



**15.247 CERTIFICATION
FCC ID: NYC-BSR-0001**

EMI TEST REPORT

HITEST BSR

PREPARED FOR

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TEST REPORT NUMBER: A803004

DATE OF TEST: FEBRUARY 24-26, 1998

**IF THIS DOCUMENT IS REPRODUCED, IT MUST BE REPRODUCED
IN IT'S ENTIRETY**



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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

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.
Test facility is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations.

NVLAP Code: 20089 effective through: March 31, 1999

2.0 TEST EQUIPMENT

Description	Manufacturer	Model	SN
EMI Receiver	HP	8546A	3325A00137
Power Meter	HP	437B	3125U13399
Power Sensor	HP	8481	3318A16275
Spectrum Analyzer	HP	8563E	3137A01183
Preamp	HP	8447F	3113A05849
Preamp	HP	8449B	3008A00527
LISN	EM	ANS-25/2	2532
Biconical Antenna	EM	EM 6912	677
Log Periodic Ant	EM	EM 6950	858
Double Ridge Horn	EM	EM 6961	6231
Filter BP 1.2-4 GHz	FSY	HM1160-11SS	001
Filter BP 4-10 GHz	FSY	HM2950-15SS	001
Filter BP10-18 GHz	FSY	HP8601-7SS	001

3.0 EUT

The Whisper System RF Metering System is defined as various gas and electric Remote Meter Interface (RMI) devices using spread spectrum, frequency hopping (SSFH) radio technology to communicate energy usage data to a Base Station Repeater (BSR) unit on a reporting schedule. The BSR communicates to a Base Station Master (BSM) over a separate SSFH RF link using MDCN protocol on a scheduled basis. Base Station Concentrators (BSC's) are standing alone RF data concentrators that function both as a BSM and a BSR. BSC's only use SSFH to communicate with and receive scheduled reports from RMI's. BSM's and BSR's are connected to a Host Control program using a landline or other WAN interface. All RF devices operate in the 902 to 928 MHz range. In addition, a back up battery box can be attached to a BSR, BSM, or BSC to provide electrical power to the device during power outage conditions.

RMI's are integrated into or connected to a standard residential or commercial and Industrial Electro-mechanical demand meter. RMI's are powered from the line for units integrated into an Electric Meter. Gas and Water Meter RMI's are battery powered. RMI's reports to a BSR or BSC on a scheduled basis, transmissions in a single channel are less than 400 mS.

The BSM Base Station Master (BSM) that polls 20 to 30 Base Station Repeaters (BSR's). A BSR can control and receive scheduled reports from 540 RMI's using a one hour reporting schedule. A BSR utilizes a schedule that assigns a six second slot to each RMI reporting to a BSM. The RMI utilizes the first two seconds of the time slot for scheduled reports. The remaining 4 second period is used for new acquisitions or re-acquisitions of RMI's. A BSR reports to a BSM every tenth reporting slot (60 seconds). A BSR to BSM reporting schedule is 2 seconds. A BSR supports 540 RMI reporting slots and 60 slots for reporting data to a BSM

Battery Box	P/N 10655-0000
Base Station Master	P/N 11034-0900
Base Station Repeater	P/N 11031-0900
Base Station Concentrator	P/N 11032-0900

4.0 SUPPORT EQUIPMENT

No support equipment was used.

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 manufacturers requirements and conditions for intended use.

EUT	CONNECTED TO	CABLE TYPE
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6.0 SUMMARY OF TESTS

The Diablo Hitest BSR is a frequency hopping spread spectrum (FHSS) radio system operating in the 902-928 MHz band. Tests were performed with one standard antenna. Test firmware resident in the EUT and software provided by Diablo was used to do the test.

6.1 15.247(a)(1) FREQUENCY HOPPING SYSTEMS

The Hitest BSR uses one FHSS radio that handles both the Metricom and Whisper mode protocols. The modes will be referenced in this report as the "Metricom" Mode and the "Whisper" Mode. The system hops using pseudorandom sequences. On average, each channel is used equally. Please refer to "**Whisper Radio System Interface Theory of Operation**" in the confidentiality package attached to this submission for more details.

Metricom Mode

6.1.1 15.247(a)(1)(i) CHANNEL UTILIZATION

The Metricom radio uses 162 channels with a channel bandwidth of 160 kHz.

Three spectrum analyzer plots labeled "**CHANNEL UTILIZATION 902 - 908 MHz**", "**CHANNEL UTILIZATION 908 - 915 MHz**" and the total number of channels shown is 75, which exceeds the minimum requirement of 50. **Plots are in Appendix A.**

Three spectrum analyzer MAX HOLD plots labeled "**20 dB BANDWIDTH**" show the 20 dB bandwidth of the hopping channel to be < 500 kHz (133 / 127 / 128 kHz) at the low/midband/high frequencies of 902.08 / 914.08 / 927.84 MHz. **Plots are in Appendix A.**

Zero span spectrum analyzer plots labeled "**CHANNEL DWELL TIME**" shows Worst case transmission time in a given slot 180 msec elapsed time, <100 % duty

Maximum allowed: 400 msec.

The test plots are in Appendix A.

6.1.2 15.247(b) MAXIMUM PEAK OUTPUT POWER

The maximum power of the hopping channel is +29.5 dBm or .891 W. The EUT was made to transmit uninterrupted random data on each of the low / mid / high channels.

The output was fed directly via a SMA 3-inch RG 142 cable to a 20-dB pad to the spectrum analyzer set on MAX HOLD with no additional attenuation.

At 902.08 MHz Pout = 29.2 dBm

At 914.08 MHz Pout = 29.3 dBm

At 927.84 MHz Pout = 29.5 dBm

Limit: +30 dBm / 1 W maximum power

6dBi antenna,

EIRP = +29.5 (peak power) +6.0(peak gain, dBi) = +35.5 dBm /
3.55W EIRP

6.1.3 15.247(c) OUT OF BAND EMISSIONS

The spectrum analyzer plots, in **Appendix A**, titled "**OUT OF BAND Lower Band Edge**", "**OUT OF BAND Upper Band Edge**" shows the output spectrum of the EUT at its highest and lowest operating frequencies. The plots show the output of the EUT to be at least 20dB down at the band edges.

The spectrum analyzer plots labeled "**OUT OF BAND Emissions 30 MHz - 1 GHz**", "**OUT OF BAND Emissions 1 - 2.75 GHz**", "**OUT OF BAND Emissions 2.75 - 26.5 GHz**" show that emissions are more than 20 dB below the highest level of the desired power outside of the 902 - 928 MHz band.

Whisper Mode

6.2.1 15.247(a)(1)(i) CHANNEL UTILIZATION

The Whisper radio uses 128 channels each 180 kHz wide.

Three spectrum analyzer plots labeled "**CHANNEL UTILIZATION 902 - 908 MHz**", "**CHANNEL UTILIZATION 908 - 915 MHz**", and The total number of channels shown is 63, which exceeds the minimum requirement of 50. **Plots are in Appendix A.**

Three spectrum analyzer MAX HOLD plots labeled "**20 dB BANDWIDTH**" show the 20 dB bandwidth of the hopping channel to be < 500 kHz (42.5.7/40.0/42.5 kHz) at the low/midband/high frequencies of 903.42 / 914.94 / 926.28 GHz. **Plots are in Appendix A.**

Zero span spectrum analyzer plots labeled "**CHANNEL DWELL TIME**" shows Worst case transmission time in a given slot: 100 msec elapsed time, <100 % duty

Maximum allowed: 400 msec.
The test plots are in Appendix A.

6.2.2 15.247(b) MAXIMUM PEAK OUTPUT POWER

The maximum power of the hopping channel is +19.7 dBm or .093W. The EUT was made to transmit uninterrupted random data on each of the low/mid/high channels.

The output was fed directly via an N Type RG 142 cable with a 10 dB pad to the spectrum analyzer set on MAX HOLD with no additional attenuation.

At 903.42 MHz Pout = 19.7 dBm / .093W

At 914.94 MHz Pout = 19.7 dBm / .093W

At 926.28 MHz Pout = 19.5dBm / .089W

Limit: +30 dBm / 1 W maximum power

6dBi antenna,

EIRP = +19.7 (peak power) +6.0(peak gain, dBi) = +25.7 dBm / 3.72W EIRP

6.2.3 15.247(c) OUT OF BAND EMISSIONS

The spectrum analyzer plots, in **Appendix A**, titled "**OUT OF BAND Lower Band Edge**", "**OUT OF BAND Upper Band Edge**" 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 902-928 MHz band.

The spectrum analyzer plots labeled "**OUT OF BAND Emissions 30 MHz - 1 GHz**", "**OUT OF BAND Emissions 1 - 2.75 GHz**", "**OUT OF BAND Emissions 2.75 - 26.5 GHz**" show that emissions are more than 20 dB below the highest level of the desired power outside of the 902 - 928 MHz band.

6.3 15.203 ANTENNA REQUIREMENT

This product is intended for professional installation by trained personnel and is therefore exempt from the requirements of 15.203.

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 tabular form showing that no spurious signals were detected above the 74-dBuV/m peak/54dBuV/m average limits. Peak measurements were taken with an RBW and VBW = 1MHz. Average readings were taken with an RBW = 1MHz and a VBW = 10 Hz. **Test data is in Appendix B.**

6.5 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. **The test data sheets are in Appendix C.**

6.6 15.209 RADIATED EMISSIONS

The data sheets in Appendix D show 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 using a pseudorandom sequence 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. The search antennas were located at 3 meters. Measurements were made in accordance with ANSI C63.4-1994.

7.0 LABELING REQUIREMENT

7.1 SAMPLE LABEL

A drawing of the label and a drawing of the label location are shown in **Appendix E**.

7.2 FCC WARNING STATEMENT

A sample of the FCC warning statement that will be placed in the manual is shown in **Appendix I**. The manual is still in the design stage and has not been included.

