

15.407 Certification
FCC ID: EV9N2L5-7S1-01

EMI TEST REPORT

On

N2 Link 1 x DS1 5.725 - 5.8250 GHz

Prepared for

Mul tipoint Networks
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Test Report Number: A804008
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
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	HP8601-7SS	001

3.0 EUT

N2 Link 1 x DS1 5.725 - 5.825 GHz

The N2 Link is comprised of the following:

N2 1 x DS1 Interface Unit, 5.725 - 5.825 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, 5.725 - 5.825 GHz

Serial Number: Prototype

FCC ID: EV9N2L5-7S1-01

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 5.725 - 5.825 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 -10.6 dBm or .087 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 = -10.9 dBm (peak reading) +0.3dB cable loss = -10.6 dBm / .087 mW EIRP
Limit: +30 dBm / 1 mW maximum power

SPB4-5.2 Antenna
EIRP = -10.6 (peak power) +33.0 (peak gain, dBi) = +22.4dBm / 173 mW EIRP
Limit: +30 dBm / 1 W maximum EIRP

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 50 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)
5.73	-11.3	27	15.7	17
5.77	-10.8	27	16.2	17
5.81	-11.1	27	15.9	17

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 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 5.725 - 5.825 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 -4.2 dBm or .38 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 = -4.5 dBm (peak reading) +0.3dB cable loss = - 4.2 dBm / .38 mW EIRP

Limit: +30 dBm / 1 W maximum power

SPB2-5.2 Antenna

EIRP = -4.2 (peak power) + 27 (peak gain, dBi) = +22.8 dBm /

190 mW EIRP

Limit: +30 dBm / 1 W maximum EIRP

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 50 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	-5.8	21	15.2	17
5.30	-4.5	21	16.5	17
5.33	-4.6	21	16.4	17

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 5.725 - 5.825 GHz band. **Test Plots are shown in Appendix A.**

6.3 15.401(g) Frequency Stability

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 EUT 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 dB_uV/m peak/54dB_uV/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 Manufacturer's control drawings, and the antenna drawings are in **Appendix B.**

