

FCC TEST DATA

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1.0 Temperature VS Frequency/Power Stability Tests

This test was performed to generate the data to demonstrate the frequency stability of the Pulsar transmitter over the range of -30 to +50 degrees Celsius.

It is noted at this time that the frequency generation circuits are locked to a highly stable 10MHz crystal oscillator, feeding a phase locked loop employed in a triple up conversion process. For this test, the transmitter, Block Up/Down Converter and 10MHz source were placed in an environmental test chamber and subjected to the following conditions:

- Step 1: The equipment was placed in the environmental chamber and thermocouples were installed on the base plate of the power amplifier. The signal and power lines were fed through a Via to the external controls & monitors.
- Step 2: The environmental chamber was set for -30 degrees and the control circuits were energized.
- Step 3: The equipment was "cold soaked" until the base plate temperature of the power amplifier stabilized at -30 degrees Celsius. This was approximately 2 hours and 37 minutes.
- Step 4: The Units Under Test (UUT) were energized via the cables fed from an external source to the UUT via connection through the Via in wall of the chamber.
- Step 5: The following measurements of frequency and power were taken each minute and the process was repeated from Step 3 downward with the temperature increased 10 degrees and stabilized each time in accordance with the base plate sensor. Calibrated test equipment was used to take the measurements and those readings are recorded as follows:

PULSAR FREQUENCY VS. TEMPERATURE STABILITY TESTS			
Time Hours	Temperature	Frequency MHz	Peak RF Power Watts
1152	-30	5550.014	314
1153	-30	5550.014	314
1154	-30	5550.014	314
1155	-30	5550.014	314
1156	-30	5550.014	314
1157	-30	5550.014	314
1158	-30	5550.014	313
1159	-30	5550.014	313
1200	-30	5550.014	314
1201	-30	5550.014	314
1207	-20	5550.014	312
1208	-20	5550.014	312
1209	-20	5550.014	312
1210	-20	5550.014	312
1211	-20	5550.014	312
1212	-20	5550.014	312
1213	-20	5550.014	312
1214	-20	5550.014	312
1215	-20	5550.014	312
1216	-20	5550.014	312

PULSAR FREQUENCY VS. TEMPERATURE STABILITY TESTS			
Time Hours	Temperature	Frequency MHz	Peak RF Power Watts
1225	-10	5550.014	309
1226	-10	5550.014	309
1227	-10	5550.014	309
1228	-10	5550.014	309
1229	-10	5550.014	309
1230	-10	5550.014	309
1231	-10	5550.014	309
1232	-10	5550.014	309
1233	-10	5550.014	309
1234	-10	5550.014	309
1242	0	5550.014	301
1243	0	5550.014	301
1244	0	5550.014	301
1245	0	5550.014	301
1246	0	5550.014	301
1247	0	5550.014	301
1248	0	5550.014	301
1249	0	5550.014	301
1250	0	5550.014	301
1251	0	5550.014	301
1300	+10	5550.014	289
1301	+10	5550.014	289
1302	+10	5550.014	289
1303	+10	5550.014	289
1304	+10	5550.014	289
1305	+10	5550.014	289
1306	+10	5550.014	289
1307	+10	5550.014	289
1308	+10	5550.014	289
1309	+10	5550.014	289
1317	+20	5550.014	281
1318	+20	5550.014	281
1319	+20	5550.014	281
1320	+20	5550.014	281
1321	+20	5550.014	281
1322	+20	5550.014	281
1323	+20	5550.014	281
1324	+20	5550.014	281
1325	+20	5550.014	281
1326	+20	5550.014	281

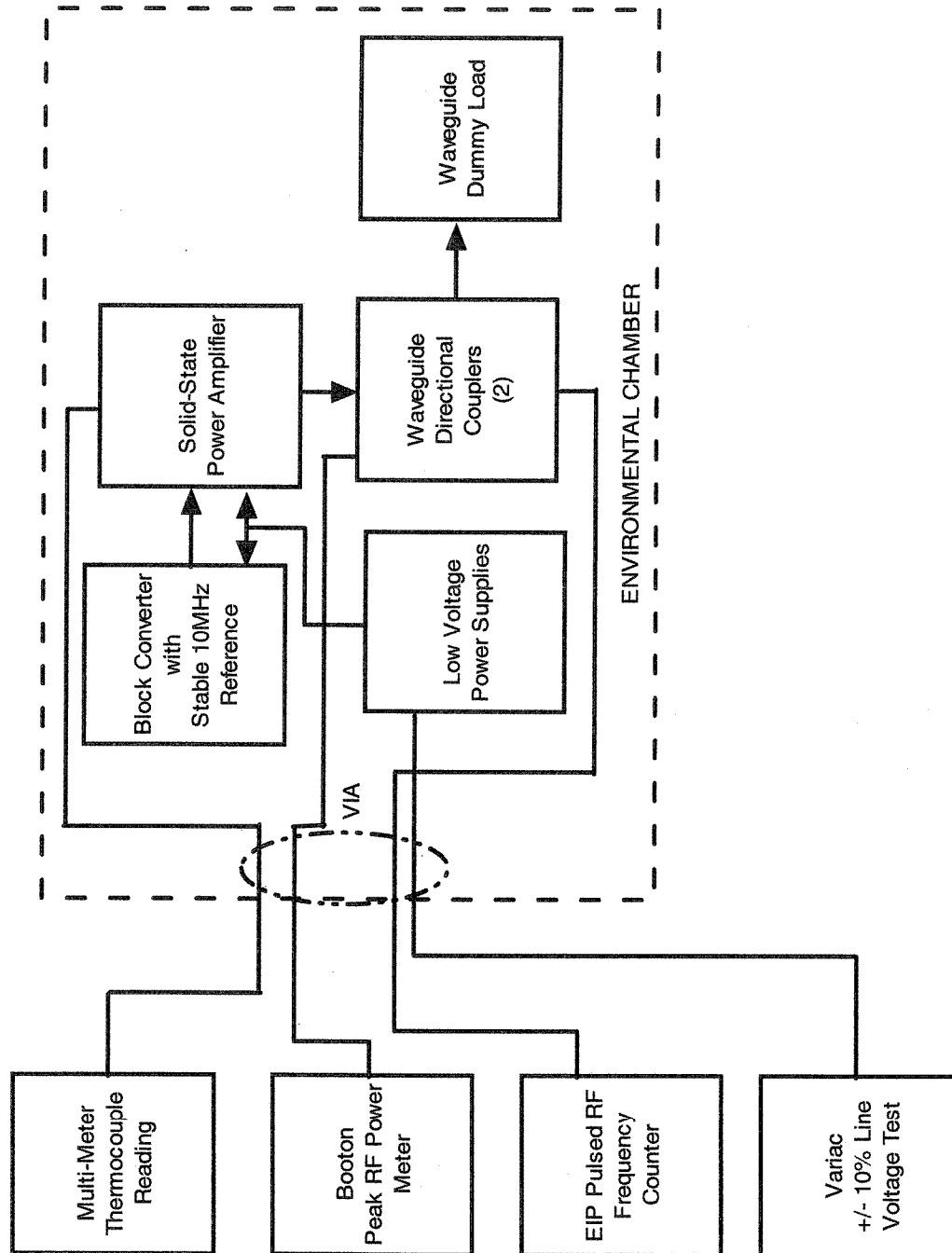
PULSAR FREQUENCY VS. TEMPERATURE STABILITY TESTS			
Time Hours	Temperature	Frequency MHz	Peak RF Power Watts
1335	+30	5550.014	272
1336	+30	5550.014	272
1337	+30	5550.014	272
1338	+30	5550.014	272
1339	+30	5550.014	272
1340	+30	5550.014	272
1341	+30	5550.014	272
1342	+30	5550.014	272
1343	+30	5550.014	272
1344	+30	5550.014	272
1335	+40	5550.014	262
1336	+40	5550.014	262
1337	+40	5550.014	262
1338	+40	5550.014	262
1339	+40	5550.014	262
1340	+40	5550.014	262
1341	+40	5550.014	262
1342	+40	5550.014	262
1343	+40	5550.014	262
1344	+40	5550.014	262
1415	+50	5550.014	252
1416	+50	5550.014	252
1417	+50	5550.014	252
1418	+50	5550.014	252
1419	+50	5550.014	252
1420	+50	5550.014	252
1421	+50	5550.014	252
1422	+50	5550.014	252
1423	+50	5550.014	252
1424	+50	5550.014	252

The "Frequency Stability/Power vs. Temperature Tests" were run in the center of the operating frequency band of 5400MHZ to 5700MHZ. The frequency remained stable over the complete temperature range although the RF Peak Pulse Power did vary from 314 watts at -30 degrees Celsius down to 252 Watts at +50 degrees Celsius.

