

MEASUREMENT AND TECHNICAL REPORT
POWERWAVE TECHNOLOGIES
2026 McGaw Avenue
Irvine, CA 92614

DATE: 31 October 2000

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	1900 MHz MCPA, Model NTGY81AA	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes:	No: X
	Defer until:	
<i>Company Name</i> 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:
<i>(*) FCC Part 2, Paragraphs 2.1046, 2.1051, 2.1053, and Part 42, Paragraph 24.238</i>		
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

The NTGY81AA is a linear, multichannel power amplifier that operates in the 60 MHz frequency band from 1930 MHz to 1990 MHz. It is designed to be mounted in an enclosure with EMI containment. Its flat base plate allows for mounting on a flat thermal-absorbing surface to provide adequate heat dissipation.

Each amplifier module has a power, alarm, and control connector that allows the host system to monitor the amplifier module performance. Primary power for the amplifier is +26 Vdc.

1.1.1 Components of EUT

Description	Model Number	Serial Number	FCC ID Number
1900 MHz MCPA	NTGY81AA		E675JS0046

1.2 Operating modes:

50 W output continuous with a WCDMA input signal. 47 dB nominal gain. 25.5 - 26.5 Vdc input.

1.3 EUT I/O Ports and Cables:

1.3.1 I/O Cables

CONNECTION:	± 26 Vdc
SHIELD:	No
CONNECTORS:	Metal
TERMINATION TYPE:	D-Sub
LENGTH:	Not Specified
REMOVABLE:	Yes

CONNECTION:	RF In / Out
SHIELD:	Yes
CONNECTORS:	Metal
TERMINATION TYPE:	SMA
LENGTH:	Not Specified
REMOVABLE:	Yes

1.3.3 Power requirements:

26 VDC 23 Amps

1.4 Oscillator Frequencies

Frequency	EUT Location	Description of use
15 MHz	PCB	Frequency reference

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

Aluminum Alloy with chem film coating.

1.6 Interfacing and/or Simulators Peripheral Equipment

DESCRIPTION:	RF Signal Generator
MANUFACTURER:	Agilent
MODEL NUMBER:	E4433B
SERIAL NUMBER:	017007
FCC ID:	N/A

DESCRIPTION:	DC Power Supply
MANUFACTURER:	HP
MODEL NUMBER:	6675A
SERIAL NUMBER:	004929
FCC ID:	N/A

DESCRIPTION:	Power Meter
MANUFACTURER:	HP
MODEL NUMBER:	E4419B
SERIAL NUMBER:	017884
FCC ID:	N/A

DESCRIPTION:	Power Sensor
MANUFACTURER:	HP
MODEL NUMBER:	8481A
SERIAL NUMBER:	017948
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 2.1051 and Part 24, Paragraph 24.238
 - 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 24, Paragraph 24.238
 - 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: 1930-1990 MHz, RF Power: 0-50W, Frequency tolerance: N/A, Emission designator: F9W, Microprocessor: N/A

Types of emission: Wideband CDMA.

Operating power range: 0-50 W

Maximum power rating: 50 W

Voltages and currents applied: Refer to schematics and block diagram

Device is a power amplifier.

RF exposure: N/A, unit meets or exceeds FCC Part 15 limits.

Device is a power amplifier.

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The Power Amplifier 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 #: S0383 Run 01
 Test Method: Spurious Emissions
 EUT Model #: NTGY81AA
 EUT Serial #: _____
 Manufacturer: Powerwave
 EUT Description: PCS Amplifier
 Notes: 50 W CDMA Mode

Test Area: Site 3 Roof
 Test Date: 07-Sep-2000
 EUT Power: +26 Vdc

Temperature: 26 °C
 Relative Humidity: 45 %
 Air Pressure: 100.1 kPa

Page: 1 of 3

Level Key	
PK - Peak	Nb - Narrow Band
Qp - QuasiPeak	Bb - Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dBm) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC Part 24	DELTA2 (dB) N/A
Mid Channel						
1960.00	38.3 Av	4.3 / 28.8 / -3.5	74.8	V / 1.0 / 0.0	-7.4	N/A
1960.00	34.8 Av	4.3 / 28.8 / -3.5	71.3	H / 1.0 / 0.0	-10.9	N/A
scan to 8th harmonic - ambient only detected						
3920.00	42.7 Pk	7.1 / 34.2 / 35.6	48.4	H / 1.0 / 0.0	-33.8	N/A
5880.00	43.8 Pk	7.6 / 36.7 / 32.6	55.5	H / 1.0 / 0.0	-26.7	N/A
7840.00	43.8 Pk	9.2 / 38.0 / 31.0	60.0	H / 1.0 / 0.0	-22.2	N/A
3920.00	43.8 Pk	7.1 / 34.2 / 35.6	49.5	V / 1.0 / 0.0	-32.7	N/A
5880.00	43.8 Pk	7.6 / 36.7 / 32.6	55.5	V / 1.0 / 0.0	-26.7	N/A
7840.00	43.8 Pk	9.2 / 38.0 / 31.0	60.0	V / 1.0 / 0.0	-22.2	N/A
9800.00	41.5 Pk	10.6 / 39.3 / 30.5	61.0	V / 1.0 / 0.0	-21.2	N/A
Low Channel						
1931.88	38.5 Av	4.2 / 28.7 / -3.4	74.8	V / 1.0 / 0.0	-7.4	N/A
1931.88	34.7 Av	4.2 / 28.7 / -3.4	71.0	H / 1.0 / 0.0	-11.2	N/A
scan to 8th harmonic - ambient only detected						
3863.70	43.2 Pk	7.0 / 34.0 / 35.5	48.7	H / 1.0 / 0.0	-33.5	N/A
5793.98	43.7 Pk	7.6 / 36.6 / 32.8	55.1	H / 1.0 / 0.0	-27.1	N/A
7727.50	42.6 Pk	9.0 / 38.0 / 31.0	58.6	H / 1.0 / 0.0	-23.6	N/A
9660.20	42.6 Pk	10.5 / 39.2 / 30.6	61.8	H / 1.0 / 0.0	-20.4	N/A
3863.70	43.1 Pk	7.0 / 34.0 / 35.5	48.6	V / 1.0 / 0.0	-33.6	N/A
5793.98	43.9 Pk	7.6 / 36.6 / 32.8	55.3	V / 1.0 / 0.0	-26.9	N/A
7725.85	42.0 Pk	9.0 / 38.0 / 31.0	58.0	V / 1.0 / 0.0	-24.2	N/A
9659.30	42.0 Pk	10.5 / 39.2 / 30.6	61.2	V / 1.0 / 0.0	-21.0	N/A
High Channel						
1988.12	39.5 Av	4.3 / 28.9 / -3.5	76.1	V / 1.0 / 0.0	-6.1	N/A
1988.12	39.5 Av	4.3 / 28.9 / -3.5	76.1	H / 1.0 / 0.0	-6.1	N/A
scan to 8th harmonic - ambient only detected						
3919.34	43.4 Pk	7.1 / 34.2 / 35.6	49.1	H / 1.0 / 0.0	-33.1	N/A
5851.80	43.4 Pk	7.6 / 36.7 / 32.7	55.0	H / 1.0 / 0.0	-27.2	N/A

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J Owen
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Radiated Electromagnetic Emissions



Test Report #: S0383 Run 01 Test Area: Site 3 Roof
 Test Method: Spurious Emissions Test Date: 07-Sep-2000
 EUT Model #: NTGY81AA EUT Power: +26 Vdc
 EUT Serial #: _____
 Manufacturer: Powerwave
 EUT Description: PCS Amplifier
 Notes: 50 W CDMA Mode

Temperature: 26 °C
 Relative Humidity: 45 %
 Air Pressure: 100.1 kPa
 Page: 2 of 3

Level Key	
Pk - Peak	Nb - Narrow Band
Qp - QuasiPeak	Bb - Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dBm) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC Part 24	DELTA2 (dB) N/A
7783.70	43.4 Pk	9.1 / 38.0 / 31.0	59.5	H / 1.0 / 0.0	-22.7	N/A
9715.60	41.8 Pk	10.6 / 39.2 / 30.5	61.1	H / 1.0 / 0.0	-21.1	N/A
3920.00	42.9 Pk	7.1 / 34.2 / 35.6	48.6	V / 1.0 / 0.0	-33.6	N/A
5851.80	43.4 Pk	7.6 / 36.7 / 32.7	55.0	V / 1.0 / 0.0	-27.2	N/A
7783.70	43.0 Pk	9.1 / 38.0 / 31.0	59.1	V / 1.0 / 0.0	-23.1	N/A
9715.60	41.6 Pk	10.6 / 39.2 / 30.5	60.9	V / 1.0 / 0.0	-21.3	N/A

Tested by: J Owen
Printed

J Owen
Signature

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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
3115	251	Antenna, Double Ridge Guide	EMCO	9412-4363	10/01
AMF-5D-010180-35-10P	719	Pre-Amplifier (38 dB gain) 1 - 18 GHz	Miteq, Inc.	--	*
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).

CLIENT: POWERWAVE
NOTE(s): Mid channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MAX 304.5 MHz
-135.00 dBm

hp REF 46.7 dBm ATTN 10 dB

10 dB/

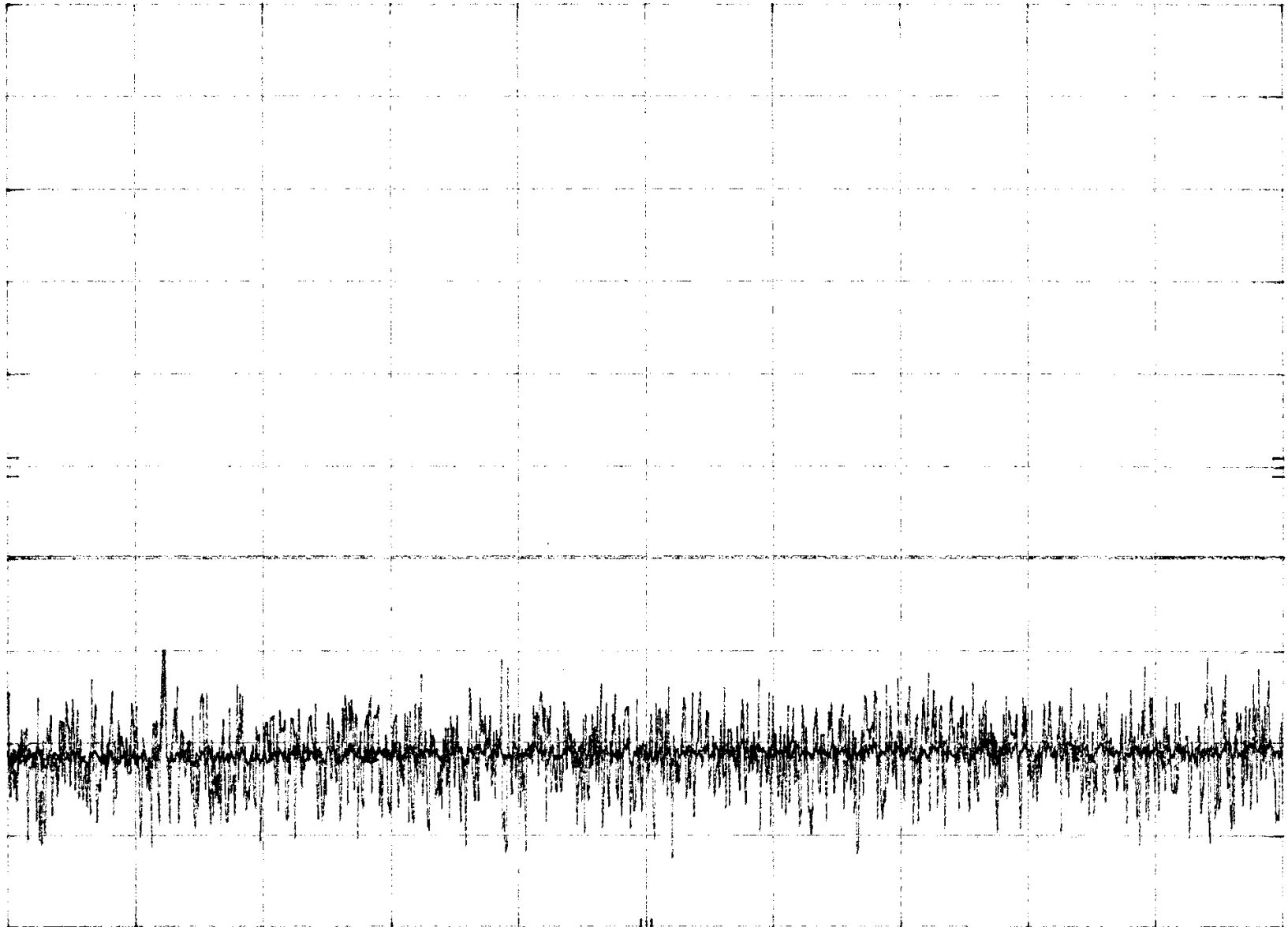
SAMPLE

OFFSET
46.7
dB

DL
-13.0
dBm

VID AVG
30

CORR'D



START 30 MHz

RES BW 1 MHz (1)

