

# TEST REPORT

## TEST PROCEDURES AND TEST SITE DESCRIPTION

| MEASUREMENT ITEMS |   | Section No.    |
|-------------------|---|----------------|
| 1.                | RF Output Power                                       | 2.1046         |
|                   | DC Voltage & Current into Final Amplifying Device     | 2.1033 (c) (8) |
| 2.                | Modulation Characteristics (Audio Frequency Response) | 2.1047         |
| 3.                | Modulation Characteristics (Modulation Limiting)      | 2.1047         |
| 4.                | Modulation Characteristics (Transient Response)       | 2.1047         |
| 5.                | Occupied Bandwidth                                    | 2.1049         |
| 6.                | Spurious & Harmonic Emission at Antenna Terminal      | 2.1051         |
| 7.                | Field Strength of Spurious & Harmonic Radiation       | 2.1053         |
| 8.                | Frequency Stability (Frequency vs. Temperature)       | 2.1055         |
| 9.                | Frequency Stability (Frequency vs. Voltage)           | 2.1055         |

**NOTE:** List of measurement equipment and test site description are included in this exhibit.

1. RF Output Power &  
DC Voltage & Current into Final Amplifying Device  
-----

JRH 2.1046  
~~2.985~~  
~~2.983(d)(5)~~  
2.1033(c)(8)

a) RF Power Output

The unit was tuned-up in accordance with the alignment procedure stated in the EXHIBIT-6, and was loaded into a 50 ohm resistive termination. Unmodulated RF output power of the unit was measured by RF power meter.

FCC limits: 4 Watts

Test Results: Refer to TEST DATA.

b) DC Voltage & Current into Final Amplifying Device

To measure the DC Voltage and Current into Final Amplifying Device, the measuring equipment were connected to the actual P.C.Board of the unit.

FCC limits: Not specified

Test Results: Refer to TEST DATA.

2. Modulation Characteristics (Audio Frequency Response)  
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JRH 2.1047  
~~2.987~~

An audio signal generator was connected to the microphone input circuit of the unit. An audio signal was supplied to obtain 50% modulation at the maximum audio frequency response of the unit, and this point was taken as the 0 dB reference level. The modulating frequency was varied from 100 Hz to 10 kHz and the level necessary to maintain a constant 50% modulation was recorded.

Test Results: Refer to TEST DATA.

3. Modulation Characteristics (Modulation Limiting)  
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JRH 2.1047  
~~2.987~~

Means for applying audio signal is as per the Measurement Procedure for Audio Frequency Response. With modulation frequencies of 400, 1000 and 2500 Hz respectively, the modulation response was measured up to the maximum modulation for each audio signal respectively. The modulation percentage was read on the wave form which is displayed on the oscilloscope.

Test Results: Refer to TEST DATA.

#### 4. Modulation Characteristics (Transient Response)

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JKH 2.1047  
~~2.987~~

The unit was modulated with a 2500 Hz tone at an input level 16dB greater than that required 50% modulation. And this signal was pulsed, without switching transients, at approximately one pulse per sec. and with a pulse length of approx. 1/2 sec. This tone burst signal was generated with the function generator.

The spectrum analyzer was tuned to the desired channel and set for the measurement as in the case of measuring the Occupied Bandwidth. Then, the spectrum analyzer was tuned to either of the two channels, adjacent (+/- 10 kHz) to the desired channel, then the spectrum analyzer was set to the time domain and modulation transient was observed.

FCC limits: The transient response not attenuated at a level of at least 33 dB with respect to the unmodulated carrier level was measured.

Test Results: Refer to TEST DATA.

#### 5. Occupied Bandwidth

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~~2.989~~

JKH 2.1049

The spectrum of the modulated carrier was monitored by a panoramic method capable of 60dB amplitude range. The unit was modulated with a 2500 Hz audio signal at an input level 16dB above that required for 50% of maximum system deviation.

FCC limits: a) -25dB (50 - 100% of assigned frequency)  
b) -35dB (100 - 250% of assigned frequency)  
c) -60dB (more than 250% of assigned frequency)

Test Results: Refer to TEST DATA.

#### 6. Spurious & Harmonic Emission at Antenna Terminal

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JKH 2.1051  
~~2.991~~

The unit was modulated with a 2500 Hz tone at an input level 16dB greater than that required 50% modulation. The spectrum was scanned from the lowest frequency generated in the unit to the tenth harmonic of the carrier.

FCC limits: -60 dB

Test Results: Refer to TEST DATA.

## 7. Field Strength of Spurious & Harmonic Radiation

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2-993  
2-1053  
GRH

### Measurement Procedure & Test Site Description:

Field strength measurement of radiated spurious emissions were made on a 3 meter range maintained by Uniden Corporation in Japan. Complete description and measurement data of this test site have been placed on file with the Commission. The equipment was scanned for radiated emissions in a scheduled enclosure prior to open field testing.

For each spurious or harmonic frequency, the antenna was raised and lowered to obtain a maximum reading on the Spectrum Analyzer with antenna horizontally polarized. Then the turntable, on which the equipment under test was placed, was rotated a minimum of 360 degree to further increase the reading on the Spectrum Analyzer. This procedure was repeated with the antenna vertically polarized.

### Test Condition:

The equipment was placed in its normal operating position on a turntable approximately 1 meter in height, with a normal power lead and microphone attached. The non-radiative dummy load was directly connected to the output terminal. The power lead was extended approximately vertically down to an external power supply located below the center of the turntable and as near to the floor of the test area as possible. Excess power lead was handled near the power supply terminals. The microphone cable was extended vertically to the maximum length of the lead above the point where its connector was attached to the equipment.

FCC limits: -60 dB

Test Results: Refer to TEST DATA.

## 8. Frequency Stability (Frequency vs. Temperature)

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2-1055  
2-995  
GRH

Frequency measurements are made at 10 deg. C intervals starting at -30 deg. C and ending +50 deg. C allowing at least two hours at each temperature for stabilization.

Before the measurement, the unit is operated in the transmitting condition for 10 second after 15 minutes in standby condition.

Measurement data showing variation in transmitter output frequency from a start and elapsed time necessary for the frequency to stabilize are made at each temperature level.

FCC limits:  $\pm 0.005\%$   
Test Results: Refer to TEST DATA.

9. Frequency Stability (Frequency vs. Voltage)

~~2.995~~  
2.1055

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Frequency measurement was performed at the extremes of throughout the range 85% and 115% of the nominal voltage.

The frequency of the unit was measured by extracting a sample of the carrier and measuring its center frequency by equipment having a degree accuracy at least 10 times that of the minimum to be measured.

FCC limits:  $\pm 0.005\%$   
Test Results: Refer to TEST DATA.

1. RF Output Power & DC Voltage and Current into  
Final Amplifying Device

1-1 RF OUTPUT POWER

| MEASURED FREQUENCY | OUTPUT POWER |
|--------------------|--------------|
| 26.965 MHz (CH 1)  | 3.85 Watts   |
| 27.175 MHz (CH 18) | 3.92 Watts   |
| 27.405 MHz (CH 40) | 3.82 Watts   |

1-2 DC VOLTAGE & CURRENT INTO FINAL AMPLIFYING DEVICE

| MEASURED FREQUENCY | OUTPUT POWER | TX FINAL TRANSISTOR |                   |
|--------------------|--------------|---------------------|-------------------|
|                    |              | COLLECTOR VOLTAGE   | COLLECTOR CURRENT |
| 26.965 MHz (CH 1)  | 3.85 Watts   | 11.9 V              | 0.68A             |
| 27.175 MHz (CH 18) | 3.92 Watts   | 11.9 V              | 0.68A             |
| 27.405 MHz (CH 40) | 3.82 Watts   | 11.9 V              | 0.68 A            |

## AF RESPONSE

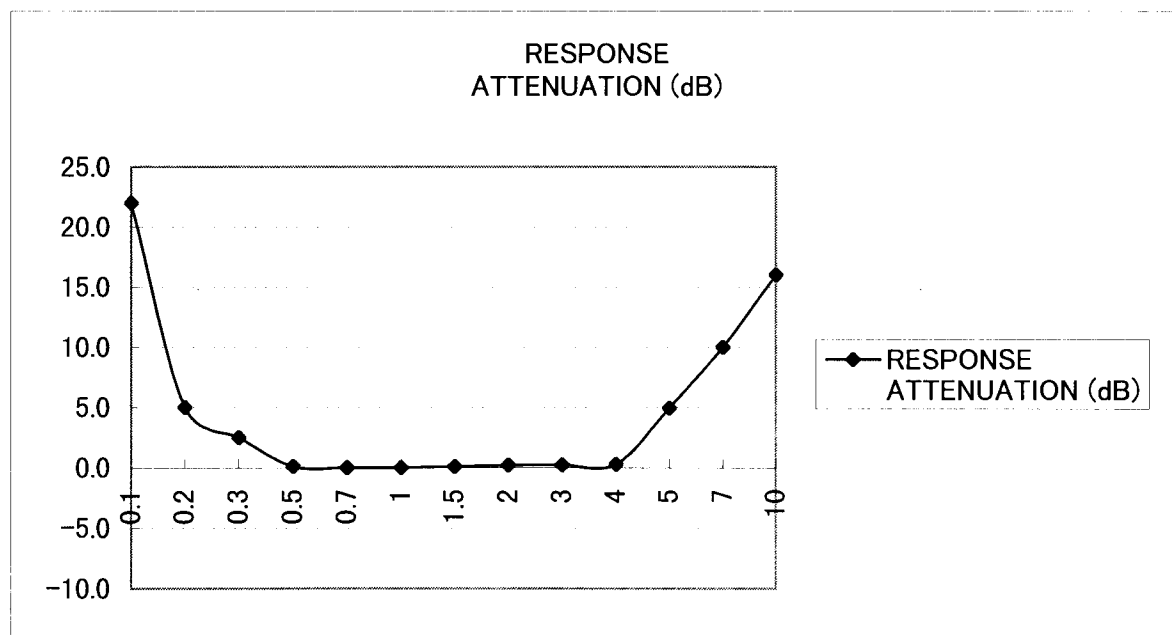
### 2. MODULATION CHARACTERISTICS (AUDIO FREQUENCY RESPONSE)

