

***FCC Part 15 Subpart C***  
***EMI TEST REPORT***  
*of*

E.U.T. : POWERFUL AV SENDER

FCC ID. : NGVAWV326R

MODEL : AWV326RX

Working Frequency : 433.94 MHz

*for*

APPLICANT : AIRWAVE TECHNOLOGIES INC.

ADDRESS : 3F, NO. 9, INDUSTRY E. RD. IX SCIENCE-  
BASED INDUSTRIAL PARK, HSINCHU,  
TAIWAN, R.O.C.

Test Performed by

**ELECTRONICS TESTING CENTER, TAIWAN**

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Report Number : ET89R-02-090-02

## TEST REPORT CERTIFICATION

Applicant : AIRWAVE TECHNOLOGIES INC.  
3F, NO. 9, INDUSTRY E. RD. IX SCIENCE-BASED INDUSTRIAL  
PARK, HSINCHU, TAIWAN, R.O.C.

Manufacturer : AIRWAVE TECHNOLOGIES INC.  
3F, NO. 9, INDUSTRY E. RD. IX SCIENCE-BASED INDUSTRIAL  
PARK, HSINCHU, TAIWAN, R.O.C.

Description of EUT :

a) Type of EUT : POWERFUL AV SENDER  
b) Trade Name : AIRWAVE  
c) Model No. : AWV326RX  
d) FCC ID : NGVAWV326R  
e) Working Frequency : 433.94 MHz  
f) Power Supply : I/P: 120VAC, 60Hz, O/P: DC 9V

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (1998)

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note : 1. The results of the testing report relate only to the items tested.  
2. The testing report shall not be reproduced except in full, without the written approval of ETC.

Issued Date : MAR. 20, 2000

Test Engineer : Jeff Chuang  
( Jeff Chuang )

Approve & Authorized Signer : Will Yauo  
Will Yauo, Supervisor  
EMI Test Site of ELECTRONICS  
TESTING CENTER, TAIWAN

# Table of Contents

# Page

|                                                               |           |
|---------------------------------------------------------------|-----------|
| <b>1. GENERAL INFORMATION .....</b>                           | <b>1</b>  |
| 1.1 PRODUCT DESCRIPTION .....                                 | 1         |
| 1.2 CHARACTERISTICS OF DEVICE: .....                          | 1         |
| 1.3 TEST METHODOLOGY .....                                    | 1         |
| 1.4 TEST FACILITY.....                                        | 1         |
| <b>2. DEFINITION AND LIMITS .....</b>                         | <b>2</b>  |
| 2.1 DEFINITION .....                                          | 2         |
| 2.2 RESTRICTED BANDS OF OPERATION.....                        | 2         |
| 2.3 LIMITATION .....                                          | 2         |
| 2.4 LABELING REQUIREMENT.....                                 | 4         |
| 2.5 USER INFORMATION .....                                    | 4         |
| <b>3. RADIATED EMISSION MEASUREMENT.....</b>                  | <b>5</b>  |
| 3.1 APPLICABLE STANDARD .....                                 | 5         |
| 3.2 MEASUREMENT PROCEDURE .....                               | 5         |
| 3.3 TEST DATA.....                                            | 7         |
| 3.3.1 RF Portion.....                                         | 7         |
| 3.3.2 Other Emission.....                                     | 8         |
| 3.4 FIELD STRENGTH CALCULATION .....                          | 11        |
| 3.5 ACTIVATE TIME .....                                       | 11        |
| 3.6 CALCULATION OF DUTY FACTOR.....                           | 11        |
| 3.7 RADIATED TEST EQUIPMENT.....                              | 12        |
| 3.8 MEASURING INSTRUMENT SETUP .....                          | 12        |
| 3.9 RADIATED MEASUREMENT PHOTOS .....                         | 13        |
| <b>4 CONDUCTED EMISSION MEASUREMENT .....</b>                 | <b>14</b> |
| 4.1 STANDARD APPLICABLE .....                                 | 14        |
| 4.2 MEASUREMENT PROCEDURE .....                               | 14        |
| 4.3 CONDUCTED EMISSION DATA.....                              | 15        |
| 4.3.1 RF Portion.....                                         | 15        |
| 4.3.2 Other Emission.....                                     | 15        |
| 4.4 RESULT DATA CALCULATION .....                             | 17        |
| 4.5 CONDUCTED MEASUREMENT EQUIPMENT.....                      | 17        |
| 4.6 PHOTOS OF CONDUCTION MEASURING SETUP .....                | 18        |
| <b>5 BANDWIDTH OF EMISSION .....</b>                          | <b>19</b> |
| 5.1 APPLICABLE STANDARD PLOT GRAPHIC OF BANDWIDTH .....       | 19        |
| 5.2 BANDWIDTH TEST EQUIPMENT.....                             | 19        |
| 5.3 PLOT GRAPHIC OF BANDWIDTH.....                            | 19        |
| <b>APPENDIX 1 : PLOTTED DATA FOR DUTY FACTOR.....</b>         | <b>20</b> |
| <b>APPENDIX 2 : PLOTTED DATA FOR CONDUCTED EMISSION.....</b>  | <b>1</b>  |
| <b>APPENDIX 3 : PLOTTED DATA FOR BANDWIDTH EMISSION .....</b> | <b>1</b>  |

## 1. GENERAL INFORMATION

### 1.1 Product Description

|                      |                                 |
|----------------------|---------------------------------|
| a) Type of EUT       | : POWERFUL AV SENDER            |
| b) Trade Name        | : AIRWAVE                       |
| c) Model No.         | : AWW326RX                      |
| d) FCC ID            | : NGVAWV326R                    |
| e) Working Frequency | : 433.94 MHz                    |
| f) Power Supply      | : I/P: 120VAC, 60Hz, O/P: DC 9V |

### 1.2 Characteristics of Device:

POWERFUL AV SENDER applies the advanced 2.4 GHz RF wireless technology to offer the users the ability to link all kinds of Audio and Video sources to TV, Monitors, and Personal Computers without wires and cables. POWERFUL AV SENDERS is easy to install completely within minutes. This plug-and-play feature helps you to expand your freedom in your home entertainment and enhance your home security.

### 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4.

The POWERFUL AV SENDER under test was operated continuously in its normal operating mode for the purpose of the measurements. In order to secure the continuous operation of the device under test, rewiring in the circuit was done by the manufacturer so as to affect its intended operation.

The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the POWERFUL AV SENDER under test.

In order to determining the average value during one pulse train of the radiated power generated from the POWERFUL AV SENDER under test, the encoded wave form in the time domain was used.

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No. 34, Lin 5, Ding Fu Tsung, Linkou Hsiang, Taipei Hisen, Taiwan 244, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10, 2000.

## 2. DEFINITION AND LIMITS

### 2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

### 2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz               | MHz                   | MHz           | GHz         |
|-------------------|-----------------------|---------------|-------------|
| 0.090 - 0.110     | 16.42-16.423          | 399.9-410     | 4.5-5.25    |
| 0.495 - 0.505 **  | 16.69475 - 16.69525   | 608-614       | 5.35-5.46   |
| 2.1735 - 2.1905   | 16.80425 - 16.80475   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67            | 1300-1427     | 8.025-8.5   |
| 4.17725-4.17775   | 37.5-38.25            | 1435-1626.5   | 9.0-9.2     |
| 4.20725-4.20775   | 73-74.6               | 1645.5-1646.5 | 9.3-9.5     |
| 6.215-6.218       | 74.8-75.2             | 1660-1710     | 10.6-12.7   |
| 6.26775-6.26825   | 108-121.94            | 1718.8-1722.2 | 13.25-13.4  |
| 6.31175-6.31225   | 123-138               | 2200-2300     | 14.47-14.5  |
| 8.291-8.294       | 149.9-150.05          | 2310-2390     | 15.35-16.2  |
| 8.362-8.366       | 156.52475 - 156.52525 | 2483.5-2500   | 17.7-21.4   |
| 8.37625-8.38675   | 156.7-156.9           | 2655-2900     | 22.01-23.12 |
| 8.41425-8.41475   | 162.0125-167.17       | 3260-3267     | 23.6-24.0   |
| 12.29-12.293      | 167.72-173.2          | 3332-3339     | 31.2-31.8   |
| 12.51975-12.52025 | 240-285               | 3345.8-3358   | 36.43-36.5  |
| 12.57675-12.57725 | 322-335.4             | 3360-4400     | Above 38.6  |
| 13.36-13.41       |                       |               |             |

Remark “\*\*” : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

### 2.3 Limitation

#### (1) Conducted Emission Limits :

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the conducted limit is the following:

| Frequency<br>( MHz ) | Emission<br>( $\mu$ V ) | Emission<br>( dB $\mu$ V ) |
|----------------------|-------------------------|----------------------------|
| 0.45 - 30.0          | 250                     | 48.0                       |

**(2) Radiated Emission Limits :**

According to 15.231 ,Periodic operation in the band 40.66-40.70 MHz and above 70 MHz, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

| Frequency Band (MHz) | Field strength of Fundamental (uV/m) | Field strength of Spurious (uV/m) |
|----------------------|--------------------------------------|-----------------------------------|
| 40.66-40.70          | 2250                                 | 225                               |
| 70-130               | 1250                                 | 125                               |
| 130-174              | *1,250 to 3,750                      | *125 to 375                       |
| 174-260              | 3750                                 | 375                               |
| 260-470              | *3,750 to 12,500                     | *375 to 1250                      |
| Above 470            | 12500                                | 1250                              |

\* Linear interpolations.

According to 15.235, the field strength of emissions from intentional radiators operated under these frequency bands shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental<br>$\mu\text{V}/\text{meter}$ | $\text{dB}\mu\text{V}/\text{meter}$ |
|-----------------------------|-------------------------------------------------------------|-------------------------------------|
| 49.82 - 49.90               | 10000                                                       | 80                                  |

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209,as following table:

| Other Frequencies (MHz) | Field Strength of Fundamental<br>$\mu\text{V}/\text{meter}$ | $\text{dB}\mu\text{V}/\text{meter}$ |
|-------------------------|-------------------------------------------------------------|-------------------------------------|
| 30 - 88                 | 100                                                         | 40.0                                |
| 88 - 216                | 150                                                         | 43.5                                |
| 216 - 960               | 200                                                         | 46.0                                |
| Above 960               | 500                                                         | 54.0                                |

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

### **(3) Limit of transmission time**

- a) A manually operated POWERFUL AV SENDER shall employ a switch that will automatically deactivate the POWERFUL AV SENDER within not more than 5 seconds of being released.
- b) A CAR ALARM /TRANSMITTER activated automatically shall cease transmission within 5 seconds after activation.

## **2.4 Labeling Requirement**

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## **2.5 User Information**

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### 3. RADIATED EMISSION MEASUREMENT

#### 3.1 Applicable Standard

For intermittent operation intentional radiator, the radiated emission shall comply with §15.231(b).

