LCTECH

NVLAP TESTING
NVLAP LAB CODE 500080-0

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Total pages: 18

Test report of

IES LM-79-08

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

Beyond LED Technology

For products:

2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces

Models No.:

BLT-FL24-K60-3065

Test Sites:

Template No.: LC-RT-PL-092 Rev.1.1

Test Note: *N/A*

Compiled by:		**Reviewed by:**	
Pengkang Liang	Pengkang Liang	**Lin Qiu**	Lin Qiu
May. 13, 2023		**May. 13, 2023**	

Table of Contents

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-FL24-K60-3065
Rated Inputs	AC100-277V, 50/60Hz
Rated Power	60W/50W/40W
Rated Light output	7500lm/6250lm/5000lm
Declared CCT	3000K/3500K/4000K/5000K/6500K
Power Supply	ZS-GW60-1390
LED Package, Array or Module	ZT2835WOM1, DONGGUAN SINOWIN OPTO-ELECTRONIC CO.,LTD
Dimming	Continuous Dimming
Integral Controls	No
Controls Controllability	No
Receipt Samples	1 unit
Sample Code of lab.	230508103002
Date of Receipt Samples	May. 8, 2023
Note	This is a color tunable and multi-power product, 3000K, 3500K, 4000K, 5000K and 6500K at 60W 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	2022-07-01	2023-06-30
Photometric colorimetric electric system[2]	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp[3]	LC-I-963	24V50W	2022-07-12	2023-07-11
Luminous Flux Lamp[4]	LC-I-PL-031	AC220V/200W	2022-07-21	2023-07-20
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°C ± 1°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	120.02 V ~60Hz	120.01 V ~60Hz	120.02 V ~60Hz	120.03 V ~60Hz
Input Current(A)	0.463	0.463	0.455	0.453	0.463
Total Power(W)	55.32	55.13	54.37	54.09	55.26
Power Factor	0.995	0.995	0.995	0.995	0.995
I-THD	3.35%	3.34%	3.31%	3.27%	3.42%
Off-state Power(W)	-	-	-	-	-

3.2 Photometric data

Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Total Lumens(lm)	6978.59	7005.29	7105.05	7189.01	7203.18
Luminaire Efficacy(lm/W)	126.15	127.07	130.68	132.91	130.35
Correlated Color Temperature (CCT)(K)	2986	3353	3839	5049	6340
Color Rendering Index (CRI)	84	86	86	85	84
R9	12	21	24	19	14
R_f	85	87	86	84	83
R_g	98	99	98	99	97
$R_{cs,h1}$	-11%	-10%	-10%	-11%	-12%
Chromaticity Coordinate (x,y)	0.4352 0.3988	0.4117 0.3896	0.3860 0.3754	0.3437 0.3496	0.3159 0.3276
Chromaticity Coordinate (u',v')	0.2517 0.5190	0.2404 0.5117	0.2294 0.5018	0.2112 0.4835	0.2006 0.4680
Duv	-0.0019	-0.0018	-0.0022	-0.0004	0.0008
Zone Lumens between 0-60°	77.24%	-	-	-	-
Spacing Criteria (0-180)	1.16	-	-	-	-
Spacing Criteria (90-270)	1.18	-	-	-	-
Maximum UGR[1]	19.9	-	-	-	-

Note:

