

**15.407 Certification
FCC ID: EV9N2L5-3S1-01**

EMI TEST REPORT

On

N2 Link 1 x DS1 5.250 - 5.350 GHz

Prepared for

**Mutlipoint Networks
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Prepared by

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**Test Report Number: A804007
Date of Test: April 10 - 13, 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
Spectrum Analyzer	HP	8564E	3741A00986
Preamplifier	HP	8447F	3113A05849
Preamplifier	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	HP8601-7SS	001

3.0 EUT

N2 Link 1 x DS1 5.250 - 5.350 GHz

The N2 Link is comprised of the following:

N2 1 x DS1 Interface Unit, 5.250 - 5.350 GHz Outdoor Unit (ODU)

3 ft. RG-8 Type N coaxial cable ODU to Antenna jumper

Radiowaves SP2-5.2 2 ft. Parabolic antenna

Radiowaves SP4-5.2 4 ft. Parabolic antenna

Model Number: 1 x DS1 Low Band, 5.250 - 5.350 GHz

Serial Number: Prototype

FCC ID: EV9N2L5-3S1-01

4.0 SUPPORT EQUIPMENT

HP 37701B T1 / Data Tester S/N 3630U00840

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 N2 Link 1 x DS1 5.250 - 5.350 GHz is a wireless point to point communications system with a low power radio system operating in the 5.250 - 5.350 GHz band. Tests were performed with two different antennas, a 33 dB gain antenna for the low power version and a 27 dB gain antenna for the high power version. Test firmware resident in the EUT was used to do the test.

6.1 Low Power Version

6.1.1 15.407(a)(2) Maximum Peak Output Power

The three spectrum analyzer plots labeled " POWER OUT" show the maximum power of the EUT to be -15.2 dBm or .03 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 = -15.2 dBm (peak reading) +0.3dB cable loss = -14.9 dBm / .03 mW EIRP
Limit: +24 dBm / 250 mW maximum power

SPB4-5.2 4 ft antenna
EIRP = -15.2 (peak power) +33.0 (peak gain, dBi) = +18.1 dBm / 64 mW EIRP
Limit: +24 dBm / 250 mW maximum power

Peak Spectral Power Density

The three spectrum analyzer plots labeled "Peak Spectral Power Density" show the power density for low / mid / high frequencies to be less than 12.5 mW / MHz. An RBW of 1MHz was used. The antenna gain has been reduced by 6 dB. **Test Plots are shown in Appendix A.**

Freq. (GHz)	Measured Peak Spectral Power Density (dBm)	Antenna Gain (dB)	Total Spectral Power Density (dBm)	Limit (dBm)
5.26	-16.2	27	10.8	11
5.30	-16.6	27	10.4	11
5.33	-16.1	27	10.9	11

6.1.2 15.407(b)(2) OUT OF BAND EMISSIONS

The spectrum analyzer plots titled "" OUT OF BAND - LOWER BAND EDGE" shows the output spectrum of the EUT when set to it's lowest transmitting frequency. The spectrum analyzer plots titled "" OUT OF BAND - UPPER BAND EDGE" shows the output spectrum of the EUT when set to it's highest transmitting frequency. The analyzer was placed in MAX HOLD mode, and several sweeps were recorded. The resultant plots show that the EUT emissions were at least 34 dB down from the band edges to 10MHz above and below the band edges.

The spectrum analyzer plots titled "" OUT OF BAND - LOWER BAND EDGE + 10MHz" shows the output spectrum of the EUT when set to it's lowest transmitting frequency. The spectrum analyzer plots titled "" OUT OF BAND - UPPER BAND EDGE + 10 MHz" shows the output spectrum of the EUT when set to it's highest transmitting frequency. The analyzer was placed in MAX HOLD mode, and several sweeps were recorded. The resultant plots show that the EUT emissions were at least 44 dB down for frequencies greater than 10MHz above and below the band edges.

The spectrum analyzer plots labeled "OUT OF BAND <30 MHz - 6 GHz", " OUT OF BAND 6 - 13 GHz", "OUT OF BAND 13 - 26.5 GHz", "OUT OF BAND 26.5 - 31GHz", and "OUT OF BAND 31 - 40 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 5.25 - 5.35 GHz band. **Test Plots are shown in Appendix A.**

6.2 High Power Version

6.2.1 15.407(a)(2) Maximum Peak Output Power

The three spectrum analyzer plots labeled " POWER OUT" show the maximum power of the EUT to be -8.6 dBm or .139 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 = -8.9 dBm (peak reading) +0.3dB cable loss = -8.6 dBm / .139 mW EIRP
Limit: +24 dBm / 250 mW maximum power

SPB2-5.2 2 Ft Antenna
EIRP = -8.6 (peak power) +27.0 (peak gain, dBi) = +18.4 dBm / 69.1mW EIRP
Limit: +24 dBm / 250 mW maximum power

Peak Spectral Power Density

The three spectrum analyzer plots labeled "Peak Spectral Power Density" show the power density for low / mid / high frequencies to be less than 12.5 mW / MHz. An RBW of 1MHZ was used. **Test Plots are shown in Appendix A.**

Freq. (GHz)	Measured Peak Spectral Power Density (dBm)	Antenna Gain (dB)	Total Spectral Power Density (dBm)	Limit (dBm)
5.26	-10.1	21	10.9	11
5.30	-9.2	21	11.8	11
5.33	-9.2	21	11.8	11

6.2.2 15.407(b)(2) OUT OF BAND EMISSIONS

The spectrum analyzer plots titled "" OUT OF BAND - LOWER BAND EDGE" shows the output spectrum of the EUT when set to it's lowest transmitting frequency. The spectrum analyzer plots titled "" OUT OF BAND - UPPER BAND EDGE" shows the output spectrum of the EUT when set to it's highest transmitting frequency. The analyzer was placed in MAX HOLD mode, and several sweeps were recorded. The resultant plots show that the EUT emissions were al least 34 dB down from the band edges to 10MHz above and below the band edges.

The spectrum analyzer plots titled "" OUT OF BAND - LOWER BAND EDGE + 10MHz" shows the output spectrum of the EUT when set to it's lowest transmitting frequency. The spectrum analyzer plots titled "" OUT OF BAND - UPPER BAND EDGE + 10 MHz" shows the output spectrum of the EUT when set to it's highest transmitting frequency. The analyzer was placed in MAX HOLD mode, and several sweeps were recorded. The resultant plots show that the EUT emissions were al least 44 dB down for frequencies grater than 10MHz above and below the band edges.

The spectrum analyzer plots labeled "OUT OF BAND <30 MHz - 6 GHz", " OUT OF BAND 6 - 13 GHz", "OUT OF BAND 13 - 26.5 GHz", "OUT OF BAND 26.5 - 31GHz", and "OUT OF BAND 31 - 40 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 5.25 - 5.35 GHz band. **Test Plots are shown in Appendix A.**

6.3 15.401(g) Frequency Stability

Since the temperature circuit is identical in both the 5.25 GHz version and the 5.75 GHz version. Temperature testing was only performed on the 5.75 GHz unit .

Frequency measurements were taken at 10 degree intervals between the temperatures of -30 and +50 degrees Celsius. The transmitter was allowed to stabilize for a minimum of 15 minutes at each temperature level before measurement data was collected. The frequency stability data is presented in tabular in Table 1. This test was performed at SE Labs. The temperature profile and log are in Appendix E

Frequency stability verses the input supply voltage data is shown in Table 2. For this test the AC line voltage was varied between 85% and 115% of the normal value. The RAN 64/25 uses standard 120 VAC 60 Hz input to its power supply. To satisfy the frequency stability requirement the line voltage was varied between 102 VAC and 138 VAC by using a variable transformer.

Temperature	Transmitter Output Frequency
-30 °C	5.77664 GHz
-20 °C	5.77664 GHz
-10 °C	5.77664 GHz
0 °C	5.77664 GHz
10 °C	5.77664 GHz
20 °C	5.77664 GHz
30 °C	5.77664 GHz
40 °C	5.77664 GHz
50 °C	5.77664 GHz

Table 1 Transmitter Frequency vs. Temperature

Line Voltage	Transmitter Output Frequency
102 VAC	5.77664 GHz
107 VAC	5.77664 GHz
112 VAC	5.77664 GHz
117 VAC	5.77664 GHz
123 VAC	5.77664 GHz
128 VAC	5.77664 GHz
132 VAC	5.77664 GHz
138 VAC	5.77664 GHz

Table 2 Transmitter Frequency vs. Input Line Voltage

6.4 **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 = 1Mhz. Average measurements were made with a RBW = 1 MHz and a VBW = 10 Hz.

6.5 **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 set in a receive only mod 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.**

6.6 **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 D.**

6.7 **15.203 ANTENNA REQUIREMENT**

The unit requires professional installation and is therefore exempt from the requirements of 15.203. This product has a standard N type Antenna connector to provide a coupling to the intentional radiator. **The manufacturers antenna drawings are in Appendix F**
Electronic Compliance Laboratories

