**4.5 RADIATED MEASUREMENTS FOR THE RECEIVER:**

**4.5.1 REQUIREMENTS:** All emanations from an unintentional radiator shall be below the levels shown on the following table.

**RADIATION LIMITS FOR UNINTENTIONAL RADIATORS**

Frequency MHz	Distance between Test Item and Antenna in Meters	Field Strength uV/m
30-88	3	100
88-216	3	150
216-960	3	200
Above 960	3	500

Note: The tighter limit shall apply at the edge between the two frequency bands.

**4.5.2 PROCEDURES:** All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with

ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 1992 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions measurements were first performed using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured.

With the broadband measuring antennas positioned at a 3 meter distance from the test item, the frequency range from 30MHz to 2GHz was investigated using a peak detector function with the antennas set for vertical polarization.

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

- 1) Measurements were made using a quasi-peak detector and a broadband bi-log antenna.
- 2) To ensure that maximum, or worst case, emission levels were measured, the following steps were taken:
  - (a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
  - (b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
  - (c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

**4.5.3 RESULTS:** The preliminary plots are presented on data

pages 35 and 36. The plots are presented for a reference only, and are not used to determine compliance.

The final open area radiated levels are presented on data page 37. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closest to the limit (worst case) occurred at 807.1MHz. The emissions level at this frequency was 2.33dBuV within the limit. See data page 37 for details. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figure 3a and 3b.

**5.0 CONCLUSION:**

It was found that the American Meter Co. model Short Range Programmer Transceiver, does comply with the limits imposed by the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Para. 15.231 for Intentional Radiators and the conducted radio interference requirements of Section 15.107 and the radiated interference requirements of Section 15.109 of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B for unintentional radiators (receivers).

**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 specification.

The data presented in this test report pertains to the test item at the test date. 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.

This report must not be used to claim product endorsement by

ENGINEERING TEST REPORT NO. 22580

NVLAP or any agency of the US Government.

**7.0 ENDORSEMENT DISCLAIMER:**

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

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TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.

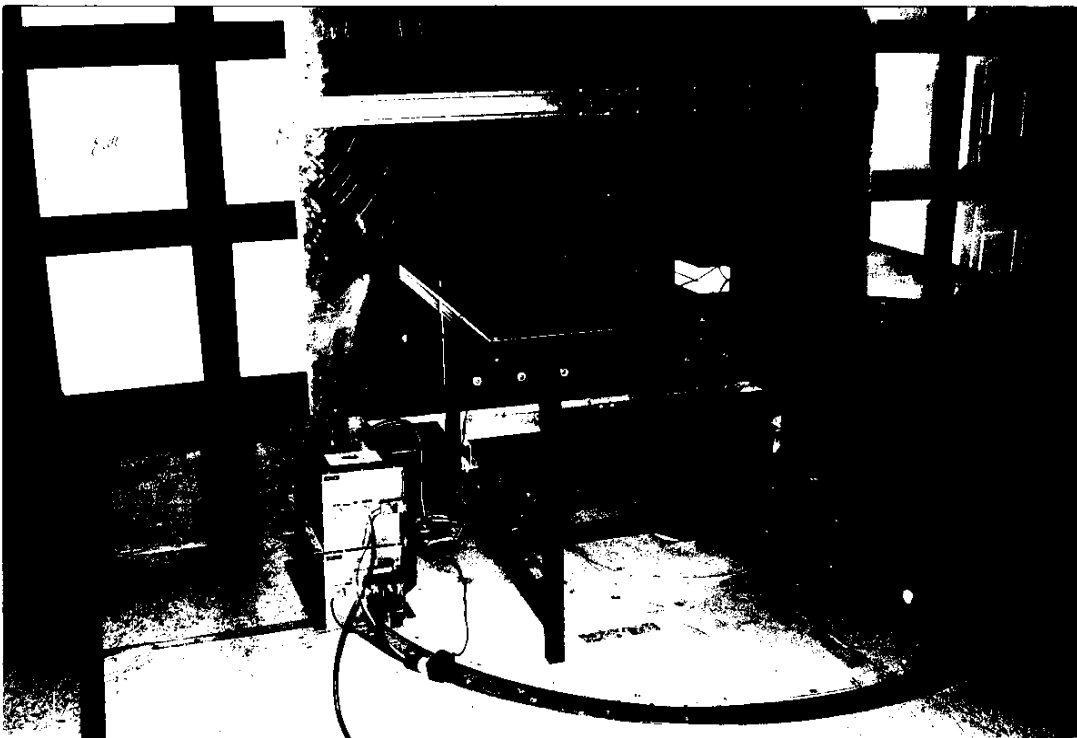
Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---	<del>01/29/99</del>	N/A	
XZG1	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---		N/A	
Equipment Type: AMPLIFIERS								
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	01/31/00	12	01/31/01
APK1	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A01243	1-26.5GHZ	02/28/00	12	02/28/01
Equipment Type: ANTENNAS								
NTA1	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2054	.03-2GHZ	06/02/99	12	06/02/00
NWF1	DOUBLE RIDGED WAVEGUIDE	EMCO	3105	2041	1-12.4GHZ	08/27/99	12	08/27/00
Equipment Type: ATTENUATORS								
T1K1	10DB, 2.5W LIMITER	HEWLETT PACKARD	11947A	3107A01737	.01-200MHZ	03/27/00	12	03/27/01
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
Equipment Type: PROBES; CLAMP-ON & LISNS								
PLL9	50UH LISN 462D	ELITE	462D/70A	010	0.01-400MHZ	01/21/00	12	01/21/01
PLLA	50UH LISN 462D	ELITE	462D/70A	011	0.01-400MHZ	01/21/00	12	01/21/01
Equipment Type: PRINTERS AND PLOTTERS								
HRE1	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061052	---		N/A	
Equipment Type: RECEIVERS								
RAC0	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	2449A01117	100HZ-22GHZ	02/29/00	12	03/01/01
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	01/19/00	12	01/19/01
RACA	RF PRESELECTOR	HEWLETT PACKARD	85685A	2926A00980	20HZ-2GHZ	03/01/00	12	03/01/01
RACC	RF PRESELECTOR	HEWLETT PACKARD	85685A	2648A00507	20HZ-2GHZ	01/10/00	12	01/10/01
RACD	RF PRESELECTOR	HEWLETT PACKARD	85685A	3010A01205	20HZ-2GHZ	03/01/00	12	03/01/01
RAE5	SPECTRUM ANALYZER	HEWLETT PACKARD	8566B	2532A02136	100HZ-22GHZ	05/27/99	12	05/27/00
RAF1	QUASIPeAK ADAPTER	HEWLETT PACKARD	85650A	2043A00271	0.01-1000MHZ	02/29/00	12	03/01/01
RAF3	QUASIPeAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/19/00	12	01/19/01

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.



FIGURE 1



TEST SETUP FOR CONDUCTED EMISSIONS MEASUREMENT  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS

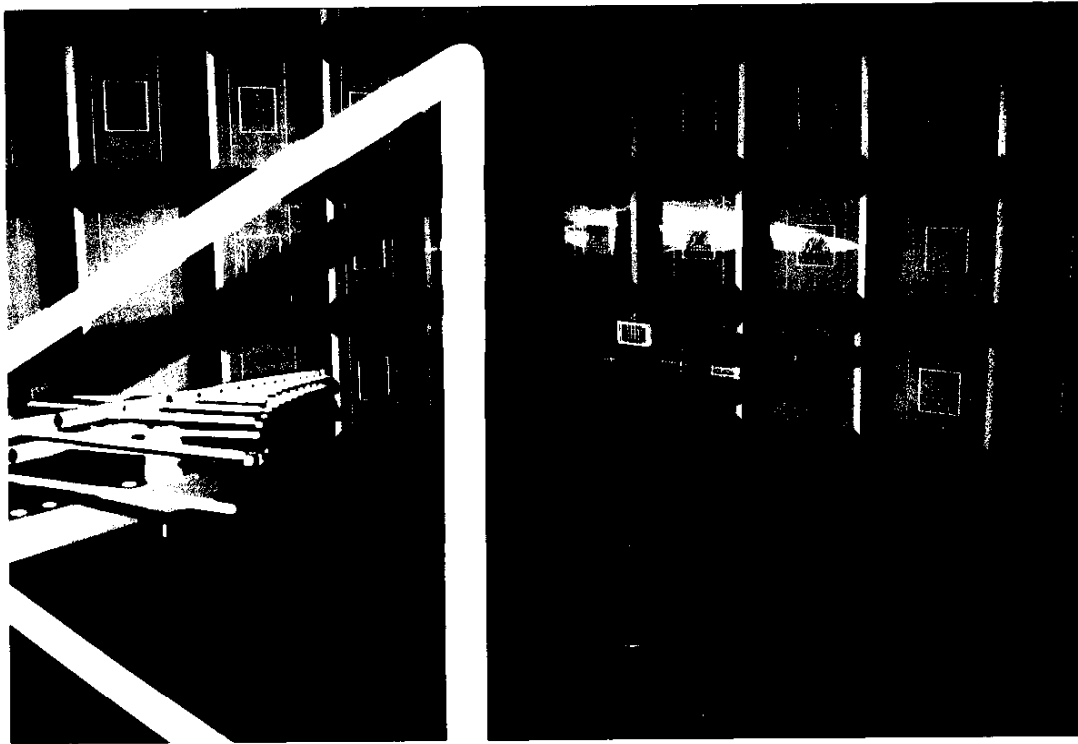


FIGURE 2A TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
HORIZONTAL POLARIZATION



