

**MEASUREMENT AND TECHNICAL REPORT**

**POWERWAVE TECHNOLOGIES**  
2026 McGaw Avenue  
Irvine, CA 92614

**DATE: 14 June 2001**

**This Report Concerns:** Original Grant: X      Class II Change:

**Equipment Type:** Powerwave RF Front End System

**Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?** Yes:      No: X  
**Defer until:**

*Company Name agrees to notify the Commission by: N/A  
of the intended date of announcement of the product so that the grant can be issued on that date.*

**Transition Rules Request per 15.37?** Yes:      \*No: X

*(\*) FCC Part 2, Paragraphs 2.1046, 2.1051, 2.1053, and Part 24, Paragraph 24.238*

*Report Prepared by:*

**TÜV PRODUCT SERVICE**  
10040 Mesa Rim Road  
San Diego, CA 92121-2912  
Phone: 858 546 3999  
Fax: 858 546 0364

## TABLE OF CONTENTS

	Pages
<b>1 GENERAL INFORMATION</b>	3
1.1 Product Description	3
1.2 Related Submittal Grant	3
1.3 Tested System Details	3
1.4 Test Methodology	4
1.5 Test Facility	4
1.6 Part 2 Requirements	5
<hr/>	
<b>2 SYSTEM TEST CONFIGURATION</b>	6
2.1 Justification	6
2.2 EUT Exercise Software	6
2.3 Special Accessories	6
2.4 Equipment Modifications	6
2.5 Configuration of Tested System	6
<hr/>	
<b>3 RADIATED EMISSION DATA/EQUIPMENT</b>	7
Field Strength Calculation	12
<hr/>	
<b>4 CONDUCTED EMISSION DATA/EQUIPMENT</b>	13
<b>5 ATTESTATION STATEMENT</b>	41
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## 1 GENERAL INFORMATION

### 1.1 Product Description

Pcs Rx and TX Booster System

Powerwave RF Front End System

Configuration tested was with CDMA modulation only. An output bandpass filter or duplexer was used with a minimum rejection of 50 dB between the Rx and Tx bands and an output power rating of 150W CW.

Voltage: 220 Vac; 1 phase; Current: 7A; Current 5.75

Unit tested at the input/output RF interface provided by the test connector supplied by Advantech.

Typical Installation: PCS network operator's cell sites. Mounted on tower.

EUT Power Cable: Permanent, Shielded

EUT Interface Ports and Cables

#### EUT I/O Ports and Cables:

**RF Input; analog; quantity 1; no shielding; coaxial termination; characteristic impedance port termination; connector type - metallized 9-pin D-sub.**

**RF Output; analog and digital; quantity 1; no shielding; coaxial termination; 50-ohm port termination; connector type - RS-485; digital; quantity 1; no shielding; 9 poles termination; 05 ohms port termination; connector type - DB9**

**AC supply; analog; quantity 1; no shielding; 3 poles termination; port termination - N/A; connector type - MIL-C 1015.**

**Mute control; digital; quantity 1; no shielding; toggle switch termination;**

**Operating Description:** Amplifier enabled, applying test signal adjusted to measure rated power at the output using a RMS power meter. Test signal IS95 - 1 carrier 9 users 11 dB crest factor.

DESCRIPTION:	<b>Power amplifier module</b>
MODEL NUMBER:	<b>0001</b>
SERIAL NUMBER:	<b>0001</b>
<hr/>	
DESCRIPTION:	<b>PA module test connector</b>

### 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:

- 1. Conducted Emissions, FCC Part 2, Paragraphs 2.1051 and Part 24, Paragraph 24.238
- 2. Radiated Emissions EN55022: 1992 Class B limit, 30 - 1,000 MHz, 10 meters
- 3. Radiated Emission per FCC Part 2, Paragraph 2.1053, & Part 24, Paragraph 24.238
- 4. Engineering evaluations
- 5. Frequency Stability, Part 2, Paragraph 2.995, and Part 87, Paragraph 87.133
- 6. RF Output Power, 2.1046

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: 858 546 3999  
Fax: 858 546 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

**Type of Emission: F9W**

**Freq. Range: 1930 - 1945 MHz**

**Range of operating power values: 0 - 55 W**

**DC voltages: 27 V / 24 A**

**Equipment an AM broadcast stereophonic exciter-generator : N/A**

## **2. SYSTEM TEST CONFIGURATION**

### **2.1 Justification**

The EUT 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 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.

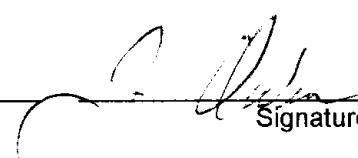
See following page(s).

# Radiated Electromagnetic Emissions

Test Report #:	50258 Run 01	Test Area:	Site 3 Roof	Temperature:	25	°C
Test Method:	Spurious Emissions	Test Date:	28-Aug-2000	Relative Humidity:	45	%
EUT Model #:	RFFE TX Module w/MPA9505- 55 HPA	EUT Power:	208 Vac/60 Hz	Air Pressure:	100.1	kPa
EUT Serial #:						Page: 1 of 2
Manufacturer:						Level Key
EUT Description:						Pk – Peak      Nb – Narrow Band
Notes:	No average measurement taken because peak value found to be below average limit.					Qp – QuasiPeak      Bb – Broad Band
RBW an VBW 1 MHz for all peak measurements. No emissions detected above third.						Av - Average

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC Part 24.238	DELTA2 (dB) N/A
Low						
1930.00	72.3 Pk	4.2 / 28.6 / -3.4	108.6	H / 1.0 / 0.0	N/A	N/A
3860.00	30.9 Pk	7.0 / 34.0 / -5.8	77.7	H / 1.0 / 0.0	-4.5	N/A
5790.00	25.3 Pk	7.6 / 36.6 / -6.2	75.6	H / 1.0 / 0.0	-6.6	N/A
High						
1945.00	73.3 Pk	4.2 / 28.7 / -3.4	109.7	H / 1.0 / 0.0	N/A	N/A
3890.00	32.3 Pk	7.1 / 34.1 / -5.8	79.2	V / 1.0 / 0.0	-3.0	N/A
5835.00	22.7 Pk	7.6 / 36.6 / -6.2	73.1	H / 1.0 / 0.0	-9.1	N/A
Mid						
1937.50	55.8 Pk	4.2 / 28.7 / -3.4	92.1	V / 1.0 / 0.0	N/A	N/A
3875.00	21.2 Pk	7.0 / 34.0 / -5.8	68.0	V / 1.0 / 0.0	-14.2	N/A

Tested by: \_\_\_\_\_ J Owen  
Printed

  
Signature

8

REPORT NO. S0258

REPORT NUMBER: COMPANY:Powerwave

## EUTRFFE Tx Module w/ MPA9505-55

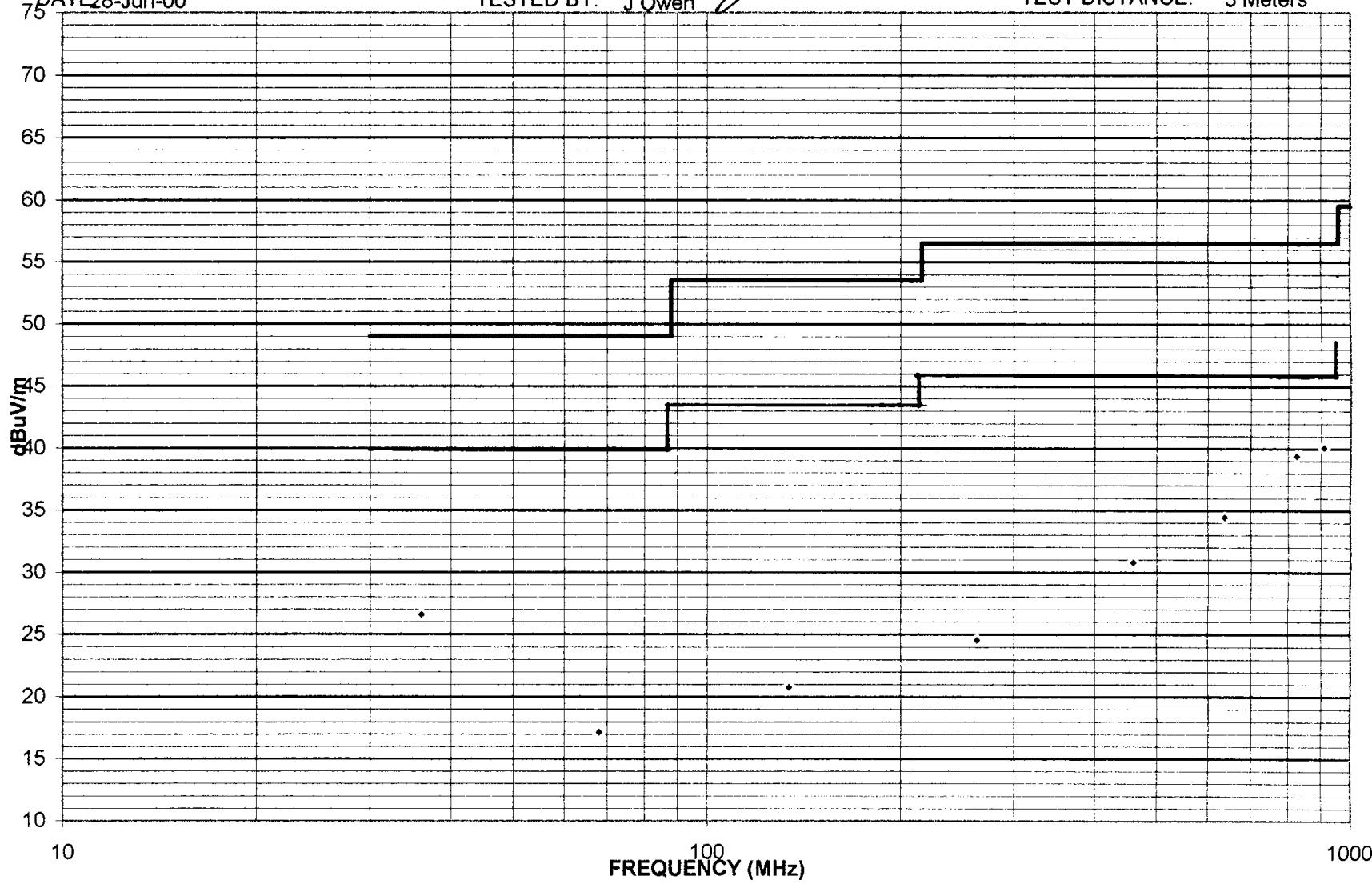
EUT MODE 47.4 dBm CW transmit power

EST MODE 47.4  
DATE 28-Jun-00

SPEC: FCC Part 15 para 15.109(a)

TESTED BY: J Owen

TEST DISTANCE: 3 Meters



REPORT No: S0258

SPEC: FCC Part 15 para 15.109(2)

CUSTOMER: Powerwave

TEST DIST: 3 Meters

EUT: RFFE Tx Module w/ MPA9505-55

TEST SITE: 1

EUT MODE: 47.4 dBm CW transmit power

BICONICAL: 738

DATE: 28-Jun-00 TESTED BY: J Owen

LOG PERIODIC: 738

NOTES: Quasi-Peak with 120 KHz measurement bandwidth.

RCVR: 466

208 Vac 60 Hz single phase

all levels are ambient

Temperature:  Relative Humidity:

Temperature: \_\_\_\_\_ Relative Humidity: \_\_\_\_\_

ver 1.8

**Emissions Test Conditions: RADIATED EMISSIONS, FCC Part 2, Paragraph 2.1053 and Part 24, Paragraph 22.238**

**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
LPB 2520/A	738	LPB	Antenna Research	1169	03/01
ESVS30	466	Test Receiver	Rohde & Schwarz	833825/003	02/02
8566B	720	Spectrum Analyzer	Hewlett Packard	211500842	03/01
8566B	721	Spectrum Analyzer Display	Hewlett Packard	2112A02185	03/01

Remarks: (\*) Verified internally

### 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 DATA**

**POWERWAVE TECHNOLOGIES**

See following page(s).

**Emissions Test Conditions: CONDUCTED EMISSIONS, EMISSION BANDWIDTH; RF POWER OUTPUT; 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 :**

Signal Generator, Hewlett Packard, E4436B, S/N US39260103, Cal: 09/01

Directional Coupler, Hewlett Packard, P/N 504\*

Attenuator, P/N Weinschel, 47-30-34, S/N BG3119, P/N 766\*

Power Divider, Weinschel Engineering, 1506A, S/N M5134\*

Variable Attenuator, Weinschel, Model 904-114-33, S/N A3171\*

Power Sensor, Hewlett Packard, 84811A, S/N 3318A05185, Cal: 04/01

Coaxial Directional Coupler, Narda, 3043B-30, S/N 10494, P/N 684\*

Load Attenuator, Hewlett Packard, 8493A\*

Isolator, Ocean Microwave, LS193199-T-14\*

Driver, Powerwave, 42.0 dB gain

Variable Attenuator, Weinschel, 940-114-33, S/N A3172

Power Meter, Hewlett Packard, 8900D, S/N 3607U00653, P/N 802, Cal: 04/01

Power Sensor, Hewlett Packard, 8481A, S/N US37296059, Cal: 06/01

Power Meter, Hewlett Packard, E4418B, S/N US39251424, Cal: 08/01

Attenuator, Narda, 02806, P/N 633\*

Spectrum Analyzer, Hewlett Packard, HP-8566B, S/N 2618A02913, P/N 744; Cal: 10/01

Attenuator, Hewlett Packard, 20 dB, P/N 636, Model 8491A\*

Variable Attenuator, ARRA, Inc. P3844-20, S/N 3426\*

(\*) Verified

08/16/00      SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.0 dBm
2. Low channel, 1930 MHz
3. CDMA

