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1.1 Product Description (continued)

EUT Operating Modes to be Tested

1. Rf applied to reach 50 Watt output

EUT System Components

Description	Model #	Serial #	FCC ID #
Power amplifier module	G3L-900-50		

Support Equipment

Description	Model #	Serial #	FCC ID #
HP SIGNAL GENERATOR	E4436B	US39260103	
HP POWER METER	E4419B	GB40201926	
RF CABLES AND CONNECTORS			

Oscillator Frequencies

Frequency	Derived Frequency	Component # / Location	Description of Use
15 MHz	15 MHz	Y1 MULTIFUNCTION BRD	CLOCK

Power Line Filters

Manufacturer	Model #	Location in EUT
Spectrum Control	52-978-107-FA3	Multifunction Brd.
Panasonic	ELK-E103FA	Multifunction Brd.

Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component # / Location
Ferrite	Fair-Rite	2743021447	10	FB1-FB10 / Multifunction brd
Bandpass Filter	Panasonic	ELK-E103FA	1	FL17 / Multifunction Brd.

EMC Critical Detail

Inductive filters, capacitive filters, noise filters

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 90, Paragraph 90.210
 - 2. Radiated Emissions EN55022: 1992 Class B limit, 30 - 1,000 MHz, 10 meters
 - X 3. Radiated Emission per FCC Part 2, Paragraph 2.153
 - 4. Engineering evaluations
 - 5. Frequency Stability, Part 2, Paragraph 2.995, and Part 87, Paragraph 87.133
 - X RF Output Power, Part 2, Paragraph 1.1046, Part 90, Paragraph 90.210

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

Equipment Specifications

Frequency range in MHz	Rated RF power output in watts	Frequency tolerance %, Hz, ppm	Emission designator (see 47 CFR §2.201 and §2.202)	Microprocessor model number
935 - 940	50 W		GXW	

DC voltages applied to and **dc currents** into the several elements of the final radio frequency amplifying device for normal operation over the power range.

27 Vdc / 27 A

For equipment employing digital modulation techniques... N/A

If equipment is an AM broadcast stereophonic exciter-generator: N/A

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The Seahawk 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.

See following page(s).

See test setup photos for radiated emissions test setup.

Radiated Electromagnetic Emissions



Test Report #: **S0303 Run 01** Test Area: **Site 3 Roof**
 Test Method: **Spurious Emissions** *2.1053* Test Date: **14-Sep-2088**
 EUT Model #: **G31-900-50-005** EUT Power: **27 Vdc**
 EUT Serial #: **C0000058N9**
 Manufacturer: **Powerwave**
 EUT Description: **GSM800 Amplifier**
 Notes: _____

Temperature: **27** °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	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC Part 24	N/A
Fundamental Measurements						
935.00	55.1 Pk	2.5 / 23.7 / 0.0	81.3	V / 1.0 / 0.0	-0.9	N/A
935.00	54.9 Pk	2.5 / 23.7 / 0.0	81.1	H / 1.0 / 0.0	-1.1	N/A
937.50	56.1 Pk	2.5 / 23.8 / 0.0	82.4	H / 1.0 / 0.0	0.2 *	N/A
937.50	56.9 Pk	2.5 / 23.8 / 0.0	83.2	V / 1.0 / 0.0	1.0 *	N/A
940.00	56.6 Pk	2.5 / 23.8 / 0.0	82.9	V / 1.0 / 0.0	0.7 *	N/A
940.00	50.0 Pk	2.5 / 23.8 / 0.0	76.3	H / 1.0 / 0.0	-5.9	N/A
High Channel						
1880.00	79.0 Pk	4.2 / 28.5 / 40.5	71.1	V / 1.0 / 0.0	-11.1	N/A
2820.00	62.0 Pk	5.5 / 31.0 / 40.3	58.2	V / 1.0 / 0.0	-24.0	N/A
3760.00	56.1 Pk	6.9 / 33.6 / 41.0	55.6	V / 1.0 / 0.0	-26.6	N/A
4700.00	59.4 Pk	7.3 / 34.3 / 41.7	59.3	V / 1.0 / 0.0	-22.9	N/A
ambient measurement below						
5640.00	44.8 Pk	7.5 / 36.3 / 39.2	49.5	V / 1.0 / 0.0	-32.7	N/A
6580.00	47.7 Pk	8.1 / 36.7 / 38.4	54.0	V / 1.0 / 0.0	-28.2	N/A
7520.00	46.8 Pk	8.7 / 38.0 / 38.1	55.4	V / 1.0 / 0.0	-26.8	N/A
8460.00	47.3 Pk	9.8 / 38.3 / 38.6	56.8	V / 1.0 / 0.0	-25.4	N/A
9400.00	47.3 Pk	10.3 / 39.4 / 39.1	57.9	V / 1.0 / 0.0	-24.3	N/A
Polarity Change						
1880.00	77.6 Pk	4.2 / 28.5 / 40.5	69.7	H / 1.0 / 0.0	-12.5	N/A
2820.00	63.1 Pk	5.5 / 31.0 / 40.3	59.3	H / 1.0 / 0.0	-22.9	N/A
3760.00	55.6 Pk	6.9 / 33.6 / 41.0	55.1	H / 1.0 / 0.0	-27.1	N/A
4700.00	55.7 Pk	7.3 / 34.3 / 41.7	55.6	H / 1.0 / 0.0	-26.6	N/A
ambient measurements below						
5640.00	44.3 Pk	7.5 / 36.3 / 39.2	49.0	H / 1.0 / 0.0	-33.2	N/A
6580.00	47.6 Pk	8.1 / 36.7 / 38.4	53.9	H / 1.0 / 0.0	-28.3	N/A
7520.00	46.3 Pk	8.7 / 38.0 / 38.1	54.9	H / 1.0 / 0.0	-27.3	N/A
8460.00	46.9 Pk	9.8 / 38.3 / 38.6	56.4	H / 1.0 / 0.0	-25.8	N/A
9400.00	47.4 Pk	10.3 / 39.4 / 39.1	58.0	H / 1.0 / 0.0	-24.2	N/A

Tested by: Jim Owen
 Printed

Jim Owen
 Signature

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Radiated Electromagnetic Emissions



Test Report #: S0303 Run 01
 Test Method: Spurious Emissions 2.1053
 EUT Model #: G31-900-50-005
 EUT Serial #: C0000058N9
 Manufacturer: Powerwave
 EUT Description: GSM800 Amplifier
 Notes:

