

# TEST REPORT



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

Thomas Industries  
1612 Hwy. 280 East  
Defuniak Springs, FL 32433

Report Issue Date: \_\_\_\_\_  
Sample S/N: \_\_\_\_\_  
Sample Receipt Date: \_\_\_\_\_  
Sample Test Date: see data sheets

Test Report Number: 00F343B  
Model Designation: Phaser  
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 \_\_\_\_\_ Name David Foerstner

Title Engineering Group Leader Date \_\_\_\_\_

**Reviewed by:**

Approved Signatory \_\_\_\_\_ Date \_\_\_\_\_

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Test Report Number 00F343B

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
- Group 2
- Class B
  
- EN 55014 : 1993
  - Household appliances and similar
  - Portable tools
  - Semiconductor devices
  
- EN 55022 : 1994 / A1:1995
  - Class A
- Class B
- AS/NZS 3548:1995
  - Class A
- Class B
- ICES-003
  - 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	_____	: _____
Atmospheric pressure	_____	: _____ millibars
Power supply system	: _____ <b>1.5</b> Volts _____ DC	

**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
<input type="checkbox"/> - 8028-50	Solar	50 $\Omega$ LISN	829012, 829022
<input type="checkbox"/> - 3825/2	Solar	50 $\Omega$ LISN	924840
<input type="checkbox"/> - EMC-30	Electro-Metrics	EMI Receiver	191
<input type="checkbox"/> - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input type="checkbox"/> - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input type="checkbox"/> - 85662A	Hewlett Packard	Analyzer Display	2403A07352
<input type="checkbox"/> - 8028-50	Solar	50 $\Omega$ LISN	903725, 903726
<input type="checkbox"/> -			

## 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
<input type="checkbox"/> - 96005	Eaton	Log Periodic Antenna	1099
<input type="checkbox"/> - BIA-25	Electro-Metrics	Biconical Antenna	4283
<input type="checkbox"/> - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input type="checkbox"/> - 85662A	Hewlett-Packard	Analyzer Display	2403A07352
<input type="checkbox"/> - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input type="checkbox"/> - ALR-30M	Electro-Metrics	Loop Antenna	824
<input type="checkbox"/> - 8447D	Hewlett Packard	Preamplifier	2944A06832
<input type="checkbox"/> - EMC-30	Electro-Metrics	EMI Receiver	191

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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
<input checked="" type="checkbox"/> - 96005	Eaton	Log Periodic Antenna	1099
<input checked="" type="checkbox"/> - BIA-25	Electro-Metrics	Biconical Antenna	4283
<input checked="" type="checkbox"/> - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input checked="" type="checkbox"/> - 85662A	Hewlett-Packard	Analyzer Display	2403A07352
<input checked="" type="checkbox"/> - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input checked="" type="checkbox"/> - 8447D	Hewlett-Packard	Preamplifier (26dB)	2944A06832
<input type="checkbox"/> - EMC-30	Electro-Metrics	EMI Receiver	191
<input type="checkbox"/> - 8568B	Hewlett Packard	Spectrum Analyzer	2407A03213
<input type="checkbox"/> - 85650A	Hewlett Packard	Quasi-Peak Adapter	2043A00358
<input type="checkbox"/> - 85662A	Hewlett Packard	Analyzer Display	2340A05806
<input type="checkbox"/> - LPA30	EM LPA	Log Periodic	2280

## 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
<input type="checkbox"/> - MDS-21	Rhode&Schwarz	Absorbing Clamp	8608447020
<input type="checkbox"/> - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
<input type="checkbox"/> - 85662A	Hewlett-Packard	Analyzer Display	2403A07352
<input type="checkbox"/> - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
<input type="checkbox"/> - 8447D	Hewlett-Packard	Amplifier (26 dB)	2944A06832

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The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range **1 GHz - 5 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
■ - 8566B	Hewlett-Packard	Spectrum Analyzer	2618A02898
■ - 85662A	Hewlett-Packard	Analyzer Display	2542A11984
■ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
■ - 8449B	Hewlett-Packard	Preamplifier	3008A00320
■ - 3115	Electro-Mechanics	Double Ridge Guide Horn	3810

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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:**

Per ANSI C63.4

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## Emission Test Results:

### Conducted emissions 10/150/450 kHz - 30 MHz

<b>The requirements are</b>	<input type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	dB	at MHz
Maximum limit exceeding	dB	at MHz
Remarks:		

### Radiated emissions (magnetic field) 10 kHz - 30 MHz

<b>The requirements are</b>	<input type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	dB	at MHz
Maximum limit exceeding	dB	at MHz
Remarks:		

### Radiated emissions (electric field) 30 MHz - 1000 MHz

<b>The requirements are</b>	<input checked="" type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	<b>9.2</b> dB	at <b>868</b> MHz
Maximum limit exceeding	dB	at MHz
Remarks:		

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

<b>The requirements are</b>	<input type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	dB	at MHz
Maximum limit exceeding	dB	at MHz
Remarks:		

### Radiated emissions 1 GHz - 5 GHz

<b>The requirements are</b>	<input checked="" type="checkbox"/> - MET	<input type="checkbox"/> - NOT MET
Minimum limit margin	<b>3.8</b> dB	at <b>3.47</b> GHz
Maximum limit exceeding	dB	at GHz
Remarks:		

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Test-setup photo(s):  
Conducted emission 450/150 kHz - 30 MHz

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Test-setup photo(s):  
Radiated emission 30 MHz - 1000 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	02/28/01
Hewlett Packard	85662A	Display	2403A07352	02/28/01
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00209	02/28/01
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06832	02/25/01
Hewlett Packard	8568B	Spectrum Analyzer	2407A03213	02/04/01
Hewlett Packard	85662A	Display	2340A05806	02/04/01
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00358	01/24/01
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/07/00
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	1937A03247	12/21/00
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	12/04/00
Hewlett Packard	8648B	Signal Generator	3443U00312	05/13/01
Hewlett Packard	8672A	Signal Generator	2211A02426	09/21/00
Eaton	96005	Log Periodic Antenna	1099	08/27/00
Electro-Metrics	LPA 30	Log Periodic Antenna	2280	08/12/00
Electro-Metrics	BIA 30	Biconical Antenna	3852	08/12/00
Electro-Metrics	BIA 25	Biconical Antenna	4283	08/27/00
Electro-Mechanics	3115	Double Ridge Guide Ant.	3810	05/27/01
Electro-Metrics	ALR30M	Magnetic Loop Antenna	824	11/08/00
Solar	8012	LISN	924840	09/22/00
Solar	8028	LISN	829012/809022	09/08/00
Solar	8028	LISN	903725/903726	08/25/00
Schwartzbeck	MDS-21	Absorbing Clamp	02581	11/24/00
Leader	LFG1310	Function Generator	8060233	01/26/00
Holiday Ind.	HI 4422	Isotropic Probe	90310	04/18/01
IFR Systems	A-8000	Spectrum Analyzer	1306	06/08/01
Fischer Custom	F-33-1	RF Current Probe	360	09/08/01
Electro-Metrics	EMC-30	EMI Receiver	191	11/01/00
Boonton	4220A	RF Power Meter	204103AA	10/28/00
Boonton	51011	RF Power Meter	28823	10/28/00

## Radiated Emissions Data

Frequency (MHz)	Level (peak) dBuV/m	Level (avg) dBuV/m	Limit dBuV/M	Delta from Limit
433.9	65.5	58.3	80.8	-22.5
867.9	58.8	51.6	60.8	-9.2
1,301	57.8	50.6	60.8	-10.2
1,735	46.1	38.9	60.8	-21.9
2,169	57.5	50.3	60.8	-10.5
2,603	51.1	43.9	60.8	-16.9
3,037	63.3	56.1	60.8	-4.7
3,471	64.2	57.0	60.8	-3.8
3,905	51.7	44.5	60.8	-16.3
4,339	49.4	42.2	60.8	-18.6

The calculations used to establish the limits stated above are:

Part 15.231 states the limit in the frequency range of 260-470 MHz as 3,750 to 12,500 uV/m for the fundamental and 375 to 1,250uV/m for the harmonics. Using linear interpolation, the limit for the fundamental was calculated as follows:

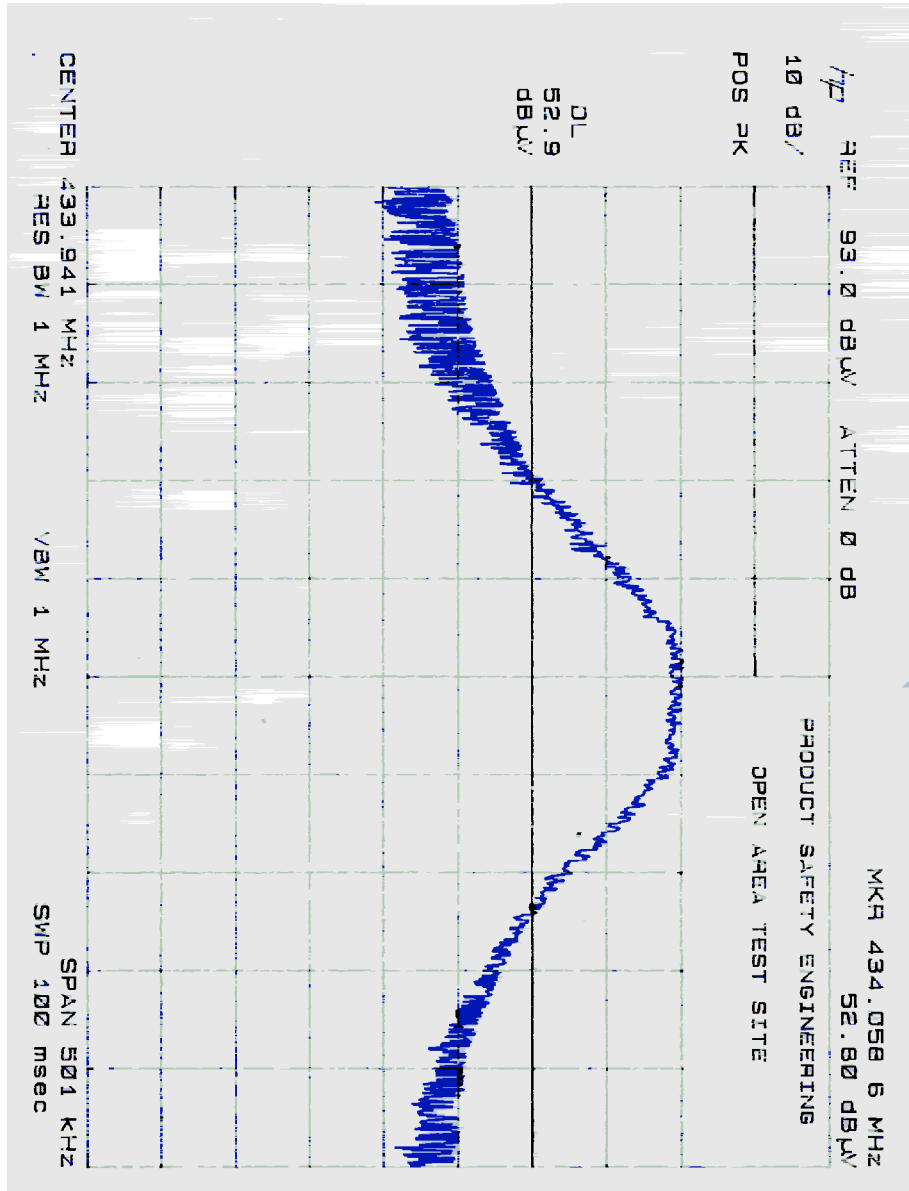
470 MHz - 260 MHz = 210 MHz range  
 12,500 uV/m - 3,750 uV/m = 8,750 uV/m range  
 $(8,750 / 210) = (41.67 \text{ uV/m per (1) MHz in change.})$   
 470 MHz - 433 MHz = 37 MHz from upper range  
 $(41.67 \times 37) = 1,542 \text{ uV/m change from upper range}$   
 $(12,500 - 1,542) = 10,958 \text{ uV/m is the extrapolated limit at 433 MHz}$   
 $(20 \text{ Log } 10,958) = 80.8 \text{ dBuV/m}$

The calculations for establishing the average level are:

$(20 \text{ log (total on time / total pulse train)})$   
 Total pulse off intervals = 13 (see A5)  
 Longest pulse off width = 36.6 mS (see A6)  
 Shortest off interval = 1.65 mS (see A7)  
 Total off time =  $(12 @ 1.65) + (1 @ 36.6) = (56.4) \text{ mS}$   
 Total Pulse train = (100) mS (see A5)  
 Total on time = Total Pulse train(100) - Total off time(56.4) = (43.6) mS  
 $(20 \text{ log (43.6 / 100)}) = (-7.2) \text{ dB}$

