15.247 Certification
FCC ID: IMK-ILC56K

EMI TEST REPORT

On

SYMPHONY CORDLESS MODEM

Prepared for

Proxim Inc.
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: A806014
Date of Test: June 24, 1998

Table of Contents

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 CORDLESS MODEM
M/N: 4500
S/N: 81500021
FCC ID: IMK-ILC56K

With Proxim built in Dipole Antenna.

4.0 SUPPORT EQUIPMENT

	Model No.	Serial No.
PC Computer	486	95808514
Keyboard		
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 CORDLESS MODEM 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 CORDLESS MODEM 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 in the confidential section 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 (.910 / .885 / .840 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 “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 19.17 dBm or 82.6 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 = 18.67 dBm (peak reading) +0.5dB cable loss = +19.17 dBm / 82 mW EIRP
Limit: +30 dBm / 1 W maximum power

Antenna
EIRP = +19.2 (peak power) +0 (peak gain, dBi) = + 19.2 dBm / 82.6 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- 1.0 GHz", " OUT OF BAND 1.0 – 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**

The antenna is an integral part of the unit, and is shown on the attached photos.

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 μV when measured with a LISN. Attached graphs and tabular data show that emissions are below the 250 μV (48 dBμV) 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

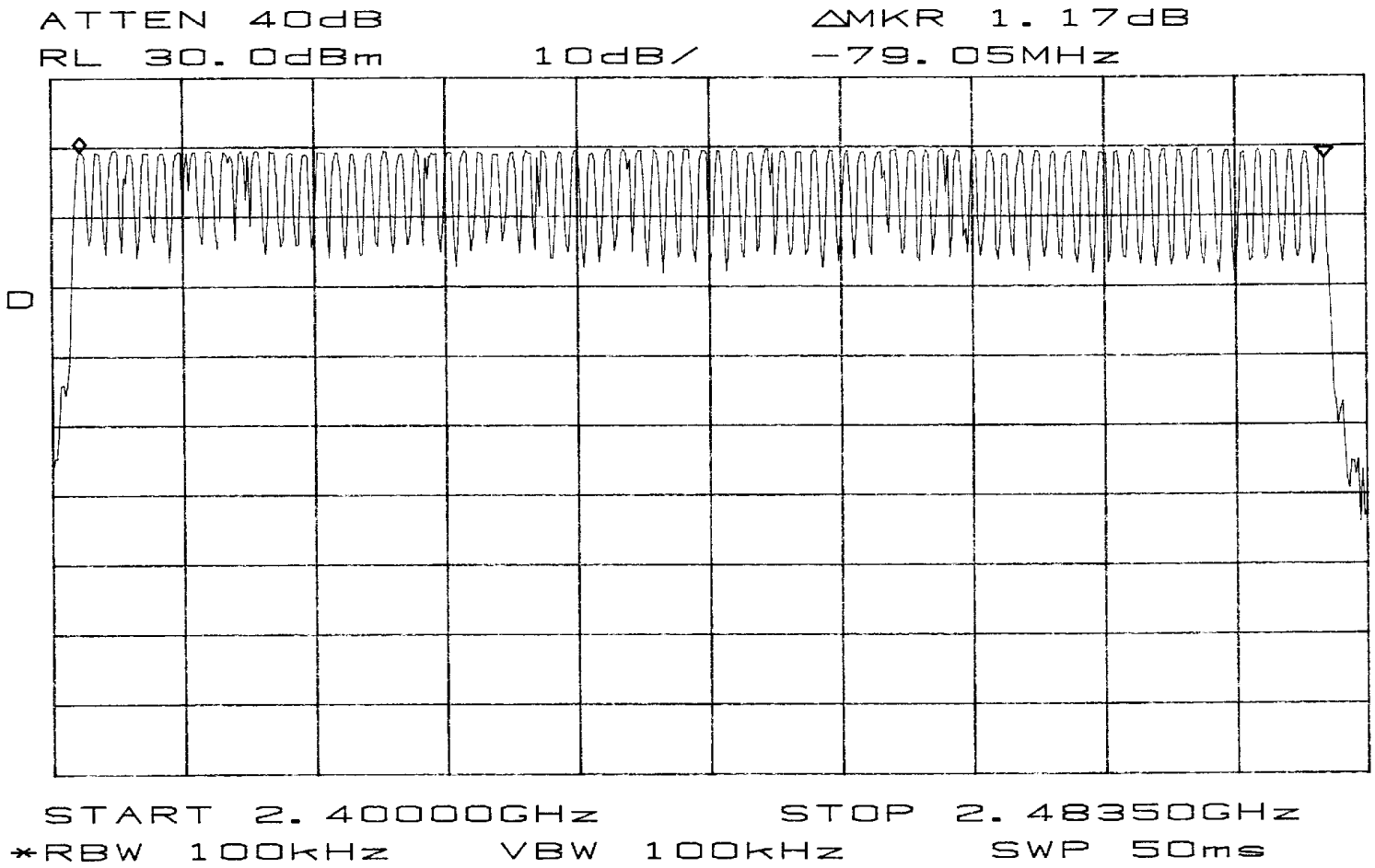
_____ _____

Chris Byleckie Date
Technical Director

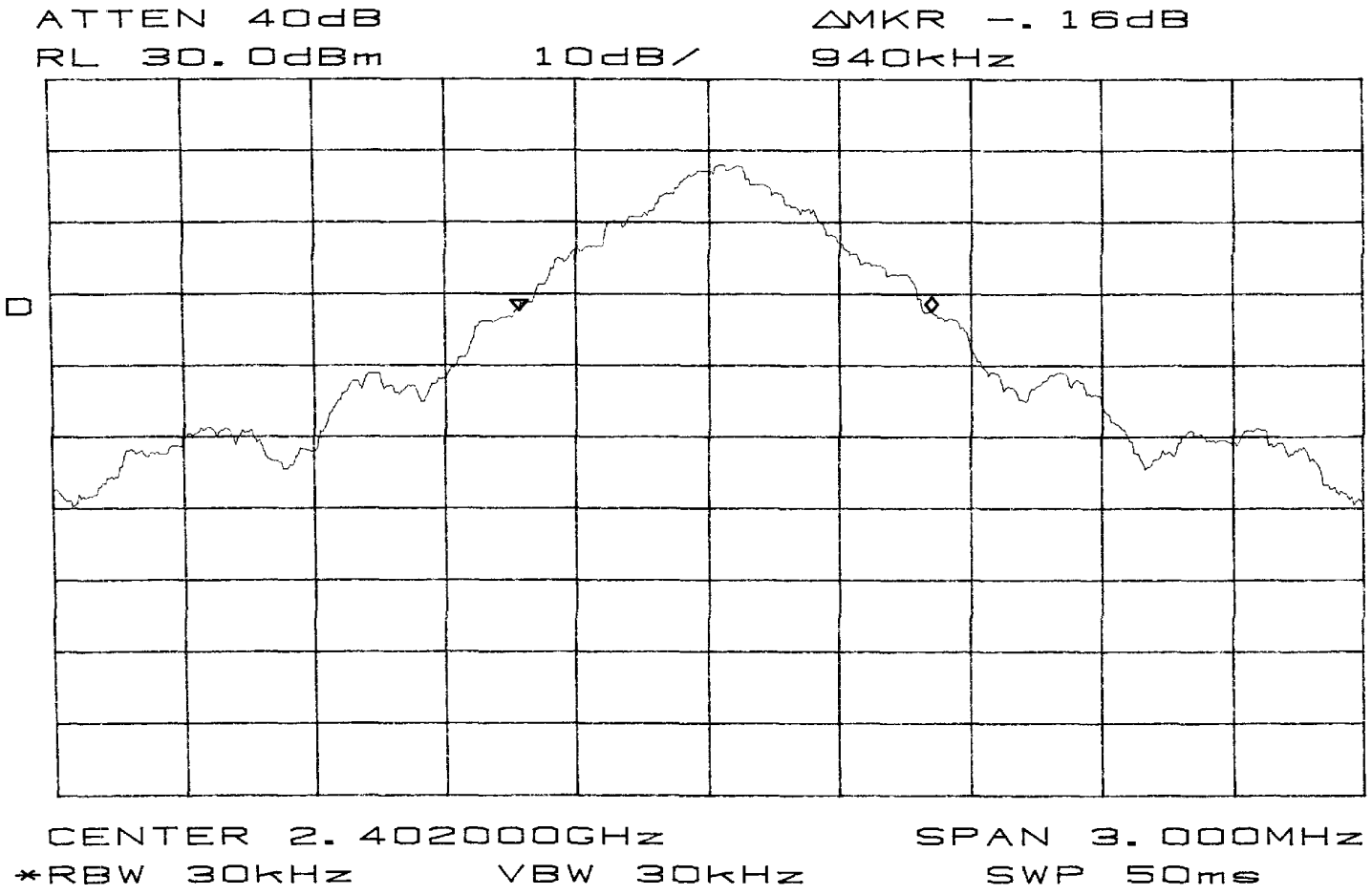
APPENDIX A

SPREAD SPECTRUM PLOTS

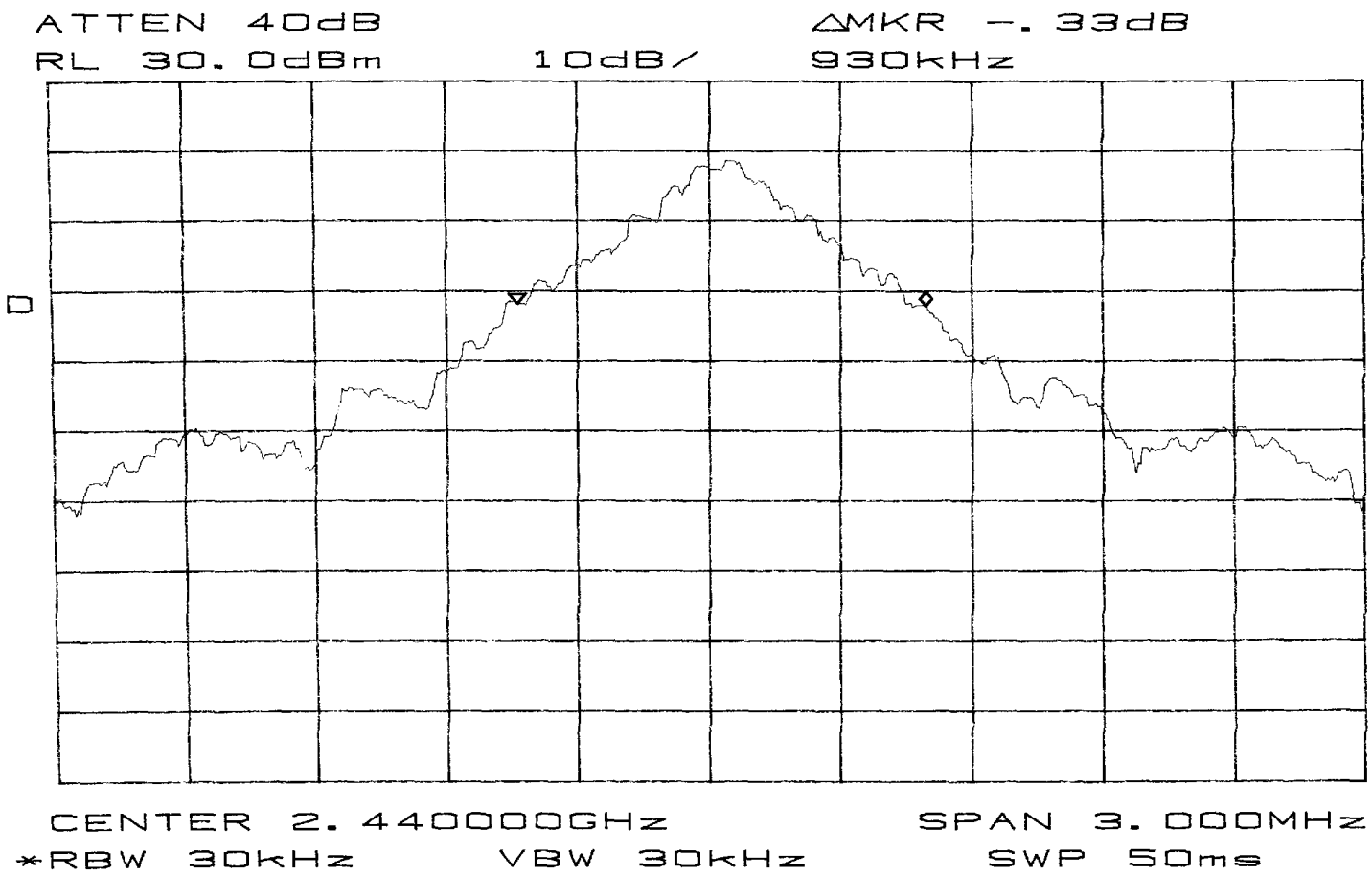
Channel Utilization



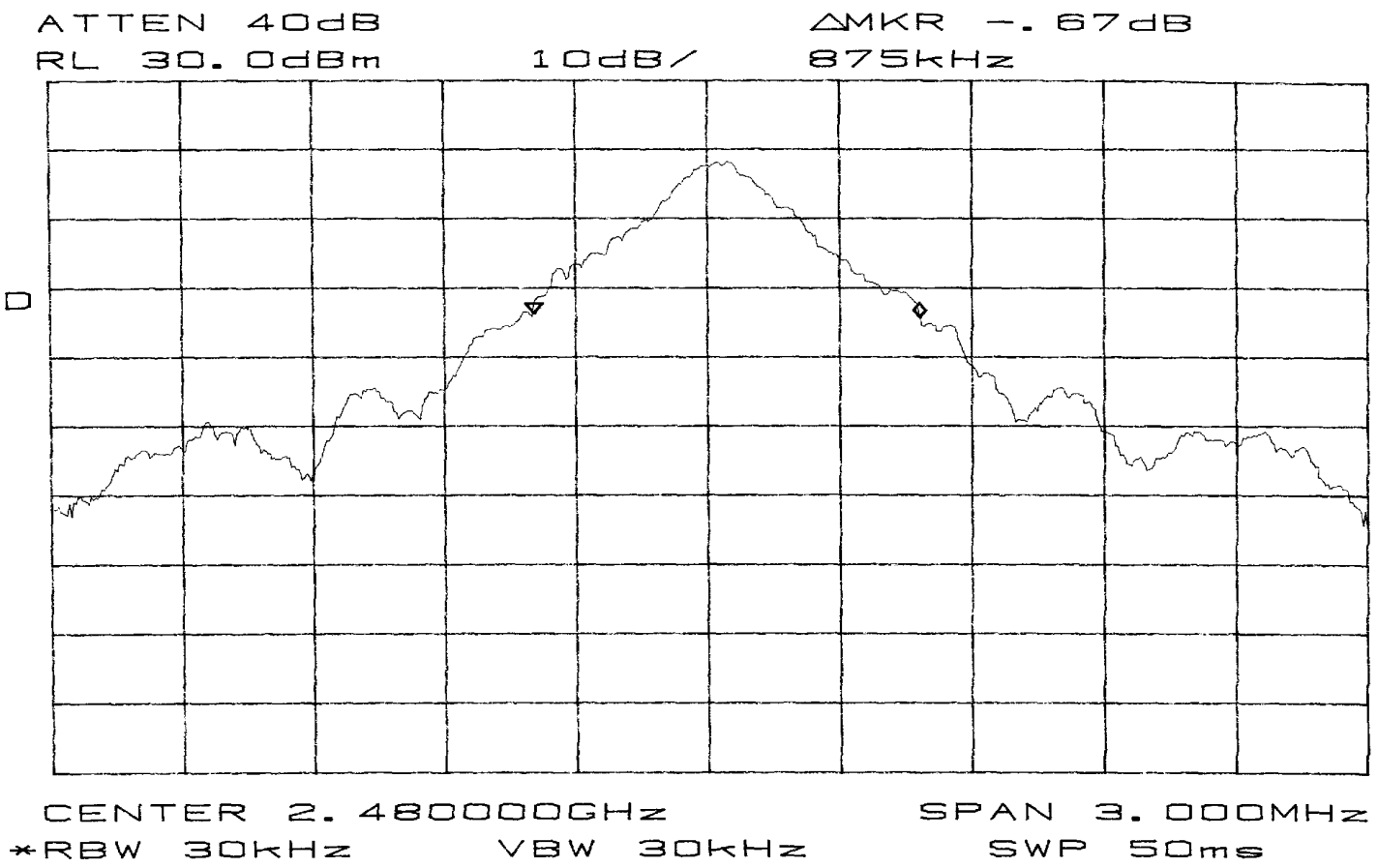
Bandwidth


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.16dB
940kHz
D
CENTER 2.402000GHz
SPAN 3.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50ms

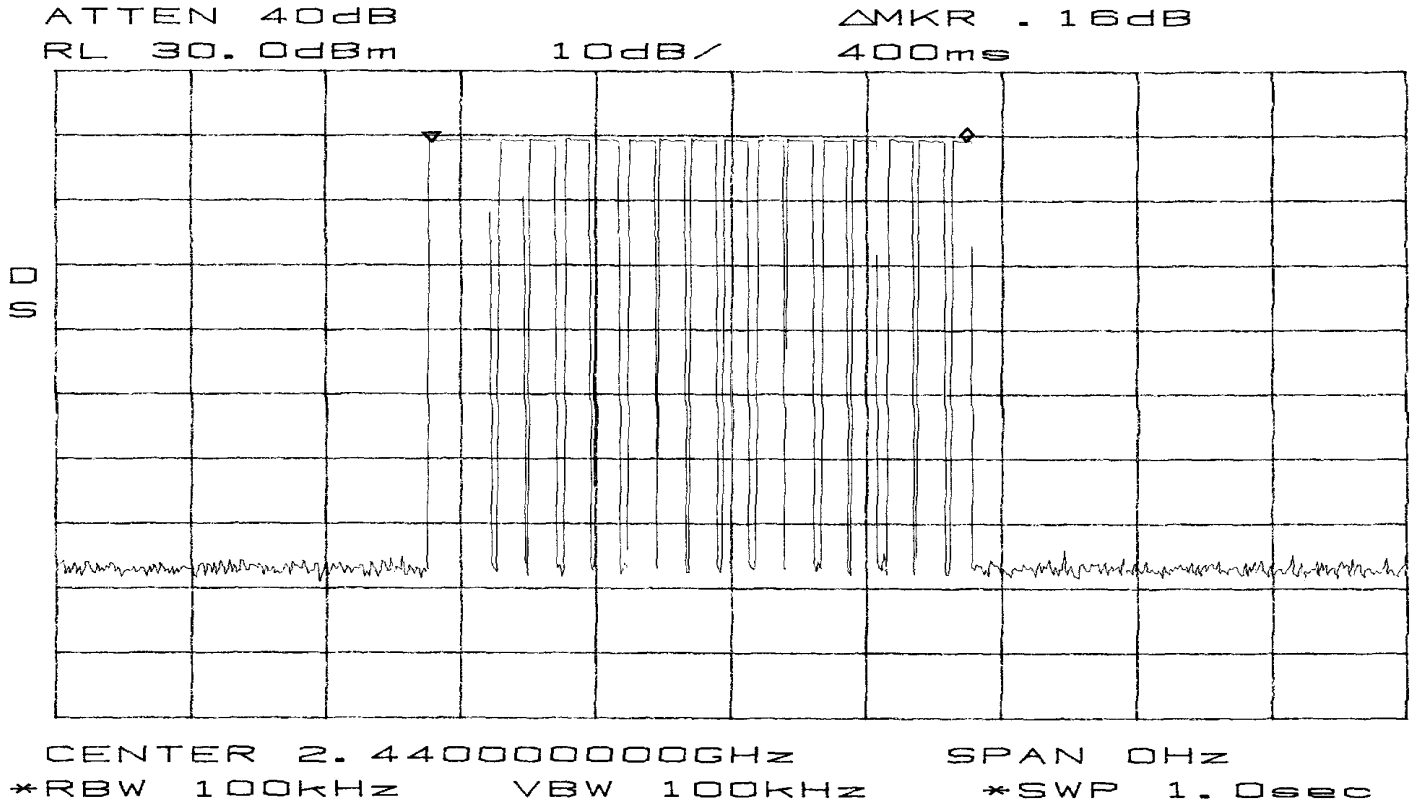
Bandwidth


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.33dB
930kHz
D
CENTER 2.440000GHz
SPAN 3.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50ms