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

3.3 Electrical data on 277V

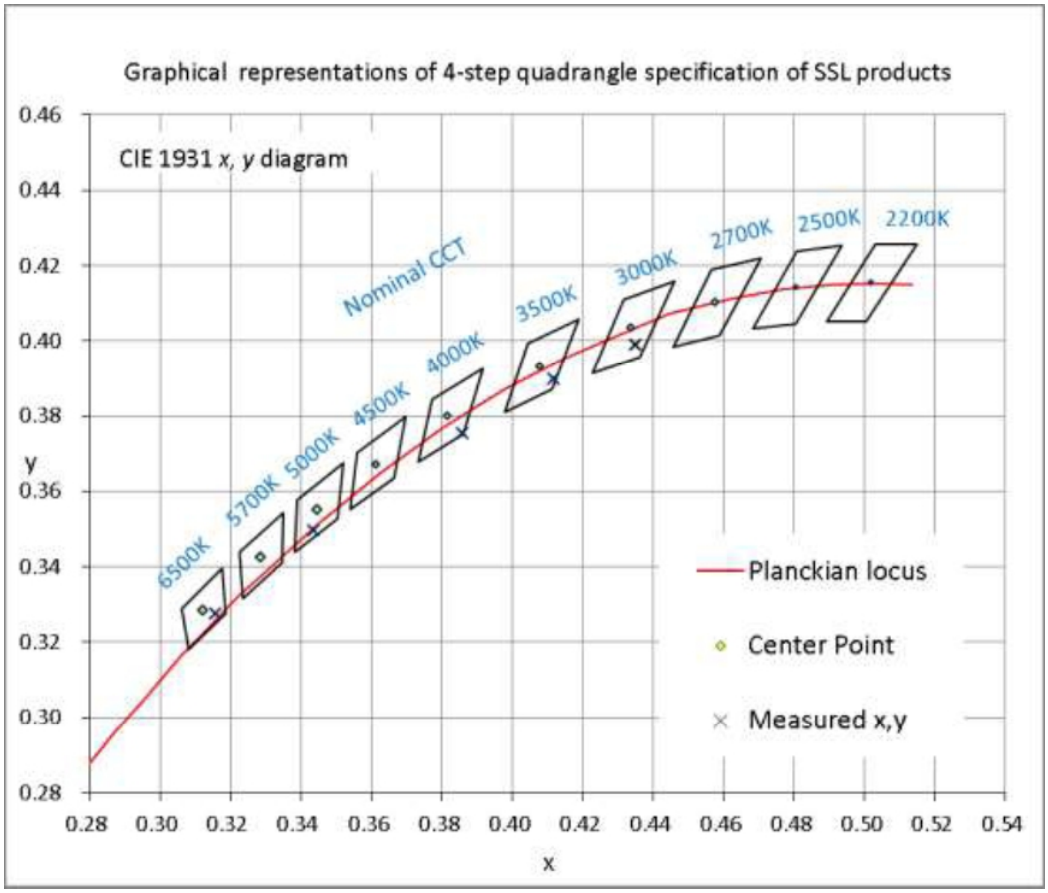
Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Input Voltage & Frequency	277.00 V ~60Hz	277.01 V ~60Hz	277.04 V ~60Hz	277.02 V ~60Hz	277.03 V ~60Hz
Power Factor	0.921	0.921	0.919	0.919	0.921
I-THD	12.96%	12.96%	12.20%	12.28%	12.95%

3.4 Color Rendering Details

3000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83	92	96	83	83	90	83	61	12	81	83	76	85	99	75
3500K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
85	92	97	86	86	90	86	67	21	82	87	74	87	99	79
4000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
86	91	95	86	86	88	87	70	24	79	87	70	87	97	80
5000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
84	89	91	86	85	85	87	71	19	73	87	67	85	95	80
6500K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83	87	89	85	84	82	88	73	14	68	86	62	84	94	79

4. Test Data

4.1 ANSI Chromaticity Quadrangles Diagram

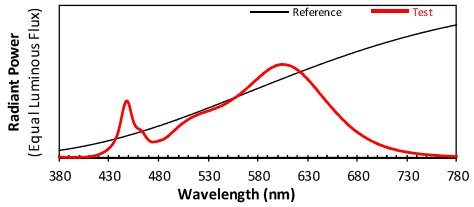


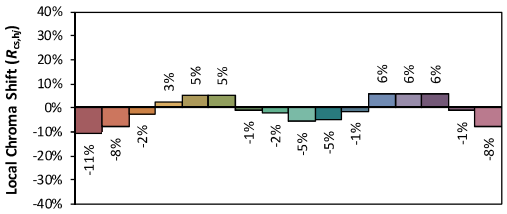
4.2 ANSI/IES TM-30-18 Color Rendition

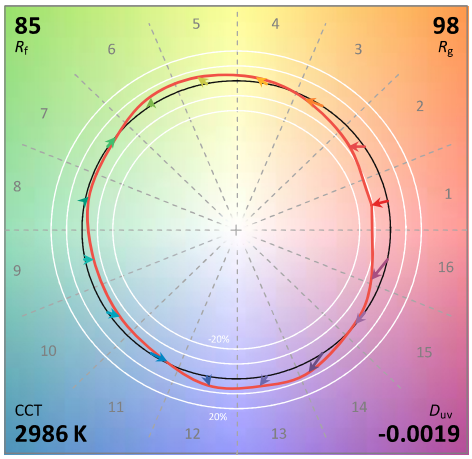
ANSI/IES TM-30-18 Color Rendition Report

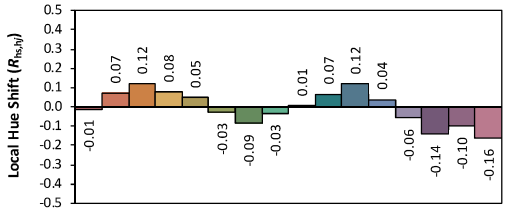
Source: SPD **Manufacturer:** Beyond LED Technology

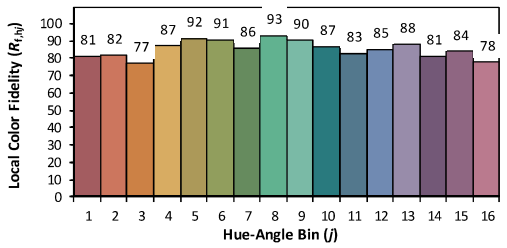
Date: 2023/5/13 **Model:** BLT-FL24-K60-3065

