

**15.247 Certification
FCC ID : IMKRL26330M**

EMI TEST REPORT

On

**RangeLAN2 - 6330
Micro ISA Design-in Card
Centurion CXR-2.4 GHz-TNSP 1.0 dBi antenna
Intermec 248X SMB 1.0 dBi Antenna
Intermec 2.4 GHz SMB 1.5 dBi antenna
Intermec 2.4 GHz TNC 1.0 dBi antenna
Intermec 2.4 GHz SMC1.0 dBi Antenna
Norand F – Style 1.0 dBi Antenna**

Prepared for

**Proxim, Inc.
295 N. Bernardo Ave
Mountain View, CA 94043
Tel: (650)960-1630
Fax: (650)960-1984**

Prepared by

**Electronic Compliance Laboratories Inc.
1249 Birchwood Dr.
Sunnyvale, CA 94089
Tel: (408) 747-1490
Fax: (408) 747-1495**

**Test Report Number: A812005
Date of Test: December 9 and 11, 1998**

**If this document is reproduced, it must be reproduced
in its entirety.**



Table of Contents

1.0 Test Facility	3
2.0 Test Equipment	3
3.0 EUT	3
4.0 Support Equipment.....	3
5.0 Equipment Configuration	4
6.0 Summary Of Tests	5
APPENDIX A Spread Spectrum Plots	8
APPENDIX B Restricted Band Data	21
APPENDIX C 15.207 Conducted Emissions	23
APPENDIX D 15.209 Radiated Emissions.....	27
APPENDIX E Set Up Photos	30
APPENDIX F Antenna Information	33

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 BP 10-18 GHz	FSY	HP 8601- 7SS	001

3.0 EUT

RangeLAN2 – 6330-05
Model Number - 6330
Serial Number - 0005
FCC ID: - IMKRL26330M

4.0 SUPPORT EQUIPMENT

Dell Computer	- M/N 466LN	S/N 5Q8D4
Logitech Mouse	- M/N M-S34-6MD	S/N LZA54637080
Packard Bell Keyboard	- M/N 7939	S/N 841180007
KFC Monitor	- M/N CA1511	S/N A4KKU4931207
Centurion CXR-2.4 GHz-TNSP 1.0 dBi Antenna	P/N CAF28771	
Intermec 248X SMB 1.0 dBi Antenna	P/N 066147	
Intermec 2.4 GHz SMB 1.5 dBi Antenna	P/N 063825	
Intermec 2.4 GHz TNC 1.0 dBi Antenna	P/N 060751	
Intermec 2.4 GHz SMC1.0 dBi Antenna	P/N 060750	
Norand F – Style 1.0 dBi Antenna	P/N 650-277	

5.0 EQUIPMENT CONFIGURATION

The RangeLAN2 6307-05 Mini ISA Design-in card was designed to be a drop-in spread spectrum device that has already been FCC certified so that customers purchasing the product would not have to apply for an intentional radiator certification.

In order to prove the module will pass all requirements in a stand alone configuration a desktop PC was used to provide DC power and to allow test commands to be sent and data received. The card was placed outside of the PC shell.

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 RangeLAN2 6330-05 is a microi ISA card 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 EUT and RL2DIAG.exe were used to do the test.

6.1 15.247(a)(1) FREQUENCY HOPPING SYSTEMS

RangeLAN2 - 6330 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 "20 dB Bandwidth" show the 20 dB bandwidth of the hopping channel to be < 1 MHz (1.0 / .90 / .99 MHz) at the low/midband/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: 18 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 " Output Power" show the maximum power of the hopping channel to be 19.97 dBm or 99.3 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 MCX connector, through 6 in. cable to the spectrum analyzer set on Max Hold with no additional attenuation.

Power = 19.67 dBm (peak reading) +0.3 dB cable loss = +19.97 dBm /
99.3 mW EIRP
Limit: +30 dBm / 1 W maximum power

Intermec 2.4 GHz SMB 1.5 dBi Antenna
EIRP = +19.97 (peak power) +1.5 (peak gain, dBi) = +21.47
dBm / 140 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 to 1000 MHz", "Out of Band 1 to 2.75 GHz", and "Out of Band 2.75 to 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 uses an MMCX type antenna connector to provide a unique coupling to the intentional radiator. The Manufacturer's control drawings, and the antenna drawings are in **Appendix B.**

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 groundplane 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 C** 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 = 1 MHz. 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 dB μV) maximum allowed level. **Test Data is in Appendix D.**

6.1.7 **15.209 RADIATED EMISSIONS**

with 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 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 groundplane 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 E.**

