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

ELITE PROJECT: 30050 DATE TESTED: July 18, 2001

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. 23904

MEASUREMENT OF RF INTERFERENCE FROM

A CARD READER TRANSMITTER

MODEL AY-Q10

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

PURCHASE ORDER NO.: P011591-00

Report By: Daniel E. Crowder

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

ENGINEERING TEST REPORT NO. 23904

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: Card Reader Transmitter

MODEL NO: AY-Q10

SERIAL NO: Sample #3

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: July 17, 2001

DATE TESTED: July 18, 2001

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

ELITE JOB NO.: 30050

ABSTRACT: The model AY-Q10 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 18.4MHz. The emissions level at this frequency was 16.2dB within the limit. See data pages 19 and 20 for more detailed results.

The radiated emissions level closest to the limit (worst case) occurred at 125.0kHz. The emissions level at this frequency was 107.3dB within the limit. See data page 26 for more details.

ENGINEERING TEST REPORT NO. 23904

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(INCLUDING DATA SHEETS): 23

ENGINEERING TEST REPORT NO. 23904

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 Card Reader Transmitter, serial number Sample #3, (hereinafter referred to as 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 2000
- 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 32°C and the relative humidity was 62%.

2.0 TEST ITEM SETUP AND OPERATION:

A block diagram of the test item setup is included as Figure 1.

2.1 POWER INPUT: The test item obtained 13VDC power via a 4 wire, 1.5 foot long, unshielded power cord. The 13VDC was supplied from a Kantech Systems, Inc. model KT200 Access Controller. The Access Controller received 24VAC, 60Hz power from the secondary of a ATC Frost model FTC7524Q Class 2 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 17 and 18. The conducted limit for intentional radiators is shown as a reference. The final quasi-peak results are presented on data pages 19 and 20.

The emissions level closest to the limit (worst case) occurred at 18.4MHz. The emissions level at this frequency was 16.2dB within the limit. Photographs of the test configuration which yielded the highest, or worst case, conducted emission levels are shown on Figure 3.

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. test chamber.

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 1 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 at an open area test site.

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 plots, with the test item transmitting at 125kHz, are presented on data page 21. 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 pages 22. 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 125.0kHz. The emissions level at this frequency was 107.3dB within the limit. See data page 22 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 AY-Q10 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

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								
XZG2	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2223A01751	---		N/A	
Equipment Type: AMPLIFIERS								
APK2	PREAMPLIFIER	AGILENT TECHNOL	8449B	3008A01595	1-26.5GHZ	05/07/01	12	05/07/02
Equipment Type: ANTENNAS								
NLS1	24" ACTIVE LOOP ANTENNA	EMCO	6502	8903-2329	0.01-30MHZ	12/27/00	12	12/27/01
Equipment Type: ATTENUATORS								
T1K1	10DB, 2.5W LIMITER	HEWLETT PACKARD	11947A	3107A01737	0.009-200MHZ	03/21/01	12	03/21/02
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	01/29/01	12	01/29/02
PLLA	50UH LISN 462D	ELITE	462D/70A	011	0.01-400MHZ	01/30/01	12	01/30/02
Equipment Type: PRINTERS AND PLOTTERS								
HRE2	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061201	---		N/A	
Equipment Type: RECEIVERS								
RAC0	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	2449A01117	100HZ-22GHZ	04/09/01	12	04/09/02
RACA	RF PRESELECTOR	HEWLETT PACKARD	85685A	2926A00980	20HZ-2GHZ	02/19/01	12	02/19/02
RAF1	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	2043A00271	0.01-1000MHZ	02/20/01	12	02/20/02

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.

