

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 & ADDRESS	KUMHO ELECTRIC, INC. 690, Byung Jom-Ri, Taean-Up, Whasung-Gun Kyunggi-Do, Korea		

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

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**KUMHO ELECTRIC, INC**

690, Byung Jom-Ri, Taean-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,

A handwritten signature in black ink, appearing to read 'Deok Jin Kim'.

Deok Jin Kim / Manager

Kumho Electric, Inc.

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

TEL : +82-331-229-6401

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1. VERIFICATION OF COMPLIANCE

APPLICANT : KUMHO ELECTRIC, INC.
690, Byung Jom-Ri, Taean-Up, Whasung-Gun Kyunggi-Do, Korea

CONTACT PERSON : Deok-Jin, Kim / Manager

TELEPHONE NO : 82-331-229-6401

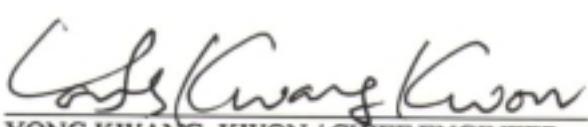
FCC ID : N4AEFTR1201 MODEL NO/NAME : EFTR 1223

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 AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	CONSUMER ISM DEVICE (CFR 47, PART 18, SUBPART-C)
MODIFICATIONS ON THE EQUIPMENT 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/manufacturer's product to establish compliance with these rules.

The test data contained in this report was obtained utilizing test procedures, equipment, and site that in 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 9109-4443 9109-4444	FEB./98	12MONTH	■
7	Log Periodic antenna	EMCO	3146	9109-3213 9109-3214 9109-3217	FEB./98	12MONTH	■
8	LISN	EMCO	3825/2	9109-1867 9109-1869	FEB./98	12MONTH	■
9	Computer System Hard disk drive	HP	98581C 9153C	98543A CMC762Z9153	N/A N/A	N/A N/A	■ ■
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 MHz	Emissions uV	Emissions 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 MHz	Emissions 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 MHz	Emissions uV	Emissions 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 by equipment(Watts)	Field Strength limit(uV/m)	Distance (meters)
Any type unless otherwise 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 and RF stabilized arc 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	$2,400/F(\text{kHz})\sqrt{\text{power}/500}$	3 300
	4,900 to 1,600kHz	Any	$2,400/F(\text{kHz})$	30
		Any	15	30
Induction cooking range	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 extend 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 (MHz)	Distance (Meters)	Radiated (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

