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1 GENERAL INFORMATION

1.1 Product Description

EUT Name: GSM Modem, Model: WMO2-G1900 S/N:WM06139

1.0 EUT Description: This is a GSM Modem. A finished product capable to establish a connection to a GSM 1900 Network. This equipment is driven through a serial link by a Set of Standardized At Commands. Its software is composed of the nominal GSM software, and a AT interpreter. It gathers the Wavecom generic GSM transceiver, a SIM Slot, Antenna Connector, and a DB15 connector for serial and audio link.

1.2 Operating modes:

Transmit

1.3 EUT I/O Ports and Cables:

1.3.1 I/O Cables

CONNECTION:	Serial Interface
SHIELD:	No
CONNECTORS:	SUB-HD
TERMINATION TYPE:	DB9
LENGTH:	3 Feet
REMOVABLE:	Yes

CONNECTION:	Power Supply
SHIELD:	No
CONNECTORS:	Micro-fit
TERMINATION TYPE:	2 "Open Wires"
LENGTH:	3 feet
REMOVABLE:	Yes

CONNECTION:	Antenna
SHIELD:	No
CONNECTORS:	SMA
TERMINATION TYPE:	Antenna
LENGTH:	10 feet
REMOVABLE:	Yes

1.3.2 Power Cords

UNIT:	--
MANUFACTURER:	Wavecom
SHIELDED:	No
LENGTH:	3 feet

1.3.3 Power requirements:

6-32 VDC 100m Amps

1.4 Oscillator Frequencies

Frequency	EUT Location	Description of use
13 Mhz	Wismo Module	To synchronize to GSM frequencies

1.5 Power Supply

Description	Manufacturer	Model #	Serial #	Switching frequency or linear
N/A				

1.6 Interfacing and/or Simulators Peripheral Equipment

DESCRIPTION:	PC Computer
DESCRIPTION:	GSM NETwork Simulator
MANUFACTURER:	Rohde&Schwartz
MODEL NUMBER:	CMD-55

Report No. 9220-08 (FCC ID: 0N8WMO2-G1900)

1 GENERAL INFORMATION (continued)

1.2 Related Submittal/Grant

None

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the ANSI C63.4 setup.

Test Performed:

- X 1. Conducted Emissions, FCC Part 2, Paragraphs 2.1046, 2.1049, 2.1051, and Part 24, Paragraph 24.238
- X 2. Radiated Emissions EN55022: 1992 Class B limit, 30 - 1,000 MHz, 10 meters
- X 3. Radiated Emission per FCC Part 2, Paragraph 2.1033, & Part 24, Paragraph 24.238
- X 4. Engineering evaluations
- X 5. Frequency Stability, Part 2, Paragraph 2.1055

Both Conducted and radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8 - M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 10 GHz).

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV PRODUCT SERVICE
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 619 546 3999
Fax: 619 546 0364

The Test Site Data and performance comply with ANSI 63.4 and are registered with the FCC, 7435 Oakland Mills Rd, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

1.6 Part 2 Requirements

Manufacturer: Wavecom SA, 39 rue du Gouverneur Gal Eboue, 92130 Issy les Moulineaux, France

Applicant: Wavecom, Inc., 5404 Morehouse Drive, Suite 330, San Diego, CA 92121

Type of Emissions: Time Division Multiple Access, GSMK Modulation

Frequency Range: RX 1930-1900 TX 1850-1910

Range of Operating Power Values: 1 Watt (30 dBm) to 1mWatt (0 dBm) by 2 dBm Step

Description of means provided for variation of operating power:
Software driven power control

Maximum Power Rating: 1 Watt

DC voltages applied to and dc currents: 4.8 volts and 0.65 A

Description of modulation system and response characteristics:
GMSK modulation, BT = 0.3, gaussian filter

Means for determining and Stabilizing frequency, suppression of spurious radiation, limiting modulation, and limiting power

- The modem is locked on the network by computing the frequency drift between its local oscillator and the network reference (0.05ppm) and applying the correction to a VCO. In case of VCO failure, no network lock will be possible. In absence of network, the module cannot transmit.
- The spurious are suppressed thanks to full modem shielding and external connectors filtering
- Power is limited due to RF power components dimensioning, power supply limitation (2.5 A) and hardware watchdog in case of software crash.
- Modulation limitation is done through harmonic filters, hardware-made modulation (only global component failure is possible in which case no modulation at all will occur)

Description of Modulation System

Modulation format

Modulating bit rate

The modulating bit rate is $1/T = 1\ 625/6$ kbit/s (i.e. approximately 270,833 kbit/s).

Start and stop of the burst :

Before the first bit of the bursts as defined in GSM 05.02 [3] enters the modulator, the modulator has an internal state as if a modulating bit stream consisting of consecutive ones ($d_i = 1$) had entered the differential encoder. Also after the last bit of the time slot, the modulator has an internal state as if a modulating bit stream consisting of consecutive ones ($d_i = 1$) had continued to enter the differential encoder. These bits are called dummy bits and define the start and the stop of the active and the useful part of the burst as illustrated in figure 1. Nothing is specified about the actual phase of the modulator output signal outside the useful part of the burst.

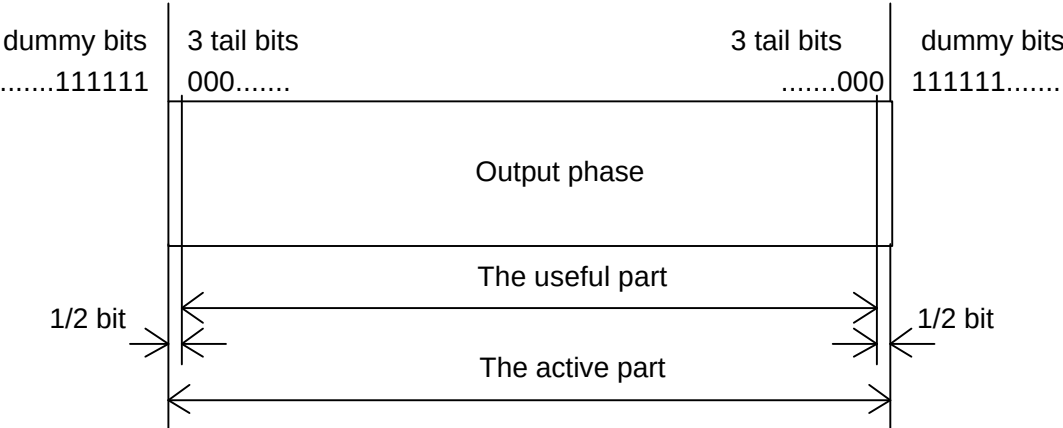


Figure 1 : Relation between active part of burst, tail bits and dummy bits.
For the normal burst the useful part lasts for 147 modulating bits

Description of Modulation System (continued)

Differential encoding

Each data value $d_i = [0,1]$ is differentially encoded. The output of the differential encoder is:

$$\hat{d}_i = d_i \oplus d_{i-1} \quad (d_i \in \{0,1\})$$

where $\oplus$ denotes modulo 2 addition.

The modulating data value a_i input to the modulator is:

$$a_i = 1 - 2\hat{d}_i \quad (a_i \in \{-1, +2\})$$

Filtering

The modulating data values a_i as represented by Dirac pulses excite a linear filter with impulse response defined by:

$$g(t) = h(t) * \text{rect}\left(\frac{t}{T}\right)$$

where the function $\text{rect}(x)$ is defined by:

$$\text{rect}\left(\frac{t}{T}\right) = \frac{1}{T} \quad \text{for } |t| < \frac{T}{2}$$

$$\text{rect}\left(\frac{t}{T}\right) = 0 \quad \text{otherwise}$$

and * means convolution. $h(t)$ is defined by:

$$h(t) = \frac{\exp\left(\frac{-t^2}{2d^2 T^2}\right)}{\sqrt{(2p)} \cdot dT}$$

where $d = \frac{\sqrt{\ln(2)}}{2pBT}$ and $BT = 0.3$

where B is the 3 dB bandwidth of the filter with impulse response $h(t)$, and T is the duration of one input data bit. This theoretical filter is associated with tolerances defined in GSM 05.05 [4].

Output phase

The phase of the modulated signal is:

$$j(t') = \sum_i a_i p h \int_{-\infty}^{t'-iT} g(u) du$$

where the modulating index h is 1/2 (maximum phase change in radians is $\pi/2$ per data interval).

The time reference $t' = 0$ is the start of the active part of the burst as shown in figure 1. This is also the start of the bit period of bit number 0 (the first tail bit) as defined in GSM 05.02 [2].

Modulation

The modulated RF carrier, except for start and stop of the TDMA burst may therefore be expressed as:

$$x(t') = \sqrt{\frac{2E_c}{T}} \cdot \cos(2p f_0 t' + j(t') + j_0)$$

where E_c is the energy per modulating bit, f_0 is the centre frequency and j_0 is a random phase and is constant during one burst.

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The Wavecom GSM1900 Modem **was initially tested for FCC emission in the following configuration:**

See Block Diagram.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Modification

None

2.5 Configuration of Tested System

See Block Diagram.

3 RADIATED EMISSION EQUIPMENT/DATA

The following data lists the significant emission frequencies, measured levels, correction factor (which includes cable and antenna corrections), the corrected reading, and the limit.

Wavecom GSM1900 Modem

See following page(s).

TESTED BY: MW

FCC Part 2/24

Part 2. 1033

CUSTOMER: Wavecom

TEST DIST: 3 Meters

E U T: 1900 MHz GSM Modem

TEST SITE: 3

EUT MODE: Transmit

BICONICAL: N/A

DATE: /25&26/1999

LOG: N/A

NOTES: RBW and VBW = 1 MHz.

OTHER: 453

No emissions were detectable after fourth harmonic.

v.beta

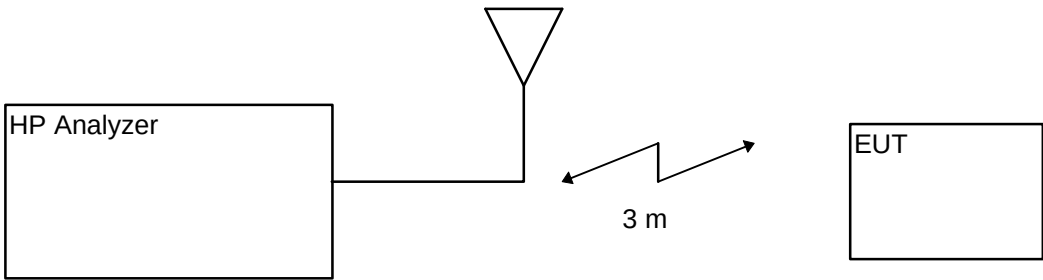
[illegible]

Emissions Test Conditions: RADIATED EMISSIONS, FCC Part 2, Paragraph 2.1033 and Part 24, Paragraph 24.238**The *RADIATED EMISSIONS* measurements were performed at the following test location :**☐ - Test not applicable☒ - Roof (Small Open Area Test Site)**Testing was performed at a test distance of:**☐ - 1 meters☒ - 3 meters☐ - 10 meters**Test Equipment Used :**

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
3115	453	Antenna, Double Ridge Guide	EMCO	9412-4363	10/99
AFD3-0208-40-25	367	Pre-Amplifier	Miteq, Inc.	155382	N/A
AFS4-08001800-70-10P-4	368	Pre-Amplifier	Miteq, Inc.	167879	N/A
AA-190-06.00.0	657	High Frequency Cable	United Microwave Pro.	--	N/A
AA-190-30.00.0	733	High Frequency Cable	United Microwave Pro.	--	N/A
8566B	720	Spectrum Analyzer	Hewlett Packard	211500842	03/00
8566B	721	Spectrum Analyzer Display	Hewlett Packard	2112A02185	03/00

Remarks: _____

Test Setup for FCC Part 2. 1033



Field Strength Calculation

If a preamplifier was used during the Radiated Emission Testing, it is required that the amplifier gain must be subtracted from the Spectrum Analyzer (Meter) Reading. In addition, a correction factor for the antenna, cable used and a distance factor, if any, must be applied to the Meter Reading before a true field strength reading can be obtained. In the automatic measurement, these considerations are automatically presented as a part of the print out. In the case of manual measurements and for greater efficiency and convenience, instead of using these correlation factors for each meter reading, the specification limit was modified to reflect these correlation factors at each frequency value so that the meter readings can be compared directly to the modified specification limit. This modified specification limit is referred to as the "Corrected Meter Reading Limit" or simply the CMRL, which is the actual field strength present at the antenna. The quantity can be derived in the following manner:

$$\text{Corrected Meter Reading Limit (CMRL)} = \text{SAR} + \text{AF} + \text{CL} - \text{AG} - \text{DC}$$

Where, SAR = Spectrum Analyzer Reading

AF = Antenna Factor

CL = Cable Loss

AG = Amplifier Gain (if any)

DC = Distance Correction (if any)

Assume the following situation: A meter reading of 29.4 dBuV was obtained from a Class A computing device measured at 83 MHz. Assume an antenna factor of 9.2 dB, a cable loss of 1.4 dB and amplifier gain of 20.0 dB at 83 MHz. The final field strength would be determined as follows:

$$\text{CMRL} = 29.4 \text{ dBuV} + 9.2 \text{ dB} - 1.4 \text{ dB} - 20 \text{ dB/M} - 0.0 \text{ dB}$$

$$\text{CMRL} = 20.0 \text{ dBuV/M}$$

This result is well below the FCC and CSA Class A limit of 29.5 dbuV/m at 83 MHz.

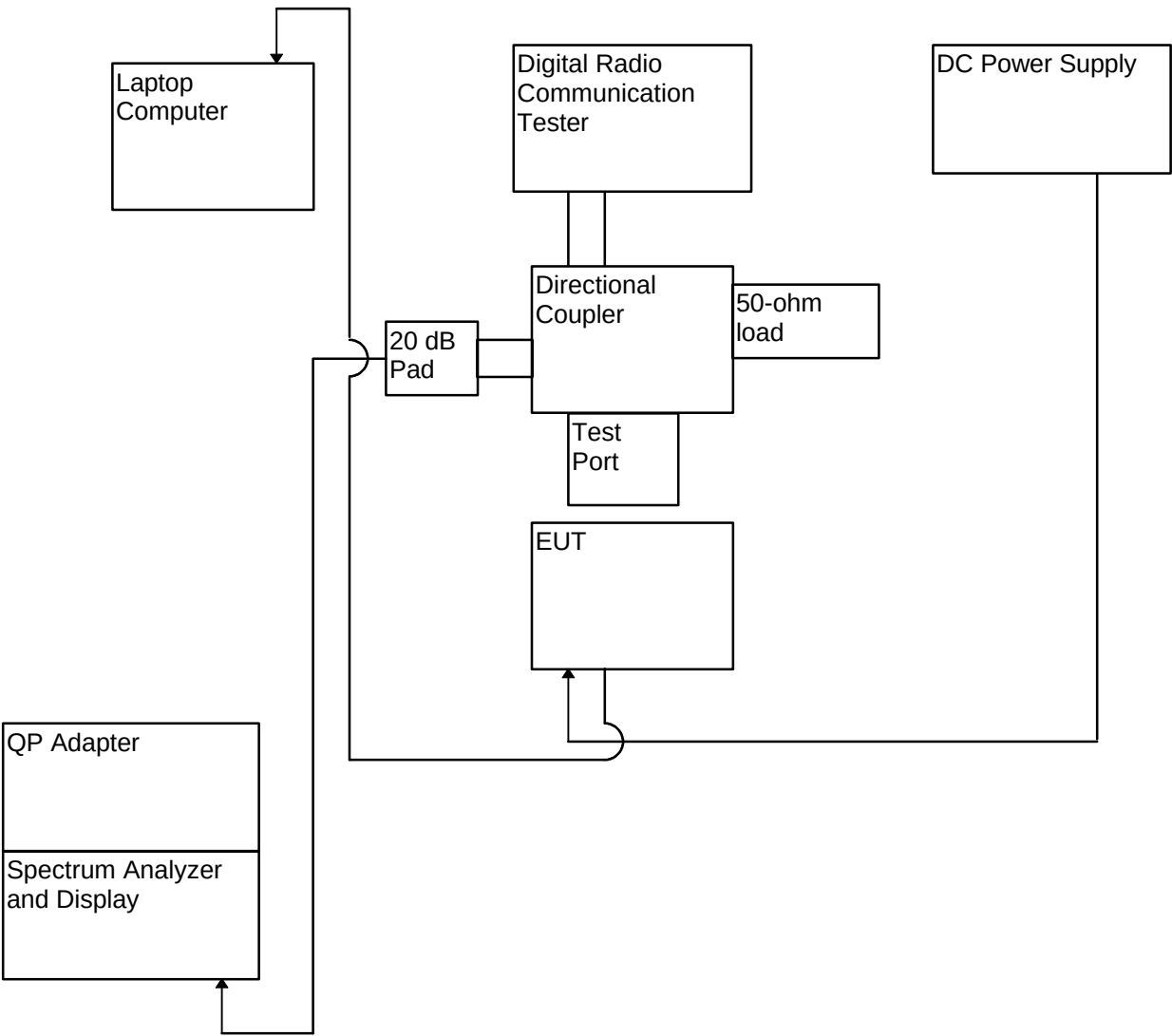
For the manual mode of measurement, a table of corrected meter reading limit was used to permit immediate comparison of the meter reading to determine if the measure emission amplitude exceeded the specification limit at that specific frequency.

4 CONDUCTED EMISSION EQUIPMENT/DATA

Wavecom GSM1900 Modem

See following page(s).

Test Setup for Part 2, Paragraphs 2.1046, 2.1046, 2.1051, and Part 24, Paragraph 24.238



Emissions Test Conditions: CONDUCTED EMISSIONS, FCC Part 2, Paragraphs 2.1046, 2.1051, and Part 24, Paragraph 24.238

The *RADIATED EMISSIONS* measurements were performed at the following test location :

☐ - Test not applicable

■ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used :

Equipment List

Attenuator, Hewlett Packard, P/N 636, Model 8491A (internal verification cal date)
QP Adapter, Electro Rent Corporation, Model HP-85650A, S/N 2521A00597, P/N 746 Cal Date 03/00
Spectrum Analyzer & Display, Model HP-8566B, S/N 2618A02913, P/N 744 Cal Date 02/00
Cable, United Microwave, Model AA-190-06.00.0, P/N 729 Verified 5/13/99
Attenuator, Werlatone, Model C2630, S/N 4172 (internal verification cal date)
Attenuator, Werlatone, Model 11691D, S/N 1212A02137 (internal verification cal date)
Attenuator, Werlatone, Model 778D S/N 1144A08801 (internal verification cal date)
DC Power Supply, Hewlett Packard, Model E 3611A NCR
Digital Radio Communication Tester, Rhode & Schwarz, Model CMD55, S/N 849709/050, CAL DUE 3/00