FIGURE 2B TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
VERTICAL POLARIZATION



FIGURE 2C TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
HORIZONTAL POLARIZATION (ABOVE 1000MHZ)



FIGURE 2D TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
VERTICAL POLARIZATION (ABOVE 1000MHZ)

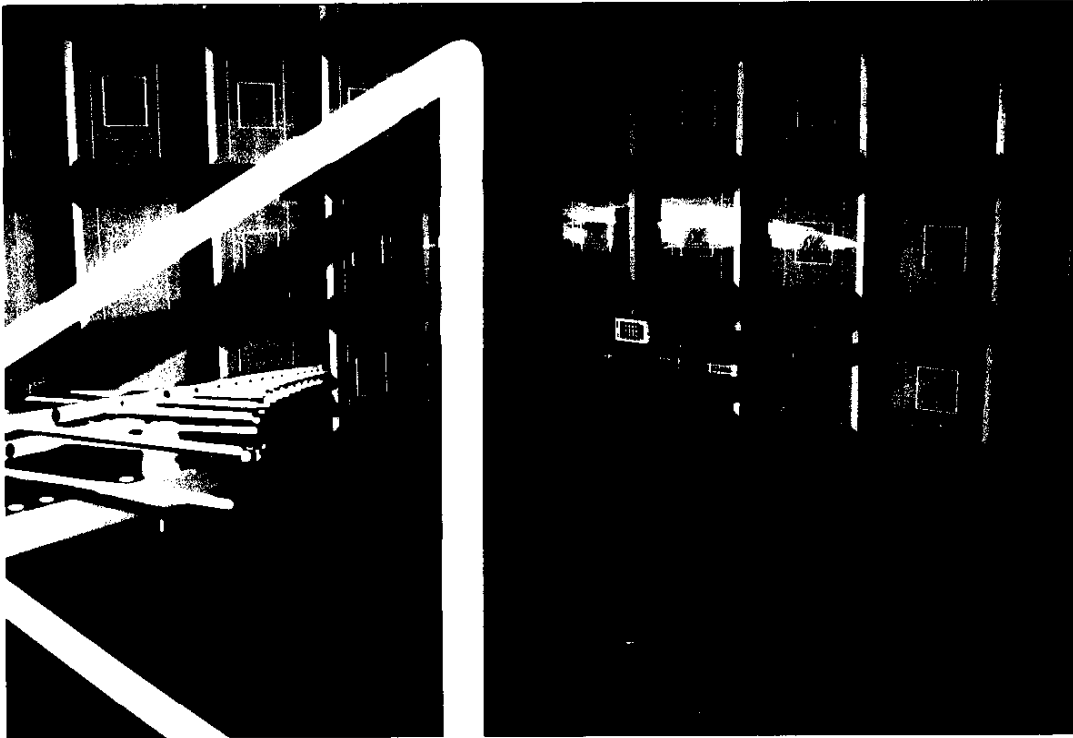


FIGURE 3A TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
HORIZONTAL POLARIZATION

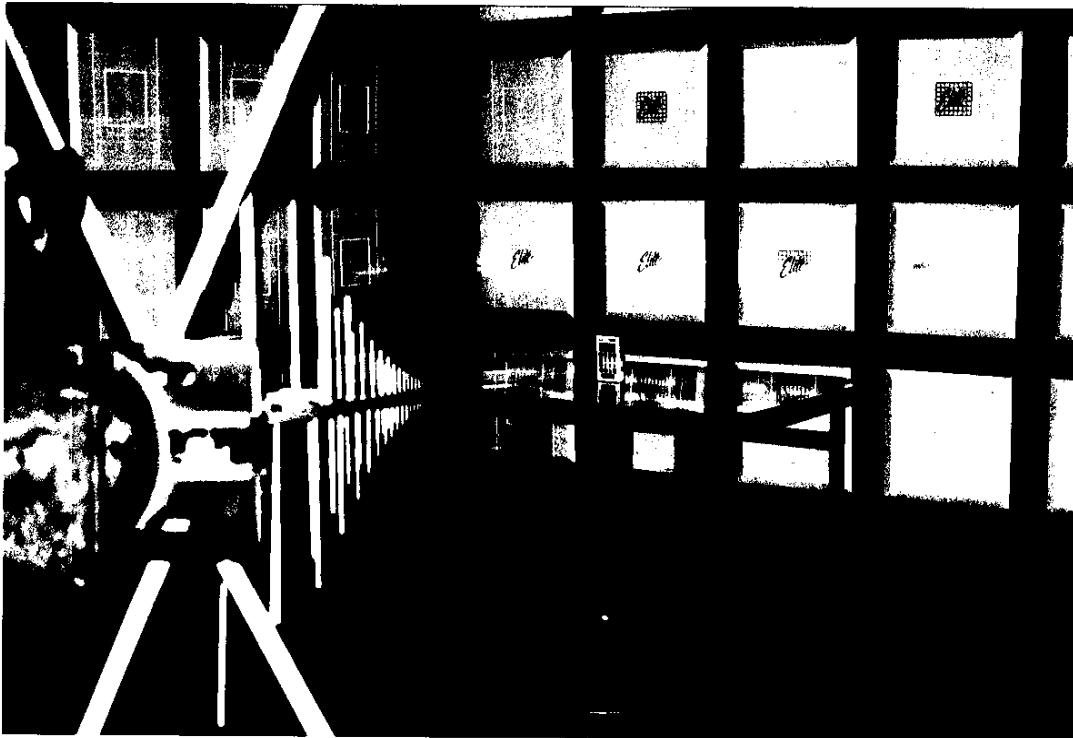
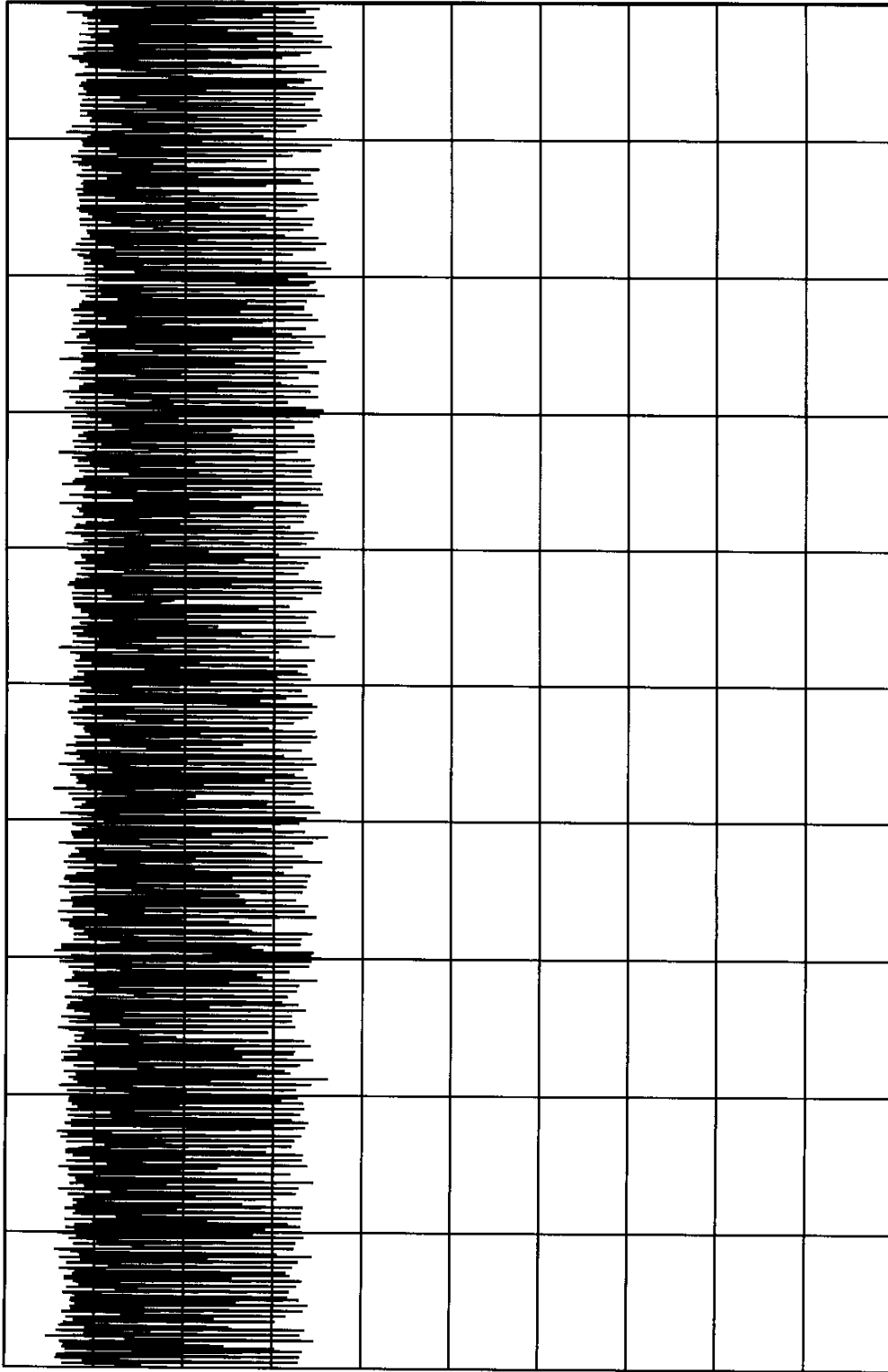


