

**TECHNICAL INFORMATION :****ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

INDUSTRIAL, SCIENTIFIC AND MEDICAL(ISM) EQUIPMENT  
CERTIFICATION TO FCC PART 18 REQUIREMENT

|                        |                                                                                       |            |     |
|------------------------|---------------------------------------------------------------------------------------|------------|-----|
| PRODUCT                | SELF-BALLASTED LAMP                                                                   |            |     |
| FCC ID                 | N4AEFTR1201                                                                           |            |     |
| MODEL NO.              | EFTR 1223                                                                             | SERIAL NO. | N/A |
| APPLICANT &<br>ADDRESS | KUMHO ELECTRIC, INC.<br>690, Byung Jom-Ri, Taeon-Up, Whasung-Gun<br>Kyunggi-Do, Korea |            |     |

|               |                                                                                                                                    |            |               |
|---------------|------------------------------------------------------------------------------------------------------------------------------------|------------|---------------|
| REPORT NO.    | E987R-012                                                                                                                          | ISSUE DATE | July 21, 1998 |
| PREPARED BY : | ONETECH CORPORATION<br>2 F. KUNHAN B/D, 1557-11, SEOCHO-DONG, SEOCHO-KU,<br>SEOUL 137-070 KOREA (TEL)02-587-9037, (FAX)02-587-9039 |            |               |

**KUMHO ELECTRIC, INC**

690, Byung Jom-Ri, Taeon-Up, Whasung-Gun, Kyunggi-Do, 445-970, Korea  
Telephone: 82-331-229-6401 Fax No: 82-331-229-6633

**AUTHORIZATION LETTER**

Federal Communications Commission  
Authorization and Evaluation Division  
Equipment Authorization Branch  
7435 Oakland Mills Road,  
Columbia, MD 21046 U.S.A

July 3, 1998

To Whom it may concern :

We, the undersigned, hereby authorize ONETECH Corporation to act on our behalf in all matters to applications for equipment authorization, including the signing of all documents relating to these matters. Any and all acts carried out by ONETECH Corporation on our behalf shall have the same effect as acts of our own.

We, the undersigned, hereby certify that we are not subject to a denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

This authorization is valid until further written notice from the applicant

Very truly yours,

Deok Jin Kim / Manager

Kumho Electric, Inc.

690, Byung Jom-Ri, Taeon-Up, Whasung-Gun  
Kyunggi-Do, Korea.

TEL : +82-331-229-6401

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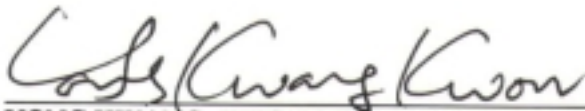
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**1. VERIFICATION OF COMPLIANCE**

APPLICANT : KUMHO ELECTRIC, INC.  
 690, Byung Jom-Ri, Tacan-Up, Whasung-Gun Kyunggi-Do, Korea  
 CONTACT PERSON : Deok-Jin, Kim / Manager  
 TELEPHONE NO : 82-331-229-6401  
 FCC ID : N4AEFTR1201 MODEL NO/NAME : EFTR 1223  
 SERIAL NUMBER : N/A  
 DATE : July 21, 1998

|                                                         |                                                     |
|---------------------------------------------------------|-----------------------------------------------------|
| DEVICE TYPE                                             | RF LIGHTING DEVICE                                  |
| E.U.T. DESCRIPTION                                      | SELF-BALLASTED LAMP                                 |
| THIS REPORT CONCERNS                                    | ORIGINAL GRANT                                      |
| MEASUREMENT PROCEDURES                                  | MP-5, ANSI C63.4                                    |
| TYPE OF EQUIPMENT TESTED                                | PRE-PRODUCTION                                      |
| KIND OF EQUIPMENT<br>AUTHORIZATION REQUESTED            | CERTIFICATION                                       |
| EQUIPMENT WILL BE OPERATED<br>UNDER FCC RULES PART(S)   | CONSUMER ISM DEVICE<br>(CFR 47, PART 18, SUBPART-C) |
| MODIFICATIONS ON THE EQUIPMENT<br>TO ACHIEVE COMPLIANCE | NO                                                  |
| FINAL TESTS WERE CONDUCTED ON                           | 3 METER OPEN TEST SITE                              |

The above equipment was tested by ONETECH CORPORATION for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.



YONG KWANG, KWON / CHIEF ENGINEER  
 EMC TESTING DEPARTMENT  
 ONETECH Testing & Eval. Lab.  
 SEOUL KOREA

## 2. SCOPE

The Federal Communications Commission (FCC) establishes rules and regulations to regulate industrial, scientific, and medical equipment (ISM) that emits electromagnetic energy on frequencies within the radio frequency spectrum in order to prevent harmful interference to authorized radio communication services. An electromagnetic emissions test has been performed on the applicant/manufacture's product to establish compliance with these rules.

