MEASUREMENT AND TECHNICAL REPORT

POWERWAVE TECHNOLOGIES
2026 McGaw Avenue
Irvine, CA 92614

DATE: 5 September 2000

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Multi-channel Power Amplifier, Model G3S-800-150	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: **Defer until:**	No: X
Company Name **agrees to notify the Commission by:** **of the intended date of announcement of the product so that the grant can be issued on that date.**	N/A	
Transition Rules Request per 15.37?	Yes:	*No:

(*) FCC Part 2, Paragraphs 2.1046, 2.1049, 2.1051, 2.1053, and Part 22, Paragraph 22.917

Report Prepared by:

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

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1 GENERAL INFORMATION

1.1 Product Description

EUT Name: Multi-channel Power Amplifier
Model: G3S-800-150

1.0 EUT Documentation

1.1 EUT Description: The G3S-800-150 is a linear, feed-forward power amplifier that operates in the 25 MHz frequency band from 869 MHz to 894 MHz. The amplifier can simultaneously transmit multiple frequencies, with better than -65 dBc third order intermodulation distortion (IMD). It is designed for use in an amplifier system that is modular in design, and is ideally suited for use in AMPS/TDMA/CDMA base stations. Each amplifier module has a status connector that allows the host system to monitor the amplifier module performance. The front panel of each amplifier module has unit level status/fault indicators and an RF on/off/reset switch. Primary power for the amplifier is +27 Vdc. Cooling for each plug-in amplifier module is provided by three fans, two mounted on the front and one on the rear of the module. The fans draw outside air through the front of the module and exhaust hot air out through the rear of the module.

1.1.1 Components of EUT

Description	Model Number	Serial Number	FCC ID Number
Multi-channel Power Amplifier	G3S-800-150	--	E675JS0044

1.2 Operating modes:

The G3S-800-150 amplifier operates in the 869-894MHz frequency range at an average output power of 150W per module stand-alone. It is capable of amplifying multiple carriers of CDMA, TDMA, or AMPS modulated input signals. The amplifier does not provide any modulation of its own.

1.3 EUT I/O Ports and Cables:

1.3.1 I/O Cables

CONNECTION:	**RF In**
SHIELD:	**Yes**
CONNECTORS:	**Metal**
TERMINATION TYPE:	**D-Subminiature**
LENGTH:	**Not specified**
REMOVABLE:	**Yes**

CONNECTION:	**RF Out**
SHIELD:	**Yes**
CONNECTORS:	**Metal**
TERMINATION TYPE:	**D-Subminiature**
LENGTH:	**Not specified**
REMOVABLE:	**Yes**

CONNECTION:	**+/-27 Vdc**
SHIELD:	**No**
CONNECTORS:	**Metal**
TERMINATION TYPE:	**D-Subminiature**
LENGTH:	**Not specified**
REMOVABLE:	**Yes**

1.3.2 Power Cords

UNIT:	**N/A**
MANUFACTURER:	
SHIELDED:	
LENGTH:	

1.3.3 Power requirements:

27 VDC 65 Amps

1.4 Oscillator Frequencies

Frequency	EUT Location	Description of use
16 MHz	Loop Ctrl. PCB	Freq. Ref.
8 MHz	Loop Ctrl. and Alarm PCB	Freq. Ref.

1.5 Power Supply

Description	Manufacturer	Model #	Serial #	Switching frequency or linear
N/A Not part of EUT				

1.6 Power Line Filters

Manufacturer	Model #	Qty	LOCATION ON EUT
N/A			

1.7 Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or value	Qty	LOCATION ON EUT
N/A				

1.8 Description of Enclosure: (including Gasketing, Coatings, Bonding, etc.)

Aluminum alloy machined housing with chem-film and paint coatings.

1.9 Interfacing and/or Simulators Peripheral Equipment

DESCRIPTION:	**RF Signal Generator (Qty. 2)**
MANUFACTURER:	**Hewlett Packard**
MODEL NUMBER:	**E4433B**
SERIAL NUMBER:	**US38330312, US38440615**
FCC ID:	**N/A**

DESCRIPTION:	**DC Power Supply**
MANUFACTURER:	**Power Ten**
MODEL NUMBER:	**P62B-30100**
SERIAL NUMBER:	**1007075**
FCC ID:	**N/A**

DESCRIPTION:	**RF Power Meter, Power Sensor**
MANUFACTURER:	**HP**
MODEL NUMBER:	**437B, 8481A**
SERIAL NUMBER:	**3125U21148, US37290513**
FCC ID:	**N/A**

DESCRIPTION:	**RF Attenuator / Load**
MANUFACTURER:	**Lucas Weinschel**
MODEL NUMBER:	**53-30-34**
SERIAL NUMBER:	**LN731**
FCC ID:	**N/A**

DESCRIPTION:	**RF Attenuator**
MANUFACTURER:	**Narda**
MODEL NUMBER:	**766-20**
SERIAL NUMBER:	**166**
FCC ID:	**N/A**

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 2.1049, and 2.1051 and Part 22, Paragraph 22.917
- 2. Radiated Emissions EN55022: 1992 Class B limit, 30 - 1,000 MHz, 10 meters
- X 3. Radiated Emission per FCC Part 2, Paragraph 2.1053, & Part 22, Paragraph 22.917
- 4. Engineering evaluations
- 5. Frequency Stability, Part 2, Paragraph 2.995, and Part 87, Paragraph 87.133
- X 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: 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

Frequency Range: 869 - 894 MHz
RF Power: 0 - 150W
Frequency Tolerance: N/A
Emission Designator: F1D, F8W, F9W, DXW
Microprocessor: N/A

Types of Emission: AMPS Voice, AMPS Wideband Data, TDMA, CDMA
Operating power range: 0 - 150 W
Maximum power rating: 150 W
Device is a power amplifier
Device is a power amplifier

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The Multi-channel Power Amplifier, Model G3S-800-150 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).

See test setup photos for radiated emissions test setup.

REPORT No: S9598 TESTED BY: J Owen SPEC: FCC Para. 2.1053

CUSTOMER: Powerwave Technologies TEST DIST: 3

E U T: Model G3S-800-150 TEST SITE: Roof

EUT MODE: Normal BICONICAL: N/A

DATE: 7-Jan-00 LOG: 244

NOTES: OTHER: 453

Above 1 GHz RBW & VBW = 1 MHz

Multi-Channel Power Amplifier

v.beta

FREQ (MHz)	VERTICAL (dBuv) pk	av	HORIZONTAL (dBuv) pk	av	CORRECTION FACTOR (dB/m)	MAX LEVEL (dBuV/m) pk	av	SPEC LIMIT (dBuV/m) pk	av	MARGIN (dB) pk	av	EUT Rotation	Antenna Height
869	69.5		69.2		26.8	**96.3**				96.3		353	1.5
1738	38.5		33.2		30.1	**68.6**		84.4		-15.8		9	1.2
2607	25.8		24.7		35.1	**60.9**		84.4		-23.5		19	1.2
3476	9		11.3		37.6	**48.9**		84.4		-35.5		19	1.2
4345	26.2		20.3		41.5	**67.7**		84.4		-16.7		0	1.2
5214	6.5		7.2		42.4	**49.6**		84.4		-34.8			
6083	11		11.7		45.2	**56.9**		84.4		-27.5		47	1.2
6952	11.8		12.5		45.4	**57.9**		84.4		-26.5			
7821	11.9		11.6		47.1	**59.0**		84.4		-25.4			
8690	11.2		11.3		48.5	**59.8**		84.4		-24.6			
881.5	72.7		69.8		27.1							168	1.5
1763	40.4		34.4		30.1	**70.5**		84.4		-13.9		30	1.2
2644.5	22.1		23		35.0	**58.0**		84.4		-26.4		119	1.2
3526	9.7		8.5		39.5	**49.2**		84.4		-35.2		6	1.2
4407.5	21.9		16.9		41.5	**63.4**		84.4		-21		333	1.2
5289	7.1		7		42.4	**49.5**		84.4		-34.9			
6170.5	13.2		15.4		45.2	**60.6**		84.4		-23.8		176	1.2
7052	11.7		11.6		46.1	**57.8**		84.4		-26.6			
7933.5	11.8		11.5		47.1	**58.9**		84.4		-25.5			
8815	11.8		11.6		48.4	**60.2**		84.4		-24.2			
894	71.9		78.9		27.1	**106.0**				106		359	1.5
1788	37.8		33.4		30.0	**67.8**		84.4		-16.6		28	1.2
2682	22.3		22.9		35.0	**57.9**		84.4		-26.5		218	1.5
3576	11.9		13.1		39.5	**52.6**		84.4		-31.8		40	1.5
4470	20.2		19.3		41.6	**61.8**		84.4		-22.6		331	1.2
5364	7		7.1		42.4	**49.5**		84.4		-34.9			
6258	13.6		13.7		45.2	**58.9**		84.4		-25.5		32	2
7152	11		11.9		46.1	**58.0**		84.4		-26.4			
8046	11.8		11.4		47.9	**59.7**		84.4		-24.7			
8940	11.9		11.4		48.4	**60.3**		84.4		-24.1			

Emissions Test Conditions: RADIATED EMISSIONS, FCC Part 2, Paragraph 2.1053 and Part 22, Paragraph 22.917

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

☐ **- Test not applicable**

■ - Canyon #3, Roof, San Diego

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	10/01
3146	244	Antenna, Log Periodic Dipole	EMCO	1063	10/00
8566B	720	Spectrum Analyzer	Hewlett Packard	211500842	03/00
8566B	721	Spectrum Analyzer Display	Hewlett Packard	2112A02185	03/00

Remarks: _____

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:

Corrected Meter Reading Limit (CMRL) = SAR + AF + CL - AG - 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:

CMRL = 29.4 dBuV + 9.2dB = 1.4 dB - 20 dB/M - 0.0 dB

CMRL = 20.0 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

Multi-channel Power Amplifier, Model G3S-800-150

See following page(s).

Emissions Test Conditions: CONDUCTED EMISSIONS, FCC Part 2, Paragraphs 2.1046, 2.1047, 2.1049, 2.1051

The *CONDUCTED 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, Part 2, Paragraph 2.1049, 2.1051 and Intermodulation

Signal Generator, Model E4433B, Hewlett Packard, S/N US38330312, 03/00
Signal Generator, Model E4432B, Hewlett Packard, S/N US38080330312, 09/00
Spectrum Analyzer/Display, Model HP-8566B, Hewlett Packard, S/N 2618A02913, P/N 744, 08/00
Power Sensor, Model 8481A, Hewlett Packard, S/N US37290513, 12/00
Power Meter, Model HP437B, Hewlett Packard, S/N 3125U21148, 10/00
High Frequency Cable, Micropore, P/N 787, 10/00
Attenuator, Narda, Model 766-20, 06/01
50 W Amp Load, Model 53-30-34, Weinschel, S/N LN 731, NCR
Attenuator, Narda, Model 766-20 757C-10, 06/01
120 Amp Load, Model 53-20-34, Weinschel, S/N LK 446, NCR

Remarks: _____

REPORT NO: 9598 **DATE**: 06 January 2000

TEST: RF Output Power

CUSTOMER: POWERWAVE TECHNOLOGIES

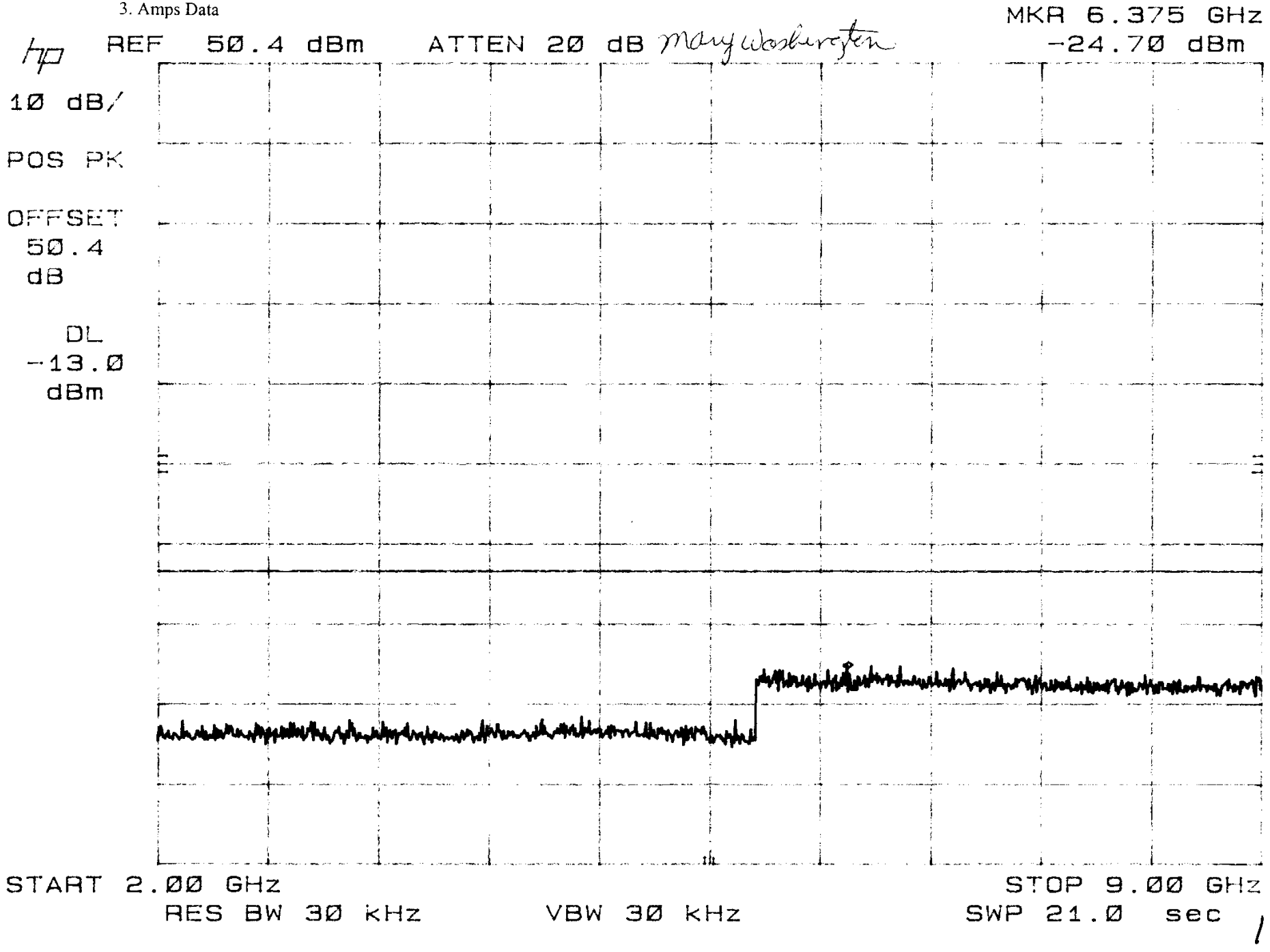
EUT: G3S-800-150 Multi-Channel Power Amplifier

SPECIFICATION: FCC Part 2, Paragraph 2.1046 and RSS-131, Section 6.3

Frequency (MHz)	Modulation	Output Power (Watts)
f_1 = 869 f_2 = 894	CDMA	150
f_1 = 869 f_2 = 894	TDMA	150
f_1 = 869 f_2 = 894	Amps Voice	150
f_1 = 869 f_2 = 894	Amps Data	150

NOTE: Measured at antenna port

CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00
SPECIFICATION: FCC Part 2 2.1051, Spurious Emissions at Antenna Terminals
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Data



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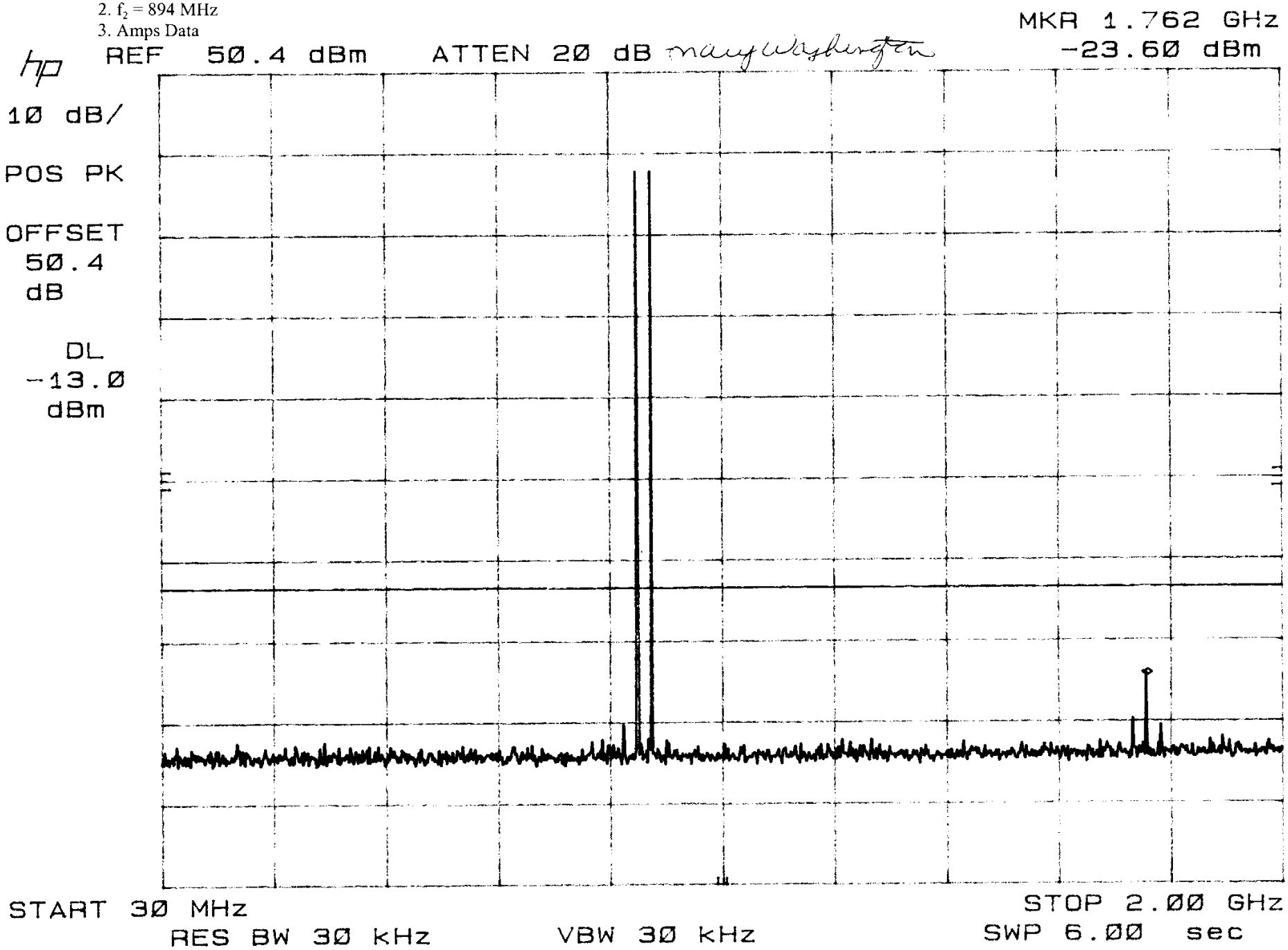