Electronic Compliance Laboratories

Chris Byleckie
Technical Director

Date

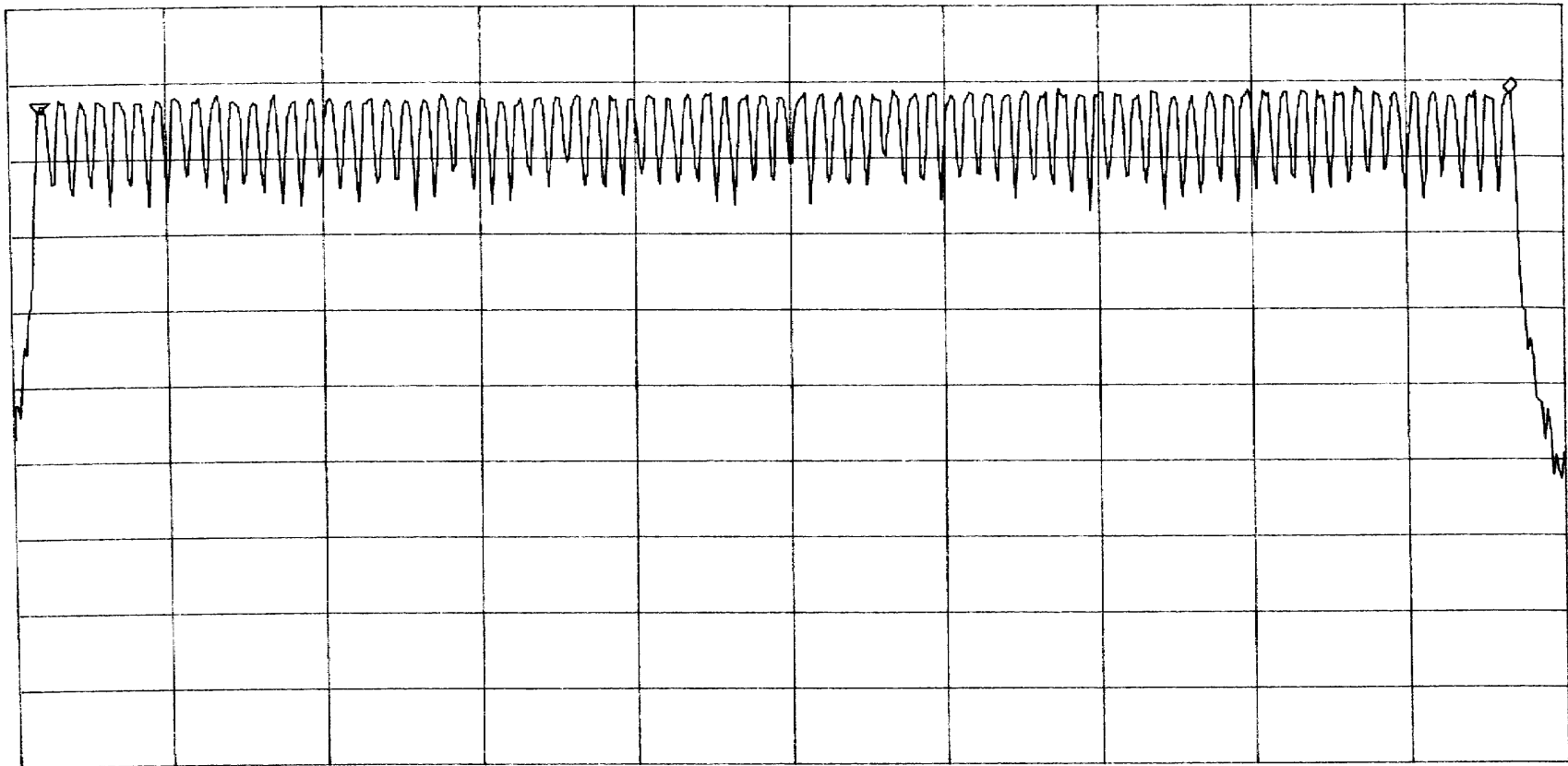
APPENDIX A
SPREAD SPECTRUM PLOTS

Channel Utilization

ATTEN 40dB
RL 30.0dBm

10dB/

ΔMKR 2.00dB
79.05MHz



START 2.40000GHz
RBW 100kHz

VBW 100kHz

STOP 2.48350GHz
SWP 50ms

20 dB Bandwidth

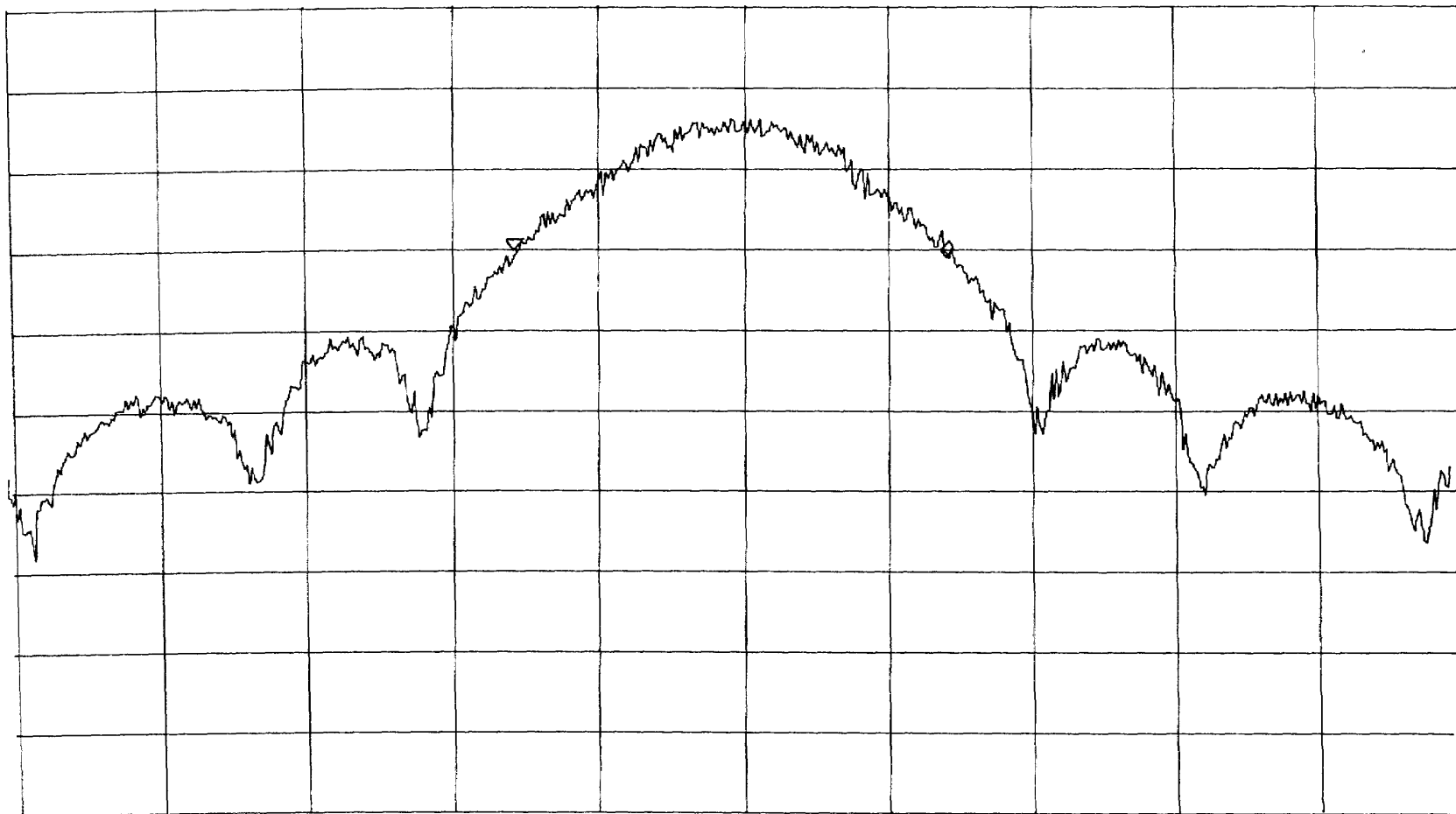


20 dB Bandwidth

ATTEN 40dB
RL 30.0dBm

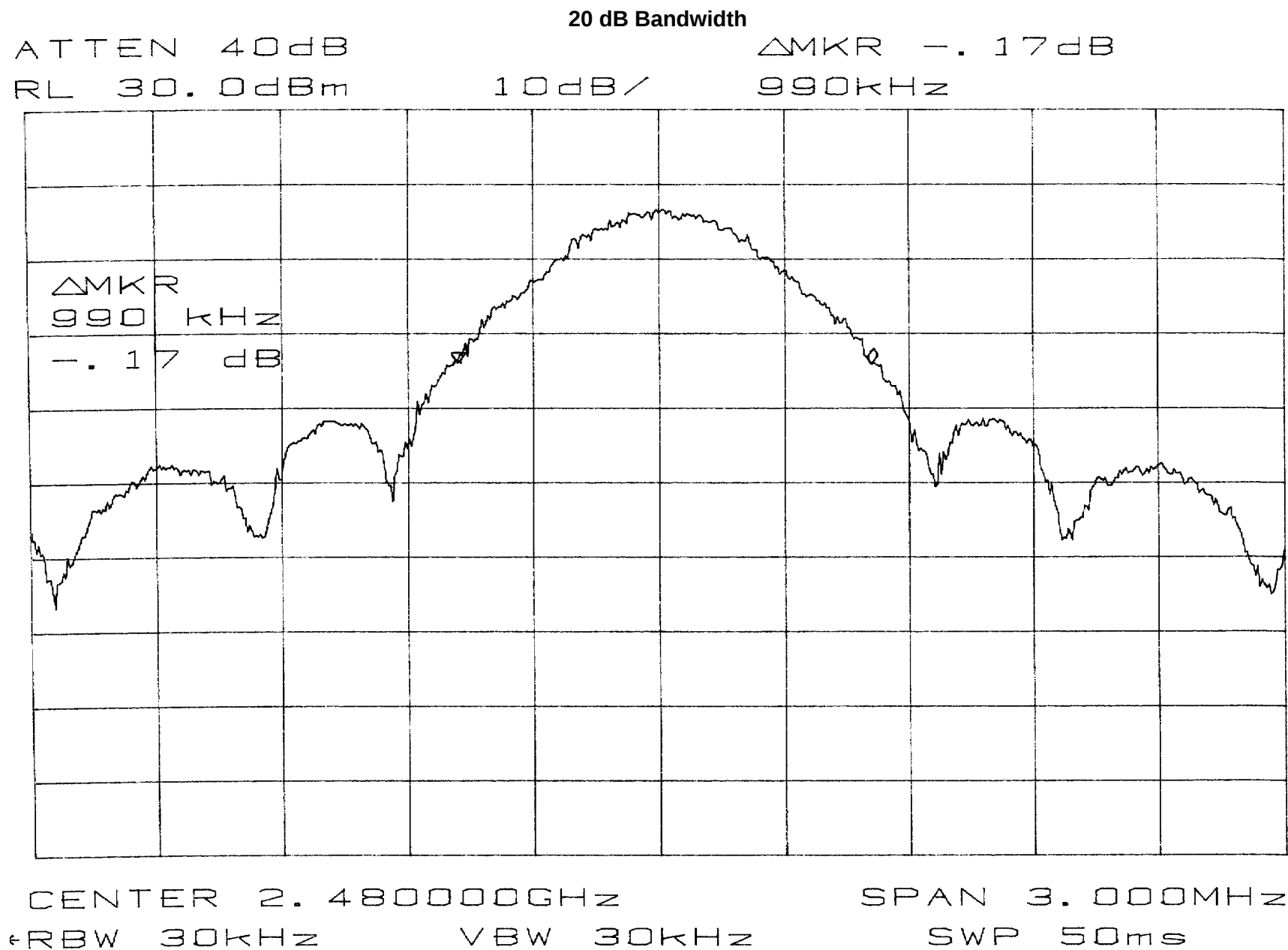