The test data contained in this report was obtained utilizing test procedures, equipment, and site that is either approved by or prescribed by the FCC. The test procedures described herein are the established methods for the measurement of radio noise emitted from ISM equipment as defined in section 18.107 of the FCC rules. The technical standards for ISM equipment are set forth in subpart C of Part 18 of FCC rules (47 CFR Part 18 Sub-C). Methods for measurement of radiated and power line conducted radio noise are covered herein.

## 3. PRODUCT INFORMATION

|                             |                              |
|-----------------------------|------------------------------|
| Product description         | : SELF-BALLASTED LAMP        |
| Housing type                | : Plastic                    |
| Power supply type           | : Switching / 120 Vac, 60 Hz |
| Line filter type            | : Built in                   |
| Line cord type              | : None-shield                |
| Normal operating frequency  | : 65 kHz                     |
| Maximum RF energy generated | : Less than 50mW             |

## 4. TEST FACILITY

### 4.1 General Information

The ONETECH CORPORATION test site is located at 426-1, Daessangryung-Ri, Chowol-Myun, Kwangju, Kun, Kyunggi-Do, 464-080, Korea. The site is constructed and calibrated in conformance with the requirements of FCC/OET55 and ANSI C63.4/1992. A site description is on file at the federal communications commission, 7435 Oakland mills Road, Columbia, MD 21046.

### 4.2 Open Field Test

The description of the open field test site maintained by ONETECH CORPORATION has been submitted to the FCC pursuant to CFR 47 section 2.948. A letter of acceptance from FCC is on file at FCC.(31040/SIT, 1200F2, January 24, 1996)

### 4.3 Preliminary Test

The Preliminary test is used for administration, preliminary radiation testing and conducted radio noise measurements.

## 5. MEASUREMENT INSTRUMENTATION

All measurements were made using equipment, which confirms to the America National Standard Specifications for Electromagnetic Interference and Field Strength Instrumentation 30 MHz to 1GHz, ANSI C63.4

### 5.1 Measuring Instrument Calibration

The measuring equipment, which was utilized in performing the test documented herein, has been calibrated in accordance with the manufacturer recommendations utilizing calibration equipment that are traceable to recognized national standards.

| No. | EQUIPMENTS                         | MFR. | MODEL           | SER. NO.                            | LAST CAL   | DUE CAL    | USE    |
|-----|------------------------------------|------|-----------------|-------------------------------------|------------|------------|--------|
| 1   | Test receiver                      | R/S  | ESVS 10         | 825120/006                          | AUG./97    | 12MONTH    | ■      |
| 2   | Spectrum analyzer                  | HP   | 8568B           | 3026A0226                           | AUG./97    | 12MONTH    | ■      |
| 3   | RF preselector                     | HP   | 85685A          | 3107A01264                          | AUG./97    | 12MONTH    | ■      |
| 4   | Quasi-Peak Adaptor                 | HP   | 85650A          | 3107A01542                          | AUG./97    | 12MONTH    | ■      |
| 5   | Dipole Antenna                     | EMCO | 3121C           | 9107-745                            | DEC/96     | 12MONTH    |        |
| 6   | Biconical antenna                  | EMCO | 3104C           | 9109-4441<br>9109-4443<br>9109-4444 | FEB./98    | 12MONTH    | ■      |
| 7   | Log Periodic antenna               | EMCO | 3146            | 9109-3213<br>9109-3214<br>9109-3217 | FEB./98    | 12MONTH    | ■      |
| 8   | LISN                               | EMCO | 3825/2          | 9109-1867<br>9109-1869              | FEB./98    | 12MONTH    | ■      |
| 9   | Computer System<br>Hard disk drive | HP   | 98581C<br>9153C | 98543A<br>CMC762Z9153               | N/A<br>N/A | N/A<br>N/A | ■<br>■ |
| 10  | Plotter                            | HP   | 7475A           | 30052 22986                         | N/A        | N/A        | ■      |
| 11  | Position Controller                | EMCO | 1090            | 9107-1038                           | N/A        | N/A        | ■      |
| 12  | Turn Table                         | EMCO | 1080-1.21       | 9109-1576                           | N/A        | N/A        | ■      |
| 13  | Antenna Master                     | EMCO | 1070-1          | 9109-1624                           | N/A        | N/A        | ■      |

The calibrations of the measuring instruments, including any accessories that may affect such calibration, are checked frequency to assure its accuracy. Adjustments are made correction factors applied in accordance with instructions contained in the manual for the measuring instrument.