2.0 Transmitter Stability With Line Voltage Fluctuations

This same test setup was also used to test the stability of the transmitter during +/-10 Line Voltage changes. The tests were run at ambient Temperature (20 degrees Celsius). See the figure on the following page for clarification. The results follow:

PULSAR FREQUENCY/ POWER STABILITY VS. LINE VOLTAGE TESTS			
Time Hours	AC Line Voltage	Frequency MHz	Peak RF Power Watts
1500	115	5550.014	281
1510	100	5550.014	281
1520	130	5550.014	281



TEST SET-UP #1

3.0 Spectrum Analysis

The following tests were performed to record the signature of the transmitted spectrum of the Pulsar radar system. The plots of the spectrum analyzer are shown on the following pages and are sequentially numbered in the bottom left hand corner of each plot. The plots and results of the measurements are listed as follows:

PULSAR EMISSION MEASUREMENTS		
Plot Number	Test	Comments
1	Emitted Spectrum, Narrow Pulse, 5500MHz	0.5µsec pulse, Spectrum width 3.37MHz, Sidelobes -15.33 and -11.66
2	Emitted Spectrum, Narrow Pulse, 5500MHz. NOTE used for Maximum Spectrum Occupancy	0.25µsec pulse, Spectrum width 5.5MHz, 40MHz span
3	Emitted Spectrum, Wide Pulse, 5500MHz	80µsec pulse, Spectrum width, 17.75kHz, Sidelobes, -17.75 and -12.84
4	Emitted Spectrum, Wide Pulse, 5500MHz	80µsec pulse, Spectrum width, 17.75kHz, Sidelobes, -17.75 and -12.84, 280kHz span
5	Emitted Spectrum, Wide Pulse, 5500MHz	80µsec pulse, Emission Bandwidth at -50dB = 470kHz
6	Emitted Spectrum, Wide Pulse, 5500MHz	80µsec pulse, Emission Bandwidth at -61dB = 2.8MHz
7	Omitted in Number	
8	Spurious Emission Test	Plot 20MHz – 5GHz, -77.33dBm
9	Spurious Emission Test	Plot 5GHz – 10GHz, -73dB
10	Spurious Emission Test	Plot 10GHz – 15GHz, -67dBm
11	Spurious Emission Test	Plot 15GHz – 20GHz, -75dBm
12	Spurious Emission Test	Plot 20GHz – 25GHz, -73.3dBm
13	Spurious Emission Test	Plot 25GHz – 30GHz, -70dBm
14	Spurious Emission Test	Plot 30GHz – 35GHz, -71.7dBm
15	Spurious Emission Test	Plot 35GHz – 40GHz, -66dBm
16	Spurious Emission Test	Plot 500kHz to 20MHz, -79dBm
17	RF Leakage, 1 meter from chassis Using double ridge horn, Reference Plot, Transmitter Radiation OFF	Reference Plot of Cellular Communications, Transmitter not radiating

PULSAR EMISSION MEASUREMENTS		
Plot Number	Test	Comments
18	RF Leakage, 1 meter from chassis Using double ridge horn, Transmitter Radiation ON	Plot 0 – 5GHz, -57dBm signal and others are Cellular signals interference
19	RF Leakage, 1 meter from chassis Using double ridge horn, Transmitter Radiation ON	Plot 5GHz – 10GHz, Carrier detected -36dBm
20	RF Leakage, 1 meter from chassis Using double ridge horn, Transmitter Radiation ON	Plot 10GHz – 15GHz, - 70dBm
21	RF Leakage, 1 meter from chassis Using double ridge horn, Transmitter Radiation ON	Plot 15GHz – 20GHz, - 70dBm
22	Detected RF Pulse	80µsec RF Pulse
23	Detected RF Pulse	20µsec RF Pulse
24	Detected RF Pulse	10µsec RF Pulse
25	Detected RF Pulse	2µsec RF Pulse
26	Detected RF Pulse	0.5µsec RF Pulse
27	RF Peak Power Measurement	0.5µsec RF Pulse at 5400MHz
28	RF Peak Power Measurement	0.5µsec RF Pulse at 5550MHz
29	RF Peak Power Measurement	0.5µsec RF Pulse at 5700MHz
30	Line Voltage Fluctuation Frequency Stability and RF power stability	80µsec RF Pulse at 5550MHz, Line voltage varied 115VAC, 100Vac, 130Vac, no change
31	Band Pass Filter Frequency Response, reject all harmonics	Sweep from 10MHz to 40GHz, cable connection invalid above 20GHz for this test
32	Antenna Pattern	5400MHz
33	Antenna Pattern	5500MHz
34	Antenna Pattern	5600MHz
35	Antenna Pattern	5700MHz
35a	RF Power Density	Pulsar Standard system
35b	RF Power Density	Pulsar-5 system

