# *FCC Part 15 Subpart C*

# *EMI TEST REPORT*

*of*

E.U.T. : REMOTE CONTROL

FCC ID. : I6ZCMXT503

MODEL : TV503

Working Frequency : 302.086MHz

*for*

APPLICANT : AFROMAX CORPORATION
ADDRESS : NO. 29-1, WU-CHUAN 3RD ROAD., WU-KU IND. ZONE, WU-KU HSIANG, TAIPEI HSIEN, TAIWAN, R.O.C.

Test Performed by

**ELECTRONICS TESTING CENTER, TAIWAN**
NO. 8 LANE 29, WENMIMG ROAD,
LOSHAN TSUN, KWEISHAN HSIANG,
TAOYUAN, TAIWAN, R.O.C.

Tel:(03)3280026-32
Fax:(03)3280034
Report Number : ET90R-02-038-01

# *TEST REPORT CERTIFICATION*

Applicant : AFROMAX CORPORATION
NO. 29-1, WU-CHUAN 3RD ROAD., WU-KU IND. ZONE, WU-KU HSIANG, TAIPEI HSIEN, TAIWAN, R.O.C.

Manufacturer : AFROMAX CORPORATION
NO. 29-1, WU-CHUAN 3RD ROAD., WU-KU IND. ZONE, WU-KU HSIANG, TAIPEI HSIEN, TAIWAN, R.O.C.

Description of EUT :

| | |
|---|---|
| a) Type of EUT | : REMOTE CONTROL |
| b) Trade Name | : MAXXSONIC |
| c) Model No. | : TV503 |
| d) FCC ID | : I6ZCMXT503 |
| e) Working Frequency | : 302.086MHz |
| f) Power Supply | : DC 3V Battery |

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (1999)

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 : Apr. 20, 2001

Test Engineer : Chin Cheng Yeh
( Chin Cheng Yeh )

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

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# 1. GENERAL INFORMATION

## 1.1 Product Description

| | |
|---|---|
| a) Type of EUT | : REMOTE CONTROL |
| b) Trade Name | : MAXXSONIC |
| c) Model No. | : TV503 |
| d) FCC ID | : I6ZCMXT503 |
| e) Working Frequency | : 302.086MHz |
| f) Power Supply | : DC 3V Battery |

## 1.2 Characteristics of Device:

The key chain Remote Controller is a convenient way to arm and disarm to this systerm. It also has a Panic key feature.

## 1.3 Test Methodology

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

The Transmitter 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 Transmitter under test.

In order to determining the average value during one pulse train of the radiated power generated from the Transmitter 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 Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, 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 ( MHz ) | Emission (μV ) | Emission ( dBμV ) |
|---|---|---|
| 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 | |
|---|---|---|
| | µV/meter | dBµV/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 | |
|---|---|---|
| | µV/meter | dBµV/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 Transmitter shall employ a switch that will automatically deactivate the Transmitter (Transmitter) within not more than 5 seconds of being released.