24.238

MKR 118.9 MHz  
-16.50 dBm

hp REF 60.7 dBm ATTEN 10 dB *Mary Washington*

10 dB/

SAMPLE

OFFSET

60.7  
dB

DL  
-13.0  
dBm

VID AVG  
30

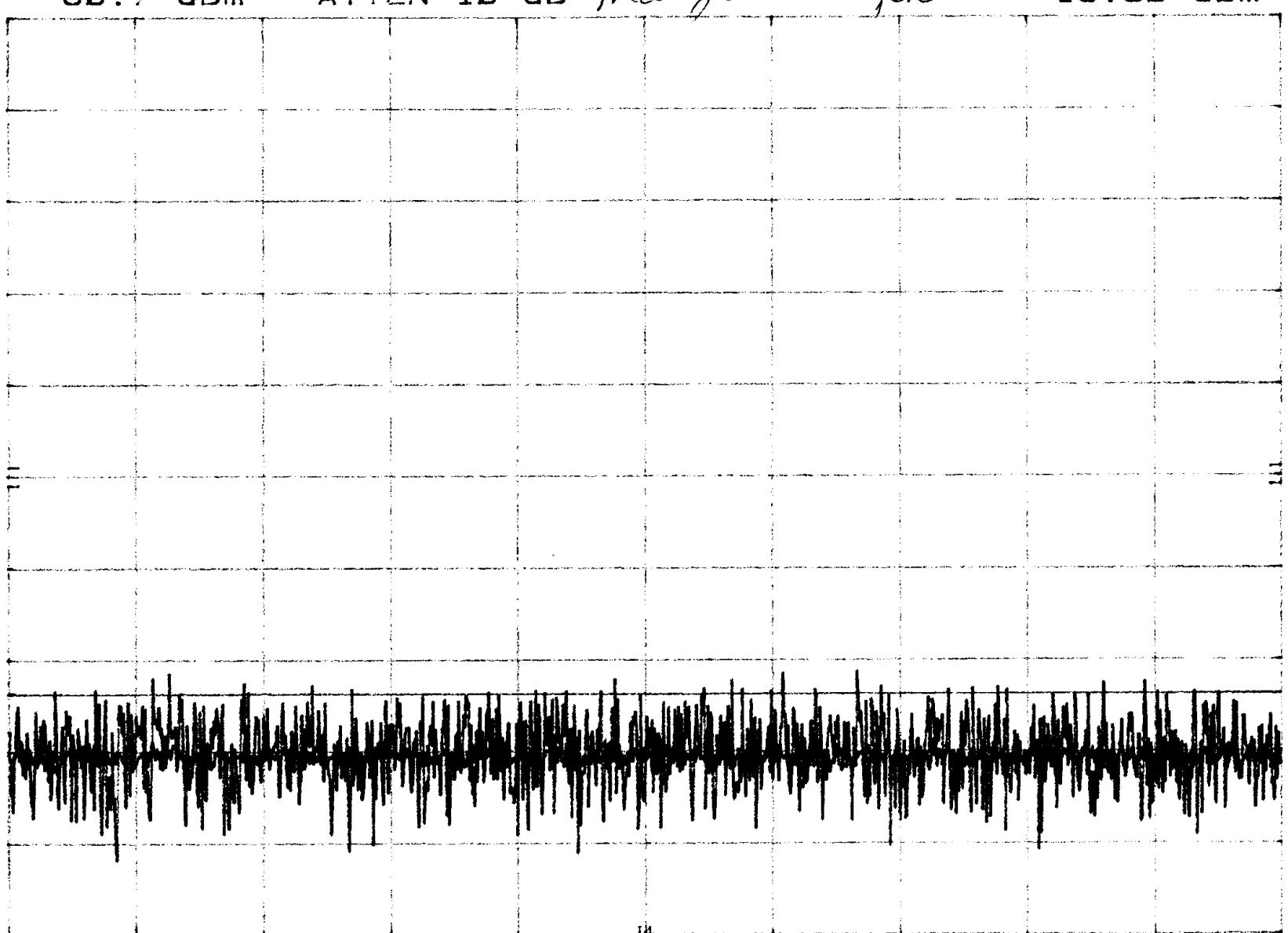
START 30 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 250 MHz

SWP 20.0 msec 15

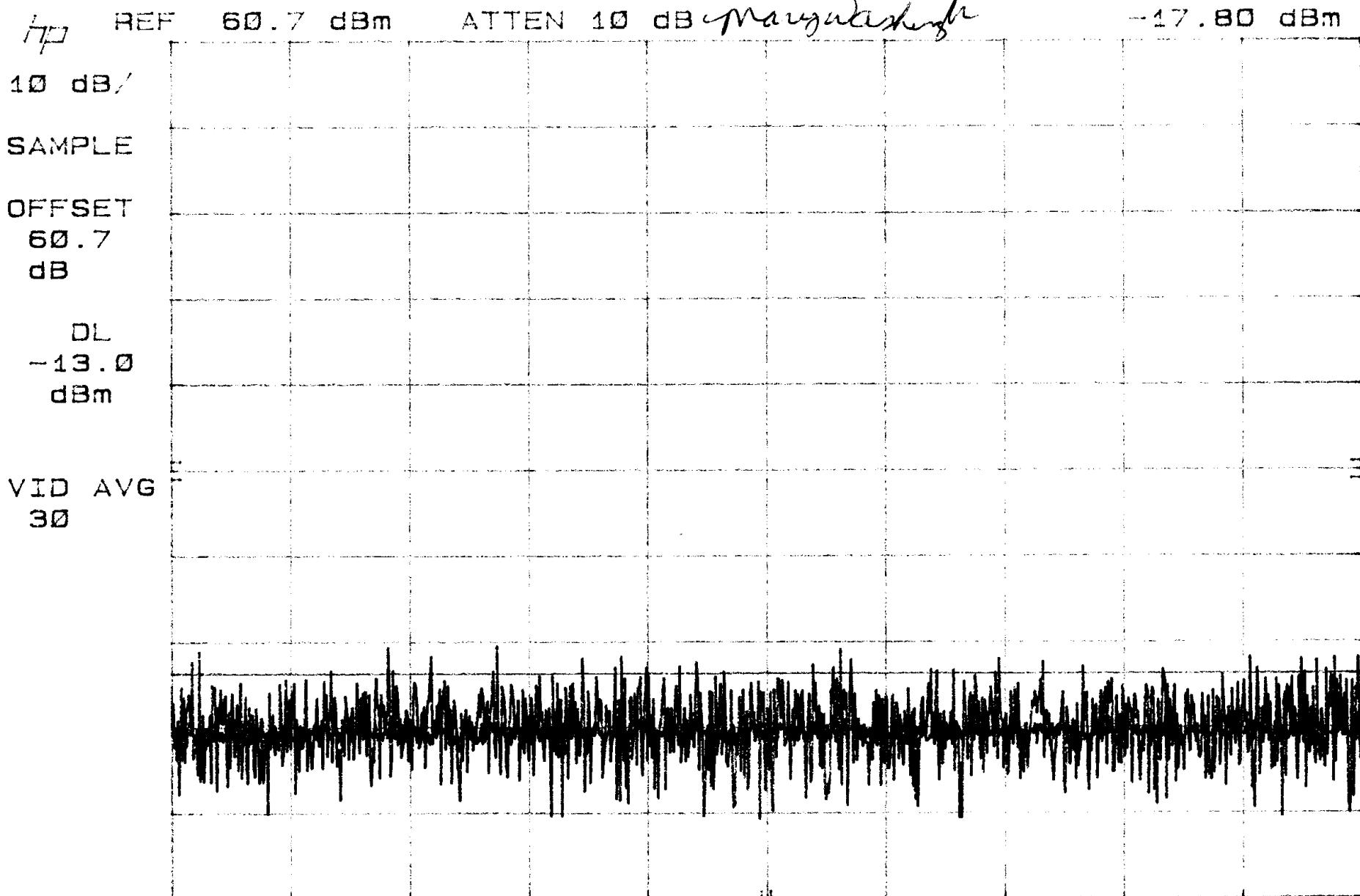


08/16/00      SPEC: Fcc Part 2, Para. 2.1051

NOTES:  
1. SG = -1.0 dBm  
2. Low channel, 1930 MHz  
3. CDMA

MKR 580.8 MHz

-17.80 dBm



START 250 MHz

RES BW 1 MHz

VBW 1 MHz

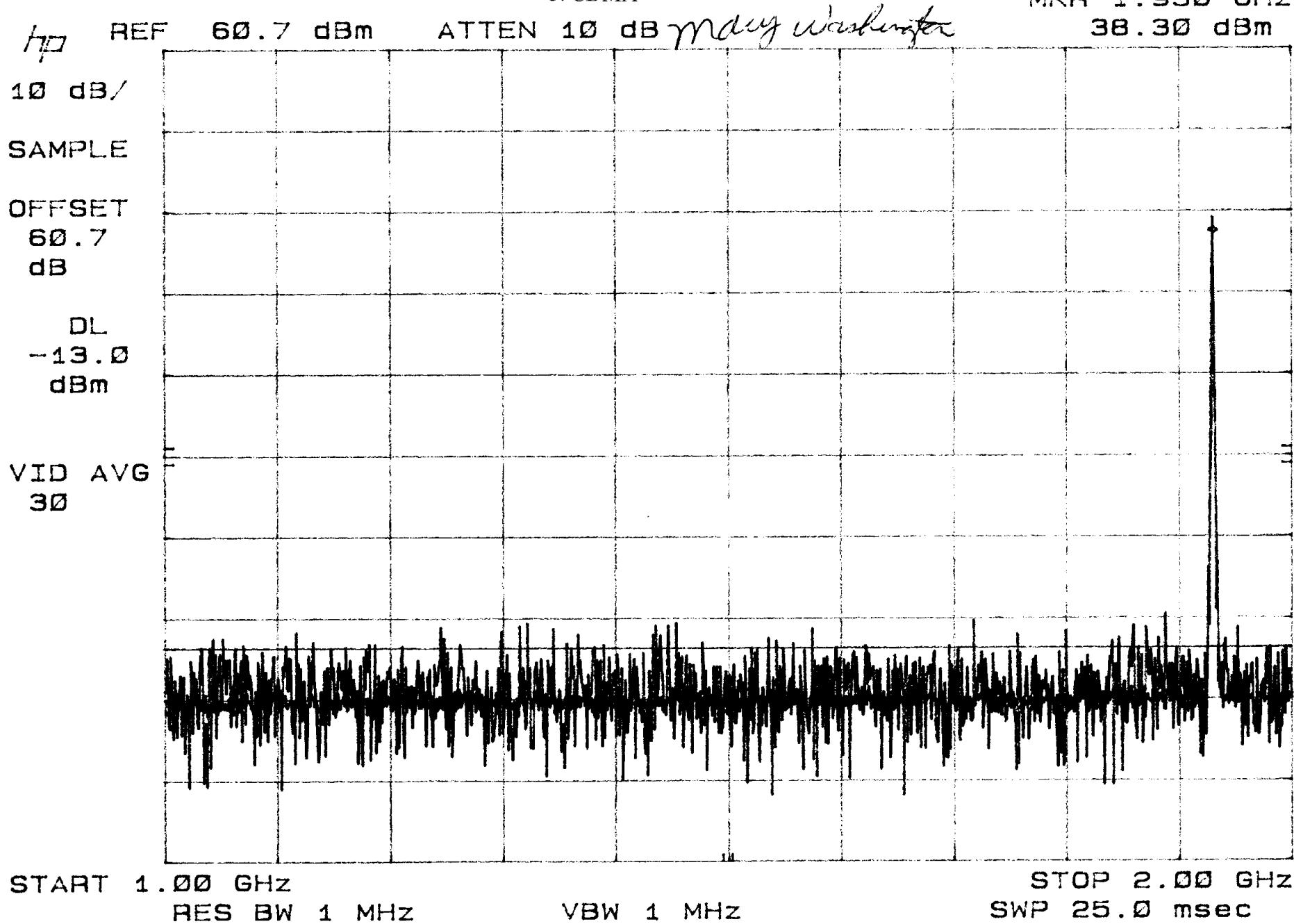
STOP 1.000 GHz

SWP 20.0 msec

16

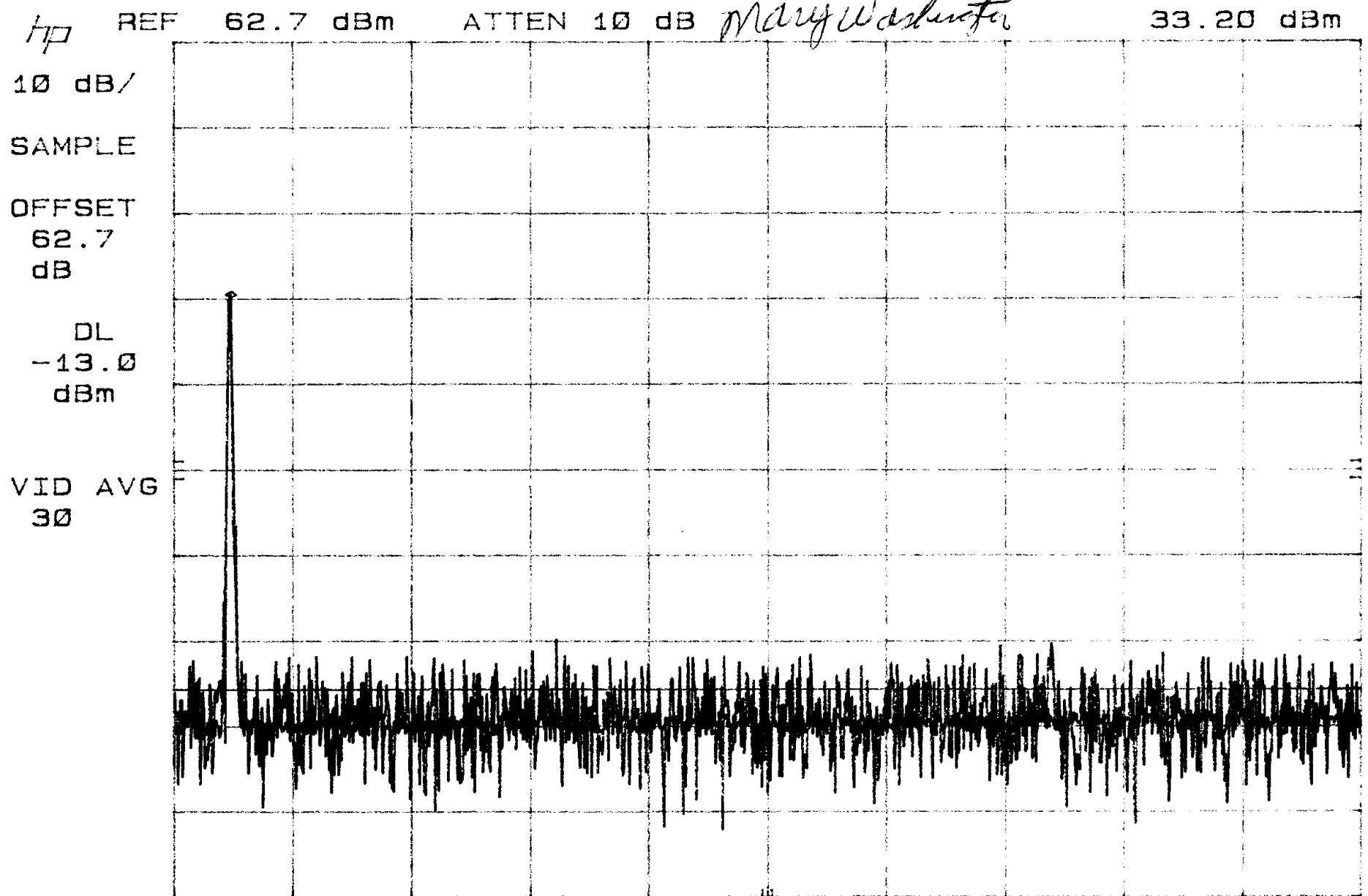
08/16/00      SPEC: Fcc Part 2, Para. 2.1051  
NOTES:      1. SG = -1.0 dBm  
                  2. Low channel, 1930 MHz  
                  3. CDMA