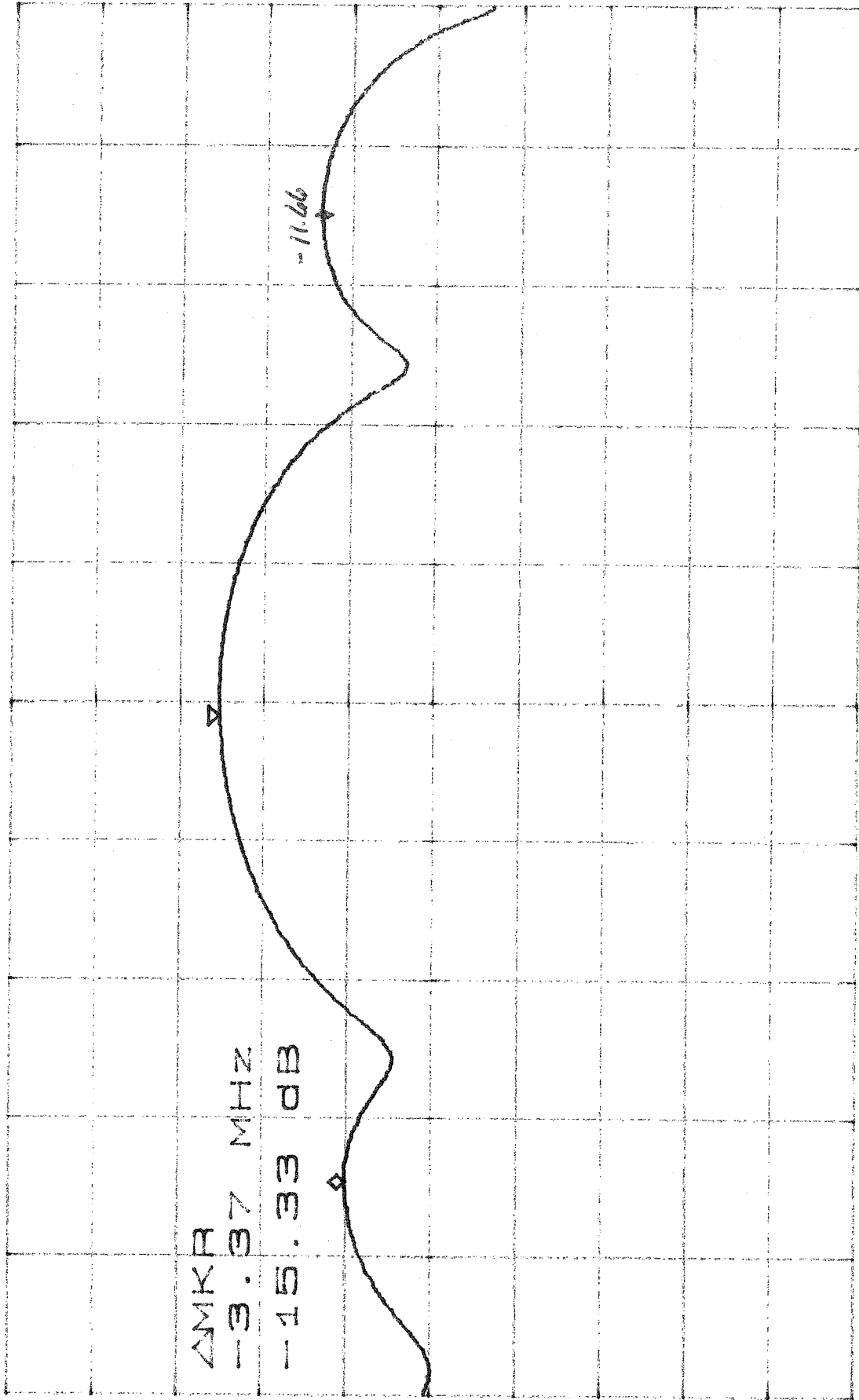
ATTEN 10dB
RL -20.0dBm

ΔMKR -15.33dB
-3.37MHz

10dB

ΔMKR
-3.37 MHz
-15.33 dB

D



CENTER 5.550000GHZ SPAN 10.00MHZ
*RBW 10KHZ VBW 10KHZ SWP 250ms

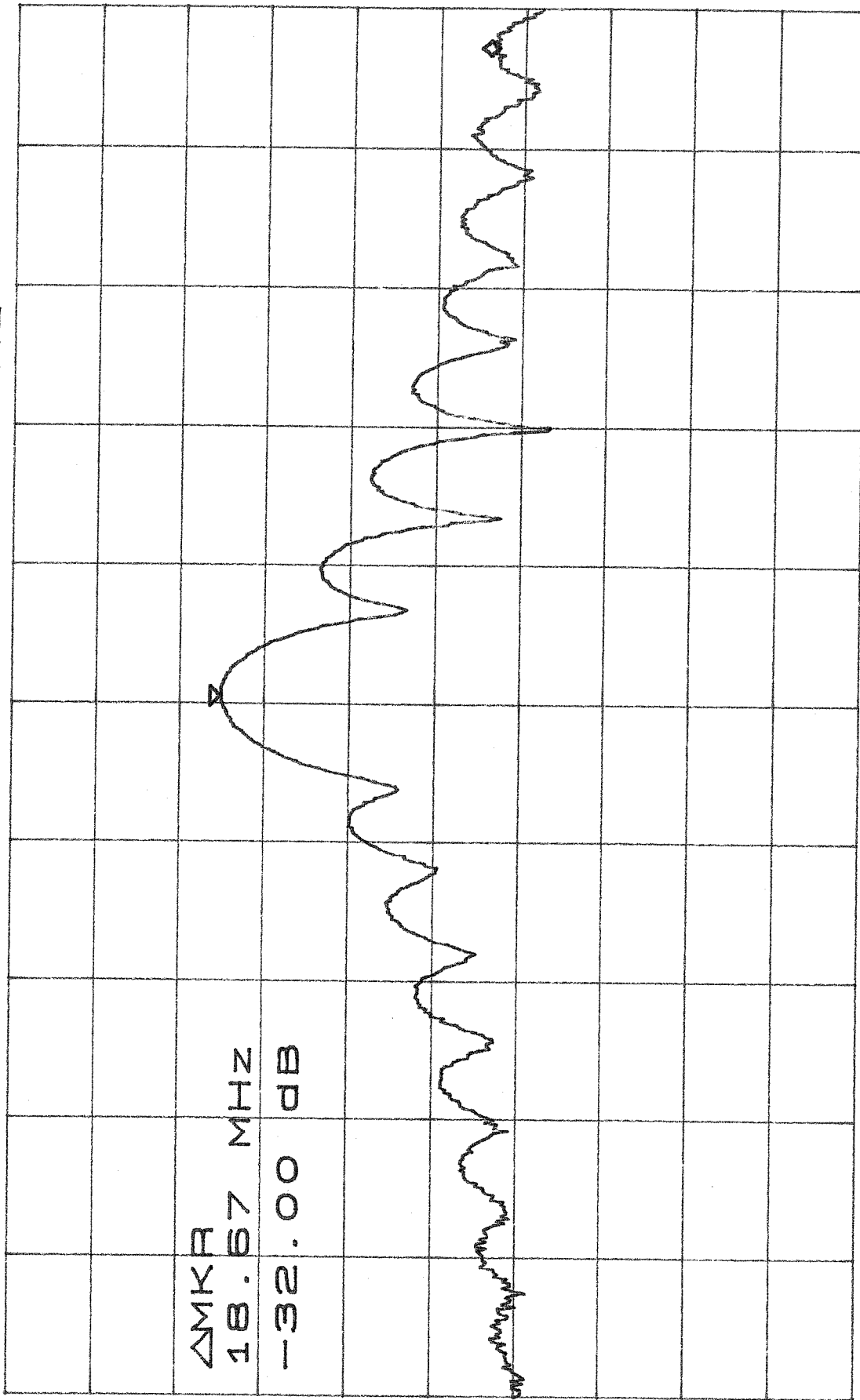
ATTEN 10dB
RL -20.00dBm

Δ MKR -32.00dB
18.67MHz

10dB/

Δ MKR
18.67 MHz
-32.00 dB

D



CENTER 5.550000GHZ

SPAN 40.00MHz

*RBW 10KHZ

VBW 10KHZ

SWP 1.00sec

Plot 2

