

**15.247 Certification
FCC ID: IMK-ILCISA**

EMI TEST REPORT

On

SYMPHONY ISA 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
Tel: (408) 747-1490
Fax: (408) 747-1495**

Test Report Number: A806003

Date of Test: June 6, 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 ISA CARD
M/N: 4100-05
S/N: A30253497
FCC ID: IMK-ILCISA

With Proxim 1900.0051 Dipole Antenna. Antennas were not serialized.

4.0 SUPPORT EQUIPMENT

	<u>Manufacturer</u>	<u>Model</u>
Host Computer	DELL	Dimension P133
Keyboard		
Mouse		
Monitor		

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 ISA CARD 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 one antenna. Test firmware resident in the Host PC was used to do the test.

6.1 15.247(a)(1) FREQUENCY HOPPING SYSTEMS

SYMPHONY ISA CARD 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 "RangeLAN2 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 (.940 / .930 / .875 MHz) at the low, mid, and high frequencies of 2.402/2.440/2.480 GHz. **Test Plots are shown in Appendix A.**

Zero span spectrum analyzer plot labeled "DWEELL 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 20.0 dBm or 100 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 1 foot of RG 142 cable, to Spectrum Analyzer set on Max Hold with no additional attenuation.

Power = 20 dBm (peak reading) +1.0dB cable loss = +21.0 dBm /
126 mW EIRP

Limit: +30 dBm / 1 W maximum power

Antenna

EIRP = +21.0 (peak power) +0 (peak gain, dBi) = + 21.0
dBm / 126 mW 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 30 MHz- 2.46 GHz", " OUT OF BAND 2.4 – 2.75 GHz ", and "OUT OF BAND 2.75 – 2.65 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 polarized SMB 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 15.207 AC LINE CONDUCTED EMISSIONS

The RF line conducted levels for emissions in the 0.45 - 30 MHz band must not exceed 250 μ V when measured with a LISN. Attached graphs and tabular data show that emissions are below the 250 μ V (48 dB μ V) maximum allowed level. **Test Data is in Appendix C.**