#### 3.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

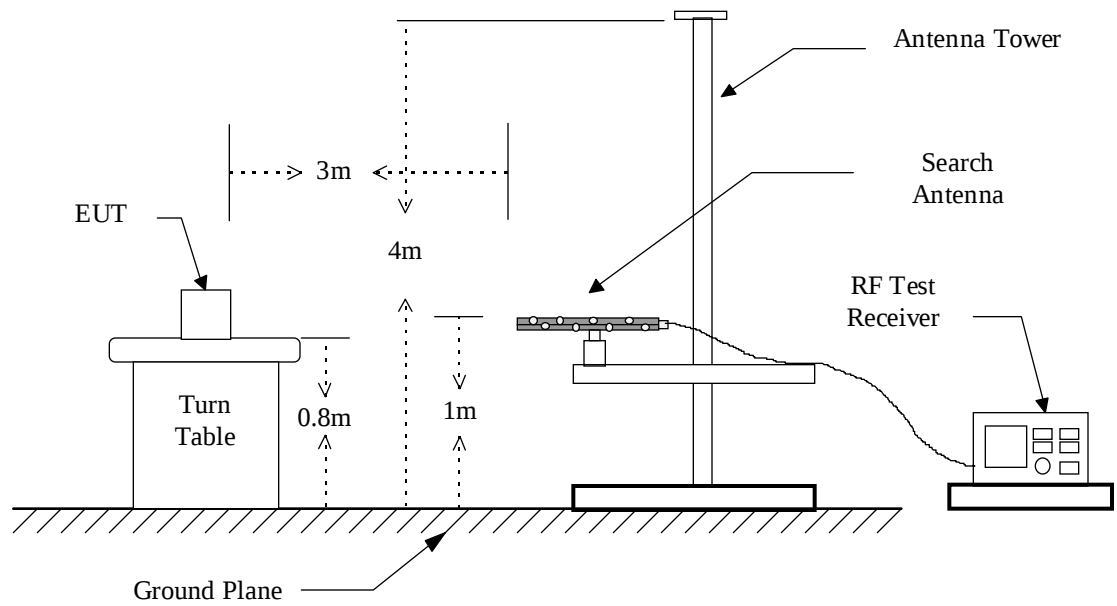
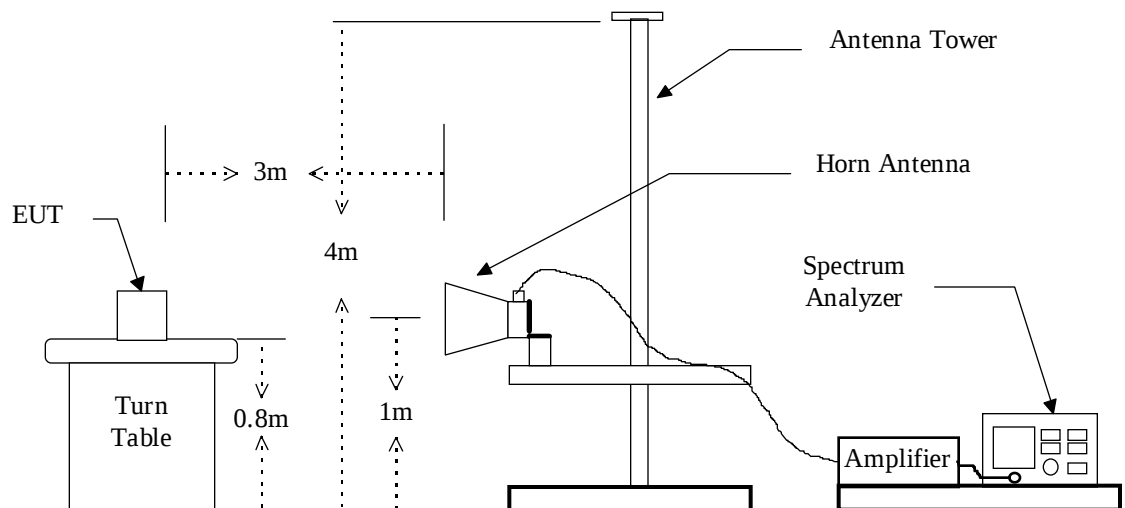


Figure 2 : Frequencies measured above 1 GHz configuration



### 3.3 Test Data

#### 3.3.1 RF Portion

Temperature : 20 •  
 Humidity : 60 •  
 Operated mode : Transmitting  
 Test Date : MAR. 04, 2000

| Frequency<br>(MHz) | Ant<br>Pol<br>H/V | Reading<br>(dBuV)<br>Peak | Factor<br>(dB) |      | Result @3m<br>(dBuV/m) |      | Limit @3m<br>(dBuV/m) |      | Margin<br>(dB) | Table<br>Degree<br>(Deg.) | Ant.<br>High<br>(m) |
|--------------------|-------------------|---------------------------|----------------|------|------------------------|------|-----------------------|------|----------------|---------------------------|---------------------|
|                    |                   |                           | C              | D    | Peak                   | Ave. | Peak                  | Ave. |                |                           |                     |
| 433.944            | V                 | 93.0                      | -5.5           | -8.4 | 87.5                   | 79.1 | 100.8                 | 80.8 | -1.7           | 180                       | 1.00                |
| 867.888            | V                 | 49.5                      | 2.3            | -8.4 | 51.8                   | 43.4 | 80.8                  | 60.8 | -17.4          | 205                       | 1.10                |
| *1301.832          | V                 | 58.4                      | -8.4           | -8.4 | 50.0                   | 41.6 | 80.8                  | 60.8 | -19.2          | 100                       | 1.10                |
| 1735.776           | V                 | 59.0                      | -6.1           | -8.4 | 52.9                   | 44.5 | 80.8                  | 60.8 | -16.3          | 125                       | 1.30                |
| 2169.720           | V                 | 57.4                      | -4.0           | -8.4 | 53.4                   | 45.0 | 80.8                  | 60.8 | -15.8          | 180                       | 1.00                |
| 2603.664           | V                 | 54.4                      | -2.4           | -8.4 | 52.0                   | 43.6 | 80.8                  | 60.8 | -17.2          | 215                       | 1.00                |
| 3037.608           | V                 | 48.3                      | -1.1           | -8.4 | 47.2                   | 38.8 | 80.8                  | 60.8 | -22.0          | 360                       | 1.00                |
| 3471.552           | V                 | 48.7                      | -0.1           | -8.4 | 48.6                   | 40.2 | 80.8                  | 60.8 | -20.6          | 180                       | 1.30                |
| *3905.496          | H/V               | ---                       | 1.6            | -8.4 | ---                    | ---  | 80.8                  | 60.8 | ---            | ---                       | ---                 |
| *4339.440          | H/V               | ---                       | 2.0            | -8.4 | ---                    | ---  | 80.8                  | 60.8 | ---            | ---                       | ---                 |

**Note :**

1. Factor C means “corrected”, and that includes antenna factor, cable loss, amplifier gain (if any). And Factor D means “Duty”, that is for calculating the average value and derived from section 3.6 in this test report.
2. Result = Reading + C. Factor  
Ave. = Peak Value + D Factor
3. “\*” means the frequency fall in the restricted frequency band, and the limit of emission is referred to FCC class B
4. The limit for spurious emissions refers to FCC§15.231.

If the measured frequencies fall in the restricted frequency band, the limit employed is §15.209 general requirement when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function, no duty factor applied.

**3.3.2 Other Emission**

a) CH 01

Operation Mode : Receiving

Local Frequency : 1934.500 MHz

Test Date : FEB. 29, 2000

Temperature : 20 •

Humidity : 60%

| Frequency<br>(MHz) | Reading (dBuV) @3m |        |           |        | Factor<br>(dB)<br>Corr. | Result @3m<br>(dBuV/m) |        | Limit @3m<br>(dBuV/m) |        | Margin<br>(dB) | Table<br>Deg.<br>(Deg.) | Ant.<br>High<br>(m) |
|--------------------|--------------------|--------|-----------|--------|-------------------------|------------------------|--------|-----------------------|--------|----------------|-------------------------|---------------------|
|                    | H<br>Peak          | Ave    | V<br>Peak | Ave    |                         | Peak                   | Ave    | Peak                  | Ave.   |                |                         |                     |
| 1934.617 •         | 44.9 •             | 33.3 • | 46.4 •    | 36.0 • | -5.0 •                  | 41.4 •                 | 31.0 • | 74.0 •                | 54.0 • | -23.0 •        | 90 •                    | 1.50                |
| 3869.234 •         | ---                | ---    | ---       | ---    | 1.5 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 5803.851 •         | 43.8 •             | 34.4 • | 47.5 •    | 42.3 • | 4.5 •                   | 52.0 •                 | 46.8 • | 74.0 •                | 54.0 • | -7.2 •         | 135 •                   | 1.50                |
| 7738.468 •         | ---                | ---    | ---       | ---    | 6.3 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 9673.085 •         | ---                | ---    | ---       | ---    | 7.3 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 11607.702 •        | ---                | ---    | ---       | ---    | 9.1 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 13542.319 •        | ---                | ---    | ---       | ---    | 11.0 •                  | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 15476.936 •        | ---                | ---    | ---       | ---    | 9.1 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 17411.553 •        | ---                | ---    | ---       | ---    | 15.6 •                  | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 19346.170 •        | ---                | ---    | ---       | ---    | 8.7 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |

Note :

1. Item “Margin” referred to Average limit while there is only peak result.
2. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark “\*\*\*” means that Peak result is meet average limit.
3. Remark “---” means that the emissions level is too low to be measured.

b) CH 02

Operation Mode : Receiving

Local Frequency : 1952.000 MHz

Test Date : FEB. 29, 2000

Temperature : 20 °

Humidity : 60%

| Frequency<br>(MHz) | Reading (dBuV) @3m |      |           |      | Factor<br>(dB)<br>Corr. | Result @3m<br>(dBuV/m) |      | Limit @3m<br>(dBuV/m) |      | Margin<br>(dB) | Table<br>Deg.<br>(Deg.) | Ant.<br>High<br>(m) |
|--------------------|--------------------|------|-----------|------|-------------------------|------------------------|------|-----------------------|------|----------------|-------------------------|---------------------|
|                    | H<br>Peak          | Ave  | V<br>Peak | Ave  |                         | Peak                   | Ave  | Peak                  | Ave. |                |                         |                     |
| 1952.468           | 44.8               | 33.4 | 46.3      | 35.8 | -4.9                    | 41.4                   | 30.9 | 74.0                  | 54.0 | -23.1          | 90                      | 1.50                |
| 3904.936           | 44.2               | 35.8 | 46.8      | 41.2 | 1.6                     | 48.4                   | 42.8 | 74.0                  | 54.0 | -11.2          | 270                     | 1.30                |
| 5857.404           | 44.4               | 36.2 | 48.3      | 44.0 | 4.5                     | 52.8                   | 48.5 | 74.0                  | 54.0 | -5.5           | 135                     | 1.50                |
| 7809.872           | ---                | ---  | ---       | ---  | 6.3                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 9762.340           | ---                | ---  | ---       | ---  | 7.3                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 11714.808          | ---                | ---  | ---       | ---  | 9.1                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 13667.276          | ---                | ---  | ---       | ---  | 11.1                    | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 15619.744          | ---                | ---  | ---       | ---  | 8.7                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 17572.212          | ---                | ---  | ---       | ---  | 16.4                    | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 19524.680          | ---                | ---  | ---       | ---  | 8.5                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |

Note :

1. Item "Margin" referred to Average limit while there is only peak result.
2. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "\*\*\*" means that Peak result is meet average limit.
3. Remark "---" means that the emissions level is too low to be measured.

c) CH 04

Operation Mode : Receiving

Local Frequency : 1988.000 MHz

Test Date : FEB. 29, 2000

Temperature : 20 •

Humidity : 60%

| Frequency<br>(MHz) | Reading (dBuV) @3m |        |           |        | Factor<br>(dB)<br>Corr. | Result @3m<br>(dBuV/m) |        | Limit @3m<br>(dBuV/m) |        | Margin<br>(dB) | Table<br>Deg.<br>(Deg.) | Ant.<br>High<br>(m) |
|--------------------|--------------------|--------|-----------|--------|-------------------------|------------------------|--------|-----------------------|--------|----------------|-------------------------|---------------------|
|                    | H<br>Peak          | Ave    | V<br>Peak | Ave    |                         | Peak                   | Ave    | Peak                  | Ave.   |                |                         |                     |
| 1988.758 •         | 42.8 •             | 32.2 • | 44.7 •    | 34.6 • | -4.7 •                  | 40.0 •                 | 29.9 • | 74.0 •                | 54.0 • | -24.1 •        | 90 •                    | 1.50                |
| 3977.516 •         | ---                | ---    | ---       | ---    | 1.9 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 5966.274 •         | 44.3 •             | 36.3 • | 47.7 •    | 42.9 • | 4.5 •                   | 52.2 •                 | 47.4 • | 74.0 •                | 54.0 • | -6.6 •         | 135 •                   | 1.50                |
| 7955.032 •         | ---                | ---    | ---       | ---    | 6.4 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 9943.790 •         | ---                | ---    | ---       | ---    | 7.4 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 11932.548 •        | ---                | ---    | ---       | ---    | 9.2 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 13921.306 •        | ---                | ---    | ---       | ---    | 11.3 •                  | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 15910.064 •        | ---                | ---    | ---       | ---    | 8.0 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 17898.822 •        | ---                | ---    | ---       | ---    | 17.2 •                  | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |
| 19887.580 •        | ---                | ---    | ---       | ---    | 8.6 •                   | ---                    | ---    | 74.0 •                | 54.0 • | ---            | ---                     | ---                 |

Note :

1. Item “Margin” referred to Average limit while there is only peak result.
2. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark “\*\*\*” means that Peak result is meet average limit.
3. Remark “---” means that the emissions level is too low to be measured.

d)

Operation Mode : Working

Test Date : FEB. 29, 2000

Temperature : 20 •

Humidity : 60%

| Frequency<br>(MHz) | Ant-Pol<br>H/V | Meter<br>Reading<br>(dBuV) | Corrected<br>Factor<br>(dB) | Result<br>@3m<br>(dBuV/m) | Limit<br>@3m<br>(dBuV/m) | Margin<br>(dB) | Table<br>Degree<br>(Deg.) | Ant. High<br>(m) |
|--------------------|----------------|----------------------------|-----------------------------|---------------------------|--------------------------|----------------|---------------------------|------------------|
| 30.000 •           | H/V •          | ---                        | -9.8 •                      | ---                       | 40.0 •                   | ---            | ---                       | ---              |
| 80.000 •           | H/V •          | ---                        | -15.0 •                     | ---                       | 40.0 •                   | ---            | ---                       | ---              |
| 150.000 •          | H/V •          | ---                        | -10.0 •                     | ---                       | 43.5 •                   | ---            | ---                       | ---              |
| 300.000 •          | H/V •          | ---                        | -0.8 •                      | ---                       | 46.0 •                   | ---            | ---                       | ---              |
| 500.000 •          | H/V •          | ---                        | -4.4 •                      | ---                       | 46.0 •                   | ---            | ---                       | ---              |
| 1000.000 •         | H/V •          | ---                        | 3.9 •                       | ---                       | 54.0 •                   | ---            | ---                       | ---              |

### 3.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

$$\text{Average} = \text{Peak Value} + \text{Duty Factor}$$

*Note : If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.*

### 3.5 Activate Time

This POWERFUL AV SENDER is operated by Manual, and Activate Time is less than 5 second after being released.

### 3.6 Calculation of Duty Factor

Due to the total period of pulse train is more than 100 ms, the time period taken into calculate Duty Factor is 100 ms which including the maximum ON duty. The total ON duty is 32.3 ms, and the duty factor is calculated with following formula :

$$20 \log \frac{\text{TotalDuty}}{\text{Period of Pulse Train}} = -8.4 \text{ (dB)}$$

*Note : Please see appendix 1 for Plotted Data*

### 3.7 Radiated Test Equipment

| Equipment                 | Manufacturer    | Model No. | Next Cal. Date |
|---------------------------|-----------------|-----------|----------------|
| Spectrum Analyzer         | Hewlett-Packard | 8568B     | 01/05/2001     |
| Pre-selector              | Hewlett-Packard | 85685A    | 01/10/2001     |
| Quasi Peak Detector       | Hewlett-Packard | 85650A    | 01/10/2001     |
| RF Test Receiver          | Rohde & Schwarz | ESVS 30   | 01/18/2001     |
| Log periodic Antenna      | EMCO            | 3146      | 11/03/2000     |
| Biconical Antenna         | EMCO            | 3110B     | 11/03/2000     |
| Hor Antenna               | EMCO            | 3115      | 05/12/2000     |
| Preamplifier              | Hewlett-Packard | 8449B     | 06/21/2000     |
| Preamplifier              | Hewlett-Packard | 8447D     | 09/16/2000     |
| Microwave EMI Test System | Hewlett-Packard | 84125C    | 01/25/2001     |

### 3.8 Measuring Instrument Setup

Explanation of measuring instrument setup in frequency band measured is as following :

| Frequency Band (MHz) | Instrument        | Function   | Resolution bandwidth | Video Bandwidth |
|----------------------|-------------------|------------|----------------------|-----------------|
| 30 to 1000           | RF Test Receiver  | Quasi Peak | 120 kHz              | N/A             |
|                      | Spectrum Analyzer | Peak       | 100 kHz              | 100 kHz         |
| Above 1000           | Spectrum Analyzer | Peak       | 1 MHz                | 1 MHz           |

### **3.9 Radiated Measurement Photos**

Please see setup photos in Exhibit F.

## 4 CONDUCTED EMISSION MEASUREMENT

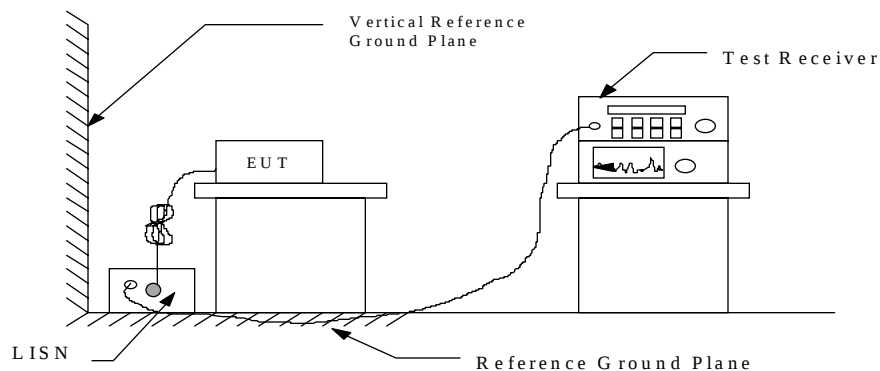
### 4.1 Standard Applicable

For intentional device, Line Conducted Emission Limits are in accordance to §15.207(a), any emissions level shall not exceed 48 dBuV.

### 4.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



### 4.3 Conducted Emission Data

#### 4.3.1 RF Portion

Operation Mode : Transmitting

Test Date : MAR. 04, 2000

Temperature : 20 •

Humidity: 60%

| Frequency<br>(MHz) | Reading (dBuV) |        | Factor<br>(dB) | Result (dBuV) |        | Limit<br>(dBuV) | Margin<br>(dB) |
|--------------------|----------------|--------|----------------|---------------|--------|-----------------|----------------|
|                    | Va             | Vb     |                | Va            | Vb     |                 |                |
| 0.5224 •           | 35.2 •         | 36.6 • | 0.2 •          | 35.4 •        | 36.8 • | 48.0 •          | -11.2          |
| 0.5551 •           | 34.4 •         | 38.0 • | 0.2 •          | 34.6 •        | 38.2 • | 48.0 •          | -9.8           |
| 0.6037 •           | 39.6 •         | 35.4 • | 0.2 •          | 39.8 •        | 35.6 • | 48.0 •          | -8.2           |
| 0.8729 •           | 33.0 •         | 32.8 • | 0.3 •          | 33.3 •        | 33.1 • | 48.0 •          | -14.7          |
| 0.9450 •           | 33.4 •         | 35.0 • | 0.3 •          | 33.7 •        | 35.3 • | 48.0 •          | -12.7          |
| 1.7496 •           | 33.3 •         | 31.2 • | 0.3 •          | 33.6 •        | 31.5 • | 48.0 •          | -14.4          |

#### 4.3.2 Other Emission

b) CH 01

Operation Mode : Receiving

Test Date : MAR. 04, 2000

Temperature : 20 •

Humidity: 60%

| Frequency<br>(MHz) | Reading (dBuV) |        | Factor<br>(dB) | Result (dBuV) |        | Limit<br>(dBuV) | Margin<br>(dB) |
|--------------------|----------------|--------|----------------|---------------|--------|-----------------|----------------|
|                    | Va             | Vb     |                | Va            | Vb     |                 |                |
| 0.5339 •           | 38.8 •         | 37.5 • | 0.2 •          | 39.0 •        | 37.7 • | 48.0 •          | -9.0           |
| 0.5709 •           | 40.6 •         | 38.0 • | 0.2 •          | 40.8 •        | 38.2 • | 48.0 •          | -7.2           |
| 0.6123 •           | 39.6 •         | 35.2 • | 0.2 •          | 39.8 •        | 35.4 • | 48.0 •          | -8.2           |
| 0.7311 •           | 34.4 •         | 30.4 • | 0.3 •          | 34.7 •        | 30.7 • | 48.0 •          | -13.3          |
| 0.9450 •           | 32.6 •         | 34.2 • | 0.3 •          | 32.9 •        | 34.5 • | 48.0 •          | -13.5          |
| 1.1823 •           | 32.6 •         | 28.8 • | 0.3 •          | 32.9 •        | 29.1 • | 48.0 •          | -15.1          |

