

LM-79-08 TEST REPORT

for

RAB Lighting INC

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LED Tube

Model: T5HE-13-48G-850-SE-BYP

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ200900611

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

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Sep. 29, 2020

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Sep. 29, 2020

TEST SUMMARY

Model	T5HE-13-48G-850-SE-BYP
Luminous Efficacy (Lumens /Watt)	140.0
Total Luminous Flux (Lumens)	1905.0
Power (Watts)	13.61
Power Factor	0.9719
CCT (K)	4982
CRI	84.1
Stabilization Time (Light & Power)	60 mins
Note	5000K

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Mar. 27, 2019
Date of Test : Mar. 28, 2019
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
ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

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SAMPLE PHOTO

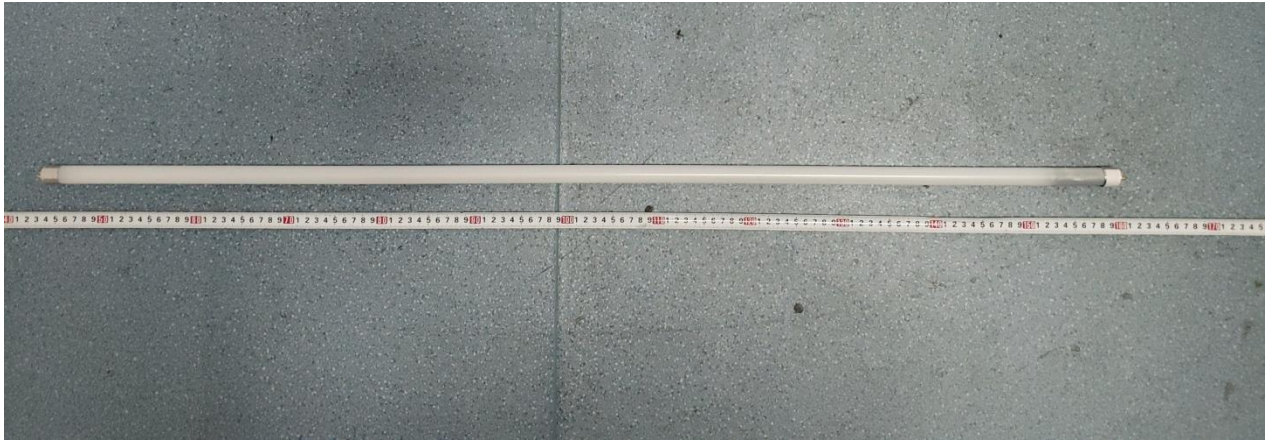


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: T5HE-13-48G-850-SE-BYP
Electrical Ratings	: 120-277V, 50/60Hz, 13W
Product Description	: G5 base, 5000K

TEST RESULTS

Test ambient temperature was 25.0°C.

Base 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.

Sphere-Spectroradiometer Method

Parameter	Result	
	Test Voltage (V)	120.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.117	0.053
Power Factor	0.9719	0.9166
Test Power (W)	13.61	13.55
THD A%	21.79	20.96
Luminous Efficacy (lm/W)	140.0	140.6
Total Luminous Flux (lm)	1905.0	1905.0
Color Rendering Index (CRI)	84.1	
R9	14.2	
Correlated Color Temperature (CCT)(K)	4982	
Chromaticity Chroma x	0.3459	
Chromaticity Chroma y	0.3562	
Chromaticity Chroma u	0.2102	
Chromaticity Chroma v	0.3247	
Duv	0.0020	
Chromaticity Chroma u'	0.2102	
Chromaticity Chroma v'	0.4870	

Special Color Rendering Indices	
R1	82.3
R2	89.5
R3	93.9
R4	82.7
R5	82.2
R6	84.5
R7	88.3
R8	69.3
R9	14.2
R10	74.4
R11	81.5
R12	59.1
R13	84.3
R14	96.9
Rf	85
Rg	96