## 5.2 Detector Function Selection and Bandwidth

| Items        | Line conducted test | Radiated test |
|--------------|---------------------|---------------|
| Bandwidth    | 9 kHz               | 120 kHz       |
| Scan width   | 200 kHz/Div         | 200 kHz/Div   |
| Sweep        | 2 MHz               | 2 MHz         |
| Scan time    | 1 ms/Div            | 5 ms/Div      |
| Sensitivity  | -90 dBm             | -90 dBm       |
| Video filter | OFF                 | OFF           |
| Reading mode | Peak                | Peak          |

All conducted and radiated radio noise emission testing was performed utilizing spectrum analyzer or radio noise meters incorporation CISPR quasi-peak function, if a weight circuit was employed in that instrument. If measurements were made using equipment that does not employ weighting circuits, measurements were made using peak reading.

## 5.3 Units of Measurement

Measurements of radiated interference are reported in terms of microvolts per meter, or dBuV/m at a specified distance. The indicated readings on the spectrum analyzer was converted to microvolts per meter, or dBuV/m by use of reported in terms of microvolts, or dBuV/m by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of microvolts, or dBuV.

## 6. ANTENNAS

| Antenna type       | Biconical                                    | Dipoles         | Log Periodic     |
|--------------------|----------------------------------------------|-----------------|------------------|
| Frequency range    | 20 MHz to 200 MHz                            | 30 MHz to 1 GHz | 200 MHz to 1 GHz |
| Correction Factors | Programmed into software                     |                 |                  |
| Antenna Height     | Varied from 1 to 4 meters above ground plane |                 |                  |
| Polarization       | Vertical / Horizontal                        |                 |                  |
| Distance from EUT  | 3 meters                                     |                 |                  |

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast three meters from the leading edge of the EUT.

The FCC Rules specify that the test height above ground for table mounted devices shall be 0.8 or 1.0 meters and for floor mounted equipment shall be less than 0.5 meters. During radiated measurements, the EUT is positioned on a non-conductive, motorized turntable in normal operating mode in conformance with this requirement.

## 7. AMBIENT CONDITION

The ambient conditions at the time of the test was conducted were as follows:

|                   |           |                   |
|-------------------|-----------|-------------------|
| Temperature       | <u>24</u> | Degree Centigrade |
| Relative Humidity | <u>65</u> | %                 |

## 8. TEST METHODS

### 8.1 Test Configuration

The equipment under test was configured and operated in a manner that tend to maximize its emission characteristics a typical application. Power and signal distribution, ground, interconnecting cabling and physical placement of equipment were simulating the typical application and usage in so far as practicable.

### 8.2 Grounding

All conducted power line measurements were performed with LISN housing, measurement instrumentation case, ground planes, etc., electrically bonded together in such a manner that they were at the same RF potential.

### 8.3 Data Report format

The measurement results expressed in accordance with MP-5 and specific limits where applicable are presented in tabular or graphical form, or alternatively as recorder charts or photographs of a spectrum analyzer display, showing the level vs. Frequency.

### 8.4 Line Conducted Test Procedure

Conducted emissions are measured at the plug end of the power cord supplied with the EUT, from the voltage developed across the 50-ohm port in the LISN. The length of the power cord in excess of 80cm, separating the EUT from the LISN, is coiled on prongs at top of LISN.

The EUT is placed 80cm from a grounded conducted surface and is kept at least 80cm from any other earth grounded conducted surface. Each device under test is separately tested for conducted emissions.

Emissions, which have peak value close to the specification limit, are also measured in the quasi-peak detection mode to determine compliance.

Analyzer setting is given on page 4. Analyzer is scanned from 0.45 MHz to 30 MHz for emissions.

During this test, EUT was operating to simulating actual use. Emission levels are checked to see if equipment/cable placements are maximized.

### 8.5 Radiated Test Procedure

Measurements of radiated radio-noise were made using the measuring instrumentation and antenna specified in 5.2 and 6 respectively. Primarily, tests were made to determine the system spectrum signature, the strengths of the stronger emissions, and the directions in which these emerge from the system. During this testing, EUT was running on normal operation.

EUT and all other equipment used with EUT were placed on a wooden table 0.8 meters above a ground screen. Table is placed three meters away from antenna.

All equipment/cable are placed in a manner which tend maximize its emission characteristics in a typical application. This is accomplished by watching the analyzer while moving equipment/cables.

Table was rotated 360 degrees to further maximize emissions.

Antenna was positioned between 1 to 4 meters above ground screen to even further maximize emissions. During test many antennas are used and positioned vertical and horizontal.

Analyzer settings are given on page 4. Analyzer is scanned from 30 MHz to 1000 MHz for emissions.

When an emission is found maximized, the frequency and condition are then entered into computer.

## 9. EQUIPMENT DEFINITION AND LIMITATIONS

The following information has been provided to clarify the FCC requirements with regard to equipment definition and technical standards, These requirements are found in the FCC Rules for devices subject to Equipment Authorization Procedures, Parts 2. J. and 18. B.

### 9.1 ISM Equipment Definition

Industrial, Scientific and Medical (ISM) equipment or appliances designed to generate and use locally RF energy for industrial, Scientific, Medical, domestic or similar purpose, excluding applications in the field of telecommunication.(Ref. CFR 47, section 18.107(c))

Industrial heating equipment : A category of ISM equipment used for or in connection with industrial heating operations utilized in a manufacturing of production process.(Ref. CFR 47, section 18.107(d))

Medical diathermy equipment : A category of ISM equipment used for therapeutic purpose, not including surgical diathermy apparatus designed for intermittent operation with low power.(Ref. CFR 47, section 18.107(e))

Ultrasonic equipment : A category of ISM equipment in which the RF energy is used to excite or drive an electromechanical transducer for the production of sonic or ultrasonic mechanical energy for industrial, scientific, medical or other non-communication purposes.(Ref. CFR 47, section 18.107(F))

Consumer ISM equipment : A category of ISM equipment used or intended to be used by the general public in a residential environment, notwithstanding use in other area.(Ref. CFR 47, section 18.107(g))

### 9.2 Equipment Limitations

Ultrasonic equipment Conduction limits : Maximum RF line voltage measured with a 5uH/50 ohm LISN.

| Frequency<br>MHz | Emissions<br>uV | Emissions<br>dBuV/m |
|------------------|-----------------|---------------------|
| 0.010 - 0.49     | 1000            | 60.0                |
| 0.49 - 30.0      | 200             | 46.0                |

Induction Cooking Ranges Conduction limits : Maximum RF line voltage measured with a 5uH/50 ohm LISN.

| Frequency<br>MHz | Emissions<br>mV            |
|------------------|----------------------------|
| 0.010 - 0.1      | 10-1(linear interpolation) |
| 0.1 - 0.5        | 1                          |
| 0.5 - 30.0       | 0.25                       |

RF lighting devices Conduction limits : Maximum RF line voltage measured with a 5uH/50 ohm LISN.

| Frequency<br>MHz       | Emissions<br>uV | Emissions<br>dBuV/m |
|------------------------|-----------------|---------------------|
| Non-consumer equipment |                 |                     |
| 0.45 - 1.6             | 1000            | 60.0                |
| 1.6 - 30               | 3000            | 69.5                |
| Consumer equipment     |                 |                     |
| 0.45 - 30              | 250             | 48                  |

Radiated Field Strength Limits : (Operating frequency lie outside the bands specified in section 18.301)

| Equipment                                              | Operating Frequency   | RF Power generated<br>by equipment(Watts) | Field Strength<br>limit(uV/m) | Distance<br>(meters) |
|--------------------------------------------------------|-----------------------|-------------------------------------------|-------------------------------|----------------------|
| Any type unless<br>otherwise<br>specified(MISC.)       | Any ISM frequency     | Below 500                                 | 25                            | 300                  |
|                                                        |                       | 500 or more                               | $25\sqrt{\text{power}/500}$   | 1 300                |
|                                                        | Any non-ISM frequency | Below 500                                 | 15                            | 300                  |
|                                                        |                       | 500 or more                               | $15\sqrt{\text{power}/500}$   | 1 300                |
| Industrial heaters<br>and RF stabilized<br>are welders | On/below 5,752 MHz    | Any                                       | 10                            | 1.600                |
|                                                        | Above 5,752 MHz       | Any                                       | (2)                           | (2)                  |
| Medical diathermy                                      | Any ISM freq.         | Any                                       | 25                            | 300                  |
|                                                        | Any non-ISM freq.     | Any                                       | 15                            | 300                  |
| Ultrasonic                                             | Below 490kHz          | Below 500                                 | $2,400/F(\text{kHz})$         | 300                  |
|                                                        |                       | 500 or more                               | $2,400/F(\text{kHz})$         | 3 300                |
|                                                        |                       |                                           | $\sqrt{\text{power}/500}$     |                      |
|                                                        | 4,900 to 1,600kHz     | Any                                       | $2,400/F(\text{kHz})$         | 30                   |
| Induction cooking<br>range                             | Above 1,600kHz        | Any                                       | 15                            | 30                   |
|                                                        | Below 90kHz           | Any                                       | 1,500                         | 4 30                 |
|                                                        | On/above              | Any                                       | 300                           | 4 30                 |

1. Field strength may not exceed 10uV/m at 1,600 meters. Consumer Equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.
2. Reduced to the greatest extent possible.
3. Field strength may not exceed 10uV/m at 1,600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.
4. Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength 1 limits for miscellaneous ISM equipment.

Radiated field strength limits for RF lighting devices.

| Frequency<br>(MHz)     | Distance<br>(Meters) | Radiated<br>(dBuV/m) |
|------------------------|----------------------|----------------------|
| Non-consumer equipment |                      |                      |
| 30-88                  | 3                    | 48.5                 |
| 88-216                 | 3                    | 54                   |
| 216-1000               | 3                    | 57                   |
| Consumer equipment     |                      |                      |
| 30-88                  | 3                    | 40                   |
| 88-216                 | 3                    | 43.5                 |
| 216-1000               | 3                    | 46                   |

## 10. SUMMARY

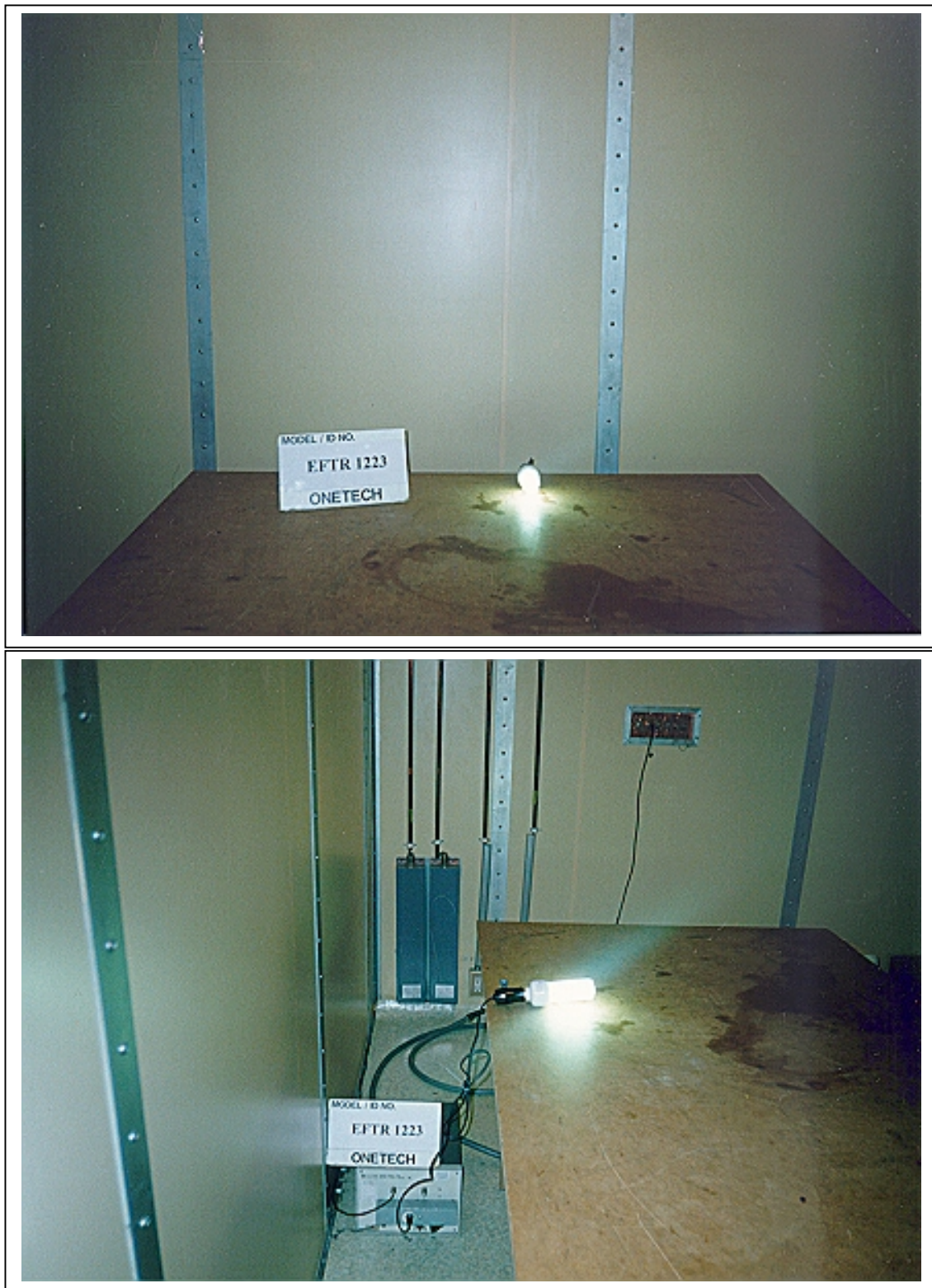
|               |                                       |
|---------------|---------------------------------------|
| Company Name  | KUMHO ELECTRIC, INC.                  |
| E.U.T.        | SELF BALLAST                          |
| Serial Number | N/A                                   |
| Type of Test  | CERTIFICATION(CFR 47, PART 18, SUB-C) |
| Passed/Fail   | PASSED                                |

|                     |                                            |
|---------------------|--------------------------------------------|
| Line Conducted Test | EUT was connected to AC 120V power source. |
|---------------------|--------------------------------------------|

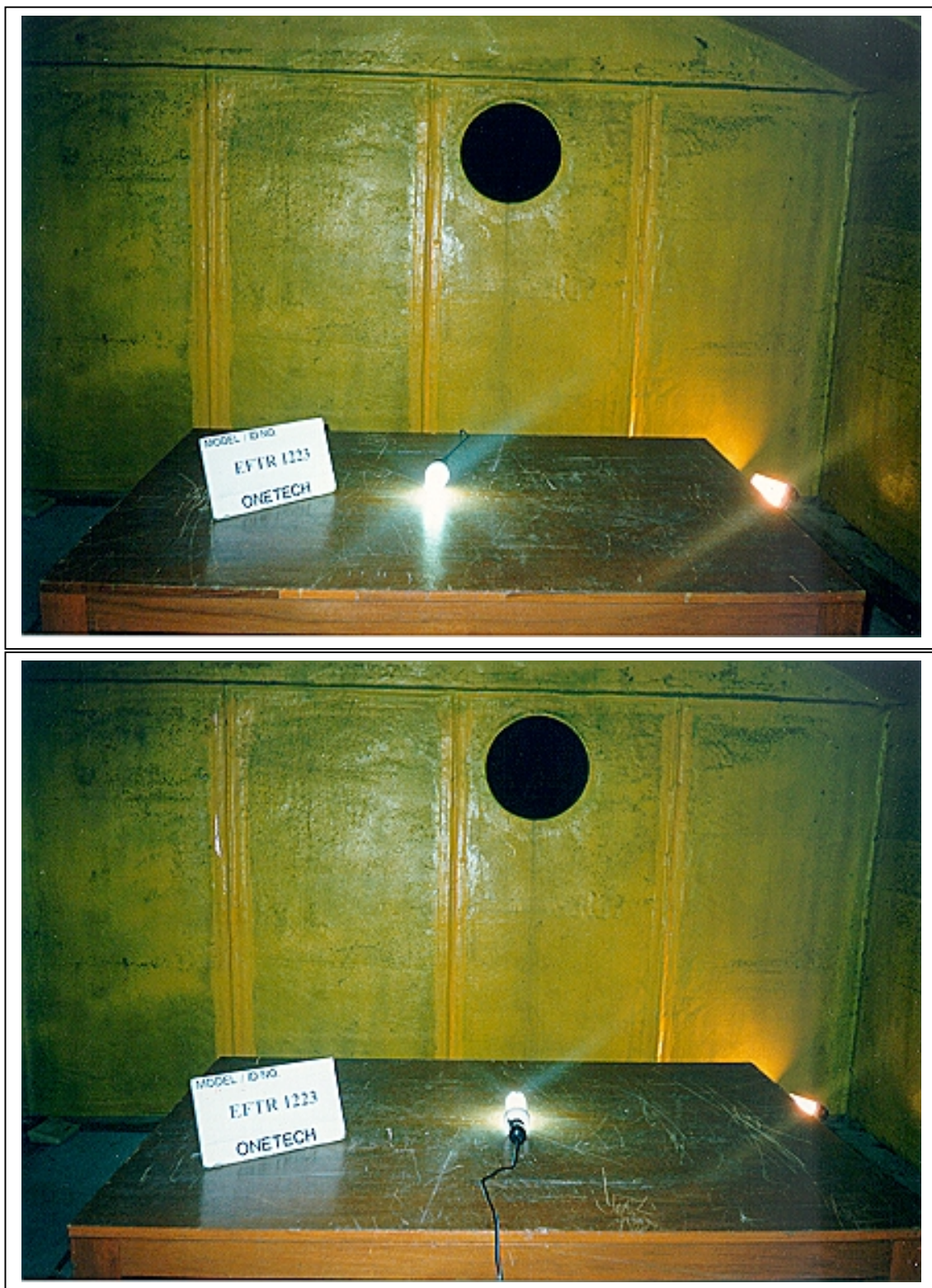
|                        |                                                                                                                |
|------------------------|----------------------------------------------------------------------------------------------------------------|
| Radiated Emission Test | EUT was setup as the same as it was in the Line Conducted Test.<br>EUT was tested at a 3-meter open test site. |
|------------------------|----------------------------------------------------------------------------------------------------------------|

## 11. CONDUCTED AND RADIATED MEASUREMENT PHOTOS

<Conducted Measurement Photos>



<Radiated Measurement Photos>



**12. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY**

Per preliminary tests, the following normal mode of operations were selected which shown the maximum emissions level.

