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

ELITE PROJECT: 28586 DATE TESTED: March 8, 2000

TEST PERSONNEL: Daniel E. Crowder

TEST SPECIFICATION: FCC "Code of Federal Regulations" Title 47
Part 15, Subpart C, Sections 15.207 & 15.209

ENGINEERING TEST REPORT NO. 22520

MEASUREMENT OF RF INTERFERENCE FROM

A MODEL AYE-10 CARD READER TRANSMITTER

FOR: Rosslare Enterprises Ltd.
Flat 12,9/F Wing Fat Industrial Bldg.
12 Wang Tai Road
Kowloon Bay, Hong Kong

PURCHASE ORDER NO.: 00011D

Report By:
Neil J. Hurley

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

ENGINEERING TEST REPORT NO. 22520

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: Card Reader Transmitter

MODEL NO: AYE-10 **SERIAL NO:** None Assigned

MANUFACTURER: Rosslare Enterprises Ltd.

APPLICABLE SPECIFICATIONS: FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C

QUANTITY OF ITEMS TESTED: One (1)

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

DATE RECEIVED: March 8, 2000

DATE TESTED: March 8, 2000

PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):
CUSTOMER: No Rosslare Enterprises Ltd. personnel were present.
ELITE ELECTRONIC: Daniel E. Crowder

ELITE JOB NO.: 28586

ABSTRACT: The model AYE-10 Card Reader Transmitter, does meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 & 15.209 for Intentional Radiators, when tested per ANSI C63.4-1992.

The conducted emissions level closest to the limit (worst case) occurred at 453kHz. The emissions level at this frequency was 12.7dB within the limit. See data pages 18 and 19 for more detailed results.

The radiated emissions level closest to the limit (worst case) occurred at 133.25kHz. The emissions level at this frequency was 96.2dB within the limit. See data page 21 for more details.

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(INCLUDING DATA SHEETS): 21

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MEASUREMENT OF RF INTERFERENCE FROM

A MODEL AYE-10 CARD READER TRANSMITTER

1.0 INTRODUCTION:

1.1 DESCRIPTION OF TEST ITEM: This document presents the results of a series of radio interference measurements performed on a model AYE-10 Card Reader Transmitter, (hereinafter referred to as the test item). No serial number was assigned to the test item. The test item was designed to transmit at approximately 125kHz using an internal antenna. The tests were performed for Rosslare Enterprises Ltd. of Hong Kong, China.

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, Sections for Intentional Radiators. 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 1998
- 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 21°C and the relative humidity was 27%.

2.0 TEST ITEM SETUP AND OPERATION:

A block diagram of the test item setup is included as Figure 3.

2.1 POWER INPUT: The test item obtained 13VDC power via a 4 wire, 1.0 foot long, unshielded power cord. The 13VDC was supplied from a PS51 Power Supply. The power supply received 16.5VAC, 60Hz power from the secondary of a Basler Electric, BE11625DCAA transformer via a 2 wire, 3.0 foot long, unshielded power cable. The primary of the transformer was connected to the 120VAC, 60Hz power.

The high and low leads were connected through a line impedance stabilization network (LISN) which was located on the copper ground plane. The network complies with the requirements of Paragraph 4.1.2 of ANSI C63.4-1992.

2.2 GROUNDING: Since only two wires were used to provide the input power, the test item was ungrounded during the tests.

2.5 OPERATIONAL MODE: For all tests the test item was energized and was placed on a 80cm high non-conductive stand.

For all tests, the test item was set to transmit continuously by placing a magnetic card near the reader. Transmission was verified by observation of an LED which changed colors momentarily whenever the transmitter was enabled. The transmitting mechanism automatically deactivated when the card was taken away from the reader. The tests were performed with the test item transmitting at 125kHz.

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.

Conducted emission tests were performed with a spectrum analyzer in conjunction with a quasi-peak adapter.

