

TEST REPORT



Certification # 1367-01

Laboratory ID

PRODUCT SAFETY ENGINEERING, INC.
12955 Bellamy Brothers Boulevard
Dade City, Florida 33525 USA
PH (352) 588-2209 FX (352) 588-2544

Submitter ID

Truett S. Thomas
1612 Highway 280 East
Defuniak Springs, FL 32433

Report Issue Date: 11 JUL 03

Sample S/N: None

Sample Receipt Date: May 20, 2003

Sample Test Date: see data sheets

Test Report Number: 03F295B

Model Designation: AAT

Product Description: 434 MHz Transmitter

Marketing Approval _____

Description of non-standard test method or test practice: *None*

Estimated Measurement Uncertainty: *Not Applicable*

Special limitations of use: *None*

Traceability: *reference standards of measurement have been calibrated by a competent body using standards traceable to the NIST.*

According to testing performed at Product Safety Engineering, Inc., the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in regulations indicated on page (3) of the test report. The test results contained herein relate only to the model(s) identified above. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Project Engineer, I hereby declare that the equipment tested as specified above conforms to the requirements indicated on page (3) of the test report.

Signature: David Foerstner Name David Foerstner

Title Engineering Group Leader Date 11 JUL 03

Reviewed by:

Approved Signatory John E. Hahn Date 11 JUL 03

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Product Safety Engineering, Inc 12955 Bellamy Brothers Blvd. Dade City, FL 33525
Tel (352) 588-2209 Fax (352) 588-2544

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EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

- ☐ - EN 50081-1 : 1992
- ☐ - EN 50081-2 : 1995

- ☐ - EN 55011 : 1998 / A1:1999
 - ☐ - Group 1
 - ☐ - Class A
- ☐ - EN 55013 : 1990 / A12:1994 / A13:1996 / A14:1999
 - ☐ - Group 2
 - ☐ - Class B

- ☐ - EN 55014 : 1993 /A1:1997
 - ☐ - Household appliances and similar
 - ☐ - Portable tools
 - ☐ - Semiconductor devices

- ☐ - EN 55022 : 1998
 - ☐ - Class A
 - ☐ - Class B
- ☐ -AS/NZS 3548:1995
 - ☐ - Class A
 - ☐ - Class B
- ☐ - ICES-003
 - ☐ - Class A
 - ☐ - Class B
- - RSS - 210
 - - Certification
- ☐ - CNS 13438
 - ☐ - Class A
 - ☐ - Class B
- ☐ - VCCI : 1999
 - ☐ - Class A
 - ☐ - Class B
- - FCC Part 15
 - ☐ - Class A
 - - Class B
 - - Certification
 - ☐ - Verification
 - ☐ - Declaration of Conformity

- ☐ - FCC Part 18

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Environmental conditions during testing:

	LAB	OATS
Temperature: *	_____	: _____
Relative Humidity: **	_____	: _____

* The ambient temperature during the testing was within the range of (50° - 104° F) unless indicted above.

** The humidity levels during the testing was within the range of (10% - 90%) relative humidity unless indicated above.

Power supply system : 3 Volts DC Hz BATTERY POWERED

Sign Explanations:

- ☐ - not applicable
- ☒ - applicable

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Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:

■ - Test not applicable

- ☐ - Darby Test Site (Open Area Test Site)
- ☐ - Darby Laboratory

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
☐	8028-50	Solar	50 Ω LISN	829012, 829022
☐	3825/2	Solar	50 Ω LISN	924840
☐	EMC-30	Electro-Metrics	EMI Receiver	191
☐	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
☐	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
☐	85662A	Hewlett Packard	Analyzer Display	2403A07352
☐	8028-50	Solar	50 Ω LISN	903725, 903726
☐	FCC-TLISN-T4	Fisher Custom Com.	Telecom ISN	20072

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD)* measurements were performed at the following test location:

- ☐ - Darby Test Site (Open Area Test Site)
- ☐ -
- ☐ -

at a test distance of :