FIGURE 3B TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS  
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS  
VERTICAL POLARIZATION

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, IL 60515



10 mSEC/DIV

TRANSMITTER DUTY CYCLE  
 FREQUENCY: 451.3234 MHz  
 ON TIME : 100 mSEC  
 OFF TIME : 0 mSEC  
 DUTY CYCLE = 1 or 0 dB  
 COMPUTED OVER 100 mSEC

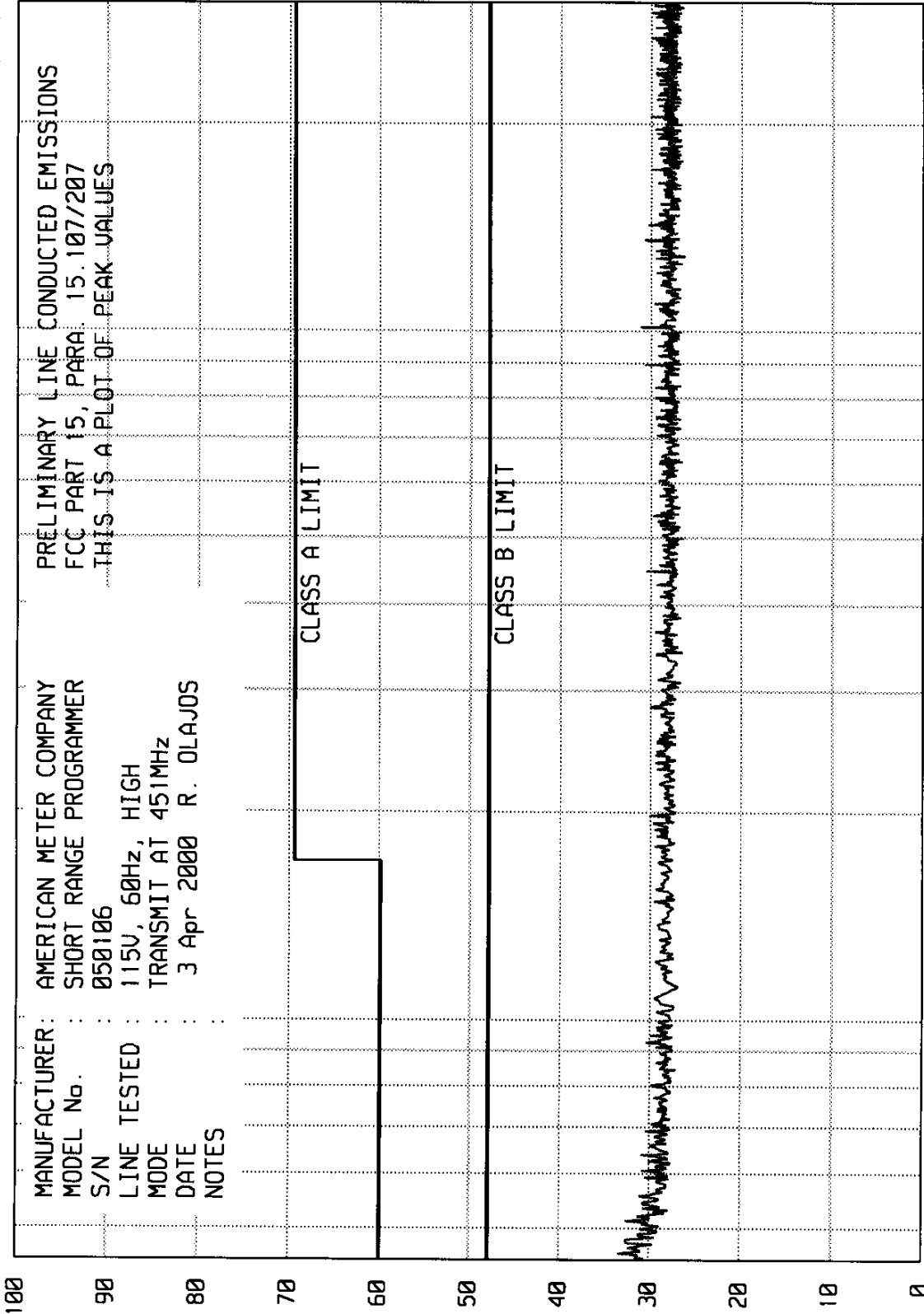
MANUFACTURER : AMERICAN METER COMPANY  
 MODEL : SHORT RANGE PROGRAMMER  
 S/N : 050103  
 TEST DATE : 29 Feb 2000  
 NOTES : Tx @ 451MHz

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

FCC15 CE RUN 4

WEAB 10/08/99

MANUFACTURER: AMERICAN METER COMPANY PRELIMINARY LINE CONDUCTED EMISSIONS  
 MODEL No. : SHORT RANGE PROGRAMMER FCC PART 15, PARA. 15.107/207  
 S/N : 050106 THIS IS A PLOT OF PEAK VALUES  
 LINE TESTED : 115V, 60Hz, HIGH  
 MODE : TRANSMIT AT 451MHz  
 DATE : 3 Apr 2000 R. OLAJOS  
 NOTES :



AMPLITUDE (dBu)

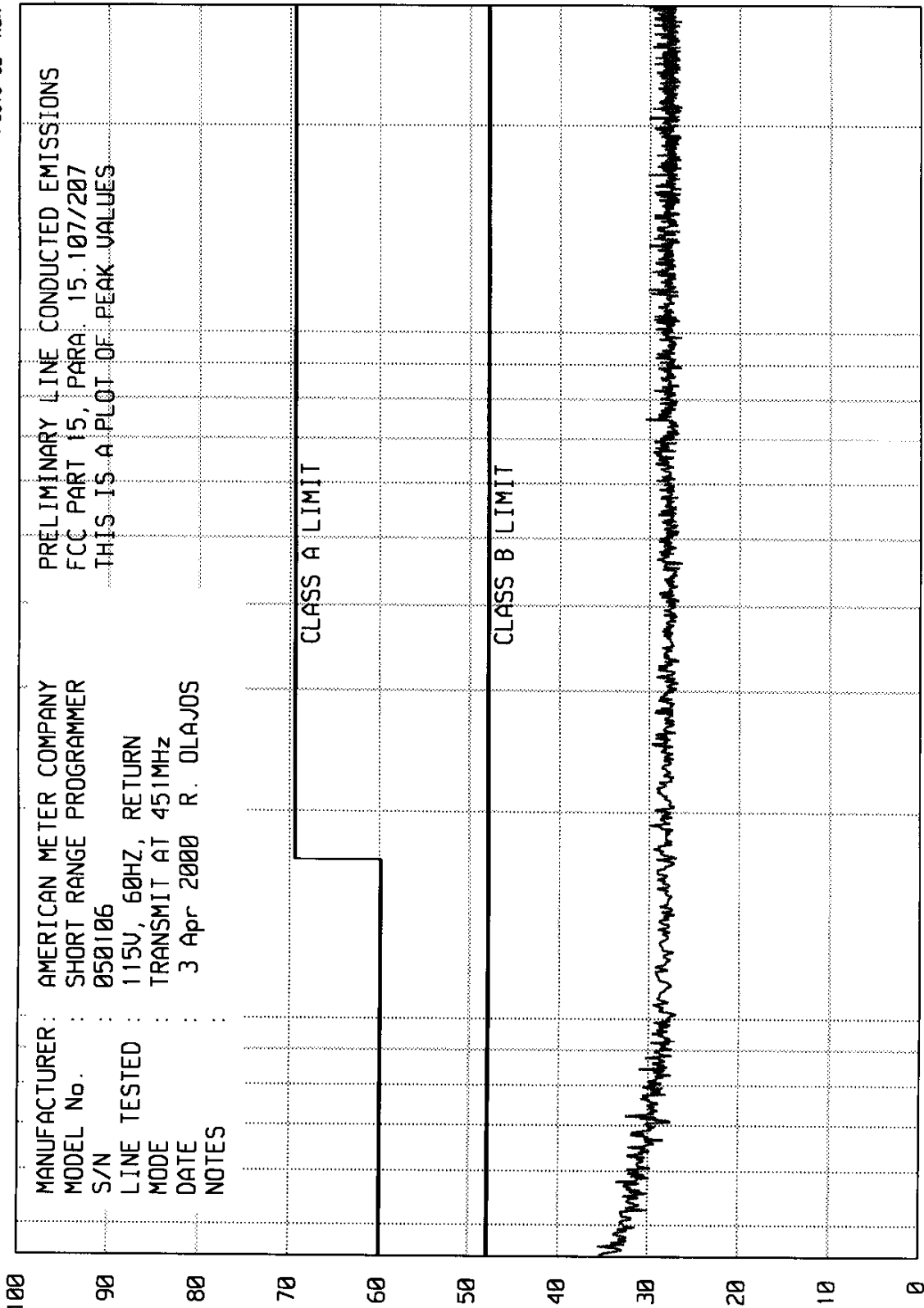
START = .45      FREQUENCY - MHz      STOP = 30

