# Certification of Compliance

CFR 47 Part 15 Subpart B / Class B PC Peripherals

**Test Report File No.** 04-IST-0039 **Date of Issue** Mar. 5, 2004

**Model** **CA-F100**

**Kind of Product** Digital Audio Player

**Applicant** CM Tech Co., Ltd.

Address 4F Samil B/D, 362-5, Wonchun Dong, Yeongtong-Gu, Suwon-City, Kyungki-Do, 442-380 South Korea

**Manufacturer** CM Tech Co., Ltd.

Address 4F Samil B/D, 362-5, Wonchun Dong, Yeongtong-Gu, Suwon-City, Kyungki-Do, 442-380 South 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 B - Class B PC Peripherals / FM Broadcast receivers
- The test report with appendix consists of 18 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 : 2001.

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# 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 | 46 % |
| Atmospheric pressure | 1002 mbar |

# POWER SUPPLY SYSTEM USED

## Product Information

| | |
|---|---|
| Memory Capacity | Internal 128MB |
| Rated Power | 1.5V |
| Battery | AAA-size x 1 |
| Dimension/Weight | 23 x 54 x 23 mm / 24g(without battery) |
| Playing time | Max 12hrs |
| Case | Aluminum / Plastic |
| FM Frequency | 88.0 ~ 108.0MHz |
| Output Frequency Range | 20Hz ~ 20kHz |
| Output Earphone Power | 5mW(max 10mW) |
| Noise Ratio | 80dB with 20kHz LPF |
| FM S/N Ratio | 45dB |

- Find product information in User's manual.

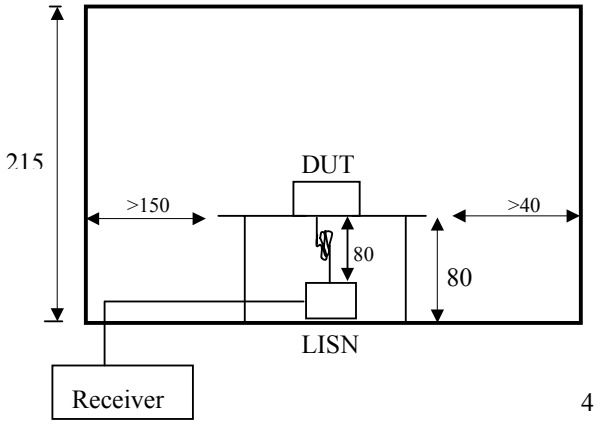
# DESCRIPTIONS OF TEST

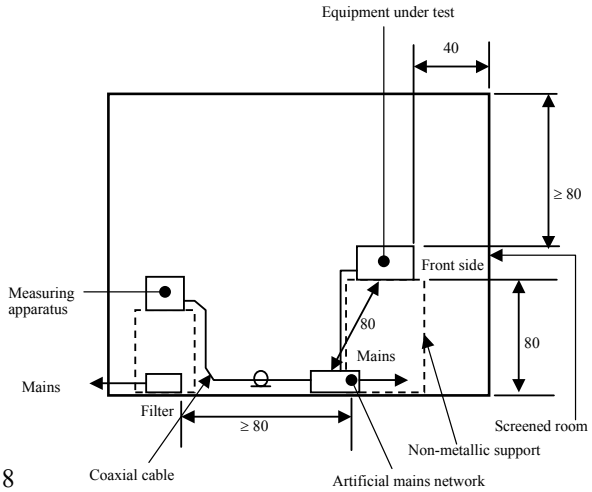
## Conducted Emissions:

The measurement were performed over the frequency range of 0.15MHz 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.



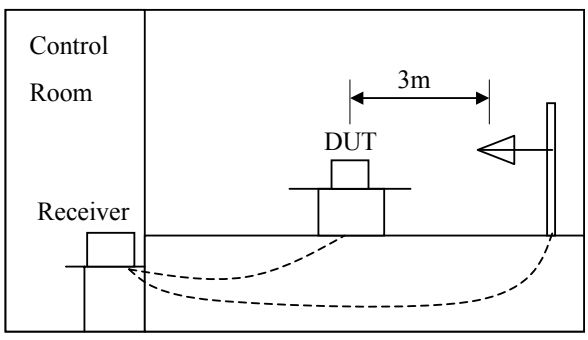
# DESCRIPTION OF TEST

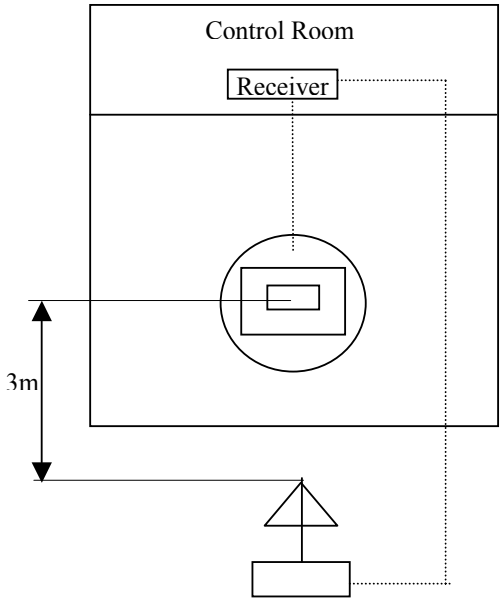
## Radiated Emissions:

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 CISPR quasi-peak 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 | 15.4dB at 0.18MHz |
| Maximum limit exceeding | |

**Remarks : With AV detector/Neutral Phase**

☒ Radiated Emission

| | |
|---|---|
| The requirements are | ● MET ○ Not MET |
| Minimum limit margin | 2.5dB at 272.2MHz |
| Maximum limit exceeding | |

**Remarks : FM Receiving Mode**

Reported By

H.C. Kim / EMC Engineer

*Note :*

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

# TEST CONDITIONS AND DATA

## Conducted Emissions

**[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 |
| NNLK8121 | Schwarzbeck | LISN | Dec. 12, 2004 |
| ESH3-Z2 | Rohde Schwarz | Pulse Limiter | Dec. 12, 2004 |

◆ Auxiliary Equipment Used

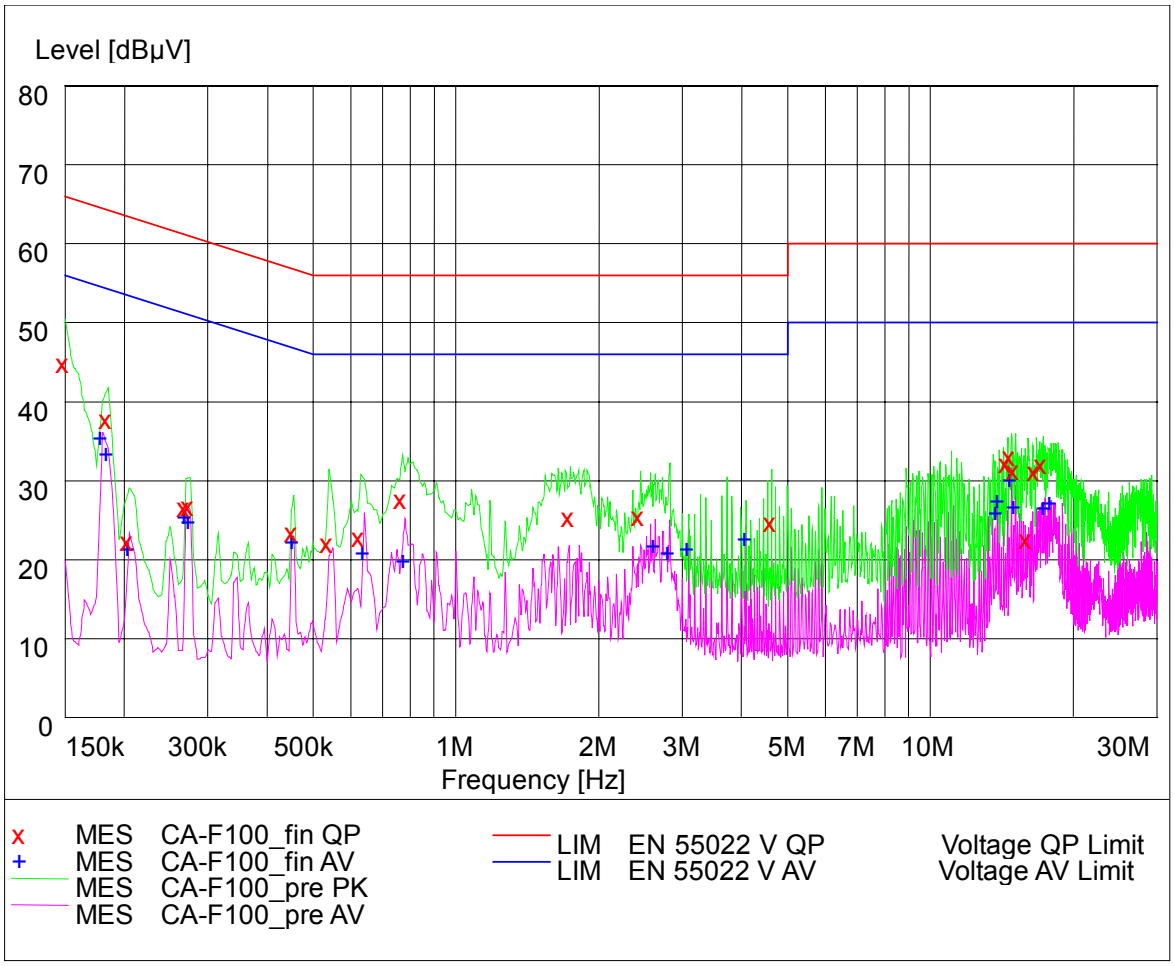
| Model Name | Manufacturer | Descriptions | FCC Compliance information |
|---|---|---|---|
| t328k | HP | Desktop PC | Doc |
| 5219 | HP | Keyboard (PS/2) | FCC ID : E5XKB5209 |
| N3+Optical | HP | Mouse (PS/2) | Doc |
| 529B | Daewoo | Monitor | FCC ID : C5F7NFFCMC529B |
| A0302380 | Northern Telecom | Printer | FCC ID : BS46XU225C-L |
| SMB-400 | Sejin Electron Inc | Mouse (RS-232C) | FCC ID : GJJS965M3 |
| AN-2005 | Aion Korea | Headset/MIC | N/A |
| HD335F | NICs Intek | External HDD | FCC ID : QGJHD335 |

◆ Test Program Read and Write

◆ Test Area Shielded Room

*Note : It was employed the EN standard in lieu of CFR 47 Part 15 Sec. 15.107.*

# Conducted Emissions




Live Phase

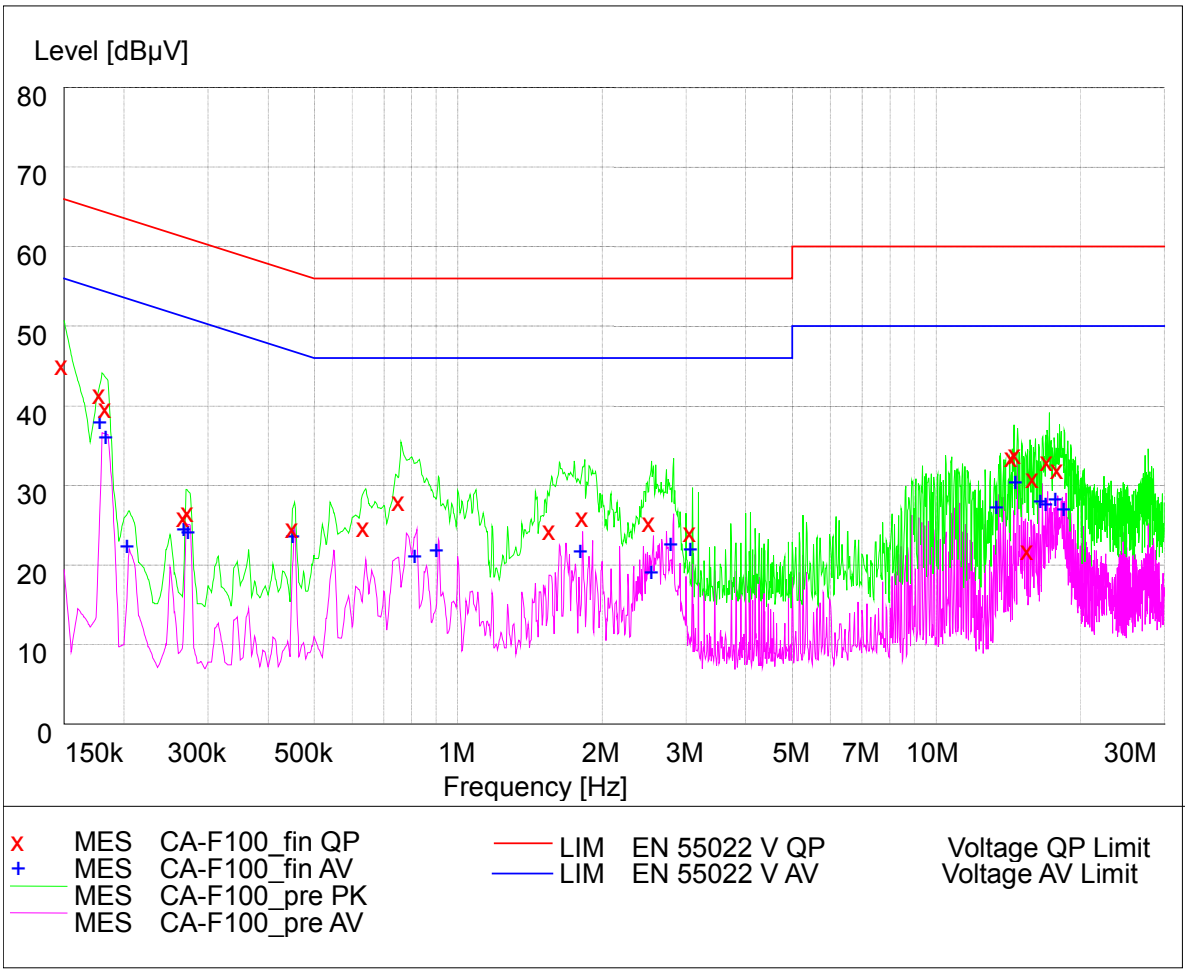
***MEASUREMENT RESULT: "CA-F100_fin QP"***

| Frequency | Level | Transd | Limit | Margin | Line | PE |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dB | | |
| 0.150000 | 46.00 | 10.1 | 66 | 20.0 | L1 | GND |
| 0.185000 | 38.90 | 10.1 | 64 | 25.4 | L1 | GND |
| 0.205000 | 23.50 | 10.1 | 63 | 39.9 | L1 | GND |
| 0.270000 | 27.70 | 10.1 | 61 | 33.4 | L1 | GND |
| 0.275000 | 27.80 | 10.1 | 61 | 33.1 | L1 | GND |
| 0.455000 | 24.60 | 10.2 | 57 | 32.2 | L1 | GND |
| 0.540000 | 23.30 | 10.2 | 56 | 32.7 | L1 | GND |
| 0.630000 | 23.90 | 10.2 | 56 | 32.1 | L1 | GND |
| 0.770000 | 28.80 | 10.2 | 56 | 27.2 | L1 | GND |
| 1.740000 | 26.50 | 10.2 | 56 | 29.5 | L1 | GND |
| 2.450000 | 26.60 | 10.3 | 56 | 29.4 | L1 | GND |
| 4.630000 | 25.90 | 10.3 | 56 | 30.1 | L1 | GND |
| 14.540000 | 33.30 | 10.8 | 60 | 26.7 | L1 | GND |
| 14.810000 | 34.20 | 10.8 | 60 | 25.8 | L1 | GND |
| 15.110000 | 32.40 | 10.8 | 60 | 27.6 | L1 | GND |
| 16.040000 | 23.70 | 10.9 | 60 | 36.3 | L1 | GND |
| 16.700000 | 32.30 | 10.9 | 60 | 27.7 | L1 | GND |
| 17.270000 | 33.10 | 11.0 | 60 | 26.9 | L1 | GND |

***MEASUREMENT RESULT: "CA-F100_fin AV"***

| Frequency | Level | Transd | Limit | Margin | Line | PE |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dB | | |
| 0.180000 | 36.40 | 10.1 | 55 | 18.1 | L1 | GND |
| 0.185000 | 34.40 | 10.1 | 54 | 19.9 | L1 | GND |
| 0.205000 | 22.40 | 10.1 | 53 | 31.0 | L1 | GND |
| 0.270000 | 26.50 | 10.1 | 51 | 24.6 | L1 | GND |
| 0.275000 | 25.80 | 10.1 | 51 | 25.1 | L1 | GND |
| 0.455000 | 23.40 | 10.2 | 47 | 23.4 | L1 | GND |
| 0.640000 | 21.90 | 10.2 | 46 | 24.1 | L1 | GND |
| 0.780000 | 20.90 | 10.2 | 46 | 25.1 | L1 | GND |
| 2.630000 | 22.80 | 10.3 | 46 | 23.2 | L1 | GND |
| 2.820000 | 21.90 | 10.3 | 46 | 24.1 | L1 | GND |
| 3.090000 | 22.40 | 10.3 | 46 | 23.6 | L1 | GND |
| 4.090000 | 23.70 | 10.3 | 46 | 22.3 | L1 | GND |
| 13.820000 | 27.00 | 10.7 | 50 | 23.0 | L1 | GND |
| 13.940000 | 28.60 | 10.7 | 50 | 21.4 | L1 | GND |
| 14.810000 | 31.10 | 10.8 | 50 | 18.9 | L1 | GND |
| 15.110000 | 27.70 | 10.8 | 50 | 22.3 | L1 | GND |
| 17.420000 | 27.60 | 11.0 | 50 | 22.4 | L1 | GND |
| 17.990000 | 28.30 | 11.1 | 50 | 21.7 | L1 | GND |

# Conducted Emissions




Neutral Phase

***MEASUREMENT RESULT: "CA-F100_fin QP"***

| Frequency | Level | Transd | Limit | Margin | Line | PE |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dB | | |
| 0.150000 | 46.20 | 10.1 | 66 | 19.8 | N | GND |
| 0.180000 | 42.50 | 10.1 | 65 | 22.0 | N | GND |
| 0.185000 | 40.80 | 10.1 | 64 | 23.5 | N | GND |
| 0.270000 | 27.10 | 10.1 | 61 | 34.0 | N | GND |
| 0.275000 | 27.70 | 10.1 | 61 | 33.2 | N | GND |
| 0.455000 | 25.70 | 10.2 | 57 | 31.1 | N | GND |
| 0.640000 | 25.90 | 10.2 | 56 | 30.1 | N | GND |
| 0.760000 | 29.10 | 10.2 | 56 | 26.9 | N | GND |
| 1.570000 | 25.50 | 10.2 | 56 | 30.5 | N | GND |
| 1.840000 | 27.10 | 10.2 | 56 | 28.9 | N | GND |
| 2.540000 | 26.50 | 10.3 | 56 | 29.5 | N | GND |
| 3.090000 | 25.20 | 10.3 | 56 | 30.8 | N | GND |
| 14.540000 | 34.70 | 10.8 | 60 | 25.3 | N | GND |
| 14.810000 | 35.00 | 10.8 | 60 | 25.0 | N | GND |
| 15.740000 | 23.00 | 10.9 | 60 | 37.0 | N | GND |
| 16.130000 | 32.00 | 10.9 | 60 | 28.0 | N | GND |
| 17.270000 | 34.10 | 11.0 | 60 | 25.9 | N | GND |
| 18.140000 | 33.10 | 11.1 | 60 | 26.9 | N | GND |

***MEASUREMENT RESULT: "CA-F100_fin AV"***

| Frequency | Level | Transd | Limit | Margin | Line | PE |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dB | | |
| 0.180000 | 39.10 | 10.1 | 55 | 15.4 | N | GND |
| 0.185000 | 37.10 | 10.1 | 54 | 17.2 | N | GND |
| 0.205000 | 23.50 | 10.1 | 53 | 29.9 | N | GND |
| 0.270000 | 25.60 | 10.1 | 51 | 25.5 | N | GND |
| 0.275000 | 25.20 | 10.1 | 51 | 25.7 | N | GND |
| 0.455000 | 24.70 | 10.2 | 47 | 22.1 | N | GND |
| 0.820000 | 22.10 | 10.2 | 46 | 23.9 | N | GND |
| 0.910000 | 23.00 | 10.2 | 46 | 23.0 | N | GND |
| 1.820000 | 22.80 | 10.2 | 46 | 23.2 | N | GND |
| 2.560000 | 20.20 | 10.3 | 46 | 25.8 | N | GND |
| 2.820000 | 23.70 | 10.3 | 46 | 22.3 | N | GND |
| 3.090000 | 23.10 | 10.3 | 46 | 22.9 | N | GND |
| 13.520000 | 28.30 | 10.7 | 50 | 21.7 | N | GND |
| 14.810000 | 31.50 | 10.8 | 50 | 18.5 | N | GND |
| 16.700000 | 29.10 | 10.9 | 50 | 20.9 | N | GND |
| 17.120000 | 28.70 | 11.0 | 50 | 21.3 | N | GND |
| 17.990000 | 29.40 | 11.1 | 50 | 20.6 | N | GND |
| 18.710000 | 28.10 | 11.3 | 50 | 21.9 | N | GND |

# 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 |

◆ Auxiliary Equipment Used

| Model Name | Manufacturer | Descriptions | FCC Compliance information |
|---|---|---|---|
| t328k | HP | Desktop PC | Doc |
| 5219 | HP | Keyboard (PS/2) | FCC ID : E5XKB5209 |
| N3+Optical | HP | Mouse (PS/2) | Doc |
| 529B | Daewoo | Monitor | FCC ID : C5F7NFFCMC529B |
| A0302380 | Northern Telecom | Printer | FCC ID : BS46XU225C-L |
| SMB-400 | Sejin Electron Inc | Mouse (RS-232C) | FCC ID : GJJS965M3 |
| AN-2005 | Aion Korea | Headset/MIC | N/A |
| HD335F | NICs Intek | External HDD | FCC ID : QGJHD335 |

◆ Test Program  Read and Write Repeated / FM Receiving

◆ Test Area  Open Area Test Site

*Note :*

## Radiated Emissions

(Disturbance Radiation)

- The measured values are as following

| | Freq. [MHz] | Reading [dBuV] | Antenna Factor [dB] | Cable Loss [dB] | Angle [deg] | Polar. [H/V] | Result [dBuV] | Limit [dBuV] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| Read/ | 115.0 | 12.0 | 2.3 | 12.2 | 161 | V | 26.5 | 43.5 | 17.0 |
| Write | 134.8 | 14.8 | 2.7 | 13.9 | 97 | H | 31.4 | 43.5 | 12.1 |
| | 150.0 | 10.3 | 2.8 | 14.7 | 218 | H | 27.8 | 43.5 | 15.7 |
| | 186.8 | 10.4 | 3.3 | 15.5 | 233 | H | 29.2 | 43.5 | 14.3 |
| | 219.7 | 11.0 | 3.7 | 17.5 | 312 | H | 32.2 | 46.0 | 13.8 |
| | 233.6 | 14.5 | 3.9 | 11.4 | 343 | H | 29.8 | 46.0 | 16.2 |
| | 266.0 | 25.5 | 4.1 | 12.2 | 65 | H | 41.8 | 46.0 | 4.2 |
| | 272.2 | 26.4 | 4.1 | 12.4 | 54 | H | 42.9 | 46.0 | 3.1 |
| | 278.3 | 27.0 | 4.2 | 12.9 | 52 | H | 42.6 | 46.0 | 3.4 |
| | 309.0 | 16.1 | 4.4 | 14.4 | 207 | H | 34.9 | 46.0 | 11.1 |
| FM | 189.2 | 12.2 | 15.6 | 3.3 | 308 | H | 31.1 | 43.5 | 12.4 |
| | 190.5 | 13.7 | 15.7 | 3.4 | 129 | H | 32.8 | 43.5 | 10.7 |
| | 196.5 | 17.8 | 15.9 | 3.4 | 132 | H | 37.1 | 43.5 | 6.4 |
| | 219.7 | 11.7 | 17.5 | 3.7 | 118 | H | 32.9 | 46.0 | 13.1 |
| | 235.3 | 13.7 | 11.4 | 3.9 | 116 | H | 29.0 | 46.0 | 17.0 |
| | 244.3 | 17.8 | 11.5 | 3.9 | 109 | H | 33.2 | 46.0 | 12.8 |
| | 266.0 | 16.5 | 12.2 | 4.1 | 122 | V | 32.8 | 46.0 | 13.2 |
| | 272.2 | 27.0 | 12.4 | 4.1 | 98 | H | 43.5 | 46.0 | 2.5 |
| | 294.8 | 18.2 | 14.4 | 4.2 | 98 | H | 36.8 | 46.0 | 9.2 |

End of data

*Note :*

## Appendix A. The EUT Photos


Front View

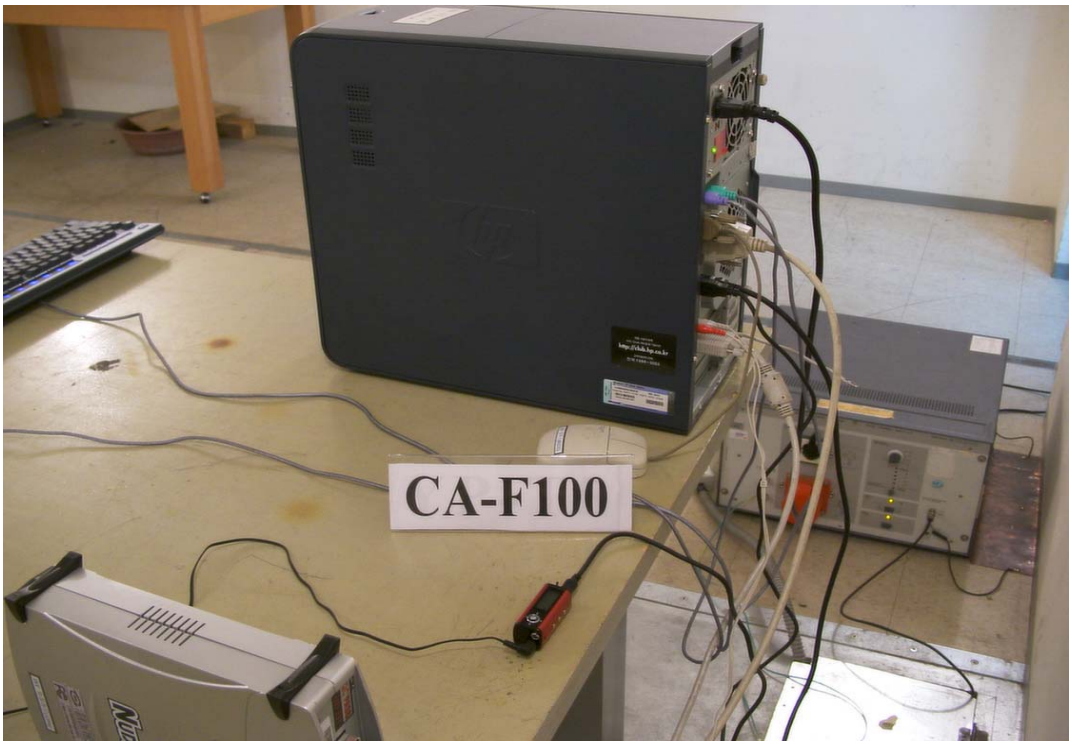

Rear View

USB Cable

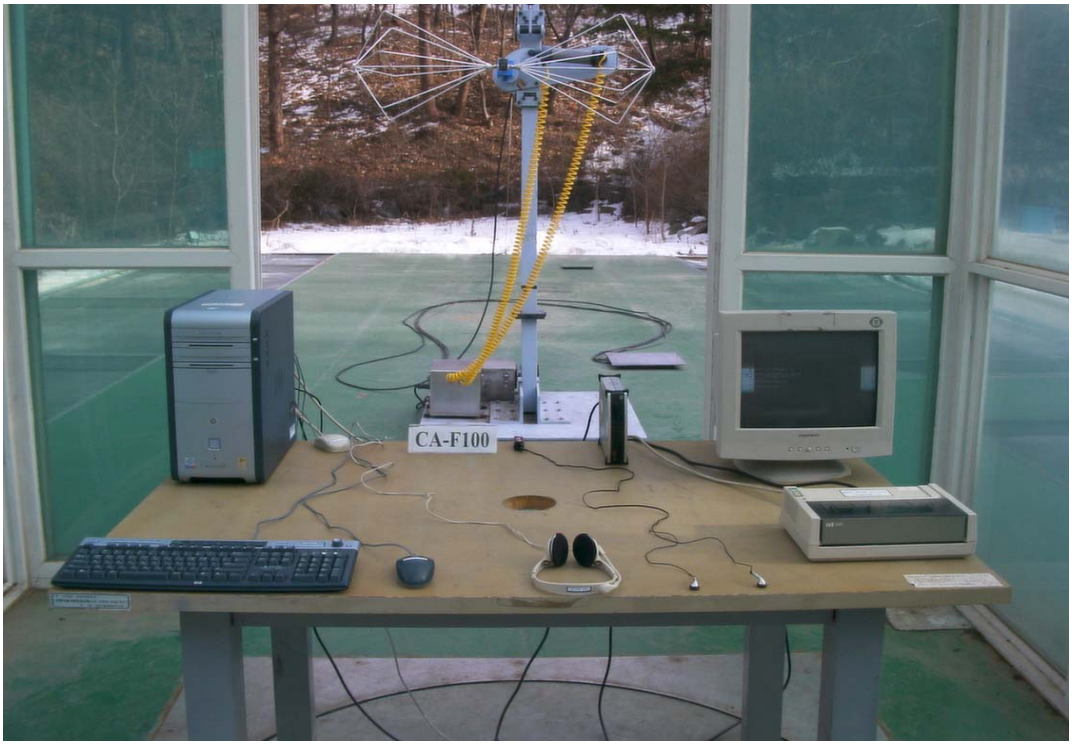
Ear-Phone

## Appendix B. The Test Setup Photos

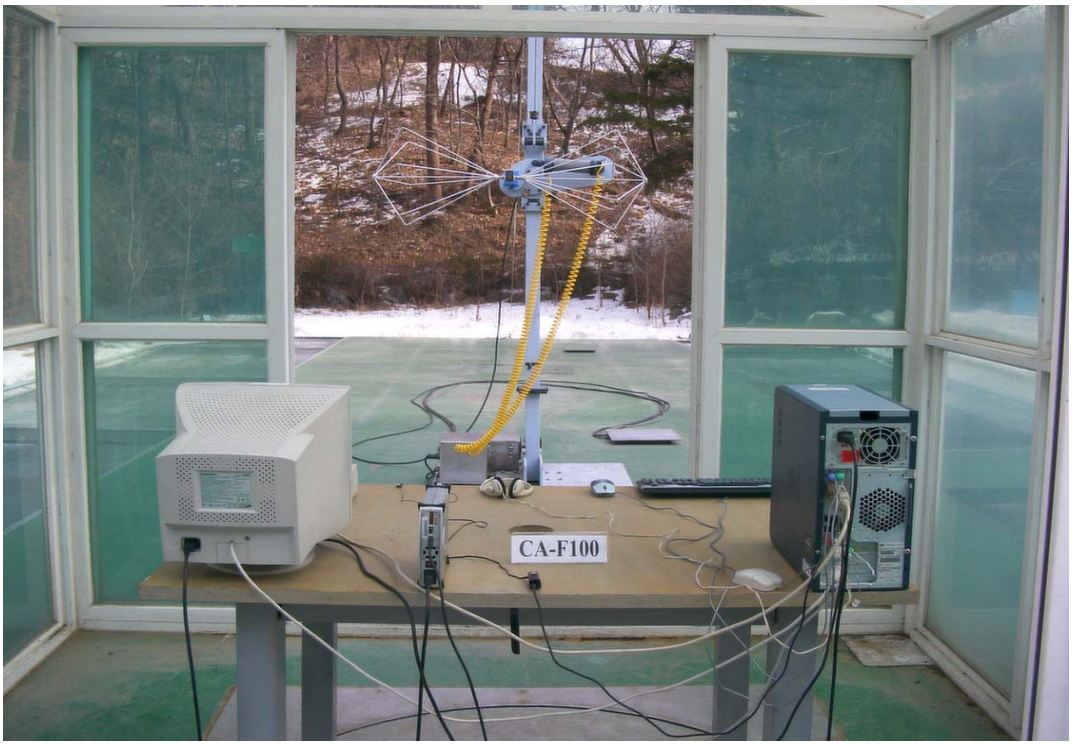

Conducted Emissions - Front View



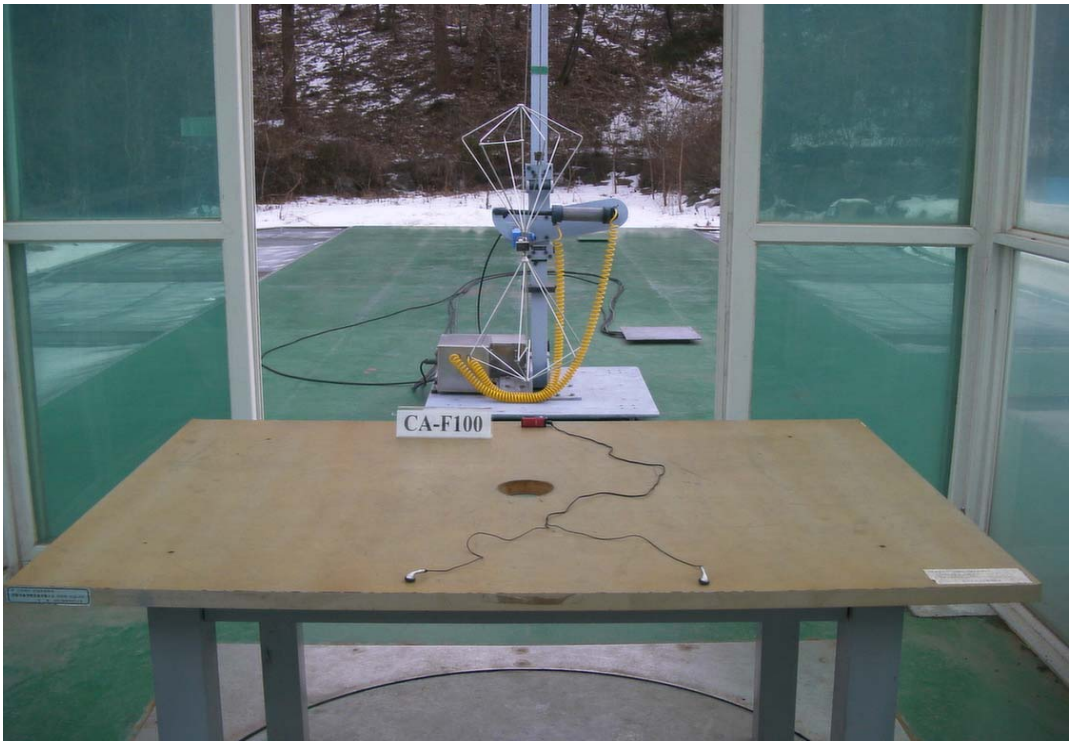

Conducted Emissions - Rear View