MKR 1.930 GHz  
38.30 dBm



08/16/00      SPEC: Fcc Part 2, Para. 2.1051  
NOTES:      1. SG = -1.0 dBm  
                  2. Low channel, 1930 MHz  
                  3. CDMA

MKR 1.928 8 GHz  
33.20 dBm



START 1.900 GHz  
RES BW 1 MHz

VBW 1 MHz

STOP 2.500 GHz  
SWP 20.0 msec 18

08/16/00

SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.0 dBm
2. Low channel, 1930 MHz
3. CDMA

MKR 4.516 GHz

-15.30 dBm

hp REF 62.7 dBm ATTN 10 dB *Mary Washington*

10 dB/

SAMPLE

OFFSET

62.7  
dBDL  
-13.0  
dBmVID AVG  
30

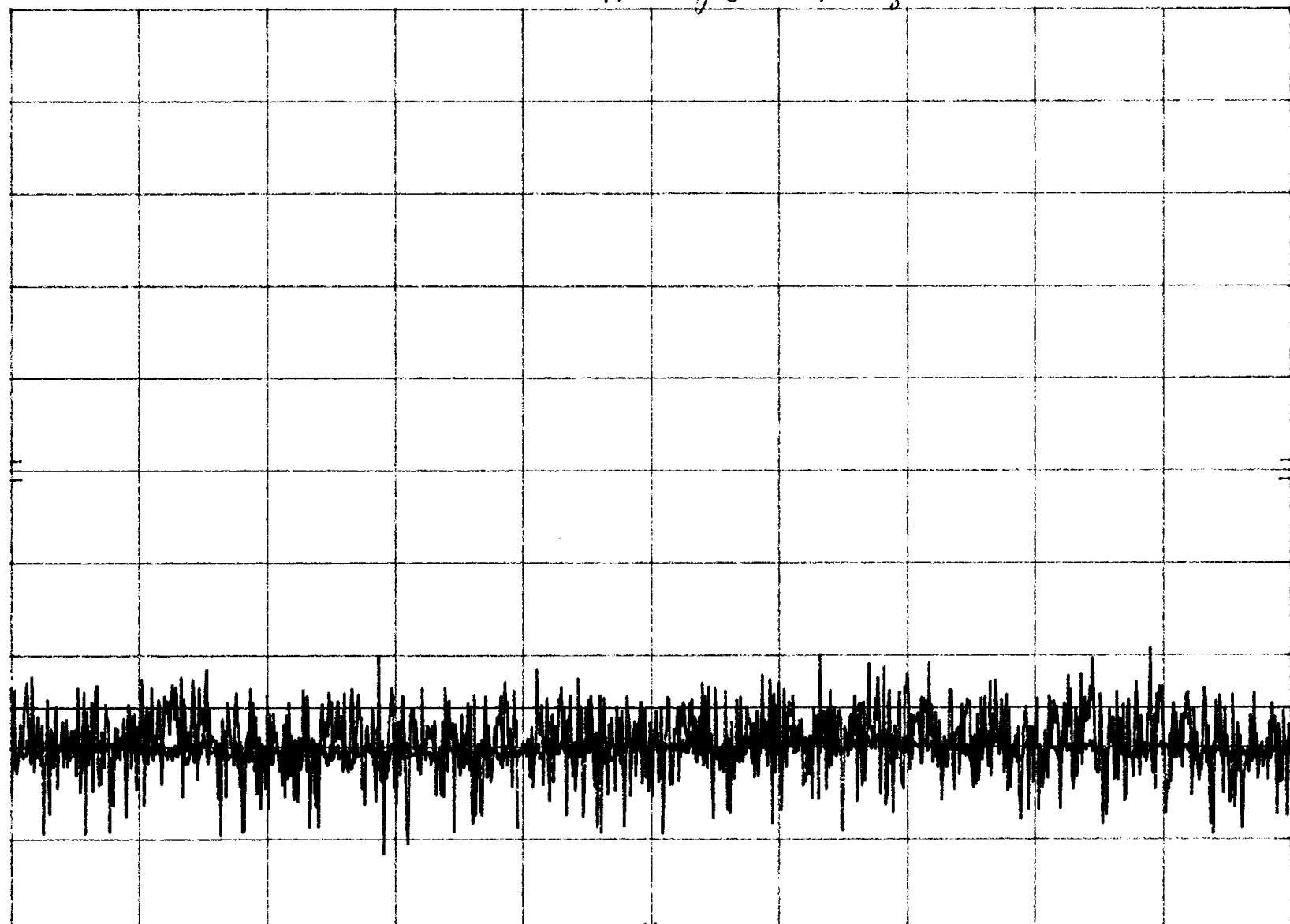
START 2.50 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 5.80 GHz

SWP 82.5 msec



08/16/00

SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.0 dBm

2. Low channel, 1930 MHz

3. CDMA

MKR 12.604 GHz

-15.70 dBm

hp

REF 52.7 dBm

ATTEN 0 dB *Mary Washington*

10 dB/

SAMPLE

OFFSET

62.7  
dBDL  
-13.0  
dBmVID AVG  
30

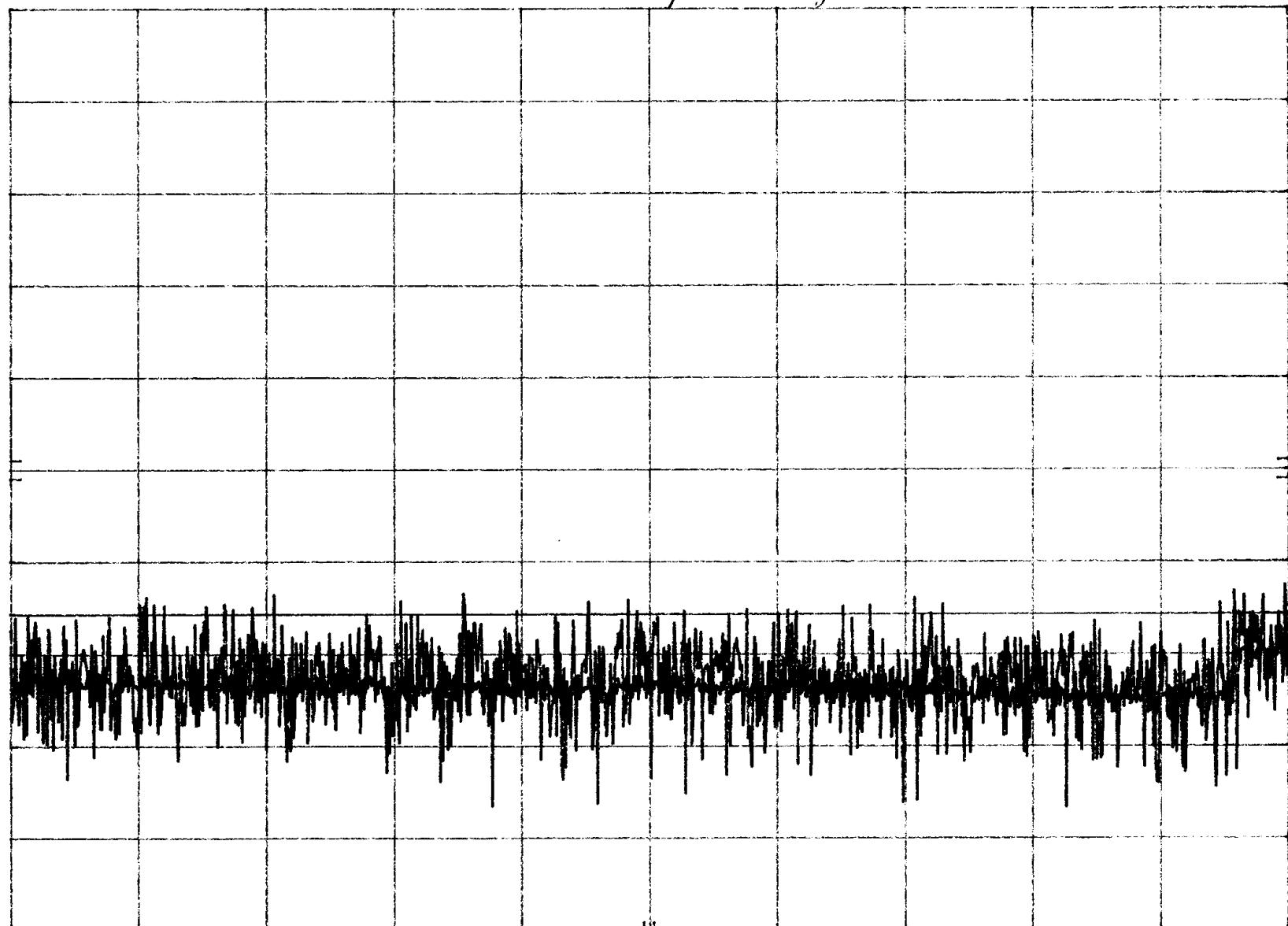
START 5.80 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 12.80 GHz

SWP 175 msec



08/16/00

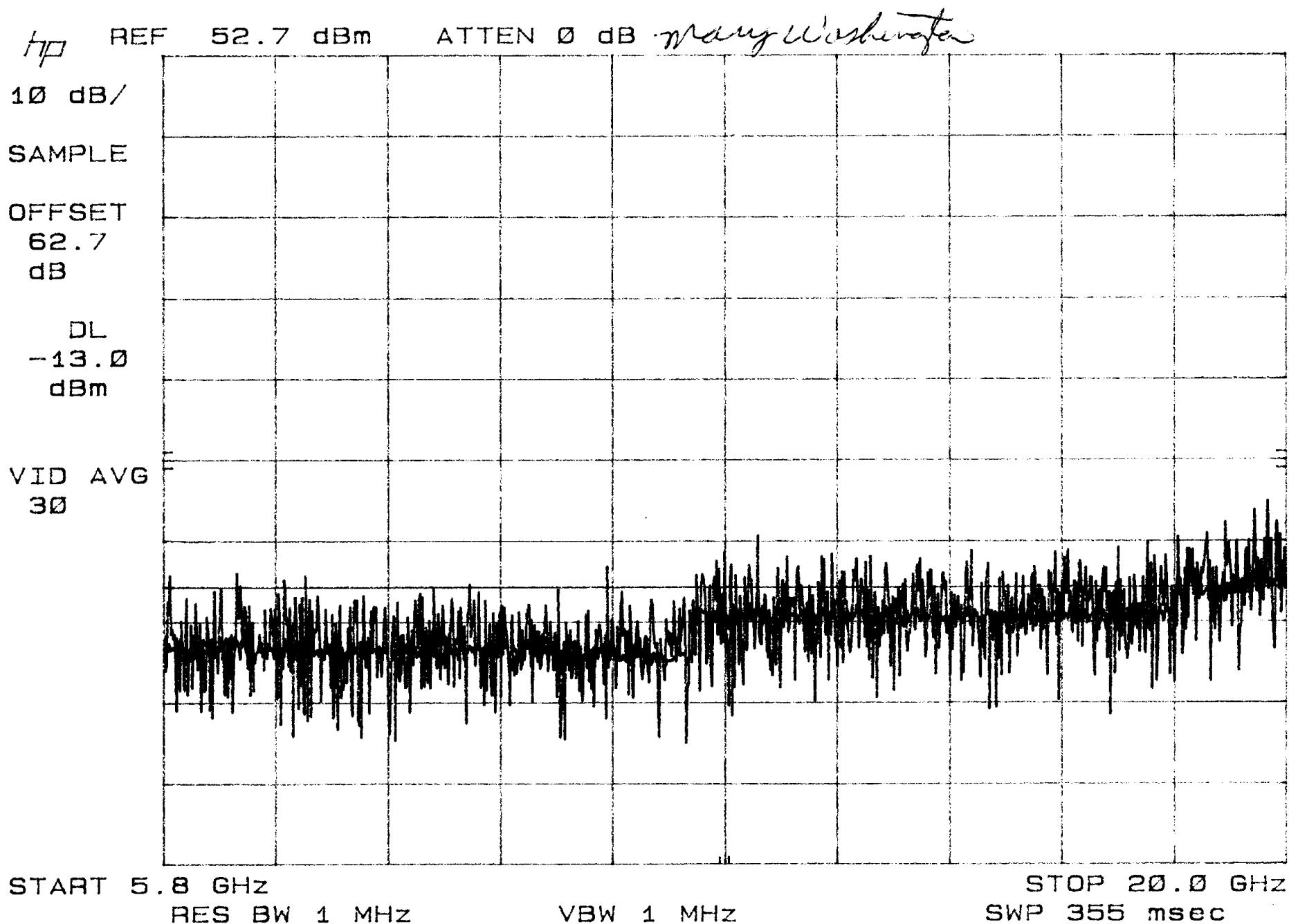
SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.0 dBm

