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Test report of

IES LM-79-08

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Rendered to:

Beyond LED Technology

For products:

2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces

Models No.:

BLT-BL24-S72-3065

Oct. 12, 2023 to Oct. 17, 2023

LCTECH Guangdong Testing Services Co., Ltd.

2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

Test Date:

Test Lab.:

Tel:+86-760-22833366 E-mail:Service@lccert.com <http://www.lccert.com>

Test Sites: 1/F., Building I, Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

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Test Note: N/A

Compiled by:

Pengkang Liang

Oct. 26, 2023

Reviewed by:

Lin Qiu

Oct. 26, 2023

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1. General

1.1 Product Information

Brand Name	Beyond LED Technology
Category	Indoor
General Application	Troffer
Primary Use	2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces
Model Number	BLT-BL24-S72-3065
Rated Inputs	AC120-277V, 50/60Hz
Rated Power	30W,40W,50W,60W,72W
Rated Light output	3900lm,5200lm,6500lm,7800lm,9360lm
Declared CCT	3000K/3500K/4000K/5000K/6500K
Power Supply	ZS-FS72-600-5
LED Package, Array or Module	HL-AS-3528HW-3C-S1-08-PCT-HR3, Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Dimming	Continuous Dimming
Integral Controls	No
Controls Controllability	No
Receipt Samples	1 unit
Sample Code of lab.	230920101003
Date of Receipt Samples	Sep. 20, 2023
Note	This is a color tunable and multi-power product, 3000K, 3500K, 4000K, 5000K and 6500K at 72W are selected for the test.

1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

No.	Name
ANSI/NEMA/ ANSLG C78.377- 2017	Specifications for the Chromaticity of Solid State Lighting Products
ANSI/IES TM-30-18 ¹	IES Method for Evaluating Light Source Color Rendition
ANSI C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CIE Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. No. 15:2004	Colorimetry
IES LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products

Note:

1, For reference only and not in the scope of NVLAP.

1.3 Equipment list

Instrument	ID	Model name	Cal. date	Next cal. Date
AC Power supply	LC-I-987	APW-120N	2022-12-13	2023-12-12
AC Power supply	LC-I-989	APW-120N	2022-12-13	2023-12-12
Power analyzer	LC-I-PL-024	WT310E	2023-03-07	2024-03-06
Power analyzer	LC-I-954	WT210	2022-12-13	2023-12-12
Multimeter	LC-I-972	Fluke 17B	2023-06-28	2024-06-27
Photometric colorimetric electric system ²	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp ³	LC-I-963	24V50W	2023-06-29	2024-06-28
Luminous Flux Lamp ⁴	LC-I-PL-031	AC220V/200W	2023-06-29	2024-06-28
Goniophotometer(with mirror)	LC-I-902	GMS2000	2023-04-14	2024-04-13
Wireless temperature transmitter	LC-I-PL-009	DWLR-DLR	2022-12-15	2023-12-14
Wireless temperature transmitter	LC-I-PL-008	DWLR-DLR	2022-12-15	2023-12-14

Note:

2, Bandwidth of spectroradiometer is 1 nm.

3, Halogen lamp, 50W, omni-directional type, and its traceability to NIM.

4, Incandescent lamp, 200W, omni-directional type, and its traceability to NIM.

2. Test conducted and method

The luminaire was operated at least 2 hours to reach stabilization and temperature equilibrium before test.

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$; the air flow around the sample(s) being tested did not affect the performance.

2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (60 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within ± 0.2 percent under load.

2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

2.4 Electrical Instrumentation

The calibration uncertainties of the instruments for AC voltage and current were less than 0.2 percent, and the calibration uncertainty of the AC power meter was less than 0.5 percent (95 % confidence interval, $k=2$).

2.5 Color Measurement Method

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were calculated from these by software automatically.

2.6 Total Luminous Flux Measurement Method

Total luminous flux was measured by both sphere-spectroradiometer system and type C goniophotometer system.

Light intensity distribution was measured by a type C goniophotometer (with mirror) which can keep the sample in burn position when the tests conduct, and the total luminous flux was calculated from the intensity data by software automatically.

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the total luminous flux was calculated from these by software automatically.

2.7 Luminous Intensity Distribution Measurement Method

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

2.8 Spatial Non-uniformity of Chromaticity

The customer did not require this measurement.

3. Test Result Summary

3.1 Electrical data

Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Input Voltage & Frequency	120.00 V ~60Hz	120.00 V ~60Hz	120.00 V ~60Hz	120.01 V ~60Hz	119.99 V ~60Hz
Input Current(A)	0.576	0.569	0.563	0.558	0.570
Total Power(W)	68.59	67.71	67.05	66.42	67.85
Power Factor	0.992	0.992	0.992	0.992	0.992
I-THD	6.73%	6.64%	6.64%	6.85%	6.64%
Off-state Power(W)	-	-	-	-	-

3.2 Photometric data

Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Total Lumens(lm)	9657.51	9730.50	10088.00	10342.78	10069.61
Luminaire Efficacy(lm/W)	140.80	143.71	150.45	155.72	148.41
Correlated Color Temperature (CCT)(K)	3014	3354	3838	4822	6643
Color Rendering Index (CRI)	83	85	85	84	84
R ₉	8	14	18	13	17
R _f	85	86	86	83	84
R _g	97	98	98	98	97
R _{cs,h1}	-11%	-11%	-10%	-11%	-11%
Chromaticity Coordinate (x,y)	0.4343	0.4128	0.3864	0.3503	0.3111
	0.4003	0.3923	0.3763	0.3558	0.3229
Chromaticity Coordinate (u',v')	0.2505	0.2399	0.2292	0.2133	0.1990
	0.5195	0.5131	0.5023	0.4875	0.4648
Duv	-0.0011	-0.0009	-0.0019	0.0000	0.0009
Zone Lumens between 0-60°	89.19%	-	-	-	-
Spacing Criteria (0-180)	1.98	-	-	-	-
Spacing Criteria (90-270)	1.98	-	-	-	-
Maximum UGR ¹	18.2	-	-	-	-

Note:

1, Based on Room dimension: X=4H, Y=8H, Reflectance: 70/50/20%.

