



## HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

INT'L STANDARD CERTIFICATION TEAM  
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA  
TEL : +82 31 639 8518 FAX : +82 31 639 8525 www.hctec.co.kr

# CERTIFICATION

**Manufacture;**

**HYUNDAI IMAGE QUEST CO., LTD.**  
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI,  
KYOUNKI-DO, 467-701, KOREA

**Date of Issue: MAY 21, 2001**

**Test Report No.: HCT-F01-0503**

**Test Site: HYUNDAI CALIBRATION & CERTIFICATION  
TECHNOLOGIES CO., LTD.**

**FCC ID :**

**PJIL15A0C060**

**MODEL / TYPE :**

**L501**

**FCC Rule Part(s):**

**Part 15 & 2; ET Docket 95-19**

**Classification:**

**FCC Class B Peripheral Device (JBP)**

**Standard(s):**

**FCC Class B: 1998 (CISPR 22)**

**Equipment(EUT) Type:**

**15" LCD Monitor**

**Max Resolution:**

**1024X768 Non-interlaced (@68.7KHz/ 85Hz)**

**Port/ Connector(s)**

**15-pin D-sub VGA connector**

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 C63.4-1992.(See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements 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 qualifications of all persons taking them.

HYUNDAI GTech. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse of 1988, 21 U.S.C.853(a).

*Ki Soo Kim*

Report prepared by : Ki-Soo Kim  
Manager of EMC Tech. Part



## TABLE OF CONTENTS

|                                                                    | PAGE      |
|--------------------------------------------------------------------|-----------|
| <b>1. GENERAL INFORMATION.....</b>                                 | <b>3</b>  |
| 1.1 Product Description.....                                       | 3         |
| 1.2 Related submittal(s)/Grant(s).....                             | 3         |
| 1.3 Tested System Details.....                                     | 4         |
| 1.4 Test Methodology.....                                          | 4         |
| 1.5 Test Facility.....                                             | 4         |
| <b>2. SYSTEM TEST CONFIGURATION.....</b>                           | <b>5</b>  |
| 2.1 Justification.....                                             | 5         |
| 2.2 EUT Exercise Software.....                                     | 5         |
| 2.3 Cable Description.....                                         | 6         |
| 2.4 Noise Suppression Parts on Cable.....                          | 6         |
| 2.5 Equipment Modifications.....                                   | 7         |
| 2.6 Configuration of Tested System.....                            | 8         |
| <b>3. PRELIMINARY TESTS.....</b>                                   | <b>9</b>  |
| 3.1 Power line Conducted Emissions Tests.....                      | 9         |
| 3.2 Radiated Emissions Tests.....                                  | 9         |
| <b>4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY.....</b> | <b>9</b>  |
| 4.1 Conducted Emission Tests.....                                  | 10        |
| 4.2 Radiated Emission Tests.....                                   | 10        |
| <b>5. FIELD STRENGTH CALCULATION.....</b>                          | <b>11</b> |
| <b>6. LIST OF TEST EQUIPMENT .....</b>                             | <b>12</b> |

|                           |                                  |
|---------------------------|----------------------------------|
| <b>ATTACHMENT A .....</b> | <b>ID Label / Location Info.</b> |
| <b>ATTACHMENT B.....</b>  | <b>External Photos.</b>          |
| <b>ATTACHMENT C .....</b> | <b>Block Diagram..</b>           |
| <b>ATTACHMENT D .....</b> | <b>Test Setup Photos.</b>        |
| <b>ATTACHMENT E .....</b> | <b>User's Manual.</b>            |
| <b>ATTACHMENT F .....</b> | <b>Internal Photos.</b>          |

## 1. GENERAL INFORMATION

### 1.1 Product Description

The Hyundai Image Quest CO., LTD. Model L501 (referred to as the EUT in this report) is a 15" LCD Monitor HOR. Freq. 68.7KHz w/max. Resolution of 1024X768 Non-Interlaced. Product specification information described herein was obtained from product data sheet or user's manual.