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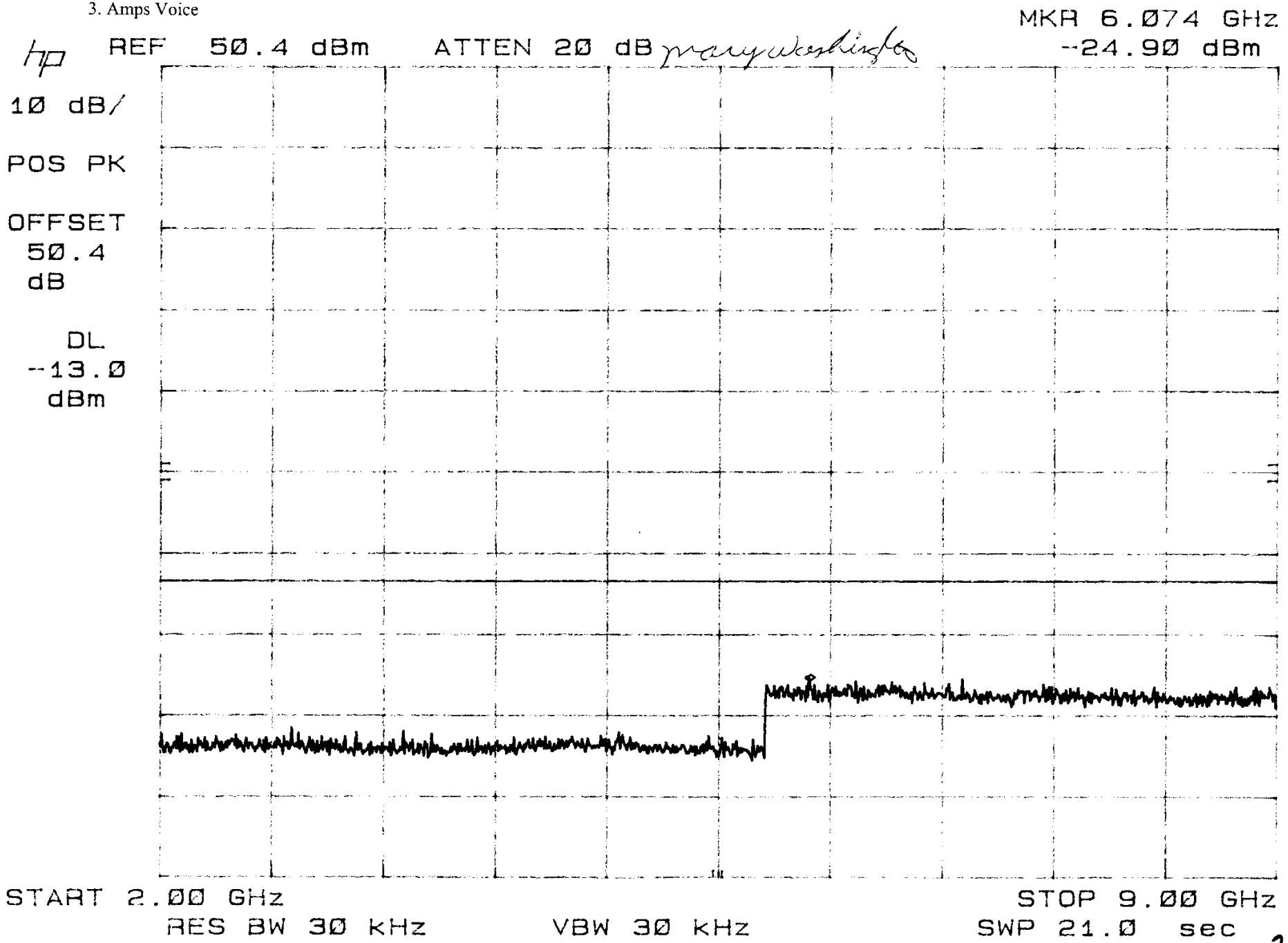

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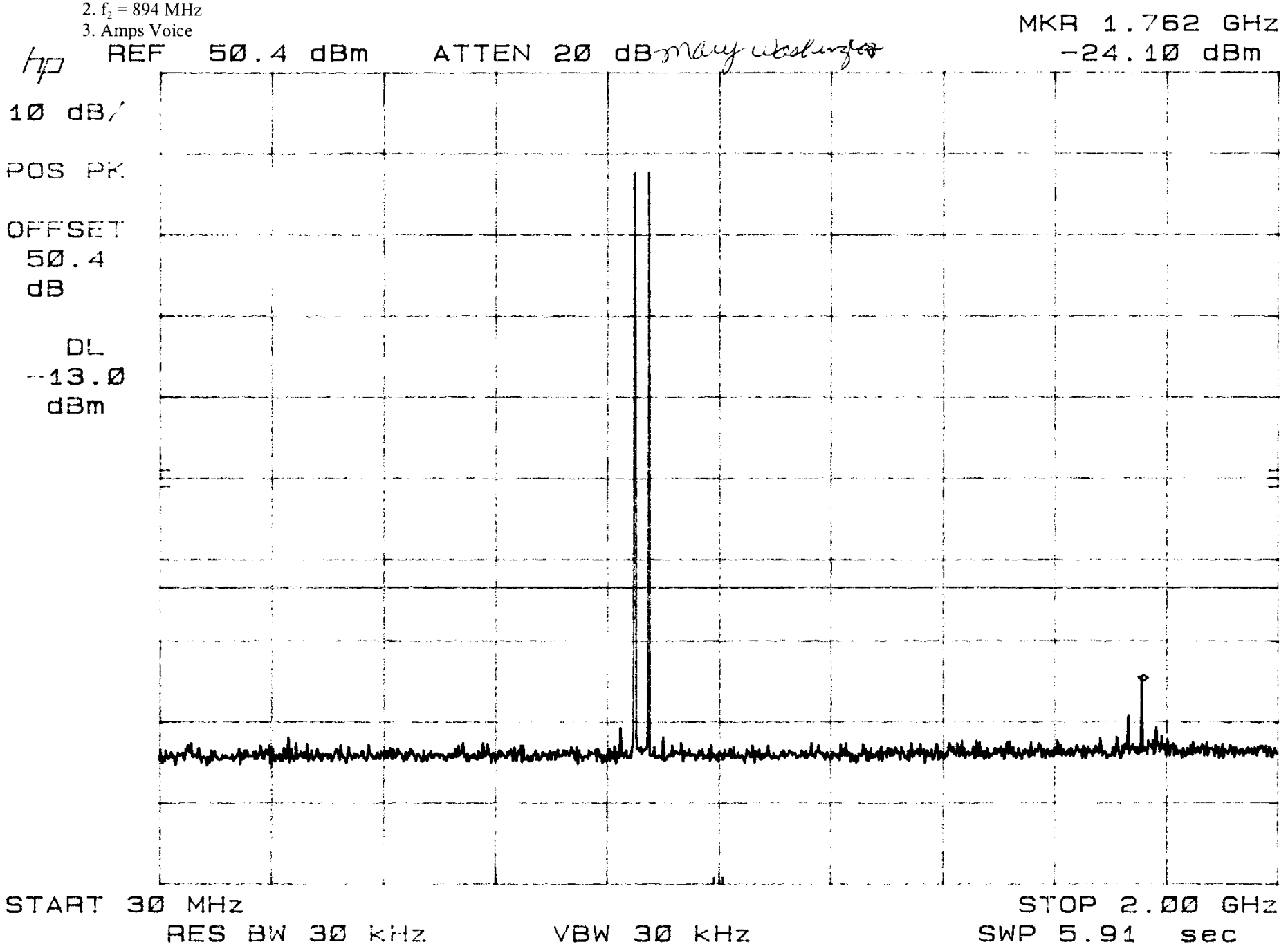

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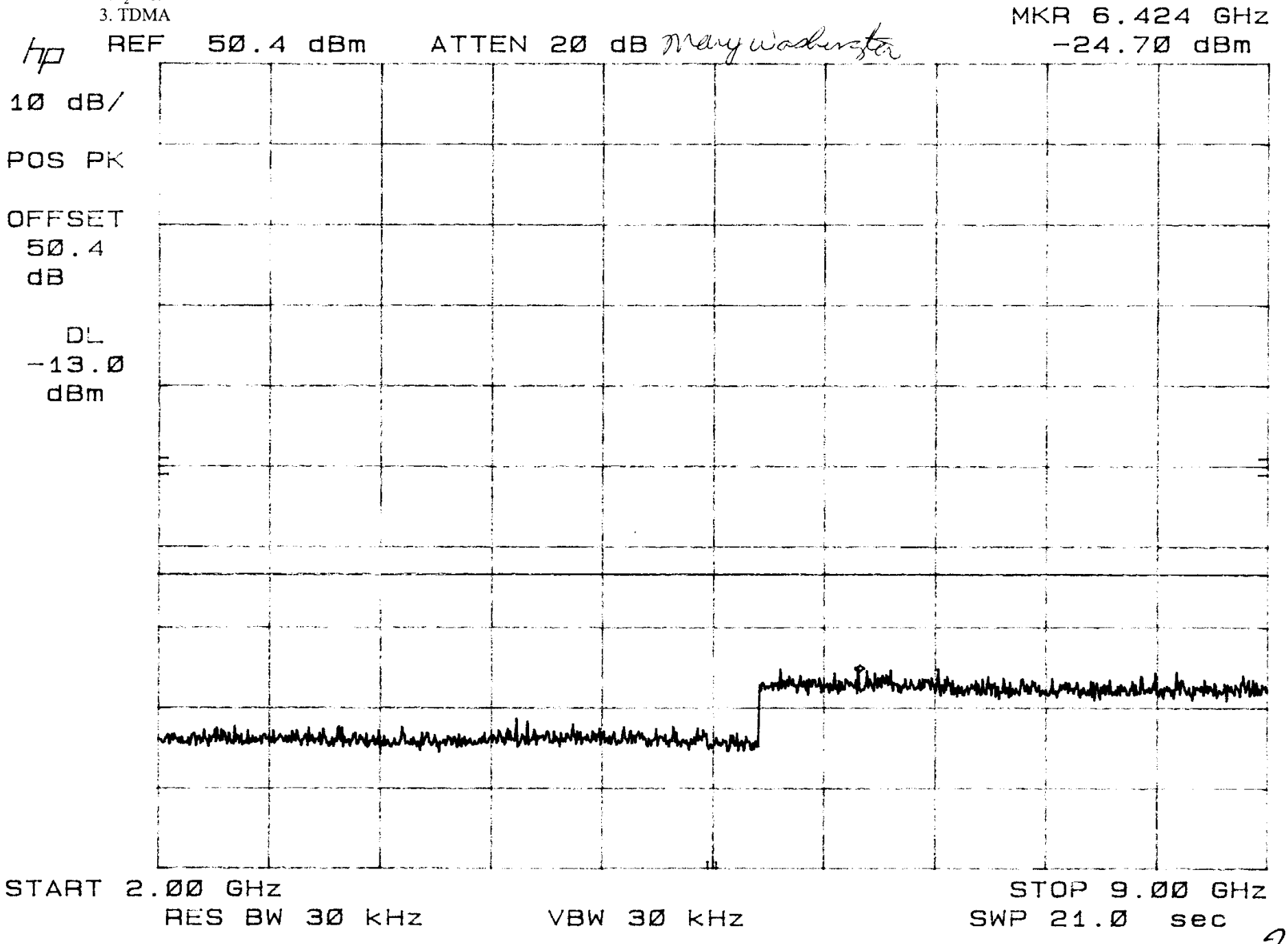
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. TDMA



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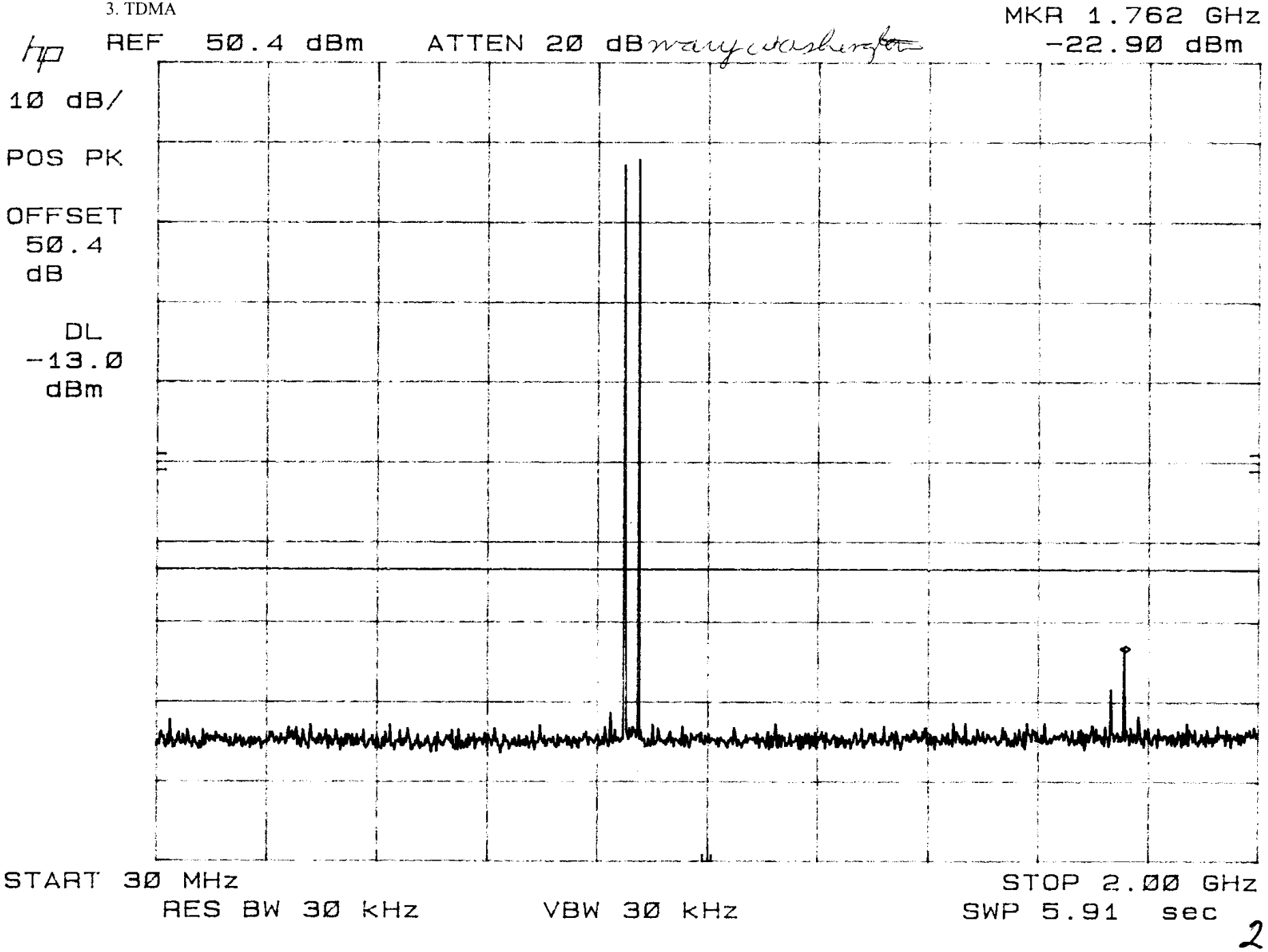

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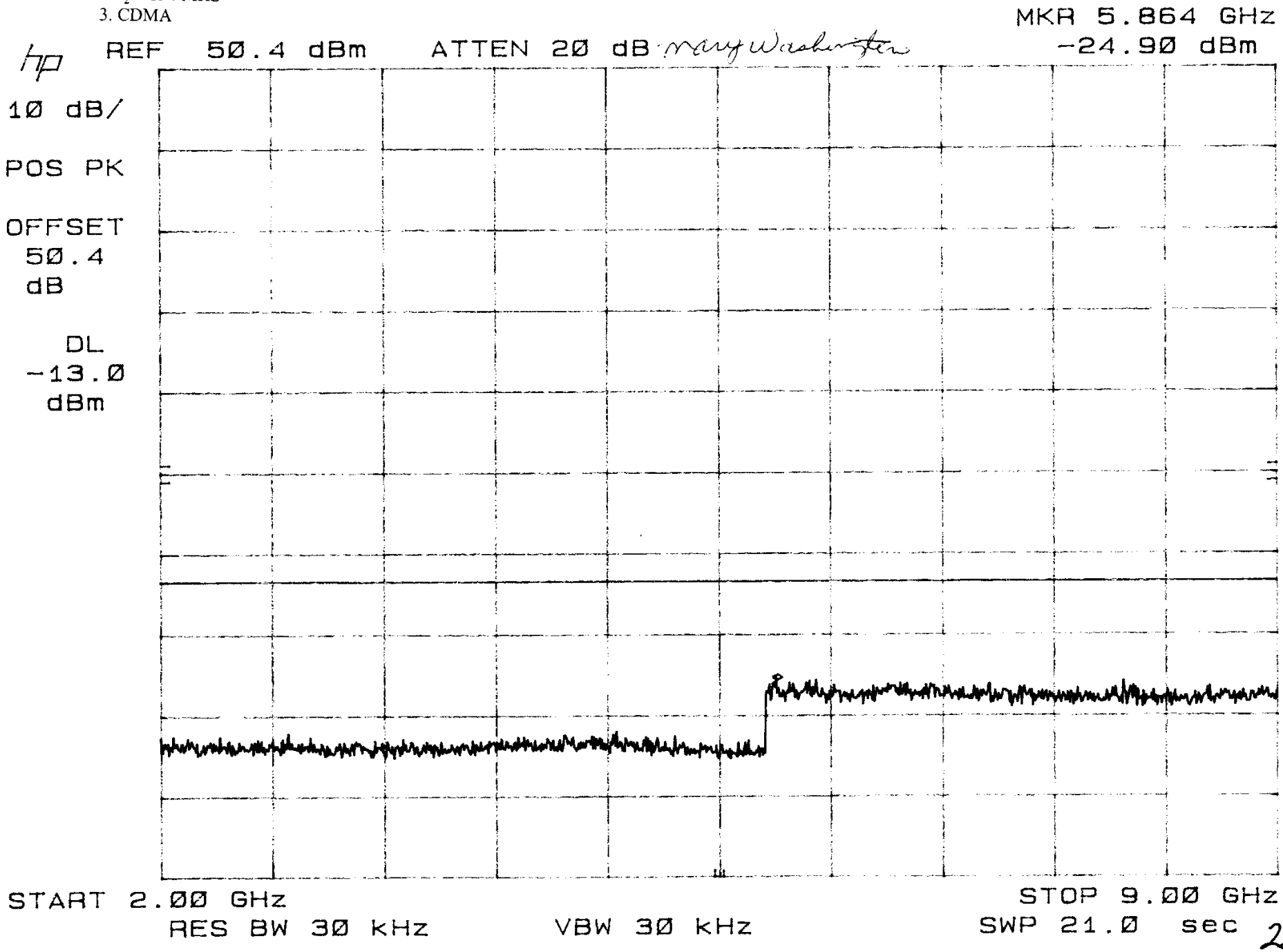
3. CDMA