- ☐ - 3 meters
- ☐ - 30 meters

■ - Test not applicable

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
☐	96005	Eaton	Log Periodic Antenna	1099
☐	BIA-25	Electro-Metrics	Biconical Antenna	4283
☐	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
☐	85662A	Hewlett-Packard	Analyzer Display	2403A07352
☐	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
☐	ALR-30M	Electro-Metrics	Loop Antenna	824
☐	8447D	Hewlett Packard	Preamplifier	2944A06832
☐	EMC-30	Electro-Metrics	EMI Receiver	191
☐	ALA-130/A	Antenna Research	Loop Antenna	106

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Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location :

☐ - Test not applicable

- - Darby Site (Open Area Test Site)
- ☐ - Darby Lab
- ☐ -

at a test distance of :

- - 3 meters
- ☐ - 10 meters
- ☐ - 30 meters

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
■ -	96005	Eaton	Log Periodic Antenna	1099
■ -	BIA-25	Electro-Metrics	Biconical Antenna	4283
■ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
■ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
■ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
■ -	8447D	Hewlett-Packard	Preamplifier (26dB)	2944A06832
☐ -	EMC-30	Electro-Metrics	EMI Receiver	191
☐ -	8568B	Hewlett Packard	Spectrum Analyzer	2407A03213
☐ -	85650A	Hewlett Packard	Quasi-Peak Adapter	2043A00358
☐ -	85662A	Hewlett Packard	Analyzer Display	2340A05806
☐ -	LPA30	Electro-Metrics	Log Periodic	2280
☐ -	BIA 30	Electro-Metrics	Biconical Antenna	3852

Emissions Test Conditions): INTERFERENCE POWER

The *INTERFERENCE POWER* measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :

■ - Test not applicable

- ☐ - Darby Lab
- ☐ -

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
☐ -	MDS-21	Rhode&Schwarz	Absorbing Clamp	8608447020
☐ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
☐ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
☐ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
☐ -	8447D	Hewlett-Packard	Amplifier (26 dB)	2944A06832
☐ -	EMC-30	Electro-Metrics	EMI Receiver	191

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The **EQUIVALENT RADIATED EMISSIONS** measurements in the frequency range 1 GHz - 4.4 GHz were performed in a horizontal and vertical polarization at the following test location :

■ - Darby Test Site (Open Area Test Site)

- ☐ -
- ☐ -
- ☐ -

at a test distance of:

- ☐ - 1 meters
- - 3 meters
- ☐ - 10 meters

☐ - Test not applicable

Test equipment used :

Model Number	Manufacturer	Description	Serial Number
■ - 8586B	Hewlett-Packard	Spectrum Analyzer	2421A00526
■ - 85862A	Hewlett-Packard	Analyzer Display	2403A07352
■ - 85850A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
■ - 8449B	Hewlett-Packard	Preamplifier	3008A00320
■ - 3115	Electro-Mechanics	Double Ridge Guide Horn	3810

The **ANTENNA TERMINAL DISTURBANCE VOLTAGE** in the frequency range 30 MHz - 1,000 MHz were performed.

- ☐ - Darby Test Site (Open Area Test Site)
- ☐ - Laboratory
- ☐ -
- ☐ -

■ - Test not applicable

Model Number	Manufacturer	Description	Serial Number
☐ - 2F9-3C4-3C5	Wavecom	UHF PAL TV Modulator	185879
☐ - 2F1-3C4-3C5	Wavecom	VHF PAL TV Modulator	157728
☐ - A-8000	IFR	Spectrum Analyzer	1306
☐ - 8648B	Hewlett-Packard	Signal Generator	3623A01433
☐ - 8648B	Hewlett-Packard	Signal Generator	3623A01477
☐ - LMV-182A	Leader	RMS Milli-Voltmeter	8010091
☐ - 3202	Krhon-Hite	Active filter	5899
☐ - FMT115	Leaming	FM Modulator	NONE
☐ - 371	UDT	Optical power meter	06657
☐ - TSG95	Tektronix	PAL video / Audio generator	B028883
☐ -			

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Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

