

**FCC Part 15.249 Test Report**

For

**Sonus Telecom, Inc.**

on the

**Cordless Telephone****Model: GH2400N****FCC ID: OU3GH2400N**

Test Report # J20006239

Date of Report: April 10, 2000

NVLAP Laboratory Code 200201-0  
Accredited for testing to FCC Parts 15

|            |                           |                    |
|------------|---------------------------|--------------------|
| Tested by: | <i>Xi-Ming Yang</i>       | Xi-Ming Yang       |
| Reviewer:  | <i>David Chernomordik</i> | David Chernomordik |

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**1 JOB DESCRIPTION****1.1 Client Information**

The EUT has been tested at the request of

**Company:** Sonus Telecom, Inc.  
123 Bldg., 2-Dong, Suite 714, 75-1 Gochuck-Dong  
Youngdungpo-Gu, Seoul  
Korea

**Name of contact:** Bryan Lee  
**Telephone:** (822) 6090-3000  
**Fax:** (822) 6090-3002

**1.2 Equipment under test (EUT)**

**Equipment type:** Cordless Telephone system

**Equipment class:** Low Power transmitter

**Model number(s):** GH2400N

**FCC ID:** OU3GH2400N

**Manufacturer:** SAME as above.

**Use of Product :** Voice communications

**Production is planned:** ☒ Yes, ☐ No

**Technical Specifications:**

|                                        |                                                                              |
|----------------------------------------|------------------------------------------------------------------------------|
| Type of Emission                       |                                                                              |
| Modulation                             | Analog                                                                       |
| Range of RF Output                     | 0.5 W (Peak EIRP)                                                            |
| Means for variation of operating power | None                                                                         |
| Frequency Range                        | to MHz                                                                       |
| Max. number of Channels                |                                                                              |
| Antenna                                | Handset:<br>Base Unit:                                                       |
| Detachable antenna ?                   | No                                                                           |
| External input                         | <ul style="list-style-type: none"><li>• Audio Voice</li><li>• PSTN</li></ul> |

EUT receive date: March 30, 2000

EUT received condition: Good condition prototype

Test start date: March 30, 2000

Test end date: April 6, 2000

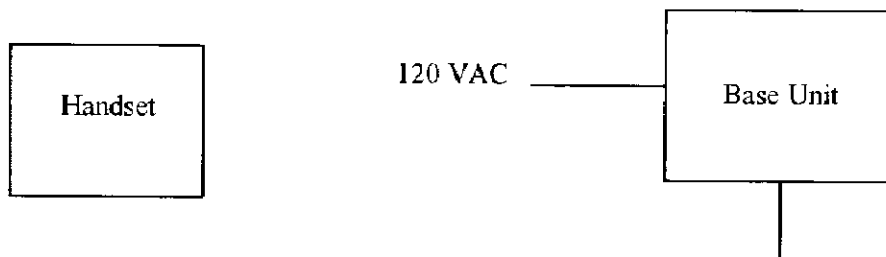
### 1.3 Test plan reference

FCC Part 2.1033, FCC Part 15.249

### 1.4 System test configuration

#### 1.4.1 System block diagram & Support equipment

The diagrams shown below details the placement of the equipment under test on the turntable.



|           |          |           |          |           |                   |
|-----------|----------|-----------|----------|-----------|-------------------|
| <b>S:</b> | Shielded | <b>U:</b> | Unshield | <b>F:</b> | With Ferrite Core |
|-----------|----------|-----------|----------|-----------|-------------------|

| Support equipment |                     |              |         |       |        |
|-------------------|---------------------|--------------|---------|-------|--------|
| Equip. #          | Equipment           | Manufacturer | Model # | S/N # | FCC ID |
| 1                 | Telephone Simulator |              |         |       | NA     |

**1.4.2 Justification**

The system was configured for testing in a typical manner in accordance with ANSI C63.4 standard.

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

**1.4.3 Mode(s) of operation**

The handset and Base unit was powered from fully charged batteries and AC adapter. During tests, EUT was operating at continuous transmitting mode.

**1.5 Modifications required for compliance**

No modifications were implemented by Intertek Testing Services.

**2 TEST SUMMARY**

| FCC RULE         | DESCRIPTION OF TEST                  | RESULT                              | PAGE |
|------------------|--------------------------------------|-------------------------------------|------|
| <b>Handset</b>   |                                      |                                     |      |
| 15.249a          | Field Strength of Emissions          | 90.4 dB( $\mu$ V/m)                 | 5    |
| 15.249c          | Field Strength of Spurious Radiation | Worst case Freq.: MHz<br>Margin: dB | 6    |
| 15.203           | Antenna requirement                  | Complies                            | 8    |
| 15.205           | Restricted bands of operation        | Worst case Freq.: MHz<br>Margin: dB |      |
| 15.207           | Line Conducted Emissions             | N/A                                 | N/A  |
| <b>Base Unit</b> |                                      |                                     |      |
| 15.249a          | Field Strength of Emissions          | DB( $\mu$ V/m)                      | 5    |
| 15.249c          | Field Strength of Spurious Radiation | Worst case Freq.: MHz<br>Margin: dB | 6    |
| 15.203           | Antenna requirement                  | Complies                            | 8    |
| 15.205           | Restricted bands of operation        | Worst case Freq.: MHz<br>Margin: dB |      |
| 15.207           | Line Conducted Emissions             | Worst case Freq.: MHz<br>Margin: dB | 9    |

### 3 FIELD STRENGTH OF EMISSIONS

#### 3.1 Test Description

|                           |               |
|---------------------------|---------------|
| Parameter:                | FCC § 15.249a |
| Requirement:              | FCC § 15.249a |
| Fundamental:<br>Harmonics |               |

#### 3.2 Test Procedure

For the measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable which is 0.8m above the ground plane on an open site. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

Radiated emission measurements were performed from 30 MHz to the 10th harmonic of transmitter frequency. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for >1000 MHz.

Measurements were performed for lowest and highest channels.

#### 3.3 Test Results

See attached.

#### 3.4 Modifications made during testing

None

#### 3.5 Test Instrumentation

☒ Hewlett Packard HP8566B Spectrum Analyzer (S.A.)

☒ EMCO 3115 Horn Antenna

☐ HP Pre-amp





### ***Radiated Emissions Test Data***

|                   |                        |                   |              |                         |              |
|-------------------|------------------------|-------------------|--------------|-------------------------|--------------|
| <b>Company:</b>   | Sonus                  | <b>Model #:</b>   | GH 2400N     | <b>Standard:</b>        | FCC § 15.249 |
| <b>EUT:</b>       | 2.4 GHz Cordless Phone | <b>S/N #:</b>     |              | <b>Limits:</b>          | 12           |
| <b>Project #:</b> | J20009278              | <b>Test Date:</b> | Mar 30, 2000 | <b>Test Distance:</b>   | 3 meters     |
| <b>Test Mode:</b> | Base hi channel        | <b>Engineer:</b>  | Barry S.     | <b>Duty Relaxation:</b> | 0 dB         |

|         | Antenna Used |          |    | Pre-Amp Used  |          |        | Cable Used |      |      | Transducer Used |
|---------|--------------|----------|----|---------------|----------|--------|------------|------|------|-----------------|
| Number: | 8            | 3        | 19 | 8             | 10       | 13     | 12         |      |      | 0               |
| Model:  | EMCO<br>3115 | CDI B100 | 0  | CDI_P100<br>0 | AFT16355 | ACD400 | Gm_M+L     | None | None | None            |

[illegible]

**Notes:**

- a) D.C.F.:Distance Correction Factor  
b) Insert. Loss (dB) = Cable A + Cable B + Cable C .  
c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).  
d) Negative signs (-) in Margin column signify levels below the limits.

### **Radiated Emissions Test Data**

|                   |                        |                   |              |                        |              |        |
|-------------------|------------------------|-------------------|--------------|------------------------|--------------|--------|
| <b>Company:</b>   | Sonus                  | <b>Model #:</b>   | GH 2400N     | <b>Standard_</b>       | FCC 5 15.249 |        |
| <b>EUT:</b>       | 2.4 GHz Cordless Phone | <b>S/N #:</b>     |              | <b>Limits</b>          | 12           |        |
| <b>Project #:</b> | J20009278              | <b>Test Date:</b> | Mar 30, 2000 | <b>Test Distance_</b>  | 3            | meters |
| <b>Test Mode:</b> | Hand low channel       | <b>Engineer:</b>  | Barry S.     | <b>Duty Relaxation</b> | 0            | dB     |

|         | Antenna Used |               |    | Pra-Amp Used  |          |         | Cable Used |      |      | Transducer Used |
|---------|--------------|---------------|----|---------------|----------|---------|------------|------|------|-----------------|
| Number: | 8            | 3             | 19 | 8             | 10       | 13      | 12         |      |      | 0               |
| Model:  | EMCO<br>3115 | CDI B100<br>0 |    | CDI_P100<br>0 | AFT16355 | ACO/400 | Gm_M+L     | None | None | None            |

[illegible]

**Notes:**

- a) D.C.F.: Distance Correction Factor  
b) Insert. Loss (dB) = Cable A + Cable B + Cable C.  
c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).  
d) Negative signs (-) in Margin column signify levels below the limits.

# Radiated Emissions Test Data

|            |                        |            |              |                  |              |
|------------|------------------------|------------|--------------|------------------|--------------|
| Company:   | Sonus                  | Model #:   | GH 2400N     | Standard:        | FCC § 15.249 |
| EUT:       | 2.4 GHz Cordless Phone | S/N #:     |              | Limits:          | 12           |
| Project #: | J20009278              | Test Date: | Mar 30, 2000 | Test Distance:   | 3 meters     |
| Test Mode: | Hand hi channel        | Engineer:  | Barry S.     | Duty Relaxation: | 0 dB         |

| Antenna Used |           |          |    | Pre-Amp Used |          |         | Cable Used |      |      | Transducer Used |
|--------------|-----------|----------|----|--------------|----------|---------|------------|------|------|-----------------|
| Number:      | 8         | 3        | 19 | 8            | 10       | 13      | 12         |      |      | 0               |
| Model:       | EMCO 3115 | CDI B100 | 0  | CDL P100     | AFT15855 | ACO/400 | Gm M+L     | None | None | None            |

| Frequency | Reading | Detector | Ant. # | Amp. # | Ant. Pol. | Ant. Factor | Pre-Amp | Insert. Loss | D. C. F. | Net      | Limit @3m | Margin |
|-----------|---------|----------|--------|--------|-----------|-------------|---------|--------------|----------|----------|-----------|--------|
| MHz       | dB(μV)  | PIA/Q    | #      | #      | H/V       | dB(1/m)     | dB      | dB           | dB       | dB(μV/m) | dB(μV/m)  | dB     |
| 2476.45   | 55.3    | Peak     | 8      |        | V         | 29.6        | 0.0     | 2.3          | 0.0      | 87.2     | 94.0      | -6.8   |
| 4952.90   | 30.7    | Peak     | 8      | 8      | V         | 33.5        | 28.1    | 3.2          | 0.0      | 39.3     | 74.0      | -34.7  |
| 4952.90   | 22.8    | Ave.     | 8      | 8      | V         | 33.5        | 28.1    | 3.2          | 0.0      | 31.4     | 54.0      | -22.6  |
| 7429.35   | 32.2    | Peak     | 8      | 8      | V         | 38.0        | 28.0    | 4.3          | 0.0      | 46.5     | 74.0      | -27.5  |
| 7429.35   | 25.7    | Ave.     | 8      | 8      | V         | 38.0        | 28.0    | 4.3          | 0.0      | 40.0     | 54.0      | -14.0  |
| 9905.80   | 32.5    | Peak     | 8      | 8      | V         | 39.3        | 27.6    | 5.0          | 0.0      | 49.2     | 74.0      | -24.8  |
| 9905.80   | 26.2    | Ave.     | 8      | 8      | V         | 39.3        | 27.6    | 5.0          | 0.0      | 42.9     | 54.0      | -11.1  |
| 12382.25  | 41.2    | Peak     | 8      | 10     | V         | 42.5        | 39.1    | 5.9          | 0.0      | 50.5     | 74.0      | -23.6  |
| 12382.25  | 33.5    | Ave.     | 8      | 10     | V         | 42.5        | 39.1    | 5.9          | 0.0      | 42.8     | 54.0      | -11.3  |
| 14858.7   | 39.0    | Peak     | 8      | 10     | V         | 42.1        | 37.4    | 6.8          | 0.0      | 50.5     | 74.0      | -23.6  |
| 14858.7   | 33.6    | Ave.     | 8      | 10     | V         | 42.1        | 37.4    | 6.8          | 0.0      | 45.1     | 54.0      | -9.0   |
| 17335.15  | 39.2    | Peak     | 8      | 10     | V         | 43.8        | 38.8    | 7.5          | 0.0      | 51.7     | 74.0      | -22.3  |
| 17335.15  | 34.2    | Ave.     | 8      | 10     | V         | 43.8        | 38.8    | 7.5          | 0.0      | 46.7     | 54.0      | -7.3   |
| 19811.6   | 39.4    | Peak     | 21     | 13     | V         | 40.3        | 23.3    | 0.0          | -9.5     | 46.9     | 74.0      | -27.1  |
| 19811.6   | 31.2    | Ave.     | 21     | 13     | V         | 40.3        | 23.3    | 0.0          | -9.5     | 38.7     | 54.0      | -15.3  |
| 22288.05  | 41.4    | Peak     | 21     | 13     | V         | 40.3        | 23.3    | 0.0          | -9.5     | 48.9     | 74.0      | -25.1  |
| 22288.05  | 34.6    | Ave.     | 21     | 13     | V         | 40.3        | 23.3    | 0.0          | -9.5     | 42.1     | 54.0      | -11.9  |
|           |         |          |        |        |           |             |         |              |          |          |           |        |
|           |         |          |        |        |           |             |         |              |          |          |           |        |
|           |         |          |        |        |           |             |         |              |          |          |           |        |
|           |         |          |        |        |           |             |         |              |          |          |           |        |

|               |                                                                                                                          |
|---------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Notes:</b> | a) D.C.F.:Distance Correction Factor                                                                                     |
|               | b) Insert. Loss (dB) = Cable A + Cable B + Cable C.                                                                      |
|               | c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only). |
|               | d) Negative signs (-) in Margin column signify levels below the limits.                                                  |
|               | e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.        |

### Radiated Emissions Test Data

|                   |                        |                   |                |                         |           |
|-------------------|------------------------|-------------------|----------------|-------------------------|-----------|
| <b>Company:</b>   | Sonus                  | <b>Model #:</b>   | GH 2400N       | <b>Standard:</b>        | FCC § 15B |
| <b>EUT:</b>       | Cordless 2.4 GHz Phone | <b>S/N #:</b>     |                | <b>Limits:</b>          | 2         |
| <b>Project #:</b> | J20009278              | <b>Test Date:</b> | March 31, 2000 | <b>Test Distance:</b>   | 3 meters  |
| <b>Test Mode:</b> | On in Standby mode     | <b>Engineer:</b>  | Barry S.       | <b>Duty Relaxation:</b> | 0 dB      |

|         | Antenna Used |               |    | Pre-Amp Used |          |         | Cable Used |      |      | Transducer Used |
|---------|--------------|---------------|----|--------------|----------|---------|------------|------|------|-----------------|
| Number: | 2            | 7             | 19 | 2            | 3        | 13      | 5          |      |      | 0               |
| Model:  | EMCO<br>3143 | EM LPA-<br>25 | 0  | HP 8447D     | MC 15542 | ACQ7400 | Sra 3 10m  | None | None | None            |

[illegible]

## Notes

- a) D.C.F.:Distance Correction Factor  
b) Insert. Loss (dB) = Cable A + Cable B + Cable C .  
c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).  
d) Negative signs (-) in Margin column signify levels below the limits.  
e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

#### 4 SPURIOUS EMISSIONS (EXCEPT HARMONICS)

##### 4.1 Test Description

|                     |                         |
|---------------------|-------------------------|
| Parameter:          | FCC § 15.249c           |
| Requirement:        | FCC § 15.249c           |
| Attenuation limits: | ≤ 50 dB or FCC § 15.209 |

##### 4.2 Test Procedure

For measurement below 1 GHz, the EUT was placed inside a TEM cell (stripline) connected to a spectrum analyzer from one side and to 50 ohm termination from one side and to 50 ohm termination from another. For measurement above 1 GHz, a horn antenna was placed at a distance of 10-15 cm from EUT and connected to a spectrum analyzer. Several plots were made to show emissions from 1 MHz up to 10<sup>th</sup> harmonic.