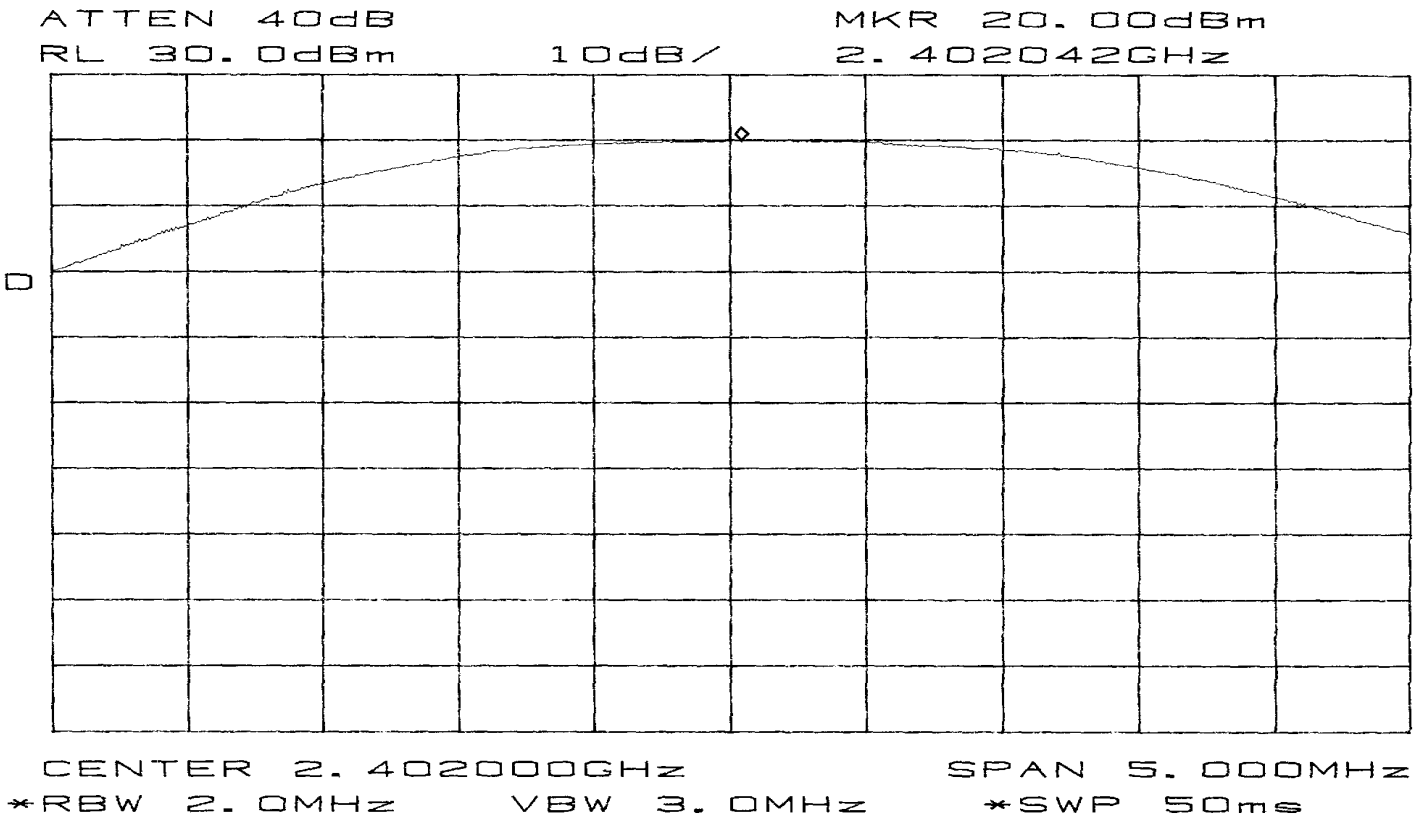
Bandwidth


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.67dB
875kHz
D
CENTER 2.4800000GHz
SPAN 3.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50ms

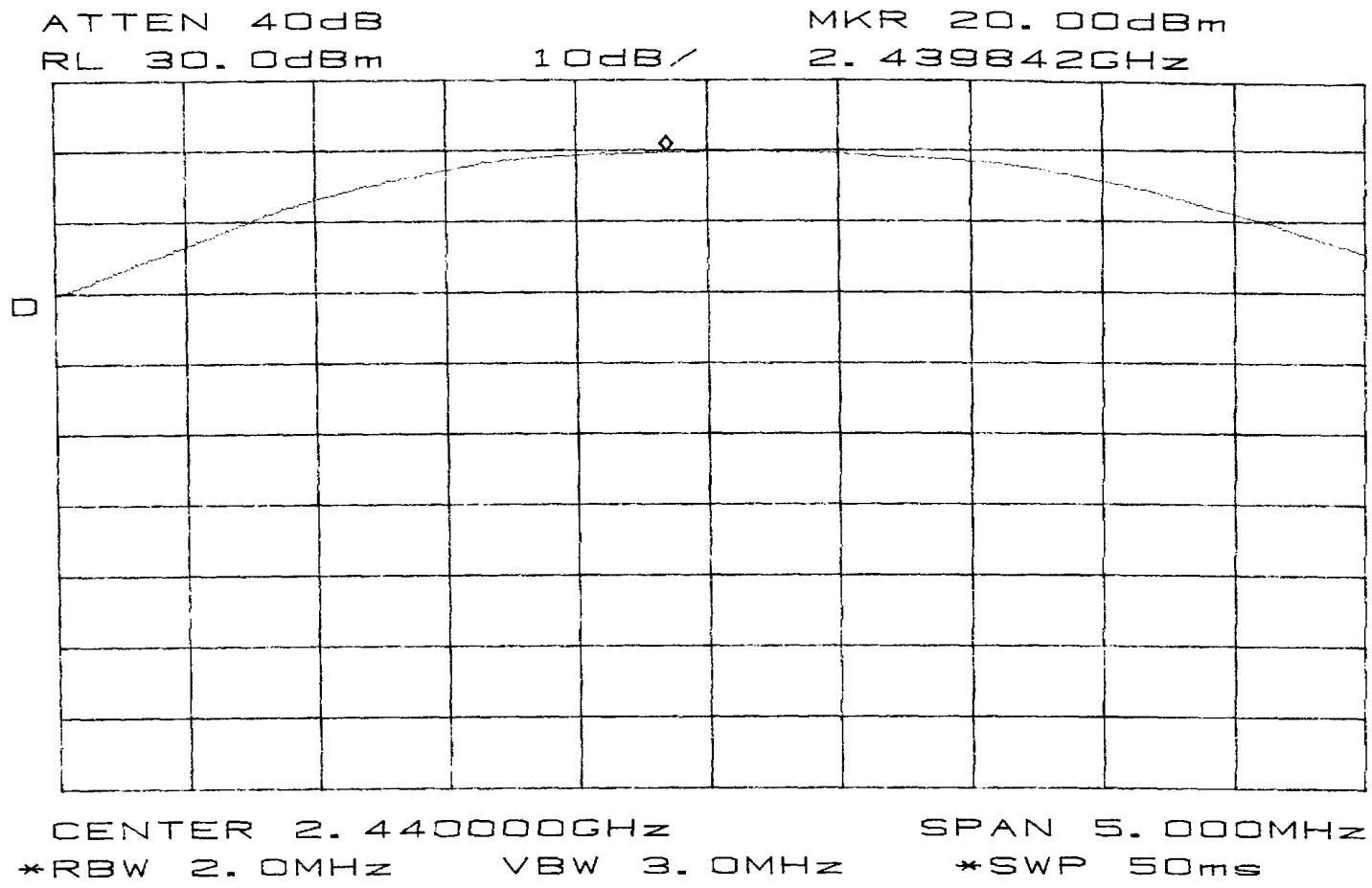
Dwell Time


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR .16dB
400ms
D
S
CENTER 2.440000000GHz
SPAN 0Hz
*RBW 100kHz
VBW 100kHz
*SWP 1.0sec

