

**Application for Type Acceptance
for an RF Power Amplifier**

**TPL Communications
3370 San Fernando Rd. # 206
Los Angeles, CA 90065**

RF Power Amplifier:

Part # RS8-1DD-MSI

FCC ID: BBD8-1DD-S

Report # RA054495/80112

This report was prepared in accordance with the requirements of FCC rules and regulations Part 2, Subpart J, 2.981 thru 2.1005, Part 22, Part 90, and other applicable sections of the rules as indicated herein.

Prepared By:

Jake Tynes

**DNB ENGINEERING, INC.
3535 W. Commonwealth Ave.
Fullerton, Ca 92833**

14 April 1998

1.0 **ADMINISTRATIVE DATA**

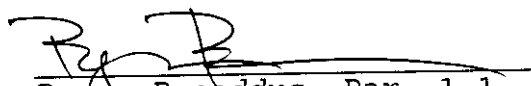
1.1 **Certifications and Qualifications**

I certify that the tests performed in order to obtain the technical data presented in this application were performed by **DNB ENGINEERING, INC.** Also, based on the results of the enclosed data, I have concluded that the equipment tested meets or exceeds the requirements of the Rules and Regulations governing this application.

1.2 **Measurement Repeatability Information**

The test data presented in this report has been acquired using the guidelines set forth in FCC Part 2.981 through 2.1005, Part 22, and Part 90. The test results presented in this document are valid only for the equipment identified herein under the test conditions described. Repeatability of these test results will only be achieved with identical measurement conditions. These conditions include the same test distance, EUT height, measurement site characteristics, and the same EUT and system components. The system must have the same interconnecting cables arranged in identical placement to that shown in the setup photos, with the system and/or EUT functioning in the identical mode of operation (i.e. software and so on) as on the date of the test. Any deviation from the test conditions and environment on the date of test may result in measurement repeatability difficulties.

All changes made to the EUT during the course of testing as identified in this report must be incorporated in the EUT or identical models to ensure compliance with the FCC regulations.


Bryan Broaddus Par. 1.1
Manager, Test Department
DNB ENGINEERING, INC.
Phone # (714) 870-7781

2.983(a) **Request For Type Acceptance**

Name of Applicant: TPL Communications
3370 San Fernando Rd. # 206
Los Angeles, CA 90065

Applicant is: ☒ Manufacturer
☐ Vendor
☐ Licensee
☐ Prospective Licensee
☐ Other

Name of Manufacturer: TPL Communications

2.983(b) **Equipment Description**

The EUT is an RF Power Amplifier.

Part Number: RS8-1DD-MSI

FCC ID: BBD8-1DD-S

2.983(c) **Anticipated Production Quantity**

☐ One Unit
☒ Multiple Units

2.983(d) **Technical Description**

See the Service Manual Included in Appendix B
herein for the complete description.

2.983(d)(1) **Type(s) of Emissions**

F3E

2.983(d)(2) **Frequency Range**

851 - 866 MHz

2.983(d)(3) **Operating Power Level**

80 Watts

2.983(d)(4) **Maximum Power Allowed in Applicable Part(s) of the Rules**

<u>Rules Part</u>	<u>Maximum Power (Watts)</u>
Part 22.757	500 Watts
Part 90.35	500 Watts

2.983(d)(5) **Final RF Amplifier Input Power**

10 Watts

2.983(d)(6) **Function of all Active Circuit Devices**

Please refer to Appendix B.

2.983(d)(7) **Circuit Diagram**

Refer to Figure in Appendix B.

2.983(d)(8) **Instruction Book(s)**

See Appendix B

2.983(d)(9) **Tune-Up Procedure**

Refer to Appendix B.

Circuit Diagram
2.983(d) (7)

SEE FIGURE IN APPENDIX B

2.983(e) **Test Data**

Refer to 2.983(e)(1) through 2.983(e)(7)

2.983(e)(1) **Measurement of RF Power Output per 2.985**

Definition: For RF Power Amplifiers.

Test Method: See Figure 2.
Output power is measured across a precision 50 ohm load with a wide-band sampling RF voltmeter.

Test Results:

Frequency	POWER OUTPUT		
	Nominal Voltage 13.8 VDC	85% Voltage 11.73 VDC	115% Voltage 15.87 VDC
851 MHz	80.0 W	57.5 W	110.0 W

2.983(e)(2) **Measurement of Modulation Characteristics per
2.987(b)(1)**

This EUT is a power amplifier and contains no circuitry to modify the RF signal provided by the driver except to raise the power level.

2.983(e)(3) **Measurement of Occupied Bandwidth per 2.989**

Definition: Occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated by a given emission.

Test Method: Connect the equipment per Figure 3.

Measurements were made with the modulating signal at 2.5 kHz with 5 kHz of FM deviation.

Test Results: See Plots following Figure 3.

The center frequency of the signal did not shift with modulation. The spectrum bandwidth was well within the limits specified in the FCC regulations