2.987

CARRIER FREQUENCY: 27.1750 MHz

OUTPUT POWER: 3.92 WATTS

| AUDIO<br>FREQUENCY<br>(kHz) | RESPONSE<br>ATTENUATION<br>(dB) |
|-----------------------------|---------------------------------|
| 0.1                         | 22.0                            |
| 0.2                         | 5.0                             |
| 0.3                         | 2.5                             |
| 0.5                         | 0.1                             |
| 0.7                         | 0.0                             |
| 1                           | 0.0                             |
| 1.5                         | 0.1                             |
| 2                           | 0.2                             |
| 3                           | 0.3                             |
| 4                           | 0.3                             |
| 5                           | 5.0                             |
| 7                           | 10.0                            |
| 10                          | 16.0                            |



# MOD LIMITING

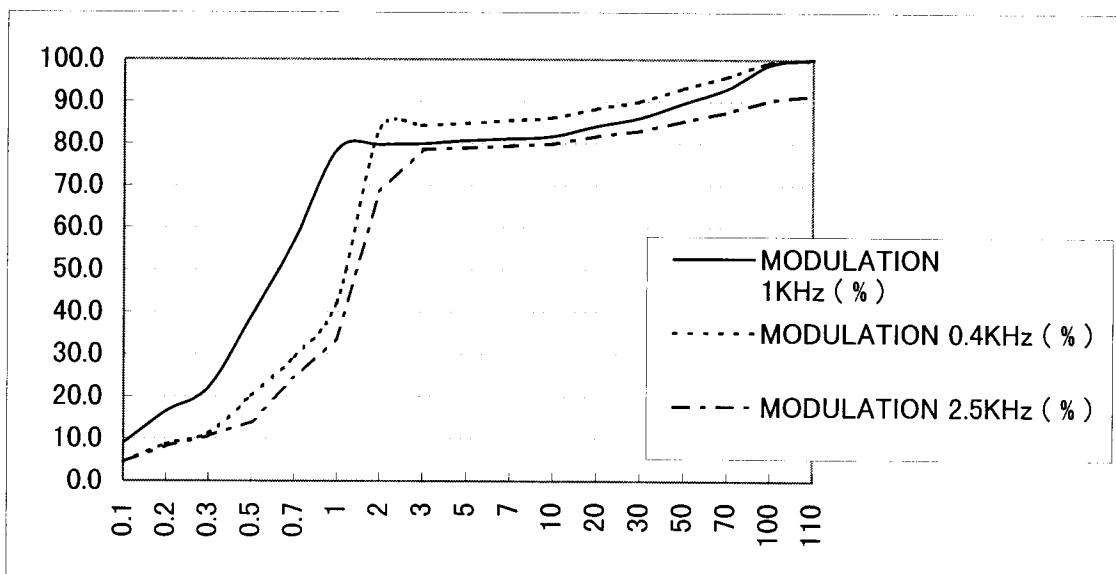
## 3. MODULATION CHARACTERISTICS (MODULATION LIMITING)

2.987

CARRIER FREQUENCY: 27.185 MHz

OUTPUT POWER: 3.92 WATTS

| AUDIO INPUT<br>LEVEL | MODULATION<br>1KHz | MODULATION<br>0.4KHz | MODULATION<br>2.5KHz |
|----------------------|--------------------|----------------------|----------------------|
| (mV)                 | ( % )              | ( % )                | ( % )                |
| 0.1                  | 8.9                | 4.4                  | 4.3                  |
| 0.2                  | 16.4               | 8.6                  | 8.1                  |
| 0.3                  | 22.0               | 11.2                 | 10.5                 |
| 0.5                  | 39.0               | 20.0                 | 13.8                 |
| 0.7                  | 56.9               | 29.3                 | 24.2                 |
| 1                    | 78.5               | 42.0                 | 33.7                 |
| 2                    | 79.6               | 83.5                 | 68.5                 |
| 3                    | 79.9               | 84.2                 | 78.5                 |
| 5                    | 80.6               | 84.7                 | 78.9                 |
| 7                    | 81.1               | 85.4                 | 79.3                 |
| 10                   | 81.7               | 86.1                 | 79.9                 |
| 20                   | 84.1               | 88.2                 | 81.7                 |
| 30                   | 86.1               | 90.0                 | 83.0                 |
| 50                   | 89.6               | 93.1                 | 85.3                 |
| 70                   | 93.0               | 95.8                 | 87.5                 |
| 100                  | 98.7               | 99.2                 | 90.3                 |
| 110                  | 100.0              | 99.8                 | 91.4                 |



## 4. MODULATION TRANSIENT RESPONSE

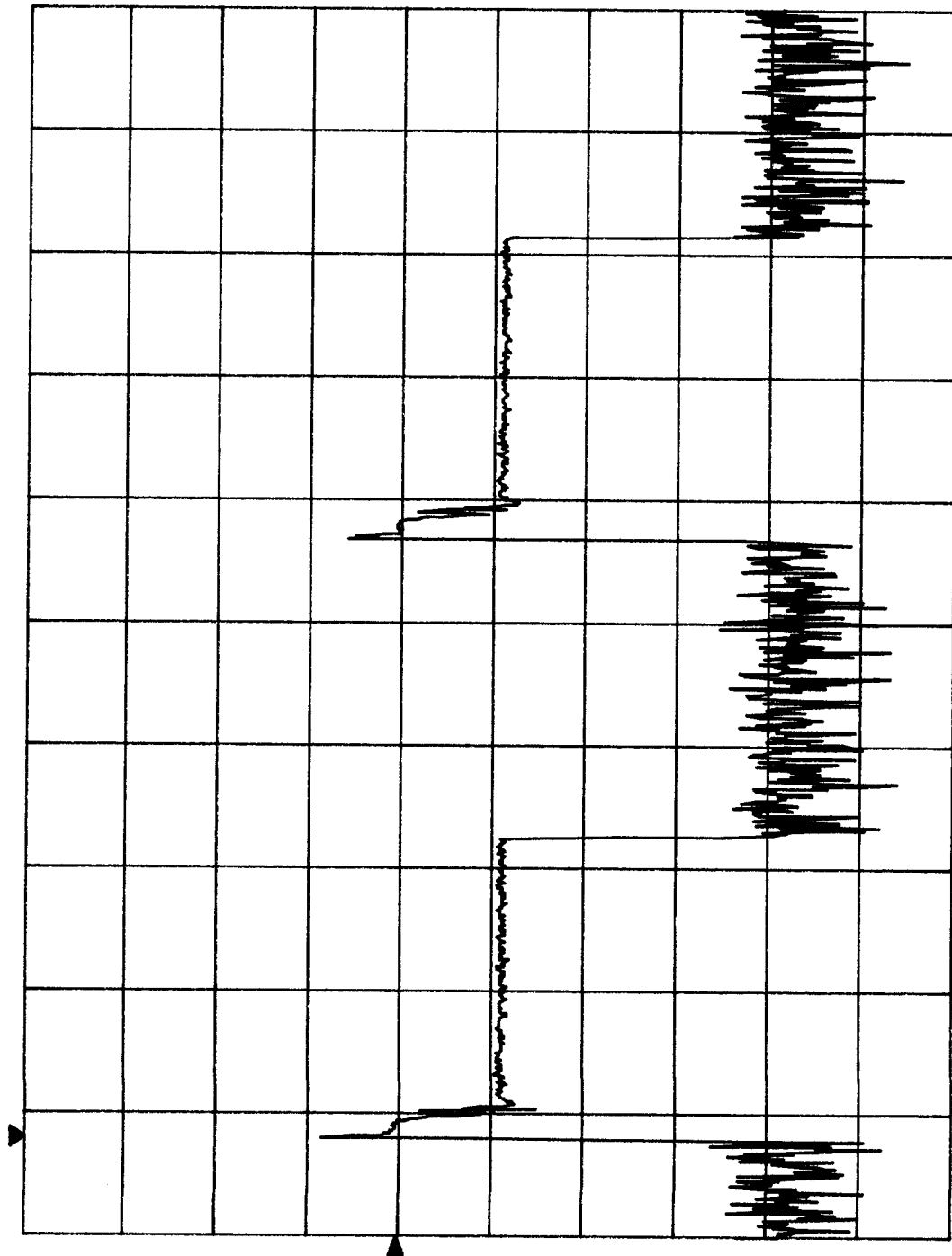
2.987

See attached graphs.

