

**EXHIBIT 2**

**Test Report**

**Lithonia Lighting**

FCC Part 15 Application  
For  
Certification  
(Low Power Transmitter)

**Indura Emergency Lighting Unit Transmitter**  
**Models: ELA RTT**

**FCC ID: xxxELARTT**

June 19, 2000

Grantee Code Applied For  
Lithonia Lighting  
FCCID: xxxELARTT

Report prepared by:

Greg A. Thompson  
Intertek Testing Services  
1950 Evergreen Blvd., Suite 100  
Duluth, GA 30096  
Phone: 678-775-2400  
FAX: 678-775-2401  
E-mail: gthompson@itsqs.com

**SUMMARY OF CONTENTS**

**LIST OF EXHIBITS**

<b>EXHIBIT 1:</b>	Operational Description / Letter of Agency
<b>EXHIBIT 2:</b>	Test Report
<b>EXHIBIT 3:</b>	ID Label & Location
<b>EXHIBIT 4:</b>	Block Diagram
<b>EXHIBIT 5:</b>	User Manual
<b>EXHIBIT 6:</b>	Test Setup Photographs
<b>EXHIBIT 7:</b>	External Photographs
<b>EXHIBIT 8:</b>	Internal Photographs
<b>EXHIBIT 9:</b>	Schematics

TABLE OF CONTENTS

<b>1.0</b>	<b>General Description .....</b>	<b>1</b>
1.1	Product Description .....	1
1.2	Related Submittals / Grants .....	1
1.3	Test Methodology.....	2
1.4	Test Facility.....	2
1.5	Test Equipment List .....	3
<b>2.0</b>	<b>System Test Configuration .....</b>	<b>4</b>
2.1	Justification.....	4
2.2	EUT Exercising Software .....	4
2.3	Special Accessories.....	4
2.4	Equipment Modification.....	4
2.5	Support Equipment List and Description.....	5
2.6	Test Configuration Block Diagram .....	5
<b>3.0</b>	<b>Emission Results .....</b>	<b>6</b>
3.1	Field Strength Calculation .....	6
3.2	Radiated Emission Test Data .....	7
3.3	Line Conducted Emission Test Data.....	9
<b>4.0</b>	<b>Miscellaneous Information .....</b>	<b>10</b>
4.1	Emissions Test Procedures .....	10
4.2	Measured Bandwidth.....	11
4.3	Calculation of Average Factor.....	12
4.4	Operating Characteristics and Holdover Time .....	13

## **1.0 General Description**

### **1.1 Product Description**

The Transmitter Model ELA RTT is part of an emergency lighting unit. The emergency lighting unit is equipped with a battery charger circuitry to detect AC power failures. The lighting unit provides 90 minutes of emergency lighting along a path of egress. The unit also contains a RF receiver circuit that controls a solid state switch. This solid state switch acts as a test switch for the unit. Pressing the button on the RF remote transmitter remotely activates this test switch via the RF receiver circuit.

The SAW stabilized transmitter is based on the well-known Colpitts oscillator topology. This design is a single transistor type that performs both the function of the oscillation and transmission via a printed circuit coil, which serves as the transmitting antenna.

### **1.2 Related Submittals**

There are no related submittals for this application.

### 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. The procedures for maximizing emissions as described in this report were followed. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

### 1.4 Test Facility

The North site is located at 4317-A Park Drive in Norcross, Georgia. The site consists of a wooden enclosed structure with a steel ground plane. The site meets the characteristics of ANSI C63.4: 1992 and is on file with the FCC. Please reference the site filing number: 3140/SIT 1300F2, dated April 26, 1996. This Facility is accredited by NAVLAB program (NVLAB Code: 100409-0). For measurements a remotely controlled flush mounted metal top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan from one to four meters in height. The site enclosure is constructed of non-conductive materials.

**1.5 Test Equipment List**

The following test equipment was used during testing:

<b>Type</b>	<b>Manufacturer</b>	<b>Model Number</b>	<b>Serial Number</b>
Spectrum Analyzer	Hewlett Packard	HP8546	3650A00362
Spectrum Analyzer	Hewlett Packard	HP8566	2134A01032
Preamplifier	Hewlett Packard	HP8449B	3008A00989
Horn Antenna	EMCO	3115	9208-3919
Horn Antenna	AHSystems	SAS-200/571	246
Antennas	Chase	CBL6112A	2245
Antenna Mast	EMCO	M100	Mast 01

### **2.0 System Test Configuration**

#### **2.1 Justification**

The transmitter was configured for testing in a typical fashion. During testing, the device was mounted to a cardboard box, which enabled the engineer to maximize emissions through placement in its three orthogonal axes.

