

15.247 Certification
FCC ID: IMK-ILC1PC

EMI TEST REPORT

On

SYMPHONY / PC Card

Prepared for

Proxim
295 N. Bernardo Ave
Mountain View, CA 94043
Tel : (650)960-1630
Fax: (650)960-0332

Prepared by

Electronic Compliance Laboratories Inc.
1249 Birchwood Dr.
Sunnyvale, CA 94089
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Test Report Number: A806001
Date of Test: May 29, 1998

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1.0 TEST FACILITY

Name: Electronic Compliance Laboratories

Location: 1249 Birchwood Dr.
Sunnyvale, CA 94089

Site Filing: A site description is on file at the Federal Communications
Commission
P.O. Box 429
Columbia, MD 21045

NVLAP LAB CODE: 200089

Types of Sites: Open Field Radiated and Indoor Screen Room (Line Conducted).
All sites are constructed and calibrated to meet ANSI C63.4-1994
requirements.

2.0 TEST EQUIPMENT

Description	Manufacturer	Model	SN
EMI Receiver	HP	8546A	3325A00137
Spectrum Analyzer	HP	8563A	3137A01183
Preamp	HP	8447F	3113A05849
Preamp	HP	8449B	3008A00527
LISN	EM	ANS-25/2	2532
Biconical Antenna	EM	EM 6912	414
Log Periodic Ant	EM	EM 6950	311
Double Ridge Horn	EM	EM 6961	6231
Filter BP 1.2-45 GHz	FSY	HM 1160-1155	001
Filter BP 4-10 GHz	FSY	HM 2950-1565	001
Filter HP 10-18 GHz	FSY	HP 8601-7SS	001

3.0 EUT

SYMPHONY / PC CARD
M/N 4401-05 Dipole 4402-05 Stub
S/N
FCC ID: IMK-ILC1PC

With one each Proxim P/N 1900.0020 Clip-on Antenna and P/N 1900.0021 Stub
Antenna. Antennas were not serialized.

4.0 SUPPORT EQUIPMENT

Toshiba Laptop Model No. T19005 S/N 11453067
110v/10Hz to 24Vac Transformer

5.0 EQUIPMENT CONFIGURATION

All of the equipment and cables were placed in worst case positions to maximize emissions.

Interconnecting cables were of the type and length specified in the individual equipment requirements.

Grounding was in accordance with the manufacturer requirements and conditions for intended use.

6.0 SUMMARY OF TESTS

The SYMPHONY / PC is a wireless LAN adapter with a low power frequency hopping spread spectrum (FHSS) radio system operating in the 2400-2483.5 MHz band. Tests were performed with two different antennas. Test firmware resident in the EUT was used to do the test.

6.1 15.247(a)(1) FREQUENCY HOPPING SYSTEMS

SYMPHONY / PC uses 79 channels, each 1 MHz wide. The system hops over one of 15 pseudorandom sequences. On average, each channel is used equally. Please refer to " SYMPHONY / PC Frequency Hopping Theory of Operation" attached to this submission for more details.

6.1.1 15.247(a)(1)(ii) CHANNEL UTILIZATION

A spectrum analyzer plots labeled "CHANNEL UTILIZATION". The total number of channels is 79. The channels used have nominal center frequencies of 2402 through 2480 MHz. Three spectrum analyzer MAX HOLD plots labeled ""BANDWIDTH" show the 20 dB bandwidth of the hopping channel to be < 1 MHz (.980 / .940 / .925 MHz) at the low/midb and/high frequencies of 2.402/2.440/2.480 GHz. **Test Plots are shown in Appendix A.**

Zero span spectrum analyzer plot labeled "DWELL TIME" shows
Worst case transmission time in a given slot: 400 ms elapsed
time, <100 % duty
Maximum allowed: 400 msec.

Test Data in Appendix A.

6.1.2 **15.247(b) MAXIMUM PEAK OUTPUT POWER**

The three spectrum analyzer plots labeled " POWER OUT" show the maximum power of the hopping channel to be 21.33 dBm or 135 mW. The EUT was made to transmit uninterrupted random data on each of the low/mid/high channels. **Test Plots are shown in Appendix A.**

The output was taken from an N connector, through 3 feet of RG 142 cable, to Spectrum Analyzer set on Max Hold with no additional attenuation.

Power = 20.33 dBm (peak reading) +1.0dB cable loss = +21.33 dBm / 135 mW EIRP

Limit: +30 dBm / 1 W maximum power

1900.0021 Stub Antenna

EIRP = +21.33 (peak power) +0.0 (peak gain, dBi) = + 21.33 dBm / 135 mW EIRP

Limit: +36 dBm / 4 W maximum EIRP

1900.0001 Clip-on Antenna

EIRP = +21.33 (peak power) + 1.0 (peak gain, dBi) = + 22.33 dBm / 171mW EIRP

Limit: +36 dBm / 4 W maximum EIRP

6.1.3 15.247(c) OUT OF BAND EMISSIONS

The spectrum analyzer plots titled "" OUT OF BAND - BAND EDGES" shows the output spectrum of the EUT while hopping one of the pseudorandom sequences and continuously transmitting packetized data. The analyzer was placed in MAX HOLD mode, and individual sweeps were recorded continually for 10 minutes with the same spectrum analyzer connection as was used for peak output power. The resultant plot shows that the EUT emissions remain inside the 2400 - 2483.5 MHz band when measured in ≥ 100 kHz bandwidth during operation.

The spectrum analyzer plots labeled "OUT OF BAND <1GHz GHz", " OUT OF BAND 1 -2.75 GHz", and "OUT OF BAND 2.75 - 26.5 GHz" show that emissions measured in ≥ 100 kHz bandwidth are more than 20 dB below the highest level of the desired power outside of the 2400 - 2483.5 MHz band. **Test Plots are shown in Appendix A.**

6.1.4 15.203 ANTENNA REQUIREMENT

This product has an MMCX connector to provide unique coupling to the antenna. The Manufacture's control drawings, and the antenna drawings are in **Appendix D.**

6.1.5 15.205 RESTRICTED BAND RADIATION LIMITS

The EUT was placed on a wooden table resting on a turntable. The wooden table was approximately 1 meter above the ground plane of the 3 meter test site. The search antenna was moved in to 1 meter when necessary to improve the noise floor, and the appropriate range factor was applied. While the EUT was transmitting uninterrupted random data on each of the low/mid/high channels and with the spectrum analyzer on MAX HOLD, the turntable was rotated, and the search antenna raised and lowered in an attempt to maximize the received radiated emission level. **Test results are attached in Appendix B** in tabular form showing that no spurious signals were detected above the 74 dBuV/m peak/54dBuV/m average limits. Peak measurements were made with a RBW and VBW = 1Mhz. Average measurements were made with a RBW = 1 MHz and a VBW = 10 Hz.

6.1.6 15.209 RADIATED EMISSIONS

The attached table shows that the Class B radiated limits from 30 - 1000 MHz are not exceeded by the EUT. The EUT was operating normally with a combination of transmission and reception and hopping one of the fifteen pseudorandom sequences during this test. The EUT was placed near one edge of a wooden table resting on a turntable. The wooden table was approximately 1 meter above the ground plane of the 3 meter test site. The search antennas were located at 3 meters. Measurements were made in accordance with ANSI C63.4-1994. **Test Data is in Appendix C.**