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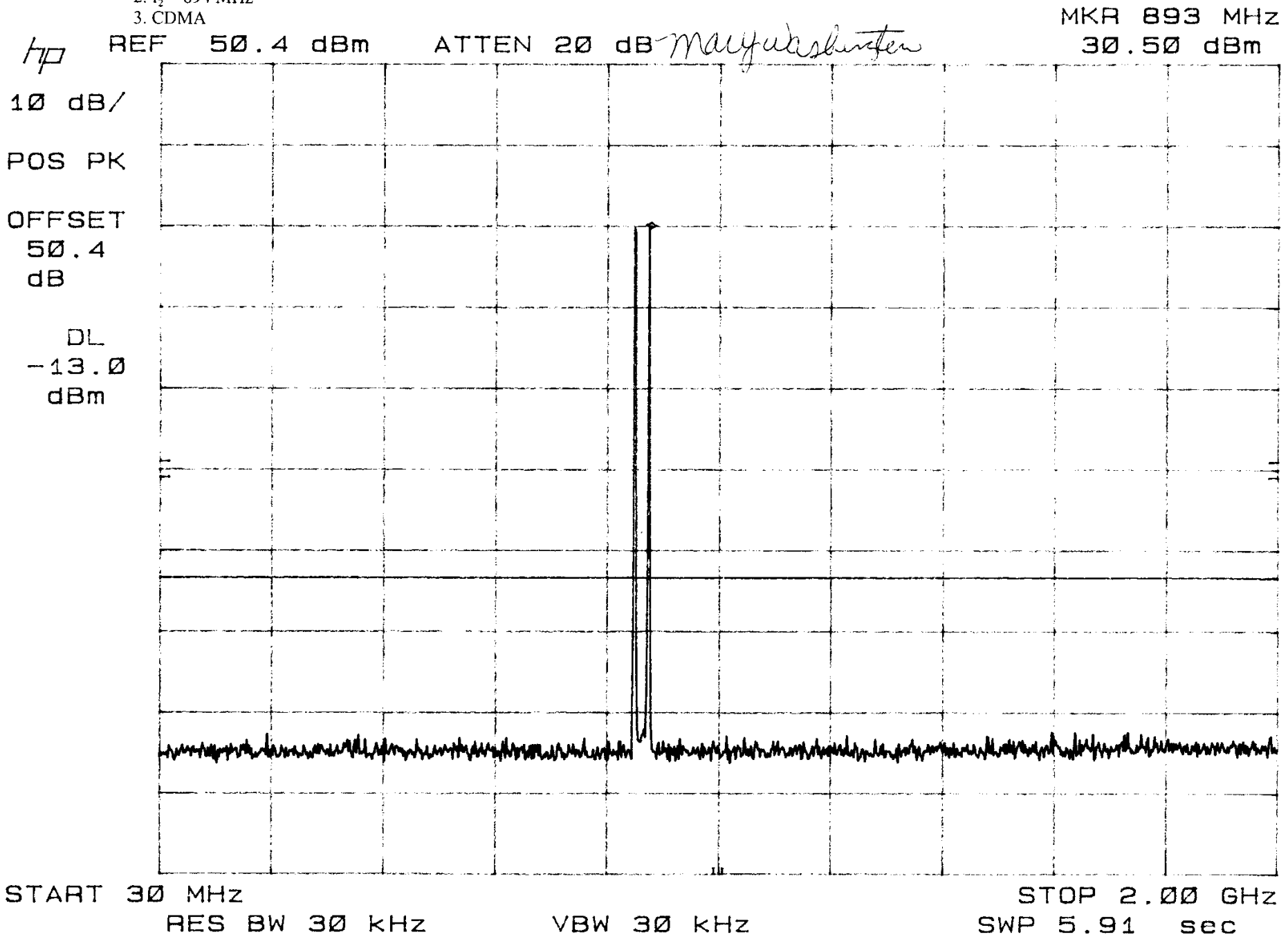
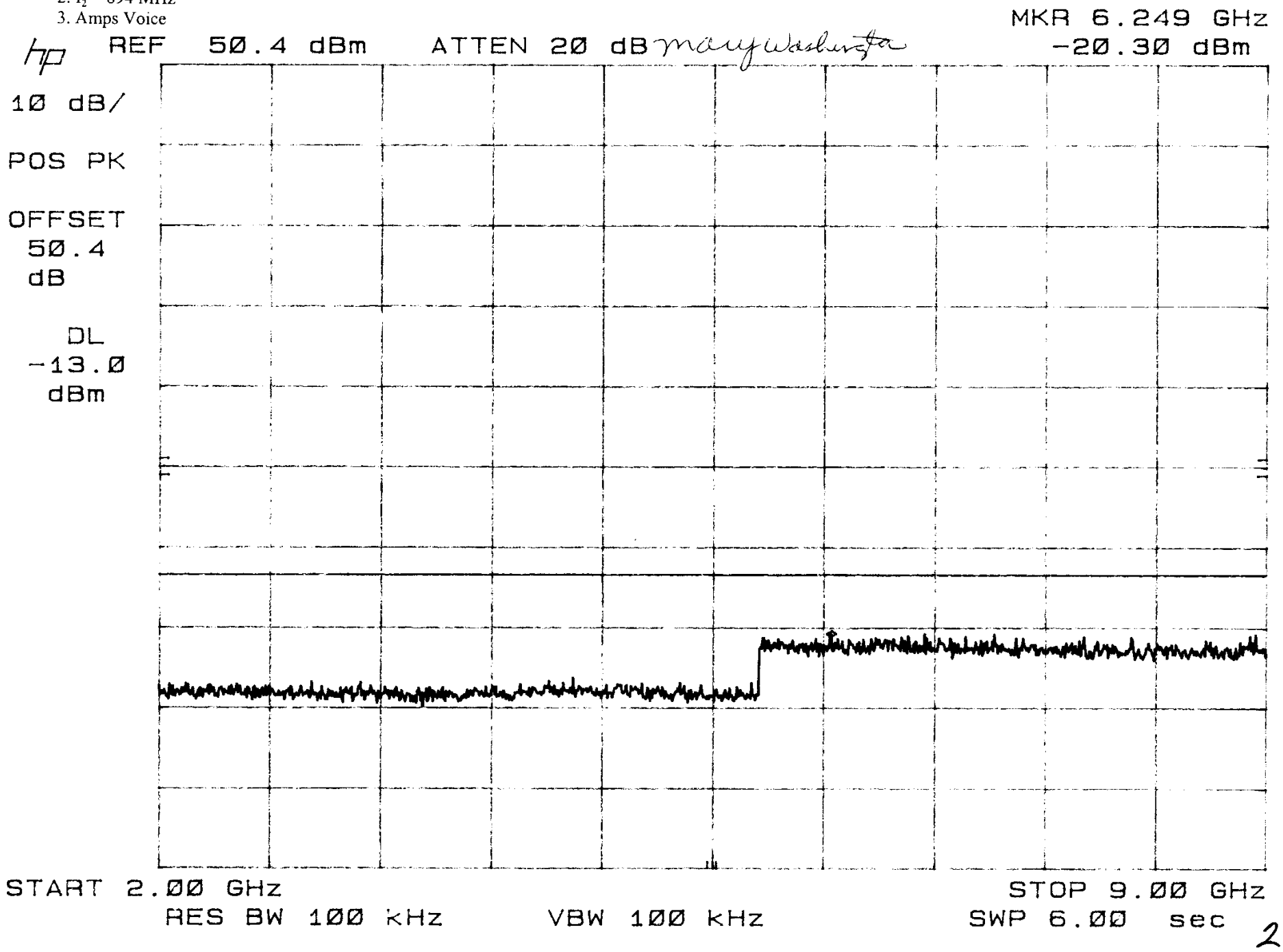


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00
SPECIFICATION: Unwanted Emissions (RSS-131, Section 6.6)
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Voice



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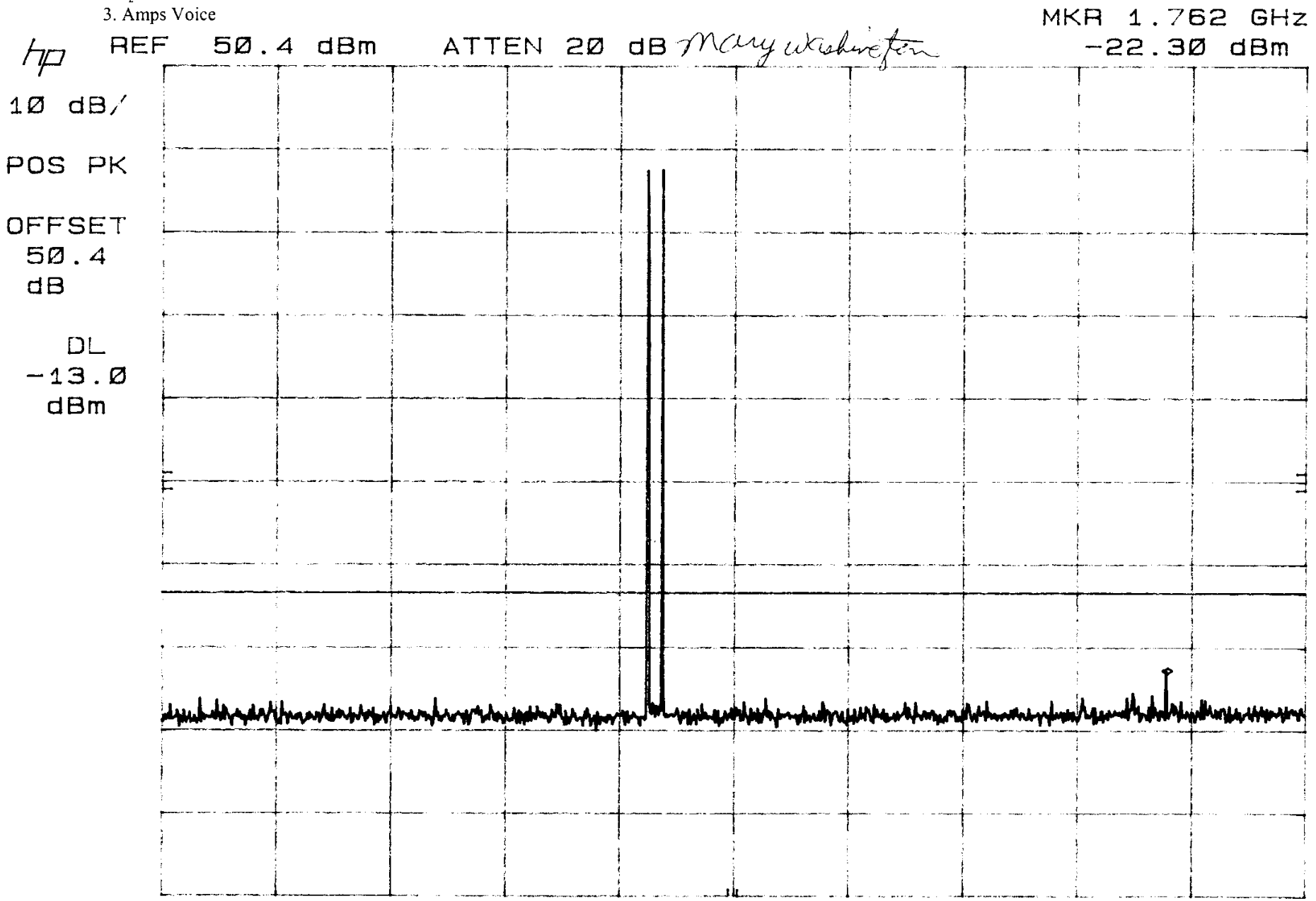

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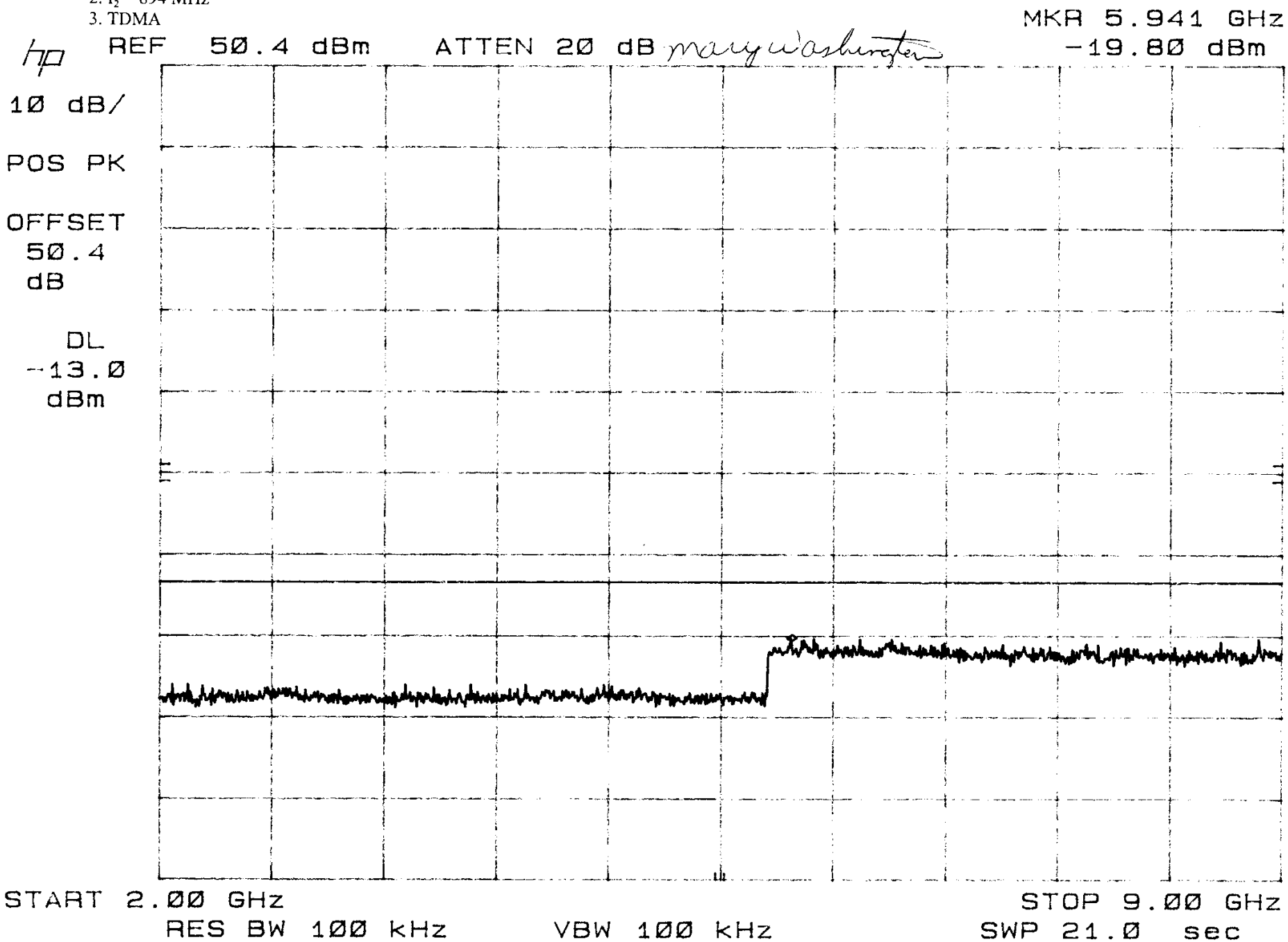

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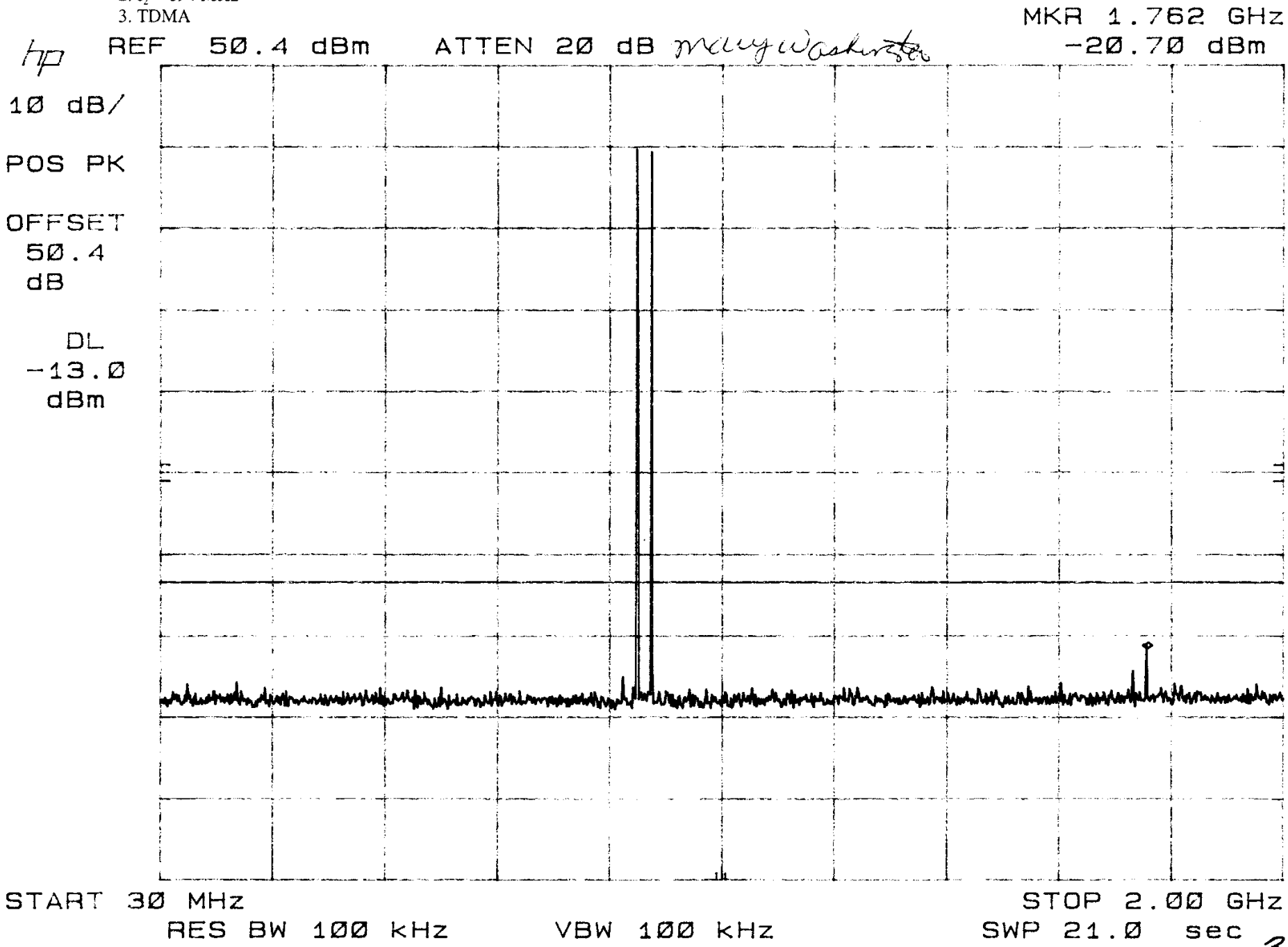