- ☐ - Standby
- ☐ - Test program (H - Pattern)
- ☐ - Test program (color bar)
- ☐ - Test program (customer specific)
- ☒ - Practice operation
- ☐ - Normal Operating Mode
- ☐ -

Configuration of the device under test:

- ☒ - See System Under Test Information in Appendix B

Rationale for EUT setup / configuration:

ANSI C63.4, FCC Parts 15.231 & 15.35

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Emission Test Results:

Conducted emissions 10/150/450 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET
Minimum limit margin dB at MHz
Remarks:

Radiated emissions (magnetic field) 10 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET
Minimum limit margin dB at MHz
Remarks:

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are ☒ - MET ☐ - NOT MET
Minimum limit margin 0.9 dB at 433.9 MHz
Remarks:

Interference Power at the mains and interface cables 30 MHz - 300 MHz

The requirements are ☐ - MET ☐ - NOT MET
Minimum limit margin dB at MHz
Remarks:

Radiated emissions 1 GHz - 4.5 GHz

The requirements are ☒ - MET ☐ - NOT MET
Minimum limit margin 1.2 dB at 1.302 GHz
Remarks:

Antenna Terminal Disturbance Voltage 30 MHz - 1,000 MHz

The requirements are ☐ - MET ☐ - NOT MET
Minimum limit margin dB at MHz
Remarks:

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GENERAL REMARKS:

The EUT can be used with virtually any infrared remote control that uses "AA" batteries. The EUT replaces one of these batteries. The EUT was tested in a generic infrared remote control and was tested in all (3) orthogonal planes. The highest emissions were observed and recorded with the remote control positioned vertically on the test table. The transmitter automatically ceases transmission within (5) seconds of the button being released.

The (20) dB bandwidth of the EUT does not exceed the (0.25%) limit. The (0.25%) bandwidth limit at (434) MHz equates to (1.085) MHz. Page A5 clearly shows the bandwidth be less than (300) kHz.

SUMMARY:

The requirements according to the technical regulations are

■ - met

□ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

□ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date

June 04, 2003

Testing End Date:

June 04, 2003

- PRODUCT SAFETY ENGINEERING INC -

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Test-setup photo(s):

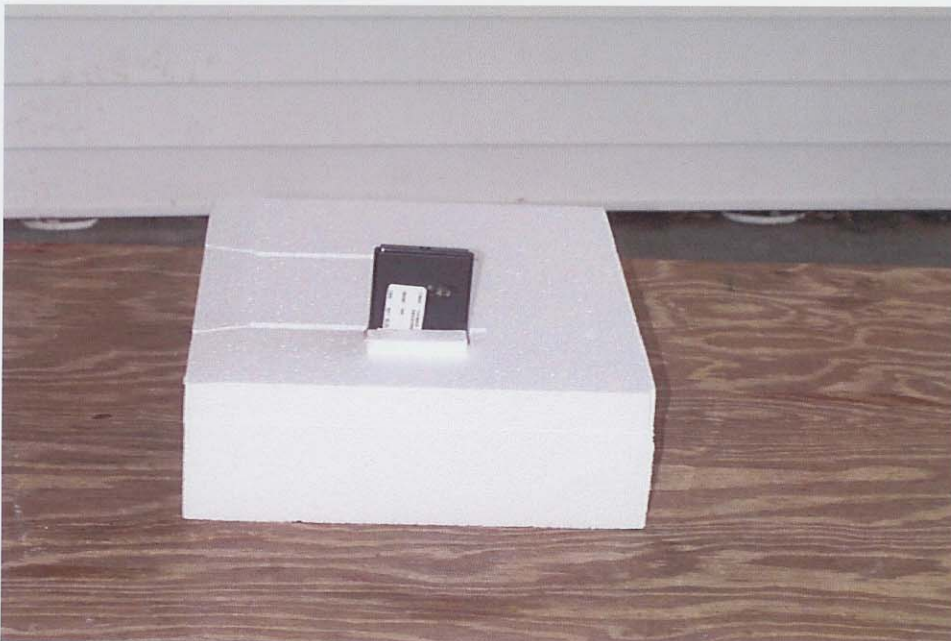
Conducted emission 450/150 kHz - 30 MHz

N/A

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Test-setup photo(s):
Radiated emission 30 MHz - 4400 MHz