3.3 Electrical data on 277V

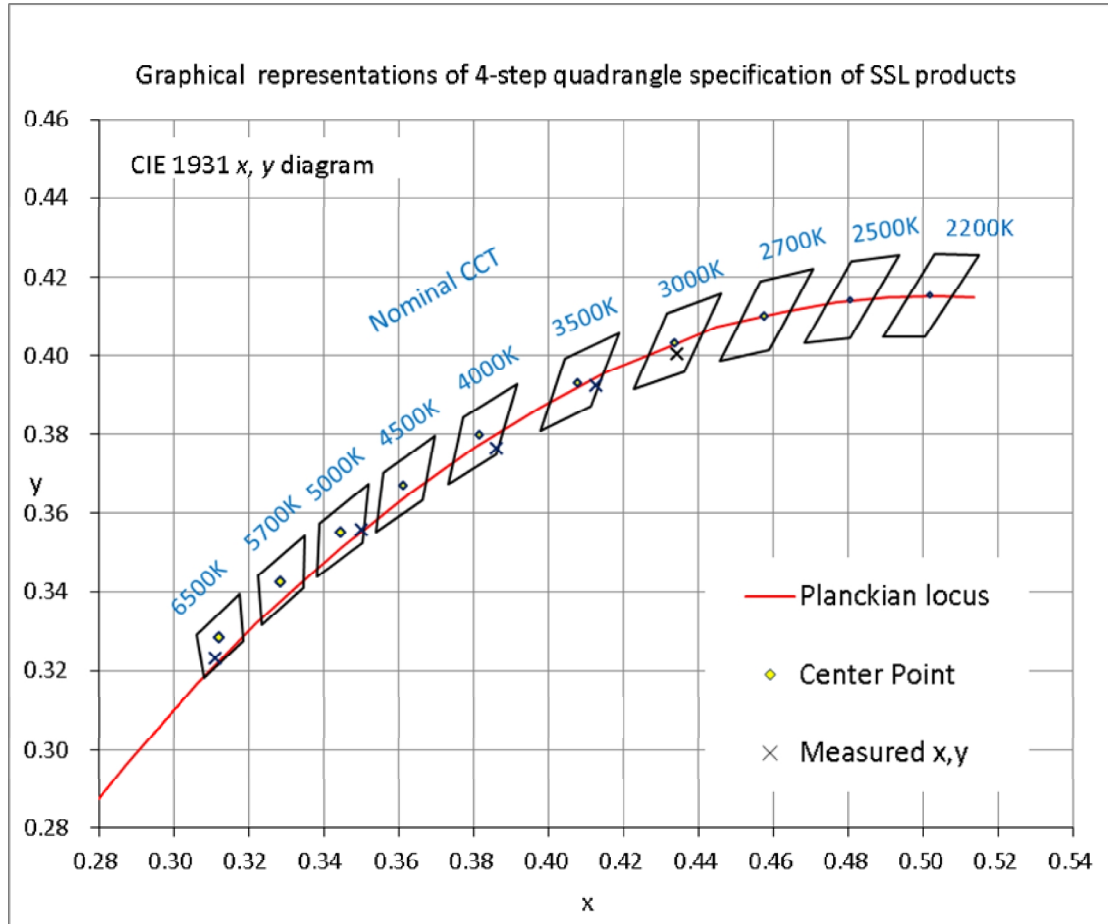
Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Input Voltage & Frequency	276.97 V ~60Hz	276.97 V ~60Hz	276.96 V ~60Hz	276.96 V ~60Hz	276.97 V ~60Hz
Power Factor	0.948	0.948	0.946	0.946	0.948
I-THD	12.76%	12.85%	12.91%	13.04%	12.87%

3.4 Color Rendering Details

3000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
82	91	96	82	82	90	83	60	8	80	82	74	84	99	74
3500K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83	91	97	84	84	89	85	64	14	79	84	72	85	98	76
4000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
84	91	95	85	85	87	87	68	18	78	86	69	86	97	79
5000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83	88	91	85	83	83	88	69	13	71	84	62	84	95	77
6500K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
84	87	89	86	85	82	88	74	17	69	86	62	84	94	80