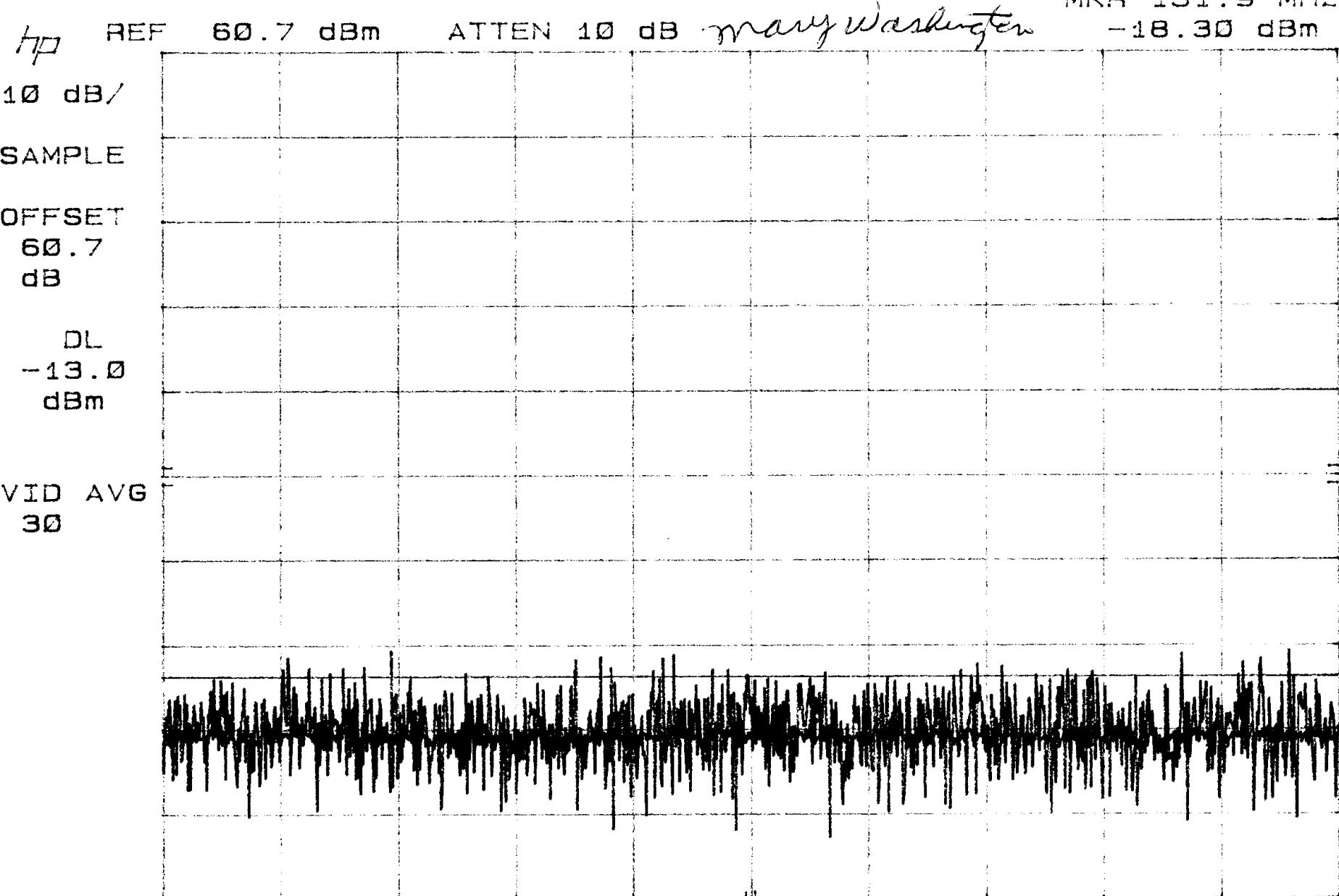
2. Low channel, 1930 MHz

3. CDMA



08/16/00      SPEC: Fcc Part 2, Para. 2.1051  
NOTES:  
1. SG = -1.3 dBm  
2. Mid channel, 1937 MHz  
3. CDMA

MKR 151.9 MHz



START 30 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 250 MHz

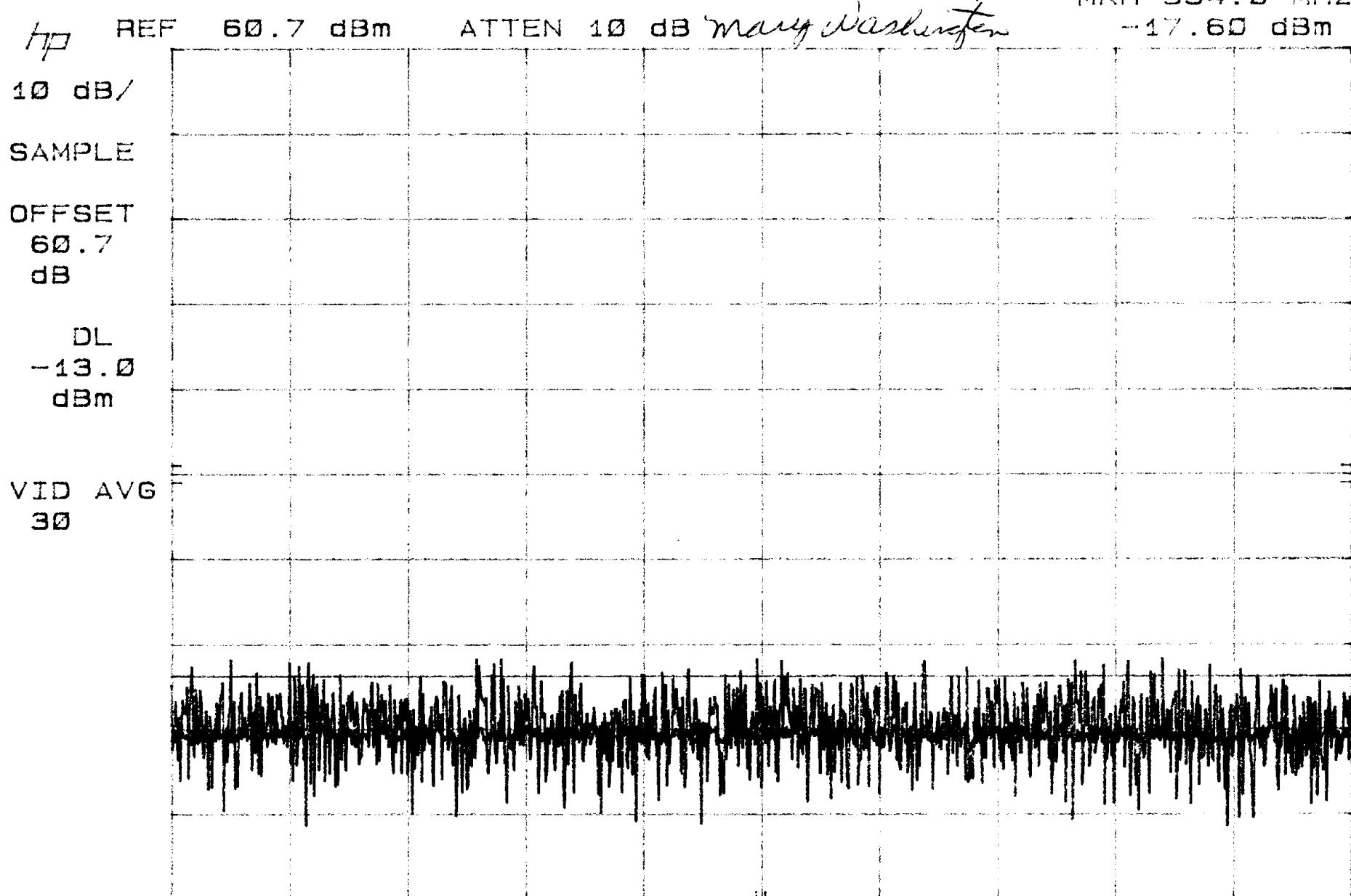
SWP 20.0 msec

22

08/16/00      SPEC: Fcc Part 2, Para. 2.1051  
NOTES:      1. SG = -1.3 dBm  
                  2. Mid channel, 1937 MHz  
                  3. CDMA

MKR 334.0 MHz

-17.60 dBm



START 250 MHz

RES BW 1 MHz

VBW 1 MHz

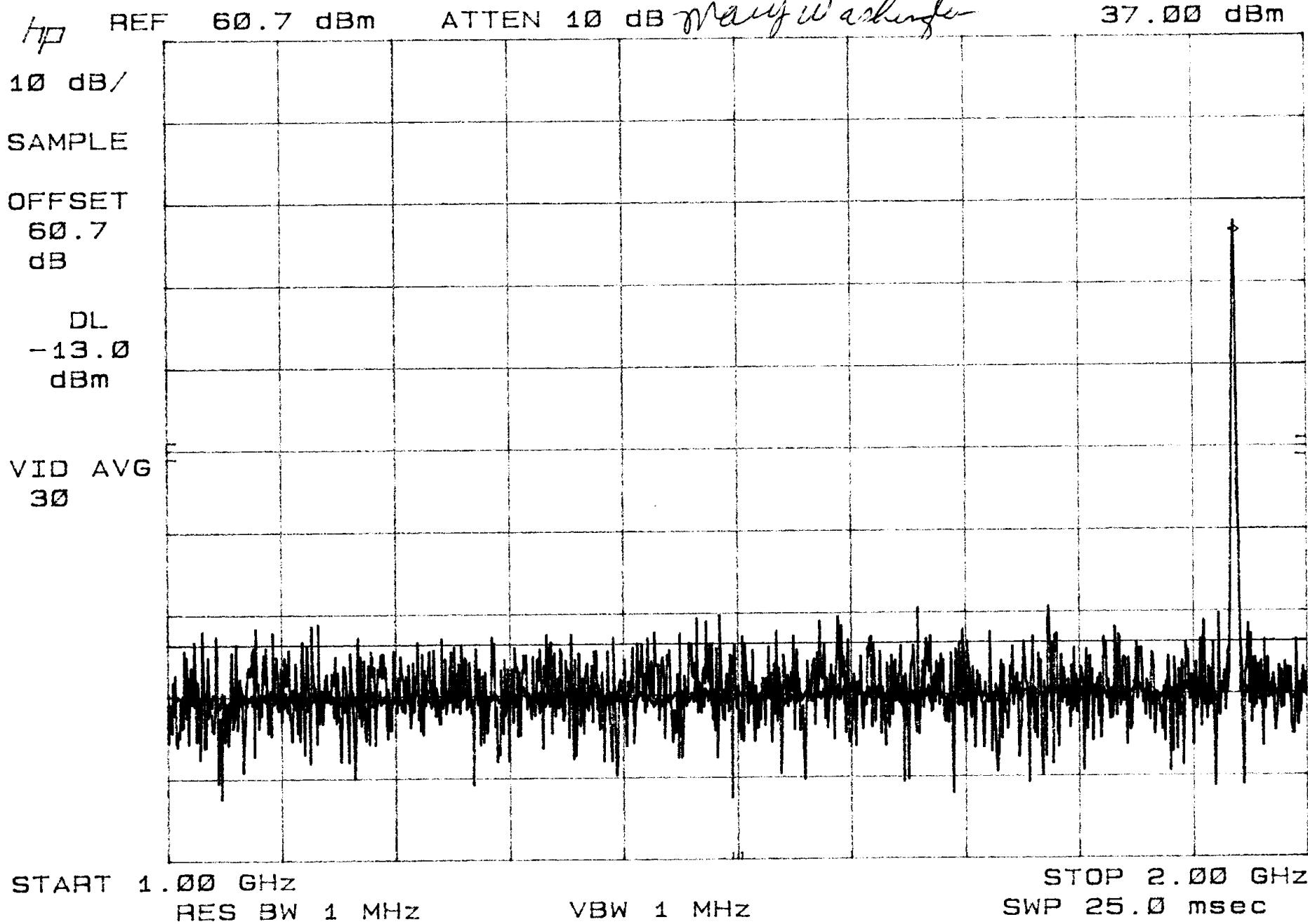
STOP 1.000 GHz

SWP 20.0 msec

22

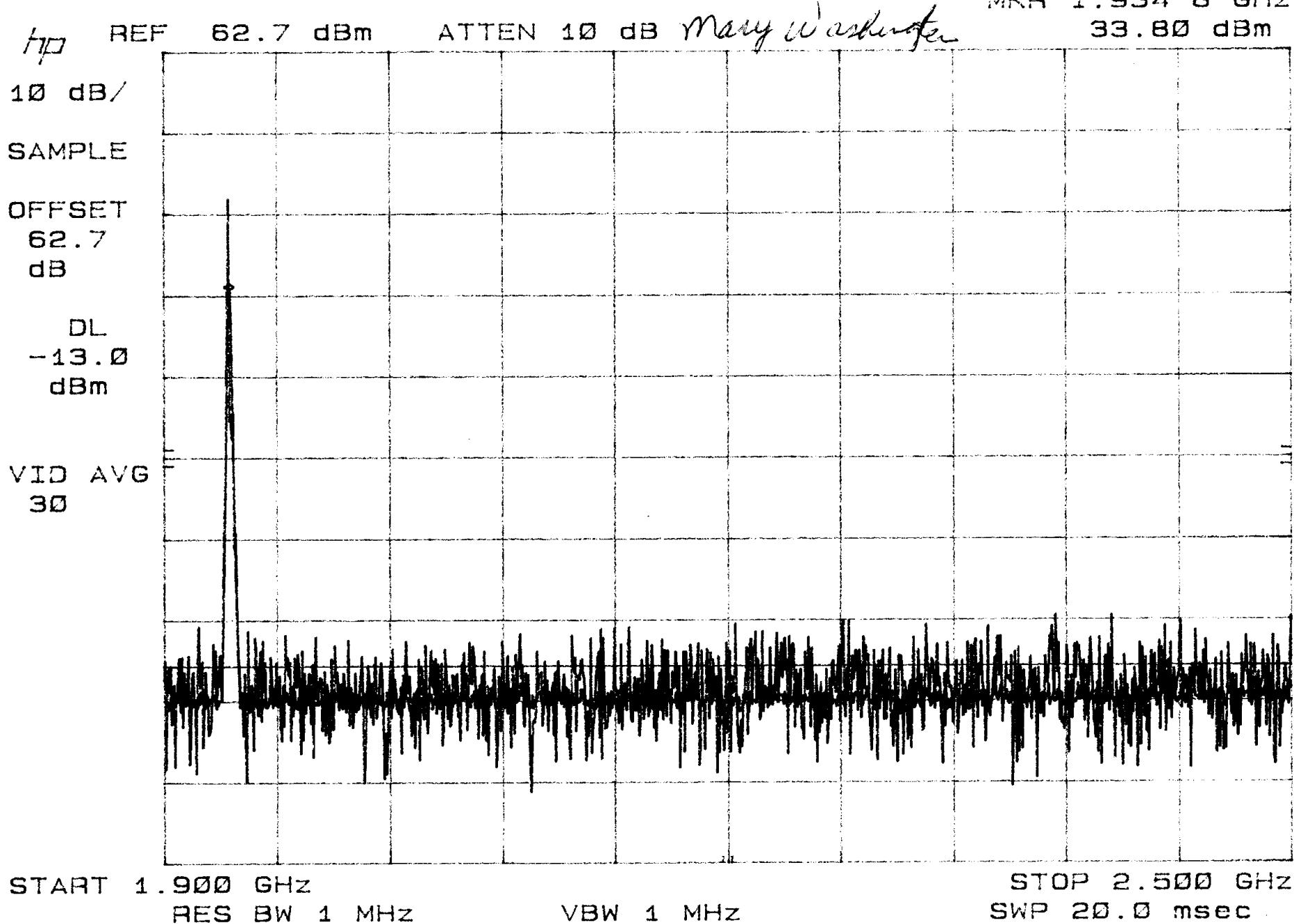
08/16/00      SPEC: Fcc Part 2, Para. 2.1051  
NOTES:  
1. SG = -1.3 dBm  
2. Mid channel, 1937 MHz  
3. CDMA

