LM-79-08 Test Report

for

Starco Lighting INC

Address: 2495 Main Street, Suite 218, Buffalo NY 14214

LED T8 Lamp

Model: SLT813P440-S

Laboratory: Leading Testing Laboratories Texas Branch

NVLAP CODE: 201071-0

20823 Park Row Dr., Houston TX 77449, U.S.A

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Report No.: UT17100002-01a

Reviewed / Approved by:

Manager: Chaoguang Su

Date: Oct. 06, 2017

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

TEST SUMMARY

Sample Tested: SLT813P440-S

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
136.90	1810.8	13.229	0.9925

CCT (K)	CRI	Stabilization Time (Light & Power)
3971	83.9	45 mins

Table 1. Executive Data Summary

Test specifications:	
Date of Receipt	: Oct. 06, 2017
Date of Test	: Oct. 06, 2017
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

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SAMPLE PHOTO

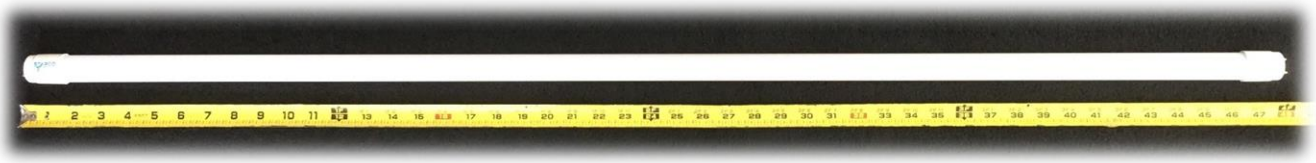


Figure 1. Overview of the sample

Equipment Under Test (EUT)	
Name	: LED T8 Lamp
Model	: SLT813P440-S
Electrical Ratings	: 100-277V AC, 50/60 Hz, 13W
Product Description	: 4000K, G13 Base, Internal- Driver, Non- Dimmable, Frosted Lens, 4 Feet Tube Model of LED light source: 2835
Manufacturer	: Starco Lighting INC
Address	: 2495 Main Street, Suite 218, Buffalo NY 14214

TEST RESULTS

Test ambient temperature was 24.9^{0}C.

Base orientation was light down. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 45 minutes, and the total operating time including stabilization was 45 minutes.

Parameter	Result			Special Color Rendering Index	
Test Voltage (V)	99.960	277.04	119.99	R1	82.3
Voltage frequency (Hz)	60.003	60.003	60.003	R2	91.1
Test Current (A)	0.13334	0.05210	0.11107	R3	96.4
Power Factor	0.9925	0.9220	0.9900	R4	81.6
Test Power (W)	13.229	13.309	13.194	R5	82.2
Luminous Efficacy (lm/W)	136.90	137.92	138.41	R6	87.8
THD A%	10.668	18.267	11.459	R7	85.7
Total Luminous Flux (lm)	1810.8	1835.3	1826.5	R8	64.3
Color Rendering Index (CRI)	83.9			R9	9.7
R9	9.7			R10	78.5
Correlated Color Temperature (CCT) (K)	3971			R11	78.8
Chromaticity Chroma x	0.3836			R12	59.5
Chromaticity Chroma y	0.3835			R13	84.4
Chromaticity Chroma u	0.2245			R14	98.5
Chromaticity Chroma v	0.3367				
Duv	0.0022				
Chromaticity Chroma u’	0.2245				
Chromaticity Chroma v’	0.5051				

Table 2. Test data per Sphere 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

