



Certelecum Laboratories Inc.

Safety - EMI - Telecom - ISO Guide 25

ENGINEERING TEST REPORT

**ON:
DETECTION SYSTEMS INC.
"FAMILY LISTING SE2X-XX-XXX TRANSMITTER"**

FCC ID: ESV-0117-3

**IN ACCORDANCE WITH:
FCC PART 15, SUBPART C
FOR LOW POWER TRANSMITTERS OPERATING PERIODICALLY
IN THE BAND 40.66 - 40.77 MHz AND ABOVE 70 MHz**

PROJECT NO.: 7R00514

TESTED FOR:

DETECTION SYSTEMS INC.
130 PERINGTON PARKWAY
FAIRPORT, NEW YORK 14450
USA

TESTED BY:

CERTELECOM LABORATORIES INC.
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NVLAP LAB CODE: 100351-0

MARCH 1998

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This report applies only to the items tested.

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"

FCC ID: ESV-0117-3

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EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"

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EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Section 1. Summary of Test Results

Manufacturer: Detection Systems Inc.
Model No.: SE2S-SN-304, SE2S-304
Serial No.: Sample 2, Sample 3

General: All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.231. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

Abstract:

Name of Test	Paragraph Number	Results
Transmission Requirements	15.231(a)	Complies
Radiated Emissions	15.231(b)	Complies
Occupied Bandwidth	15.231(c)	Complies
Frequency Tolerance	15.231(d)	Not Applicable
Periodic Alternate Field Strength Requirements	15.231(e)	Complies
Powerline Conducted Emissions	15.207	Not Applicable

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

Frequency Tolerance Not Performed - Not Applicable
Powerline Conducted Not Performed - DC Only

NVLAP

NVLAP LAB CODE: 100351-0

TESTED BY:

Wayne Clarke
Wayne Clarke, Technologist

DATE:

May 14, 98

TECHNICAL REVIEW:

Tom Tidwell
Tom Tidwell, Senior Technologist

DATE:

14 May 1998

APPROVED BY:

W. Waterhouse
W. Waterhouse, RF Engineering Lab Manager

DATE:

14 May 1998

*EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"**FCC ID: ESV-0117-3*

Section 2. Equipment Under Test (E.U.T.)**General Equipment Information:****Model Number:** SE2S-SN-304, SE2S-304**Serial Number** Sample 2, Sample 3☒ Production Unit ☐ Pre-Production Unit**Frequency Range:** 304 MHz**Operating Frequency(ies) of Sample:** 304 MHz**Type of Emission:** On/Off Keyed Manchester Encoding**Emission Designator:** 55K0L1D**Supply Power Requirement:** CR2 3V Lithium Battery**Duty Cycle Calculation:** Short Pulse Duration = 94 μ sec
Long Pulse Duration = 200 μ sec

NR Short Pulses	=	44 x 94 μ sec	=	4136 μ sec
NR Long Pulses	=	16 x 200 μ sec	=	<u>3200 μsec</u>
				7336 μ sec
			=	7.336 msec

Duty Cycle	=	20 x log x	<u>on time ms</u> 100 msec
------------	---	------------	-------------------------------

	=	20 x log x	<u>7.336</u> 100
--	---	------------	---------------------

	=	20 x log x	0.07336
--	---	------------	---------

	=	20 x -1.13
--	---	------------

	=	-22.7
--	---	-------

	=	-20 dB maximum
--	---	----------------

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Description of E.U.T.

The E.U.T. is a belt mounted personal security transmitter. Two models of the SE2X-XX-XXX series transmitters were tested. Model SE2S-304 and the SE2S-SN-304 units were used in testing. All five models use the same PCB and use the same component values (except for the "snatch" circuit). The difference between the two styles is hardware. All models have a man down and supervisory function the other style has a snatch lanyard for activation. The transmitters have a panic button and test function, the receiver activates the alarm.

The difference between SE2S-XX, SE2U and SE2M-XX is software.

Modifications Incorporated in E.U.T.

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"

FCC ID: ESI-0117-3

Theory of Operation

The E.U.T.'s were tested by activating all alarm on conditions one at a time. The E.U.T. transmits a signal to the receiver identifying which transmitter initiated the alarm.

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Justification

The E.U.T. was configured for testing as per typical installation.

The following combinations were investigated to establish worst case configuration:

- (1) The E.U.T. were both tested in three orthogonal planes. The worst case was in the vertical mode.

Exercise Program

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise mode:

- (1) The E.U.T. was wired to transmit continuously for 4 minutes before requiring resetting.
- (2) The E.U.T. supervisory function was also measured.

*EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"**FCC ID: ESV-0117-3***Section 3. Equipment Configuration****Equipment Configuration List:**

Item	Description	Model No.	Serial.	Rev.
(A)	Personal Security Transmitter	SE2S-SN-304	Sample 2	
(B)	Personal Security Transmitter	SE2S-304	Sample 3	

Inter-connection Cables:

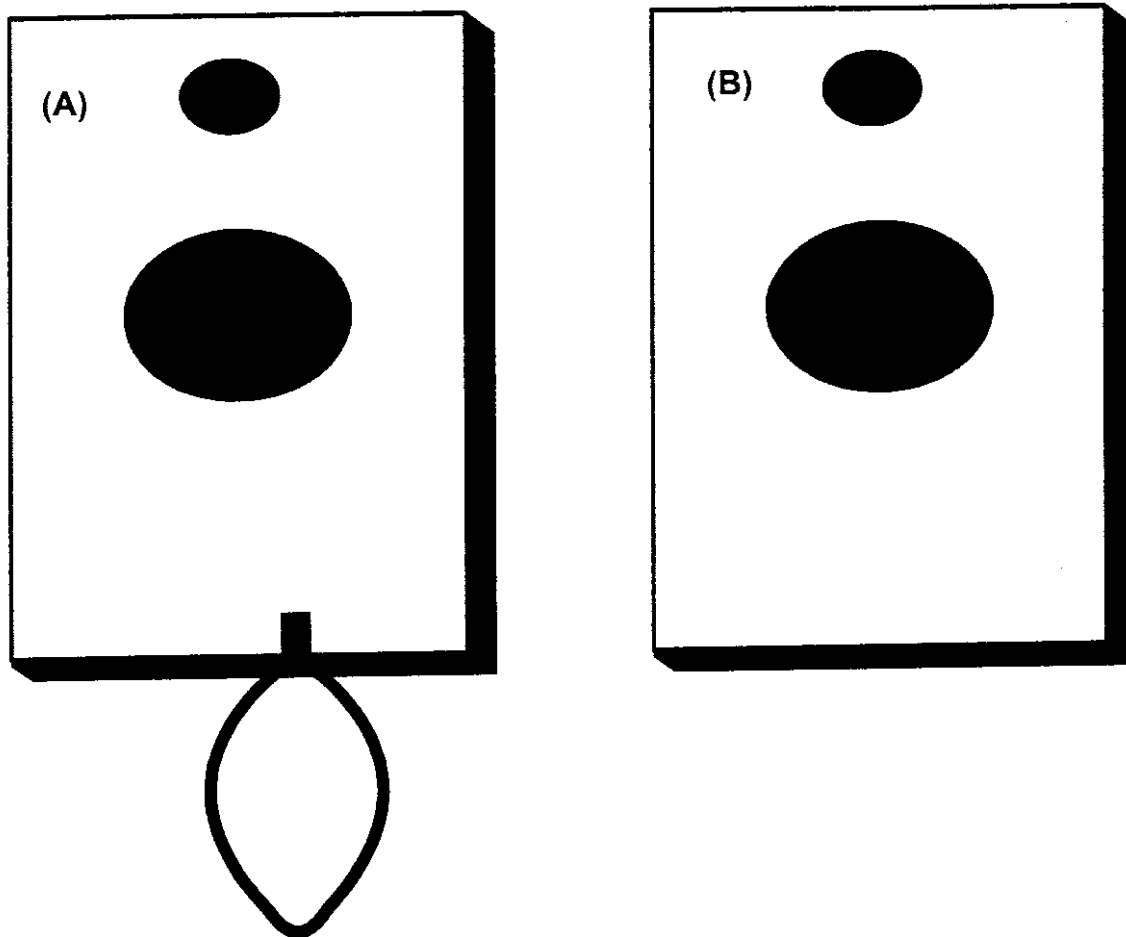
Item	Description	Length (m)
(1)		
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

NOT APPLICABLE

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"

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Configuration of the Equipment Under Test (E.U.T)



EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Section 4. Transmission Requirements

NAME OF TEST: Transmission Requirements	PARA. NO.: 15.231(a)
TESTED BY: Wayne Clarke	DATE: March 10, 1998

Test Conditions:

Test Voltage: 3 VDC
Temperature: 22 °C
Humidity: 20 %

Minimum Standard:

15.231(a) Continuous transmissions such as voice, video or data transmissions are not permitted.

15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds after being released.

15.231(a)(2) A transmitter activated automatically shall cease transmission within 5 seconds of activation.

15.231(a)(3) Periodic transmissions at regular pre-determined intervals are not permitted. However polling or supervisory transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

15.231(a)(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm.

Test Results:

Complies.

Test Data:

Compliance was determined by verification of technical specifications and a functional test on the equipment.

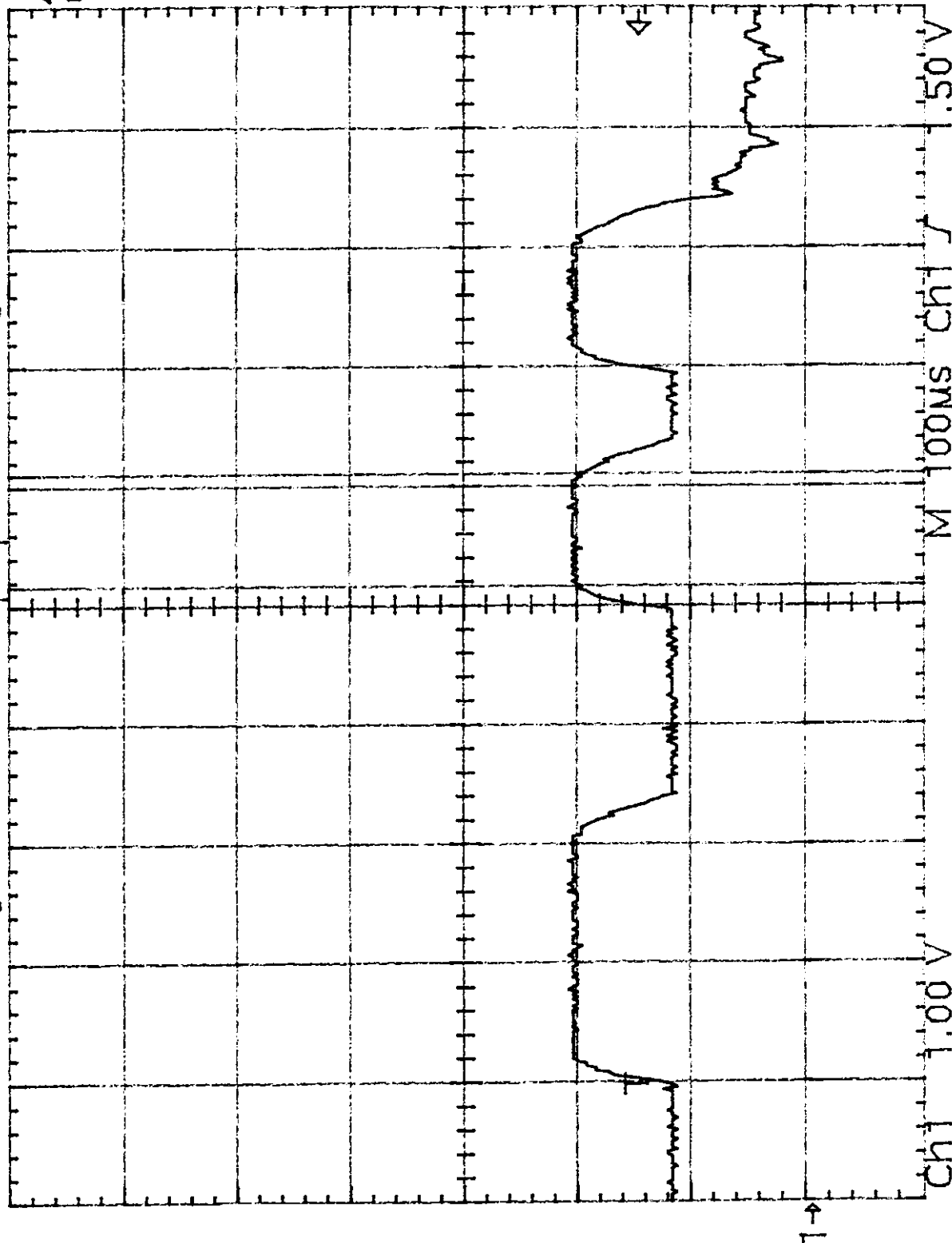
EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Rationale for Compliance with Transmission Requirements