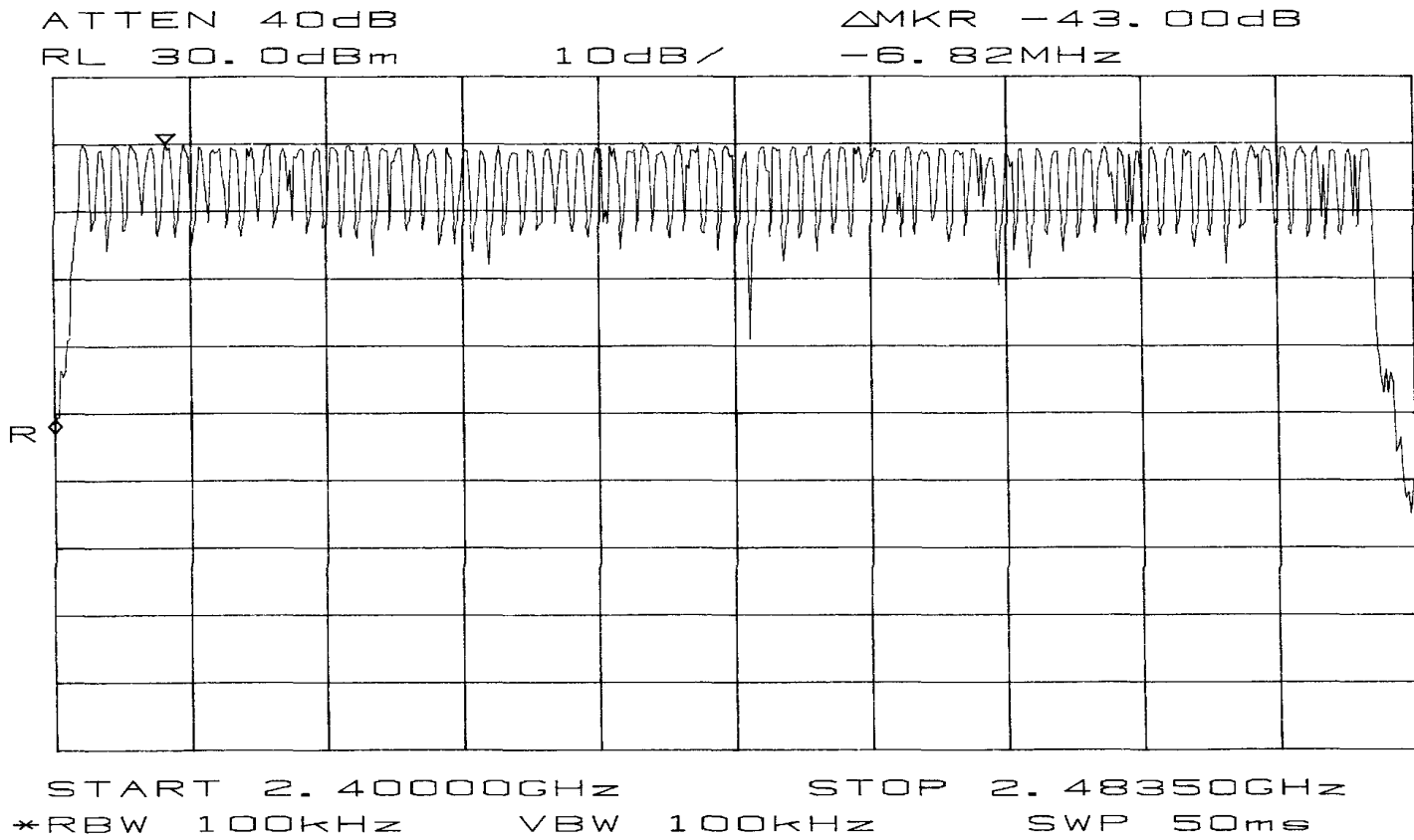
Electronic Compliance Laboratories

Chris Byleckie
Technical Director

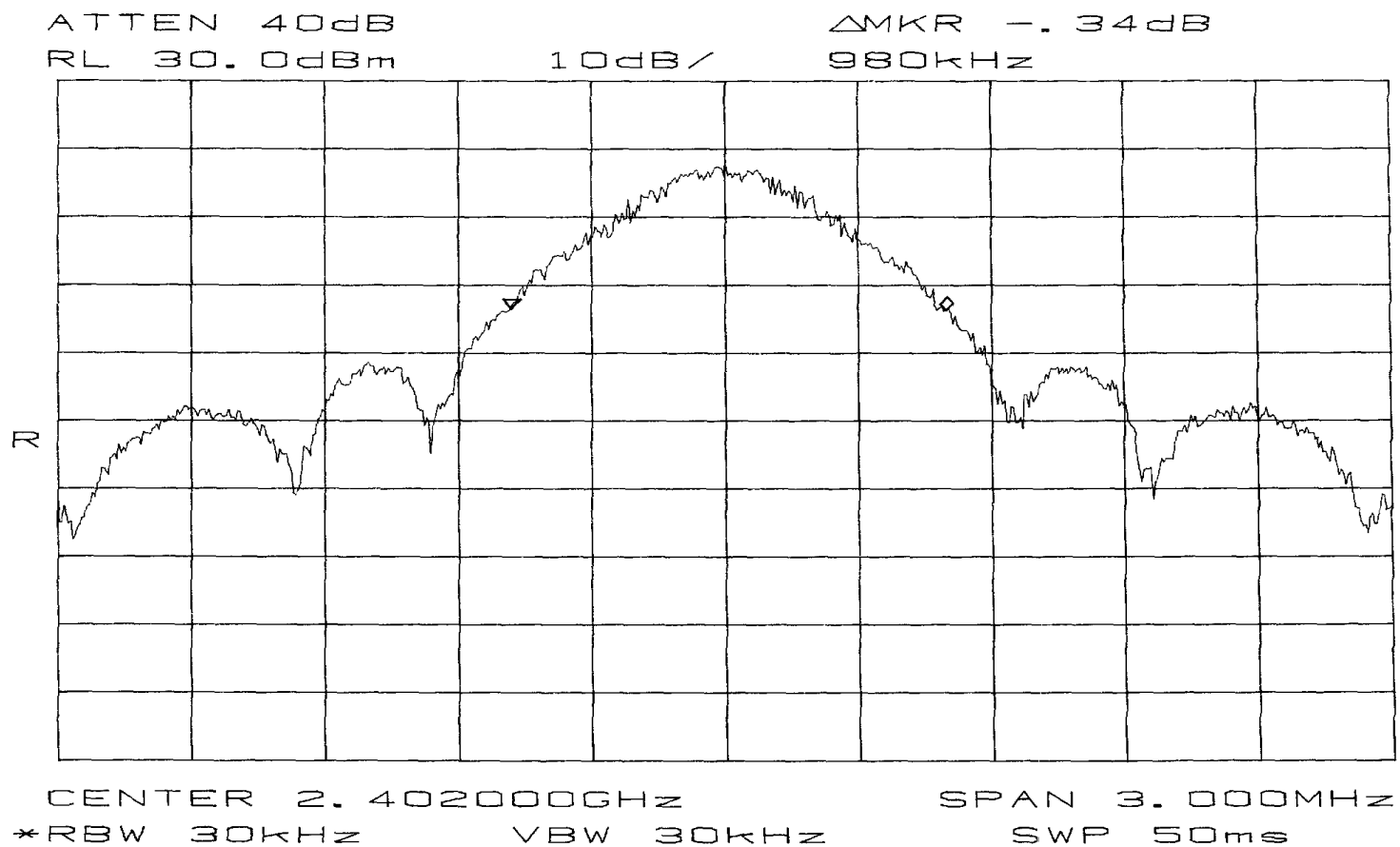
Date

APPENDIX A
SPREAD SPECTRUM PLOTS

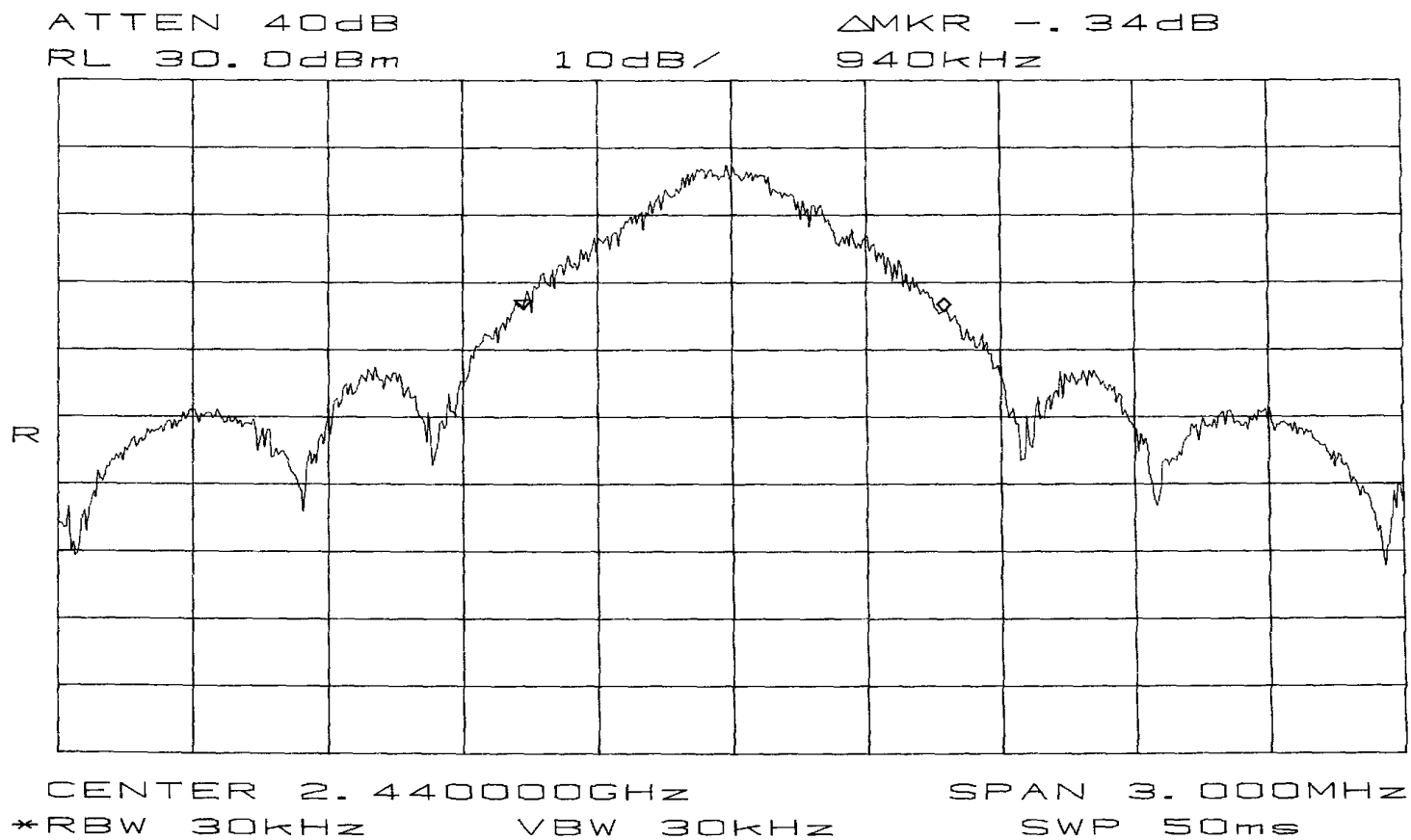
Channel Utilization



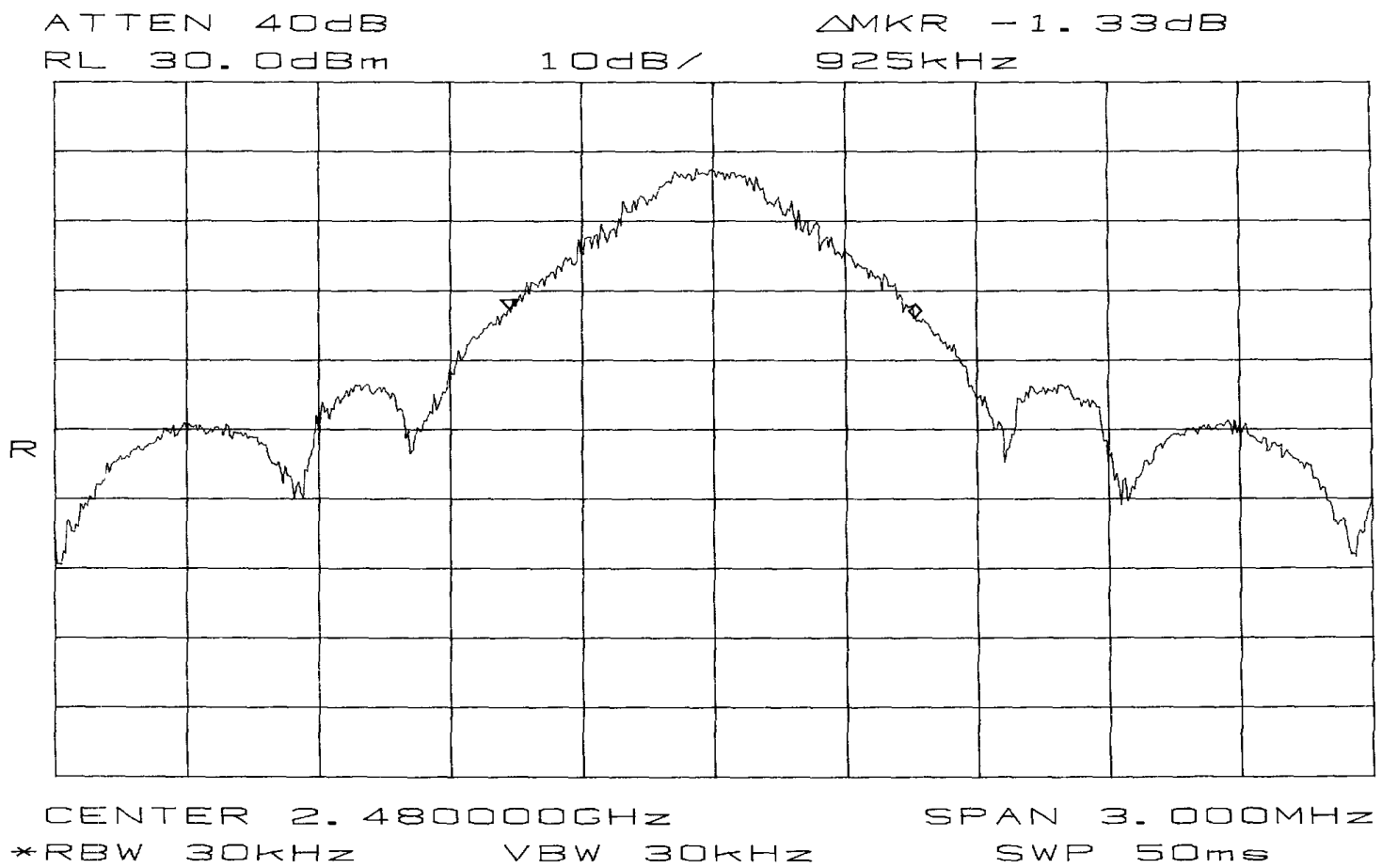