10dB/

ΔMKR -.50dB
895kHz



CENTER 2.440020GHz
←RBW 30kHz VBW 30kHz

SPAN 3.000MHz
SWP 50ms



Dwell Time

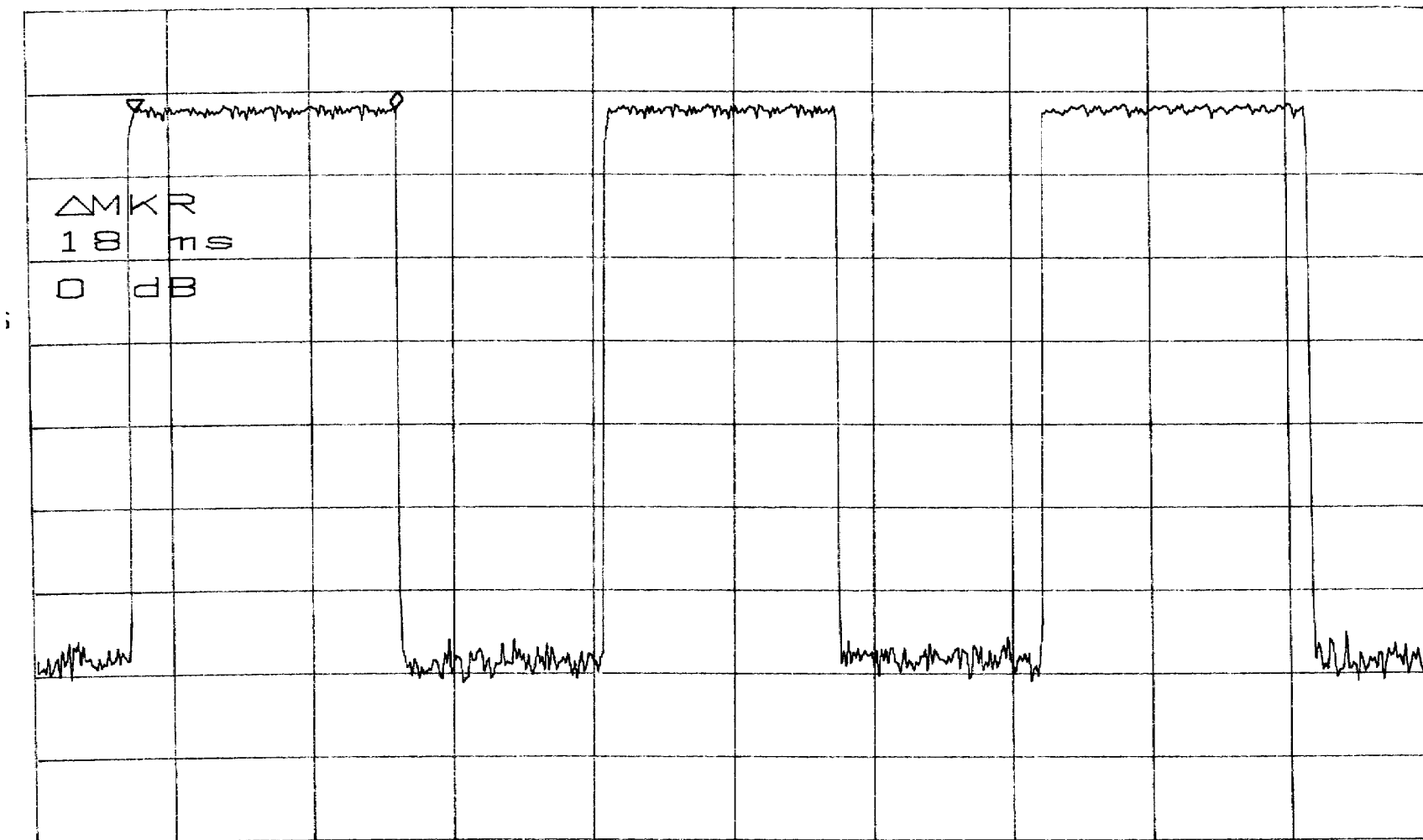
ATTEN 40dB

Δ MKR 0dB

RL 30.0dBm

10dB/

18ms



CENTER 2.402000000000GHz

SPAN 0Hz

←RBW 100kHz

VBW 100kHz

*SWP 100ms

Output Power

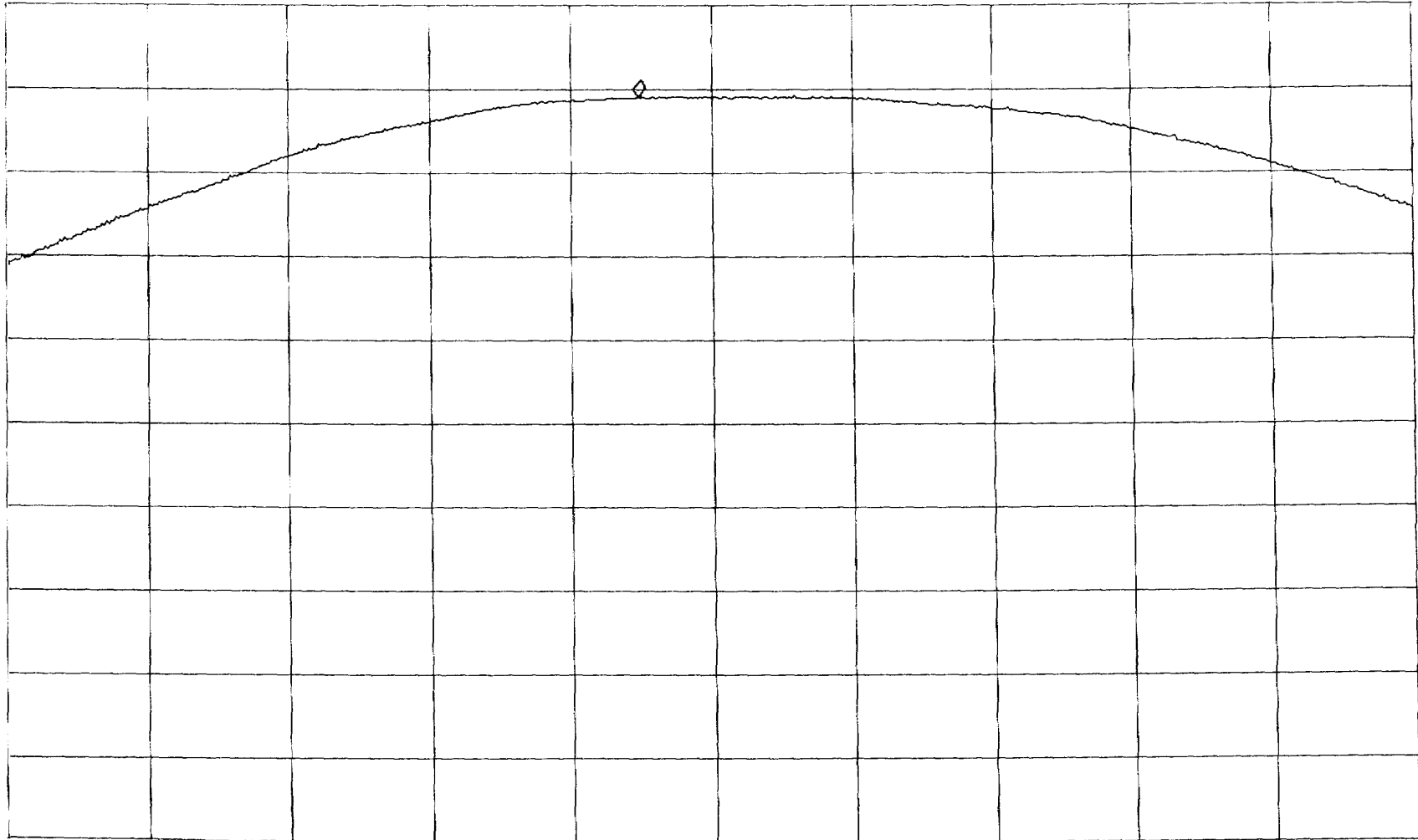
ATTEN 40dB

MKR 19.17dBm

RL 30.0dBm

10dB/

2.401742GHz



CENTER 2.402000GHz

SPAN 5.000MHz