VBW 1 MHz

STOP 1.000 GHz

SWP 24.3 msec

15

CLIENT: POWERWAVE
NOTE(s): Mid channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKR 1.425 GHz
-34.20 dBm

hp REF 46.7 dBm ATTEN 10 dB

10 dB/

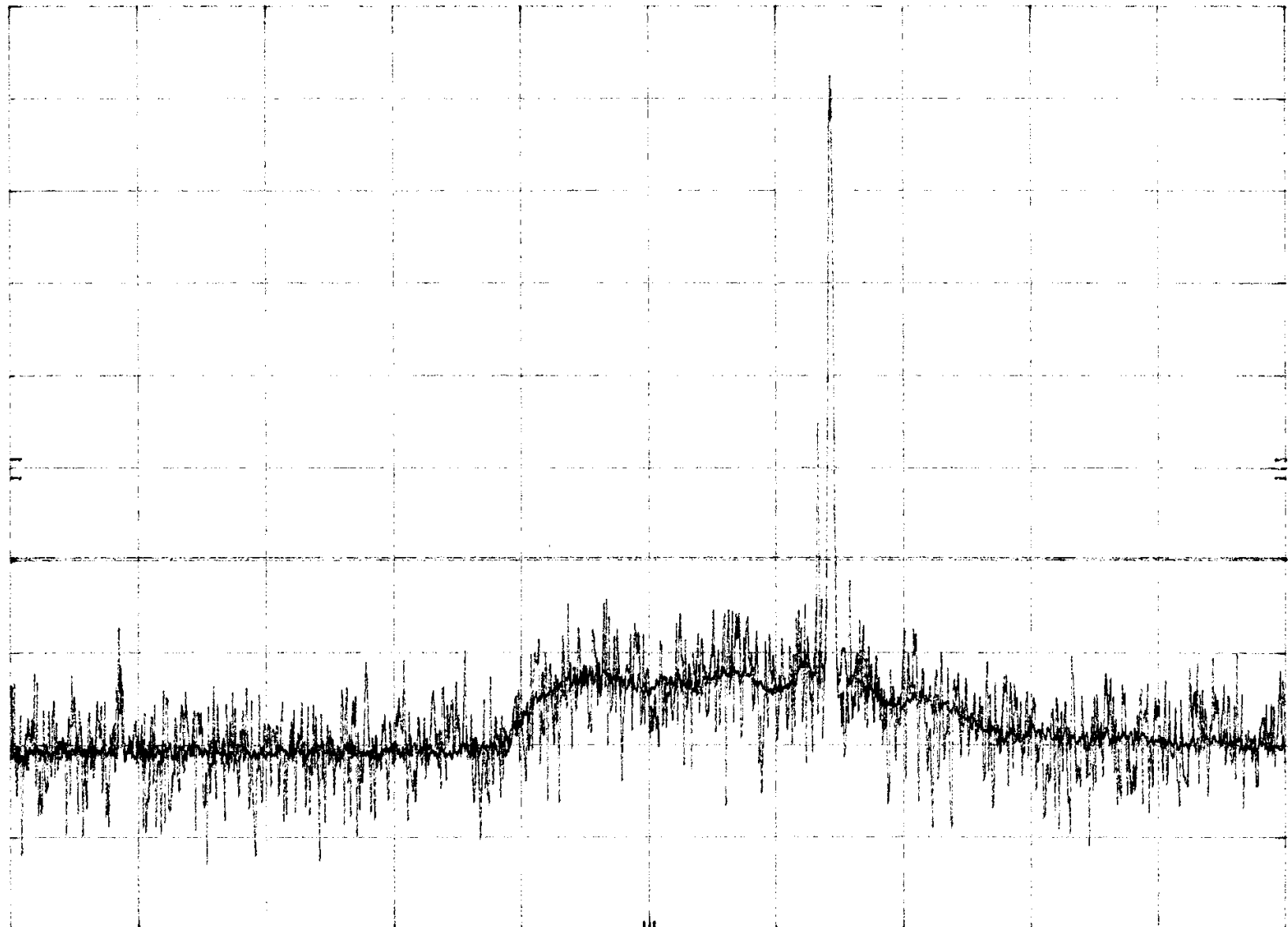
SAMPLE

OFFSET
46.7
dB

DL
-13.0
dBm

VID AVG
30

CORR'D



START 1.00 GHz

RES BW 1 MHz (i)

VBW 1 MHz

STOP 2.50 GHz

SWP 37.5 msec 16

CLIENT: POWERWAVE
NOTE(s): Mid channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKR 4.264 GHz

-34.20 dBm

hp REF 46.7 dBm ATTN 10 dB

10 dB/

SAMPLE

OFFSET

46.7
dB

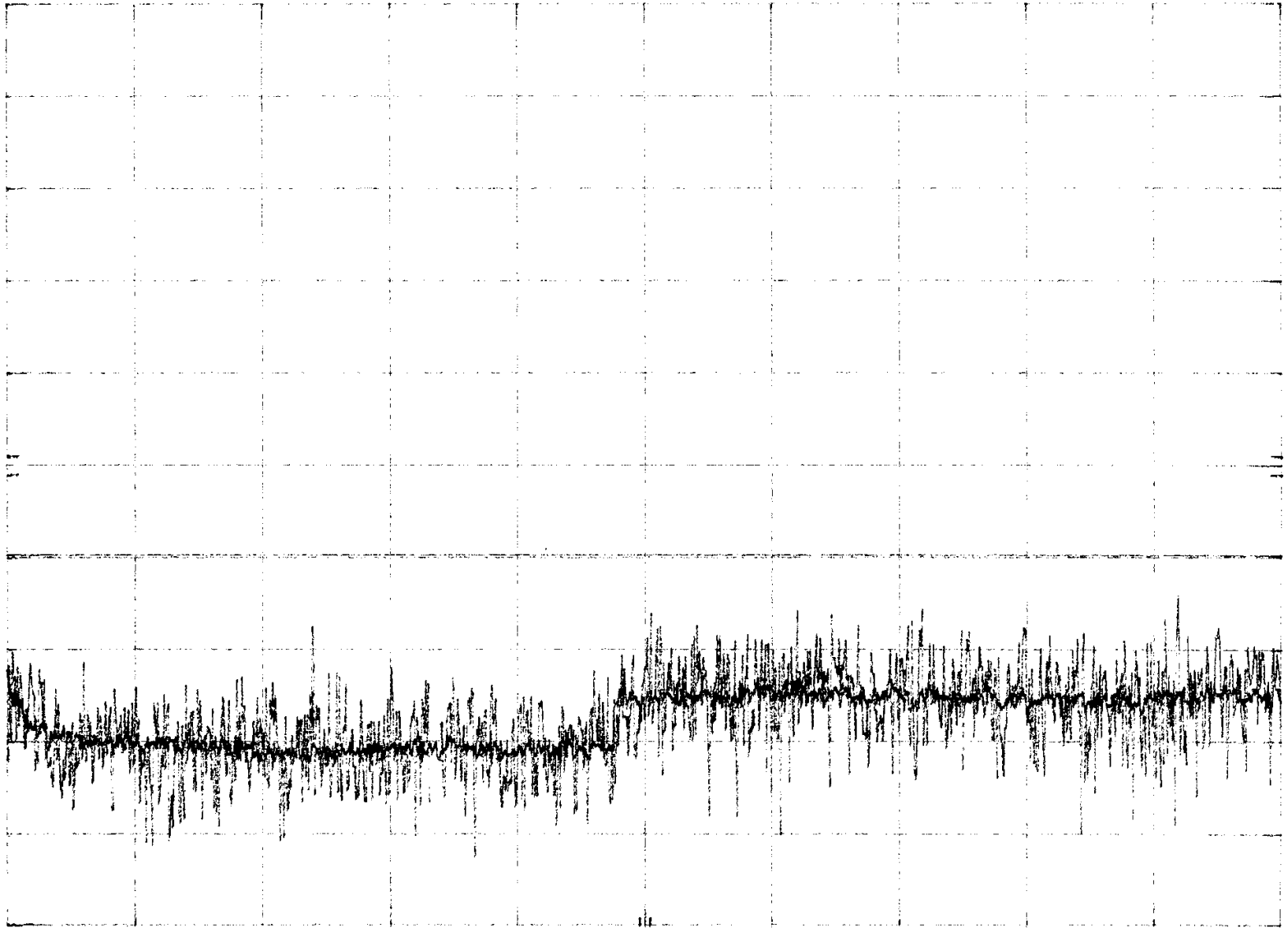
DL

-13.0
dBm

VID AVG

30

CORR'D



START 2.00 GHz

RES BW 1 MHz (1)