ATTEN 10dB

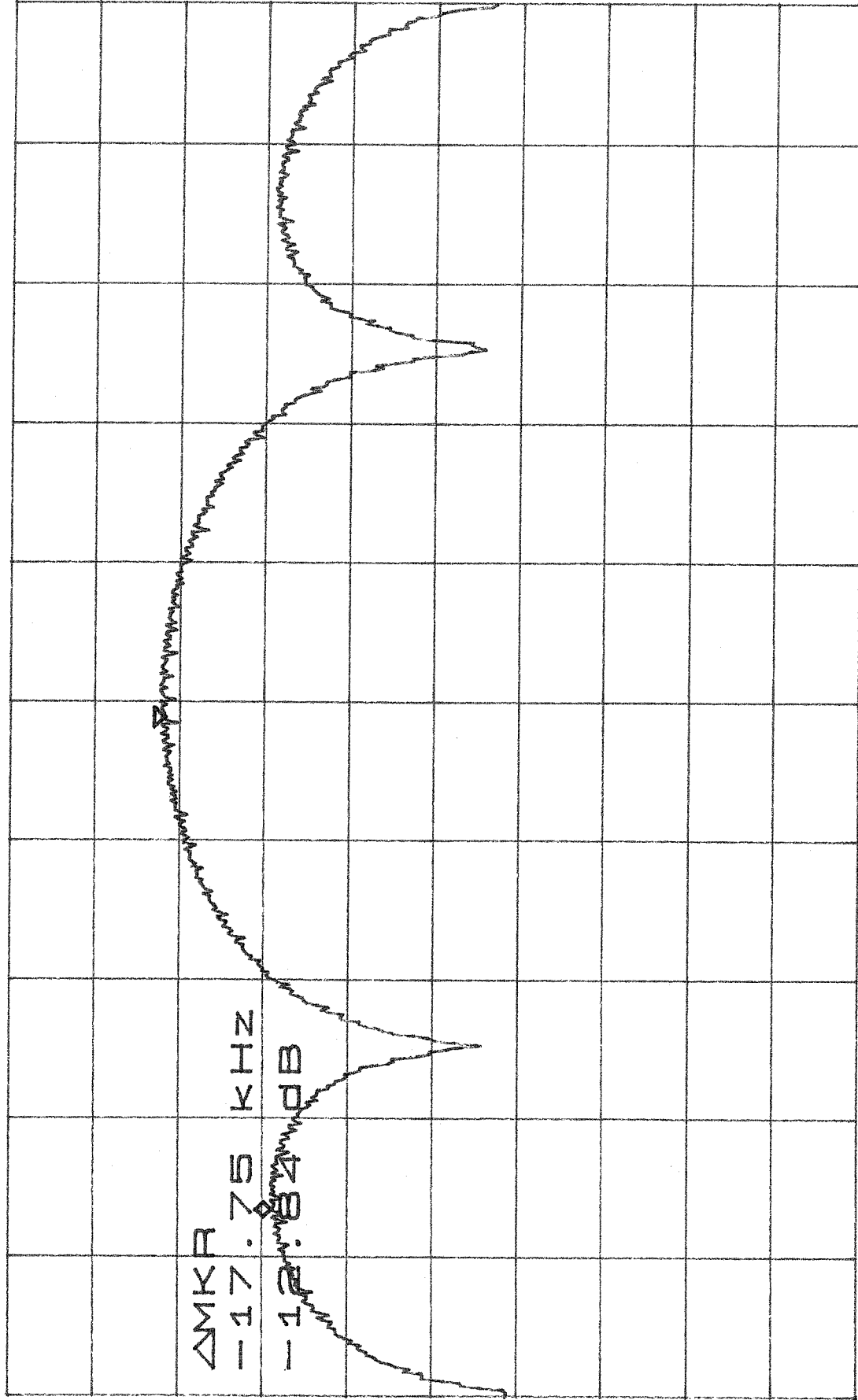
RL -10.0dBm

10dB/

ΔMKR -12.84dB

-17.75kHz

ΔMKR
-17.75 KHZ
-12.84dB



CENTER 5.550000000GHZ

RBW 300HZ

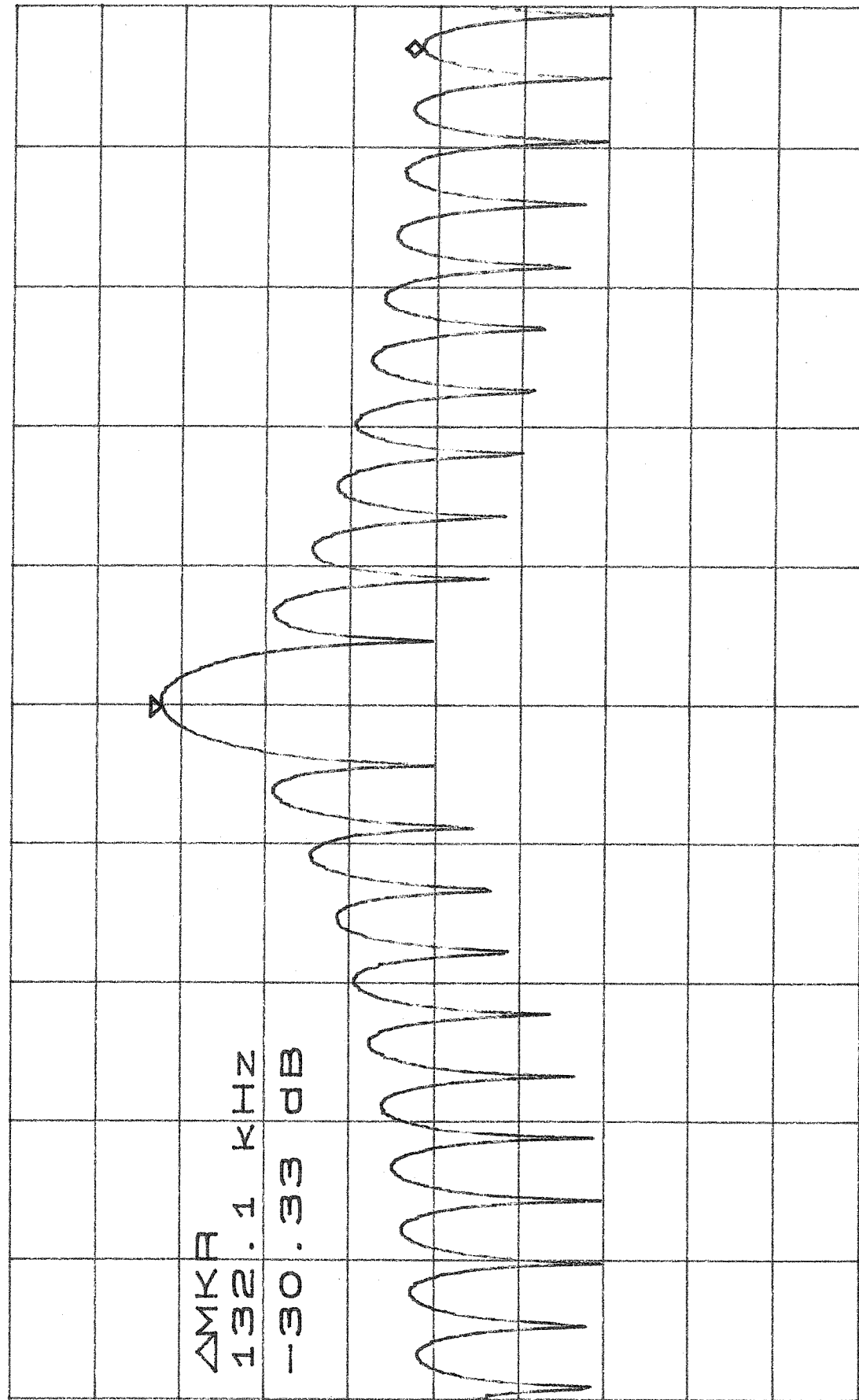
VBW 300HZ

SPAN 50.00KHZ

SWP 1.40sec

ATTEN 10dB
RL -10.0dBm

ΔMKR -30.33dB
132.1kHz



CENTER 5.5500000GHZ
*RBW 300HZ VBW 300HZ

SPAN 280.0KHZ
SWP 7.80sec

Plot 4

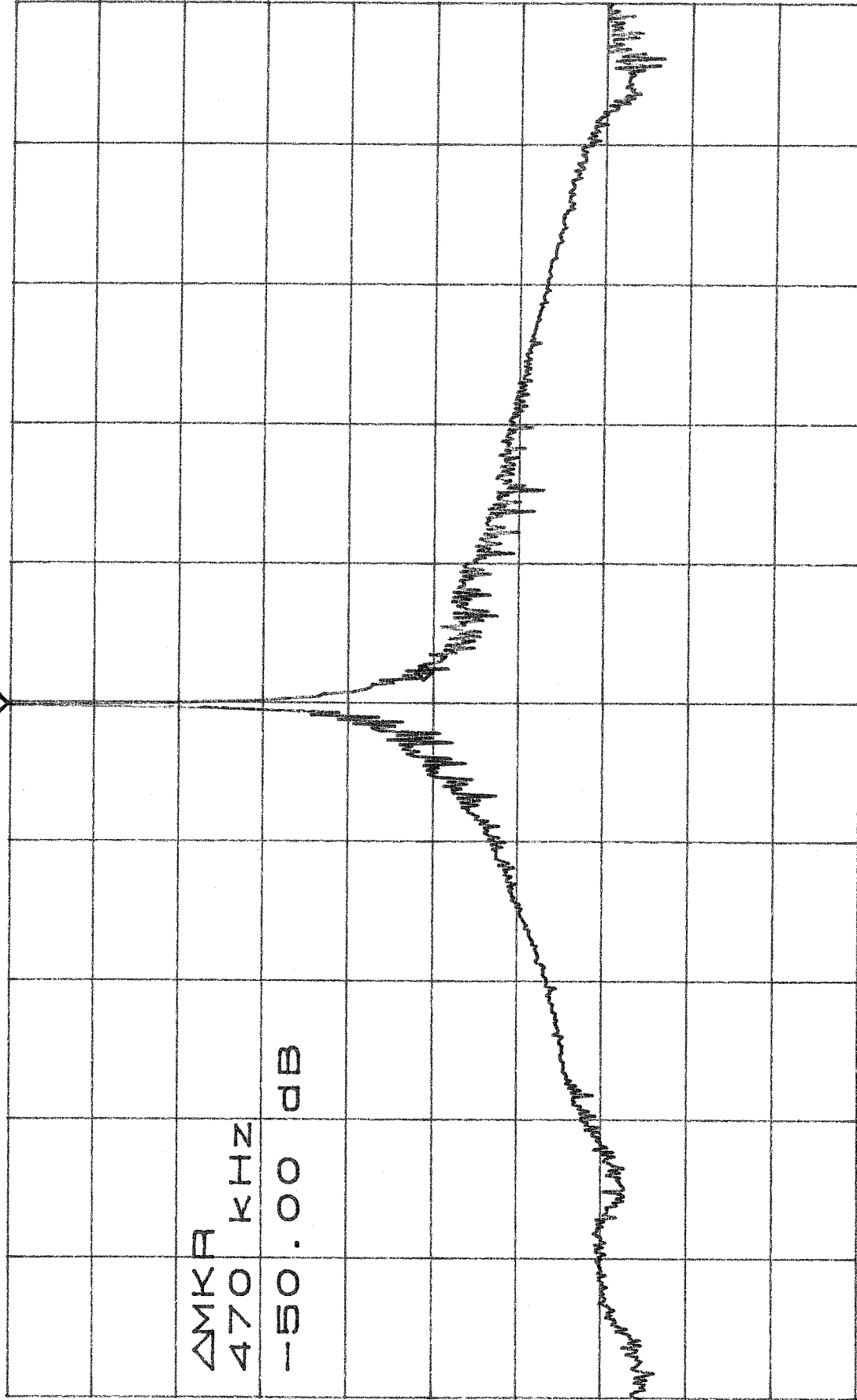