Electronic Compliance Laboratories

Chris Byleckie
Technical Director

Date

APPENDIX A
SPREAD SPECTRUM PLOTS

Low Power Setting

Peak Spectral Power Density

12:53:19 APR 15, 1998

MKR 5.735328 GHz

-10.94 dBm

REF .0 dBm

AT 10 dB

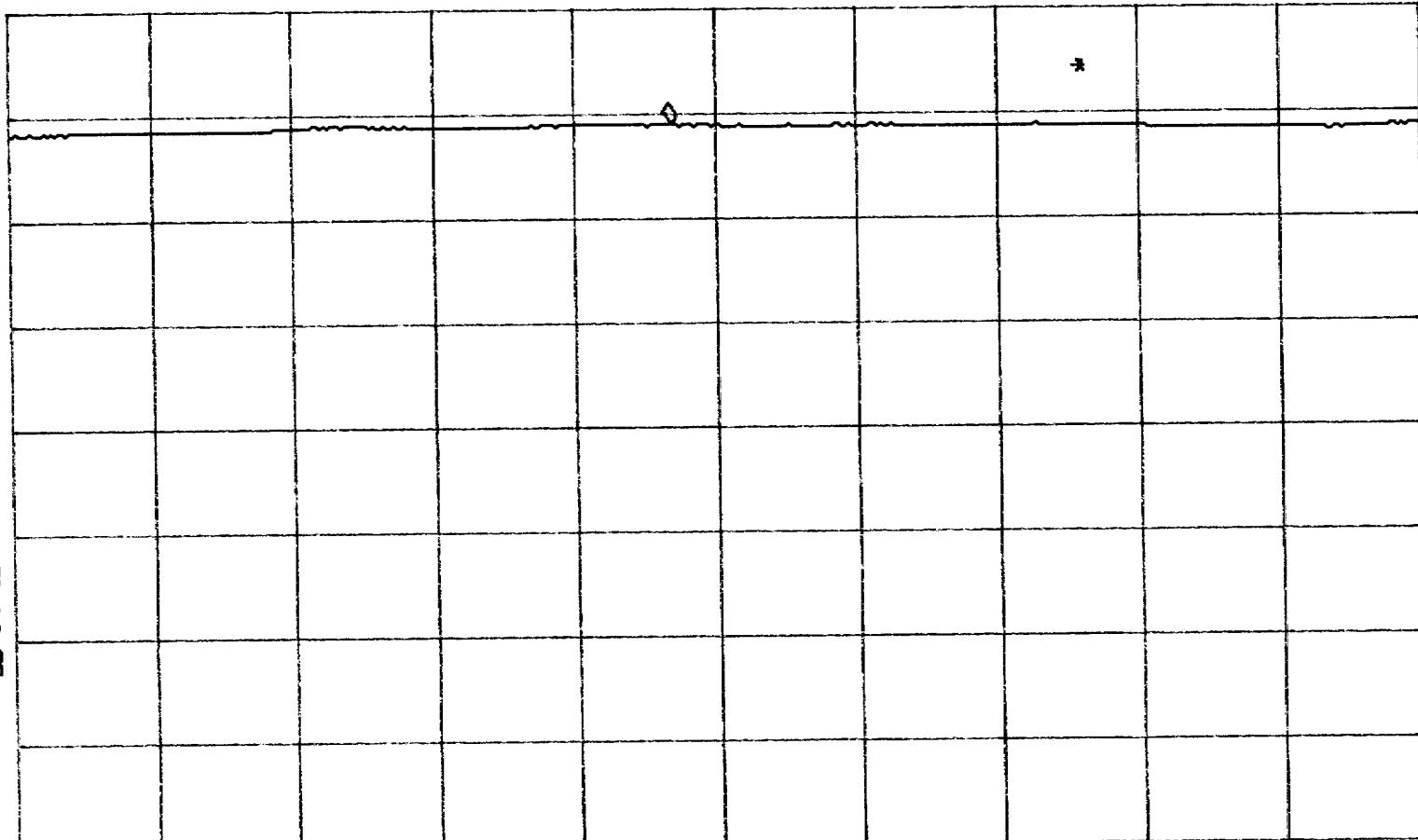
PEAK

LOG

10

dB/

VA SB
SC FC
CDRR



CENTER 5.735360 GHz
#RES BW 3.0 MHz

VBW 3 MHz

SPAN 1.000 MHz
#SWP 100 sec

Peak Spectral Power Density

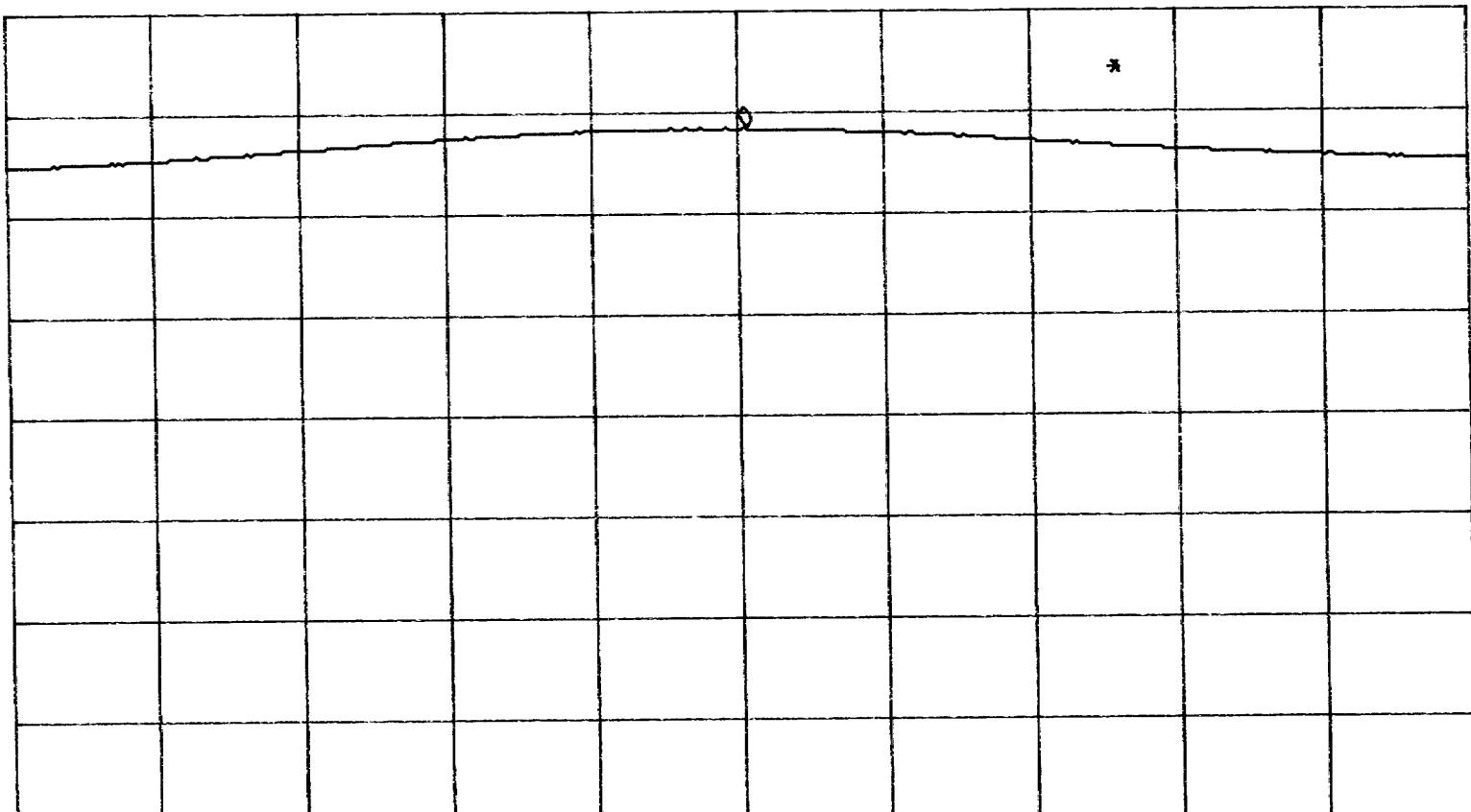
12:10:41 APR 15, 1998

MKR 5.776645 GHz
-11.58 dBm

REF .0 dBm

AT 10 dB

PEAK
LOG
10
dB/



VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec

Peak Spectral Power Density

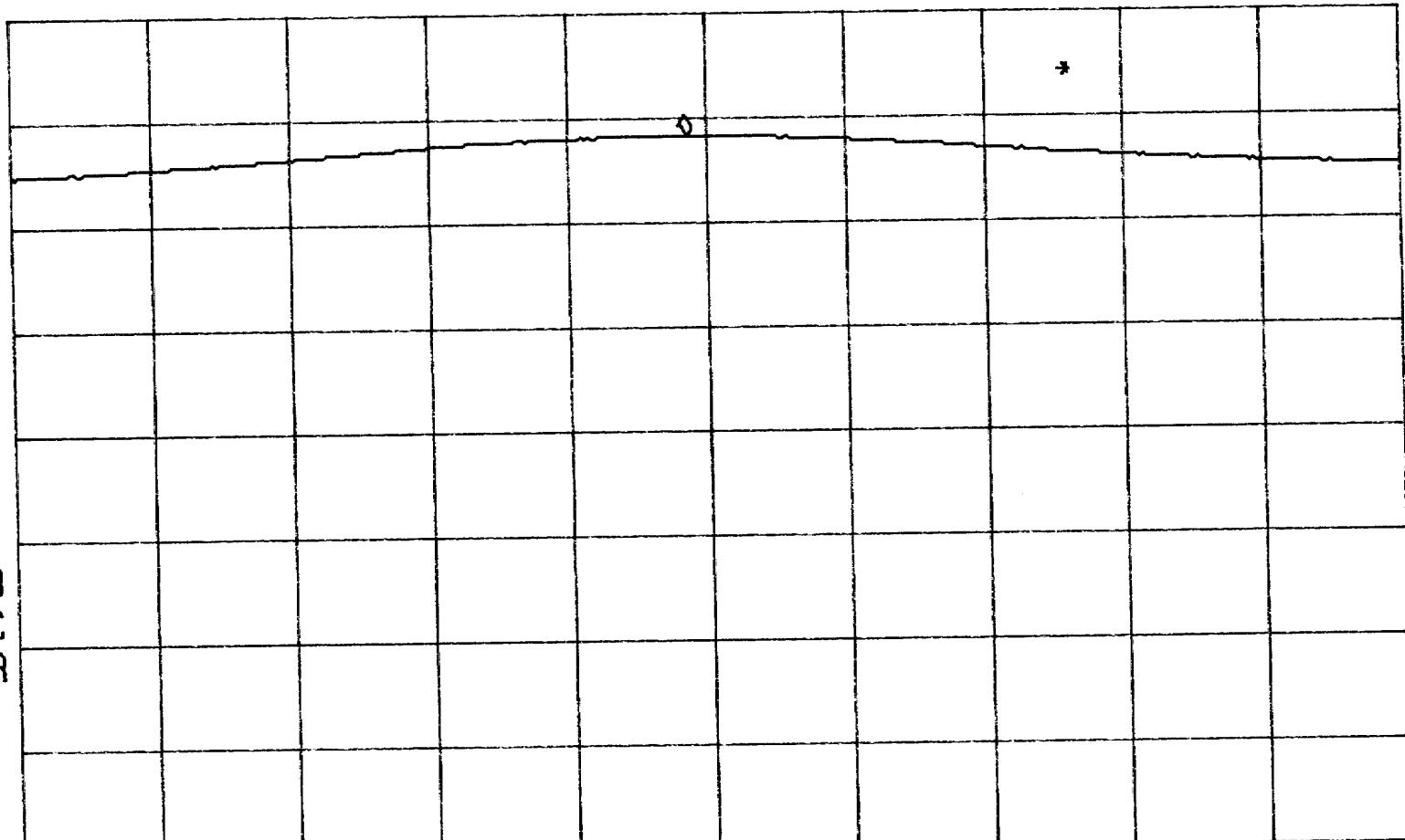
60 12:05:13 APR 15, 1998

MKR 5.809905 GHz
-11.67 dBm

REF .0 dBm

AT 10 dB

PEAK
LOG
10
dB/



CENTER 5.809920 GHz
#RES BW 1.0 MHz

VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec

Power Out

CP 12:33:48 APR 15, 1998

MKR 5.73548 GHz
-11.32 dBm

REF .0 dBm

AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR

CENTER 5.73568 GHz
#RES BW 3.0 MHz

VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

Power Out

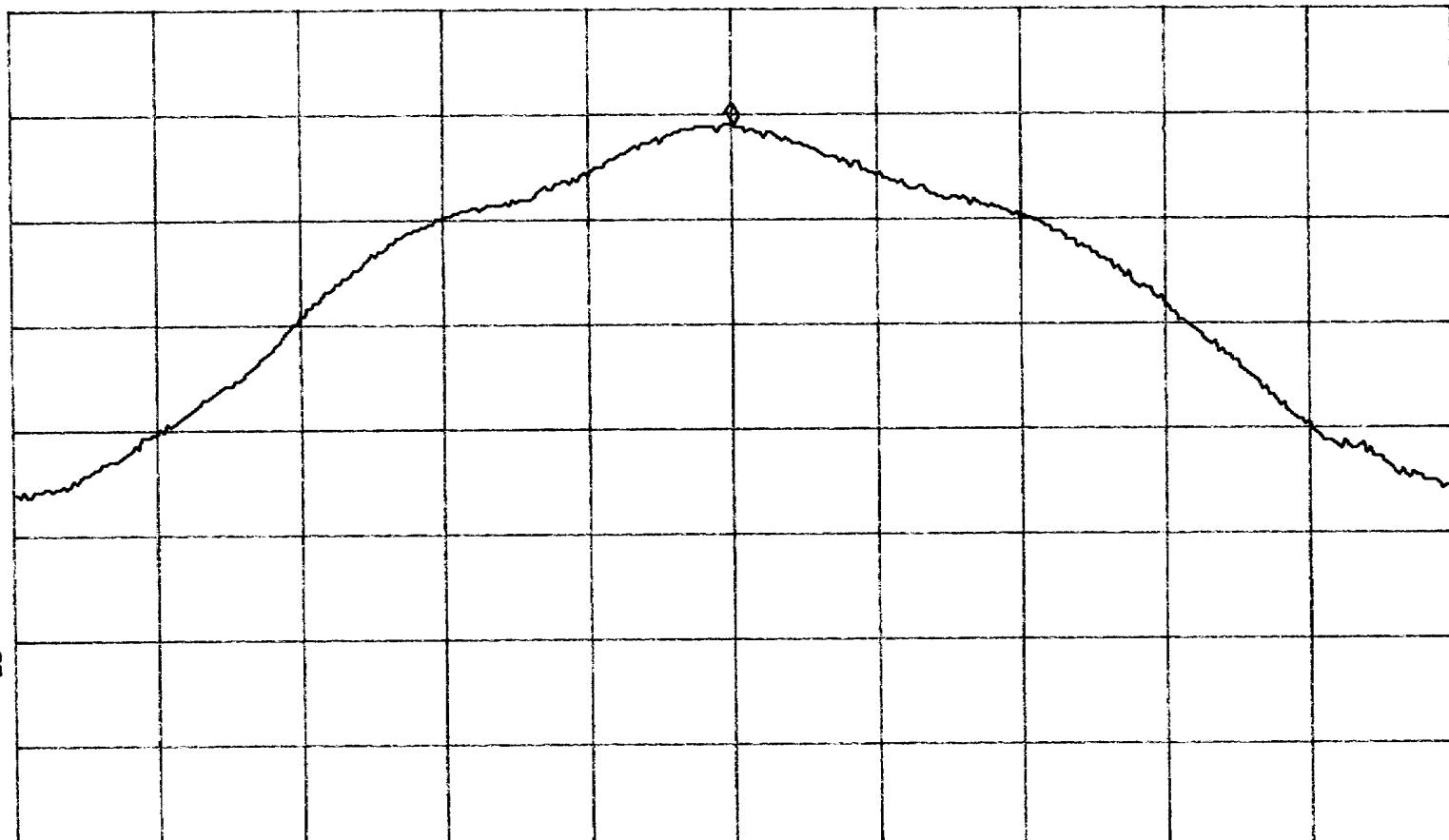
12:31:27 APR 15, 1998

MKR 5.77664 GHz
-10.89 dBm

REF .0 dBm

AT 10 dB

PEAK
LDG
10
dB/



VA SB
SC FC
CORR

CENTER 5.77664 GHz
#RES BW 3.0 MHz

VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

Power Out

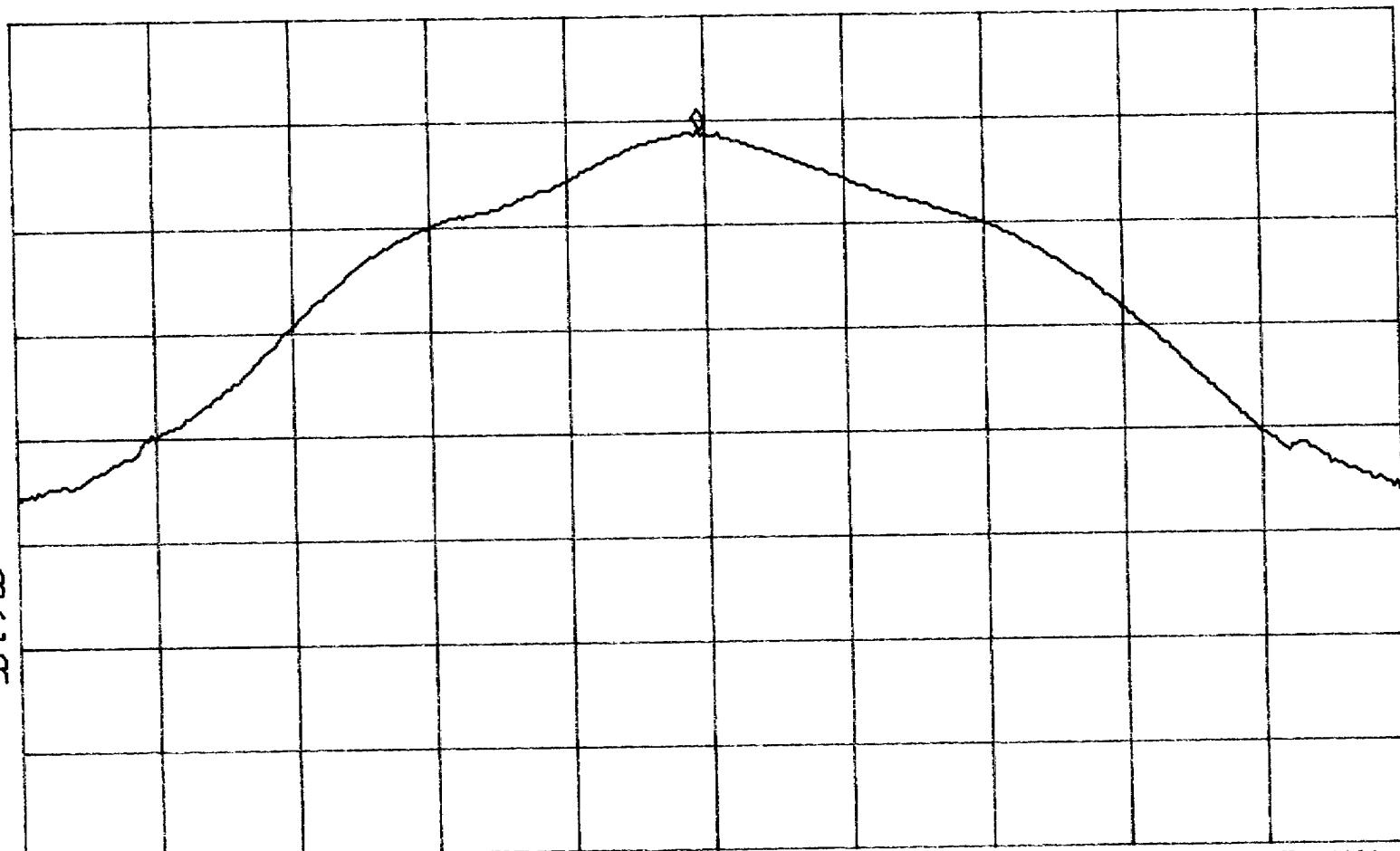
11:57:54 APR 15, 1998

REF .0 dBm

AT 10 dB

MKR 5.80982 GHz
-11.08 dBm

PEAK
LOG
10
dB/



CENTER 5.80992 GHz
