

ITS Intertek Testing Services

FCC Part 15.247 Test Report
for
Plessey Asia Pacific Pty Ltd.
on the
Spread Spectrum
Model: 90931
FCC ID: OTO90931

Test Report #: J99028006
Date of Report: November 8, 1999

Job #: J99028006
Date of Test: November 3, 1999

Total No. of Pages Contained in this Report: 15 + data pages



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FCC Part 15 DSSS Cert, Rev 9/99

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Plessey Asia Pacific Pty Ltd., Model No. 90931
FCC ID: 0TO90931

Date of Test: November 3, 1999

1.0 Summary of Tests**Model No.: 90931****FCC ID:**

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(d)	Pass
Out of Band Antenna Conducted Emission	15.247(c)	Pass
Out of Band Radiated Emission	15.247(c)	N/A
Radiated Emission in Restricted Bands	15.35(b)(c)	Pass
AC Conducted Emission	15.207	Pass
Radiated Emission from Digital Part	15.109	Pass
Radiated Emission from Receiver L.O.	15.109	Not Applicable
Processing Gain Measurements	15.247(e)	Provided by applicant
Antenna Requirement	15.203	Pass

Test Engineer: *Li Ming Yang*
X Li Ming YangDate: 11/30/99Engineering Mgr. *David Chernomordik*
David Chernomordik, Ph.D.Date: 11/30/99

Plessey Asia Pacific Pty Ltd., Model No. 90931
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2.0 General Description

2.1 Product Description

The Plessey EasyReach Model 90939 radio provides full-duplex communication for T1(1.544Mb/s) data. The unit can be configured to either 48V DC or 120 V AC. It can be used with 24dBi or 19 dBi antenna. The design provides a reliable and economic solution for linking remote areas in rural communities, and different premises in urban or suburban locations.

The Plessey EasyReach radio is delivered in a standalone chassis which can either be desktop or 19 inch rack mounted.

A pre-production version of the sample was received on November 3, 1999 in good condition.

Overview of Spread Spectrum

Applicant	Plessey Asia Pacific Pty Ltd.
Trade Name & Model No.	Plessey / 90931
FCC Identifier	
Use of Product	Wireless Communication
Manufacturer & Model of Spread Spectrum Module	Plessey Asia Pacific Pty Limited
Type of Transmission	Direct Sequence
Rated RF Output	24 dBm
Frequency Range (MHz)	2412 - 2464
Number of Channel(s)	4
Antenna(s) & Gain, dBi	24
Processing Gain Measurements	☒ Will be provided to ITS for submission with the application
Antenna Requirement	☐ The EUT uses a permanently connected antenna. ☐ The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector. ☒ The EUT requires professional installation (attach supporting documentation if using this option).
Manufacturer name & address	Plessey Asia Pacific Pty Limited 5 Talavera Road North Ryde, NSW 2113 Australia

2.2 Related Submittal(s) Grants

None.

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2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is site . This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

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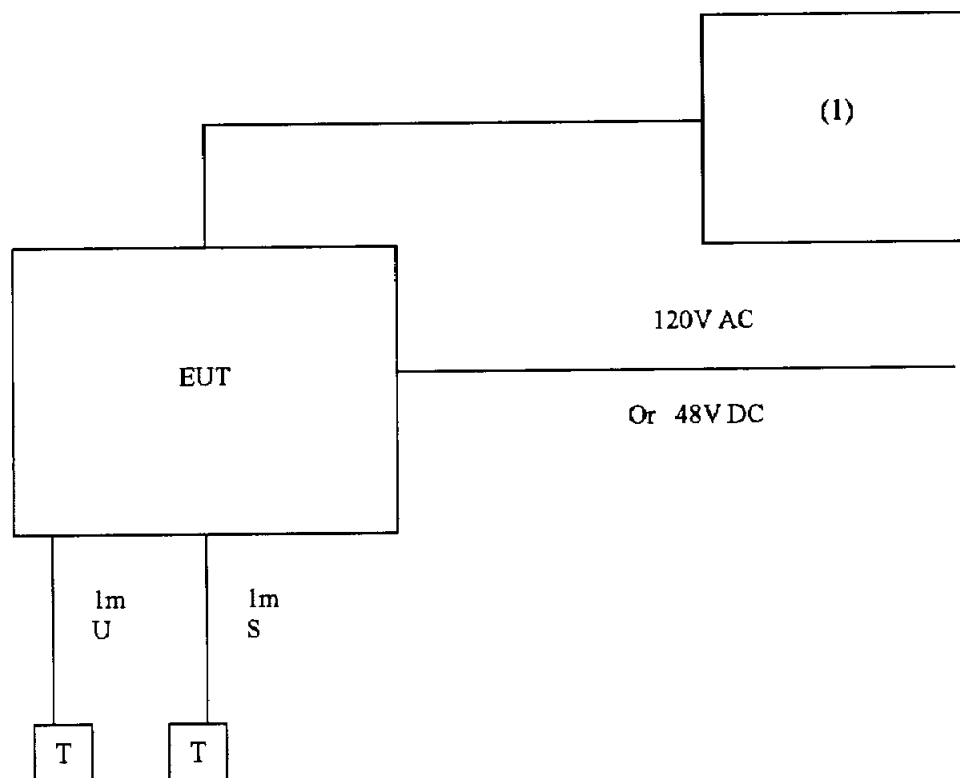
3.0 System Test Configuration

3.1 Support Equipment and description

The FCC IDs for all equipment used in the tested system (included inserted cards, which have grants) are:

Item #	Description	Model No.	Serial No.	FCC ID
1	Antenna	G0903A	N/A	N/A

3.2 Block Diagram of Test Setup



* = EUT	S = Shielded	F = With Ferrite
** = No ferrites on video cable	U = Unshielded	

3.3 Justification

For emission testing, the DC and AC models are both tested and the highest antenna gain was used. The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power without modulation.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of Operation During Test

The EUT was tested in "transmit" mode.

3.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Plessey Asia Pacific Pty Ltd. prior to compliance testing):

None.

3.7 Additions, deviations and exclusions from standards

None.

Plessey Asia Pacific Pty Ltd., Model No. 90931
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4.0 Measurement Results**4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b):**

- ☒ The antenna port of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.
- ☐ The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for maximum RES BW and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).

For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

Max. antenna gain = 24 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	24.0	251
Middle Channel: 2452	24.0	251
High Channel: 2464	24.0	251

Cable loss: 0 dBExternal Attenuation: 0 dB

Cable loss, external attenuation:

- ☐ included in OFFSET function
☐ added to SA raw reading

$$\text{EUT Maximum Output} = 30 - (24 - 6)/3 = 24 \text{ dBm}$$

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4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	Min. 6 dB Bandwidth (kHz)
2452	9240

Refer to the following plots for 6 dB bandwidth sharp:

Plot 2a: Low Channel 6 dB RF Bandwidth

Plot 2b: Middle Channel 6 dB RF Bandwidth

Plot 2c: High Channel 6 dB RF Bandwidth

h₀

REF 21.0 dBm

ATTEN 30 dB

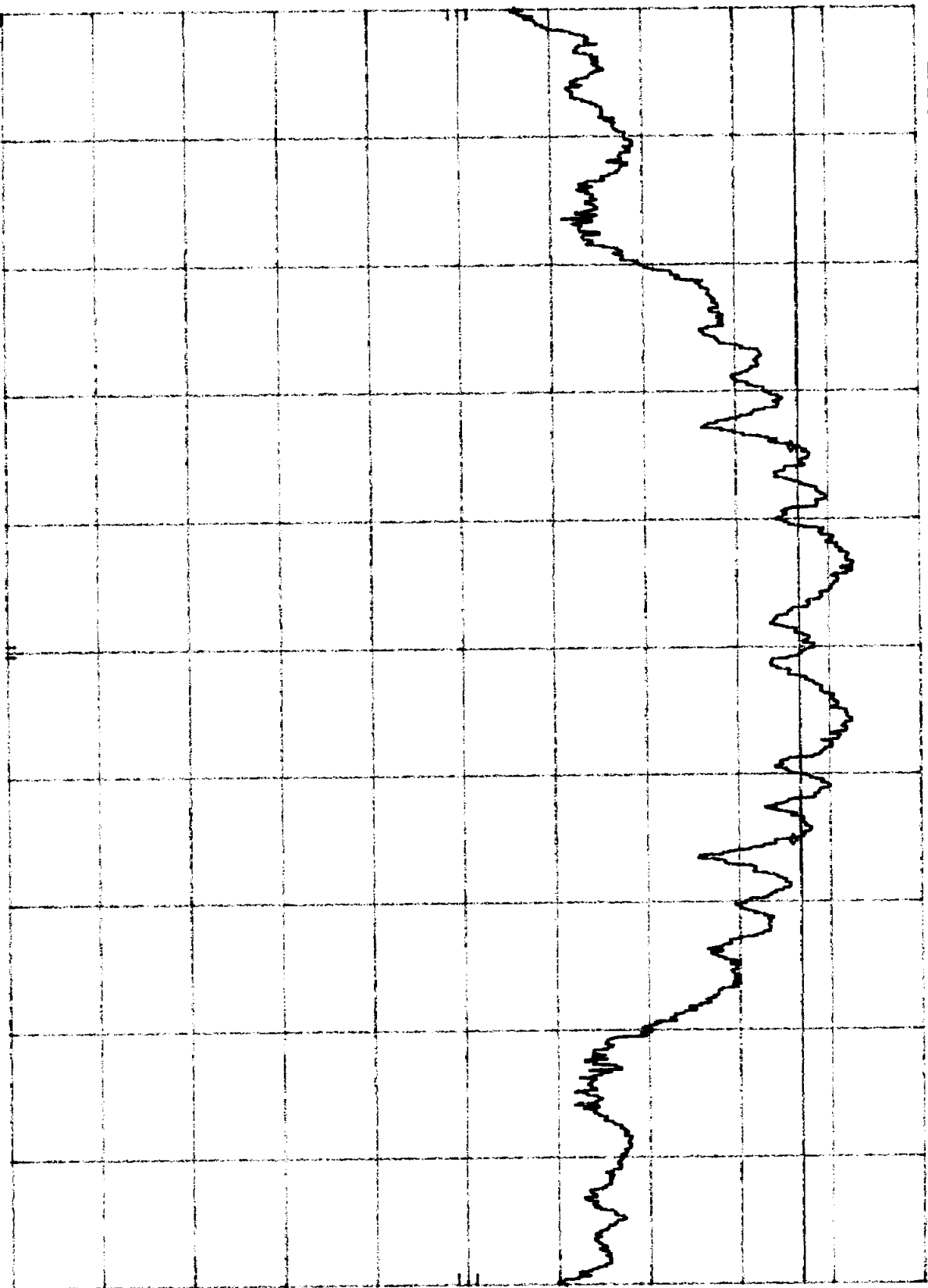
MKR Δ 9.24 MHz
-0.10 dB

10 dB/

OFFSET
1.0

dB

DL
7.8
dBm



CENTER 2.412 0 GHz
RES BW 100 KHz
VBW 100 KHz
SPAN 30.0 MHz
SWP 20.0 msec

h₀

REF 21.0 dBm

ATTEN 30 dB

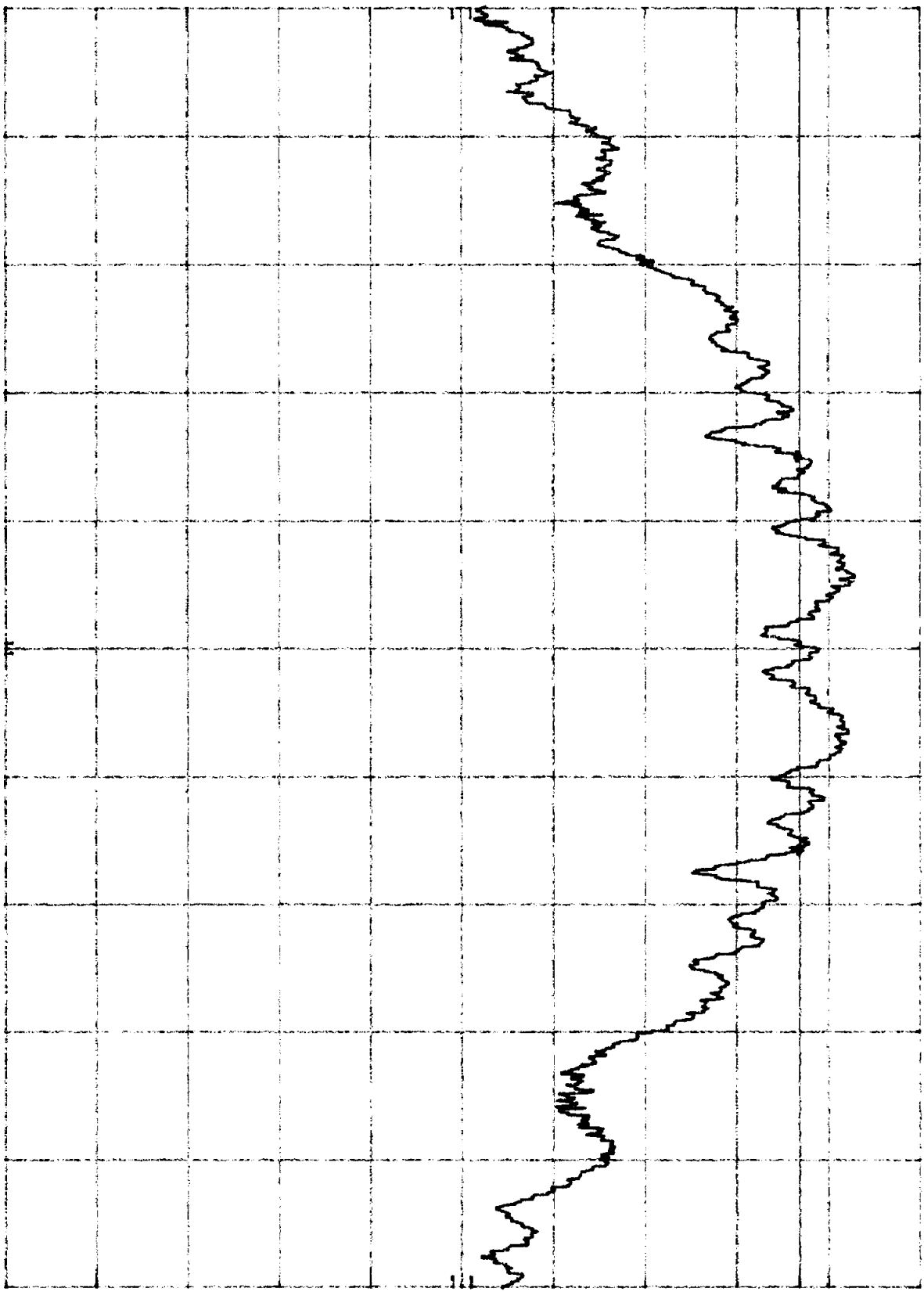
MKR Δ 9.24 MHz
0.20 dB

10 dB/

OFFSET
1.0

dB

DL
7.9
dBm



CENTER 2.452 0 GHz

RES BW 100 kHz

VBW 100 kHz

SPAN 30.0 MHz
SWP 20.0 msec

66

hpa

REF 21.0 dBm

ATTEN 30 dB

MKR Δ 11.40 MHz
-0.10 dB

10 dB/

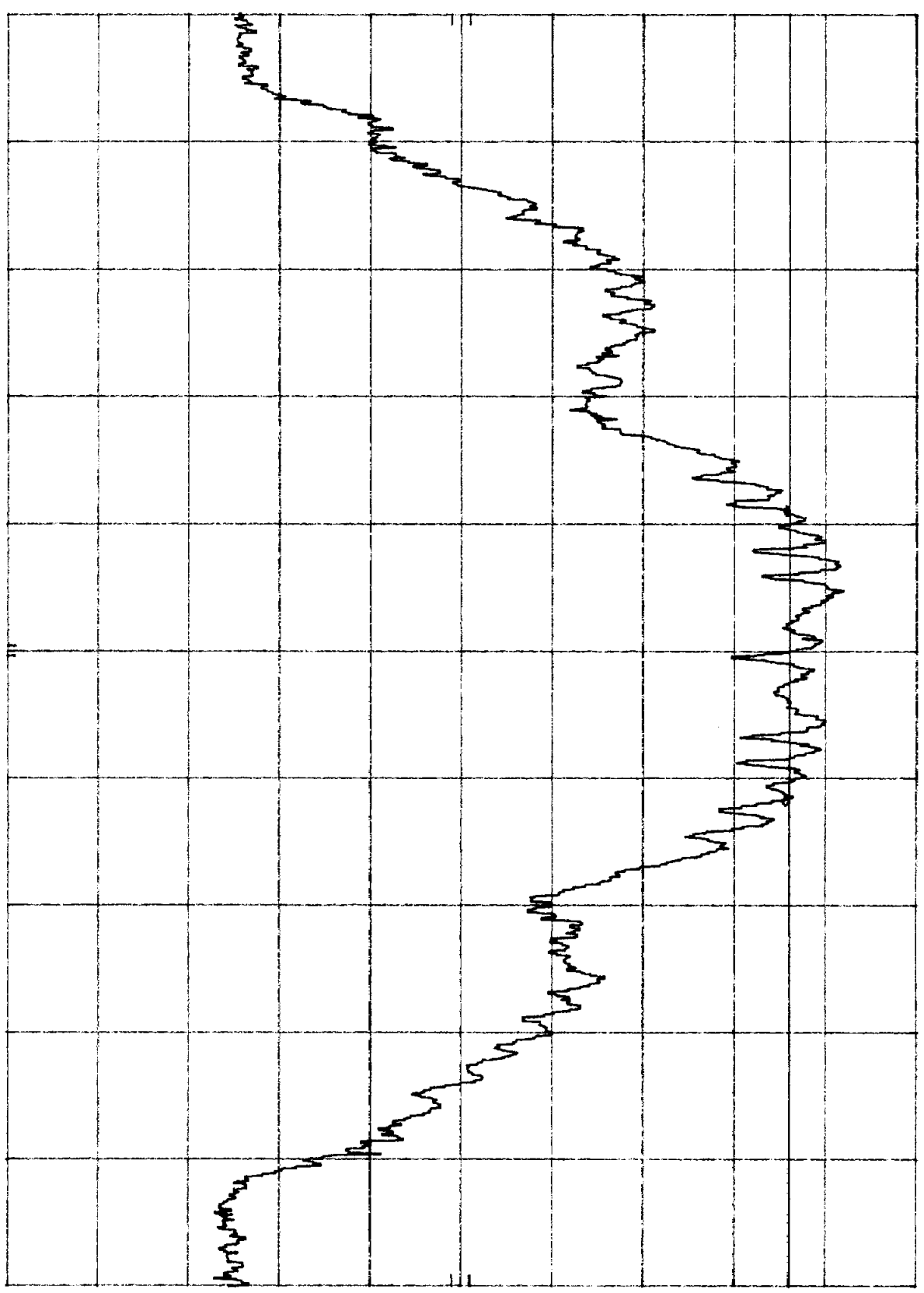
OFFSET
1.0

dB

DL

7.1

dBm



CENTER 2.464 0 GHz

RES BW 100 KHz

VBW 100 KHz

SPAN 50.0 MHz
SWP 20.0 msec

4.3 Maximum Power Density Reading, FCC Rule 15.247(d):

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

$$\text{SWEEP TIME (SEC)} = (\text{Fstop, kHz} - \text{Fstart, kHz}) / 3 \text{ kHz}$$