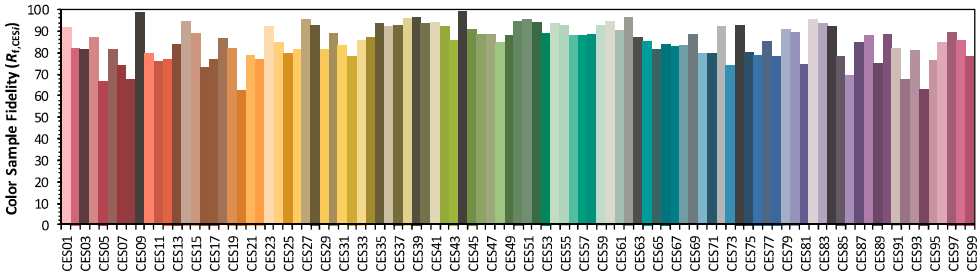












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4352
y	0.3988
u'	0.2517
v'	0.5190

CIE 13.3-1995 (CRI)

R_a	84
R_9	12

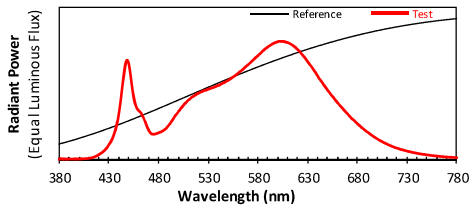
Note:

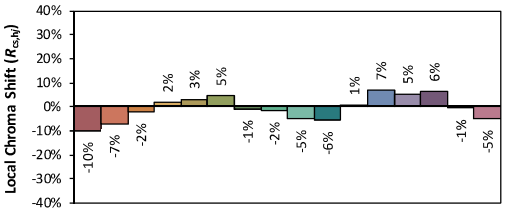
Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

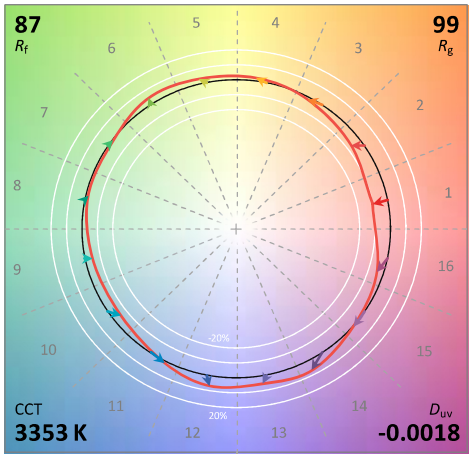
ANSI/IES TM-30-18 Color Rendition Report

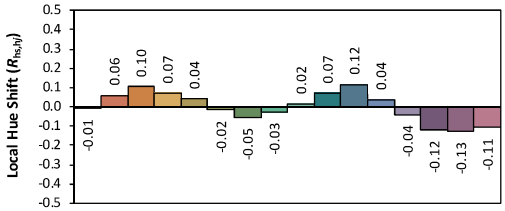
Source: SPD **Manufacturer:** Beyond LED Technology

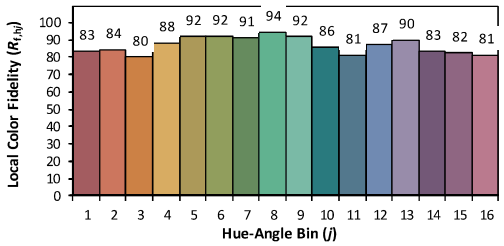
Date: 2023/5/13 **Model:** BLT-FL24-K60-3065

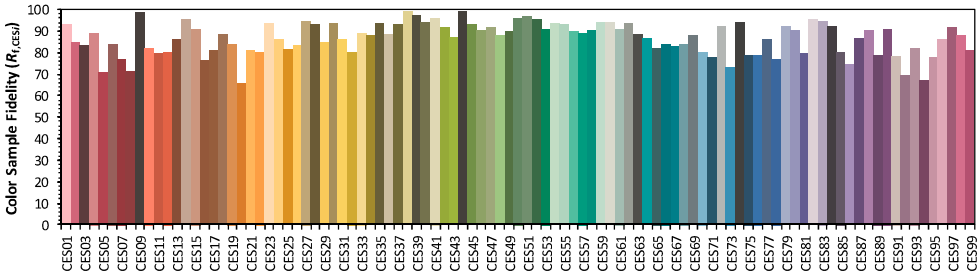












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4117
y	0.3896
u'	0.2404
v'	0.5117

CIE 13.3-1995 (CRI)

R_a	86
R_9	21

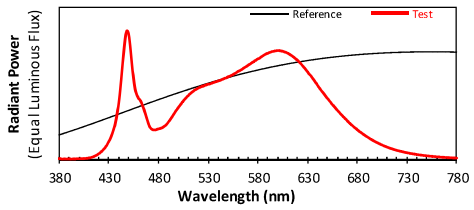
Note:

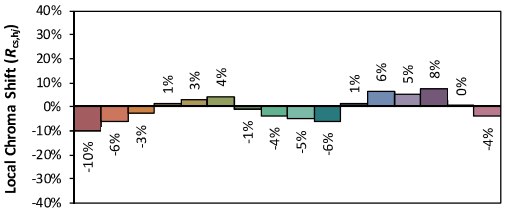
Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

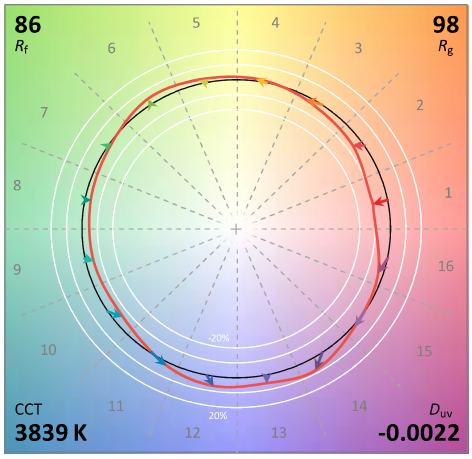
ANSI/IES TM-30-18 Color Rendition Report

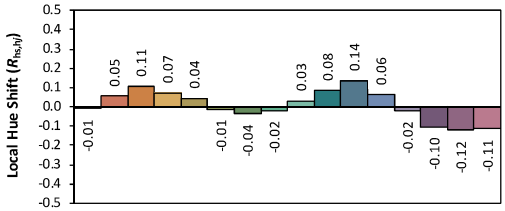
Source: SPD **Manufacturer:** Beyond LED Technology

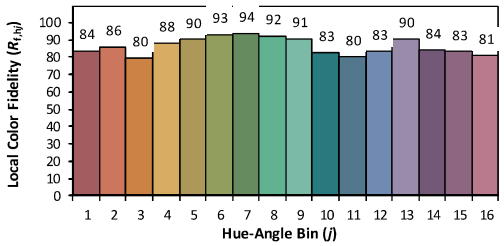
Date: 2023/5/13 **Model:** BLT-FL24-K60-3065

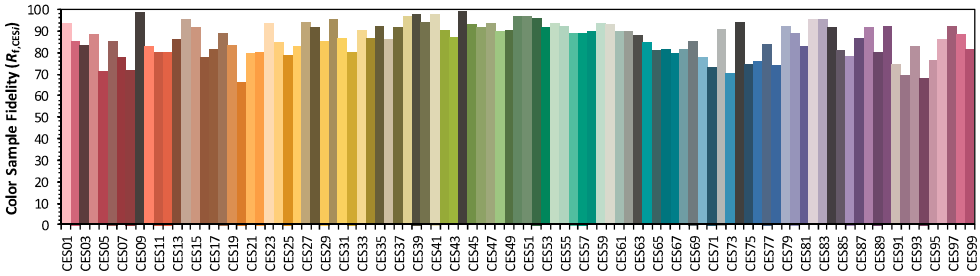












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3860
y	0.3754
u'	0.2294
v'	0.5018

CIE 13.3-1995 (CRI)

R_a	86
R_9	24

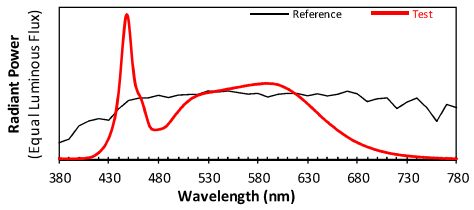
Note:

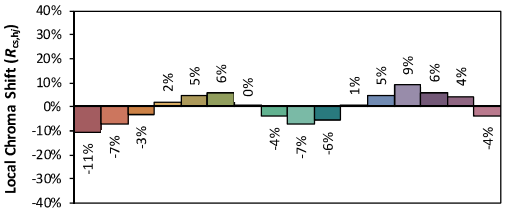
Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

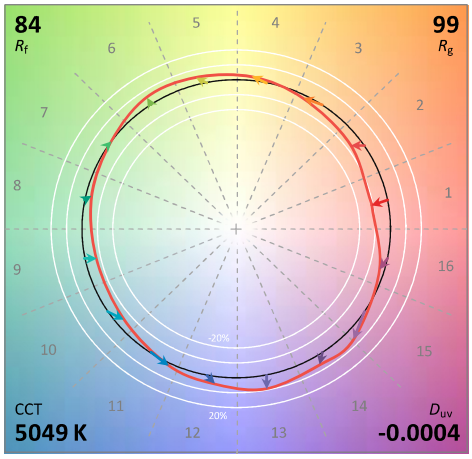
ANSI/IES TM-30-18 Color Rendition Report