ATTEN 10dB
RL -10.00dBm

ΔMKR -50.00dB
470KHZ

ΔMKR
470 KHZ

-50.00 dB

10dB/



DS

CENTER 5.54963GHZ

SPAN 20.00MHZ

*RBW 3.0KHZ

VBW 3.0KHZ

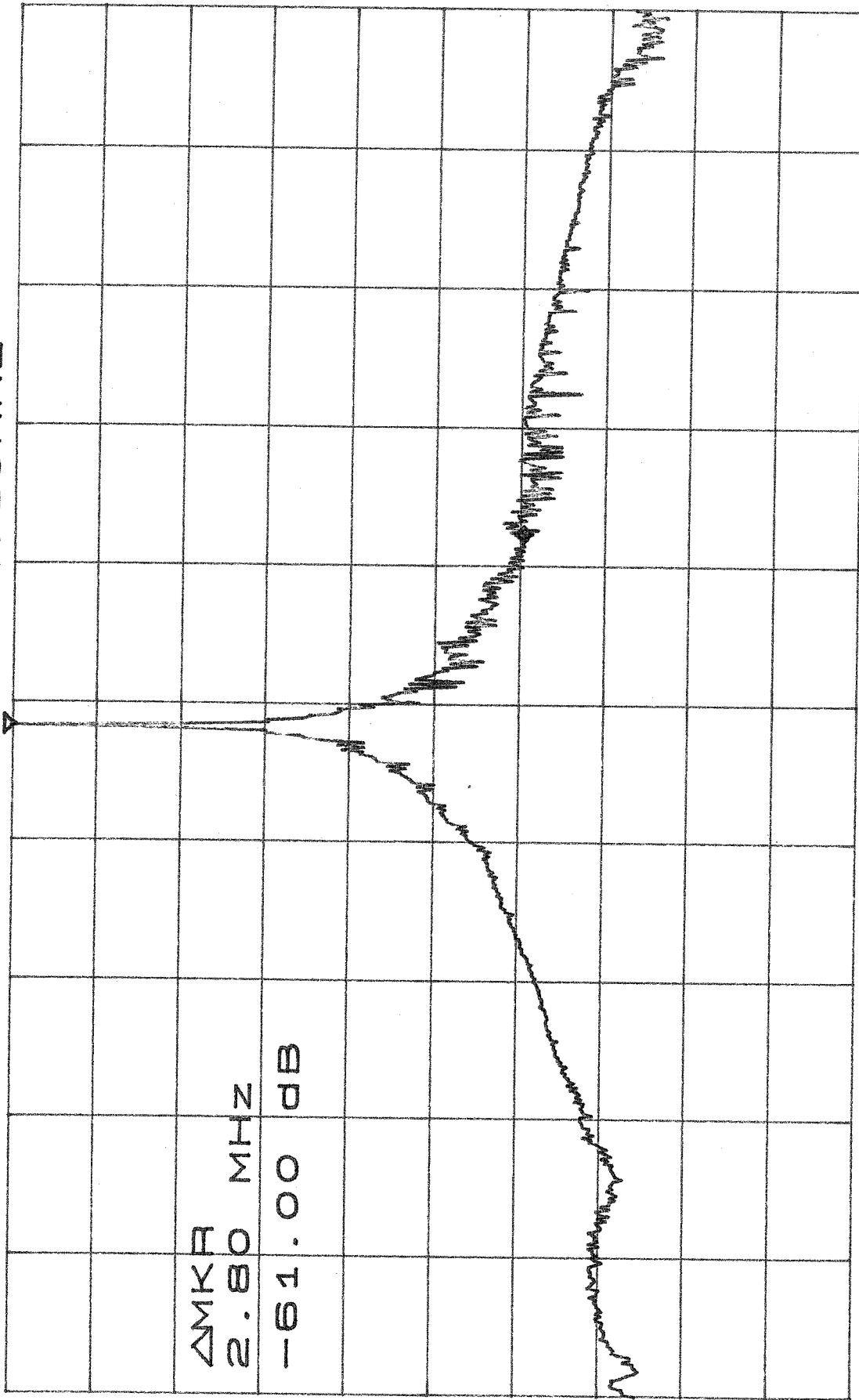
SWP 5.60sec

ATTEN 10dB
RL -10.00dBm

ΔMKR -61.00dB
2.80MHz

ΔMKR
2.80 MHz
-61.00 dB

10dB/



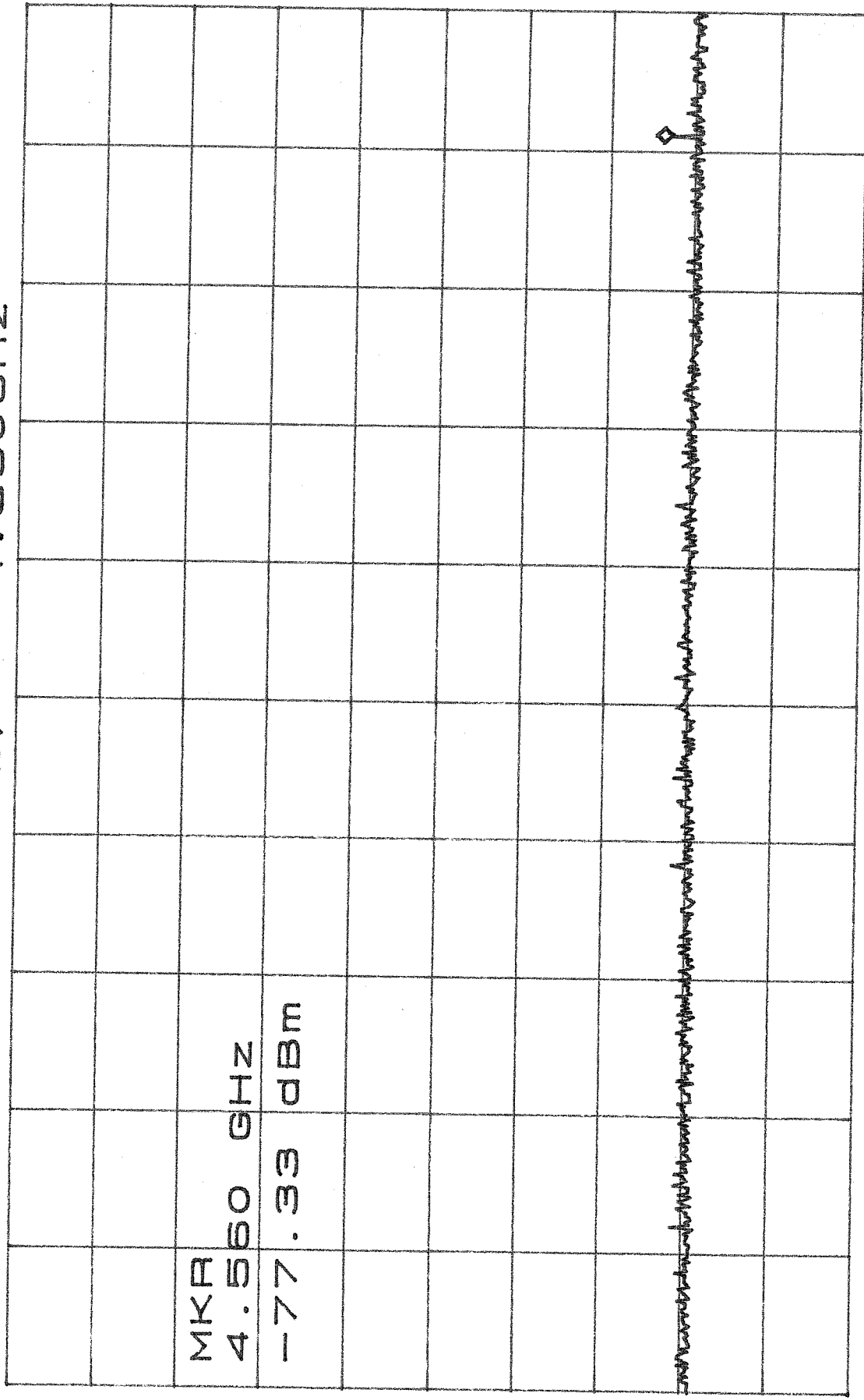
CENTER 5.550000GHZ SPAN 20.00MHZ
*RBW 3.0KHZ VBW 3.0KHZ SWP 5.60sec