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Frequency (MHz)	Power Density (dBm)
2461.456	1.8

Frequency Span = 1.2 kHz

Sweep Time = Frequency Span/3 kHz
 = 400 seconds

Refer to the following plots for power density data:

Plot 3a1 – Plot 3a2: Low Channel Power Density
Plot 3b1 – Plot 3b2: Middle Channel Power Density
Plot 3c1 – Plot 3c2: High Channel Power Density

3,9,1

HP

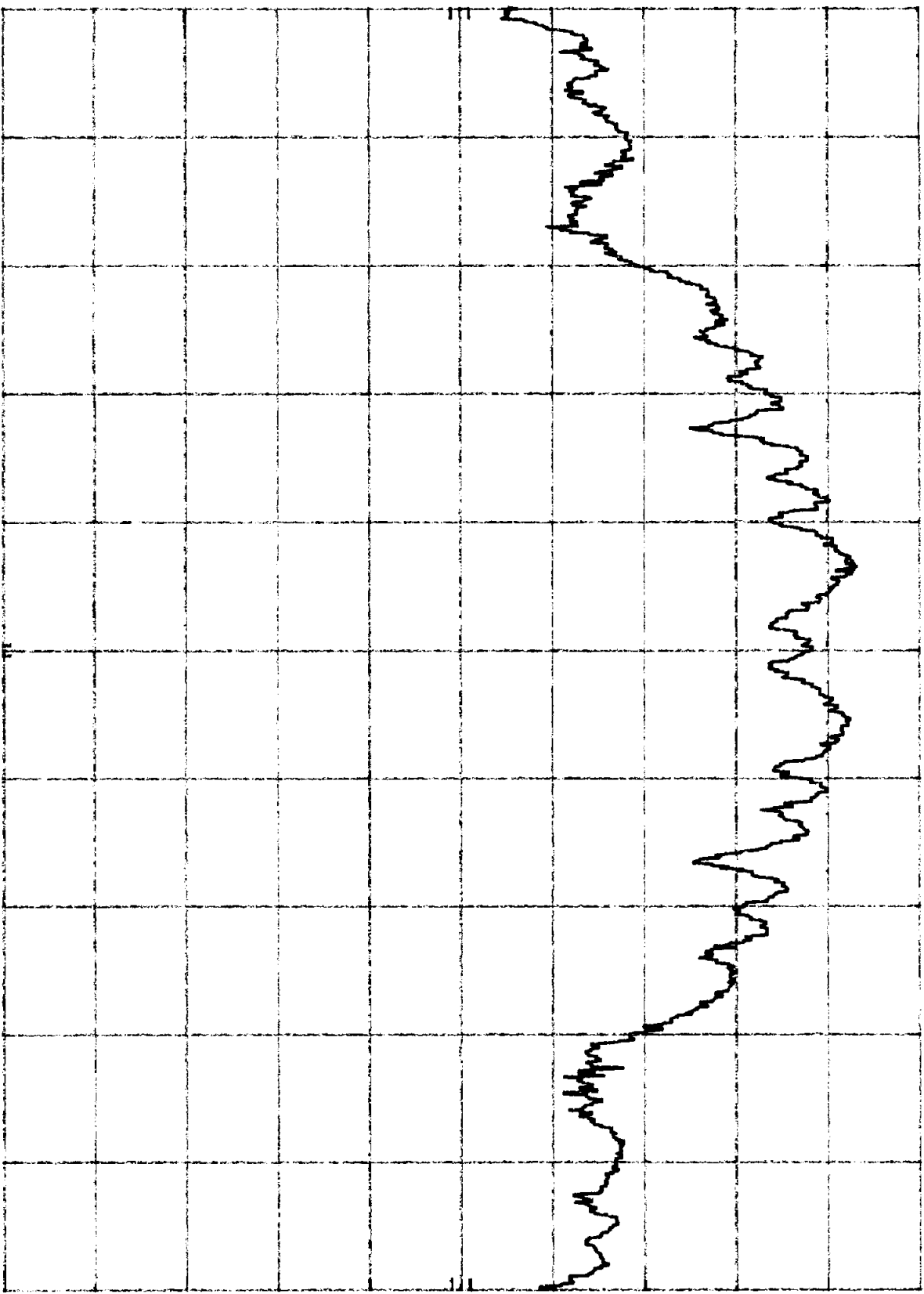
REF 21.0 dBm

ATTEN 30 dB

MKR 2.410 02 GHz
13.70 dBm

10 dB/

OFFSET
1.0
dB



CENTER 2.412 0 GHz

RES BW 100 KHz

VBW 100 KHz

SPAN 30.0 MHz
SWP 20.0 msec

h₀

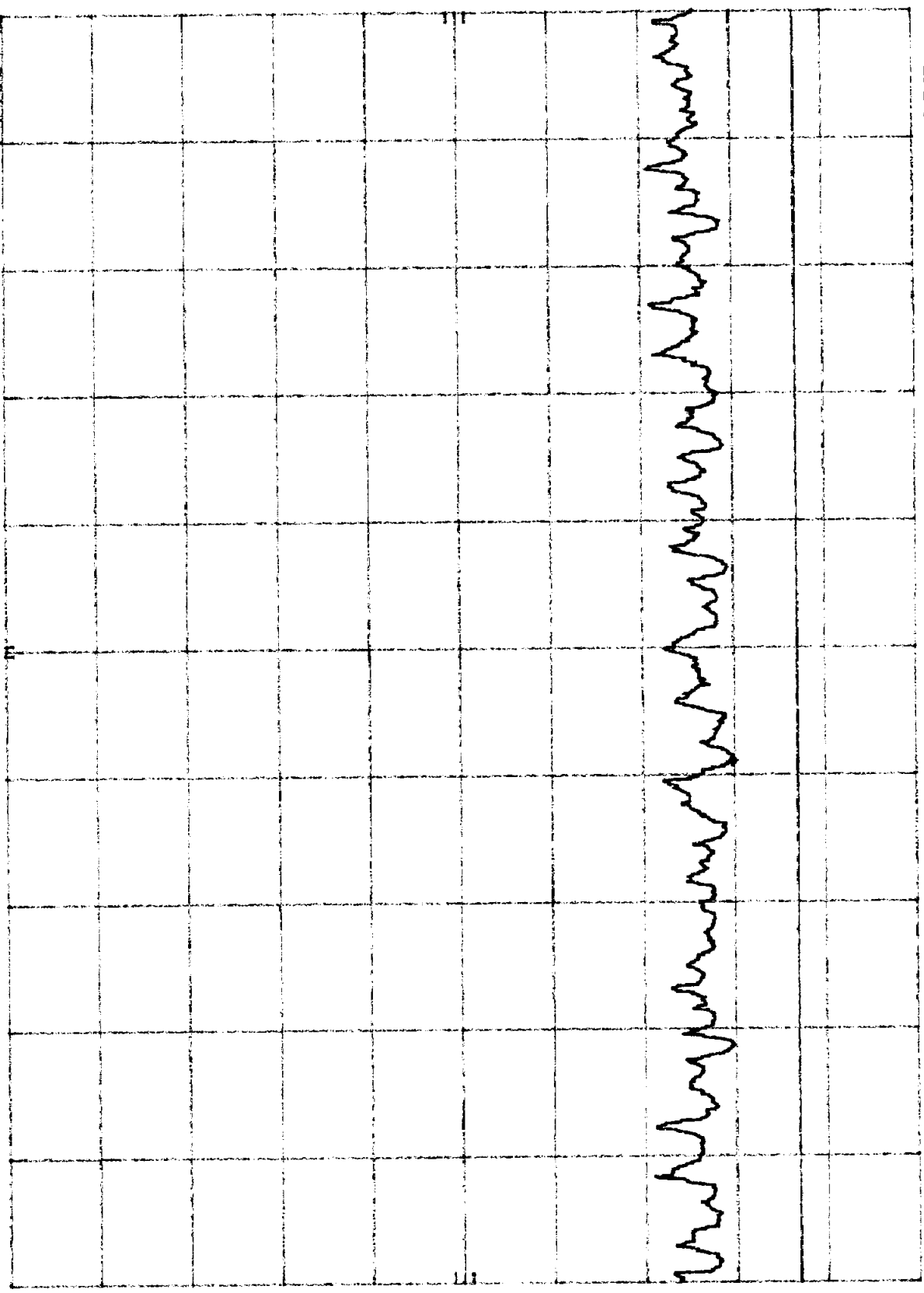
REF 21.0 dBm ATTEN 30 dB

MKR 2.410 126 GHz
0.90 dBm

10 dB/

OFFSET
1.0
dB

DL
8.0
dBm



CENTER 2.410 02 GHz
RES BW 3 kHz

VBW 3 kHz

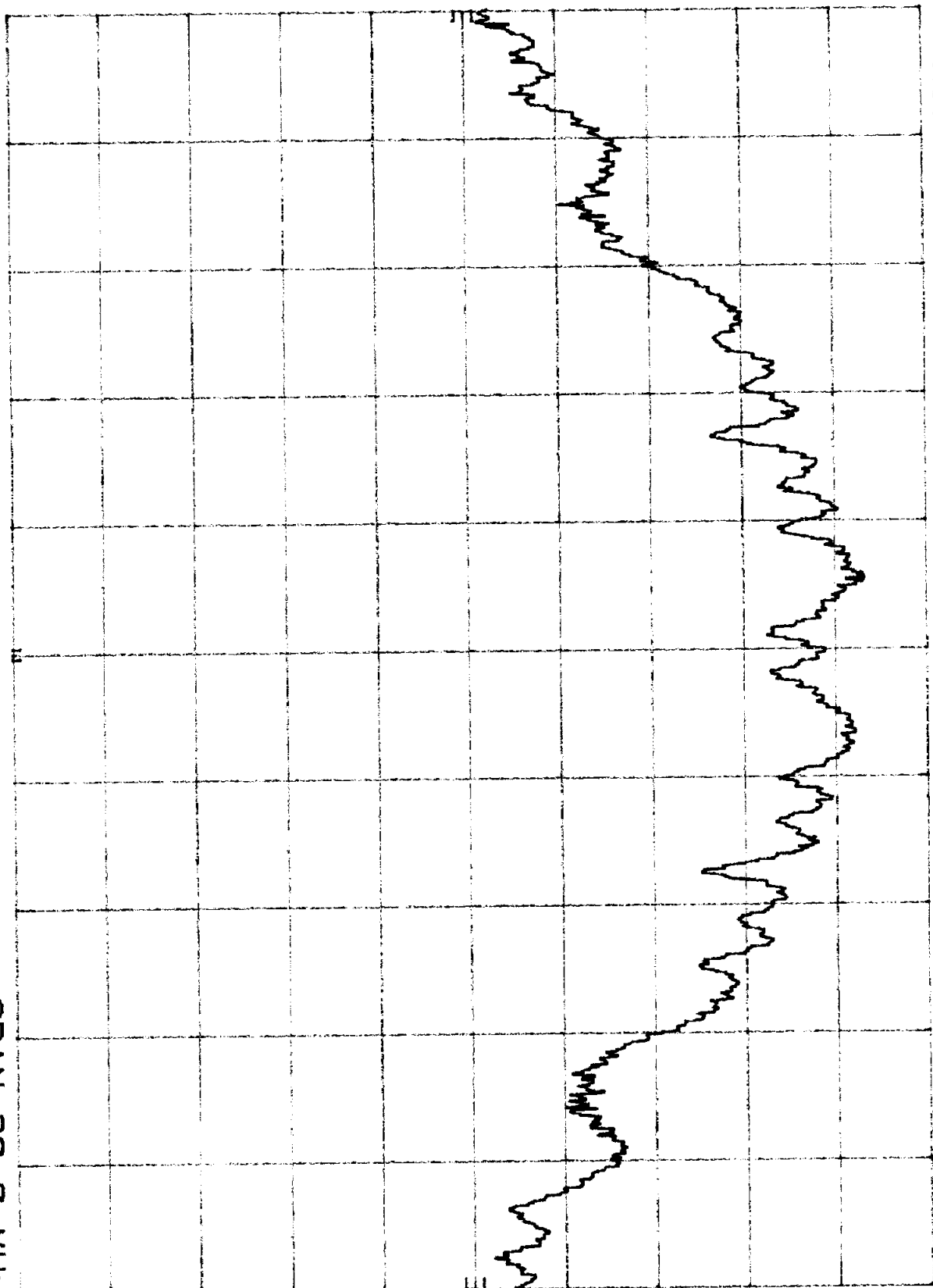
SPAN 1.20 MHz
SWP 400 sec

h₀ REF 21.0 dBm

ATTEN 30 dB

MKR 2.450 32 GHz
13.90 dBm

OFFSET
1.0
dB



CENTER 2.452 0 GHz
RES BW 100 KHz

VBW 100 KHz

SPAN 30.0 MHz
SWP 20.0 msec

40