Test Area: Site 3 Roof
 Test Date: 14-Sep-2088
 EUT Power: 27 Vdc

Temperature: 27 °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
Mid Channel						
1875.00	76.0 Pk	4.2 / 28.4 / 40.5	68.1	H / 1.0 / 0.0	-14.1	N/A
2812.50	64.0 Pk	5.5 / 31.0 / 40.3	60.2	H / 1.0 / 0.0	-22.0	N/A
3750.00	56.0 Pk	6.9 / 33.5 / 41.0	55.5	H / 1.0 / 0.0	-26.7	N/A
4687.50	61.8 Pk	7.3 / 34.2 / 41.7	61.7	H / 1.0 / 0.0	-20.5	N/A
no emissions detected above 5th harmonic						
1875.00	77.3 Pk	4.2 / 28.4 / 40.5	69.4	V / 1.0 / 0.0	-12.8	N/A
2812.50	62.7 Pk	5.5 / 31.0 / 40.3	58.9	V / 1.0 / 0.0	-23.3	N/A
3750.00	56.9 Pk	6.9 / 33.5 / 41.0	56.4	V / 1.0 / 0.0	-25.8	N/A
4687.50	60.3 Pk	7.3 / 34.2 / 41.7	60.2	V / 1.0 / 0.0	-22.0	N/A
no emissions detected above 5th harmonic						
Low Channel						
1870.00	78.2 Pk	4.1 / 28.4 / 40.5	70.3	V / 1.0 / 0.0	-11.9	N/A
2805.00	62.5 Pk	5.5 / 31.0 / 40.3	58.7	V / 1.0 / 0.0	-23.5	N/A
3740.00	58.5 Pk	6.9 / 33.5 / 40.9	58.0	V / 1.0 / 0.0	-24.2	N/A
4675.00	59.8 Pk	7.3 / 34.2 / 41.7	59.6	V / 1.0 / 0.0	-22.6	N/A
no emissions detected above 5th harmonic						
1870.00	76.3 Pk	4.1 / 28.4 / 40.5	68.4	H / 1.0 / 0.0	-13.8	N/A
2805.00	63.3 Pk	5.5 / 31.0 / 40.3	59.5	H / 1.0 / 0.0	-22.7	N/A
3740.00	55.1 Pk	6.9 / 33.5 / 40.9	54.6	H / 1.0 / 0.0	-27.6	N/A
4675.00	62.5 Pk	7.3 / 34.2 / 41.7	62.3	H / 1.0 / 0.0	-19.9	N/A

Tested by: Jim Owen
 Printed


 Signature

11

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

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

☐ - Test not applicable

■ - Roof (Small Open Area Test Site), 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
AMF-5D-010180-35-10P	719	Pre-amplifier (38 dB gain, 1 - 18 GHz	EMCO	2495	*
8566B	720	Spectrum Analyzer	Hewlett Packard	211500842	03/01
8566B	721	Spectrum Analyzer Display	Hewlett Packard	2112A02185	03/01

Remarks: (*) Verified

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

See following page(s).

Emissions Test Conditions: CONDUCTED EMISSIONS, FCC Part 2, 2.1046 and 2.1051 and Part 90, Paragraph 90.210

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 (1)
Signal Generator, Agilent, Model E4433B, Cal: 08/02(2)
Signal Generator, Agilent, Model E4433B, Cal: 08/02(3)
Circulator, Model, 1-3DF-2354, S/N 00177, verified internally (1)
Circulator, Model, 1-3DF-2354, S/N 00222, verified internally (2)
Circulator, Model, 1-3DF-2354, S/N 00260, verified internally (3)
Attenuator (variable), Arra, Model 2-8354-20D, verified internally
Spectrum Analyzer, Model HP8594E, P/N 430, Cal: ??
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
20 dB Attenuator, BPF, FSY 80212, DC0030, S/N 0003, verified

Remarks: _____

Powerwave
Project Nr. S0303

Peak Output Power

Jim Owen
09-13-00

Channel	Frequency (MHz)	Peak Power Level
Low	935.0	49.35 48.417W
Mid	937.5	48.71 47.424W
High	940.0	49.35 47.643W

Equipment Used:

Model Nr.	Property Nr.	Cal. Due
HP 8900D	PN: 802	03/31/01
HP 84811A	PN: 801	03/31/01
HP 8594E	PN: 430	05/10/01