RBW 2.0MHz

VBW 3.0MHz

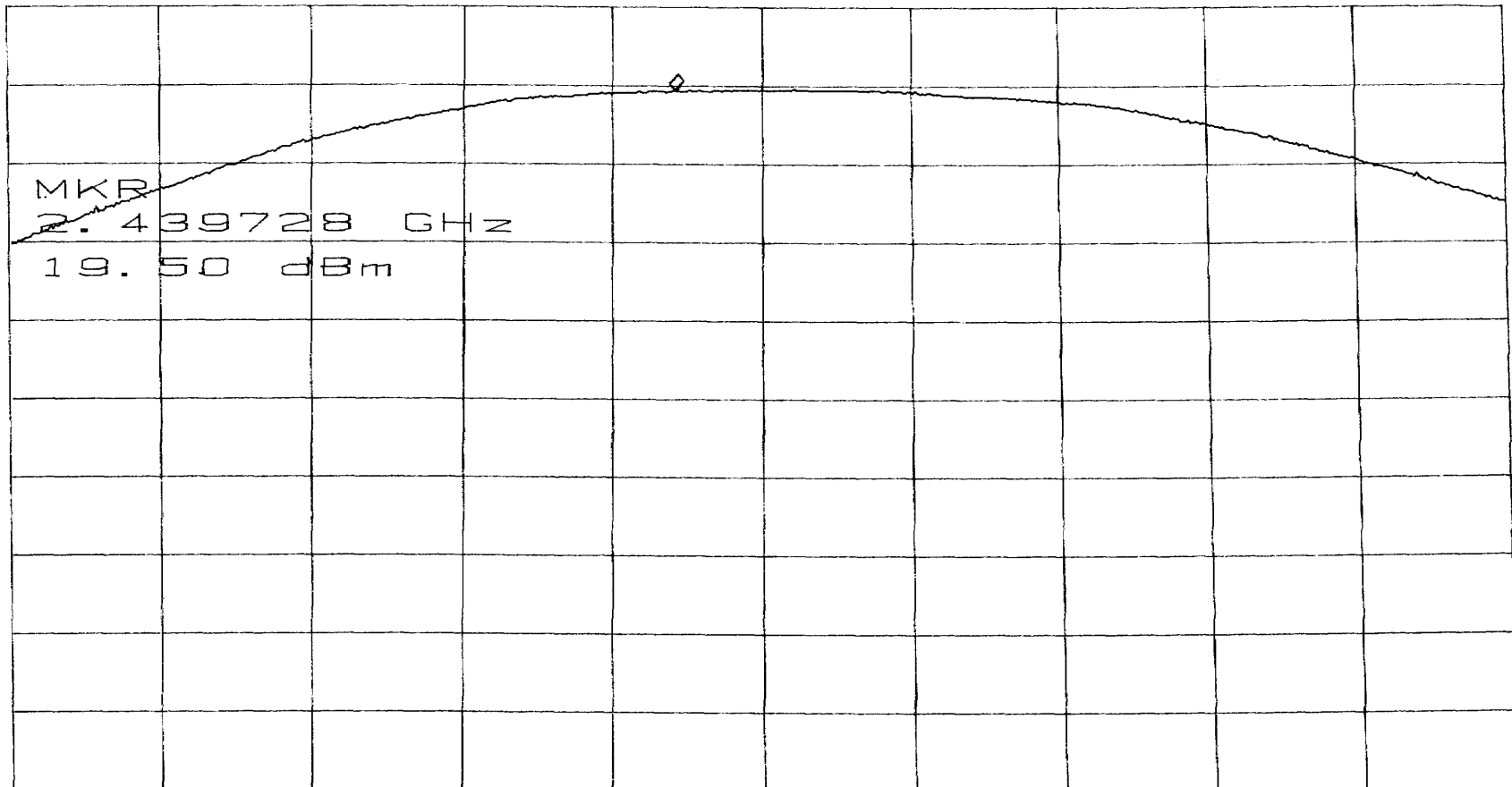
SWP 50ms

Output Power

ATTEN 40dB
RL 30.0dBm

10dB/

MKR 19.50dBm
2.439728GHz



CENTER 2.440020GHz
RBW 2.0MHz VBW 3.0MHz

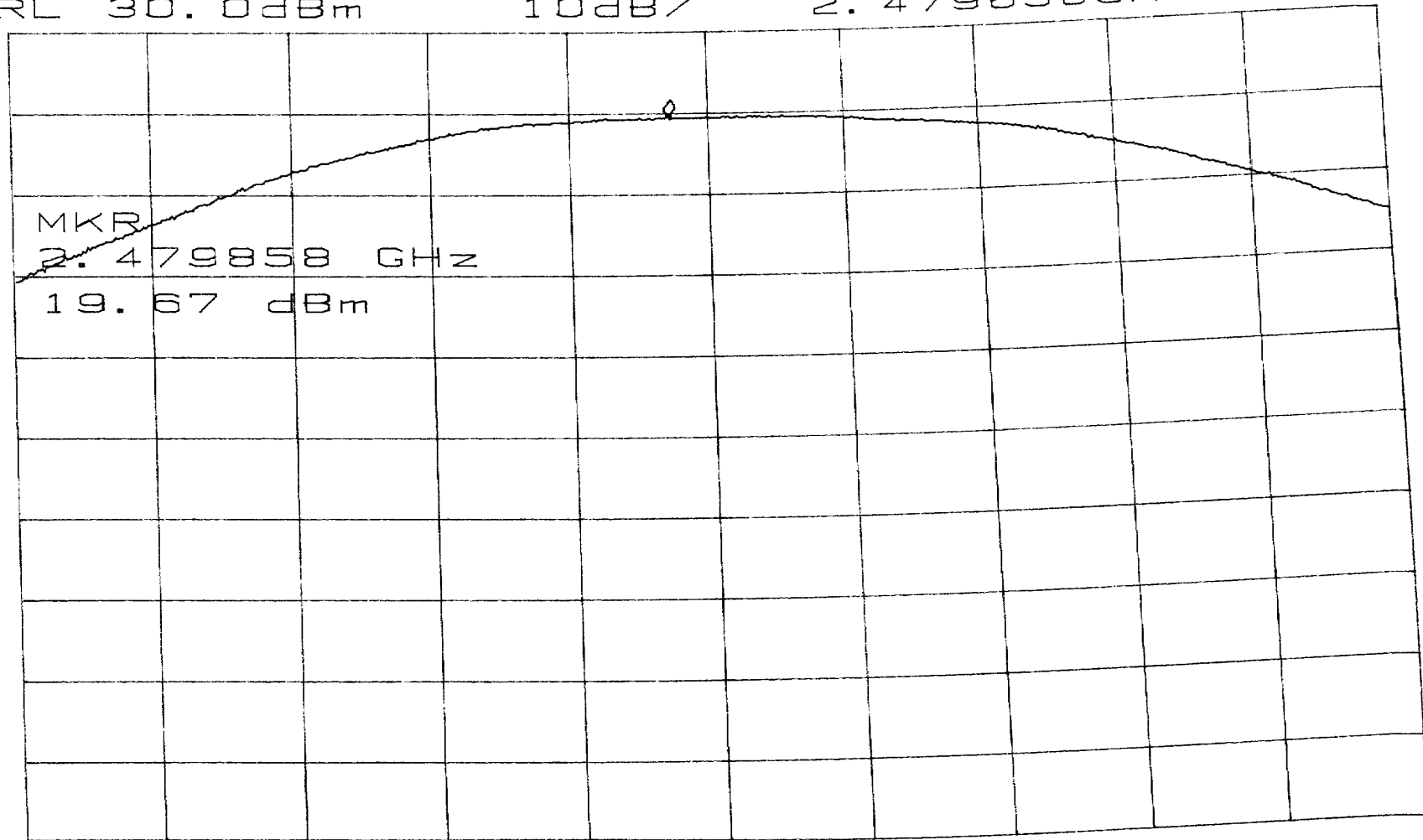
SPAN 5.000MHz
SWP 50ms

Output Power

ATTEN 40dB
RL 30.0dBm

10dB/

MKR 19.67dBm
2.479858GHz



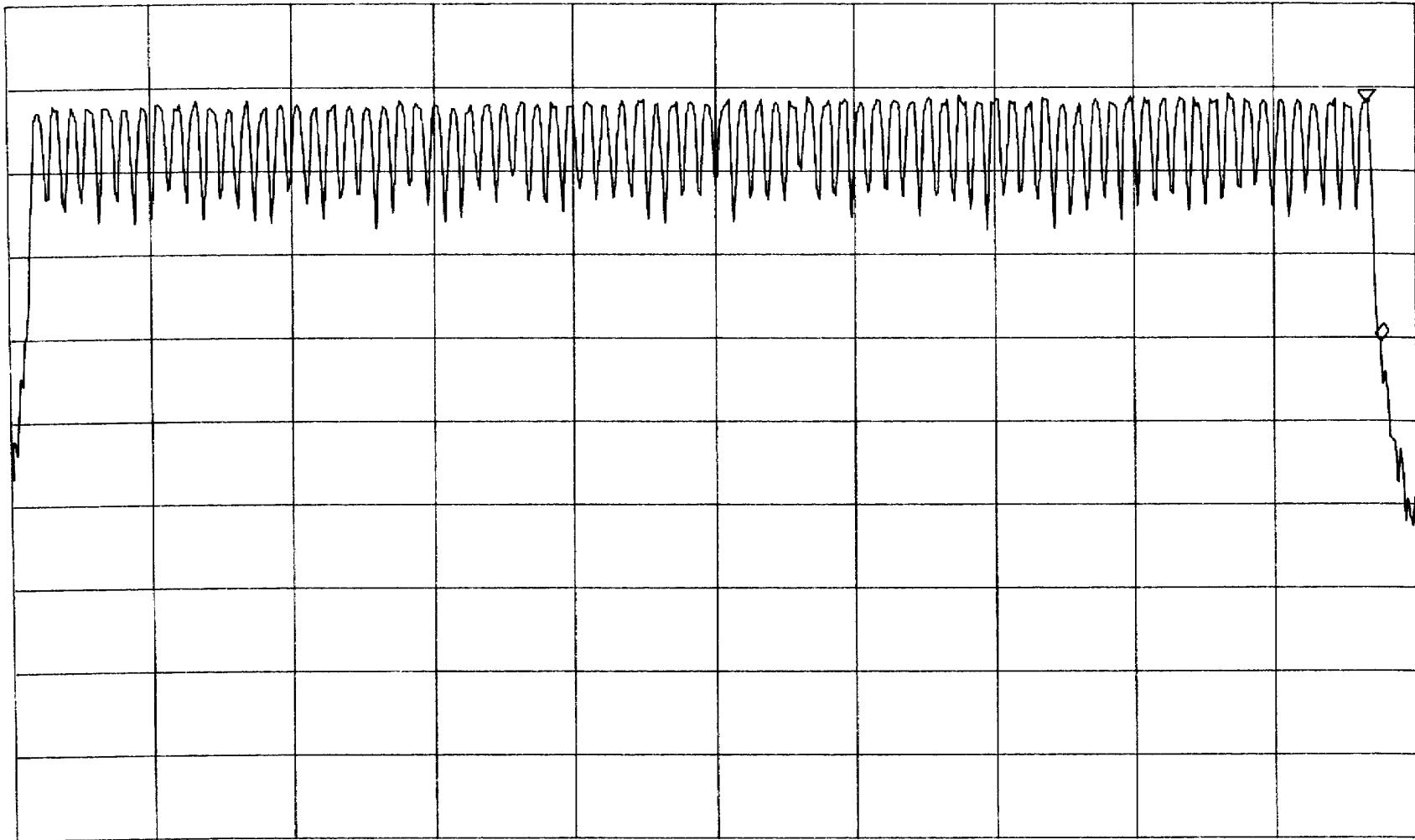
CENTER 2.480000GHz
*RBW 2.0MHz VBW 3.0MHz SPAN 5.000MHz
SWP 50ms