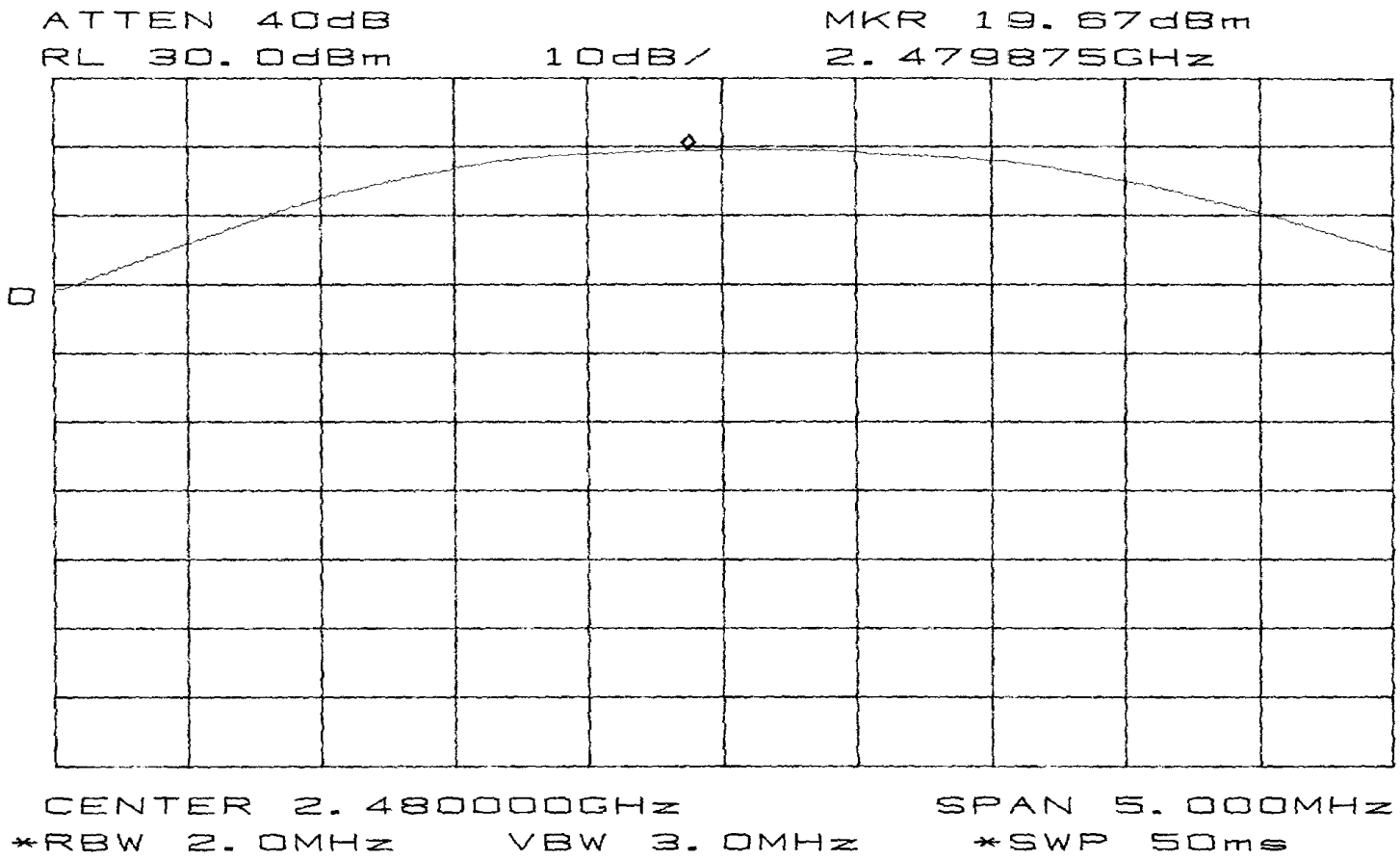
Power Out


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 20.00dBm
2.402042GHz
D
CENTER 2.402000GHz
SPAN 5.000MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50ms

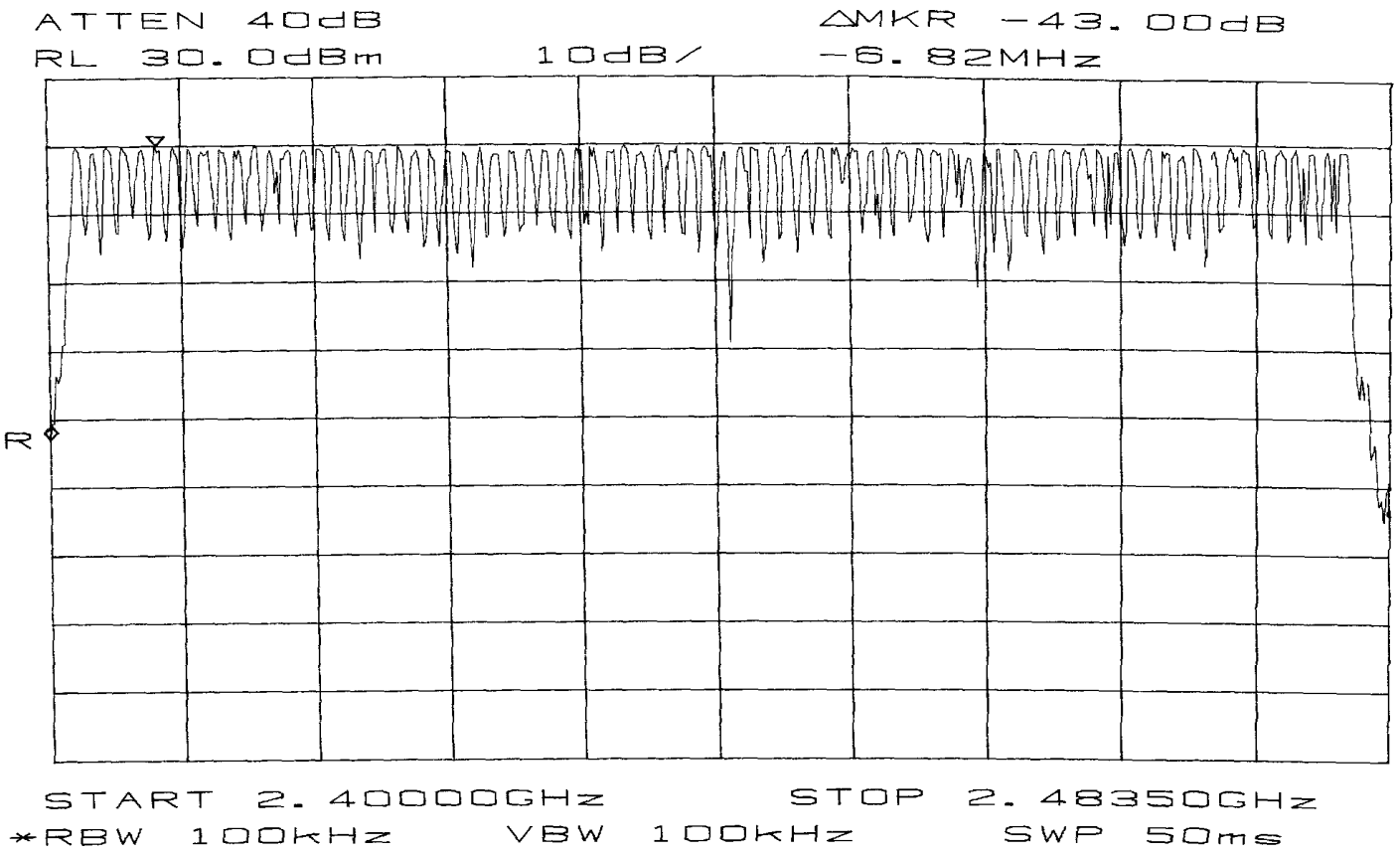
Power Out


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 20.00dBm
2.439842GHz
D
CENTER 2.440000GHz
SPAN 5.000MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50ms