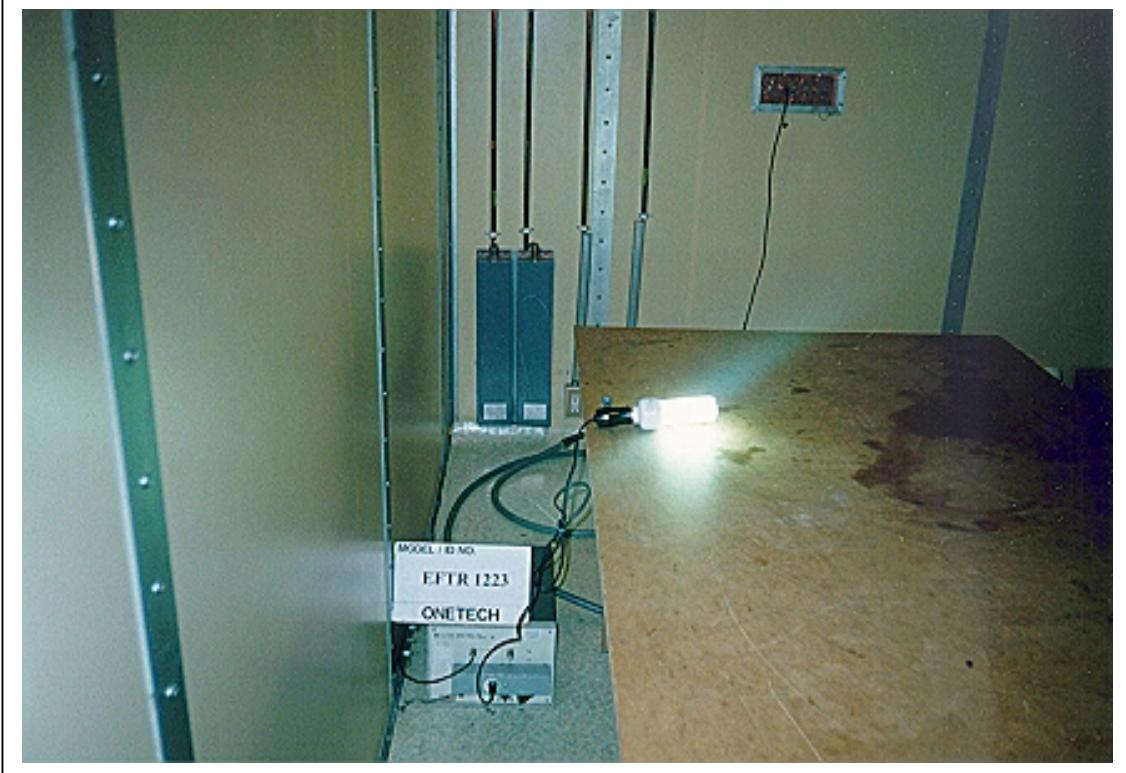
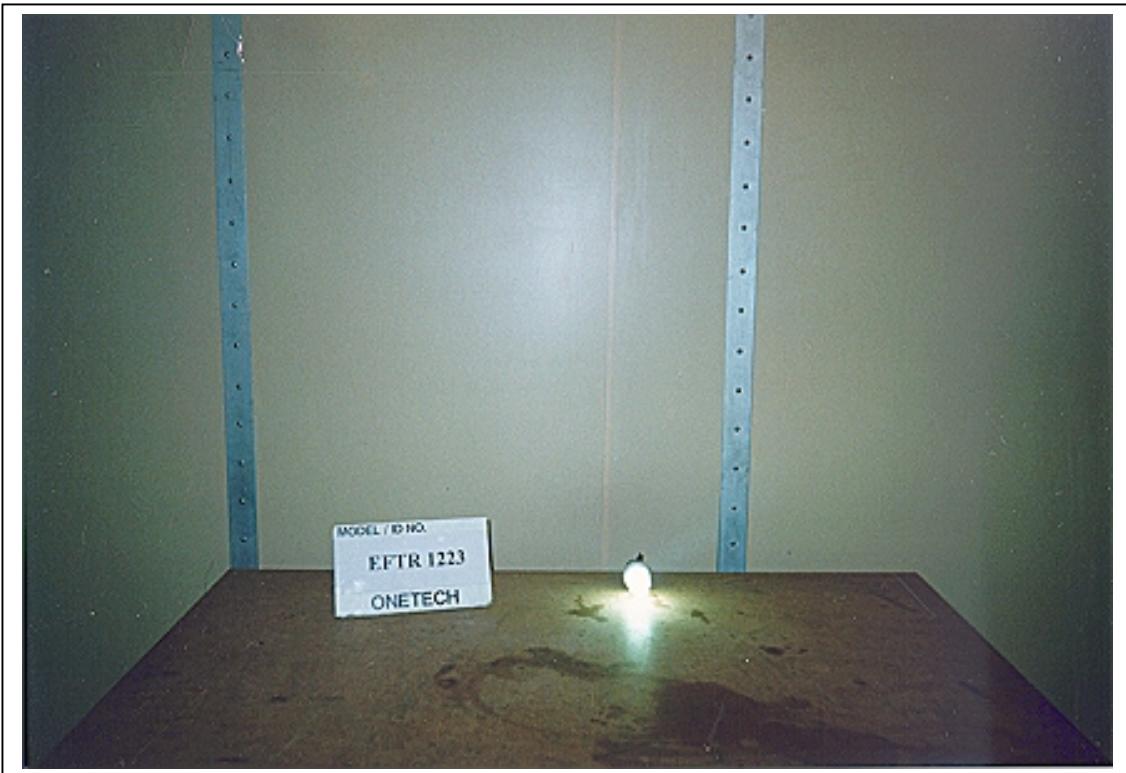
Company Name	KUMHO ELECTRIC, INC.
E.U.T.	SELF BALLAST
Serial Number	N/A
Type of Test	CERTIFICATION(CFR 47, PART 18, SUB-C)
Passed/Fail	PASSED