6.1.7 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 D.**

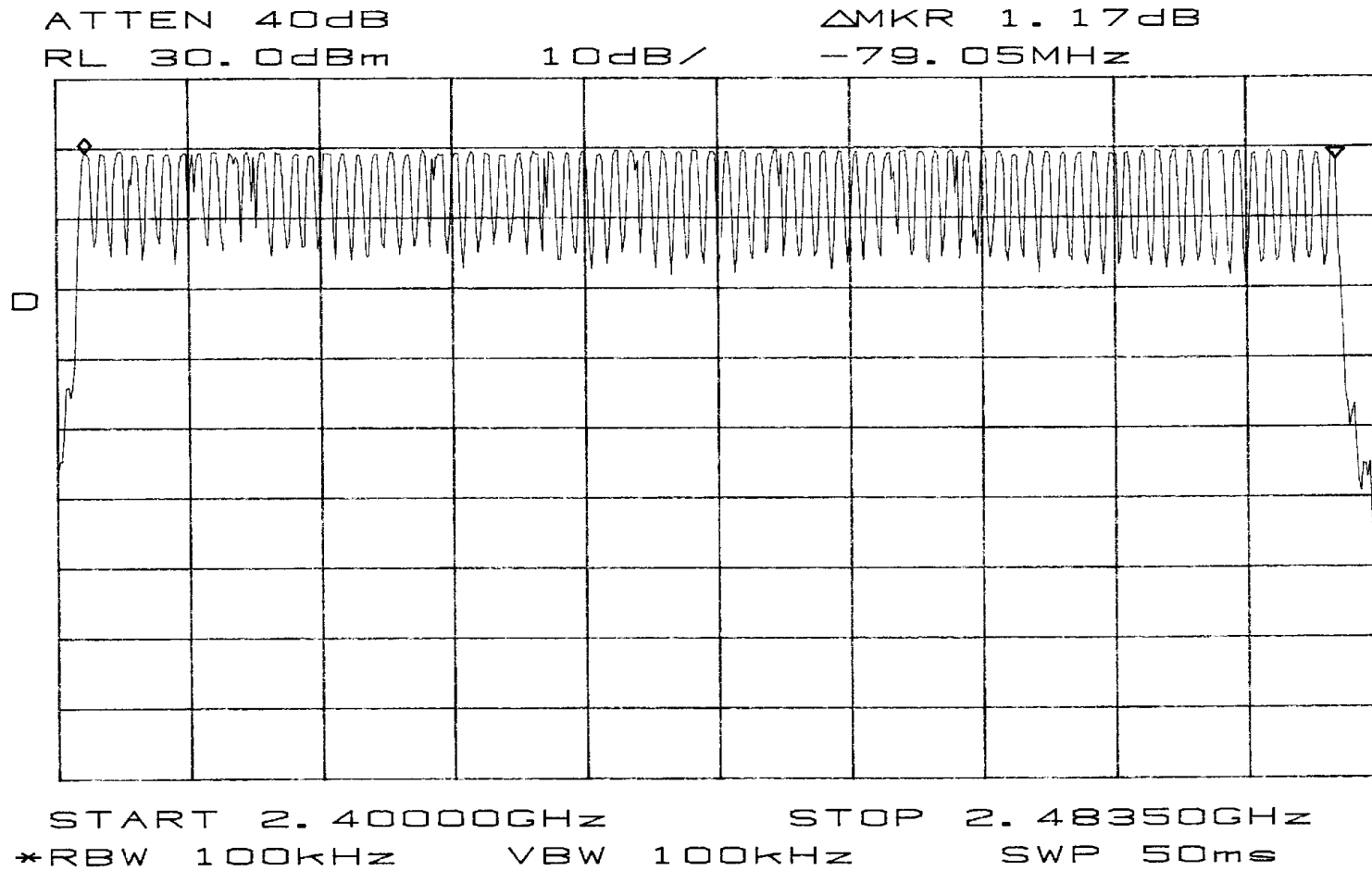
Electronic Compliance Laboratories

Chris Byleckie
Technical Director

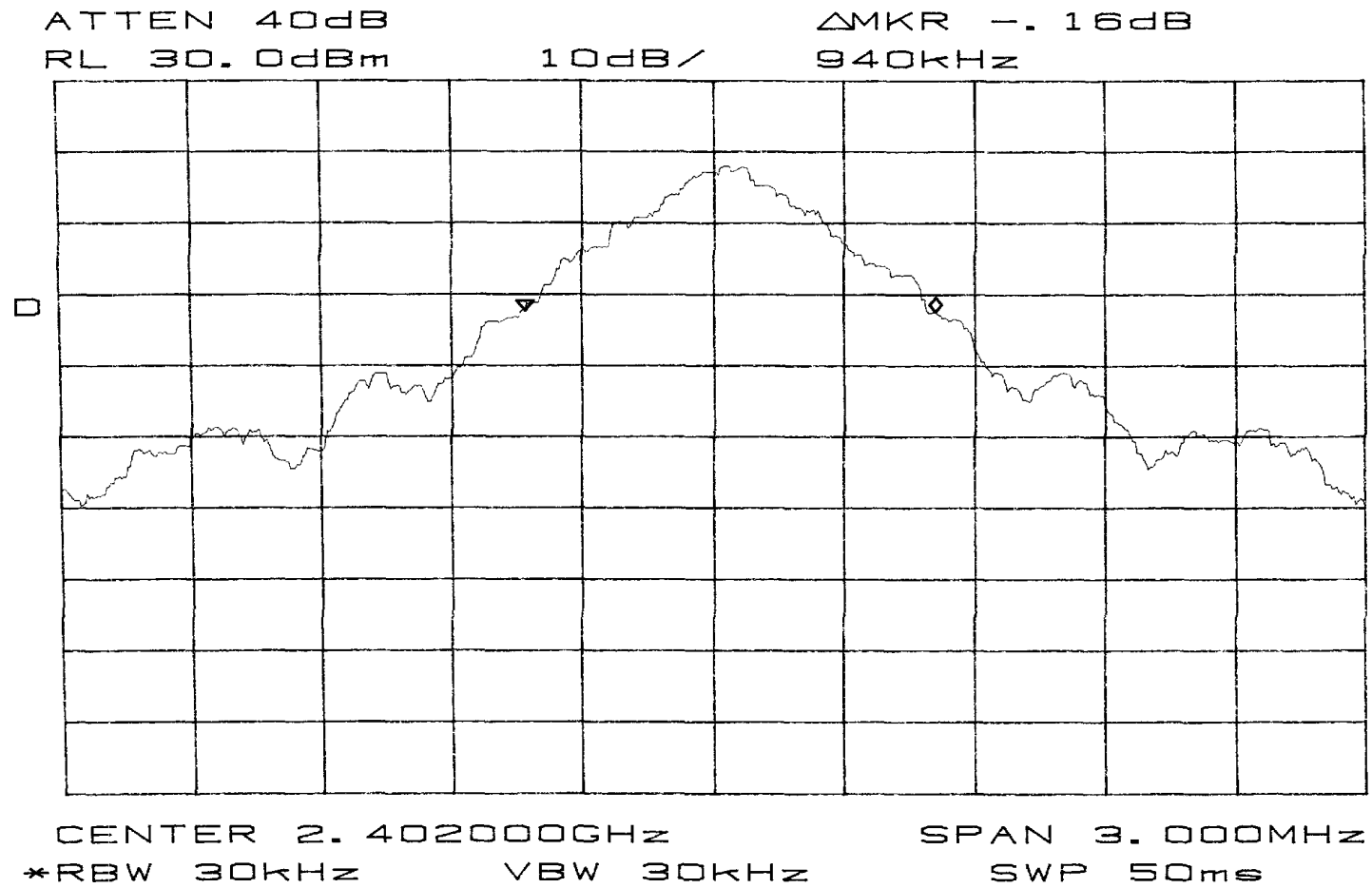