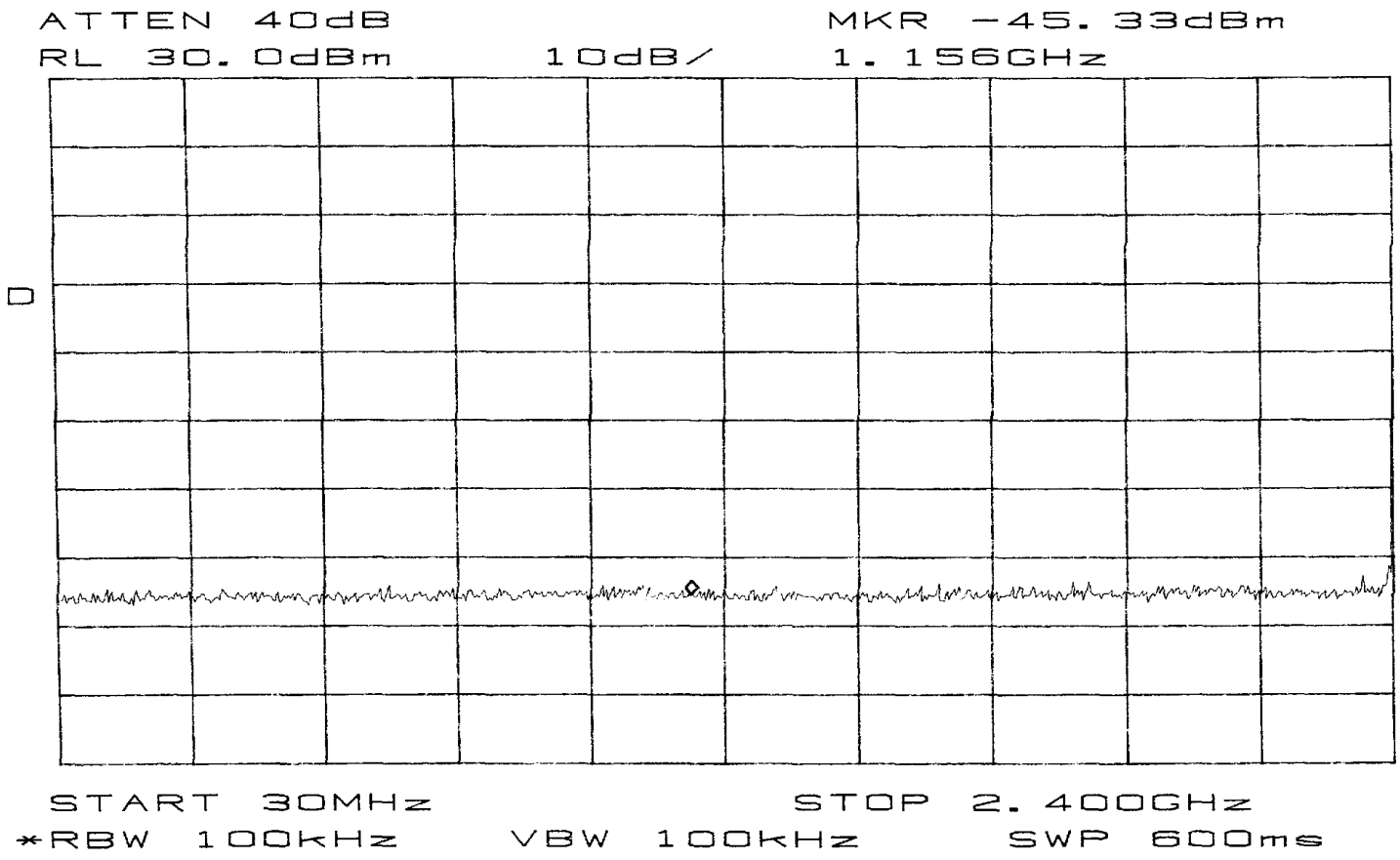
Power Out


ATTEN 40dB
MKR 19.67dBm
RL 30.0dBm
10dB/
2.479875GHz
D
CENTER 2.480000GHz
SPAN 5.000MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50ms

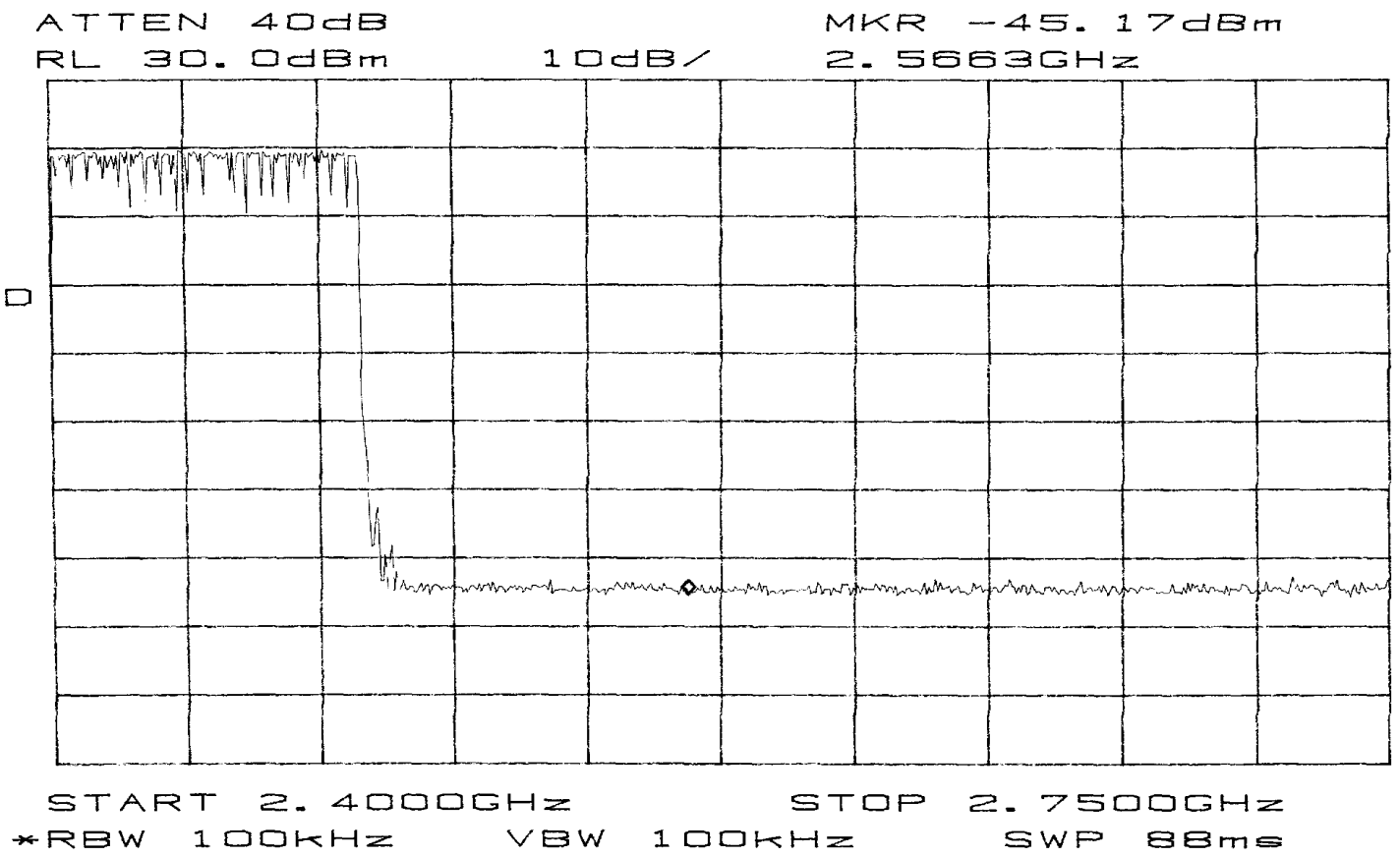
Out Of Band Emissions Band Edges



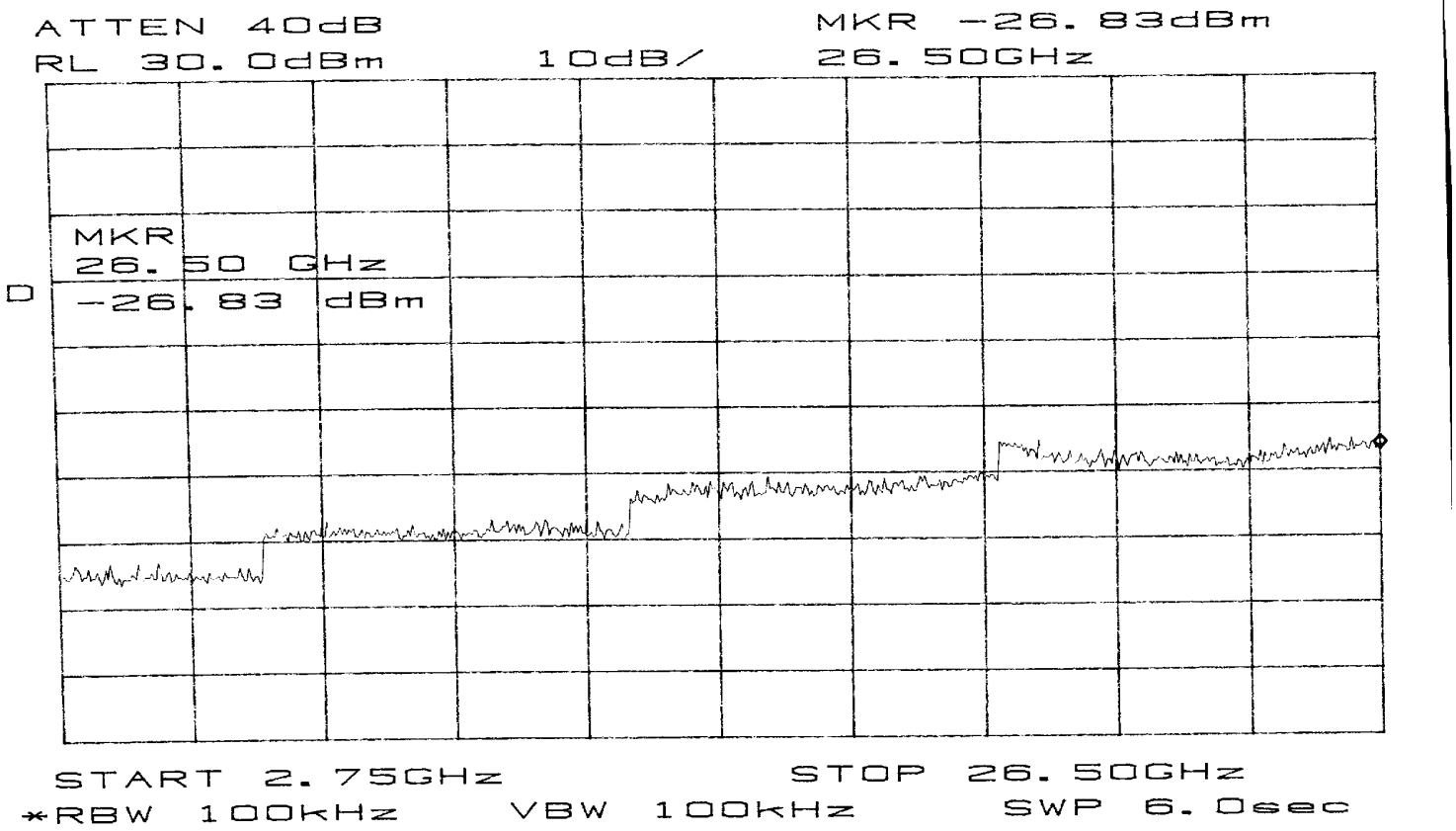
Out Of Band < 1 GHz



Out Of Band 1 – 2.75 GHz



Out of Band 2.75 – 26.5 GHz



APPENDIX B

ANTENNA DRAWINGS

NO ANTENNA DRAWINGS

APPENDIX C

RESTRICTED BAND DATA

FCC RADIATED DATA SHEET

				DATE:	Jun 24 98
EUT:	Wireless modem			**CUSTOMER NAME:**	Proxim
S/N:	Prototype			**WORK ORDER:**	8062401
RULE PART:	15.247			**FILE:**	8062401
ANTENNA:	Horn	**OTHER CAL FACTORS:**		**ATTN dB:**	0
MODULATION TYPE:				**DUTY dB:**	0
TESTED BY:	Shawn			**HP IL dB:**	0
COMMENTS:				**DIST dB:**	10

