

R & B Enterprises
20 Clipper Road
West Conshohocken, PA 19428-2721
610-825-1960



Accredited Laboratory


FCC TEST REPORT
Prepared for
TELECOURIER, INC.
on the
MINI-ALARM TRANSMITTER
Model U971
Report No. 973942

February 27, 1997

Customer:
Telecourier, Inc.
Wayne, PA 19087

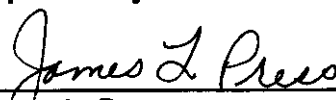
P.O. Number: 9706
Job Number: 97T010
Requirement: FCC Part 15, Subpart C
Section 15.231

Prepared by:



Dean Mazzotta
Technical Writer

Approved by:



James L. Press
Engineering Services Manager

This document shall not be reproduced, except in full, without the written approval of R&B Enterprises.
This document cannot be used to claim a product endorsement by NVLAP or any agency of the U.S. Government.

EMC Science Center, Inc. T/A
R & B Enterprises

Report No. 973942
Revision: -

TABLE OF CONTENTS

Section	Title	Page
	ADMINISTRATIVE DATA	1
	EXECUTIVE SUMMARY	2
1	INTRODUCTION	3
	1.1 Description of Equipment Under Test (EUT)	3
	1.2 Mode of Operation	3
	1.3 Applicable Documents	3
2	TEST FACILITIES	4
	2.1 Scope	4
	2.2 Open-Area Radiated Emissions Test Site	4
	2.3 Test Equipment	5
	2.3.1 Calibration	5
	2.3.2 Measurement-Receiver Characteristics	5
3	TEST PROCEDURES	6
	3.1 Open-Area Radiated Emissions Test Procedure	6
	3.2 Bandwidth of Emissions Test Procedure	6
	3.3 Test Results	6
	3.3.1 Radiated Emissions	6
	3.3.2 Bandwidth of Emissions	6
	3.4 List of Test Equipment	7
	ENCLOSURES	
	A Radiated Emissions Data	9
	B Bandwidth of Emissions	17
	C Antenna Factors	23
	D Supplemental Information	26

ADMINISTRATIVE DATA

Purpose of Test: To demonstrate compliance of the Mini-Alarm Transmitter, Model U971, with FCC Part 15, Subpart C, Section 15.231 Requirements

Equipment Tested: Mini-Alarm Transmitter
Model U971

Manufacturer: Ascom Tateco
Goteborg, Sweden

Test Specification: ANSI C63.4-1992

Test Personnel: George Robinson
EMC Test Specialist

Customer Representative: Scott Fahey
Telecourier, Inc.

Date of Test: January 24 and 28, 1997

Test Location: EMC Science Center T/A
R&B Enterprises
20 Clipper Road
West Conshohocken, PA 19428

SECTION 1 INTRODUCTION

1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The Mini-Alarm Transmitter, Model U971, is a wrist-watch-size wireless alarm transmitter used together with the U981 mini-alarm receiver as a mini-alarm system, or in an ordinary telePROTECT 900 alarm system. The unit will only transmit its ID code on command.

The U971 alarm transmitter can also be an integrated part in a teleCourier 900 paging system. Alarms are transmitted in the UHF radio band and the code format is compatible with the teleCOURIER 900 paging system.

Alarms are actuated by pressing the alarm pushbutton. Different types of alarms can be transmitted, depending on whether the button is pressed once or twice. The type of alarm and pushbutton function are programmed in an internal EEPROM.

Maximum range for the battery-operated transmitter is about 100 meters at line of sight when used together with the mini-alarm receiver, U981.

The transmitter is approximately 2" round and ½" deep. The unit is manufactured by Ascom Tateco.

1.2 MODE OF OPERATION

The EUT was transmitting continuously.

1.3 APPLICABLE DOCUMENTS

ANSI C63.4-1992 May 26, 1996	"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"
ISO 10012-1:1992(3) April 1, 1996	"Quality Assurance Requirements for Measuring Equipment Part 1: Metrological Confirmation System for Measuring Equipment"
ANSI/NCSL Z54001:1994 July 27, 1994	"American National Standard for Calibration General Requirements - Calibration Laboratories and Measuring and Test Equipment"
Code of Federal Regulations Title 47 Part 15	"Telecommunications, Federal Communications Commission Radio Frequency Devices"

SECTION 2 TEST FACILITIES

2.1 SCOPE

Radiated emission testing was performed at an antenna-to-EUT distance of 3 meters according to the procedures in ANSI C63.4-1992.

The open-area test site facility used to collect the radiated emissions data is located at the EMC Science Center, Inc., 20 Clipper Road, West Conshohocken, PA 19428. This site has been fully described in a report submitted to the FCC dated April 29, 1994.

2.2 OPEN-AREA RADIATED EMISSIONS TEST SITE

The radiated emissions test was performed on an open-area test site located adjacent to R & B Enterprises' EMI facility. (See Figure 3-1.) The test site was constructed and tested to the recommendations/requirements of ANSI C63.4-1992. The following is a description of the test site.

The conducting ground plane measures 56 feet (17 meters) wide by 70 feet (21.3 meters) long and is made up of 1/4-inch square galvanized steel mesh. Copper ground rods are connected to the ground plane at key locations.