VBW 1 MHz

STOP 10.00 GHz

SWP 200 msec

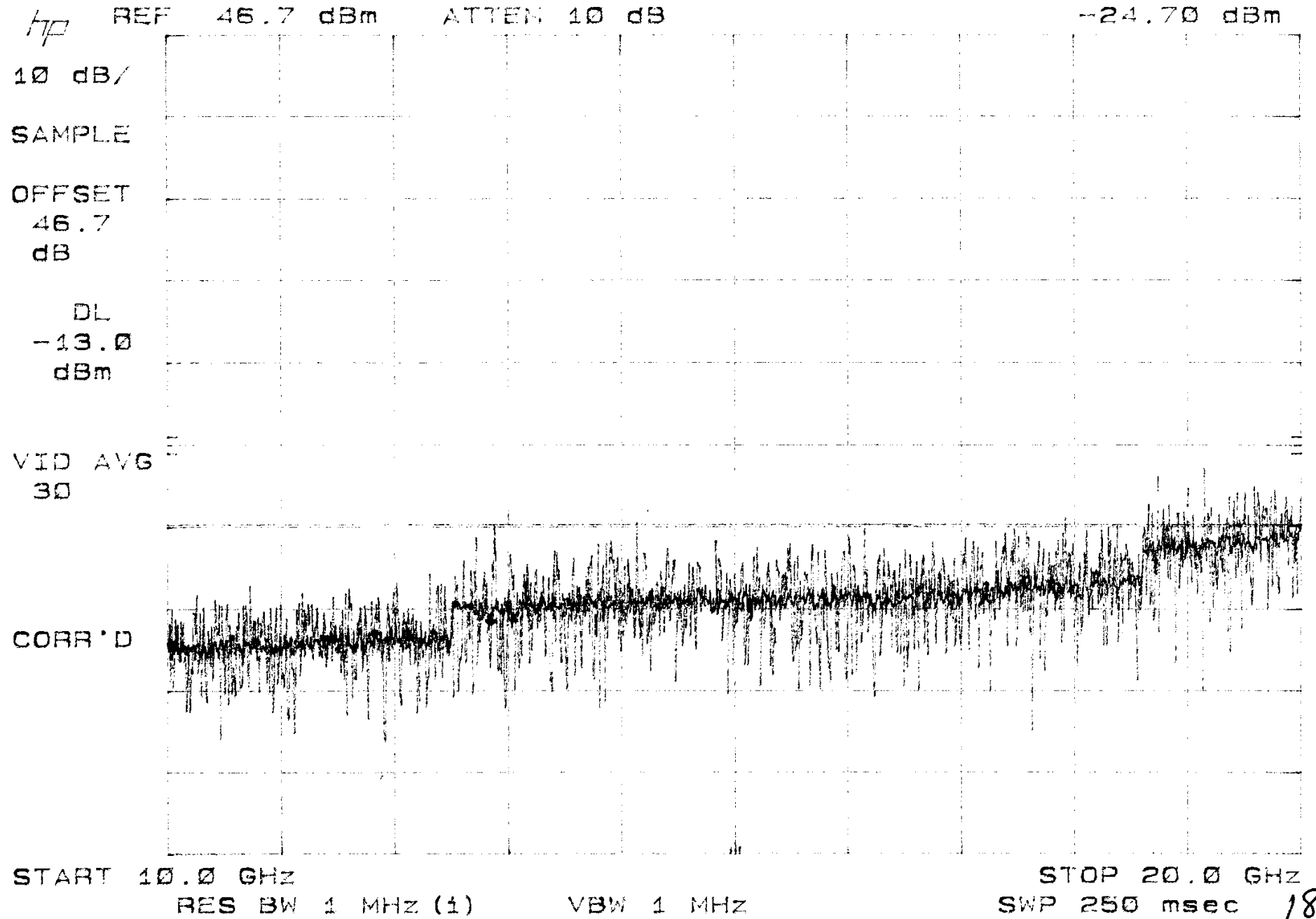
17

CLIENT: POWERWAVE
NOTE(s): Mid channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKR 12.83 GHz
-24.70 dBm



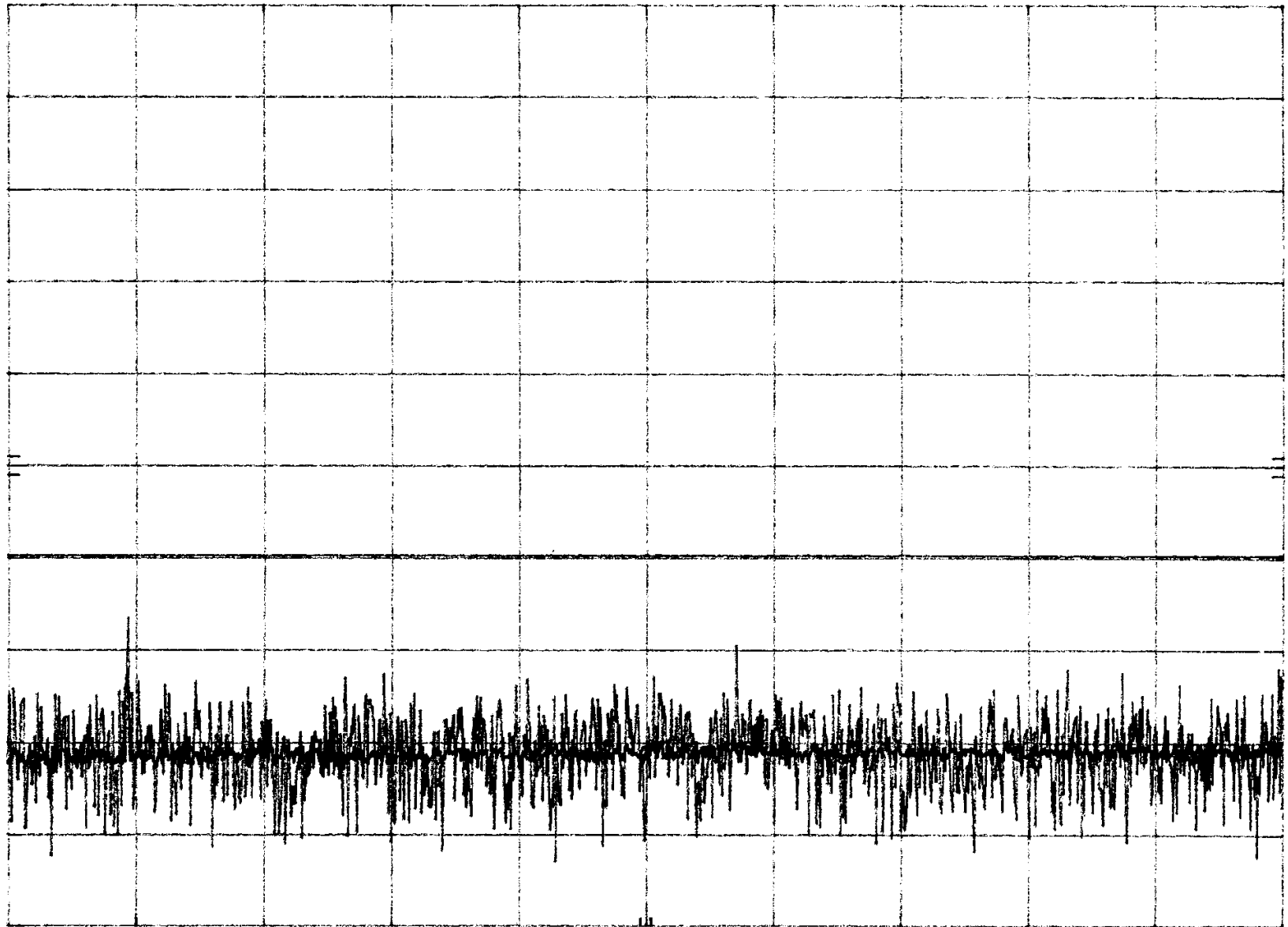
CLIENT: POWERWAVE
NOTE(s): Low channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKR 468.4 MHz
-34.90 dBm

hp
10 dB/
SAMPLE
OFFSET
46.7
dB
DL
-13.0
dBm
VID AVG
30



START 30 MHz

RES BW 1 MHz (i)

VBW 1 MHz

STOP 1.000 GHz

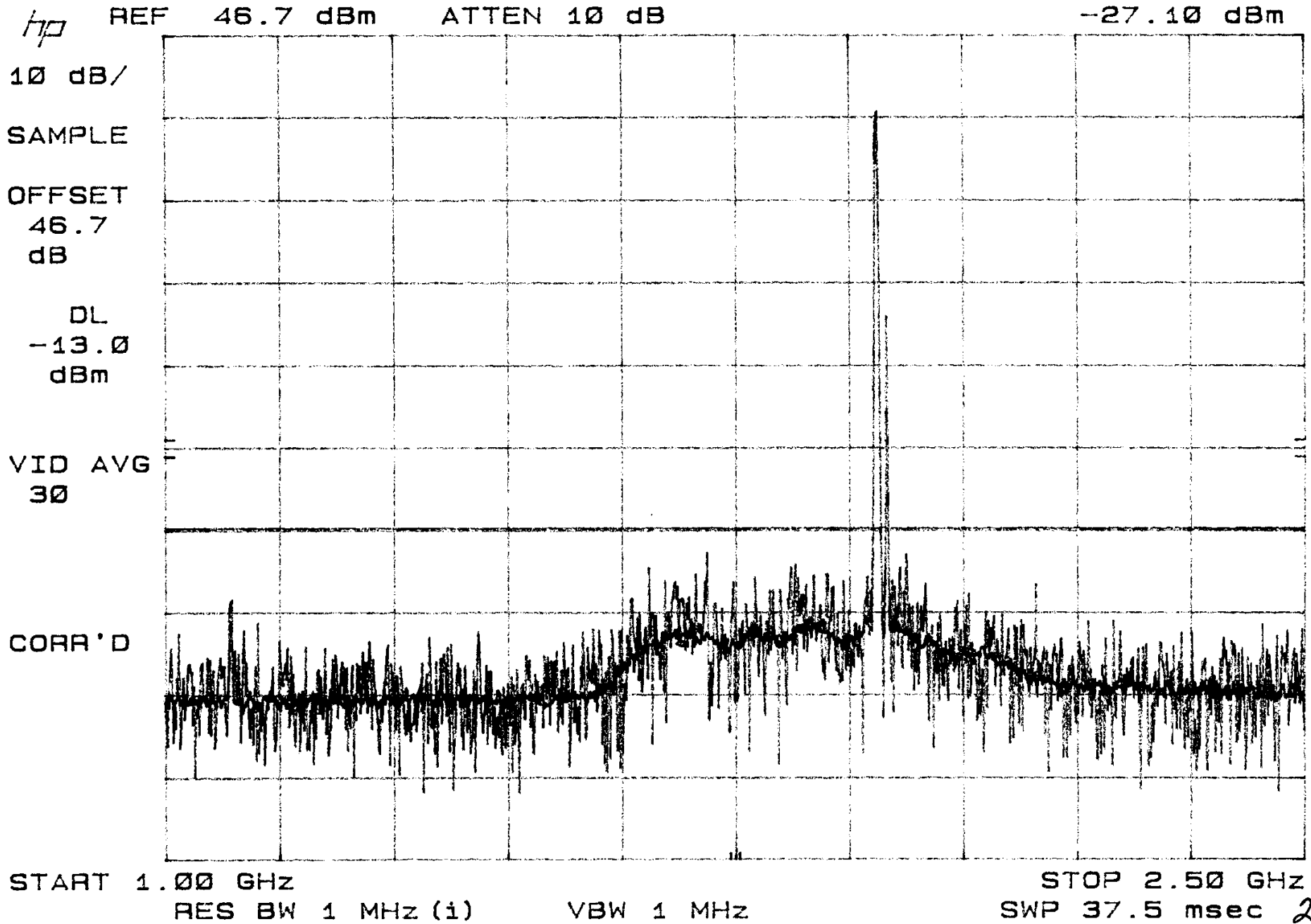
SWP 24.3 msec 19

CLIENT: POWERWAVE
NOTE(s): Low channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