##### 4.3 Test Results

See attached plots.

##### 4.4 Modifications made during testing

None

##### 4.5 Test Instrumentation

☒ Hewlett Packard HP8566B Spectrum Analyzer (S.A.)

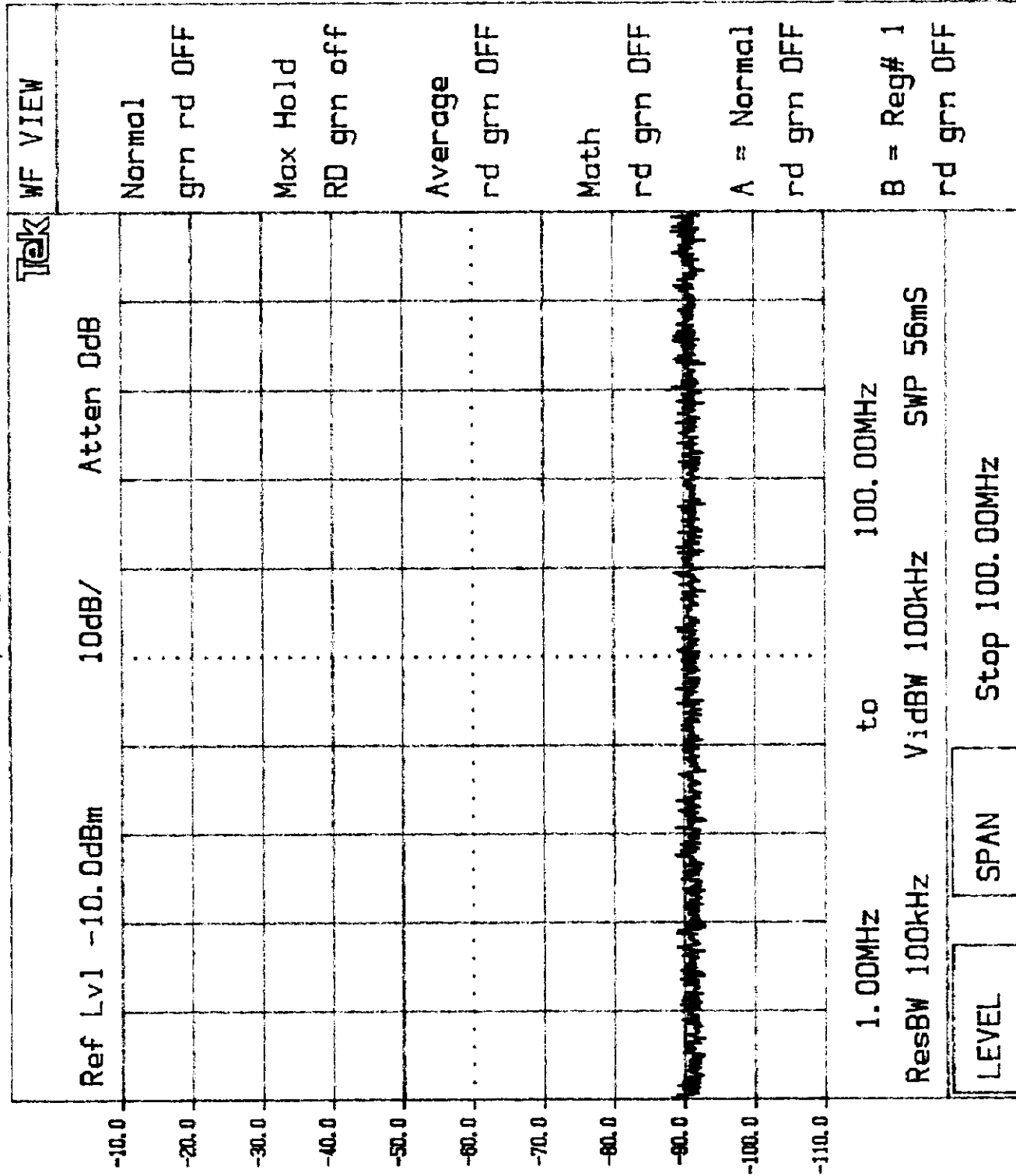
☒ EMCO 3115 Horn Antenna

☐ Pre-amplifiers

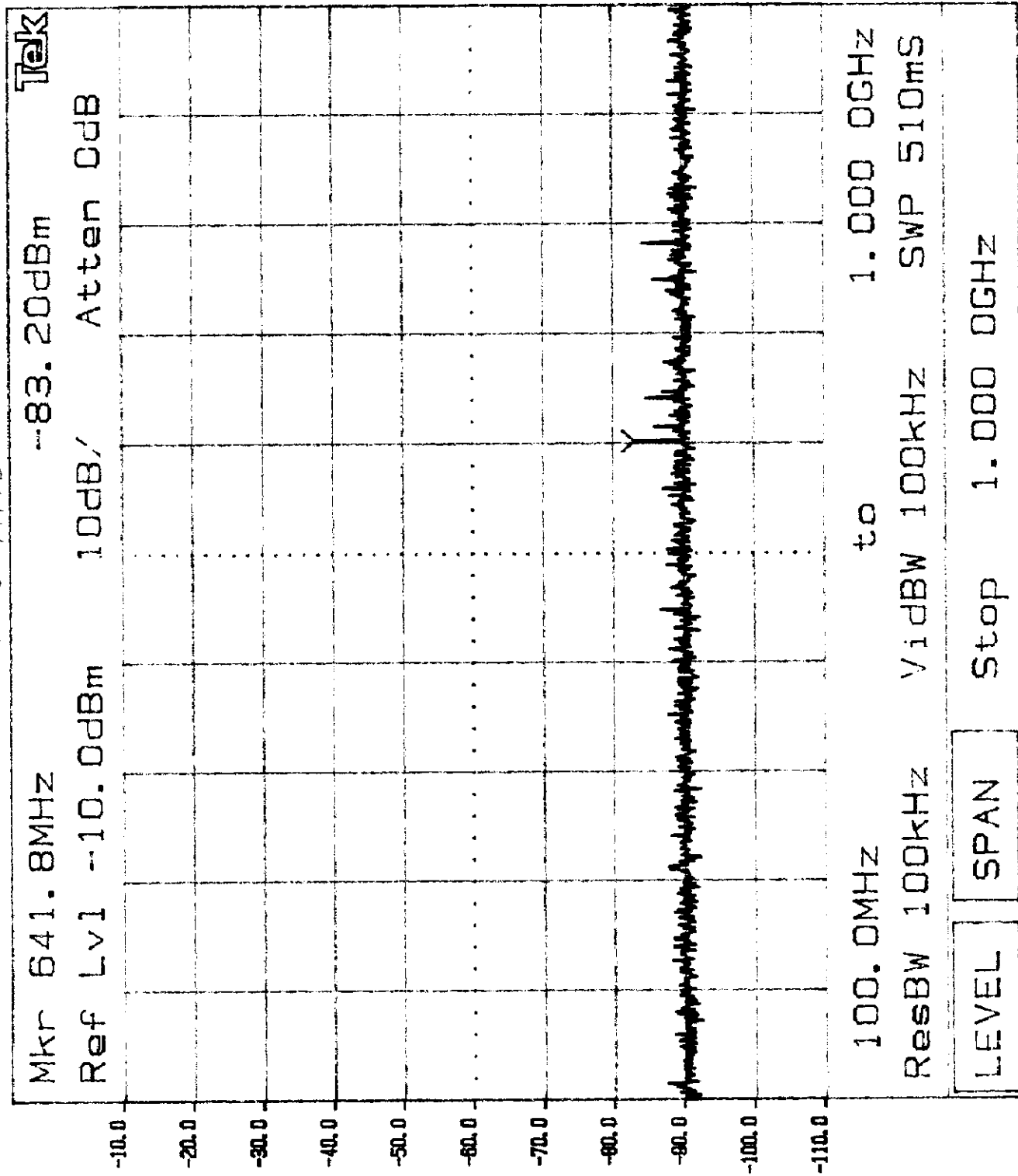
**OUT OF BAND EMISSION PLOTS**

| <b>Plot #</b> | <b>Description</b>      |
|---------------|-------------------------|
| 4.1.a – 4.1.f | Base unit, Low channel  |
| 4.2.a – 4.2.f | Base unit, High channel |
| 4.3.a – 4.3.f | Handset, Low channel    |
| 4.4.a – 4.4.f | Handset, High channel   |