The fundamental, harmonics and spurious radiated emissions were measured with a spectrum analyzer. These measurements were taken with the resolution bandwidth of the measuring instrument adjusted to 100Hz below 150kHz and 10kHz from 150kHz to 30MHz.

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).

3.3 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".

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 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.

4.1.3 RESULTS: The plots of the peak preliminary conducted voltage levels on each power line are presented on data pages 16 and 17. The conducted limit for intentional radiators is shown as a reference. The final quasi-peak results are presented on data pages 18 and 19.

The emissions level closest to the limit (worst case) occurred at 453kHz. The emissions level at this frequency was 12.7dB within the limit. Photographs of the test configuration which yielded the highest, or worst case, conducted emission levels are shown on Figure 1.

4.3 RADIATED MEASUREMENTS:

4.3.1 REQUIREMENTS: The test item must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15,

Subpart C, Section 15.209.

Paragraph 15.209 has the following radiated emission limits:

Frequency MHz	Field Strength uV/m	Measurement Distance (m)
0.009-0.49	2400/F(kHz)	300
0.49-1.705	24000/f(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

4.3.2.1 PRELIMINARY RADIATED MEASUREMENTS: All preliminary 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.

The broadband measuring antenna was positioned at a 3 meter distance from the test item. The entire frequency range from 10kHz to 30MHz was investigated using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured.

4.3.2.2 FINAL RADIATED MEASUREMENTS: Final open field measurements were manually performed at Elite's open field test site

located in Downers Grove, Illinois. The open field test site is located in a clear area and is equipped with a 1/4-inch wire mesh ground plane. The facility complies with the test site criteria in ANSI C63.4-1992 and Section 2.948 of the FCC Rules.

Measurements were performed at a test distance of 3 meters using a peak detector.

Since the test distance was reduced from either 300 or 30 meters to 3 meters, a correction factor was applied to the measurements. Radiation at 125kHz was measured at several distances and the levels plotted. A straight line was drawn through these points and the slope (which is the propagation loss constant) was calculated. Measurements and calculations are shown in Figure 2. The factors to correct levels at 3 meters to levels at 300 or 30 meters are shown on the data page.

The final open field emission tests were performed over the frequency range of 120kHz to 1500kHz. Between 120kHz and 1500kHz, a loop antenna was used as the pick-up device.

All significant broadband and narrowband signals were measured and recorded.

To ensure that maximum emission levels were measured, the following steps were taken:

1) Measurements were made using a peak detector and a loop 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 3 meters for each antenna polarization to maximize the readings.

4.3.3 RESULTS: The preliminary plot, with the test item transmitting at 125kHz, is presented on data page 20. The plot is presented for a reference only, and are not used as official data.

The final open area radiated levels, with the test item transmitting at 125kHz, is presented on data page 21. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closet to the limit (worst case) occurred at 133.25kHz. The emissions level at this frequency was 96.2dB within the limit. See data page 21 for details. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figure 4.

5.0 CONCLUSION:

It was found that the Rosslare Enterprises Ltd. model AYE-10 Card Reader Transmitter, does meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 & 15.209 for Intentional Radiators, when tested per ANSI C63.4-1992.

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 only 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.

7.0 ENDORSEMENT DISCLAIMER:

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

TABLE 1: TEST EQUIPMENT LIST

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	---	01/29/99	N/A	
Equipment Type: AMPLIFIERS								
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	01/31/00	12	01/31/01
Equipment Type: ANTENNAS								
NLS1	24" ACTIVE LOOP ANTENNA	EMCO	6502	8903-2329	0.01-30MHZ	11/29/99	12	11/29/00
Equipment Type: ATTENUATORS								
T1K1	10DB, 2.5W LIMITER	HEWLETT PACKARD	11947A	3107A01737	.01-200MHZ	03/26/99	12	03/26/00
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		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
RACA	RF PRESELECTOR	HEWLETT PACKARD	85685A	2926A00980	20HZ-2GHZ	03/01/00	12	03/01/01
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

