



LM-79-08 Test Report

for

ESPEN TECHNOLOGY, INC.

12257 Florence Ave, Santa Fe Springs, CA 90670

LED TUBE

Model: L24T8/830/9G-ID DE

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,
Hangzhou, Zhejiang Province, China 311100

Tel: +86 571 86376106

www.ledtestlab.com

Report No.: HZ17010034a

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by:

Engineer: April Zou
Jan. 19, 2017

Approved by:



Manager: Jim Zhang
Jan. 19, 2017

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government

Test Summary

Model	L24T8/830/9G-ID DE
Luminous Efficacy (Lumens /Watt)	130.8
Total Luminous Flux (Lumens)	1177.0
Power (Watts)	9.00
Power Factor	0.9895
CCT (K)	3088
CRI	82.7
Stabilization Time (Light & Power)	60 mins
Note	3000K, Opal Lens

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Nov. 17, 2016
Date of Test	: Nov. 24, 2016
Test item	: Total Luminous Flux, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photo.....	4
TEST RESULTS	5
Spectral Power Distribution - Sphere Spectroradiometer Method	6
Chromaticity Diagram - Sphere Spectroradiometer Method.....	7
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	8
EQUIPMENT LIST	9
TEST METHODS	9
Seasoning of SSL Product.....	9
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	9

Sample Photo



Sample view

Equipment Under Test (EUT)

Name	: LED TUBE
Model	: L24T8/830/9G-ID DE
Electrical Ratings	: 120-277VAC, 50/60Hz
Product Description	: 3000K, fixed end caps, 2 feet tube, Opal Lens Manufacturer of light source: EVERLIGHT ELECTRONICS CO., LTD Model of LED light source: 67-21S Series

TEST RESULTS

Test ambient temperature was 25.0°C.

Test orientation was Horizontal. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 65 minutes.

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.076	0.037
Power Factor	0.9895	0.9226
Test Power (W)	9.00	9.40
THD A%	12.17	20.08
Luminous Efficacy (lm/W)	130.8	126.9
Total Luminous Flux (lm)	1177.0	1193.0
Color Rendering Index (CRI)	82.7	
R9	6.1	
Correlated Color Temperature (CCT)(K)	3088	
Chromaticity Chroma x	0.4310	
Chromaticity Chroma y	0.4026	
Chromaticity Chroma u	0.2474	
Chromaticity Chroma v	0.3466	
Duv	0.0003	
Chromaticity Chroma u'	0.2474	
Chromaticity Chroma v'	0.5199	

Special Color Rendering Indices	
R1	81.7
R2	93.5
R3	93
R4	79.4
R5	82.4
R6	92.6
R7	81
R8	57.7
R9	6.1
R10	85.5
R11	78.9
R12	75.5
R13	84.9
R14	96.6

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u', v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Spectral Power Distribution - Sphere Spectroradiometer Method