Date

APPENDIX A
SPREAD SPECTRUM PLOTS

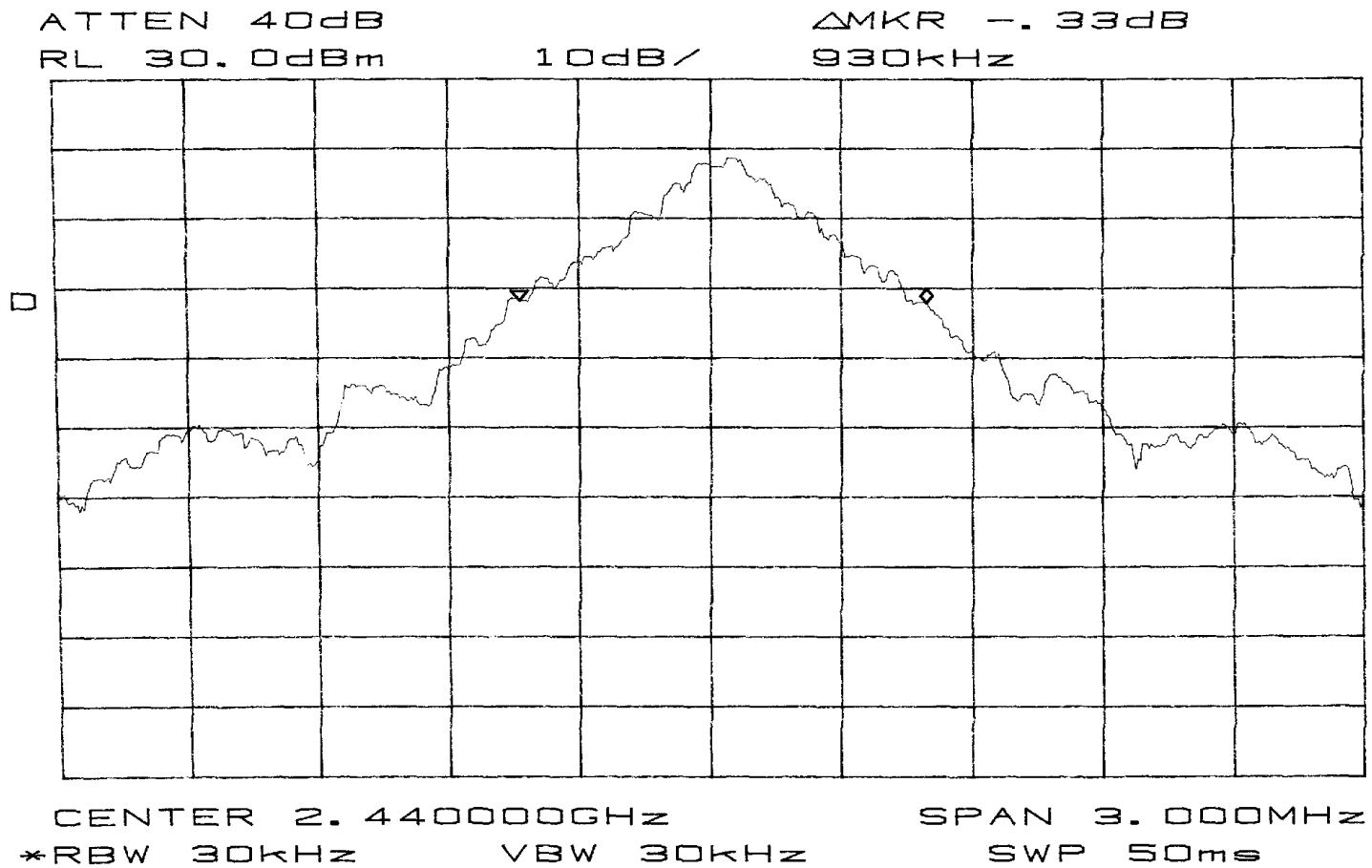
Channel Utilization



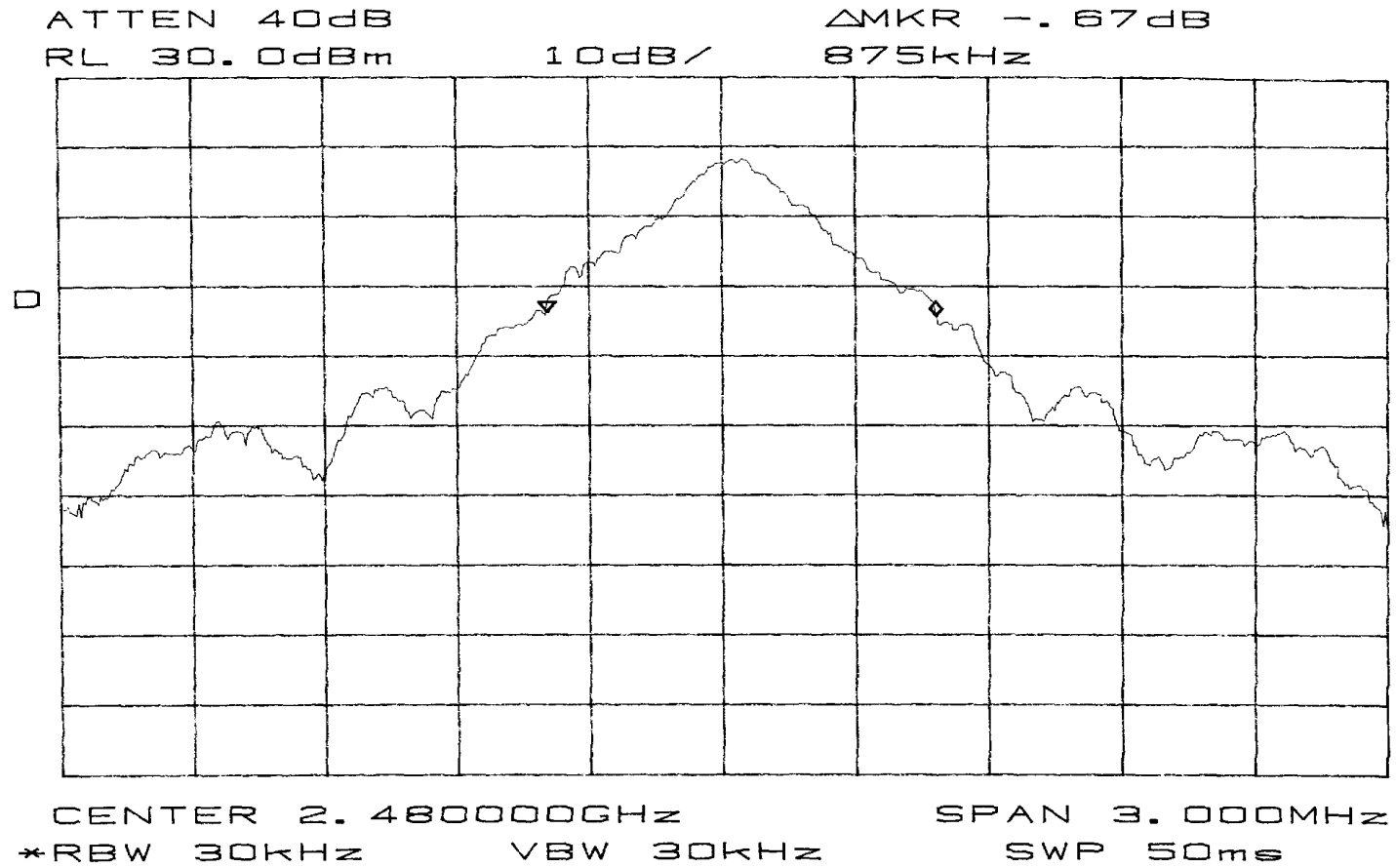
Bandwidth



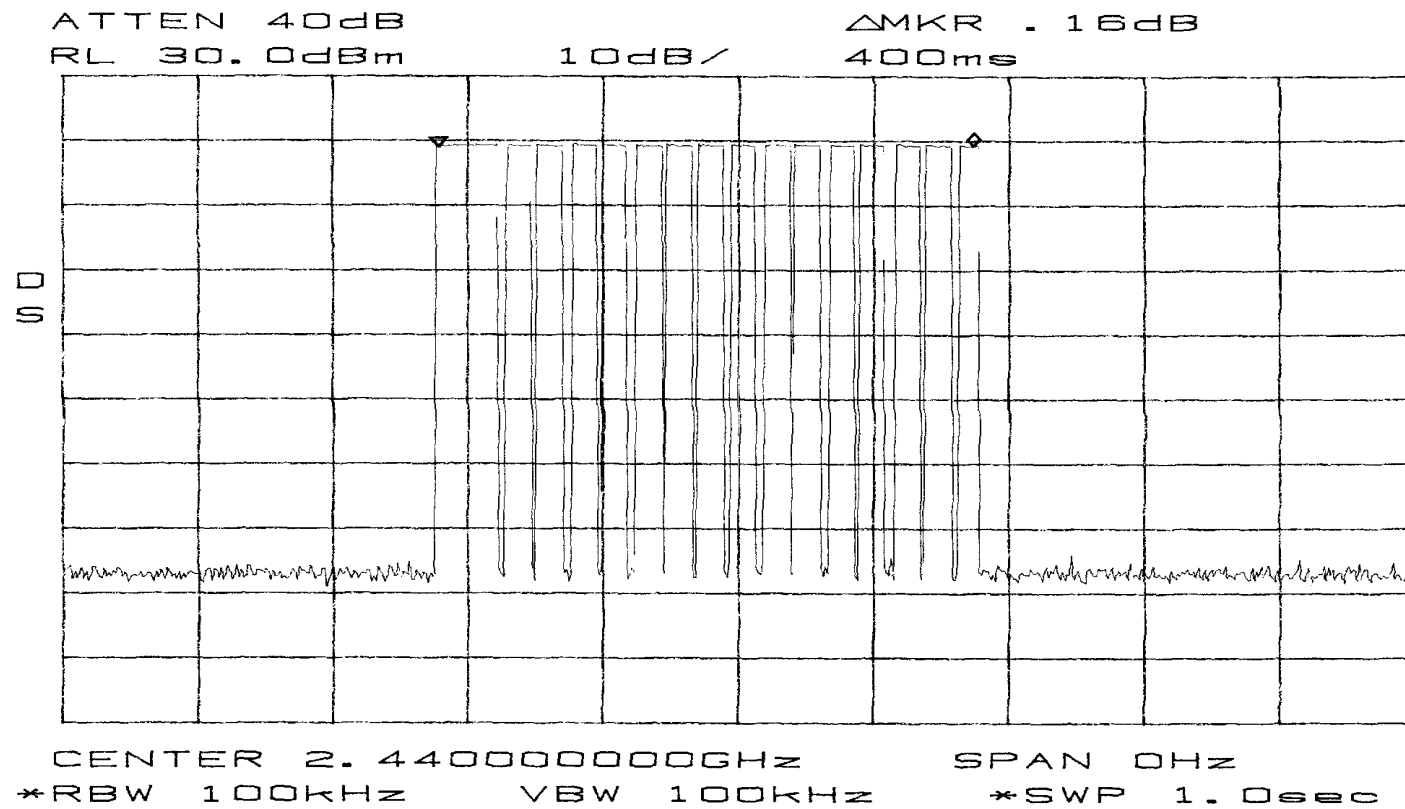
Bandwidth