FREQ.	READING	Pk, QP,	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	52.7	Pk	32.8	7.0	35.0	10.0	47.5	74.0	-26.5
4804	47.7	Avg	32.8	7.0	35.0	10.0	42.5	54.0	-11.5
9608	38.8	Pk	38.3	13.0	35.0	10.0	45.1	74.0	-28.9
9608	27.6	Avg	38.3	13.0	35.0	10.0	33.9	54.0	-20.1
12010	39.3	Pk	39.3	13.6	35.0	10.0	47.2	74.0	-26.9
12010	28.0	Avg	39.3	13.6	35.0	10.0	35.9	54.0	-18.2
Fund = 2440									
4880	48.2	Pk	32.8	7.0	35.0	10.0	43.0	74.0	-31.0
4880	41.8	Avg	32.8	7.0	35.0	10.0	36.6	54.0	-17.4
7320	50.2	Pk	36.0	10.6	35.0	10.0	51.8	74.0	-22.2
7320	34.0	Avg	36.0	10.6	35.0	10.0	35.6	54.0	-18.4
12200	39.3	Pk	39.3	13.6	35.0	10.0	47.2	74.0	-26.9
12200	27.8	Avg	39.3	13.6	35.0	10.0	35.7	54.0	-18.4
Fund = 2480									
4960	48.0	Pk	32.8	7.0	35.0	10.0	42.8	74.0	-31.2
4960	40.3	Avg	32.8	7.0	35.0	10.0	35.1	54.0	-18.9
7440	46.6	Pk	36.0	10.6	35.0	10.0	48.2	74.0	-25.8
7440	36.0	Avg	36.0	10.6	35.0	10.0	37.6	54.0	-16.4
12400	39.8	Pk	39.3	13.6	35.0	10.0	47.7	74.0	-26.4
12400	27.7	Avg	39.3	13.6	35.0	10.0	35.6	54.0	-18.5

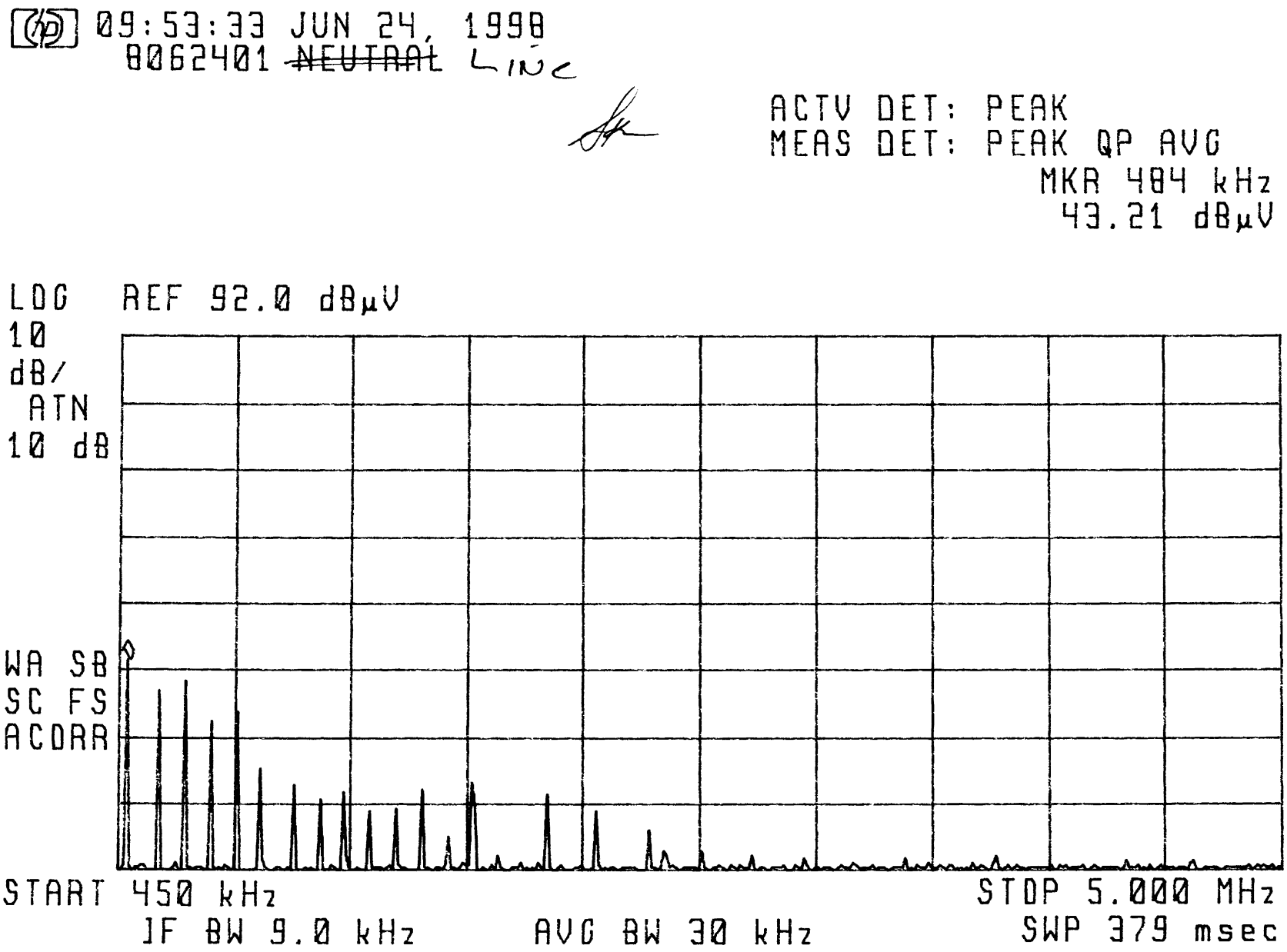
APPENDIX D
15.207
CONDUCTED EMISSIONS

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

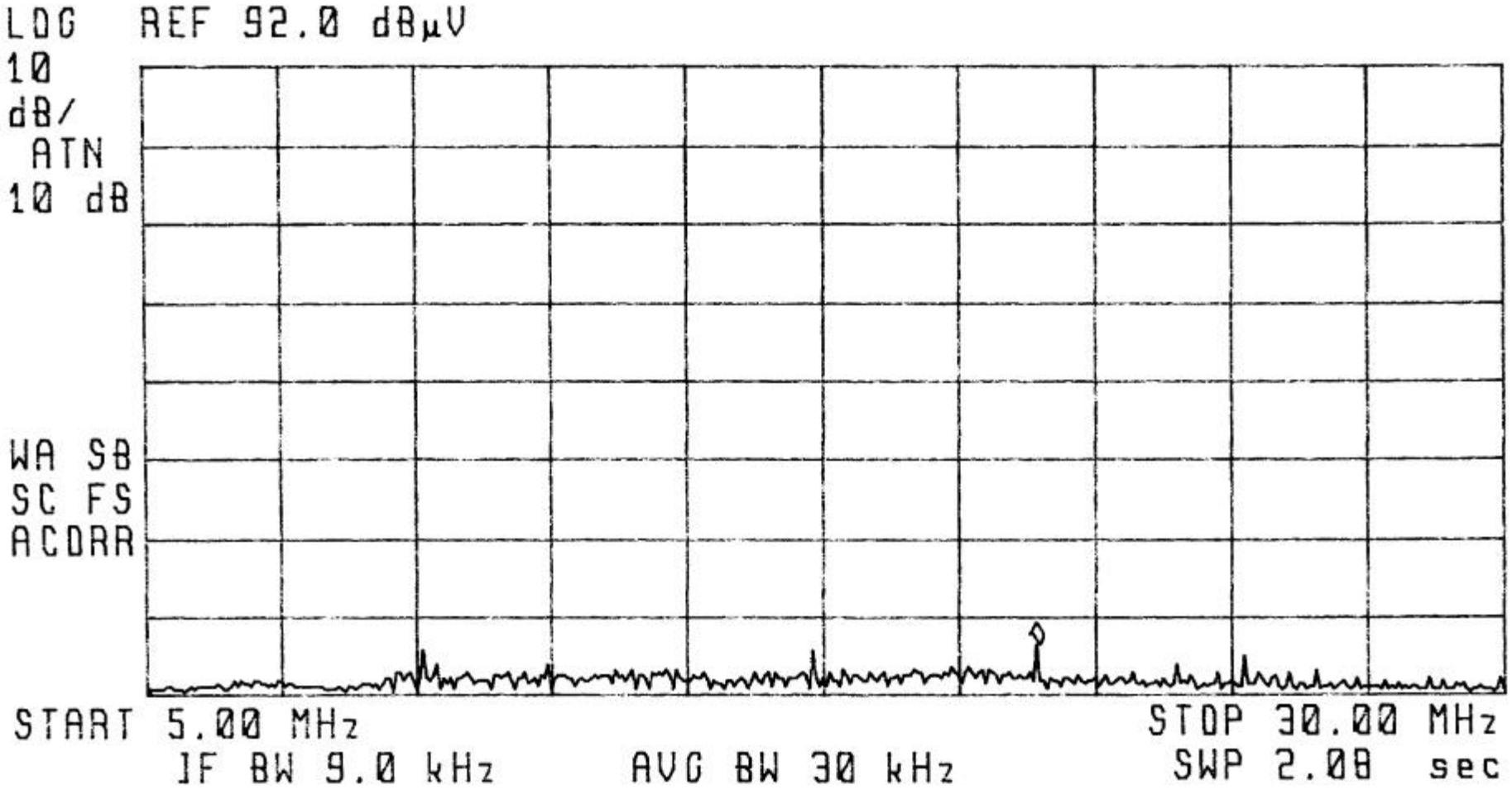
Customer:	proxim	Operator:	shawn
Date:	06-24-1998	Time:	09:45:07
Temperature Range:	70 Deg F	Percent Humidity:	40
E.U.T.:	Symphony Cordless Modem		
Serial Number:			
Support Devices:			
Serial Number:			
FCC ID:			
Exercise Program:			
Modifications:	None		
Report File Name:	F:\TESTDATA\8062401.F		