- 15.231(a)(1) :** Graph
- 15.231(a)(2) :** Not Applicable. Has to be activated manually.
- 15.231(a)(3) :** Complies - 15.231 (e) levels page 26. The E.U.T. transmits 2 packets every 90 seconds, 40 packets per hour on time 0.604 secs.
- 15.231(a)(4) :** Transmits after alarm activation until unit is reset to cancel alarm.
- Note:** The supervisory transmission is sent at a lower RF level than the alarm transmission.

Tek Stop: 500kS/s

237 Acqs



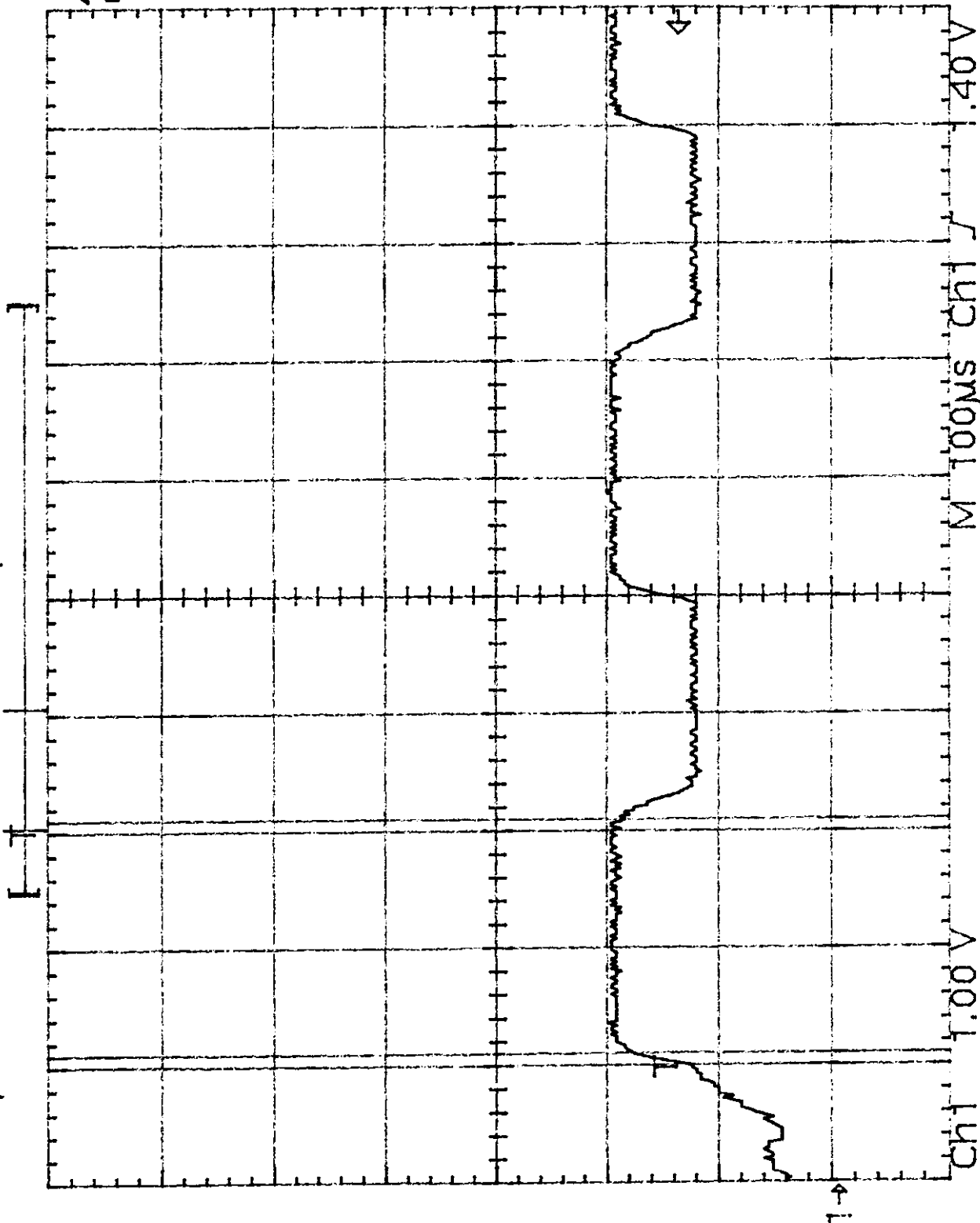
Δ : 94ms
@: 416ms

9 Apr 1998
12:29:50

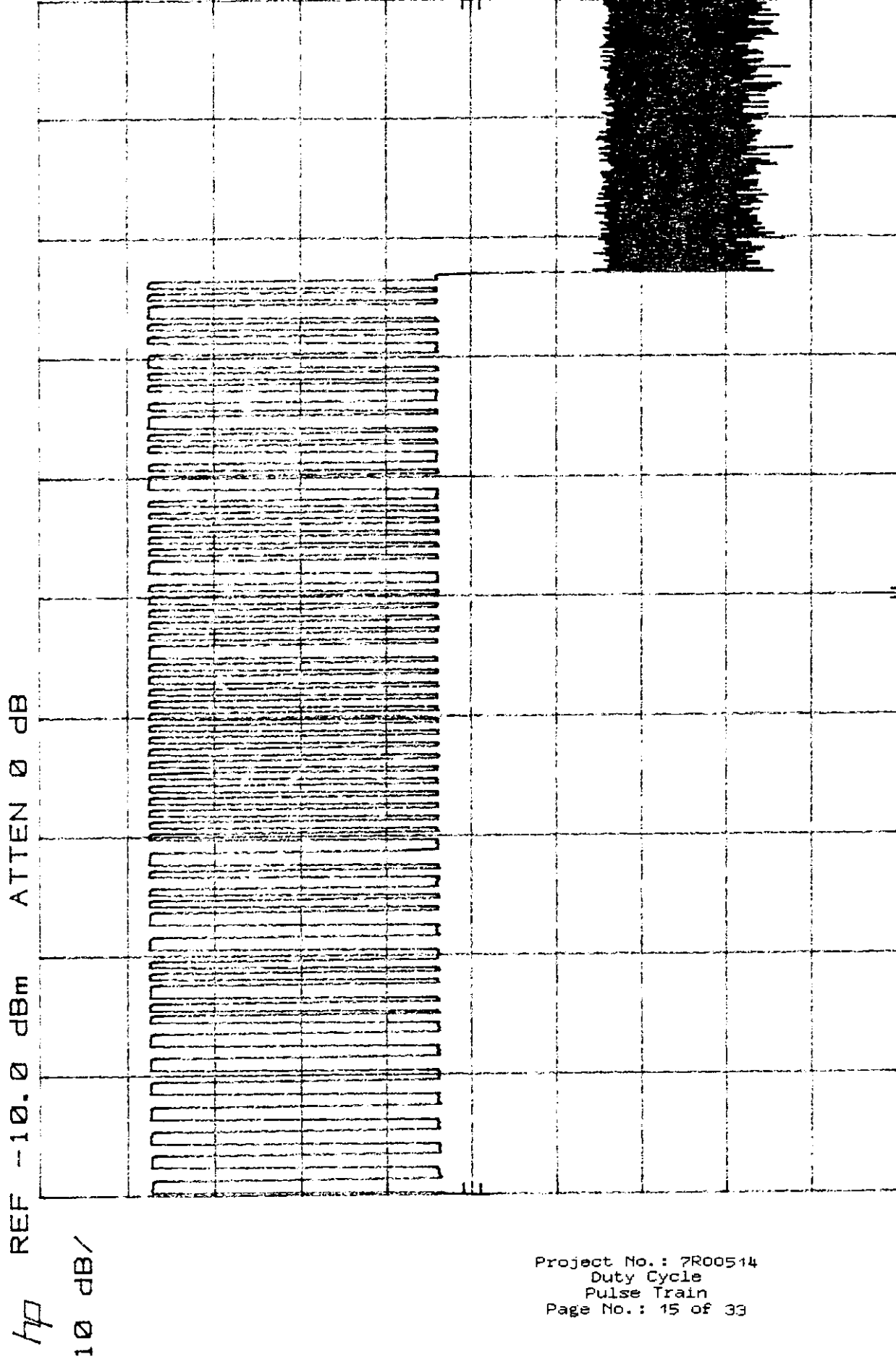
Tek Stop: 500kS/s

26 Acqs

Δ : 200 μ S
@: 210 μ S



9 Apr 1998
