



## LM-79-08 Test Report

for

### Revolution Lighting Technologies, Inc.

2280 Ward Ave. Simi Valley, CA 93065

### LED TUBE

Model: 204100-115

### Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18110009b

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

Review by:

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Nov. 07, 2018

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Nov. 07, 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	204100-115
Luminous Efficacy (Lumens /Watt)	134.8
Total Luminous Flux (Lumens)	2046.0
Power (Watts)	15.18
Power Factor	0.9873
CCT (K)	4910
CRI	81.1
Stabilization Time (Light & Power)	60 mins
Note	5000K

Table 1: Executive Data Summary

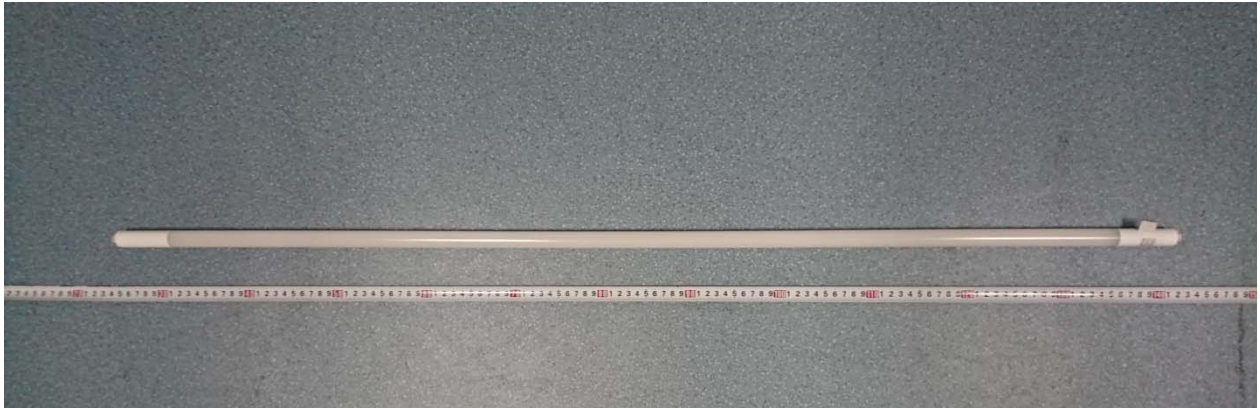
### Test specifications:

<b>Date of Receipt</b>	: Jul. 31, 2018
<b>Date of Test</b>	: Aug. 01, 2018
<b>Test item</b>	: Total Luminous Flux, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
<b>Reference Standard</b>	: 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)

<b>Name</b>	: LED TUBE
<b>Model</b>	: 204100-115
<b>Electrical Ratings</b>	: 120-277V, 60Hz
<b>Product Description</b>	: G5 base, 5000K

## TEST RESULTS

Test ambient temperature was 25.0°C.

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
Voltage frequency (Hz)	60	60
Test Current (A)	0.128	0.058
Power Factor	0.9873	0.9553
Test Power (W)	15.18	15.40
THD A%	14.73	13.26
Luminous Efficacy (lm/W)	134.8	133.1
Total Luminous Flux (lm)	2046.0	2049.0
Color Rendering Index (CRI)	81.1	
R9	-3	
Correlated Color Temperature (CCT)(K)	4910	
Chromaticity Chroma x	0.3489	
Chromaticity Chroma y	0.3661	
Chromaticity Chroma u	0.2084	
Chromaticity Chroma v	0.3281	
Duv	0.0055	
Chromaticity Chroma u'	0.2084	
Chromaticity Chroma v'	0.4921	

Special Color Rendering Indices	
R1	78
R2	86.7
R3	93.5
R4	79.5
R5	78.4
R6	81.6
R7	87.1
R8	63.8
R9	-3
R10	68.8
R11	78
R12	54.8
R13	80.2
R14	96.6

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

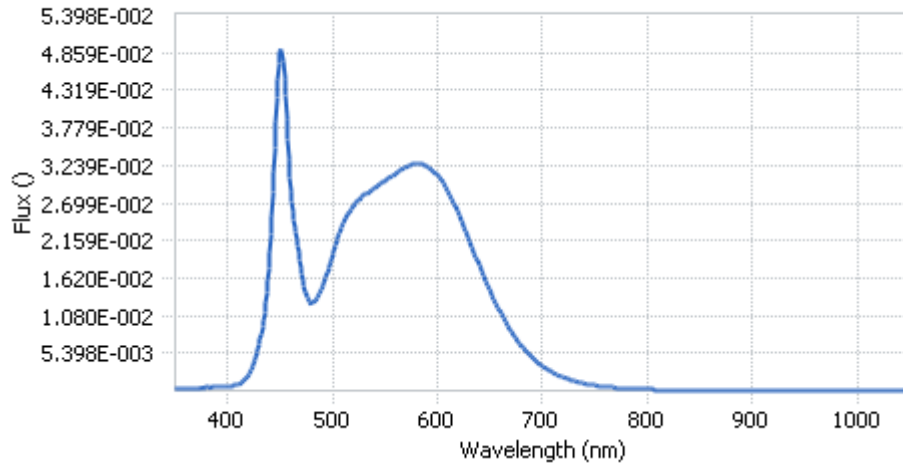


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.79E-04	485	1.33E-02	590	3.22E-02	695	4.10E-03
385	4.48E-04	490	1.47E-02	595	3.17E-02	700	3.54E-03
390	4.79E-04	495	1.70E-02	600	3.10E-02	705	3.02E-03
395	5.14E-04	500	1.98E-02	605	2.99E-02	710	2.58E-03
400	5.92E-04	505	2.22E-02	610	2.86E-02	715	2.22E-03
405	7.10E-04	510	2.40E-02	615	2.70E-02	720	1.89E-03
410	9.31E-04	515	2.56E-02	620	2.54E-02	725	1.64E-03
415	1.44E-03	520	2.67E-02	625	2.35E-02	730	1.39E-03
420	2.36E-03	525	2.75E-02	630	2.17E-02	735	1.19E-03
425	3.94E-03	530	2.82E-02	635	1.97E-02	740	1.02E-03
430	6.68E-03	535	2.85E-02	640	1.79E-02	745	8.72E-04
435	1.14E-02	540	2.92E-02	645	1.60E-02	750	7.50E-04
440	2.00E-02	545	2.96E-02	650	1.43E-02	755	6.44E-04
445	3.49E-02	550	3.01E-02	655	1.27E-02	760	5.49E-04
450	4.87E-02	555	3.07E-02	660	1.12E-02	765	4.80E-04
455	4.24E-02	560	3.12E-02	665	9.80E-03	770	4.16E-04
460	2.87E-02	565	3.18E-02	670	8.56E-03	775	3.55E-04
465	2.27E-02	570	3.21E-02	675	7.43E-03	780	3.08E-04
470	1.77E-02	575	3.23E-02	680	6.45E-03		
475	1.36E-02	580	3.26E-02	685	5.58E-03		
480	1.26E-02	585	3.26E-02	690	4.80E-03		

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

### Chromaticity Diagram - Sphere Spectroradiometer Method

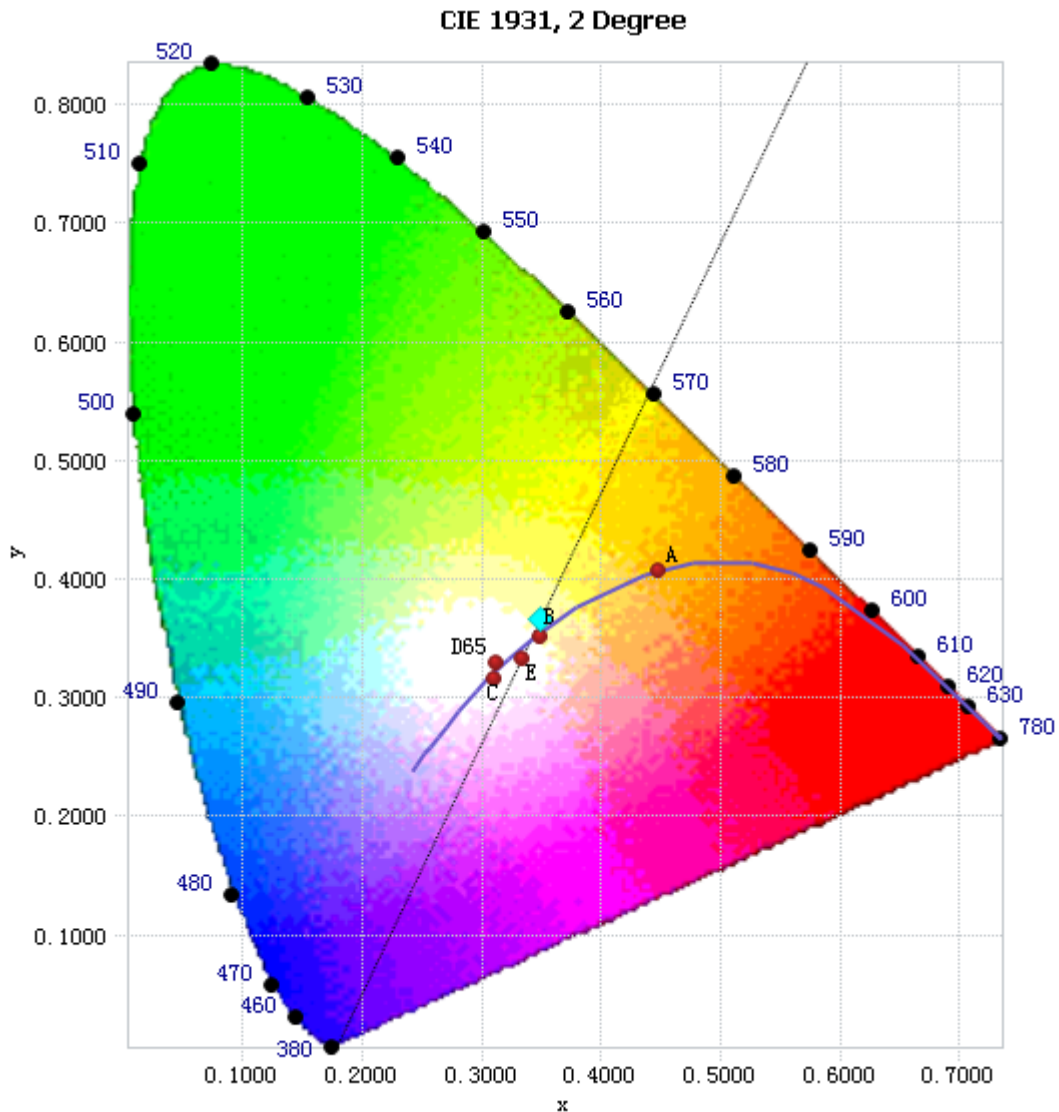


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

**Nominal CCT Quadrangles – Sphere Spectroradiometer Method**

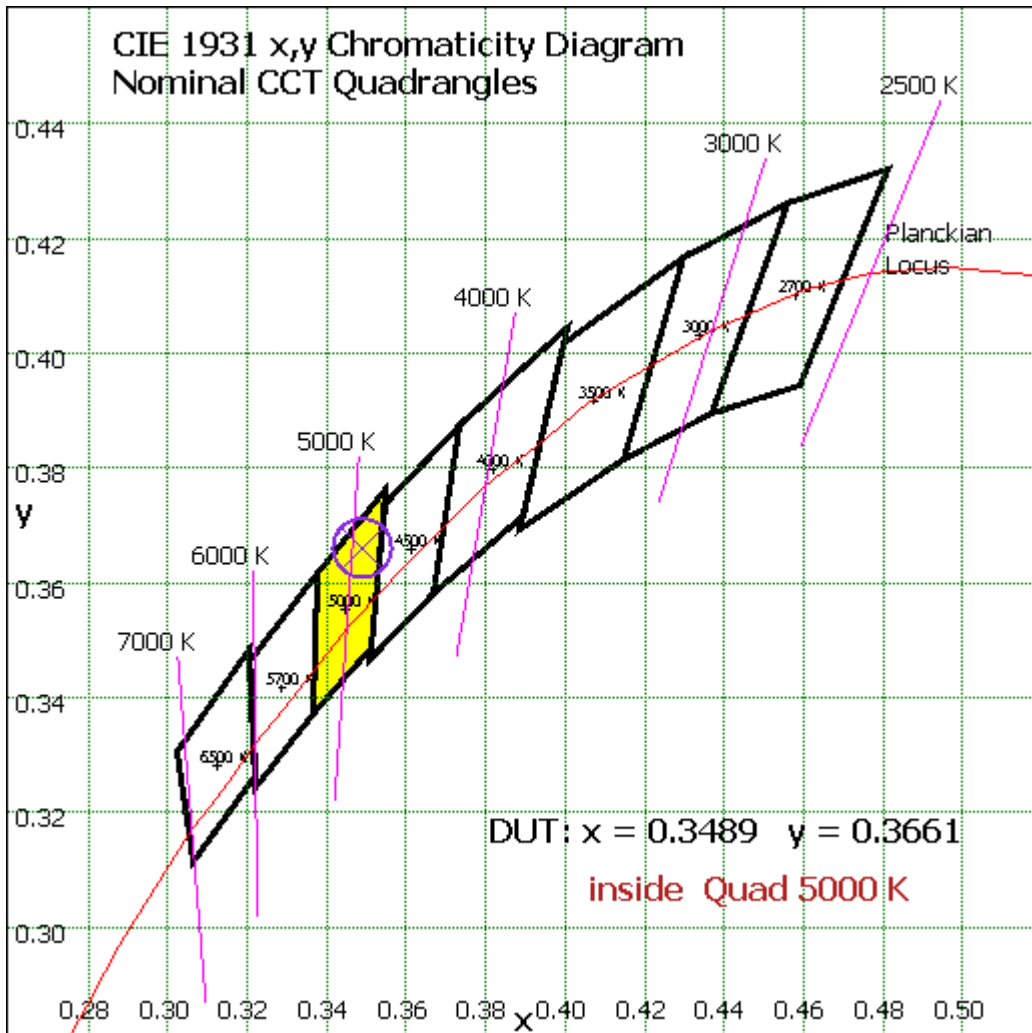


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Integrate Sphere system	2M	HZTE015-01	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  $4\pi$ . 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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