Out Of Band - Band Edges

ATTEN 40dB
RL 30.0dBm

10dB/

ΔMKR -28.66dB
840kHz



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

Out Of Band 30 to 1000 MHz

ATTEN 40dB

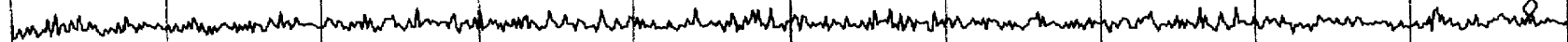
MKR -45.33dBm

RL 30.0dBm

10dB/

977.4MHz

STOP
1.0000 GHz



START 30.0MHz

STOP 1.0000GHz

*RBW 100kHz

VBW 100kHz

SWP 250ms

Out Of Band 1 to 2.75 GHz

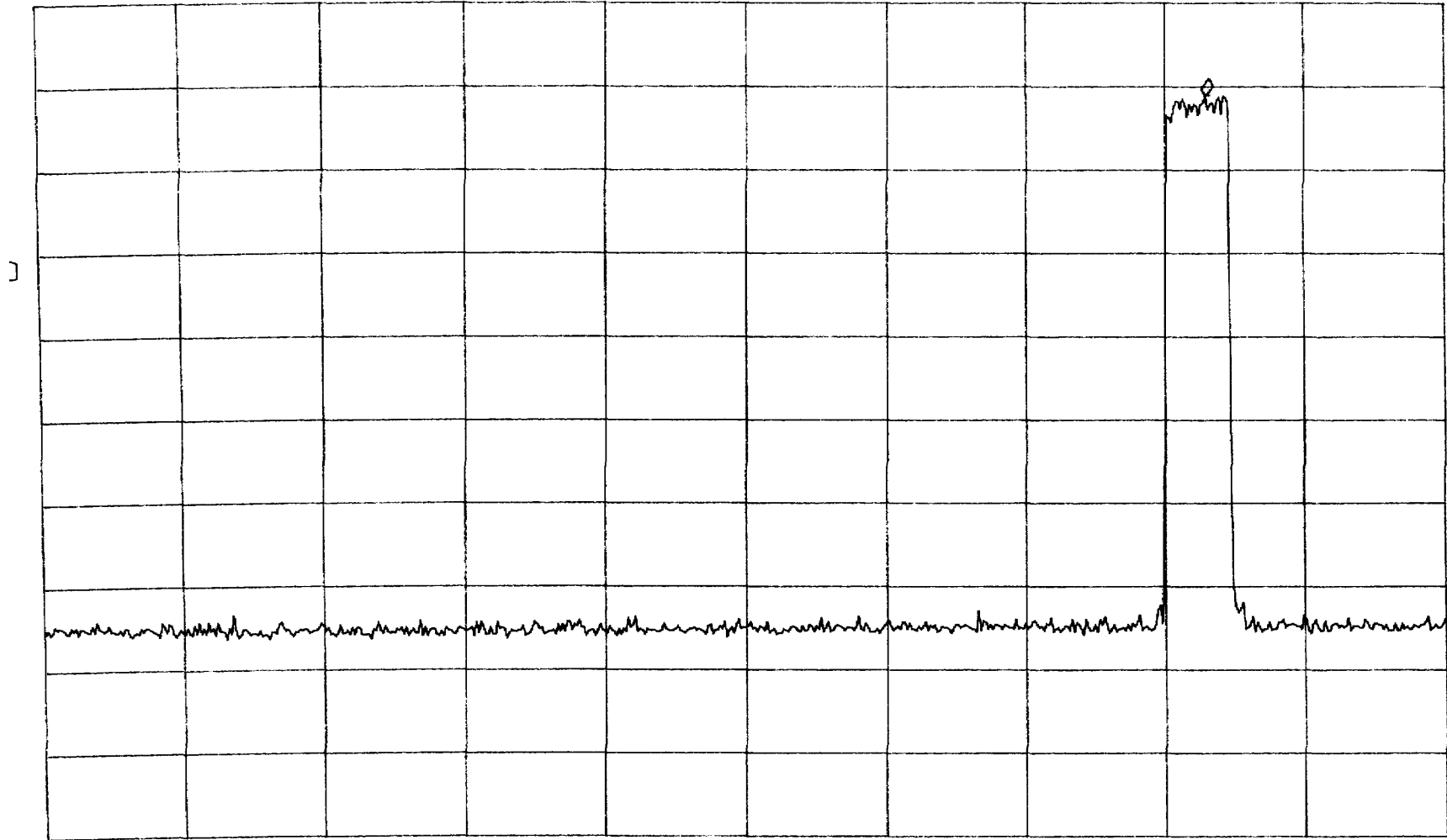
ATTEN 40dB

MKR 19.00dBm

RL 30.0dBm

10dB/

2.453GHz



START 1.000GHz

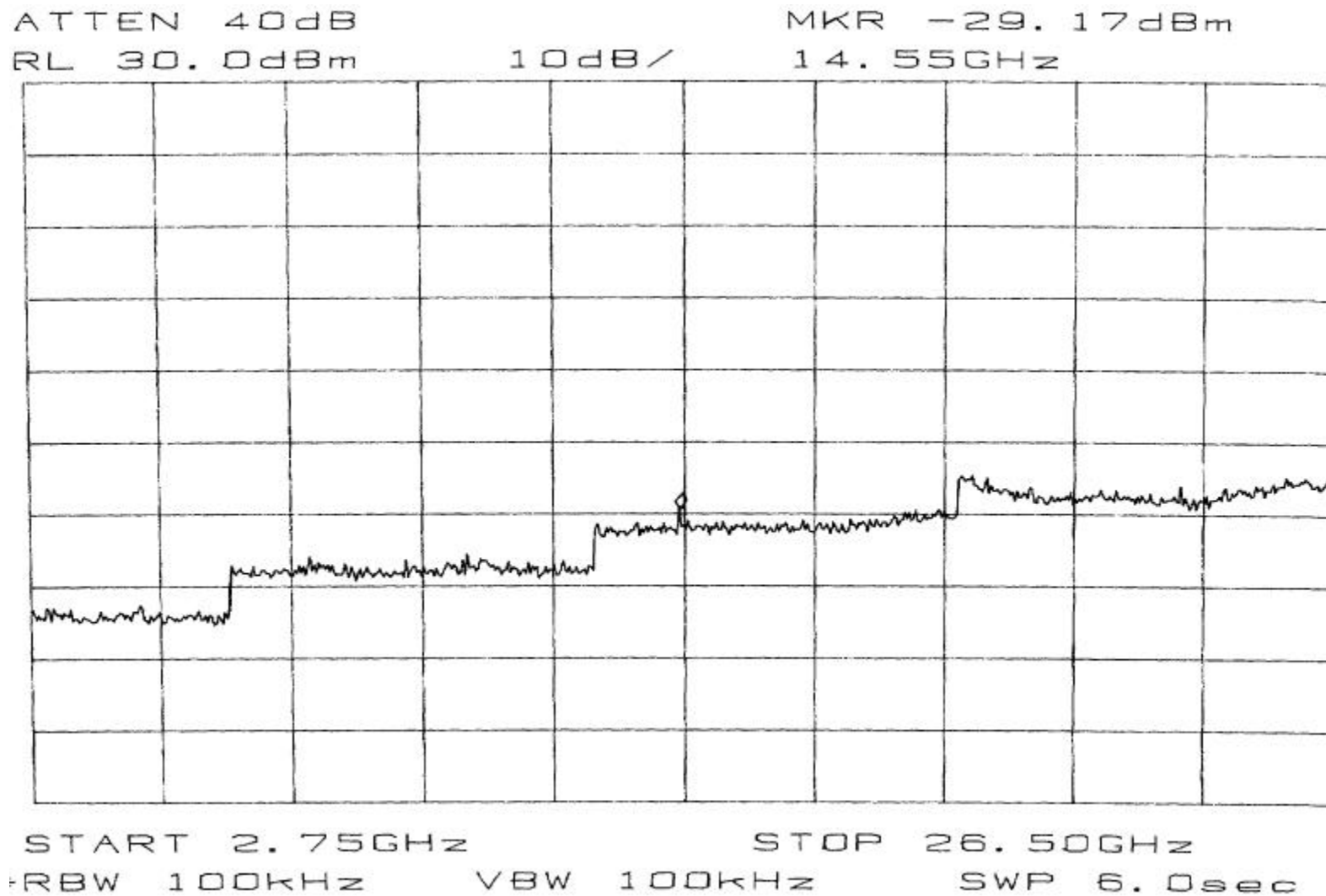
STOP 2.750GHz

*RBW 100kHz

VBW 100kHz

SWP 440ms

Out of Band 2.75 to 26.5 GHz



APPENDIX B
RESTRICTED BAND DATA

FCC RADIATED DATA SHEET									
EUT:		DESIGN-IN MOD. 6330				DATE:		DEC. 9, 1998	
S/N:		S/N 0005				CUSTOMER NAME:		PROXIM	
RULE PART:		15.247				WORK ORDER:		8120901	
						FILE:		8120901B.xls	
ANTENNA:		HORN		OTHER CAL FACTORS:		ATTN dB:		0	
MODULATION TYPE:						DUTY dB:		0	
TESTED BY:		SHAWN				HP IL dB:		0	
COMMENTS:						DIST dB:		0	
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 = 2402.0									
4804	44.3	Pk	34.2	11.0	35.0	0.0	54.5	74.0	-19.5
4804	34.2	Avg	34.2	11.0	35.0	0.0	44.4	54.0	-9.6
12010	35.2	Pk	42.6	23.5	35.0	0.0	66.3	74.0	-7.7
12010	19.0	Avg	42.6	23.5	35.0	0.0	50.1	54.0	-3.9
14412	34.5	Pk	40.9	26.9	35.0	0.0	67.3	74.0	-6.7
14412	17.4	Avg	40.9	26.9	35.0	0.0	50.2	54.0	-3.8
Fund = 2440.0									
4880	43.3	Pk	34.2	11.2	35.0	0.0	53.7	74.0	-20.3
4880	34.3	Avg	34.2	11.2	35.0	0.0	44.7	54.0	-9.3
7320	45.2	Pk	36.8	16.0	35.0	0.0	63.0	74.0	-11.0
7320	30.0	Avg	36.8	16.0	35.0	0.0	47.8	54.0	-6.2
12200	33.9	Pk	42.6	24.0	35.0	0.0	65.5	74.0	-8.5
12200	18.0	Avg	42.6	24.0	35.0	0.0	49.6	54.0	-4.4
Fund = 2480.0									
4960	45.5	Pk	34.2	11.0	35.0	0.0	55.7	74.0	-18.3
4960	37.0	Avg	34.2	11.0	35.0	0.0	47.2	54.0	-6.8
7440	46.5	Pk	36.8	15.9	35.0	0.0	64.2	74.0	-9.8
7440	32.2	Avg	36.8	15.9	35.0	0.0	49.9	54.0	-4.1
12400	34.4	Pk	42.6	24.5	35.0	0.0	66.5	74.0	-7.5
12400	17.4	Avg	42.6	24.5	35.0	0.0	49.5	54.0	-4.5

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: SHAWN
Date: 12-09-1998 Time: 15:04:40
Temperature Range: 72 Deg F Percent Humidity: 45
E.U.T.: DESIGN-IN MOD. 6330
Serial Number: 0005
Support Devices: DELL CPU, MONITOR, KEYBOARD, MOUSE
Exercise Program: rl2diag.exe
Modifications: None
Report File Name: F:\TESTDATA\8120901B.F

TEST FREQ	TEST dBuV	CLASS B LIMIT	VERSUS B LIMIT	CONDUCTOR	TYPE
=====	=====	=====	=====	=====	=====
0.890	13.4	48.0	-34.6	LINE	PK
7.990	32.8	48.0	-15.2	LINE	PK
11.460	48.6	48.0	0.6	LINE	PK
16.850	45.5	48.0	-2.5	LINE	PK
25.720	28.6	48.0	-19.4	LINE	PK
29.630	38.7	48.0	-9.3	LINE	PK
11.460	32.5	48.0	-15.5	LINE	QP
16.850	34.0	48.0	-14.0	LINE	QP
1.040	15.1	48.0	-32.9	NEUTRAL	PK
6.430	32.8	48.0	-15.2	NEUTRAL	PK
11.530	49.2	48.0	1.2	NEUTRAL	PK
16.780	45.5	48.0	-2.5	NEUTRAL	PK
24.160	24.6	48.0	-23.4	NEUTRAL	PK
28.890	36.6	48.0	-11.4	NEUTRAL	PK
11.530	34.6	48.0	-13.4	NEUTRAL	QP
16.780	33.9	48.0	-14.1	NEUTRAL	QP

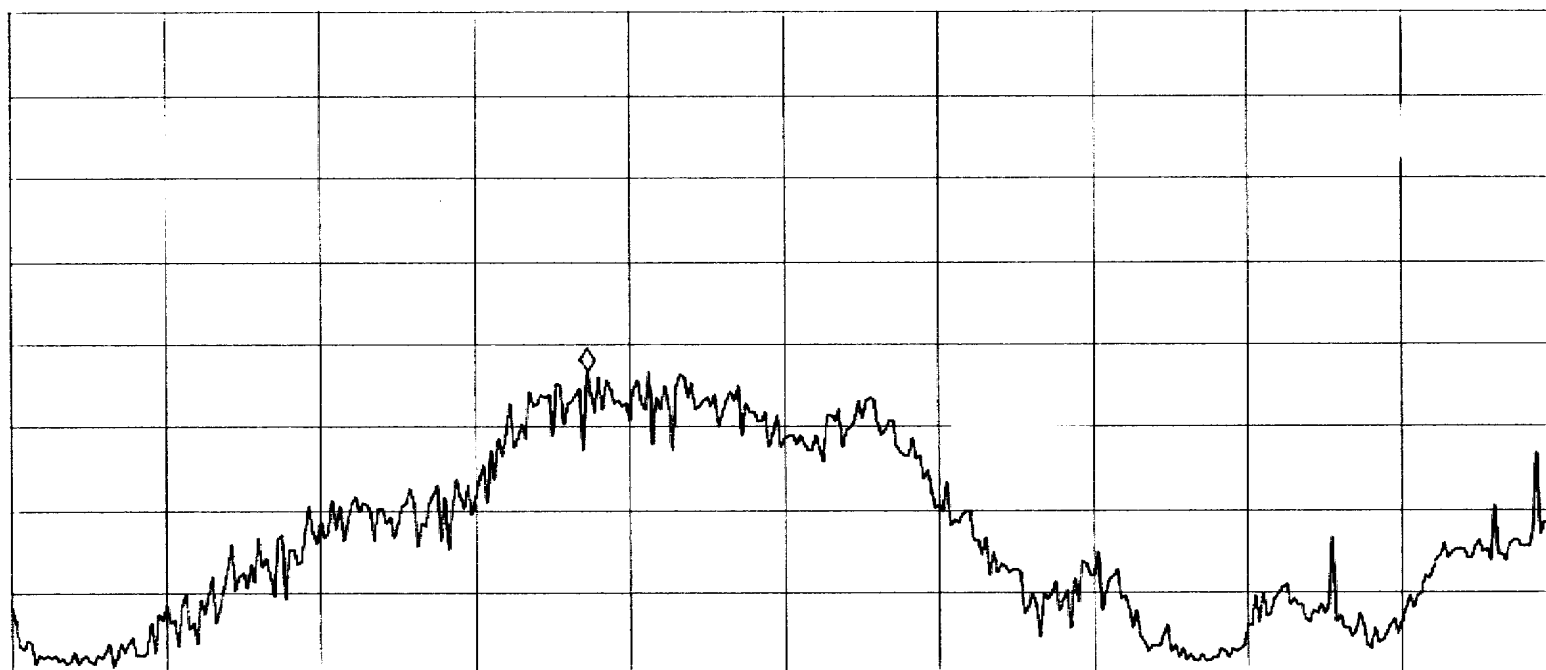
15:13:41 DEC 09, 1998
8120901B LINE

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 11.46 MHz
48.58 dB μ V

LOG REF 92.0 dB μ V

10
dB/
ATN
10 dB

WA SB
SC FS
ACORR



START 450 kHz

IF BW 9.0 kHz

AVG BW 30 kHz

STOP 30.00 MHz

SWP 2.46 sec

(P) 15:17:28 DEC 09, 1998
8120901B NEUTRAL

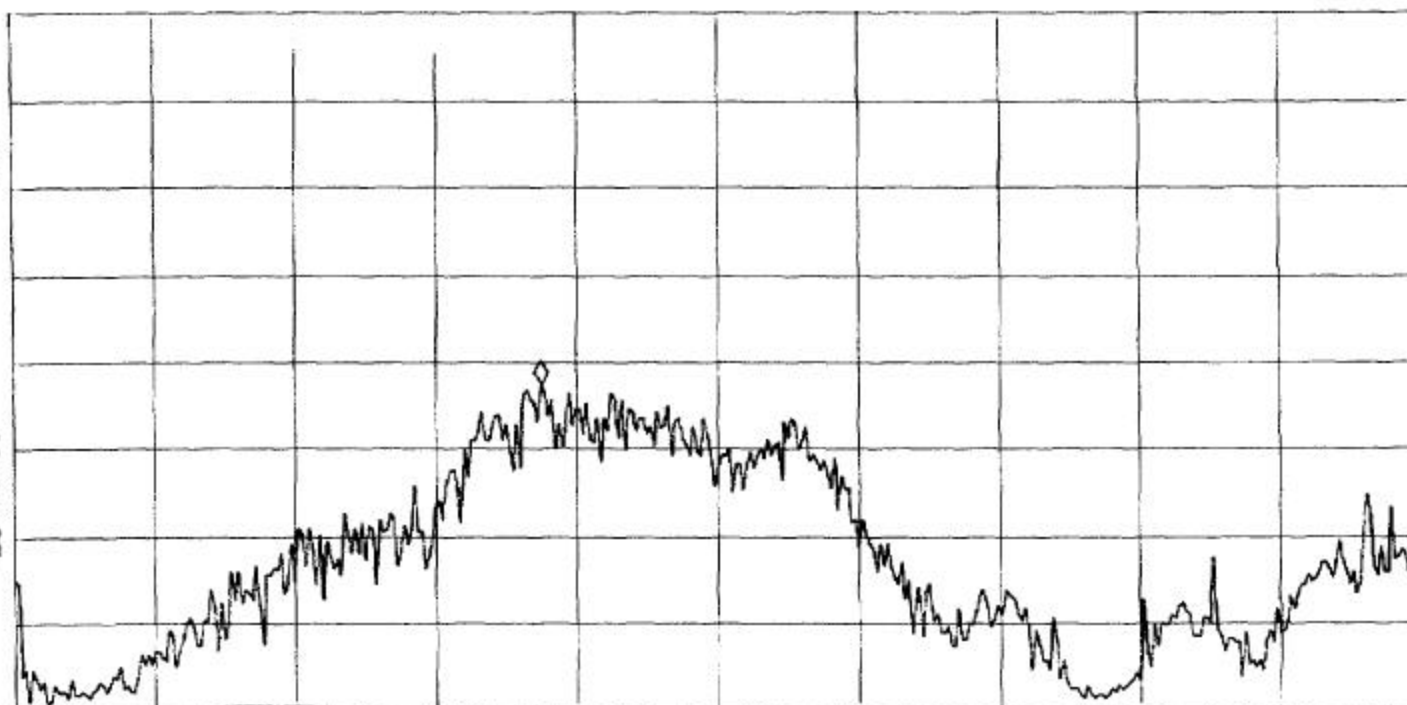
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 11.53 MHz
49.21 dB μ V

LOG REF 92.0 dB μ V

10
dB/
ATN
10 dB

WA SB
SC FS
ACORR

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: SHAWN
Date: 12-09-1998 Time: 12:30:35
Temperature Range: 52 Deg F Percent Humidity: 48
E.U.T.: DESIGN-IN MOD. 6330
Serial Number: 0005
Support Devices: DELL CPU, MONITOR, KEYBOARD, MOUSE
Exercise Program: rl2diag.exe
Modifications: None
Report File Name: F:\TESTDATA\8120901B.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
64.000	50.2	33.3	40.0	-6.7	0	2.0	V	PK
80.000	47.2	30.6	40.0	-9.4	90	2.0	V	PK
182.300	45.2	36.5	43.5	-7.0	180	2.0	V	PK
144.000	44.0	34.4	43.5	-9.1	120	2.0	V	PK
176.000	43.0	34.1	43.5	-9.4	0	1.5	V	PK
192.000	45.0	36.6	43.5	-6.9	270	1.5	V	PK
240.000	38.5	31.0	46.0	-15.0	220	1.5	V	PK
272.000	35.3	29.1	46.0	-16.9	220	1.5	V	PK
288.000	36.2	32.1	46.0	-13.9	250	1.5	H	PK
272.000	33.0	26.8	46.0	-19.2	270	1.5	H	PK
256.800	44.8	37.5	46.0	-8.5	250	2.0	H	PK
240.000	49.6	42.1	46.0	-3.9	270	1.5	H	PK
240.000	47.2	39.7	46.0	-6.3	270	1.5	H	QP
224.000	42.3	34.6	46.0	-11.4	270	2.0	H	PK
208.000	43.1	35.2	43.5	-8.3	270	2.0	H	PK
176.000	44.2	35.3	43.5	-8.2	270	2.0	H	PK
144.000	44.3	34.7	43.5	-8.8	270	2.0	H	PK
128.000	45.2	35.0	43.5	-8.5	250	1.5	H	PK
112.000	39.5	27.6	43.5	-15.9	250	2.0	H	PK
64.000	47.2	30.3	40.0	-9.7	300	2.0	H	PK

CHANGED ANTENNA TO LOG PERIODIC

304.000	34.2	25.4	46.0	-20.6	0	1.5	V	PK
320.000	38.0	28.8	46.0	-17.2	0	1.5	V	PK
336.000	41.0	32.0	46.0	-14.0	270	1.5	V	PK
352.000	32.0	23.3	46.0	-22.7	270	1.5	V	PK
384.000	41.7	33.8	46.0	-12.2	270	1.5	V	PK
400.000	32.3	24.8	46.0	-21.2	250	1.5	V	PK

416.000	31.0	23.7	46.0	-22.3	270	1.5	V	PK
---------	------	------	------	-------	-----	-----	---	----

Date: 12-09-1998
E.U.T.: DESIGN-IN MOD. 6330
Serial Number: 0005
Antenna Type: LOG PERIODIC

TEST FREQ =====	TEST dBuV =====	ACTUAL dBuV/m =====	CLASS B LIMIT =====	VERSUS B LIMIT =====	TABLE DEGREES =====	ANTENNA HEIGHT =====	POLAR- IZATION =====	DETECTOR Type =====
320.000	43.3	34.1	46.0	-11.9	300	2.0	H	PK
304.000	41.3	32.5	46.0	-13.5	300	2.0	H	PK
480.000	30.0	24.3	46.0	-21.7	250	2.0	H	PK
416.000	30.0	22.7	46.0	-23.3	270	2.0	H	PK
400.000	41.2	33.7	46.0	-12.3	270	2.0	H	PK
384.000	42.2	34.3	46.0	-11.7	340	2.0	H	PK
368.000	43.0	34.7	46.0	-11.3	300	1.5	H	PK
352.000	43.3	34.6	46.0	-11.4	300	1.5	H	PK
336.000	39.9	30.9	46.0	-15.1	300	1.5	H	PK

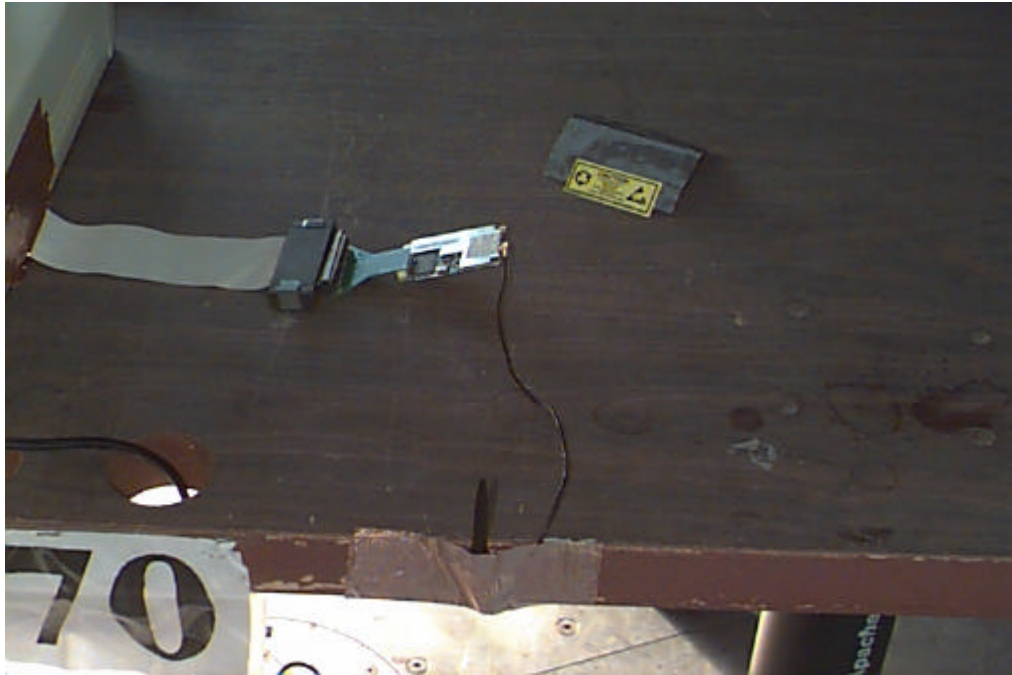
APPENDIX E
SET-UP PHOTOS



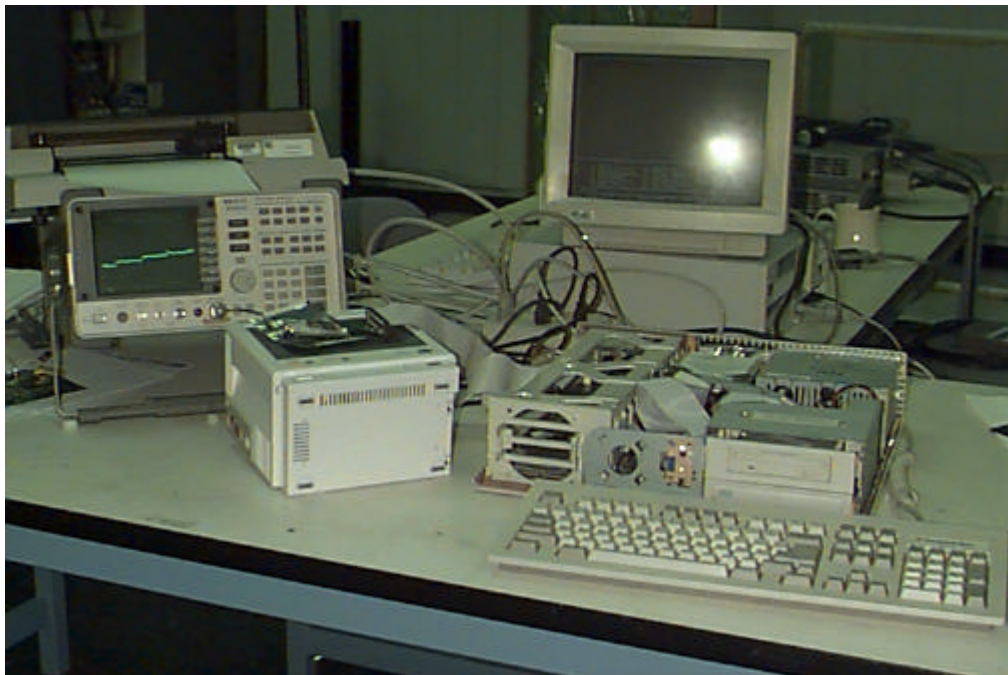
**FCC 15.209 Class B
Radiated Emissions**