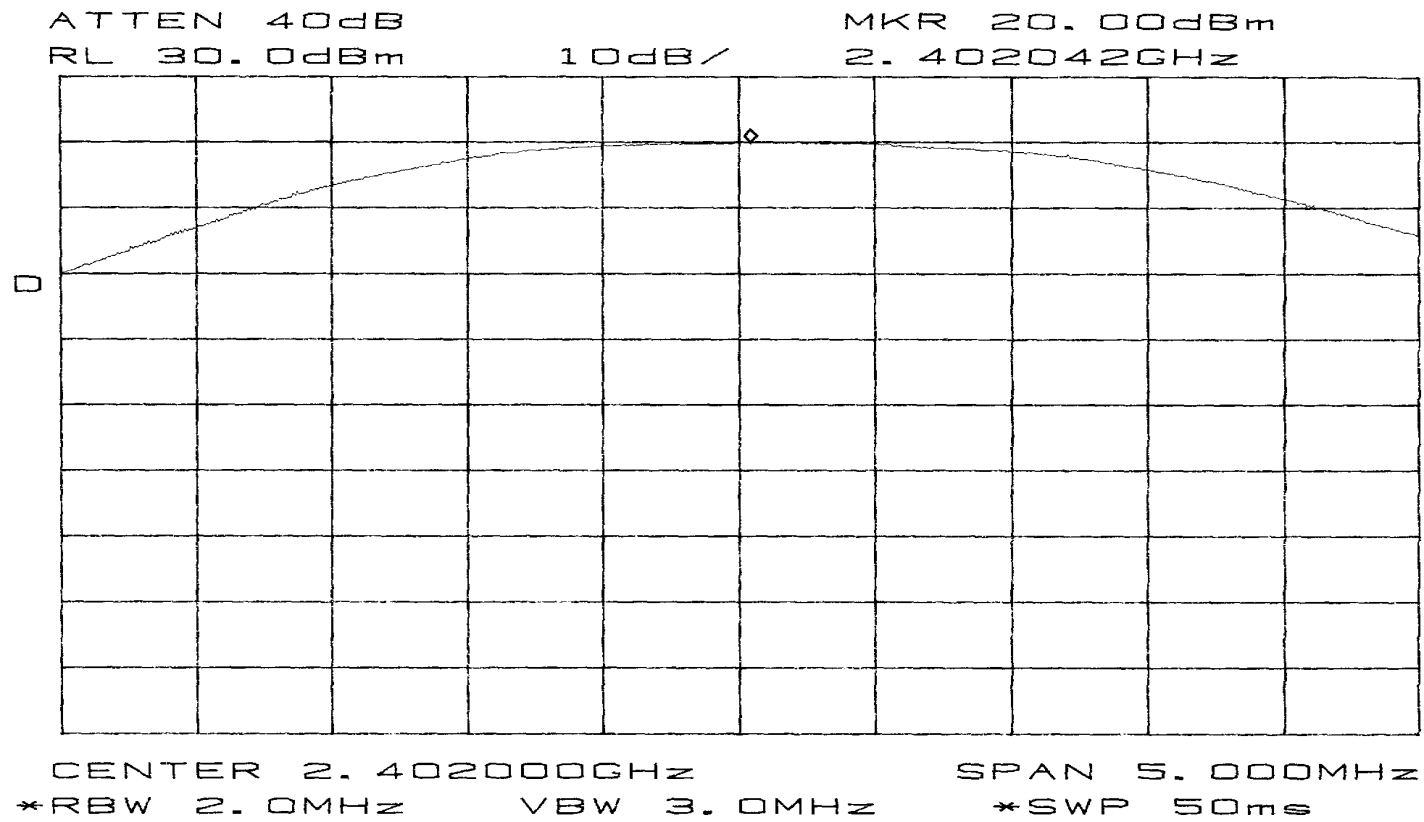
Bandwidth



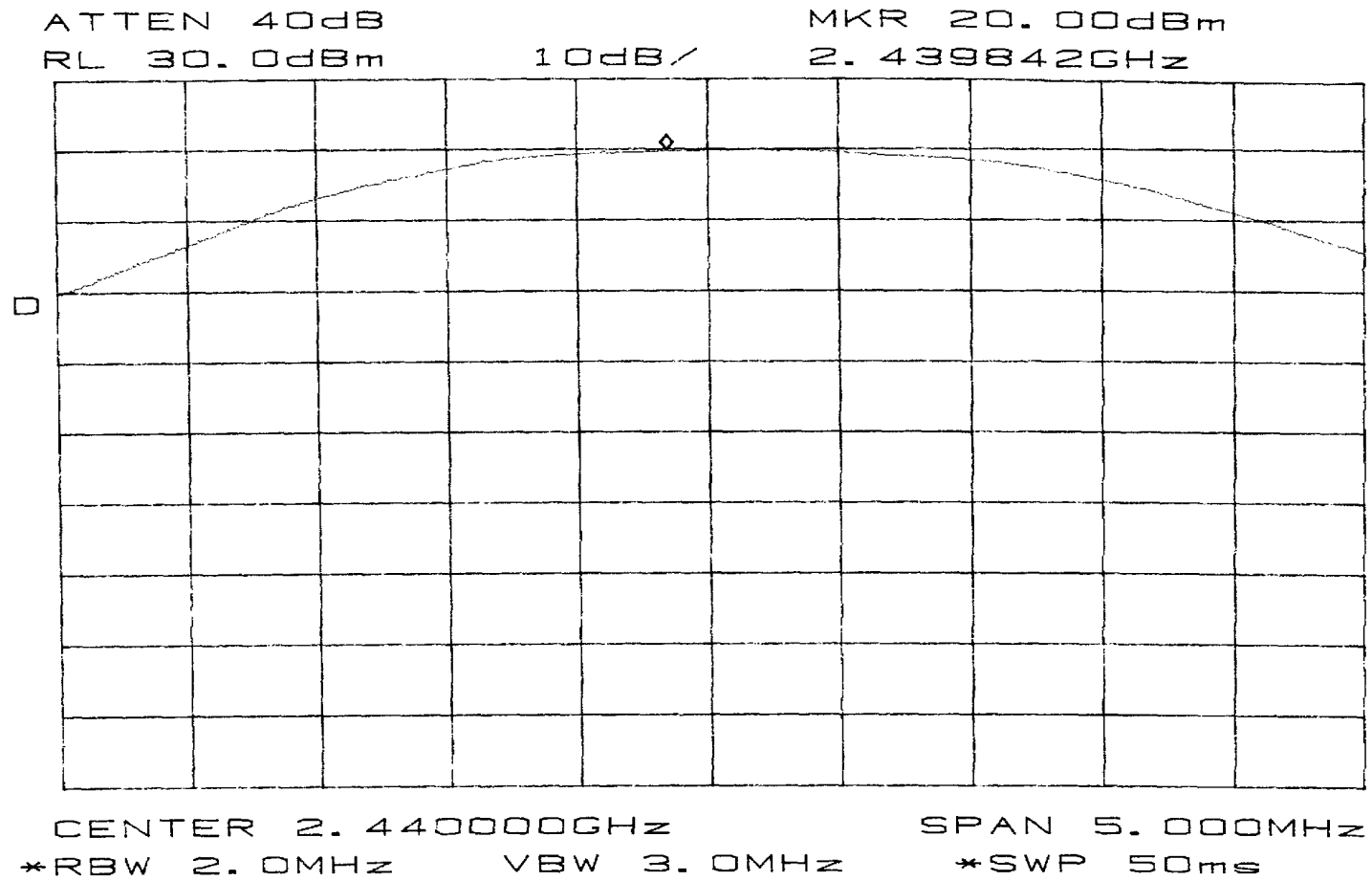
Dwell Time



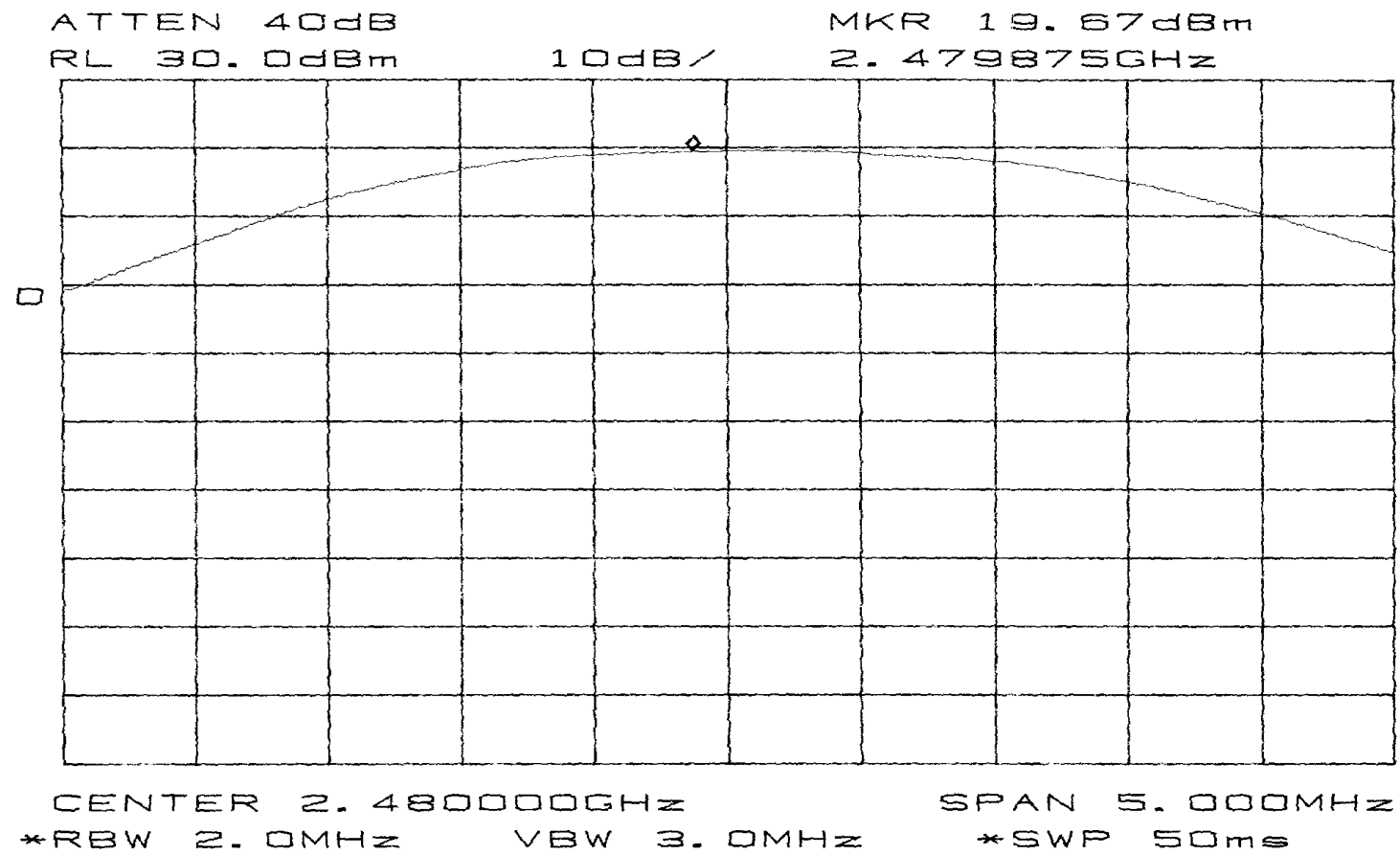
Power Out



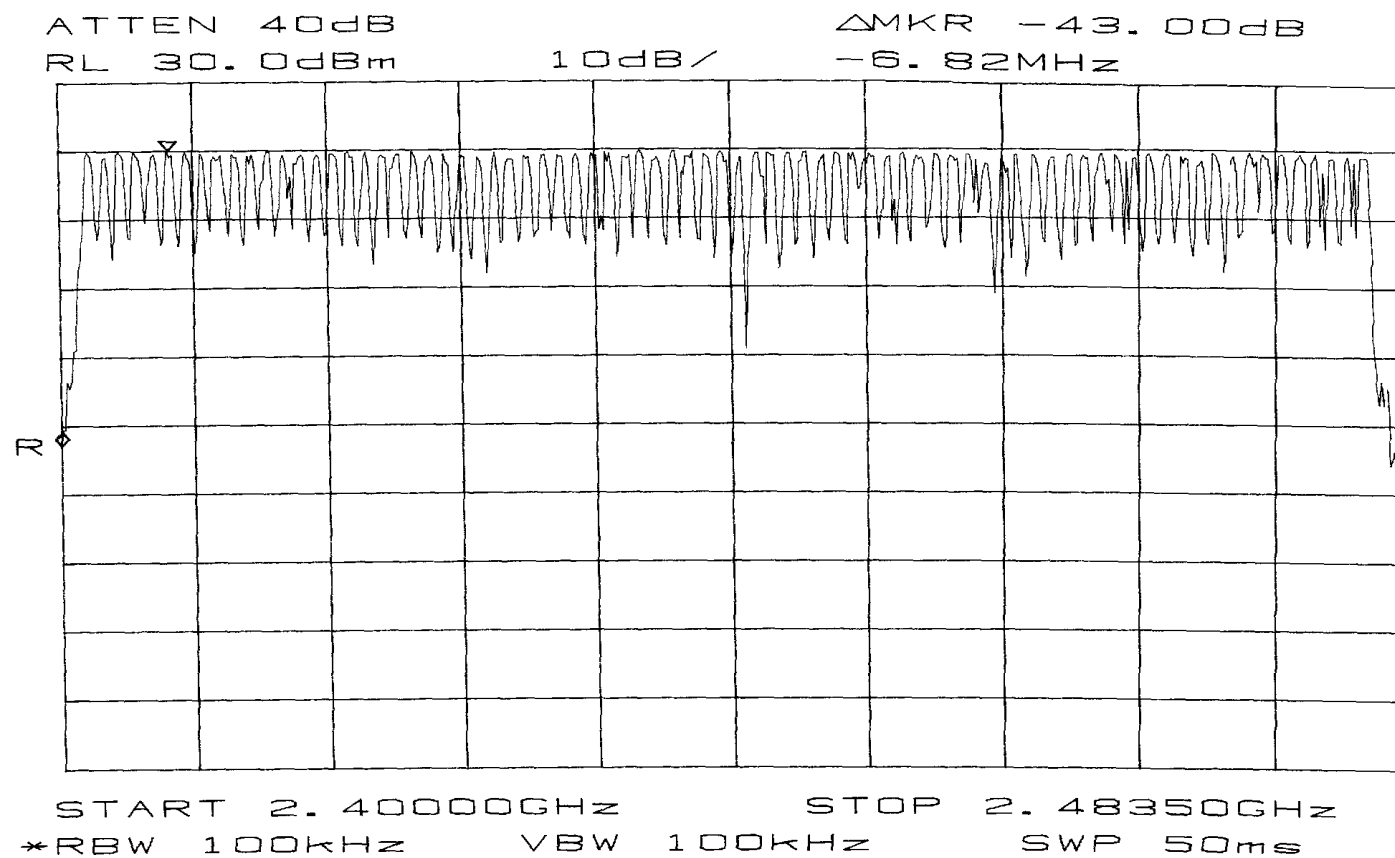
Power Out