Electronic Compliance Laboratories



Chris Byleckie
Technical Director

April - 13 - 1998
Date

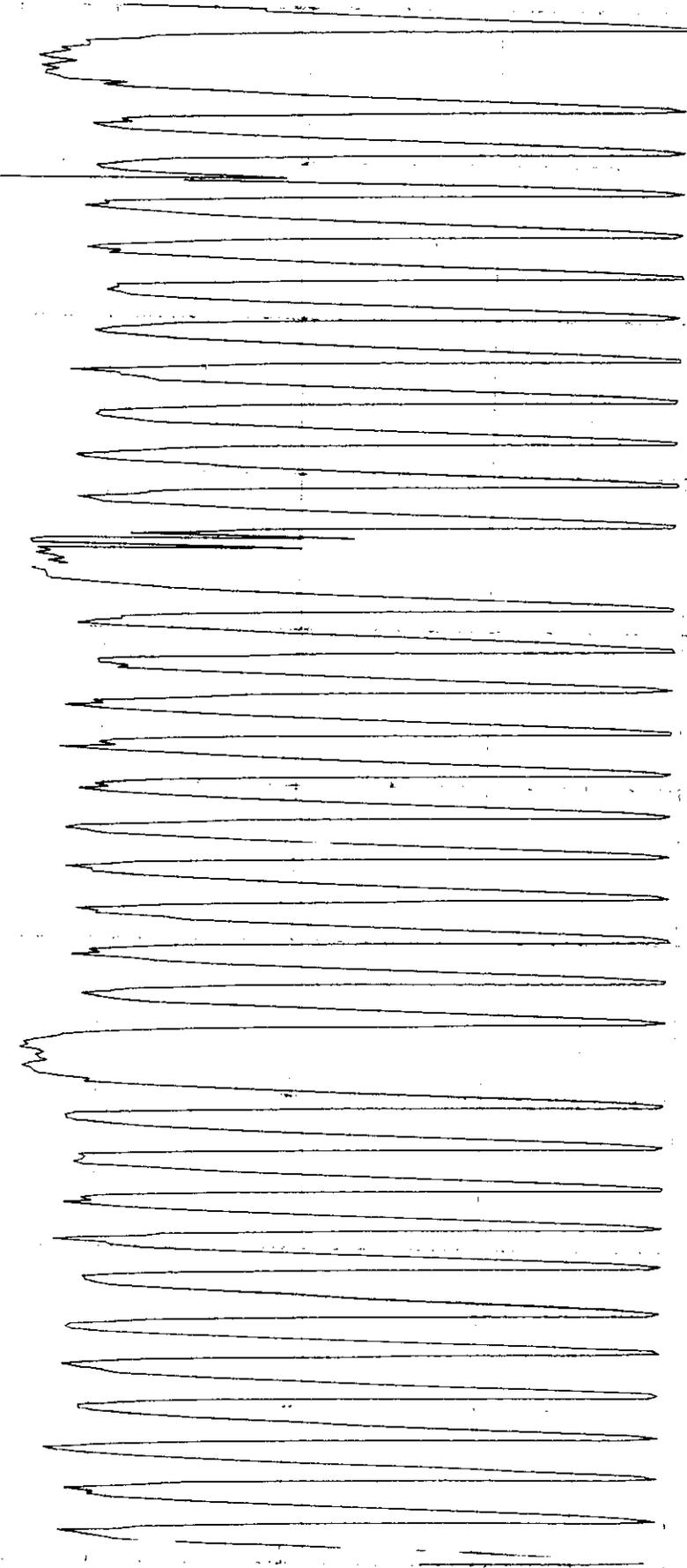
APPENDIX A
SPREAD SPECTRUM PLOTS

Metricom Mode

ATTEN 30dB Channel Utilization 902 - 908 MHz

REL 20.0dBm

10dB



START 902.000MHz

STOP 908.000MHz

*RBW 10kHz

*VBW 10kHz

100kHz

SWP 1.50MHz

A803004.DOC

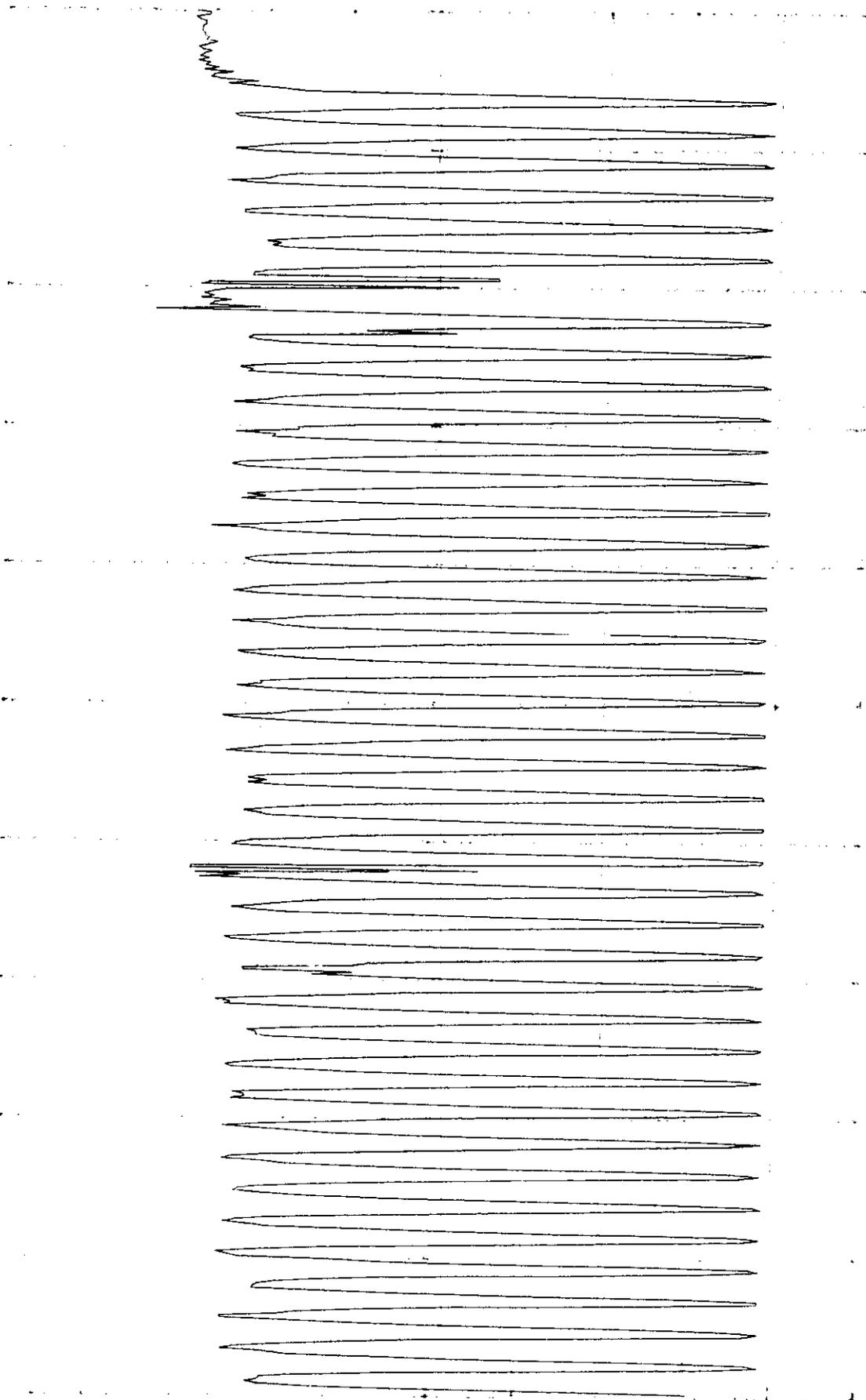
14

ATTEN 30dB

Channel Utilization 908 - 915 MHz

RL NO. 00000

100MHz



START 908.000MHz

STOP 915.000MHz

*RHW 100MHz

*V3W

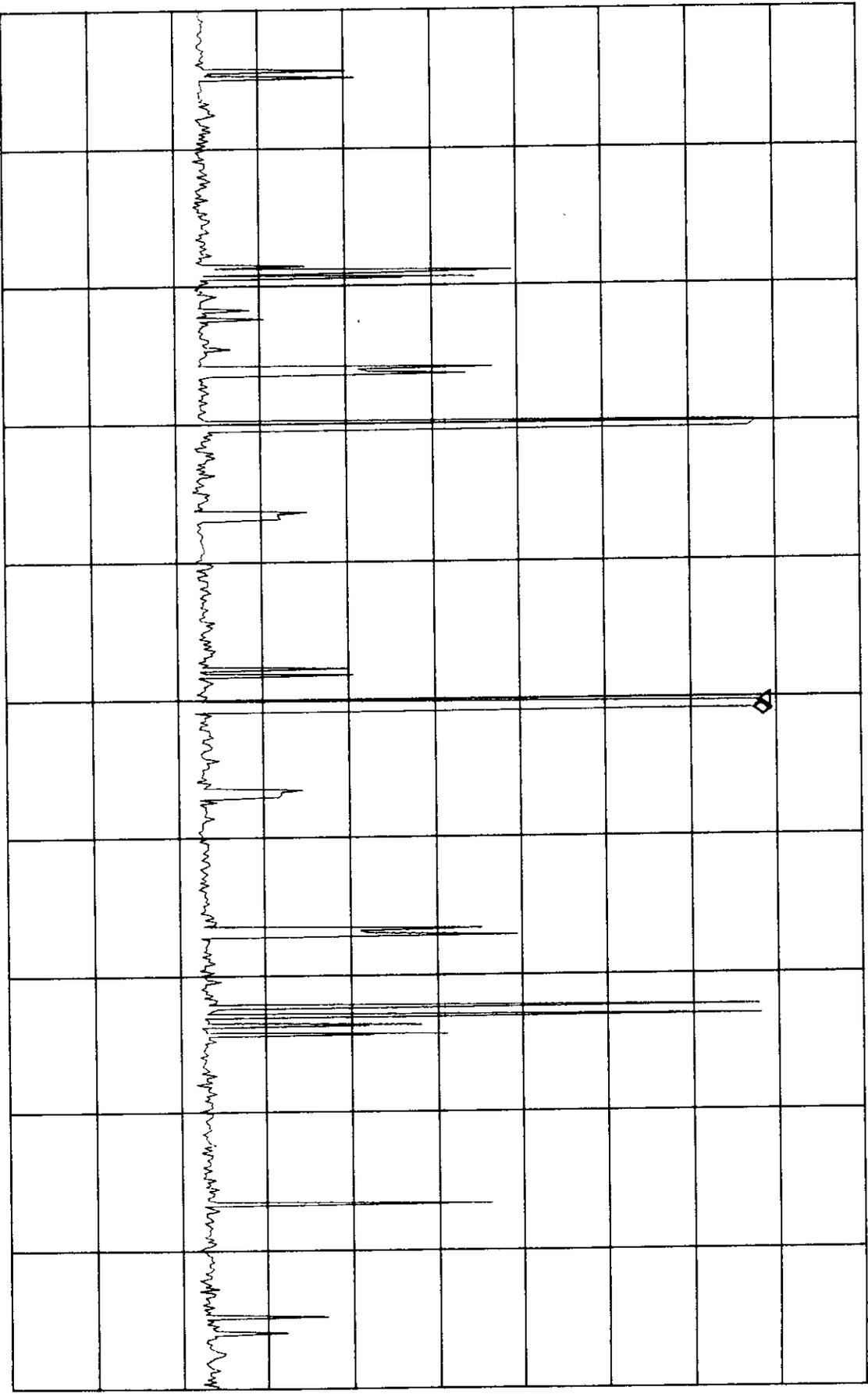
100MHz

SWP

100MHz

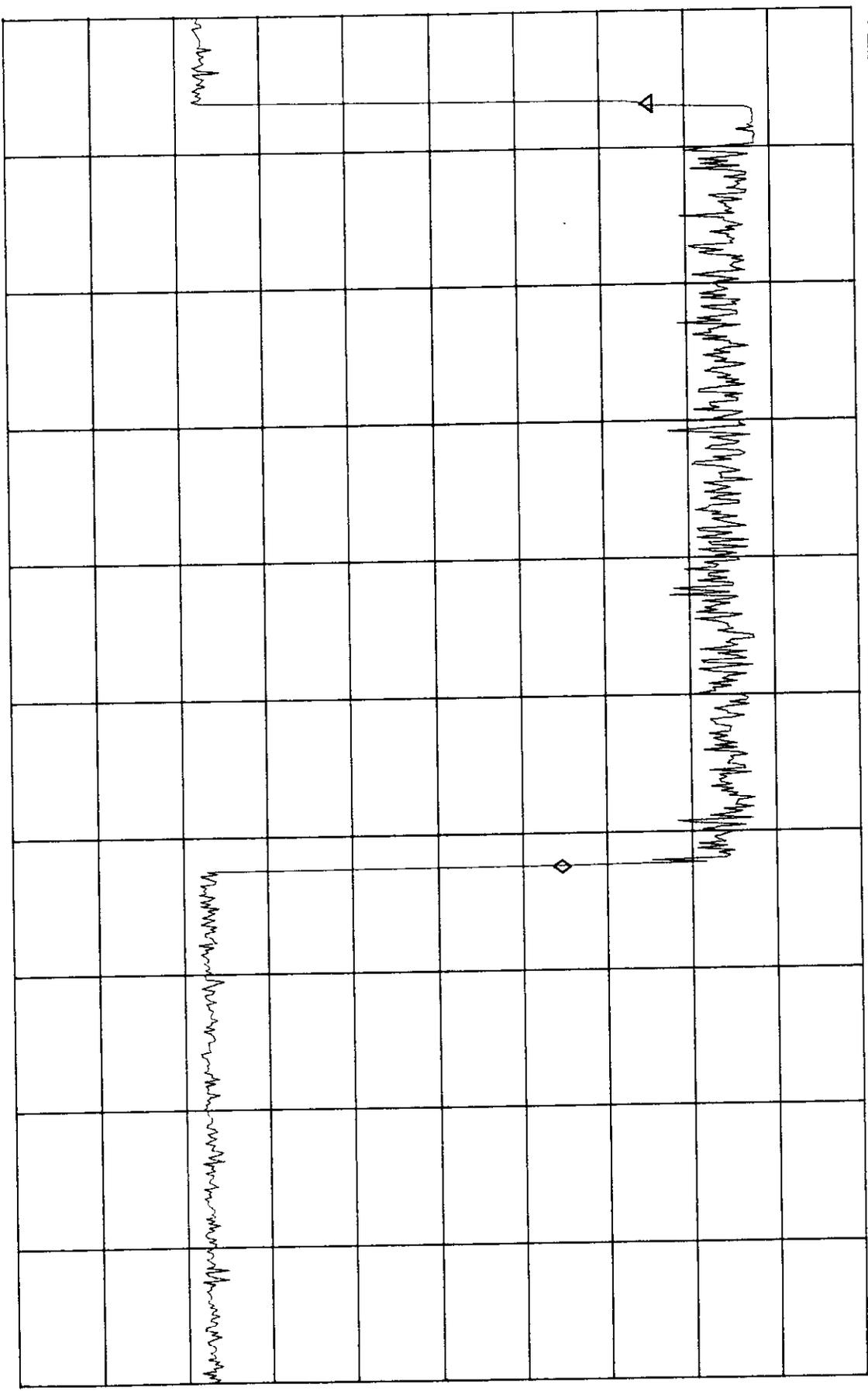
A803004.DOC

ATTEN 30DB Dwell Time 10DB / 100ms Δ MKR -.50DB
RL 20.0DBm



CENTER 914.080000MHZ SPAN 0HZ
*RBW 10KHZ *VBW 100KHZ *SWP 20sec
*805004.500

ATTEN 30DB Dwell Time ΔMKR -11.33DB
RL 20.0DBm 10DB/ 100ms



CENTER 914.080000MHZ SPAN 0HZ
*RBW 10KHZ *VBW 100KHZ SWP 180ms
*A86300#D06

ATTEN 30dB

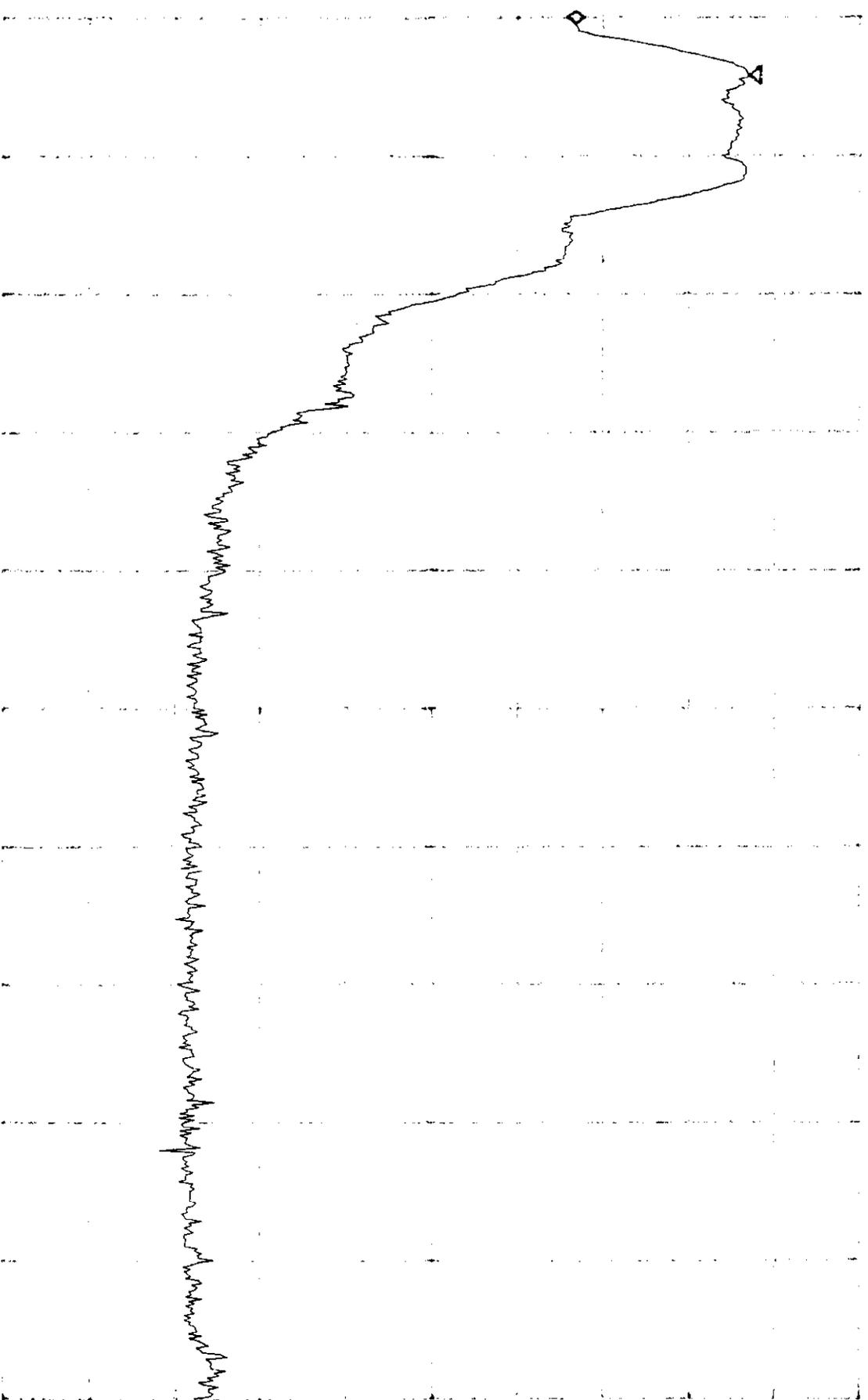
Out of Band Lower Band Edge MKR

201.17dB

REL 20.0dBm

1.0dB

4.2kHz



START 000.000MHz

STOP 000.000MHz

*REW

10kHz

*VIEW

10kHz

SWP

50MHz

DATE: 10/13/71

Out of Band Upper Edge

10.000153

RE: NO. 000000

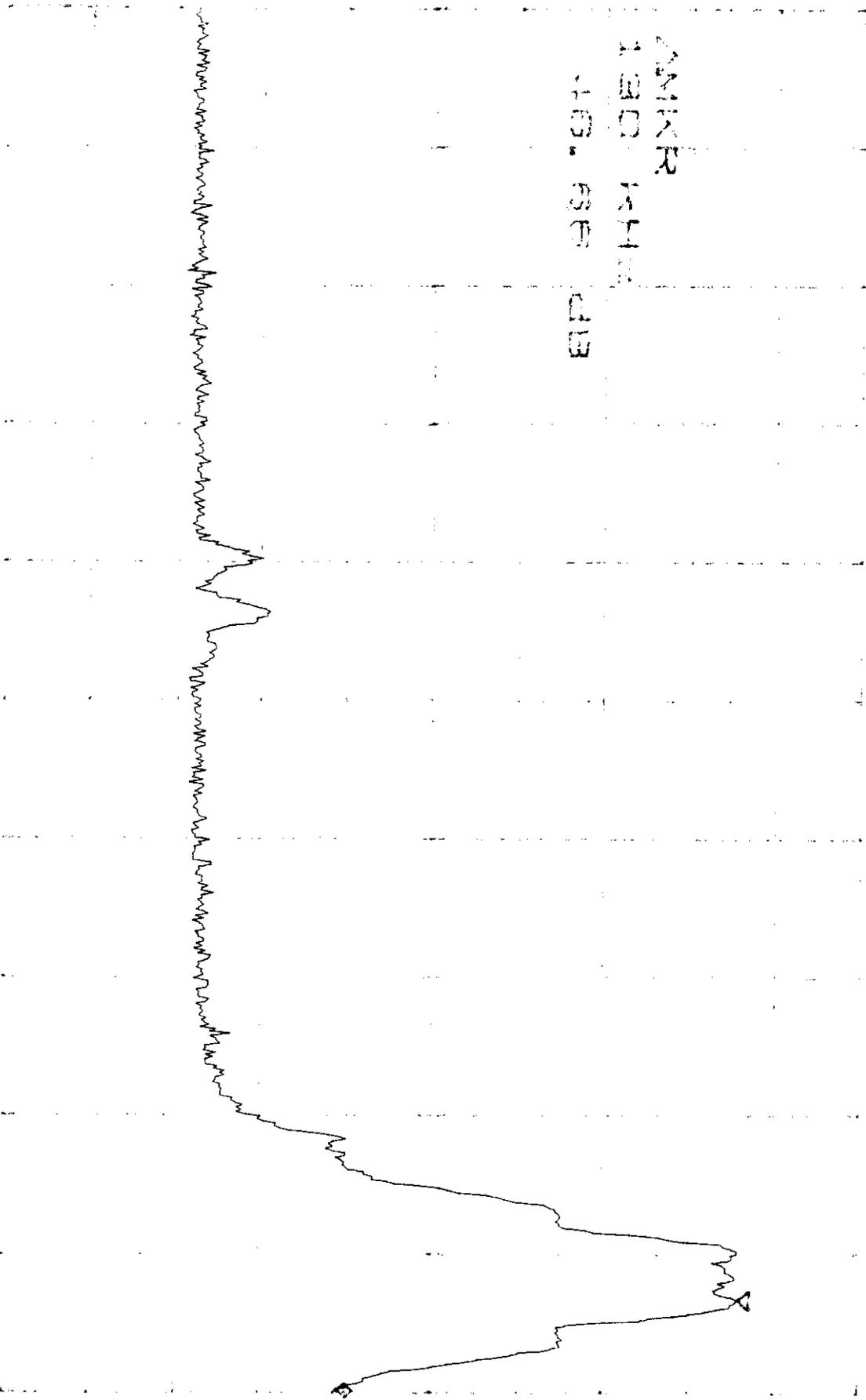
10010000

10000000

10.000153

10.000153

10.000153



START 9976.000000

STOP 9976.000000

NR13W

101414

101414

10000000

SWP 500m

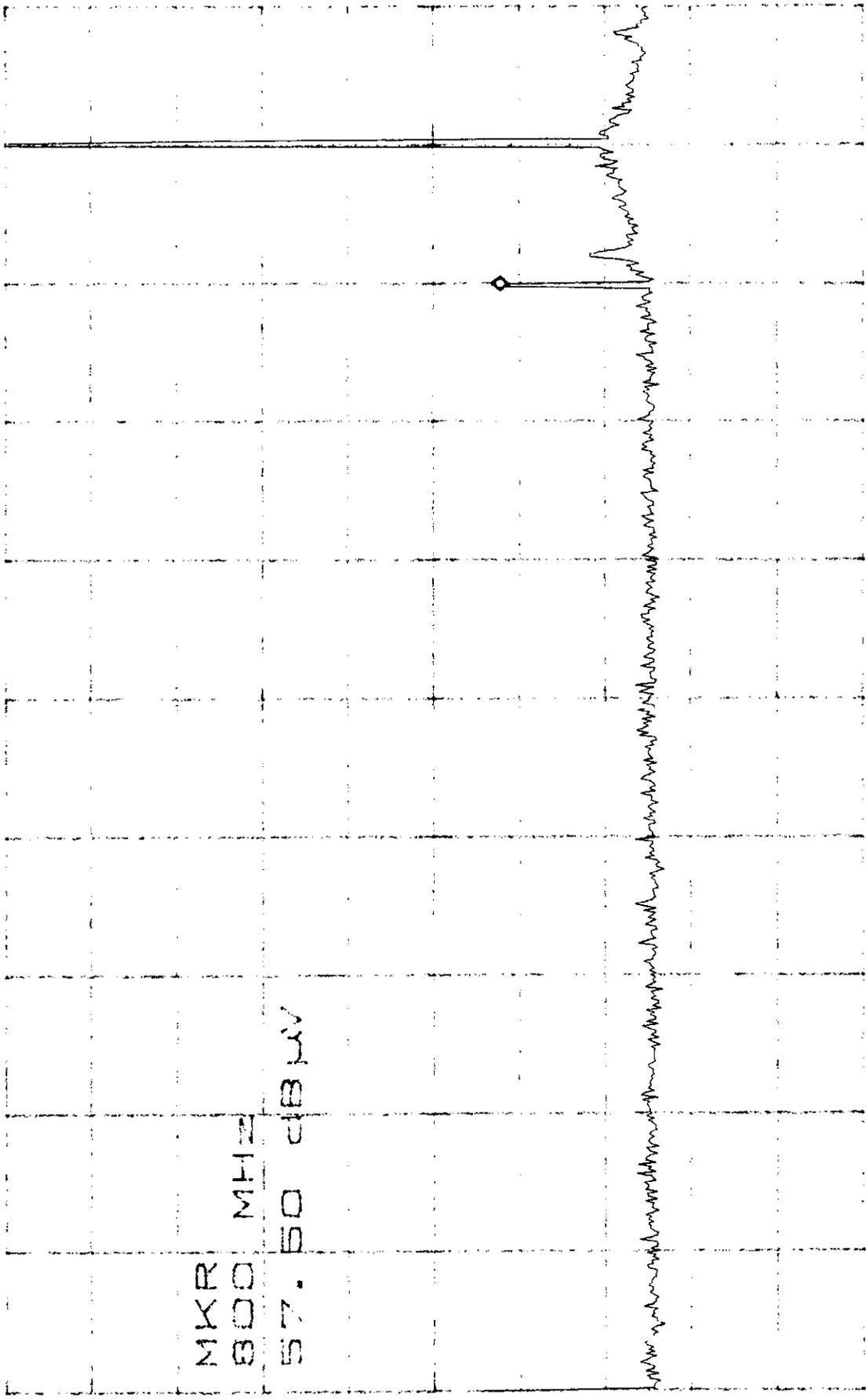
A803004.DOC

ATTEN 20.0dB of Band Emissions 0Hz - 1GHz 902.08MHz 57.50dBμV

RL 116.2dBμV 10dB 800MHz

MXR
800 MHz

57.50 dBμV