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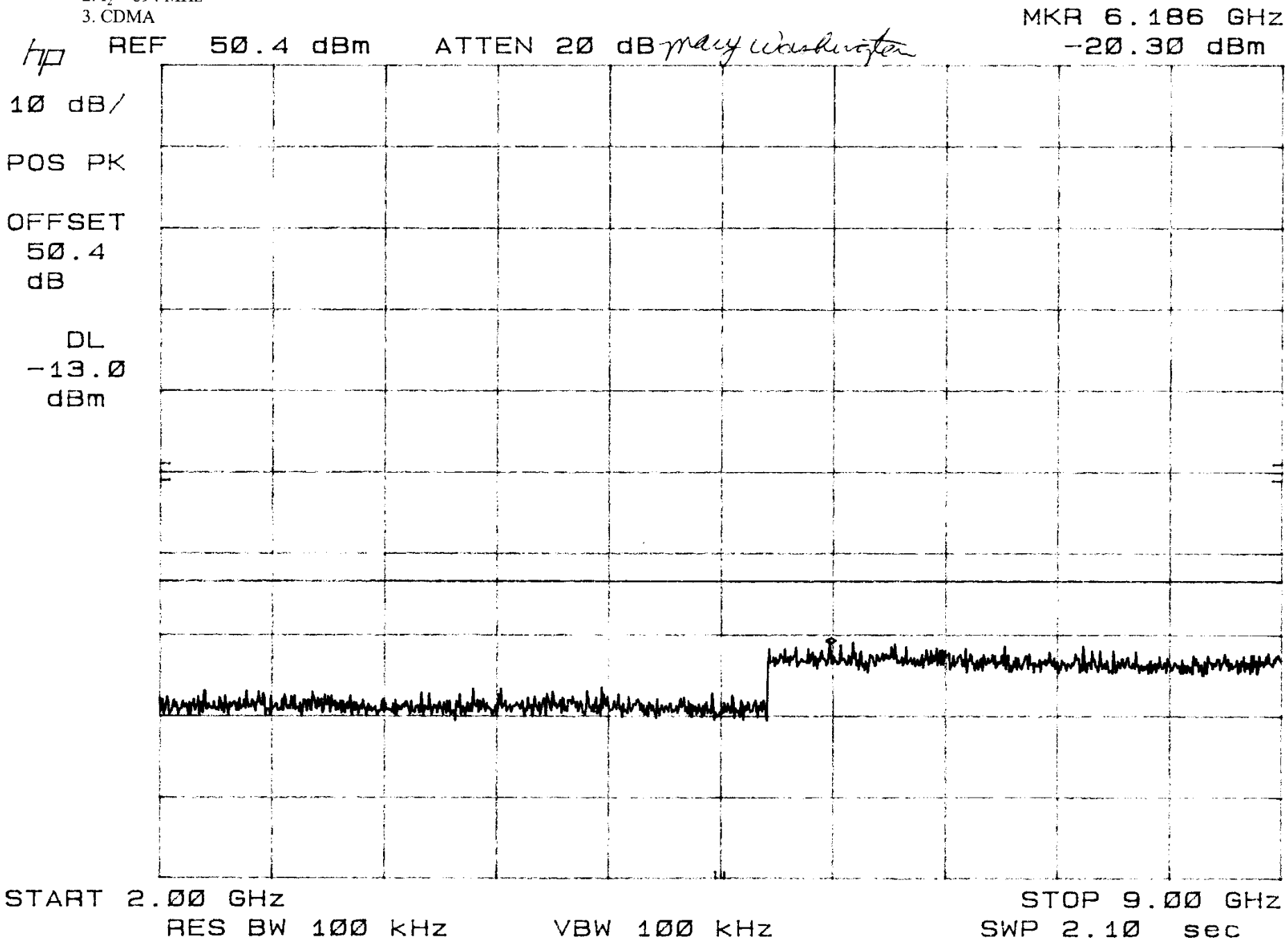

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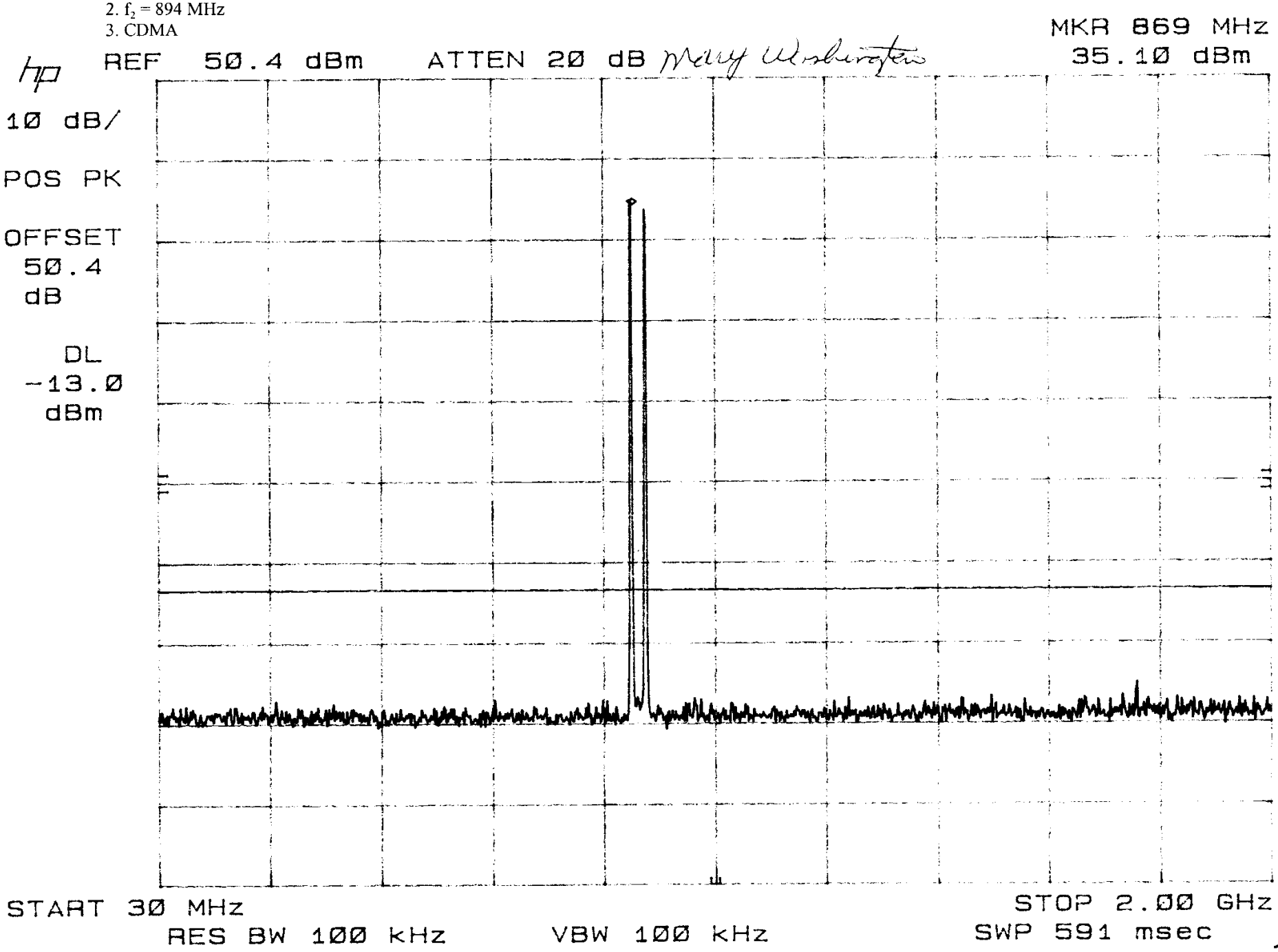

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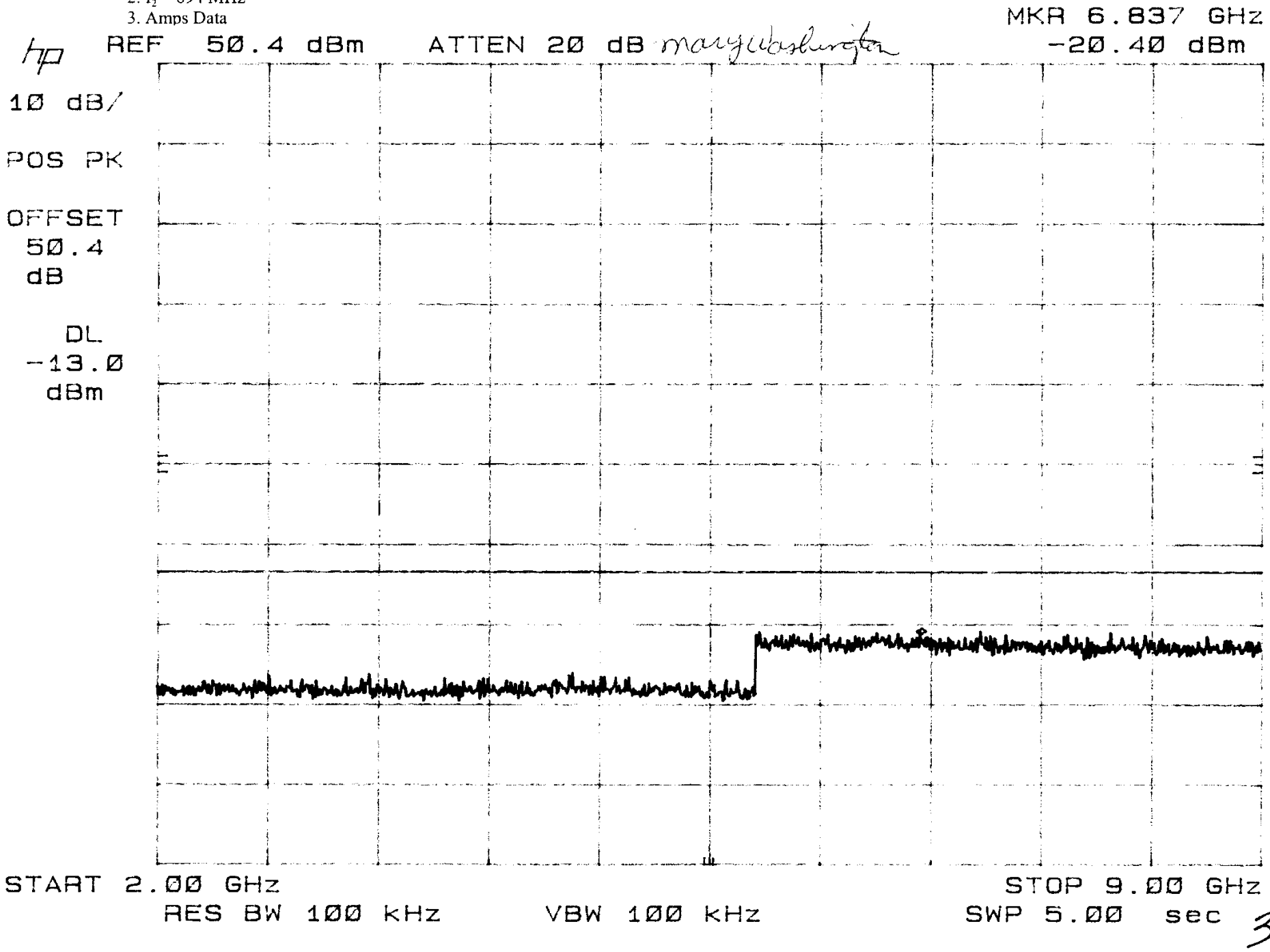
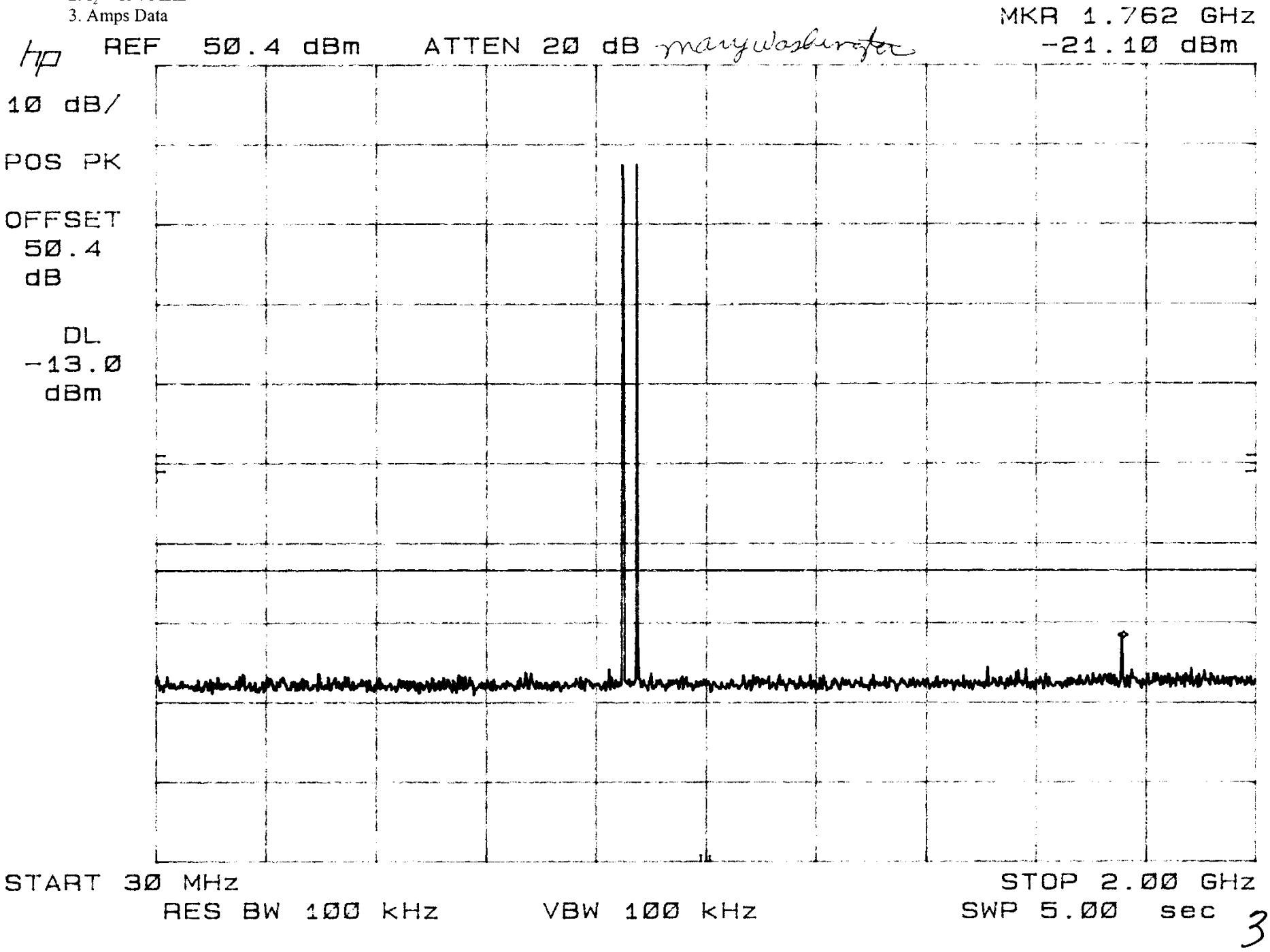
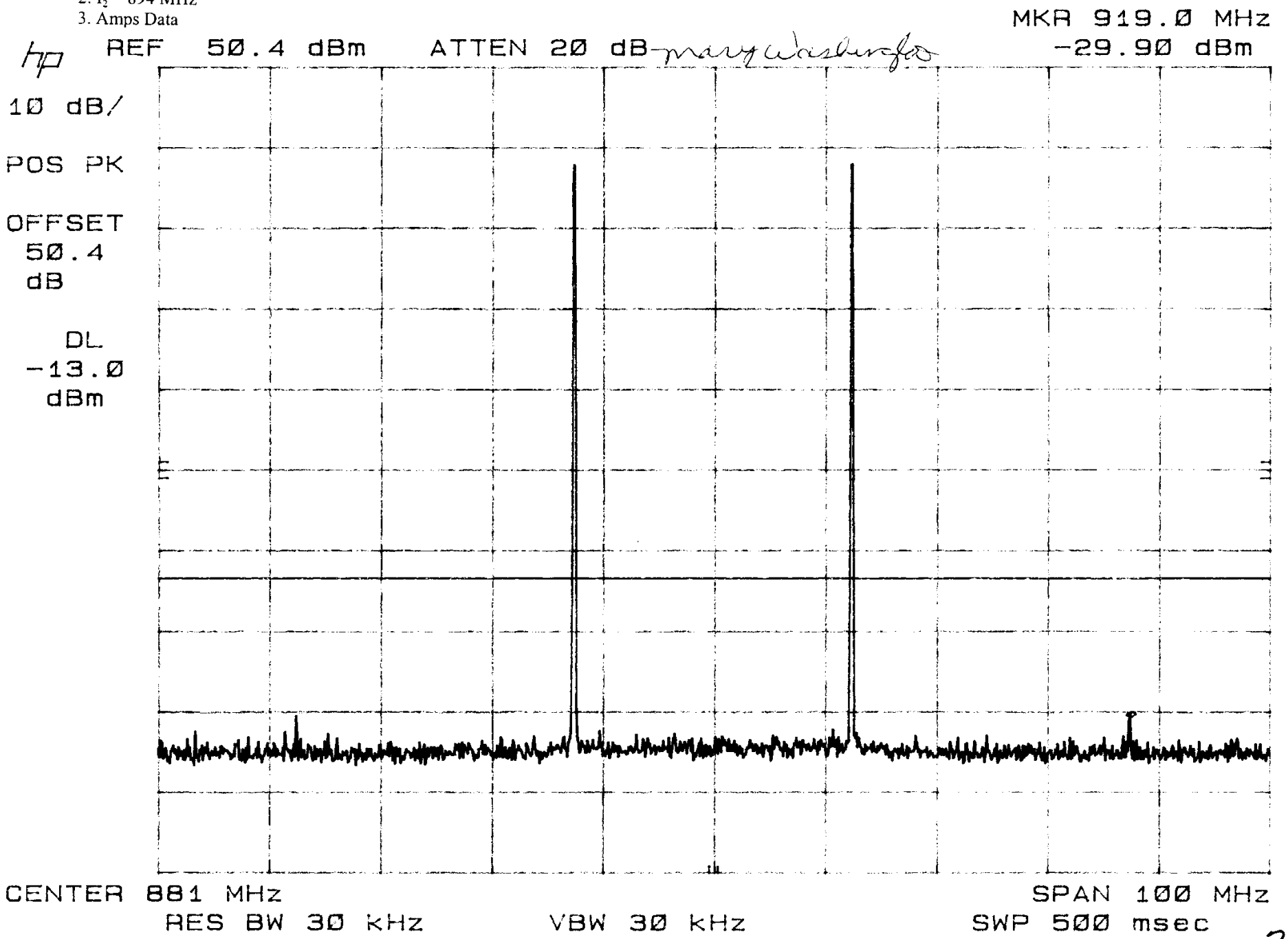