ETR 22520
FIGURE 2

PROPAGATION LOSS MEASUREMENTS AND CALCULATIONS

MEASURED LEVELS dBuV	DISTANCE METERS
58.4	3
47.6	5
36.7	7

PROPAGATION LOSS = 20 * LOG (Dm/Dl)^N
WHERE : Dm = DISTANCE OF MEASUREMENT
: Dl = LIMIT DISTANCE
: N = SLOPE OF THE LINE

SOLVING FOR N:
N = (dBV2 – dBV1)/(20*LOG(D2/D1))
N = (36.7 – 58.4)/(20 * LOG(7/3))
N = -3.29

PLACING THE SLOPE (N) INTO THE PROPAGATION LOSS EQUATION GIVES YOU:
PROPAGATION LOSS OF 131.6dB AT 300 METER TEST DISTANCE
PROPAGATION LOSS OF 65.8dB AT 30 METER TEST DISTANCE

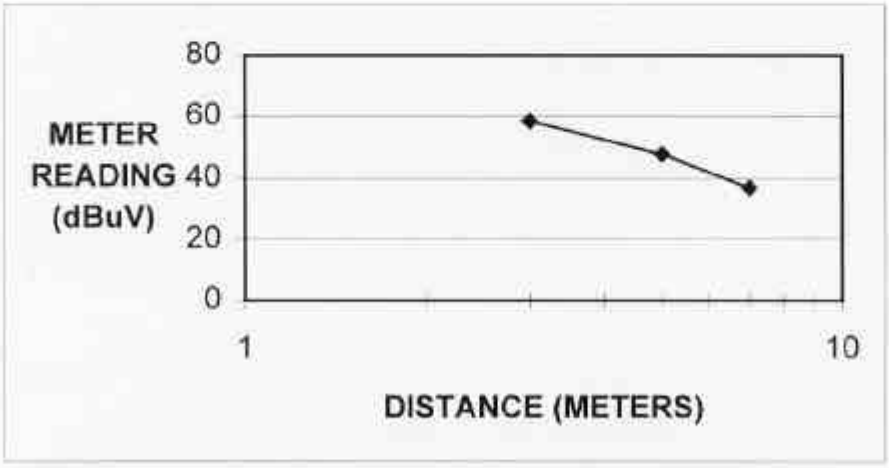


FIGURE 3

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

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

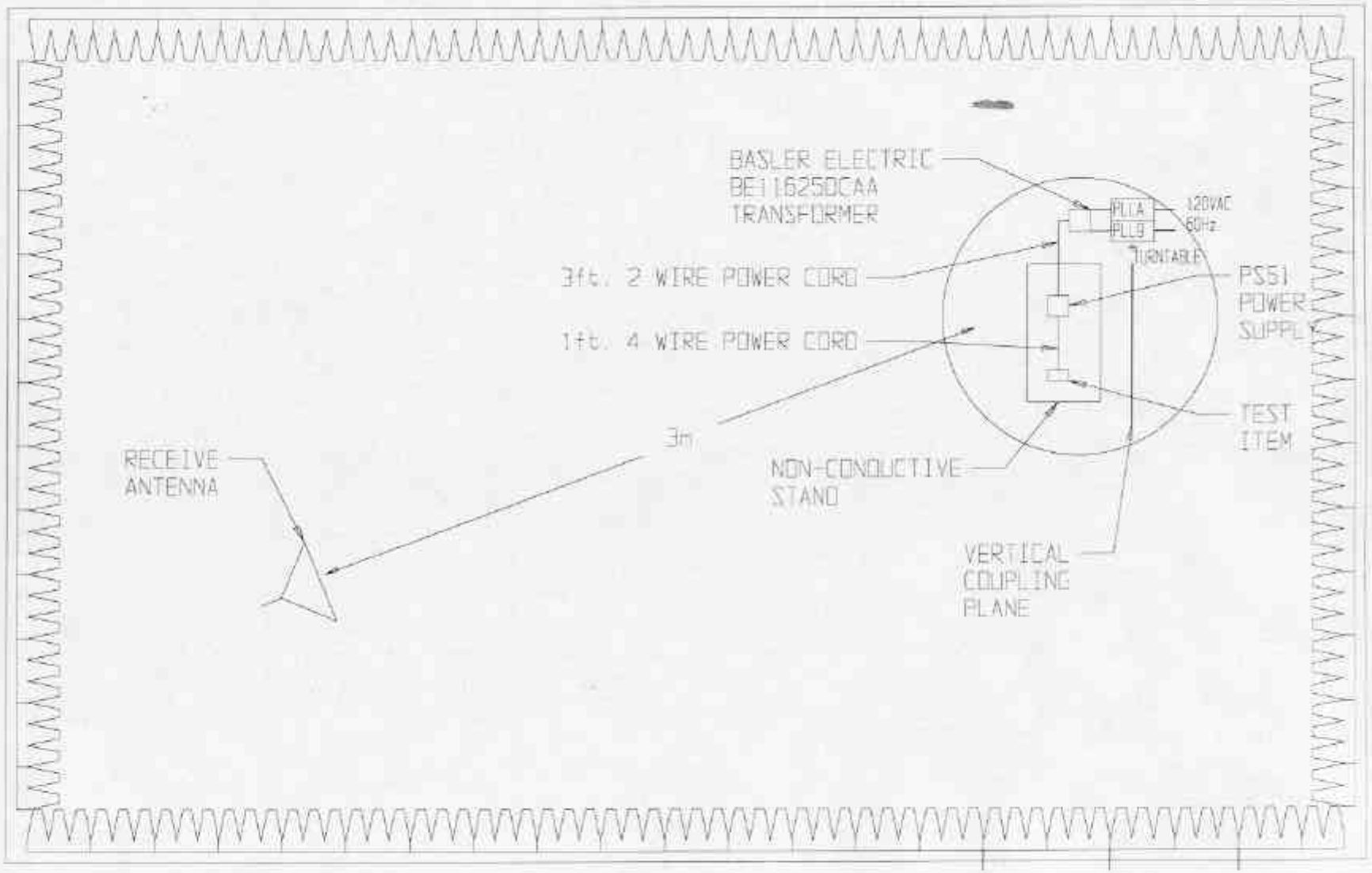
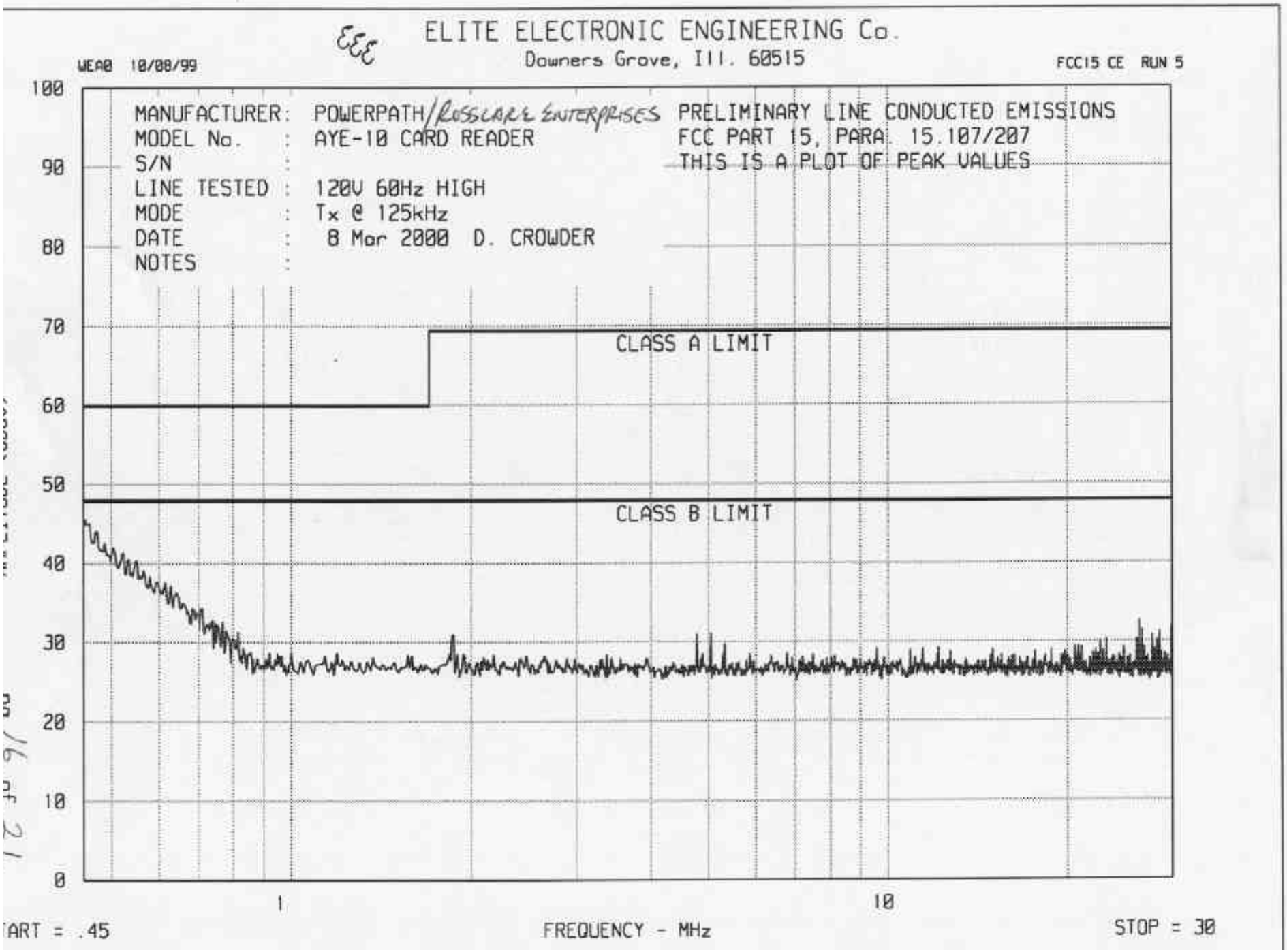
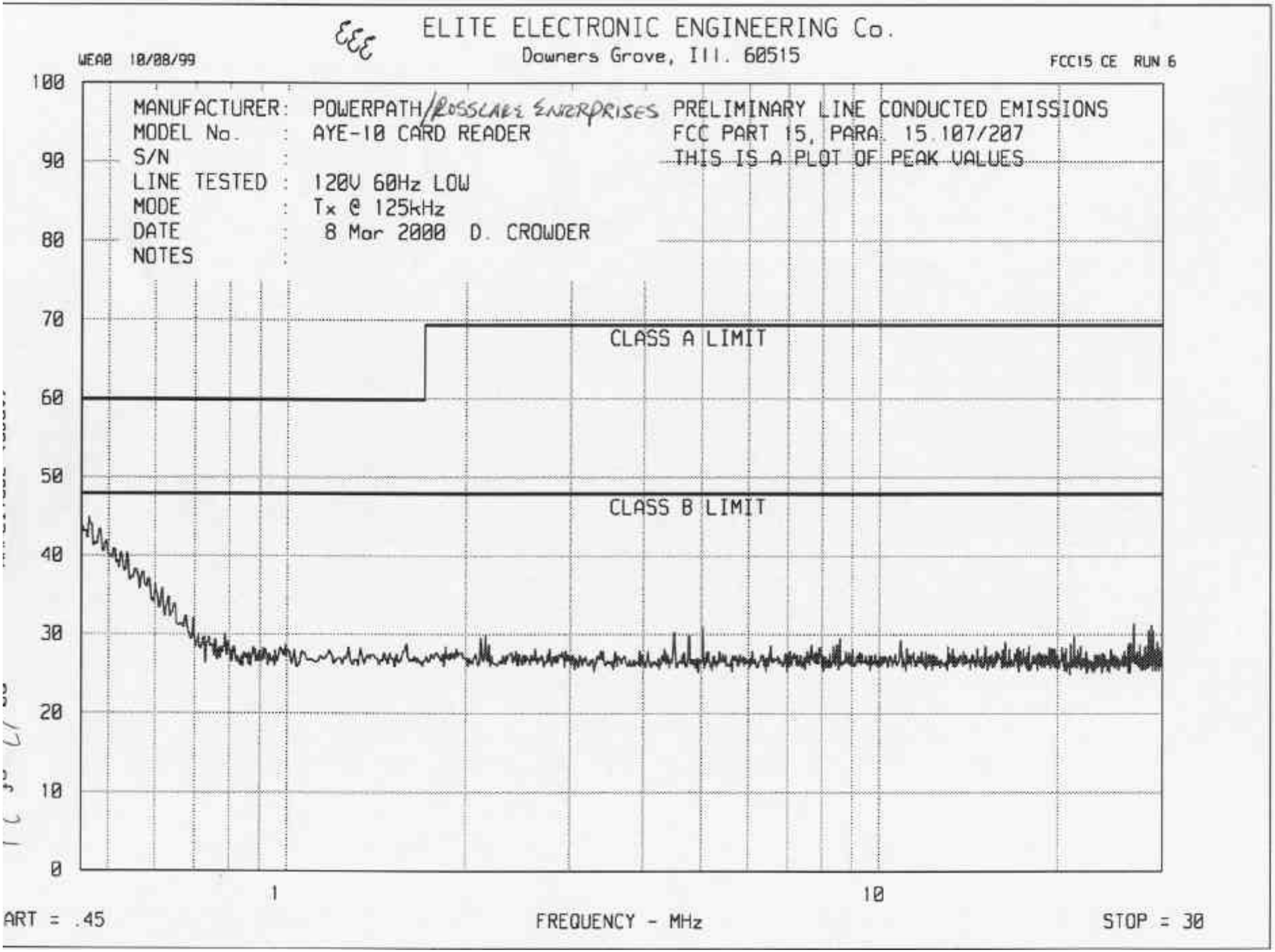