## b) CH 02

Operation Mode : Receiving

Test Date : MAR. 04, 2000

Temperature : 20 •

Humidity: 60%

| Frequency<br>(MHz) | Reading (dBuV) |        | Factor<br>(dB) | Result (dBuV) |        | Limit<br>(dBuV) | Margin<br>(dB) |
|--------------------|----------------|--------|----------------|---------------|--------|-----------------|----------------|
|                    | Va             | Vb     |                | Va            | Vb     |                 |                |
| 0.5224 •           | 40.6 •         | 35.2 • | 0.2 •          | 40.8 •        | 35.4 • | 48.0 •          | -7.2           |
| 0.5763 •           | 41.6 •         | 37.6 • | 0.2 •          | 41.8 •        | 37.8 • | 48.0 •          | -6.2           |
| 0.7311 •           | 34.8 •         | 31.6 • | 0.3 •          | 35.1 •        | 31.9 • | 48.0 •          | -12.9          |
| 0.8935 •           | 34.0 •         | 32.8 • | 0.3 •          | 34.3 •        | 33.1 • | 48.0 •          | -13.7          |
| 0.9809 •           | 32.4 •         | 32.6 • | 0.3 •          | 32.7 •        | 32.9 • | 48.0 •          | -15.1          |
| 1.4653 •           | 32.0 •         | 31.2 • | 0.3 •          | 32.3 •        | 31.5 • | 48.0 •          | -15.7          |

## d) CH 04

Operation Mode : Receiving

Test Date : MAR. 04, 2000

Temperature : 20 •

Humidity: 60%

| Frequency<br>(MHz) | Reading (dBuV) |        | Factor<br>(dB) | Result (dBuV) |        | Limit<br>(dBuV) | Margin<br>(dB) |
|--------------------|----------------|--------|----------------|---------------|--------|-----------------|----------------|
|                    | Va             | Vb     |                | Va            | Vb     |                 |                |
| 0.5474 •           | 39.0 •         | 38.0 • | 0.2 •          | 39.2 •        | 38.2 • | 48.0 •          | -8.8           |
| 0.5789 •           | 40.1 •         | 38.4 • | 0.2 •          | 40.3 •        | 38.6 • | 48.0 •          | -7.7           |
| 0.6326 •           | 35.4 •         | 30.4 • | 0.2 •          | 35.6 •        | 30.6 • | 48.0 •          | -12.4          |
| 0.9019 •           | 34.2 •         | 33.8 • | 0.3 •          | 34.5 •        | 34.1 • | 48.0 •          | -13.5          |
| 1.0870 •           | 32.6 •         | 27.8 • | 0.3 •          | 32.9 •        | 28.1 • | 48.0 •          | -15.1          |
| 1.8764 •           | 31.6 •         | 30.0 • | 0.3 •          | 31.9 •        | 30.3 • | 48.0 •          | -16.1          |

**Note : Please see appendix 2 for Plotted Data**

#### 4.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

$$\text{RESULT} = \text{READING} + \text{LISN FACTOR}$$

#### 4.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

| Equipment                               | Manufacturer      | Model No. | Next Cal. Date |
|-----------------------------------------|-------------------|-----------|----------------|
| RF Test Receiver                        | Rohde and Schwarz | ESH3      | 01/03/2001     |
| Spectrum Monitor                        | Rohde and Schwarz | EZM       | N.C.R.         |
| Line Impedance<br>Stabilization network | Kyoritsu          | KNW-407   | 12/01/2000     |
| Plotter                                 | Hewlett-Packard   | 7440A     | N/A            |
| Shielded Room                           | Riken             | N/A       | N.C.R.         |

## **4.6 Photos of Conduction Measuring Setup**

Please see setup photos in Exhibit F.

## 5 BANDWIDTH OF EMISSION

### 5.1 Applicable Standard Plot Graphic of Bandwidth

Per FCC rule §15.231(c), the permitted emission bandwidth is no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

### 5.2 Bandwidth Test Equipment

| Equipment         | Manufacturer    | Model No. | Next Cal. Date |
|-------------------|-----------------|-----------|----------------|
| EMI Test Receiver | Rohde & Schwarz | ESBI      | 09/15/2000     |
| Plotter           | Hewlett-Packard | 7550A     | N/A            |
|                   |                 |           |                |

### 5.3 Plot Graphic of Bandwidth

*Note : Please see appendix 3 for Plotted Data*

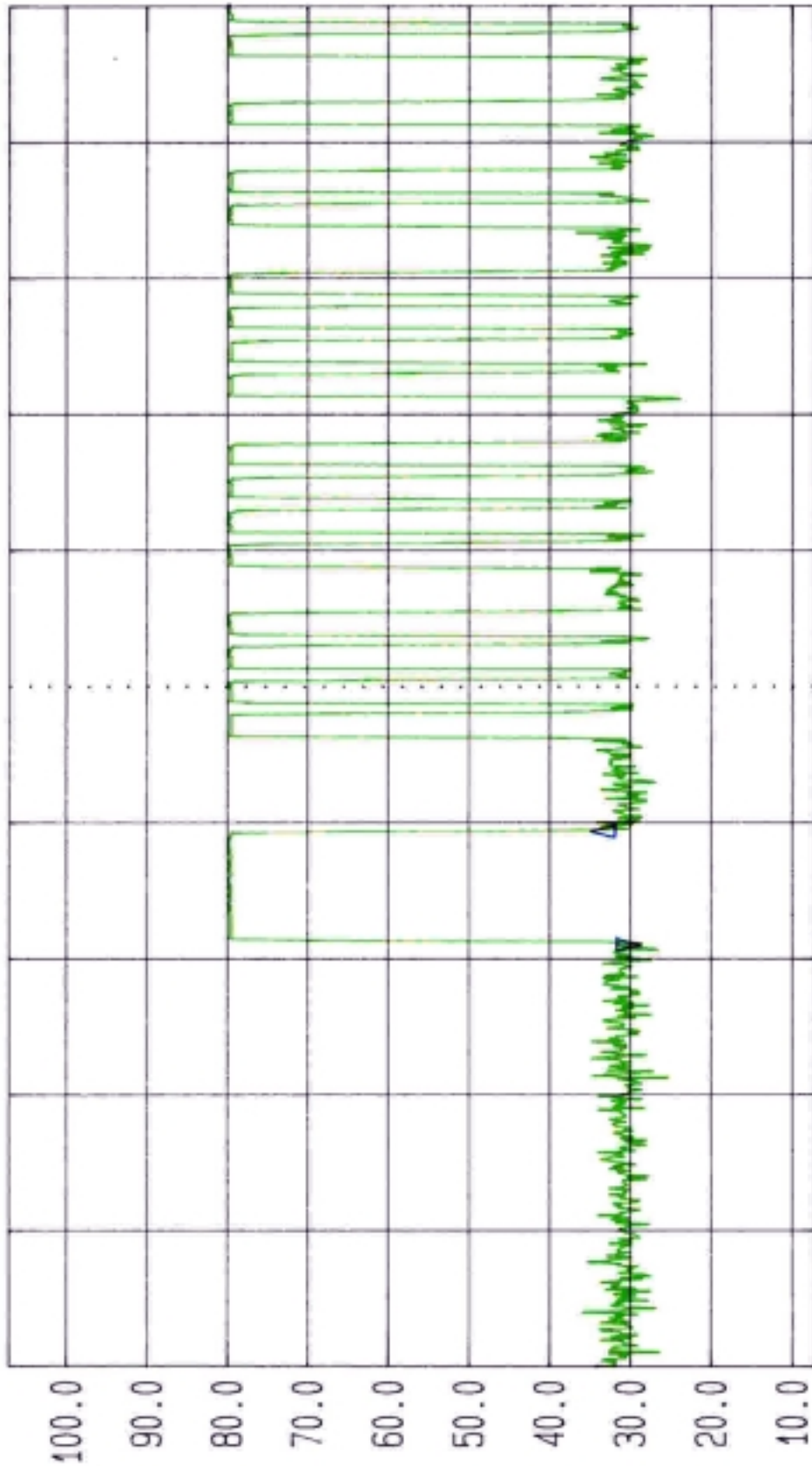
## APPENDIX 1 : PLOTTED DATA FOR DUTY FACTOR

$$20\log\left|\frac{(3.33 \times 1) + (41 \times 0.844)}{100ms}\right| = -8.4\text{dB}$$