MKR 1.937 GHz  
37.00 dBm



08/16/00      SPEC: Fcc Part 2, Para. 2.1051  
NOTES:  
1. SG = -1.3 dBm  
2. Mid channel, 1937 MHz  
3. CDMA

MKR 1.934 8 GHz  
33.80 dBm



08/16/00

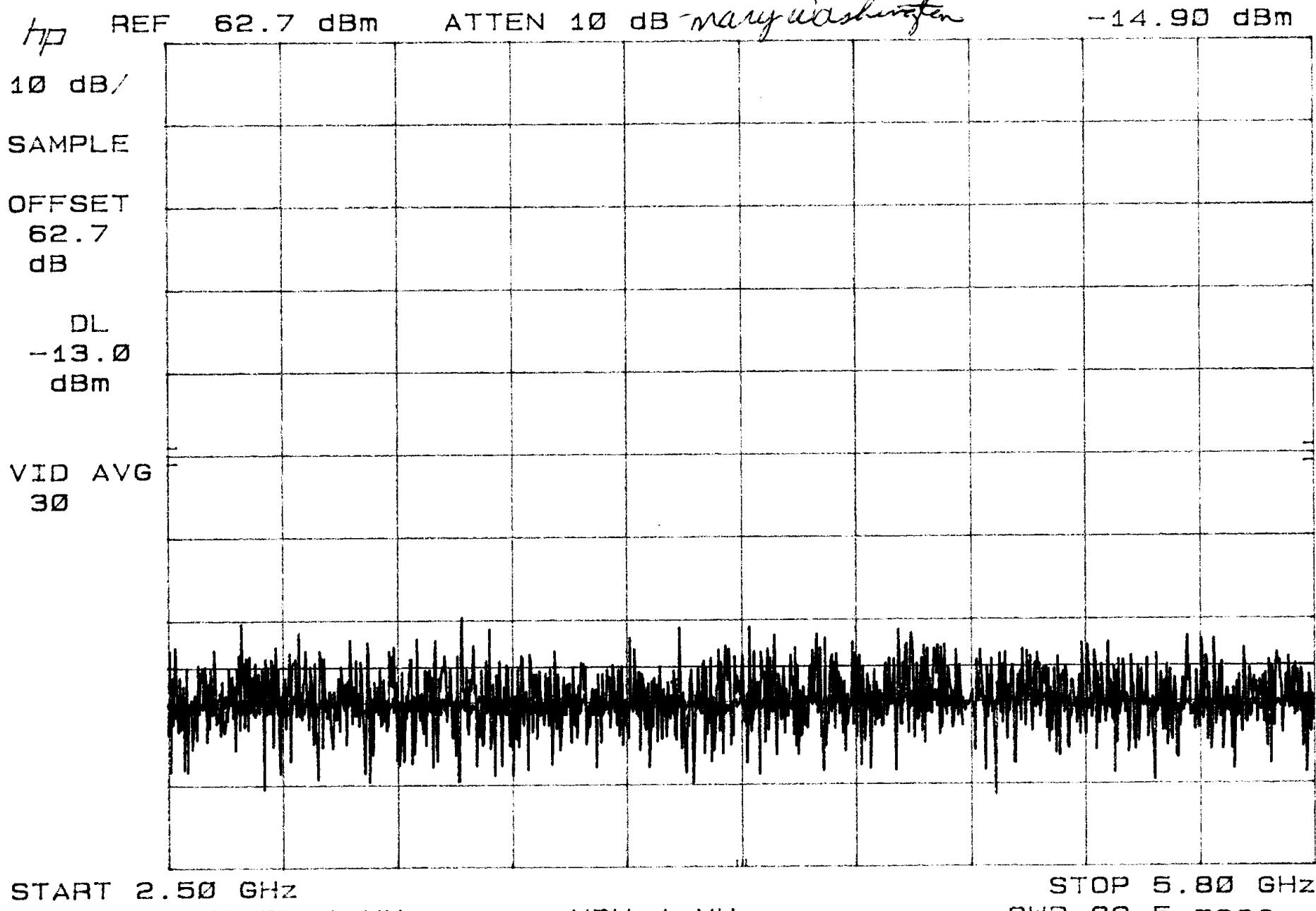
SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.3 dBm

2. Mid channel, 1937 MHz

3. CDMA

MKR 3.962 GHz  
-14.90 dBm

08/16/00

SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.3 dBm
2. Mid channel, 1937 MHz
3. CDMA

MKR 12.723 GHz

-15.40 dBm

hp

REF 52.7 dBm

ATTEN 0 dB *Many Washington*

10 dB/

SAMPLE

OFFSET

62.7  
dBDL  
-13.0  
dBmVID AVG  
30

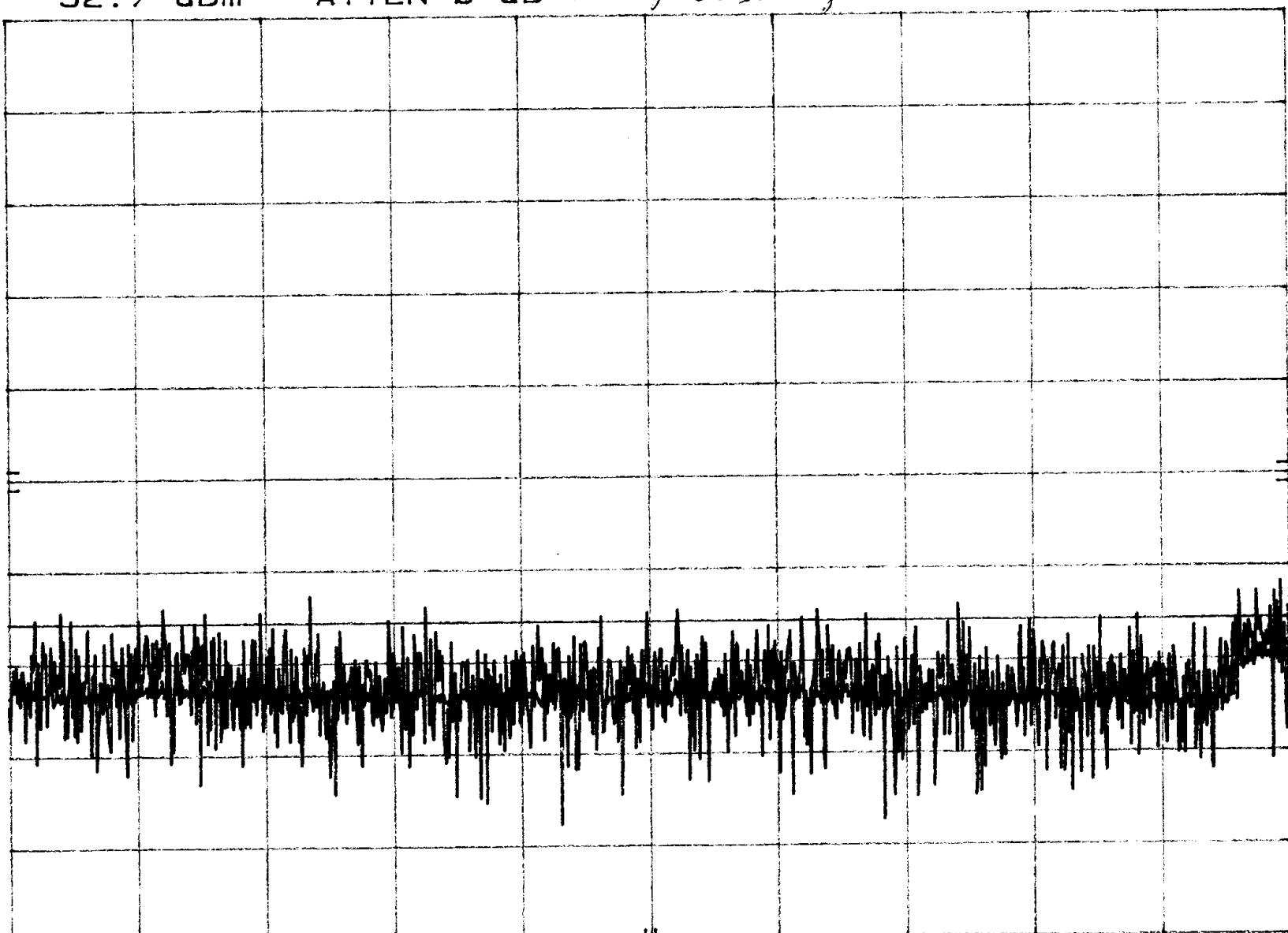
START 5.80 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 12.80 GHz *21*

SWP 175 msec

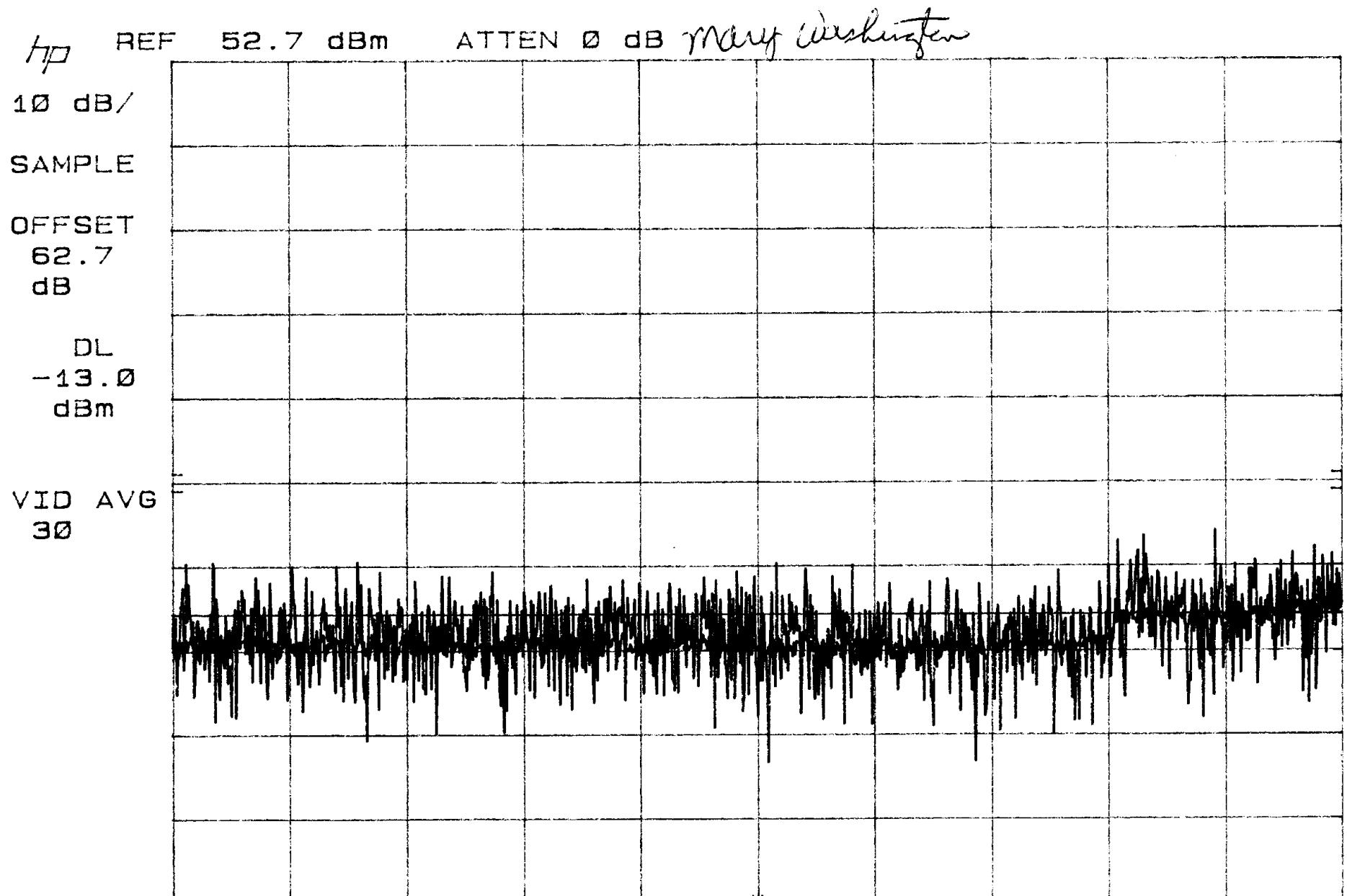


08/16/00

SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.3 dBm
2. Mid channel, 1937 MHz
3. CDMA



08/16/00

NOTES:

SPEC: Fcc Part 2, Para. 2.1051  
1. SG = -1.6 dBm  
2. High channel, 1945 MHz  
3. CDMA