This size ground plane allows an extension of five meters beyond the antenna tower and is sufficiently wide to that it extends at least five meters beyond the widest horizontally polarized antenna (dipole or biconical).

The receive antennas were placed on a remotely controlled motorized fiberglass antenna positioner located three or ten meters from the EUT. The positioner was capable of positioning the center of the antenna at any height in the range of one to four meters above the ground plane. The positioner was also capable of maintaining the antenna in both horizontal and vertical polarizations.

The antenna signals were fed to the EMI receiver located within the building via a shielded cable. The EMI receiver was powered from a common wall socket through an isolation transformer.

The EUT was placed on a wooden table with the dimensions of 1.5 meters x 1.0 meter x 0.8 meter high. The table was placed on a remotely controlled turntable, thus allowing emissions to be measured from all sides of the EUT. The EUT is located in a wooded weather protected structure 20 feet wide by 36 feet long and 16-1/2 feet high.

The power supplied to the EUT came from a separate power run from the main distribution box through underground PVC conduit. Receptacles were brought above ground via PVC conduit to the center of the turntable. The power was switchable remotely via a switch located at the building power-distribution panel

2.3 TEST EQUIPMENT

2.3.1 Calibration

The calibration due date for each piece of test equipment used was specified on a sticker affixed to its case. All of the test equipment had been calibrated in accordance with the requirements of ISO 10012-1:1992(E) and ANSI/NSL Z54001:1994 using standards directly traceable to the National Institute of Standards and Technology.

2.3.2 Measurement-Receiver Characteristics

All radiated emission measurements were made with the EMI analyzer in the quasi-peak detection mode. The bandwidths for the EMI analyzer were as follows:

<u>Frequency Range</u>	<u>Bandwidth</u>
150 kHz to 30 MHz	9 kHz
30 MHz to 1000 MHz	120 kHz

SECTION 3 TEST PROCEDURES

3.1 OPEN-AREA RADIATED EMISSIONS TEST PROCEDURE

The EUT was configured in a normal operating configuration. Preliminary radiated measurement were performed inside the shielded enclosure at a measurement distance of one meter to determine the emission characteristics of the EUT. The EUT was rotated 360° to determine the configuration that produced the highest level. This procedure was utilized for the final measurement performed.

The final radiated emissions test was performed on the open-area site. The measurements were taken with an EUT-to-antenna distance of three meters over the frequency range from 30 MHz to 1000 MHz. The frequency and amplitude of the six highest radiated emissions relative to the limit were recorded as a minimum.

The radiated emissions measurements were taken in both the horizontal and vertical polarization of the receive antenna. Also, the receive antenna was varied in height from one to four meters to measure the maximum emissions from the EUT.

3.2 BANDWIDTH OF EMISSIONS TEST PROCEDURE

The EUT was mounted on a test board (T971PA) and its output was directly coupled to a spectrum analyzer. The bandwidth was measured 20 dB below the modulated carrier.

3.3 TEST RESULTS

3.3.1 Radiated Emissions

The EUT was set up for radiated emissions testing in the open-area test site as shown in Figure 3-1. The EUT complied with FCC Part 15, Subpart C, Section 15.231 requirements. The results of the radiated emissions test are included in Appendix A.

3.3.2 Bandwidth of Emissions

The EUT complied with the requirements of Section 15.231(c).

3.4 LIST OF TEST EQUIPMENT

<u>Item</u>	<u>Charact.</u>	<u>Mfr</u>	<u>Model No.</u>	<u>Serial No.</u>	<u>Cal Due</u>
Spectrum Analyzer	9 kHz - 22 GHz	Hewlett-Packard	8593EM	3639A00177	10-30-97
Biconical Antenna	20 MHz - 200 MHz	EMCO	3109	9101-2529	07-10-97
Log Periodic Antenna	150 MHz - 1000 MHz	Antenna Corporation	2137-L1-C	141	04-11-97
Tunable Dipole Antenna Set	20 MHz - 1000 MHz	Compliance Design	Roberts	601	06-07-97
Wooden Test Bench	1.5 m x 1.0 m L x 80 cm H	R&B Enterprises	101	N/A	N/A
Antenna Tower	17 feet H Fiberglass	Electro-Metrics	EM-4720	N/A	N/A
Turntable	1.5 meter	Electro-Metrics	EM-4704	N/A	N/A

ENCLOSURE A
RADIATED EMISSIONS DATA

REC ID: BX10077

Figure A-4
Radiated Emissions Data Sheet

Test Location: Open-Area Test Site
Antenna Position: Worst Case 3 meter
Date: January 24, 1997
Antenna: Log Periodic, Model 2137-LI-C
Comments: Mini-Alarm Transmitter U971

Frequency (MHz)	Signal Type		Reading (dB μ V)	Probe Factor (dB)	IBW (dB)	Actual Level (dB μ V/m)	Limit Level in μ V/m	Actual Level in μ V/m @ 3 meters
	NB	BB						
Fundamental Frequency - Section 15.231(b)(1)(2)								
458.787	X		61.49	14.5		75.99	12,000	6309.5
Spurious Frequency - Section 15.231(b)(3)								
305.86	X		30.59	10.9		41.49	540	118
456.337	X		30.74	14.5		45.24	1190	183
457.549	X		24.74	14.5		39.24	1190	92
459.99	X		25.60	14.5		40.10	1190	102
461.233	X		32.54	14.5		47.04	1190	225
509.76	X		31.93	15.2		47.13	1250	225.5
662.71	X		18.54	20.0		38.54	1250	84.5
Restricted Band - Section 15.231(b)(3)								
611.72	X		27.44	16.5		43.94	200	157.5

