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: 91287

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

No.1805, DongLiu road, BinJiang District, Hangzhou, China

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www.ledtestlab.com

Report No.: HZ16050045o

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

Review by:

Engineer: April Zou

Jun. 08, 2016

Approved by:

Manager: Jim Zhang

Jun. 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

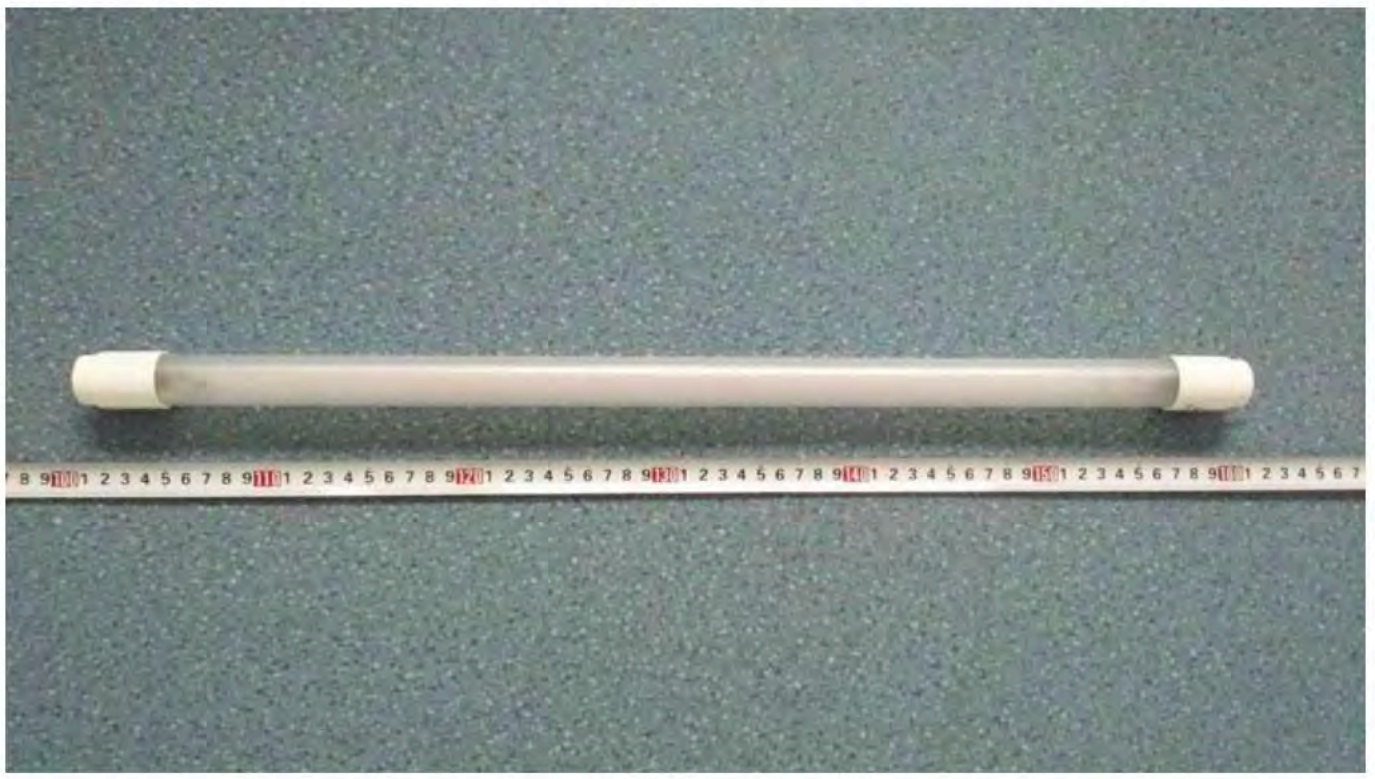
Model	91287
Luminous Efficacy (Lumens /Watt)	134.6
Total Luminous Flux (Lumens)	1182.0
Power (Watts)	8.78
Power Factor	0.9736
CCT (K)	5077
CRI	82.8
Stabilization Time (Light & Power)	60 mins
Note	5000K, Frosted lens

Table 1: Executive Data Summary

Test specifications:	
Date of Receipt	: May 24, 2016
Date of Test	: May 27, 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

Sample Photo



Sample view

Equipment Under Test (EUT)	
Name	: LED TUBE
Model	: 91287
Electrical Ratings	: AC120-277V, 50/60Hz
Product Description	: G13 base, 5000K, Frosted lens lens, 2 feet tube, fixed ends Manufacturer of light source: SAMSUNG ELECTRONICS CO., LTD Model of LED light source: SPMWHX228FXXXXXXXX
Manufacturer	: P.Q.L., Inc.
Address	: 2285 Ward Avenue Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 24.8℃.

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.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.075	0.036
Power Factor	0.9736	0.9019
Test Power (W)	8.78	9.07
THD A%	20.94	18.66
Luminous Efficacy (lm/W)	134.6	130.8
Total Luminous Flux (lm)	1182.0	1186.0
Color Rendering Index (CRI)	82.8	
R9	4.0	
Correlated Color Temperature (CCT)(K)	5077	
Chromaticity Chroma x	0.3435	
Chromaticity Chroma y	0.3579	
Chromaticity Chroma u	0.2079	
Chromaticity Chroma v	0.3250	
Duv	0.0031	
Chromaticity Chroma u ’	0.2079	
Chromaticity Chroma v’	0.4875	

Special Color Rendering Indices	
R1	80.5
R2	88.5
R3	93.7
R4	81.9
R5	81.4
R6	83.8
R7	86.7
R8	65.9
R9	4.0
R10	72.6
R11	80.9
R12	62.6
R13	82.6
R14	96.8

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

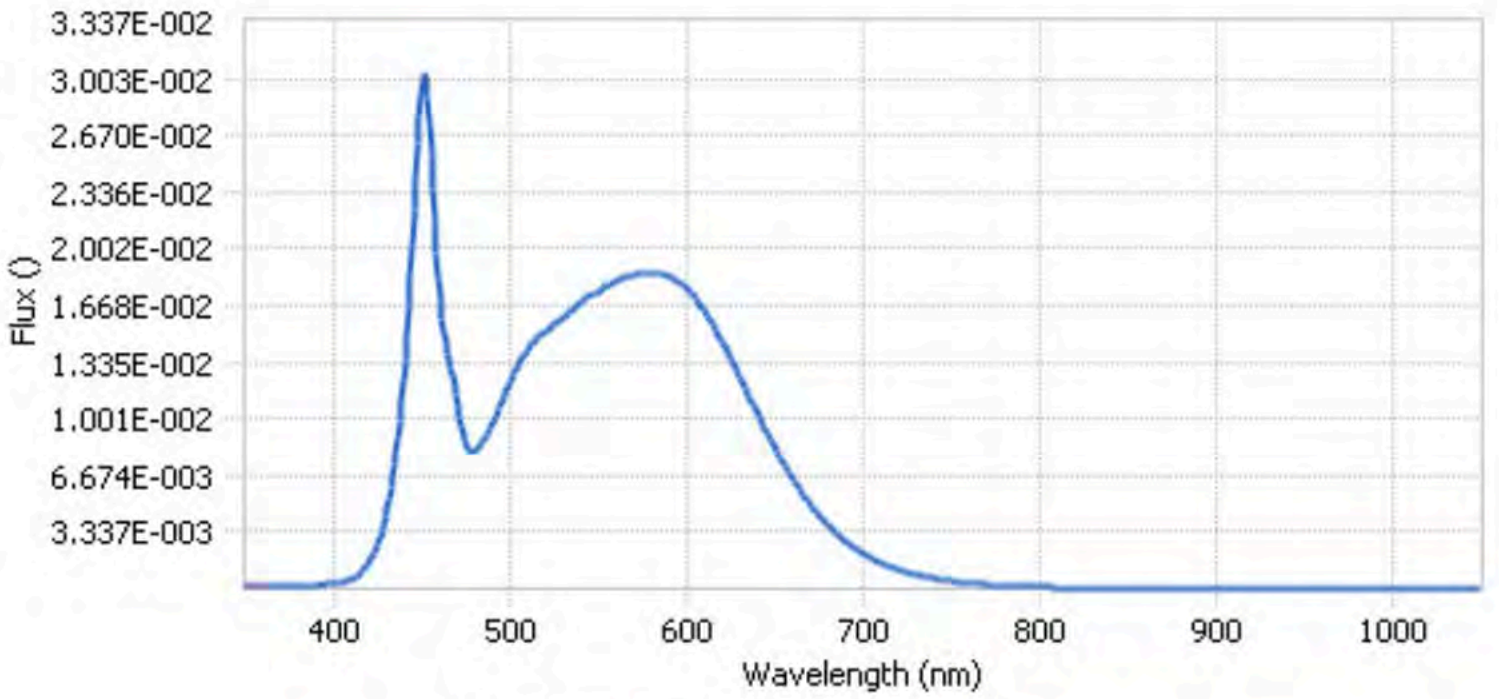
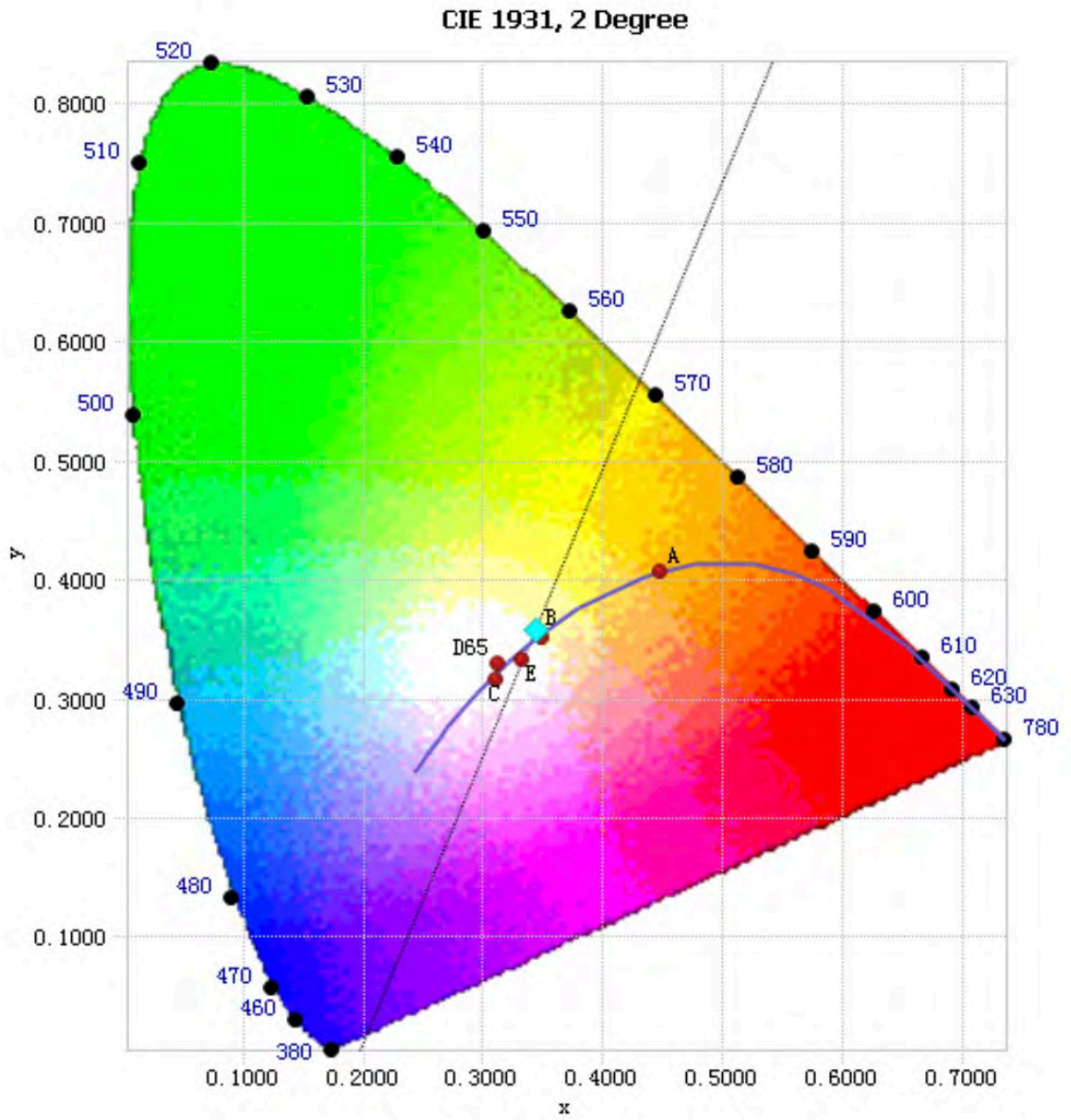


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.38E-04	485	8.69E-03	590	1.85E-02	695	2.47E-03
385	2.35E-04	490	9.58E-03	595	1.81E-02	700	2.12E-03
390	2.35E-04	495	1.08E-02	600	1.77E-02	705	1.82E-03
395	2.59E-04	500	1.21E-02	605	1.72E-02	710	1.56E-03
400	2.98E-04	505	1.32E-02	610	1.65E-02	715	1.34E-03
405	3.75E-04	510	1.40E-02	615	1.57E-02	720	1.16E-03
410	5.34E-04	515	1.46E-02	620	1.47E-02	725	9.89E-04
415	8.54E-04	520	1.51E-02	625	1.37E-02	730	8.49E-04
420	1.44E-03	525	1.55E-02	630	1.26E-02	735	7.24E-04
425	2.49E-03	530	1.59E-02	635	1.15E-02	740	6.26E-04
430	4.29E-03	535	1.63E-02	640	1.05E-02	745	5.37E-04
435	7.26E-03	540	1.68E-02	645	9.42E-03	750	4.63E-04
440	1.22E-02	545	1.72E-02	650	8.45E-03	755	3.99E-04
445	2.03E-02	550	1.74E-02	655	7.48E-03	760	3.45E-04
450	2.91E-02	555	1.78E-02	660	6.62E-03	765	2.97E-04
455	2.74E-02	560	1.80E-02	665	5.81E-03	770	2.56E-04
460	1.81E-02	565	1.83E-02	670	5.07E-03	775	2.20E-04
465	1.39E-02	570	1.85E-02	675	4.42E-03	780	1.93E-04
470	1.14E-02	575	1.86E-02	680	3.83E-03		
475	8.73E-03	580	1.86E-02	685	3.32E-03		
480	8.08E-03	585	1.86E-02	690	2.88E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.3435, 0.3579)

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

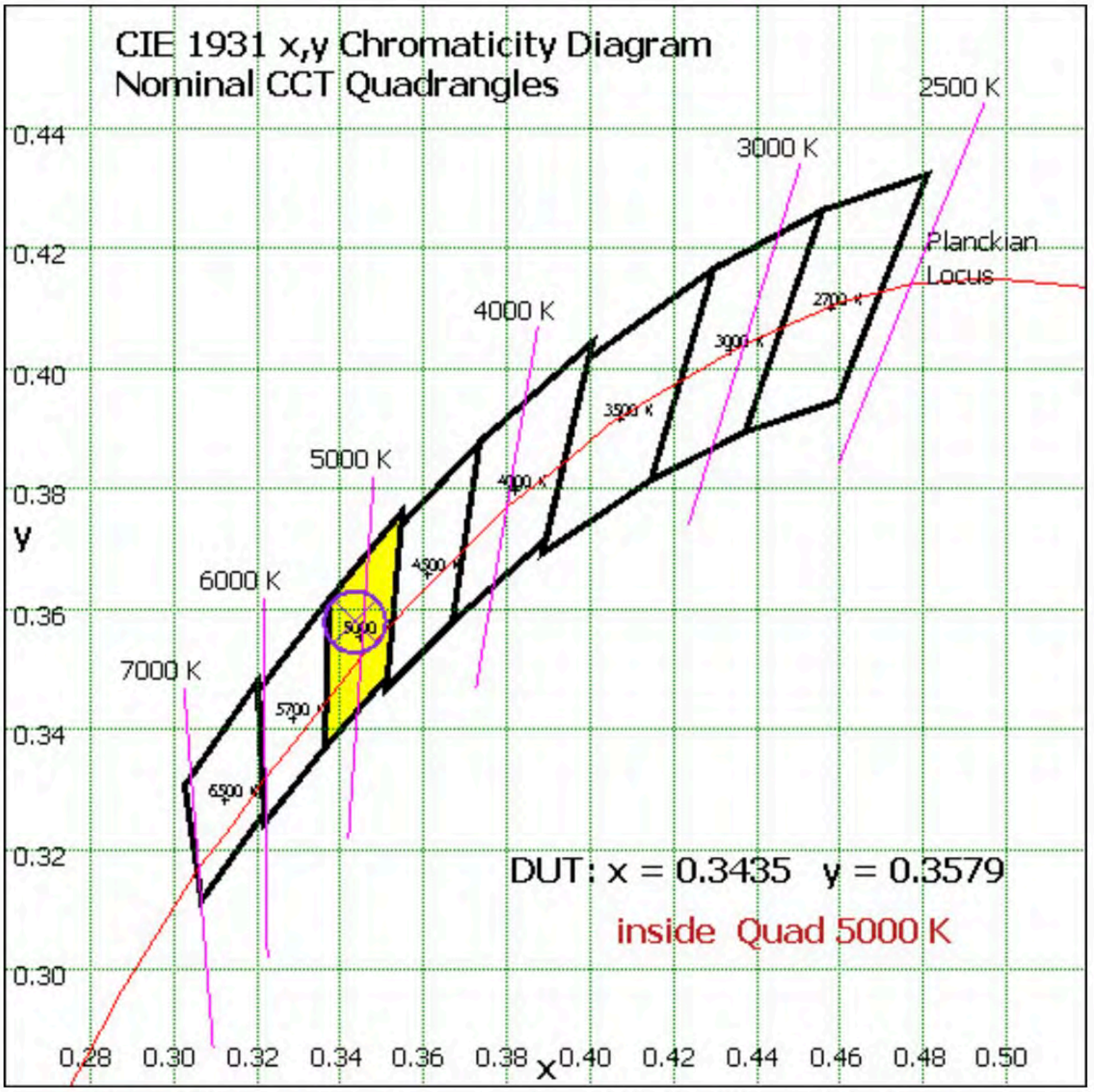


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Integrate Sphere system	2M	HZTE015-01	Jul. 16, 2015	Jul. 15, 2016
Digital Power Meter	WT210	HZTE008-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-07	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	6154	HZTE004-04	Jul. 17, 2015	Jul. 16, 2016
Temperature and humidity recorder	JR900	HZTE018-01	Jul. 21, 2015	Jul. 20, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

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 ***