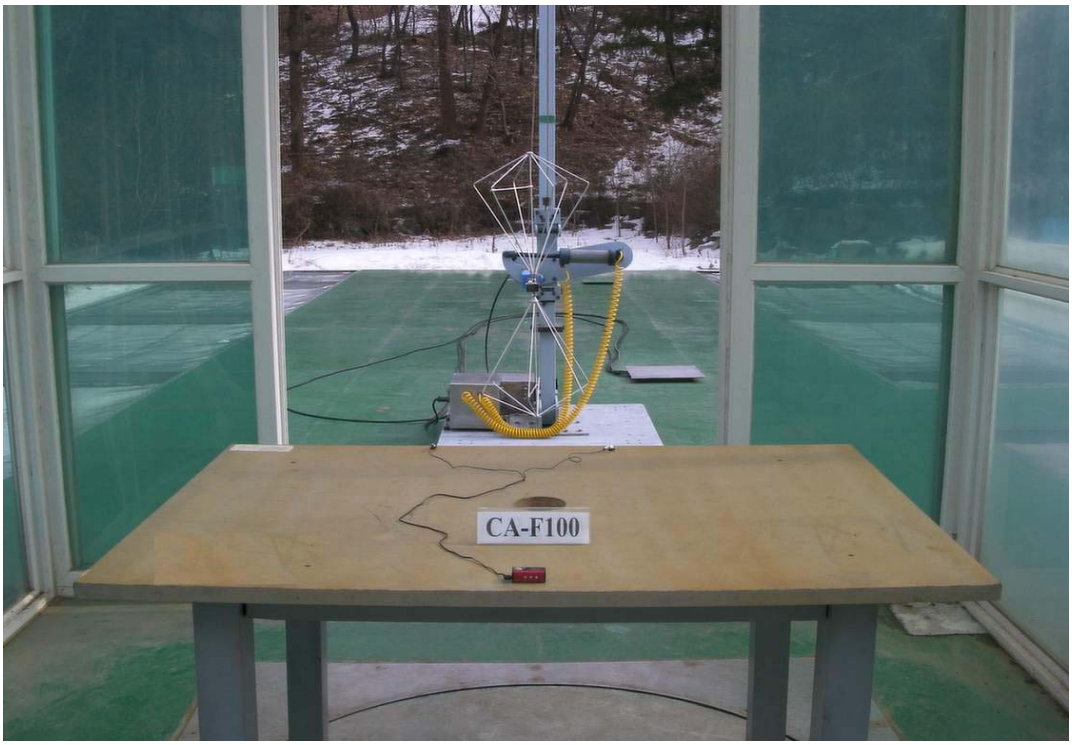

Radiated Emissions – Front View




Radiated Emissions – Rear View




Radiated Emissions – Front View (FM Receiving Mode)




Radiated Emissions – Rear View (FM Receiving Mode)