LM-79-08 Test Report

for

RAB LIGHTING INC

170 Ludlow Ave, PO BOX 970 Northvale, NJ 07647-2305 USA

TYPE B LED TUBE

Model: PLL-17-850-BYP

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18090020ae

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

Review by: April Zou

Engineer: April Zou
Sep. 12, 2018

Approved by: Jim Zhang

Manager: Jim Zhang
Sep. 12, 2018

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

Test Summary

Model	PLL-17-850-BYP
Luminous Efficacy (Lumens /Watt)	127.2
Total Luminous Flux (Lumens)	2196.0
Power (Watts)	17.26
Power Factor	0.9731
CCT (K)	5040
CRI	82.8
Stabilization Time (Light & Power)	60 mins
Note	3000K

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Apr. 12, 2018

Date of Test : Apr. 16, 2018

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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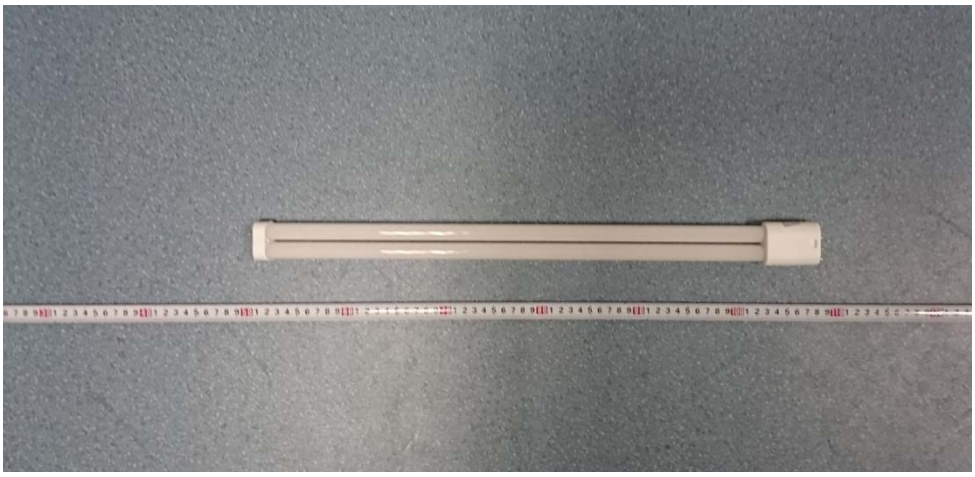
Sample Photo



Sample view

Equipment Under Test (EUT)	
Name	: TYPE B LED TUBE
Model	: PLL-17-850-BYP
Electrical Ratings	: 120-277VAC, 50/60Hz
Product Description	: 2G11 base, 5000K

TEST RESULTS

Test ambient temperature was 24.9℃.

Test orientation was light down. 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)	0.148	0.070
Power Factor	0.9731	0.9211
Test Power (W)	17.26	17.75
THD A%	22.17	21.24
Luminous Efficacy (lm/W)	127.2	124.6
Total Luminous Flux (lm)	2196.0	2211.0
Color Rendering Index (CRI)	82.8	
R9	7.2	
Correlated Color Temperature (CCT)(K)	5040	
Chromaticity Chroma x	0.3443	
Chromaticity Chroma y	0.3559	
Chromaticity Chroma u	0.2093	
Chromaticity Chroma v	0.3244	
Duv	0.0017	
Chromaticity Chroma u ’	0.2093	
Chromaticity Chroma v’	0.4866	

Special Color Rendering Indices	
R1	80.9
R2	87
R3	91.8
R4	83.5
R5	82.3
R6	82.7
R7	86.5
R8	67.6
R9	7.2
R10	69.7
R11	83.3
R12	67
R13	82.1
R14	95.6

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

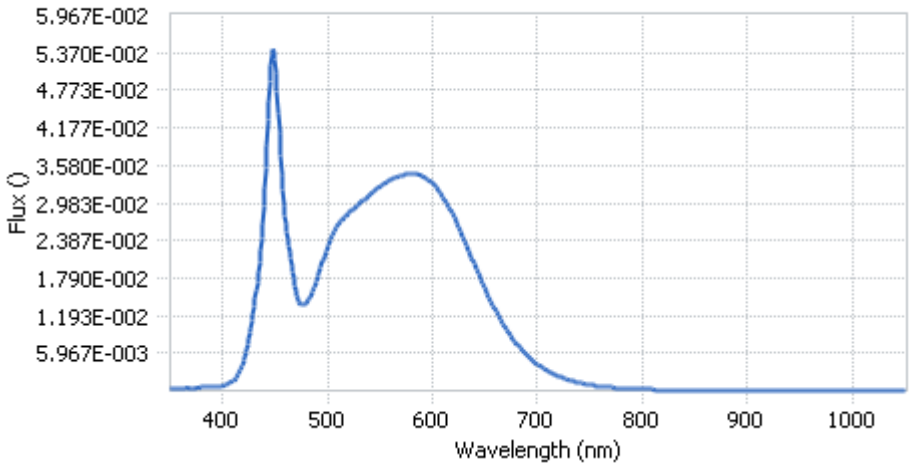
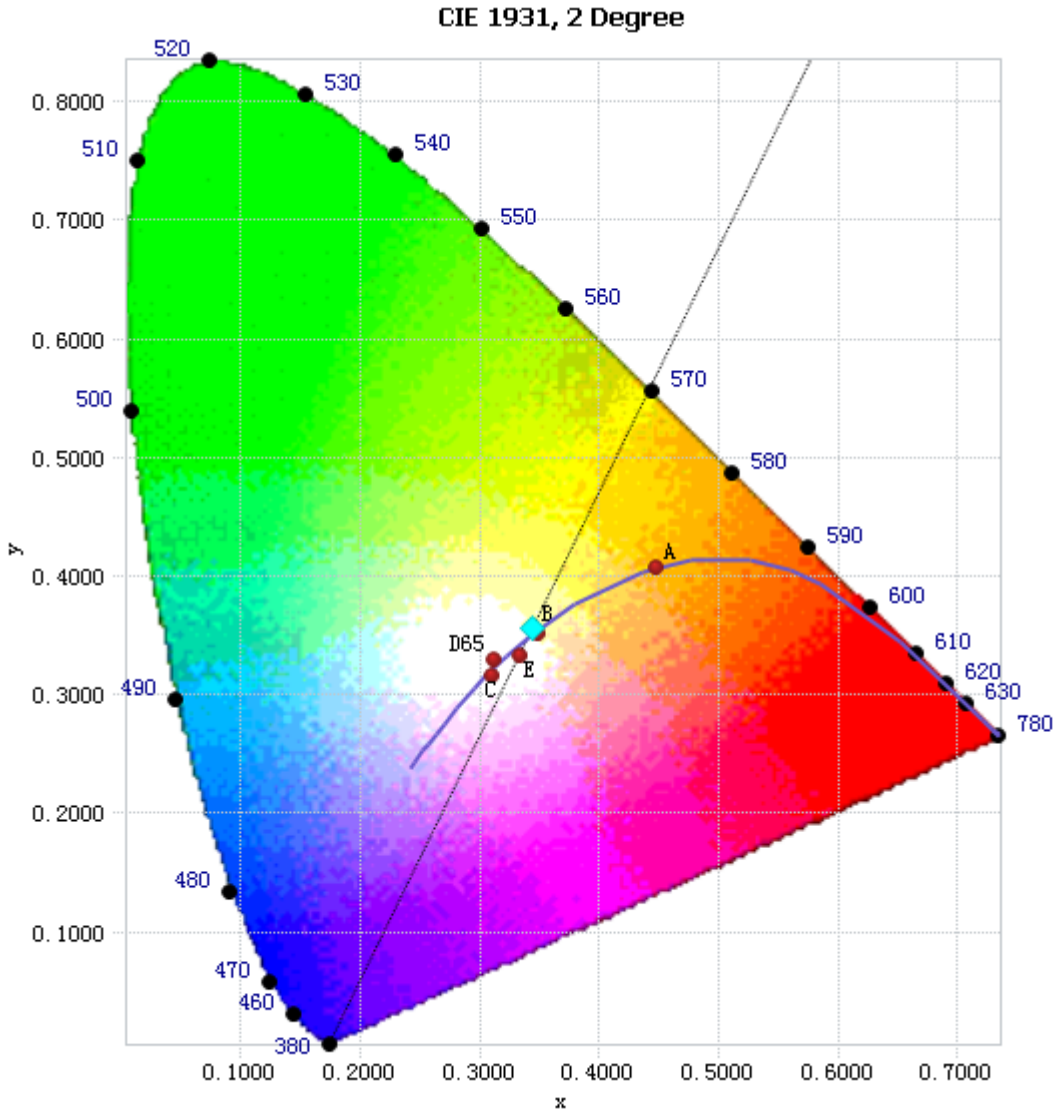


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.57E-04	485	1.55E-02	590	3.41E-02	695	4.85E-03
385	5.36E-04	490	1.77E-02	595	3.36E-02	700	4.20E-03
390	5.96E-04	495	2.06E-02	600	3.30E-02	705	3.61E-03
395	6.80E-04	500	2.30E-02	605	3.20E-02	710	3.09E-03
400	7.98E-04	505	2.49E-02	610	3.08E-02	715	2.66E-03
405	1.06E-03	510	2.64E-02	615	2.93E-02	720	2.28E-03
410	1.65E-03	515	2.75E-02	620	2.77E-02	725	1.97E-03
415	2.76E-03	520	2.83E-02	625	2.59E-02	730	1.70E-03
420	4.80E-03	525	2.88E-02	630	2.40E-02	735	1.46E-03
425	8.23E-03	530	2.98E-02	635	2.20E-02	740	1.25E-03
430	1.34E-02	535	3.04E-02	640	2.01E-02	745	1.08E-03
435	2.06E-02	540	3.12E-02	645	1.81E-02	750	9.30E-04
440	3.23E-02	545	3.18E-02	650	1.62E-02	755	8.04E-04
445	4.92E-02	550	3.25E-02	655	1.44E-02	760	6.95E-04
450	5.28E-02	555	3.30E-02	660	1.28E-02	765	6.05E-04
455	3.74E-02	560	3.34E-02	665	1.12E-02	770	5.21E-04
460	2.64E-02	565	3.38E-02	670	9.84E-03	775	4.48E-04
465	2.10E-02	570	3.42E-02	675	8.61E-03	780	3.93E-04
470	1.59E-02	575	3.44E-02	680	7.50E-03		
475	1.36E-02	580	3.44E-02	685	6.50E-03		
480	1.40E-02	585	3.44E-02	690	5.62E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.3443, 0.3559)

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

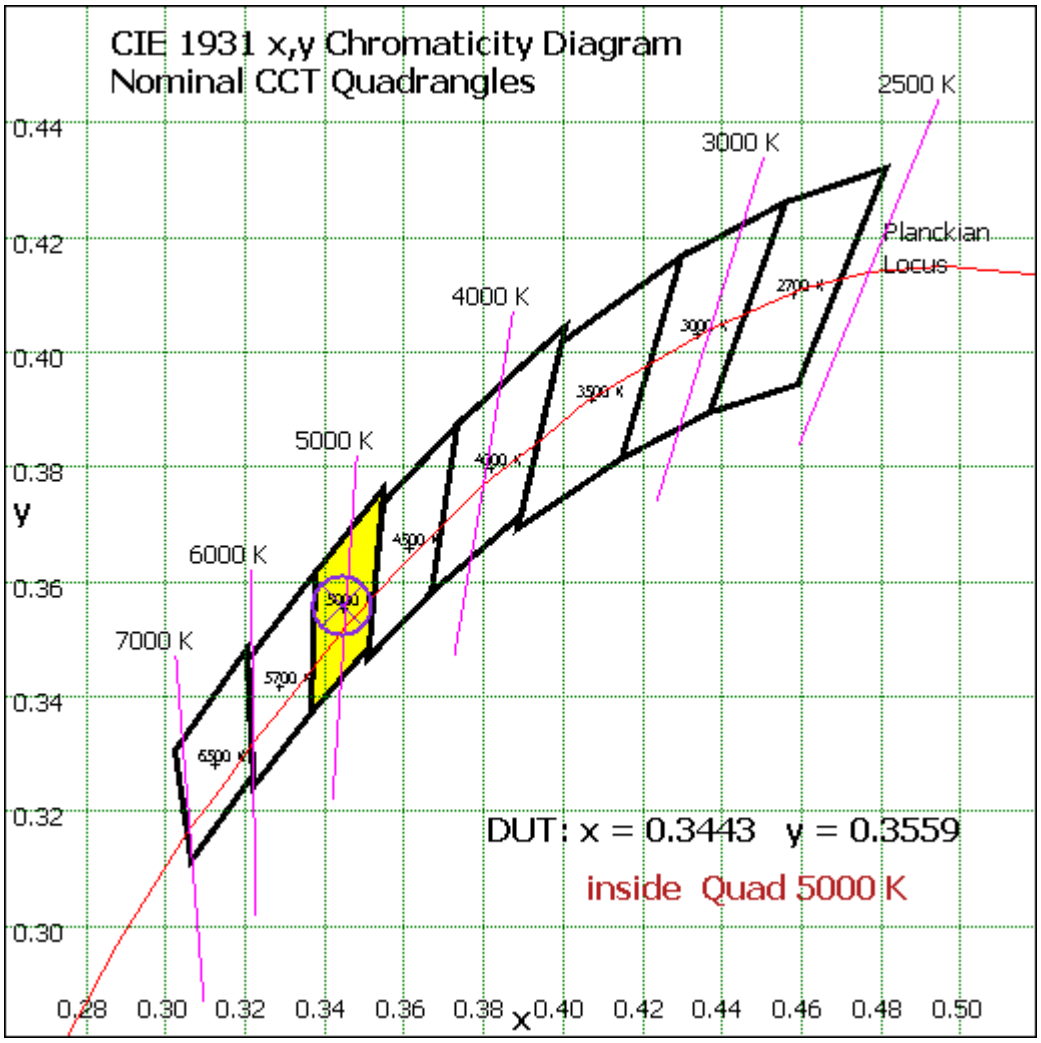


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 16, 2017	Aug. 15, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018

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 2.1% with a coverage factor k=2.

*** End of Report ***