MKR 134.1 MHz

-17.80 dBm

hp REF 60.7 dBm ATTEN 10 dB

10 dB/

SAMPLE

OFFSET

60.7

dB

DL

-13.0

dBm

VID AVG

30

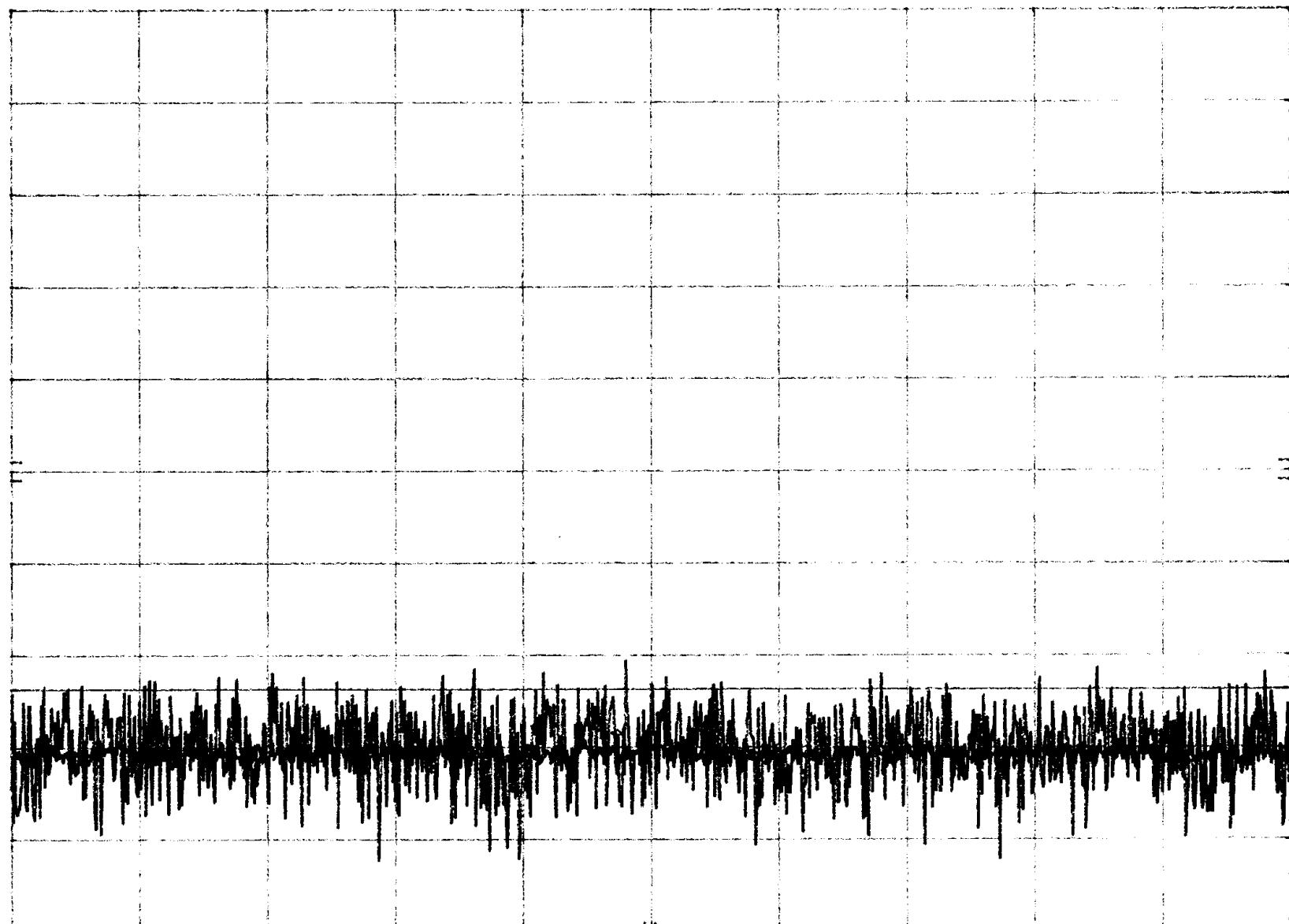
START 30 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 250 MHz

SWP 20.0 msec



08/16/00

SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.6 dBm
2. High channel, 1945 MHz
3. CDMA

MKR 522.3 MHz

hp REF 60.7 dBm ATTEN 10 dB *Mary Washington*

-17.40 dBm

10 dB/

SAMPLE

OFFSET

60.7  
dBDL  
-13.0  
dBmVID AVG  
30

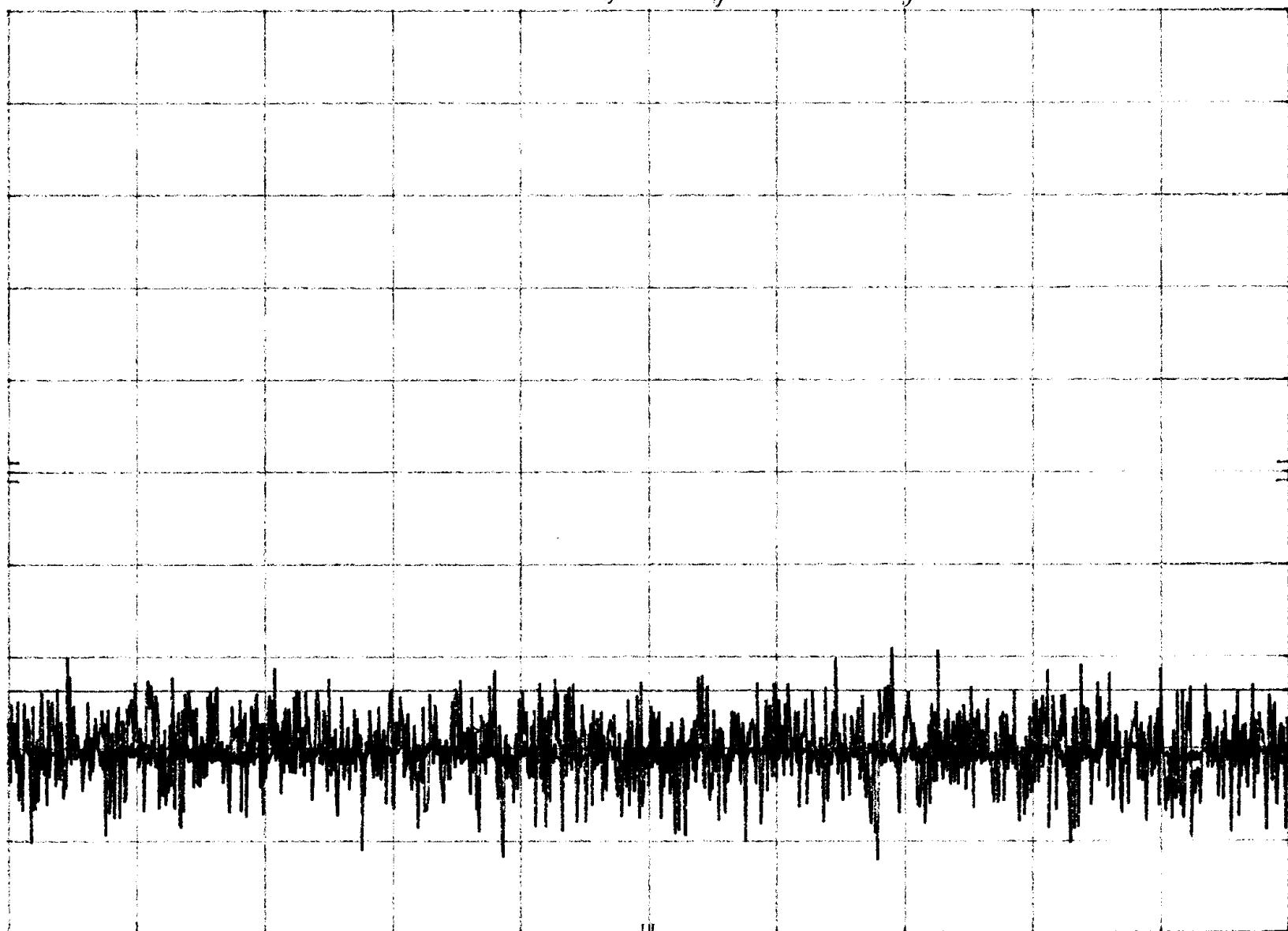
START 250 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 1.000 GHz

SWP 20.0 msec



30

08/16/00

NOTES:

SPEC: Fcc Part 2, Para. 2.1051

1. SG = -1.6 dBm

2. High channel, 1945 MHz

3. CDMA

MKR 1.945 GHz

37.50 dBm

HP

REF 60.7 dBm

ATTEN 10 dB

Mary Washington

10 dB/

SAMPLE

OFFSET

60.7  
dBDL  
-13.0  
dBmVID AVG  
30

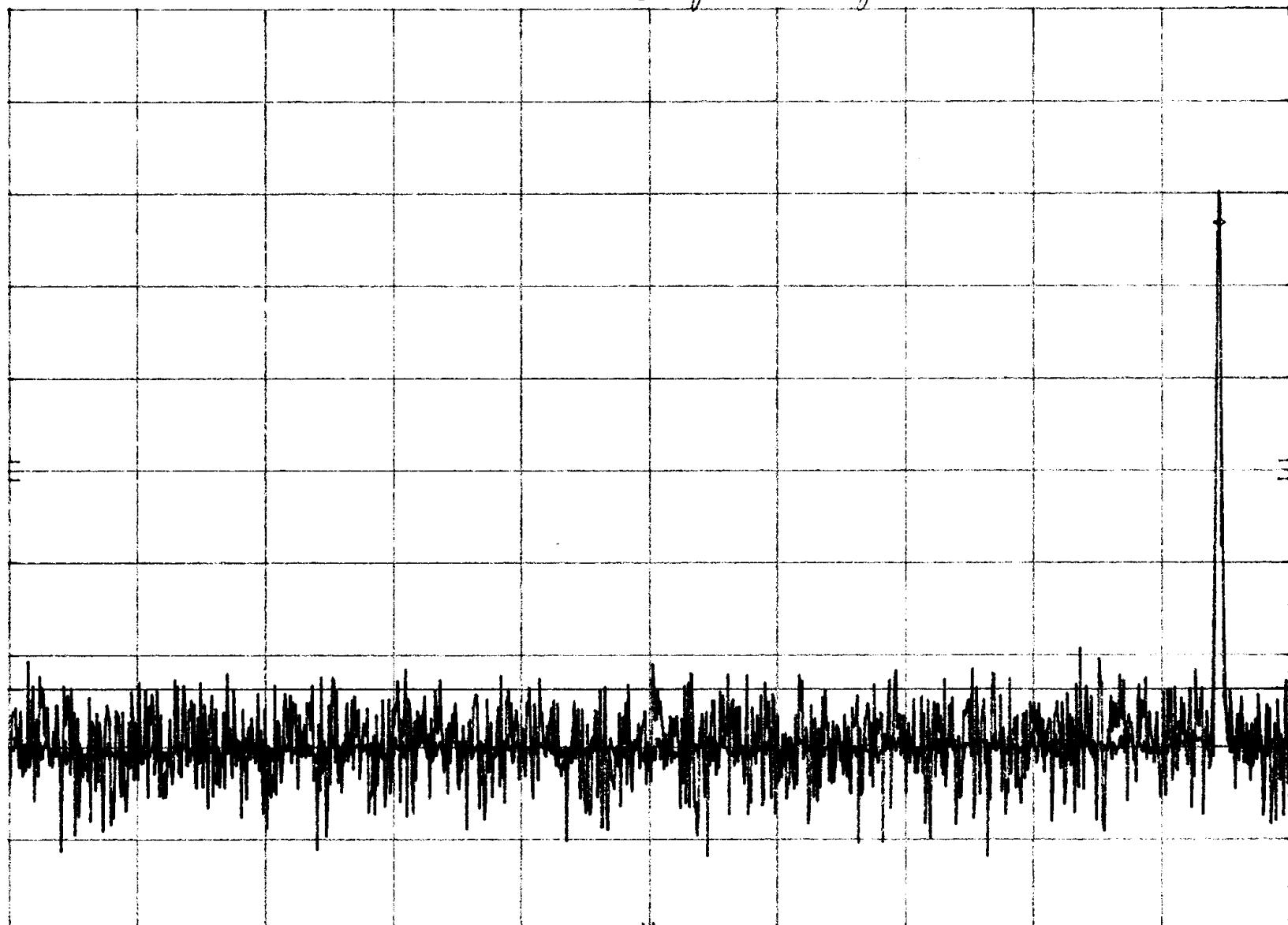
START 1.00 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 2.00 GHz 31

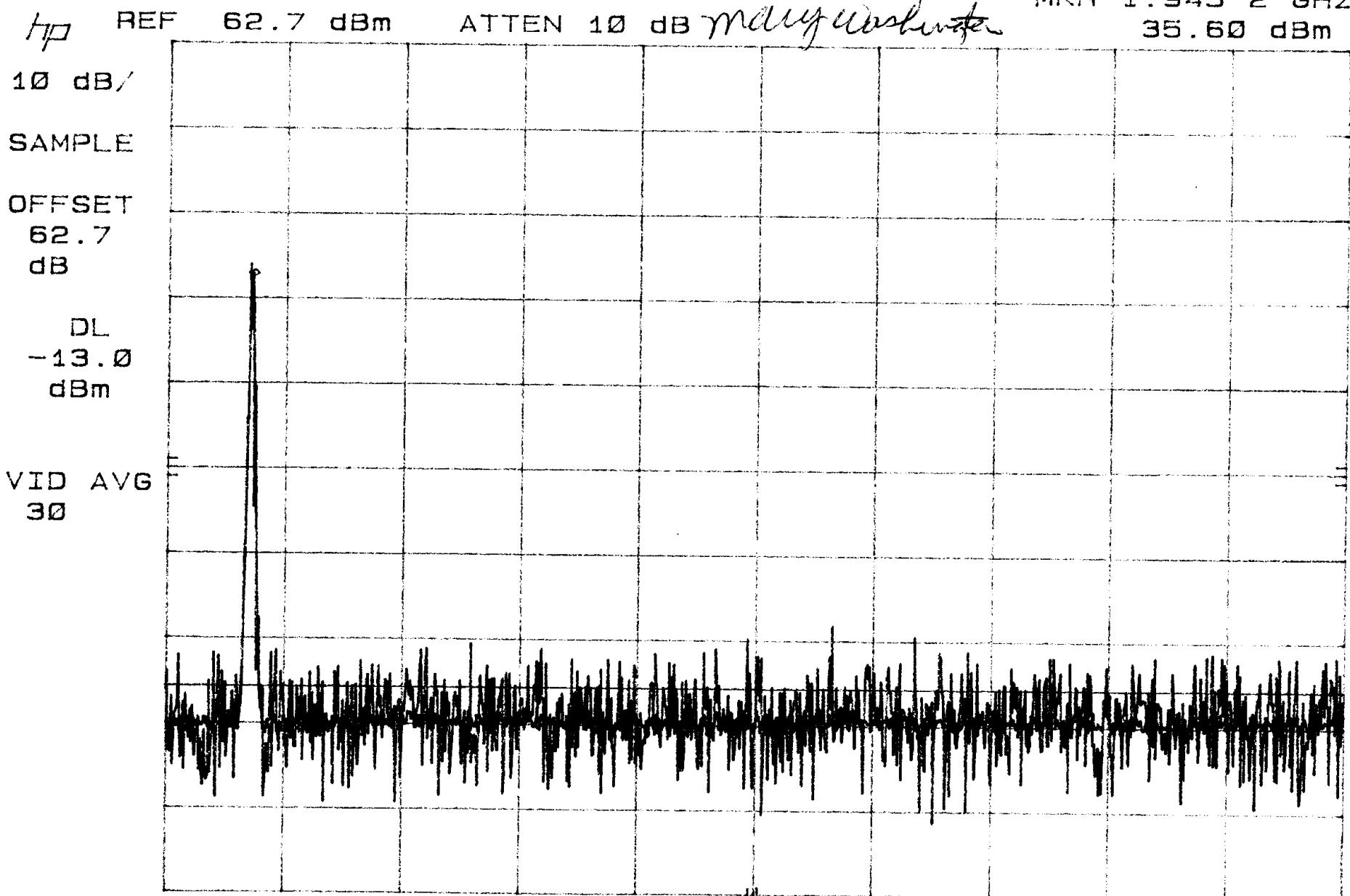
SWP 25.0 msec.