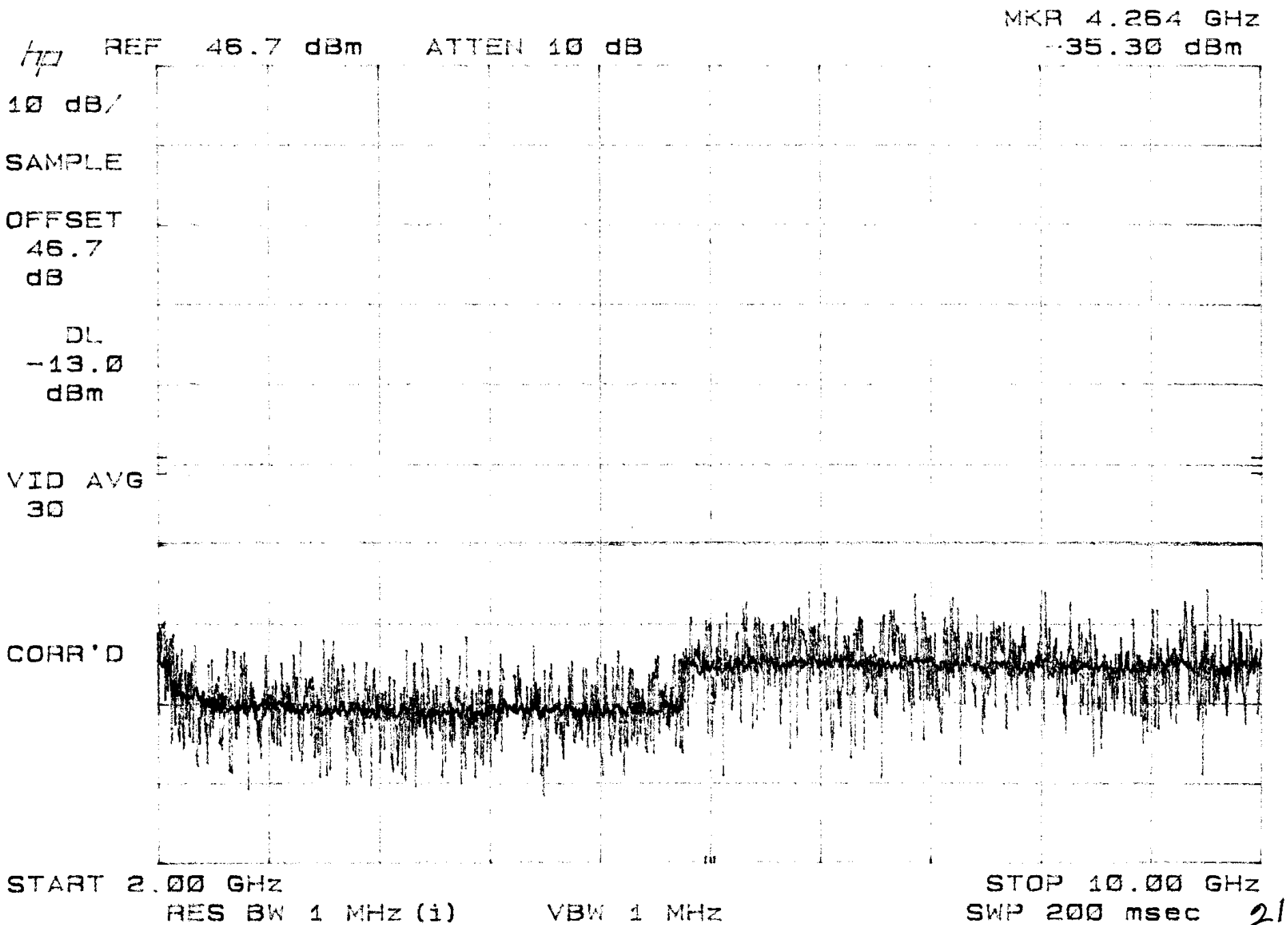
MKR 1.678 GHz
-27.10 dBm



CLIENT: POWERWAVE
NOTE(s): Low channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238



CLIENT: POWERWAVE
NOTE(s): Low channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKR 12.83 GHz
-23.60 dBm

hp REF 46.7 dBm ATTEN 10 dB

10 dB/

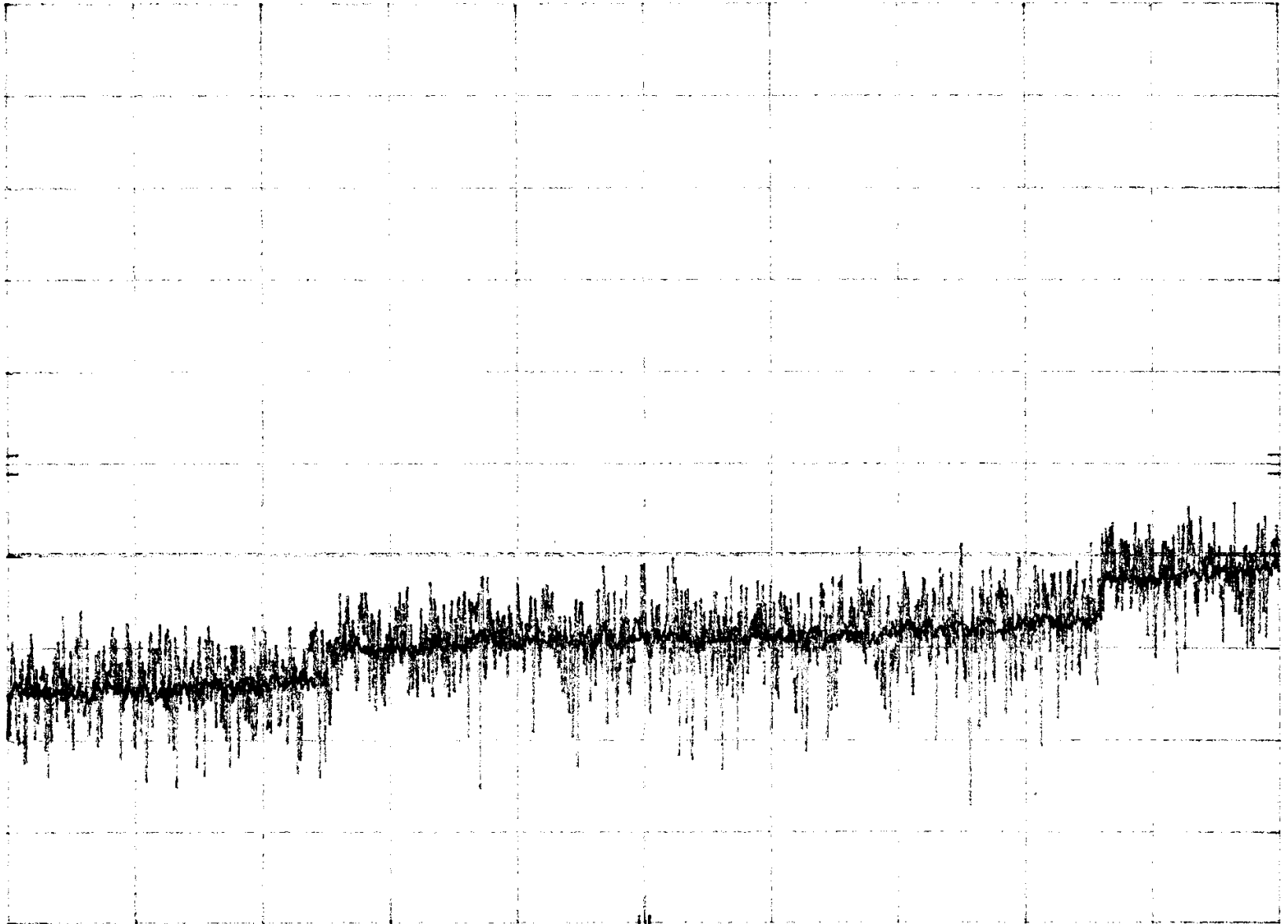
SAMPLE

OFFSET
46.7
dB

DL
-13.0
dBm

VID AVG
30

CORR'D



START 10.0 GHz

RES BW 1 MHz (1)

VBW 1 MHz

STOP 20.0 GHz

SWP 250 msec

22

CLIENT: POWERWAVE
NOTE(s): High channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKA 304.5 MHz
-33.90 dBm

hp REF 46.7 dBm ATTEN 10 dB

10 dB/

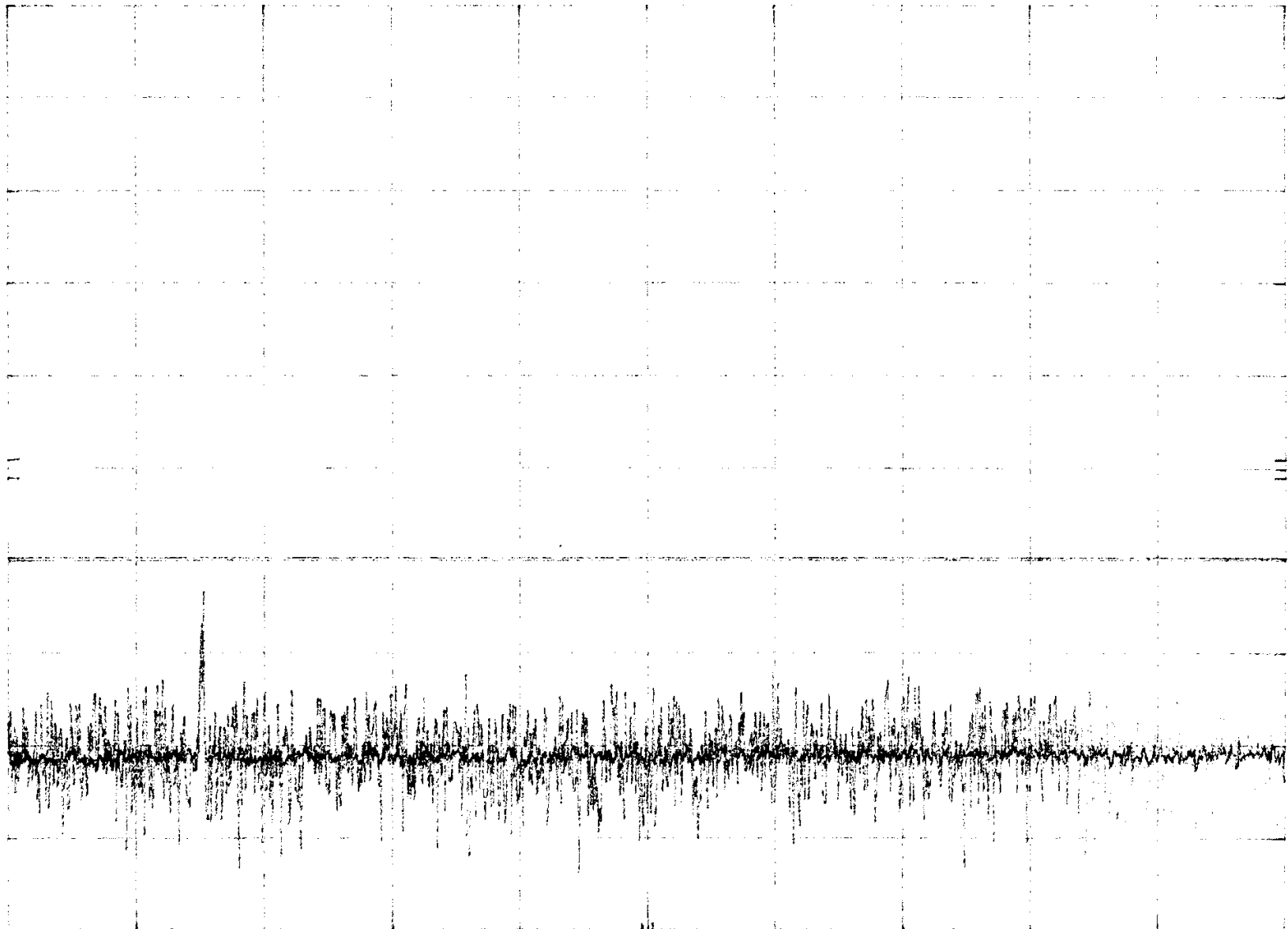
SAMPLE

OFFSET
46.7
dB

DL
-13.0
dBm

VID AVG
30

CORR'D



START 30 MHz

RES BW 1 MHz (1)