Figure A-5 Radiated Emissions Test Data

10:20:28 JAN 28, 1997

MARKER
305.860 MHz
30.59 dBµV

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 305.860 MHz
30.59 dBµV

MARKER
NORMAL

MARKER
A

MARKER
AMPTD

SELECT
1 2 3 4

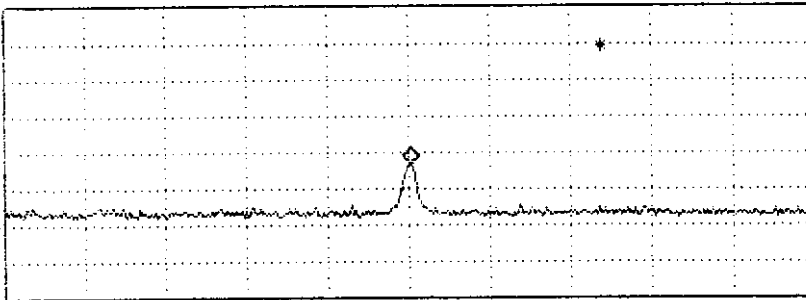
MARKER 1
ON OFF

More
1 of 3

LOG REF 74.0 dBµV

10
dB/
#ATN
0 dB

VA SB
SC FC
CORR



CENTER 305.840 MHz SPAN 7.816 MHz
IF BW 120 kHz AVG BW 300 kHz SWP 20.0 msec

10:24:58 JAN 28, 1997

CENTER
662.687 MHz

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 662.707 MHz
18.54 dBµV

CLEAR
WRITE A

MAX
HOLD A

VIEW A

BLANK A

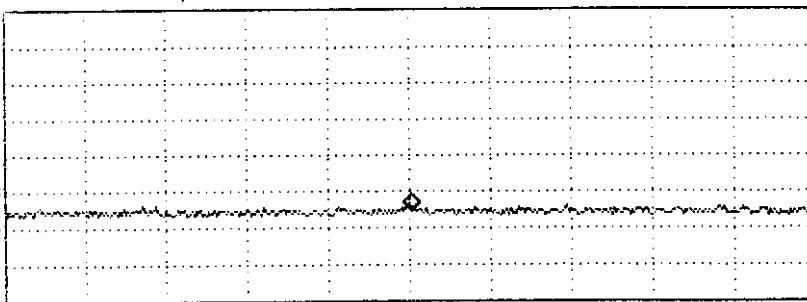
Trace
A B C

More
1 of 4

LOG REF 74.0 dBµV

10
dB/
#ATN
0 dB

VA SB
SC FC
CORR



CENTER 662.687 MHz SPAN 7.816 MHz
IF BW 120 kHz AVG BW 300 kHz SWP 20.0 msec

Figure A-6 Radiated Emissions Test Data

09:56:35 JAN 28, 1997

MARKER
509.760 MHz
31.93 dBµV

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 509.760 MHz
31.93 dBµV

MARKER
NORMAL

MARKER

▲

MARKER
AMPTD

SELECT
1 2 3 4

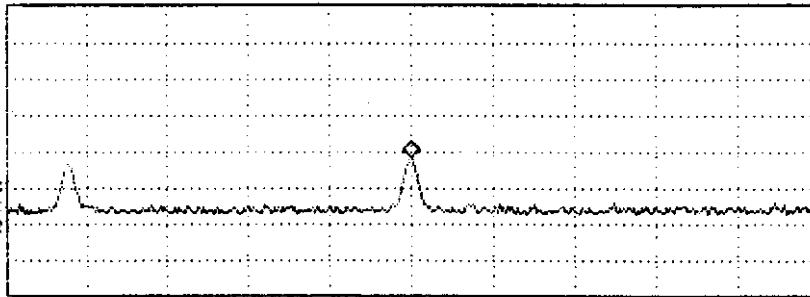
MARKER 1
ON OFF

More
1 of 3

LOG REF 74.0 dBµV

10
dB/
#ATH
0 dB

VA SB
SC FC
CORR



CENTER 509.750 MHz SPAN 7.816 MHz
IF BW 120 kHz AVG BW 300 kHz SWP 20.0 msec

10:00:20 JAN 28, 1997

MARKER
611.720 MHz
27.44 dBµV

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 611.720 MHz
27.44 dBµV

MARKER
NORMAL

MARKER

▲