Tue 1998 Dec 1 14:22

REF -21.7 dBm  
10 dB/

A\_Write



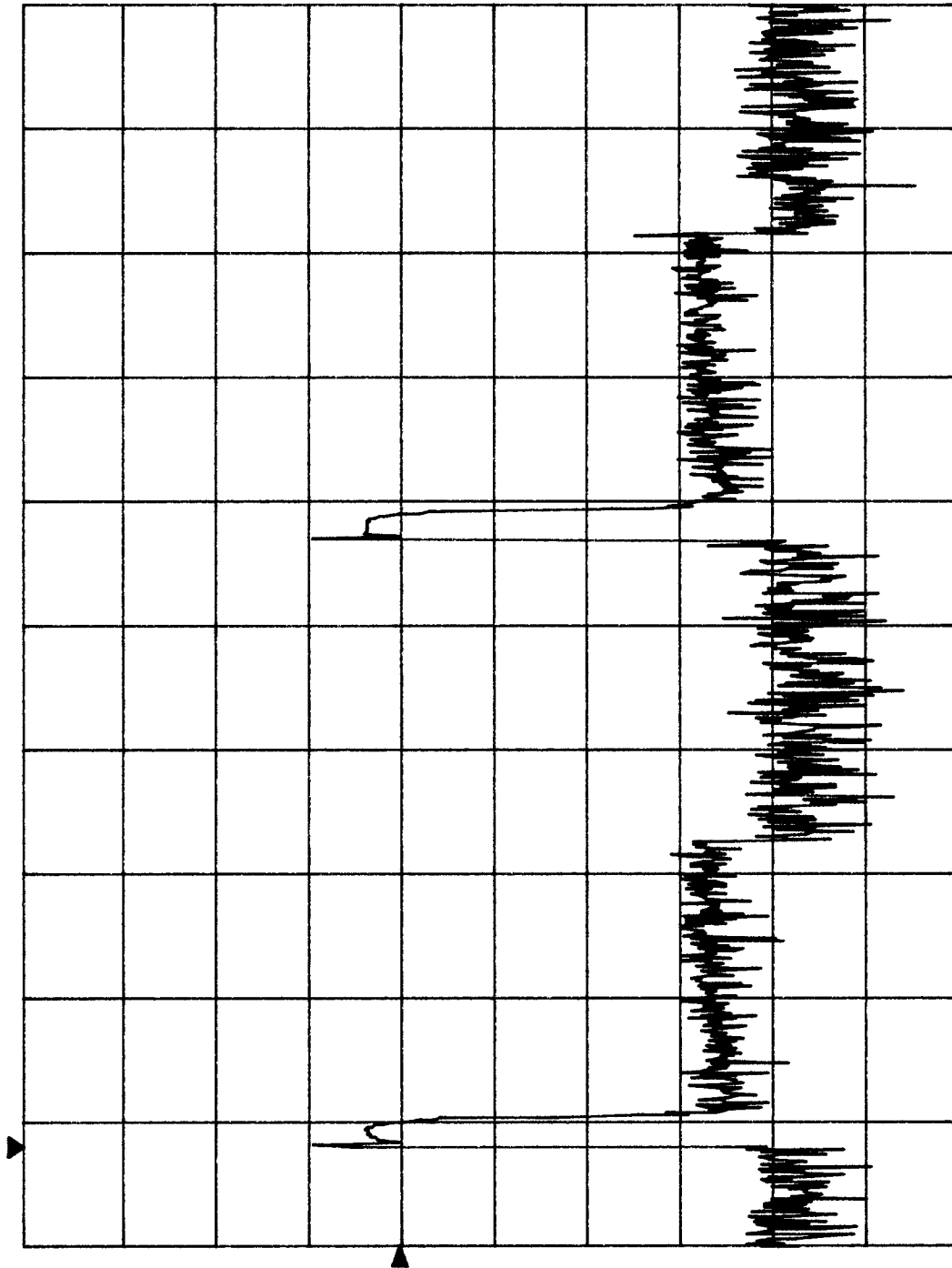
CENTER 26.955000 MHz  
\*RBW 300 Hz \*VBW 10 kHz \*SMP 2.0 s SPAN 0 Hz  
ATT 10 dB

✓

10  
-10K

Tue 1998 Dec 1 14:20

REF -21.7 dBm A\_Write  
10 dB/



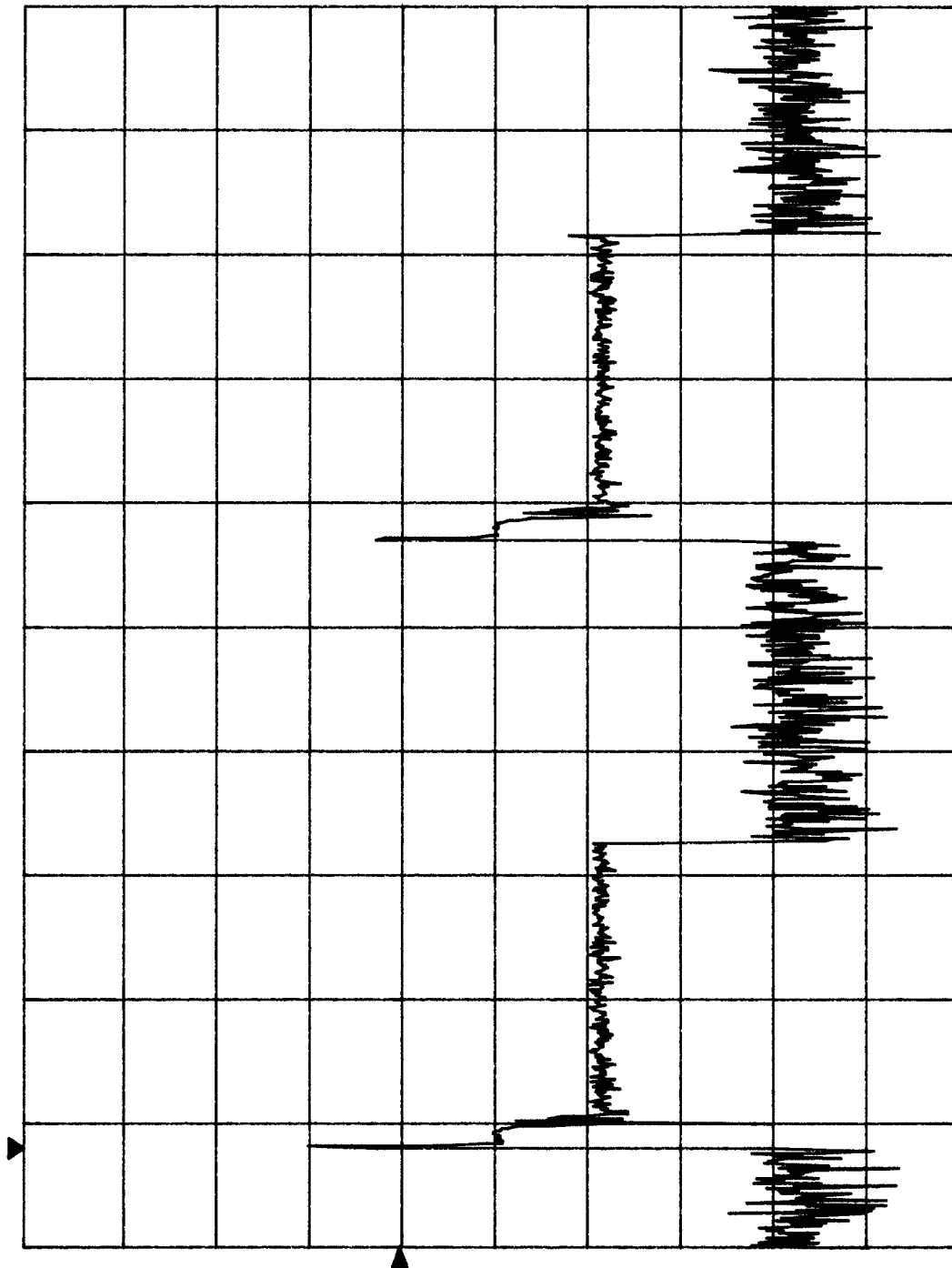
CENTER 26.975000 MHz SPAN 0 Hz  
\*RBW 300 Hz \*VBW 10 kHz \*SWP 2.0 s ATT 10 dB

2/6

1.0H  
+1.0K

Tue 1998 Dec 1 14: 14

REF -21.7 dBm A\_Write  
10 dB/



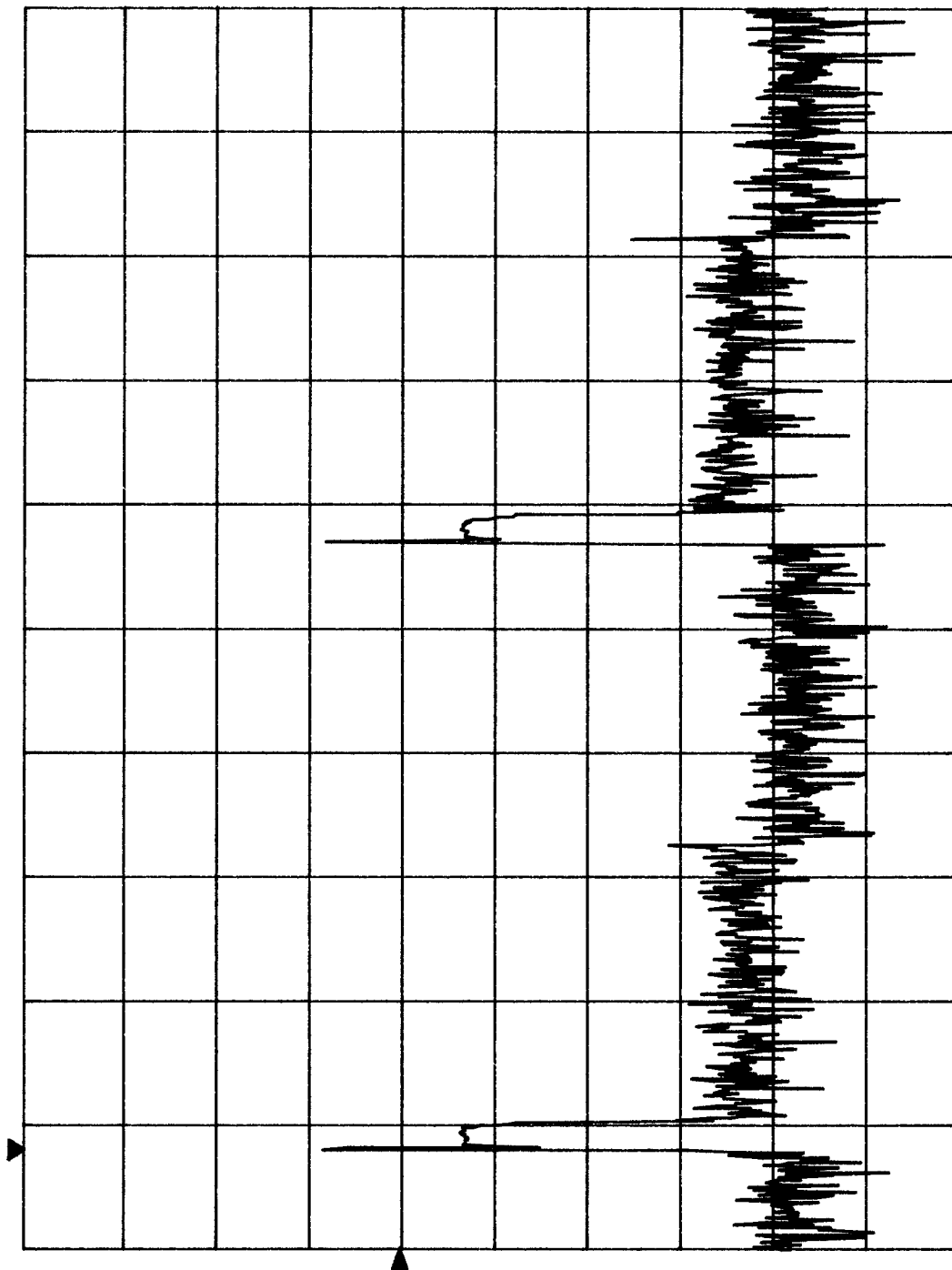
CENTER 27.165200 MHz SPAN 0 Hz  
\*RBW 300 Hz \*VBW 10 kHz \*SWP 2.0 s ATT 10 dB