08/16/00 SPEC: Fcc Part 2, Para. 2.1051

NOTES: 1. SG = -1.6 dBm  
2. High channel, 1945 MHz  
3. CDMA

MKR 1.943 2 GHz  
35.60 dBm



START 1.900 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 2.500 GHz

SWP 20.0 msec

32

08/16/00

SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.6 dBm

2. High channel, 1945 MHz

3. CDMA

MKR 2.718 GHz

-15.50 dBm

hp

REF 62.7 dBm

ATTEN 10 dB

Mary Washington

10 dB/

SAMPLE

OFFSET

62.7  
dBDL  
-13.0  
dBmVID AVG  
30

START 2.50 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 5.80 GHz

SWP 82.5 msec

32

08/16/00      SPEC: Fcc Part 2, Para. 2.1051  
NOTES:  
1. SG = -1.6 dBm  
2. High channel, 1945 MHz  
3. CDMA

MKR 12.765 GHz

-15.70 dBm

HP

REF 52.7 dBm

ATTEN 0 dB *Mary Washington*

10 dB/

SAMPLE

OFFSET

62.7  
dB

DL  
-13.0  
dBm

VID AVG  
30

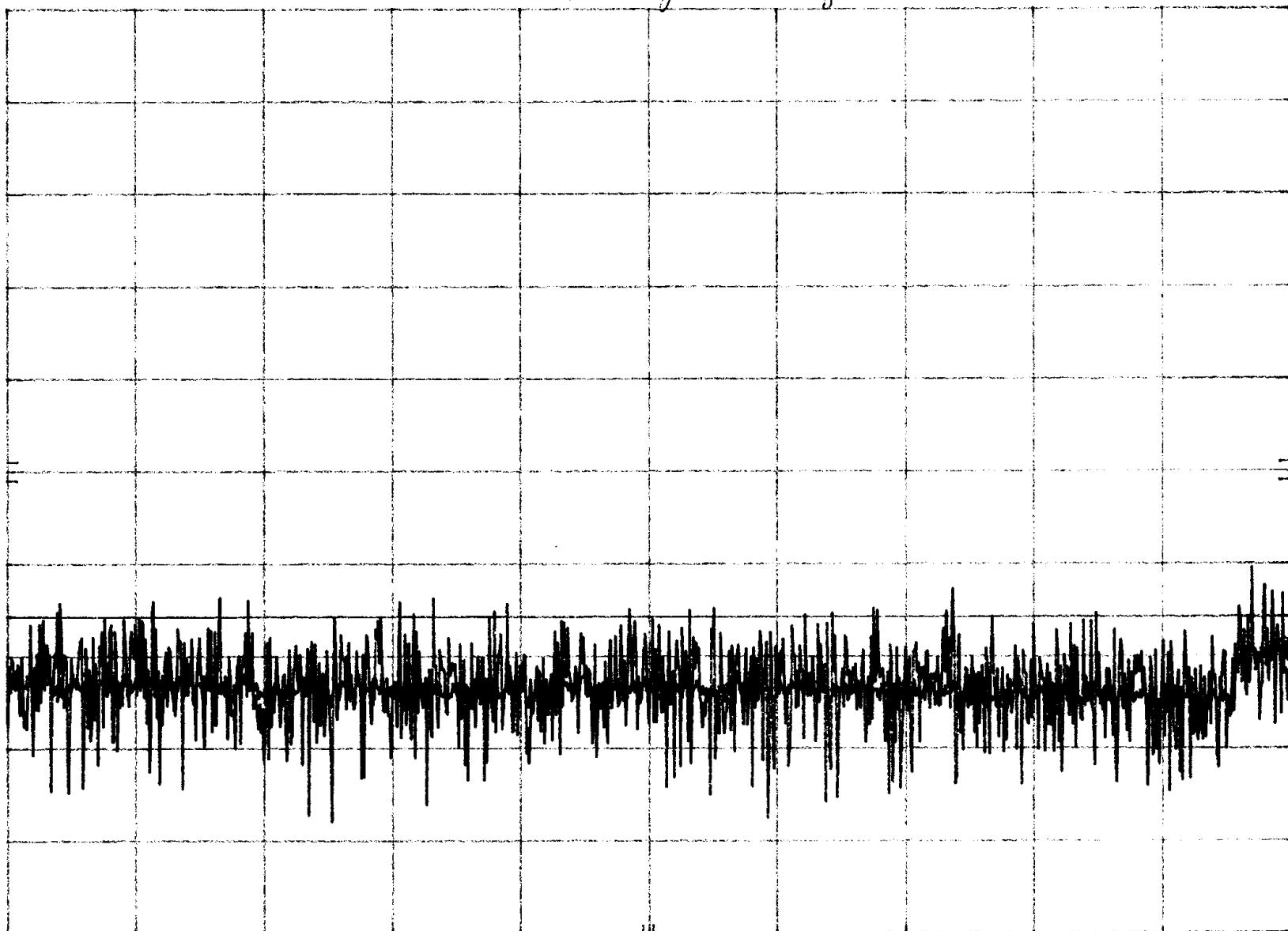
START 5.80 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 12.80 GHz

SWP 175 msec



34

08/16/00

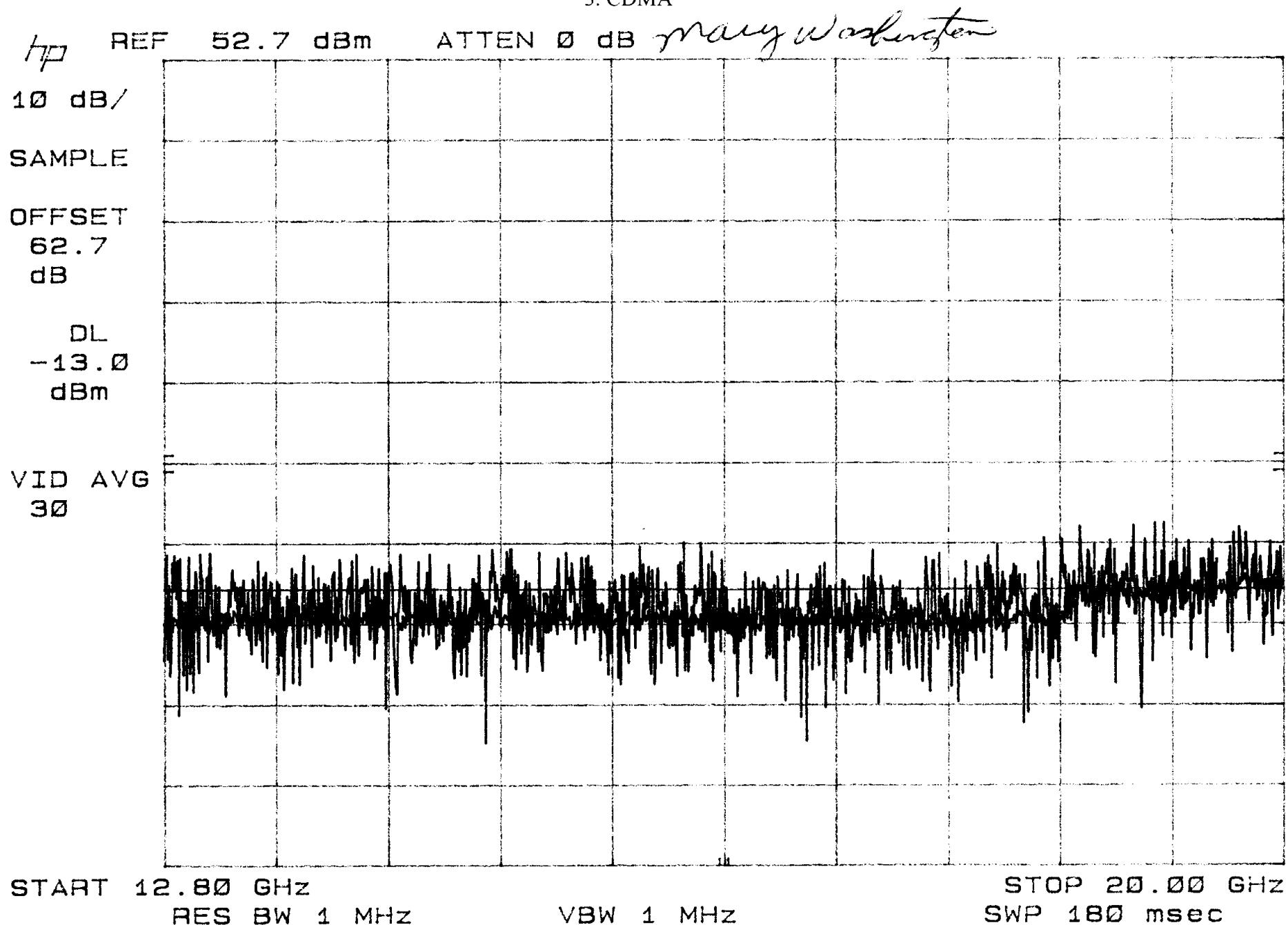
SPEC: Fcc Part 2, Para. 2.1051

NOTES:

1. SG = -1.6 dBm

2. High channel, 1945 MHz

3. CDMA

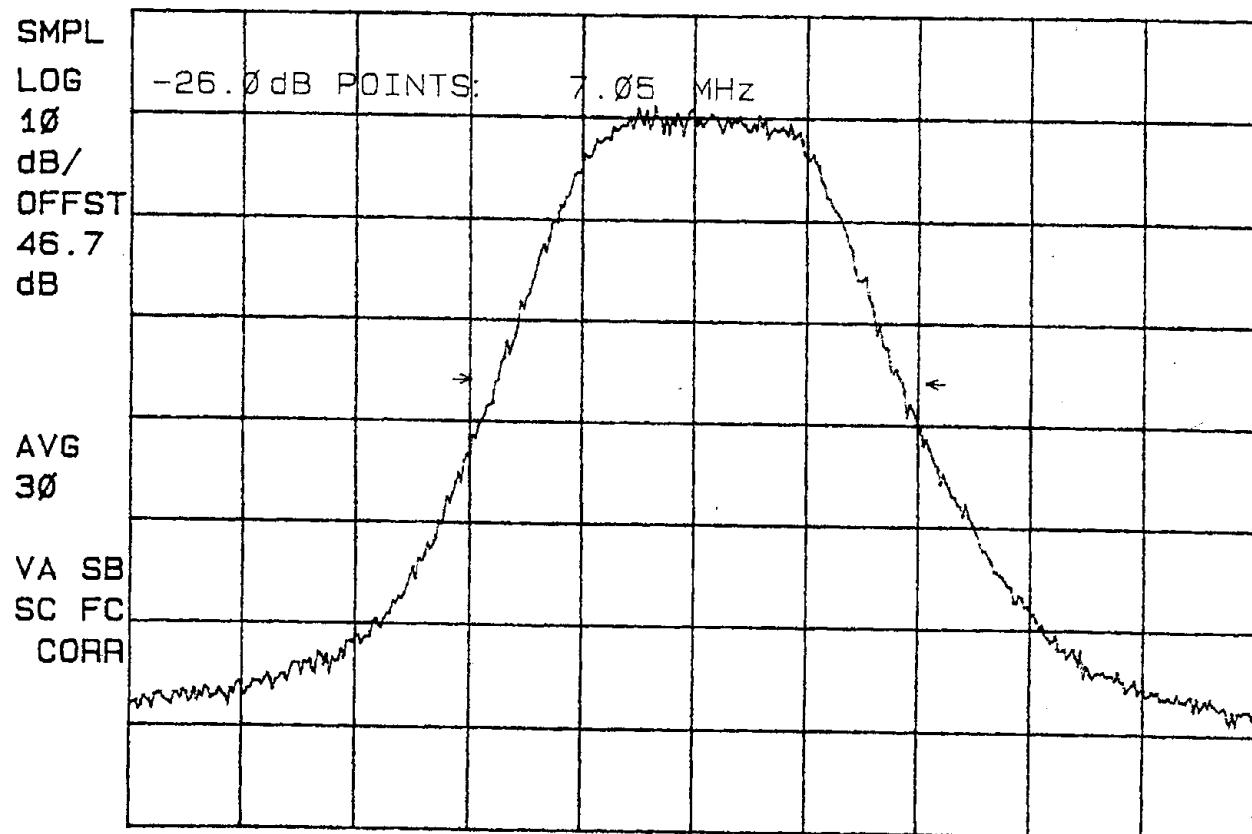


09:45:21 JUN 15, 2000

Emission Bandwidth  
Low Channel  
FCC 24.238(b)