VBW 1 MHz

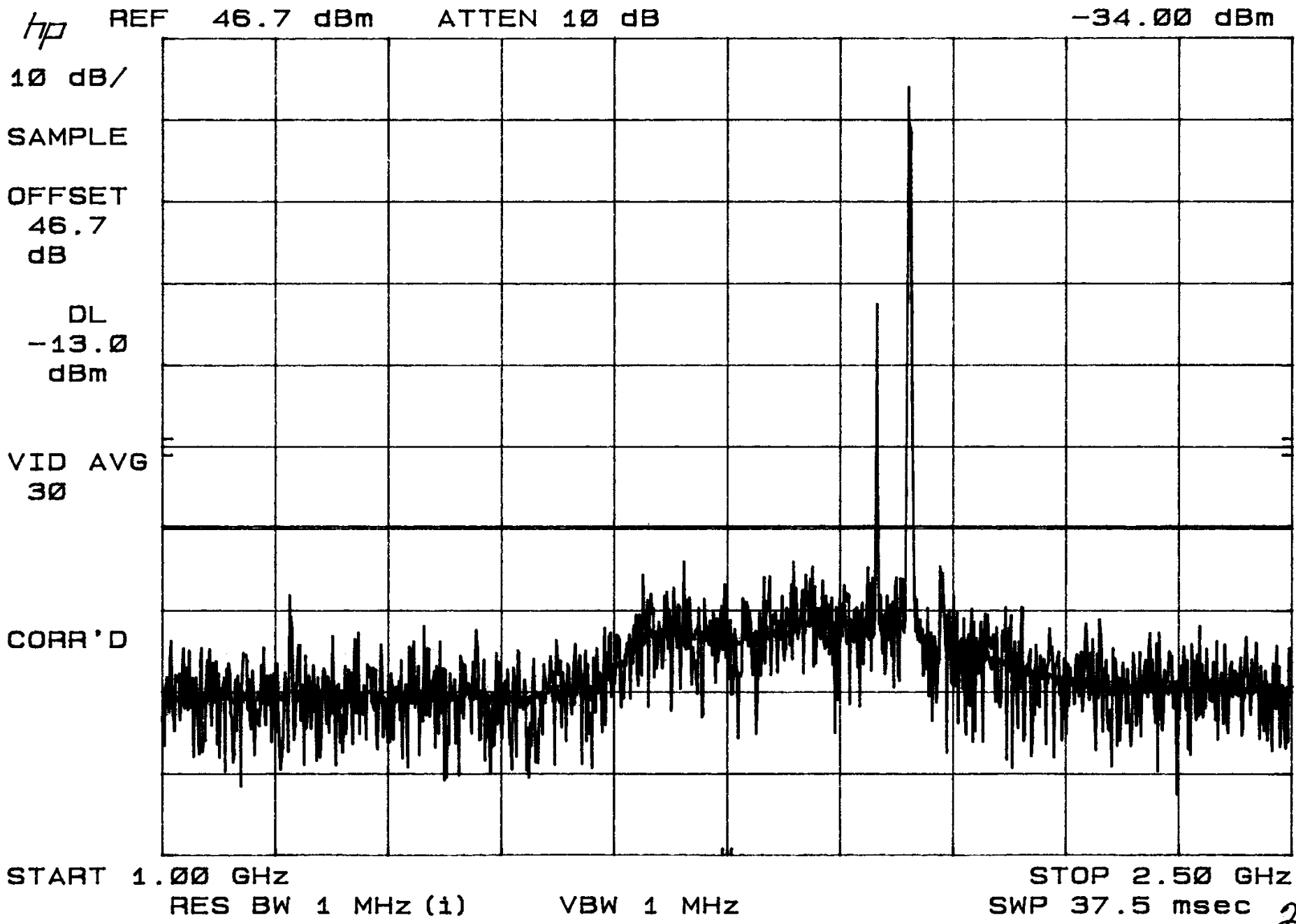
STOP 1.000 GHz
SWP 24.3 msec

23

CLIENT: POWERWAVE
NOTE(s): High channel

TEST: Antenna Port Spurious . SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKR 1.425 GHz
-34.00 dBm



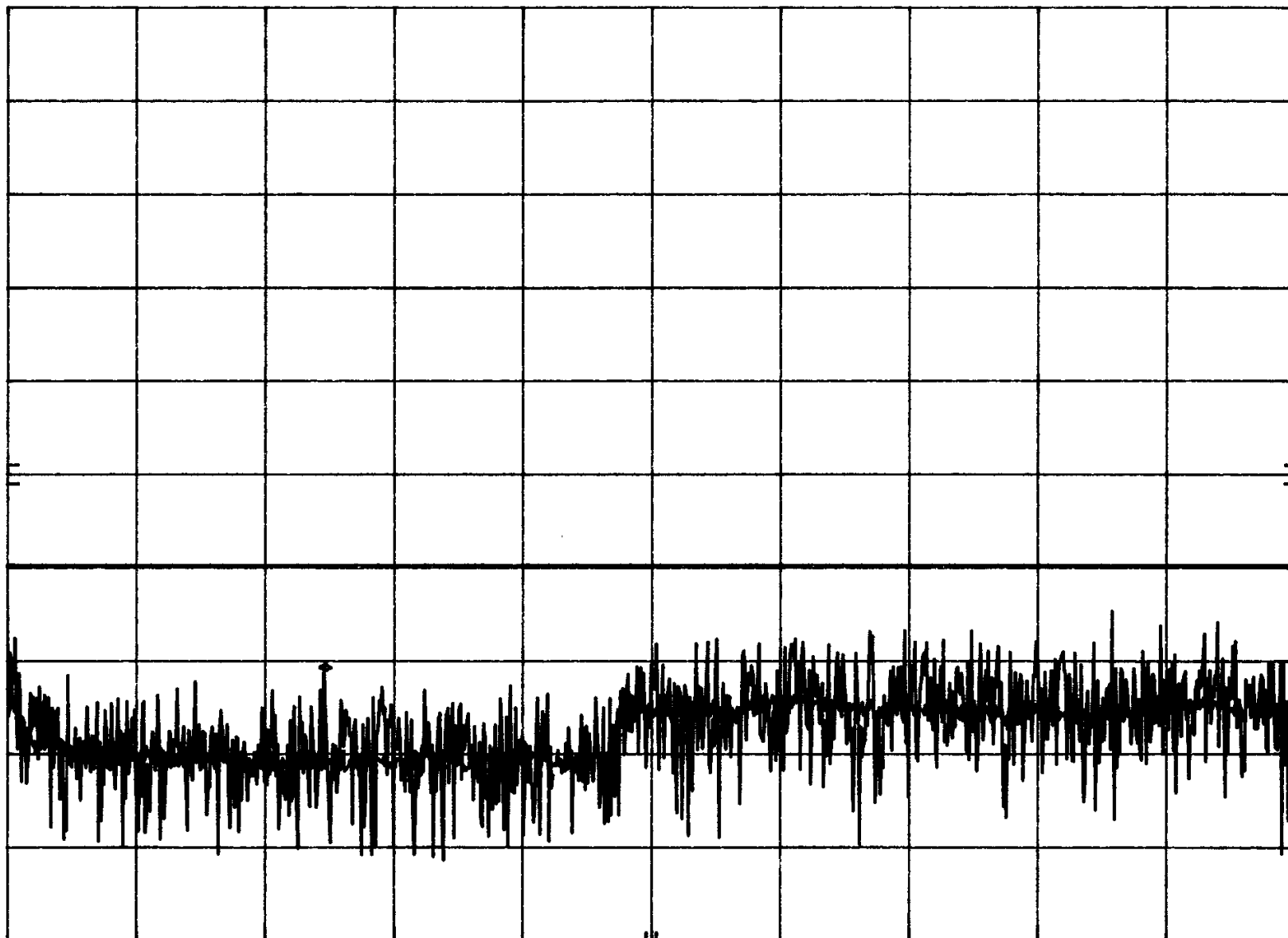
CLIENT: POWERWAVE
NOTE(s): High channel

TEST: Antenna Port Spurious

SPECIFICATION: FCC Part 2, Para. 2.1051; Part 24, Para. 24.238

MKR 3.968 GHz
-24.00 dBm

hp REF 46.7 dBm ATTEN 10 dB
10 dB/
SAMPLE
OFFSET 46.7 dB
DL -13.0 dBm
VID AVG 30



START 2.00 GHz RES BW 1 MHz (i) VBW 1 MHz STOP 10.00 GHz SWP 200 msec 25

NOTE(s): High channel

MKR 12.46 GHz
-27.90 dBm

hp REF 46.7 dBm ATTEN 10 dB

10 dB/

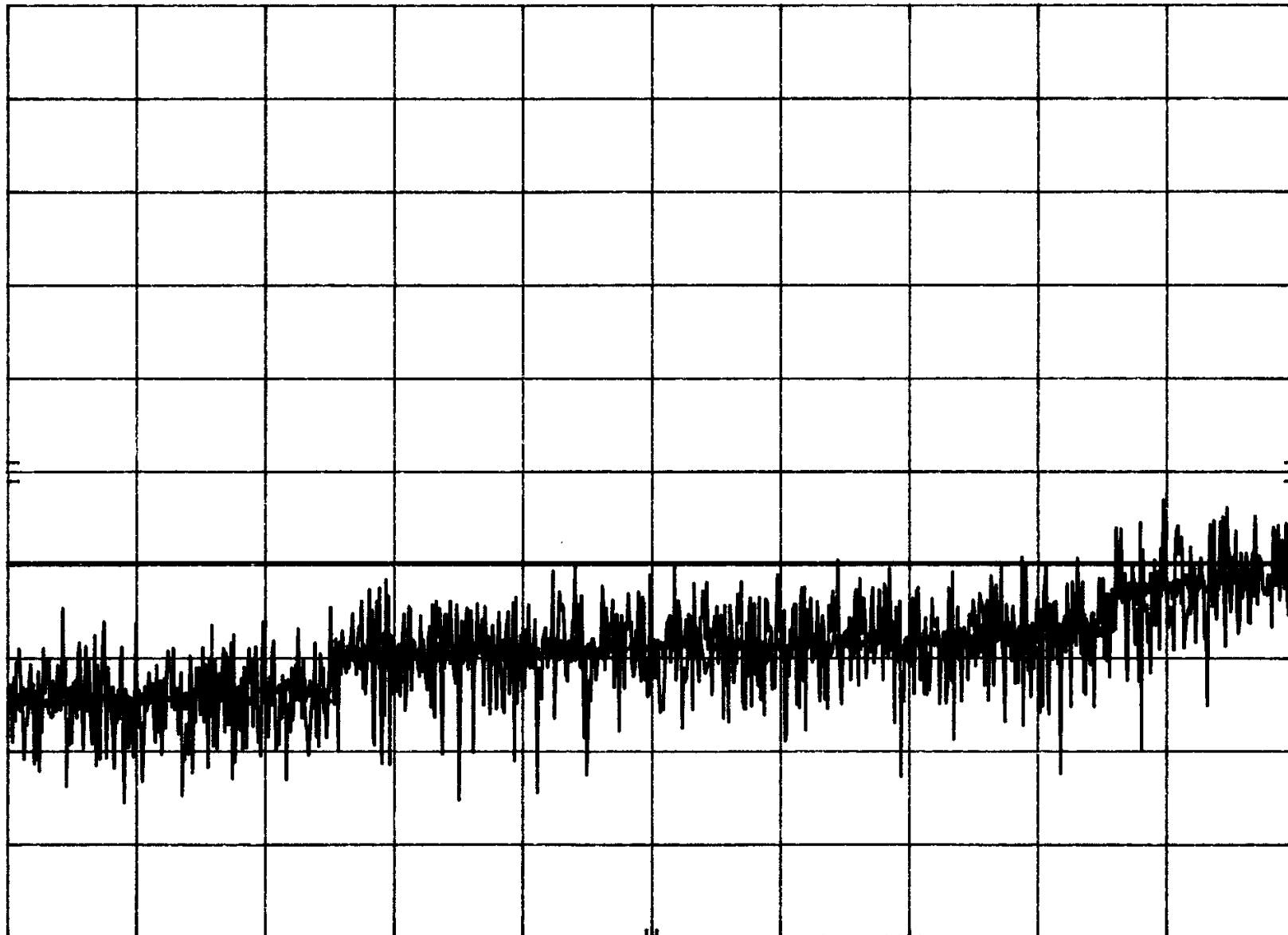
SAMPLE

OFFSET 46.7 dB

DL -13.0 dBm

VID AVG 30

CORR'D



START 10.0 GHz

RES BW 1 MHz (i)