START 0Hz STOP 1.000GHz
*RBW 100kHz VBW 100kHz SWP 250ms

ATTEN 20 Out of Band Emissions 1-2.75 GHz 992.98 MHz 56.84 dB

RF 116.00 dBm 100 Hz 1.000 GHz

NKR
1.000 GHz
56.84 dBm

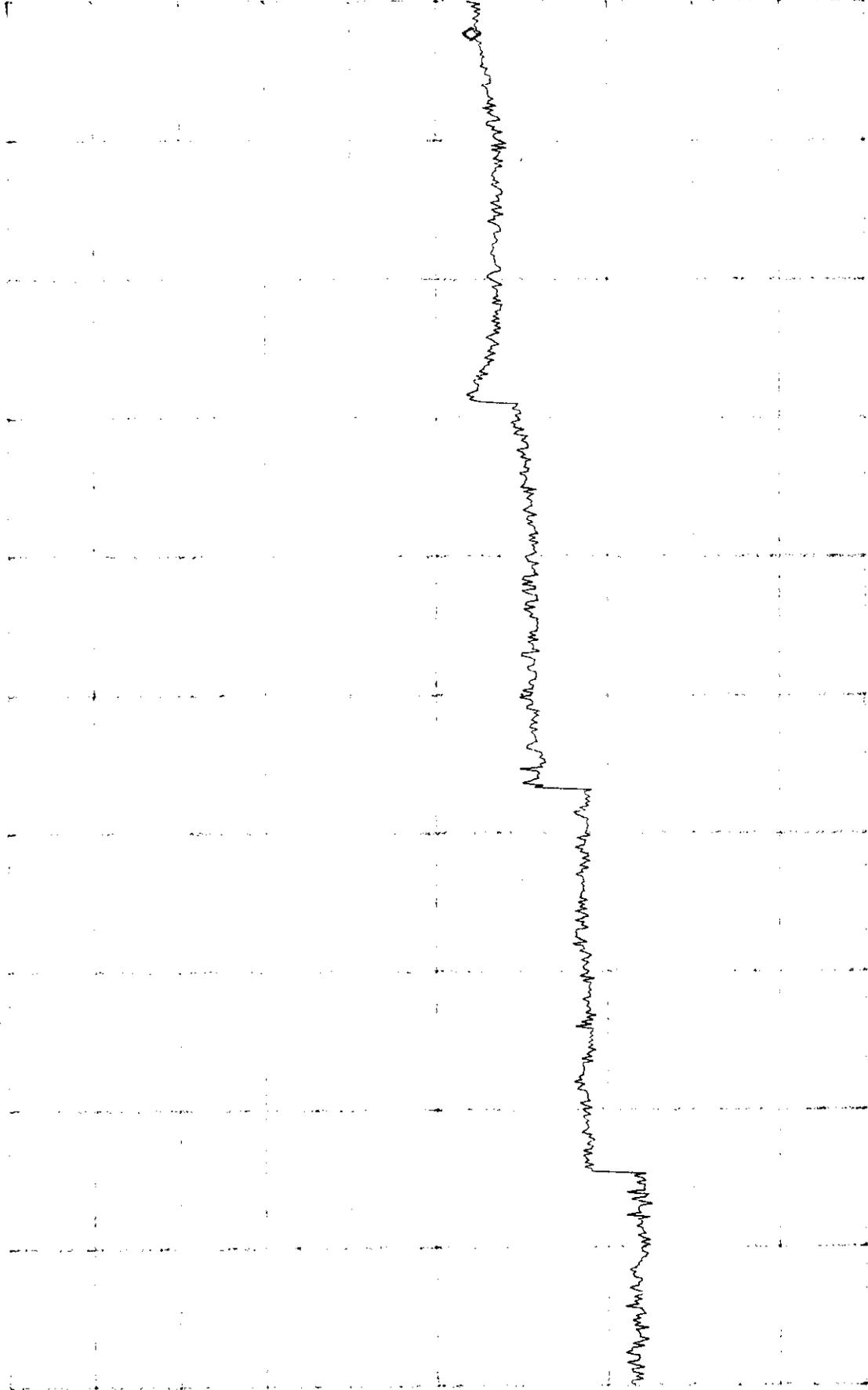
1.507 GHz
56.84

2.709 GHz
51.34

START 1.000 GHz STOP 2.750 GHz
RESW 100 kHz VBW 100 kHz SWP 440 mHz
A803004.DOC

ATTEN 20 Out of Band Emissions 2.75 -26.5 GHz 902.08MHz

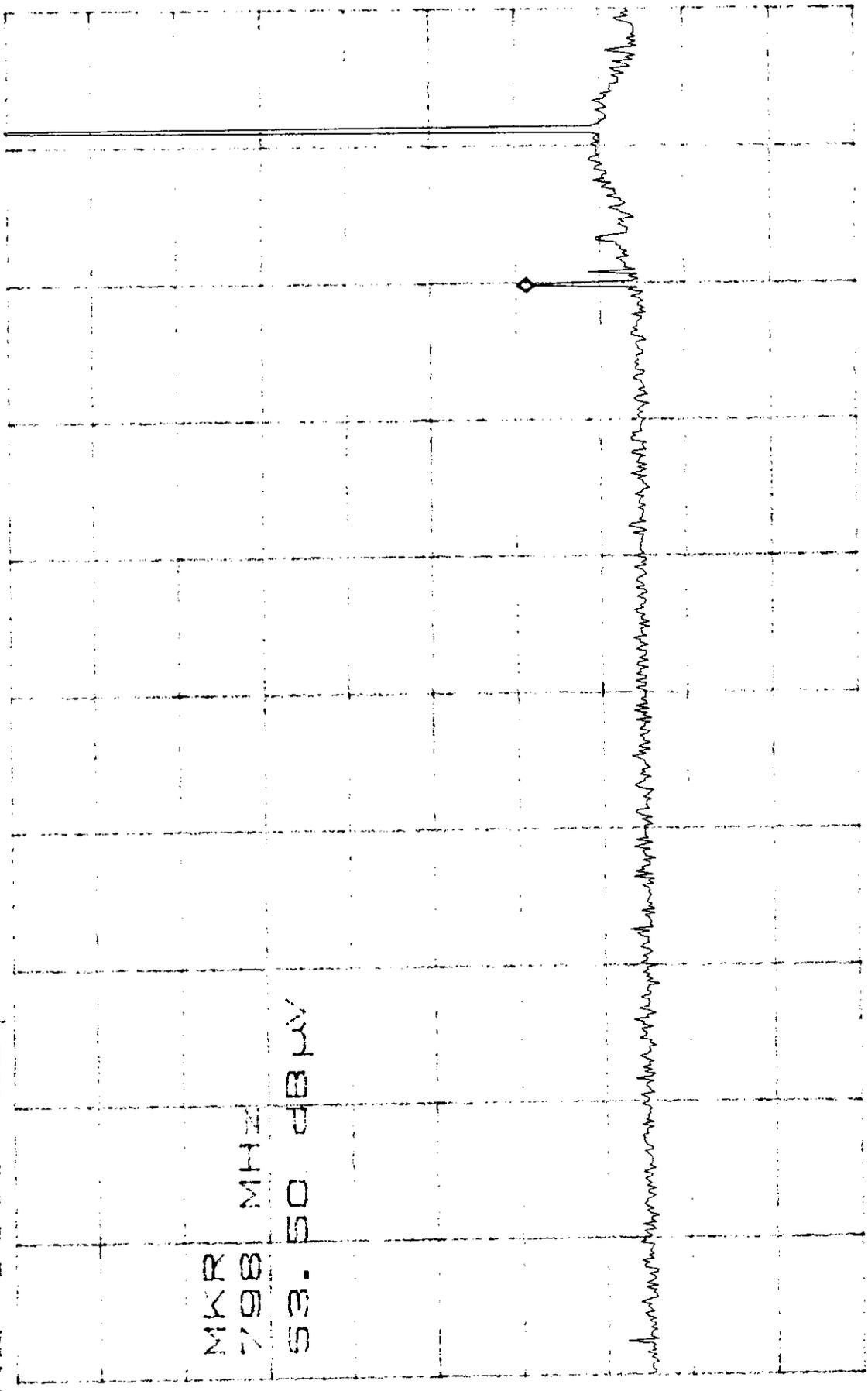
RES 116.2MHz SWP 100kHz



START 2.75GHz STOP 26.5GHz
RES 100kHz VBW 100kHz SWP 6.0sec

ATTEN 20 dB Out of Band Emissions 0Hz - 1GHz 914.08 MHz 3.50 dB μ V

RL 115.7 dB μ V 10 dB / 798 MHz



MKR

798 MHz

53.50 dB μ V

START 0Hz

*RBW 100kHz

STOP 1.000GHz

VBW 100kHz

SWP 250ms

ATTEN 20.0dB Out of Band Emissions 1-2.75 GHz 914.08MHz 5.4. 150dB/3dB

RL 115.7dBm 10dB 1.825GHz

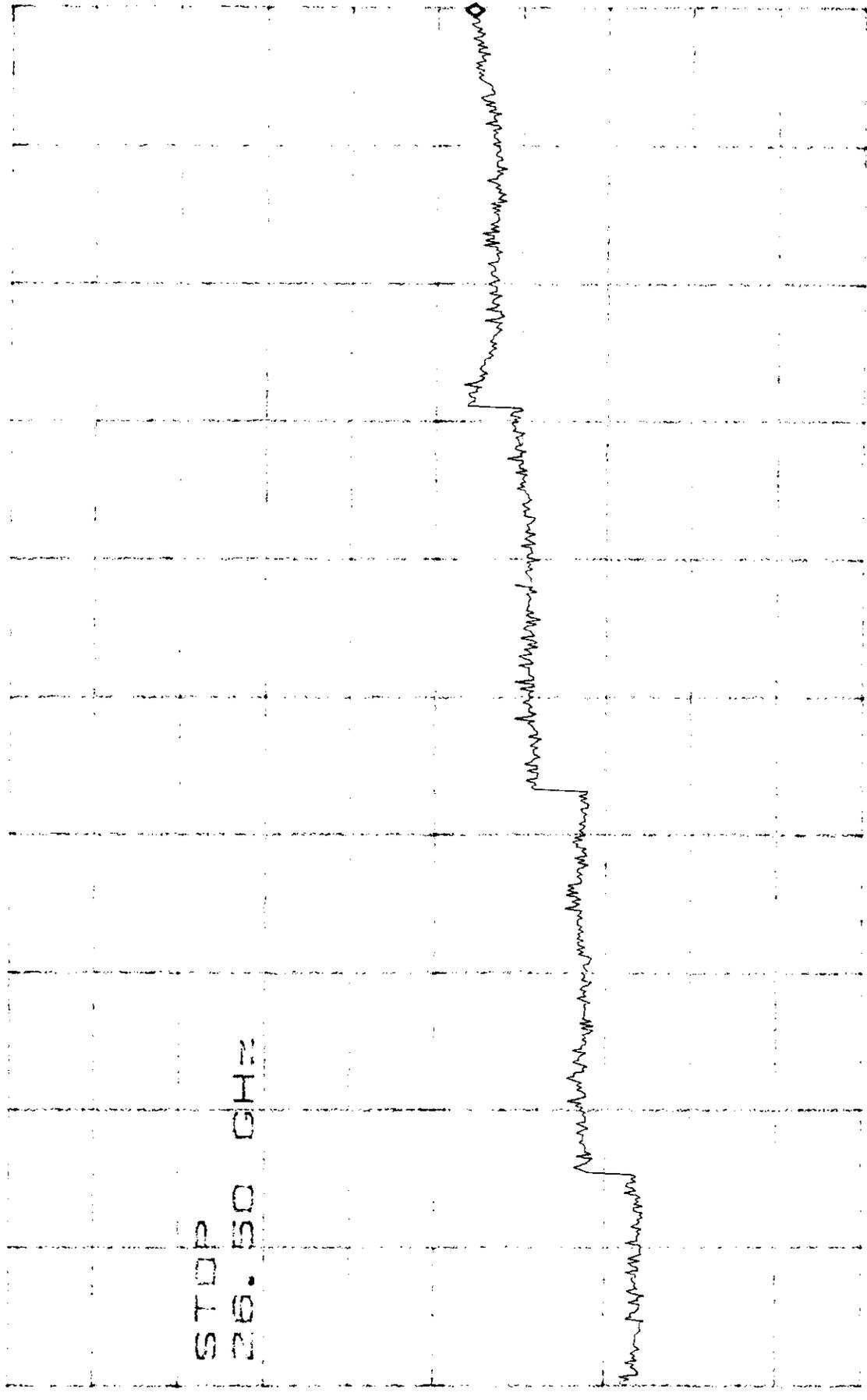
NKR
1.825 GHz
5.4. 150 dBm

1.003
51.0dBm
2.75
50.50

START 1.000GHz STOP 2.750GHz
*RBW 100kHz VBW 100kHz SWP 440ms
A803004.DOC 24

ATTEN 20 Out of Band Emissions 2.75 -26.5 GHz 914.08 MHz 0. 50 dB μ V

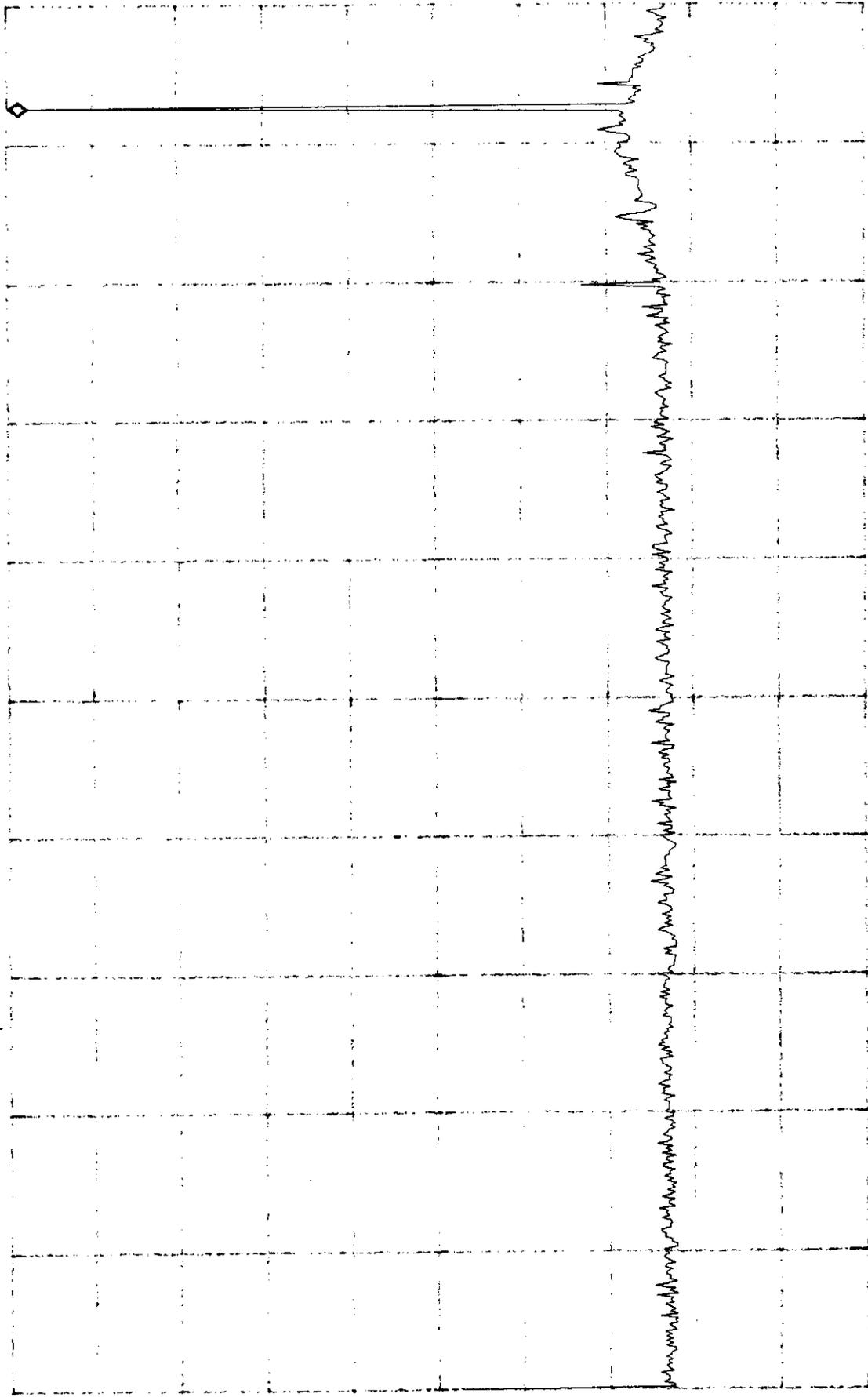
RL 115.7 dB μ V 10 dB 26.48 GHz



START 2.75 GHz STOP 26.50 GHz
*RBW 100 kHz VBW 100 kHz SWP 6.0000
A803004.DOC 25

ATTEN 20dB Out of Band Emissions 0Hz - 1GHz 927.84 MHz 14.67 dBμV

RL 117.0dBμV 10dB / 927 MHz



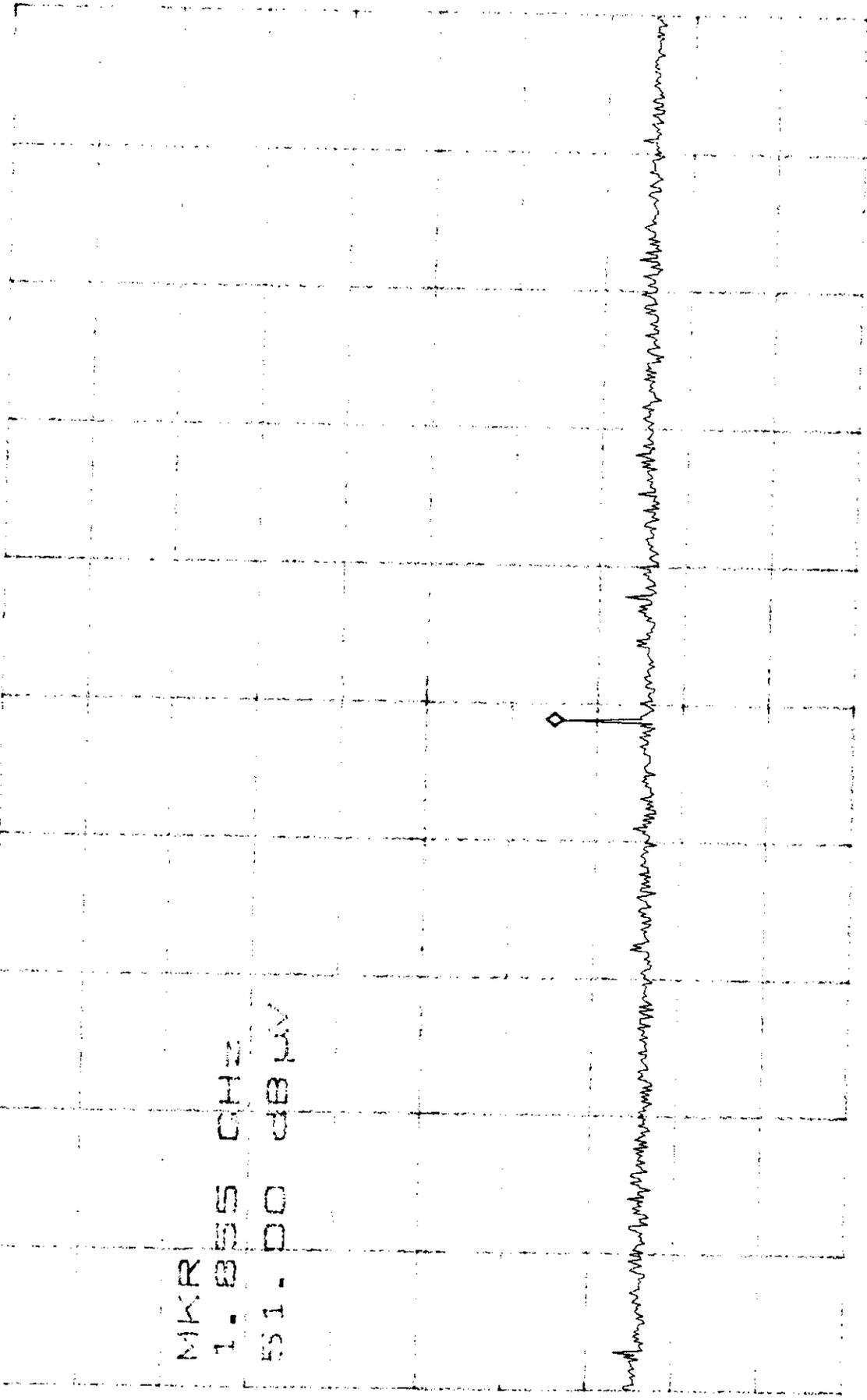
START 0HZ STOP 1.000GHZ

*RBW 100KHZ

VBW 100KHZ

SWP 250ms

ATTEN 20.0dB of Band Emissions 1-2.75 GHz 927.84MHz 1.00dB μ V
RL 117.0dB μ V 10dB 1.855GHz