#RES BW 3.0 MHz

VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

Out Of Band Lower Band Edge

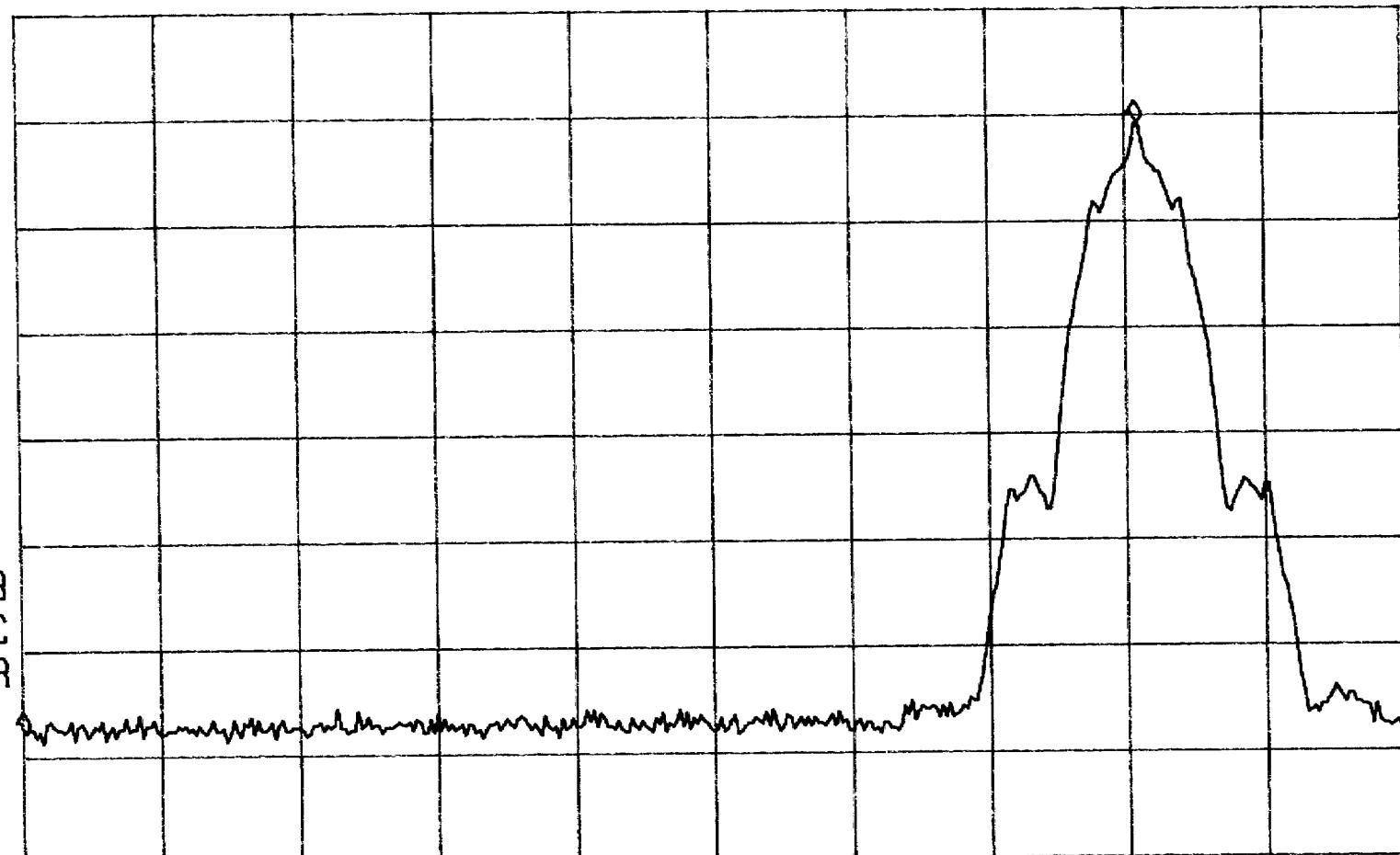
12:59:02 APR 15, 1998

REF .0 dBm

AT 10 dB

MKR_A -80.8 MHz
-56.85 dB

PEAK
LOG
10
dB/



START 5.6550 GHz

#RES BW 1.0 MHz

VBW 1 MHz

STOP 5.7550 GHz

SWP 20.0 msec

Out Of Band Upper Band Edge

13:05:00 APR 15, 1998

MKRA 80.0 MHz
-55.96 dB

REF .0 dBm

AT 10 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR

START 5.7900 GHz
#RES BW 1.0 MHz

VBW 1 MHz

STOP 5.8900 GHz
SWP 20.0 msec

Out Of Band 30 MHz - 6 GHz

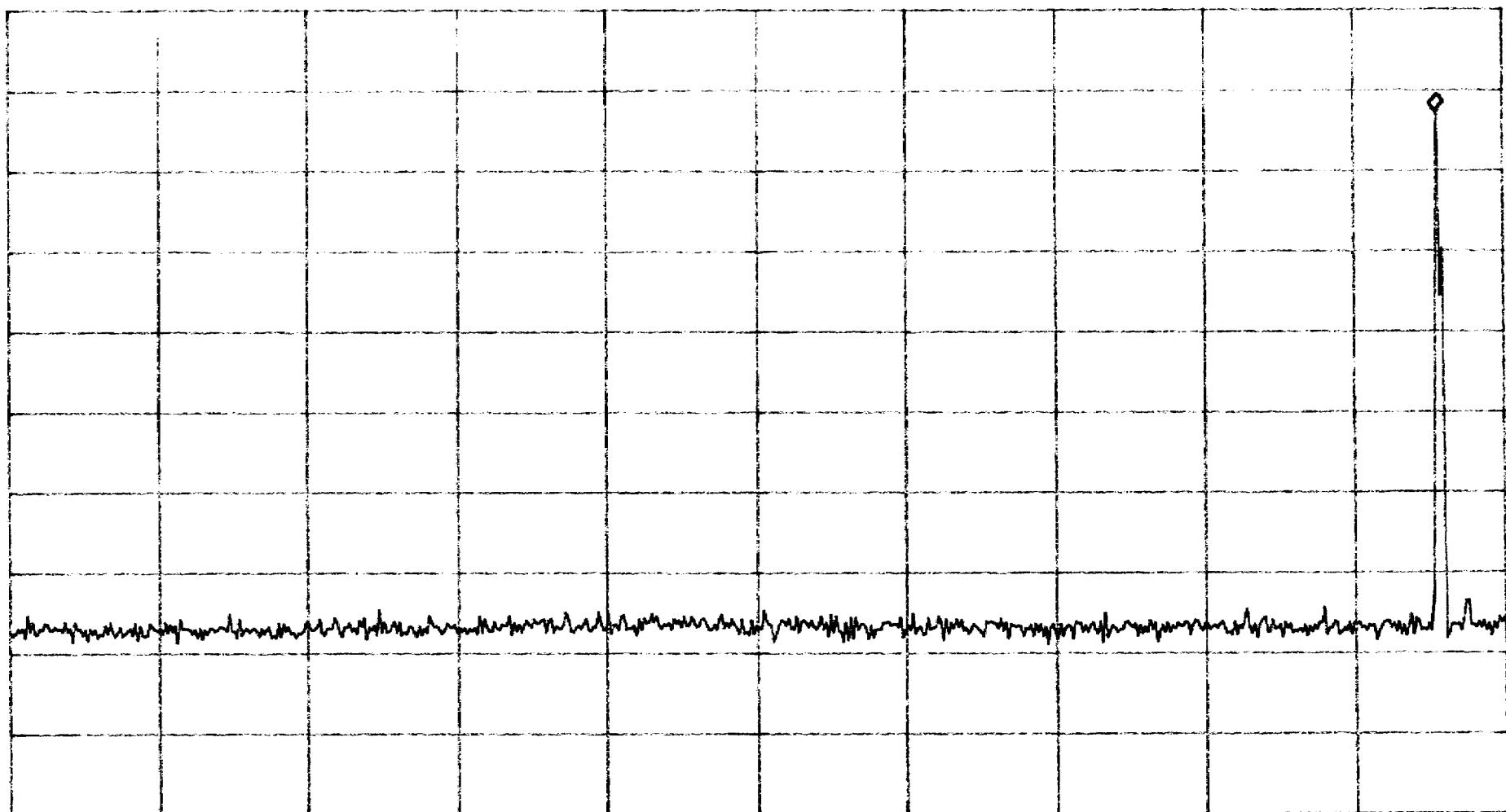
ATTEN 10dB

RL 0dBm

10dB/

MKR - 12.50dBm

5.731GHz



START 30MHz

*RBW 100kHz

STOP 6.000GHz

*VBW 100kHz

SWP 1.50sec

Out Of Band 6 - 13 GHz

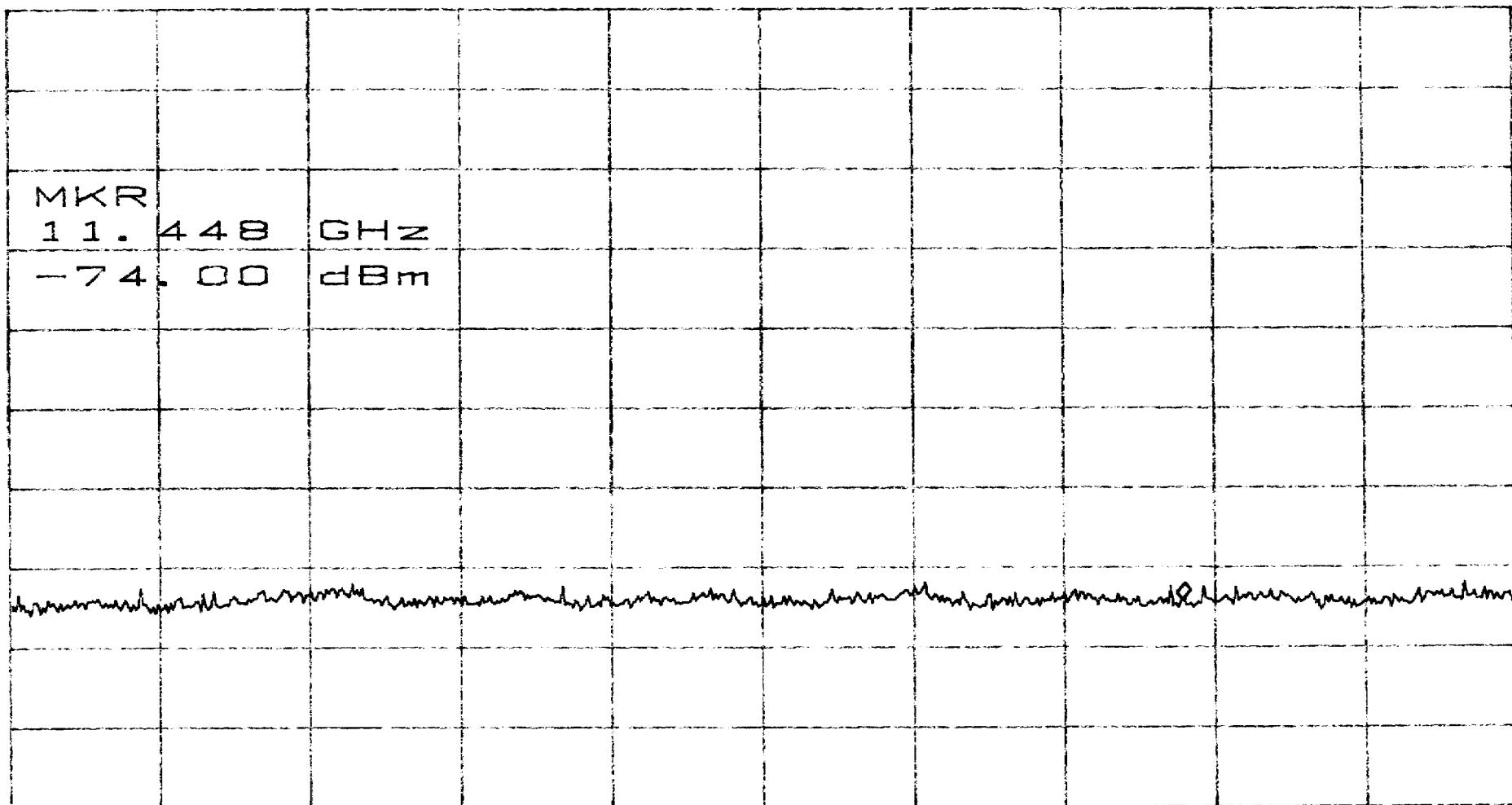
ATTEN 10dB

RL 0dBm

10dB/

MKR -74.00dBm

11.448GHz



START 6.000GHz

STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

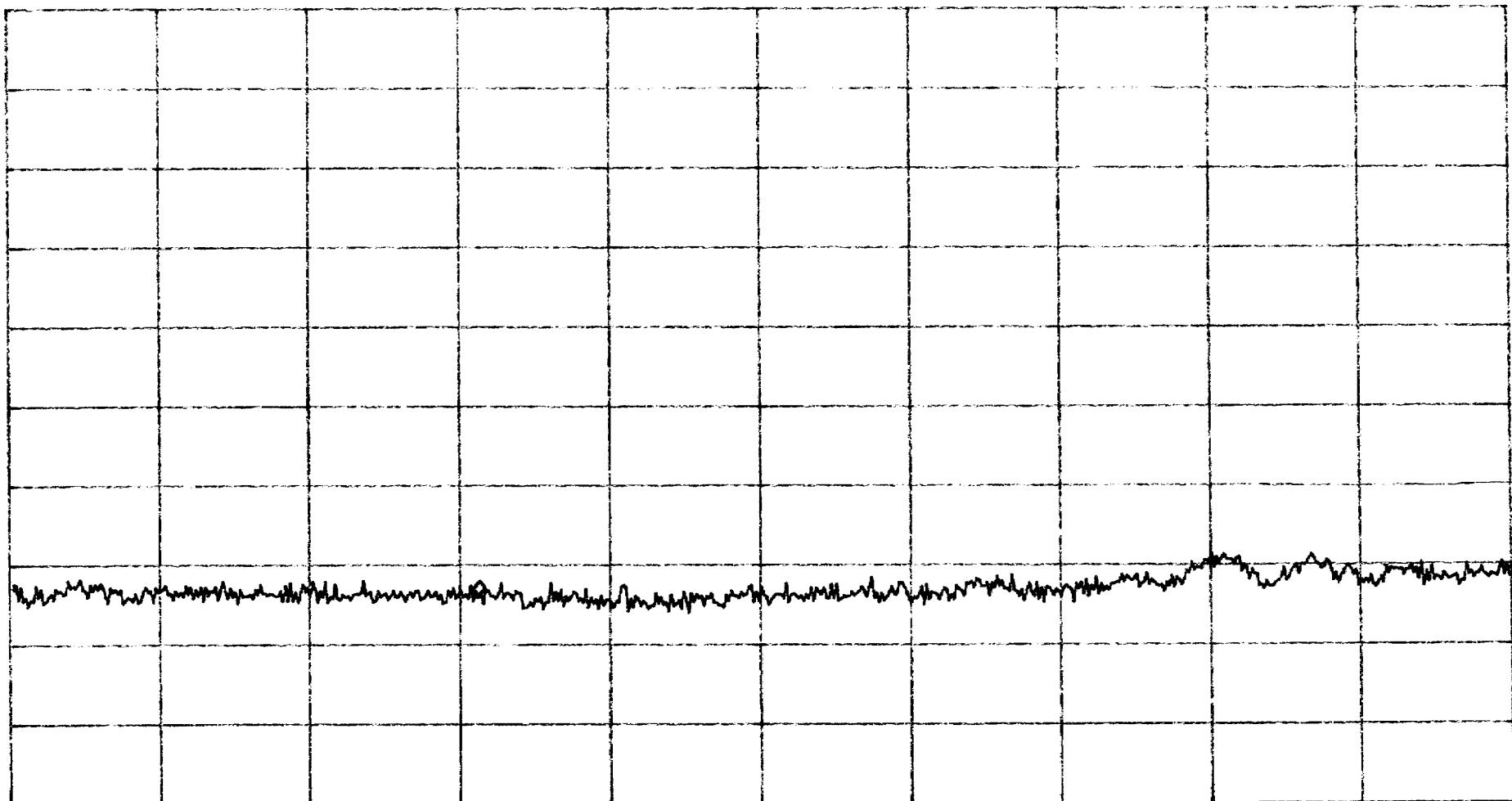
ATTEN 10dB

RL 0dBm

10dB/

MKR -74.00dBm

17.21GHz



START 13.00GHz

STOP 26.50GHz

*RBW 100kHz

*VBW 100kHz

SWP 3.40sec

Out of Band 26.5 - 31 GHz

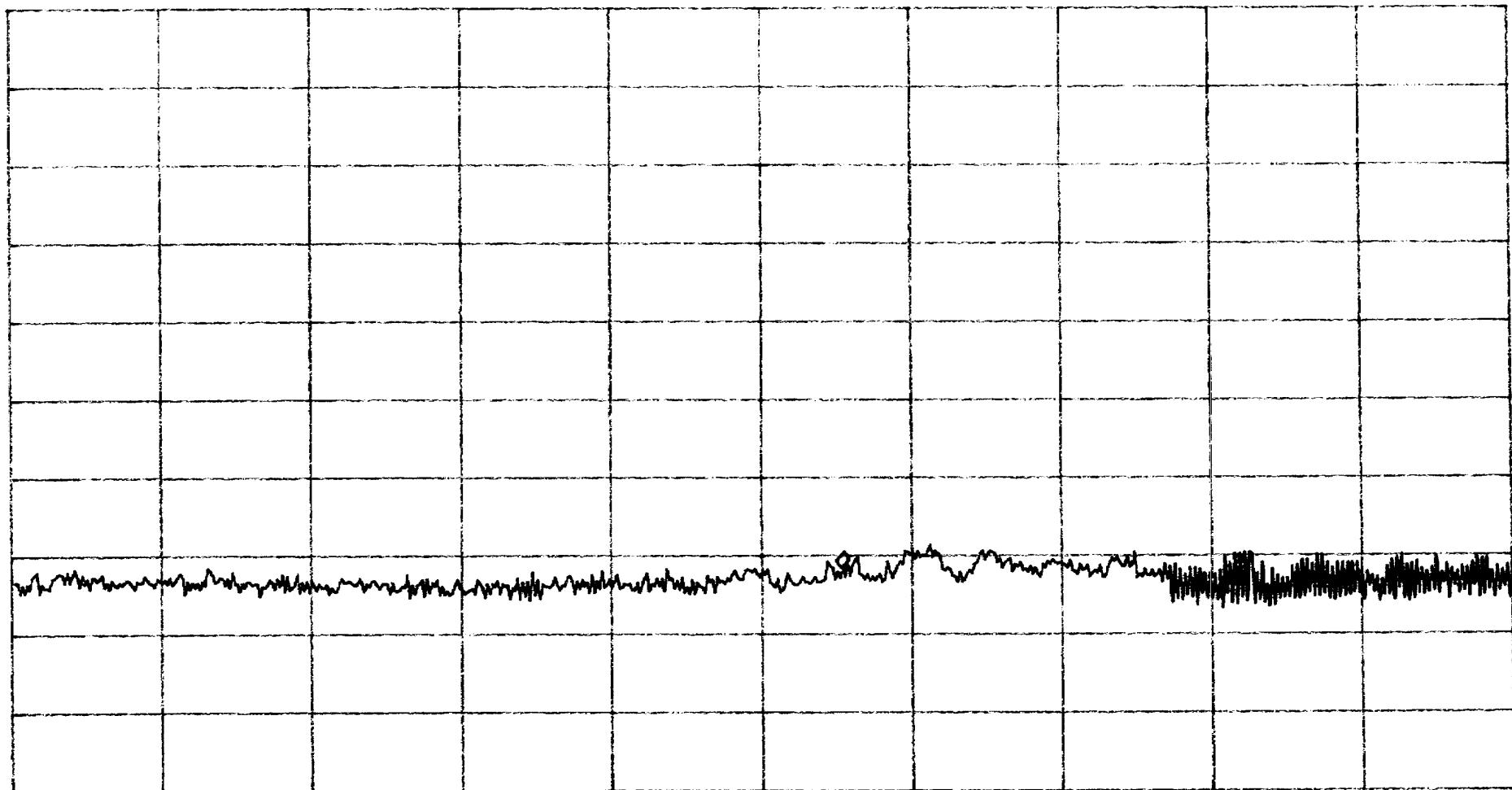
ATTEN 10dB

MKR -71.50dBm

RF 0dBm

10dB/

22.96GHz



START 13.00GHz

STOP 31.00GHz

*RBW 100kHz

*VBW 100kHz

SWP 4.50sec

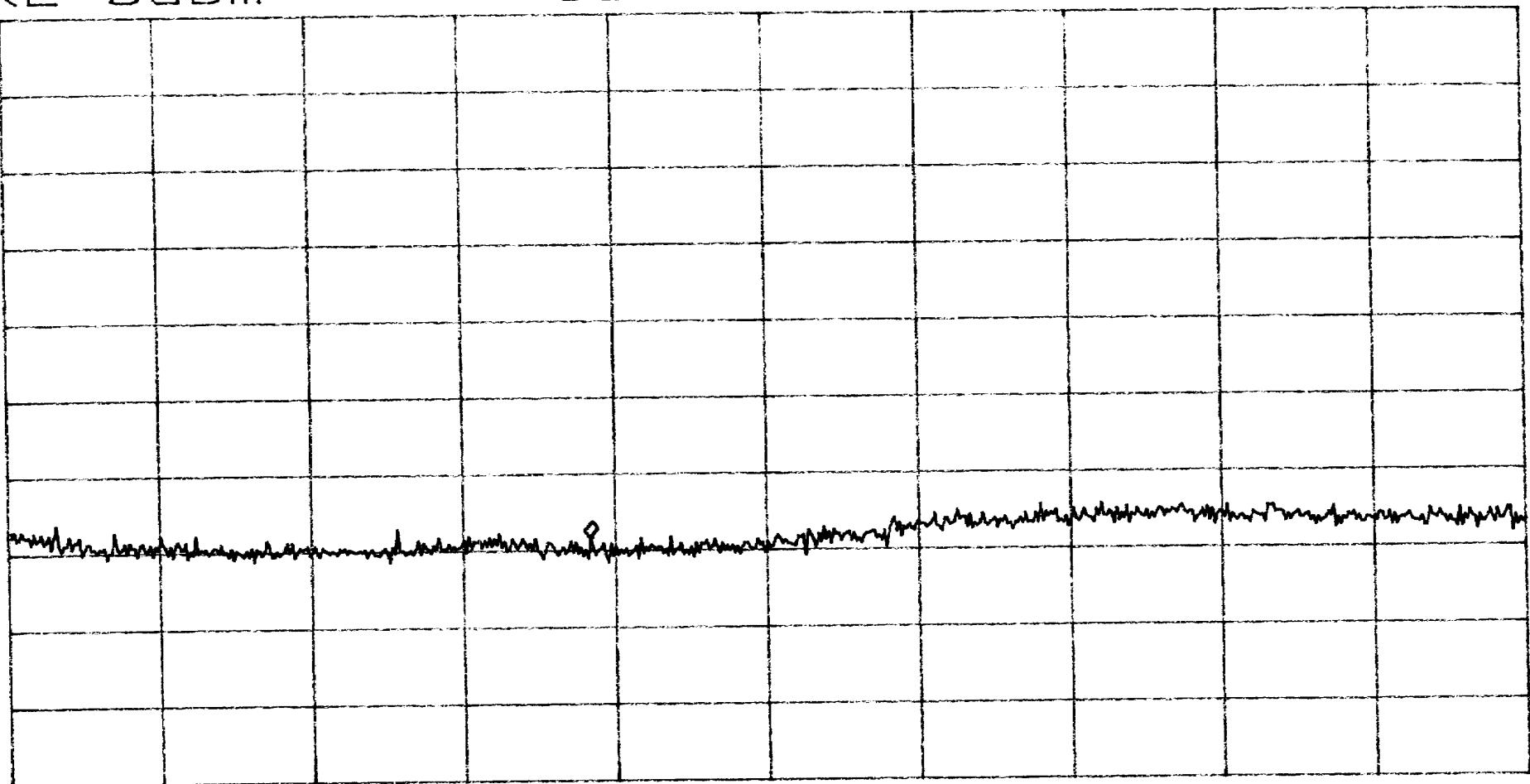
Out of Band 31 - 40 GHz

ATTEN 10dB

RL 0dBm

10dB/

MKR -68. 17dBm
34. 450GHz



START 31.000GHz
*RBW 100KHz

*VBW 100KHz

STOP 40.000GHz
SWP 2.30sec

Out Of Band 30 MHz - 6 GHz