VBW 1 MHz

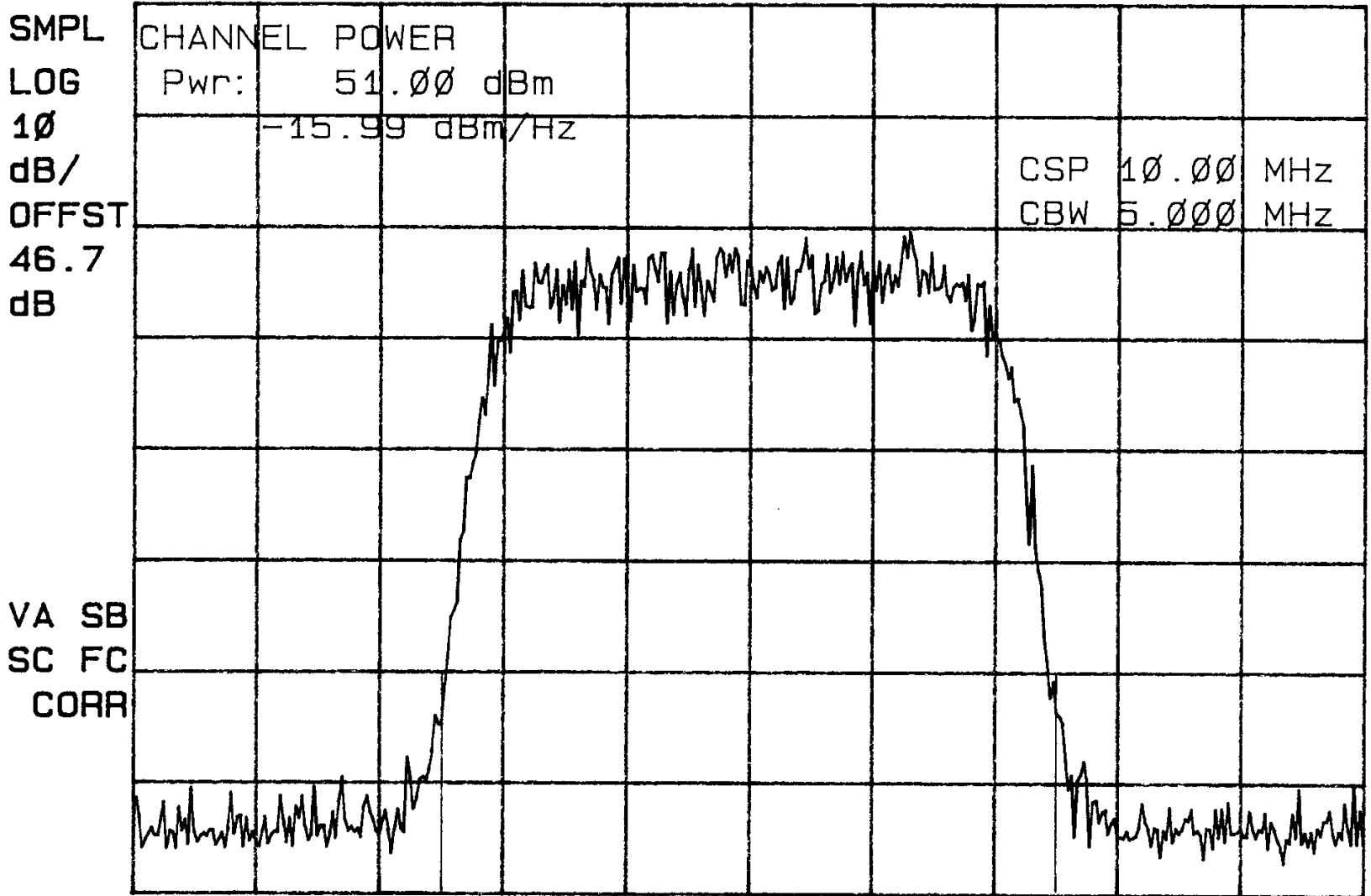
STOP 20.0 GHz

SWP 250 msec

Plot represents 3 Tones

13: 43: 47 SEP 07. 2000
hp

REF 60.0 dBm AT 30 dB



CENTER 1.93188 GHz

#RES BW 100 KHz

#VBW 1 MHz

SPAN 10.00 MHz

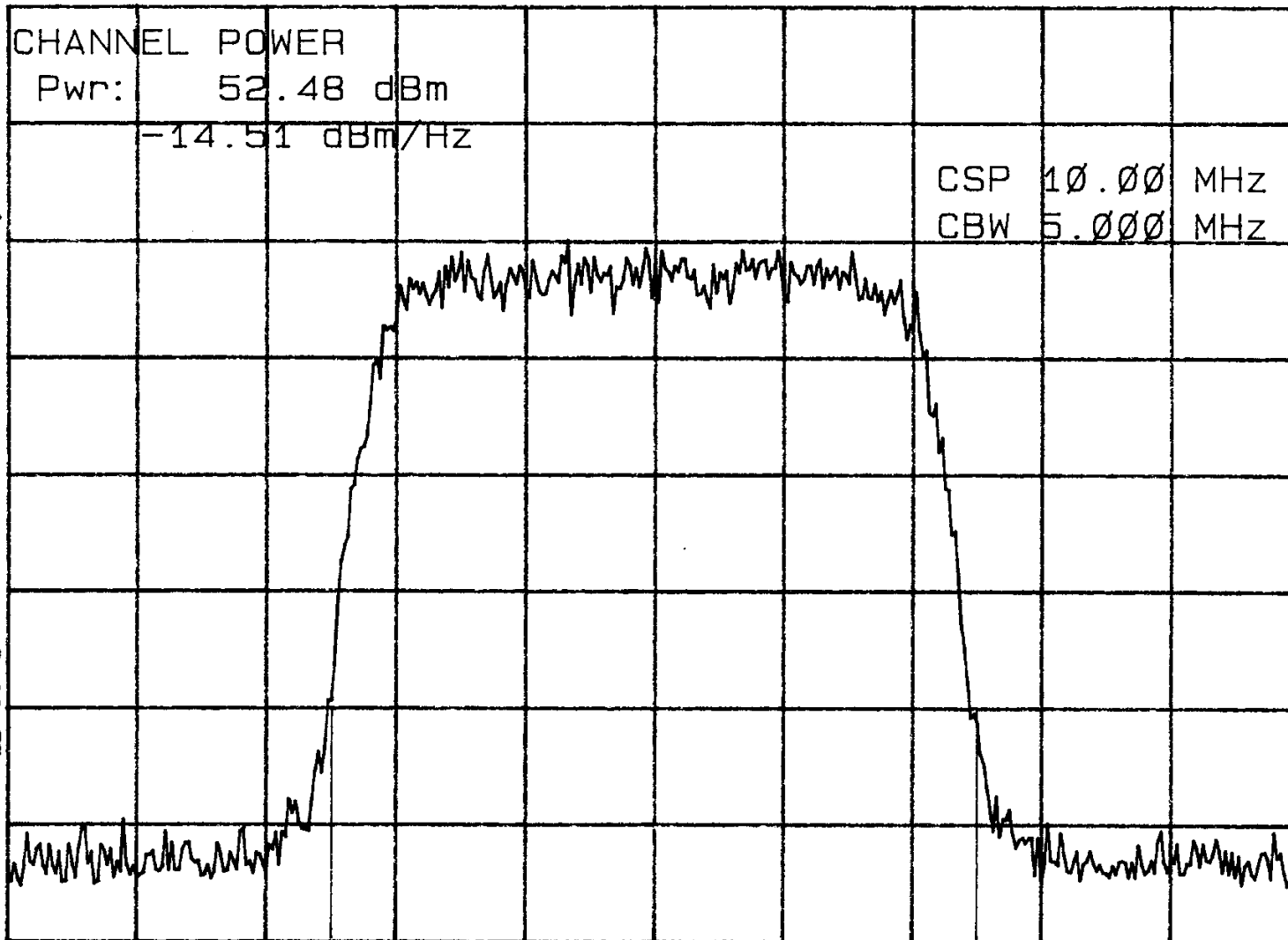
SWP 20.0 msec

Plot represents 3 Tones

13:50:38 SEP 07. 2000

REF 60.0 dBm AT 30 dB

SMPL
LOG
10
dB/
OFFST
46.7
dB



CENTER 1.96000 GHz

#RES BW 100 KHz

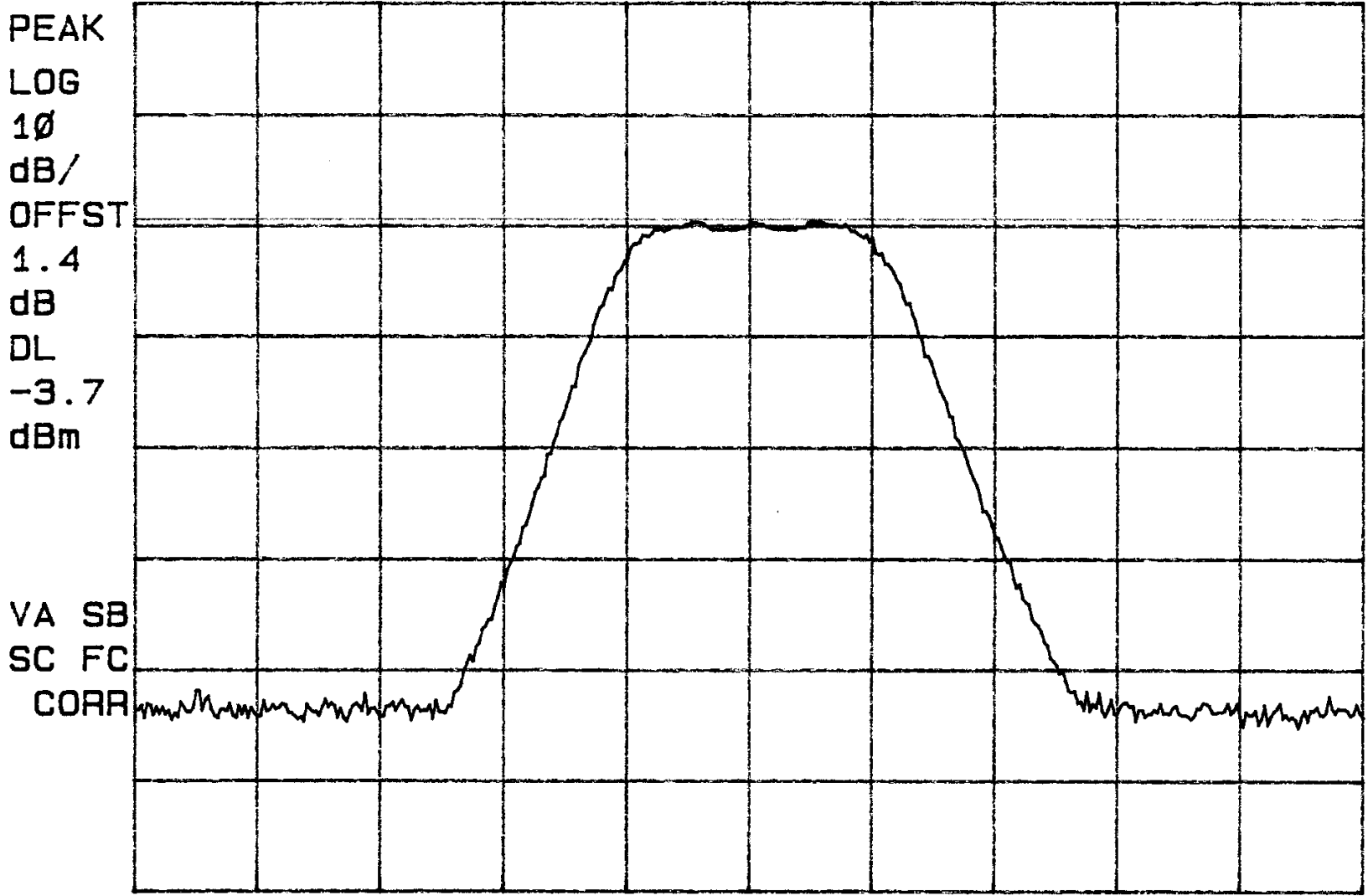
#VBW 1 MHz

SPAN 10.00 MHz

SWP 20.0 msec

14: 35: 19 SEP 07. 2000
~~hp~~

REF 15.7 dBm AT 30 dB



CENTER 1.93188 GHz

#RES BW 1.0 MHz

VBW 1 MHz

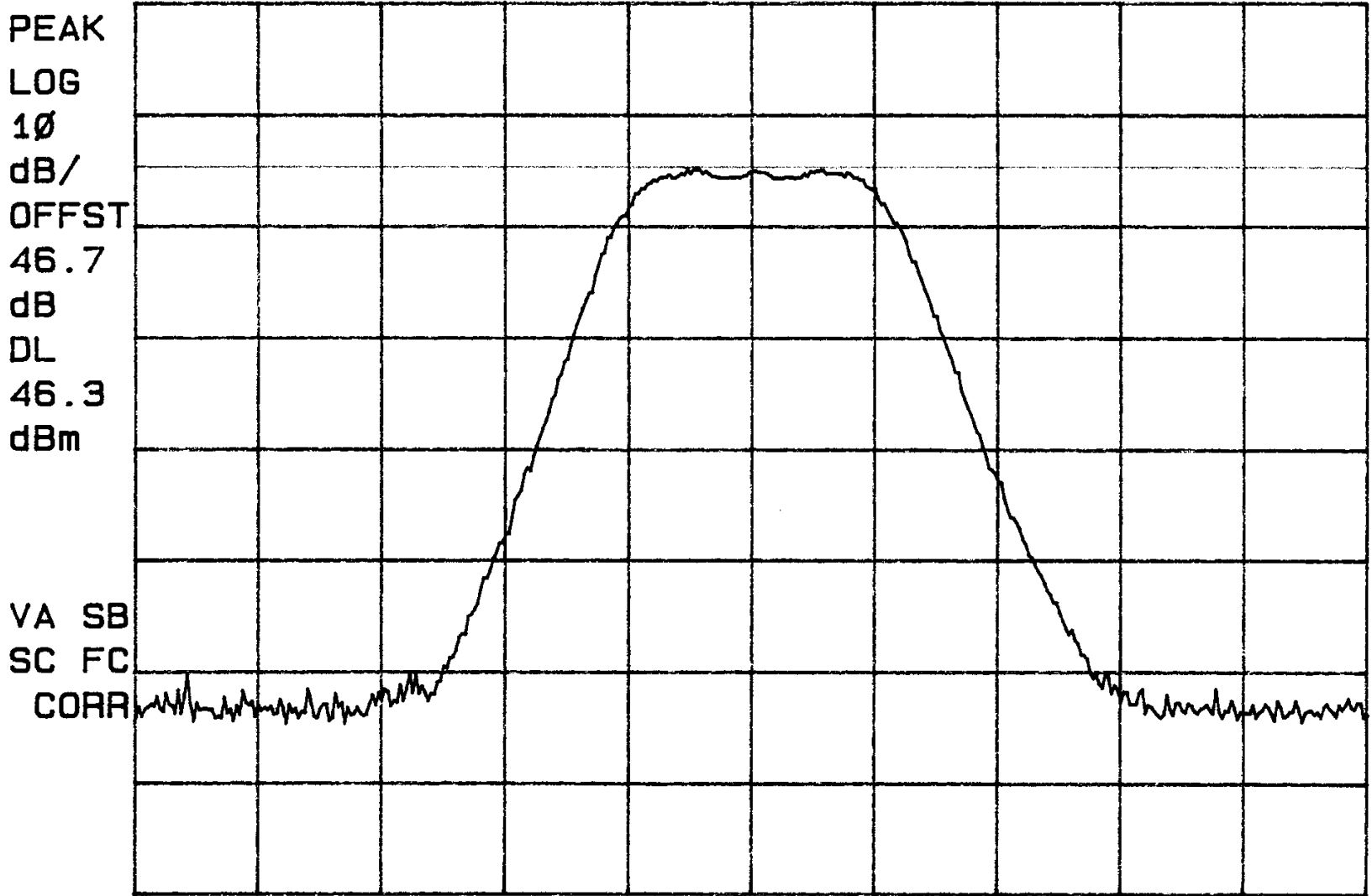
SPAN 20.00 MHz

SWP 20.0 msec

14: 32: 27 SEP 07, 2000
hp

REF 61.0 dBm

AT 30 dB



CENTER 1.93188 GHz

#RES BW 1.0 MHz