Remarks: _____

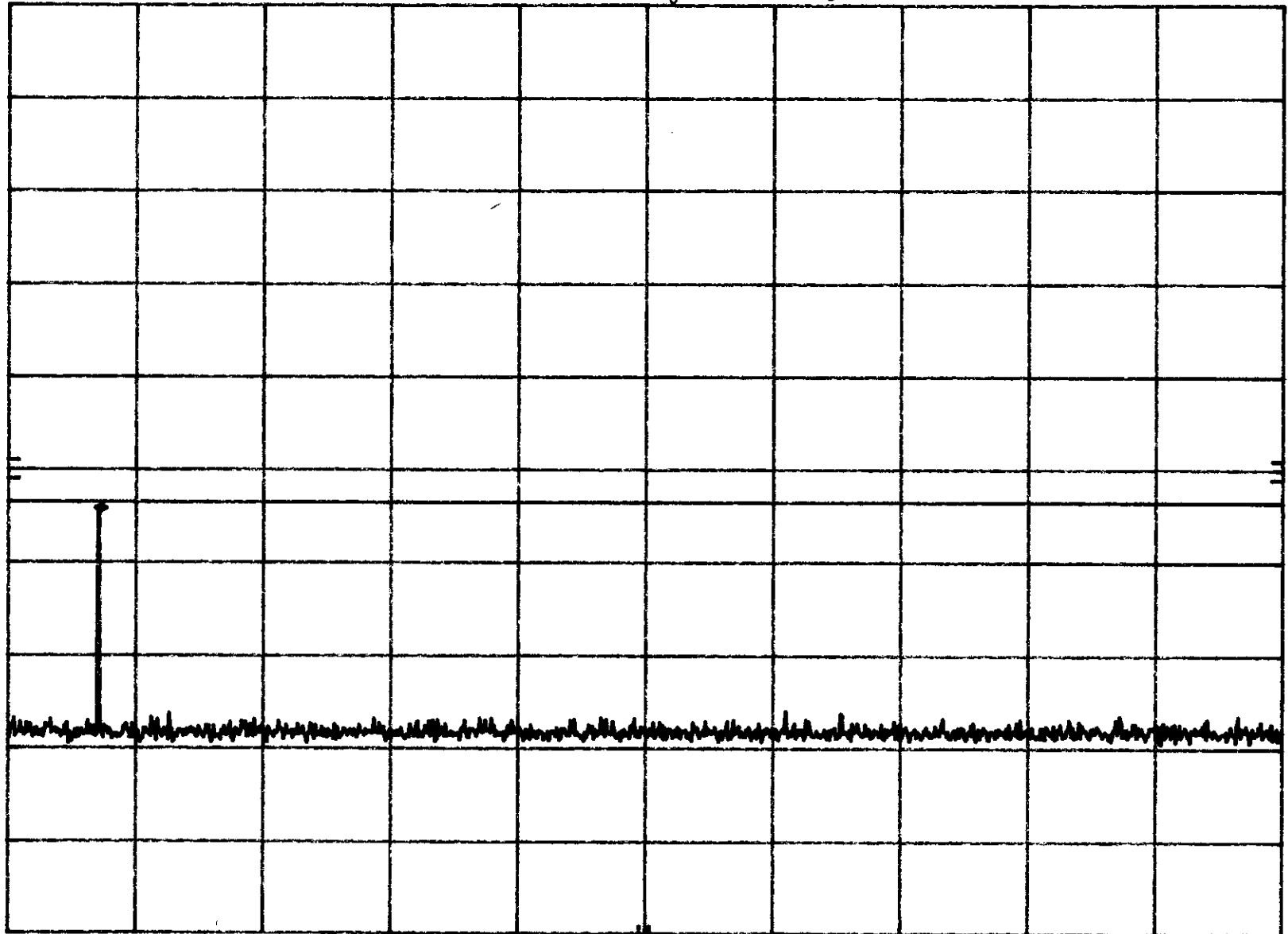
S9220
Wavecom

FCC Part 2, Paragraph 2.1051 and
Part 24, Paragraph 24.238

High Channel 1, 810
5/25/99

MKR 99.8 MHz
-13.70 dBm

hp
REF 40.5 dBm
ATTEN 10 dB
10 dB/
POS PK
OFFSET 40.5 dB
DL -13.0 dBm



START 30 MHz

RES BW 100 kHz

VBW 100 kHz

STOP 1.000 GHz
SWP 1.00 sec 18

S9220 Fcc Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

High channel, 810

5/13/99

MKR 1.910 GHz
28.80 dBm

HP

REF 41.1 dBm

ATTEN 10 dB

mary Washington

10 dB/

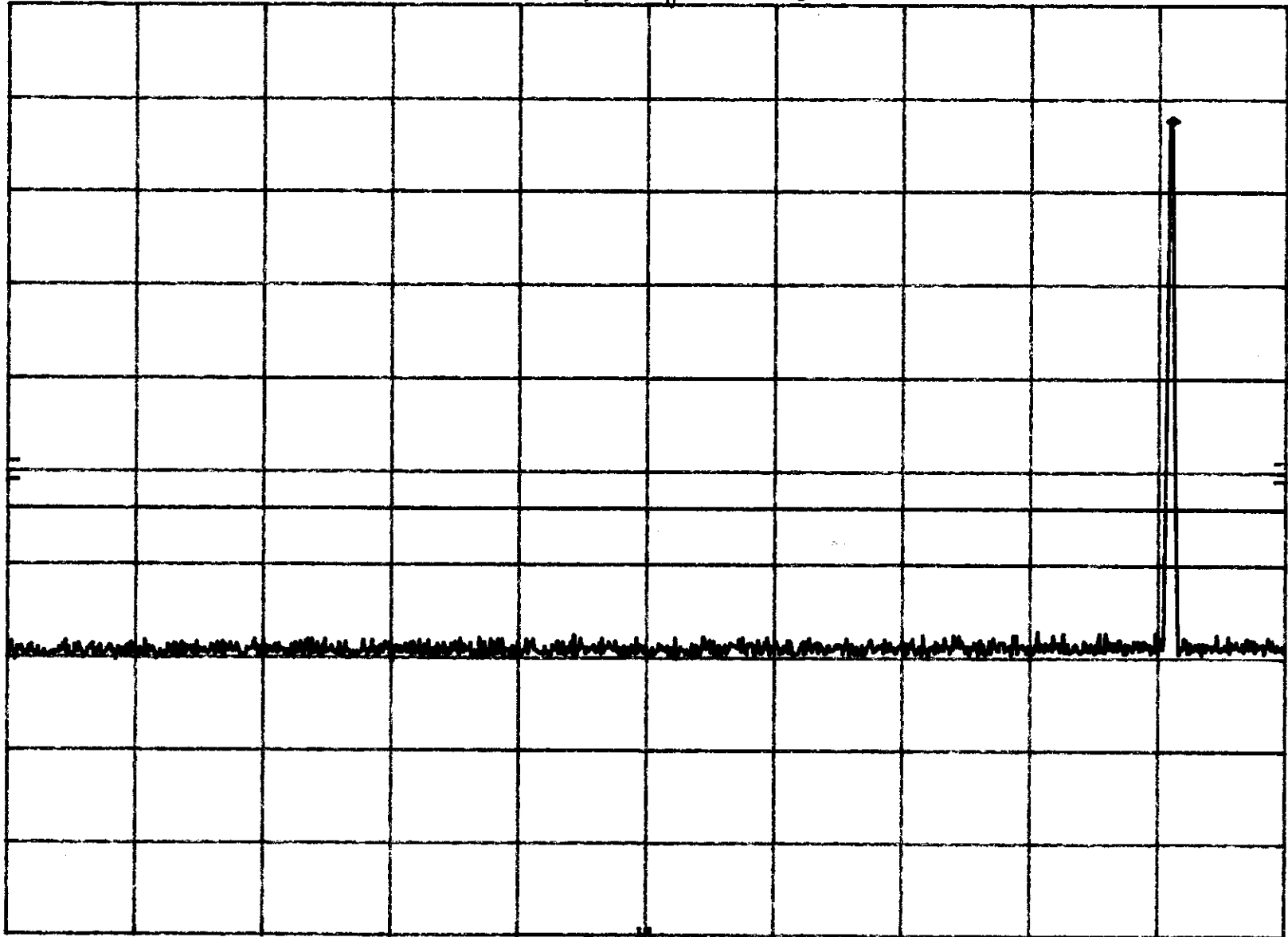
POS PK

OFFSET

41.1
dB

DL

-13.0
dBm



START 1.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 2.00 GHz

SWP 25.0 msec 19

S9220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

High Channel, 810
5/25/99

MKR 2.207 GHz
-33.60 dBm

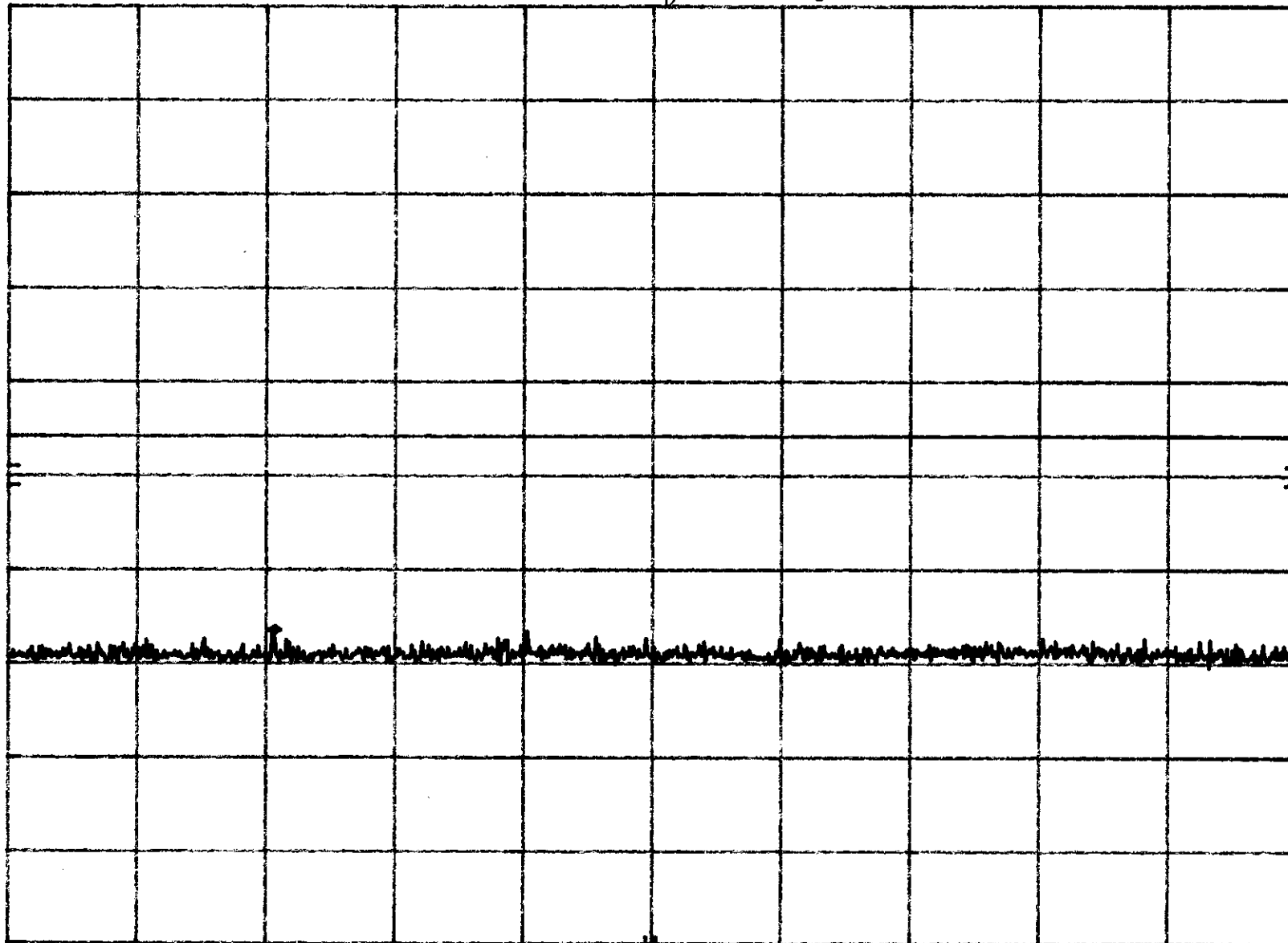
hp REF 32.8 dBm ATTN 0 dB Mary Washington

