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:
_X_ 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
_X_ 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**

Rules Part	Maximum Power (Watts)
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:

	POWER OUTPUT		
Frequency	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 Bandwith per 2.989

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

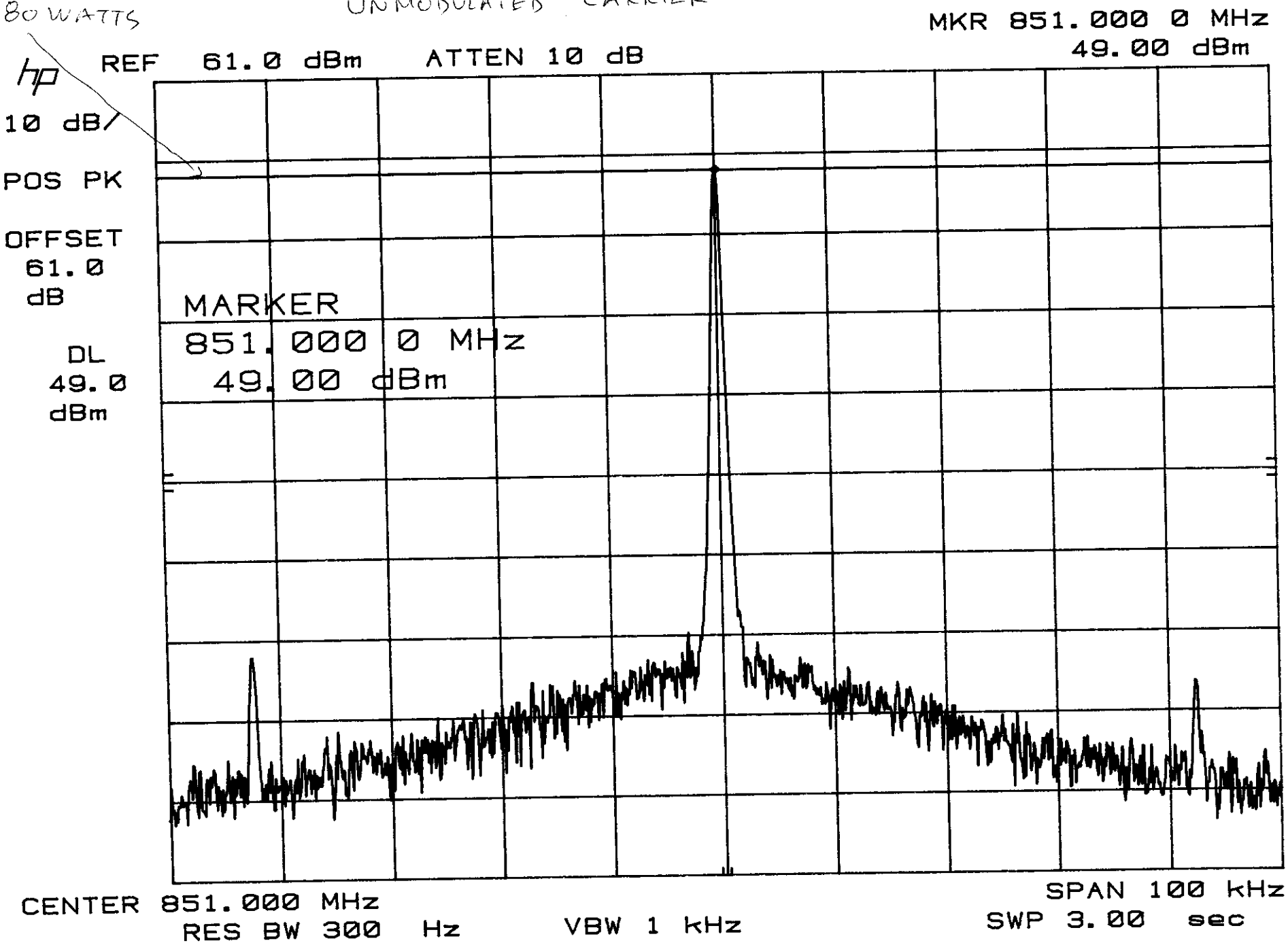
Test Method: Connect the equipment per Figure 3.

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

Test Results: See Plots following Figure 3.

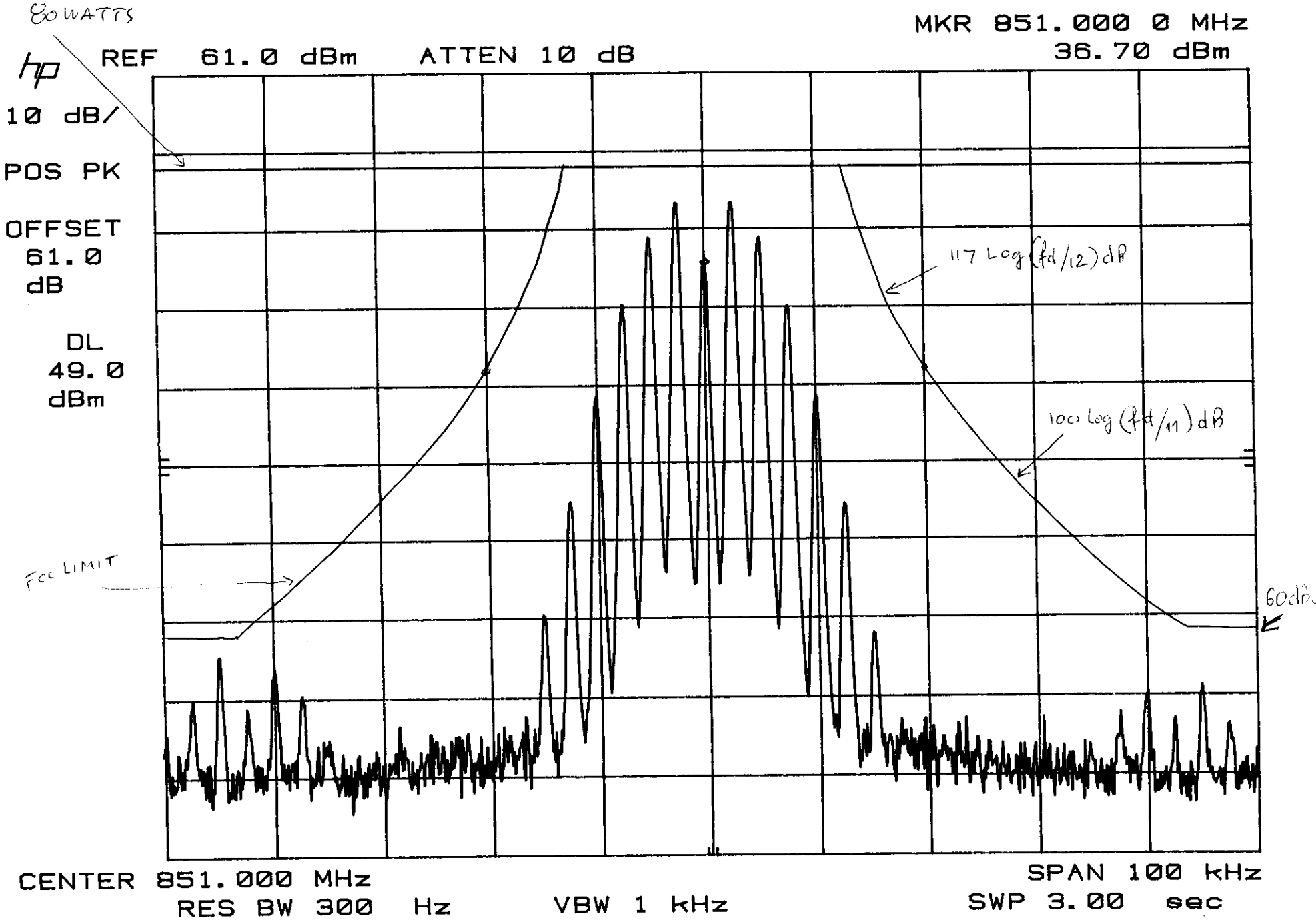
The center frequency of the signal did not shift with modulation. The spectrum bandwith was well within the limits specified in the FCC regulations