Bandwidth



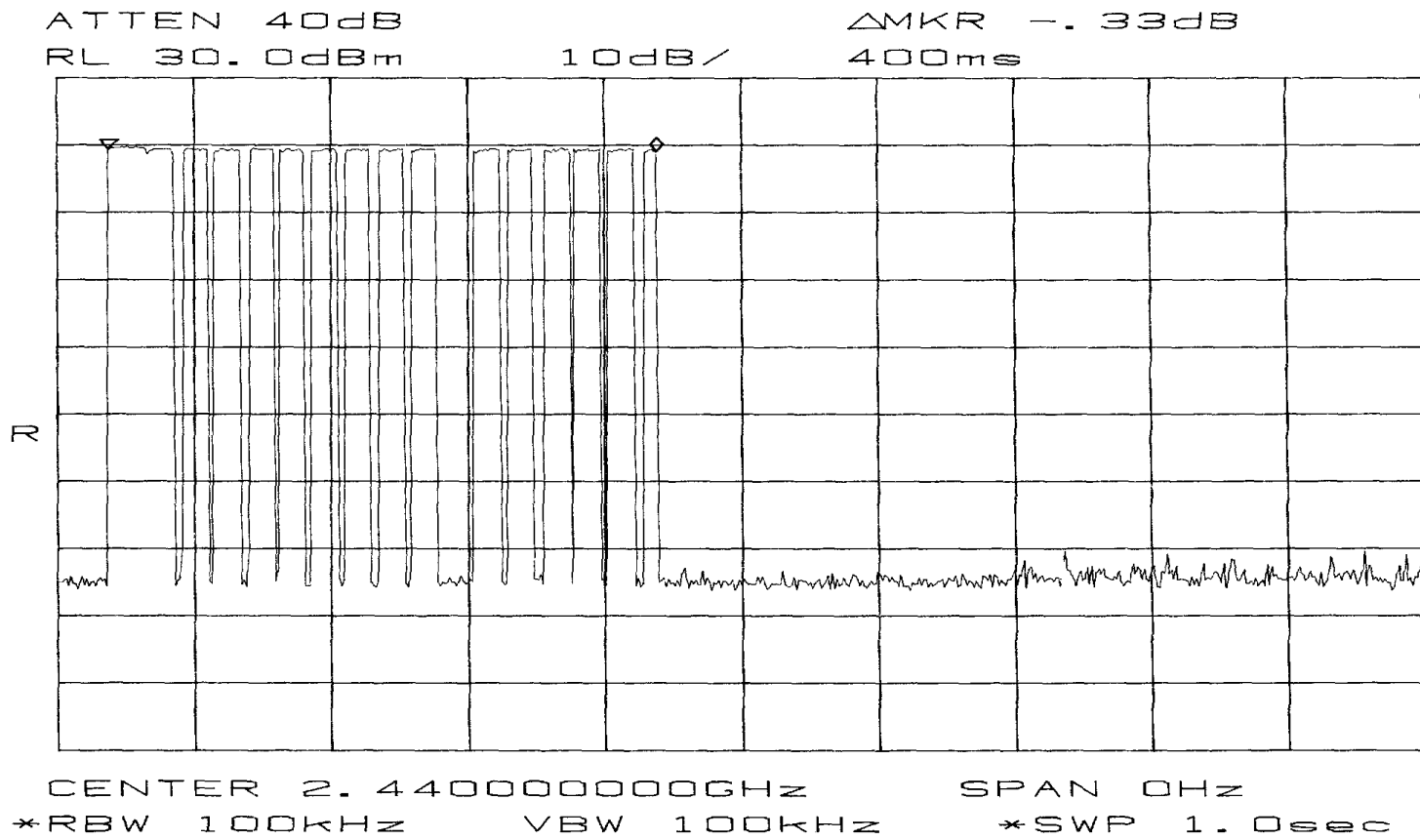
Bandwidth



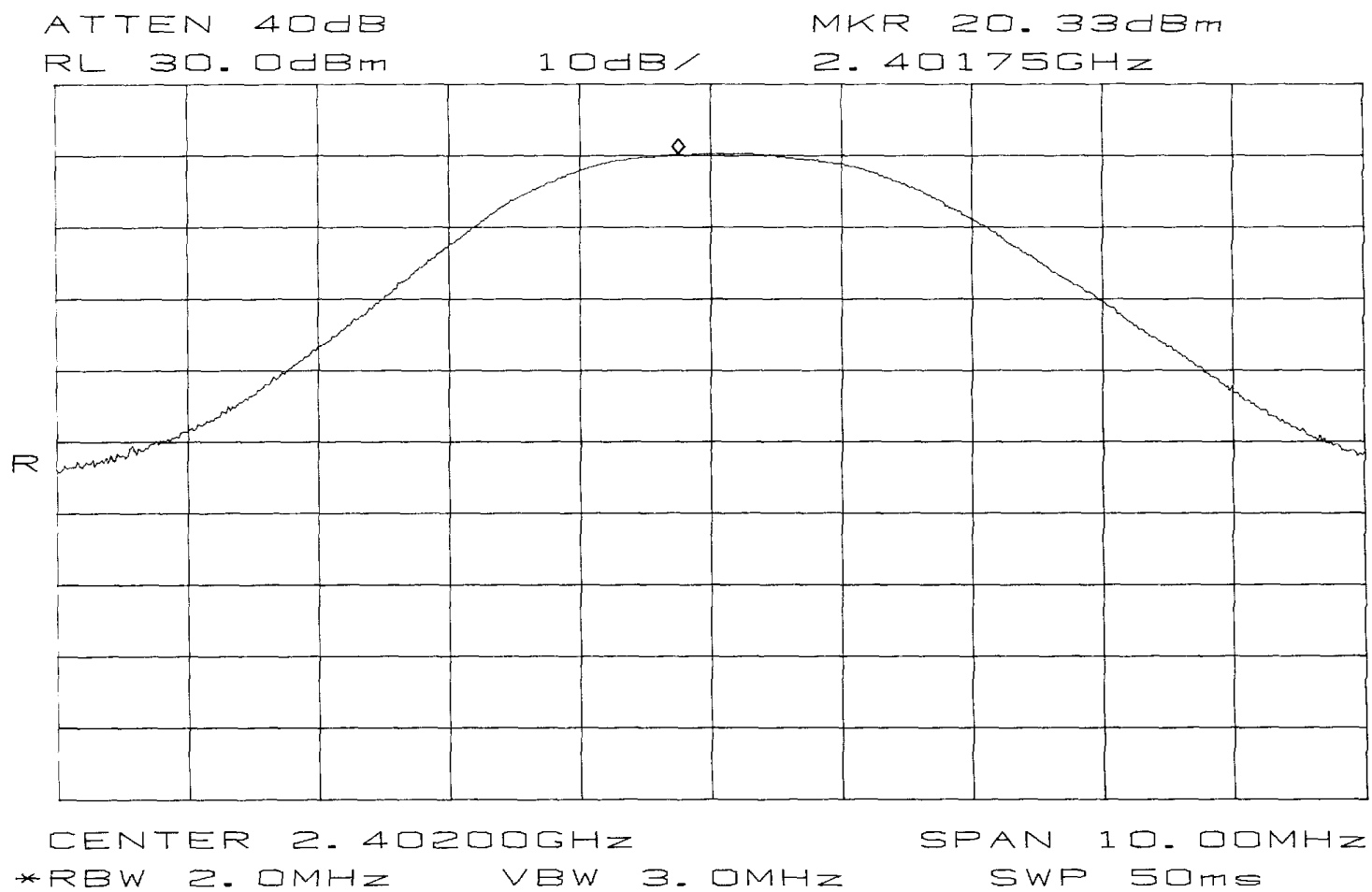
Bandwidth



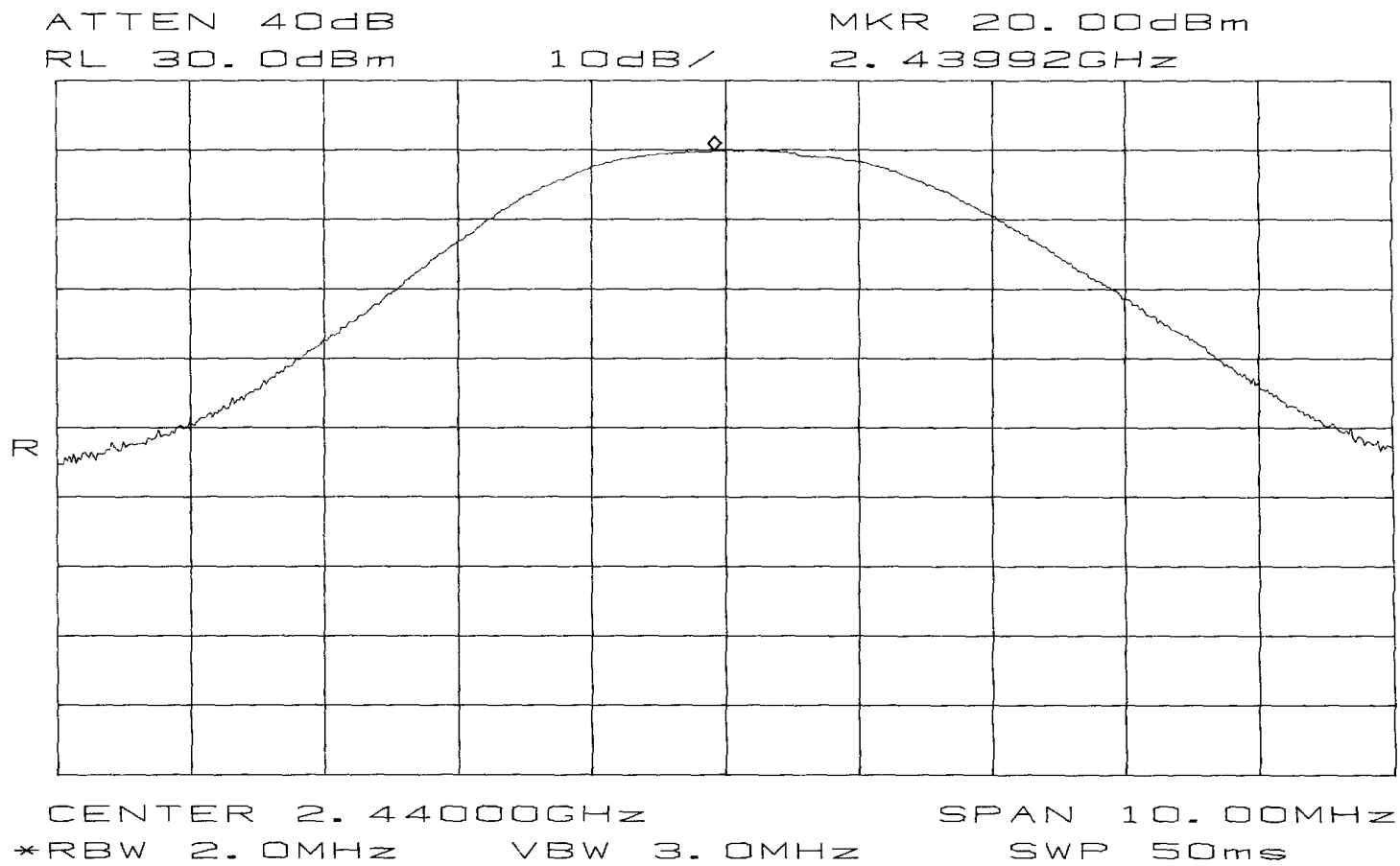
Dwell Time



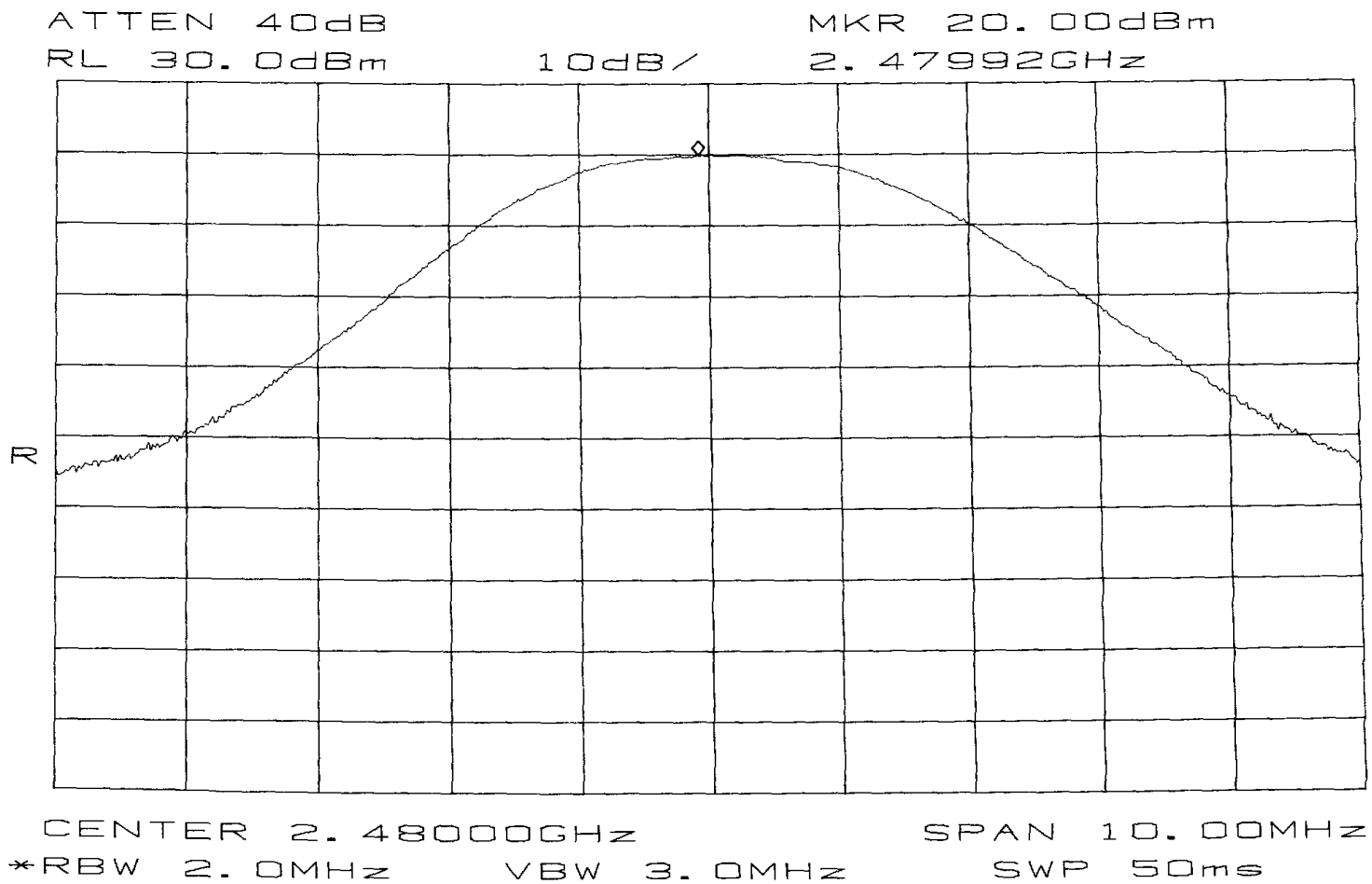
Power Out



Power Out



Power Out

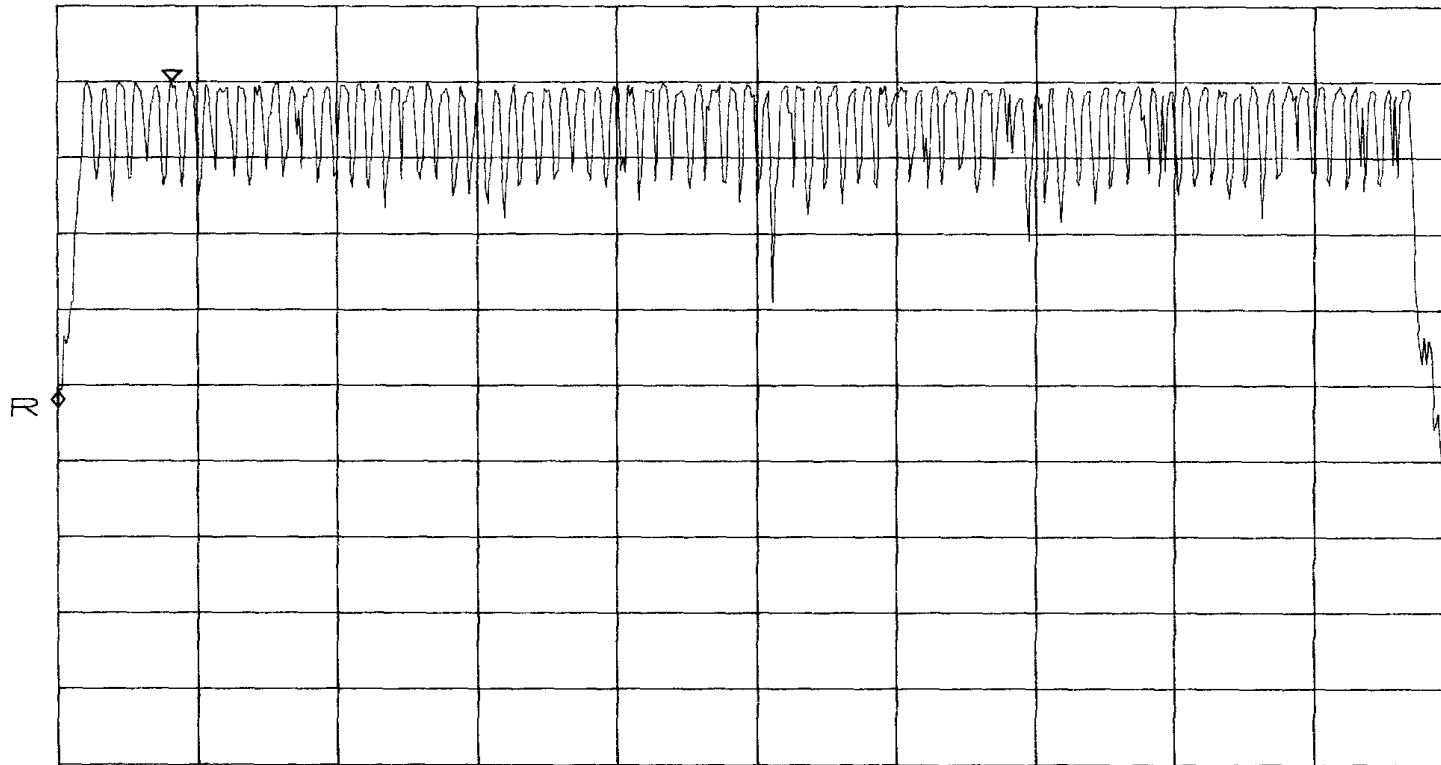