RES - ADD - MSI
UNMODULATED CARRIER

80 WATTS

MKR 851.000 0 MHz
49.00 dBm

ATTEN 10 dB

REF 61.0 dBm

HP

10 dB/

POS PK

OFFSET

61.0

dB

MARKER

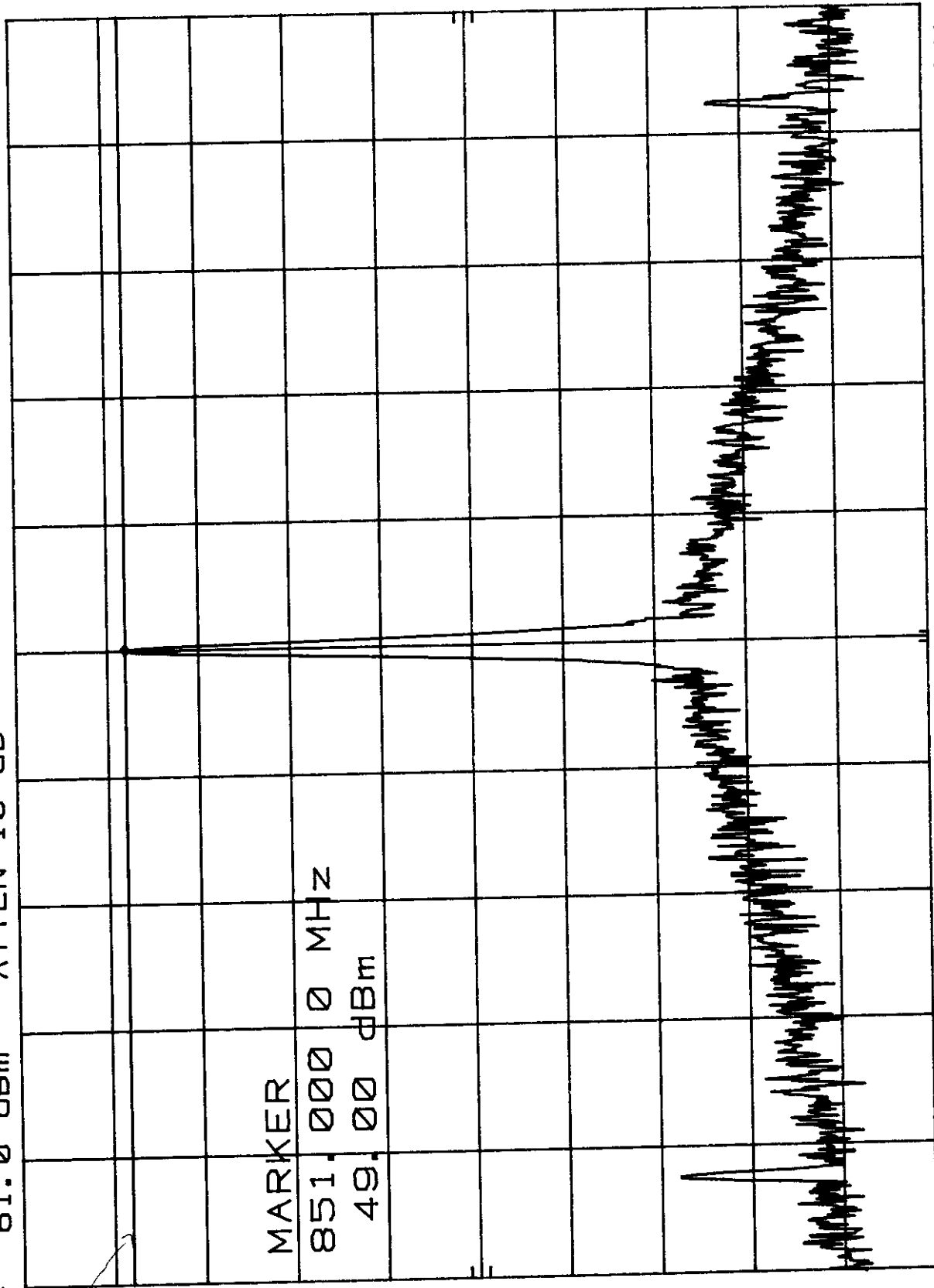
851.000 0 MHz

49.00 dBm

DL

49.0

dBm



SPAN 100 KHz
SWP 3.00 sec

VBW 1 KHz

Hz

CENTER 851.000 MHz
RES BW 300

RSB - ADD - MSI
OCCUPIED BANDWIDTH PART 22

80 WATTS

MKR 851.000 0 MHz
36.70 dBm

ATTEN 10 dB

REF 61.0 dBm

HP

10 dB/

POS PK

OFFSET

61.0

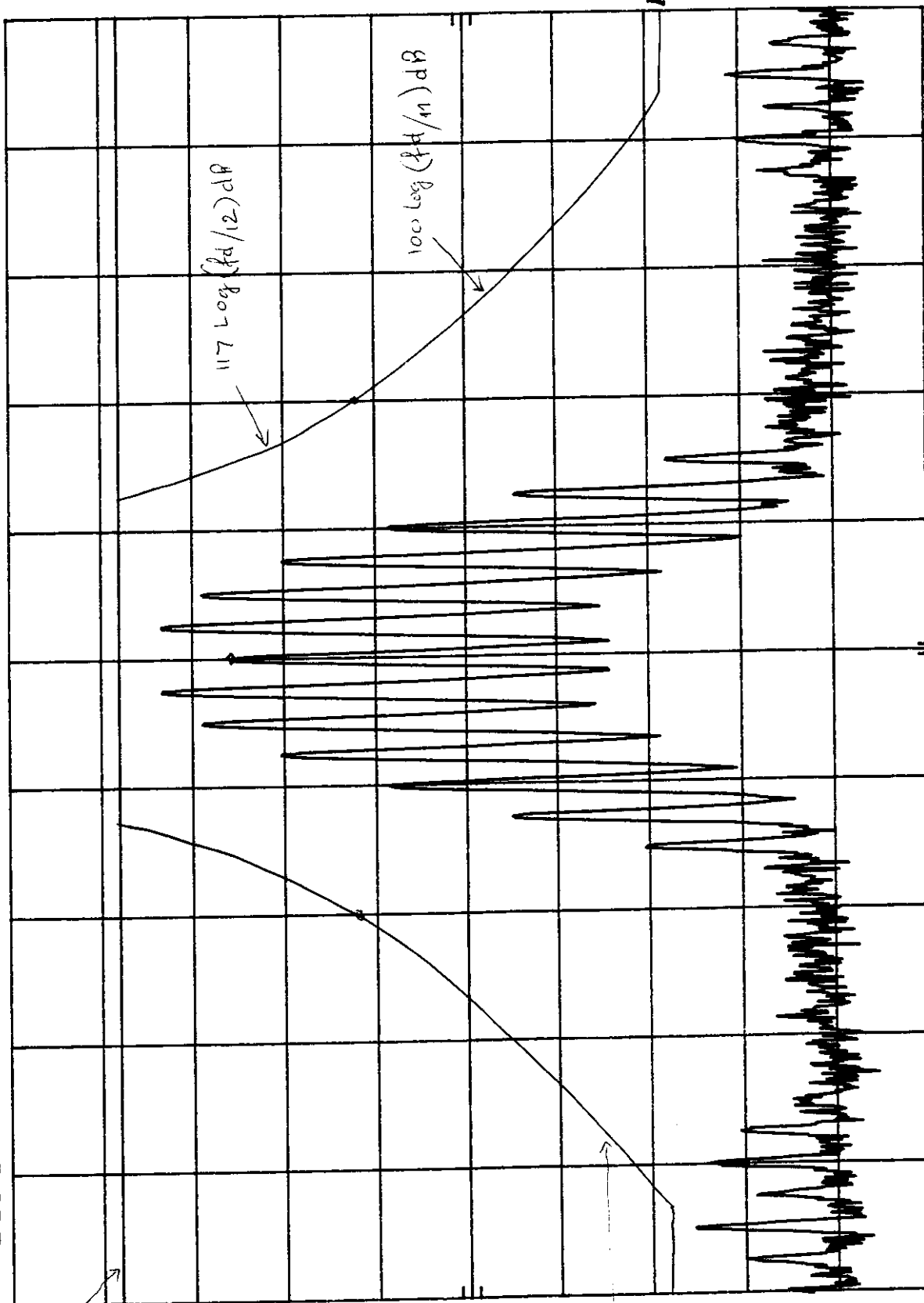
dB

DL

49.0

dBm

FCC LIMIT



SPAN 100 KHz
SWP 3.00 sec

VBW 1 KHz

CENTER 851.000 MHz
RES BW 300 Hz

R58-ADD-M31
OCCUPIED BANDWIDTH PART 90

80 WATTS

MKR 851.000 0 MHz
36.70 dBm

hp REF 61.0 dBm ATTEN 10 dB

10 dB/

POS PK

OFFSET

61.0

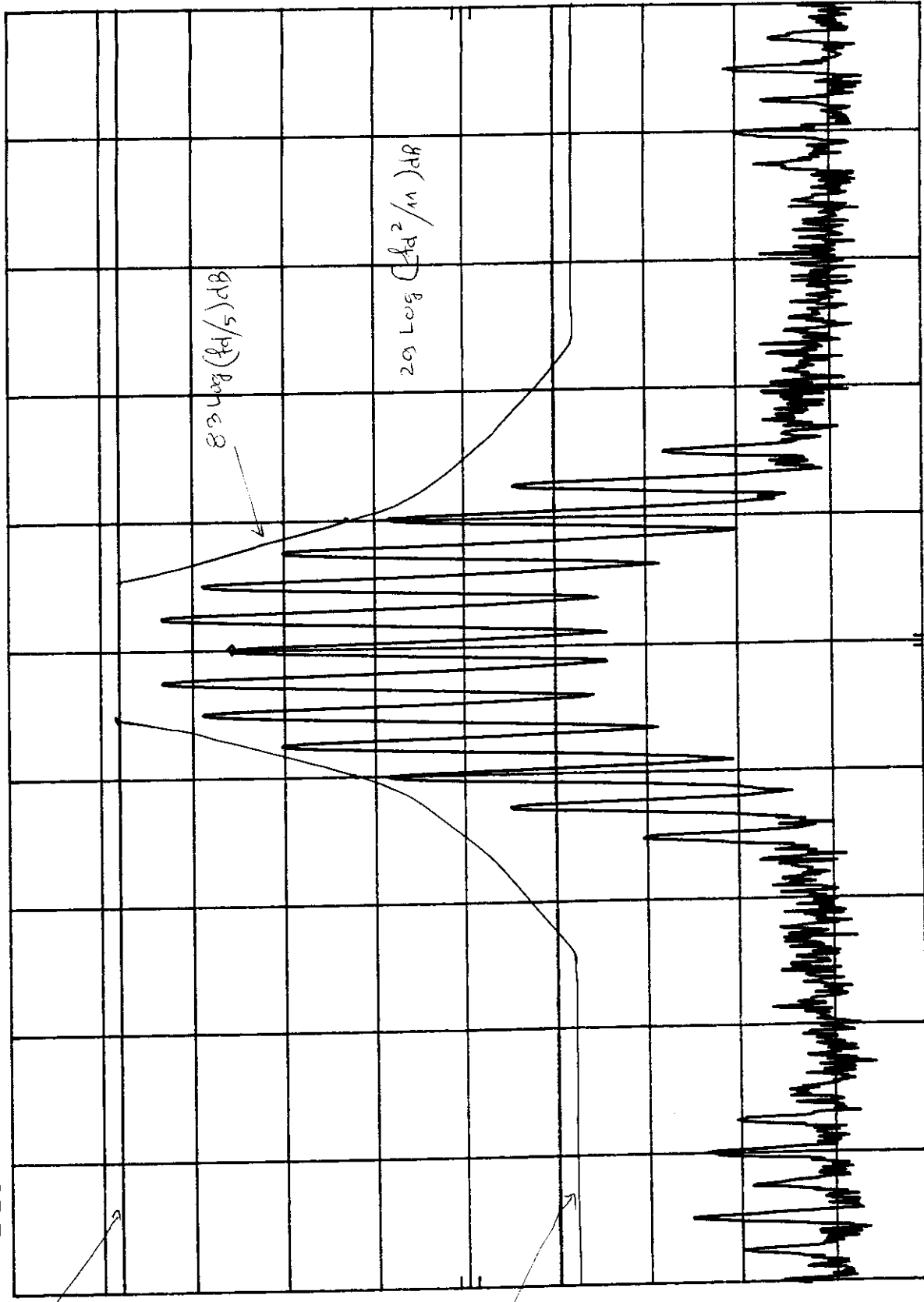