RSB - 1DD - MSI
UNMODULATED CARRIER



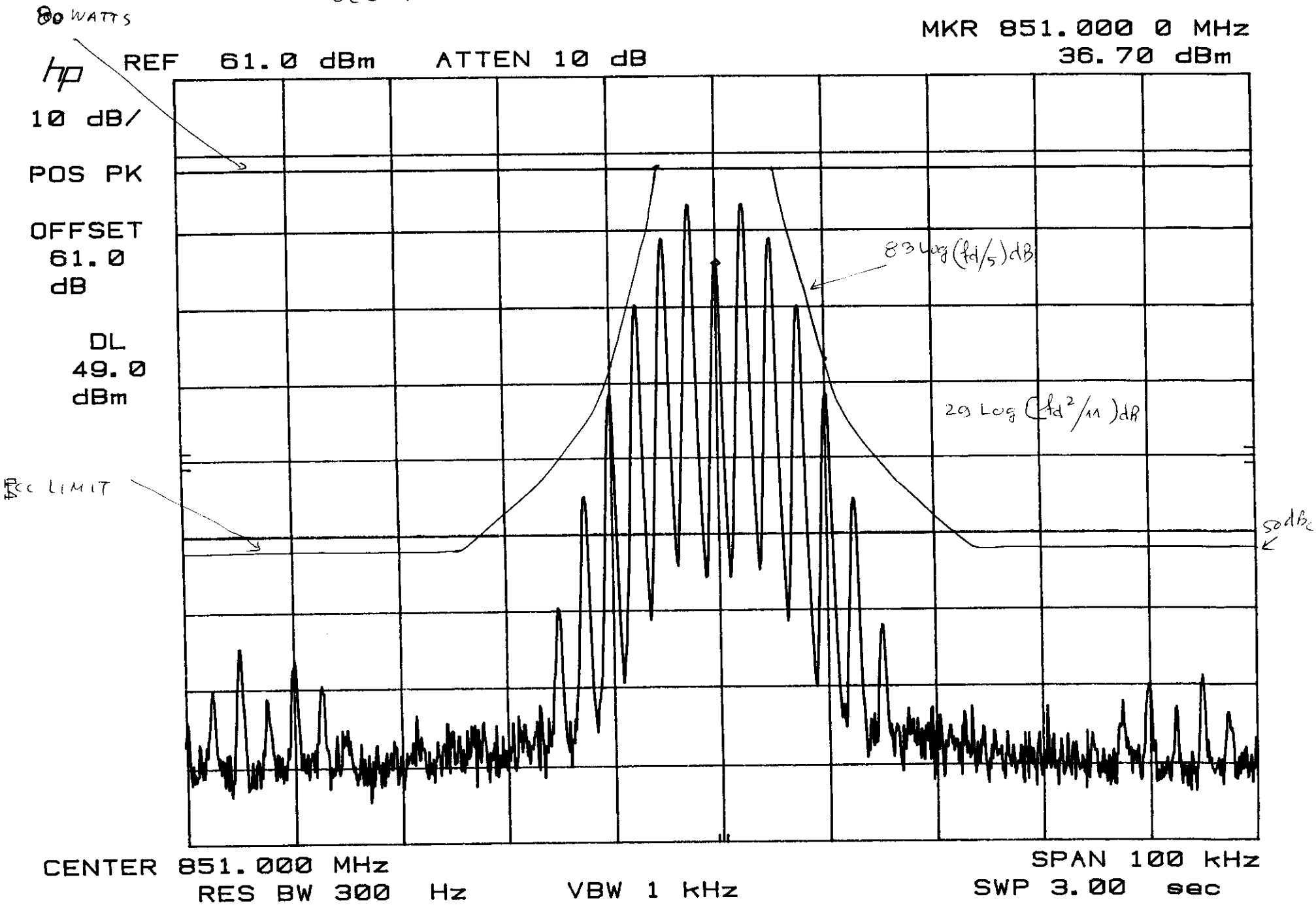
RSB - 1DD - MSI

OCCUPIED BANDWIDTH PART 22



RSB-1DD-M51

OCCUPIED BANDWIDTH PART 90



RSB -1DD- MSI

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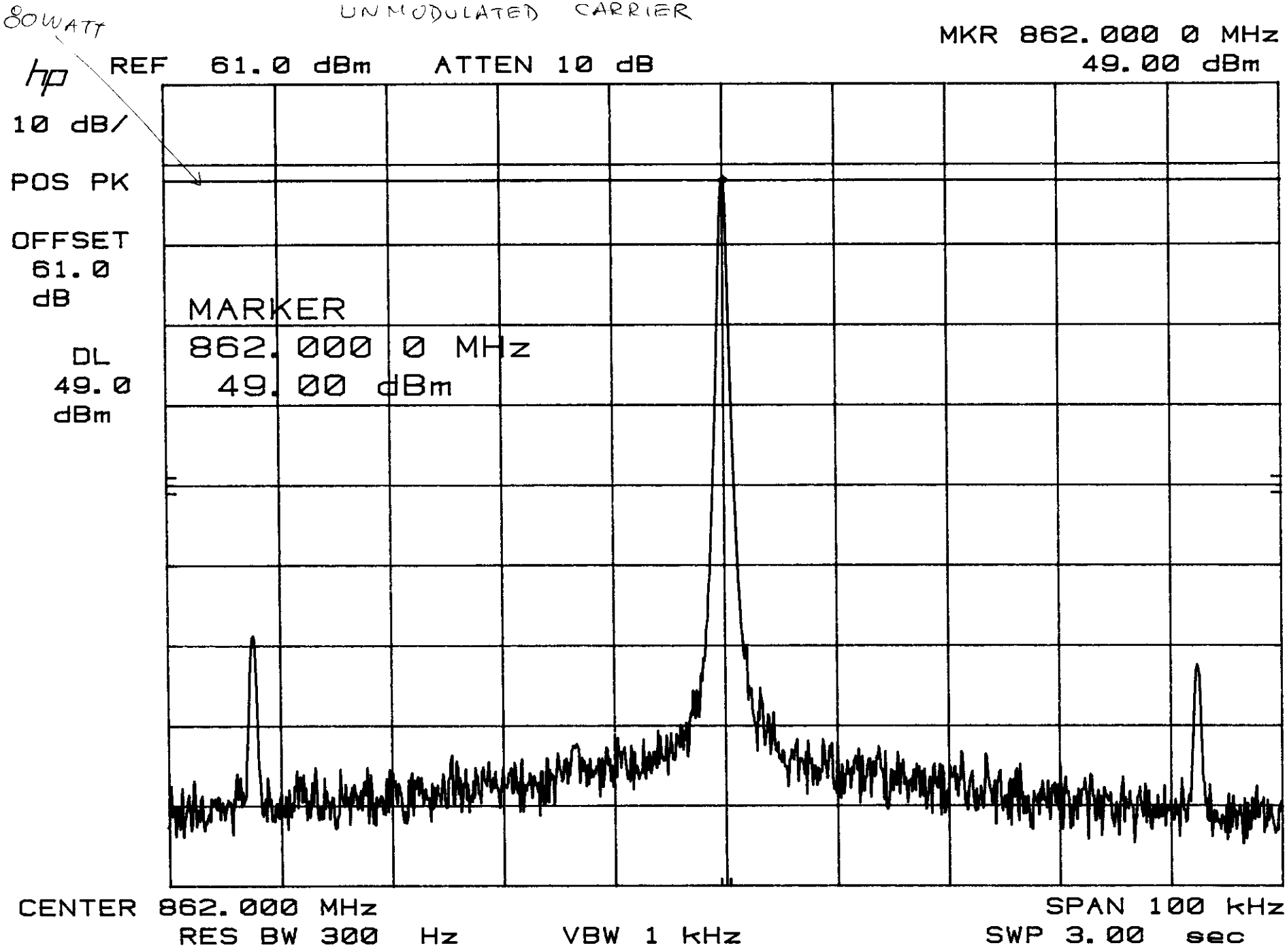

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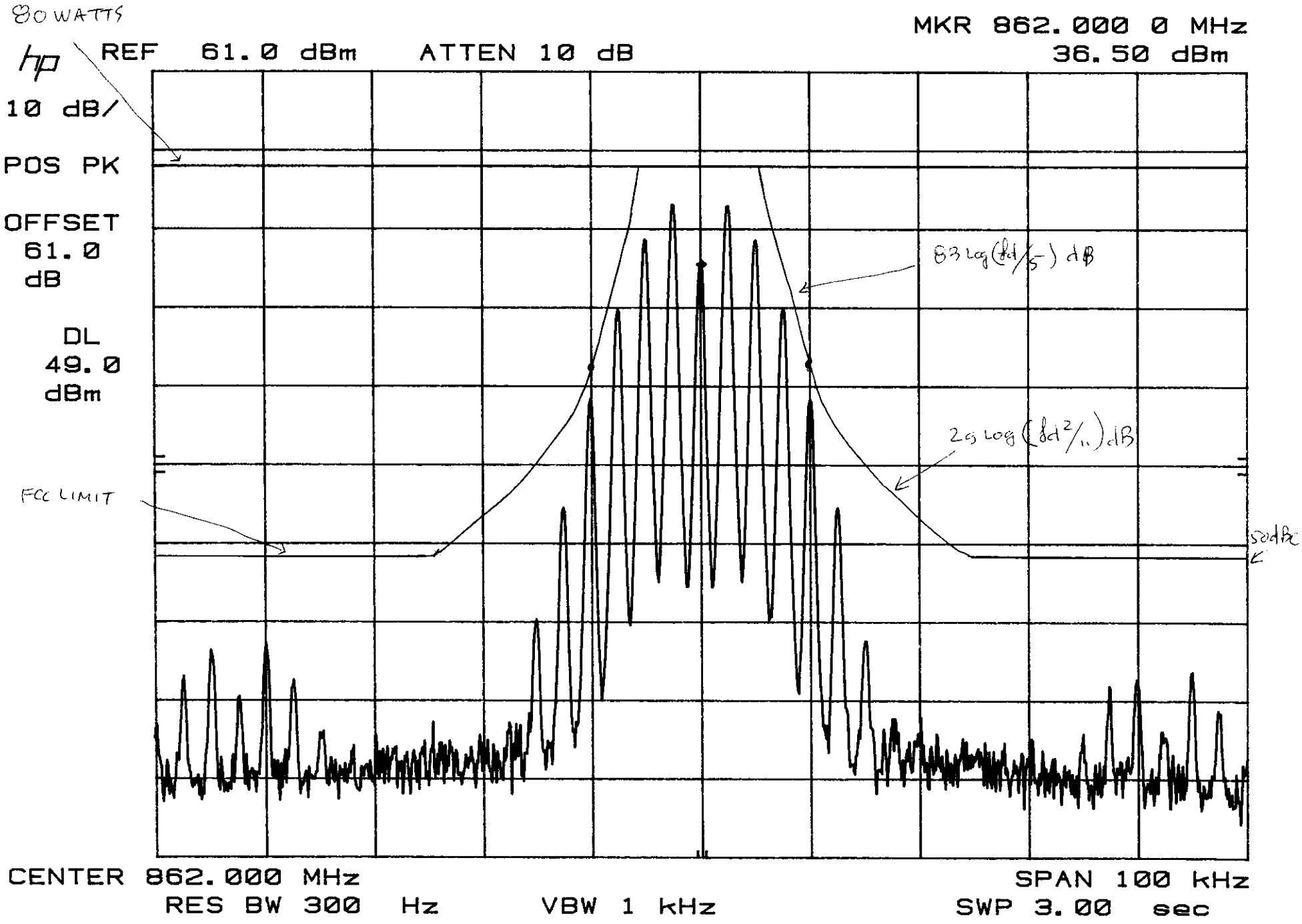
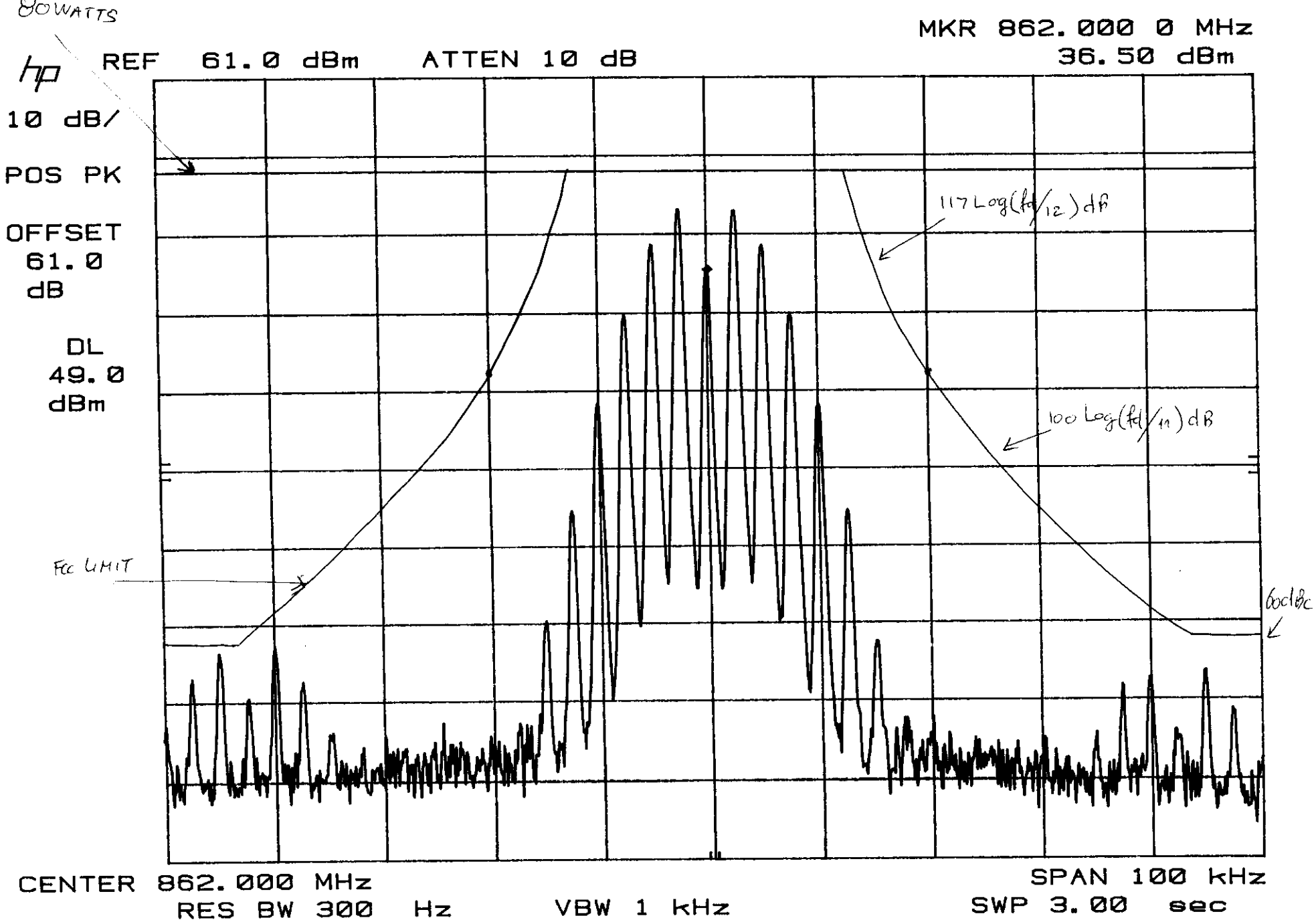