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00
SPECIFICATION: Unwanted Emissions (RSS-131, Section 6.6)
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Data



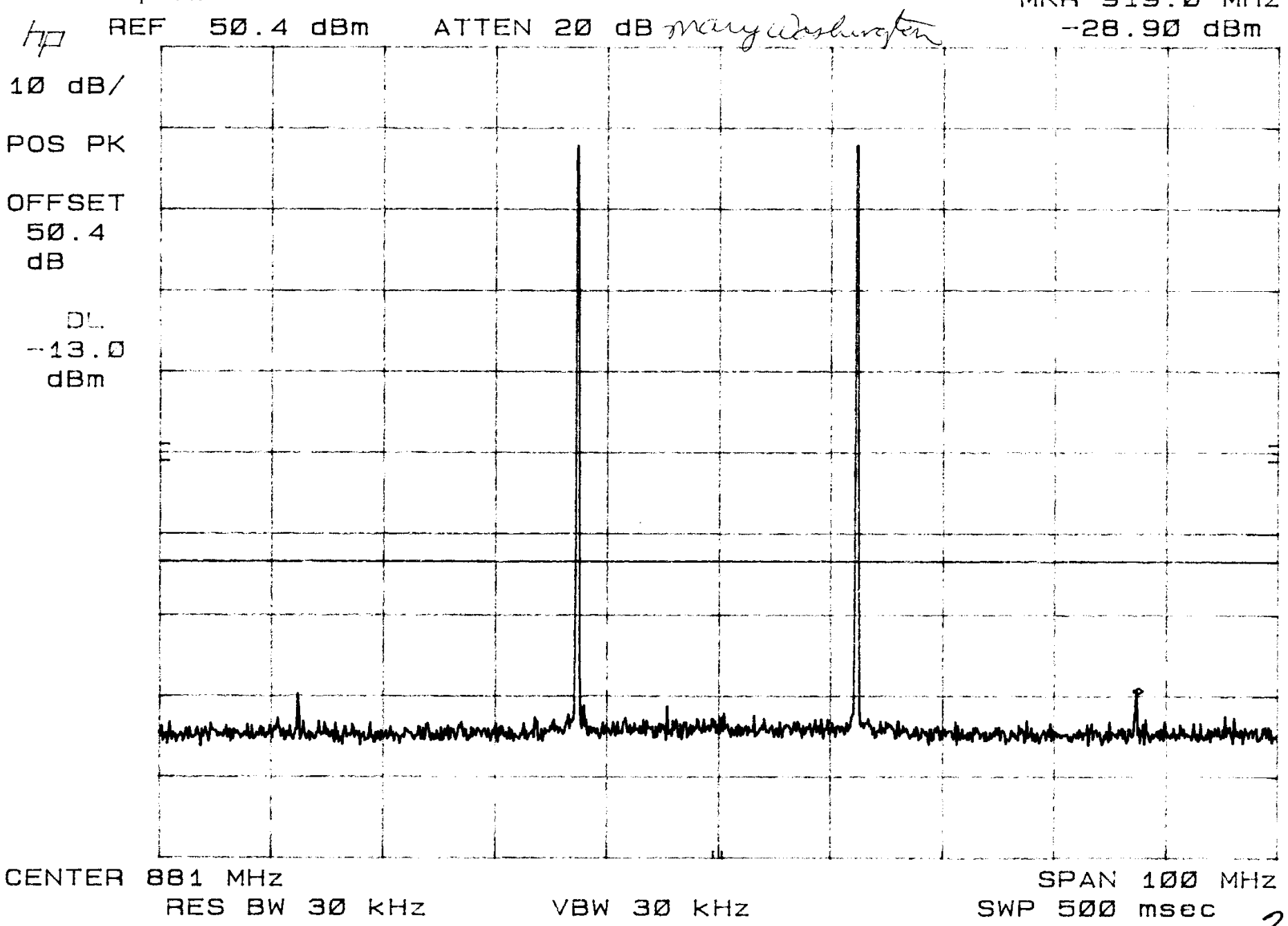
CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00
SPECIFICATION: Intermodulation
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Data



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Intermodulation

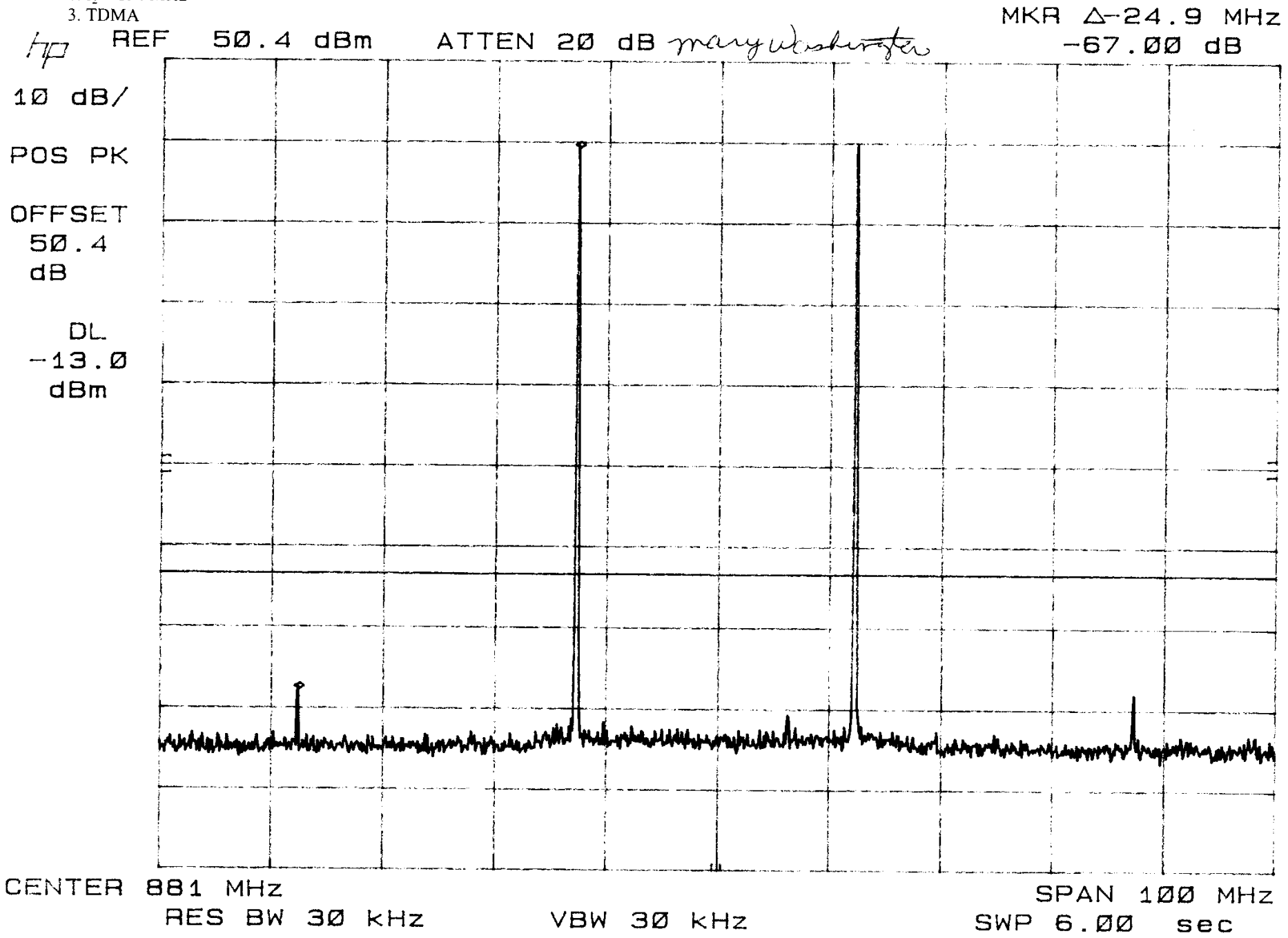
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Voice



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Intermodulation

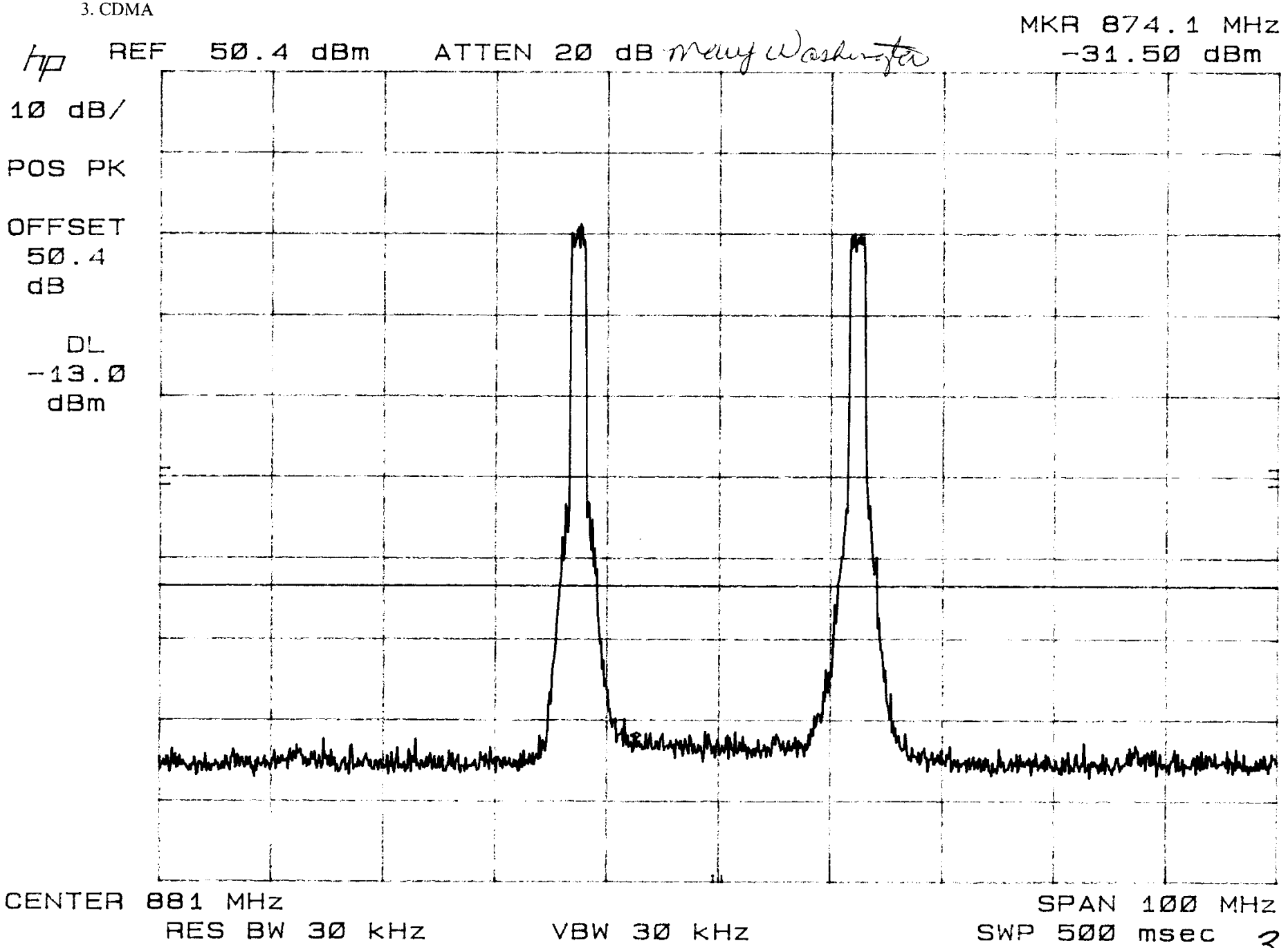
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. TDMA



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Intermodulation

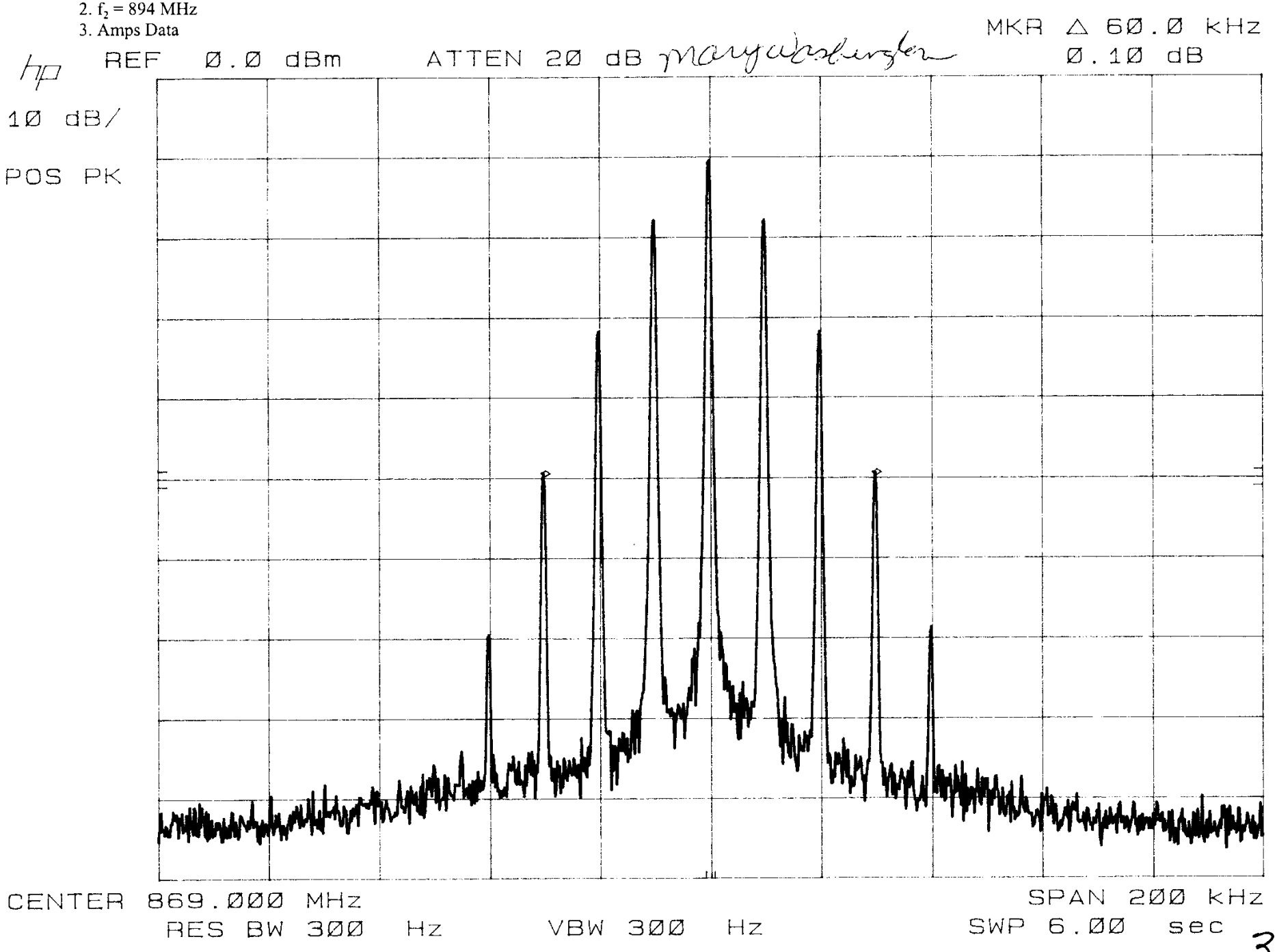
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. CDMA



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Input Plot

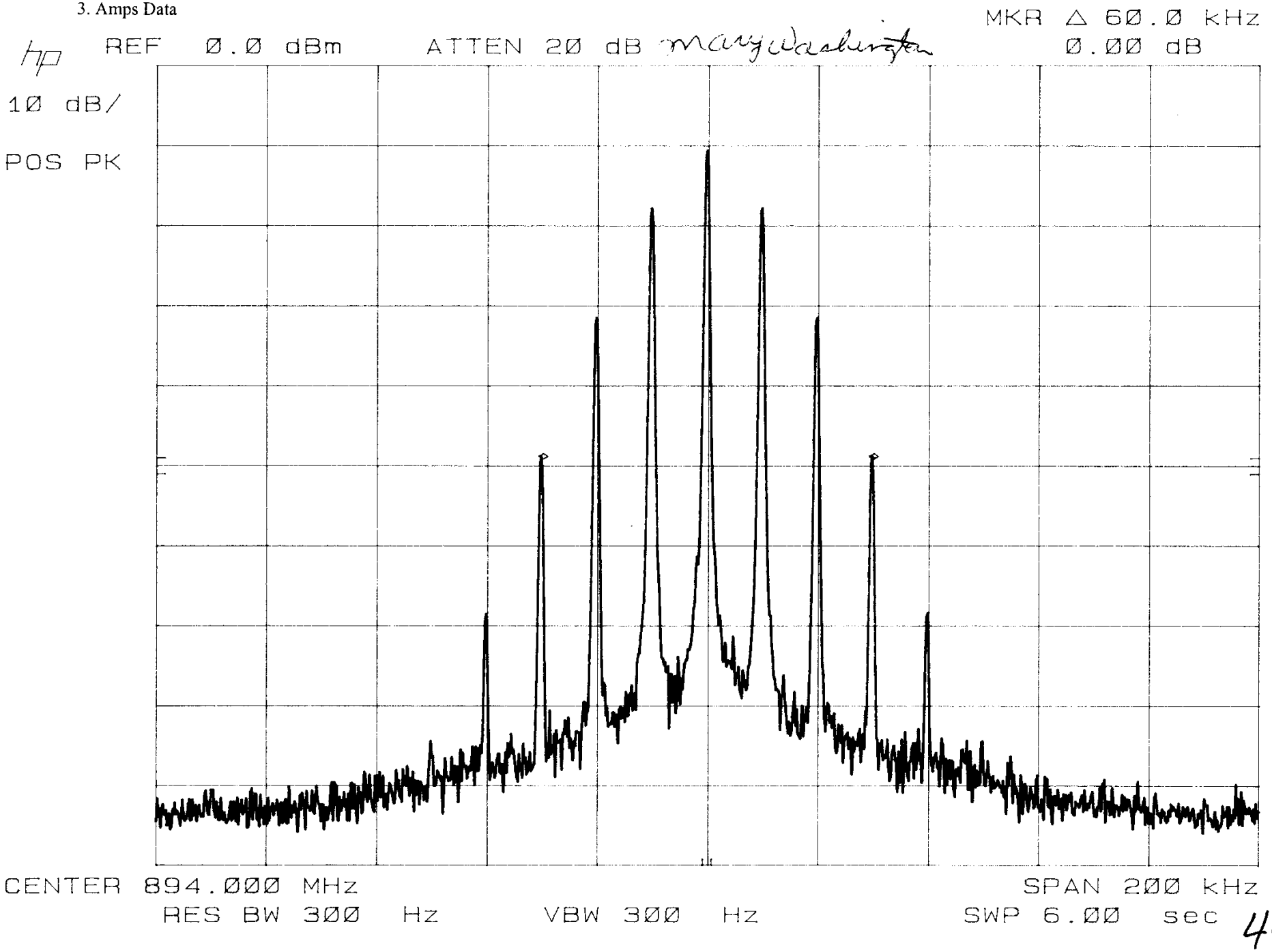
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Data