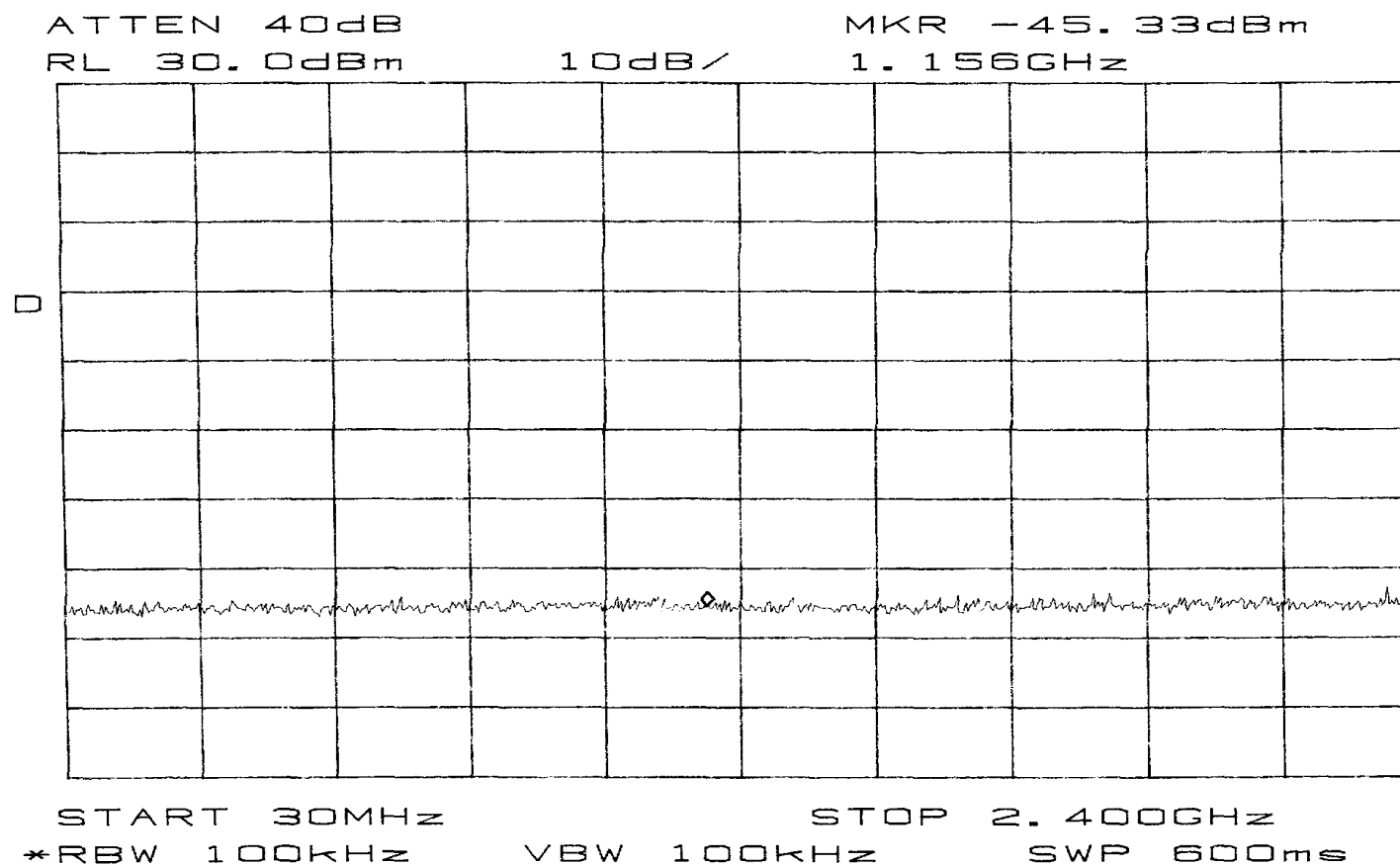
Power Out



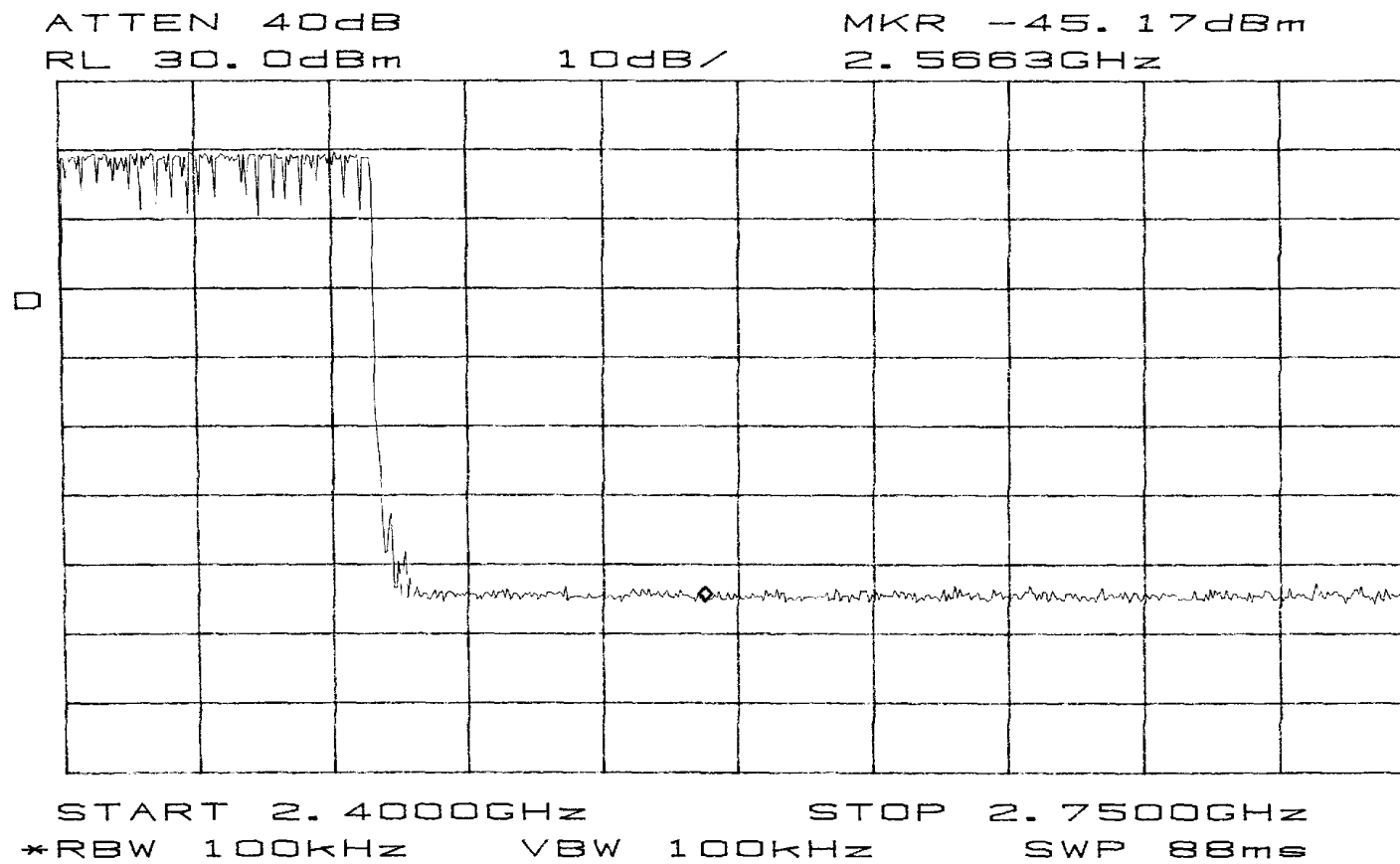
Out Of Band Emissions Band Edges



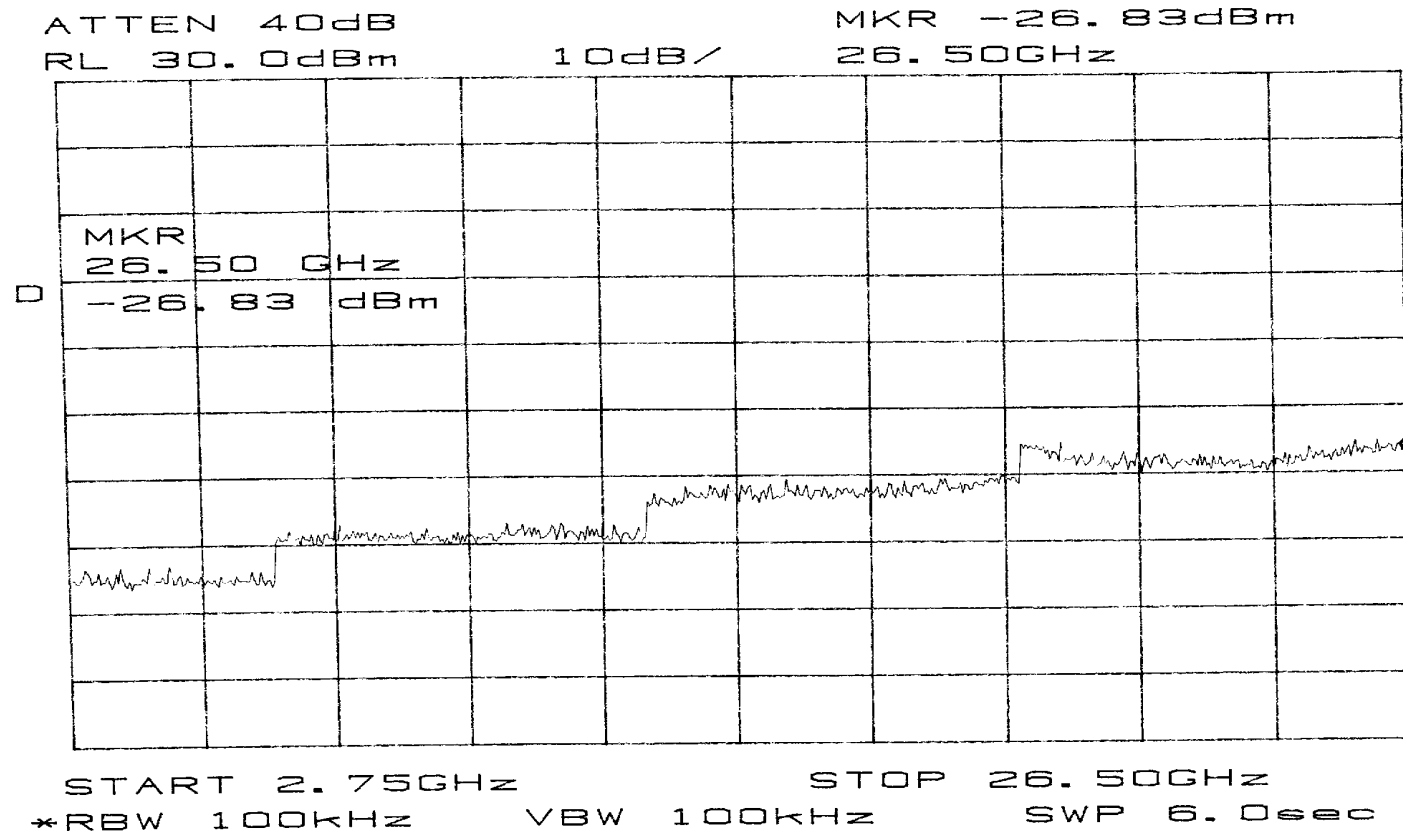
Out Of Band < 1 GHz



Out Of Band 1 - 2.75 GHz