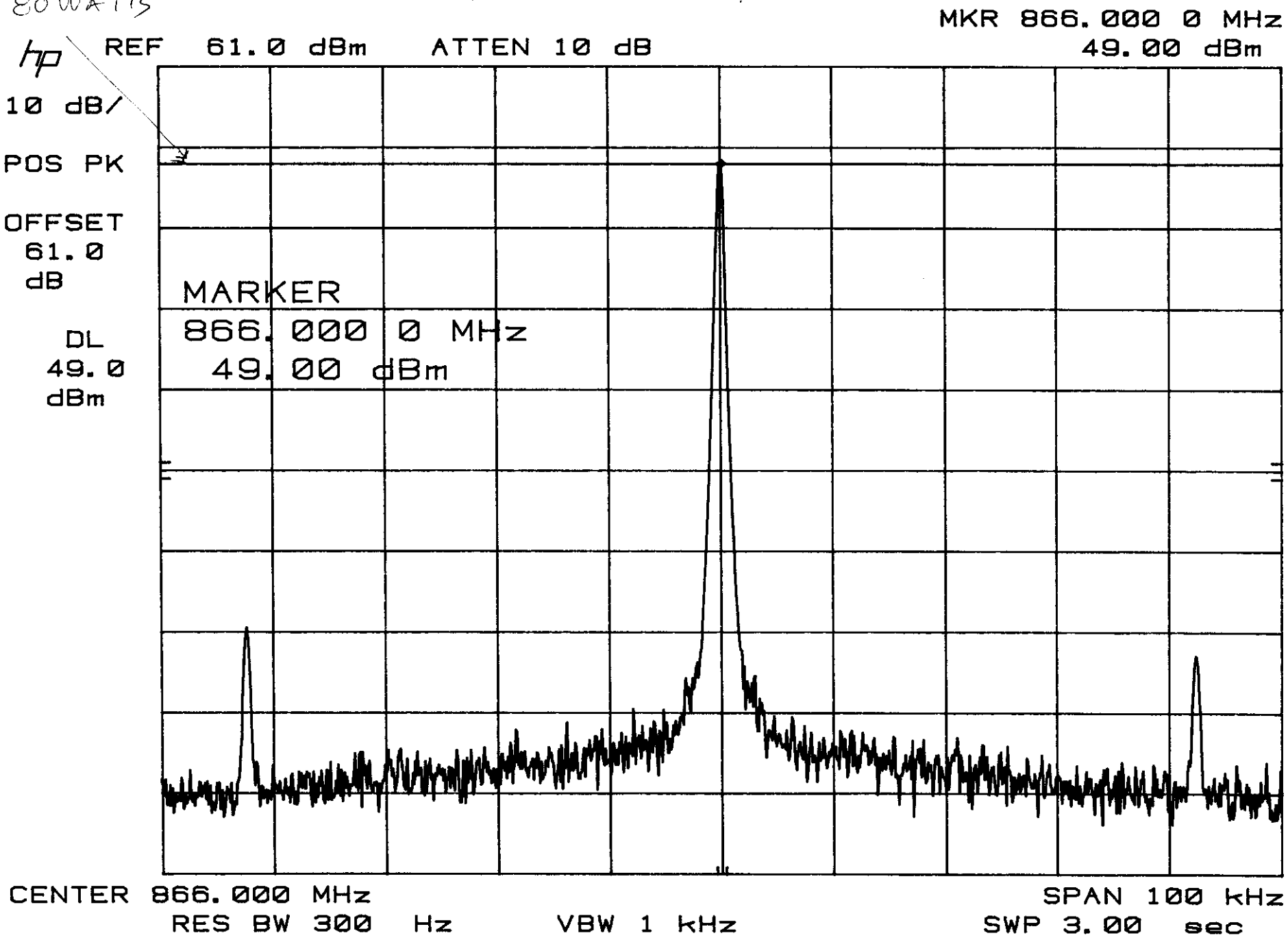
RSB-1DD-MSI

OCCUPIED BANDWITH PART 22



RS8 -1DD_ MSI
UNMODULATED CARRIER.

80 WATTS



RSB - 100 - MSI

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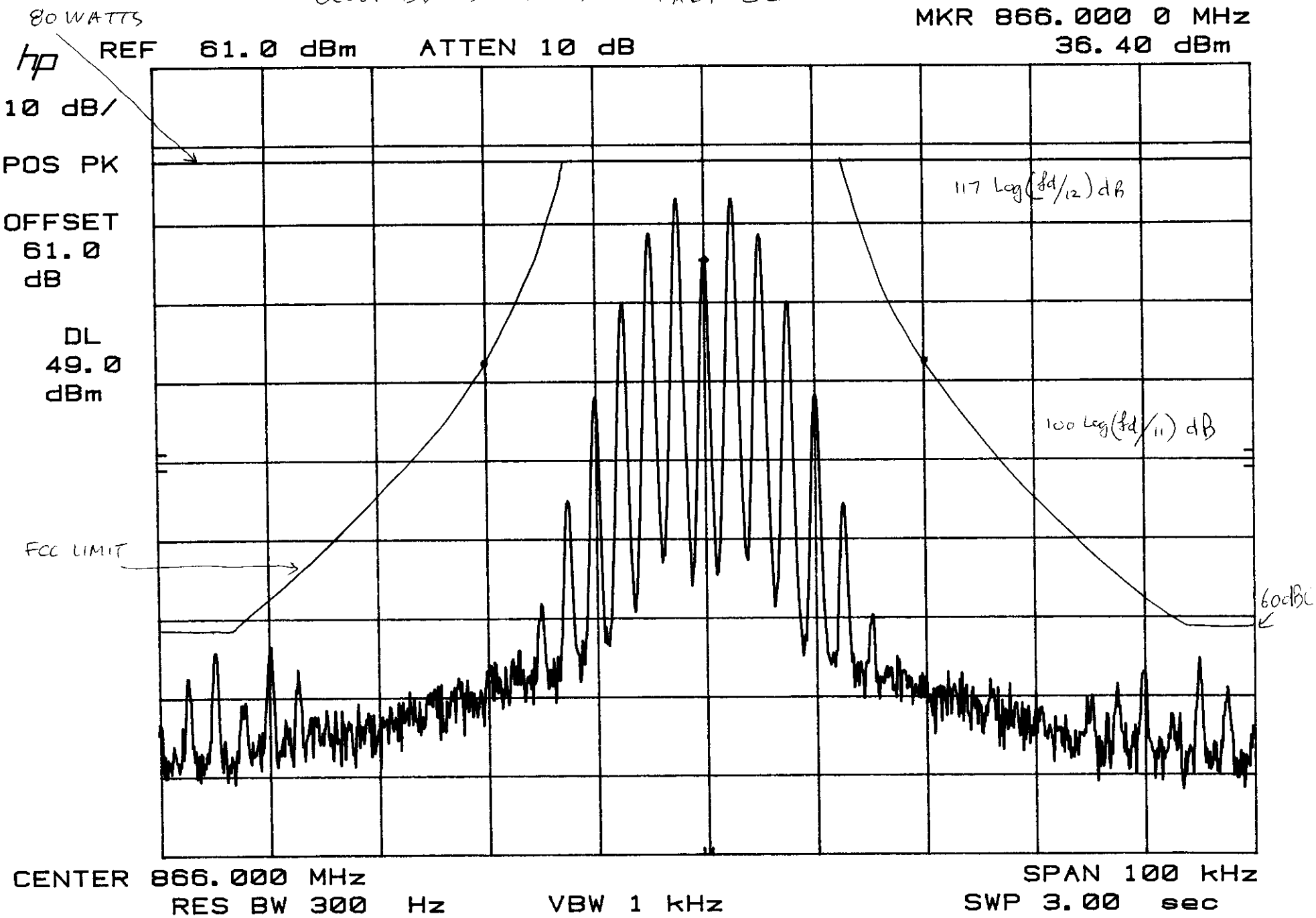