The device was powered from one new, fully charged battery.

#### **2.2 EUT Exercising Software**

There was no special software to exercise the device. Once activated, the unit transmits the typical signal. For simplicity of testing, the unit was wired to transmit continuously.

#### **2.3 Special Accessories**

There are no special accessories necessary for compliance of this product.

#### **2.4 Equipment Modification**

Any modifications installed previous to testing by Lithonia Lighting, will be incorporated in each production model sold/leased in the United States.

There were no modifications installed by Intertek Testing Services.

### 2.5 Support Equipment List and Description

The information for all equipment, plus descriptions of all cables used in the tested system are:

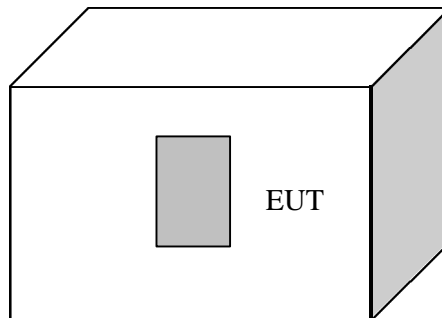
None

Cables:

None

### 2.6 Test Configuration Block Diagram

Figure 2.6 Configuration of Tested System





### 3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables the emissions are included.

#### 3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength in dB $\mu$ V/m

RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

Where FS = Field Strength in dB $\mu$ V/m

RR = RA - AG in dB $\mu$ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 23 + 9 = 32 \text{ dB}\mu\text{V/m}$$

$$RR = 23.0 \text{ dB}\mu\text{V}$$

$$LF = 9.0 \text{ dB}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

### 3.2 Radiated Emission Test Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 1.4 dB

Readings under 1GHz are Peak  
Readings over 1GHz are Peak

***Test Personnel:*** \_\_\_\_\_

*Arthur J. Croone, Project Engineer*

***Date:*** 6/19/2000

# Intertek Testing Services

## Radiated Emissions / Interference

Table: 1

Company: Lithonia Lighting, INC.