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Input Plot

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Data



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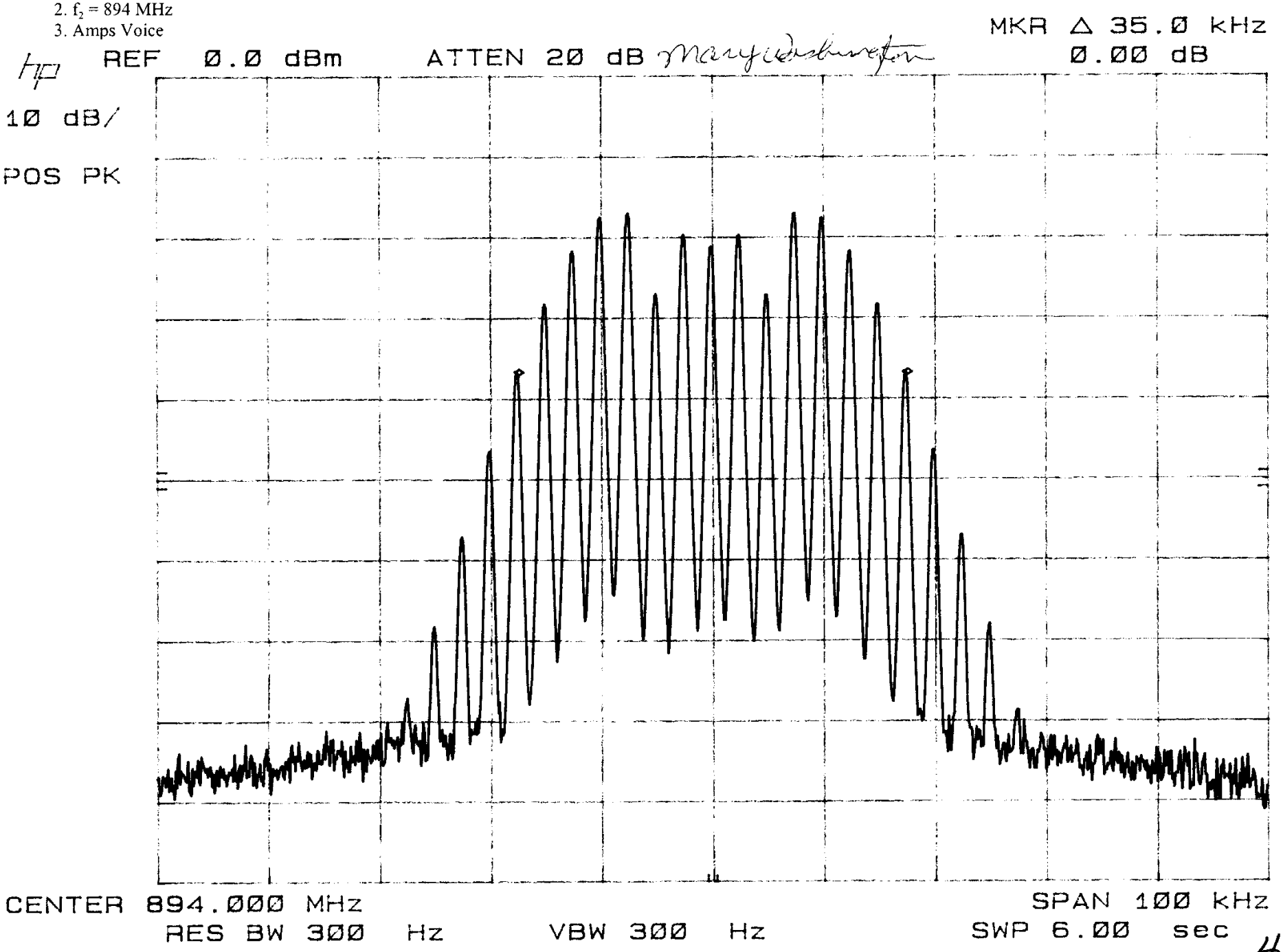
CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Input Plot

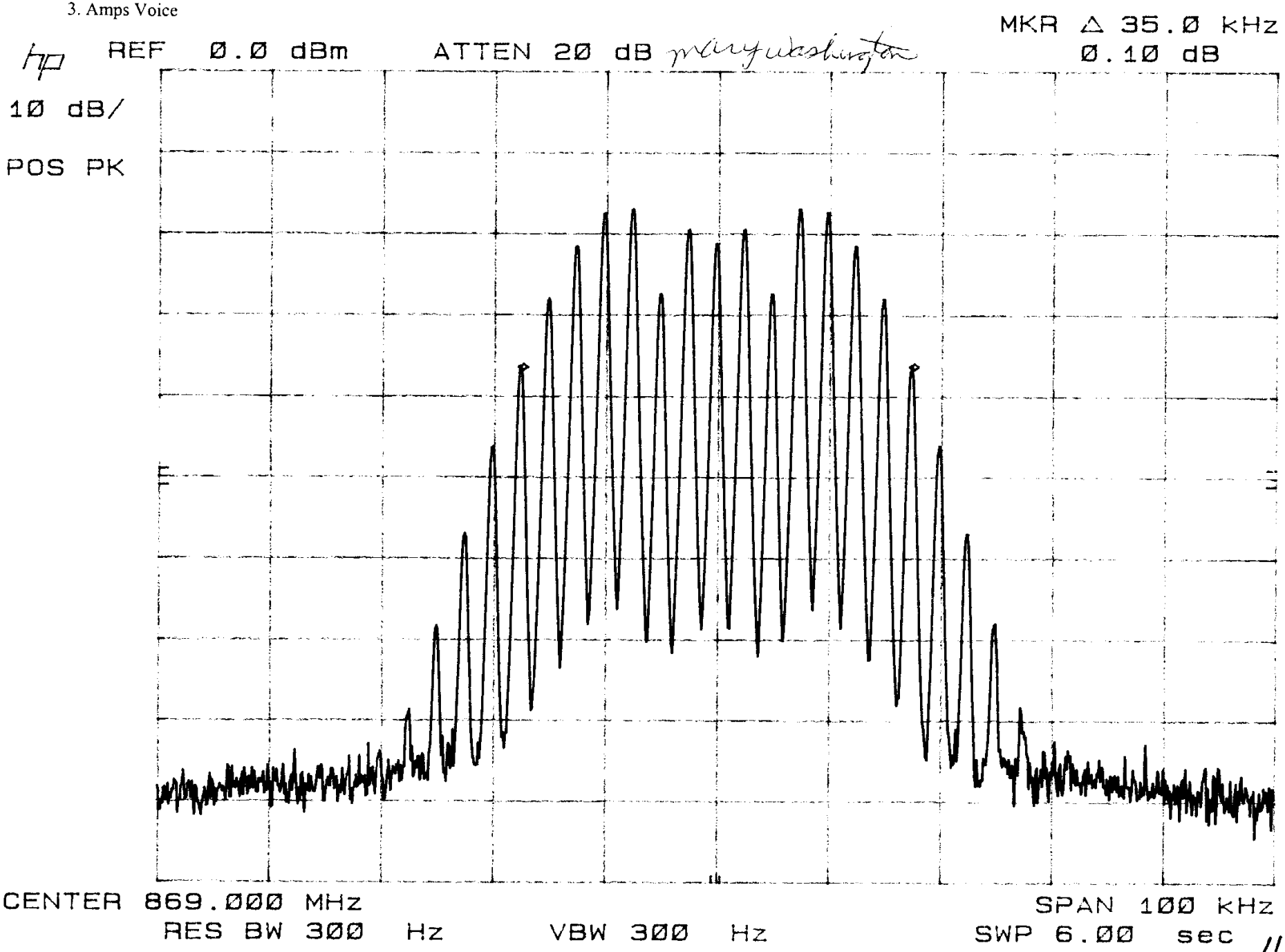
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Voice



CLIENT: POWERWAVE
SPECIFICATION: Input Plot
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Voice

EUT: G3S-800-150 Multi-channel Power Amplifier

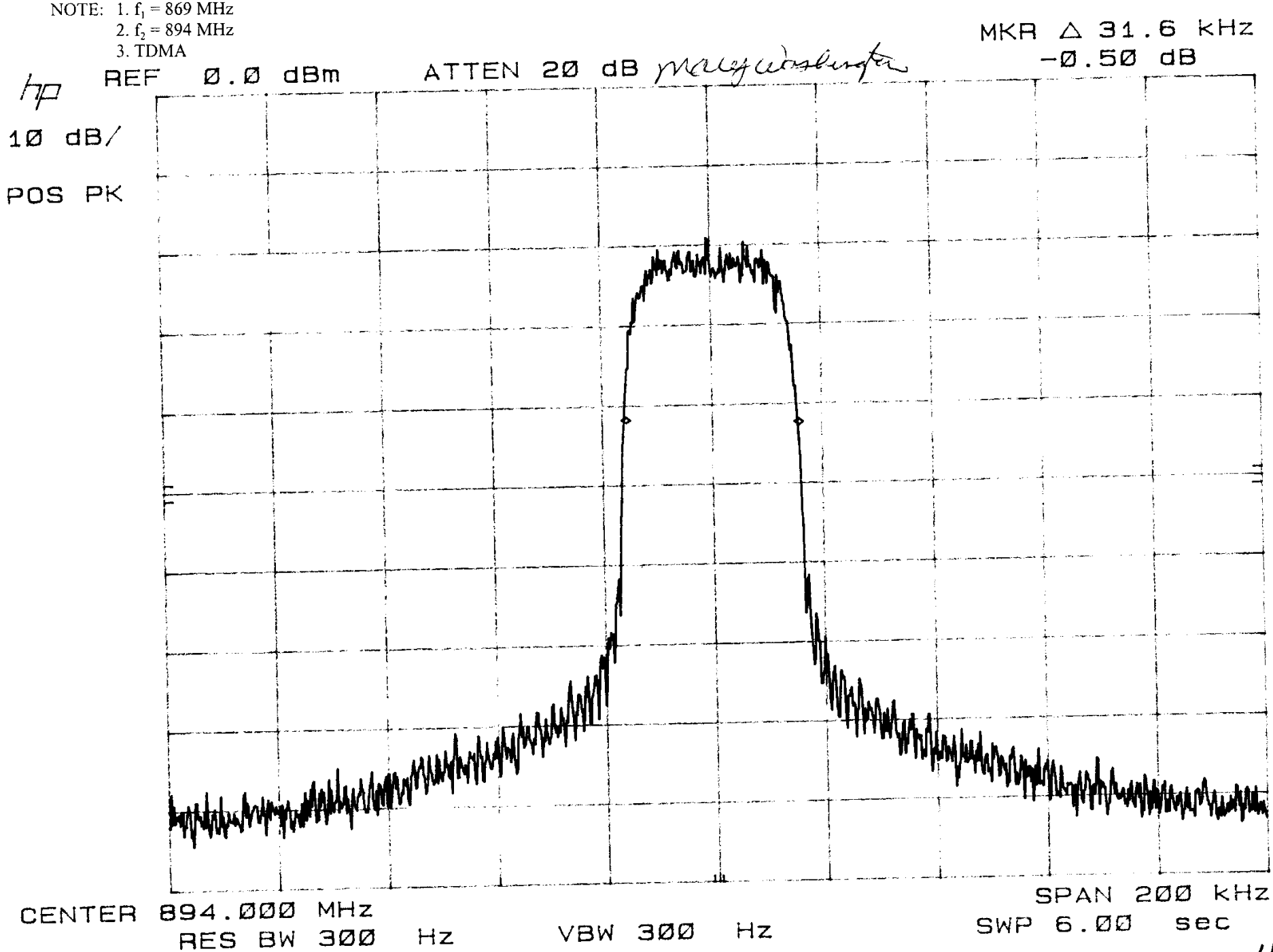
DATE: 01/06/00



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Input Plot

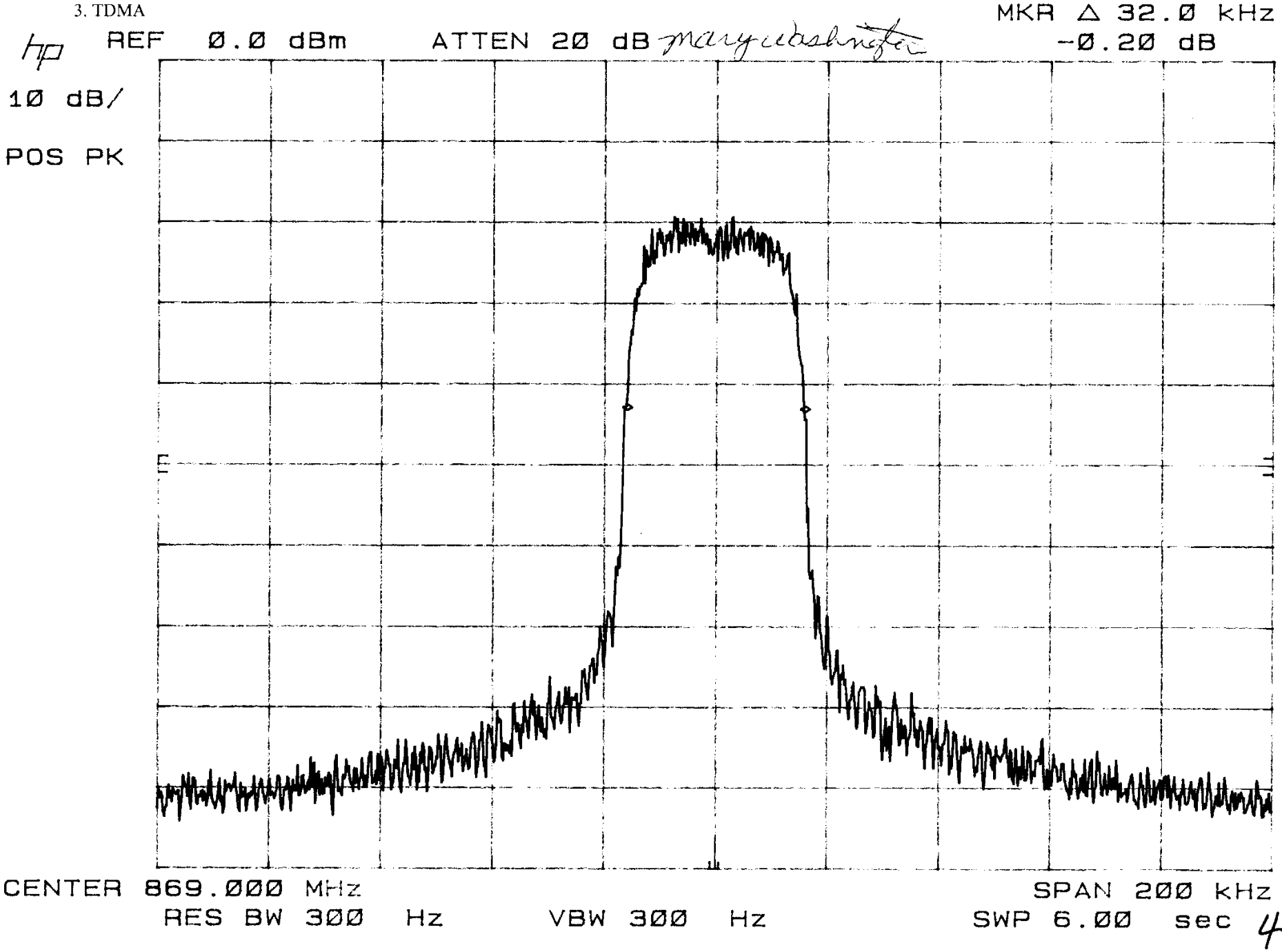
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. TDMA