MARKER
AMPTD

SELECT
1 2 3 4

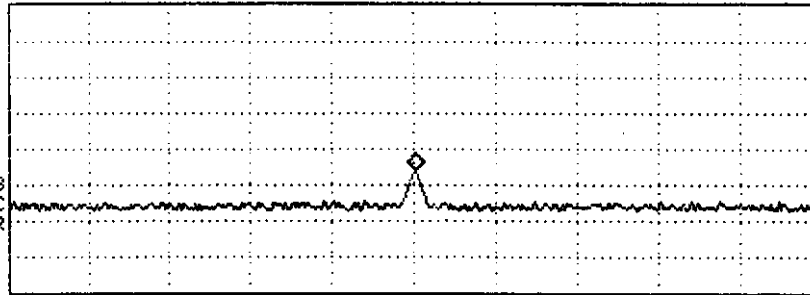
MARKER 1
ON OFF

More
1 of 3

LOG REF 74.0 dBµV

10
dB/
#ATH
0 dB

VA SB
SC FC
CORR



CENTER 611.700 MHz SPAN 7.816 MHz
IF BW 120 kHz AVG BW 300 kHz SWP 20.0 msec

Figure A-7 Radiated Emissions Test Data

09:48:41 JAN 28, 1997

REF LEVEL
74.0 dB μ V

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 451.223 MHz
32.54 dB μ V

dBm

dBmV

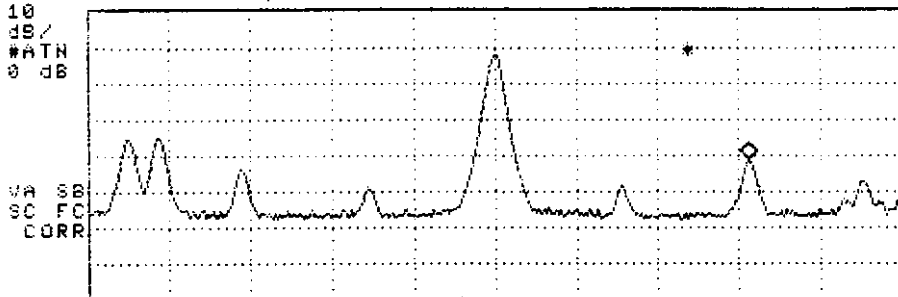
dB μ V

Volts

Watts

Previous
Menu

LOG REF 74.0 dB μ V



CENTER 458.780 MHz IF BW 120 kHz AVG BW 300 kHz SPAN 7.816 MHz SWP 20.0 msec

09:49:59 JAN 28, 1997

MARKER
458.780 MHz
51.49 dB μ V

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 458.780 MHz
51.49 dB μ V

MARKER
NORMAL

MARKER

Δ

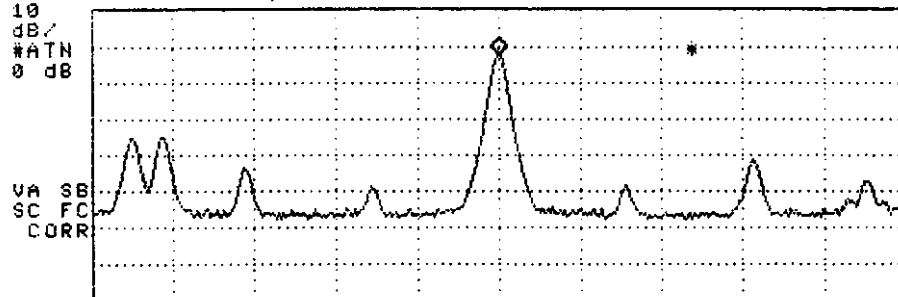
MARKER
AMPTD

SELECT
1 2 3 4

MARKER 1
ON OFF

More
1 of 3

LOG REF 74.0 dB μ V



CENTER 458.780 MHz IF BW 120 kHz AVG BW 300 kHz SPAN 7.816 MHz SWP 20.0 msec

ENCLOSURE B
BANDWIDTH OF EMISSIONS

**Enclosure B
Bandwidth of Emissions
Section 15.231 (c)**

The bandwidth of the emissions shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

Bandwidth is determined at the points 20 dB below the modulated carrier.

Bandwidth. $F_o \times 0.25 = 459^{10+6} \times 0.0025 = 1.147 \text{ MHz}$

The measured bandwidth, 20 dB below the modulated carrier, is less than 25 kHz from center frequency.