FIGURE 4 BLOCK DIAGRAM OF TEST ITEM AND PERIPHERAL EQUIPMENT SETUP

ETR 22520


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WEA0 10/08/99
FCC15 CE RUN 5
MANUFACTURER: POWERPATH/ROSSLARE ENTERPRISES
MODEL No. : AYE-10 CARD READER
S/N :
LINE TESTED : 120V 60Hz HIGH
MODE : Tx @ 125kHz
DATE : 8 Mar 2000 D. CROWDER
NOTES :
PRELIMINARY LINE CONDUCTED EMISSIONS
FCC PART 15, PARA. 15.107/207
THIS IS A PLOT OF PEAK VALUES
CLASS A LIMIT
CLASS B LIMIT
100
90
80
70
60
50
40
30
20
10
0
1
10
START = .45
FREQUENCY - MHz
STOP = 30



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ENGINEERING TEST REPORT NO. 22520

ETR No.

RUN 5

ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : POWERPATH/ROSSLARE ENTERPRISES LTD.
MODEL : AYE-10 CARD READER
S/N :
SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V 60Hz HIGH
MODE : Tx @ 125kHz
DATE : 8 Mar 2000
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. uV	LIMIT uV
.453	58.5 BB	250
.630	31.2	250
.820	19.4	250
1.170	19.6	250
1.859	21.6	250
2.452	24.6	250
3.325	27.6	250
4.778	24.3	250
5.042	23.6	250
5.573	22.4	250
6.739	19.4	250
7.451	19.4	250
9.548	20.6	250
11.406	20.6	250
12.128	19.4	250
14.985	19.6	250
15.494	19.9	250
17.636	20.1	250
18.747	19.6	250
20.548	22.1	250
21.609	22.1	250
23.203	20.1	250
24.525	22.4	250
24.790	23.1	250
26.374	24.1	250
26.640	24.6	250
29.848	19.6	250

CHECKED BY: D. CROWDER

ENGINEERING TEST REPORT NO. 22520

ETR No.