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

FCC15 CE RUN 3

EE

WEAB 10/08/99

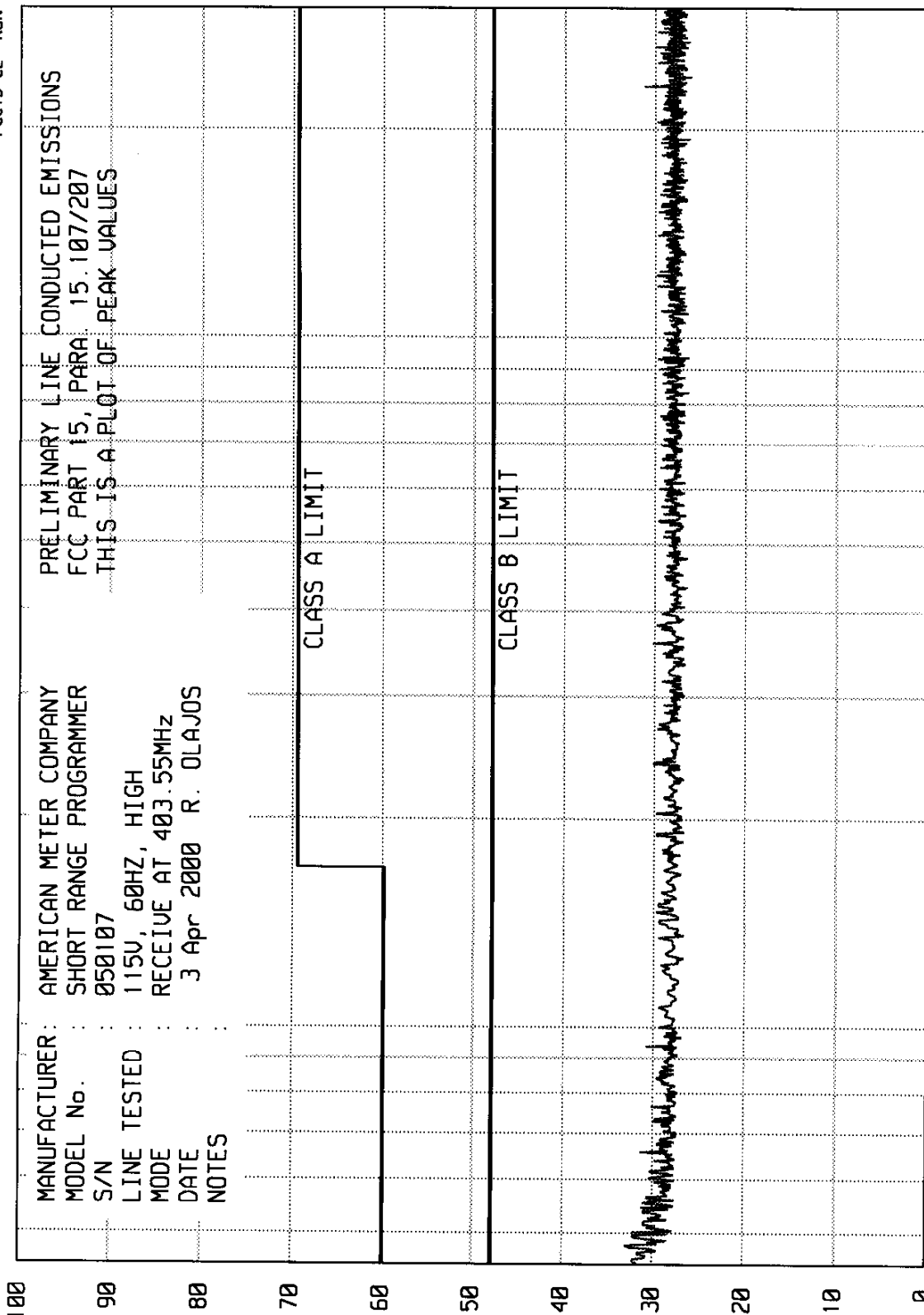


START = .45      STOP = 30

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

FCC15 CE RUN 1

WEAB 18/08/99



MANUFACTURER: AMERICAN METER COMPANY  
 MODEL No. : SHORT RANGE PROGRAMMER  
 S/N : 058107  
 LINE TESTED : 115V, 60HZ, HIGH  
 MODE : RECEIVE AT 403.55MHz  
 DATE : 3 Apr 2000 R. OLAJOS  
 NOTES :

PRELIMINARY LINE CONDUCTED EMISSIONS  
 FCC PART 15, PARA 15.107/207  
 THIS IS A PLOT OF PEAK VALUES

AMPLITUDE (dBU)

START = .45

1

FREQUENCY - MHz

10

STOP = 30

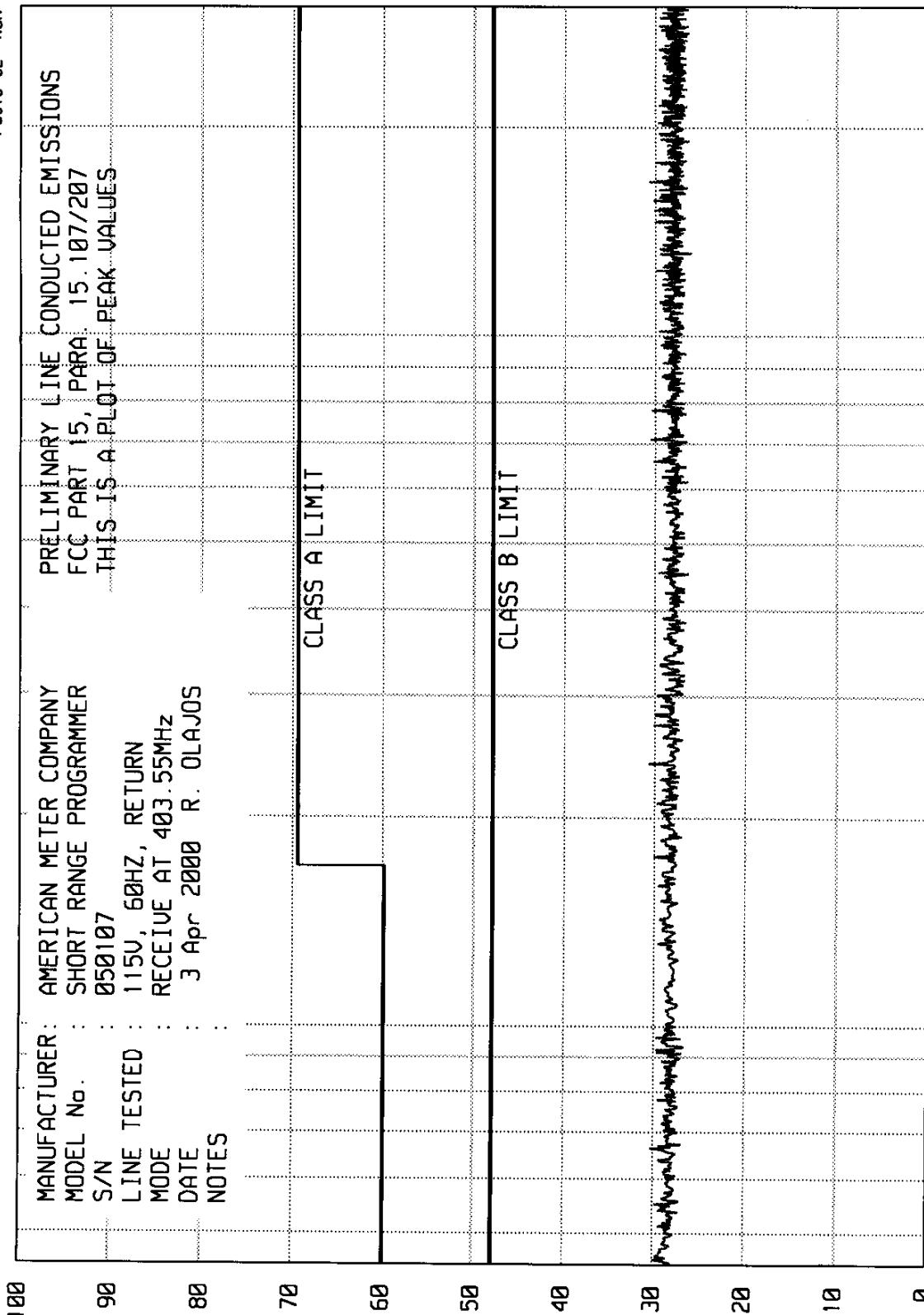


ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

FCC15 CE RUN 2

WEAB 10/08/99

MANUFACTURER: AMERICAN METER COMPANY  
MODEL No. : SHORT RANGE PROGRAMMER  
S/N : 050107  
LINE TESTED : 115V, 60HZ, RETURN  
MODE : RECEIVE AT 403.55MHz  
DATE : 3 Apr 2000 R. OLAJOS  
NOTES :  
PRELIMINARY LINE CONDUCTED EMISSIONS  
FCC PART 15, PARA 15.107/207  
THIS IS A PLOT OF PEAK VALUES