10 dB/

POS PK

OFFSET
42.8
dB

DL
-13.0
dBm



START 2.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 3.00 GHz

SWP 1.00 sec

20

39220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

High channel, 810

5/25/99

MKR 5.886 GHz
-26.50 dBm

HP

REF 33.2 dBm

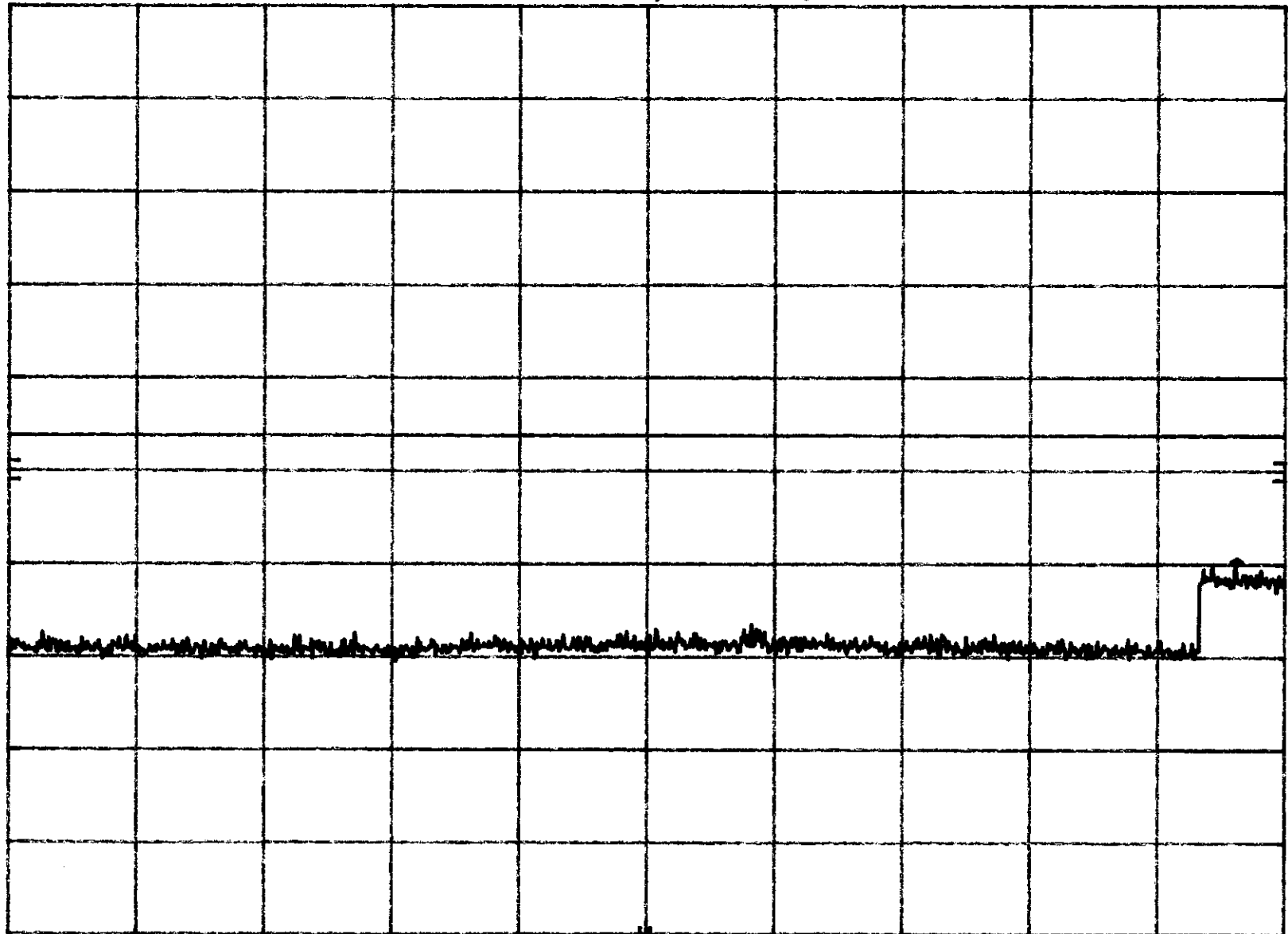
ATTEN 0 dB *mary Washington*

10 dB/

POS PK

OFFSET
43.2
dB

DL
-13.0
dBm



START 3.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 6.00 GHz

SWP 1.00 sec 21

S9220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

High channel, 810
5/25/99 MKR 6.630 GHz
-26.40 dBm

hp REF 33.5 dBm ATTN 0 dB many Washington

10 dB/

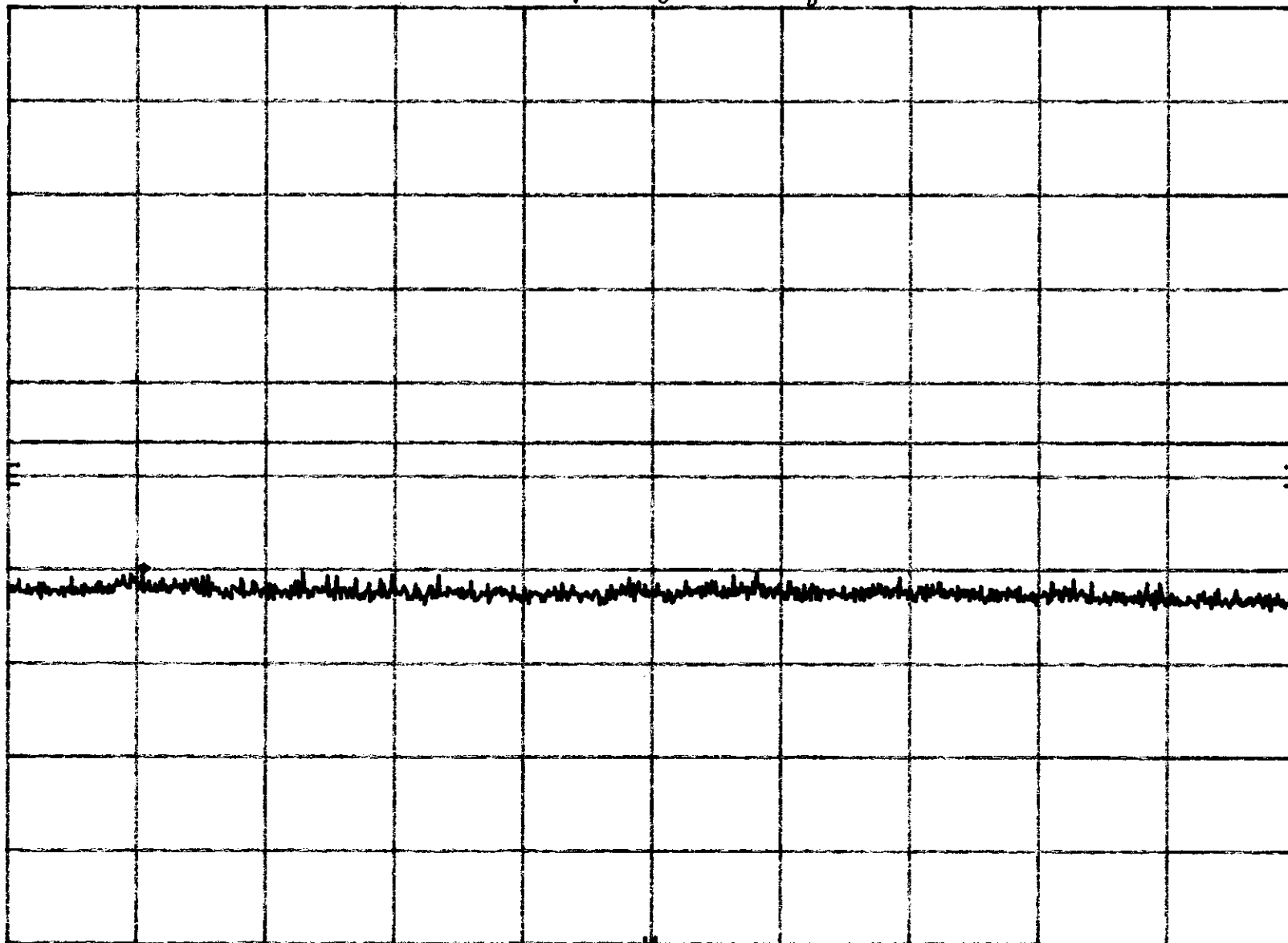
POS PK

OFFSET

43.5
dB

DL

-13.0
dBm



START 6.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 12.00 GHz

SWP 1.00 sec 22

59220

FCC Part 2, Paragraph 2.1051 and

High channel, 810

Wavecom

Part 24, Paragraph 24.238

5/25/99

MKR 13.215 GHz

-22.10 dBm

hp

REF 34.0 dBm

ATTEN 0 dB

mary Washington

10 dB/

POS PK

OFFSET

44.0

dB

DL

-13.0

dBm

DISPLAY LINE

-13.0 dBm

START 12.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 17.00 GHz

SWP 1.00 sec 23

59220 FCC Part 2, Paragraph 2.1051 and

High channel, 810

Wavecom Part 24, Paragraph 24.238

5/25/99

MKR 17.106 0 GHz

hp REF 35.0 dBm ATTN 0 dB *mary washington*

-21.40 dBm

10 dB/

POS PK

OFFSET

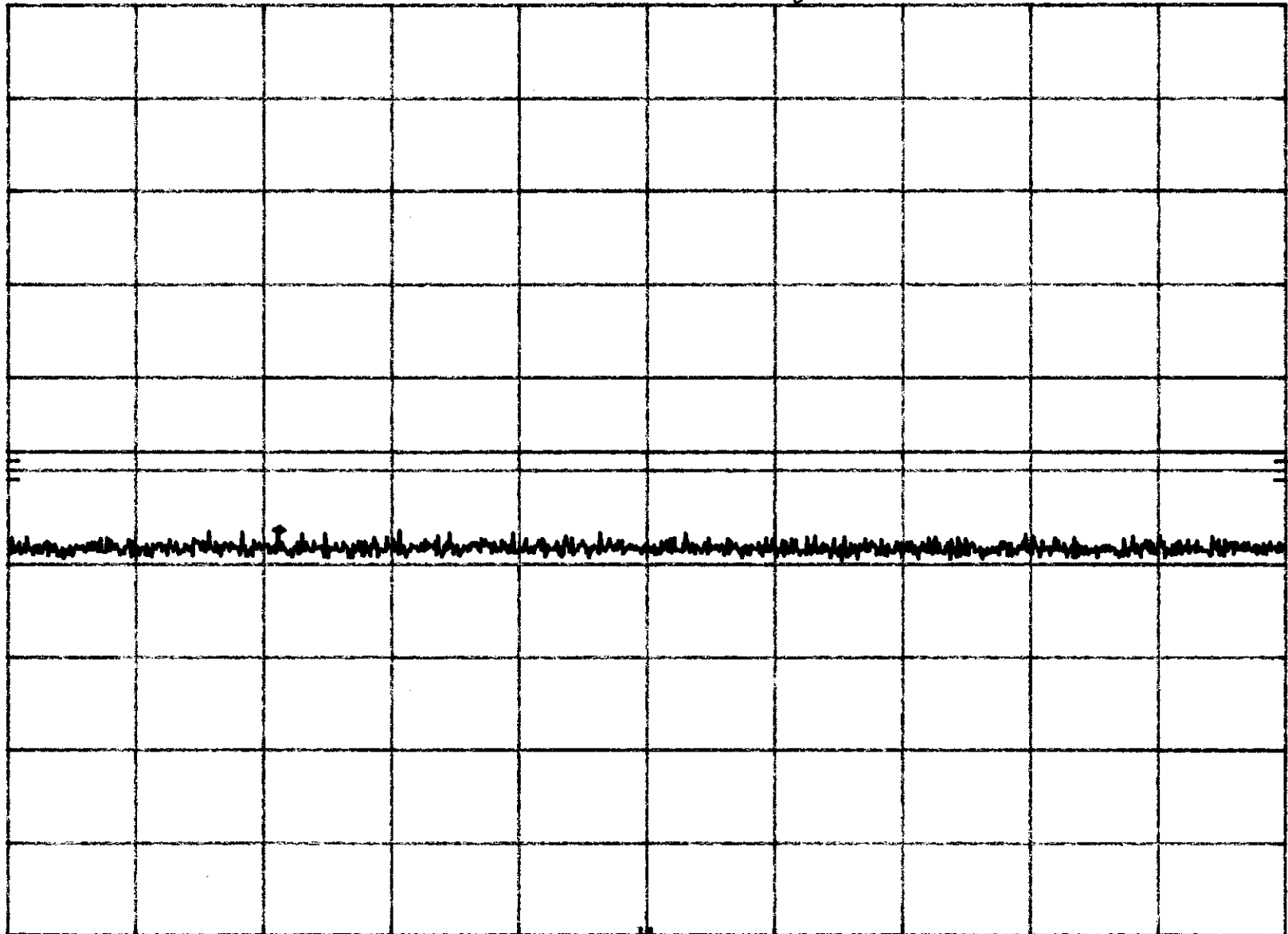
45.0

dB

DL

-13.0

dBm



START 17.000 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 17.500 GHz

SWP 1.00 sec 24

S9220

FCC Part 2, Paragraph 2.1051 and

High channel, 810

Wavecom

Part 24, Paragraph 24.238

5/25/99

MKR 19.920 GHz

hp

REF 36.0 dBm

ATTEN 0 dB many washers

-16.20 dBm

10 dB/

POS PK

OFFSET

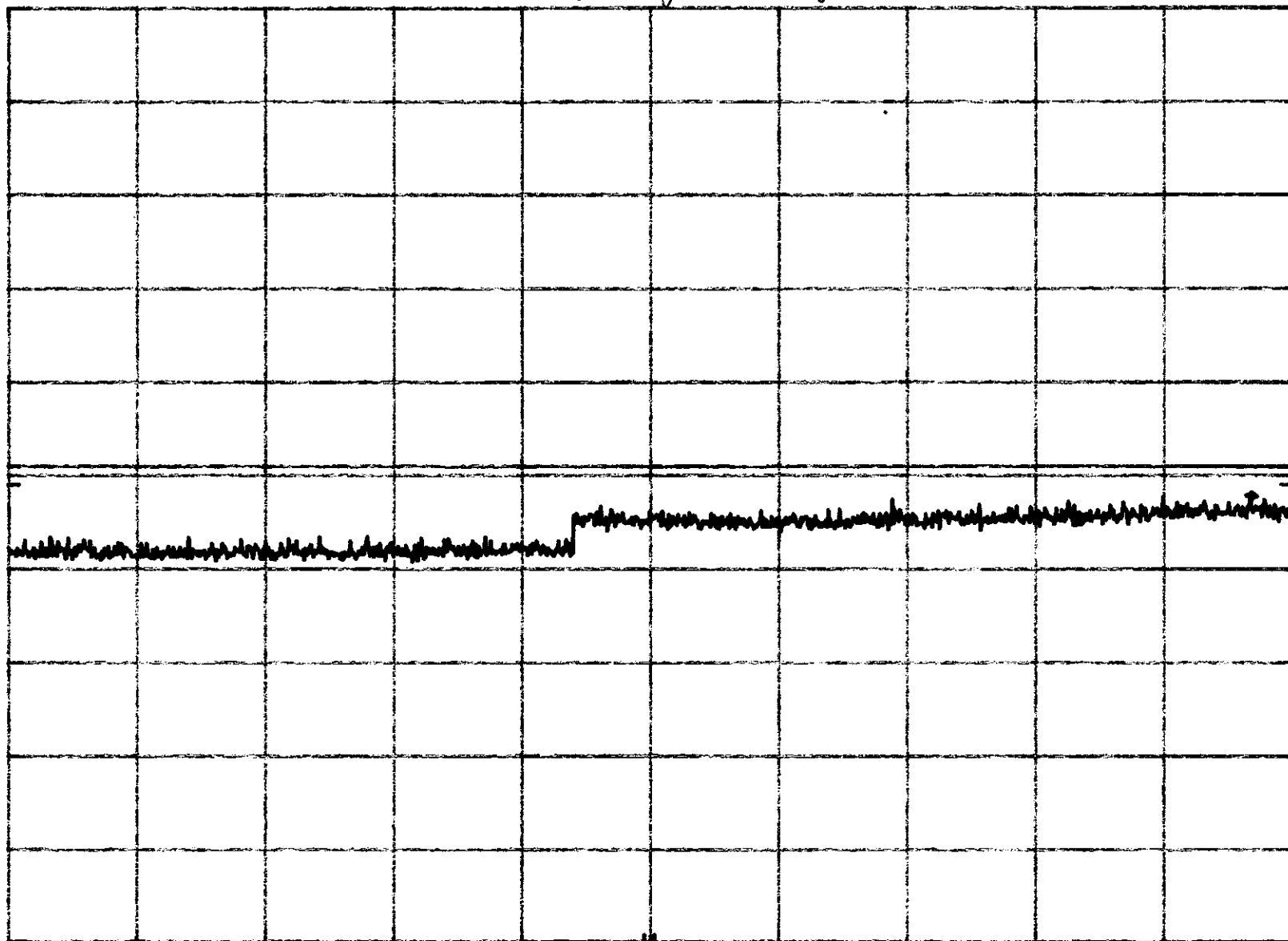
46.0

dB

DL

-13.0

dBm



START 17.50 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 20.00 GHz

SWP 1.00 sec 25

S9220

FCC Part 2, Paragraph 2.1051 and

mid channel, 661

Wavecom

Part 24, Paragraph 24.238

5/25/99

MKR 68.8 MHz

-17.90 dBm

hp

REF

40.5 dBm

ATTEN

10 dB

mary Washington

10 dB/

POS PK

OFFSET

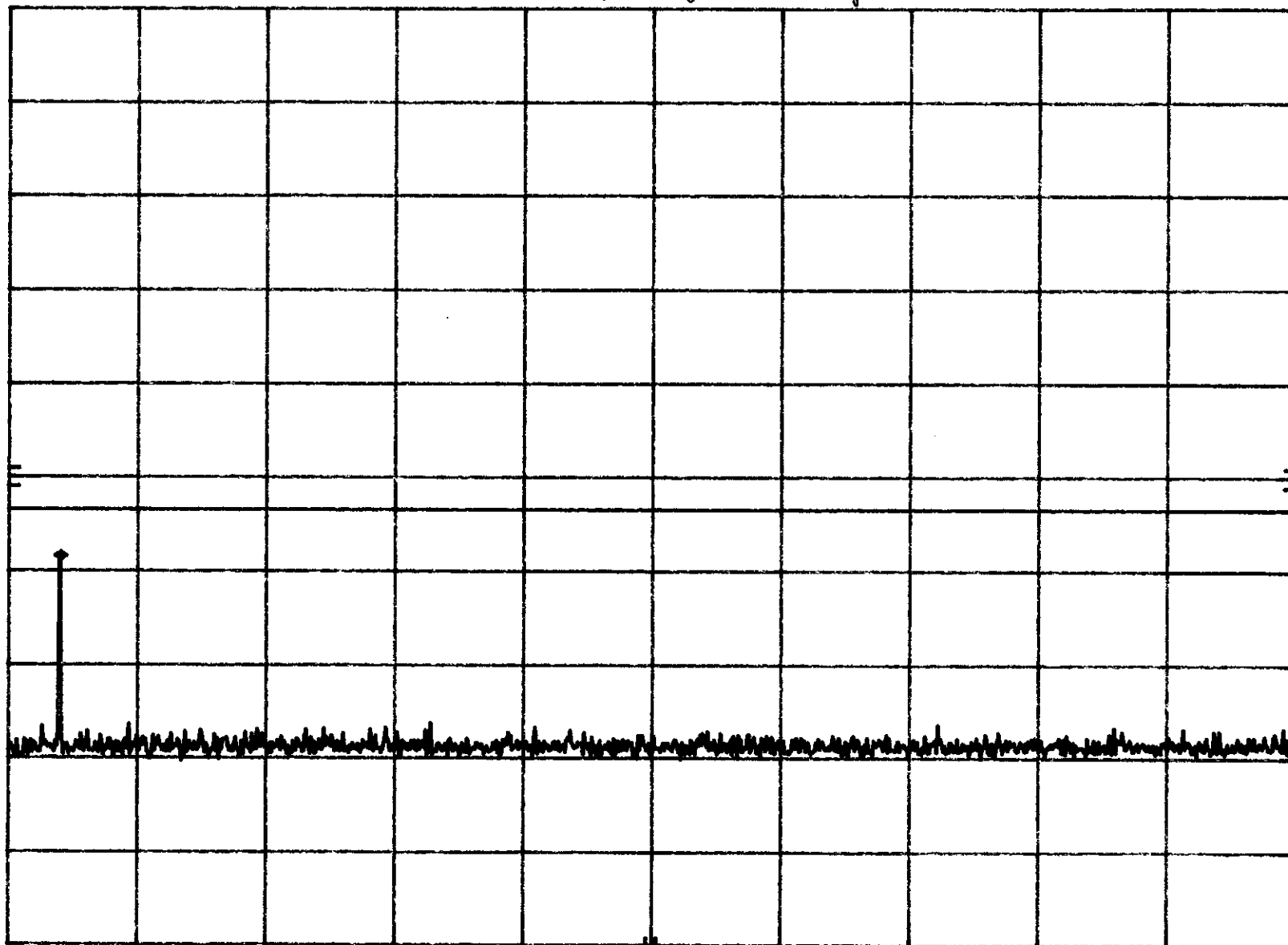
40.5

dB

DL

-13.0