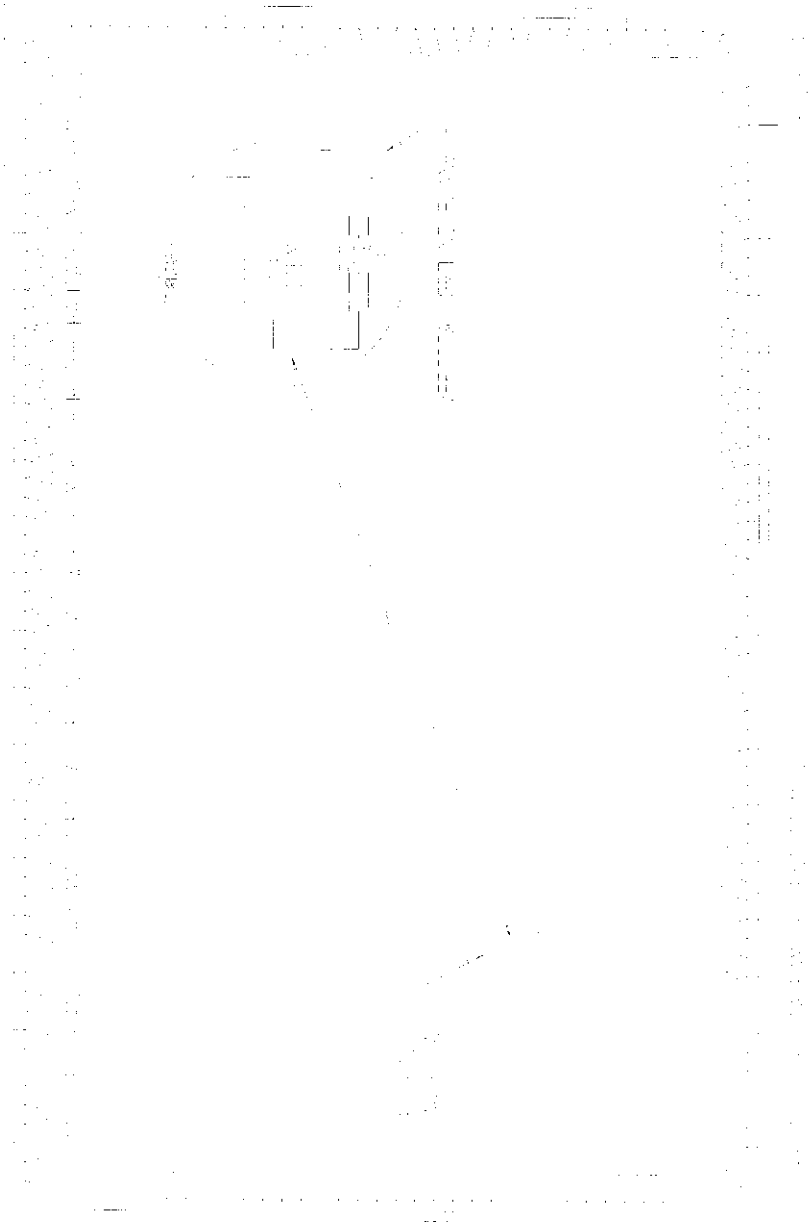


FIGURE 2

PROPAGATION LOSS MEASUREMENTS AND CALCULATIONS

TEST DISTANCE (meters)	METER READING (dBuV)
3	56.1
5	44.1
7	31.8
9	20.0

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 = (20.0 – 56.1)/(20 * LOG(9/3))
N = -3.7

PLACING THE SLOPE (N) INTO THE PROPAGATION LOSS EQUIATION GIVES YOU:
PROPAGATION LOSS OF 148.0dB AT 300 METER TEST DISTANCE
PROPAGATION LOSS OF 74.0dB AT 30 METER TEST DISTANCE

