



**Certelec Com Laboratories Inc.**

*Safety - EMI - Telecom - ISO Guide 25*

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**ENGINEERING TEST REPORT**

**ON:  
THE DETECTIONS SYSTEMS  
"EA102A-304 TRANSCEIVER"**

**FCC ID: ESV-0251-2**

**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.: 7R00514.4**

**TESTED FOR:**

DETECTION SYSTEMS INC.  
130 PERINTON PARKWAY  
FAIRPOINT, NY 14450-9099  
USA

**TESTED BY:**

CERTELECOM LABORATORIES INC.  
3325 RIVER ROAD, R.R. 5  
OTTAWA, ONTARIO K1V 1H2



**NVLAP LAB CODE: 100351-0**

**APRIL 1998**

This document contains 32 pages including this one.

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This report applies only to the items tested.

*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"*  
*FCC ID: ESV-0251-2*

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*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"*  
*FCC ID: ESV-0251-2*

**Section 1. Summary of Test Results**

Manufacturer: Detection Systems

Model No.: EA102A-304

Serial No.: Sample 2

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)	Not Applicable
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 was not performed - EUT operates at 304 MHz
- Periodic Alternate Field Strength Requirements were not performed - Not Applicable
- Conducted Emissions were not performed - EUT uses 12 Vdc.

It is recommended that the margin of compliance be improved to allow for manufacturing tolerances.



**NVLAP LAB CODE: 100351-0**

TESTED BY: Wayne Clarke DATE: May 4, 98  
Wayne Clarke, Technologist

TECHNICAL REVIEW: Tom Tidwell DATE: 6 May, 1998  
Tom Tidwell, Senior Technologist

APPROVED BY: W. Waterhouse DATE: 6th May 1998  
W. Waterhouse, RF Engineering Lab Manager

EQUIPMENT: *The Detection Systems "EA102A-304 Transceiver"*  
 FCC ID: *ESV-0251-2*

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**Section 2. Equipment Under Test (E.U.T.)**

**General Equipment Information**

Model Number: EA102A-304  
 Serial Number: Sample 2  
 Production Unit       Pre-Production Unit  
 Frequency Range: 304 MHz  
 Operating Frequency(ies) of Sample: 304.004 MHz  
 Type of Emission: L1D  
 Emission Designator: 79K33L1D  
 Supply Power Requirement: 12 Vdc

**Duty Cycle Calculation:**

$$\begin{aligned}
 &= 20 \text{ Log } \frac{\text{on time ms}}{100 \text{ ms}} \\
 \text{Long Pulse Duration} &= 140 \mu\text{sec} \\
 \text{Short Pulse Duration} &= 80 \mu\text{sec} \\
 \text{NR Long Pulses } 11 \times 140 \mu\text{sec} &= 1540 \mu\text{sec} \\
 \text{NR Short Pulses } 50 \times 80 \mu\text{sec} &= 4000 \mu\text{sec} \\
 &= 5540 \mu\text{sec} \\
 &= 5.54 \text{ msec} \\
 \text{NR Pulse Trans} &= 2 \\
 &= 20 \text{ Log } \frac{2 \times 5.54 \mu\text{sec}}{100 \mu\text{sec}} \\
 &= 20 \text{ Log } \frac{11.08}{100} \\
 &= 20 \text{ Log } .1108 \\
 &= 20 \times -0.95546 \\
 &= -19.1 \text{ dB}
 \end{aligned}$$

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**Description of E.U.T.**

The E.U.T. is a wall mounted security system transceiver which transmits buddy check packets to ensure system integrity

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**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: The Detection Systems "EA102A-304 Transceiver"*  
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### **Theory of Operation**

The E.U.T. is a wall mounted security system transceiver which transmits buddy check packets to ensure system integrity.

The E.U.T. was set to constant transmit for test purposes.

The normal mode of operation is to transmit 1 message which is comprised of 8 packets, the off time between each message is at least 1 hour or more. ✓

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### **Justification**

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

The following combinations were investigated to establish worst case configuration:

- (1) Vertical position simulation wall mounting

### **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) E.U.T. transmitting ID number.



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### **Section 3.        Equipment Configuration**

#### **Equipment Configuration List:**

<b>Item</b>	<b>Description</b>	<b>Model No.</b>	<b>Serial.</b>	<b>Rev.</b>
(A)	Transmitter	EA102-304	FCC 1	
(B)	Astron Power Supply	VS 50M	CLI 059	

