

**JungAng EMC Co., Ltd.**

109-2, Yepyung-ri, Kumsa-myun, Youju-kun, Kyungki-do, KOREA
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FCC EMI TEST REPORT

Date of Test : September 2, 2000
Test Report No : 00JAC010.FCC
Test Site : JungAng EMC Co., Ltd., Korea(31040/SIT 1300F2)

Trade Name : KOCOM
Manufacturer : KOREA COMMUNICATIONS CO., LTD.
Address : KOCOM BLDG., 260-7 Yumchang-Dong, Kangseo-Gu, Seoul, Korea

Contact Person : In-Ho Kim/Team Manager
Tel No. : 82-2-6675-2295
Fax No. : 82-2-6675-2000

Product : PC Camera

Model : KMC-77

Fcc Rule Part(s) : FCC Part 15 Subpart B

Classification : Class B

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C.63.4-1992.

I attest to the accuracy of data and all measurement reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief.
I assume full responsibility for the completeness of these measurements and vouch for the qualification of all persons taking them.

TaeHyun Nam
President-JungAng EMC Co., Ltd.
<http://www.jaemc.co.kr>

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1. DESCRIPTION OF DEVICE

1.1 General

| | |
|-------------------|---|
| Responsible Party | KOREA COMMUNICATIONS CO., LTD. |
| Contact Person | In-Ho Kim Tel No. : 82-2-6675-2295 Fax No. : 82-2-6675-2000 |
| Manufacturer | KOREA COMMUNICATIONS CO., LTD. KOCOM BLDG., 260-7 Yumchang-Dong, Kangseo-Gu, Seoul, Korea |

- Trade name KOCOM
- Model name KMC-77
- EUT Type PC Camera
- Classification FCC Part 15 Subpart B Class B
- Clock Speed Main Clock : 12MHz
- Rule Part(s) FCC Part 15 & Part 2
- Test Procedure(s) ANSI C63.4(1992)
- Date of Tests September 2, 2000
- Place of Tests JungAng EMC Co., Ltd.

1.2 EUT Description

The EUT is a small size of PC Camera, can be used with various personal purpose such as viewing images, capturing still images and motion detection, video-conference call, creating sticky pictures, photo albums and greeting cards.

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☒ **Note.** Please refer to the duties and responsibilities of the Responsible Party attached.

2. TEST FACILITY

The open field test site and conducted measurement facility used for this measurement, is located following address. This site was fully described in a report dated Nov. 24, 1998, that was submitted to the FCC. Our site and facility had been accepted in a letter dated Nov. 24, 1998(31040/SIT) :

JungAng EMC Co., Ltd.

Address : 109-2, Yepyung-ri, Kumsa-myun, Youju-kun, Kyungki-do, Korea

The detailed description of the measurement facility was found to be in compliance with the requirements of .2.948 according to ANSI C63.4 on October 19, 1992.

3. SUMMARY OF RESULTS

3.1 Electromagnetic Emission

RFI Voltage Measurement.....**PASS**

RFI Field Strength Measurement.....**PASS**

Although the measured emissions indicate that the EUT complies with the required limits, some measurements are close to these limits.

When the uncertainty of measurement is considered, there is some possibility that the EUT may not be compliant.

3.2 Modifications to the EUT : None

4. TESTED SYSTEM DETAILS

4.1 Peripherals and Others :

| Description | Model Name | Serial No. | Manufacturer | FCC ID |
|-------------|--------------|--------------|----------------|-------------|
| Computer | DESKPRO | 7836BVD20016 | Compaq | DoC |
| Printer | C2106A | 3217S91901 | HP | B94C2106X |
| Monitor | VX700 | M902080938 | Gateway | BGBTFV8705K |
| Keyboard | RT235BTW | B13BC90L39GU | Compaq | AQ6-22K15 |
| Joystick | DHA-2000 | 98DAC4355 | ARTMAN | DoC |
| Speaker | CAMAC.G7 | J11-2957 | FengShin Elec. | - |
| Mouse #1 | M-S34 | F13490N5BGF | Compaq | DZL211029 |
| Mouse #2 | OK-520 | 00DAC0231 | A4 TECH | DoC |
| Mouse #3 | 898W | 5883A001 | Han Long | HLA311001 |
| Mouse #4 | Pro Mouse II | 96002117 | NEOTEC | FSUGMZC7 |

4.2 Type of Cables Used:

| Device from | Device to | Type of Cable | Length | Type of shield |
|-------------|-------------|---------------|--------|----------------|
| Computer | Monitor | Signal cable | 1.0 | shielded |
| Computer | Printer | Signal cable | 1.8 | shielded |
| Computer | Keyboard | Signal cable | 2.0 | shielded |
| Computer | Mouse #1,#2 | Signal cable | 1.5 | shielded |
| Computer | Mouse #3#4 | Signal cable | 1.5 | shielded |
| Computer | PC Camera | Signal cable | 1.5 | shielded |
| Computer | Joystick | Signal cable | 1.5 | Non-shielded |
| Computer | Speaker | Signal cable | 1.0 | Non-shielded |
| Computer | Main Power | Power cable | 1.5 | Non-shielded |
| Monitor | Main Power | Power cable | 1.5 | Non-shielded |
| Printer | Main Power | Power cable | 1.5 | Non-shielded |

4.3 System layout on EUT and peripherals

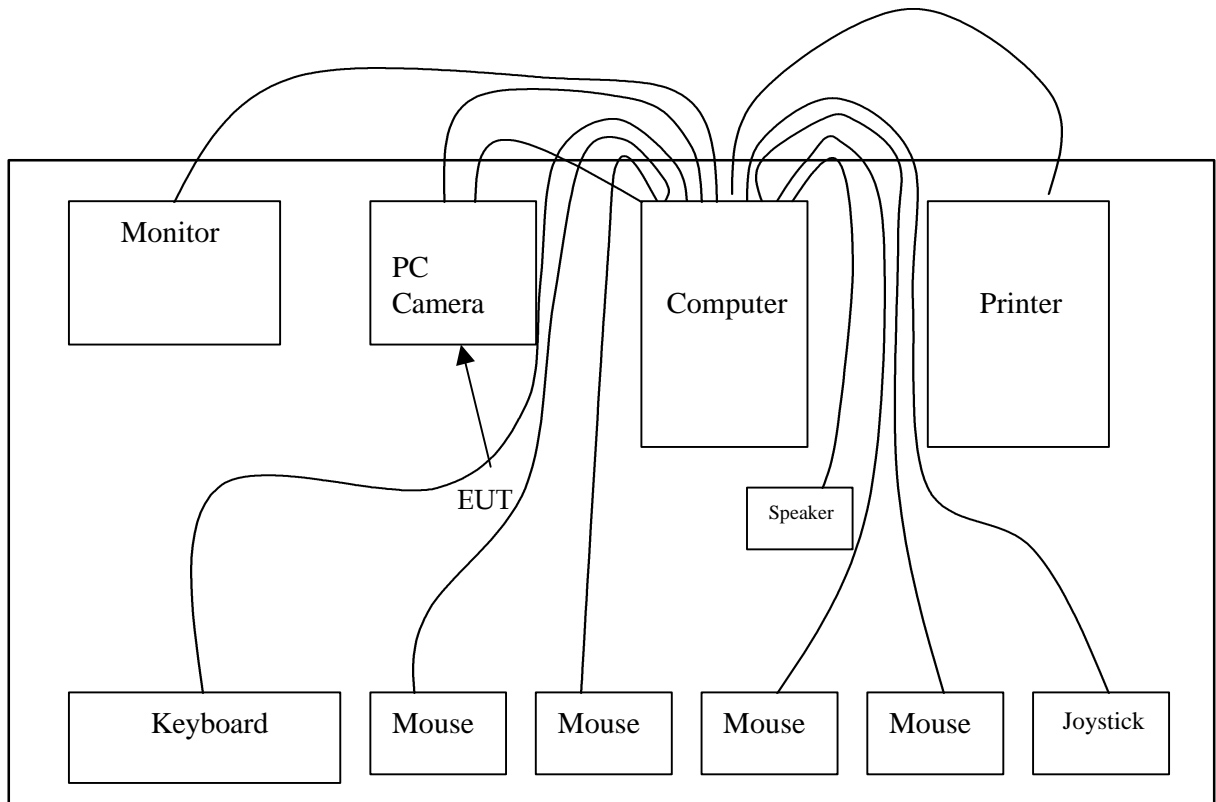


Figure 4-1System layout

5. TEST RESULT

5.1 RFI Voltage Measurement

5.1.1 Measurement Instrumentation Used

(model/serial no./manufacturer/last calibration/next calibration)

Signal Analyzer.....(PMM9000/3100J70602/PMM/08 Oct. 1999/Oct. 2000)

L.I.S.N.....(L3-25/1110K70403/PMM/30 Sep. 1999/Oct. 2000)

Coaxial cable.....(RG213U/---/MARLOW/-/-)

Shield Room.....(JASH01/JAC01/DAIL EMC/---/---)

5.1.2 Measurement Procedure

The power line conducted interference measurement were performed according to ANSI C63.4-1992 in a Shield room placed on a table, 0.8m high over a metal floor.

It was located more than required distance away from the shielded enclosure wall.

Deviations from the standard was none. The EUT was plugged into the LISN and the frequency range of interest scanned. **We measured device in normal operation mode.**

We reported at maximum emission levels.

5.1.3 Operation Modes

EUT was tested according to the specifications given by the manufacturer, and exercised in the most unfavorable manner.

The EUT was operated with continuously capturing still images, and displaying the captured images onto the monitor screen.

5.1.4 Measurement Uncertainty

Measurement uncertainty of RFI Voltage Measurement test was estimated at $\pm 1.8\text{dB}(k=2)$

5.1.5 Test Data**RFI Voltage Measurement Results (0.45 MHz to 30 MHz)**Operating mode : **Continuously capturing images and displaying it to monitor.**

Test procedure : ANSI C63.4-1992

Date of measurement : Sep. 2, 2000

Temperature : 22.6 degree C

Humidity :62 %

Model : **KMC-77**

| FREQ (MHz) | LEVEL(dBuV) | LINE | LIMIT(dBuV) | Result(dBuV) | MARGIN(dBuV) |
|------------|-------------|------|-------------|--------------|--------------|
| 0.475 | 40.50 | N | 48 | 40.50 | -7.50 |
| 0.906 | 41.10 | N | | 41.10 | -6.90 |
| 1.064 | 41.60 | N | | 41.60 | -6.40 |
| 1.144 | 40.60 | H | | 40.60 | -7.40 |
| 1.223 | 42.10 | N | | 42.10 | -5.90 |
| 1.302 | 41.90 | N | | 41.90 | -6.10 |
| 1.382 | 43.10 | N | | 43.10 | -4.90 |
| 1.536 | 42.90 | N | | 42.90 | -5.10 |
| 1.619 | 41.60 | N | | 41.60 | -6.40 |
| 1.697 | 42.10 | N | | 42.10 | -5.90 |
| 1.773 | 41.30 | N | | 41.30 | -6.70 |
| 15.310 | 34.90 | N | | 34.90 | -13.10 |

Table 1. Line Conducted Emission Tabulated Data

Note :

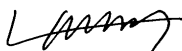
1. All modes of operation were investigated and the worst-case emission are reported.
See attached Plots.

2. The limit for Class B digital device is 250 uV(48 dBuV) from 450 KHz to 30 MHz.

3. Line H = Hot

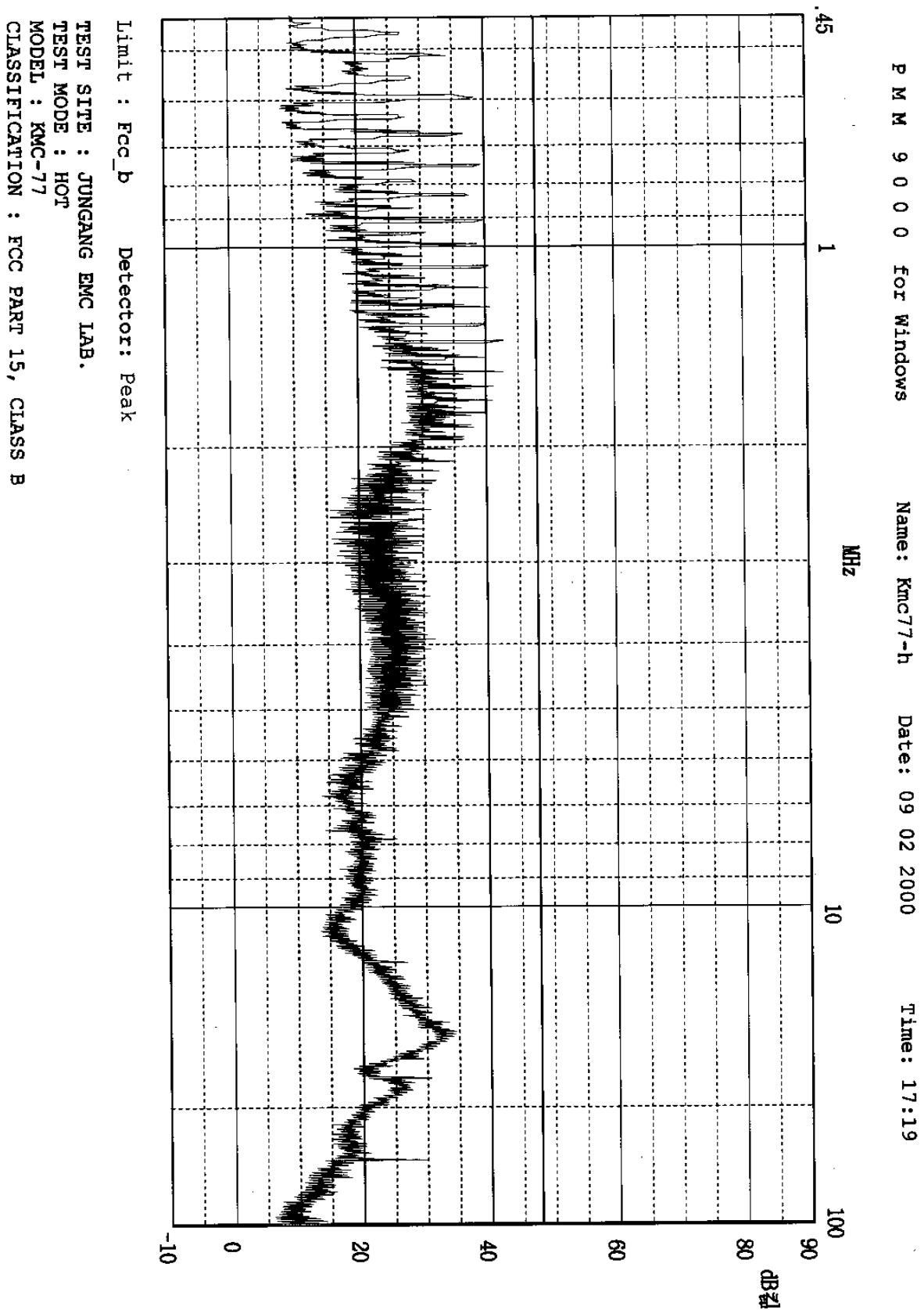
Line N = Neutral

** Measurement using CISPR quasi-peak mode

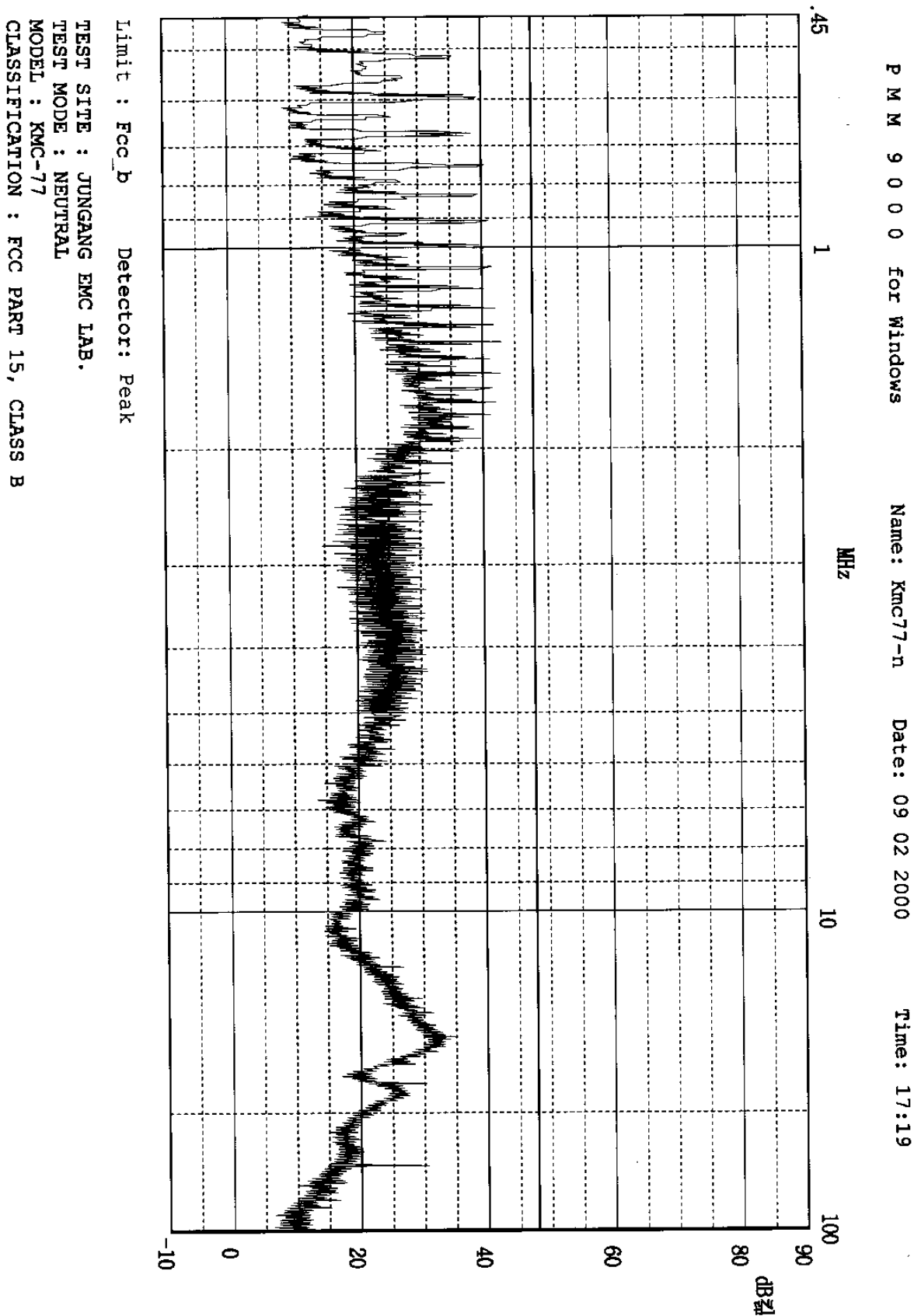


Tested by **Hyung-Seok Lee**

PLOTS OF EMISSIONS



PLOTS OF EMISSIONS



5.2 RFI Field Strength Measurement

5.2.1 Measurement Instrumentation Used

Signal Analyzer.....(PMM9000/3100J70602/PMM/08 Oct. 1999/Oct. 2000)

Spectrum Analyzer.....(R3261/61720002/Advantest/19 Aug. 2000/Aug. 2001)

Biconical antenna.....(BC01/0020J70501/PMM/08 Oct. 1999/Oct. 2000)

Log periodic antenna.....(LP01/0020J70501/PMM/08 Oct. 1999/Oct. 2000)

Coaxial cable.....(RG213U/---/MARLOW/--/--)

5.2.2 Measurement Procedure

Final test was performed according to ANSI C63.4-1992 at the open field site .
Deviations from the standard was none.

The EUT was placed in a 0.8 m high table along with the peripherals. The turn table was separated from the antenna with the distance of 3 meter. Cables were placed in a position to produce maximum emissions as determined by experimentation, and operation mode was selected for maximum.

The frequencies and amplitudes of maximum emission were measured at varying azimuths, antenna heights and antenna polarities. **We measured device in normal operation mode.**
We reported at maximum emission levels.

5.2.3 Operation Modes

EUT was tested according to the specifications given by the manufacturer, and exercised in the most unfavorable manner.

The EUT was operated with continuously capturing still images, and displaying the captured images onto the monitor screen.

5.2.4 Measurement Uncertainty

Measurement uncertainty of RFI Field Strength Measurement test was estimated at $\pm 3.5\text{dB}(k=2)$

5.2.5 Test Data

RFI Field Strength Measurement Results(30MHz to 1000MHz)