6-15.00  
0800

REF 46.7 dBm #AT 20 dB



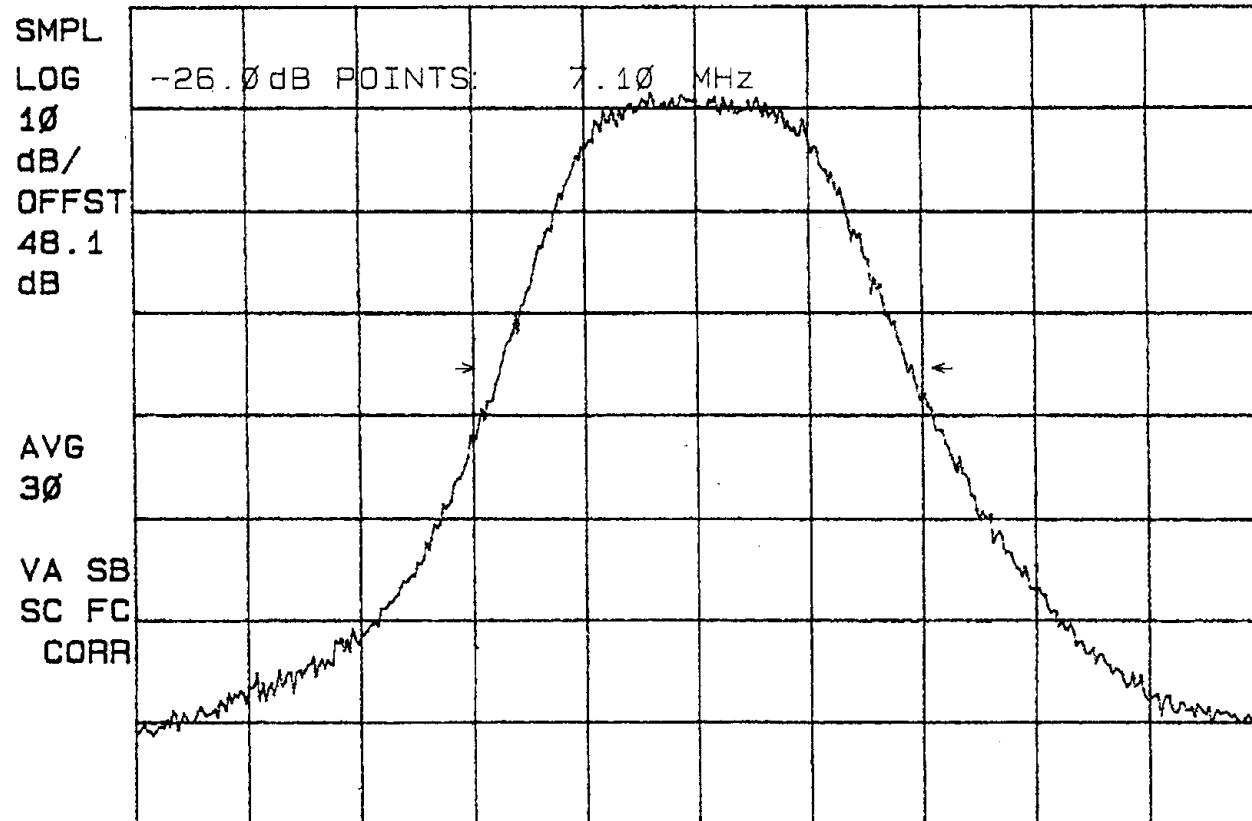
36

Emission Bandwidth  
High Channel  
FCC 24.238(b)

6-16-00  
2850

06: 27: 29 JUN 16, 2000

REF 48.1 dBm AT 10 dB



CENTER 1.94500 GHz  
#RES BW 1.0 MHz

VBW 1 MHz

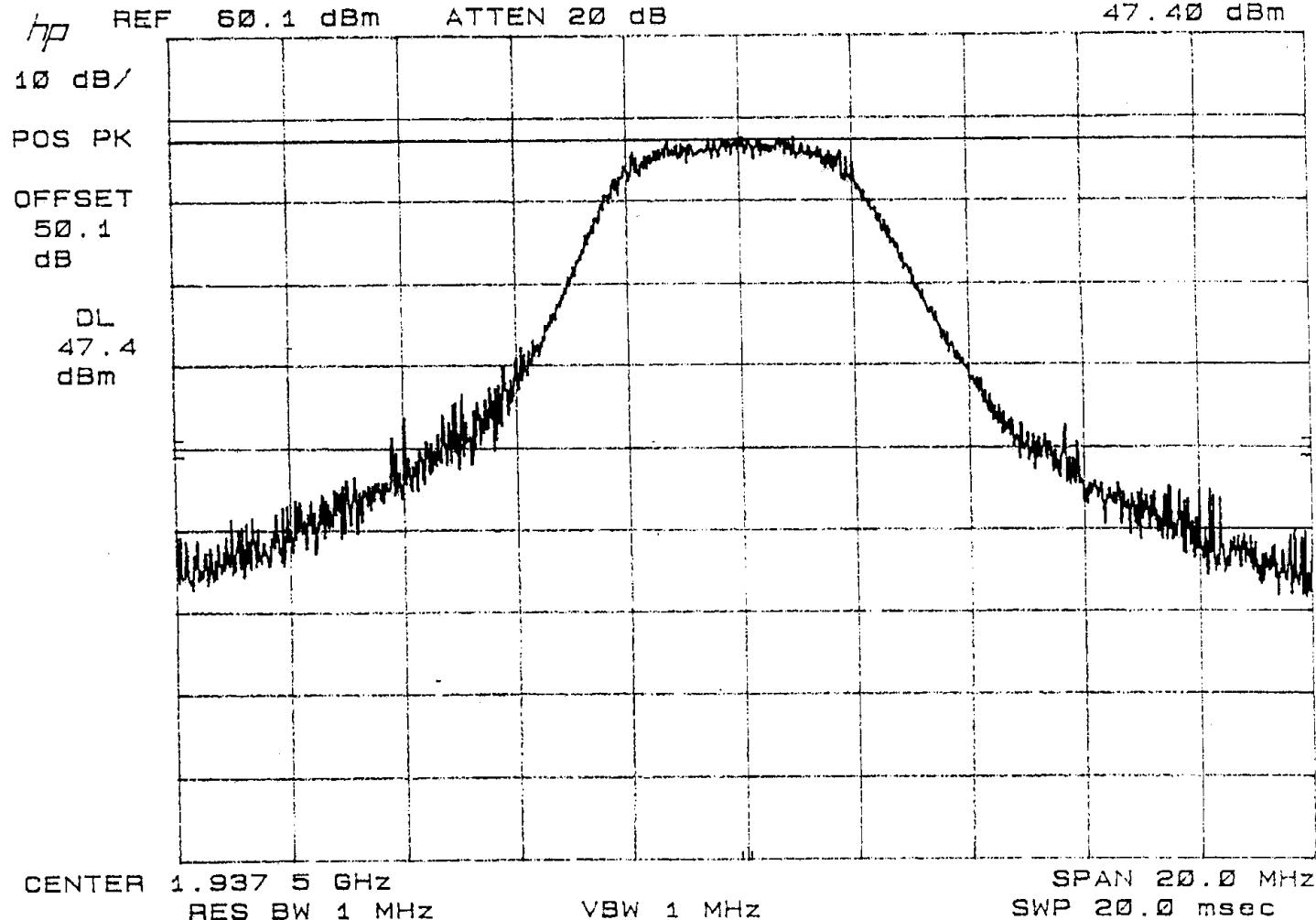
SPAN 20.00 MHz  
SWP 20.0 msec

31

RF Power Output  
2,1046

6-14-00  
2:00

MKR 1.937 54 GHz  
47.40 dBm

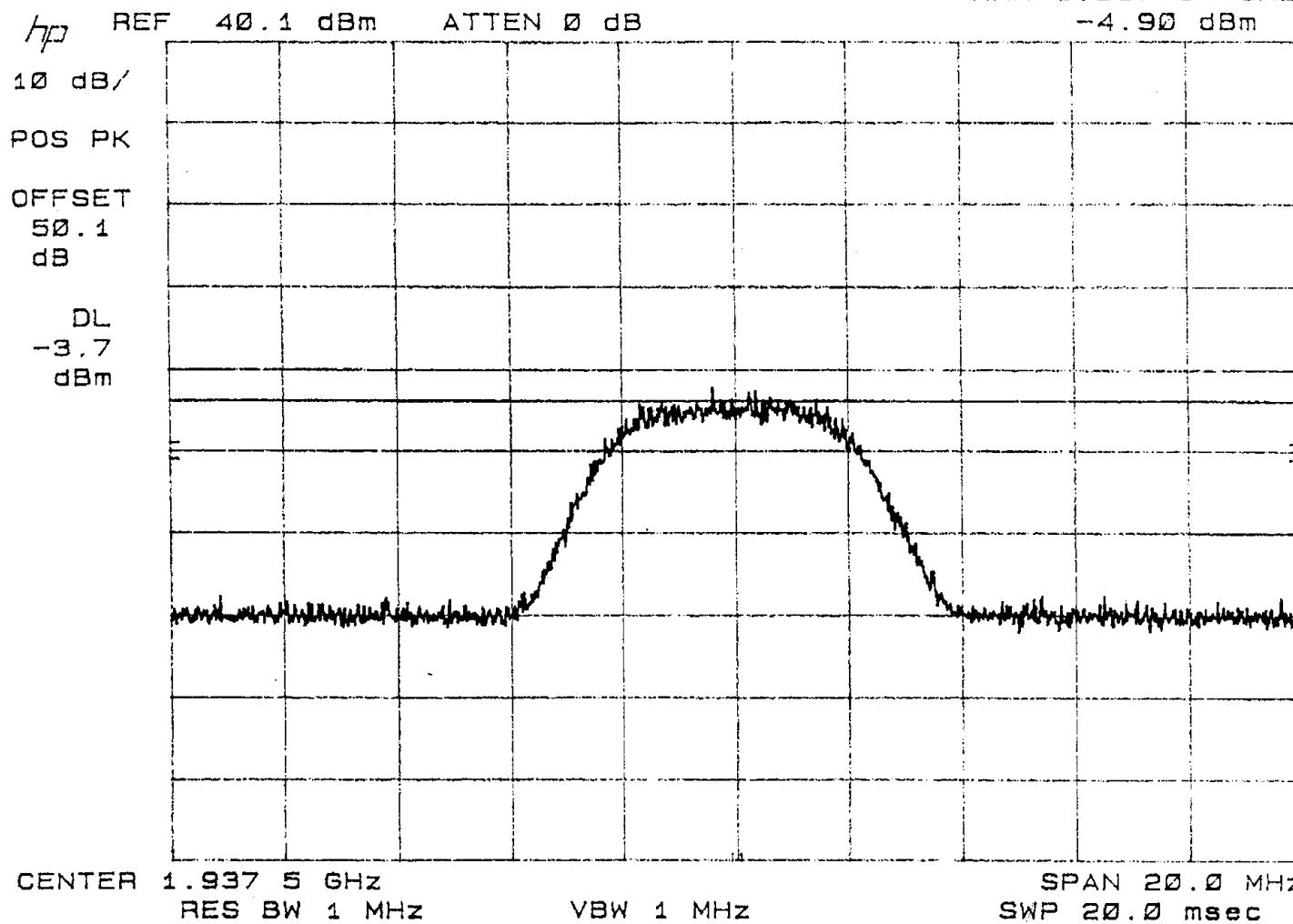


Amplifier Gain - Input

HP 8566B  
PN: 744

6-14-00  
0800

MKR 1.937 54 GHz  
-4.90 dBm

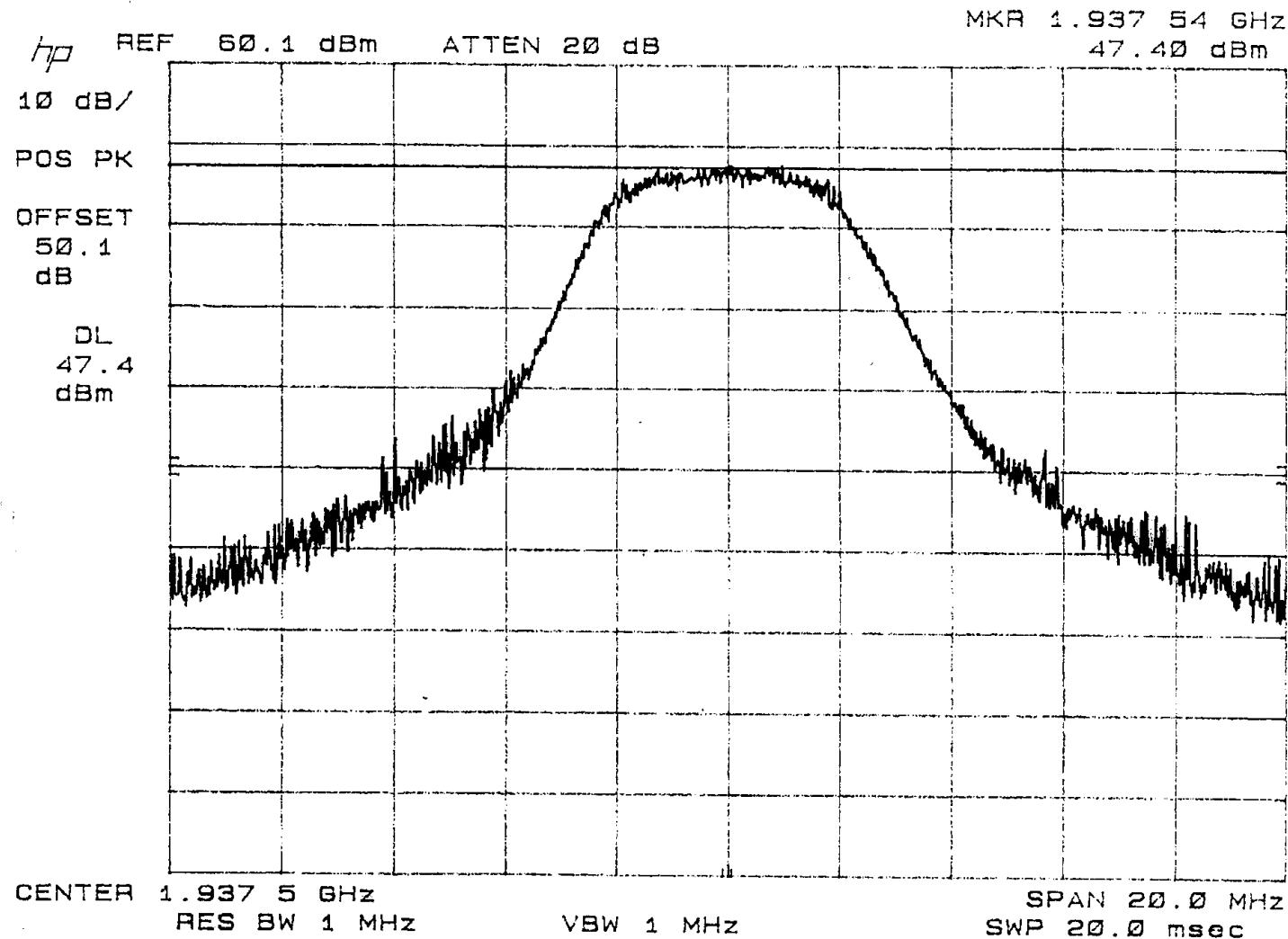


mid channel Example

Low " Taken with power  
meter - set to  
47.4 dBm

Amplifier Gain - Output

6-14-00  
OECO



## 5 ATTESTATION STATEMENT

### 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:



Jim Owen  
(EMC Engineer)