RSB - 1DD - M51

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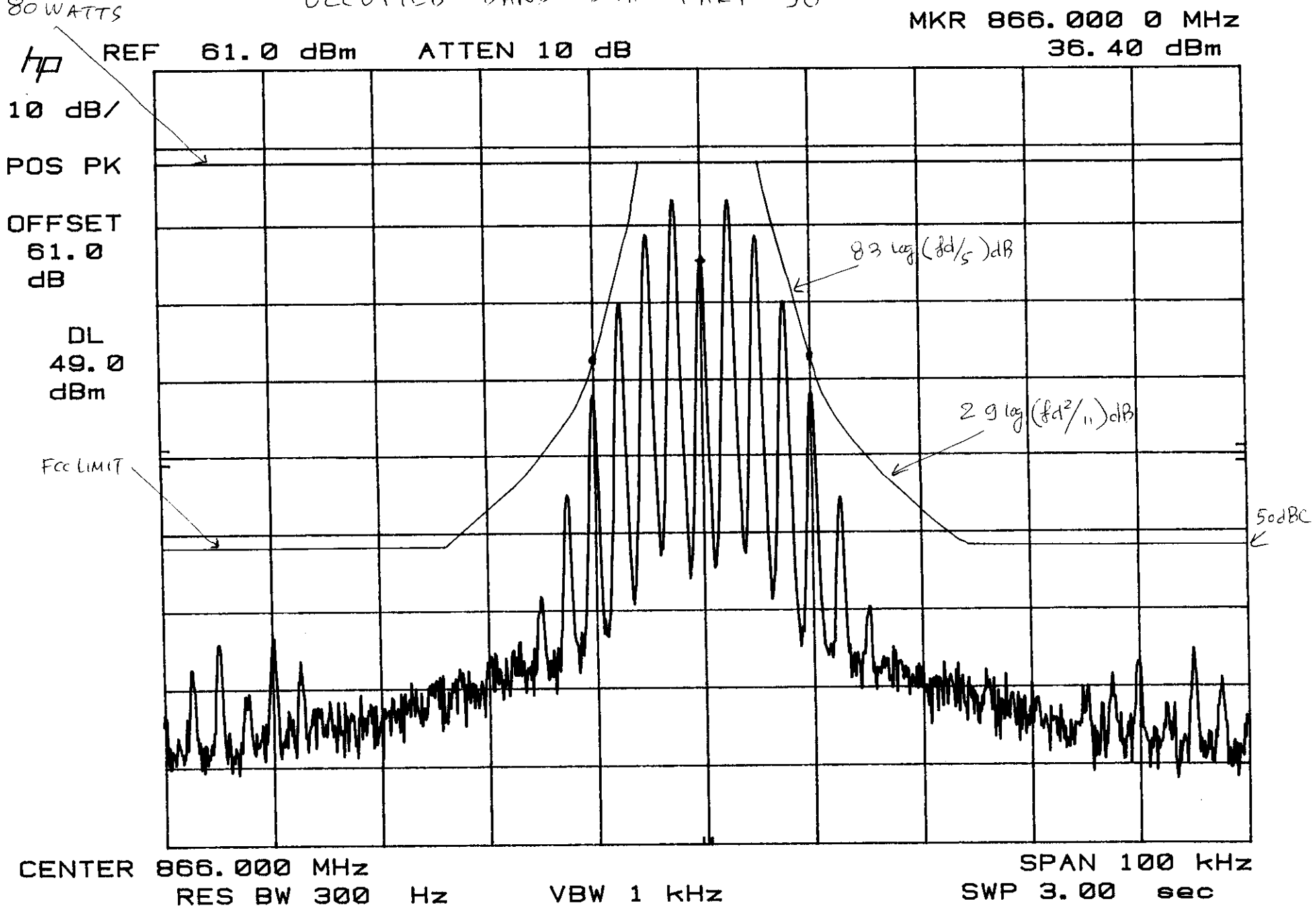
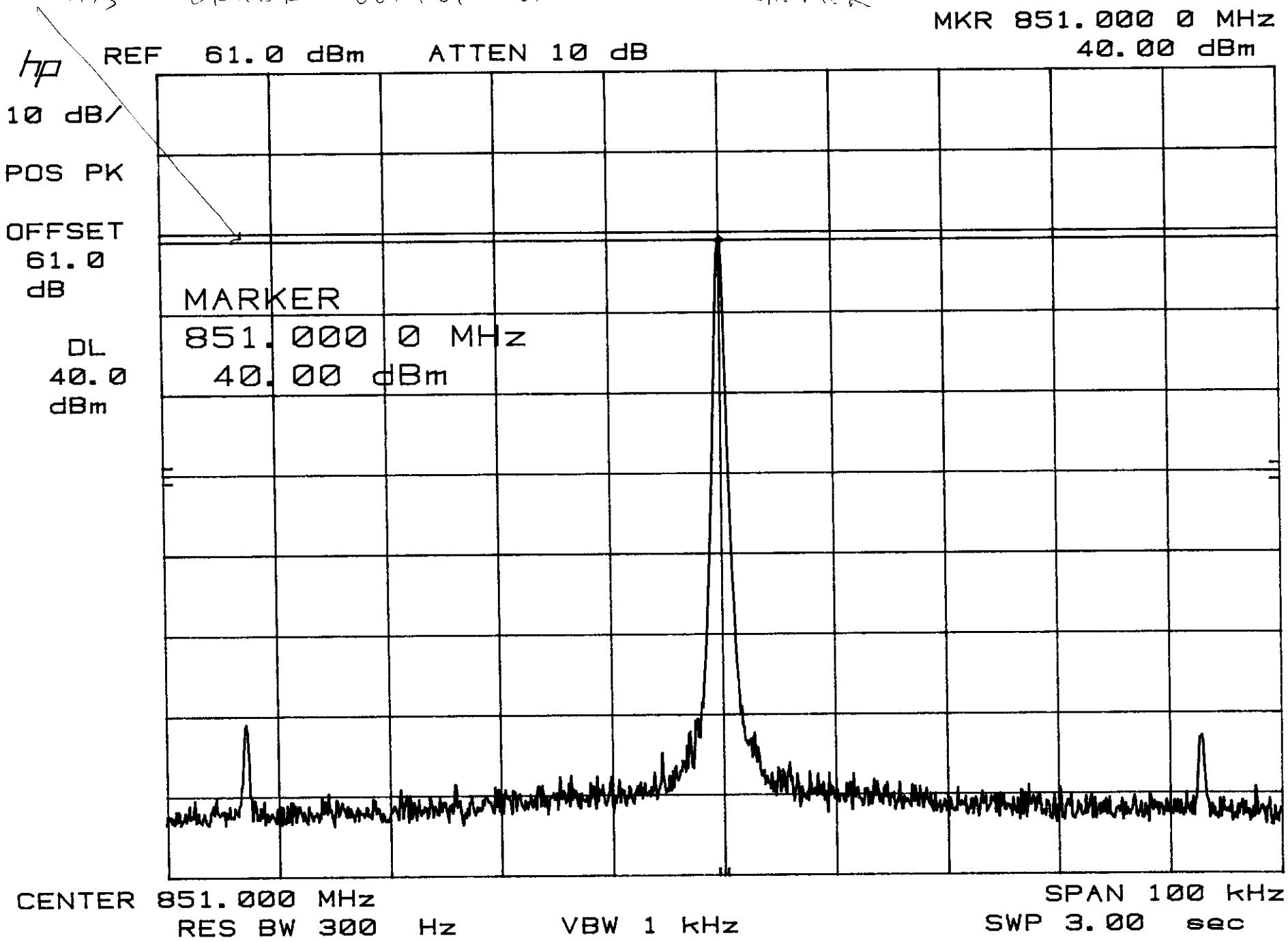
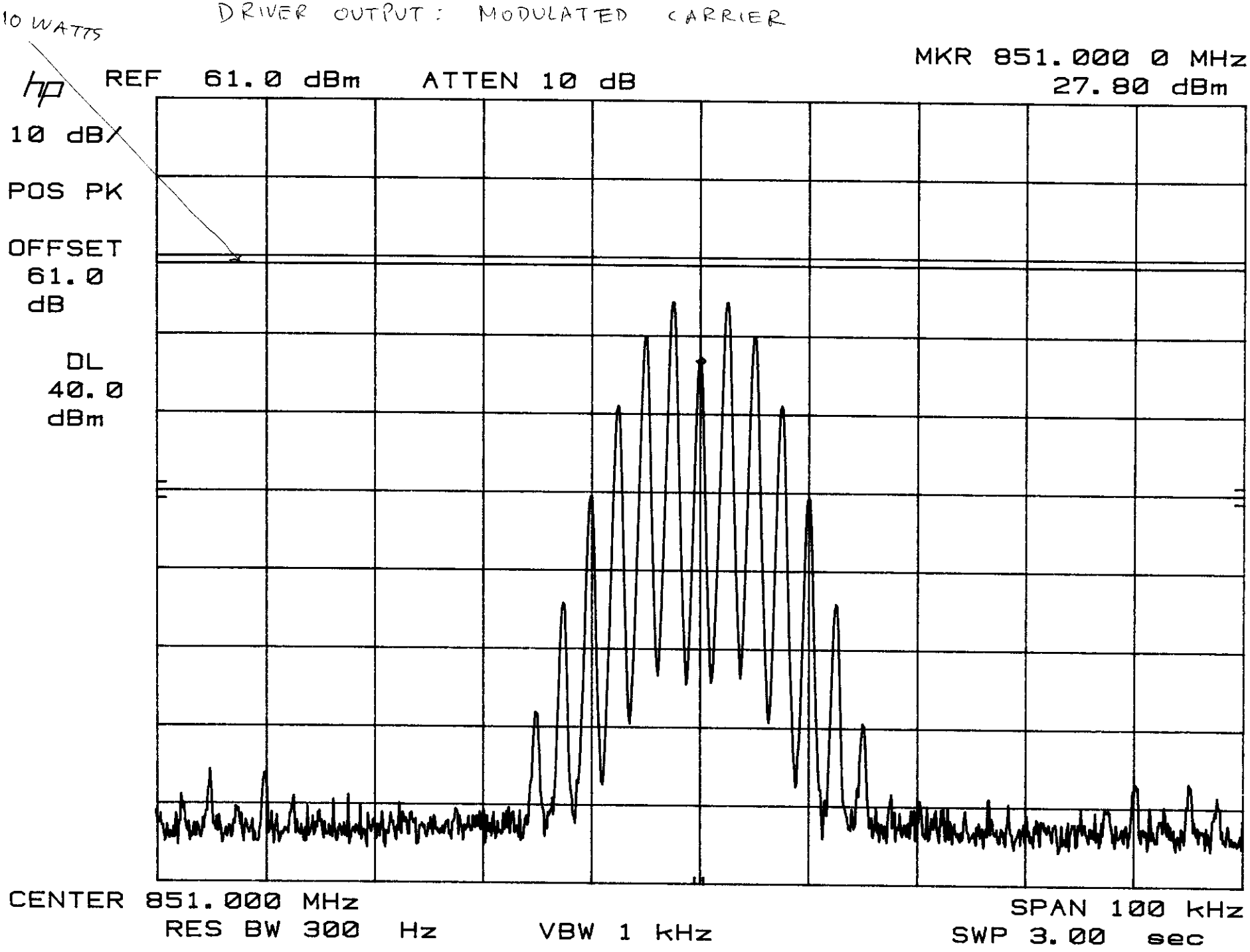