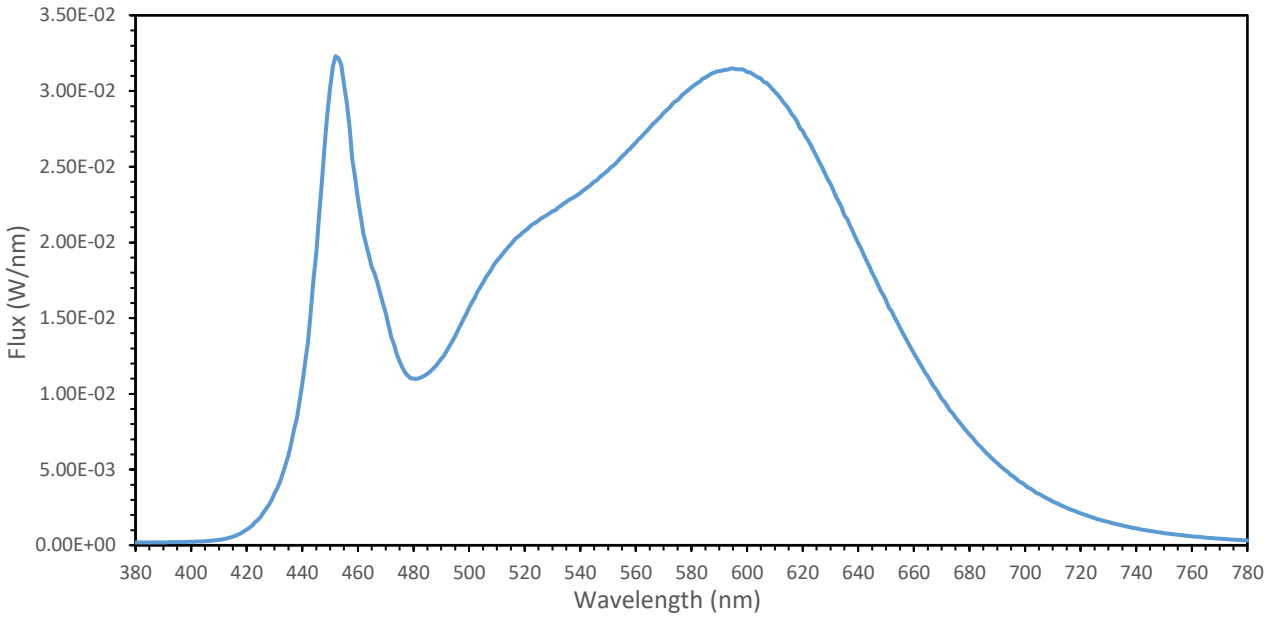
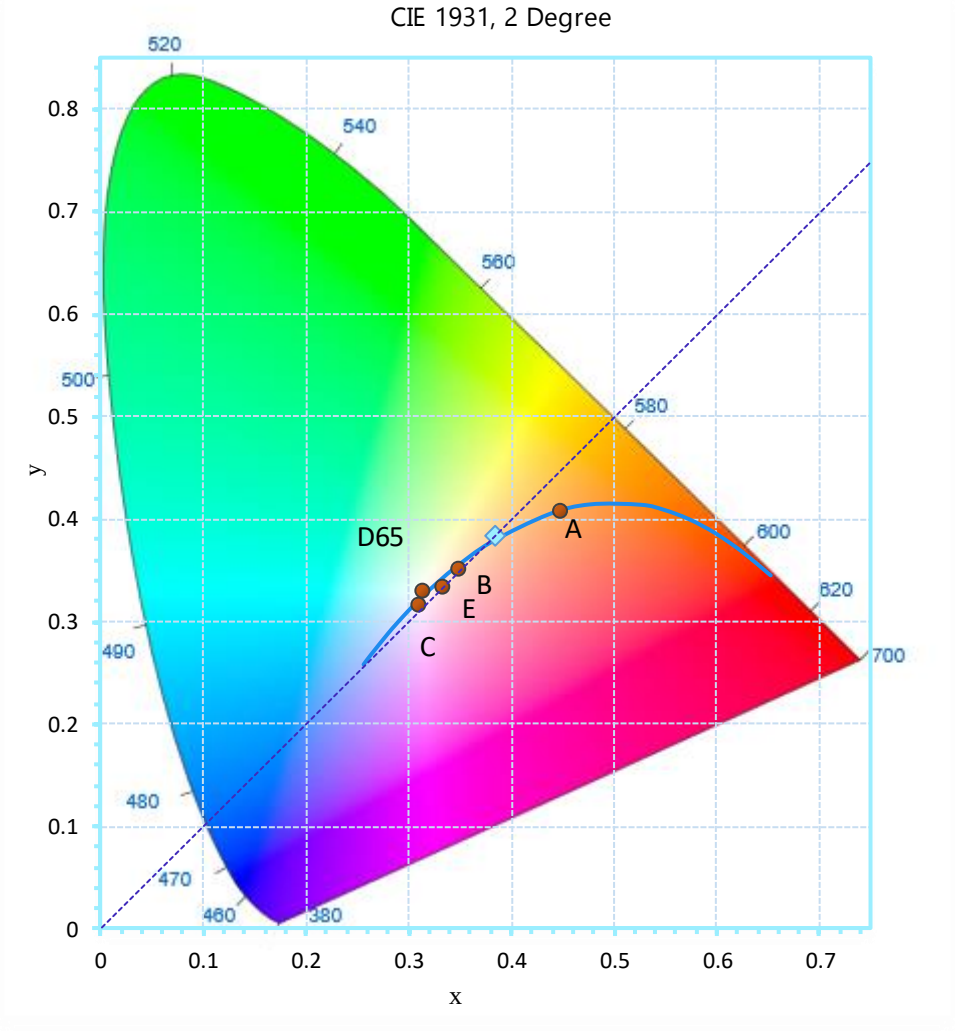