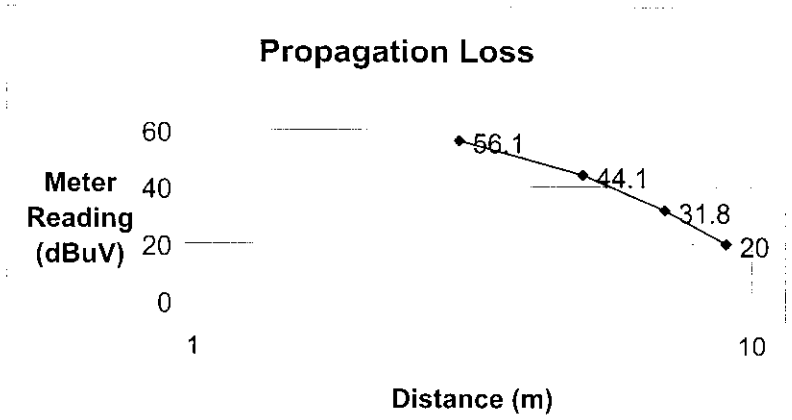
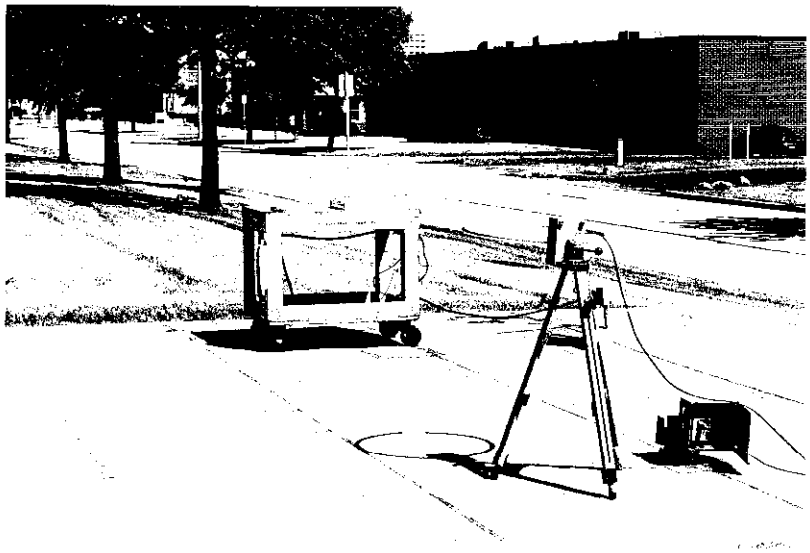


