LM-79-08 TEST REPORT

for

RAB LIGHTING INC

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

LED Tube

Model: LCBT8-14-48P-8TW-DIR-SS

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21020020a/R2

This report is replaced the old report No. HZ21020020a/R1 dated Mar. 05, 2021

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

Review by: **Approved by:**

Engineer: April Zou	Manager: Jim Zhang
Jun. 15, 2021	Jun. 15, 2021

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

TEST SUMMARY

Tested Model	LCBT8-14-48P-8TW-DIR-SS 2700K	LCBT8-14-48P-8TW-DIR-SS 4000K	LCBT8-14-48P-8TW-DIR-SS 4500K	LCBT8-14-48P-8TW-DIR-SS 6500K
Luminous Efficacy (Lumens /Watt)	125.8	131.6	132.7	135.1
Total Luminous Flux (Lumens)	2255.7	2349.0	2370.0	2414.4
Power (Watts)/2	17.94	17.86	17.86	17.88
Power Factor	0.9955	0.9955	0.9955	0.9955
CCT (K)	2722	4105	4666	6721
CRI	83.4	87.7	87.3	83.6
Stabilization Time (Light & Power)	60 mins	60 mins	60 mins	60 mins
Note	2700K	4000K	4500K	6500K

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Oct. 12, 2020

Date of Test : Oct. 15, 2020

Test item : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
In-Situ Maximum Temperature

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
ANSI/UL 8750-2011 Light Emitting Diode (LED) Equipment for Use in Lighting Products
UL 1993 Self-Ballasted Lamps and Lamp Adapters

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SAMPLE PHOTO

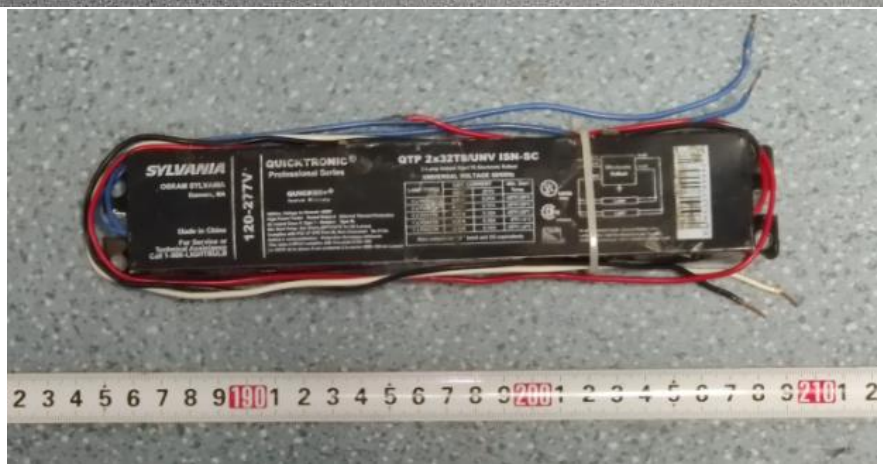


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Tube
Model	: LCBT8-14-48P-8TW-DIR-SS
Electrical Ratings	: 120-277V, 50/60Hz, 14W
Product Description	: Continuous Color-Tunable & Dimmable by app adjustment in moblie device Manufacturer of light source: Bridgelux Inc. Model of LED light source: BXVN-XXE-21M-3EV LED Tubes supplied by a high frequency fluorescent lamp ballast: QTP 2x32T8/UNV ISN-SC

TEST RESULTS of Model LCBT8-14-48P-8TW-DIR-SS 2700K

Test ambient temperature was 25.0 ℃.

Base orientation was horizontal. Test was conducted without a dimmer in the circuit.

The sample was adjusted and tested at 2700K and 100% dimming setting.

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)	0.300	0.134
Power Factor	0.9955	0.9691
Test Power (W)/2	17.94	17.94
THD A%	6.23	10.57
Luminous Efficacy (lm/W)	125.8	125.8
Total Luminous Flux (lm)	2255.7	2256.2
Color Rendering Index (CRI)	83.4	
R9	11.4	
Correlated Color Temperature (CCT)(K)	2722	
Chromaticity Chroma x	0.4551	
Chromaticity Chroma y	0.4051	
Chromaticity Chroma u	0.2619	
Chromaticity Chroma v	0.3497	
Duv	-0.0016	
Chromaticity Chroma u ’	0.2619	
Chromaticity Chroma v’	0.5245	

Special Color Rendering Indices	
R1	82.8
R2	93.6
R3	93.8
R4	81.1
R5	83.4
R6	93.2
R7	80.8
R8	58.2
R9	11.4
R10	85.7
R11	81.6
R12	77.4
R13	85.7
R14	97.5

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

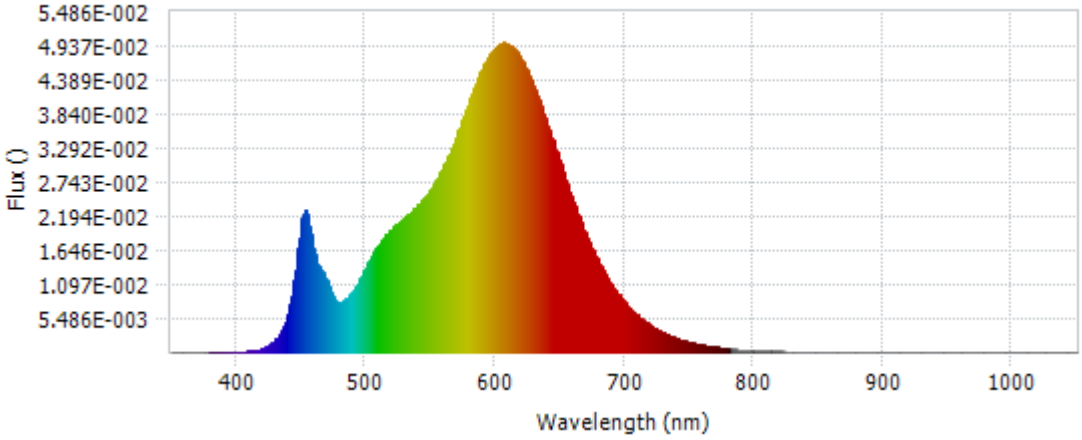
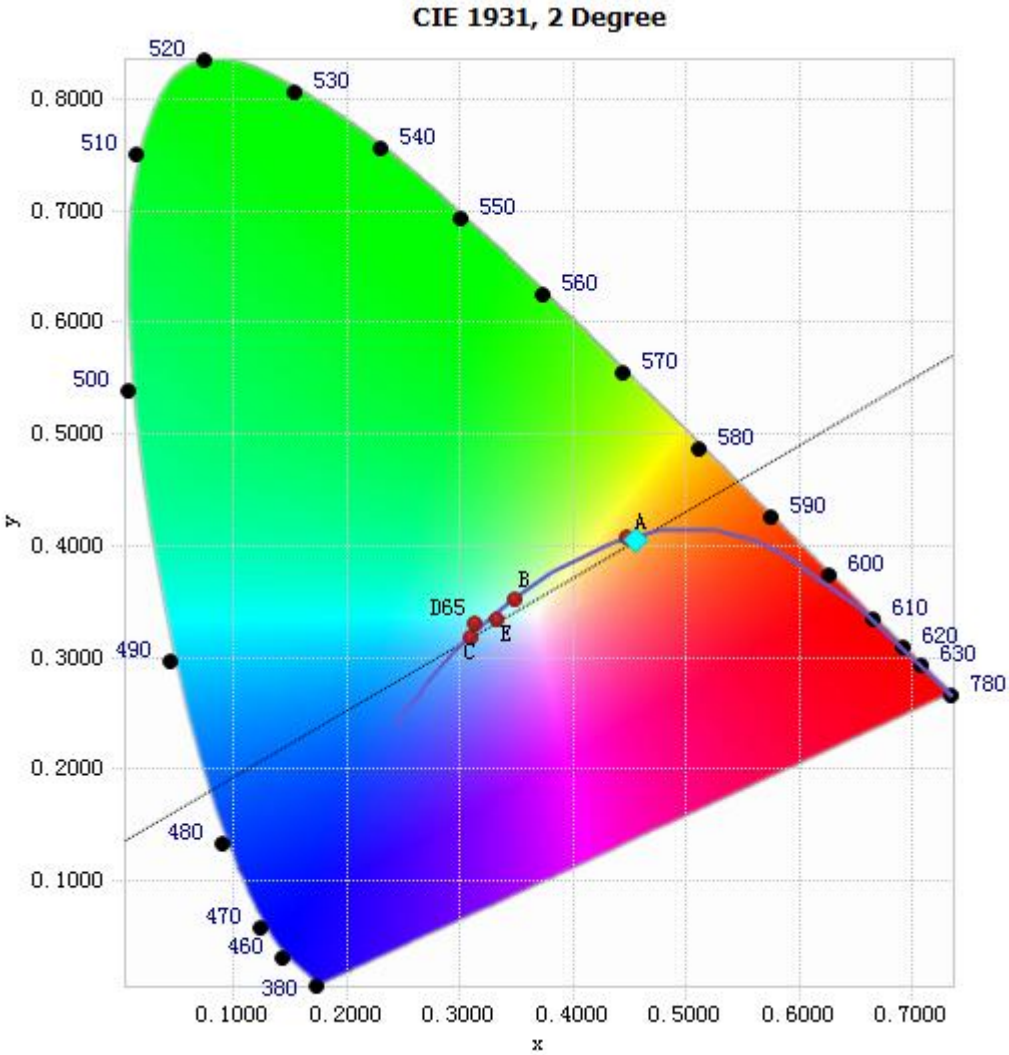


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.15E-04	485	8.65E-03	590	4.56E-02	695	9.52E-03
385	1.18E-04	490	9.72E-03	595	4.76E-02	700	8.19E-03
390	1.38E-04	495	1.15E-02	600	4.89E-02	705	7.01E-03
395	1.38E-04	500	1.36E-02	605	4.96E-02	710	5.99E-03
400	1.22E-04	505	1.56E-02	610	4.96E-02	715	5.12E-03
405	1.46E-04	510	1.72E-02	615	4.89E-02	720	4.41E-03
410	1.97E-04	515	1.87E-02	620	4.72E-02	725	3.76E-03
415	3.39E-04	520	1.98E-02	625	4.54E-02	730	3.19E-03
420	5.94E-04	525	2.08E-02	630	4.29E-02	735	2.71E-03
425	1.08E-03	530	2.17E-02	635	4.02E-02	740	2.30E-03
430	1.91E-03	535	2.25E-02	640	3.72E-02	745	1.97E-03
435	3.42E-03	540	2.35E-02	645	3.41E-02	750	1.67E-03
440	6.16E-03	545	2.48E-02	650	3.08E-02	755	1.42E-03
445	1.17E-02	550	2.61E-02	655	2.77E-02	760	1.21E-03
450	2.01E-02	555	2.78E-02	660	2.48E-02	765	1.03E-03
455	2.24E-02	560	2.97E-02	665	2.19E-02	770	8.85E-04
460	1.68E-02	565	3.20E-02	670	1.93E-02	775	7.52E-04
465	1.34E-02	570	3.47E-02	675	1.69E-02	780	6.38E-04
470	1.16E-02	575	3.74E-02	680	1.47E-02		
475	9.09E-03	580	4.04E-02	685	1.28E-02		
480	8.07E-03	585	4.31E-02	690	1.11E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4551, 0.4051)

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

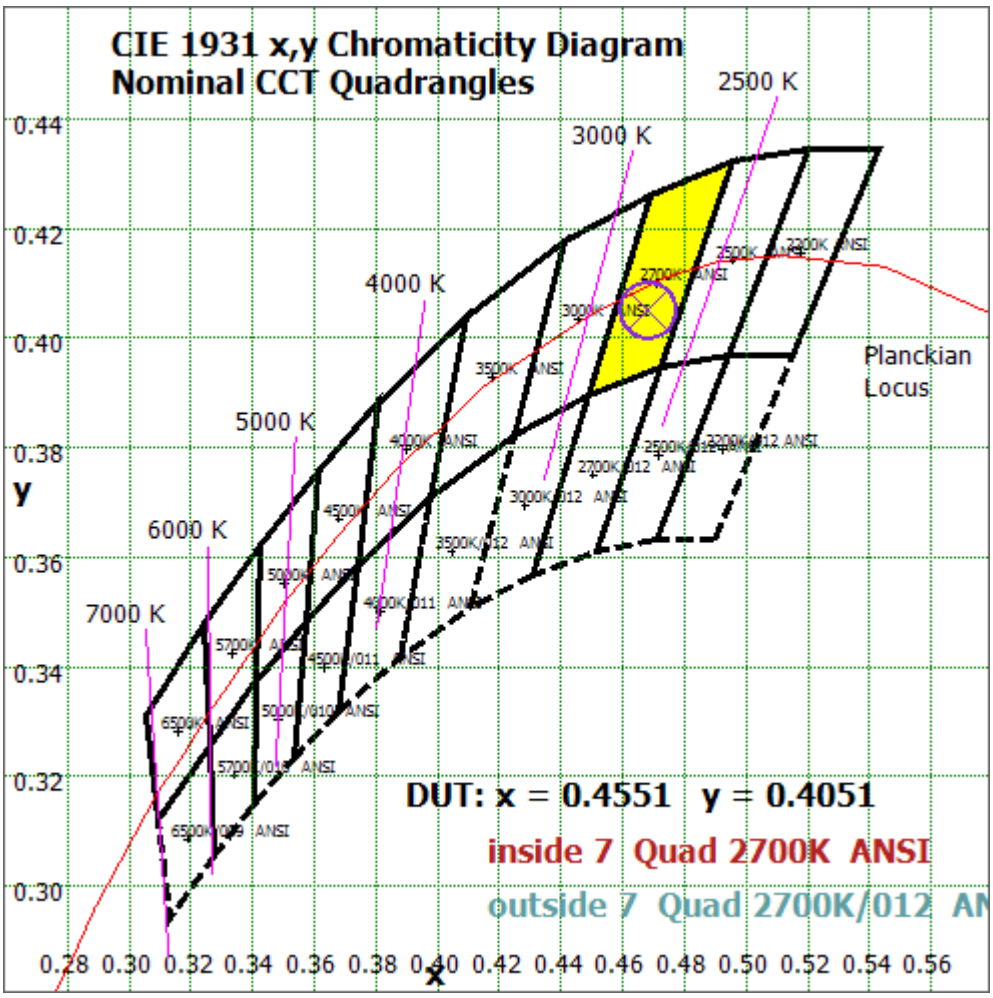


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

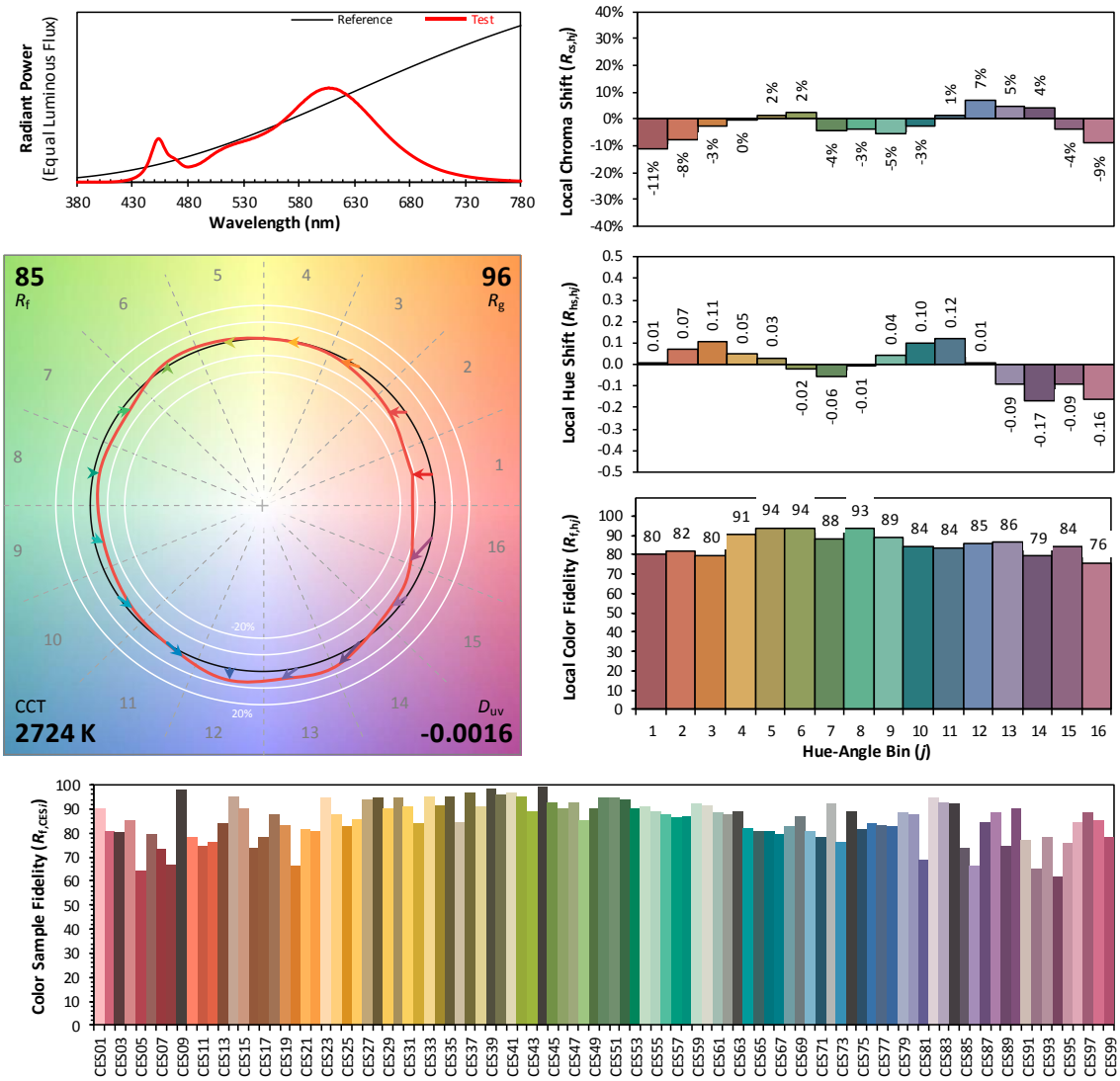
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: RAB LIGHTING INC

Date: 2020/10/15

Model: LCBT8-14-48P-8TW-DIR-SS 2700K



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

x	0.4551
y	0.4051
u'	0.2619
v'	0.5245

CIE 13.3-1995 (CRI)	
R_a	83
R_9	12

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

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.

TEST RESULTS of Model LCBT8-14-48P-8TW-DIR-SS 4000K

Test ambient temperature was 25.0 ℃.

Base orientation was horizontal. Test was conducted without a dimmer in the circuit.

The sample was adjusted and tested at 4000K and 100% dimming setting.

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)	0.299	0.133
Power Factor	0.9955	0.9688
Test Power (W)/2	17.86	17.86
THD A%	6.09	10.66
Luminous Efficacy (lm/W)	131.6	131.5
Total Luminous Flux (lm)	2349.0	2349.4
Color Rendering Index (CRI)	87.7	
R9	31.7	
Correlated Color Temperature (CCT)(K)	4105	
Chromaticity Chroma x	0.3722	
Chromaticity Chroma y	0.3593	
Chromaticity Chroma u	0.2267	
Chromaticity Chroma v	0.3283	
Duv	-0.0059	
Chromaticity Chroma u ’	0.2267	
Chromaticity Chroma v’	0.4924	

Special Color Rendering Indices	
R1	88
R2	93.2
R3	95.1
R4	87.5
R5	88.1
R6	89
R7	87.5
R8	72.8
R9	31.7
R10	82.9
R11	87.7
R12	69.4
R13	89.7
R14	97.6

Table 4: 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

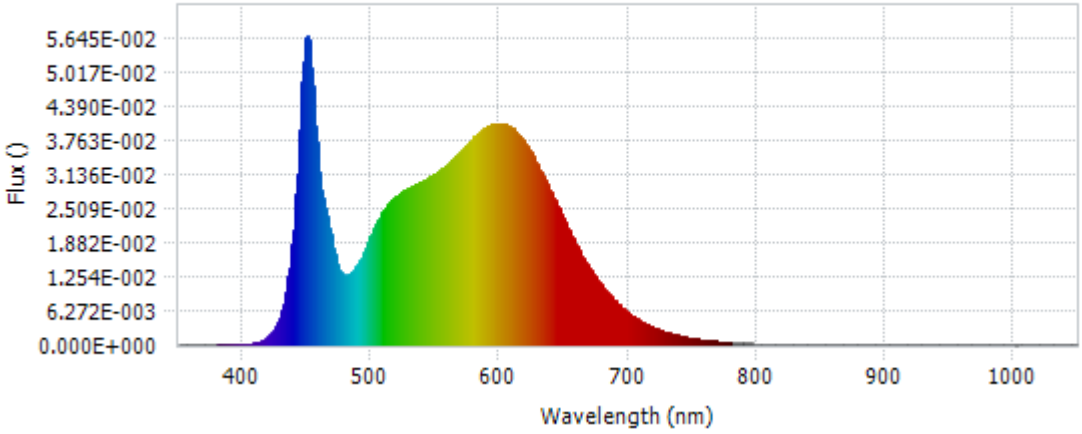
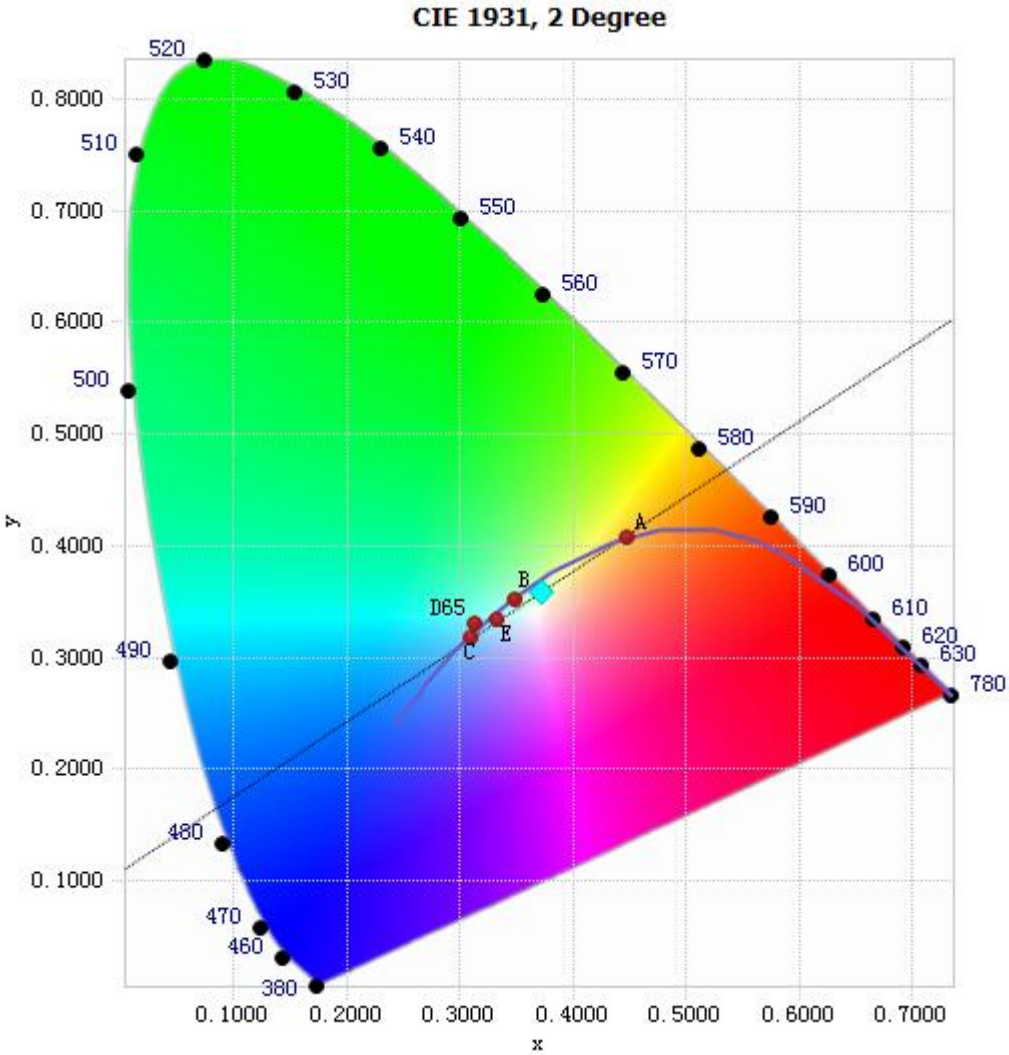


Chart 5: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.62E-04	485	1.35E-02	590	4.02E-02	695	6.91E-03
385	2.42E-04	490	1.51E-02	595	4.07E-02	700	5.93E-03
390	2.53E-04	495	1.77E-02	600	4.08E-02	705	5.08E-03
395	2.19E-04	500	2.06E-02	605	4.05E-02	710	4.31E-03
400	1.76E-04	505	2.30E-02	610	3.98E-02	715	3.70E-03
405	2.17E-04	510	2.49E-02	615	3.86E-02	720	3.18E-03
410	3.73E-04	515	2.65E-02	620	3.69E-02	725	2.71E-03
415	7.78E-04	520	2.76E-02	625	3.50E-02	730	2.30E-03
420	1.61E-03	525	2.83E-02	630	3.29E-02	735	1.96E-03
425	3.25E-03	530	2.90E-02	635	3.05E-02	740	1.66E-03
430	6.45E-03	535	2.95E-02	640	2.80E-02	745	1.41E-03
435	1.25E-02	540	3.01E-02	645	2.55E-02	750	1.21E-03
440	2.43E-02	545	3.09E-02	650	2.30E-02	755	1.03E-03
445	4.43E-02	550	3.16E-02	655	2.05E-02	760	8.83E-04
450	5.68E-02	555	3.25E-02	660	1.83E-02	765	7.47E-04
455	4.38E-02	560	3.34E-02	665	1.61E-02	770	6.40E-04
460	3.03E-02	565	3.46E-02	670	1.41E-02	775	5.46E-04
465	2.38E-02	570	3.58E-02	675	1.24E-02	780	4.68E-04
470	1.78E-02	575	3.70E-02	680	1.07E-02		
475	1.36E-02	580	3.83E-02	685	9.30E-03		
480	1.28E-02	585	3.93E-02	690	8.05E-03		

Table 5: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3722, 0.3593)

Chart 6: 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

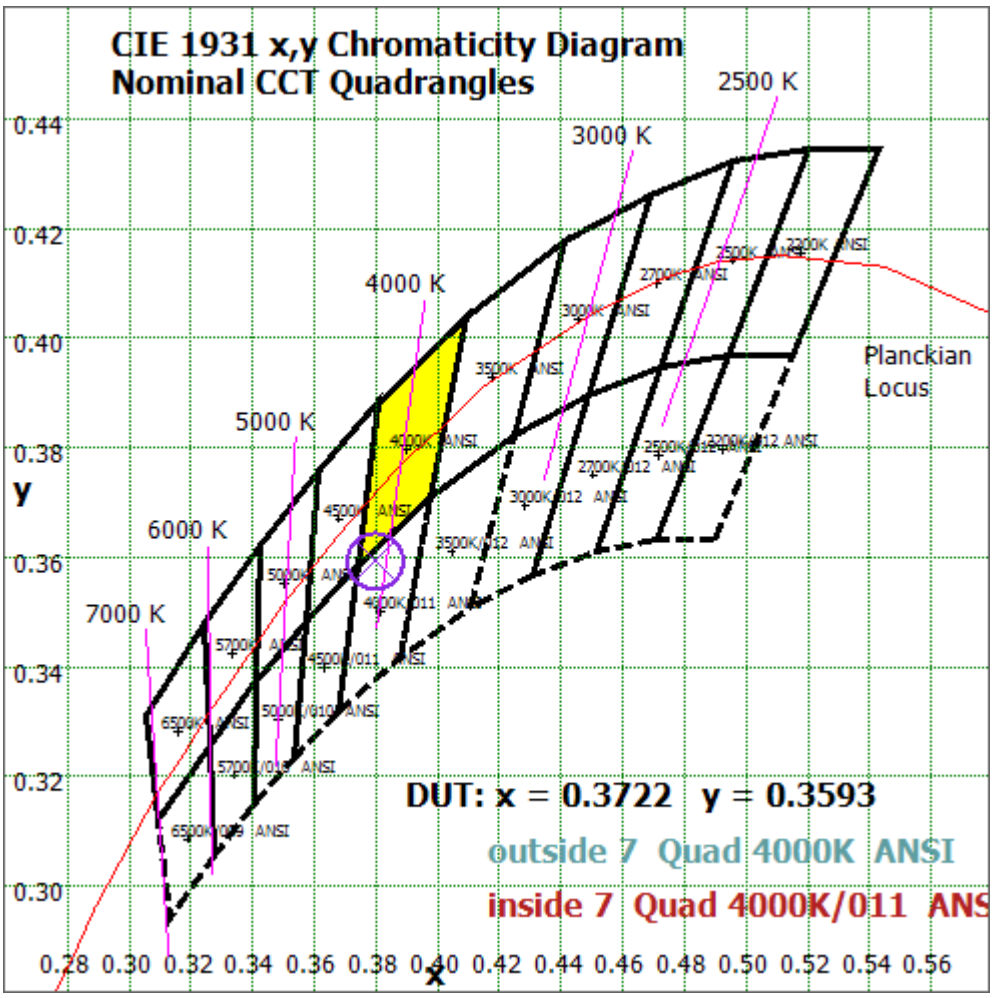


Chart 7: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

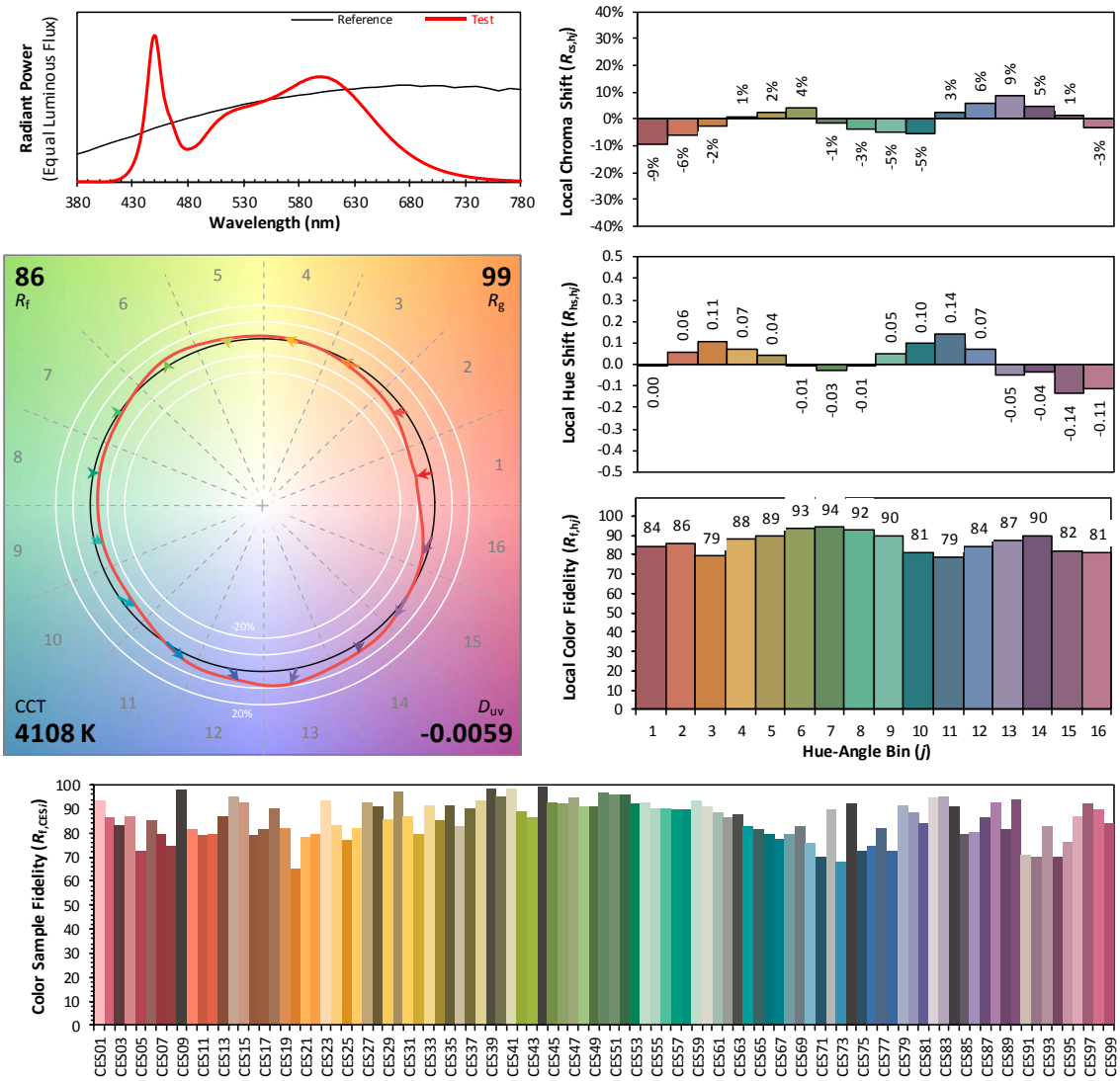
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: RAB LIGHTING INC

Date: 2020/10/15

Model: LCBT8-14-48P-8TW-DIR-SS 4000K



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

x	0.3722
y	0.3593
u'	0.2267
v'	0.4924

CIE 13.3-1995 (CRI)	
R_a	88
R_9	32

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 8: 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 4 due to rounding.

TEST RESULTS of Model LCBT8-14-48P-8TW-DIR-SS 4500K

Test ambient temperature was 25.0 ℃.

Base orientation was horizontal. Test was conducted without a dimmer in the circuit.

The sample was adjusted and tested at 4500K and 100% dimming setting.

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)	0.299	0.133
Power Factor	0.9955	0.9689
Test Power (W)/2	17.86	17.87
THD A%	6.16	10.54
Luminous Efficacy (lm/W)	132.7	132.6
Total Luminous Flux (lm)	2370.0	2369.6
Color Rendering Index (CRI)	87.3	
R9	31.5	
Correlated Color Temperature (CCT)(K)	4666	
Chromaticity Chroma x	0.3536	
Chromaticity Chroma y	0.3489	
Chromaticity Chroma u	0.2182	
Chromaticity Chroma v	0.3231	
Duv	-0.0047	
Chromaticity Chroma u ’	0.2182	
Chromaticity Chroma v’	0.4846	

Special Color Rendering Indices	
R1	87.5
R2	92
R3	93.6
R4	87.6
R5	87.4
R6	87
R7	88.7
R8	74.4
R9	31.5
R10	79.8
R11	87.6
R12	64.9
R13	89
R14	96.6

Table 6: 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

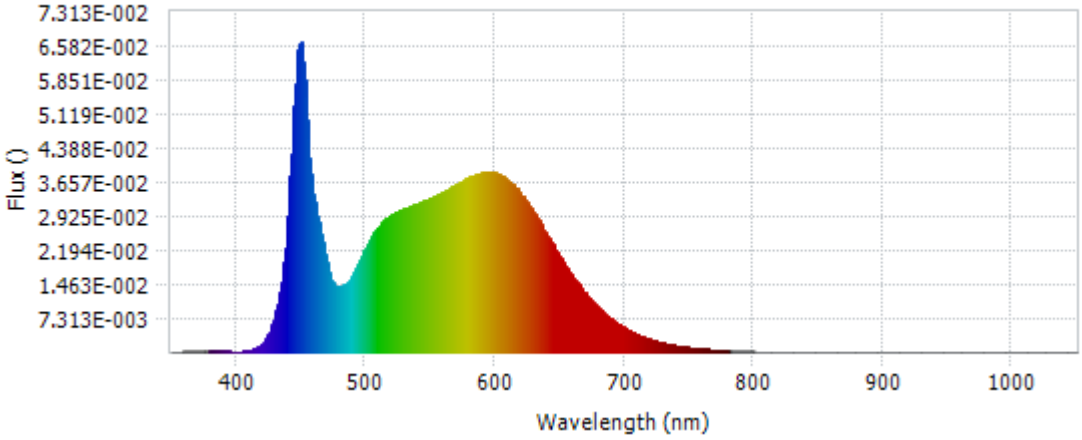
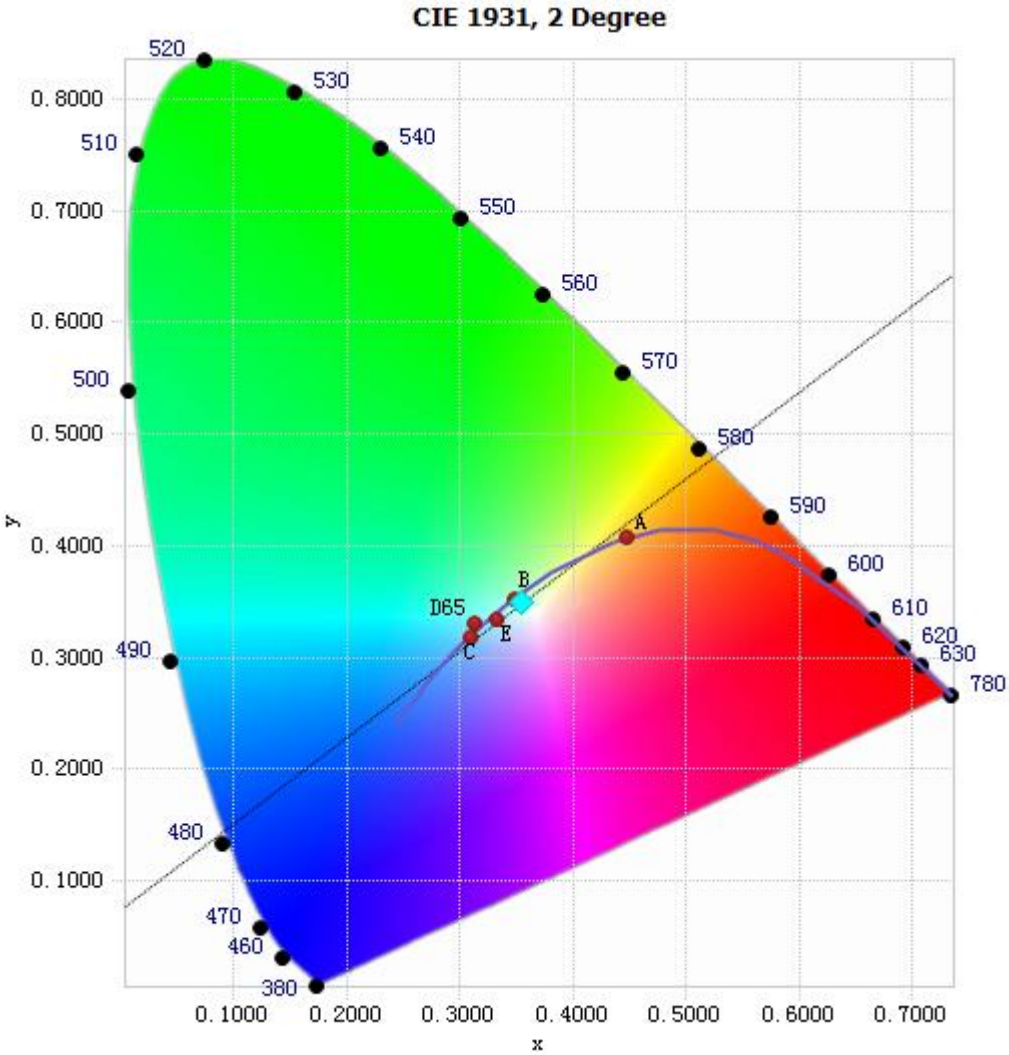


Chart 9: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.93E-04	485	1.48E-02	590	3.86E-02	695	6.18E-03
385	2.74E-04	490	1.65E-02	595	3.87E-02	700	5.31E-03
390	2.58E-04	495	1.93E-02	600	3.85E-02	705	4.53E-03
395	2.35E-04	500	2.24E-02	605	3.80E-02	710	3.87E-03
400	1.95E-04	505	2.49E-02	610	3.70E-02	715	3.31E-03
405	2.40E-04	510	2.69E-02	615	3.57E-02	720	2.83E-03
410	4.23E-04	515	2.85E-02	620	3.40E-02	725	2.43E-03
415	9.14E-04	520	2.96E-02	625	3.21E-02	730	2.06E-03
420	1.90E-03	525	3.03E-02	630	3.00E-02	735	1.76E-03
425	3.89E-03	530	3.09E-02	635	2.77E-02	740	1.49E-03
430	7.74E-03	535	3.14E-02	640	2.55E-02	745	1.27E-03
435	1.51E-02	540	3.19E-02	645	2.31E-02	750	1.09E-03
440	2.91E-02	545	3.26E-02	650	2.08E-02	755	9.22E-04
445	5.29E-02	550	3.30E-02	655	1.85E-02	760	7.89E-04
450	6.65E-02	555	3.37E-02	660	1.65E-02	765	6.69E-04
455	4.97E-02	560	3.44E-02	665	1.45E-02	770	5.75E-04
460	3.40E-02	565	3.52E-02	670	1.27E-02	775	4.91E-04
465	2.67E-02	570	3.60E-02	675	1.11E-02	780	4.20E-04
470	1.95E-02	575	3.68E-02	680	9.65E-03		
475	1.49E-02	580	3.76E-02	685	8.34E-03		
480	1.41E-02	585	3.83E-02	690	7.21E-03		

Table 7: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3536, 0.3489)

Chart 10: 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

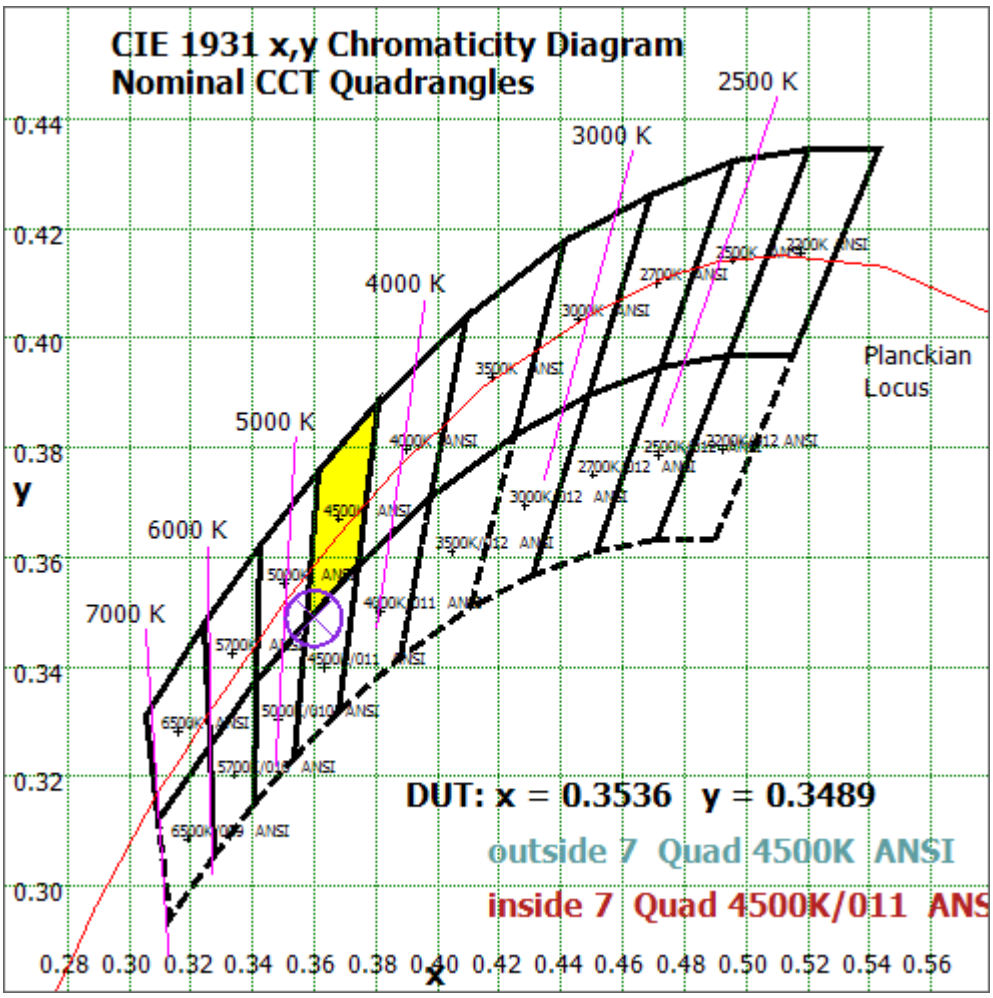


Chart 11: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

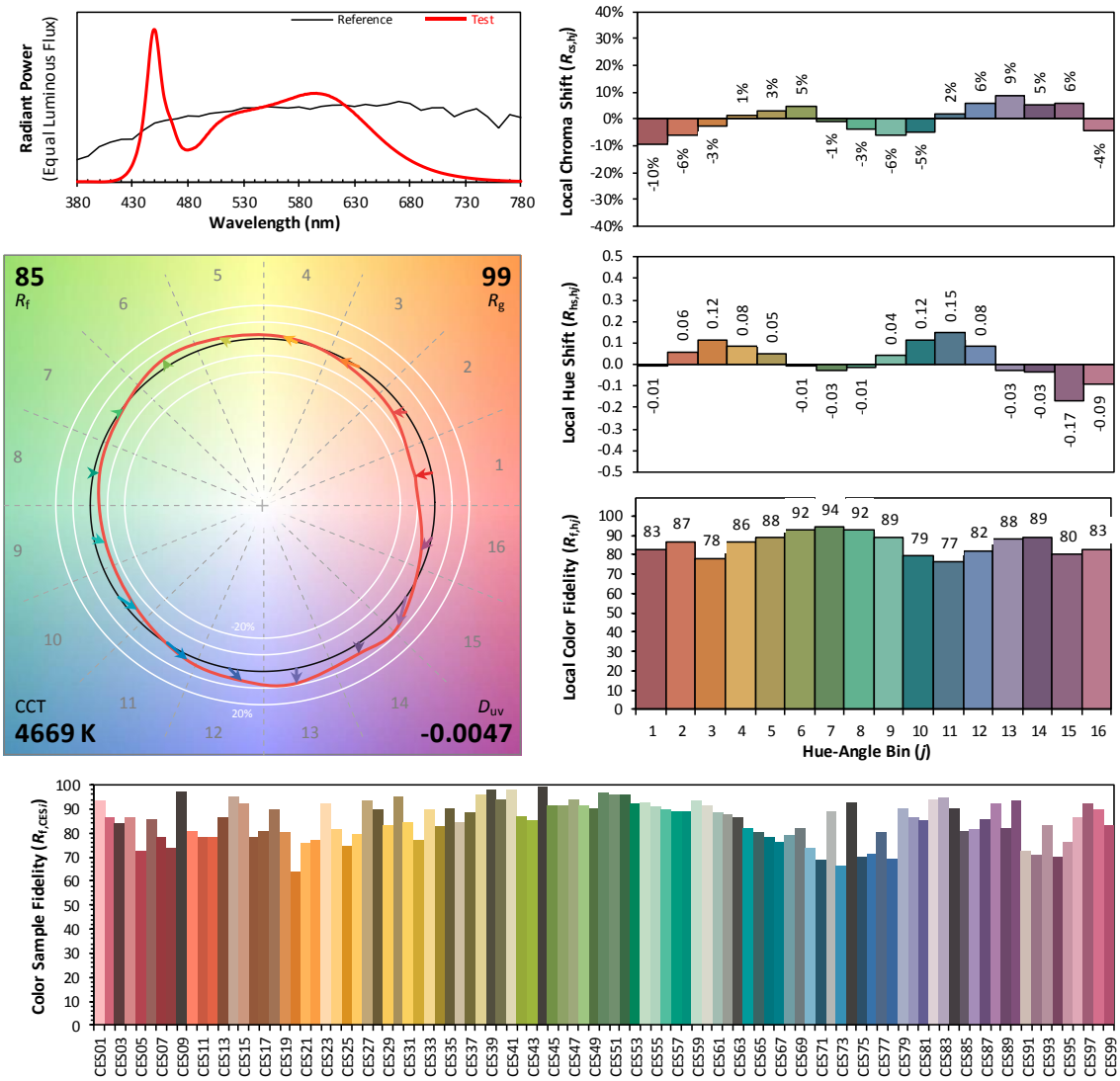
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: RAB LIGHTING INC

Date: 2020/10/15

Model: LCBT8-14-48P-8TW-DIR-SS 4500K



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

x	0.3536
y	0.3489
u'	0.2182
v'	0.4846

CIE 13.3-1995 (CRI)	
R_a	87
R_9	32

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 12: 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 6 due to rounding.

TEST RESULTS of Model LCBT8-14-48P-8TW-DIR-SS 6500K

Test ambient temperature was 25.0 ℃.

Base orientation was horizontal. Test was conducted without a dimmer in the circuit.

The sample was adjusted and tested at 6500K and 100% dimming setting.

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)	0.299	0.133
Power Factor	0.9955	0.9687
Test Power (W)/2	17.88	17.88
THD A%	6.27	10.64
Luminous Efficacy (lm/W)	135.1	135.0
Total Luminous Flux (lm)	2414.4	2414.5
Color Rendering Index (CRI)	83.6	
R9	13.8	
Correlated Color Temperature (CCT)(K)	6721	
Chromaticity Chroma x	0.3095	
Chromaticity Chroma y	0.3242	
Chromaticity Chroma u	0.1974	
Chromaticity Chroma v	0.3102	
Duv	0.0024	
Chromaticity Chroma u ’	0.1974	
Chromaticity Chroma v’	0.4653	

Special Color Rendering Indices	
R1	82.5
R2	87
R3	89
R4	84.7
R5	83.3
R6	81.2
R7	88.5
R8	72.8
R9	13.8
R10	68.4
R11	84.4
R12	58
R13	83.7
R14	94.2

Table 8: 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

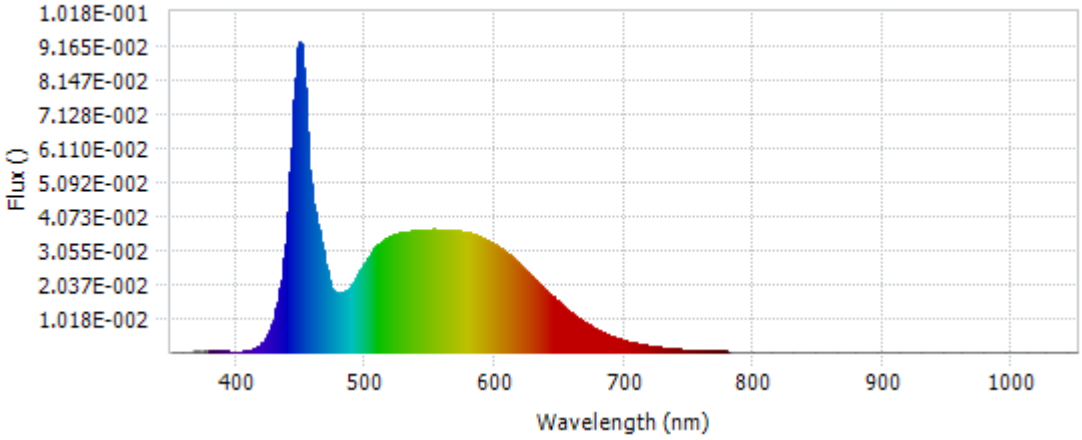
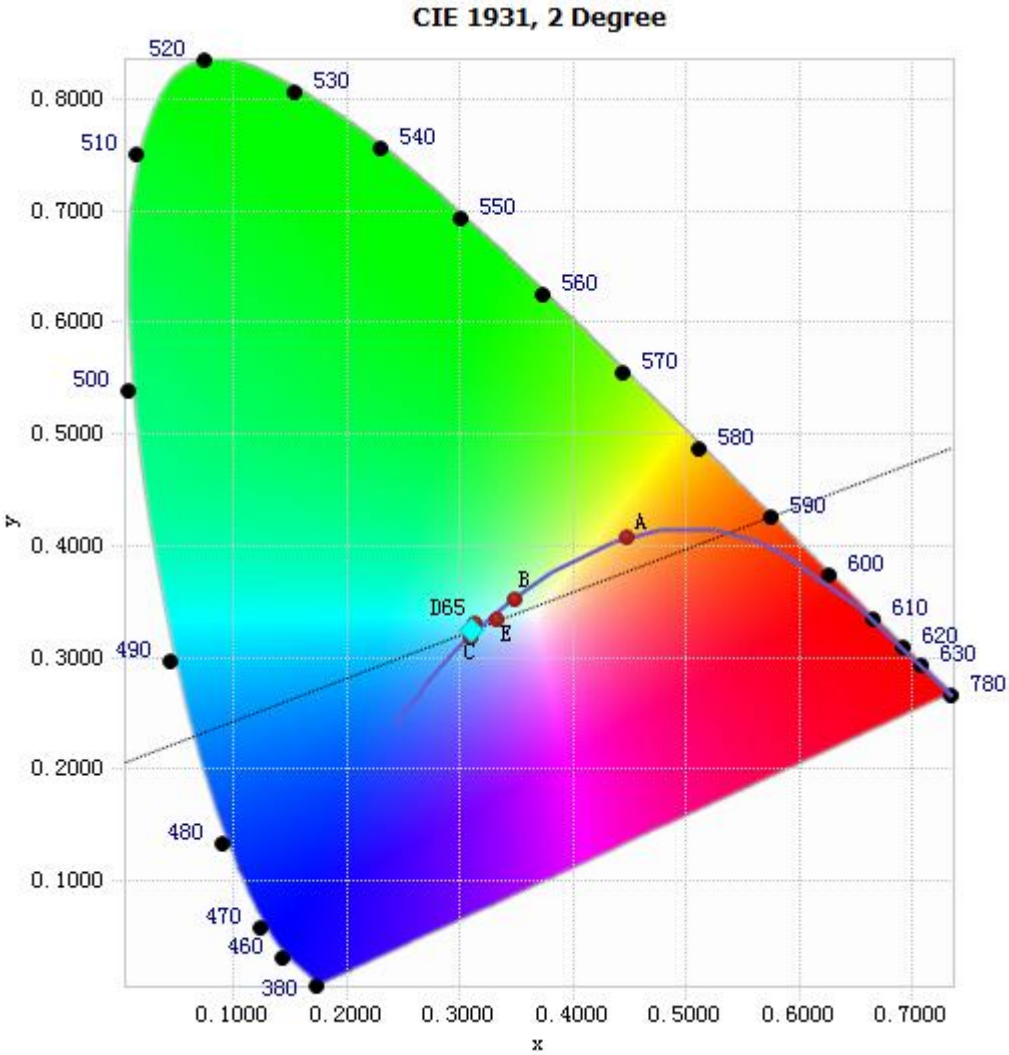


Chart 13: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.92E-04	485	1.84E-02	590	3.44E-02	695	4.23E-03
385	3.59E-04	490	2.04E-02	595	3.34E-02	700	3.62E-03
390	3.57E-04	495	2.37E-02	600	3.22E-02	705	3.09E-03
395	2.91E-04	500	2.72E-02	605	3.10E-02	710	2.64E-03
400	2.41E-04	505	3.00E-02	610	2.94E-02	715	2.26E-03
405	2.96E-04	510	3.21E-02	615	2.78E-02	720	1.95E-03
410	5.93E-04	515	3.38E-02	620	2.59E-02	725	1.66E-03
415	1.32E-03	520	3.48E-02	625	2.41E-02	730	1.42E-03
420	2.75E-03	525	3.55E-02	630	2.23E-02	735	1.21E-03
425	5.64E-03	530	3.59E-02	635	2.03E-02	740	1.03E-03
430	1.13E-02	535	3.62E-02	640	1.84E-02	745	8.77E-04
435	2.18E-02	540	3.64E-02	645	1.66E-02	750	7.49E-04
440	4.20E-02	545	3.67E-02	650	1.48E-02	755	6.46E-04
445	7.55E-02	550	3.67E-02	655	1.31E-02	760	5.50E-04
450	9.20E-02	555	3.68E-02	660	1.15E-02	765	4.73E-04
455	6.58E-02	560	3.68E-02	665	1.01E-02	770	4.06E-04
460	4.44E-02	565	3.67E-02	670	8.82E-03	775	3.51E-04
465	3.45E-02	570	3.65E-02	675	7.67E-03	780	2.97E-04
470	2.45E-02	575	3.61E-02	680	6.63E-03		
475	1.85E-02	580	3.58E-02	685	5.73E-03		
480	1.77E-02	585	3.51E-02	690	4.93E-03		

Table 9: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3095, 0.3242)

Chart 14: 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

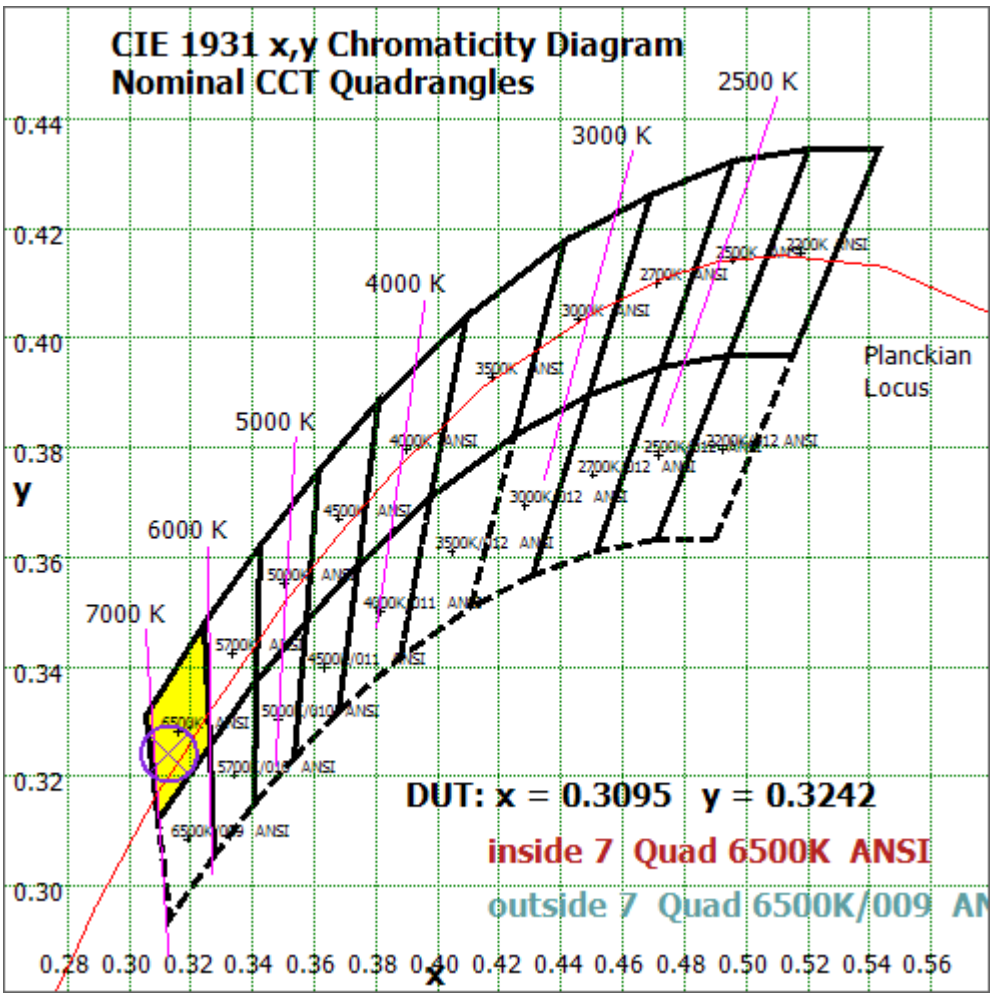


Chart 15: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

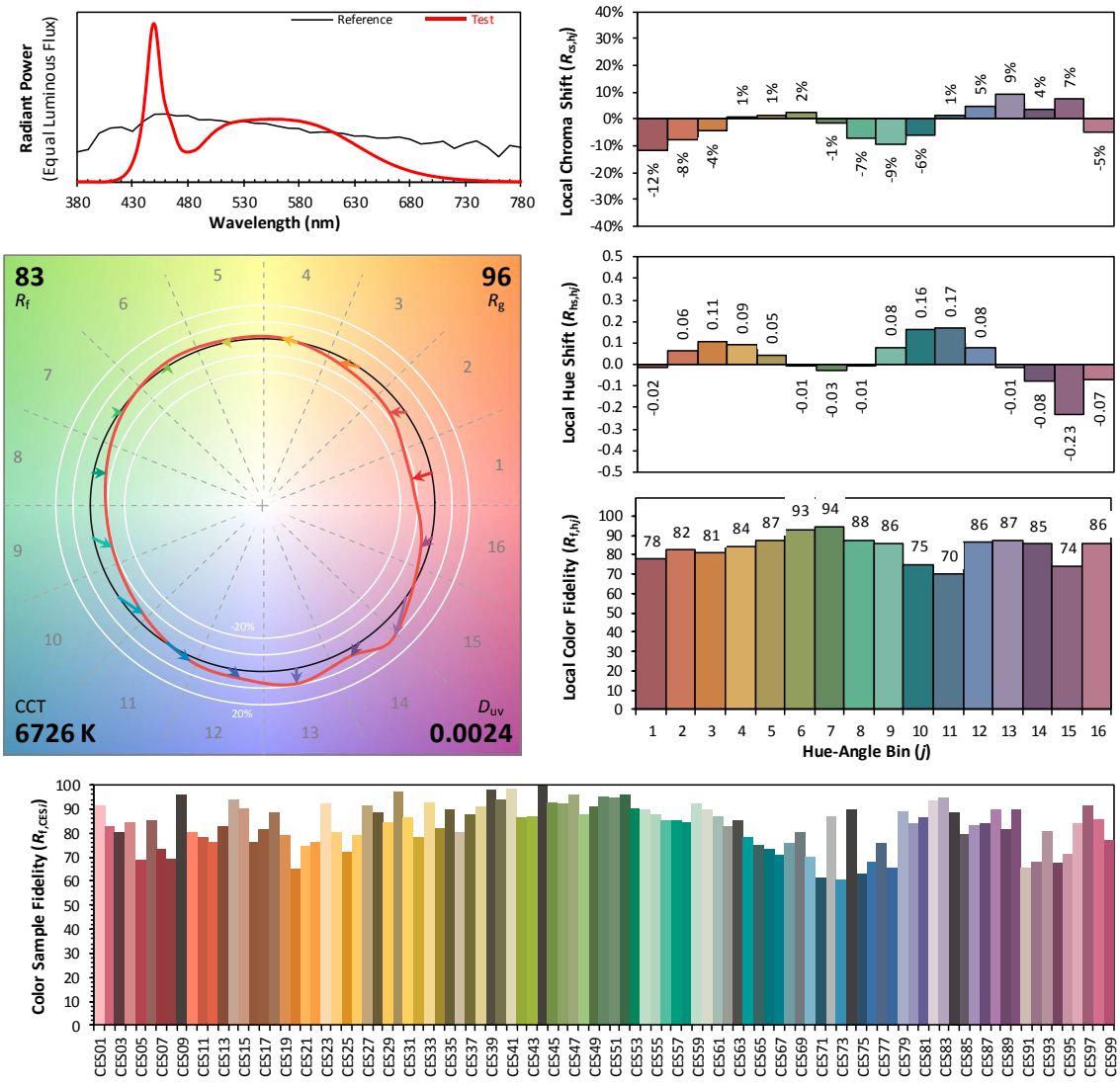
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: RAB LIGHTING INC

Date: 2020/10/15

Model: LCBT8-14-48P-8TW-DIR-SS 6500K



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

x	0.3095
y	0.3242
u'	0.1974
v'	0.4653

CIE 13.3-1995 (CRI)	
R_a	84
R_9	14

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 16: 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 8 due to rounding.

TEST RESULTS of Model LCBT8-14-48P-8TW-DIR-SS 2700K

Test ambient temperature was 25.2 ℃.

The photometric distance is 30 m.

The sample was adjusted and tested at 2700K and 100% dimming setting.

Luminous data was taken at 0.5 °vertical intervals and 10 °horizontal intervals.

Goniophotometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.298
Power Factor	0.9971
Power (W)/2	17.83
Luminous Efficacy (lm/W)	125.3
Total Luminous Flux (lm)	2233.8
Beam Angle (°)	109.7 (0°-180°) / 149.4 (90°-270°)
Center Beam Candle Power (cd)	531
Maximum Beam Candle Power (cd)	531.6 (At: C=150.0, Gamma=0.5)
Spacing Criteria	1.24 (0°-180°) / 1.34 (90°-270°)
Zonal Lumens in the 0°-60° Zone	57.32%
Zonal Lumens in the 60°-90° Zone	27.72%
Zonal Lumens in the 90°-120° Zone	11.32%
Zonal Lumens in the 120°-180° Zone	3.65%

Table 10: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	50.307	2.25%
10- 20	145.05	6.49%
20- 30	222.941	9.98%
30- 40	275.323	12.33%
40- 50	297.437	13.32%
50- 60	289.346	12.95%
60- 70	256.118	11.47%
70- 80	207.237	9.28%
80- 90	155.78	6.97%
90-100	114.274	5.12%
100-110	82.112	3.68%
110-120	56.447	2.53%
120-130	36.616	1.64%
130-140	22.551	1.01%
140-150	12.751	0.57%
150-160	6.435	0.29%
160-170	2.545	0.11%
170-180	0.576	0.03%
Total	2233.8	100%

γ(°)	Lumens	% Total
0- 60	1280.404	57.32%
60- 90	619.135	27.72%
0-90	1899.539	85.03%
90- 180	334.307	14.97%
0- 180	2233.8	100%

Table 11: Zonal Lumen

Illuminance Plots- Goniophotometer Method

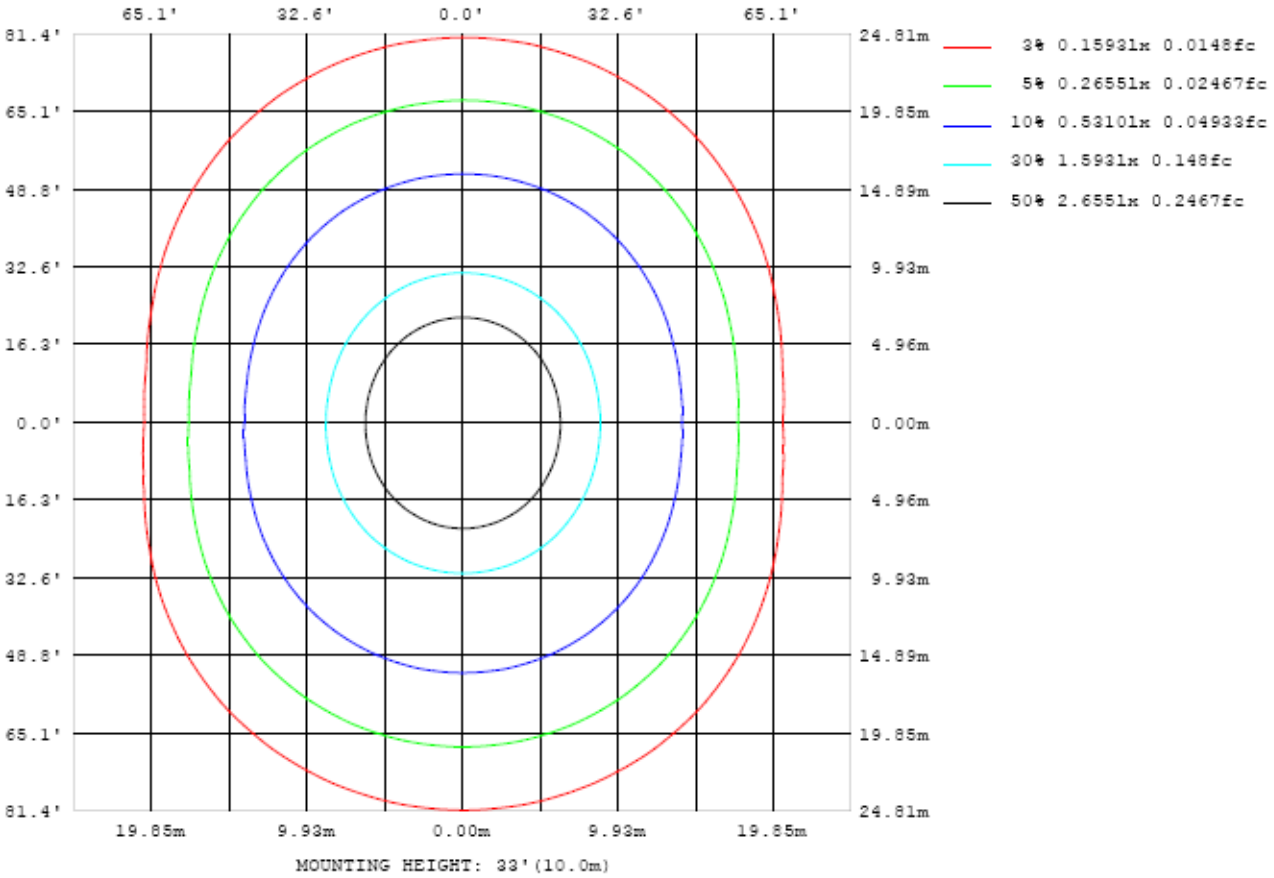


Chart 17: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

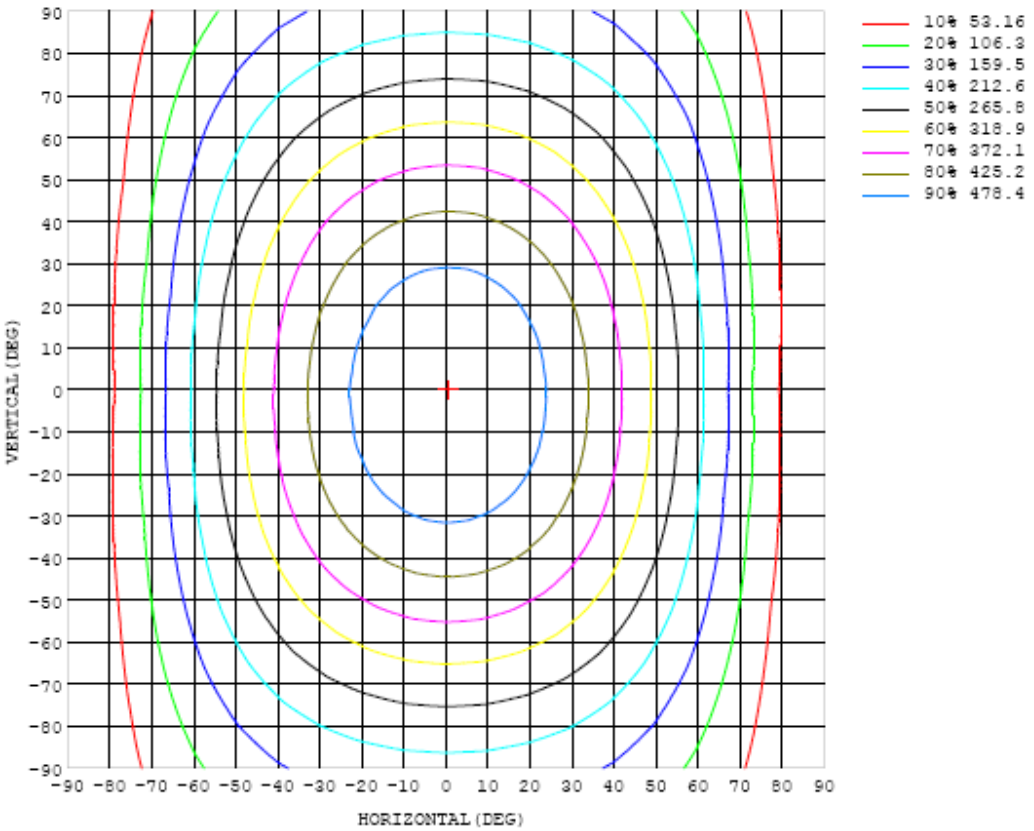


Chart 18: Isocandela Plot

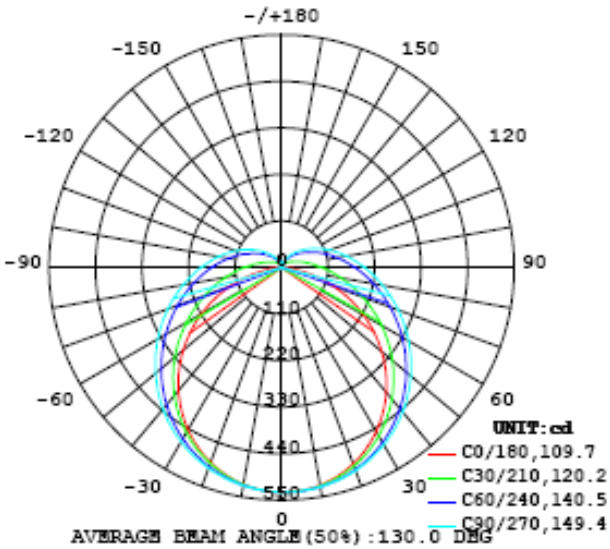


Chart 19: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531
5	529	529	529	530	530	530	530	530	530	530	530	530	530	530	529	529	528	528	528
10	522	523	524	524	525	526	526	527	527	527	527	526	525	525	523	523	521	519	520
15	510	511	512	514	515	517	519	520	521	520	520	519	517	516	513	512	509	508	508
20	494	495	497	500	503	506	508	510	511	511	511	509	506	503	500	497	493	490	490
25	473	474	477	481	486	490	495	497	499	499	497	495	492	488	483	478	472	469	468
30	447	449	453	460	466	472	477	481	483	483	483	479	474	469	462	455	449	444	443
35	418	421	426	434	442	451	457	462	465	466	465	461	454	448	438	430	421	415	413
40	385	388	396	406	416	427	435	441	444	445	444	439	432	424	413	402	390	382	379
45	349	353	362	375	388	400	411	418	422	423	421	416	408	397	384	371	357	347	343
50	309	314	327	342	358	373	385	392	398	399	397	391	381	369	354	338	322	309	304
55	267	274	289	307	327	344	357	366	372	373	371	364	354	341	323	304	285	269	262
60	224	232	250	273	294	315	329	339	345	347	344	338	326	312	292	270	247	227	219
65	178	188	212	238	263	284	301	312	318	320	318	310	299	283	261	236	209	185	174
70	132	145	173	204	232	256	273	285	292	294	291	283	271	254	231	203	173	144	129
75	87.9	104	137	172	203	228	246	259	266	268	265	257	245	227	202	173	139	104	85.2
80	47.2	66.7	105	143	175	201	221	233	241	243	240	232	219	201	176	145	108	69.8	44.6
85	14.7	37.2	78.0	117	150	177	196	209	216	219	216	209	196	177	152	120	82.3	42.2	13.5
90	0.54	19.1	57.7	95.5	128	154	174	187	194	196	194	187	173	155	130	98.7	62.5	24.5	0.30
95	0.49	10.6	42.5	77.2	108	134	153	166	173	176	173	166	153	135	111	80.9	47.3	15.0	0.47
100	0.74	7.22	31.9	63.2	91.3	116	134	146	153	156	154	146	134	117	94.0	66.9	36.5	10.8	0.74
105	1.12	4.95	24.9	51.2	76.9	99.1	116	128	135	138	136	129	117	101	79.7	54.9	28.8	8.85	1.13
110	1.52	5.50	20.2	41.7	64.6	84.6	101	112	119	121	119	113	102	86.5	67.3	45.0	23.8	7.71	1.64
115	2.05	5.44	16.1	34.6	53.8	71.7	86.0	96.5	103	105	103	97.3	86.9	73.8	56.2	37.4	20.1	7.09	2.16
120	2.60	5.38	12.7	28.9	45.1	60.3	72.9	82.1	88.1	90.2	88.5	82.8	74.0	62.1	47.1	31.9	17.1	6.76	2.65
125	3.17	5.67	12.4	23.6	38.0	50.8	61.7	69.7	74.6	76.3	74.7	70.6	62.9	52.0	39.4	26.9	15.4	5.80	3.11
130	3.72	5.64	11.4	19.0	31.4	42.7	51.9	58.9	63.3	64.9	63.7	59.6	51.7	43.3	33.6	22.7	13.5	6.47	3.50
135	4.21	5.74	10.3	17.3	25.5	35.1	43.3	49.3	53.0	54.5	53.4	49.9	43.3	36.7	28.5	20.0	12.4	6.39	3.80
140	4.64	5.92	9.59	14.9	20.8	28.4	35.2	40.4	43.7	45.0	44.2	40.3	35.6	30.7	23.9	17.0	10.6	6.00	4.14
145	4.93	5.92	9.44	13.3	18.3	22.8	27.9	32.2	35.0	36.1	35.5	32.5	29.3	25.1	20.2	14.9	9.17	6.36	4.44
150	5.15	6.05	8.32	11.3	15.6	19.5	22.9	24.9	27.2	28.1	27.6	26.4	24.2	21.2	17.0	12.2	8.84	6.63	4.68
155	5.18	6.02	8.22	10.2	12.3	16.1	18.2	20.5	21.9	22.5	22.5	21.3	19.6	17.2	13.7	10.4	7.76	6.18	4.84
160	5.08	5.51	7.85	9.18	11.2	12.4	14.4	16.2	17.2	17.6	17.4	16.4	15.0	12.6	10.5	7.95	6.91	5.42	4.87
165	4.94	4.97	6.32	8.80	9.45	10.4	11.7	12.2	12.4	12.5	11.8	12.0	11.6	9.72	7.39	6.30	5.55	4.76	4.65
170	4.78	4.67	5.00	5.94	8.25	8.96	9.35	9.75	9.90	9.75	9.49	9.28	7.21	6.22	6.20	5.78	5.30	4.60	4.57
175	5.86	5.88	5.85	5.72	5.66	5.65	6.63	7.40	8.49	8.62	6.38	4.58	4.89	5.59	5.94	6.11	5.92	5.93	5.71
180	1.66	1.66	1.65	1.65	1.65	1.65	1.65	1.65	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64

Table 12: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350
0	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531	531
5	528	528	528	528	528	529	528	528	529	529	528	529	529	529	529	529	528
10	520	520	521	520	522	523	522	523	523	524	523	523	523	522	522	522	522
15	507	508	509	510	512	513	514	516	516	516	515	515	514	512	512	511	510
20	489	491	493	495	498	501	503	505	505	505	504	503	501	499	497	495	493
25	468	470	474	476	482	485	488	491	491	492	491	487	485	481	478	475	473
30	442	445	450	455	462	467	471	475	475	476	473	470	466	460	455	450	448
35	413	417	424	431	439	446	452	455	457	457	454	449	443	436	430	422	419
40	380	386	394	404	414	423	429	434	436	436	432	426	419	410	401	392	387
45	344	352	363	375	387	398	406	412	414	413	409	402	392	381	370	359	351
50	306	315	329	344	359	371	380	387	389	388	383	375	364	351	337	323	313
55	265	278	295	313	330	344	355	362	364	363	358	348	335	319	302	286	273
60	223	239	260	281	301	317	329	336	338	337	331	321	306	287	268	247	231
65	181	201	226	250	272	289	301	309	312	311	304	293	277	256	233	209	188
70	139	164	193	220	243	262	275	283	286	284	278	265	248	226	200	172	147
75	98.2	129	162	191	216	236	250	258	261	259	252	239	221	197	169	137	106
80	62.1	98.0	134	165	191	211	225	233	236	234	227	214	195	171	141	106	69.7
85	34.2	72.1	109	141	168	187	201	210	213	211	203	190	171	147	116	79.2	41.0
90	17.6	52.4	88.3	120	146	166	179	187	190	188	181	168	150	125	94.0	58.4	22.5
95	9.56	38.4	71.0	101	126	146	159	167	170	168	161	148	129	105	76.0	43.2	12.8
100	6.77	28.7	57.3	84.8	109	127	140	148	151	149	142	129	112	88.6	61.5	32.3	8.50
105	5.52	22.1	46.2	70.7	92.1	110	123	130	133	131	124	112	95.5	74.2	49.5	24.7	6.63
110	5.20	18.1	37.3	58.7	78.3	94.5	106	113	116	114	107	96.4	80.9	61.4	39.8	19.9	5.86
115	5.06	15.4	30.9	48.5	65.7	79.7	91.1	97.7	99.9	98.2	92.1	81.9	67.6	50.4	32.6	16.5	5.43
120	5.09	13.4	26.1	40.5	54.7	66.9	76.1	82.6	84.9	83.2	77.5	68.3	56.1	41.8	27.2	13.8	5.29
125	5.25	11.8	22.2	34.0	45.8	56.1	63.0	69.2	71.0	69.5	64.7	56.9	46.7	34.9	22.9	11.8	5.35
130	5.43	10.7	19.2	28.7	38.3	46.7	53.3	57.8	59.2	57.9	53.9	47.4	39.0	29.2	19.4	10.8	5.49
135	5.58	9.69	16.3	24.2	32.0	38.8	44.2	47.8	49.1	48.0	44.7	39.3	32.4	24.5	16.3	9.59	5.70
140	5.83	8.90	14.1	20.4	26.5	32.0	36.3	34.8	40.3	39.4	36.7	32.3	26.8	20.5	14.1	9.02	5.95
145	6.08	8.39	12.2	17.1	21.9	26.1	29.4	31.6	32.6	31.9	29.8	26.4	22.1	17.0	12.0	8.48	6.22
150	6.26	8.04	10.2	14.1	17.8	21.1	23.6	25.2	26.0	25.5	23.9	20.8	17.8	13.7	10.7	8.15	6.48
155	6.01	7.56	9.03	11.7	14.1	16.6	18.5	19.7	20.2	19.9	18.7	16.9	13.9	11.9	9.67	7.92	6.57
160	5.31	6.51	7.42	8.58	10.9	12.8	14.1	14.7	13.1	15.2	14.5	13.4	12.0	10.5	9.00	7.53	5.91
165	4.71	5.33	5.89	6.56	7.33	8.94	10.3	11.5	11.7	11.8	11.5	10.9	10.1	8.32	7.73	7.07	5.12
170	4.58	4.58	5.09	5.45	5.58	5.63	5.97	7.37	9.07	9.00	9.27	7.79	7.14	7.16	7.05	5.95	4.74
175	5.69	5.57	5.43	5.70	5.45	5.53	4.88	3.91	4.07	0.41	5.29	6.16	6.46	6.36	6.51	2.95	4.12
180	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.65	1.65	1.65	1.65	1.65	1.65	1.66

Table 13: Luminous Intensity Data

ISTMT Test Results of Model LCBT8-14-48P-8TW-DIR-SS 2700K

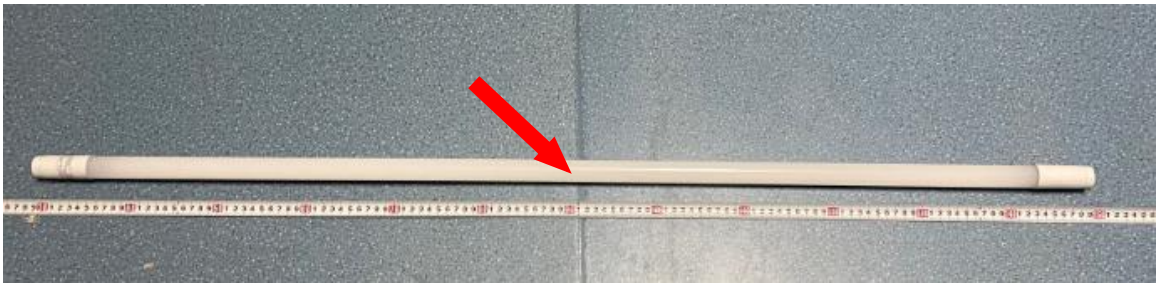
Test ambient temperature was 24.7 ℃.

Test orientation was light down.

Model of light source: BXVN-27E-21M-3EV

The stabilization time of the sample was 7.5 hours.

View of In-Situ Point- Ts



Location of In-Situ Point from overall view

Input Voltage (V)	Input Power (W)	Tested LED Source Current (mA)	Measured In-Situ Maximum Temperature (Corrected to Ta=25 ℃)
120.0	35.87	58.5	47.3
277.0	35.88	58.4	47.1

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 05, 2020	Aug. 04, 2021
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2020	Aug. 04, 2021
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2020	Aug. 04, 2021
Standard source	D908	HZTE012-01	Aug. 05, 2020	Aug. 04, 2021
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2020	Aug. 04, 2021
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2020	Aug. 04, 2021
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2020	Aug. 04, 2021
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2020	Aug. 04, 2021
Multi-Meter	FLUKE15B	HZTE020-01	Aug. 05, 2020	Aug. 04, 2021

Table 14: 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.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.
Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. 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 Everfine Digital Power Meter.
Some graphics were created with Photometric Plus software.
The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.
The uncertainty of goniophotometer system reported in this document is expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

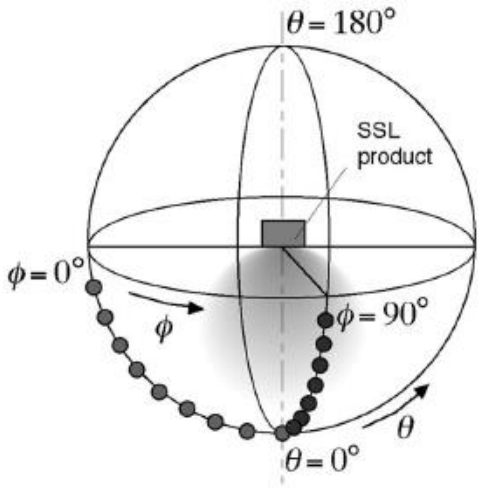
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes (C=0°/180° and C=90°/270°) and at 10° or less intervals for vertical angle until

the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate was calculated from these points. The data was then analyzed to check for delta color differences of the u', v' chromaticity coordinates. The spatial non-uniformity of chromaticity, Δu'v', is determined as the maximum deviation (distance on the CIE (u', v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



ISTMT Measurements

The luminaire was installed to simulate intended usage, in accordance with the manufacturer's instructions.

Temperatures were measured after they stabilized, when the test was run for a minimum of 7.5 h.

The tests were conducted in an ambient temperature of 25 ± 5 ℃. Ambient temperature variations above or below 25 ℃ were respectively subtracted from or added to temperatures recorded at points on the luminaire. Temperatures recorded at points on a luminaire were measured by means of thermocouples.

The thermocouples had conductors no larger than No. 24 AWG (0.21mm^2) and no smaller than No. 30 AWG (0.05mm^2). Thermocouples complied with the requirements specified in ASTM MNL 12 and thermocouples as listed in the table of the limits of error specified in NIST ITS 90, or ISA MC96.1.

The luminaire was installed in the test box in the configuration that resulted in the highest operating temperatures, considering different trim and maximum lamp wattage combinations, lamp holder adjustment heights, and the like.

The test box was constructed of 12mm thick plywood as described below:

The test box was rectangular and had four sides and a bottom.

The four sides of the test box for a ceiling-mounted luminaire were a minimum distance of 8.5 in (215mm) from the nearest part of the lamp housing or heat-producing parts. The top edge of the sides of the test box were a

minimum of 8.5 in (215mm) above the highest point of any permanently attached part of the lamp housing.
Thermal insulation of the loose-fill type was poured into the test box through the open top, until level with the top, without applying any compacting procedure.
The thermal insulation was conditioned to the density specified by the insulation manufacturer to obtain a required rated thermal resistance of Rsi 0.56 to 0.678 (R3.2 to R3.85).
All spaces around the luminaire and between it and the sides of the box were filled with the thermal insulation.

*** End of Report ***