Out Of Band Emissions Band Edges

ATTEN 40dB
RL 30.0dBm

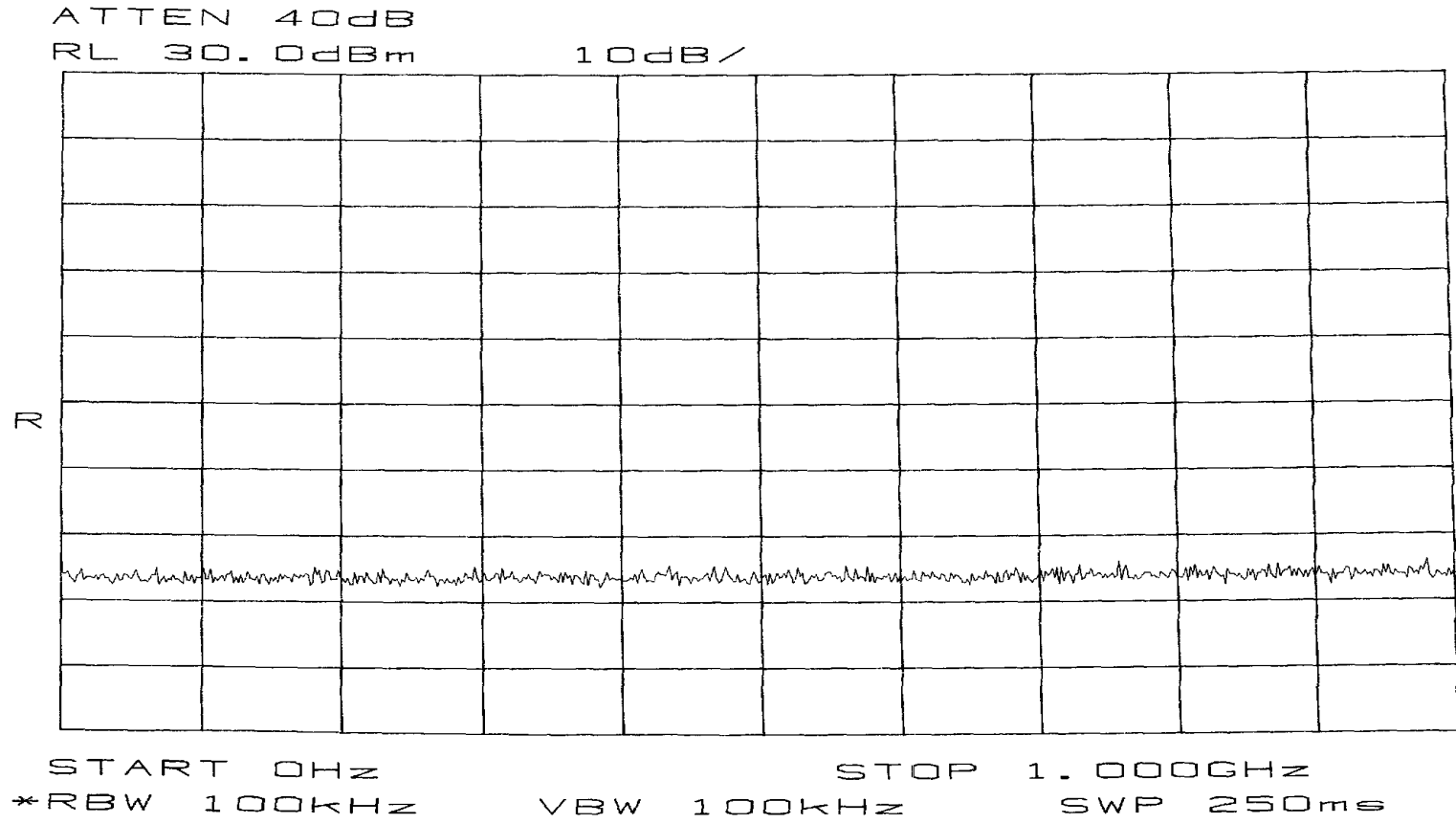
10dB/

ΔMKR -43.00dB
-9.82MHz

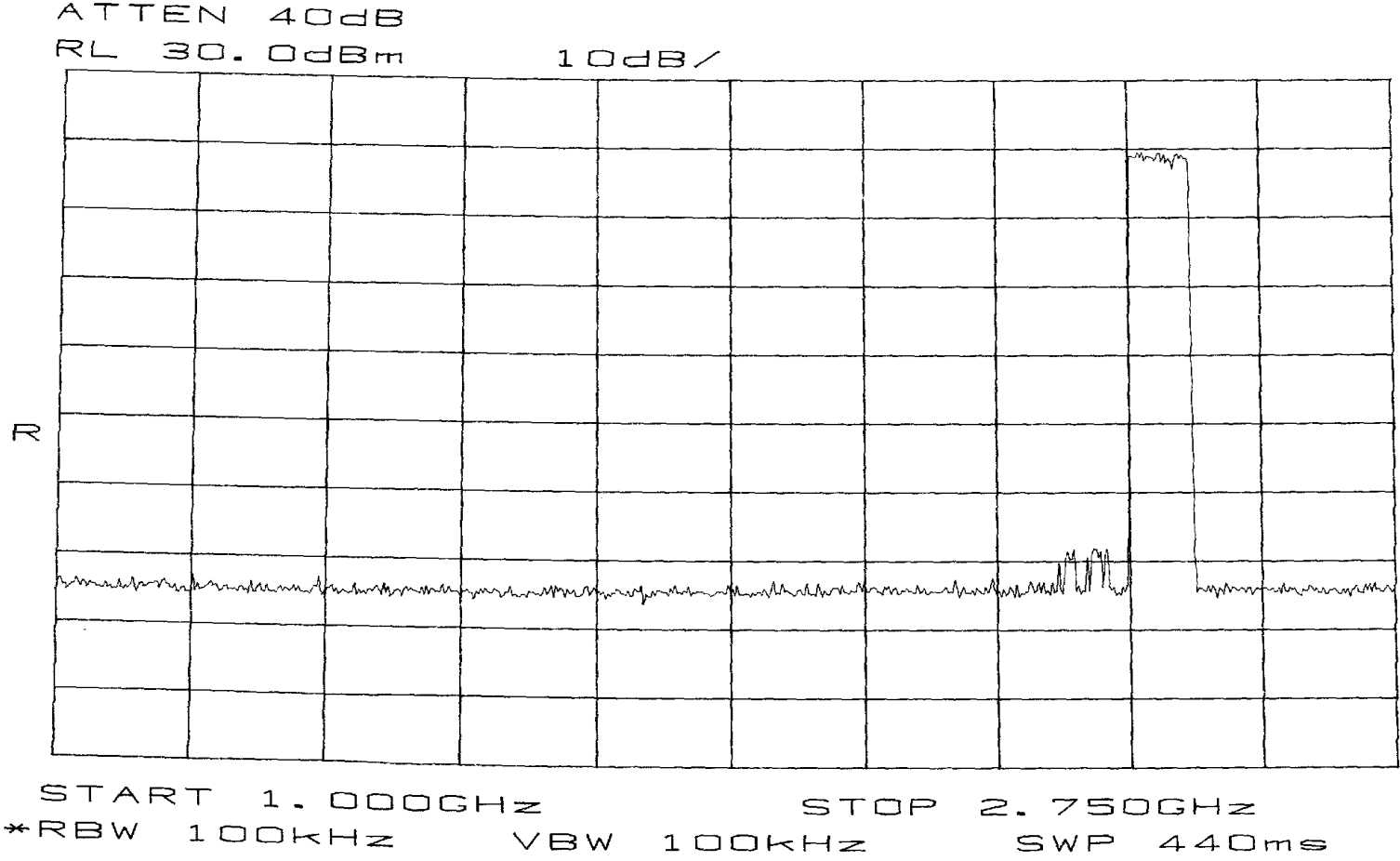


START 2.40000GHz STOP 2.48350GHz
*RBW 100kHz VBW 100kHz SWP 50ms

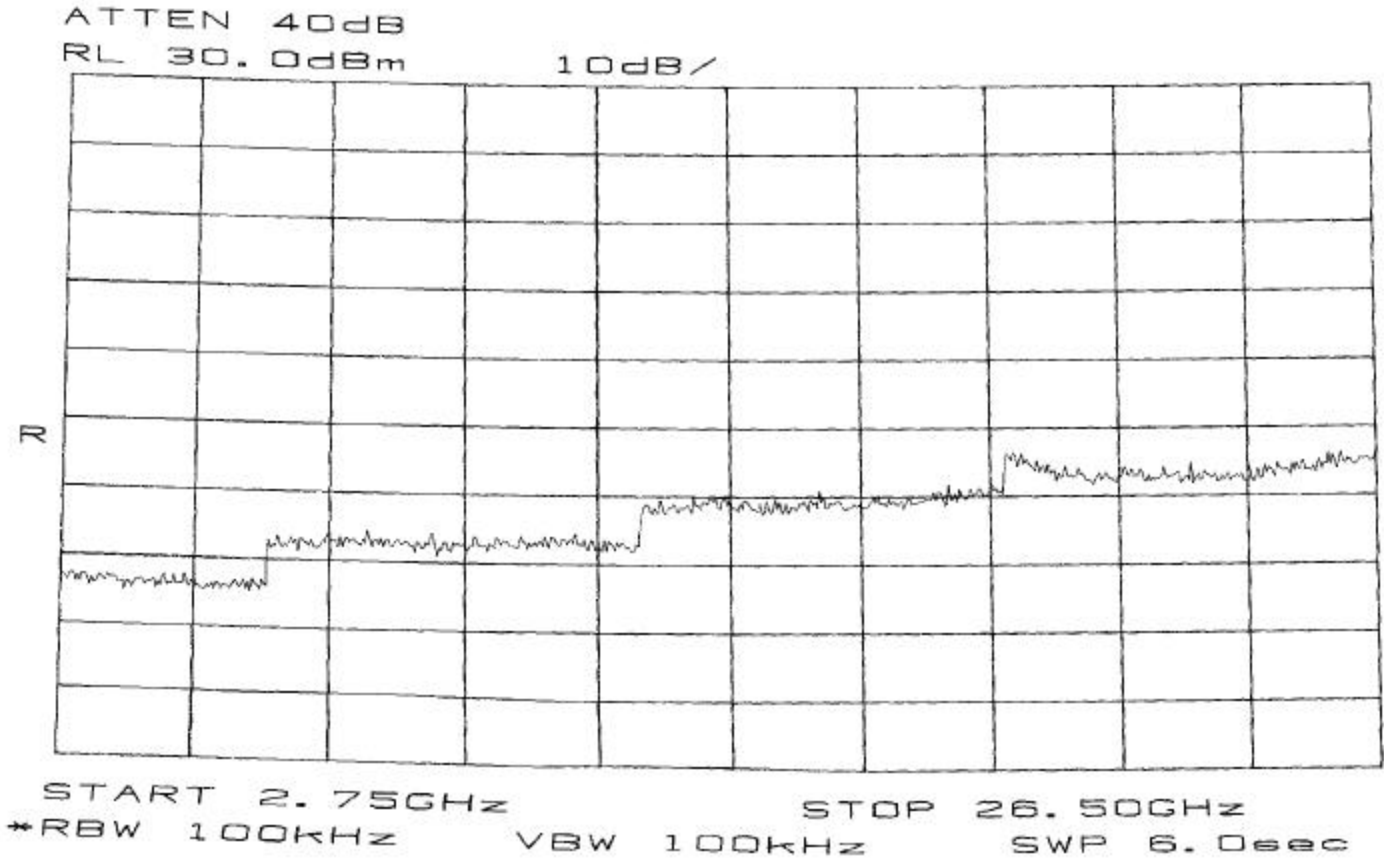