15:08:34 NOV 28, 2000

~~17~~

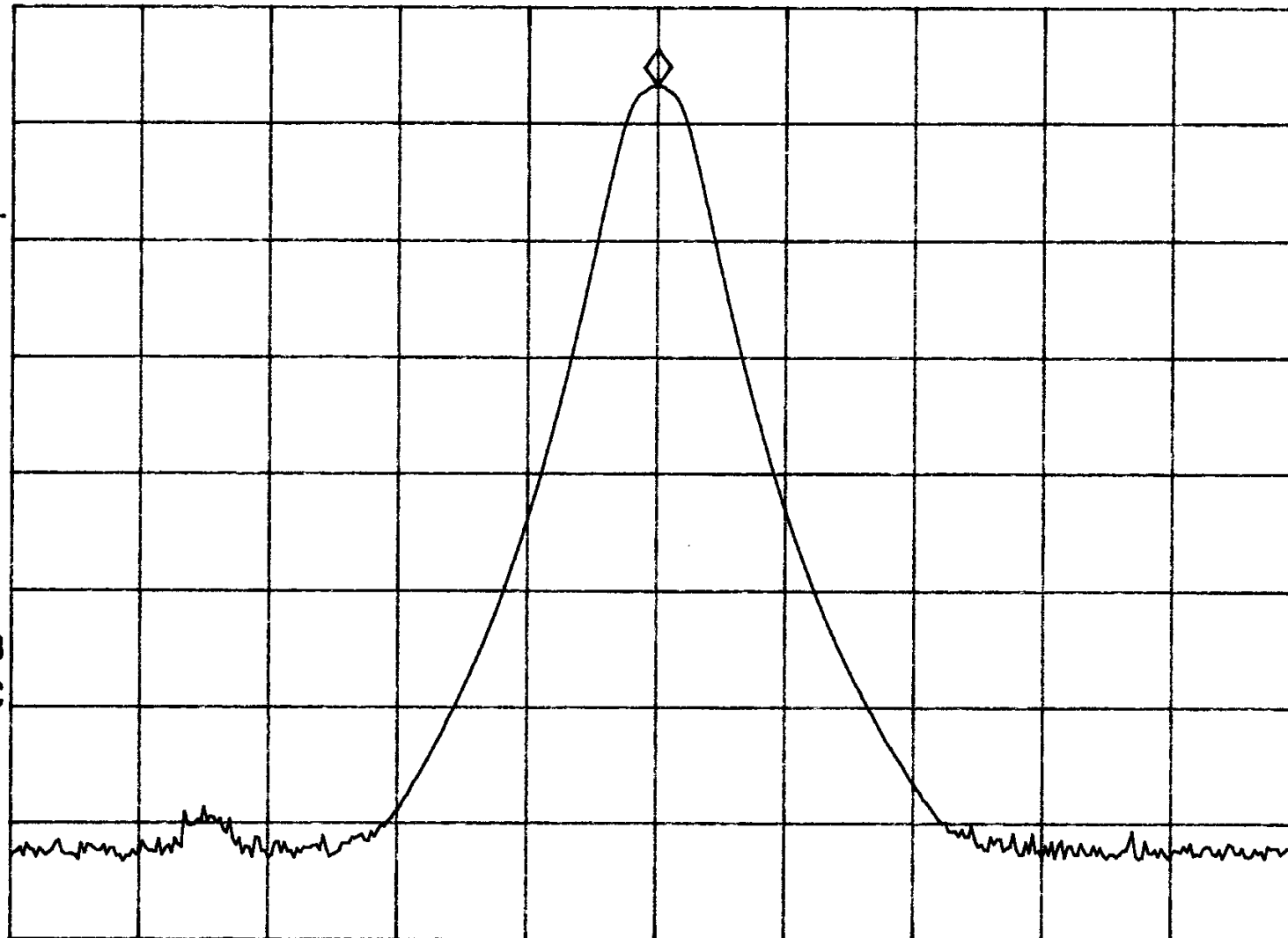
MKR 937.50 MHz

REF 223.9 W AT 10 dB

47.424 W

PEAK
LOG
10
dB/
OFFST
53.5
dB

VA SB
SC FC



CENTER 937.50 MHz
#RES BW 300 kHz

VBW 100 kHz

SPAN 10.00 MHz
SWP 20.0 msec

16a

14:52:59 NOV 28, 2000

~~HP~~

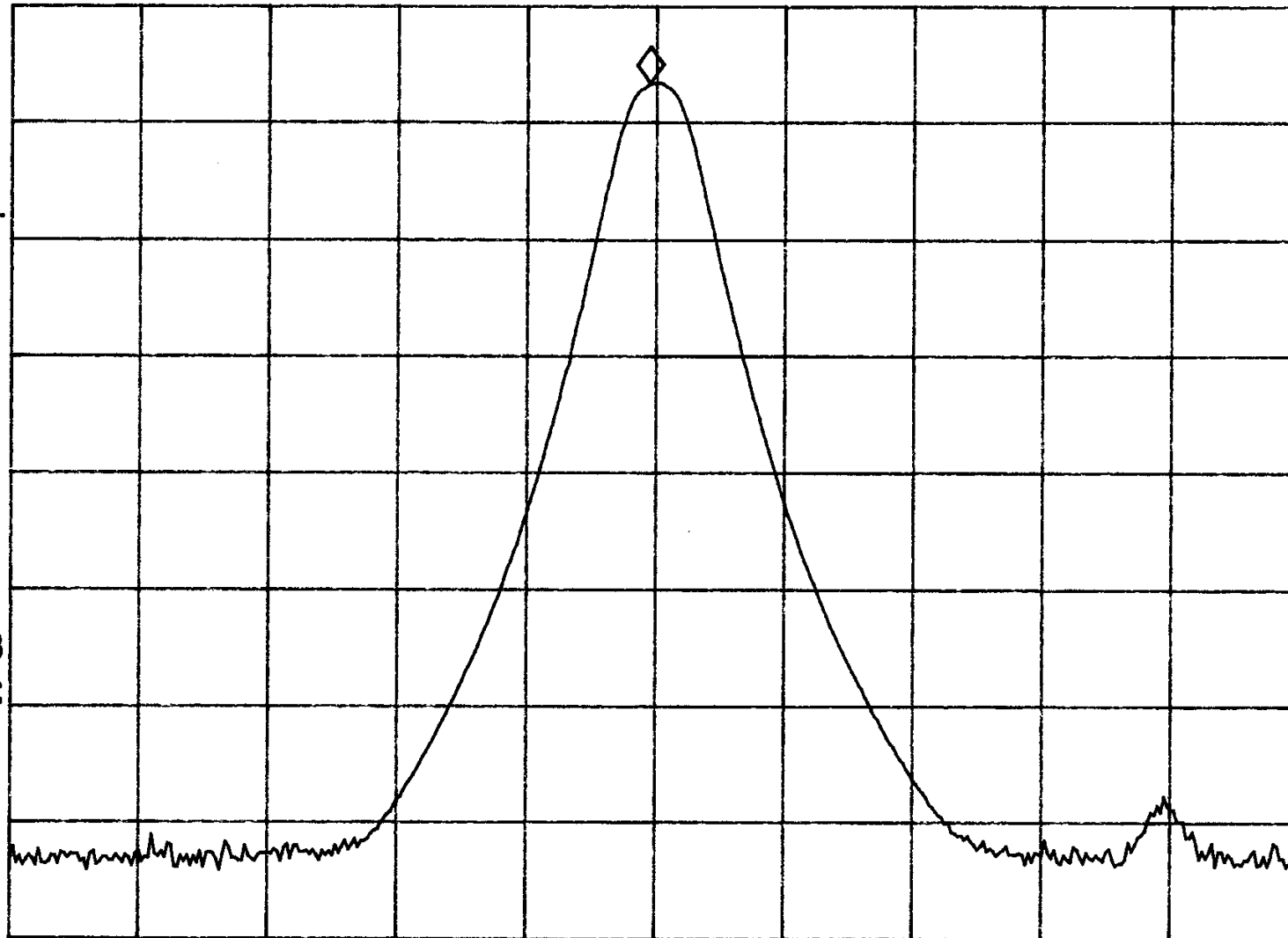
MKR 929.95 MHz

REF 223.9 W AT 10 dB

48.417 W

PEAK
LOG
10
dB/
OFFST
53.5
dB

VA SB
SC FC



CENTER 930.00 MHz

#RES BW 300 kHz

VBW 100 kHz

SPAN 10.00 MHz

SWP 20.0 msec

16b

14: 49: 29 NOV 28, 2000

hp

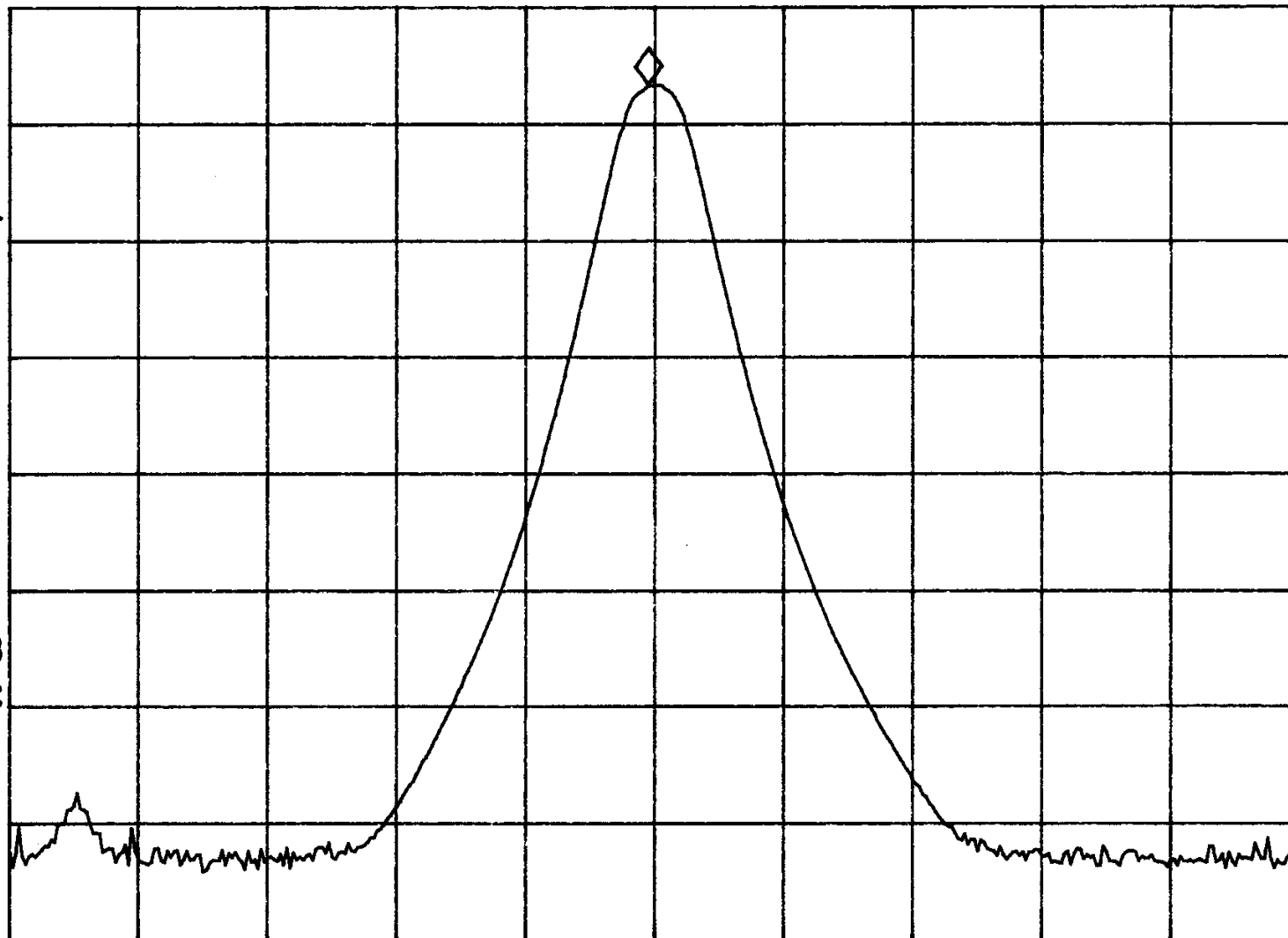
MKR 938.45 MHz

REF 223.9 W AT 10 dB

47.973 W

PEAK