Chart 1. Spectral Power Distribution

Spectral power distribution in visible wavelength							
WL(nm)	Flux (Watts/nm)	WL(nm)	Flux (Watts/nm)	WL(nm)	Flux (Watts/nm)	WL(nm)	Flux (Watts/nm)
380	1.91E-04	485	1.13E-02	590	3.13E-02	695	4.63E-03
385	1.91E-04	490	1.23E-02	595	3.15E-02	700	3.98E-03
390	1.94E-04	495	1.38E-02	600	3.13E-02	705	3.40E-03
395	2.06E-04	500	1.57E-02	605	3.08E-02	710	2.90E-03
400	2.28E-04	505	1.73E-02	610	3.00E-02	715	2.47E-03
405	2.70E-04	510	1.88E-02	615	2.88E-02	720	2.11E-03
410	3.51E-04	515	1.99E-02	620	2.74E-02	725	1.80E-03
415	5.63E-04	520	2.08E-02	625	2.57E-02	730	1.53E-03
420	1.02E-03	525	2.15E-02	630	2.39E-02	735	1.30E-03
425	1.89E-03	530	2.21E-02	635	2.18E-02	740	1.11E-03
430	3.42E-03	535	2.27E-02	640	2.00E-02	745	9.46E-04
435	5.95E-03	540	2.33E-02	645	1.80E-02	750	8.06E-04
440	1.06E-02	545	2.40E-02	650	1.62E-02	755	6.93E-04
445	1.93E-02	550	2.48E-02	655	1.44E-02	760	5.94E-04
450	3.02E-02	555	2.57E-02	660	1.27E-02	765	5.06E-04
455	3.05E-02	560	2.66E-02	665	1.12E-02	770	4.37E-04
460	2.29E-02	565	2.76E-02	670	9.67E-03	775	3.77E-04
465	1.84E-02	570	2.85E-02	675	8.46E-03	780	3.23E-04
470	1.53E-02	575	2.94E-02	680	7.31E-03		
475	1.21E-02	580	3.02E-02	685	6.32E-03		
480	1.10E-02	585	3.09E-02	690	5.43E-03		

Table 3. Total Spectral Flux

CHROMATICITY DIAGRAM



Tristimulus values (x, y): (0.3836, 0.3835)

Chart 2. Chromaticity Diagram

Note: The location on the diagram of the tri-stimulus coordinates is indicated by the blue diamond.