Out Of Band < 1 GHz



Out Of Band 1 - 2.75 GHz



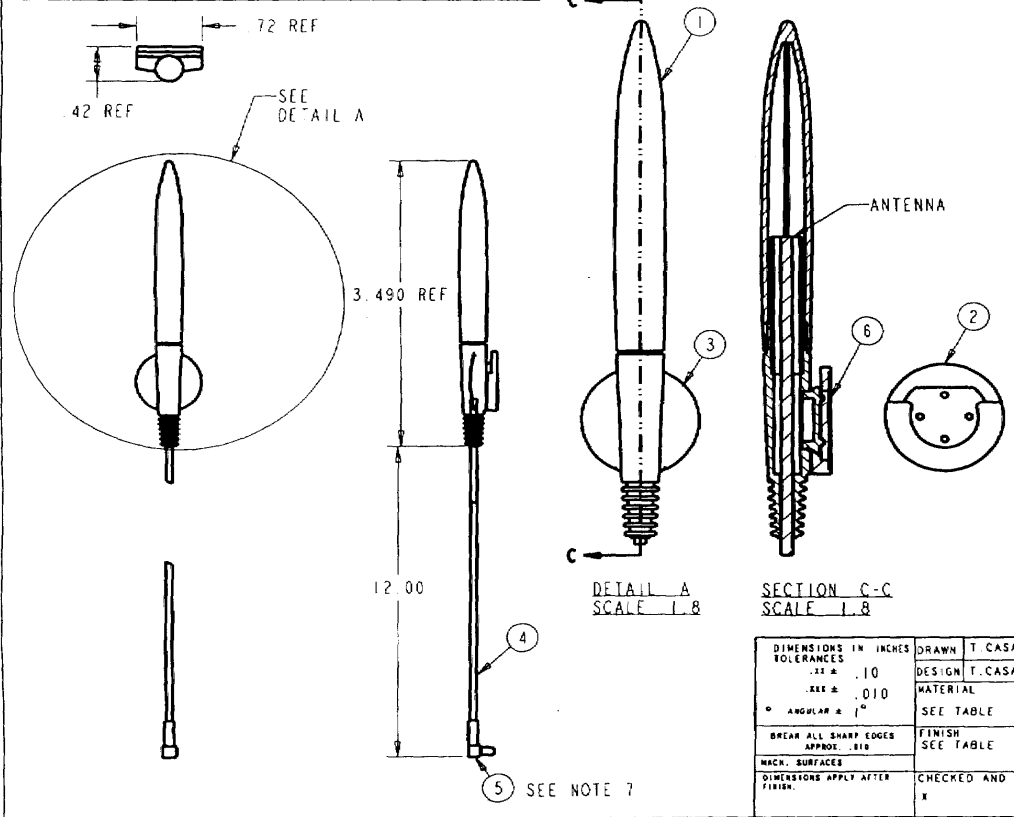
Out of Band 2.75 – 26.5 GHz



APPENDIX B
ANTENNA DRAWINGS

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REVISION				BY	APPR
LTR	ECO	DATE		TLC	-
		5/31/96	BETA RELEASE		