Table 2: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

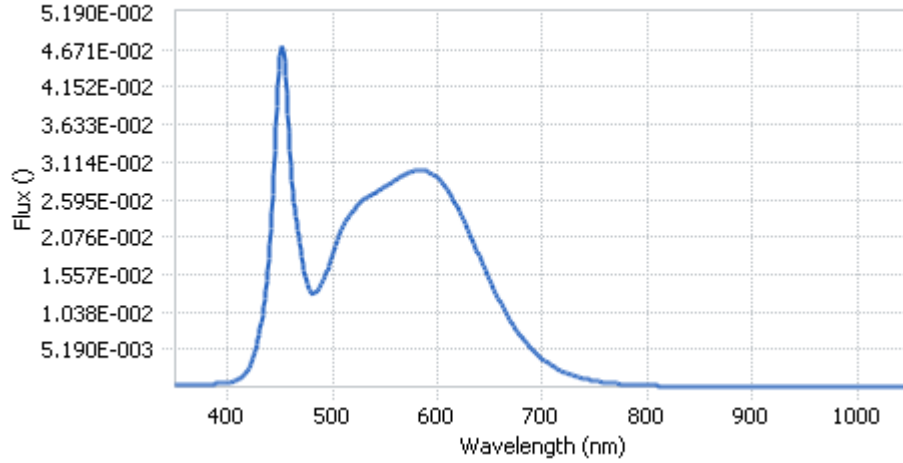
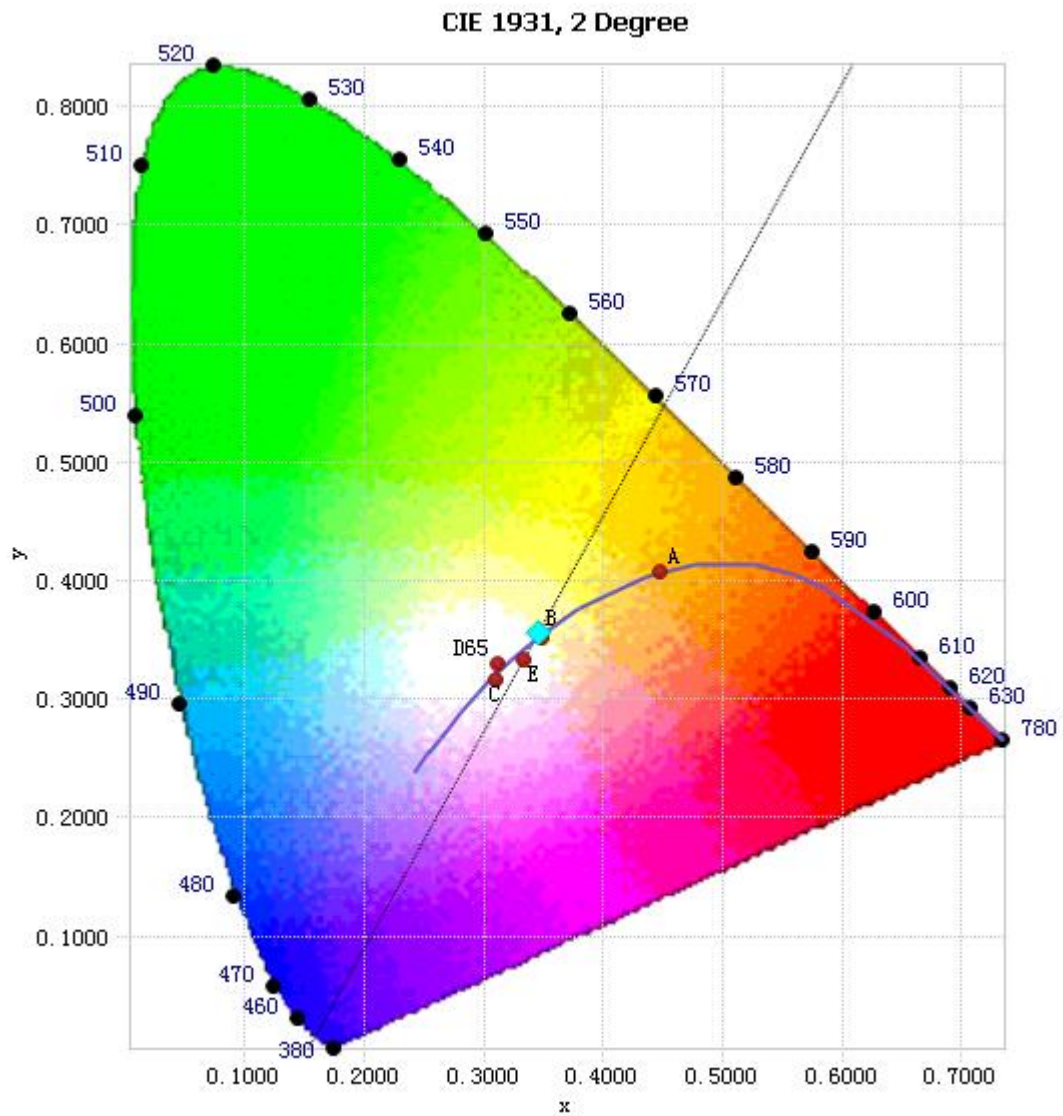


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.10E-04	485	1.33E-02	590	2.99E-02	695	4.49E-03
385	4.25E-04	490	1.44E-02	595	2.95E-02	700	3.88E-03
390	4.62E-04	495	1.62E-02	600	2.89E-02	705	3.32E-03
395	5.10E-04	500	1.84E-02	605	2.82E-02	710	2.86E-03
400	5.80E-04	505	2.05E-02	610	2.72E-02	715	2.45E-03
405	7.31E-04	510	2.23E-02	615	2.59E-02	720	2.10E-03
410	1.02E-03	515	2.36E-02	620	2.45E-02	725	1.81E-03
415	1.58E-03	520	2.45E-02	625	2.31E-02	730	1.55E-03
420	2.57E-03	525	2.53E-02	630	2.14E-02	735	1.33E-03
425	4.39E-03	530	2.60E-02	635	1.97E-02	740	1.14E-03
430	7.35E-03	535	2.64E-02	640	1.80E-02	745	9.84E-04
435	1.22E-02	540	2.68E-02	645	1.63E-02	750	8.41E-04
440	1.98E-02	545	2.73E-02	650	1.47E-02	755	7.31E-04
445	3.27E-02	550	2.77E-02	655	1.31E-02	760	6.28E-04
450	4.57E-02	555	2.82E-02	660	1.16E-02	765	5.40E-04
455	4.32E-02	560	2.86E-02	665	1.03E-02	770	4.67E-04
460	3.06E-02	565	2.92E-02	670	9.02E-03	775	4.06E-04
465	2.37E-02	570	2.95E-02	675	7.90E-03	780	3.42E-04
470	1.88E-02	575	2.97E-02	680	6.91E-03		
475	1.46E-02	580	3.00E-02	685	6.01E-03		
480	1.30E-02	585	3.01E-02	690	5.20E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3459, 0.3562)

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

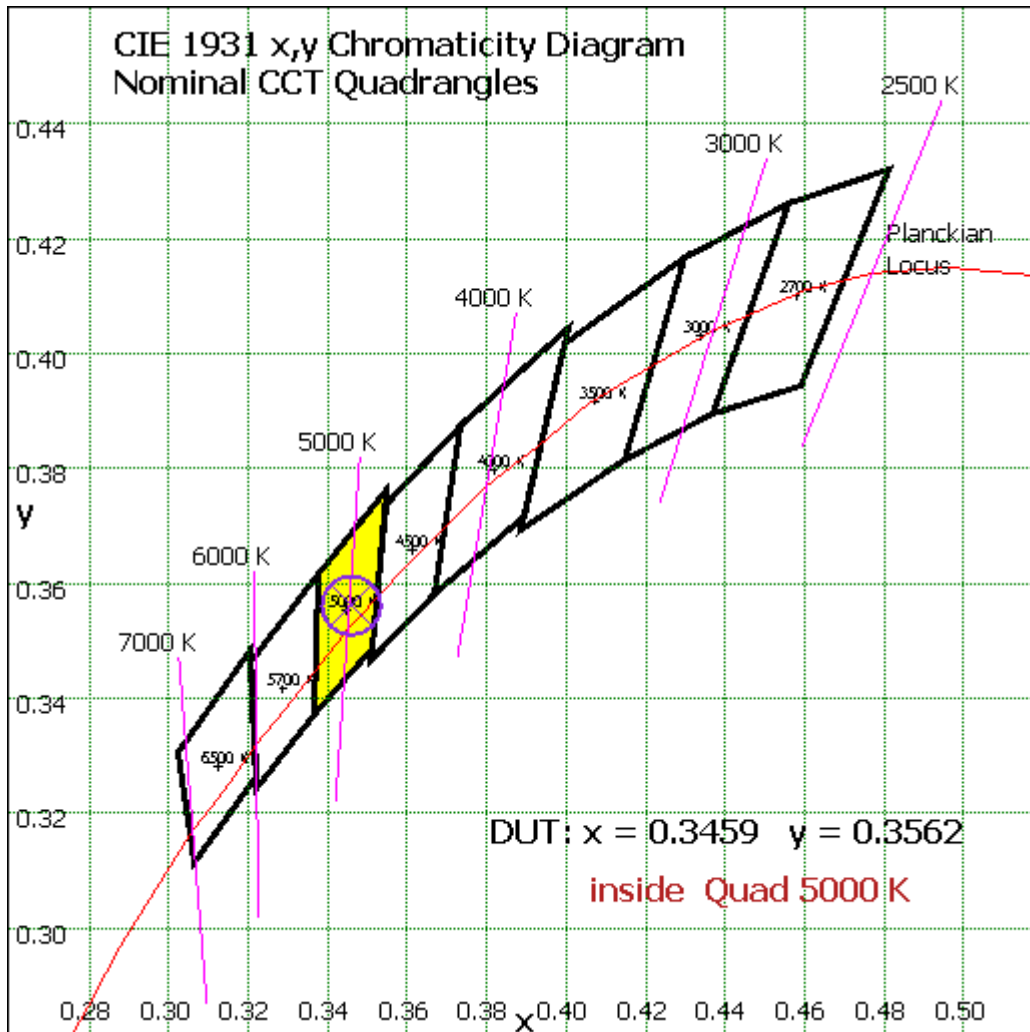
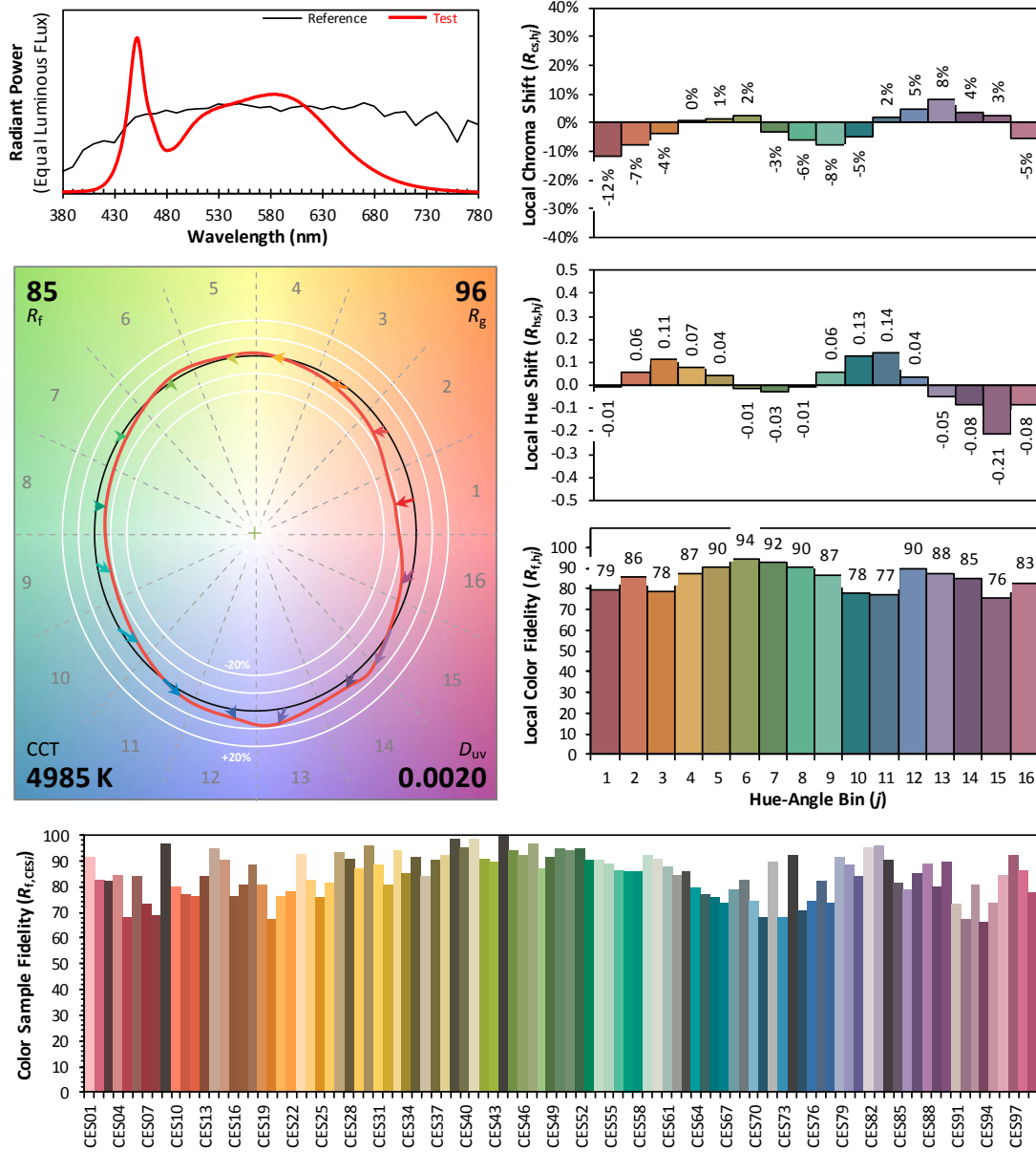


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0.3459
 y 0.3562
 u' 0.2102
 v' 0.4870

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Integrate Sphere system	3M	HZTE015-04	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Standard source	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

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 expanded uncertainty is 2.1% with a coverage factor $k=2$.

*** End of Report ***

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