REF 21.0 dBm ATTN 30 dB

MKR 2.449 937 GHz 0.00 dBm

10 dB/

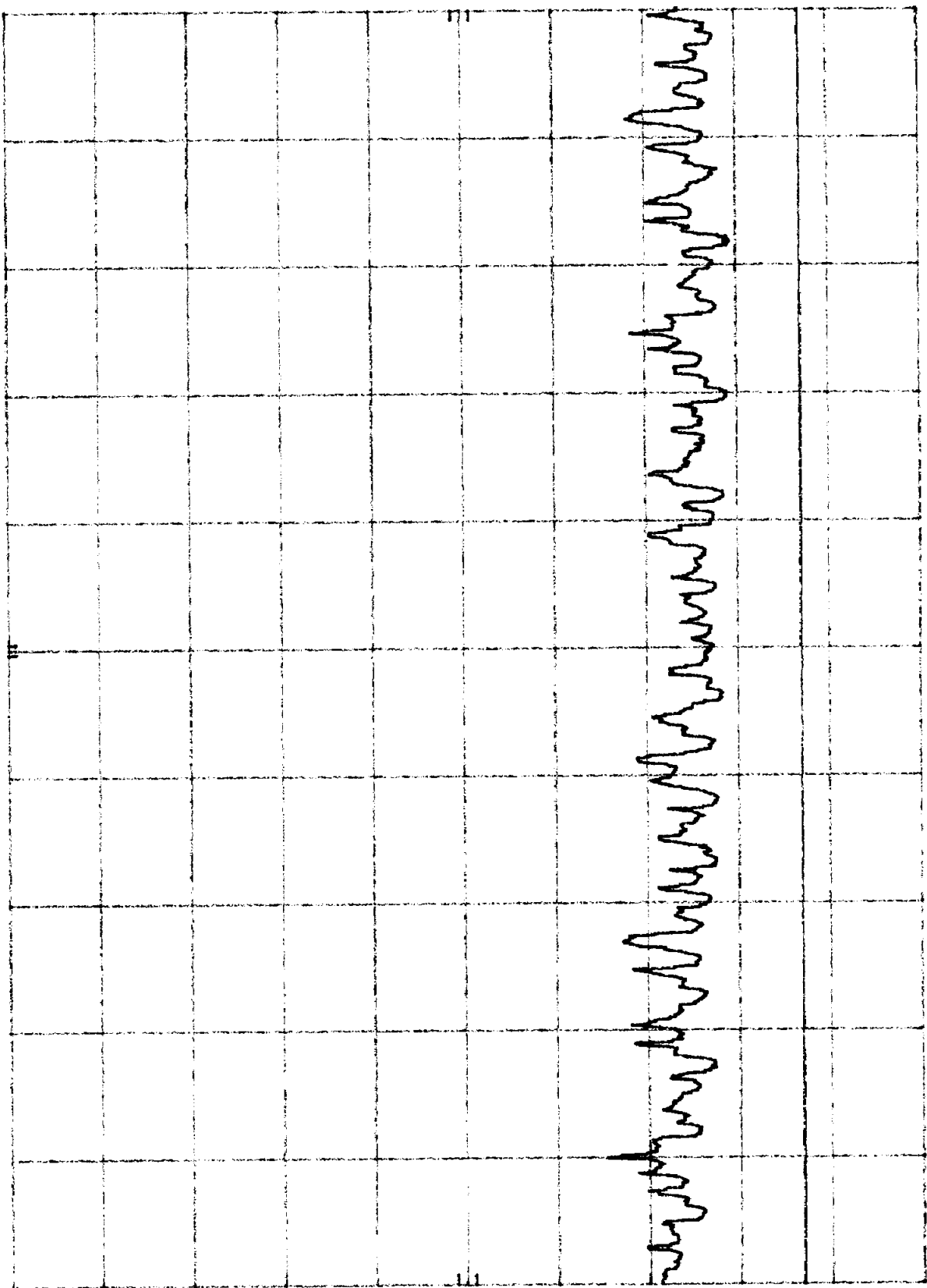
OFFSET 1.0 dB

dB

DL

8.0

dBm



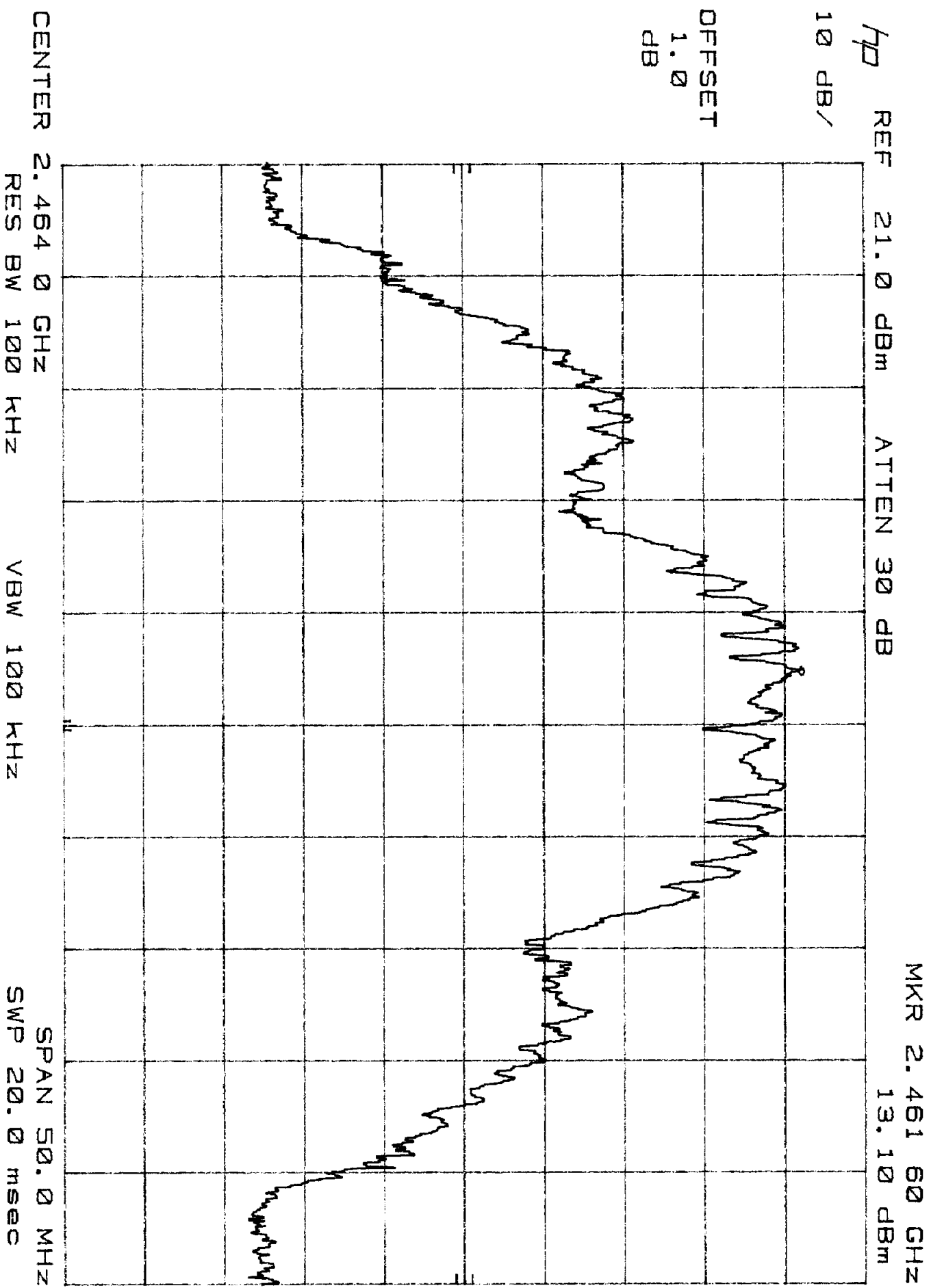
CENTER 2.450 32 GHz

RES BW 3 kHz

VBW 3 kHz

SPAN 1.20 MHz

SWP 400 sec



HP

REF 21.0 dBm

ATTEN 30 dB

MR 2.461 456 GHz
1.80 dBm

10 dB/

OFFSET

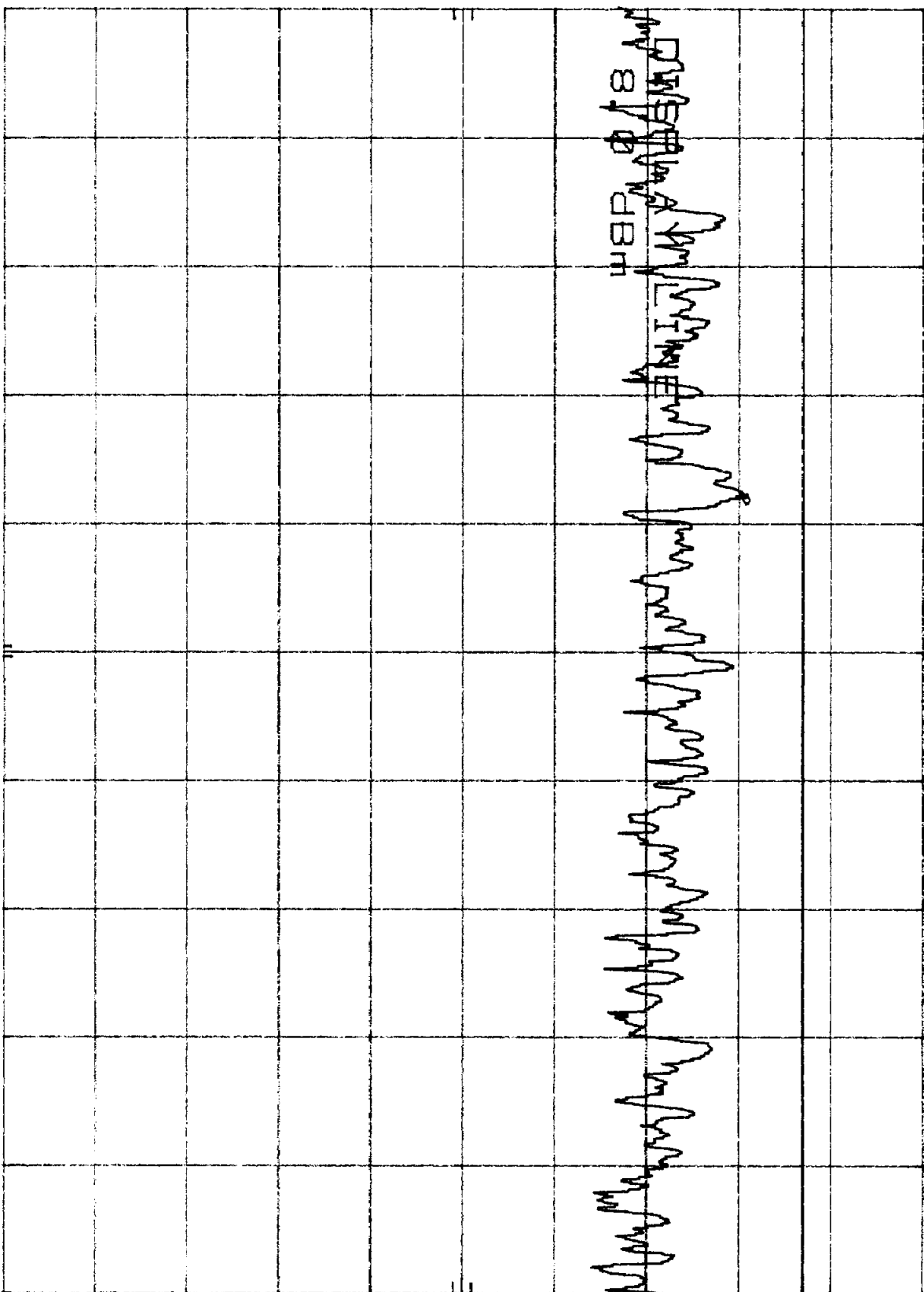
1.0

dB

DL

8.0

dBm



CENTER 2.461 60 GHz

RES BW 3 kHz

VBW 3 kHz

SPAN 1.20 MHz
SWP 400 sec

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(c):

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the following plots for out of band conducted emissions data:

Plot 4a.1 - 4a.8: Low Channel Emissions

Plot 4b.1 - 4b.5: Middle Channel Emissions

Plot 4c.1 - 4c.8: High Channel Emissions

4.5 Out of Band Radiated Emissions (for emissions in 4. above that are less than 26 dB below carrier), FCC Rule 15.247(c):

For out of band emissions that are close to or that exceed the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