**FCC 15.207 Class B
Conducted Emissions**

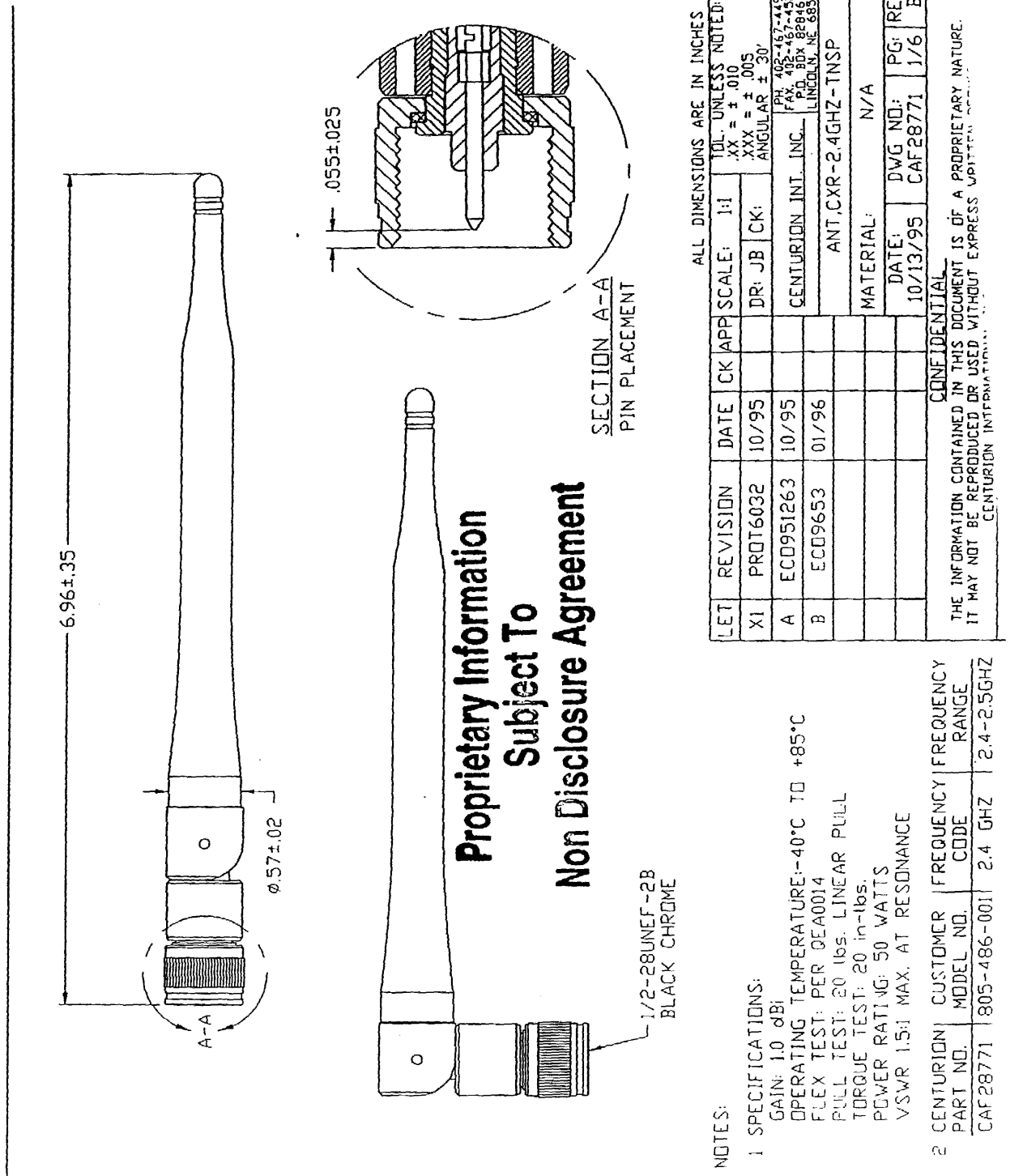


FCC 15.247 Restricted Band



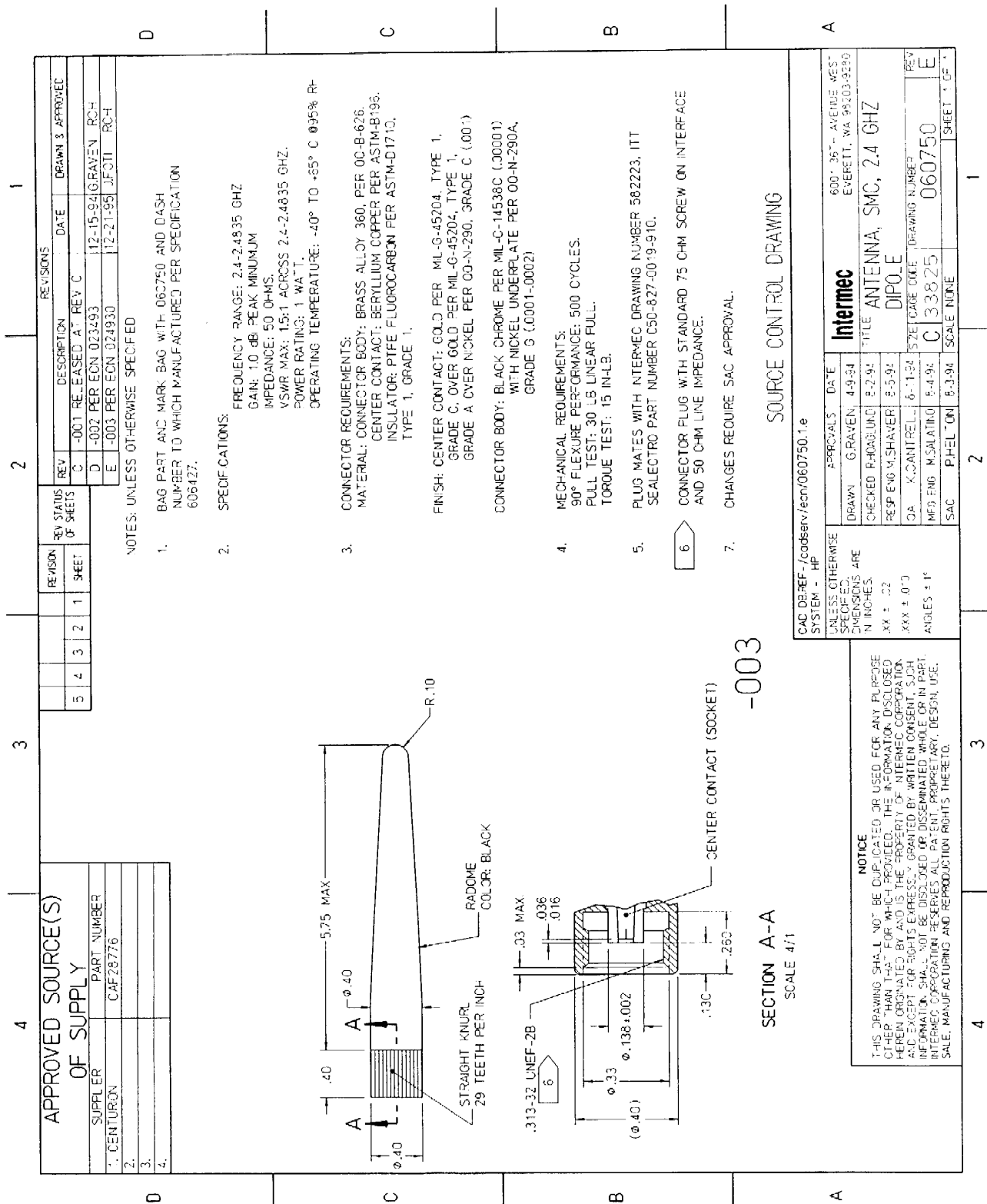
FCC 15.247 Conducted RF

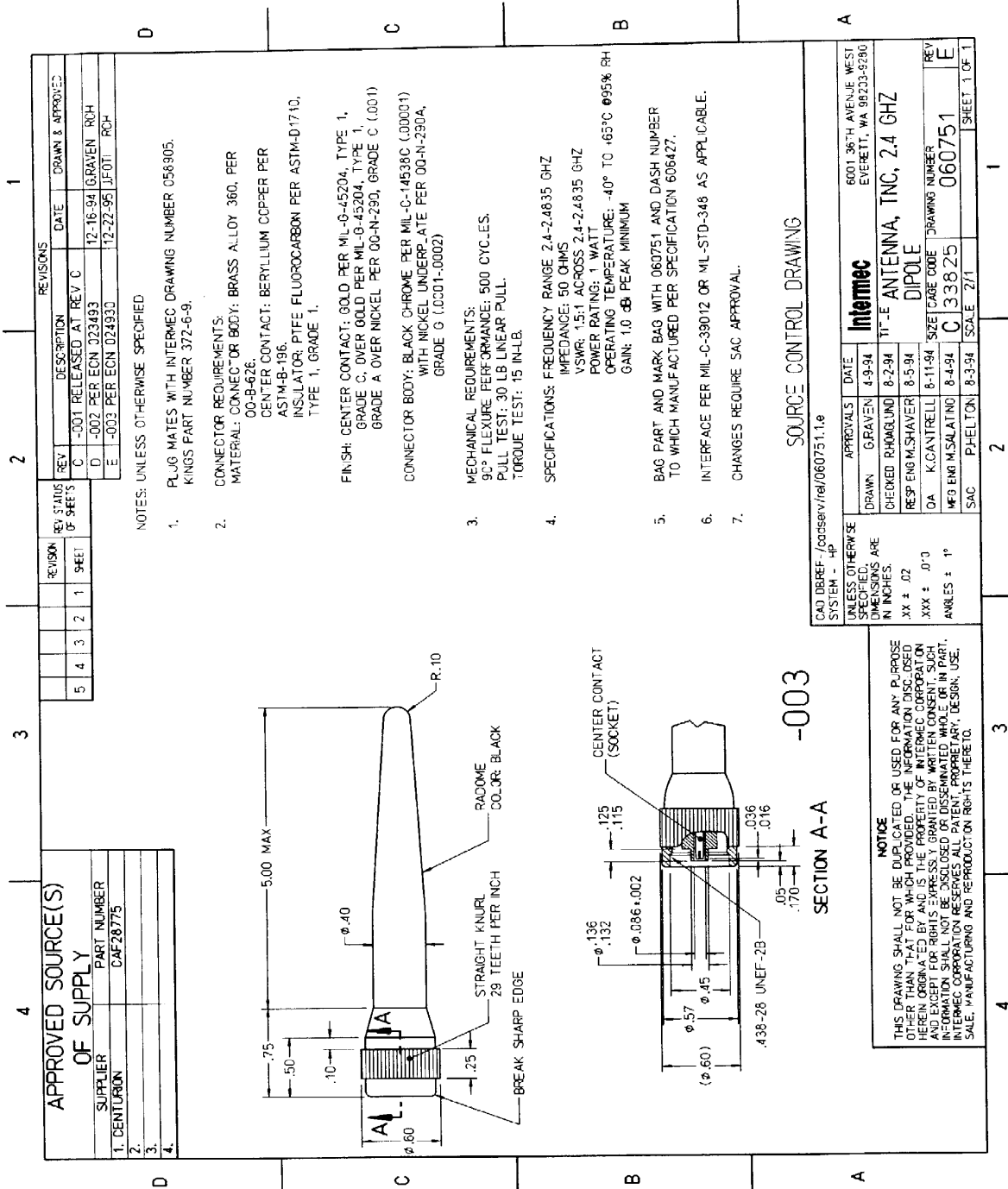
APPENDIX F
ANTENNA DRAWINGS

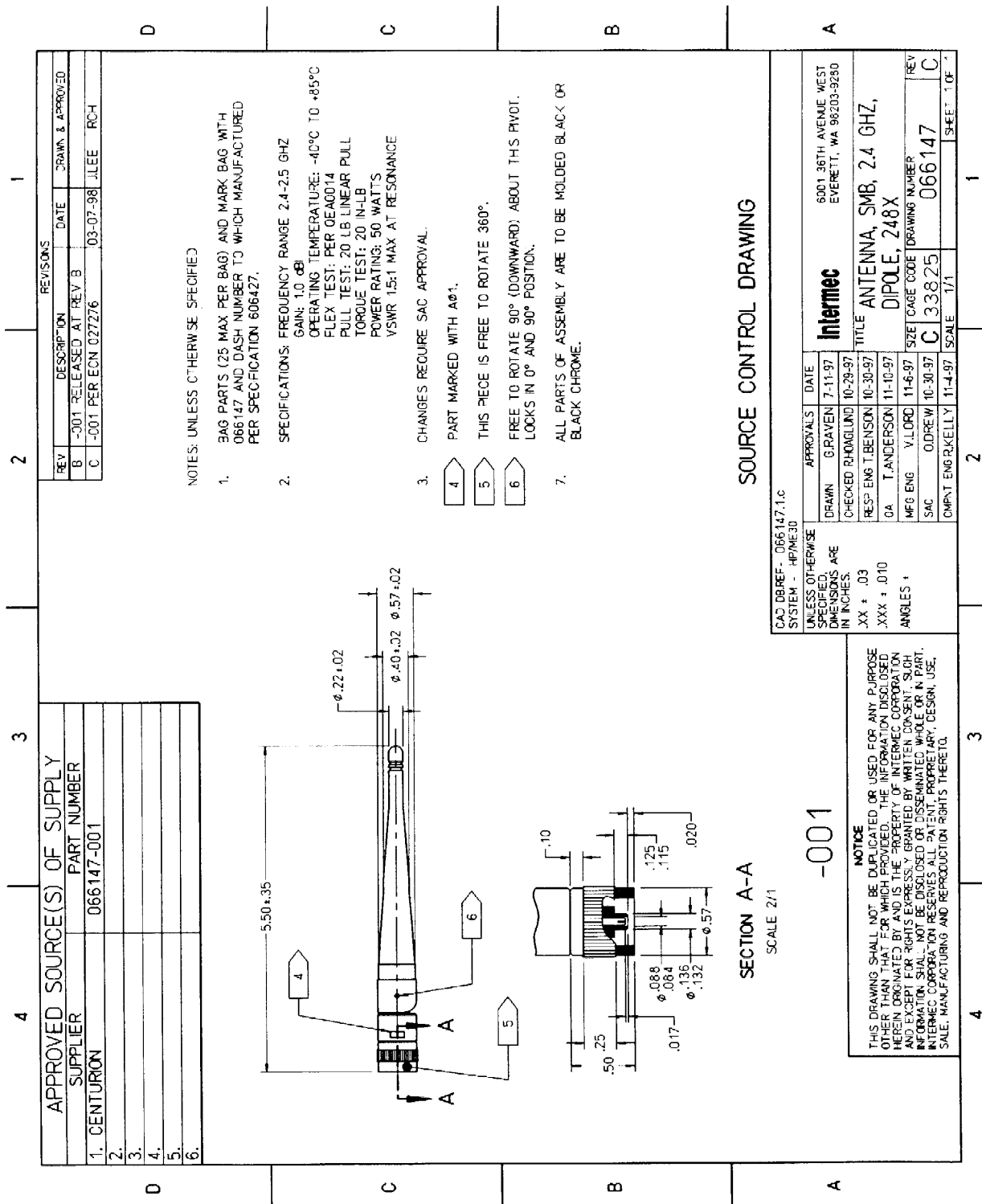


ATTACHMENT 1

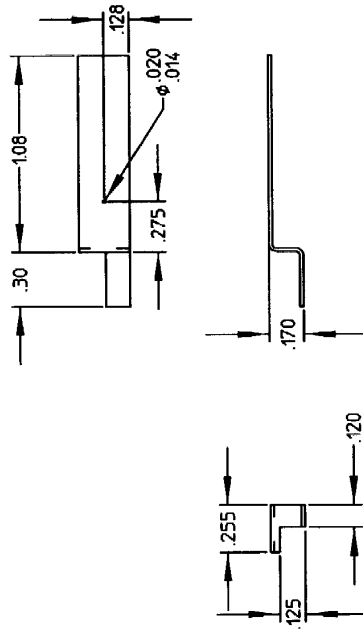
ATTACHMENT 1







REV	ECN	REVISION-DESCRIPTION	DATE	BY	CHK
A	24233	RELEASED 1) MATERIAL WAS 26 Ga. CRS.			



MATERIAL	26 Ga. CRES 300 (.0179 THK)	
FINISH	NONE	
THIS DOCUMENT IS THE PROPERTY OF SAKURA CORPORATION AND MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM SAKURA CORPORATION. NO PART OF THIS DOCUMENT SHALL BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM SAKURA CORPORATION.		
NORAND CORPORATION		550 Second Street S.E. Cedar Rapids, Iowa 52401 Phone 319/267-3300
DRAWN	CHECKED	APPROVED
MEDEMA	MEDEMA	
DATE 11-3-95	DATE 11-3-95	DATE
SCALE 2/1	USED ON	QTY
	RM80/RM90	
DRAWING TITLE		
F - STYLE ANTENNA		
DRAWING NO. 650-277	DASH NO. 001	1 OF 1
		B

REVISION STATUS OF SHEETS	1	2	3	4	5
UNLESS OTHERWISE SPECIFIED					
DIMENSIONS ARE IN INCHES					
AND THE TOLERANCES BELOW					
ARE APPLICABLE					
DECIMAL					
.XX = ±.02					
.XXX = ±.010					
ANGULAR					
±1°					