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APPENDIX

A

Test Equipment Calibration Information & Test Data Sheets

TEST EQUIPMENT CALIBRATION INFORMATION

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	08/22/03
Hewlett Packard	85662A	Display	2403A07352	08/22/03
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00209	08/22/03
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	2944A06832	11/13/03
Hewlett Packard	8568B	Spectrum Analyzer	2407A03213	08/22/03
Hewlett Packard	85662A	Display	2340A05806	08/22/03
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00358	08/22/03
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	2944A06901	08/02/03
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	1937A03247	07/19/03
Hewlett Packard	8449B	Preamplifier 1 - 26.5 GHz	3008A00320	11/08/03
Hewlett Packard	8648B	Signal Generator	3443U00312	04/25/03
Hewlett Packard	8672A	Signal Generator	2211A02426	11/14/03
Eaton	96005	Log Periodic Antenna	1099	01/24/04
Electro-Metrics	LPA 30	Log Periodic Antenna	2280	12/06/03
Electro-Metrics	BIA 30	Biconical Antenna	3852	12/05/03
Electro-Metrics	BIA 25	Biconical Antenna	4283	01/22/04
Electro-Mechanics	3115	Double Ridge Guide Ant.	3810	11/07/03
Electro-Metrics	ALR30M	Magnetic Loop Antenna	824	12/12/03
Solar	8012	LISN	924840	12/29/03
Solar	8028	LISN	829012/809022	12/19/03
Solar	8028	LISN	903725/903726	11/18/03
Schwartzbeck	MDS-21	Absorbing Clamp	02581	09/13/03
Leader	LFG1310	Function Generator	8060233	04/23/03
Holaday Ind.	HI 4422	Isotropic Probe	90310	05/22/03
IFR Systems	A-8000	Spectrum Analyzer	1306	11/13/03
Fischer Custom	F-33-1	RF Current Probe	360	11/20/03
Electro-Metrics	EMC-30	EMI Receiver	191	04/24/04
Boonton	4220A	RF Power Meter	204103AA	11/08/03
Boonton	51011	RF Power Meter	28823	11/08/03
Antenna Research	ALA-130/A	Loop Antenna	106	03/14/04
Radio Shack	63-867A	Temp & Humidity Meter	NSN	04/28/04

Truett S. Thomas model AAT Transmitter

Measured @ 3 Meters [ACF - antenna correction factor] [CL - cable loss] [PA - preamp gain]

Frequency (GHz)	Spec Limit (dBμV/M)	ACF	CL & PA	Corrected dBμV/M	Δ Limit	Pol.	Height (cm)
0.434	86.8	+17.7	-23.3	85.9	-0.9	Vert	100
0.868	66.8	+24.1	-26.3	64.7	-2.1	Vert	100
1.302	66.8	+27.1	-28.7	65.2	-1.2	Vert	100
1.736	66.8	+28.3	-26.9	60.0	-6.8	Vert	100
2.170	66.8	+30.1	-26.1	58.6	-8.2	Vert	100
2.604	66.8	+30.6	-24.1	58.2	-8.6	Vert	100
3.038	66.8	+31.8	-23.9	51.2	-15.6	Vert	100
3.472	66.8	+33.0	-20.1	51.6	-15.2	Vert	100
3.905	66.8	+34.4	-21.6	50.9	-15.9	Vert	100
4.339	66.8	+33.9	-21.2	45.6	-21.2	Vert	100

The peak limit was established per 15.231 as follows:

Fundamental frequency = 434 MHz

$(12,500 \text{ uV} - 3,750 \text{ uV}) / (470 \text{ MHz} - 260 \text{ MHz}) = 41.67 \text{ uV per MHz}$

$470 \text{ MHz} - 434 \text{ MHz} = 36 \text{ MHz}$

$36 \text{ MHz} * 41.67 \text{ uV} = 1,500 \text{ uV}$

$12,500 \text{ uV} - 1,500 \text{ uV} = 11,000 \text{ uV}$

$(20 \log 11,000) = 80.8 \text{ dBuV / m [Peak Limit at 434 MHz]}$

The peak limit relaxed for averaging was calculated as follows:

$(20 \log (\text{on time} / 100 \text{ mS}))$

Total of (23 pulses @ 780 uS and 1 pulse @ 3 mS) = $18 \text{ mS} + 3 \text{ mS} = 21 \text{ mS}$

Total on time = 21 mS [see pages A6 & A7]

$(20 \log 21/100) = 13.6 \text{ dB "relaxation"}$

Because this device can be used with various remote controls, we elected to use a general duty cycle of 50% to represent worse case. We relaxed the peak limit by (6) dB to reflect this (50%) duty cycle.

Fundamental Limit = $80.8 + 6.0 = 86.8 \text{ dBuV/m}$

Spurious Limit = $86.8 - 20 = 66.8 \text{ dBuV/m}$

Page A3 of A6

PRODUCT SAFETY ENGINEERING
REF 97.0 dBμV ATTN 0 dB

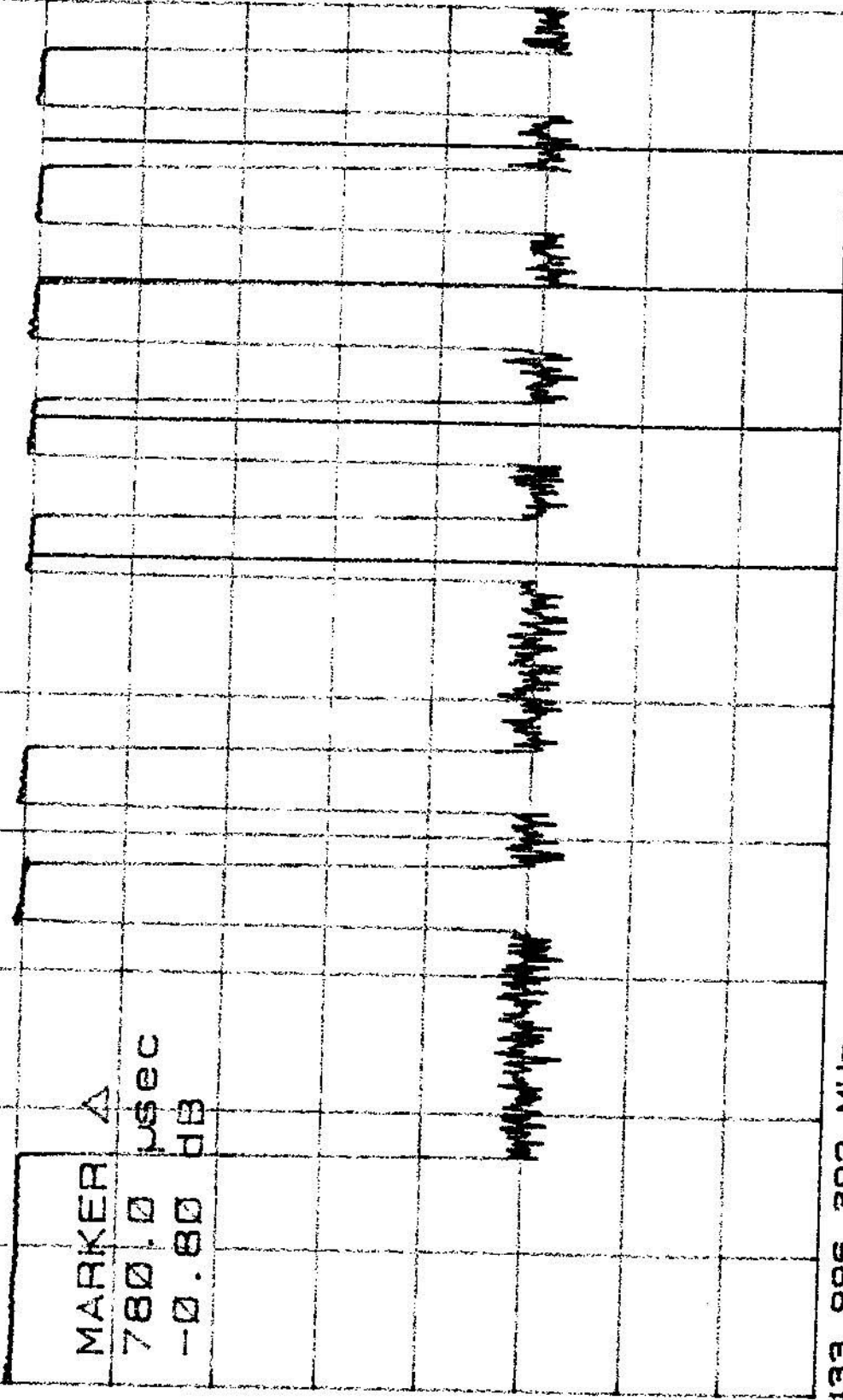
MKR Δ 780.0 μsec
-0.80 dB

10 dB/

POS PK

PRODUCT SAFETY ENGINEERING

OPEN AREA TEST SITE



CENTER 433.996 392 MHz
RES BW 1 MHz

SPAN 0 Hz
SWP 20.0 msec

54

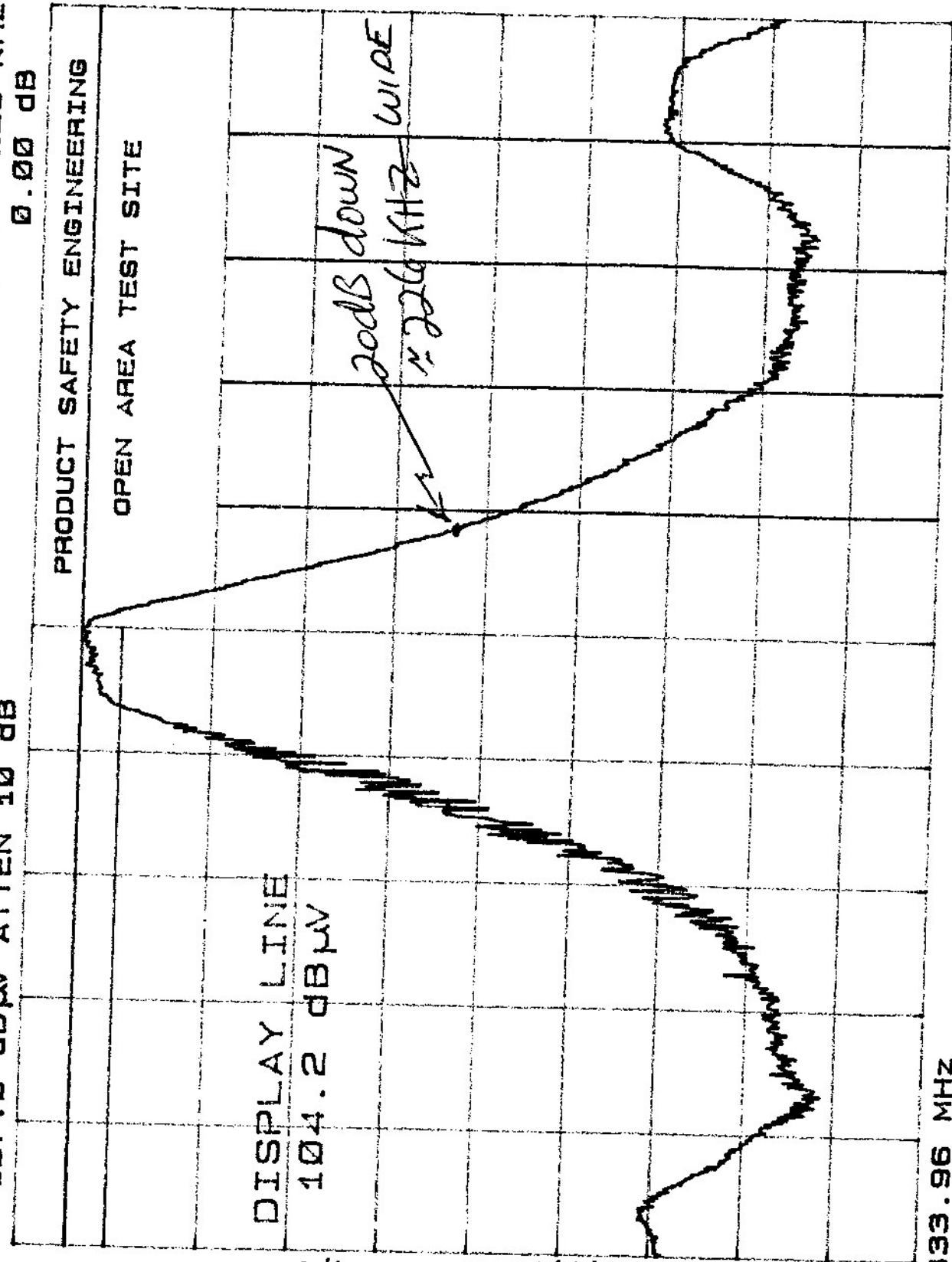
BANDWIDTH PLOT

THOMAS

15.231 (0) NO WIDER THAN 0.25% OF CENTER F
 1.0025 x 433 MHz = 1.08 MHz