LOG
10
dB/
OFFST
53.5
dB

VA SB
SC FC



CENTER 938.50 MHz
#RES BW 300 kHz

VBW 100 kHz

SPAN 10.00 MHz
SWP 20.0 msec

16c

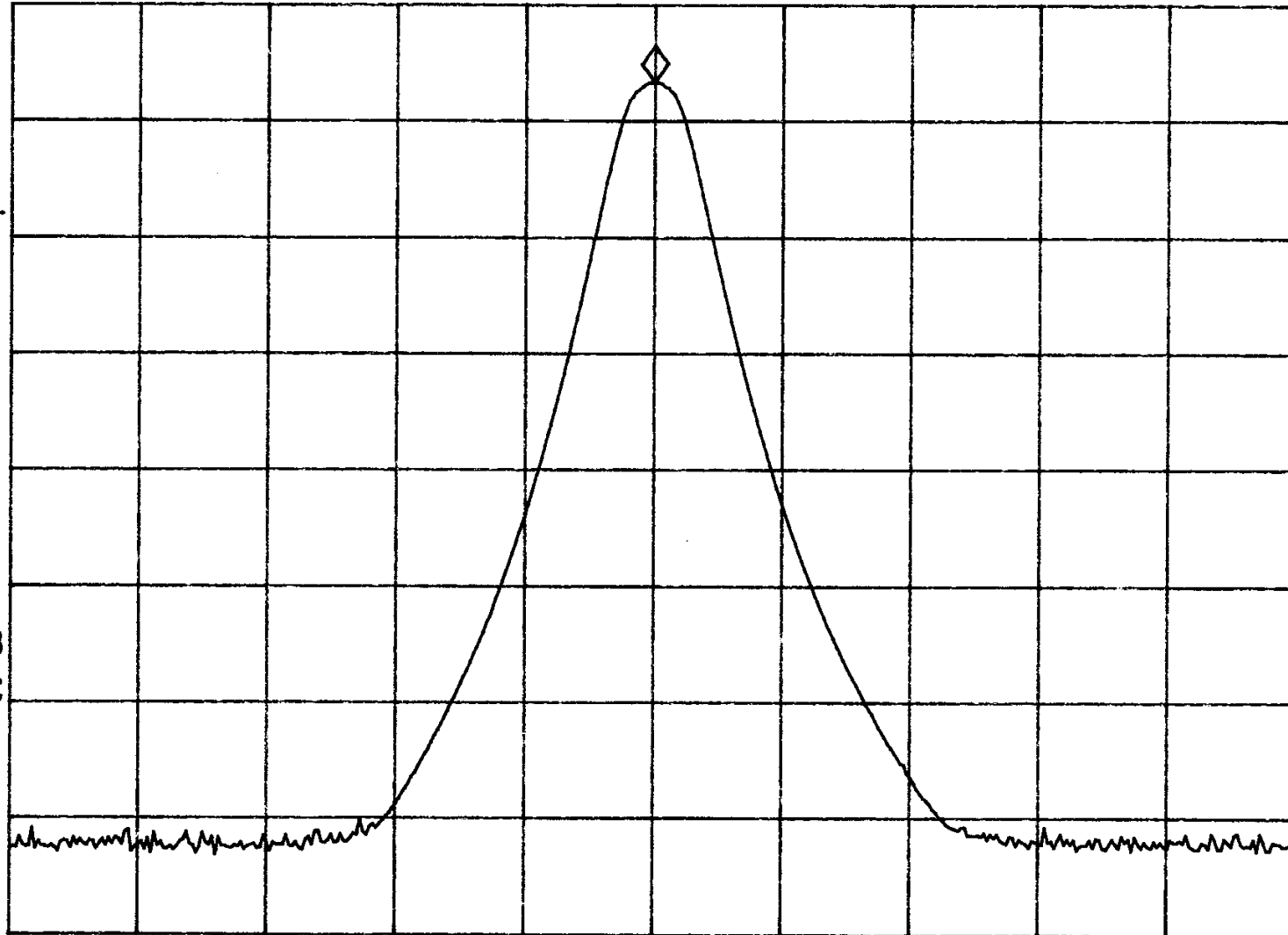
15:05:23 NOV 28, 2000
~~HP~~

MKR 940.00 MHz
47.643 W

REF 223.9 W AT 10 dB

PEAK
LOG
10
dB/
OFFST
53.5
dB

VA SB
SC FC



CENTER 940.00 MHz
#RES BW 300 kHz

VBW 100 kHz

SPAN 10.00 MHz
SWP 20.0 msec

16d

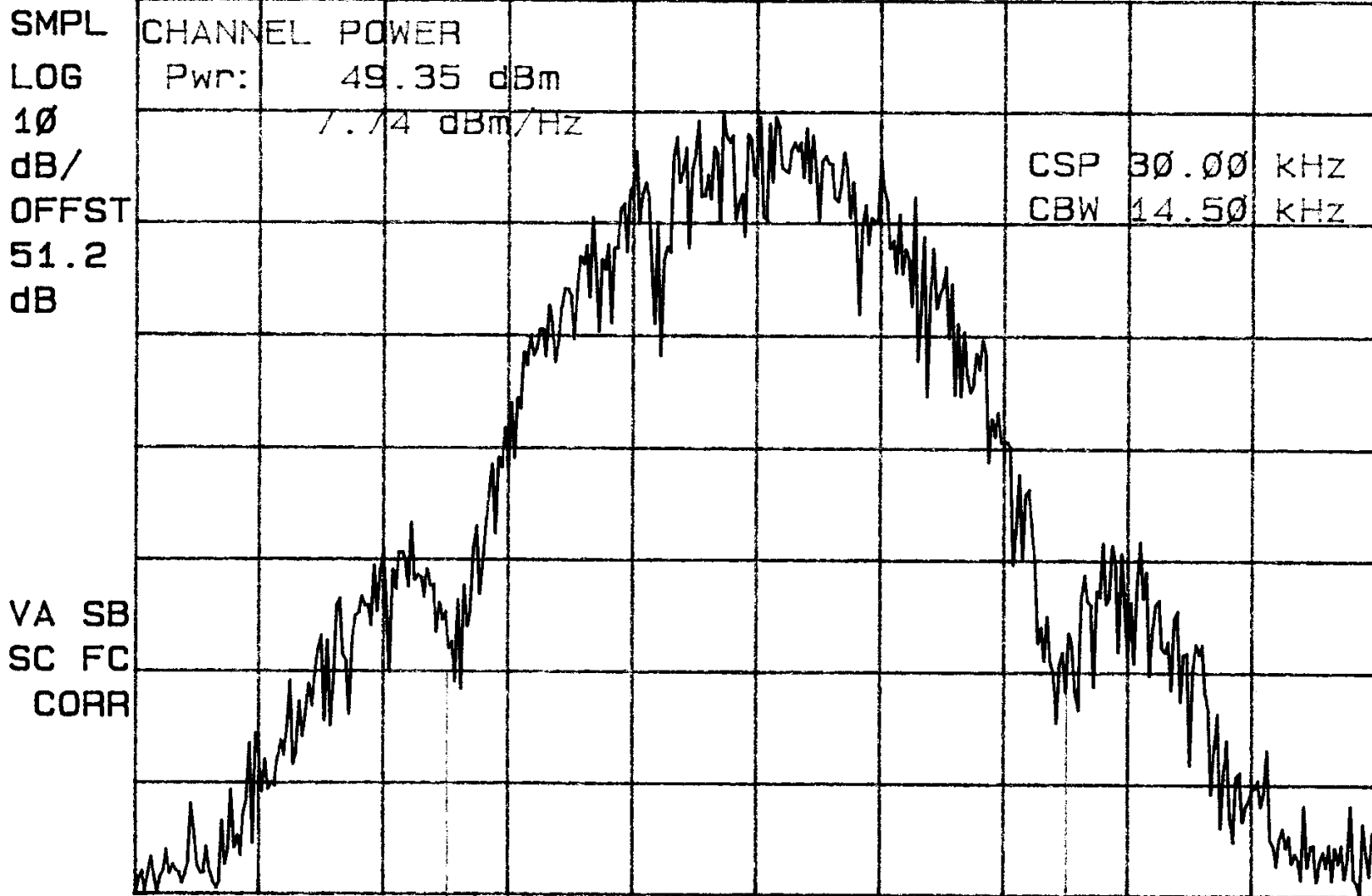
POWERWAVE
DATE: 9/13/00

TEST: Peak Output Power

SPEC.: FCC Part 2, Para. 2.1046; Part 90, Para. 90.210

15:07:38 SEP 13, 2000
hp

REF 51.6 dBm AT 20 dB



CENTER 937.50000 MHz

#RES BW 300 Hz

#VBW 3 kHz