Model: ELA RTT

Job No.: J20011987

Date: 05/01/00

Standard: FCC15

Class: C

Notes: 0

Group: None

Tested by: Arthur J. Croone

Location: Norcross

Detector: HP 8546

Antenna: AHSYS571

PreAmp: None

Cable(s): cable8 cable9

Distance: 3

Signature: \_\_\_\_\_

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	
H	315.000	37.1	13.2	4.7	0.0	5.0	50.0	75.6	-25.6	X
H	315.000	51.4	13.2	4.7	0.0	5.0	64.4	75.6	-11.2	Y
H	315.000	45.3	13.2	4.7	0.0	5.0	58.2	75.6	-17.4	Z
H	630.000	24.8	18.8	7.1	0.0	5.0	45.7	55.6	-9.9	X
H	630.000	33.3	18.8	7.1	0.0	5.0	54.2	55.6	-1.4	Y
H	630.000	28.0	18.8	7.1	0.0	5.0	48.9	55.6	-6.7	Z
H	945.000	6.4	20.5	8.8	0.0	5.0	30.7	55.6	-24.9	X
H	945.000	6.5	20.5	8.8	0.0	5.0	30.8	55.6	-24.8	Y
H	945.000	6.6	20.5	8.8	0.0	5.0	30.9	55.6	-24.7	Z
H	1260.000	9.6	25.5	1.3	0.0	5.0	31.4	54.0	-22.6	Y
H	1260.000	22.3	25.5	1.3	0.0	5.0	44.1	54.0	-9.9	X
H	1260.000	22.5	25.5	1.3	0.0	5.0	44.3	54.0	-9.7	Z
H	1575.000	8.2	26.6	1.5	0.0	5.0	31.3	54.0	-22.7	X
H	1575.000	18.1	26.6	1.5	0.0	5.0	41.2	54.0	-12.8	Y
H	1575.000	15.9	26.6	1.5	0.0	5.0	39.0	54.0	-15.0	Z
H	1890.000	7.7	28.8	1.9	0.0	5.0	33.4	55.6	-22.2	X
H	1890.000	9.2	28.8	1.9	0.0	5.0	34.9	55.6	-20.7	Y
H	1890.000	6.0	28.8	1.9	0.0	5.0	31.7	55.6	-23.9	Z
H	2205.000	4.7	30.3	2.0	0.0	5.0	32.0	54.0	-22.0	X
H	2205.000	5.4	30.3	2.0	0.0	5.0	32.7	54.0	-21.3	Y
H	2205.000	5.2	30.3	2.0	0.0	5.0	32.5	54.0	-21.5	Z
H	2520.000	6.6	31.3	2.2	0.0	5.0	35.1	54.0	-18.9	X
H	2520.000	6.2	31.3	2.2	0.0	5.0	34.7	54.0	-19.3	Y
H	2520.000	7.1	31.3	2.2	0.0	5.0	35.6	54.0	-18.4	Z
H	2835.000	4.7	32.3	2.2	0.0	5.0	34.2	54.0	-19.8	X
H	2835.000	5.2	32.3	2.2	0.0	5.0	34.7	54.0	-19.3	Y
H	2835.000	5.1	32.3	2.2	0.0	5.0	34.6	54.0	-19.4	Z
H	3150.000	5.4	32.4	2.2	0.0	5.0	35.0	54.0	-19.1	X
H	3150.000	5.6	32.4	2.2	0.0	5.0	35.2	54.0	-18.8	Y
H	3150.000	5.8	32.4	2.2	0.0	5.0	35.4	54.0	-18.7	Z

### 3.3 Line Conducted Emission Test Data

**Note:** Line Conducted Emission testing was not required for this device since it is battery powered and does not connect to the AC Mains.

### 4.0 Transmitter Information

This miscellaneous information includes details of the test procedures, measured bandwidth, and calculation of factors such as pulse desensitization and averaging factor.

#### 4.1 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under FCC Part 15 rules.

The transmitting equipment under test (EUT) is attached to a cardboard box and placed on a wooden table approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The cardboard box is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode or average mode (see attached data table). If peak measurements are taken for comparison with the average limit, they are corrected by measuring the duty cycle of the equipment under test and subtracting the corresponding average factor in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.3.

The frequency range scanned is from the lowest radio frequency signal generated, but not lower than 9kHz in the device up to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 450 KHz to 30 MHz.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Measurements were made as described in ANSI C63.4: 1992.

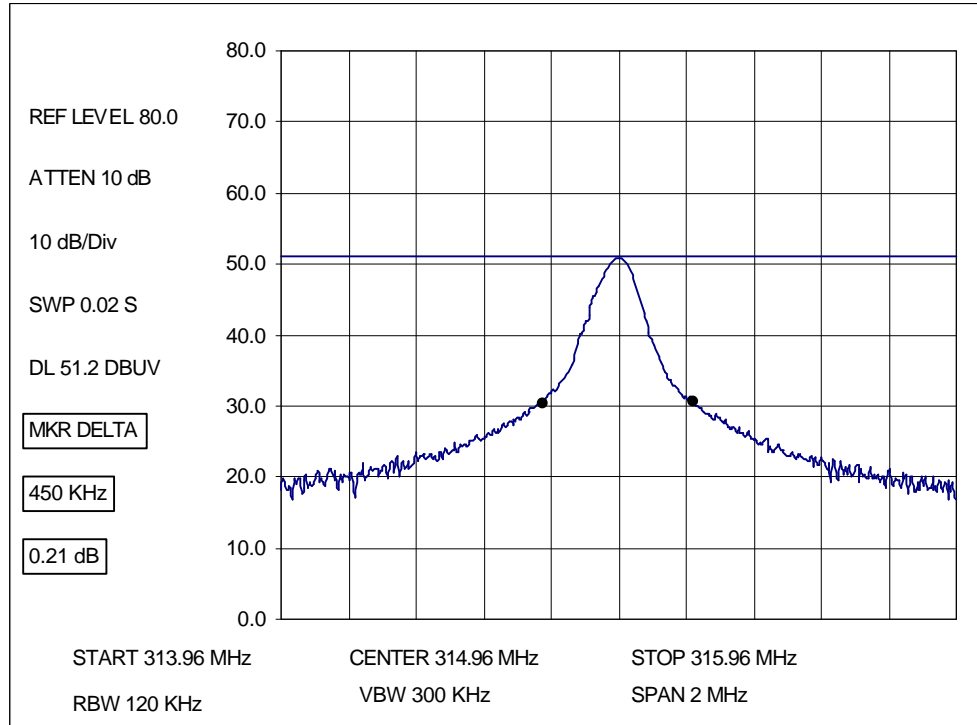
The resolution bandwidth used for measurement of radiated signal strength was 100 KHz or greater below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor readings in the forbidden bands and above 1 GHz, signals may be acquired at a distance of one meter or less. All measurements are taken at three meters unless otherwise noted on the data tables.