3/6

180H  
-10K

Tue 1998 Dec 1 14:17

REF -21.7 dBm A\_Write  
10 dB/



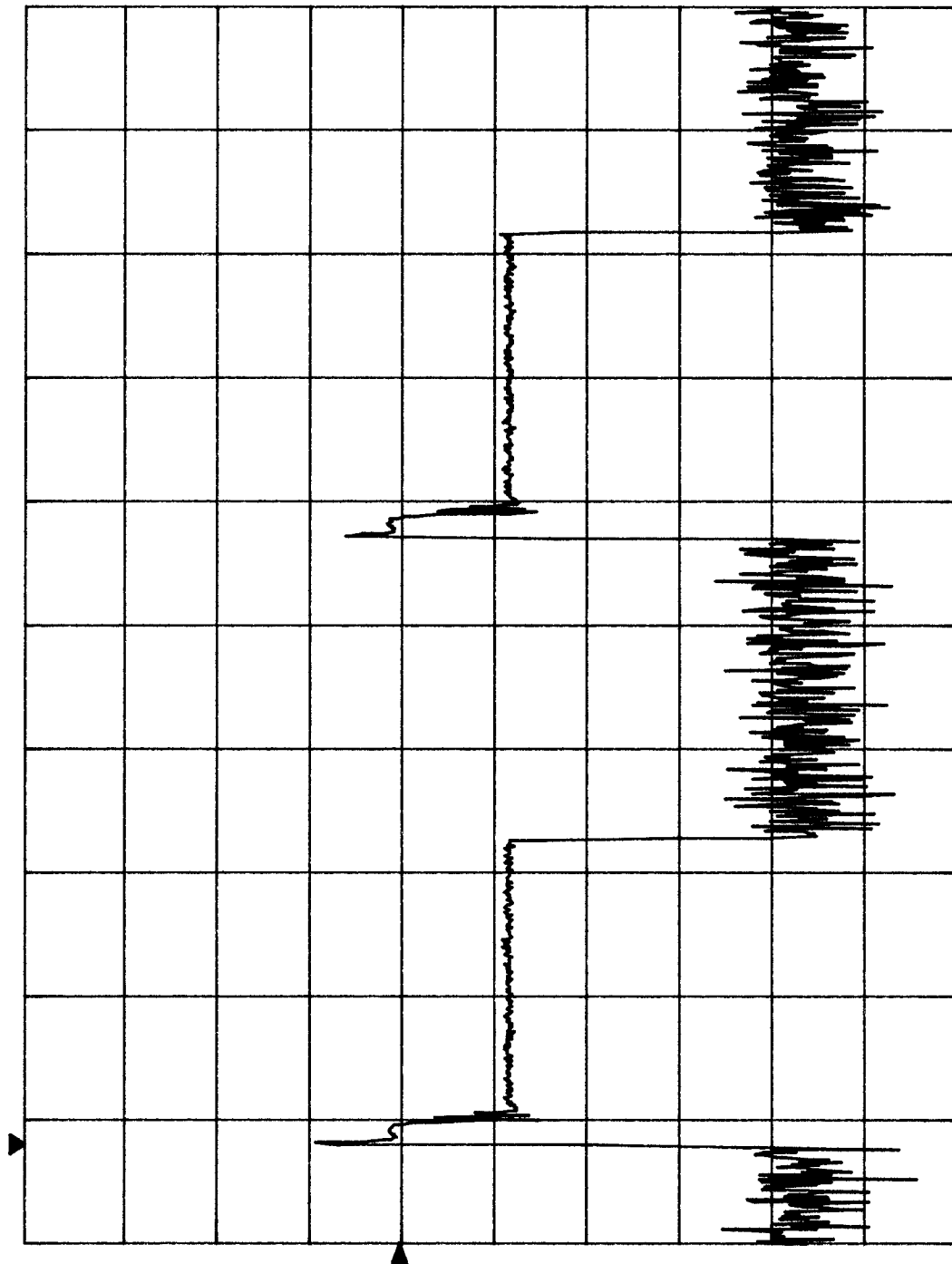
CENTER 27.185200 MHz SPAN 0 Hz  
\*RBW 300 Hz \*VBW 10 kHz \*SWP 2.0 s ATT 10 dB

4/6

1804  
+10k

Tue 1998 Dec 1 14: 09

REF -21.7 dBm A\_Write  
10 dB/



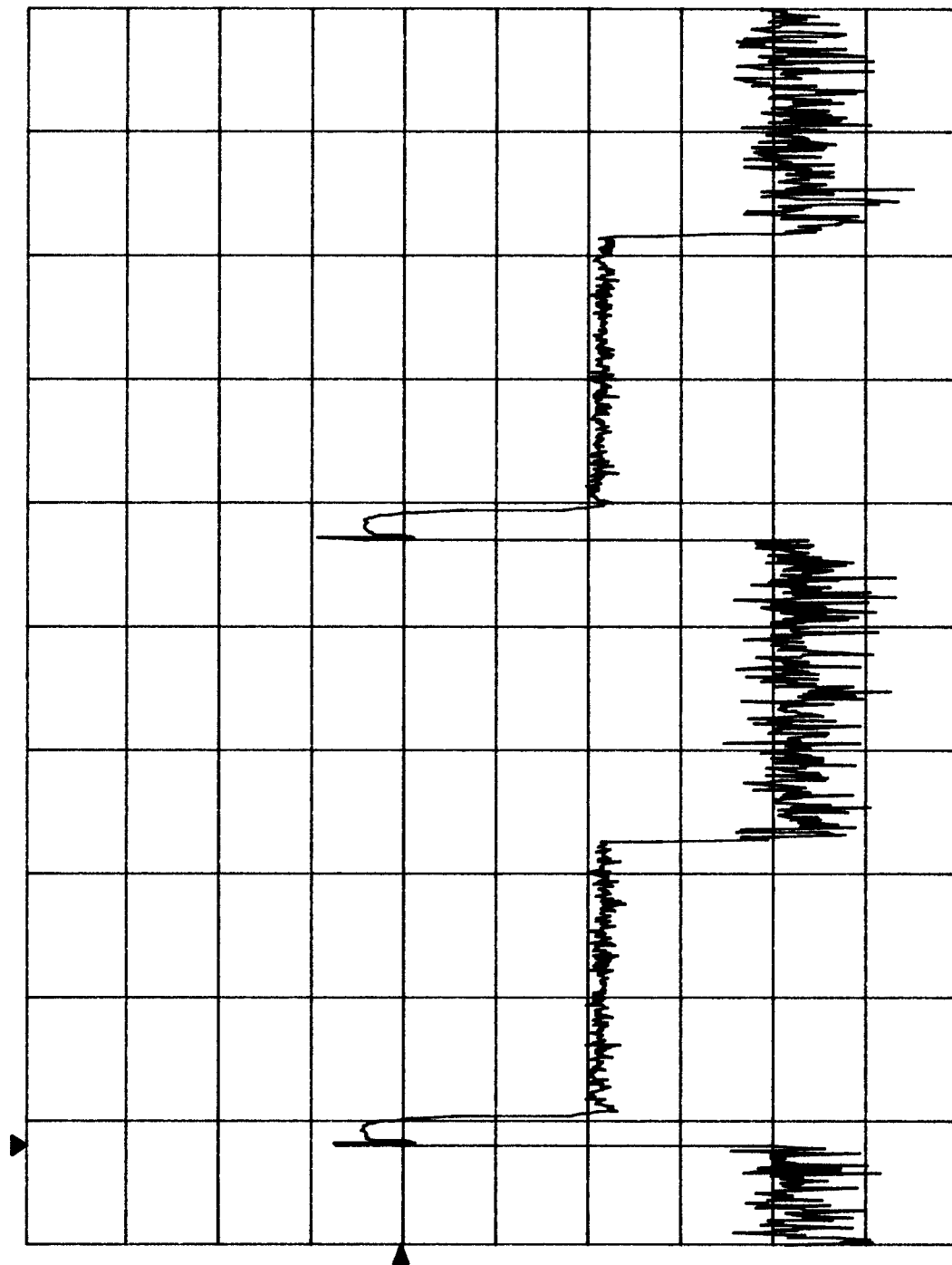
CENTER 27.395000 MHz SPAN 0 Hz  
\*RBW 300 Hz \*VBW 10 kHz ATT 10 dB  
\*SWP 2.0 s