RUN 6

ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : POWERPATH/ROSCOR ENTERPRISES LTD.
MODEL : AYE-10 CARD READER
S/N :
SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V 60Hz LOW
MODE : Tx @ 125kHz
DATE : 8 Mar 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	56.6 BB	250
.637	24.3	250
.984	19.6	250
1.589	20.9	250
2.142	19.4	250
2.606	24.3	250
3.341	19.4	250
4.505	22.4	250
5.033	22.8	250
6.503	19.4	250
8.531	19.6	250
9.008	19.6	250
10.864	20.6	250
13.008	19.6	250
14.583	19.6	250
16.294	20.6	250
17.886	19.9	250
19.323	19.6	250
20.800	20.6	250
21.326	20.4	250
21.856	20.1	250
23.184	20.1	250
24.558	19.4	250
26.628	21.9	250
26.894	21.9	250
28.744	22.1	250

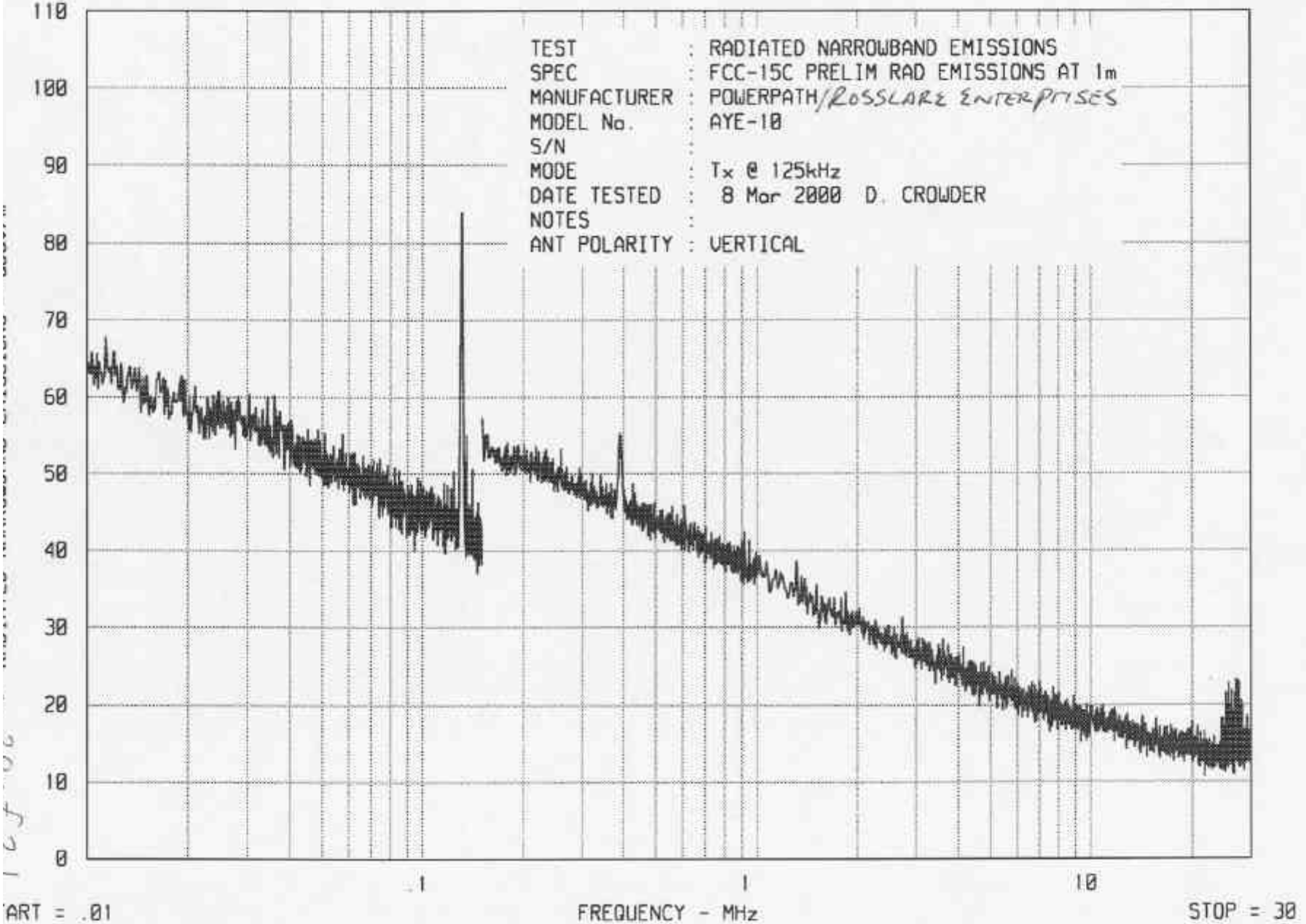
CHECKED BY: D. CROWDER

ELITE ELECTRONIC ENGINEERING Co.

Downers Grove, Ill. 60515

WKA0 09/13/99

UNIV_EM RUN RUN 2



ENGINEERING TEST REPORT NO. 22520

Elite Electronic Engineering INC.

ETR 22520
DATA SHEET

RADIATED EMISSION MEASUREMENTS
SPECIFICATION : FCC-15C (15.209)
MANUFACTURER : ROSSLARE ENTERPRISES LTD.
MODEL NO. : AYE-10
SERIAL NO. : NONE ASSIGNED
NOTES :