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Input Plot

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. TDMA



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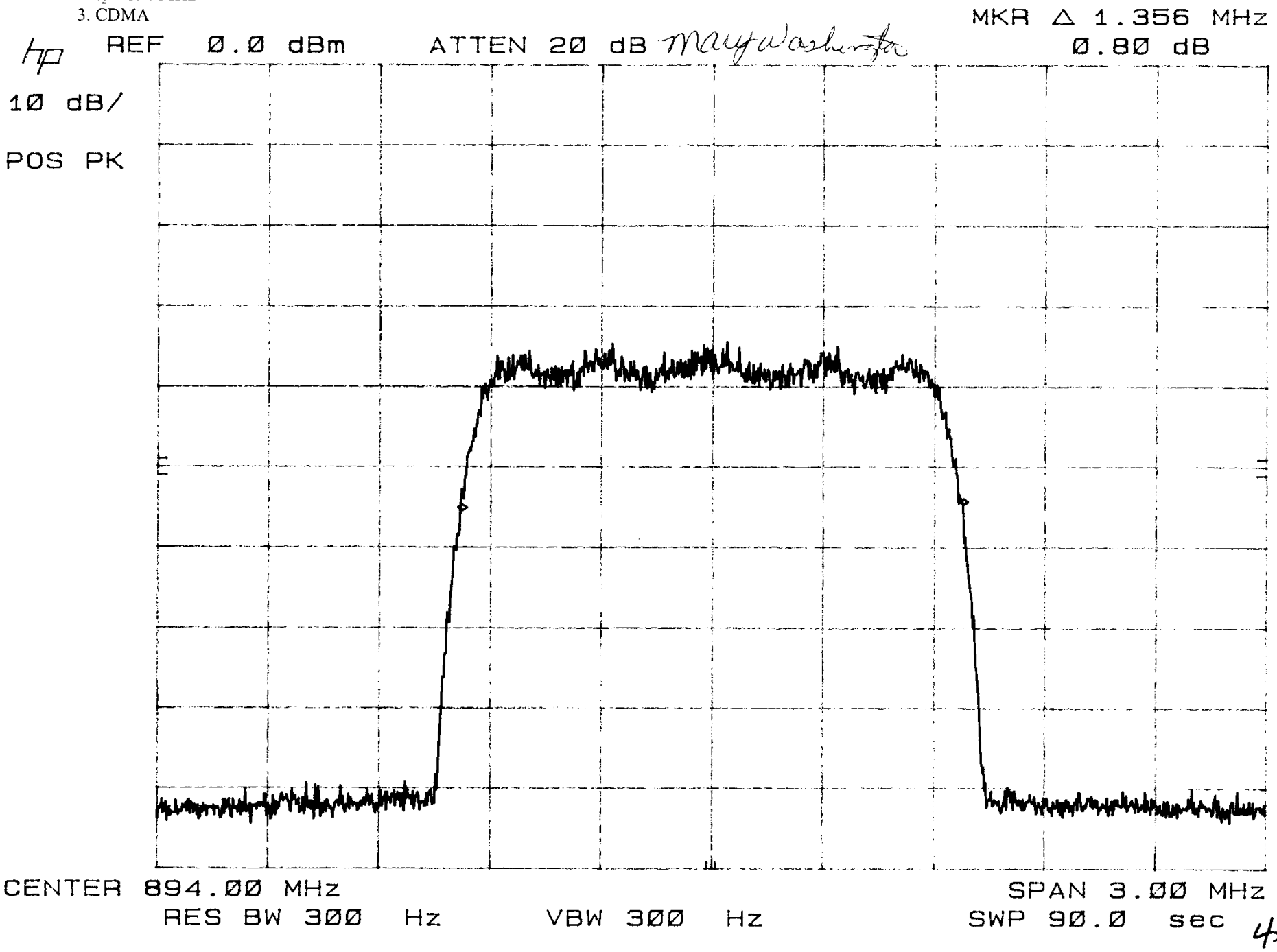
CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00
SPECIFICATION: Input Plot
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. CDMA



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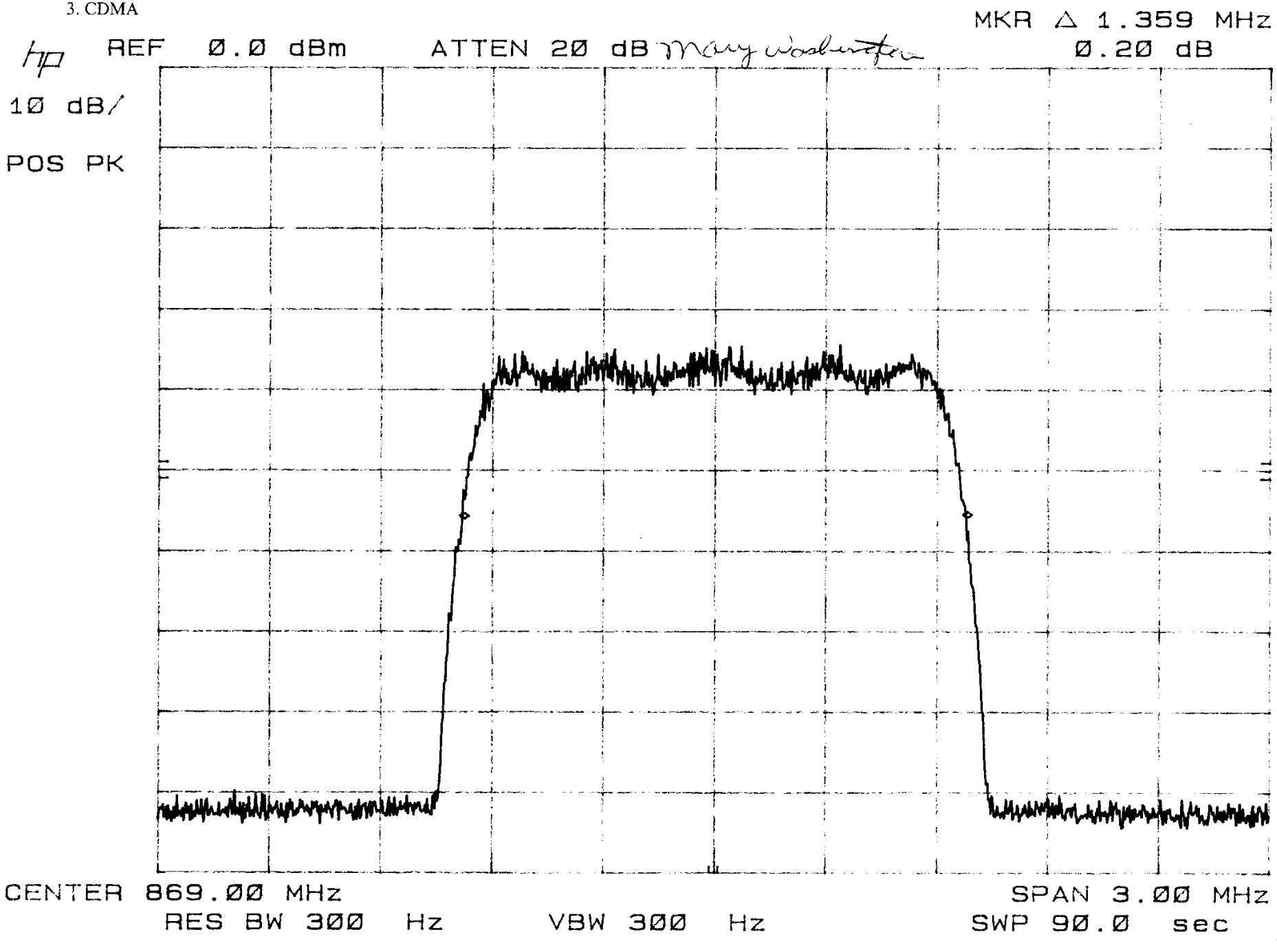
CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Input Plot

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. CDMA

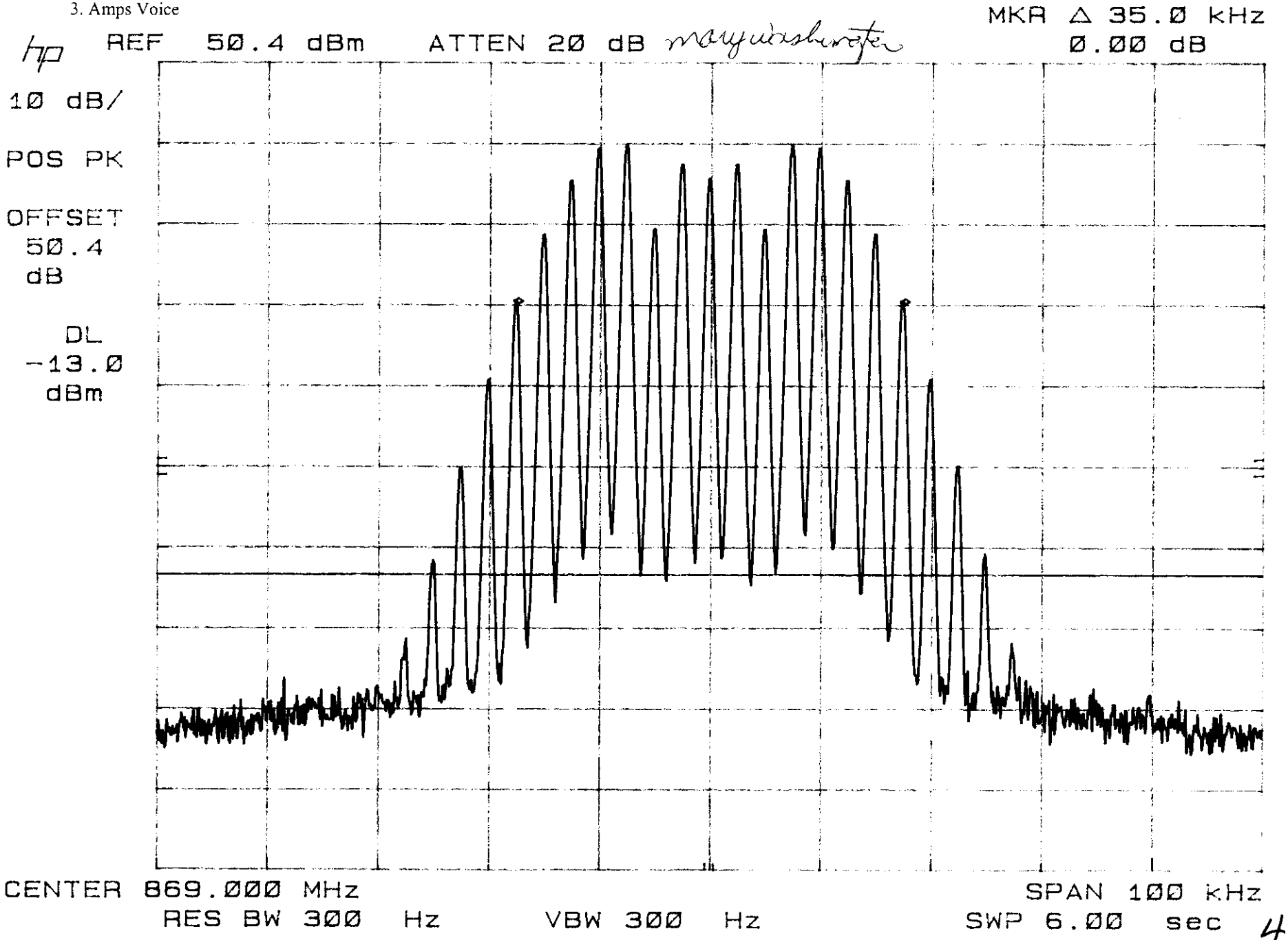


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: Output

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Voice

OUTPUT Plots

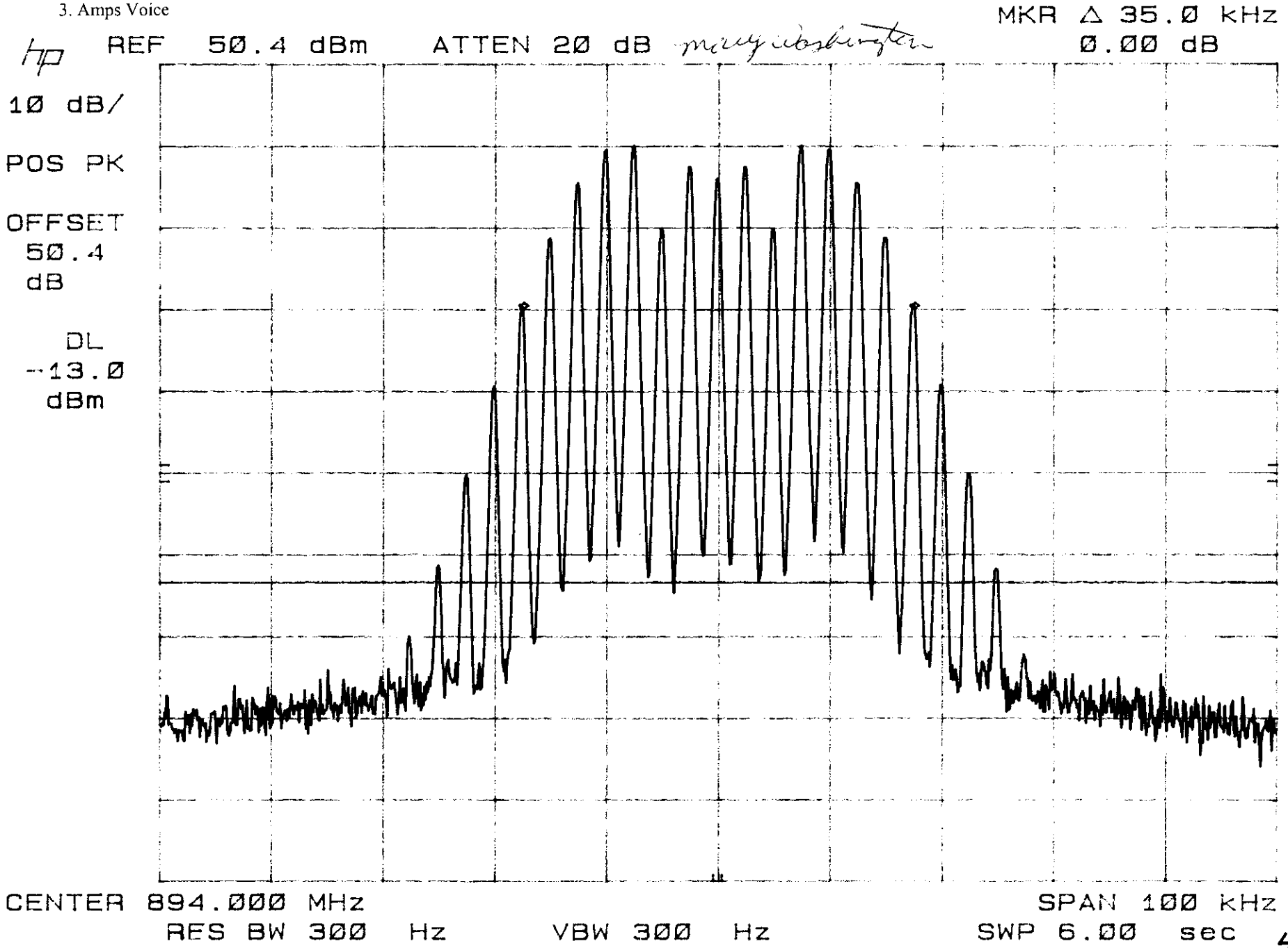


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION:

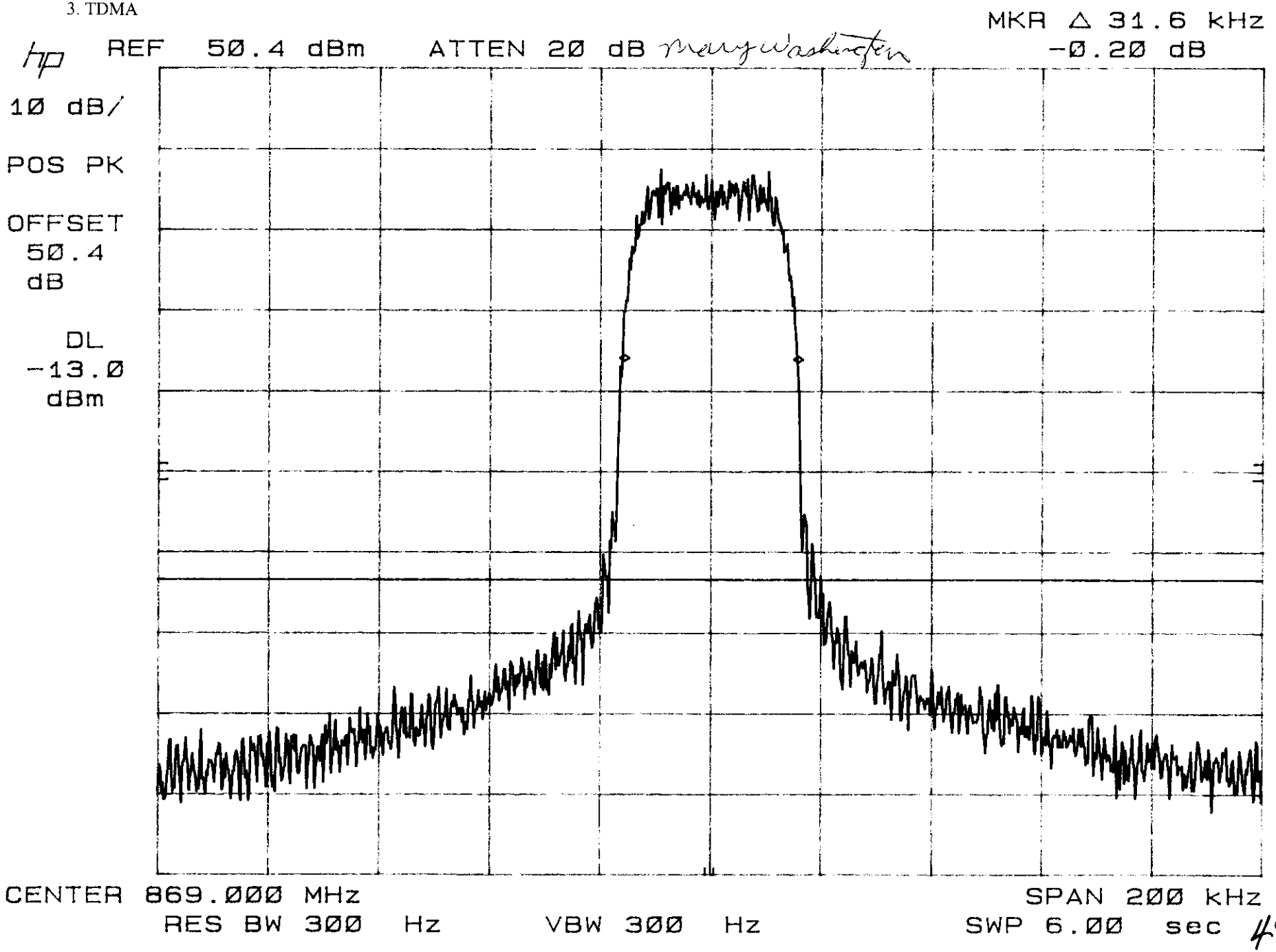
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Voice

OUTPUT PLOTS



CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00
SPECIFICATION:
NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. TDMA