12:26:28



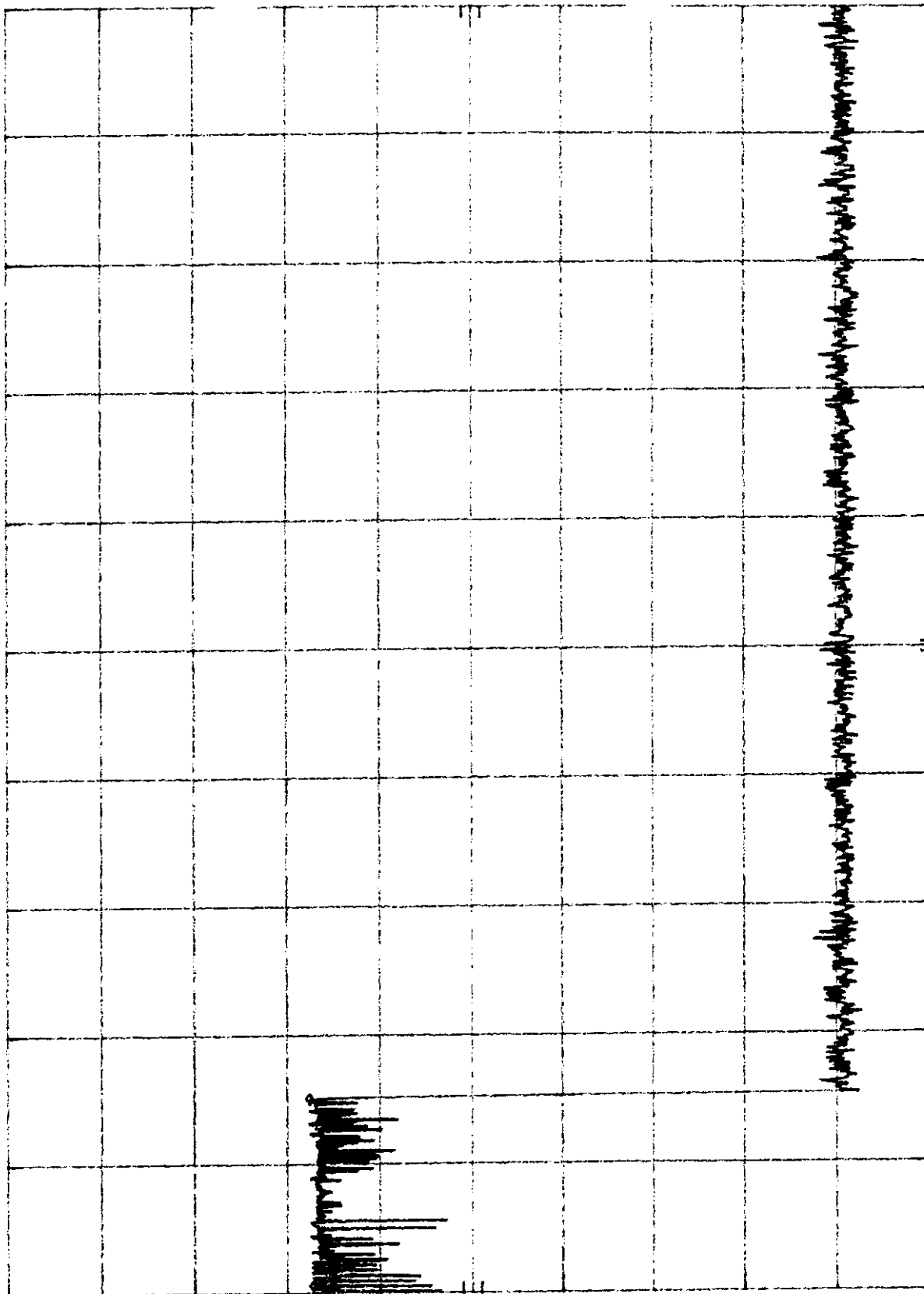
MKR Δ 14.50 msec
0.40 dB

ATTEN 10 dB

REF 0.0 dBm

h₀

10 dB/



CENTER 304.001 000 MHz
RES BW 10 KHz
VBW 30 KHz
SPAN 0 Hz
SWP 100 msec

HP MKR Δ 240.0 msec
-0.20 dB

REF 0.0 dBm ATTN 10 dB

10 dB/

MARKER Δ
240.0 msec
-0.20 dB

SPAN 0 Hz
SWP 10.0 sec

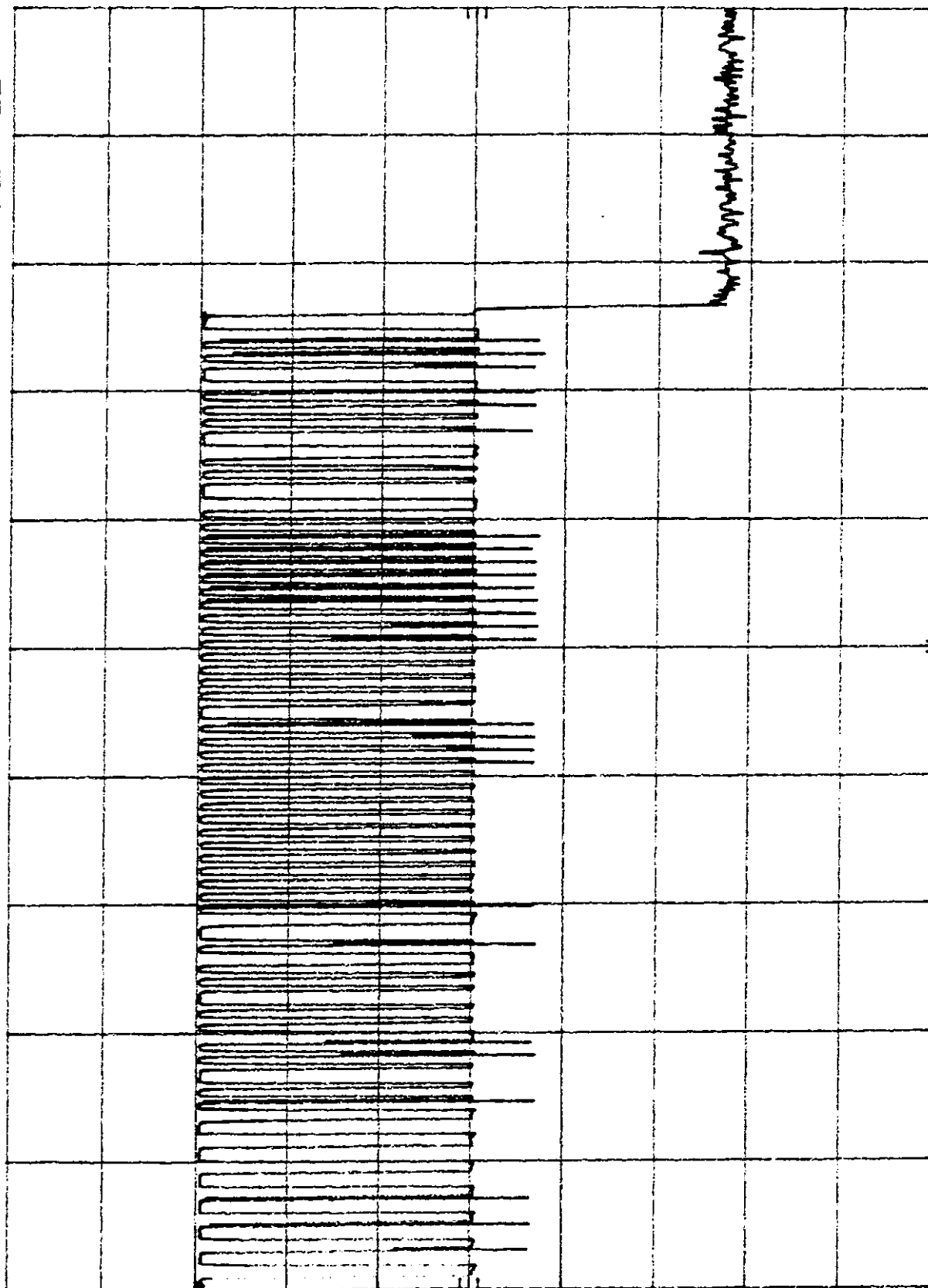
VBW 30 kHz

CENTER 304.001 000 MHz
RES BW 10 kHz

MKR Δ 15.12 msec
0.20 dB

h_p REF 0.0 dBm ATTN 10 dB

10 dB/



SPAN 0 Hz
SWP 20.0 msec

VBW 300 kHz

CENTER 304.000 000 MHz
RES BW 100 kHz

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"

FCC ID: ESV-0117-3

Section 5. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: Wayne Clarke	DATE: March 10, 1998

Test Conditions: Test Voltage: 3 VDC
 Temperature: 22 °C
 Humidity: 20 %

Minimum Standard:**Permissible Field Strength Limits (Momentarily Operated Devices)**

Fundamental Frequency (MHz)	Field Strength of Fundamental Microvolts/Meter at 3 meters; (watts)	Field Strength of Unwanted Emissions Microvolts/Meter at 3 meters; (watts)
40.66 - 40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750*	125 to 375
174-260 (note 1)	3,750	375
260-470 (note 1)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

Notes:

Use quasi-peak or averaging meter.