MKR

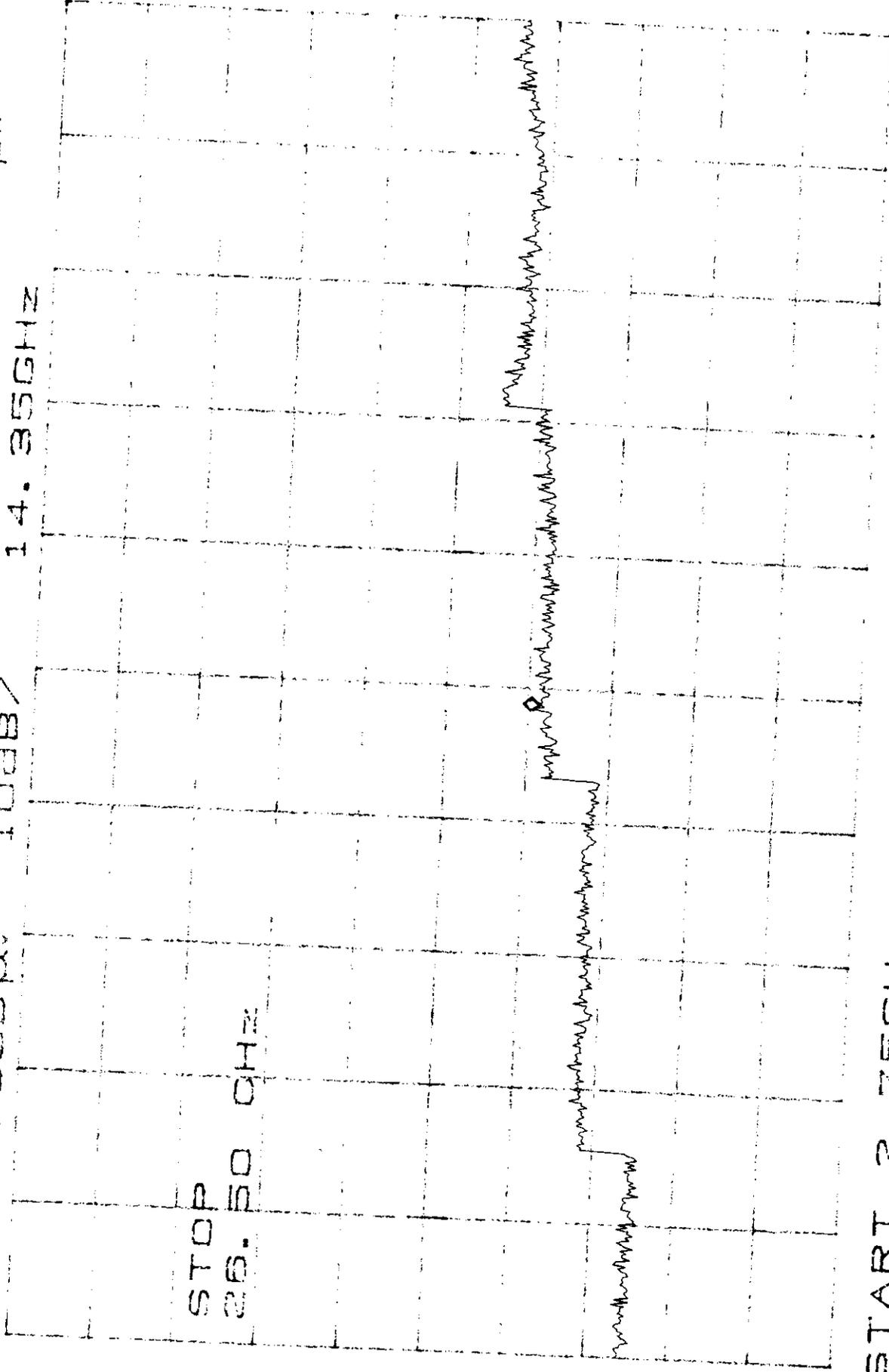
1.855 GHz

51.00 dB μ V

START 1.000GHz STOP 2.750GHz
*RBW 100kHz VBW 100kHz SWP 440ms

ATTEN 20dB
RL 117.0dBμV
10dB/

Out of Band Emissions 2.75 - 26.5 GHz
927.84MHz
55.67dBμV
14.35GHz



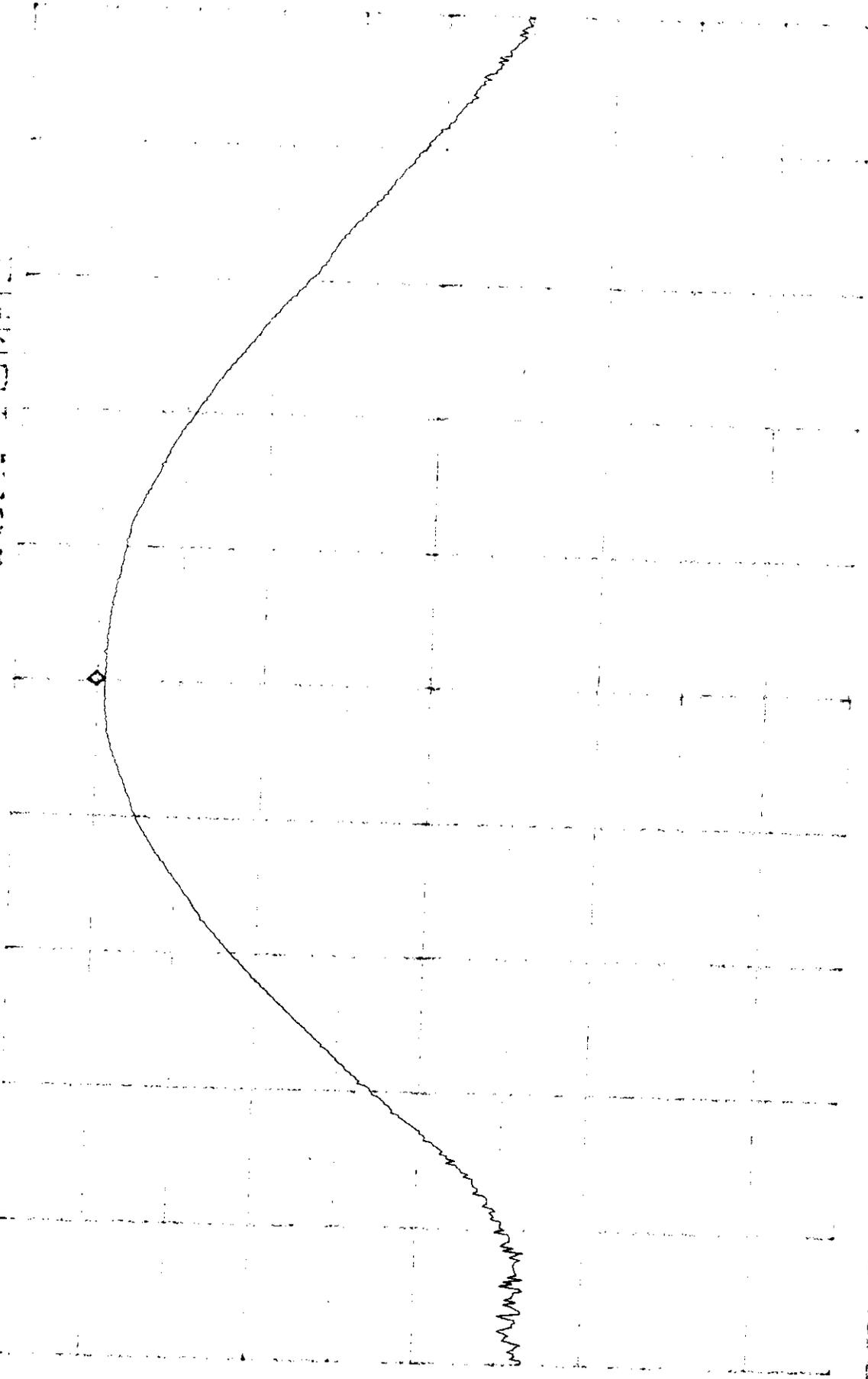
STOP
26.50 GHz

START 2.75GHz

*RBW 100kHz VBW 100kHz STOP 26.50GHz
SWP 5.0680

ATTEN 30dB
RES 20.0dBm

Output Power 902.08 MHz MKR 9.17 dBm
1.00 dB



CENTER 902.08 MHz

*RBW 3.0 MHz

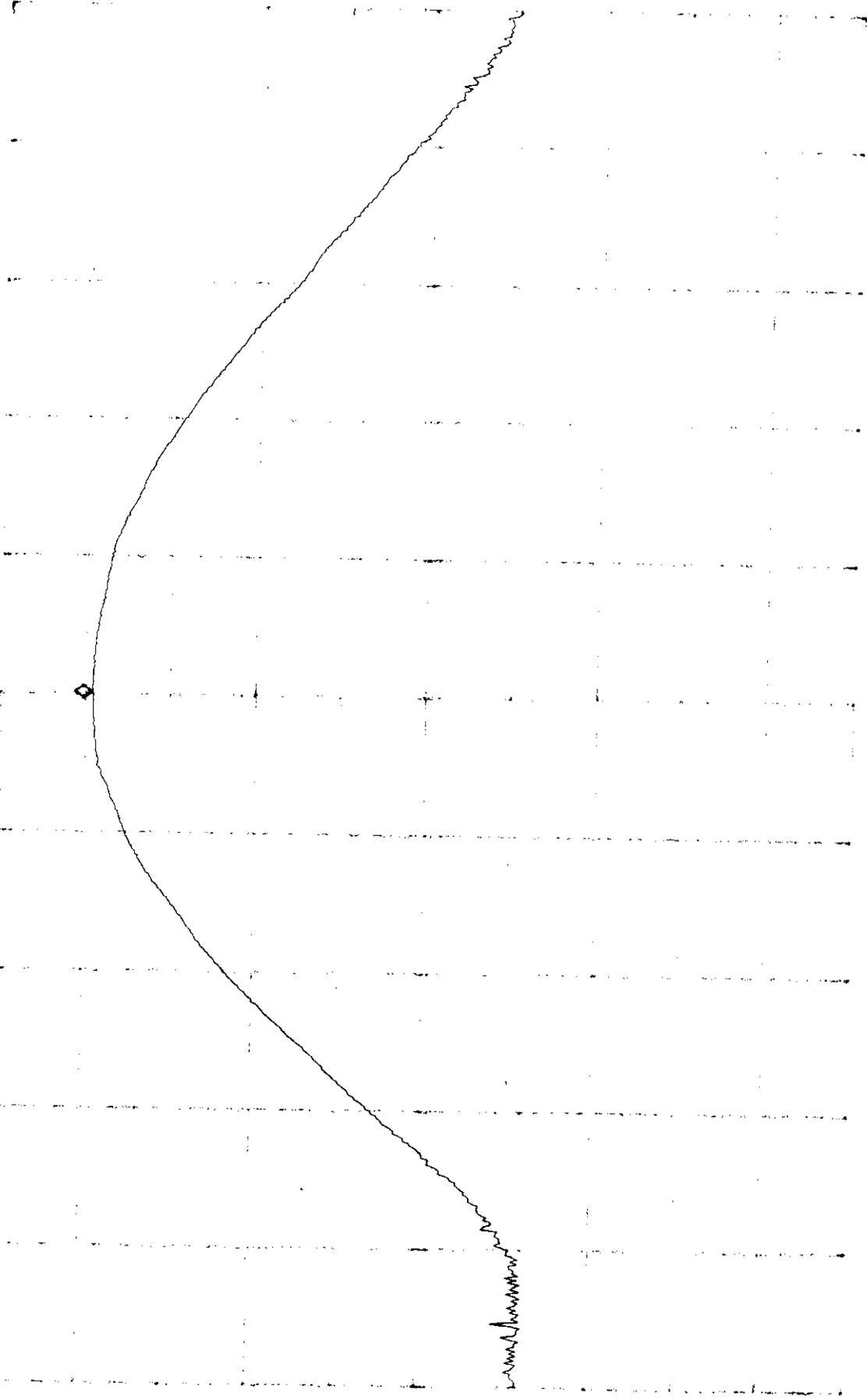
SPAN 10.00 MHz

VBW 3.0 MHz

SWP S0me

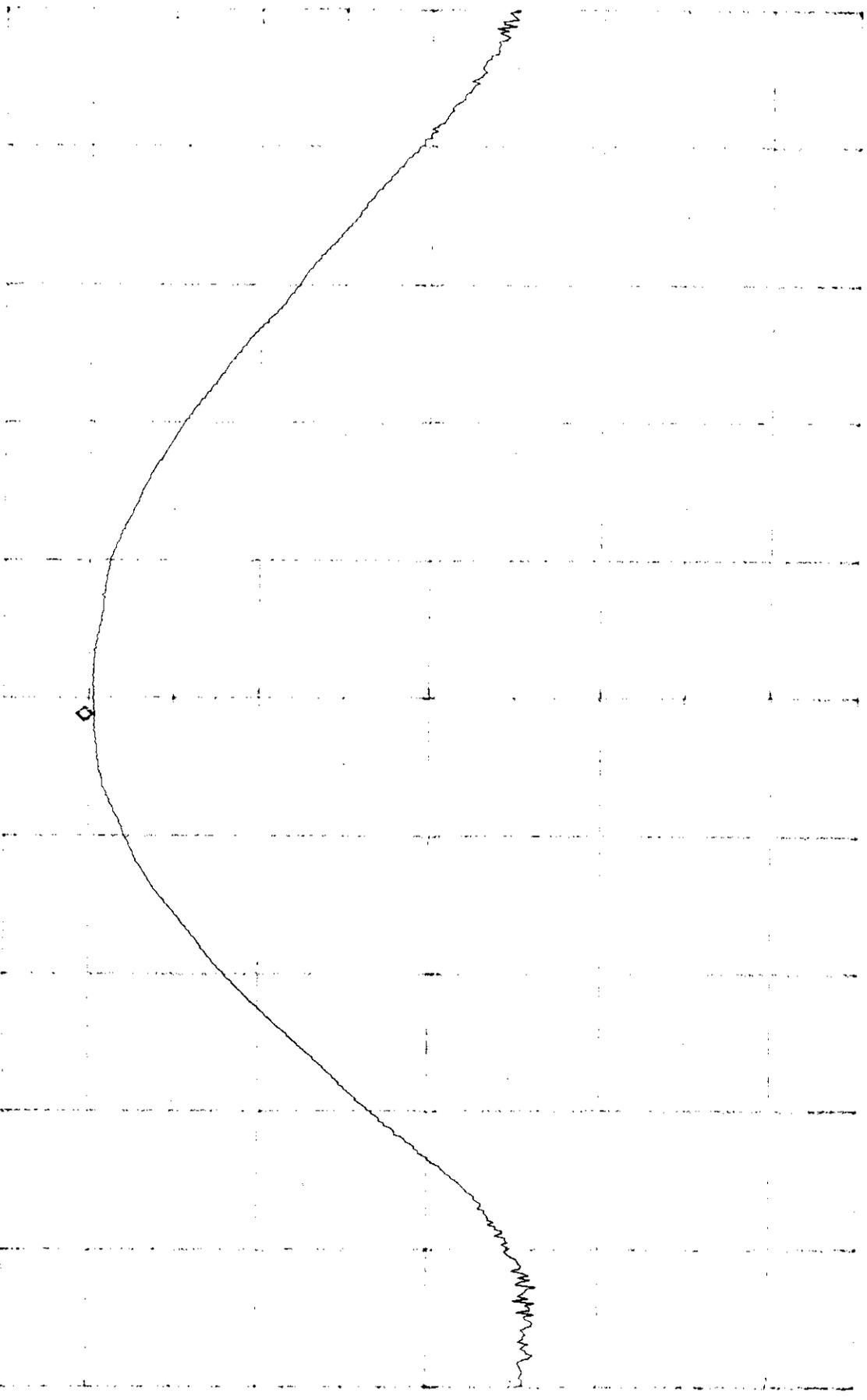
ATTEN 30dB
RL 20.0dBm

Output Power 914.08 MHz MKR 9.93dBm
10dB 914.10MHz



CENTER 914.08MHz SPAN 10.00MHz
*RBW 3.0MHz VBW 3.0MHz SWP 50ms
A803004.DOC 30

ATTEN 30dB Output Power 927.84 MHz 10.00MHz 0.500dBm
20.00dB 100dB 927.84MHz



CENTER 927.84MHz SPAN 10.00MHz
*RBW 2.0MHz VBW 3.0MHz SWP 50ms
A803004.DOC 31

ATTEN 30.0dB 20dB Occupied Bandwidth 927.84 MHz

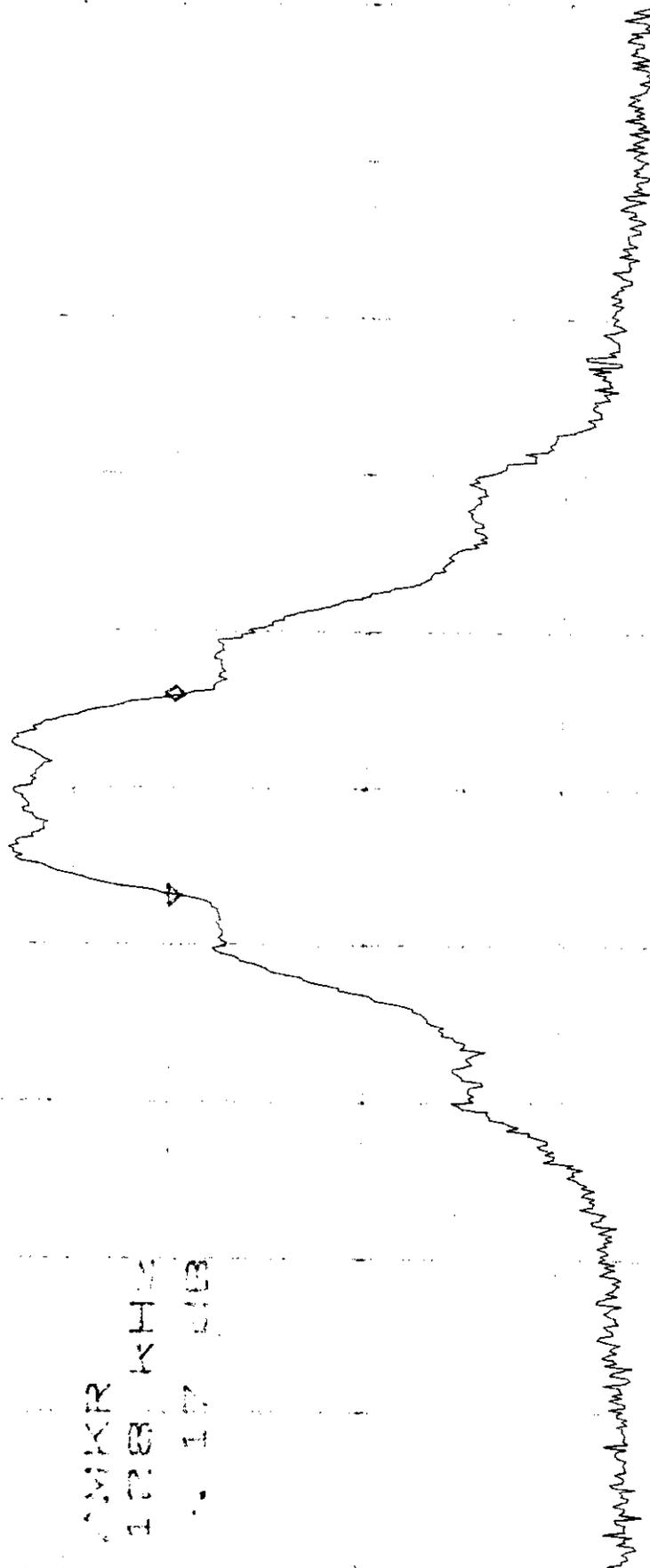
RES 200.000MHz

SPAN 1.000MHz

MARKER

100.000kHz

100.000kHz



CENT 927.840MHz

SPAN 1.000MHz

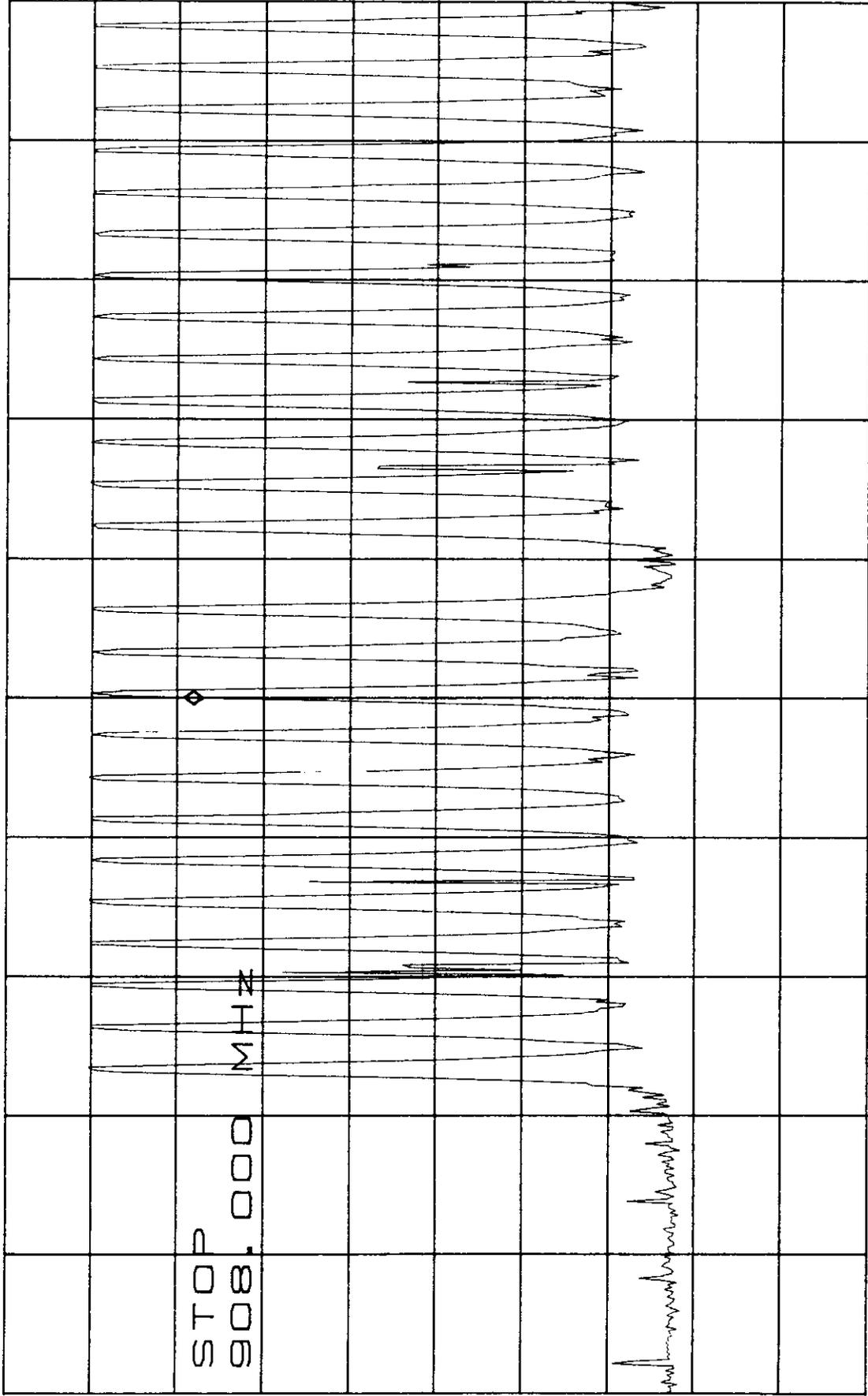
*RESW 100kHz

*VBW 100kHz

SWP 50ms

Whisper Mode

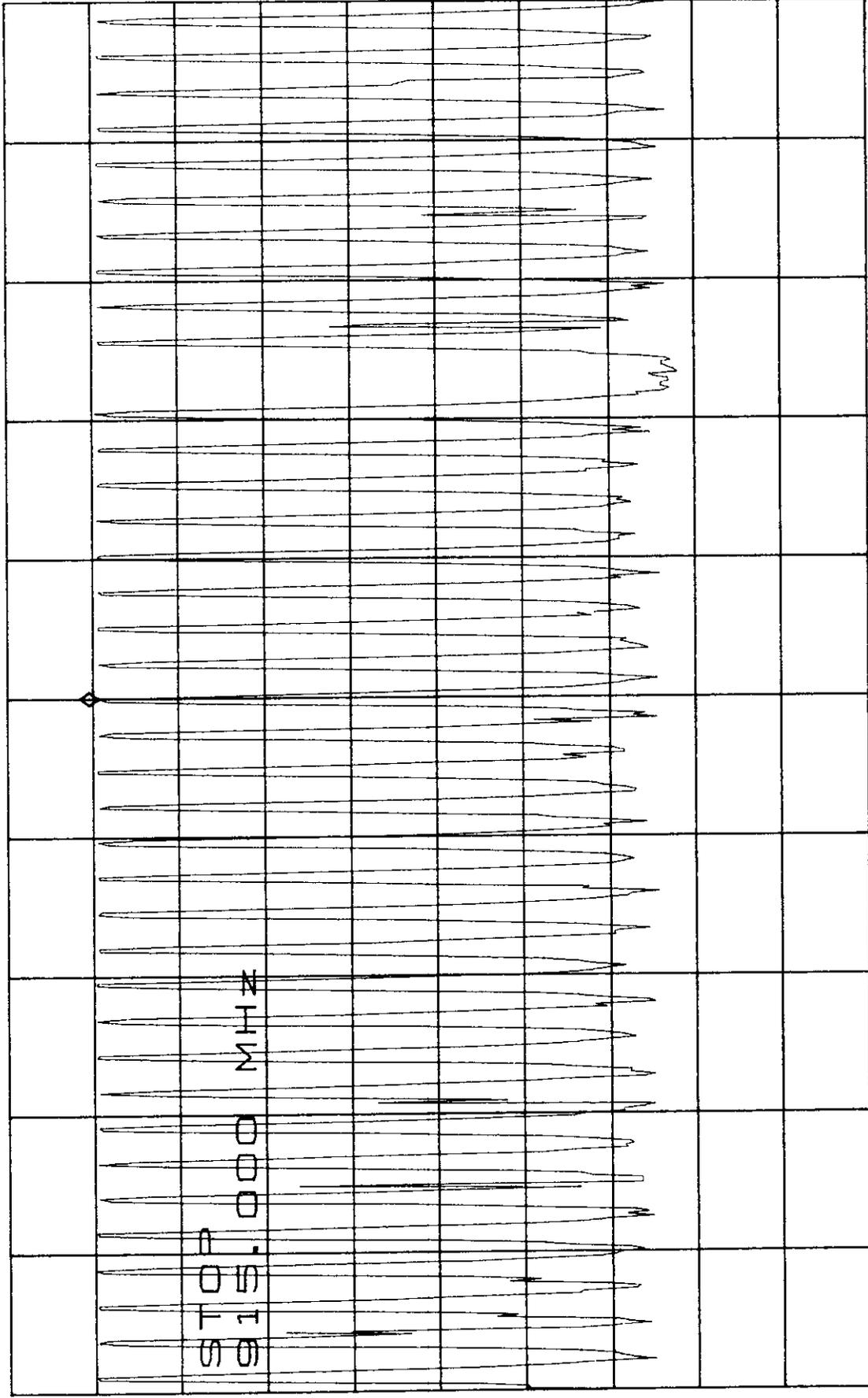
ATTEN 30dB Channel Utilization 902 - 908 MHz -2.83dBm
RL 20.0dBm 10dB/ 905.000MHz



D

START 902.000MHz STOP 908.000MHz
*RBW 10kHz *VBW 100kHz SWP 150ms
A803004.DOC 36

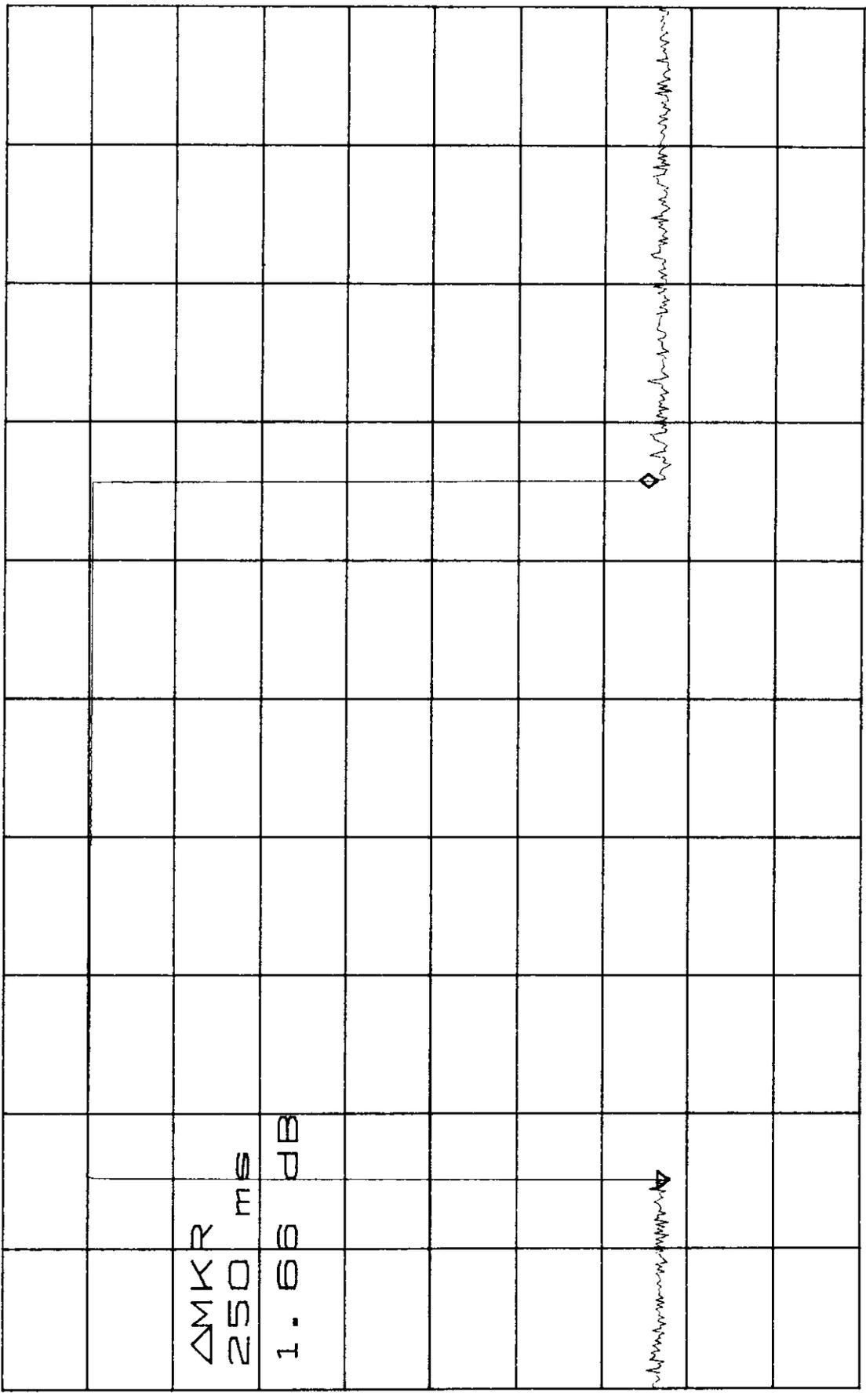
ATTEN 30dB Channel Utilization 908 - 915 MHz 9.50dBm
RL 20.0dBm 10dB/ 911.500MHz



D

START 908.000MHz STOP 915.000MHz
*RBW 10kHz *VBW 100kHz SWP 180ms
A803004.DOC 37

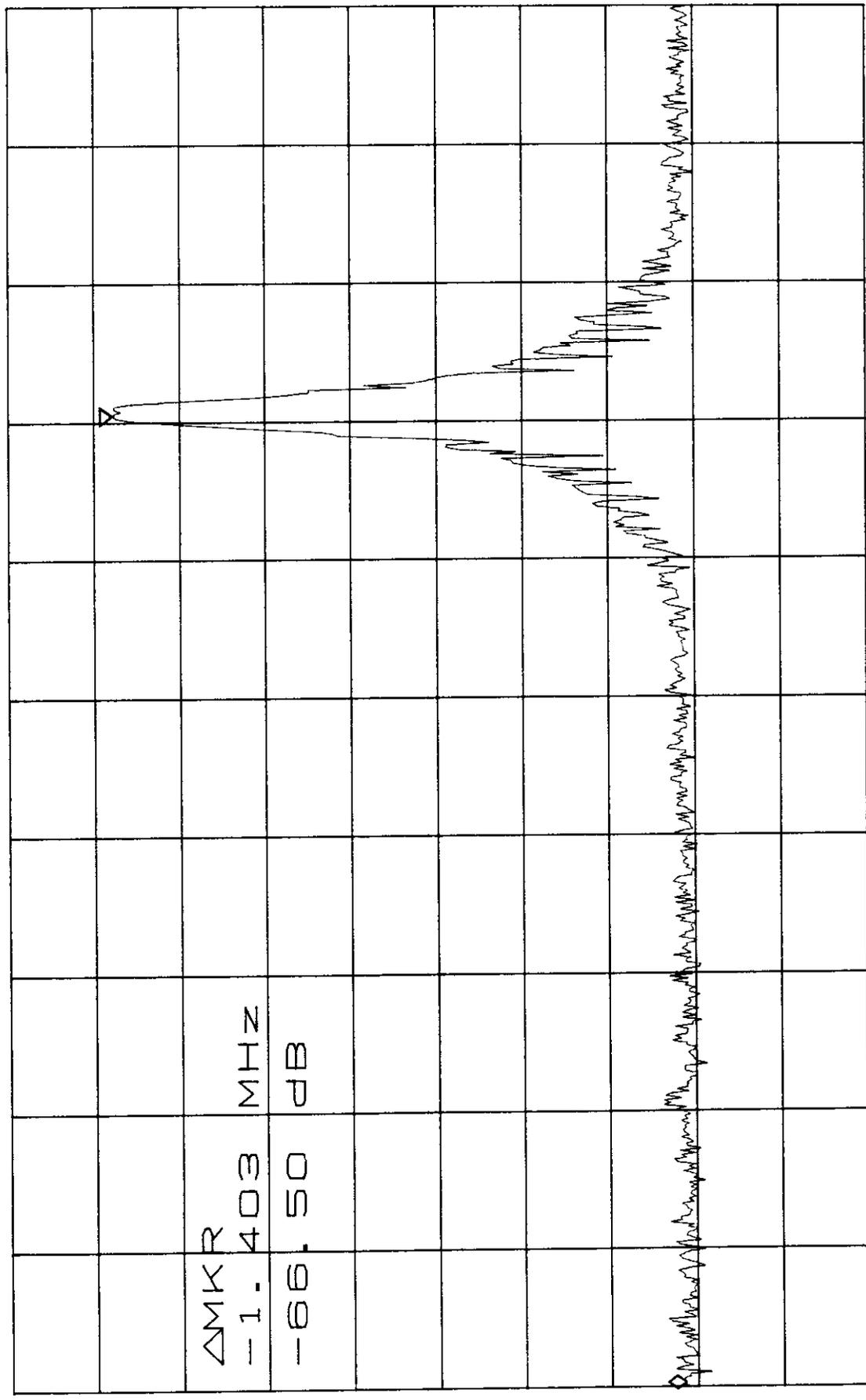
ATTEN 30dB Dwell Time ΔMKR 1.66dB
 RL 20.0dBm 10dB/ 250ms