dBm



START 30 MHz

RES BW 100 KHz

VBW 100 KHz

STOP 1.000 GHz

SWP 1.00 sec 26

S9220 FCC Part 2, Paragraph 2.1051 and

mid channel, 661

Wavecom Part 24, Paragraph 24.238

5/25/99

MKR 1.880 GHz

hp REF 41.2 dBm ATTEN 10 dB may Washington

29.30 dBm

10 dB/

POS PK

OFFSET

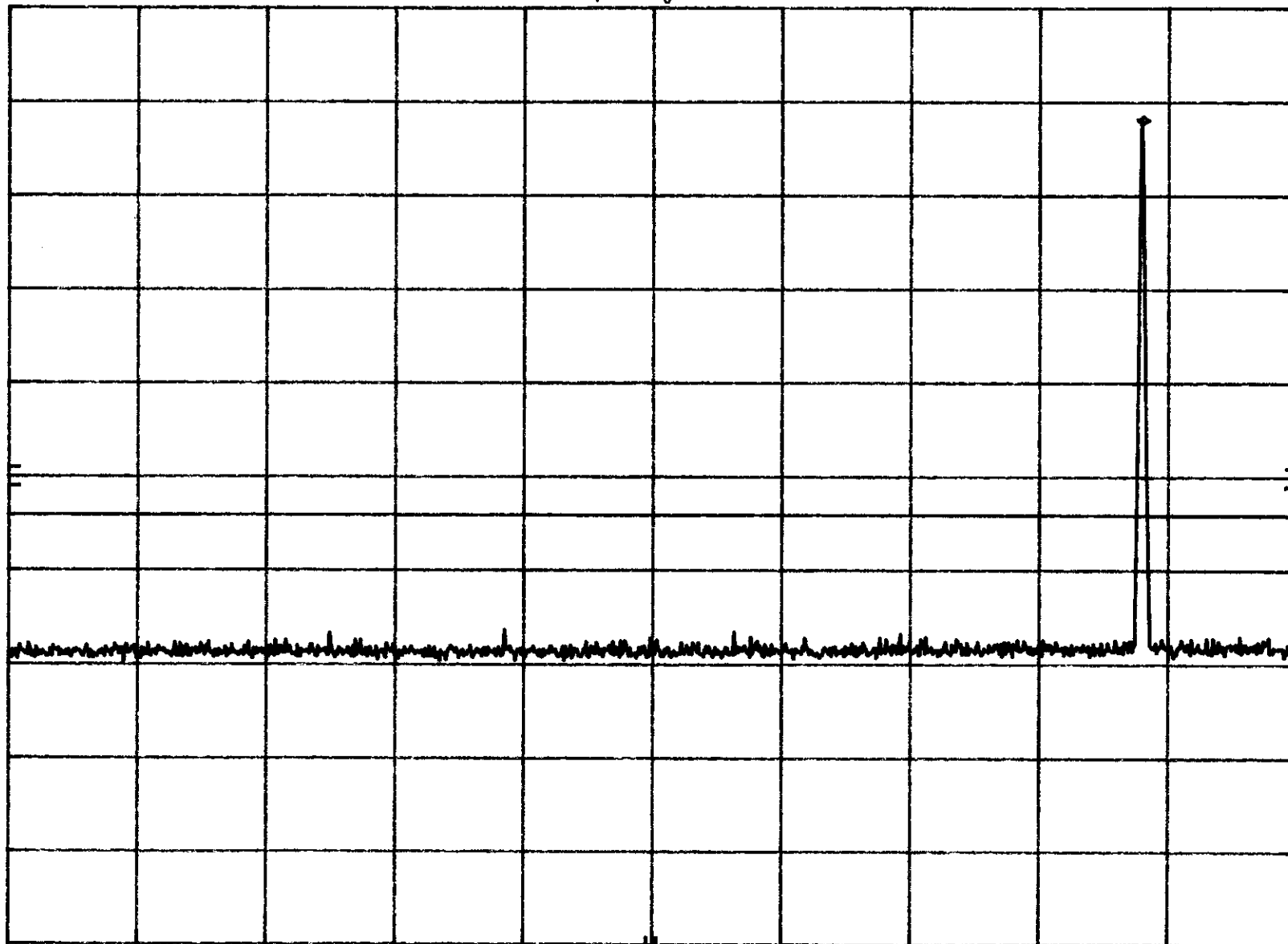
41.2

dB

DL

-13.0

dBm



START 1.00 GHz

RES BW 1 MHz

VBW 1 MHz

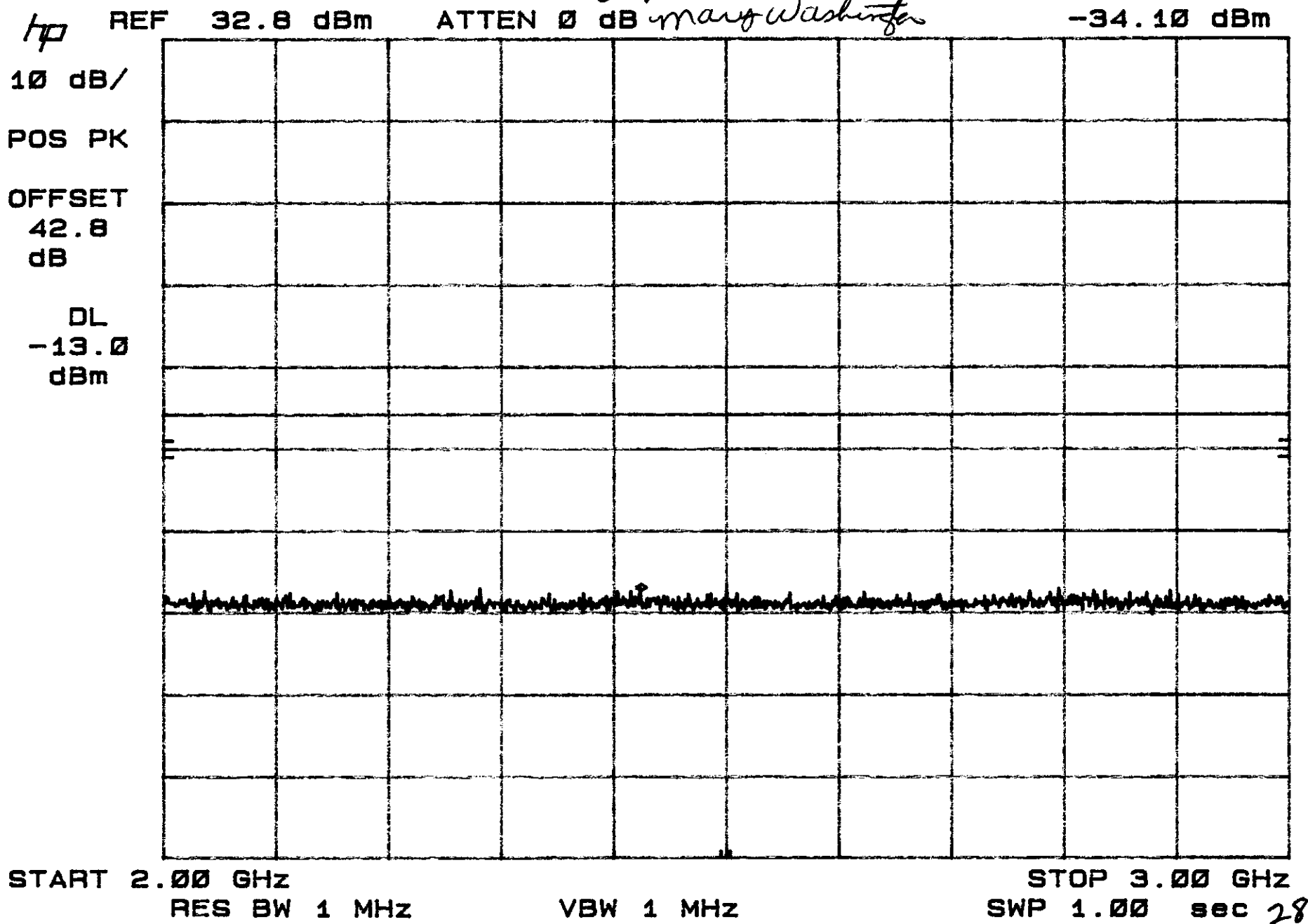
STOP 2.00 GHz

SWP 5.00 sec 21

S9220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

Mid channel, 661
5/25/99

MKR 2.424 GHz
-34.10 dBm



59220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

mid channel, 1061

5/25/99

MKR 4.587 GHz

hp

REF

33.2 dBm

ATTEN 0 dB

Mary Washington

-32.70 dBm

10 dB/

POS PK

OFFSET

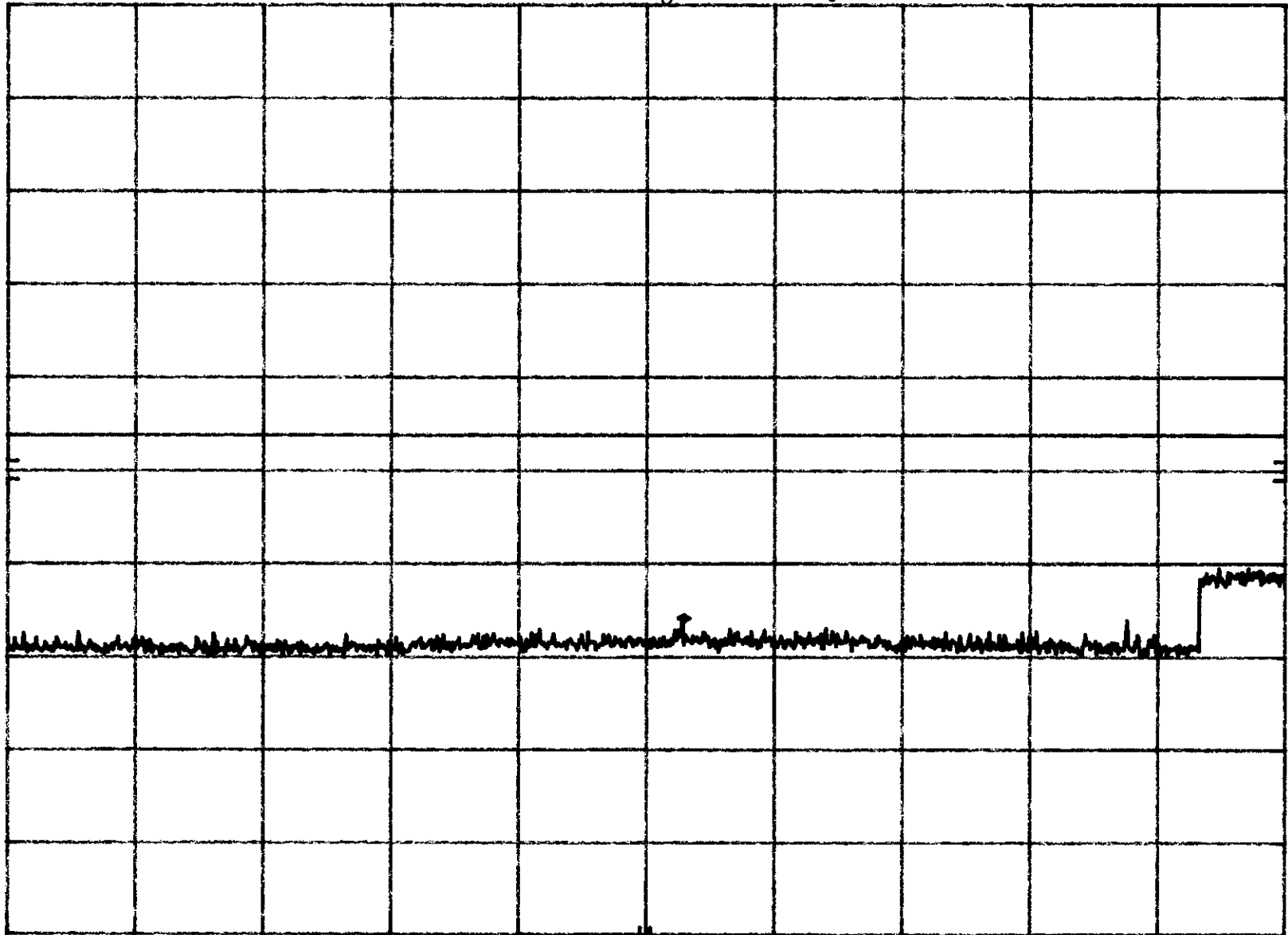
43.2

dB

DL

-13.0

dBm



START 3.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 6.00 GHz

SWP 1.00 sec 29

S9220 FCC Part 2, Paragraph 2.1051 and mid channel, 661
Wavecom Part 24, Paragraph 24.238 5/25/99

MKR 7.344 GHz
-26.70 dBm

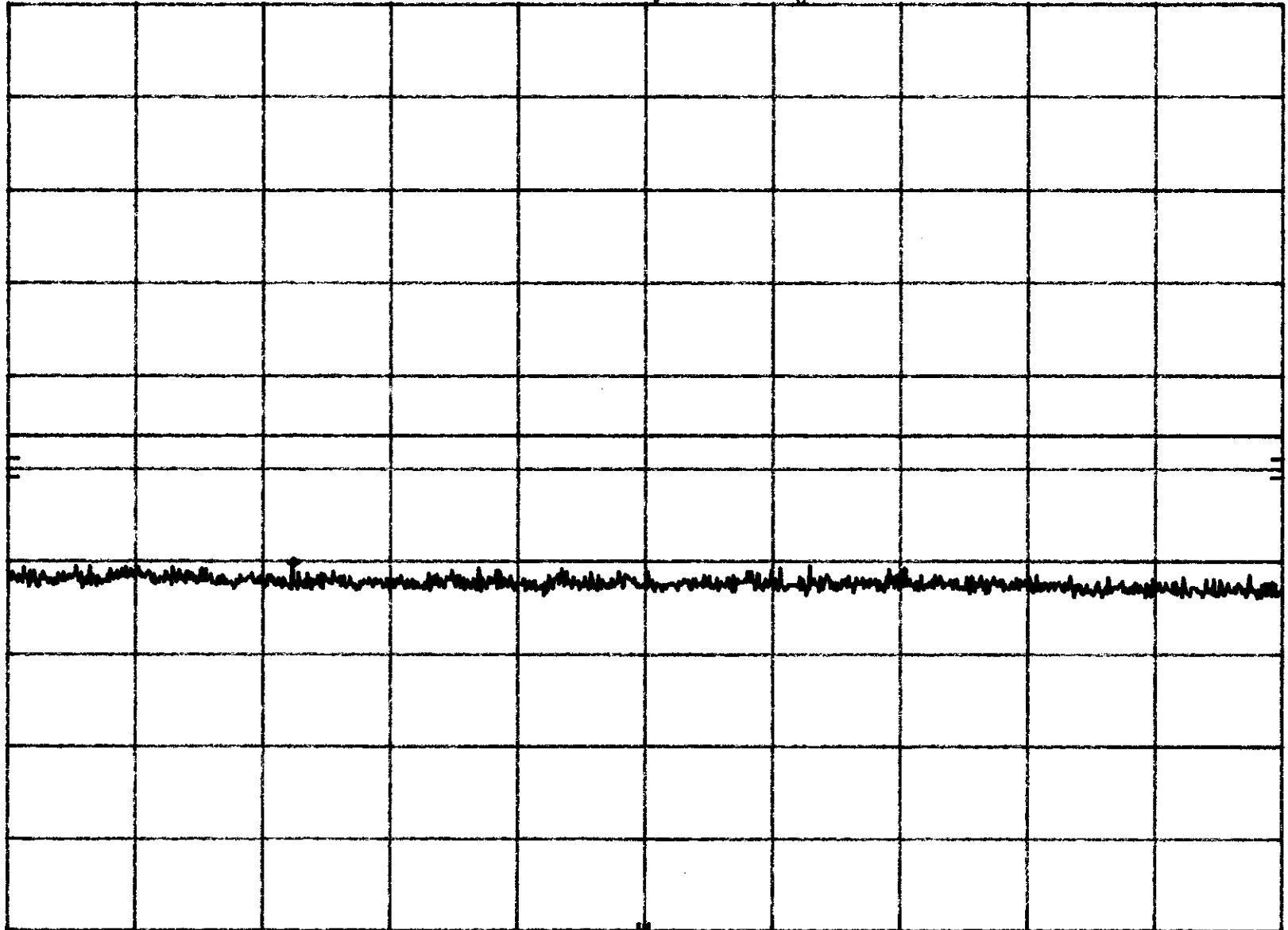
hp REF 33.5 dBm ATTN 0 dB maryabushington

10 dB/

POS PK

OFFSET
43.5
dB

DL
-13.0
dBm



START 6.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 12.00 GHz

SWP 1.00 sec 30

S9220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

mid channel, 661

5/25/99

MKA 13.920 GHz

-22.20 dBm

hp

REF

34.0 dBm

ATTEN 0 dB

mary Washington

10 dB/

POS PK

OFFSET

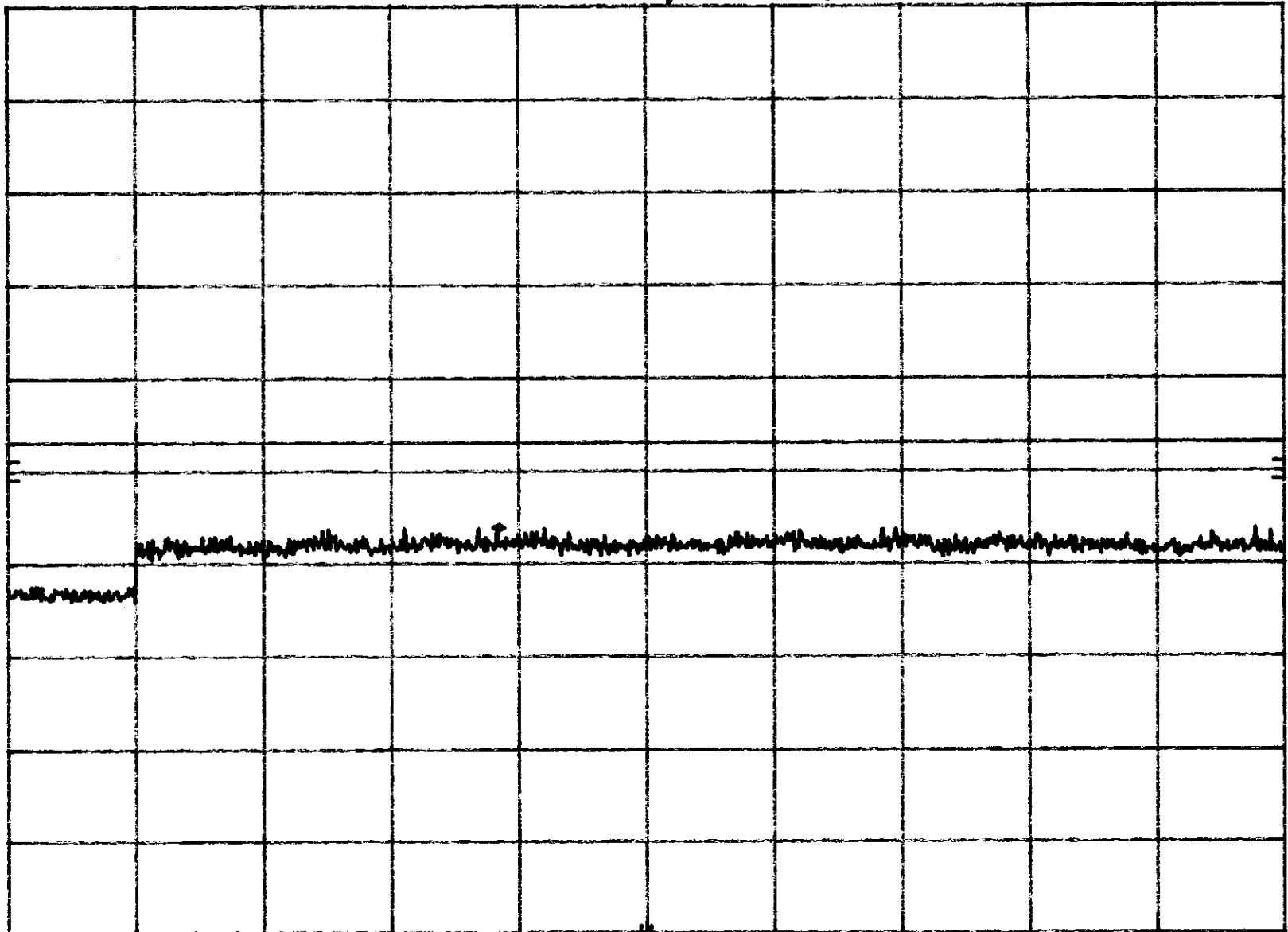
44.0

dB

DL

-13.0

dBm



START 12.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 17.00 GHz

SWP 1.00 sec 31

59220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

mid channel, 661
5/25/99

MKR 17.222 0 GHz
-21.40 dBm

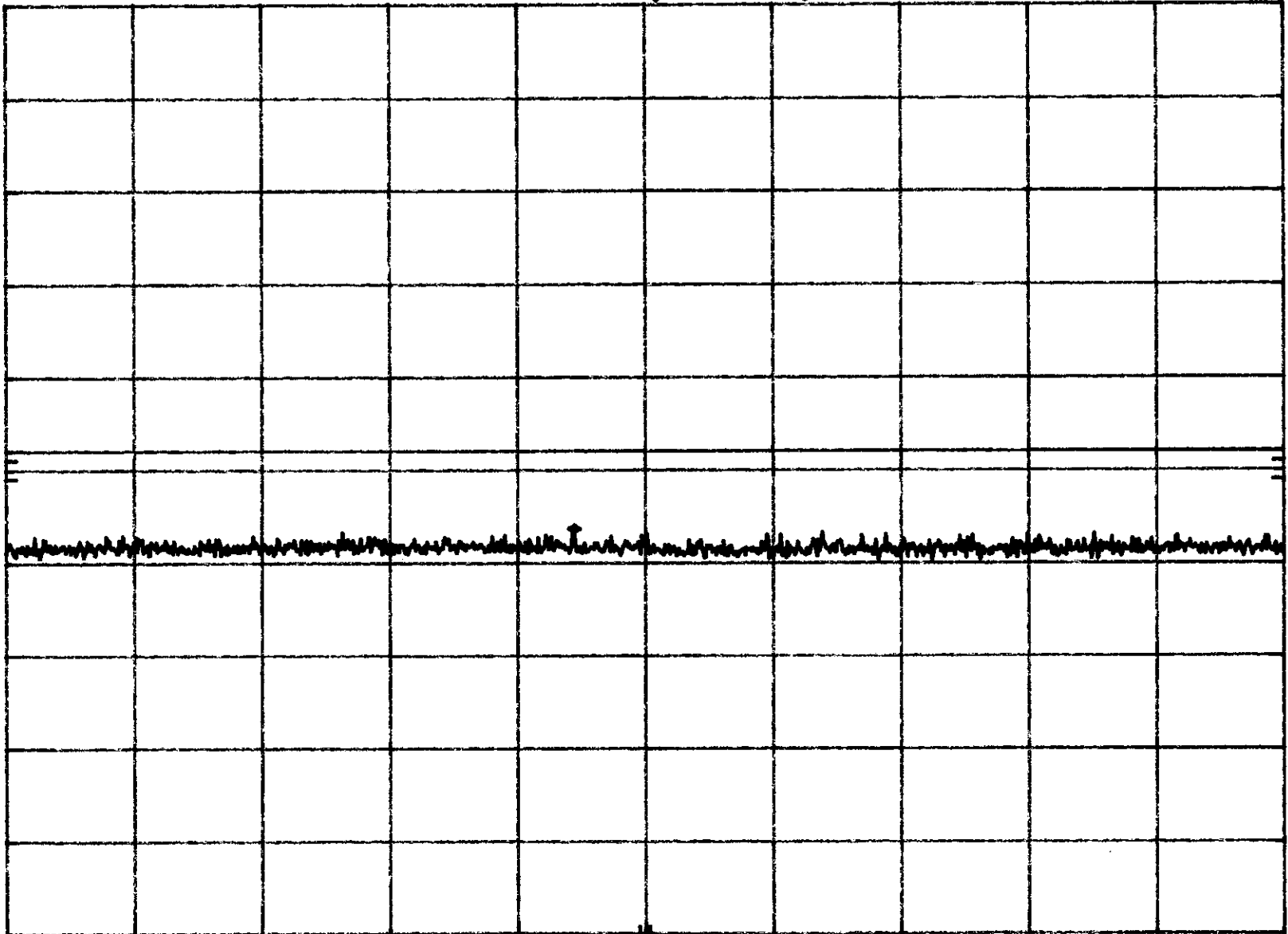
hp REF 35.0 dBm ATTN 0 dB Mary Washington

10 dB/

POS PK

OFFSET
45.0
dB

DL
-13.0
dBm



START 17.000 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 17.500 GHz

SWP 1.00 sec 32

S9220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

Mid channel, 661
5/25/99

MKR 18.798 GHz
-17.20 dBm

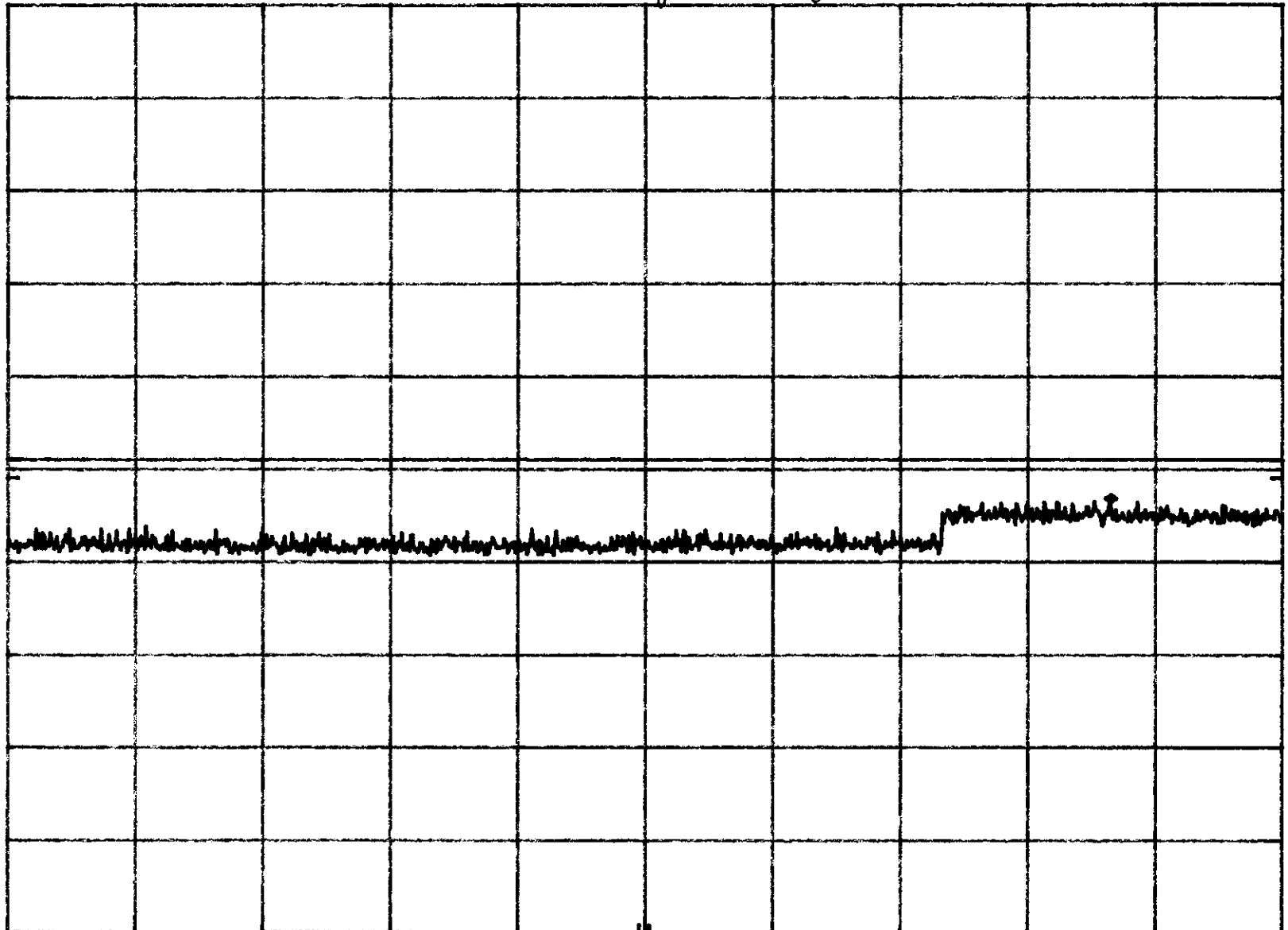
hp REF 36.0 dBm ATTN 0 dB many Washington