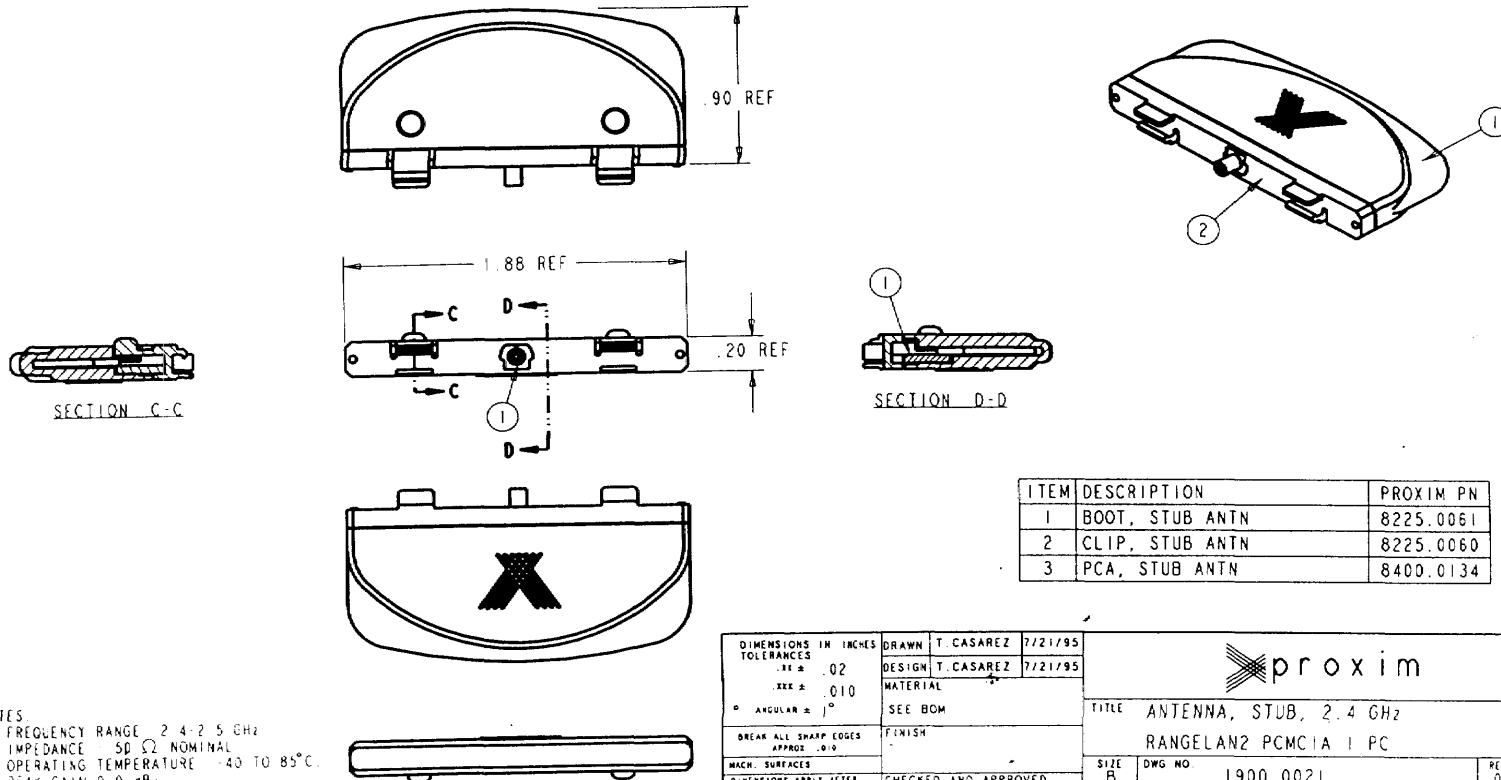
ITEM	DESCRIPTION	PROXIM PN
1	ANTENNA BOOT, BLACK	8225.0066
2	MOUNTING PLATE, BLACK	8225.0068
3	ANTENNA BASE W/DOVETAIL, BLACK	8225.0069
4	CABLE, COAX K TYPE, BLACK	6000.0041
5	RF CONNECTOR, MMCX RT ANGLE	2108.0074
6	DOUBLE COATED NEOPRENE 3M#4962 Ø.625 X .030 THK	NA