ATTEN 10dB

RL 0dBm

MKR -77.33dBm

10dB/ 4.560GHz



D

START 20MHz

STOP 5.000GHz

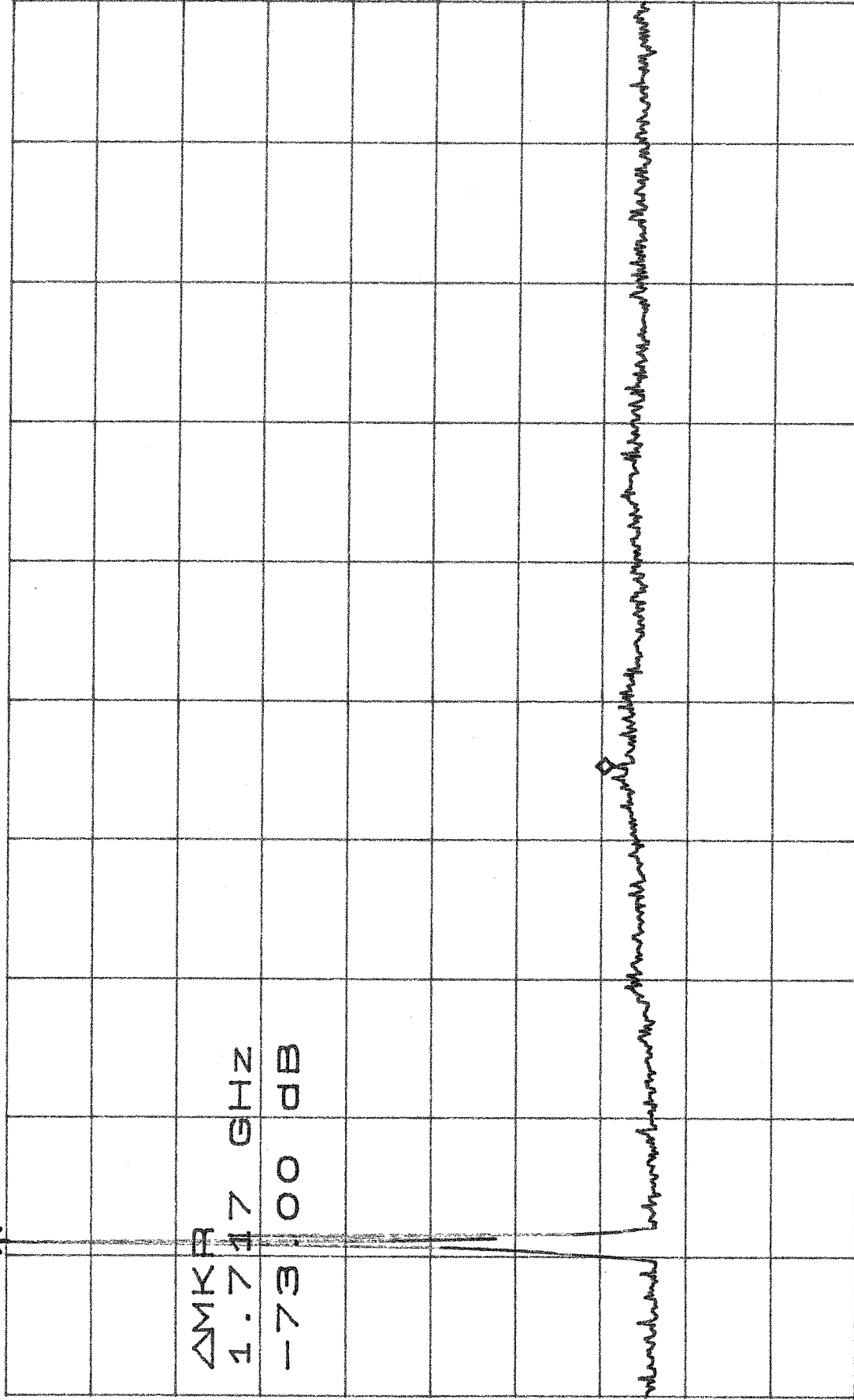
*RBW 30kHz

VBW 30kHz

SWP 14.0sec

ATTEN 20dB
PL 10.0dBm

ΔMKR -73.00dB
1.717GHz



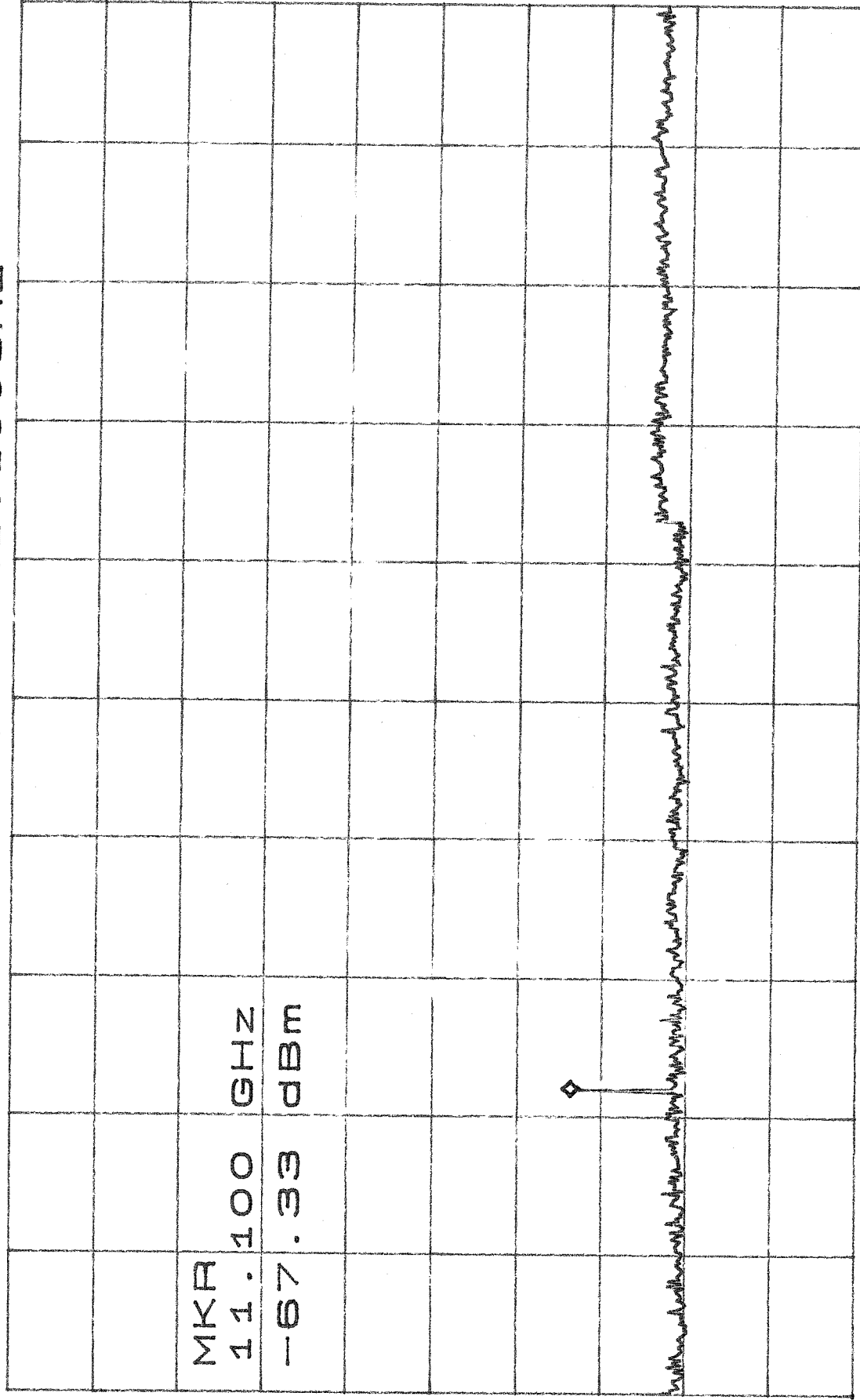
D

ATTEN 10dB

RL 0dBm

MKR -67.33dBm

10dB/ 11.100GHZ



START 10.000GHZ

STOP 15.000GHZ

*RBW 30KHZ

VBW 30KHZ

SWP 14.0sec

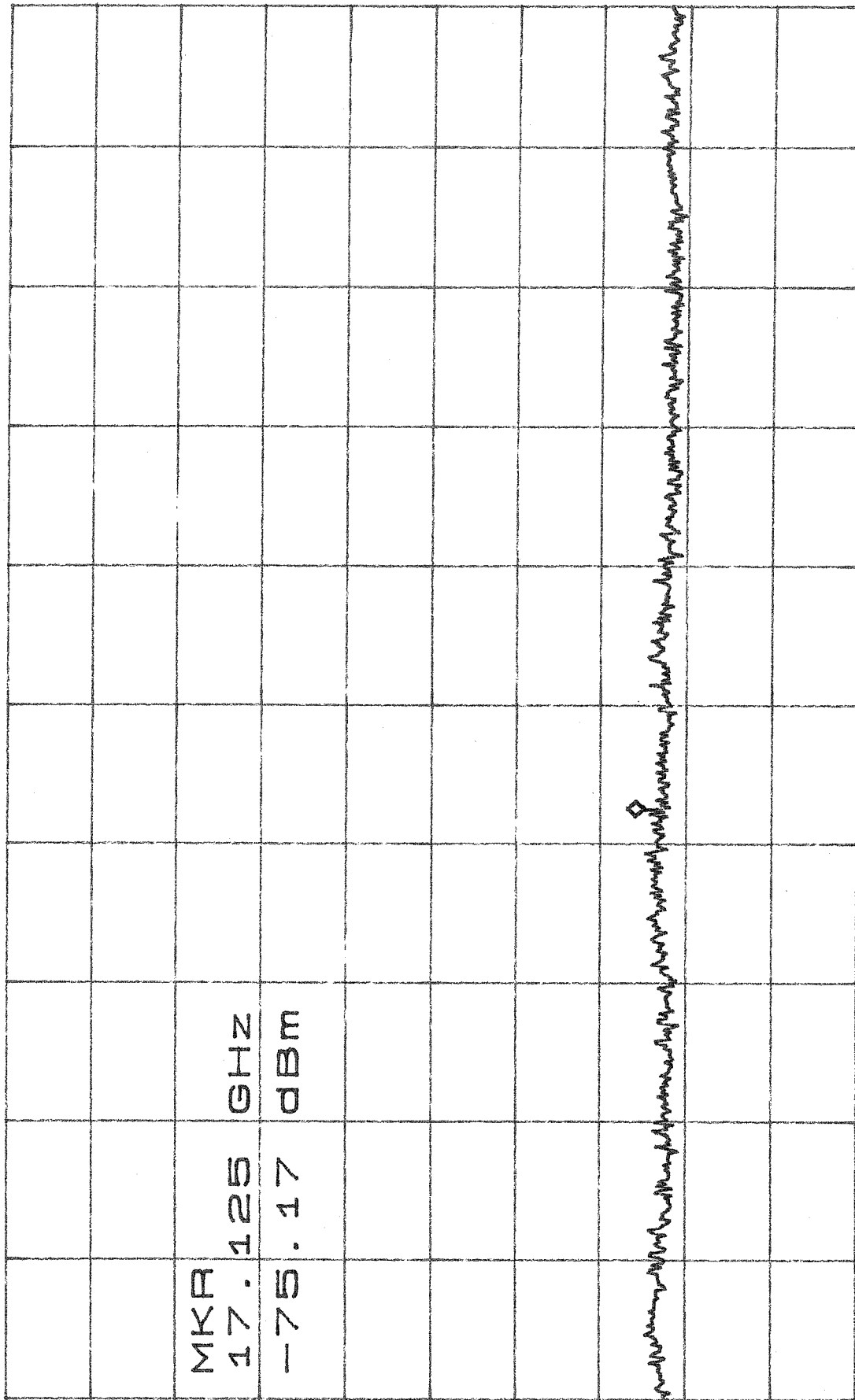
ATTEN 10dB

MKR -75.17dBm

RL 0dBm

10dB/

17.125GHz