ΔMKR
 250 ms
 1.66 dB

CENTER 914.940000MHZ SPAN 0HZ
 *RBW 10KHZ *VBW 100KHZ *SWP 500ms
 A803004.DOC 38

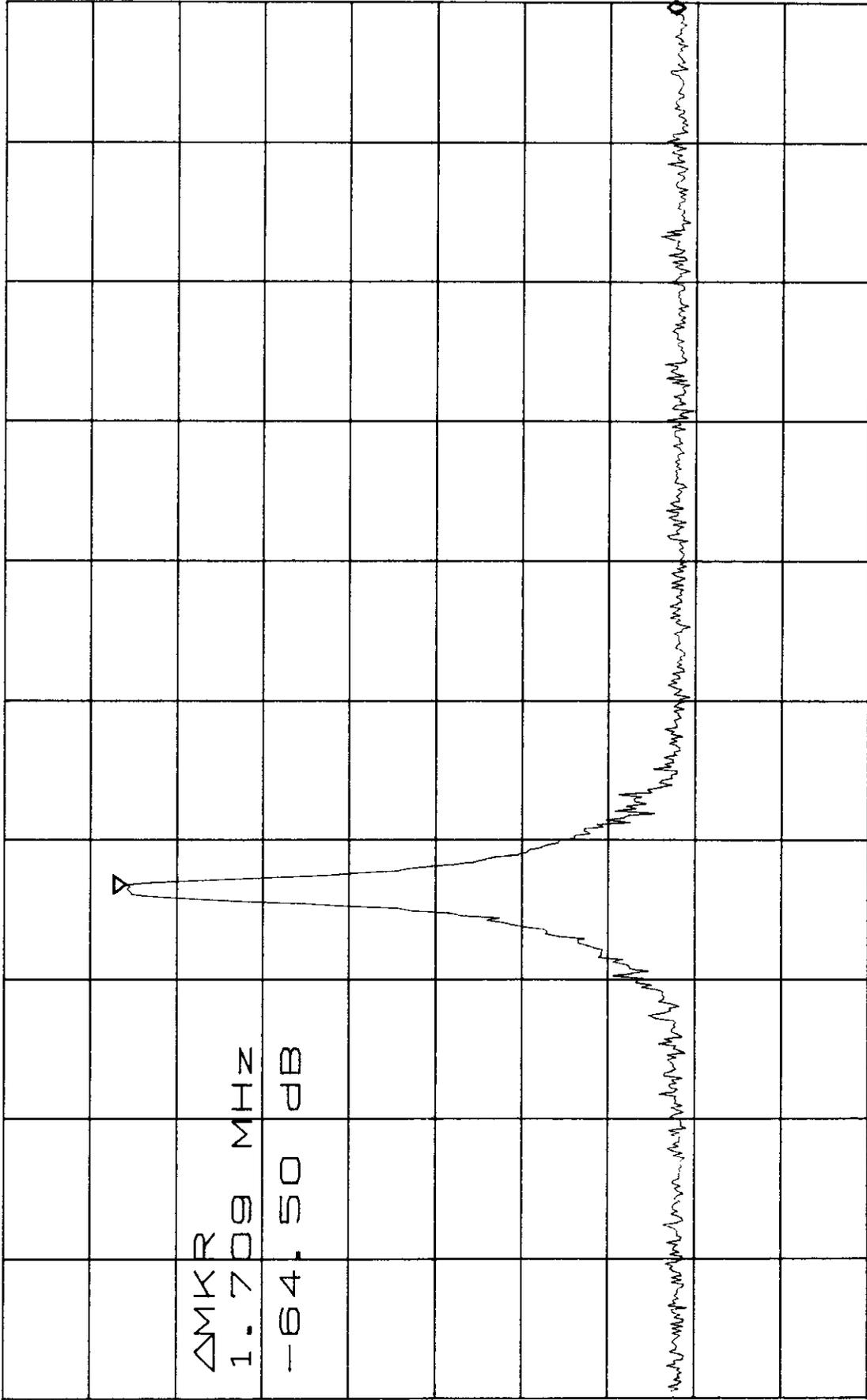
ATTN 30dB Out of Band Lower Band Edge -66.50dB
 RL 20.0dBm 10dB/ -1.403MHz



ΔMKR
 -1.403 MHz
 -66.50 dB

START 902.000MHz STOP 904.000MHz
 * RBW 10kHz * VBW 100kHz SWP 50ms
 A803004.DOC 39

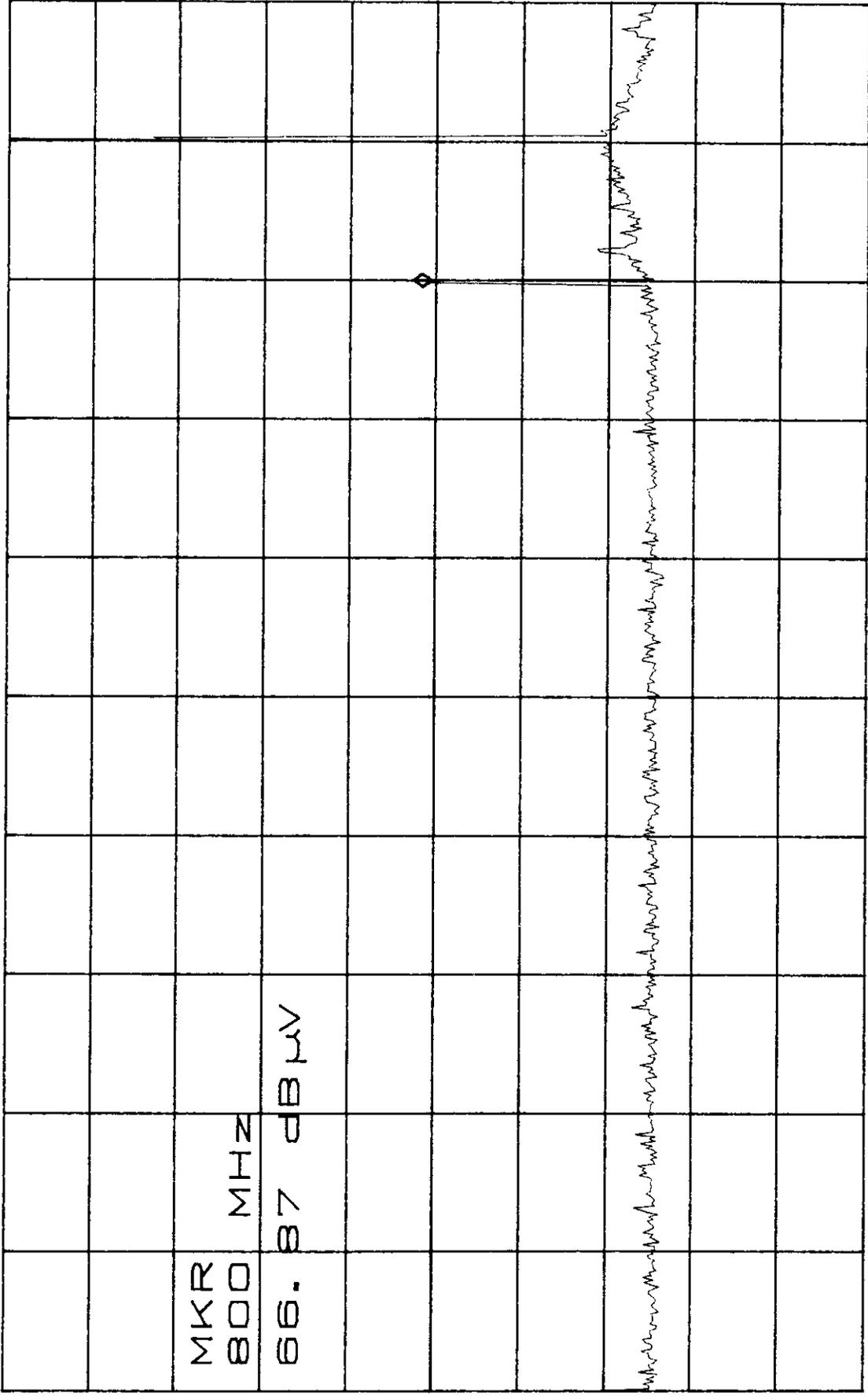
ATTEN 30dB Out of Band Upper Edge MKR -64.50dB
RL 20.0dBm 10dB/ 1.709MHz



D

START 925.280MHz STOP 928.000MHz
*RBW 10kHz *VBW 100kHz SWP 68ms
A803004.DOC 40

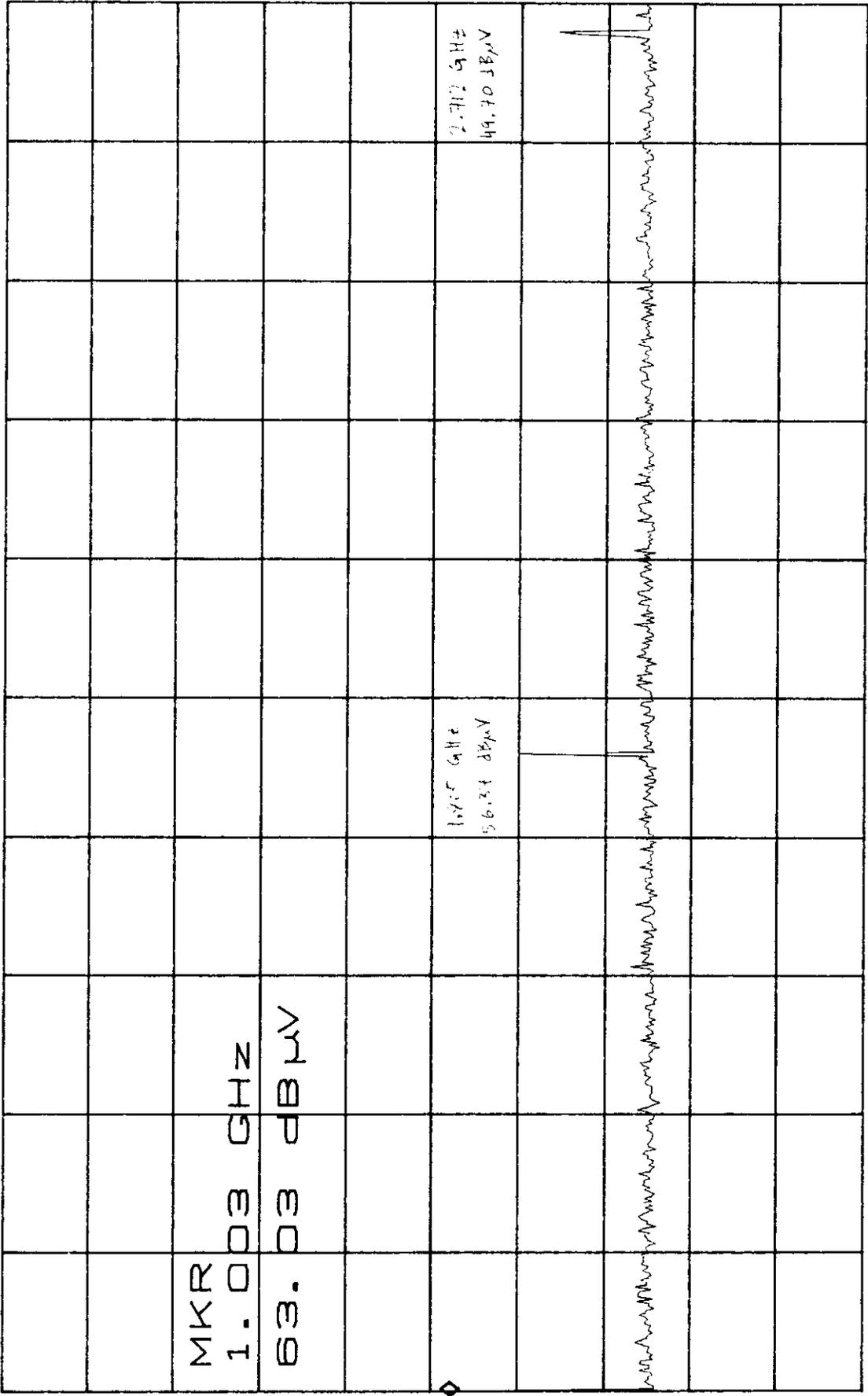
ATTEN 20 dB Out of Band Emissions 0Hz - 1GHz 903.42 MHz 6.87 dB μ V
 RL 116.2 dB μ V 10 dB / 800 MHz



D

START 0Hz STOP 1.000GHz
 *RBW 100kHz *VBW 100kHz SWP 250ms⁴¹
 A803004.DOC

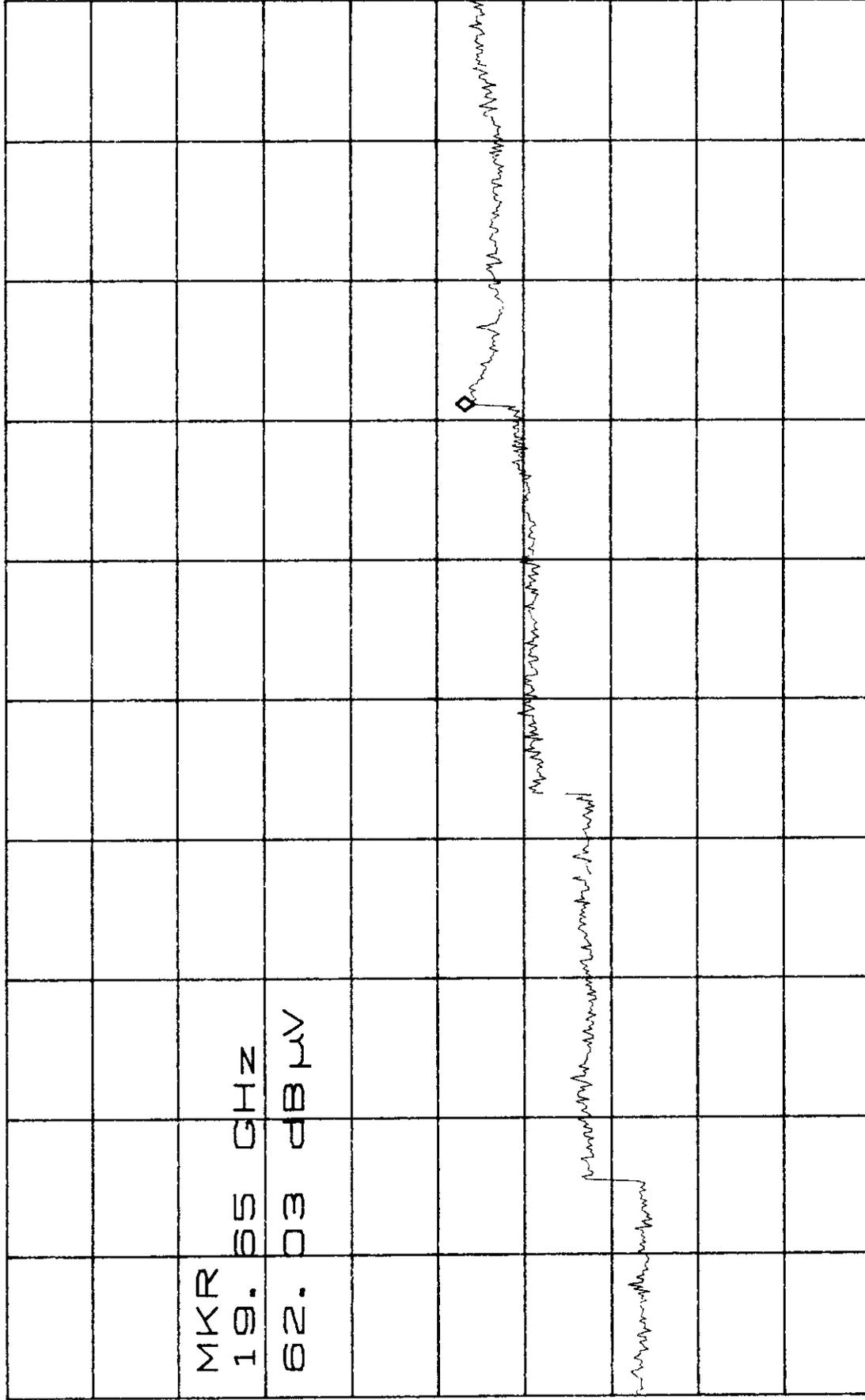
ATTEN 20dB Out of Band Emissions 1-2.75 GHz 903.42 MHz 3.03dB μ V
 RL 116.2dB μ V 10dB / 1.003GHz



START 1.000GHz STOP 2.750GHz
 *RBW 100kHz *VBW 100kHz SWP 440ms
 A803004.DOC 42

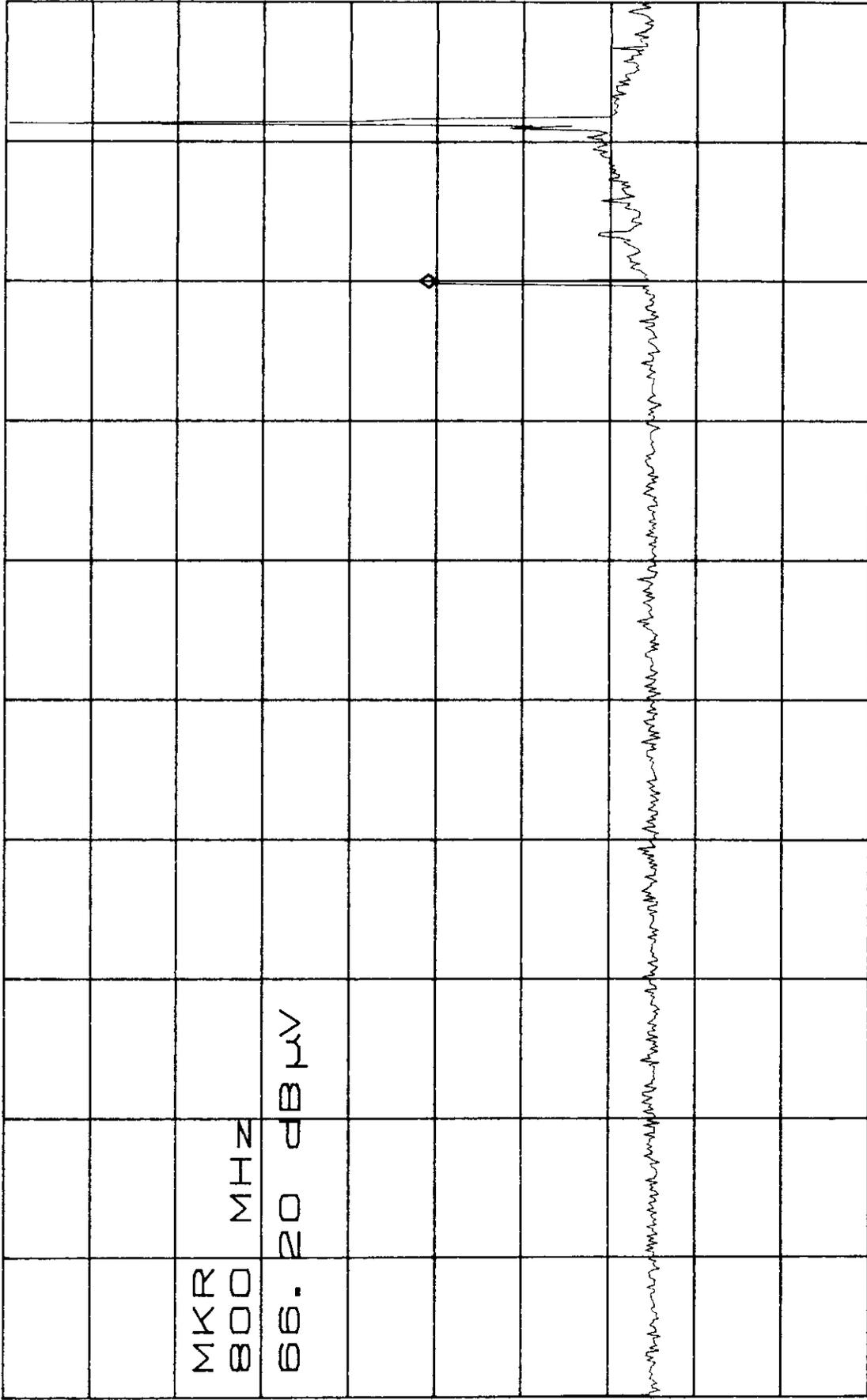
ATTEN 20 dB of Band Emissions 2.75 - 26.5 GHz ~~90.42 MHz~~ 0.3 dB μ V

RL 116.2 dB μ V 10 dB / 19.65 GHz



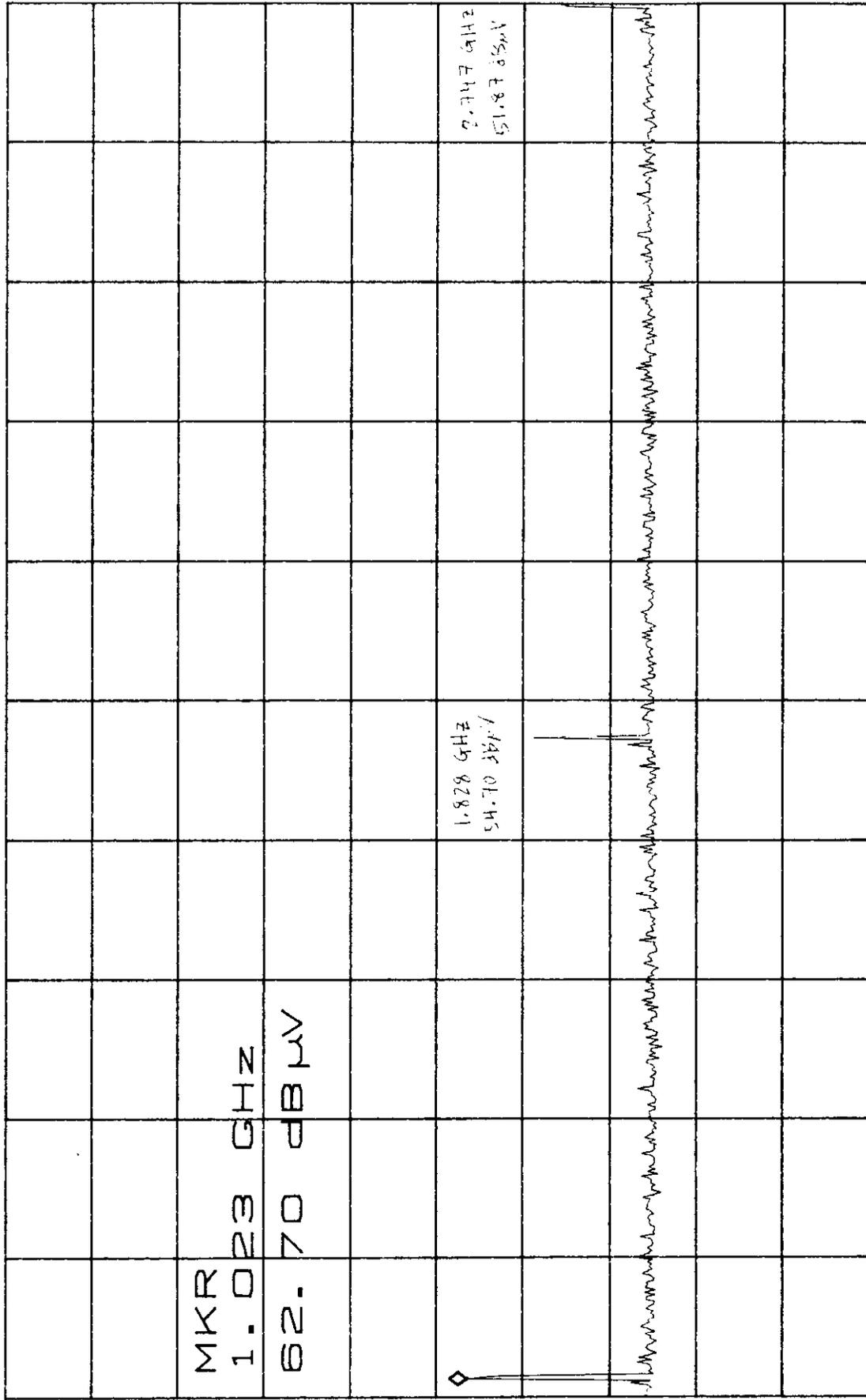
START 2.75GHz STOP 26.50GHz
*RBW 100kHz *VBW 100kHz SWP 6.0sec
A803004.DOC 43