dB

DL

49.0

dBm

REC LIMIT



SPAN 100 KHz
SWP 3.00 sec

CENTER 851.000 MHz
RES BW 300 Hz

VBW 1 KHz

R38 - ADD - MSI
UNMODULATED CARRIER

80 WATT

MKR 862.000 0 MHz
49.00 dBm

ATTEN 10 dB

REF 61.0 dBm

10 dB/

POS PK

OFFSET

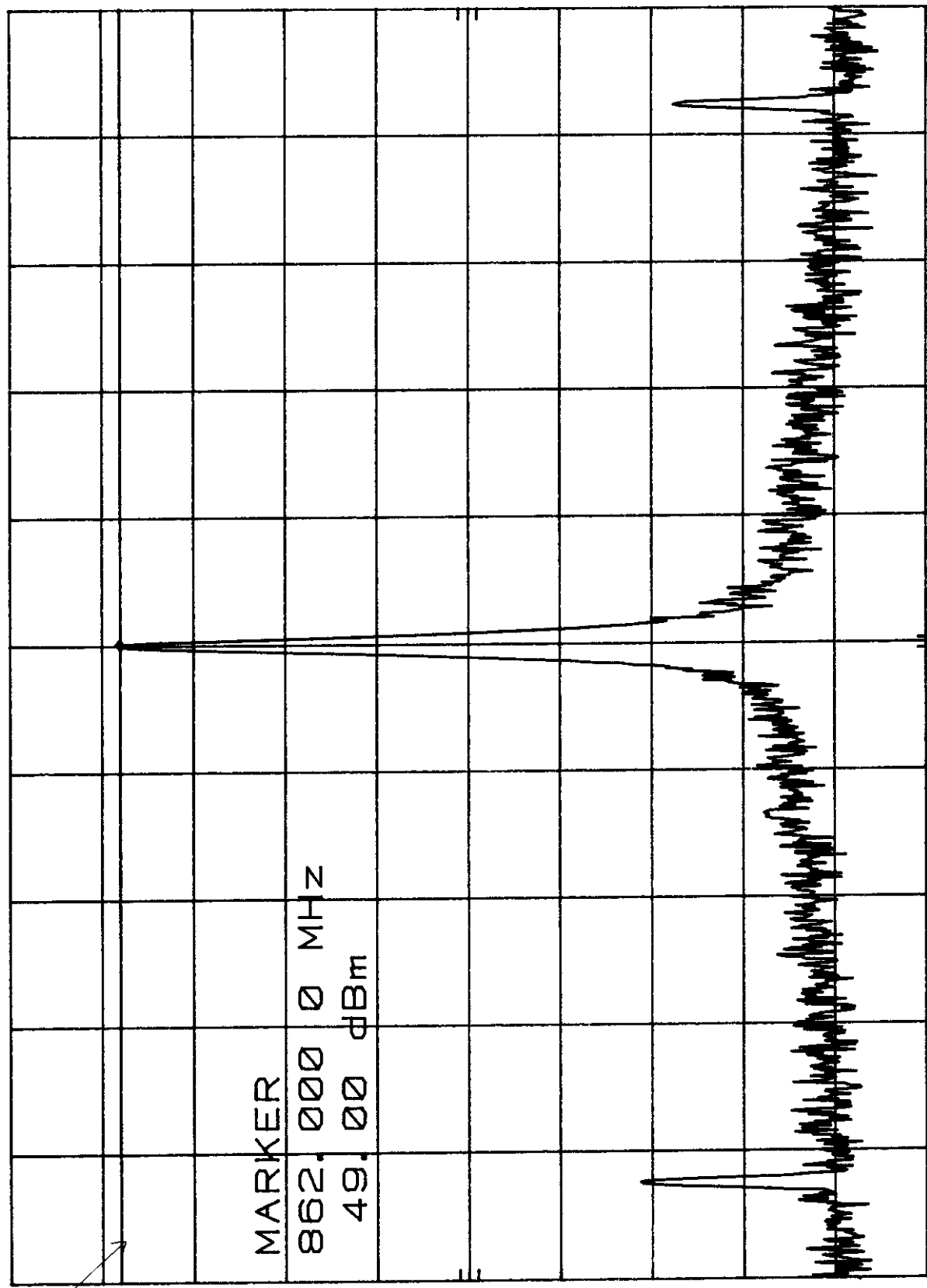
61.0
dB

DL

49.0
dBm

MARKER

862.000 0 MHz
49.00 dBm

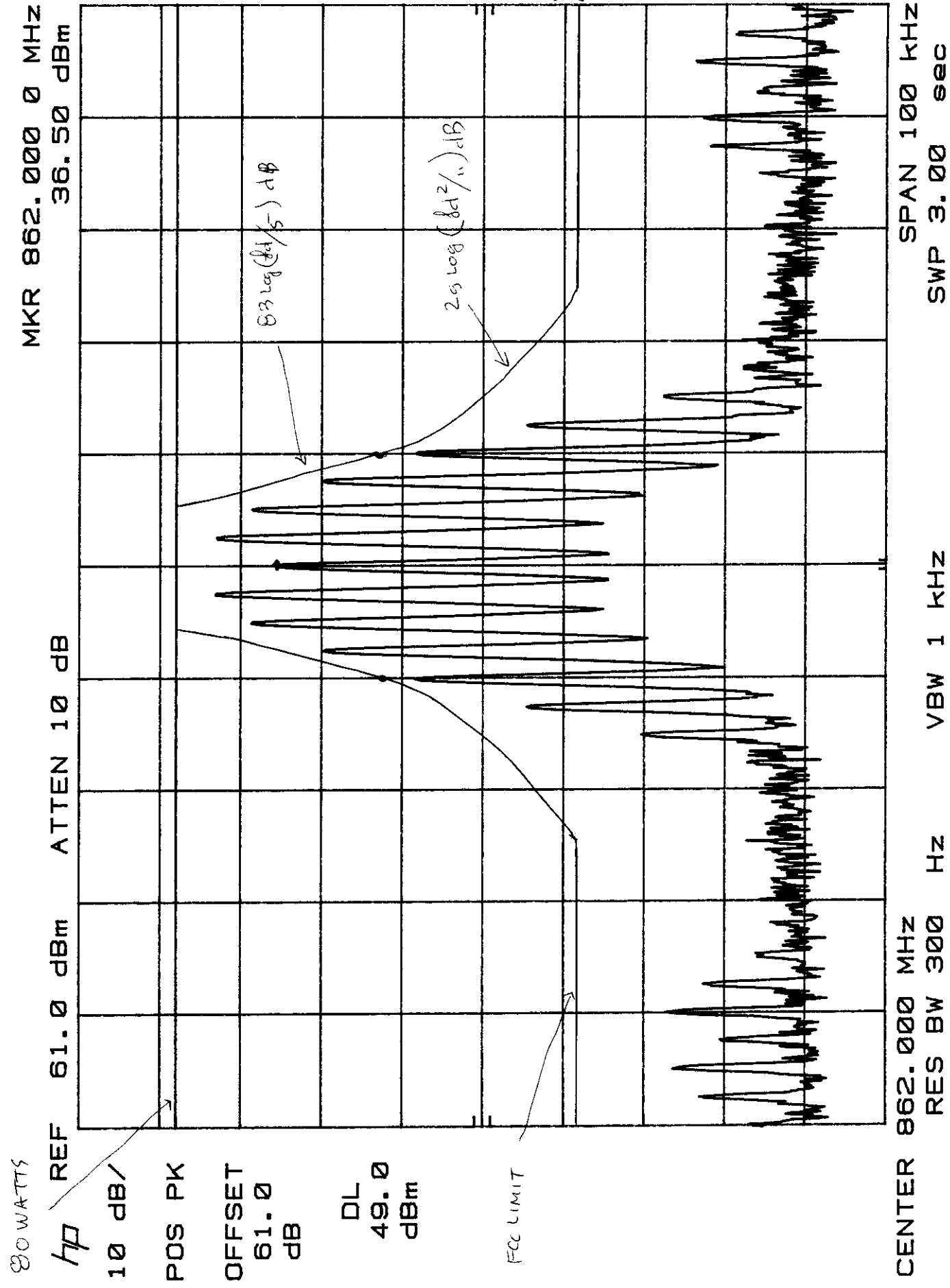


SPAN 100 KHz
SWP 3.00 sec

VBW 1 KHz

CENTER 862.000 MHz
RES BW 300 Hz

OCCUPIED BANDWIDTH PART 90



RSB-ADD-MST
OCCUPIED BANDWIDTH PART 22

80 WATTS

MKR 862.000 0 MHz
36.50 dBm

ATTEN 10 dB

HP

10 dB/

POS PK

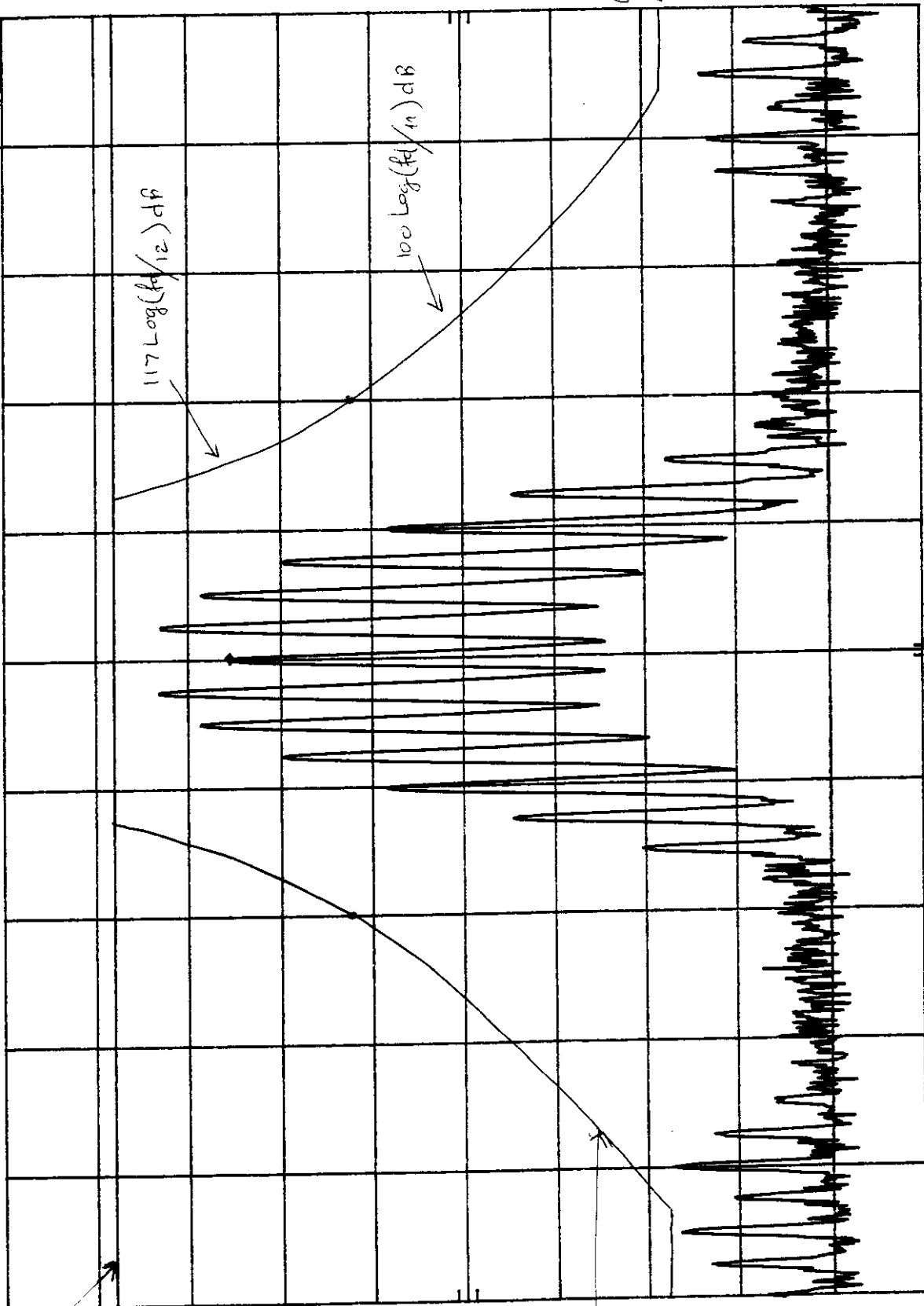
OFFSET

61.0
dB

DL

49.0
dBm

FC LIMIT



SPAN 100 KHz
SWP 3.00 sec

VBW 1 KHz

CENTER 862.000 MHz
RES BW 300 Hz

RS0-ADD-MSI
UNMODULATED CARRIER.