SPAN 29.00 kHz
SWP 1.00 sec

17

POWERWAVE
DATE: 9/12/00

TEST: Intermodulation

09: 37: 22 SEP 12, 2000

REF 52.5 dBm AT 10 dB MKR 945.10 MHz
-21.10 dBm

PEAK
LOG
10
dB/
OFFST
52.5
dB
DL
-13.0
dBm

VA SB
SC FC
CORR



CENTER 937.10 MHz

#RES BW 30 KHz

#VBW 100 KHz

SPAN 20.00 MHz

SWP 66.7 msec

18

POWERWAVE
DATE: 9/12/00

TEST: Intermodulation

09: 34: 30 SEP 12, 2000
/P

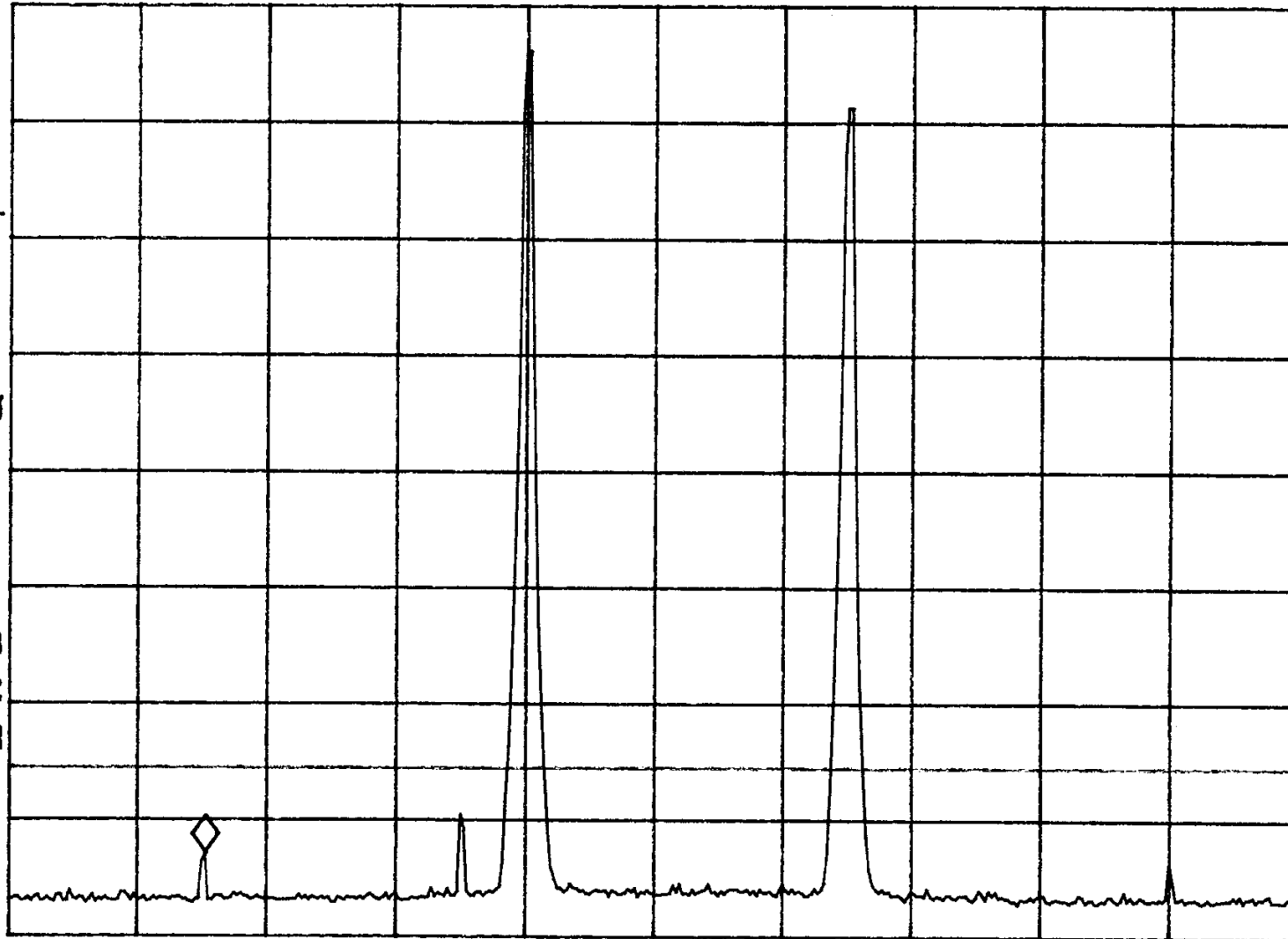
MKR 930.15 MHz
-20.31 dBm

REF 52.5 dBm

AT 10 dB

PEAK
LOG
10
dB/
OFFST
52.5
dB
DL
-13.0
dBm

VA SB
SC FC
CORR



CENTER 937.10 MHz

#RES BW 30 kHz

#VBW 100 kHz

SPAN 20.00 MHz
SWP 66.7 msec

19

POWERWAVE