## Emission Bandwidth

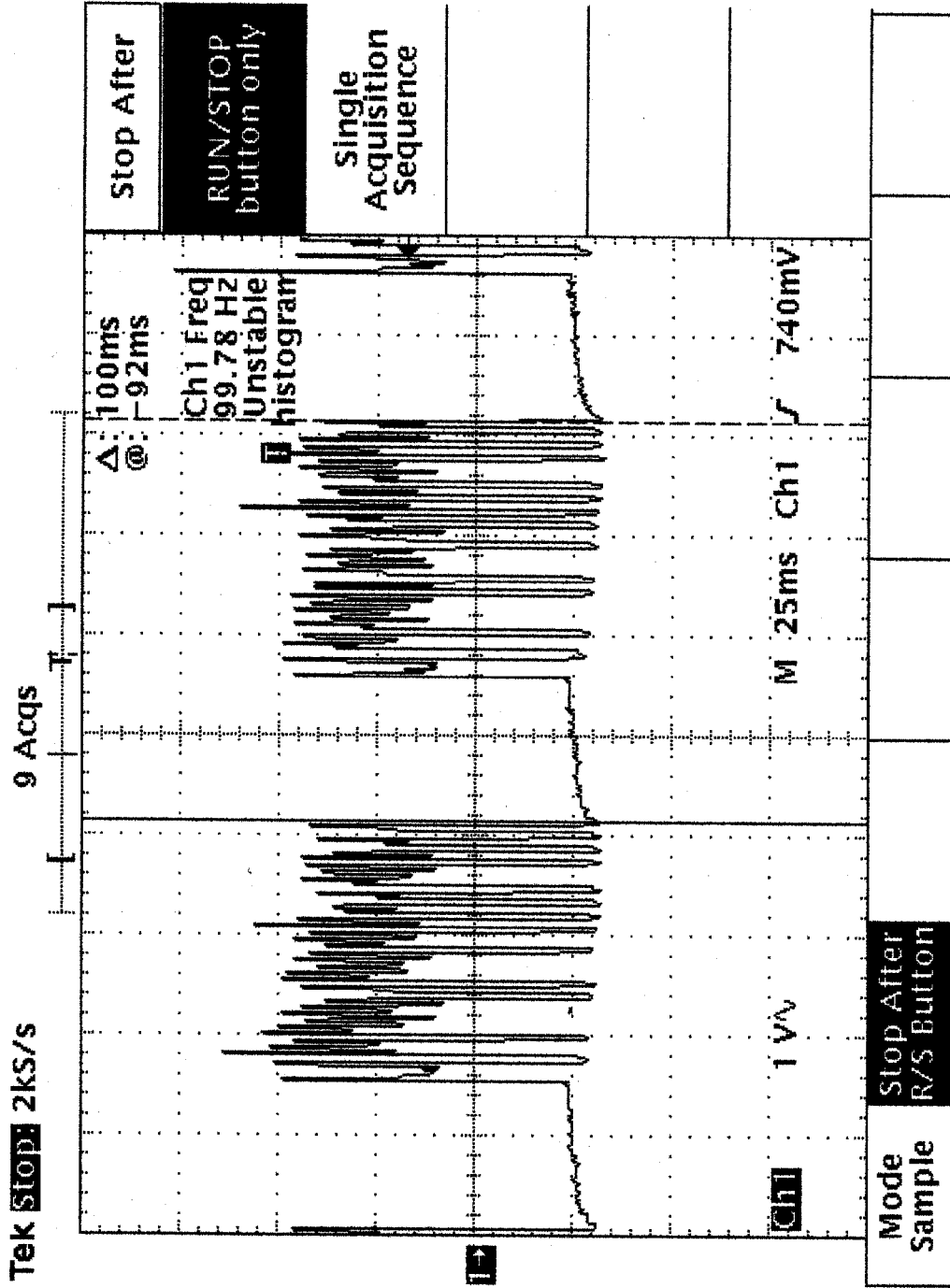
Part 15.231(c) states the maximum bandwidth as (0.25%) of the center frequency. The maximum allowable bandwidth at (434) MHz would be (1.085) MHz and the product plot below shows compliance as the entire plot span in only (500) kHz.