- NOTES:
1. POWER RATING 10 WATTS.
 2. FREQUENCY RANGE 2.4-2.5 GHz.
 3. VSWR 1.5:1 MAX AT RESONANCE.
 4. IMPEDANCE: 50 Ω NOMINAL.
 5. OPERATING TEMPERATURE -40 TO 85°C.
 6. PEAK GAIN 1.0 dBi.
 7. CONNECTOR TO BE ASSEMBLED AS SHOWN, CENTER PIN FACES THE BACK.

DIMENSIONS IN INCHES TOLERANCES .25 ± .10 .010 ± .010 ANGULAR ± 1°	DRAWN T. CASAREZ 7/21/95 DESIGN T. CASAREZ 7/21/95 MATERIAL SEE TABLE			
BREAK ALL SHARP EDGES APPROX. .010	FINISH SEE TABLE			TITLE ANTENNA, TETHERED, 2.4 GHz RANGELAN2 PCMCIA I PC
MACH. SURFACES DIMENSIONS APPLY AFTER FINISH.	CHECKED AND APPROVED X	SIZE B	DWG NO. 1900.0020	REV 1
SCALE NONE		FILE NAME	CLIP TETH	SHEET 1 OF 1

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REVISION				BY	APPR
LTR	ECO	DATE		TLC	-
01	-	6/5/95	RELEASE TO BETA		



ITEM	DESCRIPTION	PROXIM PN
1	BOOT, STUB ANT	8225.0061
2	CLIP, STUB ANT	8225.0060
3	PCA, STUB ANT	8400.0134

- NOTES:
1. FREQUENCY RANGE 2.4-2.5 GHz
 2. IMPEDANCE 50 Ω NOMINAL
 3. OPERATING TEMPERATURE -40 TO 85°C.
 4. PEAK GAIN 0.0 dBi

DIMENSIONS IN INCHES	DRAWN T. CASAREZ	7/21/95	
TOLERANCES	DESIGN T. CASAREZ	7/21/95	
.XX ± .02	MATERIAL		TITLE ANTENNA, STUB, 2.4 GHz
.XXX ± .010	SEE BOM		RANGELAN2 PCMCIA 1 PC
◻ ANGULAR ± 1°	FINISH		SIZE B
BREAK ALL SHARP EDGES APPROX .010	CHECKED AND APPROVED		DWG NO. 1900.0021
MACH. SURFACES			REV 01
DIMENSIONS APPLY AFTER FINISH			SCALE NONE
			FILE NAME STUB_ANTN
			SHEET 1 OF 1

APPENDIX C
RESTRICTED BAND DATA

FCC RADIATED DATA SHEET

DATE:5/29/98

EUT: ILC 1PC

CUSTOMER NAME: Proxim

S/N:

WORK ORDER: 8052902

RULE PART: 15.247

FILE: 8052902A

ANTENNA: Horn

OTHER CAL FACTOR: ATTN dB: 0

MODULATION TYPE:

DUTY dB: 0

TESTED BY: Chris

HP IL dB: 0

COMMENTS: 1 DB Dipole Antenna

DIST dB: 10

FREQ.	READING	Pk, QP, or Av	A.F. dB	Cable loss dB	AMP dB	O.C.F. dB	TOTAL, dB(uV/m)	LIMIT dB(uV/m)	DELTA dB
MHz	dB(uV)								
Fund = 2402									
4804	46.2	Pk	32.8	7.0	35.0	10.0	41.0	74.0	-33.0
4804	39.3	Avg	32.8	7.0	35.0	10.0	34.1	54.0	-19.9
12010	48.5	Pk	39.3	13.6	35.0	10.0	56.4	74.0	-17.7
12010	35.2	Avg	39.3	13.6	35.0	10.0	43.1	54.0	-11.0
Fund = 2440									
4880	44.3	Pk	32.8	7.0	35.0	10.0	39.1	74.0	-34.9
4880	34.5	Avg	32.8	7.0	35.0	10.0	29.3	54.0	-24.7
7320	44.7	Pk	36.0	10.6	35.0	10.0	46.3	74.0	-27.7
7320	31.5	Avg	36.0	10.6	35.0	10.0	33.1	54.0	-20.9
12200	40.0	Pk	39.3	13.6	35.0	10.0	47.9	74.0	-26.2
12200	27.5	Avg	39.3	13.6	35.0	10.0	35.4	54.0	-18.7
Fund = 2480									
4960	47.2	Pk	32.8	7.0	35.0	10.0	42.0	74.0	-32.0
4960	40.3	Avg	32.8	7.0	35.0	10.0	35.1	54.0	-18.9
7440	42.7	Pk	36.0	10.6	35.0	10.0	44.3	74.0	-29.7
7440	33.2	Avg	36.0	10.6	35.0	10.0	34.8	54.0	-19.2
12400	39.7	Pk	39.3	13.6	35.0	10.0	47.6	74.0	-26.5
12400	27.3	Avg	39.3	13.6	35.0	10.0	35.2	54.0	-18.9

FCC RADIATED DATA SHEET

EUT:	ILC 1PC	DATE:	5/29/98
S/N:		CUSTOMER NAME:	Proxim
RULE PART:	15.247	WORK ORDER:	8052902
		FILE:	8052902B
ANTENNA:	Horn	OTHER CAL FACTOR:	ATTN dB: 0
MODULATION TYPE:			DUTY dB: 0
TESTED BY:	Donnie		HP IL dB: 0
COMMENTS:	1 DB STUB ANTENNA		DIST dB: 10

FREQ.	READING	Pk, QP, or Av	A.F.	Cable loss	AMP	O.C.F.	TOTAL	LIMIT	DELTA
MHz	dB(uV)		dB	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
Fund = 2402									
4804	45.0	Pk	32.8	7.0	35.0	10.0	39.8	74.0	-34.2
4804	37.2	Avg	32.8	7.0	35.0	10.0	32.0	54.0	-22.0
12010	45.0	Pk	39.3	13.6	35.0	10.0	52.9	74.0	-21.2
12010	33.5	Avg	39.3	13.6	35.0	10.0	41.4	54.0	-12.7
Fund = 2440									
4880	44.7	Pk	32.8	7.0	35.0	10.0	39.5	74.0	-34.5
4880	44.0	Avg	32.8	7.0	35.0	10.0	38.8	54.0	-15.2
7320	47.8	Pk	36.0	10.6	35.0	10.0	49.4	74.0	-24.6
7320	39.8	Avg	36.0	10.6	35.0	10.0	41.4	54.0	-12.6
12200	39.3	Pk	39.3	13.6	35.0	10.0	47.2	74.0	-26.9
12200	27.3	Avg	39.3	13.6	35.0	10.0	35.2	54.0	-18.9
Fund = 2480									
4960	50.8	Pk	32.8	7.0	35.0	10.0	45.6	74.0	-28.4
4960	47.0	Avg	32.8	7.0	35.0	10.0	41.8	54.0	-12.2
7440	45.7	Pk	36.0	10.6	35.0	10.0	47.3	74.0	-26.7
7440	35.5	Avg	36.0	10.6	35.0	10.0	37.1	54.0	-16.9
12400	39.5	Pk	39.3	13.6	35.0	10.0	47.4	74.0	-26.7
12400	27.3	Avg	39.3	13.6	35.0	10.0	35.2	54.0	-18.9

APPENDIX D
15.209
RADIATED EMISSIONS

Electronic Compliance Laboratories, Inc.
 1249 Birchwood Ave.
 Sunnyvale, CA
 Radiated Emissions
 Frequency range: 30MHz-1000MHz
 3 Meter Open Site
 Site Calibrated: June 1997

Government Agency and Limit: FCC Class B

QP = Quasi-Peak Note: Ignore peak readings when Quasi-Peak reading exists
 PK = Peak

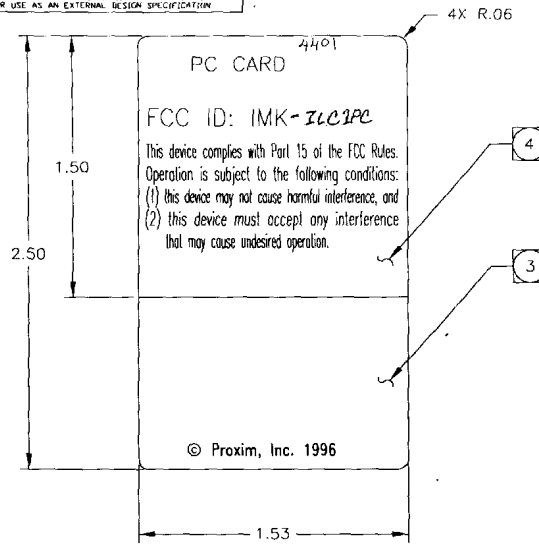
Customer: PROXIM Operator: DONNIE
 Date: 05-29-1998 Time: 08:51:25
 Temperature Range: 60 Deg F Percent Humidity: 60
 E.U.T.: ILC 1PC
 Serial Number: A30267530
 Support Devices: LAPTOP
 Serial Number:
 FCC ID:
 Exercise Program:
 Modifications: None
 Report File Name: F:\TESTDATA\8052902.RF