5/6

400M -10K

Tue 1998 Dec 1 14:12

REF -21.7 dBm A\_Write  
10 dB/



CENTER 27.415000 MHz SPAN 0 Hz  
\*RBW 300 Hz \*VBW 10 kHz \*SWP 2.0 s ATT 10 dB

6/6

400H  
+10K

OBW

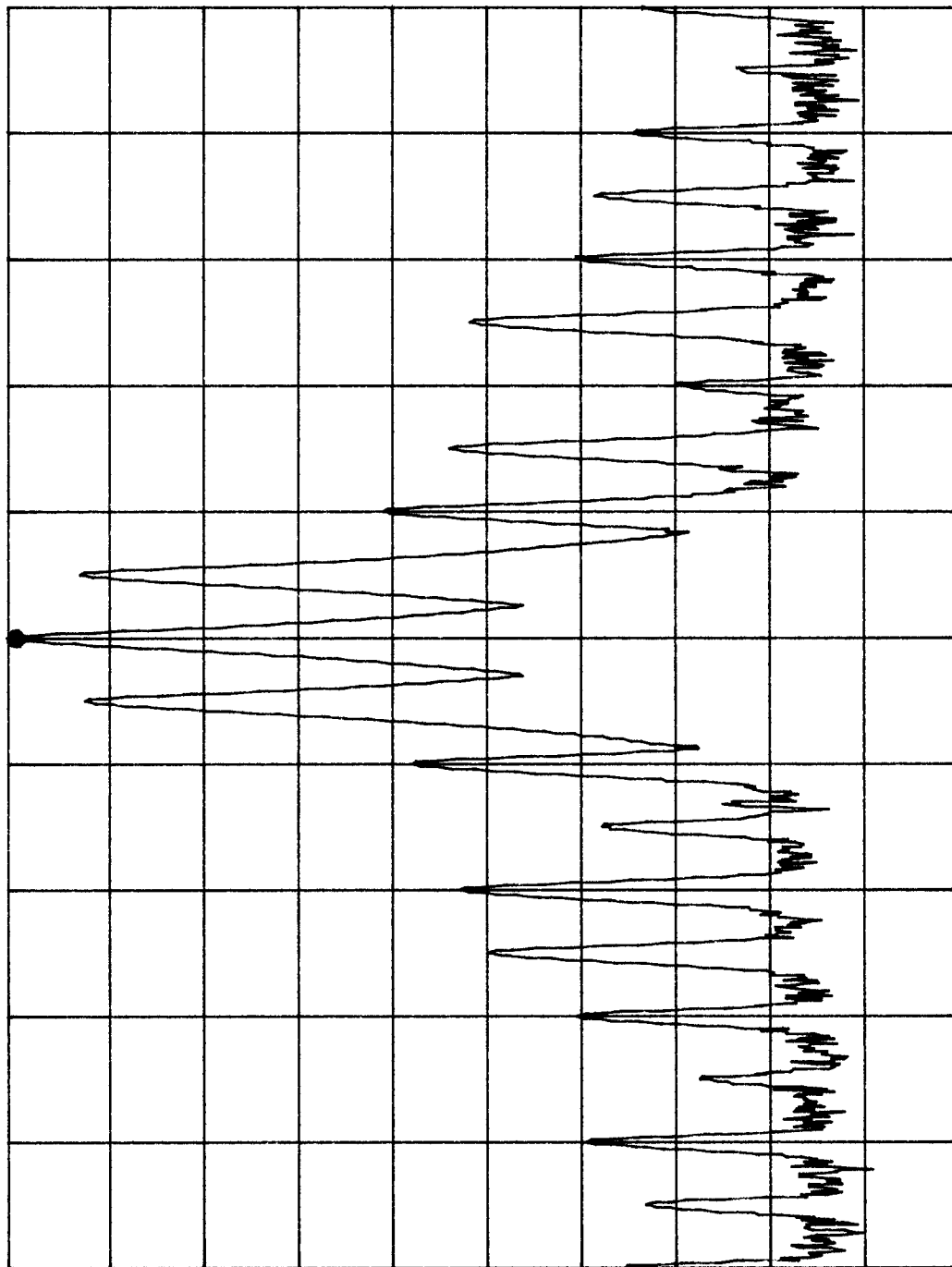
data

5. OCCUPIED BANDWIDTH

2.989

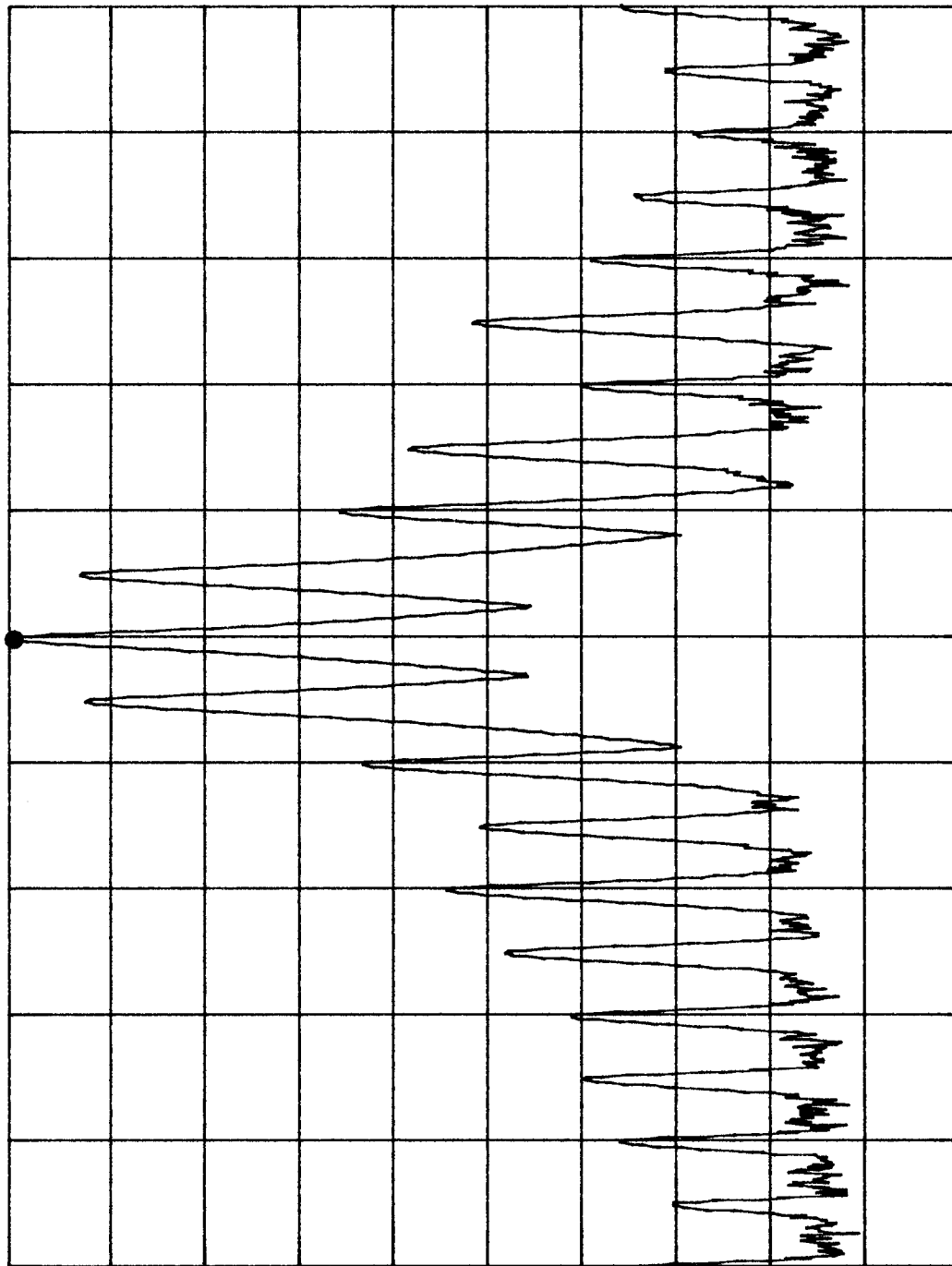
See attached graphs.

REF -21.0 dBm      A\_View    B\_Blank    MKR 26.96490 MHz      Tue 1998 Dec 1 13:38  
10 dB/      -21.65 dBm



CENTER 26.96490 MHz      SPAN 50.0 kHz  
\*RBW 300 Hz      \*VBW 1 kHz      SWP 1.2 s      ATT 10 dB

REF -21.0 dBm      A\_View    B\_Blank    MKR 27.17495 MHz      Tue 1998 Dec 1 13:35  
10 dB/      -21.52 dBm