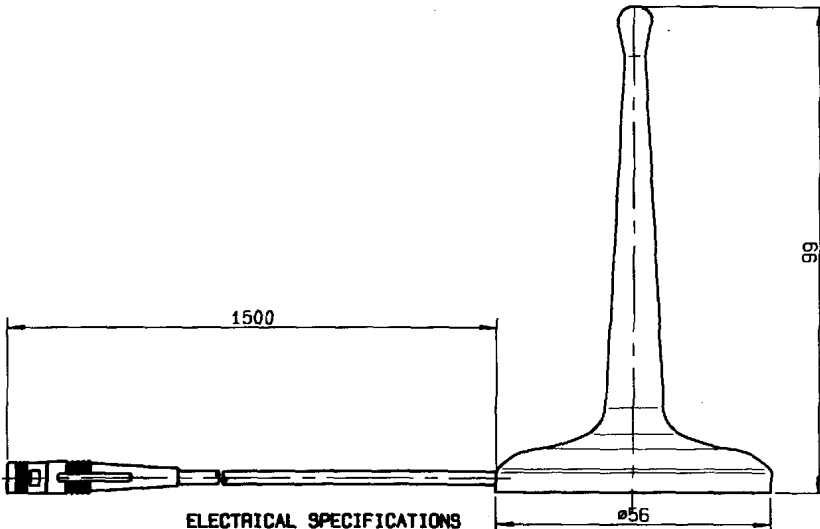


Out of Band 2.75 – 26.5 GHz



APPENDIX B
ANTENNA DRAWINGS

 RADIALL® COAXIAL CONNECTORS	TECHNICAL DATA		R380.500.104A	
	DIPOLE PISTAIL 2450 MHz		Issue : 9820	Page 1 / 1
Series : ANTENNA				