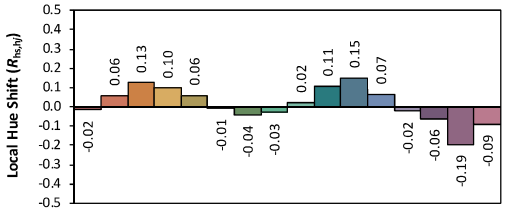
Source: SPD **Manufacturer:** Beyond LED Technology

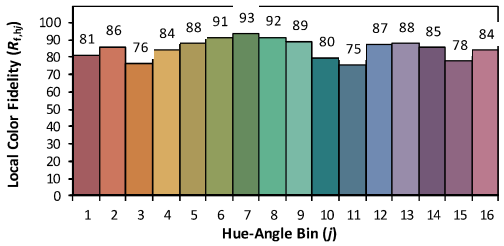
Date: 2023/5/13 **Model:** BLT-FL24-K60-3065

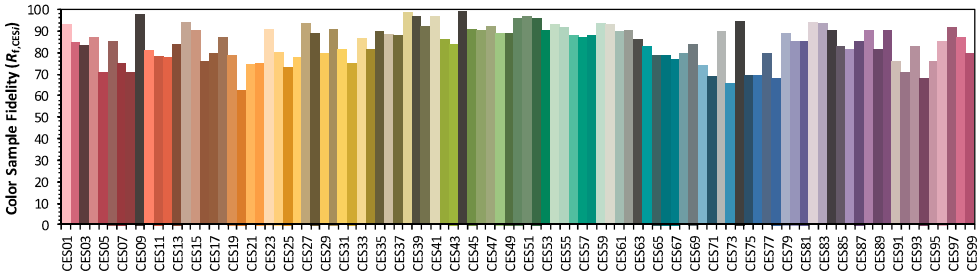












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3437
y	0.3496
u'	0.2112
v'	0.4835

CIE 13.3-1995 (CRI)

R_a	85
R_9	19

Note:

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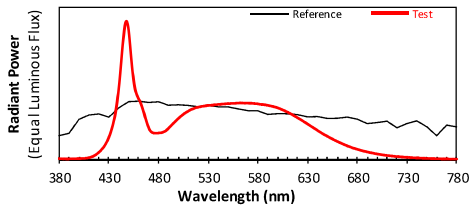
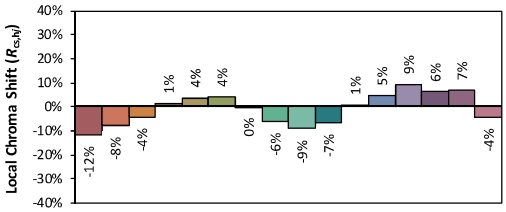
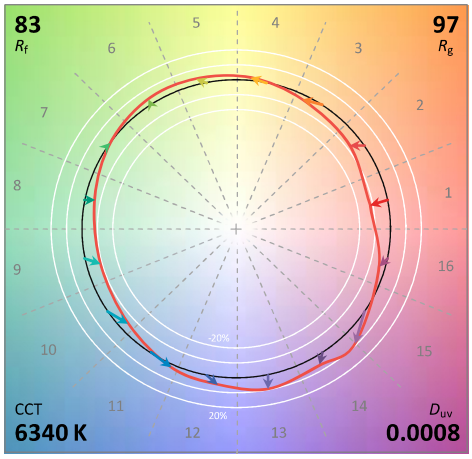
ANSI/IES TM-30-18 Color Rendition Report

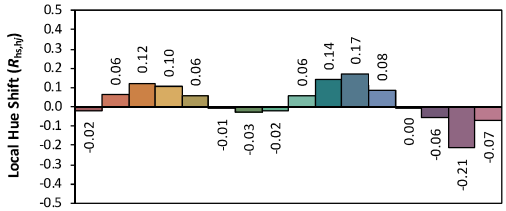
Source: SPD **Manufacturer:** Beyond LED Technology

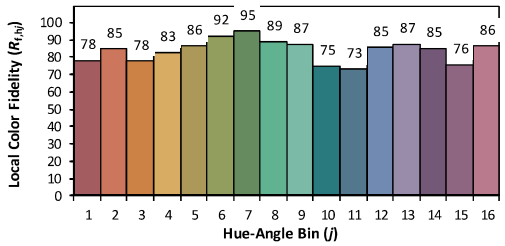
Date: 2023/5/13 **Model:** BLT-FL24-K60-3065

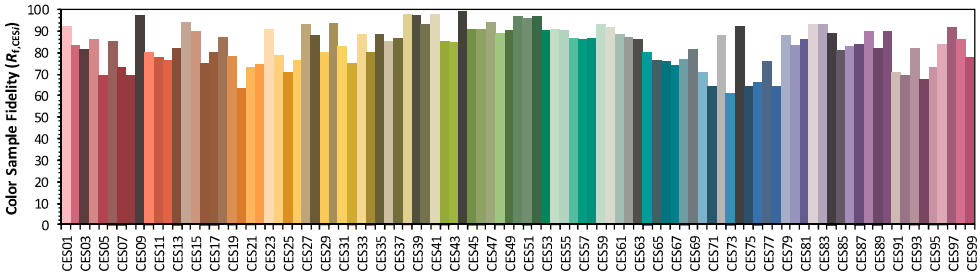












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3159
y	0.3276
u'	0.2006
v'	0.4680