ATTEN 20dB Out of Band Emissions 0Hz - 1GHz 14.94 MHz 6. 20dB μ V
RL 116. 2dB μ V 10dB / 800MHz



START 0HZ STOP 1. 000GHZ
*RBW 100KHZ *VBW 100KHZ SWP 250ms⁴⁴
A803004.DOC

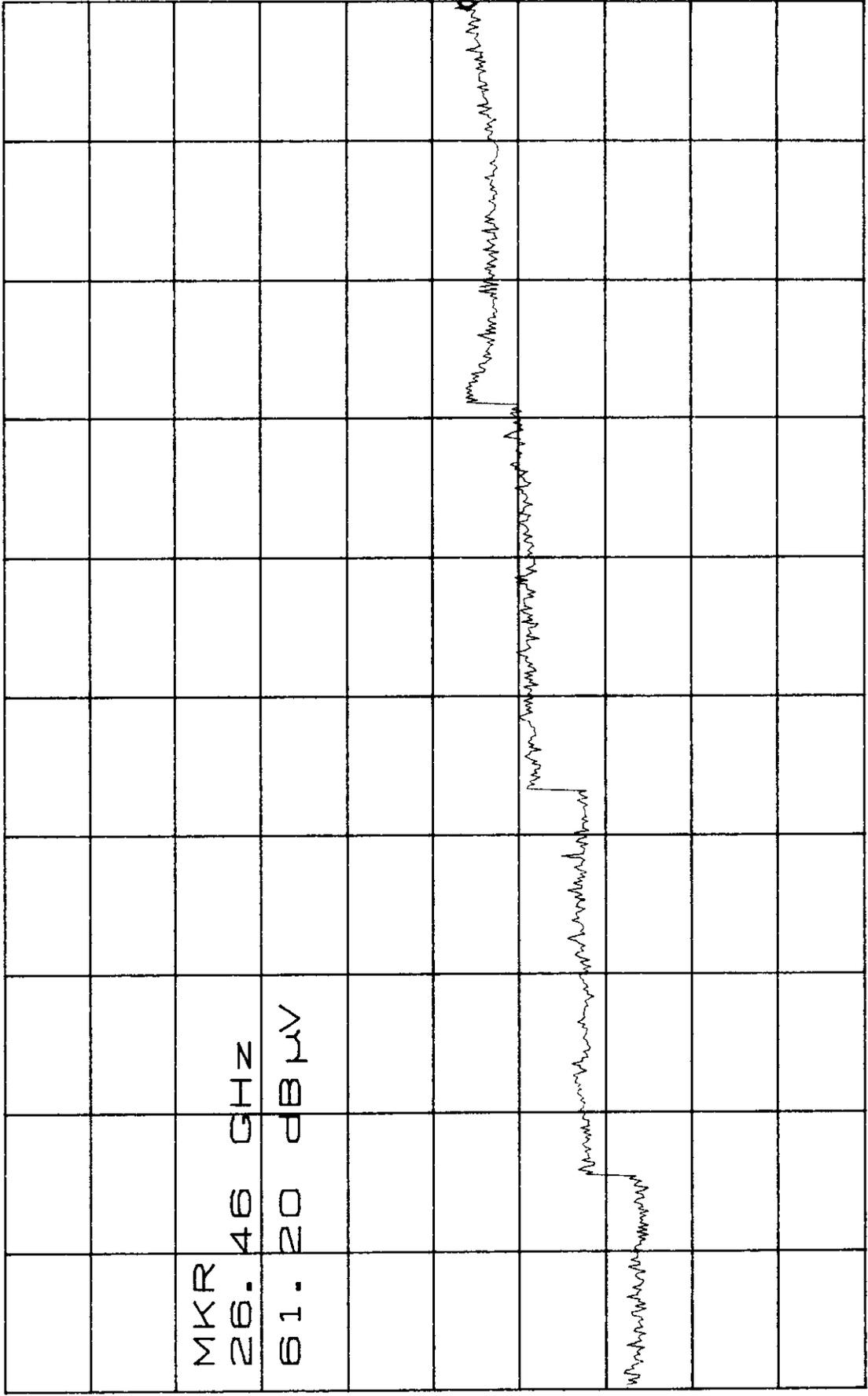
ATTEN 20dB Out of Band Emissions 1-2.75 GHz 14.94 MHz 2.70dB μ V
 RL 116.2dB μ V 10dB / 1.023GHz



D

START 1.000GHz STOP 2.750GHz
 *RBW 100kHz *VBW 100kHz SWP 440mS
 A803004.DOC 45

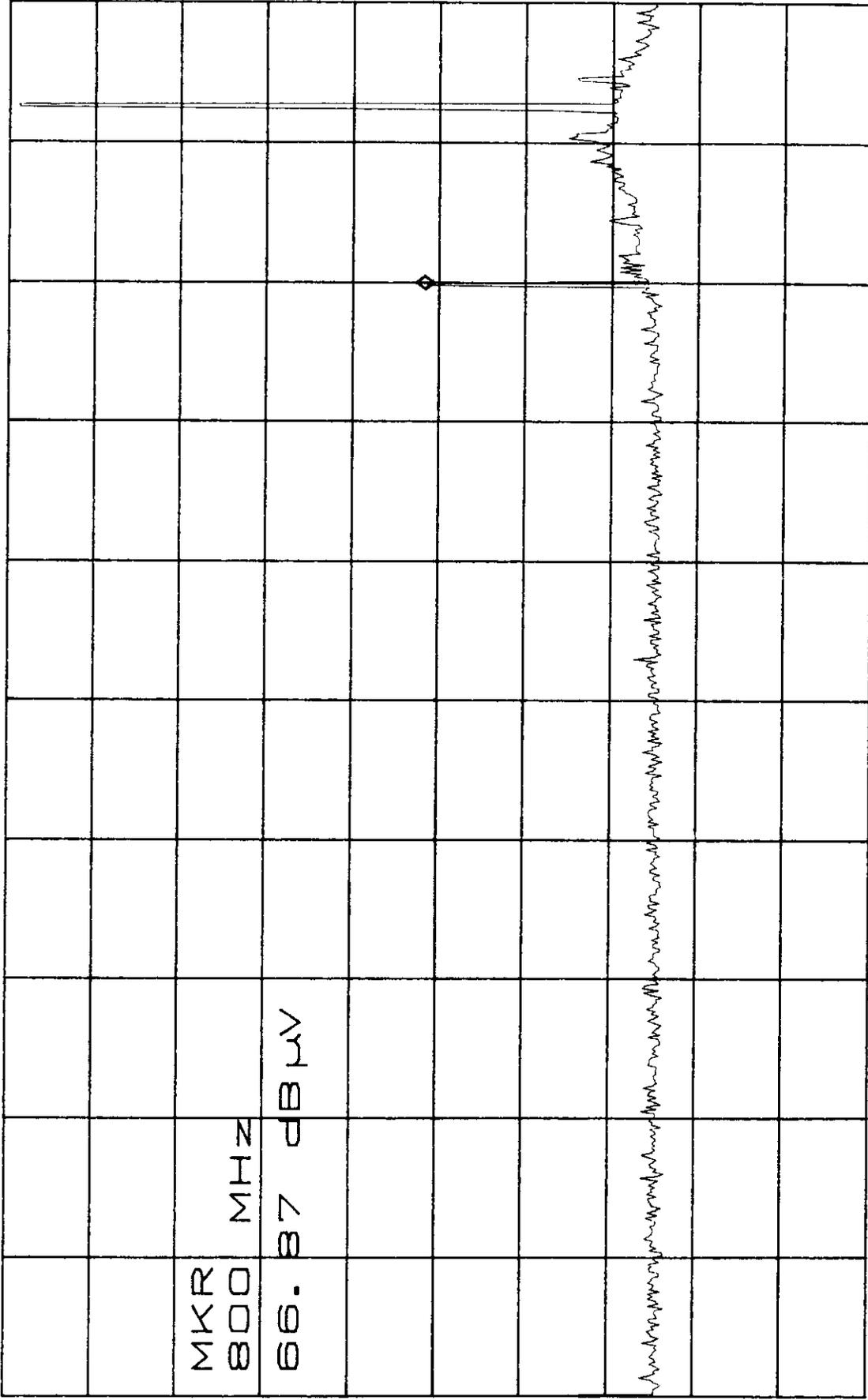
ATTEN 20 dB of Band Emissions 2.75 - 26.5 GHz ~~14.94 MHz~~ . 20 dB μ V
 RL 116.2 dB μ V 10 dB / 26.46 GHz



D

START 2.75GHz STOP 26.50GHz
 *RBW 100kHz *VBW 100kHz SWP 6.0sec
 A803004.DOC 46

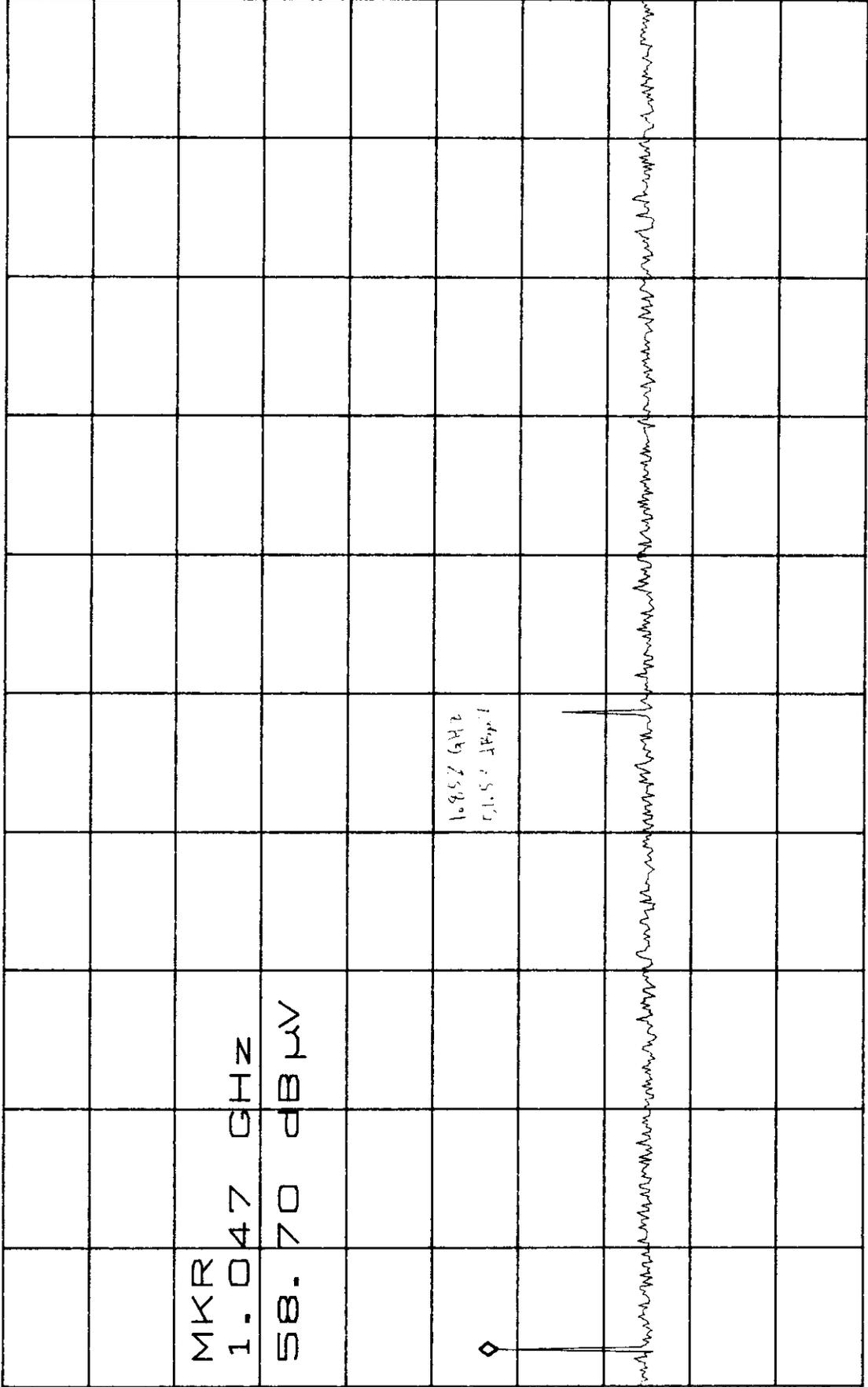
ATTEN 20dB Out of Band Emissions 0Hz - 1GHz 926.28 MHz 6.87 dB μ V
RL 116.2dB μ V 10dB / 800MHz



D

START 0Hz STOP 1.000GHz
*RBW 100kHz *VBW 100kHz SWP 250ms⁴⁷
A803004.DOC

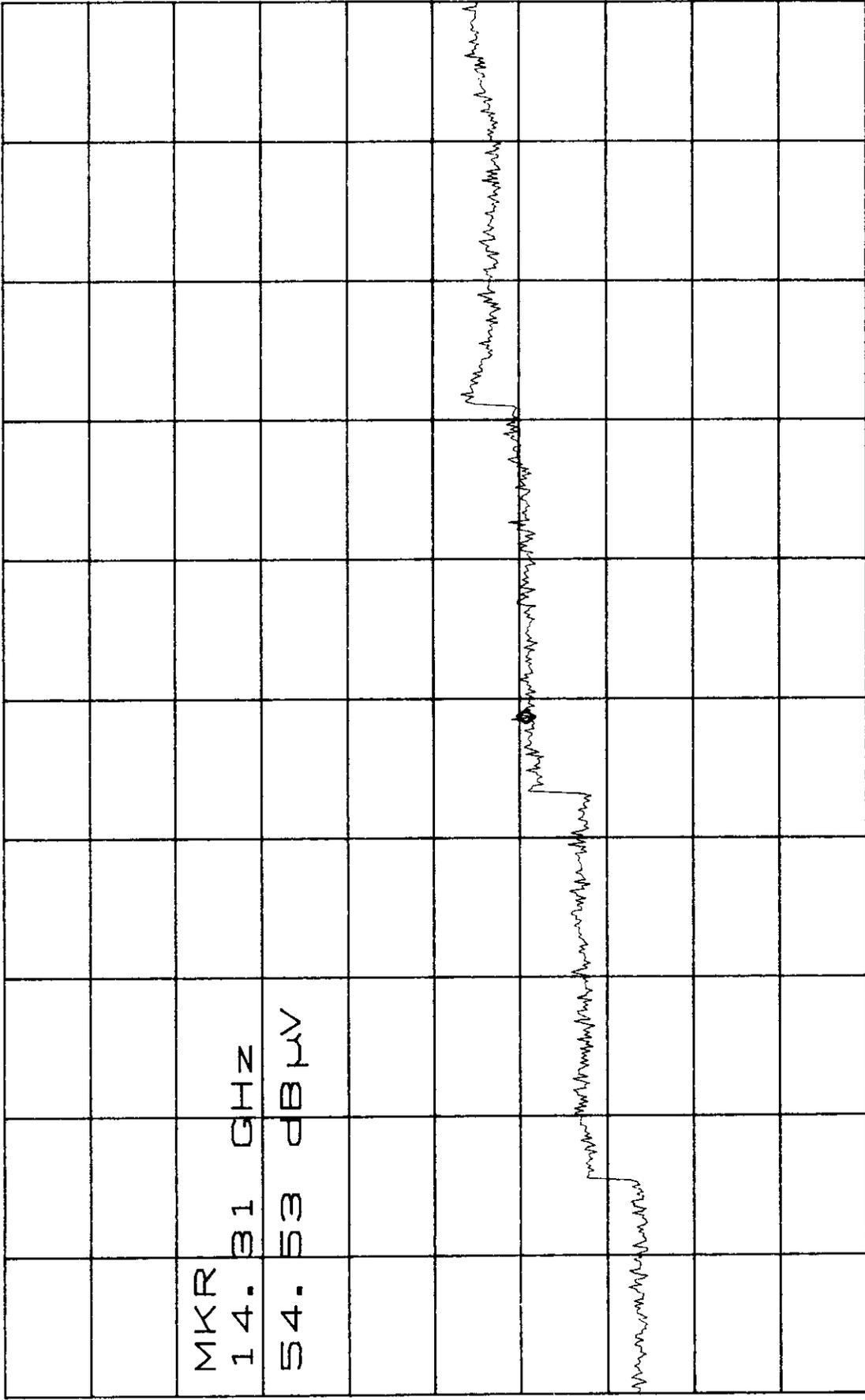
ATTEN 20 dB Out of Band Emissions 1-2.75 GHz 20 dB 8.70 dB μ V
 RL 116.2 dB μ V 10 dB / 1.047 GHz



START 1.000GHz STOP 2.750GHz

*RBW 100kHz *VBW 100kHz SWP 440ms

ATTEN 20 dB of Band Emissions 2.75 - 26.5 GHz ~~20-28 MHz~~ 4. 53 dB μ V
 RL 116.2 dB μ V 10 dB / 14.31 GHz

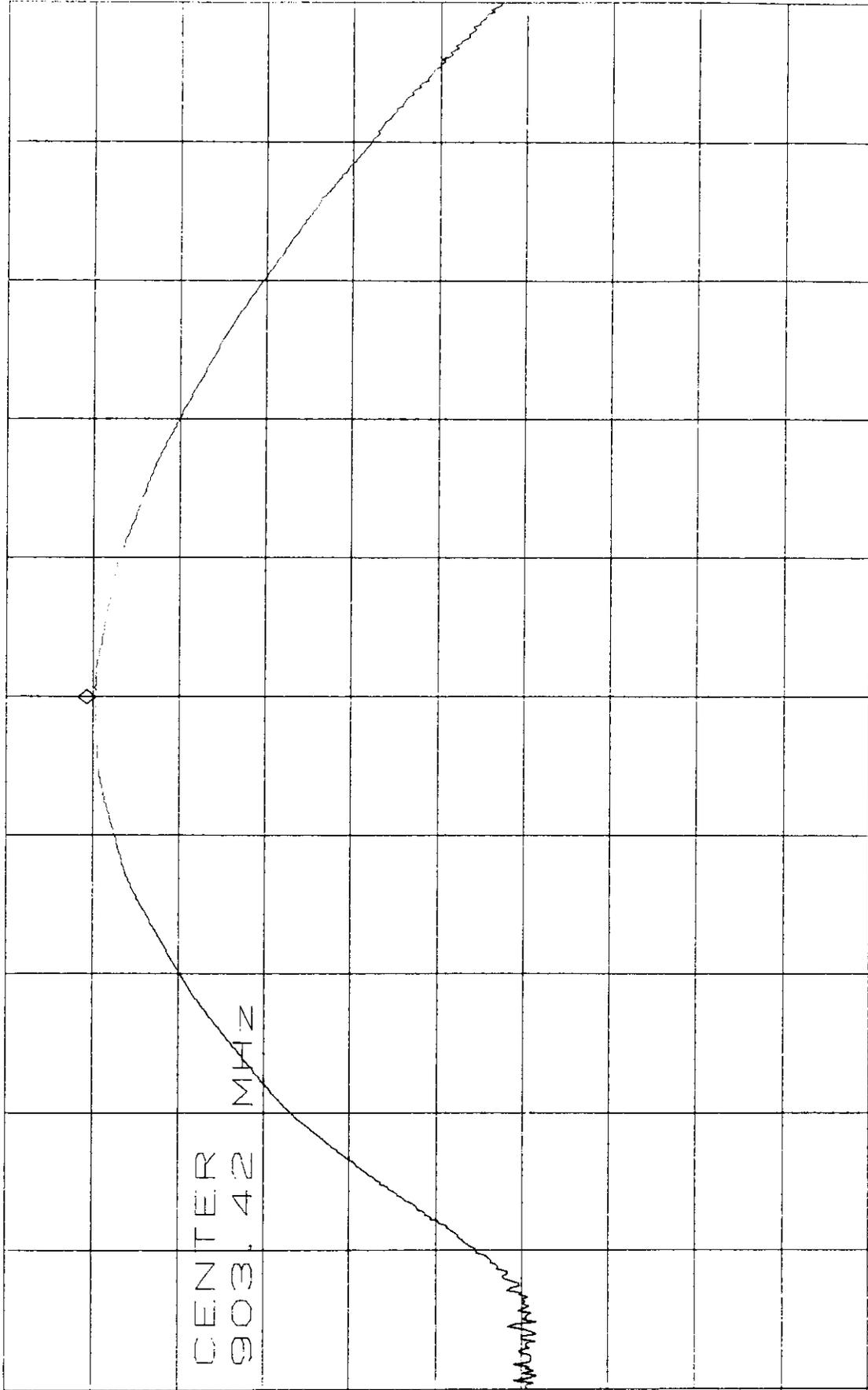


D

START 2.75GHz STOP 26.50GHz
 *RBW 100kHz *VBW 100kHz SWP 6.0sec
 A803004.DOC 49

ATTEN 30dB
RL 20.0dBm

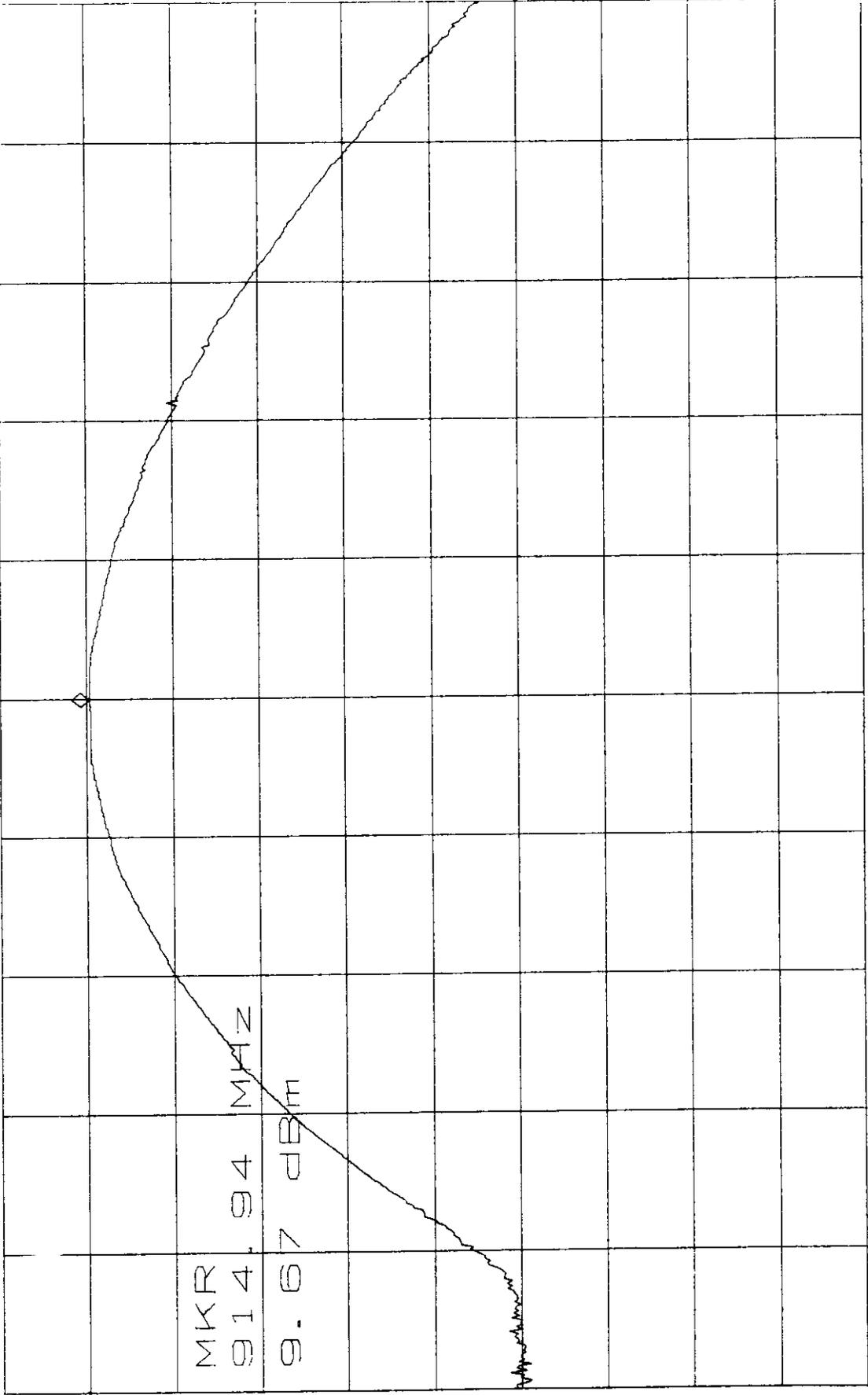
Output Power 903.42 MHz
10dB/
MKR 9.67dBm
903.42MHz