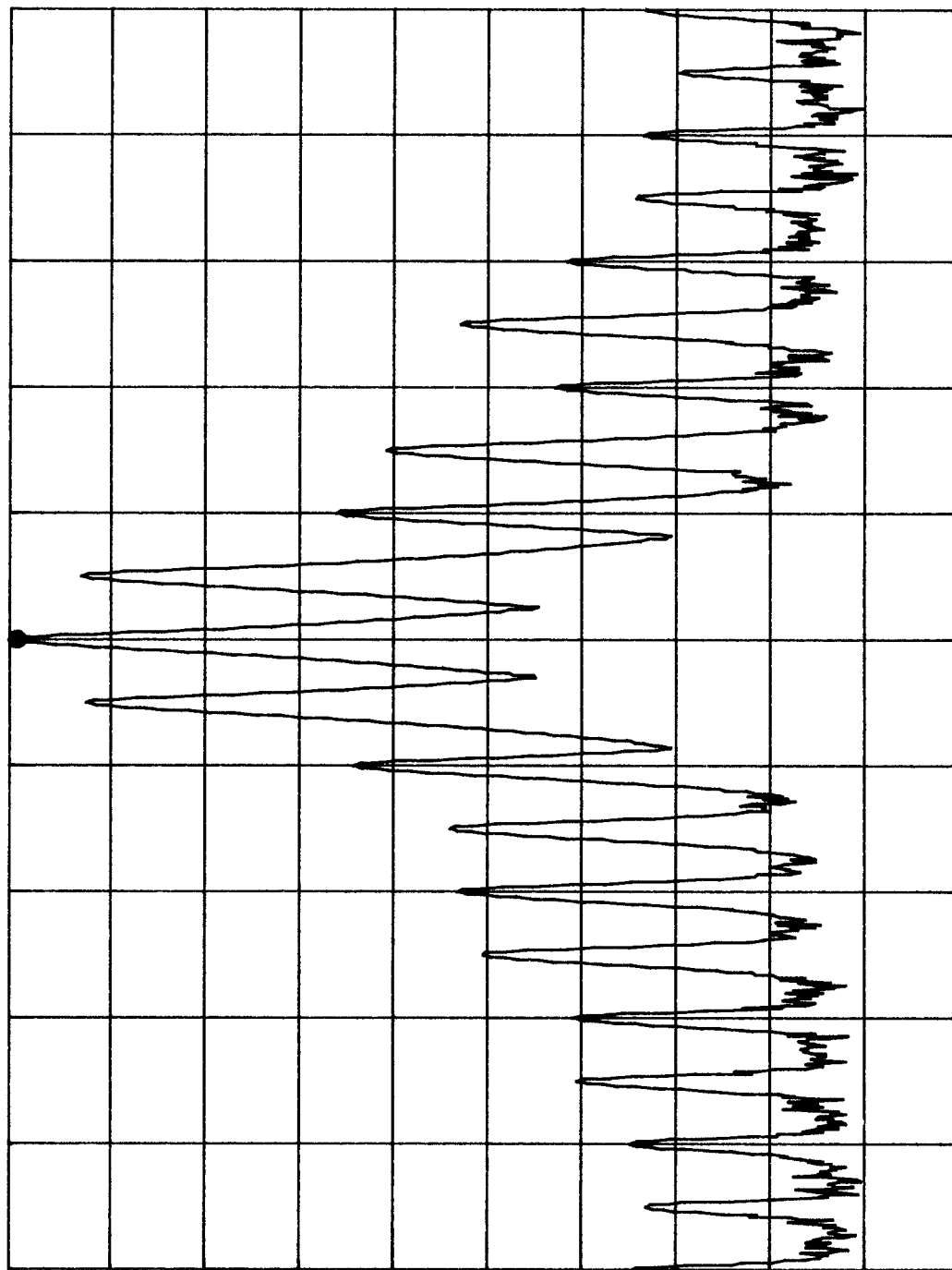


CENTER 27.17500 MHz      SPAN 50.0 kHz  
\*RBW 300 Hz      \*VBW 1 kHz      SWP 1.2 s      ATT 10 dB

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REF -21.0 dBm
10 dB/
A_View B_Blank MKR 27.40490 MHz
Tue 1998 Dec 1 13:41
-21.81 dBm

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CENTER 27.40490 MHz  
\*RBW 300 Hz \*VBW 1 kHz  
SPAN 50.0 kHz  
SWP 1.2 s ATT 10 dB

**6. SPURIOUS & HARMONICS EMISSION AT ANTENNA TERMINAL****2.991**

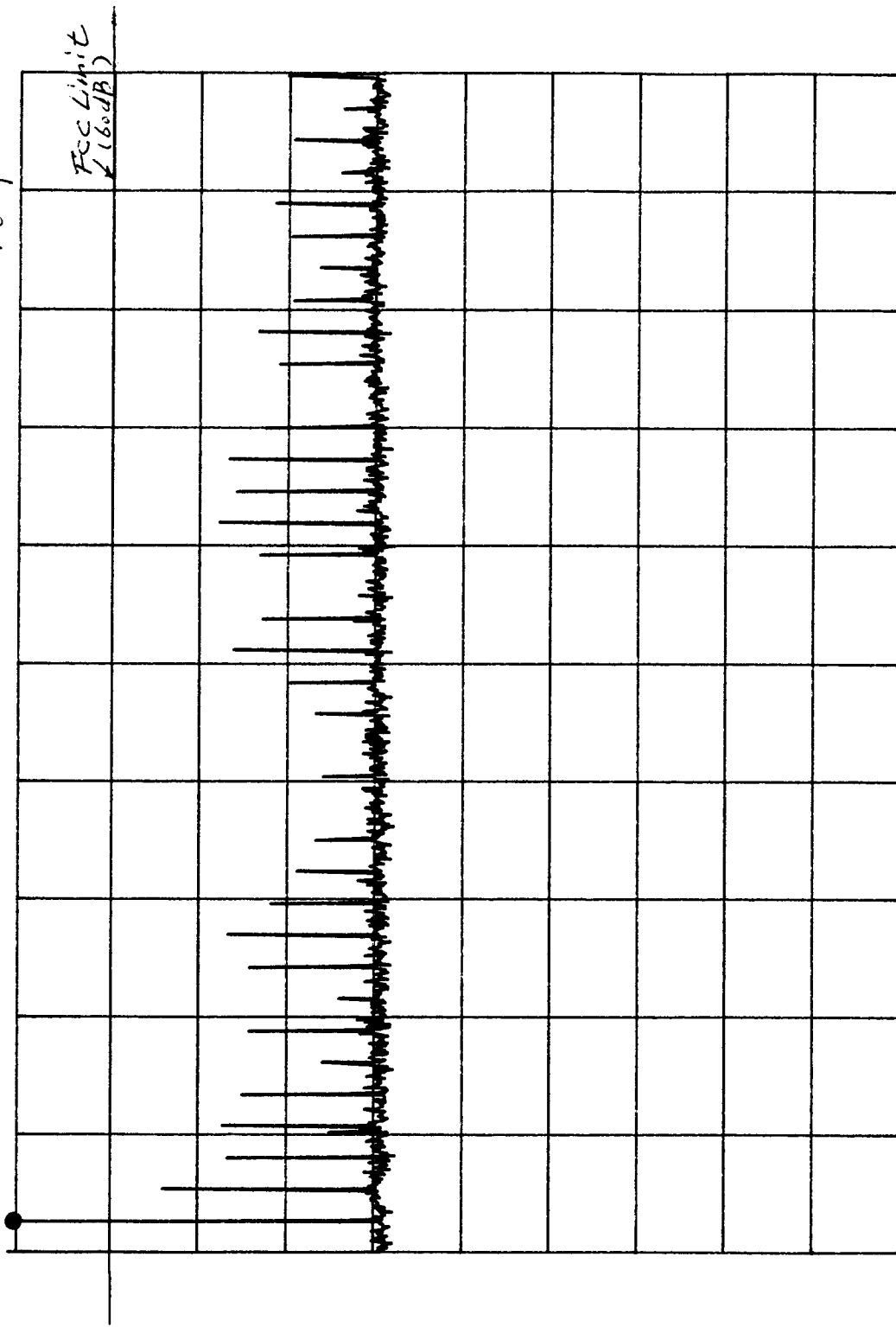
See attached graphs.

Tue 1998 Dec 1 14:51

REF -43.6 dBm  
10 dB/

A\_View B\_Blank MKR 27 MHz  
-43.29 dBm

101-



CENTER 500 MHz  
\*RBW 30 kHz  
SPAN 1.000 GHz  
ATT 10 dB  
SWP 2.3 s  
VBW 30 kHz