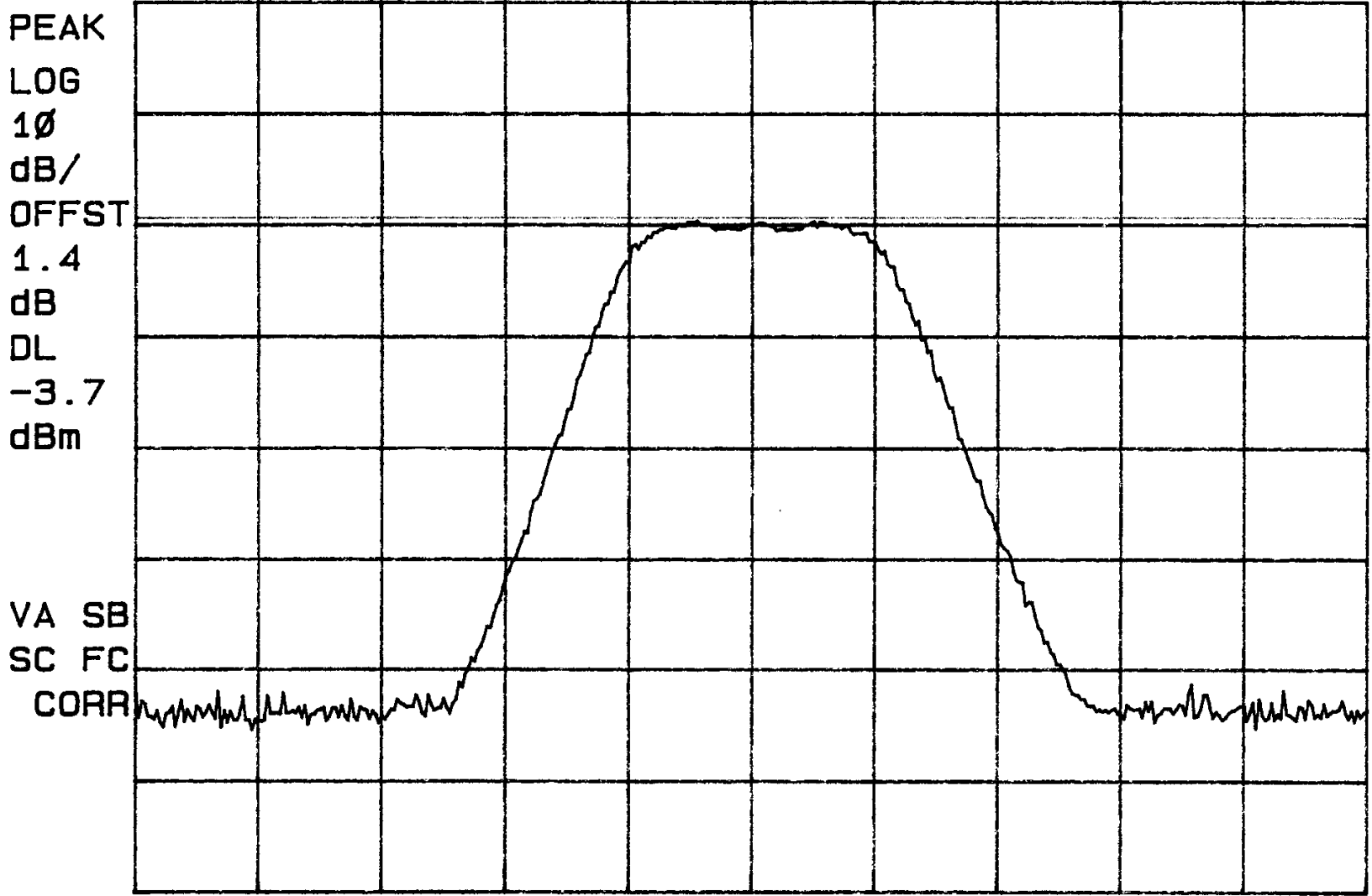
VBW 1 MHz

SPAN 20.00 MHz

SWP 20.0 msec

14: 28: 47 SEP 07. 2000
~~hp~~

REF 15.7 dBm AT 30 dB



CENTER 1.96000 GHz

#RES BW 1.0 MHz

VBW 1 MHz

SPAN 20.00 MHz

SWP 20.0 msec

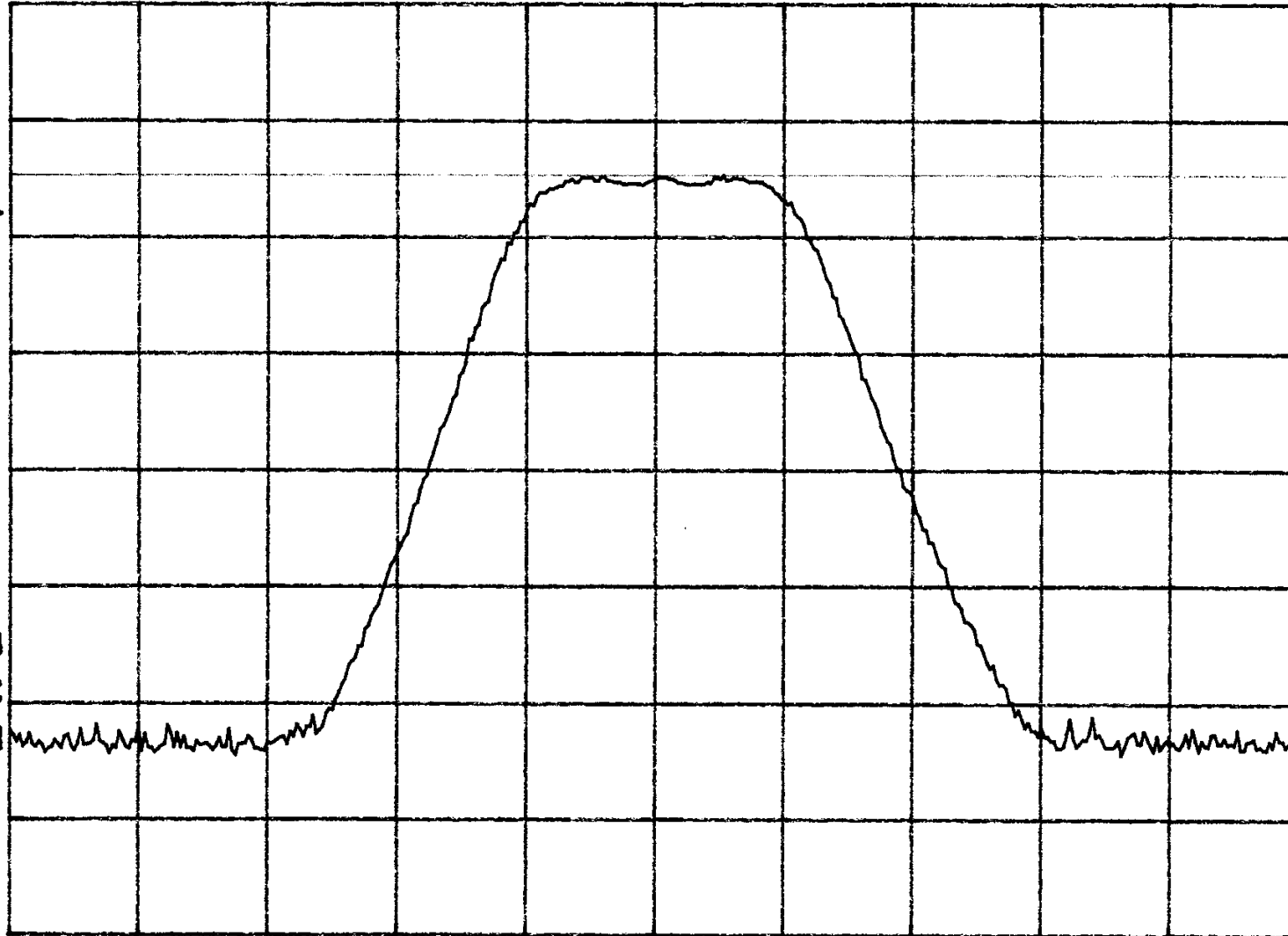
14: 24: 41 SEP 07. 2000
~~17~~

REF 61.0 dBm

AT 30 dB

PEAK
LOG
10
dB/
OFFST
46.7
dB
DL
46.3
dBm

VA SB
SC FC
CORR



CENTER 1.96000 GHz

#RES BW 1.0 MHz

VBW 1 MHz

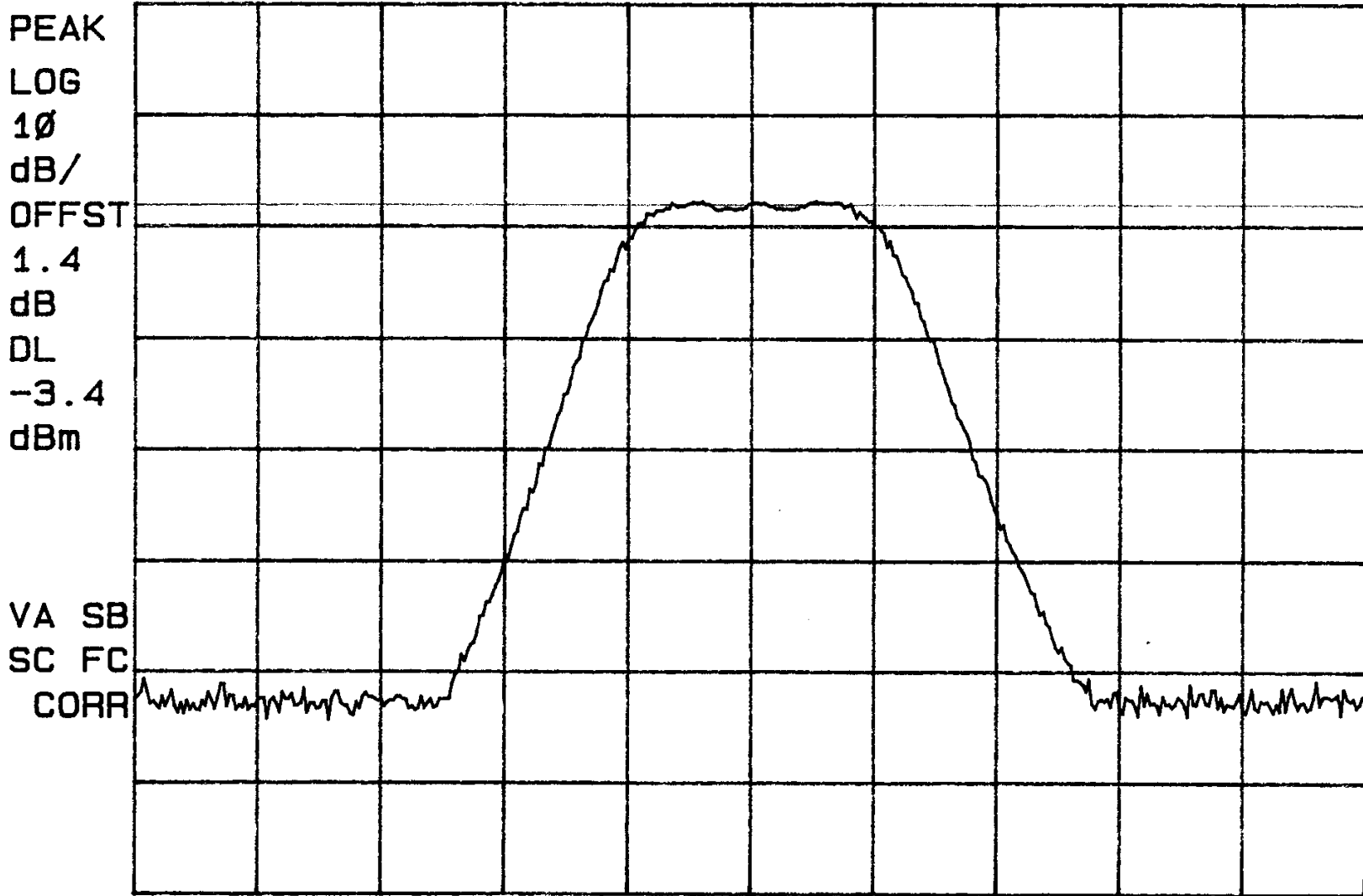
SPAN 20.00 MHz

SWP 20.0 msec

33

14: 17: 45 SEP 07. 2000
hp

REF 14.7 dBm AT 30 dB



CENTER 1.98813 GHz

#RES BW 1.0 MHz

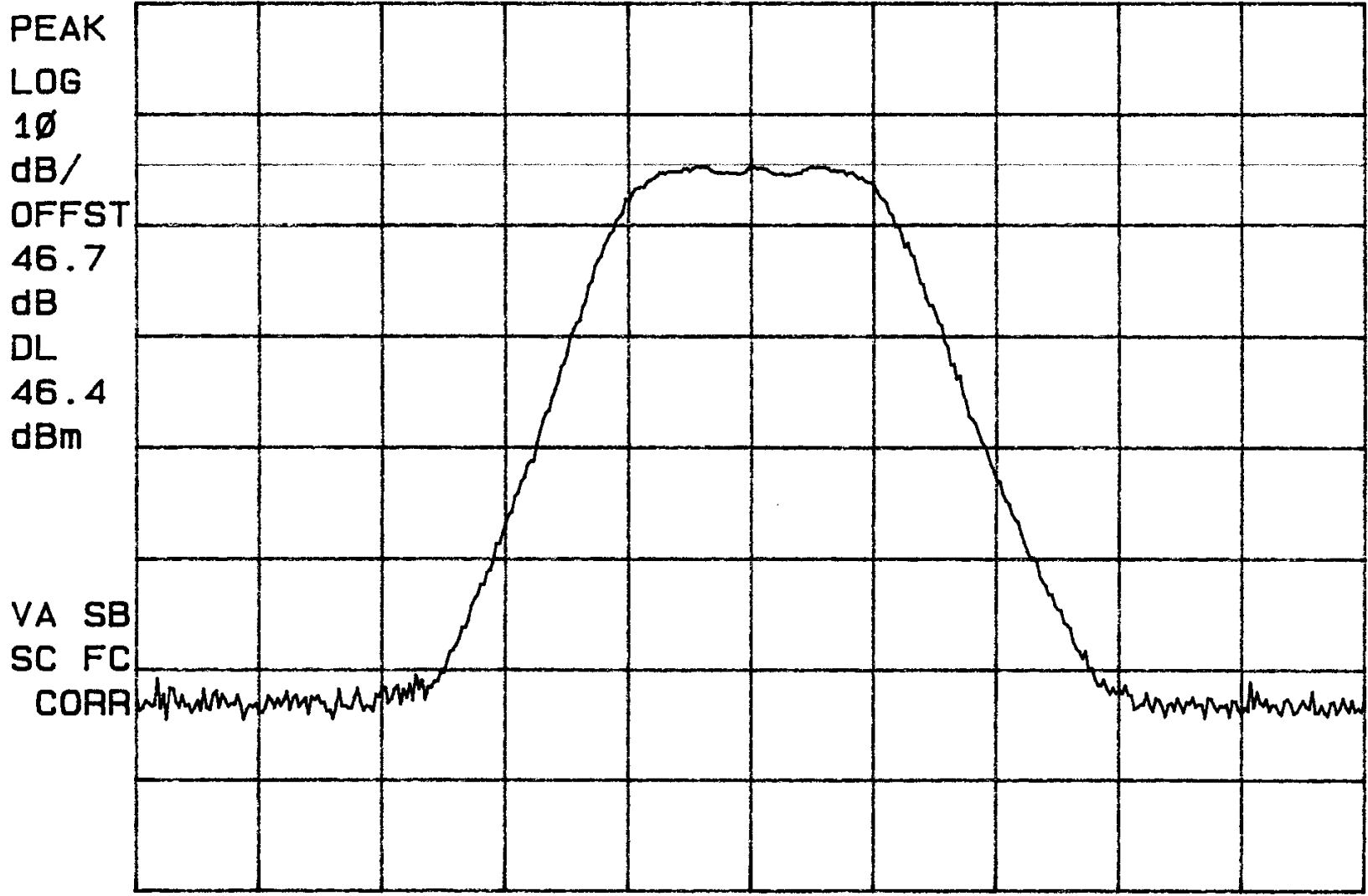
VBW 1 MHz

SPAN 20.00 MHz

SWP 20.0 msec

14: 21: 18 SEP 07, 2000
~~17~~

REF 61.0 dBm AT 30 dB



CENTER 1.98813 GHz
#RES BW 1.0 MHz

VBW 1 MHz

SPAN 20.00 MHz
SWP 20.0 msec

35

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

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, Agilent, Model E4433B, Cal: 04/13/01
Circulator, Model, 1-3DF-2354, verified internally
Attenuator (variable), Arra, Model 2-8354-20D, verified internally
Spectrum Analyzer, Model HP8566B, P/N 720, Cal: 03/01
Power Meter, HPE4419B, Cal: 12/11/00
Power Sensor, HP8481A; Cal: 07/28/01
Directional Coupler, Narda, 3022, verified internally
30 dB Attenuator, JFW, 50FH-030-100, verified internally

Remarks: _____

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:

A handwritten signature in black ink, appearing to read "Jim Owen". The signature is fluid and cursive, with a large initial "J" and "O".

Jim Owen
(EMC Engineer)