4. Test Data

4.1 ANSI Chromaticity Quadrangles Diagram



4.2 ANSI/IES TM-30-18 Color Rendition

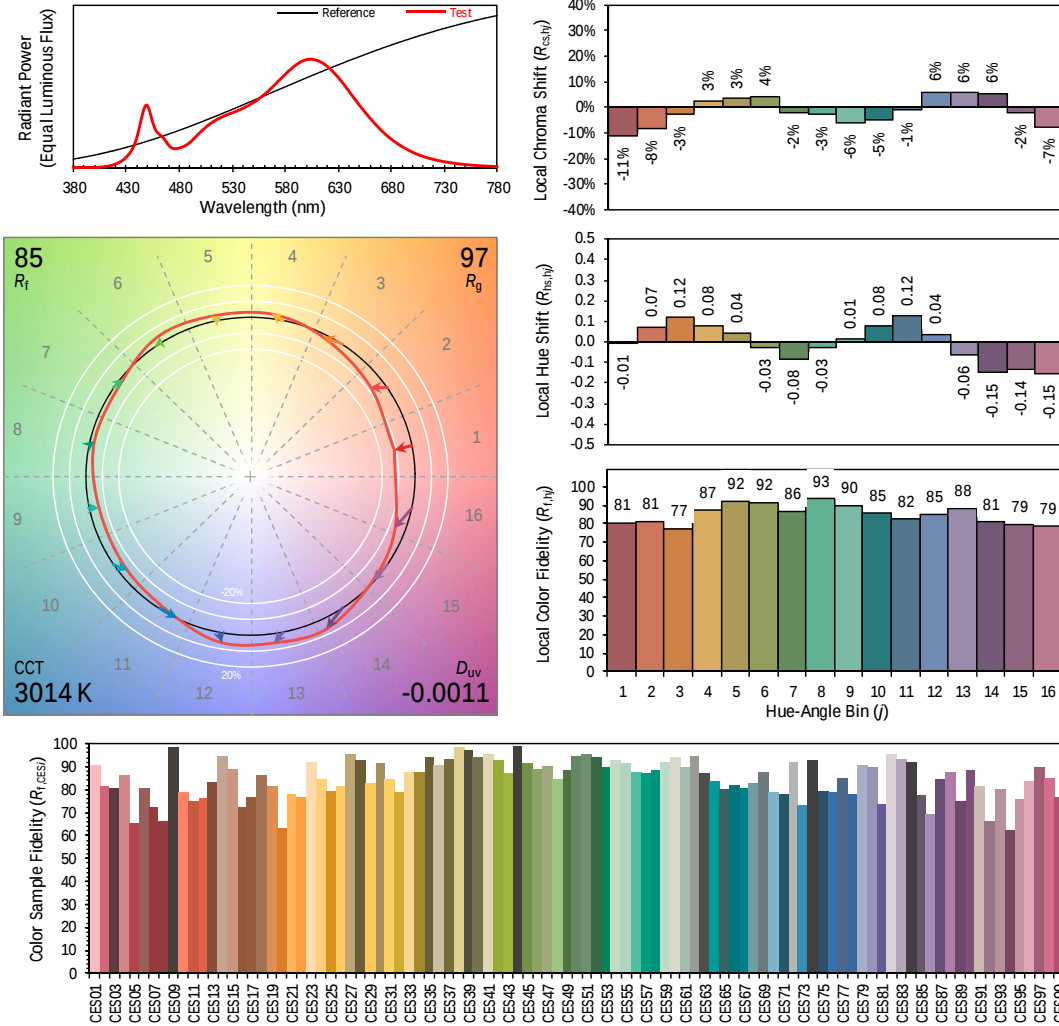
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Beyond LED Technology

Date: 2023/10/26

Model: BLT-BL24-S72-3065



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

x 0.4343
 y 0.4003
 u' 0.2505
 v' 0.5195

CIE 13.3-1995
 (CRI)

R_a 83
 R_g 8

Note:

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

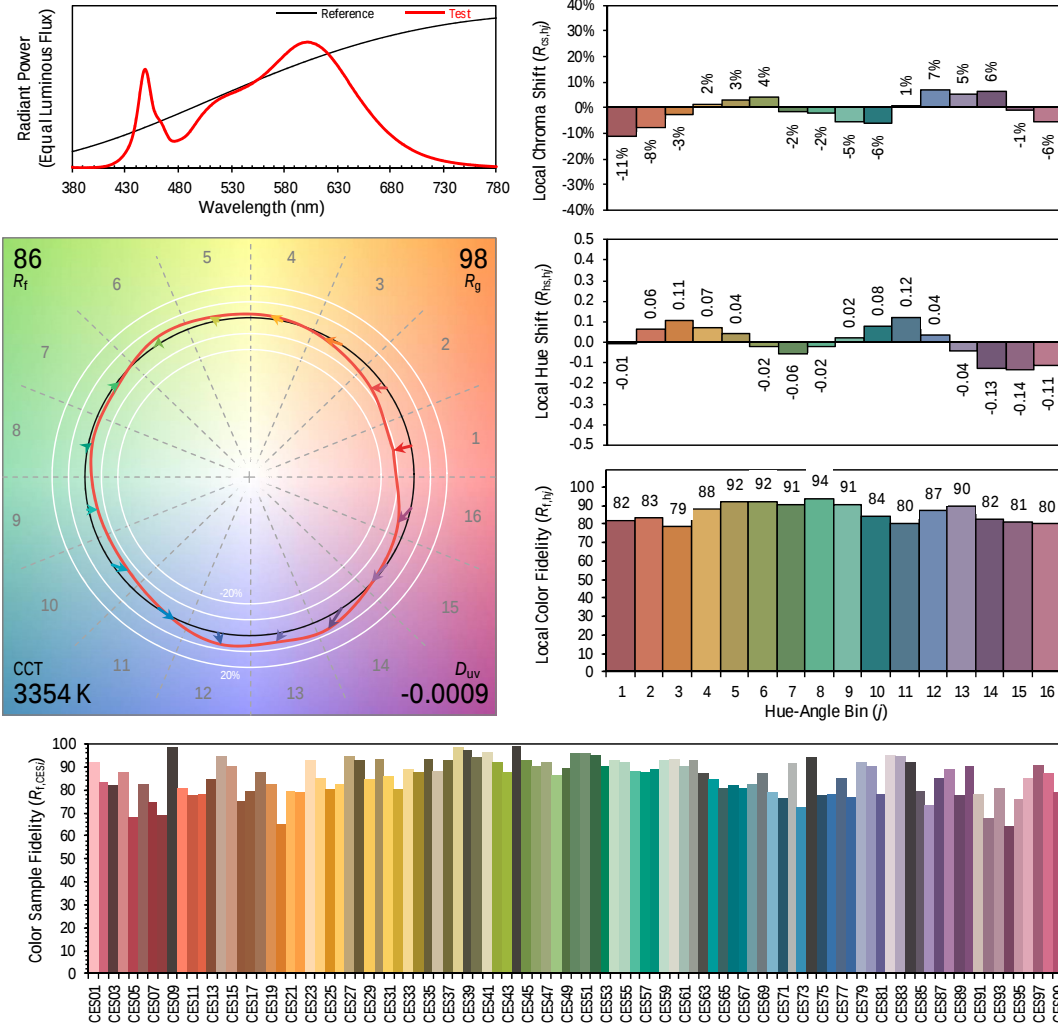
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Beyond LED Technology