|                                              |                                                                                                               |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| CHASSIS TYPE                                 | PLASTIC                                                                                                       |
| LIST OF EACH OSC. OR XTAL. FREQ.(FREQ. 1MHz) | 16MHz , 14.318MHz , 12MHz                                                                                     |
| POWER REQUIREMENT                            | 100-240 VAC 2A (12V/5V 2A)                                                                                    |
| NUMBER OF LAYERS                             | MAIN BOARD 4 LAYER<br>OSD BOARD 1 LAYER<br>POWER BOARD 1 LAYER<br>INVERTER BOARD 2 LAYER<br>CONNECTOR 2 LAYER |
| MAX. RESOLUTION                              | 1024X768 NON-INTERLACED(@ 68.7KHz/ 85Hz)                                                                      |
| H-SYNC FREQUENCY RANGE                       | 31KHz 68.7KHz                                                                                                 |
| V-SYNC FREQUENCY RANGE                       | 44Hz 87Hz                                                                                                     |
| LCD TYPE                                     | 15" ( LCD Type : L150X1M Acer Display tech. Inc.)                                                             |

### 1.2 Related Submittal(s) / Grant(s)

ORIGINAL SUBMITTAL ONLY

### 1.3 Tested System Details

The Model names for all equipment, plus descriptions used in the tested system (including inserted cards) are:

| DEVICE TYPE   | MANUFACTURER                  | MODEL NUMBER  | FCC ID / DoC | CONNECTED TO |
|---------------|-------------------------------|---------------|--------------|--------------|
| MONITOR (EUT) | HYUNDAI IMAGE QUEST CO., LTD. | L501          | PJIL15A0C060 | HOST         |
| PC(HOST)      | H/P                           | DTPC -17      | DoC          | N/A          |
| KEY BOARD     | H/P                           | SK-2501-2D-K  | GYUR385K     | HOST         |
| PRINTER       | H/P                           | HP895C        | DoC          | HOST         |
| MODEM         | 3COM CORPORATION              | 56K FAX MODEM | DoC          | HOST         |
| VIDEO CARD    | DIAMOND                       | 3D3000        | DoC          | HOST         |
| MOUSE         | H/P                           | M-S34         | DZL211029    | HOST         |

### 1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4/1992. Radiated testing was performed at an antenna to EUT distance of 10 meters.

### 1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO, 467-701,KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 24,2000(Confirmation Number: EA90661)

## 2.SYSTEM TEST CONFIGURATION

### 2.1 Justification

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following components and I/O cards inside the E.U.T were used.

| DEVICE TYPE     | MANUFACTURE                   | MODEL/PART NUMBER |
|-----------------|-------------------------------|-------------------|
| MAIN BOARD      | Hyundai Image Quest CO., Ltd. | 3041001033        |
| POWER BOARD     | C&C TECH.                     | -                 |
| CONNECTOR BOARD | Hyundai Image Quest CO., Ltd. | -                 |
| OSD BOARD       | Hyundai Image Quest CO., Ltd. | -                 |
| INVERTOR BOARD  | Green C&C TECH.               | -                 |
| LCD BOARD       | Acer Display tech. Inc.       | L150X1M           |

### 2.2 EUT exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, contained on a 3-1/2 inch disc, was inserted into drive A and is auto starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is : (1) Display test, (2) RS 232 test (3) Key board test, (4) Printer test, (5) FDD test, (6) HDD test. The complete cycle takes about 20 seconds and is repeated continuously. As the keyboard and mouse are strictly input devices, no data is transmitted to them during test. They are however, continuously scanned for data input activity. The video resolution modes setup and change program was used during the radiated and conducted emission testing.

## 2.3 Cable Description

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

|              | Power Cord<br>Shielded (Y/N) | I/O Cable Shielded<br>(Y/N) | Length (M)     |
|--------------|------------------------------|-----------------------------|----------------|
| MONITOR(EUT) | N                            | Y                           | 1.8(P), 1.5(D) |
| PC(HOST)     | N                            | N/A                         | 1.8(P)         |
| PRINTER      | N                            | Y                           | 2.0(P),1.8(D)  |
| KEYBOARD     | N/A                          | Y                           | 2.0 (D)        |
| MODEM        | N                            | Y                           | 2.0(P),0.8(D)  |
| MOUSE        | N/A                          | Y                           | 1.8(D)         |

## 2.4 Noise Suppression Parts on Cable. (I/O CABLE)

|              | Ferrite Bead<br>(Y/N) | Location | Metal Hood<br>(Y/N) | Location |
|--------------|-----------------------|----------|---------------------|----------|
| MONITOR(EUT) | Y                     | BOTH END | Y                   | BOTH END |
| PRINTER      | Y                     | PC END   | Y                   | BOTH END |
| KEYBOARD     | Y                     | PC END   | N                   | N/A      |
| MODEM        | Y                     | PC END   | Y                   | BOTH END |
| MOUSE        | N                     | N/A      | N                   | N/A      |

## **2.5 Equipment Modifications**

N/A

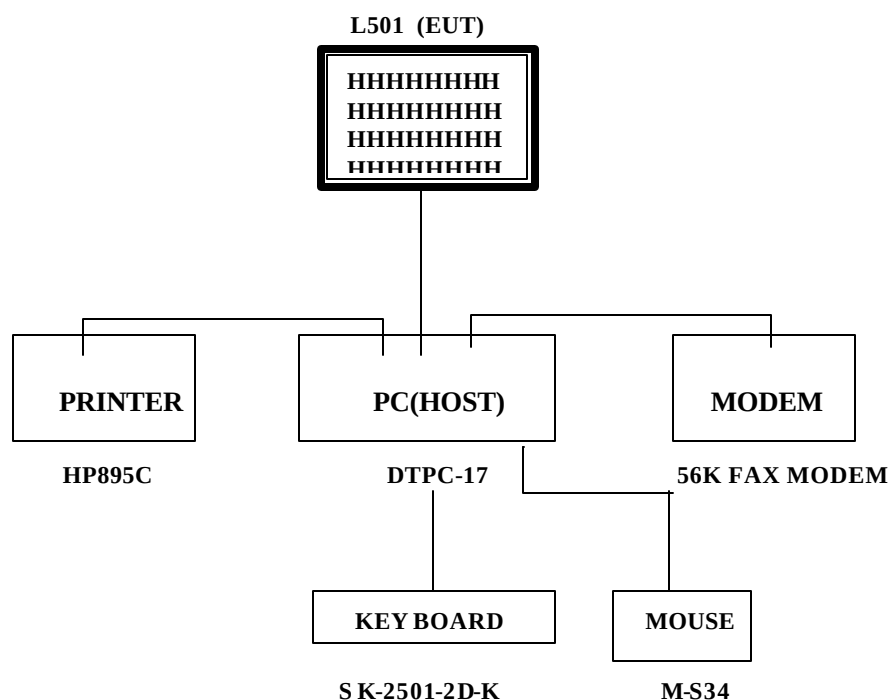
## 2.6 Configuration of Test system

**Line Conducted Test** : EUT was connected to LISN, all other supporting equipment were connected to another LISN.

Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4/1992 7.2.3 to determine the worse operating conditions.

**Radiated Emission Test** : Preliminary Radiated Emissions tests were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating condition. Final Radiated Emission tests were conducted at 10 meter open area test site.

### [Configuration of Tested System]



### 3. PRELIMINARY TESTS

#### 3.1 AC Power line Conducted Emission Tests

During Preliminary Tests, the following operating mode were investigated

| Processor Speed (MHz) | Video Resolution (w/max)                 | The worst operating condition |
|-----------------------|------------------------------------------|-------------------------------|
| Pentium 350 MHz       | 1024X768 Non-Interlaced (68.7KHz/85 Hz)  | X                             |
|                       | 1024X768 Non-Interlaced (48.4KHz/60 Hz)  |                               |
|                       | 1024X768 Non-Interlaced (56.5KHz/70 Hz)  |                               |
|                       | 720X400 Non-Interlaced (31.5KHz/70 Hz)   |                               |
|                       | 800 x 600 Non-Interlaced (46.7 KHz/75Hz) |                               |
|                       | 640 x 480 Non-Interlaced (31.5KHz/60Hz)  |                               |

#### 4.2 Radiated Emission Tests

| Processor Speed (MHz) | Video Resolution (w/max)                 | The worst operating condition |
|-----------------------|------------------------------------------|-------------------------------|
| Pentium 350 MHz       | 1024X768 Non-Interlaced (68.7KHz/85Hz)   | X                             |
|                       | 1024X768 Non-Interlaced (48.4KHz/60Hz)   |                               |
|                       | 1024X768 Non-Interlaced (56.5KHz/70Hz)   |                               |
|                       | 720X400 Non-Interlaced (31.5KHz/70Hz)    |                               |
|                       | 800 x 600 Non-Interlaced (46.7 KHz/75Hz) |                               |
|                       | 640 x 480 Non-Interlaced (31.5KHz/60Hz)  |                               |

During Preliminary Tests, the following operating mode were investigated

Tested by Keun- Ho Park / Engineer

Date : MAY 8, 2001

## 4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY

### 4.1 Conducted Emission Test

The following table shows the highest levels of conducted emissions on both polarization of hot and neutral line.

|                |                     |             |      |
|----------------|---------------------|-------------|------|
| Humidity Level | : 35%               | Temperature | : 28 |
| Limit apply to | : CISPR 22          |             |      |
| Type of Tests  | : CLASS B           |             |      |
| Date           | : MAY 10, 2001      |             |      |
| Result         | : PASSED BY -6.3 dB |             |      |
| EUT            | : 15" LCD MONITOR   |             |      |

Operating Condition : 1024X768 Non-Interlaced (Hf : 68.7KHz, Vf : 85 Hz)  
 Detector : CISPR Quasi-Peak (6 dB Bandwidth : 9 KHz)  
 CISPR Average(6 dB Bandwidth : 9 KHz)

Line Conducted Emission Tabulated Data

| Power Line Conducted Emissions |                  |           | CISPR 22     |             |               |
|--------------------------------|------------------|-----------|--------------|-------------|---------------|
| Frequency (MHz)                | Amplitude (dBuV) | Conductor | Limit (dBuV) | Margin (dB) | Detector Mode |
| 2.450                          | 49.7             | NEUTRAL   | 56.0         | -6.3        | Quasi-Peak    |
| 2.480                          | 36.6             | NEUTRAL   | 46.0         | -9.4        | Average       |
| 2.515                          | 47.4             | HOT       | 56.0         | -8.6        | Quasi-Peak    |
| 2.335                          | 34.1             | HOT       | 46.0         | -11.9       | Average       |

NOET:

1. All video modes and resolutions were investigated and the worst-case emissions are reported  
 Other video modes & resolution were tested and found to be in compliance.

Measured by : Keun-Ho Park / Engineer

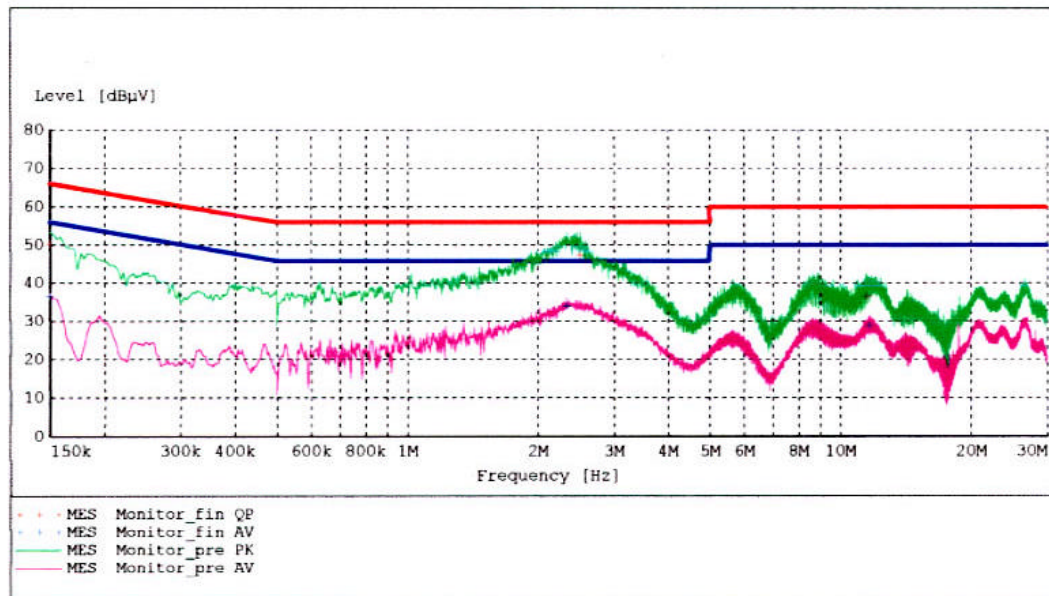
Date : MAY 10, 2001

**HYUNDAI C-TECH. CO., LTD. EMC LAB**  
**San 136-1, Ami-Ri-Bubal-Eub, Ichon-Si, Kyongki-Do**

EUT: L501  
 Manufacturer: HYUNDAI IMAGE QUEST  
 Operating Condition: 1024X768 Hf:68.7KHz Vf:85Hz  
 Test Site: Shield Room  
 Operator: Keun-Ho Park  
 Test Specification: CISPR 22 CLASS B  
 Comment: HOT

**SCAN TABLE: "CISPR22 CLASS B(PKH)"**

| Start Frequency | Stop Frequency | Step Width | Short Description: | KN22 CLASS B Voltage | Meas. Time | IF Bandw.  | Transducer |
|-----------------|----------------|------------|--------------------|----------------------|------------|------------|------------|
| 150.0 kHz       | 500.0 kHz      | 3.0 kHz    | MaxPeak            | 100.0 ms             | 9 kHz      | C/E FACTOR |            |
|                 |                |            | Average            |                      |            |            |            |
| 500.0 kHz       | 5.0 MHz        | 5.0 kHz    | MaxPeak            | 10.0 ms              | 9 kHz      | C/E FACTOR |            |
|                 |                |            | Average            |                      |            |            |            |



**MEASUREMENT RESULT: "Monitor\_fin QP"**

2/16/01 5:47PM

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Line | PE  |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.150000      | 50.40      | 0.5       | 66         | 15.6      | 1    | --- |
| 2.515000      | 47.40      | 0.6       | 56         | 8.6       | 1    | --- |
| 11.520000     | 36.70      | 1.3       | 60         | 23.3      | 1    | --- |

**MEASUREMENT RESULT: "Monitor\_fin AV"**

2/16/01 5:47PM

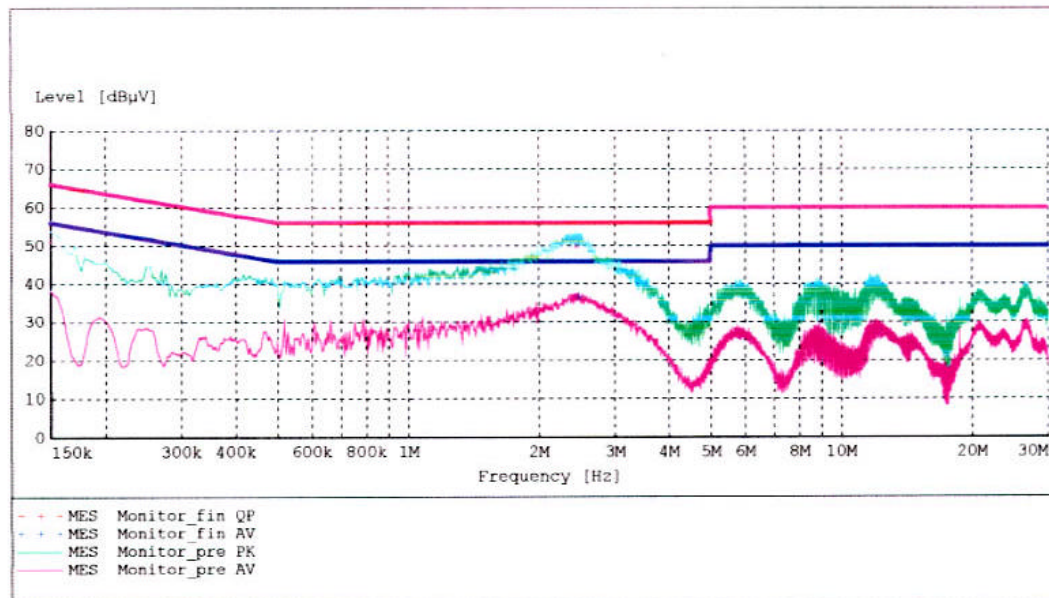
| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Line | PE  |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.150000      | 36.70      | 0.5       | 56         | 19.3      | 1    | --- |
| 2.335000      | 34.10      | 0.6       | 46         | 11.9      | 1    | --- |
| 11.695000     | 29.00      | 1.3       | 50         | 21.0      | 1    | --- |

**HYUNDAI C-TECH. CO.,LTD. EMC LAB**  
**San 136-1,Ami-Ri-Bubal-Eub,Ichon-Si,Kyongki-Do**

EUT: L501  
 Manufacturer: HYUNDAI IMAGE QUEST  
 Operating Condition: 1024X768 Hf:68.7KHz Vf:85Hz  
 Test Site: Shield Room  
 Operator: Keun-Ho Park  
 Test Specification: CISPR 22 CLASS B  
 Comment: NEUTRAL

**SCAN TABLE: "CISPR22 CLASS B(PKH)"**

| Start     | Stop      | Step    | Short Description: | KN22 CLASS B Voltage | IF     | Transducer |
|-----------|-----------|---------|--------------------|----------------------|--------|------------|
| Frequency | Frequency | Width   | Detector           | Meas. Time           | Bandw. |            |
| 150.0 kHz | 500.0 kHz | 3.0 kHz | MaxPeak            | 100.0 ms             | 9 kHz  | C/E FACTOR |
|           |           |         | Average            |                      |        |            |
| 500.0 kHz | 5.0 MHz   | 5.0 kHz | MaxPeak            | 10.0 ms              | 9 kHz  | C/E FACTOR |
|           |           |         | Average            |                      |        |            |



**MEASUREMENT RESULT: "Monitor\_fin QP"**

2/16/01 5:40PM

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Line | PE  |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.150000      | 51.00      | 0.5       | 66         | 15.0      | 1    | --- |
| 2.450000      | 49.70      | 0.6       | 56         | 6.3       | 1    | --- |

**MEASUREMENT RESULT: "Monitor\_fin AV"**

2/16/01 5:40PM

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Line | PE  |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.150000      | 38.00      | 0.5       | 56         | 18.0      | 1    | --- |
| 2.480000      | 36.60      | 0.6       | 46         | 9.4       | 1    | --- |



## 5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 21.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The 30 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 21.5 + 7.4 + 1.1 = 30 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(30 \text{ dBuV/m})/20] = 31.6 \text{ uV/m}$$

## 6. LIST OF TEST EQUIPMENT

| TYPE                        | MANUFACTURE     | MODEL           | CAL. DATE  |
|-----------------------------|-----------------|-----------------|------------|
| EMI Test Receiver           | Rohde & Schwarz | ESH3            | 2000.6.29  |
| EMI Test Receiver           | Rohde & Schwarz | ESVP            | 2001.2.14  |
| EMI Test Receiver           | Rohde & Schwarz | ESI40           | 2001.1.18  |
| EMI Test Receiver           | Rohde & Schwarz | ESVS30          | 2000.6.29  |
| Spectrum Monitor            | Rohde & Schwarz | EZM             | N.A        |
| Graphic Plotter             | Rohde & Schwarz | DOP2            | N.A        |
| Printer                     | Rohde & Schwarz | PDN             | N.A        |
| Spectrum Analyzer           | H.P             | 8591EM          | 2000.7.11  |
| LISN                        | EMCO            | 3825/2          | 2000.10.13 |
| LISN                        | Rohde & Schwarz | ESH2-Z5         | 2000.7.14  |
| Amplifier                   | Hewlett-Packard | 8447E           | 2001.3.2   |
| Dipole Antennas             | Rohde & Schwarz | VHAP            | 2000.6.29  |
| Dipole Antennas             | Rohde & Schwarz | UHAP            | 2000.6.29  |
| Biconical Antenna           | Rohde & Schwarz | BBA-9106        | 2000.6.29  |
| Log-Periodic Antenna        | Rohde & Schwarz | UHALP-9107      | 2000.6.29  |
| Antenna Position Tower      | EMCO            | 1051-12         | N.A        |
| Turn Table                  | EMCO            | 1060-06         | N.A        |
| Line Filter                 | KEENE           | ULW 2X30-60     | N.A        |
| Power Analyzer              | Voltech         | PM 3300         | 2000.12.20 |
| Reference Network Impedance | Voltech         | IEC 555         | N.A        |
| AC Power Source             | PACIFIC         | Magnetic Module | N.A        |
| AC Power Source             | PACIFIC         | 360AMX          | N.A        |