D

START 15.000GHZ

STOP 20.000GHZ

*RBW 30KHZ

VBW 30KHZ

SWP 14.0sec

Plot 11

20

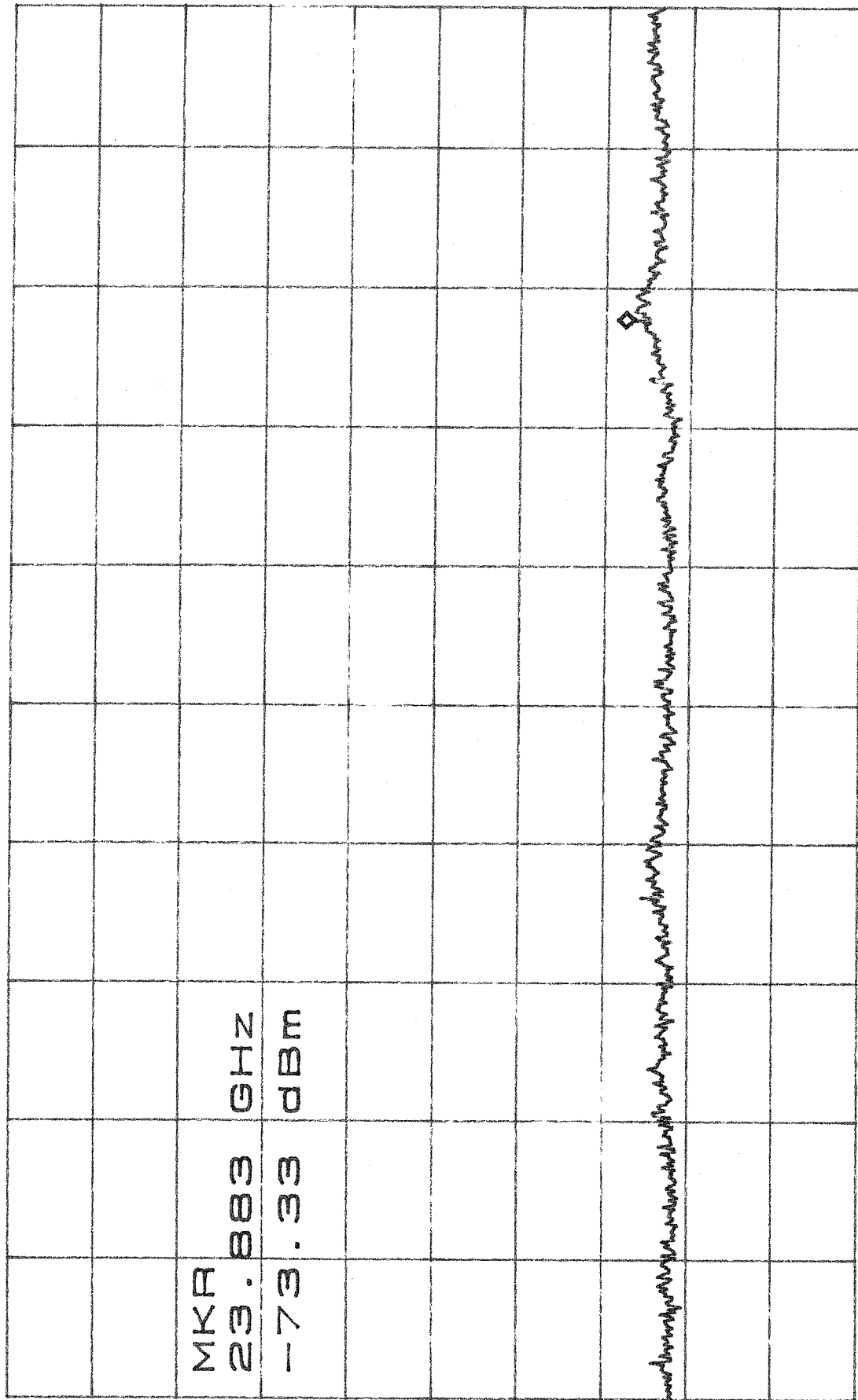
ATTEN 10dB

MKR -73.33dBm

RL 0dBm

10dB/

23.883GHz



D

START 20.000GHZ

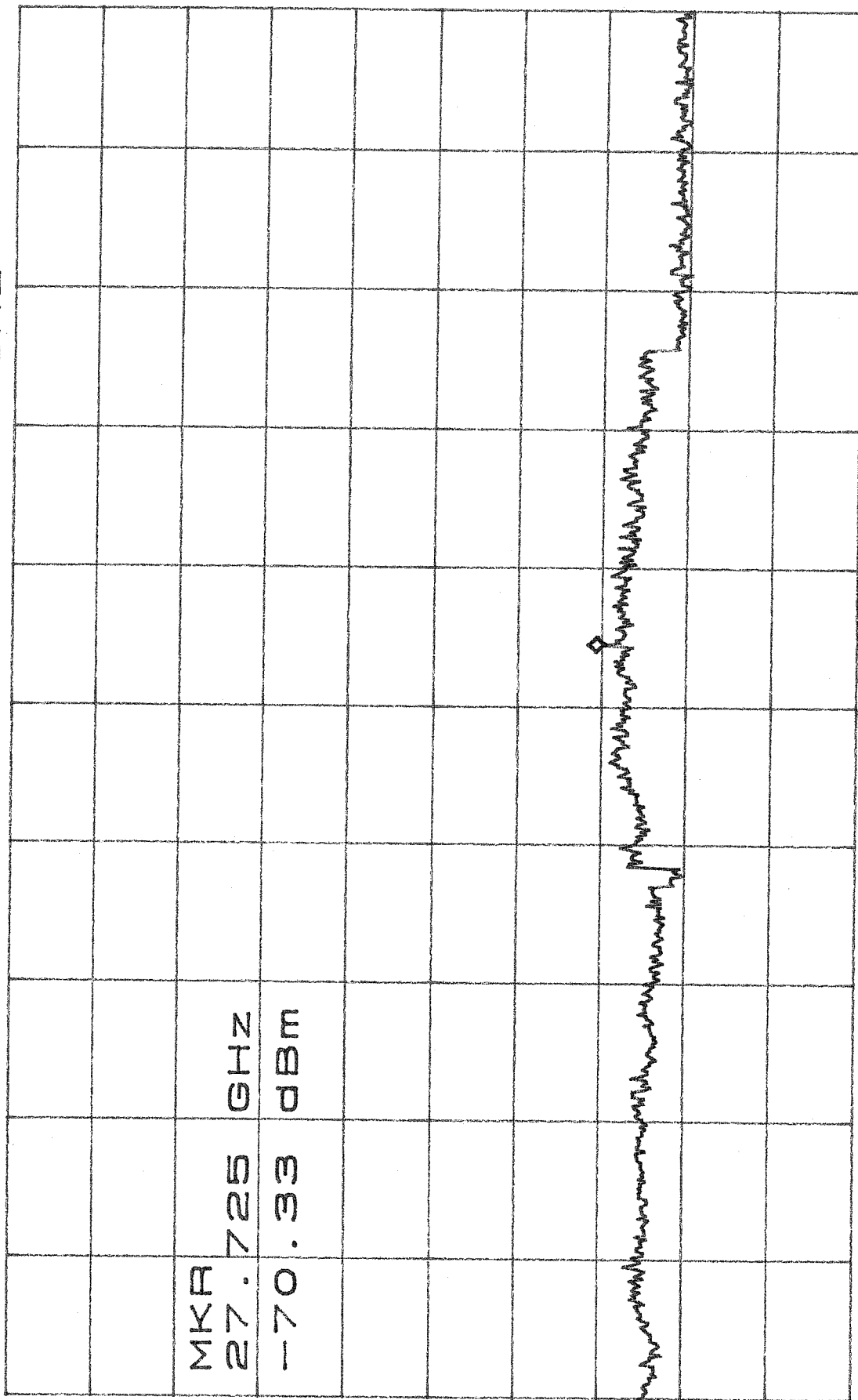
STOP 25.000GHZ

*RBW 30KHZ

VBW 30KHZ

SWP 14.0sec

ATTEN 10dB VAVG 0 MKR -70.33dBm
RL 0dBm 10dB/ 27.725GHz



D S

START 25.000GHz STOP 30.000GHz
*RBW 30kHz VBW 30kHz SWP 14.0sec

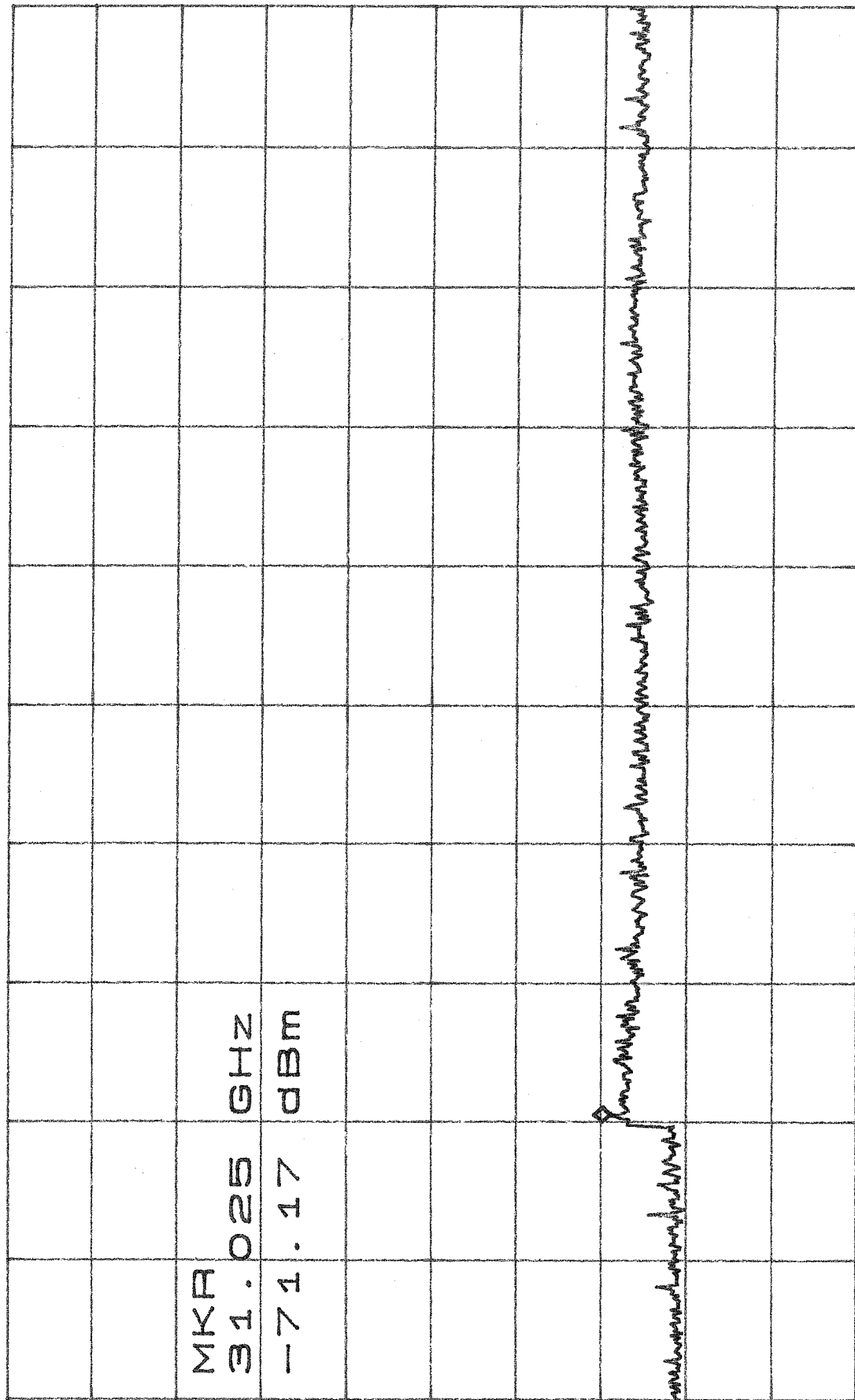