AMPLITUDE (dBV)

pg 25 of 37

START = .45

1

FREQUENCY - MHz

10

STOP = 30

MANUFACTURER : AMERICAN METER COMPANY  
MODEL : SHORT RANGE PROGRAMMER  
S/N : 050106  
SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B  
TEST : LINE CONDUCTED EMISSIONS  
LINE TESTED : 115V, 60Hz, HIGH  
MODE : TRANSMIT AT 451MHZ  
DATE : 3 Apr 2000  
NOTES :  
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR  
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. uV	LIMIT uV
.450	43.3	250
.635	15.7	250
.888	15.4	250
.920	15.4	250
1.479	15.1	250
1.971	14.9	250
2.840	15.1	250
3.615	15.4	250
4.458	15.4	250
5.344	15.1	250
7.043	15.4	250
7.977	15.4	250
8.928	15.4	250
10.103	15.4	250
12.721	15.4	250
13.038	15.4	250
13.542	15.7	250
16.436	15.7	250
17.155	15.7	250
19.636	15.4	250
20.453	15.4	250
21.726	15.4	250
22.860	15.4	250
23.710	15.4	250
26.621	15.4	250
27.542	15.4	250
28.985	15.7	250

MANUFACTURER : AMERICAN METER COMPANY  
 MODEL : SHORT RANGE PROGRAMMER  
 S/N : 050106  
 SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B  
 TEST : LINE CONDUCTED EMISSIONS  
 LINE TESTED : 115V, 60HZ, RETURN  
 MODE : TRANSMIT AT 451MHZ  
 DATE : 3 Apr 2000  
 NOTES :  
 RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR  
 VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. uV	LIMIT uV
.455	43.6	250
.720	15.9 BB	250
.834	38.9	250
1.042	15.4	250
1.902	15.1	250
2.504	15.1	250
3.100	37.6	250
4.634	15.1	250
4.869	15.4	250
5.389	15.4	250
6.640	15.4	250
7.471	15.4	250
9.209	15.7	250
11.521	15.4	250
12.248	15.4	250
13.363	15.7	250
16.006	15.7	250
16.951	15.4	250
19.794	15.7	250
20.526	15.7	250
22.668	15.4	250
23.347	15.4	250
24.625	15.4	250
26.113	15.4	250
28.079	15.4	250
29.788	15.4	250

MANUFACTURER : AMERICAN METER COMPANY  
 MODEL : SHORT RANGE PROGRAMMER  
 S/N : 050107  
 SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B  
 TEST : LINE CONDUCTED EMISSIONS  
 LINE TESTED : 115V, 60HZ, HIGH  
 MODE : RECEIVE AT 403.55MHz  
 DATE : 3 Apr 2000  
 NOTES :  
 RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR  
 VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. uV	LIMIT uV
.470	42.1	250
.661	15.7	250
.747	27.8	250
.927	31.1	250
1.471	15.4	250
2.029	14.9	250
2.389	14.9	250
3.551	30.8	250
4.470	15.1	250
5.373	15.4	250
5.985	15.4	250
7.320	15.4	250
7.684	15.4	250
9.272	15.4	250
10.910	15.4	250
11.852	15.7	250
14.003	15.4	250
15.153	15.4	250
17.253	15.4	250
19.148	15.4	250
20.487	15.4	250
22.187	15.4	250
23.105	15.4	250
24.311	15.7	250
26.342	15.4	250
27.674	15.4	250
28.736	15.7	250

MANUFACTURER : AMERICAN METER COMPANY  
 MODEL : SHORT RANGE PROGRAMMER  
 S/N : 050107  
 SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B  
 TEST : LINE CONDUCTED EMISSIONS  
 LINE TESTED : 115V, 60HZ, RETURN  
 MODE : RECEIVE AT 403.55MHz  
 DATE : 3 Apr 2000  
 NOTES :  
 RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR  
 VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. uV	LIMIT uV
.450	42.1	250
.657	15.4	250
.792	34.5	250
.970	15.4	250
1.313	15.4	250
1.744	15.1	250
2.386	15.1	250
3.001	15.4	250
4.505	15.1	250
5.743	15.4	250
7.094	15.4	250
7.777	15.4	250
9.675	15.4	250
10.175	15.7	250
12.438	15.7	250
12.602	15.4	250
14.648	15.4	250
15.307	15.7	250
15.678	15.4	250
16.675	15.4	250
19.630	15.4	250
20.283	15.4	250
21.672	15.4	250
22.841	15.4	250
23.448	15.4	250
25.979	15.4	250
28.114	15.4	250
29.953	15.4	250

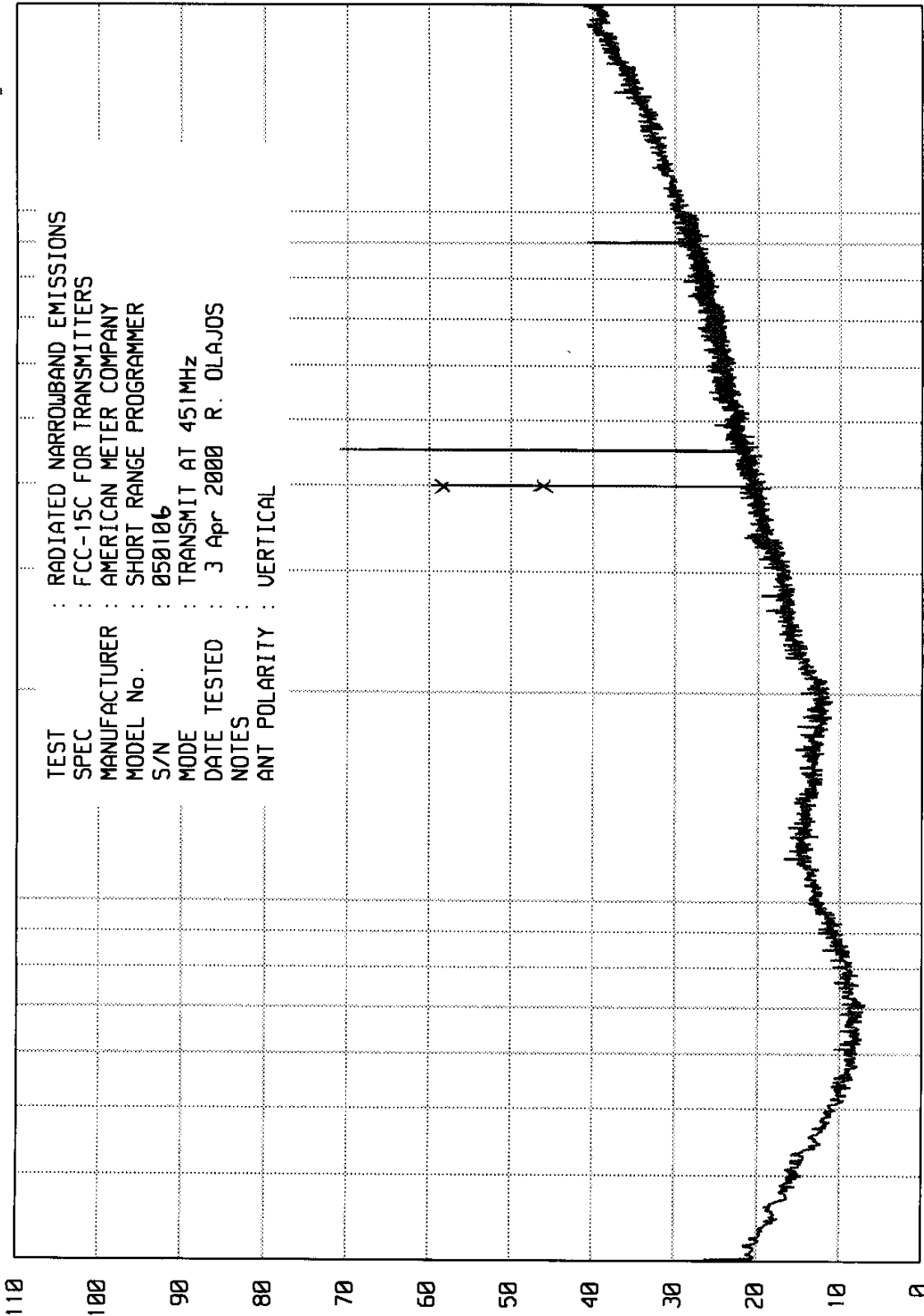
ETR 22580

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

UNIU\_EM RUN RUN 1

UKAB 09/13/99

TEST : RADIATED NARROWBAND EMISSIONS  
 SPEC : FCC-15C FOR TRANSMITTERS  
 MANUFACTURER : AMERICAN METER COMPANY  
 MODEL No. : SHORT RANGE PROGRAMMER  
 S/N : 050106  
 MODE : TRANSMIT AT 451MHz  
 DATE TESTED : 3 Apr 2000 R. OLAJOS  
 NOTES :  
 ANT POLARITY : VERTICAL