Operating mode : **Continuously capturing images and displaying it to monitor.**

Test procedure : ANSI C63.4-1992

Date of measurement : Sep. 2, 2000

Temperature : 22.6 degree C

Humidity :62 %

Model : **KMC-77**

| MEASUREMENT FREQ (MHz) | MEASUREMENT LEVEL (dBuV) | ANTENNA POLARITY (H/V) | ANTENNA FACTOR (dB) | CABLE LOSS (dB) | LIMIT (dBuV) | FIELD STRENGTH (dBuV/m) | MARGIN (dBuV/m) |
|------------------------------|--------------------------------|------------------------------|---------------------------|--------------------|-----------------|-------------------------------|--------------------|
| 71.99 | 21.40 | V | 9.76 | 1.52 | 40.00 | 32.68 | -7.32 |
| 179.99 | 17.20 | V | 14.35 | 2.60 | 43.50 | 34.15 | -9.35 |
| 208.87 | 17.80 | H | 14.74 | 2.82 | | 35.36 | -8.14 |
| 225.29 | 14.40 | H | 14.73 | 3.03 | | 32.16 | -13.84 |
| 239.99 | 16.20 | H | 14.72 | 3.10 | 46.00 | 34.02 | -11.98 |
| 242.19 | 17.90 | H | 14.72 | 3.11 | | 35.73 | -10.27 |
| 267.80 | 19.30 | V | 14.71 | 3.27 | | 37.28 | -8.72 |
| 270.33 | 17.40 | H | 14.71 | 3.30 | | 35.41 | -10.59 |
| 276.00 | 13.60 | V | 14.70 | 3.36 | | 31.66 | -14.34 |
| 331.76 | 14.10 | H | 16.01 | 3.46 | | 33.57 | -12.43 |
| 468.69 | 11.40 | H | 17.32 | 4.34 | | 33.06 | -12.94 |
| 803.51 | 5.70 | H | 23.06 | 6.22 | | 34.98 | -11.02 |

Table 2. Radiated Measurements at 3meters.

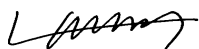
Note :

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B digital device is 100 uV(40 dBuV) from 30 MHz to 88 MHz, 150 uV(43.5 dBuV) from 88 MHz to 216 MHz, 200 uV(46 dBuV) from 216 MHz to 960 MHz and 500 uV (54 dBuV) from above 960 MHz.

* AFCL = Antenna Factor and Cable Loss

** Measurements using CISPR quasi-peak mode. Above 1 GHz, peak detector function mode is using a resolution bandwidth of 1 MHz and a video bandwidth of 1 MHz.

The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.


Tested by **Hyung-Seok Lee**

5.3 Minimum Margin

Conducted emission

PC Camera capturing and displaying mode 1.382 MHz, 4.90 dBuV

Radiated emission

PC Camera capturing and displaying mode 71.99 MHz, 7.32 dBuV/m

5.4 SAMPLE CALCULATIONS

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \log_{10} (\mu\text{V}/\text{m}) \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

EX. 1.

@ 1.382 MHz Class B limit = 250 μV = 48 dB μV

Reading = 43.10 dB μV (calibrated level)

$$10^{(43.1/20)} = 142.89 \mu\text{V}$$

Margin = 43.1 - 48 = -4.9
4.9 dBuV ; below limit

EX. 2.

@ 71.99 MHz Class B limit = 100 $\mu\text{V}/\text{m}$ = 40 dB $\mu\text{V}/\text{m}$

Reading = 21.4 dB μV (calibrated level)

Antenna factor + Cable Loss = 11.28 dB

Total = 32.68 dB $\mu\text{V}/\text{m}$

$$10^{(32.68/20)} = 43.05 \mu\text{V}$$

Margin = 32.68 - 40 = -7.32 dB $\mu\text{V}/\text{m}$
7.32 dB $\mu\text{V}/\text{m}$; below limit

6. TEST EQUIPMENTS

The listing below denotes the test equipments utilized for the test(s).

| <u>Nomenclature</u> | <u>Manufacture</u> <u>Model Number</u> | <u>Serial Number</u> | <u>Calibration</u> <u>Date</u> |
|--------------------------------------|---|----------------------|-----------------------------------|
| Signal Analyzer (9kHz - 1.2GHz) | PMM PMM 9000 | 3100J70602 | 99/10/8 |
| Spectrum Analyzer (9kHz - 2.6GHz) | ADVANTEST R3261C | 61720002 | 00/08/19 |
| Amplifier (0.1MHz-1.3GHz) | HP 8774D | 2944A08872 | - |
| LISN | PMM L3-25 | 1110k70403 | 99/09/30 |
| LISN | KYORITSU KNW-242C | 8-920-20 | 99/09/30 |
| Biconical Antenna | PMM BC01 | 0020J70501 | 99/10/8 |
| Log Periodic Antenna | PMM LP01 | 0020J70501 | 99/10/8 |
| Dipole Antenna | SWALZBECK VBA6106A | 1277 | 99/12/16 |
| Dipole Antenna | SWALZBECK UHA9105 | 91052168 | 99/12/16 |
| Plotter | HP 7475A | 7475A | - |
| Shield Room 4m x 3.5m x 2.4m | MYUNGJIN EMC 907-MJCO-12 | | |
| Turn Table | Dail EMC JAC-2 | | |
| Antenna Master | Dail EMC | | |

7. MEASUREMENT PHOTOS

7.1 Setup with the Maximized RFI Voltage Emission Level



7.2 Setup with the Maximized RFI Field Strength Emission Level