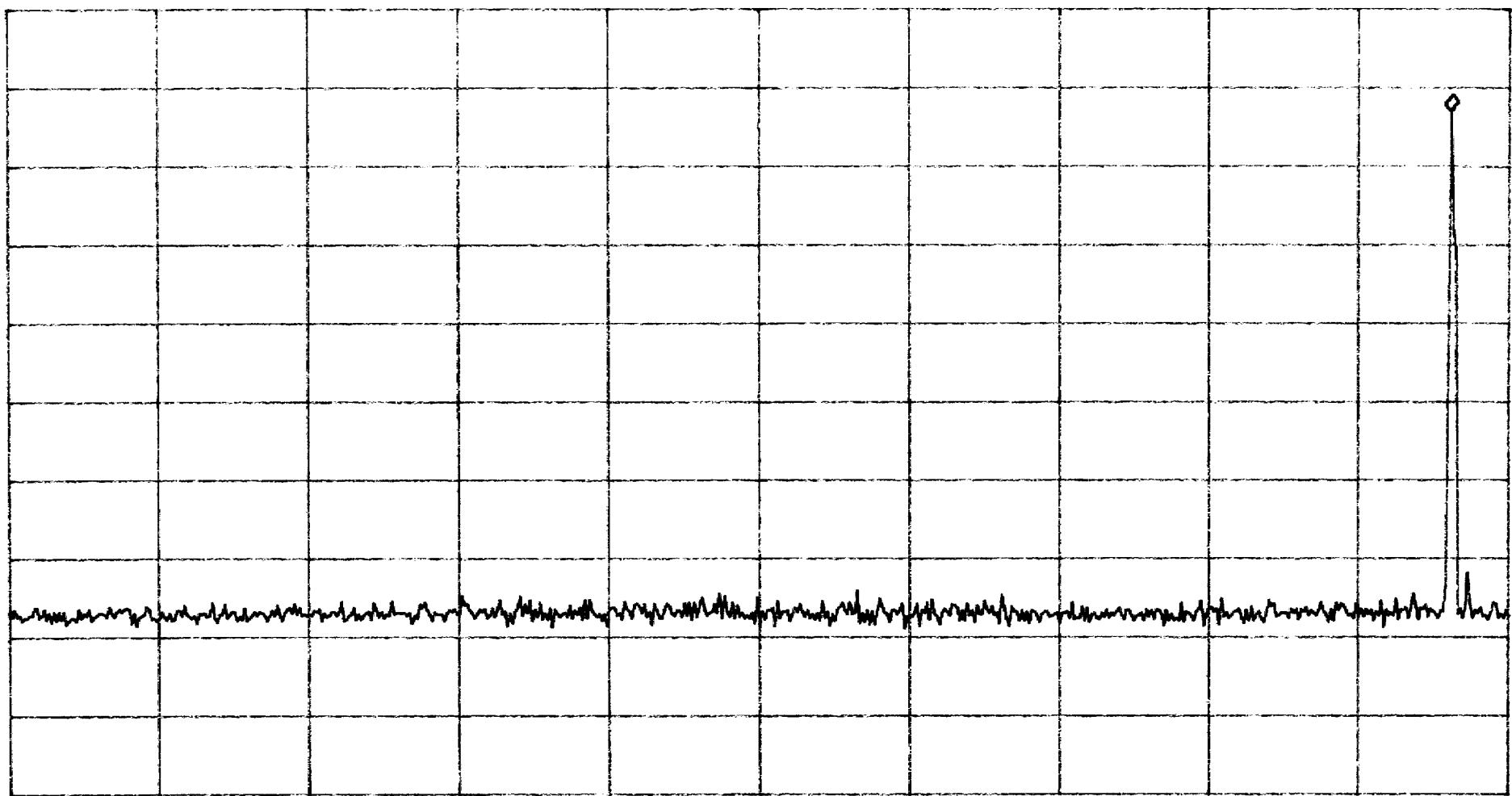
ATTEN 10dB

RF 0dBm

10dB/

MKR - 12.83dBm

5.771GHz



START 30MHz

RBW 100kHz

*VBW 100kHz

STOP 6.000GHz

SWP 1.50sec

Out Of Band 6 - 13 GHz

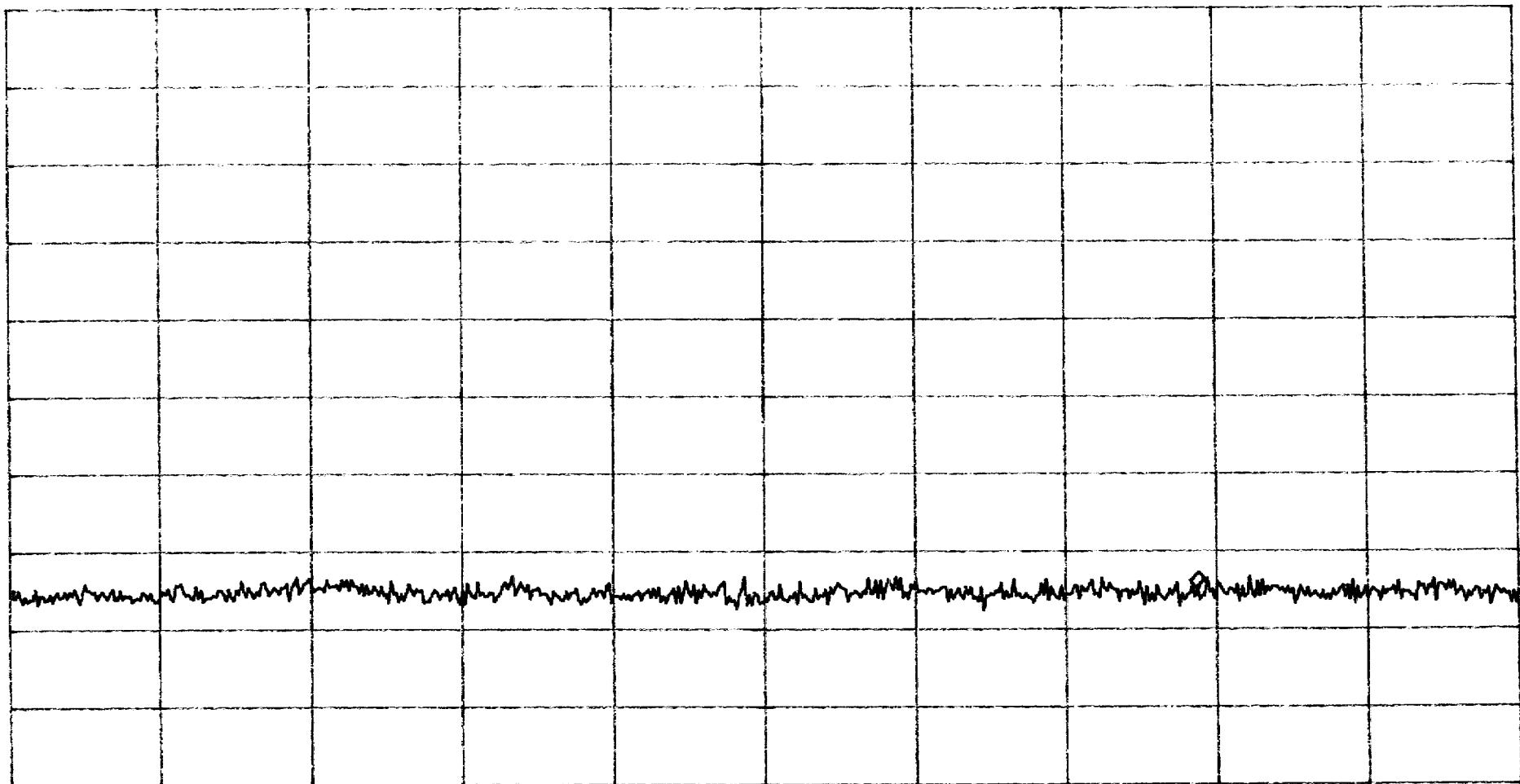
ATTEN 10dB

RL 0dBm

10dB/

MKR -74.67dBm

11.507GHz



START 6.000GHz

*RBW 100kHz

STOP 13.000GHz

SWP 1.80sec

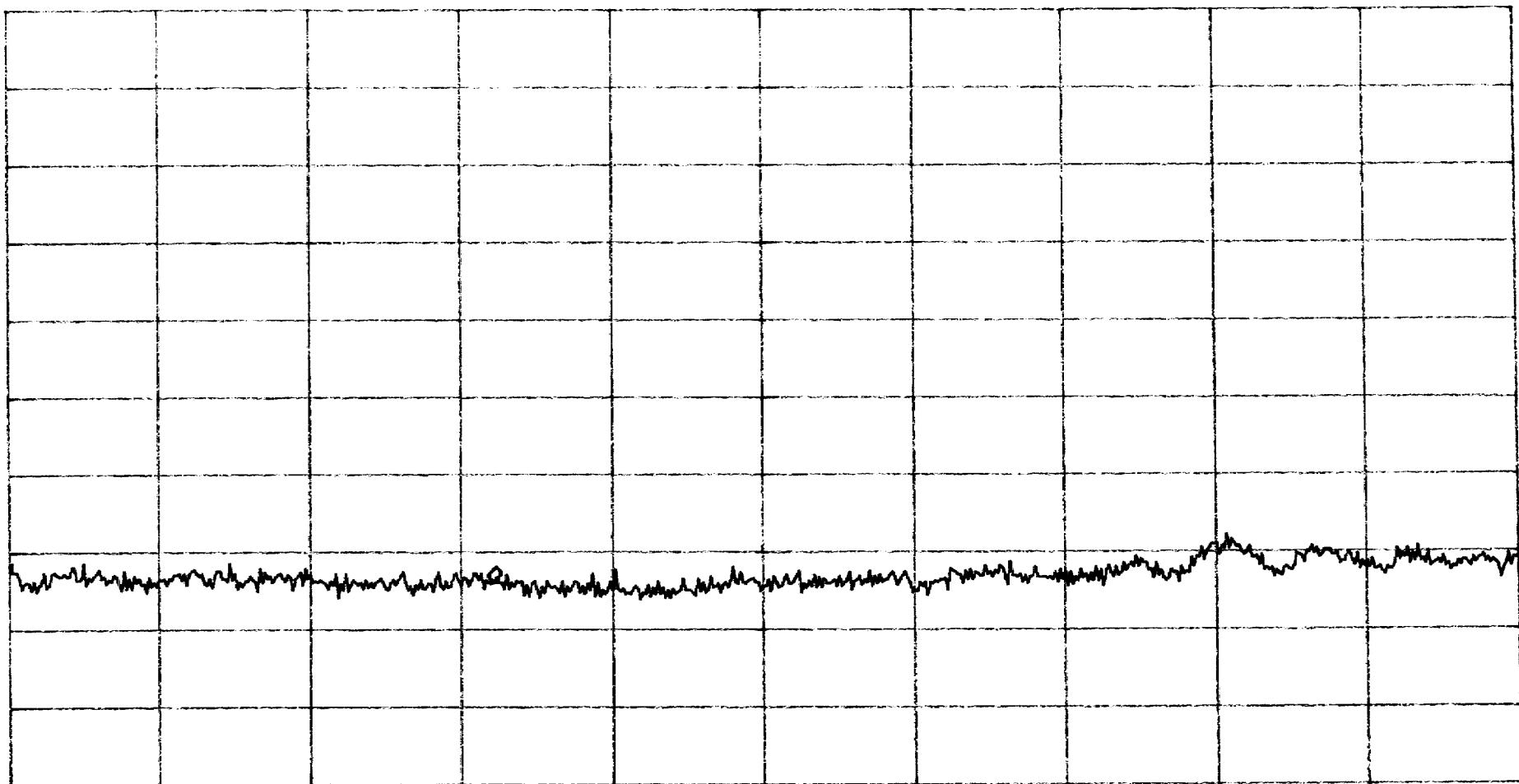
*VBW 100kHz

Out of Band 13 - 26.5 GHz

ATTEN 10dB
RF 0dBm

10dB/

MKR -73.83dBm
17.34GHz



START 13.00GHz

*RBW 100kHz

STOP 26.50GHz

*VBW 100kHz

SWP 3.40sec

Out of Band 26.5 - 31 GHz

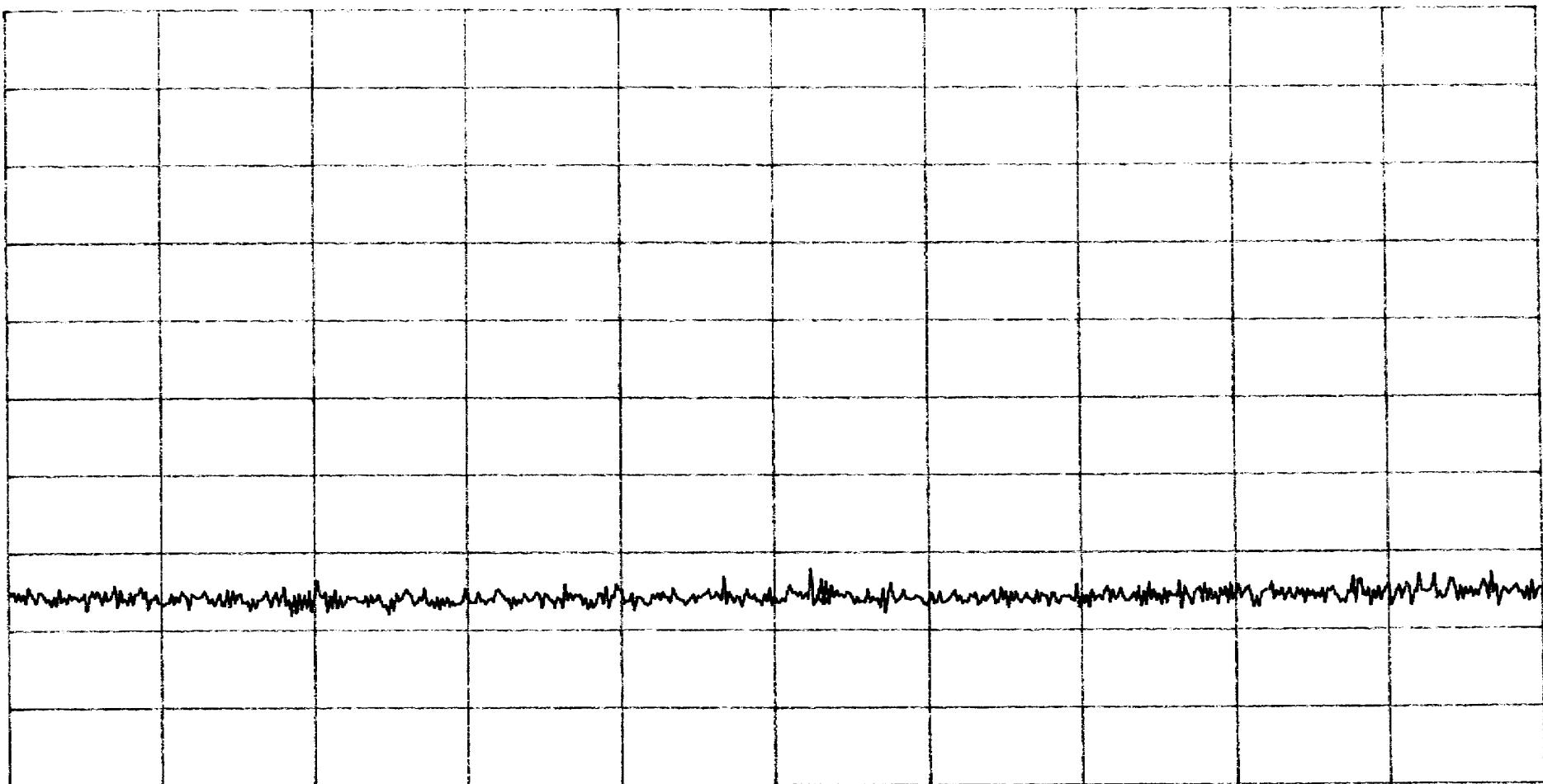
ATTEN 10dB

RF 0dBm

10dB/

MKR -76.50dBm

28.893GHz



START 26.500GHz

*RBW 100kHz

STOP 31.000GHz

SWP 1.20sec

Out of Band 31 - 40 GHz

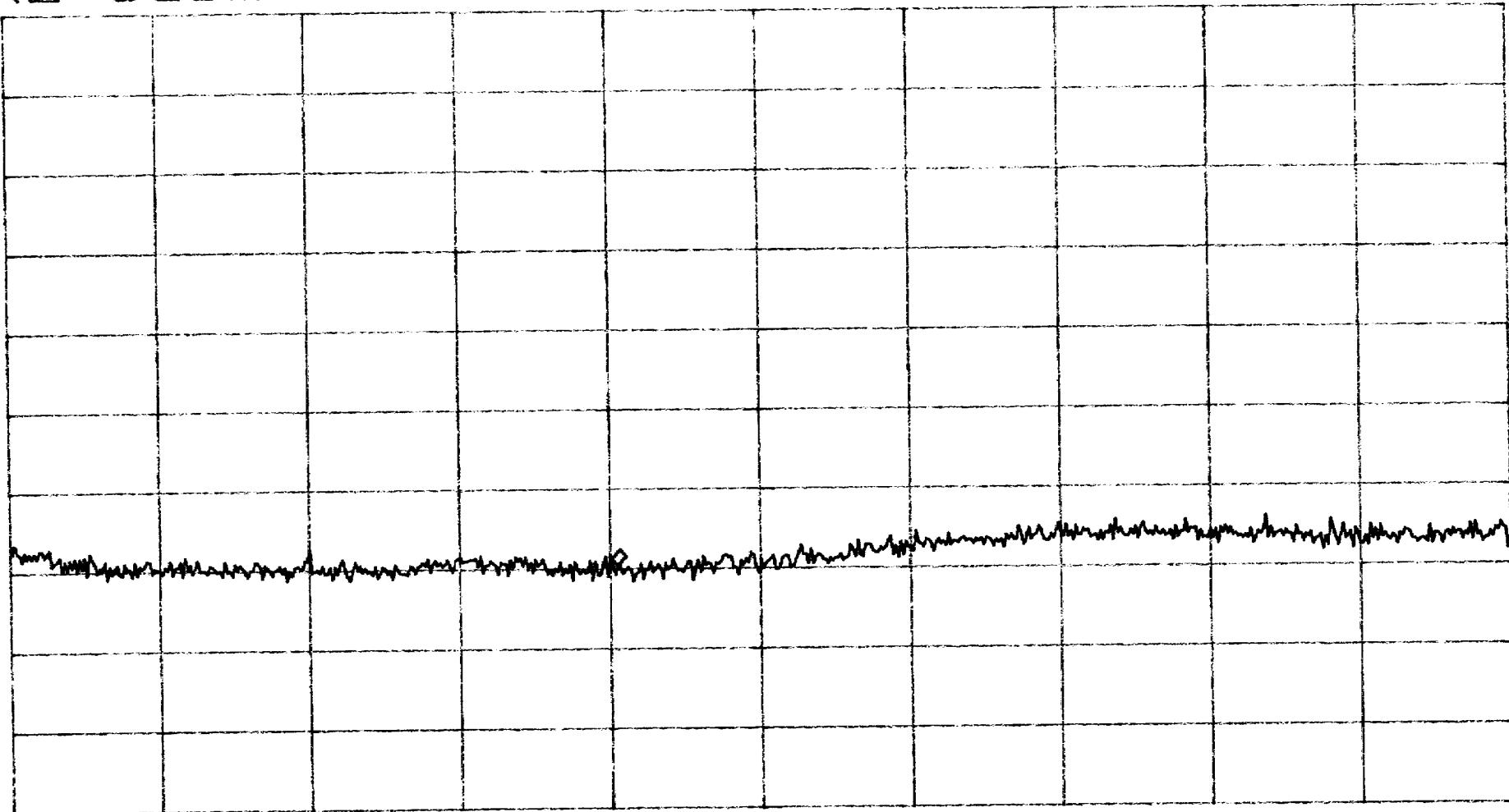
ATTEN 10dB

RF 0dBm

10dB/

MKR -69.50dBm

34.645GHz



START 31.000GHz

STOP 40.000GHz

*RBW 100kHz

*VBW 100kHz

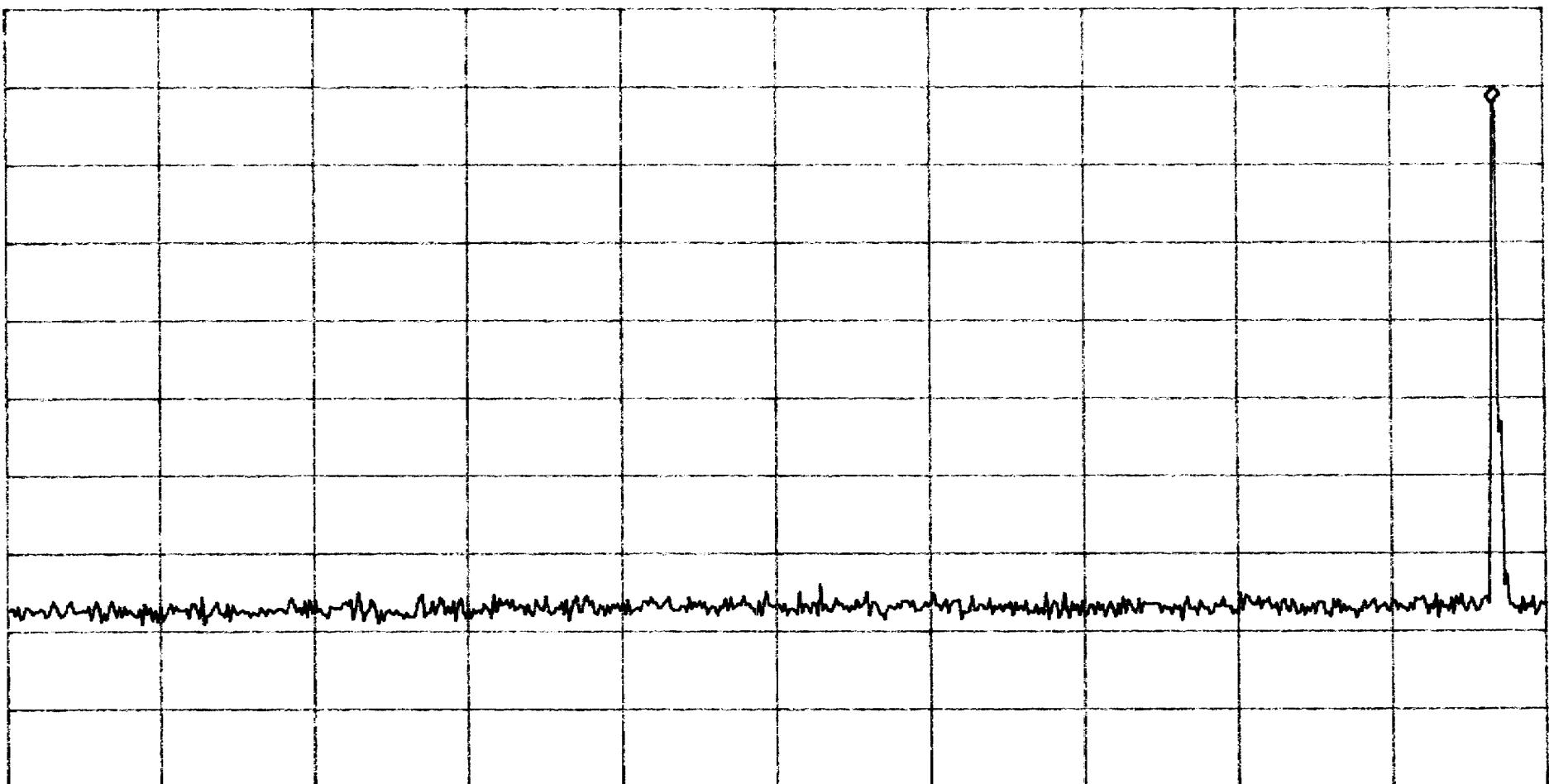
SWP 2.30sec

Out Of Band 30 MHz - 6 GHz

ATTEN 10dB
RL 0dBm

10dB/

MKR -12.00dBm
5.801GHz



START 30MHz
RBW 100kHz

*VSWR 100kHz

STOP 6.000GHz
SWP 1.50sec

Out Of Band 6 - 13 GHz

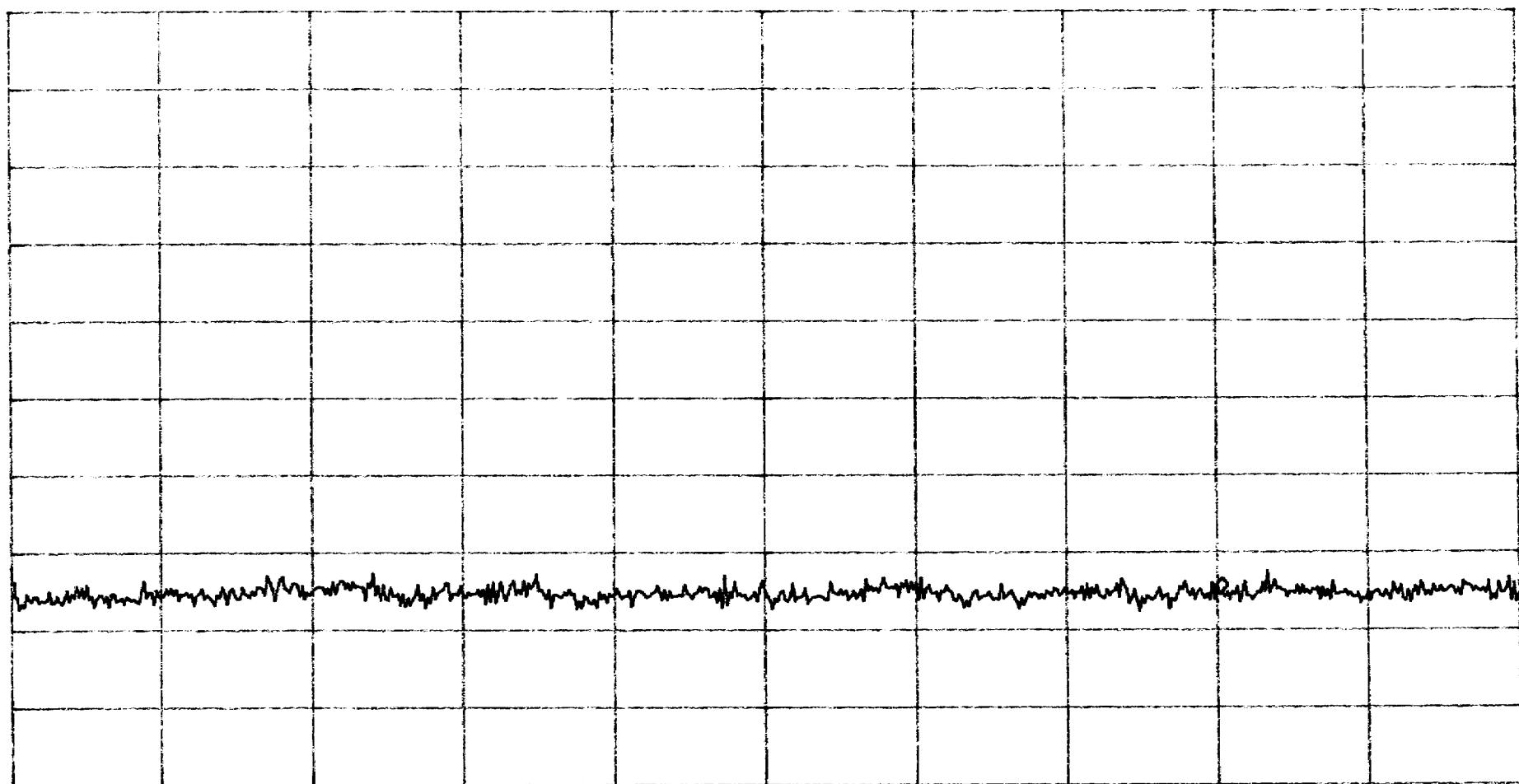
ATTEN 10dB

REF 0dB

10dB/

MKR -75.33dBm

11.612GHz



START 6.000GHz

STOP 13.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

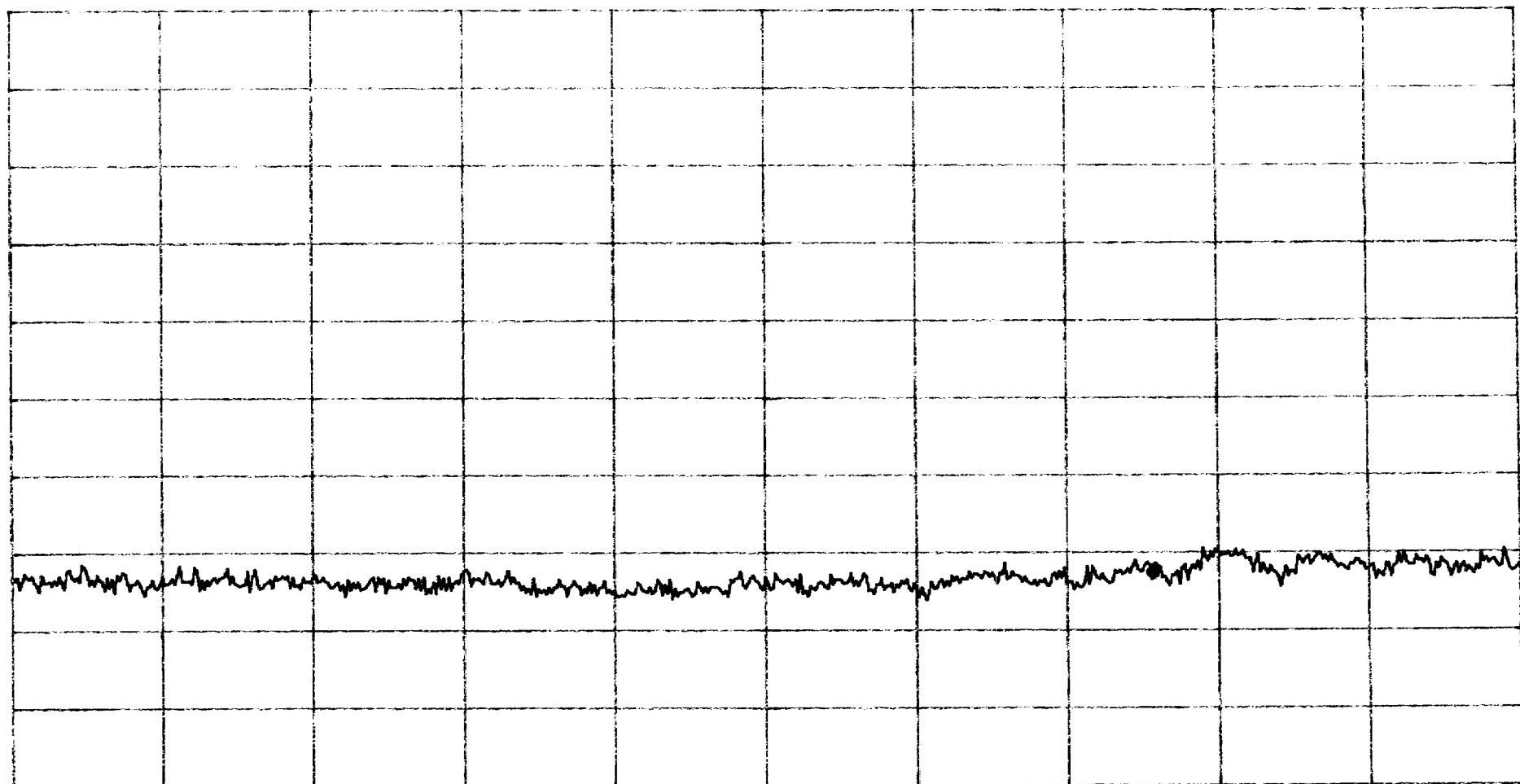
ATTEN 10dB

RF 0dBm

10dB/

MKR -73.33dBm

23.22GHz



START 13.00GHz

*RBW 100kHz

STOP 26.50GHz

SWP 3.40sec

Out of Band 26.5 - 31 GHz

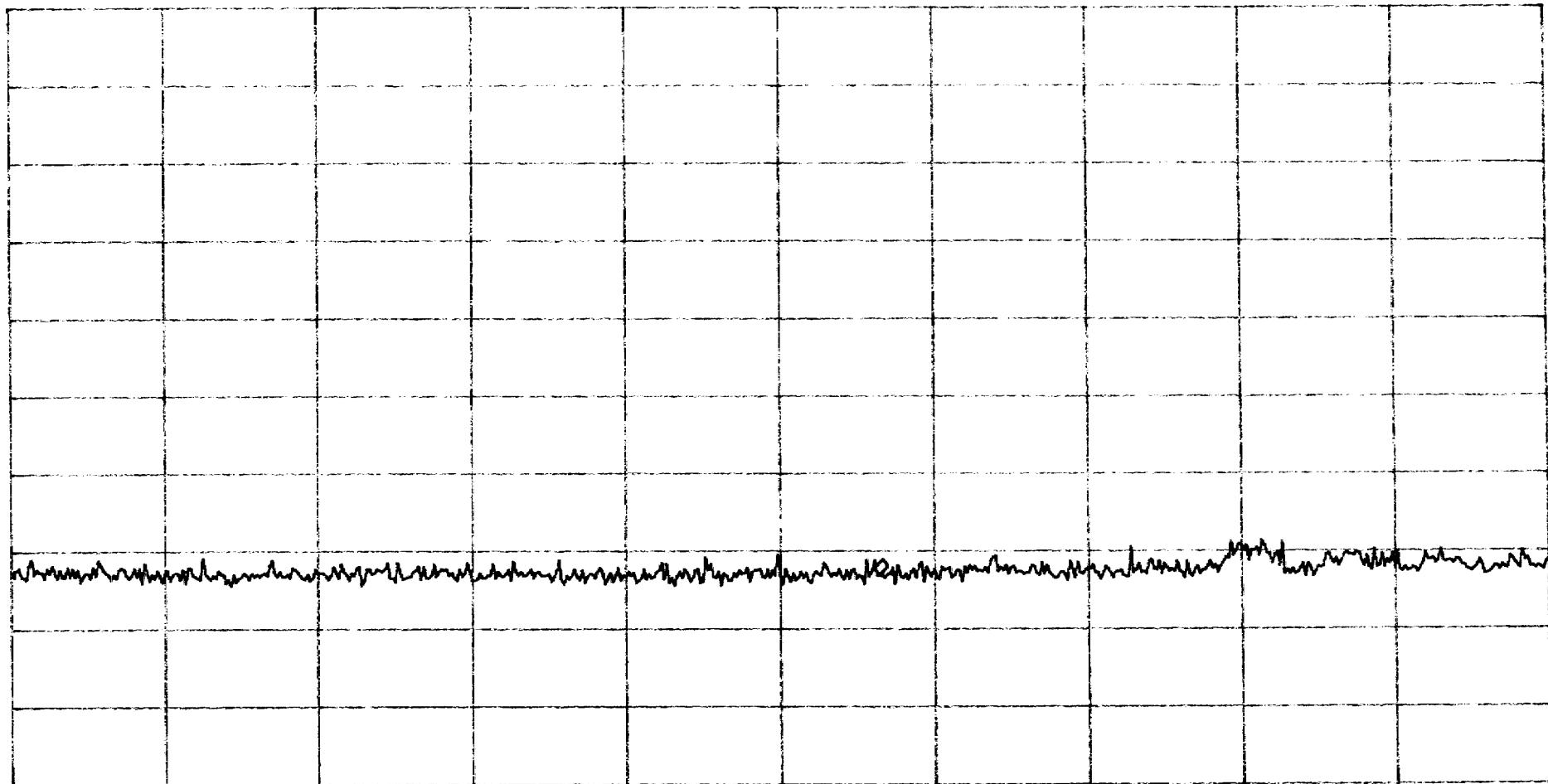