RADIATED NARROWBAND EMISSIONS - dBu/m

pg 30 of 37

START = 30

100

1000

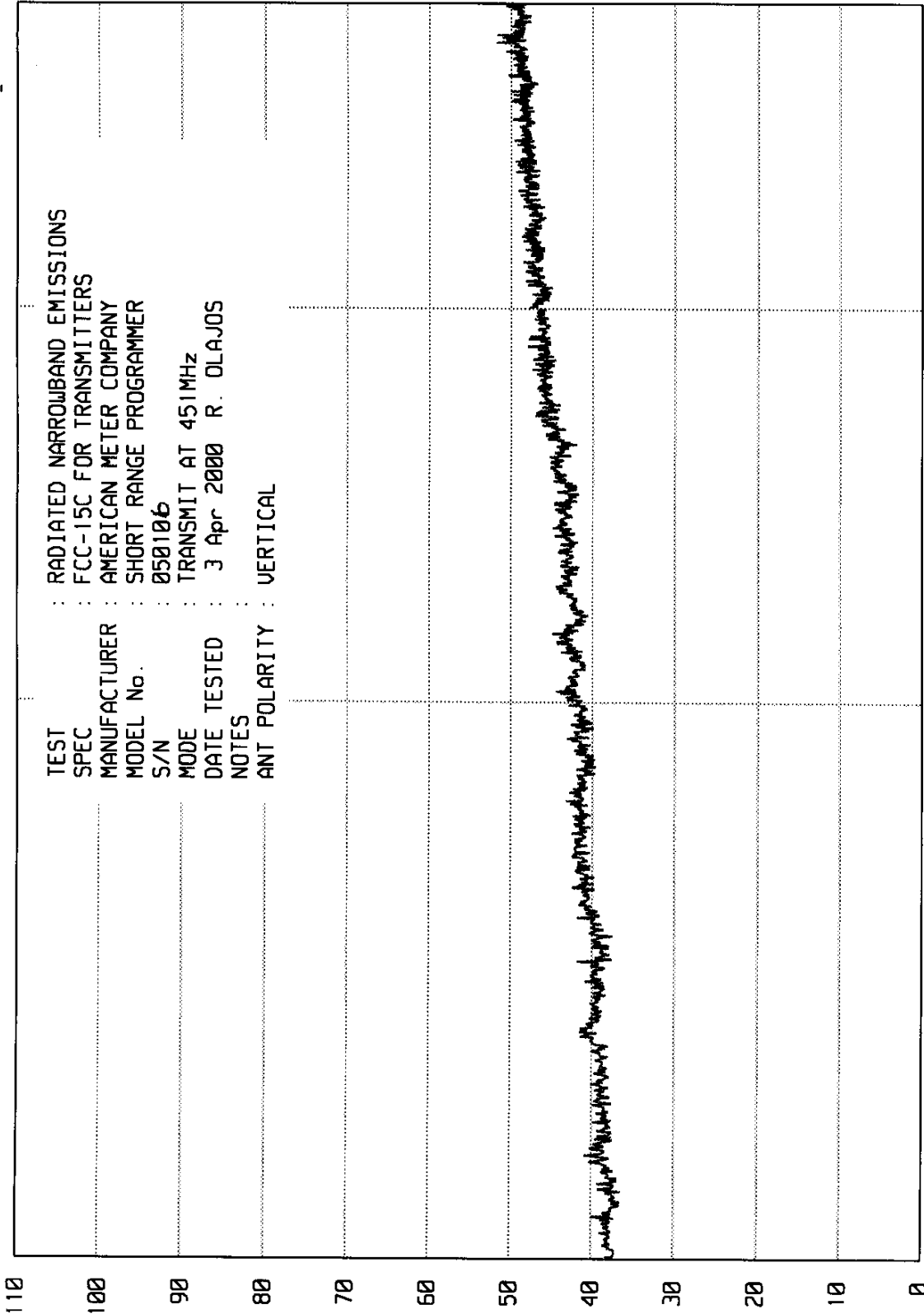
FREQUENCY - MHz

STOP = 2000

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

UNIU\_EM RUN RUN 2

UKA0 09/13/99



TEST : RADIATED NARROWBAND EMISSIONS  
 SPEC : FCC-15C FOR TRANSMITTERS  
 MANUFACTURER : AMERICAN METER COMPANY  
 MODEL No. : SHORT RANGE PROGRAMMER  
 S/N : 050106  
 MODE : TRANSMIT AT 451MHz  
 DATE TESTED : 3 Apr 2000 R. OLAJOS  
 NOTES :  
 ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dBu/m

pg 21 of 37

START = 2000

FREQUENCY - MHz

STOP = 5000

ETR No. 22580  
DATA PAGE

SPECIFICATION : FCC PART 15C (REV OCT 1, 94) TRANSMITTER OPEN FIELD DATA  
 MANUFACTURER : AMERICAN METER COMPANY  
 MODEL : SHORT RANGE PROGRAMMER  
 S/N : 050106  
 TEST DATE : APRIL 3, 2000  
 NOTES : TRANSMIT AT 451MHz  
 TEST ANTENNA : CHASE BI-LOG & DRWG ANTENNAS  
 (PERIODIC RATES EXCEEDED)

FREQUENCY MHz	ANT POL	MTR RDG dBuV	CBL FAC dB	ANT FAC dB	DUTY CYCLE dB	TOTAL dBuV/m @3m	TOTAL uV/m @3m	LIMIT uV/m @3m	NOTE
451.40	H	52.4	2.3	16.8	0.0	71.5	3775.6	4690.0	
451.40	V	53.8	2.3	16.8	0.0	72.9	4435.9	4690.0	
902.80	H	23.5	3.3	21.9	0.0	48.7	273.0	469.0	
902.80	V	22.5	3.3	21.9	0.0	47.7	243.3	469.0	
1354.20	H	10.3	4.3	25.1	0.0	39.6	95.8	500.0	*
1354.20	V	9.8	4.3	25.1	0.0	39.1	90.5	500.0	*
1805.60	H	7.9AMB	5.3	26.7	0.0	39.9	98.5	500.0	
1805.60	V	8.1AMB	5.3	26.7	0.0	40.1	100.9	500.0	
2257.00	H	8.0AMB	6.2	28.2	0.0	42.4	131.1	500.0	*
2257.00	V	7.8AMB	6.2	28.2	0.0	42.2	128.2	500.0	*
2708.40	H	9.5AMB	7.0	29.6	0.0	46.0	200.2	500.0	*
2708.40	V	10.3AMB	7.0	29.6	0.0	46.8	219.5	500.0	*
3159.00	H	7.2AMB	7.8	30.9	0.0	45.9	198.0	500.0	
3159.00	V	7.5AMB	7.8	30.9	0.0	46.2	205.0	500.0	
3611.20	H	6.9AMB	8.8	32.1	0.0	47.8	244.8	500.0	*
3611.20	V	6.7AMB	8.8	32.1	0.0	47.6	239.2	500.0	*
4062.00	H	7.3AMB	9.8	33.0	0.0	50.1	319.4	500.0	*
4062.00	V	6.8AMB	9.8	33.0	0.0	49.6	301.6	500.0	*
4514.00	H	7.6AMB	10.8	32.7	0.0	51.2	361.4	500.0	*
4514.00	V	8.5AMB	10.8	32.7	0.0	52.1	400.8	500.0	*