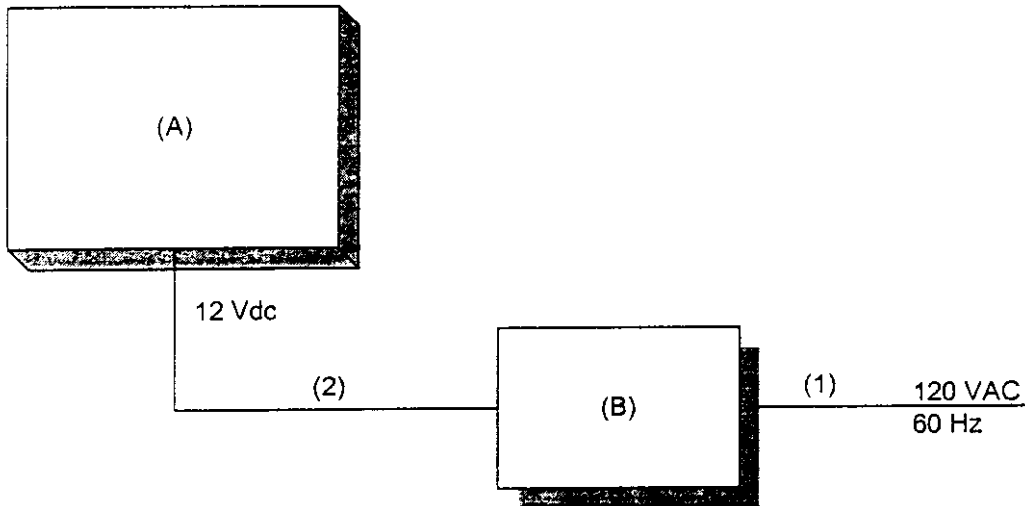
#### **Inter-connection Cables:**

<b>Item</b>	<b>Description</b>	<b>Length (m)</b>
(1)	AC Cable	1.8
(2)	2 Cond. 22GA	1.0

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



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**Section 4.           Transmission Requirements**

NAME OF TEST: Transmission Requirements	PARA. NO.: 15.231(a)
TESTED BY: Wayne Clarke	DATE: April 4, 1998

**Test Conditions:**           Test Voltage: 12 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: The Detection Systems "EA102A-304 Transceiver"*  
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**Rationale for Compliance with Transmission Requirements**

- 15.231(a)(1) : Complies
- 15.231(a)(2) : Not Applicable
- 15.231(a)(3) : The off time is at least 1 hour between the "Buddy Check" messages from the transceiver.
- 15.231(a)(4) : Not Applicable