10 dB/

POS PK

OFFSET
46.0
dB

DL
-13.0
dBm



START 17.50 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 19.00 GHz

SWP 1.00 sec 33

59220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

Low channel, 512
5/25/99

MKR 38.7 MHz
-20.00 dBm

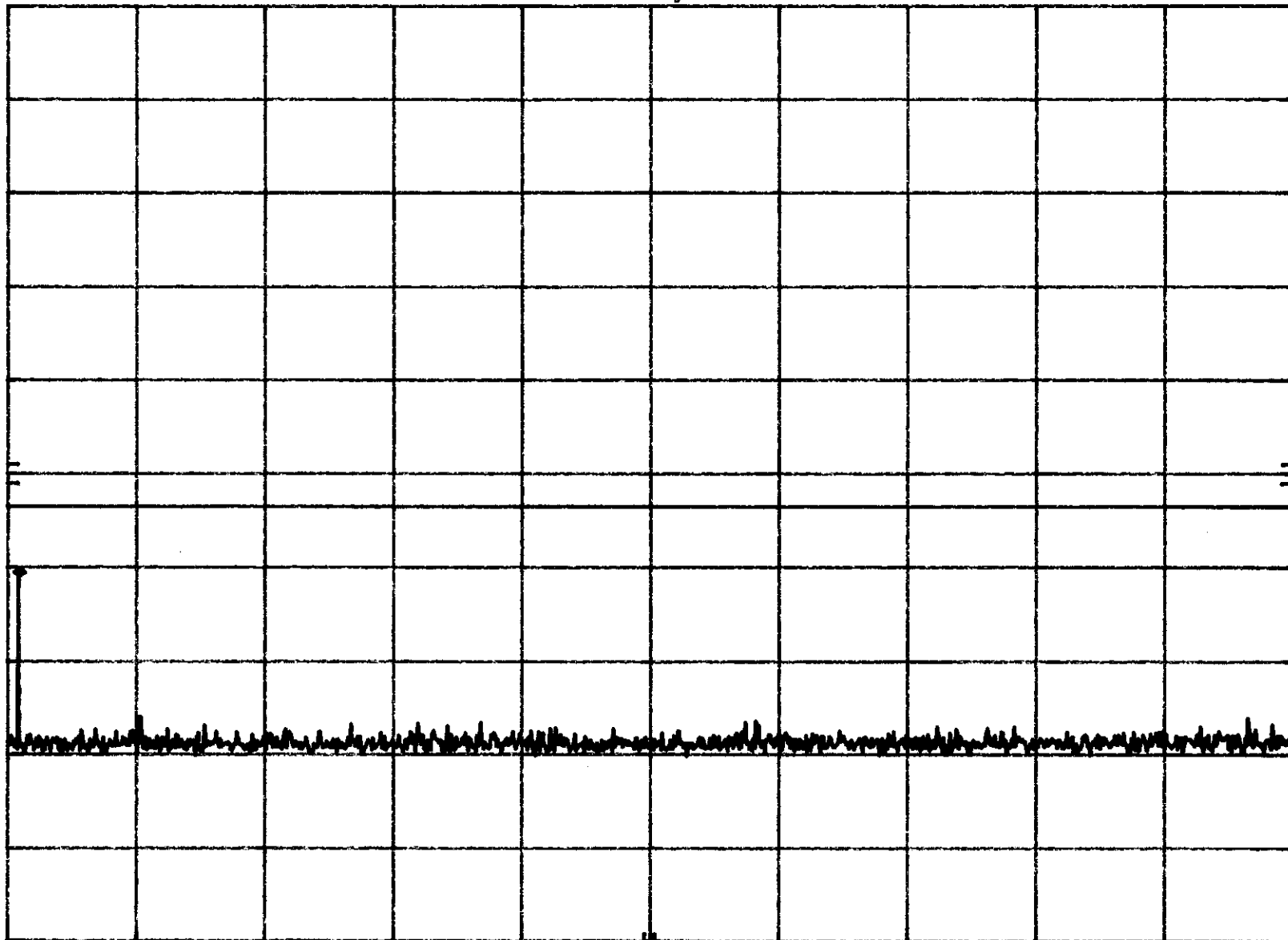
hp REF 40.5 dBm ATTN 10 dB many washers

10 dB/

POS PK

OFFSET
40.5
dB

DL
-13.0
dBm



START 30 MHz

RES BW 100 kHz

VBW 100 kHz

STOP 1.000 GHz

SWP 1.00 sec 34

S9220
Wavecom

FCC Part 2, Paragraph 2.1051 and
Part 24, Paragraph 24.238
ATTEN 10 dB Mary Washington

LOW Channel, 512
5/13/99
MKR 1.850 GHz
30.00 dBm

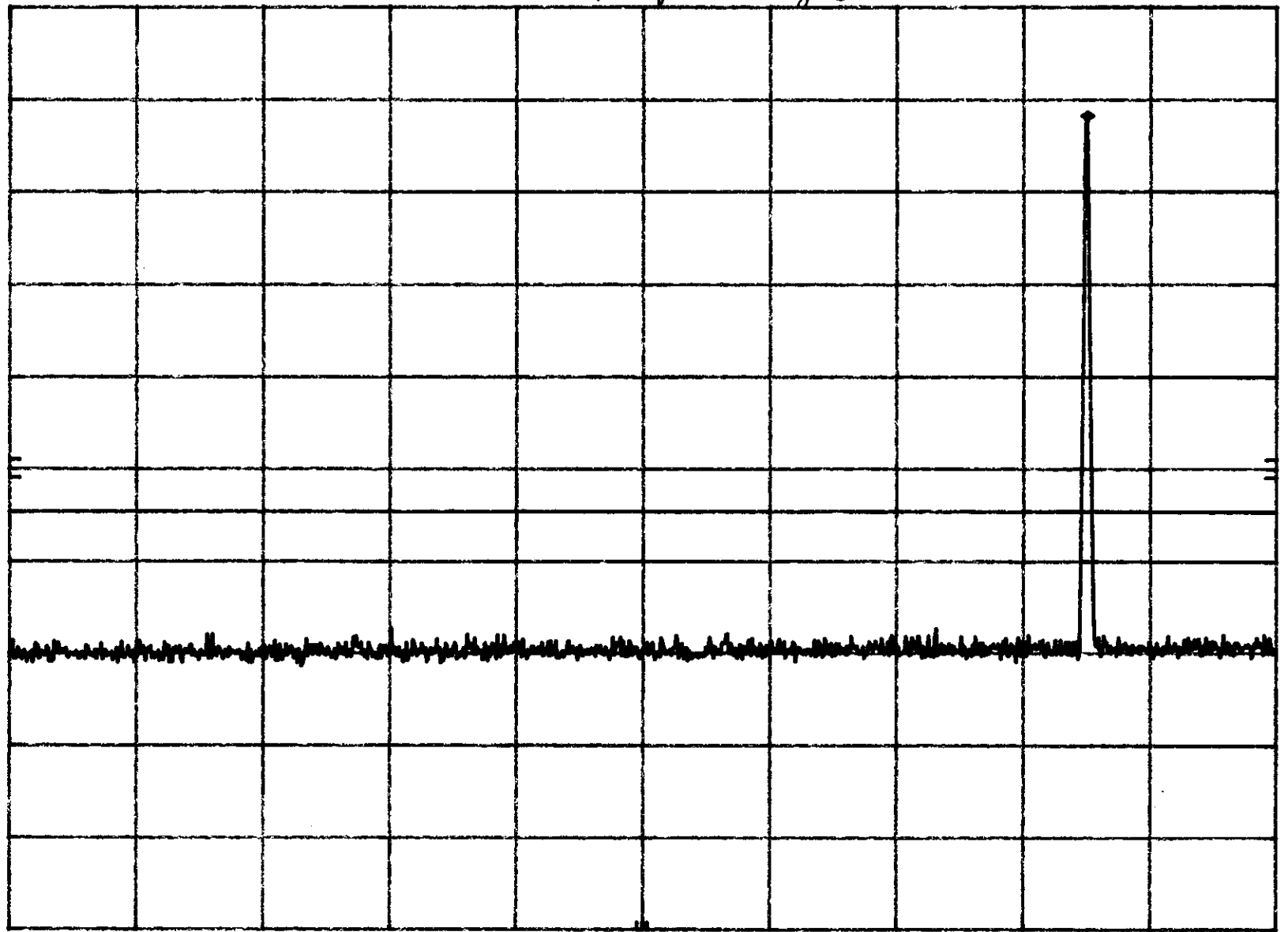
hp REF 41.8 dBm

10 dB/

POS PK

OFFSET
41.8
dB

DL
-13.0
dBm



START 1.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 2.00 GHz

SWP 25.0 msec 35

S9220
Wavecom

FCC Part 2, Paragraph 2.1051 and
Part 24, Paragraph 24.238
ATTEN 0 dB *mary washington*

Low Channel, 512
5/25/99

MKA 2.952 GHz
-33.10 dBm

hp

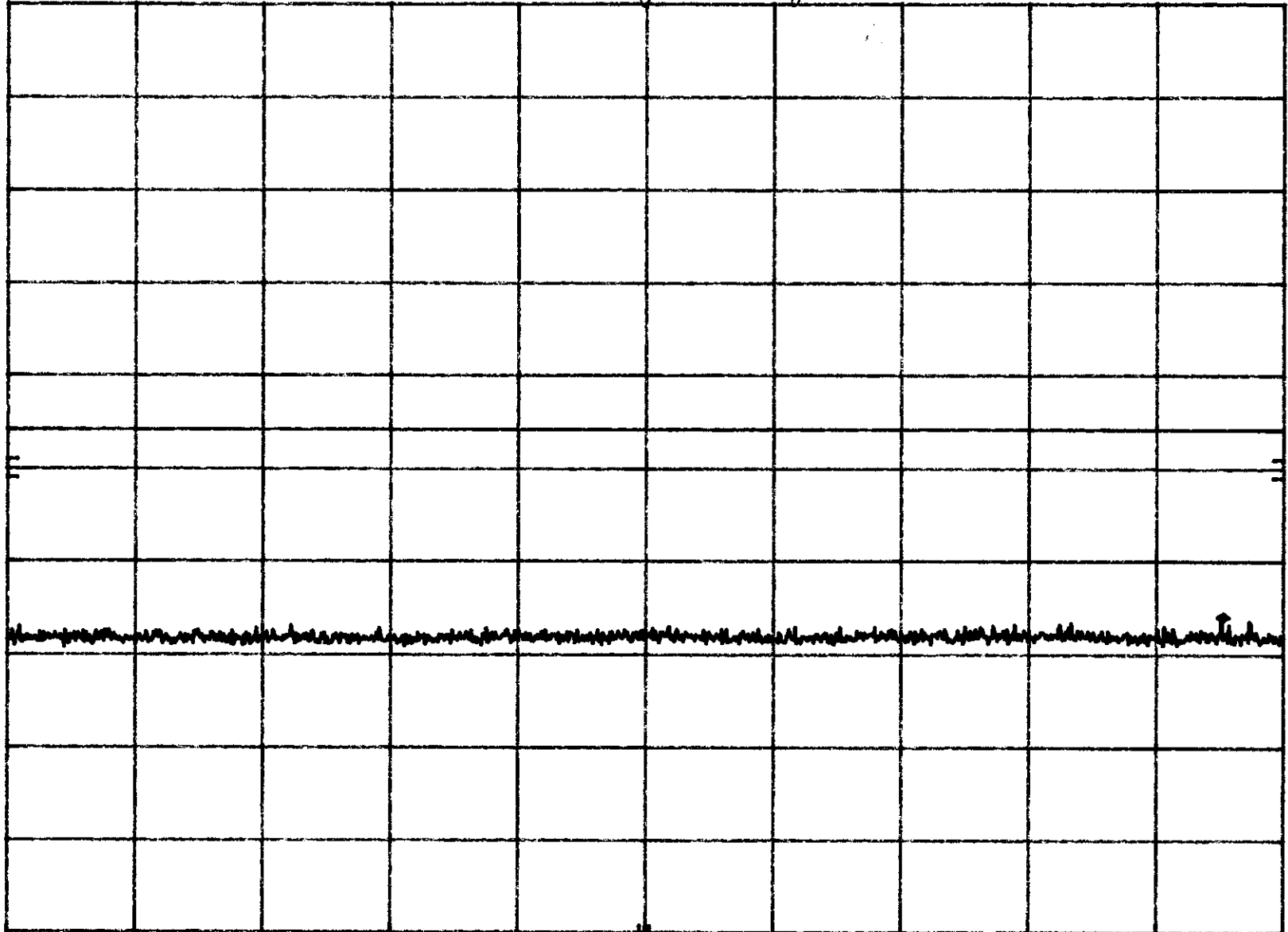
REF 32.8 dBm

10 dB/

POS PK

OFFSET
42.8
dB

DL
-13.0
dBm



START 2.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 3.00 GHz

SWP 1.00 sec 36

S9220
Wavecom

FCC Part 2, Paragraph 2.1051 and
Part 24, Paragraph 24.238

Low Channel, 512
5/25/99
MKR 5.541 GHz
-33.20 dBm

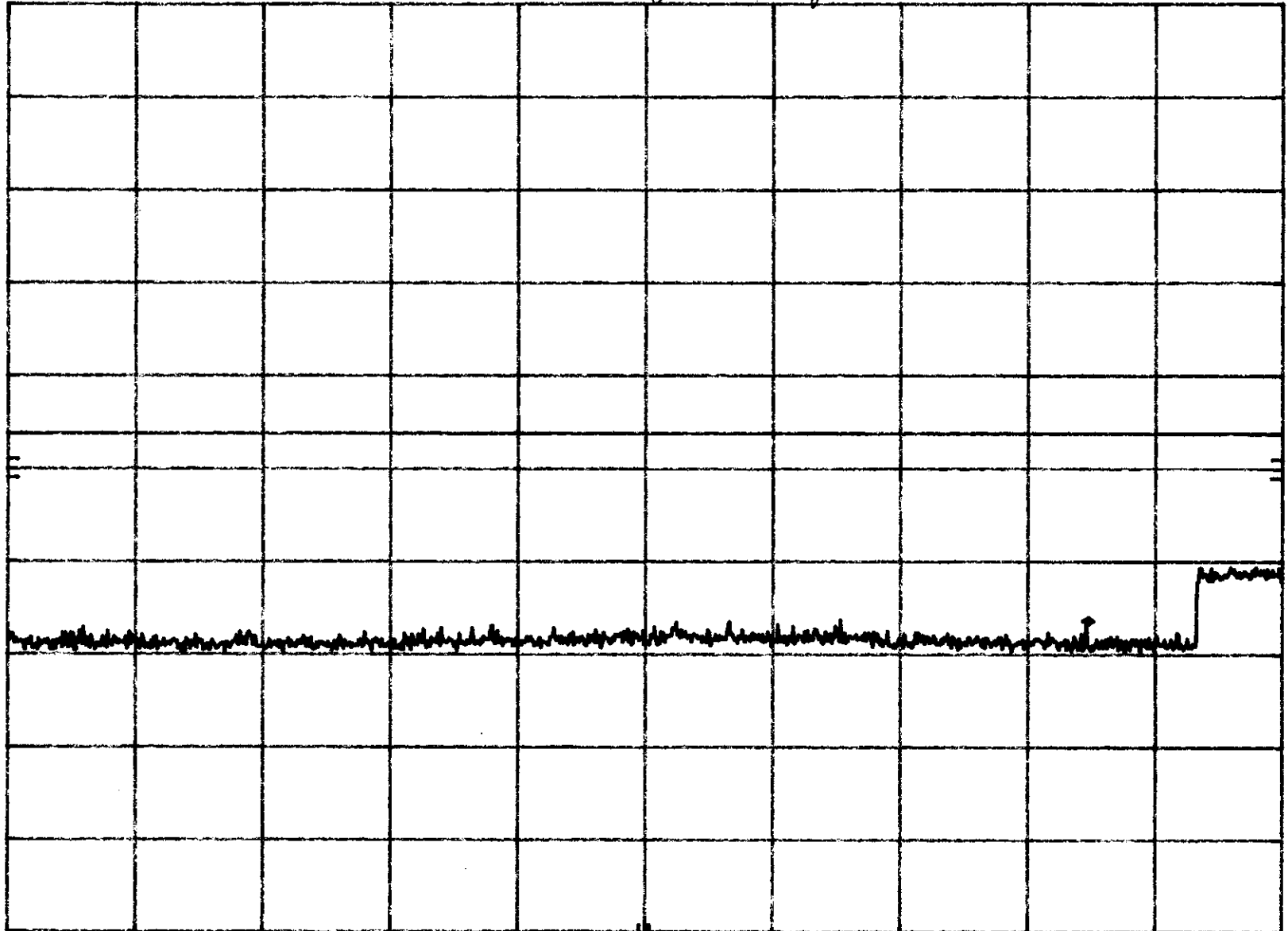
hp REF 33.2 dBm ATTN 0 dB mary washerfen

10 dB/

POS PK

OFFSET
43.2
dB

DL
-13.0
dBm



START 3.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 6.00 GHz
SWP 1.00 sec 31