For 130 - 174 MHz: $FS \text{ (microvolts/m)} = (56.82 \times F) - 6136$ * Linear interpolation with frequency F in MHzFor 260 - 470 MHz: $FS \text{ (microvolts/m)} = (41.67 \times F) - 7083$

Any emissions that fall within the restricted bands of 15.205 shall not exceed the following limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Test Results: Complies. The worst-case emission level is 45.9 dB $\mu\text{V/m}$ @ 3m at 608.0 MHz. This is 7.8 dB below the specification limit.

Test Data: See attached table.

Above 1 GHz a spectrum analyzer and low noise amplifier are used to measure emission levels. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was 3 MHz.

In the case of handheld equipment, the E.U.T. is rotated in three planes to obtain worst-case results.

Limit 304 MHz = 73.7 dB μV
 Field Strength Spurious = 53.7 dB μV

Test Data - Radiated Emissions

SE2S-304

[illegible]

B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole

** Includes cable loss when amplifier is not used.

() Denotes failing emission level.

- Restricted Bands

*EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"**FCC ID: ESV-0117-3*

Section 6. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: Wayne Clarke	DATE: March 9, 1998

Test Conditions: Test Voltage: 3 VDC
 Temperature: 22 °C
 Humidity: 20 %

Minimum Standard: 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Results: Complies. See attached graph.

Test Data: See attached graph.

MKR Δ 55 KHz
-0.70 dB

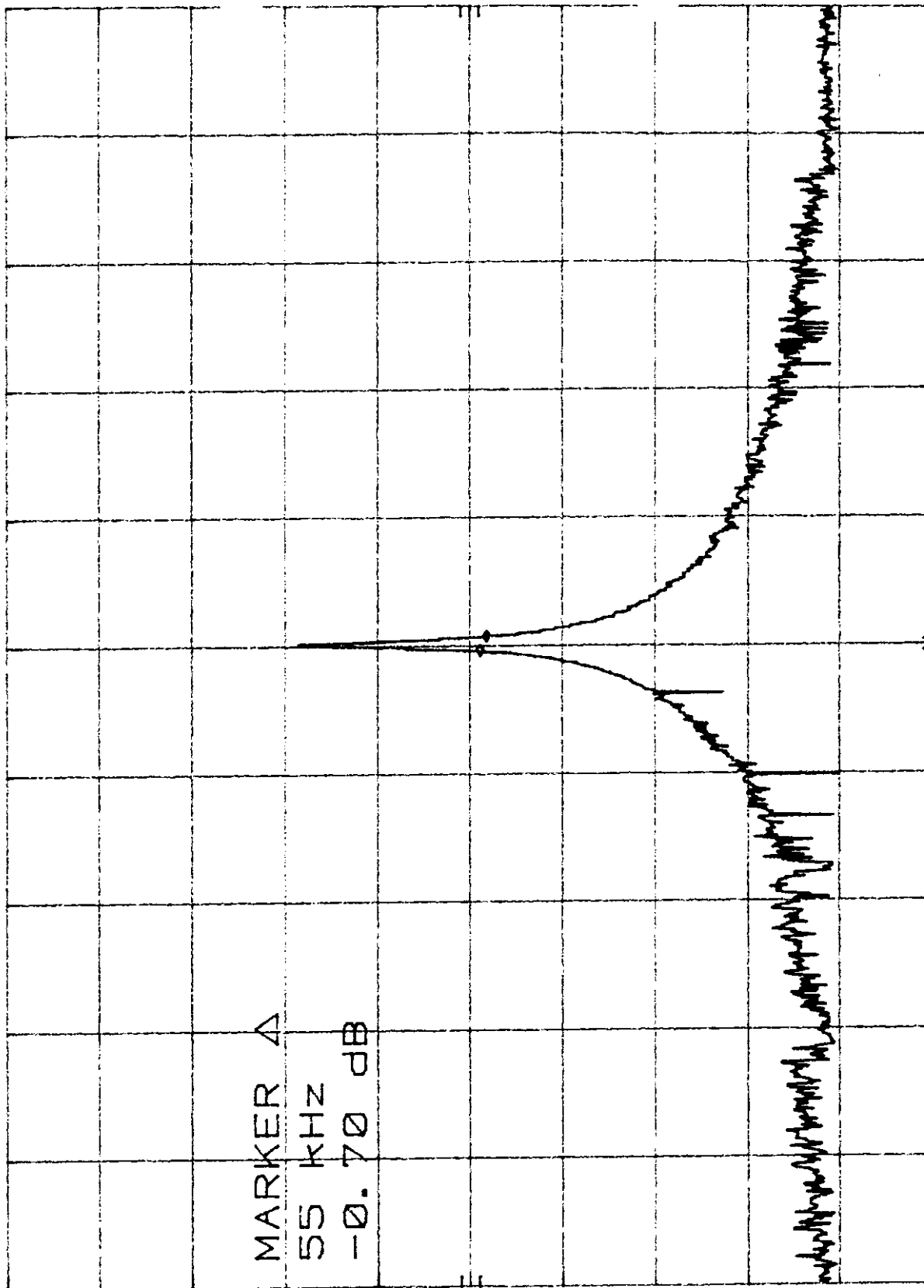
ATTEN 10 dB

REF 0.0 dBm

hp

10 dB/

MARKER Δ
55 KHz
-0.70 dB



SPAN 5.00 MHz
SWP 150 msec

VBW 30 KHz

RES BW 10 KHz

CENTER 303.99 MHz

*EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"**FCC ID: ESV-0117-3***Section 7. Frequency Tolerance**
Devices in the Frequency Band 40.66 - 40.77 MHz

NAME OF TEST: Frequency Tolerance	PARA. NO.: 15.231(d)
TESTED BY:	DATE:

Test Conditions: Test Voltage: _____ VAC
Temperature: _____ °C
Humidity: _____ %

Minimum Standard:

15.231(d) For devices operating within the frequency band 40.66 - 40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be $\pm 0.01\%$. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary power supply voltage from 80% to 115% of the rated supply voltage at a temperature of 25 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Results: Complies/Does Not Comply. See attached graph and data.

Test Data: See attached graph.

*EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"**FCC ID: ESV-0117-3***Section 8. Periodic Alternate Field Strength Requirements**

NAME OF TEST: Periodic Alternate Field Strength Requirements PARA. NO.: 15.231(e)

TESTED BY: Wayne Clarke

DATE: April 13, 1998

Test Conditions:

Test Voltage: 3 Vdc

Temperature: 22 °C

Humidity: 20 %

Minimum Standard:

15.231(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following.