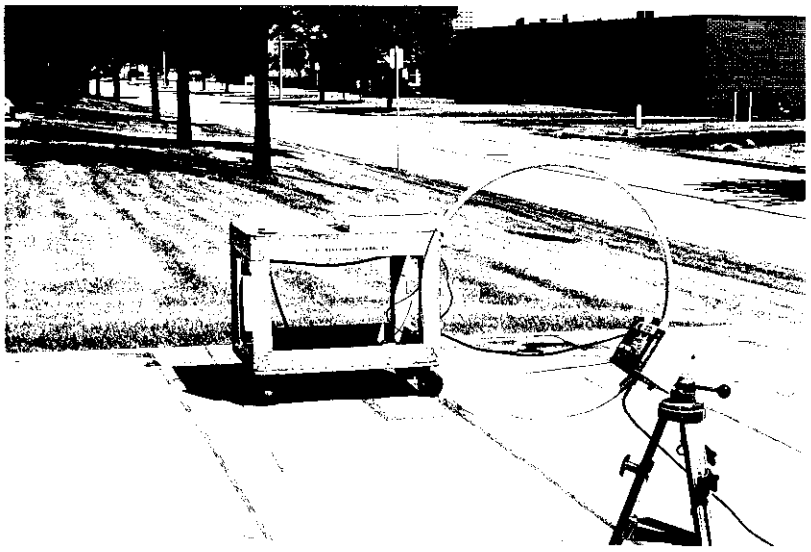
FIGURE 3

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

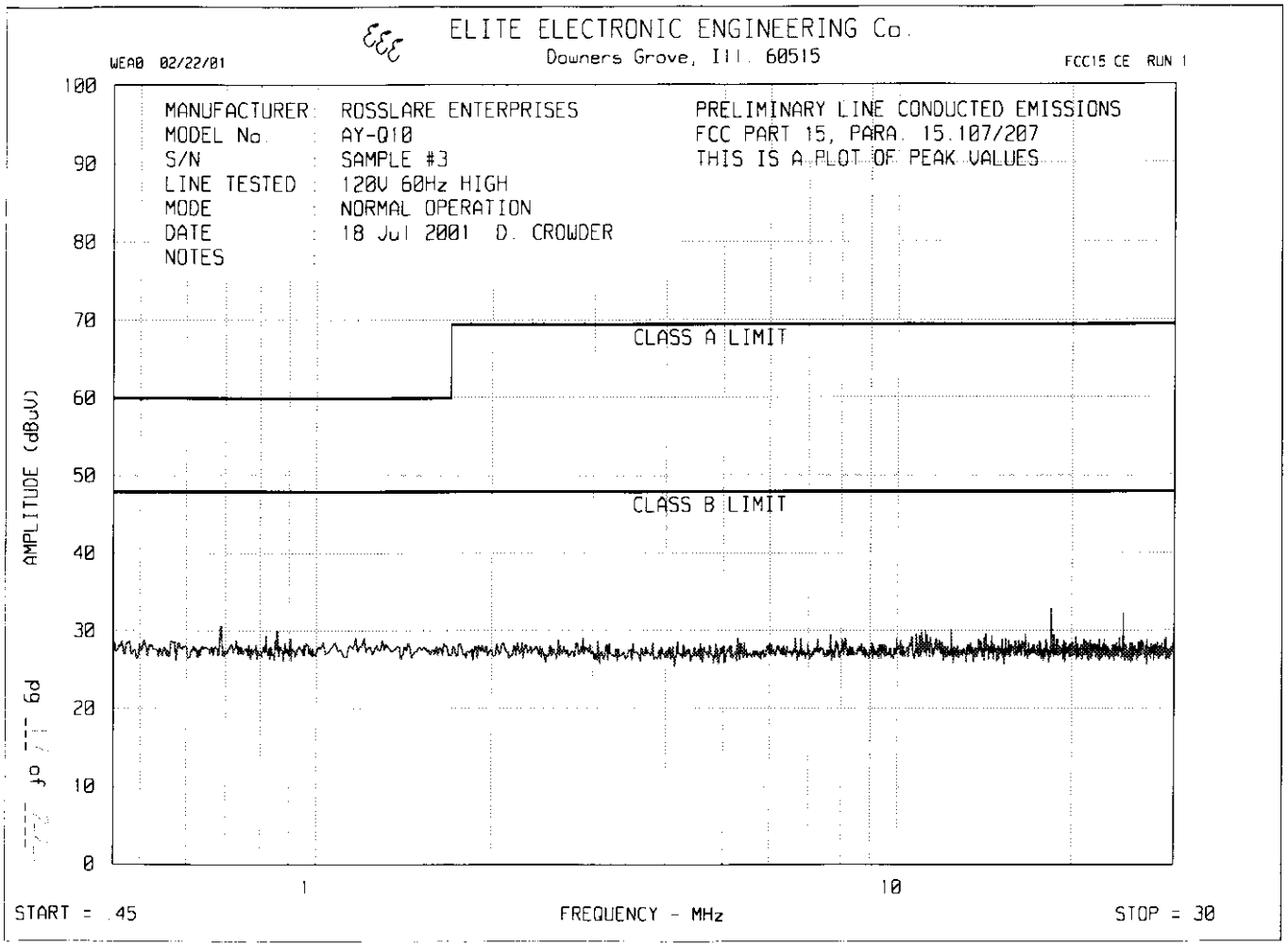
FIGURE 4

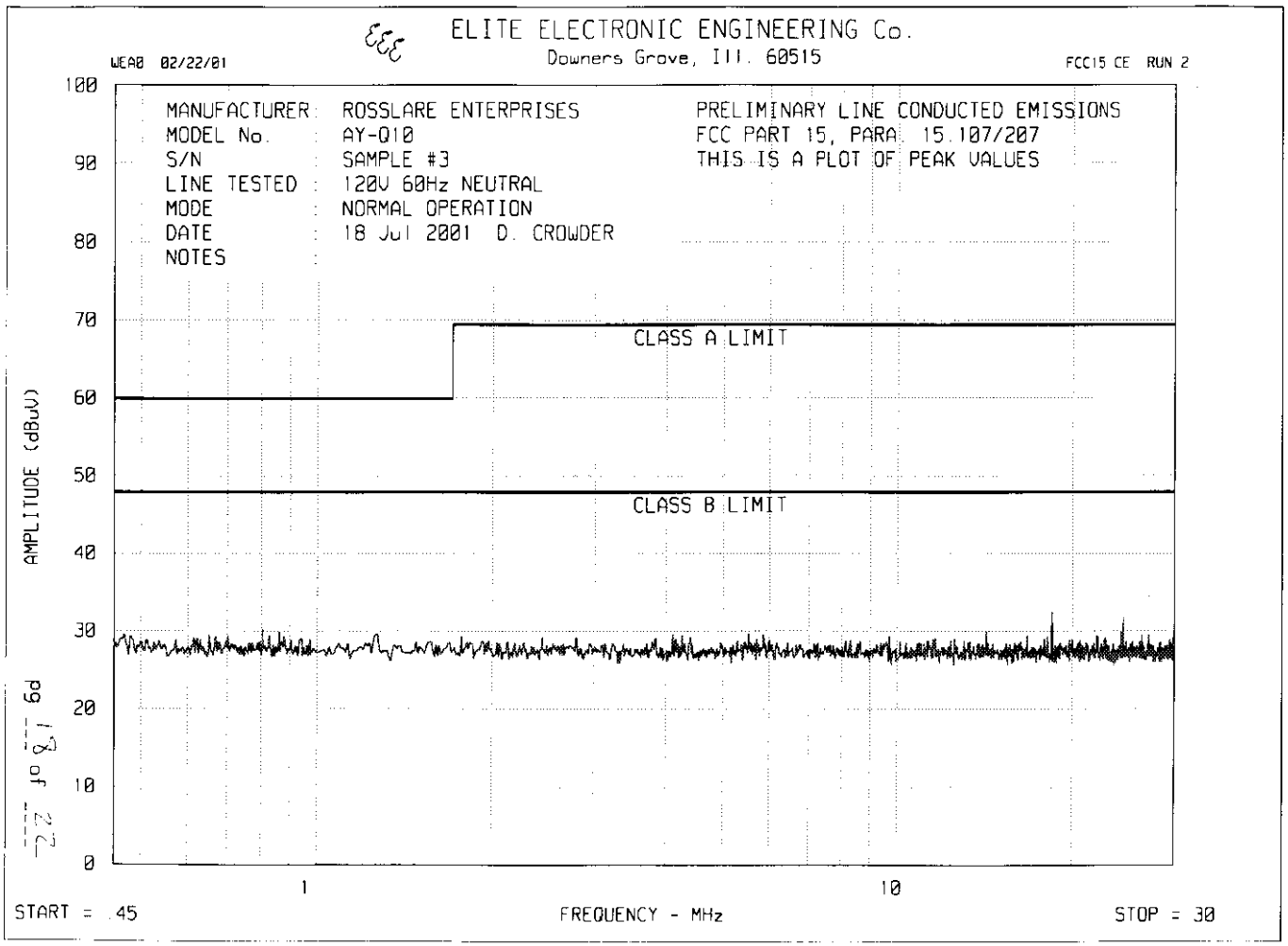


TEST SETUP FOR RADIATED EMISSIONS MEASUREMENTS
MAXIMIZED FOR MEASUREMENT OF WORST CASE EMISSIONS
HORIZONTAL POLARIZATION



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


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WEA0 02/22/01
FCC15 CE RUN 1
MANUFACTURER : ROSSLARE ENTERPRISES
MODEL No. : AY-Q10
S/N : SAMPLE #3
LINE TESTED : 120V 60Hz HIGH
MODE : NORMAL OPERATION
DATE : 18 Jul 2001 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
AMPLITUDE (dBuV)
100
90
80
70
60
50
40
30
20
10
0
1
10
START = .45
FREQUENCY - MHz
STOP = 30


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WEA0 02/22/01
FCC15 CE RUN 2
MANUFACTURER : ROSSLARE ENTERPRISES
MODEL No. : AY-Q10
S/N : SAMPLE #3
LINE TESTED : 120V 60Hz NEUTRAL
MODE : NORMAL OPERATION
DATE : 18 Jul 2001 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
AMPLITUDE (dBuV)
100
90
80
70
60
50
40
30
20
10
0
1
10
START = .45
FREQUENCY - MHz
STOP = 30

ETR No. RUN 1

ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : ROSSLARE ENTERPRISES
MODEL : AY-Q10
S/N : SAMPLE #3
SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V 60Hz HIGH
MODE : NORMAL OPERATION
DATE : 18 Jul 2001
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. uV	LIMIT uV
.499	16.4	250
.687	16.4	250
.846	16.1	250
1.153	16.1	250
2.207	15.9	250
2.640	15.9	250
2.866	15.9	250
3.059	16.4	250
3.743	16.1	250
4.191	16.1	250
5.261	16.1	250
6.646	16.4	250
7.698	16.4	250
9.985	16.4	250
11.206	16.6	250
12.384	16.4	250
14.145	16.4	250
16.631	16.9	250
18.031	17.1	250
18.433	38.9	250
20.324	16.9	250
22.223	16.1	250
24.577	33.8	250
26.314	18.1	250
26.965	16.6	250
28.982	17.6	250