Date: 2023/10/26

Model: BLT-BL24-S72-3065



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

x 0.4128
 y 0.3923
 u' 0.2399
 v' 0.5131

CIE 13.3-1995
(CRI)

R_a 85

R_g 14

Note:

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

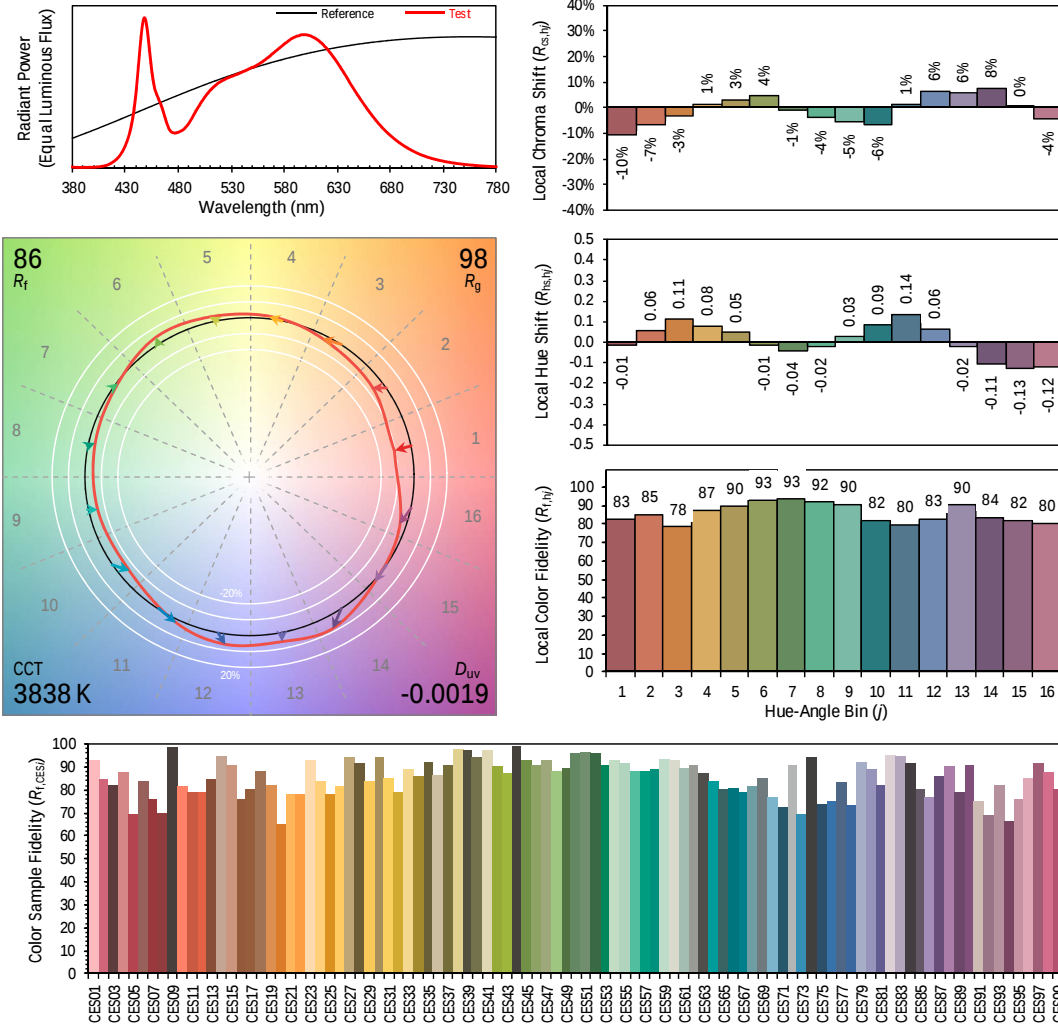
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Beyond LED Technology