ATTEN 10dB

RF 0dBm

10dB/

MKR -73.00dBm

29.043GHz



START 26.500GHz

STOP 31.000GHz

*RBW 100kHz

*VBW 100kHz

SWP 1.20sec

Out of Band 31 - 40 GHz

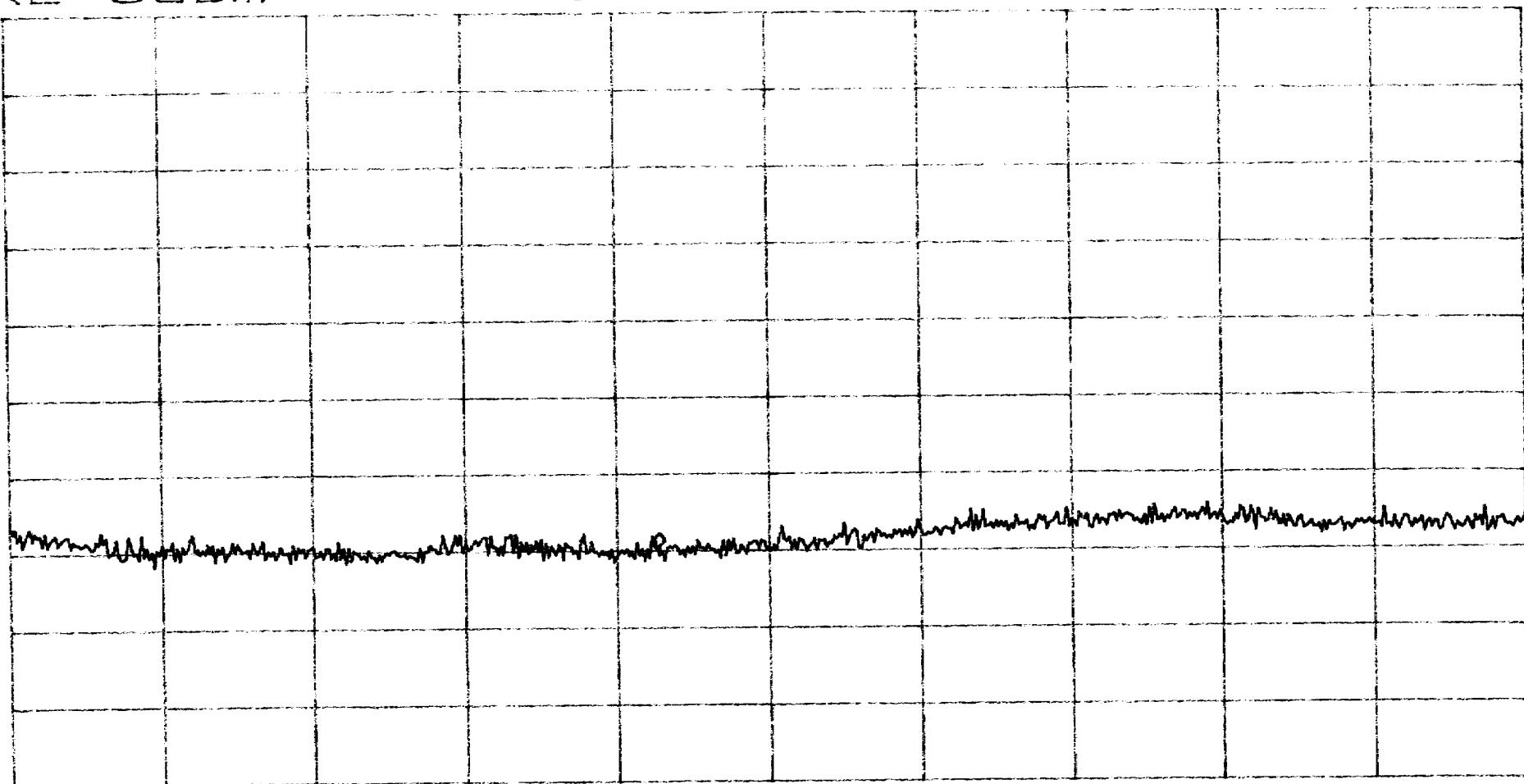
ATTEN 10dB

RBW 100KHz

10dB/

MKR -69.67dBm

34.840GHz



START 31.000GHz

*RBW 100KHz

STOP 40.000GHz

*VBW 100KHz

SWP 2.30sec

High Power Setting

Peak Spectral Power Density

09:34:39 APR 15, 1998

REF .0 dBm

AT 10 dB

MKR 5.735668 GHz

-5.72 dBm

PEAK

LOG

10

dB/

VA SB

SC FC

CDRR

CENTER 5.735680 GHz

#RES BW 1.0 MHz

VBW 1 MHz

SPAN 1.000 MHz

#SWP 100 sec

Peak Spectral Power Density

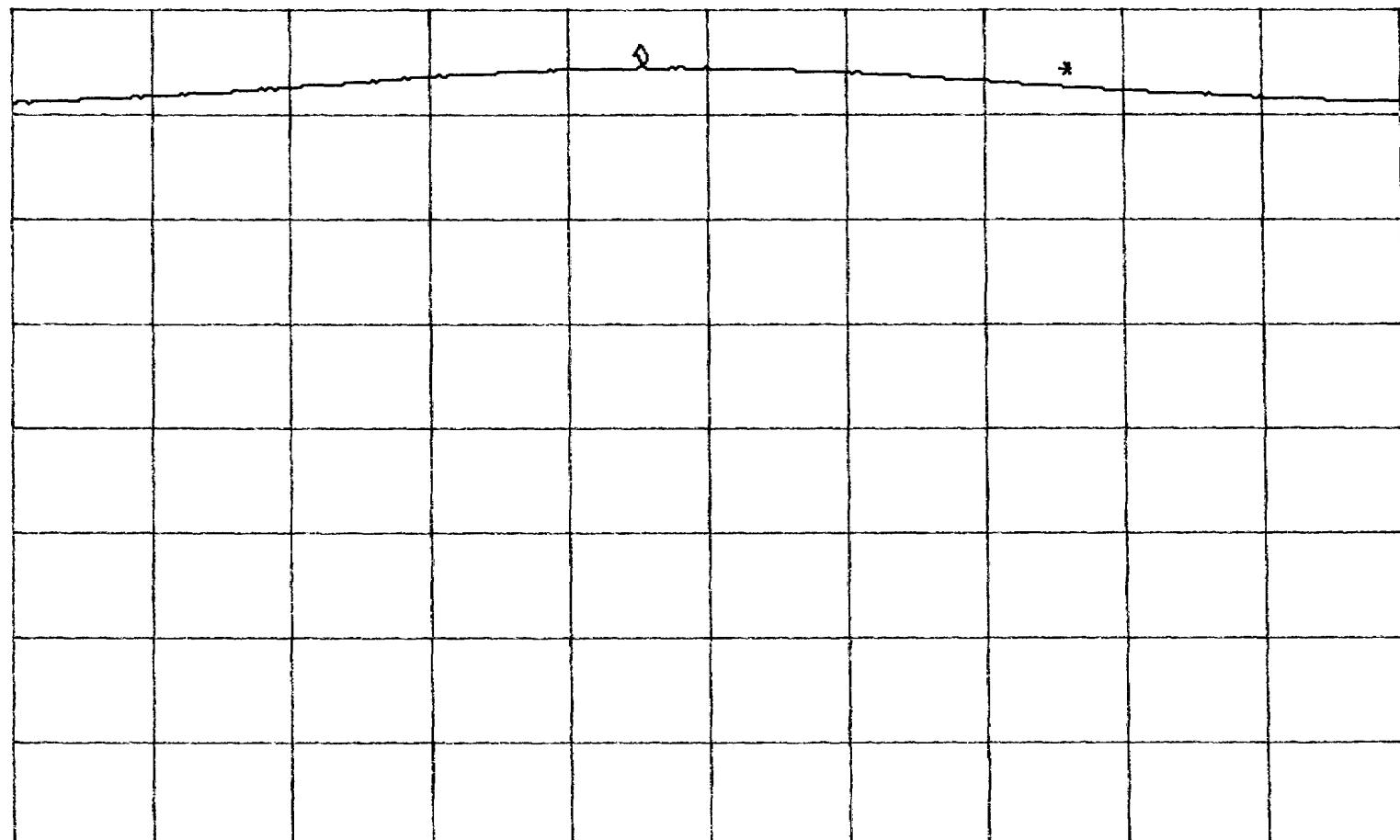
09:56:25 APR 15, 1998

MKR 5.776593 GHz
-5.44 dBm

REF .0 dBm

AT 10 dB

PEAK
LDC
10
dB/



VA SB
SC FC
CDRR

CENTER 5.776640 GHz
#RES BW 1.0 MHz

VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec

Peak Spectral Power Density

11:27:07 APR 15, 1998

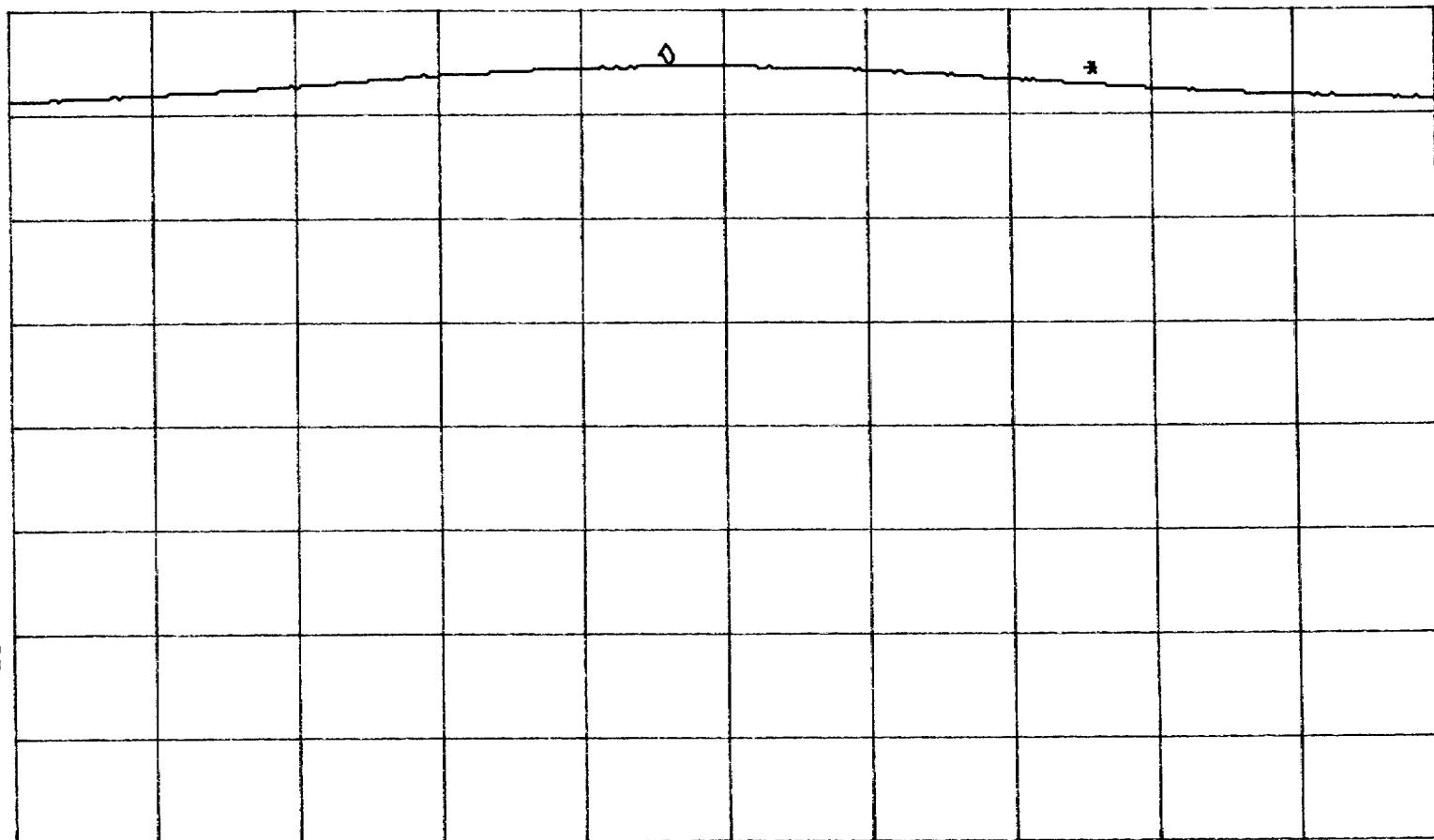
MKR 5.809900 GHz

REF .0 dBm

AT 10 dB

-5.30 dBm

PEAK
LOG
10
dB/



VA SB
SC FC
CDRR

CENTER 5.809920 GHz
#RES BW 1.0 MHz

VBW 1 MHz

SPAN 1.000 MHz
#SWP 100 sec

Power Out

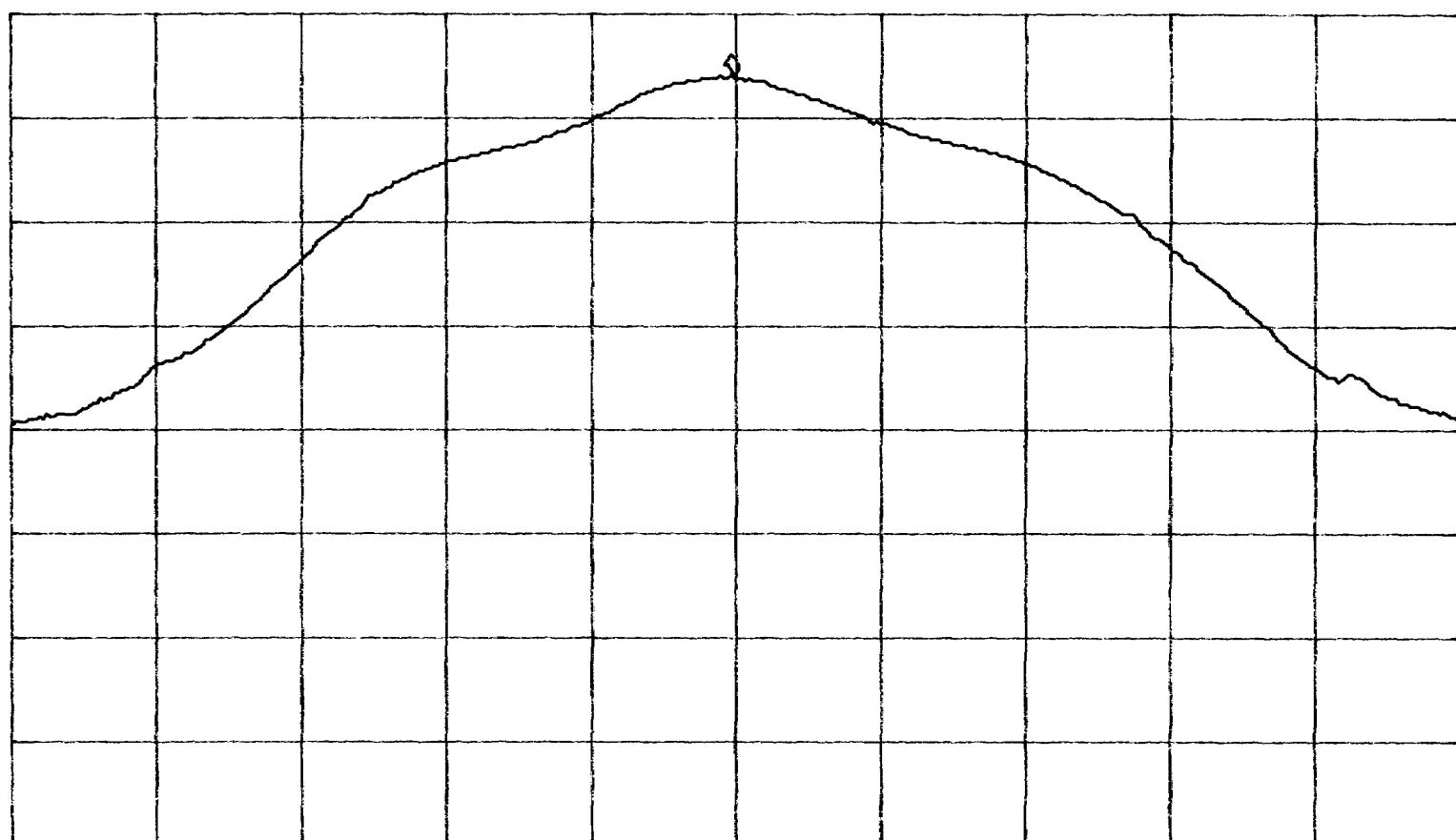
[6] 09:11:44 APR 15, 1998

REF .0 dBm

AT 10 dB

MKR 5.73563 GHz
-5.84 dBm

PEAK
LDG
10
dB/



CENTER 5.73568 GHz
#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

Power Out

CD 09:37:27 APR 15, 1998

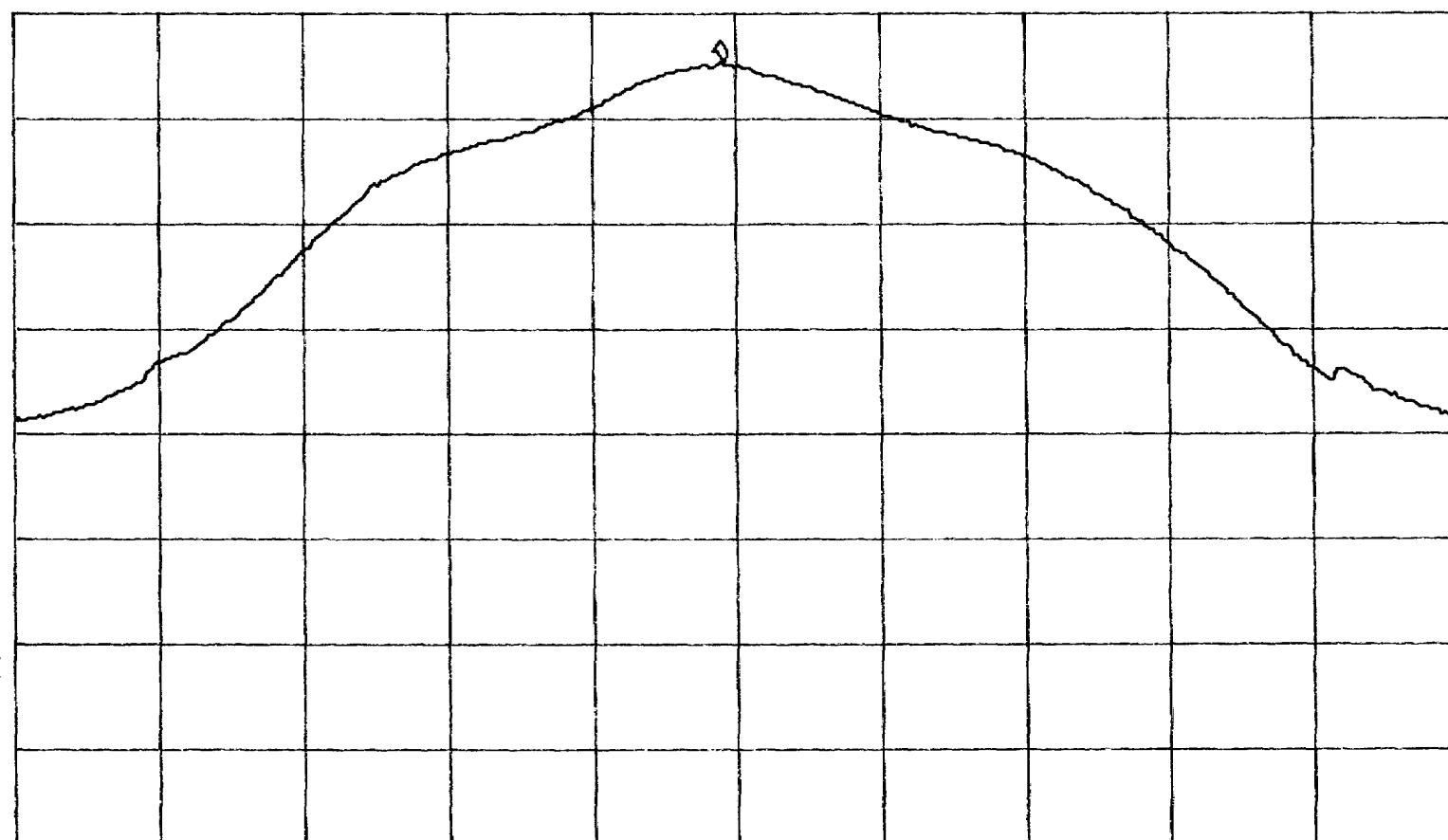
REF .0 dBm

AT 10 dB

MKR 5.77644 GHz

-4.52 dBm

PEAK
LOG
10
dB/



CENTER 5.77664 GHz

#RES BW 3.0 MHz