Chris Byleckie
Technical Director

Date

APPENDIX A
SPREAD SPECTRUM PLOTS

Low Power Setting

Peak Spectral Power Density

(HP) 10:12:14 APR 14, 1998

REF 10.0 dBm

AT 20 dB

MKR 5.260760 GHz

-26.24 dBm

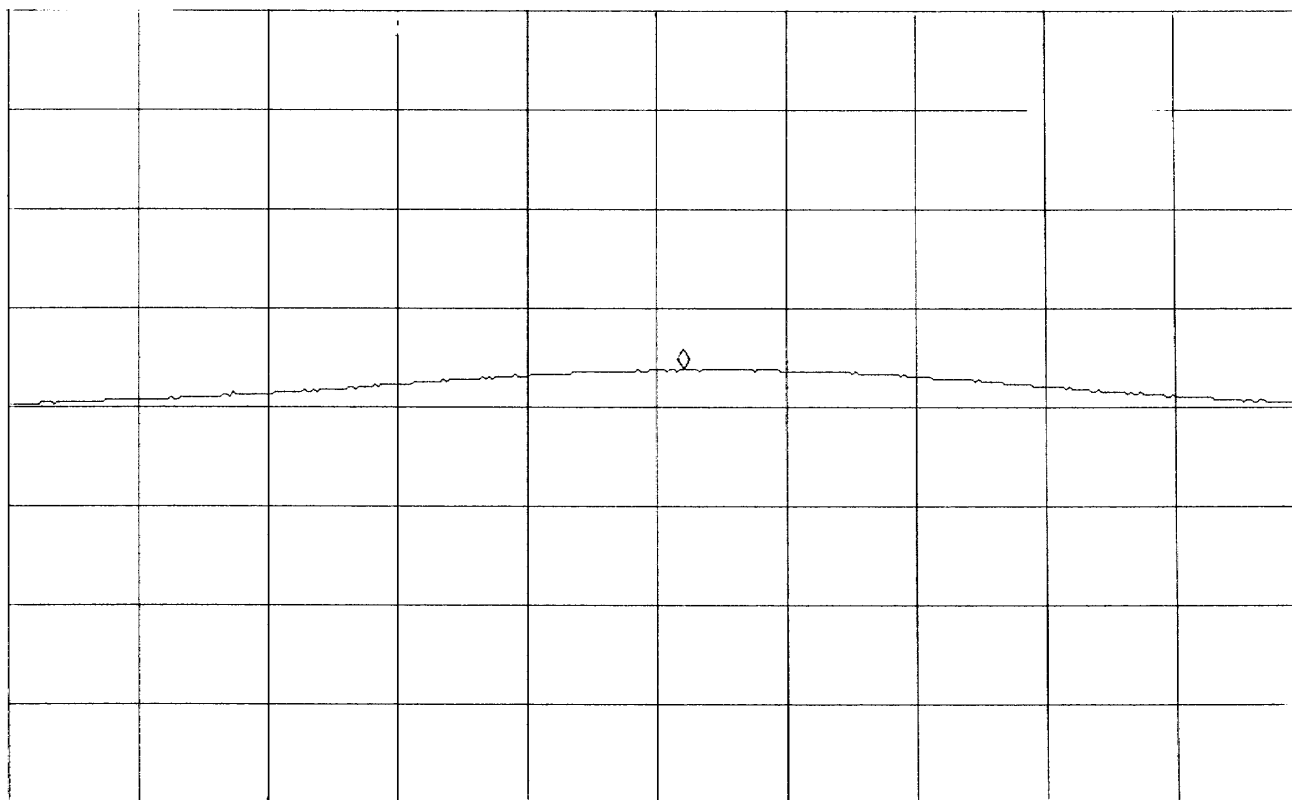
PEAK
LOG
10
dB/

VA SB
SC FC
CORR

CENTER 5.260740 GHz
#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec



Peak Spectral Power Density

16:52:45 APR 14, 1998

REF -10.0 dBm AT 10 dB

MKR 5.301745 GHz
-16.64 dBm

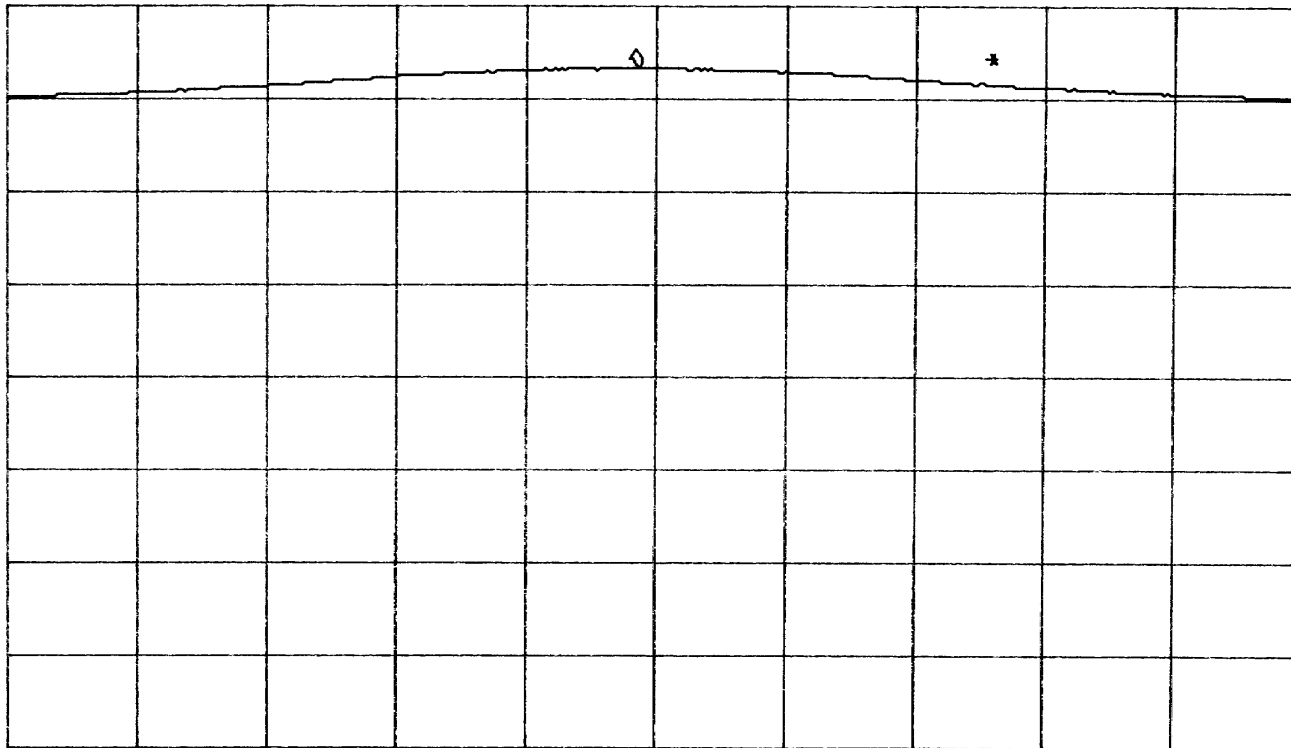
PEAK
LOG
10
dB/

VA SB
SC FC
CORR

CENTER 5.301760 GHz
#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec



Peak Spectral Power Density

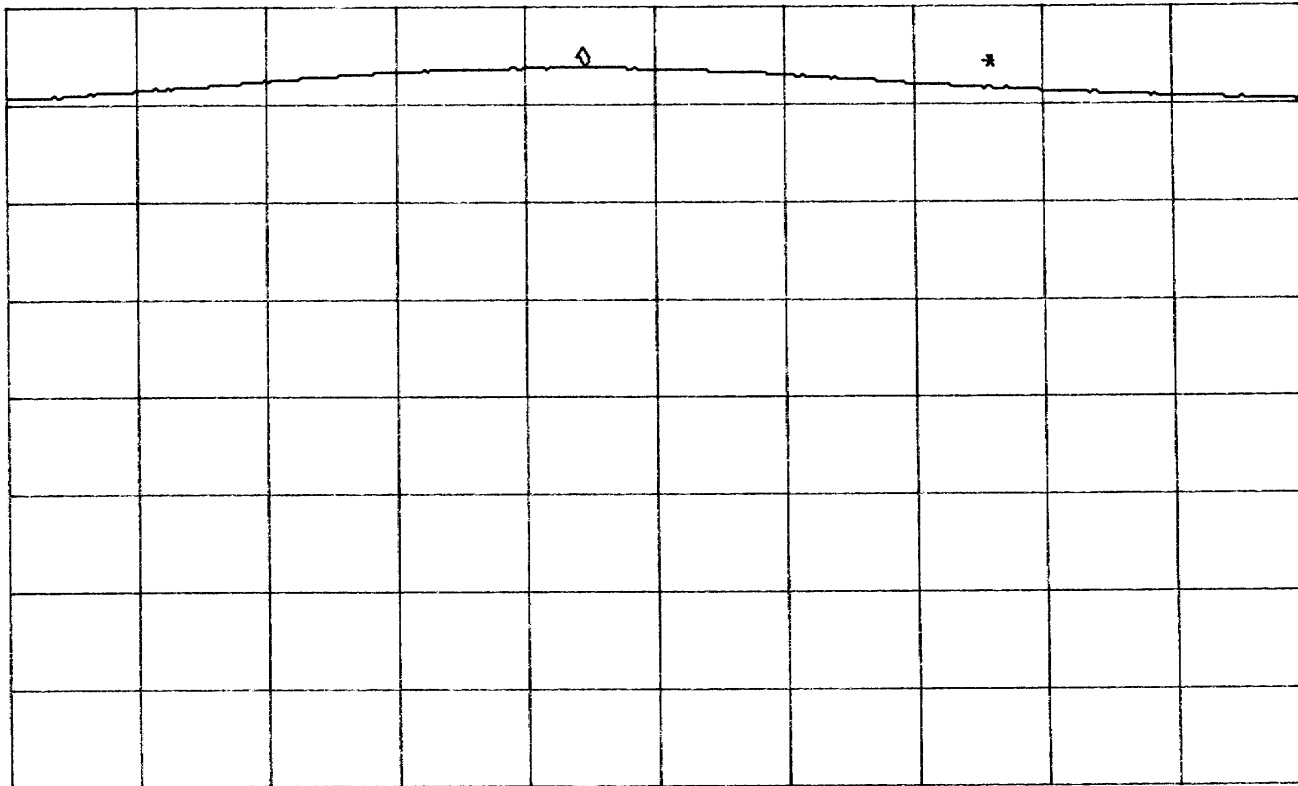
16:24:16 APR 14, 1998

MKR 5.335035 GHz
-16.09 dBm

REF -10.0 dBm AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR



CENTER 5.335090 GHz
#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec

Power Out

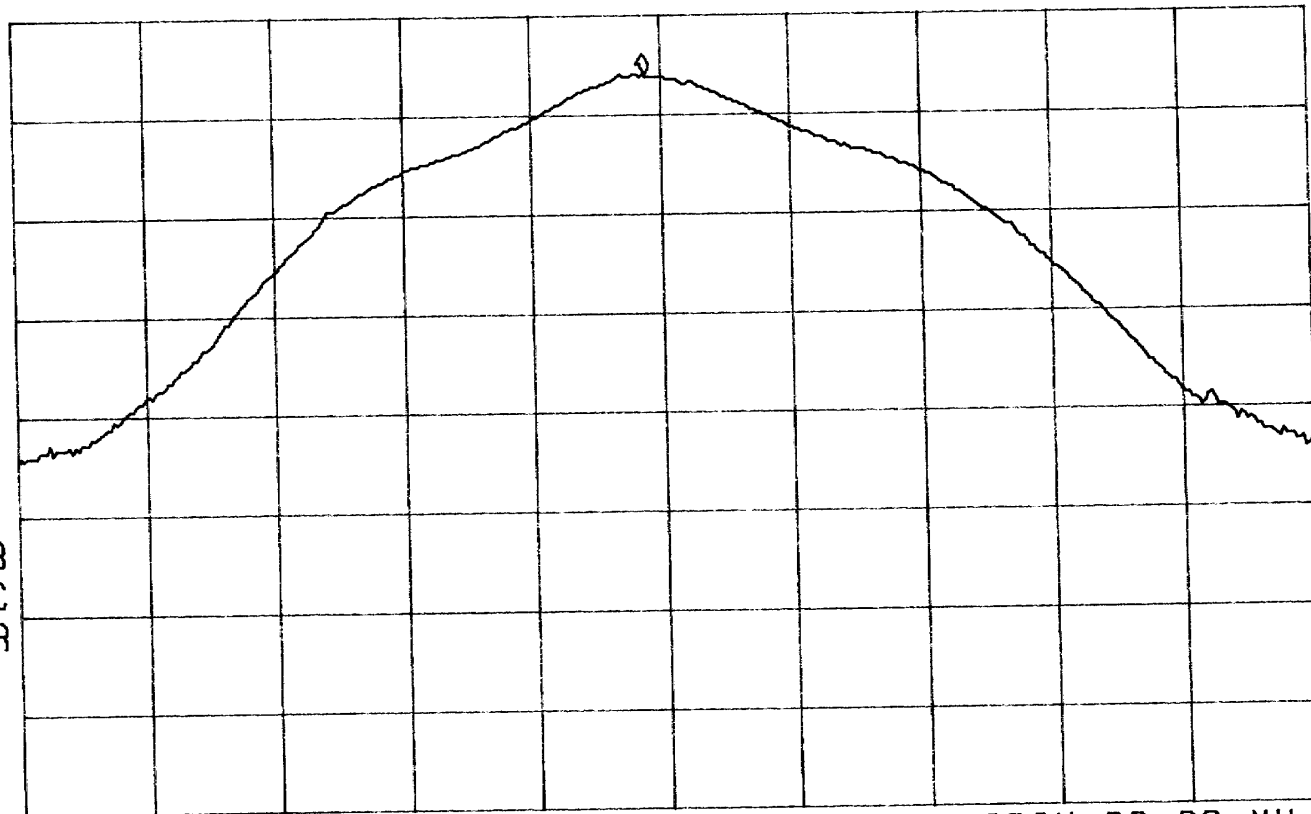
16:27:36 APR 14, 1998

MKR 5.26055 GHz
-15.87 dBm

REF -10.0 dBm AT 10 dB

PEAK
LDG
10
dB/

VA SB
SC FC
CORR



CENTER 5.26000 GHz
#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

Power Out

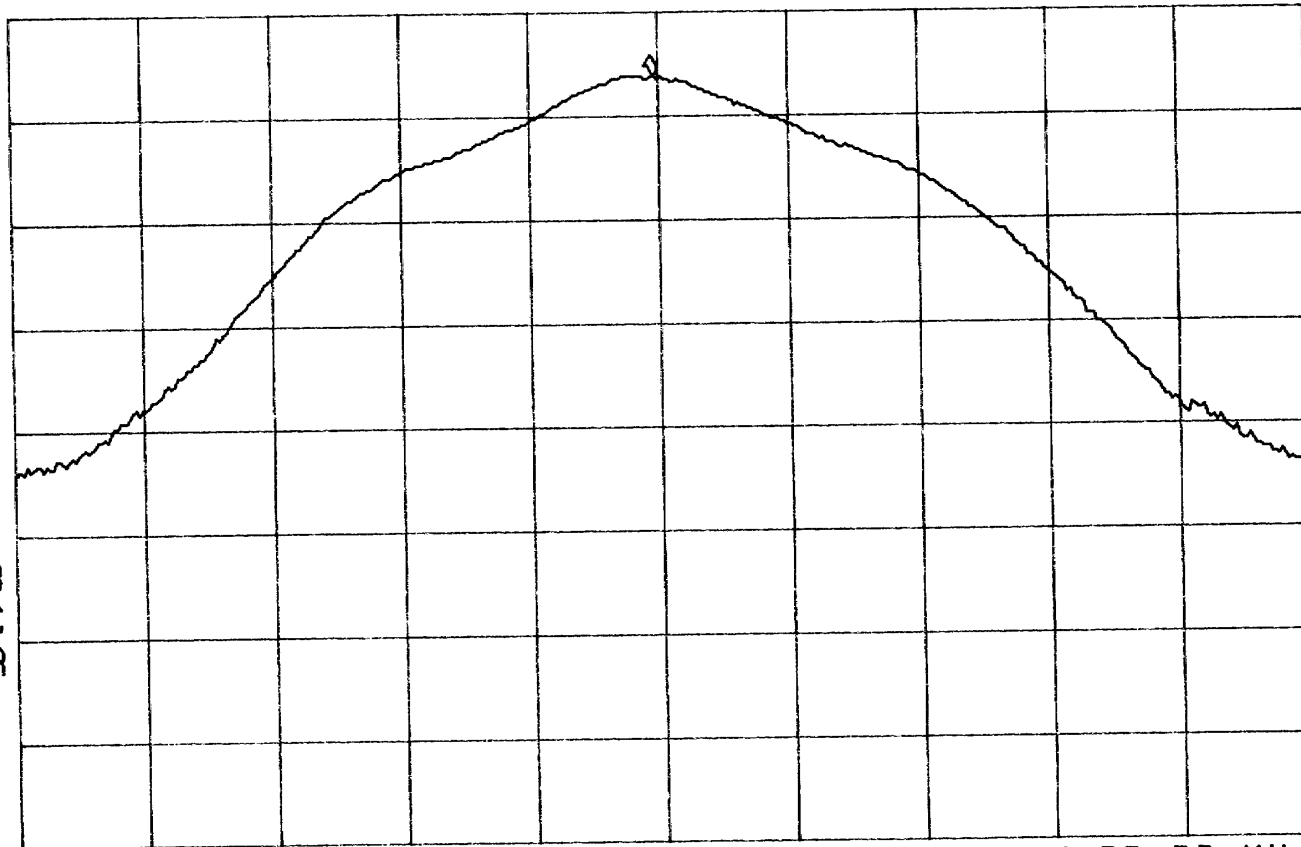
(75) 16:45:36 APR 14, 1990

MKR 5.30166 GHz
-16.00 dBm

REF -10.0 dBm AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CDRR



CENTER 5.30176 GHz
#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

Power Out

16:14:50 APR 14, 1998

MKR 5.33464 GHz

REF -10.0 dBm

AT 10 dB

-15.21 dBm

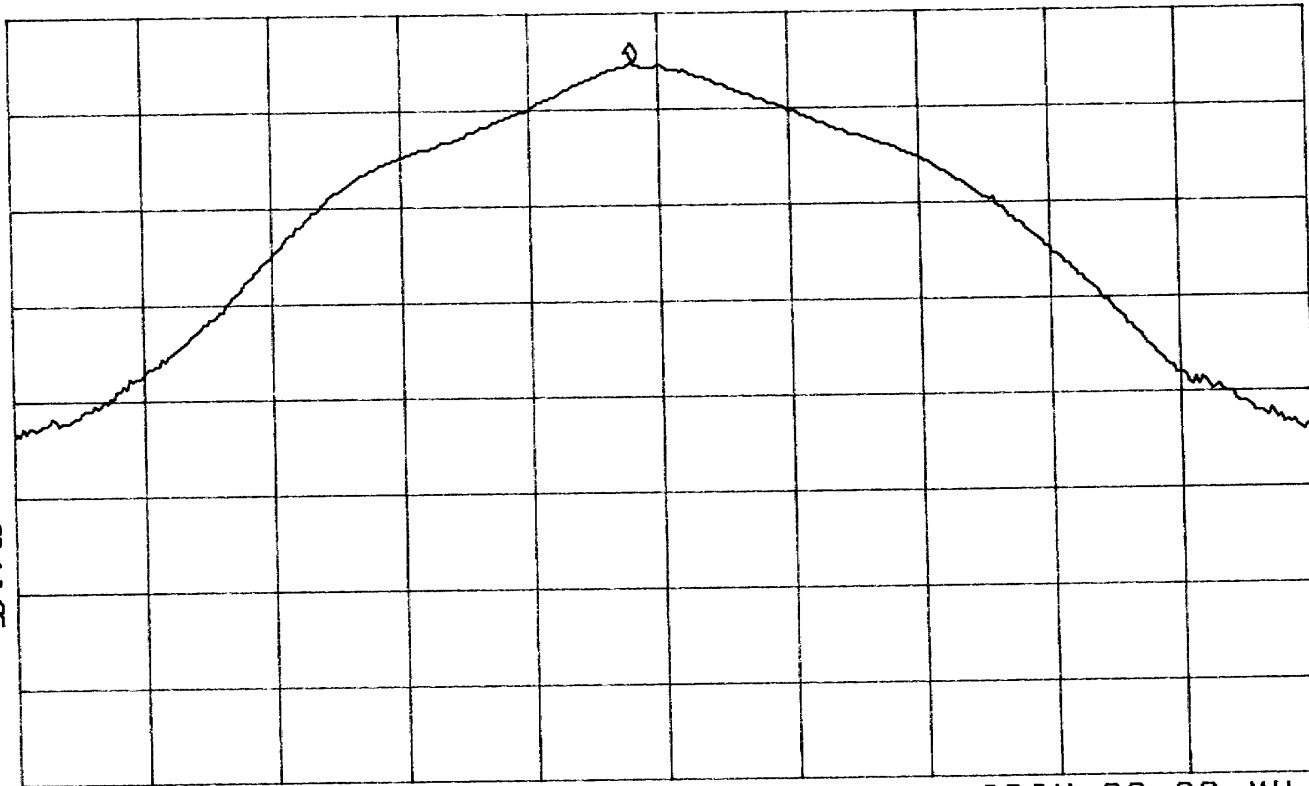
PEAK
LOG
10
dB/

VA SB
SC FC
CORR

CENTER 5.33504 GHz
#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec



Out Of Band Lower Band Edge

[(P)] 11:20:36 APR 17, 1998

MKR Δ -81.3 MHz
-49.95 dB

REF .0 dBm

AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR

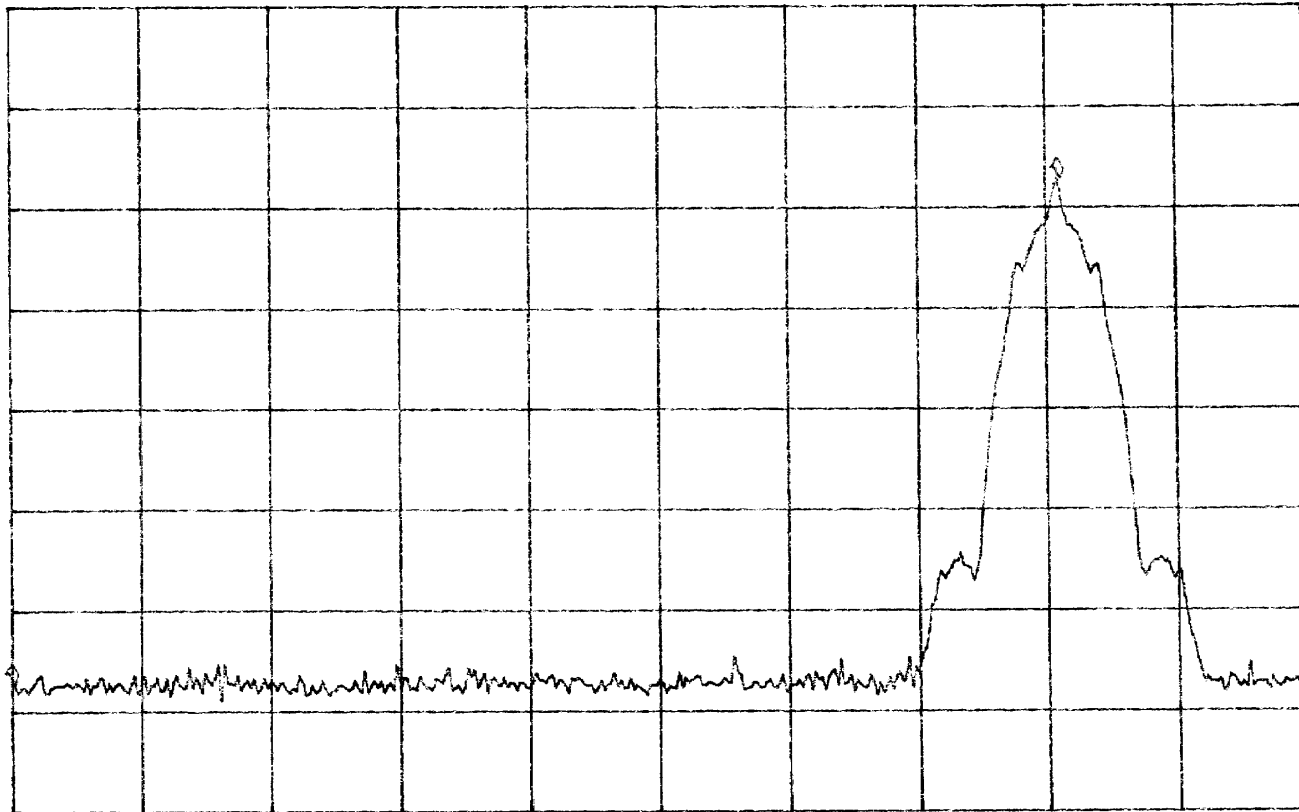
START 5.1000 GHz

#RES BW 1.0 MHz

VBW 1 MHz

STOP 5.2000 GHz

SWP 20.0 msec



Out Of Band Upper Band Edge

[G] 11:24:01 APR 17, 1998

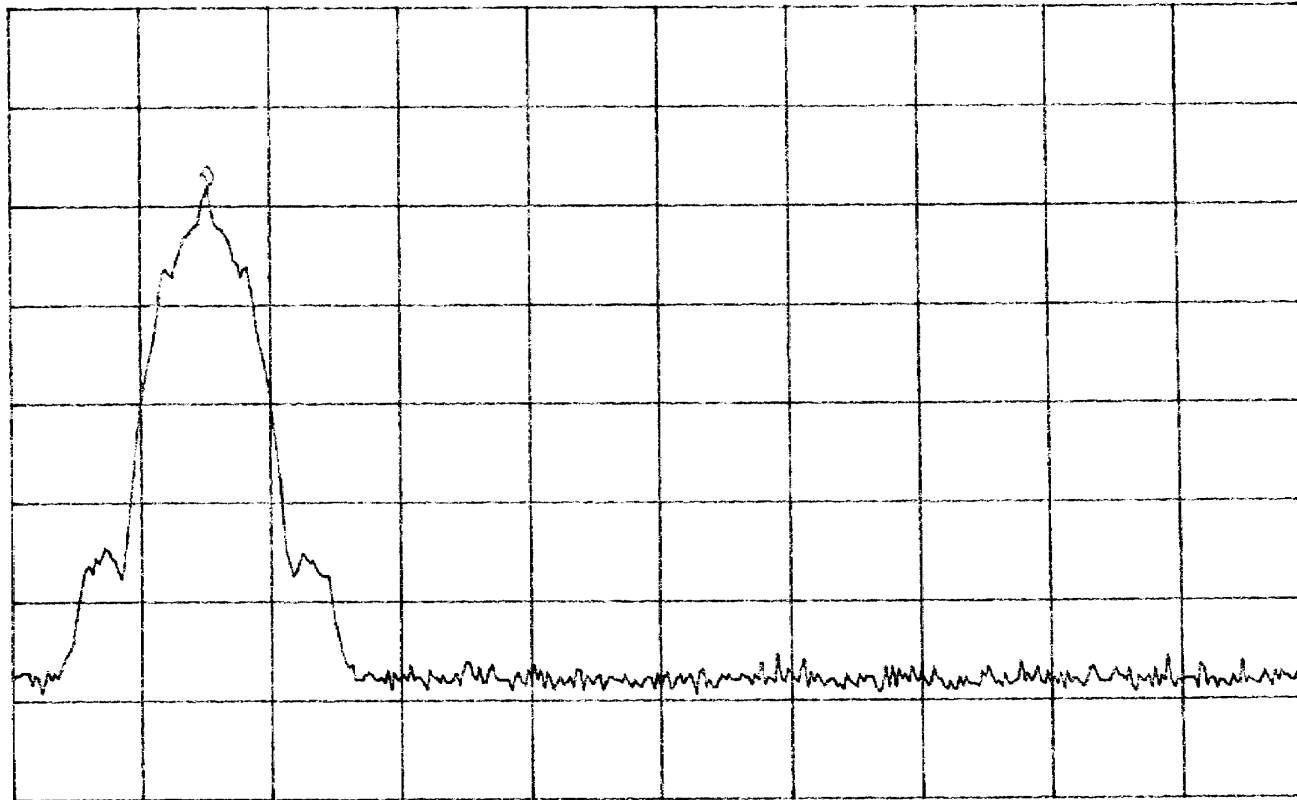
MKR Δ 84.5 MHz
-50.35 dB

REF .0 dBm

AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR



START 5.3200 GHz

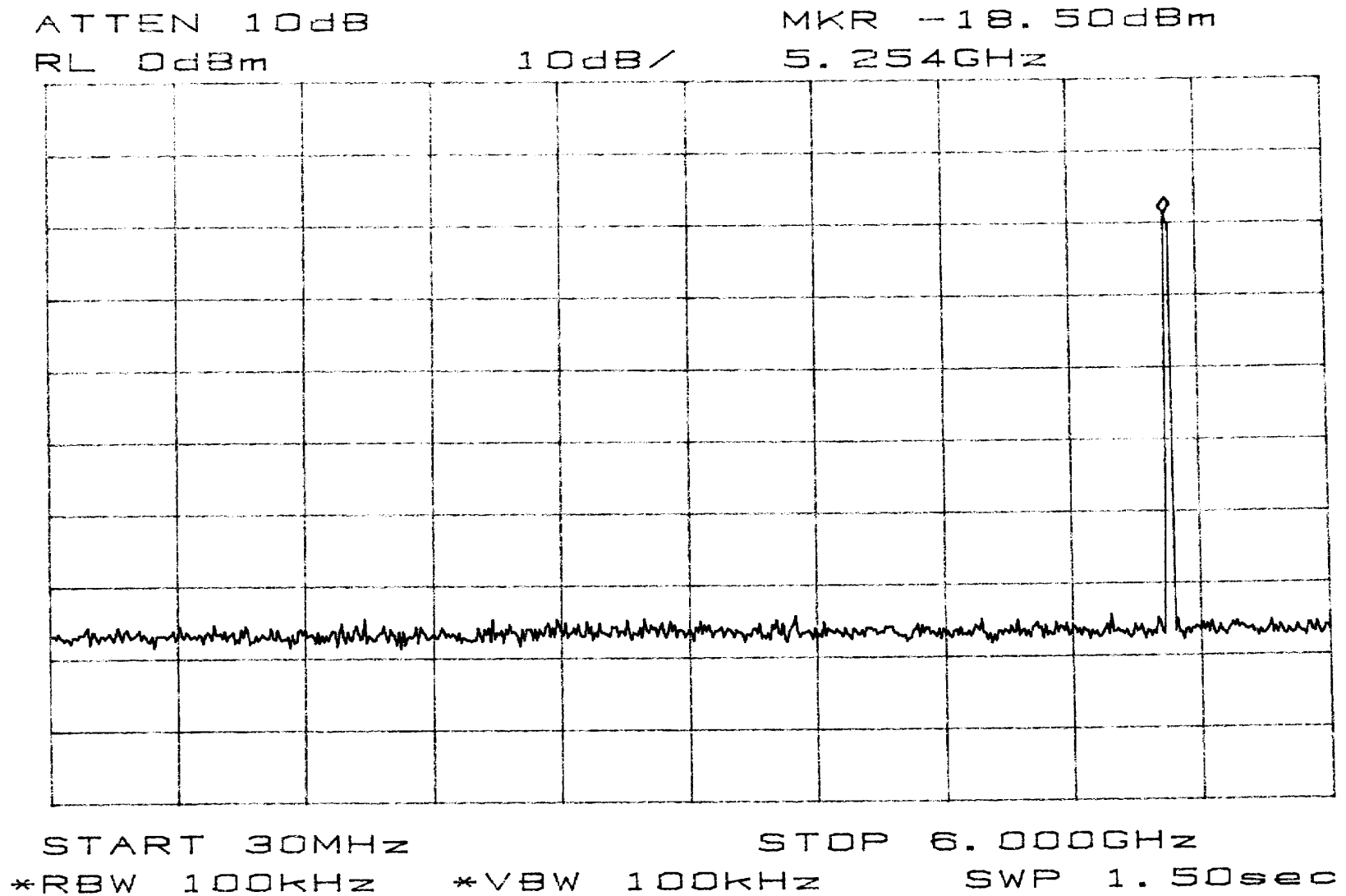
#RES BW 1.0 MHz

VBW 1 MHz

STOP 5.4200 GHz

SWP 20.0 msec

Out Of Band 30 MHz - 6 GHz



Out Of Band 6 - 13 GHz

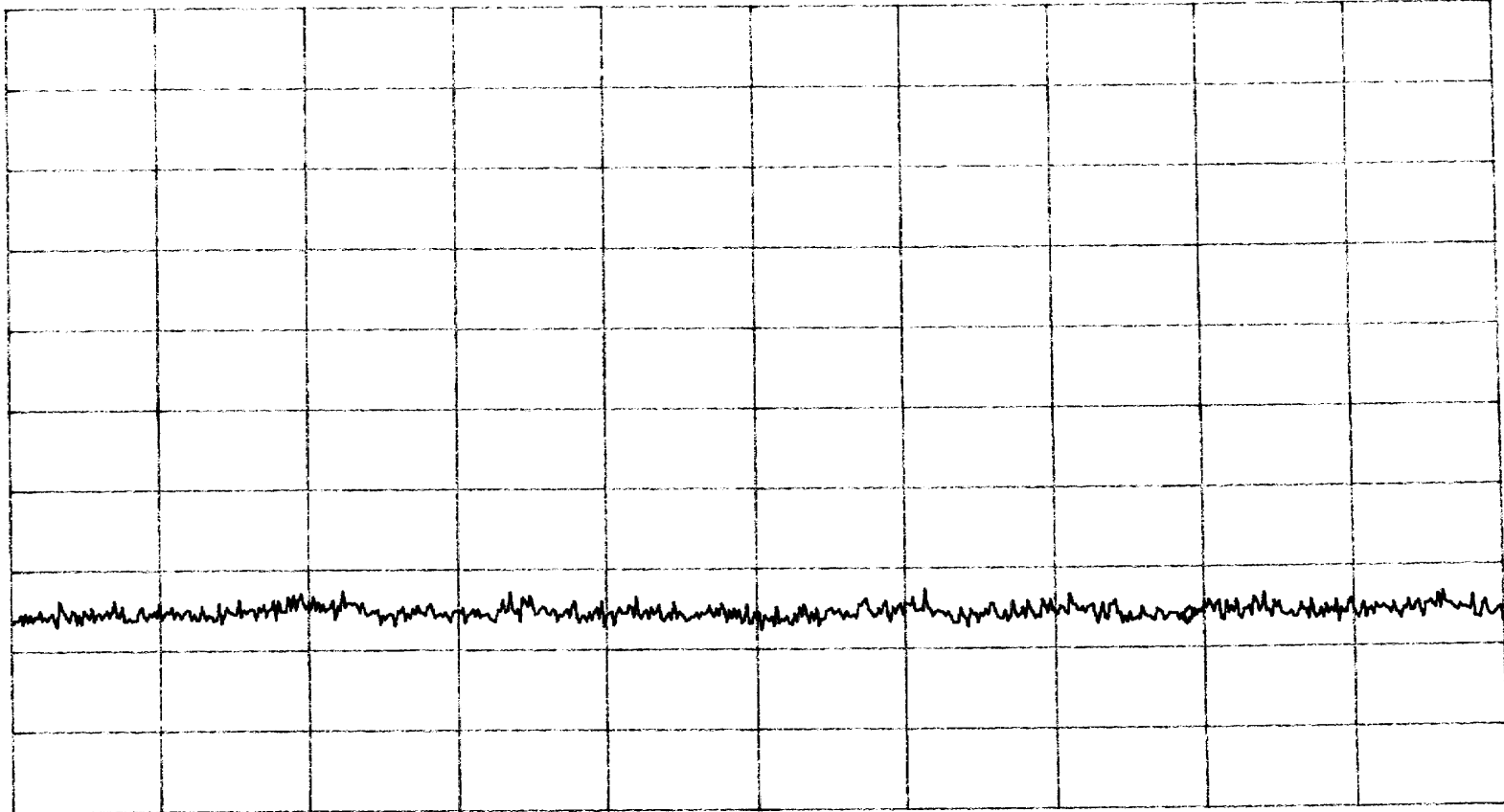
ATTN 10dB

MKR -77.00dBm

RL 0dBm

10dB/

11.518GHz



START 6.000GHz

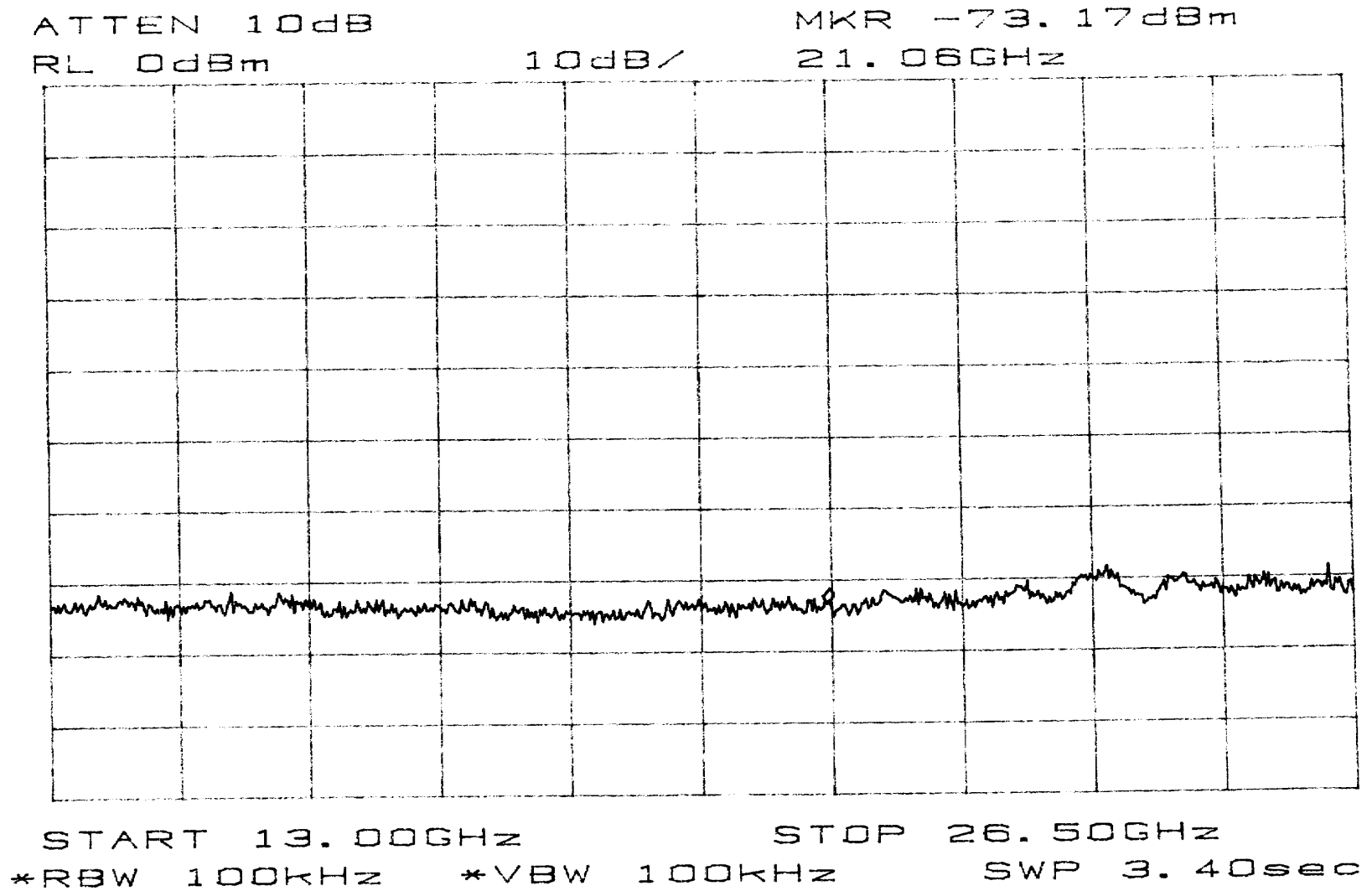
STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz



Out of Band 26.5 - 31 GHz

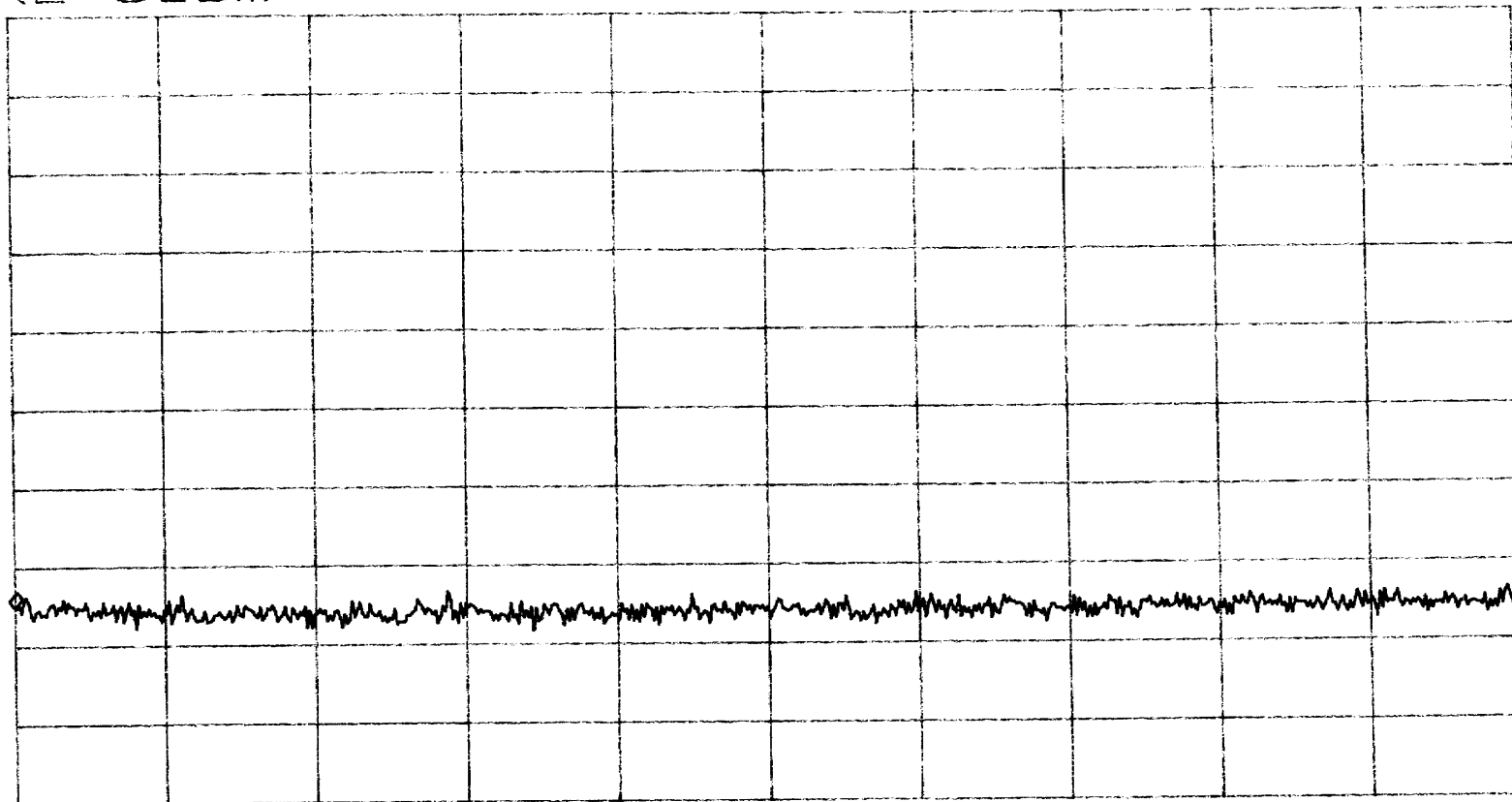
ATTEN 10dB

MKR -75.00dBm

RL 0dBm

10dB/

26.500GHz



START 26.500GHz

STOP 31.000GHz

*RBW 100kHz

*VBW 100kHz

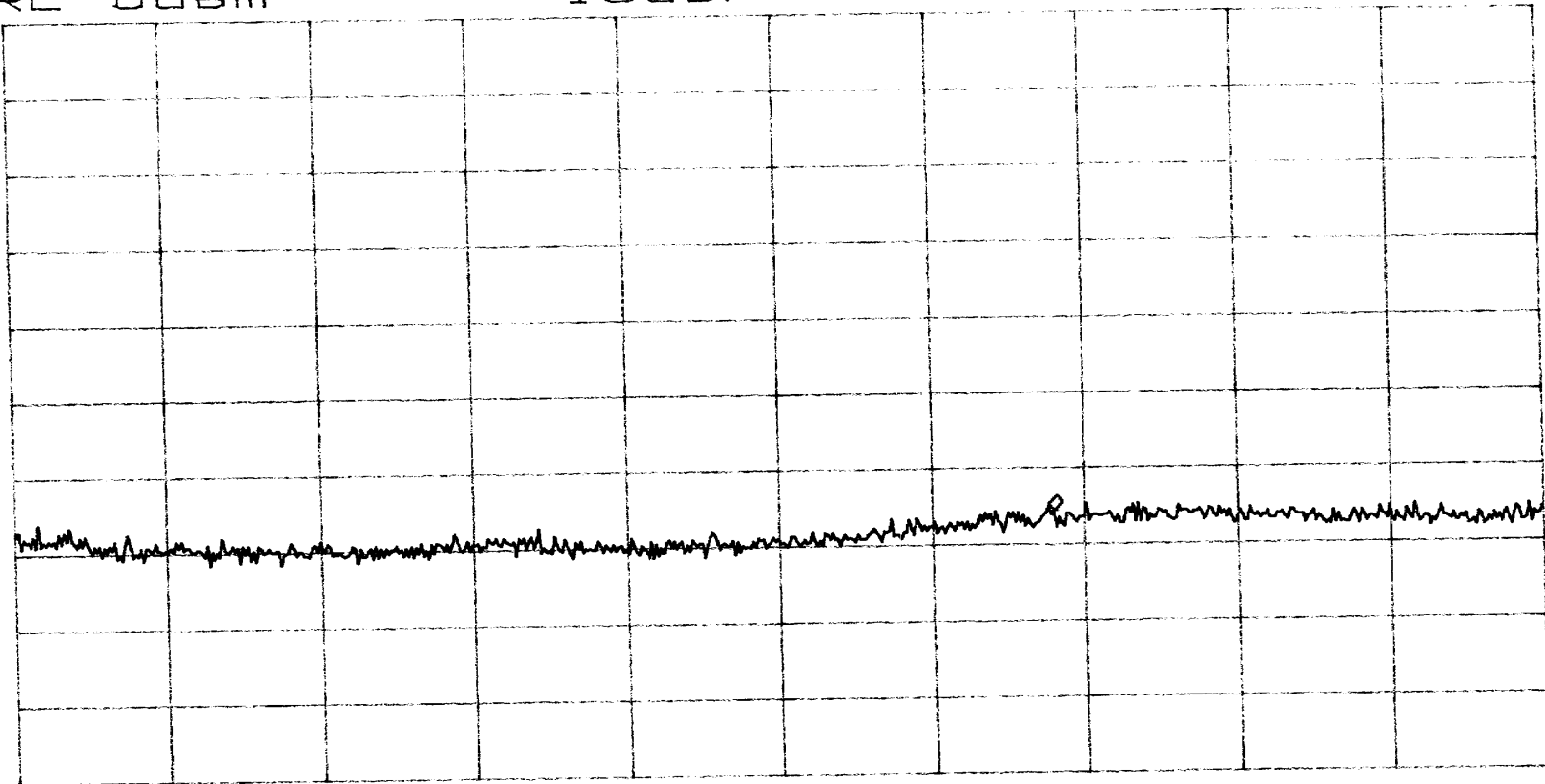
SWP 1.20sec

Out of Band 31 - 40 GHz

ATTN 10dB
RL 0dBm

10dB/

MKR -65.50dBm
37.120GHz



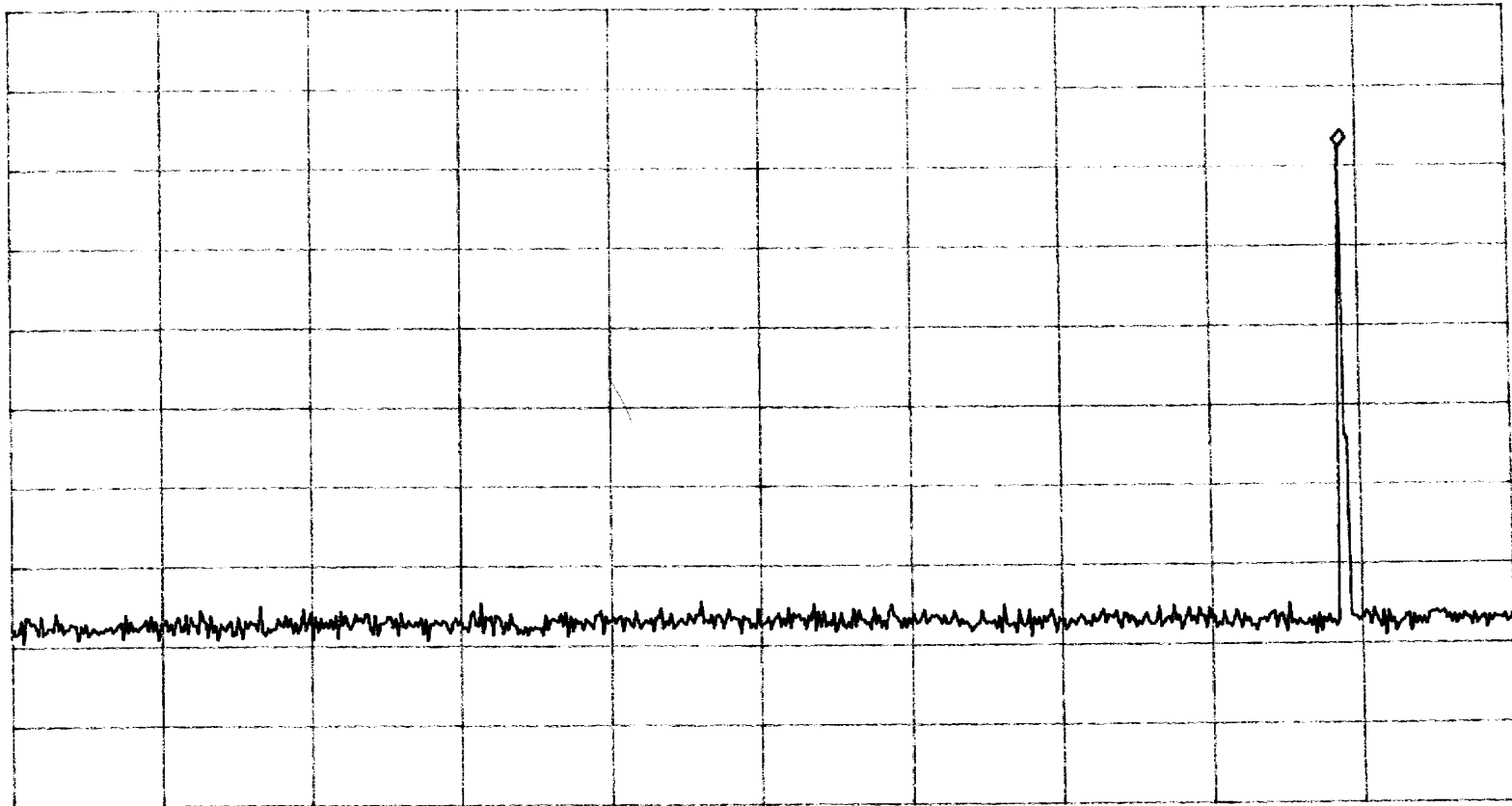
START 31.000GHz STOP 40.000GHz
*RBW 100kHz *VBW 100kHz SWP 2.30sec