Date: 2023/10/26

Model: BLT-BL24-S72-3065



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

x 0.3864
 y 0.3763
 u' 0.2292
 v' 0.5023

CIE 13.3-1995
(CRI)

R_a 85

R_g 18

Note:

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

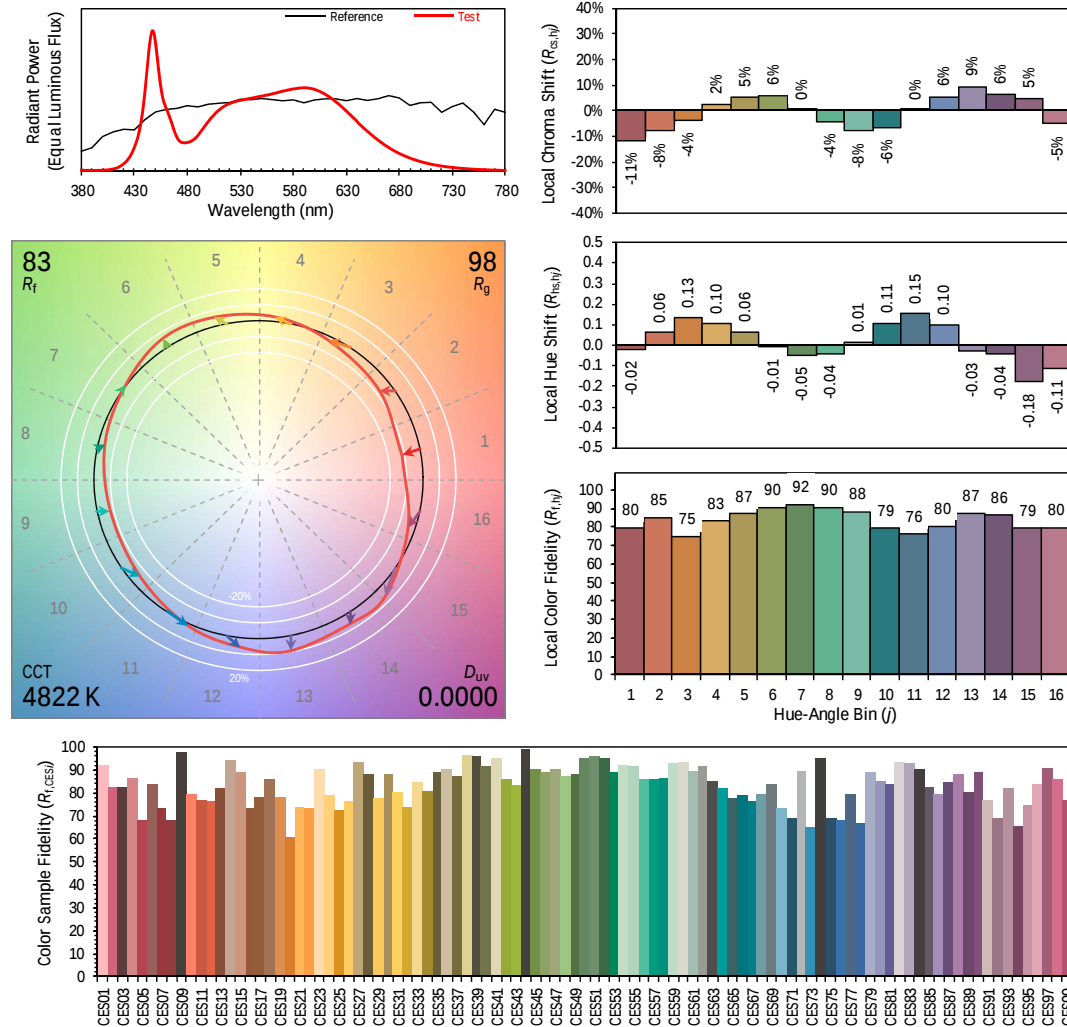
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Beyond LED Technology

Date: 2023/10/26

Model: BLT-BL24-S72-3065



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

x 0.3503
 y 0.3558
 u' 0.2133
 v' 0.4875

CIE 13.3-1995
(CRI)

R_a 84

R_g 13

Note:

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

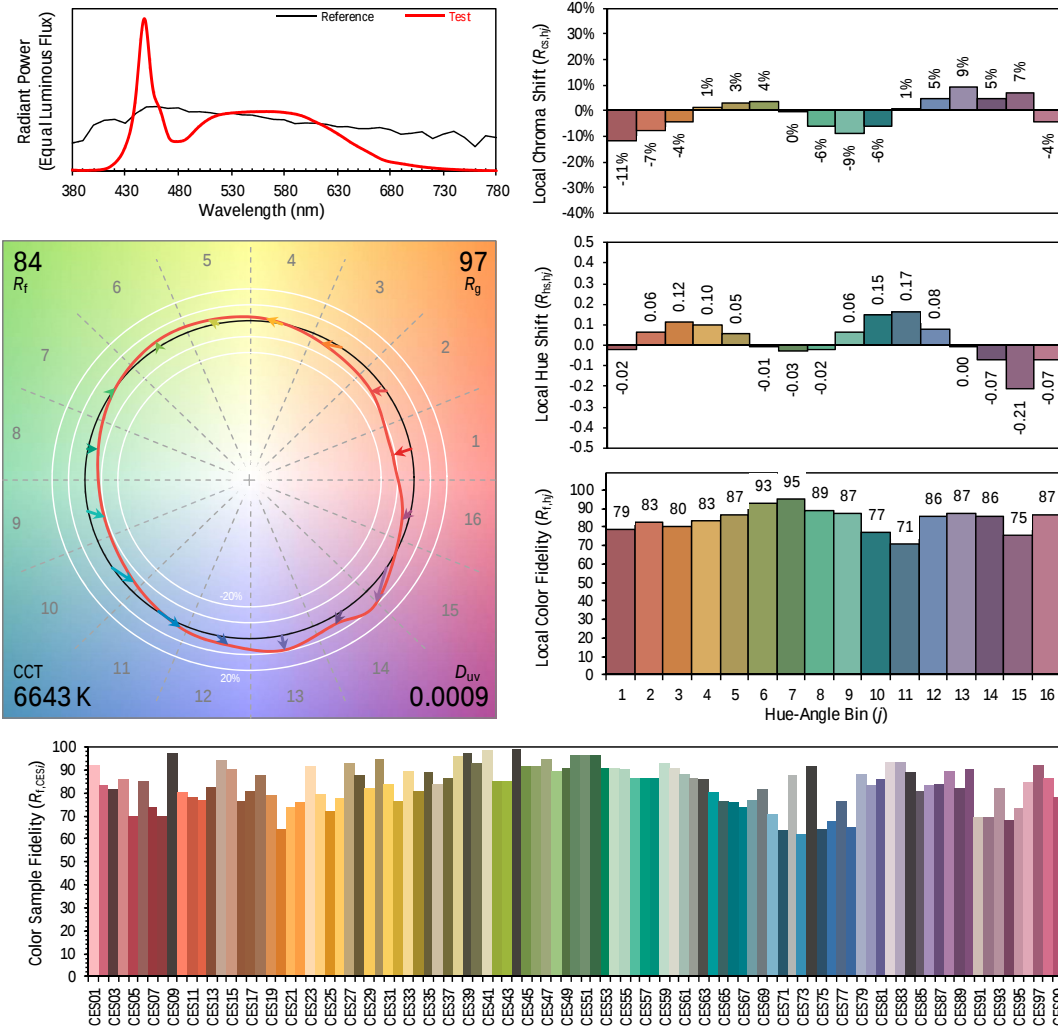
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Beyond LED Technology

Date: 2023/10/26

Model: BLT-BL24-S72-3065



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

x 0.3111
 y 0.3229
 u' 0.1990
 v' 0.4648

CIE 13.3-1995
(CRI)
 R_a 84
 R_g 17

Note:

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

**4.3 Goniometry Test Data of 3000K**

CIE Type	Direct	Basic Luminous Shape	Rectangular
Spacing Criteria (0-180)	1.98	Luminous Length	1.16 m
Spacing Criteria (90-270)	1.98	Luminous Width	0.55 m
Spacing Criteria (Diagonal)	1.72	Luminous Height	0.00 m
Test Distance	29.97 m		

4.4 Zonal Lumen Summary of 3000K

Zone	Lumens	%Lamp	%Fixt
0-20	1025.46	10.60	10.60
0-30	2560.29	26.50	26.50
0-40	4753.24	49.20	49.20
0-60	8613.2	89.20	89.20
0-80	9591.94	99.30	99.30
0-90	9635.45	99.80	99.80
10-90	9404.58	97.40	97.40
20-40	3727.78	38.60	38.60
20-50	6043.11	62.60	62.60
40-70	4602.45	47.70	47.70
60-80	978.73	10.10	10.10
70-80	236.25	2.40	2.40
80-90	43.51	0.50	0.50
90-110	4.84	0.10	0.10
90-120	7.35	0.10	0.10
90-130	10.39	0.10	0.10
90-150	15.93	0.20	0.20
90-180	22.06	0.20	0.20
110-180	17.22	0.20	0.20
0-180	9657.51	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	230.87
10-20	794.59
20-30	1534.83
30-40	2192.95
40-50	2315.33
50-60	1544.64
60-70	742.48
70-80	236.25
80-90	43.51
90-100	2.75
100-110	2.10
110-120	2.50
120-130	3.04
130-140	2.87
140-150	2.67
150-160	2.66
160-170	2.46
170-180	1.00

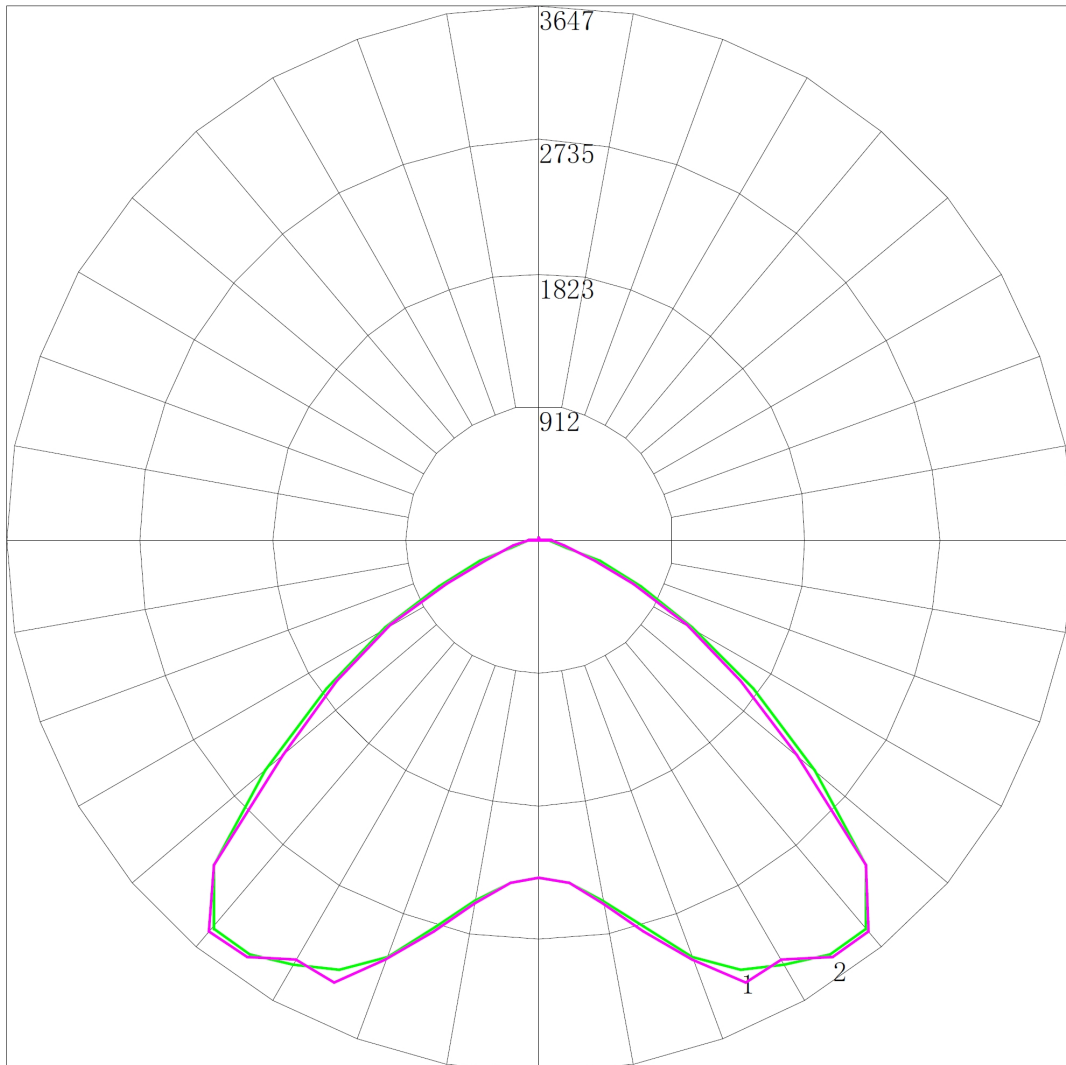


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4.5 Polar Curves of 3000K



Maximum Candela = 3646.838 Located At Horizontal Angle = 45, Vertical Angle = 30
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)



4.6 UGR Table of 3000K

Reflectances											
Ceiling Cavity		70	70	50	50	30	70	70	50	50	30
Walls		50	30	50	30	30	50	30	50	30	30
Floor Cavity		20	20	20	20	20	20	20	20	20	20
Room Size		UGR Viewed Crosswise					UGR Viewed Endwise				
X=2H	Y=2H	17.1	18.6	17.4	18.9	19.2	16.7	18.3	17.1	18.6	18.9
	3H	17.7	19.1	18.1	19.4	19.8	17.4	18.8	17.8	19.1	19.5
	4H	17.8	19.1	18.2	19.4	19.8	17.5	18.8	17.9	19.1	19.5
	6H	17.8	19.0	18.2	19.4	19.8	17.5	18.7	17.9	19.1	19.4
	8H	17.8	18.9	18.2	19.3	19.7	17.5	18.6	17.9	19.0	19.4
	12H	17.8	18.9	18.2	19.2	19.7	17.5	18.5	17.9	18.9	19.4
4H	2H	17.2	18.5	17.6	18.9	19.3	17.0	18.3	17.4	18.6	19.0
	3H	18.0	19.1	18.4	19.5	19.9	17.7	18.8	18.1	19.2	19.6
	4H	18.1	19.1	18.6	19.5	20.0	17.9	18.8	18.3	19.2	19.7
	6H	18.2	19.0	18.6	19.5	19.9	17.9	18.7	18.4	19.2	19.6
	8H	18.2	18.9	18.6	19.4	19.9	17.9	18.7	18.4	19.1	19.6
	12H	18.2	18.9	18.7	19.3	19.8	17.9	18.6	18.4	19.1	19.5
8H	4H	18.2	18.9	18.6	19.4	19.8	17.9	18.7	18.4	19.1	19.6
	6H	18.2	18.8	18.7	19.3	19.8	17.9	18.6	18.4	19.1	19.6
	8H	18.2	18.8	18.7	19.3	19.8	17.9	18.5	18.5	19.0	19.5
	12H	18.2	18.7	18.7	19.2	19.8	17.9	18.5	18.5	19.0	19.5
12H	4H	18.1	18.8	18.6	19.3	19.8	17.9	18.6	18.4	19.0	19.5
	6H	18.2	18.8	18.7	19.2	19.8	17.9	18.5	18.4	19.0	19.5
	8H	18.2	18.7	18.7	19.2	19.8	17.9	18.4	18.4	18.9	19.5

Maximum UGR = 20.0

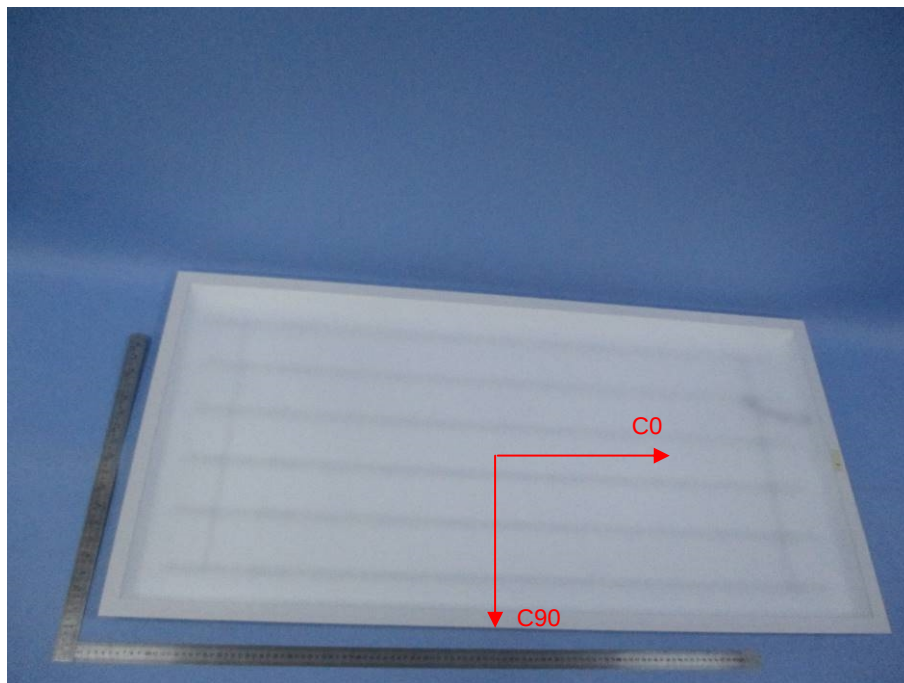
Note:

The Corrected UGR values generated by Photometric Toolbox 32(Lighting Analysts, Inc., version 2.8), based on Spacing to height ratio (S/H): 1.

4.7 Candela Tabulation of 3000K

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	2312.119	2312.119	2312.119	2312.119	2312.119	2312.119	2312.119
5	2362.596	2363.319	2364.329	2369.116	2365.824	2366.654	2363.412
10	2511.347	2519.557	2529.705	2532.920	2525.020	2524.700	2526.572
15	2745.418	2763.645	2773.069	2772.573	2775.072	2768.218	2769.979
20	3038.900	3047.509	3065.057	3077.973	3070.560	3065.569	3062.852
25	3244.829	3267.684	3347.630	3402.678	3390.150	3349.953	3341.651
30	3362.757	3414.762	3541.686	3646.838	3544.869	3376.496	3325.807
35	3463.265	3495.675	3575.754	3617.847	3492.776	3475.902	3486.711
40	3473.092	3482.271	3481.469	3257.351	3443.103	3500.950	3514.053
45	3153.702	3199.087	3072.183	2863.715	3087.226	3156.117	3151.227
50	2453.723	2509.084	2335.988	2322.519	2383.001	2382.358	2298.129
55	1790.373	1796.932	1645.963	1714.441	1590.174	1678.253	1690.930
60	1215.471	1215.113	1118.448	1093.101	1101.588	1181.560	1175.569
65	761.177	743.264	720.246	686.440	717.742	714.614	709.039
70	442.233	430.523	408.306	413.597	409.831	417.075	402.210
75	197.888	199.159	206.168	211.611	202.228	191.866	181.448
80	71.919	74.880	83.136	87.734	83.673	77.100	75.718
85	36.183	37.999	38.095	38.147	37.338	37.424	37.202
90	4.914	4.918	4.930	4.486	4.271	4.281	3.626
95	1.787	2.235	1.793	1.795	1.798	1.804	1.806
100	1.787	1.788	1.793	1.795	1.798	1.804	1.806
105	2.680	2.458	1.793	2.020	2.022	2.028	1.806
110	2.233	1.788	2.464	1.795	1.798	1.804	1.806
115	2.680	2.682	2.689	2.693	2.698	2.705	2.716
120	3.574	2.682	2.689	2.693	2.698	2.705	2.716
125	3.574	3.576	3.585	3.590	3.598	3.607	3.626
130	4.020	3.576	3.585	3.590	3.598	3.607	3.626
135	4.020	3.576	3.585	3.590	3.598	3.607	3.626
140	4.020	4.023	4.034	4.039	4.048	3.832	3.626
145	4.914	4.023	4.034	4.039	4.048	4.058	4.081
150	4.914	5.141	4.930	4.937	4.949	4.732	4.081
155	5.360	5.365	5.378	5.385	5.398	5.411	5.443
160	8.041	8.047	8.067	8.078	8.097	6.312	6.346
165	8.041	9.835	8.965	8.078	8.097	9.021	8.166
170	10.274	10.282	10.308	9.873	9.895	9.920	10.427
175	10.721	10.729	10.756	10.771	10.795	10.821	10.879
180	10.782	10.782	10.782	10.782	10.782	10.782	10.782

Appendix A Product Photo



Picture 1



Picture 2

****End of test report****