ATTEN 10dB

MKR -71.17dBm

RL 0dBm

10dB/

31.025GHz



D S

START 30.000GHz

STOP 35.000GHz

*RBW 30kHz

VBW 30kHz

SWP 14.0sec

ATTEN 10dB

MKR -68.17dBm

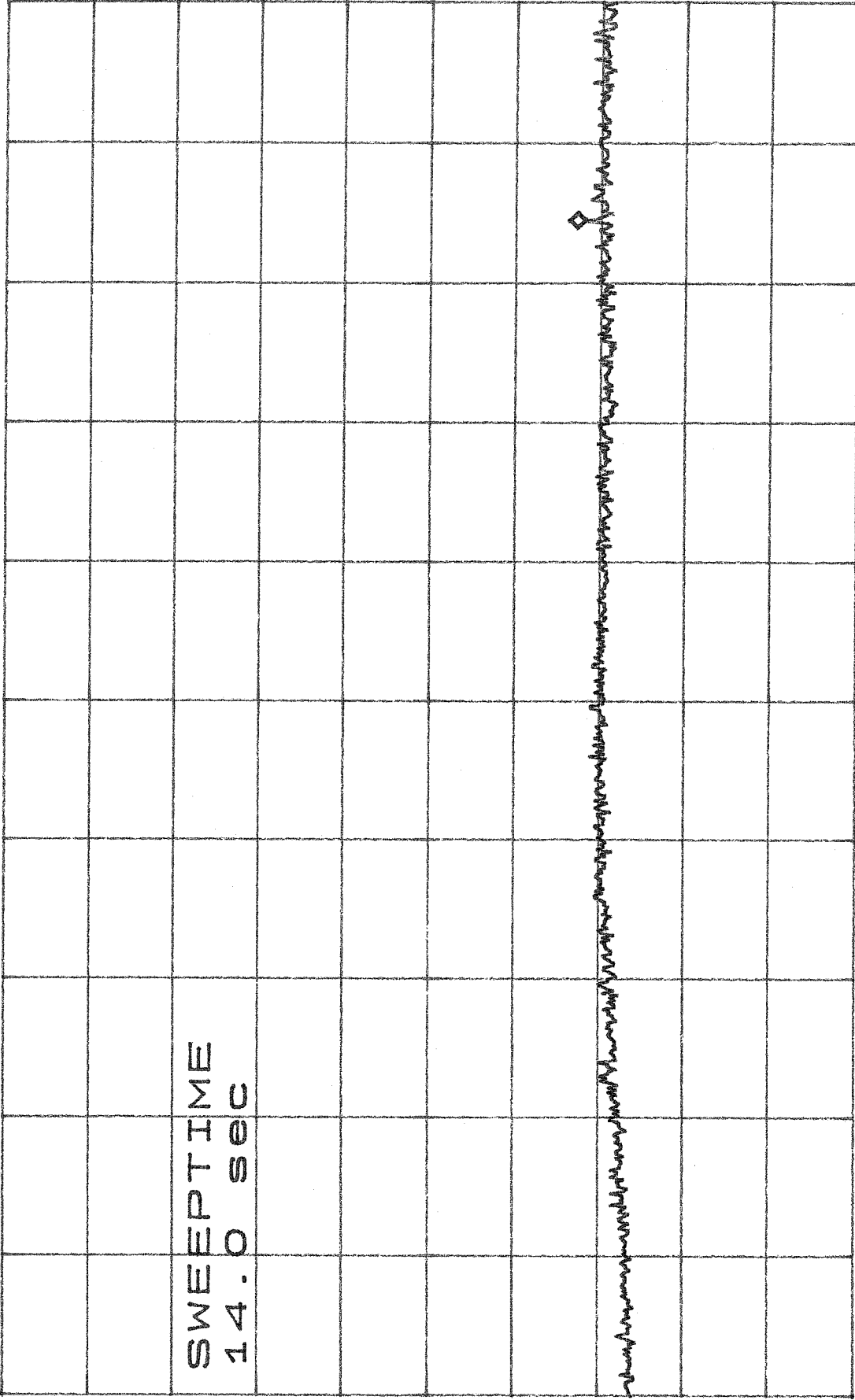
RL 0dBm

10dB/

39.225GHz

SWEPTIME
14.0 sec

DS



START 35.000GHz

STOP 40.000GHz

*RBW 30kHz

VBW 30kHz

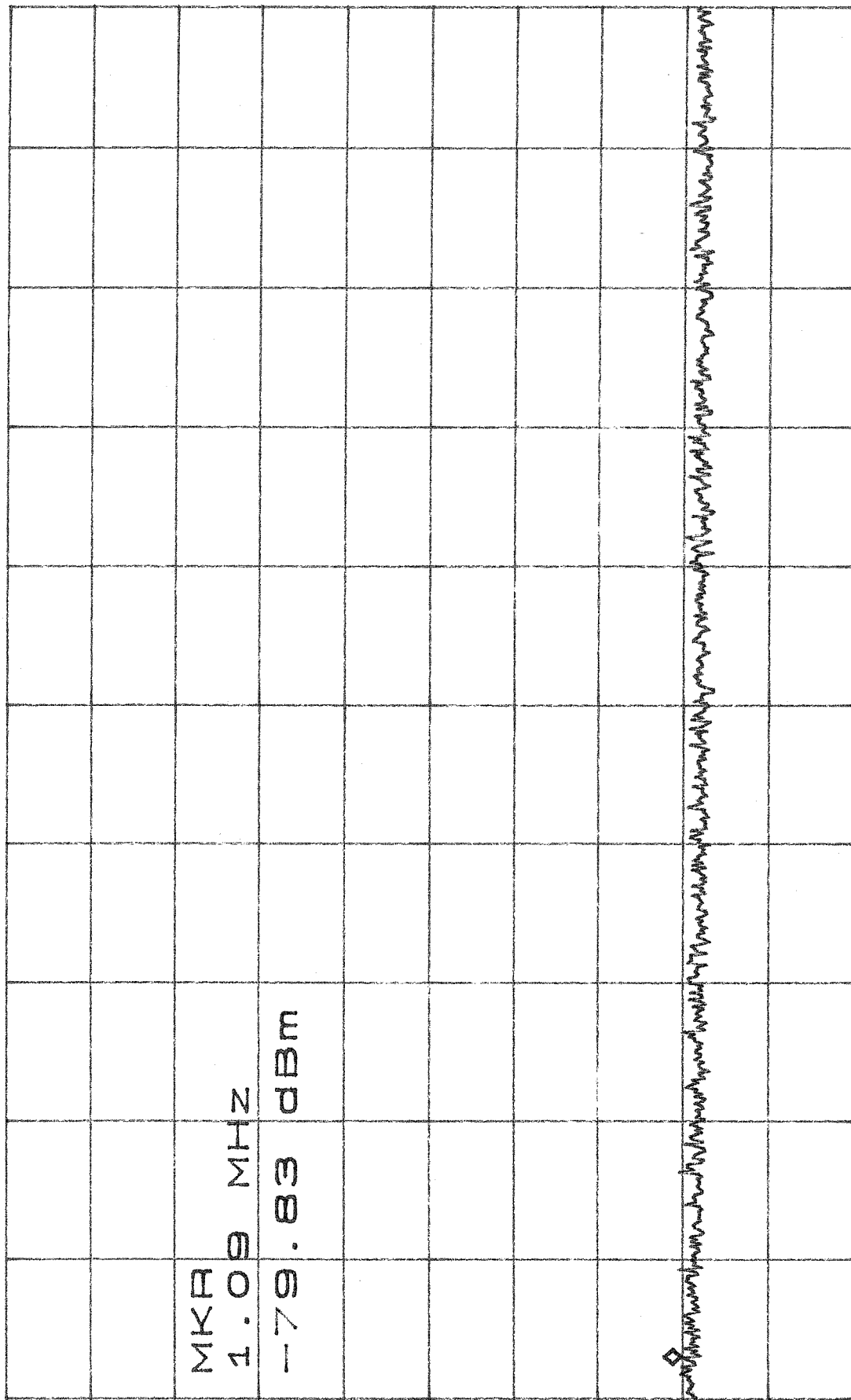
SWP 14.0sec

ATTEN 10dB

MKR -79.83dBm

RL 0dBm

10dB/ 1.09MHz



D

START 500KHZ

STOP 20.00MHZ

*RBW 30KHZ

VBW 30KHZ

SWP 55.0ms