101-

Tue 1998 Dec 1 14: 49

REF -43.6 dBm

A\_View

B\_Blank

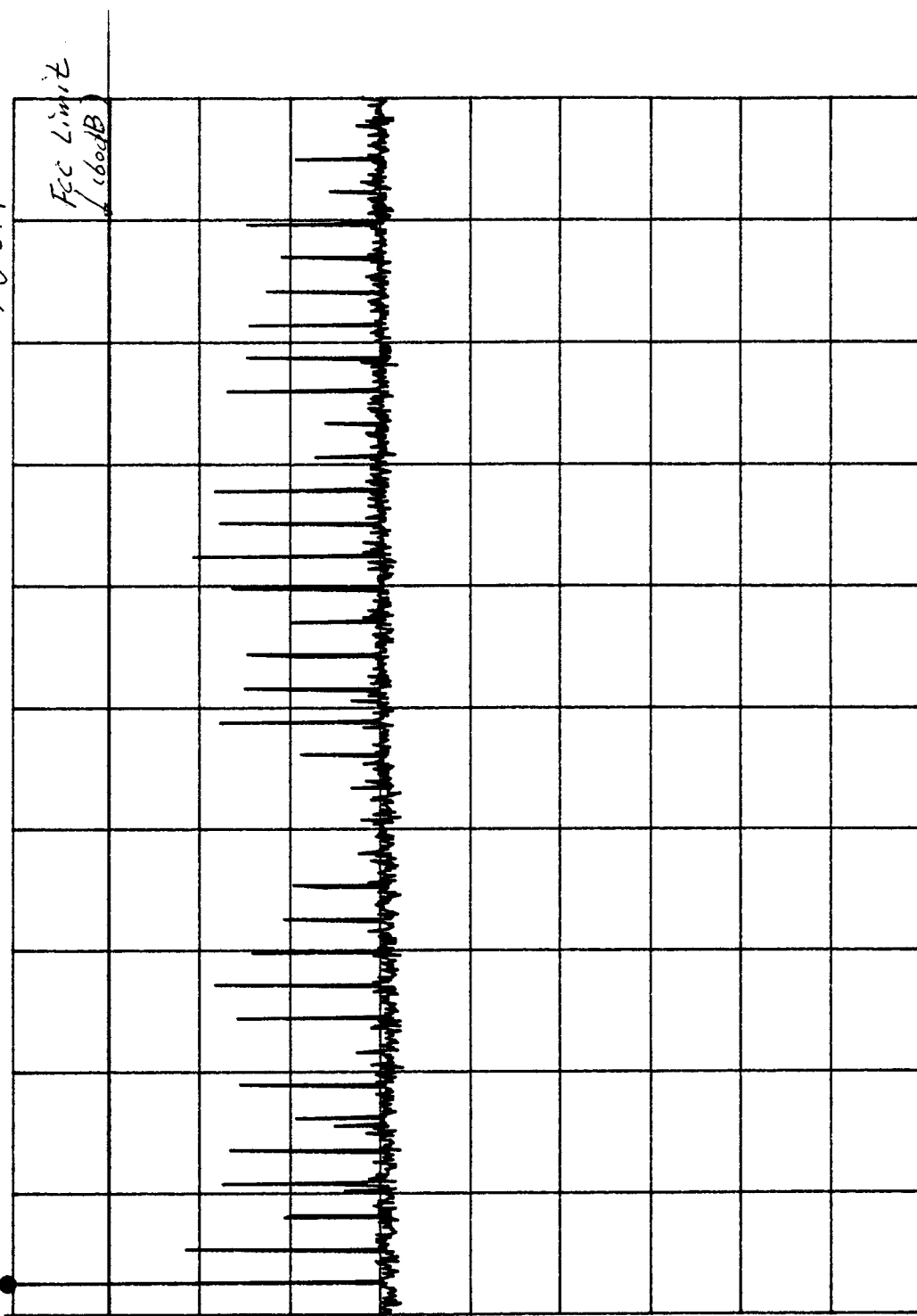
MKR

27 MHz

10 dB/

-42.90 dBm

18CH



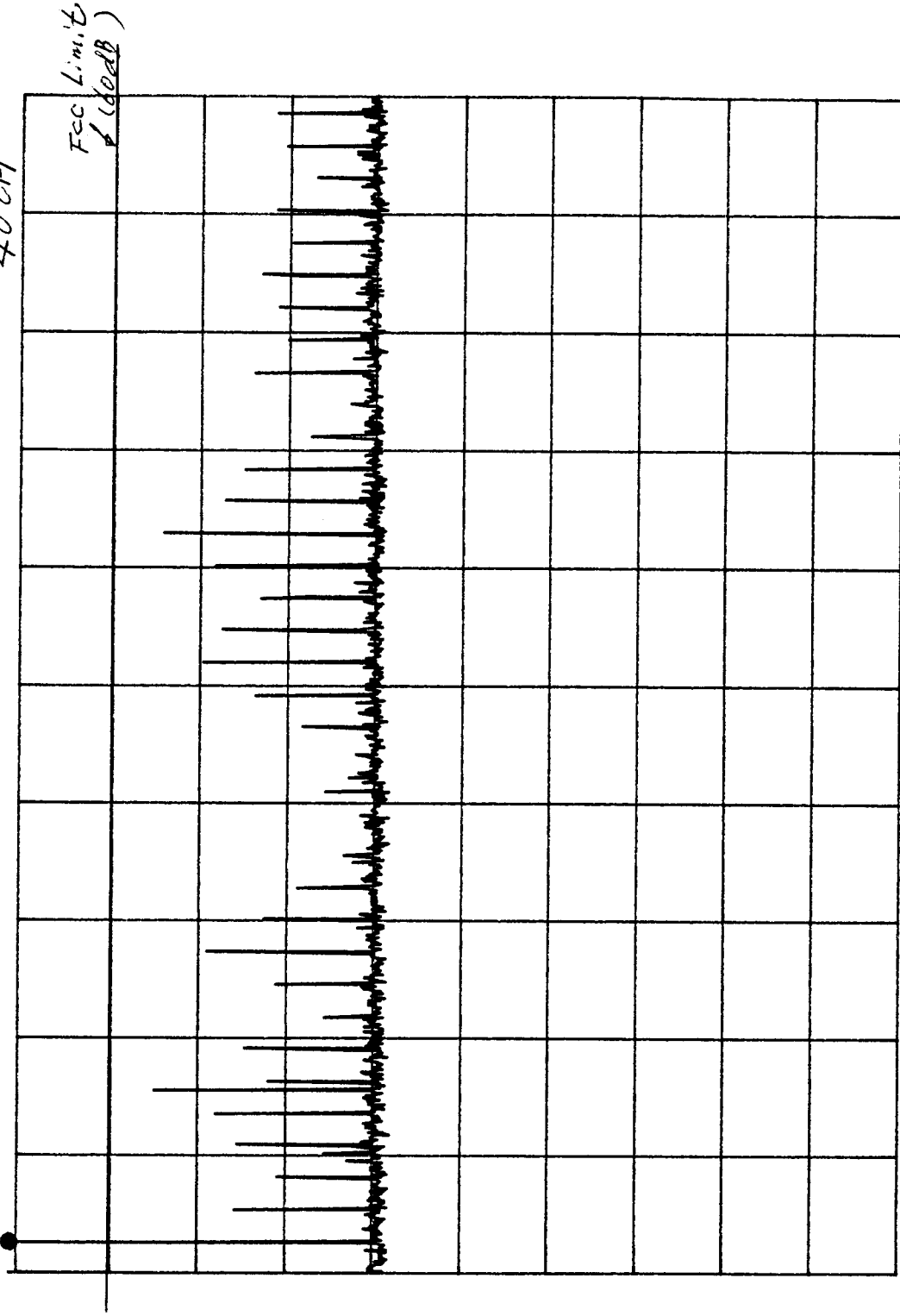
CENTER 500 MHz  
\*RBW 30 kHz  
VBW 30 kHz  
SWP 2.3 s  
SPAN 1.000 GHz  
ATT 10 dB

Tue 1998 Dec 1 14:54

REF -43.6 dBm  
10 dB/

A\_View B\_Blank MKR 27 MHz  
-42.52 dBm

40CH



CENTER 500 MHz  
\*RBW 30 kHz VBW 30 kHz SWP 2.3 s SPAN 1.000 GHz  
ATT 10 dB

3/3

## 6. SPURIOUS &amp; HARMONICS EMISSION AT ANTENNA TERMINAL

2.991

See attached graphs.

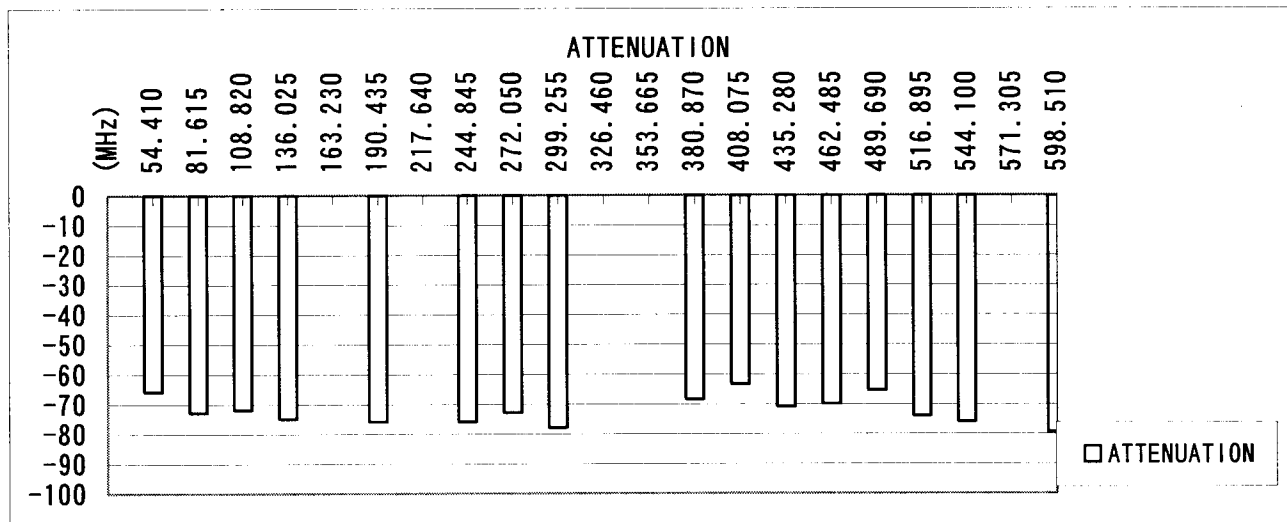
## 7. SPURIOUS &amp; HARMONICS EMISSION AT ANTENNA TERMINAL

2.933

CH-20: 27.205 MHz

| EMISSIONS<br>(MHz) | ATTENUATION<br>(dB) | FCC LIMIT<br>(dB) | MARGIN<br>(dB) |
|--------------------|---------------------|-------------------|----------------|
| 54.410             | -66.0               | -60               | 6.0            |
| 81.615             | -73.0               | -60               | 13             |
| 108.820            | -72.0               | -60               | 12             |
| 136.025            | -75.0               | -60               | 15             |
| 163.230            | -                   | -60               | --             |
| 190.435            | -76.0               | -60               | 16             |
| 217.640            | -                   | -60               | -              |
| 244.845            | -76.0               | -60               | 16.0           |
| 272.050            | -73.0               | -60               | 13.0           |
| 299.255            | -78.0               | -60               | 18.0           |
| 326.460            | --                  | -60               | --             |
| 353.665            | --                  | -60               | --             |
| 380.870            | -68.5               | -60               | 8.5            |
| 408.075            | -63.5               | -60               | 3.5            |
| 435.280            | -71.0               | -60               | 11.0           |
| 462.485            | -70.0               | -60               | 10.0           |
| 489.690            | -65.5               | -60               | 5.5            |
| 516.895            | -74.0               | -60               | 14.0           |
| 544.100            | -76.0               | -60               | 16.0           |
| 571.305            | -                   | -60               | -              |
| 598.510            | -79.5               | -60               | 19.5           |