CENTER 903.42MHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms

ATTEN 30dB
RL 20.0dBm

Output Power 914.94 MHz
10dB/
MKR 9.67dBm
914.94MHz



MKR
914.94 MHz
9.67 dBm

CENTER 914.94MHz

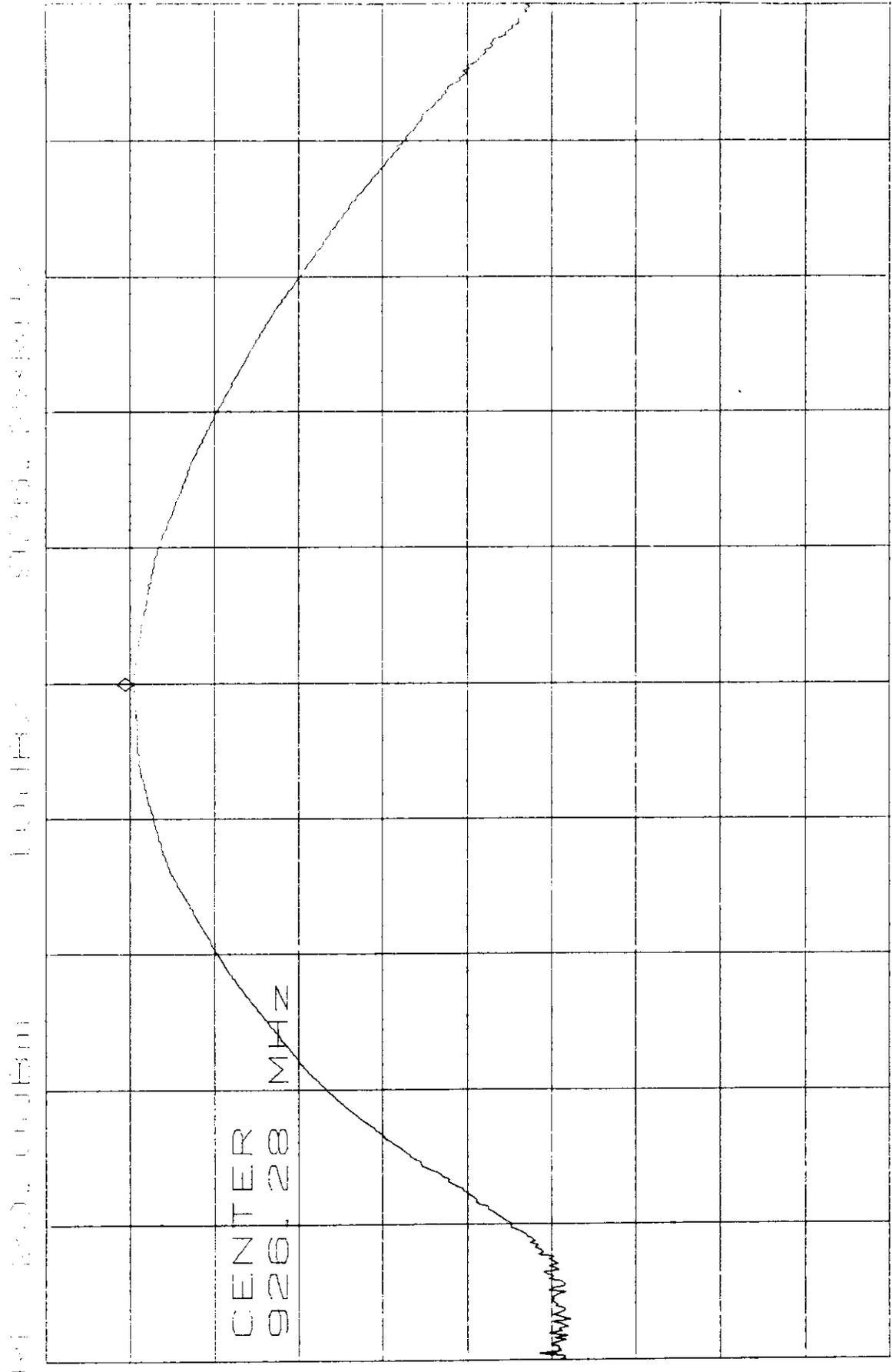
SPAN 10.00MHz

*RBW 2.0MHz

VBW 3.0MHz

SWP 50.0ms

Output Power 926.28 MHz



SPAN 10.000 MHz

RESOLUTION BANDWIDTH 3.0 MHz

VIDEO BANDWIDTH 3.0 MHz

REQUIREMENT BANDWIDTH 2.0 MHz

SPAN 10.000 MHz

RESOLUTION BANDWIDTH 3.0 MHz

VIDEO BANDWIDTH 3.0 MHz

REQUIREMENT BANDWIDTH 2.0 MHz

SPAN 10.000 MHz

RESOLUTION BANDWIDTH 3.0 MHz

VIDEO BANDWIDTH 3.0 MHz

REQUIREMENT BANDWIDTH 2.0 MHz

SPAN 10.000 MHz

RESOLUTION BANDWIDTH 3.0 MHz

VIDEO BANDWIDTH 3.0 MHz

REQUIREMENT BANDWIDTH 2.0 MHz

SPAN 10.000 MHz

RESOLUTION BANDWIDTH 3.0 MHz

VIDEO BANDWIDTH 3.0 MHz

REQUIREMENT BANDWIDTH 2.0 MHz

SPAN 10.000 MHz

RESOLUTION BANDWIDTH 3.0 MHz

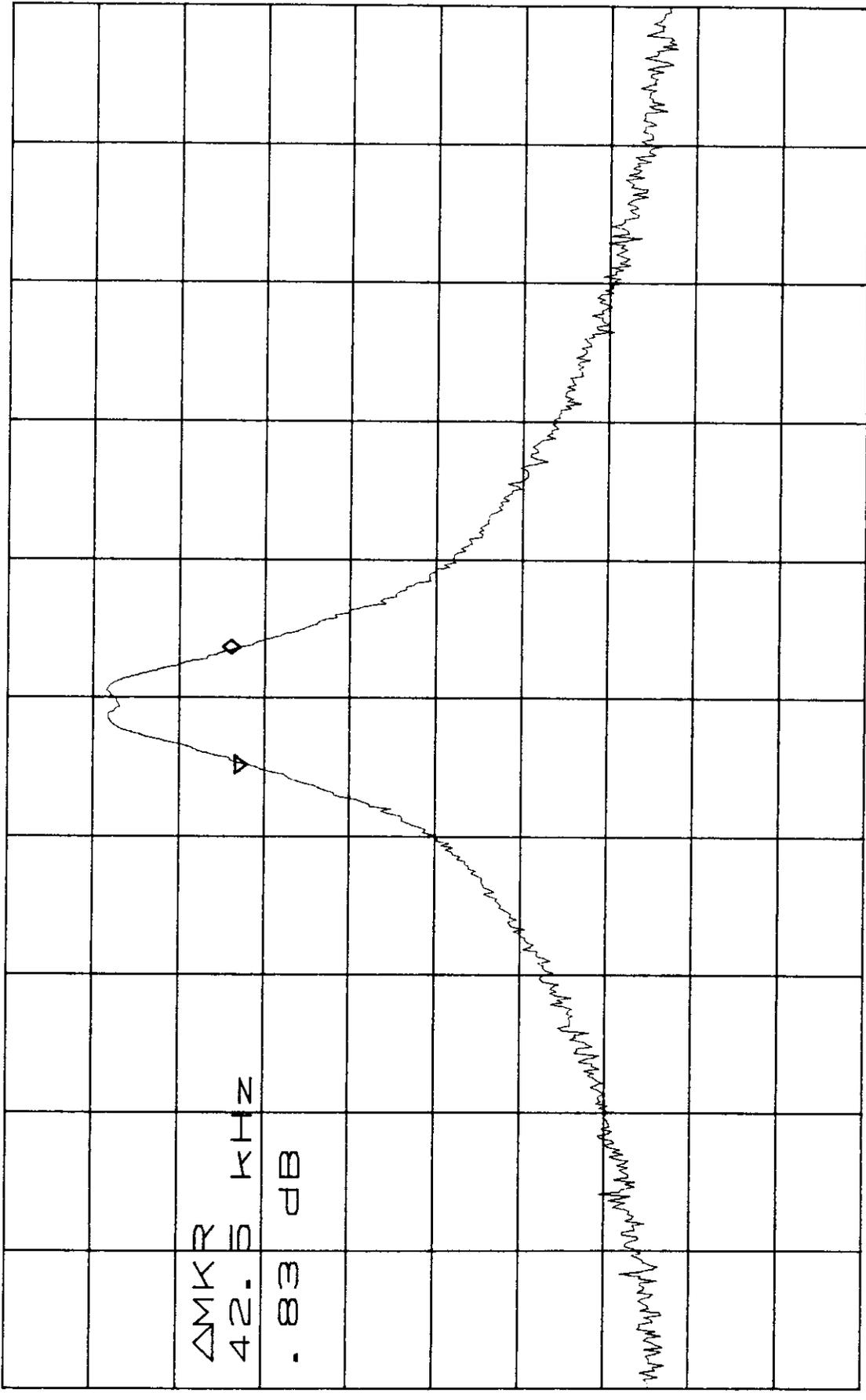
VIDEO BANDWIDTH 3.0 MHz

REQUIREMENT BANDWIDTH 2.0 MHz

SPAN 10.000 MHz

RESOLUTION BANDWIDTH 3.0 MHz

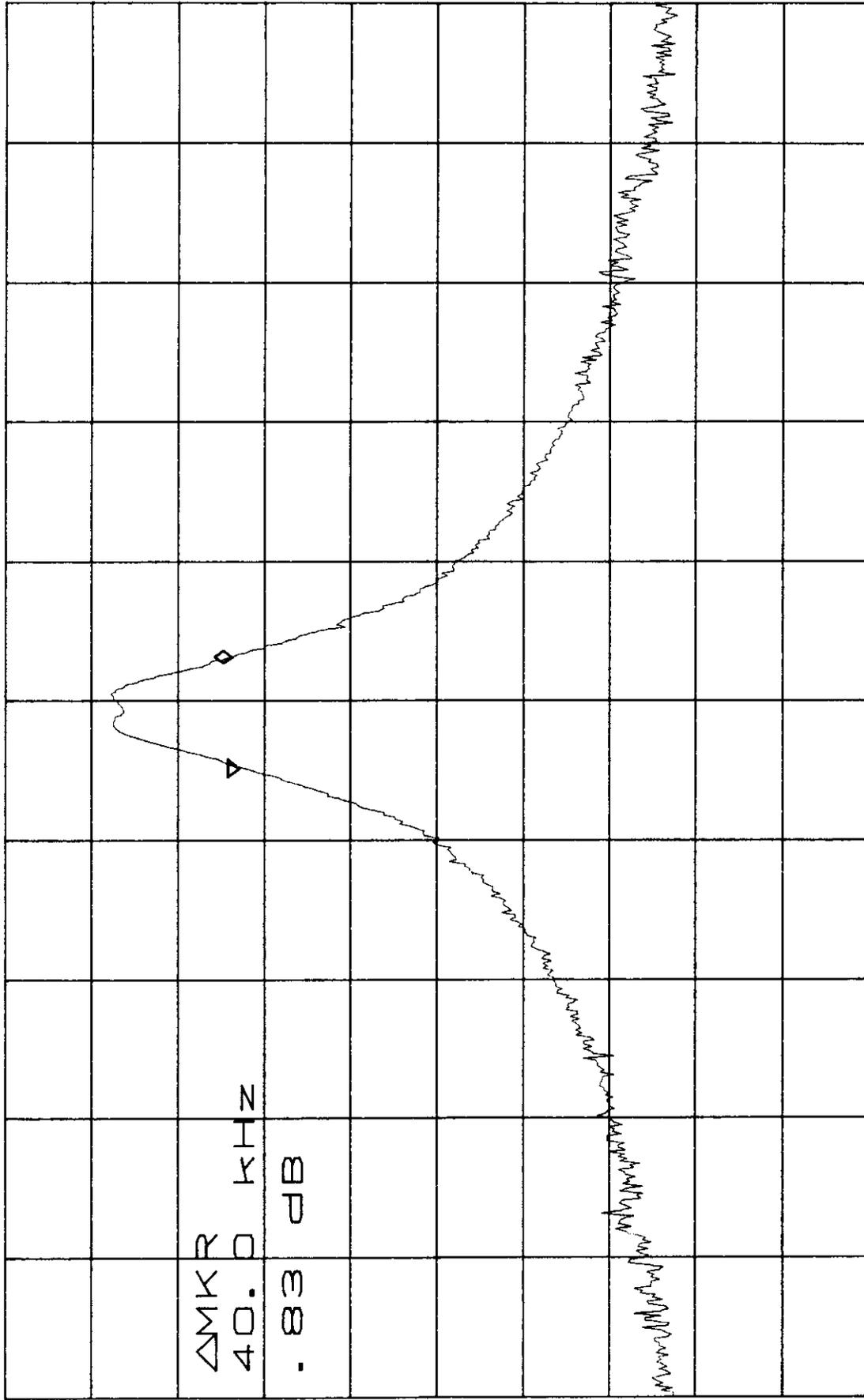
ATTEN 30dB 20dB Occupied Bandwidth 903.42MHz .83dB
RL 20.0dBm 10dB / 42.5kHz



ΔMKR
42.5 KHZ
.83 dB

CENTER 903.4200MHZ SPAN 500.0KHZ
*RBW 10KHZ *VBW 100KHZ SWP 50ms
A803004.DOC 53

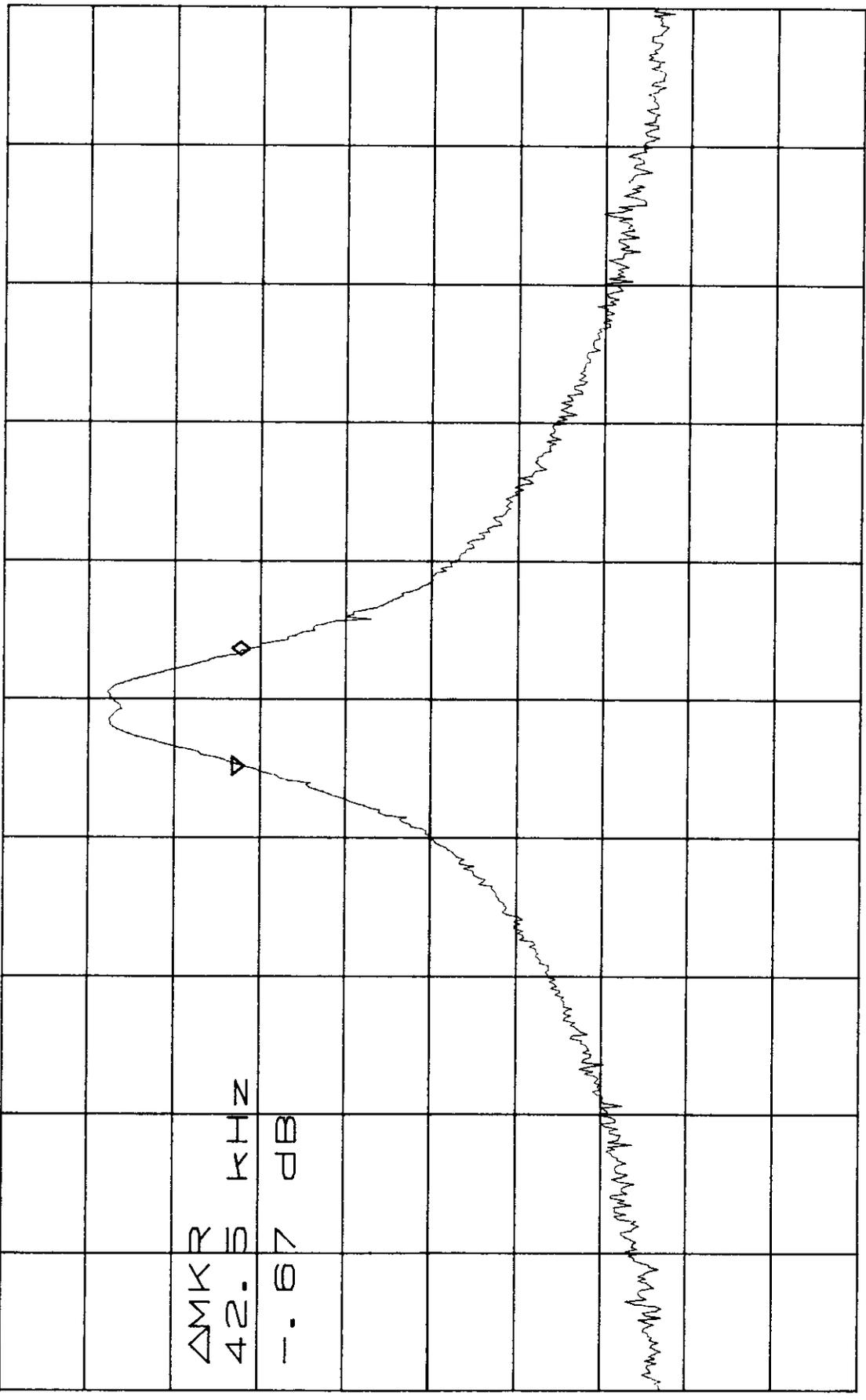
ATTEN 30dB 20dB Occupied Bandwidth 914.84 MHz . 83dB
RL 20.0dBm 10dB / 40.0KHz



D

CENTER 914.84000MHz SPAN 500.0KHz
*RBW 10KHz *VBW 100KHz SWP 50ms
A803004.DOC 54

ATTEN 30dB 20dB Occupied Bandwidth 926.28MHz - .67dB
RL 20.0dBm 10dB / 42.5kHz



CENTER 926.2800MHz SPAN 500.0kHz
*RBW 10kHz *VBW 100kHz SWP 50ms
A803004.DOC 55

APPENDIX B
RESTRICTED BAND DATA

EUT:	HIGH TEST BSR	CUSTOMER NAME:	DIABLO
RULE PART:	FCC PART 15.205	WORK ORDER:	8022401
		FILE:	8022401A.xls
ANTENNA:	HORN	ATTN d	0
POLARIZATION:	VERTICAL	DUTY d	0
MODULATION TYPE:		HP IL d	0
TESTED BY:	SURESH	DIST dB	0
COMMENT:			

FREQ. MHz	READING dB(uV)	NF	Pk or Av	A.F. dB	Cbl dB	FLTR dB	AMP dB	TOTAL, dB(uV/m)	LIMIT dB(uV/m)	DELTA dB
Ch 0 / 902.08 MHz										
2706.24	44.50		Pk	28.6	-5.3	-0.4	35.6	43.2	74.0	-30.8
2706.24	33.17		Avg	28.6	-5.3	-0.4	35.6	31.8	54.0	-22.2
3608.32	44.50		Pk	32.4	-6.2	-0.4	35.1	48.4	74.0	-25.6
3608.32	26.67		Avg	32.4	-6.2	-0.4	35.1	30.5	54.0	-23.5
4510.40	45.33	*	Pk	32.8	-7.0	-0.4	35.1	50.4	74.0	-23.6
4510.40	25.33	*	Avg	32.8	-7.0	-0.4	35.1	30.4	54.0	-23.6
5412.48	44.83		Pk	33.6	-8.1	-0.4	35.0	51.9	74.0	-22.1
5412.48	24.50		Avg	33.6	-8.1	-0.4	35.0	31.6	54.0	-22.4
8118.72	49.00	*	Pk	37.0	-11.4	-0.4	35.5	62.3	74.0	-11.7
8118.72	26.50		Avg	37.0	-11.4	-0.4	35.5	39.8	54.0	-14.2
9020.80	48.50	*	Pk	37.8	-12.1	-0.4	35.5	63.3	74.0	-10.7
9020.80	26.00		Avg	37.8	-12.1	-0.4	35.5	40.8	54.0	-13.2
CH 75 / 914.08 MHz										
2742.24	45.67	*	Pk	28.6	-5.3	-0.4	35.5	44.4	74.0	-29.6
2742.24	34.17		Avg	28.6	-5.3	-0.4	35.5	32.9	54.0	-21.1
3656.32	44.67		Pk	32.4	-6.2	-0.4	35.1	48.5	74.0	-25.5
3656.32	26.67		Avg	32.4	-6.2	-0.4	35.1	30.5	54.0	-23.5
4570.40	44.67	*	Pk	32.8	-7.0	-0.4	35.1	49.7	74.0	-24.3
4570.40	24.33	*	Avg	32.8	-7.0	-0.4	35.1	29.4	54.0	-24.6
7312.64	48.67	*	Pk	36.0	-10.6	-0.4	35.4	60.3	74.0	-13.7
7312.64	26.17	*	Avg	36.0	-10.6	-0.4	35.4	37.8	54.0	-16.2
8226.72	49.17	*	Pk	37.0	-11.4	-0.4	35.5	62.4	74.0	-11.6
8226.72	27.33		Avg	37.0	-11.4	-0.4	35.5	40.6	54.0	-13.4
9140.80	48.33	*	Pk	37.8	-12.1	-0.4	35.5	63.1	74.0	-10.9
9140.80	27.33		Avg	37.8	-12.1	-0.4	35.5	42.1	54.0	-11.9
CH 161 / 927.84 MHz										
2783.52	44.67	*	Pk	28.6	-5.3	-0.4	35.5	43.5	74.0	-30.5
2783.52	33.67		Avg	28.6	-5.3	-0.4	35.5	32.5	54.0	-21.5
3711.36	44.17	*	Pk	32.4	-6.2	-0.4	35.1	48.0	74.0	-26.0
3711.36	33.33		Avg	32.4	-6.2	-0.4	35.1	37.2	54.0	-16.8
4639.20	42.50	*	Pk	32.8	-7.0	-0.4	35.1	47.6	74.0	-26.4
4639.20	22.00	*	Avg	32.8	-7.0	-0.4	35.1	27.1	54.0	-26.9
7422.72	47.17	*	Pk	36.0	-10.6	-0.4	35.4	58.8	74.0	-15.2
7422.72	25.50	*	Avg	36.0	-10.6	-0.4	35.4	37.1	54.0	-16.9
8350.56	47.50		Pk	37.0	-11.4	-0.4	35.4	60.9	74.0	-13.1
8350.56	36.00		Avg	37.0	-11.4	-0.4	35.4	49.4	54.0	-4.6

