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## **TEST REPORT FCC Part 22 Type Acceptance**

**Spectrian  
Power Amplifier  
Model: MCPS2350-4-800**

**FCC ID: I20MCPS2000**

Report # J98033279

Date of Report: December 1, 1998

Total No. of Pages Contained in this Report: 33

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FCC Part 22

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## 1.0 Introduction

### 1.1 Test Summary

FCC RULE	DESCRIPTION OF TEST	RESULT	PAGE
2.985	RF Power Output	Pass	4
22.913	Effective Radiated Power	N/A	8
2.989(c), 22.917(b)(d)	Emission Limitation, Occupied Bandwidth.	Pass	9
22.917(e)	Spurious emissions at antenna terminals	Pass	13
2.993, 15.109	Field Strength of Spurious Radiation	Pass	27
15.107	Line Conducted Emissions	N/A	31
2.995(a)	Frequency Stability vs. Temperature	N/A	32
2.995(d)(2)	Frequency Stability vs. Voltage	N/A	33



November 30, 1998

\_\_\_\_\_  
Barry Smith  
Test Engineer

\_\_\_\_\_  
Date

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## 1.2 Product Description

The Spectrian Model MCPS2350-4-800 is a power amplifier operating in the frequency range 869 MHz - 894 MHz

For more details, refer to the users manual.

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## 2.0 **RF Power Output**, FCC §2.985(a)

### 2.1 Test Procedure

The amplifier's output was connected to a power meter and spectrum analyzer through a calibrated coaxial attenuator and directional coupler. The FM test signal was applied to the amplifier's input from a signal generator, and the input level was adjusted to obtain 55.4 dBm average output power.

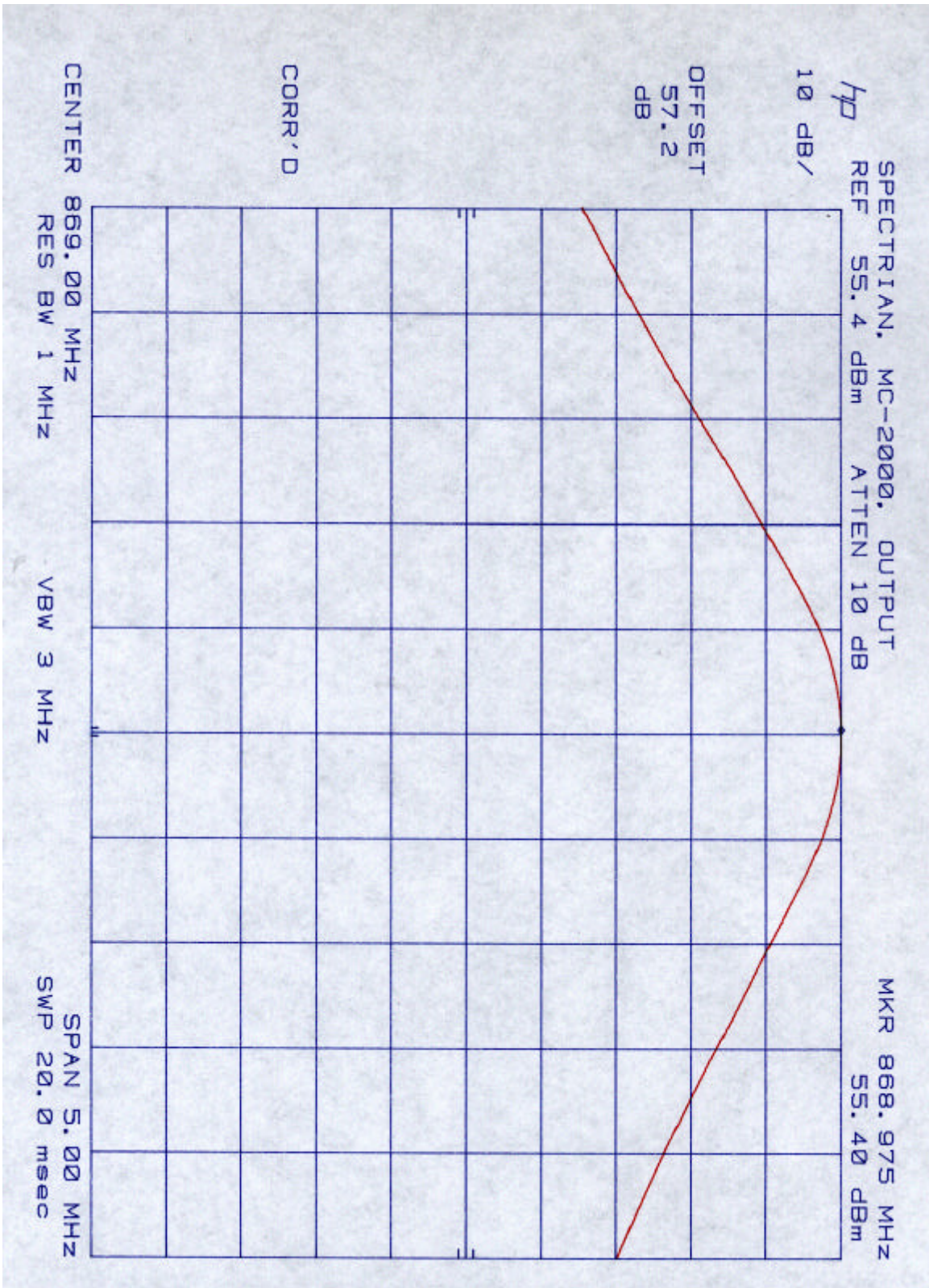
### 2.2 Test Equipment

Hewlett Packard 8482A Power Sensor, 438A Power Meter  
Hewlett Packard 8594E Spectrum Analyzer, 9 kHz - 2.9 GHz

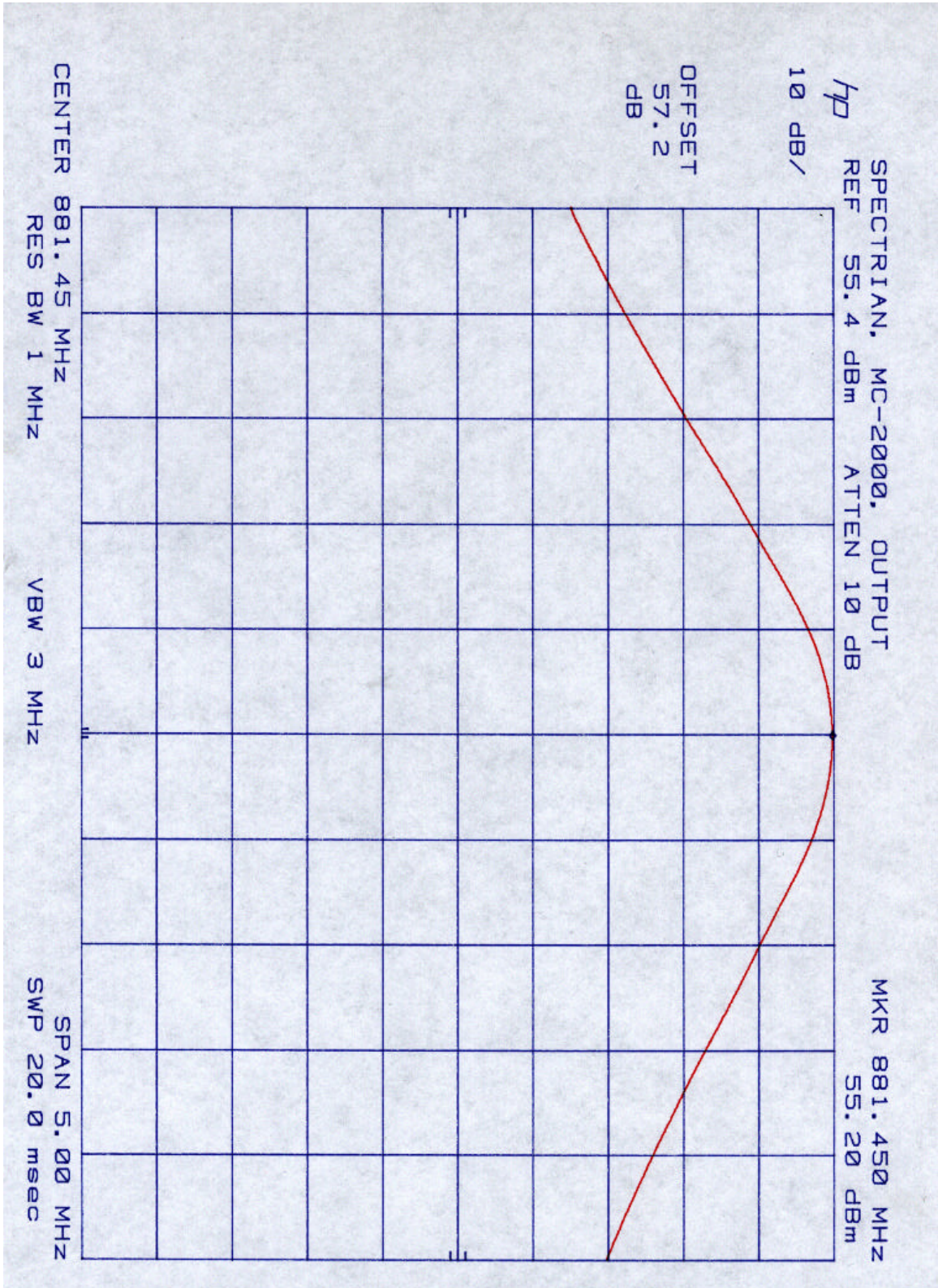
### 2.3 Test Results

The average output power is 55.4 dBm (or 350W) measured with a power meter. See also plots attached.

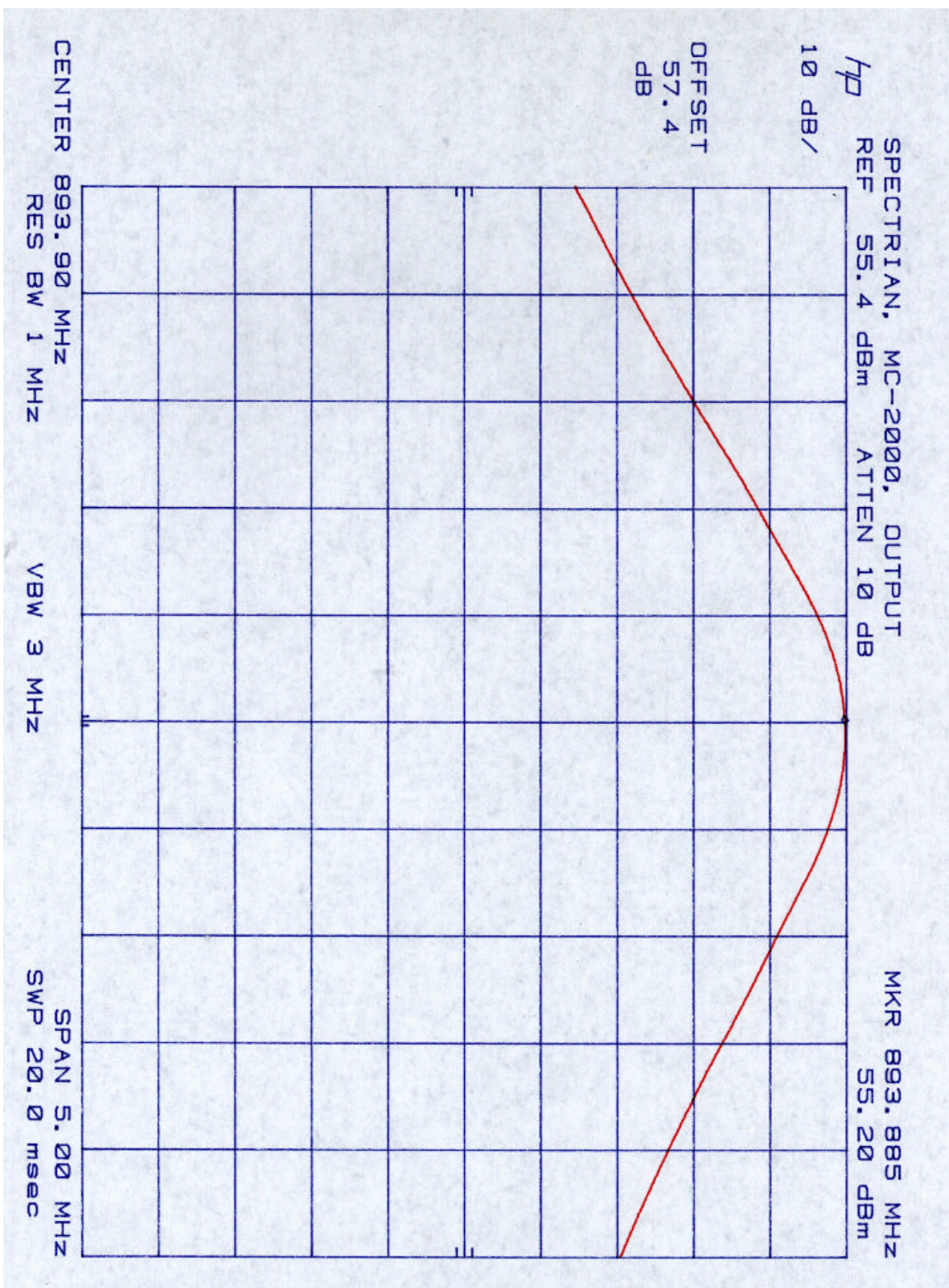
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## 3.0 **Effective Radiated Power**, FCC §22.913

Requirement: The Effective Radiated Power (ERP) must not exceed 500 Watts.

### 3.1 Test Procedure

Assuming that the EUT has an ideal matching to an antenna the ERP can be calculated as follows:

$$\text{ERP}_{(\text{dBm})} = P_{(\text{dBm})} + 10 \log G = 55.4 + 2.15 = 57.6 \text{ dBm}$$

where: G is the gain of a half-wave dipole

### 3.2 Test Results

Not Applicable

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## 4.0 **Occupied Bandwidth, Emission Limitations.** FCC §2.989(I), §22.917

### 4.1 Test Procedure

The RF output of the EUT was connected to the input of the spectrum analyzer through sufficient attenuation. The spectrum with no modulation was plotted.

The EUT was set up to transmit a FM signal and the spectrum with modulation was plotted.

### 4.2 Test Equipment

Gigatronics 8542C Power Meter

HP 8566B Spectrum Analyzer, 100 Hz - 22 GHz

Tektronix 2784 Spectrum Analyzer, 100 Hz - 40 GHz

HP 7470A Plotter

### 4.3 Test Results

For test results refer to the attached plots 4.3.a, 4.3.b showing the emissions on the amplifier's output.

The EUT passed the F3E emission mask tests.

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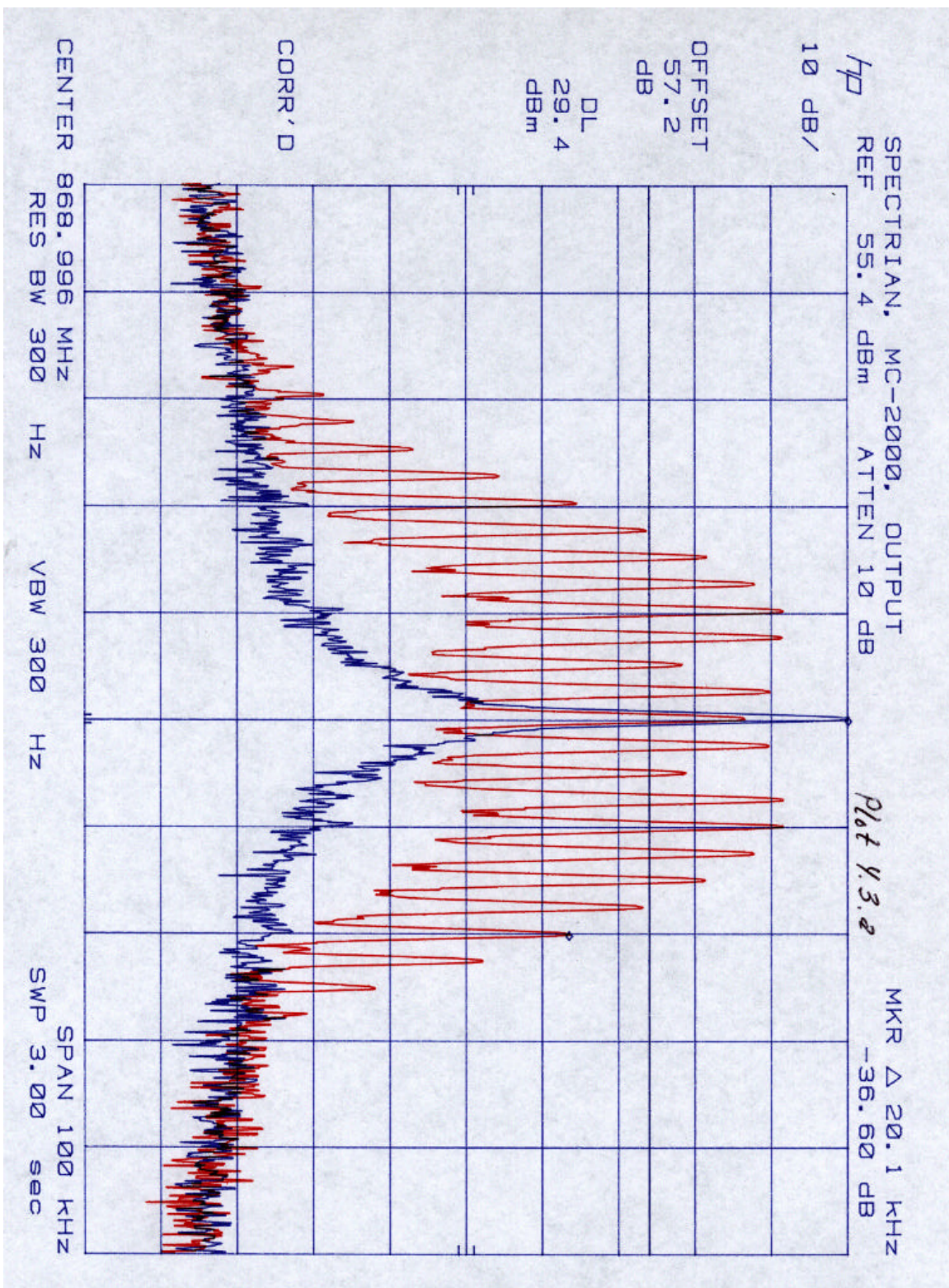
Spectrian, Power Amplifier

Date of Test: November 24, 1998

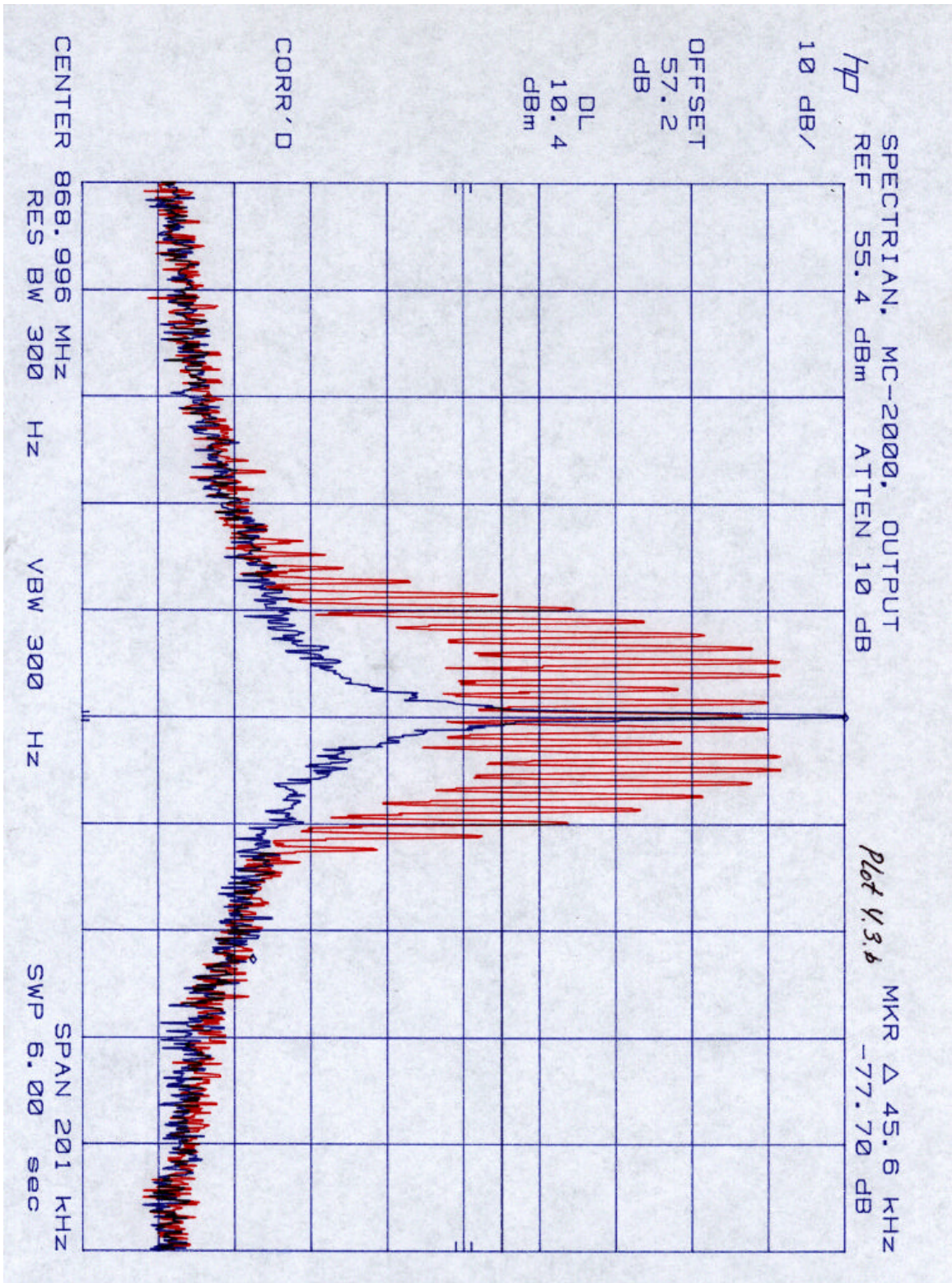
Emission Limitations, Occupied Bandwidth Plots:

<b>Plot Number</b>	<b>Description</b>
4.3.a	Output, 869 MHz, FM Modulation, 2.5 kHz Tone, 12 kHz Deviation, span 100 kHz.
4.3.b	Output, 869 MHz, FM Modulation, 2.5 kHz Tone, 12 kHz Deviation, span 200 kHz.

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## 5.0 **Out of Band Emissions at Antenna Terminals** , FCC §2.991, §22.917 (e)

### Out of Band Emissions:

The power of emissions must be attenuated below the power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least  $43+10 \log P$  dB.

### 5.1 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The FM modulation signal was set up. Sufficient scans were also taken to show the any out-of-band emissions up to 10th harmonic for 3 fundamental frequencies: 869 MHz, 881.5 MHz, and 894 MHz.

### 5.2 Test Equipment

HP 8566B Spectrum Analyzer, 100 Hz - 22 GHz  
Tektronix 2784 Spectrum Analyzer, 100 Hz - 40 GHz

### 5.3 Test Results

There are no emissions detected above the specified limit.

The EUT passed the test. For test results, refer to the attached plots.

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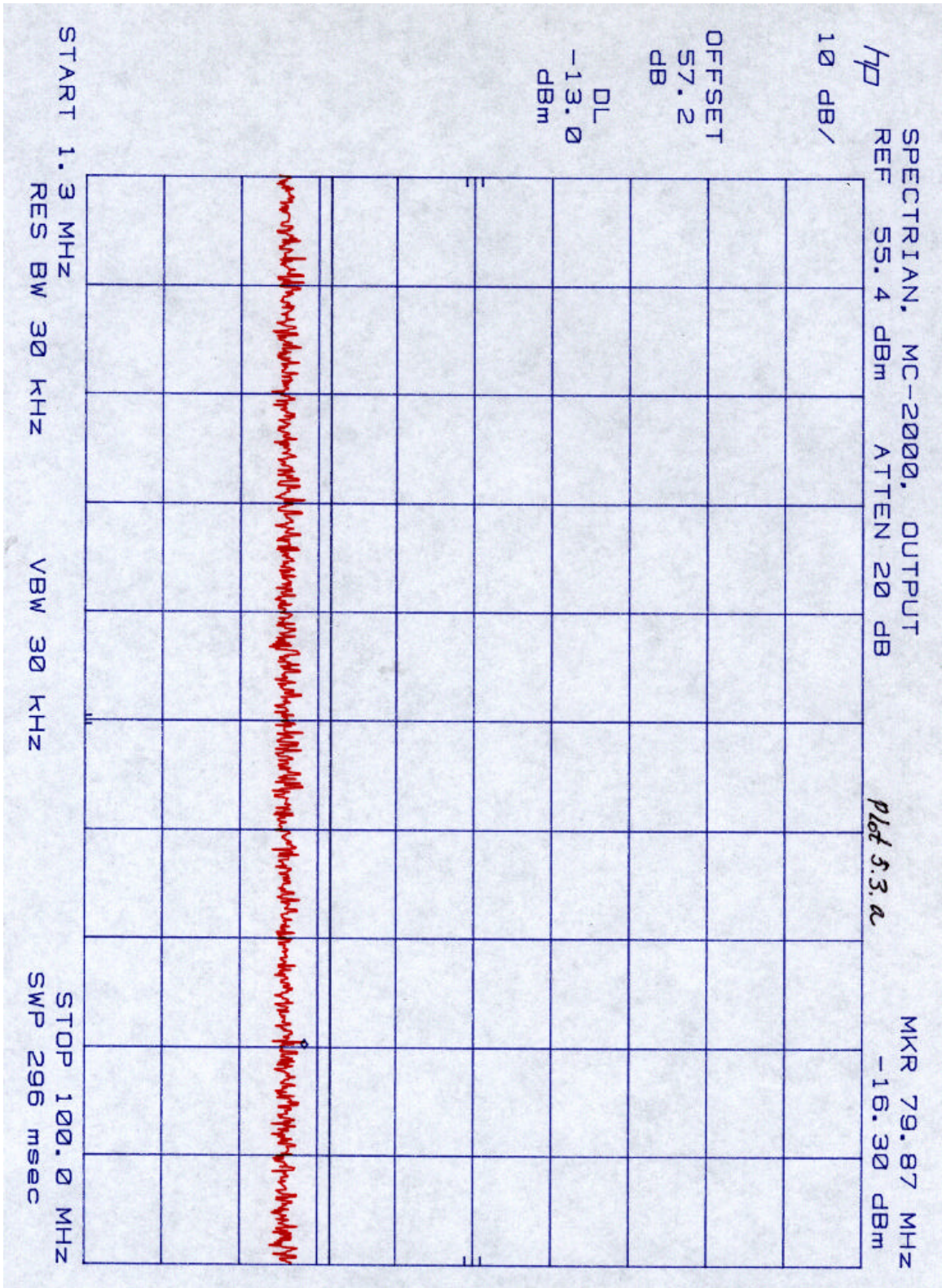
Spectrian, Power Amplifier

Date of Test: November 24, 1998

Plots of Out-of-Band Emissions at Antenna Terminal are attached.

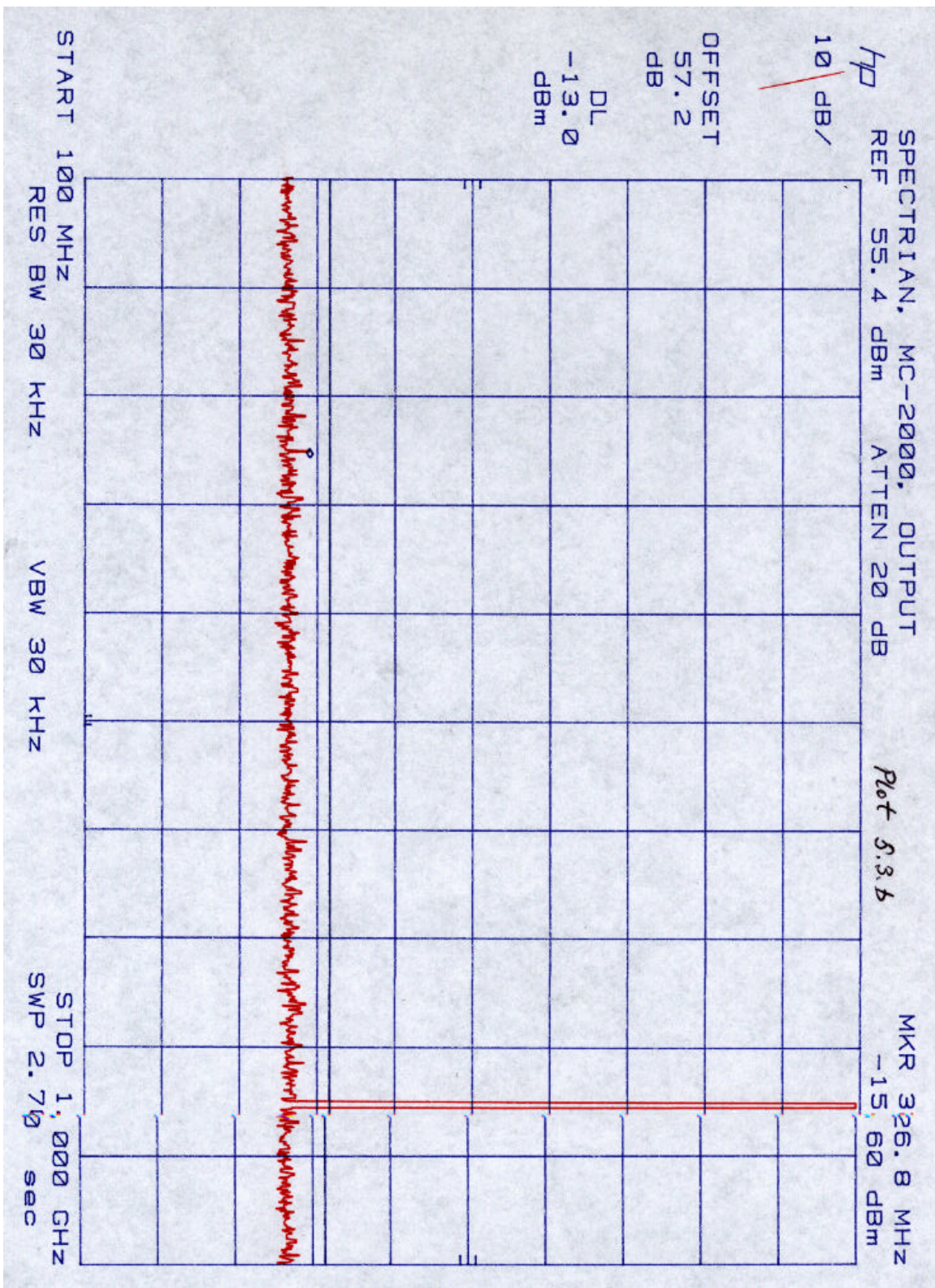
<b>PLOT NUMBER</b>	<b>DESCRIPTION</b>
5.3.a	869 MHz, Scan 1 MHz - 100 MHz
5.3.b	869 MHz, Scan 100 MHz - 1 GHz
5.3.c	869 MHz, Scan 1 GHz - 2.5 GHz
5.3.d	869 MHz, Scan 2.5 GHz - 10 GHz
5.3.e	881.5 MHz, Scan 1 MHz - 100MHz
5.3.f	881.5 MHz, Scan 100 MHz - 1 GHz
5.3.g	881.5 MHz, Scan 1 GHz - 2.5 GHz
5.3.h	881.5 MHz, Scan 2.5 GHz - 10 GHz
5.3.i	894 MHz, Scan 1 MHz - 100 MHz
5.3.j	894 MHz, Scan 100 MHz - 1 GHz
5.3.k	894 MHz, Scan 1 GHz - 2.5 GHz
5.3.l	894 MHz, Scan 2.5 GHz - 10 GHz

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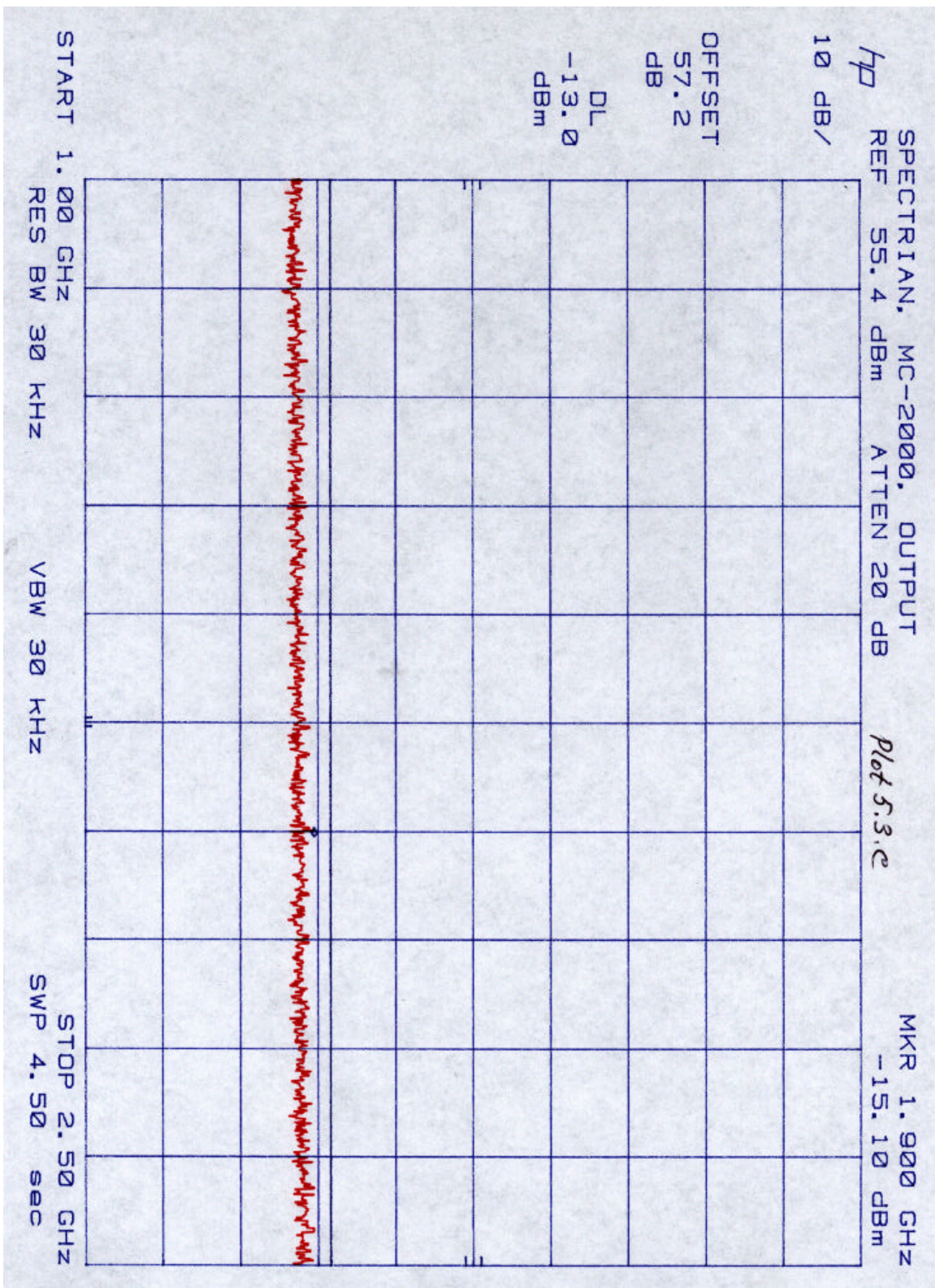




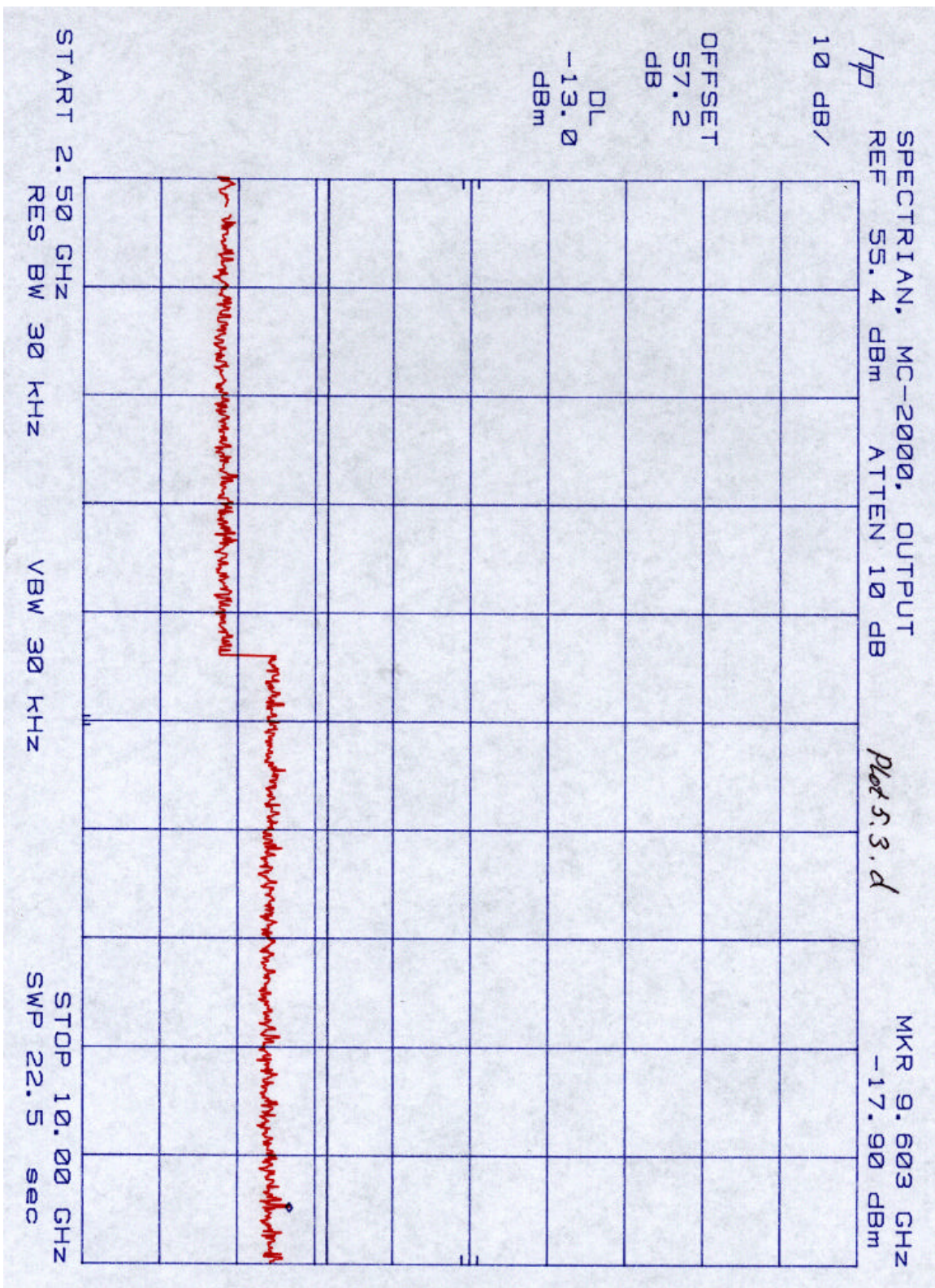
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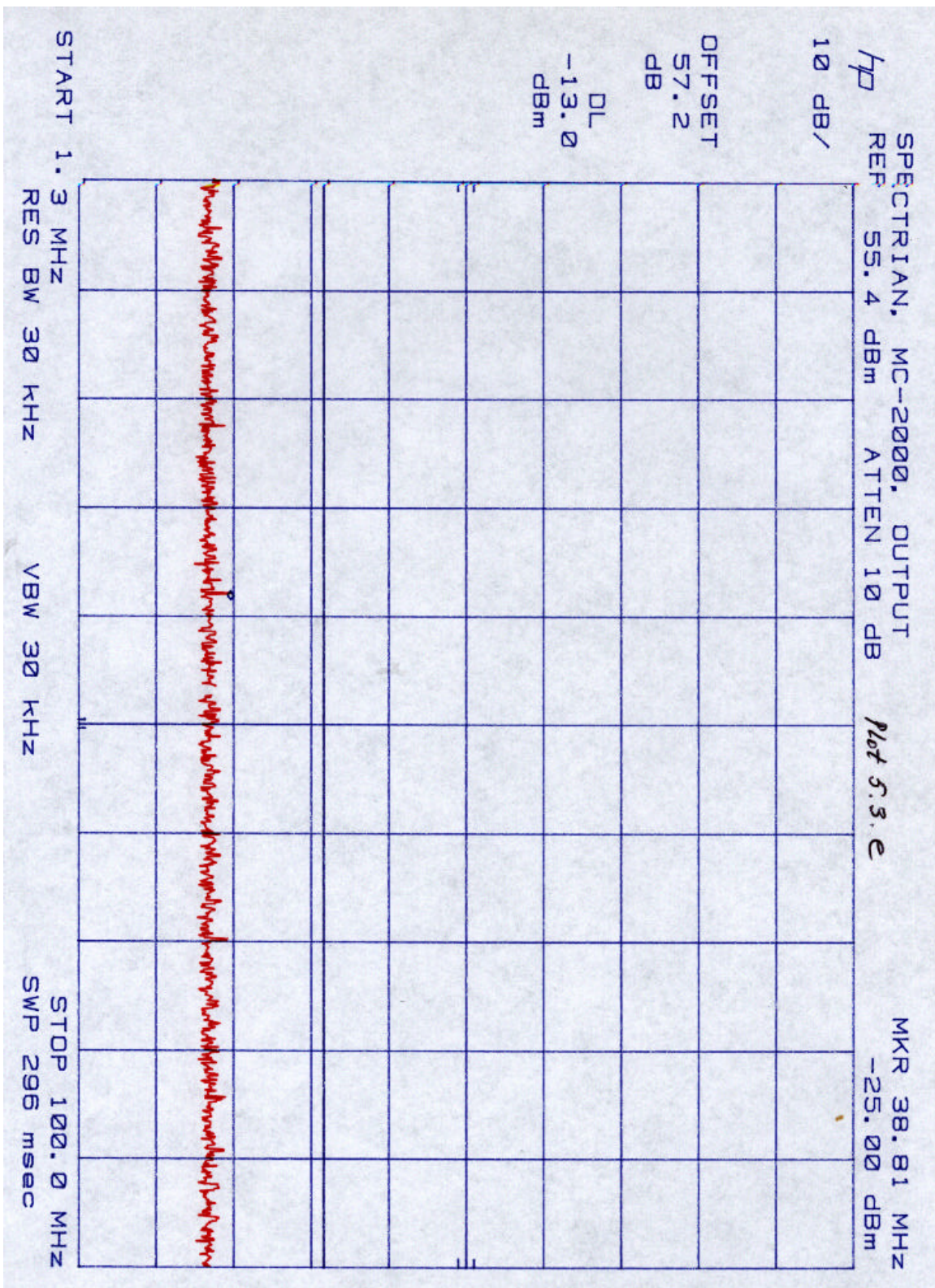
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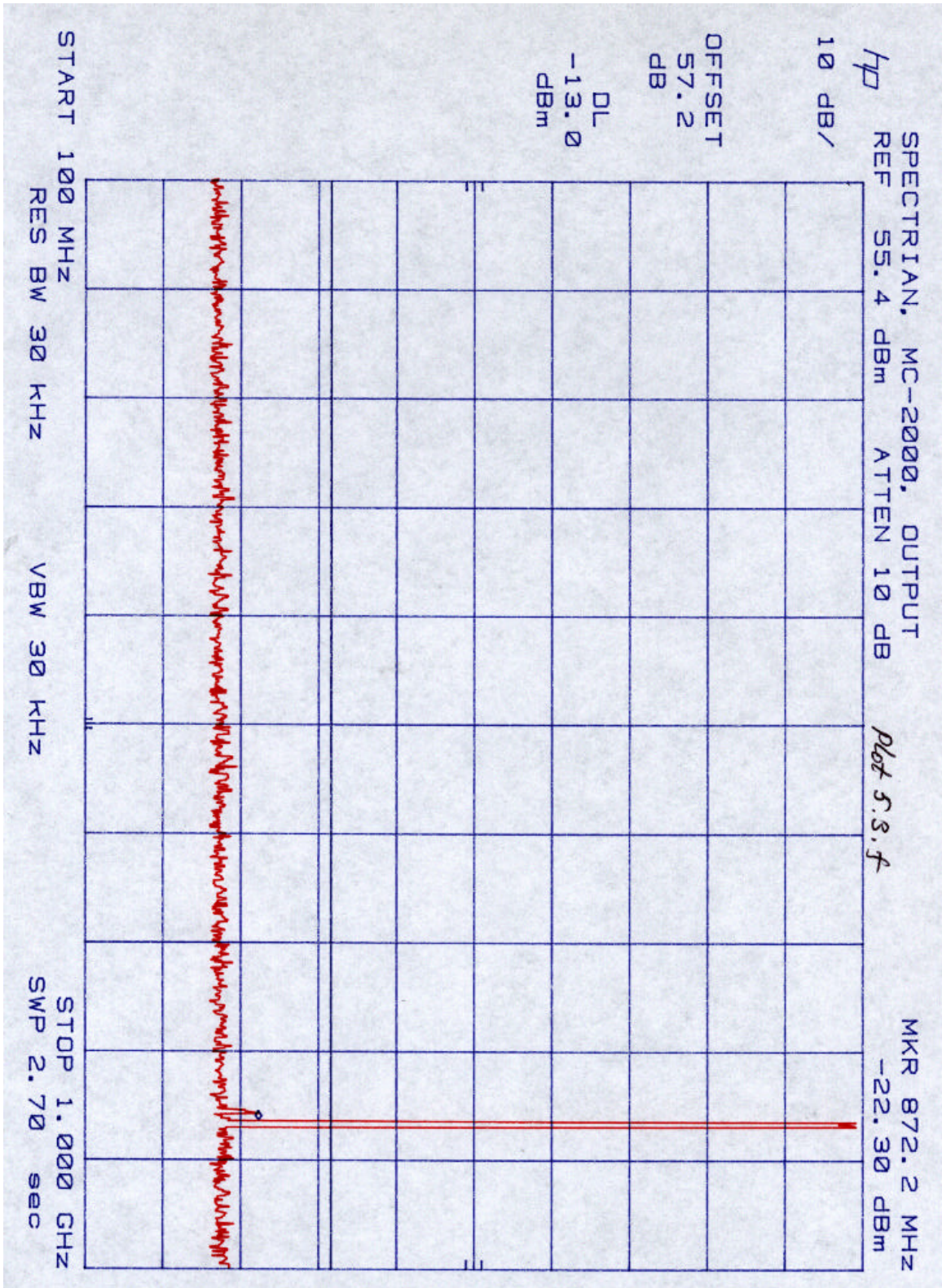
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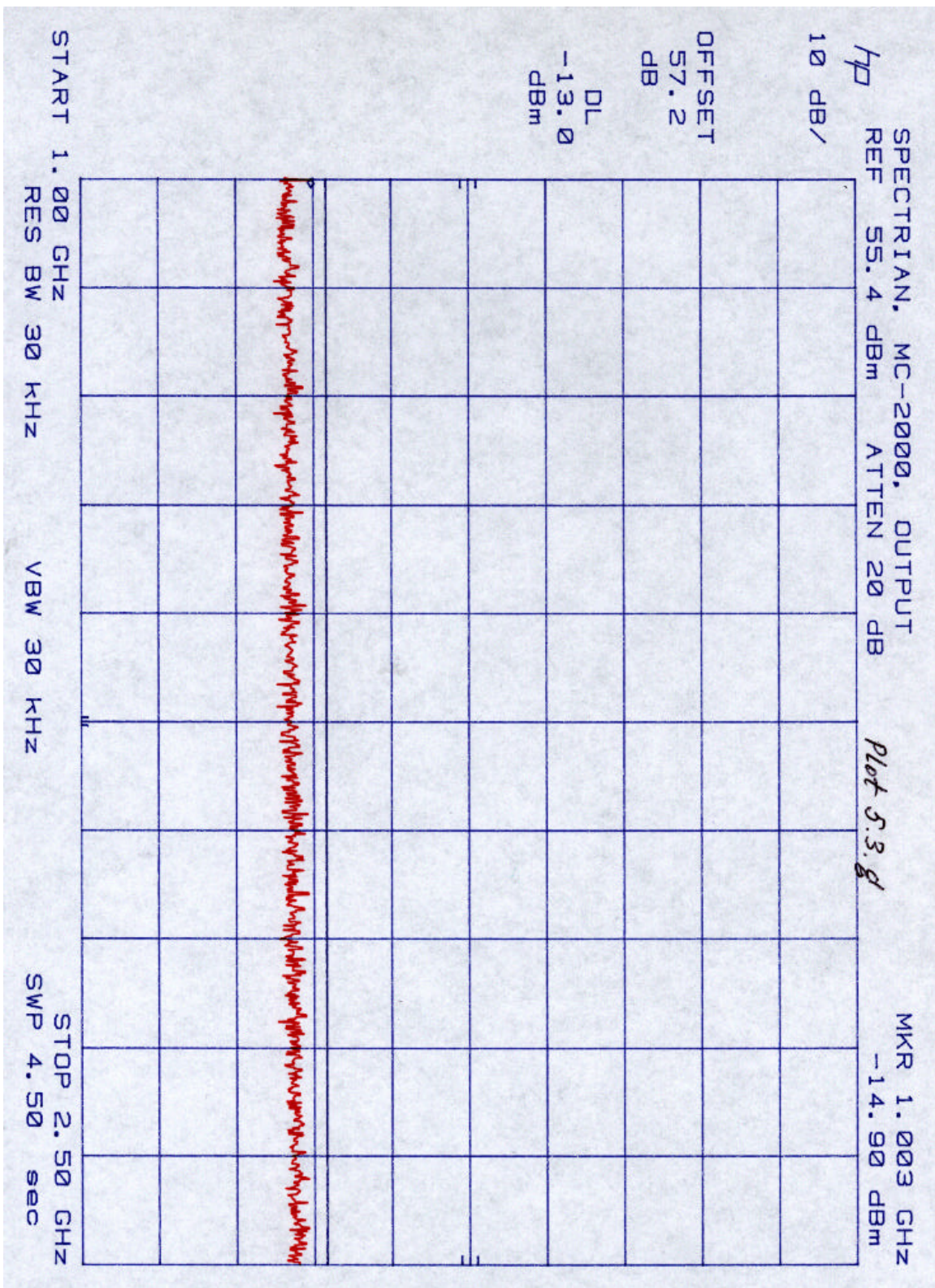
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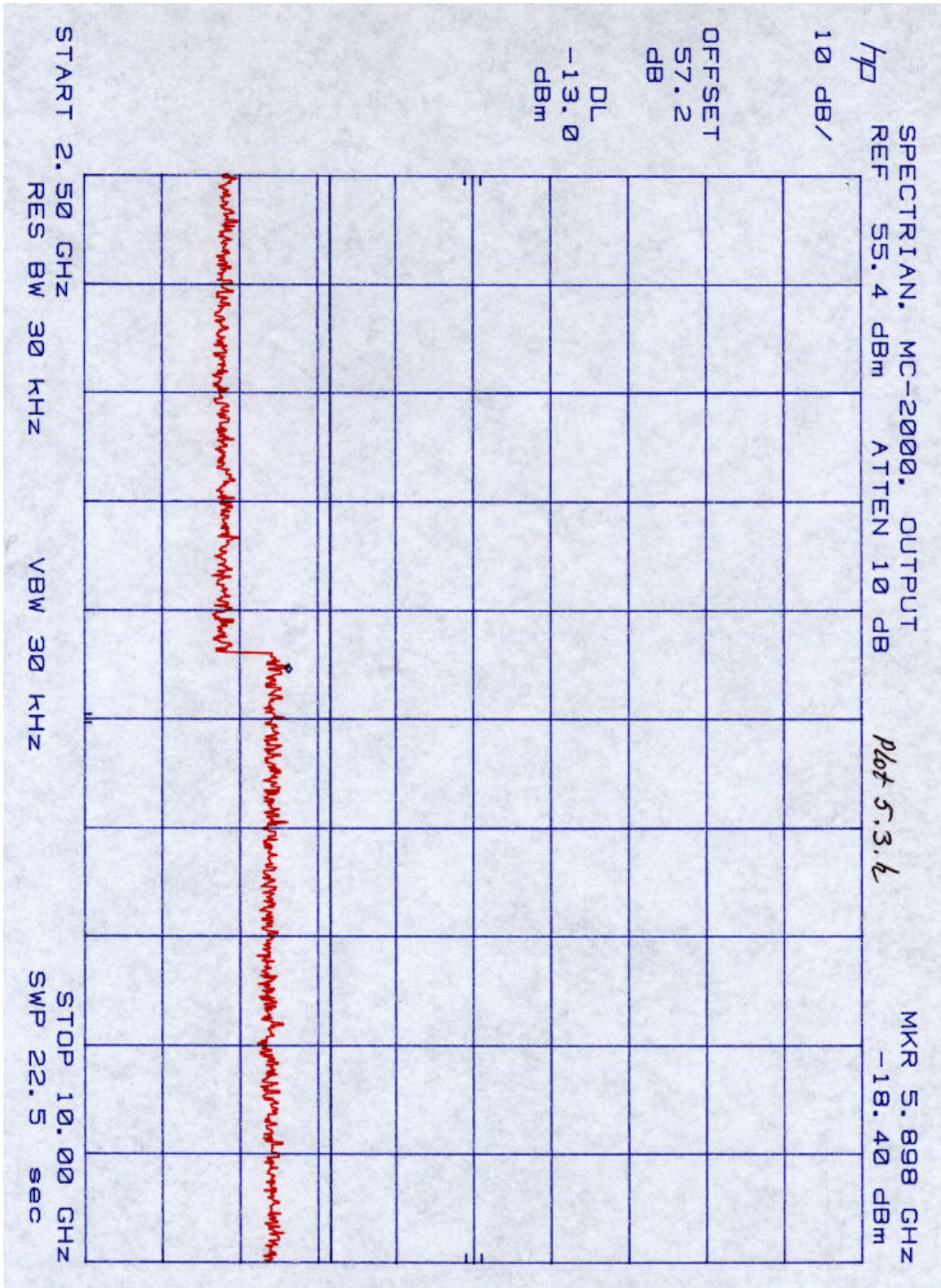
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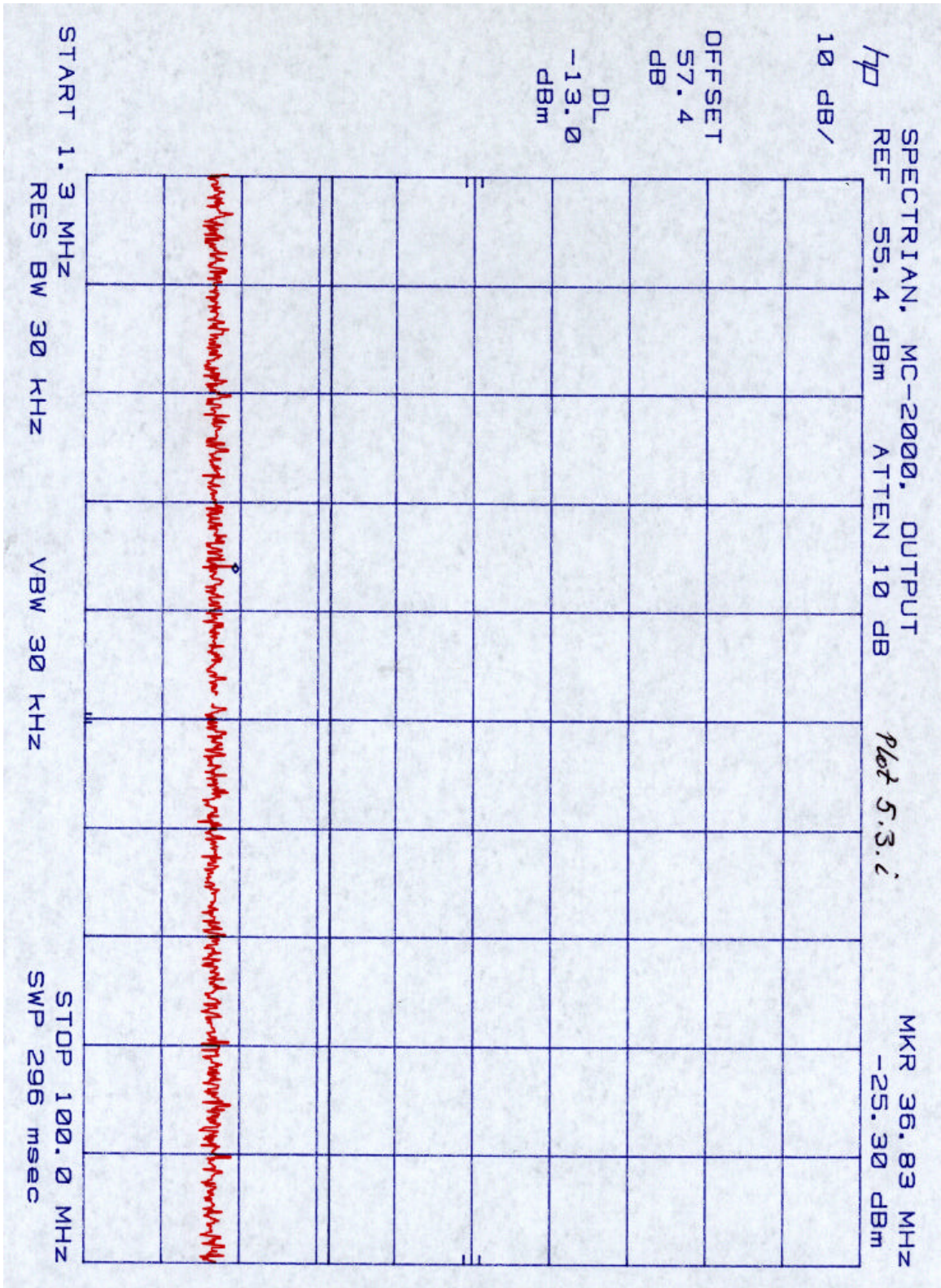
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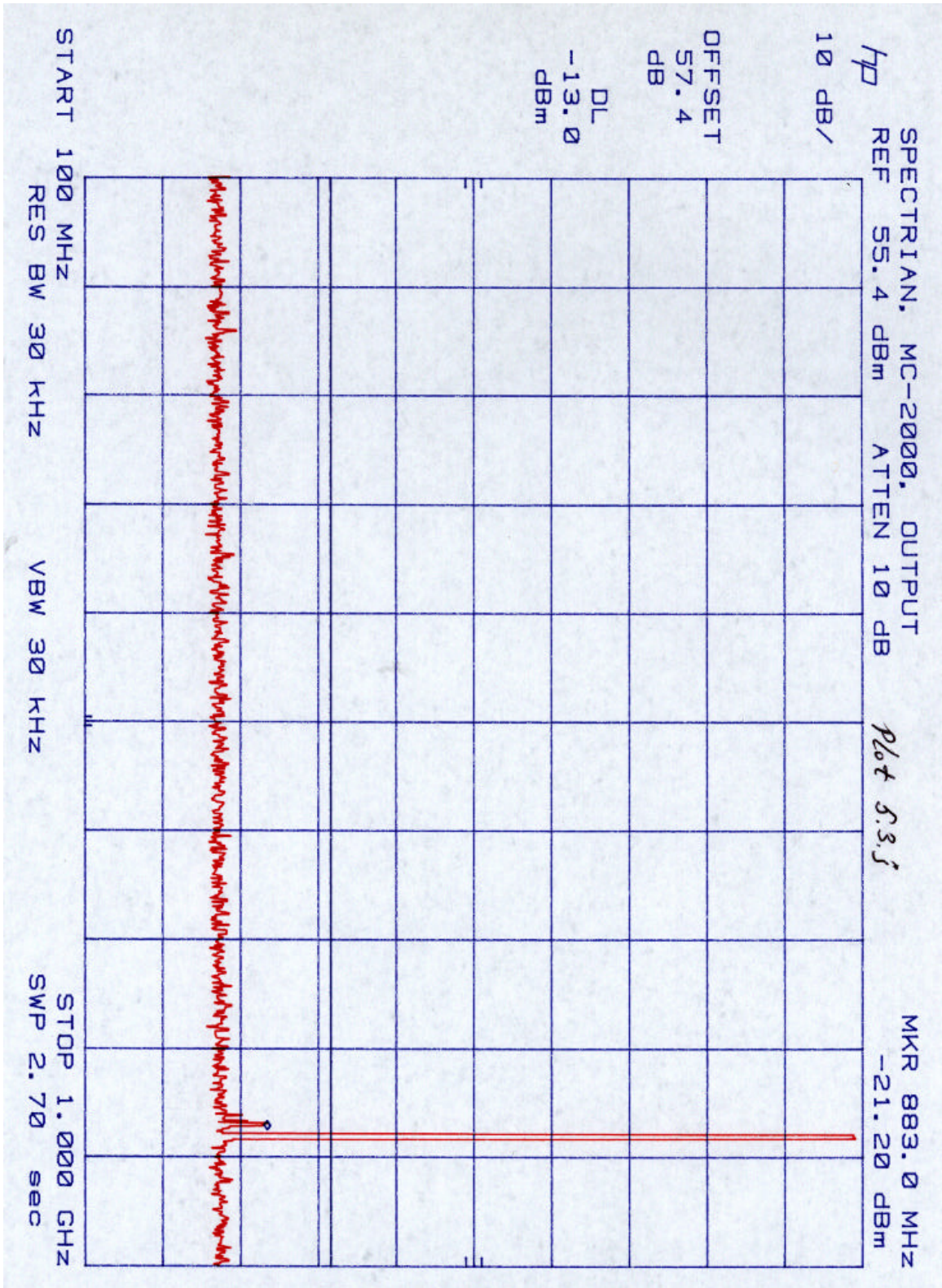


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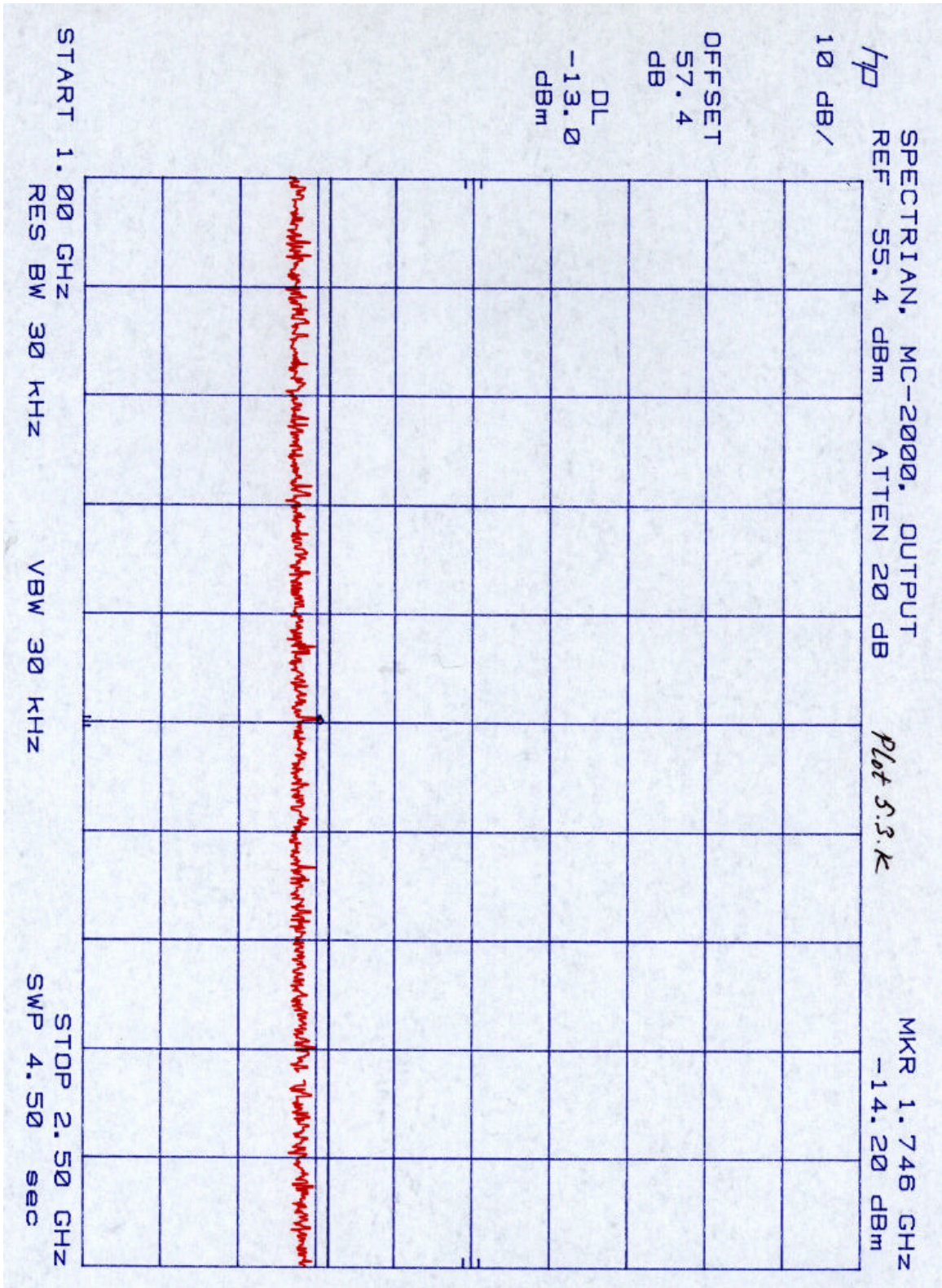




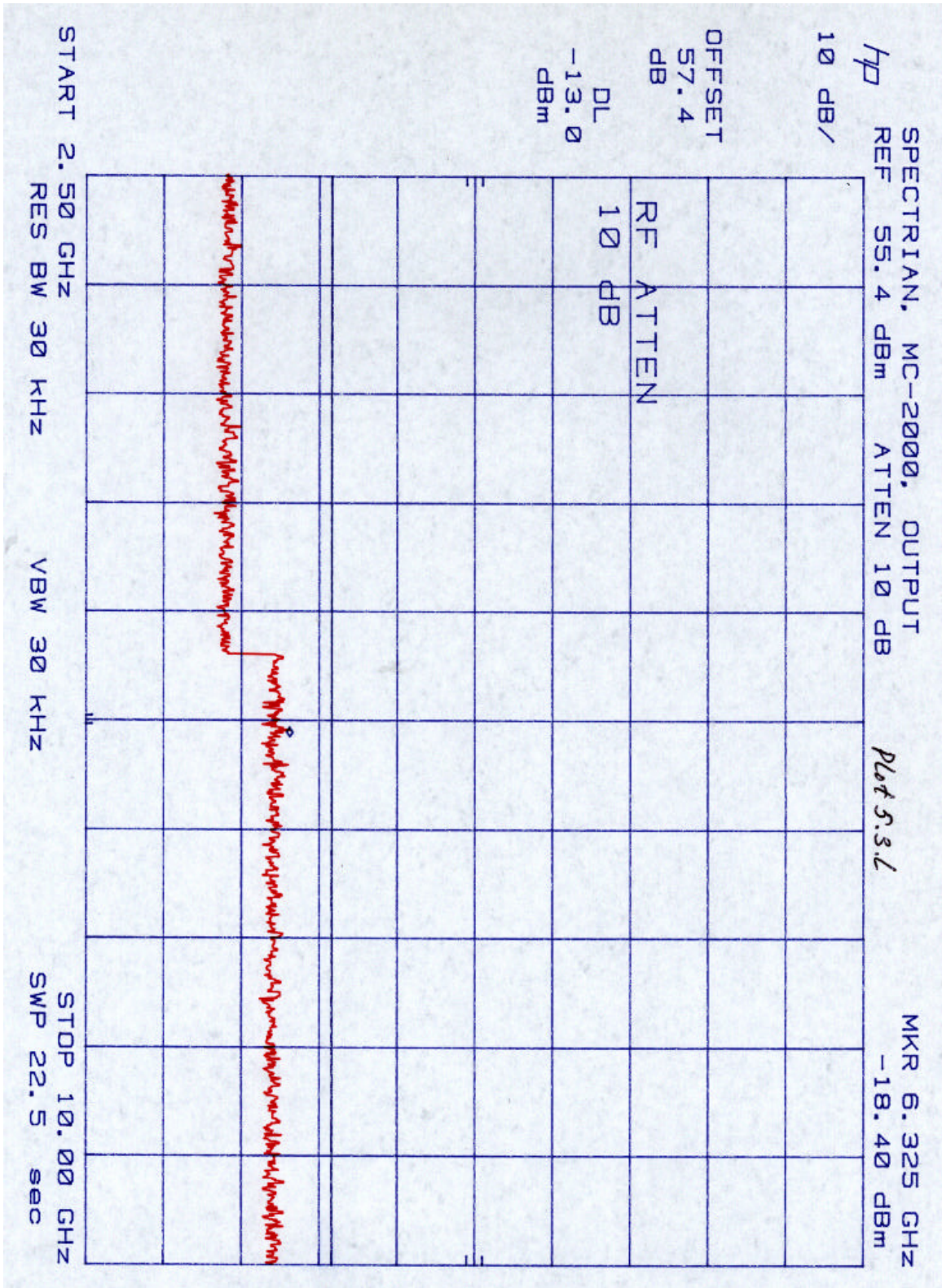
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## 6.0 Field Strength of Spurious Radiation, FCC § 2.993, §15.109

### 6.1 Test Procedure

A 50 Ohm coaxial load was connected to the amplifier output. The amplifier was placed on a wooden turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

The spurious harmonic attenuation was calculated as the difference between E in dB(uV/m) at the fundamental frequency and at the spurious emission frequency.

The Field Strength at the fundamental frequency (in dBuV/m) was calculated using the formula:

$$E_{dB(uV/m)} = P_{dBm} + 10\text{Log } 30 + 10\text{Log } G - 20\text{Log } D + 90 = 152.8 \text{ dB}(uV/m)$$

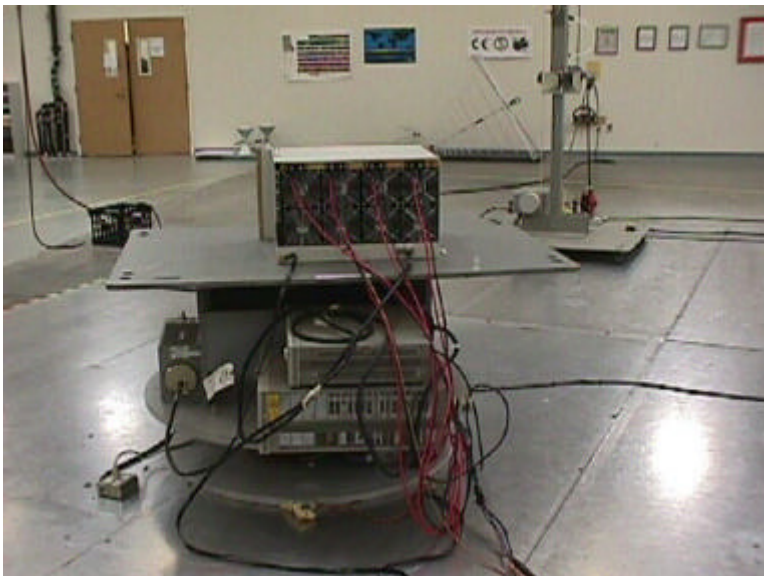
where: P = the output power,  
G=1.64 for the gain of half-wave dipole,  
D= 3 m for the distance

### 6.2 Test Equipment

EMCO 3115 Horn Antenna  
HP 8566B Spectrum Analyzer  
Tektronix 2784 Spectrum Analyzer  
High Pass Filter  
CDI Preamplifier P1000

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## 6.3 Test Configuration Setup - Radiated Emissions



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## 6.4 Test Results

The minimum spurious attenuation was found as 76.6 dB. Please refer to the attached data sheets. Since the limit for spurious attenuation is 68.4 dB, the EUT passed the test by 8.2 dB.

## ITS Intertek Testing Services

1365 Adams Court, Menlo Park CA 94025

### Radiated Emissions Test Data

Company: Spectrian  
 EUT:  
 Project #:  
 Test Mode: Operating at 869MHz

Model #: 4 brick  
 S/N or FCC#:  
 Engineer: Barry  
 Date of Test: 11/24/98 Initial:

Antenna	Pre-Amp	Cable A	Cable B	OCF	Standard_	FCC PART 22
Number: 8	8	12	0	0	Limits_	3
Model: EMCO 3115 CDI, P1000 Green M+L			None	None	Test Distance_	3 meters

Goal = 68.4

Frequency MHz	Reading dB(uV)	Det. P/A/Q	Ant. Pol. H/V	Ant. Factor dB(1/m)	Pre-Amp dB	Insert. Loss dB	D. F. dB	Net dB(uV/m)	Fundamental Field Strength	Atten dB
1738.0	80.4		v	24.9	29.4	0.0	0.0	75.9	152.8	76.9
2607.0	69.1		v	27.9	28.4	2.3	0.0	70.9	152.8	81.9
3476.0	67.6		v	30.2	27.8	2.5	0.0	72.5	152.8	80.4
4345.0	57.2		v	32.5	27.9	2.9	0.0	64.7	152.8	88.2
5214.0	56.6		v	33.1	28.3	3.5	0.0	64.9	152.8	87.9
6083.0	48.6		v	34.4	28.3	3.9	0.0	58.6	152.8	94.2
6952.0	48.8		h	34.0	28.0	4.2	0.0	59.0	152.8	93.8
7821.0	44.7		v	37.5	27.5	4.6	0.0	59.3	152.8	93.6
8690.0	38.4		v	37.3	27.1	4.7	0.0	53.3	152.8	99.5

- Notes:**
- a) P: Peak; A: Average; Q: Quasi Peak; H: Horizontal; V: Vertical; OCF: Other Correction Factor; DF: Distance Factor
  - b) Insert. Loss = Cable A + Cable B + OCF.
  - c) Negative signs (-) in Margin column signify levels below the limits.
  - d) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

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## 7.0 **Line Conducted Emissions**, FCC § 15.107

### 7.1 Test Procedure

Test procedure described in the ANSI C63.4 Standard was employed.

The EUT was connected to an AC line through the LISNs.

Both HOT and NEUTRAL leads were tested.

### 7.2 Test Configuration Setup - Line Conducted Emissions

Not applicable, the EUT is DC powered only.

### 7.3 Test Results

Not applicable, the EUT is DC powered only.



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## 8.0 **Frequency Stability vs Temperature**, FCC § 2.995(a)

### 8.1 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer via feedthrough attenuators. The EUT was placed inside the temperature chamber. The RF output cable exited the chamber through an opening.

After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the spectrum analyzer.

### 8.2 Test Equipment

Thermotron Ind. Temperature Chamber, Model S-8C  
Hewlett Packard 8591E Spectrum Analyzer

### 8.3 Test Results

Not applicable.

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## 9.0 **Frequency Stability vs Voltage**, FCC 2.995(d)(2)

### 9.1 Test Procedure

An external variable AC power source was connected to the EUT. The frequency of the transmitter was measured for 115% of the AC nominal value and for 85% of the nominal value.

### 9.2 Test Equipment

Hewlett Packard 8591E Spectrum Analyzer

### 9.3 Test Results.

Not applicable.