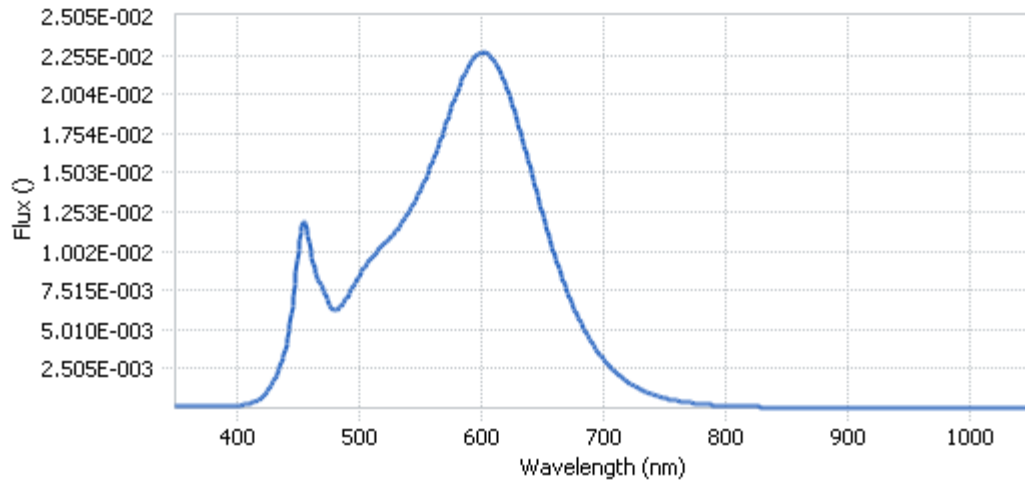
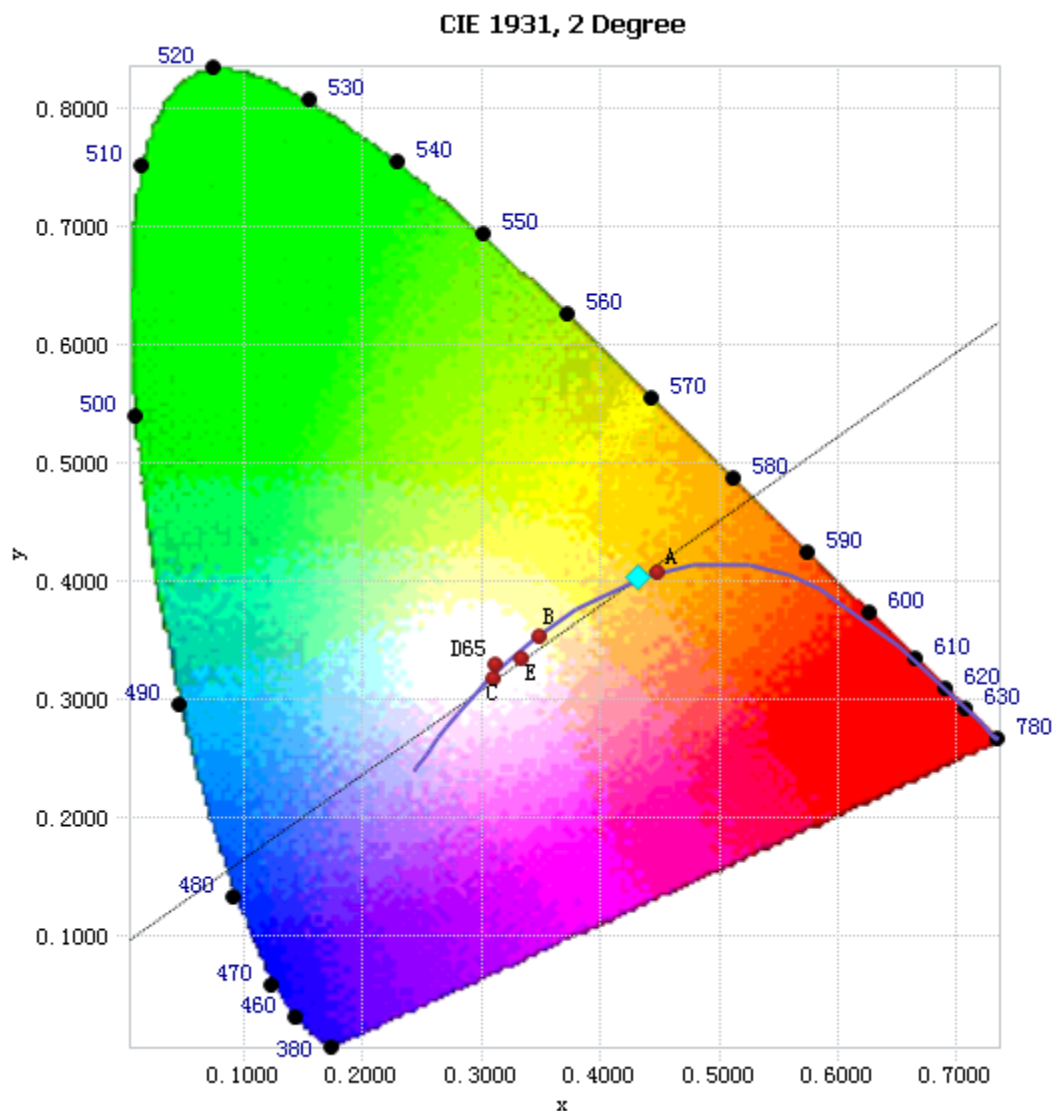


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.63E-04	485	6.47E-03	590	2.18E-02	695	3.73E-03
385	1.51E-04	490	7.02E-03	595	2.24E-02	700	3.18E-03
390	1.60E-04	495	7.67E-03	600	2.27E-02	705	2.72E-03
395	1.60E-04	500	8.38E-03	605	2.27E-02	710	2.33E-03
400	1.70E-04	505	9.01E-03	610	2.23E-02	715	2.00E-03
405	2.03E-04	510	9.56E-03	615	2.17E-02	720	1.70E-03
410	2.71E-04	515	1.00E-02	620	2.08E-02	725	1.46E-03
415	4.18E-04	520	1.04E-02	625	1.97E-02	730	1.25E-03
420	6.39E-04	525	1.08E-02	630	1.84E-02	735	1.07E-03
425	1.04E-03	530	1.12E-02	635	1.70E-02	740	9.00E-04
430	1.63E-03	535	1.18E-02	640	1.56E-02	745	7.75E-04
435	2.48E-03	540	1.24E-02	645	1.41E-02	750	6.56E-04
440	3.78E-03	545	1.31E-02	650	1.27E-02	755	5.63E-04
445	5.96E-03	550	1.38E-02	655	1.13E-02	760	4.86E-04
450	9.44E-03	555	1.46E-02	660	9.99E-03	765	4.18E-04
455	1.19E-02	560	1.56E-02	665	8.78E-03	770	3.59E-04
460	1.06E-02	565	1.67E-02	670	7.69E-03	775	3.08E-04
465	8.60E-03	570	1.78E-02	675	6.69E-03	780	2.64E-04
470	7.80E-03	575	1.89E-02	680	5.82E-03		
475	6.86E-03	580	2.00E-02	685	5.02E-03		
480	6.25E-03	585	2.11E-02	690	4.32E-03		

Table 3: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.4310, 0.4026)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

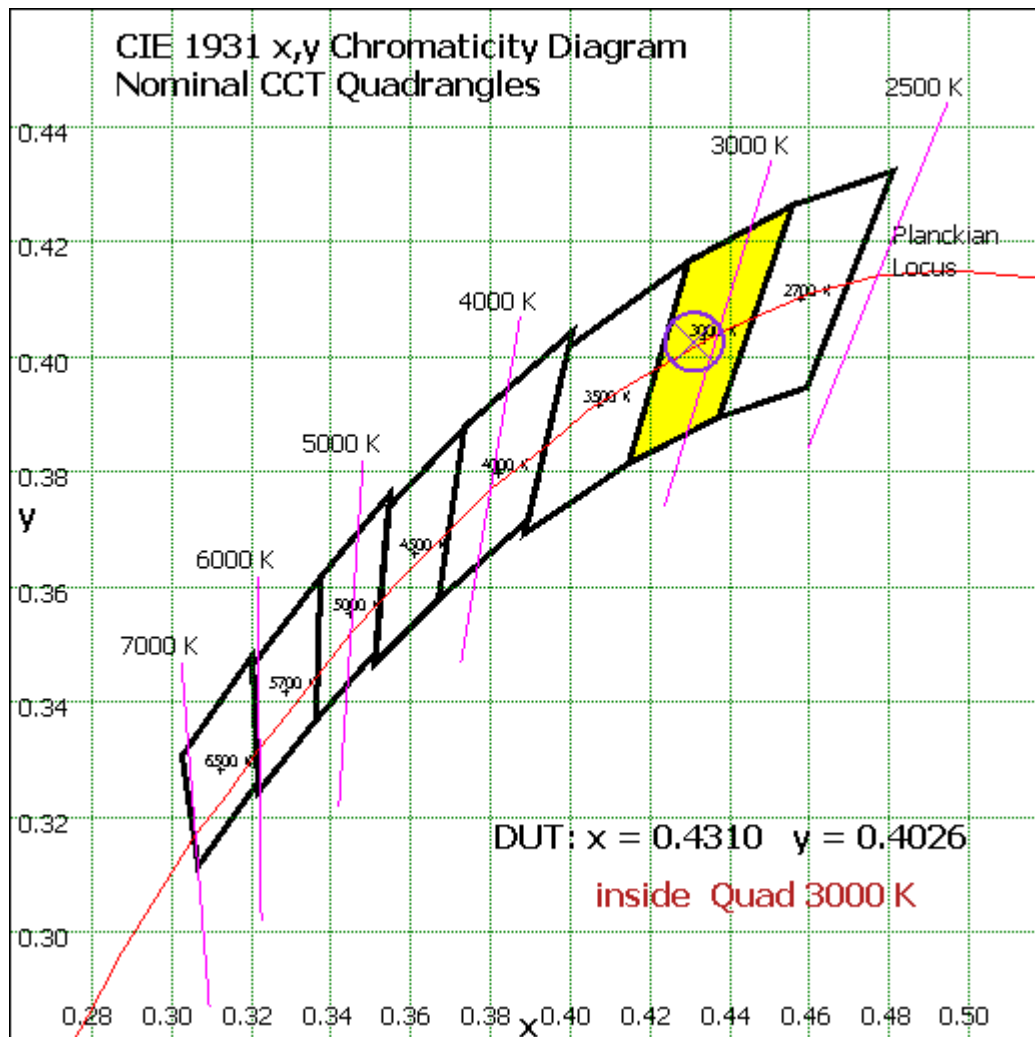


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Integrate Sphere system	2M	HZTE015-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	WT210	HZTE008-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-07	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	6154	HZTE004-04	Jul. 27, 2016	Jul. 26, 2017
Temperature and humidity recorder	JR900	HZTE018-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	SCL-1400	HZTE012-02	Jul. 27, 2016	Jul. 26, 2017

Table 4: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π . Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED TUBEs) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expended uncertainty is 1.06% with a coverage factor $k=2$.

*** End of Report ***

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.