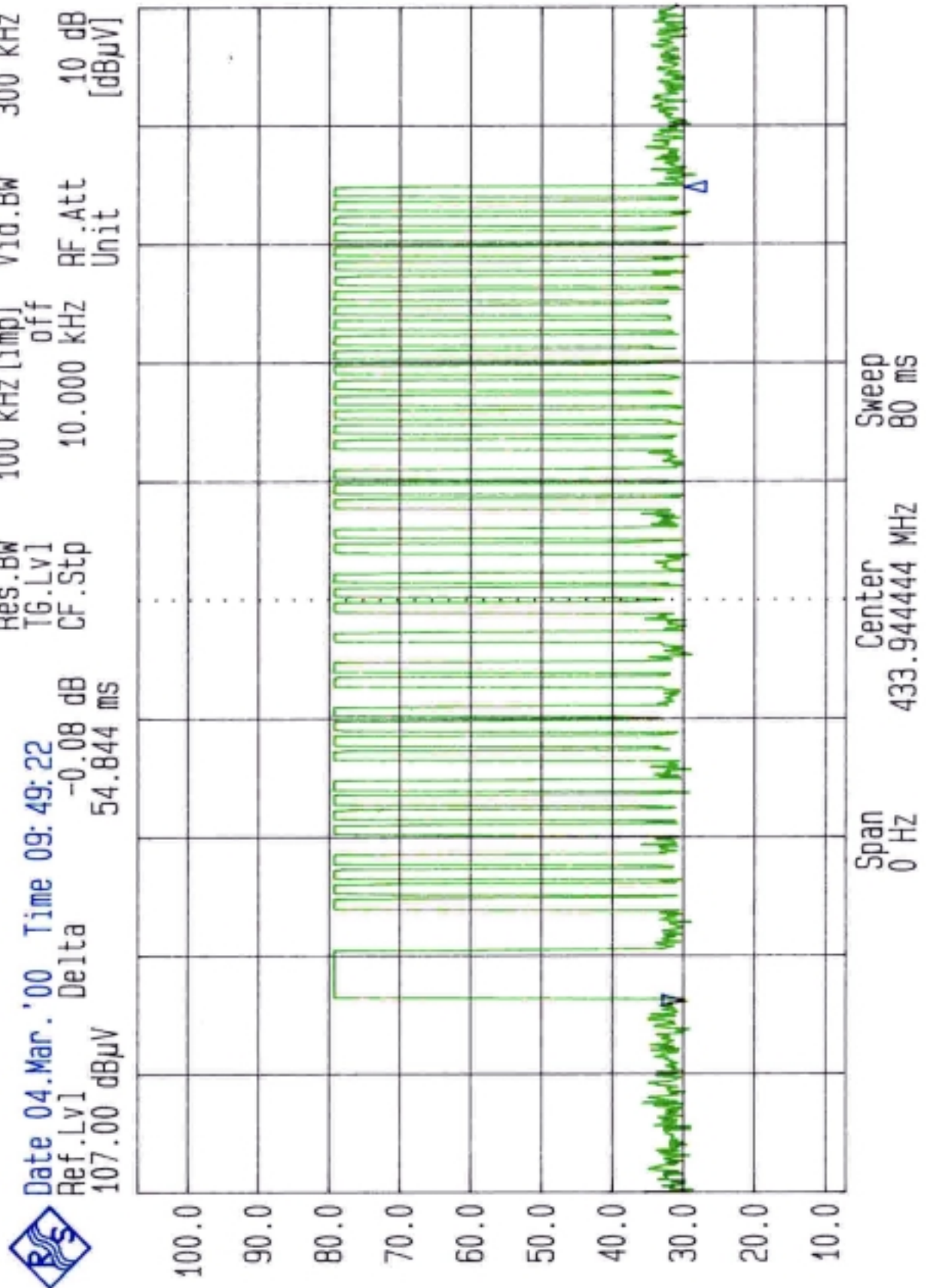


Date 04.Mar.'00 Time 10:00:45  
 Ref.Lvl Delta 107.00 dBμV  
 6.30 dB  
 3.333 ms

Res.Bw 100 kHz [imp] off  
 TG.Lvl 10.000 kHz  
 CF.Stp 10 dB  
 Vid.Bw 300 kHz  
 AF.Att Unit  
 [dBμV]



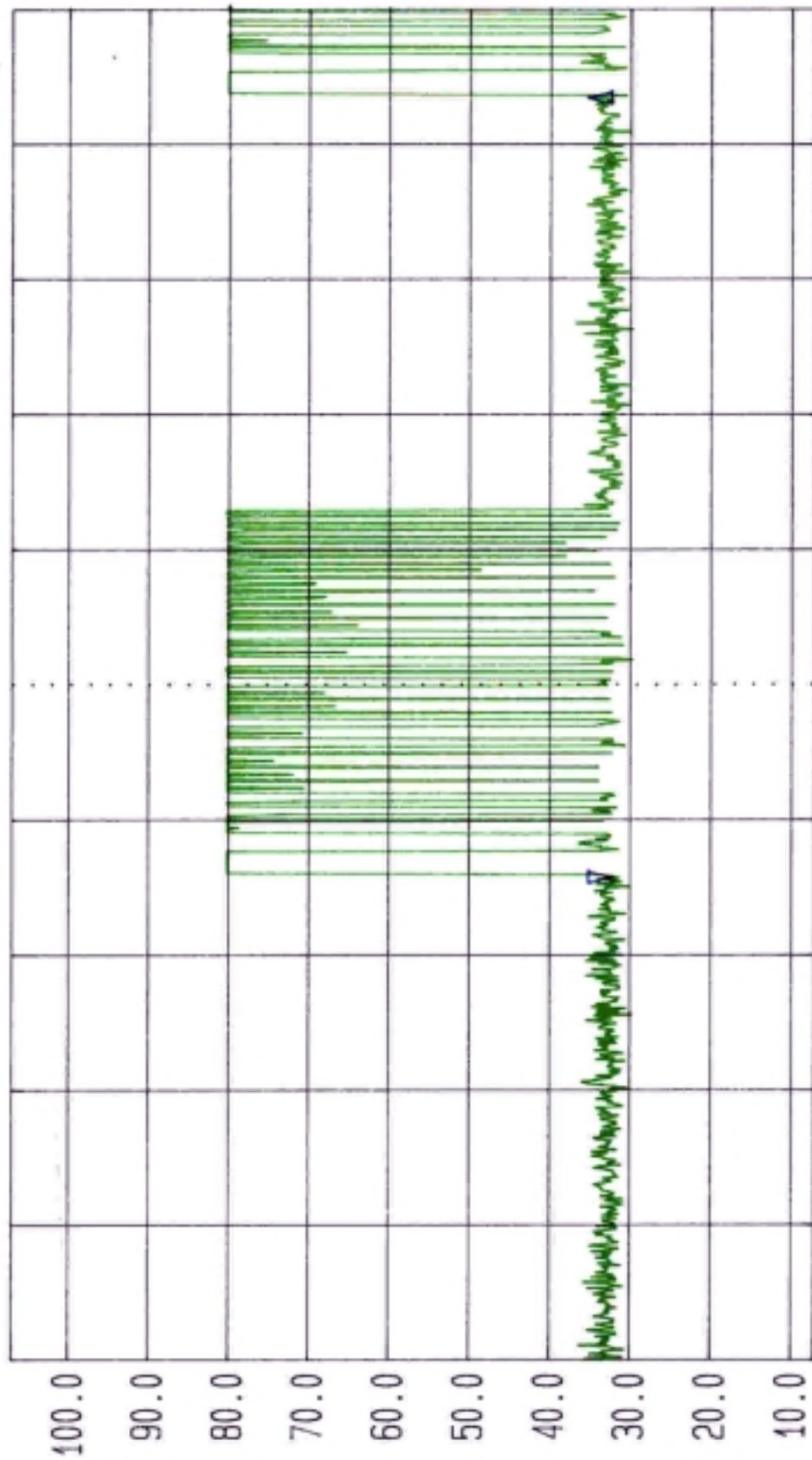
Span 0 Hz  
 Center 433.94444 MHz  
 Sweep 40 ms





Date 04.Mar.'00 Time 09:40:16  
Ref.Lvl Delta 3.43 dB  
107.00 dB $\mu$ V 115.333 ms

Res.Bw 100 kHz [imp]  
TG.Lvl off  
CF.Stp 10.000 kHz  
Vid.Bw 300 kHz  
AF.Att 10 dB  
Unit [dB $\mu$ V]

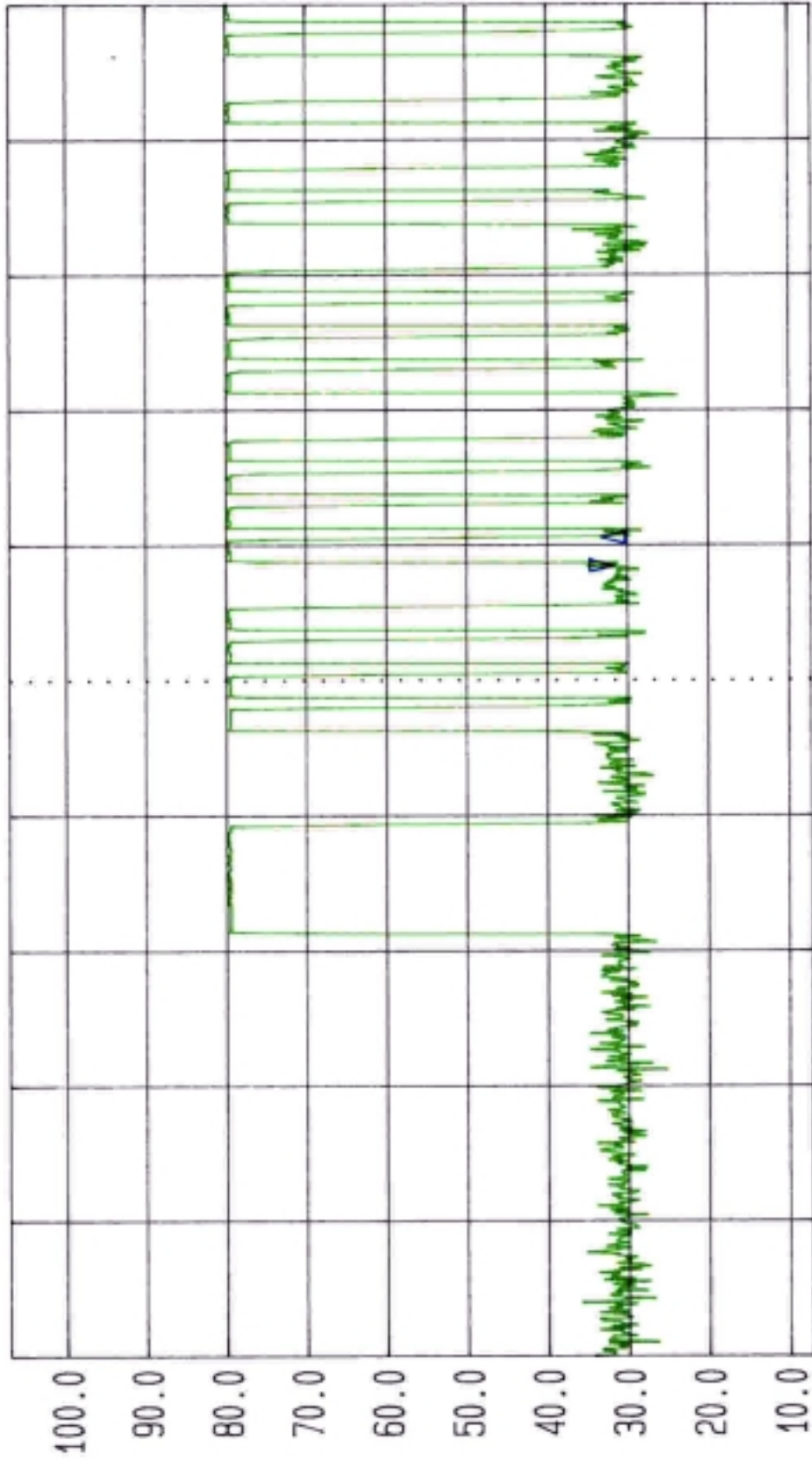


Span 0 Hz  
Center 433.94444 MHz  
Sweep 200 ms



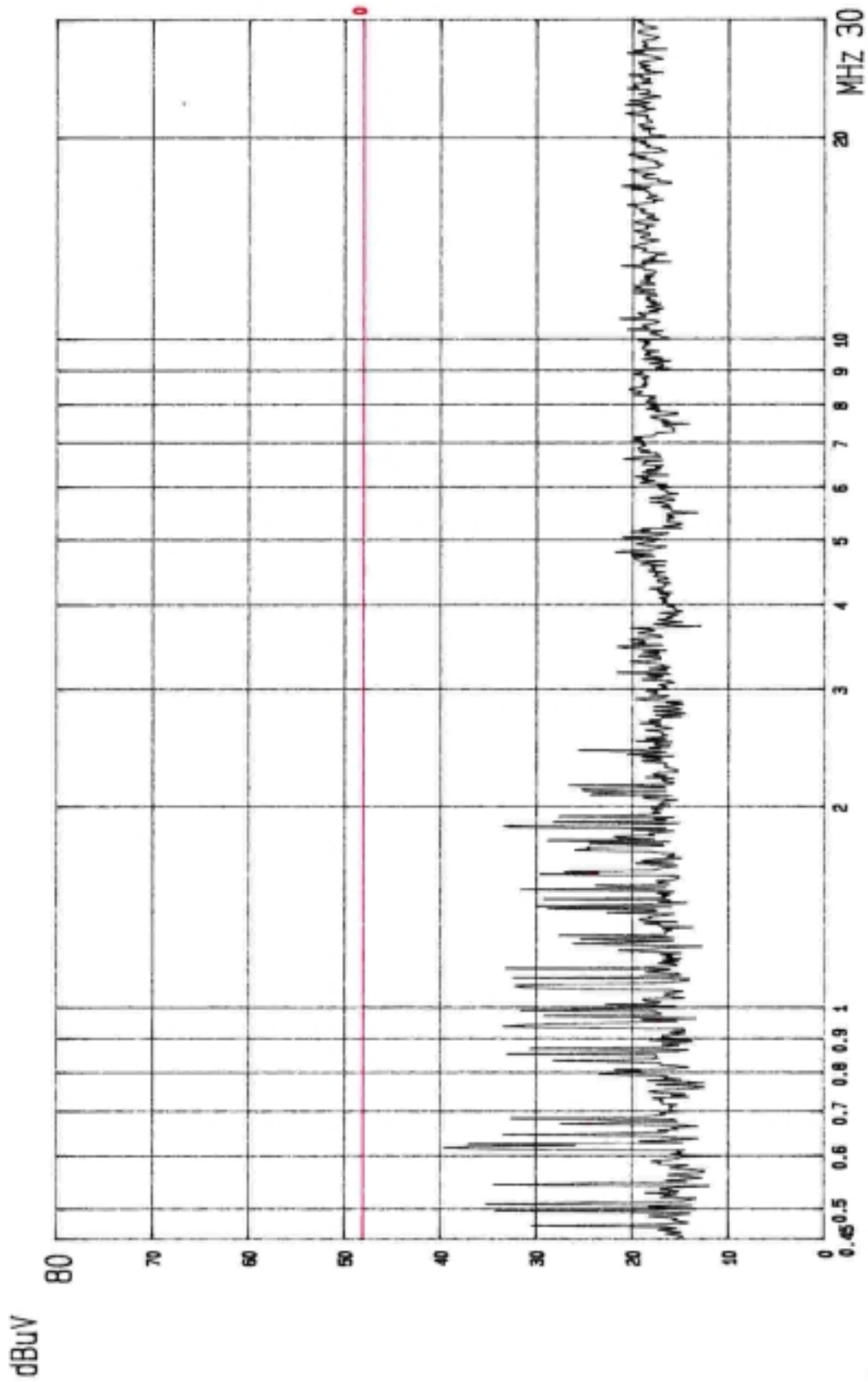
Date 04.Mar.'00 Time 09:56:47  
 Ref.Lvl Delta 1.83 dB  
 107.00 dBμV 844.444 μs

Res.Bw 100 kHz [imp] off  
 TG.Lvl  
 CF.Stp  
 Vid.Bw 300 kHz  
 RF.Att 10 dB  
 Unit [dBμV]

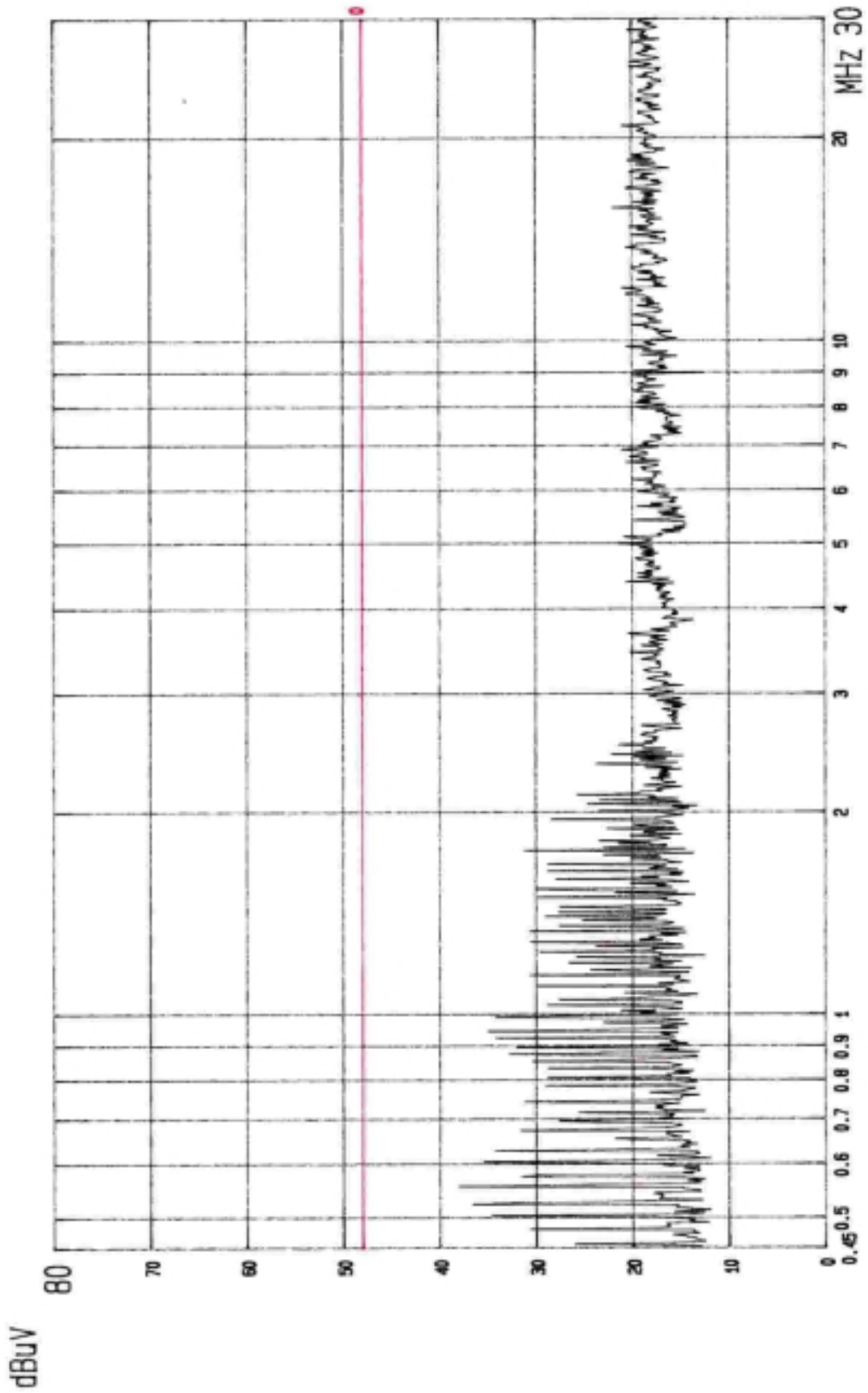


Span 0 Hz  
 Center 433.94444 MHz  
 Sweep 40 ms

## **APPENDIX 2 : PLOTTED DATA FOR CONDUCTED EMISSION**

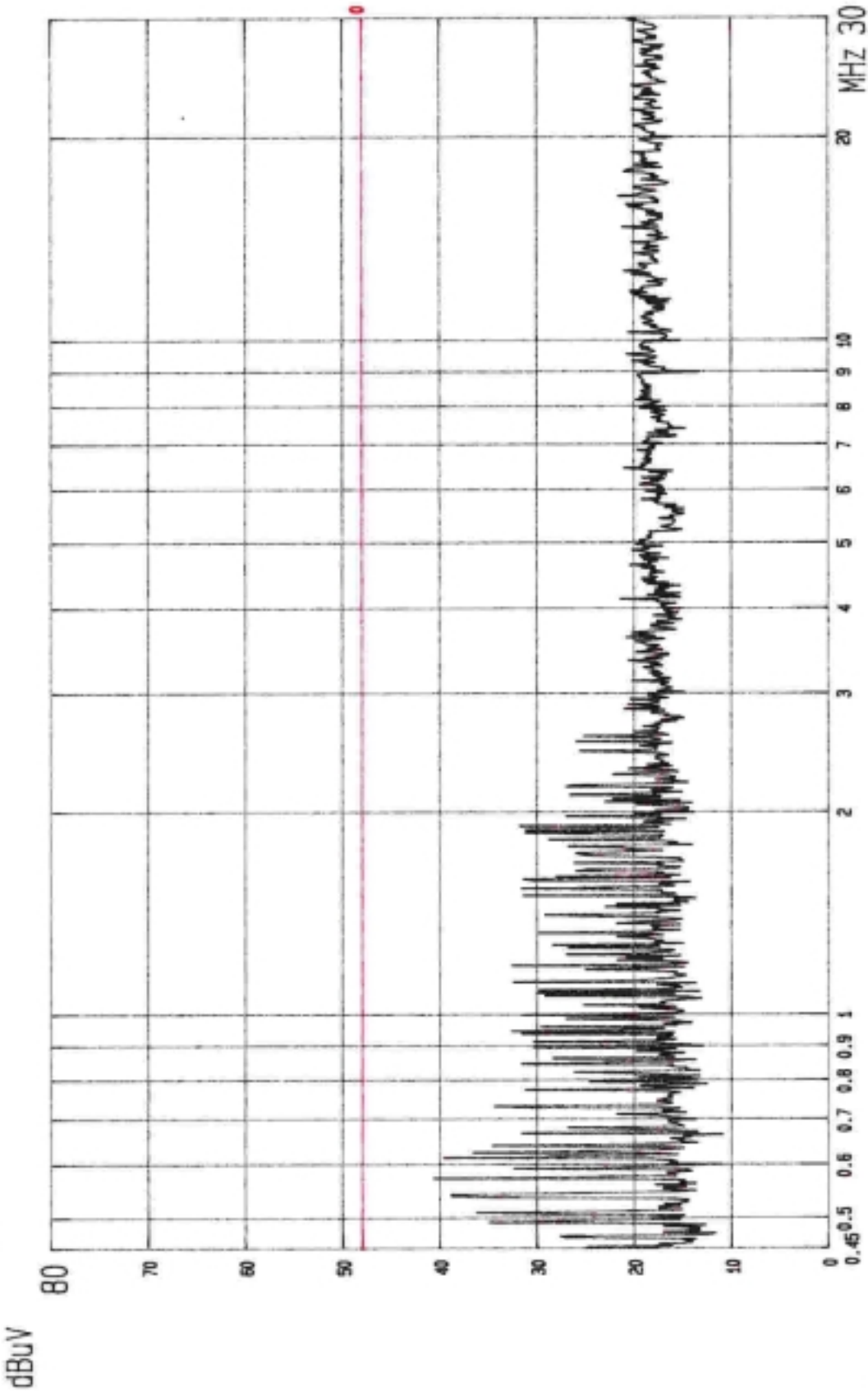


FCC CONDUCTED TEST EUT: AV SENDER POWER: 120V/60HZ 0: QP CLASS B LIMIT  
MODEL: AMV326 MODE: TX LISN: Va ETC EMI LAB.

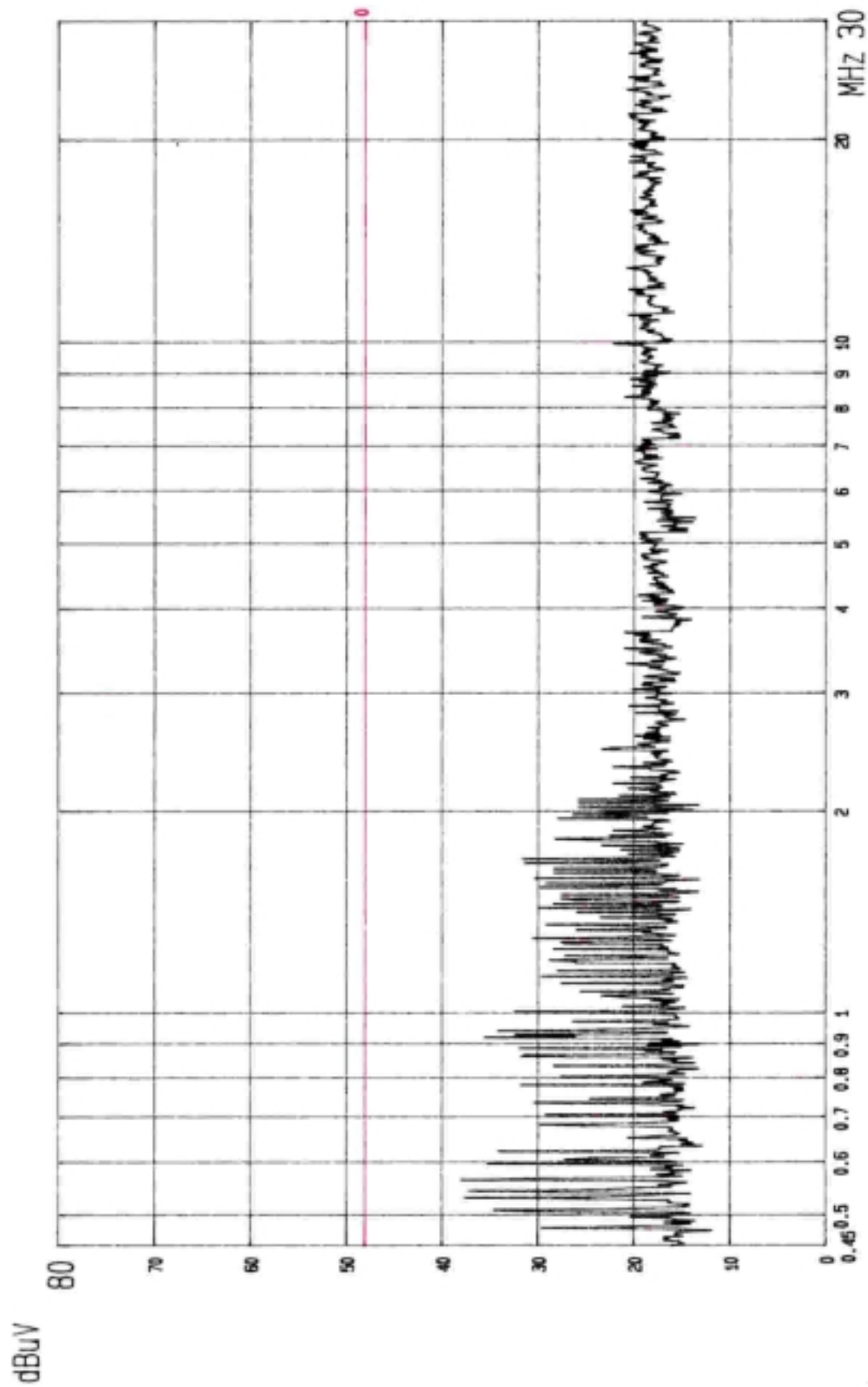
CLASS B LIMIT  
ETC EMI LAB.0: GP  
LISN: Vb

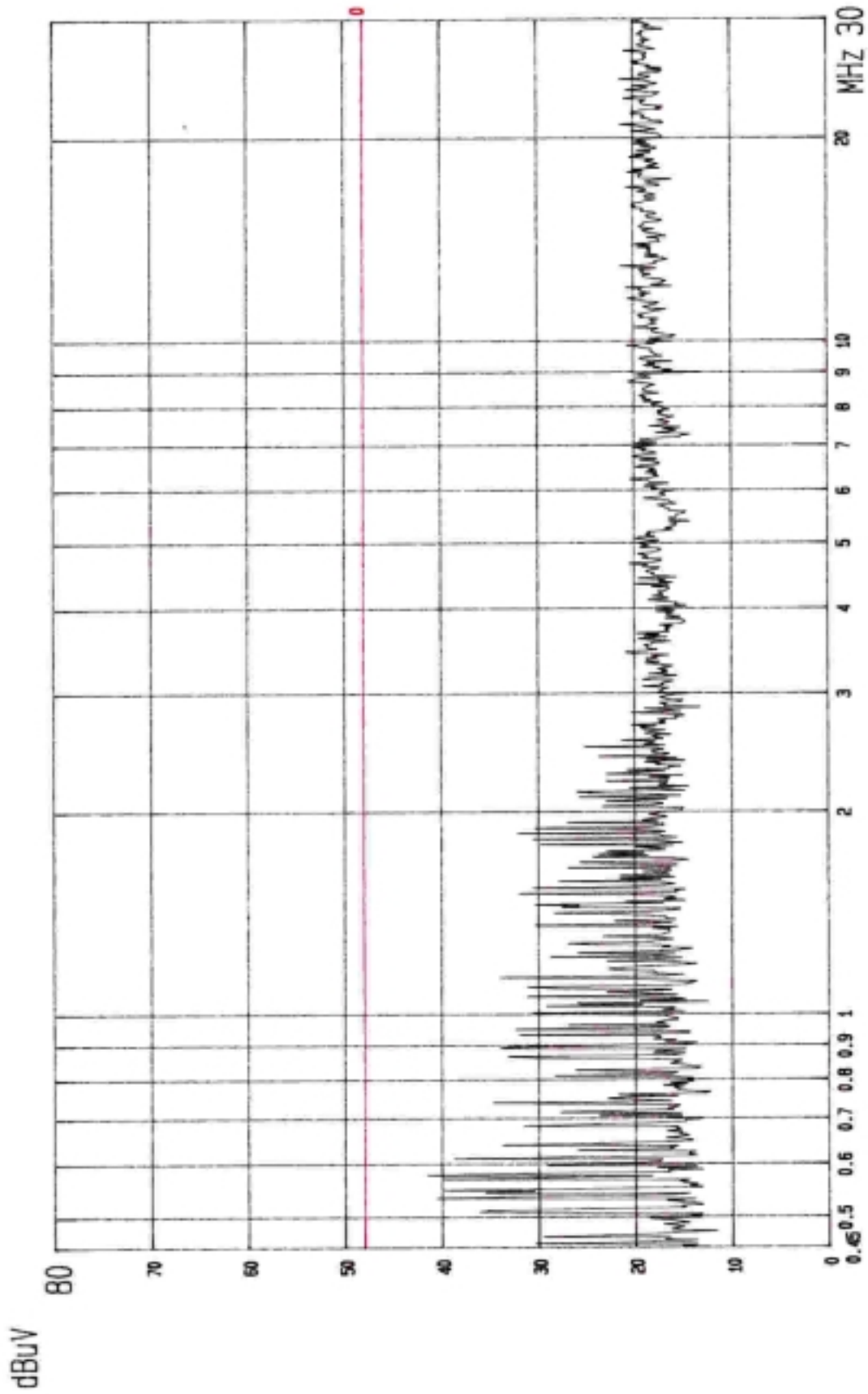
POWER: 120V/60HZ

EUT: AV SENDER  
MODE: TXFCC CONDUCTED TEST  
MODEL: AMV326

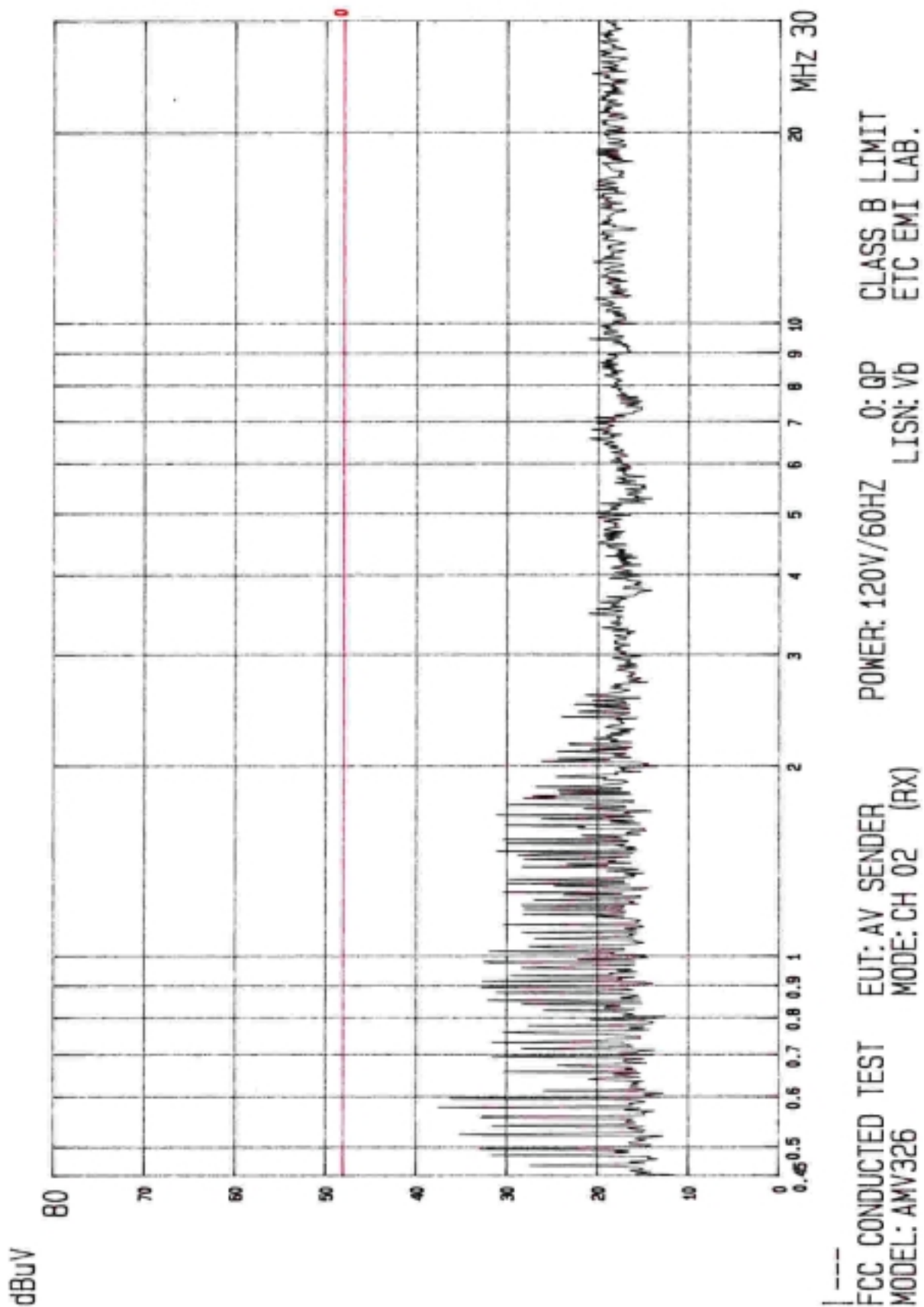


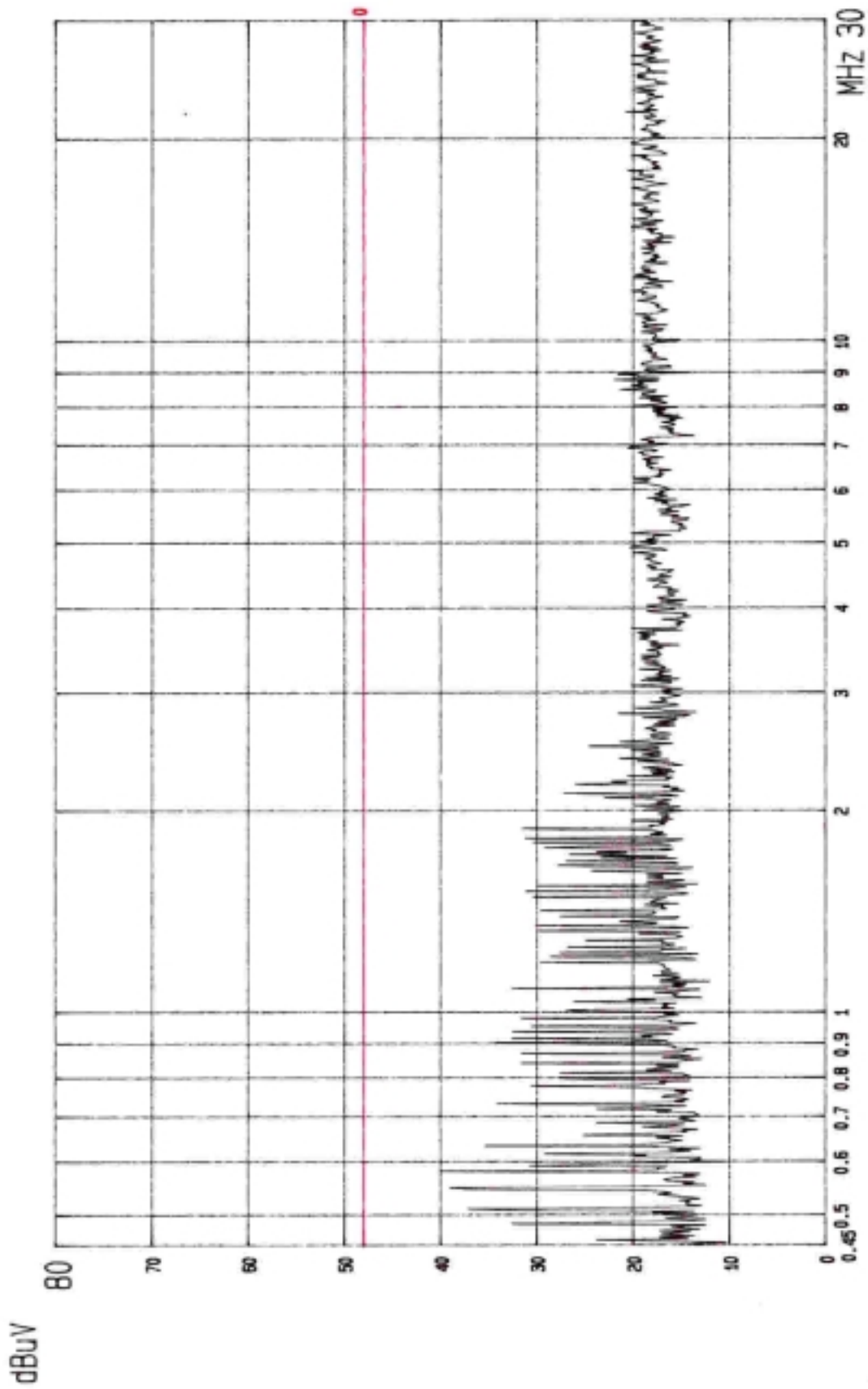
-----  
FCC CONDUCTED TEST EUT: AV SENDER POWER: 120V/60HZ 0: QP CLASS B LIMIT  
MODEL: AMV326 MODE: CH 01 (RX) LISN: Va ETC EMI LAB.



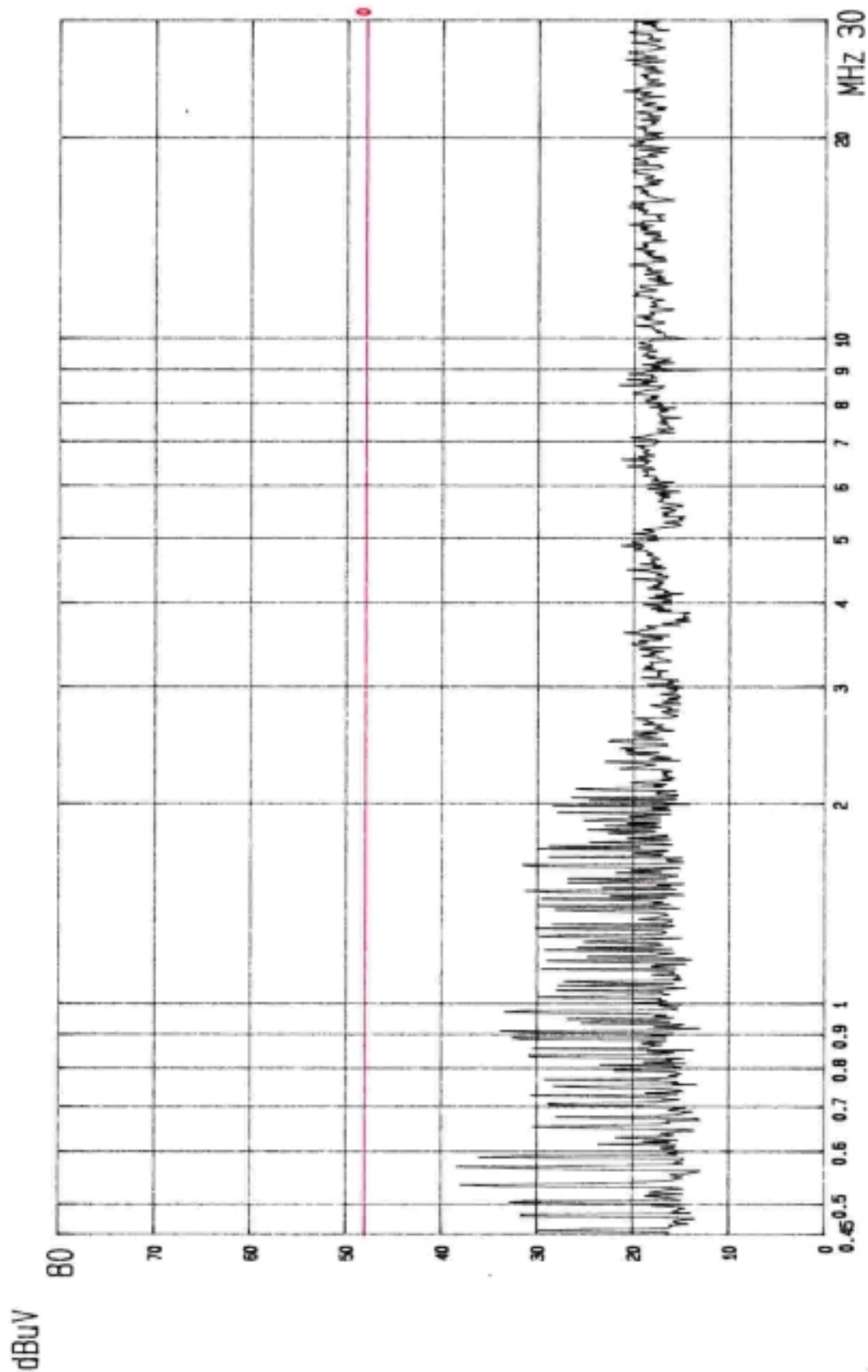


FCC CONDUCTED TEST EUT: AV SENDER POWER: 120V/60HZ 0: QP CLASS B LIMIT  
MODEL: AMV326 MODE: CH 02 (RX) LISN: Va ETC EMI LAB.





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FCC CONDUCTED TEST EUT: AV SENDER POWER: 120V/60HZ 0: GP CLASS B LIMIT  
MODEL: AMV326 MODE: CH 04 (RX) LISN: Va ETC EMI LAB.

CLASS B LIMIT  
ETC EMI LAB.POWER: 120V/60HZ 0: QP  
LISN: VbEUT: AV SENDER  
MODE: CH 04 (RX)FCC CONDUCTED TEST  
MODEL: AMV326

## **APPENDIX 3 : PLOTTED DATA FOR BANDWIDTH EMISSION**



Ref.Lvl Delta  
 107.00 dBμV

Res.Bw 100.0 kHz [3dB]  
 TG.Lvl 87.00 dBμV  
 CF.Stp 462.000 MHz

0.10 dB  
 330.3 kHz

Vid.Bw 300 kHz  
 RF.Att 20 dB  
 Unit [dBμV]



Start 432.897124 MHz  
 Span 2.09375 MHz  
 Center 433.944 MHz  
 Sweep 100 ms  
 Stop 434.990876 MHz