CIE 13.3-1995 (CRI)

R_a	84
R_9	14

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 w/Sides
Spacing Criteria (0-180)	1.16	Luminous Length	1.19 m
Spacing Criteria (90-270)	1.18	Luminous Width	0.58 m
Spacing Criteria (Diagonal)	1.28	Luminous Height	0.01 m
Test Distance	29.97 m		

4.4 Zonal Lumen Summary of 3000K

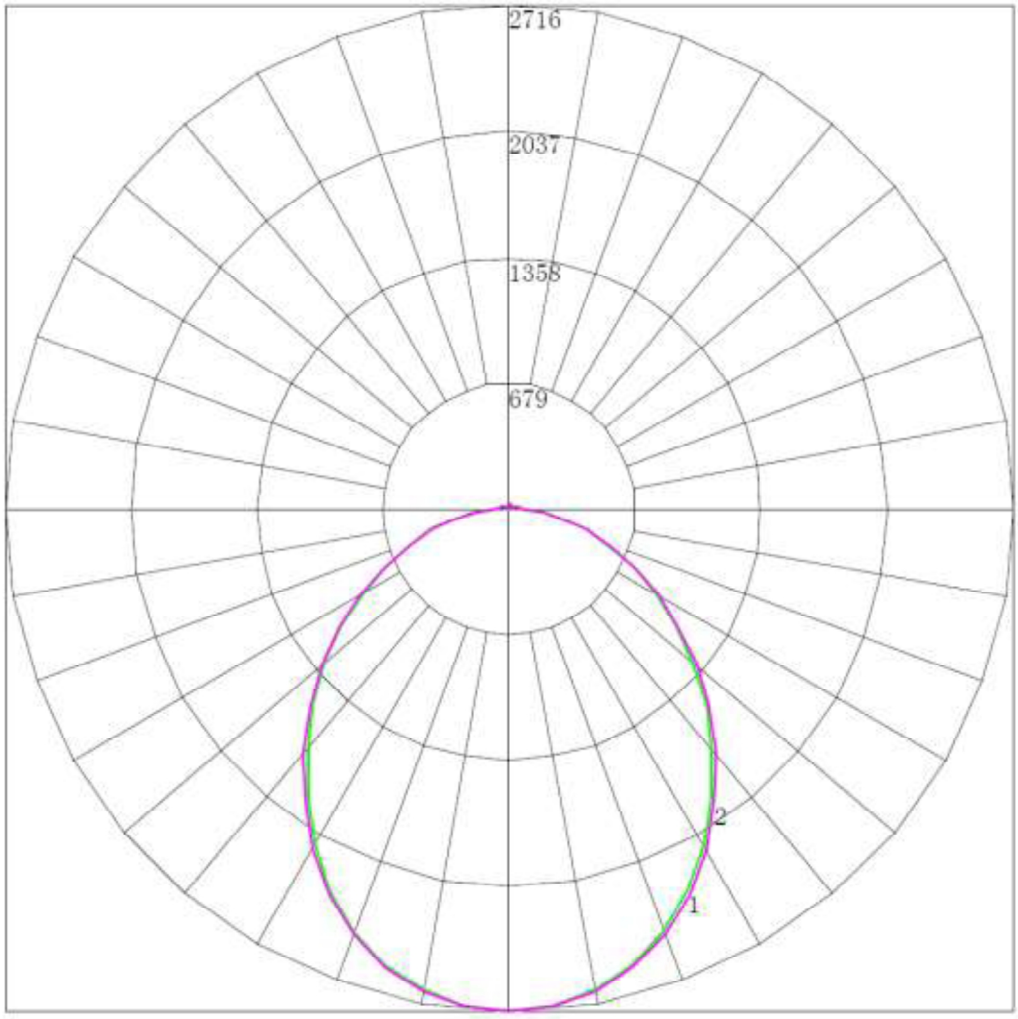
Zone	Lumens	%Lamp	%Fixt
0-20	977.00	14.00	14.00
0-30	2032.08	29.10	29.10
0-40	3233.07	46.30	46.30
0-60	5389.94	77.20	77.20
0-80	6598.53	94.60	94.60
0-90	6822.04	97.80	97.80
10-90	6566.17	94.10	94.10
20-40	2256.07	32.30	32.30
20-50	3421.05	49.00	49.00
40-70	2897.07	41.50	41.50
60-80	1208.59	17.30	17.30
70-80	468.39	6.70	6.70
80-90	223.51	3.20	3.20
90-110	82.33	1.20	1.20
90-120	106.96	1.50	1.50
90-130	125.77	1.80	1.80
90-150	144.55	2.10	2.10
90-180	156.55	2.20	2.20
110-180	74.22	1.10	1.10
0-180	6978.59	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	255.88
10-20	721.13
20-30	1055.08
30-40	1200.99
40-50	1164.98
50-60	991.89
60-70	740.20
70-80	468.39
80-90	223.51
90-100	53.67
100-110	28.66
110-120	24.63
120-130	18.81
130-140	11.89
140-150	6.89
150-160	6.07
160-170	4.39
170-180	1.54