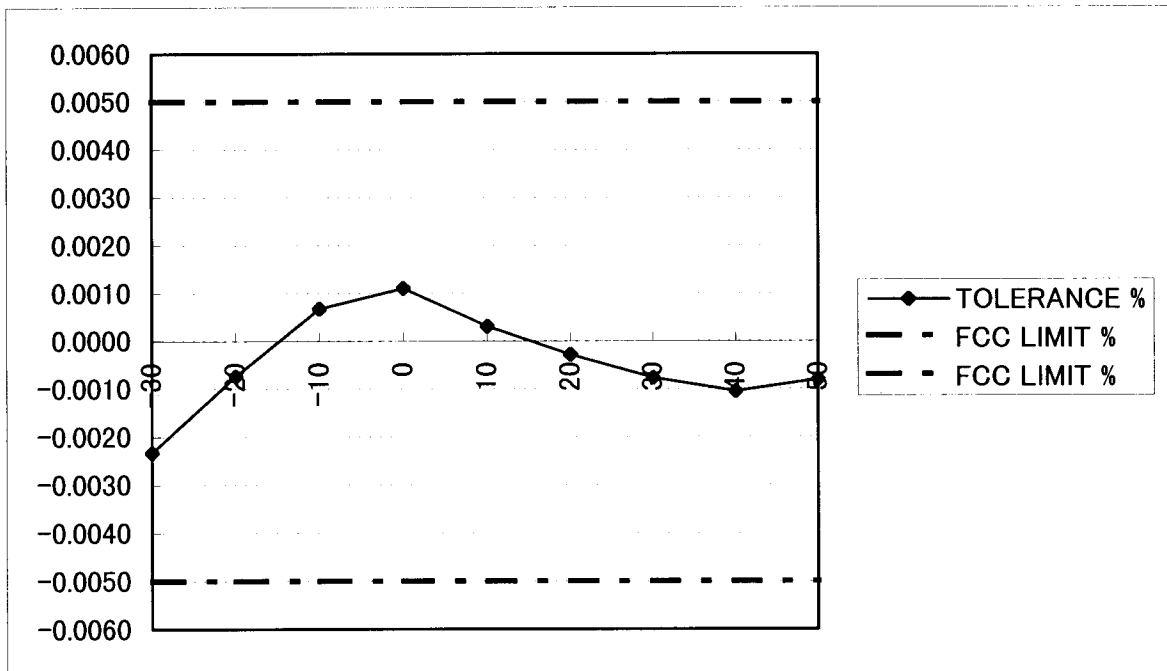
Note: All spurious emissions note reported were attenuated  
by at least 80 dB below the FCC limit.



# 8. FREQUENCY STABILITY (TEMPERATURE RANGE)

2.995 &amp; 80.209

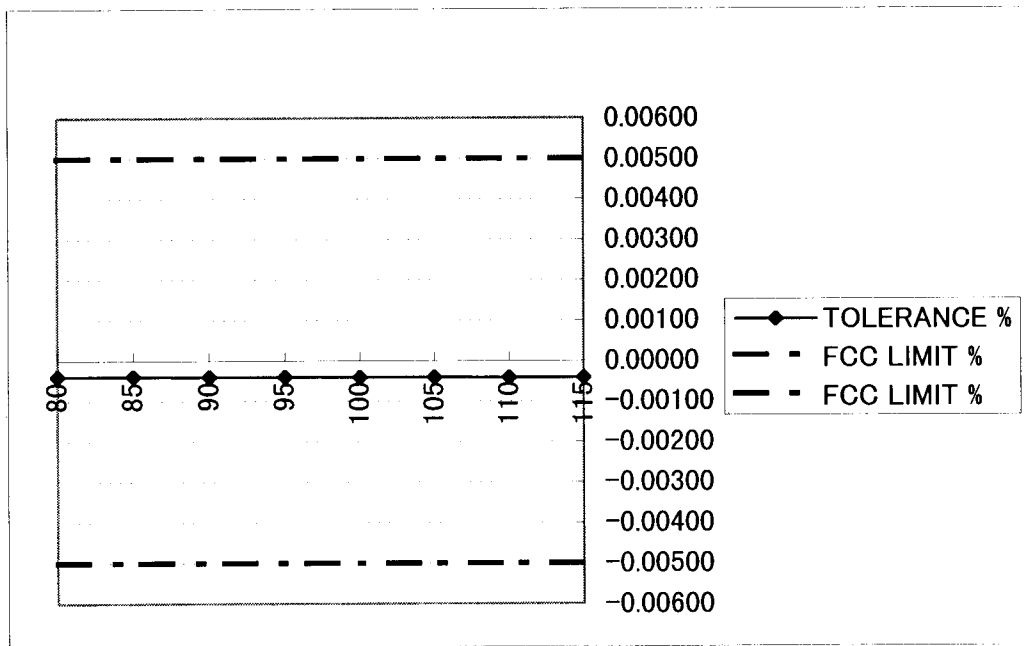
| TEMPERATURE | FREQ.     | TOLERANCE |         | FCC LIMIT |        |
|-------------|-----------|-----------|---------|-----------|--------|
| °C          | MHz       | Hz        | %       | %         | %      |
| -30         | 27.184366 | -634      | -0.0023 | 0.005     | -0.005 |
| -20         | 27.1848   | -200      | -0.0007 | 0.005     | -0.005 |
| -10         | 27.185183 | 183       | 0.0007  | 0.005     | -0.005 |
| 0           | 27.185298 | 298       | 0.0011  | 0.005     | -0.005 |
| 10          | 27.185082 | 82        | 0.0003  | 0.005     | -0.005 |
| 20          | 27.184921 | -79       | -0.0003 | 0.005     | -0.005 |
| 30          | 27.18479  | -210      | -0.0008 | 0.005     | -0.005 |
| 40          | 27.184715 | -285      | -0.0010 | 0.005     | -0.005 |
| 50          | 27.184782 | -218      | -0.0008 | 0.005     | -0.005 |



## 9. FREQUENCY STABILITY (VOLTAGE RANGE)

2.995 &amp; 80.209

| VOLTAGE |     | FREQ.     | TOLERANCE |          | FCC LIMIT |        |
|---------|-----|-----------|-----------|----------|-----------|--------|
| (V)     | (%) | MHz       | Hz        | %        | %         | %      |
| 11.04   | 80  | 27.18489  | -108      | -0.00040 | 0.005     | -0.005 |
| 11.73   | 85  | 27.18489  | -109      | -0.00040 | 0.005     | -0.005 |
| 12.42   | 90  | 27.184890 | -110      | -0.00040 | 0.005     | -0.005 |
| 13.11   | 95  | 27.18489  | -111      | -0.00041 | 0.005     | -0.005 |
| 13.80   | 100 | 27.18489  | -112      | -0.00041 | 0.005     | -0.005 |
| 14.49   | 105 | 27.18489  | -113      | -0.00042 | 0.005     | -0.005 |
| 15.18   | 110 | 27.18489  | -115      | -0.00042 | 0.005     | -0.005 |
| 15.87   | 115 | 27.18489  | -115      | -0.00042 | 0.005     | -0.005 |



LIST OF MEASUREMENT EQUIPMENT

| ENG-NO | TEST EQUIPMENT            | TYPE           | MFR         | SERIAL NO. | CATEGORY | CODE |
|--------|---------------------------|----------------|-------------|------------|----------|------|
| 1287   | AMPLIFIER                 | AFS30010040020 | MITEQ       | 138315     | 2171     | D    |
| 1294   | ANTENNA (BILOG)           | CBL6111        | CHASE       | 1057       | 2121     | D    |
| 1602   | ANTENNA (DIPOLE)          | 3120-B1        | EMCO        | 0075       |          | D    |
| 1603   | ANTENNA (DIPOLE)          | 3120-B2        | EMCO        | 0076       |          | D    |
| 1604   | ANTENNA (DIPOLE)          | 3120-B3        | EMCO        | 0076       |          | D    |
| 1560   | ANTENNA (HORN)            | 3115           | EMCO        | 2167       |          | D    |
| 1305   | SPECTRUM ANALYZER         | 8566B          | HP          | 2504A01433 | 2171     | D    |
| 1306   | SPECTRUM ANALYZER DISPLAY | 85662A         | HP          | 2403A09044 | 2171     | D    |
| 0491   | ATTENUATOR                | 30dB           | HP          | 1802A00930 |          | 3    |
| 0691   | AUDIO ANALYZER            | 8903A          | HP          | 2433A04343 | 2171     | 4    |
| 1437   | CURRENT METER             | 2011           | YEW         | M2D3017    |          | 4    |
| 1214   | LOW TEMPERATURE CHAMBER   | SU240          | TABAI ESPEC | 91001336   | 2171     | 4    |
| 0548   | MODULATION ANALYZER       | 8901A          | HP          | 2038A00181 | 2161     | 4    |
| 0510   | MULTIMETER                | E2377A         | HP          | 3323J16273 |          | 4    |
| 0643   | OSCILLOSCOPE              | COR5501        | KIKUSUI     | 13080828   | 2171     | 4    |
| 0645   | POWER METER (WATTMETER)   | 436A           | HP          | 2101A08680 |          | 3    |
| 1352   | POWER SENSOR              | 8482B          | HP          | 1802A00930 |          | 3    |
| 0551   | POWER SUPPLY              | PAK20-18A      | KIKUSUI     | 13083702   |          | 4    |
| 1626   | RADIO COMM. TEST SET      | 8920A          | HP          | 3339A03106 | 2171     | 4    |
| 1423   | SPECTRUM ANALYZER         | 8561E          | HP          | 3221A00132 |          | 4    |