Frequency Stability is not specified for this device.

## 4.2 Measured Bandwidth

The plot on this page shows the fundamental emission when modulated with a worst-case bit sequence. From the plot, the bandwidth is observed to be **450 kHz**, at 20 dBc. The bandwidth limit is **1,045 kHz**. The unit meets the FCC Part 15 bandwidth requirements.



#### 4.3 Calculation of Average Factor

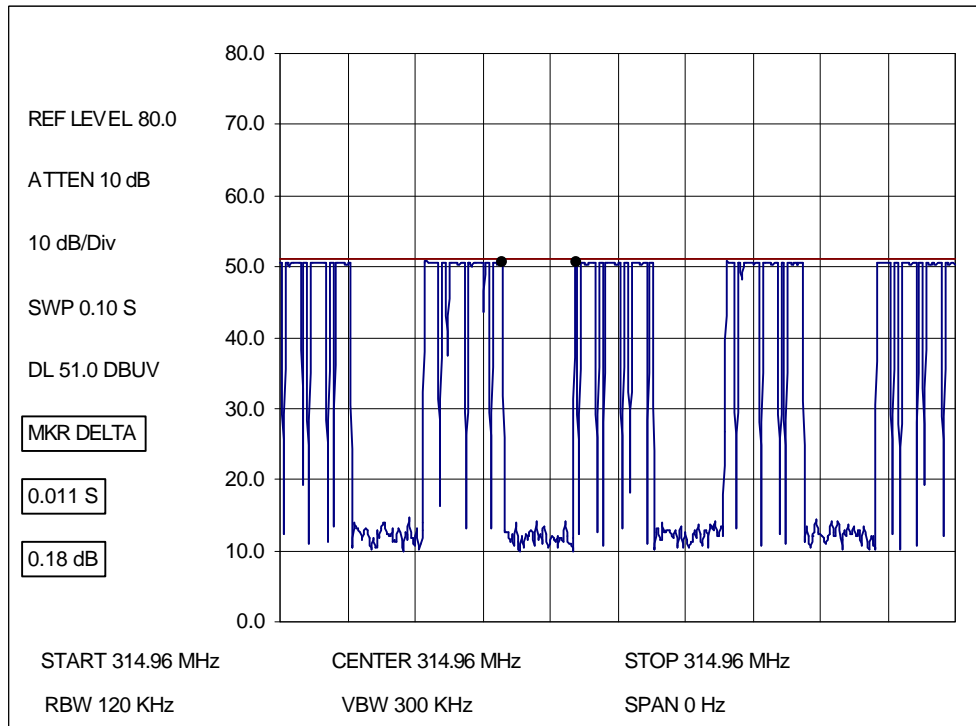
Averaging factor in dB =  $20 \log (\text{duty cycle})$

The specification for output field strengths in accordance with FCC Part 15 specifies measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero span (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

During testing, a worst-case duty cycle of 56 ms was observed. A plot of the worst-case duty cycle as observed during testing is included on this page.

Therefore, the averaging factor is found by  $20 \log_{10} (56/100) = -5.0 \text{ dB}$ .



### 4.4 Operating Characteristics and Holdover Time

This device is designed for momentary operation and is described in Section 15.231 of the FCC Rules. This device can only be activated manually. When activated manually this device will automatically deactivate within not more than five seconds of being released per 15.231(a)(1).

This device is deactivated at any time the button is not pressed.

This device does not employ periodic supervisory transmissions.