Line Conducted Test	EUT was connected to AC 120V power source.
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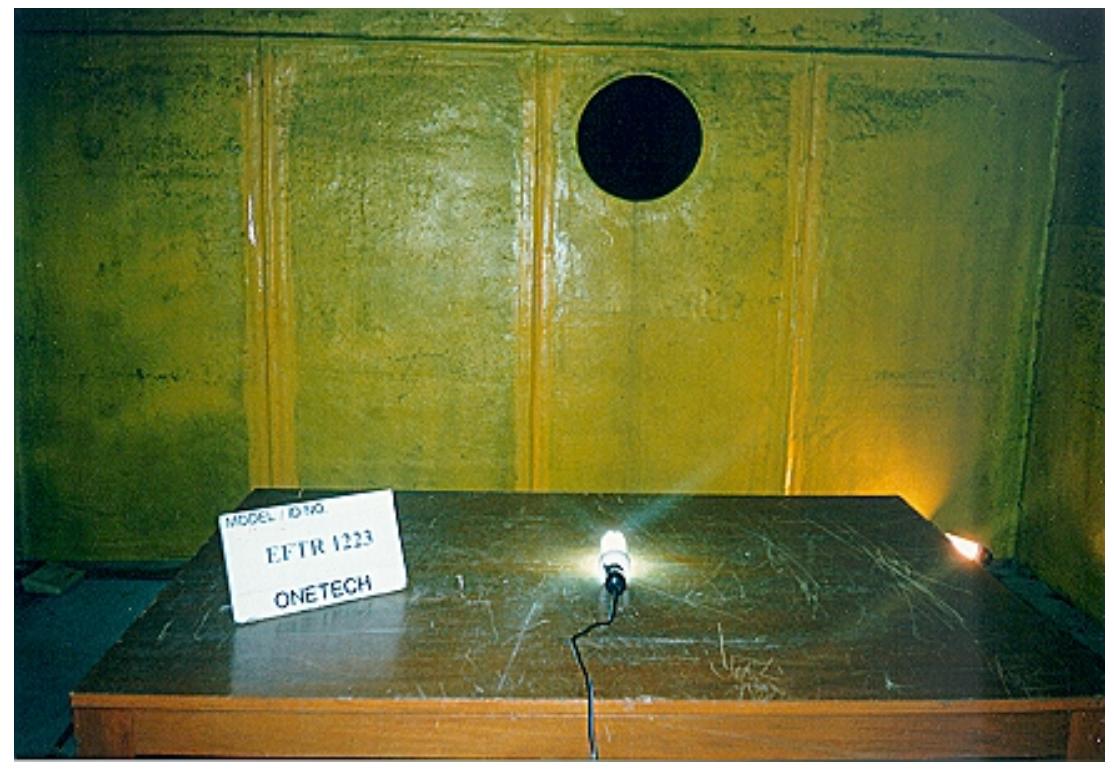
Radiated Emission Test	EUT was setup as the same as it was in the Line Conducted Test. EUT was tested at a 3-meter open test site.
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11. CONDUCTED AND RADIATED MEASUREMENT PHOTOS