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

## 3.2 Measurement Procedure

**A. Preliminary Measurement For Portable Devices**

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

**B. Final Measurement**

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

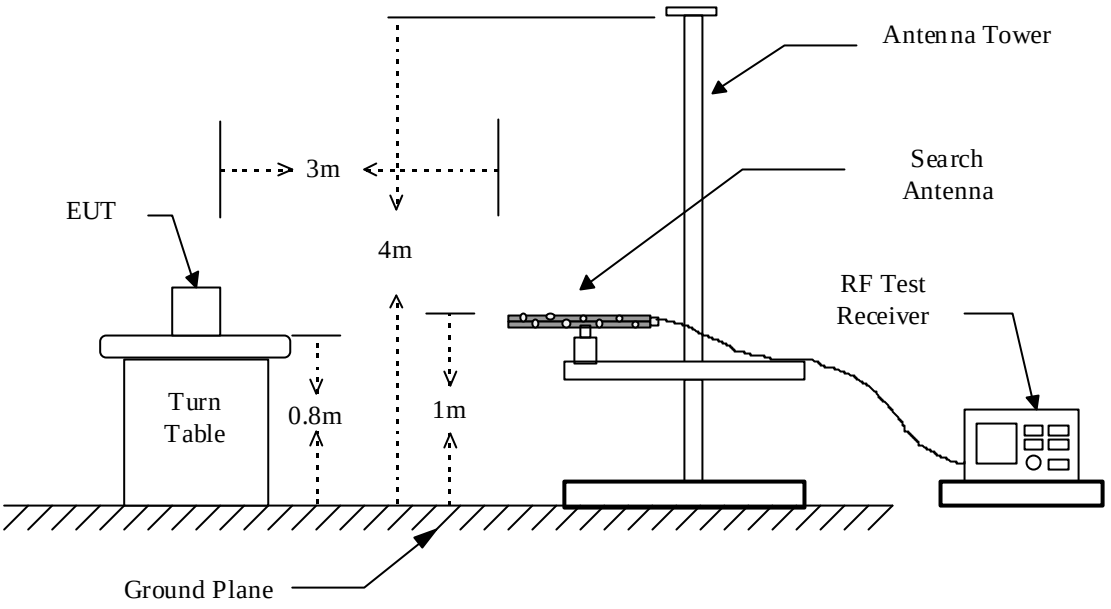
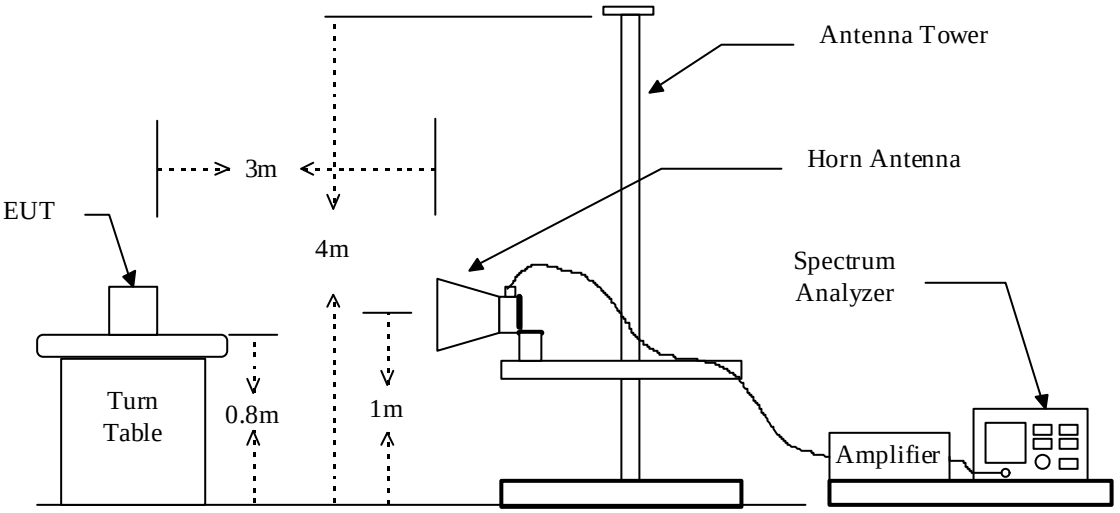



Figure 2 : Frequencies measured above 1 GHz configuration



## 3.3 Test Data

Operation Mode : Transmitting
Test Date: Feb. 23, 2001 Temperature : 27 ℃ Humidity: 70 %

| Frequency (MHz) | Reading (dBuV) Peak | | Factor (dB) C | D | Result @3m (dBuV/m) Peak | Ave. | Limit @3m (dBuV/m) Peak | Ave. | Margin (dB) | Table Degree (Deg.) | Ant. High (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 302.086 | 81.5 | 73.6 | -7.0 | -9.0 | 74.8 | 65.8 | 93.6 | 73.6 | -7.8 | 90 | 1.10 |
| 604.172 | 36.3 | 33.5 | -4.3 | -9.0 | 32.0 | 23.0 | 66.0 | 46.0 | -23.0 | 90 | 1.00 |
| 906.258 | 35.6 | 35.8 | 2.2 | -9.0 | 38.0 | 29.0 | 66.0 | 46.0 | -17.0 | 0 | 1.00 |
| *1208.344 | 45.6 | 44.7 | -8.8 | -9.0 | 36.8 | 27.8 | 74.0 | 54.0 | -26.2 | 90 | 1.50 |
| *1510.430 | --- | --- | -7.4 | -9.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 1812.516 | --- | --- | -5.7 | -9.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 2114.602 | --- | --- | -4.2 | -9.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 2416.688 | --- | --- | -3.0 | -9.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| *2718.774 | --- | --- | -2.0 | -9.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 3020.860 | --- | --- | -1.1 | -9.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