TEST DATE : 8 MARCH 2000
TEST DISTANCE : 3m

FREQ kHz	ANT POL	METER RDG (dBuV)		ANT FAC (dB)	DIST CORR (dB)	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV/m
133.25	H	50.2		10.3	131.6	-71.1	0.0003	18.0
133.25	V	58.4		10.3	131.6	-62.9	0.0007	18.0
266.6	H	29.0	AMB	10.0	131.6	-92.6	0.0000	9.0
266.6	V	33.6	AMB	10.0	131.6	-88.0	0.0000	9.0
399.8	H	27.0	AMB	10.0	131.6	-94.6	0.0000	6.0
399.8	V	34.9	AMB	10.0	131.6	-86.7	0.0000	6.0
533.1	H	23.6	AMB	10.1	65.8	-32.1	0.0248	45.0
533.1	V	42.7	AMB	10.1	65.8	-13.0	0.2239	45.0
666.3	H	22.9	AMB	10.3	65.8	-32.6	0.0234	36.0
666.3	V	31.8	AMB	10.3	65.8	-23.7	0.0653	36.0
799.6	H	21.4	AMB	10.3	65.8	-34.1	0.0197	30.0
799.6	V	34.8	AMB	10.3	65.8	-20.7	0.0923	30.0
932.8	H	24.8	AMB	10.4	65.8	-30.6	0.0295	25.7
932.8	V	30.7	AMB	10.4	65.8	-24.7	0.0582	25.7
1066.1	H	16.0	AMB	10.5	65.8	-39.3	0.0108	22.5
1066.1	V	21.7	AMB	10.5	65.8	-33.6	0.0209	22.5
1199.3	H	25.2	AMB	10.5	65.8	-30.1	0.0313	20.0
1199.3	V	32.1	AMB	10.5	65.8	-23.2	0.0692	20.0
1332.6	H	18.7	AMB	10.5	65.8	-36.6	0.0148	18.0
1332.6	V	27.9	AMB	10.5	65.8	-27.4	0.0427	18.0

AMB - AMBIENT

CHECKED BY: