# Certification of Compliance

CFR 47 Part 15 Subpart C Intentional Radiators

**Test Report File No.** 03-IST-333 **Date of Issue** Dec. 22. 2003

**Model** **TX-1000**

**Kind of Product** FM Transmitter

**Applicant** JUNG SOFT Co., Ltd.

Address 274-5, Seohyun-Dong, Bundang-Ku, Seongnam-City
Kyonggi-Do, Korea

**Manufacturer** JUNG SOFT Co., Ltd.

Address 274-5, Seohyun-Dong, Bundang-Ku, Seongnam-City
Kyonggi-Do, Korea

**Test Result** **(*)Positive** **( ) Negative**

Reviewed By

J.H. Lee / General Manager of EMC

Approved By

G. Chung / Chief

- Investigations requested : Measurement to the relevant clauses of F.C.C rules and regulations Part 15 Subpart C – Intentional Radiators
- The test report with appendix consists of 12 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST EMC Laboratory.
- This equipment as for has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4 1992.

# TABLE OF CONTENTS

**Table of contents** 2

**Information of test laboratory, Environmental condition,**

**Power used** 3

**Description of test**

Conducted Emission 4

Radiated Emission 5

**Summary** 6

**Test conditions and data**

Conducted emissions 0.15 MHz - 30 MHz Not Applicable

Test equipment 7

Data and plots

Radiated emissions 30 MHz - 1 GHz Applicable

Test equipment 8

Data 9-12

# INFORMATIONS OF TEST LABORATORY

EMC LABORATORY of IST Co., Ltd. (Yongin Lab., ***Filed to FCC***)
San 21-8, Goan-Ri, Baekam-Myun, Yongin-City
Kyonggi-Do, 449-860, Korea
TEL : +82 31 333 4093 FAX : +82 31 333 4094

EMC LABORATORY of IST Co., Ltd. (Yangji Lab., ***Filed to FCC***)
80, Jeil-RI, Yangji-Myun, Yongin-City
Kyonggi-Do, 449-825, Korea
TEL : +82 31 323 3012 FAX : +82 31 323 3014

# ENVIRONMENTAL CONDITIONS

| | |
|---|---|
| Temperature | 18 ℃ |
| Humidity | 45 % |
| Atmospheric pressure | 1002 mbar |

# POWER SUPPLY SYSTEM USED

| | |
|---|---|
| AUTO BATTERY | DC 12V |

# Product Information

| | |
|---|---|
| Signal Format | Standard FM Stereo / 38kHz subcarrier |
| Audio Range | 15Hz ~ 15kHz |
| S/N Ratio | > 60dB |
| Total Harmonic Distortion | Max. 0.3% |
| Channel Separation | Typical 40dB |
| Channel Balance | ±2dB |
| Power | Automobile 12V DC / AAA 1.5V (combined) |
| Interface | Mini Earphone stereo jack |
| Switch | Frequency Selection / Power Selection |
| Exterior | 20.6 × 30.0 × 10.0 (mm) |
| Weight | 28g |

Find product information in User's manual.

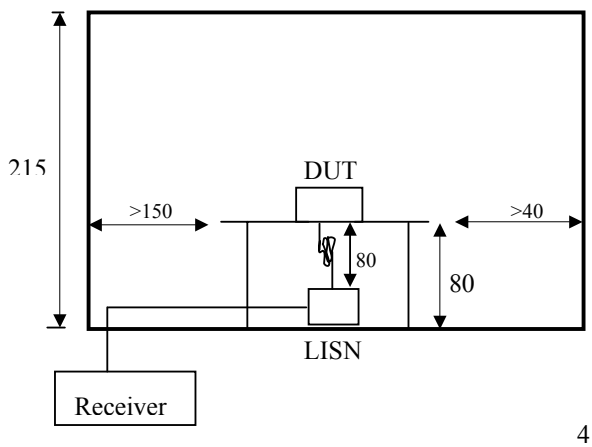
# DESCRIPTIONS OF TEST

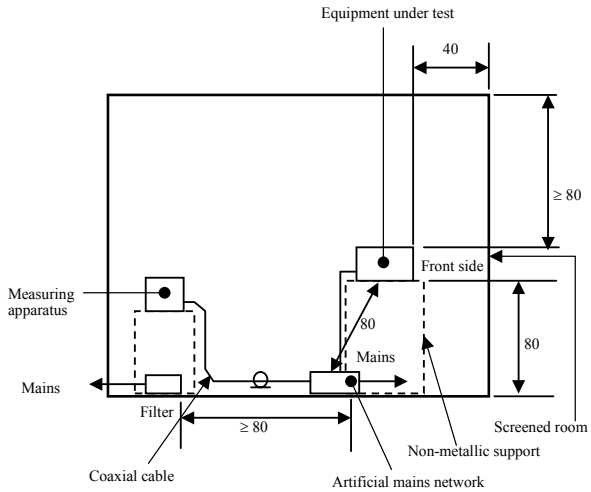
## Conducted Emissions:

The measurement were performed over the frequency range of 0.45MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within an bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

**- Procedure of Test**

The line-conducted facility is located in a shielded room. The wooden table 80cm height is placed 40cm away from the vertical wall and 1.5m away from the other wall of the shielded room. The LISNs are bonded to bottom of the shielded room. The EUT is located on the wooden table with distance more than 80cm from the LISN and powered from the powered LISN .The peripheral equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cutting power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the appropriate LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating conditions. The RF output of the LISN was connected to the R/S receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was re-measured using Quasi-Peak detector and average detector by manual measurement or final measurement program of R&S, after scanned by automatic Peak mode for frequency range from 0.15 to 30MHz. The bandwidth of the receiver was set to 10kHz. The EUT, peripheral equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.



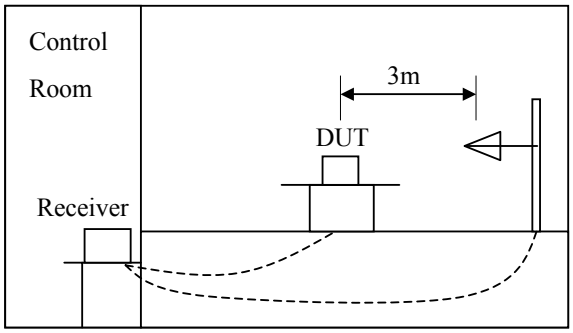
# DESCRIPTION OF TEST

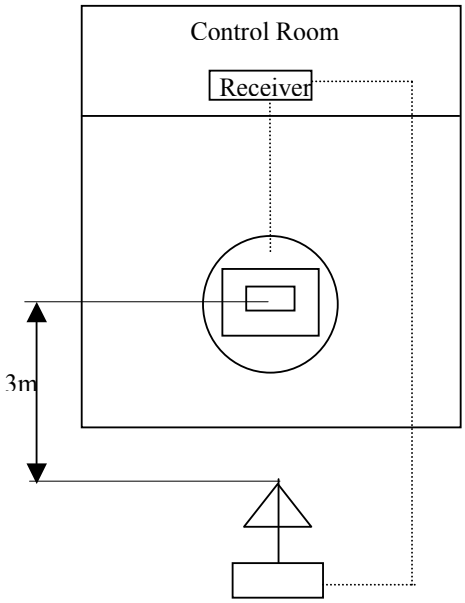
## Radiated Emissions:

The measurement was performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120KHz.

- **Procedure of Test**

Preliminary measurements were made at 3 meter using bi-conical and log-periodic antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 230MHz using bi-conical antenna and 230 to 1000MHz using log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3 or 10 meters test distance using Bi-log antenna, Bi-conical antenna, Log-periodic antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuations. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to Peak mode or Average mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were configured as same in chamber, were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.



# SUMMARY

☐ Conducted Emission

The requirements are ○ MET ○ Not MET

Minimum limit margin

Maximum limit exceeding

**Remarks :**

☒ Radiated Emission

The requirements are ● MET ○ Not MET

Minimum limit margin 27.2dB at 88.3MHz

Maximum limit exceeding

**Remarks : With average detector**

Reported By

H.C. Kim / EMC Engineer

*Note :*

☒ means the test is applicable, ☐ is not applicable.