APPENDIX C
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

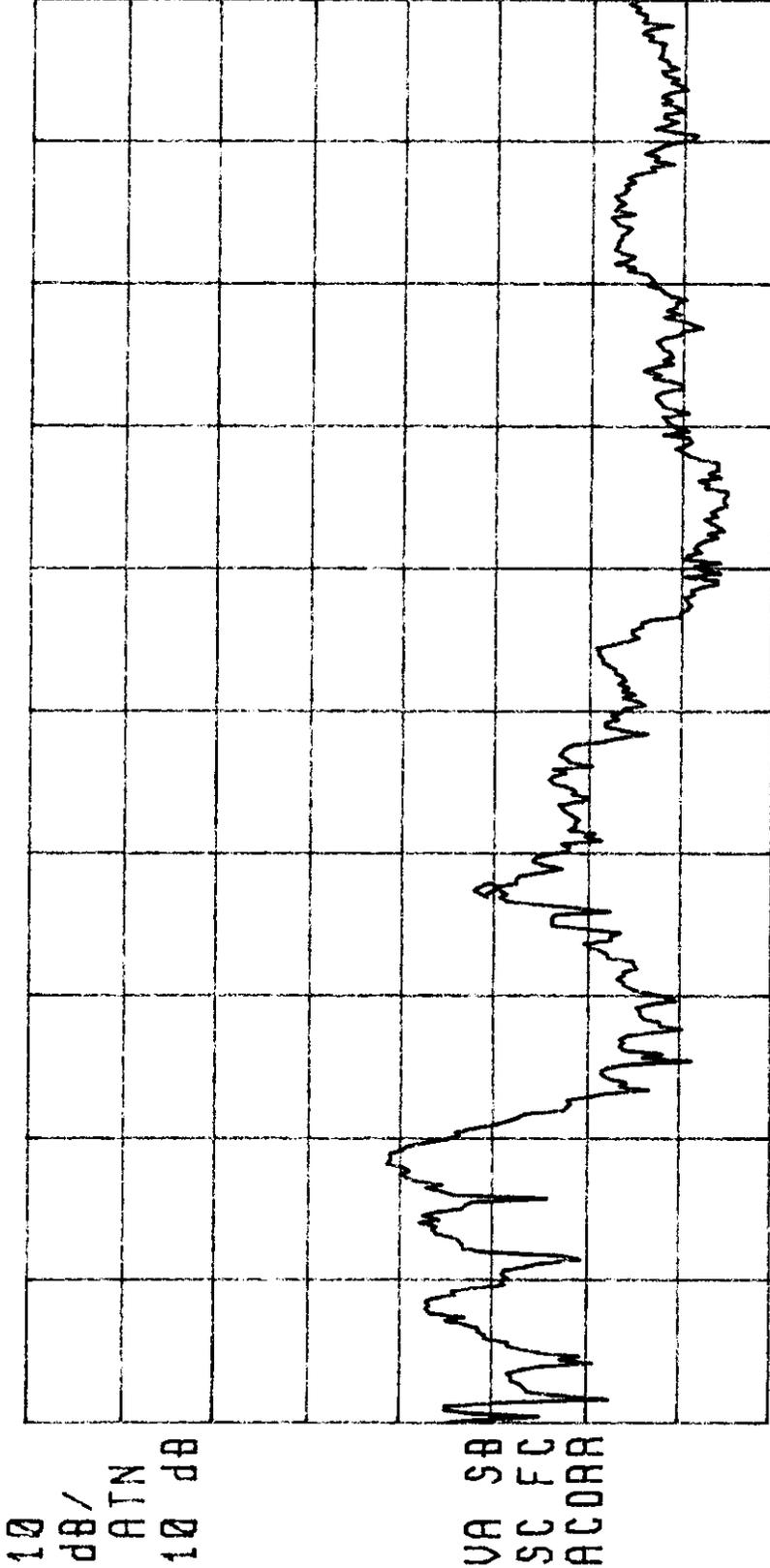
Customer: DIABLO Operator: Suresh
 Date: 02-24-1998 Time: 10:30:57
 Temperature Range: 55 Deg F Percent Humidity: 55
 E.U.T.: BASE STATION REPEATER
 Serial Number:
 Support Devices:
 Serial Number:
 FCC ID:
 Exercise Program: NONE
 Modifications: NONE
 Report File Name: F:\TESTDATA\8022401.F

TEST FREQ	TEST dBuV	CLASS B LIMIT	VERSUS B LIMIT	CONDUCTOR	TYPE
=====	=====	=====	=====	=====	=====
2.890	38.6	48.0	-9.4	LINE	PK
4.660	37.8	48.0	-10.2	LINE	PK
5.840	43.2	48.0	-4.8	LINE	PK
11.530	31.4	48.0	-16.6	LINE	PK
5.840	41.8	48.0	-6.3	LINE	QP
5.840	40.1	48.0	-7.9	LINE	AVG
0.450	39.7	48.0	-8.3	NEUTRAL	PK
2.890	36.6	48.0	-11.4	NEUTRAL	PK
4.590	37.0	48.0	-11.0	NEUTRAL	PK
5.990	40.3	48.0	-7.7	NEUTRAL	PK

11:29:58 FEB 24, 1990 DJABLO,
8022401 LINE

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

LOG REF 02.0 dB μ V

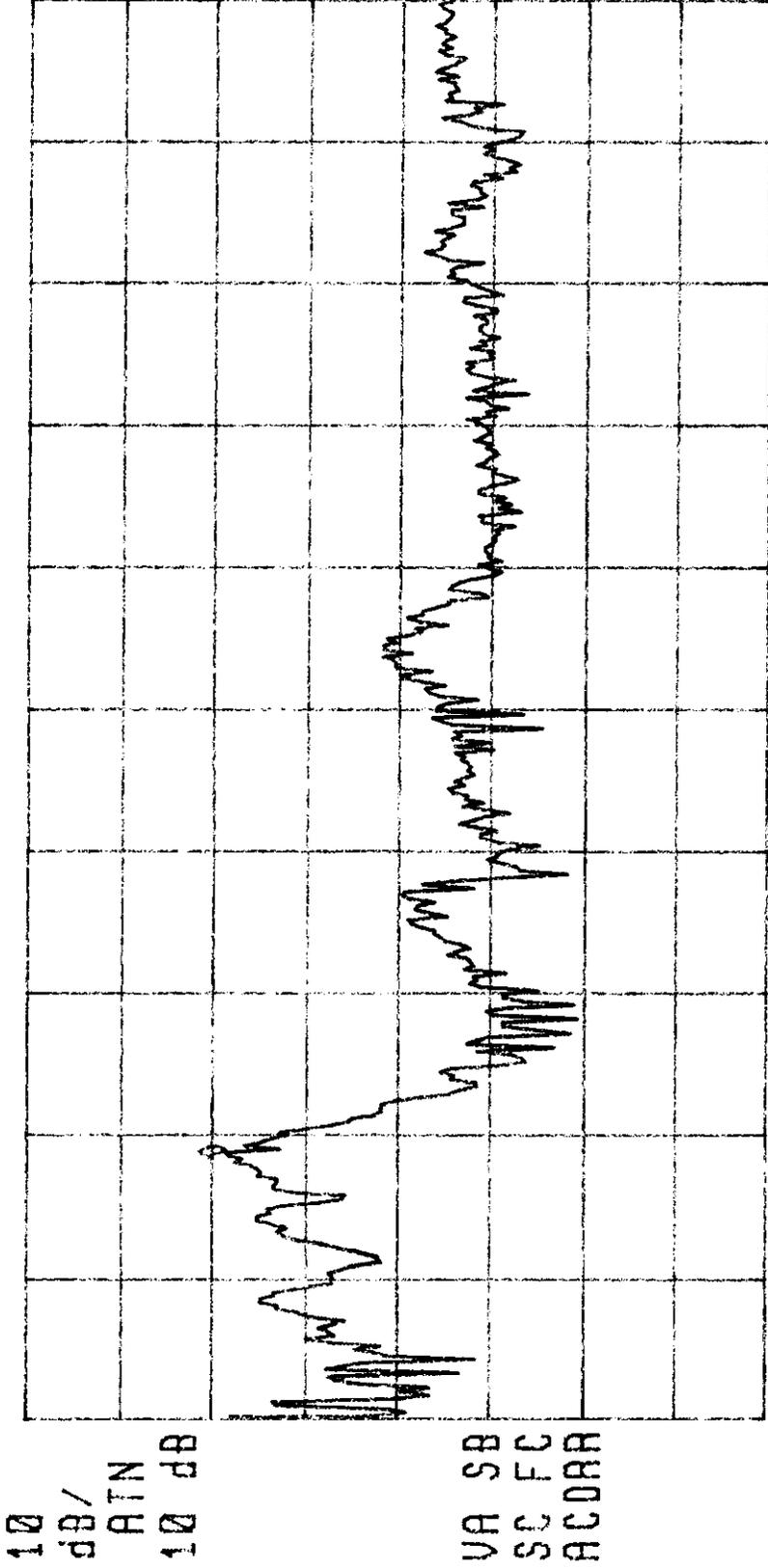


START 450 kHz IF BW 9.0 kHz AVG BW 30 kHz STOP 30.00 MHz
A803004.DOC SWP 2.46 sec

11:41:09 FEB 24, 1998 DIABLO,
8022401 NEUTRAL

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.99 MHz
40.35 dB μ V

LOG REF 62.0 dB μ V



10
dB/
ATTN
10 dB

VA SB
SC FC
ACDAR

START 450 kHz STOP 30.00 MHz
IF BW 9.0 kHz AVG BW 30 kHz SWP 2.46 sec

APPENDIX D
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: DIABLO Operator: SURESH
 Date: 02-24-1998 Time: 16:22:29
 Temperature Range: 80 Deg F Percent Humidity: 35
 E.U.T.: HITEST BSR
 Serial Number: 04-0000-12
 Support Devices:
 Serial Number:
 FCC ID:
 Exercise Program: USER CODE
 Modifications: NONE
 Report File Name: F:\TESTDATA\8022401.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
=====	=====	=====	=====	=====	=====	=====	=====	=====
49.160	43.2	28.1	40.0	-11.9	120	1.0	V	PK
170.000	41.3	31.9	43.5	-11.6	0	2.0	V	PK
185.320	41.9	33.0	43.5	-10.5	90	2.0	V	PK
214.120	32.1	24.0	43.5	-19.5	180	2.0	V	PK
170.000	49.2	39.8	43.5	-3.7	270	2.0	H	PK
170.000	47.8	38.4	43.5	-5.1	270	2.0	H	QP
184.400	48.5	39.6	43.5	-3.9	270	1.5	H	PK
184.400	43.5	34.6	43.5	-8.9	270	1.5	H	QP
213.220	36.9	28.8	43.5	-14.7	270	1.5	H	PK
117.670	47.5	36.3	43.5	-7.2	270	3.0	H	PK

CHANGED ANTENNA TO LOG PERIODIC

798.600	35.1	34.7	46.0	-11.3	45	1.5	V	PK
798.600	43.6	43.2	46.0	-2.8	270	2.0	H	PK
798.600	38.5	38.0	46.0	-8.0	270	2.0	H	QP

APPENDIX F
ANTENNA DATA SHEETS

Model ASPG916DRC

NPRR K037R

Eng. Approval [Signature]

Prod. Mgr [Signature]

Date: 2/7/97

Date: 2/19/97

ANTENNA PRODUCT SALES DATA AND TECHNICAL SPECIFICATIONS

USE PRODUCT LINE CODE NO: PR53

PRODUCT CODE NO: 0189 DESCRIPTION:

ELECTRICAL	MOBILE DATA	MECHANICAL (Base Station)
Frequency Range 902-928 MHz	Mount Type: Rooftop	Total Length in m
VSWR Bandwidth @ 1.5:1 26 MHz @ 2.0:1	Mounting Diameter in .750 mm 19.05	Mounting Length in mm Mounting mat'l Dia in mm
Power Rating (CW) 10 W	Cable Length in 9 mm 228.6	Weight lb kg
Input Impedance 50 ohms	Cable Type: RG-316	Cable Length ft m
Polarization: Vertical	Connector: SMB straight plug	Radiator Material:
Gain: 3.5 dBd omni (See Notes 2 & 3) dBd dir	Max-whip Length in 21.0 mm 533.4	Reflector Size x in x mm
Azimuthal Variation ±1.5 dB	Whip Material: 17-7 PH St Steel	Reflector Material
RADIATION PATTERN	Whip Diameter in .100 mm 2.54	Weather Protection: Fiberglass Radome
E-Plane beamwidth @ -3 dB 24 ± 2°	Spring Material: N/A	
H-Plane beamwidth @ -3dB omni ° Omnidirectional	Spring Diameter in N/A mm	Turning Radius ft m
Beamtilt @ bandwidth limits Low -6° High -1°	Spring Length N/A in mm	RS-329 WINDLOAD DATA
Relative level of largest sidelobe from major lobe >5 dB	Mount Insulation: Teflon	NO ICE RS-329 Velocity mi/h km/h Fatal Velocity mi/h km/h Windload Area (EFP) ft ² m ²
Front-to-back ratio dB	SHIPPING WEIGHT lb (See Note #1) kg SHIPPING DIMENSIONS 9 in x 8 in x 22.75 in 229 mm 204 mm x 578 mm (OR) dia x in dia x mm	NO ICE (At Rated Velocity) Lateral Thrust lb kg Bending Moment ft-lb N-m Torque Moment ft-lb N-m
Wide angle radiation level dB		NO ICE (At 100 mi/h (161 km/h): Lateral Thrust lb kg Bending Moment ft-lb N-m torque Moment ft-lb N-m
OPERATING PRINCIPLES: - 3 element collinear whip over ground plane. - 1/2 wave, over 1/2 wave, over 1/4 wave.		1/2" ICE RS-329 Velocity mi/h km/h Fatal Velocity mi/h km/h Windload Area (EFP) ft ² m ²
FEATURES:		1/2" ICE (At Rated Velocity) Lateral Thrust lb kg Bending Moment ft-lb N-m Torque Moment ft-lb N-m
		NO ICE (At 100 mi/h (161 km/h): Lateral Thrust lb kg Bending Moment ft-lb N-m Torque Moment ft-lb N-m

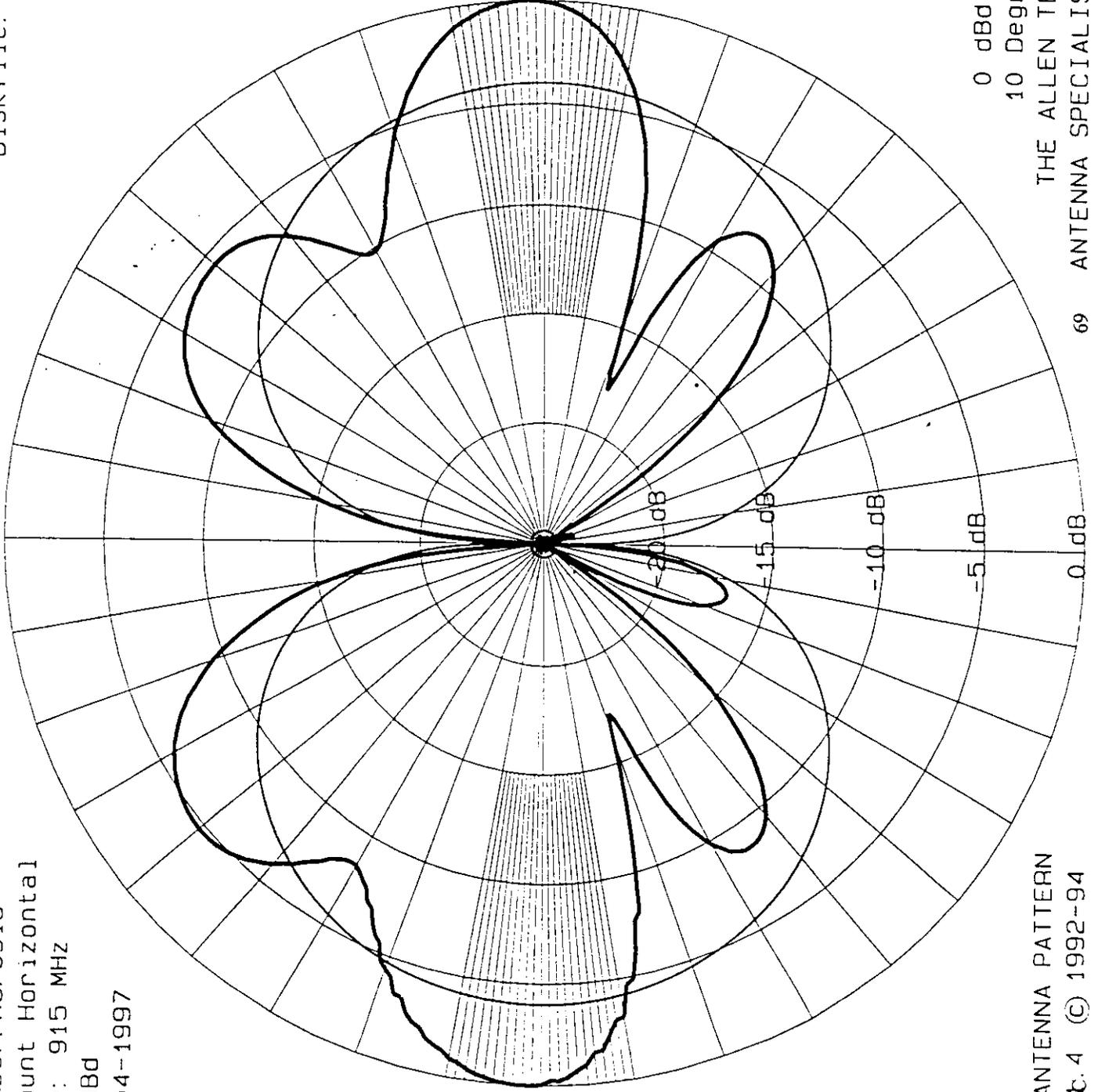
NOTES:

1. Antennas are individually sealed in poly bags and then bulk packed into master carton for shipment (approx. 25 antennas per carton, weighing approx. 20-25 lbs).

2. The antenna design intent is for usage with base housing, supplied by customer (Diablo), which serves as a ground plane and support structure (non-mobile application).

3. Maximum gain occurs at the horizon, in the long direction of the base housing. The gain in the short direction can be as much as 2 dB lower.

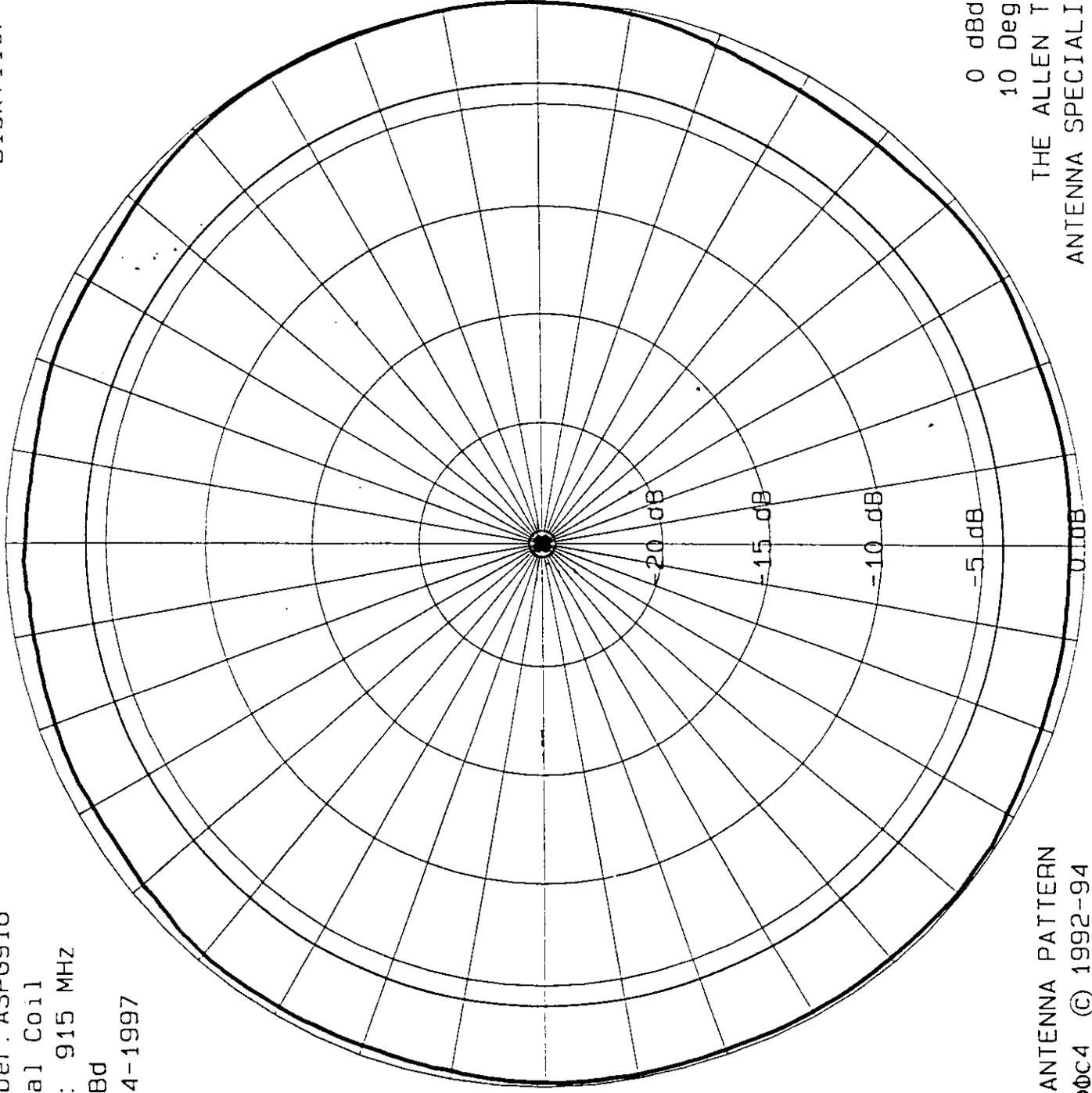
>Model Number: ASPG916
>Diablo Mount Horizontal
>Frequency: 915 MHz
>Gain: 4 dBd
>Date: 02-04-1997
>E Plane



02-04-1997
DIGITIZED ANTENNA PATTERN
PATAs93504VDoc. 4 (C) 1992-94

0 dBd Reference
10 Degree Radials
THE ALLEN TELECOM GROUP
69 ANTENNA SPECIALISTS DIVISION

>Model Number: ASPG916
>Diablo Dual Coil
>Frequency: 915 MHz
>Gain: 4 dBd
>Date: 02-04-1997
>H Plane



0 dBd Reference
10 Degree Radials
THE ALLEN TELECOM GROUP
ANTENNA SPECIALISTS DIVISION

02-04-1997
DIGITIZED ANTENNA PATTERN
PATLAB0004.DOC4 © 1992-94