4.5 Polar Curves of 3000K



Maximum Candela = 2715.561 Located At Horizontal Angle = 0, Vertical Angle = 0
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	15.1	16.7	15.5	17.0	17.4	15.2	16.8	15.6	17.1	17.5
	3H	16.8	18.3	17.3	18.6	19.1	17.0	18.4	17.4	18.8	19.2
	4H	17.6	18.9	18.0	19.3	19.8	17.7	19.1	18.1	19.4	19.9
	6H	18.2	19.5	18.7	19.9	20.3	18.3	19.6	18.8	20.0	20.4
	8H	18.5	19.7	19.0	20.1	20.6	18.6	19.8	19.1	20.2	20.7
	12H	18.8	19.9	19.2	20.3	20.8	18.9	20.0	19.3	20.4	20.9
4H	2H	15.7	17.0	16.1	17.4	17.9	15.8	17.1	16.2	17.5	17.9
	3H	17.7	18.8	18.2	19.3	19.7	17.8	19.0	18.3	19.4	19.8
	4H	18.6	19.6	19.1	20.1	20.6	18.7	19.7	19.2	20.2	20.7
	6H	19.4	20.3	19.9	20.8	21.3	19.5	20.4	20.0	20.9	21.4
	8H	19.8	20.6	20.3	21.1	21.6	19.9	20.7	20.4	21.2	21.7
	12H	20.1	20.9	20.6	21.4	21.9	20.2	21.0	20.7	21.5	22.0
8H	4H	19.0	19.9	19.5	20.3	20.8	19.1	19.9	19.6	20.4	20.9
	6H	20.0	20.7	20.5	21.2	21.8	20.1	20.8	20.6	21.3	21.8
	8H	20.5	21.1	21.0	21.7	22.2	20.6	21.2	21.1	21.7	22.3
	12H	21.0	21.5	21.5	22.1	22.7	21.1	21.6	21.6	22.2	22.8
12H	4H	19.1	19.8	19.6	20.3	20.9	19.2	19.9	19.7	20.4	20.9
	6H	20.1	20.8	20.7	21.3	21.9	20.2	20.9	20.8	21.4	21.9
	8H	20.7	21.3	21.2	21.8	22.4	20.8	21.4	21.3	21.9	22.5

Maximum UGR = 22.8

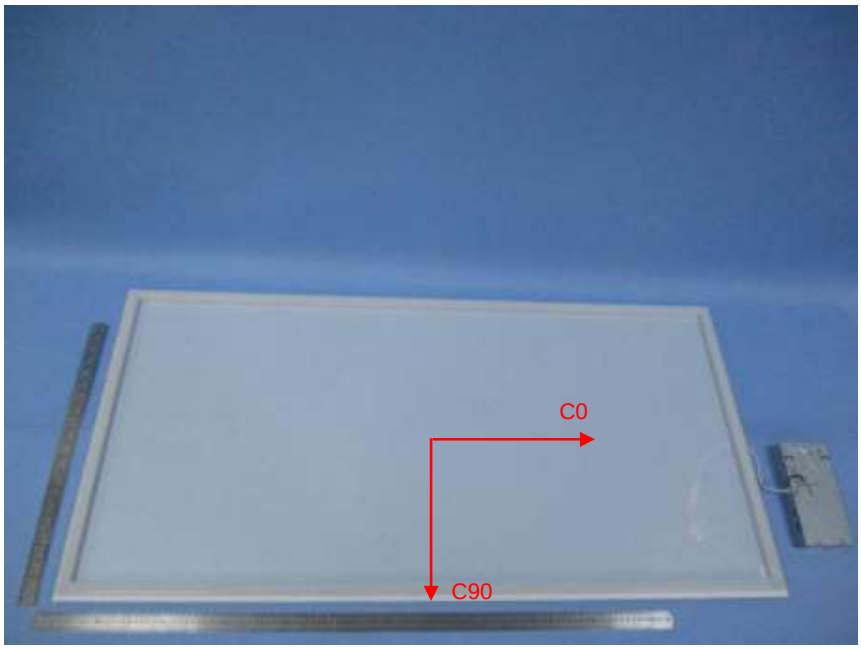
Note:

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

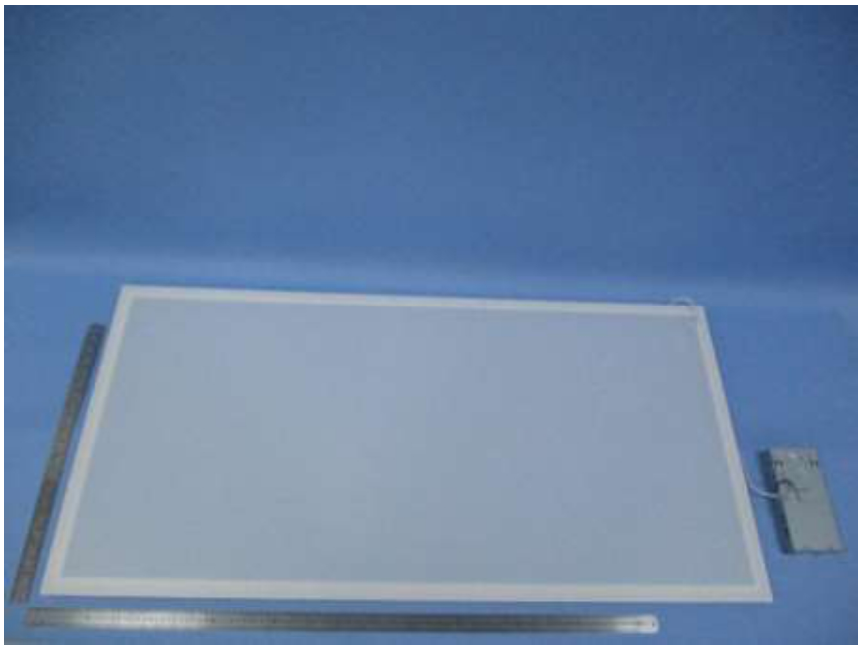
4.7 Candela Tabulation of 3000K

	0	15	30	45	60	75	90
0	2715.561	2715.561	2715.561	2715.561	2715.561	2715.561	2715.561
5	2696.690	2697.582	2698.445	2698.906	2698.017	2697.635	2696.906
10	2644.122	2643.200	2645.296	2645.344	2648.088	2647.225	2646.717
15	2560.103	2554.884	2559.717	2560.271	2563.972	2563.653	2562.327
20	2433.850	2432.633	2441.935	2441.666	2446.794	2447.367	2449.512
25	2278.393	2281.618	2290.368	2295.152	2299.927	2299.715	2299.832
30	2101.370	2102.962	2114.929	2120.957	2146.753	2123.830	2126.612
35	1904.127	1905.428	1916.520	1923.580	1926.352	1928.678	1926.298
40	1697.001	1698.907	1710.457	1714.050	1720.559	1723.890	1728.649
45	1498.411	1498.232	1497.633	1524.346	1514.092	1518.654	1522.118
50	1293.081	1295.306	1297.425	1292.515	1302.228	1312.968	1313.365
55	1098.535	1099.798	1101.044	1105.715	1109.705	1115.354	1114.384
60	909.830	908.108	933.519	920.942	921.455	924.459	921.176
65	730.560	736.870	741.160	746.074	752.323	745.211	743.515
70	569.711	575.294	582.615	589.655	591.288	584.116	578.289
75	422.341	445.638	440.058	446.969	445.097	436.912	430.386
80	292.493	303.602	317.771	324.986	321.396	306.287	291.365
85	186.908	199.331	217.105	223.259	216.138	198.739	180.771
90	104.687	86.297	100.456	105.335	101.880	92.765	79.060
95	28.755	32.136	33.109	35.785	41.383	43.915	43.083
100	8.986	14.384	25.674	28.808	31.487	34.057	33.756
105	25.610	24.944	28.151	30.158	30.588	28.679	28.426
110	23.813	21.124	25.900	28.808	28.788	25.767	26.205
115	22.914	21.124	24.774	27.233	27.889	24.198	25.317
120	22.914	21.573	23.872	25.657	24.291	22.854	23.096
125	22.016	21.124	18.017	23.856	18.892	21.062	22.208
130	21.117	19.326	17.116	17.554	17.093	19.269	19.987
135	19.320	18.427	15.764	7.427	15.744	17.476	18.210
140	16.175	14.832	8.557	8.102	8.097	12.547	16.434
145	10.783	10.562	10.360	10.353	10.121	10.082	10.216
150	12.580	12.135	11.711	11.703	11.695	11.651	11.548
155	14.378	13.484	13.062	13.053	13.045	12.995	12.880
160	14.827	14.607	14.413	14.404	14.394	14.340	14.213
165	15.725	15.731	15.765	15.754	15.744	15.236	15.545
170	16.624	16.405	16.891	16.654	16.418	16.356	16.434
175	17.972	17.753	17.566	17.330	17.318	17.701	17.766
180	8.975	8.975	8.975	8.975	8.975	8.975	8.975

Appendix A Product Photo



Picture 1



Picture 2

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