 BANDWIDTH @ 20dB down points
 must be less than 1.08 MHz

PRODUCT SAFETY ENGINEERING
 REF 107.0 dBμV ATTEN 10 dB

MKR Δ 226 KHZ
 0.00 dB



CENTER 433.96 MHz
 RES BW 1 MHz
 VBW 1 MHz
 SPAN 1.00 MHz
 SWP 100 msec

PRODUCT SAFETY ENGINEERING
 OPEN AREA TEST SITE

DISPLAY LINE
 104.2 dBμV

PULSE TRAIN LESS THAN 0.1 SECONDS

PRODUCT SAFETY ENGINEERING

REF 107.0 dBW ATTEN 10 dB

MKR Δ 99.80 msec
-40.85 dB

5 dB/

POS PK

PRODUCT SAFETY ENGINEERING

OPEN AREA TEST SITE

100ms

40ms

CALCULATION OF AVERAGE FIELD STRENGTH

$$= 20 \log(ON TIME) = 20 \log(4) = 7.9 \text{ dB}$$

$$= 20 \log(40) = 26.0 \text{ dB}$$

CENTER

433.958 804 MHz

RES BW 1 MHz

3ms

VBW 1 MHz

SPAN 0 HZ

1ms SWP 200 msec

OFF MORE THAN 60% OF TIME

2X

APPENDIX

B

System Under Test Description

SYSTEM COMPONENTS

DEVICE TYPE: EUT, AAT 433 MHZ TRANSMITTER
(INSTALLED IN BATTERY COMPARTMENT OF REMOTE)

DEVICE TYPE: REMOTE CONTROL, QUASAR Q17

INTERFACE CABLES

DEVICE TYPE: EUT NONE

SHIELD:

LENGTH:

CONNECTOR TYPE:

PORT:

AC LINE CORDS

DEVICE TYPE: EUT NONE

SHIELD:

LENGTH:

CONNECTOR TYPE:

APPENDIX

C

Measurement Protocol

The test methodology followed during the collection of the data included within this technical report was ANSI C63.4:1992.

The EUT was powered with 1.5 Volt DC Battery during the collection of data included within.

The data is compared to the FCC Part 15 Class B limits.

The "EMI" instrumentation is capable of calculating the final emission level based on the following formula:

Level at the receiver (dB μ V) + Antenna Correction Factor (dB/M) + Cable Loss (dB) - Preamp Gain (dB) = Actual Level in dB μ V/M.

The sample calculation below is based on the actual test data collected:

Observed Level		91.5	dB μ V	
ACF	+	17.7	dB/M	
Cable Loss	+	2.7	dB	
Preamp Gain	-	<u>26.0</u>	dB	
Actual Level		85.9	dB μ V/M	@ 433.9 MHz

Please have a company official review this report and sign.