20

10 WATTS DRIVER OUTPUT: UNMODULATED CARRIER

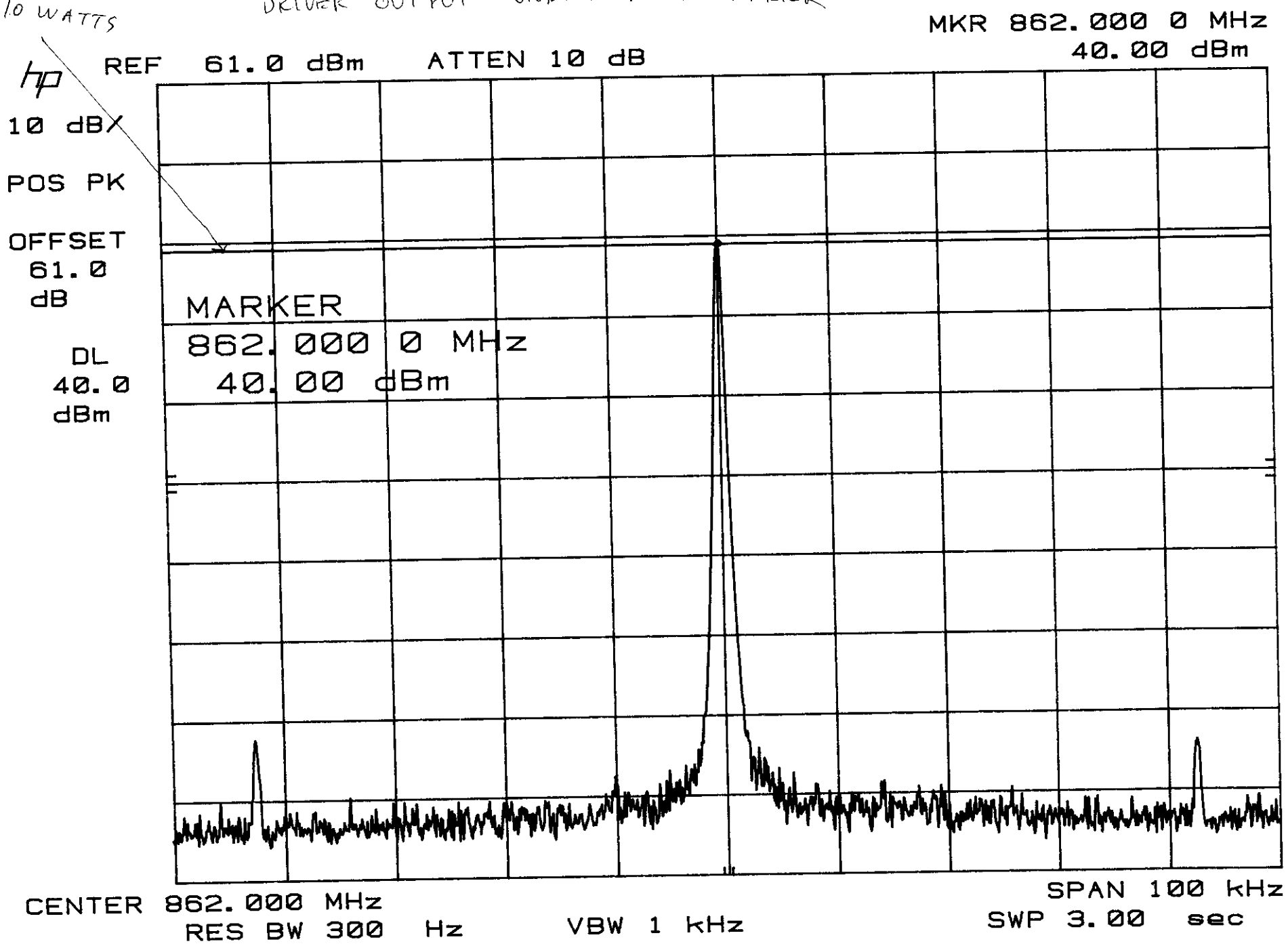


DRIVER OUTPUT : MODULATED CARRIER

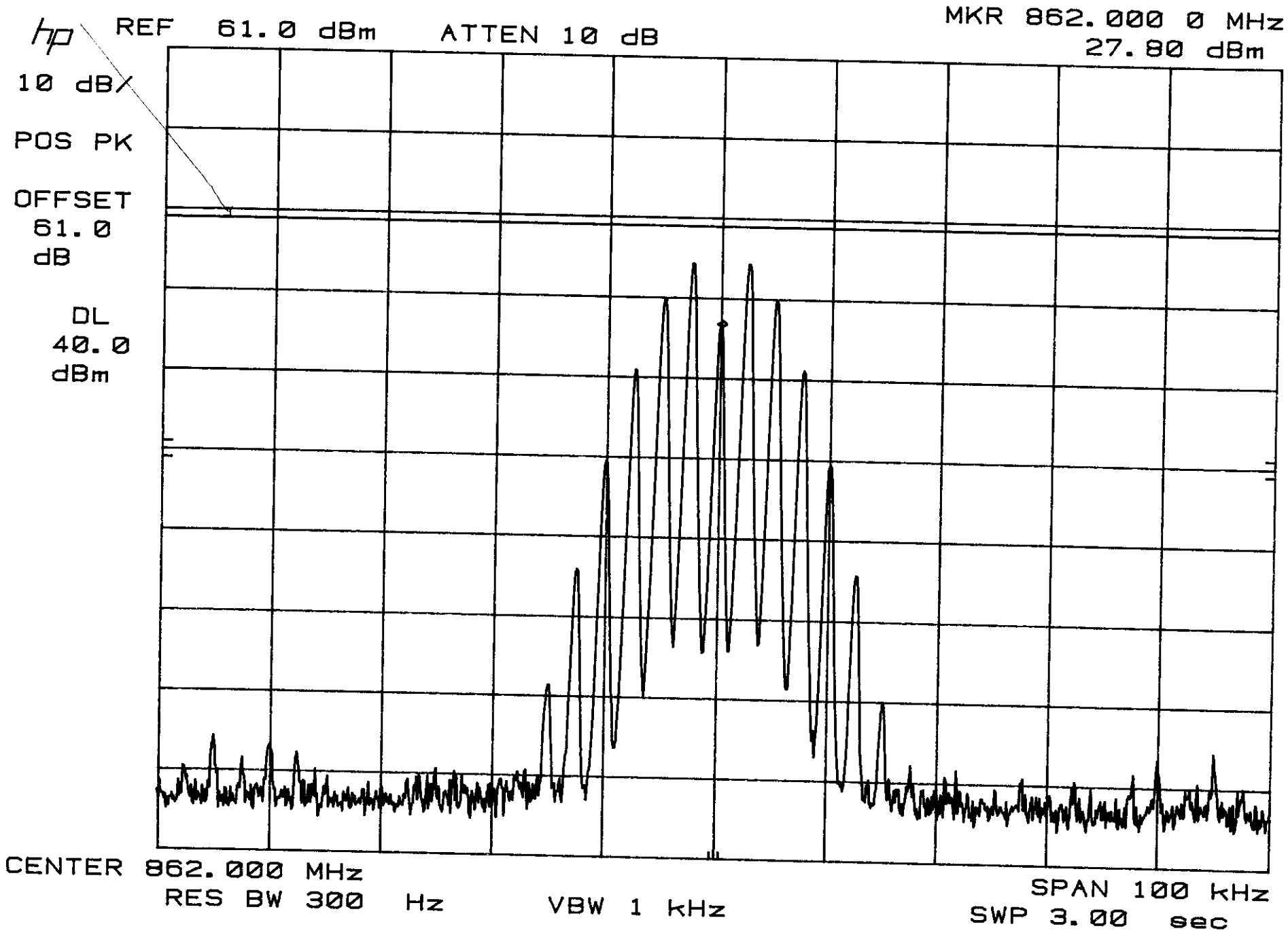


10 WATTS

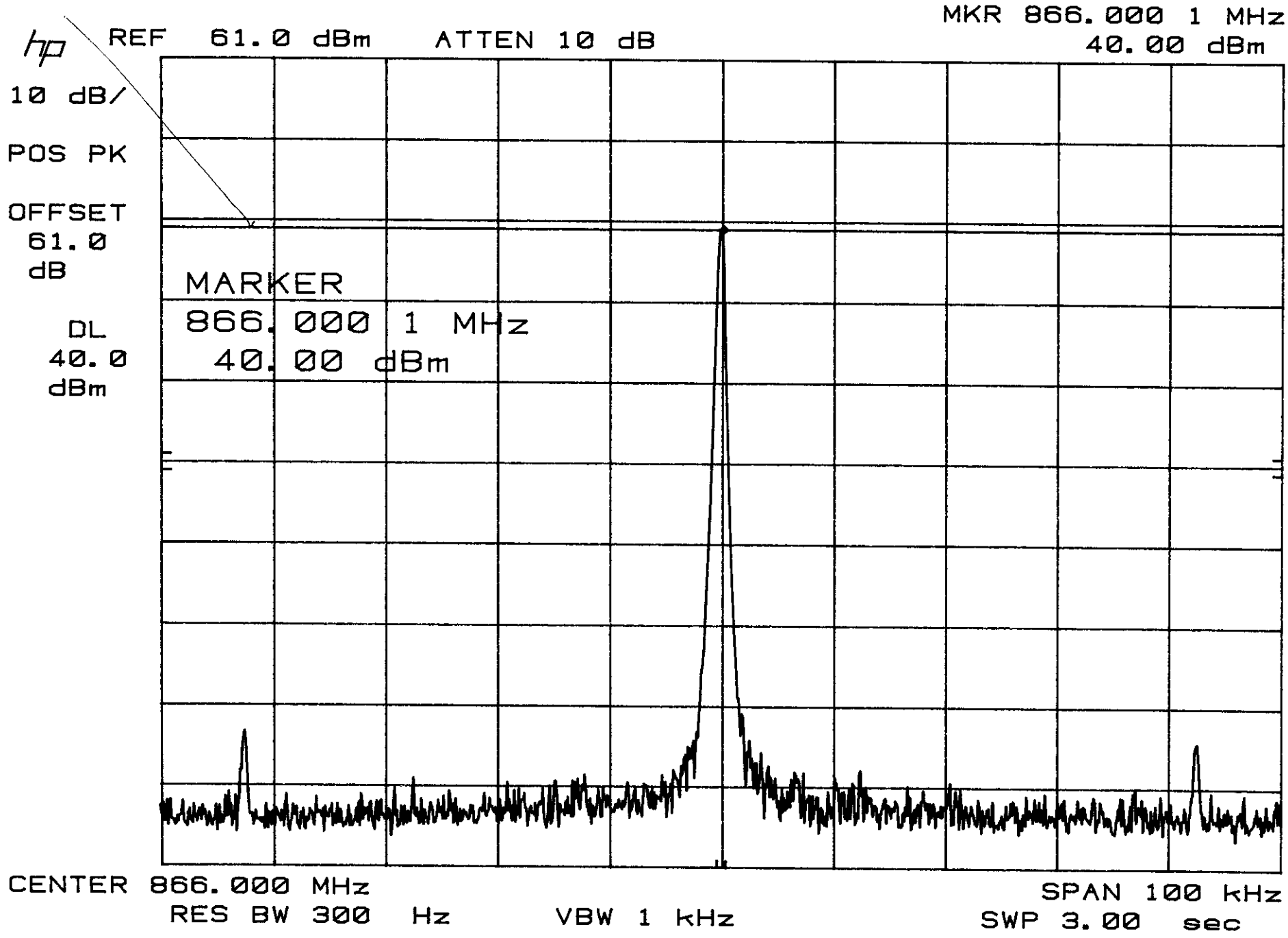
DRIVER OUTPUT - UNMODULATED CARRIER



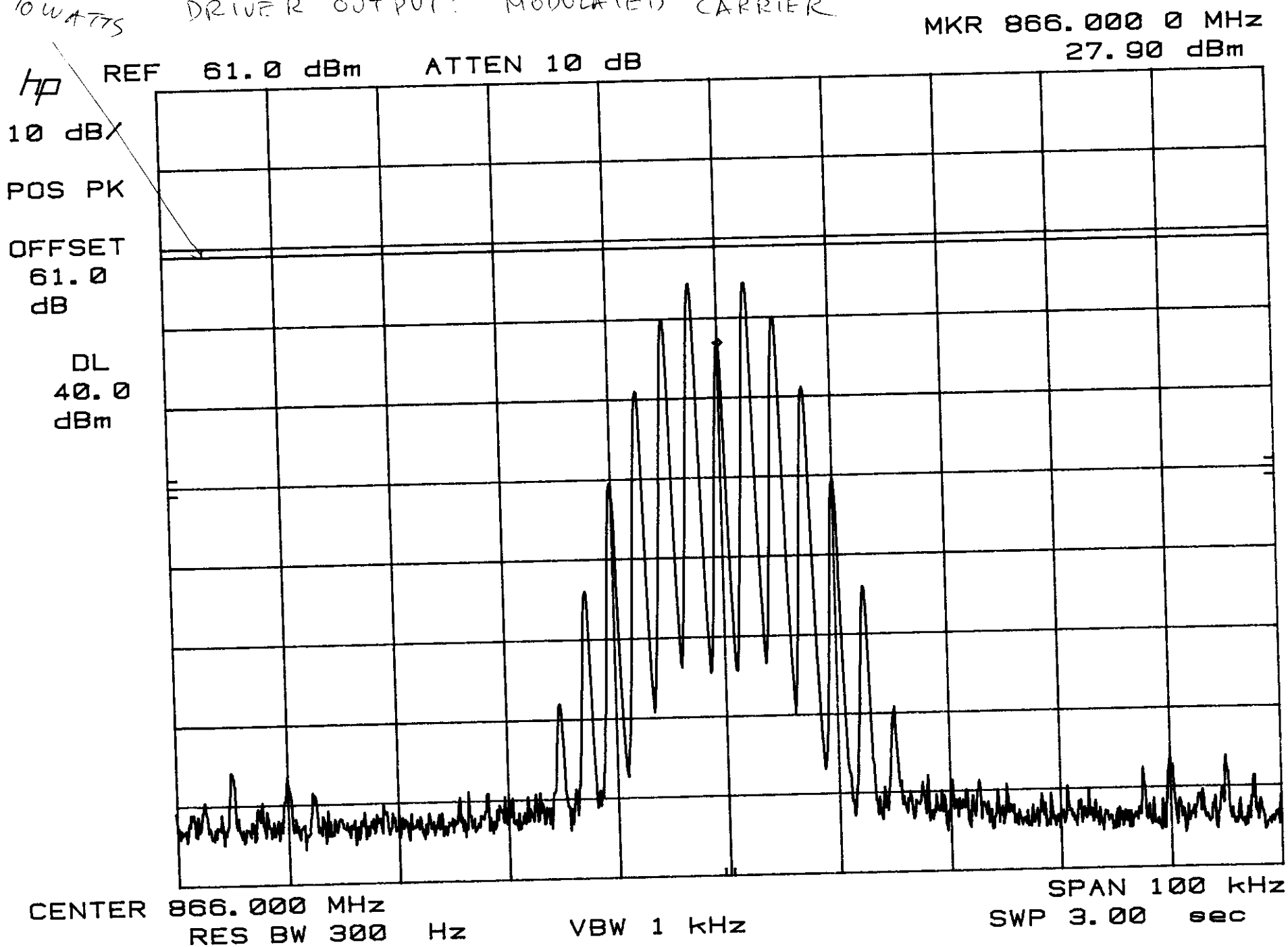
10 WATTS DRIVER OUTPUT : MODULATED CARRIER



10 WATTS DRIVER OUTPUT: UNMODULATED CARRIER



10 WATTS DRIVER OUTPUT: MODULATED CARRIER