Antenna Type: BICONICAL

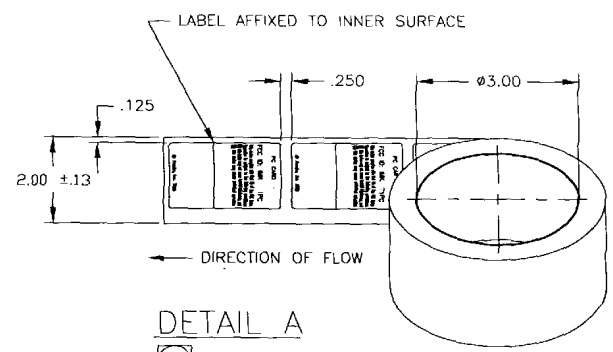
TEST FREQ	TEST dBuV	ACTUAL dBuV/m	CLASS B LIMIT	VERSUS B LIMIT	TABLE DEGREES	ANTENNA HEIGHT	POLAR- IZATION	DETECTOR Type
=====	=====	=====	=====	=====	=====	=====	=====	=====
32.000	36.1	28.3	40.0	-11.7	315	3.0	H	PK
256.000	35.9	28.7	46.0	-17.3	270	1.5	H	PK
232.000	36.6	28.8	46.0	-17.2	240	1.5	V	PK
256.000	33.6	26.4	46.0	-19.6	0	1.3	V	PK
32.000	39.2	31.4	40.0	-8.6	0	3.0	V	PK
CHANGED ANTENNA TO LOG PERIODIC								
304.000	34.2	25.4	46.0	-20.6	225	1.3	V	PK
320.000	36.4	27.6	46.0	-18.4	180	1.2	V	PK
352.000	36.3	27.8	46.0	-18.2	270	1.5	V	PK
368.000	36.6	28.2	46.0	-17.8	0	1.0	V	PK
504.000	36.6	32.0	46.0	-14.0	0	1.0	V	PK
520.000	37.3	32.8	46.0	-13.2	0	1.0	V	PK
536.000	39.1	34.7	46.0	-11.3	0	1.0	V	PK
552.000	36.5	32.2	46.0	-13.8	0	1.0	V	PK
568.000	32.5	28.6	46.0	-17.4	0	1.0	V	PK
552.000	32.2	27.9	46.0	-18.1	300	1.0	H	PK
536.000	33.4	29.0	46.0	-17.0	0	1.5	H	PK
456.000	35.8	30.3	46.0	-15.7	180	2.5	H	PK
416.000	34.8	27.3	46.0	-18.7	0	2.5	H	PK

APPENDIX E
SAMPLE LABEL

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF PROXIM AND MAY NOT, IN WHOLE OR IN PART, BE REPRODUCED, DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DESCRIBED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF PROXIM AND IS NOT INTENDED FOR USE AS AN EXTERNAL DESIGN SPECIFICATION.



REVISION				BY	APPR
LTR	ECO	DATE			
A			INITIAL RELEASE	WF	
B				WF	ES



NOTES: UNLESS OTHERWISE SPECIFIED

- 1 MATERIAL: 2 MIL WHITE MYLAR WITH PERMANENT ADHESIVE AND .5 MIL CLEAR MYLAR LAMINATION.
- 2 CARRIER: ROLL CORE PER DETAIL A.
- 3 BLUE (PMS 5395C) TEXT ON WHITE BACKGROUND.
- 4 BLUE (PMS 5395C) BACKGROUND WITH WHITE TEXT.

NOTES UNLESS SPECIFIED TOLERANCES XX+/- .01 ANGULAR XXX+/- .005 +/- 1/2° BREAK ALL SHARP EDGES APPROX. .010 MACR. SURFACES DIMENSIONS APPLY AFTER FINISH.	DRAWN	Wm FOSTER			
	DESIGN				
	MATERIAL	1	TITLE	ILC	
	FINISH	3 4	LABEL, 1PC, FCC ID		
CHECKED AND APPROVED		SIZE	DWG NO.	REV.	
		B	2460.	A	
		SCALE	FILE NAME	SHEET	
		2:1	XXX 24600	1 OF 1	

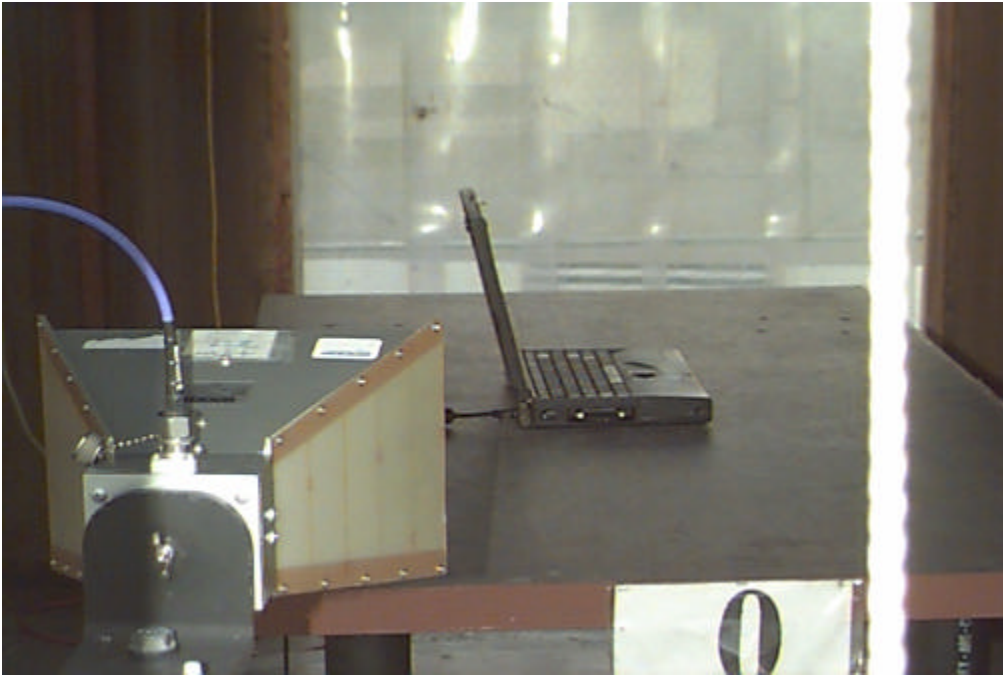
APPENDIX F
SET-UP PHOTOS



**FCC 15.209 Class B
Radiated Emissions**



**FCC 15.205 Restricted Band
Stub Antenna**



**FCC 15.205 Restricted Band
Clip-on Antenna**



FCC 15.247 Conducted RF

APPENDIX G
EUT PHOTOS

APPENDIX H
OWNERS MANUAL

Warranty Return Policy

If you have a problem with your RangeLAN2 product, please call Proxim Technical Support at 650/526-3640. Proxim Technical Support will assist with resolving any technical difficulties you may have with your Proxim product.

After calling Proxim Technical Support, if your product is found to be defective, you may return the product to Proxim after obtaining an RMA (Return Materials Authorization) number from Proxim Technical Support. The product must be returned in its original packaging. The RMA number should be clearly marked on the outside of the box. Proxim cannot be held responsible for any product returned without an RMA number, and no product will be accepted without an RMA number.

FCC WARNING

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE

Statement of Compliance Information to User

This equipment has been tested and found to comply with the European Telecommunication Standard ETS 300.328. This standard covers Wideband Data Transmission Systems referred to in the CEPT recommendation T/R 10.01. This type of accepted equipment is designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

1. Introduction

The RangeLAN
Extension Point
System Require
The Product Pa

2. Quick Instal

3. Physical Ins

Antenna Option
Outdoor Packag
Indoor Mounting

4. Wireless Top

Planning and Mi
One Hop
Multiple Linear
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How to Configur
Extension Points

5. Configuration

Locally (Out-of-t
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Main Menu
SNMP Managem
Modem Support ..

6. Configuration

TCP/IP Configura
Bridge Configur
BSA Radio Confij

E. U.S. Specifications

The following technical specification is for reference purposes only. Actual product's performance and compliance with local telecommunications regulations may vary from country to country. Proxim, Inc. will only ship products that are type approved in the destination country.

Data Rate (per port)	1.6 Mbps
Media Access Protocol	RangeLAN2 CSMA/CA
Frequency Band	2.4-2.5 GHz Worldwide (Depends on country) (spread spectrum frequency hopping)
Independent Channels	15
Output Power	100 mW or 500 mW (Depends on country and model)
ETSI Testing	For purposes of ETS 300 328 type testing, the Extension Point was tested over a temperature range of -20 C to +55 C.
Operating Temperature	-20 C to +60 C
UL Listed Power Supply	The Extension Point requires an external power supply. If you have elected not to purchase the external power supply from Proxim or need a replacement, you must use only a UL listed, Class 2 power supply, rated min. 1A at 12VDC.
FCC Notice	Warning! It is the responsibility of the installer of these antennas, as well as the responsibility of the user of this product, to guarantee that each antenna is operated at least 20 cm (8 inches) from any person. This is necessary to ensure that the product is operated in accordance with the RF Guidelines for Human Exposure which have been adopted by the Federal Communications Commission.

APPENDIX I
CLIENT CONFIDENTIAL MATERIAL