Out Of Band 30 MHz - 6 GHz

ATTEN 10dB
RL 0dBm

10dB/

MKR -17.50dBm
5.333GHz



START 30MHz STOP 6.000GHz
*RBW 100kHz *VBW 100kHz SWP 1.50sec

Out Of Band 6 - 13 GHz

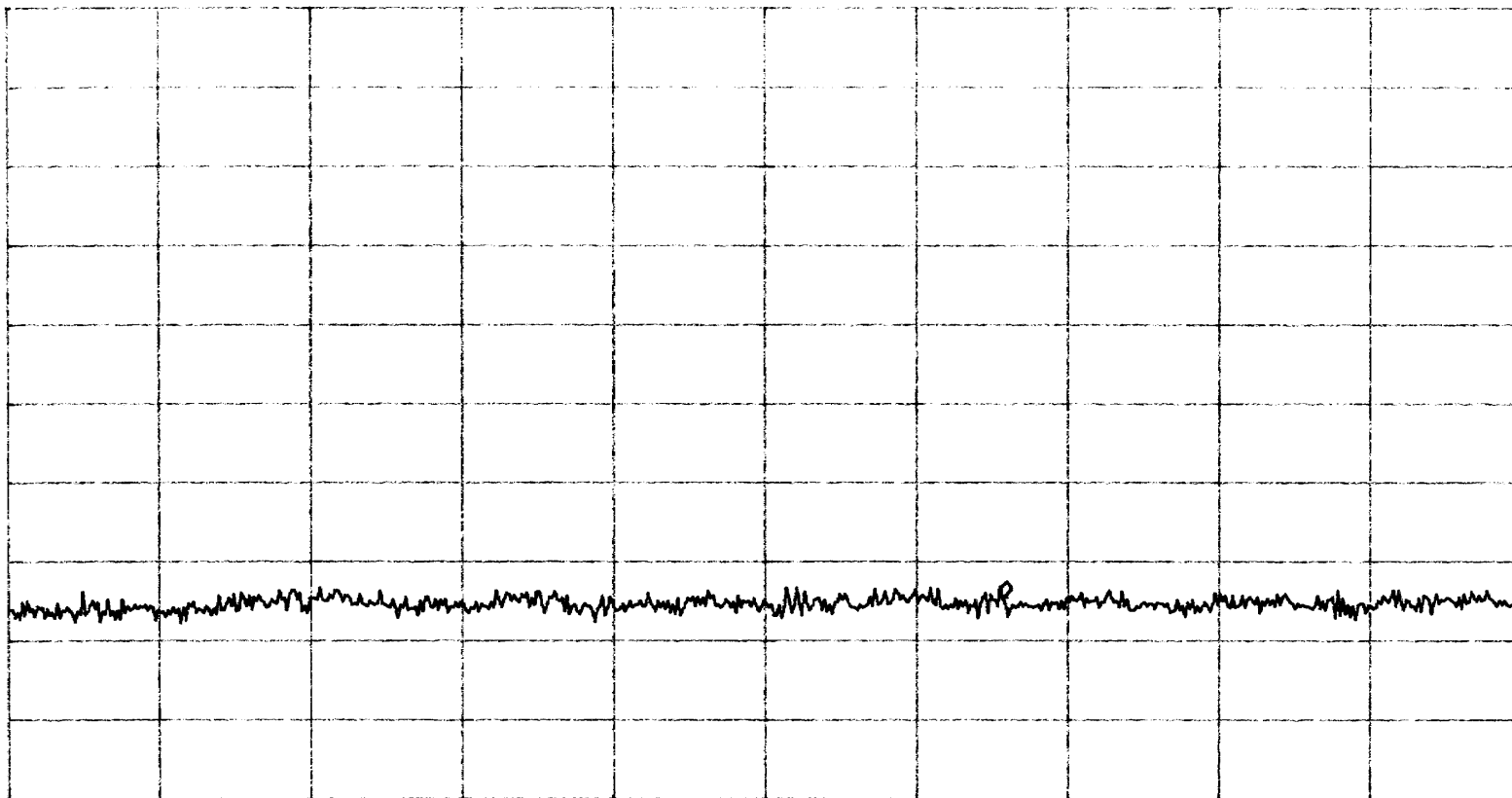
ATTEN 10dB

MKR -74.50dBm

RL 0dBm

10dB/

10.608GHz



START 6.000GHz

STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

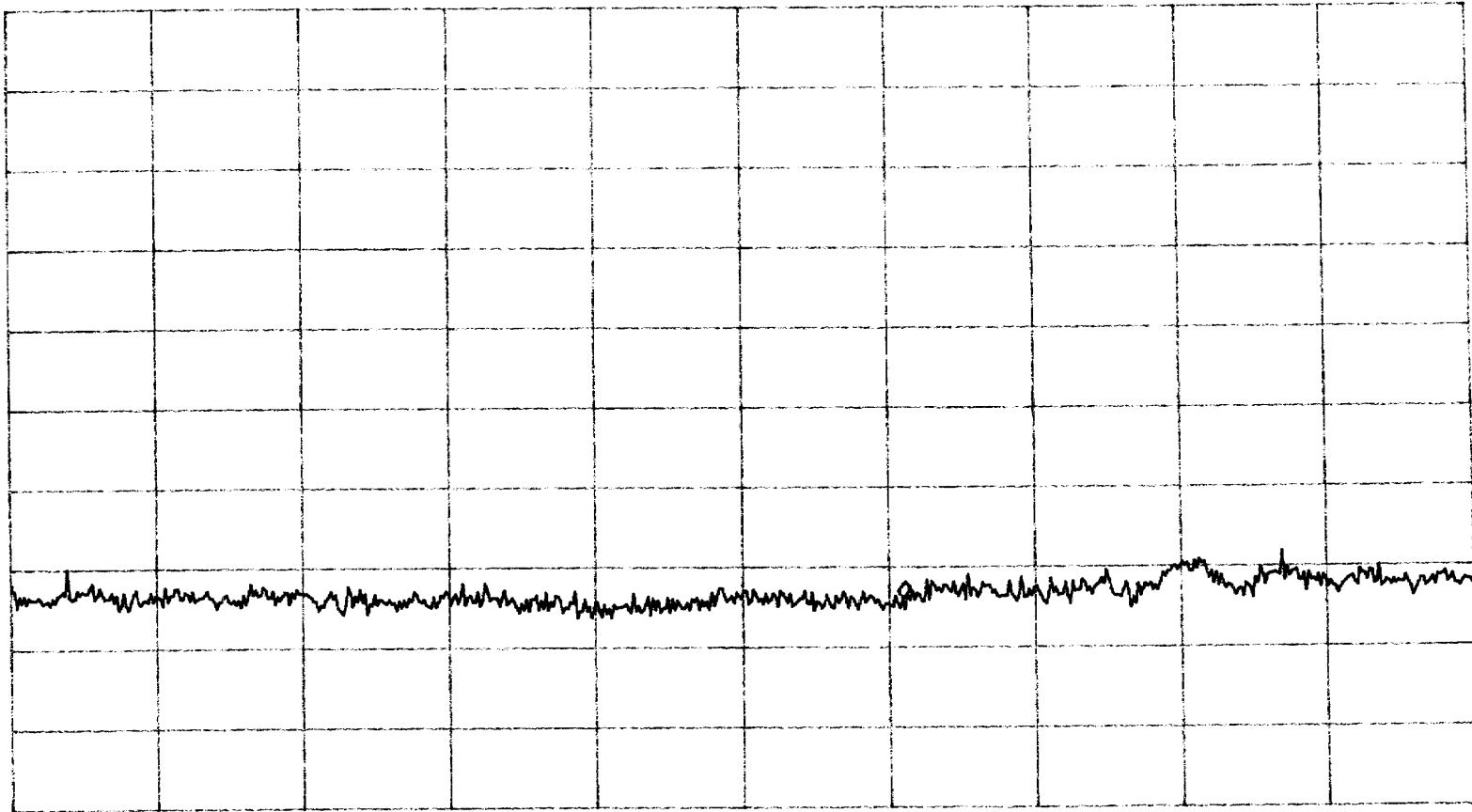
ATTEN 10dB

MKR -73.83dBm

RL 0dBm

10dB/

21.24GHz



START 13.00GHz

STOP 26.50GHz

*RBW 100kHz

*VBW 100kHz

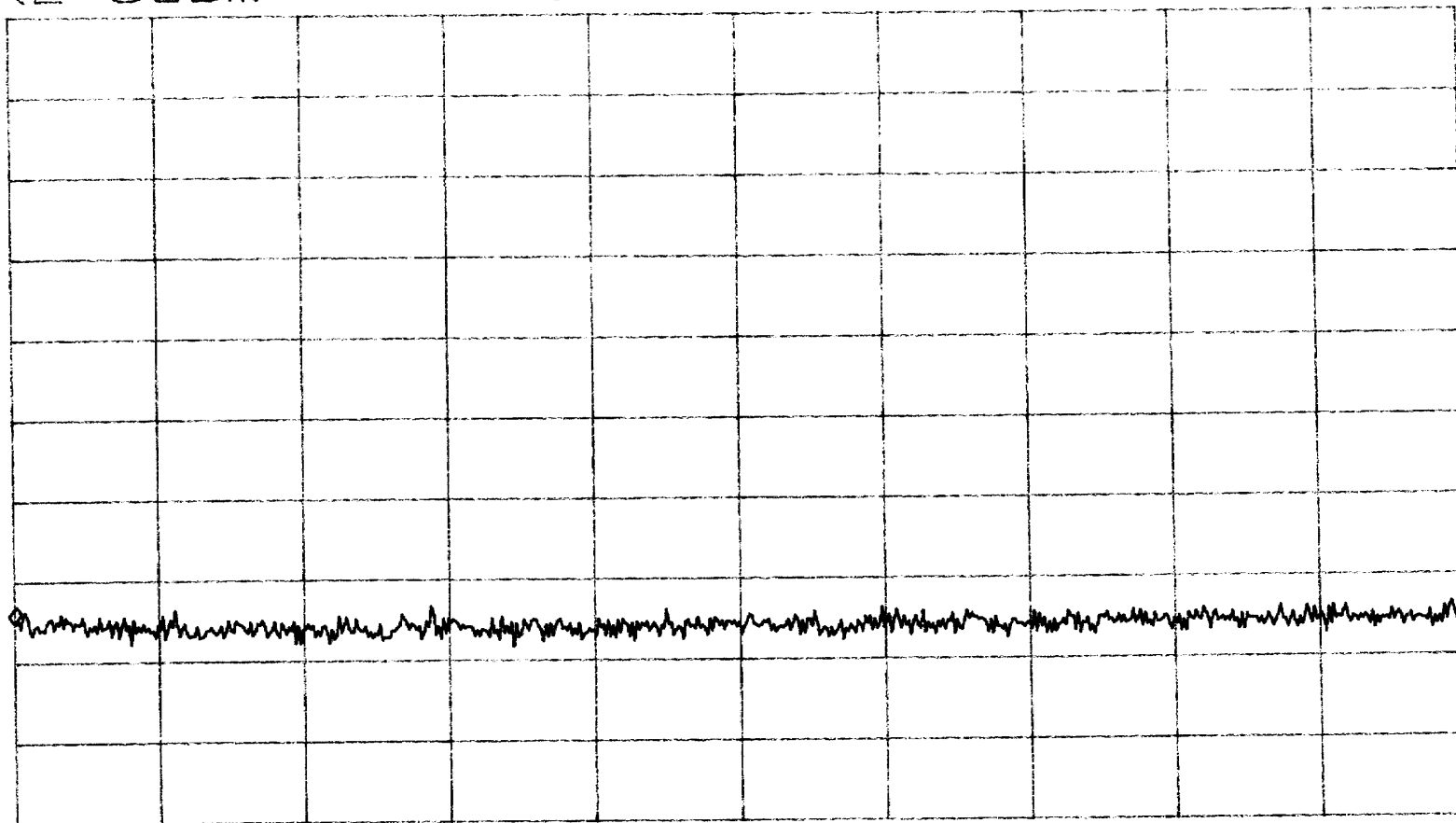
SWP 3.40sec

Out of Band 26.5 - 31 GHz

ATTEN 10dB
RL 0dBm

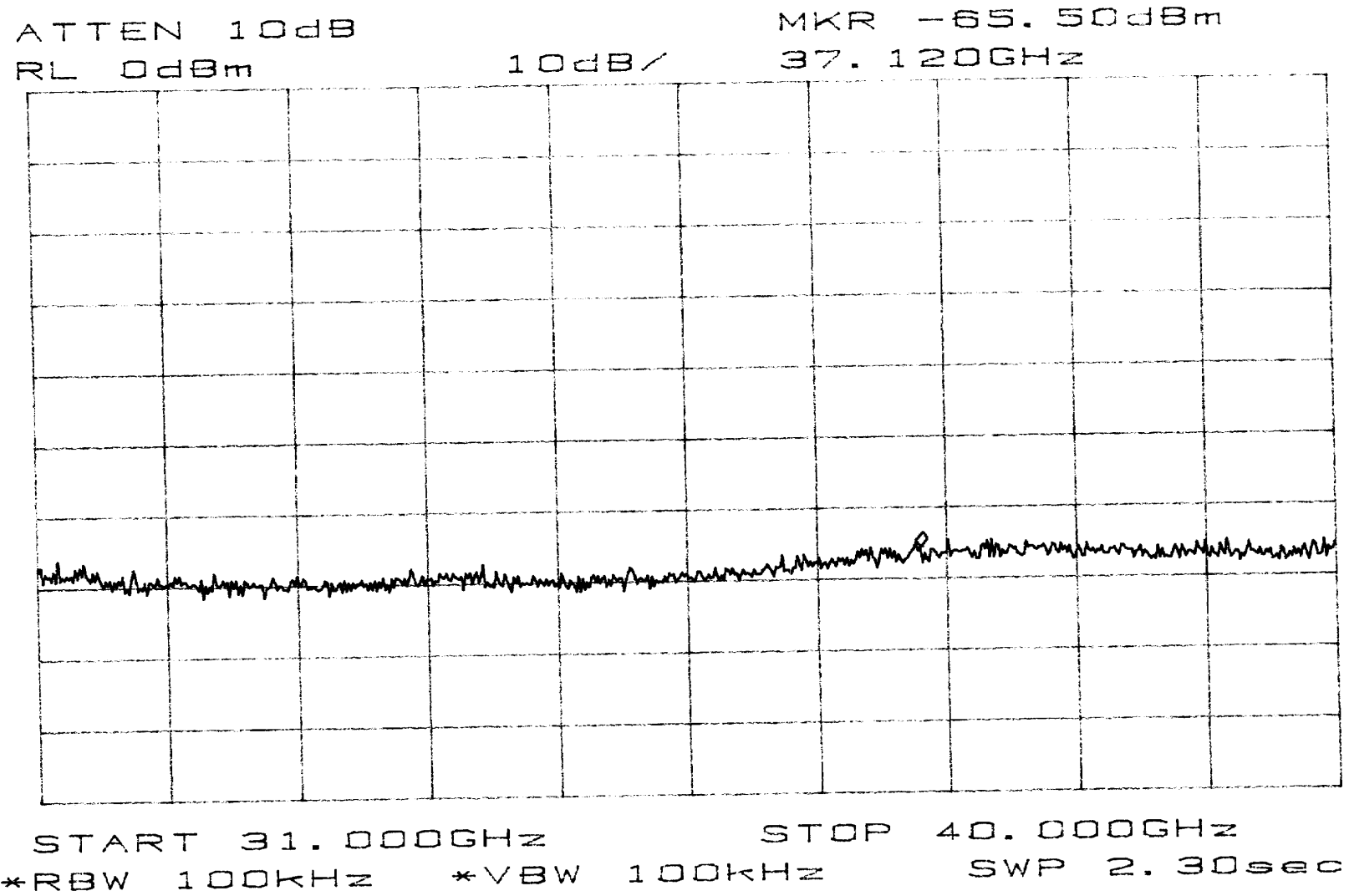
10dB/

MKR -75.00dBm
26.500GHz



START 26.500GHz STOP 31.000GHz
*RBW 100kHz *VBW 100kHz SWP 1.20sec

Out of Band 31 - 40 GHz

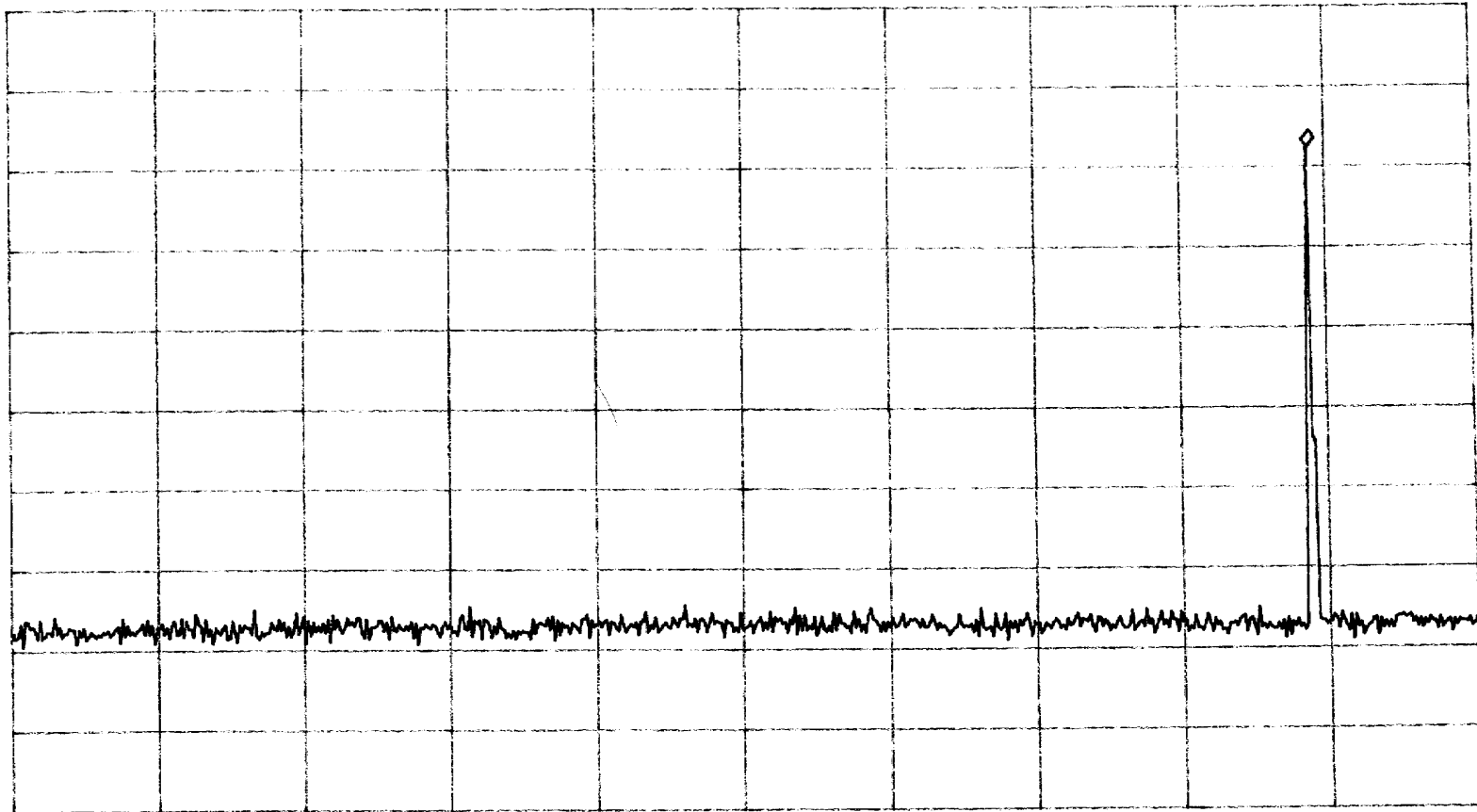


Out Of Band 30 MHz - 6 GHz

ATTEN 10dB
RL 0dBm

10dB/

MKR -17.50dBm
5.333GHz



START 30MHz STOP 6.000GHz
*RBW 100kHz *VBW 100kHz SWP 1.50sec

Out Of Band 6 - 13 GHz

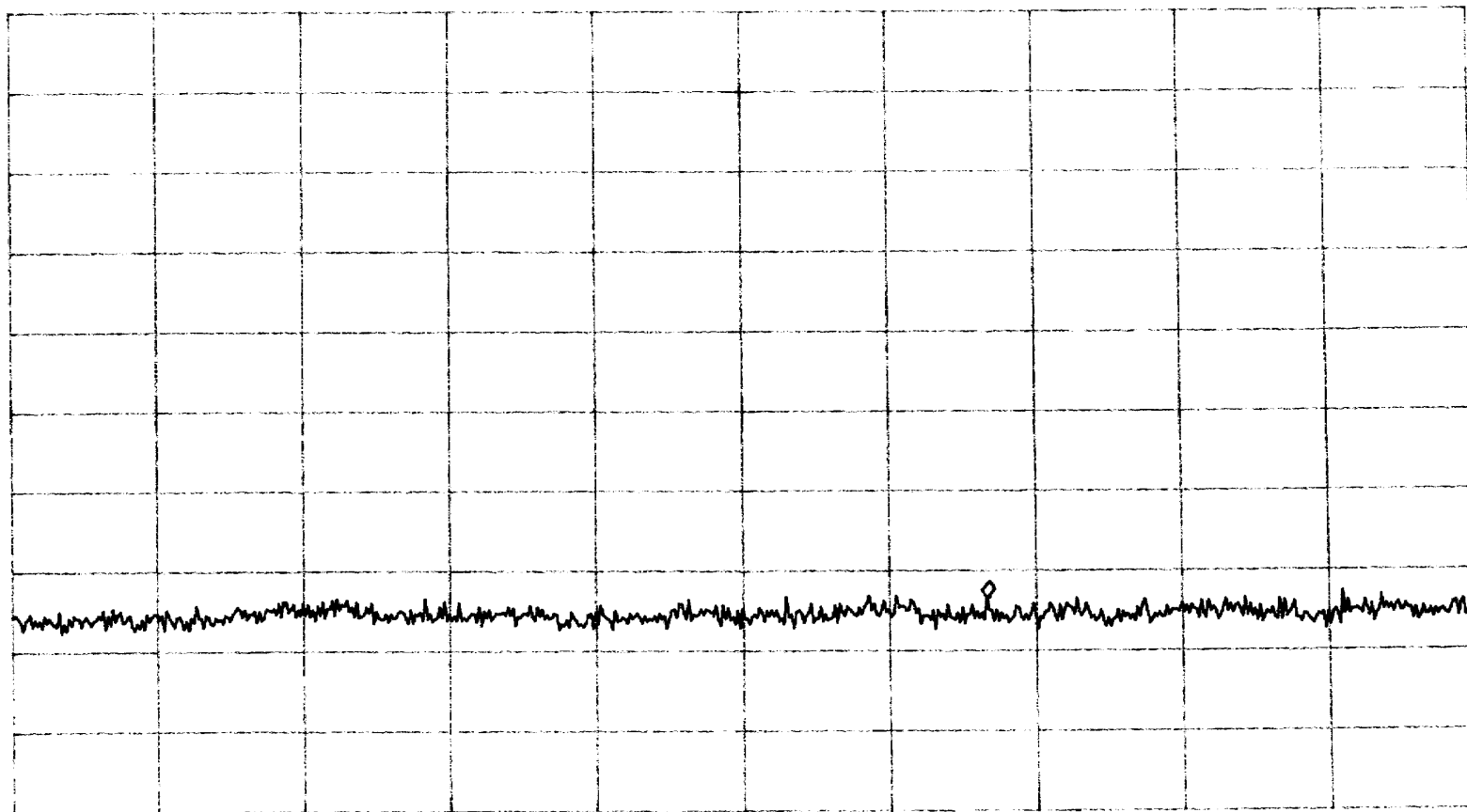
ATTEN 10dB

MKR -73.33dBm

RL 0dBm

10dB/

10.667GHz



START 6.000GHz

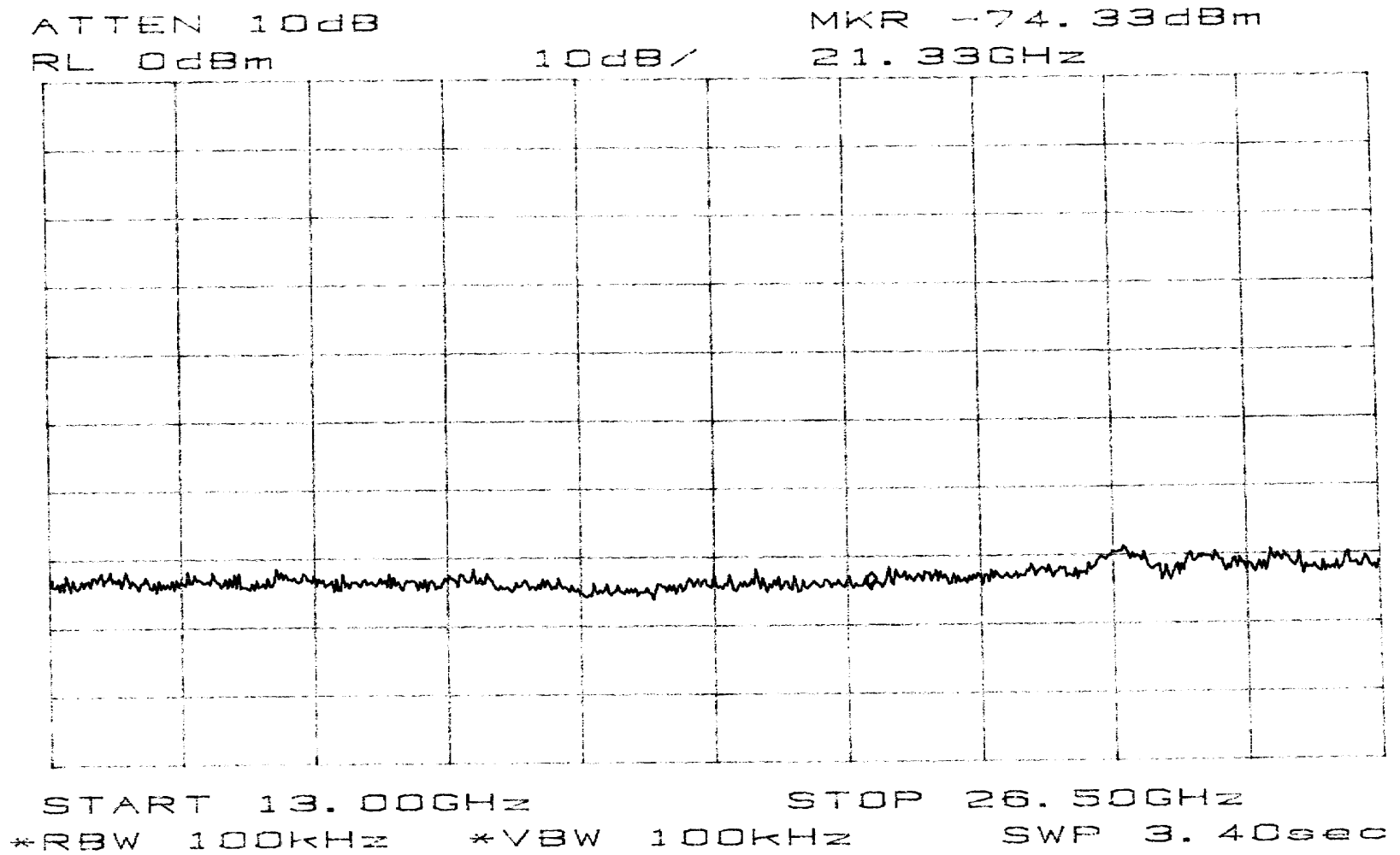
STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

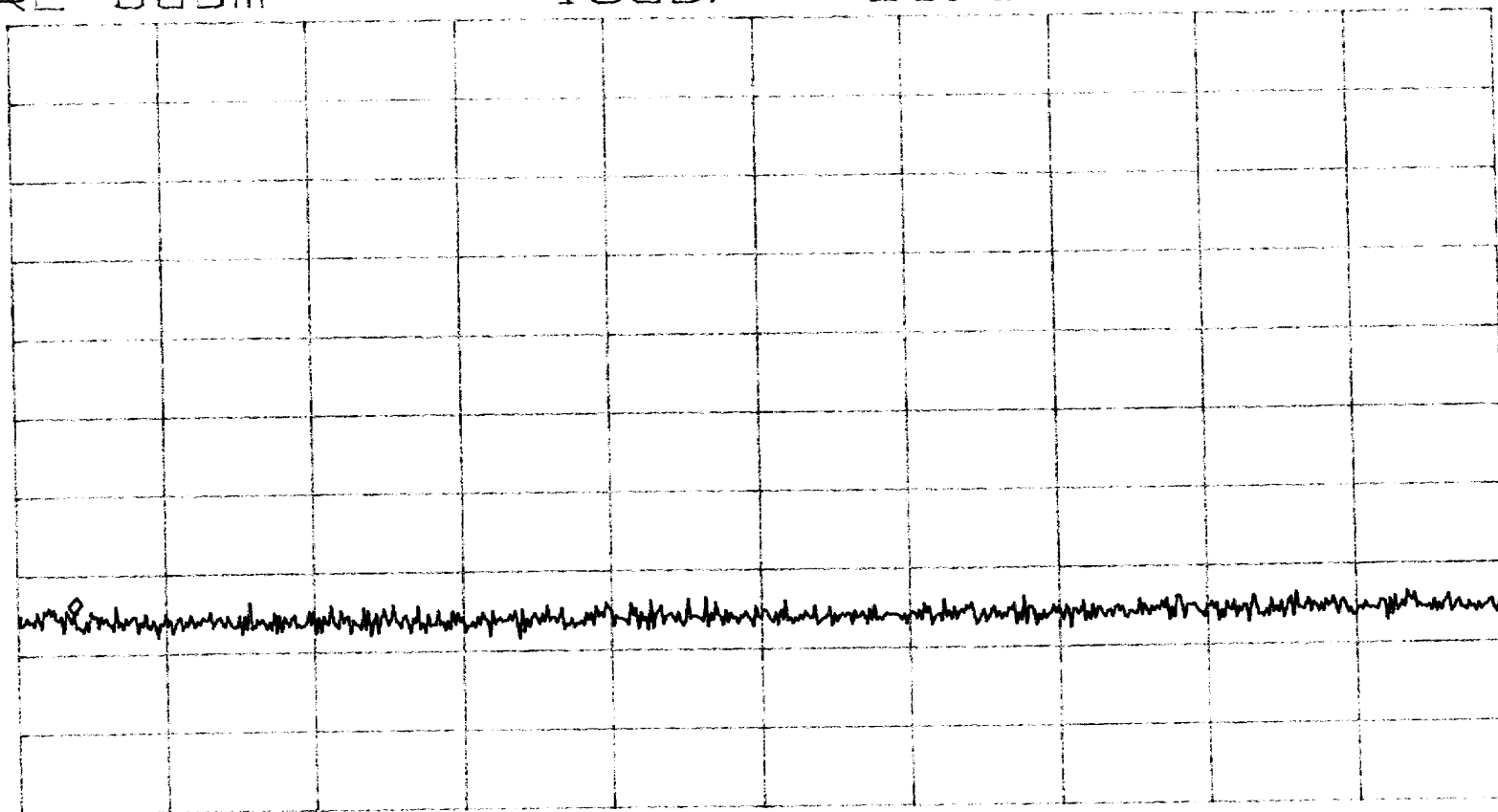


Out of Band 26.5 - 31 GHz

ATTEN 10dB
RL 0dBm

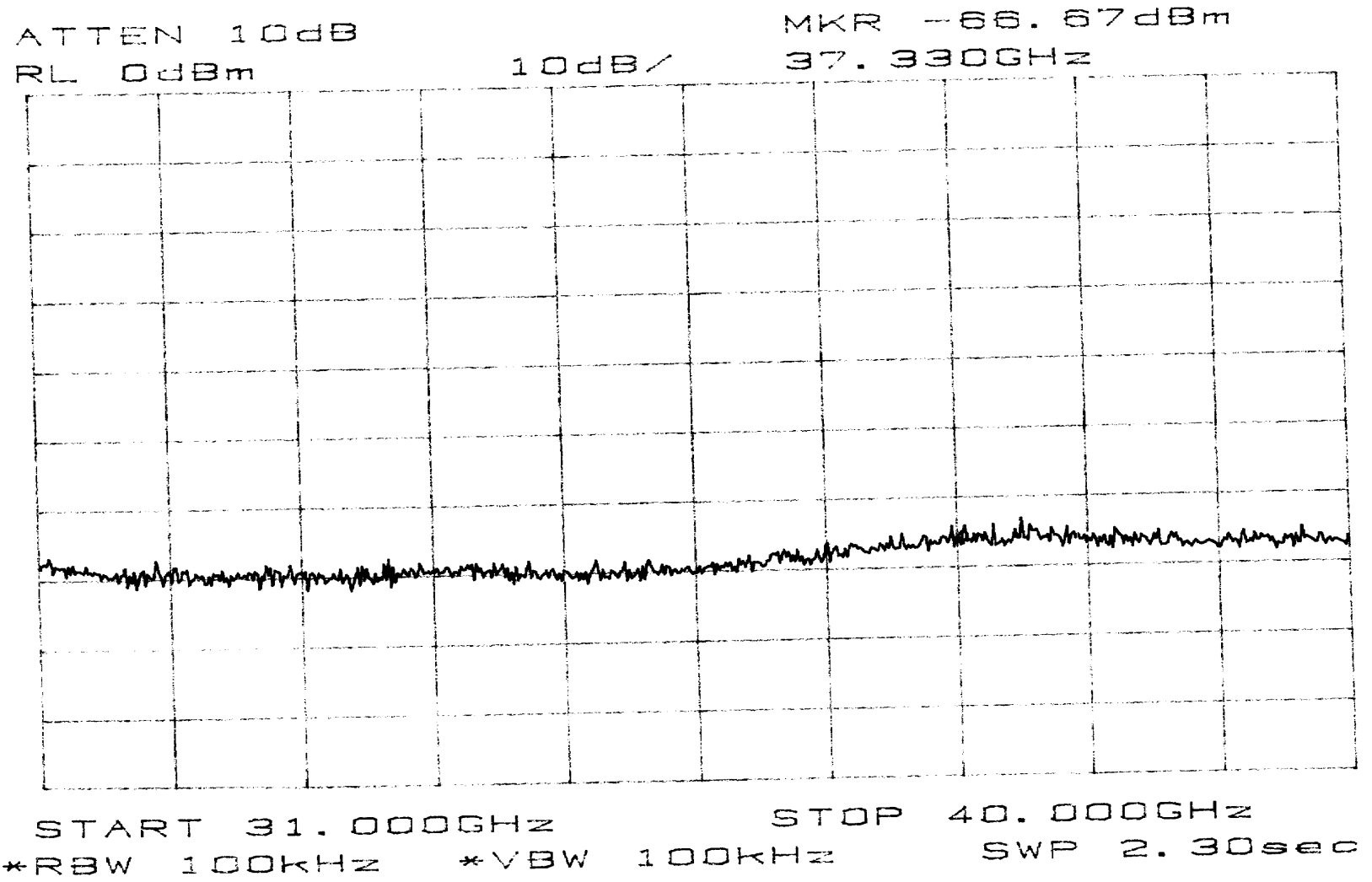
10dB/

MKR -74.67dBm
26.673GHz



START 26.500GHz STOP 31.000GHz
*RBW 100kHz *VBW 100kHz SWP 1.20sec

Out of Band 31 - 40 GHz



High Power Setting

Peak Spectral Power Density

14:59:28 APR 14, 1998

MKR 5.260760 GHz

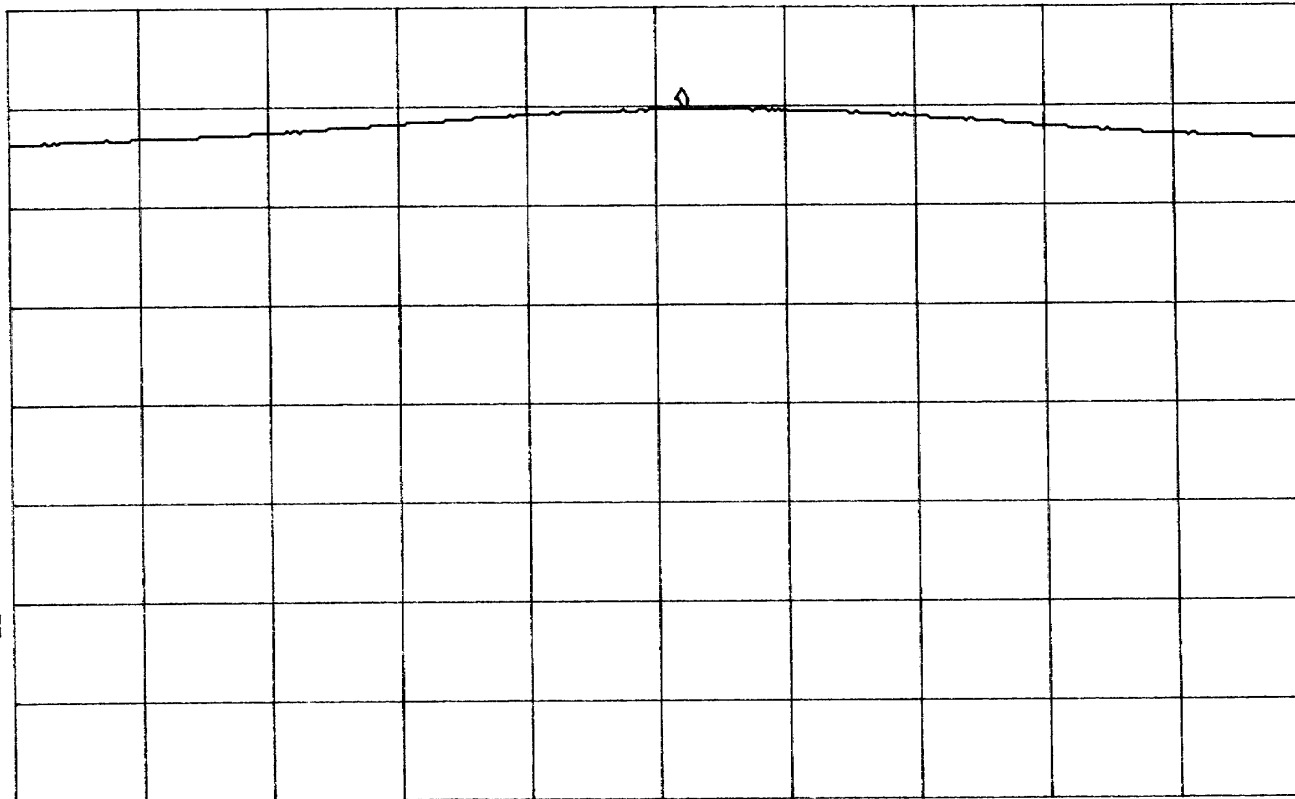
REF -10.0 dBm

AT 10 dB

-20.19 dBm

PEAK
LOG
10
dB/

VA SB
SC FC
CORR



CENTER 5.260740 GHz
#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec

Peak Spectral Power Density

(P) 15:37:59 APR 14, 1998

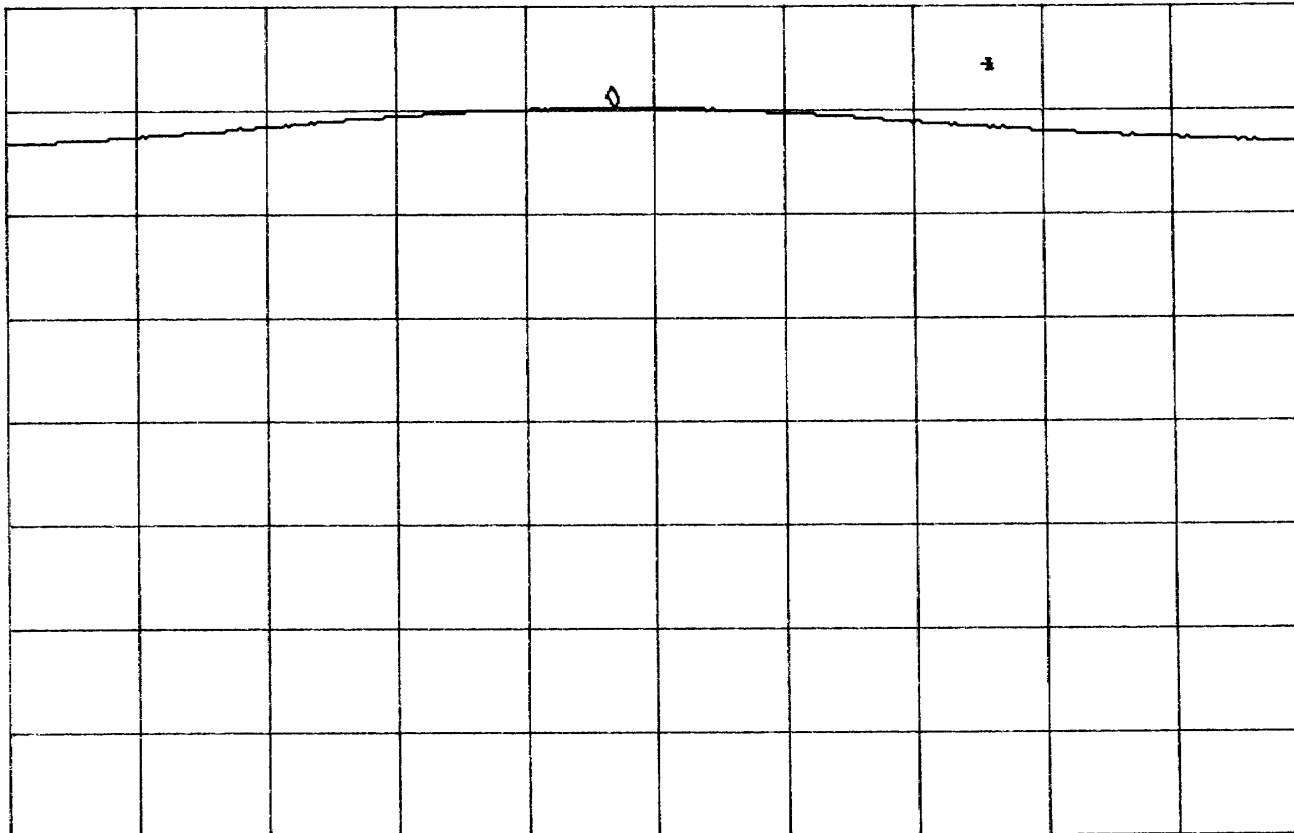
MKR 5.301747 GHz

REF -10.0 dBm AT 10 dB

-19.66 dBm

PEAK
LDG
10
dB/

VA SB
SC FC
CDRA



CENTER 5.301779 GHz

#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 1.000 MHz

#SWP 100 sec

Peak Spectral Power Density

(p) 15:46:51 APR 14, 1998

REF -10.0 dBm

AT 10 dB

MKR 5.335040 GHz

-19.22 dBm

PEAK

LOG

10

dB/

VA SB

SC FC

CORR

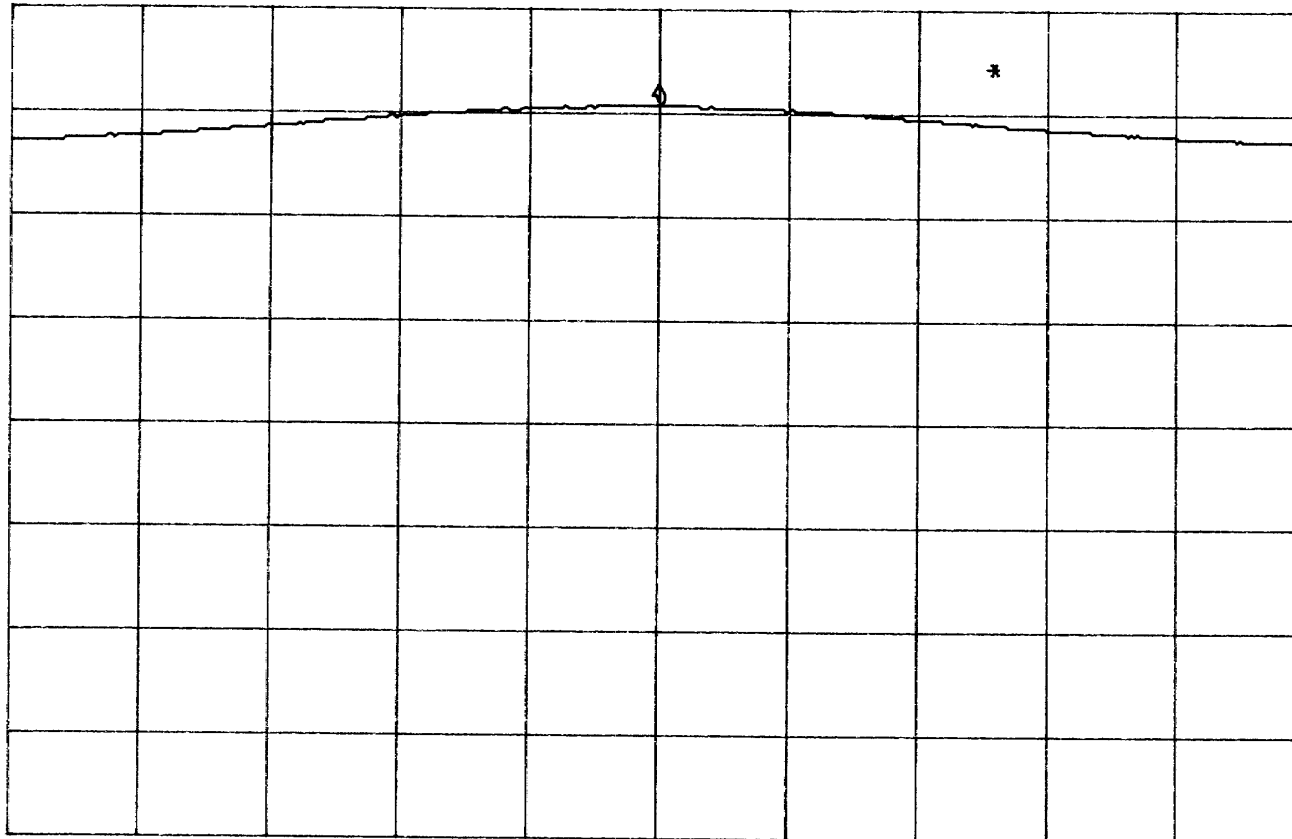
CENTER 5.335040 GHz

#RES BW 1.0 MHz

#VBW 1 MHz

SPAN 1.000 MHz

#SWP 100 sec



Power Out

15:19:22 APR 14, 1998

MKR 5.26029 GHz

REF -10.0 dBm AT 10 dB

-19.31 dBm

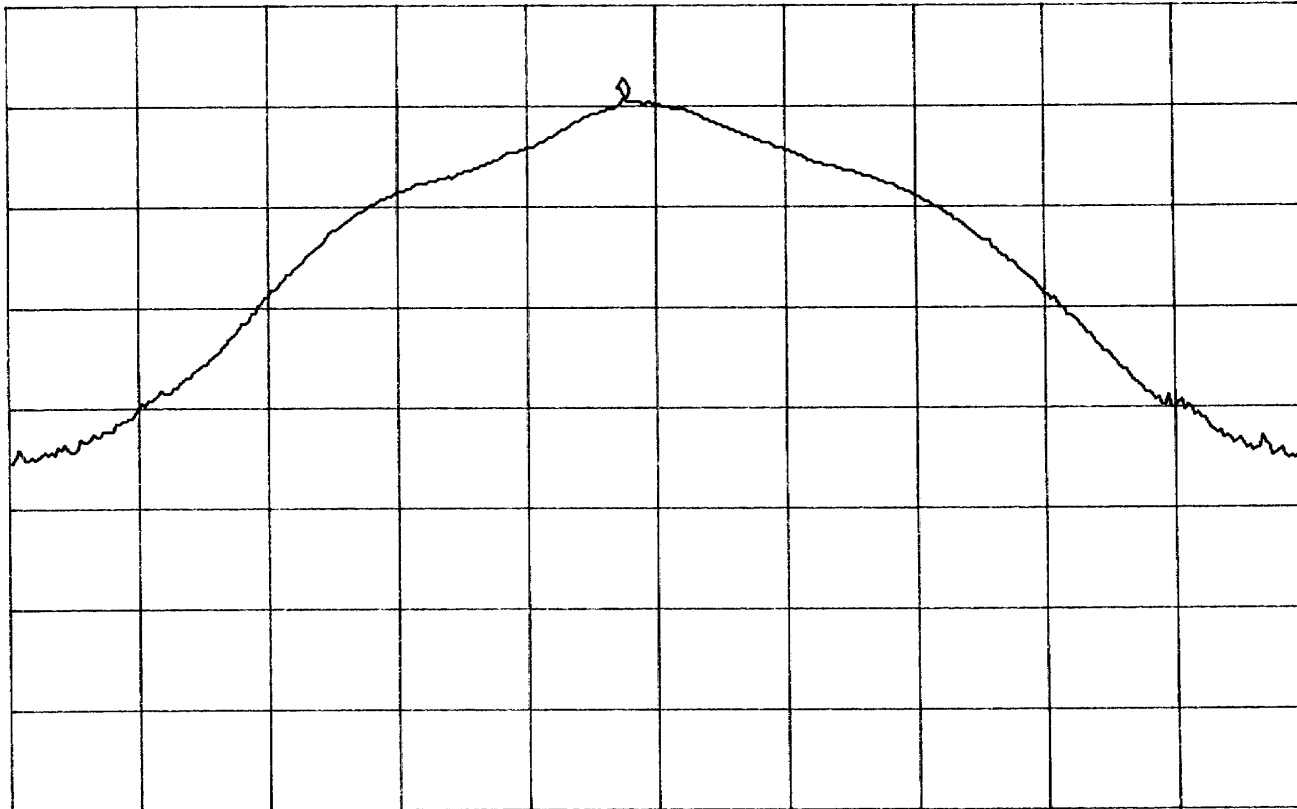
PEAK
LOG
10
dB/

VA SB
SC FC
CORR

CENTER 5.26000 GHz
#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 20.26 MHz
SWP 20.0 msec