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500	50 to 150
174 - 260	1,500	150
260-470	1,500 to 5,000	150 to 500
Above 470	5,000	500

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Test Results:

Complies.

Test Data:

See attached table.

Limit 304 MHz = 65.7 dBμV/m

Field Strength of Spurious = 45.7 dBμV/m

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"

FCC ID: ESV-0117-3

Test Data - Supervisory Transmission

SE2S-304

[illegible]

Notes:

B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn. D/P = Dipole

* Re-measured using dipole antenna.

** Includes cable loss when amplifier is not used.

*** Includes cable loss.

() Denotes failing emission level.

+ E.U.T. Searched to the 10th Harmonic

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Section 9. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207
TESTED BY:	DATE:

Test Conditions: Test Voltage: _____ VAC
Temperature: _____ °C
Humidity: _____ %

Minimum Standard:

Frequency(MHz)	Maximum Powerline Conducted RF Voltage	
	μV	dBμV
0.45 - 30.0	250	48

Test Results: Complies/Does Not Comply. See attached graphs and table.

Test Data: See attached graphs and table.

Method Of Measurement: (Procedure ANSI C63.4-1992)

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak detector.

Broadband emissions are identified by switching the receiver detector function from Quasi-Peak to Average. If the amplitude of the emission drops by 6 dB or more then the emission is classified as broadband and the Quasi-Peak level is reduced by a factor of 13 dB.

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Conducted Photographs (Worst Case Configuration)

SIDE VIEW

NOT APPLICABLE

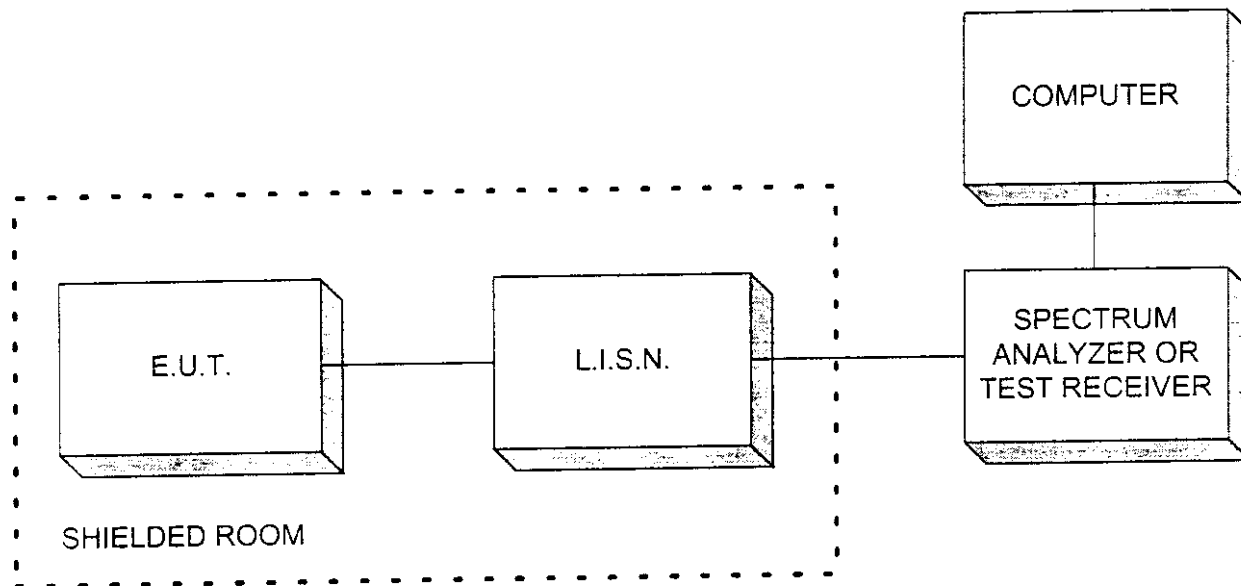
FRONT VIEW

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"