- ☒ Not required
☐ See attached data sheet

4.2.1

hp

REF 21.0 dBm

ATTEN 40 dB

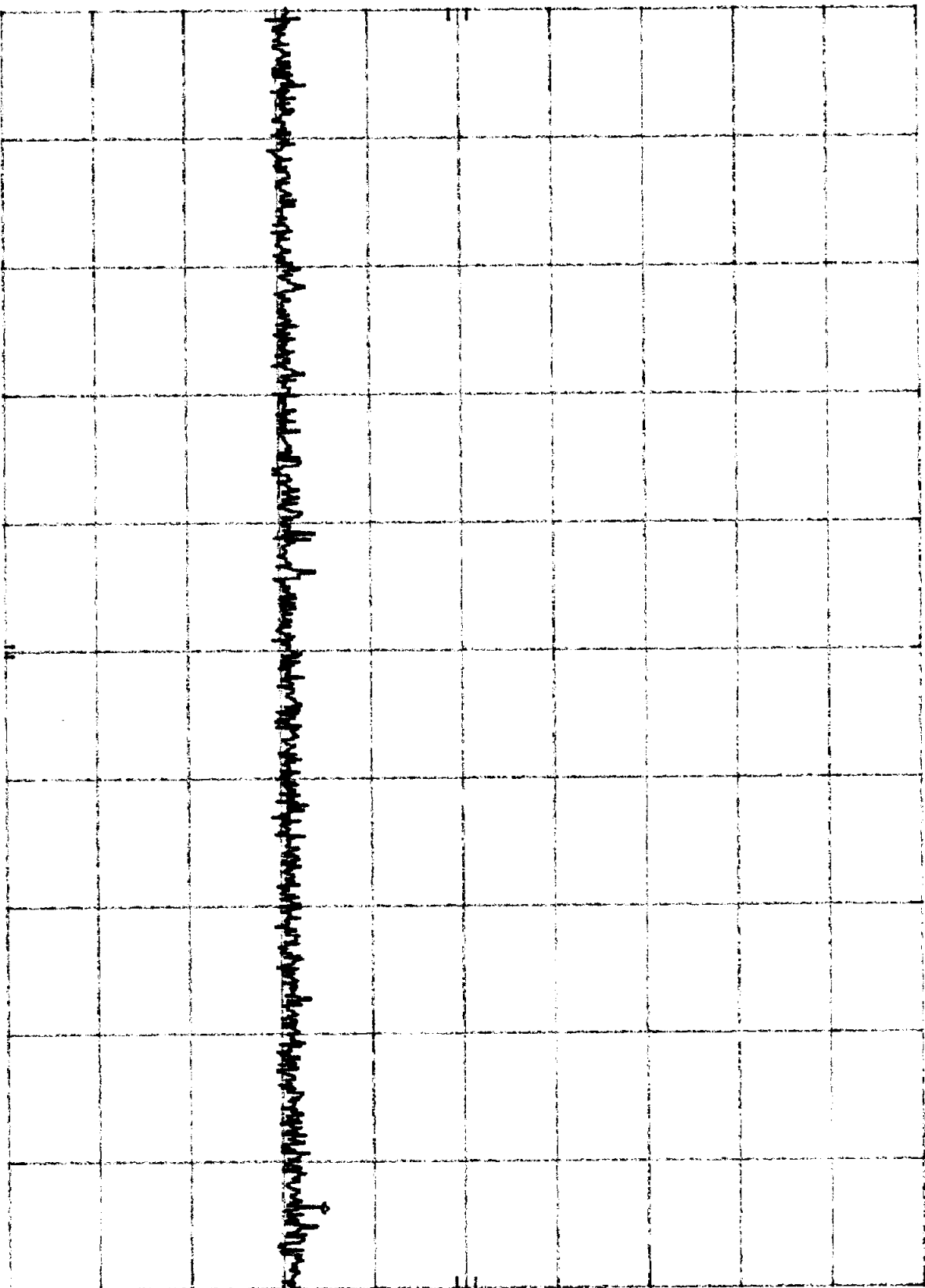
MKR 936 MHz
-44.50 dBm

10 dB/

OFFSET

1.0

dB



START 1 MHz

RES BW 100 KHz

VBW 100 KHz

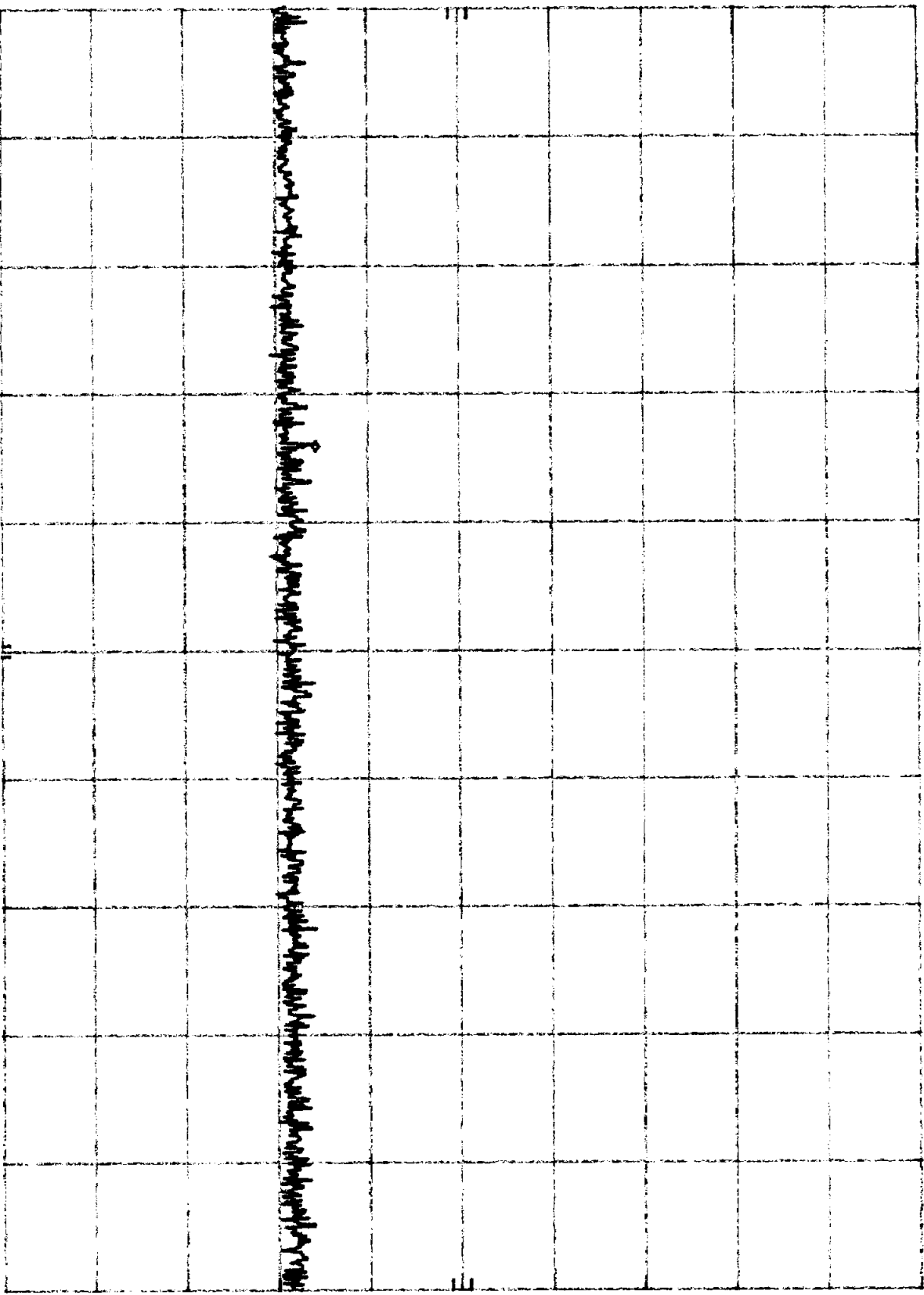
STOP 1.00 GHz
SWP 300 msec

10 dB

OFFSET
1.0
dB

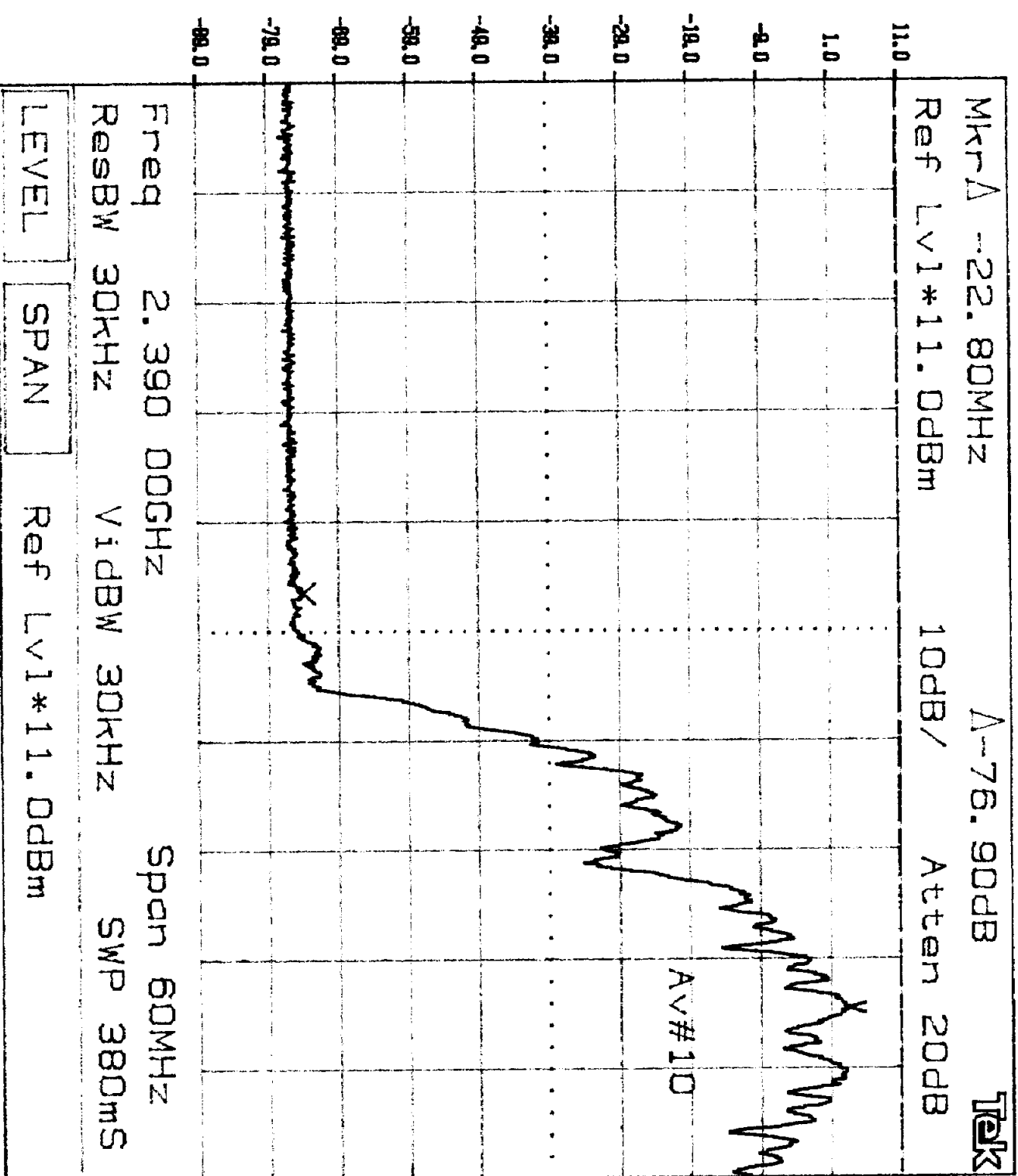
REF 21.0 dBm ATTEN 40 dB

MR 1.442 GHz
-44.70 dBm



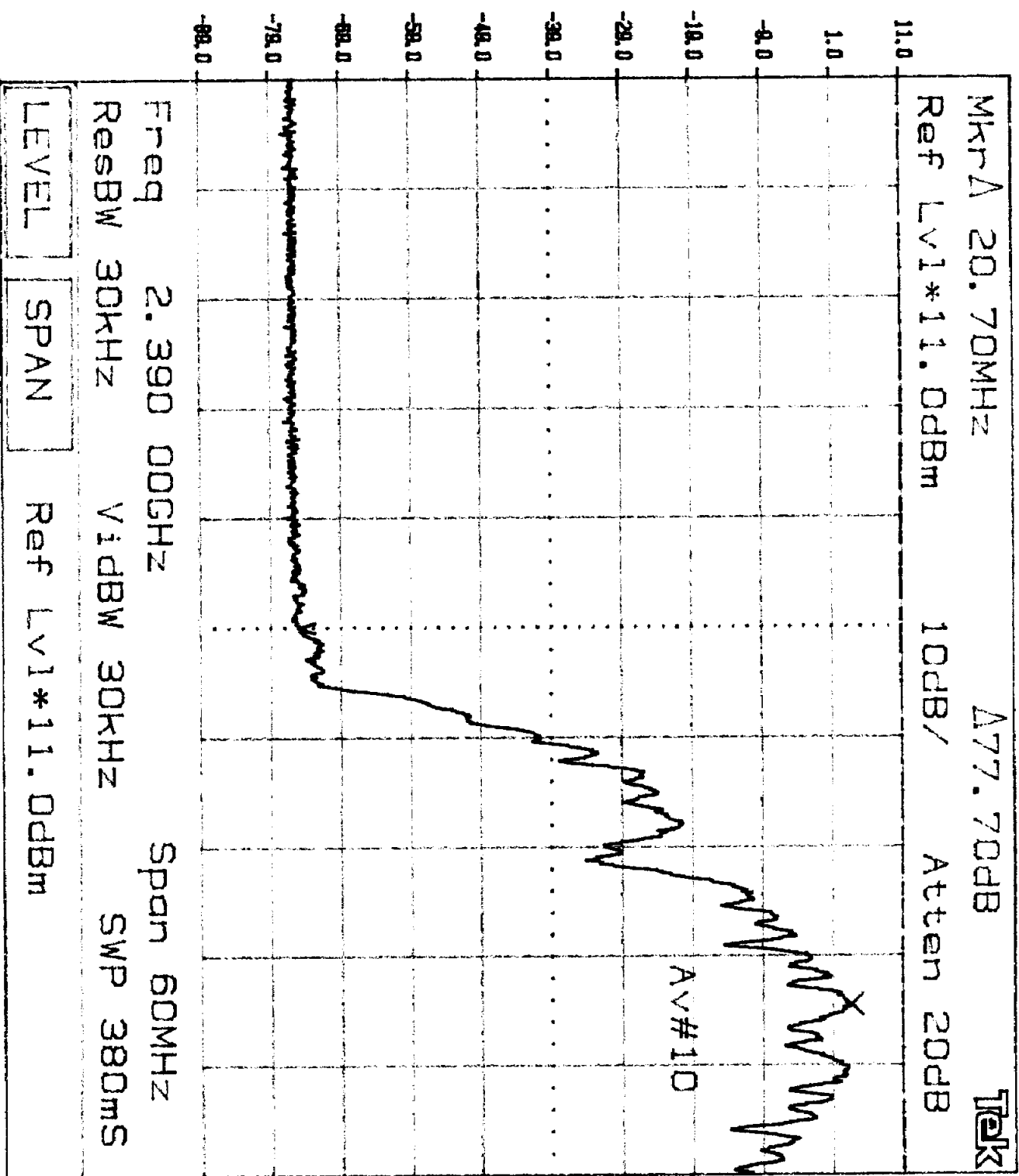
START 1.00 GHz RES BW 100 kHz VBW 100 kHz STOP 2.30 GHz
SWP 390 msec