NORMINAL CCT QUADRANGLES

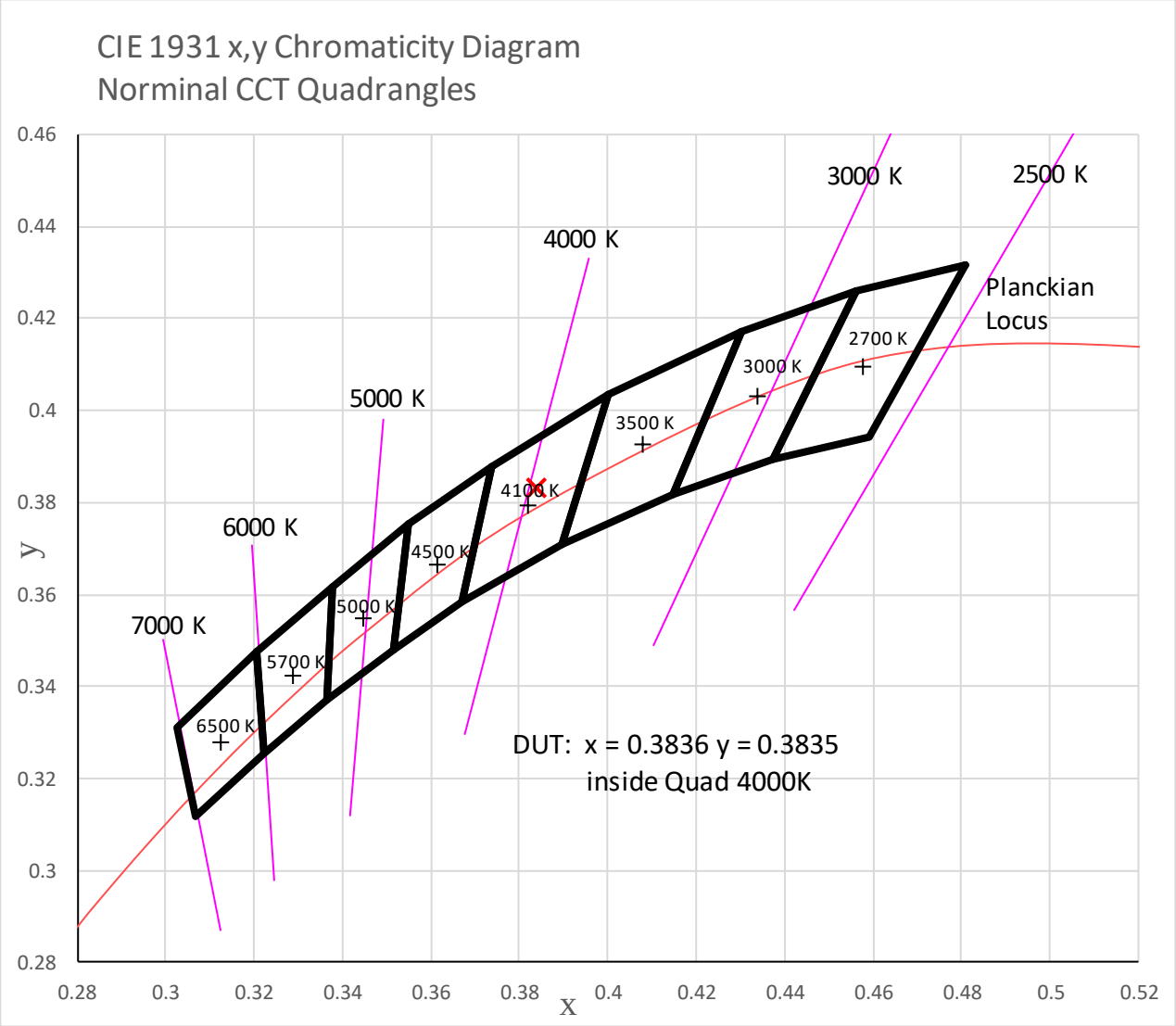


Chart 3. Plot of lamp x, y coordinates on CIE 1931 Chromaticity Diagram

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Sphere Spectroradiometer	ZWL-9200GT	UT-TE-002-01	9/18/2017	10/18/2017
Goniophotometer system	6240T	UT-TE-001-01	6/25/2017	6/25/2018
Digital Power Meter	WT310	UT-TE-001-13	6/6/2017	6/6/2018
AC Power Supply	IT7300	UT-TE-001-14	N/A	N/A
AC Power Supply	IT7321	UT-TE-002-08	N/A	N/A
Temperature Meter	TES-1310	UT-TE-003-02	6/6/2017	6/6/2018
Temperature and humidity recorder	Traceable 4800	UT-TE-003-05	2/24/2017	2/24/2019
Standard source	Labsphere SCL-1400	UT-TE-006-01	6/16/2014	TBD

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 ZVISION model ZWL-9200GT Spectroradiometer (with 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 380nm-780nm.