**12.1 Conducted Emissions Tests**

Limits apply to : FCC CFR 47, PART 18, SUBPART C  
 Type of Tests : CLASS B  
 Result : PASSED BY -3.60 dB

EUT : SELF-BALLASTED LAMP

Date : July 6, 1998

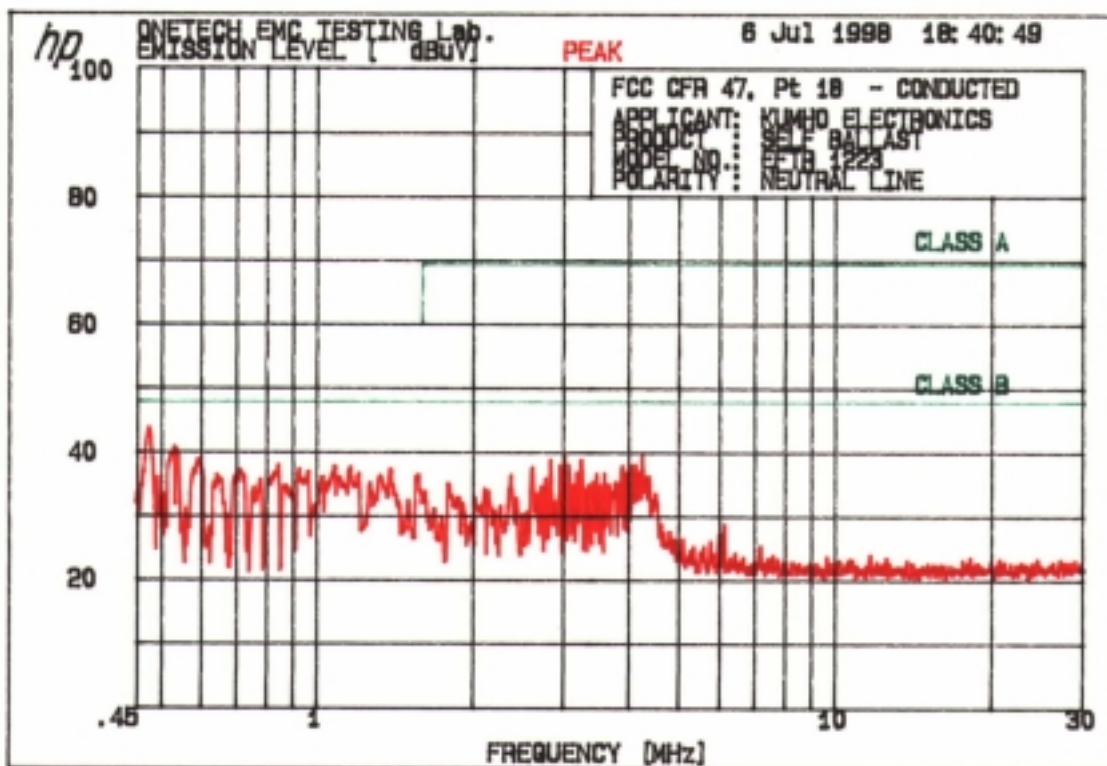
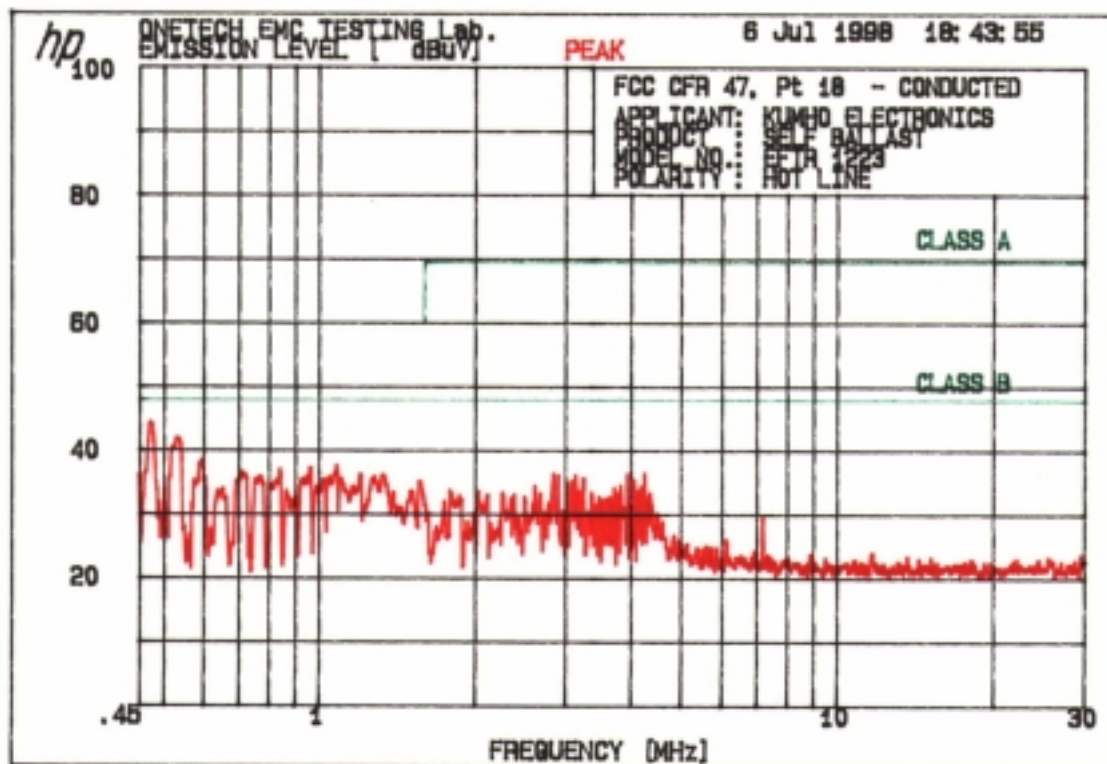
Operating Condition : NORMAL