CHECKED BY: D. CROWDER

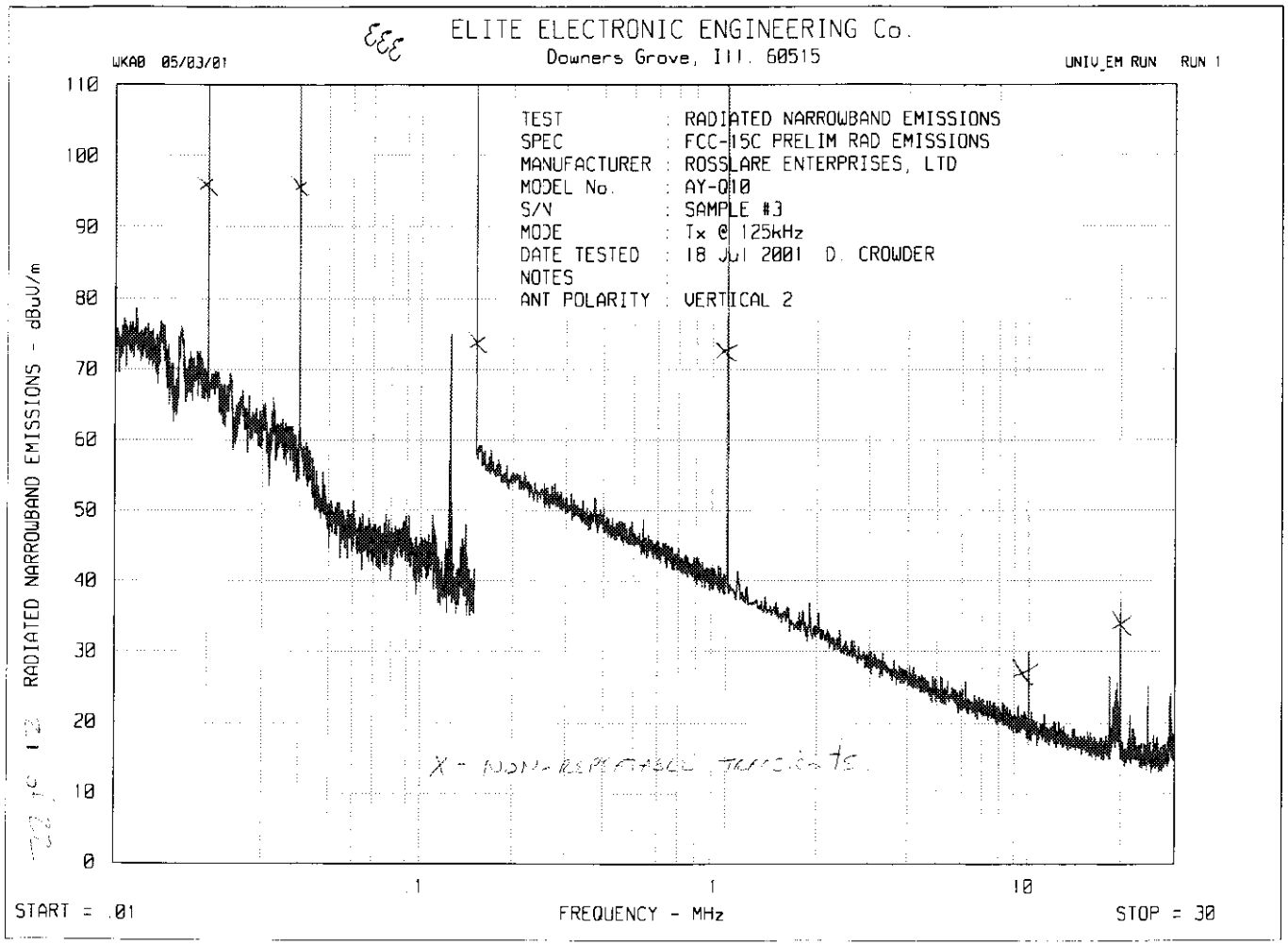
ETR No. RUN 2

ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : ROSSLARE ENTERPRISES
MODEL : AY-Q10
S/N : SAMPLE #3
SPECIFICATION : FCC DIGITAL EQUIPMENT, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 120V 60Hz NEUTRAL
MODE : NORMAL OPERATION
DATE : 18 Jul 2001
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. uV	LIMIT uV
.461	16.9	250
.805	16.4	250
.850	16.4	250
1.248	16.1	250
1.756	16.1	250
2.799	16.1	250
3.161	16.1	250
3.809	16.1	250
4.062	16.1	250
4.876	16.1	250
5.513	16.4	250
6.017	16.4	250
6.742	16.6	250
8.326	16.4	250
9.666	16.1	250
11.622	16.4	250
12.571	16.4	250
13.653	16.6	250
14.220	16.4	250
16.292	16.6	250
16.695	16.6	250
18.432	34.2	250
20.631	16.4	250
22.093	16.9	250
24.576	31.9	250
26.407	17.6	250
27.155	16.1	250
29.849	16.4	250

CHECKED BY: D. CROWDER


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKA0 05/03/01
UNIV_EM RUN RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC-15C PRELIM RAD EMISSIONS
MANUFACTURER : ROSSLARE ENTERPRISES, LTD
MODEL No. : AY-010
S/N : SAMPLE #3
MODE : Tx @ 125kHz
DATE TESTED : 18 Jul 2001 D. CROWDER
NOTES :
ANT POLARITY : VERTICAL 2
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
.1
1
10
START = .01
FREQUENCY - MHz
STOP = 30