VBW 3 MHz

SPAN 20.00 MHz

SWP 20.0 msec

Power Out

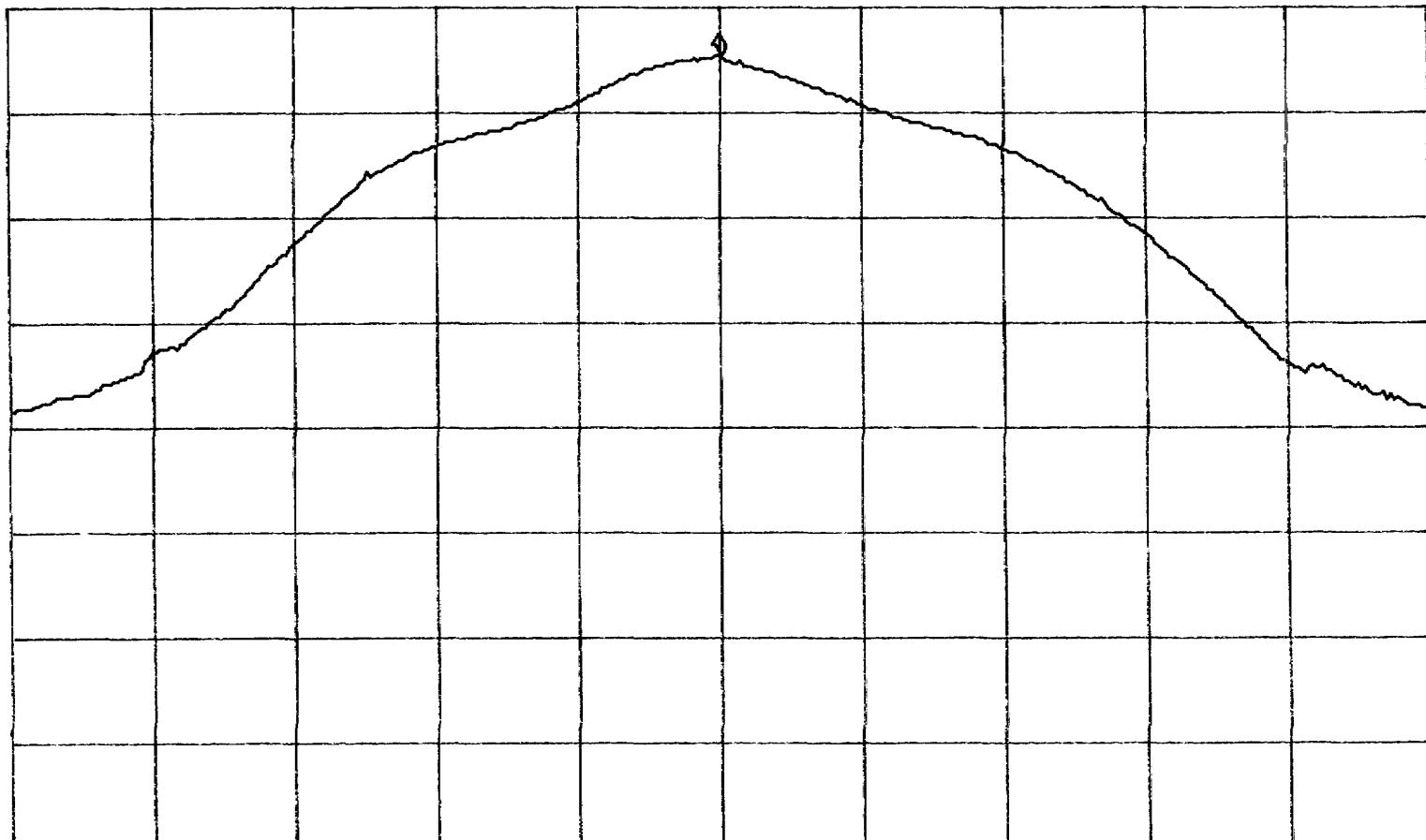
11:34:11 APR 15, 1998

MKR 5.80992 GHz
-4.59 dBm

REF .0 dBm

AT 10 dB

PEAK
LOG
10
dB/



VA SB
SC FC
CORR

CENTER 5.80992 GHz
#RES BW 3.0 MHz

VBW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

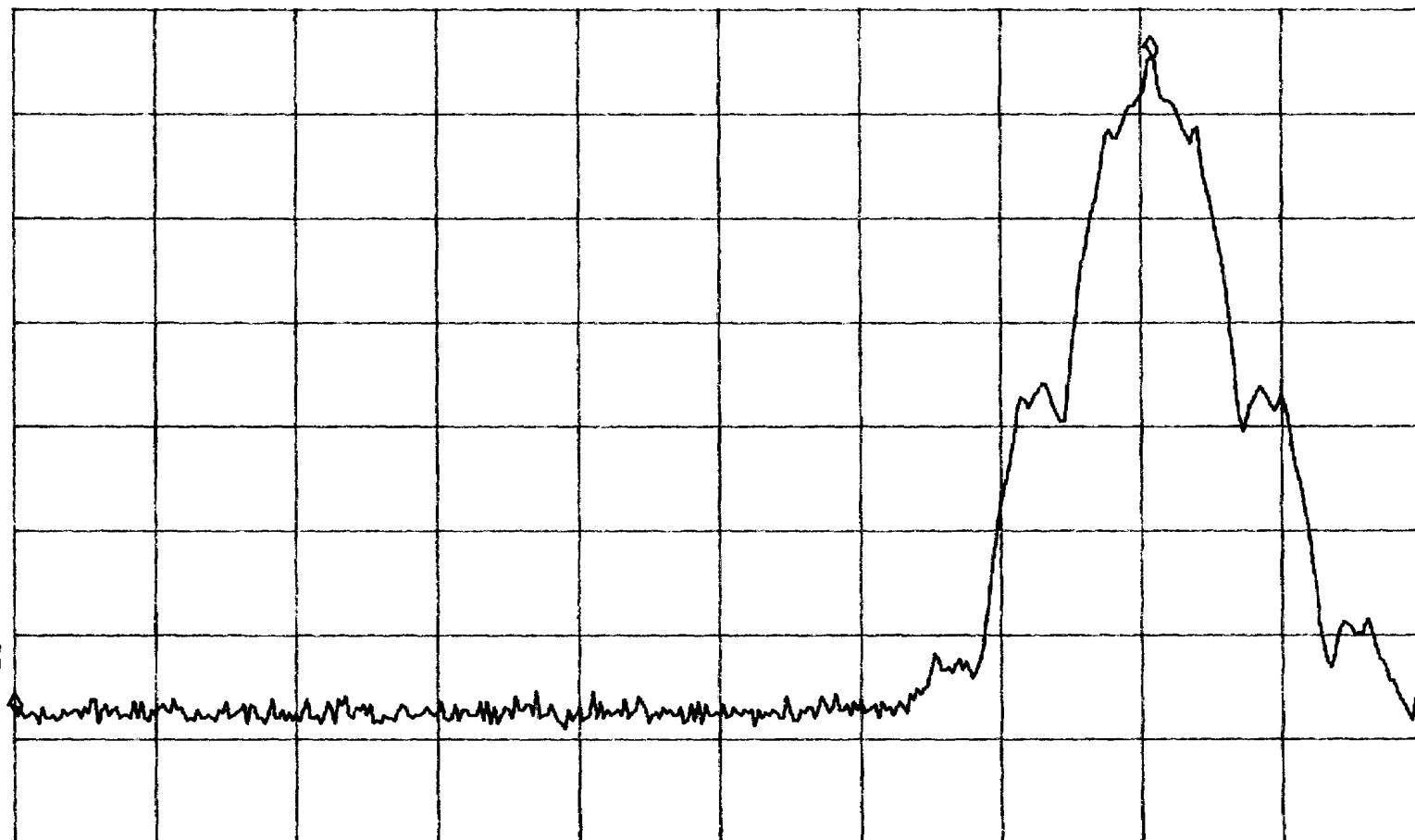
Out Of Band Lower Band Edge

CP 13:09:36 APR 15, 1998

REF .0 dBm AT 10 dB

MKR_A - 80.8 MHz
- 62.98 dB

PEAK
LOG
10
dB/



START 5.6550 GHz

#RES BW 1.0 MHz

VBW 1 MHz

STOP 5.7550 GHz

SWP 20.0 msec

Out Of Band Upper Band Edge

13:06:53 APR 15, 1998

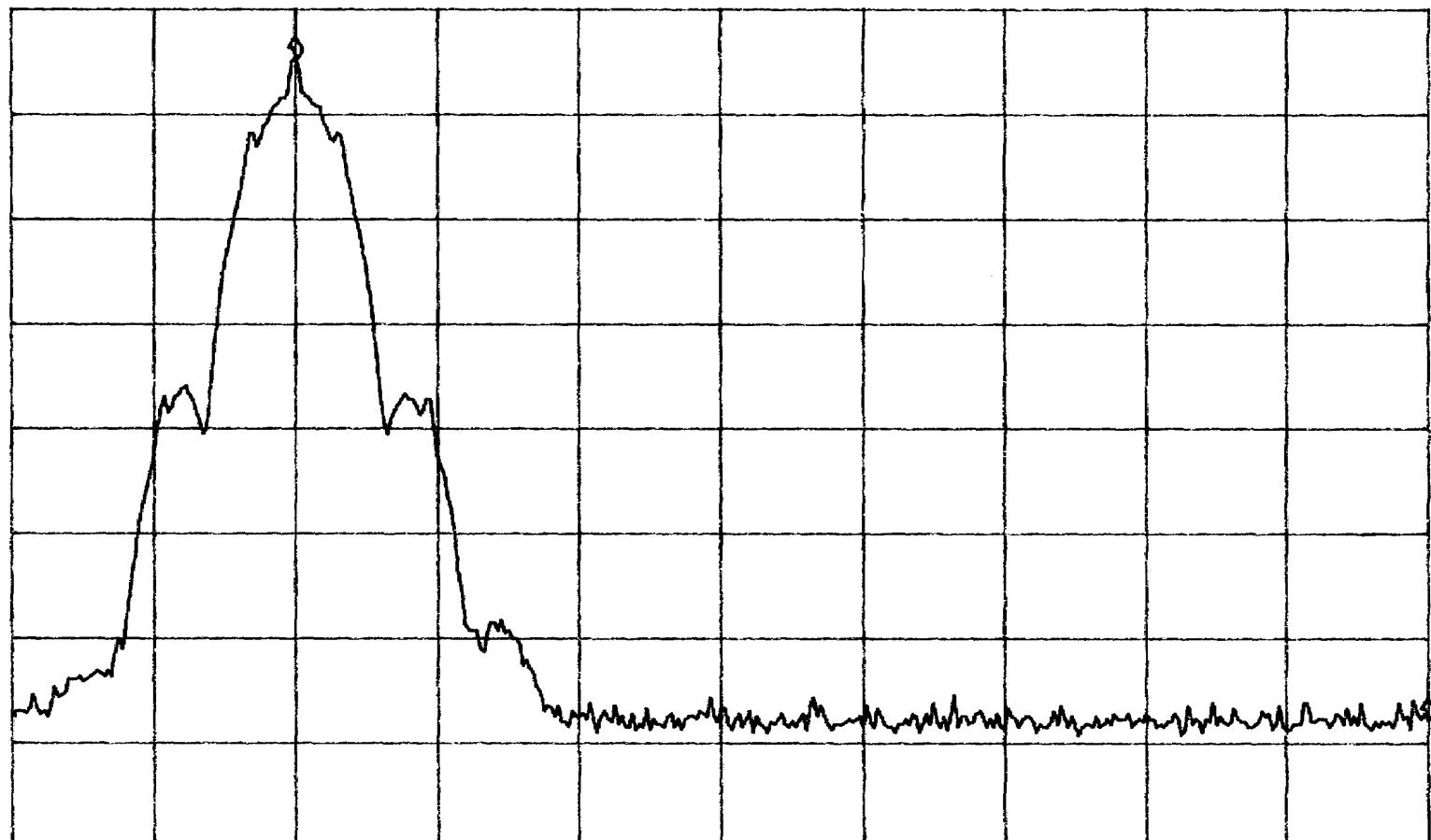
REF .0 dBm

AT 10 dB

MKR_Δ 80.0 MHz

-62.97 dB

PEAK
LOG
10
dB/



Out Of Band 30 MHz - 6 GHz

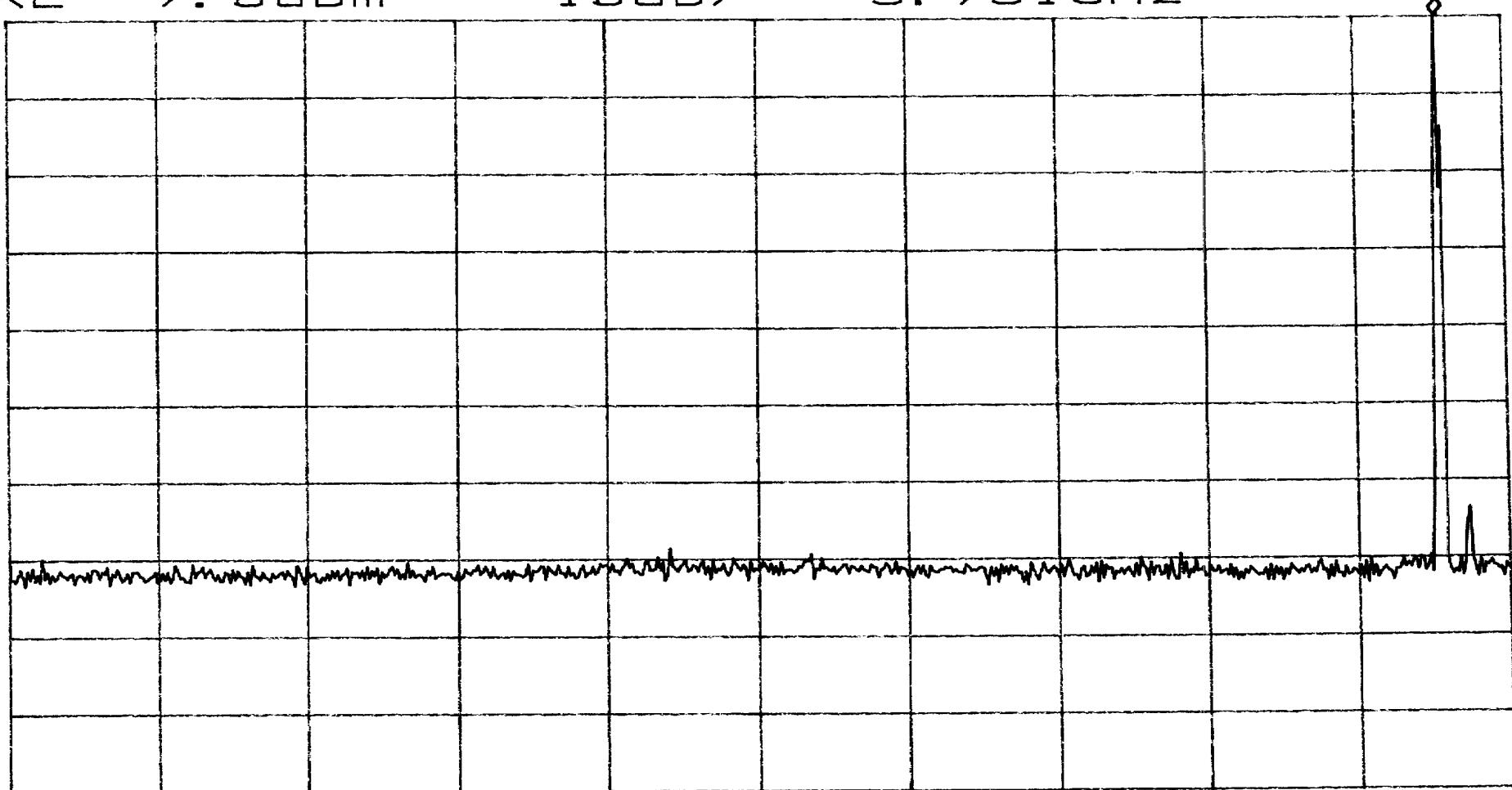
ATTEN 10dB

RL -7.0dBm

10dB/

MKR -6.67dBm

5.731GHz



START 30MHz

RBW 100kHz

VBW 100kHz

STOP 6.000GHz

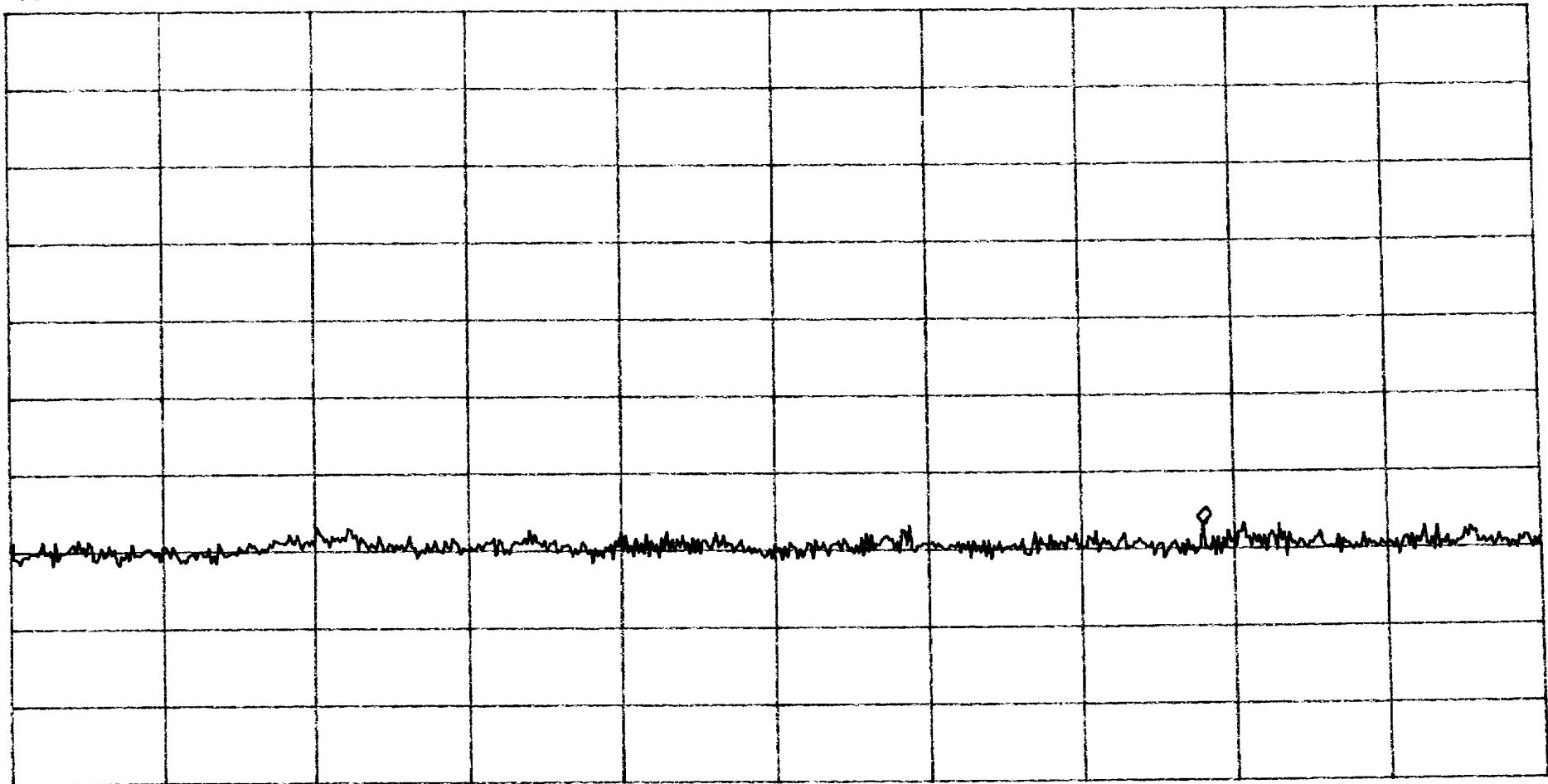
SWP 1.50sec

Out Of Band 6 - 13 GHz

ATTEN 10dB
RL -7.00dBm

10dB/

MKR -73.67dBm
11.460GHz



START 6.000GHz
RBW 100kHz

VBW 100kHz

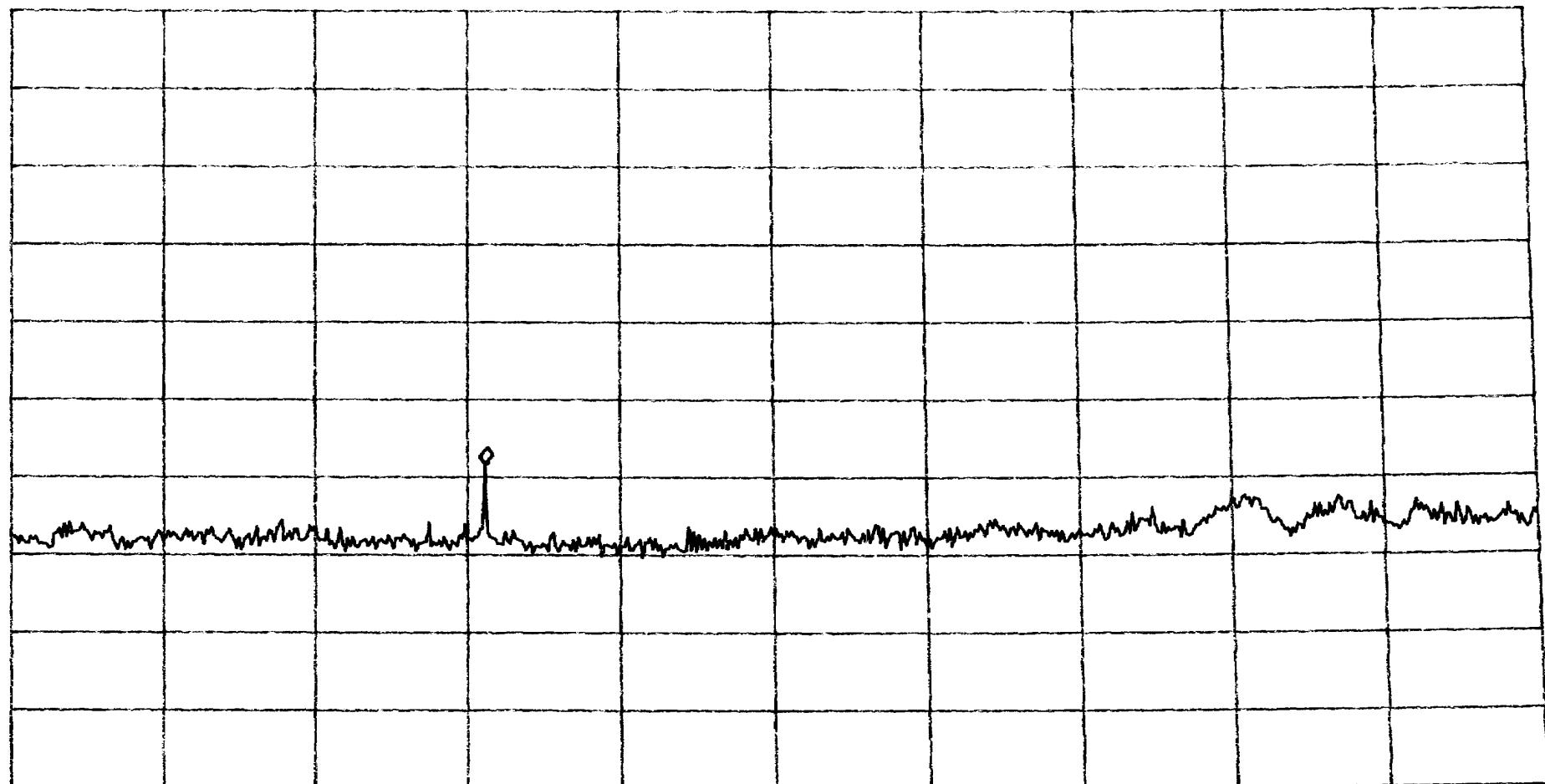
STOP 13.000GHz
SWP 1.80sec

Out of Band 13 - 26.5 GHz

ATTEN 10dB
RL -7.0dBm

10dB/

MKR -65.17dBm
17.21GHz



START 13.00GHz

STOP 26.50GHz

*RBW 100kHz

VBW 100kHz

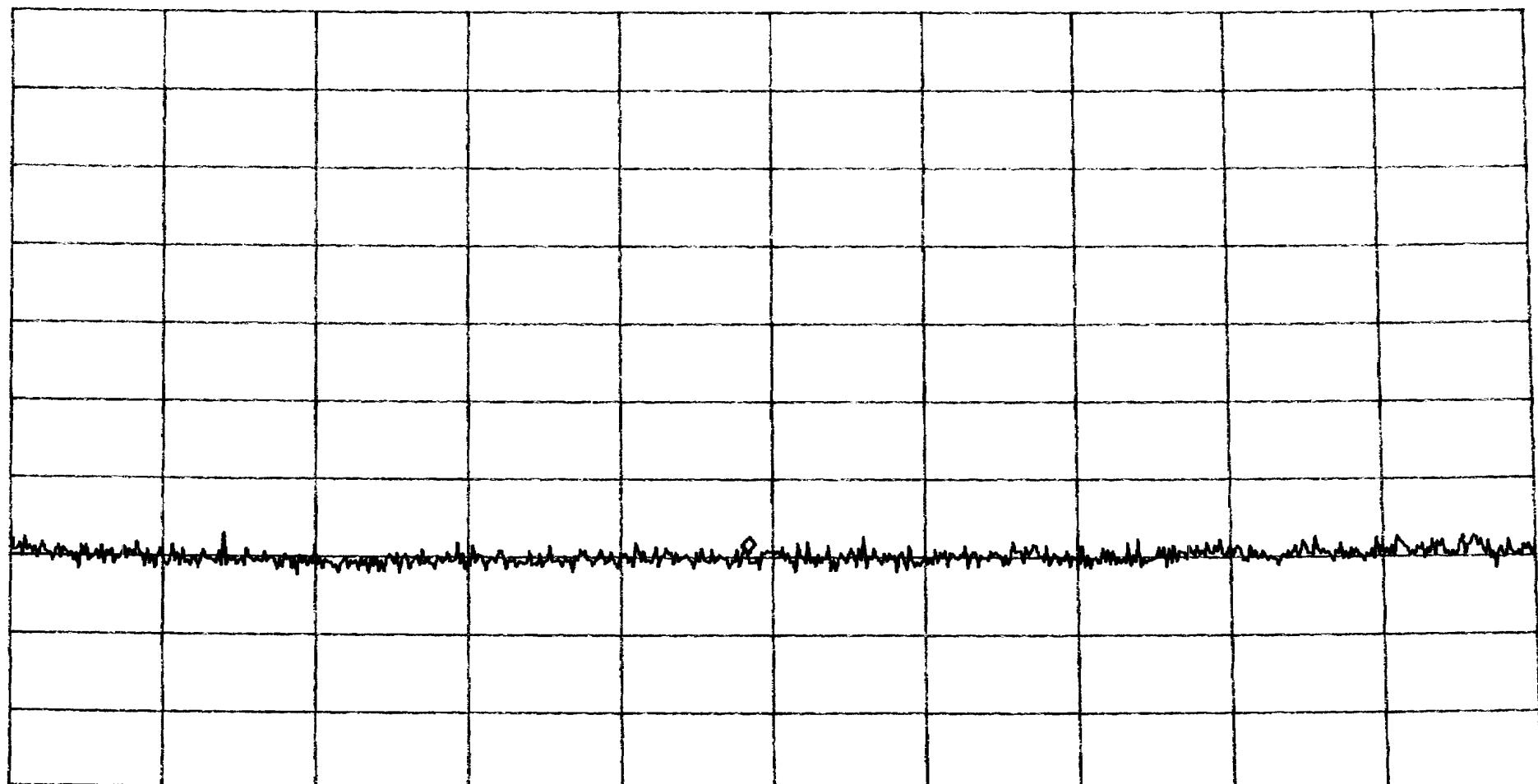
SWP 3.40sec

Out of Band 26.5 - 31 GHz

ATTEN 10dB
RL -7.0dBm

10dB/

MKR -76.33dBm
28.675GHz



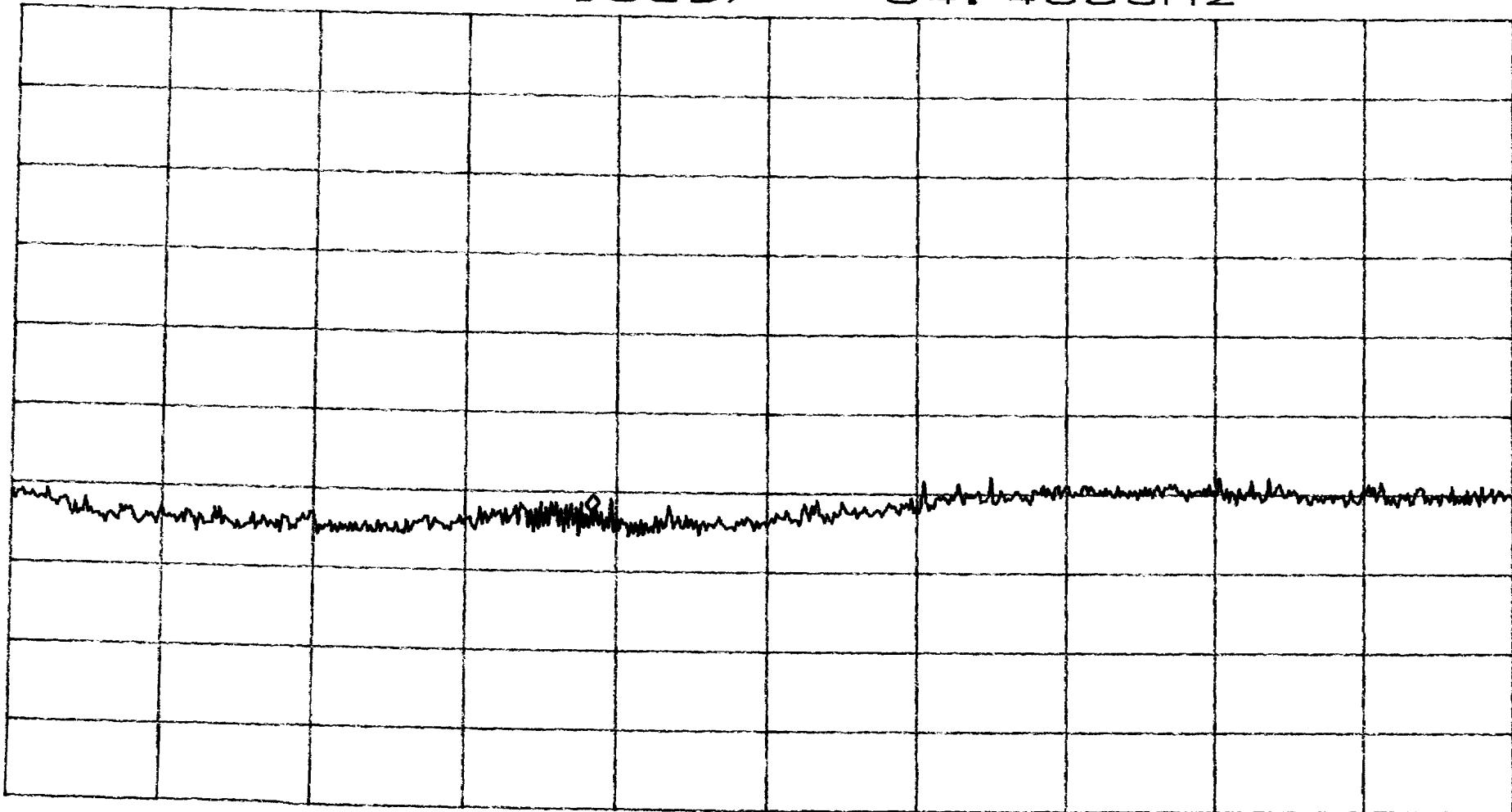
START 26.500GHz STOP 31.000GHz
RBW 100kHz VSW 100kHz SWP 1.20sec