Detector : CISPR Quasi-Peak ( 6 dB Bandwidth : 9 kHz)

| Power Line Conducted Emissions |                           |           | FCC CLASS B           |                |
|--------------------------------|---------------------------|-----------|-----------------------|----------------|
| Frequency<br>(MHz)             | Amplitude<br>(dB $\mu$ V) | conductor | Limit<br>(dB $\mu$ V) | Margin<br>(dB) |
| 0.48                           | 44.40                     | Hot       | 48.0                  | -3.60          |
| 0.53                           | 41.90                     | Hot       | 48.0                  | -6.10          |
| 0.54                           | 40.70                     | Neutral   | 48.0                  | -7.30          |
| 0.59                           | 38.90                     | Neutral   | 48.0                  | -9.10          |
| 2.84                           | 39.00                     | Neutral   | 48.0                  | -9.00          |
| 3.02                           | 39.50                     | Neutral   | 48.0                  | -8.50          |
| 3.25                           | 38.80                     | Neutral   | 48.0                  | -9.20          |
| 4.26                           | 39.80                     | Neutral   | 48.0                  | -8.20          |

Line Conducted Emissions Tabulated Data

  
 Measuring by : **Gea Won, Lee** / Project Engineer



**12.2 Radiated Emission Tests**

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Limits apply to : FCC CFR 47, PART 18, SUBPART C

Type of Tests : CLASS B

Result : PASSED BY \_\_\_\_\_ dB

EUT : SELF-BALLASTED LAMP

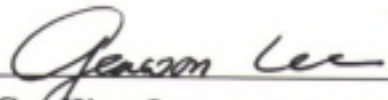
Date : July 6, 1998

Operating Condition : NORMAL

Detector : CISPR Quasi-Peak ( 6 dB Bandwidth : 120 kHz)

Distance : 3 Meters

| Radiated Emissions                                  |                      | Ant  | Correction Factors   |               | Total                  | FCC CLASS B             |                |
|-----------------------------------------------------|----------------------|------|----------------------|---------------|------------------------|-------------------------|----------------|
| Freq.<br>(MHz)                                      | Amp.<br>(dB $\mu$ V) | Pol. | Ant.<br>(dB $\mu$ V) | Cable<br>(dB) | Amp.<br>(dB $\mu$ V/m) | Limit<br>(dB $\mu$ V/m) | Margin<br>(dB) |
|                                                     |                      |      |                      |               |                        |                         |                |
|                                                     |                      |      |                      |               |                        |                         |                |
|                                                     |                      |      |                      |               |                        |                         |                |
| <b>There was no found Emissions during the test</b> |                      |      |                      |               |                        |                         |                |
|                                                     |                      |      |                      |               |                        |                         |                |
|                                                     |                      |      |                      |               |                        |                         |                |
|                                                     |                      |      |                      |               |                        |                         |                |

  
 Measuring by : **Gea Won, Lee** / Project Engineer

**13. FIELD STRENGTH CALCULATION**

Meter readings are compared to the specification limit correcting for antenna and cable losses

|                         |           |
|-------------------------|-----------|
| + Meter reading         | (□□)      |
| + Cable Loss            | (□)       |
| + Antenna Factor (Loss) | (□/meter) |

---

|                       |            |
|-----------------------|------------|
| = Corrected Reading   | (□□/meter) |
| - Specification Limit | (□□/meter) |
| = dB Relative to Spec | (+/- □)    |