S9220

FCC Part 2, Paragraph 2.1051 and

Low Channel, 512

Wavecom

Part 24, Paragraph 24.238

5/25/99

MKR 7.872 GHz

-26.60 dBm

hp

REF

33.5 dBm

ATTEN 0 dB

mary Washington

10 dB/

POS PK

OFFSET

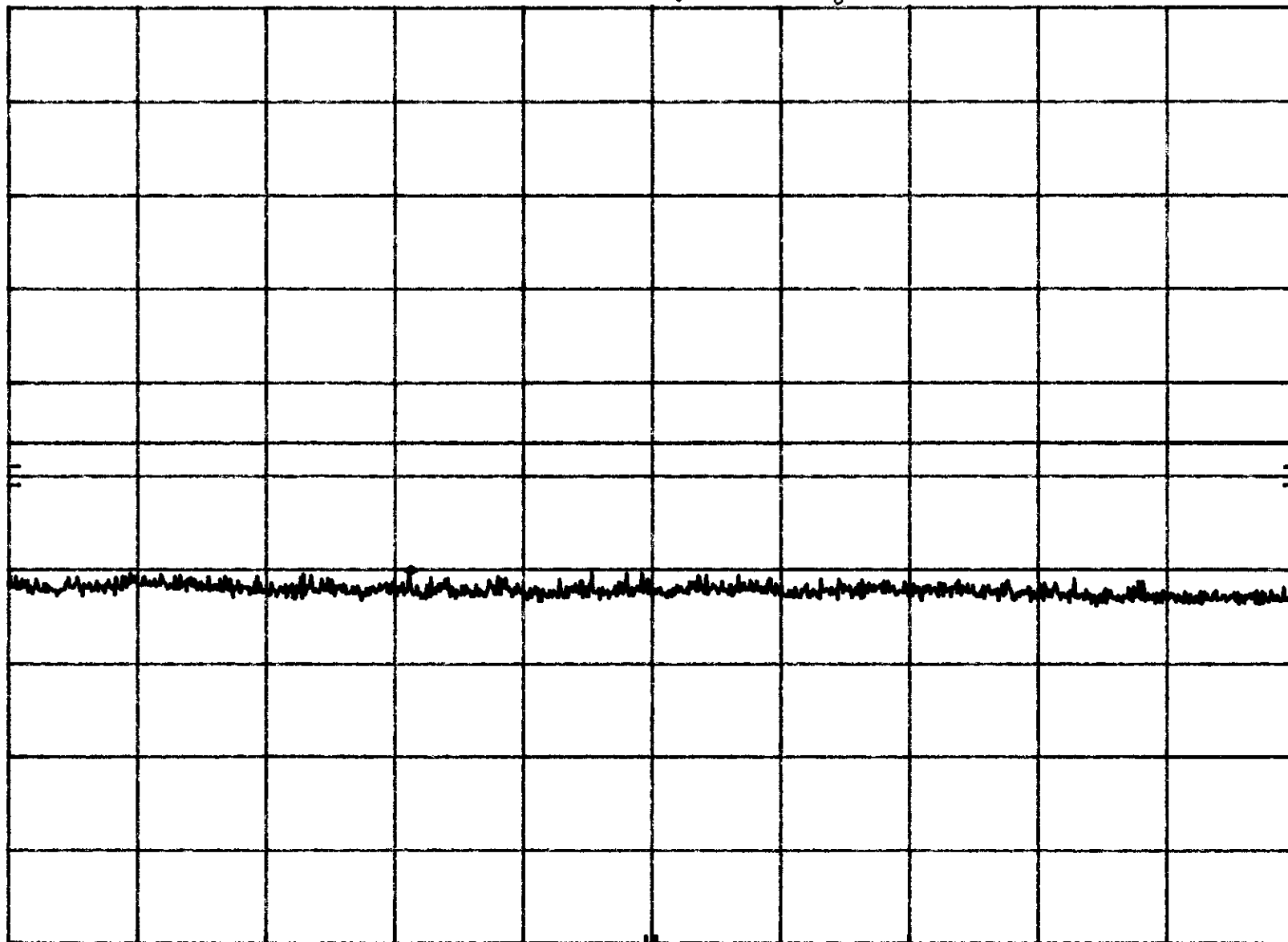
43.5

dB

DL

-13.0

dBm



START 6.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 12.00 GHz

SWP 1.00 sec 38

S9220

FCE Part 2, Paragraph 2.1051 and

Low Channel, 512

Wavecom

Part 24, Paragraph 24.238

5/25/99

MKR 15.725 GHz

hp

REF

34.0 dBm

ATTEN 0 dB Mary Washington

-21.70 dBm

10 dB/

POS PK

OFFSET

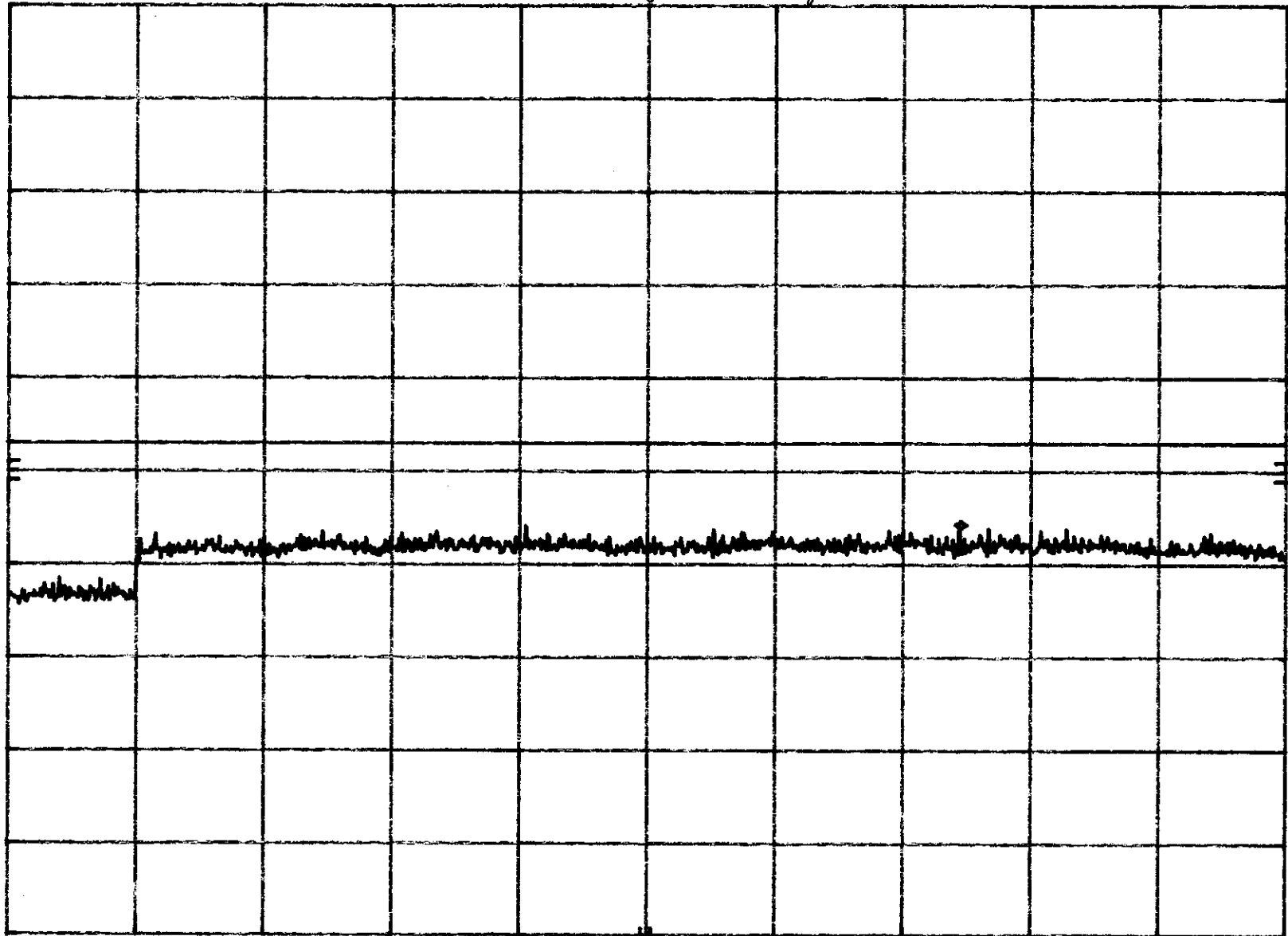
44.0

dB

DL

-13.0

dBm



START 12.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 17.00 GHz

SWP 1.00 sec 39

S9220

FCC Part 2, Paragraph 2.1051 and

Low Channel, 512

Wavecom

Part 24, Paragraph 24.238

5/25/99

MKR 17.395 0 GHz

hp

REF

35.0 dBm

ATTEN 0 dB

mary Washington

-21.10 dBm

10 dB/

POS PK

OFFSET

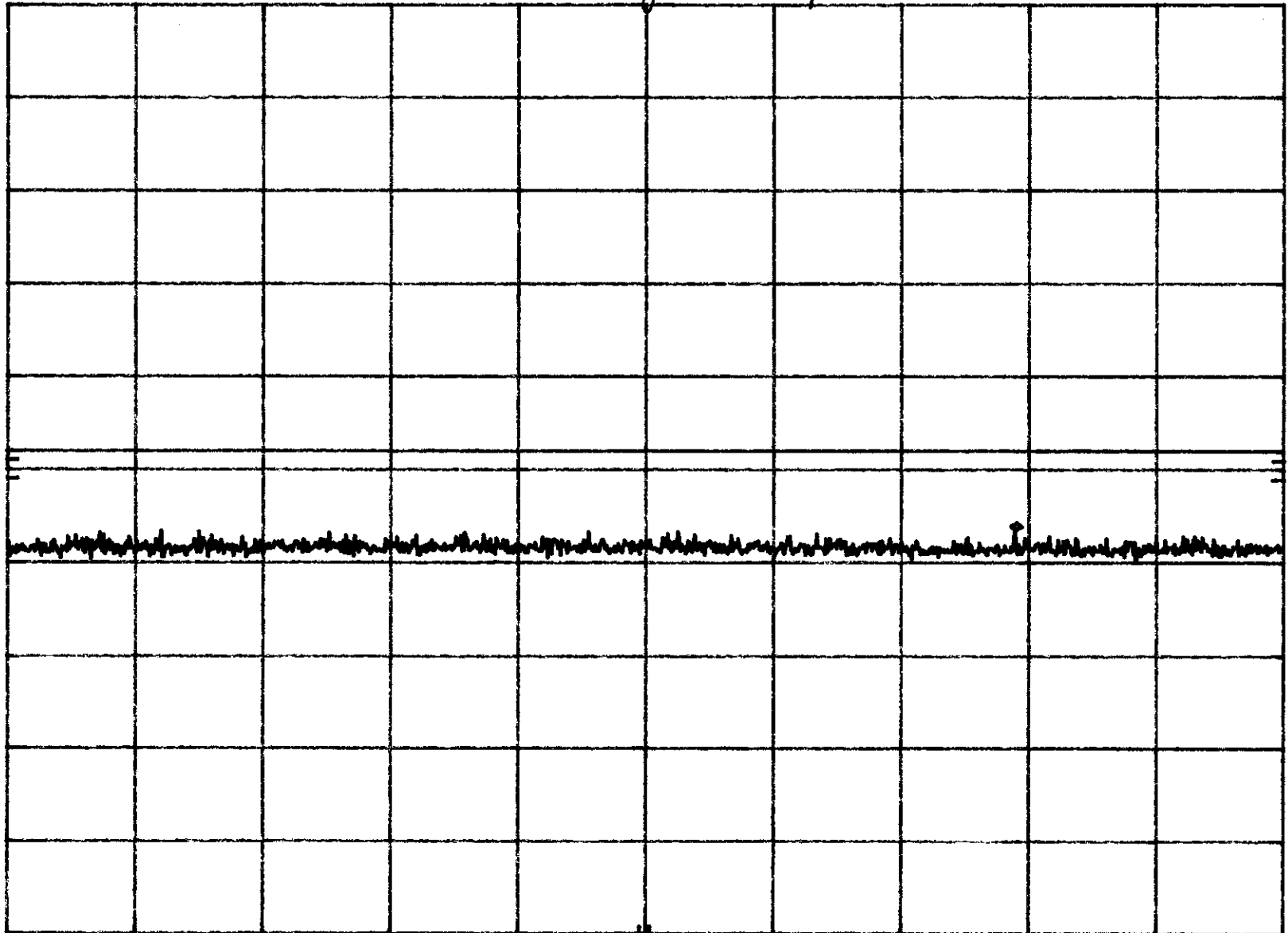
45.0

dB

DL

-13.0

dBm



START 17.000 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 17.500 GHz

SWP 1.00 sec 40

59220 FCC Part 2, Paragraph 2.1051 and
Wavecom Part 24, Paragraph 24.238

Low Channel, 512

5/25/99

MKR 18.858 GHz

-17.20 dBm

hp REF 36.0 dBm ATTN 0 dB Mary Washington

10 dB/

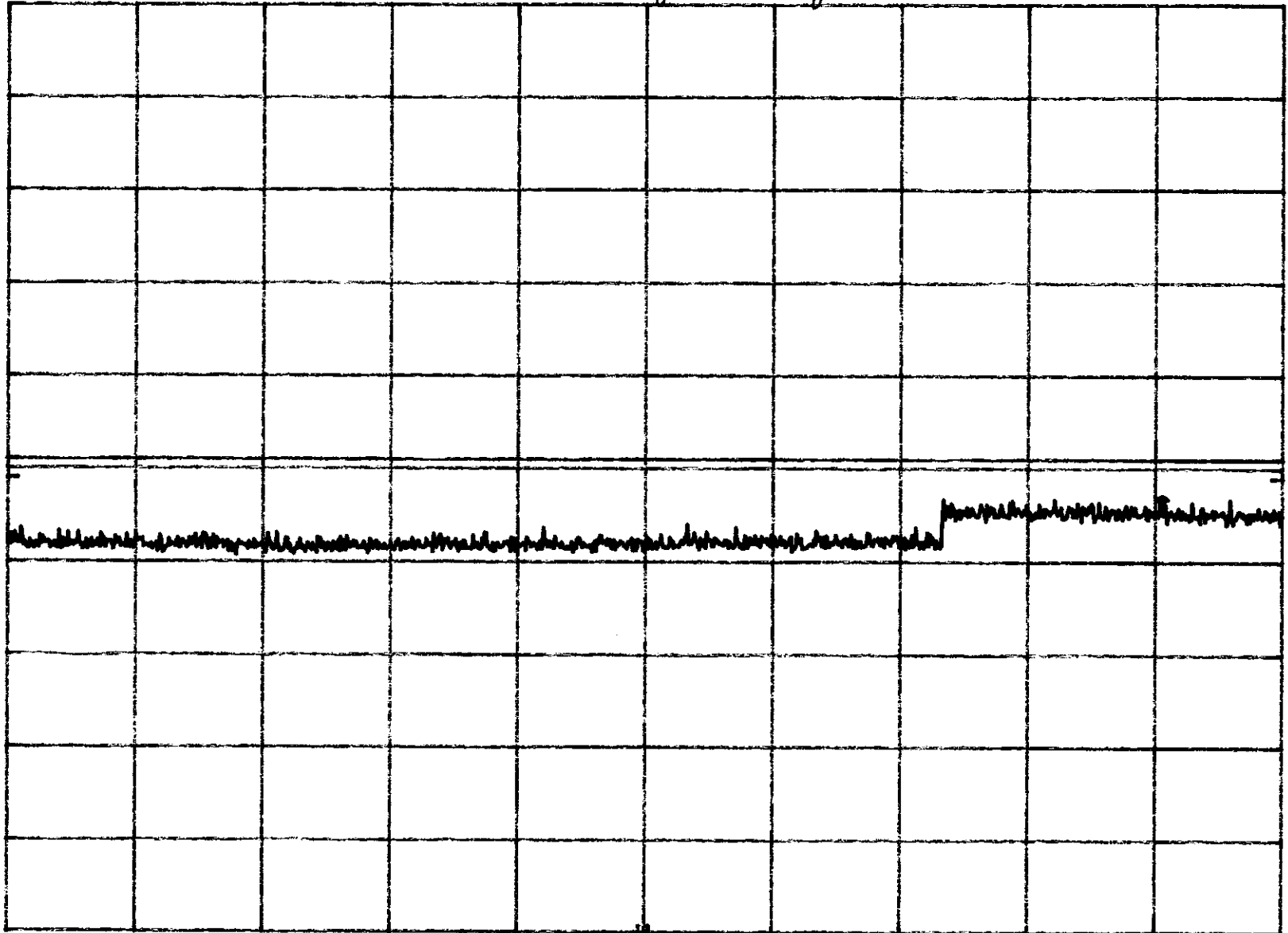
POS PK

OFFSET

46.0
dB

DL

-13.0
dBm



START 17.50 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 19.00 GHz

SWP 1.00 sec 41

S9220

Wavecom

30.2 dBm = 1.05 W

FCC Part 2, Paragraph

2.1046

Low channel, 512

5/13/99

MKR 1.850 10 GHz

30.20 dBm

HP

REF

61.8 dBm

ATTEN 30 dB many Washington

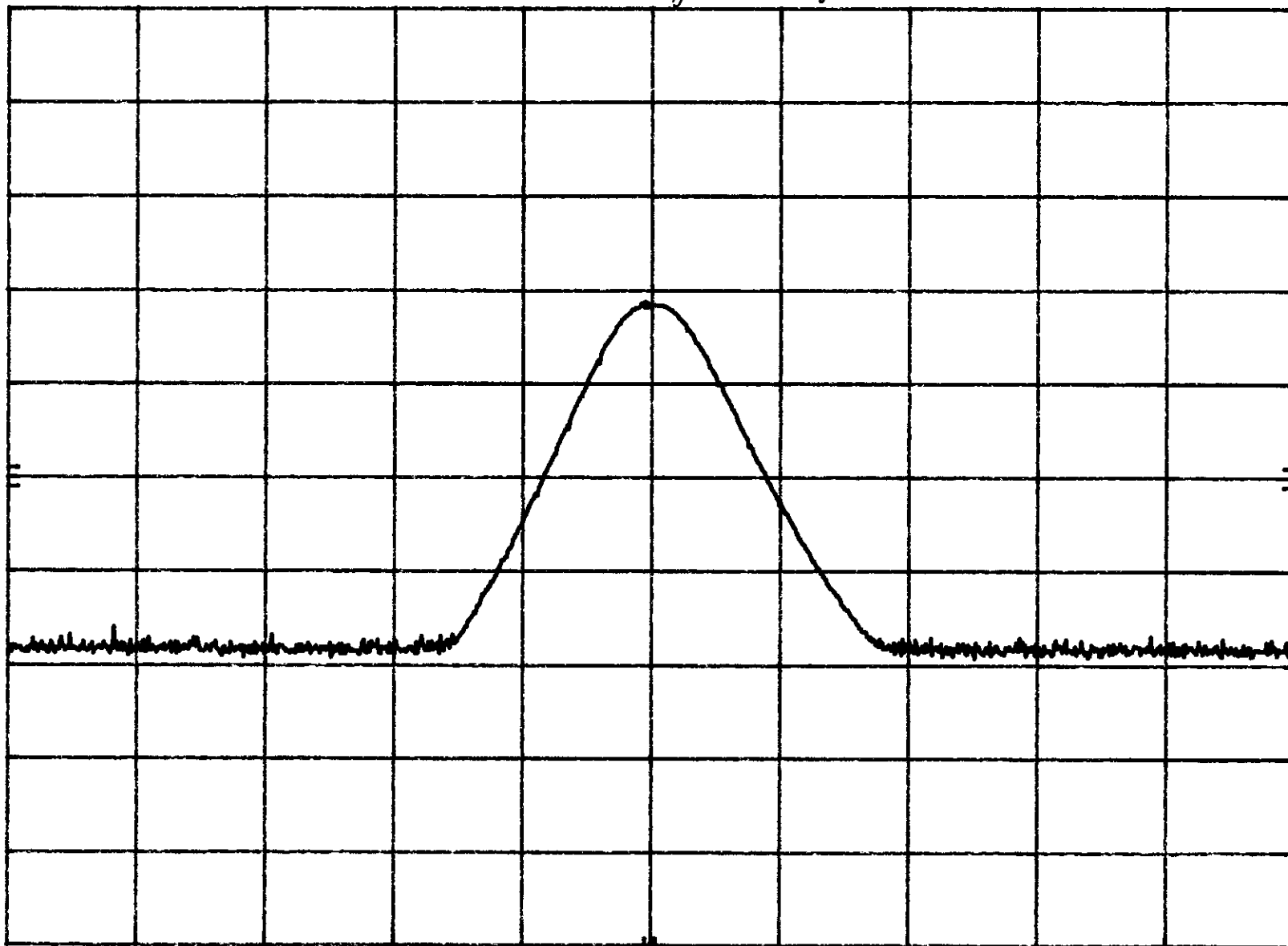
10 dB/

POS PK

OFFSET

41.8

dB



CENTER 1.850 2 GHz

RES BW 1 MHz

VBW 1 MHz

SPAN 20.0 MHz

SWP 5.00 sec 42

S9220
Wavecom

FCC Part 2, Paragraph 2.1046

Midchannel, 661
5/25/99

29.6 dBm = .91 W

MKR 1.879 92 GHz
29.60 dBm

hp

REF

61.2 dBm

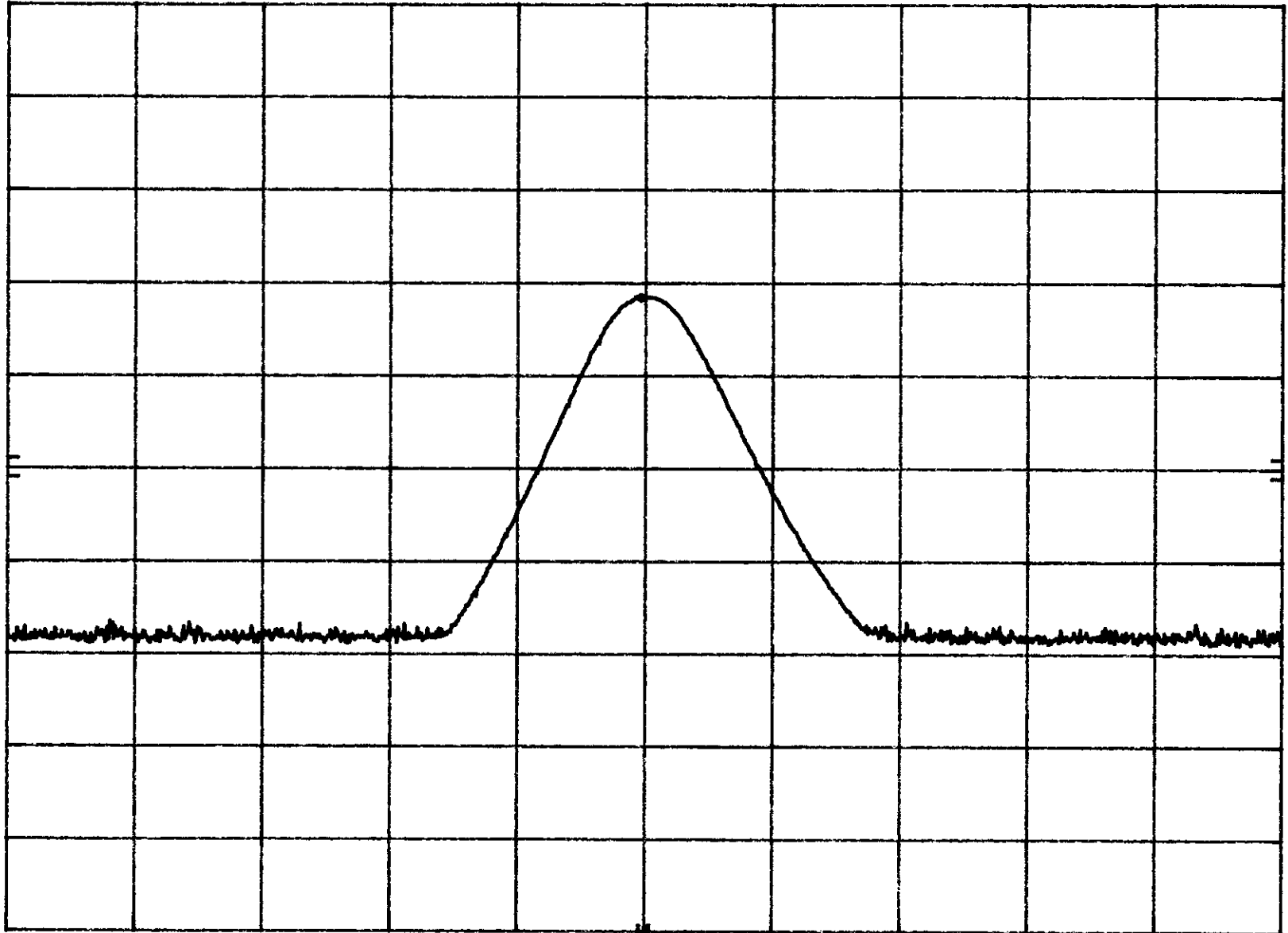
ATTEN 30 dB

10 dB/

POS PK

OFFSET

41.2
dB



CENTER 1.880 0 GHz

RES BW 1 MHz

VBW 1 MHz

SPAN 20.0 MHz

SWP 5.00 sec 43

S9220

Wavecom

29.1 dBm = 0.8W

FCC Part 2, Paragraph 2.1046

High Channel 1, 810

5/13/99

MKR 1.909 70 GHz

29.10 dBm

hp

REF

61.1 dBm

ATTEN 30 dB Mary Washington

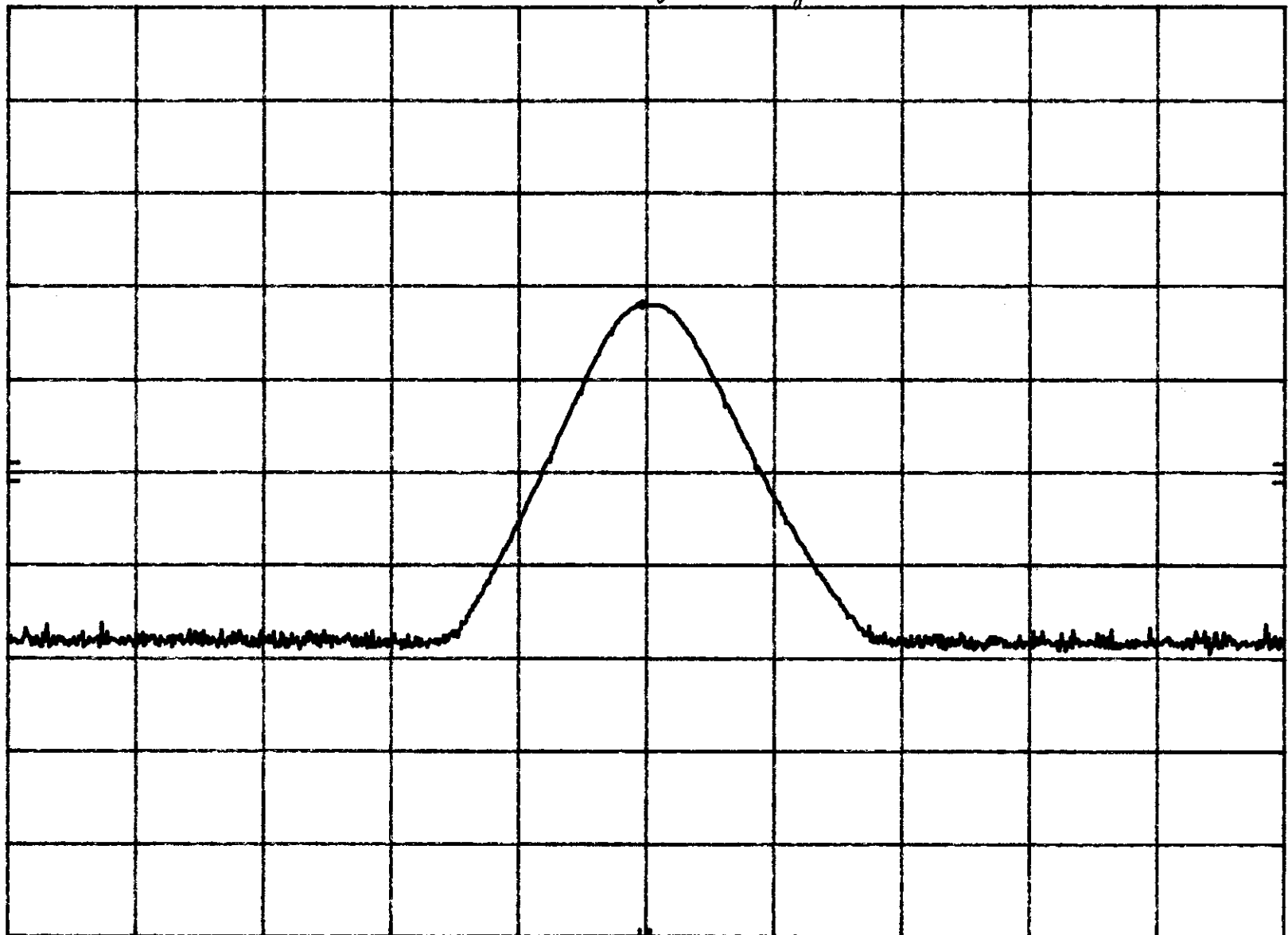
10 dB/

POS PK

OFFSET

41.1

dB



CENTER 1.909 7 GHz

RES BW 1 MHz

VBW 1 MHz

SPAN 20.0 MHz

SWP 5.00 sec

44

59220
Wavecom

FCC Part 2, Paragraph 2.1049 and
Part 24, Paragraph 24.238

Low channel, 512

5/13/99

MKR Δ 315 kHz
-0.10 dB

hp

REF 41.8 dBm

ATTEN 30 dB *mary Washington*

10 dB/

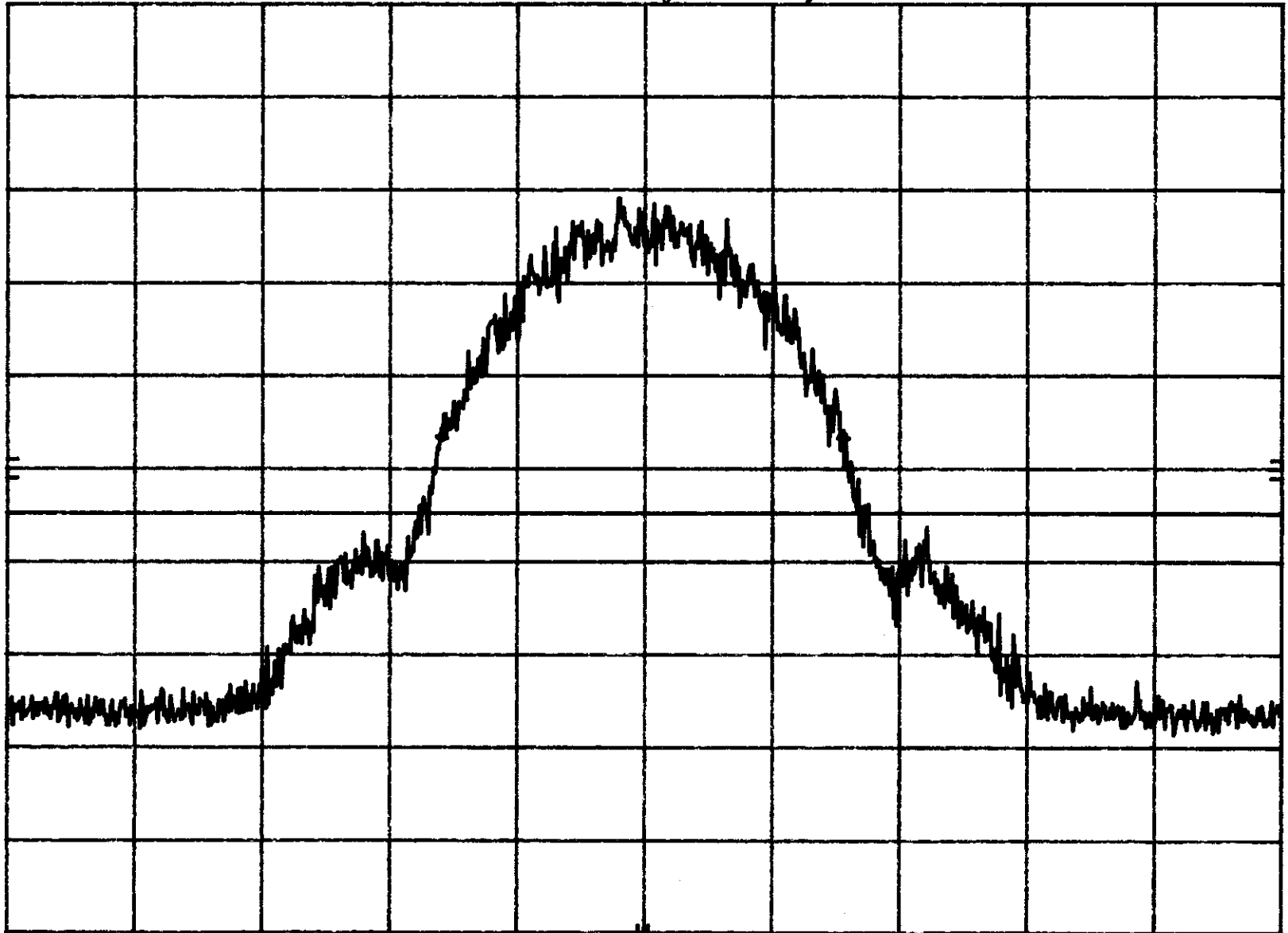
POS PK

OFFSET

41.8
dB

DL

-13.0
dBm



CENTER 1.850 20 GHz

RES BW 3 kHz

VBW 3 kHz

SPAN 1.00 MHz

SWP 5.00 sec 45

59220 FCC Part 2, Paragraph 2.1049 and
Wavecom Part 24, Paragraph 24.238

midchannel, 512
5/25/99

MKR Δ 330 KHz
0.00 dB

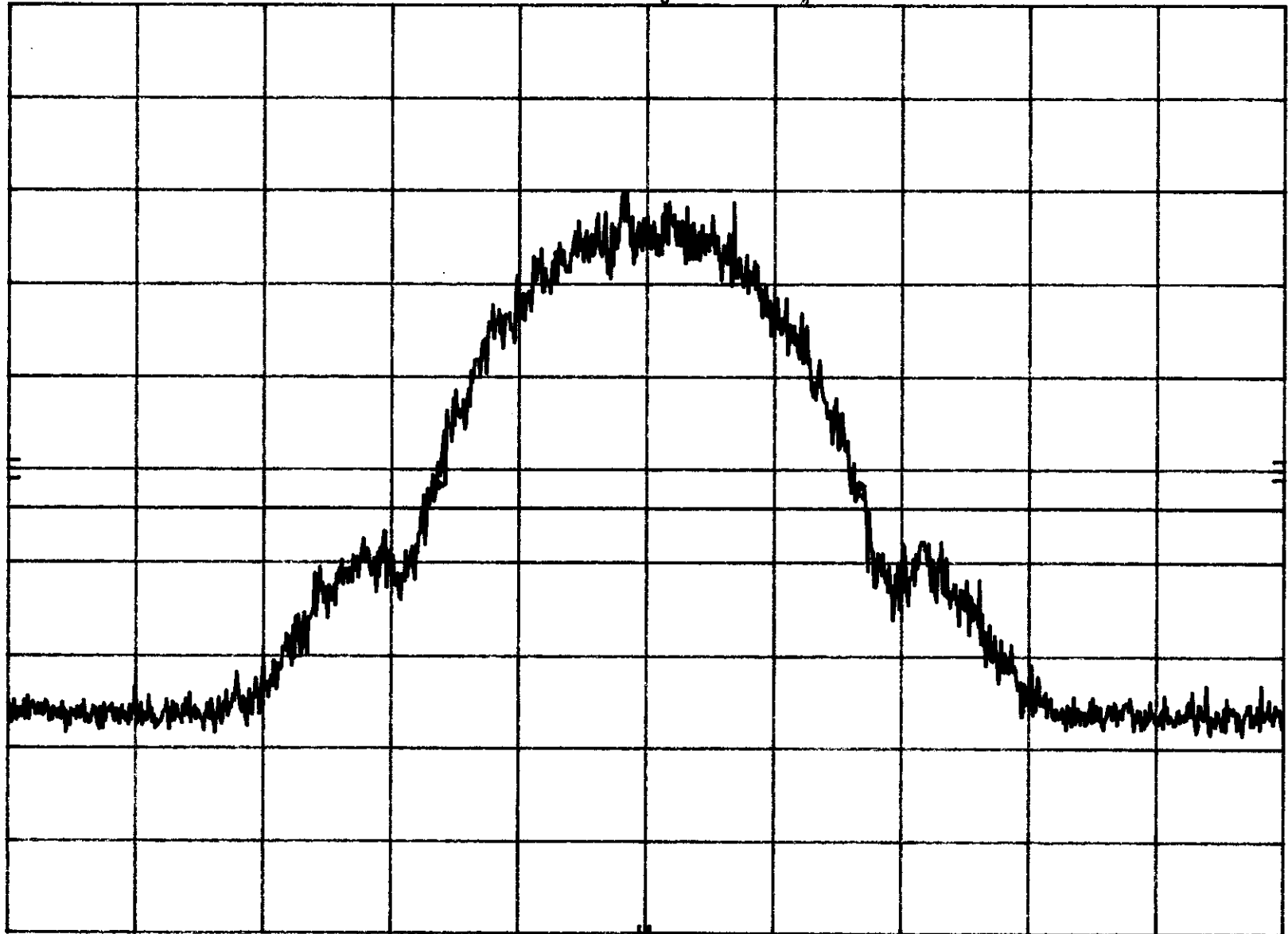
hp REF 41.2 dBm ATTN 30 dB mary washington