Out of Band 31 - 40 GHz

ATTEN 10dB
RL -7.0dBm

10dB/

MKR -69.33dBm
34.450GHz



START 31.000GHz
RBW 100kHz

VBW 100kHz

STOP 40.000GHz

SWP 2.30sec

Out Of Band 30 MHz - 6 GHz

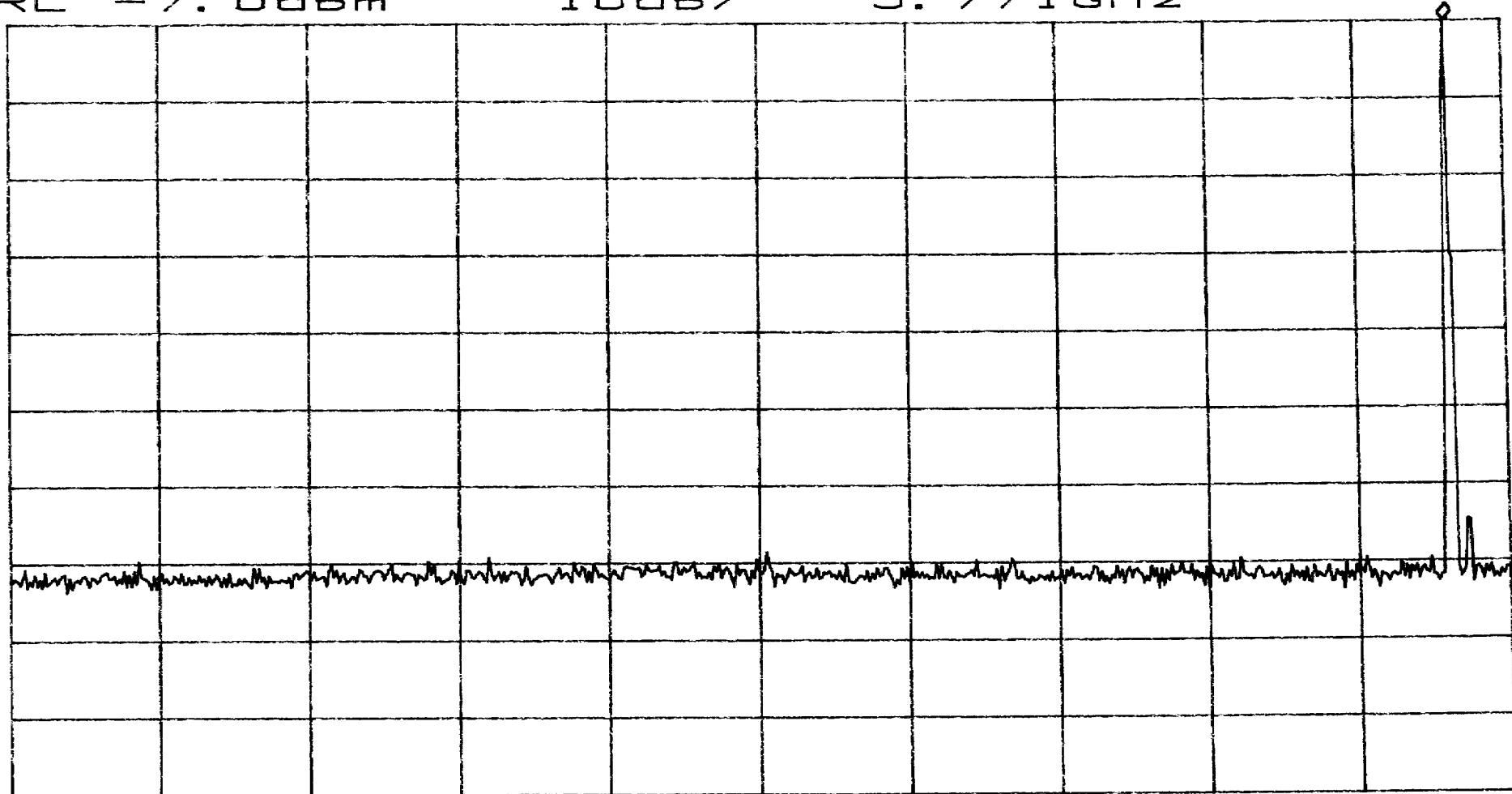
ATTEN 10dB

RF -7.00dBm

10dB/

MKR -6.83dBm

5.771GHz



START 30MHz

RBW 100kHz

VBW 100kHz

STOP 6.000GHz

SWP 1.50sec

Out Of Band 6 - 13 GHz

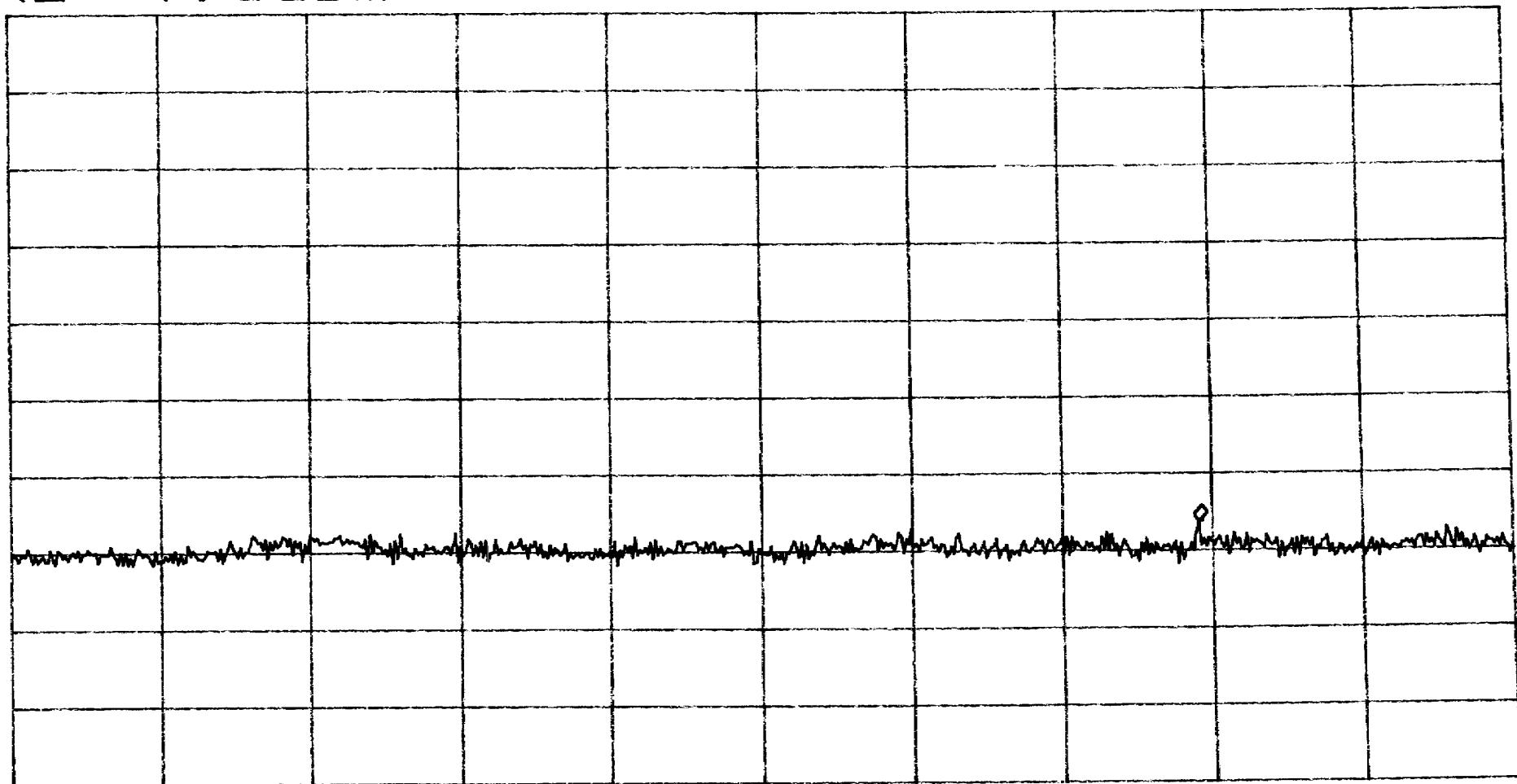
ATTEN 10dB

RL -7.0dBm

10dB/

MKR -73.17dBm

11.542GHz



START 6.000GHz

RBW 100kHz

VBW 100kHz

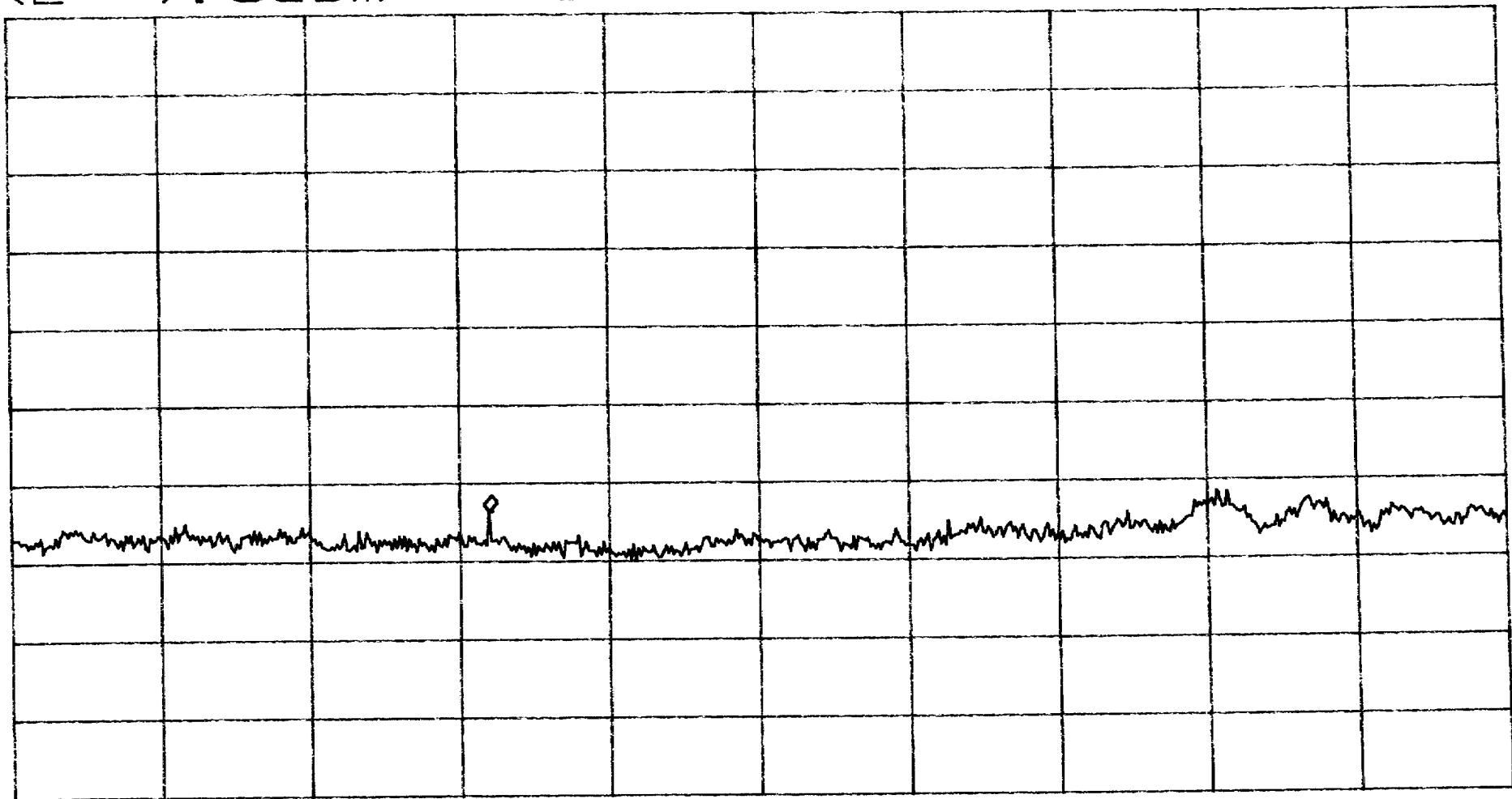
STOP 13.000GHz

SWP 1.80sec

Out of Band 13 - 26.5 GHz

ATTEN 10dB
RL -7.0dBm

MKR -70.50dBm
17.32GHz



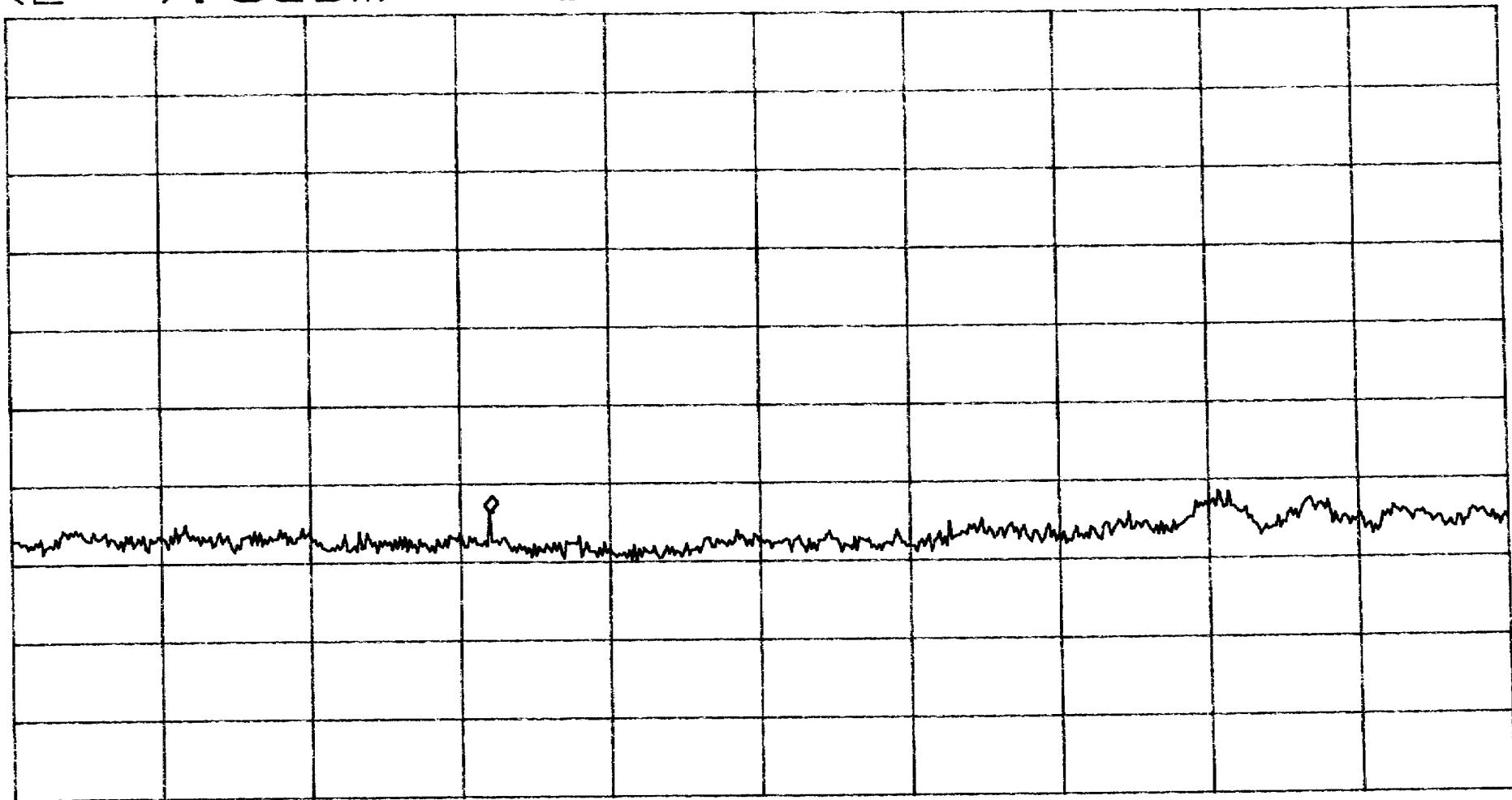
START 13.00GHz STOP 26.50GHz
*RBW 100kHz VBW 100kHz SWP 3.40sec