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 Luminaires) 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 WT-310 power meter.

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 1.62% with a coverage factor k=2.

Goniophotometer Method- Photometric and Electrical Measurements

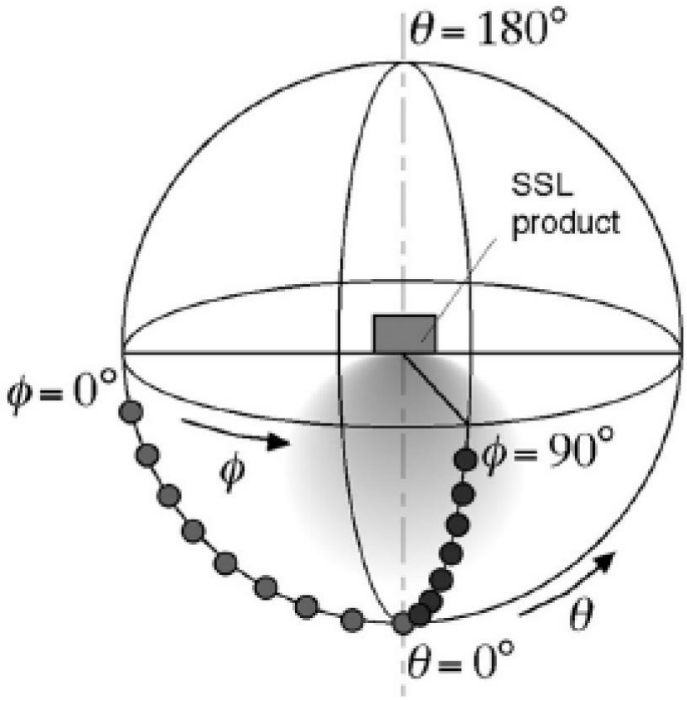
A ZVISION modelZWL-M9000 goniophotometer and gonio-colorimeter was used to measure the intensity distribution for a sample. Photometric distance is set to be 55 feet. Wavelength range for colorimetric measurement is 380nm-780nm. Ambient temperature was measured at the same height as the sample. The SSL fixture sample was operated on the client provided driver (built in or standalone) at the rated input voltage in its designated orientation.
The stabilization time typically ranges from 30 min (small integrated LED bulbs) to 2 or more hours (large SSL luminaires). SSL output is considered as being stable when 3 readings, 15 minutes apart, over 30 minutes period deviate from each other less than 0.5%, recommended in IESNA LM-79-08.
Electrical measurements including voltage, current, and power were measured using Yokogawa WT-310 power meter.
The Goniophotometer system is calibrated for intensity and colorimetric measurement using total spectral flux reference standard lamp that is traceable to NIST. The estimated luminous intensity measurement uncertainty is 2.85% (k=2).

Color Characteristics Measurements

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average. The color characteristics measurements are using sphere-spectroradiometer.

Color Spatial Uniformity

The chromaticity characteristics of SSL products may be spatially non-uniform. The chromaticity coordinates shall be measured at two vertical planes ($C=0^0/180^0$ and $C=90^0/270^0$) and in 10^0 or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The average weighted chromaticity coordinate was calculated from these points. The data was then analyzed to check for delta color differences of the (u', v') chromaticity coordinates. The spatial non-uniformity of chromaticity, $\Delta u'v'$, is determined as the maximum deviation (distance on CIE u', v' diagram) among all measured points from the spatial averaged chromaticity coordinates.
The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



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