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:

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

Where Po = output in watts

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

= 62.0 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.

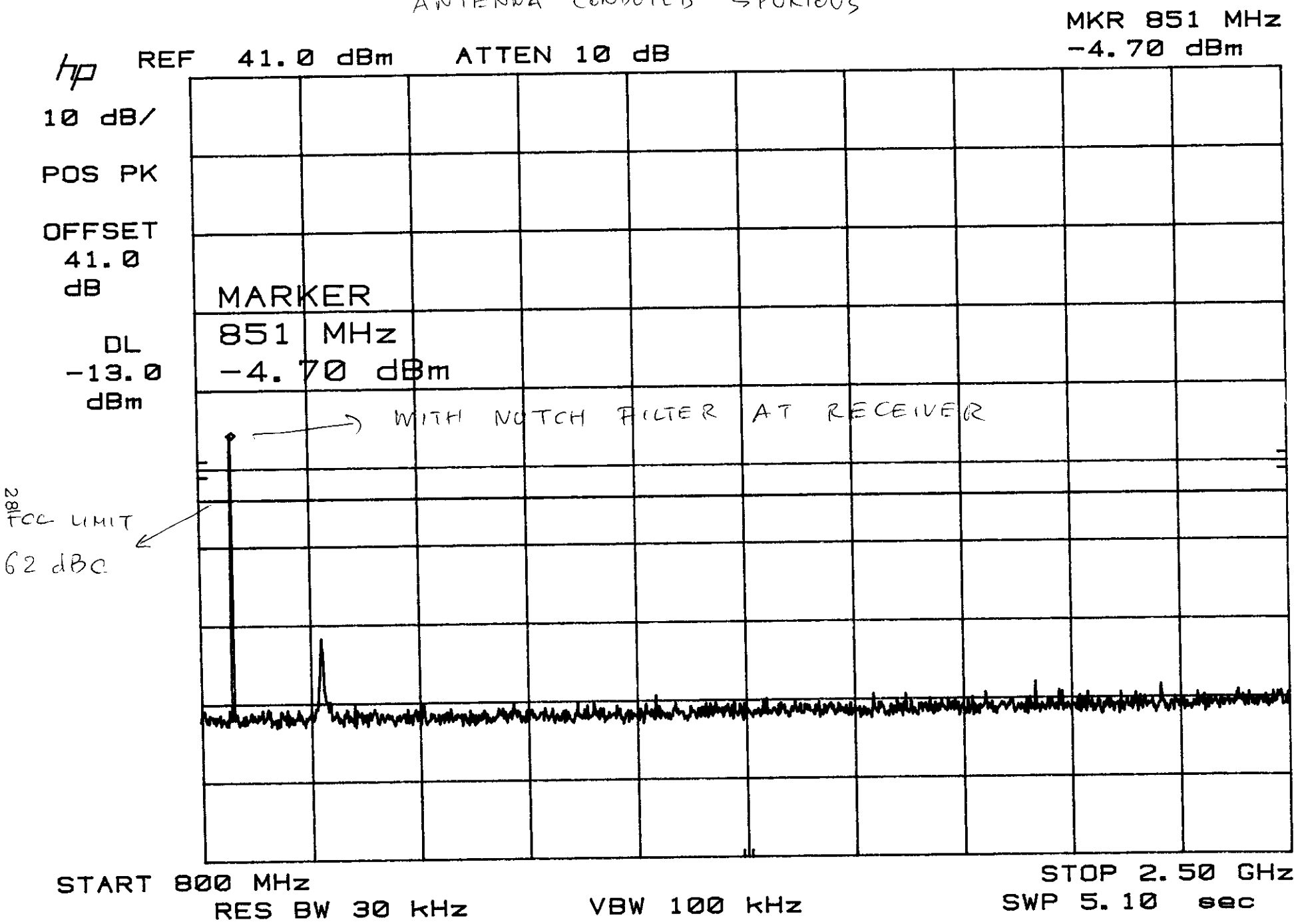
Scan the frequency spectrum from the lowest radio frequency generated in the equipment through the 10th harmonic of the carrier frequency.

Test Results: See Plots Following Figure 4.

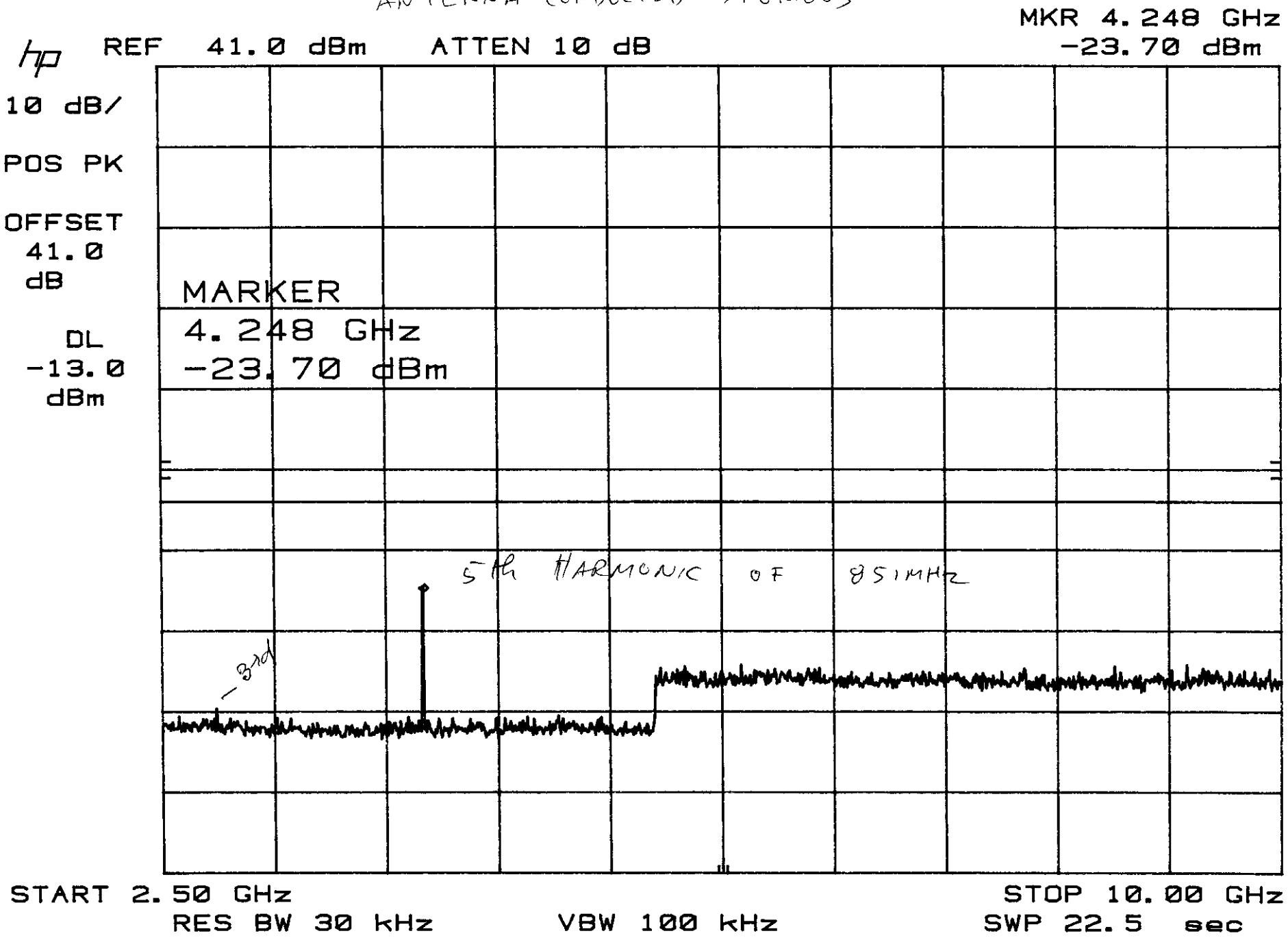
All spuirious antenna conducted emissions are below the FCC specifications.