# TEST CONDITIONS AND DATA

## Conducted Emissions

**[Not Applicable]**

◆ Test Equipment Used

| Model Name | Manufacturer | Description | Next Cal. Date |
|---|---|---|---|
| ESH3 | Rohde Schwarz | Receiver | Dec. 12, 2004 |
| ESH2-Z5 | Rohde Schwarz | LISN | Dec. 12, 2004 |
| NMLK8121 | Schwarzbeck | LISN | Dec. 12, 2004 |
| ESH3-Z2 | Rohde Schwarz | Pulse Limiter | Dec. 12, 2004 |

◆ Auxiliary Equipment Used

| Model Name | Manufacturer | Descriptions | FCC Compliance information |
|---|---|---|---|

◆ Test Program

◆ Test Area Shielded Room

*Note :*

# TEST CONDITIONS AND DATA

## Radiated Emission

**[Applicable]**

◆ Test Equipment Used

| Model Name | Manufacturer | Description | Next Cal. Date |
|---|---|---|---|
| ESVS10 | Rohde & Schwarz | Receiver | Dec. 12, 2004 |
| HUF Z3 | Rohde & Schwarz | Log-periodic Antenna | Jun. 21, 2004 |
| VHA9103 | SCHWARZBECK | Bi-conical Antenna | Jun. 20, 2004 |
| E7402A | Agilent | Spectrum Analyzer | Dec. 12, 2004 |
| HK116 | Rohde & Schwarz | Bi-conical Antenna | Jun. 18, 2004 |
| HL223 | Rohde & Schwarz | Log-periodic Antenna | Jun. 18, 2004 |

◆ Auxiliary Equipment Used

| Model Name | Manufacturer | Descriptions | FCC Compliance information |
|---|---|---|---|
| CA-K20MT | CM Tech | MP3 Player | FCC ID : QHBCMT2003K |

◆ Test Program FM Transmitting

◆ Test Area Compact Chamber / Open Area Test Site

*Note : The test signal 1kHz was used by MP3 player. The volume of MP3 was adjusted by maximum. It was investigated the emission characteristic of AAA battery powered operation and automobile battery powered operation. The last condition was employed because its maximum emission characteristics.*

# Radiated Emissions

(Disturbance Radiation)

- The measured values are as following

| Freq. (MHz) | Reading (dBuV/m) PEAK | C.Loss (dB) | Ant. Factor (dBuV/m) | Azimuth (˚) | Ant. Height (cm) | Pol. (H/V) | Limits (dBuV/m) | Result (dB) | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| Peak | | | | | | | | | |
| 88.1 | 22.8 | 1.8 | 8.1 | 180 | 189 | H | 74.0 | 32.7 | 41.3 |
| 88.3 | 22.9 | 1.8 | 8.1 | 180 | 192 | H | 74.0 | 32.8 | 41.2 |
| 88.5 | 22.5 | 1.8 | 8.1 | 180 | 188 | H | 74.0 | 32.4 | 41.6 |
| 88.7 | 22.4 | 1.8 | 8.2 | 180 | 190 | H | 74.0 | 32.4 | 41.6 |
| Average | | | | | | | | | |
| 88.1 | 16.7 | 1.8 | 8.1 | 180 | 189 | H | 54.0 | 26.6 | 27.4 |
| 88.3 | 16.9 | 1.8 | 8.1 | 180 | 192 | H | 54.0 | 26.8 | 27.2 |
| 88.5 | 16.7 | 1.8 | 8.1 | 180 | 188 | H | 54.0 | 26.6 | 27.4 |
| 88.7 | 16.6 | 1.8 | 8.2 | 180 | 190 | H | 54.0 | 26.6 | 27.4 |