***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. *Peak Result = Reading + C. Factor*
   *Ave. Result = 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.*

## 3.4 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:

***Peak = Reading + Corrected Factor***

where

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

And the average value is

***Average = Peak Value + 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 Panic Watch is operated by Manual, and Activate Time is less than 5 second after being released.

## 3.6 Calculation of Duty Factor

The duty factor is calculated with following formula :

$$20\log\frac{Total\ Duty}{Period\ of\ Pulse\ Train}$$

***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 | 12/21/2001 |
| Pre-selector | Hewlett-Packard | 85685A | 01/01/2002 |
| Quasi Peak Detector | Hewlett-Packard | 85650A | 01/01/2002 |
| Spectrum Analyzer | Hewlett-Packard | 8564E | 04/18/2002 |
| RF Test Receiver | Rohde & Schwarz | ESVS 30 | 07/30/2001 |
| Horn Antenna | EMCO | 3115 | 05/09/2001 |
| Log periodic Antenna | EMCO | 3146 | 11/02/2001 |
| Biconical Antenna | EMCO | 3110B | 11/02/2001 |
| Preamplifier | Hewlett-Packard | 8449B | 05/09/2001 |
| Preamplifier | Hewlett-Packard | 8447D | 12/29/2001 |

## 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. BANDWIDTH OF EMISSION

## 4.1 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.

## 4.2 Bandwidth Test Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Date |
|---|---|---|---|
| EMI Test Receiver | Rohde and Schwarz | ESBI | 05/19/2001 |
| Plotter | Hewlett-Packard | 7550A | N/A |