4.2.2



Knob 2 Knob 1 Keypad Tektronix 2784

4,4,0



KN0B 2 KN0B 1 KEYPAD Tektronix 2784

HP

REF 21.0 dBm

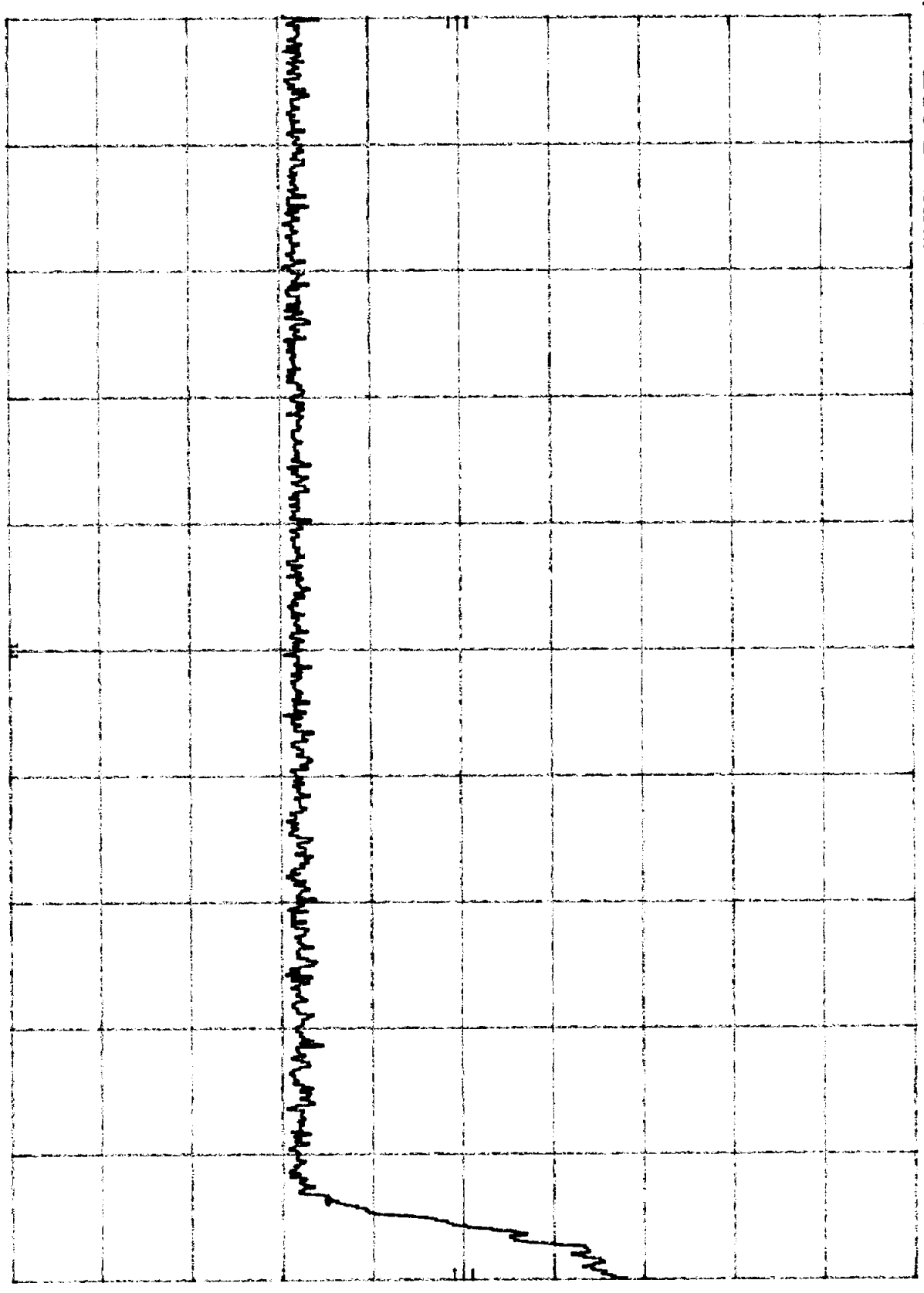
ATTEN 40 dB

MKR 2.393 6 GHz
-44.00 dBm

10 dB/

OFFSET
1.0

dB



START 2.300 GHz

RES BW 100 KHz

VBW 100 KHz

STOP 2.400 GHz

SWP 30.0 msec

4,2,6

HP

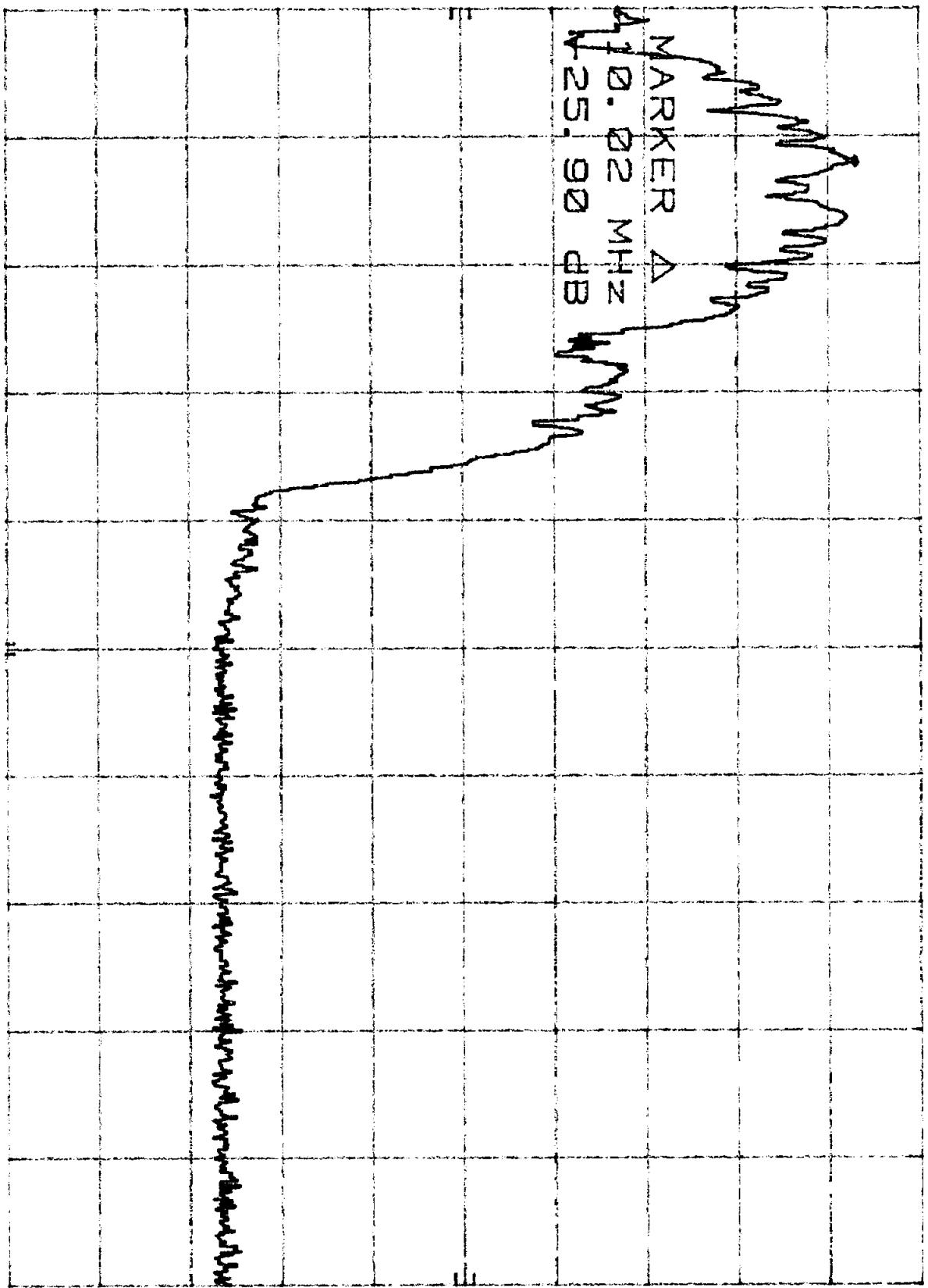
REF 21.0 dBm ATTEN 30 dB

MKR Δ -10.02 MHz
-25.90 dB

10 dB/

OFFSET
1.0

dB



START 2.400 0 GHz RES BW 100 KHz VBW 100 KHz STOP 2.483 5 GHz
SWP 25.1 msec

4, A, 7

HP

REF 21.0 dBm

ATTEN 40 dB

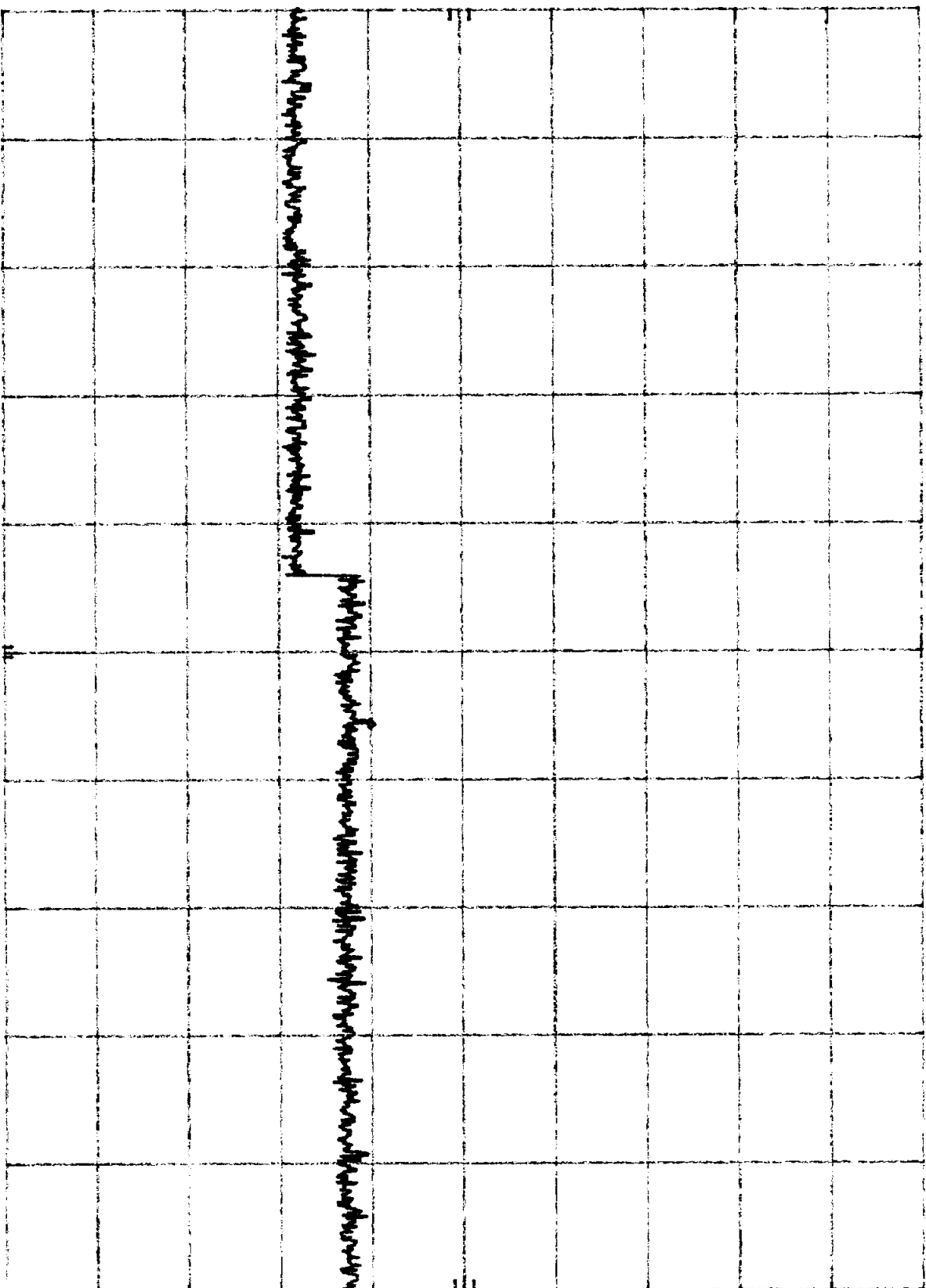
MKR 6.662 GHz
-39.00 dBm

10 dB/

OFFSET

1.0

dB

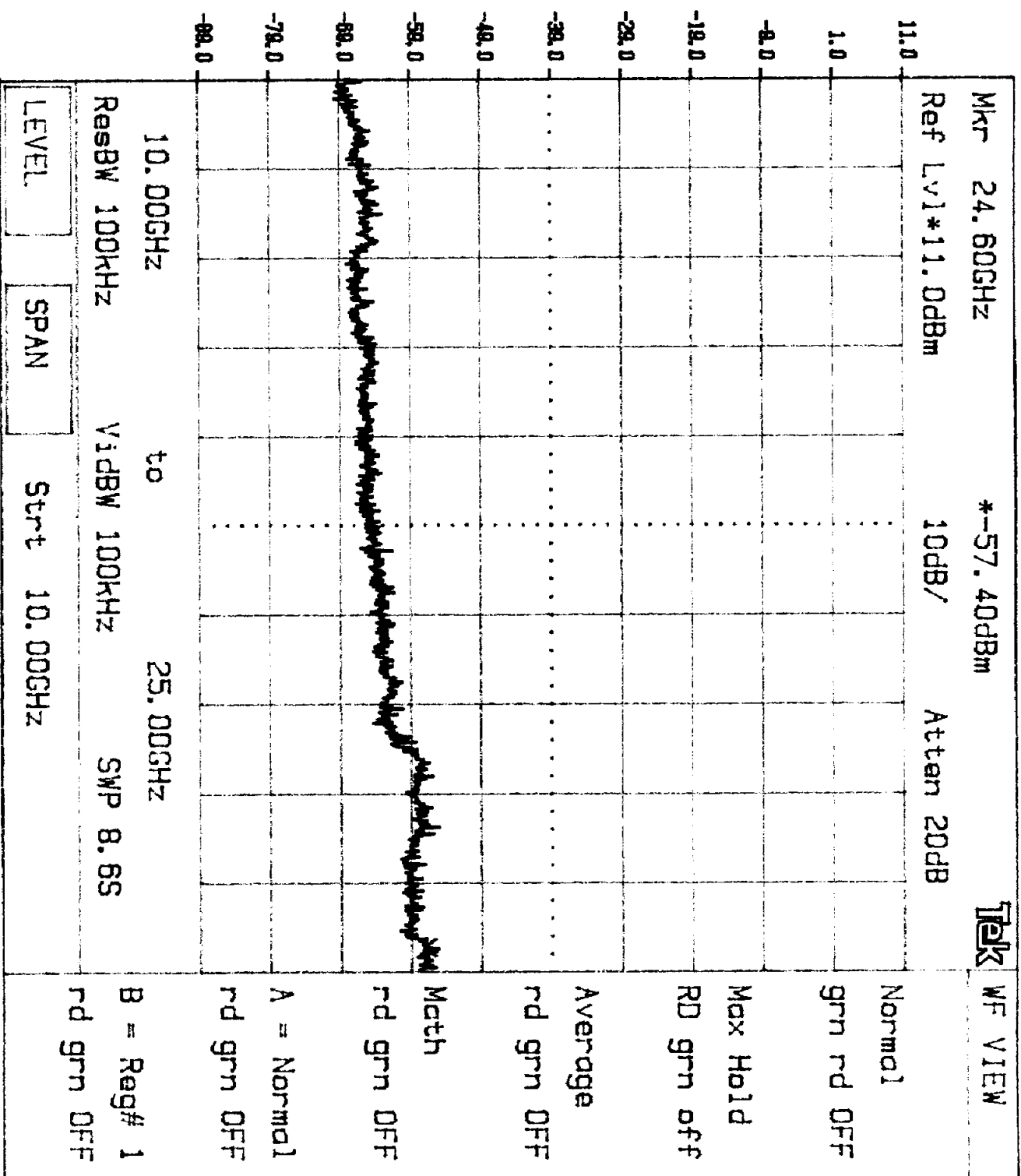


START 2.48 GHz

RES BW 100 KHz

VBW 100 KHz

STOP 10.00 GHz
SWP 2.25 sec

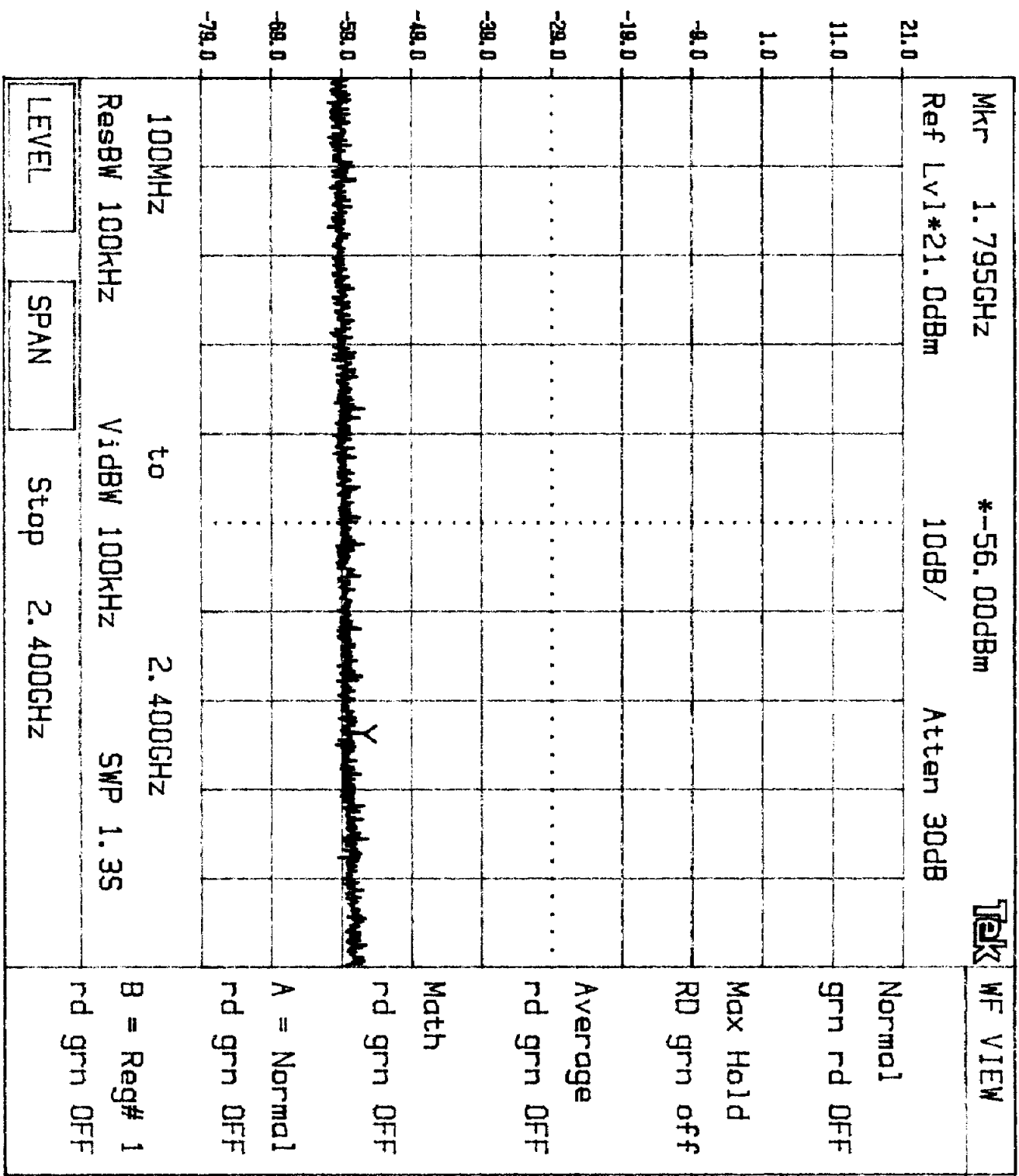


4,6,1

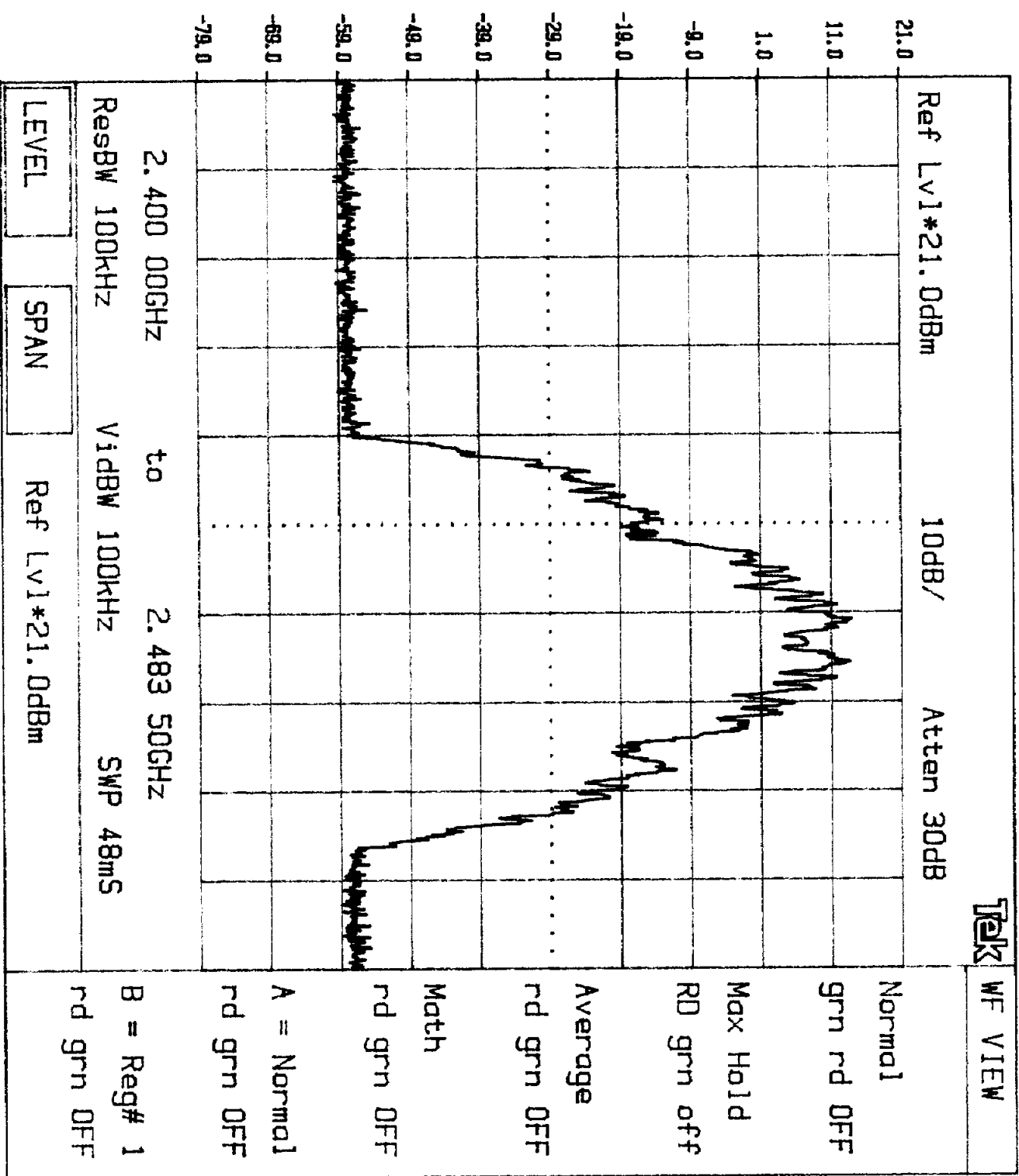
Mkr 42.88MHz		*-55.40dBm		Tek		WF VIEW
Ref Lvl*21.0dBm		10dB/		Atten 30dB		
21.0						Normal
11.0						grn rd OFF
1.0						Max Hold
-9.0						RD grn off
-19.0						
-29.0						Average
-39.0						rd grn OFF
-49.0						Math
-59.0						rd grn OFF
-69.0						A = Normal
-79.0						rd grn OFF
1.00MHz to 100.00MHz						
ResBW 100kHz VidBW 100kHz SWP 56ms						
LEVEL		SPAN		Stop 100.00MHz		