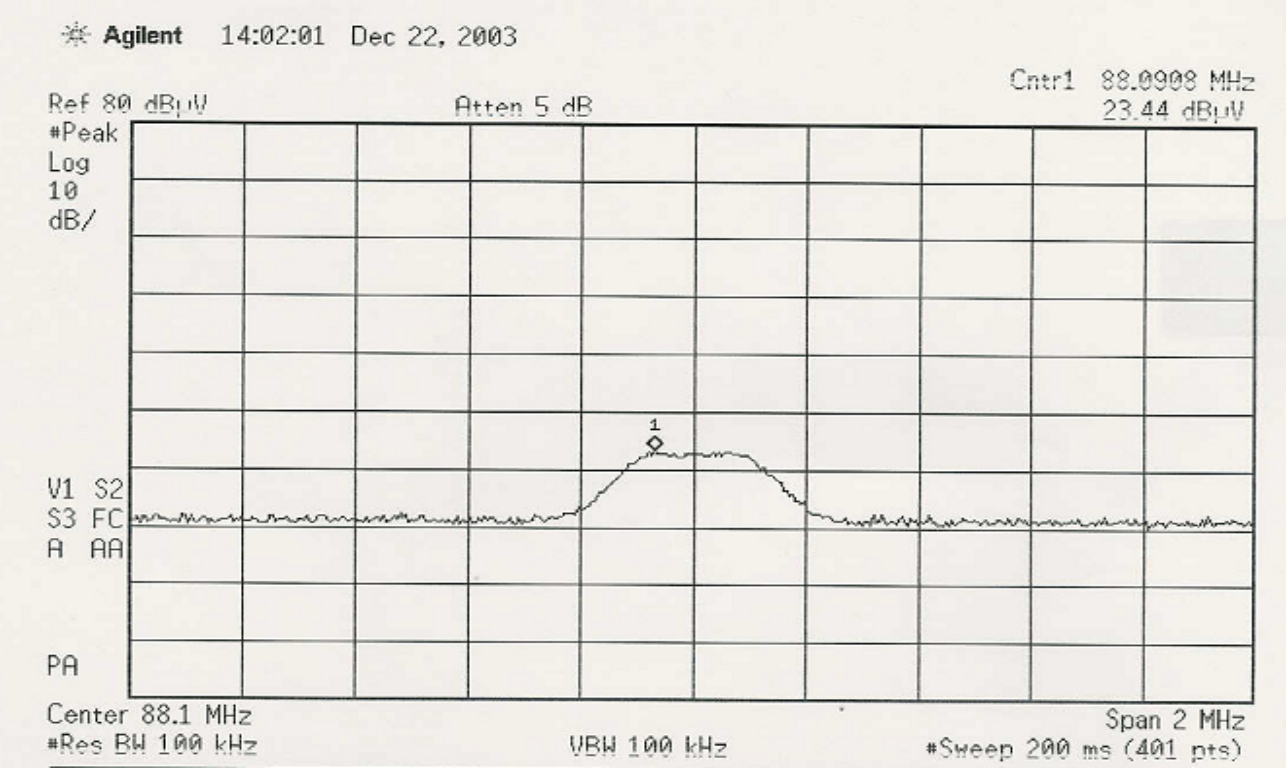
End of data

*Note :*

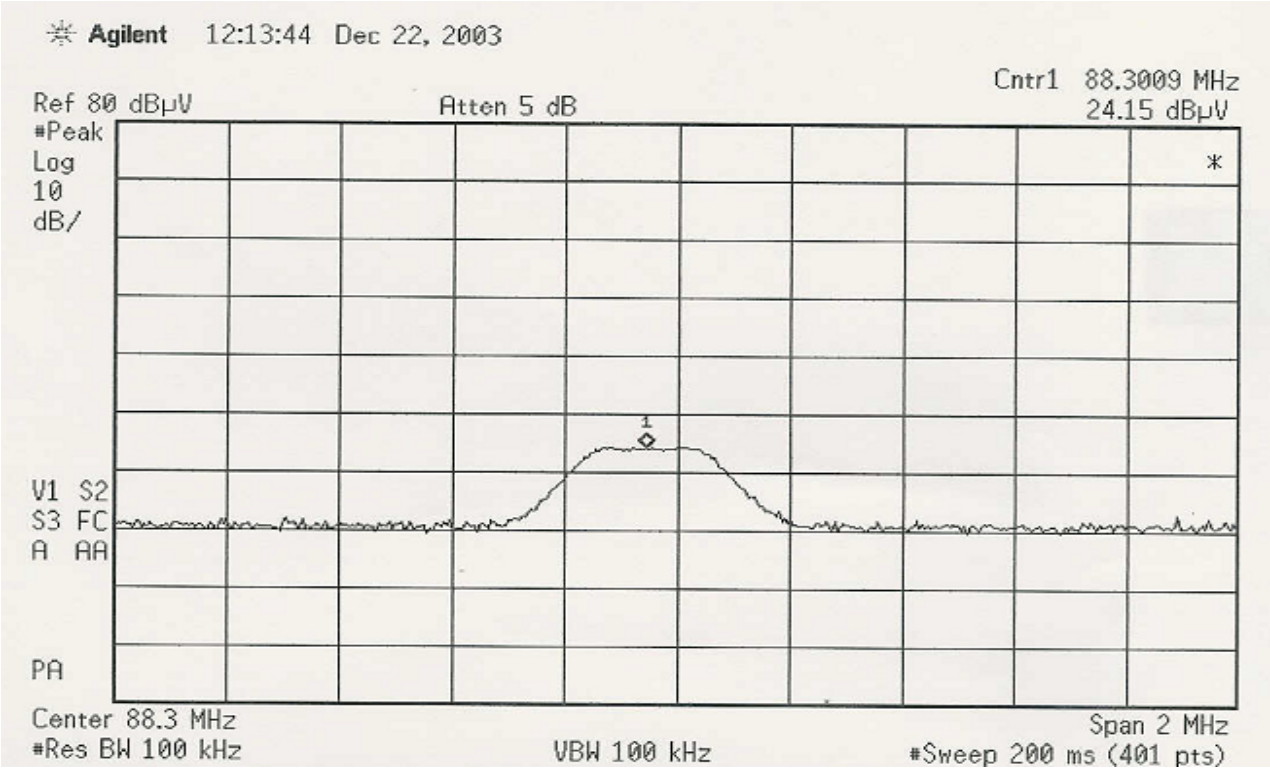
*It couldn't be measured any spurious emission or harmonic emissions Even though it was investigated the emission characteristics for whole range. Consequently there was no spurious and harmonics.*