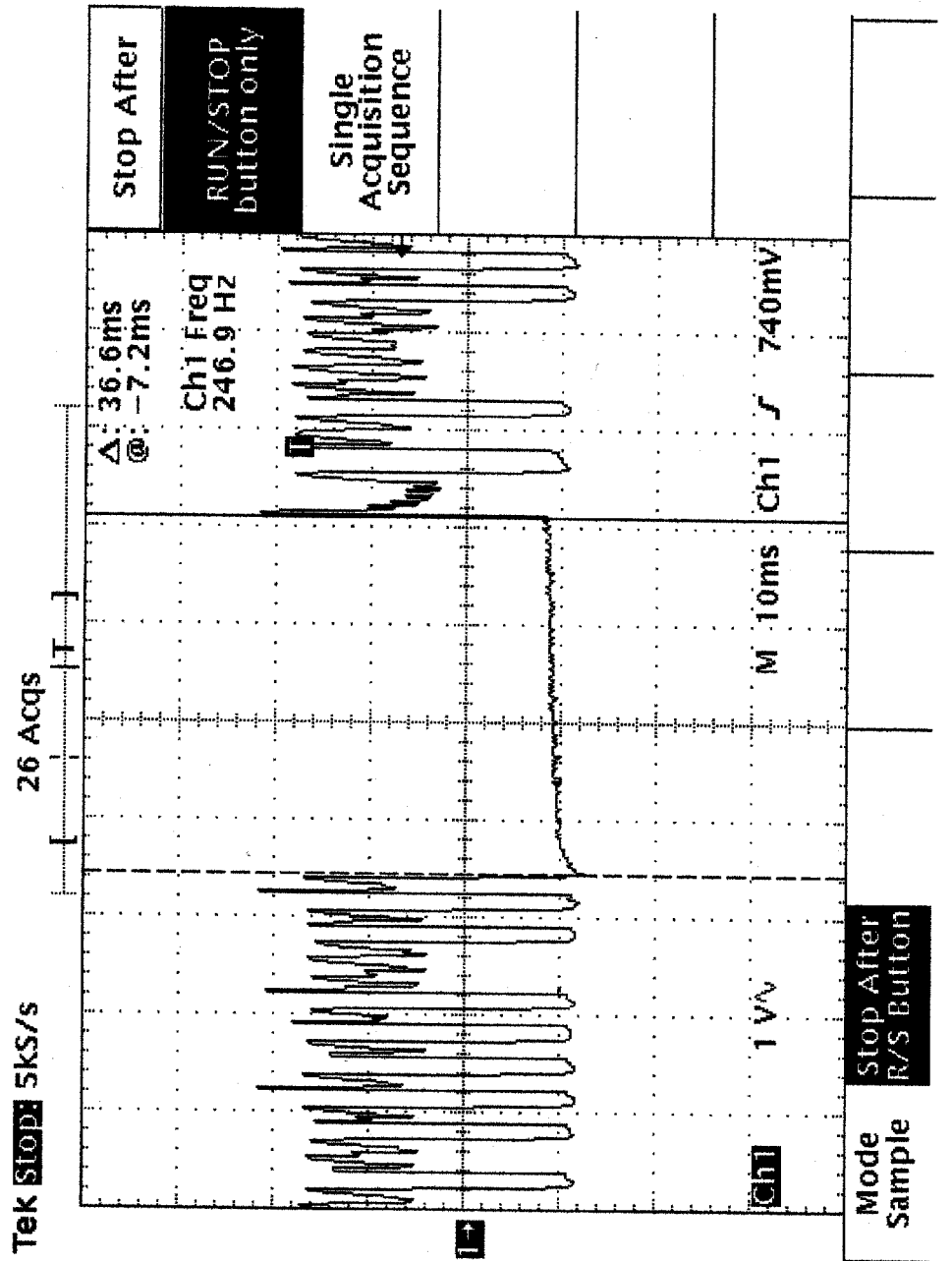


# Pulse Train Plots for Average Calculations

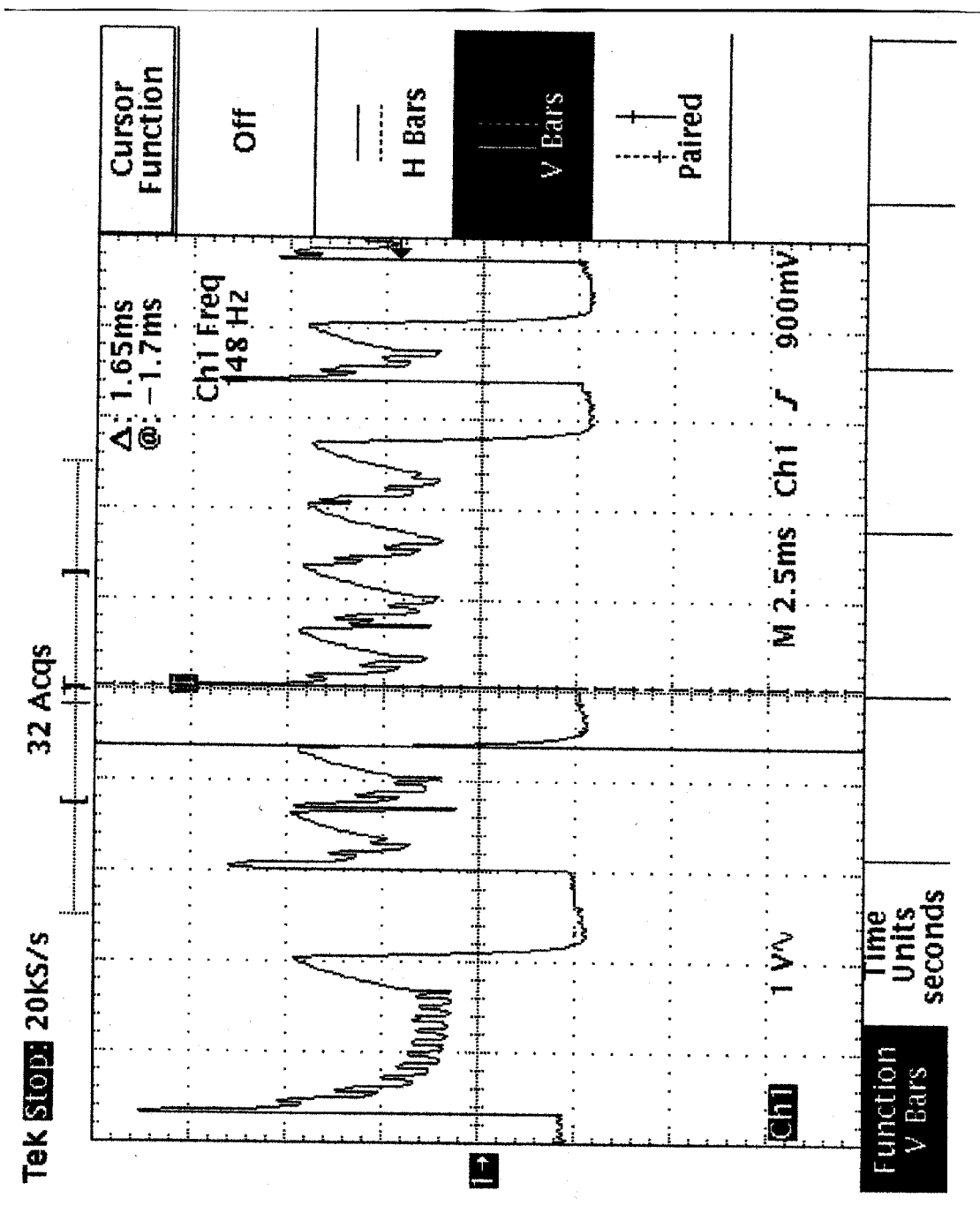
(total pulse train)



# Pulse Train Plots for Average Calculations ( Large off time )



# Pulse Train Plots for Average Calculations (shortest off time)



# **APPENDIX**

## **B**

### **System Under Test Description**

( Eut was mounted in a Zenith Television remote control)

# **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 a (6) VDC battery during the collection of data included within.

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

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

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

Observed Level		<b>60.0</b>	dB $\mu$ V	
ACF	+	<b>23.8</b>	dB/M	
Cable Loss	+	<b>1.0</b>	dB	
Preamp Gain	-	<b>26.0</b>	dB	
Actual Level		<b>58.8</b>	dB $\mu$ V/M	@ 868 MHz

**Please have a company official review this report and sign.**

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