Out of Band 26.5 - 31 GHz

ATTEN 10dB
RL -7.0dBm

10dB/

MKR -70.50dBm
17.32GHz



START 13.00GHz
*RBW 100kHz

VBW 100kHz

STOP 26.50GHz

SWP 3.40sec

Out of Band 31 - 40 GHz

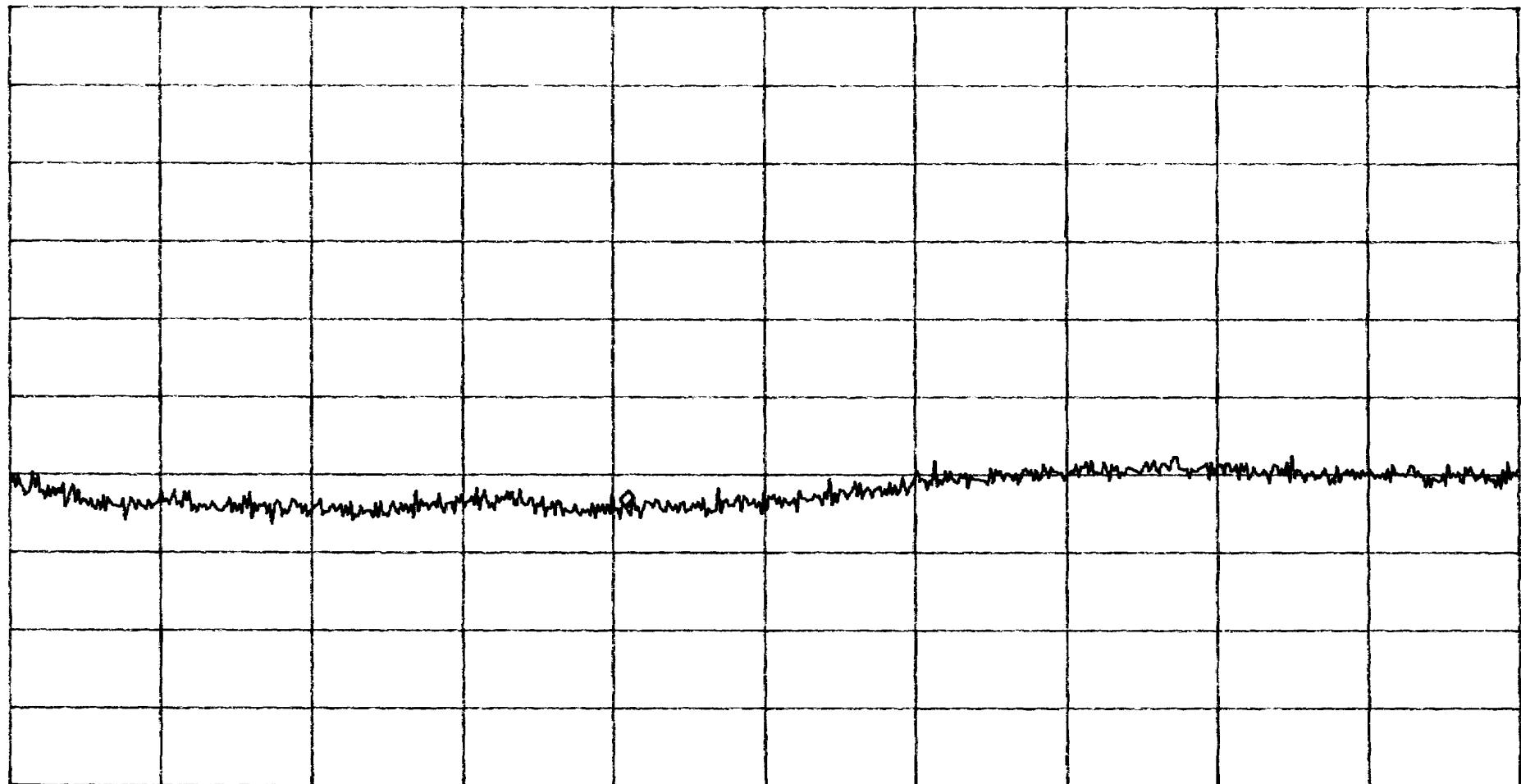
ATTEN 10dB

RL -7. 00dBm

10dB/

MKR -71. 00dBm

34. 675GHz



START 31. 000GHz

*RBW 100KHz

VBW 100KHz

STOP 40. 000GHz

SWP 2. 30sec

Out Of Band 30 MHz - 6 GHz

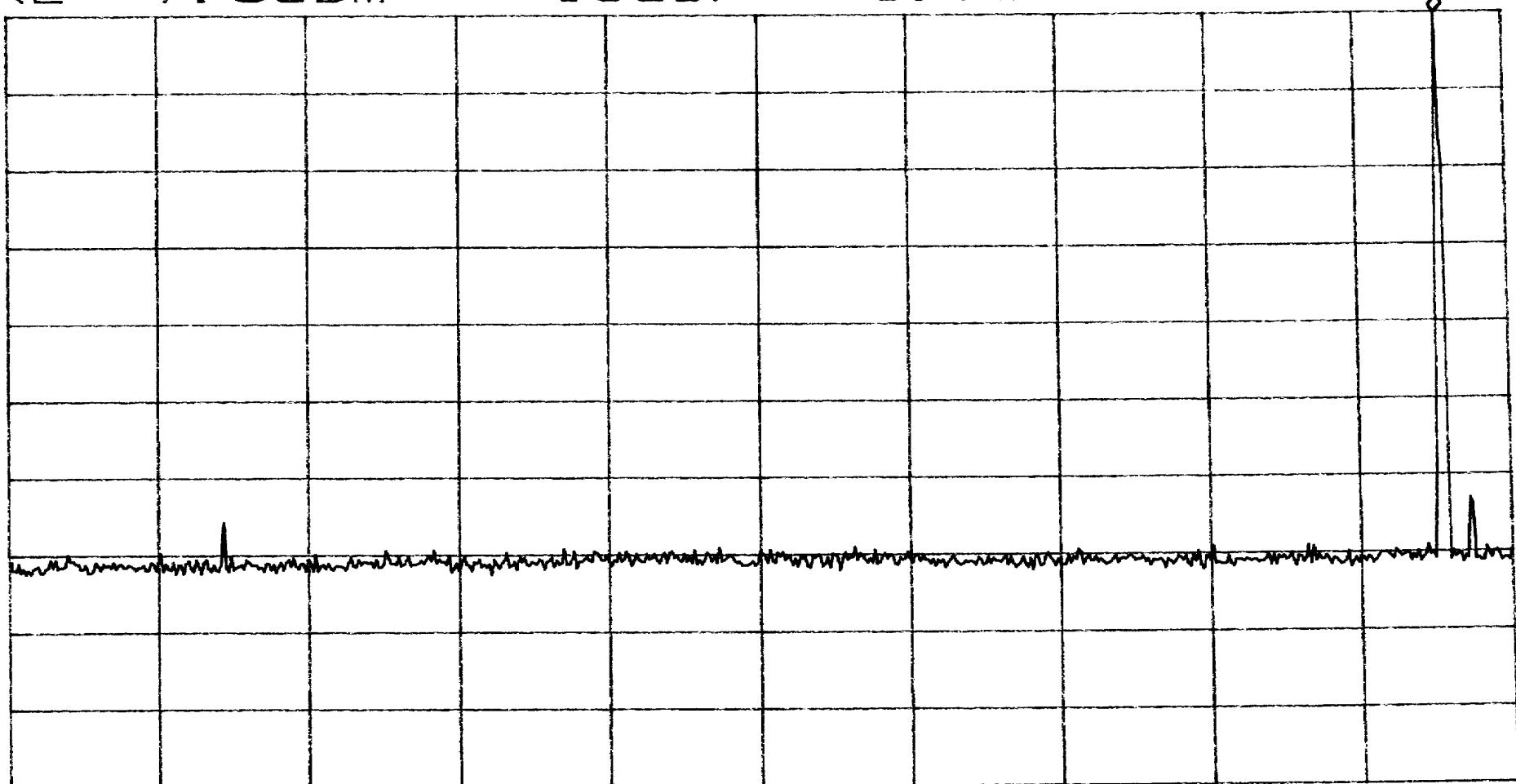
ATTEN 10dB

RF -7.0dBm

10dB/

MKR -7.0dBm

5.731GHz



START 30MHz

*RBW 100kHz

VBW 100kHz

STOP 6.000GHz

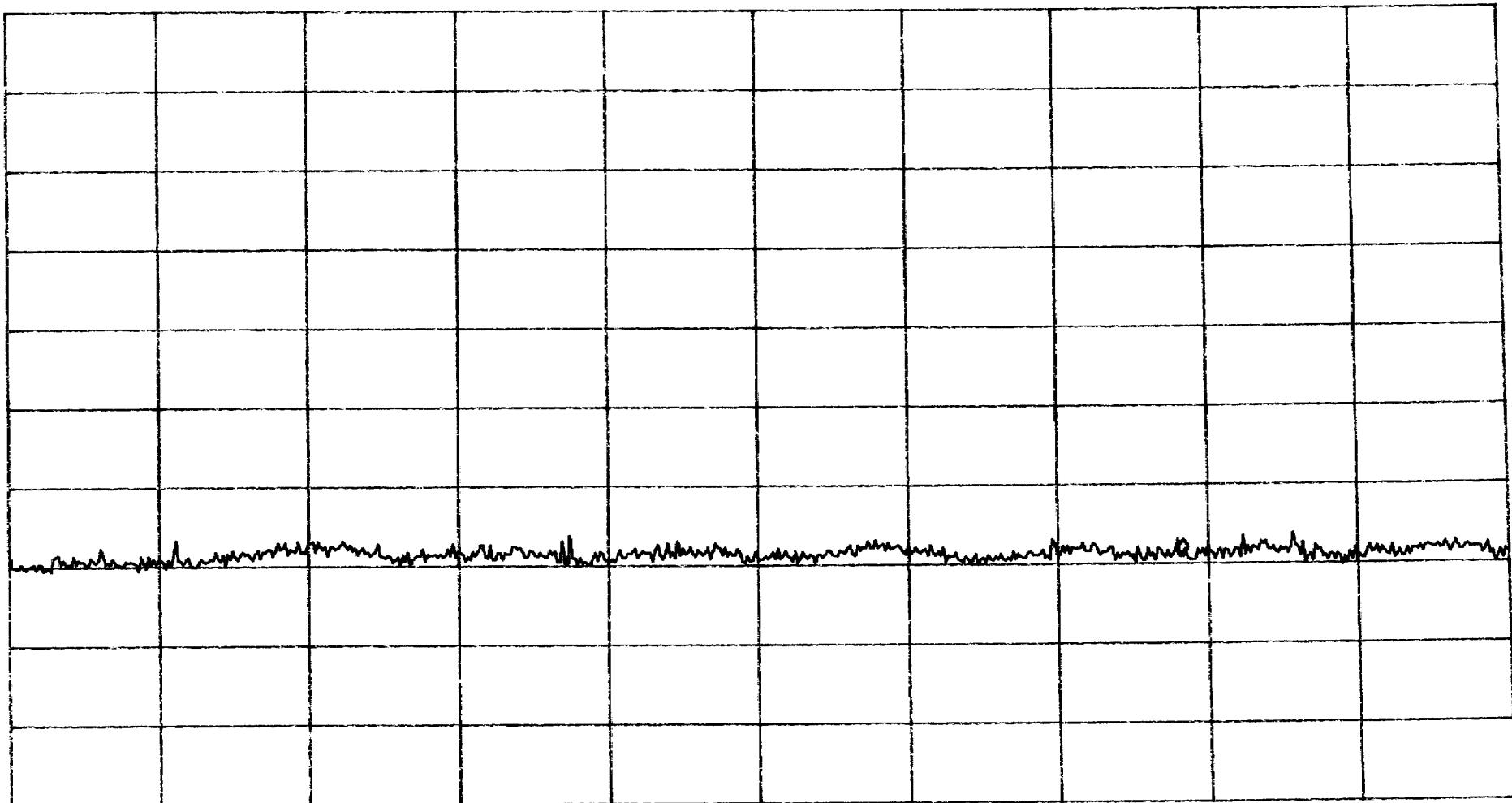
SWP 1.50sec

Out Of Band 6 - 13 GHz

ATTEN 10dB
RL -7.00dBm

10dB/

MKR -76.00dBm
11.472GHz



START 6.000GHz

STOP 13.000GHz

*RBW 100kHz

VBW 100kHz

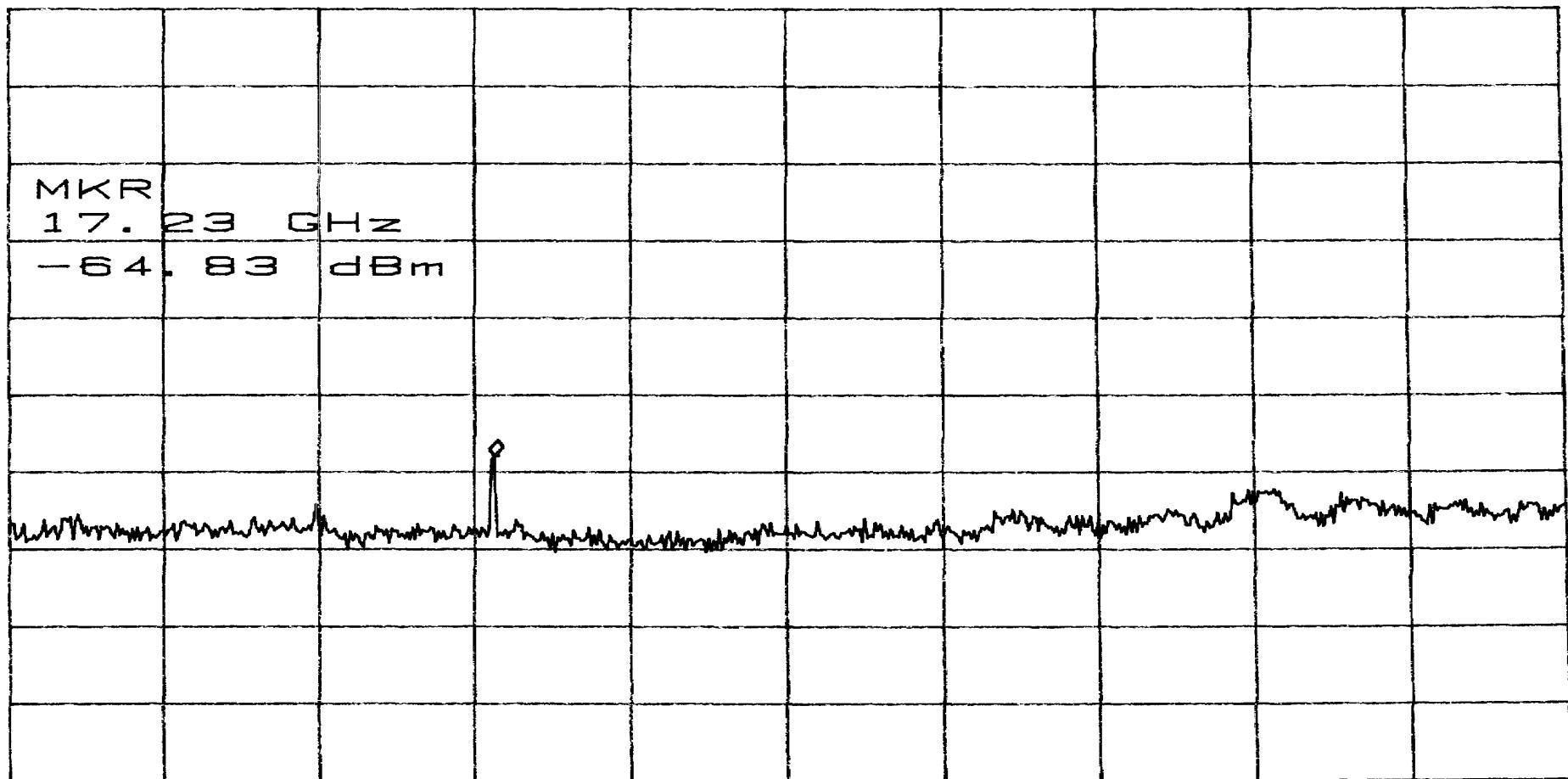
SWP 1.80sec

Out of Band 13 - 26.5 GHz

ATTEN 10dB
RL -7.0dBm

10dB/

MKR -64.83dBm
17.23GHz



START 13.00GHz STOP 26.50GHz
*RBW 100kHz VBW 100kHz SWP 3.40sec

Out of Band 26.5 - 31 GHz

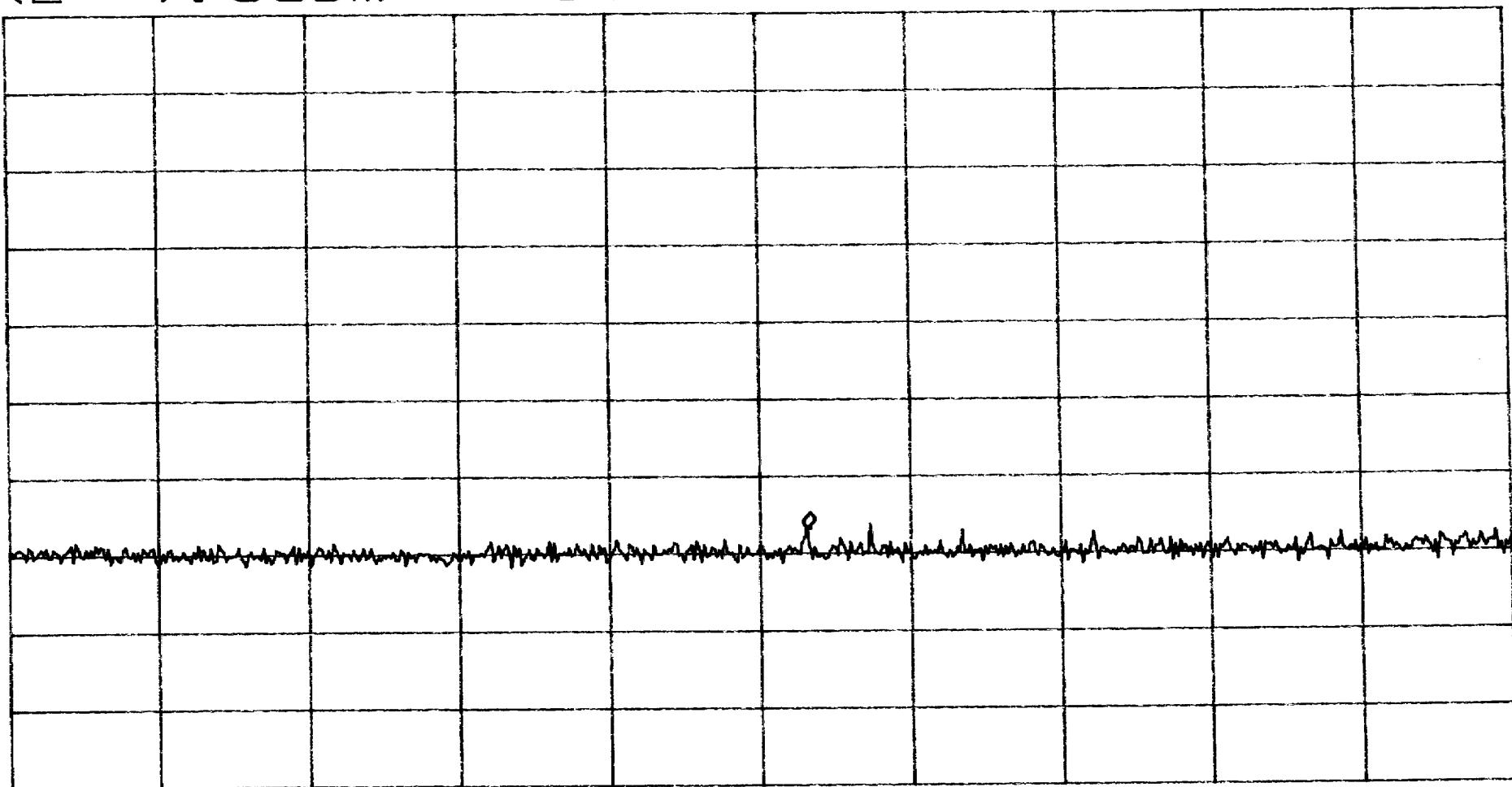
ATTEN 10dB

RL -7.0dBm

10dB/

MKR -73.67dBm

28.893GHz



START 26.500GHz

*RBW 100kHz

VBW 100kHz

STOP 31.000GHz

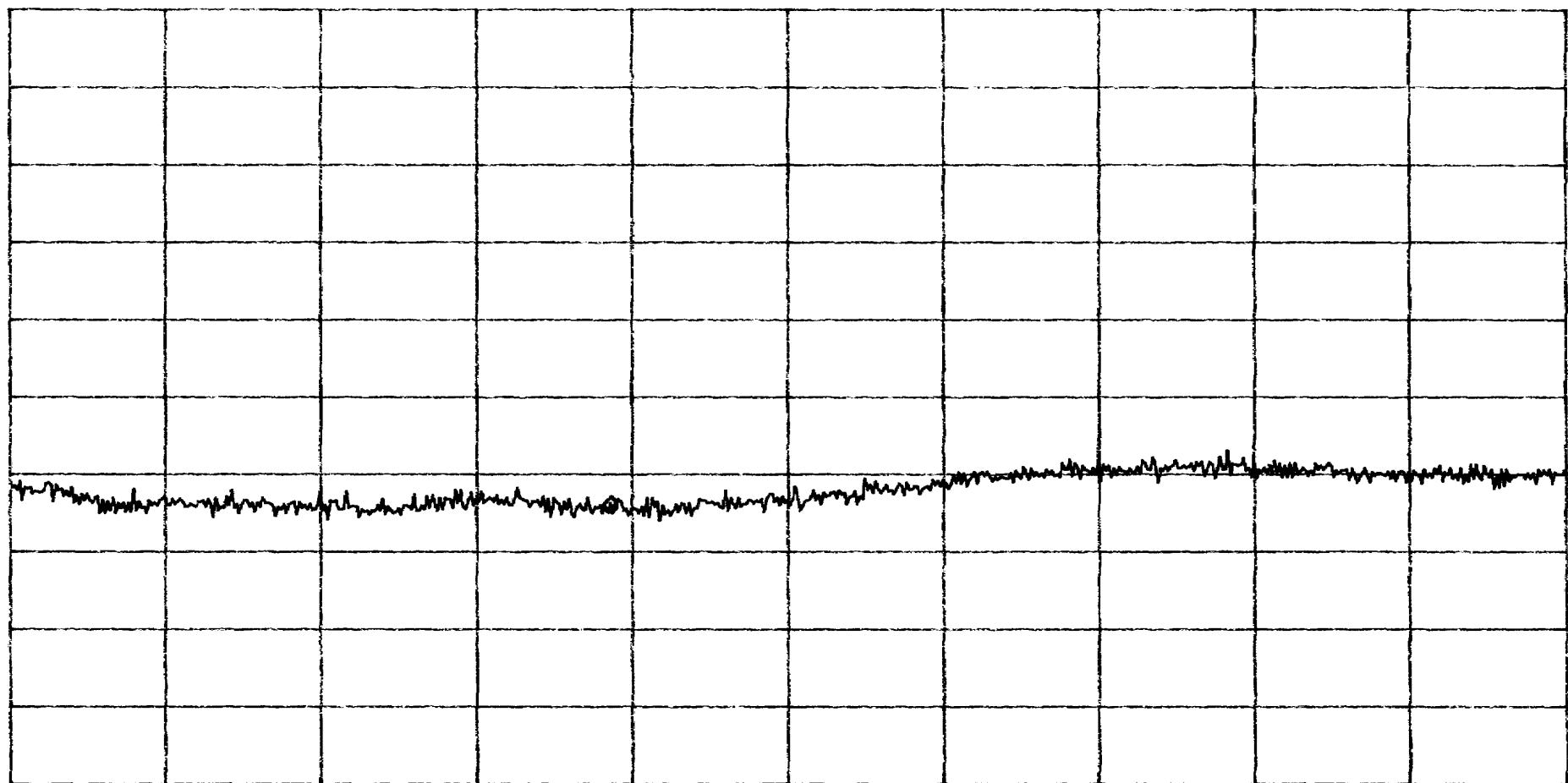
SWP 1.20sec

Out of Band 31 - 40 GHz

ATTEN 10dB
RL -7.0dBm

10dB/

MKR -71.83dBm
34.465GHz



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

APPENDIX B
RESTRICTED BAND DATA

FCC RADIATED DATA SHEET

EUT: N2 LINK 5.7 **DATE:** APR 10 98
S/N: **CUSTOMER NAME:** WIRELESS, INC
RULE PART: 15.401 **WORK ORDER:** 8041002B
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. MHz	READING dB(uV)	Pk, QP, or Av	A.F. dB	Cable loss dB	AMP dB	O.C.F. dB	TOTAL, dB(uV/m)	LIMIT dB(uV/m)	DELTA dB
Fund = 5735.68									
11471.6	39.7	Pk	38.8	13.6	35.0	0.0	57.1	74.0	-16.9
11471.6	18.0	Avg	38.8	13.6	35.0	0.0	35.4	54.0	-18.6
17207.4	45.2	Pk	44.9	16.9	35.0	0.0	72.0	74.0	-2.0
17207.4	23.8	Avg	44.9	16.9	35.0	0.0	50.6	54.0	-3.4
Fund = 5776.6									
11553.33	40.0	Pk	39.1	13.6	35.0	0.0	57.7	74.0	-16.3
11553.33	22.2	Avg	39.1	13.6	35.0	0.0	39.9	54.0	-14.1
15864.4	45.0	Pk	40.5	16.2	35.0	0.0	66.7	74.0	-7.3
15864.4	24.0	Avg	40.5	16.2	35.0	0.0	45.7	54.0	-8.3
Fund = 5809.9									
11619.8	38.7	Pk	39.1	13.6	35.0	0.0	56.4	74.0	-17.6
11619.8	18.0	Avg	39.1	13.6	35.0	0.0	35.7	54.0	-18.3
17429.8	46.3	Pk	44.9	16.9	35.0	0.0	73.1	74.0	-0.9
17429.8	24.0	Avg	44.9	16.9	35.0	0.0	50.8	54.0	-3.2

FCC RADIATED DATA SHEET

EUT: N2 LINK 5.7 **DATE:** APR 10 98
S/N: **CUSTOMER NAME:** WIRELESS, INC
RULE PART: 15.401 **WORK ORDER:** 8041002B
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. MHz	READING dB(uV)	Pk, QP, or Av	A.F. dB	Cable loss dB	AMP dB	O.C.F. dB	TOTAL, dB(uV/m)	LIMIT dB(uV/m)	DELTA dB
Fund = 5735.68									
11471.6	39.7	Pk	38.8	13.6	35.0	0.0	57.1	74.0	-16.9
11471.6	18.0	Avg	38.8	13.6	35.0	0.0	35.4	54.0	-18.6
17207.4	45.2	Pk	44.9	16.9	35.0	0.0	72.0	74.0	-2.0
17207.4	23.8	Avg	44.9	16.9	35.0	0.0	50.6	54.0	-3.4
Fund = 5776.6									
11553.33	40.0	Pk	39.1	13.6	35.0	0.0	57.7	74.0	-16.3
11553.33	22.2	Avg	39.1	13.6	35.0	0.0	39.9	54.0	-14.1
15864.4	45.0	Pk	40.5	16.2	35.0	0.0	66.7	74.0	-7.3
15864.4	24.0	Avg	40.5	16.2	35.0	0.0	45.7	54.0	-8.3
Fund = 5809.9									
11619.8	38.7	Pk	39.1	13.6	35.0	0.0	56.4	74.0	-17.6
11619.8	18.0	Avg	39.1	13.6	35.0	0.0	35.7	54.0	-18.3
17429.8	46.3	Pk	44.9	16.9	35.0	0.0	73.1	74.0	-0.9
17429.8	24.0	Avg	44.9	16.9	35.0	0.0	50.8	54.0	-3.2

**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

12:54:03 APR 13, 1998
8041002B NEUTRAL

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

LOG REF 92.0 dB μ V

10
dB/
ATN
10 dB

VA SB
SC FC
ACDRR

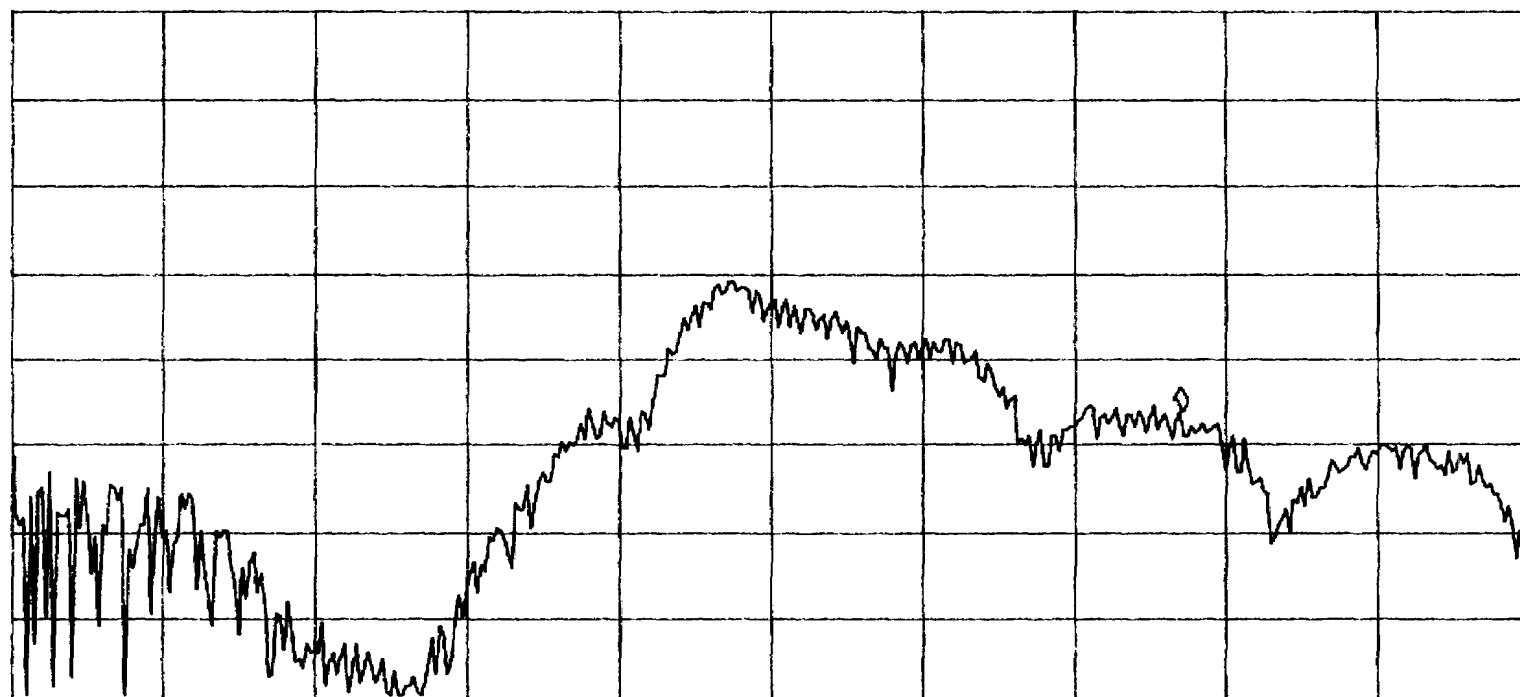
START 450 kHz

IF BW 9.0 kHz

AVG BW 30 kHz

STDP 30.00 MHz

SWP 2.46 sec

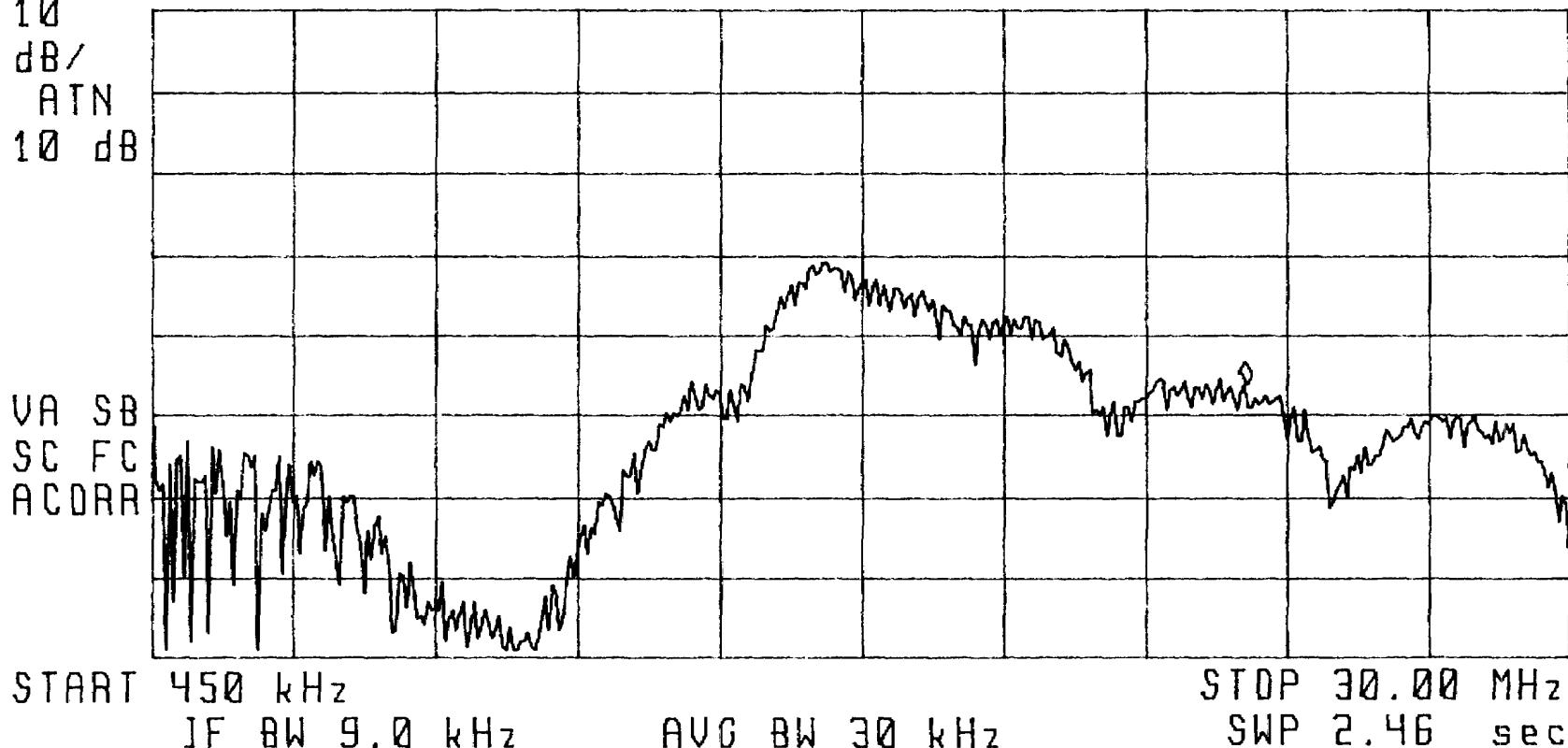


CD 12:54:03 APR 13, 1998
80410028 NEUTRAL

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

LOC REF 92.0 dB μ V

10
dB/
ATN
10 dB



**APPENDIX D
15.209
RADIATED EMISSIONS**

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

Radiated Emissions

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	OP

NOTE: above 2 readings are from broadband noise, EUT related.

```
+-----+
 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
```

NOTE: previous readings also broadband

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

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

APPENDIX F
Set-up Photographs



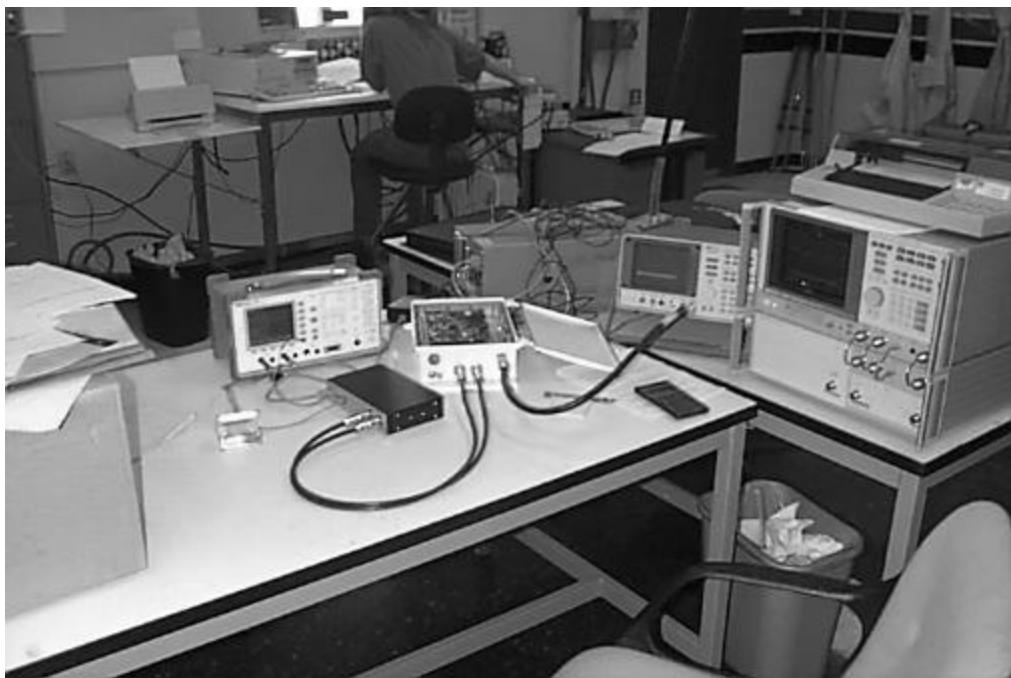
**FCC 15.209 Class A
Radiated Emissions
FCC 15.207 Class A
Conducted Emissions**



**FCC 15.205 Restricted Band
2 Ft. Antenna**



**FCC 15.205 Restricted Band
4 Ft. Antenna**



FCC 15.407 Conducted RF