*Also it was checked normal operation in a car after tesiting.*

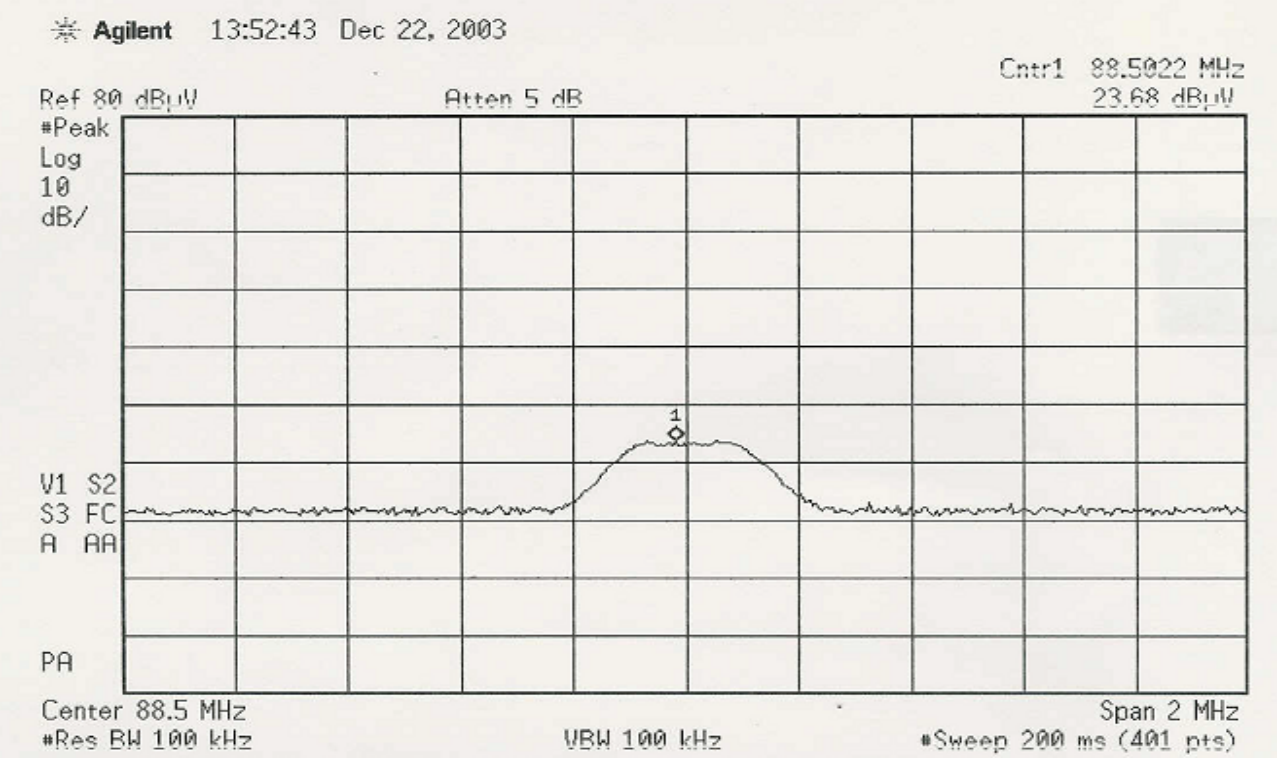
***Please refer to following pages for compact chamber test results.***