80 WATTS

MKR 866.000 0 MHz
49.00 dBm

hpo REF 61.0 dBm ATTN 10 dB

10 dB/

POS PK

OFFSET

61.0

dB

DL

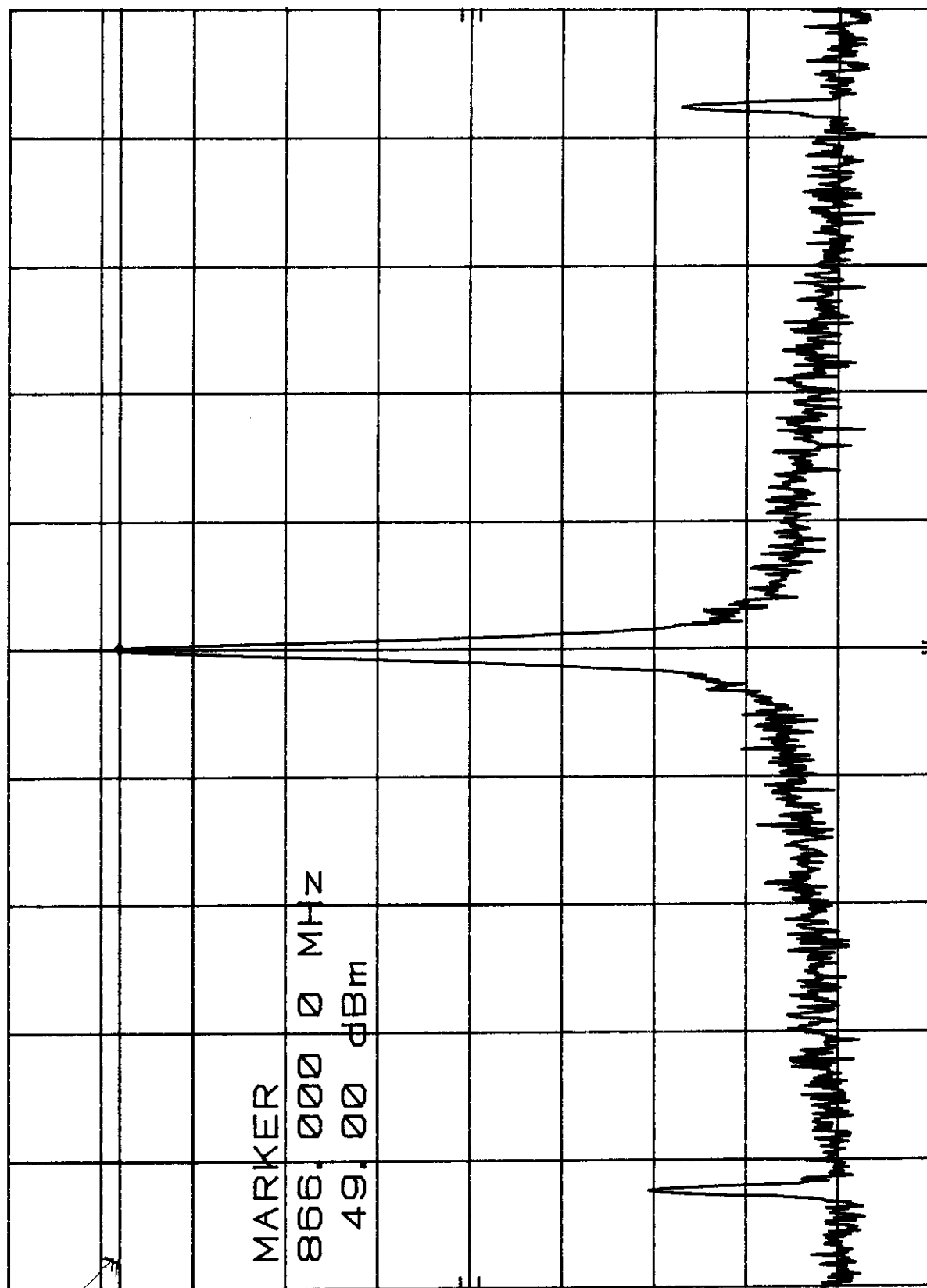
49.0

dBm

MARKER

866.000 0 MHz

49.00 dBm



SPAN 100 KHz
SWP 3.00 sec

VBW 1 KHz

CENTER 866.000 MHz
RES BW 300 Hz

RSB - 100 - MST

OCCUPIED BANDWIDTH PART 22

MKR 866.000 0 MHz
36.40 dBm

80 WATTS

hp REF 61.0 dBm ATTN 10 dB

10 dB/

POS PK

OFFSET

61.0

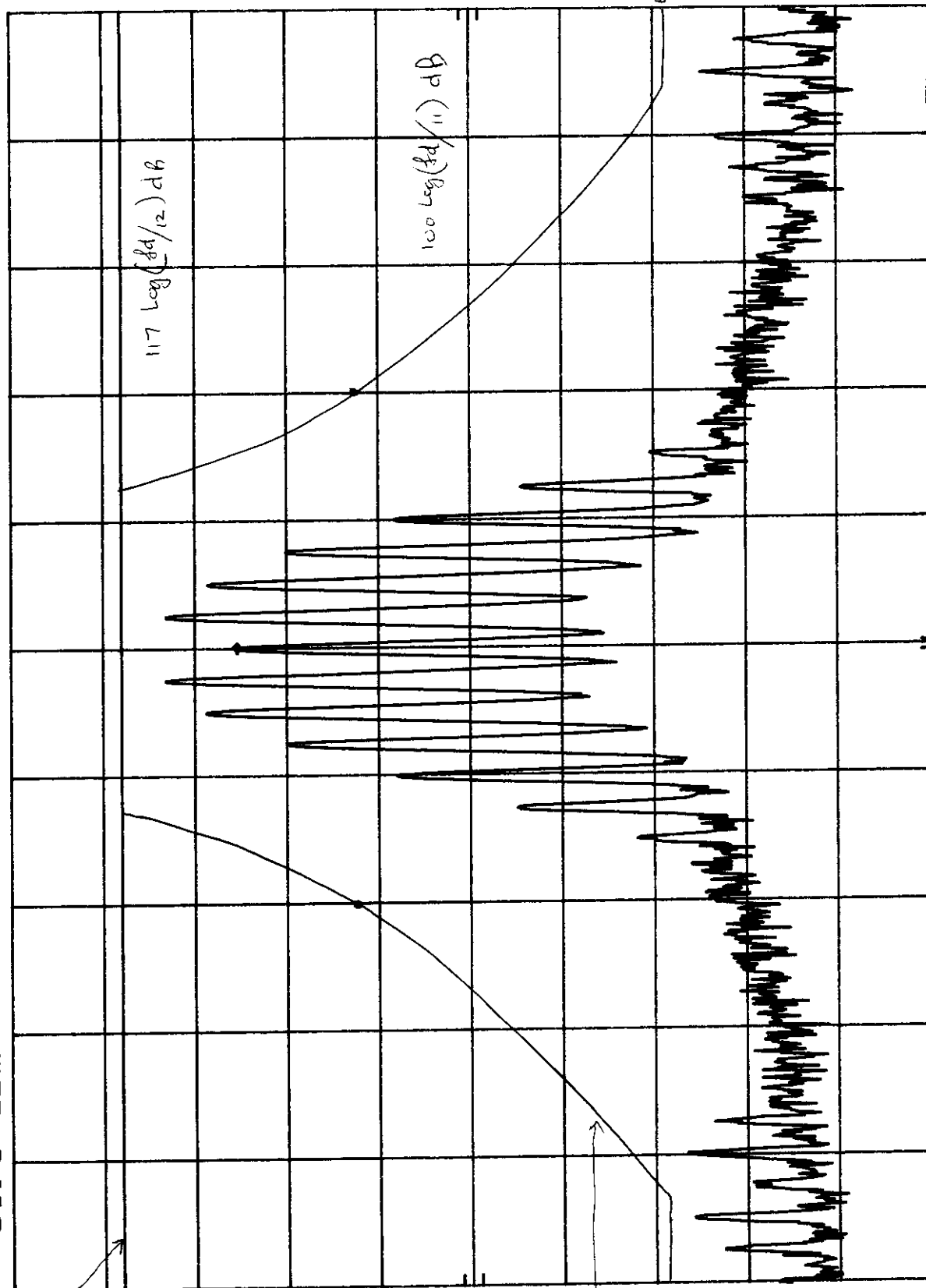
dB

DL

49.0

dBm

FCC LIMIT



CENTER 866.000 MHz
RES BW 300 Hz

SPAN 100 KHz
SWP 3.00 sec

RSB - ADD - MSI

OCCUPIED BANDWIDTH PART 90

MKR 866.000 0 MHz
36.40 dBm

80 WATTS

hp

REF 61.0 dBm ATTEN 10 dB

10 dB/

POS PK

OFFSET

61.0

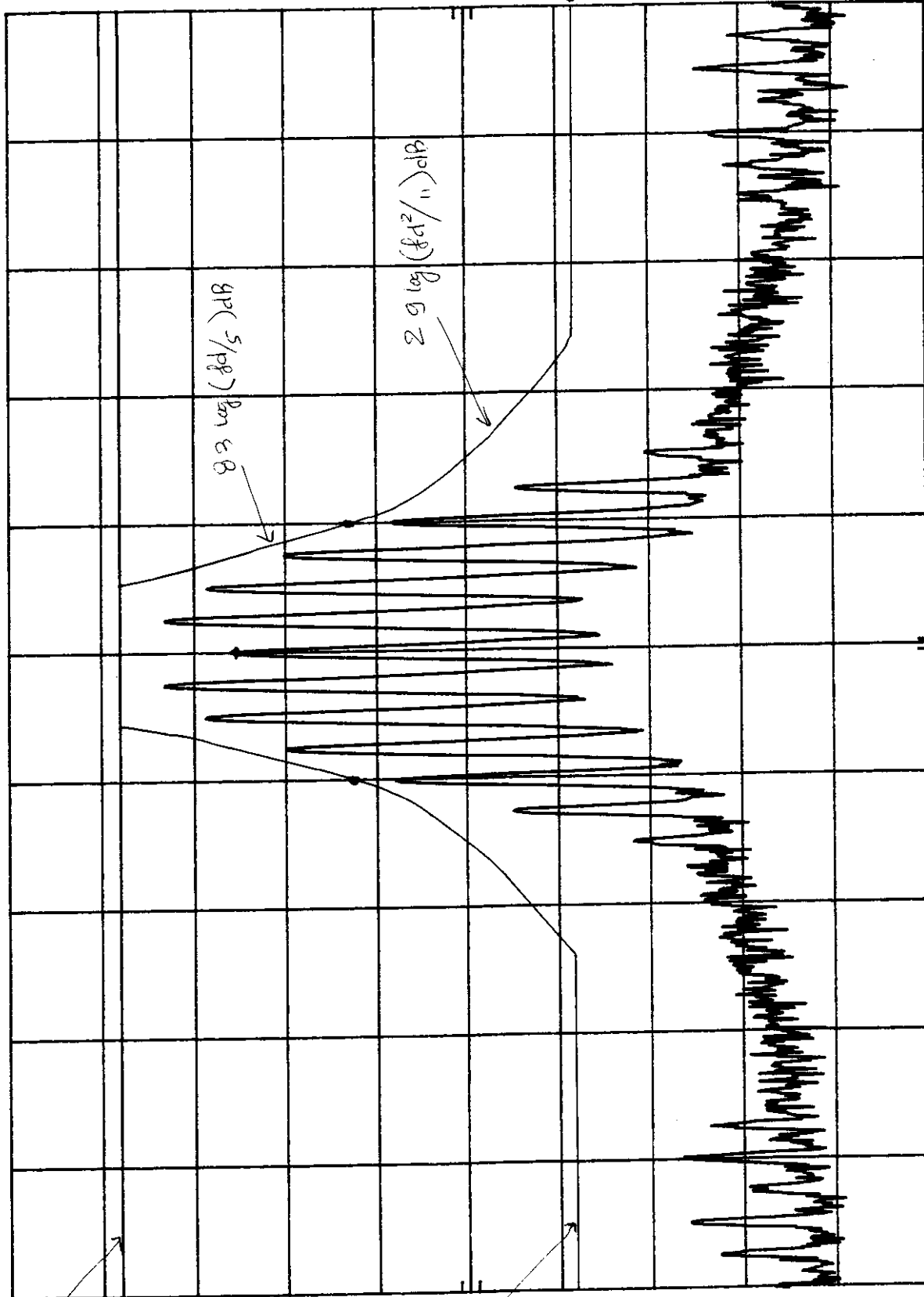
dB

DL

49.0

dBm

Fcc limit



SPAN 100 KHz
SWP 3.00 sec

VBW 1 KHz