## 4.3 Plot Graphic of Bandwidth

The emission bandwidth limit for this transmitter is

302.356 MHz× 0.25%＝755.890 KHz

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

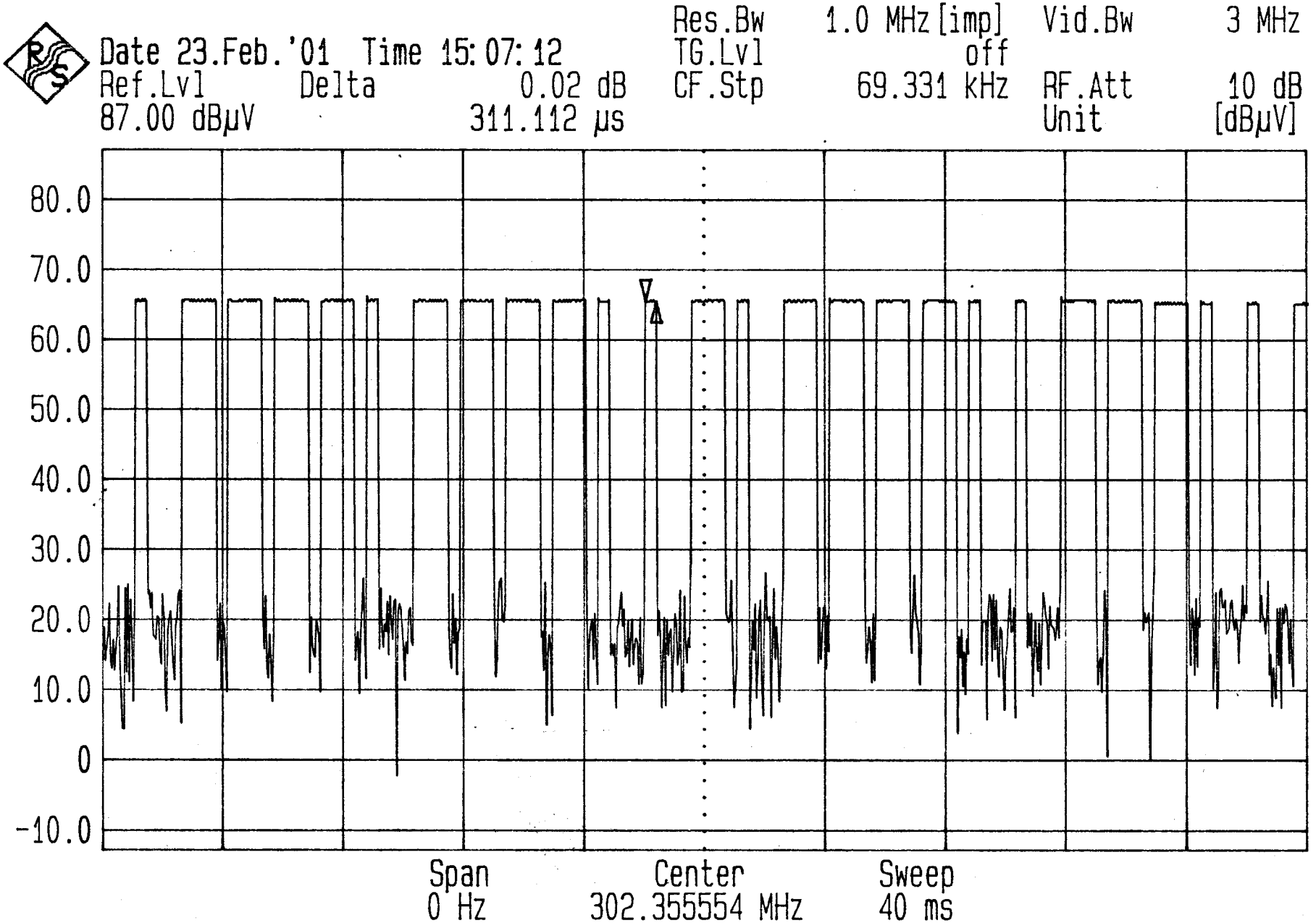
# 5. CONDUCTED EMISSION MEASUREMENT

## 5.1 Standard Applicable

This EUT is excused from investigation of conducted emission, for it is powered by battery only. According to § 15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

# APPENDIX 1 : PLOTTED DATA FOR DUTY FACTOR

$$20\log\frac{(1.066ms\times 17)+(0.311112ms\times 22)}{71.44ms} = \text{-9.0 dB}$$


Date 23.Feb.'01 Time 15:07:12
Ref.Lvl
87.00 dBµV
Delta
0.02 dB
311.112 µs
Res.Bw
1.0 MHz [imp]
TG.Lvl
off
CF.Stp
69.331 kHz
Vid.Bw
3 MHz
RF.Att
10 dB
Unit
[dBµV]
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
Span
0 Hz
Center
302.355554 MHz
Sweep
40 ms

Date 23.Feb.'01 Time 15:03:07

Ref.Lvl 87.00 dBµV

Delta -0.13 dB 1.066 ms

Res.Bw 1.0 MHz [imp]