\* DENOTES A FREQUENCY CONFLICT WITH RESTRICTED BANDS

checked by: *R. Olajos*  
R. OLAJOS



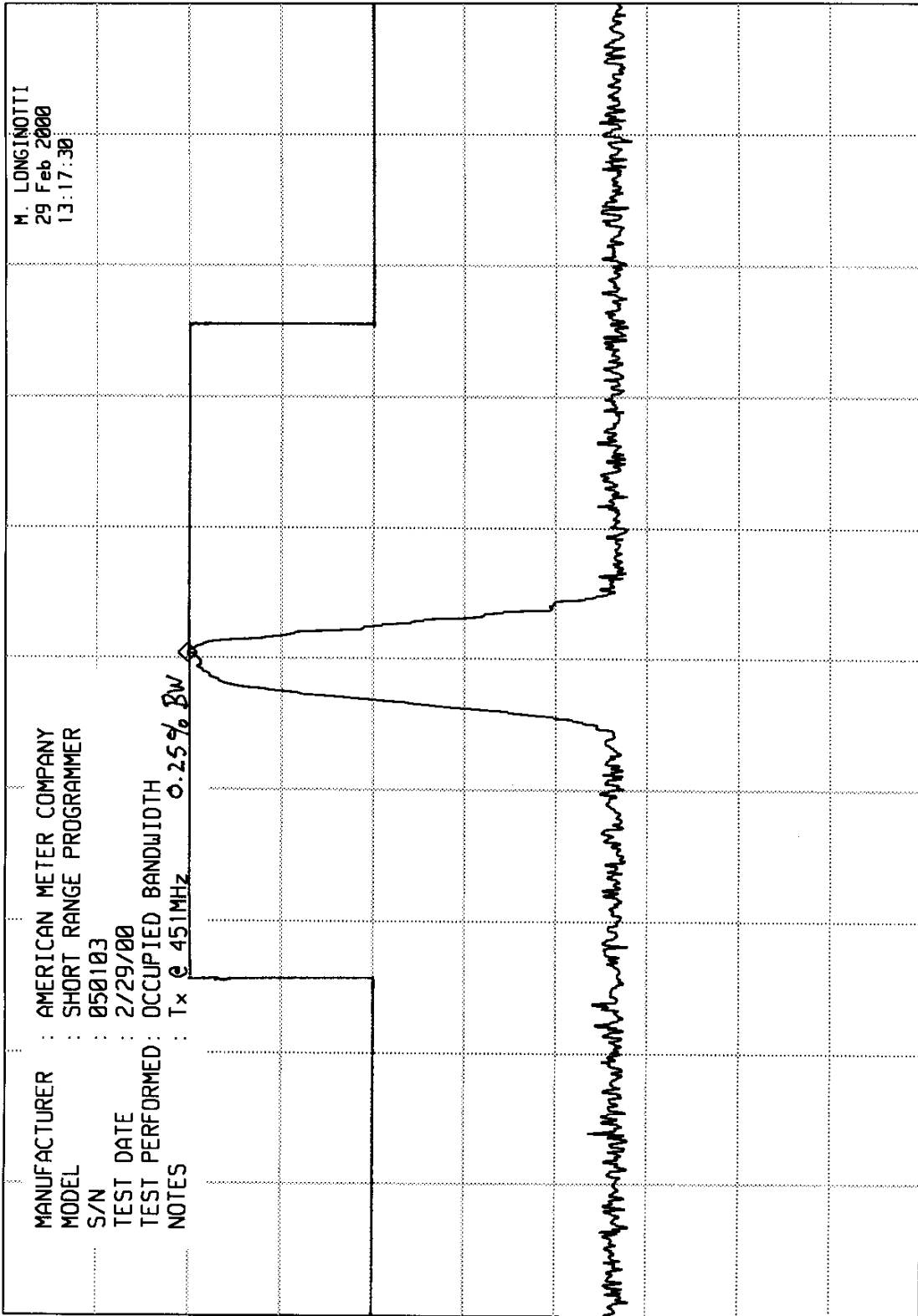
ELITE ELECTRONIC ENGINEERING CO

MR 451.311 MHz  
67.20 dBu

hp

10 dB/

REF 87.0 dBu ATTEN 10 dB



SPAN 2.00 MHz  
SUP 50.0 msec

VBW 100 kHz

CENTER 451.30 MHz  
RES BW 30 kHz (i)