CENTER 866.000 MHz
RES BW 300 Hz

10 WATTS DRIVER OUTPUT: UNMODULATED CARRIER

MKR 851.000 0 MHz
40.00 dBm

hp REF 61.0 dBm ATTN 10 dB

10 dB/

POS PK

OFFSET

61.0

dB

DL

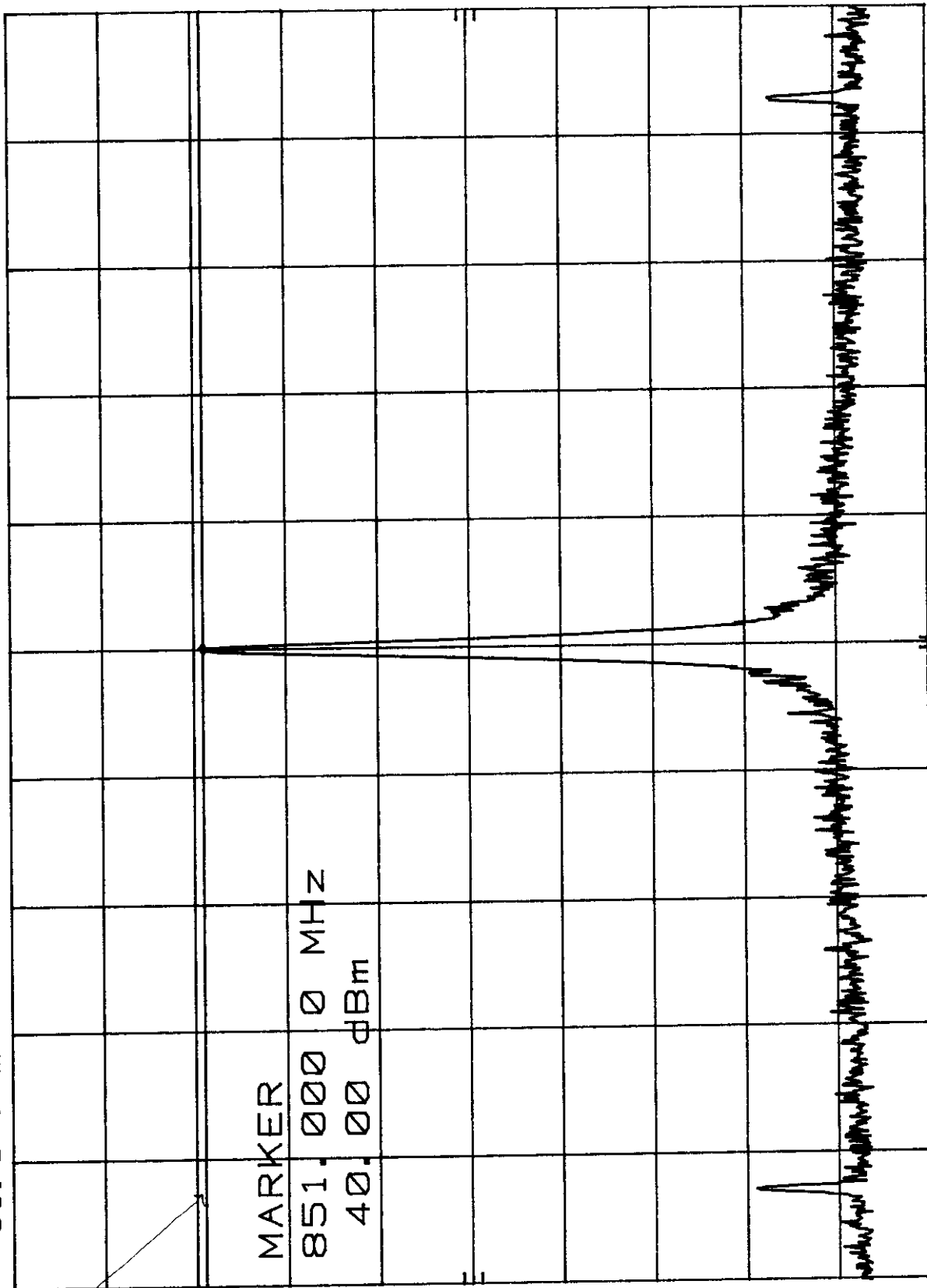
40.0

dBm

MARKER

851.000 0 MHz

40.00 dBm



CENTER 851.000 MHz
RES BW 300 Hz

SPAN 100 kHz
SWP 3.00 sec

VBW 1 kHz

DRIVER OUTPUT: MODULATED CARRIER

MKR 851.000 0 MHz
27.80 dBm

REF 61.0 dBm ATTEN 10 dB

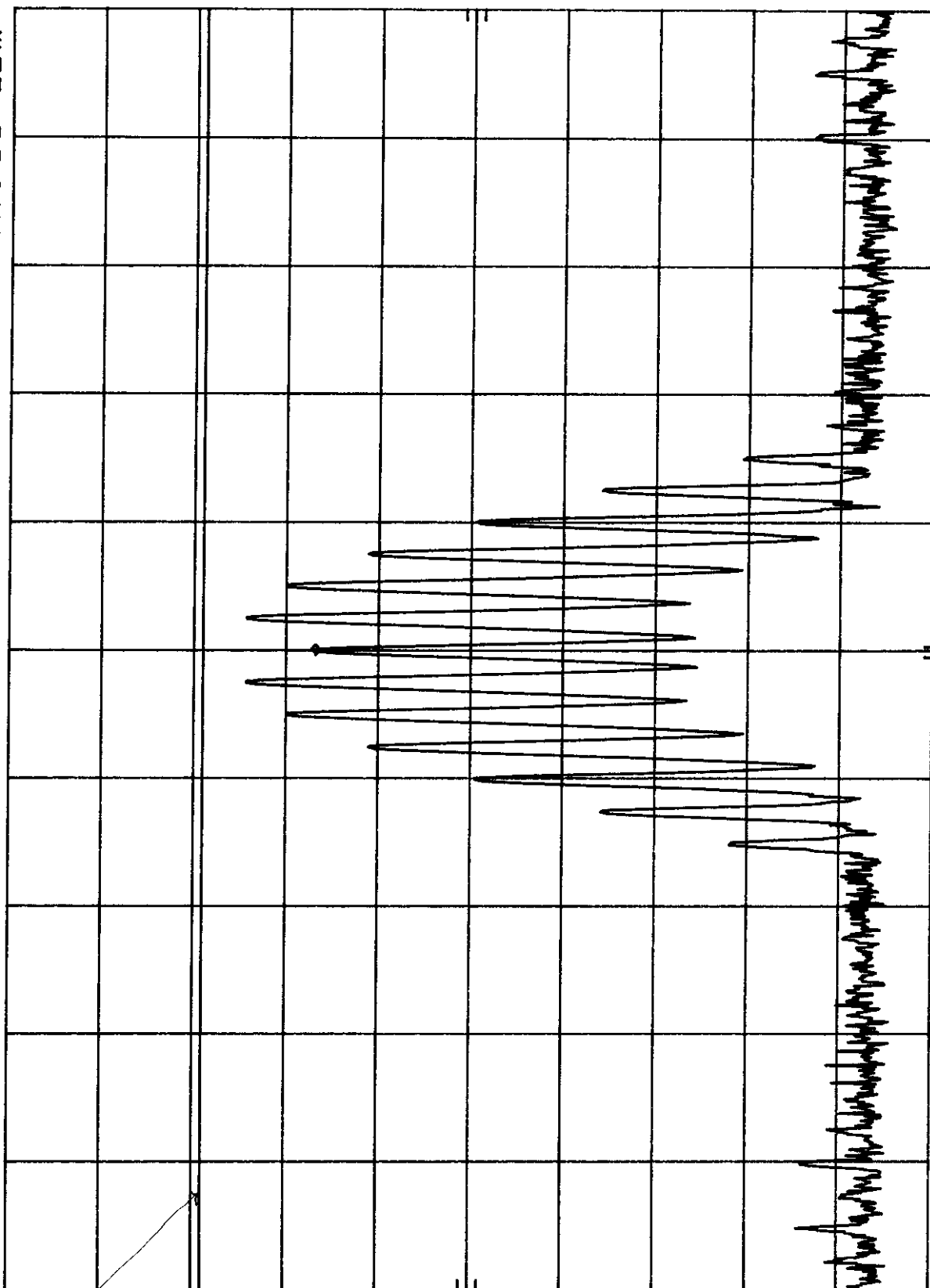
10 dBX

POS PK

OFFSET

61.0
dB

DL
40.0
dBm



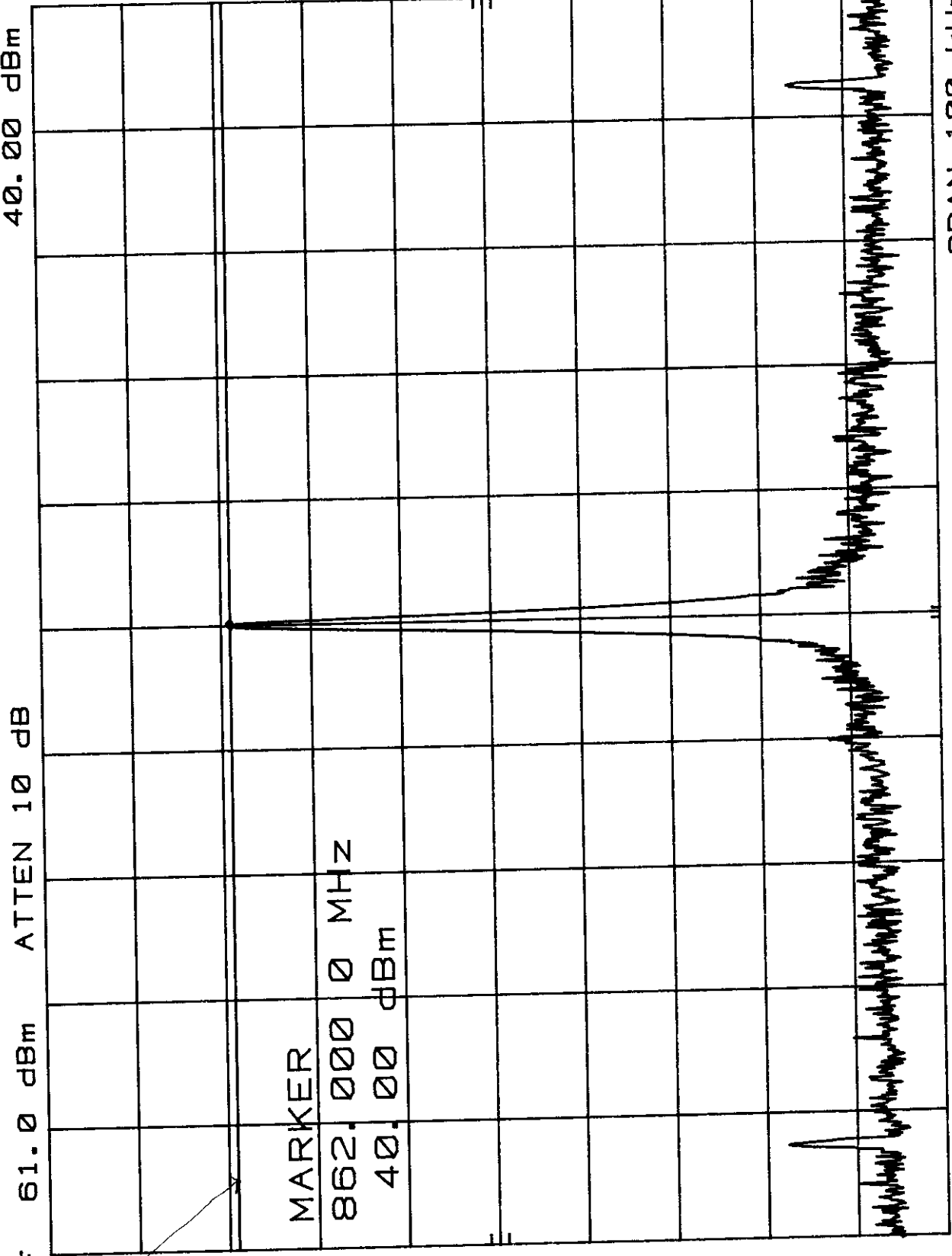
CENTER 851.000 MHz
RES BW 300 Hz

VBW 1 KHz

SPAN 100 KHz
SWP 3.00 sec

DRIVER OUTPUT - UNMODULATED CARRIER

MKR 862.000 0 MHz
40.00 dBm



CENTER 862.000 MHz
RES BW 300 Hz
SPAN 100 KHz
SWP 3.00 sec
VBW 1 KHz
ATTEN 10 dB
REF 61.0 dBm