OUTPUT PLOTS

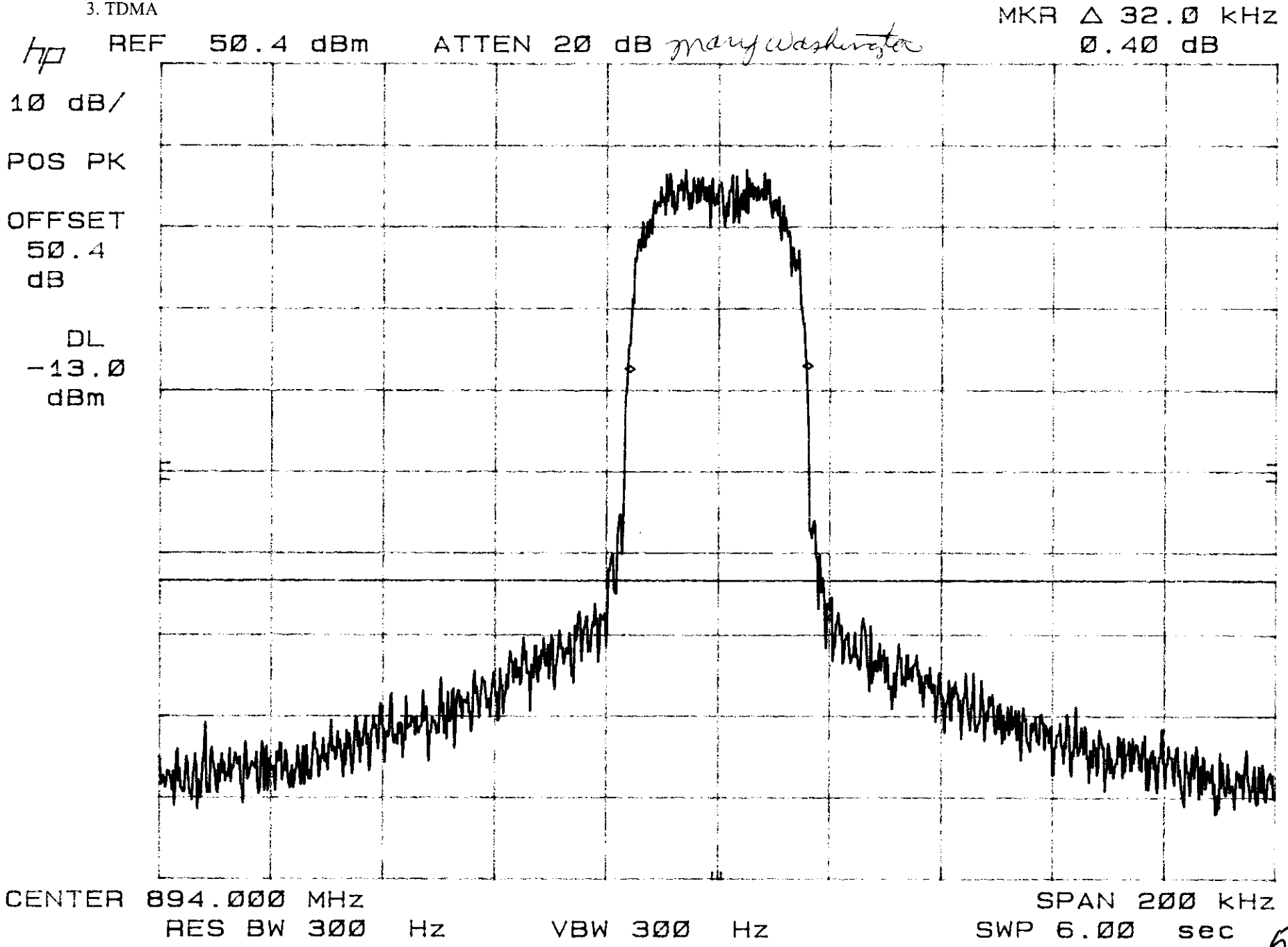


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: OUT PUT

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. TDMA

OUTPUT PLOTS

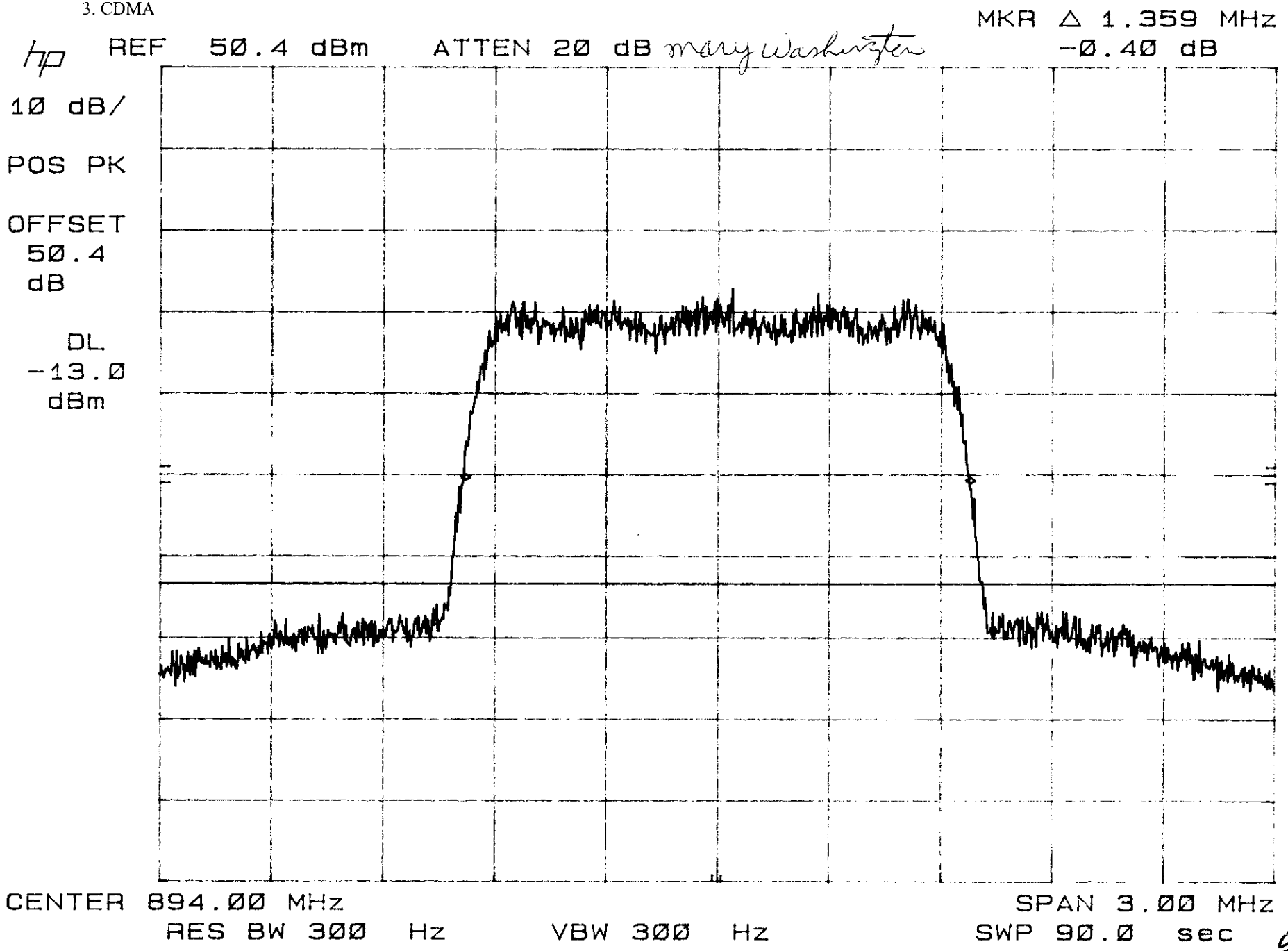


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: OUTPUT

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. CDMA

OUTPUT PLOTS

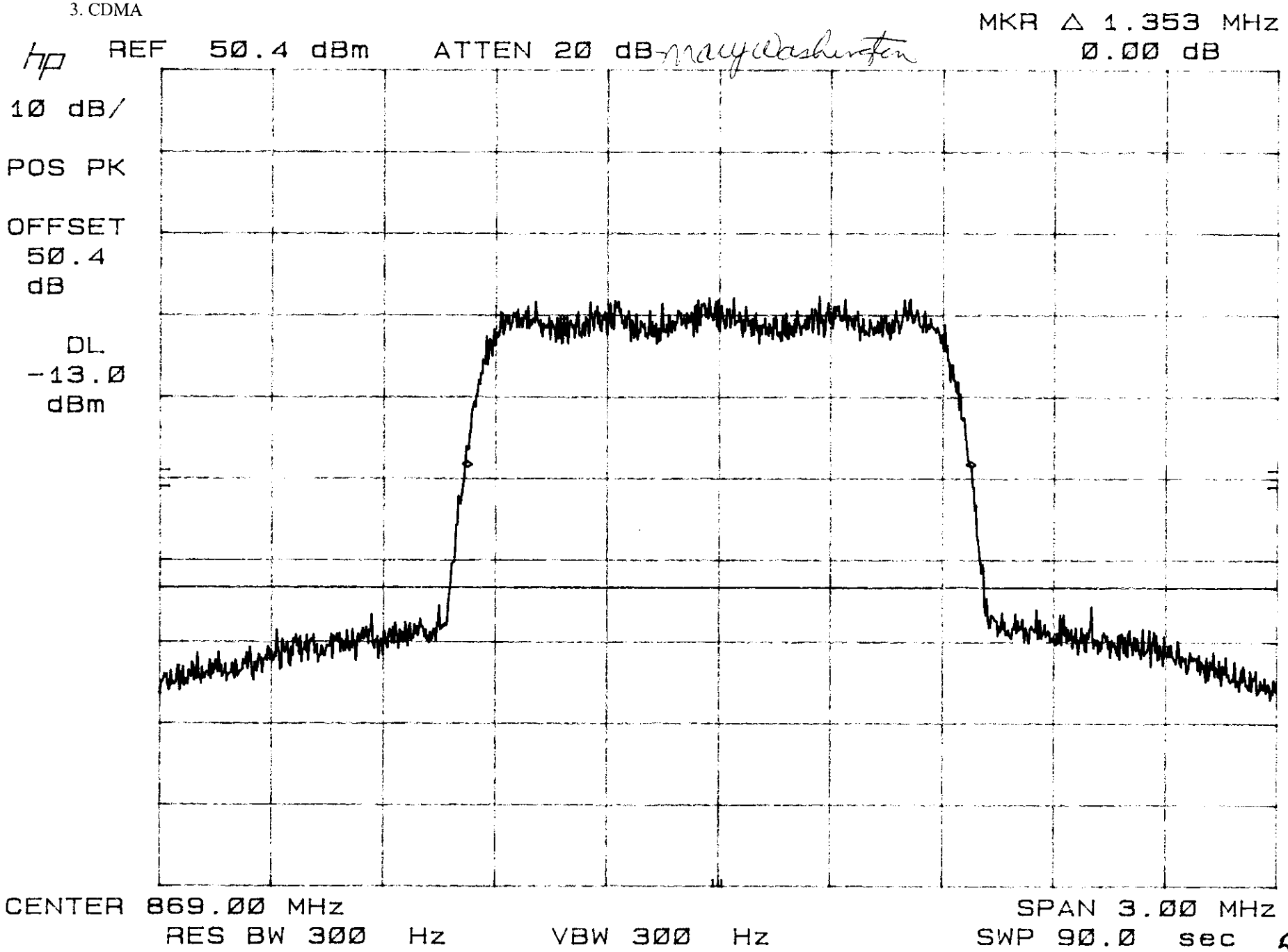


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: OUTPUT

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. CDMA

OUTPUT PLOTS

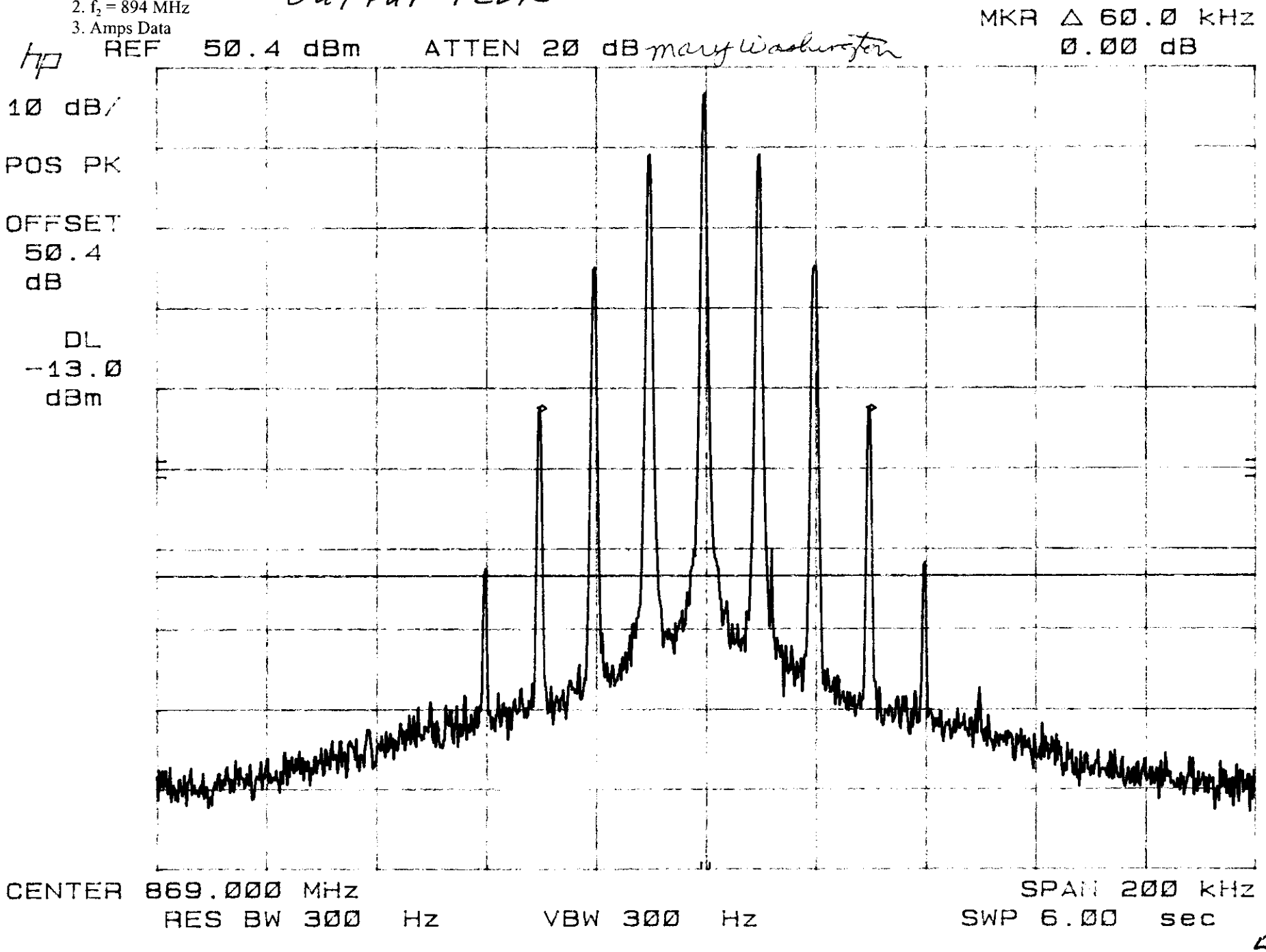


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: OUTPUT

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Data

OUTPUT PLOTS

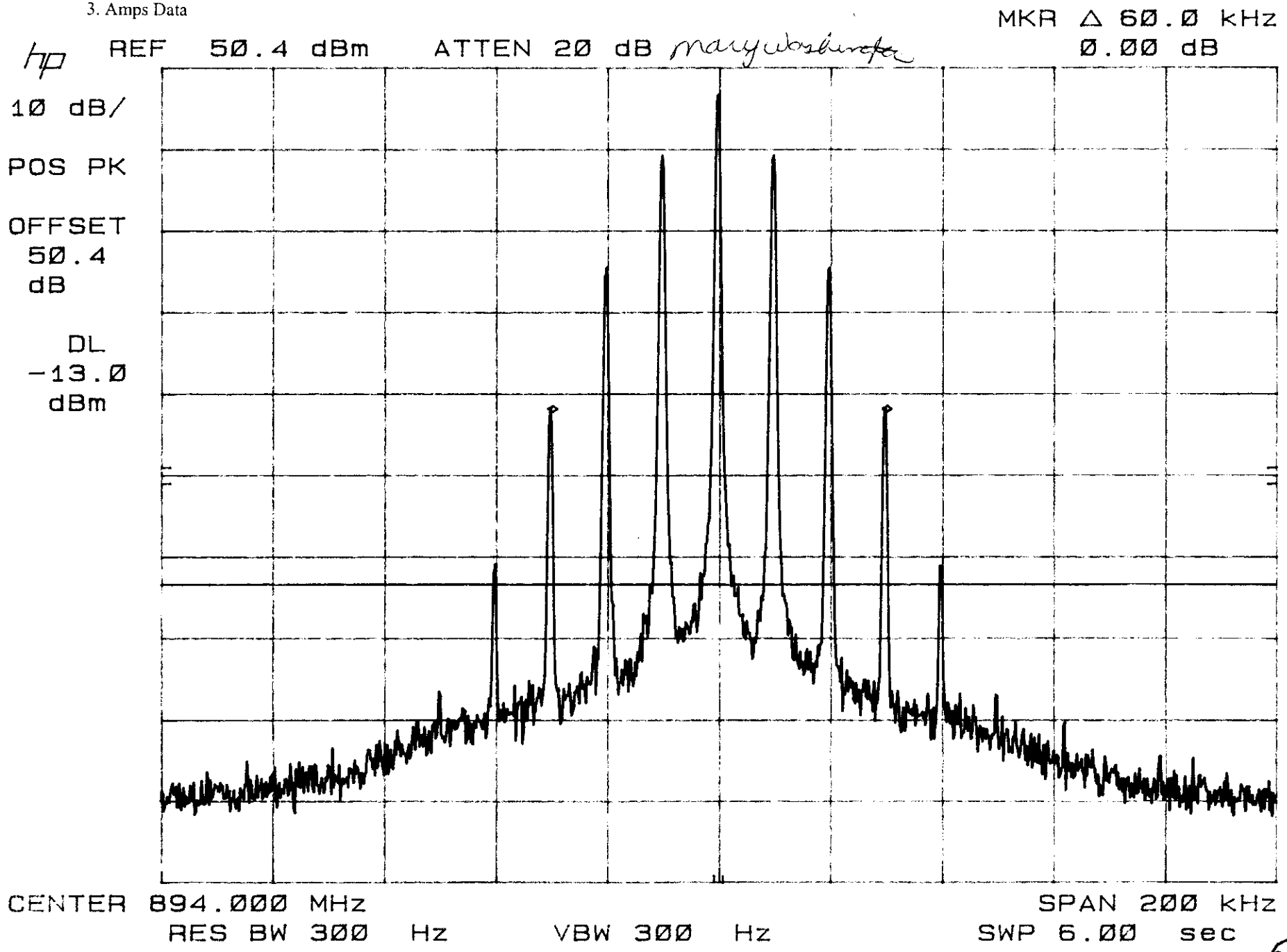


CLIENT: POWERWAVE EUT: G3S-800-150 Multi-channel Power Amplifier DATE: 01/06/00

SPECIFICATION: OUTPUT

NOTE: 1. f_1 = 869 MHz
2. f_2 = 894 MHz
3. Amps Data

OUTPUT PLOTS



5 SIGNATURE PAGE

GENERAL REMARKS:

SUMMARY:

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

■ - Performed

☐ - **Not** Performed

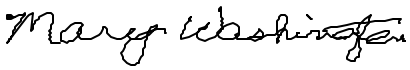
The Equipment Under Test

■ - **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)