X - NON-REPEATABLE TRANSIENTS

ETR 23904
DATA SHEET

RADIATED EMISSION MEASUREMENTS
SPECIFICATION : FCC-15C (15.209)
MANUFACTURER : ROSSLARE ENTERPRISES, LTD.
MODEL NO. : AY-Q10
SERIAL NO. : SAMPLE #3
NOTES :
TEST DATE : 18 JULY 2001
TEST DISTANCE : 3m

FREQUENCY (kHz)	ANT POL	MTR RDG dBuV	ANT FAC dB	DIST CORR dB	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV/m
125.0	H	41.1	10.3	148.0	-96.6	0.0000	19.2
125.0	V	56.1	10.3	148.0	-81.6	0.0001	19.2
250.0	H	44.9 AMB	10.1	148.0	-93.0	0.0000	9.6
250.0	V	67.2 AMB	10.1	148.0	-70.7	0.0003	9.6
375.0	H	40.1 AMB	10.1	148.0	-97.8	0.0000	6.4
375.0	V	49.7 AMB	10.1	148.0	-88.2	0.0000	6.4
500.0	H	39.1 AMB	10.0	74.0	-24.9	0.0569	48.0
500.0	V	38.8 AMB	10.0	74.0	-25.2	0.0550	48.0
625.0	H	34.2 AMB	10.0	74.0	-29.8	0.0324	38.4
625.0	V	60.6 AMB	10.0	74.0	-3.4	0.6761	38.4
750.0	H	58.7 AMB	10.0	74.0	-5.3	0.5433	32.0
750.0	V	79.0 AMB	10.0	74.0	15.0	5.6234	32.0
875.0	H	39.0 AMB	10.0	74.0	-25.0	0.0562	27.4
875.0	V	61.0 AMB	10.0	74.0	-3.0	0.7079	27.4
1000.0	H	61.0 AMB	10.2	74.0	-2.8	0.7244	24.0
1000.0	V	79.0 AMB	10.2	74.0	15.2	5.7544	24.0
1125.0	H	66.0 AMB	10.4	74.0	2.4	1.3183	21.3
1125.0	V	65.0 AMB	10.4	74.0	1.4	1.1749	21.3
1250.0	H	48.0 AMB	10.4	74.0	-15.6	0.1660	19.2
1250.0	V	74.0 AMB	10.4	74.0	10.4	3.3113	19.2

H – HORIZONTAL
V – VERTICAL

AMB - AMBIENT

CHECKED BY: