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NVLAP LAB CODE 200960-0

LM-79-08 Test Report

for

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

LED TUBE

Model: 91324

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ16100039b

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

Review by:

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Nov. 08, 2016

Approved by:



Manager: Jim Zhang
Nov. 08, 2016

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

Test Summary

Model	91324
Luminous Efficacy (Lumens /Watt)	121.1
Total Luminous Flux (Lumens)	1361.0
Power (Watts)/3	11.24
Power Factor	0.9970
CCT (K)	3930
CRI	81.7
Stabilization Time (Light & Power)	60 mins
Note	4000K

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Oct. 31, 2016
Date of Test	: Nov. 07, 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

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Sample Photo



Sample view

Equipment Under Test (EUT)

Name : LED TUBE
Model : 91324
Electrical Ratings : 120-277V, 50/60Hz
Product Description : 4000K , 2 feet tube, fixed ends
 Manufacturer of light source: SAMSUNG ELECTRONICS CO., LTD
 Model of LED light source: SPMWHX228FXXXXXXXXXX
 LED Tubes supplied by a high frequency fluorescent lamp ballast:
 QTP 3x32T8/UNV ISN-SC
Manufacturer : P.Q.L., Inc.
Address : 2285 Ward Avenue / Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 25.0°C.

Test orientation was Base up. 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.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.282	0.124
Power Factor	0.9970	0.9659
Test Power (W)/3	11.24	11.04
THD A%	6.96	13.31
Luminous Efficacy (lm/W)	121.1	123.6
Total Luminous Flux (lm)	1361.0	1365.0
Color Rendering Index (CRI)	81.7	
R9	2.4	
Correlated Color Temperature (CCT)(K)	3930	
Chromaticity Chroma x	0.3842	
Chromaticity Chroma y	0.3812	
Chromaticity Chroma u	0.2258	
Chromaticity Chroma v	0.3361	
Duv	0.0009	
Chromaticity Chroma u'	0.2258	
Chromaticity Chroma v'	0.5041	

Special Color Rendering Indices	
R1	79.4
R2	87.5
R3	94.2
R4	81.1
R5	79.9
R6	83.2
R7	85.3
R8	62.5
R9	2.4
R10	71
R11	80.1
R12	63.6
R13	81.2
R14	96.9

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

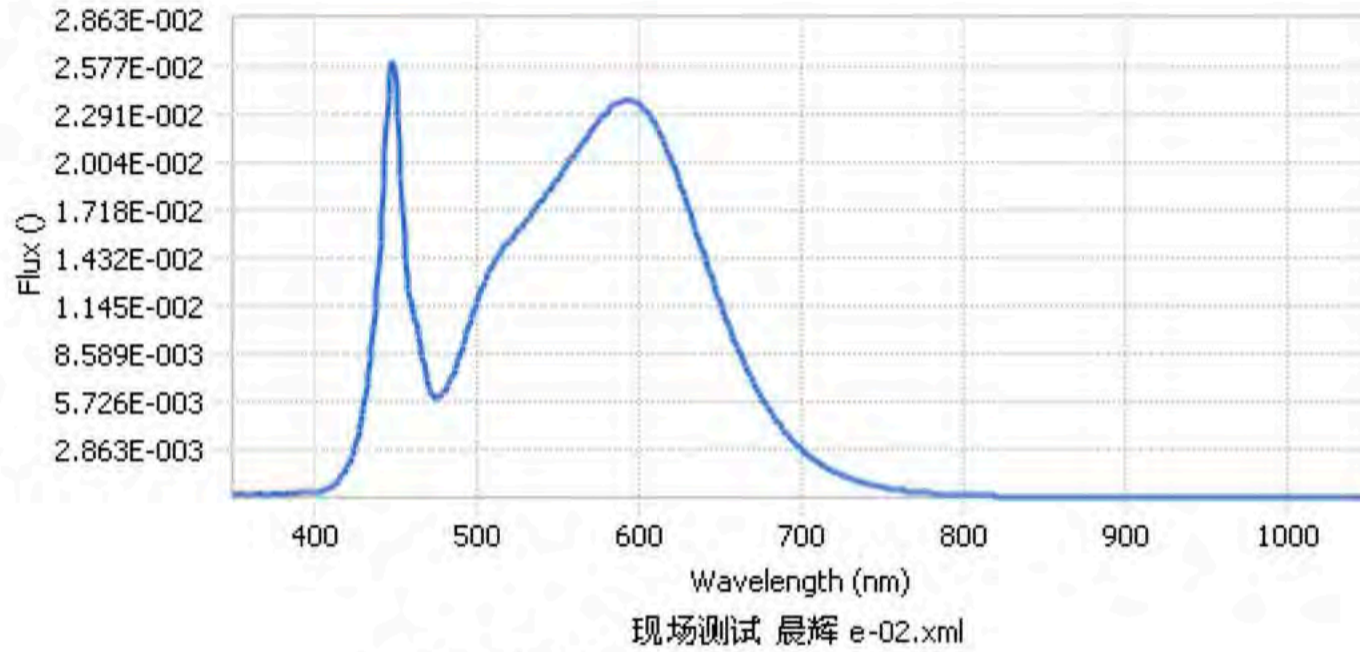


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.44E-04	485	7.12E-03	590	2.37E-02	695	3.46E-03
385	2.65E-04	490	8.47E-03	595	2.38E-02	700	2.96E-03
390	2.70E-04	495	1.00E-02	600	2.36E-02	705	2.55E-03
395	2.82E-04	500	1.16E-02	605	2.31E-02	710	2.17E-03
400	3.20E-04	505	1.29E-02	610	2.25E-02	715	1.87E-03
405	4.01E-04	510	1.39E-02	615	2.15E-02	720	1.61E-03
410	5.95E-04	515	1.47E-02	620	2.03E-02	725	1.37E-03
415	9.72E-04	520	1.52E-02	625	1.91E-02	730	1.17E-03
420	1.68E-03	525	1.58E-02	630	1.77E-02	735	9.99E-04
425	2.90E-03	530	1.64E-02	635	1.62E-02	740	8.59E-04
430	4.95E-03	535	1.70E-02	640	1.47E-02	745	7.36E-04
435	8.31E-03	540	1.77E-02	645	1.33E-02	750	6.25E-04
440	1.38E-02	545	1.84E-02	650	1.19E-02	755	5.44E-04
445	2.26E-02	550	1.90E-02	655	1.06E-02	760	4.67E-04
450	2.56E-02	555	1.97E-02	660	9.31E-03	765	4.01E-04
455	1.72E-02	560	2.04E-02	665	8.18E-03	770	3.45E-04
460	1.18E-02	565	2.12E-02	670	7.14E-03	775	3.00E-04
465	9.54E-03	570	2.18E-02	675	6.23E-03	780	2.57E-04
470	7.05E-03	575	2.24E-02	680	5.39E-03		
475	5.95E-03	580	2.30E-02	685	4.67E-03		
480	6.33E-03	585	2.35E-02	690	4.03E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

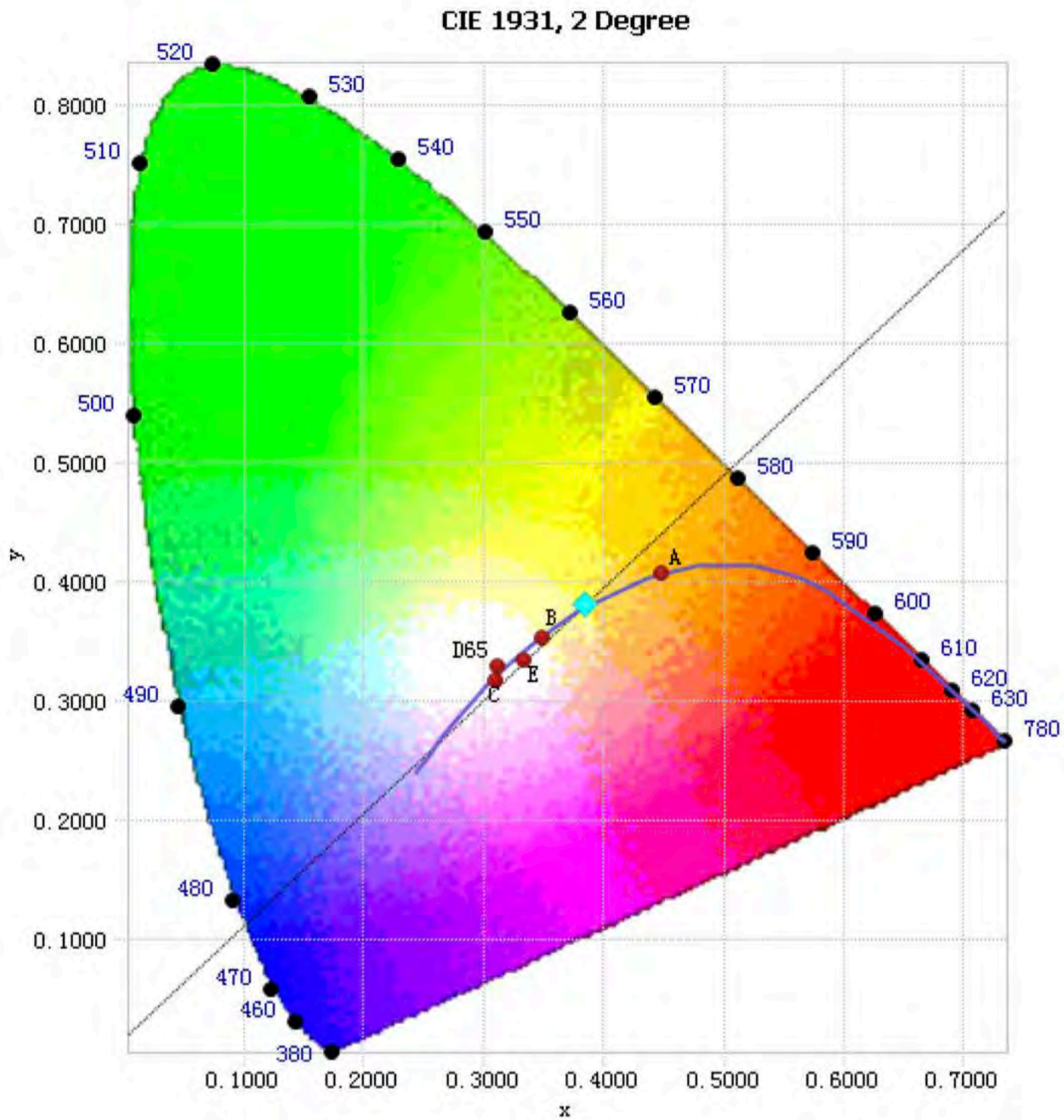


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

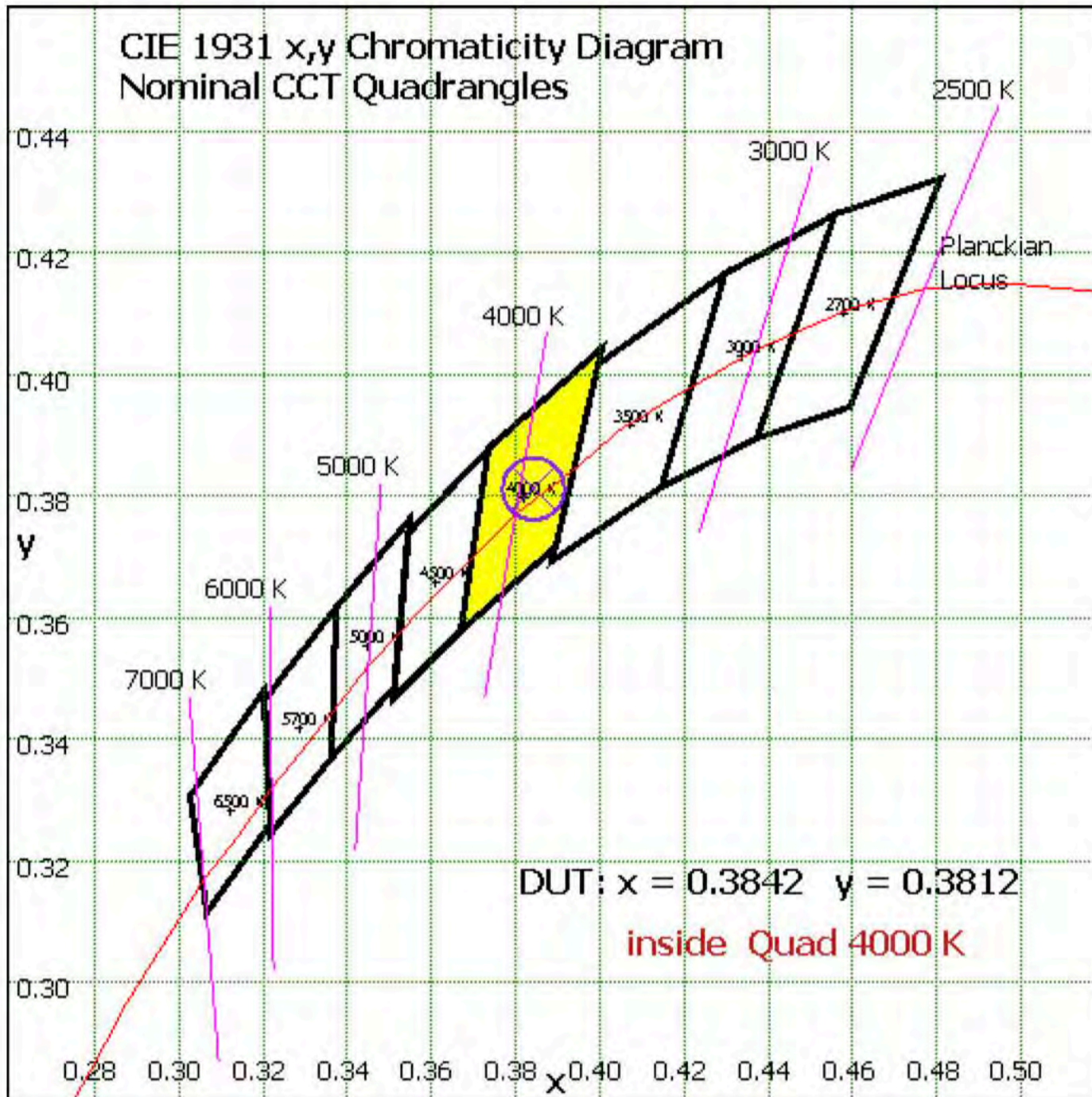


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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 lamps) 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 ***

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