ELECTRICAL SPECIFICATIONS

Operating frequency range	:2400-2500 MHz
VSWR	:2:1
Impedance	:50 Ω
Polarization	:Vertical (antenna axis)
Vertical 3 dB beamwidth	:120°
Gain	:2 dBi
Gain including cable	:0 dBi
Radiation pattern	:Omni directionnal in the Horizontal plane
Power input	:1 Watt

MECHANICAL SPECIFICATIONS

Overall length(including the cable)	:1597 mm
Weight	:60g
Connector	:polarized SMB
Color	:Black

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	:-30 °C to +85 °C
Humidity	:Up to 100% @38 °C

PNR DATA SHEET

PART # 1900.0051

SH. 2 OF 3 REV 01

Initiated on	06.05.98	
The information given here is subject to change without notice. Design changes may be in order to improve the product.		
Approval by	Brocheton	

CONSTANTIN B

APPENDIX C
RESTRICTED BAND DATA

FCC RADIATED DATA SHEET

EUT: ISA CARD

S/N:

RULE PART: 15.247

DATE:6/5/98

CUSTOMER NAME:PRC

WORK ORDER:8060502

FILE:8060502

ANTENNA: HORN VER

OTHER CAL FACTOR: ATTN dB: 10

MODULATION TYPE:

DUTY dB: 0

TESTED BY: DONNIE

HP IL dB: 0

COMMENTS:

DIST dB: 0

FREQ.	READING	Pk, OP,	A.F.	Cable loss	AMP	O.C.F.	TOTAL,	LIMIT	DELTA
MHz	dB(uV)	or Av	dB	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
Fund = 2402									
4804	48.8	Pk	34.3	7.0	35.0	10.0	45.1	74.0	-28.9
4804	36.0	Avg	34.3	7.0	35.0	10.0	32.3	54.0	-21.7
12010	38.8	Pk	40.5	13.6	35.0	10.0	47.9	74.0	-26.1
12010	27.8	Avg	40.5	13.6	35.0	10.0	36.9	54.0	-17.1
14412	44.2	Pk	40.5	14.5	35.0	10.0	54.2	74.0	-19.8
14412	33.3	Avg	40.5	14.5	35.0	10.0	43.3	54.0	-10.7
Fund = 2440									
4880	46.0	Pk	34.3	7.0	35.0	10.0	42.3	74.0	-31.7
4880	36.3	Avg	34.3	7.0	35.0	10.0	32.6	54.0	-21.4
7320	48.8	Pk	37.4	10.6	35.0	10.0	51.8	74.0	-22.2
7320	37.8	Avg	37.4	10.6	35.0	10.0	40.8	54.0	-13.2
12200	38.5	Pk	40.5	13.6	35.0	10.0	47.6	74.0	-26.4
12200	28.0	Avg	40.5	13.6	35.0	10.0	37.1	54.0	-16.9
Fund = 2480									
4960	46.7	Pk	34.3	7.0	35.0	10.0	43.0	74.0	-31.0
4960	37.2	Avg	34.3	7.0	35.0	10.0	33.5	54.0	-20.5
7440	49.8	Pk	37.4	10.6	35.0	10.0	52.8	74.0	-21.2
7440	39.0	Avg	37.4	10.6	35.0	10.0	42.0	54.0	-12.0
12400	38.7	Pk	40.5	13.6	35.0	10.0	47.8	74.0	-26.2
12400	27.5	Avg	40.5	13.6	35.0	10.0	36.6	54.0	-17.4

APPENDIX C
15.207
CONDUCTED EMISSIONS

Electronic Compliance Laboratories, Inc.
 1249 Birchwood Ave.
 Sunnyvale, CA
 Conducted Emissions
 Frequency range: 450KHz-30MHz

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: 06-05-1998 Time: 11:56:37
 Temperature Range: 70 Deg F Percent Humidity: 50
 E.U.T.: SYMPHONY ISA CARD
 Serial Number:
 Support Devices:
 Serial Number:
 FCC ID:
 Exercise Program:
 Modifications: None
 Report File Name: F:\TESTDATA\8060502.F

TEST FREQ	TEST dBuV	CLASS B LIMIT	VERSUS B LIMIT	CONDUCTOR	TYPE
=====	=====	=====	=====	=====	=====
0.450	35.5	48.0	-12.5	LINE	PK
0.820	27.5	48.0	-20.5	LINE	PK
1.850	26.2	48.0	-21.8	LINE	PK
2.150	28.6	48.0	-19.4	LINE	PK
3.410	25.9	48.0	-22.1	LINE	PK
12.270	33.1	48.0	-14.9	LINE	PK
0.450	36.6	48.0	-11.4	NEUTRAL	PK
1.670	28.6	48.0	-19.4	NEUTRAL	PK
7.540	27.3	48.0	-20.7	NEUTRAL	PK
9.130	31.0	48.0	-17.0	NEUTRAL	PK
10.140	32.3	48.0	-15.7	NEUTRAL	PK
24.040	29.6	48.0	-18.4	NEUTRAL	PK