Power Out

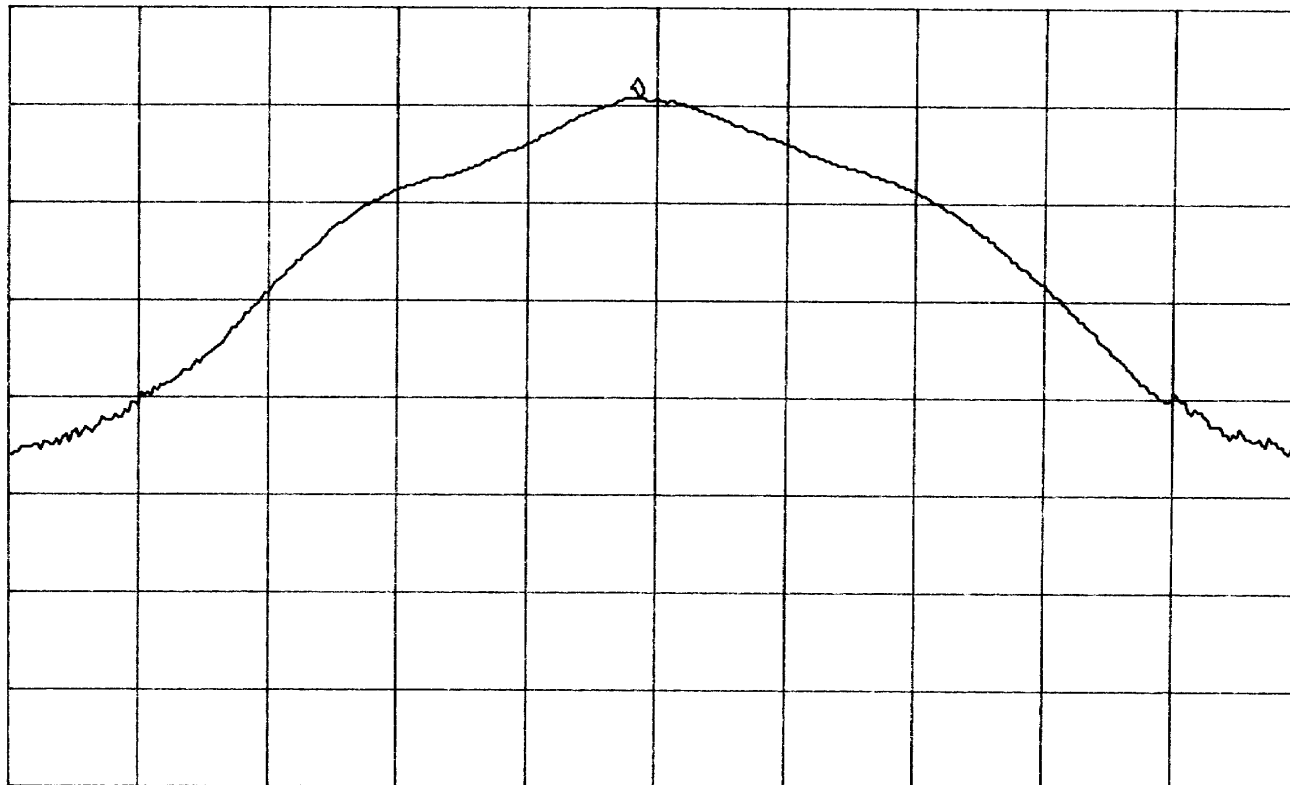
15:24:37 APR 14, 1998

REF -10.0 dBm AT 10 dB

MKR 5.30146 GHz
-19.23 dBm

PEAK
LOG
10
dB/

VA SB
SC FC
CORR



CENTER 5.30176 GHz
#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 20.26 MHz
SWP 20.0 msec

Power Out

15:51:19 APR 14, 1998

REF -10.0 dBm AT 10 dB

MKR 5.33494 GHz
-10.59 dBm

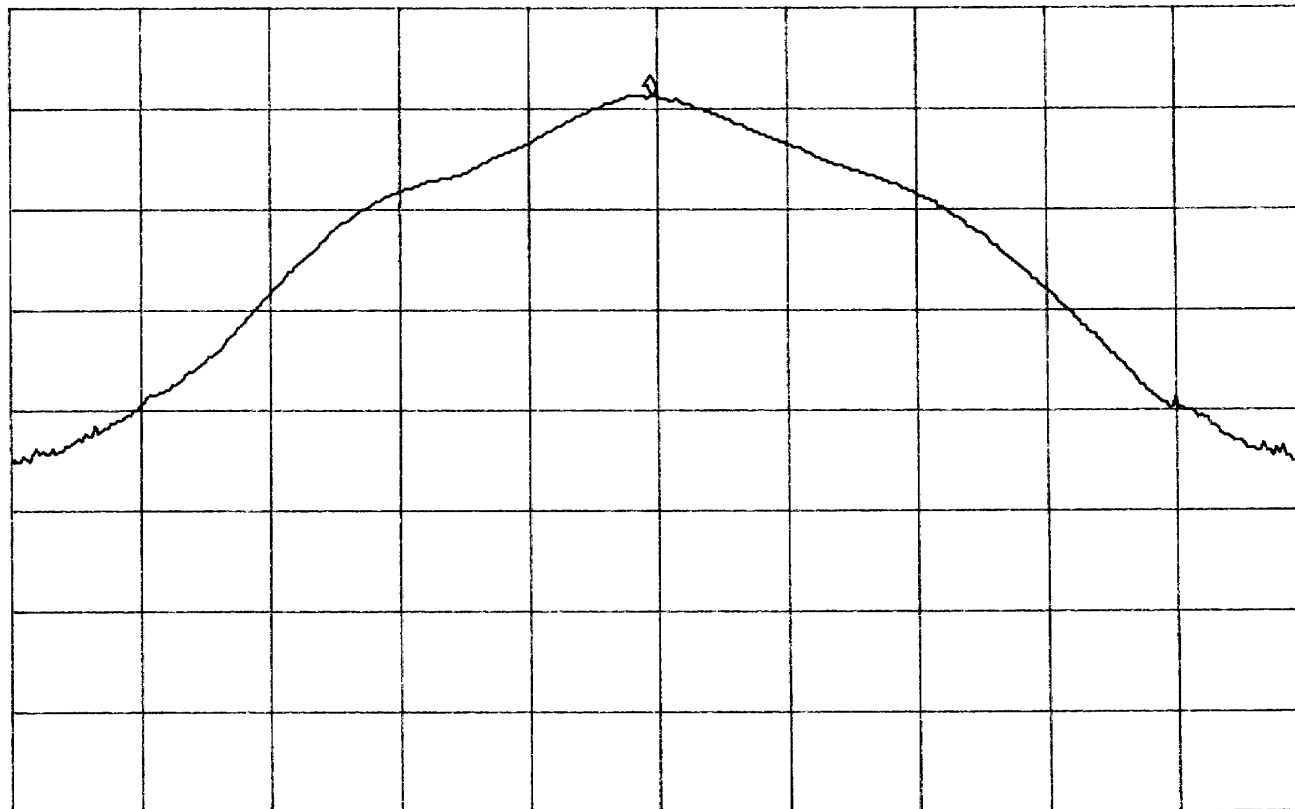
PEAK
LOG
10
dB/

VA SB
SC FC
CDRR

CENTER 5.33504 GHz
#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec



Out Of Band Lower Band Edge

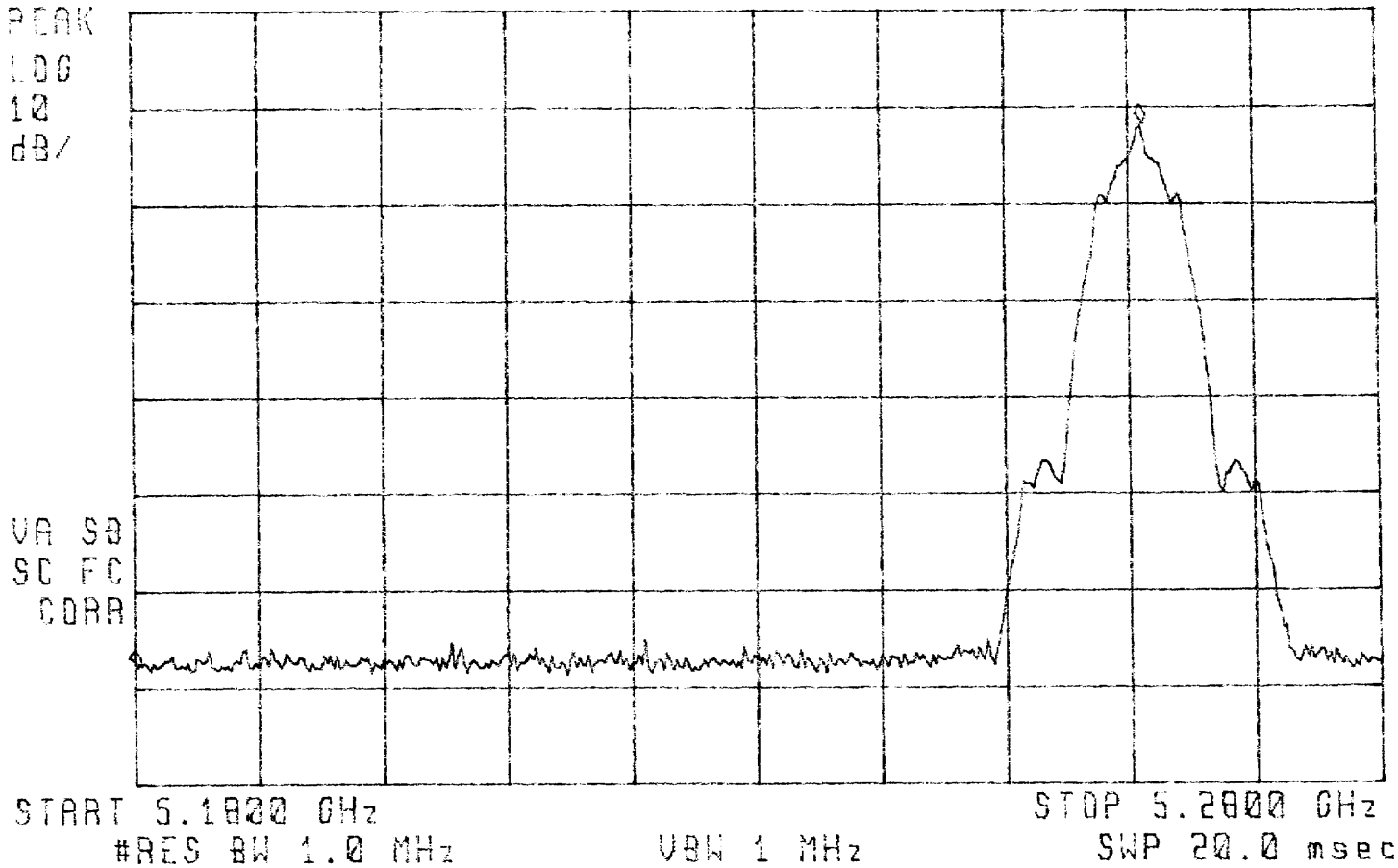
11:18:49 APR 17, 1998

MKR Δ -81.0 MHz
-56.19 dB

REF .0 dBm AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR



Out Of Band Upper Band Edge

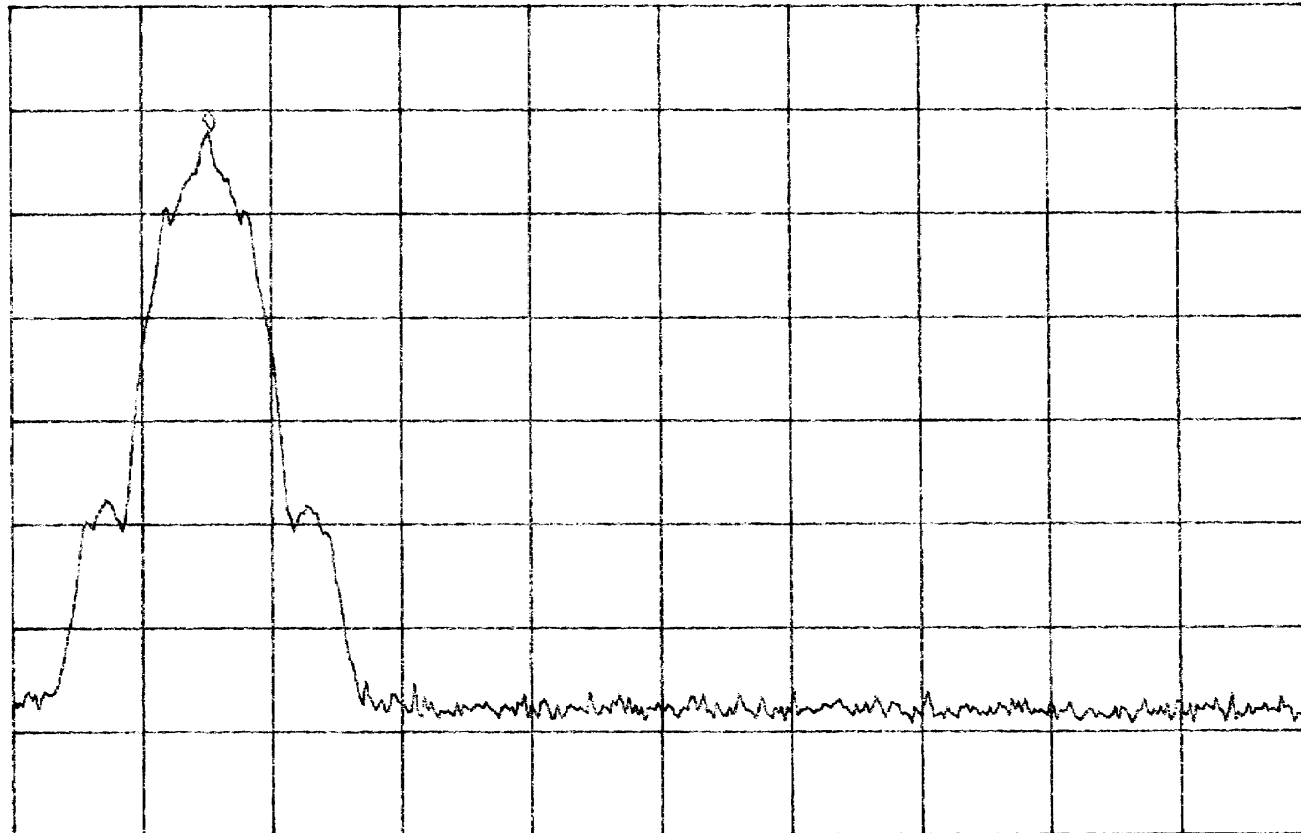
11:26:57 APR 17, 1998

MKR Δ 84.8 MHz
-54.98 dB

REF .0 dBm AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR



START 5.3200 GHz

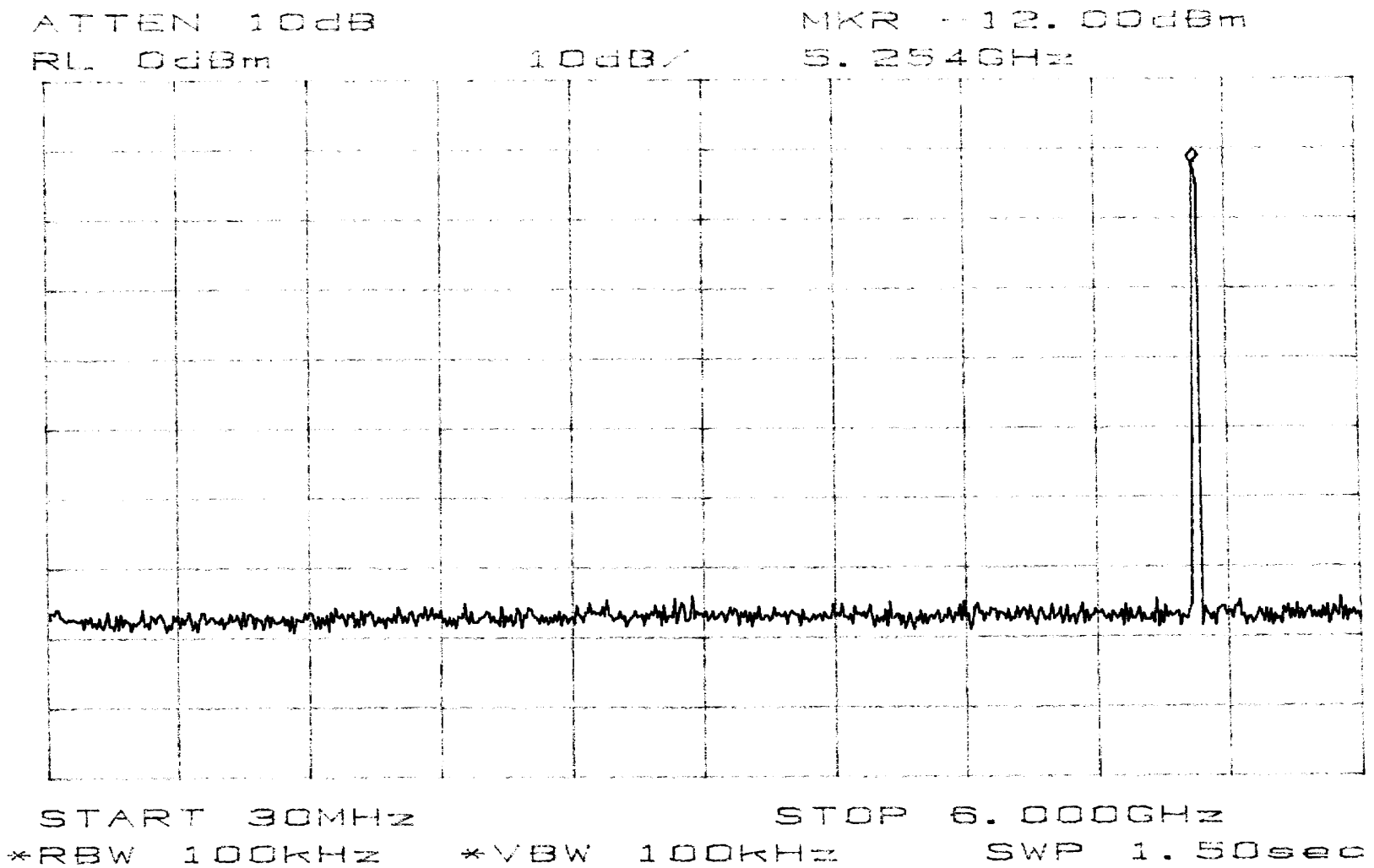
#RES BW 1.0 MHz

UBW 1 MHz

STOP 5.4200 GHz

SWP 20.0 msec

Out Of Band 30 MHz - 6 GHz



Out Of Band 6 - 13 GHz

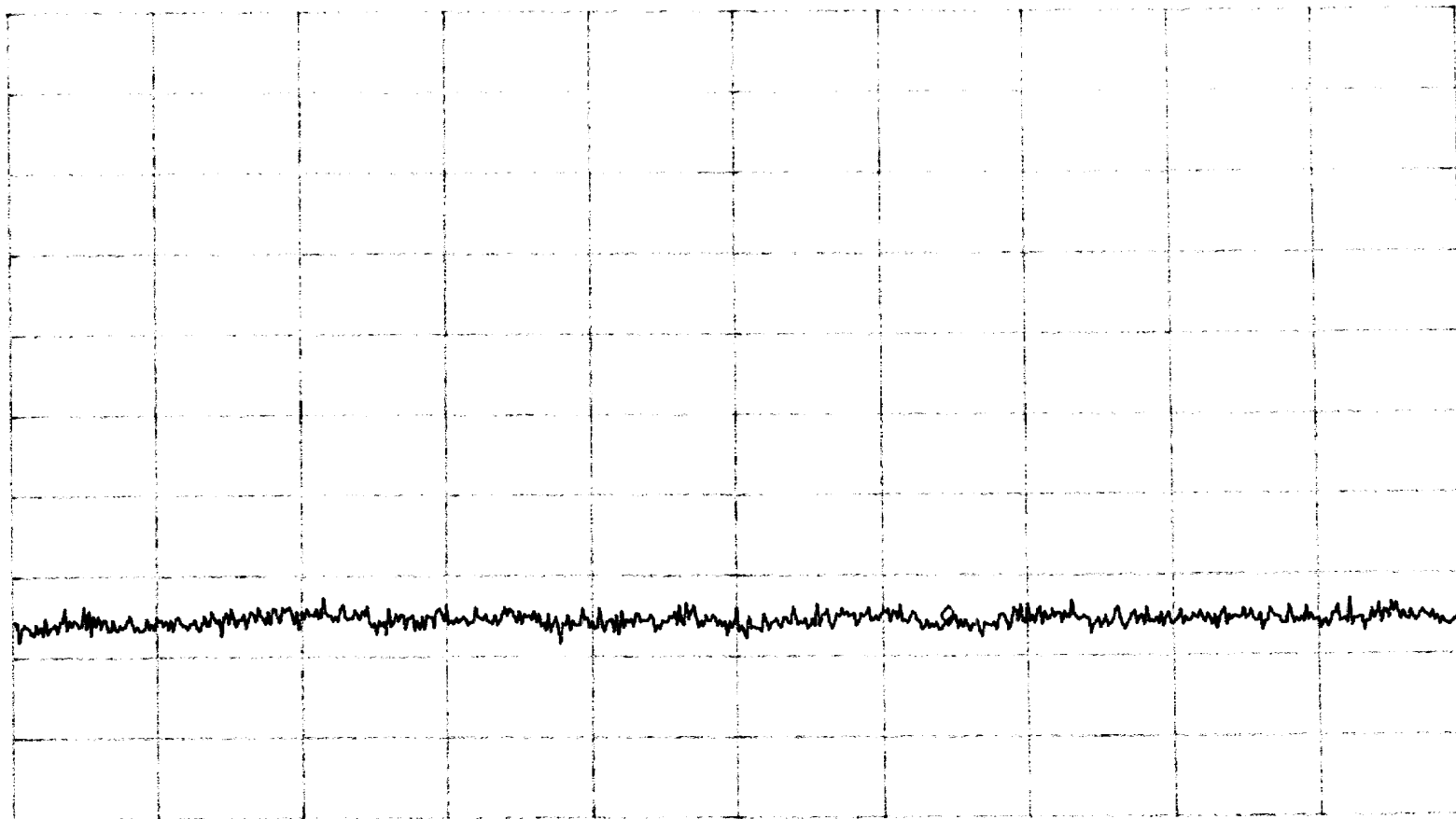
ATTEN 10dB

MKR -75.83dBm

RL 0dBm

10dB/

10.503GHz



START 6.000GHz

STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

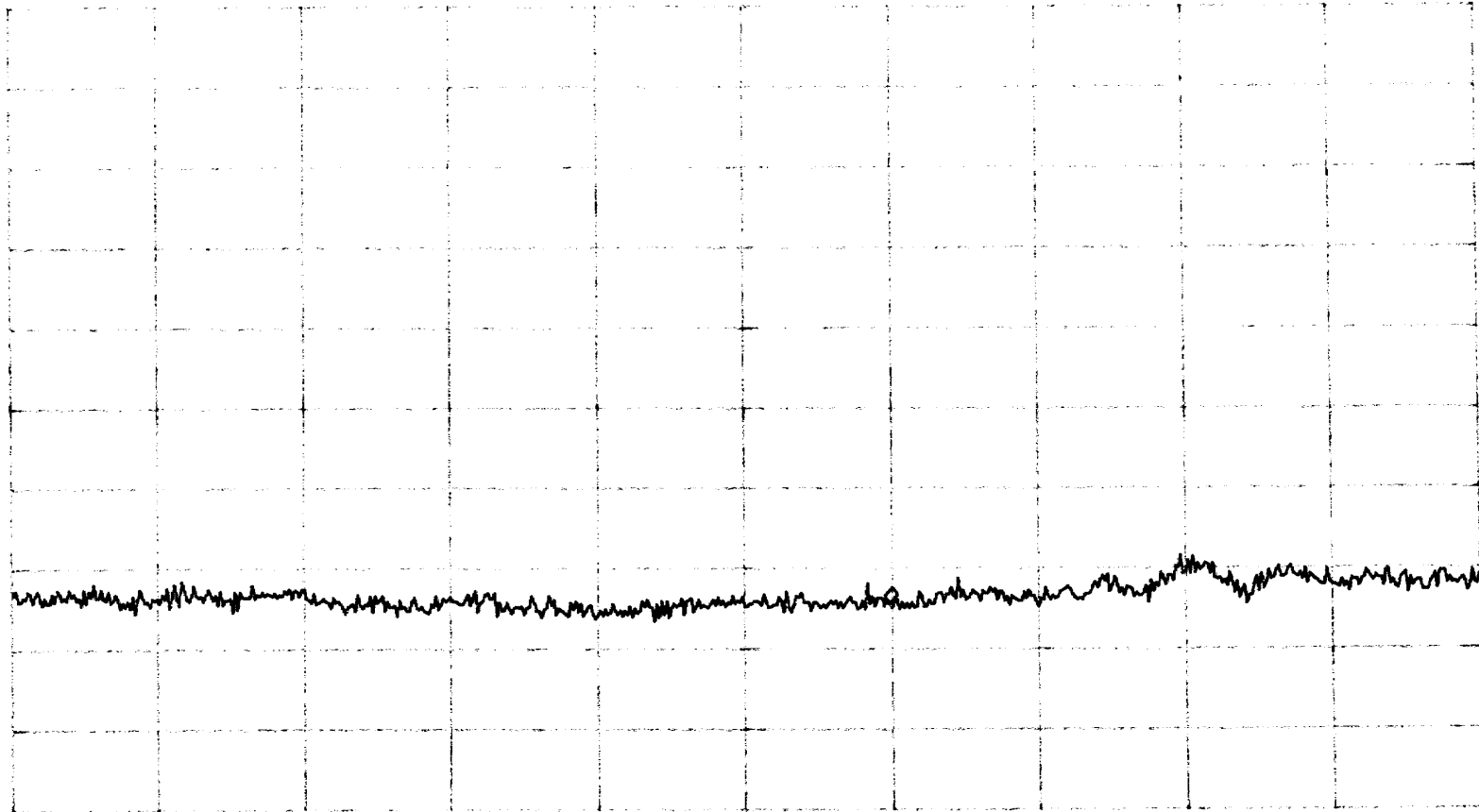
ATTEN 10dB

MKR -74.33dBm

RL 0dBm

10dB/

21.08GHz



START 13.00GHz

STOP 26.50GHz

*RBW 100kHz

*VBW 100kHz

SWP 3.40sec

Out of Band 26.5 - 31 GHz

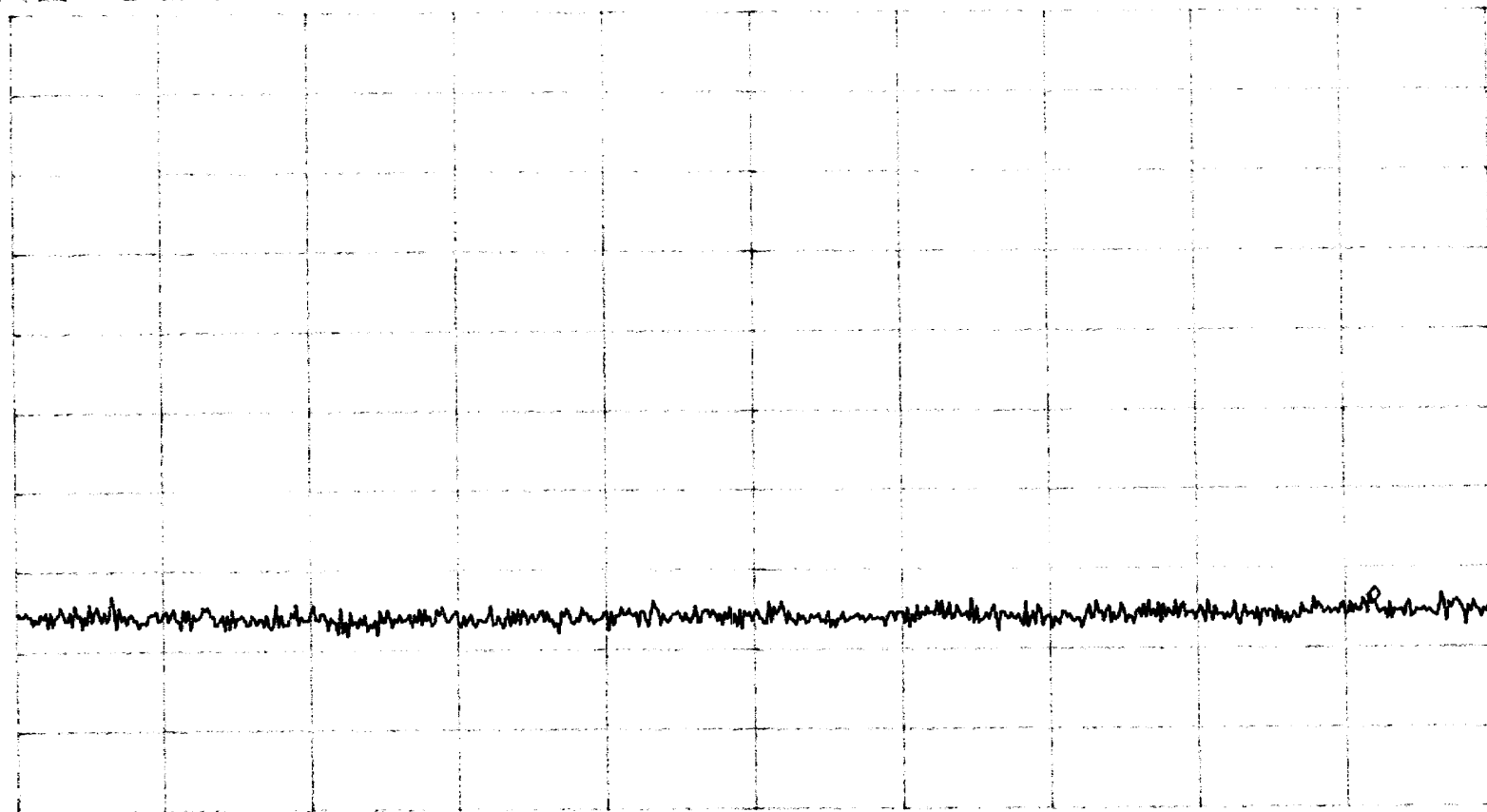
ATTEN 10dB

MKR -74.50dBm

RL 0dBm

10dB/

30.633GHz



START 26.500GHz

STOP 31.000GHz

*RBW 100kHz

*VBW 100kHz

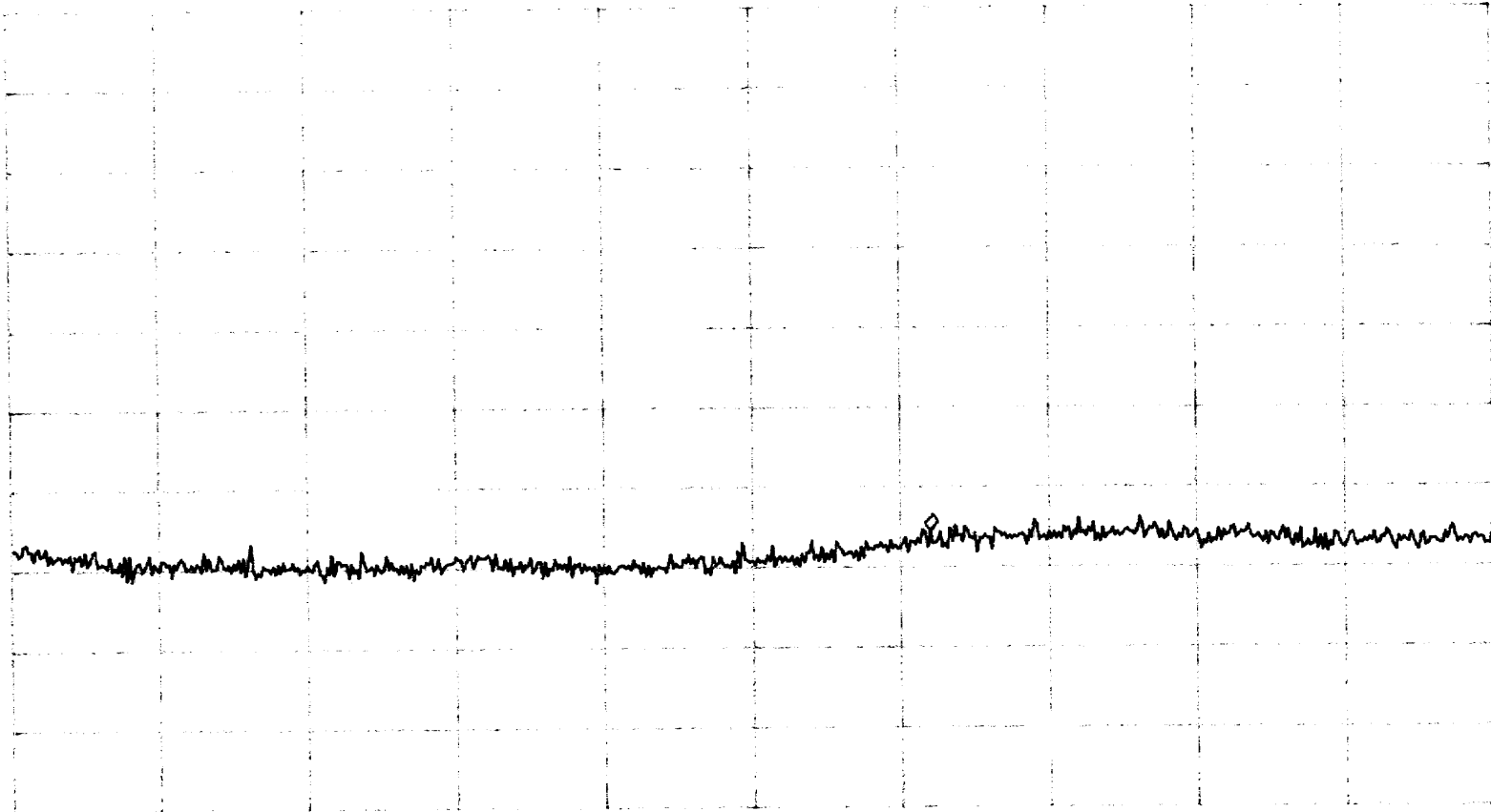
SWP 1.20sec

Out of Band 31 - 40 GHz

ATTEN 10dB
RL 0dBm

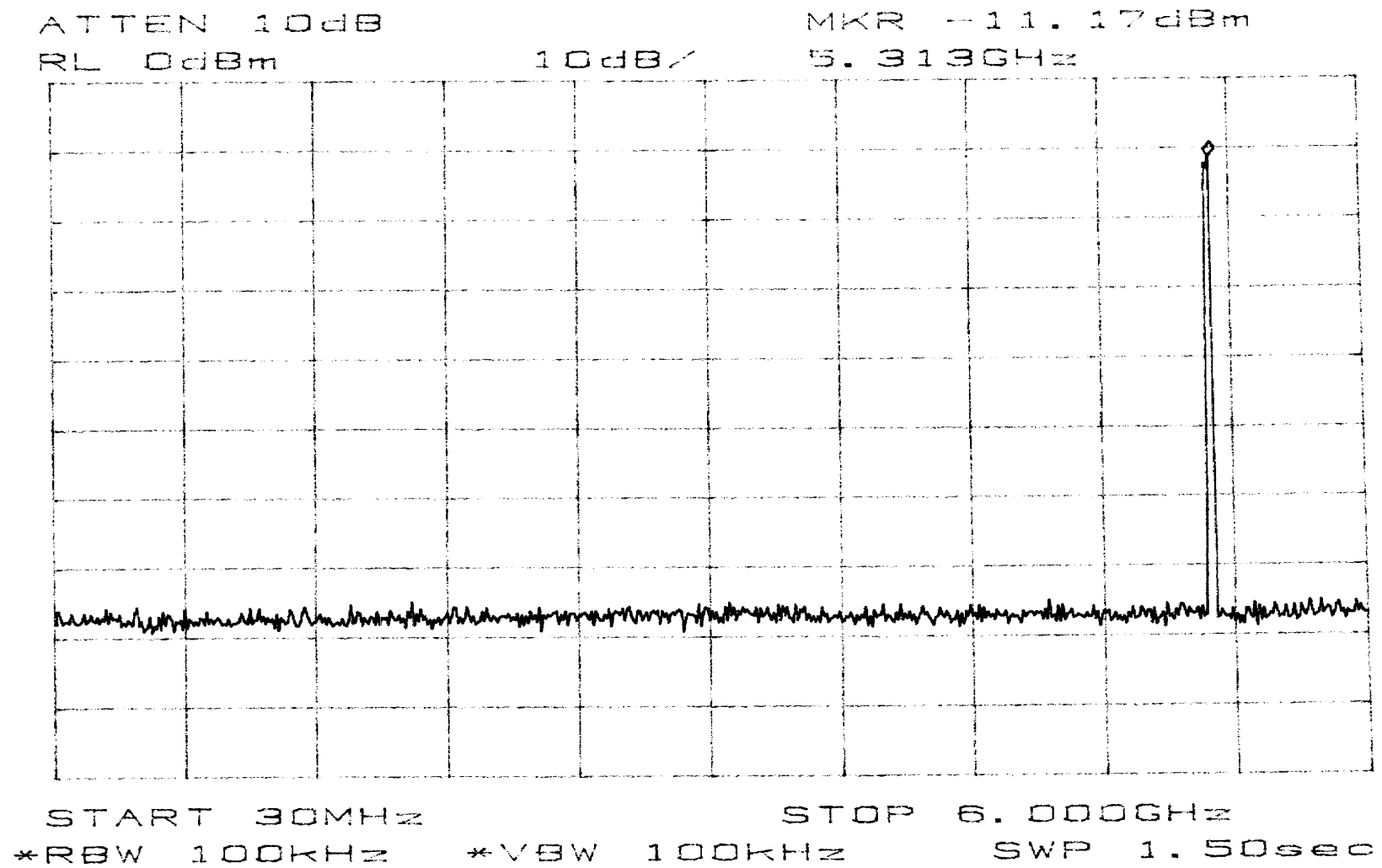
10dB/

MKR -65.50dBm
36.580GHz



START 31.000GHz STOP 40.000GHz
*RBW 100kHz *VBW 100kHz SWP 2.30sec

Out Of Band 30 MHz - 6 GHz



Out Of Band 6 - 13 GHz

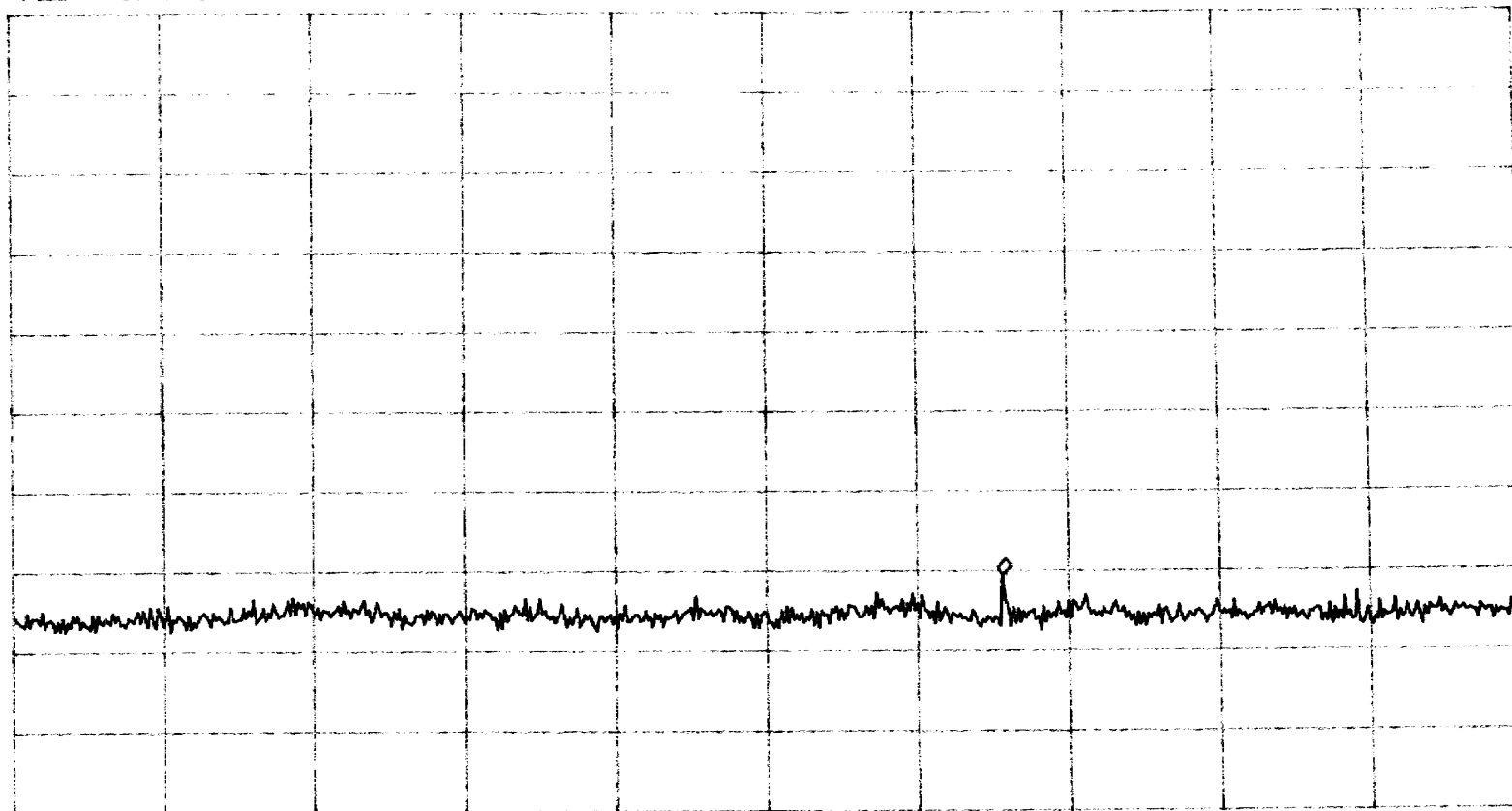
ATTEN 10dB

MKR -70.50dBm

RL 0dBm

10dB/

10.597GHz



START 6.000GHz

STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

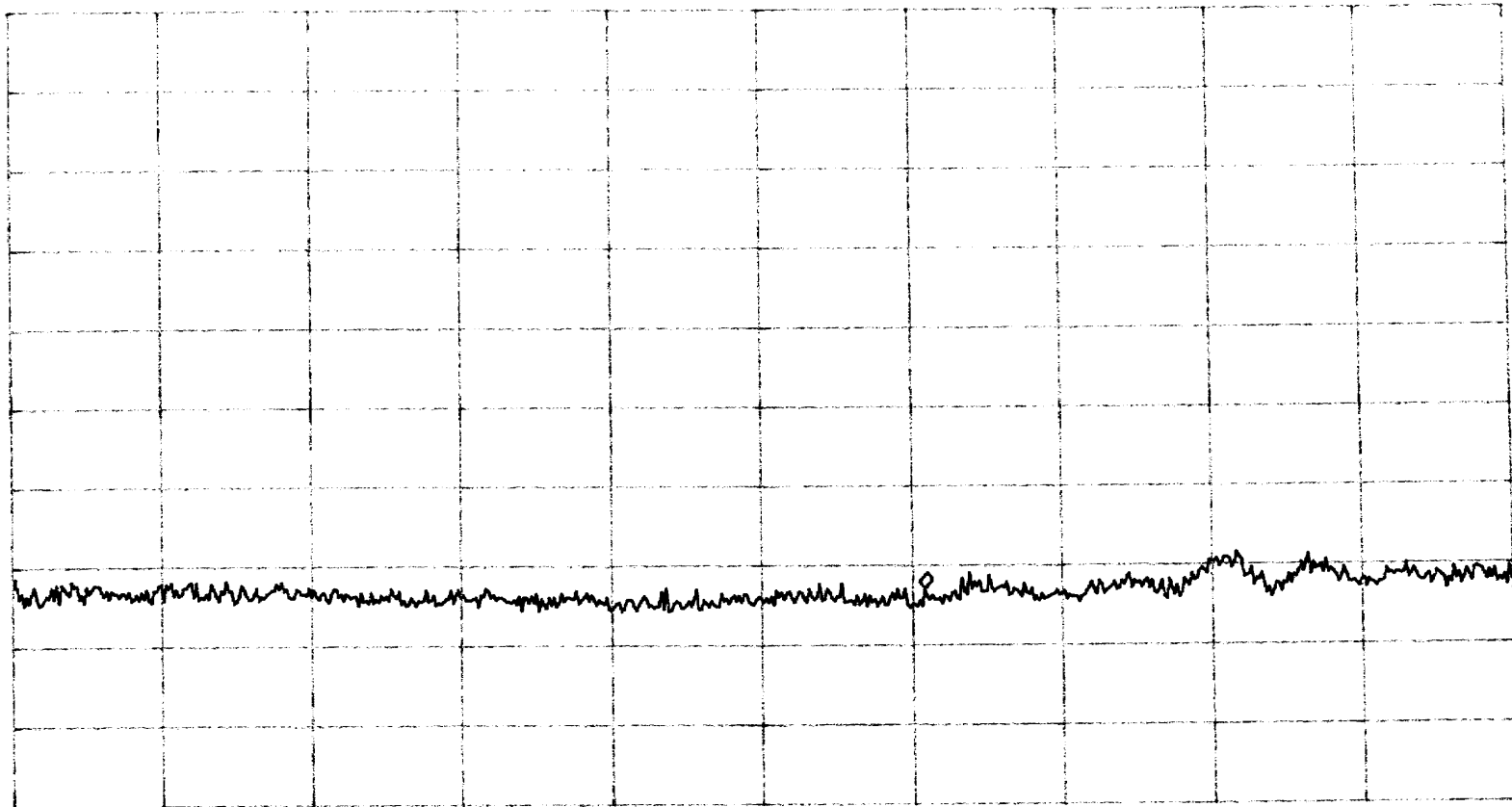
ATTEN 10dB

MKR -72.83dBm

RL 0dBm

10dB/

21.21GHz



START 13.00GHz

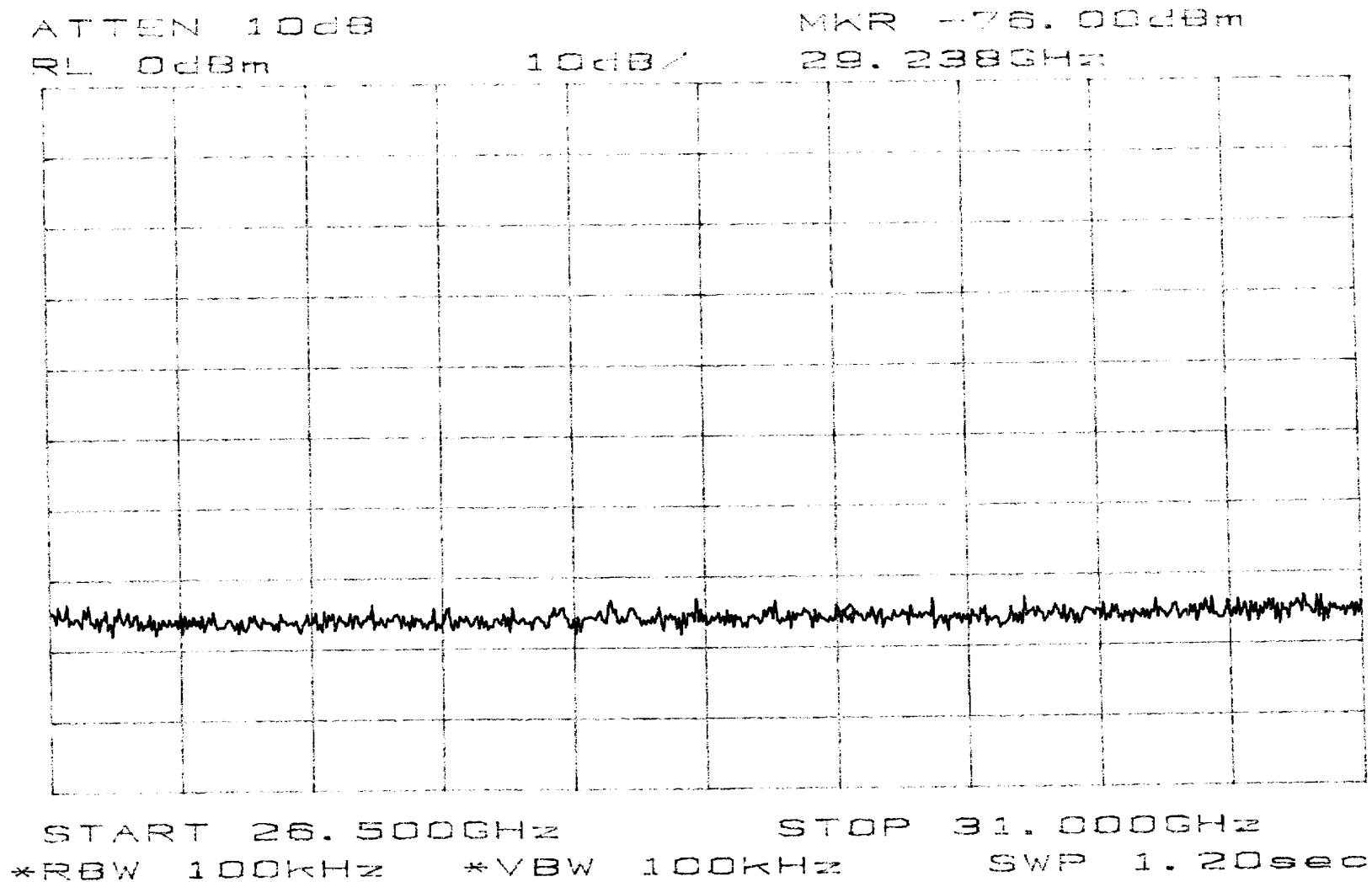
STOP 26.50GHz

*RBW 100kHz

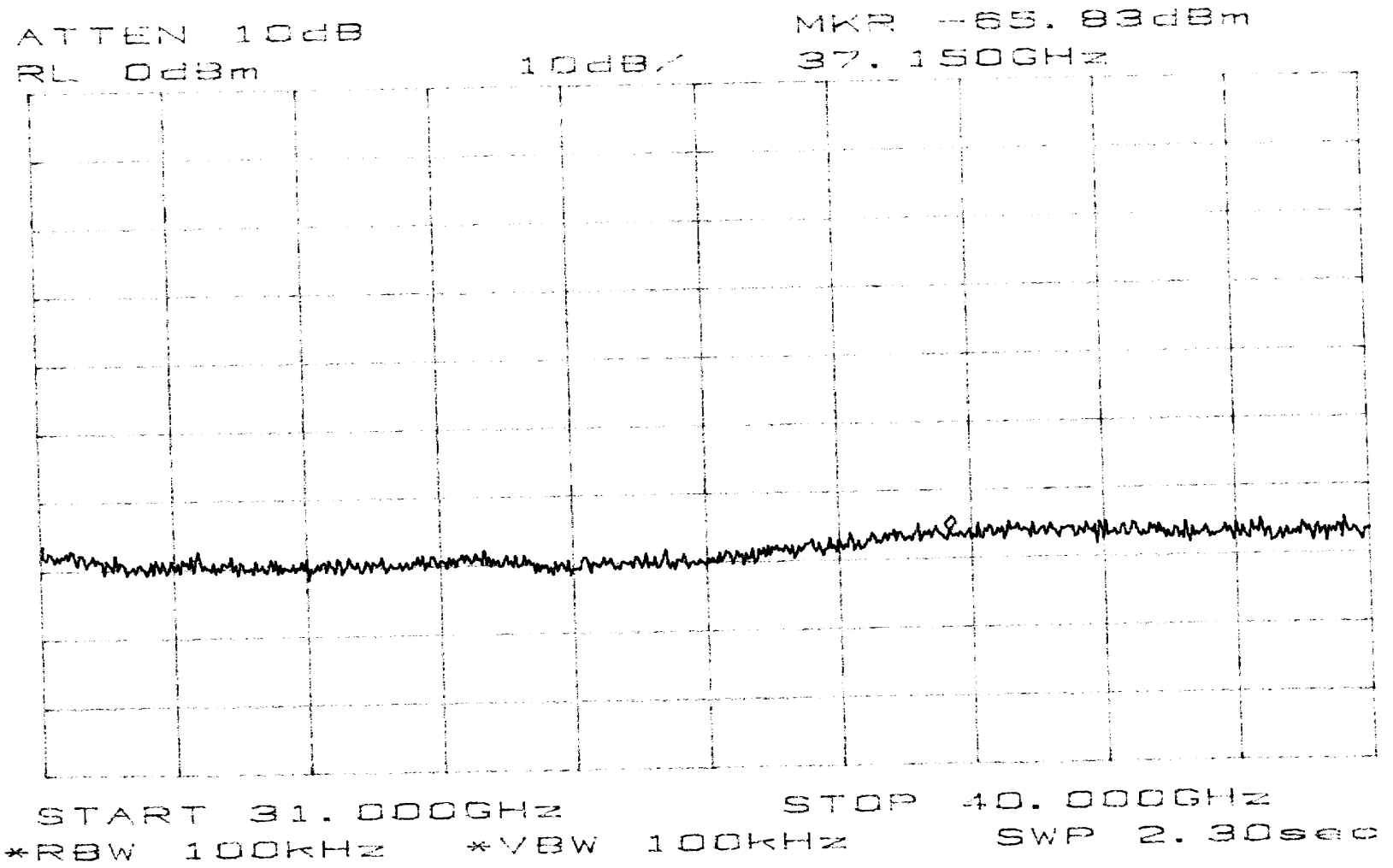
*VBW 100kHz

SWP 3.40sec

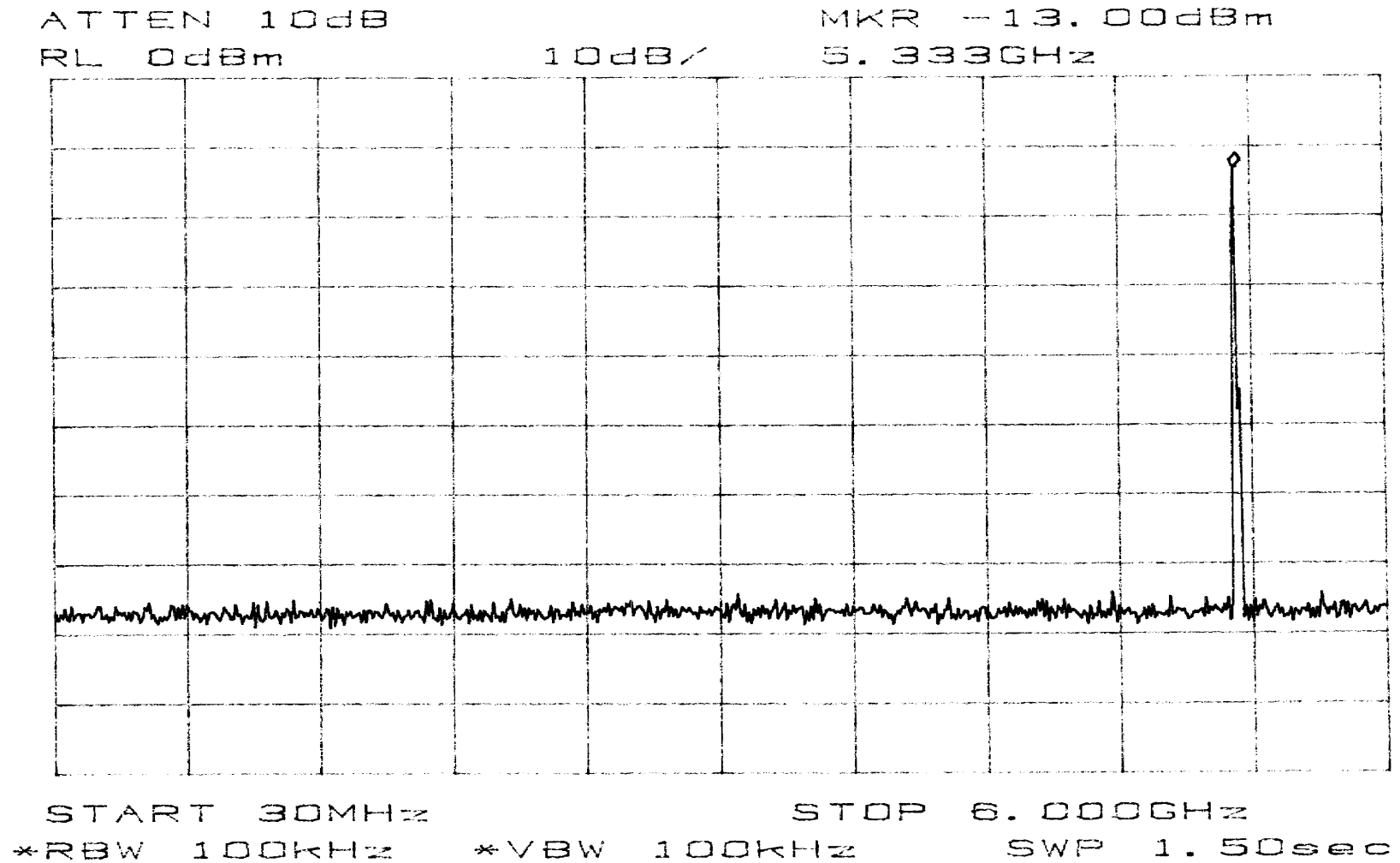
Out of Band 26.5 - 31 GHz



Out of Band 31 - 40 GHz



Out Of Band 30 MHz - 6 GHz



Out Of Band 6 - 13 GHz

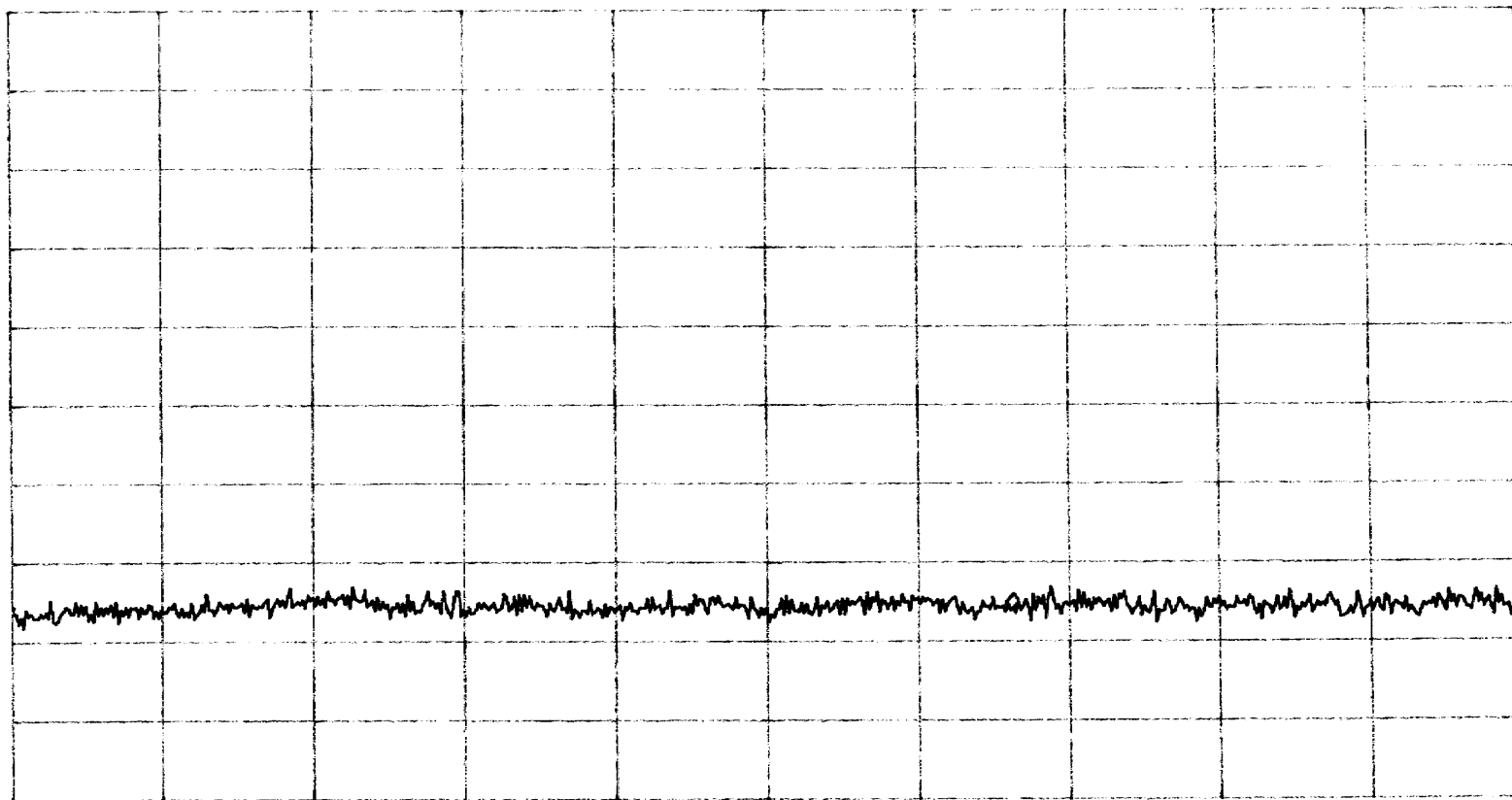
ATTEN 10dB

MKR -76.00dBm

RL 0dBm

10dB/

10.632GHz



START 6.000GHz

STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

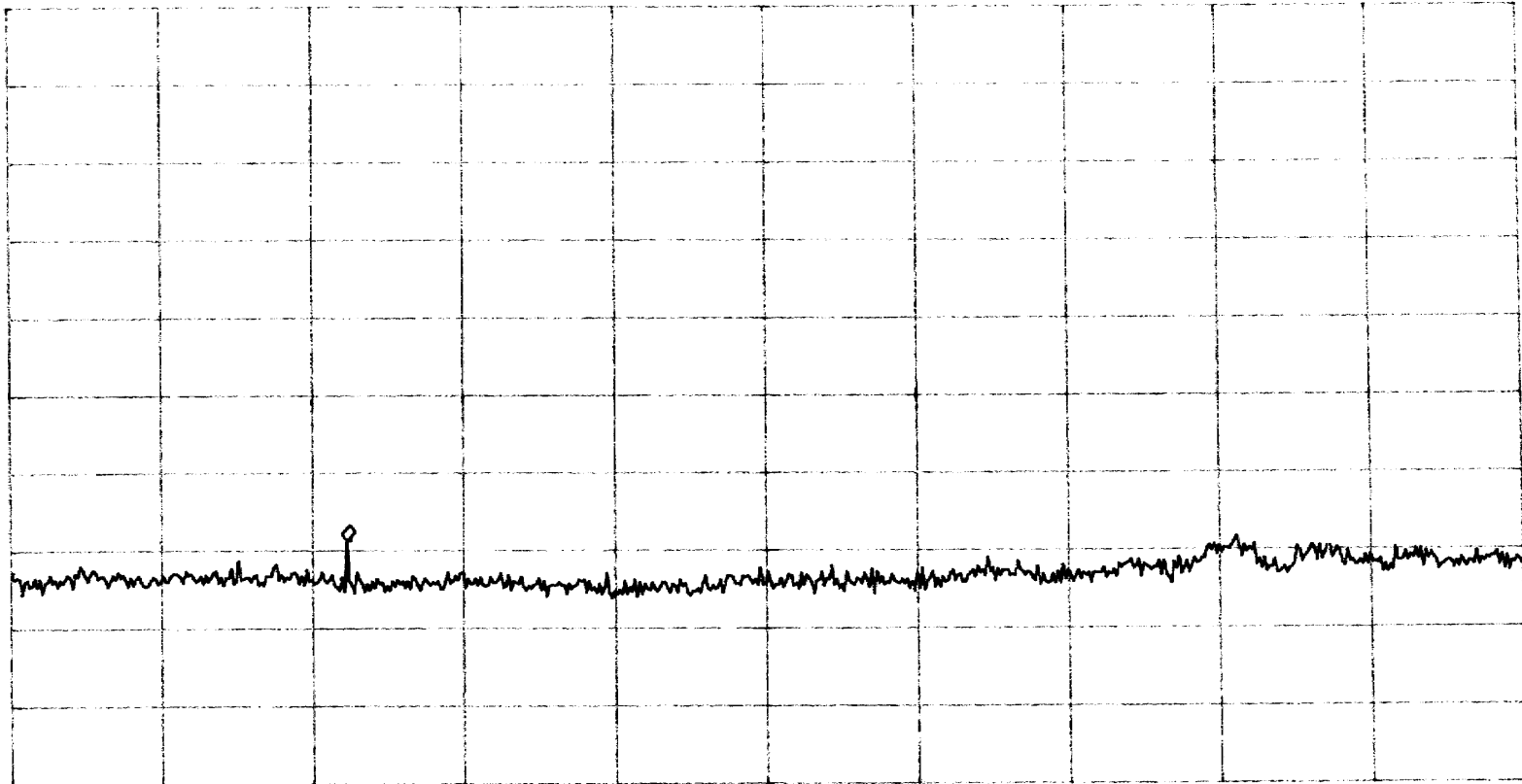
ATTEN 10dB

MKR -68.67dBm

RL 0dBm

10dB/

16.02GHz



START 13.00GHz

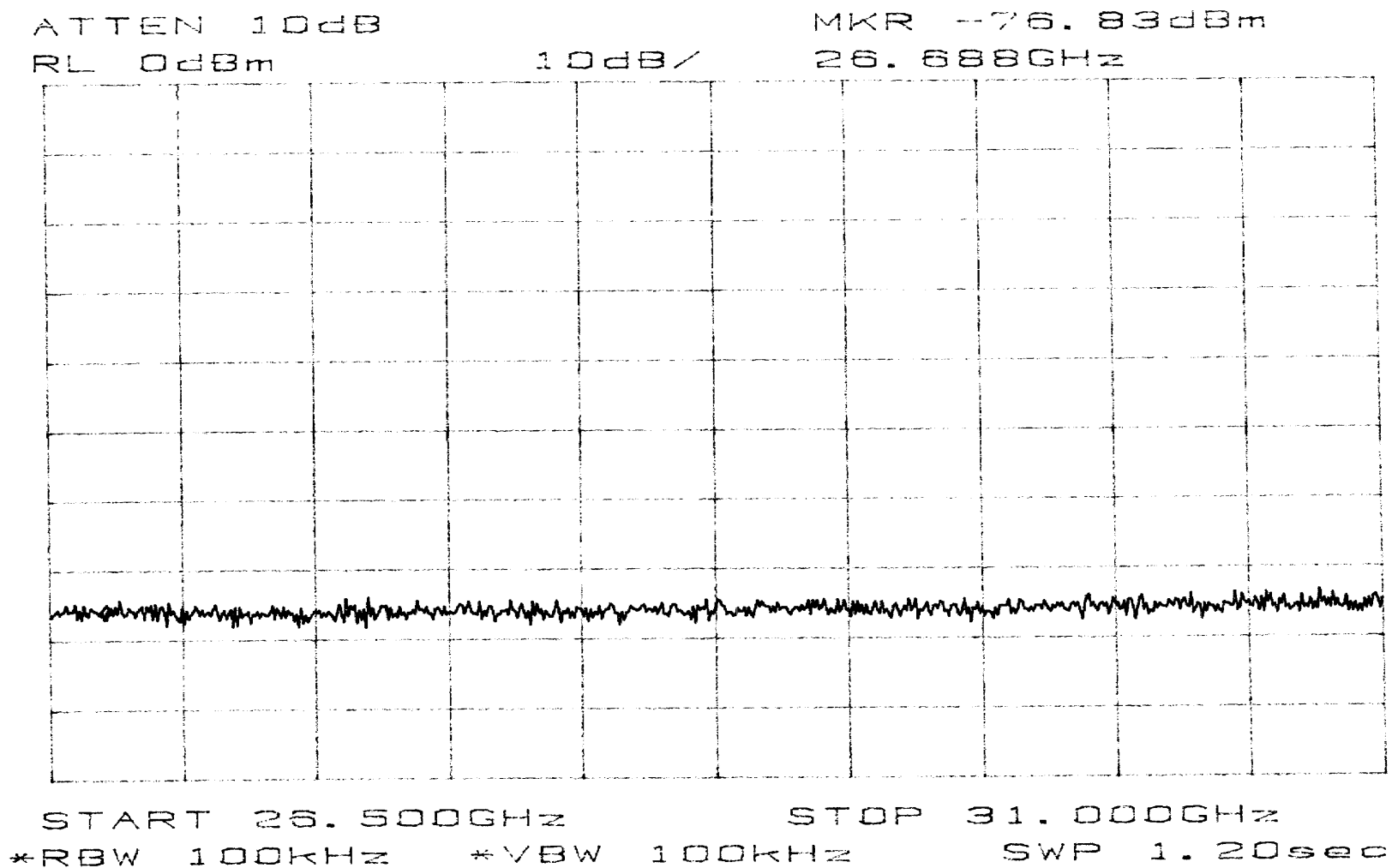
STOP 26.50GHz

*RBW 100kHz

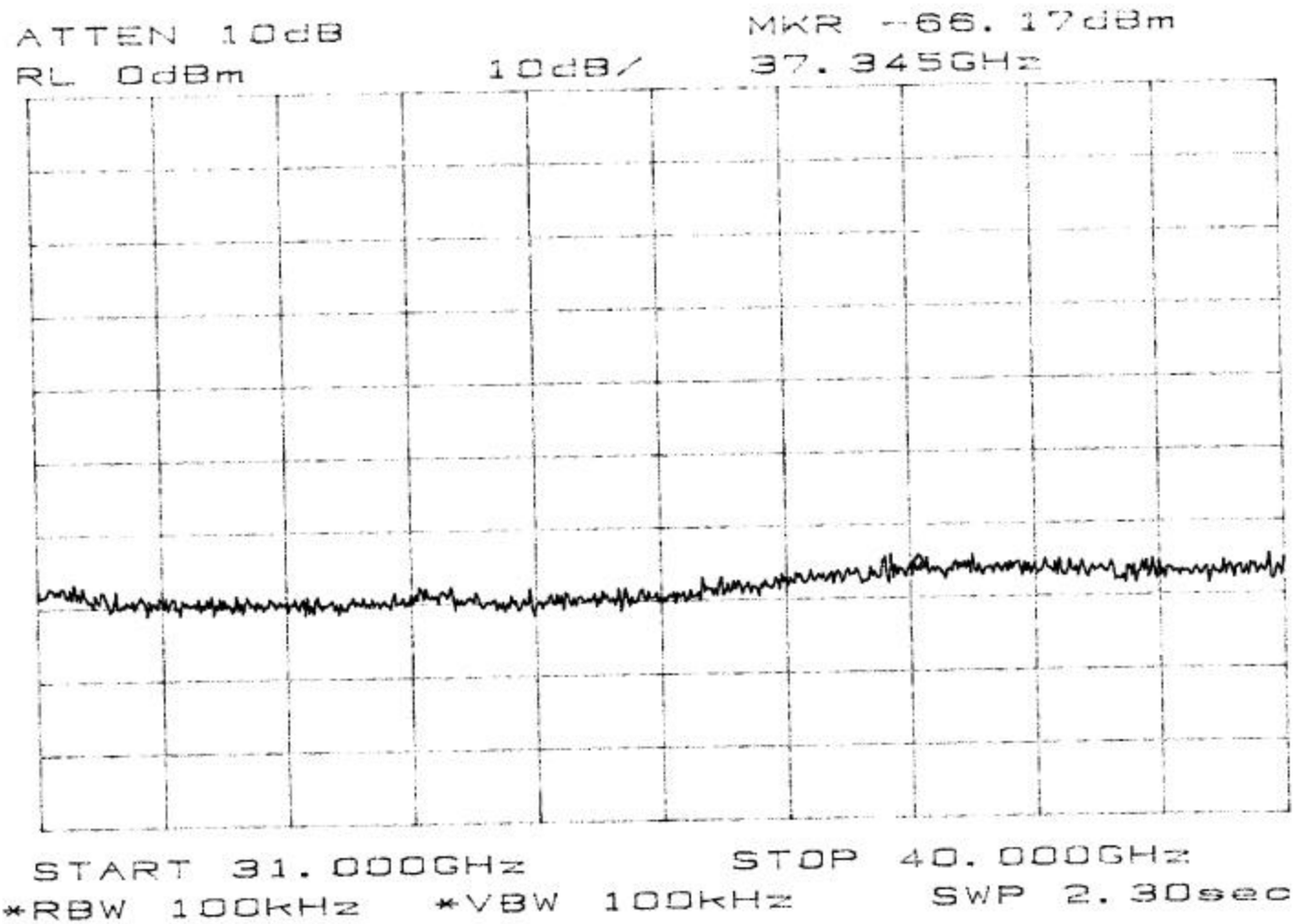
*VBW 100kHz

SWP 3.40sec

Out of Band 26.5 - 31 GHz



Out of Band 31 - 40 GHz



APPENDIX B
RESTRICTED BAND DATA

FCC RADIATED DATA SHEET									
EUT:		N2 LINK 5.250				DATE:		APR 10 98	
S/N:						CUSTOMER NAME:		WIRELESS, INC	
RULE PART:		15.401				WORK ORDER:		8041002A	
						FILE:		8041002A.xls	
ANTENNA:		HORN		OTHER CAL FACTORS:		ATTN dB:		0	
MODULATION TYPE:						DUTY dB:		0	
TESTED BY:		SURESH				HP IL dB:		0	
COMMENTS:		RADIOWAVES 2' ANTENNA				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 = 5301.76									
10604.1	38.5	Pk	38.9	13.6	35.0	0.0	56.0	74.0	-18.0
10604.1	27.3	Avg	38.9	13.6	35.0	0.0	44.8	54.0	-9.2
15905.9	44.5	Pk	40.5	16.2	35.0	0.0	66.2	74.0	-7.8
15905.9	23.5	Avg	40.5	16.2	35.0	0.0	45.2	54.0	-8.8
Fund = 5260.9									
10521.8	40.0	Pk	38.9	13.6	35.0	0.0	57.5	74.0	-16.5
10521.8	19.0	Avg	38.9	13.6	35.0	0.0	36.5	54.0	-17.5
15864.4	45.3	Pk	40.5	16.2	35.0	0.0	67.0	74.0	-7.0
15864.4	23.5	Avg	40.5	16.2	35.0	0.0	45.2	54.0	-8.8
Fund = 5335									
10670.2	41.5	Pk	38.9	13.6	35.0	0.0	59.0	74.0	-15.0
10670.2	18.7	Avg	38.9	13.6	35.0	0.0	36.1	54.0	-17.9
16005.3	45.2	Pk	41.6	16.2	35.0	0.0	68.0	74.0	-6.0
16005.3	23.7	Avg	41.6	16.2	35.0	0.0	46.5	54.0	-7.5

FCC RADIATED DATA SHEET

EUT:	N2 LINK 5.250	DATE:	APR 13 98
S/N:		CUSTOMER NAME:	WIRELESS, INC
RULE PART:	15.401	WORK ORDER:	8041002A
		FILE:	8041002A4.xls
ANTENNA:	HORN	OTHER CAL FACTORS:	ATTN dB: 0
MODULATION TYPE:			DUTY dB: 0
TESTED BY:	SURESH		HP IL dB: 0
COMMENTS:	RADIOWAVES 4' ANTENNA		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 = 5301.76									
10604.1	48.0	Pk	38.9	13.6	35.0	0.0	65.5	74.0	-8.5
10604.1	28.0	Avg	38.9	13.6	35.0	0.0	45.5	54.0	-8.5
15905.9	44.5	Pk	40.5	16.2	35.0	0.0	66.2	74.0	-7.8
15905.9	28.7	Avg	40.5	16.2	35.0	0.0	50.3	54.0	-3.7
Fund = 5260.9									
10521.8	49.3	Pk	38.9	13.6	35.0	0.0	66.8	74.0	-7.2
10521.8	27.7	Avg	38.9	13.6	35.0	0.0	45.1	54.0	-8.9
15864.4	37.8	Pk	40.5	16.2	35.0	0.0	59.5	74.0	-14.5
15864.4	28.3	Avg	40.5	16.2	35.0	0.0	50.0	54.0	-4.0
Fund = 5335									
10670.2	48.2	Pk	38.9	13.6	35.0	0.0	65.6	74.0	-8.4
10670.2	28.0	Avg	38.9	13.6	35.0	0.0	45.5	54.0	-8.5
16005.3	38.8	Pk	41.6	16.2	35.0	0.0	61.6	74.0	-12.4
16005.3	23.5	Avg	41.6	16.2	35.0	0.0	46.3	54.0	-7.7

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 A

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

PK = Peak

Customer:	Wireless	Operator:	Chris
Date:	04-13-1998	Time:	12:50:03
Temperature Range:	60 Deg F	Percent Humidity:	60
E.U.T.:	N2 Link 5.75GHz		
Serial Number:	prototype		
Support Devices:	HP T1 / Data Tester		
Serial Number:			
FCC ID:			
Exercise Program:	N/A		
Modifications:	N/A		
Report File Name:	F:\TESTDATA\8041002b.F		

TEST FREQ	TEST dBuV	CLASS A LIMIT	VERSUS A LIMIT	CONDUCTOR	TYPE
=====	=====	=====	=====	=====	=====
0.450	42.2	60.0	-17.8	LINE	PK
15.000	61.5	69.5	-8.0	LINE	PK
18.700	55.0	69.5	-14.5	LINE	PK
23.130	46.8	69.5	-22.8	LINE	PK
0.450	40.8	60.0	-19.2	NEUTRAL	PK
14.490	61.1	69.5	-8.4	NEUTRAL	PK
18.700	54.3	69.5	-15.2	NEUTRAL	PK
23.200	46.0	69.5	-23.5	NEUTRAL	PK