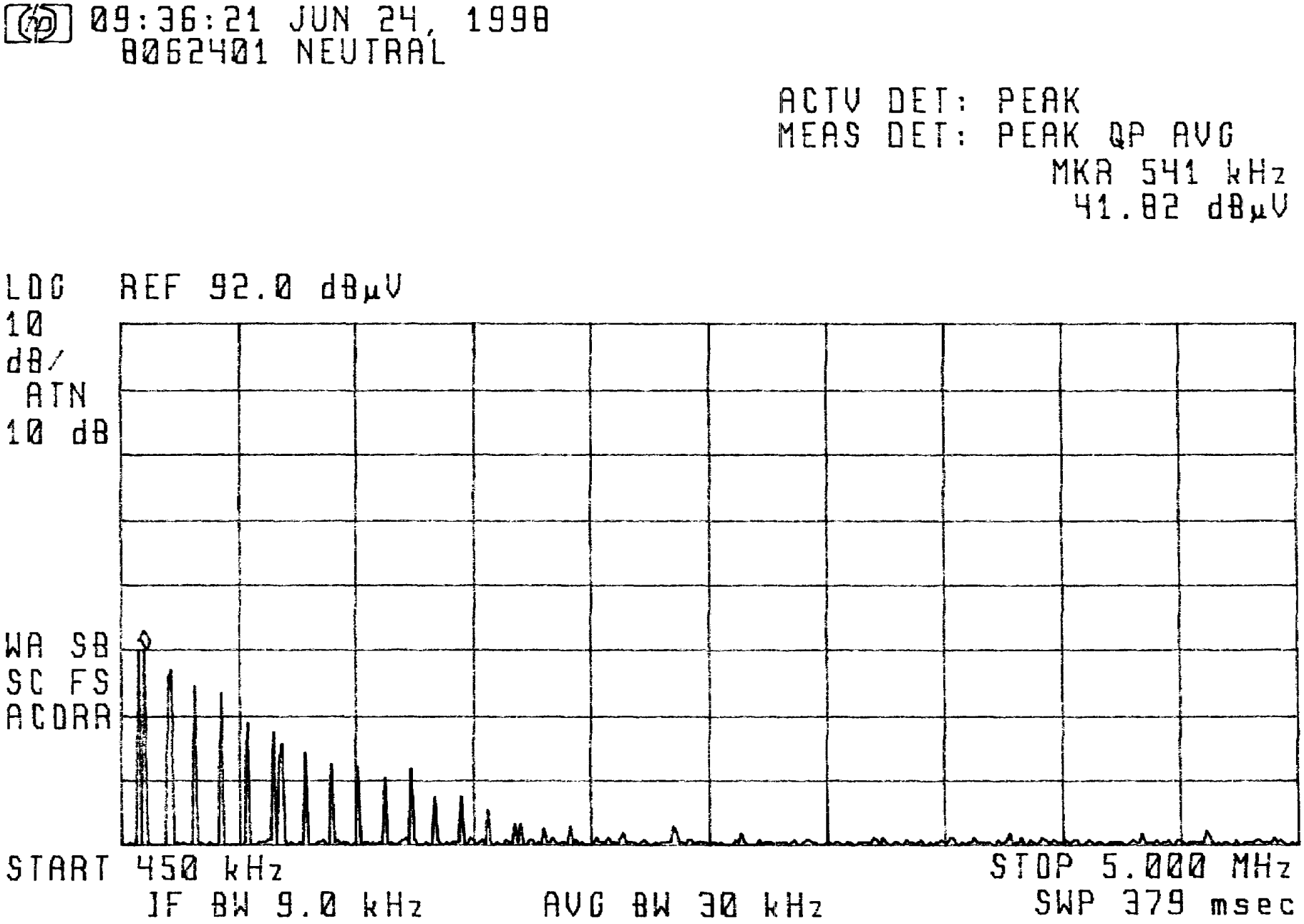
TEST FREQ	TEST dBuV	CLASS B LIMIT	VERSUS B LIMIT	CONDUCTOR	TYPE
0.541	41.8	48.0	-6.2	NEUTRAL	PK
0.837	35.4	48.0	-12.6	NEUTRAL	PK
1.770	19.5	48.0	-28.5	NEUTRAL	PK
4.647	14.2	48.0	-33.8	NEUTRAL	PK
9.940	14.7	48.0	-33.3	NEUTRAL	PK
17.310	19.2	48.0	-28.8	NEUTRAL	PK
21.440	21.1	48.0	-26.9	NEUTRAL	PK
28.630	15.1	48.0	-32.9	NEUTRAL	PK
10.130	17.7	48.0	-30.3	LINE	PK
17.310	17.6	48.0	-30.4	LINE	PK
21.440	18.5	48.0	-29.5	LINE	PK
28.600	14.0	48.0	-34.0	LINE	PK
0.484	43.2	48.0	-4.8	LINE	PK
0.916	35.6	48.0	-12.4	LINE	PK
2.532	17.9	48.0	-30.1	LINE	PK
4.659	13.5	48.0	-34.5	LINE	PK
0.484	39.0	48.0	-9.0	LINE	QP


09:53:33 JUN 24, 1998
8062401 ~~NEUTRAL~~ Line
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 484 kHz
43.21 dBµV
LOG REF 92.0 dBµV
10
dB/
ATN
10 dB
WA SB
SC FS
ACORR
START 450 kHz
STOP 5.000 MHz
IF BW 9.0 kHz
AVG BW 30 kHz
SWP 379 msec

09:47:41 JUN 24, 1998
8062401 ~~NEUTRAL~~ Line

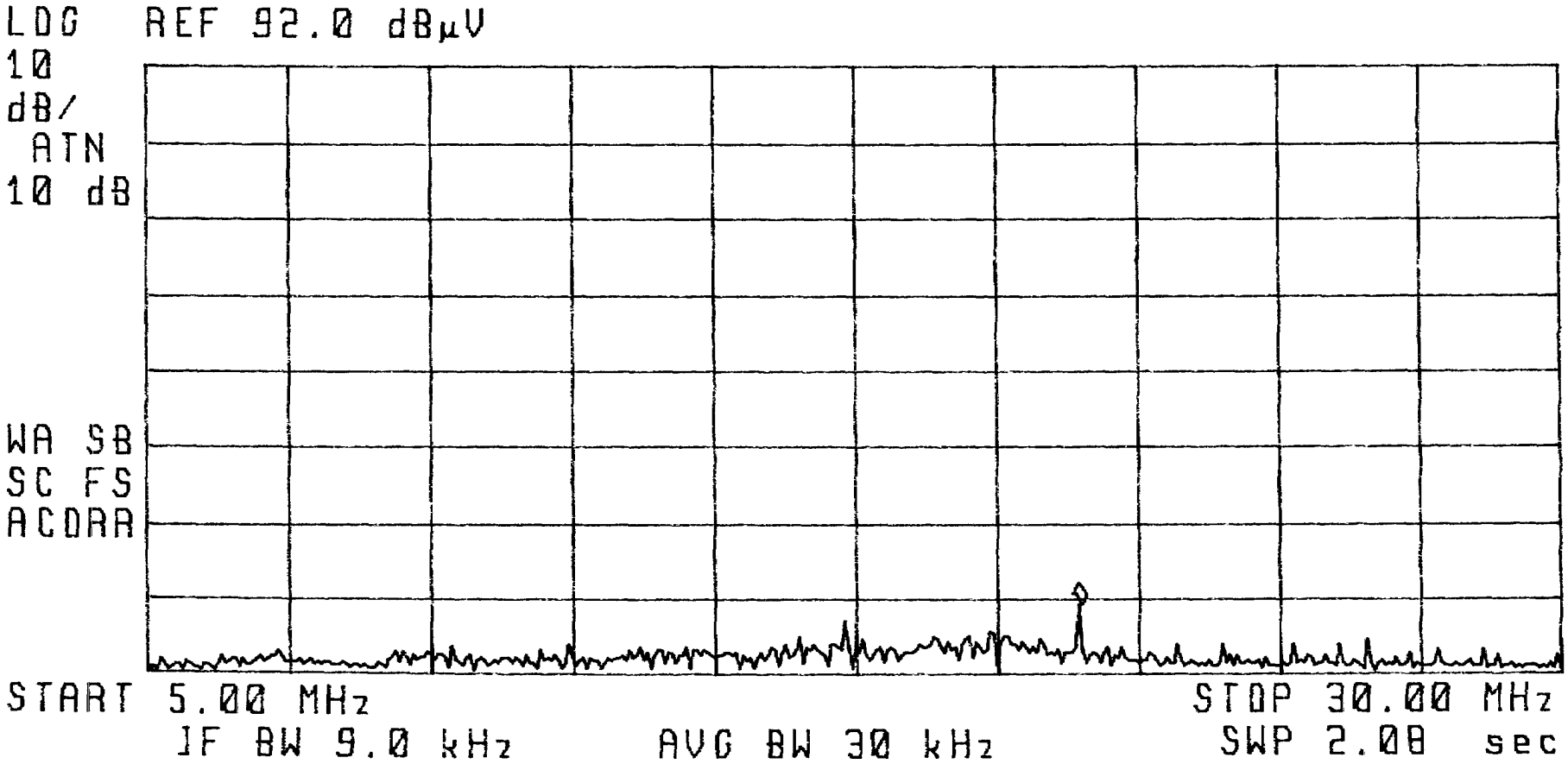
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 21.44 MHz
18.52 dBµV