10 dB/

POS PK

OFFSET
41.2
dB

DL
-13.0
dBm



CENTER 1.880 00 GHz
RES BW 3 KHz

VBW 3 KHz

SPAN 1.00 MHz
SWP 5.00 sec 46

59220

FCC Part 2, Paragraph 2.1049 and

High channel, 810

Wavecom

Part 24, Paragraph 24.238

5/13/99

MKA Δ 288 kHz

hp REF

41.1 dBm

ATTEN 30 dB many Washington

-0.10 dB

10 dB/

POS PK

OFFSET

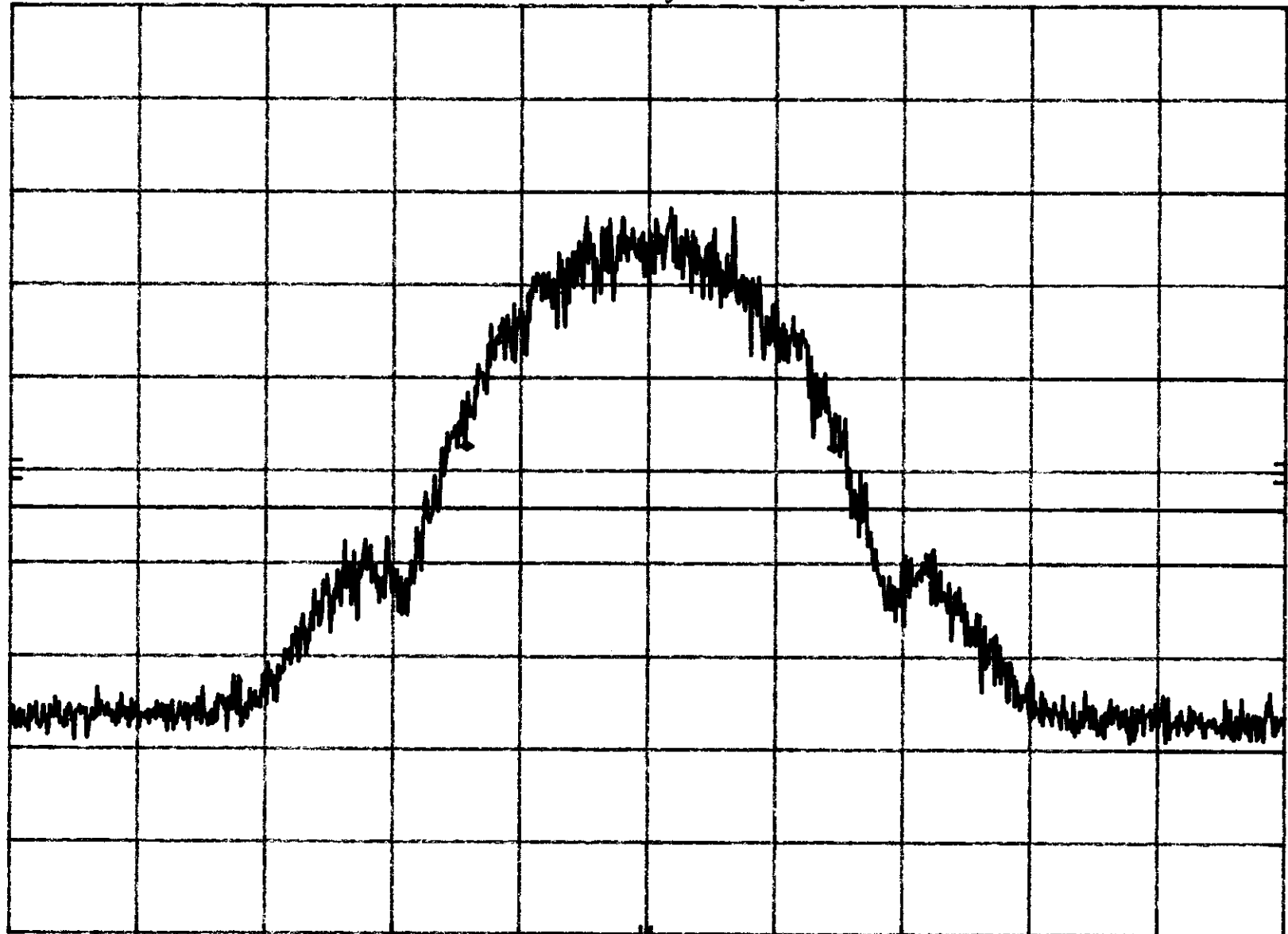
41.1

dB

DL

-13.0

dBm



CENTER 1.909 80 GHz

RES BW 3 kHz

VBW 3 kHz

SPAN 1.00 MHz

SWP 5.00 sec 47

59220

FCC Part 24, Paragraph 24.238

High Channel, 810

WaveCom

5/25/99

MKA 1.910 015 GHz

HP

REF

41.1 dBm

ATTEN 30 dB

marykushington

-15.10 dBm

10 dB/

POS PK

OFFSET

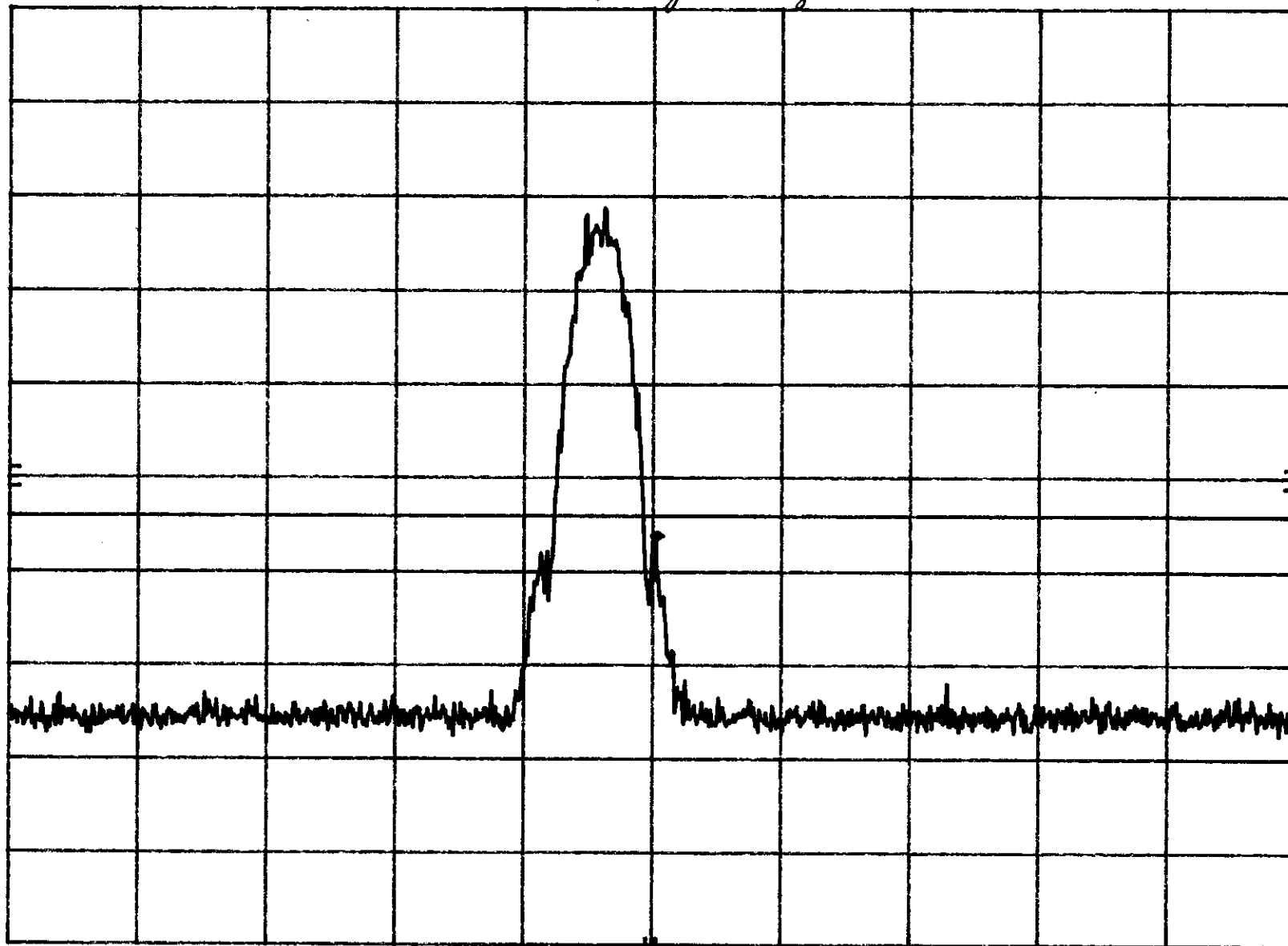
41.1

dB

DL

-13.0

dBm



CENTER 1.910 00 GHz

RES BW 3 KHz

VBW 3 KHz

SPAN 5.00 MHz

SWP 2.00 sec 48

59220

FCC Part 24, Paragraph 24.238

High channel, 810

Wavecom

5/25/99

MKR 1.909 597 GHz

-14.00 dBm

HP

REF

41.1 dBm

ATTEN 30 dB

many Washington

10 dB/

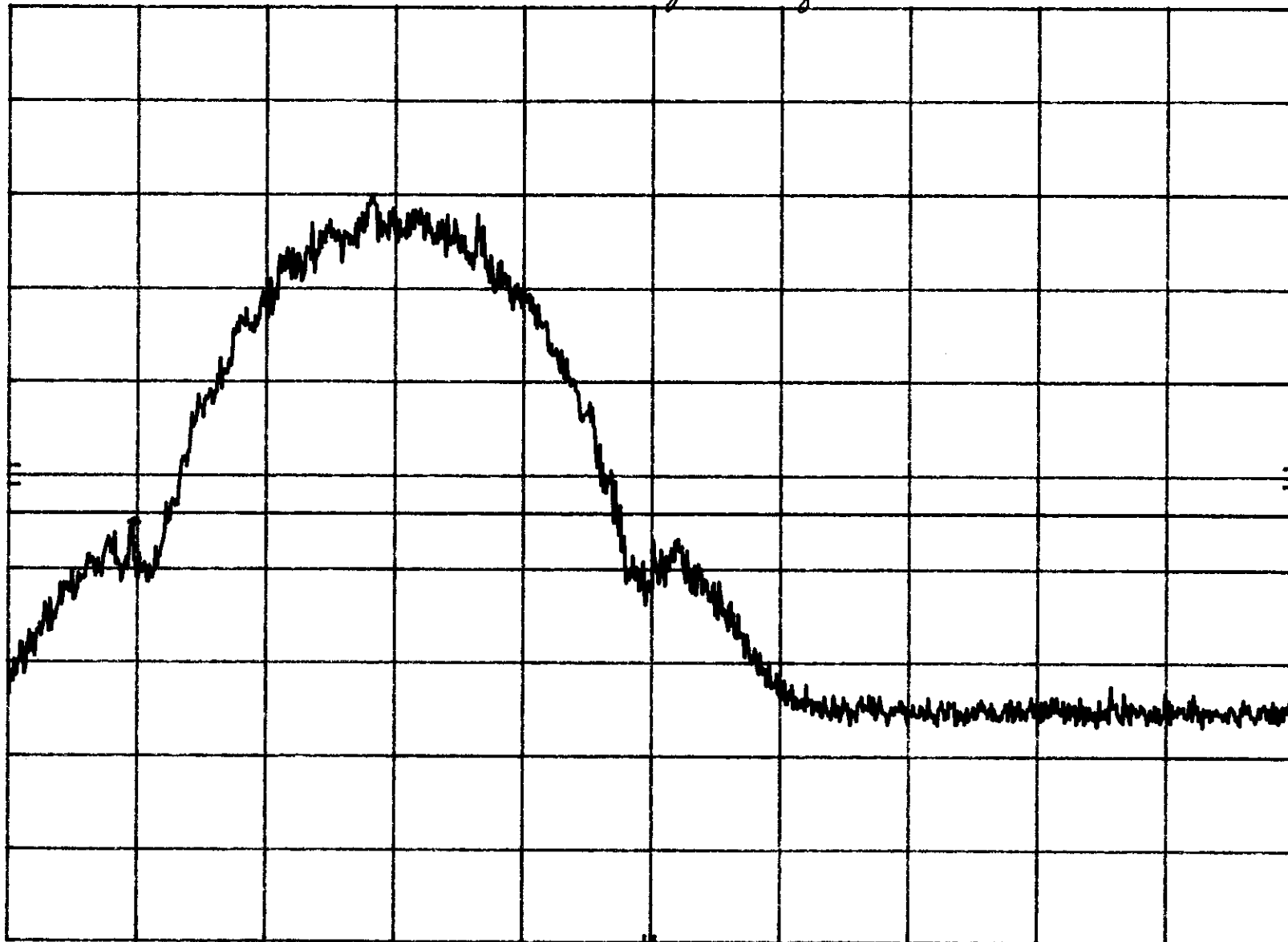
POS PK

OFFSET

41.1
dB

DL

-13.0
dBm



CENTER 1.910 00 GHz

RES BW 3 KHz

VBW 3 KHz

SPAN 1.00 MHz

SWP 6.00 sec 49

S9220
Wavecom

FCC Port 24, Paragraph 24.23P

Highchannel, 810

5/25/99

MKR 1.909 574 GHz
-16.50 dBm

HP

REF

41.1 dBm

ATTEN 30 dB Mary Washington

10 dB/

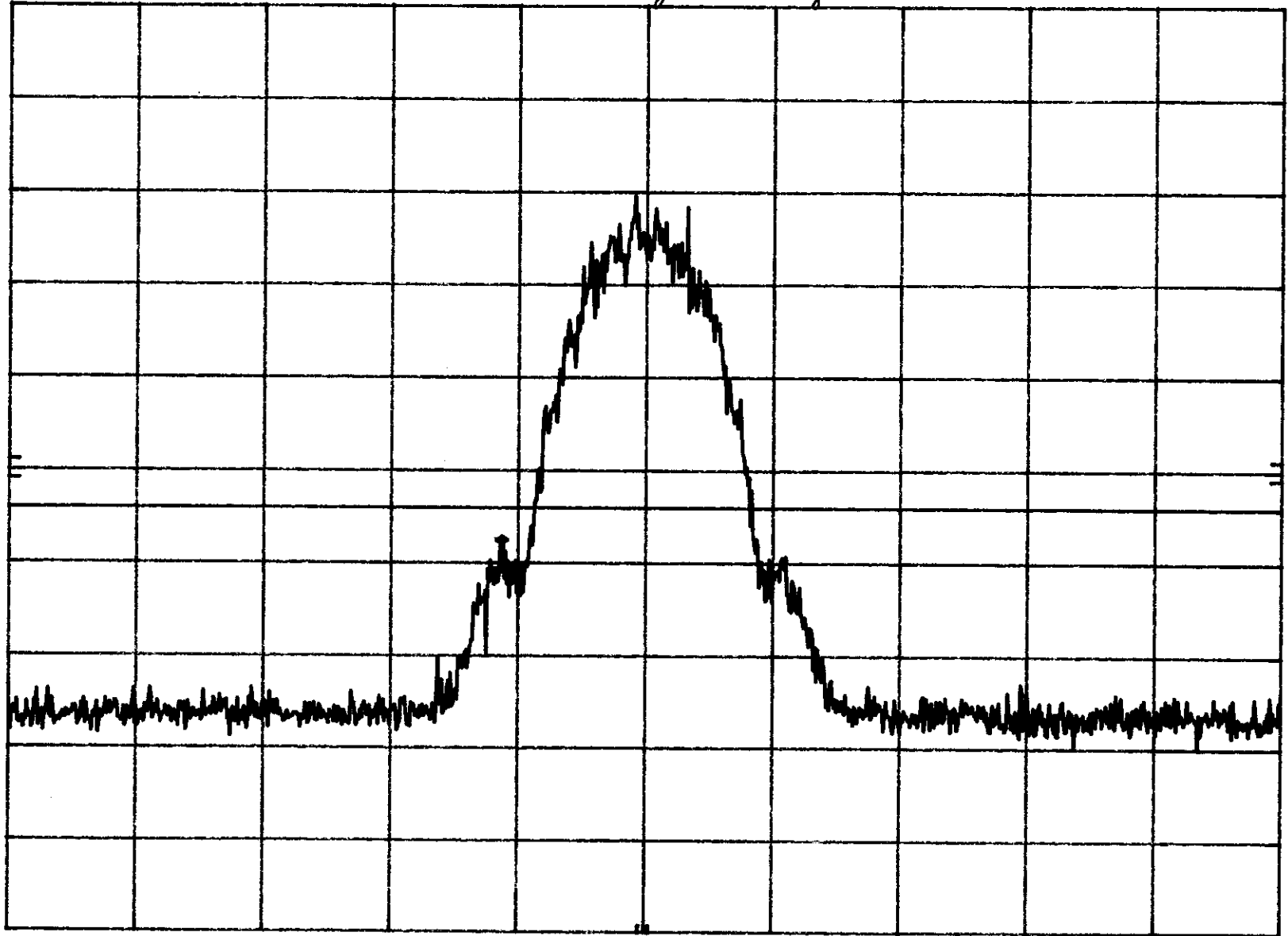
POS PK

OFFSET

41.1
dB

DL

-13.0
dBm



CENTER 1.909 574 GHz

RES BW 3 KHz

VBW 3 KHz

SPAN 2.00 MHz

SWP 6.00 sec 50

59220

FCC Part 24, Paragraph 24.238

High channel, 810

5/25/99

MKR 1.912 729 GHz
-33.90 dBm

Wavecom

hp

REF

31.1 dBm

ATTEN 0 dB

many Washington

10 dB/

POS PK

OFFSET

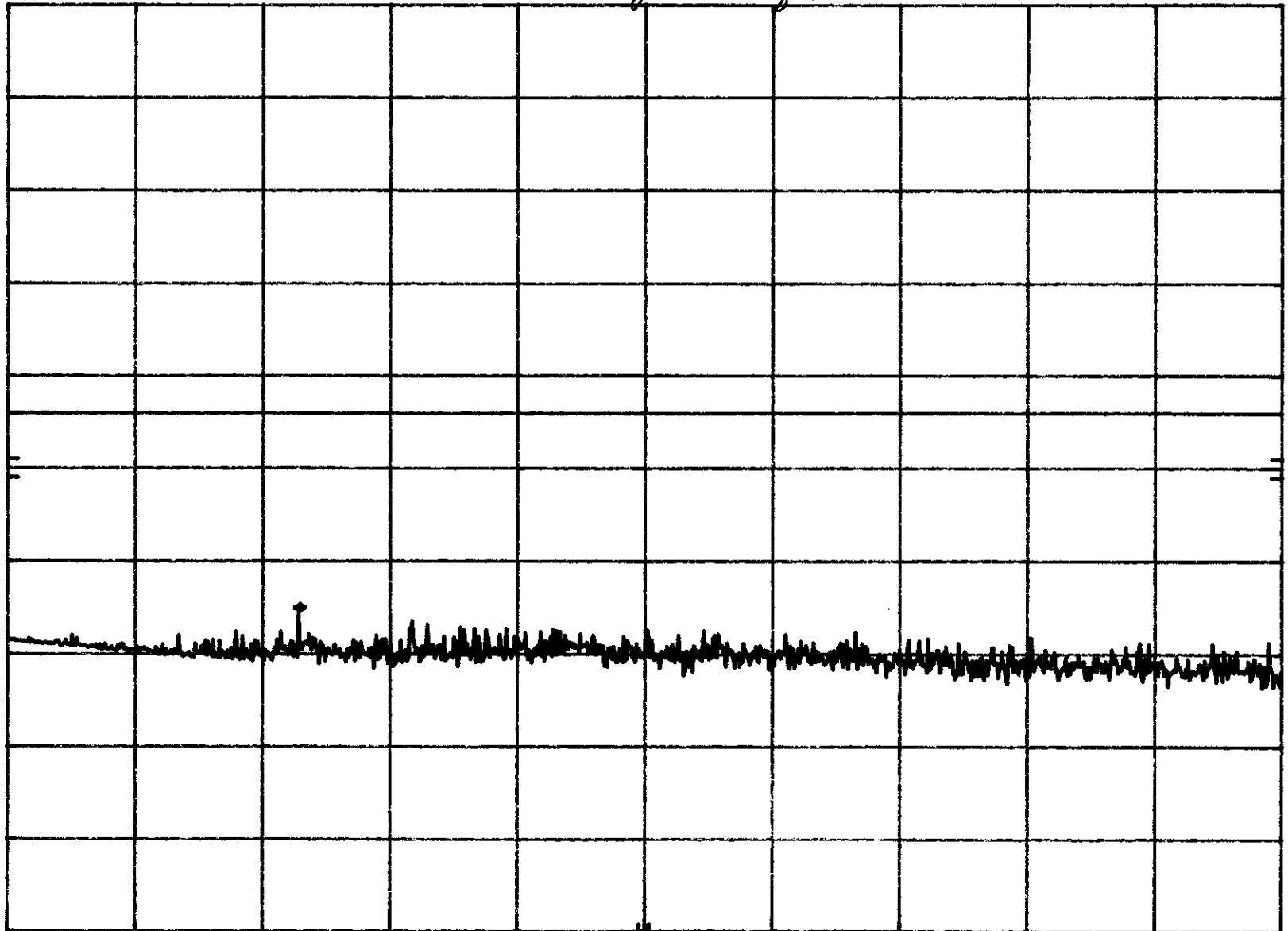
41.1

dB

DL

-13.0

dBm



START 1.912 50 GHz

RES BW 300 KHz

VBW 300 KHz

STOP 1.913 50 GHz

SWP 20.0 msec 51

S9220

FCC Part 24, Paragraph 24.23d

High channel, 810

Wavecom

5/25/99

MKR 1.913 942 GHz

-37.00 dBm

hp

REF

31.1 dBm

ATTEN 0 dB

mary washington

10 dB/

POS PK

OFFSET

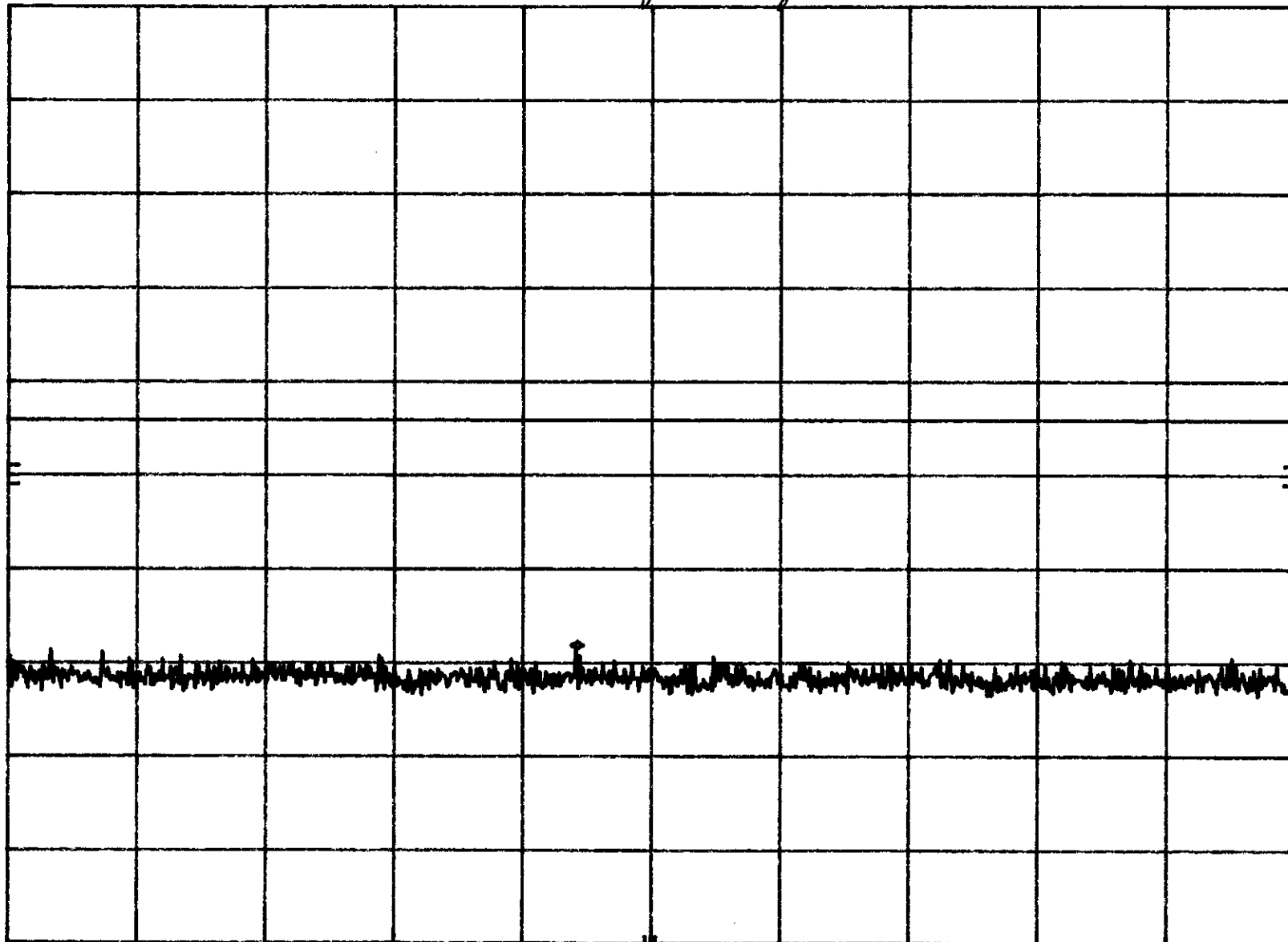
41.1

dB

DL

-13.0

dBm



START 1.913 50 GHz

RES BW 300 KHz

VBW 300 KHz

STOP 1.914 50 GHz

SWP 20.0 msec 52

59220 FCC Part 24, Paragraph 24.238

High channel, 810

5/25/99

Wavecom

MKR 1.915 249 GHz

-38.10 dBm

hp

REF

31.1 dBm

ATTEN 0 dB Mary Washington

10 dB/

POS PK

OFFSET

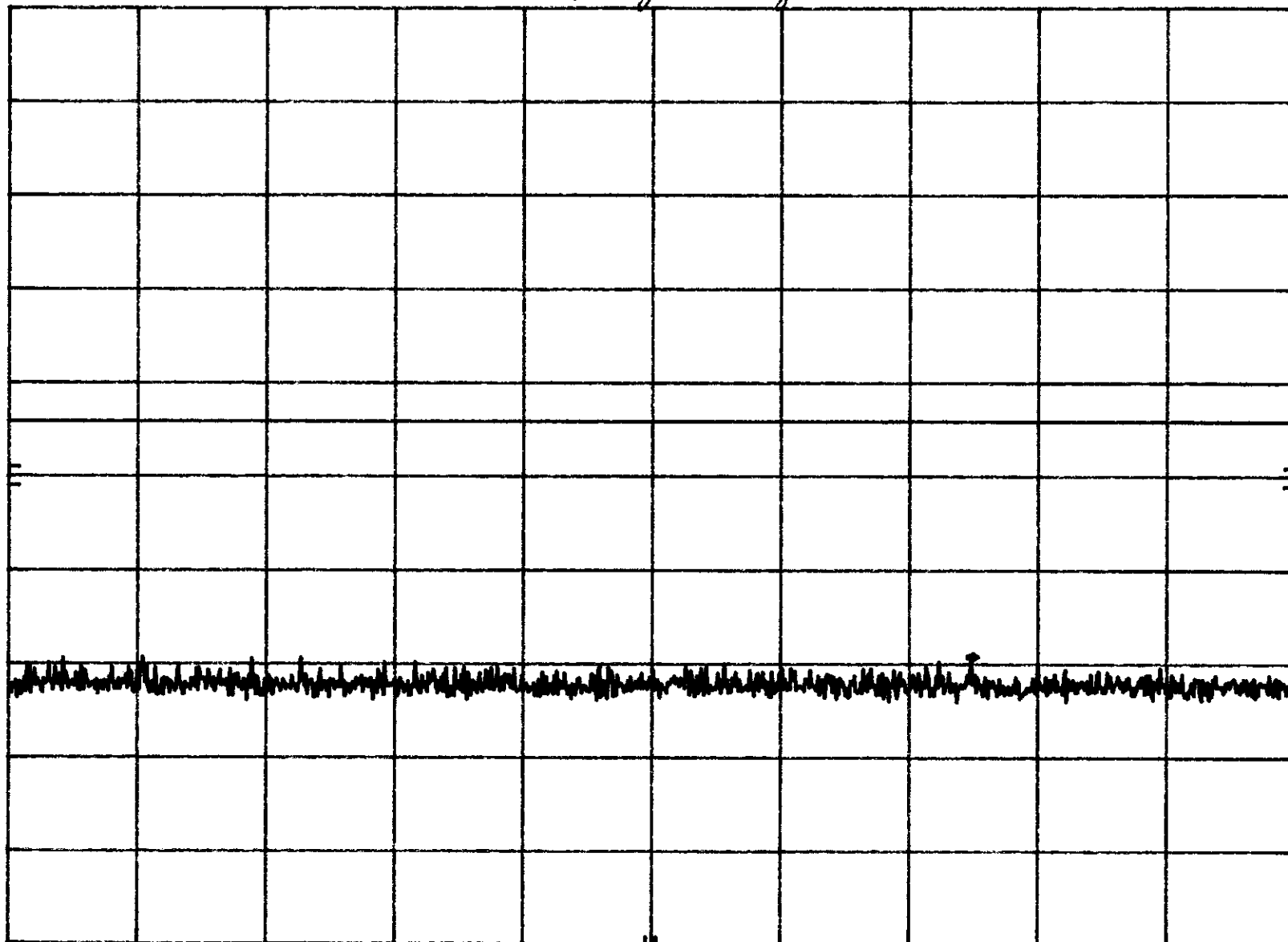
41.1

dB

DL

-13.0

dBm



START 1.914 50 GHz

RES BW 300 kHz

VBW 300 kHz

STOP 1.915 50 GHz

SWP 20.0 msec 53

59220

FCE Part 24, Paragraph 24.238

High channel, 810

Wavecom

5/25/99

MKR 1.916 448 GHz

-37.60 dBm

hp

REF 31.1 dBm

ATTEN 0 dB *mary washington*

10 dB/

POS PK

OFFSET

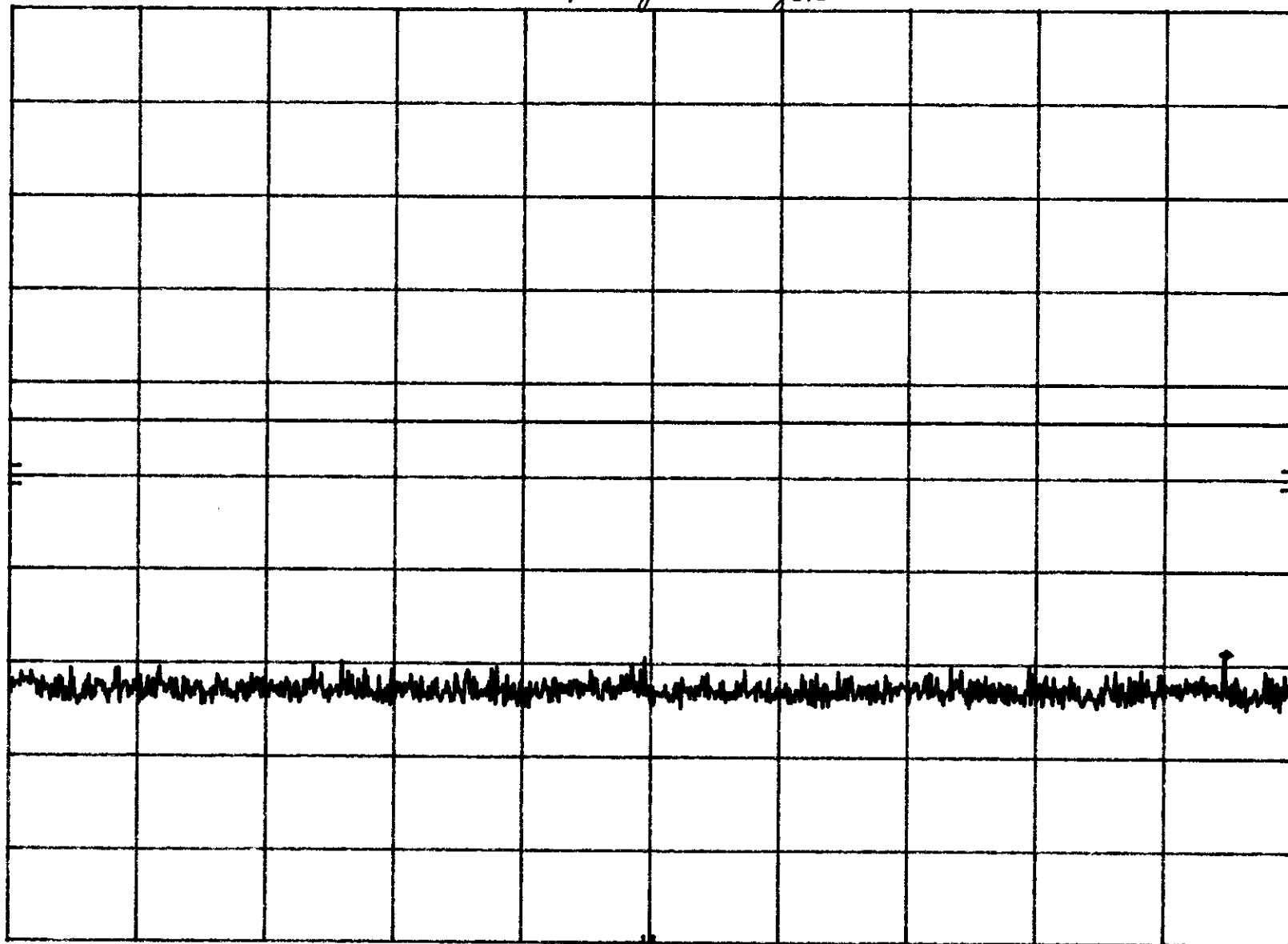
41.1

dB

DL

-13.0

dBm



START 1.915 50 GHz

RES BW 300 KHz

VBW 300 KHz

STOP 1.916 50 GHz

SWP 20.0 msec 54

S9220

FCC Part 24, Paragraph 24.238

High channel, 810

Wavecom

5/25/99

MKR 1.910 020 GHz

-16.00 dBm

hp

REF

31.1 dBm

ATTEN 0 dB

mary Washington

10 dB/

POS PK

OFFSET

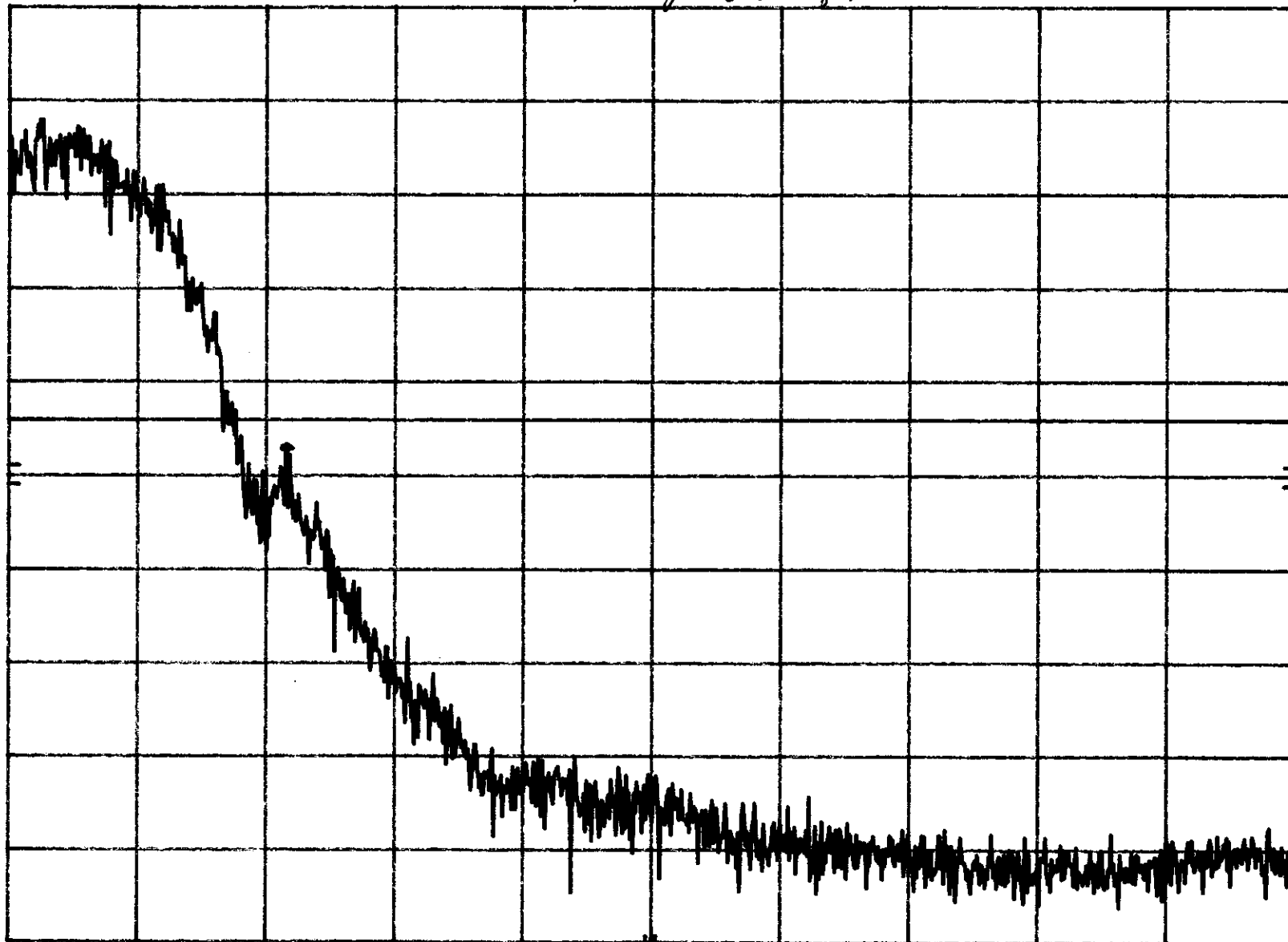
41.1

dB

DL

-13.0

dBm



START 1.909 75 GHz

RES BW 3 KHz

VBW 3 KHz

STOP 1.911 00 GHz

SWP 2.00 sec 55

5/25 High ch, 810

59220 FCC Part 24, Paragraph 24.238

Low Channel, 5/2

5/25/99

MKR 1.849 981 GHz

-14.80 dBm

Wavecom

REF

41.8 dBm

ATTEN 30 dB many ushington

hp

10 dB/

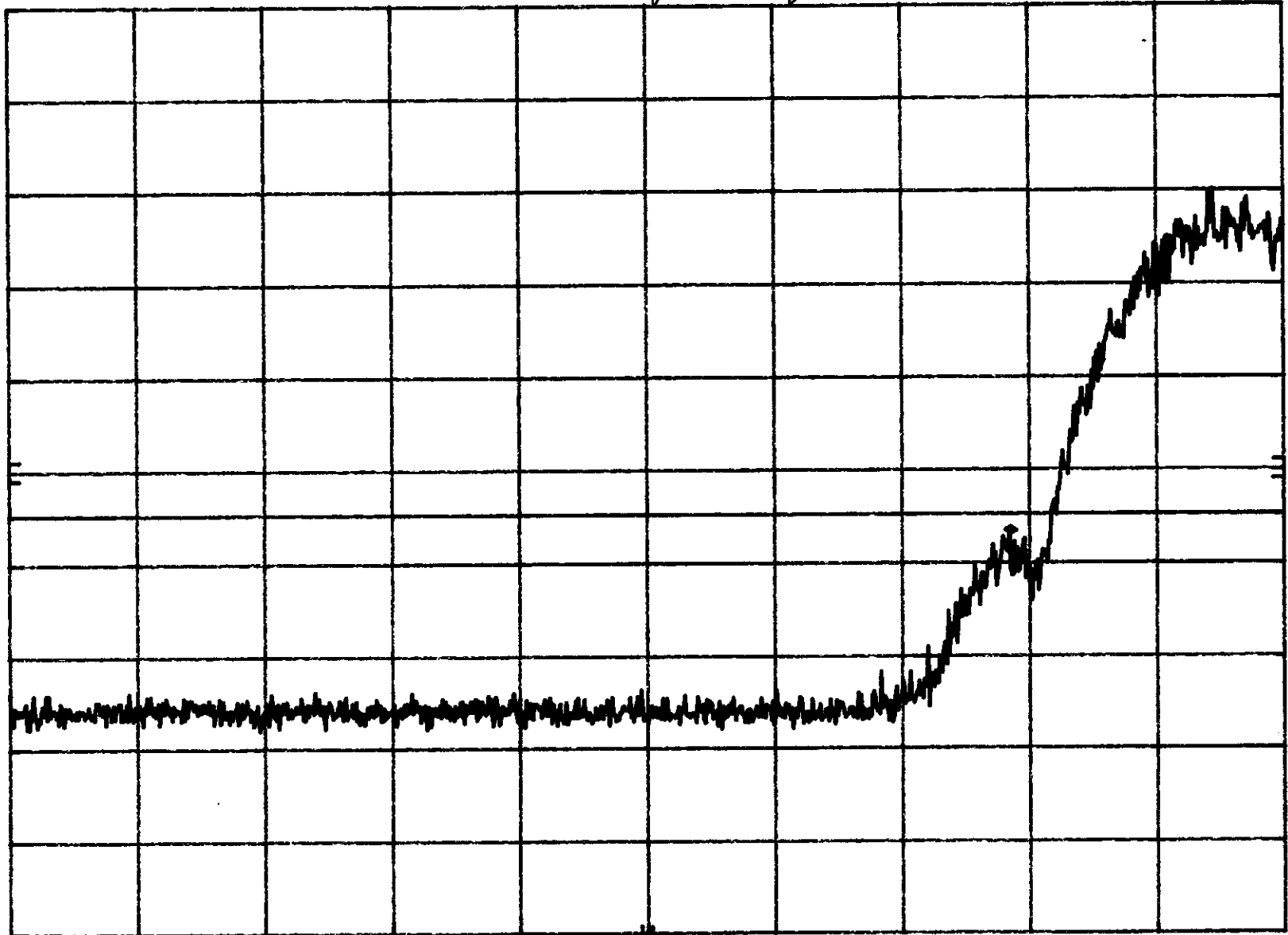
POS PK

OFFSET

41.8
dB

DL

-13.0
dBm



START 1.849 00 GHz

RES BW 3 KHz

VBW 3 KHz

STOP 1.850 25 GHz

SWP 6.00 sec 56

S9220 FCC Part 24, Paragraph 24.238

Low Channel, 5/2

5/25/99

Wavecom

MKR 1.850 405 GHz
-15.90 dBm

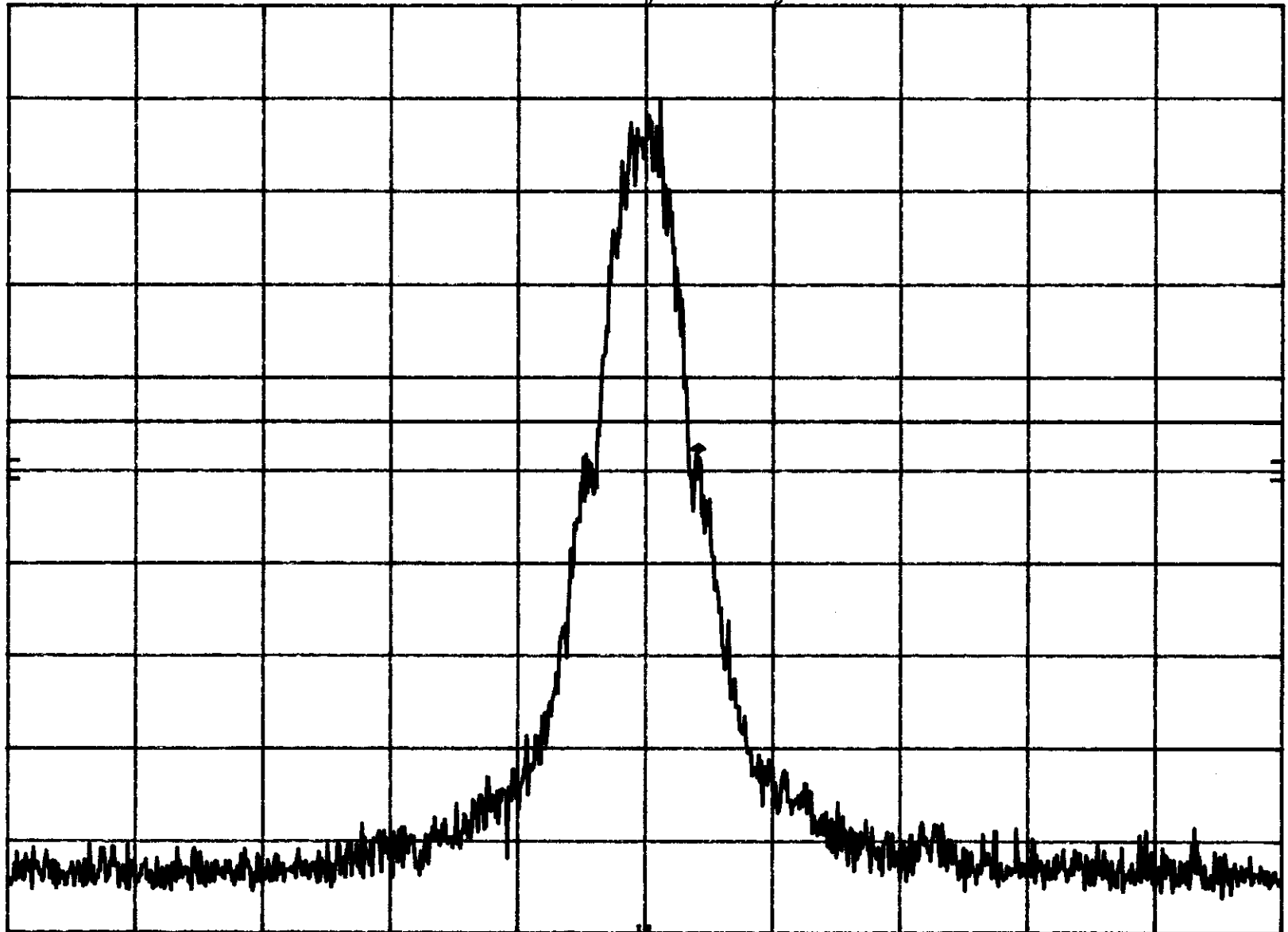
hp REF 31.8 dBm ATTN 0 dB many Washington