Knob 2 Knob 1 Keypad Tektronix 2784

1, b, c

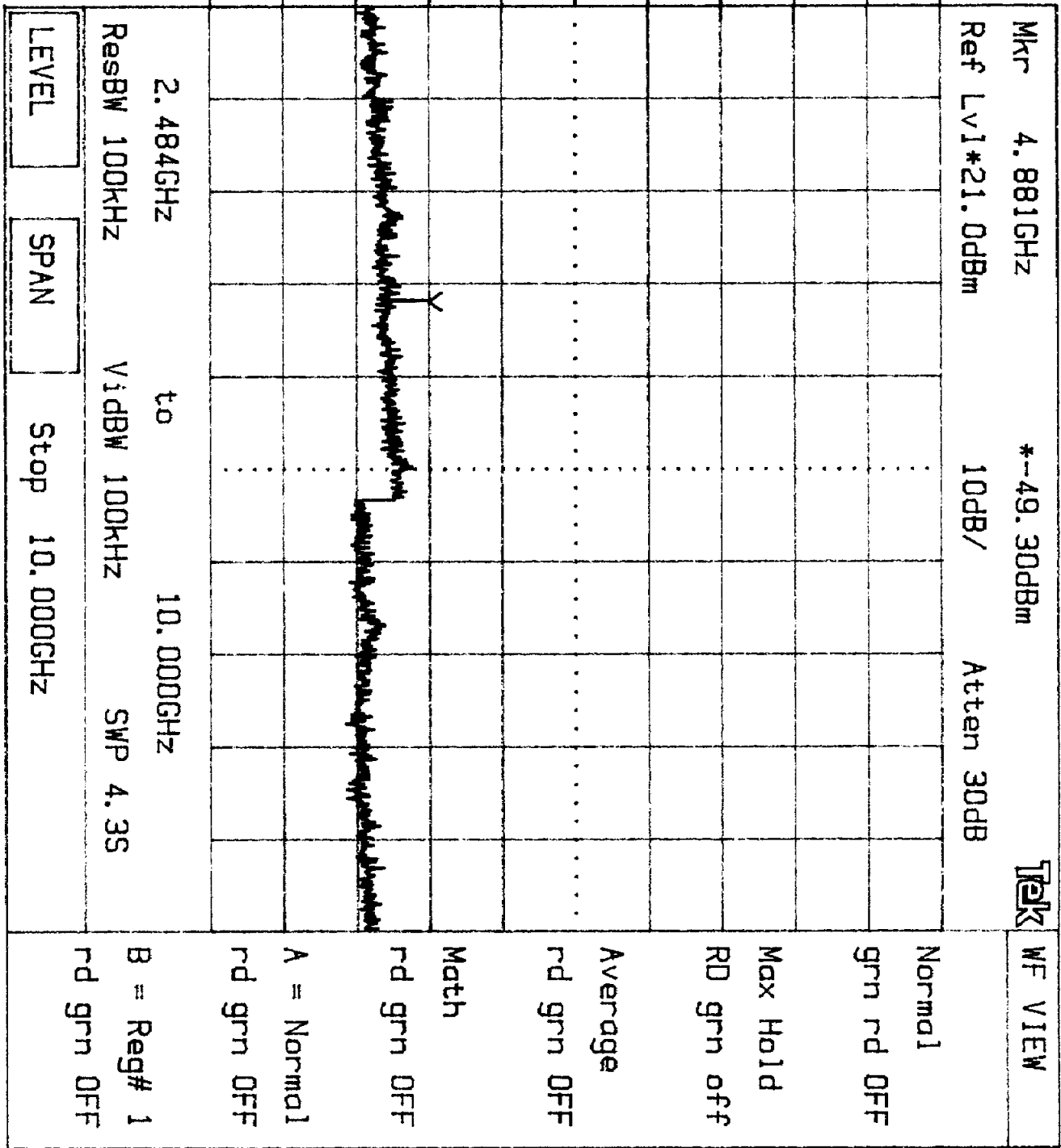


0.6, 2



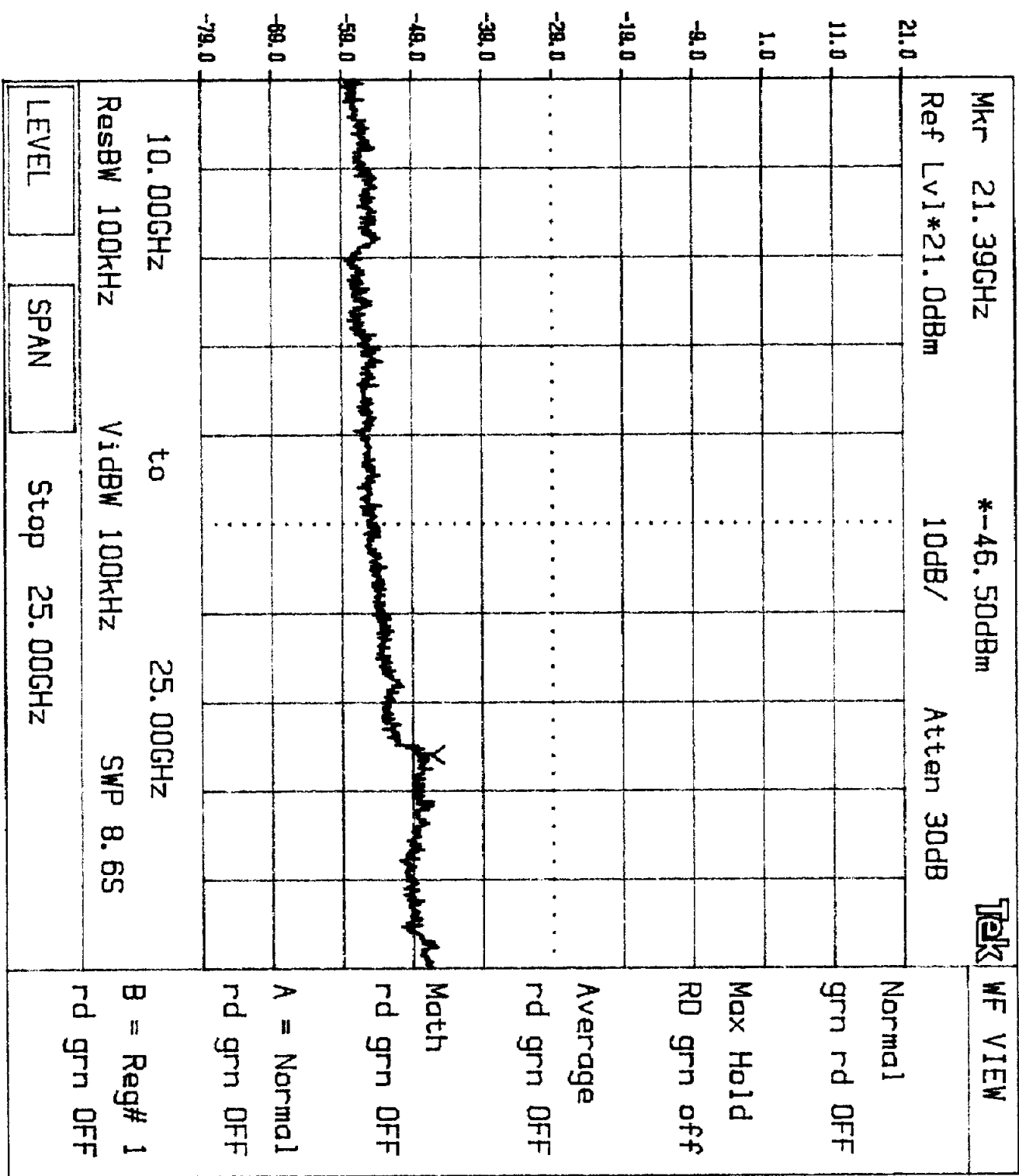
Knob 2 Knob 1 Keypad Tektronix 2784

0.6, 4



KN08 2 KN08 1 KEYPAD Taktronix 2784

4,6,5



4.C.1

HP

REF 21.0 dBm

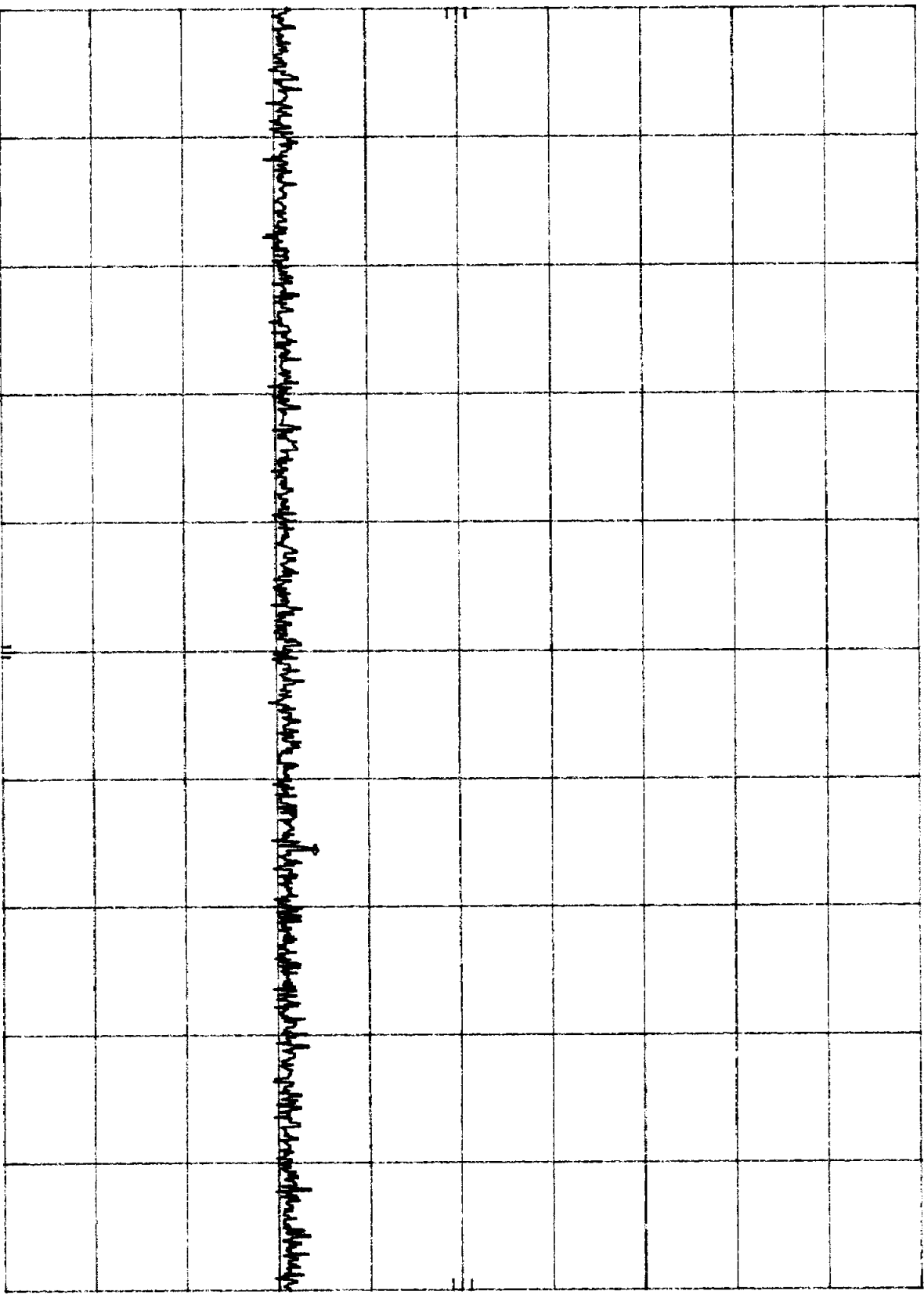
ATTEN 40 dB

MKR 655 MHz
-44.90 dBm

10 dB/

OFFSET
1.0

dB



START 1 MHz

RES BW 100 kHz

VBW 100 kHz

STOP 1.00 GHz
SWP 300 msec

4, C, 2

hp

REF 21.0 dBm ATTEN 40 dB

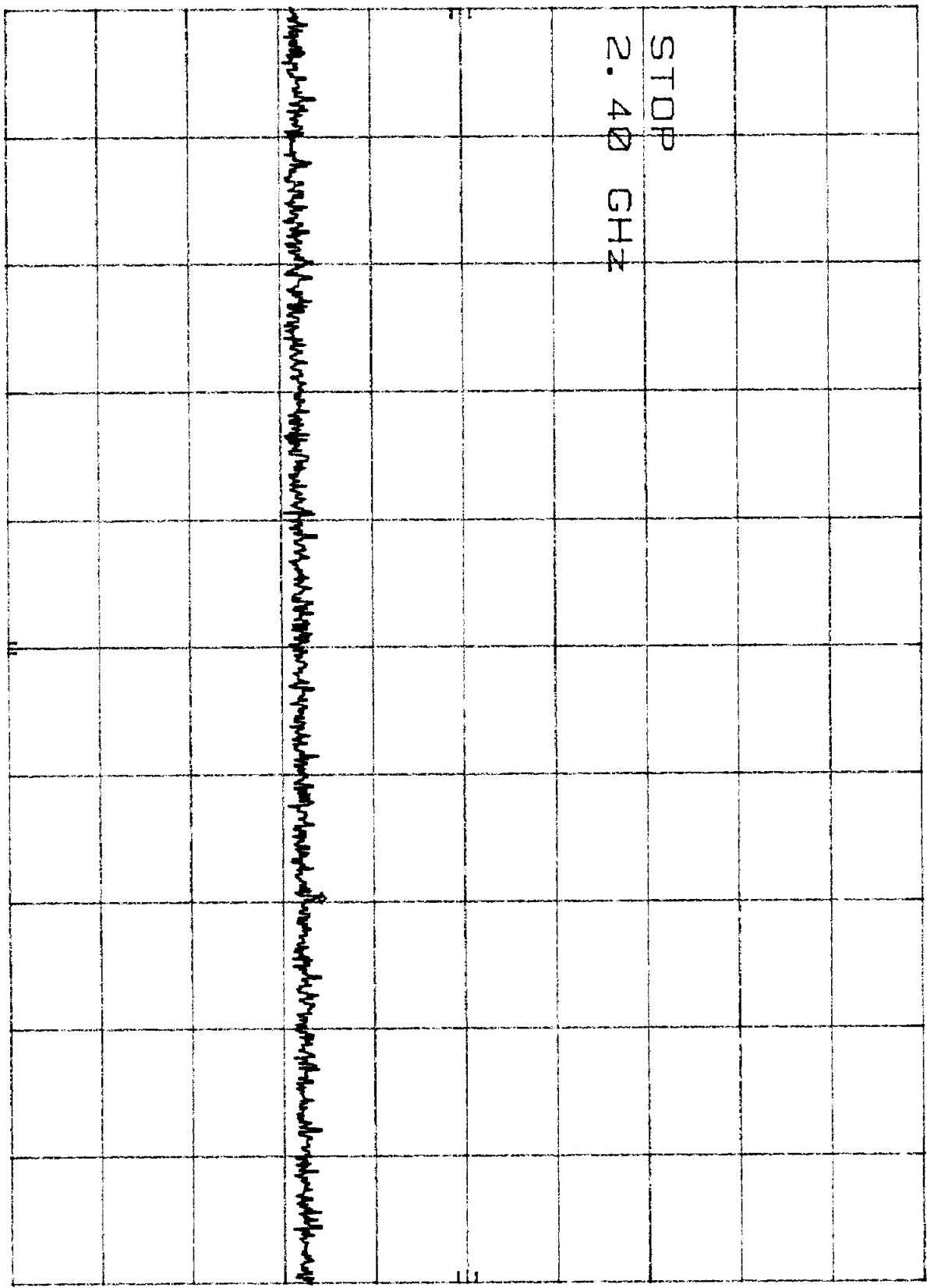
MKR 1.974 GHz
-44.70 dBm

10 dB/

OFFSET
1.0

dB

STOP
2.40 GHz



START 1.00 GHz STOP 2.40 GHz
RES BW 100 kHz VBW 100 kHz SWP 420 msec

4, C, 3

HP

REF 21.0 dBm

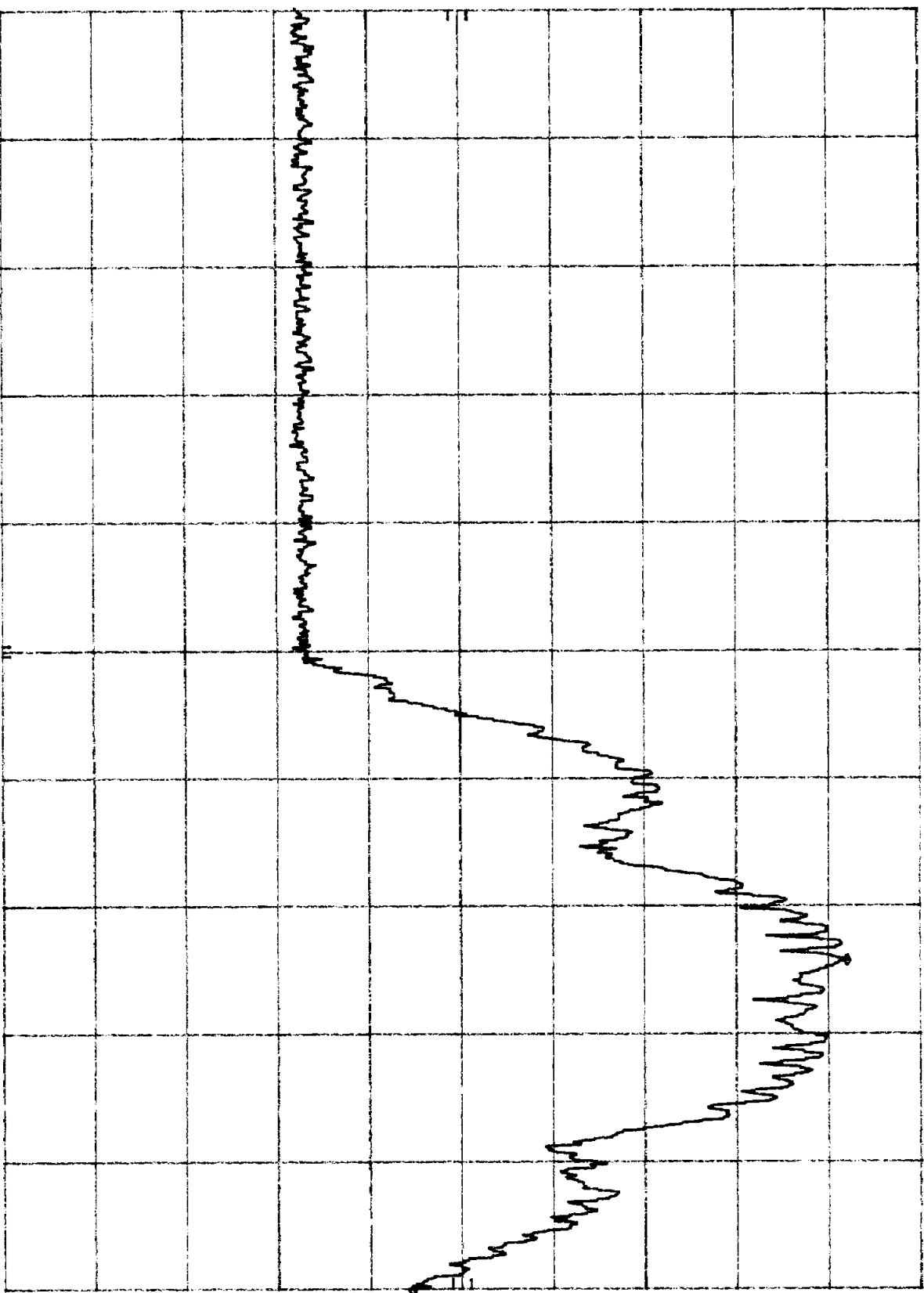
ATTEN 40 dB

MKR Δ 21.54 MHz
-47.50 dB

10 dB/

OFFSET
1.0

dB



START 2.400 0 GHz

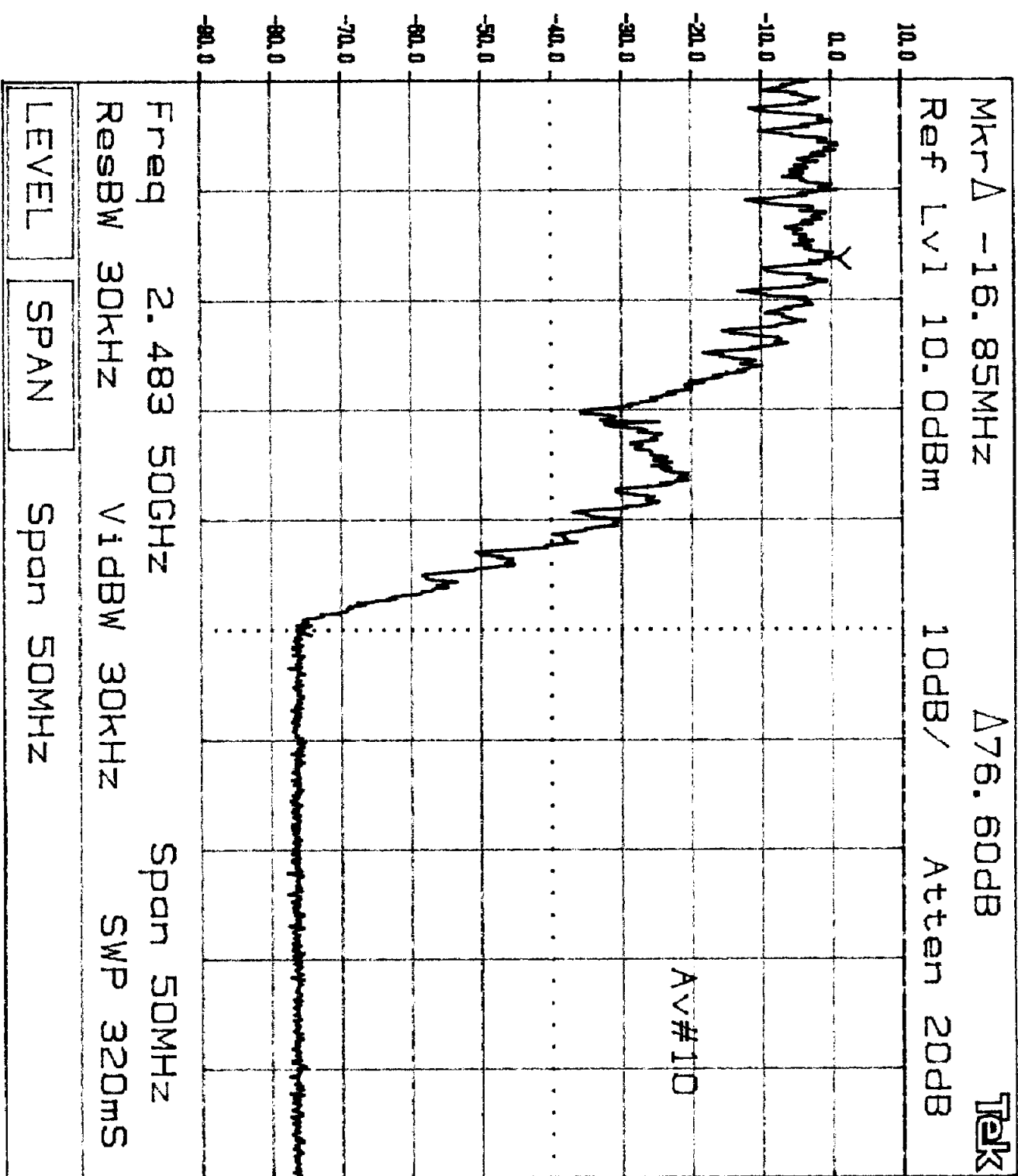
RES BW 100 KHz

VBW 100 KHz

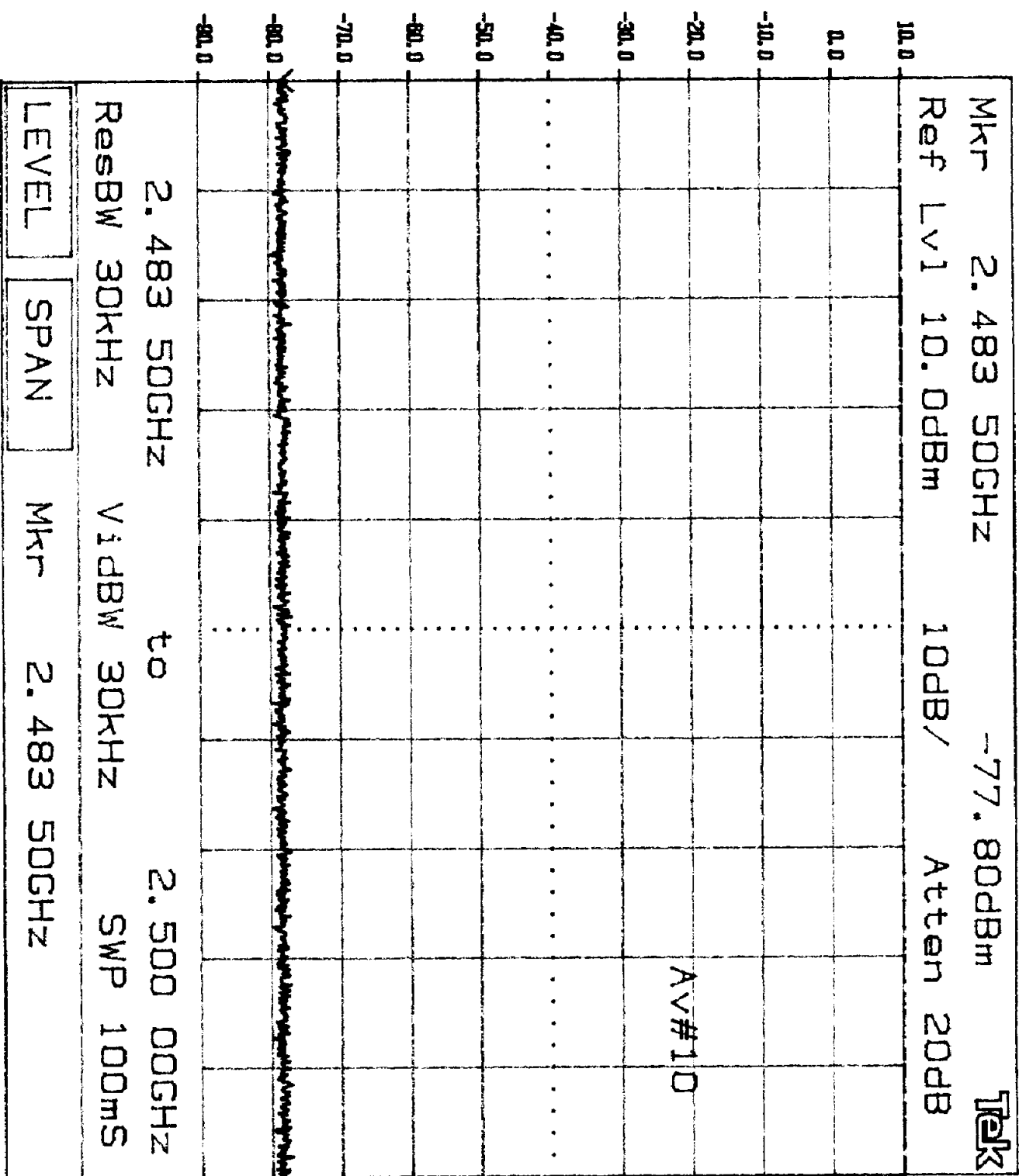
STOP 2.483 5 GHz

SWP 25.1 msec

4, C, 4



4.0.5



Knob 2 Knob 1 Keypad Tektronix 2784

4.C.6

hp

REF 21.0 dBm

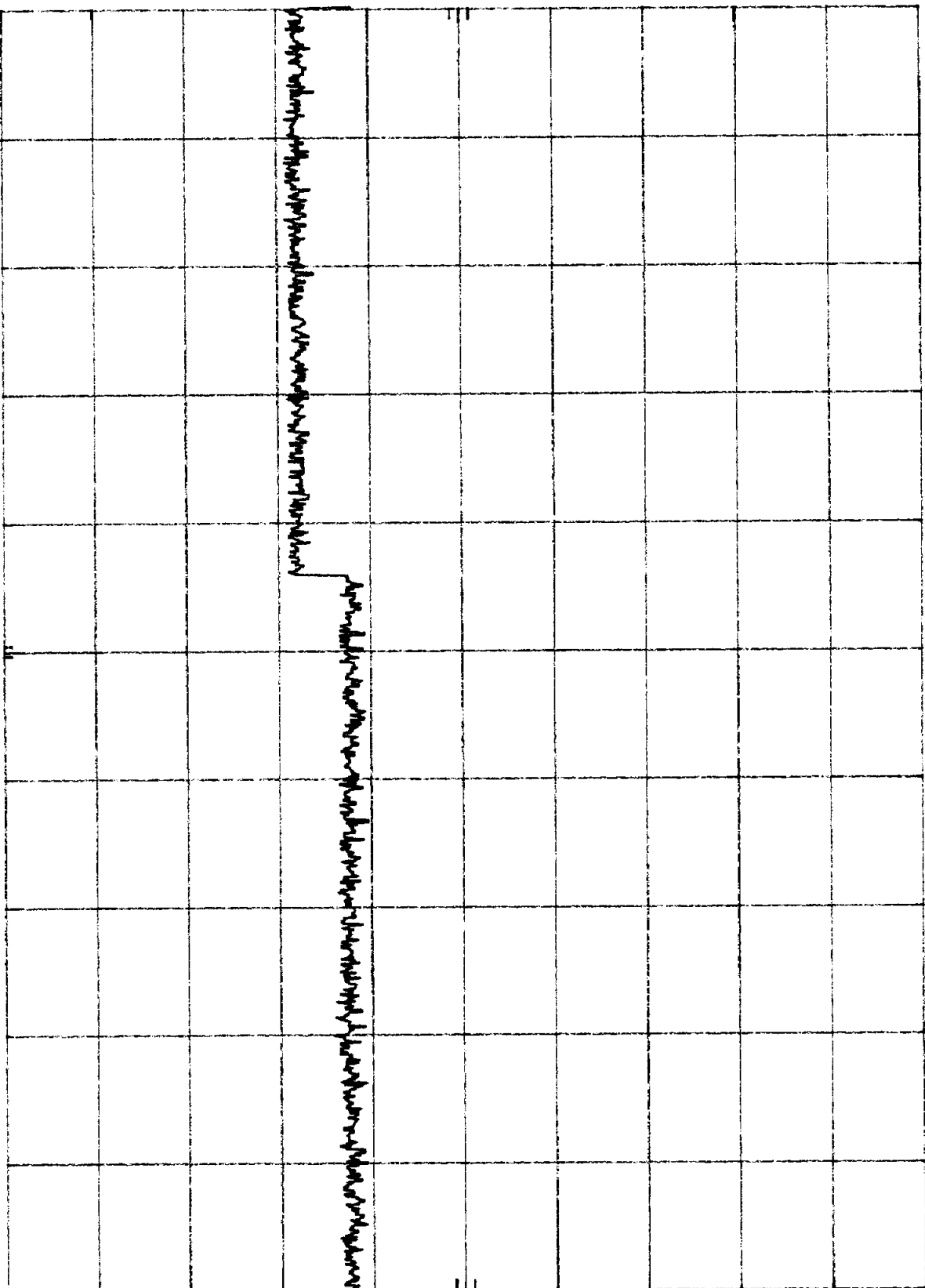
ATTEN 40 dB

10 dB/

OFFSET

1.0

dB



START 2.48 GHz

RES BW 100 KHz

VBW 100 KHz

STOP 10.00 GHz

SWP 2.25 sec

4, C. 7

HP

REF 21.0 dBm

ATTEN 30 dB

MKR 23.73 GHz

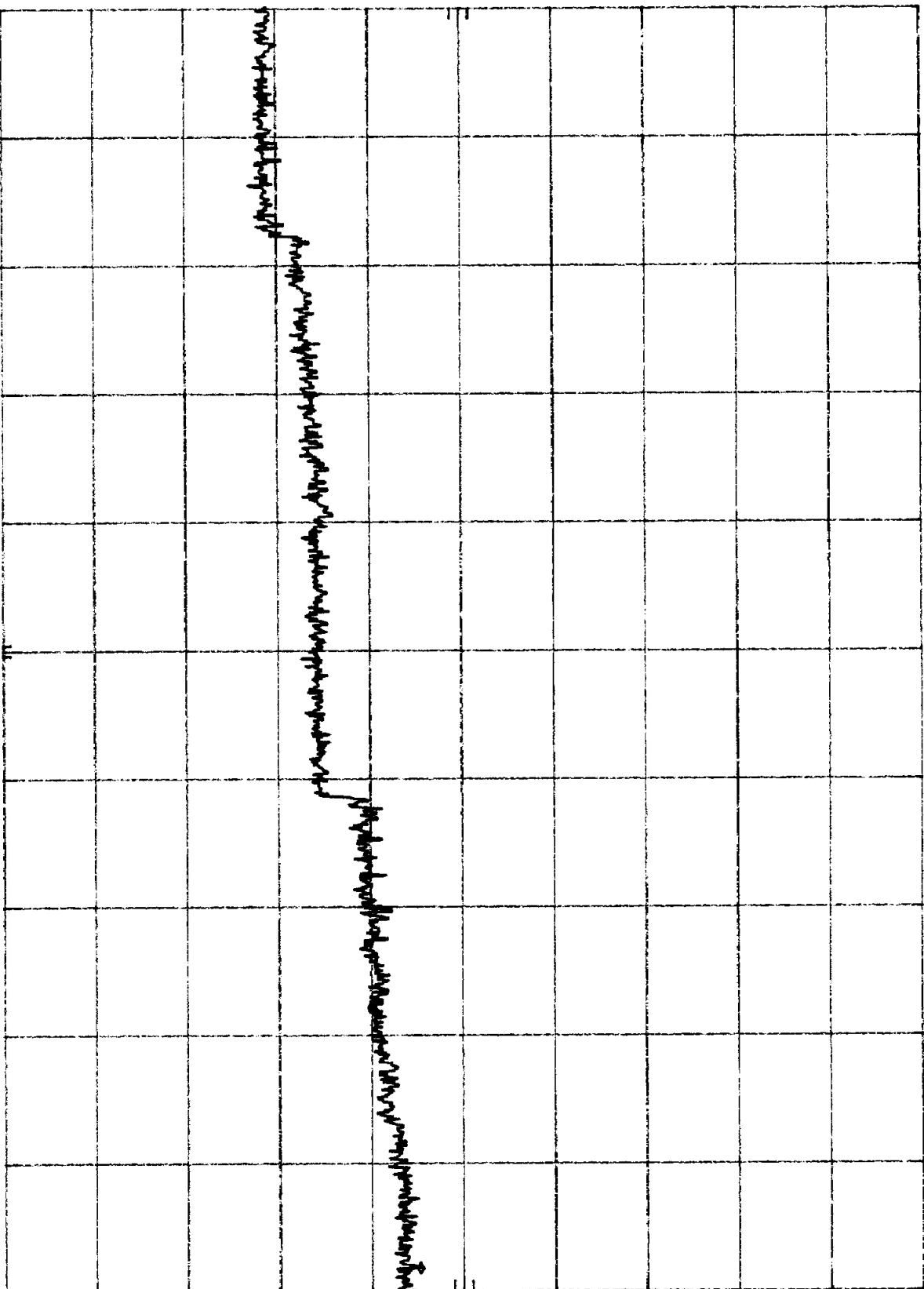
-33.70 dBm

10 dB/

OFFSET

1.0

dB



START 10.0 GHz

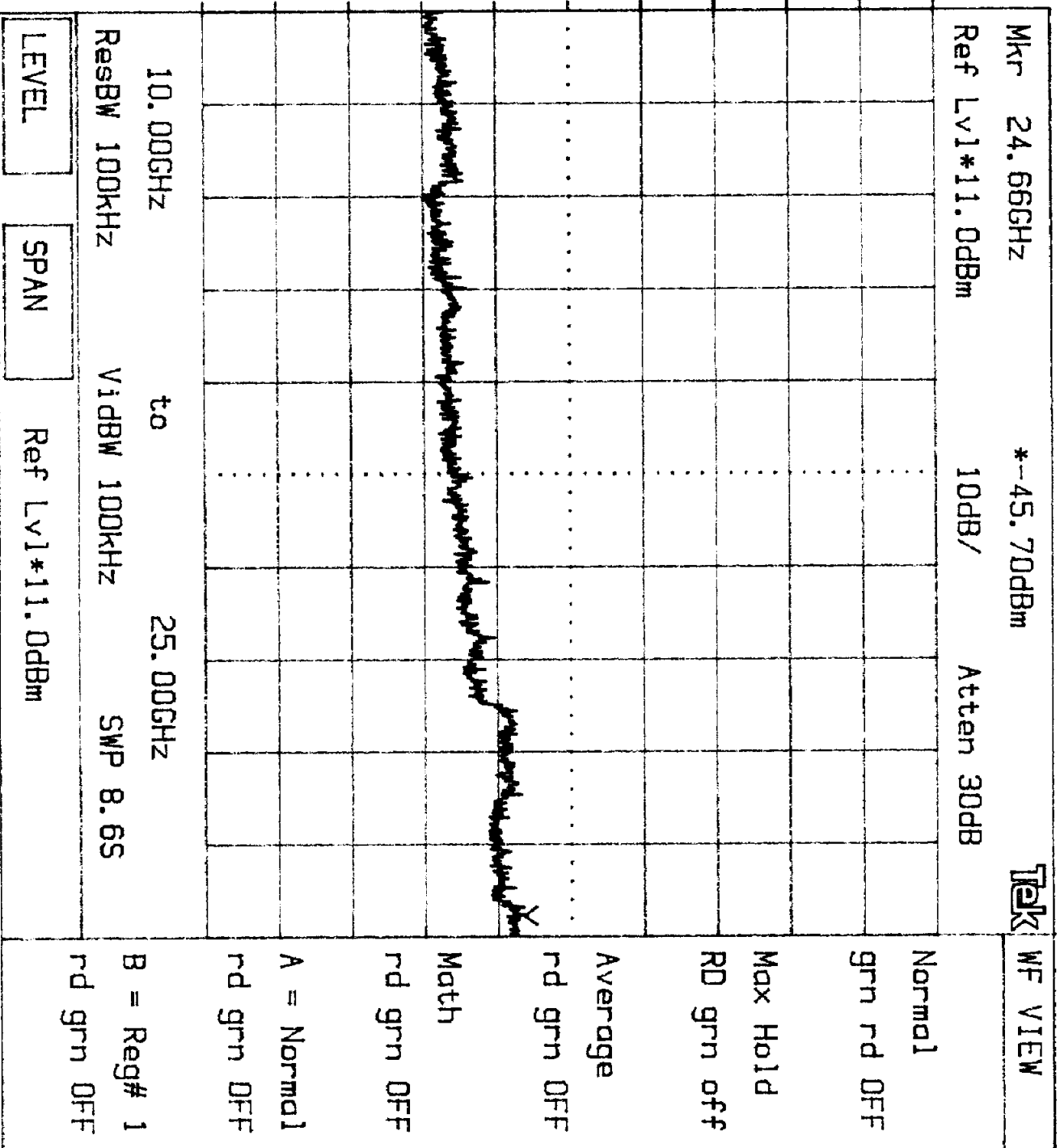
RES BW 100 KHz

VBW 100 KHz

STOP 24.0 GHz

SWP 4.20 sec

4,6,8



KN0B 2

KN0B 1

KEYPAD

Tektronix

2784

Plessey Asia Pacific Pty Ltd., Model No. 90931
FCC ID: OTO90931

Date of Test: November 3, 1999

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Radiated emission measurements were performed from 30 MHz to <25000> MHz. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for >1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection and average detection (above 1 GHz) unless otherwise specified.

On the following pages, the emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter is in full radiated power.

The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz.

The transmitter was setup to transmit at the highest channel. The spectrum analyzer with resolution bandwidth 1 MHz was connected to the antenna terminal of the transmitter. The antenna conducted emissions in the band 2400 - 2483.5 MHz were measured and plotted. The difference (delta) between the levels on fundamental frequency and on the frequency 2483.5 MHz was determined. Then the field strength (E_0 in dBuV/m) of radiated emission at the fundamental frequency at 3m was measured.

The radiated emission $E_1 = E_0 - \text{delta}$

The same procedure was used to measure the radiated emissions at the frequency 2390 MHz and down to 2310 MHz.

For the test results, refer to the attached data sheets and plots.