10 WATTS
DRIVER OUTPUT : MODULATED CARRIER

HP MKR 862.000 0 MHz
27.80 dBm

HP REF 61.0 dBm ATTEN 10 dB

10 dBX

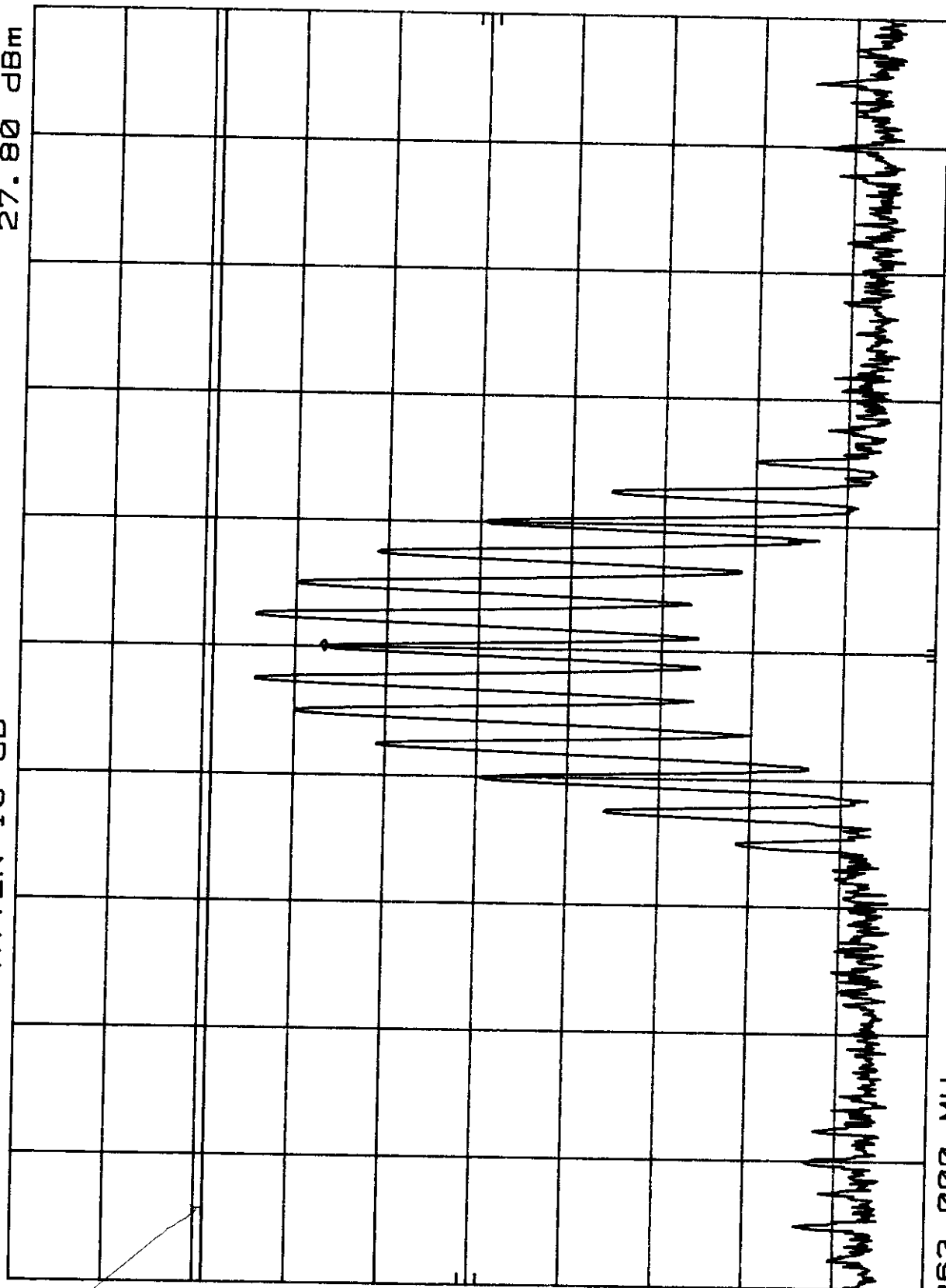
POS PK

OFFSET

61.0
dB

DL

40.0
dBm



CENTER 862.000 MHz
RES BW 300 Hz
SPAN 100 kHz
SWP 3.00 sec
VBW 1 kHz

10 WATTs

DRIVER OUTPUT: UNMODULATED CARRIER

MKR 866.000 1 MHz
40.00 dBm

h_p REF 61.0 dBm ATTEN 10 dB

10 dB/

POS PK

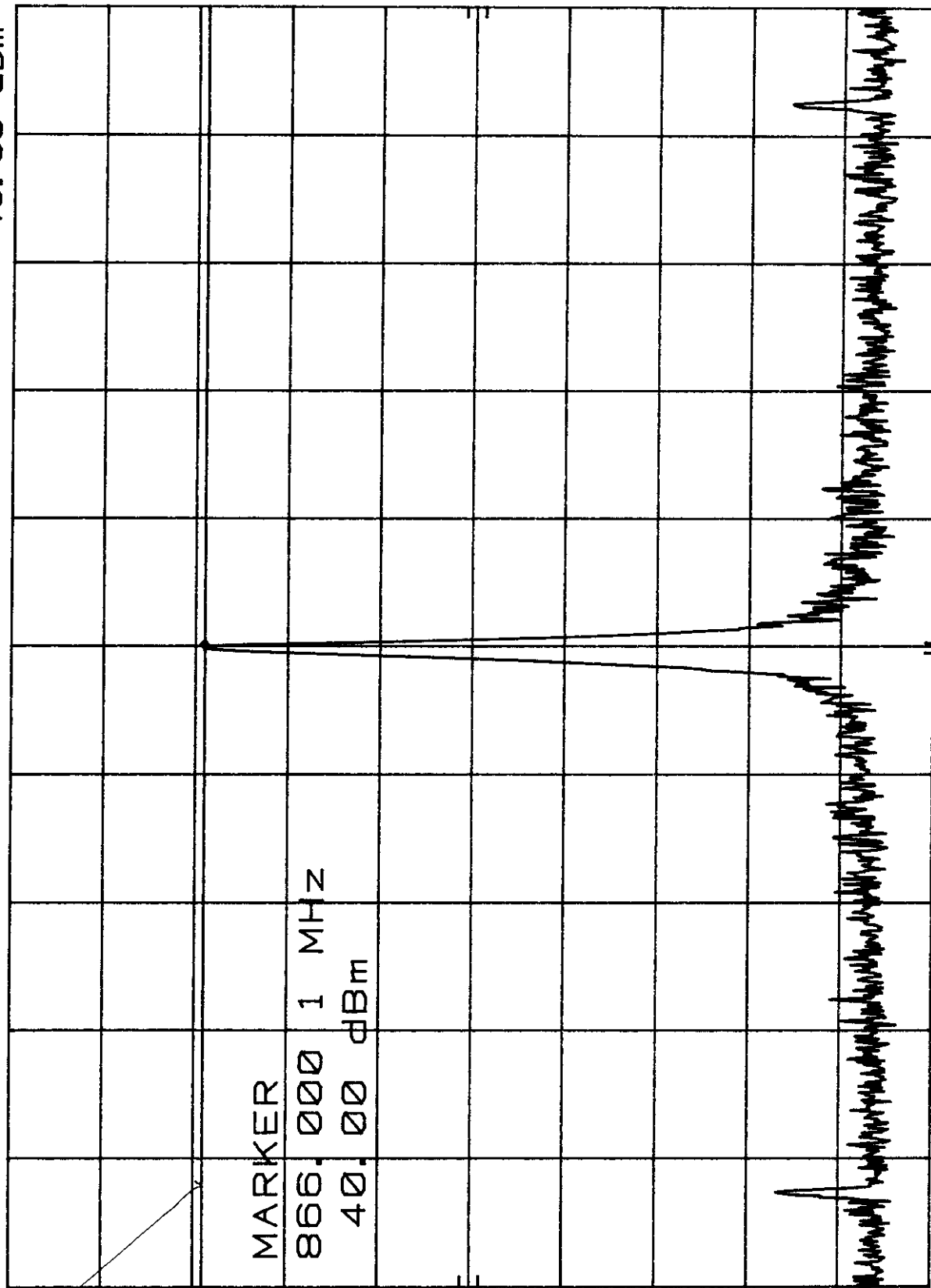
OFFSET

61.0
dB

DL
40.0
dBm

MARKER

866.000 1 MHz
40.00 dBm



CENTER 866.000 MHz
RES BW 300 Hz
SPAN 100 kHz
SWP 3.00 sec
VBW 1 kHz

DRIVER OUTPUT: MODULATED CARRIER

10 WATTS

MKR 866.000 0 MHz
27.90 dBm

REF 61.0 dBm ATTEN 10 dB

HP

10 dBX

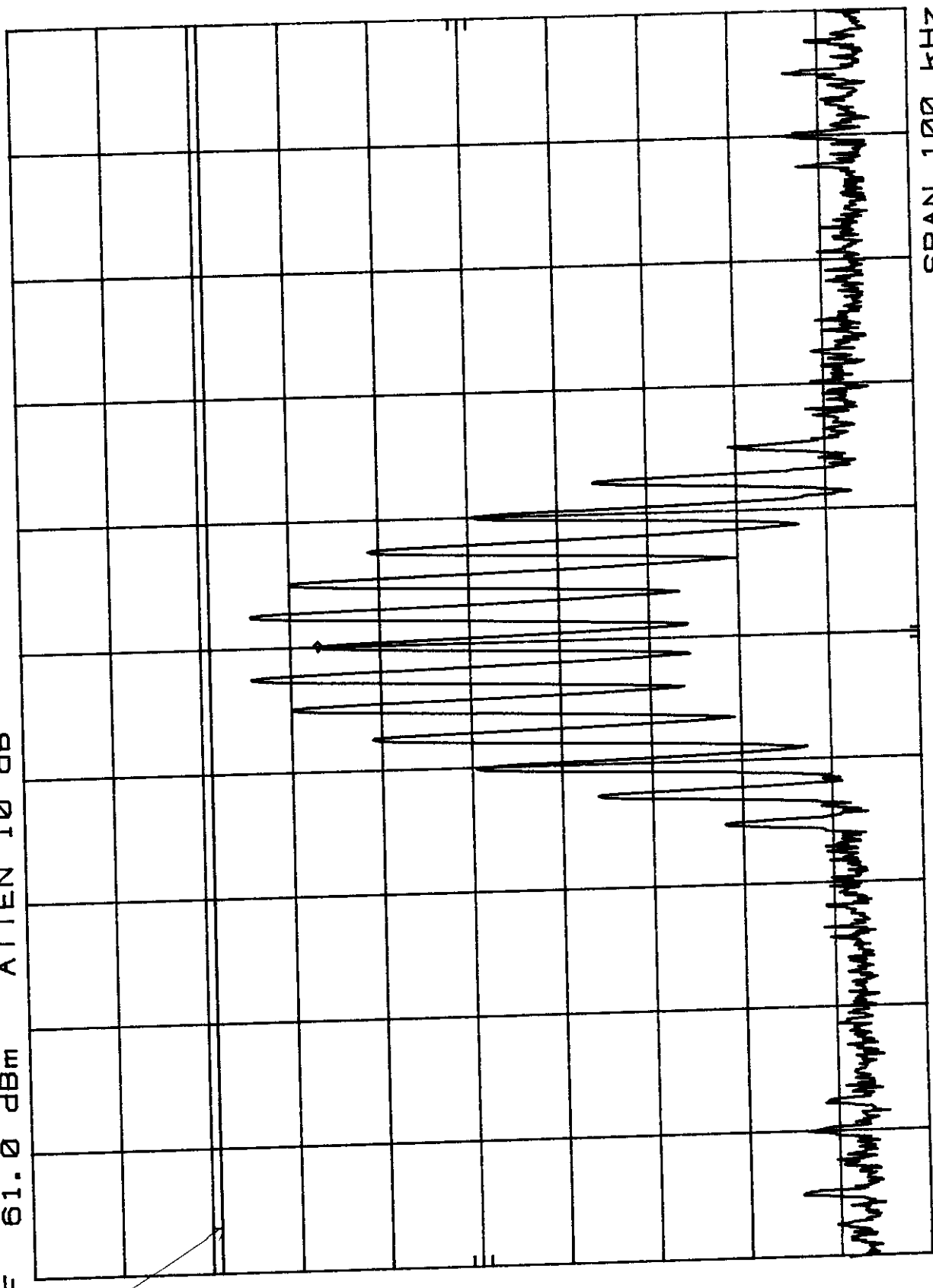
POS PK

OFFSET

61.0
dB

DL

40.0
dBm



CENTER 866.000 MHz
RES BW 300 Hz
VBW 1 KHz
SPAN 100 KHz
SWP 3.00 sec

2.983 (e) (4) **Measurement of Antenna Conducted Spurious
Emissions Per 2.991**