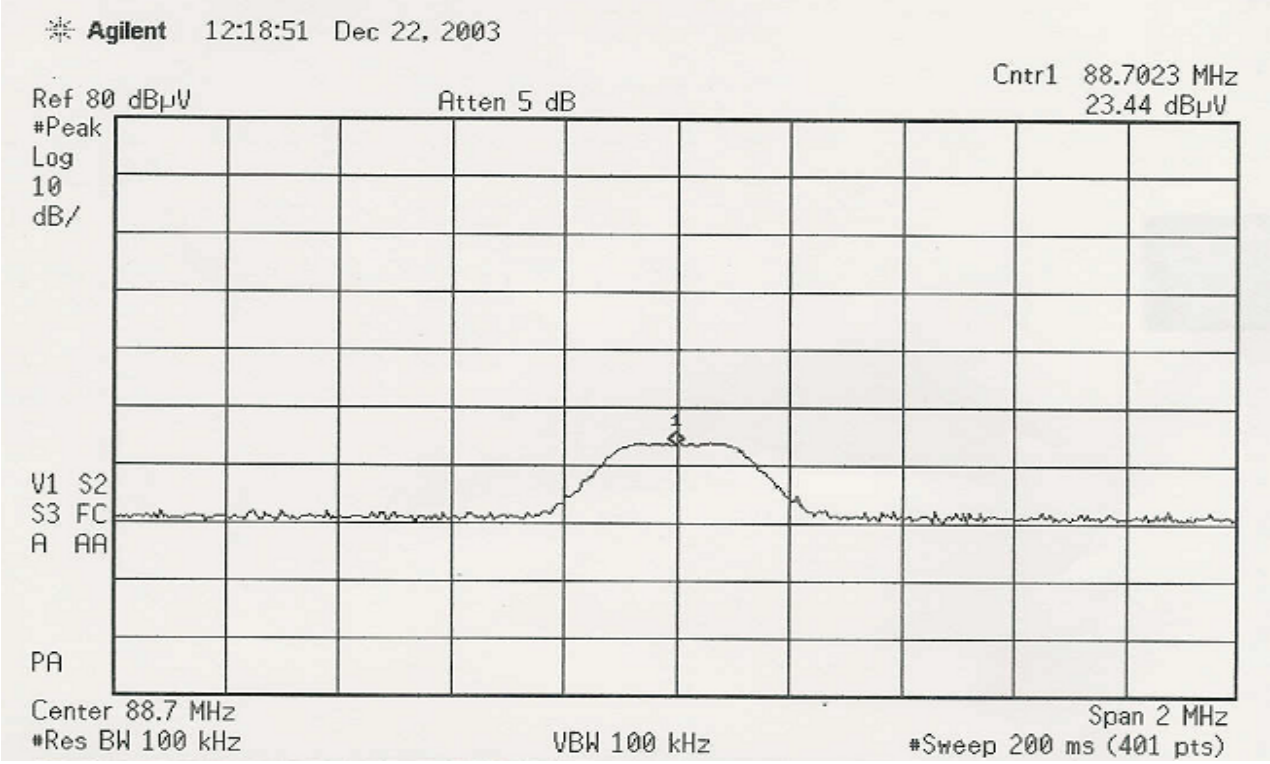

***88.1MHz*** *(Max. Hold mode for dual polarity)*
*Evaluation : 32.04[dB]=23.44(reading)+8.0(AF)+0.6(CL)*



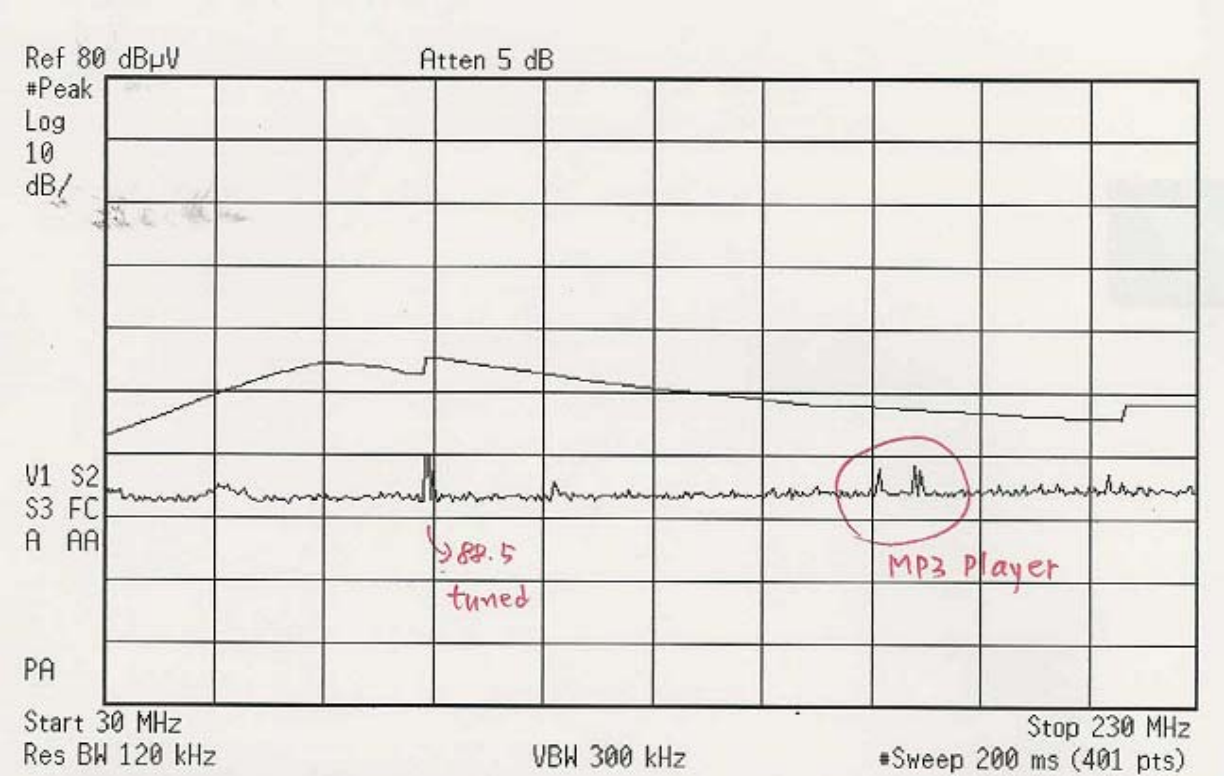

***88.3MHz*** *(Max. Hold mode for dual polarity)*
*Evaluation : 32.75[dB]=24.15(reading)+8.0(AF)+0.6(CL)*



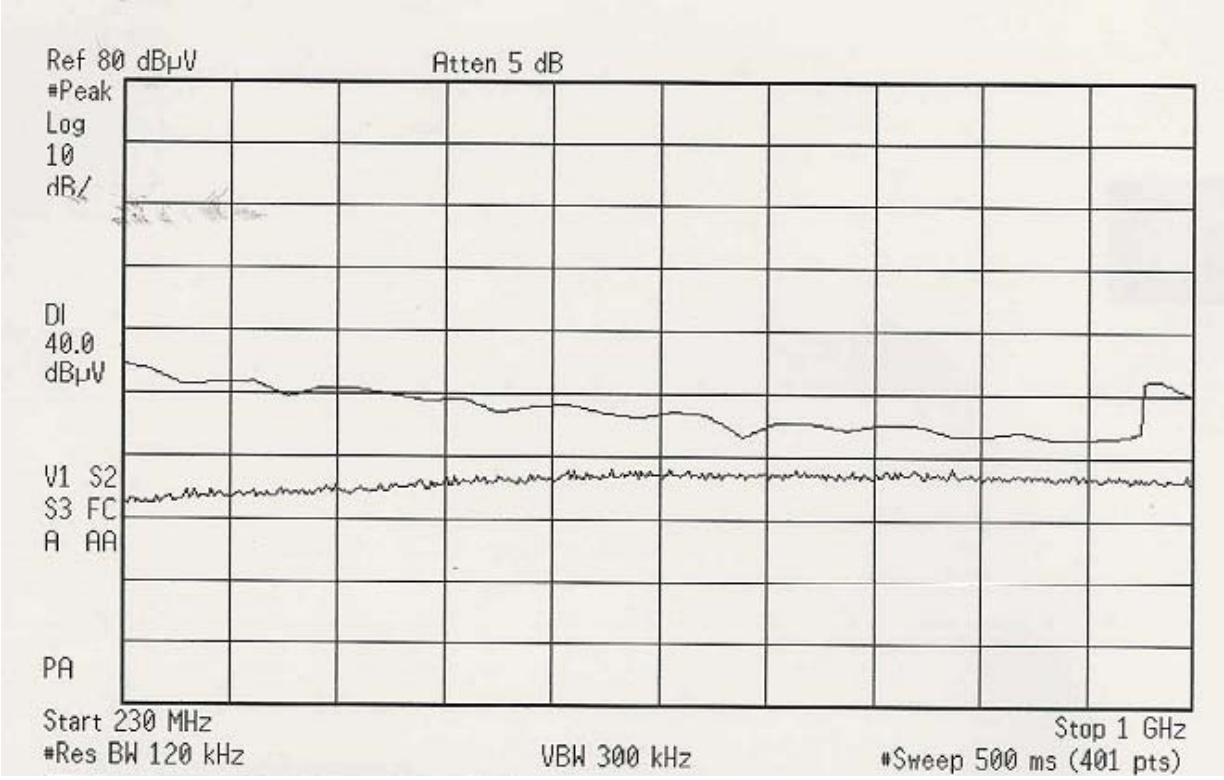

***88.5MHz*** *(Max. Hold mode for dual polarity)*
*Evaluation : 32.28[dB]=23.68(reading)+8.0(AF)+0.6(CL)*




***88.7MHz*** *(Max. Hold mode for dual polarity)*
*Evaluation : 32.04[dB]=23.44(reading)+8.0(AF)+0.6(CL)*




Spurious and Harmonic Investigation (88.5MHz tuned)




Spurious and Harmonic Investigation (88.5MHz tuned)