Figure B-1
Limits for Spurious Frequencies at 3 Meters

FCC 15.231 Limits

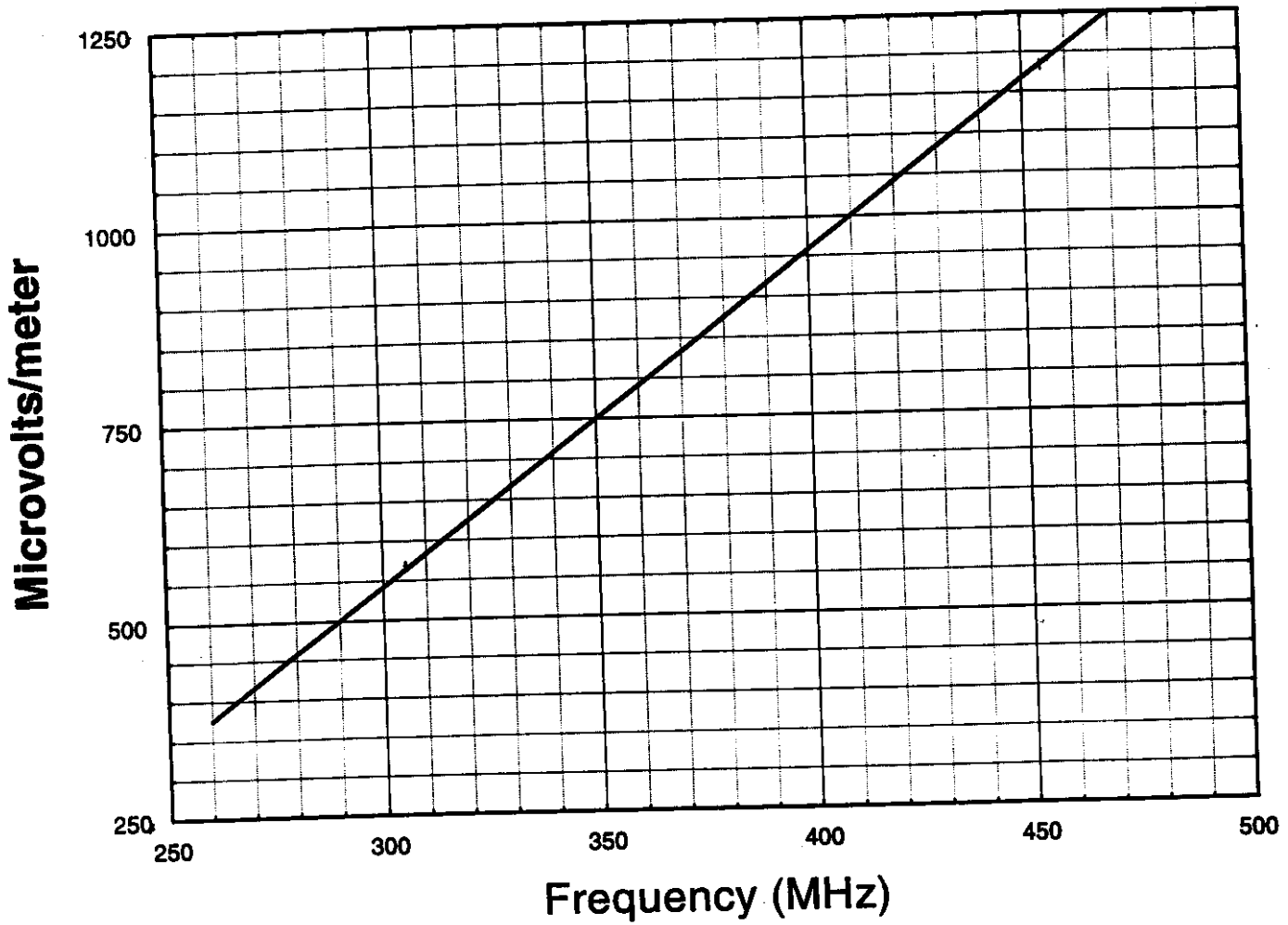


Figure B-2
Limits for Fundamental Frequencies at 3 Meters