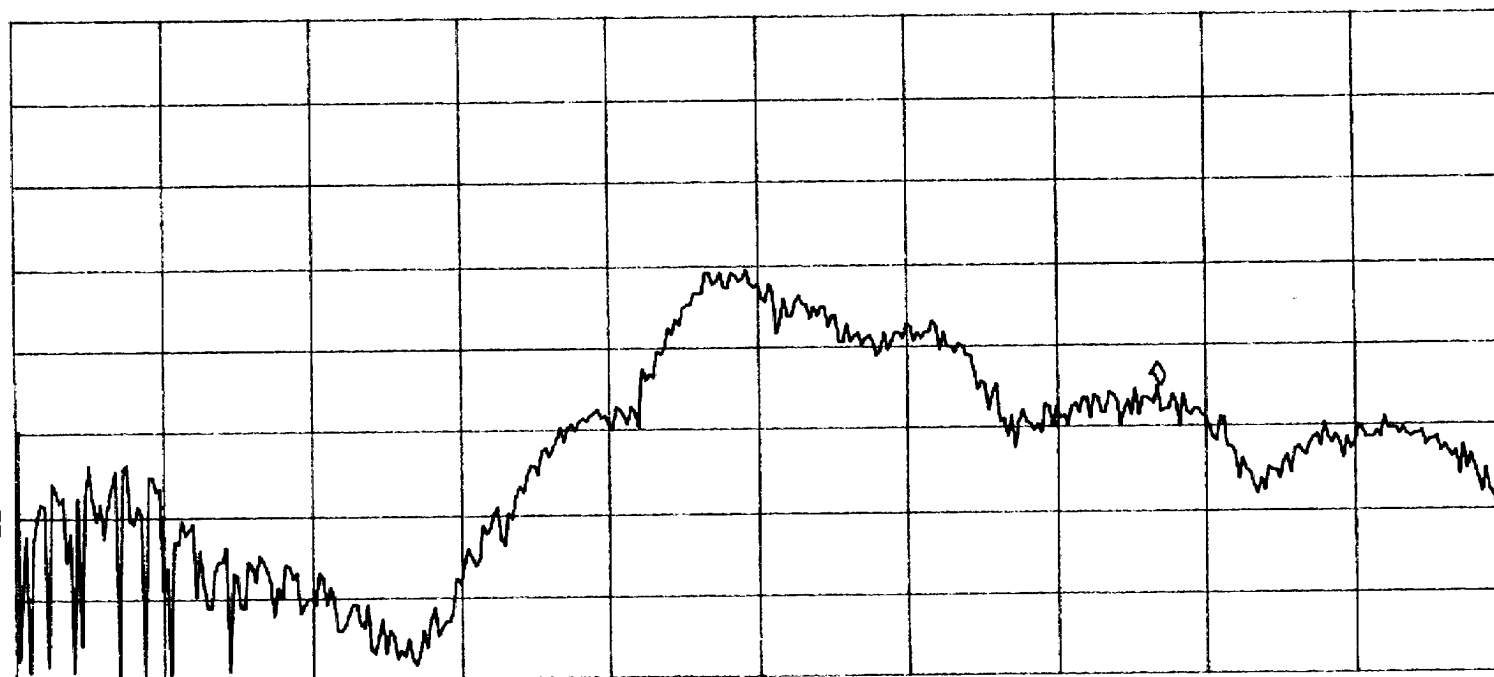
(P) 12:48:54 APR 13, 1998
80410028 LINE

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 23.13 MHz
46.75 dB μ V

LOG REF 92.0 dB μ V

10
dB/
ATN
10 dB

VA SB
SC FC
ACDRA



START 450 kHz

IF BW 9.0 kHz

AVG BW 30 kHz

STOP 30.00 MHz

SWP 2.46 sec

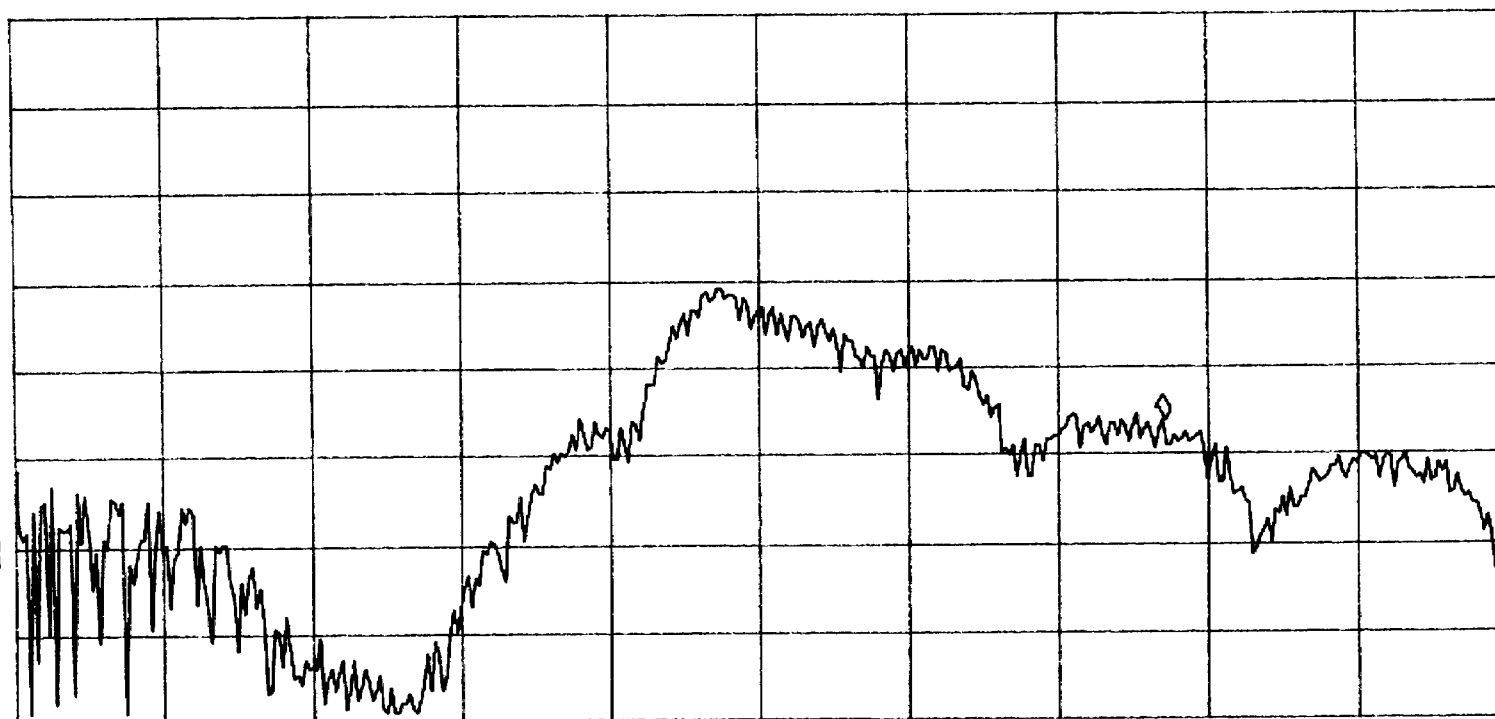
(6) 12:54:03 APR 13, 1998
80410028 NEUTRAL

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 23.20 MHz
45.96 dB μ V

LDC REF 92.0 dB μ V

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

APPENDIX D
15.209
RADIATED EMISSIONS

Electronic Compliance Laboratories, Inc.
1249 Birchwood Ave.
Sunnyvale, CA

Radiated Emissions
Frequency range: 30MHz-1000MHz

10 Meter Open Site
Site Calibrated: June 1997

Government Agency and Limit: FCC Class A

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

Customer: Wireless Operator: Chris
Date: 04-13-1998 Time: 11:04:00
Temperature Range: 55 Deg F Percent Humidity: 70
E.U.T.: N2 Link 5.7GHz
Serial Number: prototype
Support Devices: HP T / Data Tester
Serial Number: 3630U00840
FCC ID:
Exercise Program: N/A
Modifications: N/A
Report File Name: F:\TESTDATA\8041002b.RF

Antenna Type: BICONICAL

TEST FREQ	TEST dBuV	ACTUAL dBuV/m	CLASS A LIMIT	VERSUS A LIMIT	TABLE DEGREES	ANTENNA HEIGHT	POLAR- IZATION	DETECTOR Type
=====	=====	=====	=====	=====	=====	=====	=====	=====
32.419	39.4	31.7	39.0	-7.3	0	1.0	V	PK
33.960	46.0	37.1	39.0	-1.9	0	1.0	V	PK
33.960	44.2	35.3	39.0	-3.7	0	1.0	V	QP
38.590	48.1	37.1	39.0	-1.9	270	1.0	V	PK
38.590	45.2	34.2	39.0	-4.8	270	1.0	V	QP
43.157	42.6	30.1	39.0	-8.9	270	1.0	V	PK
38.740	37.5	26.5	39.0	-12.5	0	1.0	H	PK
CHANGED ANTENNA TO LOG PERIODIC								

NOTE: no emissions seen above noise floor to 1 GHz

+-----+

CHANGED ANTENNA TO 1-18Gig HORN

NOTE: no emissions seen above noise floor from 1 to 5 GHz

+-----+

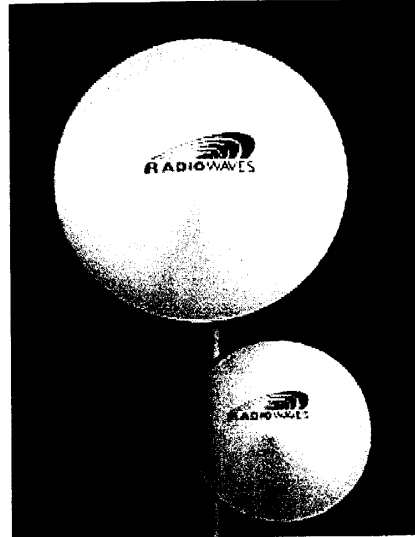
APPENDIX E
ANTENNA DRAWINGS



5.25 GHz, (5.250 - 5.850) Standard Parabolic Antenna

FEATURES

- **Antenna diameters**
 - 2' (60cm)
 - 3' (90 cm)
 - 4' (120 cm)
- **Antenna weights:**
 - 2'-22 lbs. (9.9 kg)
 - 3'-35 lbs. (18.0 kg)
 - 4'-60 lbs. (22.5 kg)
- **SP models;** standard-performance parabolic, unshielded.
- **SPD models;** dual polarization feeds available.
- **Connector interface;** type "N" female.
- **Ease of installation;** antennas shipped completely assembled, mount requires minimal assembly.
- **Optional molded radomes;** radomes shipped factory installed.
- **Left or right pole mountable.**
- **Rugged and light weight** cast aluminum mount with and without fine adjustment.
- **Standard white;** other colors and/or logos available on request.
- **Corrosive resistant;** all mount materials are coated aluminum, hot dipped galvanized steel and stainless steel (300 series).
- **Three year warranty.**

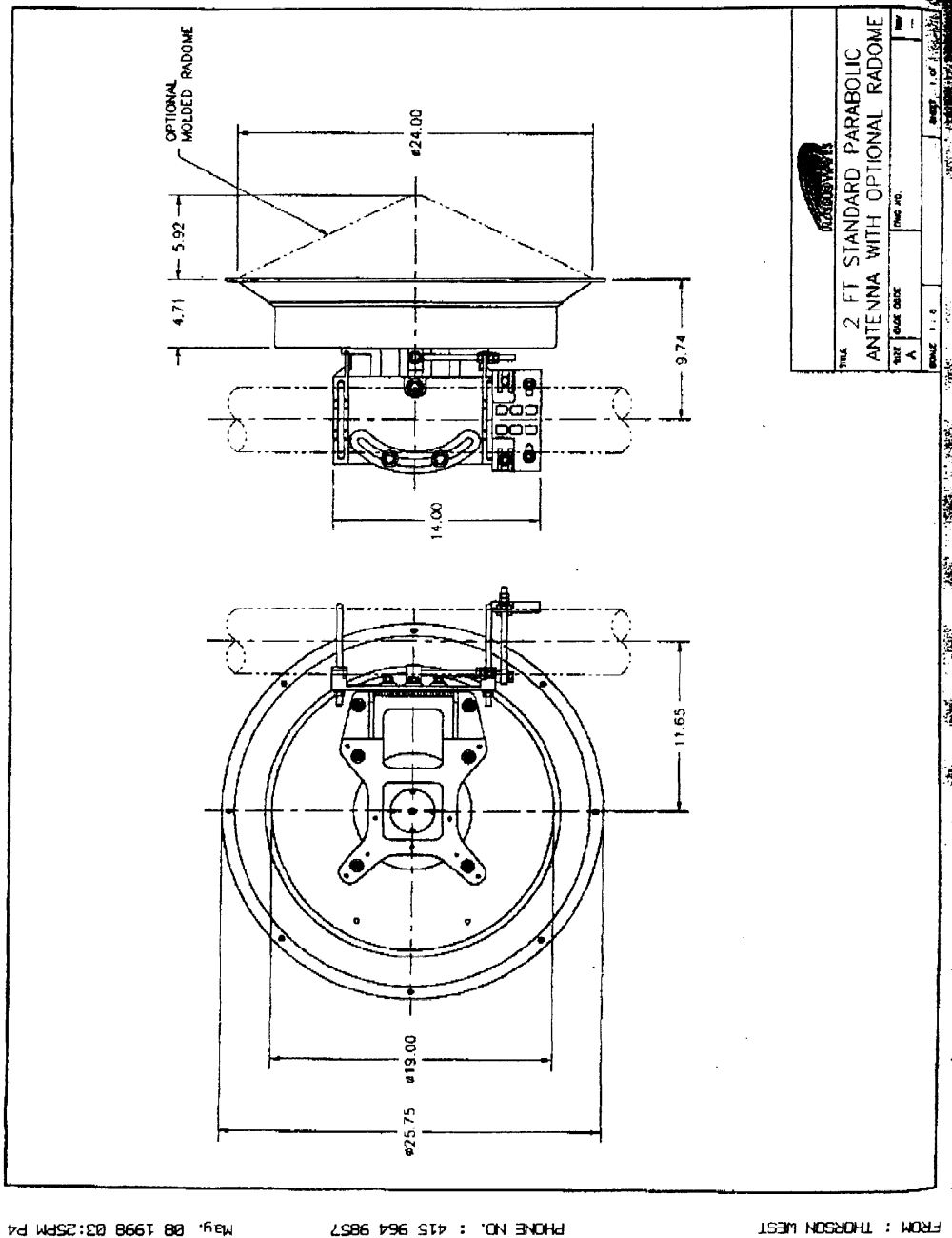


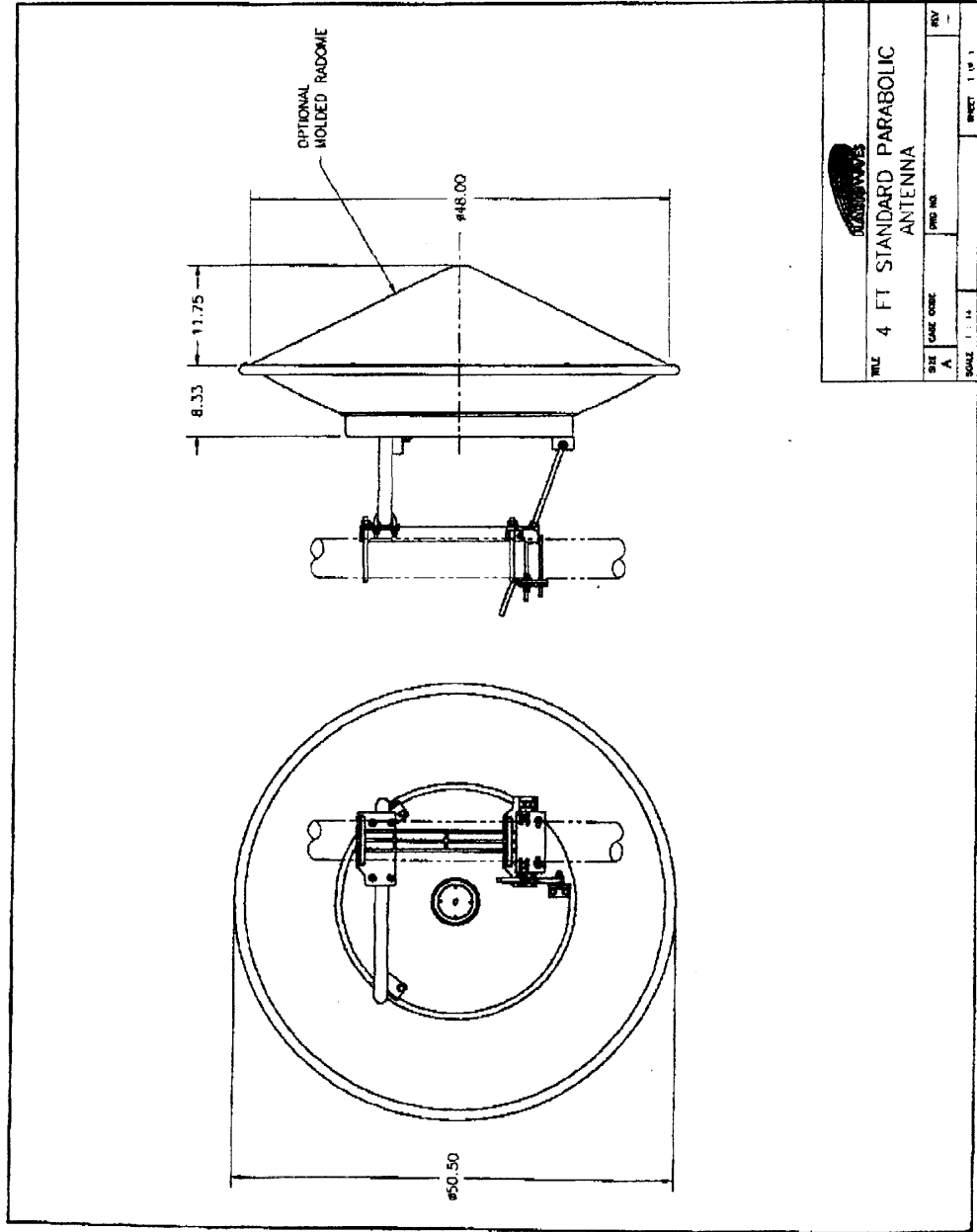
5.25 GHz ELECTRICAL SPECIFICATIONS (typical performance)*

Model Number	Frequency GHz	Diameter ft (cm)	Gain, dBi Mid-band	Beamwidth Degrees, 3dB	X Pol Disc., dB	Isolation, dB Port - Port	F/B Ratio, dB	VSWR Max. (R.L., dB)
Single Polarized								
SP2-5.2	5.25 - 5.850	2 (60)	28.3	6.2	28	—	36	1.35:1 (16.5)
SP3-5.2		3 (90)	31.4	4.2	30	—	38	1.35:1 (16.5)
SP4-5.2		4(120)	34.6	3.1	30	—	42	1.35:1 (16.5)
Dual Polarized								
SPD2-5.2	5.25 - 5.850	2 (60)	28.1	6.2	28	35	36	1.40:1 (15.5)
SPD3-5.2		3 (90)	31.1	4.2	30	35	38	1.40:1 (15.5)
SPD4-5.2		4(120)	34.4	3.1	30	35	42	1.40:1 (15.5)

*All specifications subject to change without notice.

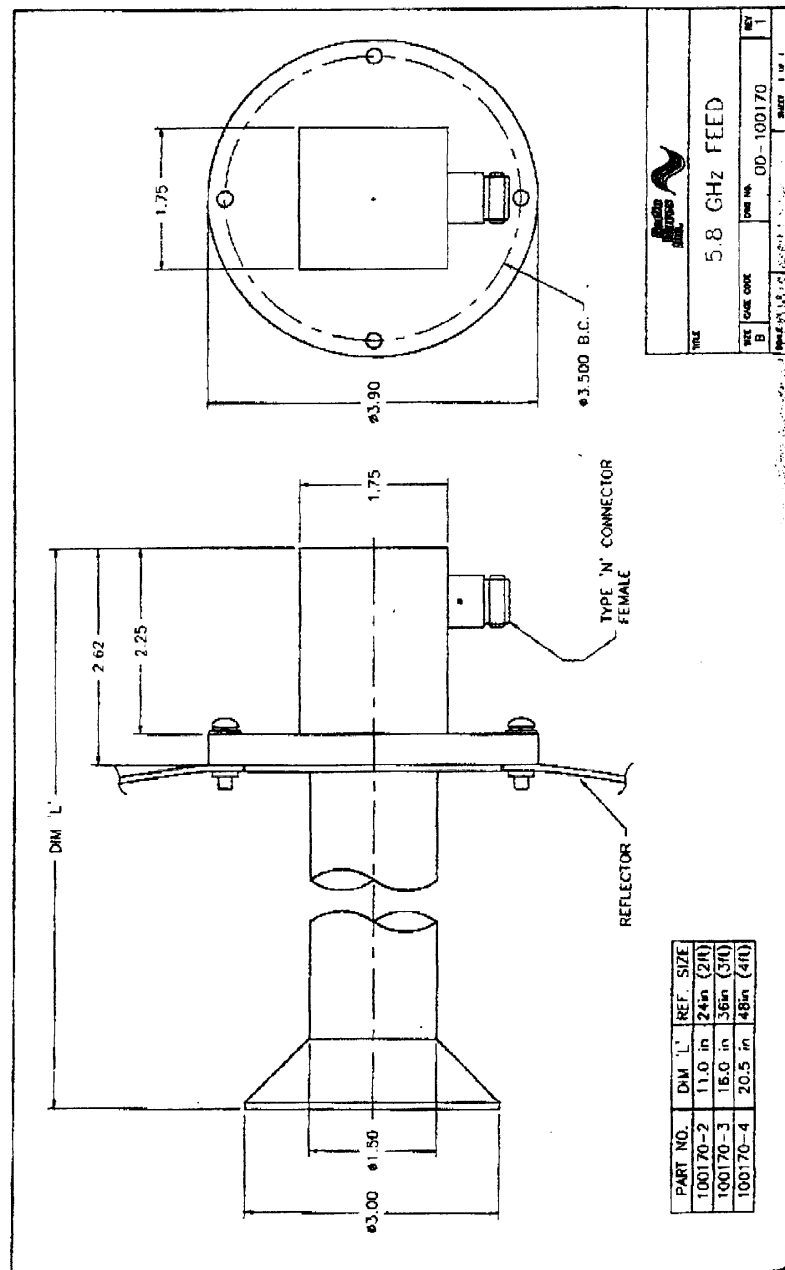
Radio Waves, Inc.
 267 Boston Road • Billerica, MA 01862
 Tel. 978•663•5777 • Fax. 978•663•6226
<http://www.radiowaves.com>





FROM : THORSON WEST
PHONE NO. : 415 964 9857
May. 08 1998 03:25PM PS

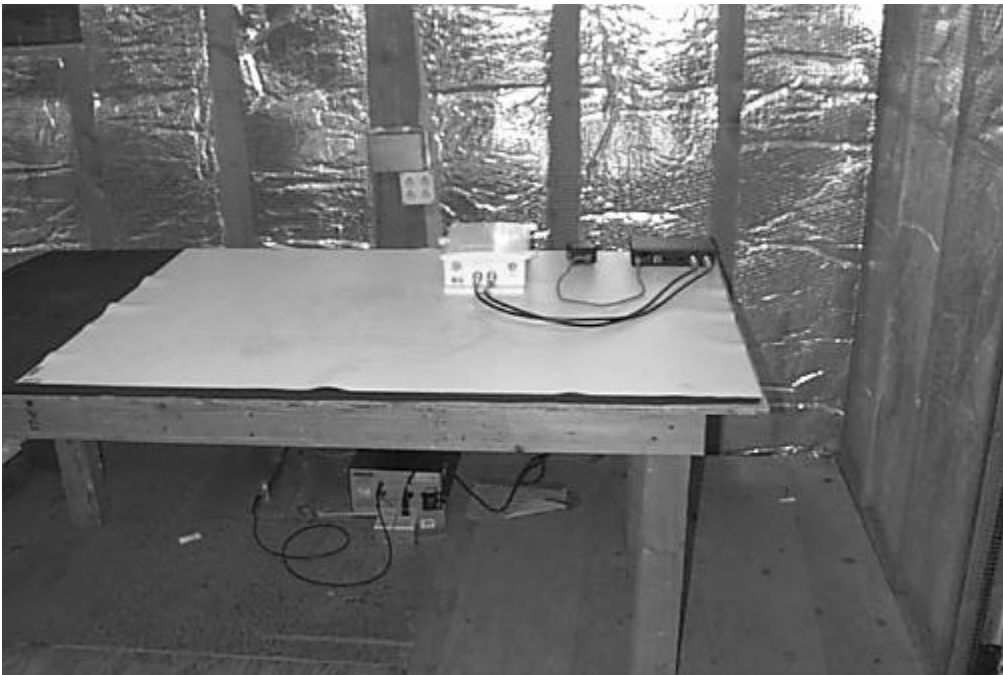
FROM : THORSON WEST PHONE NO. : 415 964 9857 May. 88 1998 03:26PM P7



APPENDIX F
Set-up Photographs



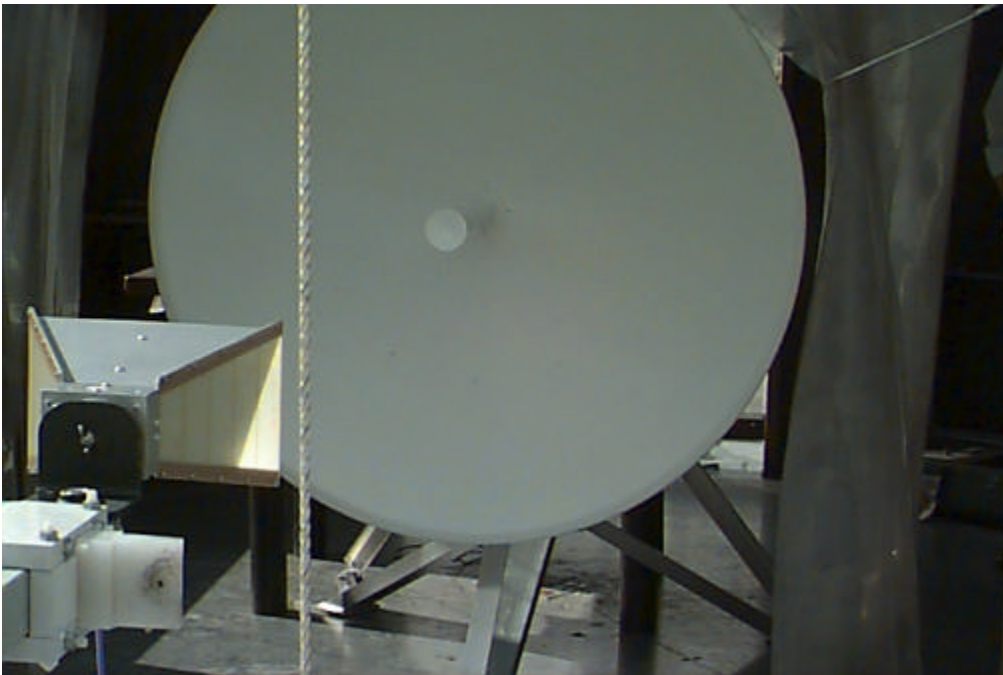
**FCC 15.209 Class B
Radiated Emissions**



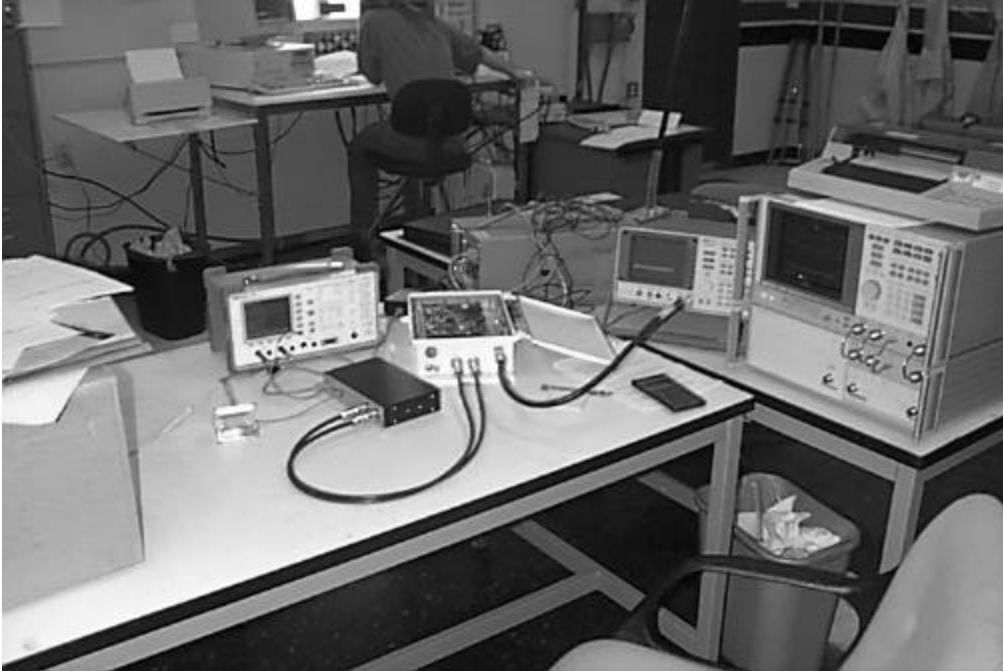
**FCC 15.207 Class B
Conducted Emissions**



**FCC 15.205 Restricted Band
SP2-5.2 Antenna**



**FCC 15.205 Restricted Band
SP4-5.2 Antenna**



FCC 15.407 Conducted RF