Definition: Conducted Spurious Emissions are emissions at the antenna terminals on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communication desired. The reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

Conducted spurious emissions shall be attenuated below the maximum level of the carrier frequency in accordance with the following formula:

$$\text{Spurious attenuation in dB} = 43 + 10 \log_{10} P_o$$

Where P_o = output in watts

$$= 43 + 10 \log_{10} (80)$$

$$= 62.0 \text{ dB}$$

Test Method: Per EIA RS 152-B, Paragraph 4.

Connect the equipment as shown in FIGURE 4.

Adjust the audio oscillator so that the frequency deviation of the transmitter is 5 kHz at a modulation frequency of 2.5 kHz. Adjust the spectrum analyzer to display the modulated carrier.

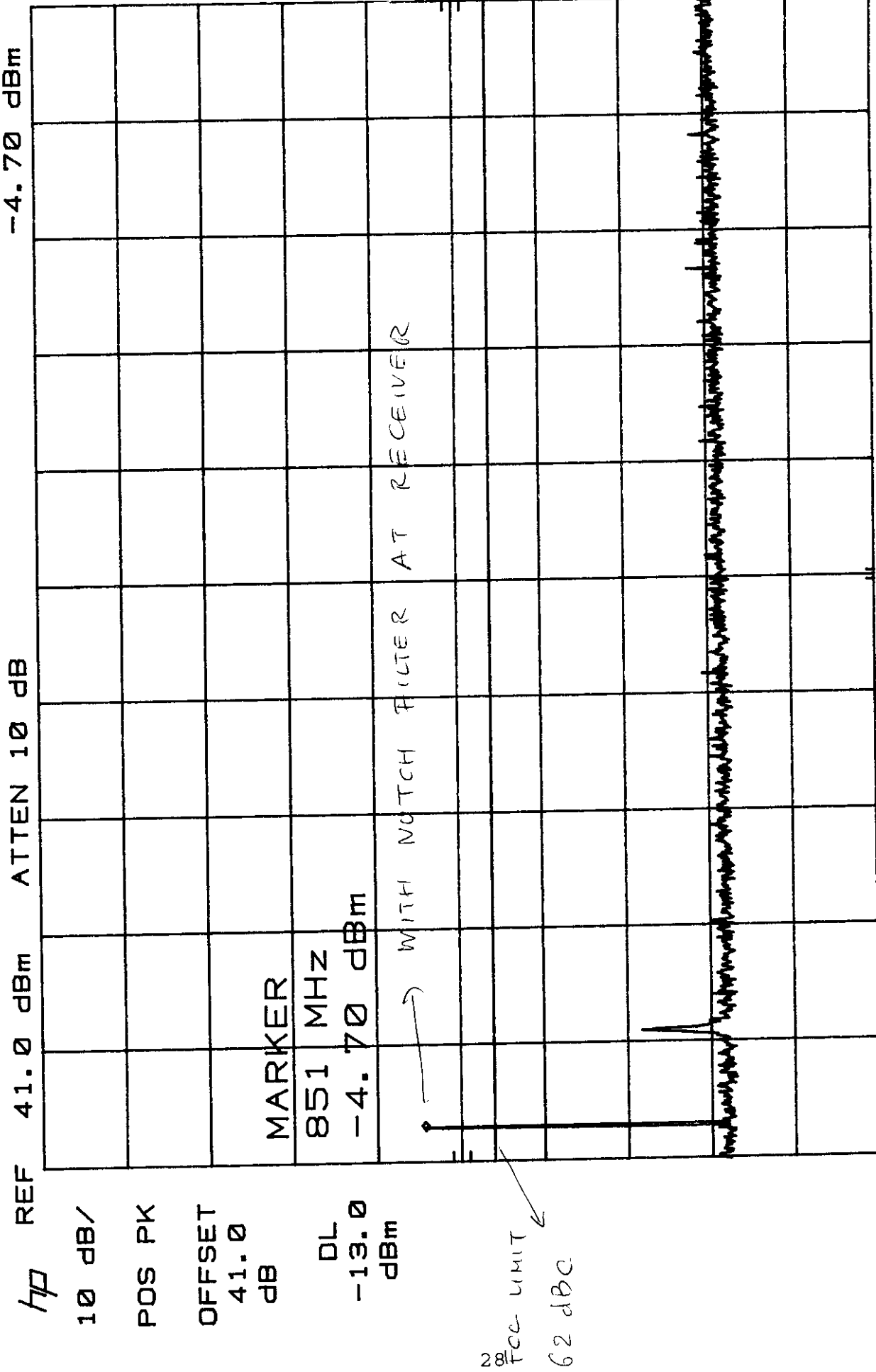
Scan the frequency spectrum from the lowest radio frequency generated in the equipment through the 10th harmonic of the carrier frequency.

Test Results: See Plots Following Figure 4.

All spurious antenna conducted emissions are below the FCC specifications.