Plot 4.1.2

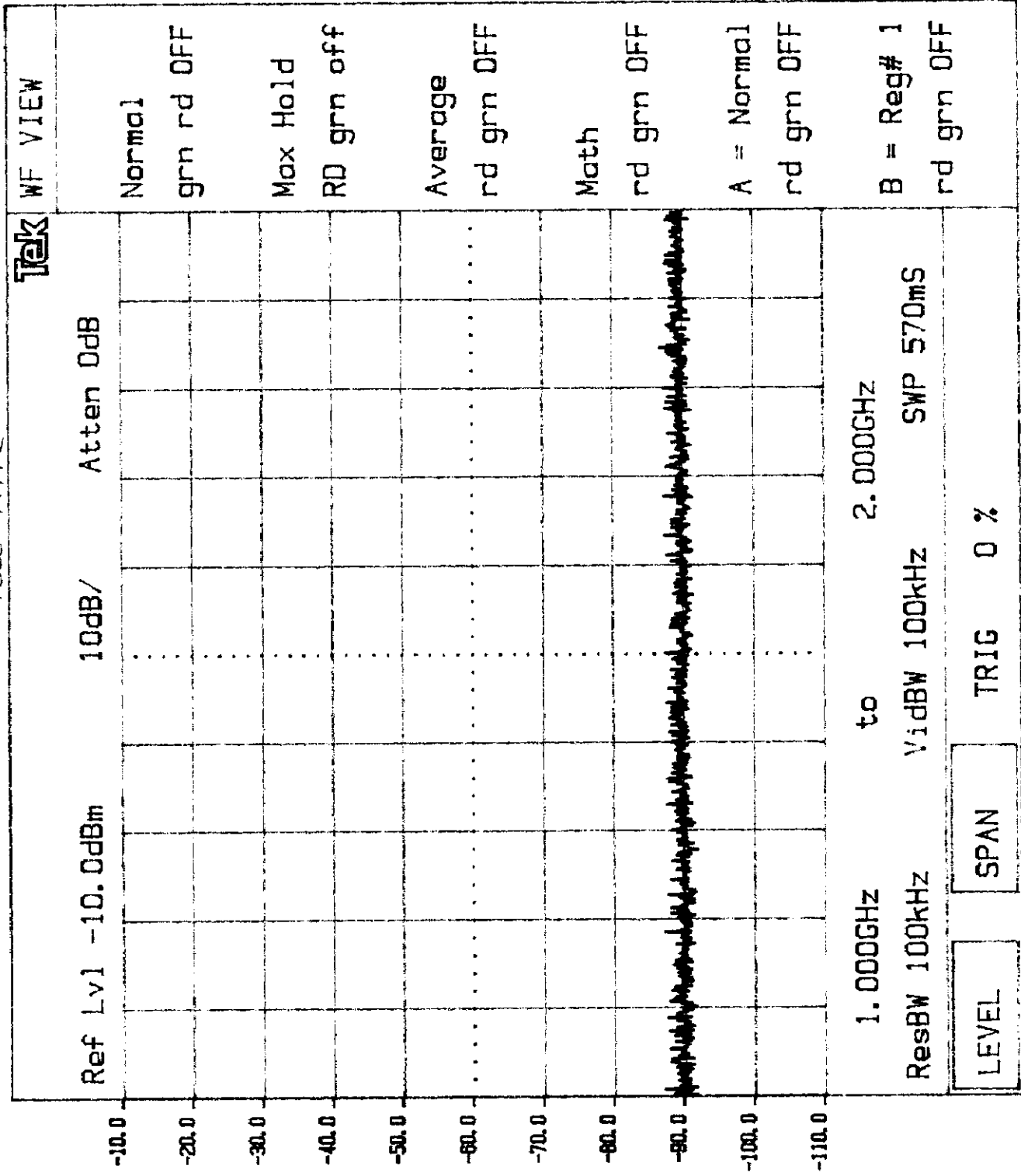


Plot 4.1.6

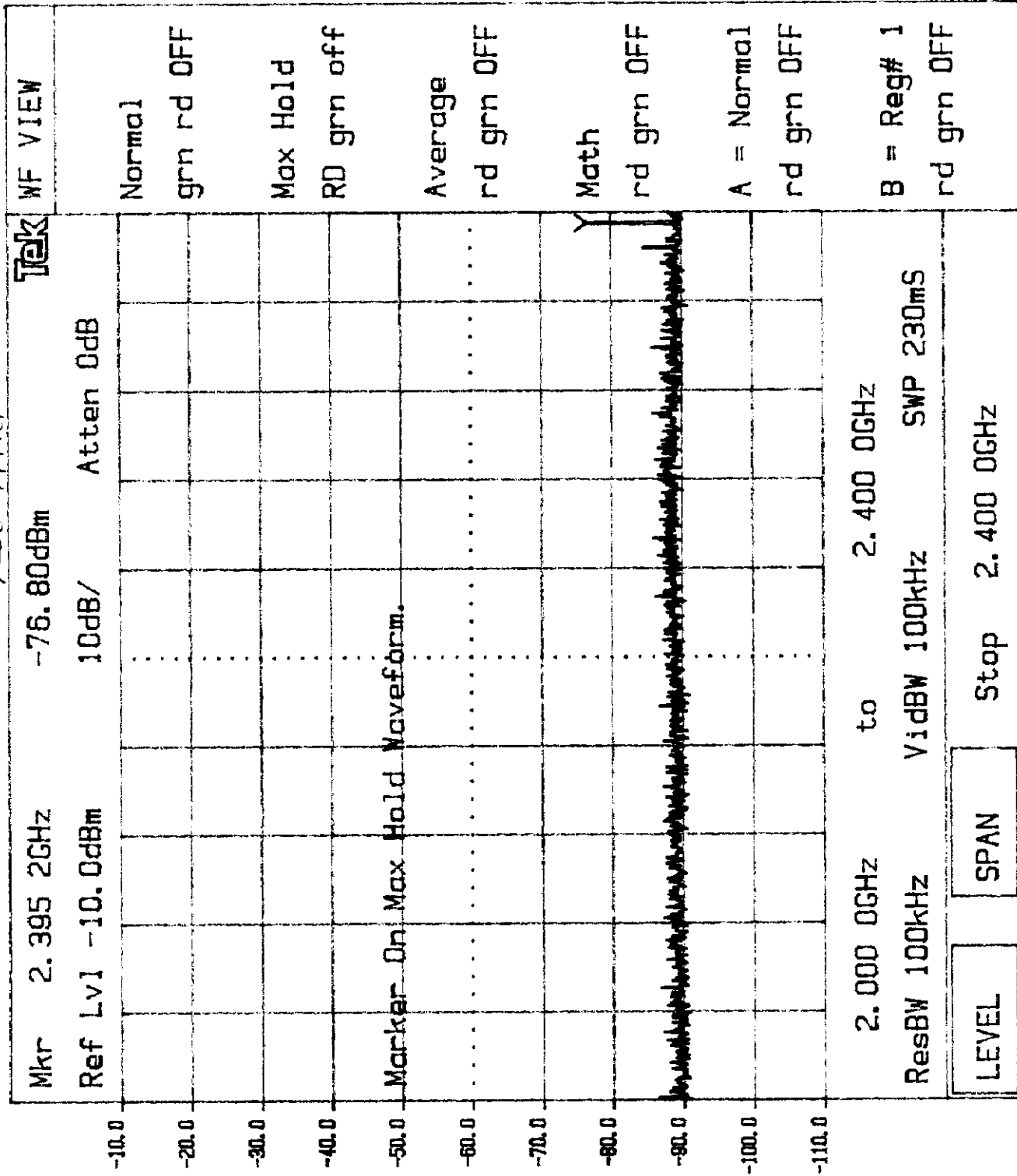




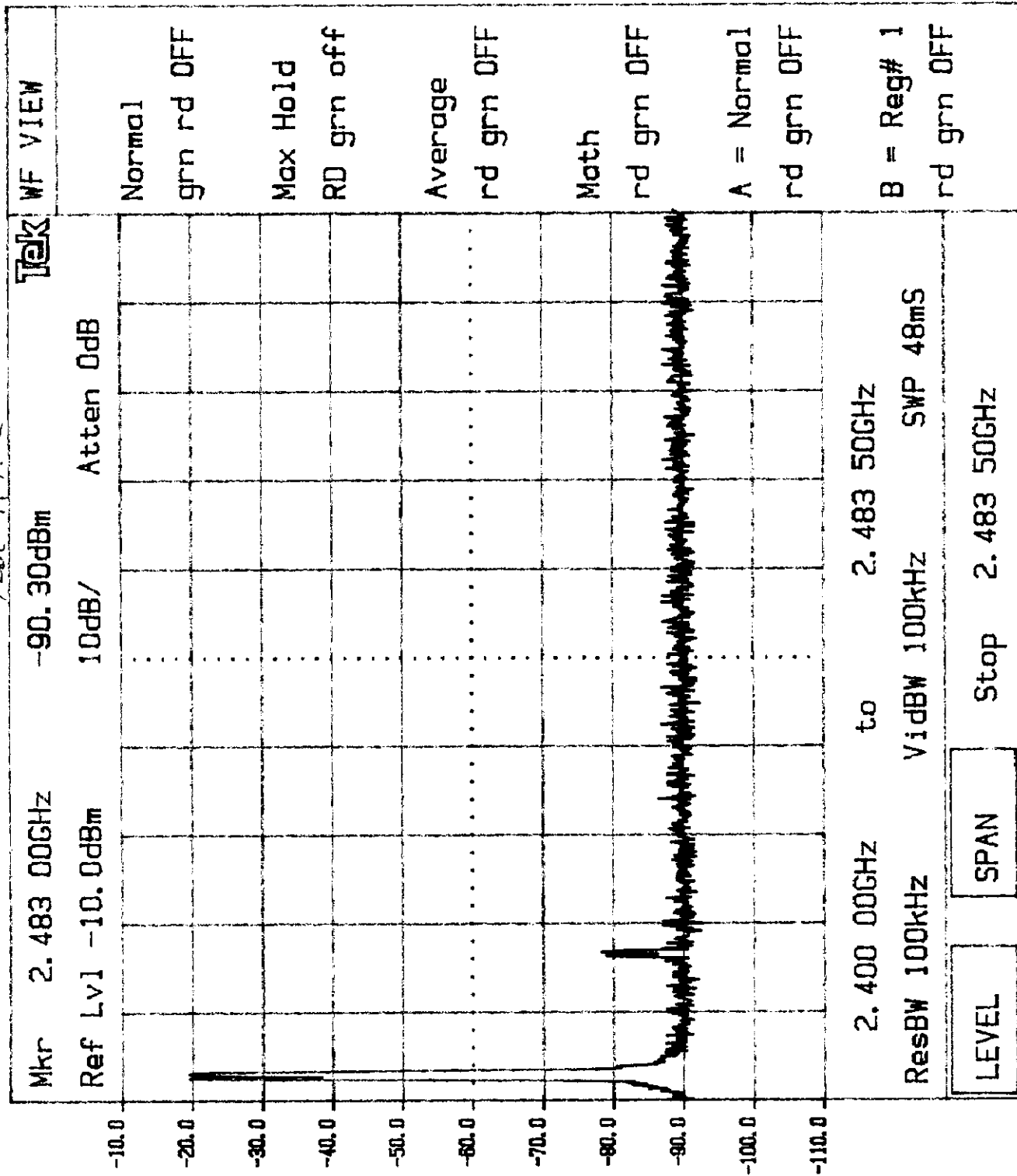
Plot 4.1.c



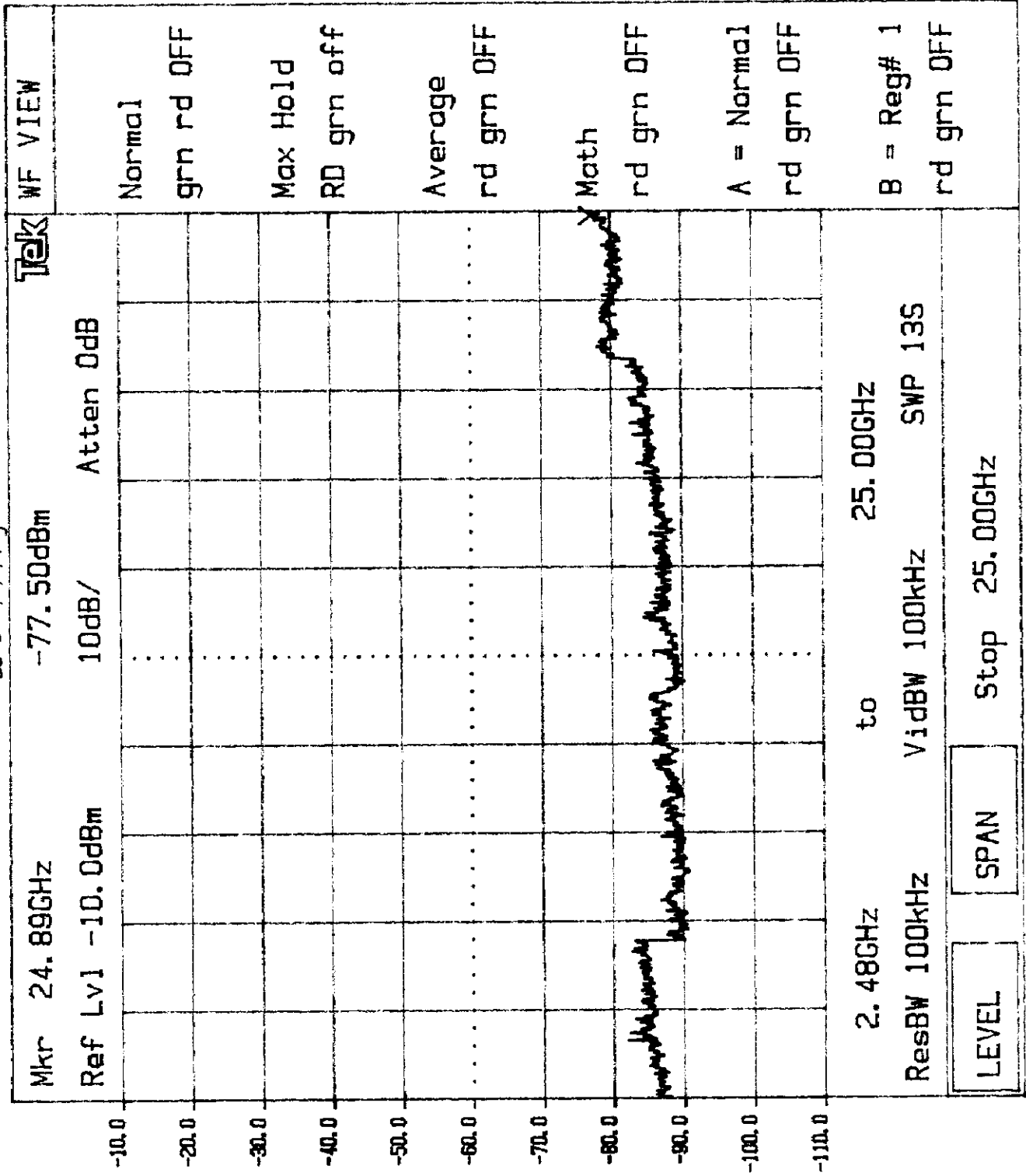
Plot 4, 1, 1, A



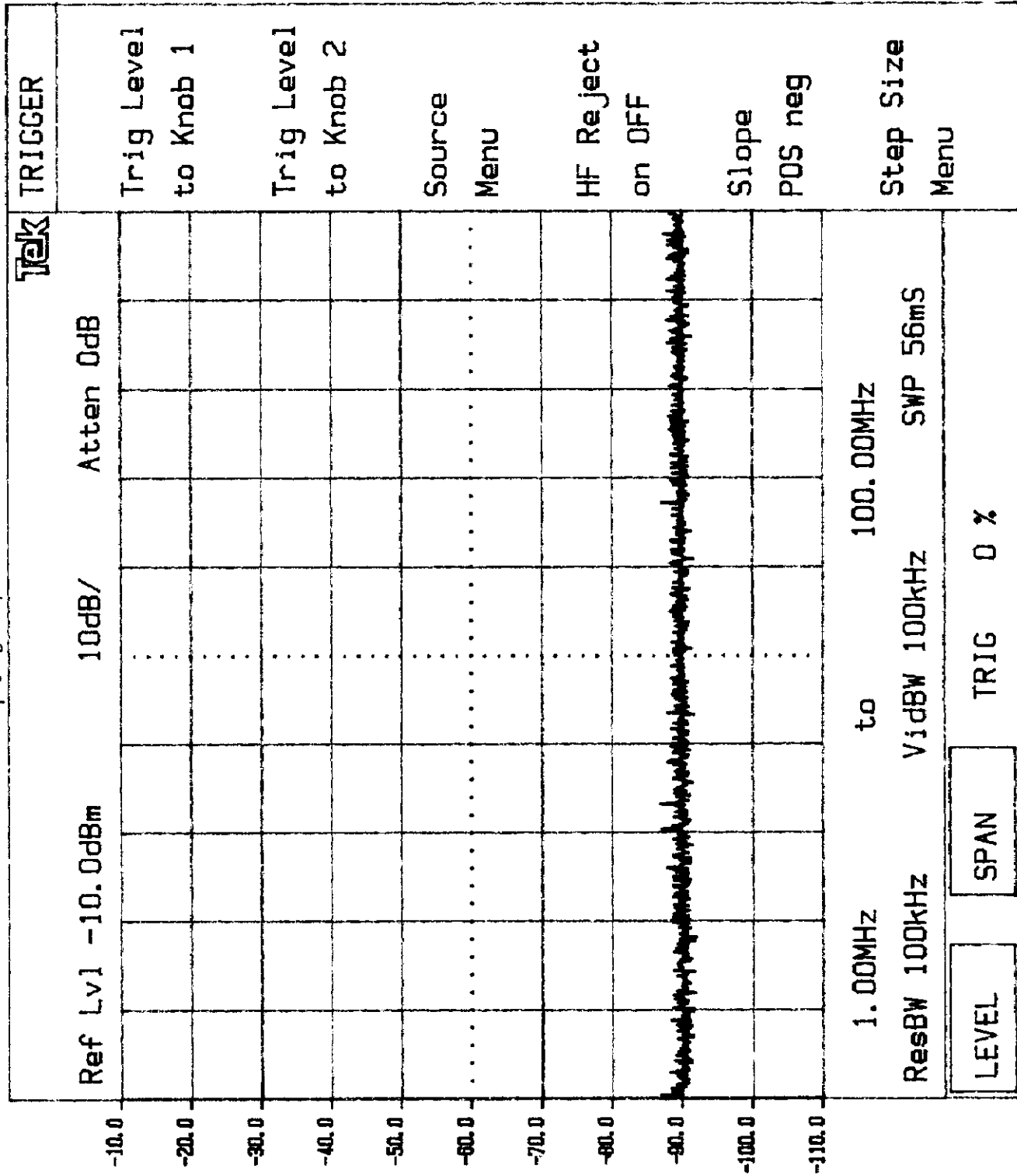
Plot 4, 1, 2



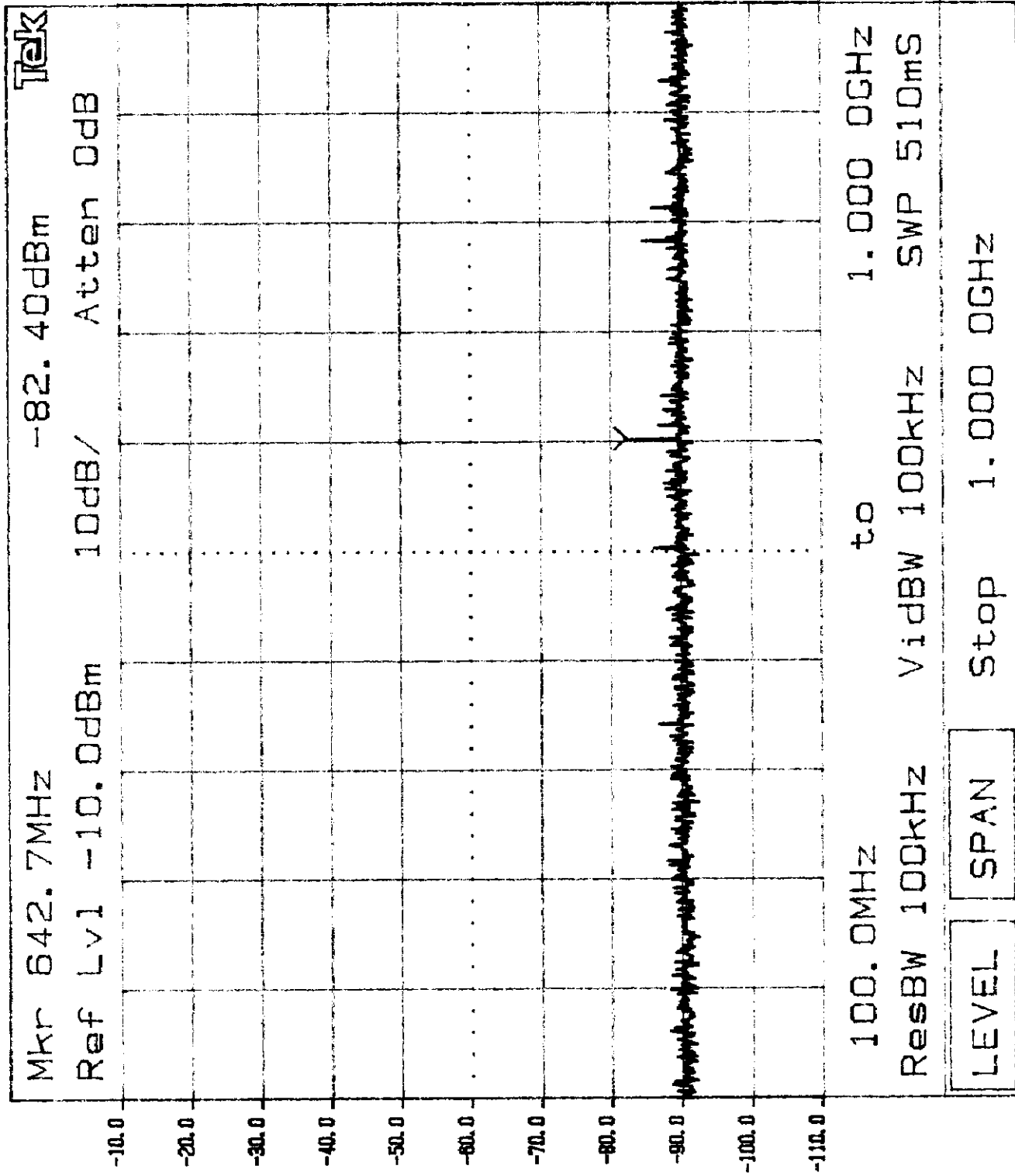
Plot 4.1.f



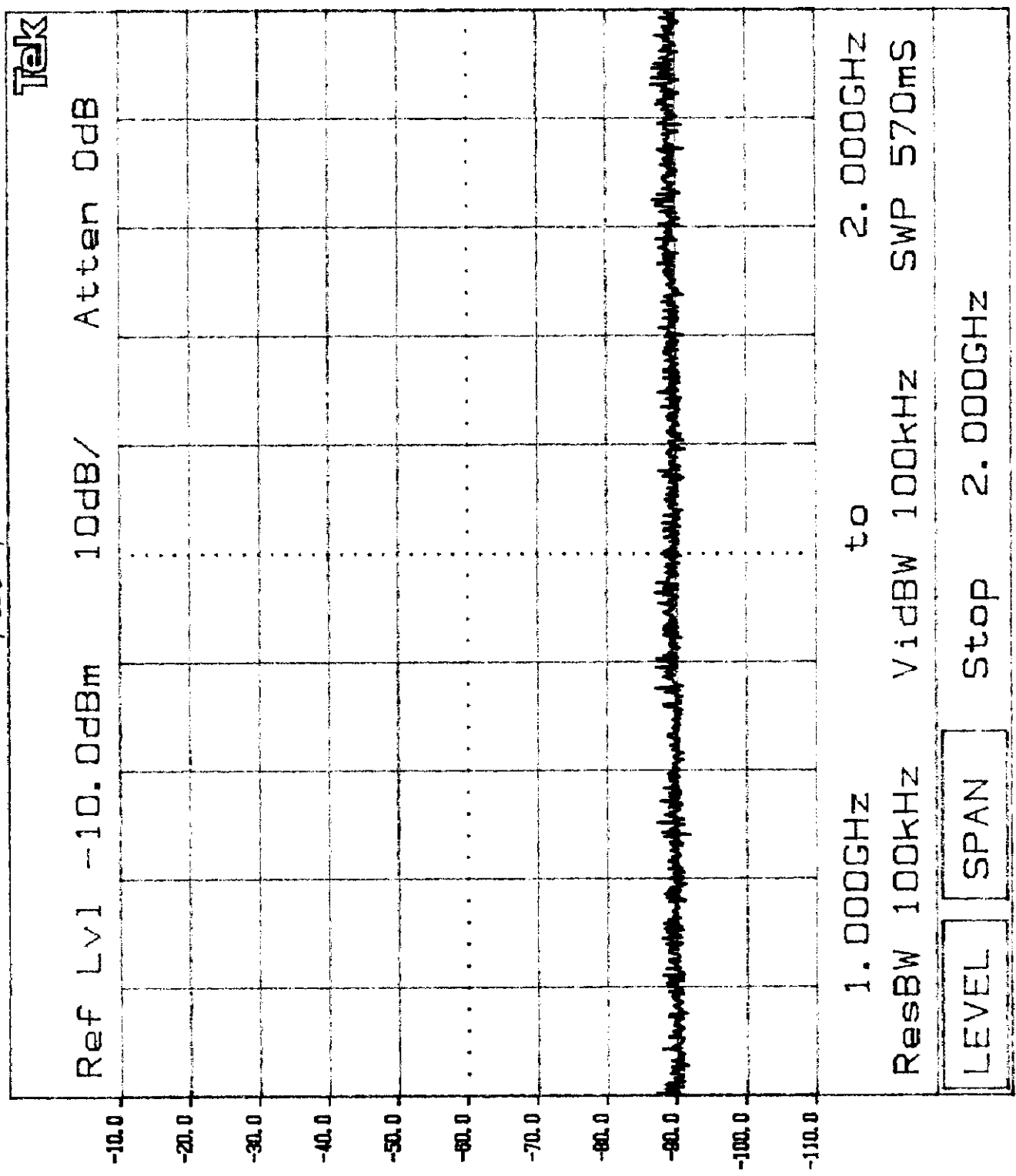
Plot 4.2.2



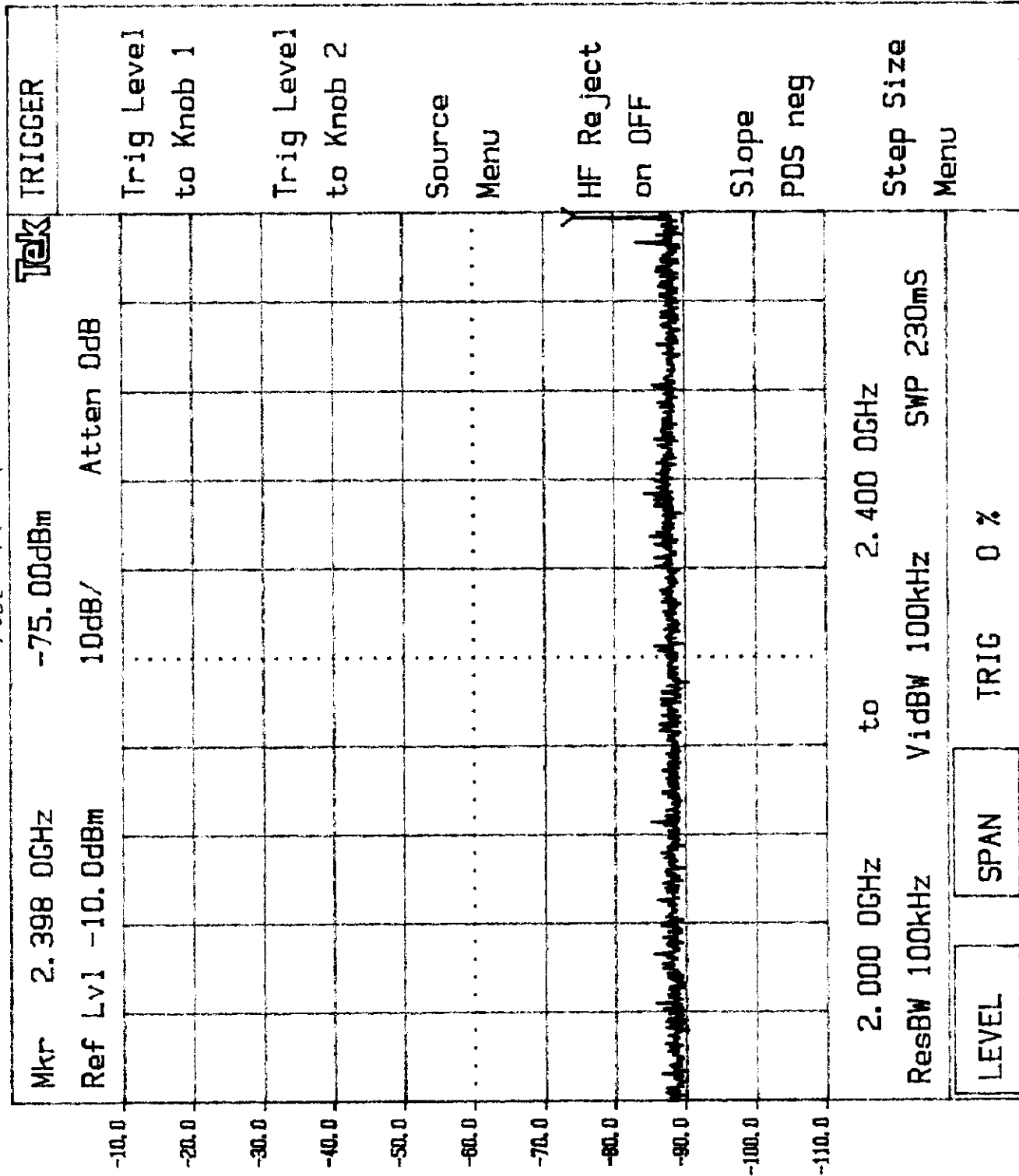
Plot 4.2.b



Plot 4.2.c

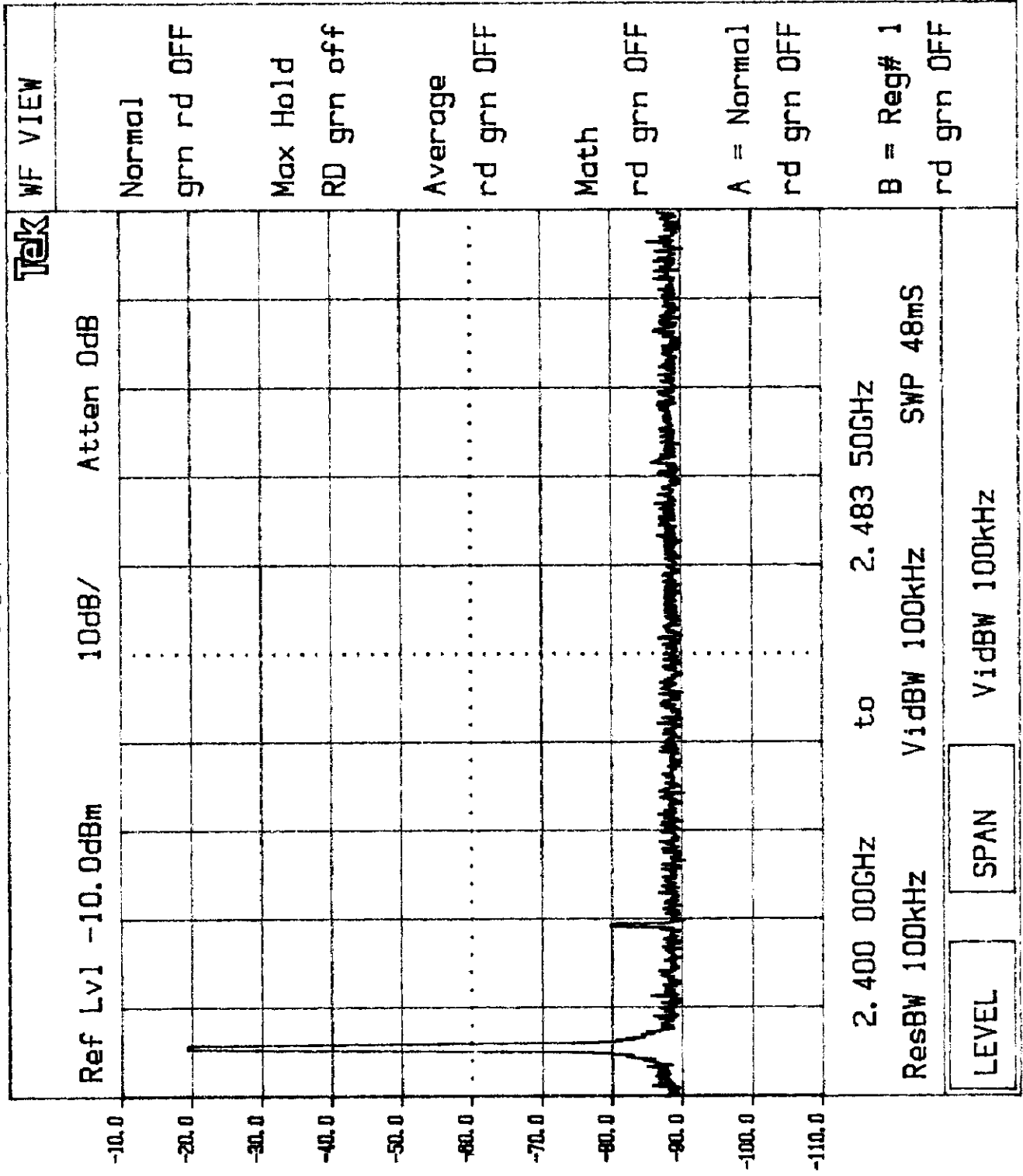


Plot 4.2.d

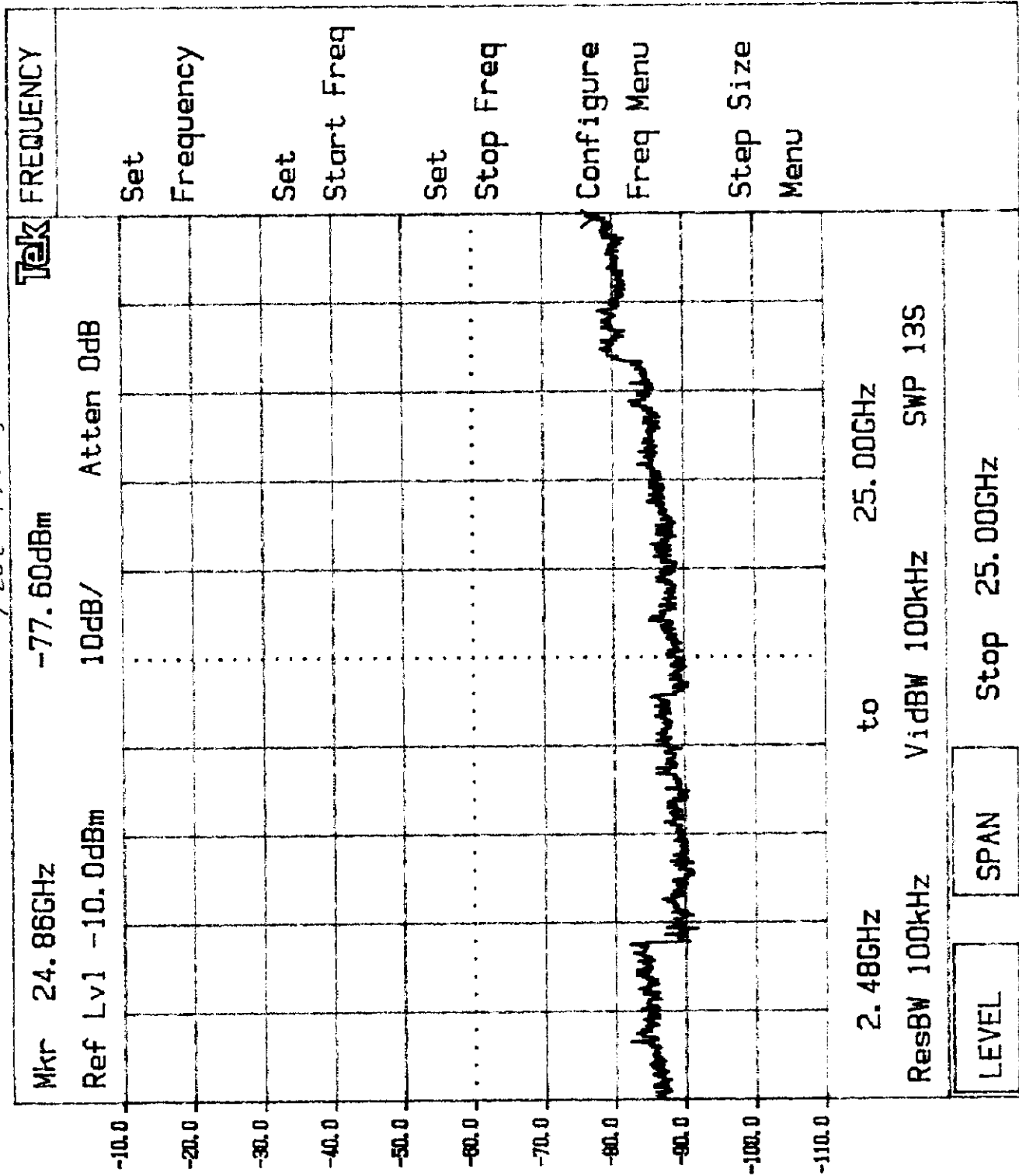




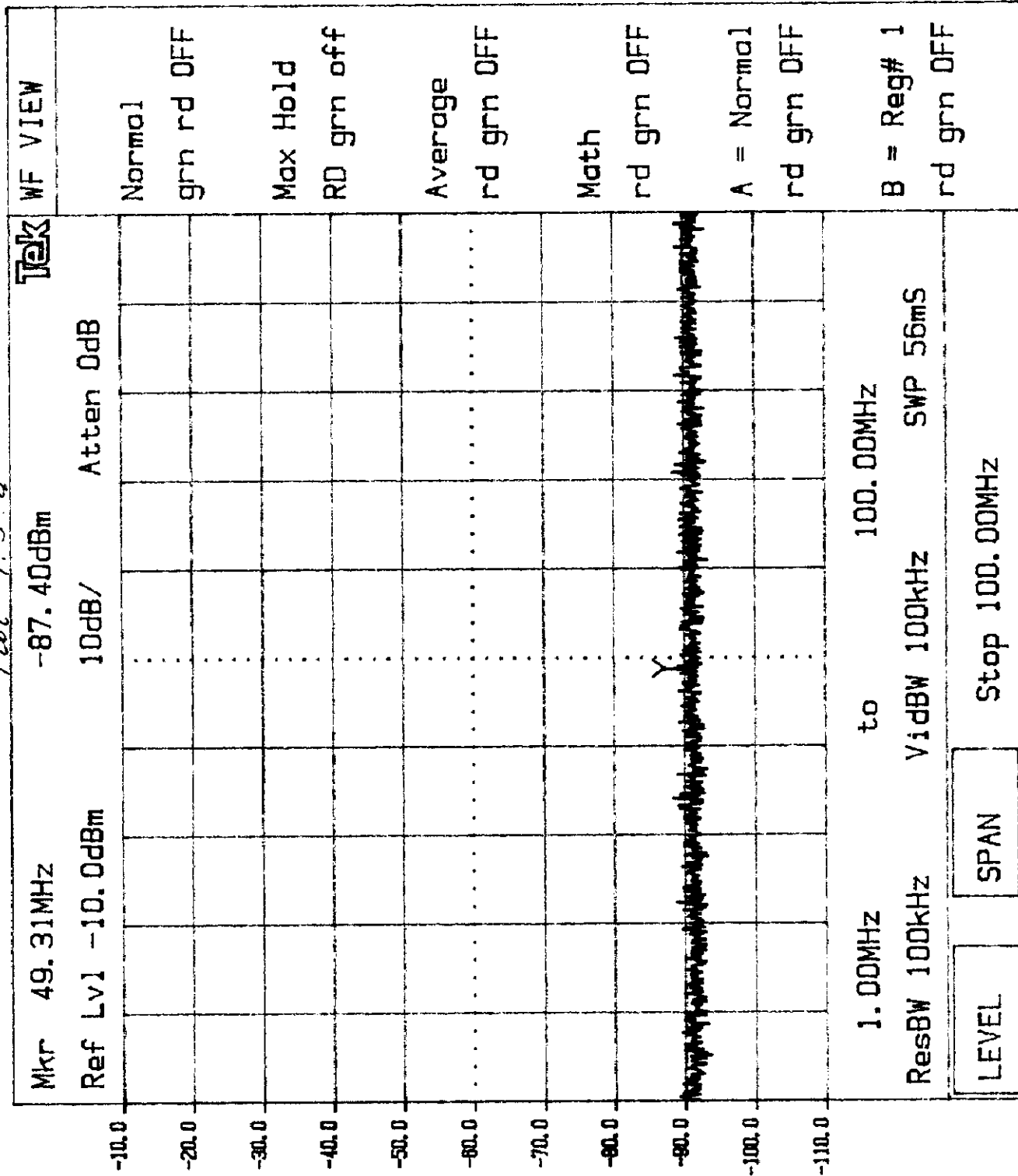
Plot 4.2.e



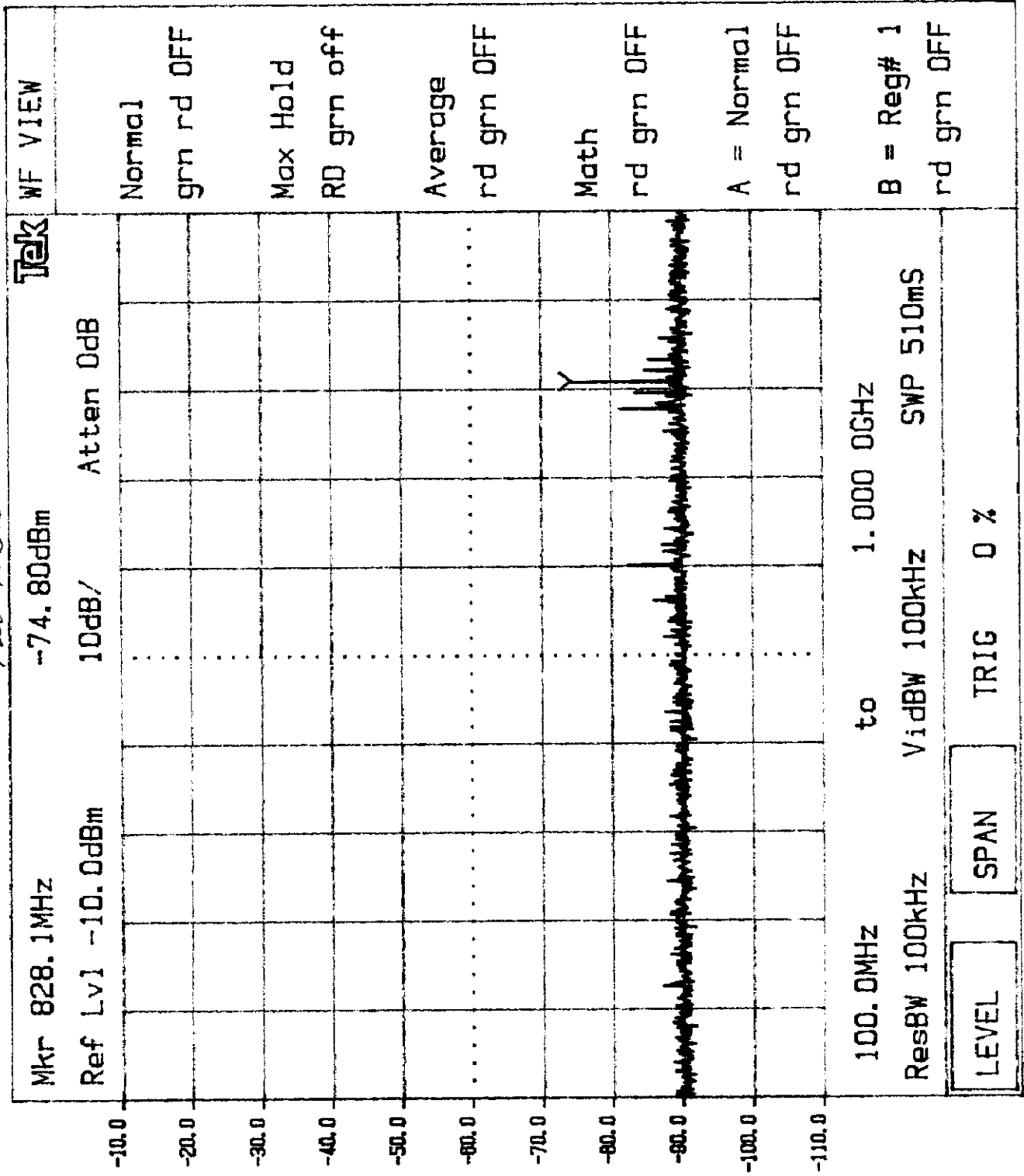
Plot 4.2. f



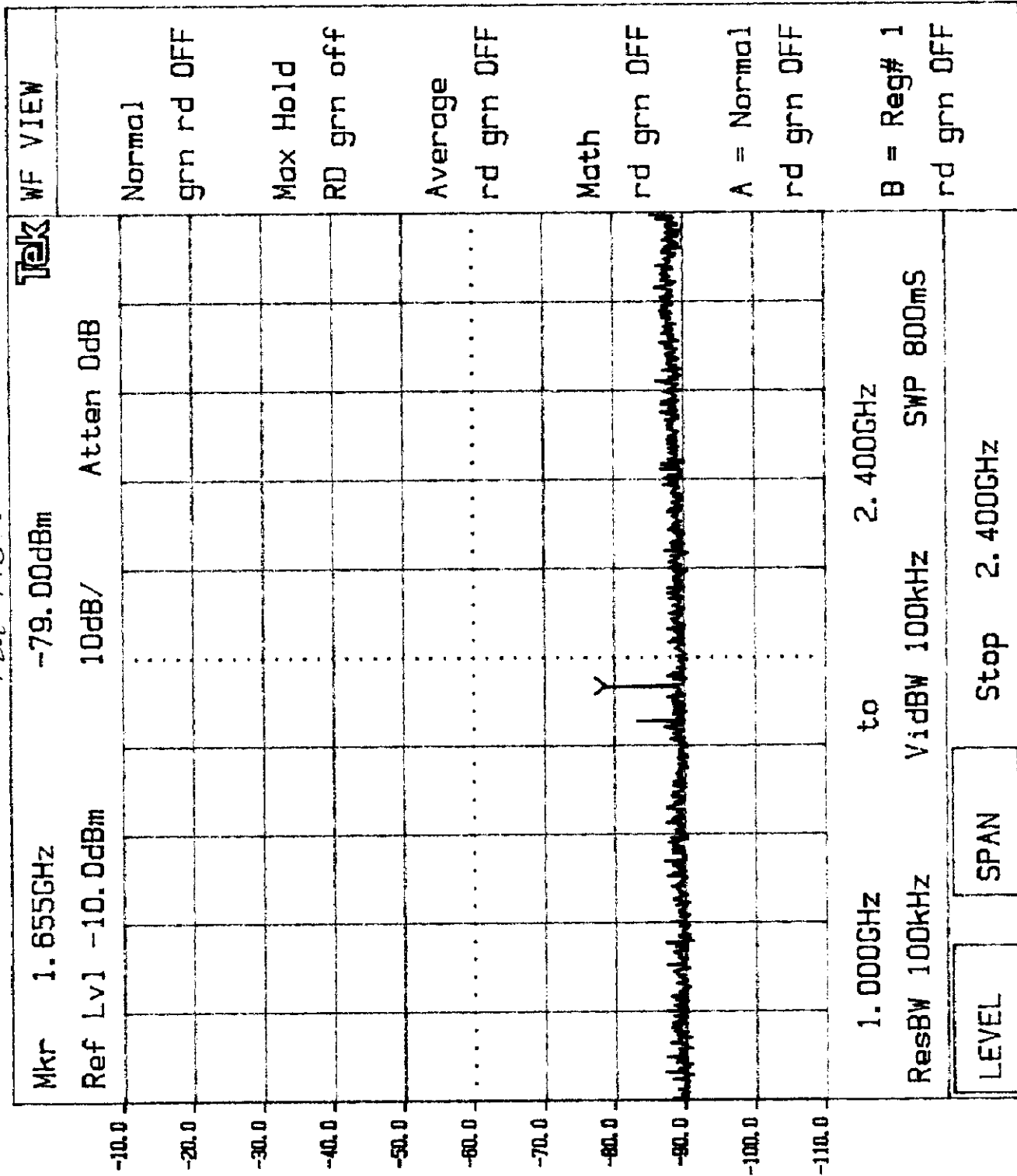
Plot 4.3.2



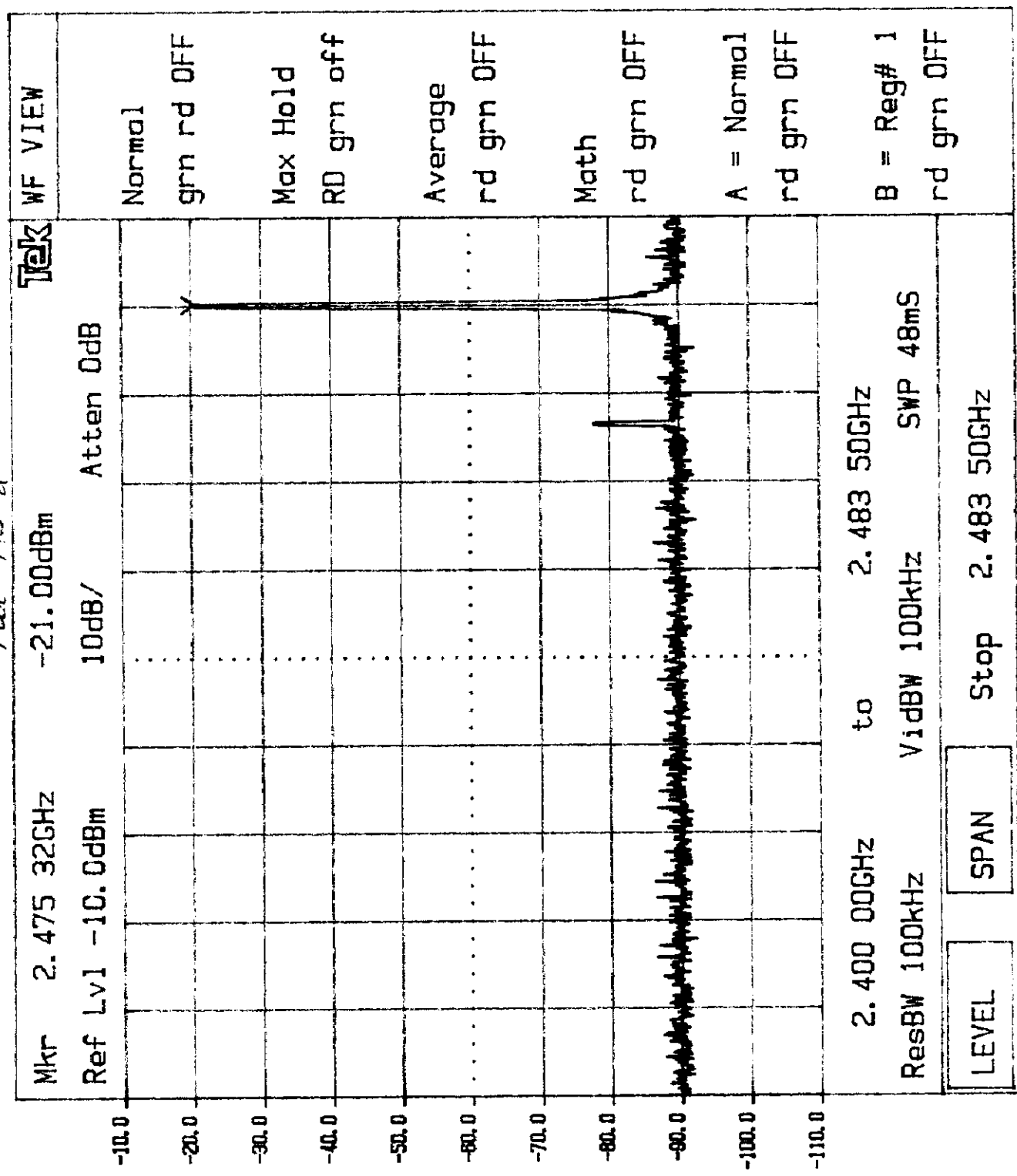
Plot 4.3.6



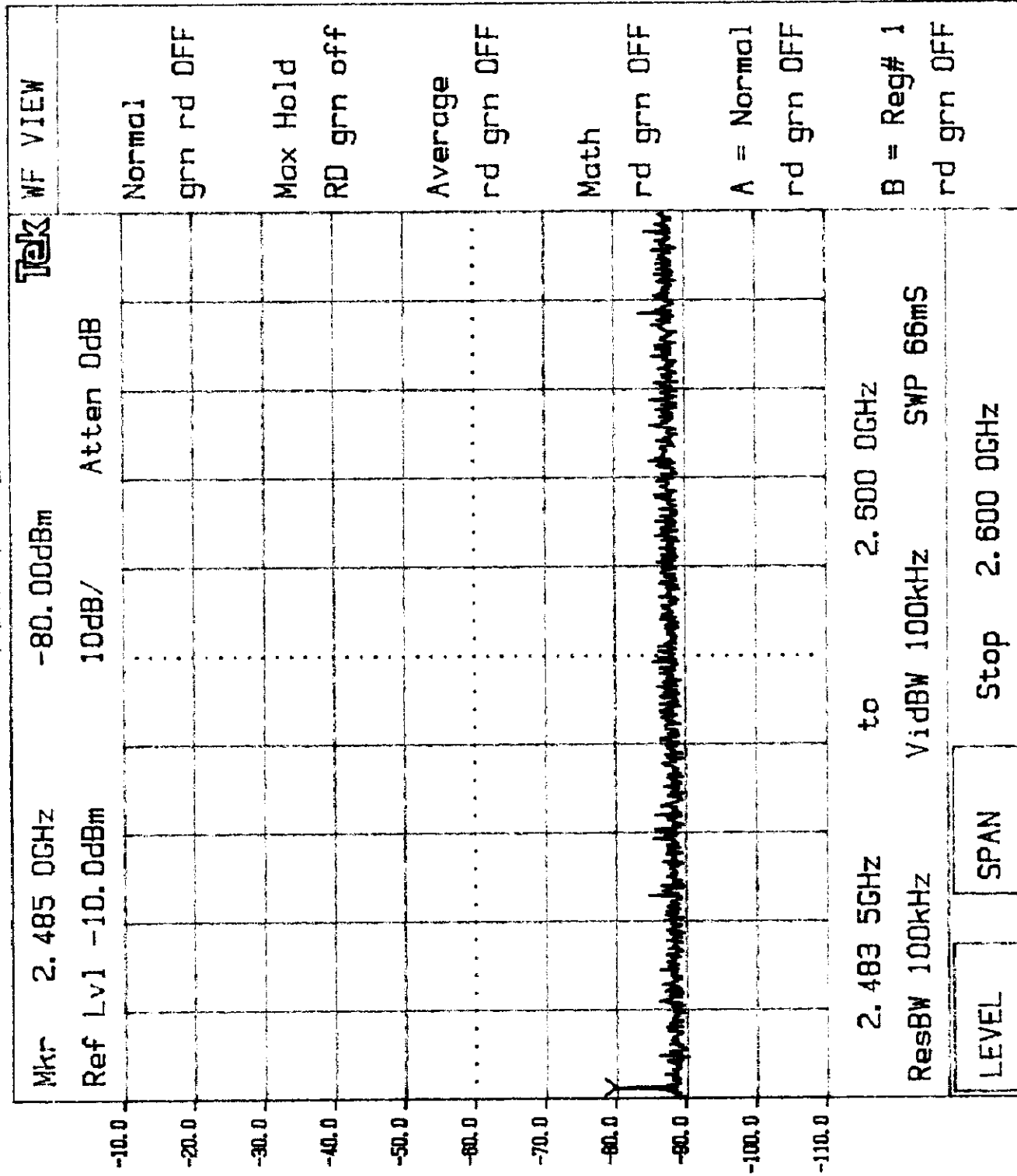
Plot 4.3.c



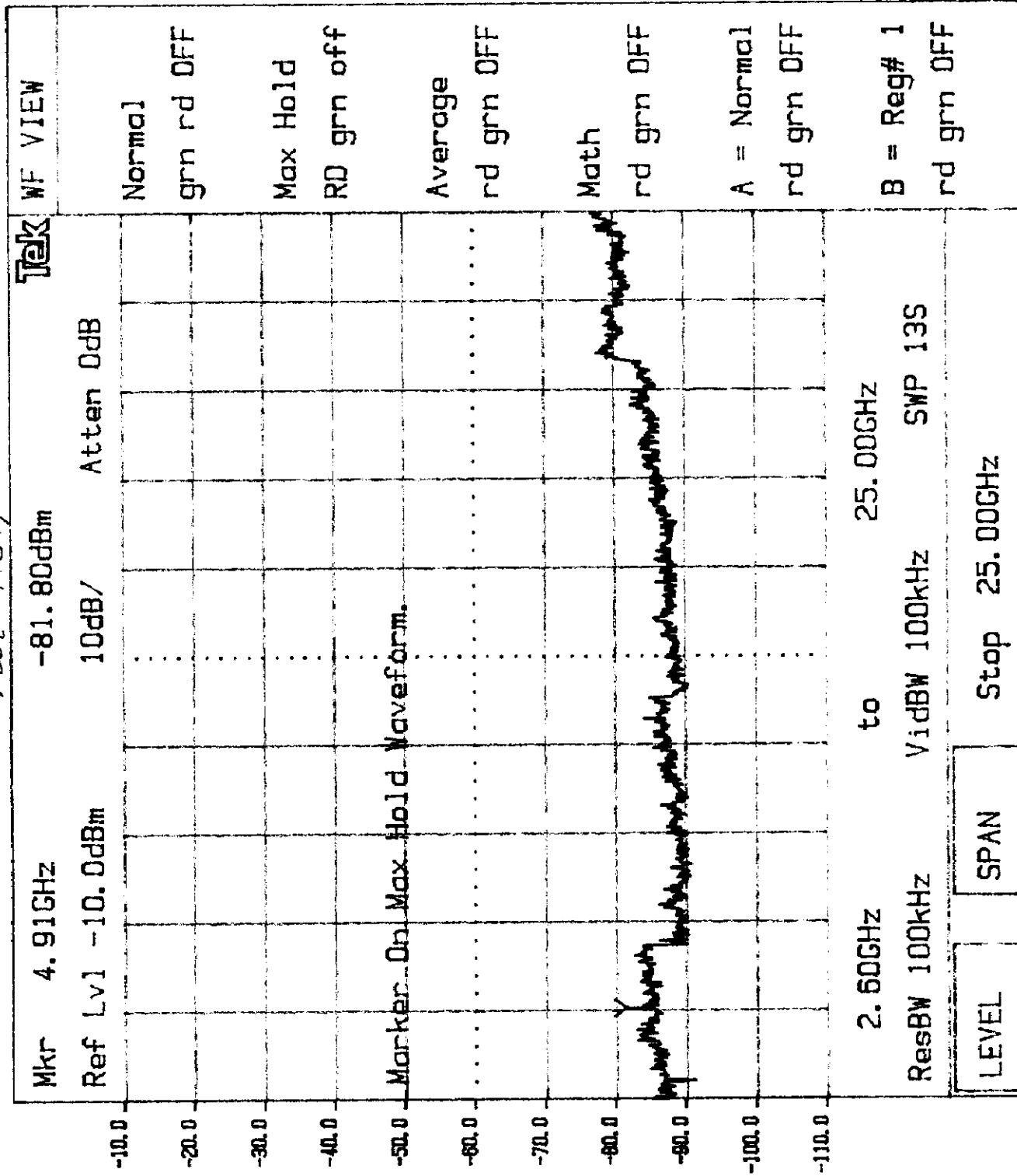
Plot 4.3 d



Plot 4.3 e

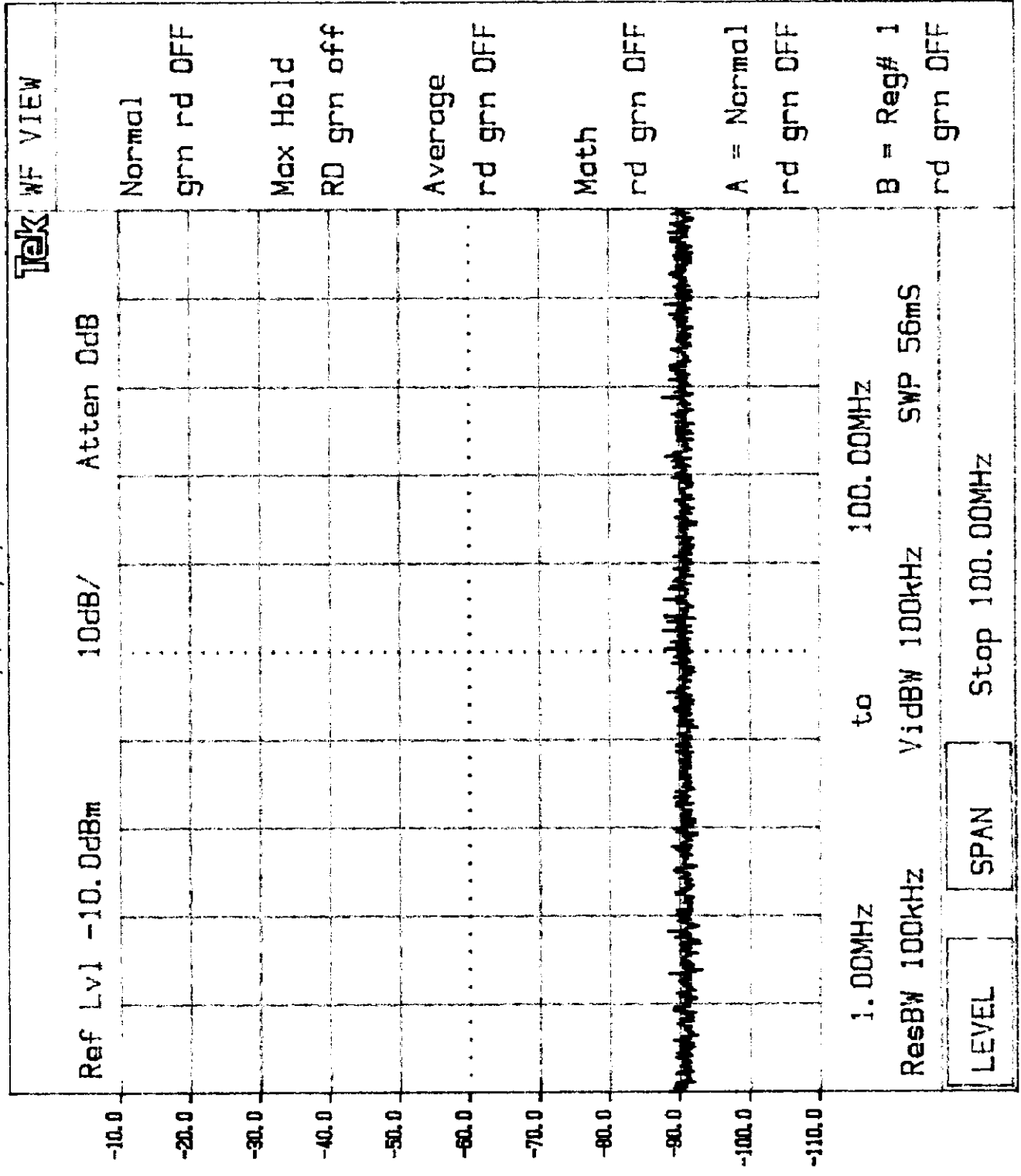


Plot 4.3.f

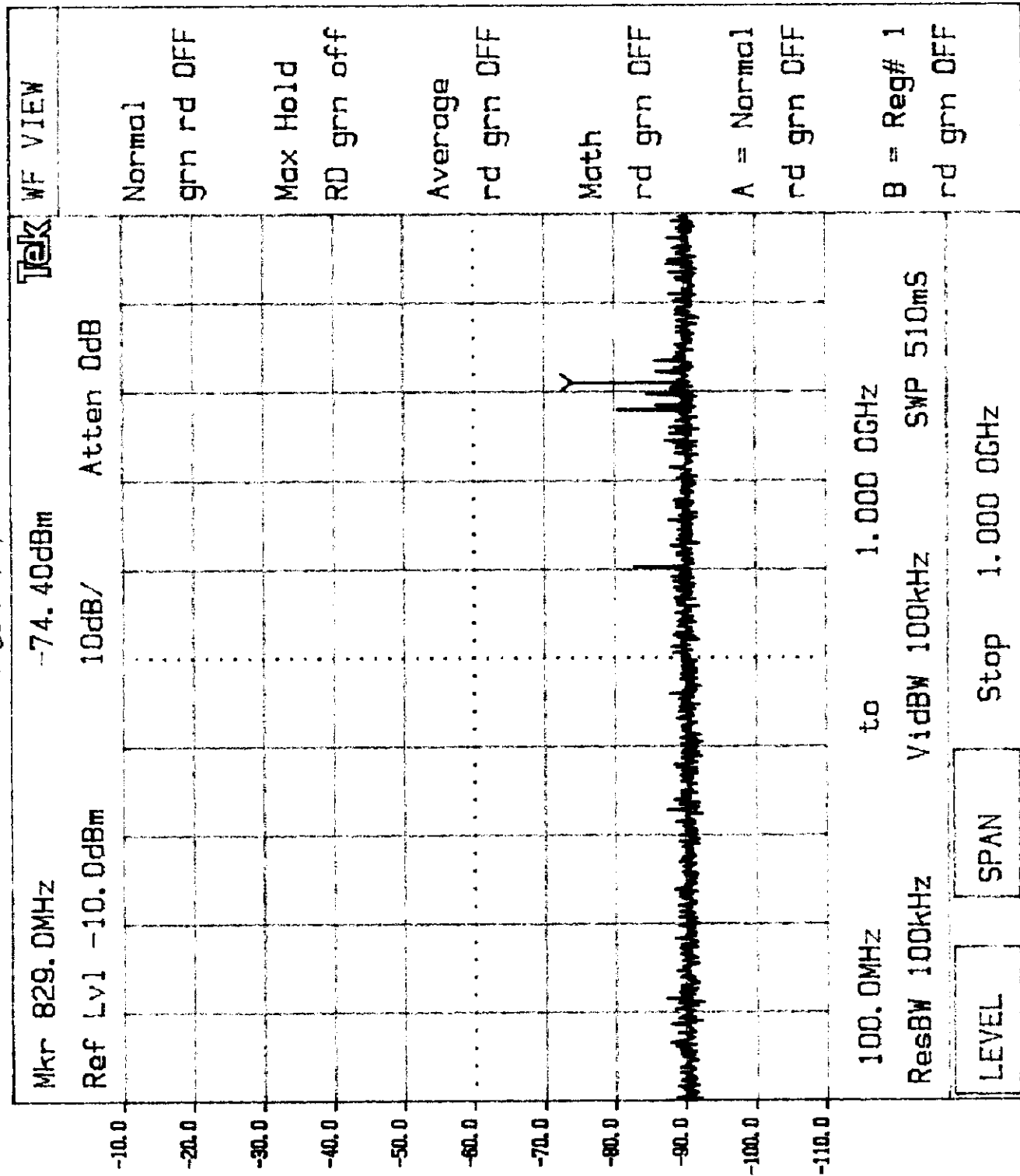




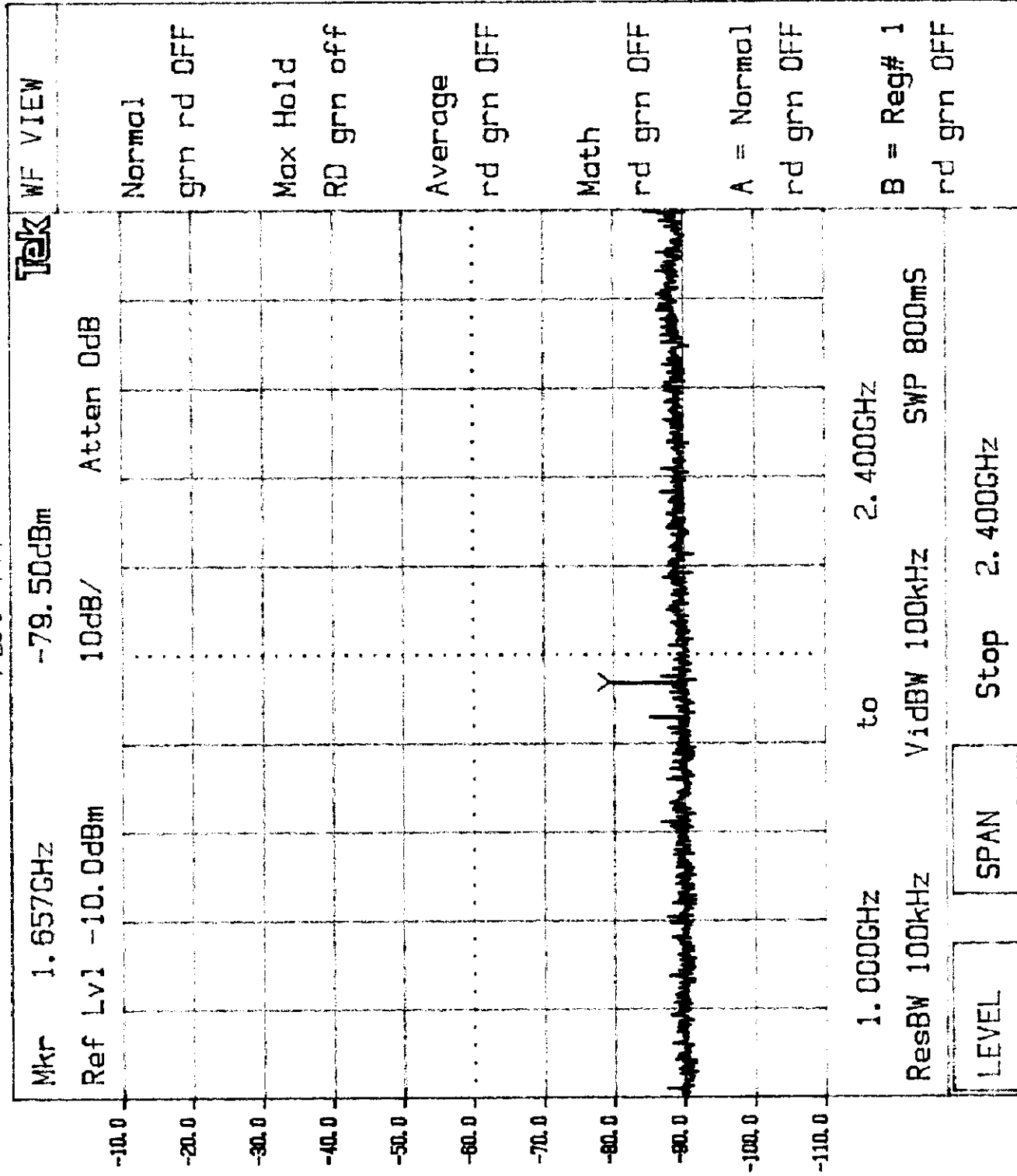
Plot 4.4.12



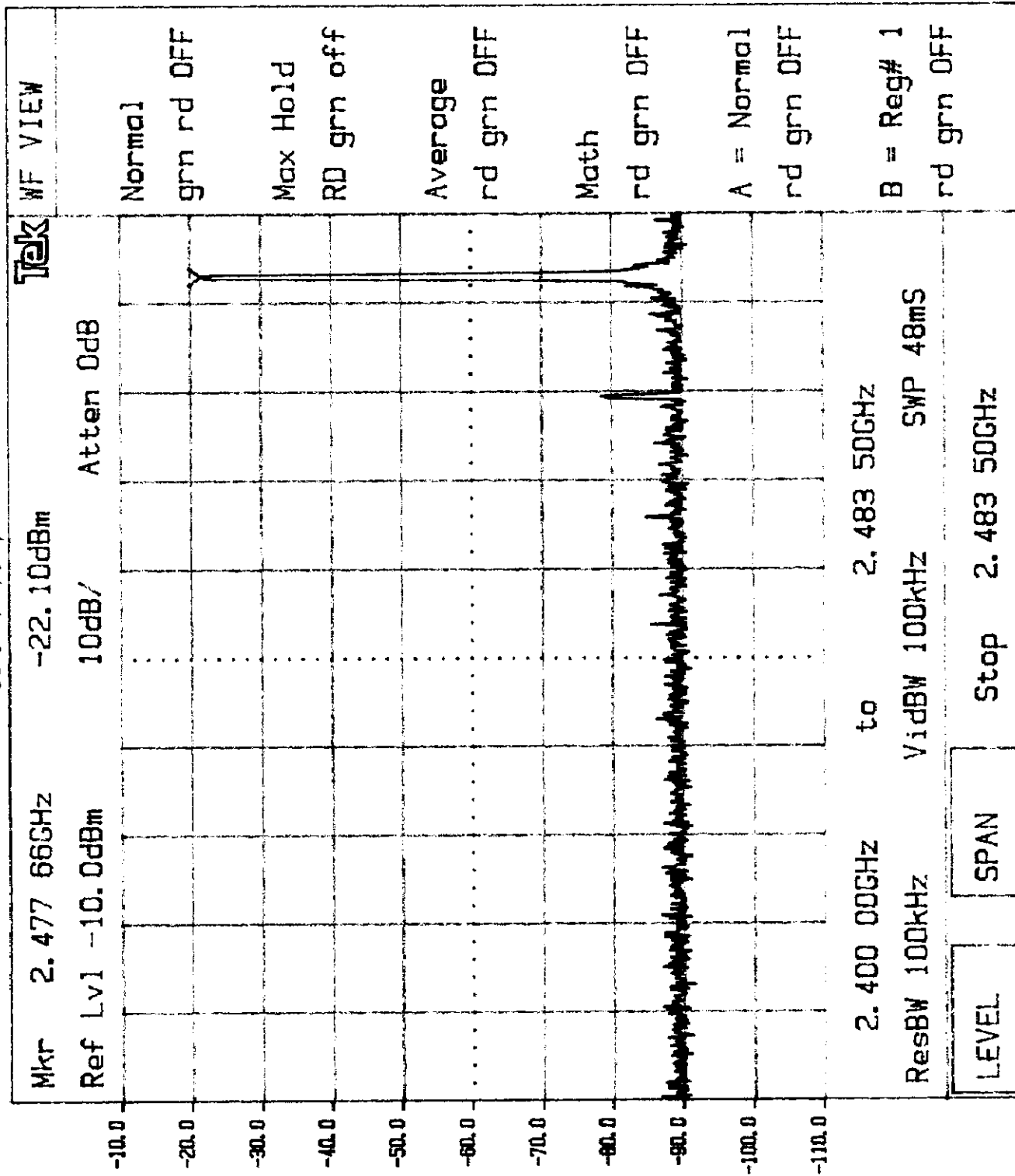
Plot 4.4.b



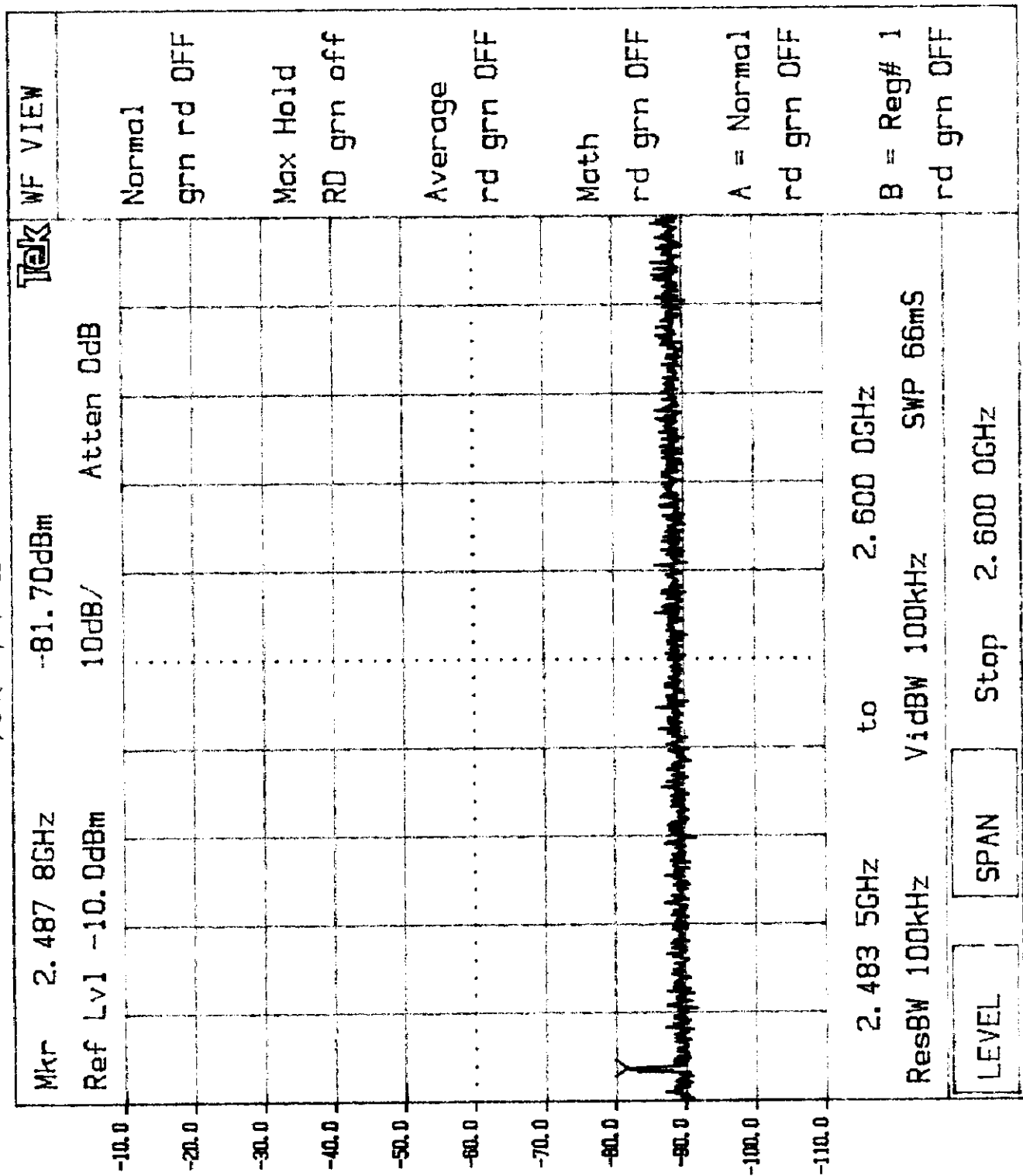
Plot 4.4.c



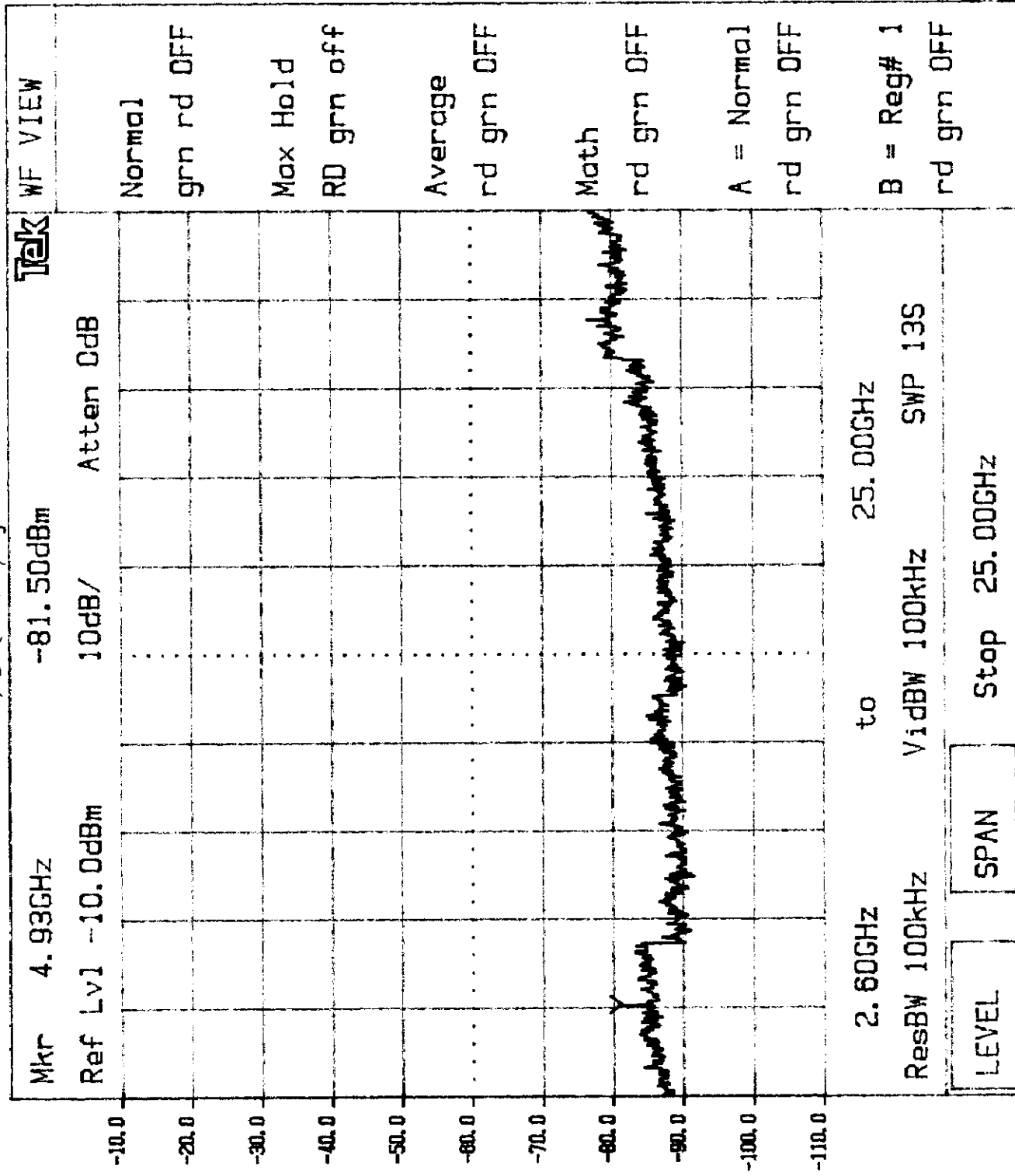
Plot 4.4. d



Plot 4.4.e



Plot 4.4.f



## 5 ANTENNA REQUIREMENTS

### 5.1 Test description

|               |                                                                                         |
|---------------|-----------------------------------------------------------------------------------------|
| Parameter:    | FCC § 15.203                                                                            |
| Requirement:  | FCC § 15.203                                                                            |
| Descriptions: | No antenna other than furnished by the responsible party shall be used with the device. |

### 5.2 Test Procedure

None

### 5.3 Test Results

The device is considered to comply with the requirements by

|   | Description                                       |
|---|---------------------------------------------------|
| X | Permanently attached antenna                      |
|   | Using an antenna with a unique coupling connector |
|   |                                                   |

### 5.4 Modifications made during testing

None

### 5.5 Test instrumentation

None

**6 AC LINE CONDUCTED EMISSIONS****6.1 Test description**

|              |                                            |
|--------------|--------------------------------------------|
| Parameter:   | ANSI C63.4                                 |
| Requirement: | FCC § 15.207                               |
| Limits:      | ≤ 250 μV within the band 450 kHz to 30 MHz |

**6.2 Test Procedure**

The EUT was connected to the DC power supply, that was connected to the AC line through the LISNs. Both HOT and NEUTRAL leads were tested.

AC line conducted emission measurements were performed from 0.45 MHz to 30 MHz. Analyzer resolution is 10 kHz or greater.

**6.3 Test Results**

| Handset                                     | Base Unit                      |
|---------------------------------------------|--------------------------------|
| Not applicable, EUT is battery powered only | See attached. Passed by 4.7 dB |

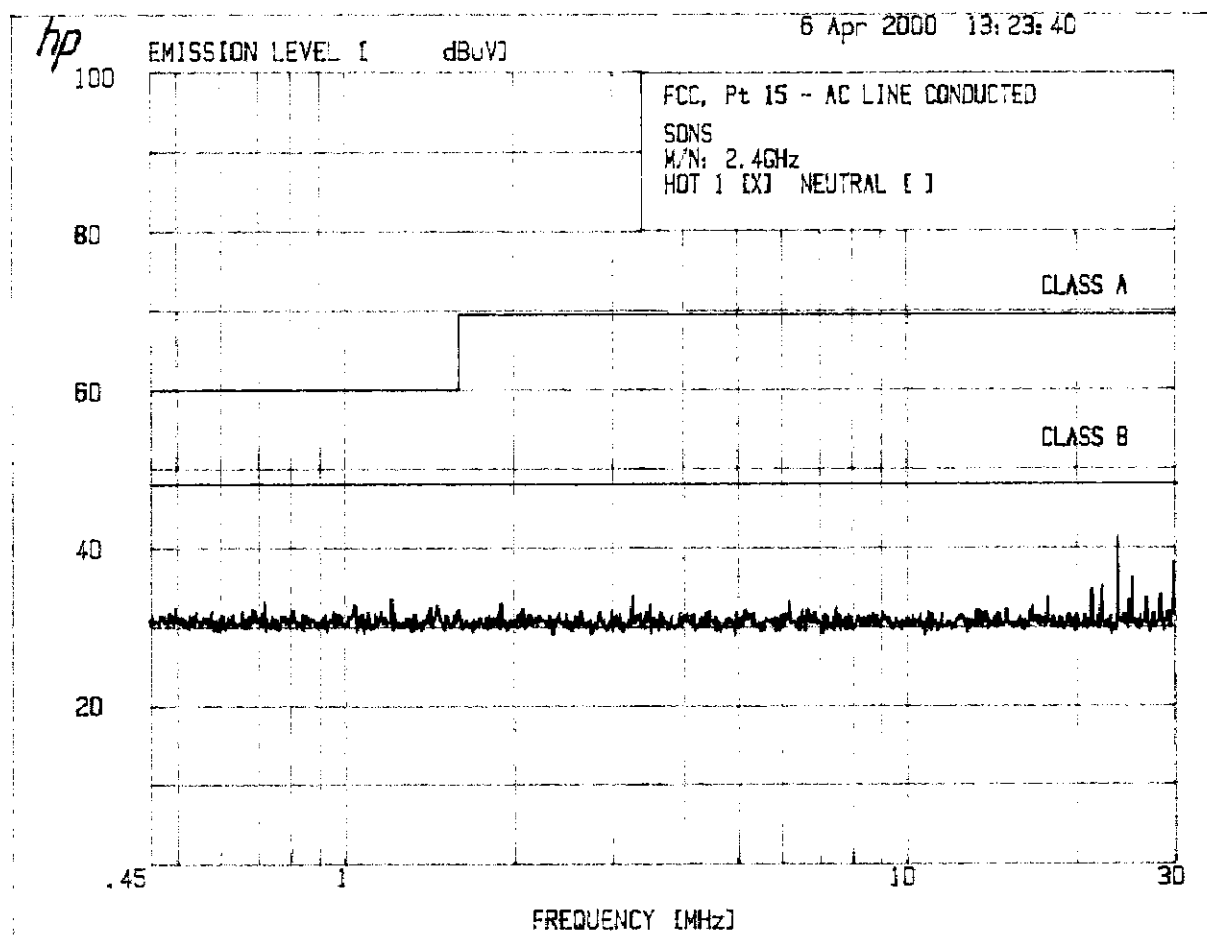
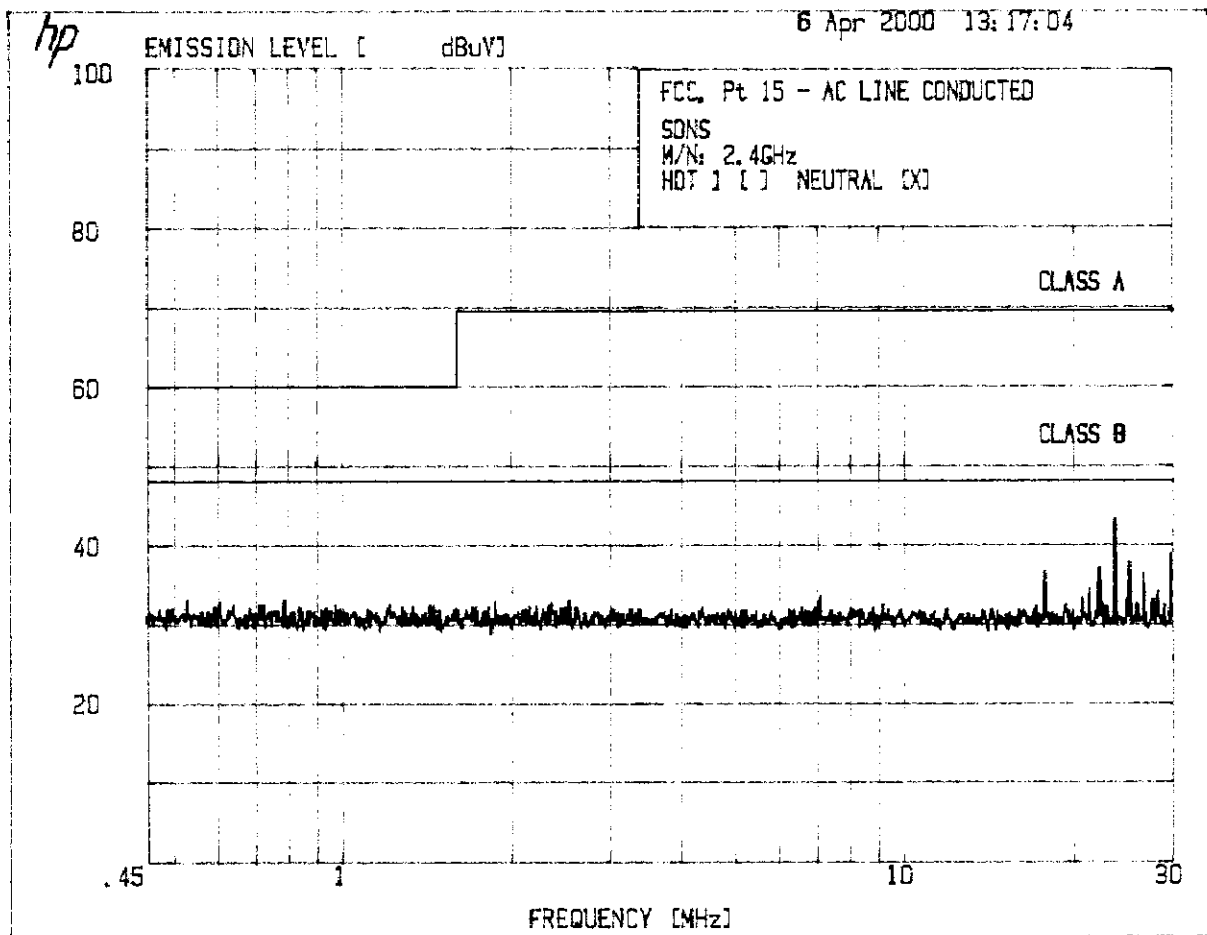
**6.4 Modifications made during testing**

None

**6.5 Test instrumentation**

- ☐ HP 8566B Spectrum Analyzer
- ☐ LISN





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5 Apr 2000 18:23:40

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3. FCC OFF 47, Pt 15

3.1 FCC, Pt 15 - AC LINE CONDUCTED

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SONS

M/N: 2.4GHz

HOT 1 [X] NEUTRAL [ ]

PEAKS FOUND ABOVE 35 dBuV

| PEAK# | FREQ (MHz) | AMPL (dBuV) |
|-------|------------|-------------|
| 1     | 22.37      | 35.3        |
| 2     | 23.82      | 41.4        |
| 3     | 25.26      | 36.3        |
| 4     | 29.87      | 38.2        |