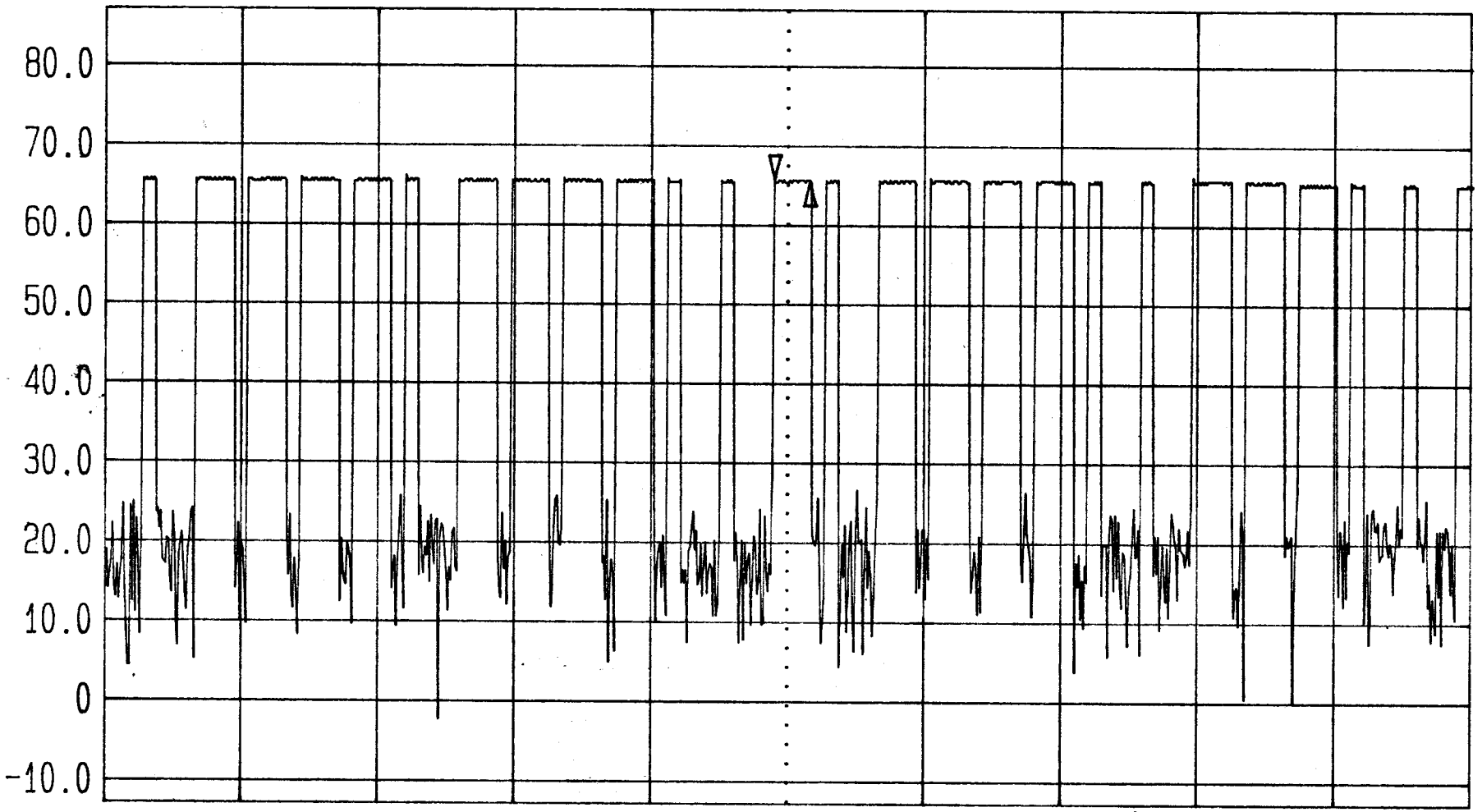
TG.Lvl off

CF.Stp 69.331 kHz