FCC 15.231 Limits

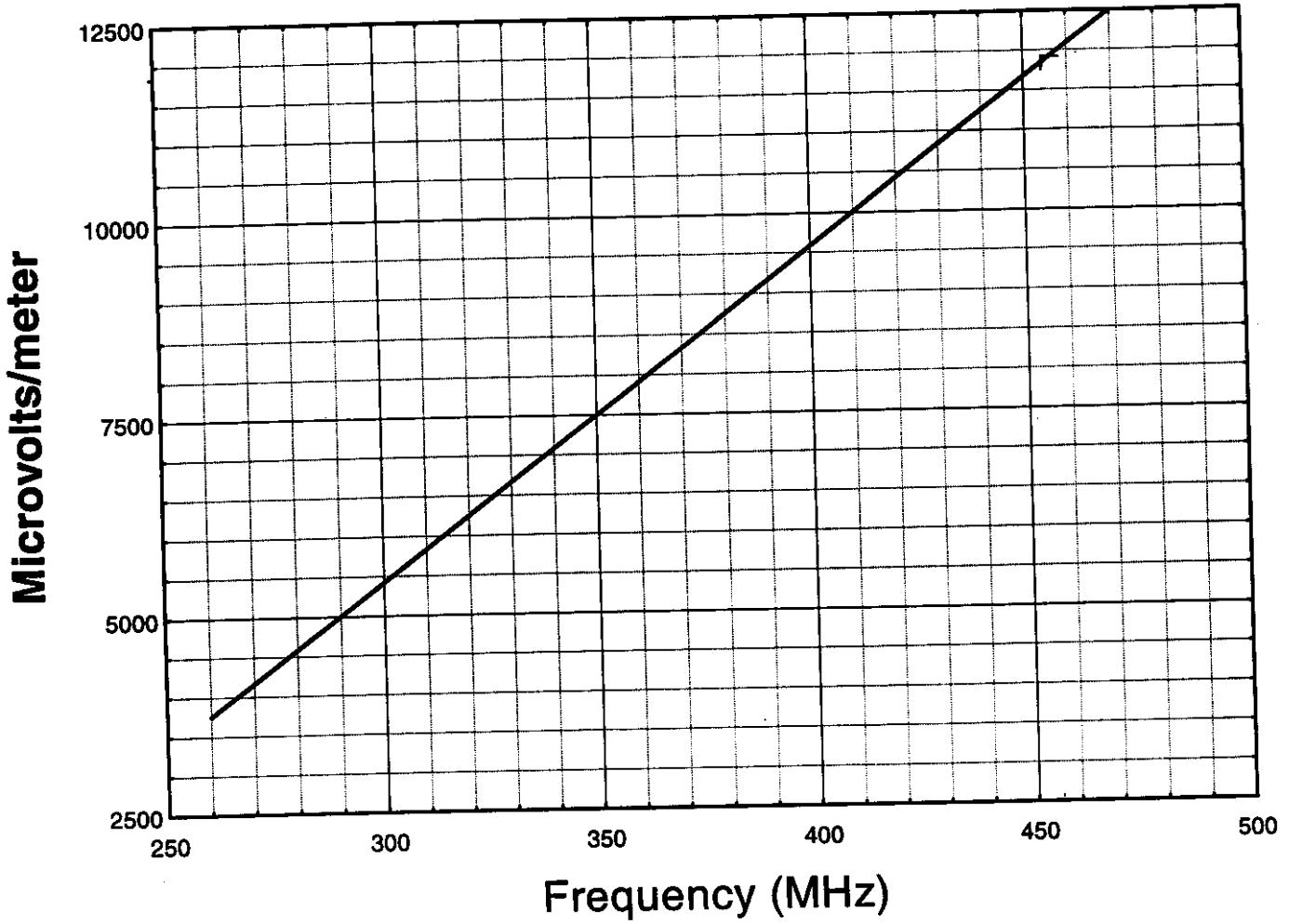
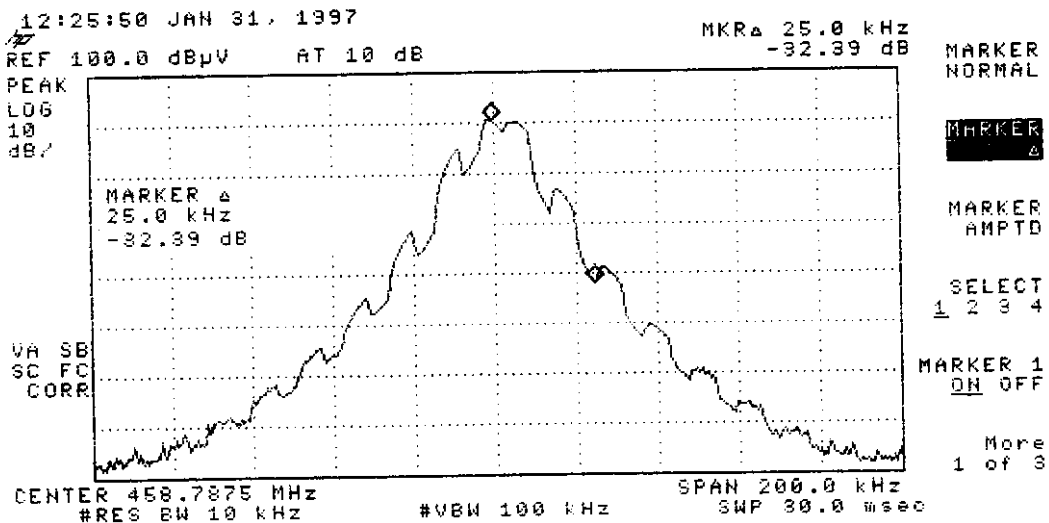
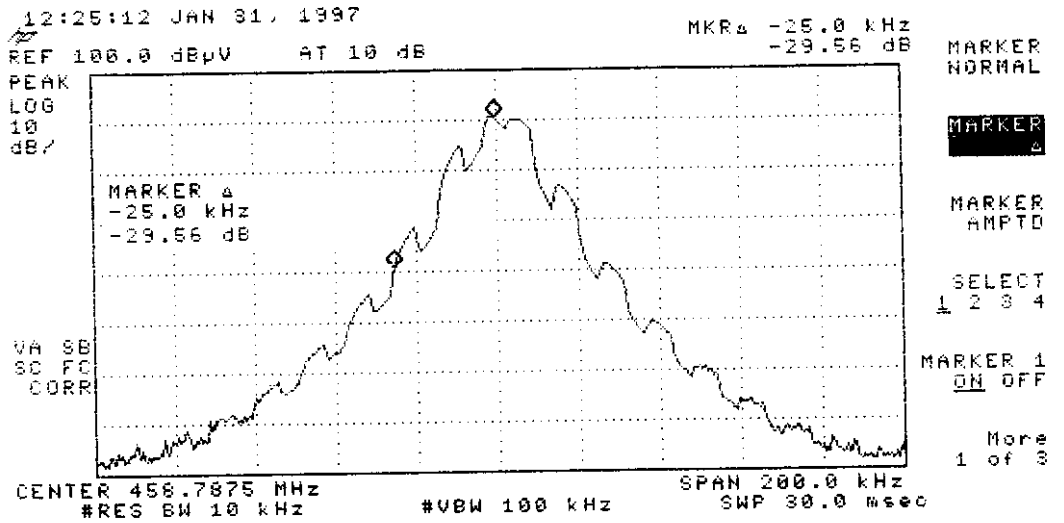