DATE: 9/12/00

IES1: Intermodulation

09:30:46 SEP 12, 2000

MKR 934.10 MHz
-16.93 dBm

REF 52.5 dBm

AT 10 dB

PEAK
LOG
10
dB/
OFFST
52.5
dB
DL
-13.0
dBm

VA SB
SC FC
CORR



CENTER 937.10 MHz

#RES BW 30 KHz

SPAN 20.00 MHz

#VBW 100 KHz

SWP 66.7 msec

20

POWERWAVE
DATE: 9/12/00

TEST: Conducted Spurious

SPEC.: FCC Part 2, Para. 2.1051; Part 90, Para. 90.210

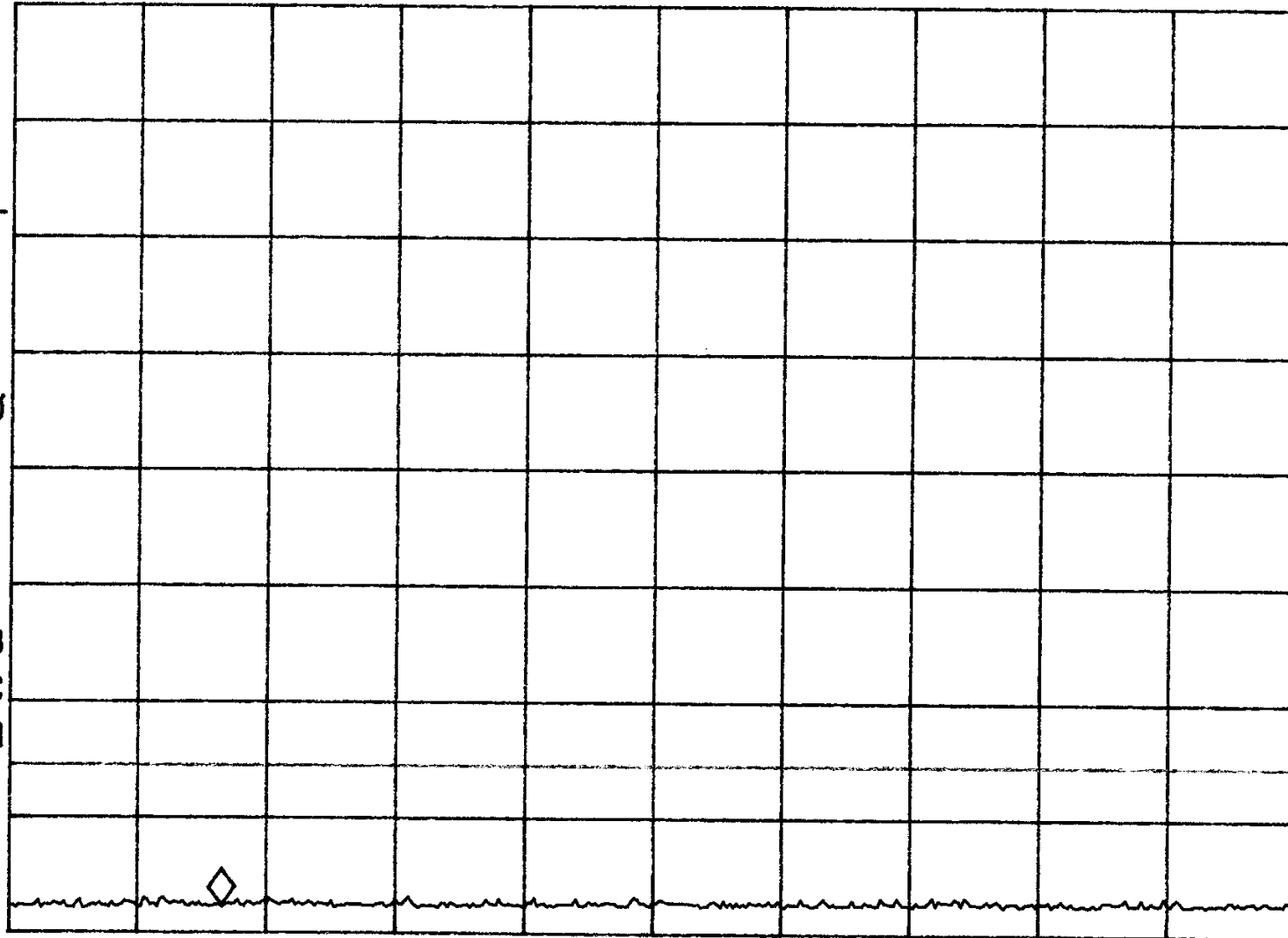
09:54:23 SEP 12, 2000

MKR 107.6 MHz
-25.13 dBm

REF 52.5 dBm AT 10 dB

PEAK
LOG
10
dB/
OFFST
52.5
dB
DL
-13.0
dBm

VA SB
SC FC
CORR



START 30.0 MHz

#RES BW 30 kHz

#VBW 100 kHz

STOP 500.0 MHz

SWP 1.57 sec

21

POWERWAVE
DATE: 9/12/00

TEST: Conducted Spurious

SPEC.: FCC Part 2, Para. 2.1051; Part 90, Para. 90.210

09: 57: 06 SEP 12, 2000

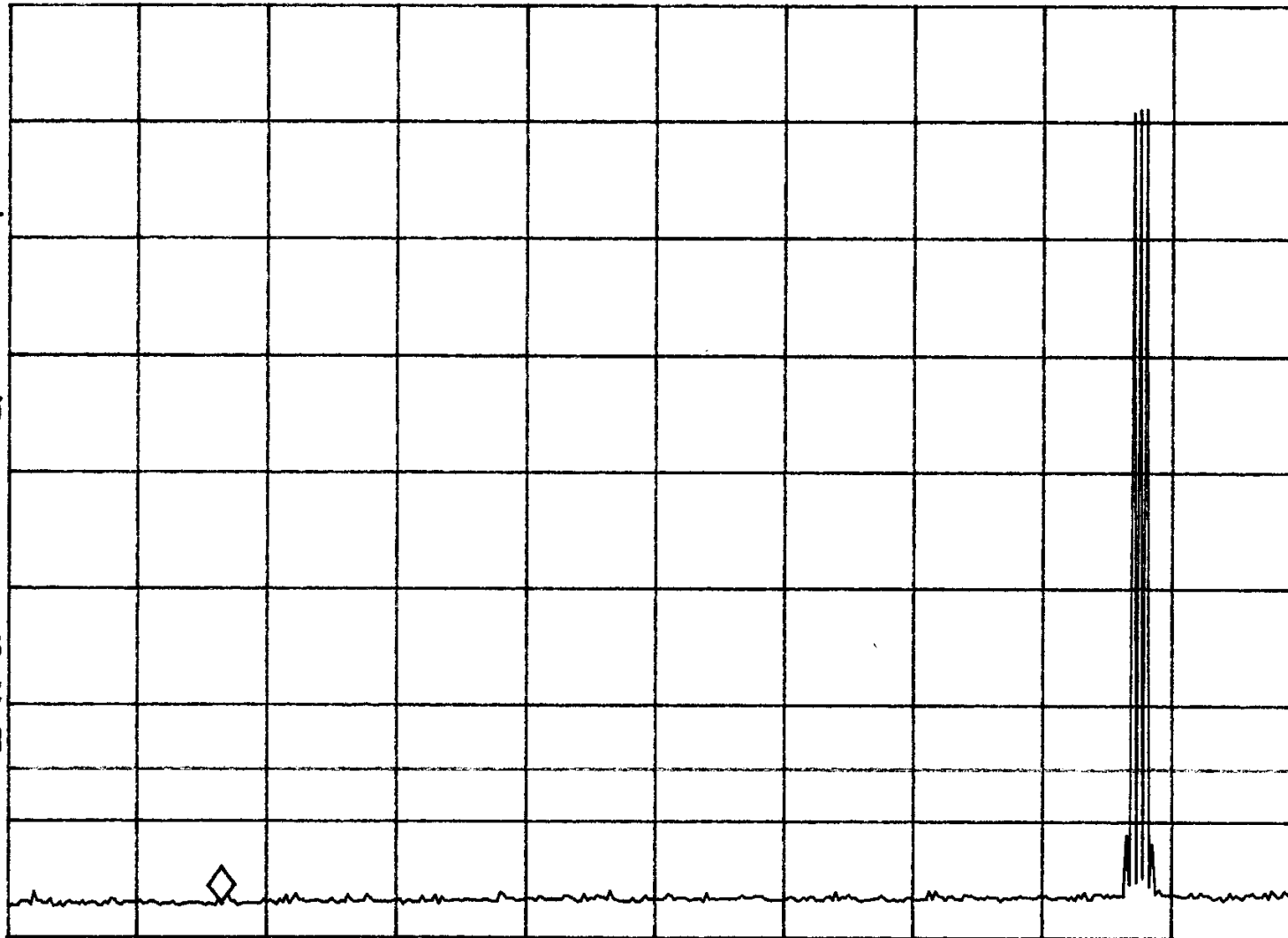
MKR 582.5 MHz

REF 52.5 dBm

AT 10 dB

-24.58 dBm

PEAK
LOG
10
dB/
OFFST
52.5
dB
DL
-13.0
dBm
VA SB
SC FC
CORR



START 500.0 MHz

#RES BW 30 kHz

#VBW 100 kHz

STOP 1.0000 GHz

SWP 1.67 sec

22

POWERWAVE
DATE: 9/12/00

TEST: Conducted Spurious

SPEC.: FCC Part 2, Para. 2.1051; Part 90, Para. 90.210

MKR 1.876 GHz
-18.10 dBm

hp REF 55.0 dBm ATTN 10 dB

10 dB/

POS PK

OFFSET
65.0
dB

DL
-13.0
dBm

CORR'D

START 1.00 GHz

RES BW 30 kHz (1)