Vid.Bw 3 MHz

RF.Att 10 dB

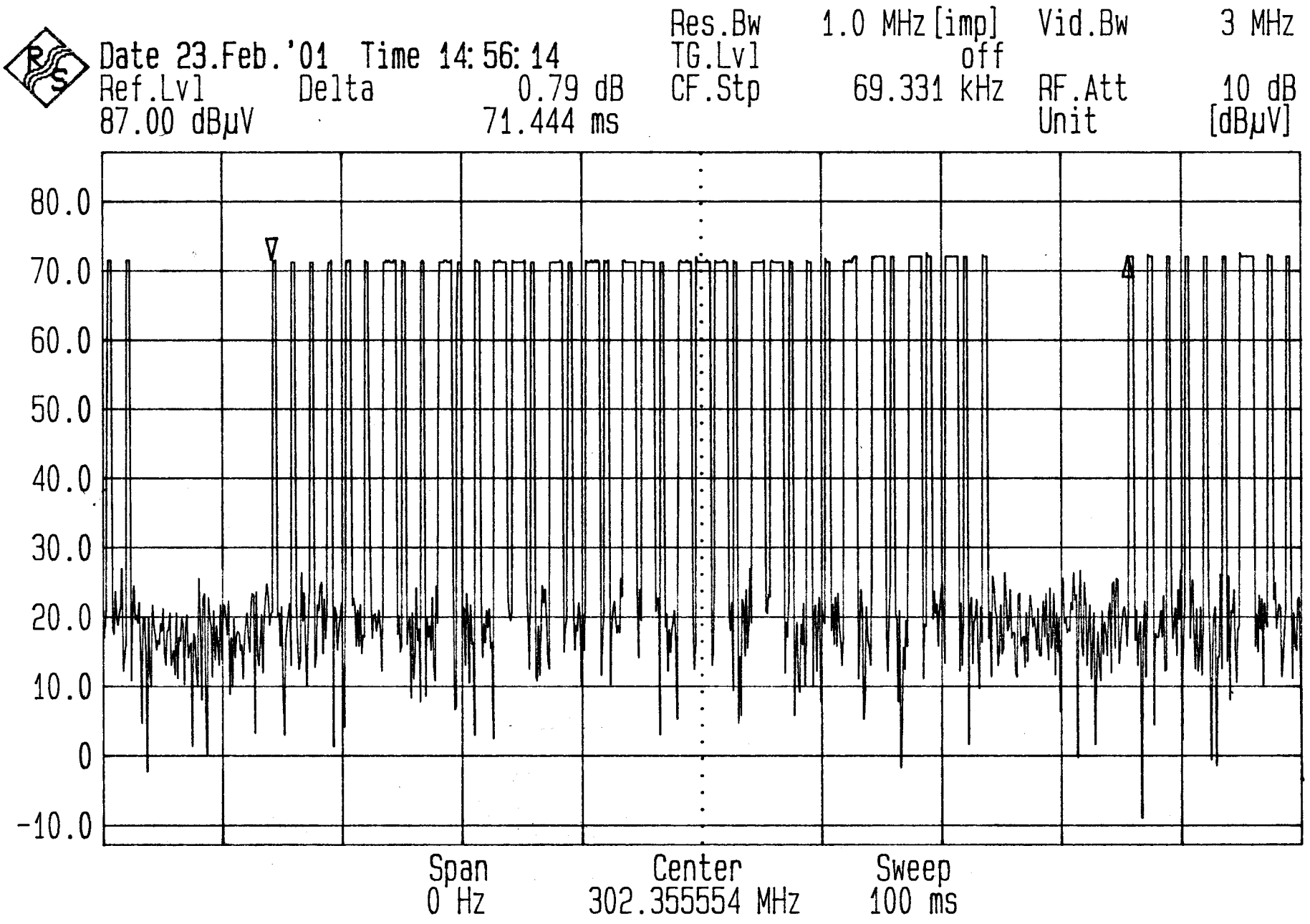
Unit [dBµV]