RS8-1DD-MSI

ANTENNA CONDUTED SPURIOUS

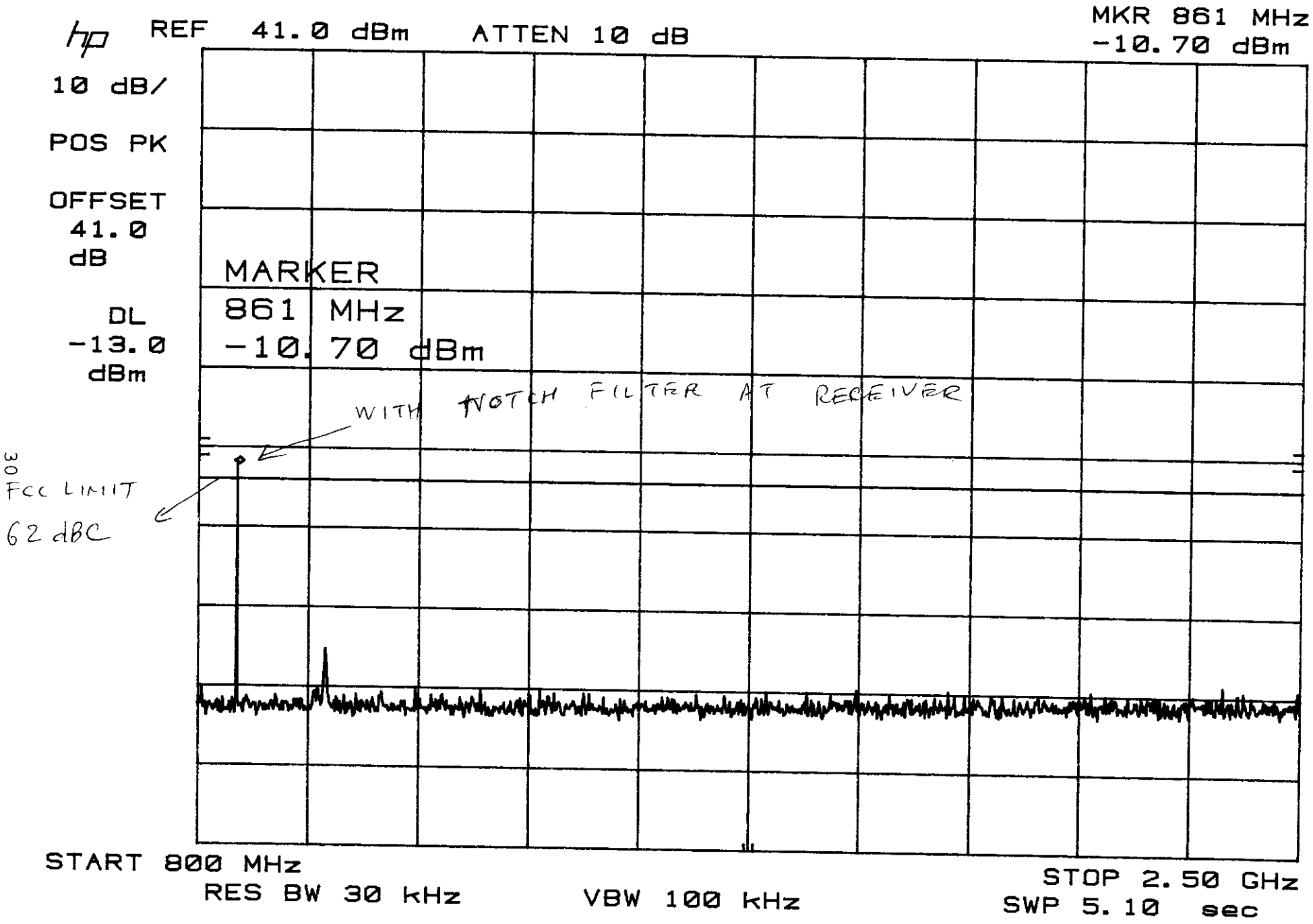


RSB - ADD - MSI
ANTENNA CONDUCTED SPURIOUS



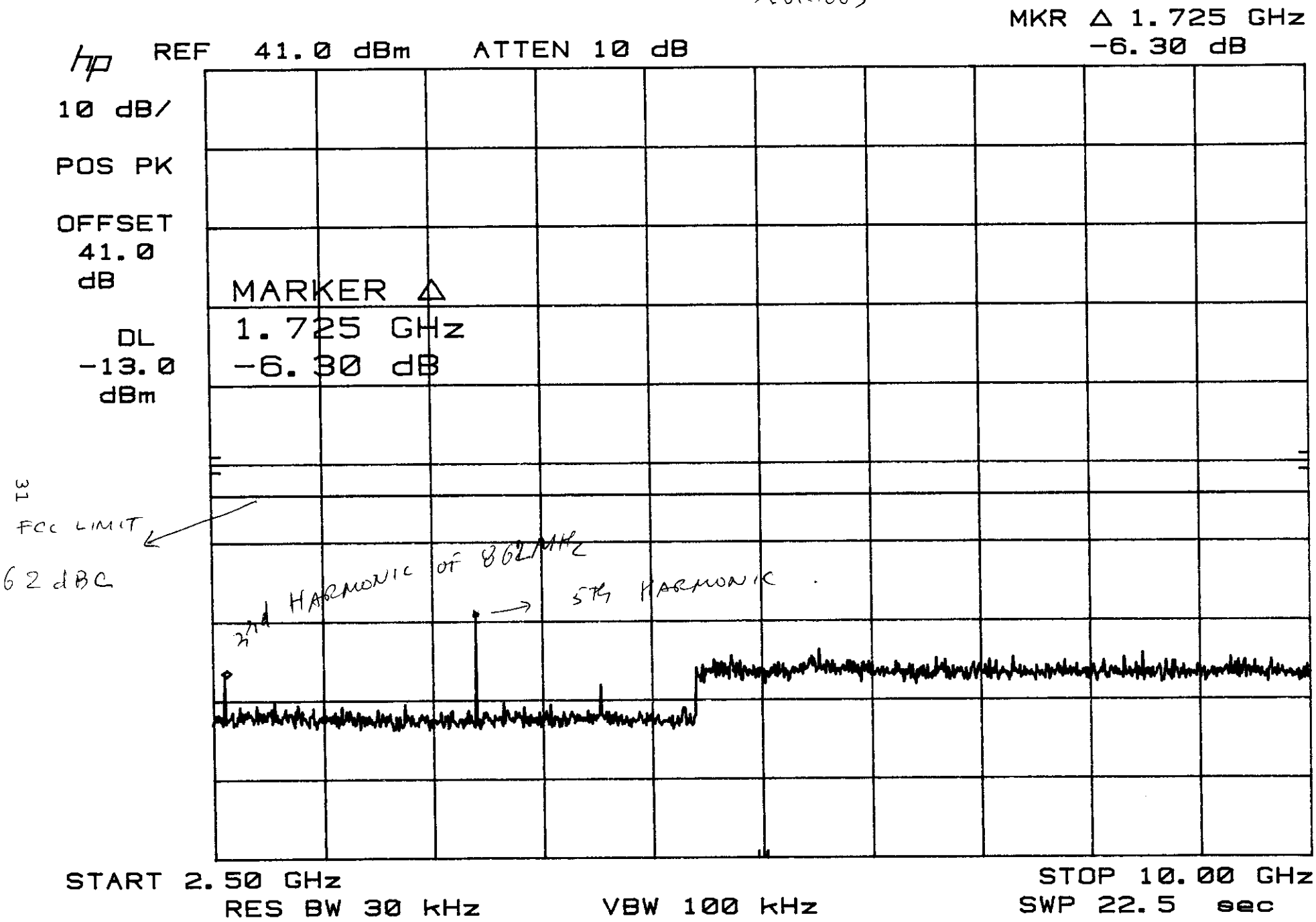
RSB_1DD_MSI

ANTENNA CONDUCTED SPURIOUS

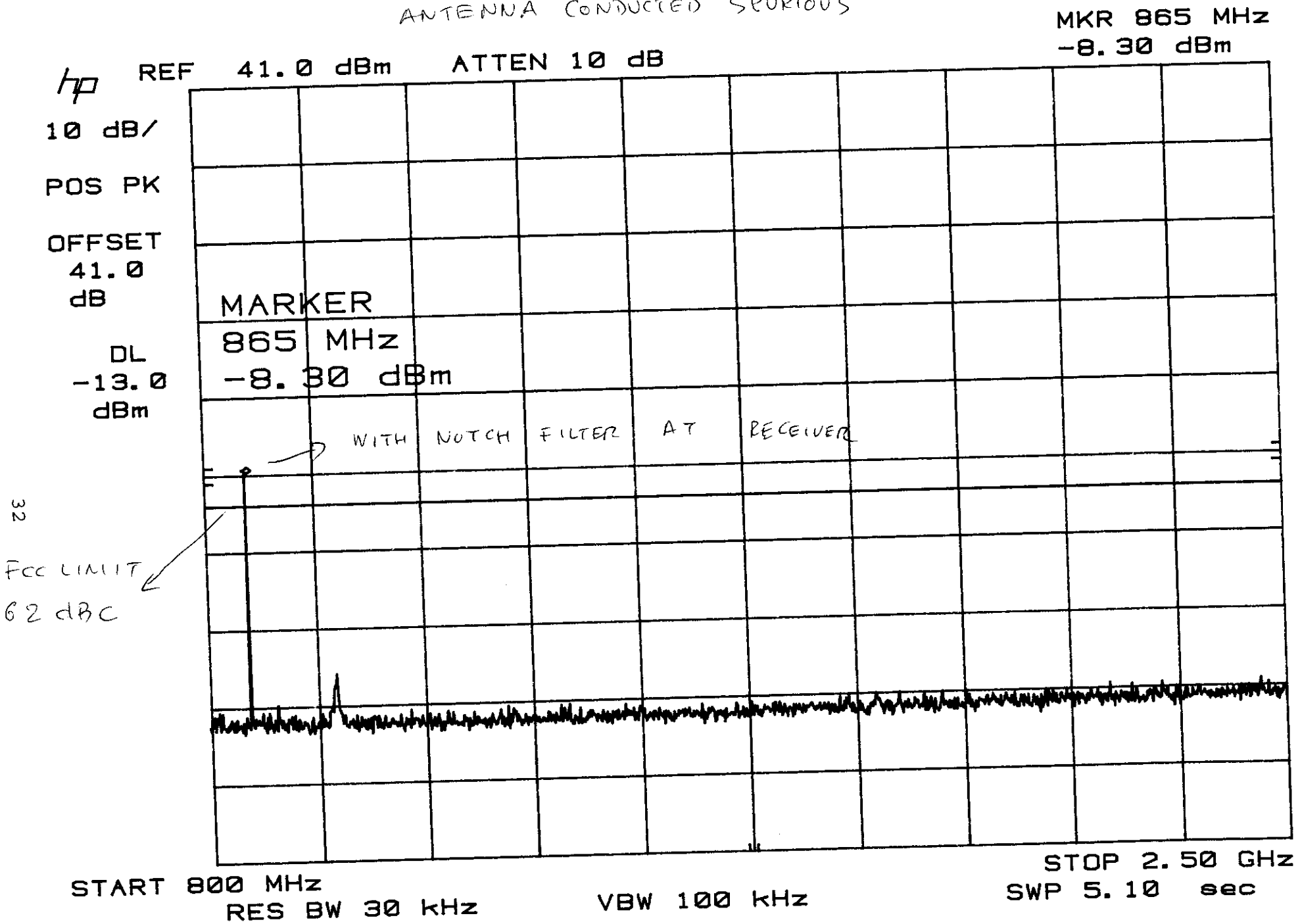


RSB - 1DD - MSI

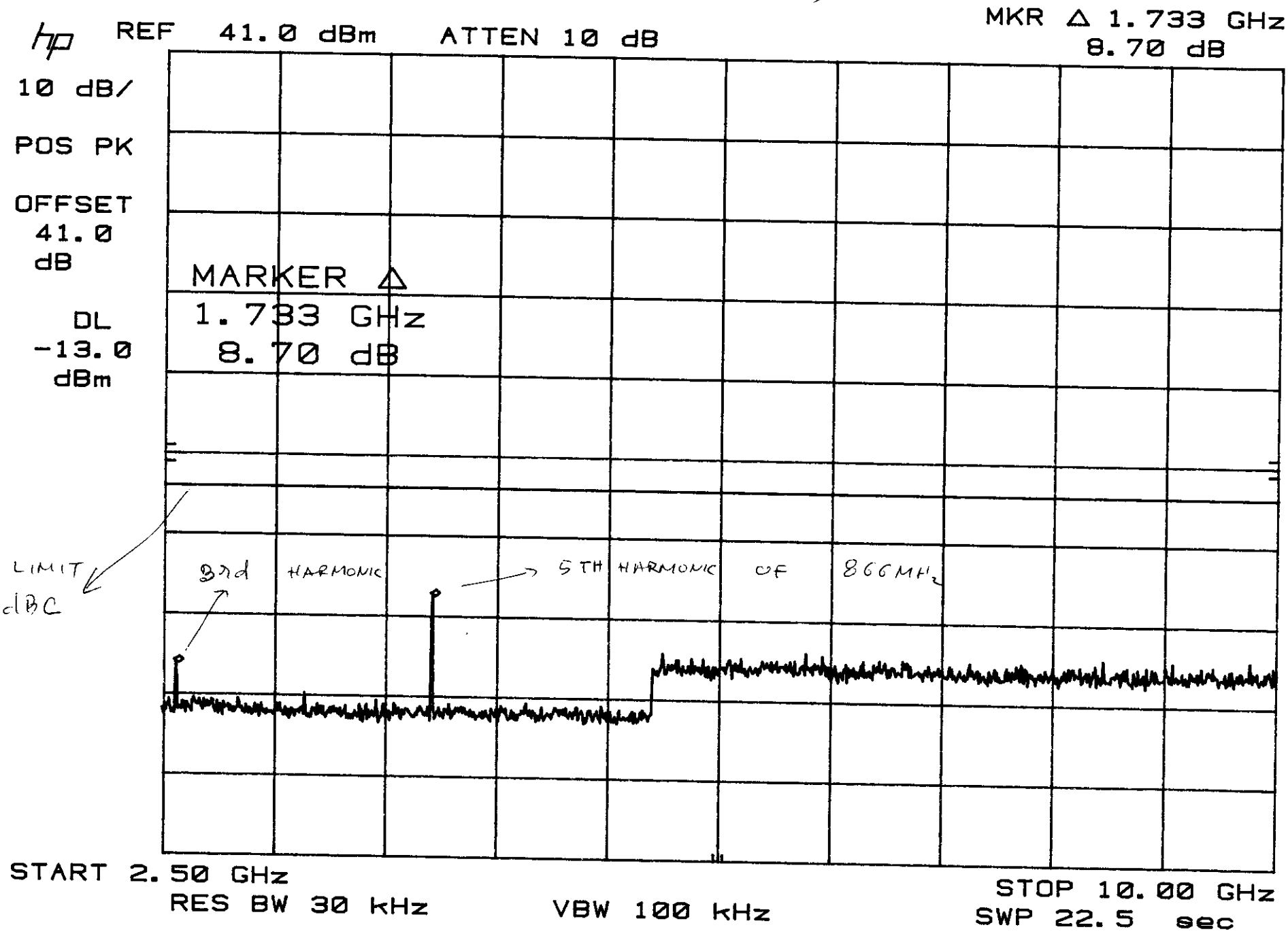
ANTENNA CONDUCTED SPURIOUS



R38_1DD - MSI
ANTENNA CONDUCTED SPURIOUS



RS8-1DD-MSI
ANTENNA CONDUCTED SPURIOUS



SPURIOUS RADIATED SIGNAL MEASUREMENTS

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

Date 4-7-98 Pass X Fail _____ (at Freq. _____)

EUT RF Power Amplifier Operating Power 80 Watts

Part No. RS8-1DD-MSI Operating Mode Saturated

Serial No. _____ Test Engineer Bry. Bz

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 CARR-IER (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 (Ro x Po)$^{1/2}$

Ro = Amplifier Output Impedance (Ohms) 50 Ω

Po = Amplifier Output Power (Watts) 80 W

Conversion from μV/m to dBμV/m = (μV/m) log x 20 = 146.4

FCC Limit = 43 + 10·log PO 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.