(P) 11:45:59 JUN 05, 1998

16:09:17 JUN 29, 1994 16:36:52 JUN 29, 1994

ACTV DET: PEAK

MEAS DET: PEAK QP AVG

MKR 1.41 MHz

24.50 dBμV

LDG REF 92.0 dBμV

10

dB/

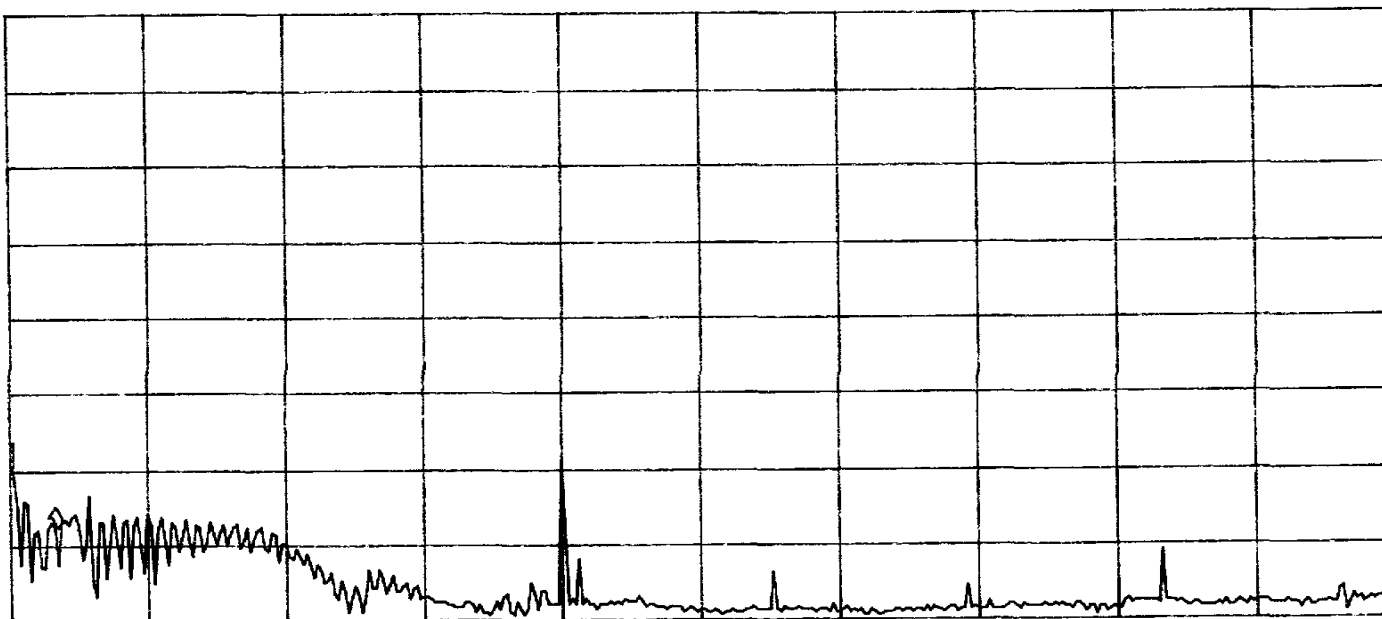
ATN

10 dB

VA SB

SC FC

ACDRR



START 450 kHz

IF BW 9.0 kHz

AVG BW 30 kHz

STOP 30.00 MHz

SWP 2.46 sec

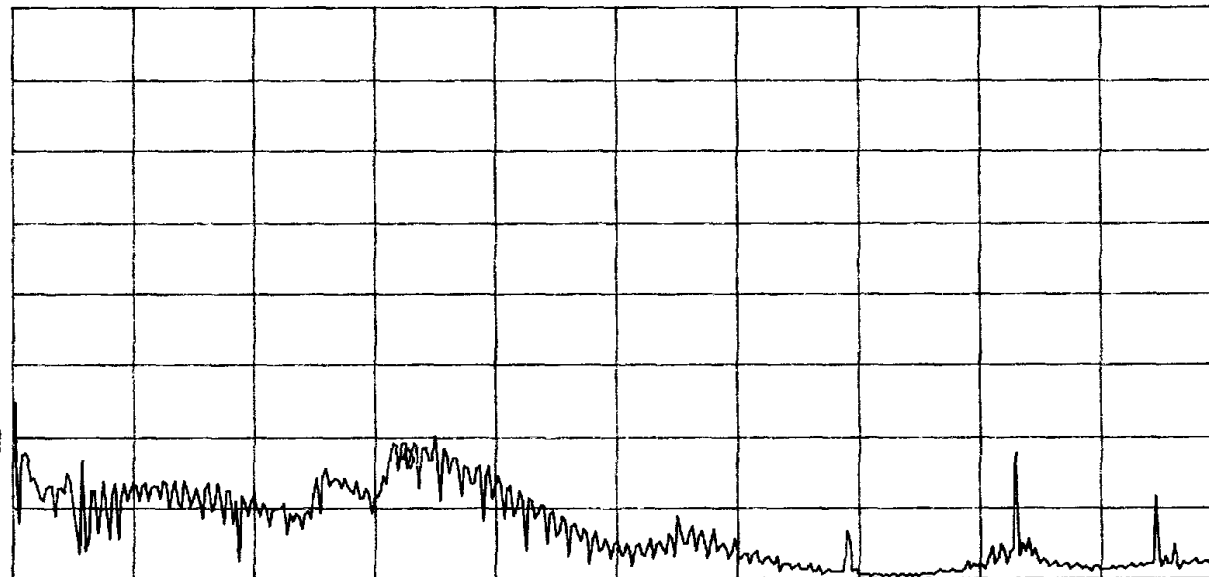
(P) 11:51:01 JUN 05, 1998
16:09:17 JUN 29, 1994 16:36:52 JUN 29, 1994

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 10.13 MHz
27.48 dB μ V

LOG REF 92.0 dB μ V

10
dB/
ATTN
10 dB

VA SB
SC FC
ACDAR



START 450 kHz

IF BW 9.0 kHz

AVG BW 30 kHz

STOP 30.00 MHz

SWP 2.46 sec

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

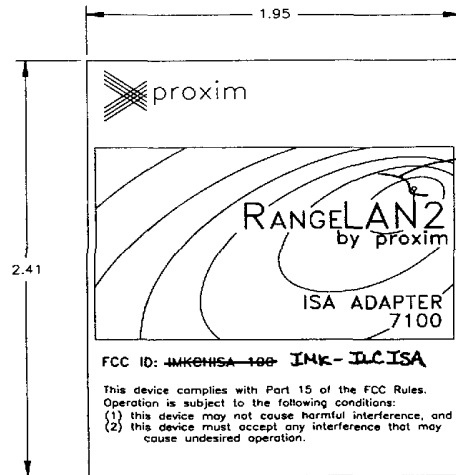
Customer: PROXIM Operator: DONNIE
Date: 06-05-1998 Time: 09:57:53
Temperature Range: 68 Deg F Percent Humidity: 55
E.U.T.: SYMPHAONY ISA CARD
Serial Number:
Support Devices:
Serial Number:
FCC ID:
Exercise Program:
Modifications: None
Report File Name: F:\TESTDATA\8060502.RF

Antenna Type: BICONICAL

TEST FREQ	TEST dBuV	ACTUAL dBuV/m	CLASS B LIMIT	VERSUS B LIMIT	TABLE DEGREES	ANTENNA HEIGHT	POLAR- IZATION	DETECTOR Type
=====	=====	=====	=====	=====	=====	=====	=====	=====
264.00	32.9	26.0	46.0	-20.0	225	1.0	V	PK
32.00	41.2	34.1	40.0	-5.9	0	1.0	V	PK
32.00	40.4	33.3	40.0	-6.7	0	1.0	V	QP
48.00	40.8	27.7	40.0	-12.3	330	1.0	V	PK
128.04	39.1	28.9	43.5	-14.6	270	2.3	V	PK
144.00	39.6	30.0	43.5	-13.5	330	2.0	V	PK
32.00	38.9	31.8	40.0	-8.2	180	4.0	H	PK
48.00	36.3	23.2	40.0	-16.8	180	4.0	H	PK
128.04	40.2	30.0	43.5	-13.5	330	4.0	H	PK
264.07	30.4	23.5	46.0	-22.5	330	3.5	H	PK
CHANGED ANTENNA TO LOG PERIODIC								
365.64	38.7	30.3	46.0	-15.7	135	1.0	V	PK
398.89	36.4	28.9	46.0	-17.1	290	1.0	V	PK
464.00	32.5	26.3	46.0	-19.7	180	1.0	V	PK
365.64	38.4	30.0	46.0	-16.0	90	1.0	H	PK
398.89	38.9	31.4	46.0	-14.6	180	1.0	H	PK
429.55	36.3	29.2	46.0	-16.8	225	1.0	H	PK
498.00	41.3	36.1	46.0	-9.9	45	1.0	H	PK
575.69	35.5	31.5	46.0	-14.5	270	1.1	H	PK

APPENDIX E
SAMPLE LABEL

REVISION					
LTR	ECO	DATE			BY APPR
A		8-5-95	INITIAL RELEASE		JP



New Artwork (TED)

NOTES:

1. MATERIAL: 2 MIL VOIDABLE MYLAR WITH 1 MIL MATTE MYLAR LAMINATE AND 1 MIL PERMANENT ACRYLIC ADHESIVE.
2. GRAPHICS: BACKGROUND: BLACK
TEXT AND BOX OUTLINE: SILVER
RINGS: REFLEX BLUE

NOTES UNLESS SPECIFIED		DRAWN BOB DEEDY	8-5-95		
TOLERANCES .XX+/- .01 ANGULAR .XX+/- +/- °		DESIGN			
BREAK ALL SHARP EDGES APPROX. .010 MACH. SURFACES DIMENSIONS APPLY AFTER FINISH.		MATERIAL	1.	TITLE SYMPHONY ISA	
		FINISH	2.	LABEL, ISA, FCC, PROXIM, 7100-	
		CHECKED AND APPROVED		SIZE B	DWG NO. 2460.0262-0762
				SCALE 2:1	REV. A
				FILE NAME 24600262	SHEET 1 OF 1

APPENDIX F
SET-UP PHOTOS



**FCC 15.207 Class B
Conducted Emissions**



**FCC 15.209 Class B
Radiated Emissions**



**FCC 15.205 Restricted Band
Antenna**

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 650/328-3640. 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 Requires
The Product Pa

2. Quick Install

3. Physical Ins

Antenna Option
Outdoor Packag
Indoor Mounting

4. Wireless Top

Planning and Mi
One Hop
Multiple Linear
Tree
Building-to-Build
Roaming
Roaming Scena
How to Configu
Extension Points

5. Configuration

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

6. Configuration

TCP/IP Configu
Bridge Configur
BSA Radio Confi

F 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