Span 0 Hz

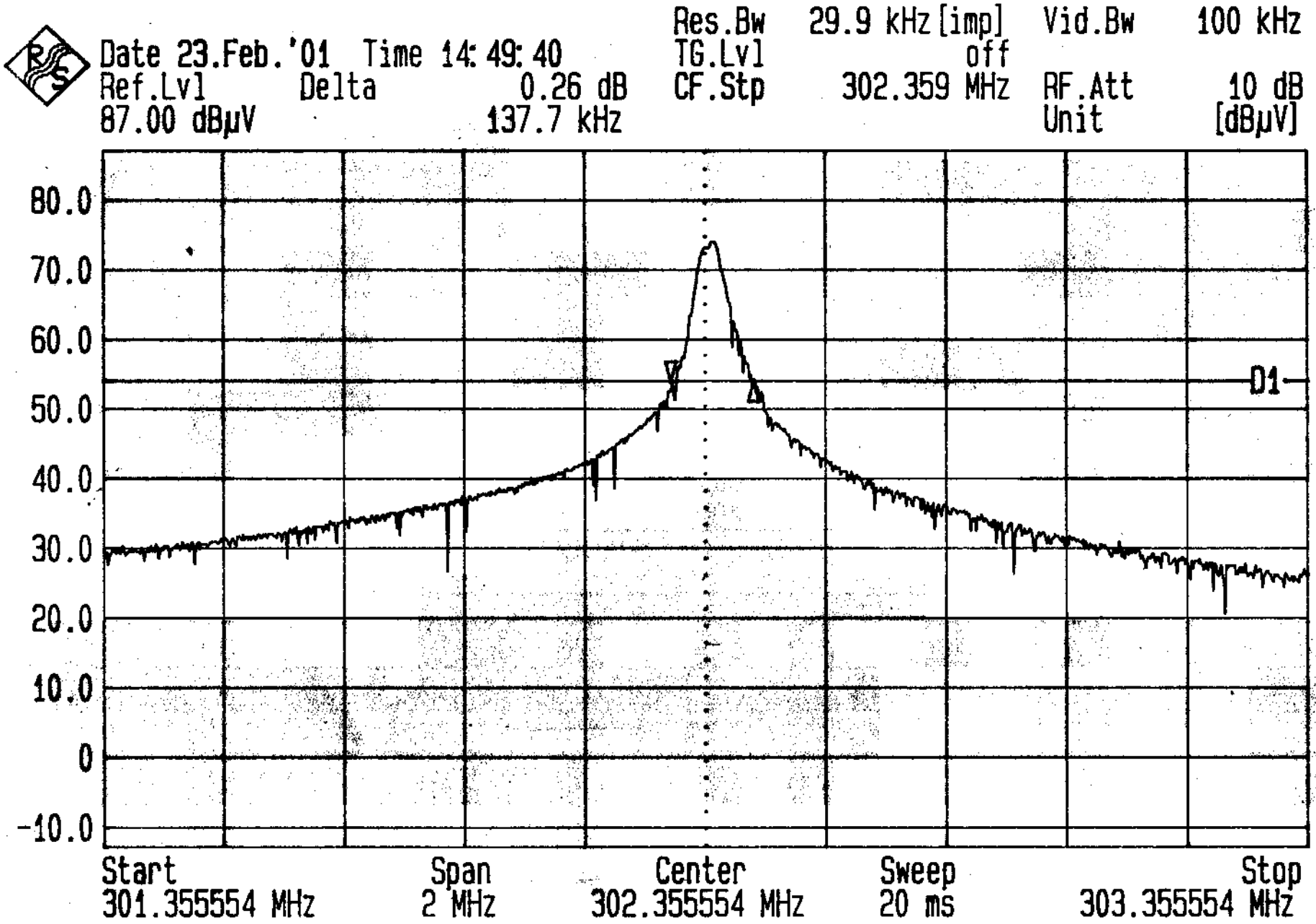
Center 302.355554 MHz

Sweep 40 ms


Date 23.Feb.'01 Time 14:56:14
Ref.Lvl
87.00 dBµV
Delta
0.79 dB
71.444 ms
Res.Bw
1.0 MHz [imp]
TG.Lvl
off
CF.Stp
69.331 kHz
Vid.Bw
3 MHz
RF.Att
10 dB
Unit
[dBµV]
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
Span
0 Hz
Center
302.355554 MHz
Sweep
100 ms

# APPENDIX 2 : PLOTTED DATA FOR BANDWIDTH

Bandwidth Limit = 302.356 MHz× 0.25%＝755.890 KHz


Date 23.Feb.'01 Time 14:49:40
Ref.Lvl
87.00 dBµV
Delta 0.26 dB
137.7 kHz
Res.Bw 29.9 kHz [imp]
TG.Lvl off
CF.Stp 302.359 MHz
Vid.Bw 100 kHz
RF.Att 10 dB
Unit [dBµV]
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
D1
Start 301.355554 MHz
Span 2 MHz
Center 302.355554 MHz
Sweep 20 ms
Stop 303.355554 MHz