10 dB/

POS PK

OFFSET
41.8
dB

DL
-13.0
dBm



CENTER 1.850 20 GHz
RES BW 3 KHz

VBW 3 KHz

SPAN 5.00 MHz
SWP 2.00 sec 51

S9220 FCC Part 24, Paragraph 24.238

Low Channel, 512

Wavecomm

5/25/99

MKR 1.850 420 GHz

-14.60 dBm

hp

REF 31.8 dBm

ATTEN 0 dB Mary Washington

10 dB/

POS PK

OFFSET

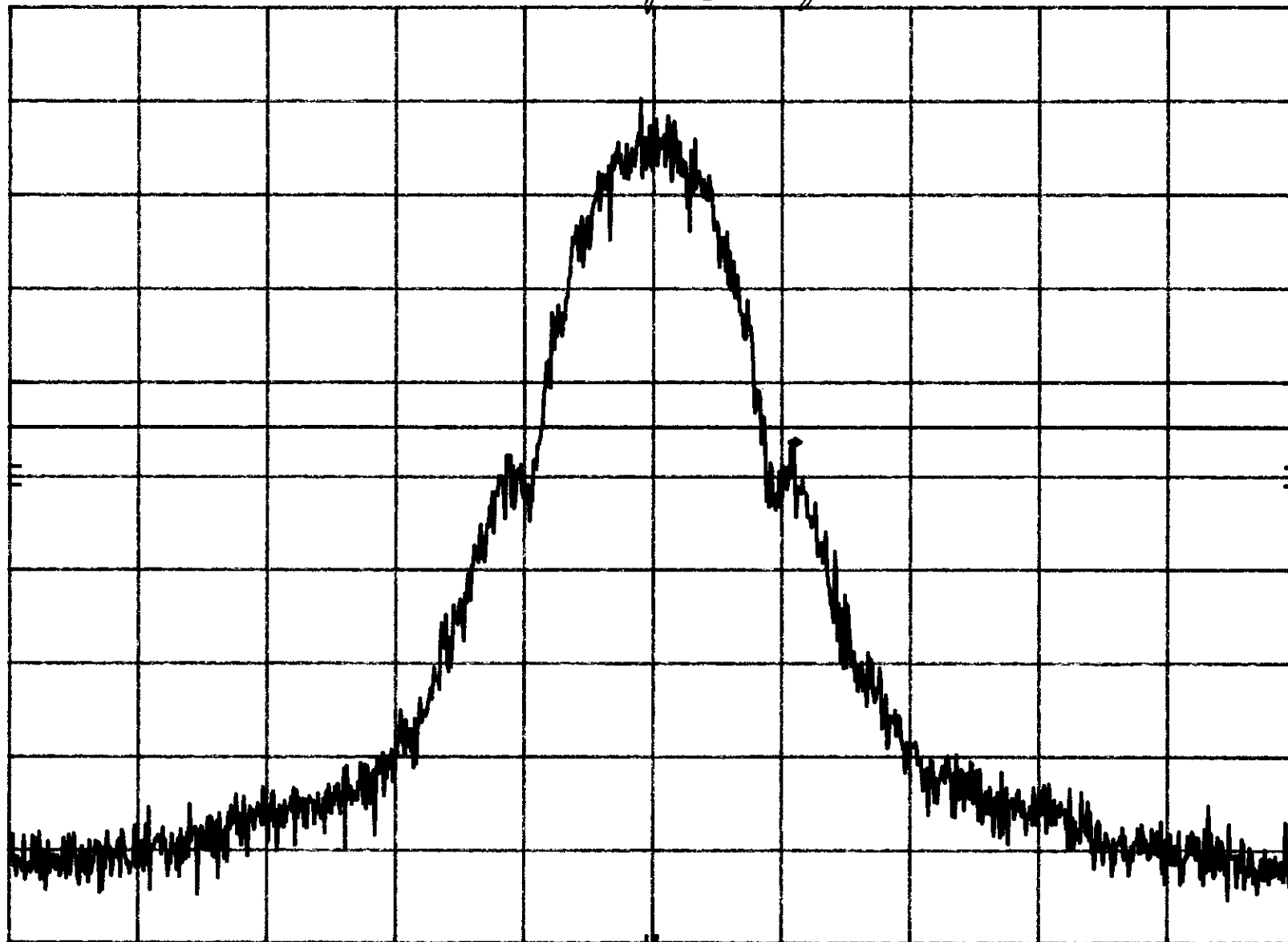
41.8

dB

DL

-13.0

dBm



CENTER 1.850 20 GHz

RES BW 3 KHz

VBW 3 KHz

SPAN 2.00 MHz

SWP 2.00 sec 58

S9220

FCC Part 24, Paragraph 24.238

Low channel, 512

Wavecom

5/25/99

MKR 1.847 174 GHz

hp REF 31.8 dBm ATTN 0 dB Mary Washington

-36.30 dBm

10 dB/

POS PK

OFFSET

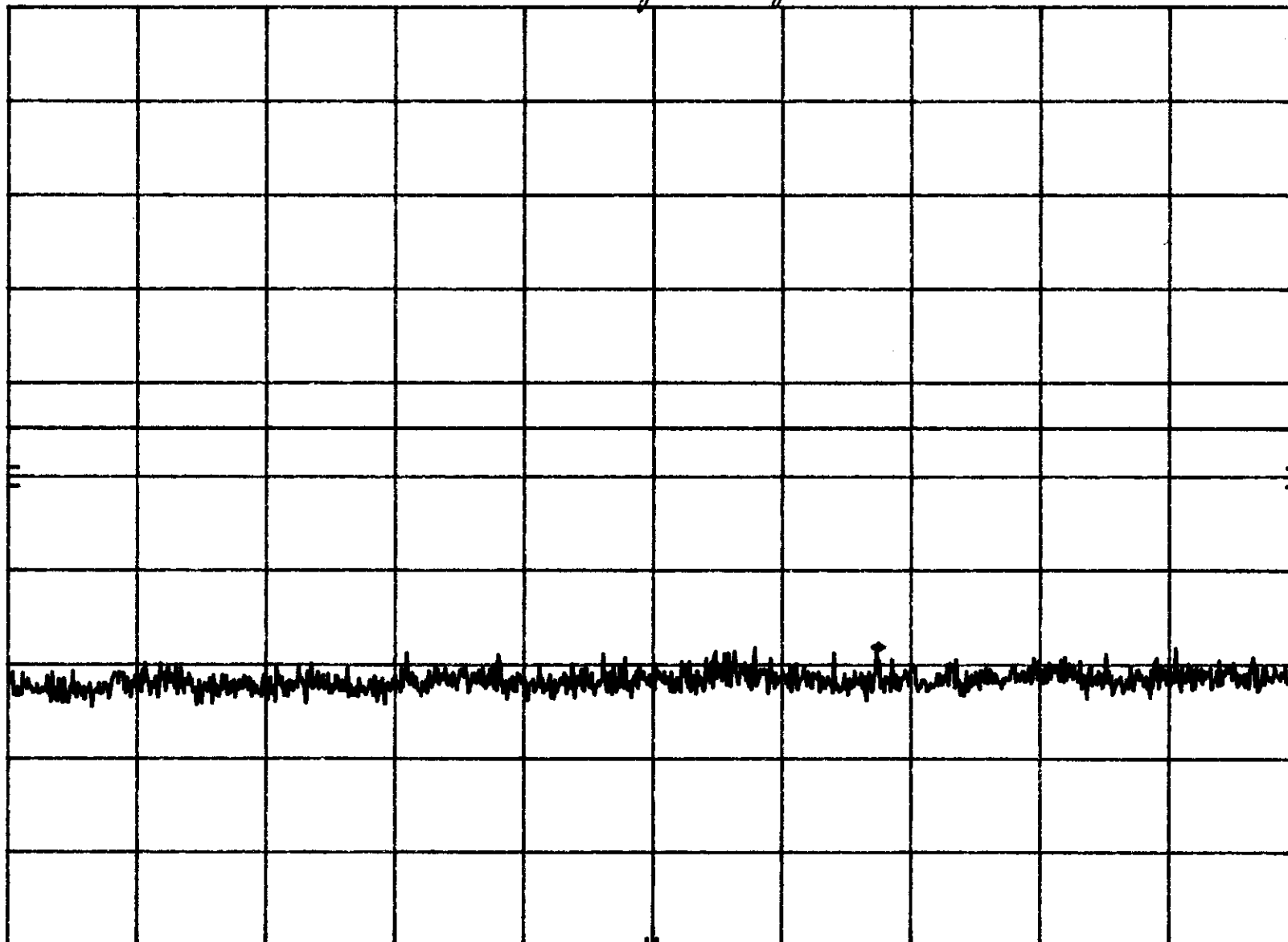
41.8

dB

DL

-13.0

dBm



START 1.846 50 GHz

RES BW 300 KHz

VBW 300 KHz

STOP 1.847 50 GHz

SWP 20.0 msec 59

S9220

FCC Part 24, Paragraph 24.238

Low channel, 512

5/25/99

Wavecom

MKR 1.846 453 GHz

-36.00 dBm

hp

REF 31.8 dBm

ATTEN 0 dB Mary Washington

10 dB/

POS PK

OFFSET

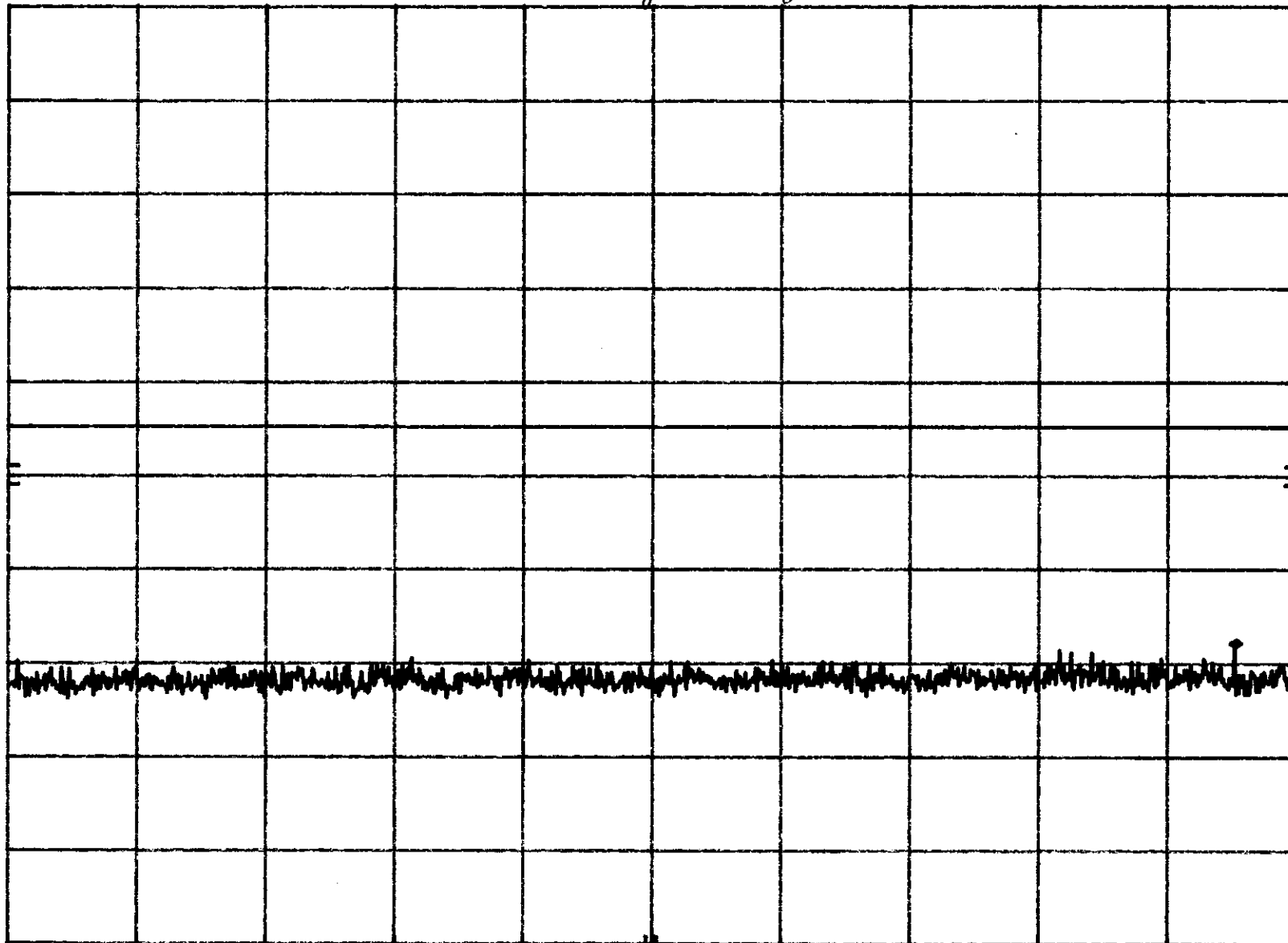
41.8

dB

DL

-13.0

dBm



START 1.845 50 GHz

RES BW 300 kHz

VBW 300 kHz

STOP 1.846 50 GHz

SWP 20.0 msec 60

S9220

FCC Part 24, Paragraph 24.238

Low Channel, 512

Wavecom

5/25/99

MKR 1.844 889 GHz

-37.80 dBm

hp

REF

31.8 dBm

ATTEN

0 dB

many Washington

10 dB/

POS PK

OFFSET

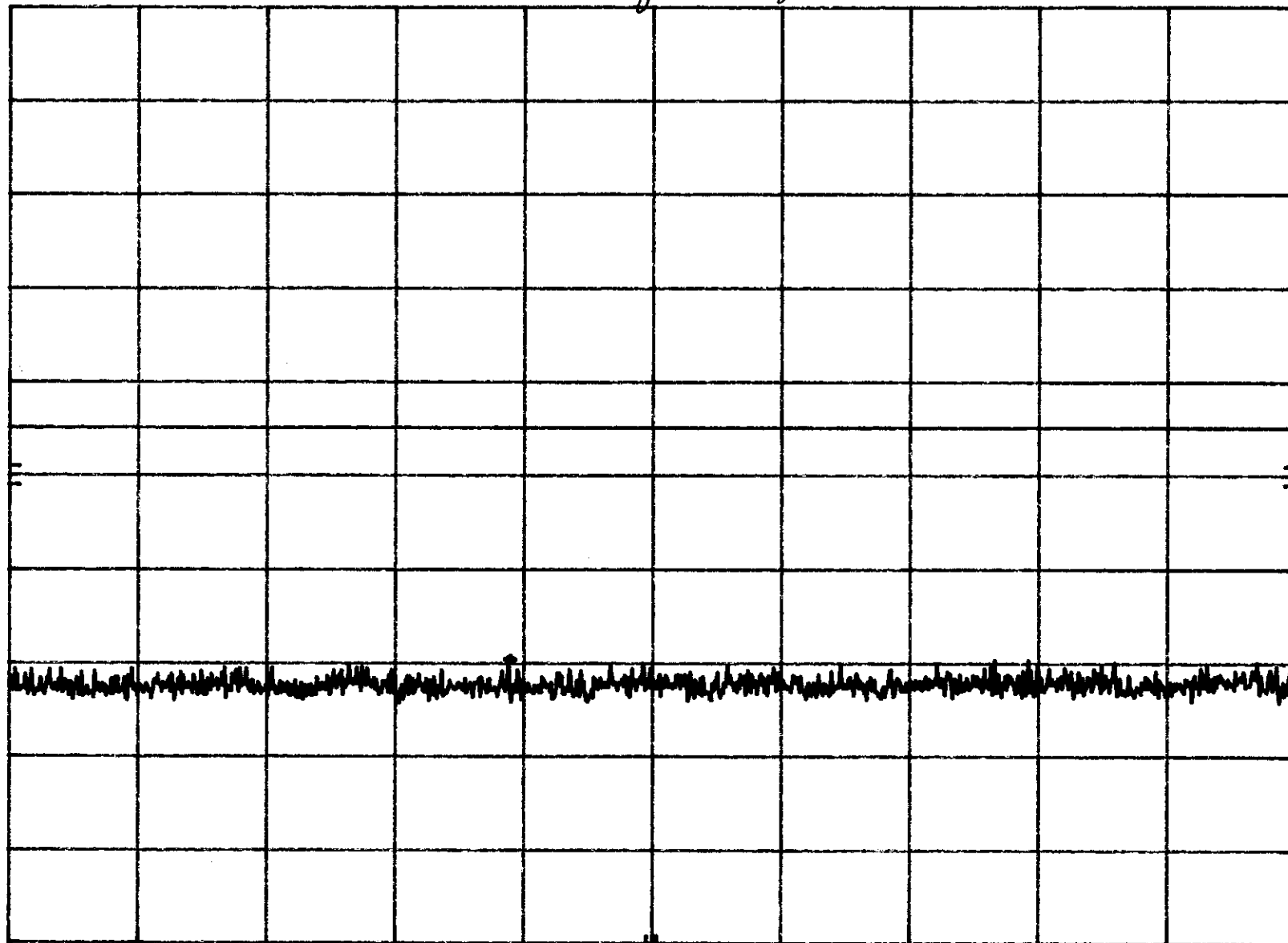
41.8

dB

DL

-13.0

dBm



START 1.844 50 GHz

RES BW 300 kHz

VBW 300 kHz

STOP 1.845 50 GHz

SWP 20.0 msec 61

S9220

FCC Part 24, Paragraph 24.238

Low channel, 512

Wavecom

5/25/99

MKR 1.844 401 GHz

-37.10 dBm

HP

REF

31.8 dBm

ATTEN 0 dB Mary Washington

10 dB/

POS PK

OFFSET

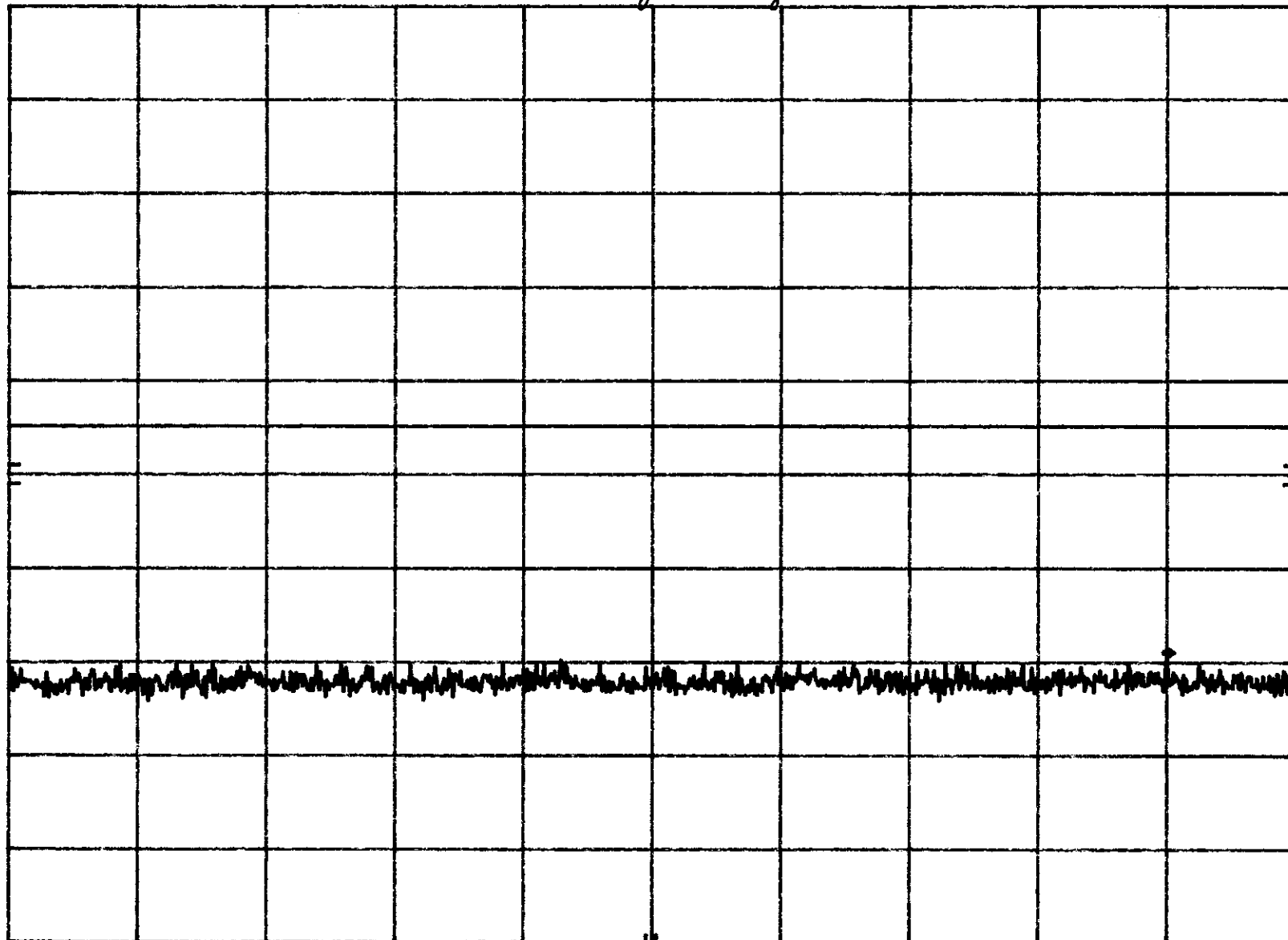
41.8

dB

DL

-13.0

dBm



START 1.843 50 GHz

RES BW 300 kHz

VBW 300 kHz

STOP 1.844 50 GHz

SWP 20.0 msec 62

5 FREQUENCY STABILITY EQUIPMENT/DATA

Wavecom GSM1900 Modem

See following page(s).

Emissions Test Conditions: FREQUENCY STABILITY, FCC Part 2, Paragraph 2.1055 and Part 24, Paragraph 24.238

The *RADIATED EMISSIONS* measurements were performed at the following test location :

☐ - Test not applicable

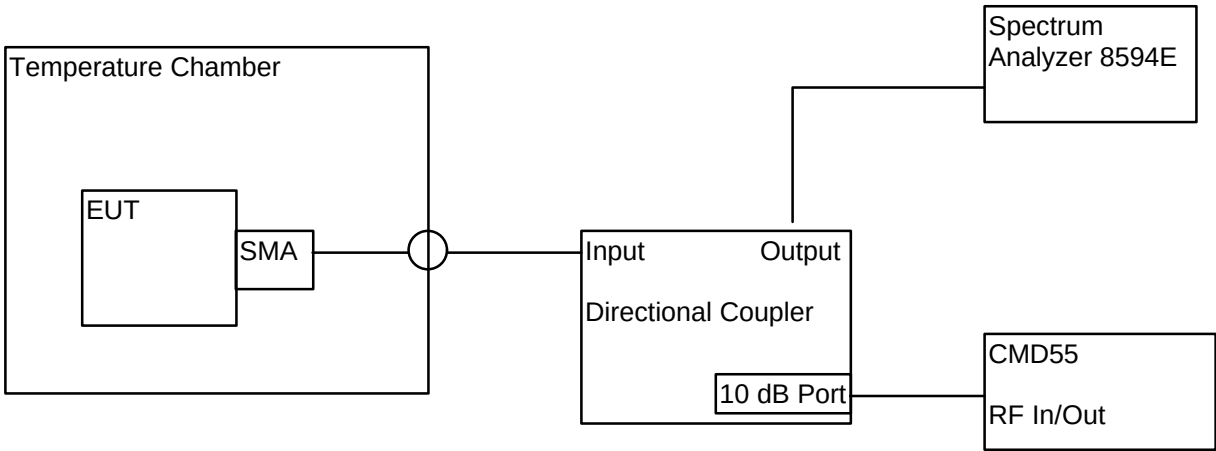
■ - Temperature Chamber

Test Equipment Used :

Equipment List

HP 8594E Spectrum analyzer, S/N 3801A01300, Cal Date 07/00
Associated Environmental Chamber, Model SK3102, S/N 1831-2
Directional coupler, Narda, Model 4242-10 NCR
Digital Radio Communication Tester, Rhode & Schwarz, Model CMD55, S/N 849709/050, CAL DUE 3/00

Test Setup for Part 2.1055



frequency_stability

Transmitter RF Carrier Frequency Stability - FCC part 2, Paragraph 2.1055

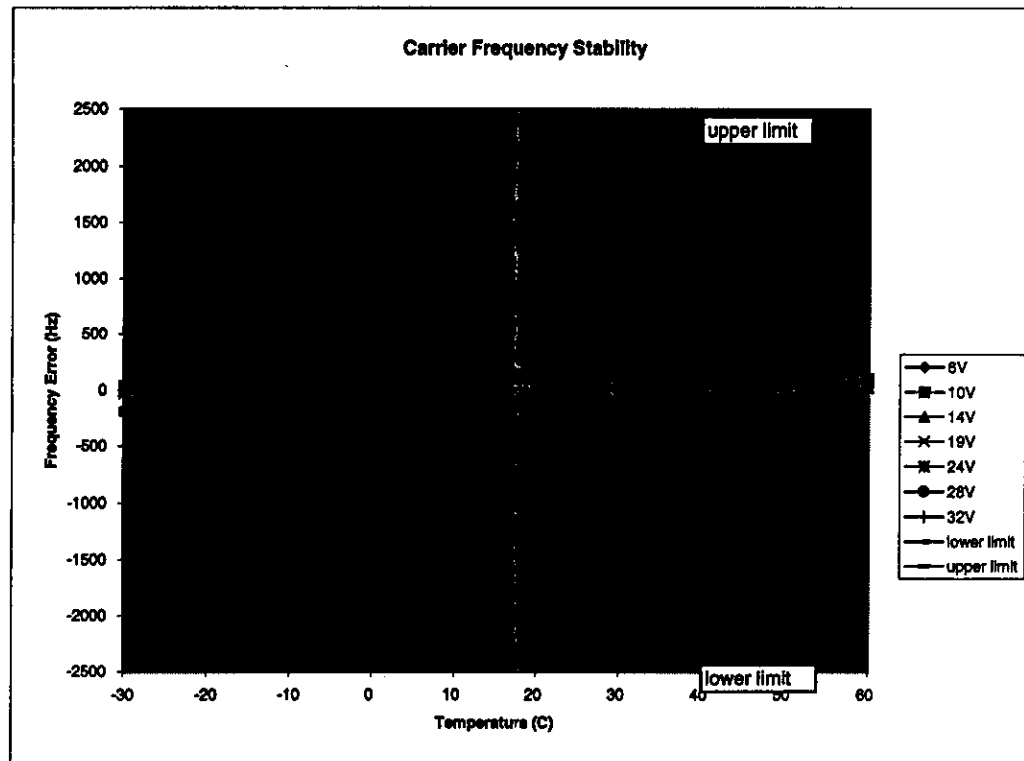
Transmitting in GSM mode

Wavecom GSM1900 Modem

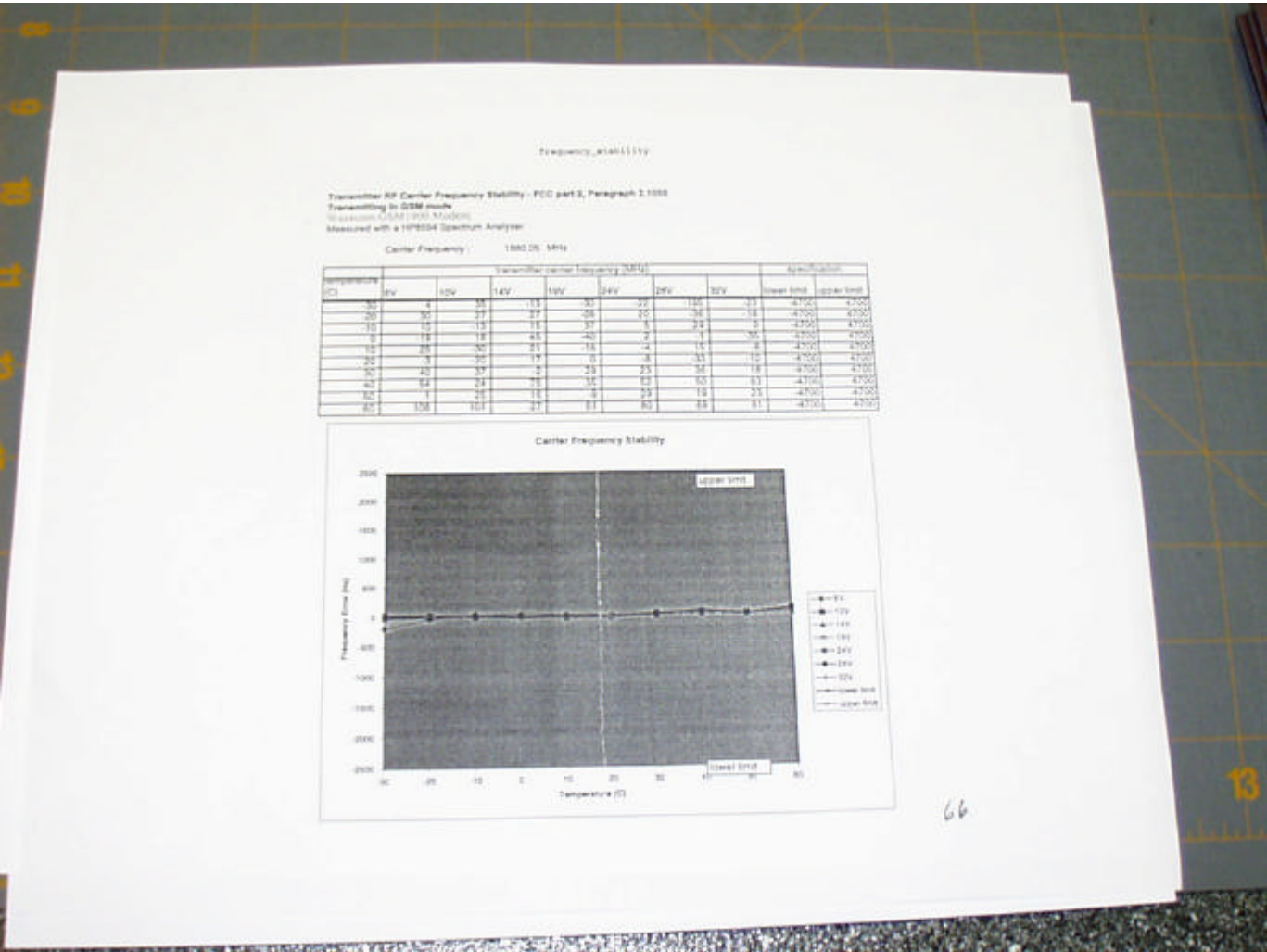
Measured with a HP8594 Spectrum Analyzer

Carrier Frequency : 1880.05 MHz

temperature (C)	transmitter carrier frequency (MHz)							specification	
	6V	10V	14V	19V	24V	28V	32V	lower limit	upper limit
-30	4	35	-13	-30	-22	-195	-23	-4700	4700
-20	30	27	27	-28	20	-36	-18	-4700	4700
-10	10	-13	15	37	5	29	0	-4700	4700
0	-19	18	45	-40	2	-1	-35	-4700	4700
10	25	-30	21	-18	-4	15	-8	-4700	4700
20	-3	-20	17	0	-8	-33	-10	-4700	4700
30	40	37	-2	29	23	36	18	-4700	4700
40	54	24	75	35	52	50	83	-4700	4700
50	1	25	16	-9	29	19	23	-4700	4700
60	108	101	27	51	80	68	81	-4700	4700



Picture of graph for frequency stability.



SIGNATURE PAGE

GENERAL REMARKS:

SUMMARY:

All tests according to the standards sited on page 1 of this report.

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements cited on page 1.

□ - **Does not** fulfill the general approval requirements cited on page 1.

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:



Mary Washington
(EMC Engineer)