09:36:21 JUN 24, 1998
8062401 NEUTRAL
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 541 kHz
41.82 dBµV
LOG REF 92.0 dBµV
10
dB/
ATN
10 dB
WA SB
SC FS
ACORR
START 450 kHz
STOP 5.000 MHz
IF BW 9.0 kHz
AVG BW 30 kHz
SWP 379 msec

09:39:24 JUN 24, 1998
8062401 NEUTRAL

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 21.44 MHz
21.12 dBµV



APPENDIX E
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:	shawn
Date:	06-24-1998	Time:	08:30:34
Temperature Range:	64 Deg F	Percent Humidity:	60
E.U.T.:	Symphony Cordless Modem		
Serial Number:			
Support Devices:			
Serial Number:			
FCC ID:			
Exercise Program:			
Modifications:	None		
Report File Name:	F:\TESTDATA\8062401.RF		

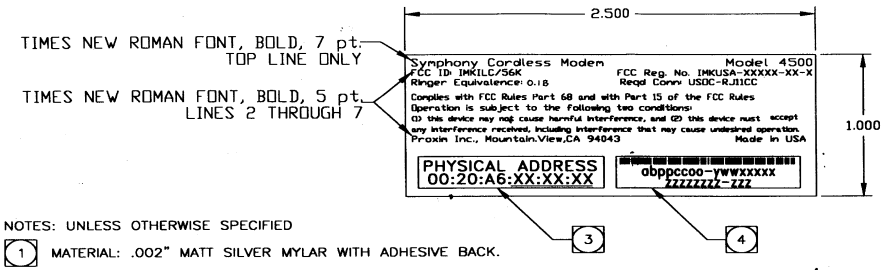
Antenna Type: BICONICAL

TEST FREQ	TEST dBuV	ACTUAL dBuV/m	CLASS B LIMIT	VERSUS B LIMIT	TABLE DEGREES	ANTENNA HEIGHT	POLAR-IZATION	DETECTOR Type
60.000	53.5	37.0	40.0	-3.0	200	1.0	V	PK
60.000	50.2	33.7	40.0	-6.3	200	1.0	V	QP
80.000	46.6	30.0	40.0	-10.0	120	1.0	V	PK
138.250	41.9	32.2	43.5	-11.3	120	1.5	V	PK
230.410	39.2	31.7	46.0	-14.3	180	1.0	V	PK
276.500	37.5	31.8	46.0	-14.2	120	1.0	V	PK
276.500	45.3	39.6	46.0	-6.4	120	2.0	H	PK
230.400	40.7	33.2	46.0	-12.8	120	1.5	H	PK
138.250	41.8	32.1	43.5	-11.4	0	2.0	H	PK
		CHANGED ANTENNA TO LOG PERIODIC						
323.000	32.0	22.7	46.0	-23.3	90	1.5	V	PK
345.260	36.9	28.1	46.0	-17.9	0	1.	V	PK
440.000	35.3	28.3	46.0	-17.7	170	1.5	V	PK
440.000	38.6	31.6	46.0	-14.4	90	2.5	H	PK
345.270	35.8	27.0	46.0	-19.0	45	2.0	H	PK
322.575	36.8	27.5	46.0	-18.5	75	2.0	H	PK

APPENDIX F

SAMPLE LABEL

REVISION					
LTR	ECO	DATE		BY	APPR
01	P1418	--	INITIAL RELEASE	BB	



NOTES: UNLESS OTHERWISE SPECIFIED

(1) MATERIAL: .002" MATT SILVER MYLAR WITH ADHESIVE BACK.

2. ALL TEXT BLACK WITH SILVER BACKGROUND.

(3) PHYSICAL ADDRESS NUMBER TO BE THE NODE ID NUMBER IDENTICAL TO OEM RADIO IN CORDLESS MODEM.

(4) PRODUCT SERIAL NUMBER LABEL TEXT FORMAT:
"abppccoo" IS THE MARKETING PRODUCT NUMBER

a	=	BRANDED/OEM PRODUCT
b	=	FORM FACTOR
pp	=	PRODUCT VARIATION
cc	=	COUNTRY CODE
oo	=	OEM CODE
y	=	YEAR OF SHIPMENT
ww	=	WEEK OF SHIPMENT
xxxx	=	UNIQUE 5 DIGIT SERIAL NUMBER (1–99999), RESETS TO 00001 EACH WEEK
zzzzzz	=	CUSTOMER SPECIFIED NUMBER IF PROCEDURE 7335.0021 TABLE 1 CONTAINS A CUSTOMER NUMBER FOR THE RESPECTIVE PRODUCT MODEL NUMBER, PRINT THE CUSTOMER NUMBER ON THE LABEL AS SHOWN, OTHERWISE LEAVE BLANK.

NOTES UNLESS SPECIFIED	DRAWN	BOB BEEDY	5-19-98
TOLERANCES .XX+/- ANGULAR .XXX+/-.005 +/- °	DESIGN		
BREAK ALL SHARP EDGES APPROX .010	MATERIAL	(1)	
MACH. SURFACES	FINISH		
DIMENSIONS APPLY AFTER FINISH.	CHECKED AND APPROVED	drc	

proxim

TITLE: LABEL, SYMPHONY CORDLESS MODEM

SIZE	DWG NO.	REV.
B	2460.0740	01

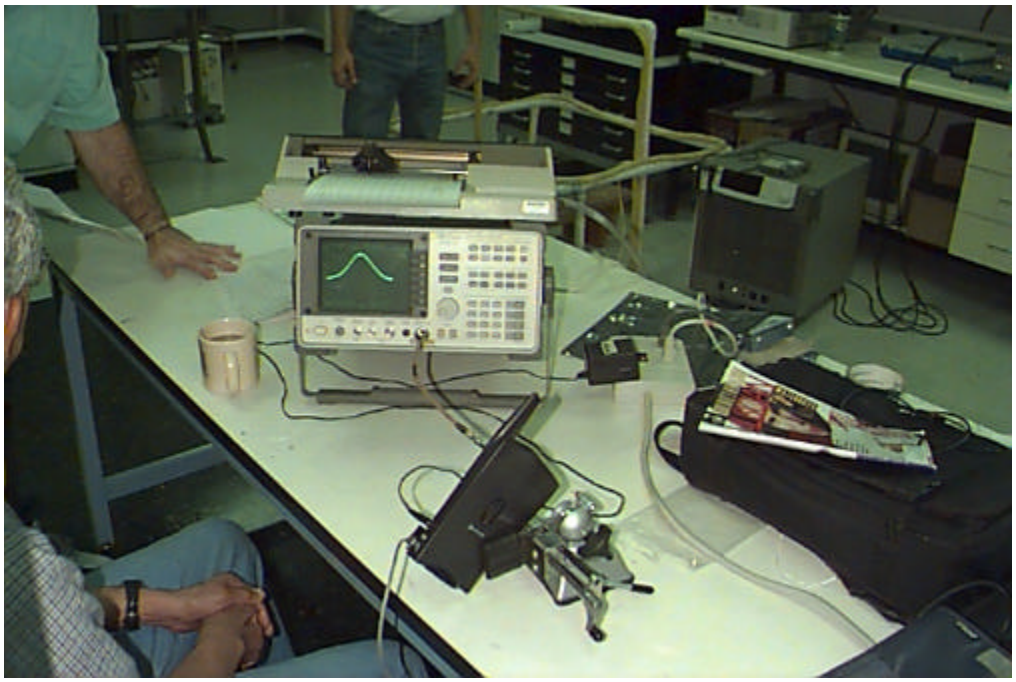
SCALE	FILE NAME	SHEET
NONE	24600740	1 OF 1

APPENDIX G

SET-UP PHOTOS

FCC 15.207 Class B
Conducted Emissions

FCC 15.209 Class B
Radiated Emissions



FCC 15.247 RF Conducted Emissions
at Antenna Terminals

FCC 15.205 Restricted Band

APPENDIX H

EUT PHOTOS

APPENDIX I

OWNERS MANUAL

Warranty Return Policy

If you have a problem with your RangeLAN2 product, please call Proxim Technical Support at 415/526-3640. 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 Customer Service. 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.

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	1.6 Mbps
Media Access Protocol	CSMA/CA
Frequency Band	2.4-2.5 GHz Worldwide (Depends on country) (spread spectrum frequency hopping)
Output Power	100 mW
Operating Temperature	0 C to +40 C

APPENDIX J

CLIENT CONFIDENTIAL MATERIAL