ANTENNA CONDUCTED SPURIOUS

MKR 851 MHz
 -4.70 dBm



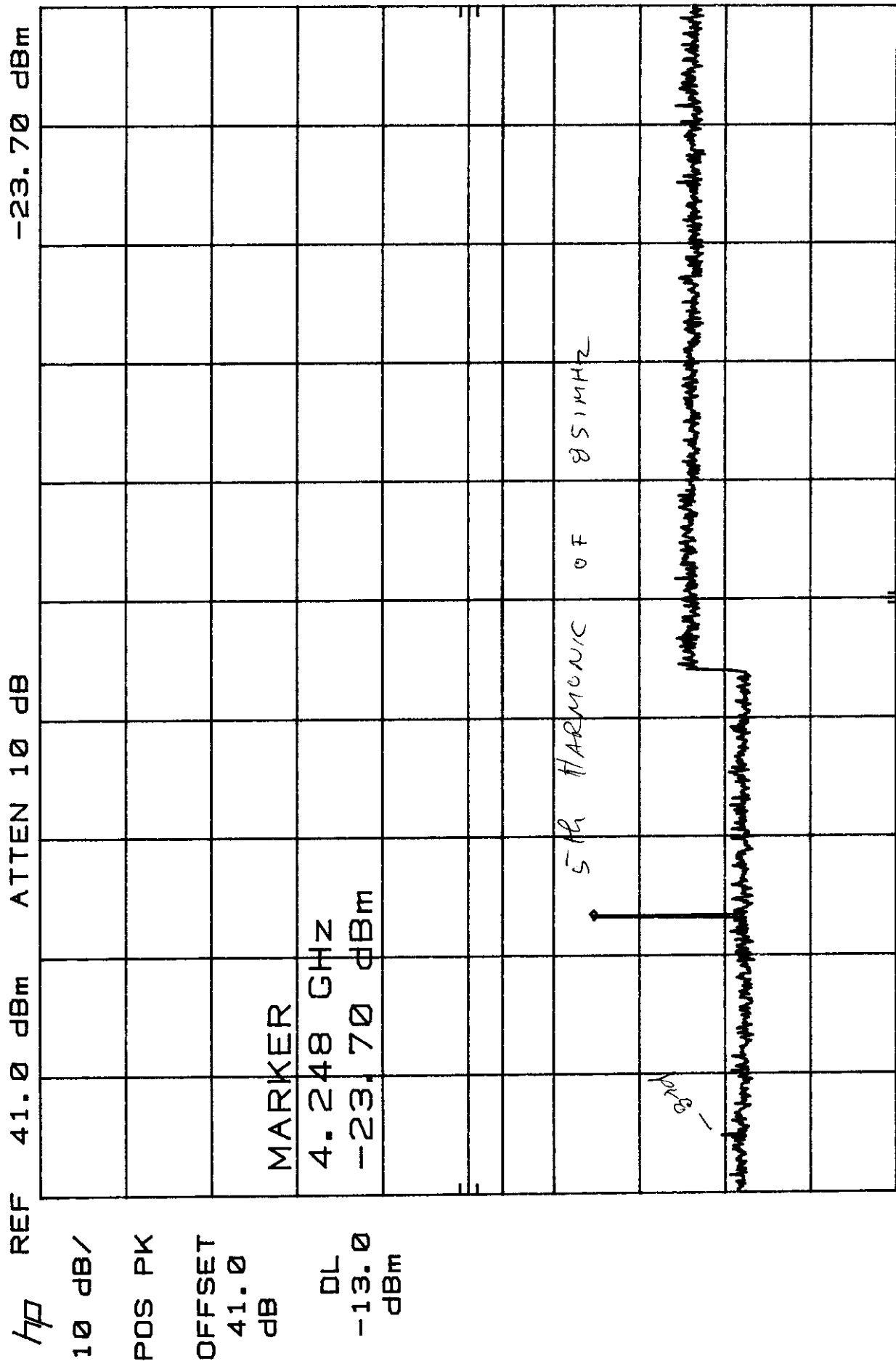
STOP 2.50 GHz
SWP 5.10 sec

VBW 100 KHZ

START 800 MHZ
RES BW 30 KHZ

RSB - ADD - MSI
ANTENNA CONDUCTED SPURIOUS

MKR 4.248 GHz
-23.70 dBm



RSB - ADD - MSI

ANTENNA CONDUCTED SPURIOUS

MKR 861 MHz
-10.70 dBm

ATTEN 10 dB

REF 41.0 dBm

10 dB/

POS PK

OFFSET

41.0

dB

DL

-13.0
dBm

MARKER

861 MHz

-10.70 dBm

WITH

NOTCH FILTER AT RECEIVER

30

FCC LIMIT

62 dBc

START 800 MHz

RES BW 30 KHz

VBW 100 KHz

STOP 2.50 GHz
SWP 5.10 sec

RS8 - ADD - MSI

ANTENNA CONDUCTED SPURIOUS

MKR Δ 1.725 GHz
-6.30 dB

ATTEN 10 dB

REF 41.0 dBm

10 dB/

POS PK

OFFSET

41.0

dB

MARKER Δ

1.725 GHz

-6.30 dB

DL

-13.0

dBm

31

FEC LIMIT

62 dBc

HARMONIC OF 862 MHz

5TH HARMONIC

→

21A

START 2.50 GHz

RES BW 30 kHz

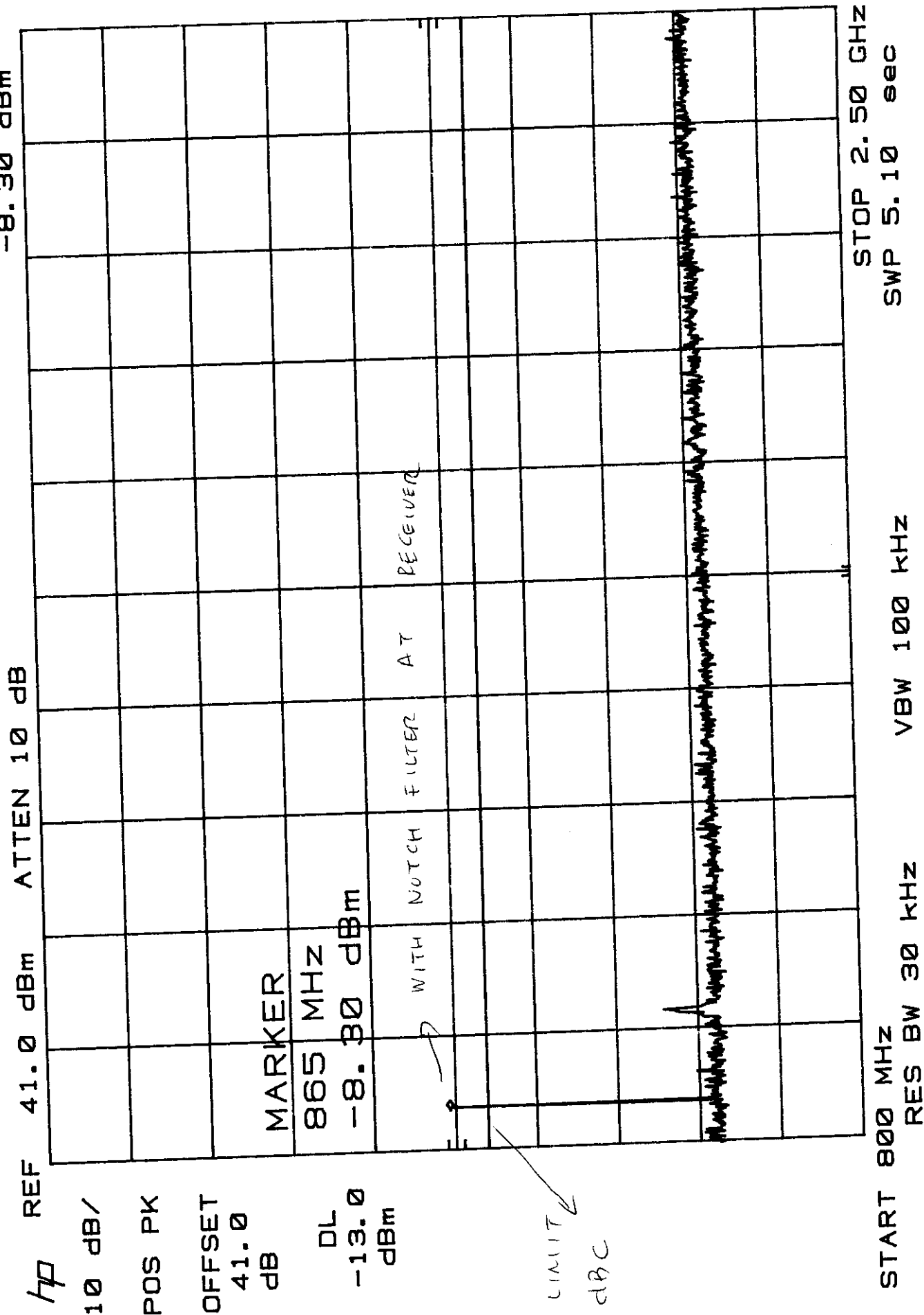
VBW 100 kHz

STOP 10.00 GHz

SWP 22.5 sec

R98-ADD - MSI
ANTENNA CONDUCTED SPURIOUS

MKR 865 MHz
-8.30 dBm



R98-ADD-MSI
ANTENNA CONDUCTED SPURIOUS

MKR Δ 1.733 GHz
8.70 dB

HP REF 41.0 dBm ATTEN 10 dB

10 dB/

POS PK

OFFSET

41.0
dB

DL
-13.0
dBm

MARKER Δ

1.733 GHz

8.70 dB

FCC LIMIT
62 dBc

3rd HARMONIC

5TH HARMONIC

OF

866 MHz

START 2.50 GHz

RES BW 30 kHz

VBW 100 kHz

STOP 10.00 GHz
SWP 22.5 sec

SPURIOUS RADIATED SIGNAL MEASUREMENTS

(Ref: Part 2, Subpart J, 2.991 & 2.993)

Date <u>4-7-98</u>	Pass ☒ Fail ☐ (at Freq. <u> </u>)
EUT <u>RF Power Amplifier</u>	Operating Power <u>80 Watts</u>
Part No. <u>RS8-1DD-MSI</u>	Operating Mode <u>Saturated</u>
Serial No. <u> </u>	Test Engineer <u>Bry. R.</u>

FREQUENCY TUNED TO 862 MHz

ANT POL	FREQ MHz	SPECTRUM ANALYZER (dBμV)	ANT. FACTOR (dB)	CABLE LOSS (dB)	AMP GAIN (dB)	dBμV/m	FUND FIELD STRENGTH dBμV/m	SPUR BELOW CARRIER (dBc)
H	862		27.2	4.3	30		146.4	—
H	1724	76.8	27.2	5.1	30	79.1	}	67.3
V	2586	69.9	29.5	6.3	30	75.7		70.7
H	3448	67.3	32.1	6.9	30	76.3		70.1
V	4310	74.6	33.5	7.7	42	73.8		72.6
V	5172	70.8	34.0	8.8	42	71.6		74.8
V	6034	65.9	35.3	9.3	42	68.5		77.9
H	6896	62.5	36.7	10.1	42	67.3		79.1
V	7758	59.8	37.7	10.8	42	66.3		80.1
V	8620	58.8	38.0	11.7	42	66.5	79.9	

Fundamental Field Strength (V/m) = $1/3 (R_o \times P_o)^{1/2}$

R_o = Amplifier Output Impedance (Ohms) 50 Ω

P_o = Amplifier Output Power (Watts) 80 W

Conversion from μV/m to dBμV/m = $(\mu V/m) \log \times 20 = 146.4$

FCC Limit = $43 + 10 \cdot \log P_o$ or 62.0

2.983(e)(6) **Measurement of Frequency Stability Per 2.995**

The EUT is a power amplifier and contains no circuitry for generating or stabilizing the RF signal. The driver will be responsible for this task.

2.983(e)(7) **Frequency Spectrum to be Investigated per 2.997**

The frequency was searched from the lowest radio frequency generated in the equipment through the 10th harmonic of the carrier frequency.

2.983(e) (5) **Measurement of Radiated Spurious Emissions Per 2.993**

Definition: Emissions from the equipment when connected into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired. The reduction in the level of these spurious emissions will not effect the quality of the information being transmitted.

Test Method: Per EIA RS 152-B.

Connect the equipment and follow the procedure described in paragraph 2.2.1.1 and paragraph 5.0. Measure the amplitude of each spurious radiated signal through the 10th harmonic. The level in dBuV/m is calculated on the following page. The spurious signals are then measured on the 3 meter range.

$$\text{Spurious attenuation dB} = 10 \log \frac{\text{Po Watts}}{\text{Calc spurious pwr}}$$

Test Results: See TABLE I.

All Radiated spuirious emissions are below the FCC specifications.