Figure B-4
Bandwidth of Emissions Test Data



ENCLOSURE C
ANTENNA FACTORS

Figure C-1

EMCO
BICONICAL ANTENNA
MODEL: 3109
S/N: 2529
CALIBRATION DUE: 07/10/97
3 meter calibration

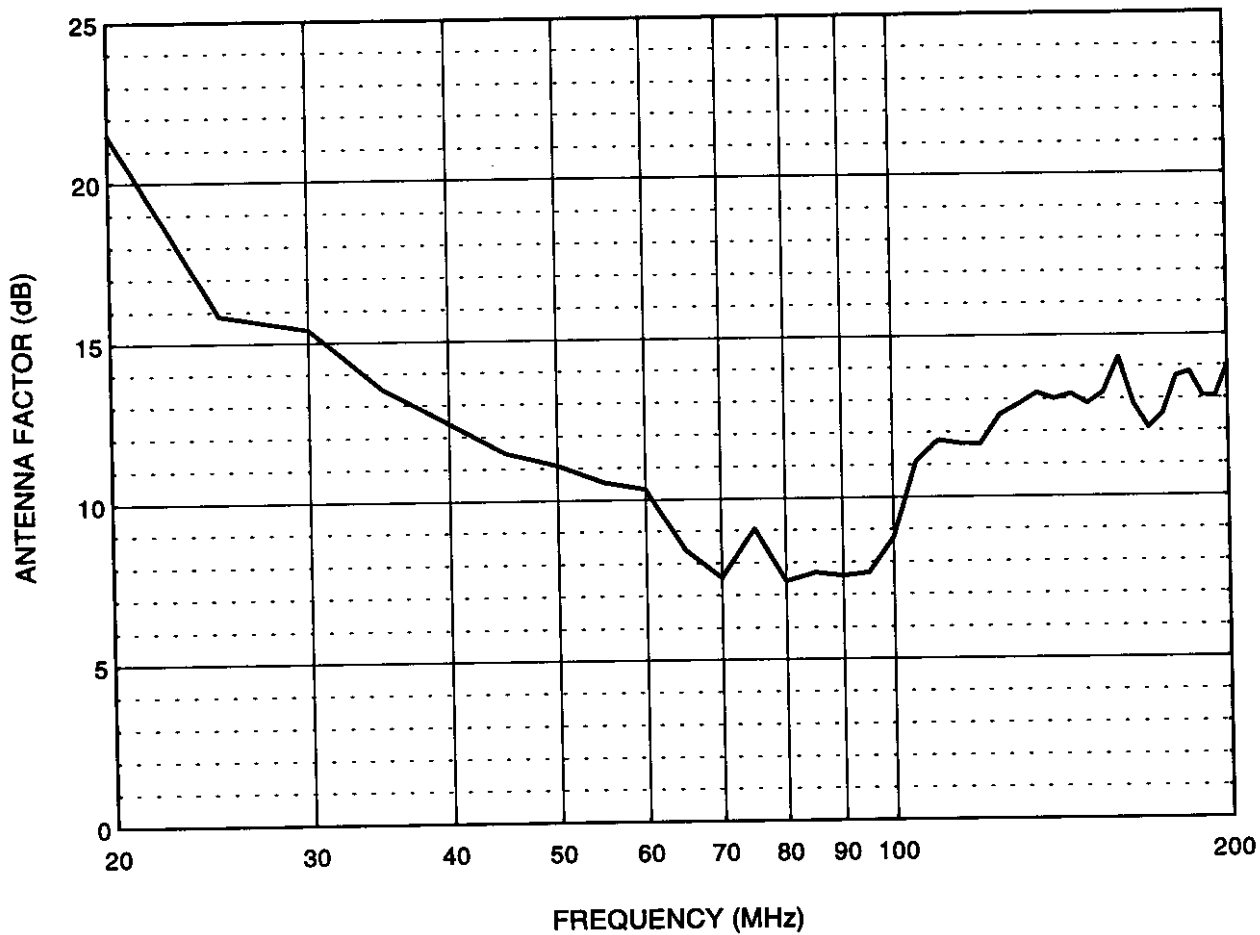
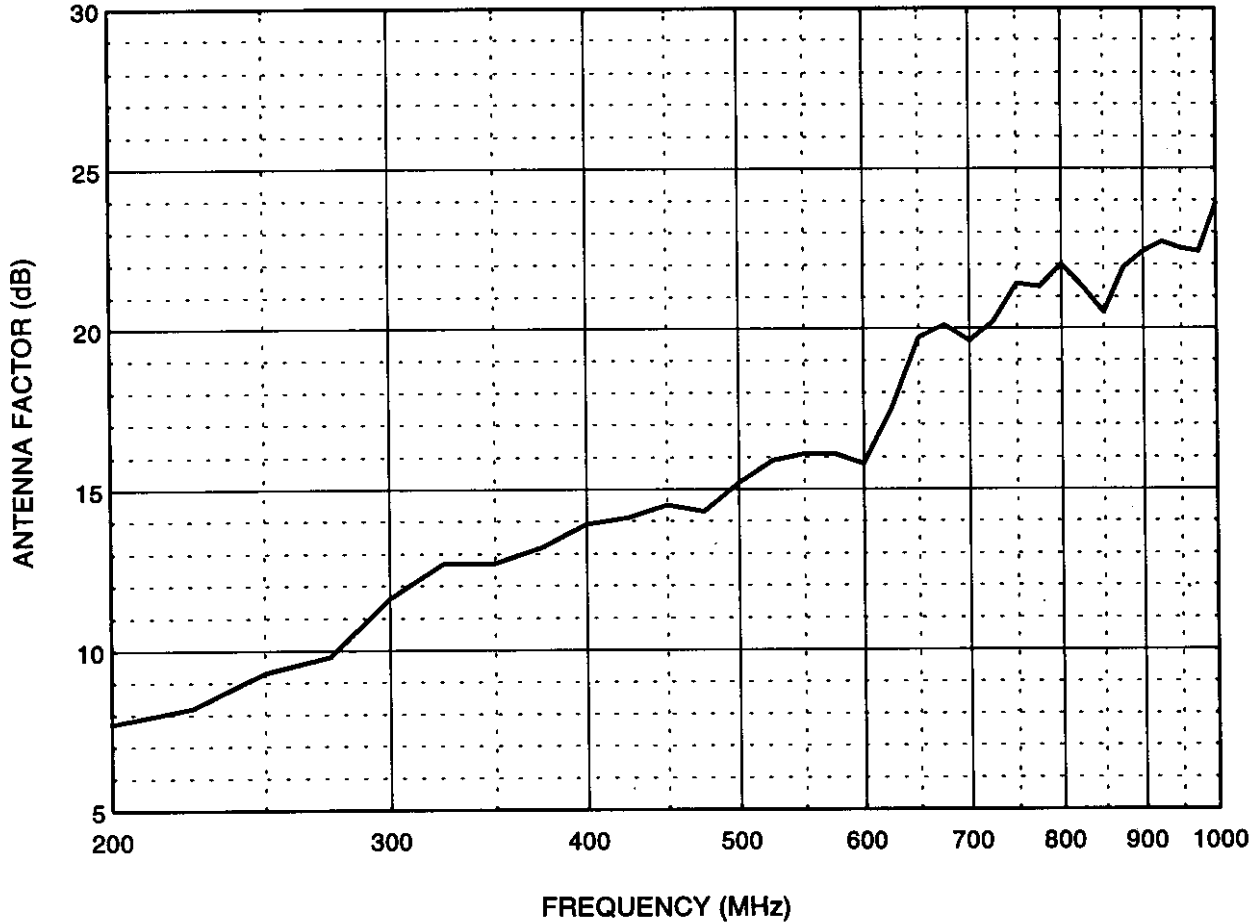