Radiated Emissions Test Data

Company: Plessey Asia Pacific Pty Ltd.	Model #: 90931	Standard: FCC § 15.247 (R.B.)
EUT: Spread Spectrum Radio	S/N #:	Limits: 11
Project #:	Test Date: November 1, 1999	Test Distance: 3 meters
Test Mode: Tx @ 2412 MHz	Engineer: Xi-Ming Y.	Duty Relaxation: 0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	8	10	8	10	0	12	0	0	0
Model:	EMCO 3143	EMCO 3113	EMCO 3104	CDL P100 0	AFT18656	None	Gm M+L	None	None	None

Frequency	Reading	Detector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(μV/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2412.0	99.9	Peak	8	0	V	29.6	0.0	2.3	0.0	131.8	N/A	N/A
2412.0	97.0	Ave.	8	0	V	29.6	0.0	2.3	0.0	128.9	N/A	N/A
2390.0										54.9*	74.0	-19.1
2390.0										52.0*	54.0	-3.0
4832.9	45.0	Peak	8	8	V	33.5	28.1	3.2	0.0	53.6	74.0	-20.4
4824.0	39.7	Ave.	8	8	H	34.0	28.1	3.2	0.0	48.8	54.0	-5.2
7235.7	35.0	Peak	8	8	V	38.0	28.0	4.3	0.0	49.3	74.0	-24.7
7235.7	26.0	Ave.	8	8	V	38.0	28.0	4.3	0.0	40.3	54.0	-13.7
1.21E+4	41.8	Peak	8	10	V	42.5	39.1	5.9	0.0	51.1	74.0	-23.0
1.21E+4	32.2	Ave.	8	10	V	42.5	39.1	5.9	0.0	41.5	54.0	-12.5
1.45E+4	41.8	Peak	8	10	V	41.5	37.8	6.5	0.0	52.0	74.0	-22.0
1.45E+4	32.2	Ave.	8	10	V	41.5	37.8	6.5	0.0	42.4	54.0	-11.6
1.93E+4	41.0	Peak	21	13	V	40.2	23.3	7.7	-9.5	56.1	74.0	-17.9
1.93E+4	31.0	Ave.	21	13	V	40.2	23.3	7.7	-9.5	46.1	54.0	-7.9
2.17E+4	43.0	Peak	21	13	V	40.3	23.3	7.9	-9.5	58.4	74.0	-15.6
2.17E+4	33.0	Ave.	21	13	V	40.3	23.3	7.9	-9.5	48.4	54.0	-5.6

Notes:

- D.C.F.: Distance Correction Factor
- Insert. Loss (dB) = Cable A + Cable B + Cable C.
- Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
- Negative signs (-) in Margin column signify levels below the limits.
- All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.
- Readings with * is calculated from fundamental minus 76.9dB (plot 4.a.3)

Radiated Emissions Test Data

Company: Plessey	Model #: 90931	Standard: FCC 47 CFR 15.247 (R.B.)
EUT:	S/N #:	Limits: 11
Project #:	Test Date: November 3, 1999	Test Distance: 3 meters
Test Mode: Tx @ 2464 MHz	Engineer: Xi-Ming Y.	Duty Relaxation: 0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	8	10	8	10	0	12	0	0	0
Model:	EMCO 3143	EMCO 3115	EMCO 3104	CDL P100 D	AFT18558	None	Gm M+L	None	None	None

Frequency	Reading	Detector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/C	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2464.00E+0	99.6	Peak	8	0	V	29.6	0.0	2.3	0.0	131.5	N/A	N/A
2464.00E+0	96.8	Ave.	8	0	V	29.6	0.0	2.3	0.0	128.7	N/A	N/A
2483.50E+0										54.9	74.0	-19.1
2483.50E+0										52.1	54.0	-1.9
4928.15E+0	46.0	Peak	8	8	V	33.5	28.1	3.2	0.0	54.6	74.0	-19.4
4928.15E+0	43.0	Ave.	8	8	V	33.5	28.1	3.2	0.0	51.6	54.0	-2.4
7393.15E+0	40.0	Peak	8	11	V	38.0	36.4	4.3	0.0	45.9	74.0	-28.1
7393.15E+0	31.0	Ave.	8	11	V	38.0	36.4	4.3	0.0	36.9	54.0	-17.1
1.23E+4	42.2	Peak	8	10	V	42.5	39.1	5.9	0.0	51.5	74.0	-22.6
1.23E+4	32.0	Ave.	8	10	V	42.5	39.1	5.9	0.0	41.3	54.0	-12.8
1.97E+4	41.0	Peak	21	13	V	40.3	23.3	7.7	-9.5	56.2	74.0	-17.8
1.97E+4	31.0	Ave.	21	13	V	40.3	23.3	7.7	-9.5	46.2	54.0	-7.8
2.22E+4	43.0	Peak	21	13	V	40.3	23.3	7.9	-9.5	58.4	74.0	-15.6
2.22E+4	33.0	Ave.	21	13	V	40.3	23.3	7.9	-9.5	48.4	54.0	-5.6

Notes:	a) D.C.F.: Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C.
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.
	f) Readings with * is calculated from fundamental minus 76.6dB (plot 4.c.4)

Radiated Emissions

Test Data

Company: Plessey	Model #: 90931	Standard:	FCC § 15.247 (R.B.)
EUT:	S/N #:	Limits:	11
Project #: J99028006	Test Date: November 4, 1999	Test Distance:	3 meters
Test Mode: Tx @ 2452MHz	Engineer: Xi-Ming Y.	Duty Relaxation:	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	8	10	8	10	0	12	0	0	0
Model:	EMCO 3143	EMCO 3115	EMCO 3104	CDL P100 0	APT15858	None	Gm_M+L	None	None	None

[illegible]

Notes

- a) D.C.F.: Distance Correction Factor
b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
d) Negative signs (-) in Margin column signify levels below the limits.
e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

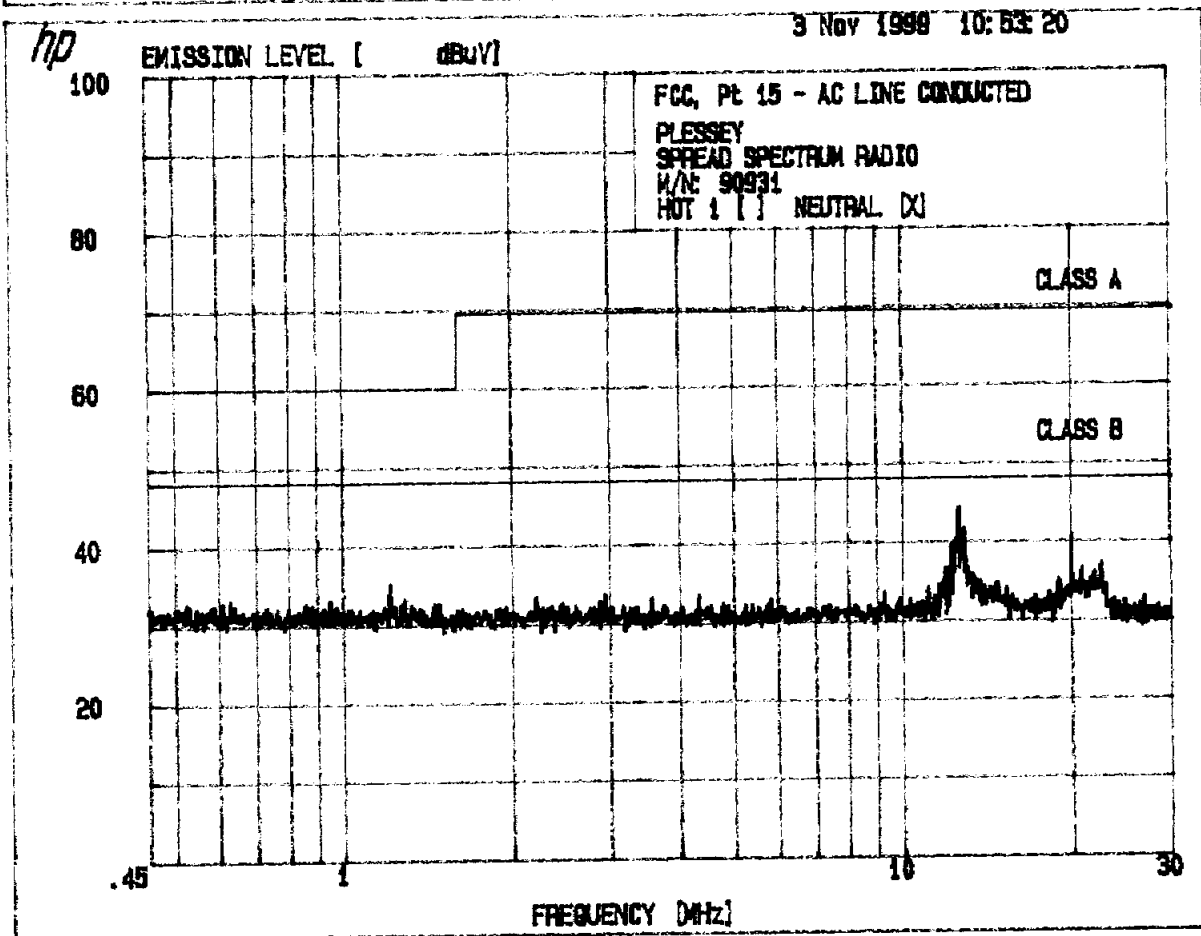
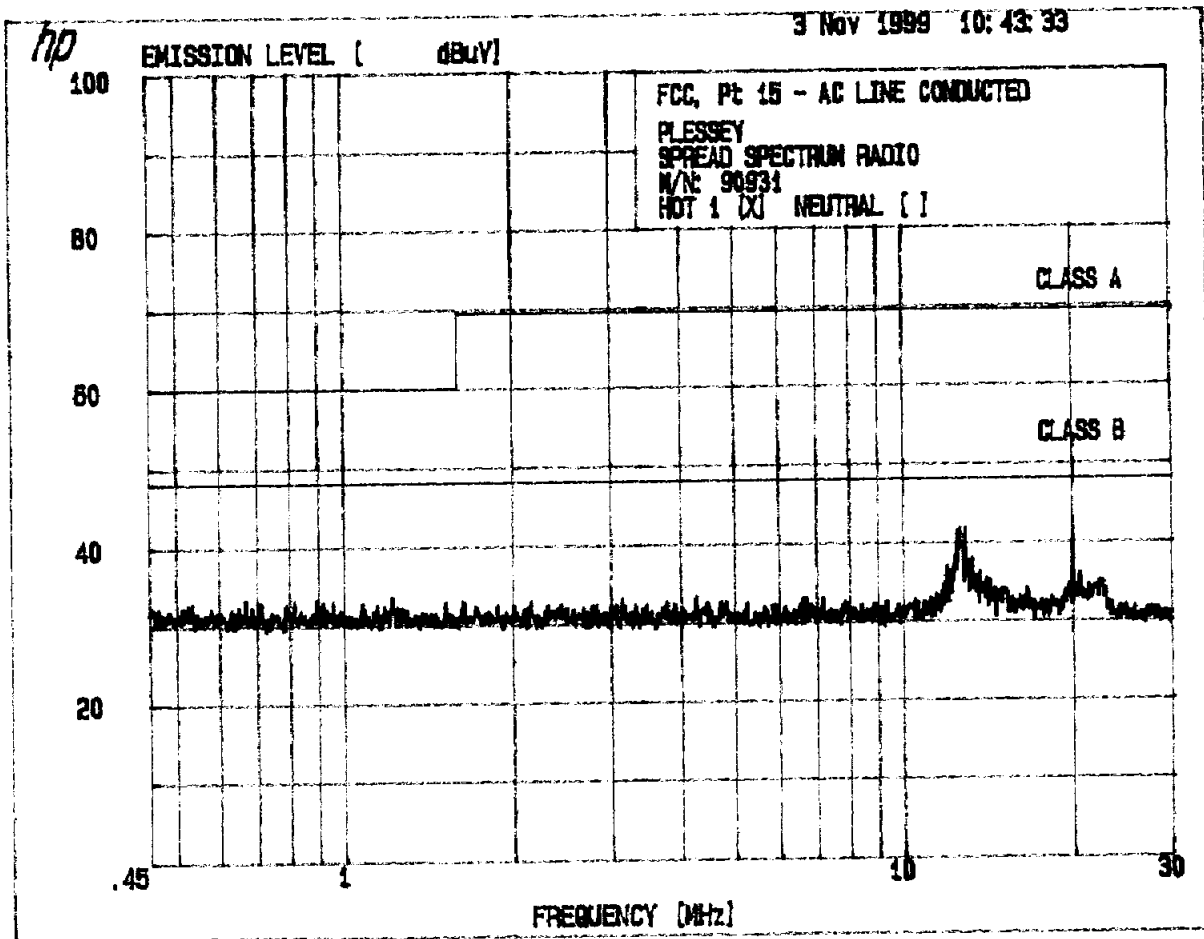
Plessey Asia Pacific Pty Ltd., Model No. 90931
FCC ID: OTO90931

Date of Test: November 3, 1999

4.7 AC Line Conducted Emission, FCC Rule 15.207:

☐ Not required; battery operation only

☒ Test data attached



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3 Nov 1999 10:53:20

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3. FCC CFR 47, Pt 15

3.1 FCC, Pt 15 -- AC LINE CONDUCTED

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PLEESSEY

SPREAD SPECTRUM RADIO

M/N: 50931

HOT () () NEUTRAL (x)

PEAKS FOUND ABOVE 40 dBuV

PEAK#	FREQ (MHz)	AMPL (dBuV)
1	12.64	41.3
2	12.91	41.6
3	20.05	40.8

Plessey Asia Pacific Pty Ltd., Model No. 90931
FCC ID: OTO90931

Date of Test: November 3, 1999

4.10 Radiated Emissions from Digital Section of Transceiver (Transmitter), FCC Ref: 15.109

- ☐ Not required - No digital part
- ☒ Test results are attached
- ☐ Included in the separate DOC report.

4.11 Radiated Emissions from Receiver Section of Transceiver (L.O. Radiation), FCC Ref: 15.109, 15.111

- ☒ Not required - EUT operation above 960 MHz only
- ☐ Not required - EUT is transmitter only
- ☐ Not performed; exempt until June 1999
- ☐ Test results are attached

Radiated Emissions Test Data

Company: Plessey	Model #: 90931	Standard	FCC § 15B
EUT:	S/N #:	Limits	2
Project #: J99028006	Test Date: November 4, 1999	Test Distance	3 meters
Test Mode: DC Power	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

Antenna Used	Pre-Amp Used	Cable Used	Transducer Used
Number: 2 8 21	8 10 13	12 0 0	0
Model: EMCO 3143 EMCO 3115 3160-0 GDI_P100 0 APT18895 ACC/400 Gm_M1L None None None			

Frequency	Reading	Detector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
40.10E+0	20.8	Peak	2	0	V	7.1	0.0	0.4	0.0	28.3	40.0	-11.7
110.00E+0	24.0	Peak	2	0	V	7.0	0.0	0.7	0.0	31.7	43.5	-11.8
120.40E+0	28.9	QP	2	0	V	6.9	0.0	0.7	0.0	36.5	43.5	-7.0
160.56E+0	27.3	Peak	2	0	V	9.6	0.0	0.8	0.0	37.7	43.5	-5.8
185.00E+0	25.0	Peak	2	0	V	9.3	0.0	0.9	0.0	35.2	43.5	-8.3
200.70E+0	23.1	Peak	2	0	H	11.1	0.0	1.0	0.0	35.2	43.5	-8.3
240.83E+0	26.4	Peak	2	0	V	11.2	0.0	1.0	0.0	38.6	46.0	-7.4
281.00E+0	21.4	Peak	2	0	H	12.6	0.0	1.1	0.0	35.1	46.0	-10.9
321.16E+0	21.0	Peak	2	0	V	14.9	0.0	1.2	0.0	37.1	46.0	-9.0
361.29E+0	19.7	Peak	2	0	H	15.6	0.0	1.3	0.0	36.6	46.0	-9.4
401.42E+0	19.3	Peak	2	0	H	16.4	0.0	1.4	0.0	37.1	46.0	-8.9

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

Radiated Emissions Test Data

Company: Plessey	Model #: 90931	Standard: FCC § 15B
EUT:	S/N #:	Limits: 1
Project #:	Test Date: November 4, 1999	Test Distance: 3 meters
Test Mode: AC	Engineer: Xi-Ming Y.	Duty Relaxation: 0 dB

	Antennas Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	8	10	0	10	11	1	0	0	0
Model:	EMCO 3145	EMCO 3115	EMCO 3104	None	APT10055	ALM100	Site 1	None	None	None

Frequency	Reading	Detector	Ant. Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @10m	Margin	
MHz	dB(μV)	P/A/G	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB	
48.00E+0	19.0	Peak	2	0	V	8.3	0.0	0.4	0.0	27.7	40.0	-12.3
110.00E+0	18.6	Peak	2	0	V	7.0	0.0	0.7	0.0	26.3	43.5	-17.2
120.40E+0	21.5	Peak	2	0	V	6.9	0.0	0.7	0.0	29.1	43.5	-14.4
160.56E+0	22.0	Peak	2	0	V	9.6	0.0	0.8	0.0	32.4	43.5	-11.1
200.70E+0	24.2	Peak	2	0	H	11.1	0.0	1.0	0.0	36.3	43.5	-7.2
240.83E+0	20.0	Peak	2	0	H	11.7	0.0	1.0	0.0	32.7	46.0	-13.3
281.00E+0	18.2	Peak	2	0	V	12.3	0.0	1.1	0.0	31.6	46.0	-14.4
321.16E+0	18.0	Peak	2	0	V	14.9	0.0	1.2	0.0	34.1	46.0	-12.0
361.29E+0	10.5	Peak	2	0	V	15.1	0.0	1.3	0.0	26.9	46.0	-19.1
401.42E+0	19.5	Peak	2	0	H	16.4	0.0	1.4	0.0	37.3	46.0	-8.7

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

Plessey Asia Pacific Pty Ltd., Model No. 90931
FCC ID: OTO90931

Date of Test: November 3, 1999

4.12 Processing Gain Measurements, FCC Rule 15.247(e)

The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned OFF, to the signal to noise ratio with the system spreading code turned ON, as measured at the demodulated output of the receiver. The processing gain shall be at least 10 dB for a direct sequence spread spectrum system.

	Refer to attached test procedure and data sheets.
X	Refer to circuit analysis and processing gain calculations provided by manufacturer.

4.13 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Duty cycle = Maximum ON time in 100 msec/100

Duty cycle correction, dB = $20 * \log(\text{DC})$

X	Not applicable
	See attached spectrum analyzer chart(s) for transmitter timing
	See transmitter timing diagram provided by manufacturer