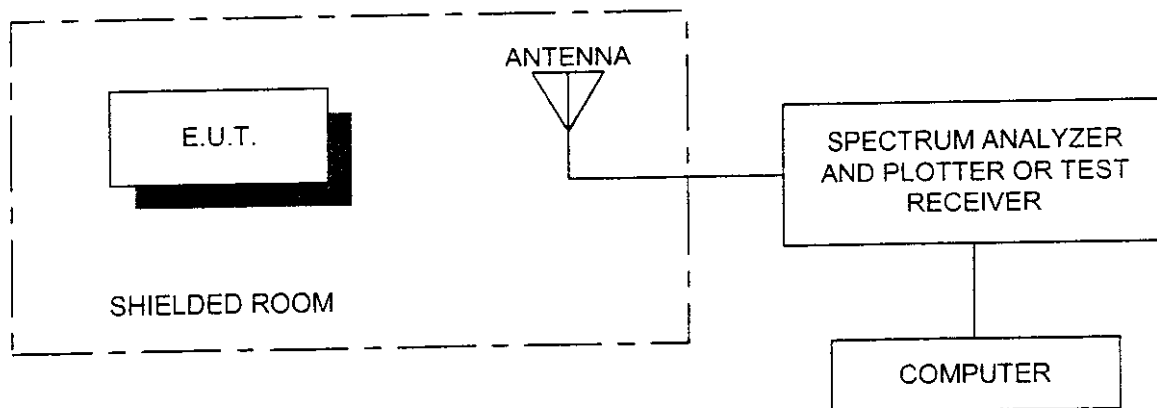
FCC ID: ESV-0117-3

Section 10. Block Diagrams

Conducted Emissions

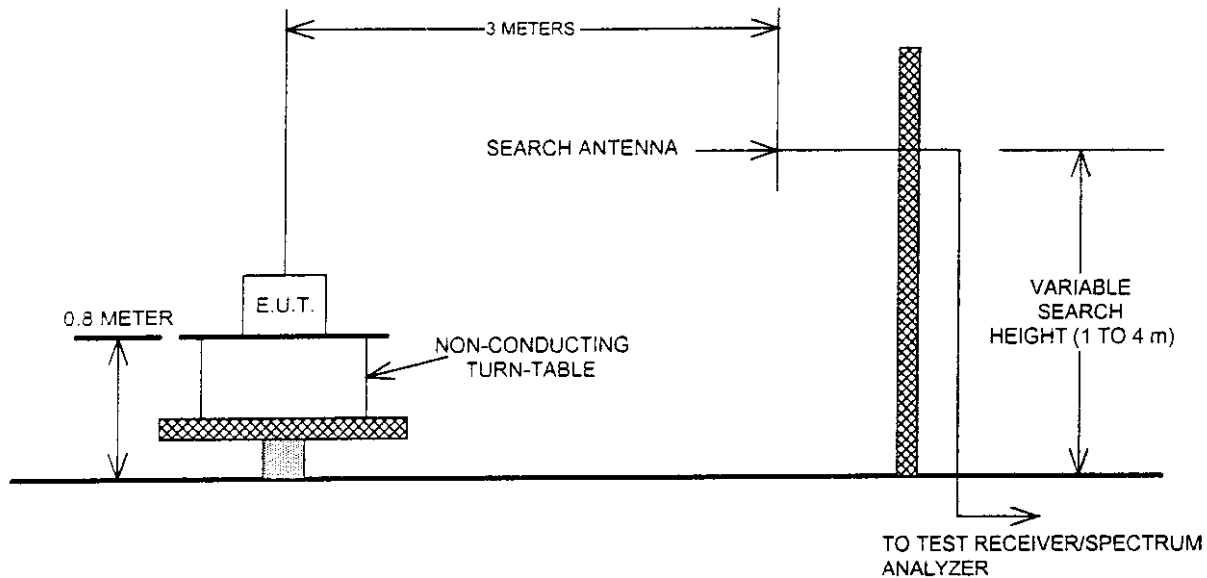


Radiated Prescan



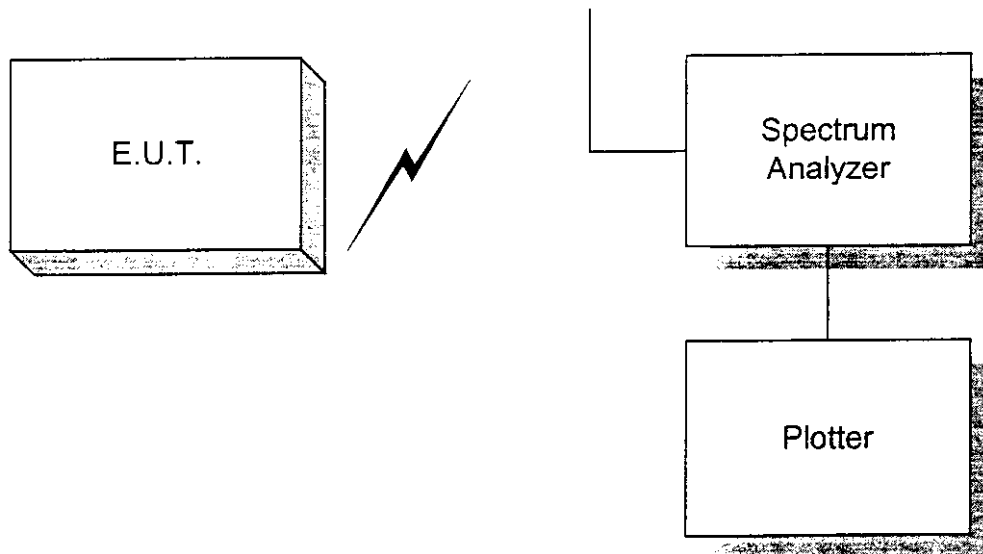
EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Outdoor Test Site For Radiated Emissions



The spectrum was searched up to the 10th harmonic of the fundamental frequency of operation.

Occupied Bandwidth



*EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"**FCC ID: ESV-0117-3*

Section 11. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
	Plotter	Hewlett Packard	7470A	2308A30807	NCR	NCR	
1 Year	Spectrum Analyzer-2	Hewlett Packard	8566B	1950A00400	Oct. 3/97	Oct. 3/98	
1 Year	Spectrum Analyzer Display-2	Hewlett Packard	85662A	1950A01177	Oct. 3/97	Oct. 3/98	
1 Year	Quasi Peak Adaptor-2	Hewlett Packard	85650A	2251A00620	Aug. 19/97	Aug. 19/98	
1 Year	Receiver	Rohde & Schwarz	ESVS-30	843710/002	Oct. 21/97	Oct. 21/98	
2 Year	Horn Antenna	EMCO #1	3115	3132	Feb 9/98	Feb 9/00	
1 Year	Dipole Antenna Set	EMCO	3121C	1029	Oct. 28/97	Oct. 28/98	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Oct. 24/97	Oct. 24/98	
1 Year	Digital Oscilloscope	Tektronix	TDS5544A	B012005	Oct. 23/97	Oct. 23/98	

KTL - Certelecom Laboratories Inc.

FCC PART 15, SUBPART C
FOR LOW POWER TRANSMITTERS
PROJECT NO.: 7R00514
ANNEX A

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

ANNEX A
RESTRICTED BANDS

EQUIPMENT: Detection System Inc. "Family Listing SE2X-XX-XXX Transmitter"
FCC ID: ESV-0117-3

Section A Restricted Bands of Operation

(a) Except as shown in paragraph (d) of this section , only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.49 - 0.51	16.69475-16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425-16.80475	960-1240	7.25-7.75
3.020 - 3.026	25.5-25.67	1300-1427	8.025-8.5
4.125 - 4.128	37.5-38.25	1435-1626.6	9.0-9.2
4.17725 - 4.17775	73-74.6	1645.5-1646.5	9.3-9.5
4.20725 - 4.20775	74.8-75.2	1660-1710	10.6-12.7
6.215 - 6.218	108-121.94	1718.8-1722.2	13.25-13.4
6.31175 - 6.31225	123-138	2220-2300	14.47-14.5
8.291 - 8.294	149.9-150.05	2310-2390	15.35-16.2
8.362 - 8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625 - 8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425 - 8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29 - 12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975 - 12.52025	240-285	3345.8-3358	36.43-36.5
12.57675 - 12.57725	322-335.4	3600-4400	Above 38.6
13.36 - 13.41			