<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

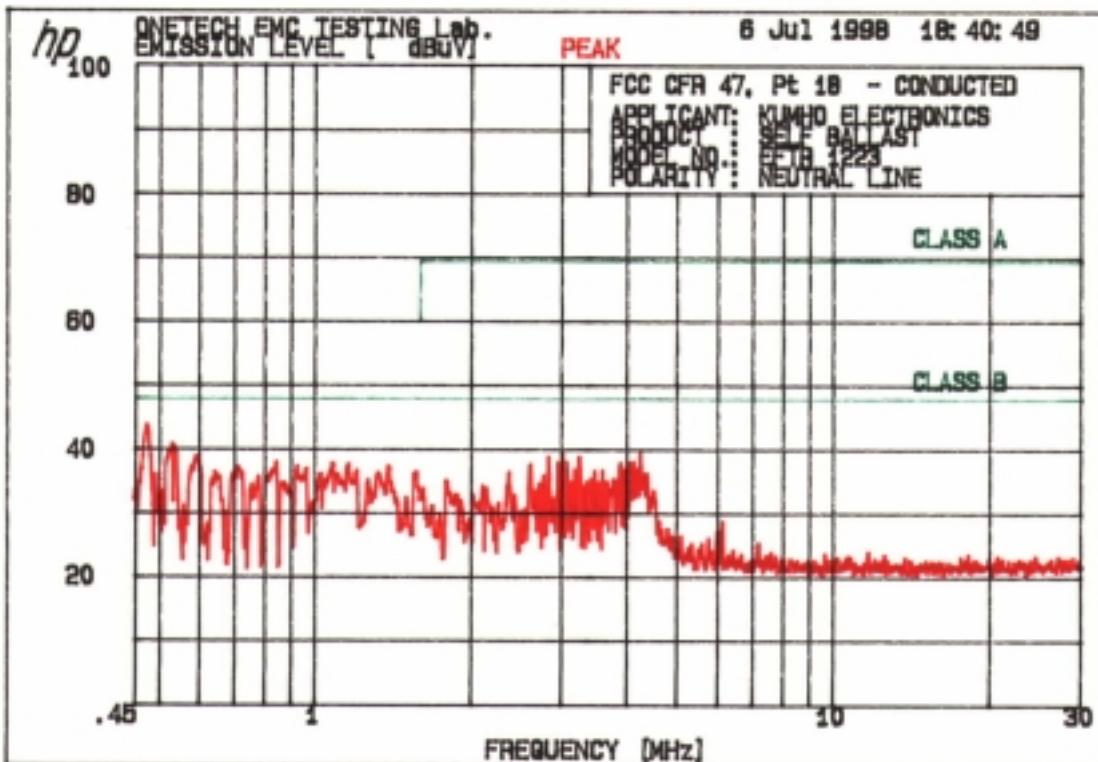
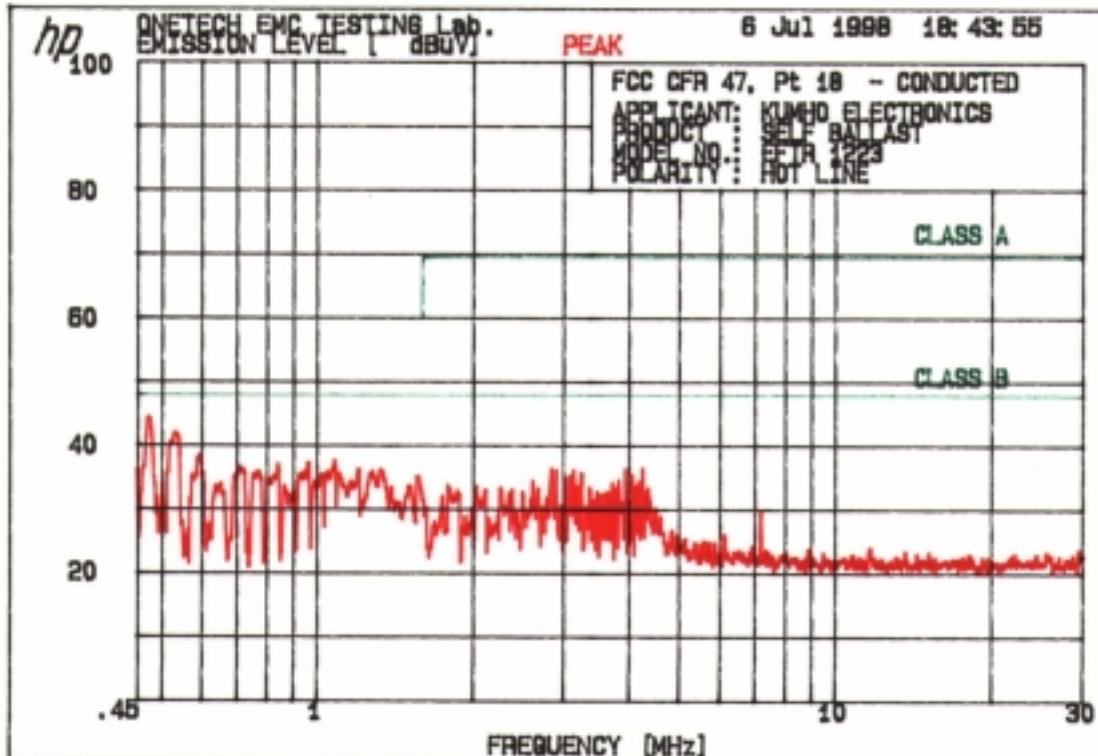
Limits apply to : FCC CFR 47, PART 18, SUBPART C
 Type of Tests : CLASS B
 Result : PASSED BY -3.60 dB

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 (MHz)	Amplitude (dB μ V)	conductor	Limit (dB μ V)	Margin (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 : Geon 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

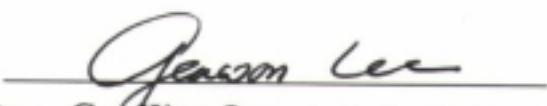
Date : July 6, 1998

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. (MHz)	Amp. (dB μ V)		Ant. (dB μ V)	Cable (dB)		Amp. (dB μ V/m)	Limit (dB μ V/m)
There was no found Emissions during the test							


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 (+/- □)