VBW 100 kHz

STOP 2.50 GHz

SWP 11.3 sec

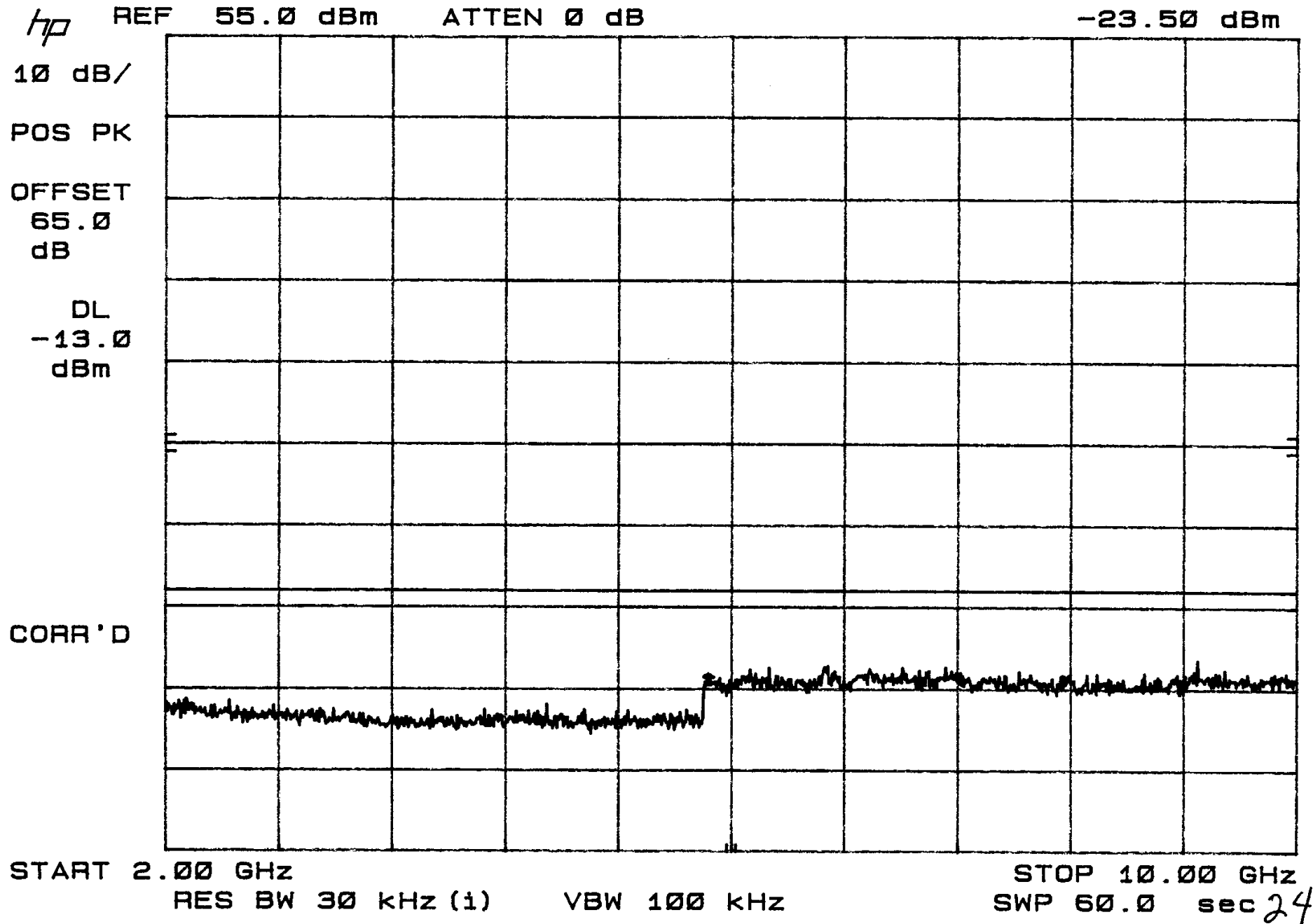
23

POWERWAVE
DATE: 9/12/00

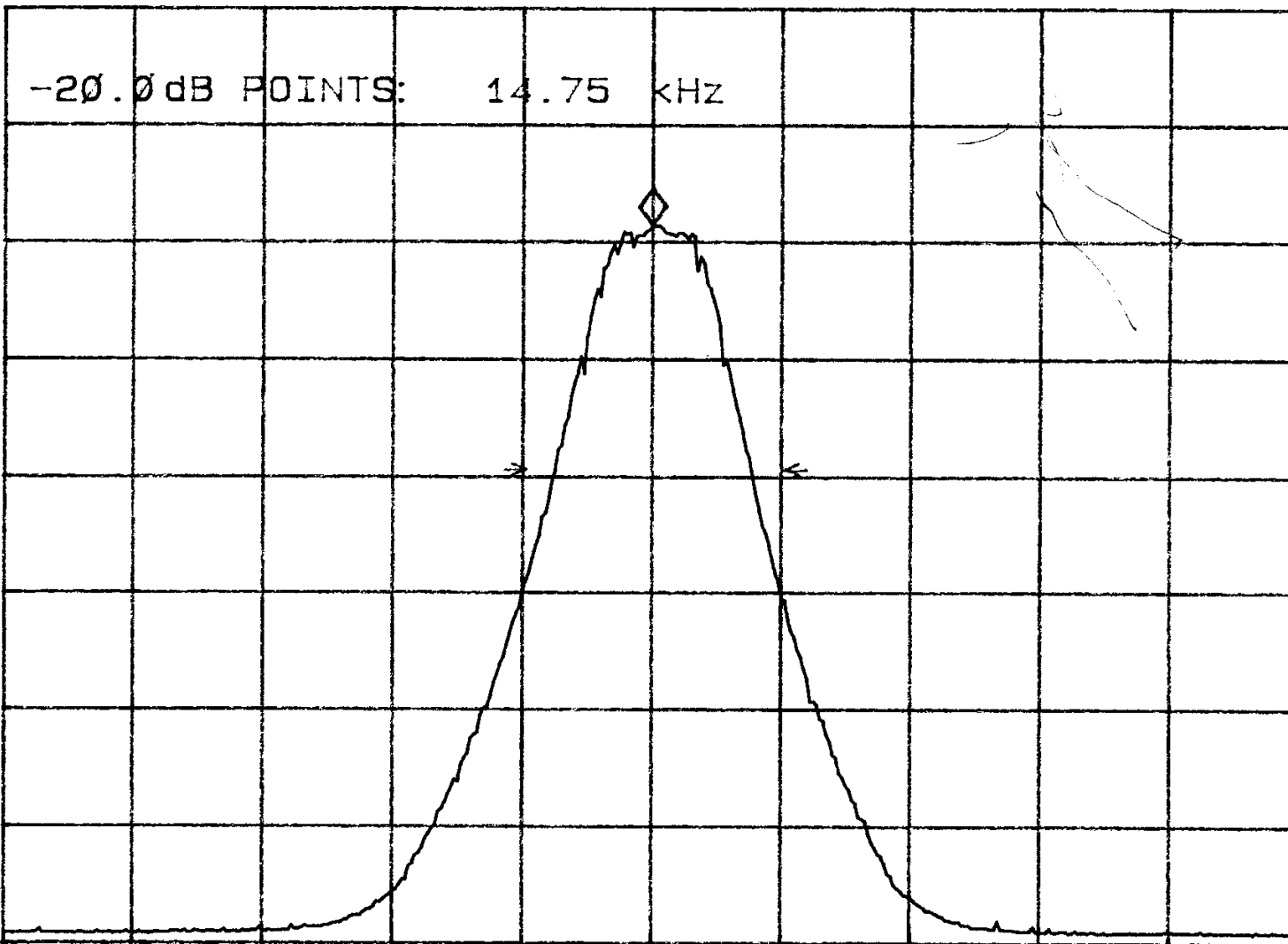
TEST: Conducted Spurious

SPEC.: FCC Part 2, Para. 2.1051; Part 90, Para. 90.210

MKR 5.832 GHz
-23.50 dBm



15: 16: 05 SEP 13, 2000

MKR 937.5000 MHz
REF 11.2 dBm AT 30 dB -7.36 dBmSMPL
LOG
10
dB/
OFFST
.8
dBCENTER 937.5000 MHz
#RES BW 3.0 kHz

#VBW 3 kHz

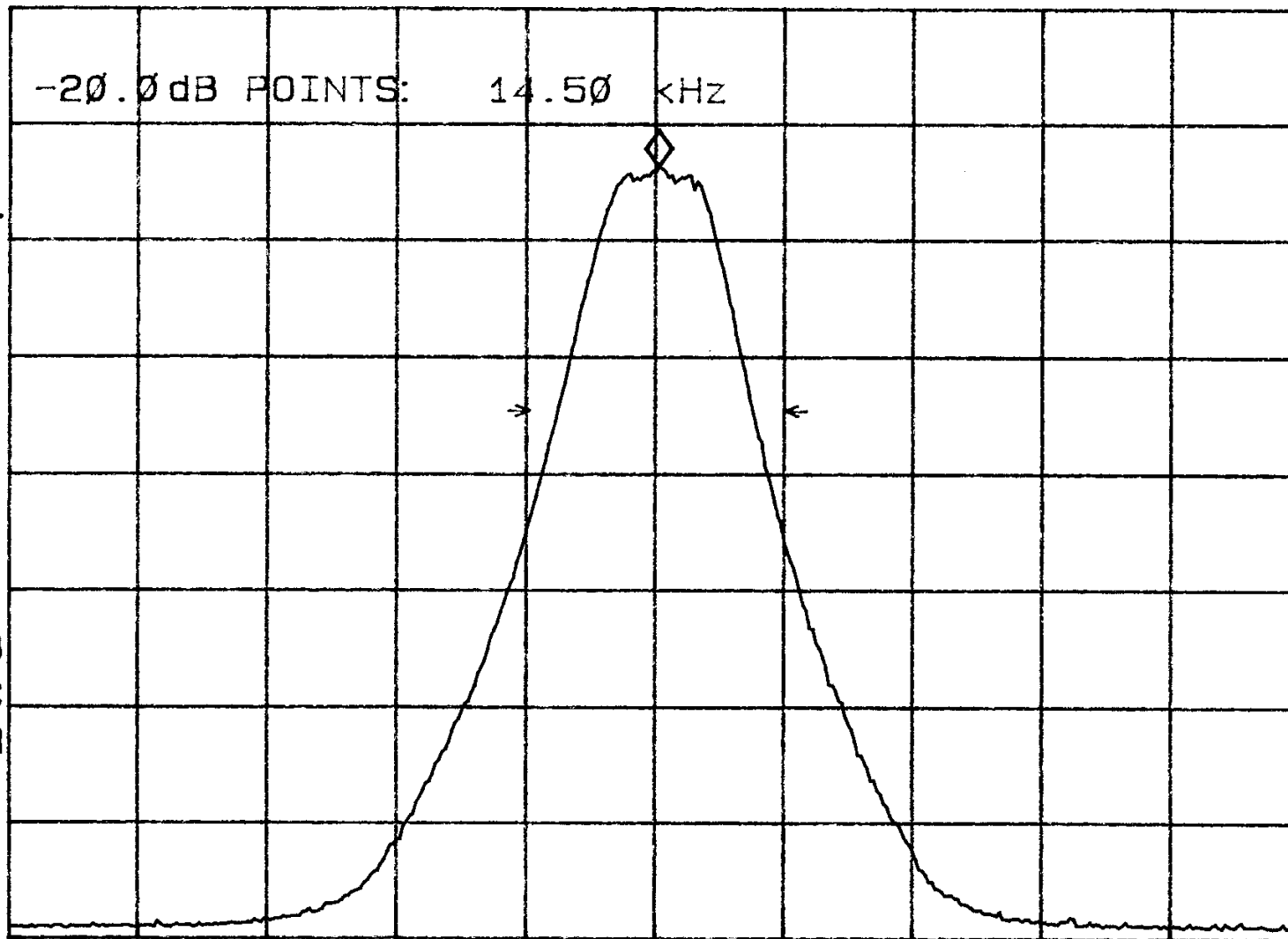
SPAN 100.0 kHz
SWP 100 msec

25

14: 58: 45 SEP 13, 2000

hp MKR 937.5002 MHz
REF 61.6 dBm AT 30 dB 47.93 dBmSMPL
LOG
10
dB/
OFFST
51.2
dB

-20.0 dB POINTS: 14.50 kHz

VA SB
SC FC
CORRCENTER 937.5000 MHz
#RES BW 3.0 kHz

#VBW 3 kHz

SPAN 100.0 kHz
SWP 100 msec

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7 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)