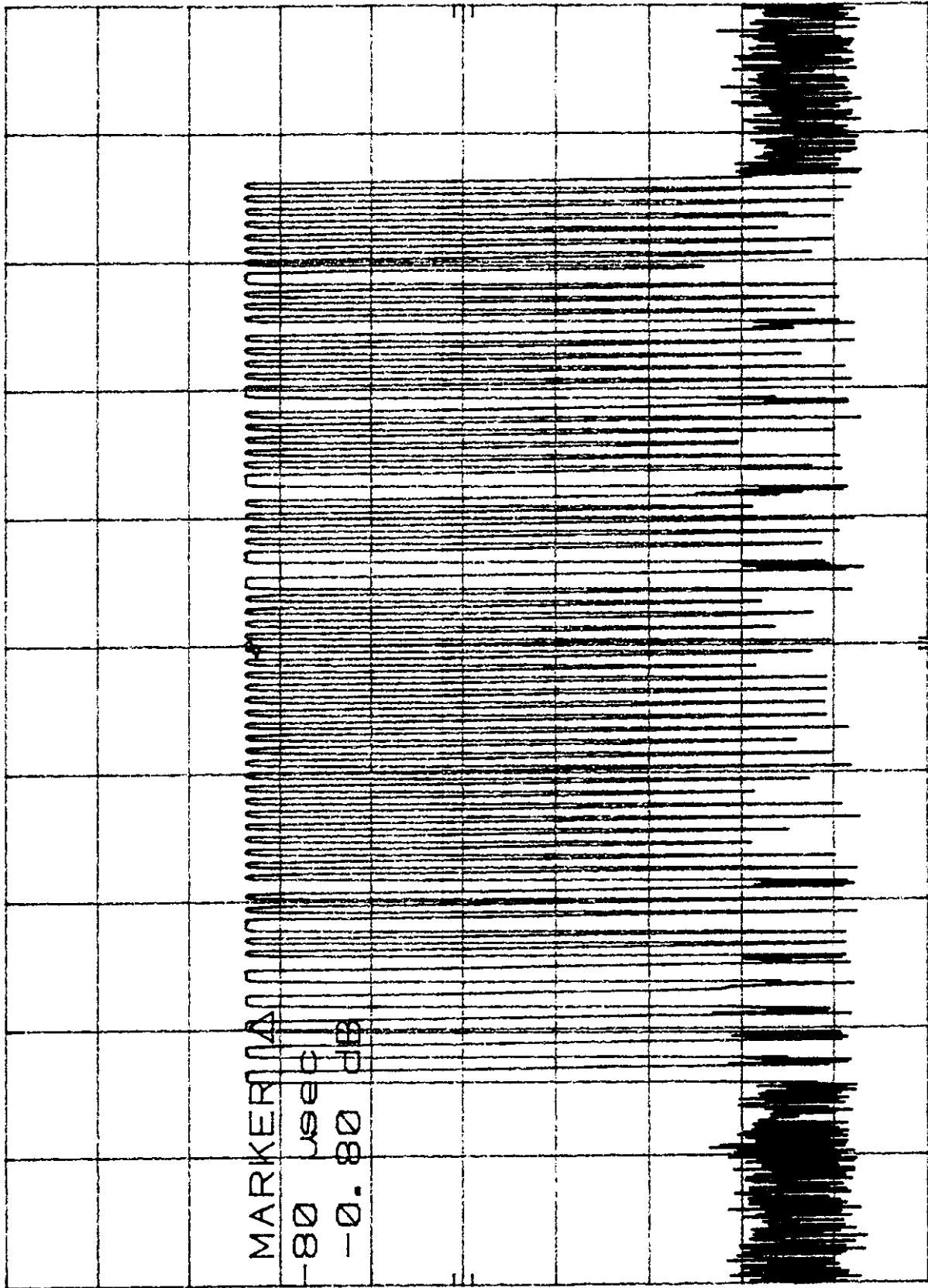
MKR  $\Delta$ -80  $\mu$ sec  
-0.80 dB

ATTEN 10 dB

REF 0.0 dBm

HP

10 dB/



CENTER 304.110 000 MHz  
RES BW 100 kHz

VBW 300 kHz

SPAN 0 Hz  
SWP 20.0 msec

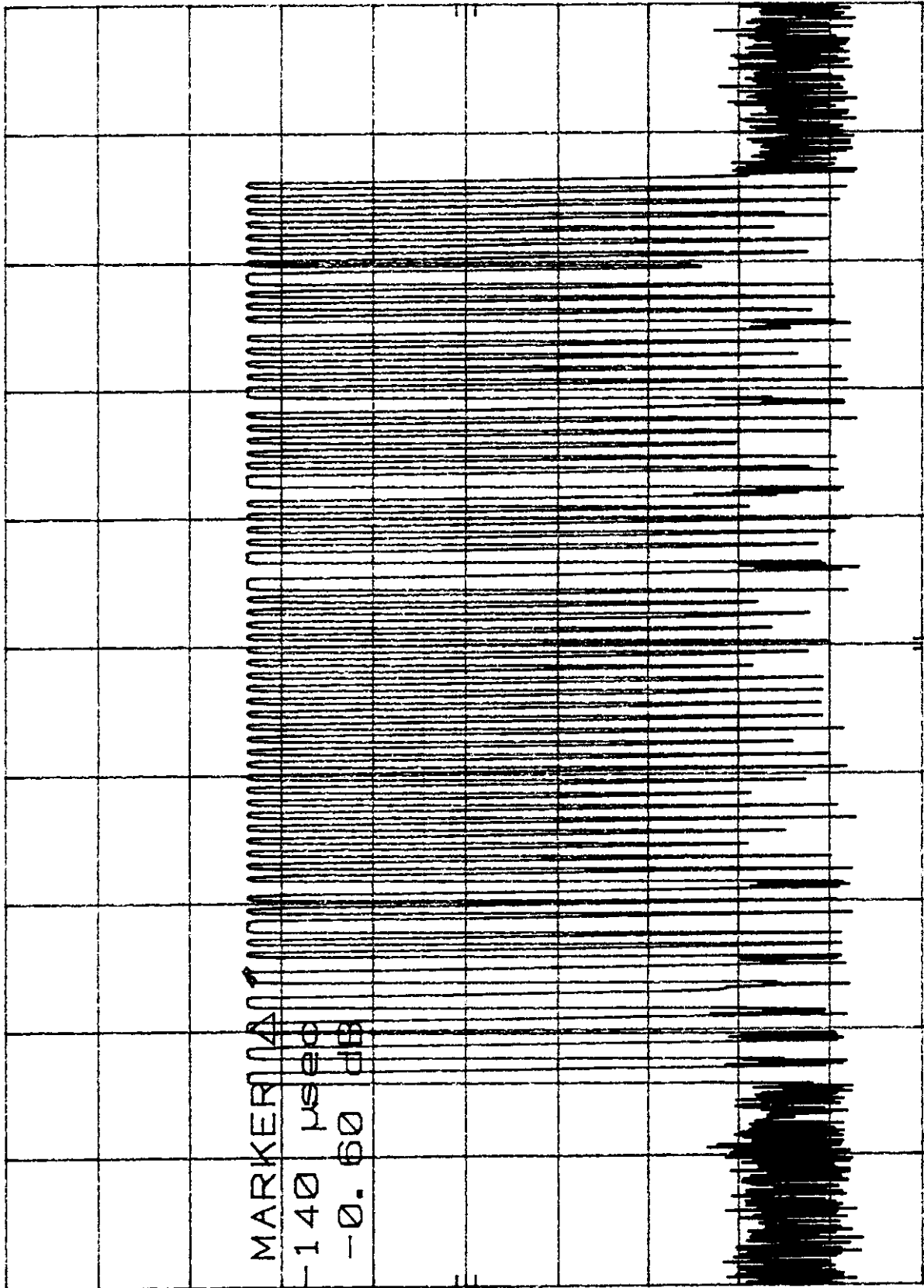
MKR  $\Delta$ -140  $\mu$ sec  
-0.60 dB

ATTEN 10 dB

REF 0.0 dBm

HP

10 dB/



CENTER 304.110 000 MHZ

RES BW 100 KHZ

VBW 300 KHZ

SPAN 0 HZ

SWP 20.0 msec

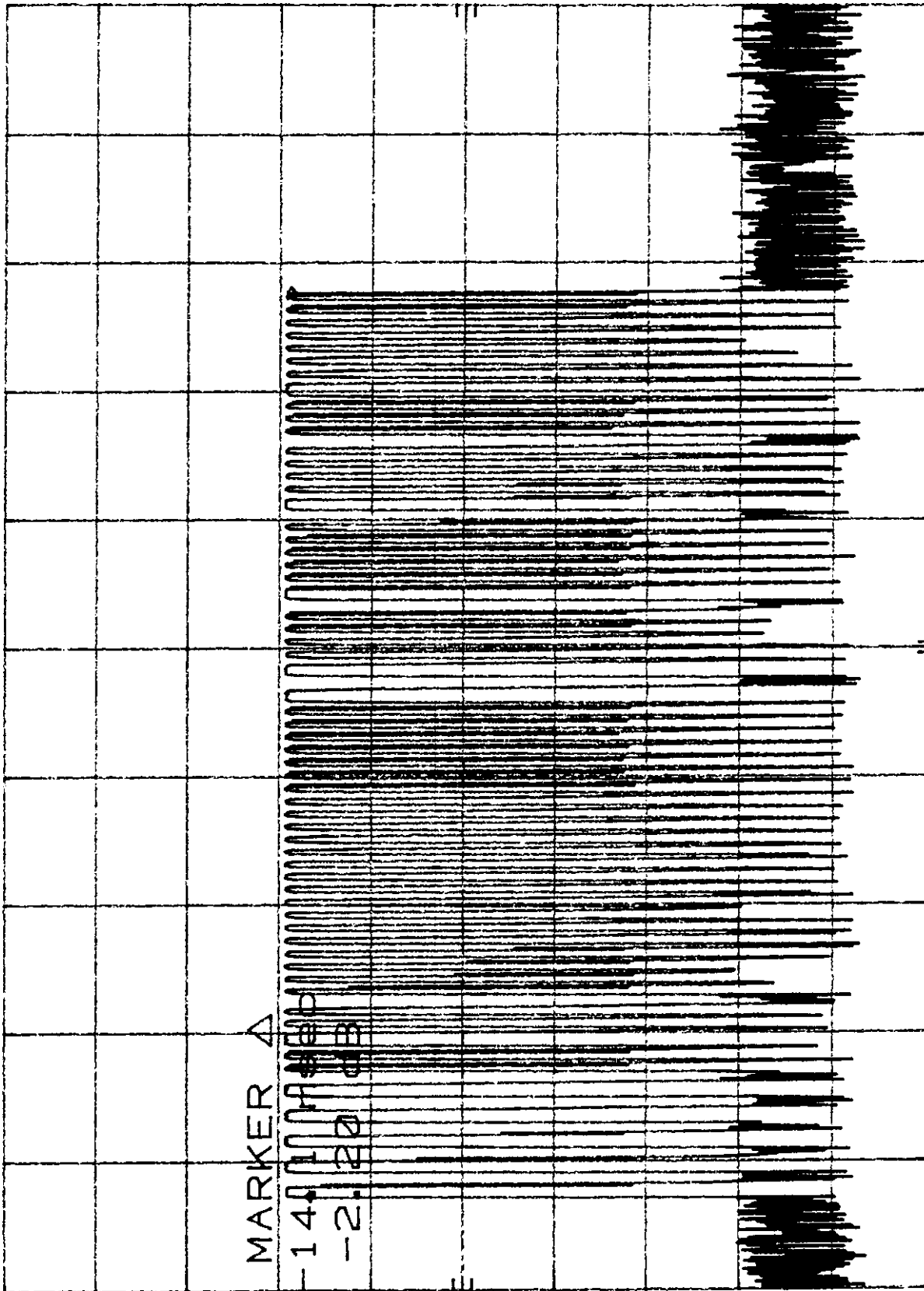
MKR  $\Delta$ -14.1 msec  
-2.20 dB

ATTEN 10 dB

REF 0.0 dBm

hp

10 dB/



SPAN 0 Hz  
SWP 20.0 msec

VBW 300 kHz

CENTER 304.110 000 MHz  
RES BW 100 kHz

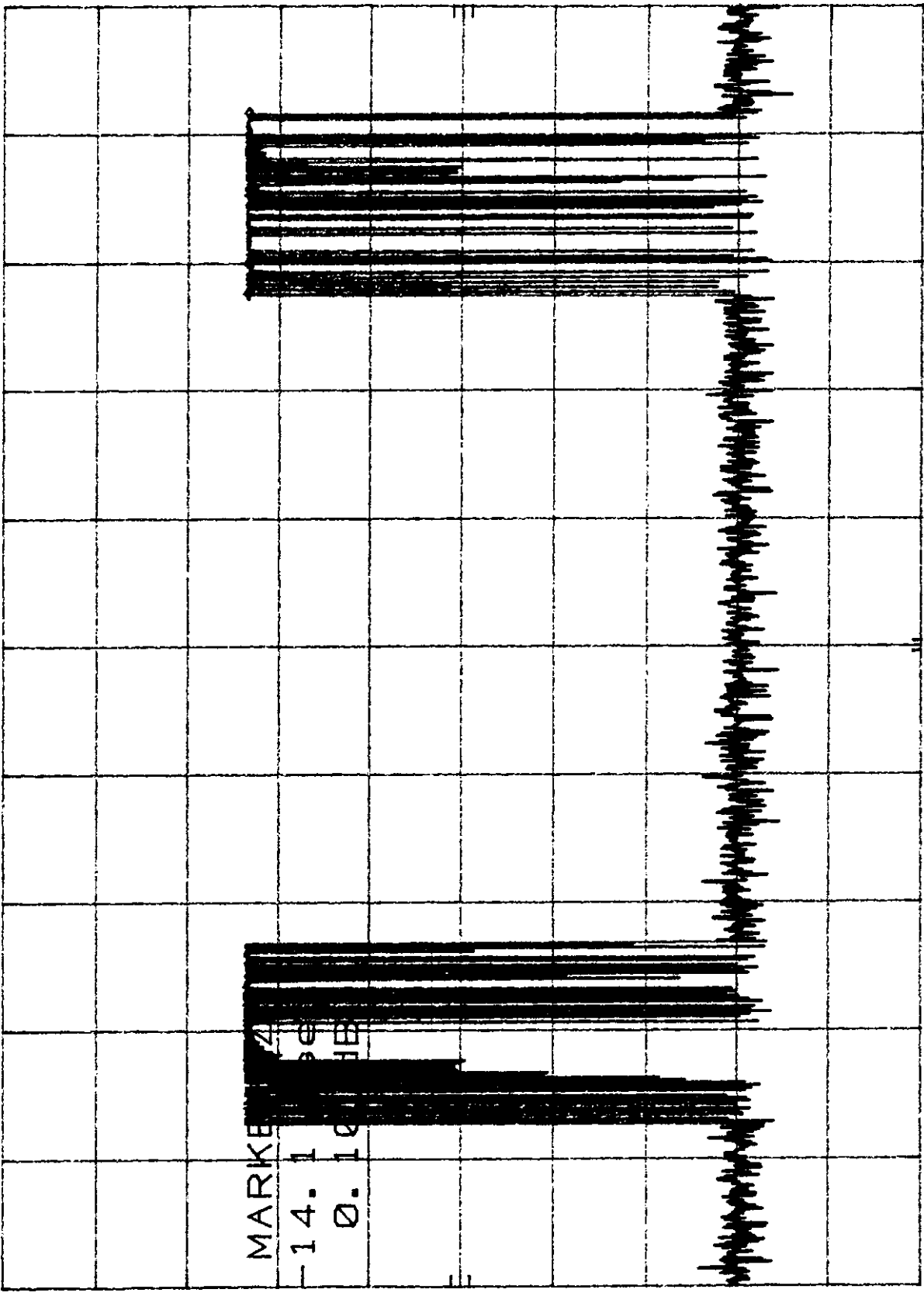
MKR  $\Delta$ -14.1 msec  
0.10 dB

ATTEN 10 dB

REF 0.0 dBm

h<sub>p</sub>

10 dB/



SPAN 0 Hz  
SWP 100 msec

VBW 300 kHz

CENTER 304.110 000 MHz  
RES BW 100 kHz



EQUIPMENT: *The Detection Systems "EA102A-304 Transceiver"*  
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**Section 5. Radiated Emissions**

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: Wayne Clarke	DATE: April 4, 1998

**Test Conditions:** Test Voltage: 12 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 (microvolts/m) = (56.82 x F) - 6136  
\* Linear interpolation with frequency F in MHz For 260 - 470 MHz: FS (microvolts/m) = (41.67 x F) - 7083

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

Frequency (MHz)	Field Strength (µV/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 43.1 dBµV/m @ 3m at 314.71 MHz. This is 2.9 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.



*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"*  
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**Section 6. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: Wayne Clarke	DATE: April 4, 1998

**Test Conditions:** Test Voltage: 12 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.

ATTEN 10dB

MKR -14.50dBm

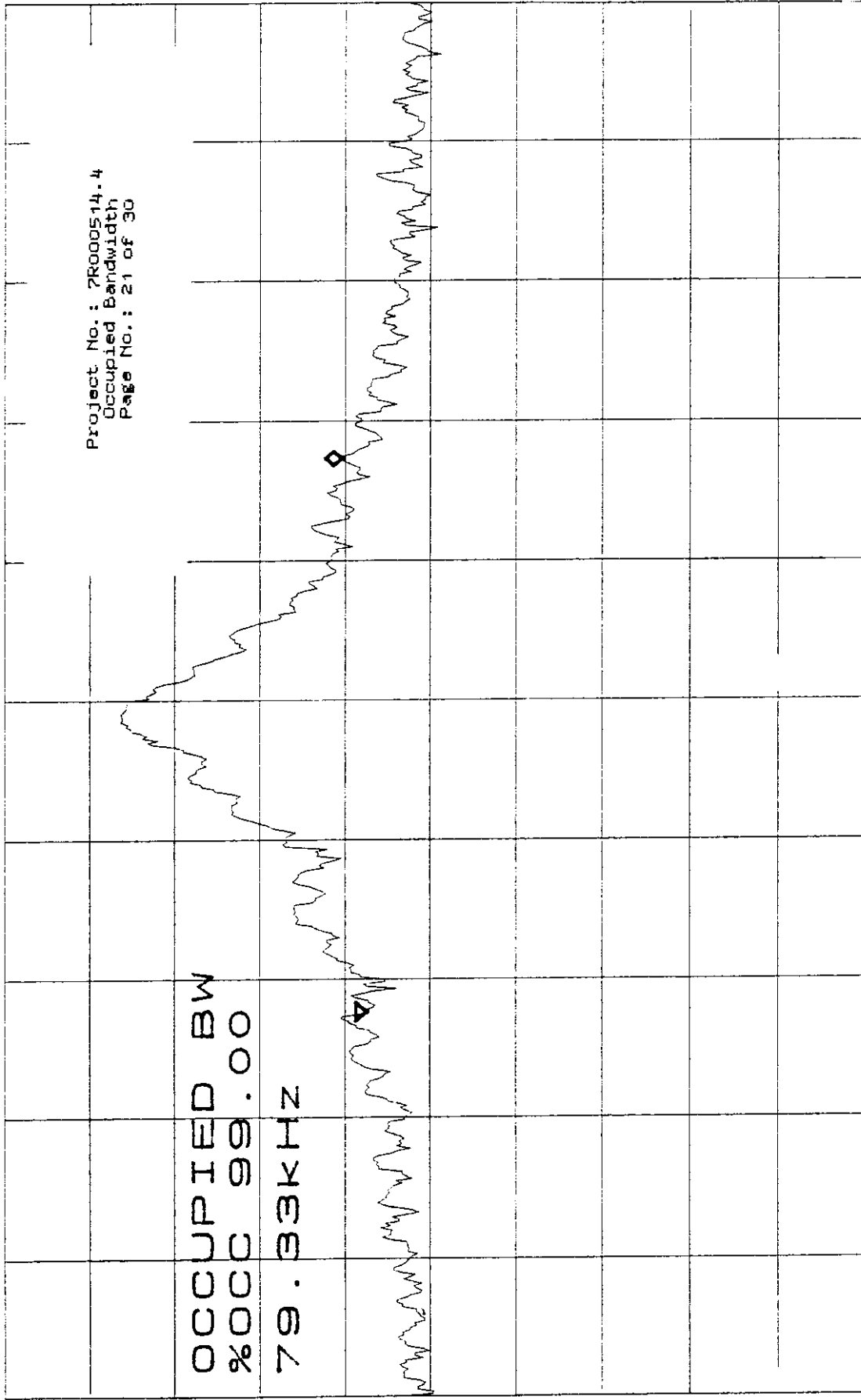
RL 0dBm

10dB/

303.9917MHZ

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Occupied Bandwidth  
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OCCUPIED BW  
%OCC 99.00  
79.33KHZ



R

CENTER 303.9917MHZ SPAN 200.0KHZ

RBW 3.0KHZ

VBW 3.0KHZ

SWP 67.0ms

MKR  $\Delta$  53.4 KHZ  
0.00 dB

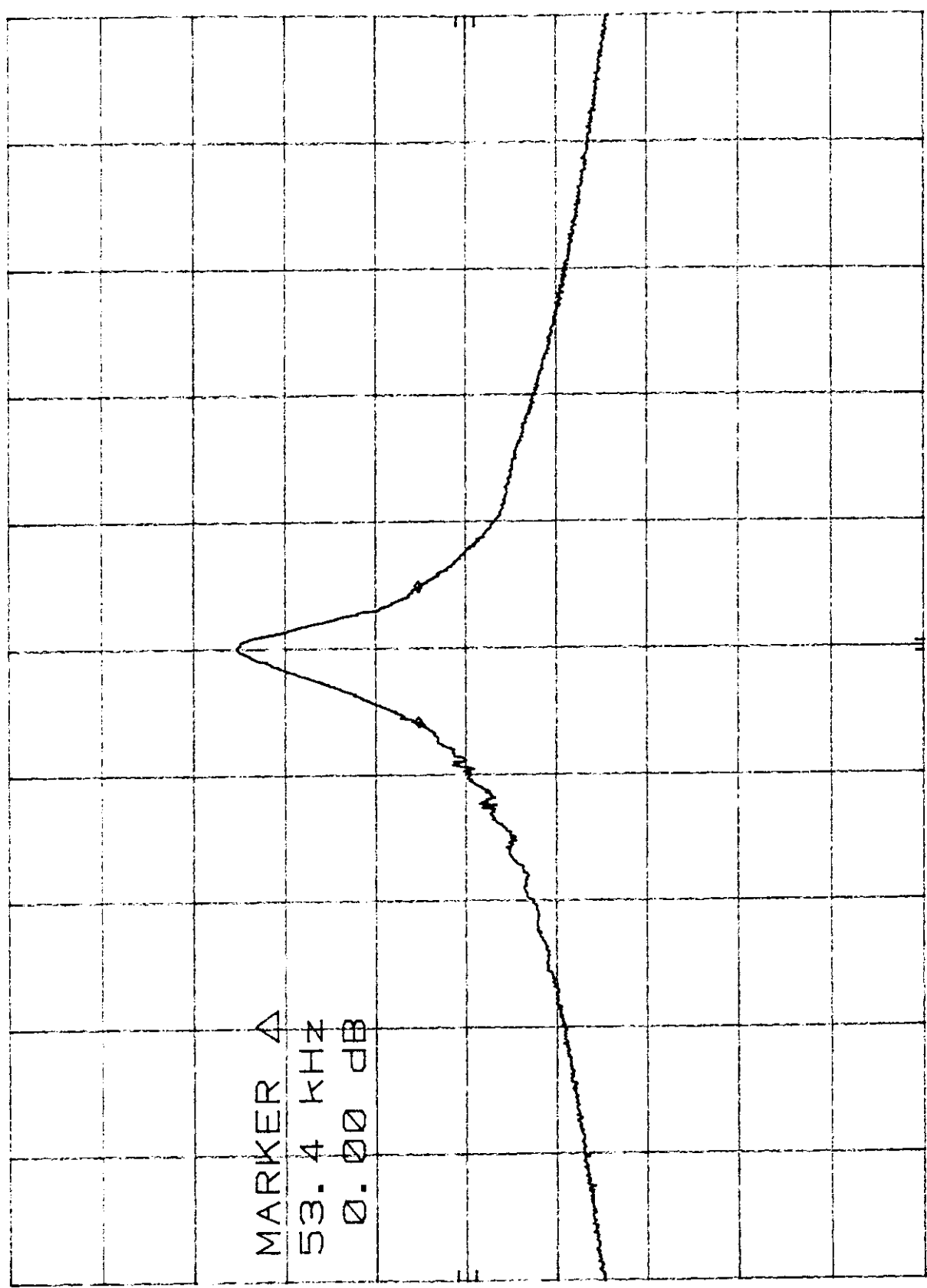
ATTEN 10 dB

REF 0.0 dBm

hp

10 dB/

MARKER  $\Delta$   
53.4 KHZ  
0.00 dB



SPAN 499 KHZ  
SWP 30.0 msec

VBW 30 KHZ

CENTER 304.004 MHZ  
RES BW 10 KHZ

EQUIPMENT: *The Detection Systems "EA102A-304 Transceiver"*  
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**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 ±0.01%. This frequency tolerance shall be maintained for a temperature variation of \_\_\_\_\_ 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 \_\_\_\_\_ 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.

**NOT APPLICABLE**

EQUIPMENT: *The Detection Systems "EA102A-304 Transceiver"*  
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**Section 8. Periodic Alternate Field Strength Requirements**

NAME OF TEST: Periodic Alternate Field Strength Requirements	PARA. NO.: 15.231(d)
TESTED BY:	DATE:

**Test Conditions:** Test Voltage: \_\_\_\_\_ VAC  
 Temperature: \_\_\_\_\_ °C  
 Humidity: \_\_\_\_\_ %

**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)
40.68 - 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/Does Not Comply.

**Test Data:** See attached table.

*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"*  
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**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.



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Measurement Data:

Conductor	Frequency (MHz)	CISPR (dB $\mu$ V)	Average (dB $\mu$ V)	BB/NB	BB Correction (dB)	Result (dB $\mu$ V)

**NOT APPLICABLE**

*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"*  
*FCC ID: ESV-0251-2*

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**Conducted Photographs (Worst Case Configuration)**

SIDE VIEW

**NOT APPLICABLE**

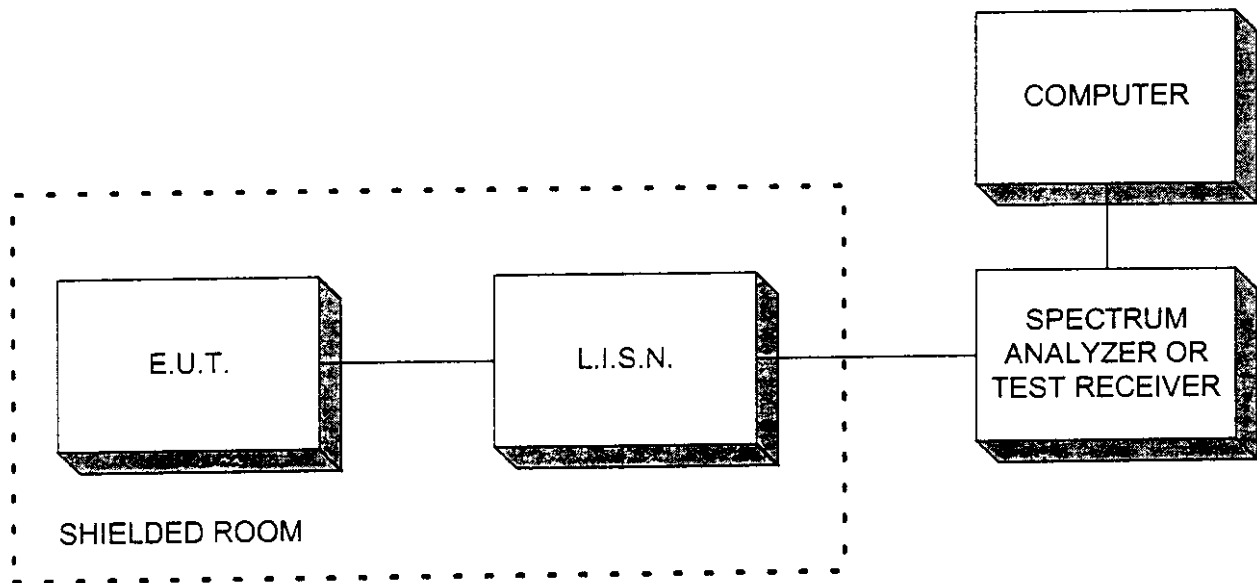
FRONT VIEW

EQUIPMENT: *The Detection Systems "EA102A-304 Transceiver"*  
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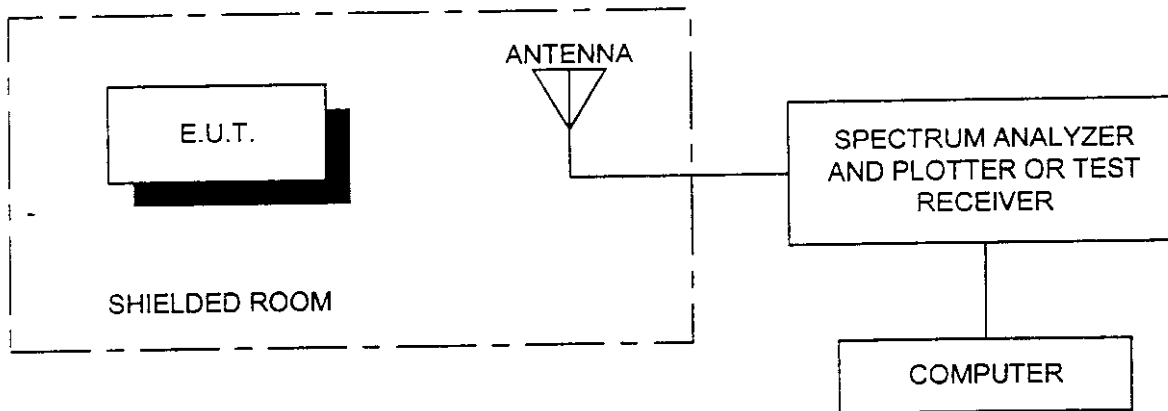
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### Section 10. Block Diagrams

#### Conducted Emissions



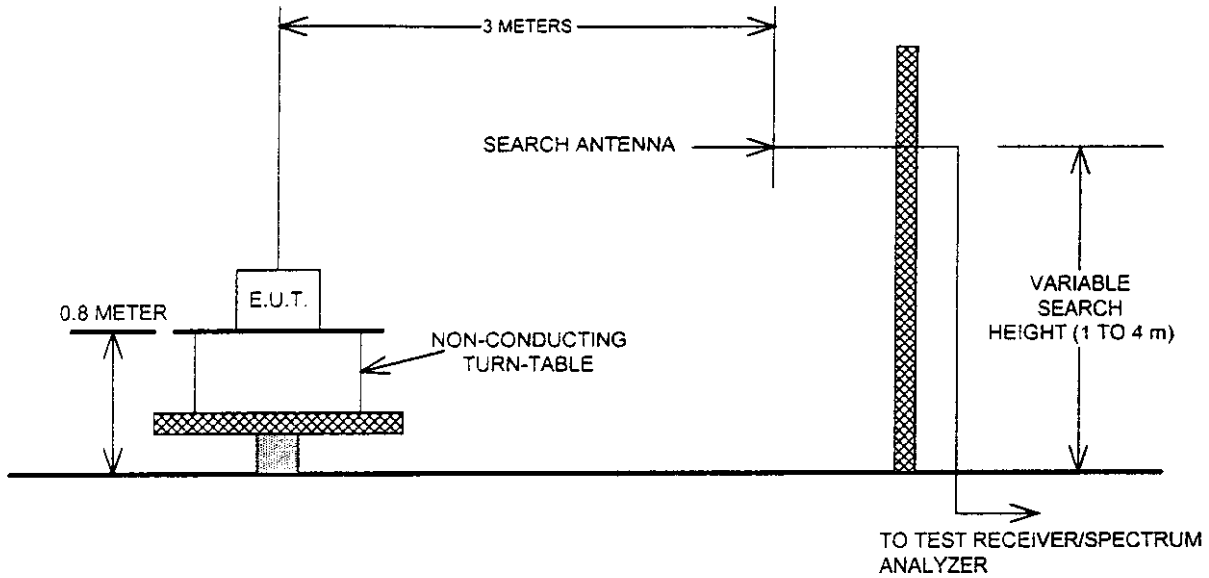
#### Radiated Prescan



EQUIPMENT: *The Detection Systems "EA102A-304 Transceiver"*  
FCC ID: *ESV-0251-2*

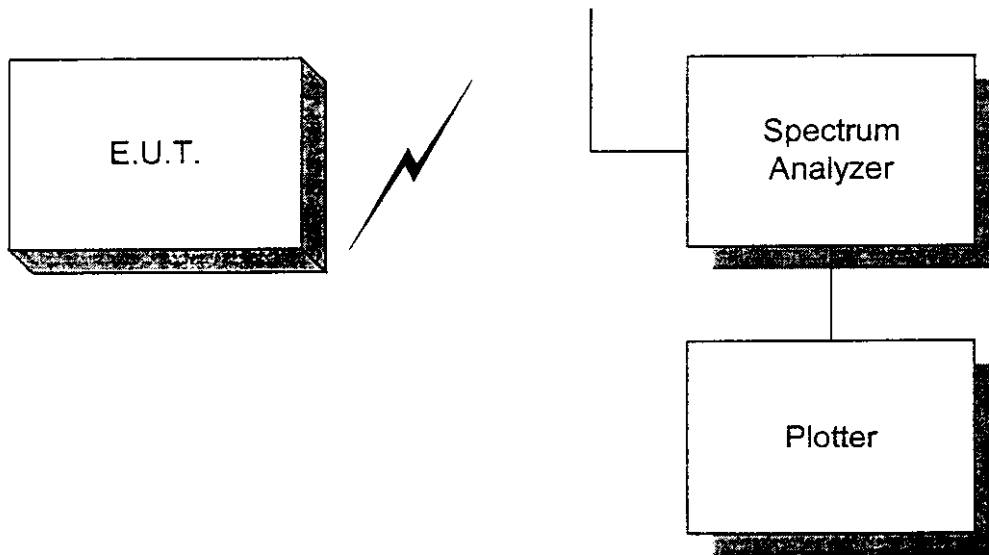
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### Outdoor Test Site For Radiated Emissions



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

### Occupied Bandwidth



*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"**FCC ID: ESV-0251-2***Section 11. Test Equipment List****Equipment List - Radiated Emissions**

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
	Biconilog Antenna	EMCO	3143	9404-1039	NCR	NCR
1 Year	Dipole Antenna Set	EMCO	3121C	1029	Oct. 28/97	Oct. 28/98
1 Year	Receiver	Rohde & Schwarz	ESVP	892661/014	Mar. 31/98	Mar. 31/99
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	2311A02238	Sept. 30/97	Sept. 30/98
1 Year	Spectrum Analyzer Display	Hewlett-Packard	8566B	2314A04759	Sept. 30/97	Sept. 30/98
1 Year	Quasi-Peak Adapter	Hewlett Packard	85650A	2043A00302	Sept. 30/97	Sept.30/98
	Plotter	Hewlett Packard	7470A	2210A08836	N/A	N/A
2 Year	Horn Antenna	EMCO	3115	4336	Oct. 30/97	Oct. 30/99
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Oct. 24/97	Oct. 24/98

Note: N/A = Not Applicable  
NCR = No Cal Required

**KTL - Certelem Laboratories Inc.**

FCC PART 15, SUBPART C  
FOR LOW POWER TRANSMITTERS  
PROJECT NO.: 7R00514.4  
ANNEX A

*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"*  
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**ANNEX A**  
**RESTRICTED BANDS**

*EQUIPMENT: The Detection Systems "EA102A-304 Transceiver"*  
*FCC ID: ESV-0251-2*

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**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			