Figure C-2

ANTENNA CORPORATION OF AMERICA LOG PERIODIC ANTENNA
 MODEL: 2137-L1-C
 S/N: 141
 CALIBRATION DUE: 4/11/97
 3 METER DATA



**ENCLOSURE D
SUPPLEMENTAL INFORMATION**

SUPPLEMENTAL INFORMATION FOR FCC TESTS AND REPORTS

- 1. Name and Address of Manufacturer: Ascom Tatica
Box 8783
5-402 76 Göteborg Sweden
- 2. Name and Address of Company Requesting Testing: Telecourier Inc
960 West Valley Rd Suite 3102
Wayne, PA 19087
- 3. Type of Product: ~~6887~~ Wireless transmitter
- 4. Product name: ~~8887~~ Teleprotect 900
- 5. Model Number: U971
Serial Number: _____

6. Brief General and Technical Descriptions of the system/device under test. Include size of unit/device, and where applicable, attach a list of all peripheral devices utilized during the testing, including names of manufacturers, model and serial numbers, and FCC IDs.

The U971 is a wireless transmitter, under part 15.231. The unit will only transmit it's ID.

Enclosed is a spec sheet for the unit and you have the set equipment for testing in the package we sent with the device

The manufacture is Ascom Tatica, it is part of the TeleProtect 900 product. The unit is the U971.

SUPPLEMENTAL INFORMATION

Page 2

7. Number of I/O Interfaces: N/A

A. Describe each, including type, configuration and length of cable:

B. Describe I/O interfaces not used:

N/A

8. Describe interface units not included in test. Include manufacturer, model and serial numbers. Draw a block diagram of equipment configuration (use additional sheet, if required.)

N/A

JAN-15-97 WED 10:48

P. 05

SUPPLEMENTAL INFORMATION

Page 3

9. Modes of operation:

A. Describe all possible:

The unit when activated will transmit it's ID code to a receiver

B. Describe mode of operation used during testing:

C. Provide justification of operating mode used during testing, if not all.:

10. Describe how cables were oriented during tests.

A. Are cables provided with EUT?

B. Are variable lengths used?

C. Why were test lengths selected?

JAN-15-97 WED 10:48

P. 06

SUPPLEMENTAL INFORMATION

Page 4

11. Describe orientation of EUT (layout) during both CE and RE tests.

A. Was this varied during both CE and RE tests to obtain maximum emissions?

B. Provide photograph of worst case of both CE and RE configurations (use additional sheet, if required.)

12. Customer Representative:

Name: Scott Felney
Title: _____
Company: Telecourier, Inc
Date: 1/15/96