ETR 22580

ETR 22580

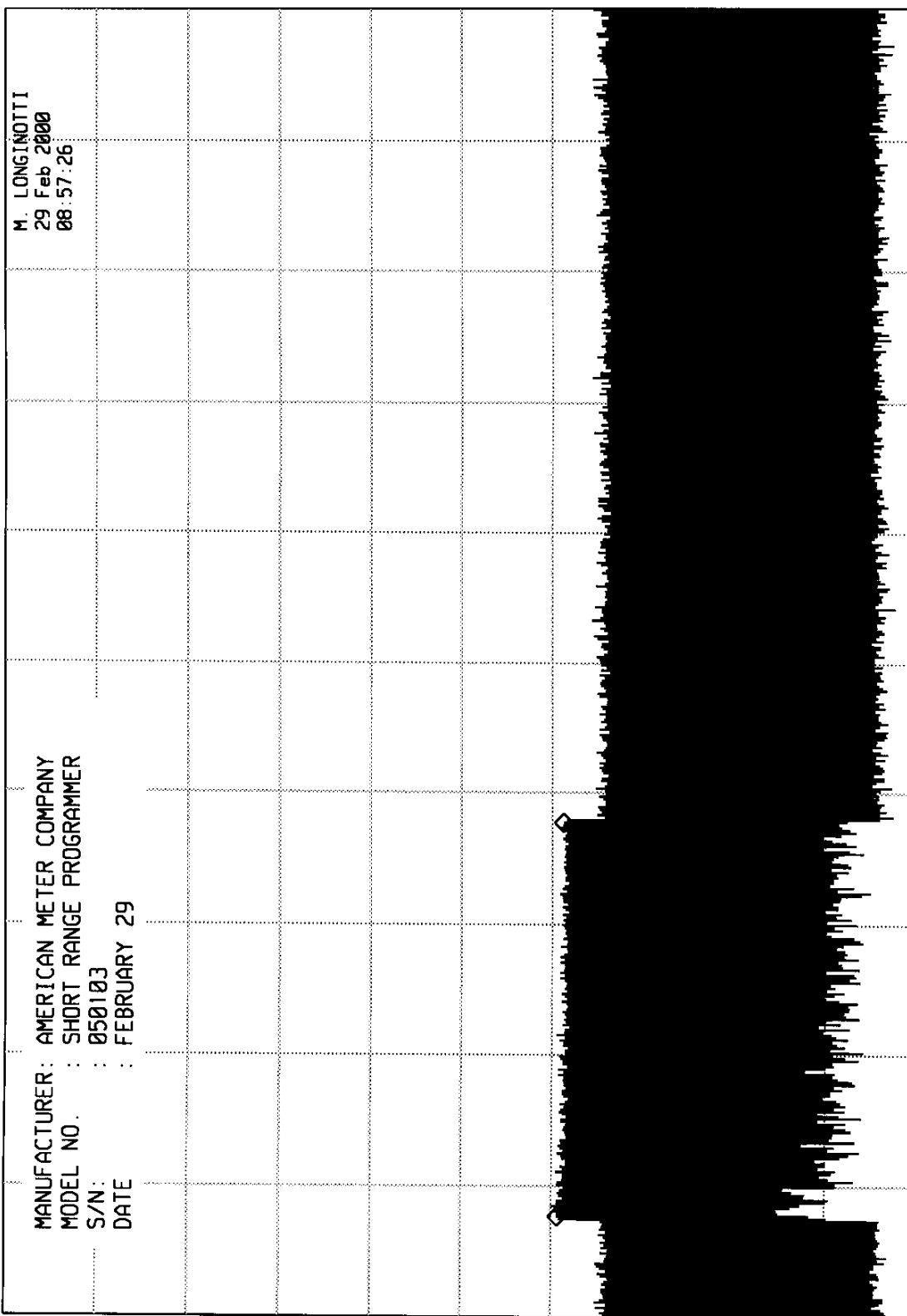
ELITE ELECTRONIC ENGINEERING CO

MKR ^ 1.500 sec  
-0.60 dB

REF 0.0 dBm

ATTEN 10 dB

hp  
10 dB/



SPAN 0 Hz  
SUP 5.00 sec

VBW 3 MHz

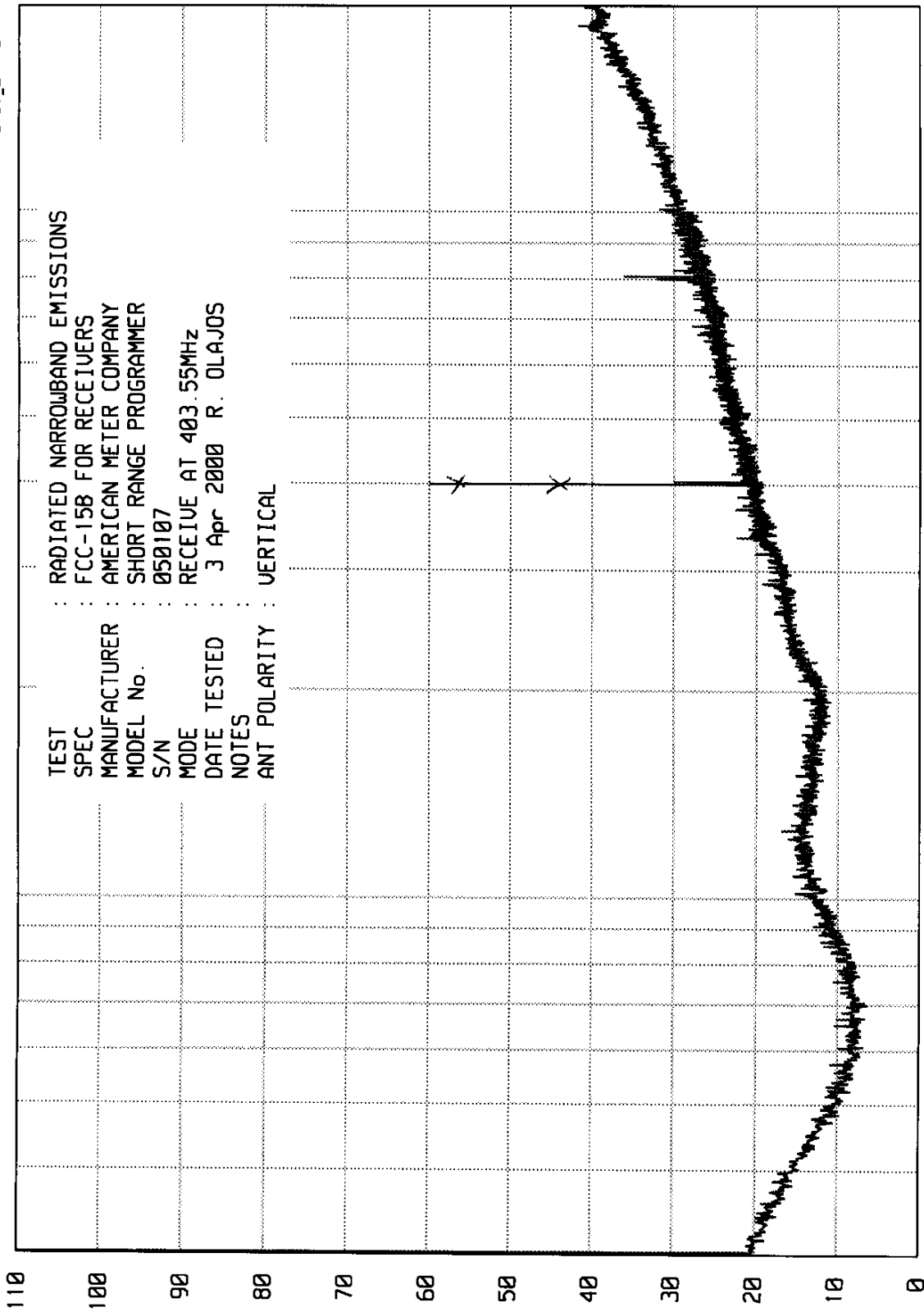
CENTER 451.214 000 MHz  
RES BW 3 MHz (i)

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

UNIV\_EM RUN RUN 1

UKA00 09/13/99

TEST : RADIATED NARROWBAND EMISSIONS  
 SPEC : FCC-15B FOR RECEIVERS  
 MANUFACTURER : AMERICAN METER COMPANY  
 MODEL No. : SHORT RANGE PROGRAMMER  
 S/N : 050107  
 MODE : RECEIVE AT 403.55MHZ  
 DATE TESTED : 3 Apr 2000 R. OLAJOS  
 NOTES :  
 ANT POLARITY : VERTICAL



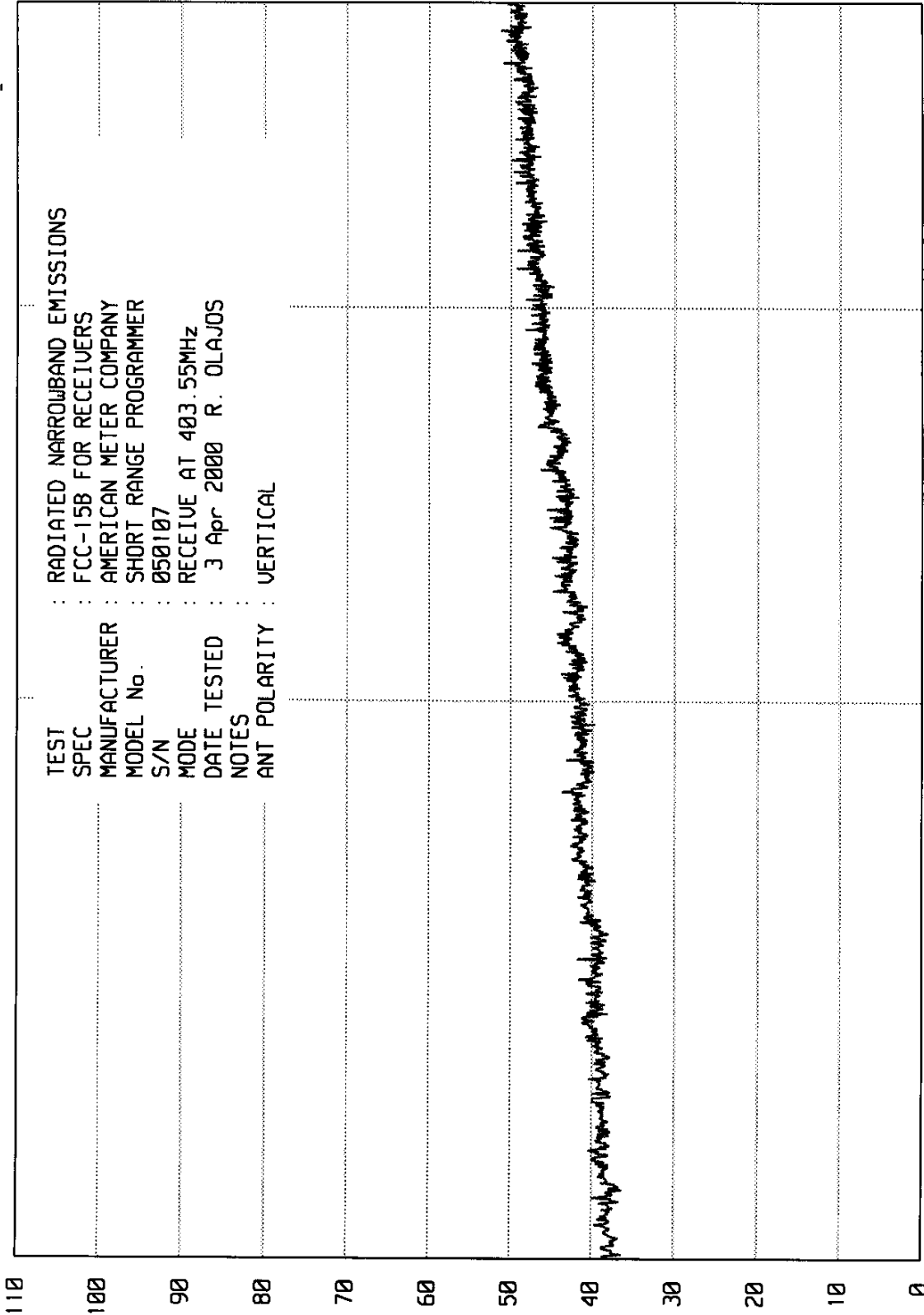
START = 30      STOP = 2000

ELITE ELECTRONIC ENGINEERING Co.  
Downers Grove, Ill. 60515

UNTU\_EH\_RUN RUN 2

WKAB 09/13/99

TEST : RADIATED NARROWBAND EMISSIONS  
 SPEC : FCC-15B FOR RECEIVERS  
 MANUFACTURER : AMERICAN METER COMPANY  
 MODEL No. : SHORT RANGE PROGRAMMER  
 S/N : 050107  
 MODE : RECEIVE AT 403.55MHz  
 DATE TESTED : 3 Apr 2000 R. OLAJOS  
 NOTES :  
 ANT POLARITY : VERTICAL



pg 36 of 37

START = 2000

FREQUENCY - MHz

STOP = 5000

ENGINEERING TEST REPORT NO. 22580

DATA SHEET

SPECIFICATION : FCC PART 15C RECEIVER OPEN FIELD DATA  
 MANUFACTURER : American Meter Company  
 MODEL NO. : Short Range Programmer  
 S/N : 050107  
 TEST EQUIPMENT : See Table I  
 NOTES : Receive at 405.33MHz  
 DATE : April 3, 2000

FREQUENCY (MHz)	ANT POL	METER RDG (dBuV)	ANTENNA FACTOR (dBuV)	CABLE FACTOR (dBuV)	PREAMP FACTOR (dBuV)	TOTAL (dBuV/m)	TOTAL (uV/m)	LIMIT (uV)
403.55	H	24.0	16.5	2.2	-----	42.7	136.4	200
403.55	V	24.2	16.5	2.2	-----	42.9	139.6	200
807.1	H	19.4	21.4	2.6	-----	43.4	147.9	200
807.1	V	19.7	21.4	2.6	-----	43.7	153.1	200
1210.65	H	53.1	24.5	4.0	-37.9	43.7	153.1	500
1210.65	V	52.0	24.5	4.0	-37.9	42.6	134.9	500
1614.2	H	49.6	25.8	4.8	-37.2	43.0	141.3	500
1614.2	V	47.6	25.8	4.8	-37.2	41.0	112.2	500

V - Vertical

H - Horizontal

Checked By: 

DATA PAGE